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
Patent Number:	10237084
Patent Number:	10735967
Patent Number:	10708893
Patent Number:	9713094
Patent Number:	10178626
Patent Number:	10091736
Patent Number:	9461771
Patent Number:	9629010
Patent Number:	10009161
Patent Number:	11258532
Patent Number:	10791530
Patent Number:	11569958
Patent Number:	11363548
Patent Number:	11115157
Patent Number:	10925079
Patent Number:	10506630
Patent Number:	11405942
Patent Number:	11044743
Patent Number:	11765735
Patent Number:	10856307
Patent Number:	10869303
Patent Number:	10897720
Patent Number:	10609699
Patent Number:	11240785
Patent Number:	11160051
Patent Number:	10715290
Patent Number:	10966253
Patent Number:	10594460
Patent Number:	10638463
Patent Number:	11219000
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
Patent Number:	10616024
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
Patent Number:	10721118
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
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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
		US Issue(DA)	11,431,460	2022.08.30
	P20160257CND1	CN Application(DA)	201811307533.9	2018.11.05
		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
	P20160645PC	PCT	PCT/KR2017/008734	2017.08.11
	P20160645US	US Application	16/331,969	2019.03.09
		US Issue	11,115,976	2021.09.07
	P20160645CN	CN Application	201780055337.4	2019.03.08
		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
	P20140174US	US Application	14/664,853	2015.03.21
		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
		CN Issue	CN 106063214 B	2019.07.02
	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
	P20160508EP	EP Application	17827948.5	2018.12.28
	P20160508CN	CN Application	201780041919.7	2019.01.04
		CN Issue	CN 109417422 B	

20	P20160627	Provisional Application	10-2016-0112748	2016.09.01
	P20170169	KR Application	10-2017-0059543	2017.05.12
		KR Issue	10-2123233	2020.06.10
	P20160627PC	PCT	PCT/KR2017/008944	2017.08.17
	P20160627US	US Application	16/318,466	2019.01.17
		US Issue	11,044,743	2021.06.22
	P20160627USC1	US Application(CA)	17/307,945	2021.05.04
	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
	P20160720PC	PCT	PCT/KR2017/010863	2017.09.28
	P20160720US	US Application	16/340,096	2019.04.05
		US Issue	11,038,735	2021.06.15
	P20160720USC1	US Application(CA)	17/314,034	2021.05.06
		US Issue(CA)		
	P20160720USC1C1	US Application(CA)	18/078,965	2022.12.11
		US Issue(CA)		
	P20160720EP	EP Application	17858693.9	2019.04.16
	P20160720CN	CN Application	201780061902.8	2019.04.04
		CN Issue	CN 109792429 B	2021.12.14

22	P20160768	Provisional Application	10-2016-0141451	2016.10.27
	P20170778	Provisional Application	10-2017-0130023	2017.10.11
	P20170798	KR Application	10-2017-0139598	2017.10.25
		KR Issue	10-2057127	2019.12.12
	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
	P20160836US	US Application	16/349,874	2019.05.14
		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
	P20160837PC	PCT	PCT/KR2017/013045	2017.11.16
	P20160837US	US Application	16/461,640	2019.05.16

		US Issue	11,240,785	2022.02.01
	P20160837USC1	US Application(CA)	17/543,675	2021.12.06
	P20160837EP	EP Application	17871249.3	2019.05.27
	P20160837CN	CN Application	201780070560.6	2019.05.15
25	P20160768	Provisional Application	10-2016-0141451	2016.10.27
	P20170778	Provisional Application	10-2017-0130023	2017.10.11
	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
	P20170142PC	PCT	PCT/KR2017/011968	2017.10.27
	P20170142US	US Application	16/340,460	2019.04.09
		US Issue	10,925,079	2021.02.16
	P20170142EP	EP Application	17865212.9	2019.04.26
	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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		US Issue	11,160,051	2021.10.26
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	P20170011CN	CN Application	201880004512.1	2019.05.22
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27	P20170132	Provisional Application	10-2017-0035615	2017.03.21
	P20170866	Provisional Application	10-2017-0101169	2017.08.09
	P20170935	KR Application	10-2018-0014576	2018.02.06
		KR Issue	10-2043996	2019.11.06
	P20170935P1	KR Application(DA)	10-2019-0135870	2019.10.29
		KR Issue(DA)	10-2206761	2021.01.19
	P20170132US	US Application	15/924,553	2018.03.19
		US Issue	10,856,307	2020.12.01
	P20170132CN	CN Application	201810236651.9	2018.03.21
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	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
	P20170866	Provisional Application	10-2017-0101169	2017.08.09
	P20180049	KR Application	10-2018-0018656	2018.02.14
		KR Issue	10-2100483	2020.04.07

