PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference PCT17-854	**FOR FURTHER ACTION** See item 4 below	
International application No. PCT/KR2017/012992	International filing date *(day/month/year)* 16 November 2017 (16.11.2017)	Priority date *(day/month/year)* 16 November 2016 (16.11.2016)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant KT CORPORATION		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 21 May 2019 (21.05.2019)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Kihwan Moon e-mail: pct.team1@wipo.int

Form PCT/IB/373 (January 2004)

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000001

특허협력조약

발신: 국제조사기관

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PCT

국제조사기관의 견해서

(PCT규칙 43의2.1)

발송일 *(일/월/년)*	2018년 02월 06일 (06.02.2018)
출원인 또는 대리인의 서류참조기호 PCT17-854	**추가적인 조치** 아래 2를 참조

국제출원번호	국제출원일 *(일/월/년)*	우선일 *(일/월/년)*
PCT/KR2017/012992	2017년 11월 16일 (16.11.2017)	2016년 11월 16일 (16.11.2016)

국제특허분류(IPC)
H04W 72/04(2009.01)i, H04W 72/12(2009.01)i

출원인
주식회사 케이티

1. 본 견해서는 다음 기재란에 관한 내용을 포함합니다.
   - ☒ 제1기재란 견해서의 기초
   - ☐ 제2기재란 우선권
   - ☐ 제3기재란 신규성, 진보성 및 산업상이용가능성에 관한 견해 부작성
   - ☐ 제4기재란 발명의 단일성 결여
   - ☒ 제5기재란 신규성, 진보성 또는 산업상이용가능성에 관한 견해(PCT규칙 43의2.1(a)(i)), 이를 뒷받침하는 인용문헌 및 설명
   - ☐ 제6기재란 특이 인용문헌
   - ☐ 제7기재란 국제출원의 흠결
   - ☐ 제8기재란 국제출원에 관한 의견

2. **추가적인 조치**

국제예비심사가 청구되면, 본 견해서는 국제예비심사기관("IPEA")의 견해서로 간주될 것입니다. 다만, 출원인이 본 기관 이외의 기관을 IPEA로 선택하고, 그 선택된 IPEA가 PCT규칙 66.1의2(b)에 따라 본 국제조사기관의 견해서가 위와 같이 간주되지 않을 것임을 국제사무국에 통보한 경우에는 그러하지 않습니다.

본 견해서가 상기와 같이 IPEA의 견해서로 간주되는 경우, 출원인은 서식 PCT/ISA/220의 발송일로부터 3월 또는 우선일부터 22월 중 늦게 만료되는 날 이전에 의견서 및 보정서(해당하는 경우)를 IPEA에 제출할 수 있습니다.

다른 선택사항에 대하여는 서식 PCT/ISA/220에 대한 안내문을 참조하십시오.

ISA/KR의 명칭 및 우편주소	본 견해서의 완료일	심사관
대한민국 특허청 (35208) 대전광역시 서구 청사로 189, 4동 (둔산동, 정부대전청사) 팩스번호 +82-42-481-8578	2018년 02월 06일 (06.02.2018)	진상범 전화번호 +82-42-481-8398

서식 PCT/ISA/237 (표지) (2015년 1월)

국제조사기관의 견해서

국제출원번호
PCT/KR2017/012992

제1기재란 본 견해서의 기초

1. **언어**와 관련하여, 본 견해서는 아래에 기초하여 작성되었습니다.

☒ 출원시의 언어로 된 국제출원

☐ 국제조사를 위하여 _____ 로 번역되어 제출된 국제출원의 번역문
(PCT규칙 12.3(a) 및 23.1(b))

2. ☐ 본 견해서는 PCT규칙 91에 따라 당해 기관이 허가하였거나 당해 기관에 통보된 **명백한 잘못의 정정**을 고려하여 작성되었습니다(PCT규칙 43의2.1(a)).

3. ☐ 국제출원에 개시된 핵산염기 및/또는 아미노산 서열과 관련하여, 본 견해서는 아래에 기초하여 작성되었습니다.

a. ☐ 아래의 형태로 출원시 국제출원의 일부를 구성하는 서열목록

☐ 부록 C/ST.25 텍스트 파일

☐ 서면 혹은 이미지 파일

b. ☐ PCT 규칙 13의3.1(a)에 따라 국제출원과 함께 국제조사만을 목적으로 부록 C/ST.25 텍스트 파일의 형태로 제출된 서열목록

c. ☐ 국제조사만을 목적으로 국제출원일 이후에 아래 형태로 제출된 서열목록

☐ 부록 C/ST.25 텍스트 파일 (규칙 13의3.1(a))

☐ 서면 혹은 이미지 파일 (규칙 13의3.1(b) 및 시행세칙 713)

4. ☐ 추가로 서열목록에 대하여 하나 이상의 버전이나 사본이 제출된 경우, 후속 버전 또는 추가된 사본에 기재되어 있는 정보가 출원시 출원의 일부를 구성하는 정보와 동일하거나 또는 출원시의 개시범위를 벗어나지 않는다는 진술서가 제출되었습니다.

5. 추가 의견:

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000003

국제조사기관의 견해서

국제출원번호
PCT/KR2017/012992

제5기재란 신규성, 진보성 또는 산업상이용가능성에 관한 견해(PCT규칙 43의2.1(a)(i)), 이를 뒷받침하는 인용문헌 및 설명

1. 견해

신규성 (N)	청구항	1-20	있음
	청구항	없음	없음
진보성 (IS)	청구항	없음	있음
	청구항	1-20	없음
산업상 이용가능성 (IA)	청구항	1-20	있음
	청구항	없음	없음

2. 인용문헌 및 설명:

참고한 인용문헌은 다음과 같습니다.

D1: US 2016-0113008 A1 (QUALCOMM INCORPORATED) 2016.04.21

D2: INTEL CORPORATION, 'Downlink URLLC transmission and multiplexing with eMBB', R1-1612003, 3GPP TSG RAN WG1 Meeting #87, Reno, USA, 2016.11.06

2.1. 신규성 및 진보성

2.1.1. 청구항 제1항-제5항

2.1.1.1. 독립항 제1항

청구항 제1항의 발명과 가장 근접한 인용문헌 D1에는 사용자 장치(UE)가 자원의 선점(preempting)을 위한 제어신호를 수신하는 것; 상기 제어 신호에 대한 모니터링 여부를 지시하는 다른 신호를 수신하는 것; 가능한 선점(possible preemption)을 위한 일련의 심볼들을 모니터링하는 것; 및 자원 선점을 위한 무선 통신 시스템을 브로드캐스트(broadcast)로 구성하는 것을 특징으로 하는 방법이 제시되어 있습니다(D1: 단락 [0002]-[0003], [0059], [0063] 및 [0065] 참조).

다만, 청구항 제1항의 발명은 '하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함'하는 점에서 인용문헌 D1과 차이가 있습니다. 그러나 URLLC에 의한 eMBB의 선점(preemption)에 관한 동일 기술 분야인 인용문헌 D2에는 적절한 간섭 추정을 촉진하기 위하여 셀 간 UE들에게 URLLC 전송에 대해서 통보하는 것 및 이러한 기능은 셀 내의 선점 이벤트(preempting event)를 다루는 것과 공통적인 특징(D2: 섹션 3 참조)이 기재되어 있습니다. 인용문헌 D1에는 선점(preempting)에 관한 모니터링 지시 신호를 수신하는 것이 기재되어 있으며(D1: 단락 [0034] 참조), 이에 적절한 간섭 추정을 위하여 셀 간 UE들에게 URLLC 전송 통보하는 것에 관한 인용문헌 D2를 채택하여 인용문헌 D1에 결합하는 것은

추가 기재란에 계속

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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추가 기재란

이전 기재란의 공간이 충분하지 아니한 경우.
제5 기재란의 연속

통상의 기술자에게 별다른 어려움이 없습니다.

따라서 청구항 제1항은 인용문헌 D1 및 D2의 결합으로부터 자명한 것이므로 PCT 제33조(3)에 따른 진보성이 없습니다.

2.1.1.2. 종속항 제2항-제5항

청구항 제2항에 기재된 추가적인 기술적 특징은 인용문헌 D2의 하향 eMBB/URLLC는 다른 서브 캐리어 스페이싱을 사용하는 것(D2: 섹션 1 참조)으로부터 통상의 지식을 가진 자가 용이하게 도출할 수 있습니다.

청구항 제3항에 기재된 추가적인 기술적 특징은 인용문헌 D1의 UE는 RRC와 같은 제어 신호를 통해서 선점을 위한 모니터링을 설정하는 특징(D1: 단락 [0059] 참조)으로부터 통상의 지식을 가진 자가 용이하게 도출할 수 있습니다.

청구항 제4항-제5항에 기재된 추가적인 기술적 특징은 인용문헌 D1의 제어 신호는 다수의 UE들이 디코딩하는 공통 신호를 포함하는 것 및 미리 정해진 심볼들을 다운링크 그랜트, RRC 신호, PDCCH 신호 또는 SIB에 지정하는 특징(D1: 단락 [0013] 및 [0060] 참조)으로부터 통상의 지식을 가진 자가 용이하게 도출할 수 있습니다.

따라서 인용문헌 D1과 인용문헌 D2에 기재된 기술적 특징을 결합하는 것은 통상의 지식을 가진 자에게 자명하므로, 청구항 제2항 내지 제5항은 PCT 제33조(3)에 따른 진보성이 없습니다.

2.1.2. 청구항 제6항-제10항

2.1.2.1. 독립항 제6항

청구항 제6항의 발명과 가장 근접한 인용문헌 D1에는 기지국이 선점(preempting)을 지시하는 제어신호를 전송하는 것; 기지국이 특정 UE에 대해서 제어 신호를 전송하여 특정 심볼들을 모니터링하도록 결정하는 것; 및 기지국이 제어 신호를 전송하여 UE로 하여금 하향링크 자원에 대한 선점을 지시하는 것; 및 자원 선점을 위한 무선 통신 시스템을 브로드캐스트(broadcast)로 구성하는 것을 특징으로 하는 방법이 제시되어 있습니다(D1: 단락 [0002]-[0003], [0038], [0058]-[0060], 및 [0062] 참조).

다만, 청구항 제6항의 발명은 '하향링크 선점 지시정보는 제1 서비스를 제공하기 위한

다음 페이지에 계속

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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추가 기재란

이전 기재란의 공간이 충분하지 아니한 경우.
이전 기재란의 연속

무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함'하는 점에서 인용문헌 D1과 차이가 있습니다. 그러나 URLLC에 의한 eMBB의 선점(preemption)에 관한 동일 기술 분야인 인용문헌 D2에는 적절한 간섭 추정을 촉진하기 위하여 셀 간 UE들에게 URLLC 전송에 대해서 통보하는 것 및 이러한 기능은 셀 내의 선점 이벤트(preempting event)를 다루는 것과 공통적인 특징(D2: 섹션 3 참조)이 기재되어 있습니다. 인용문헌 D1에는 선점(preempting)에 관한 모니터링 지시 신호를 수신하는 것이 기재되어 있으며(D1: 단락 [0034] 참조), 이에 적절한 간섭 추정을 위하여 셀 간 UE들에게 URLLC 전송 통보에 관한 인용문헌 D2를 채택하여 인용문헌 D1에 결합하는 것은 통상의 기술자에게 별다른 어려움이 없습니다.

따라서 청구항 제6항은 인용문헌 D1 및 D2의 결합으로부터 자명한 것이므로 PCT 제33조(3)에 따른 진보성이 없습니다.

2.1.2.2. 종속항 제7항-제10항

청구항 제7항에 기재된 추가적인 기술적 특징은 인용문헌 D2의 하향 eMBB/URLLC는 다른 서브 캐리어 스페이싱을 사용하는 것(D2: 섹션 1 참조)으로부터 통상의 지식을 가진 자가 용이하게 도출할 수 있습니다.

청구항 제8항에 기재된 추가적인 기술적 특징은 인용문헌 D1의 UE는 RRC와 같은 제어 신호를 통해서 선점을 위한 모니터링을 설정하는 특징(D1: 단락 [0059] 참조)으로부터 통상의 지식을 가진 자가 용이하게 도출할 수 있습니다.

청구항 제9항-제10항에 기재된 추가적인 기술적 특징은 인용문헌 D1의 제어 신호는 다수의 UE들이 디코딩하는 공통 신호를 포함하는 것 및 미리 정해진 심볼들을 다운링크 그랜트, RRC 신호, PDCCH 신호 또는 SIB에 지정하는 특징(D1: 단락 [0013] 및 [0060] 참조)으로부터 통상의 지식을 가진 자가 용이하게 도출할 수 있습니다.

따라서 인용문헌 D1과 인용문헌 D2에 기재된 기술적 특징을 결합하는 것은 통상의 지식을 가진 자에게 자명하므로, 청구항 제7항 내지 제10항은 PCT 제33조(3)에 따른 진보성이 없습니다.

2.1.3. 청구항 제11항-제15항

2.1.3.1. 독립항 제11항

다음 페이지에 계속

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
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추가 기재란

이전 기재란의 공간이 충분하지 아니한 경우.
이전 기재란의 연속

청구항 제11항은 '단말'에 관한 발명으로서, 청구항 제1항에 기재된 발명과 동일한 기술적 특징을 포함하고 있습니다. 따라서 청구항 제1항에 적용된 논리가 청구항 제11항에 적용될 수 있으므로, 청구항 제11항은 PCT 제33조(3)에 따른 진보성이 없습니다.

2.1.3.2. 종속항 제12항-제15항

청구항 제12항-제15항에 기재된 기술적 특징은 각각 청구항 제2항-제5항에 기재된 기술적 특징과 실질적으로 동일합니다. 따라서 청구항 제12항-제15항은 PCT 제33조(3)에 따른 진보성이 없습니다.

2.1.4. 청구항 제16항-제20항

2.1.4.1. 독립항 제16항

청구항 제16항은 '기지국'에 관한 발명으로서, 청구항 제6항에 기재된 발명과 동일한 기술적 특징을 포함하고 있습니다. 따라서 청구항 제6항에 적용된 논리가 청구항 제16항에 적용될 수 있으므로, 청구항 제16항은 PCT 제33조(3)에 따른 진보성이 없습니다.

2.1.4.2. 종속항 제17항-제20항

청구항 제17항-제20항에 기재된 기술적 특징은 각각 청구항 제7항-제10항에 기재된 기술적 특징과 실질적으로 동일합니다. 따라서 청구항 제17항-제20항은 PCT 제33조(3)에 따른 진보성이 없습니다.

2.2. 산업상 이용가능성

청구항 제1항 내지 제20항에 기재된 발명은 PCT 제33조(4)에 따라 산업상 이용가능합니다.

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference PCT17-854	**FOR FURTHER ACTION** See item 4 below	
International application No. PCT/KR2017/012992	International filing date *(day/month/year)* 16 November 2017 (16.11.2017)	Priority date *(day/month/year)* 16 November 2016 (16.11.2016)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant KT CORPORATION		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 10 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 21 May 2019 (21.05.2019)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Kihwan Moon e-mail: pct.team1@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

TRANSLATION

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	06.02.2018
Applicant's or agent's file reference: PCT17-854	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/KR2017/012992	16.11.2017	16.11.2016

International Patent Classification (IPC) or both national classification and IPC
H04W72/04(2009.01)i, H04W72/12(2009.01)i

Applicant
KT CORPORATION

1. This opinion contains indications relating to the following items:

- ☒ Box No. I — Basis of the opinion
- ☐ Box No. II — Priority
- ☐ Box No. III — Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV — Lack of unity of invention
- ☒ Box No. V — Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI — Certain documents cited
- ☐ Box No. VII — Certain defects in the international application
- ☐ Box No. VIII — Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/KR	Date of completion of this opinion	Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/237 (cover sheet) (January 2015)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/KR2017/012992

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

☒ the international application in the language in which it was filed

☐ a translation of the international application into _____ , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

a. ☐ forming part of the international application as filed:

☐ in the form of an Annex C/ST.25 text file.

☐ on paper or in the form of an image file.

b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/KR2017/012992

Box No. V **Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-20	YES
	Claims	None	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-20	NO
Industrial applicability (IA)	Claims	1-20	YES
	Claims	None	NO

2. Citations and explanations:

Reference is made to the following documents:

D1: US 2016-0113008 A1 (QUALCOMM INCORPORATED) 21 April 2016

D2: INTEL CORPORATION, "Downlink URLLC Transmission and Multiplexing with eMBB," R1-1612003, 3GPP TSG RAN WG1 Meeting #87, Reno, USA, 06 November 2016

2.1. Novelty and Inventive Step

2.1.1. Claims 1-5

2.1.1.1. Independent Claim 1

Document D1, which is most relevant to the invention as in claim 1, discloses a method comprising: receiving, by user equipment (UE), a control signal for preempting of resources; receiving other signals indicating whether to monitor the control signal; monitoring a series of symbols for possible preemption; and configuring, as a broadcast, a wireless communication system for resource

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Box No. V **Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

preemption (see D1, paragraphs [0002], [0003], [0059], [0063], and [0065]).

The invention as in claim 1 only differs from the invention of document D1 in that "downlink preemption indication information includes information for indicating overlapping wireless resources of wireless resources for providing a first service and wireless resources for providing a second service." However, document D2 belonging to the same technical field of preemption of eMBB by means of URLLC discloses the same features as the features wherein: UEs between cells are notified of URLLC transmission in order to promote proper interference estimation; and such a function is to handle a preempting event within the cells (see D2, section 3).

Document D1 discloses the feature of receiving a monitoring indication signal regarding preempting (see D1, paragraph [0034]). Thus, adopting document D2 pertaining to notifying UEs between cells of URLLC transmission for proper interference estimation and combining document D2 with document D1 does not involve any difficulty to a person skilled in the art.

Thus, since claim 1 would be obvious from the combination of documents D1 and D2, claim 1 does not involve an inventive step under PCT Article 33(3).

2.1.1.2. Dependent Claims 2-5

The additional technical feature set forth in claim 2 could be easily derived by a person skilled in the art from the feature in document D2, wherein downlink eMBB/URLLC uses other subcarrier spacing (see D2, section 1).

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The additional technical feature set forth in claim 3 could be easily derived by a person skilled in the art from the feature in document D1, wherein the UE sets monitoring for preemption through the control signal such as an RRC signal (see D1, paragraph [0059]).

The additional technical features set forth in claims 4-5 could be easily derived by a person skilled in the art from the features in document D1, wherein: the control signal includes a common signal decoded by a plurality of UEs; and predetermined symbols are assigned to a downlink grant, an RRC signal, a PDCCH signal, or a SIB (see D1, paragraphs [0013] and [0060]).

Thus, since combining the technical features disclosed in documents D1 and D2 would be obvious to a person skilled in the art, claims 2-5 do not involve an inventive step under PCT Article 33(3).

2.1.2. Claims 6-10

2.1.2.1. Independent Claim 6

Document D1, which is most relevant to the invention as in claim 6, discloses a method comprising: allowing a base station to transmit the control signal indicating preempting; allowing the base station to make a determination such that the control signal is transmitted to specific UE so as to monitor specific symbols; allowing the base station to transmit the control signal such that the UE indicates preempting of downlink

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resources; and configuring, as the broadcast, the wireless communication system for resource preemption (see D1, paragraphs [0002], [0003], [0038], [0058]-[0060], and [0062]).

The invention as in claim 6 only differs from the invention of document D1 in that "downlink preemption indication information includes information for indicating overlapping wireless resources of wireless resources for providing a first service and wireless resources for providing a second service." However, document D2 belonging to the same technical field of preemption of eMBB by means of URLLC discloses the same features as the features wherein: the UEs between the cells are notified of the URLLC transmission in order to promote the proper interference estimation; and such a function is to handle the preempting event within the cells (see D2, section 3). Document D1 discloses the feature of receiving the monitoring indication signal regarding preempting (see D1, paragraph [0034]). Thus, adopting document D2 pertaining to notifying the UEs between the cells of the URLLC transmission for the proper interference estimation and combining document D2 with document D1 does not involve any difficulty to a person skilled in the art.

Thus, since claim 6 would be obvious from the combination of documents D1 and D2, claim 6 does not involve an inventive step under PCT Article 33(3).

2.1.2.2. Dependent Claims 7-10

The additional technical feature set forth in claim 7 could be easily derived by a person skilled in the art

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from the feature in document D2, wherein the downlink eMBB/URLLC uses the other subcarrier spacing (see D2, section 1).

The additional technical feature set forth in claim 8 could be easily derived by a person skilled in the art from the feature in document D1, wherein the UE sets the monitoring for preemption through the control signal such as the RRC signal (see D1, paragraph [0059]).

The additional technical features set forth in claims 9-10 could be easily derived by a person skilled in the art from the features in document D1, wherein: the control signal includes the common signal decoded by the plurality of UEs; and the predetermined symbols are assigned to the downlink grant, the RRC signal, the PDCCH signal, or the SIB (see D1, paragraphs [0013] and [0060]).

Thus, since combining the technical features disclosed in documents D1 and D2 would be obvious to a person skilled in the art, claims 7-10 do not involve an inventive step under PCT Article 33(3).

2.1.3. Claims 11-15

2.1.3.1. Independent Claim 11

The invention as in claim 11 pertains to a "terminal." The invention as in claim 11 includes the same technical feature as those of the invention as set forth in claim 1. Thus, since the same reasoning as discussed with

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respect to claim 1 can be applied to claim 11, claim 11 does not involve an inventive step under PCT Article 33(3).

2.1.3.2. Dependent Claims 12-15

The technical features set forth in claims 12-15 are substantially the same as those set forth in claims 2-5, respectively. Thus, claims 12-15 do not involve an inventive step under PCT Article 33(3).

2.1.4. Claims 16-20

2.1.4.1. Independent Claim 16

The invention as in claim 16 pertains to a "base station." The invention as in claim 16 includes the same technical feature as those of the invention as set forth in claim 6. Thus, since the same reasoning as discussed with respect to claim 6 can be applied to claim 16, claim 16 does not involve an inventive step under PCT Article 33(3).

2.1.4.2. Dependent Claims 17-20

The technical features set forth in claims 17-20 are substantially the same as those set forth in claims 7-10, respectively. Thus, claims 17-20 do not involve an inventive step under PCT Article 33(3).

2.2. Industrial Applicability

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Box No. V **Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

The invention as set forth in claims 1-20 is industrially applicable under PCT Article 33(4).

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PTO-1390 (01-18)
Approved for use through 8/31/2019. OMB 0651-0021
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371

Attorney Docket No.	
811.0177	
U.S. Application No. (if known, see 37 CFR 1.5)	

International Application No.	International Filing Date	Priority Date Claimed
PCT/KR2017/012992	November 16, 2017	November 16, 2016

Title of Invention
METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

First Named Inventor
PARK, Kyujin

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). NOTE: The express request under 35 U.S.C. 371(f) will not be effective unless the requirements under 35 U.S.C. 371(c)(1), (2), and (4) for payment of the basic national fee, copy of the International Application and English translation thereof (if required), and the oath or declaration of the inventor(s) have been received.
2. ☒ A copy of the International Application (35 U.S.C. 371(c)(2)) is attached hereto (not required if the International Application was previously communicated by the International Bureau or was filed in the United States Receiving Office (RO/US)).
3. An English language translation of the International Application (35 U.S.C. 371(c)(2))
   a. ☒ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
4. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4))
   a. ☒ is attached.
   b. ☐ was previously filed in the international phase under PCT Rule 4.17(iv).

Items 5 to 8 below concern amendments made in the international phase.

PCT Article 19 and 34 amendments

5. ☐ Amendments to the claims under PCT Article 19 are attached (not required if communicated by the International Bureau) (35 U.S.C. 371(c)(3)).
6. ☐ English translation of the PCT Article 19 amendment is attached (35 U.S.C. 371(c)(3)).
7. ☐ English translation of annexes (Article 19 and/or 34 amendments only) of the International Preliminary Examination Report is attached (35 U.S.C. 371(c)(5)).

Cancellation of amendments made in the international phase

8a. ☐ Do not enter the amendment made in the international phase under PCT Article 19.

8b. ☐ Do not enter the amendment made in the international phase under PCT Article 34.

NOTE: A proper amendment made in English under Article 19 or 34 will be entered in the U.S. national phase application absent a clear instruction from applicant not to enter the amendment(s).

The following items 9 to 17 concern a document(s) or information included.

9. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
10. ☒ A preliminary amendment.
11. ☒ An Application Data Sheet under 37 CFR 1.76.
12. ☐ A substitute specification. NOTE: A substitute specification cannot include claims. See 37 CFR 1.125(b).
13. ☒ A power of attorney and/or change of address letter.
14. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13*ter*.3 and 37 CFR 1.821-1.825 (not required if sequence listing in text format was indicated on the PCT Request as part of the International Application and the sequence listing was published as part of the international application).
15. ☐ Assignment papers *(cover sheet and document(s))*. Name of Assignee: _____
16. ☐ 37 CFR 3.73(c) Statement *(when there is an Assignee)*.

This collection of information is required by 37 CFR 1.414 and 1.491-1.492. The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 15 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

U.S. APPLN. No. (if known – see 37 CFR 1.5)	INTERNATIONAL APPLICATION No.	ATTORNEY DOCKET No.
	PCT/KR2017/012992	811.0177

17. ☐ Other items or information:

The following fees have been submitted.	CALCULATIONS
18. ■ Basic national fee (37 CFR 1.492(a)) **$300**	$ 300
19. ■ Examination fee (37 CFR 1.492(c)) • If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)..... **$0** • All other situations **$760**	$ 760
20. ■ Search fee (37 CFR 1.492(b)) • If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4)..... **$0** • Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority ..... **$140** • International Search Report prepared by an ISA other than the US and provided to the Office or previously communicated to the US by the IB..... **$520** • All other situations **$660**	520 $
TOTAL OF 18, 19, and 20 =	$ 1,580

☐ Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing in compliance with 37 CFR 1.821(c) or (e) in an electronic medium or computer program listing in an electronic medium) (37 CFR 1.492(j)).

Fee for each additional 50 sheets of paper or fraction thereof **$400**

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof (round **up** to a whole number)	RATE	
- 100 =	/ 50 =		x **$400**	$

Surcharge for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h))..... **$140**	$

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	15 - 20 =		x **$100**	$ 0
Independent claims	3 - 3 =		x **$460**	$ 0
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			**+ $820**	$

Fee for submission of Sequence Listing text file of 300 MB to 800 MB (37 CFR 1.21(o)(1))..... **$1,000**	$
Fee for submission of Sequence Listing text file of more than 800 MB (37 CFR 1.21(o)(2))..... **$10,000**	$
Processing fee for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i))..... **$140 +**	$
TOTAL OF ABOVE CALCULATIONS =	$ 1,580
☐ **Applicant asserts small entity status.** See 37 CFR 1.27. Fees above are reduced by ½.	
☐ **Applicant certifies micro entity status.** See 37 CFR 1.29. Fees above are reduced by ¾. Applicant must attach form PTO/SB/15A or B or equivalent.	
TOTAL NATIONAL FEE =	$ 1,580
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31)..... **$50.00** per property **+**	$
TOTAL FEES ENCLOSED =	$ 1,580

a. ☐ A check in the amount of $_____ to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $_____ to cover the above fees.

c. ☒ The Director is hereby authorized to charge additional fees which may be required, or credit any overpayment, to Deposit Account No. 602802 as follows:

i. ☒ any required fee.

ii. ☐ any required fee except for excess claims fees required under 37 CFR 1.492(d) and (e) and multiple dependent claim fee required under 37 CFR 1.492(f).

d. ☒ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038. The PTO-2038 should only be mailed or faxed to the USPTO. However, when paying the basic national fee, the PTO-2038 may NOT be faxed to the USPTO.

ADVISORY: If filing by EFS-Web, do **NOT** attach the PTO-2038 form as a PDF along with your EFS-Web submission. Please be advised that this is **not** recommended and by doing so your **credit card information may be displayed via PAIR**. To protect your information, it is recommended to pay fees online by using the electronic payment method.

NOTE: Where an appropriate time limit under 37 CFR 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the International Application to pending status.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013, and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE 1: By providing this statement under 37 CFR 1.55 or 1.78, **this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA**.

NOTE 2: A U.S. national stage application may not claim priority to the international application of which it is the national phase. The filing date of a U.S. national stage application is the international filing date. See 35 U.S.C. 363.

Correspondence Address

☒ The address associated with Customer Number: 76277 **OR** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone			
Email					

Signature	/Ian M. Hughes/	Date	05/14/2019
Name (Print/Type)	Ian M. Hughes, Esq.	Registration No. (Attorney/Agent)	41,083

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	811.0177
	Application Number	
Title of Invention	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Kyujin		PARK	

Residence Information (Select One) US Residency ● Non US Residency Active US Military Service

City	Seoul	Country of Residence [i]	KR

Mailing Address of Inventor:

Address 1	(Korea Telecom Research Center, Umyeon-dong) 151
Address 2	Taebong-ro, Seocho-gu
City	Seoul
State/Province	
Postal Code	137-140
Country [i]	KR

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Woo-jin		CHOI	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Seoul	Country of Residence [i]	KR

Mailing Address of Inventor:

Address 1	(Korea Telecom Research Center, Umyeon-dong) 151
Address 2	Taebong-ro, Seocho-gu
City	Seoul
State/Province	
Postal Code	137-140
Country [i]	KR

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	811.0177
	Application Number	
Title of Invention	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK	

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	76277		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK		
Attorney Docket Number	811.0177	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	8	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	◯ Limited Recognition (37 CFR 11.9)
Customer Number	76277		

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	811.0177
	Application Number	
Title of Invention	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	a 371 of international	PCT/KR2017/012992	2017-11-16

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
10-2016-0152659	KR	2016-11-16	

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
10-2017-0151983	KR	2017-11-15	

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	811.0177
	Application Number	
Title of Invention	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	811.0177
	Application Number	
Title of Invention	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	KT CORPORATION		
Mailing Address Information For Applicant:			
Address 1	(206, Jeongja-dong) 90, Buljeong-ro, Bundang-gu		
Address 2	Seongnam-si		
City	Gyeonggi-do	**State/Province**	
Country	KR	Postal Code	463-711
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	811.0177
	Application Number	
Title of Invention	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

Organization Name	KT CORPORATION

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	(206, Jeongja-dong) 90, Buljeong-ro, Bundang-gu		
Address 2	Seongnam-si		
City	Gyeonggi-do	**State/Province**	
Country i	KR	Postal Code	463-711
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Ian M. Hughes/			Date (YYYY-MM-DD)	2019-05-14
First Name	Ian	Last Name	Hughes	Registration Number	41083

Additional Signature may be generated within this form by selecting the Add button. Add

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	811.0177
	Application Number	
Title of Invention	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000029

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [x] United States application or PCT international application number PCT/KR2017/012992 filed on November 16, 2017.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: PARK, Kyujin Date (Optional): 2019-04-02

Signature: _____

Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [x] United States application or PCT international application number PCT/KR2017/012992 filed on November 16, 2017.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: CHOI, Woo-jin Date (Optional): 2019-04-02

Signature:

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FIG.1

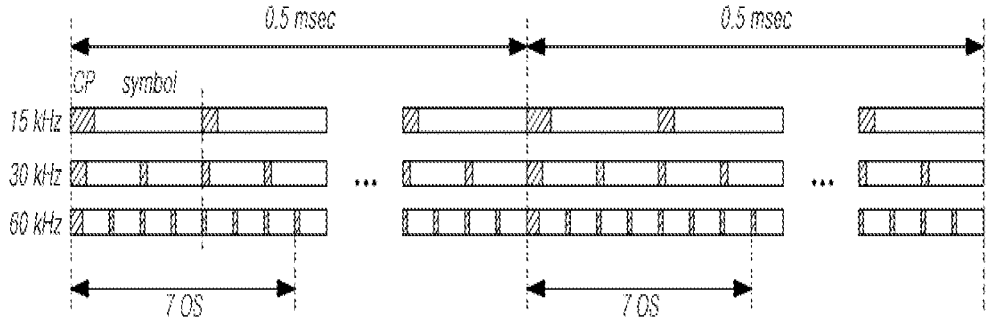

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FIG.2

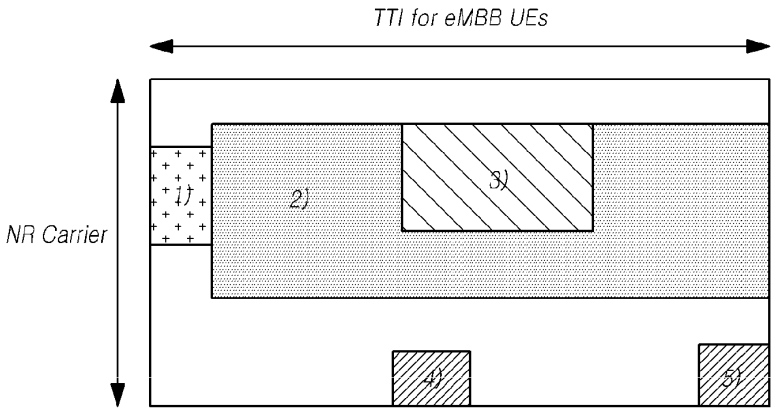

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FIG.3

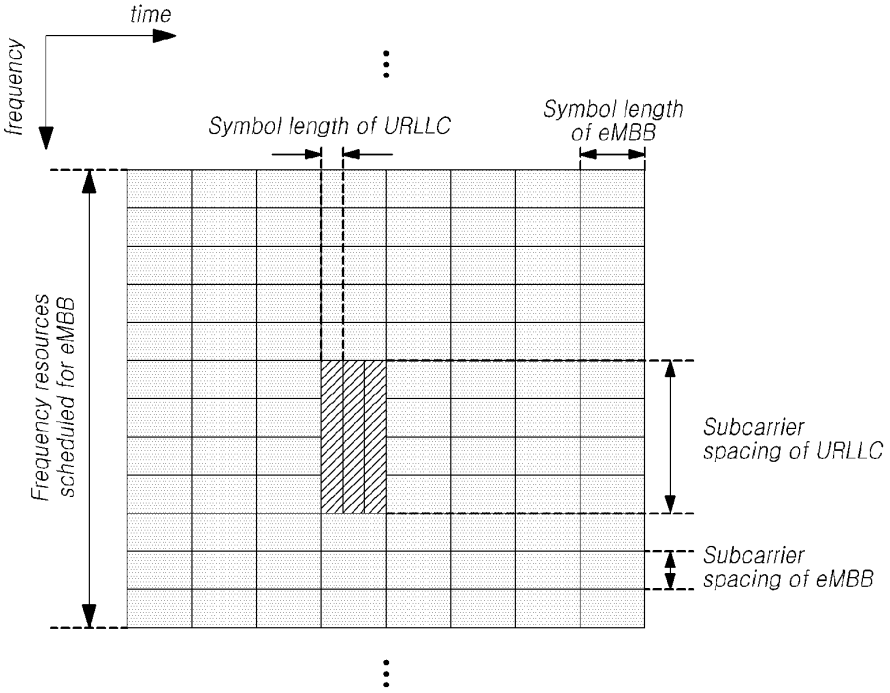

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FIG.4

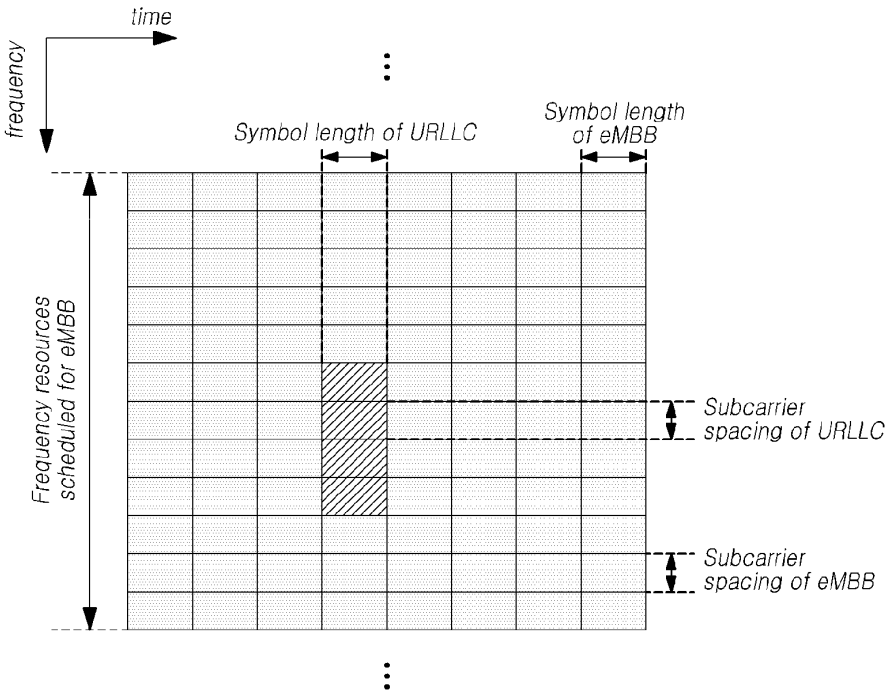

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FIG.5

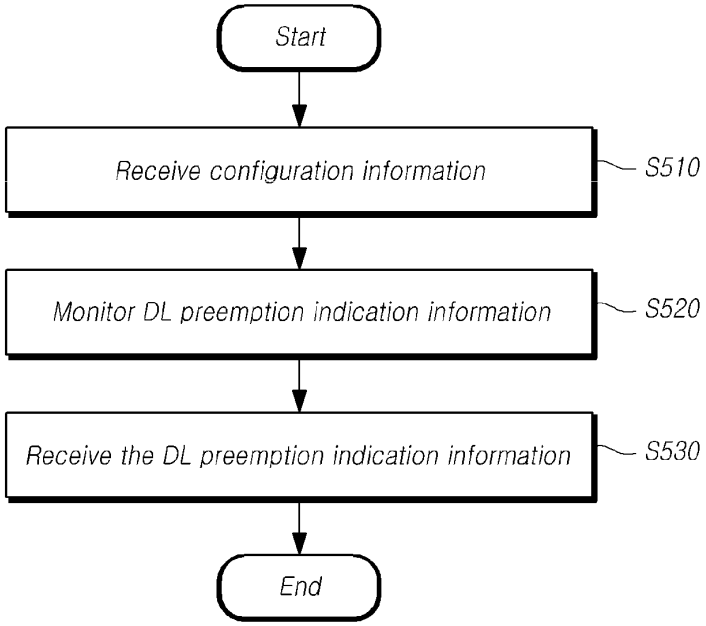

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FIG.6

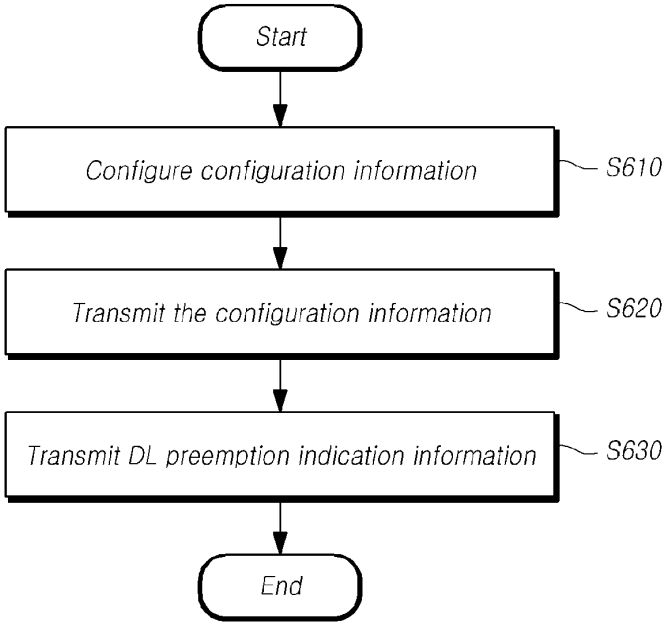

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FIG. 7

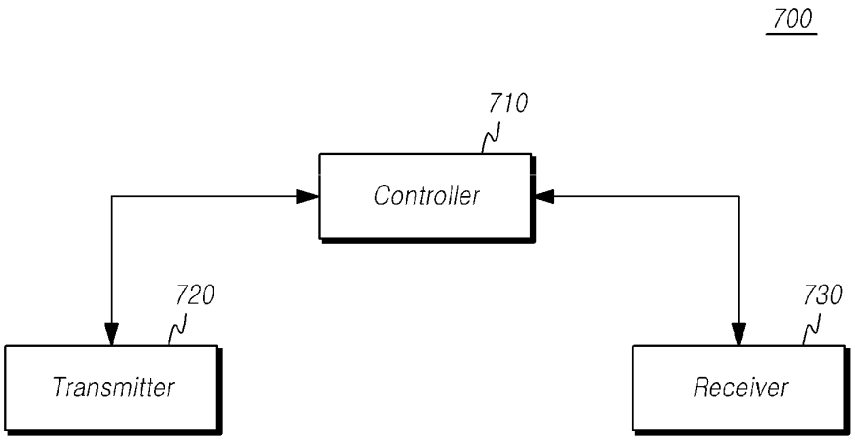

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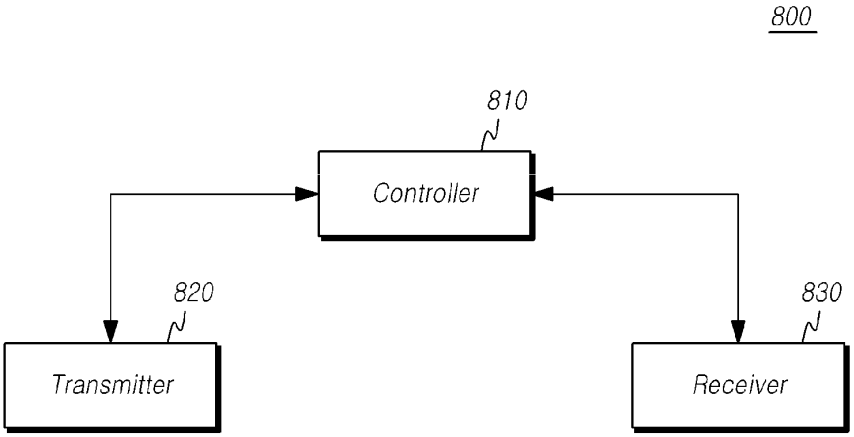
FIG. 8



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【ABSTRACT】

Provided are a method and apparatus for transmitting and receiving a downlink signal for supporting effective multiplexing between data traffic having mutually different QoS requirements in a next generation/5G wireless access network ("New Radio" (NR)) for which discussion has begun in 3GPP. The method may include receiving configuration information for receiving downlink pre-emption indication data from a base station; monitoring the downlink pre-emption indication data based on the configuration information; and receiving the downlink pre-emption indication data through a multicast or unicast signal, wherein the downlink pre-emption indication data indicates superposed radio resources for providing a first service and for providing a second service.

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【CLAIMS】

1. A method of a user equipment (UE) for receiving a downlink (DL) signal, the method comprising:

receiving configuration information for receiving DL preemption indication information from a base station;

monitoring the DL preemption indication information based on the configuration information; and

receiving the DL preemption indication information through a multicast signal or a unicast signal,

wherein the DL preemption indication information includes information for indicating superposed radio resources where radio resources for providing a first service and radio resources for providing a second service are superposed each other.

2. The method according to claim 1, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource for providing the first service is different from that of the radio resource for providing the second service.

3. The method according to claim 1, wherein the configuration information is received through UE-specific radio resource control (RRC) signaling.

4. The method according to claim 1, wherein the DL preemption indication information is received through a common search space or a group common search space of a DL control channel.

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5. The method according to claim 1, wherein the DL preemption indication information is received through a UE-specific search space of a DL control channel.

6. A method of a base station for transmitting a downlink (DL) signal, the method comprising:

generating configuration information for monitoring DL preemption indication information;

transmitting the configuration information to a user equipment (UE); and

transmitting the DL preemption indication information based on the configuration information through a multicast signal or a unicast signal,

wherein the DL preemption indication information includes information for indicating superposed radio resources on which radio resources for providing a first service and radio resources for providing a second service are superposed each other.

7. The method according to claim 6, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource for providing the first service is different from that of the radio resource for providing the second service.

8. The method according to claim 6, wherein the configuration information is transmitted through UE-specific radio resource control (RRC) signaling.

9. The method according to claim 6, wherein the DL preemption indication information is transmitted through a common search space or a group common search space of a DL control channel.

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10. The method according to claim 6, wherein the DL preemption indication information is transmitted through a UE-specific search space of a DL control channel.

11. A user equipment (UE) for receiving a downlink (DL) signal, the user equipment comprising:

a receiver receiving configuration information for receiving DL preemption indication information form a base station; and

a controller monitoring the DL preemption indication information based on the configuration information,

wherein the receiver receives the DL preemption indication information through a multicast signal or a unicast signal,

wherein the DL preemption indication information includes information for indicating superposed radio resources where radio resources for providing a first service and radio resources for providing a second service are superposed each other.

12. The user equipment according to claim 11, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource for providing the first service is different from that of the radio resource for providing the second service.

13. The user equipment according to claim 11, wherein the configuration information is received through UE-specific radio resource control (RRC) signaling.

14. The user equipment according to claim 11, wherein the DL preemption indication information is received through a common search space or a group common search space of a

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DL control channel.

15. The user equipment according to claim 11, wherein the DL preemption indication information is received through a UE-specific search space of a DL control channel.

16. A base station for transmitting a downlink (DL) signal, the base station comprising:

a controller configuring configuration information for monitoring DL preemption indication information; and

a transmitter transmitting the configuration information and transmitting the DL preemption indication information based on the configuration information through a multicast signal or a unicast signal,

wherein the DL preemption indication information includes information for indicating superposed radio resources where radio resources for providing a first service and radio resources for providing a second service are superposed each other.

17. The base station according to claim 16, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource for providing the first service is different from that of the radio resource for providing the second service.

18. The base station according to claim 16, wherein the configuration information is transmitted through UE-specific radio resource control (RRC) signaling.

19. The base station according to claim 16, wherein the DL preemption indication

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information is transmitted through a common search space or a group common search space of a DL control channel.

20. The base station according to claim 16, wherein the DL preemption indication information is transmitted through a UE-specific search space of a DL control channel.

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METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

【TECHNICAL FIELD】

[1] The present invention relates to a method and an apparatus for transmitting and receiving a downlink signal for supporting efficient multiplexing between data traffics each having different QoS requirements from another in a next generation/5G wireless access network ("New Radio" (NR)) that is under discussion in the 3rd generation partnership project (3GPP).

【BACKGROUND ART】

[2] Recently, the 3GPP has approved the "Study on New Radio Access Technology", which is a study item for research on next-generation/5G radio access technology. On the basis of the Study on New Radio Access Technology, Radio Access Network Working Group 1 (RAN WG1) has been discussing frame structures, channel coding and modulation, waveforms, multiple access methods, and the like for the new radio (NR). It is required to design the NR not only to provide an improved data transmission rate as compared with the long term evolution (LTE)/LTE-Advanced, but also to meet various requirements in detailed and specific usage scenarios.

[3] An enhanced mobile broadband (eMBB), massive machine-type communication (mMTC), and ultra-reliable and low latency communication (URLLC) are proposed as representative usage scenarios of the NR. In order to meet the requirements of the individual scenarios, it is required to design the NR to have flexible frame structures, compared with the LTE/LTE-Advanced.

[4] In order to satisfy requirements of such usage scenarios, it is necessary to satisfy various requirements of a per-usage scenario basis first. For example, the URLLC is required to satisfy quick data transmission/reception compared with the eMBB.

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[5] Since resources for transmitting/receiving radio data are limited, there is a limit to efficiently allocate the resources for satisfying requirements of all scenarios together. That is, the eMBB requires to allocate longer time-domain resources for providing a service to many user equipments. On the contrary, the URLLC requires to allocate shorter time-domain resources for low latency.

[6] Accordingly, it is necessary to multiplex radio resources suitable for each usage scenario by utilizing limited radio resources. Also, it needs to develop a specific method for transmitting and receiving radio signals for providing the radio resources.

【DETAILED DESCRIPTION OF THE INVENTION】

【TECHNICAL PROBLEM】

[7] In accordance with embodiments of the present disclosure to address such issues, methods are provided for providing each service to a plurality of user equipments, by efficiently allocating limited radio resources, in communication networks configured with several usage services.

【TECHNICAL SOLUTION】

[8] In accordance with an aspect of the present disclosure, a method of a user equipment is provided for receiving a downlink signal. The method includes: receiving configuration information for receiving downlink preemption indication information from a base station, monitoring the downlink preemption indication information based on the configuration information, and receiving the downlink preemption indication information through a multicast signal or a unicast signal. The downlink preemption indication information includes information for indicating superposed radio resources where a radio resource for providing a first service and a radio resource for providing a second service overlap each other.

[9] In accordance with another aspect of the present disclosure, a method of a base

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station is provided for transmitting a downlink signal. The method includes: configuring configuration information for monitoring downlink preemption indication information, transmitting the configuration information to a user equipment, and transmitting the downlink preemption indication information based on the configuration information through a multicast signal or a unicast signal. The downlink preemption indication information includes information for indicating superposed radio resources where a radio resource for providing a first service and a radio resource for providing a second service overlap each other.

[10] In accordance with still another aspect of the present disclosure, a user equipment is provided for receiving a downlink signal. The user equipment includes: a receiver configured to receive configuration information for receiving downlink preemption indication information from a base station, and a controller configured to monitor the downlink preemption indication information based on the configuration information. The receiver receives the downlink preemption indication information through a multicast signal or a unicast signal. The downlink preemption indication information includes information for indicating superposed radio resources where a radio resource for providing a first service and a radio resource for providing a second service overlap each other.

[11] In accordance with further another aspect of the present disclosure, a base station is provided for transmitting a downlink signal. The base station includes: a controller configured to generate configuration information for monitoring downlink preemption indication information, and a transmitter configured to transmit the configuration information to a user equipment, and to transmit the downlink preemption indication information based on the configuration information through a multicast signal or a unicast signal. The downlink preemption indication information includes information for indicating superposed radio resources where a radio resource for providing a first service and a radio resource for providing a

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second service overlap each other.

【EFFECTS OF THE INVENTION】

[12] In accordance with embodiments of the present disclosure, it is possible to efficiently multiplex for data traffic between services in a network configured with one or more usage services.

[13] In addition, it is possible to prevent unnecessary processing procedure and data loss when user equipment receives downlink data by multiplexing radio resource.

【BRIEF DESCRIPTION OF THE DRAWINGS】

[14] FIG. 1 is a diagram illustrating arrangements of orthogonal frequency division multiple (OFDM) symbols in case of using different subcarrier spacings according to embodiments of the present disclosure.

[15] FIG. 2 is a diagram illustrating a method for transmitting DL preemption indication information to a UE through a pre-notification method or a post-notification method, according to embodiments of the present disclosure.

[16] FIG. 3 is a diagram for describing multiplexing radio resources for different services according to an embodiment of the present disclosure.

[17] FIG. 4 is a diagram for describing multiplexing radio resources for different services according to another embodiment of the present disclosure.

[18] FIG. 5 is a flowchart illustrating operation of a user equipment according to embodiments of the present disclosure.

[19] FIG. 6 is a flowchart illustrating operation of a base station according to embodiments of the present disclosure.

[20] FIG. 7 is a block diagram illustrating a user equipment according to embodiments of the present disclosure.

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[21] FIG. 8 is a block diagram illustrating a base station according to embodiments of the present disclosure.

【BEST MODE FOR CARRYING OUT THE INVENTION】

[22] Hereinafter, embodiments of the present disclosure will be described in detail with reference to the accompanying drawings. In adding reference numerals to elements in each drawing, the same elements will be designated by the same reference numerals, if possible, although they are shown in different drawings. Further, in the following description of the present disclosure, a detailed description of known functions and configurations incorporated herein will be omitted when it is determined that the description may make the subject matter of the present disclosure rather unclear.

[23] In the present disclosure, a wireless communication system refers to a system for providing various communication services such as a voice communication service, a packet data service, etc. The wireless communication system includes user equipment (UE) and a base station (BS).

[24] The UE is a generic term referring to devices used in wireless communication. For example, the UE may be referred to, but not limited to, a UE supporting wideband code division multiple access (WCDMA), long term evolution (LTE), high speed packet access (HSPA), international mobile telecommunications (IMT)-2020 (5G or new radio), or the like, a mobile station (MS) supporting the global system for mobile communication (GSM), a user terminal (UT), a subscriber station (SS), a wireless device, or the like.

[25] The base station or a cell generally refers to a station communicating with the UE. The base station or cell is a generic term referring to, but not limited to, all of various communication service areas and devices, such as a Node-B, an evolved Node-B (eNB), a gNode-B (gNB), a low power node (LPN), a sector, a site, various types of antennas, a base

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transceiver system (BTS), an access point, a point (e.g., a transmitting point, a receiving point, or a transceiving point), a relay node, a megacell, a macrocell, a microcell, a picocell, a femtocell, a remote radio head (RRH), a radio unit (RU), and a small cell.

[26] Each of the various cells is controlled by a base station. Therefore, the base station may be classified into two categories. 1) The base station may be referred to an apparatus that forms and provides a corresponding communication service area, such as a megacell, a macrocell, a microcell, a picocell, a femtocell, and a small cell, or 2) the base station may be referred to a communication service area. In the case of 1), the base station may be referred to i) apparatuses that form a corresponding service area and provide a communication service within the corresponding service area, and are controlled by the same entity, or ii) apparatus that interact and cooperate with each other for forming the corresponding communication service area and providing a communication service within the corresponding communication service. According to communication schemes employed by a base station, the base station may be referred to as a point, a transmission/reception point, a transmission point, a reception point, or the like. In case of 2), the base station may be a communication service area itself where UEs able to receive signals from or transmit signals to other UEs and neighboring base stations.

[27] In the present disclosure, the cell may also refer to a coverage of a signal transmitted from a transmission/reception point, a component carrier having the coverage of a signal transmitted from a transmission point or a transmission/reception point, or a transmission/reception point itself.

[28] The UE and the base station are two entities for performing transmission/reception used to embody the technology and technical spirit described in the present specification. The UE and the base station are a generic term and not limited to specific

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terms or words.

[29] Herein, the uplink (hereinafter, referred to as "UL") refers to data transmission/reception by a UE to/from a base station, and the downlink (hereinafter, referred to as "DL") refers to data transmission/reception by a base station to/from a UE.

[30] UL transmission and DL transmission may be performed by employing i) a time division duplex (TDD) technique performing transmission through different time slots, ii) a frequency division duplex (FDD) technique performing transmission through different frequencies, or ii) a hybrid technique of the frequency division duplex (FDD) and the time division duplex (TDD).

[31] Further, the related standard of the wireless communication system defines configuring the UL and the DL based on a single carrier or a pair of carriers.

[32] The UL and the DL transmit control information through one or more control channels, such as a physical DL control channel (PDCCH), a physical UL control channel (PUCCH), and the like. The UL and DL transmit data through data channels, such as a physical DL shared channel (PDSCH), a physical UL shared channel (PUSCH), and the like.

[33] The DL may denote communication or a communication path from multiple transmission/reception points to a UE, and the UL may denote communication or a communication path from the UE to the multiple transmission/reception points. In the DL, a transmitter may be a part of multiple transmission/reception points, and a receiver may be a part of a UE. In the UL, a transmitter may be a part of a UE and a receiver may be a part of multiple transmission/reception points.

[34] Hereinafter, transmission and reception of a signal through a channel such as the PUCCH, the PUSCH, the PDCCH, or the PDSCH, may be described as the transmission and reception of the channel, such as the PUCCH, the PUSCH, the PDCCH, or the PDSCH.

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[35] Meanwhile, higher layer signaling includes radio resource control (RRC) signaling transmitting RRC information containing an RRC parameter.

[36] The base station performs DL transmission to UEs. The base station may transmit a physical DL control channel for transmitting i) DL control information, such as scheduling required to receive a DL data channel that is a primary physical channel for unicast transmission, and ii) scheduling approval information for transmission through an UL data channel. Hereinafter, transmitting/receiving a signal through each channel may be described in such a manner that a corresponding channel is transmitted/received.

[37] Any of multiple access techniques may be applied to the wireless communication system, and therefore no limitation is imposed on them. For example, the wireless communication system may employ various multiple access techniques, such as time division multiple access (TDMA), frequency division multiple access (FDMA), CDMA, orthogonal frequency division multiple access (OFDMA), non-orthogonal multiple access (NOMA), OFDM-TDMA, OFDM-FDMA, OFDM-CDMA, or the like. The NOMA includes sparse code multiple access (SCMA), low cost spreading (LDS), and the like.

[38] Embodiments of the present disclosure may be applied to resource allocation in i) asynchronous wireless communication evolving into LTE/LTE-advanced and IMT-2020 from GSM, WCDMA, and HSPA, ii) synchronous wireless communication evolving into CDMA, CDMA-2000, and UMB.

[39] In the present disclosure, a machine type communication (MTC) terminal may refer to a terminal supporting low costs (or low complexity), a terminal supporting coverage enhancement, or the like. As another example, the MTC terminal may refer to a terminal defined as a predetermined category for supporting low cost (or low complexity) and/or coverage enhancement.

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[40] In other words, the MTC terminal may refer to a low cost (or low complexity) user equipment category/type newly defined in 3GPP Release-13 and performing LTE-based MTC-related operations. The MTC device of the present disclosure may refer to a device category/type that is defined in or before 3GPP Release-12 that supports enhanced coverage in comparison with the existing LTE coverage or supports low power consumption, or may refer to a low cost (or low complexity) device category/type newly defined in Release-13. The MTC terminal may refer to a further enhanced MTC terminal defined in Release-14.

[41] In the present disclosure, a narrowband Internet of Things (NB-IoT) terminal refers to a terminal supporting radio access for cellular IoT. NB-IoT technology aims at improved indoor coverage, support for large-scale low-speed terminals, low latency sensitivity, very low terminal costs, low power consumption, and optimized network architecture.

[42]

[43] An enhanced mobile broadband (eMBB), massive machine-type communication (mMTC), and ultra-reliable and low latency communication (URLLC) are proposed as representative usage scenarios for NR having been discussed in the 3GPP recently.

[44] In the present disclosure, a frequency, a frame, a subframe, a resource, a resource block (RB), a region, a band, a sub-band, a control channel, a data channel, a synchronization signal, various reference signals, various signals, and various messages, associated with NR may be interpreted as meanings that were used in the past or are used in the present or as various meanings that will be used in the future.

[45] **NR(New Radio)**

[46] Recently, the 3GPP has approved the "Study on New Radio Access Technology", which is a study item for research on next-generation/5G radio access technology. On the basis of the Study on New Radio Access Technology, discussions have been in progress

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for frame structures, channel coding and modulation, waveforms, multiple access methods, and the like for the new radio (NR).

[47] The NR is required to be designed not only to provide an improved data transmission rate as compared with the long term evolution (LTE)/LTE-Advanced, but also to meet various requirements per detailed and specific usage scenario. An enhanced mobile broadband (eMBB), massive machine-type communication (mMTC), and ultra-reliable and low latency communication (URLLC) are proposed as representative usage scenarios of the NR. In order to meet the requirements per usage scenario, it is required to design the NR to have flexible frame structures, compared with the LTE/LTE-Advanced.

[48] Specifically, the eMBB, mMTC, URLLC are considered as representative usage scenarios of the NR by the 3GPP. Since each usage scenario imposes different requirements for data rates, latency, coverage, etc., there arises a need for a method of efficiently multiplexing numerology-based (e.g., a subcarrier spacing (SCS), a subframe, a transmission time interval (TTI), etc.) radio resource units different from each other, as a solution for efficiently satisfying requirements according to usage scenarios through a frequency band provided to an arbitrary NR system.

[49] To this end, there have been discussions on i) methods of multiplexing numerologies having subcarrier spacing (SCS) values different from one another based on TDM, FDM or TDM/FDM through one NR carrier, and ii) methods of supporting one or more time units in configuring a scheduling unit in the time domain. In this regard, in the NR, a subframe is defined as one type of a time domain structure. In addition, as a reference numerology to define a corresponding subframe duration, a single subframe duration is defined as having 14 OFDM symbols of normal CP overhead based on 15 kHz subcarrier spacing (SCS), like the LTE. Therefore, the subframe of the NR has the time duration of 1 ms. Unlike the LTE, since the

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subframe of the NR is an absolute reference time duration, a slot and a mini-slot may be defined as a time unit for actual UL/DL data scheduling. In this case, the number of OFDM symbols which constitutes a slot, a value of y, has been defined as y = 14 regardless of the numerology.

[50] Therefore, a slot may be made up of 14 symbols. In accordance with a transmission direction for a corresponding slot, all symbols may be used for DL transmission or UL transmission, or the symbols may be used in the configuration of a DL portion + a gap + a UL portion.

[51] Further, a minislot made up of fewer symbols than the slot has been defined in a numerology (or SCS). As a result, a short time domain scheduling interval may be configured for UL/DL data transmission or reception based on the minislot. Also, a long time domain scheduling interval may be configured for the UL/DL data transmission or reception by slot aggregation.

[52] Particularly, in the case of the transmission or reception of latency critical data, such as the URLLC, it is difficult to satisfy latency requirements if scheduling is performed on a per-slot basis based on 0.5 ms (7 symbols) or 1 ms (14 symbols) defined in a frame structure based on a numerology having a small SCS value (for example, 15 kHz). To this end, a mini-slot may be defined to include fewer OFDM symbols than the slot. Accordingly, the scheduling for the latency critical data, such as the URLLC, may be performed based on the mini-slot.

[53] Further, methods have been discussed for scheduling data according to latency requirements based on a slot (or a minislot) length defined for each numerology, by multiplexing numerologies having different SCS values from one another in one NR carrier, using the TDM or FDM technique, as described above. For example, since the length of a symbol for the SCS of 60 kHz as in FIG. 1 is shortened by about a fourth of that for the SCS of 15 kHz, the length of

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the slot based on the SCS of 15 kHz is 0.5 ms when one slot is comprised of seven OFDM symbols in both the cases. On the contrary, the length of the slot based on the SCS of 60 kHz is shortened to about 0.125 ms.

[54] As described above, discussion has been conducted for developing methods of satisfying each requirement of URLLC and eMBB by defining different SCSs or different TTI lengths in the NR.

[55] As described above, in order to support URLLC service in the NR, it is necessary to support a short scheduling unit or transmission time interval, (TTI) for satisfying latency boundary in the time domain. On the other hand, in defining a scheduling unit in the time domain in the eMBB or the mMTC, it may be more efficient to use a longer time-domain resource allocation unit compared with the URLLC usage scenario in terms of control overhead and coverage. Thus, as methods for satisfying various NR usage scenarios together, it is necessary to support a mixed numerology structure for supporting, through one NR carrier, both a numerology of subcarrier spacing (e.g., larger subcarrier spacing, such as 60kHz, 120kHz, etc.) that is easy to define a short time-domain resource allocation unit suitable for the URLLC and a numerology of subcarrier spacing (e.g., 15kHz for eMBB or 3.75KHz for mMTC) suitable for the eMBB and the mMTC, or it is necessary to support simultaneously time-domain scheduling units with lengths each different from another, such as a subframe, a mini-slot, a slot, etc. in an NR carrier operated with a numerology.

[56] For example, a time/frequency resource (or region) on which a resource is allocated based on an optimal scheduling unit for each usage scenario may be allocated semi-statically, and resource allocation may be performed using a time/frequency resource of a corresponding region according to each usage scenario for each UE.

[57] However, if a region for each usage scenario is divided by such a semi-static

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method, efficiency may be reduced from an NR system perspective. For example, in an NR cell sparsely having URLLC traffic, it may be undesirable to allocate always exclusively a time/frequency resource supporting a short time-domain scheduling unit in order to satisfy the sparsely occurred URLLC service.

[58] Accordingly, to address this issue, a scheduling method is required to satisfy a latency requirement of the URLLC by dynamically using a part of scheduling resources of the eMBB or the mMTC whenever URLLC traffic occurs.

[59] To this end, in the NR, an eMBB/URLLC multiplexing method based on dynamic puncturing may be considered using for urgent URLLC data transmission/reception by puncturing one or more OFDM symbols of resources allocated for a data channel of an eMBB or a mMTC. That is, in URLLC data transmission/reception, a method may be considered for supporting preemption-based scheduling.

[60] Specifically, in case dynamic puncturing based multiplexing is applied between the eMBB and the URLLC, it may consider a pre-notification method for indicating corresponding information before the puncturing is performed and a post-notification method for indicating the corresponding puncturing after corresponding on-going transmission has been completed as a method for indicating a notification to an corresponding eMBB UE for a resource on which the puncturing is performed for URLLC data transmission.

[61] The present disclosure introduces various embodiments for notifying information on punctured radio resources when radio resources are dynamically punctured.

[62] Embodiments described below may be applied to all UEs, base stations, and core network entities (MME) using mobile communication technologies. For example, embodiments of the present disclosure may be applied not only to mobile communication UEs employing long term evolution technology, but also to next generation mobile communication

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(5G mobile communication, New-RAT) UEs, base stations, and access and mobility functions (AMF). For convenience of description, a base station may denote an eNB of LTE/E-UTRAN, or denote at least one of a central unit (CU), a distribute unit (DU), and an object in which the CU and the DU are implemented as one logical object, or a gNB, in a 5G radio network in which the CU is separated from the DU.

[63] Meanwhile, the URLLC of the usage scenarios of the NR denotes a service supporting high reliability and low latency. The URLLC may be a service used when a serious problem arises if transmission/reception of the data is delayed although the size of data is not large. For example, the URLLC may be used for an autonomous vehicle because a traffic accident may occur when data transmission/reception is delayed.

[64] The eMBB uses a service of supporting data transmission at high speed and may denote a service used for transmitting and receiving a large amount of data. For example, the eMBB service may be used for transmitting and receiving a large amount of data. That is, the eMBB service may be used for a 3D video service, a UHD service, or the like.

[65] The mMTC may denote a service used for transmitting and receiving a comparatively small size of data. For example, the mMTC service may be used for sensors installed for Smart City deployment which requires a long operation time with a mounted battery.

[66] In a general case, one of the URLLC service, the eMBB service, and the mMTC service may be used depending on characteristics of a UE. Hereinafter, a UE using the URLLC service may be referred to as a URLLC UE, and UEs using the eMBB service and the mMTC service may be referred to as an eMBB UE and an mMTC UE, respectively. In addition, the eMBB, the mMTC, and the URLLC may also be interpreted as the eMBB UE, the mMTC UE, the URLLC UE.

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[67] The term "preemption" in the present disclosure may denote that when traffic for the URLLC occurs, one or more of resources allocated for the eMMB or the mMTC are re-allocated to the URLLC for satisfying a latency requirement for the URLLC. At this time, since the URLLC uses one or more resources originally allocated to an eMBB or an mMTC, it is necessary for the eMBB UE or the mMTC UE to which the one or more resources are originally allocated to receive information for indicating preempted resource. DL preemption means that a DL resource of a UE is preempted.

[68] In addition, DL preemption indication information denotes information for informing of the UE DL preemption as information for indicating which data channel is preempted in DL to a UE. In other words, DL preemption indication information may be expressed as DL preemption notification information. The DL preemption indication information may be indicated in a signal type or a channel type.

[69] In addition, an eMBB UE and an URLLC UE in the present disclosure employ concepts under discussion in the 3GPP, and it is noted that a specific distinction between them may be determined depending on whether monitoring is performed for dynamic puncturing notification information and a length of a time-domain scheduling unit.

[70] For example, in case of dynamic puncturing, a UE required to monitor notification information (or channel) on the dynamic puncturing may correspond to an eMBB UE, and a UE not required to monitor may correspond to an URLLC UE. In addition, distinction between the MBB UE and the URLLC UE may be determined by a subcarrier spacing (SCS) value configured for a corresponding UE and a time-domain scheduling unit (e.g., a slot, an aggregated slot, a mini-slot etc.) allocated for the UE. For example, a UE configured with a slot unit less than and equal to a specific SCS value or a long time-domain scheduling unit of an aggregate-slot unit may be an eMBB UE, and a UE configured with a slot unit greater than

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and equal to a specific SCS value or configured with a short time-domain scheduling unit based on a unit of a mini-slot in a SCS less than and equal to a specific value may be an URLLC UE. Alternatively, in case a reference value (e.g., X ms) of a time-domain scheduling unit (or interval) for distinguishing the eMBB and the URLLC is defined, a UE configured with a time-domain scheduling unit greater than the reference value (threshold) may be an eMBB UE, and a UE configured with a time-domain scheduling unit less than the reference value (threshold) may be an URLLC UE.

[71] FIG. 2 is a diagram for describing a method for transmitting DL preemption indication information to a UE through a pre-notification method or a post-notification method, according to embodiments of the present disclosure.

[72] Referring to FIG. 2, the horizontal axis represents a TTI for eMBB UEs as a time domain resource, and the vertical axis represents an NR carrier as a frequency domain resource.

[73] Among regions as shown in FIG. 2, the 1) region is a region for transmitting a DL control channel (PDCCH) for an eMMB UE, and the DL control channel includes scheduling information on a DL data channel (PDSCH) for the eMBB UE.

[74] The 2) region represents a region for transmitting the DL data channel to the eMBB UE.

[75] The 3) region represents a region for enabling a URLLC UE to transmit a DL control channel (PDCCH) or DL data channel (PDSCH) through a preempted resource, when DL preemption occurs. In this case, the eMBB UE is required to monitor information that the corresponding resource has been preempted by the URLLC UE, that is, DL preemption indication information, to recognize the occurrence of the DL preemption and to respond thereto.

[76] At this time, in case the pre-notification method is used, DL preemption

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indication information corresponding to the 4) region is transmitted to the eMBB UE, before the preemption occurs.

[77] On the other hand, in case the post-notification method is used, DL preemption indication information corresponding to the 5) region is transmitted to the eMBB UE, after the preemption has occurred.

[78] FIG. 3 is a diagram for describing multiplexing radio resources for different services according to an embodiment of the present disclosure.

[79] Referring to FIG. 3, a radio resource for the eMBB and a radio resource for the URLLC may be configured with a subcarrier spacing and a symbol length different from each other. For example, the subcarrier spacing for the URLLC may be configured three times the subcarrier spacing for the eMBB. The symbol length for the URLLC may be configured to have one-third of the symbol length for the eMBB.

[80] Accordingly, radio resources for the eMBB and the URLLC may be multiplexed, as shown in FIG. 3.

[81] FIG. 4 is a diagram for describing multiplexing radio resources for different services according to another embodiment of the present disclosure.

[82] Referring to FIG. 4, the eMBB and the URLLC may be configured with an dentical subcarrier spacing and an identical symbol length. In this case, as shown in FIG. 4, radio resources for the eMBB and the URLLC may be multiplexed.

[83] In accordance with at least one embodiment, it is necessary to inform if radio resources allocated for different services overlap each other or if one or more radio resources allocated to a service for sparsely generated traffic is allocated for other services. Hereinafter, operations of a UE and a base station to notify the UE will be described with reference to the accompanying drawings.

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[84] FIG. 5 is a flowchart illustrating operation of a UE according to embodiments of the present disclosure.

[85] Referring to FIG. 5, the UE may perform operations for receiving configuration information for receiving DL preemption indication information from a base station at step S510. For example, the UE may receive the configuration information for monitoring the DL preemption indication information. For example, the configuration information may be received through cell-specific signaling or UE-specific signaling. For example, the configuration information may be received through UE-specific RRC signaling. For another example, the configuration information may be received through cell-specific RRC signaling. For further another example, the configuration information may be received through UE-group common signaling.

[86] Meanwhile, the configuration information may include at least one of a subcarrier spacing, duration information, frequency resource information, a cell-specific RNTI and a slot index. The UE may recognize a resource for implicitly receiving the DL preemption indication information through this.

[87] In addition, the UE may perform operations for monitoring the DL preemption indication information based on the configuration information at step S520. For example, the UE may recognize a radio resource to be monitored using the configuration information. For example, the UE may monitor a DL control channel. Specifically, the UE may monitor a common search space or a group common search space of a DL control channel. In addition, the UE may monitor a UE-specific search space of a DL control channel.

[88] Meanwhile, the UE may perform monitoring in a blind decoding manner. For example, the UE may perform monitoring by performing CRC scrambling of DL control information including DL preemption indication information using a cell-specific radio network

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temporary identifier (RNTI). For example, the cell-specific RNTI may be configured through cell-specific high layer signaling, or configured in advance with a pre-configured value. For another example, the UE may perform monitoring by performing CRC scrambling of DL control information including DL preemption indication information using a C-RNTI or a newly defined RNTI. For example, the C-RNTI or the newly defined RNTI may be received through UE-specific RRC signaling.

[89] In addition, the UE may include operations for receiving the DL preemption indication information through a multicast signal or a unicast signal at step S530. As an example, the DL preemption indication information may include information for indicating a radio resource on which a radio resource for providing a first service and a radio resource for providing a second service overlap each other. As another example, the DL preemption indication information may include information for indicating a radio resource configured for a pre-configured specific service (e.g., the URLLC service).

[90] For example, the DL preemption indication information may be received through a common search space or a group common search space of a DL control channel. That is, the DL preemption indication information may be received through cell-specific signaling. For another example, the DL preemption indication information may be received through a UE-specific search space of a DL control channel. That is, the DL preemption indication information may be received through UE-specific signaling.

[91] The UE may recognize that a radio resource indicated by the DL preemption indication information is a resource which is tentatively allocated for a specific service, by receiving the DL preemption indication information. For example, the above described UE may be an eMBB UE, and a UE indicating a radio resource through DL preemption indication information may be an URLLC UE. That is, the first service may be the eMBB, and the second

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service may be the URLLC. Alternatively, the first service may be the URLLC, and the second service may be the eMBB. Likewise, the above embodiments or examples may be applicable to a case where the mMTC is used instead of eMBB.

[92] FIG. 6 is a flowchart illustrating operation of a base station according to embodiments of the present disclosure.

[93] Referring to FIG. 6, the base station may perform operations for generating (e.g., creating or configuring) configuration information for monitoring DL preemption indication information at step S610. As described above, the configuration information may include information for enabling a UE to monitor. For example, the configuration information may include at least one of a subcarrier spacing, duration information, frequency resource information, a cell-specific RNTI and a slot index. The UE may recognize a resource for implicitly receiving the DL preemption indication information through this.

[94] The base station may perform operations for transmitting the configuration information to the UE at step S620. For example, the configuration information may be transmitted through cell-specific signaling or UE-specific signaling. For example, the configuration information may be transmitted through UE-specific RRC signaling. As another example, the configuration information may be transmitted through cell-specific RRC signaling. As further another example, the configuration information may be transmitted through UE-group common signaling.

[95] The base station may perform operations for transmitting the DL preemption indication information based on the configuration information through a multicast signal or a unicast signal at step S630. For example, the DL preemption indication information may include information for indicating a radio resource for providing a first service and a radio resource for providing a second service overlap each other. As another example, the DL

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preemption indication information may include information for indicating a radio resource for a pre-configured specific service (e.g., the URLLC service).

[96] For example, the DL preemption indication information may be transmitted through a common search space or a group common search space of a DL control channel. That is, the DL preemption indication information may be transmitted through cell-specific signaling. For another example, the DL preemption indication information may be transmitted through a UE-specific search space of a DL control channel. That is, the DL preemption indication information may be transmitted through UE-specific signaling. The UE may receive the DL preemption indication information and recognize that the received DL preemption indication information indicates a radio resource tentatively allocated for a specific service.

[97] As described above, the UE may receive the DL preemption indication information including information for indicating a radio resource for a specific service, and the base station may configure dynamically the radio resource. Accordingly, it is possible to provide various services by multiplexing the services.

[98] Hereinafter, transmission/reception of the DL preemption indication information will be discussed in detail for each of an embodiment of using cell-specific signaling and an embodiment of using UE-specific signaling. In addition, each embodiment will be described for each of the pre-notification method and the post-notification method, and operations for transmitting/receiving configuration information will be also described in the same manner. For convenience of description and ease of understanding, the following embodiments will be discussed based on a scenario in which an eMBB UE receives DL preemption indication information on an URLLC radio resource, but embodiments of the present disclosure are not limited thereto.

[99] **Embodiment 1: Indicating through cell-specific (or slot-specific) signaling**

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[100] An NR cell/base station may transmit cell-specifically notification information (the DL preemption indication information described above) for punctured resources for eMBB data or superposed resources for eMBB DL data and URLLC DL data for transmitting URLLC data in a time-domain scheduling unit (e.g., a slot or an aggregated-slot) defined for an eMBB UE. In addition, the base station may transmit the DL preemption indication information in a UE common signaling manner or a UE-group common signaling manner.

[101] Specifically, when pre-notification-based dynamic puncturing or post-notification-based dynamic puncturing is applied, the base station may perform, through cell-specific or UE common/group-UE common signaling, the broadcasting or multicasting of resource information used for transmitting URLLC data in a corresponding slot (when pre-notification or post-notification is applied) or a prior slot (when post-notification is applied), that is, information (e.g., DL preemption indication information) on punctured resources or superposed resources with URLLC data, from an eMBB perspective.

[102] For example, in case of the pre-notification method, the base station may transmit, to an eMBB UE in a corresponding cell, resource allocation information for transmitting DL (or UL) URLLC data in a slot, that is, information (DL preemption indication information) on a punctured resource or a superposed resource for transmitting eMBB data transmitted through the corresponding slot, through common L1 control signaling in a common search space of an NR DL control channel (NR PDCCH) of the corresponding slot. Alternatively, in defining a dynamic puncturing (or superposition) notification signaling method transmitted between on-going data transmissions through the corresponding slot, the dynamic puncturing signaling may be performed by transmitting the DL preemption indication information commonly to all eMBB UEs in the cell (or configured to monitor dynamic puncturing/superposition notification in the slot). In this case, a search space or a transmission

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resource for receiving the DL preemption indication information may be configured commonly for all eMBB UEs in the cell (or configured to monitor dynamic puncturing/superposition notification in the slot). Specifically, a period of a cell-specific search space, a UE/group-UE common search space, or a pre-configured resource, for receiving the DL preemption indication information may be determined implicitly by a function of a subcarrier spacing and a slot duration, or may be configured through cell-specific RRC signaling. Frequency resource information (e.g., a sub-band or a (set of) PRB(s)) may be determined by a function of a cell-specific RNTI, a slot index, or the like for receiving cell-specific DL preemption indication information, or may be determined by cell-specific RRC signaling. Alternatively, the frequency resource information may be configured in advance.

[103] For another example, in case of the post-notification method, the base station may transmit, to an eMBB UE in a corresponding cell, resource allocation information for transmitting URLLC data in a prior slot, that is, information (DL preemption indication information) on a punctured resource or a superposed resource for transmitting eMBB data transmitted through a corresponding slot, through common L1 control signaling in a common search space of an NR PDCCH of the corresponding slot. Alternatively, in case the post-notification method is defined for enabling DL preemption indication information in a corresponding slot to be transmitted to one or more last symbols in the slot, the DL preemption indication information may be transmitted to all eMBB UEs commonly in a corresponding cell (or configured to monitor dynamic puncturing/superposition notification in the slot). In this case, as in the embodiments of the pre-notification, a search space or a transmission resource for receiving the DL preemption indication information may be configured commonly for all eMBB UEs in the cell (or configured to monitor dynamic puncturing/superposition notification in the slot). In this case, as in the pre-notification method described above, a cell-specific search

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space, a UE/group-UE common search space, or a pre-configured frequency resource information (e.g., a sub-band or a (set of) PRB(s)), for receiving the DL preemption indication information i) may be determined by a function of a cell-specific RNTI, a slot index, or the like for receiving cell-specific DL preemption indication information, ii) may be determined by cell-specific RRC signaling, or iii) may be configured in advance.

[104] Meanwhile, in case a blind decoding-based monitoring method for receiving DL preemption indication information is applied through an NR PDCCH or a separate L1 control channel, the cell-specific RNTI for CRC scrambling of DL control information including the DL preemption indication information may be configured through cell-specific higher layer signaling by a base station, or configured with a pre-configured value in advance.

[105] Furthermore, in case of performing such a cell-specific (or UE common, UE-group common) dynamic puncturing notification, in case of an eMBB UE performing data channel resource allocation in a corresponding slot, puncturing or superposition may be applied for transmitting/receiving corresponding eMBB data only when puncturing/superposition resource allocation information through the DL preemption indication information and data channel resource allocation information for the eMBB UE partially overlap each other.

[106] As described above, the DL preemption indication information may be transferred equally to a plurality of UEs, or one or more UEs included in a group of UEs cell-specifically or by a multicasting technique.

[107] **Embodiment 2: Indicating UE-specifically or slot-specifically**

[108] An NR cell/base station may transmit UE-specifically notification information (the DL preemption indication information) for punctured resources for eMBB data or superposed resources for eMBB DL data and URLLC DL data, for transmitting URLLC data in a time-domain scheduling unit (e.g., a slot or an aggregated-slot) defined for an eMBB UE.

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[109] Specifically, when pre-notification-based dynamic puncturing or post-notification-based dynamic puncturing is applied and when eMBB UEs use one or more allocated resources (e.g., allocated for the DL data) for transmitting URLLC data by eMBB UEs performing DL data resource allocation in a corresponding slot (when pre-notification or post-notification is applied) or a prior slot (when post-notification is applied) , each eMBB UE may be configured to unicast such information through UE-specific signaling.

[110] For example, in case of the pre-notification method, the transmission of DL (or UL) data transmission resource allocation information for a corresponding UE in a corresponding slot through UE-specific DCI or DL assignment DCI in a common search space of an NR PDCCH of the slot may be generated, by including resource allocation information used for transmitting URLLC data of allocated resources and information (DL preemption indication information) for indicating whether puncturing or superposition is performed for resources allocated for transmitting the URLLC data. Alternatively, in defining a DL preemption indication information signaling method for transmitting between on-going data transmissions for an eMBB UE for transmitting DL data through a corresponding slot, by defining a search space or a resource for receiving UE-specific DL preemption indication information for each UE, the DL preemption indication information may be transmitted UE-specifically based the defined search space or resource. In this case, a period of the search space or the resource for receiving the DL preemption indication information in the slot may be determined implicitly by a function of a subcarrier spacing and a slot duration, or may be defined through UE-specific or cell-specific RRC signaling. Frequency resource information (e.g., a sub-band or a (set of) PRB(s)) may be determined by a function an identifier of the UE (e.g., a C-RNTI), a slot index, an index of an RB (e.g., a lowest RB index or a highest RB index) on which the eMBB data transmission is performed, or the like, or may be determined by UE-specific/cell-specific RRC

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signaling.

