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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
62/368,369	07/29/2016		260	0203-1959		

68103
Jefferson IP Law, LLP
1130 Connecticut Ave., NW, Suite 420
Washington, DC 20036

CONFIRMATION NO. 1014
FILING RECEIPT



Date Mailed: 08/11/2016

Receipt is acknowledged of this provisional patent application. It will not be examined for patentability and will become abandoned not later than twelve months after its filing date. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, 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 Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections 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**

Inventor(s)

Anil AGIWAL, Suwon-si, KOREA, REPUBLIC OF;
Hyunseok RYU, Yongin-si, KOREA, REPUBLIC OF;
Peng XUE, Suwon-si, KOREA, REPUBLIC OF;

Applicant(s)

Samsung Electronics Co., Ltd., Suwon-si, KOREA, REPUBLIC OF;

Power of Attorney: The patent practitioners associated with Customer Number 68103

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: No

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: 08/10/2016

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 62/368,369**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title**METHOD AND APPARATUS FOR HANDLING COLLISIONS IN NEXT GENERATION
COMMUNICATION SYSTEM****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 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 Assets Control, 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).

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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 or equivalent) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5. If the Power of Attorney by Applicant form is not accompanied by this transmittal form or an equivalent, the Power of Attorney will not be recognized in the application.

Application Number	
Filing Date	July 29, 2016
First Named Inventor	Anil AGIWAL
Title	METHOD AND APPARATUS...
Art Unit	
Examiner Name	
Attorney Docket Number	0203-1959

SIGNATURE of Applicant or Patent Practitioner

Signature	/Gregory L. CLINTON/	Date	July 29, 2016
Name	Gregory L. Clinton	Telephone	202-293-2539
Registration Number	Reg # 59,134		

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

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.31, 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.

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.

POWER OF ATTORNEY BY APPLICANT

REGISTERED PRACTITIONERS

I hereby revoke all previous powers of attorney given in the application identified in the attached transmittal letter.

- ☒ I hereby appoint 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 equivalent):

68103

OR

- ☐ I hereby appoint Practitioner(s) named below 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 equivalent):

Name	Registration Number	Name	Registration Number

Please recognize or change the correspondence address for the application identified in the attached transmittal letter to:

- ☒ The address associated with the above-mentioned Customer Number.

OR

- ☐ The address associated with Customer Number:

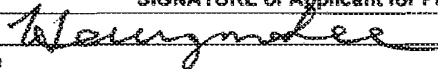
OR

☐ Firm or Individual Name			
Address			
City	State	Zip	
Country			
Telephone	Email		

I am the Applicant:

- ☐ 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	2012.10.11
Name	Heungmo Lee	Telephone	+82-31-279-4761
Title and Company	Vice President, Samsung Electronics Co., Ltd.		

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 *.

- ☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.31, 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.

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	0203-1959
		Application Number	
Title of Invention	METHOD AND APPARATUS FOR HANDLING COLLISIONS IN NEXT GENERATION COMMUNICATION SYSTEM		
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.)
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Inventor Information:

Inventor	1				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Anil		AGIWAL		
Residence Information (Select One) US Residency ● Non US Residency Active US Military Service					
City	Suwon-si	Country of Residence ⁱ	KR		
Mailing Address of Inventor:					
Address 1	No.104-1902, 363, Hyowon-ro, Yeongtong-gu				
Address 2					
City	Suwon-si, Gyeonggi-do	State/Province			
Postal Code		Country ⁱ	KR		
Inventor	2				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Hyunseok		RYU		
Residence Information (Select One) US Residency ● Non US Residency Active US Military Service					
City	Yongin-si	Country of Residence ⁱ	KR		
Mailing Address of Inventor:					
Address 1	No.501-1103, 37, Heungdeok 1-ro 79beon-gil				
Address 2	Giheung-gu				
City	Yongin-si, Gyeonggi-do	State/Province			
Postal Code		Country ⁱ	KR		
Inventor	3				Remove
Legal Name					

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0203-1959
		Application Number	
Title of Invention	METHOD AND APPARATUS FOR HANDLING COLLISIONS IN NEXT GENERATION COMMUNICATION SYSTEM		

Prefix	Given Name	Middle Name	Family Name	Suffix
	Peng		XUE	
Residence Information (Select One) US Residency ☒ Non US Residency Active US Military Service				
City	Suwon-si	Country of Residence ⁱ	KR	

Mailing Address of Inventor:

Address 1	No.300-1101, 134, Beopjo-ro, Yeongtong-gu			
Address 2				
City	Suwon-si, Gyeonggi-do	State/Province		
Postal Code		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:

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	68103		
Email Address	usdocketing@jeffersonip.com	Add Email	Remove Email

Application Information:

Title of the Invention	METHOD AND APPARATUS FOR HANDLING COLLISIONS IN NEXT GENERATION COMMUNICATION SYSTEM		
Attorney Docket Number	0203-1959	Small Entity Status Claimed	☐
Application Type	Provisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)		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 ⁱ

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0203-1959
		Application Number	
Title of Invention	METHOD AND APPARATUS FOR HANDLING COLLISIONS IN NEXT GENERATION COMMUNICATION SYSTEM		

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	68103		

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 this 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 blank.

Prior Application Status		Remove
Application Number	Continuity Type	Prior Application Number
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).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Remove
			Access Code ⁱ (if applicable)

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0203-1959
		Application Number	
Title of Invention	METHOD AND APPARATUS FOR HANDLING COLLISIONS IN NEXT GENERATION COMMUNICATION SYSTEM		

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.