	P20170479US	US Application	15/923,658	2018.03.16
		US Issue	10,869,303	2020.12.15
	P20170479CN	CN Application	201810217863.2	2018.03.16
		CN Issue	CN 108633072 B	8/26/2022
29	P20170142	Provisional Application	10-2017-0037553	2017.03.24
	P20170428	Provisional Application	10-2017-0079911	2017.06.23
	P20170800	KR Application	10-2017-0139604	2017.10.25
		KR Issue	10-2010019	2019.08.06
	P20170428US	US Application	15/934,927	2018.03.23
		US Issue	10,506,630	2019.12.10
	P20170428CN	CN Application	201810251436.6	2018.03.26
		CN Issue	CN 108633076 B	
30	P20170318	Provisional Application	10-2017-0067957	2017.05.31
	P20180018	KR Application	10-2018-0035572	2018.03.28
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	P20170318US	US Application	15/990,895	2018.05.29
		US Issue	10,805,050	2020.10.13
	P20170318CN	CN Application	201810524233.X	2018.05.28
		CN Issue	CN 108988984 B	2021.07.09
31	P20170531	Provisional Application	10-2017-0089654	2017.07.14
	P20180193	KR Application	10-2018-0054207	2018.05.11
		KR Issue	10-2128964	2020.06.25
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	P20170531CN	CN Application	201810756991.4	2018.07.11
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	P20170621	Provisional Application	10-2017-0102577	2017.08.11
	P20180204	KR Application	10-2018-0057278	2018.05.18
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		US Issue	10,594,460	2020.03.17
	P20170594CN	CN Application	201810801096.X	2018.07.20
		CN Issue	CN 109309558 B	2021.10.08
33	P20170764	Provisional Application	10-2017-0128188	2017.09.29
	P20170916	Provisional Application	10-2017-0162728	2017.11.30
	P20180207	KR Application	10-2018-0077270	2018.07.03
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		KR Issue(DA)	10-2246988	2021.04.26
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		US Issue	10,638,463	2020.04.28
	P20170764USD1	US Application(DA)	16/826,482	2020.03.23
		US Issue(DA)	11,219,000	2022.01.04
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		CN Issue	CN 109586883 B	2021.11.05

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	P20180507	KR Application	10-2018-0132306	2018.10.31
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	P20180014US	US Application	16/241,086	2019.01.07
		US Issue	11,258,532	2022.02.22
	P20180014USC1	US Application(CA)	17/565,353	2021.12.29
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	P20180014CN	CN Application	201910011509.9	2019.01.07
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		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
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		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
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		KR Issue	10-1866619	2018.06.04
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		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
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		KR Issue	10-1632277	2016.06.15
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		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
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		KR Issue(DA)	10-2133255	2020.07.07
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	P20160805EP	EP Application	17867340.6	2019.05.16
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		CN Issue	CN 109906630 B	9/16/2022
41	P20170009	Provisional Application	10-2017-0002440	2017.01.06
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		US Issue	10,880,222	2020.12.29
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43	P20160264	Provisional Application	10-2016-0058157	2016.05.12
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44	P20170082	Provisional Application	10-2017-0027919	2017.03.03
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		US Issue	11,012,911	2021.05.18
45	P20170144	Provisional Application	10-2017-0037934	2017.03.24
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		KR Issue	10-2174936	2020.10.30

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		KR Issue	10-2115233	2020.05.20
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		US Issue	10,708,968	2020.07.07
47	P20180026	Provisional Application	10-2018-0006980	2018.01.19
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		US Issue	10,812,230	2020.10.20
48	P20150254	Provisional Application	10-2015-0067848	2015.05.15
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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
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		US Issue(CA)	10,178,626	2019.01.08
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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
		KR Issue	10-1632354	2016.06.15
	P20140175PC	PCT	PCT/KR2015/002022	2015.03.03
	P20140175US	US Application	14/664,854	2015.03.21
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	P20140175CN	CN Application	201580006949.5	2016.08.02
		CN Issue	CN 106464647 B	2019.09.13
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	P20170314CN	CN Application	201810531289.8	2018.05.29
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53	P20160663	Provisional Application	10-2016-0122503	2016.09.23
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		KR Issue	10-2127753	2020.06.23
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54	P20160696	Provisional Application	10-2016-0127093	2016.09.30
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		US Issue	11,363,548	2022.06.14
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55	P20160790	Provisional Application	10-2016-0143013	2016.10.31
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		KR Issue	10-2114940	2020.05.19
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		US Issue(CA)	11540272	2022.12.08
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56	P20160806	Provisional Application	10-2016-0146950	2016.11.04
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	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
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		US Issue	10,897,720	2021.01.19