[111] As another example, in case of the post-notification method, resource information used for transmitting URLLC DL data of DL data resources received in a prior slot and DL control information for indicating whether puncturing or superposition is performed for resources allocated for transmitting the URLLC may be transmitted through UE-specific L1 control signaling of a UE-specific search space of an NR PDCCH of a slot. Alternatively, in defining a post-notification method for signaling DL preemption indication information in a slot through one or more last symbols of the slot on which DL eMBB data transmission has been performed, the signaling of the DL preemption indication information to this end may be performed such that a search space or a resource for receiving UE-specific DL preemption indication information for each UE is defined in the same manner as the pre-notification case described above, and DL preemption indication information is transmitted UE-specifically based on the defined search space or resource. In this case, information (e.g., a sub-band or a (set of) PRB(s)) on the search space or the resource for receiving the DL preemption indication information in the slot may be determined by a function of an identifier of the corresponding UE (e.g., a C-RNTI), a slot index, an index of an RB (e.g., a lowest RB index or a highest RB index) on which the eMBB data transmission is performed, or the like, or may be determined by UE-specific/cell-specific RRC signaling.

[112] Meanwhile, in case a blind decoding-based monitoring method for receiving DL preemption indication information is applied through an NR PDCCH or a separate L1 control channel, for a RNTI for CRC scrambling of DCI for DL indication information, a C-RNTI may be reused, or a base station may configure a separate UE-specific RNTI to this end and transmit to each UE through UE-specific RRC signaling.

[113] As described above, the base station may transmit the DL preemption indication

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information through UE-specific signaling. In addition, the UE may receive configuration information (e.g., the RNTI etc.) for monitoring the DL preemption indication information through UE-specific or cell-specific RRC signaling.

[114] Hereinafter, structures of a UE and a base station for performing any part or all of the embodiments described above will be discussed with reference to the accompanying drawings.

[115] FIG. 7 is a block diagram illustrating a UE according to embodiments of the present disclosure.

[116] Referring to FIG. 7, a UE 700 may include a receiver 730 configured to receive configuration information for receiving DL preemption indication information from a base station and a controller 710 configured to monitor the DL preemption indication information based on the configuration information.

[117] In addition, the receiver 730 may receive the DL preemption indication information through a multicasting signal or a unicasting signal. The DL preemption indication information may include information for indicating superposed radio resources where radio resources for providing a first service and radio resources for providing a second service overlap (e.g., are superposed) each other. Further, at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource for providing the first service may be different from that of the radio resource for providing the second service. Alternatively, the radio resource for providing the first service and the radio resource for providing the second service may be configured with an identical subcarrier spacing and time-domain scheduling unit.

[118] Meanwhile, the configuration information may be received through UE-specific RRC signaling, and the DL preemption indication information may be received through a common search space or group common search space of a DL control channel, or may be

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received through a UE-specific search space of the DL control channel.

[119] In addition, the receiver 730 is configured to receive DL control information and data, messages from the base station through a corresponding channel.

[120] Furthermore, the controller 710 controls overall operations of the UE 700 for receiving dynamically the DL preemption indication information and using radio resources by multiplexing, according to embodiments of the present disclosure.

[121] The transmitter 720 is configured to transmit UL control information and data, messages to the base station through a corresponding channel.

[122] FIG. 8 is a block diagram illustrating a base station according to embodiments of the present disclosure.

[123] Referring to FIG. 8, the base station 800 may include a controller 810 configured to generate (e.g., create or configure) configuration information for monitoring DL preemption indication information, and a transmitter 820 configured to transmit the configuration information to a UE and transmit the DL preemption indication information based on the configuration information through a multicast signal or a unicast signal. The DL preemption indication information may include information for indicating superposed radio resources where radio resources for providing a first service and radio resources for providing a second service overlap (e.g., are superposed) each other. Further, at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource for providing the first service may be different from that of the radio resource for providing the second service. Alternatively, the radio resource for providing the first service and the radio resource for providing the second service may be configured with an identical subcarrier spacing and time-domain scheduling unit.

[124] Meanwhile, the configuration information may be transmitted through UE-specific RRC signaling, and the DL preemption indication information may be transmitted

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through a common search space or group common search space of a DL control channel, or may be transmitted through a UE-specific search space of the DL control channel.

[125] In addition, the controller 810 is configured to control overall operations of the UE 800 for dynamically configuring and transmitting the DL preemption indication information and using radio resources by multiplexing, according to embodiments of the present disclosure.

[126] In addition, the transmitter 820 and the receiver 830 are configured to transmit or receive signals, messages, data required to perform embodiments described above to or from a UE.

[127] The standardized specifications or standard documents related to the embodiments described above constitute a part of the present disclosure. Accordingly, it should be construed that the incorporation of the content of the standardized specifications and part of the standard documents into the detailed description and claims is included within the scope of the present disclosure.

[128] Although a preferred embodiment of the present disclosure has been described for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims. Therefore, exemplary aspects of the present disclosure have not been described for limiting purposes, but to describe the embodiments, the therefore, the scope of the present disclosure shall not be limited to such embodiments. The scope of protection of the present disclosure should be construed based on the following claims, and all technical ideas within the scope of equivalents thereof should be construed as being included within the scope of the present disclosure.

[129] CROSS-REFERENCE TO RELATED APPLICATION

[130] If applicable, this application claims priority under 35 U.S.C §119(a) of Patent

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Application No. 10-2016-0152659, filed on November 16, 2016, and Patent Application No. 10-2017-0151983, filed on November 15, 2017, in Korea, the entire contents of which are incorporated herein by reference. In addition, this non-provisional application claims priorities in countries other than the U.S. for the same reason based on the Korean Patent Applications, the entire contents of which are hereby incorporated by reference.

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(12) 특허협력조약에 의하여 공개된 국제출원

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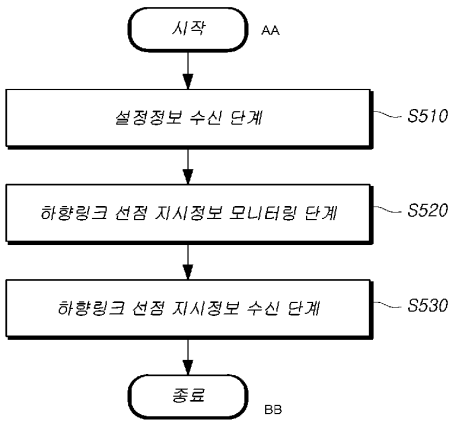
(81) 지정국 (별도의 표시가 없는 한, 가능한 모든 종류의 국내 권리의 보호를 위하여): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) 지정국 (별도의 표시가 없는 한, 가능한 모든 종류의 역내 권리의 보호를 위하여): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), 유라시아 (AM, AZ, BY, KG, KZ, RU, TJ, TM), 유럽 (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(54) **Title:** METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

(54) **발명의 명칭:** 차세대 무선망에서 하향링크 신호를 송수신하는 방법 및 그 장치



S510 ... Step for receiving configuration data
S520 ... Step for monitoring downlink pre-emption indication data
S530 ... Step for receiving downlink pre-emption indication data
AA ... Start
BB ... End

(57) **Abstract:** The present invention relates to a method and apparatus for transmitting and receiving a downlink signal for supporting effective multiplexing between data traffic having mutually different QoS requirements in a next generation/5G wireless access network ("New Radio" (NR)) for which discussion has begun in 3GPP. A method for a terminal receiving a downlink signal according to one embodiment comprises the steps of: receiving configuration data for receiving downlink pre-emption indication data from a base station; monitoring the downlink pre-emption indication data on the basis of the configuration data; and receiving the downlink pre-emption indication data by means of a multicast or unicast signal, wherein the downlink pre-emption indication data comprises data for indicating the overlapping wireless resource between a wireless resource for providing a first service, and a wireless resource for providing a second service.

(57) **요약서:** 본 발명은 3GPP에서 논의가 시작된 차세대/5G 무선 액세스망(이하, "NR[New Radio]"라 함)에서 서로 다른 QoS 요구사항를 갖는 데이터 트래픽(traffic) 간의 효율적인 멀티플렉싱(multiplexing)을 지원하기 위한 하향링크 신호 송수신 방법 및 장치에 관한 것이다. 일 실시예는, 단말이 하향링크 신호를 수신하는 방법에 있어서, 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 단계와 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 단계 및 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하는 단계를 포함하되, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법 및 장치를 제공한다.

[다음 쪽 계속]

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공개:

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명세서

발명의 명칭: 차세대 무선망에서 하향링크 신호를 송수신하는 방법 및 그 장치

기술분야

[1] 본 발명은 3GPP에서 논의가 시작된 차세대/5G 무선 액세스망(이하, "NR[New Radio]"라 함)에서 서로 다른 QoS 요구사항를 갖는 데이터 트래픽(traffic) 간의 효율적인 멀티플렉싱(multiplexing)을 지원하기 위한 하향링크 신호 송수신 방법 및 장치에 관한 것이다.

배경기술

[2] 3GPP는 최근 차세대/5G 무선 액세스 기술에 대한 연구를 위한 스터디 아이템인 "Study on New Radio Access Technology"를 승인하고, 이를 기반으로 RAN WG1에서는 각각 NR(New Radio)을 위한 프레임 구조, 채널 코딩 및 변조, 파형 및 다중 접속 방식 등에 대한 논의를 진행하고 있다. NR은 LTE/LTE-Advanced에 대비하여 향상된 데이터 전송률뿐만 아니라 세분화되고 구체화된 사용 시나리오 별로 요구되는 다양한 요구를 만족시킬 수 있는 설계가 이루어지도록 요구되고 있다.

[3] NR의 대표적 사용 시나리오로서 eMBB(enhancement Mobile BroadBand), mMTC(massive Machine Type Communication) 및 URLLC(Ultra Reliable and Low Latency Communications)가 제기되고, 각각의 사용 시나리오 별 요구를 만족시키기 위하여 LTE/LTE-Advanced 대비 플렉서블한 프레임 구조 설계가 요구되고 있다.

[4] 그러나, 이와 같이 다양한 사용 시나리오를 만족시키기 위해서는 각 시나리오 별로 요구되는 다양한 요구사항을 만족시킬 필요가 있다. 예를 들어, eMBB 대비 URLLC는 빠른 데이터 송수신을 만족시킬 필요가 있다.

[5] 다만, 무선 데이터 송수신을 위한 자원은 한정되어 있기 때문에 각 시나리오를 모두 만족시키면서 자원을 효율적으로 할당하는 데에는 한계점이 존재한다. 즉, 효율성 측면에서 eMBB의 경우 긴 시구간 자원을 할당하여 넓은 범위의 단말에 서비스를 제공할 필요성이 있는 반면에 URLLC의 경우 저지연을 위해서 짧은 시구간 자원을 할당하는 것이 필요하다.

[6] 이와 같은 상황에서 한정된 무선자원을 활용하여 각 시나리오에 맞는 무선자원을 멀티플렉싱할 필요성이 있으며, 이를 제공하기 위한 구체적인 무선 신호 송수신 방법에 대한 연구가 요구되고 있다.

발명의 상세한 설명

기술적 과제

[7] 본 실시예들의 목적은, 각 서비스 시나리오가 혼재된 상황에서 한정된 무선자원을 효율적으로 할당하여 각 서비스를 복수의 단말에게 제공하기 위한

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구체적인 방안을 제공하는 데 있다.

과제 해결 수단

[8] 전술한 과제를 해결하기 위해서 안출된 일 실시예는, 단말이 하향링크 신호를 수신하는 방법에 있어서, 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 단계와 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 단계 및 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하는 단계를 포함하되, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법을 제공한다.

[9] 또한, 일 실시예는 기지국이 하향링크 신호를 전송하는 방법에 있어서, 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 단계와 설정정보를 단말로 전송하는 단계 및 설정정보에 기초하여 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 단계를 포함하되, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법을 제공한다.

[10] 또한, 일 실시예는 하향링크 신호를 수신하는 단말에 있어서, 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 수신부 및 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 제어부를 포함하되, 수신부는 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하고, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 단말을 제공한다.

[11] 또한, 일 실시예는 하향링크 신호를 전송하는 기지국에 있어서, 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 제어부 및 설정정보를 단말로 전송하고, 설정정보에 기초하여 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 송신부를 포함하되, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 기지국를 제공한다.

발명의 효과

[12] 본 실시예들에 의하면, 각 서비스 시나리오가 혼재된 네트워크에서 각 서비스 간의 데이터 트래픽에 대한 효율적인 멀티플렉싱을 제공하는 효과가 있다.

[13] 또한, 각 단말이 무선자원을 멀티플렉싱하여 하향링크 데이터를 수신함에 있어서 불필요한 프로세싱 과정 및 데이터 손실을 방지하는 효과를 제공한다.

도면의 간단한 설명

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[14] 도 1은 본 실시예들에 따른 서로 다른 서브캐리어 스페이싱을 사용하는 경우에서 OFDM 심볼의 정렬을 나타낸 도면이다.

[15] 도 2는 본 실시예들에 따른 하향 링크 선점 지시 정보가 미리-알림(pre-notification) 또는 이후-알림(post-notification) 방법을 통해 단말에 전송되는 방법을 나타낸 도면이다.

[16] 도 3은 일 실시예에 따른 서로 다른 서비스를 위한 무선자원 다중화를 예시적으로 도시한 도면이다.

[17] 도 4는 다른 실시예에 따른 서로 다른 서비스를 위한 무선자원 다중화를 예시적으로 도시한 도면이다.

[18] 도 5는 일 실시예에 따른 단말의 동작을 설명하기 위한 도면이다.

[19] 도 6은 일 실시예에 따른 기지국의 동작을 설명하기 위한 도면이다.

[20] 도 7은 일 실시예에 따른 단말의 구성을 보여주는 도면이다.

[21] 도 8은 일 실시예에 따른 기지국의 구성을 보여주는 도면이다.

발명의 실시를 위한 최선의 형태

[22] 이하, 본 발명의 일부 실시예들을 예시적인 도면을 통해 상세하게 설명한다. 각 도면의 구성요소들에 참조부호를 부가함에 있어서, 동일한 구성요소들에 대해서는 비록 다른 도면상에 표시되더라도 가능한 한 동일한 부호를 가지도록 하고 있음에 유의해야 한다. 또한, 본 발명을 설명함에 있어, 관련된 공지 구성 또는 기능에 대한 구체적인 설명이 본 발명의 요지를 흐릴 수 있다고 판단되는 경우에는 그 상세한 설명은 생략한다.

[23] 본 명세서에서 무선 통신 시스템은 음성, 패킷 데이터 등과 같은 다양한 통신 서비스를 제공하기 위한 시스템을 의미한다. 무선 통신 시스템은 사용자 단말(User Equipment, UE) 및 기지국(Base Station, BS)을 포함한다.

[24] 사용자 단말은 무선 통신에서의 단말을 의미하는 포괄적 개념으로서, WCDMA, LTE, HSPA 및 IMT-2020(5G 또는 New Radio) 등에서의 UE(User Equipment)는 물론, GSM에서의 MS(Mobile Station), UT(User Terminal), SS(Subscriber Station), 무선 기기(wireless device) 등을 모두 포함하는 개념으로 해석되어야 할 것이다.

[25] 기지국 또는 셀(Cell)은 일반적으로 사용자 단말과 통신하는 지점(station)을 말하며, 노드-B(Node-B), eNB(evolved Node-B), gNB(gNode-B), LPN(Low Power Node), 섹터(Sector), 싸이트(Site), 다양한 형태의 안테나, BTS(Base Transceiver System), 액세스 포인트(Access Point), 포인트(예를 들어, 송신포인트, 수신포인트, 송수신포인트), 릴레이 노드(Relay Node), 메가 셀, 매크로 셀, 마이크로 셀, 피코 셀, 펨토 셀, RRH(Remote Radio Head), RU(Radio Unit), 스몰 셀(small cell) 등 다양한 커버리지 영역을 모두 포괄하는 의미이다.

[26] 앞서 나열된 다양한 셀은 각 셀을 제어하는 기지국이 존재하므로 기지국은 두 가지 의미로 해석될 수 있다. 1) 무선 영역과 관련하여 메가 셀, 매크로 셀,

마이크로 셀, 피코 셀, 펨토 셀, 스몰 셀(small cell)을 제공하는 장치 그 자체이거나, 2) 무선 영역 그 자체를 지시할 수 있다. 1)에서 소정의 무선 영역을 제공하는 장치들이 동일한 개체에 의해 제어되거나 무선 영역을 협업으로 구성하도록 상호 작용하는 모든 장치들을 모두 기지국으로 지시한다. 무선 영역의 구성 방식에 따라 포인트, 송수신 포인트, 송신 포인트, 수신 포인트 등은 기지국의 일 실시예가 된다. 2)에서 사용자 단말의 관점 또는 이웃하는 기지국의 입장에서 신호를 수신하거나 송신하게 되는 무선 영역 그 자체를 기지국으로 지시할 수 있다.

[27] 본 명세서에서 셀(Cell)은 송수신 포인트로부터 전송되는 신호의 커버리지 또는 송수신 포인트(transmission point 또는 transmission/reception point)로부터 전송되는 신호의 커버리지를 가지는 요소 반송파(component carrier), 그 송수신 포인트 자체를 의미할 수 있다.

[28] 본 명세서에서 사용자 단말과 기지국은, 본 발명에서 기술되는 기술 또는 기술적 사상을 구현하는데 사용되는 두 가지(Uplink 또는 Downlink) 송수신 주체로 포괄적인 의미로 사용되며 특정하게 지칭되는 용어 또는 단어에 의해 한정되지 않는다.

[29] 여기서, 상향링크(Uplink, UL, 또는 업링크)는 사용자 단말에 의해 기지국으로 데이터를 송수신하는 방식을 의미하며, 하향링크(Downlink, DL, 또는 다운링크)는 기지국에 의해 사용자 단말로 데이터를 송수신하는 방식을 의미한다.

[30] 상향링크 전송 및 하향링크 전송은 서로 다른 시간을 사용하여 전송되는 TDD(Time Division Duplex) 방식이 사용될 수 있고, 서로 다른 주파수를 사용하여 전송되는 FDD(Frequency Division Duplex) 방식, TDD 방식과 FDD 방식의 혼용 방식이 사용될 수 있다.

[31] 또한, 무선 통신 시스템에서는 하나의 반송파 또는 반송파 쌍을 기준으로 상향링크와 하향링크를 구성하여 규격을 구성한다.

[32] 상향링크와 하향링크는, PDCCH(Physical Downlink Control CHannel), PUCCH(Physical Uplink Control CHannel) 등과 같은 제어 채널을 통하여 제어 정보를 전송하고, PDSCH(Physical Downlink Shared CHannel), PUSCH(Physical Uplink Shared CHannel) 등과 같은 데이터 채널로 구성되어 데이터를 전송한다.

[33] 하향링크(downlink)는 다중 송수신 포인트에서 단말로의 통신 또는 통신 경로를 의미할 수 있으며, 상향링크(uplink)는 단말에서 다중 송수신 포인트로의 통신 또는 통신 경로를 의미할 수 있다. 이때, 하향링크에서 송신기는 다중 송수신 포인트의 일부분일 수 있고, 수신기는 단말의 일부분일 수 있다. 또한, 상향링크에서 송신기는 단말의 일부분일 수 있고, 수신기는 다중 송수신 포인트의 일부분일 수 있다.

[34] 이하에서는 PUCCH, PUSCH, PDCCH 및 PDSCH 등과 같은 채널을 통해 신호가 송수신되는 상황을 'PUCCH, PUSCH, PDCCH 및 PDSCH를 전송, 수신한다'는

형태로 표기하기도 한다.

[35] 한편, 이하에서 기재하는 상위계층 시그널링(High Layer Signaling)은 RRC 파라미터를 포함하는 RRC 정보를 전송하는 RRC 시그널링을 포함한다.

[36] 기지국은 단말들로 하향링크 전송을 수행한다. 기지국은 유니캐스트 전송(unicast transmission)을 위한 주 물리 채널인 하향링크 데이터 채널의 수신에 필요한 스케줄링 등의 하향링크 제어 정보 및 상향링크 데이터 채널에서의 전송을 위한 스케줄링 승인 정보를 전송하기 위한 물리 하향링크 제어 채널을 전송할 수 있다. 이하에서는, 각 채널을 통해 신호가 송수신 되는 것을 해당 채널이 송수신되는 형태로 기재하기로 한다.

[37] 무선 통신 시스템에서 적용되는 다중 접속 기법에는 제한이 없다. TDMA(Time Division Multiple Access), FDMA(Frequency Division Multiple Access), CDMA(Code Division Multiple Access), OFDMA(Orthogonal Frequency Division Multiple Access), NOMA(Non-Orthogonal Multiple Access), OFDM-TDMA, OFDM-FDMA, OFDM-CDMA와 같은 다양한 다중 접속 기법을 사용할 수 있다. 여기서, NOMA는 SCMA(Sparse Code Multiple Access)와 LDS(Low Density Spreading) 등을 포함한다.

[38] 본 발명의 일 실시예는 GSM, WCDMA, HSPA를 거쳐 LTE/LTE-Advanced, IMT-2020으로 진화하는 비동기 무선 통신과, CDMA, CDMA-2000 및 UMB로 진화하는 동기식 무선 통신 분야 등의 자원 할당에 적용될 수 있다.

[39] 본 명세서에서 MTC(Machine Type Communication) 단말은 low cost(또는 low complexity)를 지원하는 단말 또는 coverage enhancement를 지원하는 단말 등을 의미할 수 있다. 또는 본 명세서에서 MTC 단말은 low cost(또는 low complexity) 및/또는 coverage enhancement를 지원하기 위한 특정 카테고리로 정의된 단말을 의미할 수 있다.

[40] 다시 말해 본 명세서에서 MTC 단말은 LTE 기반의 MTC 관련 동작을 수행하는 새롭게 정의된 3GPP Release-13 low cost(또는 low complexity) UE category/type을 의미할 수 있다. 또는 본 명세서에서 MTC 단말은 기존의 LTE coverage 대비 향상된 coverage를 지원하거나, 또는 저전력 소모를 지원하는 기존의 3GPP Release-12 이하에서 정의된 UE category/type, 또는 새롭게 정의된 Release-13 low cost(또는 low complexity) UE category/type을 의미할 수 있다. 또는, Release-14에서 정의된 further Enhanced MTC 단말을 의미할 수도 있다.

[41] 본 명세서에서 NB-IoT(NarrowBand Internet of Things) 단말은 셀룰러 IoT를 위한 무선 액세스를 지원하는 단말을 의미한다. NB-IoT 기술의 목적은 향상된 인도어(Indoor) 커버리지, 대규모의 저속 단말에 대한 지원, 저지연민감도, 초저가 단말 비용, 낮은 전력 소모, 그리고 최적화된 네트워크 구조를 포함한다.

[42]

[43] *3GPP에서 최근 논의 중인 NR(New Radio)에서 대표적인 사용 시나리오(usage scenario)로서, eMBB(enhanced Mobile BroadBand), mMTC(massive Machine Type

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Communication), URLLC(Ultra Reliable and Low Latency Communication)가 제기되고 있다.

[44] 본 명세서에서 NR(New Radio)과 관련한 주파수, 프레임, 서브프레임, 자원, 자원블럭, 영역(region), 밴드, 서브밴드, 제어채널, 데이터채널, 동기신호, 각종 참조신호, 각종 신호, 각종 메시지는 과거 또는 현재 사용되는 의미 또는 장래 사용되는 다양한 의미로 해석될 수 있다.

[45] **NR(New Radio)**

[46] 3GPP는 최근 차세대/5G 무선 액세스 기술에 대한 연구를 위한 스터디 아이템인 "Study on New Radio Access Technology"를 승인하고, 이를 기반으로 각각 NR(New Radio)를 위한 프레임 구조, 채널 코딩 및 변조, 파형 및 다중 접속 스킴(frame structure, channel coding & modulation, waveform & multiple access scheme)등에 대한 논의가 시작되었다.

[47] NR은 LTE/LTE-Advanced 대비 향상된 데이터 전송률뿐 아니라, 세분화되고 구체화된 사용 시나리오(usage scenario) 별로 요구되는 다양한 요구(requirements)를 만족시킬 수 있는 설계가 이루어지도록 요구되고 있다. 특히 NR의 대표적 사용 시나리오(usage scenario)로서 eMBB(enhancement Mobile BroadBand), mMTC(massive MTC) 및 URLLC(Ultra Reliable and Low Latency Communications)가 제기되었으며, 각각의 사용 시나리오(usage scenario)별 요구(requirements)를 만족하기 위한 방법으로서 LTE/LTE-Advanced 대비 플렉서블한 프레임 구조(frame structure) 설계가 요구되고 있다.

[48] 구체적으로 3GPP에서 논의 중인 NR의 대표적 사용 시나리오(usage scenario)로서 eMBB, mMTC, URLLC가 고려되고 있다. 각각의 사용 시나리오(usage scenario)는 데이터 레이트(data rates), 레이턴시(latency), 커버리지(coverage) 등에 대한 요구(requirements)가 서로 상이하기 때문에 임의의 NR 시스템을 구성하는 주파수 대역을 통해 각각의 사용 시나리오(usage scenario)별 요구(requirements)를 효율적으로 만족시키기 위한 방법으로서 서로 다른 뉴머롤러지(numerology)(e.g. subcarrier spacing, subframe, TTI, etc.) 기반의 무선 자원 유닛(unit)을 효율적으로 다중화(multiplexing)하는 방안에 대한 필요성이 제기되고 있다.

[49] 이를 위한 한 방법으로서, 서로 다른 서브캐리어 스페이싱(SCS, subcarrier spacing)값을 갖는 뉴머롤러지(numerology)에 대해 하나의 NR 캐리어(carrier)를 통해 TDM, FDM 또는 TDM/FDM 기반으로 다중화하여 지원하는 방법 및 시간 도메인(time domain)에서의 스케줄링 단위를 구성함에 있어서 하나 이상의 시간 유닛(time unit)을 지원하는 방안에 대한 논의가 이루어졌다. 이와 관련하여 NR에서는 시간 도메인 구조(time domain structure)의 한 종류로서 서브프레임(subframe)에 대한 정의가 이루어졌으며, 해당 서브프레임 지속기간(subframe duration)을 정의하기 위한 레퍼런스 뉴머롤러지(reference numerology)로서 LTE와 동일한 15kHz SCS(Sub-Carrier Spacing) 기반 normal CP

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overhead의 14개의 OFDM 심볼로 구성된 단일한 서브프레임 지속기간을 정의하기로 결정하였다. 이에 따라 NR에서 서브프레임은 1ms의 지속기간(time duration)을 가진다. 단, LTE와 달리 NR의 서브프레임은 절대적인 레퍼런스 지속기간(reference time duration)으로서, 실제 상/하향 링크 데이터 스케줄링의 기반의 되는 시간 유닛(time unit)으로서 슬롯(slot) 및 미니 슬롯(mini-slot)이 정의될 수 있다. 이 경우, 해당 슬롯을 구성하는 OFDM 심볼의 개수, y값은 뉴머롤러지에 관계없이 y=14의 값을 갖도록 결정되었다.

[50] 이에 따라 임의의 슬롯은 14개의 심볼로 구성될 수 있으며, 또한 해당 슬롯의 전송 지시(transmission direction)에 따라 모든 심볼이 하향 링크 전송(DL transmission)을 위해 이용되거나, 또는 모든 심볼이 상향 링크 전송(UL transmission)을 위해 이용되거나, 또는 하향 링크 부분(DL portion) + (gap) + 상향 링크 부분(UL portion)의 형태로 이용될 수 있다.

[51] 또한 임의의 뉴머롤러지(numerology)(또는 SCS)에서 해당 슬롯보다 적은 수의 심볼로 구성된 미니 슬롯이 정의되어 이를 기반으로 상/하향 링크 데이터 송수신을 위한 짧은 길이의 시간 도메인 스케줄링 간격(time-domain scheduling interval)이 설정되거나, 또는 슬롯 병합(slot aggregation)을 통해 상/하향 링크 데이터 송수신을 위한 긴 길이의 시간 도메인 스케줄링 간격(time-domain scheduling interval)이 구성될 수 있다.

[52] 특히 URLLC와 같이 지연 크리티컬(latency critical)한 데이터에 대한 송수신의 경우, 15kHz와 같이 SCS값이 작은 뉴머롤러지 기반의 프레임 구조에서 정의된 0.5ms(7 symbols) 또는 1ms(14 symbols) 기반의 슬롯 단위로 스케줄링이 이루어질 경우, 지연 시간 요구 사항(latency requirement)를 만족시키기 힘들 수 있기 때문에 이를 위해서 해당 슬롯보다 적은 수의 OFDM 심볼로 구성된 미니-슬롯(mini-slot)을 정의하여 이를 기반으로 해당 URLLC와 같은 지연 크리티컬(latency critical)한 데이터에 대한 스케줄링이 이루어지도록 정의할 수 있다.

[53] 또는 전술한 바와 같이 하나의 NR 캐리어 내에서 서로 다른 SCS값을 갖는 뉴머롤러지를 TDM 방식 또는 FDM 방식으로 다중화하여 지원함으로써, 각각의 뉴머롤러지 별로 정의된 슬롯(또는 미니-슬롯) 길이를 기반으로 지연 시간 요구 사항(latency requirement)에 맞추어 데이터를 스케줄링하는 방안도 고려되고 있다. 예를 들어 도 1과 같이 SCS가 60kHz인 경우, SCS 15kHz인 경우보다 심볼 길이가 1/4정도로 줄어들기 때문에 동일하게 7개의 OFDM 심볼로 하나의 슬롯을 구성할 경우, 해당 15kHz 기반의 슬롯 길이는 0.5ms이 되는 반면, 60kHz 기반의 슬롯 길이는 약 0.125ms으로 줄어들게 된다.

[54] 이처럼 NR에서는 서로 다른 SCS 또는 서로 다른 TTI 길이를 정의함으로써, URLLC와 eMBB 각각의 요구사항을 만족시키는 방법에 대한 논의가 진행되고 있다.

[55] 전술한 바와 같이 NR에서 URLLC 서비스를 지원하기 위해서는 시간

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도메인(time domain)에서 latency boundary를 만족시킬 수 있는 짧은 스케줄링 단위(short scheduling unit) 또는 TTI(Transmission Time Interval)을 지원할 필요가 있다. 반면, eMBB 혹은 mMTC의 경우, 시간 도메인에서 스케줄링 단위(scheduling unit)을 정의함에 있어서, URLLC 사용 시나리오 대비 조금 더 긴 시구간 자원 할당 단위를 적용하는 것이 컨트롤 오버헤드(control overhead) 및 커버리지(coverage) 측면에서 효율적일 수 있다. 이처럼 다양한 NR 사용 시나리오를 동시에 만족시키기 위한 방법으로 URLLC에 적합한 짧은 시구간 자원 할당 단위를 정의하는데 용이한 서브캐리어 스페이싱(subcarrier spacing, 예를 들어, 60kHz, 120kHz, 등의 larger subcarrier spacing)의 뉴머롤러지(numerology)와 eMBB 및 mMTC에 적합한 subcarrier spacing(e.g. 15kHz for eMBB 혹은 3.75kHz for mMTC)의 뉴머롤러지(numerology)를 하나의 NR 캐리어를 통해 지원하는 혼합 뉴머롤러지(mixed numerology) 구조를 지원하거나, 혹은 임의의 하나의 뉴머롤러지(numerology)로 동작하는 NR 캐리어 내에서 서브프레임 또는 슬롯(slot) 또는 미니 슬롯(mini-slot) 등 서로 다른 길이(length)를 갖는 시구간 스케줄링 단위(time-domain scheduling unit)을 동시에 지원할 필요가 있다.

[56] 이를 위한 한 방법으로 각각의 서비스 사용 시나리오 별 최적의 스케줄링 단위(scheduling unit)를 기반으로 자원 할당이 이루어지는 시간/주파수 자원(time/frequency resource(혹은 region))를 준 정적(semi-static)으로 할당하고, 각각의 단말 별 사용 시나리오에 따라 그에 해당하는 영역(region)의 시간/주파수 자원을 사용해 자원 할당이 이루어지도록 설정할 수 있다.

[57] 그러나, 이처럼 준 정적인 방법으로 사용 시나리오 별 무선자원의 영역을 구분할 경우, NR 시스템 관점에서의 효율성이 다소 떨어질 수 있다. 예를 들어, URLLC 트래픽이 드물게(sparse) 발생하는 임의의 NR 셀에서 해당 드물게 발생하는 URLLC 서비스를 만족시키키 위해 항상 짧은 시구간 스케줄링 단위(time-domain scheduling unit)을 지원하는 시간/주파수 자원(time/frequency resource)을 전용(dedication)하는 것은 바람직하지 않을 수 있다.

[58] 따라서, 이를 해결하기 위해서 해당 URLLC 트래픽이 발생할 때마다 동적으로(dynamic) eMBB 또는 mMTC의 스케줄링 자원(scheduling resource)의 일부를 사용하여 해당 URLLC의 지연 요구 사항(latency requirement)을 만족시키기 위한 스케줄링 방법이 요구되고 있다.

[59] 이를 위해 NR에서는 임의의 eMBB 또는 mMTC의 데이터 채널을 위해 할당된 자원 중 일부 OFDM 심볼을 펑처링(puncturing)하여 긴급한 URLLC 데이터 송수신을 위해 사용하는 동적 펑처링(dynamic puncturing) 기반의 eMBB/URLLC 멀티플렉싱(multiplexing) 방법을 고려할 수 있다. 즉, URLLC 데이터 송수신에 있어서 선점(preemption) 기반의 스케줄링을 지원하는 방안을 고려할 수 있다.

[60] 구체적으로 eMBB/URLLC 간 동적 펑처링(dynamic puncturing) 기반의 멀티플렉싱(multiplexing)이 적용되는 경우에, URLLC 데이터 전송을 위해

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펑처링(puncturing)이 이루어진 자원을 해당 eMBB 단말에 알림(notification)을 지시하기 위한 방법으로서 펑처링(puncturing) 전에 해당 정보를 지시(indication)해주는 미리-알림(pre-notification) 방법과 해당 진행 중 전송(on-going transmission)이 끝난 후에 해당 펑처링(puncturing) 여부를 지시(indication)해주는 이후-알림(post-notification) 방법을 고려할 수 있다.

[61] 본 명세서에서는 무선자원을 동적으로 펑처링하는 기술을 적용하는 경우, 해당 펑처링된 무선자원 정보를 알려주기 위한 다양한 실시예를 제안하고자 한다.

[62] 이하에서 설명하는 실시예들은 모든 이동통신 기술을 사용하는 단말, 기지국, 코어망 개체(MME)에 적용될 수 있다. 예를 들어, 본 실시예들은 LTE 기술이 적용되는 이동통신 단말뿐만 아니라 차세대 이동통신(5G 이동통신, New-RAT) 단말, 기지국, 코어망 개체(AMF: Access and Mobility Function)에도 적용될 수 있다. 설명의 편의를 위해 이하에서 기지국은 LTE/E-UTRAN의 eNB를 나타낼 수도 있고, CU(Central Unit)와 DU(Distributed Unit)가 분리된 5G 무선망에서 기지국(CU, DU, 또는 CU와 DU가 하나의 논리적인 개체로 구현된 개체), gNB를 나타낼 수도 있다.

[63] 한편, NR의 사용 시나리오에서 URLLC는 고신뢰, 저지연을 지원하는 서비스를 의미하며 송수신되는 데이터의 크기가 크지는 않지만 데이터 송수신 과정에서 지연이 발생하면 심각한 문제가 발생하는 경우에 사용되는 서비스를 의미할 수 있다. 예를 들어서 자율 주행 차량과 같이 데이터 송수신의 지연이 커지면 교통 사고로 인한 인적/물적 손해가 발생할 수 있는 경우에 URLLC 서비스가 사용될 수 있다.

[64] eMBB는 초고속의 데이터 전송을 지원하는 서비스를 이용하며 대량의 데이터가 송수신될 필요가 있을 경우에 사용되는 서비스를 의미할 수 있다. 예를 들어서 3D 동영상, UHD 서비스와 같이 단위 시간당 대량의 데이터가 전송될 필요가 있는 경우 eMBB 서비스가 사용될 수 있다.

[65] mMTC는 송수신되는 데이터의 크기가 크지 않고 지연 발생이 문제되지 않으나, 저전력 소모가 필요한 경우에 사용되는 서비스를 의미할 수 있다. 예를 들어서 스마트 시티(Smart City) 구축을 위해 설치한 센서 장비들의 경우 탑재된 배터리로 가능한 오랜 시간 동안 동작해야 하므로 mMTC 서비스가 사용될 수 있다.

[66] 일반적인 경우 단말의 특성에 따라 전술한 URLLC/eMBB/mMTC의 세 가지 서비스 중 하나가 단말에 서비스될 수 있다. 이하에서는 필요한 경우, URLLC 서비스를 이용하는 단말을 URLLC 단말, eMBB 서비스를 이용하는 단말을 eMBB 단말, mMTC 서비스를 이용하는 단말을 mMTC 단말이라 구분하여 칭할 수 있다. 그리고 eMBB, mMTC, URLLC는 각각 eMBB 단말, mMTC 단말, URLLC 단말로도 해석될 수 있다.

[67] 그리고 본 실시예에서 선점(preemption)은 URLLC에 대한 트래픽 발생 시 eMMB 또는 mMTC에 할당된 자원의 일부를 URLLC에 대한 지연 요구

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사항(latency requirement)를 만족하기 위해서 URLLC에 다시 할당하는 것을 의미한다. 이때, 원래 eMBB 또는 mMTC에 할당된 자원을 URLLC에서 사용하기 때문에 원래 자원을 할당받았던 eMBB 단말 또는 mMTC 단말이 어떤 자원이 선점되었는지에 대한 정보를 수신해야 한다. 하향링크 선점은 단말의 하향링크 자원에 대한 선점이 일어나는 것을 의미한다.

[68] 그리고 하향 링크 선점(preemption) 지시 정보는 하향링크에서 어떤 데이터 채널(또는 무선자원)이 선점되었는지를 단말에 지시하기 위한 정보로서 하향링크 선점을 단말에 알려주는 정보이므로 하향링크 선점 알림(notification) 정보로도 표현될 수 있다. 이러한 하향링크 선점 지시정보는 신호(signal) 또는 채널(channel) 형태로 지시될 수 있다.

[69] 또한, 본 명세서에서의 eMBB 단말과 URLLC 단말은 현재 통상적으로 3GPP에서 논의되는 개념을 적용하도록 하지만, 이에 대한 구체적인 구분은 다음과 같이 동적 펑처링 알림(dynamic puncturing notification) 정보에 대한 모니터링 수행 여부 및 시구간 스케줄링 단위의 길이에 의해 결정될 수 있다.

[70] 예를 들어, 동적 펑처링(dynamic puncturing)이 적용될 경우, 동적 펑처링(dynamic puncturing)에 대한 알림 정보(혹은 channel)에 대한 모니터링이 필요한 단말이 eMBB 단말에 해당하며, 이에 대한 모니터링이 필요 없는 단말은 URLLC 단말에 해당할 수 있다. 또한, eMBB 단말과 URLLC 단말의 구분은 해당 단말을 위해 설정된 SCS(Subcarrier Spacing) 값과 해당 단말을 위해 할당된 시구간 스케줄링 단위(예를 들어, slot, aggregated slot, mini-slot 등)에 의해 결정될 수 있으며, 이에 대한 일 예로 특정 SCS 값 이하의 slot 단위 혹은 aggregate-slot 단위의 긴 시구간 스케줄링 단위를 갖는 단말은 eMBB 단말이고, 특정 SCS 값 이상의 전송 뉴머롤러지를 갖거나, 혹은 특정 SCS 값 이하에서 mini-slot 단위의 짧은 시구간 스케줄링 단위를 갖는 단말은 URLLC 단말일 수 있다. 또는 eMBB와 URLLC를 구분하기 위한 시구간 스케줄링 단위(혹은 interval)의 기준값(예를 들어, X ms)값을 정의하고 해당 기준값(threshold) 보다 큰 시구간 스케줄링 단위를 갖는 단말은 eMBB 단말 해당 기준값(threshold) 보다 작은 시구간 스케줄링 단위를 갖는 단말은 URLLC 단말일 수 있다.

[71] 도 2는 본 실시예들에 따른 하향 링크 선점 지시 정보가 미리-알림(pre-notification) 또는 이후-알림(post-notification) 방법을 통해 단말에 전송되는 방법을 나타낸 도면이다.

[72] 도 2를 참조하면, 가로축은 시간축 자원으로 eMMB 단말에 대한 TTI(TTI for eMBB UEs)를 나타내고 세로축은 주파수축 자원으로 NR 캐리어를 나타낸다.

[73] 도 2의 영역 중 1)은 eMMB 단말에 대한 하향 링크 제어 채널(PDCCH)이 전송되는 영역으로, 하향 링크 제어 채널은 eMBB 단말에 대한 하향 링크 데이터 채널(PDSCH)에 관한 스케줄링 정보를 포함하고 있다.

[74] 그리고 2)는 eMBB 단말에 전술한 하향 링크 데이터 채널이 전송되는 영역을 나타낸다.

[75] 그리고 3)은 하향 링크 선점(preemption)이 발생한 경우에, URLLC 단말이 선점한 자원을 통해 하향 링크 제어 채널(PDCCH) 또는 하향 링크 데이터 채널(PDSCH)을 전송하는 영역을 나타낸다. 이 경우 eMBB 단말은 해당 자원이 URLLC 단말에 의해 선점되었다는 정보, 즉 하향 링크 선점 지시 정보를 모니터링하고 있어야 하향 링크 선점의 발생을 인지하고 이에 대한 대응을 할 수 있다.

[76] 이 때, 전술한 미리-알림(pre-notification) 방식을 사용하는 경우에는 4)의 영역, 즉 선점이 일어나기 전에 하향 링크 선점 지시 정보가 eMBB 단말에 전송된다.

[77] 반면, 전술한 이후-알림(post-notification) 방식을 사용하는 경우에는 5)의 영역, 즉 선점이 일어난 후에 하향 링크 선점 지시 정보가 eMBB 단말에 전송된다.

[78] 도 3은 일 실시예에 따른 서로 다른 서비스를 위한 무선자원 다중화를 예시적으로 도시한 도면이다.

[79] 도 3을 참조하면, eMBB를 위한 무선자원과 URLLC를 위한 무선자원은 서브캐리어 스페이싱 및 심볼 길이가 상이하게 설정될 수 있다. 예를 들어, URLLC를 위한 서브캐리어 스페이싱은 eMBB를 위한 서브캐리어 스페이싱의 3배로 설정될 수 있으며, 심볼 길이는 1/3으로 설정될 수 있다.

[80] 따라서, eMBB와 URLLC를 위한 무선자원이 멀티플렉싱 되는 경우 도 3과 같이 설정될 수 있다.

[81] 도 4는 다른 실시예에 따른 서로 다른 서비스를 위한 무선자원 다중화를 예시적으로 도시한 도면이다.

[82] 도 4를 참조하면, 또 다른 예로 eMBB와 URLLC를 위한 서브캐리어 스페이싱과 심볼 길이가 동일하게 설정될 수도 있다. 이 경우에도 도 4와 같이 eMBB와 URLLC를 위한 무선자원이 멀티플렉싱될 수 있다.

[83] 이하에서는, 본 실시예에 따른 서로 다른 서비스를 위해서 할당되는 무선자원이 중첩되거나, 드물게 발생하는 무선자원을 다른 서비스를 위해서 할당된 무선자원에 할당하는 경우에 이를 단말에 알리기 위한 단말 및 기지국의 동작을 도면을 참조하여 설명한다.

[84] 도 5는 일 실시예에 따른 단말의 동작을 설명하기 위한 도면이다.

[85] 도 5를 참조하면, 단말은 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 단계를 수행할 수 있다(S510). 예를 들어, 단말은 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 수신할 수 있다. 예를 들어, 설정정보는 셀 특정한 시그널링 또는 단말 특정한 시그널링을 통해서 수신될 수 있다. 일 예로, 설정정보는 단말 특정 RRC 시그널링을 통해서 수신될 수 있다. 다른 예로, 설정정보는 셀 특정 RRC 시그널링을 통해서 수신될 수 있다. 또 다른 예로, 설정정보는 단말 그룹 공통 시그널링을 통해서 수신될 수도 있다.

[86] 한편, 설정정보는 서브캐리어 스페이싱, 듀레이션 정보, 주파수 자원 정보, 셀 특정 RNTI 및 슬롯 인덱스 중 적어도 하나의 정보를 포함할 수 있으며. 단말은 이를 통해서 묵시적(implicit)으로 하향링크 선점 지시정보를 수신하기 위한

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자원을 확인할 수 있다.

[87] 또한, 단말은 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 단계를 수행할 수 있다(S520). 예를 들어, 단말은 설정정보를 이용하여 단말이 모니터링을 수행해야 하는 무선자원을 확인할 수 있다. 일 예로, 단말은 하향링크 제어채널을 모니터링할 수 있다. 구체적으로, 단말은 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 모니터링할 수 있다. 또는, 단말은 하향링크 제어채널의 단말 특정 검색 공간을 모니터링할 수도 있다.

[88] 한편, 단말은 블라인드 디코딩 방식으로 모니터링을 수행할 수 있다. 일 예로, 단말은 셀 특정 RNTI를 이용하여 하향링크 선점 지시정보를 포함하는 하향링크 제어정보의 CRC 스크램블링을 수행하여 모니터링을 수행할 수 있다. 예를 들어, 셀 특정 RNTI는 셀 특정 상위계층 시그널링을 통해서 설정되거나, 임의의 값으로 미리 설정될 수도 있다. 다른 예로, 단말은 C-RNTI 또는 새롭게 정의되는 RNTI를 이용하여 하향링크 선점 지시정보를 포함하는 하향링크 제어정보의 CRC 스크램블링을 수행하여 모니터링을 수행할 수 있다. 예를 들어, C-RNTI 또는 새롭게 정의되는 RNTI는 단말 특정 RRC 시그널링을 통해서 수신될 수도 있다.

[89] 또한, 단말은 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하는 단계를 포함할 수 있다(S530). 일 예로, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함할 수 있다. 다른 예로, 하향링크 선점 지시정보는 미리 설정된 특정 서비스(예를 들어, URLLC)를 위해서 설정되는 무선자원을 지시하기 위한 정보를 포함할 수 있다.

[90] 일 예로, 하향링크 선점 지시정보는 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 수신될 수 있다. 즉, 하향링크 선점 지시정보는 셀 특정 시그널링을 통해서 수신될 수 있다. 다른 예로, 하향링크 선점 지시정보는 하향링크 제어채널의 단말 특정 검색 공간을 통해서 수신될 수 있다. 즉, 하향링크 선점 지시정보는 단말 특정 시그널링을 통해서 수신될 수 있다.

[91] 단말은 하향링크 선점 지시정보를 수신하여, 하향링크 선점 지시정보가 지시하는 무선자원은 특정 서비스를 위해서 일시적으로 할당된 자원인 것을 인지할 수 있다. 예를 들어, 이상에서 설명한 단말이 eMBB 단말이고, 하향링크 선점 지시정보를 통해서 무선자원이 지시되는 단말이 URLLC 단말일 수 있다. 즉, 제1 서비스는 eMBB이고, 제2 서비스는 URLLC일 수 있다. 또는 제1 서비스가 URLLC이고, 제2 서비스가 eMBB일 수도 있다. 마찬가지로, eMBB 대신 mMTC가 적용되는 경우에도 동일하게 적용될 수 있다.

[92] 도 6은 일 실시예에 따른 기지국의 동작을 설명하기 위한 도면이다.

[93] 도 6을 참조하면, 기지국은 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 단계를 수행할 수 있다(S610). 전술한 바와 같이,

설정정보는 단말이 하향링크 선점 지시정보를 모니터링하는 데에 필요한 정보를 포함할 수 있다. 예를 들어, 설정정보는 서브캐리어 스페이싱, 듀레이션 정보, 주파수 자원 정보, 셀 특정 RNTI 및 슬롯 인덱스 중 적어도 하나의 정보를 포함할 수 있으며. 단말은 이를 통해서 묵시적(implicit)으로 하향링크 선점 지시정보를 수신하기 위한 자원을 확인할 수 있다.

[94] 기지국은 설정정보를 단말로 전송하는 단계를 수행할 수 있다(S620). 예를 들어, 설정정보는 셀 특정한 시그널링 또는 단말 특정한 시그널링을 통해서 전송될 수 있다. 일 예로, 설정정보는 단말 특정 RRC 시그널링을 통해서 전송될 수 있다. 다른 예로, 설정정보는 셀 특정 RRC 시그널링을 통해서 전송될 수 있다. 또 다른 예로, 설정정보는 단말 그룹 공통 시그널링을 통해서 전송될 수도 있다.

[95] 기지국은 설정정보에 기초하여 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 단계를 수행할 수 있다(S630). 일 예로, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함할 수 있다. 다른 예로, 하향링크 선점 지시정보는 미리 설정된 특정 서비스(예를 들어, URLLC)를 위해서 설정되는 무선자원을 지시하기 위한 정보를 포함할 수 있다.

[96] 일 예로, 하향링크 선점 지시정보는 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 전송될 수 있다. 즉, 하향링크 선점 지시정보는 셀 특정 시그널링을 통해서 전송될 수 있다. 다른 예로, 하향링크 선점 지시정보는 하향링크 제어채널의 단말 특정 검색 공간을 통해서 전송될 수 있다. 즉, 하향링크 선점 지시정보는 단말 특정 시그널링을 통해서 전송될 수 있다. 단말은 하향링크 선점 지시정보를 수신하여, 하향링크 선점 지시정보가 지시하는 무선자원은 특정 서비스를 위해서 일시적으로 할당된 자원인 것을 인지할 수 있다.

[97] 이상에서 설명한 바와 같이, 단말은 특정 서비스를 위한 무선자원을 지시하는 정보를 포함하는 하향링크 선점 지시정보를 수신하고, 기지국은 무선자원을 동적으로 구성함으로써, 다양한 서비스를 멀티플렉싱하여 제공할 수 있다.

[98] 이하에서는 전술한 하향링크 선점 지시정보를 송수신함에 있어서, 셀 특정 시그널링을 사용하는 경우와 단말 특정 시그널링을 사용하는 경우를 나누어 보다 구체적으로 설명한다. 아울러, 각 실시예에서 미리 알림 방식과 이후 알림 방식을 나누어 설명하며, 설정정보의 송수신 동작에 대해서도 실시예를 나누어 설명한다. 설명의 편의를 위하여 이하의 세부 실시예에서는 eMBB 단말이 URLLC 무선자원에 대해서 하향링크 선점 지시정보를 수신하는 동작을 중심으로 설명하나, 이에 한정되는 것은 아니다.

[99] **제 1 실시예: 셀 특정Cell-specific(or slot-specific)한 시그널을 통해서** 지시하는 방법

[100] 임의의 NR 셀/기지국은 eMBB 단말을 위해 정의된 임의의 시구간 스케줄링

단위(예를 들어, slot 혹은 aggregated-slot)에서 URLLC 데이터 전송을 위해 eMBB 데이터에 대한 펑처링(puncturing)이 이루어지는 자원 또는 eMBB와 URLLC 하향링크 데이터에 대한 중첩(superposition)이 이루어지는 자원에 대한 알림(notification) 정보(전술한 하향링크 선점 지시정보)를 셀 특정(cell-specific)하게 전송하도록 할 수 있다. 또는, 기지국은 하향링크 선점 지시정보를 단말 공통(UE common) 혹은 단말 그룹 공통(UE-group common)하게 전송할 수도 있다.

[101] 구체적으로 상기의 미리 알림(pre-notification) 기반의 동적 펑처링(dynamic puncturing) 혹은 이후 알림(post-notification) 기반의 동적 펑처링 적용 시, 해당 슬롯(pre-notification 적용 혹은 post-notification 적용 시) 또는 이전 슬롯(post-notification 적용 시)에서 URLLC 데이터 전송을 위해 사용된 자원 정보, 즉 eMBB 단말 관점에서 데이터 펑처링 혹은 URLLC 데이터와의 중첩이 이루어진 자원 정보(예를 들어, 하향링크 선점 지시정보)를 기지국은 셀 특정(cell-specific) 혹은 단말 공통/그룹 단말 공통 시그널링(UE common/group-UE common signaling)을 통해 브로드캐스팅 혹은 멀티캐스팅해주도록 할 수 있다.

[102] 예를 들어, 미리 알림(pre-notification) 방법이 적용될 경우, 해당 slot의 차세대 무선 액세스 망에서의 하향링크 제어채널(NR PDCCH)의 공통 검색 공간(common search space)에서 common L1 control signaling를 통해 해당 slot에서 하향링크(혹은 상향링크) URLLC 데이터 전송을 위한 자원 할당 정보, 즉 임의의 해당 slot을 통해 전송되는 eMBB 데이터 전송에 대한 펑처링(puncturing) 혹은 중첩(superposition)이 이루어지는 자원 정보(하향링크 선점 지시정보)를 해당 셀 내의 eMBB 단말에게 기지국이 전송하도록 할 수 있다. 혹은 해당 slot을 통한 on-going data transmission 간에 전송되는 동적 펑처링(혹은 중첩) 알림 시그널링 방법을 정의함에 있어서, 해당 동적 펑처링 시그널링은 해당 셀 내의 (혹은 해당 slot에서 dynamic puncturing/superposition notification을 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 공통적으로 해당 하향링크 선점 지시정보를 전송하도록 할 수 있다. 이 경우, 해당 하향링크 선점 지시정보 수신을 위한 검색 공간이나 혹은 전송자원 역시 해당 셀 내의(혹은 해당 slot에서 하향링크 선점 지시정보를 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 공통적으로 구성되도록 한다. 구체적으로 해당 하향링크 선점 지시정보 수신을 위한 셀 특정(cell-specific) 혹은 단말/그룹 단말 공통(UE/group-UE common) 검색 공간 혹은 미리 설정된 자원의 주기는 서브캐리어 스페이싱 및 슬롯 지속시간(slot duration)의 함수로서 묵시적(implicit)으로 결정되거나, 셀 특정 RRC 시그널링(cell-specific RRC signaling)을 통해 설정될 수 있으며, 주파수 자원 정보(예를 들어, sub-band 혹은 a (set of) PRB(s))는 해당 셀 특정 하향링크 선점 지시정보 수신을 위한 셀 특정 RNTI(cell-specific RNTI), 슬롯 인덱스(slot index) 등의 함수로서 결정되거나, 혹은 셀 특정 RRC 시그널링(cell-specific RRC signaling)에 의해 결정될 수 있다.

또는 미리 설정될 수도 있다.

[103] 또 다른 예로서 이후 알림(post-notification) 방법이 적용될 경우, 임의의 slot의 NR PDCCH의 공통 검색 공간의 common L1 control signaling을 통해 이전 slot에서의 URLLC 데이터 전송을 위한 자원 할당 정보, 즉 임의의 해당 slot을 통해 전송되는 eMBB 데이터 전송에 대한 펑처링 혹은 중첩이 이루어지는 자원 정보(하향링크 선점 지시정보)를 해당 셀 내의 eMBB 단말에게 전송하도록 설정할 수 있다. 또는 해당 slot의 마지막 심볼(들)에 해당 slot에서의 하향링크 선점 지시정보전송을 하는 이후 알림(post-notification) 방법을 정의할 경우, 해당 하향링크 선점 지시정보는 해당 셀 내의 (혹은 해당 slot에서 하향링크 선점 지시정보를 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 공통적으로 해당 하향링크 선점 지시정보를 전송하도록 할 수 있다. 이 경우에도 전술한 이전 알림(pre-notification) 에와 마찬가지로, 해당 하향링크 선점 지시정보 수신을 위한 검색 공간이나 혹은 전송 자원 역시 해당 셀 내의 (혹은 해당 slot에서 하향링크 선점 지시정보를 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 공통적으로 구성될 수 있다. 이 경우, 전술한 이전 알림(pre-notification) 방법의 경우와 마찬가지로 해당 하향링크 선점 지시정보 수신을 위한 셀 특정 혹은 단말/단말 그룹 공통한 검색 공간 혹은 미리 설정된 주파수 자원 정보(예를 들어, sub-band 혹은 a (set of) PRB(s))는 해당 셀 특정 하향링크 선점 지시정보 수신을 위한 셀 특정 RNTI, 슬롯 인덱스 등의 함수로서 결정되거나, 혹은 셀 특정 RRC 시그널링에 의해 결정되거나, 혹은 미리 설정될 수 있다.

[104] 한편, 해당 하향링크 선점 지시정보 수신을 위해 NR PDCCH 혹은 별도의 L1 control channel을 통한 블라인드 디코딩(blind decoding) 기반의 모니터링 방법이 적용될 경우, 해당 하향링크 선점 지시정보를 포함하는 하향링크 제어정보의 CRC 스크램블링(scrambling)을 위한 전술한 셀 특정 RNTI는 기지국에 의해 셀 특정 상위계층 시그널링(cell-specific higher layer signaling)을 통해 설정되거나, 혹은 임의의 값으로 미리 설정될 수 있다.

[105] 또한, 이처럼 셀 특정(혹은 단말 공통, 단말 그룹 공통)한 동적 펑처링 알림이 이루어질 경우, 해당 slot에서 데이터 채널 자원 할당이 이루어진 eMBB 단말의 경우, 해당 하향링크 선점 지시정보를 통한 펑처링/중첩 자원 할당 정보와 해당 eMBB 단말을 위한 데이터 채널 자원 할당 정보가 부분적으로 겹치는(partially overlap) 경우에 대해서만 해당 eMBB 데이터 송수신에 대한 펑처링 또는 중첩을 적용할 수 있다.

[106] 이상에서와 같이, 하향링크 선점 지시정보는 셀 특정하게 멀티캐스트 방식을 통해서 복수의 단말 또는 단말 그룹 내에 포함된 단말에 동일하게 전달될 수 있다.

[107] **제 2 실시예: 단말 특정 또는 슬롯 특정(UE-specific(or slot-specific))하**게 지시하는 방법.

[108] 임의의 NR 셀/기지국은 eMBB 단말을 위해 정의된 임의의 시구간 스케줄링

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단위(예를 들어, slot 혹은 aggregated-slot)에서 URLLC 데이터 전송을 위해 eMBB 데이터에 대한 펑처링이 이루어지는 자원 혹은 eMBB와 URLLC 하향링크 데이터에 대한 중첩이 이루어지는 자원에 대한 알림 정보(하향링크 선점 지시정보)를 단말 특정(UE-specific)하게 전송하도록 할 수 있다.

[109] 구체적으로 상기의 미리 알림(pre-notification) 기반의 동적 펑처링(dynamic puncturing) 혹은 이후 알림(post-notification) 기반의 동적 펑처링(dynamic puncturing) 적용 시, 해당 slot(pre-notification 적용 혹은 post-notification 적용 시) 혹은 이전 slot(post-notification 적용 시)에서 하향링크 데이터 자원 할당이 이루어진 eMBB 단말들에 대해 해당 데이터 전송을 위해 할당된 자원 중 일부 자원이 URLLC 데이터 전송을 위해 사용된 경우, 이를 해당 eMBB 단말 각각에게 단말 특정 시그널링(UE-specific signaling)을 통해 유니캐스팅(unicasting)하도록 설정할 수 있다.

[110] 예를 들어, 미리 알림(pre-notification) 방법이 적용될 경우, 해당 slot의 NR PDCCH의 단말 특정 검색 공간(UE-specific search space)에서 단말 특정 하향링크 제어정보(UE-specific DCI) 혹은 하향링크 할당을 위한 하향링크 제어정보(DL assignment DCI)를 통해 해당 slot에서 해당 단말을 위한 하향링크(혹은 상향링크) 데이터 전송 자원 할당 정보 전송 시, 할당된 자원 중 URLLC 데이터 전송을 위해 사용되는 자원 할당정보 및 해당 URLLC 데이터 전송을 위해 할당된 자원에 대한 펑처링 혹은 중첩 여부를 지시해주는 정보(하향링크 선점 지시정보)를 함께 전송하도록 할 수 있다. 혹은 해당 slot을 하향링크 데이터 전송이 이루어지는 eMBB 단말에 대해 on-going data transmission 간에 전송되는 하향링크 선점 지시정보 시그널링 방법을 정의함에 있어서, 각각의 단말 별로 단말 특정한 하향링크 선점 지시정보 수신을 위한 검색 공간 혹은 자원을 정의하여 이를 기반으로 단말 특정하게 해당 하향링크 선점 지시정보를 전송하도록 할 수 있다. 이 경우, 해당 slot에서의 하향링크 선점 지시정보 수신을 위한 검색 공간 혹은 자원의 주기는 서브캐리어 스페이싱 및 슬롯 듀레이션(slot duration)의 함수로서 묵시적으로 결정되거나, 단말 트정 혹은 셀 특정 RRC 시그널링을 통해 정의될 수 있으며, 주파수 자원 정보(예를 들어, sub-band 혹은 a (set of) PRB(s))는 해당 단말의 아이디(예를 들어, C-RNTI), slot index, 해당 eMBB 데이터 전송이 이루어지는 RB index(e.g. lowest RB 혹은 highest RB index) 등의 함수로서 결정되거나, 혹은 단말 특정/셀 특정 RRC 시그널링에 의해 결정될 수 있다.

[111] 또 다른 예로서 이후 알림(post-notification) 방법이 적용될 경우, 임의의 slot의 NR PDCCH의 단말 특정 검색 공간(UE-specific search space)의 UE-specific L1 control signaling을 통해 이전 slot에서의 수신한 하향링크 데이터 자원 중 URLLC 하향링크 데이터 전송을 위해 사용된 자원 정보 및 해당 URLLC 데이터 전송을 위해 할당된 자원에 대한 펑처링 혹은 중첩 여부를 지시해주는 하향링크 제어 정보를 전송하도록 정의할 수 있다. 또는 하향링크 eMBB 데이터 전송이 이루어진 해당 slot의 마지막에 심볼(들)을 통해 해당 slot에서의 하향링크 선점

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지시정보 시그널링을 하는 이후 알림(post-notification) 방법을 정의할 경우, 이를 위한 하향링크 선점 지시정보 시그널링은 전술한 이전 알림(pre-notification) 경우와 동일하게 각각의 단말 별로 단말 특정한 하향링크 선점 지시정보 수신을 위한 검색 공간 혹은 자원을 정의하고, 이를 기반으로 단말 특정하게 해당 하향링크 선점 지시정보를 전송하도록 할 수 있다. 이 경우, 해당 slot에서의 하향링크 선점 지시정보 수신을 위한 검색 공간 혹은 주파수 자원 정보(예를 들어, sub-band 혹은 a (set of) PRB(s))는 해당 단말의 아이디(예를 들어, C-RNTI), slot index, 해당 eMBB 데이터 전송이 이루어지는 RB index(예를 들어, lowest RB 혹은 highest RB index) 등의 함수로서 결정되거나, 혹은 단말 특정/셀 특정 RRC 시그널링에 의해 결정될 수 있다.

[112] 한편, 해당 하향링크 선점 지시정보 수신을 위해 NR PDCCH 혹은 별도의 L1 control channel을 통한 blind decoding 기반의 모니터링 방법이 적용될 경우, 해당 하향링크 지시정보에 대한 DCI의 CRC 스크램블링(scrambling)을 위한 RNTI는 해당 단말의 C-RNTI를 재사용하거나, 혹은 이를 위한 별도의 단말 특정 RNTI를 기지국이 설정하여 각각의 단말에게 단말 특정 RRC 시그널링(UE-specific RRC signaling)을 통해 전송하도록 할 수 있다.

[113] 이상에서 설명한 바와 같이, 기지국은 단말 특정 시그널링을 통해서 하향링크 선점 지시정보를 전송할 수 있다. 또한, 단말은 단말 특정 또는 셀 특정한 시그널링을 통해서 하향링크 선점 지시정보를 모니터링하기 위한 설정정보(예를 들어, 전술한 RNTI 등)를 수신할 수도 있다.

[114] 이하에서는, 이상에서 설명한 본 실시예들의 일부 또는 전부가 모두 수행될 수 있는 단말 및 기지국의 구성에 대해서 도면을 참조하여 설명한다.

[115] 도 7은 일 실시예에 따른 단말의 구성을 보여주는 도면이다.

[116] 도 7을 참조하면, 단말(700)은 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 수신부(730) 및 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 제어부(710)를 포함할 수 있다.

[117] 또한, 수신부(730)는 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하고, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함할 수 있다. 또한, 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은 서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정될 수 있다. 또는 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은 서브 캐리어 스페이싱 및 시구간 스케줄링 단위가 동일하게 설정될 수도 있다.

[118] 한편, 설정정보는 단말-특정(UE-specific) RRC 시그널링을 통해 수신될 수 있으며, 하향링크 선점 지시정보는 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 수신되거나, 하향링크 제어채널의 단말 특정 검색

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공간을 통해서 수신될 수도 있다.

[119] 이 외에도 수신부(730)는 기지국으로부터 하향링크 제어정보 및 데이터, 메시지를 해당 채널을 통해 수신한다.

[120] 또한, 제어부(710)는 전술한 본 발명에 따른 하향링크 선점 지시정보를 동적으로 수신하여 무선자원을 멀티플렉싱하여 사용하는 데에 따른 전반적인 사용자 단말(700)의 동작을 제어한다.

[121] 송신부(720)는 기지국에 상향링크 제어정보 및 데이터, 메시지를 해당 채널을 통해 전송한다.

[122] 도 8은 일 실시예에 따른 기지국의 구성을 보여주는 도면이다.

[123] 도 8을 참조하면, 기지국(800)은 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 제어부(810) 및 설정정보를 단말로 전송하고, 설정정보에 기초하여 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 송신부(820)를 포함할 수 있다. 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함할 수 있다. 또한, 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은 서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정될 수 있다. 또는 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은 서브 캐리어 스페이싱 및 시구간 스케줄링 단위가 동일하게 설정될 수도 있다.

[124] 한편, 설정정보는 단말-특정(UE-specific) RRC 시그널링을 통해 전송할 수 있으며, 하향링크 선점 지시정보는 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 전송되거나, 하향링크 제어채널의 단말 특정 검색 공간을 통해서 전송될 수도 있다.

[125] 이 외에도, 제어부(810)는 전술한 본 발명에 따른 하향링크 선점 지시정보를 동적으로 구성하고 전송하여 무선자원을 멀티플렉싱하여 사용하는 데에 따른 전반적인 기지국(800)의 동작을 제어한다.

[126] 또한, 송신부(820)와 수신부(830)는 전술한 본 실시예들을 수행하기에 필요한 신호나 메시지, 데이터를 단말과 송수신하는데 사용된다.

[127] 전술한 실시예에서 언급한 표준내용 또는 표준문서들은 명세서의 설명을 간략하게 하기 위해 생략한 것으로 본 명세서의 일부를 구성한다. 따라서, 위 표준내용 및 표준문서들의 일부의 내용을 본 명세서에 추가하거나 청구범위에 기재하는 것은 본 발명의 범위에 해당하는 것으로 해석되어야 한다.

[128] 이상의 설명은 본 발명의 기술 사상을 예시적으로 설명한 것에 불과한 것으로서, 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자라면 본 발명의 본질적인 특성에서 벗어나지 않는 범위에서 다양한 수정 및 변형이 가능할 것이다. 따라서, 본 발명에 개시된 실시예들은 본 발명의 기술 사상을 한정하기 위한 것이 아니라 설명하기 위한 것이고, 이러한 실시예에 의하여 본

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발명의 기술사상의 범위가 한정되는 것은 아니다. 본 발명의 보호 범위는 아래의 청구범위에 의하여 해석되어야 하며, 그와 동등한 범위 내에 있는 모든 기술 사상은 본 발명의 권리범위에 포함되는 것으로 해석되어야 할 것이다.

[129] CROSS-REFERENCE TO RELATED APPLICATION

[130] 본 특허출원은 2016년 11월 16일 한국에 출원한 특허출원번호 제 10-2016-0152659호 및 2017년 11월 15일 한국에 출원한 특허출원번호 제 10-2017-0151983호 에 대해 미국 특허법 119(a)조 (35 U.S.C § 119(a))에 따라 우선권을 주장하며, 그 모든 내용은 참고문헌으로 본 특허출원에 병합된다. 아울러, 본 특허출원은 미국 이외에 국가에 대해서도 위와 동일한 이유로 우선권을 주장하면 그 모든 내용은 참고문헌으로 본 특허출원에 병합된다.

청구범위

[청구항 1] 단말이 하향링크 신호를 수신하는 방법에 있어서,
기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 단계;
상기 설정정보에 기초하여 상기 하향링크 선점 지시정보를 모니터링 하는 단계; 및
상기 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하는 단계를 포함하되,
상기 하향링크 선점 지시정보는,
제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법.

[청구항 2] 제 1 항에 있어서,
상기 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은,
서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정되는 것을 특징으로 하는 방법.

[청구항 3] 제 1 항에 있어서,
상기 설정정보는,
단말-특정(UE-specific) RRC 시그널링을 통해 수신되는 것을 특징으로 하는 방법.

[청구항 4] 제 1 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 수신되는 것을 특징으로 하는 방법.

[청구항 5] 제 1 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 단말 특정 검색 공간을 통해서 수신되는 것을 특징으로 하는 방법.

[청구항 6] 기지국이 하향링크 신호를 전송하는 방법에 있어서,
하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 단계;
상기 설정정보를 단말로 전송하는 단계; 및
상기 설정정보에 기초하여 상기 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 단계를 포함하되,
상기 하향링크 선점 지시정보는,
제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법.

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[청구항 7] 제 6 항에 있어서,
상기 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은,
서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정되는 것을 특징으로 하는 방법.

[청구항 8] 제 6 항에 있어서,
상기 설정정보는,
단말-특정(UE-specific) RRC 시그널링을 통해 전송되는 것을 특징으로 하는 방법.

[청구항 9] 제 6 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 전송되는 것을 특징으로 하는 방법.

[청구항 10] 제 6 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 단말 특정 검색 공간을 통해서 전송되는 것을 특징으로 하는 방법.

[청구항 11] 하향링크 신호를 수신하는 단말에 있어서,
기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 수신부; 및
상기 설정정보에 기초하여 상기 하향링크 선점 지시정보를 모니터링 하는 제어부를 포함하되,
상기 수신부는,
상기 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하고,
상기 하향링크 선점 지시정보는,
제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 단말.

[청구항 12] 제 11 항에 있어서,
상기 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은,
서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정되는 것을 특징으로 하는 단말.

[청구항 13] 제 11 항에 있어서,
상기 설정정보는,
단말-특정(UE-specific) RRC 시그널링을 통해 수신되는 것을 특징으로 하는 단말.

[청구항 14] 제 11 항에 있어서,

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상기 하향링크 선점 지시정보는,
하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 수신되는 것을 특징으로 하는 단말.

[청구항 15] 제 11 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 단말 특정 검색 공간을 통해서 수신되는 것을 특징으로 하는 단말.

[청구항 16] 하향링크 신호를 전송하는 기지국에 있어서,
하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 제어부; 및
상기 설정정보를 단말로 전송하고, 상기 설정정보에 기초하여 상기 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 송신부를 포함하되,
상기 하향링크 선점 지시정보는,
제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 기지국.

[청구항 17] 제 16 항에 있어서,
상기 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은,
서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정되는 것을 특징으로 하는 기지국.

[청구항 18] 제 16 항에 있어서,
상기 설정정보는,
단말-특정(UE-specific) RRC 시그널링을 통해 전송되는 것을 특징으로 하는 기지국.

[청구항 19] 제 16 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 전송되는 것을 특징으로 하는 기지국.

[청구항 20] 제 16 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 단말 특정 검색 공간을 통해서 전송되는 것을 특징으로 하는 기지국.

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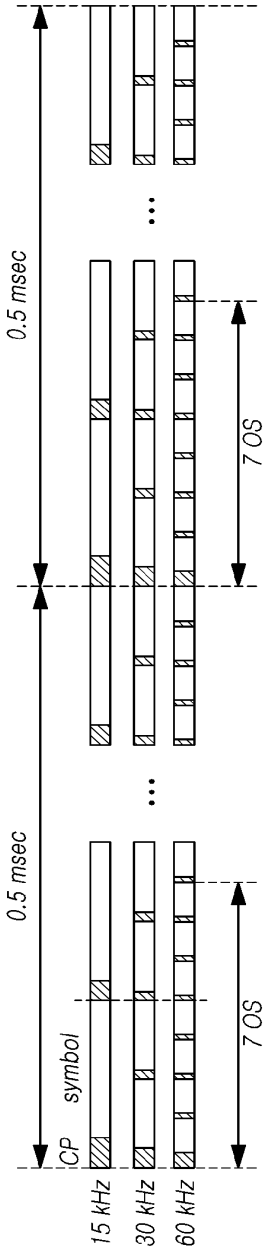
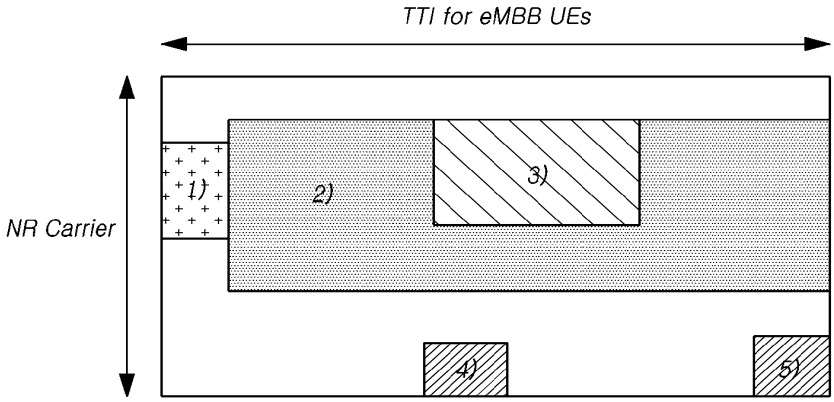
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000099

[도1]



[도2]



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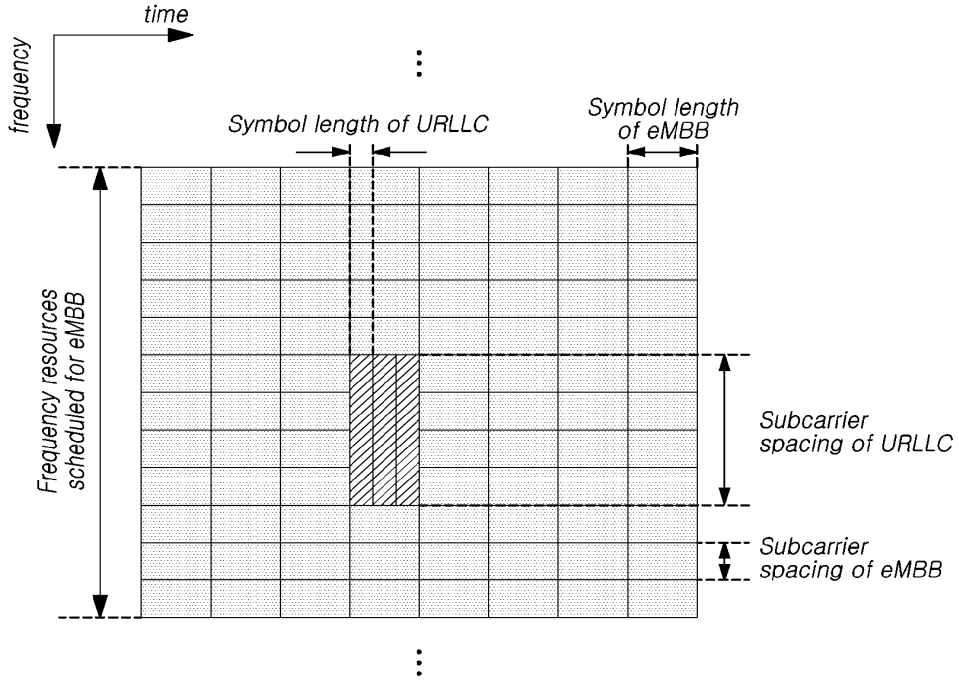
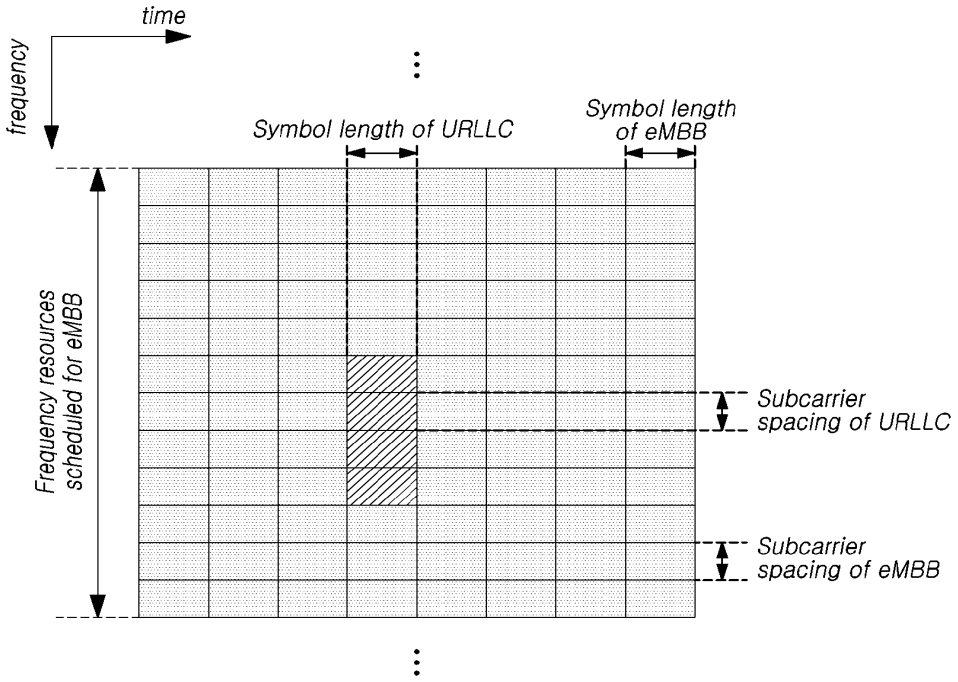


Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000101

[도4]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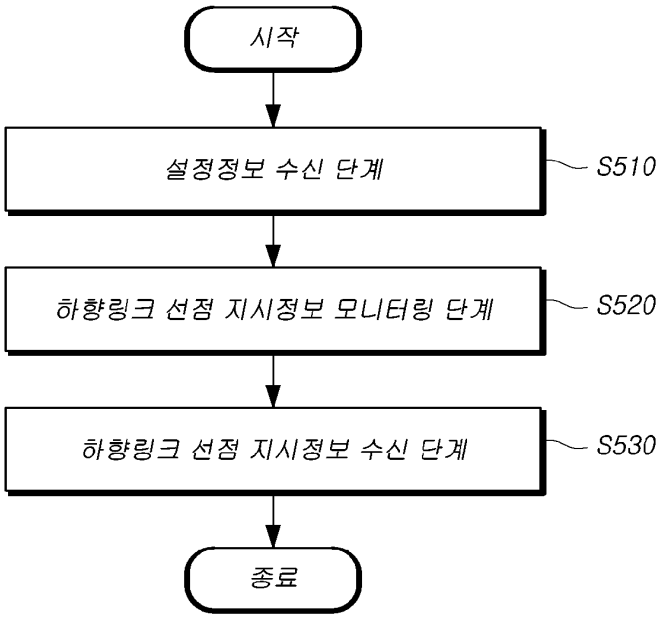
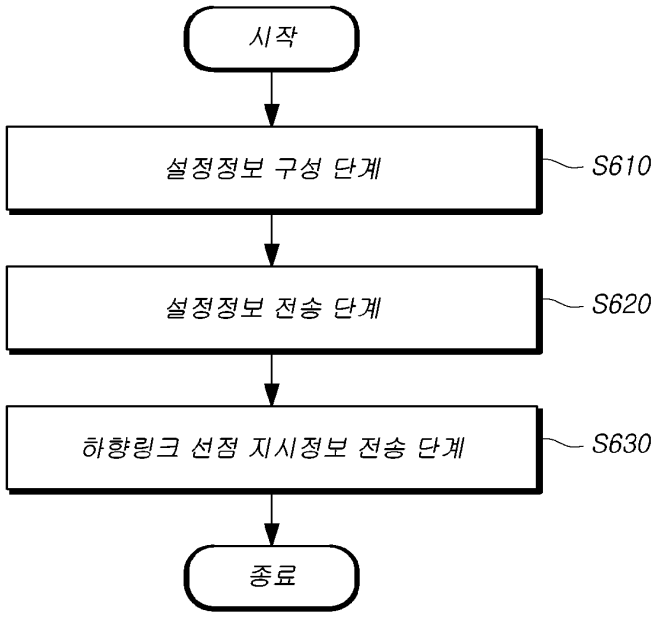
frequency
Symbol length of URLLC
Symbol length of eMBB
Frequency resources scheduled for eMBB
Subcarrier spacing of URLLC
Subcarrier spacing of eMBB

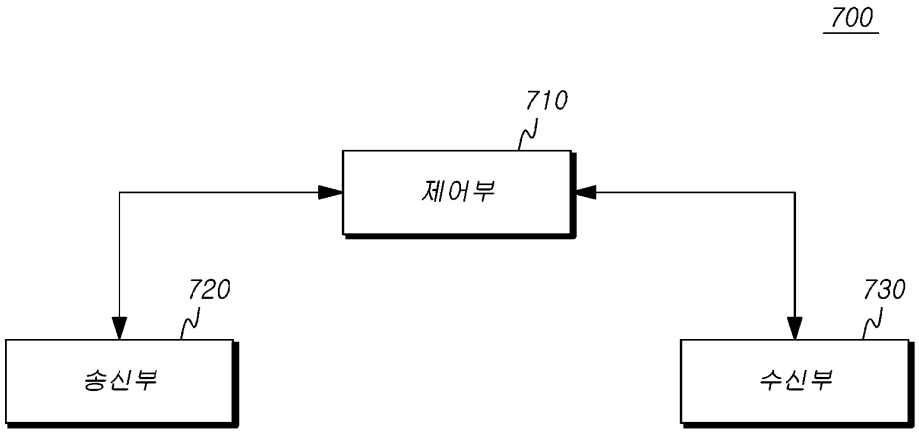
[도5]


시작
설정정보 수신 단계
S510
하향링크 선점 지시정보 모니터링 단계
S520
하향링크 선점 지시정보 수신 단계
S530
종료

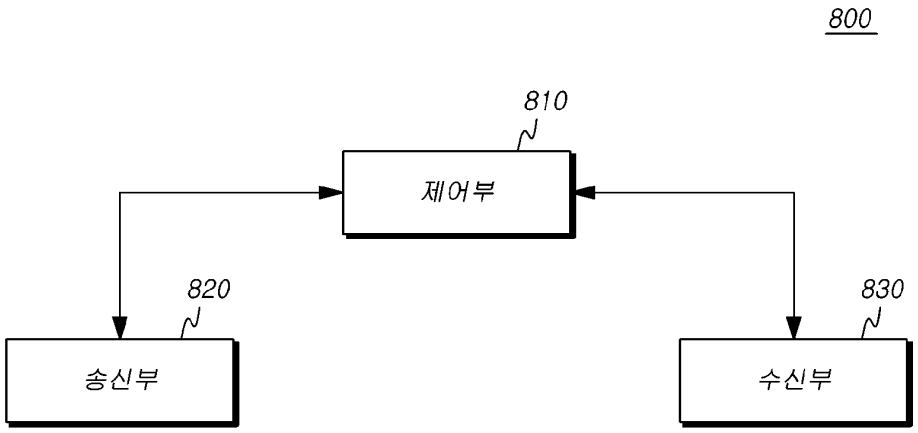
[도6]


시작
설정정보 구성 단계
S610
설정정보 전송 단계
S620
하향링크 선점 지시정보 전송 단계
S630
종료

[도7]


700
710
제어부
720
송신부
730
수신부

[도8]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2017/012992

A. CLASSIFICATION OF SUBJECT MATTER

H04W 72/04(2009.01)i, H04W 72/12(2009.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04W 72/04; H04L 5/00; H04W 72/14; H04J 11/00; H04L 1/18; H04W 72/08; H04W 72/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS (KIPO internal) & Keywords: downward, link, preoccupancy, preemption, indication, overlap, RRC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2016-0113008 A1 (QUALCOMM INCORPORATED) 21 April 2016 See paragraphs [0002]-[0008], [0013], [0034], [0038], [0058]-[0065], [0071]; and figure 6.	1-20
Y	INTEL CORPORATION, "Downlink URLLC Transmission and Multiplexing with eMBB", R1-1612003, 3GPP TSG RAN WG1 Meeting #87, Reno, USA, 06 November 2016 See sections 1-4.	1-20
A	US 2016-0218849 A1 (TEXAS INSTRUMENTS INCORPORATED) 28 July 2016 See paragraphs [0009], [0086]-[0088]; and figure 9.	1-20
A	US 2016-0037517 A1 (INTERDIGITAL TECHNOLOGY CORPORATION) 04 February 2016 See paragraphs [0011]-[0012], [0026], [0036]; and figure 1.	1-20
A	US 2008-0068979 A1 (VISOTSKY, Eugene et al.) 20 March 2008 See paragraphs [0023]-[0024]; and figure 3.	1-20

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
06 FEBRUARY 2018 (06.02.2018)	**06 FEBRUARY 2018 (06.02.2018)**
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. +82-42-481-8578	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2017/012992

Patent document cited in search report	Publication date	Patent family member	Publication date
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Page 000106

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2017/012992

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		KR 10-1186381 B1	26/09/2012
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		KR 10-2012-0006957 A	19/01/2012
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		WO 2005-125226 A3	24/08/2006
US 2008-0068979 A1	20/03/2008	NONE	

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000107

국 제 조 사 보 고 서

국제출원번호
PCT/KR2017/012992

A. 발명이 속하는 기술분류(국제특허분류(IPC))

H04W 72/04(2009.01)i, H04W 72/12(2009.01)i

B. 조사된 분야

조사된 최소문헌(국제특허분류를 기재)
H04W 72/04; H04L 5/00; H04W 72/14; H04J 11/00; H04L 1/18; H04W 72/08; H04W 72/12

조사된 기술분야에 속하는 최소문헌 이외의 문헌
한국등록실용신안공보 및 한국공개실용신안공보: 조사된 최소문헌란에 기재된 IPC
일본등록실용신안공보 및 일본공개실용신안공보: 조사된 최소문헌란에 기재된 IPC

국제조사에 이용된 전산 데이터베이스(데이터베이스의 명칭 및 검색어(해당하는 경우))
eKOMPASS(특허청 내부 검색시스템) & 키워드: 하향, 링크, 선점, preemption, 지시, 중첩, RRC

C. 관련 문헌

카테고리*	인용문헌명 및 관련 구절(해당하는 경우)의 기재	관련 청구항
Y	US 2016-0113008 A1 (QUALCOMM INCORPORATED) 2016.04.21 단락 [0002]-[0008], [0013], [0034], [0038], [0058]-[0065], [0071]; 및 도면 6 참조.	1-20
Y	INTEL CORPORATION, `Downlink URLLC transmission and multiplexing with eMBB', R1-1612003, 3GPP TSG RAN WG1 Meeting #87, Reno, USA, 2016.11.06 섹션 1-4 참조.	1-20
A	US 2016-0218849 A1 (TEXAS INSTRUMENTS INCORPORATED) 2016.07.28 단락 [0009], [0086]-[0088]; 및 도면 9 참조.	1-20
A	US 2016-0037517 A1 (INTERDIGITAL TECHNOLOGY CORPORATION) 2016.02.04 단락 [0011]-[0012], [0026], [0036]; 및 도면 1 참조.	1-20
A	US 2008-0068979 A1 (EUGENE VISOTSKY 등) 2008.03.20 단락 [0023]-[0024]; 및 도면 3 참조.	1-20

☐ 추가 문헌이 C(계속)에 기재되어 있습니다.