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices

If 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 World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0203-1959
		Application Number	
Title of Invention	METHOD AND APPARATUS FOR HANDLING COLLISIONS IN NEXT GENERATION COMMUNICATION SYSTEM		

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	Samsung Electronics Co., Ltd.		
Mailing Address Information For Applicant:			
Address 1	129, Samsung-ro, Yeongtong-gu		
Address 2			
City	Suwon-si, Gyeonggi-do	State/Province	
Country	KR	Postal Code	16677
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.	
Assignee	1 Remove
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.	
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	0203-1959
		Application Number	
Title of Invention	METHOD AND APPARATUS FOR HANDLING COLLISIONS IN NEXT GENERATION COMMUNICATION SYSTEM		

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1				
Address 2				
City		State/Province		
Country ⁱ		Postal Code		
Phone Number		Fax Number		
Email Address				

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

Signature:

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

Signature	/Gregory CLINTON/			Date (YYYY-MM-DD)	2016-07-29
First Name	Gregory	Last Name	Clinton	Registration Number	59134

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

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 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.

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	METHOD AND APPARATUS FOR HANDLING COLLISIONS IN NEXT GENERATION COMMUNICATION SYSTEM			
First Named Inventor/Applicant Name:	Anil AGIWAL			
Filer:	George Charles Eckert/Natalie Love			
Attorney Docket Number:	0203-1959			
Filed as Large Entity				
Filing Fees for Provisional				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Provisional Application Filing	1005	1	260	260
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
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Total in USD (\$)				260

Electronic Acknowledgement Receipt

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International Application Number:	
Confirmation Number:	1014
Title of Invention:	METHOD AND APPARATUS FOR HANDLING COLLISIONS IN NEXT GENERATION COMMUNICATION SYSTEM
First Named Inventor/Applicant Name:	Anil AGIWAL
Customer Number:	68103
Filer:	George Charles Eckert/Natalie Love
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Attorney Docket Number:	0203-1959
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Provisional Cover Sheet (SB16)	0203-1959ProvisionalApplicationTransmittalAsFiled.pdf	1477190	no	3
			b0d17a126e1f4ed2dc765fed67251a280f8aad5c		
Warnings:					
Information:					
2	Specification	0203-1959ProvisionalApplicationAsFiled.pdf	555071	no	11
			d5fda5c0c10a5e3a6e9438b76f45e75b4f882a23		
Warnings:					
Information:					
3	Power of Attorney	0203-1959PowerofAttorneyAsFiled.pdf	1149258	no	2
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Warnings:					
Information:					
4	Application Data Sheet	0203-1959ApplicationDataSheetAsFiled.pdf	1819137	no	7
			0af981087be992fcb8b589d7c940738b33f681a5		
Warnings:					
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5	Fee Worksheet (SB06)	fee-info.pdf	29999	no	2
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Provisional Application for Patent Cover Sheet

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

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

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Title of Invention

METHOD AND APPARATUS FOR HANDLING COLLISIONS IN NEXT
GENERATION COMMUNICATION SYSTEM

Attorney Docket Number (if applicable)

0203-1959

Correspondence Address

Direct all correspondence to (select one):

☒ The address corresponding to Customer Number

☐ Firm or Individual Name

Customer Number

68103

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Applicant asserts small entity status under 37 CFR 1.27 or applicant certifies micro entity status under 37 CFR 1.29

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Signature	/Gregory CLINTON/		Date (YYYY-MM-DD)	2016-07-29
First Name	Gregory	Last Name	Clinton	Registration Number (If appropriate)
				59134

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INVENTION TITLE: Method and Apparatus for Handling Collisions in Next Generation Communication System

DESCRIPTION OF THE INVENTION

This description should be written in the Inventor's own words and should follow this guideline:

- 1. Describe the disadvantages of the prior art without mentioning your invention (Including any related publicly available documentation, such as journal articles or patents).**

In the recent years several broadband wireless technologies have been developed to meet the growing number of broadband subscribers and to provide more and better applications and services. The second generation wireless communication system has been developed to provide voice services while ensuring the mobility of users. Third generation wireless communication system supports not only the voice service but also data service. In recent years, the fourth wireless communication system has been developed to provide high-speed data service. However, currently, the fourth generation wireless communication system suffers from lack of resources to meet the growing demand for high speed data services. So fifth generation wireless communication system is being developed to meet the growing demand for high speed data services, support ultra-reliability and low latency applications and support massive machine type communication.

For uplink (UL) packet transmission user equipment (UE) is first allocated resources using scheduling control channel (e.g. Physical downlink common control channel (PDCCH)) in time slot (e.g. subframe) N and then UE transmits using the allocated resources in time slot N+P. The value of 'P' is different for different type of services/packets. For enhanced mobile broadband (eMBB) service/packet 'P' is larger than ultra-low latency (URLL) service/packet. In order to support low latency 'P' is smaller for URLL packet. This may result in collision between URLL and eMBB packet transmissions from different UEs.

In another scenario a UE may be allocated semi persistently scheduled (SPS) resource. The allocated SPS resource occur periodically every SPS interval. In this case URLL packet resources allocated to another UE using dynamic scheduling may collide with SPS resource.

So a method of handling packet collisions is needed.

- 2. Description of the invention in detail (Including its operation, purpose, environment and how your invention overcomes the shortcomings of the prior art). Begin with a system level diagram and associated high level description of your invention in the context of a possible product deployment of your invention, for example a handset, a base station, and/or a wireless network comprising one or more base stations and one or more handsets.**

Note: symbol refers to OFDM symbol in the description.