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	P20170622	Provisional Application	10-2017-0101782	2017.08.10
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	P20170131CN	CN Application	201810217772.9	2018.03.16
		CN Issue	CN 108633071 B	8/23/2022
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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		US Issue	10,979,190	2021.04.13

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		CN Issue	CN 108966181 B	2021.07.23
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		KR Issue	10-2114919	2020.05.19
	P20180097P1	KR Application(DA)	10-2020-0034779	2020.03.23
		KR Issue(DA)	10-2198758	2020.12.29
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		US Issue	10,284,404	2019.05.07
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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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		US Issue	10,616,834	2020.04.07
	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
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	P20180532	Provisional Application	10-2018-0084727	2018.07.20
	P20180540	KR Application	10-2018-0092635	2018.08.08
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		US Issue	10,721,765	2020.07.21
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64	P20170795	Provisional Application	10-2017-0128513	2017.10.02
	P20180084	Provisional Application	10-2018-0022186	2018.02.23
	P20180208	KR Application	10-2018-0096773	2018.08.20
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		US Issue	10,715,283	2020.07.14
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		CN Issue	CN 109600212 B	2021.08.31
65	P20140677	Provisional Application	10-2014-0119263	2014.09.05
	P20150247	KR Application	10-2015-0094021	2015.07.01

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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
	P20150098US	US Application	15/556,028	2017.09.06
		US Issue	10,708,893	2020.07.07
	P20150098CN	CN Application	201680013808.0	2017.09.05
		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
	P20160241US	US Application	15/498,607	2017.04.27
		US Issue	10,420,067	2019.09.17
	P20160241CN	CN Application	201710282167.5	2017.04.26
		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

	P20170178	KR Application	10-2017-0053295	2017.04.26
		KR Issue	10-2057212	2019.12.12
	P20160249PC	PCT	PCT/KR2017/004432	2017.04.26
	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
	P20170076	KR Application	10-2017-0045815	2017.04.10
		KR Issue	10-2005910	2019.07.25
	P20160251US	US Application	15/582,906	2017.05.01
		US Issue	10,159,025	2018.12.18
	P20160251CN	CN Application	201710291278.2	2017.04.28
		CN Issue	CN 107343299 B	2021.01.05
70	P20170098	Provisional Application	10-2017-0030764	2017.03.10
	P20170317	Provisional Application	10-2017-0068074	2017.05.31
	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
	P20170098US	US Application	16/349,259	2019.05.10
		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
	P20160481PC	PCT	PCT/KR2017/007452	2017.07.12
	P20160481US	US Application	16/316,092	2019.01.08
		US Issue	10,869,243	2020.12.15
73	P20170018	Provisional Application	10-2017-0005590	2017.01.12
	P20170938	KR Application	10-2018-0002947	2018.01.09
		KR Issue	10-2117098	2020.05.25
	P20170018PC	PCT	PCT/KR2018/000518	2018.01.11
	P20170018US	US Application	16/343,819	2019.04.22
		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
	P20180146	KR Application	10-2018-0036753	2018.03.29
		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
	P20190047	KR Application	10-2019-0020835	2019.02.22
		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
	P20160807PC	PCT 국제출원	PCT/KR2017/012003	2017.10.27
	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

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United States Patent and Trademark Office
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/826,482	01/04/2022	11219000	KT21-0115D1	6363

126667 7590 12/15/2021

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 0 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 Data Management (ODM) at (571)-272-4200.

INVENTOR(s) (Please see PAIR WEB site http://pair.uspto.gov for additional inventors):

Kyujin PARK, 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;

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 USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

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**

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)

INVENSTONE PATENT, LLC.
14291-A Brushwood way
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, EFS-Web transmitted, or facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's Name)
(S-signature)
(Date)

APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
16/826,482	03/23/2020	Kyujin PARK	KT21-0115D1	6363

TITLE OF INVENTION: APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO

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	12/08/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
HO, CHUONG T	2412	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.
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 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
☐ Payment be credit card. Form PTO-2038 is attached
☑ 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)

5. Change of Entity Status (from status indicated above)

☐ 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 November 25, 2021

Typed or printed name Daniel CHUNG Registration No. 57,889

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 39 of 595

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.