☒ 대응특허에 관한 별지를 참조하십시오.

* 인용된 문헌의 특별 카테고리:

"A" 특별히 관련이 없는 것으로 보이는 일반적인 기술수준을 정의한 문헌

"E" 국제출원일보다 빠른 출원일 또는 우선일을 가지나 국제출원일 이후에 공개된 선출원 또는 특허 문헌

"L" 우선권 주장에 의문을 제기하는 문헌 또는 다른 인용문헌의 공개일 또는 다른 특별한 이유(이유를 명시)를 밝히기 위하여 인용된 문헌

"O" 구두 개시, 사용, 전시 또는 기타 수단을 언급하고 있는 문헌

"P" 우선일 이후에 공개되었으나 국제출원일 이전에 공개된 문헌

"T" 국제출원일 또는 우선일 후에 공개된 문헌으로, 출원과 상충하지 않으며 발명의 기초가 되는 원리나 이론을 이해하기 위해 인용된 문헌

"X" 특별한 관련이 있는 문헌. 해당 문헌 하나만으로 청구된 발명의 신규성 또는 진보성이 없는 것으로 본다.

"Y" 특별한 관련이 있는 문헌. 해당 문헌이 하나 이상의 다른 문헌과 조합하는 경우로 그 조합이 당업자에게 자명한 경우 청구된 발명은 진보성이 없는 것으로 본다.

"&" 동일한 대응특허문헌에 속하는 문헌

국제조사의 실제 완료일	국제조사보고서 발송일
2018년 02월 06일 (06.02.2018)	2018년 02월 06일 (06.02.2018)

ISA/KR의 명칭 및 우편주소
대한민국 특허청
(35208) 대전광역시 서구 청사로 189,
4동 (둔산동, 정부대전청사)
팩스 번호 +82-42-481-8578

심사관
진상범
전화번호 +82-42-481-8398

서식 PCT/ISA/210 (두 번째 용지) (2015년 1월)

국 제 조 사 보 고 서
대응특허에 관한 정보

국제출원번호
PCT/KR2017/012992

국제조사보고서에서 인용된 특허문헌	공개일	대응특허문헌	공개일
US 2016-0113008 A1	2016/04/21	AU 2015-333980 A1	2017/03/30
		CN 107079450 A	2017/08/18
		EP 3207750 A1	2017/08/23
		JP 2017-535187 A	2017/11/24
		KR 10-2017-0069224 A	2017/06/20
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Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000109

국 제 조 사 보 고 서
대응특허에 관한 정보

국제출원번호
PCT/KR2017/012992

국제조사보고서에서 인용된 특허문헌	공개일	대응특허문헌	공개일
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Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000110

Customer No.: 76277 *PATENT*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Kyujin PARK et al. Re: Attorney Docket No.: 811.0177

Serial No.: Group Art Unit:
Filed: 05/14/2019 Examiner:
Matter No.: 811.0177 Conf. No.:

For: METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

PRELIMINARY AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Prior to examination on the merits, please amend the above-identified application as follows.

Amendments to the Specification begin on page 2.

Amendments to the Claims begin on page 3.

Remarks begin on page 6.

AMENDMENTS TO THE SPECIFICATION

In the Specification

Please **INSERT** the following paragraph under the title of the invention on page 1 as follows.

-- CROSS REFERENCE TO RELATED APPLICATIONS

This application is a National Stage Patent Application of PCT International Patent Application No. PCT/KR2017/012992 (filed on November 16, 2017) under 35 U.S.C. §371, which claims priority to Korean Patent Application Nos. 10-2016-0152659 (filed on November 16, 2016) and 10-2017-0151983 (filed on November 15, 2017), the teachings of which are incorporated herein in their entireties by reference.--

Please **AMEND** the paragraph [129] ~ [130] as follows.

~~[129] CROSS-REFERENCE TO RELATED APPLICATION~~

~~[130] If applicable, this application claims priority under 35 U.S.C §119(a) of Patent Application No. 10-2016-0152659, filed on November 16, 2016, and Patent Application No. 10-2017-0151983, filed on November 15, 2017, in Korea, the entire contents of which are incorporated herein by reference. In addition, this non-provisional application claims priorities in countries other than the U.S. for the same reason based on the Korean Patent Applications, the entire contents of which are hereby incorporated by reference.~~

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Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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AMENDMENTS TO THE CLAIMS

1. **(Currently Amended)** A method of a user equipment (UE) for receiving a downlink (DL) signal, the method comprising:

receiving configuration information for receiving DL preemption indication information from a base station;

monitoring the DL preemption indication information based on the configuration information; and

receiving the DL preemption indication information through a multicast signal ~~or a unicast signal~~,

wherein the DL preemption indication information includes information for indicating superposed radio resources where radio resources ~~for providing a first service~~ allocated for the UE and radio resources ~~for providing a second service~~ allocated for other UE are superposed each other.

2. (Original) The method according to claim 1, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource for providing the first service is different from that of the radio resource for providing the second service.

3. (Original) The method according to claim 1, wherein the configuration information is received through UE-specific radio resource control (RRC) signaling.

4. (Original) The method according to claim 1, wherein the DL preemption indication information is received through a common search space or a group common search space of a DL control channel.

5. (Original) The method according to claim 1, wherein the DL preemption indication information is received through a UE-specific search space of a DL control channel.

6. **(Currently Amended)** A method of a base station for transmitting a downlink (DL) signal, the method comprising:

generating configuration information for monitoring DL preemption indication information;

transmitting the configuration information to a user equipment (UE); and

transmitting the DL preemption indication information based on the configuration information through a multicast signal ~~or a unicast signal~~,

wherein the DL preemption indication information includes information for indicating superposed radio resources on which radio resources ~~for providing a first service~~ allocated for the UE and radio resources ~~for providing a second service~~ allocated for other UE are superposed each other.

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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000113

7. (Original) The method according to claim 6, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource for providing the first service is different from that of the radio resource for providing the second service.

8. (Original) The method according to claim 6, wherein the configuration information is transmitted through UE-specific radio resource control (RRC) signaling.

9. (Original) The method according to claim 6, wherein the DL preemption indication information is transmitted through a common search space or a group common search space of a DL control channel.

10. (Original) The method according to claim 6, wherein the DL preemption indication information is transmitted through a UE-specific search space of a DL control channel.

11. **(Currently Amended)** A user equipment (UE) for receiving a downlink (DL) signal, the user equipment comprising:

a receiver receiving configuration information for receiving DL preemption indication information form a base station; and

a controller monitoring the DL preemption indication information based on the configuration information,

wherein the receiver receives the DL preemption indication information through a multicast signal ~~or a unicast signal~~,

wherein the DL preemption indication information includes information for indicating superposed radio resources where radio resources ~~for providing a first service~~ allocated for the UE and radio resources ~~for providing a second service~~ allocated for other UE are superposed each other.

12. (Original) The user equipment according to claim 11, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource for providing the first service is different from that of the radio resource for providing the second service.

13. (Original) The user equipment according to claim 11, wherein the configuration information is received through UE-specific radio resource control (RRC) signaling.

14. (Original) The user equipment according to claim 11, wherein the DL preemption indication information is received through a common search space or a group common search space of a DL control channel.

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Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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15. (Original) The user equipment according to claim 11, wherein the DL preemption indication information is received through a UE-specific search space of a DL control channel.

16. **(Canceled)**

17. **(Canceled)**

18. **(Canceled)**

19. **(Canceled)**

20. **(Canceled)**

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REMARKS

Claims 1-20 were previously pending in the application. By this amendment, the specification is amended to claim priority, claims 1, 6, 11 are amended, and claims 16-20 are cancelled without prejudice or disclaimer. Assuming the entry of this amendment, claims 1-15 are now pending in the application. Applicant respectfully submits that no new matter is added and the support for the amendments may be found throughout the specification as originally filed.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided. Prompt and favorable consideration of this Amendment is respectfully requested.

Respectfully submitted,

Date: 14 May 2019
Customer No. 76277
IP Legal Services, LLC
P.O. Box 651325
Sterling, VA 20165

/Ian M. Hughes/
Ian M. Hughes, Reg. No. 41,083
Kyung Hee Kim, Reg. No. 69,183
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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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Doc Code: PA..

Document Description: Power of Attorney

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Application Number	TBD
Filing Date	May 14, 2019
First Named Inventor	Kyujin PARK
Title	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT...
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	811.0177

SIGNATURE of Applicant or Patent Practitioner

Signature	/Ian M. Hughes/	Date	05/14/2019
Name	Ian M. Hughes	Telephone	571-267-7183
Registration Number	41,083		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications.

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76277

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I am the Applicant:

☐ Inventor or Joint Inventor

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor

☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (*e.g.*, a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document)

SIGNATURE of Applicant for Patent

Signature		Date	10/29/2012
Name	CHOI, Ji-Myung	Telephone	82-31-727-2661
Title and Company	General Manager of KT CORPORATION		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms for more than one signature, see below *.

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Application Number:	
Filing Date:	
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Filer:	Kyung Hee Kim/HYE WON CHUNG
Attorney Docket Number:	811.0177

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Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
NATIONAL STAGE FEE	1631	1	300	300
NATL STAGE SEARCH FEE - REPORT PROVIDED	1642	1	520	520
NATIONAL STAGE EXAM - ALL OTHER CASES	1633	1	760	760
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
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Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
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Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1580**

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EFS ID:	36011001
Application Number:	16349874
International Application Number:	PCT/KR2017/012992
Confirmation Number:	1053
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	76277
Filer:	Kyung Hee Kim/HYE WON CHUNG
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Attorney Docket Number:	811.0177
Receipt Date:	14-MAY-2019
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Time Stamp:	16:28:21
Application Type:	U.S. National Stage under 35 USC 371

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Warnings:					
Information:					
2	Application Data Sheet	028110177NewADS.pdf	1831824 38f31545d00abe69824f17c72895f50e38815c67	no	8
Warnings:					
Information:					
3	Oath or Declaration filed	038110177ExecutedDeclarations.pdf	150369 c53129b97b26ff731044e6e58c84aeb67c438b3d	no	2
Warnings:					
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4	Preliminary Amendment	048110177PreliminaryAmendment.pdf	97300 a18aae99b756af447bdbbc8885161e526b5e35d8	no	6
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Drawings-only black and white line drawings	37	44
Abstract	36	36
Claims	31	35

	Specification		1	30	
Warnings:					
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Warnings:					
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7	Power of Attorney	078110177PoATransmittal1.pdf	1554052 41320e2a0391353a53f6bc67b9d04d51b8e4d482	no	3
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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99**)		
	Application Number	16349874
	Filing Date	2019-05-14
	First Named Inventor	Kyujin PARK
	Art Unit	
	Examiner Name	
	Attorney Docket Number	811.0177

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20160113008	A1	2016-04-21	Jelena Damnjanovic et al.	
	2	20190090239	A1	2019-03-21	Jelena Damnjanovic et al.	
	3	20160218849	A1	2016-07-28	Pierre Bertrand et al.	
	4	20160037517	A1	2016-02-04	Stephen E. Terry	
	5	20060007880	A1	2006-01-12	Stephen E. Terry	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16349874
	Filing Date	2019-05-14
	First Named Inventor	Kyujin PARK
	Art Unit	
	Examiner Name	
	Attorney Docket Number	811.0177

	6	20100208689	A1	2010-08-19	Stephen E. Terry	
	7	20130272243	A1	2013-10-17	Stephen E. Terry	
	8	20080068979	A1	2008-03-20	Eugene Visotsky et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	INTEL CORPORATION, "Downlink URLLC transmission and multiplexing with eMBB", R1-1612003, 3GPP TSG RAN WG1 Meeting #87, Reno, USA, 14th - 18th November 2016, pp. 1-9	X

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000126

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16349874
	Filing Date	2019-05-14
	First Named Inventor	Kyujin PARK
	Art Unit	
	Examiner Name	
	Attorney Docket Number	811.0177

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000127

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16349874
	Filing Date	2019-05-14
	First Named Inventor	Kyujin PARK
	Art Unit	
	Examiner Name	
	Attorney Docket Number	811.0177

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Ian M. Hughes/	Date (YYYY-MM-DD)	2019-05-14
Name/Print	Ian M. Hughes	Registration Number	41083

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000128

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000129

Electronic Acknowledgement Receipt

EFS ID:	36011129
Application Number:	16349874
International Application Number:	
Confirmation Number:	1053
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Correspondence Address:	IP LEGAL SERVICES, LLC - P.O. Box 651325 - Sterling VA 20165 US 5712677183 email@iplsllc.com
Filer:	Kyung Hee Kim/HYE WON CHUNG
Filer Authorized By:	Kyung Hee Kim
Attorney Docket Number:	811.0177
Receipt Date:	14-MAY-2019
Filing Date:	
Time Stamp:	16:33:30
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	088110177IDSForm.pdf	612826 89136ed83615f6ea7417bc2f16af72a20b8a4dce	no	5
Warnings:					
Information:					
2	Non Patent Literature	088110177Ref1.pdf	1579896 aba00051fff9919d47c845b1512e0a07bcc8db17	no	9
Warnings:					
Information:					
		Total Files Size (in bytes):	2192722		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92*bis*.1 and Administrative Instructions, Section 422)

To:

YUIL HIGHEST INTERNATIONAL PATENT AND LAW FIRM
(Yeoksam-dong, Oksan Bldg.) 2F, 59,
Gangnam-daero 94-gil,
Gangnam-gu
Seoul 06130
RÉPUBLIQUE DE CORÉE

Date of mailing *(day/month/year)*
31 May 2018 (31.05.2018)

Applicant's or agent's file reference
PCT17-854

IMPORTANT NOTIFICATION

International application No.
PCT/KR2017/012992

International filing date *(day/month/year)*
16 November 2017 (16.11.2017)

1. The following indications appeared on record concerning:

☐ the applicant ☐ the inventor ☒ the agent ☐ the common representative

Name and Address
YUIL HIGHEST INTERNATIONAL PATENT AND LAW FIRM

State of Nationality | State of Residence

Telephone No.

Facsimile No.

E-mail address
ip@youhighest.com

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☐ the name ☐ the address ☐ the nationality ☐ the residence

Name and Address
See box 3.

State of Nationality | State of Residence

Telephone No.

Facsimile No.

E-mail address
☐ Notifications by e-mail authorized

3. Further observations, if necessary:
Please note that the agent in box 1 will receive notification by e-mail only.

4. A copy of this notification has been sent to:

☒ the receiving Office
☐ the International Searching Authority
☐ the Authority(ies) specified for supplementary search
☐ the International Preliminary Examining Authority
☒ the designated Offices concerned
☐ the elected Offices concerned
☐ other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 70 90

Authorized officer
Lee Yun-Joo
e-mail pct.team1@wipo.int
Telephone No. +41 22 338 74 01

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000132

PCT 출원서

출력(전자적 형태가 원본)

0	**수리관청 전용**	
0-1	국제출원번호	**PCT/KR2017/012992**
0-2	국제출원일자	**2017년 11월 16일 (16.11.2017)**
0-3	수리관청 명칭 및 "PCT 국제출원"	**RO/KR**

0-4	서식 **PCT/RO/101 - PCT 출원서**	
0-4-1	우측에 기재된 바와 같이 작성되었다.	**PCT-SAFE** **버전 3.51.078.254 MT/FOP 20170701/0.20.5.24**
0-5	**신청** 아래 서명인은 본 국제 출원서가 특허협력조약에 의해 처리될 것을 청구합니다.	
0-6	**출원인이 지정한 수리관청**	**대한민국 특허청 (RO/KR)**
0-7	**출원인 또는 대리인의 서류참조기호**	**PCT17-854**
I	**발명의 명칭**	**차세대 무선망에서 하향링크 신호를 송수신하는 방법 및 그 장치**
II	**출원인**	
II-1	이 사람은	**오직 출원인 (applicant only)**
II-2	우측 지정국에 관한 출원인	**모든 지정국 (all designated States)**
II-4ko	성명	**주식회사 케이티**
II-4en	Name:	**KT CORPORATION**
II-5ko	주소	**대한민국** **13606** **경기도 성남시 분당구 불정로 90 (정자동 206번지)**
II-5en	Address:	**(206, Jeongja-dong) 90, Buljeong-ro, Bundang-gu,** **Seongnam-si Gyeonggi-do 13606** **Republic of Korea**
II-6	국적	**대한민국 KR**
II-7	거주국	**대한민국 KR**
II-8	전화번호	**+82-31-727-1133**
II-9	팩스번호	**+82-31-727-1546**
II-10	이메일 주소	**standard@kt.com**
II-11	출원인 코드	**2-1998-005456-3**

PCT 출원서

출력(전자적 형태가 원본)

III-1	**출원인 및/또는 발명자**	
III-1-1	이 사람은	오직 발명자 (inventor only)
III-1-3	우측 지정국에 관한 발명자	모든 지정국 (all designated States)
III-1-4ko	성명	박규진
III-1-4en	Name (LAST, First):	**PARK, Kyujin**
III-1-5ko	주소	대한민국 **06763** 서울시 서초구 태봉로 **151** (우면동, **KT**연구개발센터)
III-1-5en	Address:	**(Korea Telecom Research Center, Umyeon-dong) 151, Taebong-ro Seocho-gu Seoul 06763 Republic of Korea**
III-2	**출원인 및/또는 발명자**	
III-2-1	이 사람은	오직 발명자 (inventor only)
III-2-3	우측 지정국에 관한 발명자	모든 지정국 (all designated States)
III-2-4ko	성명	최우진
III-2-4en	Name (LAST, First):	**CHOI, Woo-jin**
III-2-5ko	주소	대한민국 **06763** 서울시 서초구 태봉로 **151** (우면동, **KT**연구개발센터)
III-2-5en	Address:	**(Korea Telecom Research Center, Umyeon-dong) 151, Taebong-ro Seocho-gu Seoul 06763 Republic of Korea**
IV-1	**대리인 또는 대표자** 아래에 기재된 자는 관할 국제기관에 대하여 우측에 표시된 자격으로 출원인을 대리하는 것으로 선임되었다.	대리인
IV-1-1ko	성명	특허법인(유한)유일하이스트
IV-1-1en	Name:	**YUIL HIGHEST INTERNATIONAL PATENT AND LAW FIRM**
IV-1-2ko	주소	대한민국 **06130** 서울시 강남구 강남대로**94**길 **59, 2**층(역삼동, 옥산빌딩)
IV-1-2en	Address:	**(Yeoksam-dong, Oksan Bldg.) 2F, 59, Gangnam-daero 94-gil, Gangnam-gu Seoul 06130 Republic of Korea**
IV-1-3	전화번호	**02-568-6177**
IV-1-4	팩스번호	**02-568-6176**
IV-1-5	이메일 주소	**ip@youhighest.com**
IV-1-5(a)	이메일 사용동의 수리관청, 국제조사기관, 국제사무국, 국제예비심사기관이 필요 시 이 이메일 주소를 사용하여 이 국제 출원과 관련하여 발행된 통지서를 송부할 것에 동의한다.	서면 통지서에 앞서 선람용 사본 송부
IV-1-6	대리인 코드	**9-2017-100261-6**

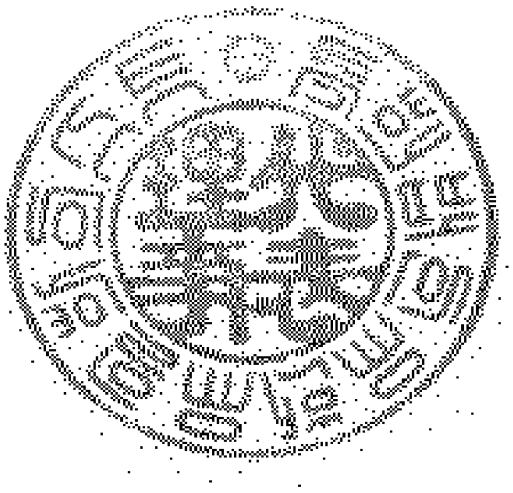
PCT 출원서

출력(전자적 형태가 원본)

V	지정국		
V-1	**본 출원서의 제출로, 규칙 4.9(a)에 따라, 부여될 수 있는 모든 종류의 권리 보호를 위하여, 그리고 해당하는 경우 지역특허 및 국내특허 모두를 위하여 당해 국제출원일에 PCT에 기속되는 모든 체약국이 지정된다.**		
V-2	**V-2란은 출원서 제출시 또는 규칙 26의2.1에 의해 그 이후 출원서 제6기재란에 위 특정 관련 체약국의 국내 선출원에 대한 우선권주장이 포함되어 있을 경우 당해 체약국의 국내법에 의해 해당 국내 선출원의 효력이 상실되는 것을 방지하기 위한 목적으로 당해 체약국의 지정을 제외하는 데에만 사용될 수 있다 (지정 제외시 이의 취소 불가능).**	**KR**	
VI-1	**선국내출원에 대한 우선권 주장**		
VI-1-1	출원일	**2016년 11월 16일 (16.11.2016)**	
VI-1-2	출원번호	**10-2016-0152659**	
VI-1-3	파리협약 당사국명 또는 WTO 회원국명	**KR**	
VI-2	**선국내출원에 대한 우선권 주장**		
VI-2-1	출원일	**2017년 11월 15일 (15.11.2017)**	
VI-2-2	출원번호	**10-2017-0151983**	
VI-2-3	파리협약 당사국명 또는 WTO 회원국명	**KR**	
VI-3	**우선권서류 신청**		
	수리관청에 대하여 위에 명시된 선출원의 인증등본을 준비하여 국제사무국에 송부하여 줄 것을 신청한다.	**VI-1** **VI-2**	
VI-4	**인용에 의한 보완**		
	조약 제11조(1)(iii)(d) 또는 (e)에서 규정하는 국제출원의 요소, 또는 규칙 20.5(a)에서 규정하는 명세서, 청구 범위 또는 도면의 일부가 본 국제출원에는 포함되어 있지 않지만 조약 제11조(1)(iii) 규정의 요소 중 하나 이상이 수리관청에 최초로 접수된 날에 우선권주장의 기초가 된 선출원에 완전히 포함되어 있는 경우, 그 요소 또는 부분은 규칙 20.6 규정에 의한 확인을 조건으로, 규칙 20.6의 규정과 관련하여 본 국제출원에 있어서 인용에 의해 보완된다.		
VII-1	**국제조사기관(ISA) 선택**	**대한민국 특허청 (ISA/KR)**	
VIII	**선언서**	선언서 개수	
VIII-1	발명자의 신원에 관한 선언	-	
VIII-2	국제출원일에 특허출원 및 특허를 받을 수 있는 출원인의 자격에 관한 선언	-	
VIII-3	국제출원일에 선출원의 우선권을 주장할 수 있는 출원인의 자격에 관한 선언	-	
VIII-4	발명자 선언(미국에 대한 지정의 경우에 한함)	-	
VIII-5	신규성을 해치지 아니하는 개시 또는 신규성 상실의 예외에 관한 선언	-	

PCT 출원서

출력(전자적 형태가 원본)

IX	**체크 리스트**	용지 수	전자적 파일 첨부
IX-1	출원서(선언서 포함)	**5**	✓
IX-2	명세서	**19**	✓
IX-3	청구범위	**3**	✓
IX-4	요약서	**1**	✓
IX-5	도면	**5**	✓
IX-7	용지매수 소계	**33**	
	첨부 항목	서면 첨부	전자적 파일 첨부
IX-8	수수료 계산 용지	-	✓
IX-9	개별위임장 원본	-	✓
IX-20	**요약서에 수반되어야 할 도면 번호**	**5**	
IX-21	**국제출원의 출원 언어**	한국어	
X-1	**출원인, 대리인 또는 대표자의 서명 또는 날인**		
X-1-1	성명	특허법인(유한)유일하이스트	
X-1-2	서명인의 성명	특허법인(유한)유일하이스트	
X-1-3	권한 (출원서를 통해 서명자의 자격이 명백하지 않은 경우에는 그 자격도 표시)	특허법인(유한)유일하이스트	

PCT 출원서

출력(전자적 형태가 원본)

수리관청 전용

10-1	국제출원으로 제출된 서류의 실제 접수일	**2017년 11월 16일 (16.11.2017)**
10-2	도면	
10-2-1	접수	
10-2-2	미접수	
10-3	국제출원으로 제출된 서류를 완성하는 서류 또는 도면의 추후 기간내 제출에 따른 정정된 실제 접수일	
10-4	**PCT** 제**11**조(**2**)에 따라 제출이 요구된 보완서로서 기간내 제출된 보완서의 접수일	
10-5	국제조사기관(**ISA**)	**ISA/KR**
10-6	조사료 납부시까지 지연된 조사용 사본의 송부	

국제 사무국 전용

11-1	국제 사무국의 기록원본 접수일	

대한민국 특허청
KOREAN INTELLECTUAL PROPERTY OFFICE

별첨 사본은 아래 출원의 원본과 동일함을 증명함.

This is to certify that the following application annexed hereto is a true copy from the records of the Korean Intellectual Property Office.

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출 원 인 : 주식회사 케이티
Applicant(s) KT Corporation

2017 년 11 월 22 일

특 허 청
COMMISSIONER

2016-11-16

【서지사항】

【서류명】 특허출원서

【출원구분】 특허출원

【출원인】

【명칭】 주식회사 케이티

【특허고객번호】 2-1998-005456-3

【대리인】

【성명】 김은구

【대리인번호】 9-1999-000318-1

【포괄위임등록번호】 2011-023059-1

【대리인】

【성명】 송해모

【대리인번호】 9-2002-000179-4

【포괄위임등록번호】 2011-023060-3

【발명의 국문명칭】 차세대 무선 액세스망을 위한 하향 링크 데이터 다중화 방법 및 장치

【발명의 영문명칭】 Apparatus and method of DL data multiplexing for NR(New Radio)

【발명자】

【성명】 박규진

【성명의 영문표기】 PARK, Kyu Jin

【주민등록번호】 811018-1XXXXXX

【우편번호】 137-140

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【주소】 서울특별시 서초구 우면동 17 KT연구개발센터

【국적】 KR

【발명자】

【성명】 최우진

【성명의 영문표기】 CHOI, Woo Jin

【주민등록번호】 660822-1XXXXXX

【우편번호】 137-140

【주소】 서울특별시 서초구 우면동 17 KT연구개발센터

【국적】 KR

【출원언어】 국어

【취지】 위와 같이 특허청장에게 제출합니다.

대리인 김은구 (서명 또는 인)

대리인 송해모 (서명 또는 인)

【수수료】

【출원료】	0	면	46,000 원
【가산출원료】	24	면	0 원
【우선권주장료】	0	건	0 원
【심사청구료】	0	항	0 원
【합계】	46,000 원		

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【발명의 설명】

【발명의 명칭】

차세대 무선 액세스망을 위한 하향 링크 데이터 다중화 방법 및 장치 {Apparatus and method of DL data multiplexing for NR(New Radio)}

【기술분야】

【0001】 본 발명은 3GPP에서 논의가 시작된 차세대/5G 무선 액세스망(이하, "NR[New Radio]"라 함)에서 서로 다른 QoS requirement를 갖는 traffic 간의 효율적인 multiplexing을 지원하기 위한 하향 링크 제어 정보 전송 방법에 관한 것이다.

【발명의 내용】

【과제의 해결 수단】

【0002】 일 실시예는, 차세대 무선 액세스망을 위한 하향 링크 데이터 다중화 방법에 있어서, pre-notification 기반의 dynamic puncturing 또는 post-notification 기반의 dynamic puncturing을 적용하는 단계와, 해당 slot 또는 이전 slot에서 URLLC 데이터 전송을 위해 사용된 자원 정보를 cell-specific 또는 UE common signalling을 통해 브로드캐스팅 또는 멀티캐스팅하는 단계를 포함하는 방법을 제공한다.

【도면의 간단한 설명】

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【0003】도 1은 Example of symbol level alignment among different SCS 를 나타낸 도면이다.

도 2는 또 다른 실시예에 의한 기지국의 구성을 보여주는 도면이다.

도 3은 또 다른 실시예에 의한 사용자 단말의 구성을 보여주는 도면이다.

【발명을 실시하기 위한 구체적인 내용】

【0004】이하, 본 발명의 일부 실시예들을 예시적인 도면을 통해 상세하게 설명한다. 각 도면의 구성요소들에 참조부호를 부가함에 있어서, 동일한 구성요소들에 대해서는 비록 다른 도면상에 표시되더라도 가능한 한 동일한 부호를 가지도록 하고 있음에 유의해야 한다. 또한, 본 발명을 설명함에 있어, 관련된 공지 구성 또는 기능에 대한 구체적인 설명이 본 발명의 요지를 흐릴 수 있다고 판단되는 경우에는 그 상세한 설명은 생략한다.

【0005】본 명세서에서 MTC 단말은 low cost(또는 low complexity)를 지원하는 단말 또는 coverage enhancement를 지원하는 단말 등을 의미할 수 있다. 본 명세서에서 MTC 단말은 low cost(또는 low complexity) 및 coverage enhancement를 지원하는 단말 등을 의미할 수 있다. 또는 본 명세서에서 MTC 단말은 low cost(또는 low complexity) 및/또는 coverage enhancement를 지원하기 위한 특정 카테고리로 정의된 단말을 의미할 수 있다.

【0006】다시 말해 본 명세서에서 MTC 단말은 LTE 기반의 MTC 관련 동작을 수행하는 새롭게 정의된 3GPP Release-13 low cost(또는 low complexity) UE

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category/type을 의미할 수 있다. 또는 본 명세서에서 MTC 단말은 기존의 LTE coverage 대비 향상된 coverage를 지원하거나, 혹은 저전력 소모를 지원하는 기존의 3GPP Release-12 이하에서 정의된 UE category/type, 혹은 새롭게 정의된 Release-13 low cost(또는 low complexity) UE category/type을 의미할 수 있다.

【0007】 본 발명에서의 무선통신시스템은 음성, 패킷 데이터 등과 같은 다양한 통신 서비스를 제공하기 위해 널리 배치된다. 무선통신시스템은 사용자 단말(User Equipment, UE) 및 기지국(Base Station, BS, 또는 eNB)을 포함한다. 본 명세서에서의 사용자 단말은 무선 통신에서의 단말을 의미하는 포괄적 개념으로서, WCDMA 및 LTE, HSPA 등에서의 UE(User Equipment)는 물론, GSM에서의 MS(Mobile Station), UT(User Terminal), SS(Subscriber Station), 무선기기(wireless device) 등을 모두 포함하는 개념으로 해석되어야 할 것이다.

【0008】 기지국 또는 셀(cell)은 일반적으로 사용자 단말과 통신하는 지점(station)을 말하며, 노드-B(Node-B), eNB(evolved Node-B), 섹터(Sector), 싸이트(Site), BTS(Base Transceiver System), 액세스 포인트(Access Point), 릴레이 노드(Relay Node), RRH(Remote Radio Head), RU(Radio Unit), small cell 등 다른 용어로 불릴 수 있다.

【0009】 즉, 본 명세서에서 기지국 또는 셀(cell)은 CDMA에서의 BSC(Base Station Controller), WCDMA의 NodeB, LTE에서의 eNB 또는 섹터(싸이트) 등이 커버하는 일부 영역 또는 기능을 나타내는 포괄적인 의미로 해석되어야 하며, 메가셀, 매크로셀, 마이크로셀, 피코셀, 펨토셀 및 릴레이 노드(relay node), RRH, RU,

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small cell 통신범위 등 다양한 커버리지 영역을 모두 포괄하는 의미이다.

【0010】 상기 나열된 다양한 셀은 각 셀을 제어하는 기지국이 존재하므로 기지국은 두 가지 의미로 해석될 수 있다. i) 무선 영역과 관련하여 메가셀, 매크로셀, 마이크로셀, 피코셀, 펨토셀, 스몰 셀을 제공하는 장치 그 자체이거나, ii) 상기 무선영역 그 자체를 지시할 수 있다. i)에서 소정의 무선 영역을 제공하는 장치들이 동일한 개체에 의해 제어되거나 상기 무선 영역을 협업으로 구성하도록 상호작용하는 모든 장치들을 모두 기지국으로 지시한다. 무선 영역의 구성 방식에 따라 eNB, RRH, 안테나, RU, LPN, 포인트, 송수신포인트, 송신 포인트, 수신 포인트 등은 기지국의 일 실시예가 된다. ii)에서 사용자 단말의 관점 또는 이웃하는 기지국의 입장에서 신호를 수신하거나 송신하게 되는 무선 영역 그 자체를 기지국으로 지시할 수 있다.

【0011】 따라서, 메가셀, 매크로셀, 마이크로셀, 피코셀, 펨토셀, 스몰 셀, RRH, 안테나, RU, LPN(Low Power Node), 포인트, eNB, 송수신포인트, 송신 포인트, 수신 포인트를 통칭하여 기지국으로 지칭한다.

【0012】 본 명세서에서 사용자 단말과 기지국은 본 명세서에서 기술되는 기술 또는 기술적 사상을 구현하는데 사용되는 두 가지 송수신 주체로 포괄적인 의미로 사용되며 특정하게 지칭되는 용어 또는 단어에 의해 한정되지 않는다. 사용자 단말과 기지국은, 본 발명에서 기술되는 기술 또는 기술적 사상을 구현하는데 사용되는 두 가지(Uplink 또는 Downlink) 송수신 주체로 포괄적인 의미로 사용되며 특정하게 지칭되는 용어 또는 단어에 의해 한정되지 않는다. 여기서, 상향링크

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(Uplink, UL, 또는 업링크)는 사용자 단말에 의해 기지국으로 데이터를 송수신하는 방식을 의미하며, 하향링크(Downlink, DL, 또는 다운링크)는 기지국에 의해 사용자 단말로 데이터를 송수신하는 방식을 의미한다.

【0013】무선통신시스템에 적용되는 다중 접속 기법에는 제한이 없다. CDMA(Code Division Multiple Access), TDMA(Time Division Multiple Access), FDMA(Frequency Division Multiple Access), OFDMA(Orthogonal Frequency Division Multiple Access), OFDM-FDMA, OFDM-TDMA, OFDM-CDMA와 같은 다양한 다중 접속 기법을 사용할 수 있다. 본 발명의 일 실시예는 GSM, WCDMA, HSPA를 거쳐 LTE 및 LTE-advanced로 진화하는 비동기 무선통신과, CDMA, CDMA-2000 및 UMB로 진화하는 동기식 무선 통신 분야 등의 자원할당에 적용될 수 있다. 본 발명은 특정한 무선통신 분야에 한정되거나 제한되어 해석되어서는 아니 되며, 본 발명의 사상이 적용될 수 있는 모든 기술분야를 포함하는 것으로 해석되어야 할 것이다.

【0014】상향링크 전송 및 하향링크 전송은 서로 다른 시간을 사용하여 전송되는 TDD(Time Division Duplex) 방식이 사용될 수 있고, 또는 서로 다른 주파수를 사용하여 전송되는 FDD(Frequency Division Duplex) 방식이 사용될 수 있다.

【0015】또한, LTE, LTE-advanced와 같은 시스템에서는 하나의 반송파 또는 반송파 쌍을 기준으로 상향링크와 하향링크를 구성하여 규격을 구성한다. 상향링크와 하향링크는, PDCCH(Physical Downlink Control CHannel), PCFICH(Physical Control Format Indicator CHannel), PHICH(Physical Hybrid ARQ Indicator CHannel), PUCCH(Physical Uplink Control CHannel), EPDCCH(Enhanced Physical

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Downlink Control CHannel) 등과 같은 제어채널을 통하여 제어정보를 전송하고, PDSCH(Physical Downlink Shared CHannel), PUSCH(Physical Uplink Shared CHannel) 등과 같은 데이터채널로 구성되어 데이터를 전송한다.

【0016】 한편 EPDCCH(enhanced PDCCH 또는 extended PDCCH)를 이용해서도 제어 정보를 전송할 수 있다.

【0017】 본 명세서에서 셀(cell)은 송수신 포인트로부터 전송되는 신호의 커버리지 또는 송수신 포인트(transmission point 또는 transmission/reception point)로부터 전송되는 신호의 커버리지를 가지는 요소 반송파(component carrier), 그 송수신 포인트 자체를 의미할 수 있다.

【0018】 실시예들이 적용되는 무선통신 시스템은 둘 이상의 송수신 포인트들이 협력하여 신호를 전송하는 다중 포인트 협력형 송수신 시스템(coordinated multi-point transmission/reception System; CoMP 시스템) 또는 협력형 다중 안테나 전송방식(coordinated multi-antenna transmission system), 협력형 다중 셀 통신시스템일 수 있다. CoMP 시스템은 적어도 두 개의 다중 송수신 포인트와 단말들을 포함할 수 있다.

【0019】 다중 송수신 포인트는 기지국 또는 매크로 셀(macro cell, 이하 'eNB'라 함)과, eNB에 광케이블 또는 광섬유로 연결되어 유선 제어되는, 높은 전송파워를 갖거나 매크로 셀영역 내의 낮은 전송파워를 갖는 적어도 하나의 RRH일 수도 있다.

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【0020】이하에서 하향링크(downlink)는 다중 송수신 포인트에서 단말로의 통신 또는 통신 경로를 의미하며, 상향링크(uplink)는 단말에서 다중 송수신 포인트로의 통신 또는 통신 경로를 의미한다. 하향링크에서 송신기는 다중 송수신 포인트의 일부분일 수 있고, 수신기는 단말의 일부분일 수 있다. 상향링크에서 송신기는 단말의 일부분일 수 있고, 수신기는 다중 송수신 포인트의 일부분일 수 있다.

【0021】이하에서는 PUCCH, PUSCH, PDCCH, EPDCCH 및 PDSCH 등과 같은 채널을 통해 신호가 송수신되는 상황을 'PUCCH, PUSCH, PDCCH, EPDCCH 및 PDSCH를 전송, 수신한다' 는 형태로 표기하기도 한다.

【0022】또한 이하에서는 PDCCH를 전송 또는 수신하거나 PDCCH를 통해서 신호를 전송 또는 수신한다는 기재는 EPDCCH를 전송 또는 수신하거나 EPDCCH를 통해서 신호를 전송 또는 수신하는 것을 포함하는 의미로 사용될 수 있다.

【0023】즉, 이하에서 기재하는 물리 하향링크 제어채널은 PDCCH를 의미하거나, EPDCCH를 의미할 수 있으며, PDCCH 및 EPDCCH 모두를 포함하는 의미로도 사용된다.

【0024】또한, 설명의 편의를 위하여 PDCCH로 설명한 부분에도 본 발명의 일 실시예인 EPDCCH를 적용할 수 있으며, EPDCCH로 설명한 부분에도 본 발명의 일 실시예로 EPDCCH를 적용할 수 있다.

【0025】한편, 이하에서 기재하는 상위계층 시그널링(High Layer Signaling)은 RRC 파라미터를 포함하는 RRC 정보를 전송하는 RRC시그널링을 포함한다.

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【0026】eNB은 단말들로 하향링크 전송을 수행한다. eNB은 유니캐스트 전송(unicast transmission)을 위한 주 물리 채널인 물리 하향링크 공유채널(Physical Downlink Shared Channel, PDSCH), 그리고 PDSCH의 수신에 필요한 스케줄링 등의 하향링크 제어 정보 및 상향링크 데이터 채널(예를 들면 물리 상향링크 공유채널(Physical Uplink Shared Channel, PUSCH))에서의 전송을 위한 스케줄링 승인 정보를 전송하기 위한 물리 하향링크 제어채널(Physical Downlink Control Channel, PDCCH)을 전송할 수 있다. 이하에서는, 각 채널을 통해 신호가 송수신 되는 것을 해당 채널이 송수신되는 형태로 기재하기로 한다.

【0027】NR(New Radio)

【0028】3GPP는 최근 차세대/5G 무선 액세스 기술에 대한 연구를 위한 study item인 "Study on New Radio Access Technology"를 승인하고, 이를 기반으로 RAN WG1에서는 각각 NR(New Radio)를 위한 frame structure, channel coding & modulation, waveform & multiple access scheme 등에 대한 논의가 시작되었다. NR은 LTE 대비 향상된 데이터 전송율 뿐 아니라, 세분화되고 구체화된 usage scenario 별로 요구되는 다양한 requirements를 만족시킬 수 있는 설계가 이루어지도록 요구되고 있다. 특히 NR의 대표적 usage scenario로서 eMBB(enhancement Mobile BroadBand), mMTC(massive MTC) 및 URLLC(Ultra Reliable and Low Latency Communications)가 제기되었으며, 각각의 usage scenario별 requirements를 만족하기 위한 방법으로서 LTE 대비 flexible한 frame structure 설계가 요구되고 있다. 구체적으로 3GPP에서 논의 중인 NR의 대표적 usage scenario로서 eMBB, mMTC,

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URLLC가 고려되고 있다. 각각의 usage scenario는 data rates, latency, coverage 등에 대한 requirements가 서로 상이하기 때문에 임의의 NR 시스템을 구성하는 주파수 대역을 통해 각각의 usage scenario 별 requirements를 효율적으로 만족시키기 위한 방법으로서 서로 다른 numerology(e.g. subcarrier spacing, subframe, TTI, etc.) 기반의 무선 자원 유닛(unit)을 효율적으로 multiplexing하는 방안에 대한 필요성이 제기되고 있다.

【0029】 이를 위한 한 방법으로서, 서로 다른 subcarrier spacing값을 갖는 numerology에 대해 하나의 NR carrier를 통해 TDM, FDM 혹은 TDM/FDM 기반으로 다중화하여 지원하는 방법 및 time domain에서의 스케줄링 단위를 구성함에 있어서 하나 이상의 time unit을 지원하는 방안에 대한 논의가 이루어졌다. 이와 관련하여 NR에서는 time domain structure의 한 종류로서 subframe에 대한 정의가 이루어졌으며, 해당 subframe duration을 정의하기 위한 reference numerology로서 LTE와 동일한 15kHz SCS(Sub-Carrier Spacing) 기반 normal CP overhead의 14개의 OFDM symbols로 구성된 단일한 subframe duration을 정의하기로 결정하였다. 이에 따라 NR에서 subframe은 1ms의 time duration을 가진다. 단, LTE와 달리 NR의 subframe은 절대적인 reference time duration으로서, 실제 상/하향 링크 데이터 스케줄링의 기반의 되는 time unit으로서 slot 및 mini-slot이 정의될 수 있다. 이 경우, 해당 slot을 구성하는 OFDM 심볼의 개수, y값은 up to 60kHz의 SCS값을 갖는 numerology에 대해 y=7 and 14으로 정의되고, 60kHz보다 큰 SCS값을 갖는 numerology의 경우 y=14의 값을 갖도록 결정되었다.

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【0030】이에 따라 임의의 slot은 7개 혹은 14개의 심볼로 구성될 수 있으며, 또한 해당 slot의 transmission direction에 따라 모든 심볼이 DL transmission을 위해 이용되거나, 혹은 모든 심볼이 UL transmission을 위해 이용되거나, 혹은 DL portion + (gap) + UL portion의 형태로 이용될 수 있다.

【0031】또한 임의의 numerology(혹은 SCS)에서 해당 slot보다 적은 수의 심볼로 구성된 mini-slot이 정의되어 이를 기반으로 상/하향 링크 데이터 송수신을 위한 짧은 길이의 time-domain scheduling interval이 설정되거나, 혹은 slot aggregation을 통해 상/하향 링크 데이터 송수신을 위한 긴 길이의 time-domain scheduling interval이 구성될 수 있다. 특히 URLLC와 같이 latency critical한 데이터에 대한 송수신의 경우, 15kHz와 같이 SCS값이 작은 numerology 기반의 frame 구조에서 정의된 0.5ms 혹은 1ms 기반의 slot 단위로 스케줄링이 이루어질 경우, latency requirement를 만족시키기 힘들 수 있기 때문에 이를 위해서 해당 slot보다 적은 수의 OFDM 심볼로 구성된 mini-slot을 정의하여 이를 기반으로 해당 URLLC와 같은 latency critical한 데이터에 대한 스케줄링이 이루어지도록 정의할 수 있다.

【0032】또는 상기에서 서술한 바와 같이 하나의 NR Carrier 내에서 서로 다른 SCS값을 갖는 numerology를 TDM and/or FDM 방식으로 다중화하여 지원함으로써, 각각의 numerology 별로 정의된 slot(혹은 mini-slot) length를 기반으로 latency requirement에 맞추어 데이터를 스케줄링하는 방안도 고려되고 있다. 예를 들어 도 1과 같이 SCS가 60kHz인 경우, SCS 15kHz인 경우보다 심볼 길이가 1/4정도로 줄어

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들기 때문에 동일하게 7개의 OFDM 심볼로 하나의 slot을 구성할 경우, 해당 15kHz 기반의 slot length는 0.5ms이 되는 반면, 60kHz 기반의 slot length는 약 0.125ms으로 줄어들게 된다.

【0033】 이처럼 NR에서는 서로 다른 SCS 혹은 서로 다른 TTI length를 정의함으로써, URLLC와 eMBB 각각의 requirement를 만족시키는 방법에 대한 논의가 진행되고 있다.

【0034】 상기에서 서술한 바와 같이 NR에서 URLLC 서비스를 지원하기 위해서는 time domain에서 latency boundary를 만족시킬 수 있는 short scheduling unit (혹은 TTI, Transmission Time Interval)을 지원할 필요가 있다. 반면, eMBB 혹은 mMTC의 경우, time domain에서 scheduling unit을 정의함에 있어서, URLLC usage scenario 대비 조금 더 긴 시구간 자원 할당 단위를 적용하는 것이 control overhead 및 coverage 측면에서 효율적일 수 있다. 이처럼 다양한 NR usage scenario를 동시에 만족시키기 위한 방법으로 URLLC에 적합한 짧은 시구간 자원 할당 단위를 정의하는데 용이한 subcarrier spacing(e.g. 60kHz, 120kHa, 등의 larger subcarrier spacing)의 numerology와 eMBB 및 mMTC에 적합한 subcarrier spacing(e.g. 15kHz for eMBB 혹은 3.75kHZ for mMTC)의 numerology를 하나의 NR carrier를 통해 지원하는 mixed numerology 구조를 지원하거나, 혹은 임의의 하나의 numerology로 동작하는 NR carrier내에서 subframe 혹은 slot 혹은 mini-slot 등 서로 다른 length를 갖는 time-domain scheduling unit을 동시에 지원할 필요가 있다. 이를 위한 한 방법으로 각각의 usage scenario 별 최적의 scheduling unit을

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기반으로 자원 할당이 이루어지는 time/frequency resource(혹은 region)를 semi-static하게 할당하고, 각각의 단말 별 usage scenario에 따라 그에 해당하는 region의 time/frequency resource를 사용해 자원 할당이 이루어지도록 정의할 수 있다.

【0035】 하지만, 이처럼 semi-static한 방법으로 usage scenario별 region을 구분할 경우, NR 시스템 관점에서의 효율성이 다소 떨어질 수 있다. 예를 들어, URLLC 트래픽이 sparse하게 발생하는 임의의 NR 셀에서 해당 sparse한 URLLC 서비스를 만족시키키 위해 항상 짧은 time-domain scheduling unit을 지원하는 time/frequency resource를 dedication하는 것은 바람직하지 않을 수 있다.

【0036】 이를 해결하기 위한 방법으로 해당 URLLC 트래픽이 발생할 때마다 dynamic하게 eMBB 혹은 mMTC의 scheduling resource의 일부를 사용하여 해당 URLLC latency requirement를 만족시키기 위한 scheduling 방법이 요구되고 있다.

【0037】 이를 위해서 NR에서는 임의의 eMBB 혹은 mMTC의 데이터 채널을 위해 할당된 자원 중 일부 OFDM 심볼을 puncturing하여 긴급한 URLLC 데이터 송수신을 위해 사용하는 dynamic puncturing 기반의eMBB/URLLC multiplexing 방법에 대해 논의가 진행 중이다.

【0038】 구체적으로 eMBB/URLLC 간 dynamic puncturing 기반의 multiplexing이 적용될 경우, URLLC 데이터 전송을 위해 puncturing이 이루어진 자원을 해당 eMBB 단말에 notification하기 위한 방법으로서, puncturing 전에 해당 정보를 indication해주는 pre-notification 방법과 해당 on-going transmission이 끝난 후

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에 해당 puncturing 여부를 indication해주는 post-notification 방법이 제안되고 있다.

【0039】본 발명에서는 dynamic puncturing 적용 시, 해당 punctured resource 정보를 notification해주는 방법에 대해 제안하도록 한다.

【0040】본 발명의 설명을 위해 eMBB 단말과 URLLC 단말은 현재 통상적으로 3GPP에서 논의되는 개념을 적용하도록 하지만, 이에 대한 구체적인 구분은 다음과 같이 dynamic puncturing notification 정보에 대한 모니터링 수행 여부 및 시구간 스케줄링 단위의 길이에 의해 결정될 수 있다.

【0041】구체적으로 dynamic punturing이 적용될 경우, dynamic puncturing에 대한 notification 정보(혹은 channel)에 대한 모니터링이 필요한 단말이 eMBB 단말에 해당하며, 이에 대한 모니터링이 필요 없는 단말은 URLLC 단말에 해당할 수 있다. 또한 eMBB 단말과 URLLC 단말의 구분은 해당 단말을 위해 설정된 SCS(Subcarrier Spacing) 값과 해당 단말을 위해 할당된 시구간 스케줄링 단위(e.g. slot, aggregated slot, mini-slot, etc.)에 의해 결정될 수 있으며, 이에 대한 한 예로 특정 SCS 값 이하의 slot 단위 혹은 aggregate-slot 단위의 긴 시구간 스케줄링 단위를 갖는 단말은 eMBB 단말이고, 특정 SCS 값 이상의 transmission numerology를 갖거나, 혹은 특정 SCS 값 이하에서 mini-slot 단위의 짧은 시구간 스케줄링 단위를 갖는 단말은 URLLC 단말일 수 있다. 또는 eMBB와 URLLC를 구분하기 위한 시구간 스케줄링 단위(혹은 interval)의 threshold(e.g. X ms)값을 정의하고 해당 threshold보다 큰 시구간 스케줄링 단위를 갖는 단말은 eMBB 단말 해당

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threshold보다 작은 시구간 스케줄링 단위를 갖는 단말은 URLLC 단말일 수 있다.

【0042】 방법 1. Cell-specific(or slot-specific) indication

【0043】 임의의 NR 셀/기지국은 eMBB 단말을 위해 정의된 임의의 시구간 스케줄링 단위(e.g. slot 혹은 aggregated-slot)에서 URLLC 데이터 전송을 위해 eMBB 데이터에 대한 puncturing이 이루어지는 자원 혹은 eMBB와 URLLC 하향 링크 데이터에 대한 superposition 이 이루어지는 자원에 대한 notification 정보를 cell-specific(혹은 UE common 혹은 UE-group common)하게 전송하도록 할 수 있다.

【0044】 구체적으로 상기의 pre-notification 기반의 dynamic puncturing 혹은 post-notification 기반의 dynamic puncturing 적용 시, 해당 slot(pre-notification 적용 혹은 post-notification 적용 시) 혹은 이전 slot(post-notification 적용 시)에서 URLLC 데이터 전송을 위해 사용된 자원 정보, 즉 eMBB 단말 관점에서 데이터 puncturing 혹은 URLLC 데이터와의 superpostion이 이루어진 자원 정보를 cell-specific 혹은 UE common/group-UE common signaling을 통해 브로드캐스팅 혹은 멀티캐스팅해주도록 할 수 있다.

【0045】 예를 들어, pre-notification 방법이 적용될 경우, 해당 slot의 NR PDCCH의 common search space에서 common L1 control signaling를 통해 해당 slot에서 하향(혹은 상향 링크) 링크 URLLC 데이터 전송을 위한 자원 할당 정보, 즉 임의의 해당 slot을 통해 전송되는 eMBB 데이터 전송에 대한 puncturing 혹은 superposition이 이루어지는 자원 정보를 해당 셀 내의 eMBB 단말에게 전송하도록 정의할 수 있다. 혹은 해당 slot을 통한 on-going data transmission 간에 전송되

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는 dynamic puncturing(혹은 superposition) notification signaling을 방법을 정의함에 있어서, 해당 dynamic puncturing signaling은 해당 셀 내의 (혹은 해당 slot에서 dynamic puncturing/superposition notification을 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 common 하게 해당 dynamic puncturing(혹은 superposition) notification 정보를 전송하도록 할 수 있다. 이 경우, 해당 dynamic puncturing(혹은 superposition) notification 정보 수신을 위한 검색 공간이나 혹은 전송 자원 역시 해당 셀 내의 (혹은 해당 slot에서 dynamic puncturing/superposition notification을 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 common게 구성되도록 한다. 구체적으로 해당 dynamic puncturing(혹은 superposition) notification 정보 수신을 위한 cell-specific 혹은 UE/UE-group common한 검색 공간 혹은 predefined 자원의 주기는 SCS 및 slot duration의 함수로서 implicit하게 결정되거나, cell-specific RRC signaling을 통해 정의될 수 있으며, 주파수 자원 정보(e.g. sub-band 혹은 a (set of) PRB(s))는 해당 cell-specific dynamic puncturing notification 수신을 위한 cell-specific RNTI, slot index 등의 함수로서 결정되거나, 혹은 cell-specific RRC signaling에 의해 결정될되거나, 혹은 pre-defined될 수 있다.

【0046】또 다른 예로서 post-notification 방법이 적용될 경우, 임의의 slot의 NR PDCCH의 common search space의 common L1 control signaling을 통해 이전 slot에서의 URLLC 데이터 전송을 위한 자원 할당 정보, 즉 임의의 해당 slot을 통해 전송되는 eMBB 데이터 전송에 대한 puncturing 혹은 superposition이 이루어

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지는 자원 정보를 해당 셀 내의 eMBB 단말에게 전송하도록 정의할 수 있다. 또는 해당 slot의 마지막 심볼(들)에 해당 slot에서의 dynamic puncturing(혹은 superposition) notification signaling을 하는 post-notification 방법을 정의할 경우, 해당 dynamic puncturing signaling은 해당 셀 내의 (혹은 해당 slot에서 dynamic puncturing/superposition notification을 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 common 하게 해당 dynamic puncturing(혹은 superposition) notification 정보를 전송하도록 할 수 있다. 이 경우에도 상기의 pre-notification 예와 마찬가지로, 해당 dynamic puncturing(혹은 superposition) notification 정보 수신을 위한 검색 공간이나 혹은 전송 자원 역시 해당 셀 내의 (혹은 해당 slot에서 dynamic puncturing/superposition notification을 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 common게 구성되도록 한다. 이 경우, 상기의 pre-notification의 경우와 마찬가지로 해당 dynamic puncturing(혹은 superposition) notification 정보 수신을 위한 cell-specific 혹은 UE/UE-group common한 검색 공간 혹은 predefined 주파수 자원 정보(e.g. sub-band 혹은 a (set of) PRB(s))는 해당 cell-specific dynamic puncturing notification 수신을 위한 cell-specific RNTI, slot index 등의 함수로서 결정되거나, 혹은 cell-specific RRC signaling에 의해 결정될되거나, 혹은 pre-defined될 수 있다.

【0047】추가적으로 해당 dynamic puncturing notification 수신을 위해 NR PDCCH 혹은 별도의 L1 control channel을 통한 blind decoding 기반의 모니터링 방법이 적용될 경우, 해당 dynamic puncturing notification DCI의 CRC scrambling을

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위한 상기의 cell-specific RNTI는 기지국에 의해 cell-specific higher layer signaling을 통해 설정되거나, 혹은 임의의 값으로 predefined될 수 있다.

【0048】 또한 이처럼 cell-specific(혹은 UE common, UE-group common)한 dynamic puncturing notification이 이루어질 경우, 해당 slot에서 데이터 채널 자원 할당이 이루어진 eMBB 단말의 경우, 해당 cell-specific(혹은 UE common, UE-group common)한 dynamic puncturing notification을 통한 puncturing/superposition 자원 할당 정보가 해당 eMBB 단말을 위한 데이터 채널 자원 할당 정보가 partially overlap되는 경우에 대해서만 해당 eMBB 데이터 송수신에 대한 puncturing 혹은 superposition을 기대/적용하도록 정의할 수 있다.

【0049】 방법 2.UE-specific(or slot-specific) indication

【0050】 임의의 NR 셀/기지국은 eMBB 단말을 위해 정의된 임의의 시구간 스케줄링 단위(e.g. slot 혹은 aggregated-slot)에서 URLLC 데이터 전송을 위해 eMBB 데이터에 대한 puncturing이 이루어지는 자원 혹은 eMBB와 URLLC 하향 링크 데이터에 대한 superposition 이 이루어지는 자원에 대한 notification 정보를 UE-specific하게 전송하도록 할 수 있다.

【0051】 구체적으로 상기의 pre-notification 기반의 dynamic puncturing 혹은 post-notification 기반의 dynamic puncturing 적용 시, 해당 slot(pre-notification 적용 혹은 post-notification 적용 시) 혹은 이전 slot(post-notification 적용 시)에서 하향 링크 데이터 자원 할당이 이루어진 eMBB 단말들에 대해 해당 데이터 전송을 위해 할당된 자원 중 일부 자원이 URLLC 데이터 전송을

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위해 사용된 경우, 이를 해당 eMBB 단말 각각에게 UE-specific signaling을 통해 unicasting하도록 정의할 수 있다.

【0052】 예를 들어, pre-notification 방법이 적용될 경우, 해당 slot의 NR PDCCH의 UE-specific search space에서 UE-specific DCI 혹은 DL assignment DCI를 통해 해당 slot에서 해당 단말을 위한 하향(혹은 상향 링크) 링크 데이터 전송 자원 할당 정보 전송 시, 할당된 자원 중 URLLC 데이터 전송을 위해 사용되는 자원 할당 정보 및 해당 URLLC 데이터 전송을 위해 할당된 자원에 대한 puncturing 혹은 superposition 여부를 indication해주는 정보를 함께 전송하도록 헐 수 있다. 혹은 해당 slot을 하향 링크 데이터 전송이 이루어지는 eMBB 단말에 대해 on-going data transmission 간에 전송되는 dynamic puncturing(혹은 superposition) notification signaling을 방법을 정의함에 있어서, 각각의 단말 별로 UE-specific 한 dynamic puncturing(혹은 superposition) notification signalling 수신을 위한 검색 공간 혹은 자원을 정의하여 이를 기반으로 UE-specific하게 해당 dynamic puncturing(혹은 superposition) notification 정보를 전송하도록 할 수 있다. 이 경우, 해당 slot에서의 dynamic puncturing(혹은 superposition) notification signalling 수신을 위한 검색 공간 혹은 자원의 주기는 SCS 및 slot duration의 함수로서 implicit하게 결정되거나, UE-specific 혹은 cell-specific RRC signaling을 통해 정의될 수 있으며, 주파수 자원 정보(e.g. sub-band 혹은 a (set of) PRB(s))는 해당 단말의 아이디(e.g. C-RNTI), slot index, 해당 eMBB 데이터 전송이 이루어지는 RB index(e.g. lowest RB 혹은 highest RB index) 등의 함수로서 결

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정되거나, 혹은 UE-specific/cell-specific RRC signaling에 의해 결정될 수 있다.

【0053】또 다른 예로서 post-notification 방법이 적용될 경우, 임의의 slot의 NR PDCCH의 UE-specific search space의 UE-specific L1 control signaling을 통해 이전 slot에서의 수신한 하향 링크 데이터 자원 중 URLLC에 대한 하향 링크 데이터 전송을 위해 사용된 자원 정보 및 해당 URLLC 데이터 전송을 위해 할당된 자원에 대한 puncturing 혹은 superposition 여부를 indication해주는 하향 링크 제어 정보를 전송하도록 정의할 수 있다. 또는 하향 링크 eMBB 데이터 전송이 이루어진 해당 slot의 마지막에 심볼(들)을 통해 해당 slot에서의 dynamic puncturing(혹은 superposition) notification signaling을 하는 post-notification 방법을 정의할 경우, 이를 위한 dynamic puncturing(혹은 superposition) notificagion signaling은 상기의 pre-notification 경우와 동일하게 각각의 단말 별로 UE-specific한 dynamic puncturing(혹은 superposition) notification signalling 수신을 위한 검색 공간 혹은 자원을 정의하여 이를 기반으로 UE-specific하게 해당 dynamic puncturing(혹은 superposition) notification 정보를 전송하도록 할 수 있다. 이 경우, 해당 slot에서의 dynamic puncturing(혹은 superposition) notification signalling 수신을 위한 검색 공간 혹은 주파수 자원 정보(e.g. sub-band 혹은 a (set of) PRB(s))는 해당 단말의 아이디(e.g. C-RNTI), slot index, 해당 eMBB 데이터 전송이 이루어지는 RB index(e.g. lowest RB 혹은 highest RB index) 등의 함수로서 결정되거나, 혹은 UE-specific/cell-specific RRC signaling에 의해 결정될 수 있다.

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【0054】추가적으로 해당 dynamic puncturing notification 수신을 위해 NR PDCCH 혹은 별도의 L1 control channel을 통한 blind decoding 기반의 모니터링 방법이 적용될 경우, 해당 dynamic puncturing notification DCI의 CRC scrambling을 위한 RNTI는 해당 단말의 C-RNTI를 reuse하거나, 혹은 이를 위한 별도의 UE-specific RNTI를 기지국이 설정하여 각각의 단말에게 UE-specific RRC signaling을 통해 전송하도록 할 수 있다.

【0055】도 2는 또 다른 실시예에 의한 기지국의 구성을 보여주는 도면이다.

【0056】도 2를 참조하면, 또 다른 실시예에 의한 기지국(1000)은 제어부(1010)과 송신부(1020), 수신부(1030)을 포함한다.

【0057】제어부(1010)는 전술한 본 발명에 따라 dynamic puncturing 적용시 해당 punctured resource 정보를 notification함에 따른 전반적인 기지국(1000)의 동작을 제어한다.

【0058】송신부(1020)와 수신부(1030)는 전술한 본 발명을 수행하기에 필요한 신호나 메시지, 데이터를 단말과 송수신하는데 사용된다.

【0059】도 3은 또 다른 실시예에 의한 사용자 단말의 구성을 보여주는 도면이다.

【0060】도 3을 참조하면, 또 다른 실시예에 의한 사용자 단말(1100)은 수신부(1110) 및 제어부(1120), 송신부(1130)을 포함한다.

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【0061】 수신부(1110)는 기지국으로부터 하향링크 제어정보 및 데이터, 메시지를 해당 채널을 통해 수신한다.

【0062】 또한, 제어부(1120)는 전술한 본 발명에 따라 dynamic puncturing 적용시 notification되는 해당 punctured resource 정보를 인지함에 따른 전반적인 사용자 단말(1100)의 동작을 제어한다.

【0063】 송신부(1130)는 기지국에 상향링크 제어정보 및 데이터, 메시지를 해당 채널을 통해 전송한다.

【0064】 전술한 실시예에서 언급한 표준내용 또는 표준문서들은 명세서의 설명을 간략하게 하기 위해 생략한 것으로 본 명세서의 일부를 구성한다. 따라서, 위 표준내용 및 표준문서들의 일부의 내용을 본 명세서에 추가하거나 청구범위에 기재하는 것은 본 발명의 범위에 해당하는 것으로 해석되어야 한다.

【0065】 이상의 설명은 본 발명의 기술 사상을 예시적으로 설명한 것에 불과한 것으로서, 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자라면 본 발명의 본질적인 특성에서 벗어나지 않는 범위에서 다양한 수정 및 변형이 가능할 것이다. 따라서, 본 발명에 개시된 실시예들은 본 발명의 기술 사상을 한정하기 위한 것이 아니라 설명하기 위한 것이고, 이러한 실시예에 의하여 본 발명의 기술사상의 범위가 한정되는 것은 아니다. 본 발명의 보호 범위는 아래의 청구범위에 의하여 해석되어야 하며, 그와 동등한 범위 내에 있는 모든 기술 사상은 본 발명의 권리범위에 포함되는 것으로 해석되어야 할 것이다.

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【청구범위】

【청구항 1】

차세대 무선 액세스망을 위한 하향 링크 데이터 다중화 방법에 있어서,

pre-notification 기반의 dynamic puncturing 또는 post-notification 기반의 dynamic puncturing을 적용하는 단계; 및

해당 slot 또는 이전 slot에서 URLLC 데이터 전송을 위해 사용된 자원 정보를 cell-specific 또는 UE common signalling을 통해 브로드캐스팅 또는 멀티캐스팅하는 단계를 포함하는 방법.

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【요약서】

【요약】

본 발명은 3GPP에서 논의가 시작된 차세대/5G 무선 액세스망(NR)에서 eMBB, mMTC 및 URLLC와 같이 서로 다른 QoS requirement를 갖는 traffic 간의 효율적인 multiplexing을 지원하기 위한 하향 링크 제어 정보 전송 방법에 대해 제안한다.

【대표도】

도 1

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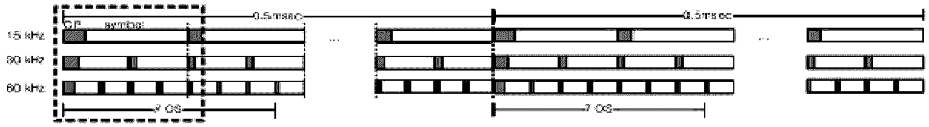
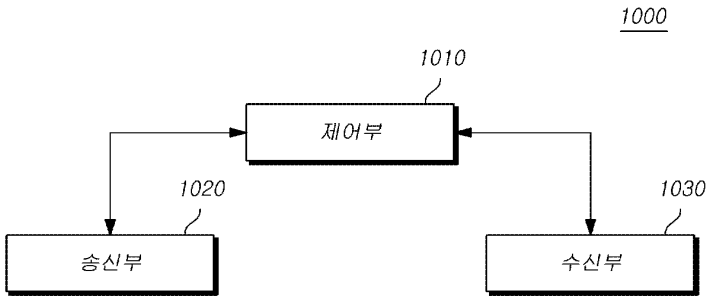
【도면】

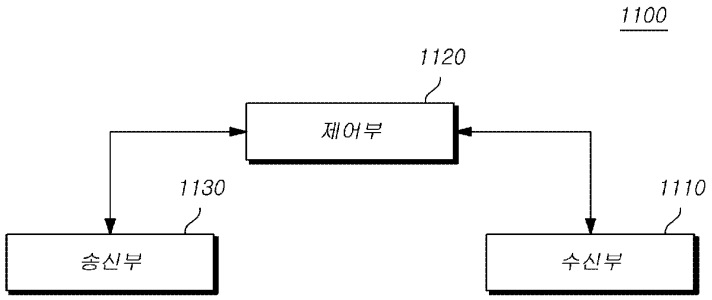
【도 1】



【도 2】



【도 3】



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【발명의 국문명칭】 차세대 무선망에서 하향링크 신호를 송수신하는 방법 및 그 장치

【발명의 영문명칭】 Methods for transmitting and receiving a downlink signal for new radio access network and Apparatuses thereof

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【수수료】

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【발명의 설명】

【발명의 명칭】

차세대 무선망에서 하향링크 신호를 송수신하는 방법 및 그 장치{Methods for transmitting and receiving a downlink signal for new radio access network and Apparatuses thereof}

【기술분야】

【0001】 본 발명은 3GPP에서 논의가 시작된 차세대/5G 무선 액세스망(이하, "NR[New Radio]"라 함)에서 서로 다른 QoS 요구사항를 갖는 데이터 트래픽(traffic) 간의 효율적인 멀티플렉싱(multiplexing)을 지원하기 위한 하향링크 신호 송수신 방법 및 장치에 관한 것이다.

【발명의 배경이 되는 기술】

【0002】 3GPP는 최근 차세대/5G 무선 액세스 기술에 대한 연구를 위한 스터디 아이템인 "Study on New Radio Access Technology"를 승인하고, 이를 기반으로 RAN WG1에서는 각각 NR(New Radio)을 위한 프레임 구조, 채널 코딩 및 변조, 파형 및 다중 접속 방식 등에 대한 논의를 진행하고 있다. NR은 LTE/LTE-Advanced에 대비하여 향상된 데이터 전송률뿐만 아니라 세분화되고 구체화된 사용 시나리오 별로 요구되는 다양한 요구를 만족시킬 수 있는 설계가 이루어지도록 요구되고 있다.

【0003】 NR의 대표적 사용 시나리오로서 eMBB(enhancement Mobile BroadBand), mMTC(massive Machine Type Communication) 및 URLLC(Ultra Reliable

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and Low Latency Communications)가 제기되고, 각각의 사용 시나리오 별 요구를 만족시키기 위하여 LTE/LTE-Advanced 대비 플렉서블한 프레임 구조 설계가 요구되고 있다.

【0004】 그러나, 이와 같이 다양한 사용 시나리오를 만족시키기 위해서는 각 시나리오 별로 요구되는 다양한 요구사항을 만족시킬 필요가 있다. 예를 들어, eMBB 대비 URLLC는 빠른 데이터 송수신을 만족시킬 필요가 있다.

【0005】 다만, 무선 데이터 송수신을 위한 자원은 한정되어 있기 때문에 각 시나리오를 모두 만족시키면서 자원을 효율적으로 할당하는 데에는 한계점이 존재한다. 즉, 효율성 측면에서 eMBB의 경우 긴 시구간 자원을 할당하여 넓은 범위의 단말에 서비스를 제공할 필요성이 있는 반면에 URLLC의 경우 저지연을 위해서 짧은 시구간 자원을 할당하는 것이 필요하다.

【0006】 이와 같은 상황에서 한정된 무선자원을 활용하여 각 시나리오에 맞는 무선자원을 멀티플렉싱할 필요성이 있으며, 이를 제공하기 위한 구체적인 무선 신호 송수신 방법에 대한 연구가 요구되고 있다.

【발명의 내용】

【해결하고자 하는 과제】

【0007】 본 실시예들의 목적은, 각 서비스 시나리오가 혼재된 상황에서 한정된 무선자원을 효율적으로 할당하여 각 서비스를 복수의 단말에게 제공하기 위한 구체적인 방안을 제공하는 데 있다.

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【과제의 해결 수단】

【0008】 전술한 과제를 해결하기 위해서 안출된 일 실시예는, 단말이 하향링크 신호를 수신하는 방법에 있어서, 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 단계와 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 단계 및 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하는 단계를 포함하되, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법을 제공한다.

【0009】 또한, 일 실시예는 기지국이 하향링크 신호를 전송하는 방법에 있어서, 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 단계와 설정정보를 단말로 전송하는 단계 및 설정정보에 기초하여 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 단계를 포함하되, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법을 제공한다.

【0010】 또한, 일 실시예는 하향링크 신호를 수신하는 단말에 있어서, 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 수신부 및 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 제어부를 포함하되, 수신부는 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해

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서 수신하고, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 단말을 제공한다.

【0011】 또한, 일 실시예는 하향링크 신호를 전송하는 기지국에 있어서, 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 제어부 및 설정정보를 단말로 전송하고, 설정정보에 기초하여 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 송신부를 포함하되, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 기지국를 제공한다.

【발명의 효과】

【0012】 본 실시예들에 의하면, 각 서비스 시나리오가 혼재된 네트워크에서 각 서비스 간의 데이터 트래픽에 대한 효율적인 멀티플렉싱을 제공하는 효과가 있다.

【0013】 또한, 각 단말이 무선자원을 멀티플렉싱하여 하향링크 데이터를 수신함에 있어서 불필요한 프로세싱 과정 및 데이터 손실을 방지하는 효과를 제공한다.

【도면의 간단한 설명】

【0014】 도 1은 본 실시예들에 따른 서로 다른 서브캐리어 스페이싱을 사용하는 경우에서 OFDM 심볼의 정렬을 나타낸 도면이다.

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도 2는 본 실시예들에 따른 하향 링크 선점 지시 정보가 미리-알림(pre-notification) 또는 이후-알림(post-notification) 방법을 통해 단말에 전송되는 방법을 나타낸 도면이다.

도 3은 일 실시예에 따른 서로 다른 서비스를 위한 무선자원 다중화를 예시적으로 도시한 도면이다.

도 4는 다른 실시예에 따른 서로 다른 서비스를 위한 무선자원 다중화를 예시적으로 도시한 도면이다.

도 5는 일 실시예에 따른 단말의 동작을 설명하기 위한 도면이다.

도 6은 일 실시예에 따른 기지국의 동작을 설명하기 위한 도면이다.

도 7은 일 실시예에 따른 단말의 구성을 보여주는 도면이다.

도 8은 일 실시예에 따른 기지국의 구성을 보여주는 도면이다.

【발명을 실시하기 위한 구체적인 내용】

【0015】 이하, 본 발명의 일부 실시예들을 예시적인 도면을 통해 상세하게 설명한다. 각 도면의 구성요소들에 참조부호를 부가함에 있어서, 동일한 구성요소들에 대해서는 비록 다른 도면상에 표시되더라도 가능한 한 동일한 부호를 가지도록 하고 있음에 유의해야 한다. 또한, 본 발명을 설명함에 있어, 관련된 공지 구성 또는 기능에 대한 구체적인 설명이 본 발명의 요지를 흐릴 수 있다고 판단되는 경우에는 그 상세한 설명은 생략한다.

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【0016】본 명세서에서 무선 통신 시스템은 음성, 패킷 데이터 등과 같은 다양한 통신 서비스를 제공하기 위한 시스템을 의미한다. 무선 통신 시스템은 사용자 단말(User Equipment, UE) 및 기지국(Base Station, BS)을 포함한다.

【0017】사용자 단말은 무선 통신에서의 단말을 의미하는 포괄적 개념으로서, WCDMA, LTE, HSPA 및 IMT-2020(5G 또는 New Radio) 등에서의 UE(User Equipment)는 물론, GSM에서의 MS(Mobile Station), UT(User Terminal), SS(Subscriber Station), 무선 기기(wireless device) 등을 모두 포함하는 개념으로 해석되어야 할 것이다.

【0018】기지국 또는 셀(Cell)은 일반적으로 사용자 단말과 통신하는 지점(station)을 말하며, 노드-B(Node-B), eNB(evolved Node-B), gNB(gNode-B), LPN(Low Power Node), 섹터(Sector), 싸이트(Site), 다양한 형태의 안테나, BTS(Base Transceiver System), 액세스 포인트(Access Point), 포인트(예를 들어, 송신포인트, 수신포인트, 송수신포인트), 릴레이 노드(Relay Node), 메가 셀, 매크로 셀, 마이크로 셀, 피코 셀, 펨토 셀, RRH(Remote Radio Head), RU(Radio Unit), 스몰 셀(small cell) 등 다양한 커버리지 영역을 모두 포괄하는 의미이다.

【0019】앞서 나열된 다양한 셀은 각 셀을 제어하는 기지국이 존재하므로 기지국은 두 가지 의미로 해석될 수 있다. 1) 무선 영역과 관련하여 메가 셀, 매크로 셀, 마이크로 셀, 피코 셀, 펨토 셀, 스몰 셀(small cell)을 제공하는 장치 그 자체이거나, 2) 무선 영역 그 자체를 지시할 수 있다. 1)에서 소정의 무선 영역을 제공하는 장치들이 동일한 개체에 의해 제어되거나 무선 영역을 협업으로 구성하도록

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상호 작용하는 모든 장치들을 모두 기지국으로 지시한다. 무선 영역의 구성 방식에 따라 포인트, 송수신 포인트, 송신 포인트, 수신 포인트 등은 기지국의 일 실시예가 된다. 2)에서 사용자 단말의 관점 또는 이웃하는 기지국의 입장에서 신호를 수신하거나 송신하게 되는 무선 영역 그 자체를 기지국으로 지시할 수 있다.

【0020】 본 명세서에서 셀(Cell)은 송수신 포인트로부터 전송되는 신호의 커버리지 또는 송수신 포인트(transmission point 또는 transmission/reception point)로부터 전송되는 신호의 커버리지를 가지는 요소 반송파(component carrier), 그 송수신 포인트 자체를 의미할 수 있다.

【0021】 본 명세서에서 사용자 단말과 기지국은, 본 발명에서 기술되는 기술 또는 기술적 사상을 구현하는데 사용되는 두 가지(Uplink 또는 Downlink) 송수신 주체로 포괄적인 의미로 사용되며 특정하게 지칭되는 용어 또는 단어에 의해 한정되지 않는다.

【0022】 여기서, 상향링크(Uplink, UL, 또는 업링크)는 사용자 단말에 의해 기지국으로 데이터를 송수신하는 방식을 의미하며, 하향링크(Downlink, DL, 또는 다운링크)는 기지국에 의해 사용자 단말로 데이터를 송수신하는 방식을 의미한다.

【0023】 상향링크 전송 및 하향링크 전송은 서로 다른 시간을 사용하여 전송되는 TDD(Time Division Duplex) 방식이 사용될 수 있고, 서로 다른 주파수를 사용하여 전송되는 FDD(Frequency Division Duplex) 방식, TDD 방식과 FDD 방식의 혼용 방식이 사용될 수 있다.

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【0024】또한, 무선 통신 시스템에서는 하나의 반송파 또는 반송파 쌍을 기준으로 상향링크와 하향링크를 구성하여 규격을 구성한다.

【0025】상향링크와 하향링크는, PDCCH(Physical Downlink Control CHannel), PUCCH(Physical Uplink Control CHannel) 등과 같은 제어 채널을 통하여 제어 정보를 전송하고, PDSCH(Physical Downlink Shared CHannel), PUSCH(Physical Uplink Shared CHannel) 등과 같은 데이터 채널로 구성되어 데이터를 전송한다.

【0026】하향링크(downlink)는 다중 송수신 포인트에서 단말로의 통신 또는 통신 경로를 의미할 수 있으며, 상향링크(uplink)는 단말에서 다중 송수신 포인트로의 통신 또는 통신 경로를 의미할 수 있다. 이때, 하향링크에서 송신기는 다중 송수신 포인트의 일부분일 수 있고, 수신기는 단말의 일부분일 수 있다. 또한, 상향링크에서 송신기는 단말의 일부분일 수 있고, 수신기는 다중 송수신 포인트의 일부분일 수 있다.