Collision Handling in UL

Method 1:

In this method of the proposed invention we proposed that, if URLL packet scheduled in time slot (e.g. subframe) 'X' overlaps with one or more eMBB packet(s) then, eNB/BS transmits (broadcast or dedicated manner) an indication in time slot 'X-P' ($P > 0$) to skip UL transmission in URLL symbol(s) in time slot 'X' OR drop UL packet transmission in time slot 'X'. UE skips UL transmission in URLL symbol(s) which overlaps with its UL packet transmission or UE drops UL packet transmission if it overlaps with URLL symbol(s). 'P' can be in unit of symbols or subframes or time slots.

In one embodiment the one or more time slots 'X' can be explicitly indicated in the indication. In alternate embodiment one or more time slots 'X' can be at a fixed offset from time slot in which indication is transmitted by NB/BS.

In one embodiment the one or more URLL symbol(s) to be skipped in one or time slots 'X' can be explicitly indicated in the indication by NB/BS. In alternate embodiment, one or more URLL symbol(s) can be pre-defined. In another embodiment, one or more URLL symbol(s) can be broadcasted in system information by NB/BS.

The indication can be signaled in broadcast or dedicated manner. In case of dedicated signaling, indication can be addressed to UE's C-RNTI. Depending on whether collision is with one or multiple UEs, appropriate signaling method can be used by NR/BS. In case of broadcast signaling indication can be addressed to broadcast RNTI. Alternately in case of broadcast signaling indication can be addressed to a new RNTI e.g. skip-RNTI. UEs which have been scheduled UL packet (and/or UL packet which has low priority compared to other packets (e.g. URLL)) may only monitor indication addressed to skip-RNTI. Indication can be an RRC message or MAC CE included in DL MAC PDU or DCI in PDCCH. Indication can also be signaled using BCH.

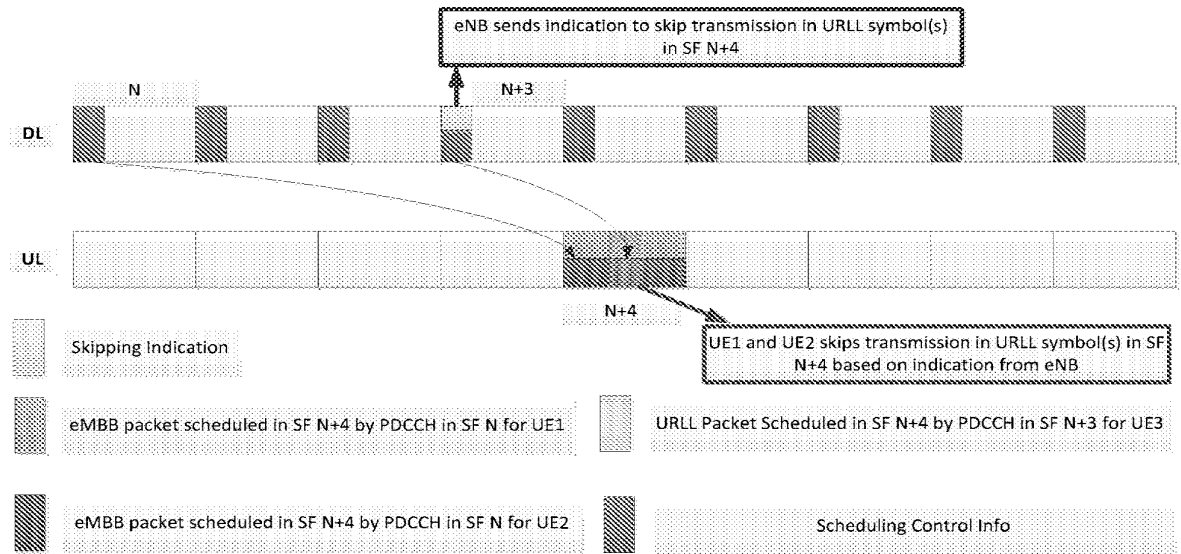


Figure 1

Figure 1 illustrates an example of handling collision using the proposed method. As illustrated in Figure 5, NB schedules UE1 and UE2 in subframe N+4 by transmitting scheduling control information (i.e. PDCCH) in subframe N. Later there is an urgent need to schedule UE3. So UE3 is scheduled in same subframe N+4 by transmitting scheduling control information (i.e. PDCCH) in subframe N+3. In this case, NB/BS knows that it has already scheduled UE1 and UE2 in subframe N+4. To avoid collision URLL service is prioritised over eMBB service. NB/BS sends an indication before subframe N+4 indicating UE1 and UE2 to skip transmission in URLL symbols in SF N+4. Alternately, NB/BS sends an indication before subframe N+4 indicating UE1 and UE2 to drop UL packet transmission in SF N+4.

Figure 2 illustrates message flows between UE and NB/BS for collision handling in case of dynamic scheduling. UE1 is first scheduled an eMBB packet in SF X by scheduling control information transmitted by NB/BS in subframe N1. Later UE3 is scheduled a URLL packet in SF X by scheduling control information transmitted by NB/BS in subframe N2, where $N2 > N1$. NB/BS determines whether to transmit skipping indication or not. Skipping indication is sent in subframe N3 where $N3 > N2$, if there is collision between eMBB packet scheduled to UE1 and URLL packet scheduled to UE3. If skipping indication is received by UE1 and is applicable to its UL packet transmission then it skips UL transmission in URLL symbol(s) or drop UL packet transmission. Skipping indication is applicable to UE it is addressed to it and/or its UL packet transmission collides with URLL symbol(s).