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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:

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 Patent Application Fee Transmittal

Application Number:	16826482
Filing Date:	23-Mar-2020
Title of Invention:	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO
First Named Inventor/Applicant Name:	Kyujin PARK
Filer:	Daniel Chung/judy Kim
Attorney Docket Number:	KT21-0115D1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

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:	44370286
Application Number:	16826482
International Application Number:	
Confirmation Number:	6363
Title of Invention:	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	126667
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	KT21-0115D1
Receipt Date:	25-NOV-2021
Filing Date:	23-MAR-2020
Time Stamp:	00:15:22
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1200
RAM confirmation Number	E2021AO116153909
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 1.16 (National application filing, search, and examination fees) 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)

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)	KT21-0115D1-PTOL85b.pdf	156962 a1d131babdf45ebf7d3fd41740a6c09c02610768	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	37728 e4a630b8b687ff5e7369fed448a47e23d399bfe3	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	194690		

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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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/826,482	03/23/2020	Kyujin PARK	KT21-0115D1	6363

7590 11/03/2021

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14291-A Brushwood way
Centreville, VA 20121

EXAMINER	
HO, CHUONG T	

ART UNIT	PAPER NUMBER
2412	

NOTIFICATION DATE	DELIVERY MODE
11/03/2021	ELECTRONIC

NOTICE OF NON-COMPLIANT INFORMATION DISCLOSURE STATEMENT

An Information Disclosure Statement (IDS) filed 10/14/2021 in the above-identified application fails to meet the requirements of 37 CFR 1.97(d) for the reason(s) specified below. Accordingly, the IDS will be placed in the file, but the information referred to therein has not been considered.

The IDS is not compliant with 37 CFR 1.97(d) because:

☐ The IDS lacks a statement as specified in 37 CFR 1.97(e).

☑ The IDS lacks the fee set forth in 37 CFR 1.17(p).

☐ The IDS was filed after the issue fee was paid. Applicant may wish to consider filing a petition to withdraw the application from issue under 37 CFR 1.313(c) to have the IDS considered. See MPEP 1308.

C. Garner, for

571-272-4200 or 1-888-786-0101
Application Assistance Unit
Office of Data Management

FORM PTOM327-B (Rev. 02/08)

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 45 of 595

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	16826482
	Filing Date	2020-03-23
	First Named Inventor	Kyujin PARK
	Art Unit	2412
	Examiner Name	HO, CHUONG T
	Attorney Docket Number	KT21-0115D1

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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]

EFS Web 2.1.18

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16826482
	Filing Date	2020-03-23
	First Named Inventor	Kyujin PARK
	Art Unit	2412
	Examiner Name	HO, CHUONG T
	Attorney Docket Number	KT21-0115D1

	1	《 2017 11th International Conference on Signal Processing and Communication Systems (ICSPCS) 》 Lihui Wang 等 "Uplink control channel for 5G new RAT"	
	2	《 2018 IEEE 5G World Forum (5GWF) 》 Lopamudra Kundu;Gang Xiong;Joonyoung Cho "Physical Uplink Control Channel Design for 5G New Radio"	

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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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16826482
	Filing Date	2020-03-23
	First Named Inventor	Kyujin PARK
	Art Unit	2412
	Examiner Name	HO, CHUONG T
	Attorney Docket Number	KT21-0115D1

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	/Daniel CHUNG/	Date (YYYY-MM-DD)	2021-10-14
Name/Print	Daniel CHUNG	Registration Number	57889

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.

Electronic Acknowledgement Receipt

EFS ID:	44025809
Application Number:	16826482
International Application Number:	
Confirmation Number:	6363
Title of Invention:	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	126667
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	KT21-0115D1
Receipt Date:	14-OCT-2021
Filing Date:	23-MAR-2020
Time Stamp:	02:14:35
Application Type:	Utility under 35 USC 111(a)

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)	IDS_SB08.pdf	1037566 921a374136da0b9308660ed523fead40560e27dc	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	Physical_Uplink_Control_Channel_Design_for_5G_New_Radio.pdf	5684298 7aa28afb3c27acfaf35a23752b92ff9be3b6749f	no	6
Warnings:					
Information:					
3	Non Patent Literature	Uplink_control_channel_for_5G_new_RAT.pdf	329791 bcff3ed12070d6e97bbb4ea2aaad9b3f2fa899c3	no	7
Warnings:					
Information:					
4	Non Patent Literature	CN_OA.pdf	418970 c35390aa0100cbf2234713c3c5d0e7d5dbd3919a	no	7
Warnings:					
Information:					
			Total Files Size (in bytes):	7470625	

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

126667 7590 09/08/2021

INVENSTONE PATENT, LLC
14291-A Brushwood way
Centreville, VA 20121

EXAMINER	
HO, CHUONG T	
ART UNIT	PAPER NUMBER
2412	

DATE MAILED: 09/08/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/826,482	03/23/2020	Kyujin PARK	KT21-0115D1	6363

TITLE OF INVENTION: APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO

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	12/08/2021

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 and an extra copy of the form should be submitted. 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.