【0027】이하에서는 PUCCH, PUSCH, PDCCH 및 PDSCH 등과 같은 채널을 통해 신호가 송수신되는 상황을 'PUCCH, PUSCH, PDCCH 및 PDSCH를 전송, 수신한다'는 형태로 표기하기도 한다.

【0028】한편, 이하에서 기재하는 상위계층 시그널링(High Layer Signaling)은 RRC 파라미터를 포함하는 RRC 정보를 전송하는 RRC 시그널링을 포함한다.

【0029】기지국은 단말들로 하향링크 전송을 수행한다. 기지국은 유니캐스트 전송(unicast transmission)을 위한 주 물리 채널인 하향링크 데이터 채널의 수신

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에 필요한 스케줄링 등의 하향링크 제어 정보 및 상향링크 데이터 채널에서의 전송을 위한 스케줄링 승인 정보를 전송하기 위한 물리 하향링크 제어 채널을 전송할 수 있다. 이하에서는, 각 채널을 통해 신호가 송수신 되는 것을 해당 채널이 송수신되는 형태로 기재하기로 한다.

【0030】 무선 통신 시스템에서 적용되는 다중 접속 기법에는 제한이 없다. TDMA(Time Division Multiple Access), FDMA(Frequency Division Multiple Access), CDMA(Code Division Multiple Access), OFDMA(Orthogonal Frequency Division Multiple Access), NOMA(Non-Orthogonal Multiple Access), OFDM-TDMA, OFDM-FDMA, OFDM-CDMA와 같은 다양한 다중 접속 기법을 사용할 수 있다. 여기서, NOMA는 SCMA(Sparse Code Multiple Access)와 LDS(Low Density Spreading) 등을 포함한다.

【0031】 본 발명의 일 실시예는 GSM, WCDMA, HSPA를 거쳐 LTE/LTE-Advanced, IMT-2020으로 진화하는 비동기 무선 통신과, CDMA, CDMA-2000 및 UMB로 진화하는 동기식 무선 통신 분야 등의 자원 할당에 적용될 수 있다.

【0032】 본 명세서에서 MTC(Machine Type Communication) 단말은 low cost (또는 low complexity)를 지원하는 단말 또는 coverage enhancement를 지원하는 단말 등을 의미할 수 있다. 또는 본 명세서에서 MTC 단말은 low cost(또는 low complexity) 및/또는 coverage enhancement를 지원하기 위한 특정 카테고리로 정의된 단말을 의미할 수 있다.

【0033】 다시 말해 본 명세서에서 MTC 단말은 LTE 기반의 MTC 관련 동작을

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수행하는 새롭게 정의된 3GPP Release-13 low cost(또는 low complexity) UE category/type을 의미할 수 있다. 또는 본 명세서에서 MTC 단말은 기존의 LTE coverage 대비 향상된 coverage를 지원하거나, 또는 저전력 소모를 지원하는 기존의 3GPP Release-12 이하에서 정의된 UE category/type, 또는 새롭게 정의된 Release-13 low cost(또는 low complexity) UE category/type을 의미할 수 있다. 또는, Release-14에서 정의된 further Enhanced MTC 단말을 의미할 수도 있다.

【0034】 본 명세서에서 NB-IoT(NarrowBand Internet of Things) 단말은 셀룰러 IoT를 위한 무선 액세스를 지원하는 단말을 의미한다. NB-IoT 기술의 목적은 향상된 인도어(Indoor) 커버리지, 대규모의 저속 단말에 대한 지원, 저지연민감도, 초저가 단말 비용, 낮은 전력 소모, 그리고 최적화된 네트워크 구조를 포함한다.

【0035】 3GPP에서 최근 논의 중인 NR(New Radio)에서 대표적인 사용 시나리오(usage scenario)로서, eMBB(enhanced Mobile BroadBand), mMTC(massive Machine Type Communication), URLLC(Ultra Reliable and Low Latency Communication)가 제기되고 있다.

【0036】 본 명세서에서 NR(New Radio)과 관련한 주파수, 프레임, 서브프레임, 자원, 자원블럭, 영역(region), 밴드, 서브밴드, 제어채널, 데이터채널, 동기신호, 각종 참조신호, 각종 신호, 각종 메시지는 과거 또는 현재 사용되는 의미 또는 장래 사용되는 다양한 의미로 해석될 수 있다.

【0037】 NR(New Radio)

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【0038】3GPP는 최근 차세대/5G 무선 액세스 기술에 대한 연구를 위한 스터디 아이템인 "Study on New Radio Access Technology"를 승인하고, 이를 기반으로 각각 NR(New Radio)를 위한 프레임 구조, 채널 코딩 및 변조, 파형 및 다중 접속 스킴(frame structure, channel coding & modulation, waveform & multiple access scheme)등에 대한 논의가 시작되었다.

【0039】NR은 LTE/LTE-Advanced 대비 향상된 데이터 전송률뿐 아니라, 세분화되고 구체화된 사용 시나리오(usage scenario) 별로 요구되는 다양한 요구(requirements)를 만족시킬 수 있는 설계가 이루어지도록 요구되고 있다. 특히 NR의 대표적 사용 시나리오(usage scenario)로서 eMBB(enhancement Mobile BroadBand), mMTC(massive MTC) 및 URLLC(Ultra Reliable and Low Latency Communications)가 제기되었으며, 각각의 사용 시나리오(usage scenario)별 요구(requirements)를 만족하기 위한 방법으로서 LTE/LTE-Advanced 대비 플렉서블한 프레임 구조(frame structure) 설계가 요구되고 있다.

【0040】구체적으로 3GPP에서 논의 중인 NR의 대표적 사용 시나리오(usage scenario)로서 eMBB, mMTC, URLLC가 고려되고 있다. 각각의 사용 시나리오(usage scenario)는 데이터 레이트(data rates), 레이턴시(latency), 커버리지(coverage) 등에 대한 요구(requirements)가 서로 상이하기 때문에 임의의 NR 시스템을 구성하는 주파수 대역을 통해 각각의 사용 시나리오(usage scenario) 별 요구(requirements)를 효율적으로 만족시키기 위한 방법으로서 서로 다른 뉴머롤러지(numerology)(e.g. subcarrier spacing, subframe, TTI, etc.) 기반의 무선 자원

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유닛(unit)을 효율적으로 다중화(multiplexing)하는 방안에 대한 필요성이 제기되고 있다.

【0041】이를 위한 한 방법으로서, 서로 다른 서브캐리어 스페이싱(SCS, subcarrier spacing)값을 갖는 뉴머롤러지(numerology)에 대해 하나의 NR 캐리어(carrier)를 통해 TDM, FDM 또는 TDM/FDM 기반으로 다중화하여 지원하는 방법 및 시간 도메인(time domain)에서의 스케줄링 단위를 구성함에 있어서 하나 이상의 시간 유닛(time unit)을 지원하는 방안에 대한 논의가 이루어졌다. 이와 관련하여 NR에서는 시간 도메인 구조(time domain structure)의 한 종류로서 서브프레임(subframe)에 대한 정의가 이루어졌으며, 해당 서브프레임 지속기간(subframe duration)을 정의하기 위한 레퍼런스 뉴머롤러지(reference numerology)로서 LTE와 동일한 15kHz SCS(Sub-Carrier Spacing) 기반 normal CP overhead의 14개의 OFDM 심볼로 구성된 단일한 서브프레임 지속기간을 정의하기로 결정하였다. 이에 따라 NR에서 서브프레임은 1ms의 지속기간(time duration)을 가진다. 단, LTE와 달리 NR의 서브프레임은 절대적인 레퍼런스 지속기간(reference time duration)으로서, 실제 상/하향 링크 데이터 스케줄링의 기반의 되는 시간 유닛(time unit)으로서 슬롯(slot) 및 미니 슬롯(mini-slot)이 정의될 수 있다. 이 경우, 해당 슬롯을 구성하는 OFDM 심볼의 개수, y값은 뉴머롤러지에 관계없이 y=14의 값을 갖도록 결정되었다.

【0042】이에 따라 임의의 슬롯은 14개의 심볼로 구성될 수 있으며, 또한 해당 슬롯의 전송 지시(transmission direction)에 따라 모든 심볼이 하향 링크 전송

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(DL transmission)을 위해 이용되거나, 또는 모든 심볼이 상향 링크 전송(UL transmission)을 위해 이용되거나, 또는 하향 링크 부분(DL portion) + (gap) + 상향 링크 부분(UL portion)의 형태로 이용될 수 있다.

【0043】 또한 임의의 뉴머롤러지(numerology)(또는 SCS)에서 해당 슬롯보다 적은 수의 심볼로 구성된 미니 슬롯이 정의되어 이를 기반으로 상/하향 링크 데이터 송수신을 위한 짧은 길이의 시간 도메인 스케줄링 간격(time-domain scheduling interval)이 설정되거나, 또는 슬롯 병합(slot aggregation)을 통해 상/하향 링크 데이터 송수신을 위한 긴 길이의 시간 도메인 스케줄링 간격(time-domain scheduling interval)이 구성될 수 있다.

【0044】 특히 URLLC와 같이 지연 크리티컬(latency critical)한 데이터에 대한 송수신의 경우, 15kHz와 같이 SCS값이 작은 뉴머롤러지 기반의 프레임 구조에서 정의된 0.5ms(7 symbols) 또는 1ms(14 symbols) 기반의 슬롯 단위로 스케줄링이 이루어질 경우, 지연 시간 요구 사항(latency requirement)를 만족시키기 힘들 수 있기 때문에 이를 위해서 해당 슬롯보다 적은 수의 OFDM 심볼로 구성된 미니-슬롯(mini-slot)을 정의하여 이를 기반으로 해당 URLLC와 같은 지연 크리티컬(latency critical)한 데이터에 대한 스케줄링이 이루어지도록 정의할 수 있다.

【0045】 또는 전술한 바와 같이 하나의 NR 캐리어 내에서 서로 다른 SCS값을 갖는 뉴머롤러지를 TDM 방식 또는 FDM 방식으로 다중화하여 지원함으로써, 각각의 뉴머롤러지 별로 정의된 슬롯(또는 미니-슬롯) 길이를 기반으로 지연 시간 요구 사항(latency requirement)에 맞추어 데이터를 스케줄링하는 방안도 고려되고 있다.

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예를 들어 도 1과 같이 SCS가 60kHz인 경우, SCS 15kHz인 경우보다 심볼 길이가 1/4정도로 줄어들기 때문에 동일하게 7개의 OFDM 심볼로 하나의 슬롯을 구성할 경우, 해당 15kHz 기반의 슬롯 길이는 0.5ms이 되는 반면, 60kHz 기반의 슬롯 길이는 약 0.125ms으로 줄어들게 된다.

【0046】 이처럼 NR에서는 서로 다른 SCS 또는 서로 다른 TTI 길이를 정의함으로써, URLLC와 eMBB 각각의 요구사항을 만족시키는 방법에 대한 논의가 진행되고 있다.

【0047】 전술한 바와 같이 NR에서 URLLC 서비스를 지원하기 위해서는 시간 도메인(time domain)에서 latency boundary를 만족시킬 수 있는 짧은 스케줄링 단위(short scheduling unit) 또는 TTI(Transmission Time Interval)을 지원할 필요가 있다. 반면, eMBB 혹은 mMTC의 경우, 시간 도메인에서 스케줄링 단위(scheduling unit)을 정의함에 있어서, URLLC 사용 시나리오 대비 조금 더 긴 시구간 자원 할당 단위를 적용하는 것이 컨트롤 오버헤드(control overhead) 및 커버리지(coverage) 측면에서 효율적일 수 있다. 이처럼 다양한 NR 사용 시나리오를 동시에 만족시키기 위한 방법으로 URLLC에 적합한 짧은 시구간 자원 할당 단위를 정의하는데 용이한 서브캐리어 스페이싱(subcarrier spacing, 예를 들어, 60kHz, 120kHz, 등의 larger subcarrier spacing)의 뉴머롤러지(numerology)와 eMBB 및 mMTC에 적합한 subcarrier spacing(e.g. 15kHz for eMBB 혹은 3.75kHz for mMTC)의 뉴머롤러지(numerology)를 하나의 NR 캐리어를 통해 지원하는 혼합 뉴머롤러지(mixed numerology) 구조를 지원하거나, 혹은 임의의 하나의 뉴머롤러지

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(numerology)로 동작하는 NR 캐리어 내에서 서브프레임 또는 슬롯(slot) 또는 미니 슬롯(mini-slot) 등 서로 다른 길이(length)를 갖는 시구간 스케줄링 단위(time-domain scheduling unit)을 동시에 지원할 필요가 있다.

【0048】 이를 위한 한 방법으로 각각의 서비스 사용 시나리오 별 최적의 스케줄링 단위(scheduling unit)를 기반으로 자원 할당이 이루어지는 시간/주파수 자원(time/frequency resource(혹은 region))를 준 정적(semi-static)으로 할당하고, 각각의 단말 별 사용 시나리오에 따라 그에 해당하는 영역(region)의 시간/주파수 자원을 사용해 자원 할당이 이루어지도록 설정할 수 있다.

【0049】 그러나, 이처럼 준 정적인 방법으로 사용 시나리오 별 무선자원의 영역을 구분할 경우, NR 시스템 관점에서의 효율성이 다소 떨어질 수 있다. 예를 들어, URLLC 트래픽이 드물게(sparse) 발생하는 임의의 NR 셀에서 해당 드물게 발생하는 URLLC 서비스를 만족시키키 위해 항상 짧은 시구간 스케줄링 단위(time-domain scheduling unit)을 지원하는 시간/주파수 자원(time/frequency resource)을 전용(dedication)하는 것은 바람직하지 않을 수 있다.

【0050】 따라서, 이를 해결하기 위해서 해당 URLLC 트래픽이 발생할 때마다 동적으로(dynamic) eMBB 또는 mMTC의 스케줄링 자원(scheduling resource)의 일부를 사용하여 해당 URLLC의 지연 요구 사항(latency requirement)을 만족시키기 위한 스케줄링 방법이 요구되고 있다.

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【0051】이를 위해 NR에서는 임의의 eMBB 또는 mMTC의 데이터 채널을 위해 할당된 자원 중 일부 OFDM 심볼을 펑처링(puncturing)하여 긴급한 URLLC 데이터 송수신을 위해 사용하는 동적 펑처링(dynamic puncturing) 기반의 eMBB/URLLC 멀티플렉싱(multiplexing) 방법을 고려할 수 있다. 즉, URLLC 데이터 송수신에 있어서 선점(preemption) 기반의 스케줄링을 지원하는 방안을 고려할 수 있다.

【0052】구체적으로 eMBB/URLLC 간 동적 펑처링(dynamic puncturing) 기반의 멀티플렉싱(multiplexing)이 적용되는 경우에, URLLC 데이터 전송을 위해 펑처링(puncturing)이 이루어진 자원을 해당 eMBB 단말에 알림(notification)을 지시하기 위한 방법으로서 펑처링(puncturing) 전에 해당 정보를 지시(indication)해주는 미리-알림(pre-notification) 방법과 해당 진행 중 전송(on-going transmission)이 끝난 후에 해당 펑처링(puncturing) 여부를 지시(indication)해주는 이후-알림(post-notification) 방법을 고려할 수 있다.

【0053】본 명세서에서는 무선자원을 동적으로 펑처링하는 기술을 적용하는 경우, 해당 펑처링된 무선자원 정보를 알려주기 위한 다양한 실시예를 제안하고자 한다.

【0054】이하에서 설명하는 실시예들은 모든 이동통신 기술을 사용하는 단말, 기지국, 코어망 개체(MME)에 적용될 수 있다. 예를 들어, 본 실시예들은 LTE 기술이 적용되는 이동통신 단말뿐만 아니라 차세대 이동통신(5G 이동통신, New-RAT) 단말, 기지국, 코어망 개체(AMF: Access and Mobility Function)에도 적용될 수 있다. 설명의 편의를 위해 이하에서 기지국은 LTE/E-UTRAN의 eNB를 나타낼 수도

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있고, CU(Central Unit)와 DU(Distributed Unit)가 분리된 5G 무선망에서 기지국(CU, DU, 또는 CU와 DU가 하나의 논리적인 개체로 구현된 개체), gNB를 나타낼 수도 있다.

【0055】 한편, NR의 사용 시나리오에서 URLLC는 고신뢰, 저지연을 지원하는 서비스를 의미하며 송수신되는 데이터의 크기가 크지는 않지만 데이터 송수신 과정에서 지연이 발생하면 심각한 문제가 발생하는 경우에 사용되는 서비스를 의미할 수 있다. 예를 들어서 자율 주행 차량과 같이 데이터 송수신의 지연이 커지면 교통 사고로 인한 인적/물적 손해가 발생할 수 있는 경우에 URLLC 서비스가 사용될 수 있다.

【0056】 eMBB는 초고속의 데이터 전송을 지원하는 서비스를 이용하며 대량의 데이터가 송수신될 필요가 있을 경우에 사용되는 서비스를 의미할 수 있다. 예를 들어서 3D 동영상, UHD 서비스와 같이 단위 시간당 대량의 데이터가 전송될 필요가 있는 경우 eMBB 서비스가 사용될 수 있다.

【0057】 mMTC는 송수신되는 데이터의 크기가 크지 않고 지연 발생이 문제되지 않으나, 저전력 소모가 필요한 경우에 사용되는 서비스를 의미할 수 있다. 예를 들어서 스마트 시티(Smart City) 구축을 위해 설치한 센서 장비들의 경우 탑재된 배터리로 가능한 오랜 시간 동안 동작해야 하므로 mMTC 서비스가 사용될 수 있다.

【0058】 일반적인 경우 단말의 특성에 따라 전술한 URLLC/eMBB/mMTC의 세 가지 서비스 중 하나가 단말에 서비스될 수 있다. 이하에서는 필요한 경우, URLLC 서비스를 이용하는 단말을 URLLC 단말, eMBB 서비스를 이용하는 단말을 eMBB 단말,

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mMTC 서비스를 이용하는 단말을 mMTC 단말이라 구분하여 칭할 수 있다. 그리고 eMBB, mMTC, URLLC는 각각 eMBB 단말, mMTC 단말, URLLC 단말로도 해석될 수 있다.

【0059】 그리고 본 실시예에서 선점(preemption)은 URLLC에 대한 트래픽 발생 시 eMMB 또는 mMTC에 할당된 자원의 일부를 URLLC에 대한 지연 요구 사항(latency requirement)를 만족하기 위해서 URLLC에 다시 할당하는 것을 의미한다. 이때, 원래 eMBB 또는 mMTC에 할당된 자원을 URLLC에서 사용하기 때문에 원래 자원을 할당받았던 eMBB 단말 또는 mMTC 단말이 어떤 자원이 선점되었는지에 대한 정보를 수신해야 한다. 하향링크 선점은 단말의 하향링크 자원에 대한 선점이 일어나는 것을 의미한다.

【0060】 그리고 하향 링크 선점(preemption) 지시 정보는 하향링크에서 어떤 데이터 채널(또는 무선자원)이 선점되었는지를 단말에 지시하기 위한 정보로서 하향링크 선점을 단말에 알려주는 정보이므로 하향링크 선점 알림(notification) 정보로도 표현될 수 있다. 이러한 하향링크 선점 지시정보는 신호(signal) 또는 채널(channel) 형태로 지시될 수 있다.

【0061】 또한, 본 명세서에서의 eMBB 단말과 URLLC 단말은 현재 통상적으로 3GPP에서 논의되는 개념을 적용하도록 하지만, 이에 대한 구체적인 구분은 다음과 같이 동적 펑처링 알림(dynamic puncturing notification) 정보에 대한 모니터링 수행 여부 및 시구간 스케줄링 단위의 길이에 의해 결정될 수 있다.

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【0062】예를 들어, 동적 펑처링(dynamic puncturing)이 적용될 경우, 동적 펑처링(dynamic puncturing)에 대한 알림 정보(혹은 channel)에 대한 모니터링이 필요한 단말이 eMBB 단말에 해당하며, 이에 대한 모니터링이 필요 없는 단말은 URLLC 단말에 해당할 수 있다. 또한, eMBB 단말과 URLLC 단말의 구분은 해당 단말을 위해 설정된 SCS(Subcarrier Spacing) 값과 해당 단말을 위해 할당된 시구간 스케줄링 단위(예를 들어, slot, aggregated slot, mini-slot 등)에 의해 결정될 수 있으며, 이에 대한 일 예로 특정 SCS 값 이하의 slot 단위 혹은 aggregate-slot 단위의 긴 시구간 스케줄링 단위를 갖는 단말은 eMBB 단말이고, 특정 SCS 값 이상의 전송 뉴머롤러지를 갖거나, 혹은 특정 SCS 값 이하에서 mini-slot 단위의 짧은 시구간 스케줄링 단위를 갖는 단말은 URLLC 단말일 수 있다. 또는 eMBB와 URLLC를 구분하기 위한 시구간 스케줄링 단위(혹은 interval)의 기준값(예를 들어, X ms)값을 정의하고 해당 기준값(threshold) 보다 큰 시구간 스케줄링 단위를 갖는 단말은 eMBB 단말 해당 기준값(threshold) 보다 작은 시구간 스케줄링 단위를 갖는 단말은 URLLC 단말일 수 있다.

【0063】도 2는 본 실시예들에 따른 하향 링크 선점 지시 정보가 미리-알림(pre-notification) 또는 이후-알림(post-notification) 방법을 통해 단말에 전송되는 방법을 나타낸 도면이다.

【0064】도 2를 참조하면, 가로축은 시간축 자원으로 eMMB 단말에 대한 TTI(TTI for eMBB UEs)를 나타내고 세로축은 주파수축 자원으로 NR 캐리어를 나타낸다.

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【0065】도 2의 영역 중 1)은 eMMB 단말에 대한 하향 링크 제어 채널(PDCCH)이 전송되는 영역으로, 하향 링크 제어 채널은 eMBB 단말에 대한 하향 링크 데이터 채널(PDSCH)에 관한 스케줄링 정보를 포함하고 있다.

【0066】그리고 2)는 eMBB 단말에 전술한 하향 링크 데이터 채널이 전송되는 영역을 나타낸다.

【0067】그리고 3)은 하향 링크 선점(preemption)이 발생한 경우에, URLLC 단말이 선점한 자원을 통해 하향 링크 제어 채널(PDCCH) 또는 하향 링크 데이터 채널(PDSCH)을 전송하는 영역을 나타낸다. 이 경우 eMBB 단말은 해당 자원이 URLLC 단말에 의해 선점되었다는 정보, 즉 하향 링크 선점 지시 정보를 모니터링하고 있어야 하향 링크 선점의 발생을 인지하고 이에 대한 대응을 할 수 있다.

【0068】이 때, 전술한 미리-알림(pre-notification) 방식을 사용하는 경우에는 4)의 영역, 즉 선점이 일어나기 전에 하향 링크 선점 지시 정보가 eMBB 단말에 전송된다.

【0069】반면, 전술한 이후-알림(post-notification) 방식을 사용하는 경우에는 5)의 영역, 즉 선점이 일어난 후에 하향 링크 선점 지시 정보가 eMBB 단말에 전송된다.

【0070】도 3은 일 실시예에 따른 서로 다른 서비스를 위한 무선자원 다중화를 예시적으로 도시한 도면이다.

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【0071】도 3을 참조하면, eMBB를 위한 무선자원과 URLLC를 위한 무선자원은 서브캐리어 스페이싱 및 심볼 길이가 상이하게 설정될 수 있다. 예를 들어, URLLC를 위한 서브캐리어 스페이싱은 eMBB를 위한 서브캐리어 스페이싱의 3배로 설정될 수 있으며, 심볼 길이는 1/3으로 설정될 수 있다.

【0072】따라서, eMBB와 URLLC를 위한 무선자원이 멀티플렉싱 되는 경우 도 3과 같이 설정될 수 있다.

【0073】도 4는 다른 실시예에 따른 서로 다른 서비스를 위한 무선자원 다중화를 예시적으로 도시한 도면이다.

【0074】도 4를 참조하면, 또 다른 예로 eMBB와 URLLC를 위한 서브캐리어 스페이싱과 심볼 길이가 동일하게 설정될 수도 있다. 이 경우에도 도 4와 같이 eMBB와 URLLC를 위한 무선자원이 멀티플렉싱될 수 있다.

【0075】이하에서는, 본 실시예에 따른 서로 다른 서비스를 위해서 할당되는 무선자원이 중첩되거나, 드물게 발생하는 무선자원을 다른 서비스를 위해서 할당된 무선자원에 할당하는 경우에 이를 단말에 알리기 위한 단말 및 기지국의 동작을 도면을 참조하여 설명한다.

【0076】도 5는 일 실시예에 따른 단말의 동작을 설명하기 위한 도면이다.

【0077】도 5를 참조하면, 단말은 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 단계를 수행할 수 있다(S510). 예를 들어, 단말은 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 수신할 수 있다. 예

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를 들어, 설정정보는 셀 특정한 시그널링 또는 단말 특정한 시그널링을 통해서 수신될 수 있다. 일 예로, 설정정보는 단말 특정 RRC 시그널링을 통해서 수신될 수 있다. 다른 예로, 설정정보는 셀 특정 RRC 시그널링을 통해서 수신될 수 있다. 또 다른 예로, 설정정보는 단말 그룹 공통 시그널링을 통해서 수신될 수도 있다.

【0078】 한편, 설정정보는 서브캐리어 스페이싱, 듀레이션 정보, 주파수 자원 정보, 셀 특정 RNTI 및 슬롯 인덱스 중 적어도 하나의 정보를 포함할 수 있으며. 단말은 이를 통해서 묵시적(implicit)으로 하향링크 선점 지시정보를 수신하기 위한 자원을 확인할 수 있다.

【0079】 또한, 단말은 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 단계를 수행할 수 있다(S520). 예를 들어, 단말은 설정정보를 이용하여 단말이 모니터링을 수행해야 하는 무선자원을 확인할 수 있다. 일 예로, 단말은 하향링크 제어채널을 모니터링할 수 있다. 구체적으로, 단말은 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 모니터링할 수 있다. 또는, 단말은 하향링크 제어채널의 단말 특정 검색 공간을 모니터링할 수도 있다.

【0080】 한편, 단말은 블라인드 디코딩 방식으로 모니터링을 수행할 수 있다. 일 예로, 단말은 셀 특정 RNTI를 이용하여 하향링크 선점 지시정보를 포함하는 하향링크 제어정보의 CRC 스크램블링을 수행하여 모니터링을 수행할 수 있다. 예를 들어, 셀 특정 RNTI는 셀 특정 상위계층 시그널링을 통해서 설정되거나, 임의의 값으로 미리 설정될 수도 있다. 다른 예로, 단말은 C-RNTI 또는 새롭게 정의되는 RNTI를 이용하여 하향링크 선점 지시정보를 포함하는 하향링크 제어정보의 CRC

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스크램블링을 수행하여 모니터링을 수행할 수 있다. 예를 들어, C-RNTI 또는 새롭게 정의되는 RNTI는 단말 특정 RRC 시그널링을 통해서 수신될 수도 있다.

【0081】 또한, 단말은 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하는 단계를 포함할 수 있다(S530). 일 예로, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함할 수 있다. 다른 예로, 하향링크 선점 지시정보는 미리 설정된 특정 서비스(예를 들어, URLLC)를 위해서 설정되는 무선자원을 지시하기 위한 정보를 포함할 수 있다.

【0082】 일 예로, 하향링크 선점 지시정보는 하향링크 제어채널의 공통 검색공간 또는 그룹 공통 검색 공간을 통해서 수신될 수 있다. 즉, 하향링크 선점 지시정보는 셀 특정 시그널링을 통해서 수신될 수 있다. 다른 예로, 하향링크 선점 지시정보는 하향링크 제어채널의 단말 특정 검색 공간을 통해서 수신될 수 있다. 즉, 하향링크 선점 지시정보는 단말 특정 시그널링을 통해서 수신될 수 있다.

【0083】 단말은 하향링크 선점 지시정보를 수신하여, 하향링크 선점 지시정보가 지시하는 무선자원은 특정 서비스를 위해서 일시적으로 할당된 자원인 것을 인지할 수 있다. 예를 들어, 이상에서 설명한 단말이 eMBB 단말이고, 하향링크 선점 지시정보를 통해서 무선자원이 지시되는 단말이 URLLC 단말일 수 있다. 즉, 제1 서비스는 eMBB이고, 제2 서비스는 URLLC일 수 있다. 또는 제1 서비스가 URLLC이고, 제2 서비스가 eMBB일 수도 있다. 마찬가지로, eMBB 대신 mMTC가 적용되는 경우에도 동일하게 적용될 수 있다.

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【0084】도 6은 일 실시예에 따른 기지국의 동작을 설명하기 위한 도면이다.

【0085】도 6을 참조하면, 기지국은 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 단계를 수행할 수 있다(S610). 전술한 바와 같이, 설정정보는 단말이 하향링크 선점 지시정보를 모니터링하는 데에 필요한 정보를 포함할 수 있다. 예를 들어, 설정정보는 서브캐리어 스페이싱, 듀레이션 정보, 주파수 자원 정보, 셀 특정 RNTI 및 슬롯 인덱스 중 적어도 하나의 정보를 포함할 수 있으며. 단말은 이를 통해서 묵시적(implicit)으로 하향링크 선점 지시정보를 수신하기 위한 자원을 확인할 수 있다.

【0086】기지국은 설정정보를 단말로 전송하는 단계를 수행할 수 있다(S620). 예를 들어, 설정정보는 셀 특정한 시그널링 또는 단말 특정한 시그널링을 통해서 전송될 수 있다. 일 예로, 설정정보는 단말 특정 RRC 시그널링을 통해서 전송될 수 있다. 다른 예로, 설정정보는 셀 특정 RRC 시그널링을 통해서 전송될 수 있다. 또 다른 예로, 설정정보는 단말 그룹 공통 시그널링을 통해서 전송될 수도 있다.

【0087】기지국은 설정정보에 기초하여 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 단계를 수행할 수 있다(S630). 일 예로, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함할 수 있다. 다른 예로, 하향링크 선점 지시정보는 미리 설정된 특정 서비스(예를 들어, URLLC)를 위해서 설정되는 무선자원을 지시하기 위한 정보를 포함할 수 있다.

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【0088】일 예로, 하향링크 선점 지시정보는 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 전송될 수 있다. 즉, 하향링크 선점 지시정보는 셀 특정 시그널링을 통해서 전송될 수 있다. 다른 예로, 하향링크 선점 지시정보는 하향링크 제어채널의 단말 특정 검색 공간을 통해서 전송될 수 있다. 즉, 하향링크 선점 지시정보는 단말 특정 시그널링을 통해서 전송될 수 있다. 단말은 하향링크 선점 지시정보를 수신하여, 하향링크 선점 지시정보가 지시하는 무선자원은 특정 서비스를 위해서 일시적으로 할당된 자원인 것을 인지할 수 있다.

【0089】이상에서 설명한 바와 같이, 단말은 특정 서비스를 위한 무선자원을 지시하는 정보를 포함하는 하향링크 선점 지시정보를 수신하고, 기지국은 무선자원을 동적으로 구성함으로써, 다양한 서비스를 멀티플렉싱하여 제공할 수 있다.

【0090】이하에서는 전술한 하향링크 선점 지시정보를 송수신함에 있어서, 셀 특정 시그널링을 사용하는 경우와 단말 특정 시그널링을 사용하는 경우를 나누어 보다 구체적으로 설명한다. 아울러, 각 실시예에서 미리 알림 방식과 이후 알림 방식을 나누어 설명하며, 설정정보의 송수신 동작에 대해서도 실시예를 나누어 설명한다. 설명의 편의를 위하여 이하의 세부 실시예에서는 eMBB 단말이 URLLC 무선자원에 대해서 하향링크 선점 지시정보를 수신하는 동작을 중심으로 설명하나, 이에 한정되는 것은 아니다.

【0091】제 1 실시예: 셀 특정Cell-specific(or slot-specific)한 시그널을 통해서 지시하는 방법

【0092】임의의 NR 셀/기지국은 eMBB 단말을 위해 정의된 임의의 시구간 스

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케줄링 단위(예를 들어, slot 혹은 aggregated-slot)에서 URLLC 데이터 전송을 위해 eMBB 데이터에 대한 펑처링(puncturing)이 이루어지는 자원 또는 eMBB와 URLLC 하향링크 데이터에 대한 중첩(superposition)이 이루어지는 자원에 대한 알림(notification) 정보(전술한 하향링크 선점 지시정보)를 셀 특정(cell-specific)하게 전송하도록 할 수 있다. 또는, 기지국은 하향링크 선점 지시정보를 단말 공통(UE common) 혹은 단말 그룹 공통(UE-group common)하게 전송할 수도 있다.

【0093】 구체적으로 상기의 미리 알림(pre-notification) 기반의 동적 펑처링(dynamic puncturing) 혹은 이후 알림(post-notification) 기반의 동적 펑처링 적용 시, 해당 슬롯(pre-notification 적용 혹은 post-notification 적용 시) 또는 이전 슬롯(post-notification 적용 시)에서 URLLC 데이터 전송을 위해 사용된 자원 정보, 즉 eMBB 단말 관점에서 데이터 펑처링 혹은 URLLC 데이터와의 중첩이 이루어진 자원 정보(예를 들어, 하향링크 선점 지시정보)를 기지국은 셀 특정(cell-specific) 혹은 단말 공통/그룹 단말 공통 시그널링(UE common/group-UE common signaling)을 통해 브로드캐스팅 혹은 멀티캐스팅해주도록 할 수 있다.

【0094】 예를 들어, 미리 알림(pre-notification) 방법이 적용될 경우, 해당 slot의 차세대 무선 액세스 망에서의 하향링크 제어채널(NR PDCCH)의 공통 검색 공간(common search space)에서 common L1 control signaling를 통해 해당 slot에서 하향링크(혹은 상향링크) URLLC 데이터 전송을 위한 자원 할당 정보, 즉 임의의 해당 slot을 통해 전송되는 eMBB 데이터 전송에 대한 펑처링(puncturing) 혹은 중첩(superposition)이 이루어지는 자원 정보(하향링크 선점 지시정보)를 해당 셀 내의

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eMBB 단말에게 기지국이 전송하도록 할 수 있다. 혹은 해당 slot을 통한 on-going data transmission 간에 전송되는 동적 펑처링(혹은 중첩) 알림 시그널링 방법을 정의함에 있어서, 해당 동적 펑처링 시그널링은 해당 셀 내의 (혹은 해당 slot에서 dynamic puncturing/superposition notification을 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 공통적으로 해당 하향링크 선점 지시정보를 전송하도록 할 수 있다. 이 경우, 해당 하향링크 선점 지시정보 수신을 위한 검색 공간이나 혹은 전송 자원 역시 해당 셀 내의(혹은 해당 slot에서 하향링크 선점 지시정보를 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 공통적으로 구성되도록 한다. 구체적으로 해당 하향링크 선점 지시정보 수신을 위한 셀 특정(cell-specific) 혹은 단말/그룹 단말 공통(UE/group-UE common) 검색 공간 혹은 미리 설정된 자원의 주기는 서브캐리어 스페이싱 및 슬롯 지속시간(slot duration)의 함수로서 묵시적(implicit)으로 결정되거나, 셀 특정 RRC 시그널링(cell-specific RRC signaling)을 통해 설정될 수 있으며, 주파수 자원 정보(예를 들어, sub-band 혹은 a (set of) PRB(s))는 해당 셀 특정 하향링크 선점 지시정보 수신을 위한 셀 특정 RNTI(cell-specific RNTI), 슬롯 인덱스(slot index) 등의 함수로서 결정되거나, 혹은 셀 특정 RRC 시그널링(cell-specific RRC signaling)에 의해 결정될 수 있다. 또는 미리 설정될 수도 있다.

【0095】 또 다른 예로서 이후 알림(post-notification) 방법이 적용될 경우, 임의의 slot의 NR PDCCH의 공통 검색 공간의 common L1 control signaling을 통해 이전 slot에서의 URLLC 데이터 전송을 위한 자원 할당 정보, 즉 임의의 해당 slot

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을 통해 전송되는 eMBB 데이터 전송에 대한 펑처링 혹은 중첩이 이루어지는 자원 정보(하향링크 선점 지시정보)를 해당 셀 내의 eMBB 단말에게 전송하도록 설정할 수 있다. 또는 해당 slot의 마지막 심볼(들)에 해당 slot에서의 하향링크 선점 지시정보전송을 하는 이후 알림(post-notification) 방법을 정의할 경우, 해당 하향링크 선점 지시정보는 해당 셀 내의 (혹은 해당 slot에서 하향링크 선점 지시정보를 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 공통적으로 해당 하향링크 선점 지시정보를 전송하도록 할 수 있다. 이 경우에도 전술한 이전 알림(pre-notification) 예와 마찬가지로, 해당 하향링크 선점 지시정보 수신을 위한 검색 공간이나 혹은 전송 자원 역시 해당 셀 내의 (혹은 해당 slot에서 하향링크 선점 지시정보를 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 공통적으로 구성될 수 있다. 이 경우, 전술한 이전 알림(pre-notification) 방법의 경우와 마찬가지로 해당 하향링크 선점 지시정보 수신을 위한 셀 특정 혹은 단말/단말 그룹 공통한 검색 공간 혹은 미리 설정된 주파수 자원 정보(예를 들어, sub-band 혹은 a (set of) PRB(s))는 해당 셀 특정 하향링크 선점 지시정보 수신을 위한 셀 특정 RNTI, 슬롯 인덱스 등의 함수로서 결정되거나, 혹은 셀 특정 RRC 시그널링에 의해 결정되거나, 혹은 미리 설정될 수 있다.

【0096】 한편, 해당 하향링크 선점 지시정보 수신을 위해 NR PDCCH 혹은 별도의 L1 control channel을 통한 블라인드 디코딩(blind decoding) 기반의 모니터링 방법이 적용될 경우, 해당 하향링크 선점 지시정보를 포함하는 하향링크 제어정보의 CRC 스크램블링(scrambling)을 위한 전술한 셀 특정 RNTI는 기지국에 의해 셀

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특정 상위계층 시그널링(cell-specific higher layer signaling)을 통해 설정되거나, 혹은 임의의 값으로 미리 설정될 수 있다.

【0097】 또한, 이처럼 셀 특정(혹은 단말 공통, 단말 그룹 공통)한 동적 펑처링 알림이 이루어질 경우, 해당 slot에서 데이터 채널 자원 할당이 이루어진 eMBB 단말의 경우, 해당 하향링크 선점 지시정보를 통한 펑처링/중첩 자원 할당 정보와 해당 eMBB 단말을 위한 데이터 채널 자원 할당 정보가 부분적으로 겹치는(partially overlap) 경우에 대해서만 해당 eMBB 데이터 송수신에 대한 펑처링 또는 중첩을 적용할 수 있다.

【0098】 이상에서와 같이, 하향링크 선점 지시정보는 셀 특정하게 멀티캐스트 방식을 통해서 복수의 단말 또는 단말 그룹 내에 포함된 단말에 동일하게 전달될 수 있다.

【0099】 제 2 실시예: 단말 특정 또는 슬롯 특정(UE-specific(or slot-specific))하게 지시하는 방법.

【0100】 임의의 NR 셀/기지국은 eMBB 단말을 위해 정의된 임의의 시구간 스케줄링 단위(예를 들어, slot 혹은 aggregated-slot)에서 URLLC 데이터 전송을 위해 eMBB 데이터에 대한 펑처링이 이루어지는 자원 혹은 eMBB와 URLLC 하향링크 데이터에 대한 중첩이 이루어지는 자원에 대한 알림 정보(하향링크 선점 지시정보)를 단말 특정(UE-specific)하게 전송하도록 할 수 있다.

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【0101】구체적으로 상기의 미리 알림(pre-notification) 기반의 동적 펑처링(dynamic puncturing) 혹은 이후 알림(post-notification) 기반의 동적 펑처링(dynamic puncturing) 적용 시, 해당 slot(pre-notification 적용 혹은 post-notification 적용 시) 혹은 이전 slot(post-notification 적용 시)에서 하향링크 데이터 자원 할당이 이루어진 eMBB 단말들에 대해 해당 데이터 전송을 위해 할당된 자원 중 일부 자원이 URLLC 데이터 전송을 위해 사용된 경우, 이를 해당 eMBB 단말 각각에게 단말 특정 시그널링(UE-specific signaling)을 통해 유니캐스팅(unicasting)하도록 설정할 수 있다.

【0102】예를 들어, 미리 알림(pre-notification) 방법이 적용될 경우, 해당 slot의 NR PDCCH의 단말 특정 검색 공간(UE-specific search space)에서 단말 특정 하향링크 제어정보(UE-specific DCI) 혹은 하향링크 할당을 위한 하향링크 제어정보(DL assignment DCI)를 통해 해당 slot에서 해당 단말을 위한 하향링크(혹은 상향링크) 데이터 전송 자원 할당 정보 전송 시, 할당된 자원 중 URLLC 데이터 전송을 위해 사용되는 자원 할당정보 및 해당 URLLC 데이터 전송을 위해 할당된 자원에 대한 펑처링 혹은 중첩 여부를 지시해주는 정보(하향링크 선점 지시정보)를 함께 전송하도록 할 수 있다. 혹은 해당 slot을 하향링크 데이터 전송이 이루어지는 eMBB 단말에 대해 on-going data transmission 간에 전송되는 하향링크 선점 지시 정보 시그널링 방법을 정의함에 있어서, 각각의 단말 별로 단말 특정한 하향링크 선점 지시정보 수신을 위한 검색 공간 혹은 자원을 정의하여 이를 기반으로 단말 특정하게 해당 하향링크 선점 지시정보를 전송하도록 할 수 있다. 이 경우, 해당

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slot에서의 하향링크 선점 지시정보 수신을 위한 검색 공간 혹은 자원의 주기는 서브캐리어 스페이싱 및 슬롯 듀레이션(slot duration)의 함수로서 묵시적으로 결정되거나, 단말 트정 혹은 셀 특정 RRC 시그널링을 통해 정의될 수 있으며, 주파수 자원 정보(예를 들어, sub-band 혹은 a (set of) PRB(s))는 해당 단말의 아이디(예를 들어, C-RNTI), slot index, 해당 eMBB 데이터 전송이 이루어지는 RB index(e.g. lowest RB 혹은 highest RB index) 등의 함수로서 결정되거나, 혹은 단말 특정/셀 특정 RRC 시그널링에 의해 결정될 수 있다.

【0103】 또 다른 예로서 이후 알림(post-notification) 방법이 적용될 경우, 임의의 slot의 NR PDCCH의 단말 특정 검색 공간(UE-specific search space)의 UE-specific L1 control signaling을 통해 이전 slot에서의 수신한 하향링크 데이터 자원 중 URLLC 하향링크 데이터 전송을 위해 사용된 자원 정보 및 해당 URLLC 데이터 전송을 위해 할당된 자원에 대한 펑처링 혹은 중첩 여부를 지시해주는 하향링크 제어 정보를 전송하도록 정의할 수 있다. 또는 하향링크 eMBB 데이터 전송이 이루어진 해당 slot의 마지막에 심볼(들)을 통해 해당 slot에서의 하향링크 선점 지시정보 시그널링을 하는 이후 알림(post-notification) 방법을 정의할 경우, 이를 위한 하향링크 선점 지시정보 시그널링은 전술한 이전 알림(pre-notification) 경우와 동일하게 각각의 단말 별로 단말 특정한 하향링크 선점 지시정보 수신을 위한 검색 공간 혹은 자원을 정의하고, 이를 기반으로 단말 특정하게 해당 하향링크 선점 지시정보를 전송하도록 할 수 있다. 이 경우, 해당 slot에서의 하향링크 선점 지시정보 수신을 위한 검색 공간 혹은 주파수 자원 정보(예를 들어, sub-band 혹은

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a (set of) PRB(s))는 해당 단말의 아이디(예를 들어, C-RNTI), slot index, 해당 eMBB 데이터 전송이 이루어지는 RB index(예를 들어, lowest RB 혹은 highest RB index) 등의 함수로서 결정되거나, 혹은 단말 특정/셀 특정 RRC 시그널링에 의해 결정될 수 있다.

【0104】 한편, 해당 하향링크 선점 지시정보 수신을 위해 NR PDCCH 혹은 별도의 L1 control channel을 통한 blind decoding 기반의 모니터링 방법이 적용될 경우, 해당 하향링크 지시정보에 대한 DCI의 CRC 스크램블링(scrambling)을 위한 RNTI는 해당 단말의 C-RNTI를 재사용하거나, 혹은 이를 위한 별도의 단말 특정 RNTI를 기지국이 설정하여 각각의 단말에게 단말 특정 RRC 시그널링(UE-specific RRC signaling)을 통해 전송하도록 할 수 있다.

【0105】 이상에서 설명한 바와 같이, 기지국은 단말 특정 시그널링을 통해서 하향링크 선점 지시정보를 전송할 수 있다. 또한, 단말은 단말 특정 또는 셀 특정한 시그널링을 통해서 하향링크 선점 지시정보를 모니터링하기 위한 설정정보(예를 들어, 전술한 RNTI 등)를 수신할 수도 있다.

【0106】 이하에서는, 이상에서 설명한 본 실시예들의 일부 또는 전부가 모두 수행될 수 있는 단말 및 기지국의 구성에 대해서 도면을 참조하여 설명한다.

【0107】 도 7은 일 실시예에 따른 단말의 구성을 보여주는 도면이다.

【0108】 도 7을 참조하면, 단말(700)은 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 수신부(730) 및 설정정보에 기초하여

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하향링크 선점 지시정보를 모니터링 하는 제어부(710)를 포함할 수 있다.

【0109】 또한, 수신부(730)는 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하고, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함할 수 있다. 또한, 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은 서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정될 수 있다. 또는 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은 서브 캐리어 스페이싱 및 시구간 스케줄링 단위가 동일하게 설정될 수도 있다.

【0110】 한편, 설정정보는 단말-특정(UE-specific) RRC 시그널링을 통해 수신될 수 있으며, 하향링크 선점 지시정보는 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 수신되거나, 하향링크 제어채널의 단말 특정 검색 공간을 통해서 수신될 수도 있다.

【0111】 이 외에도 수신부(730)는 기지국으로부터 하향링크 제어정보 및 데이터, 메시지를 해당 채널을 통해 수신한다.

【0112】 또한, 제어부(710)는 전술한 본 발명에 따른 하향링크 선점 지시정보를 동적으로 수신하여 무선자원을 멀티플렉싱하여 사용하는 데에 따른 전반적인 사용자 단말(700)의 동작을 제어한다.

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【0113】송신부(720)는 기지국에 상향링크 제어정보 및 데이터, 메시지를 해당 채널을 통해 전송한다.

【0114】도 8은 일 실시예에 따른 기지국의 구성을 보여주는 도면이다.

【0115】도 8을 참조하면, 기지국(800)은 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 제어부(810) 및 설정정보를 단말로 전송하고, 설정정보에 기초하여 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 송신부(820)를 포함할 수 있다. 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함할 수 있다. 또한, 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은 서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정될 수 있다. 또는 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은 서브 캐리어 스페이싱 및 시구간 스케줄링 단위가 동일하게 설정될 수도 있다.

【0116】한편, 설정정보는 단말-특정(UE-specific) RRC 시그널링을 통해 전송할 수 있으며, 하향링크 선점 지시정보는 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 전송되거나, 하향링크 제어채널의 단말 특정 검색 공간을 통해서 전송될 수도 있다.

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【0117】 이 외에도, 제어부(810)는 전술한 본 발명에 따른 하향링크 선점 지시정보를 동적으로 구성하고 전송하여 무선자원을 멀티플렉싱하여 사용하는 데에 따른 전반적인 기지국(800)의 동작을 제어한다.

【0118】 또한, 송신부(820)와 수신부(830)는 전술한 본 실시예들을 수행하기에 필요한 신호나 메시지, 데이터를 단말과 송수신하는데 사용된다.

【0119】 전술한 실시예에서 언급한 표준내용 또는 표준문서들은 명세서의 설명을 간략하게 하기 위해 생략한 것으로 본 명세서의 일부를 구성한다. 따라서, 위 표준내용 및 표준문서들의 일부의 내용을 본 명세서에 추가하거나 청구범위에 기재하는 것은 본 발명의 범위에 해당하는 것으로 해석되어야 한다.

【0120】 이상의 설명은 본 발명의 기술 사상을 예시적으로 설명한 것에 불과한 것으로서, 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자라면 본 발명의 본질적인 특성에서 벗어나지 않는 범위에서 다양한 수정 및 변형이 가능할 것이다. 따라서, 본 발명에 개시된 실시예들은 본 발명의 기술 사상을 한정하기 위한 것이 아니라 설명하기 위한 것이고, 이러한 실시예에 의하여 본 발명의 기술사상의 범위가 한정되는 것은 아니다. 본 발명의 보호 범위는 아래의 청구범위에 의하여 해석되어야 하며, 그와 동등한 범위 내에 있는 모든 기술 사상은 본 발명의 권리범위에 포함되는 것으로 해석되어야 할 것이다.

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【청구범위】

【청구항 1】

단말이 하향링크 신호를 수신하는 방법에 있어서,

기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 단계;

상기 설정정보에 기초하여 상기 하향링크 선점 지시정보를 모니터링 하는 단계; 및

상기 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하는 단계를 포함하되,

상기 하향링크 선점 지시정보는,

제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법.

【청구항 2】

제 1 항에 있어서,

상기 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은,

서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정되는 것을 특징으로 하는 방법.

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【청구항 3】

제 1 항에 있어서,

상기 설정정보는,

단말-특정(UE-specific) RRC 시그널링을 통해 수신되는 것을 특징으로 하는 방법.

【청구항 4】

제 1 항에 있어서,

상기 하향링크 선점 지시정보는,

하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 수신되는 것을 특징으로 하는 방법.

【청구항 5】

제 1 항에 있어서,

상기 하향링크 선점 지시정보는,

하향링크 제어채널의 단말 특정 검색 공간을 통해서 수신되는 것을 특징으로 하는 방법.

【청구항 6】

기지국이 하향링크 신호를 전송하는 방법에 있어서,

하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 단계;

상기 설정정보를 단말로 전송하는 단계; 및

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상기 설정정보에 기초하여 상기 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 단계를 포함하되,

상기 하향링크 선점 지시정보는,

제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법.

【청구항 7】

제 6 항에 있어서,

상기 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은,

서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정되는 것을 특징으로 하는 방법.

【청구항 8】

제 6 항에 있어서,

상기 설정정보는,

단말-특정(UE-specific) RRC 시그널링을 통해 전송되는 것을 특징으로 하는 방법.

【청구항 9】

제 6 항에 있어서,

상기 하향링크 선점 지시정보는,

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하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 전송되는 것을 특징으로 하는 방법.

【청구항 10】

제 6 항에 있어서,

상기 하향링크 선점 지시정보는,

하향링크 제어채널의 단말 특정 검색 공간을 통해서 전송되는 것을 특징으로 하는 방법.

【청구항 11】

하향링크 신호를 수신하는 단말에 있어서,

기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 수신부; 및

상기 설정정보에 기초하여 상기 하향링크 선점 지시정보를 모니터링 하는 제어부를 포함하되,

상기 수신부는,

상기 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하고,

상기 하향링크 선점 지시정보는,

제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 단말.

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【청구항 12】

제 11 항에 있어서,

상기 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은,

서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정되는 것을 특징으로 하는 단말.

【청구항 13】

제 11 항에 있어서,

상기 설정정보는,

단말-특정(UE-specific) RRC 시그널링을 통해 수신되는 것을 특징으로 하는 단말.

【청구항 14】

제 11 항에 있어서,

상기 하향링크 선점 지시정보는,

하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 수신되는 것을 특징으로 하는 단말.

【청구항 15】

제 11 항에 있어서,

상기 하향링크 선점 지시정보는,

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하향링크 제어채널의 단말 특정 검색 공간을 통해서 수신되는 것을 특징으로 하는 단말.

【청구항 16】

하향링크 신호를 전송하는 기지국에 있어서,

하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 제어부; 및

상기 설정정보를 단말로 전송하고, 상기 설정정보에 기초하여 상기 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 송신부를 포함하되,

상기 하향링크 선점 지시정보는,

제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 기지국.

【청구항 17】

제 16 항에 있어서,

상기 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은,

서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정되는 것을 특징으로 하는 기지국.

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【청구항 18】

제 16 항에 있어서,

상기 설정정보는,

단말-특정(UE-specific) RRC 시그널링을 통해 전송되는 것을 특징으로 하는 기지국.

【청구항 19】

제 16 항에 있어서,

상기 하향링크 선점 지시정보는,

하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 전송되는 것을 특징으로 하는 기지국.

【청구항 20】

제 16 항에 있어서,

상기 하향링크 선점 지시정보는,

하향링크 제어채널의 단말 특정 검색 공간을 통해서 전송되는 것을 특징으로 하는 기지국.

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【요약서】

【요약】

본 발명은 3GPP에서 논의가 시작된 차세대/5G 무선 액세스망(이하, "NR[New Radio]"라 함)에서 서로 다른 QoS 요구사항를 갖는 데이터 트래픽(traffic) 간의 효율적인 멀티플렉싱(multiplexing)을 지원하기 위한 하향링크 신호 송수신 방법 및 장치에 관한 것이다. 일 실시예는, 단말이 하향링크 신호를 수신하는 방법에 있어서, 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 단계와 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 단계 및 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하는 단계를 포함하되, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법 및 장치를 제공한다.

【대표도】

도 5

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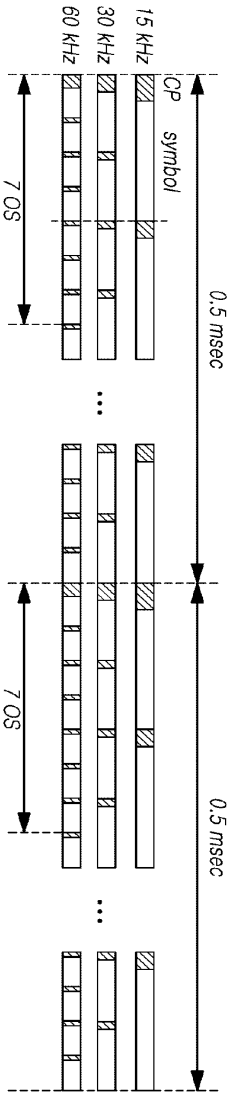
【도면】

【도 1】



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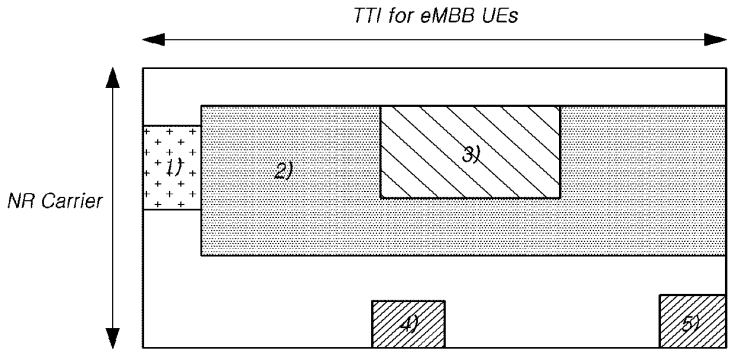
【도 2】



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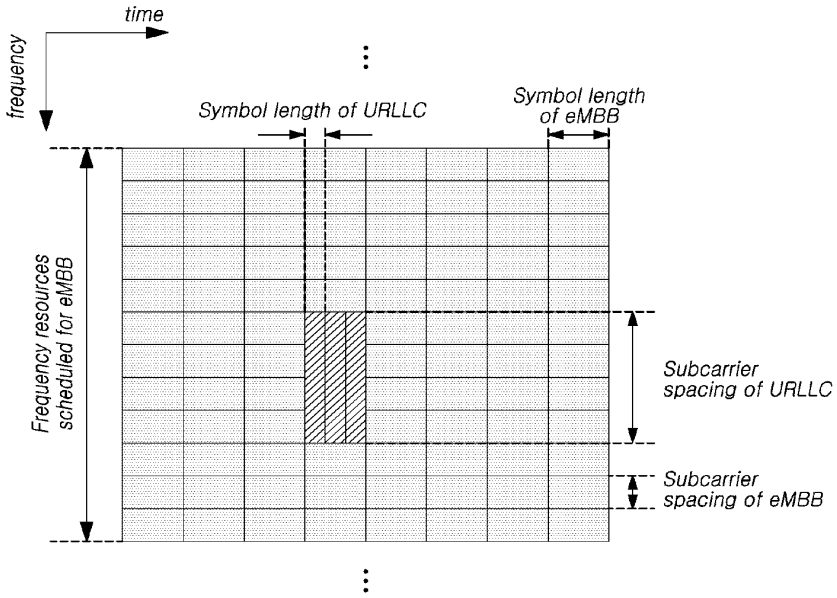

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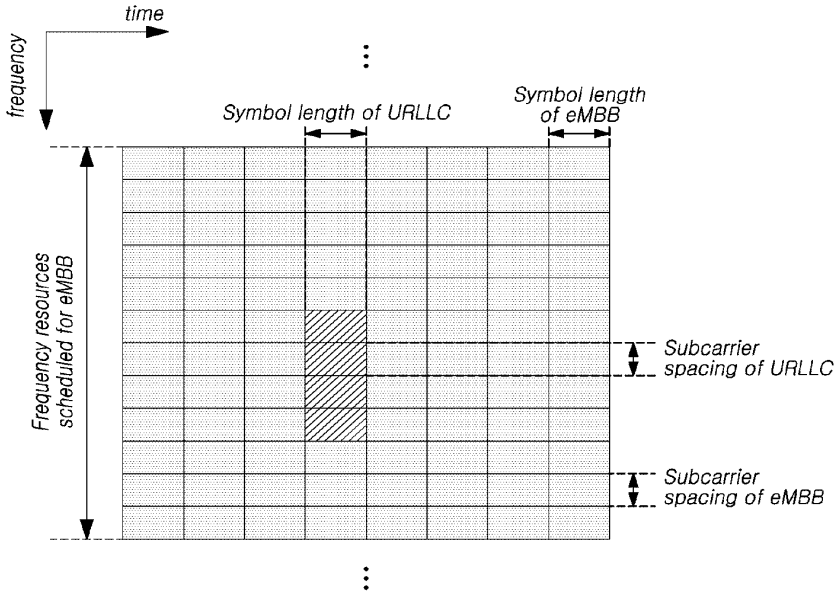
【도 4】



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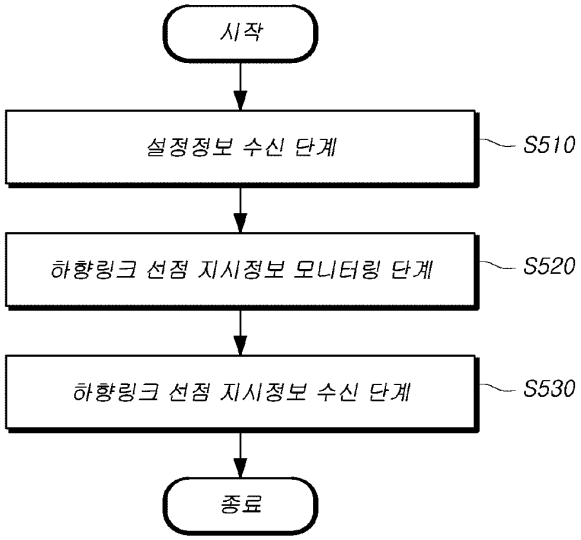
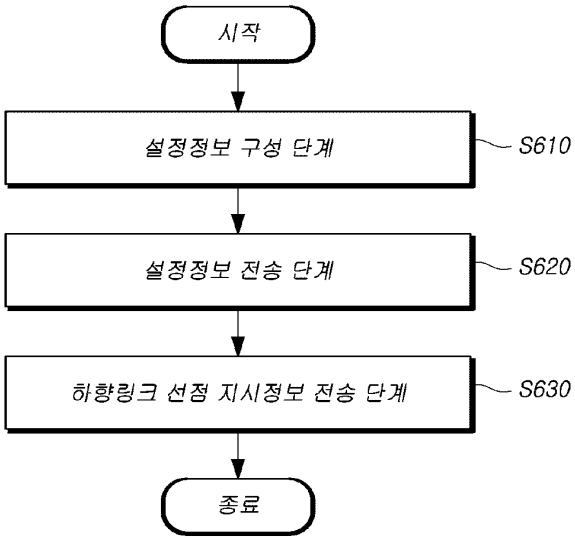
【도 5】



【도 6】



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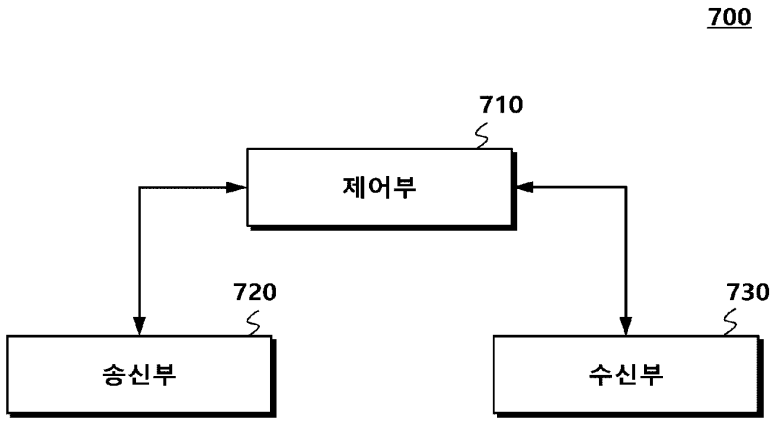
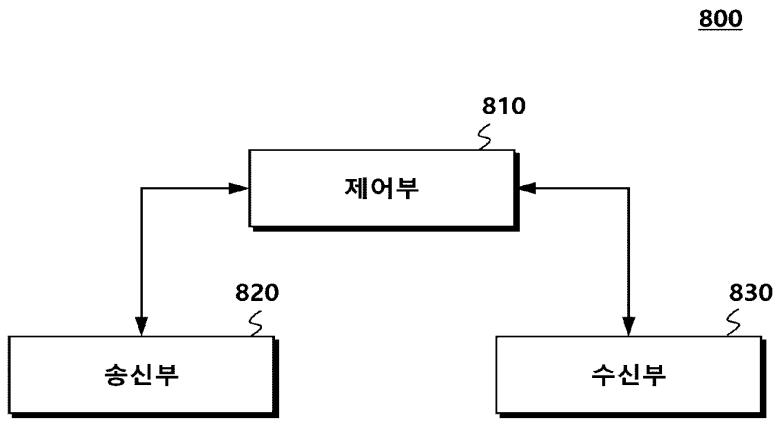
【도 7】



【도 8】



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(12) 특허협력조약에 의하여 공개된 국제출원

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국제사무국

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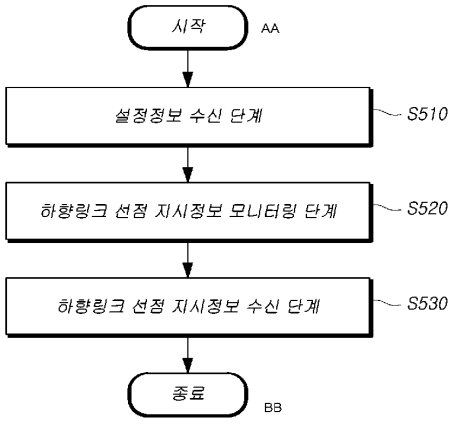
(54) **Title:** METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

(54) **발명의 명칭:** 차세대 무선망에서 하향링크 신호를 송수신하는 방법 및 그 장치



S510 ... Step for receiving configuration data
S520 ... Step for monitoring downlink pre-emption indication data
S530 ... Step for receiving downlink pre-emption indication data
AA ... Start
BB ... End

(57) **Abstract:** The present invention relates to a method and apparatus for transmitting and receiving a downlink signal for supporting effective multiplexing between data traffic having mutually different QoS requirements in a next generation/5G wireless access network ("New Radio" (NR)) for which discussion has begun in 3GPP. A method for a terminal receiving a downlink signal according to one embodiment comprises the steps of: receiving configuration data for receiving downlink pre-emption indication data from a base station; monitoring the downlink pre-emption indication data on the basis of the configuration data; and receiving the downlink pre-emption indication data by means of a multicast or unicast signal, wherein the downlink pre-emption indication data comprises data for indicating the overlapping wireless resource between a wireless resource for providing a first service, and a wireless resource for providing a second service.

(57) **요약서:** 본 발명은 3GPP에서 논의가 시작된 차세대/5G 무선 액세스망(이하, "NR[New Radio]"라 함)에서 서로 다른 QoS 요구사항를 갖는 데이터 트래픽(traffic) 간의 효율적인 멀티플렉싱(multiplexing)을 지원하기 위한 하향링크 신호 송수신 방법 및 장치에 관한 것이다. 일 실시예는, 단말이 하향링크 신호를 수신하는 방법에 있어서, 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 단계와 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 단계 및 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하는 단계를 포함하되, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법 및 장치를 제공한다.

[다음 쪽 계속]

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공개:

— 국제조사보고서와 함께 (조약 제21조(3))

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명세서

발명의 명칭: 차세대 무선망에서 하향링크 신호를 송수신하는 방법 및 그 장치

기술분야

[1] 본 발명은 3GPP에서 논의가 시작된 차세대/5G 무선 액세스망(이하, "NR[New Radio]"라 함)에서 서로 다른 QoS 요구사항를 갖는 데이터 트래픽(traffic) 간의 효율적인 멀티플렉싱(multiplexing)을 지원하기 위한 하향링크 신호 송수신 방법 및 장치에 관한 것이다.

배경기술

[2] 3GPP는 최근 차세대/5G 무선 액세스 기술에 대한 연구를 위한 스터디 아이템인 "Study on New Radio Access Technology"를 승인하고, 이를 기반으로 RAN WG1에서는 각각 NR(New Radio)을 위한 프레임 구조, 채널 코딩 및 변조, 파형 및 다중 접속 방식 등에 대한 논의를 진행하고 있다. NR은 LTE/LTE-Advanced에 대비하여 향상된 데이터 전송률뿐만 아니라 세분화되고 구체화된 사용 시나리오 별로 요구되는 다양한 요구를 만족시킬 수 있는 설계가 이루어지도록 요구되고 있다.

[3] NR의 대표적 사용 시나리오로서 eMBB(enhancement Mobile BroadBand), mMTC(massive Machine Type Communication) 및 URLLC(Ultra Reliable and Low Latency Communications)가 제기되고, 각각의 사용 시나리오 별 요구를 만족시키기 위하여 LTE/LTE-Advanced 대비 플렉서블한 프레임 구조 설계가 요구되고 있다.

[4] 그러나, 이와 같이 다양한 사용 시나리오를 만족시키기 위해서는 각 시나리오 별로 요구되는 다양한 요구사항을 만족시킬 필요가 있다. 예를 들어, eMBB 대비 URLLC는 빠른 데이터 송수신을 만족시킬 필요가 있다.

[5] 다만, 무선 데이터 송수신을 위한 자원은 한정되어 있기 때문에 각 시나리오를 모두 만족시키면서 자원을 효율적으로 할당하는 데에는 한계점이 존재한다. 즉, 효율성 측면에서 eMBB의 경우 긴 시구간 자원을 할당하여 넓은 범위의 단말에 서비스를 제공할 필요성이 있는 반면에 URLLC의 경우 저지연을 위해서 짧은 시구간 자원을 할당하는 것이 필요하다.

[6] 이와 같은 상황에서 한정된 무선자원을 활용하여 각 시나리오에 맞는 무선자원을 멀티플렉싱할 필요성이 있으며, 이를 제공하기 위한 구체적인 무선 신호 송수신 방법에 대한 연구가 요구되고 있다.

발명의 상세한 설명

기술적 과제

[7] 본 실시예들의 목적은, 각 서비스 시나리오가 혼재된 상황에서 한정된 무선자원을 효율적으로 할당하여 각 서비스를 복수의 단말에게 제공하기 위한

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구체적인 방안을 제공하는 데 있다.

과제 해결 수단

[8] 전술한 과제를 해결하기 위해서 안출된 일 실시예는, 단말이 하향링크 신호를 수신하는 방법에 있어서, 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 단계와 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 단계 및 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하는 단계를 포함하되, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법을 제공한다.

[9] 또한, 일 실시예는 기지국이 하향링크 신호를 전송하는 방법에 있어서, 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 단계와 설정정보를 단말로 전송하는 단계 및 설정정보에 기초하여 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 단계를 포함하되, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법을 제공한다.

[10] 또한, 일 실시예는 하향링크 신호를 수신하는 단말에 있어서, 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 수신부 및 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 제어부를 포함하되, 수신부는 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하고, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 단말을 제공한다.

[11] 또한, 일 실시예는 하향링크 신호를 전송하는 기지국에 있어서, 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 제어부 및 설정정보를 단말로 전송하고, 설정정보에 기초하여 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 송신부를 포함하되, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 기지국를 제공한다.

발명의 효과

[12] 본 실시예들에 의하면, 각 서비스 시나리오가 혼재된 네트워크에서 각 서비스 간의 데이터 트래픽에 대한 효율적인 멀티플렉싱을 제공하는 효과가 있다.

[13] 또한, 각 단말이 무선자원을 멀티플렉싱하여 하향링크 데이터를 수신함에 있어서 불필요한 프로세싱 과정 및 데이터 손실을 방지하는 효과를 제공한다.

도면의 간단한 설명

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[14] 도 1은 본 실시예들에 따른 서로 다른 서브캐리어 스페이싱을 사용하는 경우에서 OFDM 심볼의 정렬을 나타낸 도면이다.

[15] 도 2는 본 실시예들에 따른 하향 링크 선점 지시 정보가 미리-알림(pre-notification) 또는 이후-알림(post-notification) 방법을 통해 단말에 전송되는 방법을 나타낸 도면이다.

[16] 도 3은 일 실시예에 따른 서로 다른 서비스를 위한 무선자원 다중화를 예시적으로 도시한 도면이다.

[17] 도 4는 다른 실시예에 따른 서로 다른 서비스를 위한 무선자원 다중화를 예시적으로 도시한 도면이다.

[18] 도 5는 일 실시예에 따른 단말의 동작을 설명하기 위한 도면이다.

[19] 도 6은 일 실시예에 따른 기지국의 동작을 설명하기 위한 도면이다.

[20] 도 7은 일 실시예에 따른 단말의 구성을 보여주는 도면이다.

[21] 도 8은 일 실시예에 따른 기지국의 구성을 보여주는 도면이다.

발명의 실시를 위한 최선의 형태

[22] 이하, 본 발명의 일부 실시예들을 예시적인 도면을 통해 상세하게 설명한다. 각 도면의 구성요소들에 참조부호를 부가함에 있어서, 동일한 구성요소들에 대해서는 비록 다른 도면상에 표시되더라도 가능한 한 동일한 부호를 가지도록 하고 있음에 유의해야 한다. 또한, 본 발명을 설명함에 있어, 관련된 공지 구성 또는 기능에 대한 구체적인 설명이 본 발명의 요지를 흐릴 수 있다고 판단되는 경우에는 그 상세한 설명은 생략한다.

[23] 본 명세서에서 무선 통신 시스템은 음성, 패킷 데이터 등과 같은 다양한 통신 서비스를 제공하기 위한 시스템을 의미한다. 무선 통신 시스템은 사용자 단말(User Equipment, UE) 및 기지국(Base Station, BS)을 포함한다.

[24] 사용자 단말은 무선 통신에서의 단말을 의미하는 포괄적 개념으로서, WCDMA, LTE, HSPA 및 IMT-2020(5G 또는 New Radio) 등에서의 UE(User Equipment)는 물론, GSM에서의 MS(Mobile Station), UT(User Terminal), SS(Subscriber Station), 무선 기기(wireless device) 등을 모두 포함하는 개념으로 해석되어야 할 것이다.

[25] 기지국 또는 셀(Cell)은 일반적으로 사용자 단말과 통신하는 지점(station)을 말하며, 노드-B(Node-B), eNB(evolved Node-B), gNB(gNode-B), LPN(Low Power Node), 섹터(Sector), 싸이트(Site), 다양한 형태의 안테나, BTS(Base Transceiver System), 액세스 포인트(Access Point), 포인트(예를 들어, 송신포인트, 수신포인트, 송수신포인트), 릴레이 노드(Relay Node), 메가 셀, 매크로 셀, 마이크로 셀, 피코 셀, 펨토 셀, RRH(Remote Radio Head), RU(Radio Unit), 스몰 셀(small cell) 등 다양한 커버리지 영역을 모두 포괄하는 의미이다.

[26] 앞서 나열된 다양한 셀은 각 셀을 제어하는 기지국이 존재하므로 기지국은 두 가지 의미로 해석될 수 있다. 1) 무선 영역과 관련하여 메가 셀, 매크로 셀,

마이크로 셀, 피코 셀, 펨토 셀, 스몰 셀(small cell)을 제공하는 장치 그 자체이거나, 2) 무선 영역 그 자체를 지시할 수 있다. 1)에서 소정의 무선 영역을 제공하는 장치들이 동일한 개체에 의해 제어되거나 무선 영역을 협업으로 구성하도록 상호 작용하는 모든 장치들을 모두 기지국으로 지시한다. 무선 영역의 구성 방식에 따라 포인트, 송수신 포인트, 송신 포인트, 수신 포인트 등은 기지국의 일 실시예가 된다. 2)에서 사용자 단말의 관점 또는 이웃하는 기지국의 입장에서 신호를 수신하거나 송신하게 되는 무선 영역 그 자체를 기지국으로 지시할 수 있다.

[27] 본 명세서에서 셀(Cell)은 송수신 포인트로부터 전송되는 신호의 커버리지 또는 송수신 포인트(transmission point 또는 transmission/reception point)로부터 전송되는 신호의 커버리지를 가지는 요소 반송파(component carrier), 그 송수신 포인트 자체를 의미할 수 있다.

[28] 본 명세서에서 사용자 단말과 기지국은, 본 발명에서 기술되는 기술 또는 기술적 사상을 구현하는데 사용되는 두 가지(Uplink 또는 Downlink) 송수신 주체로 포괄적인 의미로 사용되며 특정하게 지칭되는 용어 또는 단어에 의해 한정되지 않는다.

[29] 여기서, 상향링크(Uplink, UL, 또는 업링크)는 사용자 단말에 의해 기지국으로 데이터를 송수신하는 방식을 의미하며, 하향링크(Downlink, DL, 또는 다운링크)는 기지국에 의해 사용자 단말로 데이터를 송수신하는 방식을 의미한다.

[30] 상향링크 전송 및 하향링크 전송은 서로 다른 시간을 사용하여 전송되는 TDD(Time Division Duplex) 방식이 사용될 수 있고, 서로 다른 주파수를 사용하여 전송되는 FDD(Frequency Division Duplex) 방식, TDD 방식과 FDD 방식의 혼용 방식이 사용될 수 있다.

[31] 또한, 무선 통신 시스템에서는 하나의 반송파 또는 반송파 쌍을 기준으로 상향링크와 하향링크를 구성하여 규격을 구성한다.

[32] 상향링크와 하향링크는, PDCCH(Physical Downlink Control CHannel), PUCCH(Physical Uplink Control CHannel) 등과 같은 제어 채널을 통하여 제어 정보를 전송하고, PDSCH(Physical Downlink Shared CHannel), PUSCH(Physical Uplink Shared CHannel) 등과 같은 데이터 채널로 구성되어 데이터를 전송한다.

[33] 하향링크(downlink)는 다중 송수신 포인트에서 단말로의 통신 또는 통신 경로를 의미할 수 있으며, 상향링크(uplink)는 단말에서 다중 송수신 포인트로의 통신 또는 통신 경로를 의미할 수 있다. 이때, 하향링크에서 송신기는 다중 송수신 포인트의 일부분일 수 있고, 수신기는 단말의 일부분일 수 있다. 또한, 상향링크에서 송신기는 단말의 일부분일 수 있고, 수신기는 다중 송수신 포인트의 일부분일 수 있다.

[34] 이하에서는 PUCCH, PUSCH, PDCCH 및 PDSCH 등과 같은 채널을 통해 신호가 송수신되는 상황을 'PUCCH, PUSCH, PDCCH 및 PDSCH를 전송, 수신한다'는

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형태로 표기하기도 한다.

[35] 한편, 이하에서 기재하는 상위계층 시그널링(High Layer Signaling)은 RRC 파라미터를 포함하는 RRC 정보를 전송하는 RRC 시그널링을 포함한다.

[36] 기지국은 단말들로 하향링크 전송을 수행한다. 기지국은 유니캐스트 전송(unicast transmission)을 위한 주 물리 채널인 하향링크 데이터 채널의 수신에 필요한 스케줄링 등의 하향링크 제어 정보 및 상향링크 데이터 채널에서의 전송을 위한 스케줄링 승인 정보를 전송하기 위한 물리 하향링크 제어 채널을 전송할 수 있다. 이하에서는, 각 채널을 통해 신호가 송수신 되는 것을 해당 채널이 송수신되는 형태로 기재하기로 한다.

[37] 무선 통신 시스템에서 적용되는 다중 접속 기법에는 제한이 없다. TDMA(Time Division Multiple Access), FDMA(Frequency Division Multiple Access), CDMA(Code Division Multiple Access), OFDMA(Orthogonal Frequency Division Multiple Access), NOMA(Non-Orthogonal Multiple Access), OFDM-TDMA, OFDM-FDMA, OFDM-CDMA와 같은 다양한 다중 접속 기법을 사용할 수 있다. 여기서, NOMA는 SCMA(Sparse Code Multiple Access)와 LDS(Low Density Spreading) 등을 포함한다.

[38] 본 발명의 일 실시예는 GSM, WCDMA, HSPA를 거쳐 LTE/LTE-Advanced, IMT-2020으로 진화하는 비동기 무선 통신과, CDMA, CDMA-2000 및 UMB로 진화하는 동기식 무선 통신 분야 등의 자원 할당에 적용될 수 있다.

[39] 본 명세서에서 MTC(Machine Type Communication) 단말은 low cost(또는 low complexity)를 지원하는 단말 또는 coverage enhancement를 지원하는 단말 등을 의미할 수 있다. 또는 본 명세서에서 MTC 단말은 low cost(또는 low complexity) 및/또는 coverage enhancement를 지원하기 위한 특정 카테고리로 정의된 단말을 의미할 수 있다.

[40] 다시 말해 본 명세서에서 MTC 단말은 LTE 기반의 MTC 관련 동작을 수행하는 새롭게 정의된 3GPP Release-13 low cost(또는 low complexity) UE category/type을 의미할 수 있다. 또는 본 명세서에서 MTC 단말은 기존의 LTE coverage 대비 향상된 coverage를 지원하거나, 또는 저전력 소모를 지원하는 기존의 3GPP Release-12 이하에서 정의된 UE category/type, 또는 새롭게 정의된 Release-13 low cost(또는 low complexity) UE category/type을 의미할 수 있다. 또는, Release-14에서 정의된 further Enhanced MTC 단말을 의미할 수도 있다.

[41] 본 명세서에서 NB-IoT(NarrowBand Internet of Things) 단말은 셀룰러 IoT를 위한 무선 액세스를 지원하는 단말을 의미한다. NB-IoT 기술의 목적은 향상된 인도어(Indoor) 커버리지, 대규모의 저속 단말에 대한 지원, 저지연민감도, 초저가 단말 비용, 낮은 전력 소모, 그리고 최적화된 네트워크 구조를 포함한다.

[42]

[43] *3GPP에서 최근 논의 중인 NR(New Radio)에서 대표적인 사용 시나리오(usage scenario)로서, eMBB(enhanced Mobile BroadBand), mMTC(massive Machine Type

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Communication), URLLC(Ultra Reliable and Low Latency Communication)가 제기되고 있다.

[44] 본 명세서에서 NR(New Radio)과 관련한 주파수, 프레임, 서브프레임, 자원, 자원블럭, 영역(region), 밴드, 서브밴드, 제어채널, 데이터채널, 동기신호, 각종 참조신호, 각종 신호, 각종 메시지는 과거 또는 현재 사용되는 의미 또는 장래 사용되는 다양한 의미로 해석될 수 있다.

[45] **NR(New Radio)**

[46] 3GPP는 최근 차세대/5G 무선 액세스 기술에 대한 연구를 위한 스터디 아이템인 "Study on New Radio Access Technology"를 승인하고, 이를 기반으로 각각 NR(New Radio)를 위한 프레임 구조, 채널 코딩 및 변조, 파형 및 다중 접속 스킴(frame structure, channel coding & modulation, waveform & multiple access scheme)등에 대한 논의가 시작되었다.

[47] NR은 LTE/LTE-Advanced 대비 향상된 데이터 전송률뿐 아니라, 세분화되고 구체화된 사용 시나리오(usage scenario) 별로 요구되는 다양한 요구(requirements)를 만족시킬 수 있는 설계가 이루어지도록 요구되고 있다. 특히 NR의 대표적 사용 시나리오(usage scenario)로서 eMBB(enhancement Mobile BroadBand), mMTC(massive MTC) 및 URLLC(Ultra Reliable and Low Latency Communications)가 제기되었으며, 각각의 사용 시나리오(usage scenario)별 요구(requirements)를 만족하기 위한 방법으로서 LTE/LTE-Advanced 대비 플렉서블한 프레임 구조(frame structure) 설계가 요구되고 있다.

[48] 구체적으로 3GPP에서 논의 중인 NR의 대표적 사용 시나리오(usage scenario)로서 eMBB, mMTC, URLLC가 고려되고 있다. 각각의 사용 시나리오(usage scenario)는 데이터 레이트(data rates), 레이턴시(latency), 커버리지(coverage) 등에 대한 요구(requirements)가 서로 상이하기 때문에 임의의 NR 시스템을 구성하는 주파수 대역을 통해 각각의 사용 시나리오(usage scenario)별 요구(requirements)를 효율적으로 만족시키기 위한 방법으로서 서로 다른 뉴머롤러지(numerology)(e.g. subcarrier spacing, subframe, TTI, etc.) 기반의 무선 자원 유닛(unit)을 효율적으로 다중화(multiplexing)하는 방안에 대한 필요성이 제기되고 있다.