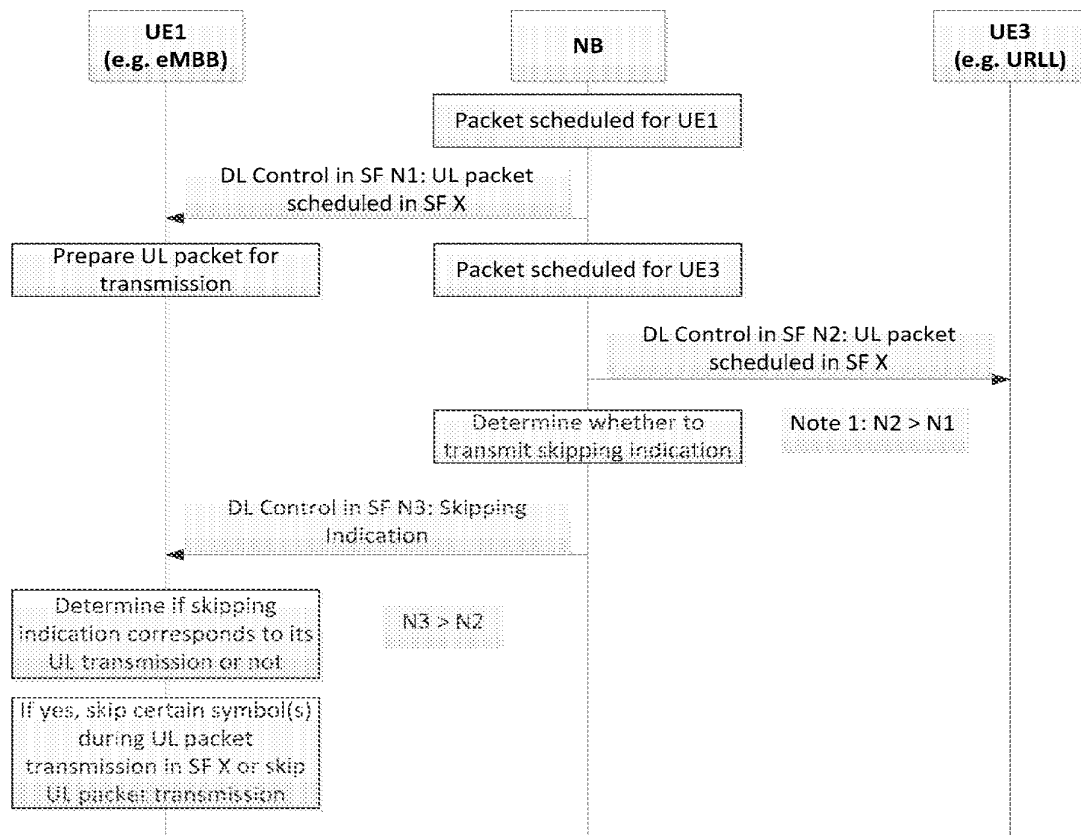


Figure 2

Figure 3 illustrates an alternate message flows between UE and NB/BS for collision handling in case of dynamic scheduling. This is same as figure 2 except that skipping indication is sent in subframe N3 where N3 equals N2.

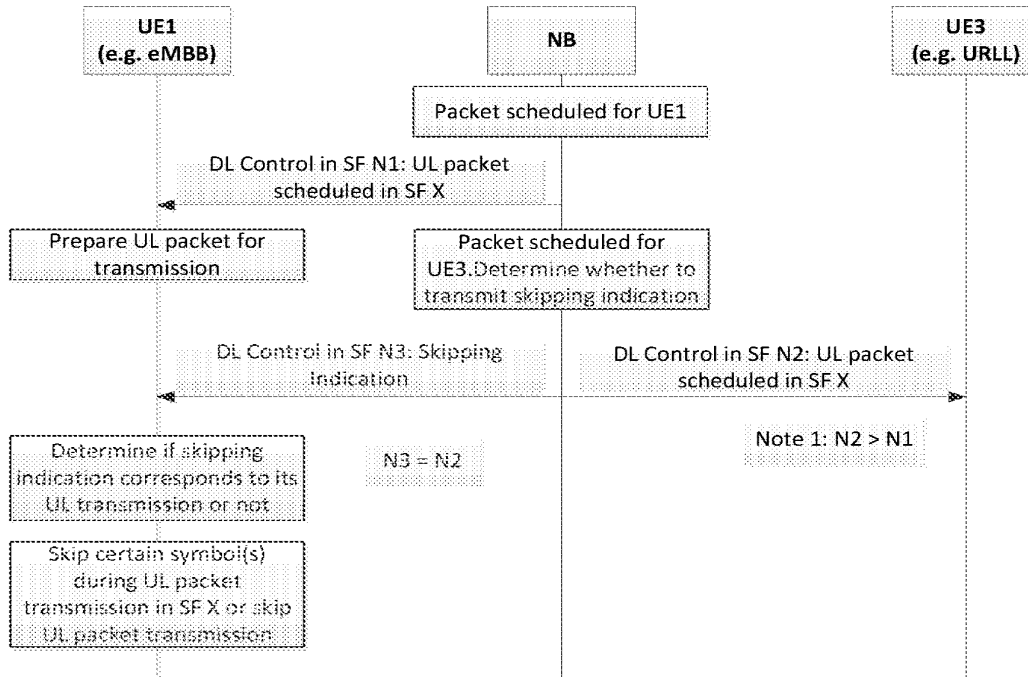


Figure 3

Figure 4 illustrates message flows between UE and NB/BS for collision handling in case of SPS.