PTOL-85 (Rev. 02/11)

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 52 of 595

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 09/08/2021
INVENSTONE PATENT, LLC
14291-A Brushwood way
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.
16/826,482	03/23/2020	Kyujin PARK	KT21-0115D1	6363

TITLE OF INVENTION: APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO

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	12/08/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
HO, CHUONG T	2412	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/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 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. _____

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 53 of 595

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.
16/826,482	03/23/2020	Kyujin PARK	KT21-0115D1	6363

126667 7590 09/08/2021

INVENSTONE PATENT, LLC
14291-A Brushwood way
Centreville, VA 20121

EXAMINER	
HO, CHUONG T	
ART UNIT	PAPER NUMBER
2412	

DATE MAILED: 09/08/2021

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.

PTOL-85 (Rev. 02/11)

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. 16/826,482	Applicant(s) PARK, Kyujin	
	Examiner CHUONG T HO	Art Unit 2412	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 06/21/2021.
   ☐ 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 16-27 . 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. 1020170128 .
   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 _____.

/CHUONG T HO/
Primary Examiner, Art Unit 2412

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 56 of 595

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.

This office action is in response to the amendment filed 06/21/2021.

Claims 16-19, 20-23, 24-27 are pending.

Priority

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119 (a)-(d). The certified copy has been filed in parent Application No. REPUBLIC OF KOREA 10-2017-0128188, filed on 09/29/2017.

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119 (a)-(d). The certified copy has been filed in parent Application No. REPUBLIC OF KOREA 10-2017-0162728, filed on 11/30/2017.

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119 (a)-(d). The certified copy has been filed in parent Application No. REPUBLIC OF KOREA 10-2018-0077270, filed on 07/03/2018.

Allowable Subject Matter

1. Claims 16-19, 20-23, 24-27 are allowed.

2. The following is a statement of reasons for the indication of allowable subject matter:

Claim 16 is allowed over the prior art or record since the cited reference taken individually or in combination fails to particular disclose the following limitations: " wherein the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling " and in combination with other limitations recited as specified in claim 16.

Claim 20 is allowed over the prior art or record since the cited reference taken individually or in combination fails to particular disclose the following limitations: " wherein the UL control channel resource set configuration information is transmitted through UE specific radio resource control (RRC) signaling " and in combination with other limitations recited as specified in claim 20.

Claim 24 is allowed over the prior art or record since the cited reference taken individually or in combination fails to particular disclose the following limitations: " wherein the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling " and in combination with other limitations recited as specified in claim 24.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHUONG T HO whose telephone number is (571)272-3133. The examiner can normally be reached on 7:30-4:00.

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, Charles C Jiang can be reached on 571-270-7191. 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.

/CHUONG T HO/
Primary Examiner, Art Unit 2412

Notice of References Cited	Application/Control No. 16/826,482	Applicant(s)/Patent Under Reexamination PARK, Kyujin	
	Examiner CHUONG T HO	Art Unit 2412	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-20200059327-A1	02-2020	Kini; Ananth	H04W72/042	1/1
*	B	US-20200221444-A1	07-2020	Tiirola; Esa Tapani	H04L1/1812	1/1
*	C	US-20150195063-A1	07-2015	Ro; Sangmin	H04L5/005	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.

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 60 of 595

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/826,482	PARK, Kyujin
	Examiner	Art Unit
	CHUONG T HO	2412

✓	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	11/01/2020	04/12/2021	08/28/2021						
	1	-	-							
	2	-	-							
	3	-	-							
	4	-	-							
	5	-	-							
	6	-	-							
	7	-	-							
	8	-	-							
	9	-	-							
	10	-	-							
	11	-	-							
	12	-	-							
	13	-	-							
	14	-	-							
	15	-	-							
1	16	✓	✓	=						
2	17	✓	✓	=						
3	18	✓	O	=						
4	19	✓	O	=						
5	20	✓	✓	=						
6	21	✓	✓	=						
7	22	✓	O	=						
8	23	✓	O	=						
9	24	✓	✓	=						
10	25	✓	✓	=						
11	26	✓	O	=						
12	27	✓	O	=						
	28									
	29									
	30									

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 61 of 595

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/826,482	PARK, Kyujin
	Examiner	Art Unit
	CHUONG T HO	2412

CPC							
Symbol						Type	Version
H04W	/	72	/	0413		F	2013-01-01
H04W	/	72	/	042		A	2013-01-01

CPC Combination Sets								
Symbol						Type	Set	Ranking	Version
	/		/						

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	12	
/CHUONG T HO/ Primary Examiner, Art Unit 2412	28 August 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	16	1

U.S. Patent and Trademark Office — Part of Paper No.: 20210828

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 62 of 595

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/826,482	PARK, Kyujin
	Examiner	Art Unit
	CHUONG T HO	2412

INTERNATIONAL CLASSIFICATION					
CLAIMED					
H04J	/	4	/	00	
	/		/		

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
370	329

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					
370	330					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	12	
/CHUONG T HO/ Primary Examiner, Art Unit 2412	28 August 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	16	1