[49] 이를 위한 한 방법으로서, 서로 다른 서브캐리어 스페이싱(SCS, subcarrier spacing)값을 갖는 뉴머롤러지(numerology)에 대해 하나의 NR 캐리어(carrier)를 통해 TDM, FDM 또는 TDM/FDM 기반으로 다중화하여 지원하는 방법 및 시간 도메인(time domain)에서의 스케줄링 단위를 구성함에 있어서 하나 이상의 시간 유닛(time unit)을 지원하는 방안에 대한 논의가 이루어졌다. 이와 관련하여 NR에서는 시간 도메인 구조(time domain structure)의 한 종류로서 서브프레임(subframe)에 대한 정의가 이루어졌으며, 해당 서브프레임 지속기간(subframe duration)을 정의하기 위한 레퍼런스 뉴머롤러지(reference numerology)로서 LTE와 동일한 15kHz SCS(Sub-Carrier Spacing) 기반 normal CP

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overhead의 14개의 OFDM 심볼로 구성된 단일한 서브프레임 지속기간을 정의하기로 결정하였다. 이에 따라 NR에서 서브프레임은 1ms의 지속기간(time duration)을 가진다. 단, LTE와 달리 NR의 서브프레임은 절대적인 레퍼런스 지속기간(reference time duration)으로서, 실제 상/하향 링크 데이터 스케줄링의 기반의 되는 시간 유닛(time unit)으로서 슬롯(slot) 및 미니 슬롯(mini-slot)이 정의될 수 있다. 이 경우, 해당 슬롯을 구성하는 OFDM 심볼의 개수, y값은 뉴머롤러지에 관계없이 y=14의 값을 갖도록 결정되었다.

[50] 이에 따라 임의의 슬롯은 14개의 심볼로 구성될 수 있으며, 또한 해당 슬롯의 전송 지시(transmission direction)에 따라 모든 심볼이 하향 링크 전송(DL transmission)을 위해 이용되거나, 또는 모든 심볼이 상향 링크 전송(UL transmission)을 위해 이용되거나, 또는 하향 링크 부분(DL portion) + (gap) + 상향 링크 부분(UL portion)의 형태로 이용될 수 있다.

[51] 또한 임의의 뉴머롤러지(numerology)(또는 SCS)에서 해당 슬롯보다 적은 수의 심볼로 구성된 미니 슬롯이 정의되어 이를 기반으로 상/하향 링크 데이터 송수신을 위한 짧은 길이의 시간 도메인 스케줄링 간격(time-domain scheduling interval)이 설정되거나, 또는 슬롯 병합(slot aggregation)을 통해 상/하향 링크 데이터 송수신을 위한 긴 길이의 시간 도메인 스케줄링 간격(time-domain scheduling interval)이 구성될 수 있다.

[52] 특히 URLLC와 같이 지연 크리티컬(latency critical)한 데이터에 대한 송수신의 경우, 15kHz와 같이 SCS값이 작은 뉴머롤러지 기반의 프레임 구조에서 정의된 0.5ms(7 symbols) 또는 1ms(14 symbols) 기반의 슬롯 단위로 스케줄링이 이루어질 경우, 지연 시간 요구 사항(latency requirement)를 만족시키기 힘들 수 있기 때문에 이를 위해서 해당 슬롯보다 적은 수의 OFDM 심볼로 구성된 미니-슬롯(mini-slot)을 정의하여 이를 기반으로 해당 URLLC와 같은 지연 크리티컬(latency critical)한 데이터에 대한 스케줄링이 이루어지도록 정의할 수 있다.

[53] 또는 전술한 바와 같이 하나의 NR 캐리어 내에서 서로 다른 SCS값을 갖는 뉴머롤러지를 TDM 방식 또는 FDM 방식으로 다중화하여 지원함으로써, 각각의 뉴머롤러지 별로 정의된 슬롯(또는 미니-슬롯) 길이를 기반으로 지연 시간 요구 사항(latency requirement)에 맞추어 데이터를 스케줄링하는 방안도 고려되고 있다. 예를 들어 도 1과 같이 SCS가 60kHz인 경우, SCS 15kHz인 경우보다 심볼 길이가 1/4정도로 줄어들기 때문에 동일하게 7개의 OFDM 심볼로 하나의 슬롯을 구성할 경우, 해당 15kHz 기반의 슬롯 길이는 0.5ms이 되는 반면, 60kHz 기반의 슬롯 길이는 약 0.125ms으로 줄어들게 된다.

[54] 이처럼 NR에서는 서로 다른 SCS 또는 서로 다른 TTI 길이를 정의함으로써, URLLC와 eMBB 각각의 요구사항을 만족시키는 방법에 대한 논의가 진행되고 있다.

[55] 전술한 바와 같이 NR에서 URLLC 서비스를 지원하기 위해서는 시간

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도메인(time domain)에서 latency boundary를 만족시킬 수 있는 짧은 스케줄링 단위(short scheduling unit) 또는 TTI(Transmission Time Interval)을 지원할 필요가 있다. 반면, eMBB 혹은 mMTC의 경우, 시간 도메인에서 스케줄링 단위(scheduling unit)을 정의함에 있어서, URLLC 사용 시나리오 대비 조금 더 긴 시구간 자원 할당 단위를 적용하는 것이 컨트롤 오버헤드(control overhead) 및 커버리지(coverage) 측면에서 효율적일 수 있다. 이처럼 다양한 NR 사용 시나리오를 동시에 만족시키기 위한 방법으로 URLLC에 적합한 짧은 시구간 자원 할당 단위를 정의하는데 용이한 서브캐리어 스페이싱(subcarrier spacing, 예를 들어, 60kHz, 120kHz, 등의 larger subcarrier spacing)의 뉴머롤러지(numerology)와 eMBB 및 mMTC에 적합한 subcarrier spacing(e.g. 15kHz for eMBB 혹은 3.75kHz for mMTC)의 뉴머롤러지(numerology)를 하나의 NR 캐리어를 통해 지원하는 혼합 뉴머롤러지(mixed numerology) 구조를 지원하거나, 혹은 임의의 하나의 뉴머롤러지(numerology)로 동작하는 NR 캐리어 내에서 서브프레임 또는 슬롯(slot) 또는 미니 슬롯(mini-slot) 등 서로 다른 길이(length)를 갖는 시구간 스케줄링 단위(time-domain scheduling unit)을 동시에 지원할 필요가 있다.

[56] 이를 위한 한 방법으로 각각의 서비스 사용 시나리오 별 최적의 스케줄링 단위(scheduling unit)를 기반으로 자원 할당이 이루어지는 시간/주파수 자원(time/frequency resource(혹은 region))를 준 정적(semi-static)으로 할당하고, 각각의 단말 별 사용 시나리오에 따라 그에 해당하는 영역(region)의 시간/주파수 자원을 사용해 자원 할당이 이루어지도록 설정할 수 있다.

[57] 그러나, 이처럼 준 정적인 방법으로 사용 시나리오 별 무선자원의 영역을 구분할 경우, NR 시스템 관점에서의 효율성이 다소 떨어질 수 있다. 예를 들어, URLLC 트래픽이 드물게(sparse) 발생하는 임의의 NR 셀에서 해당 드물게 발생하는 URLLC 서비스를 만족시키키 위해 항상 짧은 시구간 스케줄링 단위(time-domain scheduling unit)을 지원하는 시간/주파수 자원(time/frequency resource)을 전용(dedication)하는 것은 바람직하지 않을 수 있다.

[58] 따라서, 이를 해결하기 위해서 해당 URLLC 트래픽이 발생할 때마다 동적으로(dynamic) eMBB 또는 mMTC의 스케줄링 자원(scheduling resource)의 일부를 사용하여 해당 URLLC의 지연 요구 사항(latency requirement)을 만족시키기 위한 스케줄링 방법이 요구되고 있다.

[59] 이를 위해 NR에서는 임의의 eMBB 또는 mMTC의 데이터 채널을 위해 할당된 자원 중 일부 OFDM 심볼을 펑처링(puncturing)하여 긴급한 URLLC 데이터 송수신을 위해 사용하는 동적 펑처링(dynamic puncturing) 기반의 eMBB/URLLC 멀티플렉싱(multiplexing) 방법을 고려할 수 있다. 즉, URLLC 데이터 송수신에 있어서 선점(preemption) 기반의 스케줄링을 지원하는 방안을 고려할 수 있다.

[60] 구체적으로 eMBB/URLLC 간 동적 펑처링(dynamic puncturing) 기반의 멀티플렉싱(multiplexing)이 적용되는 경우에, URLLC 데이터 전송을 위해

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펑처링(puncturing)이 이루어진 자원을 해당 eMBB 단말에 알림(notification)을 지시하기 위한 방법으로서 펑처링(puncturing) 전에 해당 정보를 지시(indication)해주는 미리-알림(pre-notification) 방법과 해당 진행 중 전송(on-going transmission)이 끝난 후에 해당 펑처링(puncturing) 여부를 지시(indication)해주는 이후-알림(post-notification) 방법을 고려할 수 있다.

[61] 본 명세서에서는 무선자원을 동적으로 펑처링하는 기술을 적용하는 경우, 해당 펑처링된 무선자원 정보를 알려주기 위한 다양한 실시예를 제안하고자 한다.

[62] 이하에서 설명하는 실시예들은 모든 이동통신 기술을 사용하는 단말, 기지국, 코어망 개체(MME)에 적용될 수 있다. 예를 들어, 본 실시예들은 LTE 기술이 적용되는 이동통신 단말뿐만 아니라 차세대 이동통신(5G 이동통신, New-RAT) 단말, 기지국, 코어망 개체(AMF: Access and Mobility Function)에도 적용될 수 있다. 설명의 편의를 위해 이하에서 기지국은 LTE/E-UTRAN의 eNB를 나타낼 수도 있고, CU(Central Unit)와 DU(Distributed Unit)가 분리된 5G 무선망에서 기지국(CU, DU, 또는 CU와 DU가 하나의 논리적인 개체로 구현된 개체), gNB를 나타낼 수도 있다.

[63] 한편, NR의 사용 시나리오에서 URLLC는 고신뢰, 저지연을 지원하는 서비스를 의미하며 송수신되는 데이터의 크기가 크지는 않지만 데이터 송수신 과정에서 지연이 발생하면 심각한 문제가 발생하는 경우에 사용되는 서비스를 의미할 수 있다. 예를 들어서 자율 주행 차량과 같이 데이터 송수신의 지연이 커지면 교통 사고로 인한 인적/물적 손해가 발생할 수 있는 경우에 URLLC 서비스가 사용될 수 있다.

[64] eMBB는 초고속의 데이터 전송을 지원하는 서비스를 이용하며 대량의 데이터가 송수신될 필요가 있을 경우에 사용되는 서비스를 의미할 수 있다. 예를 들어서 3D 동영상, UHD 서비스와 같이 단위 시간당 대량의 데이터가 전송될 필요가 있는 경우 eMBB 서비스가 사용될 수 있다.

[65] mMTC는 송수신되는 데이터의 크기가 크지 않고 지연 발생이 문제되지 않으나, 저전력 소모가 필요한 경우에 사용되는 서비스를 의미할 수 있다. 예를 들어서 스마트 시티(Smart City) 구축을 위해 설치한 센서 장비들의 경우 탑재된 배터리로 가능한 오랜 시간 동안 동작해야 하므로 mMTC 서비스가 사용될 수 있다.

[66] 일반적인 경우 단말의 특성에 따라 전술한 URLLC/eMBB/mMTC의 세 가지 서비스 중 하나가 단말에 서비스될 수 있다. 이하에서는 필요한 경우, URLLC 서비스를 이용하는 단말을 URLLC 단말, eMBB 서비스를 이용하는 단말을 eMBB 단말, mMTC 서비스를 이용하는 단말을 mMTC 단말이라 구분하여 칭할 수 있다. 그리고 eMBB, mMTC, URLLC는 각각 eMBB 단말, mMTC 단말, URLLC 단말로도 해석될 수 있다.

[67] 그리고 본 실시예에서 선점(preemption)은 URLLC에 대한 트래픽 발생 시 eMMB 또는 mMTC에 할당된 자원의 일부를 URLLC에 대한 지연 요구

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사항(latency requirement)를 만족하기 위해서 URLLC에 다시 할당하는 것을 의미한다. 이때, 원래 eMBB 또는 mMTC에 할당된 자원을 URLLC에서 사용하기 때문에 원래 자원을 할당받았던 eMBB 단말 또는 mMTC 단말이 어떤 자원이 선점되었는지에 대한 정보를 수신해야 한다. 하향링크 선점은 단말의 하향링크 자원에 대한 선점이 일어나는 것을 의미한다.

[68] 그리고 하향 링크 선점(preemption) 지시 정보는 하향링크에서 어떤 데이터 채널(또는 무선자원)이 선점되었는지를 단말에 지시하기 위한 정보로서 하향링크 선점을 단말에 알려주는 정보이므로 하향링크 선점 알림(notification) 정보로도 표현될 수 있다. 이러한 하향링크 선점 지시정보는 신호(signal) 또는 채널(channel) 형태로 지시될 수 있다.

[69] 또한, 본 명세서에서의 eMBB 단말과 URLLC 단말은 현재 통상적으로 3GPP에서 논의되는 개념을 적용하도록 하지만, 이에 대한 구체적인 구분은 다음과 같이 동적 펑처링 알림(dynamic puncturing notification) 정보에 대한 모니터링 수행 여부 및 시구간 스케줄링 단위의 길이에 의해 결정될 수 있다.

[70] 예를 들어, 동적 펑처링(dynamic puncturing)이 적용될 경우, 동적 펑처링(dynamic puncturing)에 대한 알림 정보(혹은 channel)에 대한 모니터링이 필요한 단말이 eMBB 단말에 해당하며, 이에 대한 모니터링이 필요 없는 단말은 URLLC 단말에 해당할 수 있다. 또한, eMBB 단말과 URLLC 단말의 구분은 해당 단말을 위해 설정된 SCS(Subcarrier Spacing) 값과 해당 단말을 위해 할당된 시구간 스케줄링 단위(예를 들어, slot, aggregated slot, mini-slot 등)에 의해 결정될 수 있으며, 이에 대한 일 예로 특정 SCS 값 이하의 slot 단위 혹은 aggregate-slot 단위의 긴 시구간 스케줄링 단위를 갖는 단말은 eMBB 단말이고, 특정 SCS 값 이상의 전송 뉴머롤러지를 갖거나, 혹은 특정 SCS 값 이하에서 mini-slot 단위의 짧은 시구간 스케줄링 단위를 갖는 단말은 URLLC 단말일 수 있다. 또는 eMBB와 URLLC를 구분하기 위한 시구간 스케줄링 단위(혹은 interval)의 기준값(예를 들어, X ms)값을 정의하고 해당 기준값(threshold) 보다 큰 시구간 스케줄링 단위를 갖는 단말은 eMBB 단말 해당 기준값(threshold) 보다 작은 시구간 스케줄링 단위를 갖는 단말은 URLLC 단말일 수 있다.

[71] 도 2는 본 실시예들에 따른 하향 링크 선점 지시 정보가 미리-알림(pre-notification) 또는 이후-알림(post-notification) 방법을 통해 단말에 전송되는 방법을 나타낸 도면이다.

[72] 도 2를 참조하면, 가로축은 시간축 자원으로 eMMB 단말에 대한 TTI(TTI for eMBB UEs)를 나타내고 세로축은 주파수축 자원으로 NR 캐리어를 나타낸다.

[73] 도 2의 영역 중 1)은 eMMB 단말에 대한 하향 링크 제어 채널(PDCCH)이 전송되는 영역으로, 하향 링크 제어 채널은 eMBB 단말에 대한 하향 링크 데이터 채널(PDSCH)에 관한 스케줄링 정보를 포함하고 있다.

[74] 그리고 2)는 eMBB 단말에 전술한 하향 링크 데이터 채널이 전송되는 영역을 나타낸다.

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[75] 그리고 3)은 하향 링크 선점(preemption)이 발생한 경우에, URLLC 단말이 선점한 자원을 통해 하향 링크 제어 채널(PDCCH) 또는 하향 링크 데이터 채널(PDSCH)을 전송하는 영역을 나타낸다. 이 경우 eMBB 단말은 해당 자원이 URLLC 단말에 의해 선점되었다는 정보, 즉 하향 링크 선점 지시 정보를 모니터링하고 있어야 하향 링크 선점의 발생을 인지하고 이에 대한 대응을 할 수 있다.

[76] 이 때, 전술한 미리-알림(pre-notification) 방식을 사용하는 경우에는 4)의 영역, 즉 선점이 일어나기 전에 하향 링크 선점 지시 정보가 eMBB 단말에 전송된다.

[77] 반면, 전술한 이후-알림(post-notification) 방식을 사용하는 경우에는 5)의 영역, 즉 선점이 일어난 후에 하향 링크 선점 지시 정보가 eMBB 단말에 전송된다.

[78] 도 3은 일 실시예에 따른 서로 다른 서비스를 위한 무선자원 다중화를 예시적으로 도시한 도면이다.

[79] 도 3을 참조하면, eMBB를 위한 무선자원과 URLLC를 위한 무선자원은 서브캐리어 스페이싱 및 심볼 길이가 상이하게 설정될 수 있다. 예를 들어, URLLC를 위한 서브캐리어 스페이싱은 eMBB를 위한 서브캐리어 스페이싱의 3배로 설정될 수 있으며, 심볼 길이는 1/3으로 설정될 수 있다.

[80] 따라서, eMBB와 URLLC를 위한 무선자원이 멀티플렉싱 되는 경우 도 3과 같이 설정될 수 있다.

[81] 도 4는 다른 실시예에 따른 서로 다른 서비스를 위한 무선자원 다중화를 예시적으로 도시한 도면이다.

[82] 도 4를 참조하면, 또 다른 예로 eMBB와 URLLC를 위한 서브캐리어 스페이싱과 심볼 길이가 동일하게 설정될 수도 있다. 이 경우에도 도 4와 같이 eMBB와 URLLC를 위한 무선자원이 멀티플렉싱될 수 있다.

[83] 이하에서는, 본 실시예에 따른 서로 다른 서비스를 위해서 할당되는 무선자원이 중첩되거나, 드물게 발생하는 무선자원을 다른 서비스를 위해서 할당된 무선자원에 할당하는 경우에 이를 단말에 알리기 위한 단말 및 기지국의 동작을 도면을 참조하여 설명한다.

[84] 도 5는 일 실시예에 따른 단말의 동작을 설명하기 위한 도면이다.

[85] 도 5를 참조하면, 단말은 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 단계를 수행할 수 있다(S510). 예를 들어, 단말은 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 수신할 수 있다. 예를 들어, 설정정보는 셀 특정한 시그널링 또는 단말 특정한 시그널링을 통해서 수신될 수 있다. 일 예로, 설정정보는 단말 특정 RRC 시그널링을 통해서 수신될 수 있다. 다른 예로, 설정정보는 셀 특정 RRC 시그널링을 통해서 수신될 수 있다. 또 다른 예로, 설정정보는 단말 그룹 공통 시그널링을 통해서 수신될 수도 있다.

[86] 한편, 설정정보는 서브캐리어 스페이싱, 듀레이션 정보, 주파수 자원 정보, 셀 특정 RNTI 및 슬롯 인덱스 중 적어도 하나의 정보를 포함할 수 있으며. 단말은 이를 통해서 묵시적(implicit)으로 하향링크 선점 지시정보를 수신하기 위한

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자원을 확인할 수 있다.

[87] 또한, 단말은 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 단계를 수행할 수 있다(S520). 예를 들어, 단말은 설정정보를 이용하여 단말이 모니터링을 수행해야 하는 무선자원을 확인할 수 있다. 일 예로, 단말은 하향링크 제어채널을 모니터링할 수 있다. 구체적으로, 단말은 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 모니터링할 수 있다. 또는, 단말은 하향링크 제어채널의 단말 특정 검색 공간을 모니터링할 수도 있다.

[88] 한편, 단말은 블라인드 디코딩 방식으로 모니터링을 수행할 수 있다. 일 예로, 단말은 셀 특정 RNTI를 이용하여 하향링크 선점 지시정보를 포함하는 하향링크 제어정보의 CRC 스크램블링을 수행하여 모니터링을 수행할 수 있다. 예를 들어, 셀 특정 RNTI는 셀 특정 상위계층 시그널링을 통해서 설정되거나, 임의의 값으로 미리 설정될 수도 있다. 다른 예로, 단말은 C-RNTI 또는 새롭게 정의되는 RNTI를 이용하여 하향링크 선점 지시정보를 포함하는 하향링크 제어정보의 CRC 스크램블링을 수행하여 모니터링을 수행할 수 있다. 예를 들어, C-RNTI 또는 새롭게 정의되는 RNTI는 단말 특정 RRC 시그널링을 통해서 수신될 수도 있다.

[89] 또한, 단말은 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하는 단계를 포함할 수 있다(S530). 일 예로, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함할 수 있다. 다른 예로, 하향링크 선점 지시정보는 미리 설정된 특정 서비스(예를 들어, URLLC)를 위해서 설정되는 무선자원을 지시하기 위한 정보를 포함할 수 있다.

[90] 일 예로, 하향링크 선점 지시정보는 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 수신될 수 있다. 즉, 하향링크 선점 지시정보는 셀 특정 시그널링을 통해서 수신될 수 있다. 다른 예로, 하향링크 선점 지시정보는 하향링크 제어채널의 단말 특정 검색 공간을 통해서 수신될 수 있다. 즉, 하향링크 선점 지시정보는 단말 특정 시그널링을 통해서 수신될 수 있다.

[91] 단말은 하향링크 선점 지시정보를 수신하여, 하향링크 선점 지시정보가 지시하는 무선자원은 특정 서비스를 위해서 일시적으로 할당된 자원인 것을 인지할 수 있다. 예를 들어, 이상에서 설명한 단말이 eMBB 단말이고, 하향링크 선점 지시정보를 통해서 무선자원이 지시되는 단말이 URLLC 단말일 수 있다. 즉, 제1 서비스는 eMBB이고, 제2 서비스는 URLLC일 수 있다. 또는 제1 서비스가 URLLC이고, 제2 서비스가 eMBB일 수도 있다. 마찬가지로, eMBB 대신 mMTC가 적용되는 경우에도 동일하게 적용될 수 있다.

[92] 도 6은 일 실시예에 따른 기지국의 동작을 설명하기 위한 도면이다.

[93] 도 6을 참조하면, 기지국은 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 단계를 수행할 수 있다(S610). 전술한 바와 같이,

설정정보는 단말이 하향링크 선점 지시정보를 모니터링하는 데에 필요한 정보를 포함할 수 있다. 예를 들어, 설정정보는 서브캐리어 스페이싱, 듀레이션 정보, 주파수 자원 정보, 셀 특정 RNTI 및 슬롯 인덱스 중 적어도 하나의 정보를 포함할 수 있으며. 단말은 이를 통해서 묵시적(implicit)으로 하향링크 선점 지시정보를 수신하기 위한 자원을 확인할 수 있다.

[94] 기지국은 설정정보를 단말로 전송하는 단계를 수행할 수 있다(S620). 예를 들어, 설정정보는 셀 특정한 시그널링 또는 단말 특정한 시그널링을 통해서 전송될 수 있다. 일 예로, 설정정보는 단말 특정 RRC 시그널링을 통해서 전송될 수 있다. 다른 예로, 설정정보는 셀 특정 RRC 시그널링을 통해서 전송될 수 있다. 또 다른 예로, 설정정보는 단말 그룹 공통 시그널링을 통해서 전송될 수도 있다.

[95] 기지국은 설정정보에 기초하여 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 단계를 수행할 수 있다(S630). 일 예로, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함할 수 있다. 다른 예로, 하향링크 선점 지시정보는 미리 설정된 특정 서비스(예를 들어, URLLC)를 위해서 설정되는 무선자원을 지시하기 위한 정보를 포함할 수 있다.

[96] 일 예로, 하향링크 선점 지시정보는 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 전송될 수 있다. 즉, 하향링크 선점 지시정보는 셀 특정 시그널링을 통해서 전송될 수 있다. 다른 예로, 하향링크 선점 지시정보는 하향링크 제어채널의 단말 특정 검색 공간을 통해서 전송될 수 있다. 즉, 하향링크 선점 지시정보는 단말 특정 시그널링을 통해서 전송될 수 있다. 단말은 하향링크 선점 지시정보를 수신하여, 하향링크 선점 지시정보가 지시하는 무선자원은 특정 서비스를 위해서 일시적으로 할당된 자원인 것을 인지할 수 있다.

[97] 이상에서 설명한 바와 같이, 단말은 특정 서비스를 위한 무선자원을 지시하는 정보를 포함하는 하향링크 선점 지시정보를 수신하고, 기지국은 무선자원을 동적으로 구성함으로써, 다양한 서비스를 멀티플렉싱하여 제공할 수 있다.

[98] 이하에서는 전술한 하향링크 선점 지시정보를 송수신함에 있어서, 셀 특정 시그널링을 사용하는 경우와 단말 특정 시그널링을 사용하는 경우를 나누어 보다 구체적으로 설명한다. 아울러, 각 실시예에서 미리 알림 방식과 이후 알림 방식을 나누어 설명하며, 설정정보의 송수신 동작에 대해서도 실시예를 나누어 설명한다. 설명의 편의를 위하여 이하의 세부 실시예에서는 eMBB 단말이 URLLC 무선자원에 대해서 하향링크 선점 지시정보를 수신하는 동작을 중심으로 설명하나, 이에 한정되는 것은 아니다.

[99] **제 1 실시예: 셀 특정Cell-specific(or slot-specific)한 시그널을 통해서** 지시하는 방법

[100] 임의의 NR 셀/기지국은 eMBB 단말을 위해 정의된 임의의 시구간 스케줄링

단위(예를 들어, slot 혹은 aggregated-slot)에서 URLLC 데이터 전송을 위해 eMBB 데이터에 대한 펑처링(puncturing)이 이루어지는 자원 또는 eMBB와 URLLC 하향링크 데이터에 대한 중첩(superposition)이 이루어지는 자원에 대한 알림(notification) 정보(전술한 하향링크 선점 지시정보)를 셀 특정(cell-specific)하게 전송하도록 할 수 있다. 또는, 기지국은 하향링크 선점 지시정보를 단말 공통(UE common) 혹은 단말 그룹 공통(UE-group common)하게 전송할 수도 있다.

[101] 구체적으로 상기의 미리 알림(pre-notification) 기반의 동적 펑처링(dynamic puncturing) 혹은 이후 알림(post-notification) 기반의 동적 펑처링 적용 시, 해당 슬롯(pre-notification 적용 혹은 post-notification 적용 시) 또는 이전 슬롯(post-notification 적용 시)에서 URLLC 데이터 전송을 위해 사용된 자원 정보, 즉 eMBB 단말 관점에서 데이터 펑처링 혹은 URLLC 데이터와의 중첩이 이루어진 자원 정보(예를 들어, 하향링크 선점 지시정보)를 기지국은 셀 특정(cell-specific) 혹은 단말 공통/그룹 단말 공통 시그널링(UE common/group-UE common signaling)을 통해 브로드캐스팅 혹은 멀티캐스팅해주도록 할 수 있다.

[102] 예를 들어, 미리 알림(pre-notification) 방법이 적용될 경우, 해당 slot의 차세대 무선 액세스 망에서의 하향링크 제어채널(NR PDCCH)의 공통 검색 공간(common search space)에서 common L1 control signaling를 통해 해당 slot에서 하향링크(혹은 상향링크) URLLC 데이터 전송을 위한 자원 할당 정보, 즉 임의의 해당 slot을 통해 전송되는 eMBB 데이터 전송에 대한 펑처링(puncturing) 혹은 중첩(superposition)이 이루어지는 자원 정보(하향링크 선점 지시정보)를 해당 셀 내의 eMBB 단말에게 기지국이 전송하도록 할 수 있다. 혹은 해당 slot을 통한 on-going data transmission 간에 전송되는 동적 펑처링(혹은 중첩) 알림 시그널링 방법을 정의함에 있어서, 해당 동적 펑처링 시그널링은 해당 셀 내의 (혹은 해당 slot에서 dynamic puncturing/superposition notification을 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 공통적으로 해당 하향링크 선점 지시정보를 전송하도록 할 수 있다. 이 경우, 해당 하향링크 선점 지시정보 수신을 위한 검색 공간이나 혹은 전송자원 역시 해당 셀 내의(혹은 해당 slot에서 하향링크 선점 지시정보를 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 공통적으로 구성되도록 한다. 구체적으로 해당 하향링크 선점 지시정보 수신을 위한 셀 특정(cell-specific) 혹은 단말/그룹 단말 공통(UE/group-UE common) 검색 공간 혹은 미리 설정된 자원의 주기는 서브캐리어 스페이싱 및 슬롯 지속시간(slot duration)의 함수로서 묵시적(implicit)으로 결정되거나, 셀 특정 RRC 시그널링(cell-specific RRC signaling)을 통해 설정될 수 있으며, 주파수 자원 정보(예를 들어, sub-band 혹은 a (set of) PRB(s))는 해당 셀 특정 하향링크 선점 지시정보 수신을 위한 셀 특정 RNTI(cell-specific RNTI), 슬롯 인덱스(slot index) 등의 함수로서 결정되거나, 혹은 셀 특정 RRC 시그널링(cell-specific RRC signaling)에 의해 결정될 수 있다.

또는 미리 설정될 수도 있다.

[103] 또 다른 예로서 이후 알림(post-notification) 방법이 적용될 경우, 임의의 slot의 NR PDCCH의 공통 검색 공간의 common L1 control signaling을 통해 이전 slot에서의 URLLC 데이터 전송을 위한 자원 할당 정보, 즉 임의의 해당 slot을 통해 전송되는 eMBB 데이터 전송에 대한 펑처링 혹은 중첩이 이루어지는 자원 정보(하향링크 선점 지시정보)를 해당 셀 내의 eMBB 단말에게 전송하도록 설정할 수 있다. 또는 해당 slot의 마지막 심볼(들)에 해당 slot에서의 하향링크 선점 지시정보전송을 하는 이후 알림(post-notification) 방법을 정의할 경우, 해당 하향링크 선점 지시정보는 해당 셀 내의 (혹은 해당 slot에서 하향링크 선점 지시정보를 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 공통적으로 해당 하향링크 선점 지시정보를 전송하도록 할 수 있다. 이 경우에도 전술한 이전 알림(pre-notification) 예와 마찬가지로, 해당 하향링크 선점 지시정보 수신을 위한 검색 공간이나 혹은 전송 자원 역시 해당 셀 내의 (혹은 해당 slot에서 하향링크 선점 지시정보를 모니터링 하도록 설정된) 모든 eMBB 단말에 대해 공통적으로 구성될 수 있다. 이 경우, 전술한 이전 알림(pre-notification) 방법의 경우와 마찬가지로 해당 하향링크 선점 지시정보 수신을 위한 셀 특정 혹은 단말/단말 그룹 공통한 검색 공간 혹은 미리 설정된 주파수 자원 정보(예를 들어, sub-band 혹은 a (set of) PRB(s))는 해당 셀 특정 하향링크 선점 지시정보 수신을 위한 셀 특정 RNTI, 슬롯 인덱스 등의 함수로서 결정되거나, 혹은 셀 특정 RRC 시그널링에 의해 결정되거나, 혹은 미리 설정될 수 있다.

[104] 한편, 해당 하향링크 선점 지시정보 수신을 위해 NR PDCCH 혹은 별도의 L1 control channel을 통한 블라인드 디코딩(blind decoding) 기반의 모니터링 방법이 적용될 경우, 해당 하향링크 선점 지시정보를 포함하는 하향링크 제어정보의 CRC 스크램블링(scrambling)을 위한 전술한 셀 특정 RNTI는 기지국에 의해 셀 특정 상위계층 시그널링(cell-specific higher layer signaling)을 통해 설정되거나, 혹은 임의의 값으로 미리 설정될 수 있다.

[105] 또한, 이처럼 셀 특정(혹은 단말 공통, 단말 그룹 공통)한 동적 펑처링 알림이 이루어질 경우, 해당 slot에서 데이터 채널 자원 할당이 이루어진 eMBB 단말의 경우, 해당 하향링크 선점 지시정보를 통한 펑처링/중첩 자원 할당 정보와 해당 eMBB 단말을 위한 데이터 채널 자원 할당 정보가 부분적으로 겹치는(partially overlap) 경우에 대해서만 해당 eMBB 데이터 송수신에 대한 펑처링 또는 중첩을 적용할 수 있다.

[106] 이상에서와 같이, 하향링크 선점 지시정보는 셀 특정하게 멀티캐스트 방식을 통해서 복수의 단말 또는 단말 그룹 내에 포함된 단말에 동일하게 전달될 수 있다.

[107] **제 2 실시예: 단말 특정 또는 슬롯 특정(UE-specific(or slot-specific))하**게 지시하는 방법.

[108] 임의의 NR 셀/기지국은 eMBB 단말을 위해 정의된 임의의 시구간 스케줄링

단위(예를 들어, slot 혹은 aggregated-slot)에서 URLLC 데이터 전송을 위해 eMBB 데이터에 대한 펑처링이 이루어지는 자원 혹은 eMBB와 URLLC 하향링크 데이터에 대한 중첩이 이루어지는 자원에 대한 알림 정보(하향링크 선점 지시정보)를 단말 특정(UE-specific)하게 전송하도록 할 수 있다.

[109] 구체적으로 상기의 미리 알림(pre-notification) 기반의 동적 펑처링(dynamic puncturing) 혹은 이후 알림(post-notification) 기반의 동적 펑처링(dynamic puncturing) 적용 시, 해당 slot(pre-notification 적용 혹은 post-notification 적용 시) 혹은 이전 slot(post-notification 적용 시)에서 하향링크 데이터 자원 할당이 이루어진 eMBB 단말들에 대해 해당 데이터 전송을 위해 할당된 자원 중 일부 자원이 URLLC 데이터 전송을 위해 사용된 경우, 이를 해당 eMBB 단말 각각에게 단말 특정 시그널링(UE-specific signaling)을 통해 유니캐스팅(unicasting)하도록 설정할 수 있다.

[110] 예를 들어, 미리 알림(pre-notification) 방법이 적용될 경우, 해당 slot의 NR PDCCH의 단말 특정 검색 공간(UE-specific search space)에서 단말 특정 하향링크 제어정보(UE-specific DCI) 혹은 하향링크 할당을 위한 하향링크 제어정보(DL assignment DCI)를 통해 해당 slot에서 해당 단말을 위한 하향링크(혹은 상향링크) 데이터 전송 자원 할당 정보 전송 시, 할당된 자원 중 URLLC 데이터 전송을 위해 사용되는 자원 할당정보 및 해당 URLLC 데이터 전송을 위해 할당된 자원에 대한 펑처링 혹은 중첩 여부를 지시해주는 정보(하향링크 선점 지시정보)를 함께 전송하도록 할 수 있다. 혹은 해당 slot을 하향링크 데이터 전송이 이루어지는 eMBB 단말에 대해 on-going data transmission 간에 전송되는 하향링크 선점 지시정보 시그널링 방법을 정의함에 있어서, 각각의 단말 별로 단말 특정한 하향링크 선점 지시정보 수신을 위한 검색 공간 혹은 자원을 정의하여 이를 기반으로 단말 특정하게 해당 하향링크 선점 지시정보를 전송하도록 할 수 있다. 이 경우, 해당 slot에서의 하향링크 선점 지시정보 수신을 위한 검색 공간 혹은 자원의 주기는 서브캐리어 스페이싱 및 슬롯 듀레이션(slot duration)의 함수로서 묵시적으로 결정되거나, 단말 트정 혹은 셀 특정 RRC 시그널링을 통해 정의될 수 있으며, 주파수 자원 정보(예를 들어, sub-band 혹은 a (set of) PRB(s))는 해당 단말의 아이디(예를 들어, C-RNTI), slot index, 해당 eMBB 데이터 전송이 이루어지는 RB index(e.g. lowest RB 혹은 highest RB index) 등의 함수로서 결정되거나, 혹은 단말 특정/셀 특정 RRC 시그널링에 의해 결정될 수 있다.

[111] 또 다른 예로서 이후 알림(post-notification) 방법이 적용될 경우, 임의의 slot의 NR PDCCH의 단말 특정 검색 공간(UE-specific search space)의 UE-specific L1 control signaling을 통해 이전 slot에서의 수신한 하향링크 데이터 자원 중 URLLC 하향링크 데이터 전송을 위해 사용된 자원 정보 및 해당 URLLC 데이터 전송을 위해 할당된 자원에 대한 펑처링 혹은 중첩 여부를 지시해주는 하향링크 제어 정보를 전송하도록 정의할 수 있다. 또는 하향링크 eMBB 데이터 전송이 이루어진 해당 slot의 마지막에 심볼(들)을 통해 해당 slot에서의 하향링크 선점

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지시정보 시그널링을 하는 이후 알림(post-notification) 방법을 정의할 경우, 이를 위한 하향링크 선점 지시정보 시그널링은 전술한 이전 알림(pre-notification) 경우와 동일하게 각각의 단말 별로 단말 특정한 하향링크 선점 지시정보 수신을 위한 검색 공간 혹은 자원을 정의하고, 이를 기반으로 단말 특정하게 해당 하향링크 선점 지시정보를 전송하도록 할 수 있다. 이 경우, 해당 slot에서의 하향링크 선점 지시정보 수신을 위한 검색 공간 혹은 주파수 자원 정보(예를 들어, sub-band 혹은 a (set of) PRB(s))는 해당 단말의 아이디(예를 들어, C-RNTI), slot index, 해당 eMBB 데이터 전송이 이루어지는 RB index(예를 들어, lowest RB 혹은 highest RB index) 등의 함수로서 결정되거나, 혹은 단말 특정/셀 특정 RRC 시그널링에 의해 결정될 수 있다.

[112] 한편, 해당 하향링크 선점 지시정보 수신을 위해 NR PDCCH 혹은 별도의 L1 control channel을 통한 blind decoding 기반의 모니터링 방법이 적용될 경우, 해당 하향링크 지시정보에 대한 DCI의 CRC 스크램블링(scrambling)을 위한 RNTI는 해당 단말의 C-RNTI를 재사용하거나, 혹은 이를 위한 별도의 단말 특정 RNTI를 기지국이 설정하여 각각의 단말에게 단말 특정 RRC 시그널링(UE-specific RRC signaling)을 통해 전송하도록 할 수 있다.

[113] 이상에서 설명한 바와 같이, 기지국은 단말 특정 시그널링을 통해서 하향링크 선점 지시정보를 전송할 수 있다. 또한, 단말은 단말 특정 또는 셀 특정한 시그널링을 통해서 하향링크 선점 지시정보를 모니터링하기 위한 설정정보(예를 들어, 전술한 RNTI 등)를 수신할 수도 있다.

[114] 이하에서는, 이상에서 설명한 본 실시예들의 일부 또는 전부가 모두 수행될 수 있는 단말 및 기지국의 구성에 대해서 도면을 참조하여 설명한다.

[115] 도 7은 일 실시예에 따른 단말의 구성을 보여주는 도면이다.

[116] 도 7을 참조하면, 단말(700)은 기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 수신부(730) 및 설정정보에 기초하여 하향링크 선점 지시정보를 모니터링 하는 제어부(710)를 포함할 수 있다.

[117] 또한, 수신부(730)는 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하고, 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함할 수 있다. 또한, 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은 서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정될 수 있다. 또는 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은 서브 캐리어 스페이싱 및 시구간 스케줄링 단위가 동일하게 설정될 수도 있다.

[118] 한편, 설정정보는 단말-특정(UE-specific) RRC 시그널링을 통해 수신될 수 있으며, 하향링크 선점 지시정보는 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 수신되거나, 하향링크 제어채널의 단말 특정 검색

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공간을 통해서 수신될 수도 있다.

[119] 이 외에도 수신부(730)는 기지국으로부터 하향링크 제어정보 및 데이터, 메시지를 해당 채널을 통해 수신한다.

[120] 또한, 제어부(710)는 전술한 본 발명에 따른 하향링크 선점 지시정보를 동적으로 수신하여 무선자원을 멀티플렉싱하여 사용하는 데에 따른 전반적인 사용자 단말(700)의 동작을 제어한다.

[121] 송신부(720)는 기지국에 상향링크 제어정보 및 데이터, 메시지를 해당 채널을 통해 전송한다.

[122] 도 8은 일 실시예에 따른 기지국의 구성을 보여주는 도면이다.

[123] 도 8을 참조하면, 기지국(800)은 하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 제어부(810) 및 설정정보를 단말로 전송하고, 설정정보에 기초하여 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 송신부(820)를 포함할 수 있다. 하향링크 선점 지시정보는 제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함할 수 있다. 또한, 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은 서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정될 수 있다. 또는 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은 서브 캐리어 스페이싱 및 시구간 스케줄링 단위가 동일하게 설정될 수도 있다.

[124] 한편, 설정정보는 단말-특정(UE-specific) RRC 시그널링을 통해 전송할 수 있으며, 하향링크 선점 지시정보는 하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 전송되거나, 하향링크 제어채널의 단말 특정 검색 공간을 통해서 전송될 수도 있다.

[125] 이 외에도, 제어부(810)는 전술한 본 발명에 따른 하향링크 선점 지시정보를 동적으로 구성하고 전송하여 무선자원을 멀티플렉싱하여 사용하는 데에 따른 전반적인 기지국(800)의 동작을 제어한다.

[126] 또한, 송신부(820)와 수신부(830)는 전술한 본 실시예들을 수행하기에 필요한 신호나 메시지, 데이터를 단말과 송수신하는데 사용된다.

[127] 전술한 실시예에서 언급한 표준내용 또는 표준문서들은 명세서의 설명을 간략하게 하기 위해 생략한 것으로 본 명세서의 일부를 구성한다. 따라서, 위 표준내용 및 표준문서들의 일부의 내용을 본 명세서에 추가하거나 청구범위에 기재하는 것은 본 발명의 범위에 해당하는 것으로 해석되어야 한다.

[128] 이상의 설명은 본 발명의 기술 사상을 예시적으로 설명한 것에 불과한 것으로서, 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자라면 본 발명의 본질적인 특성에서 벗어나지 않는 범위에서 다양한 수정 및 변형이 가능할 것이다. 따라서, 본 발명에 개시된 실시예들은 본 발명의 기술 사상을 한정하기 위한 것이 아니라 설명하기 위한 것이고, 이러한 실시예에 의하여 본

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발명의 기술사상의 범위가 한정되는 것은 아니다. 본 발명의 보호 범위는 아래의 청구범위에 의하여 해석되어야 하며, 그와 동등한 범위 내에 있는 모든 기술 사상은 본 발명의 권리범위에 포함되는 것으로 해석되어야 할 것이다.

[129] CROSS-REFERENCE TO RELATED APPLICATION

[130] 본 특허출원은 2016년 11월 16일 한국에 출원한 특허출원번호 제 10-2016-0152659호 및 2017년 11월 15일 한국에 출원한 특허출원번호 제 10-2017-0151983호 에 대해 미국 특허법 119(a)조 (35 U.S.C § 119(a))에 따라 우선권을 주장하며, 그 모든 내용은 참고문헌으로 본 특허출원에 병합된다. 아울러, 본 특허출원은 미국 이외에 국가에 대해서도 위와 동일한 이유로 우선권을 주장하면 그 모든 내용은 참고문헌으로 본 특허출원에 병합된다.

청구범위

[청구항 1] 단말이 하향링크 신호를 수신하는 방법에 있어서,
기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 단계;
상기 설정정보에 기초하여 상기 하향링크 선점 지시정보를 모니터링 하는 단계; 및
상기 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하는 단계를 포함하되,
상기 하향링크 선점 지시정보는,
제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법.

[청구항 2] 제 1 항에 있어서,
상기 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은,
서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정되는 것을 특징으로 하는 방법.

[청구항 3] 제 1 항에 있어서,
상기 설정정보는,
단말-특정(UE-specific) RRC 시그널링을 통해 수신되는 것을 특징으로 하는 방법.

[청구항 4] 제 1 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 수신되는 것을 특징으로 하는 방법.

[청구항 5] 제 1 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 단말 특정 검색 공간을 통해서 수신되는 것을 특징으로 하는 방법.

[청구항 6] 기지국이 하향링크 신호를 전송하는 방법에 있어서,
하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 단계;
상기 설정정보를 단말로 전송하는 단계; 및
상기 설정정보에 기초하여 상기 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 단계를 포함하되,
상기 하향링크 선점 지시정보는,
제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 방법.

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[청구항 7] 제 6 항에 있어서,
상기 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은,
서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정되는 것을 특징으로 하는 방법.

[청구항 8] 제 6 항에 있어서,
상기 설정정보는,
단말-특정(UE-specific) RRC 시그널링을 통해 전송되는 것을 특징으로 하는 방법.

[청구항 9] 제 6 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 전송되는 것을 특징으로 하는 방법.

[청구항 10] 제 6 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 단말 특정 검색 공간을 통해서 전송되는 것을 특징으로 하는 방법.

[청구항 11] 하향링크 신호를 수신하는 단말에 있어서,
기지국으로부터 하향링크 선점 지시정보를 수신하기 위한 설정정보를 수신하는 수신부; 및
상기 설정정보에 기초하여 상기 하향링크 선점 지시정보를 모니터링 하는 제어부를 포함하되,
상기 수신부는,
상기 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 수신하고,
상기 하향링크 선점 지시정보는,
제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 단말.

[청구항 12] 제 11 항에 있어서,
상기 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은,
서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정되는 것을 특징으로 하는 단말.

[청구항 13] 제 11 항에 있어서,
상기 설정정보는,
단말-특정(UE-specific) RRC 시그널링을 통해 수신되는 것을 특징으로 하는 단말.

[청구항 14] 제 11 항에 있어서,

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상기 하향링크 선점 지시정보는,
하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 수신되는 것을 특징으로 하는 단말.

[청구항 15] 제 11 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 단말 특정 검색 공간을 통해서 수신되는 것을 특징으로 하는 단말.

[청구항 16] 하향링크 신호를 전송하는 기지국에 있어서,
하향링크 선점 지시정보를 모니터링하기 위한 설정정보를 구성하는 제어부; 및
상기 설정정보를 단말로 전송하고, 상기 설정정보에 기초하여 상기 하향링크 선점 지시정보를 멀티캐스트 또는 유니캐스트 신호를 통해서 전송하는 송신부를 포함하되,
상기 하향링크 선점 지시정보는,
제1 서비스를 제공하기 위한 무선자원과 제2 서비스를 제공하기 위한 무선자원의 중첩되는 무선자원을 지시하기 위한 정보를 포함하는 기지국.

[청구항 17] 제 16 항에 있어서,
상기 제1 서비스를 제공하기 위한 무선자원과 상기 제2 서비스를 제공하기 위한 무선자원은,
서브 캐리어 스페이싱 및 시구간 스케줄링 단위 중 적어도 하나가 상이하게 설정되는 것을 특징으로 하는 기지국.

[청구항 18] 제 16 항에 있어서,
상기 설정정보는,
단말-특정(UE-specific) RRC 시그널링을 통해 전송되는 것을 특징으로 하는 기지국.

[청구항 19] 제 16 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 공통 검색 공간 또는 그룹 공통 검색 공간을 통해서 전송되는 것을 특징으로 하는 기지국.

[청구항 20] 제 16 항에 있어서,
상기 하향링크 선점 지시정보는,
하향링크 제어채널의 단말 특정 검색 공간을 통해서 전송되는 것을 특징으로 하는 기지국.

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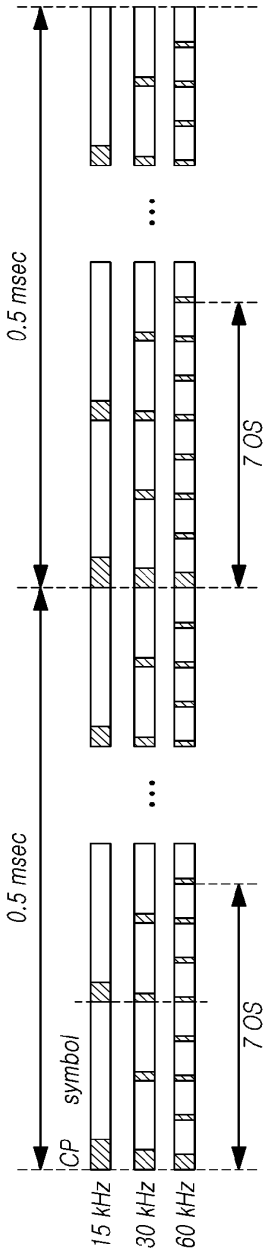
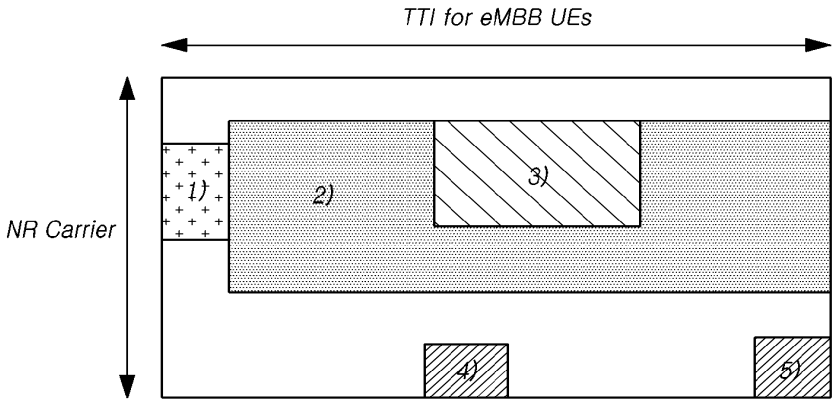
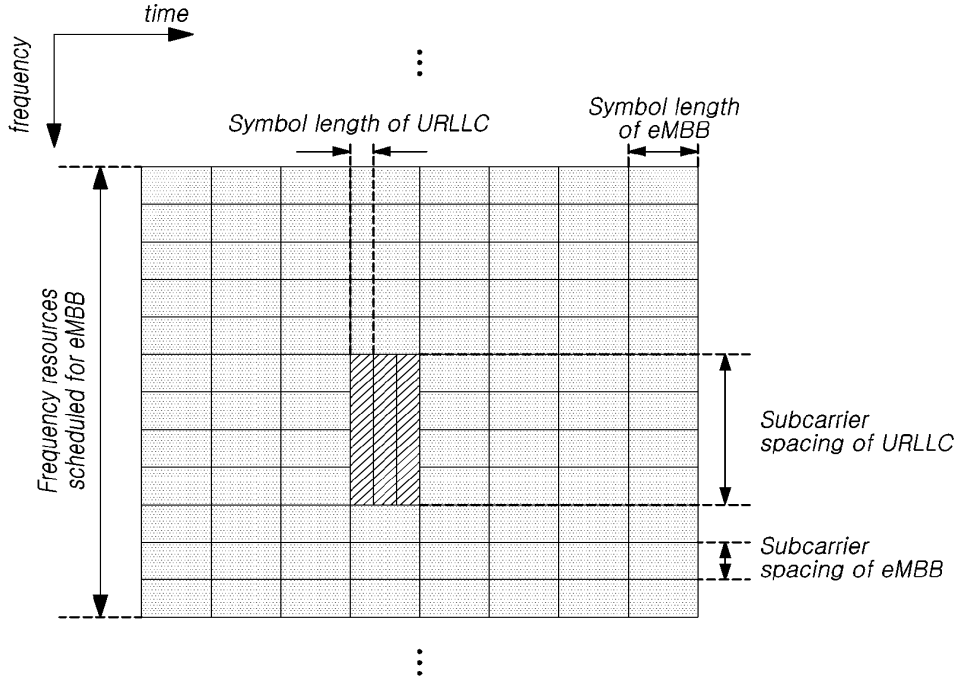
[도1]



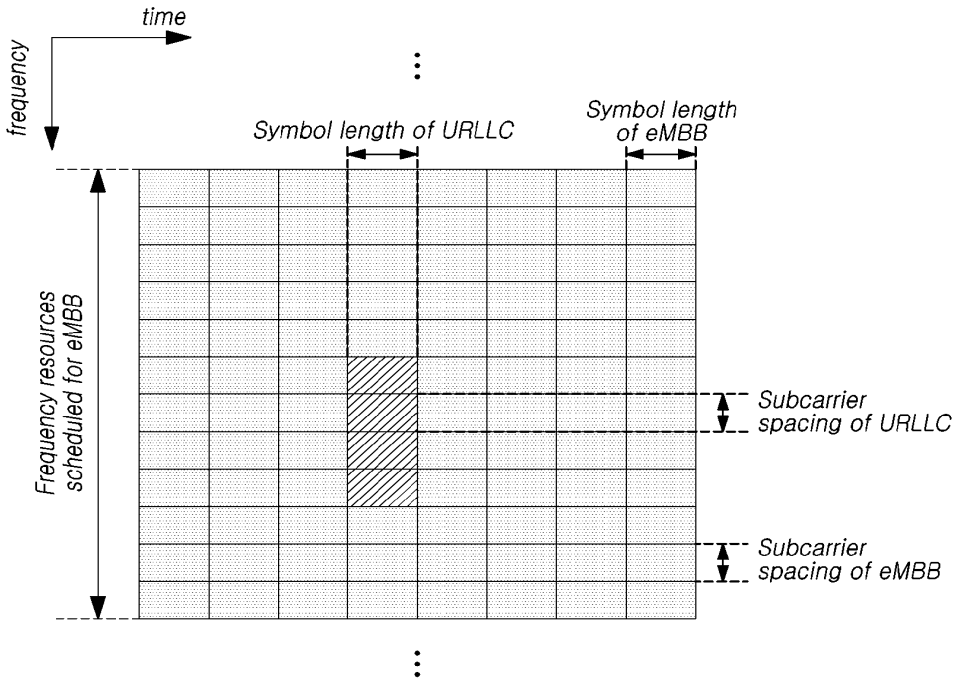
[도2]


TTI for eMBB UEs
NR Carrier
1)
2)
3)
4)
5)

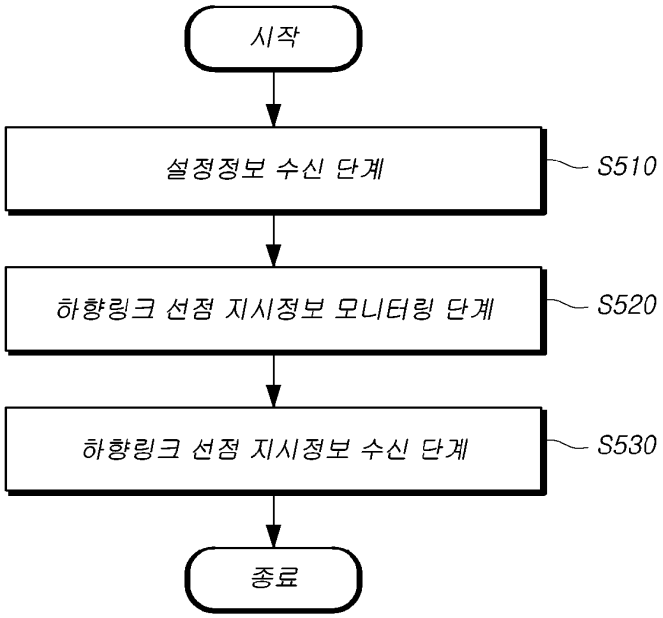
[도3]


time
frequency
Symbol length of URLLC
Symbol length of eMBB
Frequency resources scheduled for eMBB
Subcarrier spacing of URLLC
Subcarrier spacing of eMBB

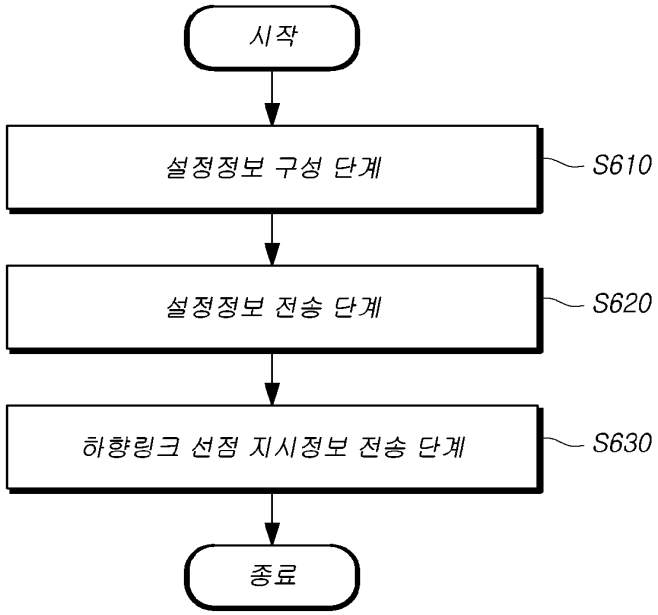
[도4]


time
frequency
Symbol length of URLLC
Symbol length of eMBB
Frequency resources scheduled for eMBB
Subcarrier spacing of URLLC
Subcarrier spacing of eMBB

[도5]


시작
설정정보 수신 단계
S510
하향링크 선점 지시정보 모니터링 단계
S520
하향링크 선점 지시정보 수신 단계
S530
종료

[도6]


시작
설정정보 구성 단계
S610
설정정보 전송 단계
S620
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S630
종료

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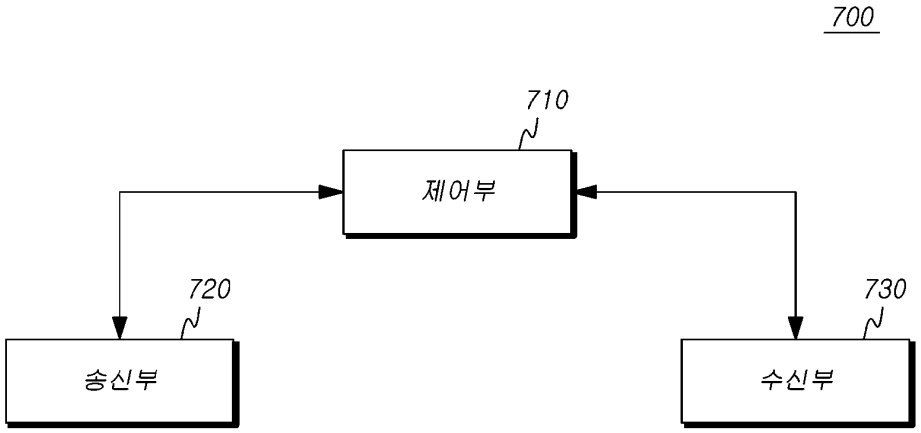
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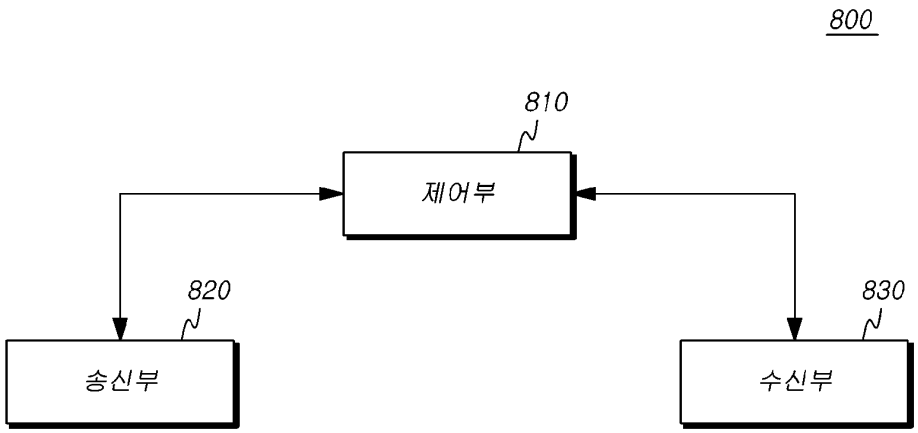

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2017/012992

A. CLASSIFICATION OF SUBJECT MATTER

H04W 72/04(2009.01)i, H04W 72/12(2009.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04W 72/04; H04L 5/00; H04W 72/14; H04J 11/00; H04L 1/18; H04W 72/08; H04W 72/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS (KIPO internal) & Keywords: downward, link, preoccupancy, preemption, indication, overlap, RRC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2016-0113008 A1 (QUALCOMM INCORPORATED) 21 April 2016 See paragraphs [0002]-[0008], [0013], [0034], [0038], [0058]-[0065], [0071]; and figure 6.	1-20
Y	INTEL CORPORATION, "Downlink URLLC Transmission and Multiplexing with eMBB", R1-1612003, 3GPP TSG RAN WG1 Meeting #87, Reno, USA, 06 November 2016 See sections 1-4.	1-20
A	US 2016-0218849 A1 (TEXAS INSTRUMENTS INCORPORATED) 28 July 2016 See paragraphs [0009], [0086]-[0088]; and figure 9.	1-20
A	US 2016-0037517 A1 (INTERDIGITAL TECHNOLOGY CORPORATION) 04 February 2016 See paragraphs [0011]-[0012], [0026], [0036]; and figure 1.	1-20
A	US 2008-0068979 A1 (VISOTSKY, Eugene et al.) 20 March 2008 See paragraphs [0023]-[0024]; and figure 3.	1-20

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
06 FEBRUARY 2018 (06.02.2018)	**06 FEBRUARY 2018 (06.02.2018)**
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. +82-42-481-8578	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2017/012992

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Petitioner's Exhibit 1002
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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2017/012992

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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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국 제 조 사 보 고 서

국제출원번호
PCT/KR2017/012992

A. 발명이 속하는 기술분류(국제특허분류(IPC))

H04W 72/04(2009.01)i, H04W 72/12(2009.01)i

B. 조사된 분야

조사된 최소문헌(국제특허분류를 기재)
H04W 72/04; H04L 5/00; H04W 72/14; H04J 11/00; H04L 1/18; H04W 72/08; H04W 72/12

조사된 기술분야에 속하는 최소문헌 이외의 문헌
한국등록실용신안공보 및 한국공개실용신안공보: 조사된 최소문헌란에 기재된 IPC
일본등록실용신안공보 및 일본공개실용신안공보: 조사된 최소문헌란에 기재된 IPC

국제조사에 이용된 전산 데이터베이스(데이터베이스의 명칭 및 검색어(해당하는 경우))
eKOMPASS(특허청 내부 검색시스템) & 키워드: 하향, 링크, 선점, preemption, 지시, 중첩, RRC

C. 관련 문헌

카테고리*	인용문헌명 및 관련 구절(해당하는 경우)의 기재	관련 청구항
Y	US 2016-0113008 A1 (QUALCOMM INCORPORATED) 2016.04.21 단락 [0002]-[0008], [0013], [0034], [0038], [0058]-[0065], [0071]; 및 도면 6 참조.	1-20
Y	INTEL CORPORATION, `Downlink URLLC transmission and multiplexing with eMBB', R1-1612003, 3GPP TSG RAN WG1 Meeting #87, Reno, USA, 2016.11.06 섹션 1-4 참조.	1-20
A	US 2016-0218849 A1 (TEXAS INSTRUMENTS INCORPORATED) 2016.07.28 단락 [0009], [0086]-[0088]; 및 도면 9 참조.	1-20
A	US 2016-0037517 A1 (INTERDIGITAL TECHNOLOGY CORPORATION) 2016.02.04 단락 [0011]-[0012], [0026], [0036]; 및 도면 1 참조.	1-20
A	US 2008-0068979 A1 (EUGENE VISOTSKY 등) 2008.03.20 단락 [0023]-[0024]; 및 도면 3 참조.	1-20

☐ 추가 문헌이 C(계속)에 기재되어 있습니다.

☒ 대응특허에 관한 별지를 참조하십시오.

* 인용된 문헌의 특별 카테고리:

"A" 특별히 관련이 없는 것으로 보이는 일반적인 기술수준을 정의한 문헌

"E" 국제출원일보다 빠른 출원일 또는 우선일을 가지나 국제출원일 이후에 공개된 선출원 또는 특허 문헌

"L" 우선권 주장에 의문을 제기하는 문헌 또는 다른 인용문헌의 공개일 또는 다른 특별한 이유(이유를 명시)를 밝히기 위하여 인용된 문헌

"O" 구두 개시, 사용, 전시 또는 기타 수단을 언급하고 있는 문헌

"P" 우선일 이후에 공개되었으나 국제출원일 이전에 공개된 문헌

"T" 국제출원일 또는 우선일 후에 공개된 문헌으로, 출원과 상충하지 않으며 발명의 기초가 되는 원리나 이론을 이해하기 위해 인용된 문헌

"X" 특별한 관련이 있는 문헌. 해당 문헌 하나만으로 청구된 발명의 신규성 또는 진보성이 없는 것으로 본다.

"Y" 특별한 관련이 있는 문헌. 해당 문헌이 하나 이상의 다른 문헌과 조합하는 경우로 그 조합이 당업자에게 자명한 경우 청구된 발명은 진보성이 없는 것으로 본다.

"&" 동일한 대응특허문헌에 속하는 문헌

국제조사의 실제 완료일	국제조사보고서 발송일
2018년 02월 06일 (06.02.2018)	2018년 02월 06일 (06.02.2018)

ISA/KR의 명칭 및 우편주소
대한민국 특허청
(35208) 대전광역시 서구 청사로 189,
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진상범
전화번호 +82-42-481-8398

서식 PCT/ISA/210 (두 번째 용지) (2015년 1월)

국 제 조 사 보 고 서
대응특허에 관한 정보

국제출원번호
PCT/KR2017/012992

국제조사보고서에서 인용된 특허문헌	공개일	대응특허문헌	공개일
US 2016-0113008 A1	2016/04/21	AU 2015-333980 A1	2017/03/30
		CN 107079450 A	2017/08/18
		EP 3207750 A1	2017/08/23
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US 2016-0218849 A1	2016/07/28	CN 107210861 A	2017/09/26
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Petitioner's Exhibit 1002
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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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국 제 조 사 보 고 서
대응특허에 관한 정보

국제출원번호
PCT/KR2017/012992

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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/349,874	05/14/2019		1580	811.0177	15	3

CONFIRMATION NO. 1053

76277
IP LEGAL SERVICES, LLC
P.O. Box 651325
Sterling, VA 20165

FILING RECEIPT

OC000000108467385

Date Mailed: 05/28/2019

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Kyujin PARK, Seoul, KOREA, REPUBLIC OF;
Woo-jin CHOI, Seoul, KOREA, REPUBLIC OF;

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Assignment For Published Patent Application

KT CORPORATION, Gyeonggi-do, KOREA, REPUBLIC OF

Power of Attorney: The patent practitioners associated with Customer Number 76277

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/KR2017/012992 11/16/2017

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
REPUBLIC OF KOREA 10-2017-0151983 11/15/2017
REPUBLIC OF KOREA 10-2016-0152659 11/16/2016

Permission to Access Application via Priority Document Exchange: No

Permission to Access Search Results: No

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000253

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 05/24/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/349,874**

Projected Publication Date: 09/05/2019

Non-Publication Request: No

Early Publication Request: No

Title

METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

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countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

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technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

U.S. APPLICATION NO.	FIRST NAMED INVENTOR	ATTY. DOCKET NO.
16/349,874	Kyujin PARK	811.0177

76277
IP LEGAL SERVICES, LLC
P.O. Box 651325
Sterling, VA 20165

INTERNATIONAL APPLICATION NO.	
PCT/KR2017/012992	
I.A. FILING DATE	PRIORITY DATE
11/16/2017	11/16/2016

CONFIRMATION NO. 1053
371 ACCEPTANCE LETTER

OC000000108467386

Date Mailed: 05/28/2019

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office, in its capacity as a Designated / Elected Office (37 CFR 1.495), has ACCEPTED the above identified international application for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above. A Filing Receipt will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE "FILING DATE or 371(c) DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1) and (c)(2) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN BELOW.** The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363)

05/14/2019
DATE OF RECEIPT OF 35 U.S.C.
371(c)(1) and (c)(2) REQUIREMENTS

The following items have been received:

- Copy of the International Application filed on 05/14/2019
- English Translation of the IA filed on 05/14/2019
- Copy of the International Search Report filed on 05/14/2019
- Preliminary Amendments filed on 05/14/2019
- Information Disclosure Statements filed on 05/14/2019
- Inventor's Oath or Declaration filed on 05/14/2019
- Request for Immediate Examination filed on 05/14/2019
- U.S. Basic National Fees filed on 05/14/2019
- Assignee Statement for PGPUB filed on 05/14/2019
- Priority Documents filed on 05/14/2019
- Power of Attorney filed on 05/14/2019
- Application Data Sheet (37 CFR 1.76) filed on 05/14/2019

FORM PCT/DO/EO/903 (371 Acceptance Notice)

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Page 000257

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

JOHN L ANDERSON

Telephone: (571) 272-0385

FORM PCT/DO/EO/903 (371 Acceptance Notice)

Petitioner's Exhibit 1002
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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000258

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/349,874

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	520
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))	15 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 460 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1580

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET

Substitute for Form PTO-1360
(For use with Form PTO/SB/06)

Application Number	Filing Date
16349874	

Applicant(s) Kyujin PARK

* May be used for additional claims or amendments

CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT	
	Indep	Depend	Indep	Depend	Indep	Depend
1	1		1			
2		1		1		
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Total Indep	4		3		0	
Total Depend	16	↵	12	↵	0	↵
Total Claims	20		15		0	

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/349,874	05/14/2019	Kyujin PARK	811.0177

CONFIRMATION NO. 1053

76277
IP LEGAL SERVICES, LLC
P.O. Box 651325
Sterling, VA 20165

PUBLICATION NOTICE

OC00000010898721

Title:METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

Publication No.US-2019-0274153-A1
Publication Date:09/05/2019

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99**)		
	Application Number	16349874
	Filing Date	2019-05-14
	First Named Inventor	Kyujin PARK
	Art Unit	2464
	Examiner Name	NGO, RICKY QUOC
	Attorney Docket Number	811.0177

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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If you wish to add additional U.S. Published Application citation information please click the Add button.						Add

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
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If you wish to add additional Foreign Patent Document citation information please click the Add button								Add

NON-PATENT LITERATURE DOCUMENTS			Remove
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000262

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16349874
	Filing Date	2019-05-14
	First Named Inventor	Kyujin PARK
	Art Unit	2464
	Examiner Name	NGO, RICKY QUOC
	Attorney Docket Number	811.0177

	1	ERICSSON, "Summary of e-mail discussions on downlink control signaling", R1-1612908, TSG-RAN WG1 #87, Reno, NV, USA, November 14 – 18, 2016	X

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16349874
	Filing Date	2019-05-14
	First Named Inventor	Kyujin PARK
	Art Unit	2464
	Examiner Name	NGO, RICKY QUOC
	Attorney Docket Number	811.0177

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Ian M. Hughes/	Date (YYYY-MM-DD)	2020-02-28
Name/Print	Ian M. Hughes	Registration Number	41083

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000265

Electronic Acknowledgement Receipt

EFS ID:	38726794
Application Number:	16349874
International Application Number:	
Confirmation Number:	1053
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	76277
Filer:	Kyung Hee Kim/yujin Chun
Filer Authorized By:	Kyung Hee Kim
Attorney Docket Number:	811.0177
Receipt Date:	28-FEB-2020
Filing Date:	14-MAY-2019
Time Stamp:	15:23:23
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	8110177IDSForm.pdf	624716 300636c21280129f216d5a659833834067a202e1	no	4
Warnings:					

Information:					
A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
2	Non Patent Literature	Ref1nonpatent1.pdf	8170015 f794315f35da02a3f7a4246874e1e0dec7876511	no	37
Warnings:					
Information:					
			Total Files Size (in bytes):	8794731	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99**)		
	Application Number	16349874
	Filing Date	2019-05-14
	First Named Inventor	Kyujin PARK
	Art Unit	2466
	Examiner Name	DECKER, CASSANDRA L
	Attorney Docket Number	811.0177

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000268

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16349874
	Filing Date	2019-05-14
	First Named Inventor	Kyujin PARK
	Art Unit	2466
	Examiner Name	DECKER, CASSANDRA L
	Attorney Docket Number	811.0177

	1	NOKIA et al., "Basic grant-free transmission procedure for URLLC", R1-1612250, 3GPP TSG-RAN WG1 #87, Reno, USA, 14th - 18th November 2016	☒
	2	FUJITSU, "DL control channel related to multiplexing eMBB and URLLC", R1-1611465, 3GPP TSG RAN WG1 Meeting #87, Reno, USA, 14th - 18th November 2016, pp. 1-4	☒
	3	CATT, "NR frame structure for multiplexing of URLLC and eMBB traffic", R1-1611367, 3GPP TSG RAN WG1 Meeting #87, Reno, NV, USA, 14th – 18th November 2016, pp. 1-4	☒
	4	ETRI, "Multiplexing of eMBB and URLLC transmissions", R1-1609392, 3GPP TSG RAN WG1 Meeting #86bis, Lisbon, Portugal, 10th – 14th October 2016, pp. 1-3	☒
	5	SAMSUNG, "Multiplexing URLLC and eMBB in DL", R1-1609059, 3GPP TSG RAN WG1 Meeting #86bis, Lisbon, Portugal, 10th – 14th October 2016, pp. 1-5	☒
	6	SAMSUNG, "Evaluation results of superposition scheme in case of multiplexing eMBB and URLLC", R1-1609058, 3GPP TSG RAN WG1 Meeting #86bis, Lisbon, Portugal, 10th – 14th October 2016	☒
	7	FUJITSU, "DL control channel related to multiplexing eMBB and URLLC", R1-1608814, 3GPP TSG RAN WG1 Meeting #86bis, Lisbon, Portugal 10th - 14th October 2016, pp. 1-4	☒

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000269

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16349874
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	First Named Inventor	Kyujin PARK
	Art Unit	2466
	Examiner Name	DECKER, CASSANDRA L
	Attorney Docket Number	811.0177

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Ian M. Hughes/	Date (YYYY-MM-DD)	2020-09-16
Name/Print	Ian M. Hughes	Registration Number	41083

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000270

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000271

Electronic Acknowledgement Receipt

EFS ID:	40576631
Application Number:	16349874
International Application Number:	
Confirmation Number:	1053
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	76277
Filer:	Kyung Hee Kim/yujin Chun
Filer Authorized By:	Kyung Hee Kim
Attorney Docket Number:	811.0177
Receipt Date:	16-SEP-2020
Filing Date:	14-MAY-2019
Time Stamp:	15:26:01
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	8110177IDSForm.pdf	624217 cff5df8a4ab3404398f64b3b2a0d9248621b6d46	no	4
Warnings:					

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2	Non Patent Literature	Ref1nonpatent1.pdf	677181 9eccd2351a5a771519fa8c2cc157075c163635a5	no	4
Warnings:					
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3	Non Patent Literature	Ref2nonpatent2.pdf	805588 8aa19ae5a198502bbfbf61d5aa028bd90bee4f5c	no	4
Warnings:					
Information:					
4	Non Patent Literature	Ref3nonpatent3.pdf	636786 68aae40d51b5190053eef4616f5e3b18510403a9	no	4
Warnings:					
Information:					
5	Non Patent Literature	Ref4nonpatent4.pdf	570320 4f4bec5cb9e84dc5bd040d76614412fe84742427	no	3
Warnings:					
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6	Non Patent Literature	Ref5nonpatent5.pdf	912614 ee6bcf9899ed732d86a64cb80e5d339ee210afd0	no	5
Warnings:					
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7	Non Patent Literature	Ref6nonpatent6.pdf	821574 108eb708fb9ff9a2812b2a7579001606ce9ed14d	no	5
Warnings:					
Information:					

8	Non Patent Literature	Ref7nonpatent7.pdf	654714 551cd41e56600927538c9fe9748d9e296b3f11e6	no	4
Warnings:					
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			Total Files Size (in bytes):	5702994	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/349,874	05/14/2019	Kyujin PARK	811.0177	1053

76277 7590 10/22/2020

IP LEGAL SERVICES, LLC
P.O. Box 651325
Sterling, VA 20165

EXAMINER	
DECKER, CASSANDRA L	

ART UNIT	PAPER NUMBER
2466	

NOTIFICATION DATE	DELIVERY MODE
10/22/2020	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

email@iplsllc.com

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000275

Office Action Summary	Application No. 16/349,874	Applicant(s) PARK et al.	
	Examiner CASSANDRA L DECKER	Art Unit 2466	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 14 May 2019.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-15 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-15 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 14 May 2019 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☑ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☑ All b)☐ Some** c)☐ None of the:

1.☑ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000276

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Objections

Claims 11-15 are objected to because of the following informalities.

In Claim 11 (line 4), "form a base station" should be corrected to ---from a base station---.

Remaining claims are objected as depending from an objected claim.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-15 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

For Claims 1, 6, and 11, "for other UE" should probably be corrected to either ---for another UE---- or –for other UEs---, but it is not clear which correction should be made.

For Claims 1, 6, and 11, it is not clear what is meant by "are superposed each other". This should probably be corrected to ---are superposed on each other---.

For Claims 2, 7, and 12, "the first service" and "the second service" lack antecedent basis in the claim. It is probable that "for providing the first service" should be corrected to ---for the UE--- and "for providing the second service" should be corrected to ---for the another UE---.

Remaining claims are rejected as depending from a rejected claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a)(2) the claimed invention was described in a patent issued under section 151, or in an application for patent published or deemed published under section 122(b), in which the patent or application, as the case may be, names another inventor and was effectively filed before the effective filing date of the claimed invention.

Claim(s) 1, 3, 4, 6, 8, 9, 11, 13, and 14 is/are rejected under 35 U.S.C. 102(a)(2) as being anticipated by Lyu et al. (US 2019/0200235).

For Claims 1 and 11, Lyu teaches a method and a user equipment (UE), comprising a receiver and a controller (see Figure 5 and paragraphs 121-123: receiver, processor, controller), for receiving a downlink (DL) signal, the method comprising:

receiving configuration information for receiving DL preemption indication information from a base station (see abstract, paragraph 55, Figure 2 step S101 and paragraph 61: terminal receives indication information indicating need to receive pre-emption information);

monitoring the DL preemption indication information based on the configuration information (see paragraph 62-64, Figure 2 step S102: terminal detects pre-emption information in accord with indication); and

receiving the DL preemption indication information through a multicast signal (see paragraphs 21, 22: in common search space; paragraph 24: sent to all terminals),

wherein the DL preemption indication information includes information for indicating superposed radio resources where radio resources allocated for the UE and radio resources allocated for other UE are superposed each other (see paragraphs 55, 56: resource puncturing for non-URLLC vs. URLLC services).

For Claim 6, Lyu teaches a method of a base station for transmitting a downlink (DL) signal, the method comprising:

generating configuration information for monitoring DL preemption indication information (see paragraphs 9, 14: base station (network device) has indication information to provide);

transmitting the configuration information to a user equipment (UE) (see abstract, paragraph 55, Figure 2 step S101 and paragraph 61: network device provides indication information indicating need to receive pre-emption information); and

transmitting the DL preemption indication information based on the configuration information through a multicast signal (see paragraphs 21, 22: in common search space; paragraph 24: sent to all terminals),

wherein the DL preemption indication information includes information for indicating superposed radio resources on which radio resources allocated for the UE and radio resources allocated for other UE are superposed each other (see paragraphs 55, 56: resource puncturing for non-URLLC vs. URLLC services).

For Claims 3, 8, and 13, Lyu teaches the method, wherein the configuration information is received through UE-specific radio resource control (RRC) signaling (see paragraphs 12, 77, 78: provided through RRC signaling; Figure 2: signaling to a specific UE).

For Claims 4, 9, and 14, Lyu teaches the method, wherein the DL preemption indication information is received through a common search space or a group common search space of a DL control channel (see paragraphs 21, 22: common search space).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

Claims 2, 7, and 12 is/are rejected under 35 U.S.C. 103 as being unpatentable over Lyu et al. (US 2019/0200235) as applied to claims 1, 6, and 11 above, and further in view of Yi et al. (US 2019/0116007).

For Claims 2, 7, and 12, while Lyu does suggest flexible subcarrier spacing and TTIs (see paragraph 4), and the use of URLLC and eMBB services (see paragraph 56), Lyu as applied above is not explicit as to, but Yi teaches that it is known for URLLC and eMBB services to use respectively different subcarrier spacing (see Figure 16, paragraph 157).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed that the services provided in Lyu are those wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource for providing the first service is different from that of the radio resource for providing the second service. One of ordinary skill would have been able to use such configurations with the reasonably predictable result of providing known services in a known manner.

Claims 5, 10, and 15 is/are rejected under 35 U.S.C. 103 as being unpatentable over Lyu et al. (US 2019/0200235) as applied to claims 1, 6, and 11 above, and further in view of Marinier et al. (US 2015/0358111).

For Claims 5, 10, and 15, while Lyu does teach that the second DCI is provided in a CSS and that the DCI is associated with the MCS (see paragraphs 94, 76), Lyu as applied above is not explicit as to, but Marinier teaches that it is known to provide such information through a UE-specific search space of a DL control channel (see paragraph 65: MCS DCI conveyed in YESS PDCCH).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to provide the DCI of Lyu as shown in Marinier. One of ordinary skill would have been able to

do so with the reasonably predictable result of conveying known control information in a known manner.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Agiwal et al. (US 2018/0035332) teaches a system in which a gNB informs a UE as to whether to monitor for indication of preemption. Soldati et al. (US 2018/0019852) teaches a system in which dynamic control information is provided for transmission and reception of data in the same or overlapping resources

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CASSANDRA L DECKER whose telephone number is (571)270-3946. The examiner can normally be reached on 7:30 am - 4:00 pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Faruk Hamza can be reached on 571-272-7969. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact

the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/CASSANDRA L DECKER/
Examiner, Art Unit 2466
7/23/2020

/FARUK HAMZA/
Supervisory Patent Examiner, Art Unit 2466

Notice of References Cited	Application/Control No. 16/349,874	Applicant(s)/Patent Under Reexamination PARK et al.	
	Examiner CASSANDRA L DECKER	Art Unit 2466	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20190200235-A1	06-2019	Lyu; Yongxia	H04L5/0094	1/1
*	B	US-20150358111-A1	12-2015	Marinier; Paul	H04L27/0008	370/329
*	C	US-20190116007-A1	04-2019	YI; Yunjung	H04L27/2607	1/1
*	D	US-20180035332-A1	02-2018	AGIWAL; Anil	H04W74/0858	1/1
*	E	US-20180019852-A1	01-2018	SOLDATI; Pablo	H04L5/0053	1/1
	F					
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	J					
	K					
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FOREIGN PATENT DOCUMENTS

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	N					
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	P					
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	R					
	S					
	T					

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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000284

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	Art Unit
	CASSANDRA L DECKER	2466

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/23/2020								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
	10	✓								
	11	✓								
	12	✓								
	13	✓								
	14	✓								
	15	✓								
	16	-								
	17	-								
	18	-								
	19	-								
	20	-								

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000285

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	Art Unit
	CASSANDRA L DECKER	2466

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
inventorship	07/21/2020	Decker
text-limited CPC: H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007	07/23/2020	Decker
text-limiting terms: uess, dci, pdcch, superpose, pre-empt, puncture, indicate, configure, rrc	07/23/2020	Decker
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	Art Unit
	CASSANDRA L DECKER	2466

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

Petitioner's Exhibit 1002
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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000287

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
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Application Number	16349874
Filing Date	2019-05-14
First Named Inventor	Kyujin PARK
Art Unit	
Examiner Name	/CASSANDRA L DECKER/
Attorney Docket Number	811.0177

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20160113008	A1	2016-04-21	Jelena Damnjanovic et al.	
	2	20190090239	A1	2019-03-21	Jelena Damnjanovic et al.	
	3	20160218849	A1	2016-07-28	Pierre Bertrand et al.	
	4	20160037517	A1	2016-02-04	Stephen E. Terry	
	5	20060007880	A1	2006-01-12	Stephen E. Terry	

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	Application Number	16349874
	Filing Date	2019-05-14
	First Named Inventor	Kyujin PARK
	Art Unit	
	Examiner Name	
	Attorney Docket Number	811.0177

	6	20100208689	A1	2010-08-19	Stephen E. Terry	
	7	20130272243	A1	2013-10-17	Stephen E. Terry	
	8	20080068979	A1	2008-03-20	Eugene Visotsky et al.	