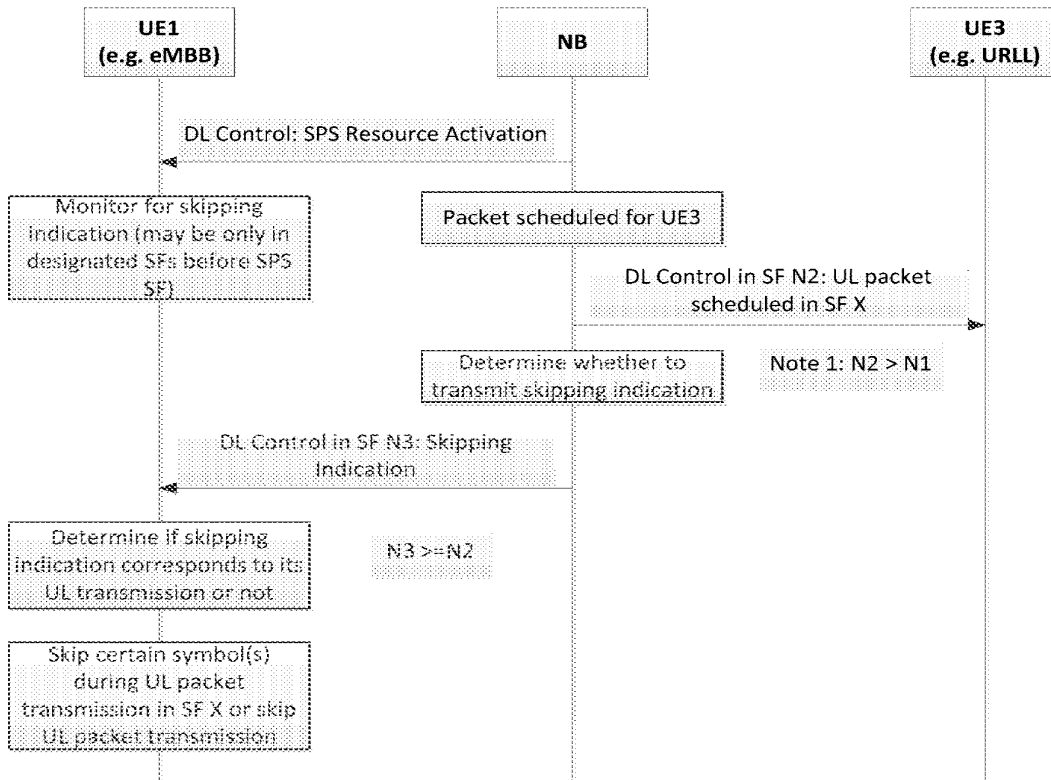


Figure 4

In one embodiment whether the UE has to apply skipping/dropping rule for a scheduled UL packet can be signaled by NB/BS. Only if this is signaled then only UE skip/drop based on skipping indication.

1. Whether the UE has to apply skipping rule or process skipping indication or not can be indicated in dedicated signaling
2. Whether the UE has to apply skipping rule or process skipping indication can be specified for each logical channel or LCG. Scheduling info can be there specific to logical channel or LCG. So UE applies the skipping rule or process skipping indication for UL packets of logical channel or LCG for which it is allowed.
3. Whether to apply skipping rule or process skipping indication can be specified for each RAN slice.
4. A packet type can be there in scheduling info. Whether to apply skipping rule or process skipping indication can be applied for specific packet type. So UE applies the skipping rule or process skipping indication for UL packets of packet type for which it is allowed.

In one embodiment the skipping indication can be named as URLL usage indication or overlapping indication. ENB/BS transmits (broadcast or dedicated manner) an indication that UL URLL symbol(s) in time slot 'X' are used. UE skips UL transmission in URLL symbol(s) which overlaps with its UL packet transmission or UE drops UL packet transmission if it overlaps with URLL symbol(s). In one embodiment the one or more time slots 'X' can be explicitly indicated in the indication. In alternate embodiment one or more time slots 'X' can be at a fixed offset from time slot in which indication is transmitted by NB/BS. In one embodiment the one or more URLL symbol(s) used in one or time slots 'X' can be explicitly indicated in the indication by NB/BS. In alternate embodiment, one or more URLL symbol(s) can be pre-defined. In another embodiment, one or more URLL symbol(s) can be broadcasted in system information by NB/BS.

Method 2:

In this method of invention we propose that UE skips transmission in one or more URLL symbols(s) in time slot X if time slot X is a URLL time slot or is a time slot having URLL symbols and UL packet is scheduled to UE in time slot X and resources allocated for UL packet overlaps with URLL resources. One or more URLL time slots are signaled by NB/BS in broadcast signaling. One or more URLL symbols in the URLL time slots can be pre-defined in system. Alternately one or more URLL symbols in URLL time slots can also be signaled by NB/BS in broadcast signaling. Frequency resources in URLL symbols can also be signaled if symbol is partially used for URLL.