U.S. Patent and Trademark Office — Part of Paper No.: 20210828

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 63 of 595

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/826,482	PARK, Kyujin
	Examiner	Art Unit
	CHUONG T HO	2412

☐ 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		10	4	19		28								
	2		11	5	20		29								
	3		12	6	21		30								
	4		13	7	22										
	5		14	8	23										
	6		15	9	24										
	7	1	16	10	25										
	8	2	17	11	26										
	9	3	18	12	27										

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	12	
/CHUONG T HO/ Primary Examiner, Art Unit 2412	28 August 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	16	1

U.S. Patent and Trademark Office Part of Paper No.: 20210828

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 64 of 595

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/826,482	PARK, Kyujin
	Examiner	Art Unit
	CHUONG T HO	2412

CPC - Searched*		
Symbol	Date	Examiner
(H04W72/0413 or H04W72/042 or H04L5/0053 or H04W72/0453	08/28/2021	CH

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
370	329,330	08/28/2021	CH

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 65 of 595

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/826,482	PARK, Kyujin
	Examiner	Art Unit
	CHUONG T HO	2412

Search Notes		
Search Notes	**Date**	**Examiner**
(H04W72/0413 or H04W72/042 or H04L5/0053 or H04W72/0453 (Text search only - see search history printout)	08/28/2021	CH
370/329,330 (Text search only - see search history printout)	08/28/2021	CH
Claims search - see search history printout	08/28/2021	CH
Interference search - see search history printout.	08/28/2021	CH
Inventor and Assignee search in EAST and PALM - see search history printout.	08/28/2021	CH
IEEE search - see search history printout.	08/28/2021	CH
EAST search (USPAT, USPGPUB, EPO, USOCR, FERS, JPO, DERWENT, IBM_TDB) see search history printout.	08/28/2021	CH

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
	Interference search - see search history printout	08/28/2021	CH
370	329, 330	08/28/2021	CH
H04W	72/0413, 72/042, 72/0453	08/28/2021	CH
H04L	5/0053	08/28/2021	CH

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 66 of 595

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

BIB DATA SHEET

CONFIRMATION NO. 6363

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
16/826,482	03/23/2020 **RULE**	370	2412	KT21-0115D1

APPLICANTS
KT CORPORATION, Gyeonggi-do, KOREA, REPUBLIC OF;

INVENTORS
Kyujin PARK, Seoul, KOREA, REPUBLIC OF;

** **CONTINUING DATA** *************************
This application is a DIV of 16/147,530 09/28/2018 PAT 10638463

** **FOREIGN APPLICATIONS** *************************
REPUBLIC OF KOREA 10-2017-0128188 09/29/2017
REPUBLIC OF KOREA 10-2017-0162728 11/30/2017
REPUBLIC OF KOREA 10-2018-0077270 07/03/2018

** **IF REQUIRED, FOREIGN FILING LICENSE GRANTED** **
04/01/2020

	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
Foreign Priority claimed ☑ Yes ☐ No 35 USC 119(a-d) conditions met ☑ Yes ☐ No ☑ Met after Allowance Verified and Acknowledged ______ Examiner's Signature CH Initials	KOREA, REPUBLIC OF	9	12	3

ADDRESS

INVENSTONE PATENT, LLC
14291-A Brushwood way
Centreville, VA 20121
UNITED STATES

TITLE

APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO

FILING FEE RECEIVED		
1720	FEES: Authority has been given in Paper No.____________ to charge/credit DEPOSIT ACCOUNT No.____________ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other ________________ ☐ Credit

BIB (Rev. 05/07).

Doc Code: ECOMM.AUTH/ECOMM.WTDW
Doc Description: Internet Communications Authorized/Internet Communications Authorization Withdrawn

PTO/SB/439 (11-15)

AUTHORIZATION FOR INTERNET COMMUNICATIONS IN A PATENT APPLICATION OR REQUEST TO WITHDRAW AUTHORIZATION FOR INTERNET COMMUNICATIONS		
	Application No.	16/826,482
	Filing Date	03-23-2020
	First Named Inventor	Kyujin PARK
	Art Unit	2412
	Examiner Name	HO, CHUONG T
	Practitioner Docket No.	KT21-0115D1

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

I. To authorize permission for Internet Communications.

☑ Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned and practitioners in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via video conferencing, instant messaging, or electronic mail. I understand that a copy of these communications will be made of record in the application file. (MPEP 502.03)

II. To withdraw authorization for Internet Communications.

☐ The authorization given on _____, to the USPTO to communicate with the undersigned and any practitioner in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via Internet communications such as video conferencing, instant messaging, or electronic mail is hereby withdrawn. I understand that the withdrawal is effective when approved rather than when received.