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	1	INTEL CORPORATION, "Downlink URLLC transmission and multiplexing with eMBB", R1-1612003, 3GPP TSG RAN WG1 Meeting #87, Reno, USA, 14th - 18th November 2016, pp. 1-9	X

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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000289

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
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Application Number	16349874
Filing Date	2019-05-14
First Named Inventor	Kyujin PARK
Art Unit	2464
Examiner Name	NGO, RICKY QUOC /CASSANDRA L DECKER/
Attorney Docket Number	811.0177

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16349874
	Filing Date	2019-05-14
	First Named Inventor	Kyujin PARK
	Art Unit	2464
	Examiner Name	NGO, RICKY QUOC
	Attorney Docket Number	811.0177

	1	ERICSSON, "Summary of e-mail discussions on downlink control signaling", R1-1612908, TSG-RAN WG1 #87, Reno, NV, USA, November 14 – 18, 2016	X

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EAST Search History

EAST Search History (Prior Art)

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S6	21	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	US-PGPUB; USPAT	ADJ	ON	2020/07/21 11:00
S7	98,179	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2020/07/21 13:44
S8	8	("20060007880" | "20080068979" | "20100208689" | "20130272243" | "20160037517" | "20160113008" | "20160218849" | "20190090239").PN.	US-PGPUB; USPAT	ADJ	ON	2020/07/21 13:49
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		(@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")				
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S15	364	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (inform$3 or indicat$3 or configur$5) with (rrc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2020/07/22 10:36
S16	236	S11 and S15	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2020/07/22 10:36
S17	22	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (ue specific) with (rrc or radio resource control) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2020/07/22 14:44
S18	739	(downlink or dl) with (ue specific) with (rrc or radio resource control) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2020/07/22 14:49
S19	502	S11 and S18	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2020/07/22 14:49
S20	269	(downlink or dl) with (ue specific) with (rrc or radio resource control) with	US-PGPUB; USPAT; EPO;	ADJ	ON	2020/07/22 14:50

		signal$4 with configur$5 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	JPO; DERWENT; IBM_TDB			
S21	207	S11 and S20	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2020/07/22 14:50
S22	1,154	(ue specific) near3 (rrc or radio resource control) near3 signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2020/07/22 14:51
S23	749	S11 and S22	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2020/07/22 14:51
S24	585	(ue specific) adj (rrc or radio resource control) adj signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2020/07/22 14:51
S25	413	S11 and S24	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2020/07/22 14:52
S26	6	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (ue specific) adj (rrc or radio resource control) adj signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2020/07/22 14:52

EAST Search History (Interference)

<This search history is empty>

7/23/2020 1:35:03 PM
C:\Users\cdecker\Documents\EAST\Workspaces\16349874.wsp

Bibliographic Data

Application No: 16/349,874

Foreign Priority claimed: (•) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [ ] Met After Allowance

Verified and Acknowledged: /CASSANDRA L DECKER/ (Examiner's Signature) [ ] (Initials)

Title: METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
05/14/2019	370	2466	811.0177
RULE			

APPLICANTS

KT CORPORATION, Gyeonggi-do, KOREA, REPUBLIC OF

INVENTORS

Kyujin PARK, Seoul, KOREA, REPUBLIC OF

Woo-jin CHOI, Seoul, KOREA, REPUBLIC OF

CONTINUING DATA

This application is a 371 of PCT/KR2017/012992 11/16/2017

FOREIGN APPLICATIONS

KOREA, REPUBLIC OF 10-2016-0152659 11/16/2016

KOREA, REPUBLIC OF 10-2017-0151983 11/15/2017

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UNITED STATES

FILING FEE RECEIVED

$1,580

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16349874
Filing Date	2019-05-14
First Named Inventor	Kyujin PARK
Art Unit	2466
Examiner Name	DECKER, CASSANDRA L
Attorney Docket Number	811.0177

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.L.D/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16349874
	Filing Date	2019-05-14
	First Named Inventor	Kyujin PARK
	Art Unit	2466
	Examiner Name	DECKER, CASSANDRA L
	Attorney Docket Number	811.0177

	1	NOKIA et al., "Basic grant-free transmission procedure for URLLC", R1-1612250, 3GPP TSG-RAN WG1 #87, Reno, USA, 14th - 18th November 2016	☒
	2	FUJITSU, "DL control channel related to multiplexing eMBB and URLLC", R1-1611465, 3GPP TSG RAN WG1 Meeting #87, Reno, USA, 14th - 18th November 2016, pp. 1-4	☒
	3	CATT, "NR frame structure for multiplexing of URLLC and eMBB traffic", R1-1611367, 3GPP TSG RAN WG1 Meeting #87, Reno, NV, USA, 14th – 18th November 2016, pp. 1-4	☒
	4	ETRI, "Multiplexing of eMBB and URLLC transmissions", R1-1609392, 3GPP TSG RAN WG1 Meeting #86bis, Lisbon, Portugal, 10th – 14th October 2016, pp. 1-3	☒
	5	SAMSUNG, "Multiplexing URLLC and eMBB in DL", R1-1609059, 3GPP TSG RAN WG1 Meeting #86bis, Lisbon, Portugal, 10th – 14th October 2016, pp. 1-5	☒
	6	SAMSUNG, "Evaluation results of superposition scheme in case of multiplexing eMBB and URLLC", R1-1609058, 3GPP TSG RAN WG1 Meeting #86bis, Lisbon, Portugal, 10th – 14th October 2016	☒
	7	FUJITSU, "DL control channel related to multiplexing eMBB and URLLC", R1-1608814, 3GPP TSG RAN WG1 Meeting #86bis, Lisbon, Portugal 10th - 14th October 2016, pp. 1-4	☒

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/CASSANDRA L DECKER/	Date Considered	10/15/2020

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.L.D/

Electronic Acknowledgement Receipt

EFS ID:	41725228
Application Number:	16349874
International Application Number:	
Confirmation Number:	1053
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	76277
Filer:	Kyung Hee Kim
Filer Authorized By:	
Attorney Docket Number:	811.0177
Receipt Date:	22-JAN-2021
Filing Date:	14-MAY-2019
Time Stamp:	21:21:18
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	8110177Reply.pdf	108481 2ff73e84bfb5b04ab7b189b91a143f5a7fa4c85d	no	7

Warnings:

Information:	
Total Files Size (in bytes):	108481

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	16/349,874	Confirmation No.	:	1053
Inventor(s)	:	Park et al.	Examiner	:	Cassandra L. Decker
Filed	:	May 14, 2019	Art Unit	:	2466

Applicant	:	KT Corporation
Docket No.	:	811.0177
Customer No.	:	76277

Title: Method and Apparatus for Transmitting and Receiving Downlink Signal in Next Generation Wireless Network

RESPONSE UNDER 37 C.F.R. 1.111

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

In response to the Non-Final Office Action dated **October 22, 2020**, please reconsider the above-identified patent application in view of the following.

Amendments to the Claims are reflected in the claim listing beginning on page **2** of this document.

Remarks begin on page **5** of this document.

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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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Claims

This listing of the claims will replace all prior versions and listings of the claims in the application.

1. (Currently Amended) A method of configuring a first user equipment (UE) for receiving a downlink (DL) signal, the method comprising:

receiving configuration information for receiving DL preemption indication information from a base station;

monitoring the DL preemption indication information based on the configuration information; and

receiving the DL preemption indication information through a multicast signal,

wherein the DL preemption indication information includes information for indicating ~~superposed~~ radio resources ~~where radio resources~~ allocated ~~for the~~ to another UE and not used for the first UE among radio resources allocated to the first ~~for other~~ UE ~~are superposed each other~~,

wherein the configuration information includes radio network temporary identifier (RNTI) configuration information for CRC scrambling DL control information including the DL preemption indication information.

2. (Currently Amended) The method according to claim 1, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource allocated for the first UE are ~~for providing the first service is~~ different from that of the radio resources allocated for another UE ~~providing the second service~~.

3. (Original) The method according to claim 1, wherein the configuration information is received through UE-specific radio resource control (RRC) signaling.

4. (Original) The method according to claim 1, wherein the DL preemption indication information is received through a common search space or a group common search space of a DL control channel.

5. (Original) The method according to claim 1, wherein the DL preemption indication information is received through a UE-specific search space of a DL control channel.

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6. (Currently Amended) A method of configuring a base station for transmitting a downlink (DL) signal, the method comprising:

generating configuration information for monitoring DL preemption indication information;

transmitting the configuration information to a first user equipment (UE); and

transmitting the DL preemption indication information based on the configuration information through a multicast signal,

wherein the DL preemption indication information includes information for indicating ~~superposed~~ radio resources ~~where radio resources~~ allocated ~~for the~~ to another UE and not used for the first UE among radio resources allocated to the first ~~for other~~ UE ~~are superposed each other~~,

wherein the configuration information includes radio network temporary identifier (RNTI) configuration information for CRC scrambling DL control information including the DL preemption indication information.

7. (Currently Amended) The method according to claim 6, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource allocated for the first UE are ~~for providing the first service is~~ different from that of the radio resources allocated for another UE ~~providing the second service~~.

8. (Original) The method according to claim 6, wherein the configuration information is transmitted through UE-specific radio resource control (RRC) signaling.

9. (Original) The method according to claim 6, wherein the DL preemption indication information is transmitted through a common search space or a group common search space of a DL control channel.

10. (Original) The method according to claim 6, wherein the DL preemption indication information is transmitted through a UE-specific search space of a DL control channel.

11. (Currently Amended) A user equipment (UE) for receiving a downlink (DL) signal, the user equipment comprising:

a receiver receiving configuration information for receiving DL preemption indication information from ~~form~~ a base station; and

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a controller monitoring the DL preemption indication information based on the configuration information,

wherein the receiver receives the DL preemption indication information through a multicast signal,

wherein the DL preemption indication information includes information for indicating ~~superposed~~ radio resources ~~where radio resources~~ allocated ~~for the~~ to another UE and not used for the first UE among radio resources allocated to the first ~~for other~~ UE ~~are superposed each other~~,

wherein the configuration information includes radio network temporary identifier (RNTI) configuration information for CRC scrambling DL control information including the DL preemption indication information.

12. (Currently Amended) The user equipment according to claim 11, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource allocated for the first UE are ~~for providing the first service is~~ different from that of the radio resources allocated for another UE ~~providing the second service~~.

13. (Original) The user equipment according to claim 11, wherein the configuration information is received through UE-specific radio resource control (RRC) signaling.

14. (Original) The user equipment according to claim 11, wherein the DL preemption indication information is received through a common search space or a group common search space of a DL control channel.

15. (Original) The user equipment according to claim 11, wherein the DL preemption indication information is received through a UE-specific search space of a DL control channel.

16-20. (Canceled)

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REMARKS

Claims 1-15 were previously pending in the application. Claims 1-15 are rejected. Claims 1, 2, 6, 7, 11, and 12 are amended herein. No claims are added. No claims are canceled herein. Applicant submits that no new matter is added. Applicant respectfully requests that the Examiner reconsider the application in view of the foregoing amendments and the remarks below.

Objections

On page 2 of the Office Action, the Examiner objects to claim 11 and dependent claims 12-15 due to claim 11 containing an informality. Applicant has herein amended claim 11 as suggested by the Examiner, and respectfully requests that the objection be withdrawn.

Rejections

35 U.S.C. §112(b)

On pages 2-3 of the Office Action, the Examiner rejects claims 1-15 as indefinite for failing to particularly point out and distinctly claim the subject matter. Applicant herein amends independent claims 1, 6, and 11 to more clearly recite the claimed subject matter. Applicant respectfully requests that the rejection be withdrawn.

35 U.S.C. §102(a)(2) and §103

On pages 3-4 of the Office Action, the Examiner rejects claims 1, 3, 4, 6, 8, 9, 11, 13, and 14 under 35 U.S.C. §102(a)(2) as being anticipated by U.S. Patent Application Publication No. 2019/0200235 to Lyu et al. (hereinafter "*Lyu*"). On pages 5-6 of the Office Action, the Examiner rejects claims 2, 7, and 12 under 35 U.S.C. §103 as being unpatentable over *Lyu* in view of U.S. Patent Application Publication No. 2019/0116007 to Yi et al. (hereinafter "*Yi*"). On pages 6-7 of the Office Action, the Examiner rejects claims 5, 10, and 15 under 35 U.S.C. §103 as being unpatentable over *Lyu* in view of U.S. Patent Application Publication No. 2015/0358111 to Marinier et al. (hereinafter "*Marinier*").

Applicant herein amends independent claims 1, 6, and 11 to recite in pertinent part: "wherein the DL preemption indication information includes information for indicating radio resources allocated to another UE and not used for the first UE among radio resources allocated to the first UE,

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wherein the configuration information includes radio network temporary identifier (RNTI) configuration information for CRC scrambling DL control information including the DL preemption indication information."

Support for this amendment may be found in Applicant's specification as originally filed, for example at paragraphs [86]-[89]. Particularly, as described in paragraphs [86]-[89], the configuration information for receiving preemption indication information may include cell-specific RNTI configuration information for CRC scrambling of DL control information based on the cell-specific RNTI. Thus, the preemptive indication information recited in the present claims is information indicating radio resources allocated to other UEs among radio resources allocated to the first UE. The indicated radio resource is not used for transmission to the first UE.

Applicant asserts that the presently cited references fail to disclose or suggest using "the DL preemption indication information includes information for indicating radio resources allocated to another UE and not used for the first UE among radio resources allocated to the first UE, wherein the configuration information includes radio network temporary identifier (RNTI) configuration information for CRC scrambling DL control information including the DL preemption indication information." In particular, *Yi* is silent regarding sending RNTI information, and therefore does not describe a scrambling DL preemption indication information as recited in the independent claims.

While *Lyu* and *Marinier* may describe performing scrambling of downlink control information using an RNTI (see *Lyu* paragraphs [0025]-[0026] and [0093]-[0095]; *Marinier* paragraph [0128]), neither *Lyu* nor *Marinier* disclose or suggest "the DL preemption indication information includes information for indicating radio resources allocated to another UE and not used for the first UE among radio resources allocated to the first UE, wherein the configuration information includes radio network temporary identifier (RNTI) configuration information for CRC scrambling DL control information including the DL preemption indication information," as recited in the independent claims. Particularly, the cited references do not disclose or suggest the preemptive indication information indicates radio resources allocated to other UEs among radio resources allocated to the first UE that are not used for transmission to the first UE.

Therefore, the cited references, whether taken alone or in combination, fail to disclose every feature of Applicant's independent claims, for example, "the DL preemption indication information includes information for indicating radio resources allocated to another UE and not used for the first UE among radio resources allocated to the first UE, wherein the configuration information includes radio network temporary identifier (RNTI)

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configuration information for CRC scrambling DL control information including the DL preemption indication information."

"[A]nticipation under §102 can be found only when the reference discloses exactly what is claimed…" *Titanium Metals Corp. v. Banner*, 778 F.2d 775, (Fed. Cir. 1985). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236 (Fed. Cir. 1989).

"When determining whether a claim is obvious, an examiner must make 'a searching comparison of the claimed invention – including all its limitations – with the teaching of the prior art.' Thus, 'obviousness requires a suggestion of all limitations in a claim.'" *In re Wada and Murphy*, Appeal 2007-3733 (BPAI 2008), *citing In re Ochiai*, 71 F.3d 1565, 1572 (Fed. Cir. 1995) and *CFMT, Inc. v. Yieldup Intern. Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003).

Since the cited references, whether taken alone or in any combination, fail to disclose or suggest each and every feature recited in the amended independent claims, Applicant asserts that the present rejections are overcome, and respectfully requests that the rejections under §§102 and 103 be withdrawn.

It is believed that all the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for withdrawing the prior art cited with regards to any or all pending claims that have not been expressed. Finally, nothing in this paper should be construed as intent to concede any issue regarding any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

The Assistant Commissioner is hereby authorized to charge payment of any additional fees associated with this communication or credit any overpayment to Deposit Account No. 60-2802, including, but not limited to, any charges for extensions of time under 37 C.F.R. §1.136.

Respectfully submitted,

Date: 22 Jan. 2021

/Joung Kook Park/

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Sterling, VA 20165

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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000308

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/349,874	Filing Date 05/14/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	01/22/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 15	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/DORIS M KING/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	16/349,874
Filing Date	May 14, 2019
First Named Inventor	Kyujin PARK
Title	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
Art Unit	2466
Examiner Name	DECKER, CASSANDRA L
Attorney Docket Number	KT21-0111

SIGNATURE of Applicant or Patent Practitioner

Signature	/Daniel CHUNG/	Date (Optional)	
Name	Daniel CHUNG	Registration Number	57889
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Doc Code: PA..
Document Description: Power of Attorney

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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 126667

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	[signature]	Date (Optional)	
Name	Sung-Ho Lee		
Title	Team leader		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	41883959
Application Number:	16349874
International Application Number:	
Confirmation Number:	1053
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	76277
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	811.0177
Receipt Date:	10-FEB-2021
Filing Date:	14-MAY-2019
Time Stamp:	01:58:50
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	210210-KT21-0111_POA.pdf	564330 5bab57f33a2c0c1d53051fa558c9e0f1aa4891e9	no	2
Warnings:					

Information:	
Total Files Size (in bytes):	564330

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/349,874	05/14/2019	Kyujin PARK	811.0177

CONFIRMATION NO. 1053

IMPROPER CPOA LETTER

76277
IP LEGAL SERVICES, LLC
P.O. Box 651325
Sterling, VA 20165

OC00000123327828

Date Mailed: 02/12/2021

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the power of attorney filed 02/10/2021. The power of attorney in this application is not accepted for the reason(s) listed below:

- The revocation is not signed by the applicant, the assignee of the entire interest, or one particular principal attorney having the authority to revoke.

/dtdinh/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

126667
INVENSTONE PATENT, LLC
14291-A Brushwood way
Centreville, VA 20121
UNITED STATES

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000314

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	16/349,874
Filing Date	May 14, 2019
First Named Inventor	Kyujin PARK
Title	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
Art Unit	2466
Examiner Name	DECKER, CASSANDRA L
Attorney Docket Number	KT21-0111

SIGNATURE of Applicant or Patent Practitioner

Signature	/Daniel CHUNG/	Date (Optional)	
Name	Daniel CHUNG	Registration Number	57889
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 11/30/2014. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 126667

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

KT CORPORATION

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	[signature]	Date (Optional)	
Name	Sung-Ku Lee		
Title	Team leader, KT CORPORATION		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Electronic Acknowledgement Receipt

EFS ID:	41928253
Application Number:	16349874
International Application Number:	
Confirmation Number:	1053
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	76277
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	811.0177
Receipt Date:	16-FEB-2021
Filing Date:	14-MAY-2019
Time Stamp:	11:03:06
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	210216-KT21-0111_POA.pdf	579202 fe30f7162bfadf8db787a97bac7250e5e52d47f0	no	2

Warnings:

Information:	
Total Files Size (in bytes):	579202

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/96 (08-12)
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Kyujin PARK

Application No./Patent No.: 16/349,874 Filed/Issue Date: 05-14-2019

Titled: METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

KT CORPORATION, a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 049175, Frame 0889, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Daniel CHUNG/	February 17, 2021
Signature	Date
Daniel CHUNG	57889
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	41951061
Application Number:	16349874
International Application Number:	
Confirmation Number:	1053
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	126667
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	KT21-0111
Receipt Date:	17-FEB-2021
Filing Date:	14-MAY-2019
Time Stamp:	20:35:04
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73	aia0096-KT21-0111.pdf	112819 95e01469a149a8ed3b3f7be54556bb63307bec42	no	3
Warnings:					

Information:	
Total Files Size (in bytes):	112819

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/349,874	05/14/2019	Kyujin PARK	KT21-0111

CONFIRMATION NO. 1053

126667
INVENSTONE PATENT, LLC
14291-A Brushwood way
Centreville, VA 20121

POA ACCEPTANCE LETTER

OC00000123460384

Date Mailed: 02/22/2021

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/16/2021.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/lqchau/

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000324

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/349,874	05/14/2019	Kyujin PARK	811.0177

CONFIRMATION NO. 1053

76277
IP LEGAL SERVICES, LLC
P.O. Box 651325
Sterling, VA 20165

POWER OF ATTORNEY NOTICE

OC000000123460369

Date Mailed: 02/22/2021

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/16/2021.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/lqchau/

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000325

UNITED STATES PATENT AND TRADEMARK OFFICE

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Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/349,874	05/14/2019	Kyujin PARK	KT21-0111	1053

126667 7590 02/24/2021

INVENSTONE PATENT, LLC
14291-A Brushwood way
Centreville, VA 20121

EXAMINER	
DECKER, CASSANDRA L	

ART UNIT	PAPER NUMBER
2466	

NOTIFICATION DATE	DELIVERY MODE
02/24/2021	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

dan@invenstonepat.com
mail@invenstonepat.com

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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Office Action Summary	Application No. 16/349,874	Applicant(s) PARK et al.	
	Examiner CASSANDRA L DECKER	Art Unit 2466	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 22 January 2021.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☑ This action is **FINAL.** 2b) ☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-15 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-15 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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DETAILED ACTION

This Office action is in response to the amendment filed 22 January 2021. Claims 1-15 are pending in this application.

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-15 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor (or for applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention.

For the independent claims, it is not clear what is meant by “for CRC scrambling DL control information”. This should probably be amended to “for CRC scrambling of DL control information” or “for CRC scrambling for DL control information” as in paragraph 109 of the pre-grant publication of this application.

For Claims 2, 7, and 12, “another UE” appears to have antecedent basis in the claim and should probably be amended to ---the another UE---.

For Claims 3, 8, and 13, the claimed feature of using RRC signaling appears to conflict with the requirements of the independent claims. The feature claimed in the independent claims, "radio network temporary identifier (RNTI) configuration information for CRC scrambling DL control information", is a physical layer transmission. RRC signaling is transmitted at a higher layer than the physical layer.

For Claim 6, the claim recites that it is directed to "A method of configuring a base station for transmitting a downlink (DL) signal". However, the recited method steps are executed by a base station for the purpose of configuring a UE. The claim does not appear to be a method for configuring a base station.

Remaining claims are rejected as depending from a rejected claim.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 3, 4, 6, 8, 9, 11, 13, and 14, as understood in light of any rejections under 35 USC 112, is/are rejected under 35 U.S.C. 103 as being unpatentable over Lyu et al. (US 2019/0200235) in view of Nam et al. (US 2010/0323709).

For Claims 1 and 11, Lyu teaches a method of configuring a first user equipment (UE) for receiving a downlink (DL) signal, and a user equipment (UE), comprising a receiver and a controller (see Figure 5 and paragraphs 121-123: receiver, processor, controller), for receiving a downlink (DL) signal, the method comprising:

receiving configuration information for receiving DL preemption indication information from a base station (see abstract, paragraph 55, Figure 2 step S101 and paragraph 61: terminal receives indication information indicating need to receive pre-emption information);

monitoring the DL preemption indication information based on the configuration information (see paragraph 62-64, Figure 2 step S102: terminal detects pre-emption information in accord with indication); and

receiving the DL preemption indication information through a multicast signal (see paragraphs 21, 22: in common search space; paragraph 24: sent to all terminals),

wherein the DL preemption indication information includes information for indicating radio resources allocated to another UE and not used for the first UE among radio resources allocated to the first UE (see paragraphs 55, 56: resource puncturing for non-URLLC vs. URLLC services),

wherein the configuration information includes radio network temporary identifier (RNTI) configuration information for DL control information including the DL preemption indication information (see paragraphs 93-95).

Lyu as applied above is not explicit as to, but Nam teaches that it is known to provide the configuration information including radio network temporary identifier (RNTI) configuration information for CRC scrambling DL control information (see abstract, paragraphs 6, 7, and 9: RNT for CRC scrambling a DCI conveys information about the grant of resources).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to convey the DL preemption indication information of Lyu by using the RNTI for CRC scrambling the DCI as in Nam. One of ordinary skill would have been able to convey known information in a known manner within the routine skill in the art.

For Claim 6, Lyu teaches a method of configuring a base station for transmitting a downlink (DL) signal, the method comprising:

generating configuration information for monitoring DL preemption indication information (see paragraphs 9, 14: base station (network device) has indication information to provide);

transmitting the configuration information to a first user equipment (UE) (see abstract, paragraph 55, Figure 2 step S101 and paragraph 61: network device provides indication information indicating need to receive pre-emption information); and

transmitting the DL preemption indication information based on the configuration information through a multicast signal (see paragraphs 21, 22: in common search space; paragraph 24: sent to all terminals),

wherein the DL preemption indication information includes information for indicating radio resources allocated to another UE and not used for the first UE among radio resources allocated to the first UE,

wherein the configuration information includes radio network temporary identifier (RNTI) configuration information for DL control information including the DL preemption indication information (see paragraphs 93-95).

Lyu as applied above is not explicit as to, but Nam teaches that it is known to provide the configuration information including radio network temporary identifier (RNTI) configuration information for CRC scrambling DL control information (see abstract, paragraphs 6, 7, and 9: RNT for CRC scrambling a DCI conveys information about the grant of resources).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to convey the DL preemption indication information of Lyu by using the RNTI for CRC scrambling the DCI as in Nam. One of ordinary skill would have been able to convey known information in a known manner within the routine skill in the art.

For Claims 3, 8, and 13, Lyu teaches the method, wherein the configuration information is received through UE-specific radio resource control (RRC) signaling (see paragraphs 12, 77, 78: provided through RRC signaling; Figure 2: signaling to a specific UE).

For Claims 4, 9, and 14, Lyu teaches the method, wherein the DL preemption indication information is received through a common search space or a group common search space of a DL control channel (see paragraphs 21, 22: common search space).

Claims 2, 7, and 12 is/are rejected under 35 U.S.C. 103 as being unpatentable over Lyu et al. (US 2019/0200235) and Nam et al. (US 2010/0323709)as applied to claims 1, 6, and 11 above, and further in view of Yi et al. (US 2019/0116007).

For Claims 2, 7, and 12, while Lyu does suggest flexible subcarrier spacing and TTIs (see paragraph 4), and the use of URLLC and eMBB services (see paragraph 56), the references as applied above are not explicit as to, but Yi teaches that it is known for URLLC and eMBB services of respectively different UEs to use respectively different subcarrier spacing (see Figure 16, paragraph 157).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed that the resources provided in Lyu are those wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource allocated for the first UE are different from that of the radio resources allocated for another UE. One of ordinary skill would have been able to use such configurations with the reasonably predictable result of providing known services in a known manner.

Claims 5, 10, and 15 is/are rejected under 35 U.S.C. 103 as being unpatentable over Lyu et al. (US 2019/0200235) and Nam et al. (US 2010/0323709)as applied to claims 1, 6, and 11 above, and further in view of Marinier et al. (US 2015/0358111).

For Claims 5, 10, and 15, while Lyu does teach that the second DCI is provided in a CSS and that the DCI is associated with the MCS (see paragraphs 94, 76) and Nam teaches using a UESS which is well known to be provided in a PDCCH (see paragraphs 7, 9), the references as applied above are not explicit

as to, but Marinier teaches that it is known to provide such information through a UE-specific search space of a DL control channel (see paragraph 65: MCS DCI conveyed in UESS PDCCH).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to provide the DCI of Lyu as shown in Marinier. One of ordinary skill would have been able to do so with the reasonably predictable result of conveying known control information in a known manner.

Response to Arguments

The amendment filed 22 January 2021 has been entered.

Previous objections and rejections under 35 USC 112 are withdrawn in light of the amendments to the claims. However, the amendments have resulted in new rejections under 35 USC 112(b).

Applicant's arguments with respect to rejections over prior art have been fully considered, but are moot in view of the new grounds of rejection introduced herein. The claims remain rejected under 35 USC 103.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Zhang et al. (US 2017/0367070) teaches indicating information about downlink communications by using a certain RNTI for CRC scrambling of DCI.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CASSANDRA L DECKER whose telephone number is (571)270-3946. The examiner can normally be reached on 7:30 am - 4:00 pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Faruk Hamza can be reached on 571-272-7969. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-

my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/CASSANDRA L DECKER/
Examiner, Art Unit 2466
2/10/2021

/FARUK HAMZA/
Supervisory Patent Examiner, Art Unit 2466

Notice of References Cited	Application/Control No. 16/349,874	Applicant(s)/Patent Under Reexamination PARK et al.	
	Examiner CASSANDRA L DECKER	Art Unit 2466	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20100323709-A1	12-2010	Nam; Young-Han	H04L5/0023	455/450
*	B	US-20170367070-A1	12-2017	ZHANG; Wen	H04W52/0238	1/1
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	**Art Unit**
	CASSANDRA L DECKER	2466

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/23/2020	02/10/2021							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	✓							
	9	✓	✓							
	10	✓	✓							
	11	✓	✓							
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	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
	16	-	-							
	17	-	-							
	18	-	-							
	19	-	-							
	20	-	-							

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	Art Unit
	CASSANDRA L DECKER	2466

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Petitioner's Exhibit 1002
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	Art Unit
	CASSANDRA L DECKER	2466

Search Notes		
Search Notes	**Date**	**Examiner**
inventorship	07/21/2020 (updated 2/10/2021)	Decker
text-limited CPC: H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007	07/23/2020 (updated 2/10/2021)	Decker
text-limiting terms: uess, dci, pdcch, superpose, pre-empt, puncture, indicate, configure, rrc	07/23/2020	Decker
free text: uess, dci, pdcch, superpose, pre-empt, puncture, indicate, configure, rrc, signaling, downlink, multicast, embb, urllc, subcarier spacing	07/23/2020	Decker
search terms: rnti, scramble, crc, dci, superpose, overlap	02/10/2021	Decker
see SEARCH printout for search history		

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L2	16	"349874".ap.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/21 09:37 AM
L6	21	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	US-PGPUB; USPAT	ADJ	ON	ON	2020/07/21 11:00 AM
L7	98179	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/21 01:44 PM
L8	8	("20060007880"|"20080068979"|"20100208689"|"20130272243"|"20160037517"|"20160113008"|"20160218849"|"20190090239").PN.	US-PGPUB; USPAT	ADJ	ON	ON	2020/07/21 01:49 PM
L9	32	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (signal$4 or configur$5) with (downlink or dl) with multicast$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 09:28 AM
L10	4472	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (signal$4 or configur$5) with (downlink or dl) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 10:29 AM

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L11	98179	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 10:29 AM
L12	1756	L10 and L11	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 10:29 AM
L13	2155	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (inform$3 or indicat$3 or configur$5) with (downlink or dl) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 10:33 AM
L14	1116	L11 and L13	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 10:33 AM
L15	364	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (inform$3 or indicat$3 or configur$5) with (rrc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 10:36 AM
L16	236	L11 and L15	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 10:36 AM
L17	22	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (ue specific) with (rrc or radio resource control) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 02:44 PM
L18	739	(downlink or dl) with (ue	US-PGPUB; USPAT; EPO;	ADJ	ON	ON	2020/07/22

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		specific) with (rrc or radio resource control) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	JPO; DERWENT; IBM_TDB				02:49 PM
L19	502	L11 and L18	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 02:49 PM
L20	269	(downlink or dl) with (ue specific) with (rrc or radio resource control) with signal$4 with configur$5 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 02:50 PM
L21	207	L11 and L20	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 02:50 PM
L22	1154	(ue specific) near3 (rrc or radio resource control) near3 signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 02:51 PM
L23	749	L11 and L22	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 02:51 PM
L24	585	(ue specific) adj (rrc or radio resource control) adj signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 02:51 PM
L25	413	L11 and L24	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 02:52 PM
L26	6	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (ue specific) adj (rrc or radio resource control) adj signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/22 02:52 PM
L27	1059	(ue specific search space or uess or uss) with dci	US-PGPUB; USPAT; EPO; JPO; DERWENT;	ADJ	ON	ON	2020/07/23 10:12 AM

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		with pdcch and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	IBM_TDB				
L28	98220	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:13 AM
L29	875	L27 and L28	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:13 AM
L30	0	(ue specific search space or uess or uss) with dci with pdcch with punctur$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:13 AM
L31	0	(ue specific search space or uess or uss) with dci with pdcch with urllc and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:14 AM
L32	35	(ue specific search space or uess or uss) with dci with pdcch with (superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:14 AM
L33	7	(ue specific search space or uess or uss) with pdcch with punctur$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:16 AM
L34	0	(ue specific search space or uess or uss) with dci	US-PGPUB; USPAT; EPO; JPO; DERWENT;	ADJ	ON	ON	2020/07/23 10:17 AM

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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		with pdcch same (embb or urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	IBM_TDB				
L35	41	(ue specific search space or uess or uss) with dci with pdcch and (embb or urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:17 AM
L36	0	(ue specific search space or uess or uss) with (control channel or pdcch) same (embb or urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:27 AM
L37	2	(ue specific search space or uess or uss) same (embb or urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:27 AM
L38	1059	(ue specific search space or uess or uss) with dci with pdcch and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:32 AM
L39	2	(ue specific search space or uess or uss) with dci with pdcch with dynamic and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:33 AM
L40	0	(ue specific search space or uess or uss) with dci with pdcch with (punctur$3 or preempt$3 or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:35 AM
L41	0	(ue specific search space or uess or uss) with dci with pdcch same (punctur$3 or preempt$3	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:35 AM

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Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000344

		or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")					
L42	17	(ue specific search space or uess or uss) with pdcch same (punctur$3 or preempt$3 or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:36 AM
L43	112	(ue specific search space or uess or uss) with dci with pdcch with indicat$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 10:40 AM
L44	53	(subcarrier with spac$3) with (embb) with (urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 11:47 AM
L45	19	(subcarrier with spac$3) with differ$4 with (embb) with (urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2020/07/23 11:47 AM
L46	23	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	US-PGPUB; USPAT	ADJ	ON	ON	2021/02/10 08:22 AM
L47	4367	(rnti WITH crc WITH dci) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2021/02/10 08:24 AM
L48	3062	28 AND 47	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2021/02/10 08:25 AM
L49	79	(rnti WITH crc WITH dci) SAME (superpos$5 OR overlap$4) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2021/02/10 08:26 AM
L50	2362	(rnti WITH scrambl$3 WITH crc WITH dci) AND	US-PGPUB; USPAT; EPO; JPO; DERWENT;	ADJ	ON	ON	2021/02/10 08:38 AM

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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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		(@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	IBM_TDB				
L51	104585	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2021/02/10 08:38 AM
L52	1680	50 AND 51	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	ON	2021/02/10 08:39 AM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000346

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	16/349,874	Filing Date	2019-05-14	Docket Number (if applicable)	KT21-0111	Art Unit	2466
First Named Inventor	Kyujin PARK			Examiner Name	DECKER, CASSANDRA L		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 602040

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/Daniel Chung/	Date (YYYY-MM-DD)	2021-04-12
Name	Daniel Chung	Registration Number	57889

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000349

Electronic Patent Application Fee Transmittal

Application Number:	16349874
Filing Date:	14-May-2019
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Filer:	Daniel Chung/judy Kim
Attorney Docket Number:	KT21-0111

Filed as Large Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 1ST REQUEST	1801	1	1360	1360
		Total in USD ($)		**1360**

Electronic Acknowledgement Receipt

EFS ID:	42421397
Application Number:	16349874
International Application Number:	
Confirmation Number:	1053
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	126667
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	KT21-0111
Receipt Date:	12-APR-2021
Filing Date:	14-MAY-2019
Time Stamp:	03:07:19
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1360
RAM confirmation Number	E20214B407522962
Deposit Account	602040
Authorized User	judy Kim

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

37 CFR 1.492 (National application filing, search, and examination fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		P20160836US_KT21-0111_OA_FOA.pdf	129203 66b31571d3bb355e3651f4f5587b9ebf3279ca7d	yes	17
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Amendment Submitted/Entered with Filing of CPA/RCE		1	1	
	Claims		2	7	
	Applicant Arguments/Remarks Made in an Amendment		8	17	
Warnings:					
Information:					
2	Request for Continued Examination (RCE)	P20160836US_KT21-0111_sb0030efs.pdf	1349948 c04f100c70da57e76c1dcb1f0a9d6817c37f3bb2	no	3
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30634 ef4ffb6e45233da0af94ca08b163bcfd3450834d	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1509785		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Attorney Docket No.: KT21-0111

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Kyujin PARK et al.	Examiner: DECKER, CASSANDRA L
Application No.:	16/349,874	Group Art Unit: 2466
Filing Date:	05-14-2019	Confirmation No.: 1053
For:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK	

Via Mail Stop RCE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT UNDER 37 C.F.R. 1.114

In response to the Final Office Action dated Feb. 24, 2021, please consider the following:

Amendments to the Claims begin on page 2.

Remarks begin on page 8.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A method of ~~configuring a first user equipment (UE) for~~ receiving a downlink (DL) signal by a first user equipment (UE), the method comprising:

receiving, by the first UE, configuration information including a specific radio network temporary identifier (RNTI) for ~~receiving~~ DL preemption indication information ~~from a base station~~;

monitoring, by the first UE, a DL control channel for receiving the DL preemption indication information based on the specific RNTI included in the configuration information; and

receiving, by the first UE, the DL preemption indication information through a multicast signal,

wherein the specific RNTI is different from at least a cell-RNTI (C-RNTI), and the specific RNTI is a dedicated RNTI for monitoring the DL preemption indication information, and

wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received

~~wherein the DL preemption indication information includes information for indicating radio resources allocated to another UE and not used for the first UE among radio resources allocated to the first UE,~~

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~~wherein the configuration information includes radio network temporary identifier (RNTI) configuration information for CRC scrambling DL control information including the DL preemption indication information~~.

2. (Currently Amended) The method according to claim 1, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resources allocated for the first UE are different from that of the radio resources allocated for a second ~~another~~ UE.

3. (Original) The method according to claim 1, wherein the configuration information is received through UE-specific radio resource control (RRC) signaling.

4. (Currently Amended) The method according to claim 1, wherein the DL preemption indication information is received through a common search space ~~or a group common search space~~ of the [[a]] DL control channel.

5. (Currently Amended) The method according to claim 1, wherein the DL preemption indication information is received through a UE-specific search space of the [[a]] DL control channel.

6. (Currently Amended) A method of ~~configuring a base station for~~ transmitting a downlink (DL) signal by a base station (BS), the method comprising:

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generating, by the BS, configuration information including a specific radio network temporary identifier (RNTI) for ~~monitoring~~ DL preemption indication information;

transmitting, from the BS, the configuration information to a first user equipment (UE); and

transmitting, from the BS, the DL preemption indication information based on the specific RNTI included in the configuration information through a multicast signal,

wherein the specific RNTI is different from at least a cell-RNTI (C-RNTI), and the specific RNTI is a dedicated RNTI for transmitting the DL preemption indication information, and

wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is transmitted

~~wherein the DL preemption indication information includes information for indicating radio resources allocated to another UE and not used for the first UE among radio resources allocated to the first UE,~~

~~wherein the configuration information includes radio network temporary identifier (RNTI) configuration information for CRC scrambling DL control information including the DL preemption indication information~~.

7. (Currently Amended) The method according to claim 6, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resources allocated for the first UE are different from that of the radio resources allocated for the second ~~another~~ UE.

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8. (Original) The method according to claim 6, wherein the configuration information is transmitted through UE-specific radio resource control (RRC) signaling.

9. (Currently Amended) The method according to claim 6, wherein the DL preemption indication information is transmitted through a common search space ~~or a group common search space~~ of the [[a]] DL control channel.

10. (Currently Amended) The method according to claim 6, wherein the DL preemption indication information is transmitted through a UE-specific search space of the [[a]] DL control channel.

11. (Currently Amended) A user equipment (UE) for receiving a downlink (DL) signal, the UE ~~user equipment~~ comprising:

a receiver receiving configuration information including a specific radio network temporary identifier (RNTI) for ~~receiving~~ DL preemption indication information ~~from a base station~~;

a controller monitoring a DL control channel for receiving the DL preemption indication information based on the specific RNTI included in the configuration information,

wherein the receiver receives the DL preemption indication information through a multicast signal,

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wherein the specific RNTI is different from at least a cell-RNTI (C-RNTI), and the specific RNTI is a dedicated RNTI for monitoring the DL preemption indication information, and

wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received

~~wherein the DL preemption indication information includes information for indicating radio resources allocated to another UE and not used for the first UE among radio resources allocated to the first UE,~~

~~wherein the configuration information includes radio network temporary identifier (RNTI) configuration information for CRC scrambling DL control information including the DL preemption indication information~~.

12. (Currently Amended) The UE ~~user equipment~~ according to claim 11, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resources allocated for the ~~first~~ UE are different from that of the radio resources allocated for another UE.

13. (Currently Amended) The UE ~~user equipment~~ according to claim 11, wherein the configuration information is received through UE-specific radio resource control (RRC) signaling.

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14. (Currently Amended) The UE ~~user equipment~~ according to claim 11, wherein the DL preemption indication information is received through a common search space ~~or a group common search space~~ of the [[a]] DL control channel.

15. (Currently Amended) The UE ~~user equipment~~ according to claim 11, wherein the DL preemption indication information is received through a UE-specific search space of the [[a]] DL control channel.

16-20 (Canceled)

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REMARKS

Applicant wish to thank the Examiner for the thoroughness of examination and for the issues pointed out in the Final Office Action. Applicant respectfully requests reconsideration of this application in view of the foregoing amendments and following remarks.

Status of the Claims

Claims 1-15 are pending in the application. Claims 1-15 are rejected. By this Response, claims 1, 2, 4-7 and 9-15 are amended. No new matter has been added.

Rejection under 35 U.S.C. §112(b)

On pages 2-3 of the Final Office Action, the Examiner rejects claims 1-15 as indefinite for failing to particularly point out and distinctly claim the subject matter.

For the independent claims, the Examiner rejected the independent claims that it is not clear what is meant by "for CRC scrambling DL control information". Applicant herein amends independent claims 1, 6 and 11 to more clearly recite the claimed subject matter. Specifically, the Examiner's indicated vague limitation "for CRC scrambling DL control information" has been deleted by this amendment.

For claims 2, 7 and 12, the Examiner pointed out that "another UE" has to have antecedent basis in the claims. In order to cure such deficiency, Applicant herein amends claims 2 and 7 by replacing the limitation "another UE" with "second UE", while maintaining the limitation "another UE", as the amended independent claim 11 of claim 12 does not have "another UE" in the independent claim 11 anymore.

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For claims 3, 8 and 13, the Examiner pointed out that the claimed feature of using RRC signaling appears to conflict with the requirements of the independent claims. In order to cure such deficiency, Applicant herein amends independent claims 1, 6 and 11 to more clearly recite the claimed subject matter, and by amending independent claims 1, 6 and 11, Applicant believes that the rejections for claims 3, 8 and 13 have been resolved.

For claim 6, the Examiner rejected that the claim 6 does not appear to be a method for configuring a base station. In order to address this matter, Applicant respectively submits that herein amends claim 6 to incorporate the limitation "A method of ~~configuring a base station for~~ transmitting a downlink (DL) signal by a base station,"

With the above amendment, Applicant believes that the rejection for claim 6 should be withdrawn.

Rejection under 35 U.S.C. §103

On pages 3-6 of the Final Office Action, claims 1, 3, 4, 6, 8, 9, 11, 13 and 14 were rejected under 35 U.S.C 103 as allegedly being unpatentable over Lyu et al. (U.S. Publication No. US 2019/0200235) in view of Nam et al. (U.S. Patent Publication No. US 2010/0323709).

On pages 6 of the Final Office Action, claims 2, 7 and 12 were rejected under 35 U.S.C 103 as allegedly being unpatentable over Lyu et al. (U.S. Publication No. US 2019/0200235) in view of Nam et al. (U.S. Patent Publication No. US 2010/0323709), and further in view of Yi et al. (U.S. Patent Publication No. US 2019/0116007).

On page. 6-7 of the Final Office Action, claims 5, 10 and 15 were rejected under 35 U.S.C 103 as allegedly being unpatentable over Lyu et al. (U.S. Publication No. US

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2019/0200235) in view of Nam et al. (U.S. Patent Publication No. US 2010/0323709), and further in view of Marinier et al. (U.S. Patent Publication No. US 2015/0358111).

In order to make claim 1 more clearly and to distinguish the technical features over the cited references, claim 1 is herewith amended as follows:

> *1. A method of receiving a downlink (DL) signal by a first user equipment (UE), the method comprising:*
>
> *receiving, by the first UE,* ***configuration information including a specific radio network temporary identifier (RNTI) for DL preemption indication information****;*
>
> *monitoring, by the first UE, a DL control channel for receiving the DL preemption indication information based on the specific RNTI included in the configuration information; and*
>
> *receiving, by the first UE, the DL preemption indication information through a multicast signal,*
>
> *wherein the specific RNTI is different from at least a cell-RNTI (C-RNTI), and the specific RNTI is a dedicated RNTI for monitoring the DL preemption indication information, and*
>
> *wherein* ***the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received****. (Emphasis added)*

Independent claim 6 is directed to a method of transmitting a downlink (DL) signal by a base station, and the amended claim 6 now includes the corresponding limitations as the amended claim 1.

Independent claim 11 is directed to a user equipment for receiving a downlink (DL) signal, and the amended claim 11 now includes also the same corresponding limitations as the amended claim 1.

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Support for the amendment may be found in Applicant's specification as originally filed, for example at paragraphs [85], [88] and [110]-[112].

Applicant respectfully submits that claim 1 (as amended) is patentable because the cited references, taken alone or in combination, do not disclose or suggest each and every element of the claim. For example, Applicant respectfully submits that the cited references do not disclose or suggest at least the above-emphasized features, in combination with other elements of the claim.

On pages 3-4 of the Office Action, the Examiner asserts that Lyu et al teaches the feature of "receiving configuration information for receiving DL preemption indication information from a base station".

In order to further distinguish the technical features over Lyu et al, Applicant respectively submits that the pending claim 1 has been amended to make more clearly recite the gist of present invention, as followings:

> *receiving, by the first UE,* ***configuration information including a specific radio network temporary identifier (RNTI) for DL preemption indication information****;*
>
> *monitoring, by the first UE, a DL control channel for receiving the DL preemption indication information based on the specific RNTI included in the configuration information; and*

That is, according to the present disclosure (as amended herewith), configuration information includes a specific radio network temporary identifier (RNTI) for DL preemption indication information. Thereafter, by utilizing this specific RNTI included in the configuration information, according to the present invention, monitoring operation is performed for receiving the DL preemption indication information.

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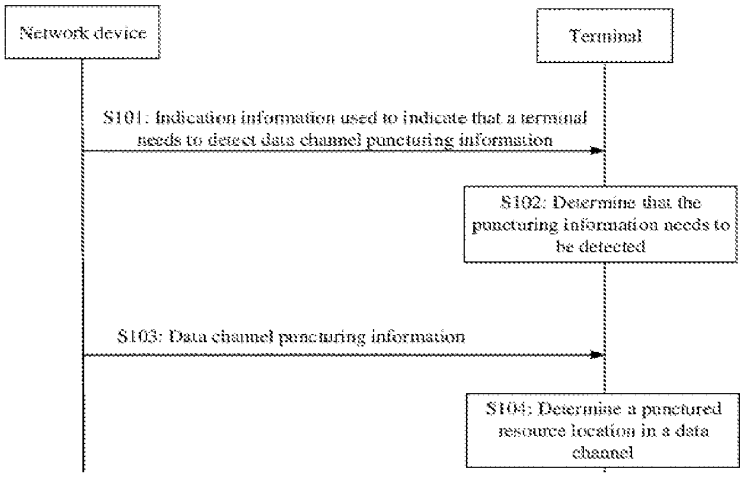
In contrast to this, Applicant believes that the aforementioned applicant's novel limitations are not explicitly taught by Lyu et al.

First, Lyu et al merely discloses that the terminal receives "Indication information (S101)" (FIG. 2 of Lyu et al), which may be corresponding to "the receiving step of configuration information" in Applicant's claimed features in claim 1. However, Applicant's claim 1 (as amended), further recites that "configuration information including a specific radio network temporary identifier (RNTI)", which is not explicitly taught by Lyu et al.

In overall teaching of Lyn et al, Lyu et al somewhat discloses a use of a radio network temporary identifier (RNTI). However, the use of the RNTI of Lyu et al is only limited to use for transmitting/receiving "Data channel puncturing information (S103)" (FIG.2 of Lyu et al), which cannot be considered same as "configuration information including the specific RNTI for DL preemption indication information" of applicant's claimed invention. (See the following portion in FIG. 2, and [0060]-[0064] and [0093] of Lyu et al)



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[0060] FIG. **2** is a flowchart of implementation of methods for sending and receiving data channel puncturing information according to an embodiment of this application. As shown in FIG. **2**, the methods include the following.

[0061] **S101**: A network device sends, to a terminal, indication information indicating that the terminal needs to detect data channel puncturing information.

[0062] **S102**: The terminal receives the indication information, and determines that the data channel puncturing information needs to be detected.

[0063] **S103**: The network device sends the data channel puncturing information to the terminal, where the data channel puncturing information indicates a punctured resource location.

[0064] **S104**: The terminal receives the data channel puncturing information, and determines the punctured resource location in a data channel.

[0093] The network device may scramble the second downlink control information by a radio network temporary identifier (RNTI) having a specified value, to identify that the second downlink control information is downlink control information used to send the data channel puncturing information. The specified value may be any one of FFF4 to FFFC, for example, may be FFF5. Certainly, a value of the RNTI is not limited in this embodiment of this application, for example, may be any unused value selected from 0000 to FFFF. The second downlink control information scrambled by the RNTI indicates the data channel puncturing information.

Furthermore, in order to further differentiate the technical features over Lyu et al, Applicant respectfully submits that claim 1 is further amended to incorporate the limitation of "wherein the DL preemption indication information indicates preempted resource information in

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a prior slot, which precedes a slot in which the DL preemption indication information is received".

Applicant strongly believes that this applicant's novel feature is not taught by Lyu et al. In contrast to the applicant's claimed invention, Lyu et al merely discloses that "the symbol of the downlink control information indicating the data channel puncturing information may be sent after or before the symbol of the downlink data channel is sent.". (See the following [0089] of Lyu et al)

> **[0089]** In this embodiment of this application, a sequence of sending a symbol of the downlink control information indicating the data channel puncturing information and sending a symbol of a downlink data channel is not limited. For example, the symbol of the downlink control information indicating the data channel puncturing information may be sent after or before the symbol of the downlink data channel is sent.

In other words, in the teaching of Lyu et al, the data channel puncturing information is indicated in a specific symbol, which is sent after or before the transmission of symbol of the downlink data channel. Namely, according to Lyu et al, a level of symbol has been adapted and used for such indication.

In clear contrast, according to the present invention, the preempted resource information is indicated in a prior slot, which implies a slot basis indication.

As such, Applicant respectfully submits that the criterion of indicating preempted resource information is related to a slot basis in Applicant's claimed invention, whereas the criterion of the Lyu et al is related to a symbol basis.

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Accordingly, Applicant respectfully submits that claim 1 is patentable over Lyu et al because Lyu et al do not teach or suggest all of the features of the amended claim 1.

Furthermore, Applicant respectfully submits that Nam et al. does not teach or suggest all of the features of the amended claim 1, and the combination of Lyu et al and Nam et al also does not teach or suggest all of the features of the amended claim 1.

Independent claims 6 and 11 recite features similar to the above-discussed features of claim 1. Accordingly, Applicant respectfully submits that claims 6 and 11 are patentable for at least reasons similar to those provided above with regard to claim 1

Rejection of claims 2, 7, and 12 were rejected under 35 U.S.C. 103 as being unpatentable over the combination of Lyu et al (U.S. 2019/0200235) and Nam et al (U.S. 2010/0323709) and further in view of Yi et al (U.S. 2019/0116007)

Regarding the rejection of claims 2, 7, and 12, Applicant respectfully submits that these claims are patentable for at least the reasons set forth above due to their respective dependencies.

Rejection of claims 5, 10, and 15 were rejected under 35 U.S.C. 103 as being unpatentable over the combination of Lyu et al (U.S. 2019/0200235) and Nam et al (U.S. 2010/0323709) and further in view of Marinier et al (U.S. 2015/0358111)

Regarding the rejection of claims 5, 10, and 15, Applicant respectfully submits that these claims are patentable for at least the reasons set forth above due to their respective dependencies.

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Conclusion

In view of the present amendment and the above discussion, Applicant respectfully submits that the present application is in condition for allowance, and an early issuance of a Notice of Allowance is respectfully requested.

No additional fees are believed to be necessitated by this response. If any other fees are determined to be due with this filing, the Director is authorized to charge any such fees, or credit any overpayment, to our Deposit Account No. 602040, referencing the Docket No. stated above.

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Respectfully Submitted,

Date: April 12, 2021

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ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	**Application No.** 16/349,874	**Applicant(s)** PARK et al.	
	Examiner CASSANDRA L DECKER	**Art Unit** 2466	**AIA (FITF) Status** Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 12 April 2021.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-15 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-15 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

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DETAILED ACTION

This Office action is in response to the RCE filed 12 April 2021. Claims 1-15 are pending in this application.

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12 March 2021 has been entered.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-15 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for applications subject to pre-AIA 35 U.S.C. 112, the inventor(s), at the time the application was filed, had possession of the claimed invention. The disclosure does not appear to teach the specific RNTI being "a dedicated RNTI for monitoring the DL preemption indication information". While paragraph 87 of the pre-grant publication does teach "the newly defined RNTI", the disclosure does not teach that such an RNTI is "dedicated" to a particular purpose.

> The following is a quotation of 35 U.S.C. 112(b):
> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

> The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2, 7, and 12 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor (or for applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention.

For Claims 2, 7, and 12, both instances of "the radio resources" lack antecedent basis in the claims.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 3, 4, 6, 8, 9, 11, 13, and 14 is/are rejected under 35 U.S.C. 103 as being unpatentable over Lyu et al. (US 2019/0200235) in view of Islam et al. (US 2018/0070341) and Agiwal et al. (US 2018/0035332).

For Claims 1 and 11, Lyu teaches a method of receiving a downlink (DL) signal by a first user equipment (UE), and a first user equipment (UE), comprising a receiver and a controller (see Figure 5 and paragraphs 121-123: receiver, processor, controller), for receiving a downlink (DL) signal, the method comprising:

receiving, by the first UE, configuration information including an RNTI for DL preemption indication information (see abstract, paragraph 55, Figure 2 step S101 and paragraph 61: terminal receives indication information indicating need to receive pre-emption information; see paragraphs 93-95: RNTI identifies that DCI is used to send DL preemption indication information);

monitoring, by the first UE, a DL control channel for receiving the DL preemption indication information based on the configuration information (see paragraphs 21, 87); and

receiving, by the first UE, the DL preemption indication information through a multicast signal (see paragraphs 21, 22: in common search space; paragraph 24: sent to all terminals).

The references as applied above are not explicit as to, but Islam teaches the DL preemption indication information indicating preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received (see paragraphs 85, 125: indication refers to the preceding DL transmission).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to provide for post-notification as in Islam when implementing the method of Lyu. The

motivation would be to conserve bandwidth by only providing the notification when it has been determined to be needed.

The references as applied above are not explicit as to, but Agiwal teaches a specific radio network temporary identifier (RNTI), wherein the specific RNTI is different from at least a cell-RNTI (C-RNTI), and the specific RNTI is a dedicated RNTI for monitoring the DL preemption indication information (see paragraph 110, Figure 10: special RNTI for indicating colliding resources).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to use the special RNTI as in Agiwal when implementing the method of Lyu, Nam, and Islam. One of ordinary skill would have been able to use a known indicator in a known manner with the reasonably predictable result of providing for necessary notification.

For Claim 6, Lyu teaches a method of transmitting a downlink (DL) signal by a base station (BS), the method comprising:

generating, by the BS, configuration information including a specific radio network temporary identifier (RNTI) for DL preemption indication information (see paragraphs 9, 14: base station (network device) has indication information to provide);

transmitting, from the BS, the configuration information including an RNTI to a first user equipment (UE) (see abstract, paragraph 55, Figure 2 step S101 and paragraph 61: network device provides indication information indicating need to receive pre-emption information; see paragraphs 93-95); and

transmitting, from the BS, the DL preemption indication information based on the specific RNTI included in the configuration information through a multicast signal (see paragraphs 21, 22, 87: in common search space, control channel; paragraph 24: sent to all terminals).

The references as applied above are not explicit as to, but Islam teaches the DL preemption indication information indicating preempted resource information in a prior slot, which precedes a slot

in which the DL preemption indication information is received (see paragraphs 85, 125: indication refers to the preceding DL transmission).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to provide for post-notification as in Islam when implementing the method of Lyu. The motivation would be to conserve bandwidth by only providing the notification when it has been determined to be needed.

The references as applied above are not explicit as to, but Agiwal teaches a specific radio network temporary identifier (RNTI), wherein the specific RNTI is different from at least a cell-RNTI (C-RNTI), and the specific RNTI is a dedicated RNTI for monitoring the DL preemption indication information (see paragraph 110, Figure 10: special RNTI for indicating colliding resources).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to use the special RNTI as in Agiwal when implementing the method of Lyu, Nam, and Islam. One of ordinary skill would have been able to use a known indicator in a known manner with the reasonably predictable result of providing for necessary notification.

For Claims 3, 8, and 13, Lyu teaches the method, wherein the configuration information is received through UE-specific radio resource control (RRC) signaling (see paragraphs 12, 77, 78: provided through RRC signaling; Figure 2: signaling to a specific UE).

For Claims 4, 9, and 14, Lyu teaches the method, wherein the DL preemption indication information is received through a common search space of the DL control channel (see paragraphs 21, 22: common search space).

Claims 2, 7, and 12 is/are rejected under 35 U.S.C. 103 as being unpatentable over Lyu et al. (US 2019/0200235), Islam et al. (US 2018/0070341) and Agiwal et al. (US 2018/0035332) as applied to claims 1, 6, and 11 above, and further in view of Yi et al. (US 2019/0116007).

For Claims 2, 7, and 12, while Lyu does suggest flexible subcarrier spacing and TTIs (see paragraph 4), and the use of URLLC and eMBB services (see paragraph 56), the references as applied above are not explicit as to, but Yi teaches that it is known for URLLC and eMBB services of respectively different UEs to use respectively different subcarrier spacing (see Figure 16, paragraph 157).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed that the resources provided in Lyu are those wherein at least one of a subcarrier spacing and a time-domain scheduling unit of the radio resource allocated for the first UE are different from that of the radio resources allocated for a second UE. One of ordinary skill would have been able to use such configurations with the reasonably predictable result of providing known services in a known manner.

Claims 5, 10, and 15 is/are rejected under 35 U.S.C. 103 as being unpatentable over Lyu et al. (US 2019/0200235), Islam et al. (US 2018/0070341) and Agiwal et al. (US 2018/0035332) as applied to claims 1, 6, and 11 above, and further in view of Marinier et al. (US 2015/0358111).

For Claims 5, 10, and 15, while Lyu does teach that the second DCI is provided in a CSS and that the DCI is associated with the MCS (see paragraphs 94, 76), the references as applied above are not explicit as to, but Marinier teaches that it is known to provide such information through a UE-specific search space of the DL control channel (see paragraph 65: MCS DCI conveyed in UESS PDCCH).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to provide the DCI of Lyu as shown in Marinier. One of ordinary skill would have been able to do so with the reasonably predictable result of conveying known control information in a known manner.

Response to Arguments

The amendment filed 12 February 2021 has been entered.

Previous rejections under 35 USC 112 are withdrawn in light of the amendments to the claims. However, the amendments have resulted in new rejections under 35 USC 112(b).

Applicant's arguments with respect to rejections over prior art have been fully considered, but are either not persuasive or moot in view of the new grounds of rejection introduced herein. The claims remain rejected under 35 USC 103.

As regards teachings of Lyu, Lyu does teach the transmission of a specific RNTI for DL preemption indication information. As the only claimed requirement of "configuration information" is the inclusion of the RNTI, then the information transmitted in Lyu including the RNTI qualifies as such.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Sun et al. (US 2016/0066345) teaches a system in which downlink transmissions to UEs in a group occupy overlapping resources.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CASSANDRA L DECKER whose telephone number is (571)270-3946. The examiner can normally be reached on 7:30 am - 4:00 pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Faruk Hamza can be reached on 571-272-7969. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/CASSANDRA L DECKER/
Examiner, Art Unit 2466
5/3/2021

/FARUK HAMZA/
Supervisory Patent Examiner, Art Unit 2466

Notice of References Cited	Application/Control No. 16/349,874	Applicant(s)/Patent Under Reexamination PARK et al.	
	Examiner CASSANDRA L DECKER	Art Unit 2466	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20180035332-A1	02-2018	AGIWAL; Anil	H04W74/0858	1/1
*	B	US-20180070341-A1	03-2018	ISLAM; TOUFIQUL	H04L1/1887	1/1
*	C	US-20160066345-A1	03-2016	Sun; Jing	H04J11/004	370/329
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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	16/349,874	PARK et al.
	Examiner	Art Unit
	CASSANDRA L DECKER	2466

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

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	16/349,874	PARK et al.
	Examiner	Art Unit
	CASSANDRA L DECKER	2466

Search Notes		
Search Notes	**Date**	**Examiner**
inventorship	07/21/2020 (updated 2/10/2021, 4/30/2021)	Decker
text-limited CPC: H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007	07/23/2020 (updated 2/10/2021, 4/30/2021)	Decker
text-limiting terms: uess, dci, pdcch, superpose, pre-empt, puncture, indicate, configure, rrc	07/23/2020	Decker
free text: uess, dci, pdcch, superpose, pre-empt, puncture, indicate, configure, rrc, signaling, downlink, multicast, embb, urllc, subcarier spacing	07/23/2020	Decker
search terms: rnti, scramble, crc, dci, superpose, overlap	02/10/2021	Decker
search terms: rnti, dl, prior, precede, prempt, puncture, overlap, indicate, notify, subsequent	4/30/2021	Decker
see SEARCH printout for search history		

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

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	Examiner	**Art Unit**
	CASSANDRA L DECKER	2466

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/23/2020	02/10/2021	05/03/2021						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
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	5	✓	✓	✓						
	6	✓	✓	✓						
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	11	✓	✓	✓						
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	14	✓	✓	✓						
	15	✓	✓	✓						
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	19	-	-	-						
	20	-	-	-						

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L2	16	"349874".ap.	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/21 09:37 AM
L6	21	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB ; USPAT)	ADJ	ON	ON	2020/07/21 11:00 AM
L7	98179	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/21 01:44 PM
L8	8	("20060007880"|"20080068979"|"20100208689"|"20130272243"|"20160037517"|"20160113008"|"20160218849"|"20190090239").PN.	(US-PGPUB ; USPAT)	ADJ	ON	ON	2020/07/21 01:49 PM
L9	32	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (signal$4 or configur$5) with (downlink or dl) with multicast$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/22 09:28 AM
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L12	1756	L10 and L11	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:29 AM

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L13	2155	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (inform$3 or indicat$3 or configur$5) with (downlink or dl) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:33 AM
L14	1116	L11 and L13	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:33 AM
L15	364	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (inform$3 or indicat$3 or configur$5) with (rrc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:36 AM
L16	236	L11 and L15	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:36 AM
L17	22	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (ue specific) with (rrc or radio resource control) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:44 PM
L18	739	(downlink or dl) with (ue specific) with (rrc or radio resource control) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:49 PM
L19	502	L11 and L18	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:49 PM
L20	269	(downlink or dl) with (ue specific) with (rrc or radio resource control) with signal$4 with configur$5 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:50 PM
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L23	749	L11 and L22	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:51 PM

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L24	585	(ue specific) adj (rrc or radio resource control) adj signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:51 PM
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L26	6	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (ue specific) adj (rrc or radio resource control) adj signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:52 PM
L27	1059	(ue specific search space or uess or uss) with dci with pdcch and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:12 AM
L28	98220	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:13 AM
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L30	0	(ue specific search space or uess or uss) with dci with pdcch with punctur$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:13 AM
L31	0	(ue specific search space or uess or uss) with dci with pdcch with urllc and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:14 AM
L32	35	(ue specific search space or uess or uss) with dci with pdcch with (superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:14 AM

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L33	7	(ue specific search space or uess or uss) with pdcch with punctur$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:16 AM
L34	0	(ue specific search space or uess or uss) with dci with pdcch same (embb or urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:17 AM
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L42	17	(ue specific search space or uess or uss) with pdcch same (punctur$3 or preempt$3 or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:36 AM
L43	112	(ue specific search space or uess or uss) with dci with pdcch with indicat$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:40 AM
L44	53	(subcarrier with spac$3) with (embb) with (urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/23 11:47 AM
L45	19	(subcarrier with spac$3) with differ$4 with (embb) with (urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2020/07/23 11:47 AM
L46	23	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB ; USPAT)	ADJ	ON	ON	2021/02/10 08:22 AM
L47	4367	(rnti WITH crc WITH dci) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:24 AM
L48	3062	28 AND 47	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:25 AM
L49	79	(rnti WITH crc WITH dci) SAME (superpos$5 OR overlap$4) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:26 AM
L50	2362	(rnti WITH scrambl$3 WITH crc WITH dci) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:38 AM
L51	104585	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:38 AM

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L52	1680	50 AND 51	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:39 AM
L53	24	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB ; USPAT)	ADJ	ON	ON	2021/04/30 08:04 AM
L54	67	(rnti WITH (downlink OR dl) WITH (preempt$3 OR overlap$4 OR punctur$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 08:06 AM
L55	131	(rnti WITH (downlink OR dl) WITH (prior OR preced$3 OR already)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:19 AM
L56	1580	(rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR later)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:32 AM
L57	883	51 AND 56	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:32 AM
L58	1582	(rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR later OR post)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:32 AM
L59	883	51 AND 58	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:33 AM
L60	568	(notif$4 OR notification OR indicat$3) WITH (rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR later OR post)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:33 AM
L61	338	51 AND 60	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:34 AM

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L62	4	(notif$4 OR notification OR indicat$3) WITH (rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR later OR post)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:05 AM
L63	9	(notif$4 OR notification OR indicat$3) WITH (rnti WITH (downlink OR dl) SAME (subsequent$2 OR following OR after OR later OR post)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:05 AM
L64	18	(notif$4 OR notification OR indicat$3) SAME (rnti WITH (downlink OR dl) SAME (subsequent$2 OR following OR after OR later OR post)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:06 AM
L65	0	(notif$4 OR notification OR indicat$3) SAME (rnti WITH (downlink OR dl) SAME (prior OR preced$3 OR already)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:08 AM
L66	19	(rnti WITH (downlink OR dl) SAME (prior OR preced$3 OR already)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:08 AM

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L67	51	(rnti SAME (prior OR preced$3 OR already)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:11 AM
L68	19953	(notif$4 OR notification OR indicat$3) SAME (prior OR preced$3 OR already) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:24 AM
L69	2456	(notif$4 OR notification OR indicat$3) WITH (prior OR preced$3 OR already) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:24 AM
L70	76	51 AND 69	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:24 AM
L71	2	"20190268130"	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 01:53 PM
L72	2	"20190268930"	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 01:54 PM
L73	285	(notif$4 OR notification OR indicat$3) SAME (rnti) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:32 PM
L74	150	(notif$4 OR notification OR indicat$3) SAME ((user specific OR ue) WITH rnti) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:32 PM

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L75	22	(notif$4 OR notification OR indicat$3) WITH ((user specific OR ue) WITH rnti) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:33 PM
L76	5	(notif$4 OR notification OR indicat$3) WITH ((new$2 OR novel) WITH rnti) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB ; USPAT ; EPO ; JPO ; DERWENT ; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:49 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

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Courtesy Reminder for
Application Serial No: 16/349,874

Attorney Docket No: KT21-0111
Customer Number: 126667
Date of Electronic Notification: 06/29/2021

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

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Attorney Docket No.: KT21-0111

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Kyujin PARK et al.	Examiner: DECKER, CASSANDRA L
Application No.:	16/349,874	Group Art Unit: 2466
Filing Date:	05-14-2019	Confirmation No.: 1053
For:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK	

Via Mail Stop AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT UNDER 37 C.F.R. 1.111

In response to the Office Action dated June 29, 2021, please consider the following:

Amendments to the Claims begin on page 2.

Remarks begin on page 7.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A method of receiving a downlink (DL) signal by a first user equipment (UE), the method comprising:

receiving, by the first UE, ~~configuration information including~~ a specific radio network temporary identifier (RNTI) for DL preemption indication information through a UE-specific radio resource control (RRC) signaling;

after receiving the specific RNTI, monitoring, by the first UE, a DL control channel for receiving the DL preemption indication information based on the received specific RNTI ~~included in the configuration information~~; and

receiving, by the first UE, the DL preemption indication information through a multicast signal,

wherein the specific RNTI received through the UE specific RRC signaling is a newly defined RNTI other than ~~different from~~ at least a cell-RNTI (C-RNTI), and ~~the specific RNTI is a dedicated RNTI for monitoring the DL preemption indication information, and~~

wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received.

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2. (Currently Amended) The method according to claim 1, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of ~~the~~ first radio resources allocated for the first UE are different from ~~that of the~~ second radio resources allocated for a second UE.

3. (Canceled)

4. (Previously Presented) The method according to claim 1, wherein the DL preemption indication information is received through a common search space of the DL control channel.

5. (Canceled)

6. (Currently Amended) A method of transmitting a downlink (DL) signal by a base station (BS), the method comprising:

~~generating~~ configuring, by the BS, ~~configuration information including~~ a specific radio network temporary identifier (RNTI) for DL preemption indication information;

transmitting, from the BS, ~~the configuration information~~ the configured specific RNTI to a first user equipment (UE) through a UE-specific radio resource control (RRC) signaling; and

transmitting, from the BS, the DL preemption indication information based on the specific RNTI ~~included in the configuration information~~ through a multicast signal,

wherein the specific RNTI transmitted through the UE specific RRC signaling is a newly defined RNTI other than ~~different from~~ at least a cell-RNTI (C-RNTI), and ~~the specific RNTI is a dedicated RNTI for transmitting the DL preemption indication information, and~~

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wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is transmitted.

7. (Currently Amended) The method according to claim 6, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of ~~the~~ first radio resources allocated for the first UE are different from ~~that of the~~ second radio resources allocated for ~~the~~ a second UE.

8. (Canceled)

9. (Previously Presented) The method according to claim 6, wherein the DL preemption indication information is transmitted through a common search space of the DL control channel.

10. (Canceled)

11. (Currently Amended) A user equipment (UE) for receiving a downlink (DL) signal, the UE comprising:

a receiver configured to receive ~~receiving configuration information including~~ a specific radio network temporary identifier (RNTI) for DL preemption indication information through a UE-specific radio resource control (RRC) signaling;

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after reception of the specific RNTI, a controller configured to monitor ~~monitoring~~ a DL control channel for receiving the DL preemption indication information based on the received specific RNTI ~~included in the configuration information~~,

wherein the receiver further configured to receive ~~receives~~ the DL preemption indication information through a multicast signal,

wherein the specific RNTI received through the UE specific RRC signaling is a newly defined RNTI other than ~~different from~~ at least a cell-RNTI (C-RNTI), and ~~the specific RNTI is a dedicated RNTI for monitoring the DL preemption indication information, and~~

wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received.

12. (Currently Amended) The UE according to claim 11, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of ~~the~~ first radio resources allocated for the UE are different from ~~that of the~~ second radio resources allocated for another UE.

13. (Canceled)

14. (Currently Amended) The UE according to claim 11, wherein the DL preemption indication information is received through a common search space of the DL control channel.

15. (Canceled)

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16-20 (Canceled)

21. (New) The method according to claim 1, wherein the specific RNTI is received with time and frequency information.

22. (New) The method according to claim 21, wherein the time and frequency information comprises frequency resource information and slot index information.

23. (New) The method according to claim 6, wherein the specific RNTI is transmitted with time and frequency information.

24. (New) The method according to claim 23, wherein the time and frequency information comprises frequency resource information and slot index information.

25. (New) The UE according to claim 11, wherein the specific RNTI is received with time and frequency information.

26. (New) The UE according to claim 25, wherein the time and frequency information comprises frequency resource information and slot index information.

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REMARKS

Applicant wishes to thank the Examiner for the thoroughness of examination and for the issues pointed out in the Office Action. Applicant respectfully requests reconsideration of this application in view of the foregoing amendments and following remarks.

Status of the Claims

Claims 1-15 are rejected. By this Response, claims 1-2, 6-7 and 11-12 are amended, and claims 21-26 are added to better define the claimed invention. Claims 3, 5, 8, 16, 13 and 15 are canceled without any prejudice and disclaimer. Applicant respectfully submits that the amendments are supported throughout the specification as originally filed, and do not add new matter.

Rejection under 35 U.S.C. §112

On pages 2-3 of the Office Action, claims 1-15 were rejected under 35. U.S.C. sec. 112(a) or 35 U.S.C. sec. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The Examiner pointed out that the disclosure does not teach a "dedicated RNTI", while the disclosure does teach "the newly defined RNTI". Applicant herein amends independent claims 1, 6 and 11, respectively, by replacing the limitation "a dedicated RNTI" with "a newly defined RNTI".

With the above amendment, Applicant believes that the rejections for claims 1-15 should be withdrawn.

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On page 3 of the Office Action, claims 2, 7 and 12 were rejected under 35. U.S.C. sec. 112(b) or 35 U.S.C. sec. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter. The Examiner pointed out that "the radio resources" lack antecedent basis in the claims 2, 7 and 12. Applicant herein amends claims 2, 7 and 12, respectively, by replacing the limitation "the radio resources" with "first radio resource" and "second radio resources" to more clearly recite the claimed subject matter.

With the above amendments, Applicant believes that the rejections for claims 2, 7 and 12 should be withdrawn as well.

Rejection under 35 U.S.C. §103

On pages 4-6 of the Office Action, claims 1, 3, 4, 6, 8, 9, 11, 13 and 14 were rejected under 35 U.S.C. sec. 103 as allegedly being unpatentable over Lyu et al. (U.S. Publication No. US 2019/0200235) (hereinafter "*Lyu*") in view of Islam et al. (U.S. Patent Publication No. US 2018/0070341) (hereinafter "*Islam*") and Agiwal et al. (U.S. Patent Publication No. US 2018/0035332) (hereinafter "*Agiwal*").

On pages 6-7 of the Office Action, claims 2, 7 and 12 were rejected under 35 U.S.C. sec. 103 as allegedly being unpatentable over *Lyu*, *Islam* and *Agiwal*, and further in view of Yi et al. (U.S. Patent Publication No. US 2019/0116007) (hereinafter "*Yi*").

On page 7 of the Office Action, claims 5, 10 and 15 were rejected under 35 U.S.C. sec. 103 as allegedly being unpatentable over *Lyu*, *Islam* and *Agiwal*, and further in view of Marinier et al. (U.S. Patent Publication No. US 2015/0358111) (hereinafter "*Marinier*").

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In order to further clarify claim 1 and to emphasize certain technical features, claim 1 is herewith amended as follows:

> *1. A method of receiving a downlink (DL) signal by a first user equipment (UE), the method comprising:*
>
> ***receiving**, by the first UE, **a specific radio network temporary identifier (RNTI)** for DL preemption indication information **through a UE-specific radio resource control (RRC) signaling**;*
>
> ***after receiving the specific RNTI**, **monitoring**, by the first UE, **a DL control channel** for receiving the DL preemption indication information based on the received specific RNTI; and*
>
> *receiving, by the first UE, the DL preemption indication information through a multicast signal,*
>
> *wherein the specific RNTI received through the UE specific RRC signaling is a newly defined RNTI other than at least a cell-RNTI (C-RNTI), and*
>
> *wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received. **(Emphasis added)***

Independent claim 6 is directed to a method of transmitting a downlink (DL) signal by a base station, and the amended claim 6 now includes similar limitations as amended claim 1.

Independent claim 11 is directed to a user equipment (UE) for receiving a downlink (DL) signal, and the amended claim 11 now includes also similar limitations as amended claim 1.

Support for the amendment may be found in Applicant's specification as originally filed, for example at paragraphs [85] and [88], and Figure 5.

Applicant respectfully submits that claim 1 (as amended) is patentable because the cited references, taken alone or in combination, do not disclose or suggest each and every element of the claim. Namely, Applicant respectfully submits that the cited references, taken alone or in any combination, do not disclose or suggest at least the above-emphasized features, in combination

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with other elements of the claims.

Specifically, Applicant's amended claim 1 now recites the above-emphasized features, which are i) "**receiving**, by the first UE, **a specific radio network temporary identifier (RNTI)** ... **through a UE-specific radio resource control (RRC) signaling**", and ii) "**after receiving the specific RNTI**, **monitoring**, by the first UE, **a DL control channel** …". That is, according to the present invention as claimed, as a first step, the (first) UE receives a RNTI (for DL preemption indication information) through a UE-specific RRC signaling, and then (as a second step) the UE performs monitoring of a DL control channel after receiving the RNTI (through the UE-specific RRC signaling).

In contrast to Applicant's claimed invention, *Lyu*, and *Islam* and *Agiwal* fail to teach or suggest the aforementioned claimed features as a whole.

In fact, *Lyu* merely discloses that the terminal receives "indication information (S101 or S102)" (FIG. 2 of *Lyu*), which (is) used to indicate that (the) terminal needs to detect data channel puncturing information. However, the "indication information" of *Lyu* is silent about a RNTI. (i.e., there is no specific relationship between the "indication information" of *Lyu* and "RNTI" of applicants' claimed invention) It appears that *Lyu* somewhat discloses a use of RNTI for transmitting second downlink control information, which the RNTI is used to scramble the second downlink control information. (See the following paragraphs [0060]-[0064] and [0093] of *Lyu*)

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[0060] FIG. **2** is a flowchart of implementation of methods for sending and receiving data channel puncturing information according to an embodiment of this application. As shown in FIG. **2**, the methods include the following.

[0061] **S101**: A network device sends, to a terminal, indication information indicating that the terminal needs to detect data channel puncturing information.

[0062] **S102**: The terminal receives the indication information, and determines that the data channel puncturing information needs to be detected.

[0063] **S103**: The network device sends the data channel puncturing information to the terminal, where the data channel puncturing information indicates a punctured resource location.

[0064] **S104**: The terminal receives the data channel puncturing information, and determines the punctured resource location in a data channel.

[0093] The network device may scramble the second downlink control information by a radio network temporary identifier (RNTI) having a specified value, to identify that the second downlink control information is downlink control information used to send the data channel puncturing information. The specified value may be any one of FFF4 to FFFC, for example, may be FFF5. Certainly, a value of the RNTI is not limited in this embodiment of this application, for example, may be any unused value selected from 0000 to FFFF. The second downlink control information scrambled by the RNTI indicates the data channel puncturing information.

The use of RNTI in association with the second downlink control information of *Lyu* may correspond to monitoring step (i.e., monitoring ... a DL control channel ... based on the specific RNTI) of Applicant's claimed invention. However, the receiving step of the RNTI of Applicant's claimed invention, especially, before monitoring a DL control channel, is not explicitly disclosed in the teaching of *Lyu*. Furthermore, Applicant wishes to point out that *Lyu* fails to teach or suggest "a UE-specific RRC signaling" used for receiving of the (specific) RNTI of Applicant's claimed invention.

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Also, *Islam* and *Agiwal* also fail to teach or suggest the aforementioned claimed features as well. Applicant strongly believes that *Islam* is completely silent about a RNTI, whereas *Agiwal* somewhat discloses a use of a special RNTI, which may be used in a similar manner of *Lyu*. That is the special RNTI of *Agiwal* is reserved (used) for masking PDCCH for the indication. (See the following paragraph [110] of *Agiwal*)

> **[0110]** Referring to FIG. **10**, in method 1, resources for URLLC **1040** are reserved and indicated to the UE in broadcast or dedicated signaling. The gNB/BS sends indication **1010**, **1015** indicating whether reserved resources in the corresponding time slot (e.g., a subframe, transmission time interval (TTI), and the like) are used or not (i.e., whether URLLC traffic is scheduled or not). In an embodiment of the present disclosure, the indication **1010**, **1015** can be there in grant or in DCI. In an embodiment of the present disclosure, the indication **1010**, **1015** can be for a group of UEs, e.g., eMBB UEs. In an embodiment of the present disclosure, the gNB/BS can inform the UE to monitor the indication **1010**, **1015** or not by RRC signaling. In an embodiment of the present disclosure, the indication **1010**, **1015** can be transmitted in a dedicated channel, or a normal PDCCH at pre-defined location. In an embodiment of the present disclosure, special RNTI can be reserved for masking PDCCH for this indication **1010**, **1015**. This method is

However, the receiving step of the RNTI (before monitoring a DL control channel) of Applicant's claimed invention, is not disclosed in *Agiwal*. Furthermore, *Agiwal* also fails to teach or suggest "a UE-specific RRC signaling" used for receiving of the (specific) RNTI of Applicant's claimed invention.

Additionally, one skilled in the art (at the time of Applicant's invention) without the benefit of Applicant's own invention disclosure (i.e., without impermissible hindsight), **would not and could not** have been motivated to combine or modify *Lyu* with *Islam* and *Agiwal*,

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because none of *Lyu*, *Islam* and *Agiwal* provide any hint or suggestion about the need for "the receiving step of the RNTI" (before monitoring a DL control channel) as per amended claim 1.

Accordingly, Applicant respectfully submits that claim 1 is patentable over the cited references because the cited references do not teach or suggest all of the features of the amended claim 1.

Independent claims 6 and 11 recite features similar to the above-discussed features of claim 1. Therefore, Applicant respectfully submits that independent claims 6 and 11 are patentable over the cited references for at least reasons set forth above with regards to claim 1.

Regarding the newly added claims 21-22, 23-24 and 25-26, Applicant respectfully submits that these claims are patentable for at least the reasons set forth above due to their respective dependencies.

Rejection of claims 2, 7, and 12 were rejected under 35 U.S.C. sec. 103 as being unpatentable over *Lyu*, *Islam* and *Agiwal*, and further in view of *Yi*

Regarding the rejection of claims 2, 7, and 12, Applicant respectfully submits that these claims are patentable for at least the reasons set forth above due to their respective dependencies.

Rejection of claims 5, 10, and 15 were rejected under 35 U.S.C. sec. 103 as being unpatentable over *Lyu*, *Islam* and *Agiwal*, and further in view of *Marinier*

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Regarding the rejection of claims 5, 10, and 15, Applicant respectfully submits that these claims are patentable for at least the reasons set forth above due to their respective dependencies.