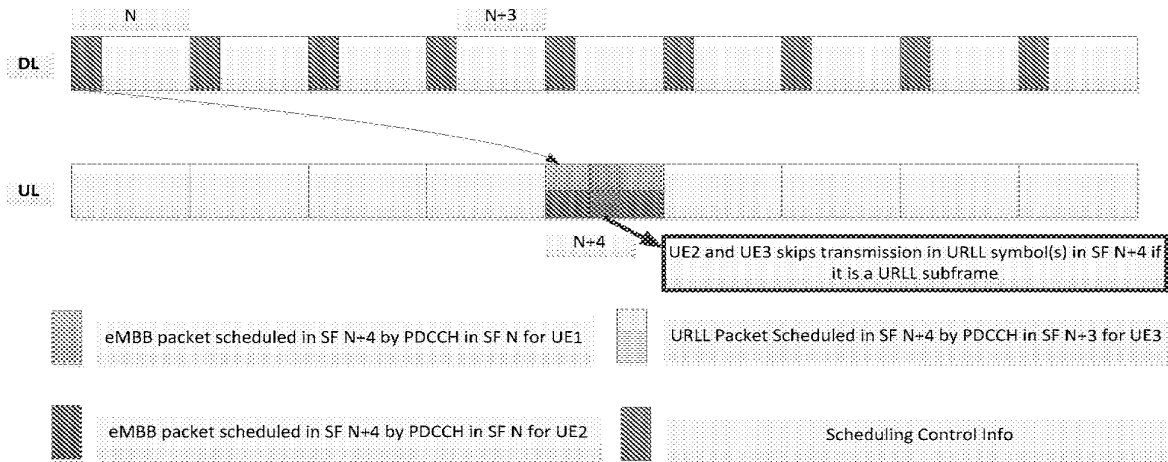


Figure 5

Figure 5 illustrates an example of handling collision using the proposed method. As illustrated in Figure 9, NB/BS schedules UE1 and UE2 in subframe N+4 by transmitting scheduling control information (i.e. PDCCH) in subframe N. Later there is an urgent need to schedule UE3. So UE3 is scheduled in same subframe N+4 by transmitting scheduling control information (i.e. PDCCH) in subframe N+3. Alternately UE3 may autonomously use URLL resource in subframe N+4. To avoid collision URLL service is prioritised over eMBB service. UE1 and UE2 skip transmission in URLL symbols in SF N+4 if it is URLL subframe and resources allocated for its UL packet in SF N+4 overlaps with URLL resources. Alternately UE1 and UE2 drops UL packet transmission in SF N+4 if SF N+4 is a URLL subframe and resources allocated for its UL packet in SF N+4 overlaps with URLL resources.

Figure 6 illustrates message flows between UE and NB/BS for collision handling in case of dynamic scheduling. URLL configuration (subframes, OFDM symbols, PRBs or sub carriers etc) is broadcasted by NR/BS. UE is first scheduled an eMBB packet in SF X by scheduling control information transmitted by NB/BS. UE prepare packet for transmission. UE skip transmission in URLL symbols in SF X if it is URLL subframe and resources allocated for its UL packet in SF X overlaps with URLL resources in that subframe. Alternately UE drops UL packet transmission in SF X if it is URLL subframe and resources allocated for its UL packet in SF X overlaps with URLL resources in that subframe.

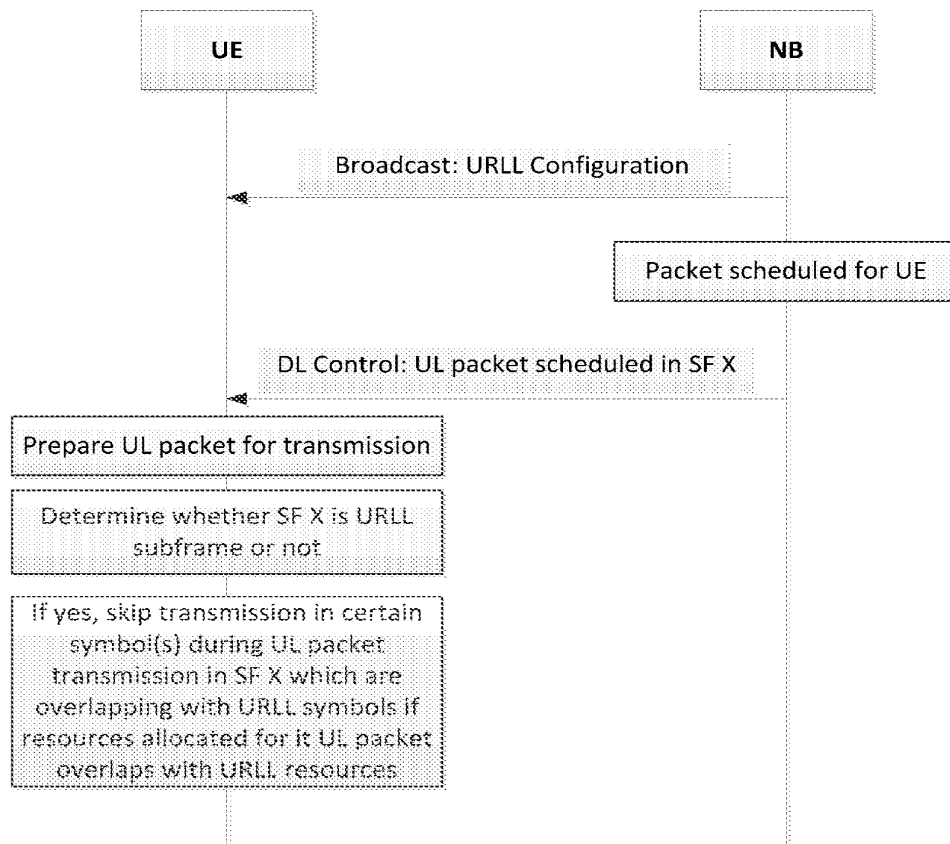


Figure 6

In one embodiment whether the UE has to apply skipping/dropping rule for a scheduled UL packet can be signaled by NB/BS. Only if this is signaled then only UE skip/drop if resources allocated for its UL packet in SF X overlaps with URLL resources in that subframe.