I am the

☐ applicant.

☑ attorney or agent of record. Registration number 57,889.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Daniel J. Chung/	AUG. 29, 2021
Signature	Date
Daniel J. Chung	703-879-5205
Typed or printed name	Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Juristic entities must be represented by a patent practitioner (see 37 CFR 1.31, which is applicable to any paper filed on or after September 16, 2012, that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

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:	43630375
Application Number:	16826482
International Application Number:	
Confirmation Number:	6363
Title of Invention:	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	126667
Filer:	Daniel Chung
Filer Authorized By:	
Attorney Docket Number:	KT21-0115D1
Receipt Date:	29-AUG-2021
Filing Date:	23-MAR-2020
Time Stamp:	14:24:41
Application Type:	Utility under 35 USC 111(a)

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	Internet Communications Authorized	16826482_sb0439.pdf	74944 bf4d0f3875ff7ecfbb9f0def98d9c66ccddbefe0	no	2

Warnings:

Information:	
Total Files Size (in bytes):	74944

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 16/826,482	Filing Date 03/23/2020	☐ 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

AMENDMENT	06/21/2021	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) 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

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) 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".	/TAMMY D MCBETH BROWN/
*** 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.

Attorney Docket No.: KT21-0115D1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Kyujin PARK	Examiner: HO, CHUONG T
Application No.:	16/826,482	Group Art Unit: 2412
Filing Date:	03-23-2020	Confirmation No.: 6363
For:	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO	

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 April 16, 2021, please consider the following:

Amendments to the Claims begin on page 2.

Remarks begin on page 6.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1-15. (Canceled)

16. (Currently Amended) A method of transmitting uplink (UL) control information by a user equipment (UE), the method comprising:

receiving, from a base station, UL control channel resource set configuration information for UL control information transmission;

determining one of UL control channel resource sets contained in the received UL control channel resource set configuration information;

determining one of UL control channel resources contained in the determined UL control channel resource set; and

transmitting UL control information through the determined UL control channel resource,

wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information, and

wherein the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling.

17. (Currently Amended) The method according to claim 16, wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the UE ~~user equipment~~.

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18. (Currently Amended) The method according to claim 17, wherein the each UL BWP is activated through downlink (DL) control information.

19. (Currently Amended) The method according to claim 16, further comprising:

receiving, from the base station, downlink (DL) control information containing information indicating the one of the UL control channel resources for the UL control information transmission,

wherein the one of the UL control channel resources is indicated from the base station through the DL control information.

20. (Currently Amended) A method of receiving uplink (UL) control information by a base station, the method comprising:

transmitting, to a user equipment (UE), UL control channel resource set configuration information for ~~transmitting~~ UL control information ~~to a user equipment~~; and

receiving the UL control information through one of UL control channel resources ~~configuring~~ in one of UL control channel resource sets contained in the transmitted UL control channel resource set configuration information,

wherein the one of the UL control channel resource sets for the UL control information transmission is determined based on a size of the UL control information, and

wherein the UL control channel resource set configuration information is transmitted through UE specific radio resource control (RRC) signaling.

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21. (Currently Amended) The method according to claim 20, wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the UE ~~user equipment~~.

22. (Previously Presented) The method according to claim 21, wherein the each UL BWP is activated through downlink (DL) control information.

23. (Currently Amended) The method according to claim 20, further comprising:

transmitting, to the user equipment, downlink (DL) control information containing information that indicates the one of the UL control channel resources for the UL control information transmission,

wherein the one of the UL control channel resources is indicated to the UE ~~user equipment~~ through the DL control information.

24. (Currently Amended) A user equipment (UE) for transmitting uplink (UL) control information, comprising:

a receiver configured to receive, from a base station, UL control channel resource set configuration information for UL control information transmission;

a controller configured to determine one of UL control channel resource sets contained in the received UL control channel resource set configuration information, and determine one of UL control channel resources configuring the determined one UL control channel resource set; and

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a transmitter configured to transmit the UL control information through the determined UL control channel resource,

wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information, and

wherein the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling.

25. (Currently Amended) The UE ~~user equipment~~ according to claim 24, wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the UE ~~user equipment~~.

26. (Currently Amended) The UE ~~user equipment~~ according to claim 25, wherein the each UL BWP is activated through downlink (DL) control information.

27. (Currently Amended) The UE ~~user equipment~~ according to claim 24, wherein the receiver receives, from the base station, DL control information containing information that indicates the one of the UL control channel resources for the UL control information transmission,

wherein the one of the UL control channel resources is indicated from the base station through the DL control information.

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REMARKS

Applicant wish 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 16-17, 20-21 and 24-25 are rejected, and claims 18-19, 22-23 and 26-27 are objected. By this Response, claims 16-21 and 23-27 are amended. The amendments are supported by page. 10, lines 3-4, and page. 33, lines 5-13, and do not add new matter.