Conclusion

In view of the present amendment and the above discussion, Applicant respectfully submits that the present application is in condition for allowance, and an early issuance of a Notice of Allowance is respectfully requested.

No additional fees are believed to be necessitated by this response. If any other fees are determined to be due with this filing, the Director is authorized to charge any such fees, or credit any overpayment, to our Deposit Account No. 602040, referencing the Docket No. stated above.

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Respectfully Submitted,

Date: September 21, 2021

By /Daniel J. Chung/
Daniel J. Chung
Registration No. 57,889

INVENSTONE Patent, LLC.
14291-A Brushwood Way
Centreville, VA 20121
703-879-5205

Electronic Acknowledgement Receipt

EFS ID:	43815938
Application Number:	16349874
International Application Number:	
Confirmation Number:	1053
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	126667
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	KT21-0111
Receipt Date:	21-SEP-2021
Filing Date:	14-MAY-2019
Time Stamp:	05:12:59
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		P20160836US_KT21-0111_16349874_Response.pdf	126222 175650c54d832bb7e1c75a996db508e5e46625fd	yes	15

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	15
Warnings:			
Information:			
	Total Files Size (in bytes):	126222	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/349,874	Filing Date 05/14/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	09/21/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 15	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/NICOLE L NICHOLSON/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/349,874	05/14/2019	Kyujin PARK	KT21-0111	1053

126667 7590 10/20/2021

INVENSTONE PATENT, LLC
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EXAMINER
DECKER, CASSANDRA L

ART UNIT	PAPER NUMBER
2466	

NOTIFICATION DATE	DELIVERY MODE
10/20/2021	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

dan@invenstonepat.com
mail@invenstonepat.com

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000414

Office Action Summary	**Application No.** 16/349,874	**Applicant(s)** PARK et al.	
	Examiner CASSANDRA L DECKER	**Art Unit** 2466	**AIA (FITF) Status** Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 21 September 2021.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☑ This action is **FINAL.** 2b) ☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-2,4,6-7,9,11-12,14 and 21-26 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-2,4,6-7,9,11-12,14 and 21-26 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000415

DETAILED ACTION

This Office action is in response to the amendment filed 21 September 2021. Claims 1-2, 4, 6-7, 9, 11-12, 14, and 21-26 are pending in this application.

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 4, 6, 9, 11, and 14 is/are rejected under 35 U.S.C. 103 as being unpatentable over Lyu et al. (US 2019/0200235) in view of Islam et al. (US 2018/0070341), Agiwal et al. (US 2018/0035332), and Mochizuki et al. (US2019/0021085).

For Claims 1 and 11, Lyu teaches a method of receiving a downlink (DL) signal by a first user equipment (UE), and a first user equipment (UE), comprising a receiver and a controller (see Figure 5 and paragraphs 121-123: receiver, processor, controller), for receiving a downlink (DL) signal, the method comprising:

receiving, by the first UE, a specific radio network temporary identifier (RNTI) for DL preemption indication information (the reception of the RNTI is at least implicit because the UE uses the RNTI to unmask the pre-emption information; see abstract, paragraphs 116, 55, Figure 2 step S101 and paragraph 61: terminal receives indication information indicating need to receive pre-emption information; see paragraphs 93-95: RNTI identifies that DCI is used to send DL preemption indication information);

after receiving the specific RNTI, monitoring, by the first UE, a DL control channel for receiving the DL preemption indication information based on the received specific RNTI (see paragraphs 21, 87; as the UE is able to use the RNTI to unmask the preemption indication information, the RNTI has necessarily been received already); and

receiving, by the first UE, the DL preemption indication information through a multicast signal (see paragraphs 21, 22: in common search space; paragraph 24: sent to all terminals).

Lyu as applied above is not explicit as to, but Islam teaches the DL preemption indication information indicating preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received (see paragraphs 85, 125: indication refers to the preceding DL transmission).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to provide for post-notification as in Islam when implementing the method of Lyu. The motivation would be to conserve bandwidth by only providing the notification when it has been determined to be needed.

The references as applied above are not explicit as to, but Agiwal teaches a specific radio network temporary identifier (RNTI), wherein the specific RNTI is a newly defined RNTI other than at least a cell-RNTI (C-RNTI) (see paragraphs 60, 110, Figure 10: new, special RNTI for indicating colliding resources).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to use the special RNTI as in Agiwal when implementing the method of Lyu and Islam. One of ordinary skill would have been able to use a known indicator in a known manner with the reasonably predictable result of providing for necessary notification.

The references as applied above are not explicit as to, but Mochizuki teaches that it is known to notify a UE of an RNTI through UE-specific RRC signaling (see paragraph 154, 160, 493, 496).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to use UE-specific RRC signaling as in Mochizuki when notifying the UE of the specific RNTI of Lyu and Agiwal. One of ordinary skill would have been able to do so with the reasonably predictable result of providing a known identifier in a known manner.

For Claim 6, Lyu teaches a method of transmitting a downlink (DL) signal by a base station (BS), the method comprising:

configuring, by the BS, a specific radio network temporary identifier (RNTI) for DL preemption indication information (the generation of the RNTI is at least implicit because the UE uses the RNTI to unmask the pre-emption information; see paragraphs 9, 14: base station (network device) has indication information to provide);

transmitting, from the BS, the configured specific RNTI to a first user equipment (UE) (the transmission of the RNTI is at least implicit because the UE uses the RNTI to unmask the pre-emption information; see abstract, paragraphs 116, 55, Figure 2 step S101 and paragraph 61: network device provides indication information indicating need to receive pre-emption information; see paragraphs 93-95); and

transmitting, from the BS, the DL preemption indication information based on the specific RNTI through a multicast signal (see paragraphs 21, 22, 87: in common search space, control channel; paragraph 24: sent to all terminals).

Lyu as applied above is not explicit as to, but Islam teaches the DL preemption indication information indicating preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received (see paragraphs 85, 125: indication refers to the preceding DL transmission).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to provide for post-notification as in Islam when implementing the method of Lyu. The

motivation would be to conserve bandwidth by only providing the notification when it has been determined to be needed.

The references as applied above are not explicit as to, but Agiwal teaches a specific radio network temporary identifier (RNTI), wherein the specific RNTI is a newly defined RNTI other than at least a cell-RNTI (C-RNTI) (see paragraph 110, Figure 10: special RNTI for indicating colliding resources).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to use the special RNTI as in Agiwal when implementing the method of Lyu and Islam. One of ordinary skill would have been able to use a known indicator in a known manner with the reasonably predictable result of providing for necessary notification.

The references as applied above are not explicit as to, but Mochizuki teaches that it is known to notify a UE of an RNTI through UE-specific RRC signaling (see paragraph 154, 160, 493, 496).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to use UE-specific RRC signaling as in Mochizuki when notifying the UE of the specific RNTI of Lyu and Agiwal. One of ordinary skill would have been able to do so with the reasonably predictable result of providing a known identifier in a known manner.

For Claims 4, 9, and 14, Lyu teaches the method, wherein the DL preemption indication information is received through a common search space of the DL control channel (see paragraphs 21, 22: common search space).

Claims 2, 7, and 12 is/are rejected under 35 U.S.C. 103 as being unpatentable over Lyu et al. (US 2019/0200235), Islam et al. (US 2018/0070341), Agiwal et al. (US 2018/0035332), and Mochizuki et al. (US 2019/0021085) as applied to claims 1, 6, and 11 above, and further in view of Yi et al. (US 2019/0116007).

For Claims 2, 7, and 12, while Lyu does suggest flexible subcarrier spacing and TTIs (see paragraph 4), and the use of URLLC and eMBB services (see paragraph 56), the references as applied above are not explicit as to, but Yi teaches that it is known for URLLC and eMBB services of respectively different UEs to use respectively different subcarrier spacing (see Figure 16, paragraph 157).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed that the resources provided in Lyu are those wherein at least one of a subcarrier spacing and a time-domain scheduling unit of first radio resources allocated for the first UE are different from second radio resources allocated for a second UE. One of ordinary skill would have been able to use such configurations with the reasonably predictable result of providing known services in a known manner.

Claims 21-26 is/are rejected under 35 U.S.C. 103 as being unpatentable over Lyu et al. (US 2019/0200235), Islam et al. (US 2018/0070341), Agiwal et al. (US 2018/0035332), and Mochizuki et al. (US 2019/0021085) as applied to claims 1, 6, and 11 above, and further in view of Lo (US 2018/0020441).

For Claims 21, 23, and 25, the references as applied above are not explicit as to, but Lo teaches the method, wherein the specific RNTI is received with time and frequency information (see paragraphs 33-35: configuration information includes RNTI, slot index, and bandwidth information).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to provide known information such as slot index and frequency resource information when providing the RNTI, as shown in Lo, when providing the specific RNTI as in Lyu, Islam, Agiwal, and Mochizuki. One of ordinary skill would have been able to do so with the reasonably predictable result of providing known configuration information in a known manner.

For Claims 22, 24, and 26, the references as applied above are not explicit as to, but Lo teaches the method wherein the time and frequency information comprises frequency resource information and

slot index information (see paragraphs 33-35: configuration information includes RNTI, slot index, and bandwidth information).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to provide known information such as slot index and frequency resource information when providing the RNTI, as shown in Lo, when providing the specific RNTI as in Lyu, Islam, Agiwal, and Mochizuki. One of ordinary skill would have been able to do so with the reasonably predictable result of providing known configuration information in a known manner.

Response to Arguments

The amendment filed 21 September 2021 has been entered.

Previous rejections under 35 USC 112 are withdrawn in light of the amendments to the claims.

Applicant's arguments with respect to rejections over prior art have been fully considered, but are either not persuasive or moot in view of the new grounds of rejection introduced herein. The claims remain rejected under 35 USC 103.

As regards teachings of Agiwal, the cited portions of Agiwal do specifically teach a special RNTI for encoding the PDCCH. Lyu teaches an RNTI for encoding a PDCCH for conveying DL preemption information. Using known means of encoding and conveying known information is within the routine skill in the art and would not involve hindsight reasoning.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Chen et al. (US 2012/0176957) teaches that it is known to provide an RNTI by dedicated RRC signaling (see paragraphs 44, 68). Pan et al. (US 2020/0037297) teaches that an RNTI may be calculated

based on slot index and frequency index information. Stern-Berkowitz et al. (US 2014/0086112) teaches that an RNTI may be configured by RRC signaling.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CASSANDRA L DECKER whose telephone number is (571)270-3946. The examiner can normally be reached 7:30 am - 4:00 pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Faruk Hamza can be reached on 571-272-7969. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/CASSANDRA L DECKER/
Examiner, Art Unit 2466
10/8/2021

/FARUK HAMZA/
Supervisory Patent Examiner, Art Unit 2466

Notice of References Cited	Application/Control No. 16/349,874	Applicant(s)/Patent Under Reexamination PARK et al.	
	Examiner CASSANDRA L DECKER	Art Unit 2466	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20180020441-A1	01-2018	Lo; Titus	H04W72/044	1/1
*	B	US-20120176957-A1	07-2012	Chen; Si	H04B7/155	370/315
*	C	US-20190021085-A1	01-2019	MOCHIZUKI; Mitsuru	H04W72/0446	1/1
*	D	US-20200037297-A1	01-2020	Pan; Kyle Jung-Lin	H04W56/001	1/1
*	E	US-20140086112-A1	03-2014	Stern-Berkowitz; Janet A.	H04L1/1822	370/280
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	**Art Unit**
	CASSANDRA L DECKER	2466

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/23/2020	02/10/2021	05/03/2021	10/08/2021					
	1	✓	✓	✓	✓					
	2	✓	✓	✓	✓					
	3	✓	✓	✓	-					
	4	✓	✓	✓	✓					
	5	✓	✓	✓	-					
	6	✓	✓	✓	✓					
	7	✓	✓	✓	✓					
	8	✓	✓	✓	-					
	9	✓	✓	✓	✓					
	10	✓	✓	✓	-					
	11	✓	✓	✓	✓					
	12	✓	✓	✓	✓					
	13	✓	✓	✓	-					
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	21				✓					
	22				✓					
	23				✓					
	24				✓					
	25				✓					
	26				✓					

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	16/349,874	PARK et al.
	Examiner	Art Unit
	CASSANDRA L DECKER	2466

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
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Search Notes		
Search Notes	**Date**	**Examiner**
inventorship	07/21/2020 (updated 2/10/2021, 4/30/2021, 10/7/2021)	Decker
text-limited CPC: H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007	07/23/2020 (updated 2/10/2021, 4/30/2021, 10/7/2021)	Decker
text-limiting terms: uess, dci, pdcch, superpose, pre-empt, puncture, indicate, configure, rrc	07/23/2020	Decker
free text: uess, dci, pdcch, superpose, pre-empt, puncture, indicate, configure, rrc, signaling, downlink, multicast, embb, urllc, subcarier spacing	07/23/2020	Decker
search terms: rnti, scramble, crc, dci, superpose, overlap	02/10/2021	Decker
search terms: rnti, dl, prior, precede, prempt, puncture, overlap, indicate, notify, subsequent	4/30/2021	Decker
search terms: rnti, rrc, slot index, frequency, receive, specific, preempt, puncture	10/7/2021	Decker
see SEARCH printout for search history		

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L2	16	"349874".ap.	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/21 09:37 AM
L6	21	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/07/21 11:00 AM
L7	98179	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/21 01:44 PM
L8	8	("20060007880"|"20080068979"|"20100208689"|"20130272243"|"20160037517"|"20160113008"|"20160218849"|"20190090239").PN.	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/07/21 01:49 PM
L9	32	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (signal$4 or configur$5) with (downlink or dl) with multicast$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 09:28 AM
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L11	98179	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:29 AM

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		H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")					
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L13	2155	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (inform$3 or indicat$3 or configur$5) with (downlink or dl) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:33 AM
L14	1116	L11 and L13	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:33 AM
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L16	236	L11 and L15	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:36 AM
L17	22	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (ue specific) with (rrc or radio resource control) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:44 PM
L18	739	(downlink or dl) with (ue specific) with (rrc or radio resource control) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:49 PM
L19	502	L11 and L18	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:49 PM
L20	269	(downlink or dl) with (ue specific) with (rrc or	(US-PGPUB; USPAT; EPO; JPO;	ADJ	ON	ON	2020/07/22 02:50 PM

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		radio resource control) with signal$4 with configur$5 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	DERWENT; IBM_TDB)				
L21	207	L11 and L20	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:50 PM
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L23	749	L11 and L22	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:51 PM
L24	585	(ue specific) adj (rrc or radio resource control) adj signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:51 PM
L25	413	L11 and L24	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:52 PM
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L27	1059	(ue specific search space or uess or uss) with dci with pdcch and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:12 AM
L28	98220	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:13 AM

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		@prad<"20161116")					
L29	875	L27 and L28	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:13 AM
L30	0	(ue specific search space or uess or uss) with dci with pdcch with punctur$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:13 AM
L31	0	(ue specific search space or uess or uss) with dci with pdcch with urllc and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:14 AM
L32	35	(ue specific search space or uess or uss) with dci with pdcch with (superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:14 AM
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L35	41	(ue specific search space or uess or uss) with dci with pdcch and (embb or urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:17 AM
L36	0	(ue specific search space or uess or uss) with (control channel or pdcch) same (embb or urllc) and (@ad<"20161116" or	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:27 AM

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		@rlad<"20161116" or @prad<"20161116")					
L37	2	(ue specific search space or uess or uss) same (embb or urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:27 AM
L38	1059	(ue specific search space or uess or uss) with dci with pdcch and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:32 AM
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L42	17	(ue specific search space or uess or uss) with pdcch same (punctur$3 or preempt$3 or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:36 AM
L43	112	(ue specific search space or uess or uss) with dci with pdcch with indicat$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:40 AM
L44	53	(subcarrier with spac$3)	(US-PGPUB; USPAT;	ADJ	ON	ON	2020/07/23

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		with (embb) with (urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	EPO; JPO; DERWENT; IBM_TDB)				11:47 AM
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L46	23	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2021/02/10 08:22 AM
L47	4367	(rnti WITH crc WITH dci) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:24 AM
L48	3062	28 AND 47	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:25 AM
L49	79	(rnti WITH crc WITH dci) SAME (superpos$5 OR overlap$4) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:26 AM
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L51	104585	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:38 AM
L52	1680	50 AND 51	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:39 AM
L53	24	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2021/04/30 08:04 AM
L54	67	(rnti WITH (downlink	(US-PGPUB; USPAT;	ADJ	ON	ON	2021/04/30

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		OR dl) WITH (preempt$3 OR overlap$4 OR punctur$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	EPO; JPO; DERWENT; IBM_TDB)				08:06 AM
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L56	1580	(rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR later)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:32 AM
L57	883	51 AND 56	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:32 AM
L58	1582	(rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR later OR post)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:32 AM
L59	883	51 AND 58	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:33 AM
L60	568	(notif$4 OR notification OR indicat$3) WITH (rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR later OR post)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:33 AM
L61	338	51 AND 60	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:34 AM
L62	4	(notif$4 OR notification OR indicat$3) WITH (rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:05 AM

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Nokia of America Corp., et al. v. KT Corporation, et al.
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		later OR post)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					
L63	9	(notif$4 OR notification OR indicat$3) WITH (rnti WITH (downlink OR dl) SAME (subsequent$2 OR following OR after OR later OR post)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:05 AM
L64	18	(notif$4 OR notification OR indicat$3) SAME (rnti WITH (downlink OR dl) SAME (subsequent$2 OR following OR after OR later OR post)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:06 AM
L65	0	(notif$4 OR notification OR indicat$3) SAME (rnti WITH (downlink OR dl) SAME (prior OR preced$3 OR already)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:08 AM
L66	19	(rnti WITH (downlink OR dl) SAME (prior OR preced$3 OR already)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:08 AM

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000435

		@prad<"20161116")					
L67	51	(rnti SAME (prior OR preced$3 OR already)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:11 AM
L68	19953	(notif$4 OR notification OR indicat$3) SAME (prior OR preced$3 OR already) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:24 AM
L69	2456	(notif$4 OR notification OR indicat$3) WITH (prior OR preced$3 OR already) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:24 AM
L70	76	51 AND 69	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:24 AM
L71	2	"20190268130"	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 01:53 PM
L72	2	"20190268930"	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 01:54 PM
L73	285	(notif$4 OR notification OR indicat$3) SAME (rnti) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:32 PM
L74	150	(notif$4 OR notification OR indicat$3) SAME ((user specific OR ue) WITH rnti) SAME (punctur$3 OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:32 PM

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000436

		overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					
L75	22	(notif$4 OR notification OR indicat$3) WITH ((user specific OR ue) WITH rnti) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:33 PM
L76	5	(notif$4 OR notification OR indicat$3) WITH ((new$2 OR novel) WITH rnti) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:49 PM
L77	25	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2021/10/07 12:44 PM
L78	108172	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 12:44 PM
L79	17	(rnti) WITH rrc WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 12:49 PM
L80	15	(rnti) WITH rrc SAME (punctur$3 OR overlap$4 OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 12:53 PM

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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		preempt$3 OR pre empt$3) WITH pdcch AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					
L81	88	(rnti) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) WITH pdcch AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 12:56 PM
L82	491	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:05 PM
L83	241	78 AND 82	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:05 PM
L84	6	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:45 PM
L85	8	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND ((dl OR downlink) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) WITH pdcch) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:46 PM
L86	27	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND ((dl OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:47 PM

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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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		downlink) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					
L87	194	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:49 PM
L88	18	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) WITH rnti) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:52 PM
L89	1	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) SAME slot index SAME frequency AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:39 PM
L90	1	(rnti) WITH (rrc) WITH (specific OR dedicated OR unicast$3) SAME slot index SAME frequency AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:40 PM
L91	1	(rnti) WITH (rrc) WITH (receiv$3 OR reception) SAME slot index SAME frequency AND (@ad<"20161116" OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:40 PM

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		@rlad<"20161116" OR @prad<"20161116")					
L92	1	(rnti) WITH (receiv$3 OR reception) SAME slot index SAME frequency AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:41 PM
L93	28	(rnti) SAME slot index SAME frequency AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:44 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	16/349,874	Filing Date	2019-05-14	Docket Number (if applicable)	KT21-0111	Art Unit	2466
First Named Inventor	Kyujin PARK			Examiner Name	DECKER, CASSANDRA L		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 602040

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

PTO/SB/30EFS (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/Daniel J. Chung/	Date (YYYY-MM-DD)	2021-12-08
Name	Daniel J. Chung	Registration Number	57889

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000443

Electronic Patent Application Fee Transmittal

Application Number:	16349874
Filing Date:	14-May-2019
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Filer:	Daniel Chung/judy Kim
Attorney Docket Number:	KT21-0111

Filed as Large Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	1820	1	2000	2000
		Total in USD ($)		**2000**

Electronic Acknowledgement Receipt

EFS ID:	44460058
Application Number:	16349874
International Application Number:	
Confirmation Number:	1053
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	126667
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	KT21-0111
Receipt Date:	08-DEC-2021
Filing Date:	14-MAY-2019
Time Stamp:	06:11:03
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$2000
RAM confirmation Number	E2021B8711361946
Deposit Account	602040
Authorized User	judy Kim

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

37 CFR 1.492 (National application filing, search, and examination fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		KT21-0111_Response_FOA.pdf	96144 6a0c4bb40c6476ad8357f4009accee29d4daeaae	yes	13

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment Submitted/Entered with Filing of CPA/RCE	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	13

Warnings:					
Information:					
2	Request for Continued Examination (RCE)	KT21-0111_sb0030efs.pdf	1349957 064d4fd2a1b37a3e34e917563bea239a66f901c1	no	3
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	38233 c6b2f4b12af17e4a7eab3fd9fc2933d33e8ffd59	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1484334		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Attorney Docket No.: KT21-0111

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Kyujin PARK et al.	Examiner: DECKER, CASSANDRA L
Application No.:	16/349,874	Group Art Unit: 2466
Filing Date:	05-14-2019	Confirmation No.: 1053
For:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK	

Via Mail Stop RCE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT UNDER 37 C.F.R. 1.114

In response to the Final Office Action dated October 20, 2021, please consider the following:

Amendments to the Claims begin on page 2.

Remarks begin on page 7.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A method of receiving a downlink (DL) signal by a first user equipment (UE), the method comprising:

receiving, by the first UE, a specific radio network temporary identifier (RNTI) for DL preemption indication information through a UE-specific radio resource control (RRC) signaling;

after receiving the specific RNTI, monitoring, by the first UE, a DL control channel for receiving the DL preemption indication information based on the received specific RNTI; and

receiving, by the first UE, the DL preemption indication information through a multicast signal,

wherein the specific RNTI received through the UE specific RRC signaling is a newly defined RNTI other than at least a cell-RNTI (C-RNTI), ~~and~~

wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received,

wherein the specific RNTI is received with information related to time and frequency, and

wherein the information related to time and frequency is received for the reception of the DL preemption indication information.

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2. (Previously Presented) The method according to claim 1, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of first radio resources allocated for the first UE are different from second radio resources allocated for a second UE.

3. (Canceled)

4. (Previously Presented) The method according to claim 1, wherein the DL preemption indication information is received through a common search space of the DL control channel.

5. (Canceled)

6. (Currently Amended) A method of transmitting a downlink (DL) signal by a base station (BS), the method comprising:

configuring, by the BS, a specific radio network temporary identifier (RNTI) for DL preemption indication information;

transmitting, from the BS, the configured specific RNTI to a first user equipment (UE) through a UE-specific radio resource control (RRC) signaling; and

transmitting, from the BS, the DL preemption indication information based on the specific RNTI through a multicast signal,

wherein the specific RNTI transmitted through the UE specific RRC signaling is a newly defined RNTI other than at least a cell-RNTI (C-RNTI), ~~and~~

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wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is transmitted,

wherein the specific RNTI is transmitted with information related to time and frequency, and

wherein the information related to time and frequency is transmitted for a reception of the DL preemption indication information by the first UE.

7. (Previously Presented) The method according to claim 6, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of first radio resources allocated for the first UE are different from second radio resources allocated for a second UE.

8. (Canceled)

9. (Previously Presented) The method according to claim 6, wherein the DL preemption indication information is transmitted through a common search space of the DL control channel.

10. (Canceled)

11. (Currently Amended) A user equipment (UE) for receiving a downlink (DL) signal, the UE comprising:

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a receiver configured to receive a specific radio network temporary identifier (RNTI) for DL preemption indication information through a UE-specific radio resource control (RRC) signaling;

after reception of the specific RNTI, a controller configured to monitor a DL control channel for receiving the DL preemption indication information based on the received specific RNTI,

wherein the receiver further configured to receive the DL preemption indication information through a multicast signal,

wherein the specific RNTI received through the UE specific RRC signaling is a newly defined RNTI other than at least a cell-RNTI (C-RNTI), ~~and~~

wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received,

wherein the specific RNTI is received with information related to time and frequency, and

wherein the information related to time and frequency is received for the reception of the DL preemption indication information.

12. (Previously Presented) The UE according to claim 11, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of first radio resources allocated for the UE are different from second radio resources allocated for another UE.

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13. (Canceled)

14. (Currently Amended) The UE according to claim 11, wherein the DL preemption indication information is received through a common search space of the DL control channel.

15-21 (Canceled)

22. (Currently Amended) The method according to claim ~~21~~ 1, wherein the time and frequency information comprises frequency resource information and slot index information.

23. (Canceled)

24. (Currently Amended) The method according to claim ~~23~~ 6, wherein the time and frequency information comprises frequency resource information and slot index information.

25. (Canceled)

26. (Currently Amended) The UE according to claim ~~25~~ 11, wherein the time and frequency information comprises frequency resource information and slot index information.

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REMARKS

Applicant wishes to thank the Examiner for the thoroughness of examination and for the issues pointed out in the Final Office Action. Applicant respectfully requests reconsideration of this application in view of the foregoing amendments and following remarks.

Status of the Claims

Claims 1-2, 4, 6-7, 9, 11-12, 14 and 21-26 are rejected. By this Response, claims 1, 6 and 11 are amended to better define the claimed invention. Claims 21, 23 and 25 are canceled and now included into the independent claims 1, 6 and 11 respectively. Applicant respectfully submits that the amendments are supported throughout the specification as originally filed, and do not add new matter.

Rejection under 35 U.S.C. §103

On pages 2-5 of the Final Office Action, claims 1, 4, 6, 9, 11 and 14 were rejected under 35 U.S.C. sec. 103 as allegedly being unpatentable over Lyu et al. (U.S. Publication No. US 2019/0200235) (hereinafter "*Lyu*") in view of Islam et al. (U.S. Patent Publication No. US 2018/0070341) (hereinafter "*Islam*"), Agiwal et al. (U.S. Patent Publication No. US 2018/0035332) (hereinafter "*Agiwal*") and Mochizuki et al (U.S. Patent Publication No. US 2019/0021085) (hereinafter "*Mochizuki*").

On pages 5-6 of the Final Office Action, claims 2, 7 and 12 were rejected under 35 U.S.C. sec. 103 as allegedly being unpatentable over *Lyu*, *Islam*, *Agiwal* and *Mochizuki*, and further in view of Yi et al. (U.S. Patent Publication No. US 2019/0116007) (hereinafter "*Yi*").

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On pages 6-7 of the Final Office Action, claims 21-26 were rejected under 35 U.S.C. sec. 103 as allegedly being unpatentable over *Lyu*, *Islam*, *Agiwal* and *Mochizuki*, and further in view of Lo (U.S. Patent Publication No. US 2018/0020441) (hereinafter "*Lo*").

In order to further clarify claim 1 and to emphasize certain technical features, claim 1 is herewith amended as follows:

> *1. A method of receiving a downlink (DL) signal by a first user equipment (UE), the method comprising:*
>
> *receiving, by the first UE, a specific radio network temporary identifier (RNTI) for DL preemption indication information through a UE-specific radio resource control (RRC) signaling;*
>
> *after receiving the specific RNTI, monitoring, by the first UE, a DL control channel for receiving the DL preemption indication information based on the received specific RNTI; and*
>
> *receiving, by the first UE, the DL preemption indication information through a multicast signal,*
>
> *wherein the specific RNTI received through the UE specific RRC signaling is a newly defined RNTI other than at least a cell-RNTI (C-RNTI),*
>
> *wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received,*
>
> *wherein the specific RNTI is received with information related to time and frequency, and*
>
> *wherein* ***the information related to time and frequency is received for the reception of the DL preemption indication information****. **(Emphasis added)***

Independent claim 6 is directed to a method of transmitting a downlink (DL) signal by a base station, and the amended claim 6 now includes corresponding limitations as amended claim 1.

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Independent claim 11 is directed to a user equipment (UE) for receiving a downlink (DL) signal, and the amended claim 11 now includes also corresponding limitations as amended claim 1.

Applicant respectfully submits that claim 1 (as amended) is patentable because the cited references, taken alone or in combination, do not disclose or suggest each and every element of the claim. Namely, Applicant respectfully submits that the cited references, taken alone or in any combination, do not disclose or suggest at least the above-emphasized features, in combination with other elements of the claims.

Specifically, Applicant's amended claim 1 now recites the above-underlined features, which are i) "the specific RNTI is received with information related to time and frequency", and ii) "**the information related to time and frequency is received for the reception of the DL preemption indication information**". Applicant respectfully submits that the first feature (i.e., the specific RNTI is received with information related to time and frequency), which is limitation of previous claim 21 that is now canceled, is added to independent claim 1, and the second feature (i.e., the information related to time and frequency is received for the reception of the DL preemption indication information) is added to claim 1 in order to further clarify Applicant's claimed invention.

According to the present invention as claimed, the specific RNTI, and information related to time and frequency are received together. Both the specific RNTI, and information related to

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time and frequency information are used for receiving of the DL preemption indication information.

In contrast to Applicant's claimed invention, *Lyu*, *Islam*, *Agiwal* and *Mochizuki* fail to teach or suggest the aforementioned claimed features as a whole.

In fact, on page 6 of the Final Office Action, the Examiner also admitted that the references (i.e., *Lyu*, *Islam*, *Agiwal* and *Mochizuki*) are not explicit as to teach for claim 21, which is now included in amended claim 1. However, in the outstanding Final Office Action, the Examiner relied on the teaching of *Lo* in order to cover such lack of the references (i.e., *Lyu*, *Islam*, *Agiwal* and *Mochizuki*). In particular, the Examiner asserted that *Lo* teaches the aforementioned features as follows:

> **[0033]** In some embodiments, the configuration information **406** may include at least one of these parameters:
>
> **[0034]** one or more parameters for identifying the serving base station and the initiator (e.g., a cell ID, and/or an Radio Network Temporary Identifier (RNTI));
>
> **[0035]** one or more parameters for a scheduled transmission (e.g., a frame number, a time slot index, a resource block number, an indication of bandwidth for uplink transmission, an indication of normal or extended cyclic prefix, an indication of subcarrier spacing, an indication of a component carrier, an indication of uplink shared channel, and/or an indication of physical uplink control channel (PUCCH) format);

Applicant respectfully submits that the first feature (i.e., the specific RNTI is received with information related to time and frequency) of Applicant's amended claim 1 may be taught by *Lo*. However, the second feature (i.e., the information related to time and frequency is

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received for the reception of the DL preemption indication information) of Applicant's amended claim 1 is still not taught or suggested by *Lo*.

More specifically, the information related to time and frequency of Applicant's amended claim 1 is for a downlink, whereas *Lo* rather relates to an uplink, which is the opposite direction of the downlink. Furthermore, the information related to time and frequency of Applicant's amended claim 1 is relates to downlink preemption. One skilled in the art may consider that *Lo* teaches away from this Applicant's novel feature because *Lo* discloses "one or more parameters for a scheduled transmission", and the term of "preemption" in Applicant's claimed invention means that one or more allocated (i.e., scheduled) resources are preempted. (See the following portion in paragraph [67] of Applicant's specification as originally filed.)

> [67] The term "preemption" in the present disclosure may denote that when traffic for the URLLC occurs, one or more of resources allocated for the eMMB or the mMTC are re-allocated to the URLLC for satisfying a latency requirement for the URLLC. At this time, since the URLLC uses one or more resources originally allocated to an eMBB or an mMTC, it is necessary for the eMBB UE or the mMTC UE to which the one or more resources are originally allocated to receive information for indicating preempted resource. DL preemption means that a DL resource of a UE is preempted.

Accordingly, Applicant respectfully submits that claim 1 is patentable over the cited references because the cited references do not teach or suggest all of the features of the amended claim 1.

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Independent claims 6 and 11 recite features similar to the above-discussed features of claim 1. Therefore, Applicant respectfully submits that independent claims 6 and 11 are patentable over the cited references for at least reasons set forth above with regards to claim 1.

Rejection of claims 21-26 were rejected under 35 U.S.C. sec. 103 as being unpatentable over *Lyu*, *Islam*, *Agiwal*, *Mochizuki*, and further in view of *Lo*

Regarding the rejection of claims 21, 23, and 25, Applicant respectfully submits that these claims are canceled. Therefore, the rejection is moot.

Regarding the rejection of claims 22, 24, and 26, Applicant respectfully submits that these claims are patentable for at least the reasons set forth above due to their respective dependencies.

Conclusion

In view of the present amendment and the above discussion, Applicant respectfully submits that the present application is in condition for allowance, and an early issuance of a Notice of Allowance is respectfully requested.

No additional fees are believed to be necessitated by this response. If any other fees are determined to be due with this filing, the Director is authorized to charge any such fees, or credit any overpayment, to our Deposit Account No. 602040, referencing the Docket No. stated above.

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Respectfully Submitted,

Date: December 8, 2021

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16/349,874	05/14/2019	Kyujin PARK	KT21-0111	1053

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EXAMINER	
DECKER, CASSANDRA L	

ART UNIT	PAPER NUMBER
2466	

NOTIFICATION DATE	DELIVERY MODE
02/11/2022	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

dan@invenstonepat.com
mail@invenstonepat.com

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Office Action Summary	**Application No.** 16/349,874	**Applicant(s)** PARK et al.	
	Examiner CASSANDRA L DECKER	**Art Unit** 2466	**AIA (FITF) Status** Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 8 December 2021.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-2,4,6-7,9,11-12,14,22,24 and 26 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-2,4,6-7,9,11-12,14,22,24 and 26 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

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DETAILED ACTION

This Office action is in response to the RCE filed 8 December 2021. Claims 1, 2, 4, 6, 7, 9, 11, 12, 14, 22, 24, and 26 are pending in this application.

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8 December 2021 has been entered.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1, 4, 6, 9, 11, and 14 is/are rejected under 35 U.S.C. 103 as being unpatentable over Agiwal et al. (US 2018/0035332) in view of Kowalski et al. (US 2019/0281609).

For Claims 1 and 11, Agiwal teaches a method of receiving a downlink (DL) signal by a first user equipment (UE), and a first user equipment (UE), comprising a receiver and a controller (see paragraphs 19, 45, 133), for receiving a downlink (DL) signal, the method comprising:

receiving, by the first UE, a specific radio network temporary identifier (RNTI) for DL preemption indication information through a UE-specific radio resource control (RRC) signaling (see paragraphs 57, 60, 116-117);

after receiving the specific RNTI, monitoring, by the first UE, a DL control channel for receiving the DL preemption indication information based on the received specific RNTI (see paragraphs 116, 117); and

receiving, by the first UE, the DL preemption indication information through a multicast signal (see paragraphs 116: indication for a group of UEs, paragraph 117: group common DCI),

wherein the specific RNTI received through the UE specific RRC signaling is a newly defined RNTI other than at least a cell-RNTI (C-RNTI) (see paragraphs 60, 110, 116, Figure 10),

wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received (see paragraph 118),

wherein the information related to time and frequency is received for the reception of the DL preemption indication information (see paragraphs 60, 117: CORESET information for monitoring for preemption indication).

Though suggested by Agiwal (see paragraphs 60, 110, 117: the skip RNTI is related to the time and frequency information provided), Agiwal as applied above is not explicit as to, but Kowalski teaches the specific RNTI being received with information related to time and frequency (see paragraph 36: new RNTI; paragraphs 40, 66: signaling, configuration of time/frequency resources which may be punctured; paragraphs 68-69: downlink puncturing of eMBB with URLLC transmissions; paragraph 72: flag to indicate puncturing; paragraph 74: UE uses new RNTI to unscramble the URLLC transmissions).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to convey information needed to interpret the downlink signal as in Kowalski when providing

information for receiving a punctured signal as in Agiwal. One of ordinary skill would have been able to do so with the reasonably predictable result of explicitly conveying known information in a known type of signaling with the reasonably predictable result of the UE unscrambling the signal.

For Claim 6, Agiwal teaches a method of transmitting a downlink (DL) signal by a base station (BS), the method comprising:

configuring, by the BS, a specific radio network temporary identifier (RNTI) for DL preemption indication information (see paragraphs 57, 60, 116-117);

transmitting, from the BS, the configured specific RNTI to a first user equipment (UE) through a UE-specific radio resource control (RRC) signaling (see paragraphs 57, 60, 116-117); and

transmitting, from the BS, the DL preemption indication information based on the specific RNTI through a multicast signal (see paragraphs 116: indication for a group of UEs, paragraph 117: group common DCI),

wherein the specific RNTI transmitted through the UE specific RRC signaling is a newly defined RNTI other than at least a cell-RNTI (C-RNTI) (see paragraphs 60, 110, 116, Figure 10),

wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is transmitted (see paragraph 118),

wherein the information related to time and frequency is transmitted for a reception of the DL preemption indication information by the first UE (see paragraphs 60, 116-117: CORESET information for monitoring for preemption indication).

Though suggested by Agiwal (see paragraphs 60, 116-117: the skip RNTI is related to the time and frequency information provided), Agiwal as applied above is not explicit as to, but Kowalski teaches the specific RNTI being received with information related to time and frequency (see paragraph 36: new RNTI; paragraphs 40, 66: signaling, configuration of time/frequency resources which may be punctured;

paragraphs 68-69: downlink puncturing of eMBB with URLLC transmissions; paragraph 72: flag to indicate puncturing; paragraph 74: UE uses new RNTI to unscramble the URLLC transmissions).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to convey information needed to interpret the downlink signal as in Kowalski when providing information for receiving a punctured signal as in Agiwal. One of ordinary skill would have been able to do so with the reasonably predictable result of explicitly conveying known information in a known type of signaling with the reasonably predictable result of the UE unscrambling the signal.

For Claims 4, 9, and 14, Agiwal further teaches the method, wherein the DL preemption indication information is received through a common search space of the DL control channel (see paragraph 60: group common DCI).

Claims 2, 7, and 12 is/are rejected under 35 U.S.C. 103 as being unpatentable over Agiwal et al. (US 2018/0035332) and Kowalski et al. (US 2019/0281609) as applied to claims 1, 6, and 11 above, and further in view of Yi et al. (US 2019/0116007).

For Claims 2, 7, and 12, while Agiwal does teach the use of URLLC and eMBB services (paragraph 110), the references as applied above are not explicit as to, but Yi teaches that it is known for URLLC and eMBB services of respectively different UEs to use respectively different subcarrier spacing (see Figure 16, paragraph 157).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed that the resources provided in Lyu are those wherein at least one of a subcarrier spacing and a time-domain scheduling unit of first radio resources allocated for the first UE are different from second radio resources allocated for a second UE. One of ordinary skill would have been able to use such configurations with the reasonably predictable result of providing known services in a known manner.

Claims 22, 24, and 26 is/are rejected under 35 U.S.C. 103 as being unpatentable over Agiwal et al. (US 2018/0035332) and Kowalski et al. (US 2019/0281609) as applied to claims 1, 6, and 11 above, and further in view of Lo (US 2018/0020441).

For Claims 22, 24, and 26, the references as applied above are not explicit as to, but Lo teaches the method wherein the time and frequency information comprises frequency resource information and slot index information (see paragraphs 33-35: configuration information includes RNTI, slot index, and bandwidth information).

Thus it would have been obvious to one of ordinary skill in the art at the time the application was filed to provide known information such as slot index and frequency resource information when providing the RNTI, as shown in Lo, when providing the specific RNTI as in Agiwal. One of ordinary skill would have been able to do so with the reasonably predictable result of providing known configuration information in a known manner.

Response to Arguments

The amendment filed 8 December 2021 has been entered.

Applicant's arguments with respect to rejections over prior art have been fully considered, but are either not persuasive or moot in view of the new grounds of rejection introduced herein. The claims remain rejected under 35 USC 103.

As regards teachings of Lo, Lo does teach the matter for which Lo is relied upon: that it is known to provide configuration information with specific parameters relating to time and frequency information with an RNTI.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Li et al. (US 2018/0027493) teaches a system in which a signal indicated preemption is scrambled with a special RNTI. Lee et al. (US 2021/0288705) teaches a system in which an RNTI and other information are used to determine punctured time/frequency resources.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CASSANDRA L DECKER whose telephone number is (571)270-3946. The examiner can normally be reached 7:30 am - 4:00 pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Faruk Hamza can be reached on 571-272-7969. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/CASSANDRA L DECKER/
Examiner, Art Unit 2466
1/18/2022

/FARUK HAMZA/
Supervisory Patent Examiner, Art Unit 2466

Notice of References Cited	Application/Control No. 16/349,874	Applicant(s)/Patent Under Reexamination PARK et al.	
	Examiner CASSANDRA L DECKER	Art Unit 2466	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20190281609-A1	09-2019	Kowalski; John Michael	H04W72/1242	1/1
*	B	US-20180027493-A1	01-2018	LI; Xincai	H04W52/0216	370/280
*	C	US-20210288705-A1	09-2021	Lee; Moon-il	H04B7/0626	1/1
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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Nokia of America Corp., et al. v. KT Corporation, et al.
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	Art Unit
	CASSANDRA L DECKER	2466

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	Art Unit
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Search Notes		
Search Notes	**Date**	**Examiner**
inventorship	07/21/2020 (updated 2/10/2021, 4/30/2021, 10/7/2021, 1/14/2022)	Decker
text-limited CPC: H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007	07/23/2020 (updated 2/10/2021, 4/30/2021, 10/7/2021, 1/14/2022)	Decker
text-limiting terms: uess, dci, pdcch, superpose, pre-empt, puncture, indicate, configure, rrc	07/23/2020	Decker
free text: uess, dci, pdcch, superpose, pre-empt, puncture, indicate, configure, rrc, signaling, downlink, multicast, embb, urllc, subcarier spacing	07/23/2020	Decker
search terms: rnti, scramble, crc, dci, superpose, overlap	02/10/2021	Decker
search terms: rnti, dl, prior, precede, prempt, puncture, overlap, indicate, notify, subsequent	4/30/2021	Decker
search terms: rnti, rrc, slot index, frequency, receive, specific, preempt, puncture	10/7/2021	Decker
search terms: rnti, subcarrier, frequency, duration slot index, offset, receive, puncture, preemption, specific, special, coreset, downlink, skip	01/18/2022	Decker
see SEARCH printout for search history		

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant						☐ CPA	☐ T.D.		☐ R.1.47	
CLAIM		DATE								
Final	Original	07/23/2020	02/10/2021	05/03/2021	10/08/2021	01/18/2022				
	1	✓	✓	✓	✓	✓				
	2	✓	✓	✓	✓	✓				
	3	✓	✓	✓	-	-				
	4	✓	✓	✓	✓	✓				
	5	✓	✓	✓	-	-				
	6	✓	✓	✓	✓	✓				
	7	✓	✓	✓	✓	✓				
	8	✓	✓	✓	-	-				
	9	✓	✓	✓	✓	✓				
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	11	✓	✓	✓	✓	✓				
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	22				✓	✓				
	23				✓	-				
	24				✓	✓				
	25				✓	-				
	26				✓	✓				

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L2	16	"349874".ap.	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/21 09:37 AM
L6	21	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/07/21 11:00 AM
L7	98179	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/21 01:44 PM
L8	8	("20060007880"|"20080068979"|"20100208689"|"20130272243"|"20160037517"|"20160113008"|"20160218849"|"20190090239").PN.	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/07/21 01:49 PM
L9	32	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (signal$4 or configur$5) with (downlink or dl) with multicast$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 09:28 AM
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L11	98179	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:29 AM

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		H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")					
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L13	2155	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (inform$3 or indicat$3 or configur$5) with (downlink or dl) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:33 AM
L14	1116	L11 and L13	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:33 AM
L15	364	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (inform$3 or indicat$3 or configur$5) with (rrc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:36 AM
L16	236	L11 and L15	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:36 AM
L17	22	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (ue specific) with (rrc or radio resource control) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:44 PM
L18	739	(downlink or dl) with (ue specific) with (rrc or radio resource control) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:49 PM
L19	502	L11 and L18	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:49 PM
L20	269	(downlink or dl) with (ue specific) with (rrc or	(US-PGPUB; USPAT; EPO; JPO;	ADJ	ON	ON	2020/07/22 02:50 PM

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		radio resource control) with signal$4 with configur$5 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	DERWENT; IBM_TDB)				
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L23	749	L11 and L22	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:51 PM
L24	585	(ue specific) adj (rrc or radio resource control) adj signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:51 PM
L25	413	L11 and L24	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:52 PM
L26	6	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (ue specific) adj (rrc or radio resource control) adj signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:52 PM
L27	1059	(ue specific search space or uess or uss) with dci with pdcch and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:12 AM
L28	98220	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:13 AM

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		@prad<"20161116")					
L29	875	L27 and L28	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:13 AM
L30	0	(ue specific search space or uess or uss) with dci with pdcch with punctur$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:13 AM
L31	0	(ue specific search space or uess or uss) with dci with pdcch with urllc and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:14 AM
L32	35	(ue specific search space or uess or uss) with dci with pdcch with (superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:14 AM
L33	7	(ue specific search space or uess or uss) with pdcch with punctur$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:16 AM
L34	0	(ue specific search space or uess or uss) with dci with pdcch same (embb or urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:17 AM
L35	41	(ue specific search space or uess or uss) with dci with pdcch and (embb or urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:17 AM
L36	0	(ue specific search space or uess or uss) with (control channel or pdcch) same (embb or urllc) and (@ad<"20161116" or	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:27 AM

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		@rlad<"20161116" or @prad<"20161116")					
L37	2	(ue specific search space or uess or uss) same (embb or urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:27 AM
L38	1059	(ue specific search space or uess or uss) with dci with pdcch and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:32 AM
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L41	0	(ue specific search space or uess or uss) with dci with pdcch same (punctur$3 or preempt$3 or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:35 AM
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L43	112	(ue specific search space or uess or uss) with dci with pdcch with indicat$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:40 AM
L44	53	(subcarrier with spac$3)	(US-PGPUB; USPAT;	ADJ	ON	ON	2020/07/23

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		with (embb) with (urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	EPO; JPO; DERWENT; IBM_TDB)				11:47 AM
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L46	23	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2021/02/10 08:22 AM
L47	4367	(rnti WITH crc WITH dci) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:24 AM
L48	3062	28 AND 47	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:25 AM
L49	79	(rnti WITH crc WITH dci) SAME (superpos$5 OR overlap$4) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:26 AM
L50	2362	(rnti WITH scrambl$3 WITH crc WITH dci) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:38 AM
L51	104585	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:38 AM
L52	1680	50 AND 51	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:39 AM
L53	24	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2021/04/30 08:04 AM
L54	67	(rnti WITH (downlink	(US-PGPUB; USPAT;	ADJ	ON	ON	2021/04/30

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		OR dl) WITH (preempt$3 OR overlap$4 OR punctur$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	EPO; JPO; DERWENT; IBM_TDB)				08:06 AM
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L56	1580	(rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR later)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:32 AM
L57	883	51 AND 56	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:32 AM
L58	1582	(rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR later OR post)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:32 AM
L59	883	51 AND 58	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:33 AM
L60	568	(notif$4 OR notification OR indicat$3) WITH (rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR later OR post)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:33 AM
L61	338	51 AND 60	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:34 AM
L62	4	(notif$4 OR notification OR indicat$3) WITH (rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:05 AM

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		later OR post)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					
L63	9	(notif$4 OR notification OR indicat$3) WITH (rnti WITH (downlink OR dl) SAME (subsequent$2 OR following OR after OR later OR post)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:05 AM
L64	18	(notif$4 OR notification OR indicat$3) SAME (rnti WITH (downlink OR dl) SAME (subsequent$2 OR following OR after OR later OR post)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:06 AM
L65	0	(notif$4 OR notification OR indicat$3) SAME (rnti WITH (downlink OR dl) SAME (prior OR preced$3 OR already)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:08 AM
L66	19	(rnti WITH (downlink OR dl) SAME (prior OR preced$3 OR already)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:08 AM

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		@prad<"20161116")					
L67	51	(rnti SAME (prior OR preced$3 OR already)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:11 AM
L68	19953	(notif$4 OR notification OR indicat$3) SAME (prior OR preced$3 OR already) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:24 AM
L69	2456	(notif$4 OR notification OR indicat$3) WITH (prior OR preced$3 OR already) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:24 AM
L70	76	51 AND 69	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:24 AM
L71	2	"20190268130"	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 01:53 PM
L72	2	"20190268930"	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 01:54 PM
L73	285	(notif$4 OR notification OR indicat$3) SAME (rnti) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:32 PM
L74	150	(notif$4 OR notification OR indicat$3) SAME ((user specific OR ue) WITH rnti) SAME (punctur$3 OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:32 PM

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		overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					
L75	22	(notif$4 OR notification OR indicat$3) WITH ((user specific OR ue) WITH rnti) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:33 PM
L76	5	(notif$4 OR notification OR indicat$3) WITH ((new$2 OR novel) WITH rnti) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:49 PM
L77	25	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2021/10/07 12:44 PM
L78	108172	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 12:44 PM
L79	17	(rnti) WITH rrc WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 12:49 PM
L80	15	(rnti) WITH rrc SAME (punctur$3 OR overlap$4 OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 12:53 PM

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		preempt$3 OR pre empt$3) WITH pdcch AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					
L81	88	(rnti) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) WITH pdcch AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 12:56 PM
L82	491	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:05 PM
L83	241	78 AND 82	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:05 PM
L84	6	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:45 PM
L85	8	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND ((dl OR downlink) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) WITH pdcch) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:46 PM
L86	27	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND ((dl OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:47 PM

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		downlink) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					
L87	194	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:49 PM
L88	18	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) WITH rnti) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:52 PM
L89	1	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) SAME slot index SAME frequency AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:39 PM
L90	1	(rnti) WITH (rrc) WITH (specific OR dedicated OR unicast$3) SAME slot index SAME frequency AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:40 PM
L91	1	(rnti) WITH (rrc) WITH (receiv$3 OR reception) SAME slot index SAME frequency AND (@ad<"20161116" OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:40 PM

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		@rlad<"20161116" OR @prad<"20161116")					
L92	1	(rnti) WITH (receiv$3 OR reception) SAME slot index SAME frequency AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:41 PM
L93	28	(rnti) SAME slot index SAME frequency AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:44 PM
L94	5	(rnti) SAME (slot index OR frequency OR duration OR subcarrer spac$3) SAME (preemption OR pre-emption) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/13 02:53 PM
L95	217	(rnti) SAME (slot index OR frequency OR duration OR subcarrer spac$3) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/13 02:56 PM
L96	7	"20180083758"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 07:57 AM
L97	25	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2022/01/14 11:55 AM
L98	499	(rnti) WITH (specific OR dedicated OR	(US-PGPUB; USPAT; EPO; JPO;	ADJ	ON	ON	2022/01/14 11:57 AM

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		unicast$3) SAME ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	DERWENT; IBM_TDB)				
L99	109026	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 11:57 AM
L100	425	99 AND 98	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 11:57 AM
L101	50	(rnti) WITH (specific OR dedicated OR unicast$3) SAME ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3)) SAME (frequency OR duration OR slot index OR subcarrier) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 12:00 PM
L102	494	(rnti) WITH (skip$4 OR specific OR dedicated) SAME ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 01:58 PM
L103	48	(rnti) WITH (skip$4 OR specific OR dedicated) SAME ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) SAME (frequency OR subcarrier OR sub carrier)) AND (@ad<"20161116" OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 01:59 PM

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		@rlad<"20161116" OR @prad<"20161116")					
L104	3546	(rnti) WITH (skip$4 OR specific OR dedicated) SAME (frequency OR subcarrier OR sub carrier) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:48 PM
L105	2200	(rnti) WITH (skip$4 OR specific OR dedicated) WITH (frequency OR subcarrier OR sub carrier) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:48 PM
L106	843	(rnti) WITH (skip$4 OR specific OR dedicated) WITH (frequency OR subcarrier OR sub carrier OR ofdm) WITH (dl OR downlink) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:48 PM
L107	459	99 AND 106	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:48 PM
L108	35	((rnti) near3(skip$4 OR specific OR dedicated)) WITH (frequency OR subcarrier OR sub carrier OR ofdm) WITH (dl OR downlink) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:50 PM
L109	52	((rnti) near3(skip$4 OR specific OR dedicated)) WITH (frequency OR subcarrier OR sub carrier OR ofdm OR duration OR offset) WITH (dl OR downlink) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:54 PM
L110	1	((rnti) near3(skip$4 OR specific OR dedicated)) WITH (coreset) WITH (dl OR downlink) AND (@ad<"20161116" OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:56 PM

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		@rlad<"20161116" OR @prad<"20161116")					
L111	1	((rnti)) WITH (coreset) WITH (dl OR downlink) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:56 PM
L112	3	((rnti)) WITH (coreset) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:57 PM
L113	1375	((rnti)) WITH (subcarrier OR sub carrier OR frequency OR duration OR slot index OR offset) WITH (receiv$3 OR reception) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 03:01 PM
L114	170	((rnti)) WITH (subcarrier OR sub carrier OR frequency OR duration OR slot index OR offset) WITH (receiv$3 OR reception) AND (preemption OR punctur$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 03:02 PM
L115	0	((rnti) WITH (subcarrier OR sub carrier OR frequency OR duration OR slot index OR offset)) SAME ((receiv$3 OR reception) WITH (preemption OR punctur$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/18 06:55 AM
L116	116	((rnti) WITH (subcarrier OR sub carrier OR frequency OR duration OR slot index OR offset)) AND ((receiv$3 OR reception) WITH (preemption OR punctur$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/18 06:55 AM

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		@prad<"20161116")					

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

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Attorney Docket No.: KT21-0111

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Kyujin PARK et al.	Examiner: DECKER, CASSANDRA L
Application No.:	16/349,874	Group Art Unit: 2466
Filing Date:	05-14-2019	Confirmation No.: 1053
For:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK	

Mail Stop Amendment

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT UNDER 37 C.F.R. 1.111

In response to the Office Action dated February 11, 2022, please consider the following:

Amendments to the Claims begin on page 2.

Remarks begin on page 7.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) A method of receiving a downlink (DL) signal by a first user equipment (UE), the method comprising:

receiving, by the first UE, a specific radio network temporary identifier (RNTI) for DL preemption indication information through a UE-specific radio resource control (RRC) signaling;

after receiving the specific RNTI, monitoring, by the first UE, a DL control channel for receiving the DL preemption indication information based on the received specific RNTI; and

receiving, by the first UE, the DL preemption indication information through a multicast signal,

wherein the specific RNTI received through the UE specific RRC signaling is a newly defined RNTI other than at least a cell-RNTI (C-RNTI),

wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received,

wherein the specific RNTI is received with information related to time and frequency, and

wherein the information related to time and frequency is received for the reception of the DL preemption indication information through the UE-specific RRC signaling.

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2. (Previously Presented) The method according to claim 1, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of first radio resources allocated for the first UE are different from second radio resources allocated for a second UE.

3. (Canceled)

4. (Previously Presented) The method according to claim 1, wherein the DL preemption indication information is received through a common search space of the DL control channel.

5. (Canceled)

6. (Currently Amended) A method of transmitting a downlink (DL) signal by a base station (BS), the method comprising:

configuring, by the BS, a specific radio network temporary identifier (RNTI) for DL preemption indication information;

transmitting, from the BS, the configured specific RNTI to a first user equipment (UE) through a UE-specific radio resource control (RRC) signaling; and

transmitting, from the BS, the DL preemption indication information based on the specific RNTI through a multicast signal,

wherein the specific RNTI transmitted through the UE specific RRC signaling is a newly defined RNTI other than at least a cell-RNTI (C-RNTI),

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wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is transmitted,

wherein the specific RNTI is transmitted with information related to time and frequency, and

wherein the information related to time and frequency is transmitted for a reception of the DL preemption indication information by the first UE through the UE-specific RRC signaling.

7. (Previously Presented) The method according to claim 6, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of first radio resources allocated for the first UE are different from second radio resources allocated for a second UE.

8. (Canceled)

9. (Previously Presented) The method according to claim 6, wherein the DL preemption indication information is transmitted through a common search space of the DL control channel.

10. (Canceled)

11. (Currently Amended) A user equipment (UE) for receiving a downlink (DL) signal, the UE comprising:

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a receiver configured to receive a specific radio network temporary identifier (RNTI) for DL preemption indication information through a UE-specific radio resource control (RRC) signaling;

after reception of the specific RNTI, a controller configured to monitor a DL control channel for receiving the DL preemption indication information based on the received specific RNTI,

wherein the receiver further configured to receive the DL preemption indication information through a multicast signal,

wherein the specific RNTI received through the UE specific RRC signaling is a newly defined RNTI other than at least a cell-RNTI (C-RNTI),

wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received,

wherein the specific RNTI is received with information related to time and frequency, and

wherein the information related to time and frequency is received for the reception of the DL preemption indication information through the UE-specific RRC signaling.

12. (Previously Presented) The UE according to claim 11, wherein at least one of a subcarrier spacing and a time-domain scheduling unit of first radio resources allocated for the UE are different from second radio resources allocated for another UE.

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13. (Canceled)

14. (Previously Presented) The UE according to claim 11, wherein the DL preemption indication information is received through a common search space of the DL control channel.

15-21 (Canceled)

22. (Previously Presented) The method according to claim 1, wherein the time and frequency information comprises frequency resource information and slot index information.

23. (Canceled)

24. (Previously Presented) The method according to claim 6, wherein the time and frequency information comprises frequency resource information and slot index information.

25. (Canceled)

26. (Previously Presented) The UE according to claim 11, wherein the time and frequency information comprises frequency resource information and slot index information.

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REMARKS

Applicant wishes to thank the Examiner for the thoroughness of examination and for the issues pointed out in the Office Action. Applicant respectfully requests reconsideration of this application in view of the foregoing amendments and following remarks.

Status of the Claims

Claims 1-2, 4, 6-7, 9, 11-12, 14, 22, 24 and 26 are rejected. By this Response, claims 1, 6 and 11 are amended to better define the claimed invention. Applicant respectfully submits that the amendments are supported throughout the specification as originally filed, and do not add new matter.

Rejection under 35 U.S.C. §103

On pages 2-5 of the Office Action, claims 1, 4, 6, 9, 11 and 14 were rejected under 35 U.S.C. sec. 103 as allegedly being unpatentable over Agiwal et al. (U.S. Patent Publication No. US 2018/0035332) (hereinafter "*Agiwal*") and Kowalski et al (U.S. Patent Publication No. US 2019/0281609) (hereinafter "*Kowalski*").

On page 5 of the Office Action, claims 2, 7 and 12 were rejected under 35 U.S.C. sec. 103 as allegedly being unpatentable over *Agiwal* and *Kowalski*, and further in view of Yi et al. (U.S. Patent Publication No. US 2019/0116007) (hereinafter "*Yi*").

On pages 6 of the Office Action, claims 22, 24 and 26 were rejected under 35 U.S.C. sec. 103 as allegedly being unpatentable over *Agiwal*, *Kowalski*, and further in view of Lo (U.S. Patent Publication No. US 2018/0020441) (hereinafter "*Lo*").

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In order to further clarify claim 1 and to emphasize certain technical features, claim 1 is herewith amended as follows:

> *1. A method of receiving a downlink (DL) signal by a first user equipment (UE), the method comprising:*
>
> ***receiving, by the first UE, a specific radio network temporary identifier (RNTI) for DL preemption indication information through a UE-specific radio resource control (RRC) signaling;***
>
> *after receiving the specific RNTI, monitoring, by the first UE, a DL control channel for receiving the DL preemption indication information based on the received specific RNTI; and*
>
> ***receiving, by the first UE, the DL preemption indication information through a multicast signal,***
>
> *wherein the specific RNTI received through the UE specific RRC signaling is a newly defined RNTI other than at least a cell-RNTI (C-RNTI),*
>
> ***wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received,***
>
> *wherein the specific RNTI is received with information related to time and frequency, and*
>
> ***wherein the information related to time and frequency is received for the reception of the DL preemption indication information through the UE specific RRC signaling. (Emphasis is added)***

Independent claim 6 is directed to a method of transmitting a downlink (DL) signal by a base station, and the amended claim 6 now includes corresponding limitations as amended claim 1.

Independent claim 11 is directed to a user equipment (UE) for receiving a downlink (DL) signal, and the amended claim 11 now includes also corresponding limitations as amended claim 1.

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Applicant respectfully submits that claim 1 (as amended) is patentable because the cited references, taken alone or in combination, do not disclose or suggest each and every element of the claim. Namely, Applicant respectfully submits that the cited references, taken alone or in any combination, do not disclose or suggest at least the above-emphasized features, in combination with other elements of the claims.

Applicant's amended claim 1 now recites the above-emphasized features, which are i) "**receiving**, by the first UE, **a specific radio network temporary identifier (RNTI)** for DL preemption indication information **through a UE-specific radio resource control (RRC) signaling**", ii) "**receiving**, by the first UE, **the DL preemption indication information through a multicast signal**", iii) "wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received", and iv) "wherein the information related to time and frequency is received for the reception of the DL preemption indication information **through the UE specific RRC signaling**".

Firstly, with respect to the features i) "**receiving** ... **a specific radio network temporary identifier (RNTI)** ... **through a UE-specific radio resource control (RRC) signaling**", and ii) "**receiving** ... **the DL preemption indication information through a multicast signal**" of Applicant's claim 1, it appears that *Agiwal* somewhat teaches about an indication (e.g., skipping indication or pre-emption indication) being addressed by a certain RNTI (e.g., skip-RNTI). However, Applicant strongly believes that the teaching of *Agiwal* merely corresponds to the

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feature ii) of Applicant's claim 1. As such, Applicant's claimed feature i) "**receiving** ... **a specific radio network temporary identifier (RNTI)** ... **through a UE-specific radio resource control (RRC) signaling**" is still cannot be found or cannot be possibly deduced from the teaching of *Agiwal*. Furthermore, with respect to "**through a multicast signal**" of feature ii) of Applicant' claim 1, it appears that *Agiwal* may teach a use of an indication for a group of UEs and a group common DCI in paragraphs [0116] and [0117]. However, Applicant wishes to point out that *Agiwal* cannot claim priority to the filing date of the provisional application No. 62/368,369 with regarding to paragraphs [0116] and [0117] because the '369 provisional application does not support the above feature. At least for this reason, Applicant strongly believes that the feature of "… through a multicast signal" still cannot be found or cannot be possible deduced from the teaching of *Agiwal*.

Secondly, with respect to the feature iii) "wherein the DL preemption indication information indicates preempted resource information in a prior slot, which precedes a slot in which the DL preemption indication information is received" of Applicant's claim 1, it appears that paragraph [0118] and FIG. 12 of *Agiwal* can be considered as most relevant portion. However, Applicant wishes to point out that *Agiwal* cannot claim priority to the filing date of the provisional application No. 62/368,369 with respect to paragraphs [0118] and FIG. 12 as the '369 provisional application does not support this feature as well.

Lastly, with respect to feature iv) "wherein the information related to time and frequency is received for the reception of the DL preemption indication information" of applicant's claimed

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invention, on page 3 of outstanding Office Action, the Examiner admitted that *Agiwal* is not explicit as to teach for the feature iv) of Applicant's claim 1. However, in the outstanding Office Action, the Examiner relied on the teaching of *Kowalski* in order to cover such lack of *Agiwal*.

In order to further differentiate over the prior art, Applicant's novel feature of "… through the UE specific RRC signaling" has been further incorporated into independent claim 1. That is, according to the present invention (as amended herewith), the information related to time and frequency is transmitted through the UE specific RRC singling. And, this applicant's novel feature still cannot be possibly deduced from both *Agiwal* and *Kowalski*.

Accordingly, Applicant respectfully submits that claim 1 is patentable over the cited references because the cited references do not teach or suggest all of the features of the amended claim 1.

Independent claims 6 and 11 recite features corresponding to the above-discussed features of claim 1. Therefore, Applicant respectfully submits that independent claims 6 and 11 are patentable over the cited references for at least reasons set forth above with regards to claim 1.

Regarding the rejections of claims 4, 9, and 14, it appears that *Agiwal* somewhat disclose about a use of a group common DCI in paragraphs [0060] (and [0117]). However, Applicant wishes to point out that *Agiwal* cannot claim priority to the filing date of the provisional application No. 62/368,369 with respect to paragraphs [0060] (and [0117]) because the '369

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provisional application does not support the group common DCI. Moreover, Applicant respectfully submits that these claims are patentable for at least the reasons set forth above due to their respective dependencies.

Rejection of claims 2, 7 and 12 were rejected under 35 U.S.C. sec. 103 as being unpatentable over *Agiwal* and *Kowalski*, and further in view of *Yi*

Regarding the rejection of claims 2, 7 and 12, Applicant respectfully submits that these claims are patentable for at least the reasons set forth above due to their respective dependencies.

Rejection of claims 22, 24 and 26 were rejected under 35 U.S.C. sec. 103 as being unpatentable over *Agiwal* and *Kowalski*, and further in view of *Lo*

Regarding the rejection of claims 22, 24 and 26, Applicant respectfully submits that these claims are patentable for at least the reasons set forth above due to their respective dependencies.

Conclusion

In view of the present amendment and the above discussion, Applicant respectfully submits that the present application is in condition for allowance, and an early issuance of a Notice of Allowance is respectfully requested.

No additional fees are believed to be necessitated by this response. If any other fees are determined to be due with this filing, the Director is authorized to charge any such fees, or credit any overpayment, to our Deposit Account No. 602040, referencing the Docket No. stated above.

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Respectfully Submitted,

Date: May 2, 2022

By /Daniel J. Chung/
Daniel J. Chung
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Electronic Acknowledgement Receipt

EFS ID:	45606746
Application Number:	16349874
International Application Number:	
Confirmation Number:	1053
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	126667
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	KT21-0111
Receipt Date:	02-MAY-2022
Filing Date:	14-MAY-2019
Time Stamp:	09:26:42
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		KT21-0111_Response_5thOA.pdf	71983 17fe0d9a8a53cd405fc9112d09260039dbb4a801	yes	13

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Request for Reconsideration-After Non-Final Rejection	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	13
Warnings:			
Information:			
	Total Files Size (in bytes):	71983	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/349,874	Filing Date 05/14/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	05/02/2022	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 12	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/DANTE SMITH/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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NOTICE OF ALLOWANCE AND FEE(S) DUE

126667 7590 06/02/2022

INVENSTONE PATENT, LLC
14291-A Brushwood way
Centreville, VA 20121

EXAMINER
DECKER, CASSANDRA L

ART UNIT	PAPER NUMBER
2466	

DATE MAILED: 06/02/2022

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/349,874	05/14/2019	Kyujin PARK	KT21-0111	1053

TITLE OF INVENTION: METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	09/02/2022

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

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Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000508

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

126667 7590 06/02/2022
INVENSTONE PATENT, LLC
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Centreville, VA 20121

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/349,874	05/14/2019	Kyujin PARK	KT21-0111	1053

TITLE OF INVENTION: METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	09/02/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
DECKER, CASSANDRA L	2466	370-329000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1_____
2_____
3_____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required) ❑Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000509

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/349,874	05/14/2019	Kyujin PARK	KT21-0111	1053

126667 7590 06/02/2022

INVENSTONE PATENT, LLC
14291-A Brushwood way
Centreville, VA 20121

EXAMINER
DECKER, CASSANDRA L

ART UNIT	PAPER NUMBER
2466	

DATE MAILED: 06/02/2022

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

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Nokia of America Corp., et al. v. KT Corporation, et al.
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OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/349,874	Applicant(s) PARK et al.	
	Examiner CASSANDRA L DECKER	Art Unit 2466	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to the amendment filed 2 May 2022.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are See Continuation Sheet . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☑ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☑ All b) ☐ Some* c) ☐ None of the:

   1. ☑ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/CASSANDRA L DECKER/ Examiner, Art Unit 2466	/FARUK HAMZA/ Supervisory Patent Examiner, Art Unit 2466

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000512

Continuation of 3. The allowed claim(s) is/are: 1-2,4,6-7,9,11-12,14,22,24 and 26

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	Art Unit
	CASSANDRA L DECKER	2466

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

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Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	Art Unit
	CASSANDRA L DECKER	2466

Search Notes		
Search Notes	**Date**	**Examiner**
inventorship	07/21/2020 (updated 2/10/2021, 4/30/2021, 10/7/2021, 1/14/2022, 5/19/2022)	Decker
text-limited CPC: H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007	07/23/2020 (updated 2/10/2021, 4/30/2021, 10/7/2021, 1/14/2022)	Decker
text-limiting terms: uess, dci, pdcch, superpose, pre-empt, puncture, indicate, configure, rrc	07/23/2020	Decker
free text: uess, dci, pdcch, superpose, pre-empt, puncture, indicate, configure, rrc, signaling, downlink, multicast, embb, urllc, subcarier spacing	07/23/2020	Decker
search terms: rnti, scramble, crc, dci, superpose, overlap	02/10/2021	Decker
search terms: rnti, dl, prior, precede, prempt, puncture, overlap, indicate, notify, subsequent	4/30/2021	Decker
search terms: rnti, rrc, slot index, frequency, receive, specific, preempt, puncture	10/7/2021	Decker
search terms: rnti, subcarrier, frequency, duration slot index, offset, receive, puncture, preemption, specific, special, coreset, downlink, skip	01/18/2022	Decker
online searches: see attached printouts	05/20/2022	Decker
text-limited CPC: H04W72/1257 OR H04L5/0094 OR H04W24/08 OR H04W72/042 OR H04W72/1273 OR H04W76/27 OR H04W72/1289 OR H04L5/0007 OR H04L5/0044 OR H04L5/005	05/23/2022	Decker
search terms: rrc, rnti, receive, previous, prior, preemption, puncture, pdcch	05/23/2022	Decker
see SEARCH printout for search history		

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Nokia of America Corp., et al. v. KT Corporation, et al.
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	Art Unit
	CASSANDRA L DECKER	2466

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	see interference search printout	05/23/2022	Decker

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	**Art Unit**
	CASSANDRA L DECKER	2466

CPC							
Symbol						**Type**	**Version**
H04W	/	72	/	1257		F	2013-01-01
H04W	/	72	/	042		I	2013-01-01
H04W	/	76	/	27		I	2018-02-01
H04L	/	5	/	0094		I	2013-01-01
H04W	/	24	/	08		I	2013-01-01
H04W	/	72	/	1273		I	2013-01-01
H04L	/	5	/	0044		I	2013-01-01
H04L	/	5	/	0007		I	2013-01-01
H04L	/	5	/	0053		I	2013-01-01
H04W	/	72	/	1289		A	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

/CASSANDRA L DECKER/ Examiner, Art Unit 2466	23 May 2022	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	12	
/FARUK HAMZA/ Supervisory Patent Examiner, Art Unit 2466	24 May 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office — Part of Paper No.: 20220523

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	**Art Unit**
	CASSANDRA L DECKER	2466

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04W	/	72	/	12
H04L	/	5	/	00
H04W	/	24	/	08
H04W	/	72	/	04
H04W	/	76	/	27
	/		/	

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

/CASSANDRA L DECKER/ Examiner, Art Unit 2466	23 May 2022	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	12	
/FARUK HAMZA/ Supervisory Patent Examiner, Art Unit 2466	24 May 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/349,874	PARK et al.
	Examiner	**Art Unit**
	CASSANDRA L DECKER	2466

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1		10		19										
2	2	9	11		20										
	3	10	12		21										
3	4		13	4	22										
	5	11	14		23										
5	6		15	8	24										
6	7		16		25										
	8		17	12	26										
7	9		18												

/CASSANDRA L DECKER/ Examiner, Art Unit 2466	23 May 2022	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	12	
/FARUK HAMZA/ Supervisory Patent Examiner, Art Unit 2466	24 May 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office — Part of Paper No.: 20220523

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L2	16	"349874".ap.	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/21 09:37 AM
L6	21	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/07/21 11:00 AM
L7	98179	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/21 01:44 PM
L8	8	("20060007880"|"20080068979"|"20100208689"|"20130272243"|"20160037517"|"20160113008"|"20160218849"|"20190090239").PN.	(US-PGPUB; USPAT)	ADJ	ON	ON	2020/07/21 01:49 PM
L9	32	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (signal$4 or configur$5) with (downlink or dl) with multicast$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 09:28 AM
L10	4472	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (signal$4 or configur$5) with (downlink or dl) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:29 AM
L11	98179	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:29 AM

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Nokia of America Corp., et al. v. KT Corporation, et al.
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		H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")					
L12	1756	L10 and L11	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:29 AM
L13	2155	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (inform$3 or indicat$3 or configur$5) with (downlink or dl) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:33 AM
L14	1116	L11 and L13	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:33 AM
L15	364	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (inform$3 or indicat$3 or configur$5) with (rrc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:36 AM
L16	236	L11 and L15	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 10:36 AM
L17	22	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (ue specific) with (rrc or radio resource control) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:44 PM
L18	739	(downlink or dl) with (ue specific) with (rrc or radio resource control) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:49 PM
L19	502	L11 and L18	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:49 PM
L20	269	(downlink or dl) with (ue specific) with (rrc or	(US-PGPUB; USPAT; EPO; JPO;	ADJ	ON	ON	2020/07/22 02:50 PM

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		radio resource control) with signal$4 with configur$5 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	DERWENT; IBM_TDB)				
L21	207	L11 and L20	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:50 PM
L22	1154	(ue specific) near3 (rrc or radio resource control) near3 signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:51 PM
L23	749	L11 and L22	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:51 PM
L24	585	(ue specific) adj (rrc or radio resource control) adj signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:51 PM
L25	413	L11 and L24	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:52 PM
L26	6	(superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) with (ue specific) adj (rrc or radio resource control) adj signal$4 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/22 02:52 PM
L27	1059	(ue specific search space or uess or uss) with dci with pdcch and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:12 AM
L28	98220	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:13 AM

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Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
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		@prad<"20161116")					
L29	875	L27 and L28	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:13 AM
L30	0	(ue specific search space or uess or uss) with dci with pdcch with punctur$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:13 AM
L31	0	(ue specific search space or uess or uss) with dci with pdcch with urllc and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:14 AM
L32	35	(ue specific search space or uess or uss) with dci with pdcch with (superpos$3 or overlap$4 or punctur$3 or preempt$3 or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:14 AM
L33	7	(ue specific search space or uess or uss) with pdcch with punctur$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:16 AM
L34	0	(ue specific search space or uess or uss) with dci with pdcch same (embb or urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:17 AM
L35	41	(ue specific search space or uess or uss) with dci with pdcch and (embb or urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:17 AM
L36	0	(ue specific search space or uess or uss) with (control channel or pdcch) same (embb or urllc) and (@ad<"20161116" or	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:27 AM

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		@rlad<"20161116" or @prad<"20161116")					
L37	2	(ue specific search space or uess or uss) same (embb or urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:27 AM
L38	1059	(ue specific search space or uess or uss) with dci with pdcch and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:32 AM
L39	2	(ue specific search space or uess or uss) with dci with pdcch with dynamic and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:33 AM
L40	0	(ue specific search space or uess or uss) with dci with pdcch with (punctur$3 or preempt$3 or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:35 AM
L41	0	(ue specific search space or uess or uss) with dci with pdcch same (punctur$3 or preempt$3 or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:35 AM
L42	17	(ue specific search space or uess or uss) with pdcch same (punctur$3 or preempt$3 or pre empt$3) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:36 AM
L43	112	(ue specific search space or uess or uss) with dci with pdcch with indicat$3 and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 10:40 AM
L44	53	(subcarrier with spac$3)	(US-PGPUB; USPAT;	ADJ	ON	ON	2020/07/23

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		with (embb) with (urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	EPO; JPO; DERWENT; IBM_TDB)				11:47 AM
L45	19	(subcarrier with spac$3) with differ$4 with (embb) with (urllc) and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2020/07/23 11:47 AM
L46	23	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2021/02/10 08:22 AM
L47	4367	(rnti WITH crc WITH dci) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:24 AM
L48	3062	28 AND 47	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:25 AM
L49	79	(rnti WITH crc WITH dci) SAME (superpos$5 OR overlap$4) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:26 AM
L50	2362	(rnti WITH scrambl$3 WITH crc WITH dci) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:38 AM
L51	104585	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:38 AM
L52	1680	50 AND 51	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/02/10 08:39 AM
L53	24	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2021/04/30 08:04 AM
L54	67	(rnti WITH (downlink	(US-PGPUB; USPAT;	ADJ	ON	ON	2021/04/30

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		OR dl) WITH (preempt$3 OR overlap$4 OR punctur$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	EPO; JPO; DERWENT; IBM_TDB)				08:06 AM
L55	131	(rnti WITH (downlink OR dl) WITH (prior OR preced$3 OR already)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:19 AM
L56	1580	(rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR later)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:32 AM
L57	883	51 AND 56	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:32 AM
L58	1582	(rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR later OR post)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:32 AM
L59	883	51 AND 58	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:33 AM
L60	568	(notif$4 OR notification OR indicat$3) WITH (rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR later OR post)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:33 AM
L61	338	51 AND 60	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 09:34 AM
L62	4	(notif$4 OR notification OR indicat$3) WITH (rnti WITH (downlink OR dl) WITH (subsequent$2 OR following OR after OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:05 AM

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		later OR post)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					
L63	9	(notif$4 OR notification OR indicat$3) WITH (rnti WITH (downlink OR dl) SAME (subsequent$2 OR following OR after OR later OR post)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:05 AM
L64	18	(notif$4 OR notification OR indicat$3) SAME (rnti WITH (downlink OR dl) SAME (subsequent$2 OR following OR after OR later OR post)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:06 AM
L65	0	(notif$4 OR notification OR indicat$3) SAME (rnti WITH (downlink OR dl) SAME (prior OR preced$3 OR already)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:08 AM
L66	19	(rnti WITH (downlink OR dl) SAME (prior OR preced$3 OR already)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:08 AM

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		@prad<"20161116")					
L67	51	(rnti SAME (prior OR preced$3 OR already)) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:11 AM
L68	19953	(notif$4 OR notification OR indicat$3) SAME (prior OR preced$3 OR already) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:24 AM
L69	2456	(notif$4 OR notification OR indicat$3) WITH (prior OR preced$3 OR already) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:24 AM
L70	76	51 AND 69	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 10:24 AM
L71	2	"20190268130"	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 01:53 PM
L72	2	"20190268930"	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 01:54 PM
L73	285	(notif$4 OR notification OR indicat$3) SAME (rnti) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:32 PM
L74	150	(notif$4 OR notification OR indicat$3) SAME ((user specific OR ue) WITH rnti) SAME (punctur$3 OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:32 PM

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		overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					
L75	22	(notif$4 OR notification OR indicat$3) WITH ((user specific OR ue) WITH rnti) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:33 PM
L76	5	(notif$4 OR notification OR indicat$3) WITH ((new$2 OR novel) WITH rnti) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/04/30 02:49 PM
L77	25	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2021/10/07 12:44 PM
L78	108172	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 12:44 PM
L79	17	(rnti) WITH rrc WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 12:49 PM
L80	15	(rnti) WITH rrc SAME (punctur$3 OR overlap$4 OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 12:53 PM

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		preempt$3 OR pre empt$3) WITH pdcch AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					
L81	88	(rnti) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) WITH pdcch AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 12:56 PM
L82	491	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:05 PM
L83	241	78 AND 82	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:05 PM
L84	6	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:45 PM
L85	8	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND ((dl OR downlink) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) WITH pdcch) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:46 PM
L86	27	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND ((dl OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:47 PM

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		downlink) WITH (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					
L87	194	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:49 PM
L88	18	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) AND ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) WITH rnti) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 01:52 PM
L89	1	(rnti) WITH (rrc) WITH (receiv$3 OR reception) WITH (specific OR dedicated OR unicast$3) SAME slot index SAME frequency AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:39 PM
L90	1	(rnti) WITH (rrc) WITH (specific OR dedicated OR unicast$3) SAME slot index SAME frequency AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:40 PM
L91	1	(rnti) WITH (rrc) WITH (receiv$3 OR reception) SAME slot index SAME frequency AND (@ad<"20161116" OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:40 PM

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		@rlad<"20161116" OR @prad<"20161116")					
L92	1	(rnti) WITH (receiv$3 OR reception) SAME slot index SAME frequency AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:41 PM
L93	28	(rnti) SAME slot index SAME frequency AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2021/10/07 02:44 PM
L94	5	(rnti) SAME (slot index OR frequency OR duration OR subcarrer spac$3) SAME (preemption OR pre-emption) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/13 02:53 PM
L95	217	(rnti) SAME (slot index OR frequency OR duration OR subcarrer spac$3) SAME (punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/13 02:56 PM
L96	7	"20180083758"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/14 07:57 AM
L97	25	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2022/01/14 11:55 AM
L98	499	(rnti) WITH (specific OR dedicated OR	(US-PGPUB; USPAT; EPO; JPO;	ADJ	ON	ON	2022/01/14 11:57 AM

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		unicast$3) SAME ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	DERWENT; IBM_TDB)				
L99	109026	(H04W72/1257 or H04W72/1273 or H04W72/042 or H04W76/27 or H04L5/0094 or H04W24/08 or H04W72/1289 or H04L5/0053 or H04L5/0044 or H04L5/0007).cpc. and (@ad<"20161116" or @rlad<"20161116" or @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 11:57 AM
L100	425	99 AND 98	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 11:57 AM
L101	50	(rnti) WITH (specific OR dedicated OR unicast$3) SAME ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3)) SAME (frequency OR duration OR slot index OR subcarrier) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 12:00 PM
L102	494	(rnti) WITH (skip$4 OR specific OR dedicated) SAME ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 01:58 PM
L103	48	(rnti) WITH (skip$4 OR specific OR dedicated) SAME ((punctur$3 OR overlap$4 OR preempt$3 OR pre empt$3) SAME (frequency OR subcarrier OR sub carrier)) AND (@ad<"20161116" OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 01:59 PM

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		@rlad<"20161116" OR @prad<"20161116")					
L104	3546	(rnti) WITH (skip$4 OR specific OR dedicated) SAME (frequency OR subcarrier OR sub carrier) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:48 PM
L105	2200	(rnti) WITH (skip$4 OR specific OR dedicated) WITH (frequency OR subcarrier OR sub carrier) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:48 PM
L106	843	(rnti) WITH (skip$4 OR specific OR dedicated) WITH (frequency OR subcarrier OR sub carrier OR ofdm) WITH (dl OR downlink) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:48 PM
L107	459	99 AND 106	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:48 PM
L108	35	((rnti) near3(skip$4 OR specific OR dedicated)) WITH (frequency OR subcarrier OR sub carrier OR ofdm) WITH (dl OR downlink) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:50 PM
L109	52	((rnti) near3(skip$4 OR specific OR dedicated)) WITH (frequency OR subcarrier OR sub carrier OR ofdm OR duration OR offset) WITH (dl OR downlink) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:54 PM
L110	1	((rnti) near3(skip$4 OR specific OR dedicated)) WITH (coreset) WITH (dl OR downlink) AND (@ad<"20161116" OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:56 PM

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		@rlad<"20161116" OR @prad<"20161116")					
L111	1	((rnti)) WITH (coreset) WITH (dl OR downlink) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:56 PM
L112	3	((rnti)) WITH (coreset) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 02:57 PM
L113	1375	((rnti)) WITH (subcarrier OR sub carrier OR frequency OR duration OR slot index OR offset) WITH (receiv$3 OR reception) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 03:01 PM
L114	170	((rnti)) WITH (subcarrier OR sub carrier OR frequency OR duration OR slot index OR offset) WITH (receiv$3 OR reception) AND (preemption OR punctur$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/14 03:02 PM
L115	0	((rnti) WITH (subcarrier OR sub carrier OR frequency OR duration OR slot index OR offset)) SAME ((receiv$3 OR reception) WITH (preemption OR punctur$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/18 06:55 AM
L116	116	((rnti) WITH (subcarrier OR sub carrier OR frequency OR duration OR slot index OR offset)) AND ((receiv$3 OR reception) WITH (preemption OR punctur$3)) AND (@ad<"20161116" OR @rlad<"20161116" OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/01/18 06:55 AM

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		@prad<"20161116")					
L117	25	(PARK-Kyujin.in. or CHOI-Woo-jin.in.) and (superpos$5 or overlap$4).clm.	(US-PGPUB; USPAT)	ADJ	ON	ON	2022/05/19 10:51 AM
L118	439343	(H04W72/1257 or H04L5/0094 or H04W24/08 or H04W72/042 or H04W72/1273 or H04W76/27 or H04W72/1289 or H04L5/0007 or H04L5/0044 or H04L5/0053).cpc.	(US-PGPUB; USPAT; USOCR; FIT (EP, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/19 10:52 AM
L119	146361	(H04W72/1257 OR H04L5/0094 OR H04W24/08 OR H04W72/042 OR H04W72/1273 OR H04W76/27 OR H04W72/1289 OR H04L5/0007 OR H04L5/0044 OR H04L5/0053).cpc. AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; FIT (EP, WO); DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/19 10:53 AM
L120	0	((rnti) WITH (receiv$3 OR reception) WITH (preemption OR punctur$3) WITH rrc) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/19 01:35 PM
L121	1504	((rnti) WITH (receiv$3 OR reception) WITH rrc) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/19 01:35 PM
L122	0	(rnti) WITH (receiv$3 OR reception) WITH rrc SAME preempt$3 AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/19 01:36 PM
L123	1099	119 AND 121	(US-PGPUB; USPAT; FIT (EP, WO); DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/19 01:36 PM
L124	115	((rnti) WITH (receiv$3 OR reception) WITH rrc) AND (preempt$3 OR punctur$3) AND	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/19 01:37 PM

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		(@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					
L125	2	"20190281609"	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/19 02:44 PM
L126	2	"20180092104"	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/19 02:45 PM
L127	22	"2018064360"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/05/20 02:26 PM
L128	375	((rnti) WITH rrc) AND (preempt$3 OR punctur$3) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/20 02:28 PM
L129	243	119 AND 128	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/20 02:28 PM
L130	0	((pdcch) WITH (receiv$3 OR reception) WITH (preemption OR punctur$3) WITH (prior OR previous$2 OR earlier)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/23 11:56 AM
L131	8	((pdcch) WITH (preemption OR punctur$3) WITH (prior OR previous$2 OR earlier)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/23 11:59 AM
L132	3	((multicast) WITH (preemption OR punctur$3) WITH (prior OR previous$2 OR	(US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB)	ADJ	ON	ON	2022/05/23 12:00 PM

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		earlier)) AND (@ad<"20161116" OR @rlad<"20161116" OR @prad<"20161116")					

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	379	(rrc AND rnti AND specific).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/05/23 09:50 AM
N2	2	(rrc AND rnti AND specific AND preemption).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/05/23 09:50 AM
N3	8	(rrc AND rnti AND preemption).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/05/23 10:42 AM

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Bibliographic Data

Application No: 16/349,874

Foreign Priority claimed: (•) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [✓] Met After Allowance

Verified and Acknowledged: /CASSANDRA L DECKER/ (Examiner's Signature) C.L.D (Initials)

Title: METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
05/14/2019	370	2466	KT21-0111
RULE			

APPLICANTS

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Kyujin PARK, Seoul, KOREA, REPUBLIC OF

Woo-jin CHOI, Seoul, KOREA, REPUBLIC OF

CONTINUING DATA

This application is a 371 of PCT/KR2017/012992 11/16/2017

FOREIGN APPLICATIONS

KOREA, REPUBLIC OF KR10-2016-0152659 11/16/2016

KOREA, REPUBLIC OF KR10-2017-0151983 11/15/2017

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UNITED STATES

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16349874 05022022 Search History

Report Run Date: 2022-05-19 UTC
Searches: 4
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Search #	Timestamp	Results	Page
1	2022-05-19 17:48 UTC	2	3
2	2022-05-19 17:51 UTC	0	3
3	2022-05-19 17:52 UTC	0	3
4	2022-05-19 17:52 UTC	0	3

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Content: Non-Patent Literature (23)

IEEE Xplore Publications: IEEE Periodicals | IEEE Xplore Publications: IEEE Conferences | IEEE Xplore Publications: IEEE Standards | IEEE Xplore Publications: IEEE Early Access | IEEE Xplore Publications: SMPTE Periodicals | IEEE Xplore Publications: SMPTE Conferences | IEEE Xplore Publications: SMPTE Standards | IEEE Xplore Publications: MIT Press eBooks | IEEE Xplore Publications: Wiley-IEEE eBooks | IEEE Xplore Publications: IBM Periodicals | IEEE Xplore Publications: URSI Periodicals | IEEE Xplore Publications: VDE Conferences | IEEE Xplore Publications: Periodicals from China | IP.com Prior Art Database: The IP.com Journal | IP.com Prior Art Database: Internet Society RFC | IP.com Prior Art Database: IBM TDB Archive | IP.com Prior Art Database: Legacy Journals | IP.com Prior Art Database: Software Patent Institute | OnePetro.org: Periodicals at OnePetro.org | OnePetro.org: Conferences at OnePetro.org | Other Literature: IBM Redbooks | Other Literature: PubMed Central | Other Literature: arXiv.org

1 **2022-05-19 17:48 UTC | 2 results from**

De-Dup: None | **Cut-off:** None | **Sort:** Relevance

Main Concept: Document
US20190274153 Method and apparatus for transmitting and receiving downlink signal in next generation wireless network (view)

Concept Modifiers: None

Filters (2):
Publication Date: To 2016-11-16
Classic Syntax limited to: all=(rnti WITH rrc with specific)

2 **2022-05-19 17:51 UTC | 0 results from**

De-Dup: None | **Cut-off:** None | **Sort:** Relevance

Main Concept: Same as Search 1

Concept Modifiers: None

Filters (2):
Publication Date: To 2016-11-16
Classic Syntax limited to: all=(rnti WITH rrc and preemption)

3 **2022-05-19 17:52 UTC | 0 results from**

De-Dup: None | **Cut-off:** None | **Sort:** Relevance

Main Concept: Same as Search 1

Concept Modifiers: None

Filters (2):
Publication Date: To 2016-11-16
Classic Syntax limited to: all=(rnti WITH rrc and puncture)

4 **2022-05-19 17:52 UTC | 0 results from**

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De-Dup: None | **Cut-off:** None | **Sort:** Relevance

Main Concept: Same as Search 1

Concept Modifiers: None

Filters (2):
Publication Date: To 2016-11-16
Classic Syntax limited to: all=(rnti and rrc and puncture)

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Web Search History

date, time	web site	search string
5/19/2022 2:32:18 PM	Google Scholar	indication information preemption indication information service receiving
5/19/2022 2:32:18 PM	Google Patents	**Keyword Group 1** [indication information] **Keyword Group 2** [preemption indication] **Keyword Group 3** [information] **Keyword Group 4** [service] **Keyword Group 5** [receiving] **Before** Priority Date: priority:20161116
5/19/2022 2:34:23 PM	Google Scholar	(rnti) (preemption) (rrc signaling) (UE specific) (receiving)
5/19/2022 2:34:23 PM	Google Patents	**Keyword Group 1** [(rnti) (preemption) (rrc signaling) (UE specific) (receiving)] **Before** Priority Date: priority:20161116
5/19/2022 2:35:35 PM	Google Scholar	(s-rnti) (preemption) (rrc signaling) (UE specific) (receiving)
5/19/2022 2:35:35 PM	Google Patents	**Keyword Group 1** [(s-rnti) (preemption) (rrc signaling) (UE specific) (receiving)] **Before** Priority Date: priority:20161116
5/19/2022 2:36:01 PM	Google Scholar	("s-rnti") (preemption) (rrc signaling) (UE specific) (receiving)
5/19/2022 2:36:01 PM	Google Patents	**Keyword Group 1** [("s-rnti") (preemption) (rrc signaling) (UE specific) (receiving)] **Before** Priority Date: priority:20161116
5/19/2022 2:36:32 PM	Google Scholar	(skip rnti) (preemption) (rrc signaling) (UE specific) (receiving)

date, time	web site	search string
5/19/2022 2:36:32 PM	Google Patents	Keyword Group 1 [(skip rnti) (preemption) (rrc signaling) (UE specific) (receiving)] Before Priority Date: priority:20161116
5/19/2022 2:37:13 PM	Google Scholar	(skip rnti) (preemption or puncturing) (rrc signaling) (UE specific) (receiving)
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5/19/2022 2:40:22 PM	Google Patents	Keyword Group 1 [(urllc)(rnti) (preemption or puncturing) (rrc signaling) (UE specific) (receiving)] Before Priority Date: priority:20161116
5/19/2022 2:41:16 PM	Google Scholar	(rmbb)(urllc)(rnti) (preemption or puncturing) (rrc) (UE specific)
5/19/2022 2:41:16 PM	Google Patents	Keyword Group 1 [(rmbb)(urllc)(rnti) (preemption or puncturing) (rrc) (UE specific)] Before Priority Date: priority:20161116
5/19/2022 2:42:59 PM	Google Scholar	(embb)(urllc)(rnti) (preemption or puncturing) (rrc) (UE specific)
5/19/2022 2:46:25 PM	Google Patents	Keyword Group 1 [(embb)(urllc)(rnti) (preemption or puncturing) (rrc) (UE specific)] Before Priority Date: priority:20161116

Patents (embb)(urllc)(rnti) (preemption or puncturing) (rrc

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Flexible slot architecture for low latency communication

WO EP US CN JP BR · US10205581B2 · Toufiqul Islam · Huawei Technologies Co , Ltd

Priority 2016-09-22 • Filed 2017-09-19 • Granted 2019-02-12 • Published 2019-02-12

381 , 383 . FDM provides the flexibility to schedule **eMBB** (more generally latency tolerant UEs) and **URLLC** (more generally low latency UEs) together in shared resources. In FIG. 10 , an example is shown where two regions are identified: **eMBB** only region and coexistence region. Large packets of **eMBB** ...