1. Whether the UE has to apply skipping rule or not can be indicated in dedicated signaling
2. Whether the UE has to apply skipping rule can be specified for each logical channel or LCG. Scheduling info can be there specific to logical channel or LCG. So UE applies the skipping rule for UL packets of logical channel or LCG for which it is allowed.
3. Whether to apply skipping rule can be specified for each RAN slice.
4. A packet type can be there in scheduling info. Whether to apply skipping rule can be applied for specific packet type. So UE applies the skipping rule for UL packets of packet type for which it is allowed.

Method 3:

In this method of invention we propose that UE skips transmission in one or more URLL symbols(s) in time slot X if UL packet is scheduled to UE in time slot X and scheduling info indicates to skip one or more URLL symbols. URLL symbols to be skipped are indicated in scheduling info.

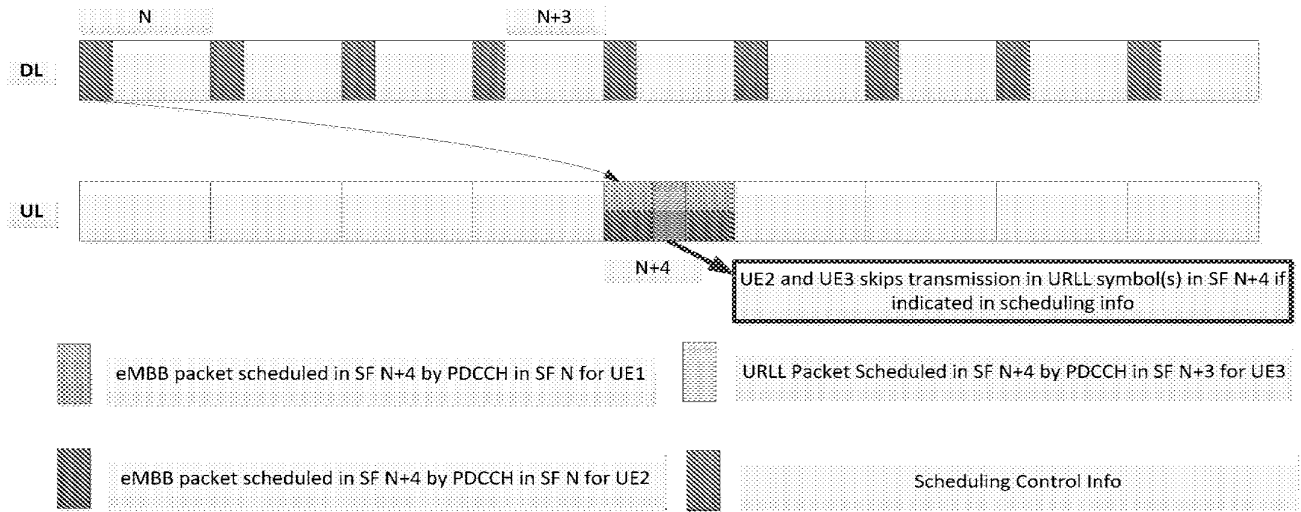


Figure 7

Figure 7 illustrates an example of handling collision using the proposed method. As illustrated in Figure 11, NB/BS schedules UE1 and UE2 in subframe N+4 by transmitting scheduling control information (i.e. PDCCH) in subframe N. Later there is an urgent need to schedule UE3. So UE3 is scheduled in same subframe N+4 by transmitting scheduling control information (i.e. PDCCH) in subframe N+3. Alternately UE3 may autonomously use URLL resource in subframe N+4. To avoid collision URLL service is prioritised over eMBB service. UE1 and UE2 skip transmission in URLL symbols in SF N+4 if these are indicated in scheduling info transmitted in subframe N. This method may lead to wastage if URLL symbols are not used for URLL service. However there is reduced signaling overhead of broadcasting URLL configuration and skipping indication.

The above methods have been explained for handling collision between URLL and eMBB across UEs. In case of collision between URLL and eMBB transmission within same UE, UE knows both URLL and eMBB transmission resources, so UE can skip transmission of either URLL or eMBB in colliding resources. In one embodiment UE skip transmission of URLL or eMBB only in symbols where there is collision. In one embodiment UE can skip transmission of complete URLL or eMBB packet in case of collision. In one embodiment URLL is prioritised and eMBB transmission is skipped. In another embodiment whether to prioritize eMBB or URLL can be indicated by network.

In the methods (method1 to method 3) explained above, whether to skip only symbols or entire packet when there is collision can decide based on number of symbols where there is collision. If the number of symbols where there is collision is above a threshold then UE skips entire packet transmission otherwise it skips only transmission in colliding symbols. Threshold can be signaled by NB/BS in broadcast or dedicated signaling.

Collision Handling in DL

Method 1:

In this method we assume that resources for URLL are reserved and indicated to UE in broadcast or dedicated signaling. BS sends indication indicating whether reserved resources in the corresponding subframe are used or not (i.e. whether URLL traffic is scheduled or not). Indication can be there in grant or in DCI. Special RNTI can be reserved for masking PDCCH for this indication. This method is illustrated in Figure 8. If the UE DL packet resources collide with the URLL resources and URLL reserved resources are in use, then during the decoding UE does not consider the information in colliding resources.

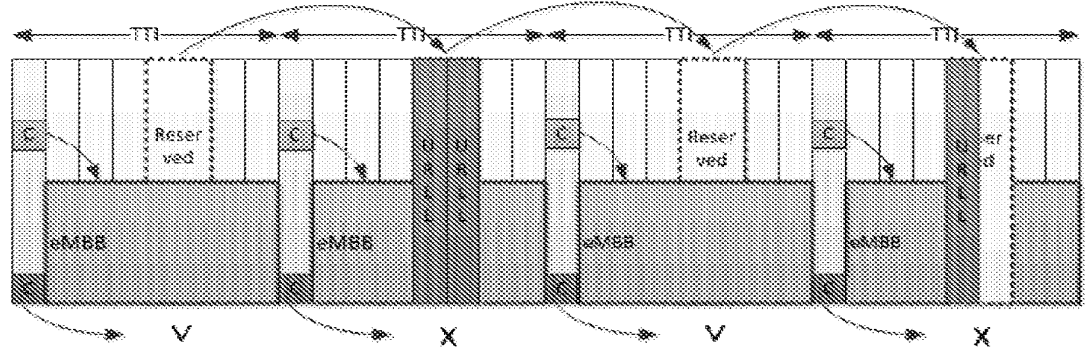


Figure 8

Method 2:

In this method we assume that resources for URLL are dynamically scheduled. BS sends indication indicating that certain resources (OFDM symbols and/or PRBs) are used for URLL in the subframe. URLL resources can be pre-defined or indicated in indication or broadcasted. For URLL resource usage indication UE may read PDCCH region for URLL. If the UE DL packet resources collides with the URLL resources, during the decoding UE does not consider the information in colliding resources. This method is illustrated in Figure 9.

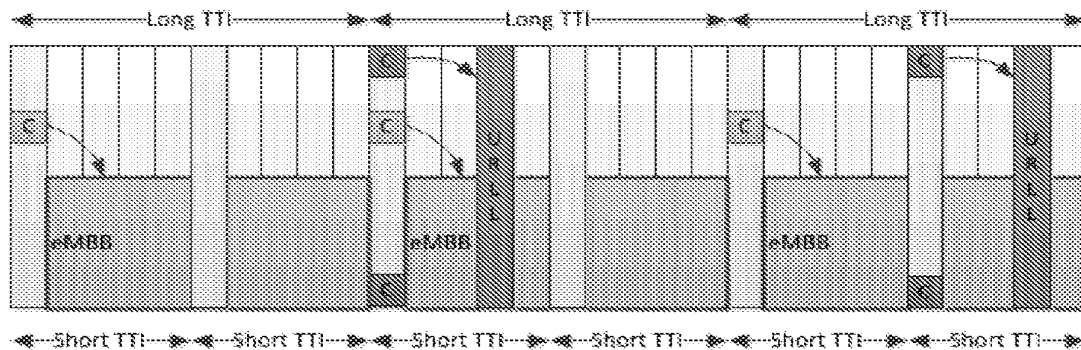


Figure 9

The above methods have been explained for handling collision between URLL and eMBB transmissions across UEs. In case of collision between URLL and eMBB transmission within same UE, UE knows both URLL and eMBB reception resources, so UE can skip received information of either URLL or eMBB in colliding resources during decoding. In one embodiment URLL is prioritised and eMBB information is skipped. In another embodiment whether to prioritize eMBB or URLL can be indicated by network.

Collision Handling between CSI RS and URLL transmissions

To support low latency fast data scheduling is needed. As a result there can be collision between CSI-RS and URLL transmission as shown in Figure 10. 'P' is delay between CSI-RS trigger and transmission of CSI-RS. 'Q' is delay between URLL trigger and transmission of URLL packet. In this case we propose that CSI-RS transmission is dropped and URLL packet is transmitted. URLL packet transmission is more urgent then CSI-RS. CSI-RS transmission and CSI-RS reporting can be re-triggered by eNB.

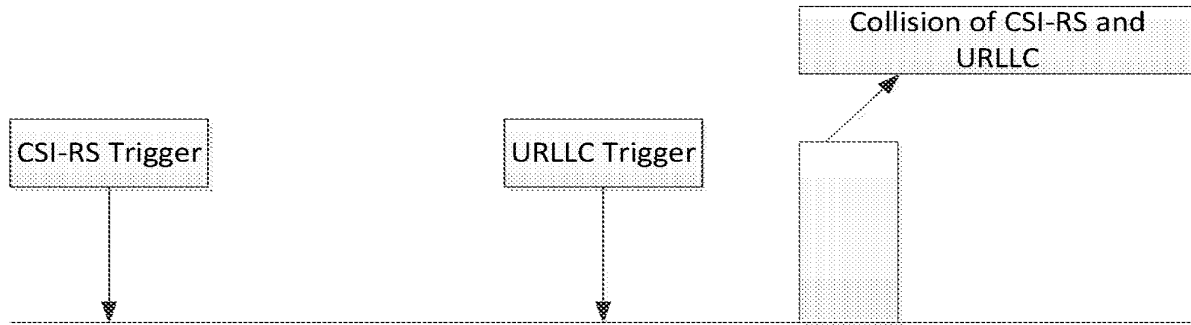


Figure 10

In case of collision URLL packet is transmitted instead of CSI-RS, so UE measuring CSI-RS will have incorrect measurement and CSI reporting will be not correct. In case CSI-RS is periodically transmitted and there is no measurement restriction then UE can send CSI report based on measurement of any CSI-RS transmission. So we propose to have measurement restriction i.e. CSI report should be based on measurement of latest N CSI-RS transmissions. N can be one. Based on this eNB will know whether CSI report is correct or not as it know which CSI-RS was collided. Whether to apply restriction or not can be signaled. It can also be implicit i.e. UE applies if URLL is configured.