Flow-based processing in wireless systems

WO EP US JP · EP3863358A1 · Ghyslain Pelletier · IDAC Holdings, Inc.

Priority 2016-05-12 • Filed 2017-05-12 • Published 2021-08-11

A WTRU may perform duplication of data across different TrCHs (for example of possibly the same type but using different carriers, frequency, transmission methods and/or the like) to reach a certain reliability level (e.g., for a **URLLC** service). A WTRU may associate different priorities and/or ...

Method and apparatus for handling collisions in next-generation communication ...

WO EP US CN KR · KR1020364058B1 · 아닐 에기왈 · 삼성전자 주식회사

Priority 2016-07-29 • Filed 2017-07-26 • Granted 2022-02-17 • Published 2022-02-17

A method performed by a terminal of a wireless communication system, comprising: Receiving, from a base station, information on a pre-emption-related radio network temporary identifier (**RNTI**) dedicated for monitoring a pre-emption indication in a physical downlink control channel (PDCCH);

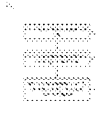
Grant-free access method for **urllc** service

US · US20180092104A1 · Jia Sheng · Sharp Laboratories Of America, Inc.

Priority 2016-09-28 • Filed 2017-09-27 • Published 2018-03-29

transmit or receive an enhanced mobile broadband (**eMBB**) transmission that uses a same time/frequency and/or spatial resources as an ultra-reliable low latency communication (**URLLC**) transmission, wherein the **eMBB** transmission uses a grant-free access based on a signature associated with the grant- ...

User equipment and base stations that transceive ultra reliable low latency ...

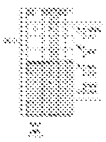


WO EP US CN · US20190281609A1 · John Michael Kowalski · Sharp Kabushiki Kaisha

Priority 2016-07-21 • Filed 2019-05-17 • Published 2019-09-12

A user equipment (UE) is described. The UE includes a processor and memory in electronic communication with the processor. Instructions stored in the memory are executable to transmit or receive an ultra-reliable low latency communication (**URLLC**) transmission that overrides a downlink (DL) ...

System and method for multiplexing traffic



WO EP US CN JP BR · US11071136B2 · Toufiqul Islam · Huawei Technologies Co., Ltd.

Priority 2016-08-25 • Filed 2017-06-30 • Granted 2021-07-20 • Published 2021-07-20

wherein the one or more processors further execute the instructions to monitor the second indicator. 17. The first apparatus of claim 15 , wherein the first indicator is signaled via Radio Resource Control (**RRC**) signaling. 18. The first apparatus of claim 15 , wherein the second indicator is received ...

Coexistence of grant-based uplink transmission and unlicensed uplink ...

WO EP CN · CN109565578B · 阿瑟贡尔·伊斯兰 · 华为技术有限公司

Priority 2016-07-29 • Filed 2017-06-30 • Granted 2021-03-30 • Published 2021-03-30
In another example, HARQ feedback for DL **URLLC** traffic (as part of UL control information) may also trigger preemption of resources from delay tolerant UL traffic in the data region (i.e., PUSCH) or in a designated control region (i.e., PUCCH). The base station may signal to the delay tolerant UEs ...

Coexistence of Grant-Based and Grant-Free Uplink Transmissions in a Channel

~~US~~ • US20180035459A1 • Toufiqul Islam • Huawei Technologies Co., Ltd.
Priority 2016-07-29 • Filed 2017-09-06 • Published 2018-02-01
823 in the downlink subframe 802 . The control channel 823 may be a **UE-specific** or group-specific control channel. The time frequency resources where 823 is located may or may not be shared with other control channel and/or downlink data transmissions. The indication sent over the control channel ...

Base station assisted outer code usage

~~WO US~~ • US20180041858A1 • Jia Sheng • Sharp Laboratories Of America, Inc.
Priority 2016-08-08 • Filed 2017-08-04 • Published 2018-02-08
wherein the UE receives, from the eNB when a **URLLC** message is to be transmitted, a DCI format with one or more fields indicating a modulation and coding scheme (MCS) that are updated with a new inner coding rate. 8 . The UE of claim 6 , wherein the UE receives, from the eNB when a **URLLC** message is to ...

Data reception method and device, and data transmission method and device

WO US • US10849265B2 • Hyangsun You • Lg Electronics Inc
Priority 2016-07-01 • Filed 2017-07-03 • Granted 2020-11-24 • Published 2020-11-24
If data (e.g., **URLLC** data) in which latency is regarded as an important factor and data (e.g., **eMBB** data) in which latency is regarded as a relatively less important factor are multiplexed into the same frequency resource of the same cell and then transmitted, transmission of the former data may ...

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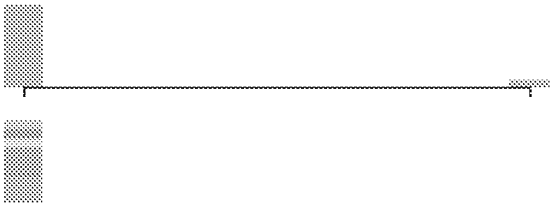

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Sharp Laboratories Of America, Inc.		23%
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삼성전자 주식회사		7.6%
Lg Electronics Inc.		7.6%

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Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000548

Patents (indication information) (preemption indication) (inf

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Method, device and user equipment for indicating **service** interruption of ...

WO EP US CN · WO2012155408A1 · 许静 · 中兴通讯股份有限公司

Priority 2011-05-17 · Filed 2011-08-31 · Published 2012-11-22

The MCE sends the **indication information** of the Pre-emption to the MME. After **receiving** the Pre-emption indication, the MME sends an MBMS **service** ... The MCE in the network side sends the resource **preemption indication information** to the MME. After **receiving** the resource **preemption indication**, the ...

Method and apparatus for handling collisions in next-generation communication ...

WO EP US CN KR · KR102364058B1 · 아닐 에기월 · 삼성전자 주식회사

Priority 2016-07-29 · Filed 2017-07-26 · Granted 2022-02-17 · Published 2022-02-17

Indication information The purpose of the indication is, for example, when resources are allocated to the UE for URLLC **service**, some UEs (eg, that a ... **receiving**, from the base station, the **preemption indication** in the PDCCH by monitoring the PDCCH based on the preemption-related RNTI, and **Receiving** ...

Device-to-device(d2d) pre-emption and access control

WO EP US CN JP KR AU BR CA IL MX RU SG · KR102213905B1 · 마리안 루들프 · 인터디지털 패튼 홀딩스, 인크

Priority 2014-08-06 · Filed 2015-08-06 · Granted 2021-02-10 · Published 2021-02-10

And determining whether to transmit the **preemption indication** according to any of the **received** configuration **information** and an indication from a ... D2D **service** access classes may be associated with stored configuration **information** that may establish different types of allowed D2D **services** in D2D ...

Method and apparatus for transmitting data or control **information** in wireless ...

US CN · US11121846B2 · Jingxing FU · Samsung Electronics Co., Ltd.

Priority 2016-07-18 · Filed 2017-07-18 · Granted 2021-09-14 · Published 2021-09-14

may perform control to **receive** allocation **information** for a first resource for a first **service**, **receive** a signal of the first **service** through the first resource, **receive indication information** relating to a second resource for a second **service**, which occupies at least a part of an area indicated by ...

Data transmission method and device, base station and user equipment

WO EP US CN · WO2016119530A1 · 李新彬 · 中兴通讯股份有限公司

Priority 2015-01-30 · Filed 2015-12-10 · Published 2016-08-04

... one of the following **information**, the UE that sends the pre-scheduling signaling: a scheduling request SR, a buffer status report BSR, a **service** of ... After **receiving** the resource **indication information**, the UE performs uplink data transmission according to the timing relationship of N+4, where N is ...

Distributed scheduling for device-to-device communication

WO EP US CN JP KR CA SG TW · KR102058563B1 · 쭝 마리니에르 · 인터디지털 패튼 홀딩스, 인크

Priority 2013-08-07 · Filed 2014-08-06 · Granted 2019-12-24 · Published 2019-12-24

... used for encoding and interleaving some uplink control **information** (eg, HARQ acknowledgment / negative acknowledgment (A / N) and rank **indication**). ... / **receive** unit (WTRU). The method of claim 1, Transmitting the D2D data to the second WTRU comprises transmitting data mapped to a D2D **service**.

Evolved multimedia broadcast multicast **service** on enhanced component carriers

WO EP US CN JP KR • US10368336B2 • Xiaoxia Zhang • Qualcomm Incorporated
Priority 2015-01-08 • Filed 2018-01-11 • Granted 2019-07-30 • Published 2019-07-30
UE 115 - c may decode the unicast data. The decoding may be based on control **information indicating** the resource elements assigned to UE 115 - c. In some ... - c may **receive** an eMBMS **preemption indication** and determine that the eMBMS-scheduled burst contains unicast data (e.g., unicast data with a higher ...

System and method for coexistence of delay tolerant and low delay ...

WO EP US CN • CN109644451B • 阿里克尔·伊斯兰、华为技术有限公司
Priority 2016-09-02 • Filed 2017-09-01 • Granted 2020-12-08 • Published 2020-12-08
... first data regarding a first resource; and **receiving** update **information indicating** that the first data is no longer scheduled on the first resource. ... The present application claims priority from united states provisional patent application No. 62/383,149 entitled "coexistence of hybrid **services** in ...

Resource allocation method and apparatus, and server

WO CN • WO2016095535A1 • 周智伟 • 中兴通讯股份有限公司
Priority 2014-12-15 • Filed 2015-08-04 • Published 2016-06-23
A resource allocation device comprising: a **receiving** module, configured to **receive** a request signal for the **service**, where the request signal carries **indication information** used to indicate that the **service** needs to occupy resources; An acquiring module, configured to acquire, from a preset domain, ...

Resource allocation method and network device

WO EP US CN • WO2017167226A1 • 张屹 • 华为技术有限公司
Priority 2016-03-31 • Filed 2017-03-30 • Published 2017-10-05
The **receiving** unit 801 is configured to **receive**, by using a system message, an RRC message, or a downlink control channel, the **indication information**, where the **indication information** is used to indicate a resource that carries the first **service** data in the subframe or the TTI, where the resource ...

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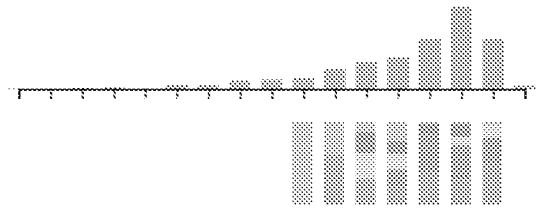

Relative count of top 5 values

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华为技术有限公司		7.9%
中兴通讯股份有限公司		6.2%
Huawei Technologies Co., Ltd.		2.5%
Lg电子株式会社		2%
高通股份有限公司		1.6%

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Page 000551

Patents (rnti) (preemption) (rrc signaling) (UE specific) (rec

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Method for transmission and reception of uplink data in wireless communication ...

WO US · WO2016208829A1 · 이윤종 · 엘지전자(주)

Priority 2015-06-26 · Filed 2015-12-02 · Published 2016-12-29

When the fast UL grant is transmitted through the **UE-specific** search space (UES), The fast UL grant is transmitted through a third downlink control information format. The third DCI format is a resource information (RI) field associated with a **preempted** resource, a HARQ process ID field associated ...

Method for transmitting and **receiving** uplink data in wireless communication ...

WO EP US CN JP · WO2017003047A1 · 이윤종 · 엘지전자(주)

Priority 2015-07-02 · Filed 2015-12-02 · Published 2017-01-05

The present description provides a method for transmitting and **receiving** uplink (UL) data in a wireless communication system. A method, which is carried out by means of a terminal, comprises the steps of: **receiving** a first uplink grant from a base station; transmitting, on the basis of the first ...

Evolved multimedia broadcast multicast service on enhanced component carriers

WO EP US CN JP KR · EP3243351B1 · Xiaoxia Zhang · QUALCOMM Incorporated

Priority 2015-01-08 · Filed 2016-01-06 · Granted 2019-04-10 · Published 2019-04-10

The method of claim 1, wherein determining that the set of resources is scheduled for the eMBMS comprises: **receiving** a system information block, SIB, indicating the eMBMS and **receiving** a multicast control channel, MCCH, based at least in part on the SIB. An apparatus for communication at a wireless ...

Parallel low latency awareness

WO EP US CN JP KR *BR* ES · KR102187008B1 · 완시 천 · 퀄컴 인코포레이티드

Priority 2015-02-06 · Filed 2016-01-13 · Granted 2020-12-04 · Published 2020-12-04

The method of claim 1, The indication is **received** in a broadcast message or in a unicast message. The method of claim 6, The indication is **received** subsequent to the first TTI or the second TTI. The method of claim 6, The indication is **received** during one or more control channel symbol periods. The ...

Method for transmitting uplink data in wireless communication system and device ...

WO US · US20200037311A1 · Eunjong Lee · Lg Electronics Inc.

Priority 2015-06-30 · Filed 2019-10-04 · Published 2020-01-30

1 . A method for transmitting, by a wireless device, data in a wireless communication system, the method comprising: **receiving**, through a first channel, control information related to a low latency service from a network; and transmitting, through a second channel, data of the low latency service to ...

Method and apparatus for controlling connectivity to a network

WO EP US CN JP KR CA *SG* TW · CA2832067C · Ghyslain Pelletier · Interdigital Patent Holdings, Inc.

Priority 2011-04-01 · Filed 2012-03-30 · Granted 2019-10-01 · Published 2019-10-01

Method and apparatus for controlling connectivity to a network for intermittent data services are disclosed. A new dormant mode is defined such that a wireless transmit/**receive** unit (WTRU) may transition from a connected state or an idle state to the dormant mode based on triggering conditions.

Medium access for shared or unlicensed spectrum

WO EP US CN JP KR *BR* TW · KR102017672B1 · 첼레니 발자노빅 · 퀄컴 인코포레이티드

Priority 2015-01-19 • Filed 2016-01-07 • Granted 2019-09-03 • Published 2019-09-03

Transmitting the signal on a carrier of the shared or unlicensed spectrum during the first transmission time period; identifying a medium **preemption** opportunity for the carrier during a dedicated time interval; **Receiving** an indication of media **preemption** during the media **preemption** opportunity from ...

Signal transmission method and device of device to device terminal in wireless ...

WO EP US CN • WO2016072708A1 • 채혁진 • 엘지전자 주식회사

Priority 2014-11-03 • Filed 2015-11-03 • Published 2016-05-12

In a method for transmitting a signal from a device to device (D2D) terminal in a wireless communication system, **Receiving** a resource configured for D2D transmission from a base station; And Selecting a time frequency resource from the resource and transmitting a D2D control signal; Including; If ...

Method and apparatus for downlink data arrival

WO EP US CN JP KR TW • US8619684B2 • Arnaud Meylan • Qualcomm Incorporated

Priority 2008-05-01 • Filed 2009-04-30 • Granted 2013-12-31 • Published 2013-12-31

means for **receiving** a signaled uplink operation by **receiving** the second message protocol in a resource search space of the first message protocol without using an additional bit to signal the uplink operation, wherein the encapsulated second message protocol being in the resource search space of ...

Data transmission method and device, base station and user equipment

WO EP US CN • WO2016113930A1 • 李新彩 • 中兴通讯股份有限公司

Priority 2015-01-30 • Filed 2015-12-10 • Published 2016-08-04

The apparatus of claim 34 wherein said second transmission module comprises one of: a third transmission unit, configured to: when the base station contends to the unlicensed carrier, **receive** a transmission indication signaling sent by the base station to indicate data transmission with the UE;

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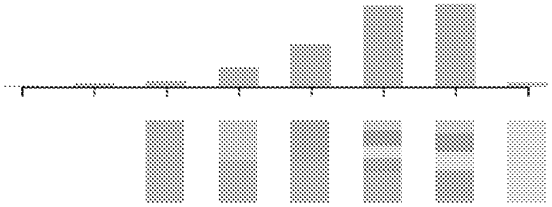

Relative count of top 5 values

Assignees	Inventors	CPCs
Lg电子株式会社		7.9%
엘지전자 주식회사		4.6%
Lg Electronics Inc.		3.9%
엘지전자(주)		3.9%
华为技术有限公司		3.6%

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Page 000554

Patents (skip rnti) (preemption or puncturing) (rrc signaling

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Parallel low latency awareness

WO EP US CN JP KR BR ES · KR102187008B1 · 완시 천 · 퀄컴 인코포레이티드

Priority 2015-02-06 · Filed 2016-01-13 · Granted 2020-12-04 · Published 2020-12-04

And mapping the set of modulation symbols of the non-low latency transmission to a set of resources excluding the portion of the data area within the first TTI. The method of claim 1, The indication is **received** in a broadcast message or in a unicast message. The method of claim 6, The indication is ...

Flexible slot architecture for low latency communication

WO EP US CN JP BR · US10205581B2 · Toufiqui Islam · Huawei Technologies Co., Ltd.

Priority 2016-09-22 · Filed 2017-09-19 · Granted 2019-02-12 · Published 2019-02-12

16. A user equipment (UE) comprising: a receiver to **receive** configuration signaling indicating a plurality of start locations, wherein each start location occurs x OFDM symbols apart from an adjacent start location; a control information processor to, for each one of at least some of the plurality ...

Method and apparatus for handling collisions in next generation communication ...

WO EP US CN KR · KR20190024994A · 아닐 에기월 · 삼성전자주식회사

Priority 2016-07-29 · Filed 2017-07-26 · Published 2019-03-08

A communication method of a terminal, **Receiving**, from a base station, scheduling information for a first uplink packet transmission in a first time slot; Determining if the first uplink packet transmission in the first time slot is restricted based on information corresponding to a second uplink ...

Method for transmitting synchronisation reference signal for device-to-device (...

WO US KR · KR102252510B1 · 이승민 · 엘지전자 주식회사

Priority 2013-09-27 · Filed 2014-09-29 · Granted 2021-05-14 · Published 2021-05-14

Selecting a synchronization reference terminal from among the candidate terminals, The **received** power of the first synchronization signal of the synchronization reference terminal exceeds a first threshold value, The first synchronization signal of the synchronization reference terminal is searched ...

Reference signal configuration

WO US ~~GN~~ AR ~~TW~~ · US20200011957A1 · Guodong Zhang · Interdigital Patent Holdings, Inc.

Priority 2009-04-27 · Filed 2019-07-22 · Published 2020-01-09

Methods and apparatus for supporting reference signals are disclosed. A wireless transmit **receive** unit (WTRU) is configured to **receive** a reference signal of a first type. The first type is other than a cell specific reference signal (CRS), an Multicast Broadcast Single Frequency Network (MBSFN) ...

Distributed scheduling for device-to-device communication

WO EP US CN JP KR CA SG TW · KR101845463B1 · 폴 마리니에르 · 인터디지털 패튼 홀딩스, 인크

Priority 2013-08-07 · Filed 2014-08-06 · Granted 2018-04-04 · Published 2018-04-04

12. The method of claim 11, The method includes determining the set of allowed D2D resources or allowed SA resources based on a signal **received** from a second WTRU, the signal being **received** via a D2D channel using a D2D related control message To-device (D2D) communication method. 12. The method of ...

Setting up a communication session within a wireless communications system

WO US · US20130250790A1 · Yih-Hao Lin · Qualcomm Incorporated

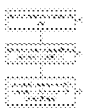
Priority 2009-05-22 · Filed 2013-05-09 · Published 2013-09-26

644 . As will be appreciated by one of ordinary skill in the art, the RAN 120 cannot simply transmit the announce message to UE 1 immediately after **receiving** the call announce message from the application server 170 . Rather, the RAN 120 waits for a next DRX cycle or paging cycle at which target UE 1

Grant-free access method for urllc service

~~US~~ • US20180092104A1 • Jia Sheng • Sharp Laboratories Of America, Inc.
Priority 2016-09-28 • Filed 2017-09-27 • Published 2018-03-29
transmit or **receive** an enhanced mobile broadband (eMBB) transmission that uses a same time/frequency and/or spatial resources as an ultra-reliable low latency communication (URLLC) transmission, wherein the eMBB transmission uses a grant-free access based on a signature associated with the grant- ...

User equipment and base stations that transceive ultra reliable low latency ...



~~WO EP US~~ CN • US20180027578A1 • John Michael Kowalski • Sharp Laboratories Of America, Inc.
Priority 2016-07-21 • Filed 2017-07-19 • Published 2018-01-25
14 . The eNB of claim 13 , wherein configuration to transmit or **receive** URLLC services is indicated in a configuration message where time, frequency and spatial resources are potentially used for URLLC transmission or reception. 15 . The eNB of claim 13 , wherein prioritization of the URLLC ...

Flexible transmission time interval and on slot aggregation for data ...

WO • WO2018031623A1 • Jeongho Jeon • Intel Corporation
Priority 2016-08-11 • Filed 2017-08-09 • Published 2018-02-15
25. The apparatus of any one of claims 22-24, wherein the one or more baseband processors are to decode an indication **received** from the gNB of channel state information reference signal (CSI-RS) or other RS configurations within the aggregation of one or more slots via downlink control information ...

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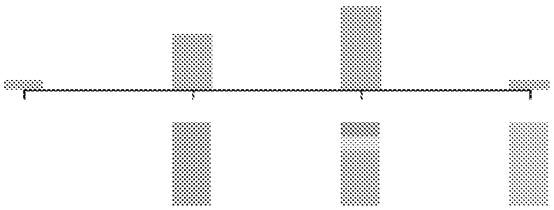

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Sharp Laboratories Of America, Inc.		23.5%
Qualcomm Incorporated		5.8%
Huawei Technologies Co., Ltd.		5.8%
삼성전자주식회사		5.8%
Interdigital Patent Holdings, Inc.		5.8%

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Patents (s-rnti) (preemption) (rrc signaling) (UE specific) (re

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Method for resuming connection in wireless communication system and device for ...

WO EP US KR · WO2017126922A1 · 류진숙 · 엘지전자(주)

Priority 2016-01-19 • Filed 2017-01-19 • Published 2017-07-27

A method for a network node to perform a connection resume procedure in a wireless communication system, **Receive** a message including a Tracking Area Update Request (TAU Request) of a User Equipment (UE) from an eNB (eNodeB), The message includes a result of determining, by the eNB, a validity as to ...

LTE and LTE advanced: 4G network radio interface

Google Scholar · scholar.google.com · Perez A

Published 2015

Method for transmitting/**receiving** data in wireless communication system, and ...

WO EP US CN JP KR · WO2017078258A1 · 조희정 · 엘지전자(주)

Priority 2015-11-05 • Filed 2016-08-26 • Published 2017-05-11

The message is transmitted and **received** via the second session. The method of claim 1, The message including an indicator indicating that the message is sent over the first session regardless of the quality of service of the message. An apparatus for transmitting and **receiving** data in a wireless ...

Method for transmitting/**receiving** data in wireless communication system, and ...

WO US · WO2016208950A1 · 조희정 · 엘지전자(주)

Priority 2015-06-23 • Filed 2016-06-22 • Published 2016-12-29

The method of claim 11, **Receiving** information indicating setting of a terminal context from a second network node. The method of claim 11, Determining the terminal context holding group, **Receiving** terminal context retention attribute information from at least one peripheral network node. The method ...

Method for transmitting and **receiving** data in wireless communication system, ...

WO EP US · WO2017159972A1 · 조희정 · 엘지전자(주)

Priority 2016-03-17 • Filed 2016-12-23 • Published 2017-09-21

The present invention relates to a method and an apparatus for transmitting and **receiving**, by a device, data in a wireless communication system. The present invention can provide a method and an apparatus which **receive**, from a first network node, configuration information of a contention-based ...

Method for **receiving** mbms service and device for supporting same

WO EP US · WO2017222322A1 · 이영대 · 엘지전자 주식회사

Priority 2016-06-23 • Filed 2017-06-22 • Published 2017-12-28

The method of claim 1, After performing the step of **receiving** the MBMS frequency type indicator, Determining whether the MBMS frequency indicated by the **received** MBMS frequency type indicator is supported by the terminal. The method of claim 11, **Receiving** the MBMS service, If it is determined that ...

Method for performing cell reselection procedure by terminal, and apparatus for ...

WO US · WO2017200292A1 · 김상원 · 엘지전자 주식회사

Priority 2016-05-18 • Filed 2017-05-17 • Published 2017-11-23

The method of claim 6, After performing the step of **receiving** the configuration information of the candidate cell, Performing a cell reselection procedure on any one of the candidate cells included in the configuration

information; Establishing the RRC connection comprises establishing an RRC ...

Relocation also of parts of radio resource management control functionality ...

WO EP US CN JP ~~KR~~ DE • EP1592275A1 • Dragan Petrovic • Matsushita Electric Industrial Co., Ltd.
Priority 2004-04-29 • Filed 2004-04-29 • Published 2005-11-02
The method according to one of claims 1 to 3, wherein the information **received** at the controlling base station indicates the processing load at the respective reporting base station, and it is determined to relocate resource management control functionality in case the processing load at the ...

Method and apparatus for improving downlink broadcast for v2v communication in ...

WO ~~US~~ • WO2017196085A2 • 이영대 • 엘지전자 주식회사
Priority 2016-05-11 • Filed 2017-05-11 • Published 2017-11-16
Uplink (UL) feedback-based hybrid automatic repeat request (HARQ) retransmission may be proposed as an example for improving downlink (DL) broadcast for vehicle-to-everything (V2X) communication, especially for V2V(vehicle-to-vehicle) communication. An eNodeB (eNB) **receives**, from a neighboring eNB ...

Method for transmitting uplink data in wireless communication system and ...

WO US • WO2017159886A1 • 이은종 • 엘지전자(주)
Priority 2016-03-14 • Filed 2016-03-14 • Published 2017-09-21
A base station for transmitting and **receiving** data in a wireless communication system supporting a low latency service, Communication unit for transmitting and **receiving** a wireless signal with the outside; And A processor is functionally coupled with the communication unit, wherein the processor ...

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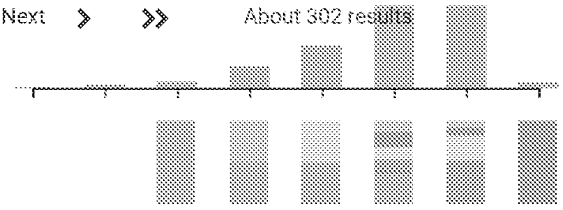

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Lg电子株式会社		7.9%
엘지전자(주)		6.1%
엘지전자 주식회사		5%
Lg Electronics Inc.		3.6%
华为技术有限公司		3.2%

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Patents (urllc)(rnti) (preemption or puncturing) (rrc signalir

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Flexible slot architecture for low latency communication

WO EP US CN JP *BR* · US10205561B2 · Toufiqul Islam · Huawei Technologies Co , Ltd

Priority 2016-09-22 · Filed 2017-09-19 · Granted 2019-02-12 · Published 2019-02-12

16. A user equipment (UE) comprising: a receiver to **receive** configuration signaling indicating a plurality of start locations, wherein each start location occurs x OFDM symbols apart from an adjacent start location; a control information processor to, for each one of at least some of the plurality ...

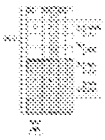
Method and apparatus for handling collisions in next-generation communication ...

WO EP US CN KR · KR102364058B1 · 아닐 에기왈 · 삼성전자 주식회사

Priority 2016-07-29 · Filed 2017-07-26 · Granted 2022-02-17 · Published 2022-02-17

A method performed by a terminal of a wireless communication system, comprising: **Receiving**, from a base station, information on a pre-emption-related radio network temporary identifier (**RNTI**) dedicated for monitoring a pre-emption indication in a physical downlink control channel (PDCCH);

System and method for multiplexing traffic



WO EP US CN JP *BR* · US11071136B2 · Toufiqul Islam · Huawei Technologies Co., Ltd.

Priority 2016-08-25 · Filed 2017-06-30 · Granted 2021-07-20 · Published 2021-07-20

wherein the one or more processors further execute the instructions to monitor the second indicator. 17. The first apparatus of claim 15 , wherein the first indicator is signaled via Radio Resource Control **(RRC) signaling**. 18. The first apparatus of claim 15 , wherein the second indicator is **received** ...

Flow-based processing in wireless systems

WO EP US JP · EP3863358A1 · Ghyslain Pelletier · IDAC Holdings, Inc.

Priority 2016-05-12 · Filed 2017-05-12 · Published 2021-08-11

A method implemented by wireless transmit/**receive** unit (WTRU), the method comprising: **receiving**, by the WTRU, configuration information including data radio bearer information and Quality of Service (QoS) flow information; generating, by the WTRU, at least a first data flow and a second data flow; ...

Coexistence of grant-based uplink transmission and unlicensed uplink ...

WO EP CN · CN109565678B · 陶建荣尔伊斯兰 · 华为技术有限公司

Priority 2016-07-29 · Filed 2017-06-30 · Granted 2021-03-30 · Published 2021-03-30

In accordance with yet another embodiment, a method for mitigating interference in a subframe is provided. In this example, the method includes: **receiving** a scheduling instruction indicating that uplink resources are scheduled to carry grant-based uplink transmissions of a first UE; monitoring one ...

Method for inter-cell interference coordination in wireless communication ...

WO US · WO2017217778A1 · 백종현 · 엘지전자(주)

Priority 2016-06-15 · Filed 2017-06-15 · Published 2017-12-21

Receiving a DL grant for downlink (DL) reception of the service type information from the first eNB; Further comprising, ICIC support method of the UE. [Claim 6] The method of claim 5, The **receiving** of the service type information may include: decoding the DL data **received** from the first eNB based ...

Grant-free access method for **urllc** service

~~US~~ · US20180092104A1 · Jia Sheng · Sharp Laboratories Of America, Inc.

Priority 2016-09-28 • Filed 2017-09-27 • Published 2018-03-29

transmit or **receive** an enhanced mobile broadband (eMBB) transmission that uses a same time/frequency and/or spatial resources as an ultra-reliable low latency communication (**URLLC**) transmission, wherein the eMBB transmission uses a grant-free access based on a signature associated with the grant- ...

User equipment and base stations that transceive ultra reliable low latency ...

~~WO~~ ~~EP~~ ~~US~~ ~~CN~~ • WO2018017802A1 • John Michael Kowalski • Sharp Laboratories Of America, Inc.

Priority 2016-07-21 • Filed 2017-07-20 • Published 2018-01-25

2. The UE of claim 1, wherein configuration to transmit or **receive URLLC** services is indicated in a configuration message where time, frequency and spatial resources are potentially used for **URLLC** transmission or reception. 3. The UE of claim 1, wherein prioritization of the **URLLC** transmission on ...

Coexistence of Grant-Based and Grant-Free Uplink Transmissions in a Channel

~~US~~ • US20180035459A1 • Toufiqul Islam • Huawei Technologies Co., Ltd.

Priority 2016-07-29 • Filed 2017-09-06 • Published 2018-02-01

transmits and **receives** signaling over a wireline medium, e.g., twisted-pair cable, coaxial cable, optical fiber, etc. Specific processing systems and/or transceivers may utilize all of the components shown, or only a subset of the components, and levels of integration may vary from device to device ...

Base station assisted outer code usage

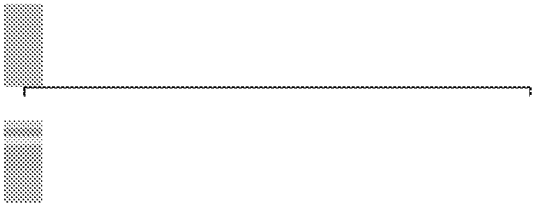
~~WO~~ ~~US~~ • US20180041858A1 • Jia Sheng • Sharp Laboratories Of America, Inc.

Priority 2016-08-08 • Filed 2017-08-04 • Published 2018-02-08

wherein the UE **receives**, from the eNB when a **URLLC** message is to be transmitted, a DCI format with one or more fields indicating a modulation and coding scheme (MCS) that are updated with a new inner coding rate. 8 . The UE of claim 6 , wherein the UE **receives**, from the eNB when a **URLLC** message is to ...

Next › About 12 results

Top 1000 results by filing date



Relative count of top 5 values

Assignees	Inventors	CPCs
Sharp Laboratories Of America, Inc.		33.3%
Huawei Technologies Co., Ltd.		25%
IDAC Holdings, Inc.		8.3%
华为技术有限公司		8.3%
엘지전자(주)		8.3%

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PART B – FEE(S) TRANSMITTAL

Complete and send this form, together with the applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22314-1450
or Fax **(571)-273-2885**

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INVENSTONE PATENT, LLC.
14291-A Brushwood way
Centreville, VA 20121

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(Depositor's Name)
(S-signature)
(Date)

APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
16/349,874	05/14/2019	Kyujin PARK	KT21-0111	1053

TITLE OF INVENTION: METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK

APPLN: TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0	$0	$1200	09/02/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
DECKER, CASSANDRA L	2466	370-329000

1. Change of correspondence address or indication of "Fee Address" (37CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered attorney or agent. If no name is listed, no name will be printed

1. INVENSTONE Patent, LLC
2.
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3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)
PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

1a. NAME OF ASSIGNEE: KT CORPORATION

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Gyeonggi-do, KOREA

Please check the appropriate assignee categories (will not be printed on the patent): ☐ Individual ☑ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☑ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies

4b. Payment of Fees(s): **(Please first reapply and previously paid fee shown above)**
☐ A check is enclosed
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☑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 60-2040 (enclose an extra copy of this form)

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☐ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

☐ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

☐ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Daniel CHUNG/ Date June 23, 2022

Typed or printed name Daniel CHUNG Registration No. 57,889

Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000563

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

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The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	16349874
Filing Date:	14-May-2019
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Filer:	Daniel Chung/judy Kim
Attorney Docket Number:	KT21-0111

Filed as Large Entity

Filing Fees for U.S. National Stage under 35 USC 371

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1200	1200

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1200**

Electronic Acknowledgement Receipt

EFS ID:	46023968
Application Number:	16349874
International Application Number:	
Confirmation Number:	1053
Title of Invention:	METHOD AND APPARATUS FOR TRANSMITTING AND RECEIVING DOWNLINK SIGNAL IN NEXT GENERATION WIRELESS NETWORK
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	126667
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	KT21-0111
Receipt Date:	23-JUN-2022
Filing Date:	14-MAY-2019
Time Stamp:	08:07:36
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1200
RAM confirmation Number	E20226M908313208
Deposit Account	602040
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37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

37 CFR 1.492 (National application filing, search, and examination fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	KT21-0111_PTOL85b_KT.pdf	159467 8899217c36efc901c7911ccc7c68e4129e07023d	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	38170 b8b15d2c592e6568c838d7730ccc54730551afd0	no	2
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/349,874	08/02/2022	11405942	KT21-0111	1053

126667 7590 07/13/2022

INVENSTONE PATENT, LLC
14291-A Brushwood way
Centreville, VA 20121

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 100 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PAIR WEB site http://pair.uspto.gov for additional inventors):

Kyujin PARK, Seoul, KOREA, REPUBLIC OF;
Woo-jin CHOI, Seoul, KOREA, REPUBLIC OF;

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

KT CORPORATION, Gyeonggi-do, KOREA, REPUBLIC OF;

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Petitioner's Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00317; U.S. Patent No. 11,405,942
Page 000569

508169037 10/11/2023

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT8216218

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	EXCLUSIVE LICENSE WITH ALL SUBSTANTIAL RIGHT

CONVEYING PARTY DATA

Name	Execution Date
KT CORPORATION	12/23/2022

RECEIVING PARTY DATA

Name:	PEGASUS WIRELESS INNOVATION LLC
Street Address:	20319 KIAWAH ISLAND DR
City:	ASHBURN
State/Country:	VIRGINIA
Postal Code:	20147

PROPERTY NUMBERS Total: 92

Property Type	Number
Patent Number:	9894644
Patent Number:	9998269
Patent Number:	10181931
Patent Number:	10306546
Patent Number:	10341806
Patent Number:	10728693
Patent Number:	10085249
Patent Number:	10568071
Patent Number:	11082957
Patent Number:	10432361
Patent Number:	10742364
Patent Number:	10644819
Patent Number:	10412731
Patent Number:	10616889
Patent Number:	10581560
Patent Number:	11197309
Patent Number:	10892867
Patent Number:	11431460
Patent Number:	11431461
Patent Number:	11115976

Property Type	Number
Patent Number:	10849111
Patent Number:	11330573
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Patent Number:	10178626
Patent Number:	10091736
Patent Number:	9461771
Patent Number:	9629010
Patent Number:	10009161
Patent Number:	11258532
Patent Number:	10791530
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Patent Number:	11363548
Patent Number:	11115157
Patent Number:	10925079
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Patent Number:	10715283
Patent Number:	10616916
Patent Number:	10764099
Patent Number:	10868702
Patent Number:	10952206
Patent Number:	11540272

Property Type	Number
Patent Number:	10979190
Patent Number:	11671218
Patent Number:	10284404
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Patent Number:	10721765
Patent Number:	10721031
Patent Number:	10958380
Patent Number:	10805050
Patent Number:	10616834
Patent Number:	9497666
Patent Number:	9832806
Patent Number:	10334657
Patent Number:	10420067
Patent Number:	10159025
Patent Number:	10667322
Patent Number:	10986530
Patent Number:	10511994
Patent Number:	10448386
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Patent Number:	10880222
Patent Number:	11044777
Patent Number:	11627631
Patent Number:	11012911
Patent Number:	10869236
Patent Number:	10708968
Patent Number:	10616932
Patent Number:	10660004
Patent Number:	10869243
Patent Number:	10470159
Patent Number:	10499376
Patent Number:	10812230
Patent Number:	10873671
Patent Number:	11178573
Patent Number:	10772148

CORRESPONDENCE DATA

Fax Number:

Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.

Phone:	4349062975
Email:	yoon@pegasuswi.com
Correspondent Name:	YEASUN YOON
Address Line 1:	20319 KIAWAH ISLAND DR
Address Line 4:	ASHBURN, VIRGINIA 20147

ATTORNEY DOCKET NUMBER:	ASSIGNMENT KT PEGASUS 01
NAME OF SUBMITTER:	YEASUN YOON
SIGNATURE:	/yoon/
DATE SIGNED:	10/11/2023
	This document serves as an Oath/Declaration (37 CFR 1.63).

Total Attachments: 33

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PATENT RIGHTS ASSIGNMENT

WHEREAS, **KT Corporation**, having a place of business at KT Kwanghwamun Bldg, East 33, Jong-ro 3-gil, Seoul, Korea 03155 (hereinafter "Assignor") is the sole owner of any and all patents and/or patent applications in the Patent Families listed in Schedule 1 annexed hereto (collectively referred to as the "Patents"). Herein, the term "Patent Families" means a collection of (i) a patent or a patent application; (ii) any and all foreign counterparts of the patent or the patent application described in (i); (iii) any divisionals, continuations, continuations-in-part, reissues, reexaminations, utility models, parents, or extensions, relating to any of the patents and patent applications described in (i) and (ii);, and (iv) any patent or patent application whose priority is based upon or in common with any patents and patent applications described in (i), (ii) and (ii).

WHEREAS, **Pegasus Wireless Innovation LLC**, having a place of business at 20319 Kiawah island Drive Ashburn VA 20147 USA (hereinafter "Purchaser") is desirous of acquiring all substantial rights in and to the Patents; and

Now, Therefore,

For good and valuable consideration, the receipt of which is hereby acknowledged, Assignor does hereby sell, assign, transfer and set over to Assignee, subject to existing encumbrances, (a) an exclusive, worldwide license to import, manufacture, have manufactured, use, lease, sell, offer to sell, or otherwise dispose of products encompassed by one or more claims of the Patents; (b) the exclusive right to: (i) enforce the Patents; (ii) sublicense or otherwise grant rights under the Patents; (iii) collect and receive damages, royalties, injunctive relief, and/or settlements for past, current, and future infringements of and to the Patents; (iv) sue or otherwise assert causes of action for the past, current,

and future infringements of and to the Patents; (v) control the prosecution of the Patents before any patent office in the world; (vi) indulge infringement of the Patents; and (c) any and all other substantial rights to and in the Patents necessary and sufficient under any applicable law or precedent to confer standing to Assignee and permit Assignee to initiate any actions on its own.

Assignor has executed this Assignment by its duly authorized representative.

KT Corporation

By: 閔燦皓.

Name: Chanho Min

Title: Team Manager.

Date: 12/23/2022

SCHEDULE 1

No.	REF-NO	Country	Application/Issue No.	Application/issue date
1	P20130686	Provisional Application	10-2013-0114759	2013.09.26
	P20140028	KR Application	10-2014-0007262	2014.01.21
		KR Issue	10-1940344	2019.01.14
	P20130686PC	PCT	PCT/KR2014/008216	2014.09.02
	P20130686US	US Application	15/024,862	2016.03.25
		US Issue	9,894,644	2018.02.13
	P20130686CN	CN Application	201480053323.5	2016.03.25
		CN Issue	CN105659511B	2019.02.12
2	P20130687	Provisional Application	10-2013-0114763	2013.09.26
	P20130953	Provisional Application	10-2013-0138703	2013.11.15
	P20140134	KR Application	10-2014-0027531	2014.03.10
		KR Issue	10-1561838	2015.10.14
	P20140134P1	KR Application(DA)	10-2015-0139479	2015.10.05
		KR Issue(DA)	10-1645898	2016.07.28
	P20130687PC	PCT	PCT/KR2014/008708	2014.09.18
	P20130687US	US Application	15/024,873	2016.03.25
		US Issue	10,432,361	2019.10.01
	P20130687USC1	US Application(CA)	16/542,513	2019.08.16
		US Issue(CA)	10,742,364	2020.08.11
	P20130687CN	CN Application	201480053584.7	2016.03.28

3	P20130698	Provisional Application	10-2013-0115367	2013.09.27
	P20140216	KR Application	10-2014-0057938	2014.05.14
		KR Issue	10-1904572	2018.09.27
	P20130698PC	PCT	PCT/KR2014/008765	2014.09.22
	P20130698US	US Application	15/025,262	2016.03.25
		US Issue	10,181,931	2018.01.15
	P20130698CN	CN Application	201480053321.6	2016.03.25
		CN Issue	CN105594139B	2019.10.25
4	P20130737	Provisional Application	10-2013-0118593	2013.10.04
	P20131006	Provisional Application	10-2013-0142479	2013.11.21
	P20140221	KR Application	10-2014-0067128	2014.06.02
		KR Issue	10-1919636	2018.11.12
	P20140221PC	PCT	PCT/KR2014/008995	2014.09.26
	P20140221US	US Application	15/026,260	2016.03.31
		US Issue	9,998,269	2018.06.12
	P20140221CN	CN Application	201480054504.X	2016.04.01
		CN Issue	CN105659514B	2018.06.01
5	P20140587	Provisional Application	10-2014-0101467	2014.08.07
	P20150161	KR Application	10-2015-0094846	2015.07.02
		KR Issue	10-1875255	2018.06.29
	P20140587PC	PCT	PCT/KR2015/008037	2015.07.31
	P20140587US	US Application	15/501,263	2017.02.02
		US Issue	10,644,819	2020.05.05

	P20140587USD1	US Application(DA)	16/832,151	2020.03.27
	P20140587CN	CN Application	201580042296.6	2017.02.06
		CN Issue	CN106664697B	2020.06.16
6	P20150017	Provisional Application	10-2015-0008486	2015.01.19
	P20150734	Provisional Application	10-2015-0135899	2015.09.24
	P20150844	KR Application	10-2016-0005012	2016.01.15
		KR Issue	10-1856304	2018.05.02
	P20150017PC	PCT	PCT/KR2016/000494	2016.01.18
	P20150017US	US Application	15/544,363	2017.07.18
		US Issue	10,306,546	2019.05.28
	P20150017CN	CN Application	201680004482.5	2017.06.23
		CN Issue	CN107113149B	2020.12.08
7	P20150278	Provisional Application	10-2015-0068715	2015.05.18
	P20150609	Provisional Application	10-2015-0114876	2015.08.13
	P20160030	KR Application	10-2016-0027594	2016.03.08
		KR Issue	10-1956978	2019.03.05
	P20150278PC	PCT	PCT/KR2016/005215	2016.05.17
	P20150278US	US Application	15/569,133	2017.10.25
		US Issue	10,341,806	2019.07.02
	P20150278USC1	US Application(CA)	16/412,376	2019.05.14
		US Issue(CA)	10,728,693	2020.07.28
	P20150278CN	CN Application	201680006425.0	2017.07.19

		CN Issue	CN107211238B	2020.11.06
8	P20150724	Provisional Application	10-2015-0135756	2015.09.24
	P20150865	Provisional Application	10-2015-0162286	2015.11.19
	P20160287	KR Application	10-2016-0098858	2016.08.03
		KR Issue	10-1896766	2018.09.03
	P20150724US	US Application	15/260,373	2016.09.09
		US Issue	10,085,249	2018.09.25
	P20150724CN	CN Application	201610806693.2	2016.09.06
		CN Issue	CN106559161B	2019.01.04
9	P20160067	Provisional Application	10-2016-0014509	2016.02.04
	P20160076	Provisional Application	10-2016-0015050	2016.02.05
	P20160169	Provisional Application	10-2016-0039529	2016.03.31
	P20160548	KR Application	10-2016-0117138	2016.09.12
		KR Issue	10-1910245	2018.10.15
	P20160067US	US Application	15/415,781	2017.01.25
		US Issue	10,568,071	2020.02.18
	P20160067CN	CN Application	201710021966.9	2017.01.12
10	P20160126	Provisional Application	10-2016-0030172	2016.03.14
	P20160855	KR Application	10-2017-0022956	2017.02.21
		KR Issue	10-2237525	2021.04.01
	P20160126PC	PCT	PCT/KR2017/002535	2017.03.08
	P20160126US	US Application	16/084,594	2018.09.13

		US Issue	11,197,309	2021.12.07
	P20160126CN	CN Application	201780017398.1	2018.09.14
		CN Issue	CN 108781154B	2021.12.14
11	P20160143	Provisional Application	10-2016-0037224	2016.03.28
	P20160856	KR Application	10-2017-0022964	2017.02.21
		KR Issue	10-2065432	2020.01.07
	P20160143PC	PCT	PCT/KR2017/002536	2017.03.08
	P20160143US	US Application	16/088,914	2018.09.27
		US Issue	10,892,867	2021.01.12
	P20160143CN	CN Application	201780013601.8	2018.08.27
		CN Issue	CN 108702280 B	
12	P20160240	Provisional Application	10-2016-0051737	2016.04.27
	P20160818	KR Application	10-2016-0171232	2016.12.15
		KR Issue	10-1963483	2019.03.22
	P20160240US	US Application	15/497,362	2017.04.26
		US Issue	10,412,731	2019.09.10
	P20160240USC1	US Application(CA)	16/529,789	2019.08.02
		US Issue(CA)	10,616,889	2020.04.07
	P20160240CN	CN Application	201710280467.X	2017.04.26
		CN Issue	CN 107317662 B	2020.12.08
13	P20160257	Provisional Application	10-2016-0055676	2016.05.04
	P20160265	Provisional Application	10-2016-0058317	2016.05.12

	P20170206	KR Application	10-2017-0056206	2017.05.02
		KR Issue	10-2120976	2020.06.03
	P20170207	KR Application	10-2017-0056011	2017.05.02
		KR Issue	10-2093906	2020.03.20
	P20160257PC	PCT	PCT/KR2017/004702	2017.05.02
	P20160257US	US Application	16/098,812	2018.11.02
		US Issue	11,431,460	2022.08.30
	P20160257CN	CN Application	201780027159.4	2018.11.01
		CN Issue	CN 109075949 B	2021.12.14
	P20170207P1	KR Application(DA)	10-2020-0031570	2020.03.13
		KR Issue(DA)	10-2121009	2020.06.03
	P20160257USD1	US Application(DA)	16/179,863	2018.11.02
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		CN Issue(DA)	CN 109547182 B	2021.07.23
14	P20160645	Provisional Application	10-2016-0116784	2016.09.09
	P20170334	KR Application	10-2017-0098820	2017.08.04
		KR Issue	10-2120856	2020.06.03
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		US Issue	11,115,976	2021.09.07
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		CN Issue	CN 109691000 B	2021.11.05

15	P20160670	Provisional Application	10-2016-0122509	2016.09.23
	P20170648	KR Application	10-2017-0118923	2017.09.15
		KR Issue	10-2186397	2020.11.27
	P20160670PC	PCT	PCT/KR2017/010496	2017.09.22
	P20160670US	US Application	16/335,717	2019.03.22
		US Issue	10,849,111	2020.11.24
	P20160670CN	CN Application	201780058930.4	2019.03.25
		CN Issue	CN 109792315 B	2021.10.26
16	P20160683	Provisional Application	10-2016-0127089	2016.09.30
	P20170199	KR Application	10-2017-0080594	2017.06.26
		KR Issue	10-2085195	2020.02.28
	P20160683US	US Application	15/716,568	2017.09.27
		US Issue	10,581,560	2020.03.03
	P20160683CN	CN Application	201710795343.5	2017.09.06
		CN Issue	CN 107888333 B	2020.12.08
17	P20140174	Provisional Application	10-2014-0033579	2014.03.21
	P20140196	Provisional Application	10-2014-0034955	2014.03.25
	P20140207	Provisional Application	10-2014-0037394	2014.03.31
	P20140784	KR Application	10-2014-0175190	2014.12.08
		KR Issue	10-1722300	2017.03.27
	P20140174PC	PCT	PCT/KR2015/002021	2015.03.03
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		US Issue	9,629,010	2017.04.18

	P20140174USC1	US Application(CA)	15/454,020	2017.03.09
		US Issue(CA)	10,009,161	2018.06.26
	P20140174CN	CN Application	201580006948.0	2016.08.02
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	P20140174CND1	CN Application(DA)	201910480118.1	2019.06.04
		CN Issue(DA)	CN 110149169 B	2021.12.14
18	P20140253	Provisional Application	10-2014-0046986	2014.04.18
	P20141039	KR Application	10-2015-0021154	2015.02.11
		KR Issue	10-1674791	2016.11.03
	P20140253US	US Application	14/687,865	2015.04.15
		US Issue	10091736	2018.10.02
	P20140253CN	CN Application	201510188805.8	2015.04.20
		CN Issue	CN 105007616 B	2019.09.24
19	P20160508	Provisional Application	10-2016-0089972	2016.07.15
	P20170351	KR Application	10-2017-0087597	2017.07.11
		KR Issue	10-2178412	2020.11.09
	P20160508PC	PCT	PCT/KR2017/007466	2017.07.12
	P20160508US	US Application	16/316,774	2019.01.10
		US Issue	10,791,530	2020.09.29
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20	P20160627	Provisional Application	10-2016-0112748	2016.09.01
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		US Issue	11,044,743	2021.06.22
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	P20160627EP	EP Application	17846885.6	2018.12.28
	P20160627CN	CN Application	201780039745.0	2018.12.26
		CN Issue	CN 109328481 B	
21	P20160720	Provisional Application	10-2016-0130101	2016.10.07
	P20170649	KR Application	10-2017-0124261	2017.09.26
		KR Issue	10-2156672	2020.09.10
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		US Issue	11,038,735	2021.06.15
	P20160720USC1	US Application(CA)	17/314,034	2021.05.06
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		US Issue(CA)		
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	P20160720CN	CN Application	201780061902.8	2019.04.04
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22	P20160768	Provisional Application	10-2016-0141451	2016.10.27
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	P20170798	KR Application	10-2017-0139598	2017.10.25
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	P20160768PC	PCT	PCT/KR2017/011958	2017.10.27
	P20160768US	US Application	16/344,947	2019.04.25
		US Issue	11,115,157	2021.09.07
	P20160768USC1	US Application(CA)	17/379,977	2021.07.19
	P20160768EP	EP Application	17865477.8	2019.04.26
	P20160768CN	CN Application	201780062118.9	2019.04.08
		CN Issue	CN 109804692 B	2022.07.15
23	P20160836	Provisional Application	10-2016-0152659	2016.11.16
	P20170803	KR Application	10-2017-0151983	2017.11.15
		KR Issue	10-2156668	2020.09.10
	P20160836PC	PCT	PCT/KR2017/012992	2017.11.16
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		US Issue	11,405,942	2022.08.02
	P20160836CN	CN Application	201780069729.6	2019.05.10
24	P20160837	Provisional Application	10-2016-0152587	2016.11.16
	P20170804	KR Application	10-2017-0153125	2017.11.16
		KR Issue	10-2195869	2020.12.21
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	P20160837US	US Application	16/461,640	2019.05.16

		US Issue	11,240,785	2022.02.01
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	P20160837CN	CN Application	201780070560.6	2019.05.15
25	P20160768	Provisional Application	10-2016-0141451	2016.10.27
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	P20170142	Provisional Application	10-2017-0037553	2017.03.24
	P20170428	Provisional Application	10-2017-0079911	2017.06.23
	P20170808	KR Application(병합)	10-2017-0139885	2017.10.26
		KR Issue(병합)	10-2162591	2020.09.28
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		US Issue	10,925,079	2021.02.16
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	P20170142CN	CN Application	201780066539.9	2019.04.26
		CN Issue	CN 109891988 B	2022.08.09
26	P20170011	Provisional Application	10-2017-0002589	2017.01.06
	P20170296	Provisional Application	10-2017-0066632	2017.05.30
	P20170933	KR Application	10-2018-0001157	2018.01.04
		KR Issue	10-2114096	2020.05.18
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	P20170011US	US Application	16/464,135	2019.05.24
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		CN Issue	CN 110024323 B	
27	P20170132	Provisional Application	10-2017-0035615	2017.03.21
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		KR Issue(DA)	10-2206761	2021.01.19
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28	P20170131	Provisional Application	10-2017-0033297	2017.03.16
	P20170479	Provisional Application	10-2017-0082920	2017.06.29
	P20170622	Provisional Application	10-2017-0101782	2017.08.10
	P20170132	Provisional Application	10-2017-0035615	2017.03.21
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29	P20170142	Provisional Application	10-2017-0037553	2017.03.24
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	P20170800	KR Application	10-2017-0139604	2017.10.25
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30	P20170318	Provisional Application	10-2017-0067957	2017.05.31
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31	P20170531	Provisional Application	10-2017-0089654	2017.07.14
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33	P20170764	Provisional Application	10-2017-0128188	2017.09.29
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		CN Issue	CN 109586883 B	2021.11.05

34	P20180014	Provisional Application	10-2018-0004091	2018.01.11
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		CN Issue	CN 110034906 B	8/30/2022
35	P20150004	Provisional Application	10-2015-0002948	2015.01.08
	P20150843	KR Application	10-2016-0000376	2016.01.04
		KR Issue	10-1818833	2018.01.09
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	P20150004US	US Application	15/541,792	2017.07.06
		US Issue	11,330,573	2022.05.10
	P20150004CN	CN Application	201680004054.2	2017.06.08
		CN Issue	CN 107005903 B	2021.01.15
36	P20160666	Provisional Application	10-2016-0122506	2016.09.23
	P20170333	KR Application	10-2017-0104068	2017.08.17
		KR Issue	10-2001301	2019.07.11
	P20160666US	US Application	15/712,079	2017.09.21
		US Issue	10,334,657	2019.06.25

	P20160666CN	CN Application	201710864759.8	2017.09.22
		CN Issue	CN 108307543 B	2021.06.15
37	P20150003	Provisional Application	10-2015-0002930	2015.01.08
	P20150842	KR Application	10-2015-0185653	2015.12.24
		KR Issue	10-1866619	2018.06.04
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	P20150003US	US Application	15/541,753	2017.07.06
		US Issue	10,237,084	2019.03.19
	P20150003CN	CN Application	201580066326.7	2017.06.06
		CN Issue	CN 107005820 B	2020.11.03
38	P20130110	Provisional Application	10-2013-0034603	2013.03.29
	P20130939	KR Application	10-2013-0136724	2013.11.12
		KR Issue	10-1632277	2016.06.15
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	P20130110US	US Application	14/779,957	2015.09.24
		US Issue	9497666	2016.11.15
	P20130110CN	CN Application	201480019499.9	2015.09.29
		CN Issue	CN 105103613 B	2018.12.25
39	P20130124	Provisional Application	10-2013-0036870	2013.04.04
	P20130843	Provisional Application	10-2013-0130502	2013.10.30
	P20131105	KR Application	10-2013-0161241	2013.12.23
		KR Issue	10-1628874	2016.06.02
	P20130124PC	PCT	PCT/KR2014/002902	2014.04.04

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		US Issue	9,832,806	2017.11.28
	P20130124CN	CN Application	201480020250.X	2015.10.08
		CN Issue	CN 105103593 B	2019.04.19
40	P20160805	Provisional Application	10-2016-0146054	2016.11.03
	P20170809	KR Application	10-2017-0142205	2017.10.30
		KR Issue	10-2108871	2020.05.04
	P20170809P1	KR Application(DA)	10-2020-0051219	2020.04.28
		KR Issue(DA)	10-2133255	2020.07.07
	P20160805PC	PCT	PCT/KR2017/012319	2017.11.02
	P20160805US	US Application	16/346,987	2019.05.02
		US Issue	11,044,777	2021.06.22
	P20160805USC1	US Application(CA)	17/314,064	2021.05.07
	P20160805EP	EP Application	17867340.6	2019.05.16
	P20160805CN	CN Application	201780068268.0	2019.05.05
		CN Issue	CN 109906630 B	9/16/2022
41	P20170009	Provisional Application	10-2017-0002440	2017.01.06
	P20170905	KR Application	10-2017-0169910	2017.12.12
		KR Issue	10-2016728	2019.08.26
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		US Issue	10,448,386	2019.10.15
	P20170009CN	CN Application	201810011263.0	2018.01.05
		CN Issue	CN 108282823 B	8/26/2022

42	P20170232	Provisional Application	10-2017-0054976	2017.04.28
	P20170929	KR Application	10-2018-0033007	2018.03.22
		KR Issue	10-2023539	2019.09.16
	P20170232US	US Application	15/963,422	2018.04.26
		US Issue	10,880,222	2020.12.29
	P20170232CN	CN Application	201810384302.1	2018.04.26
		CN Issue	CN 108810969 B	2021.10.26
43	P20160264	Provisional Application	10-2016-0058157	2016.05.12
	P20160472	Provisional Application	10-2016-0083270	2016.07.01
	P20170196	KR Application	10-2017-0057549	2017.05.08
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		US Issue	10,721,118	2020.07.21
	P20160264CN	CN Application	201780029131.4	2018.11.12
44	P20170082	Provisional Application	10-2017-0027919	2017.03.03
	P20170715	KR Application	10-2018-0002228	2018.01.08
		KR Issue	10-2056256	2019.12.10
	P20170082US	US Application	15/909,898	2018.03.01
		US Issue	11,012,911	2021.05.18
45	P20170144	Provisional Application	10-2017-0037934	2017.03.24
	P20180124	KR Application	10-2018-0033250	2018.03.22
		KR Issue	10-2174936	2020.10.30

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	P20170144US	US Application	16/347,572	2019.05.03
		US Issue	10,869,236	2020.12.15
46	P20170654	Provisional Application	10-2017-0107962	2017.08.25
	P20180471	KR Application	10-2018-0088414	2018.07.30
		KR Issue	10-2115233	2020.05.20
	P20170654US	US Application	16/112,619	2018.08.24
		US Issue	10,708,968	2020.07.07
47	P20180026	Provisional Application	10-2018-0006980	2018.01.19
	P20180533	KR Application	10-2018-0091232	2018.08.06
		KR Issue	10-2057139	2019.12.12
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		US Issue	10,812,230	2020.10.20
48	P20150254	Provisional Application	10-2015-0067848	2015.05.15
	P20150496	KR Application	10-2015-0099891	2015.07.14
		KR Issue	10-2106134	2020.04.23
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	P20150496US	US Application	15/744,823	2018.01.14
		US Issue	10,616,932	2020.04.07
49	P20130907	Provisional Application	10-2013-0135867	2013.11.08
	P20140043	Provisional Application	10-2014-0012709	2014.02.04
	P20140224	KR Application	10-2014-0088948	2014.07.15
		KR Issue	10-1611825	2016.04.06

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		US Issue(CA)	10,178,626	2019.01.08
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		CN Issue	CN 105594263 B	2019.11.01
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	P20140208	Provisional Application	10-2014-0037398	2014.03.31
	P20140325	Provisional Application	10-2014-0059630	2014.05.19
	P20140785	KR Application	10-2014-0175182	2014.12.08
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	P20140175CN	CN Application	201580006949.5	2016.08.02
		CN Issue	CN 106464647 B	2019.09.13
	P20140175CND1	CN Application(DA)	201910768106.9	2019.08.20
		CN Issue(DA)	CN 110460409 B	2022.06.24

51	P20160068	Provisional Application	10-2016-0014508	2016.02.04
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		KR Issue	10-1888251	2018.08.07
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		US Issue	11,082,957	2021.08.03
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		CN Issue	CN 107040338 B	2020.11.06
52	P20170314	Provisional Application	10-2017-0068023	2017.05.31
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	P20170314US	US Application	15/990,917	2018.05.29
		US Issue	10,616,916	2020.04.07
	P20170314CN	CN Application	201810531289.8	2018.05.29
		CN Issue	CN 108988997 B	2021.04.02
53	P20160663	Provisional Application	10-2016-0122503	2016.09.23
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		KR Issue	10-2127753	2020.06.23
	P20170584P1	KR Application(DA)	10-2020-0072207	2020.06.15
		KR Issue(DA)	10-2222399	2021.02.24
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		US Issue	10,764,099	2020.09.01
	P20160663USD1	US Application(DA)	16/929,568	2020.07.15
		US Issue(DA)	10,868,702	2020.12.15

	P20160663EP	EP Application	17853481.4	2018.12.28
	P20160663CN	CN Application	201780041877.7	2019.01.04
		CN Issue	CN 109417529 B	2021.08.31
54	P20160696	Provisional Application	10-2016-0127093	2016.09.30
	P20170667	KR Application	10-2017-0124195	2017.09.26
	P20160696PC	PCT	PCT/KR2017/010811	2017.09.28
	P20160696US	US Application	16/338,433	2019.03.29
		US Issue	11,363,548	2022.06.14
	P20160696EP	EP Application	17856779.8	2019.04.10
	P20160696CN	CN Application	201780061059.3	2019.04.01
		CN Issue	CN 109906569 B	2021.05.11
55	P20160790	Provisional Application	10-2016-0143013	2016.10.31
	P20170799	KR Application	10-2017-0140898	2017.10.27
		KR Issue	10-2114940	2020.05.19
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		KR Issue(DA)	10-2130803	2020.06.29
	P20160790PC	PCT	PCT/KR2017/012105	2017.10.30
	P20160790US	US Application	16/346,108	2019.04.29
		US Issue	10,952,206	2021.03.16
	P20160790USC1	US Application(CA)	17/170,922	2021.02.09
		US Issue(CA)	11540272	2022.12.08
	P20160790USC1C1	US Application(CA)	17/970604	2022.10.21
	P20160790EP	EP Application	17865576.7	2019.05.10

	P20160790CN	CN Application	201780066665.4	2019.04.26
		CN Issue	CN 110114997 B	2021.12.10
56	P20160806	Provisional Application	10-2016-0146950	2016.11.04
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		KR Issue	10-2092560	2020.03.18
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	P20160806US	US Application	16/347,568	2019.05.03
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	P20160806USC1	US Application(CA)	17/176,149	2021.02.15
	P20160806EP	EP Application	17866547.7	2019.05.13
		EP Issue	3537794	2021.09.08
	P20160806DE	DE Application	17866547.7	2019.05.13
		DE Issue	3537794	2021.09.08
	P20160806GB	GB Application	17866547.7	2019.05.13
		GB Issue	3537794	2021.09.08
	P20160806FR	FR Application	17866547.7	2019.05.13
		FR Issue	3537794	2021.09.08
	P20160806CN	CN Application	201780067632.1	2019.04.30
57	P20160835	Provisional Application	10-2016-0152845	2016.11.16
	P20170801	KR Application	10-2017-0150595	2017.11.13
		KR Issue	10-2129362	2020.06.26
	P20160835PC	PCT	PCT/KR2017/012910	2017.11.15
	P20160835US	US Application	16/349,347	2019.05.13
		US Issue	10,897,720	2021.01.19

	P20160835CN	CN Application	201780069670.0	2019.05.10
58	P20170131	Provisional Application	10-2017-0033297	2017.03.16
	P20170479	Provisional Application	10-2017-0082920	2017.06.29
	P20170622	Provisional Application	10-2017-0101782	2017.08.10
	P20170934	KR Application	10-2018-0014571	2018.02.06
		KR Issue	10-2117970	2020.05.27
	P20170131US	US Application	15/920,524	2018.03.14
		US Issue	10,609,699	2020.03.31
	P20170131USC1	US Application(CA)	16/792,826	2020.02.17
		US Issue(CA)	11,044,718	2021.06.22
	P20170131USC1C1	US Application(CA)	17/307,978	2021.05.04
	P20170131CN	CN Application	201810217772.9	2018.03.16
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59	P20170303	Provisional Application	10-2017-0065379	2017.05.26
	P20170451	Provisional Application	10-2017-0081411	2017.06.27
	P20180017	KR Application	10-2018-0037938	2018.04.02
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	P20170303US	US Application	15/985,862	2018.05.22
		US Issue	10,979,190	2021.04.13

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	P20170303CN	CN Application	201810493891.7	2018.05.22
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		KR Issue(DA)	10-2198758	2020.12.29
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61	P20170741	Provisional Application	10-2017-0118757	2017.09.15
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		KR Issue	10-2198015	2020.12.28
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	P20170741CN	CN Application	201811085562.5	2018.09.17
62	P20170743	Provisional Application	10-2017-0118409	2017.09.15
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		KR Issue	10-2193191	2020.12.14

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63	P20170765	Provisional Application	10-2017-0128177	2017.09.29
	P20170917	Provisional Application	10-2017-0162692	2017.11.30
	P20180532	Provisional Application	10-2018-0084727	2018.07.20
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	P20180208	KR Application	10-2018-0096773	2018.08.20
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	P20170795US	US Application	16/149,344	2018.10.02
		US Issue	10,715,283	2020.07.14
	P20170795CN	CN Application	201811168010.0	2018.10.08
		CN Issue	CN 109600212 B	2021.08.31
65	P20140677	Provisional Application	10-2014-0119263	2014.09.05
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		KR Issue	10-1814248	2017.12.26
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		US Issue	10,735,967	2020.08.04
	P20140677CN	CN Application	201580047094.0	2017.03.02
		CN Issue	CN 106717045 B	2021.03.05
66	P20150098	Provisional Application	10-2015-0032665	2015.03.09
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		KR Issue	10-1987525	2019.06.03
	P20150098PC	PCT	PCT/KR2016/002281	2016.03.08
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		US Issue	10,708,893	2020.07.07
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		CN Issue	CN 107431592 B	2020.07.07
67	P20160241	Provisional Application	10-2016-0054935	2016.05.03
	P20170025	KR Application	10-2017-0044062	2017.04.05
		KR Issue	10-2016106	2019.08.23
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		CN Issue	CN 107360561 B	2020.09.11
68	P20160249	Provisional Application	10-2016-0054937	2016.05.03
	P20160250	Provisional Application	10-2016-0054936	2016.05.03

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	P20160249US	US Application	16/098,841	2018.11.02
		US Issue	10,667,322	2020.05.26
	P20160249CN	CN Application	201780027502.5	2018.11.02
		CN Issue	CN 109076496 B	2021.09.03
69	P20160251	Provisional Application	10-2016-0054930	2016.05.03
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		KR Issue	10-2005910	2019.07.25
	P20160251US	US Application	15/582,906	2017.05.01
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	P20160251CN	CN Application	201710291278.2	2017.04.28
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70	P20170098	Provisional Application	10-2017-0030764	2017.03.10
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	P20170896	Provisional Application	10-2017-0152149	2017.11.15
	P20180044	KR Application	10-2018-0026611	2018.03.07
		KR Issue	10-2065137	2020.01.06
	P20170098PC	PCT	PCT/KR2018/002750	2018.03.08
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		US Issue	10,986,530	2021.04.20
	P20170098CN	CN Application	201880004237.3	2019.05.06

		CN Issue	CN 109937587 B	2022.06.14
71	P20170397	Provisional Application	10-2017-0076126	2017.06.15
	P20170930	KR Application	10-2018-0051293	2018.05.03
		KR Issue	10-2023672	2019.09.16
	P20170397US	US Application	16/004,783	2018.06.11
		US Issue	10,511,994	2019.12.17
	P20170397CN	CN Application	201810612491.3	2018.06.14
	P20170397CN	CN Issue	CN 109151878 B	2021.12.14
72	P20160282	Provisional Application	10-2016-0062068	2016.05.20
	P20160481	KR Application	10-2016-0088331	2016.07.13
		KR Issue	10-2100491	2020.04.07
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		US Issue	10,869,243	2020.12.15
73	P20170018	Provisional Application	10-2017-0005590	2017.01.12
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		KR Issue	10-2117098	2020.05.25
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		US Issue	10,660,004	2020.05.19
74	P20170234	Provisional Application	10-2017-0054983	2017.04.28
	P20170673	KR Application	10-2018-0000256	2018.01.02
		KR Issue	10-1957087	2019.03.05
	P20170234US	US Application	15/967,512	2018.04.30

		US Issue	10,772,148	2020.09.08
75	P20170238	Provisional Application	10-2017-0057299	2017.05.08
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		KR Issue	10-2066689	2020.01.09
	P20170238US	US Application	15/969,858	2018.05.03
		US Issue	10,470,159	2019.11.05
76	P20170389	Provisional Application	10-2017-0076924	2017.06.16
	P20180250	KR Application	10-2018-0053053	2018.05.09
		KR Issue	10-2042036	2019.11.01
	P20170389US	US Application	16/007,050	2018.06.13
		US Issue	10,499,376	2019.12.03
77	P20180202	Provisional Application	10-2018-0039897	2018.04.05
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		KR Issue	10-2206773	2021.01.19
	P20180202US	US Application	16/373,808	2019.04.03
		US Issue	10,873,671	2020.12.22
78	P20180557	Provisional Application	10-2018-0090004	2018.08.01
	P20190287	KR Application	10-2019-0075402	2019.06.25
		KR Issue	10-2198010	2020.12.28
	P20180557US	US Application	16/528,980	2019.08.01
		US Issue	11,178,573	2021.11.16
79	P20160807	가출원	10-2016-0146955	2016.11.04
	P20170669	KR 출원	10-2017-0135215	2017.10.18

		KR 등록	10-2130999	2020.07.01
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	P20160807US	US 출원	16/347,571	2019.05.03
	P20160807EP	EP 출원	17867332.3	2019.05.13
	P20160807CN	CN 출원	201780067633.6	2019.04.30
80	P20170184	가출원	10-2017-0047545	2017.04.12
	P20170239	가출원	10-2017-0056477	2017.05.02
	P20170507	가출원	10-2017-0086107	2017.07.06
	P20180096	정규출원	10-2018-0034955	2018.03.27
	P20170184US	US 출원	15/951,349	2018.04.12
		US 등록	10,958,380	2021.03.23
	P20170184USC1	US 출원(CA)	17/173,097	2021.02.10
	P20170184CN	CN 출원	201810318869.9	2018.04.11