Rejection under 35 U.S.C. §103

On pages 4-9 of the Office Action, claims 16-17, and 24-25 were rejected under 35 U.S.C §103 as allegedly being unpatentable over Hooli et al. (U.S. Publication No. US 2018/0324786) (hereinafter "*Hooli*") in view of Yiu et al (U.S. Publication No. US 2019/0044689) (hereinafter "*Yiu*"), and further in view of AHN et al (U.S. Publication No. US 2019/0268123) (hereinafter "*AHN*").

On pages 9-11 of the Office Action, claims 20-21 were rejected under 35 U.S.C §103 as allegedly being unpatentable over *Hooli* in view of *Yiu*, and further in view of *AHN*.

In order to clarify and emphasize certain technical features, independent claim 16 is herewith amended as follows:

> *16. A method of transmitting uplink (UL) control information by a user equipment (UE), the method comprising:*

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receiving, *from a base station,* ***UL control channel resource set configuration information*** *for UL control information transmission;*

determining one of UL control channel resource sets contained in the received UL control channel resource set configuration information*;*

determining one of UL control channel resources contained in the determined UL control channel resource set; and

transmitting UL control information through the determined UL control channel resource,

wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information, and

wherein ***the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling****. (Emphasis added)*

Independent claim 20 is basically directed to a method of receiving uplink (UL) control information by a base station and amended claim 20 now includes certain corresponding limitations of amended independent claim 21.

Independent claim 24 is basically directed to a user equipment (UE) for transmitting uplink (UL) control information and now includes corresponding limitations of amended independent claim 21.

Applicant respectfully submits that independent claim 16 (as amended) is patentable because the cited reference, does not disclose or suggest each and every element of the claim. For example, Applicant respectfully submits that the cited reference does not disclose or suggest at least the above-emphasized features, in combination with other elements of the claim.

The Applicant's amended claim 16 now recites the above-emphasized features, i) "receiving, from a base station, UL control channel resource set configuration information for UL control information transmission", ii) "determining one of UL control channel resource sets

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contained in the received UL control channel resource set configuration information", and iii) "the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling".

On page. 5 of the Office Action, the Examiner admitted that *Hooli* does not explicitly teach UL control channel resource set configuration. That is, there is no specific teaching in *Hooli* regarding to the above-emphasized applicant's novel feature i), which is "receiving, from a base station, UL control channel resource set configuration information for UL control information transmission". In order to cover such lack of teaching by *Hooli*, in the outstanding Office Action, Examiner relied on *Yiu*. Specifically, the Examiner asserted that *Yiu* teaches the above-emphasized feature i). However, Applicant respectfully disagrees.

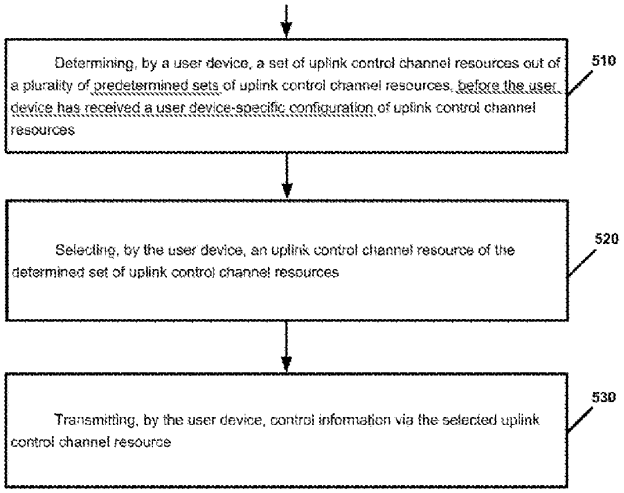
In particular, Examiner's relied portions of *Yiu* merely disclose that a plurality of BWPs, BWP transitions, and RRC signals used to set or transition states for BWPs. (See paragraphs [0138], [0142] and [0146] from Examiner's indicated paragraphs [0137]-[0152]).

> **[0138]** As stated above, there can be a plurality of BWPs for the UE **401**. In one example, there are a total of 4 BWPs. In another example, there are more than four BWPs. The BWPs can be set or configured as initial, active or default, in one example.
>
> **[0142]** The UE **401** transitions **516** from the initial BWP **502** to the active BWP **504** when radio resource control (RRC) indicates the UE **401** is in a connected mode with data. This is the RRC connected mode with data.
>
> **[0146]** Generally, RRC signals can be used to set or transition states for BWPs.

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From the paragraphs [0138] and [0142] of *Yiu*, people in the ordinary skilled in the art may deduce that certain (RRC) information can be signaled to set or configure BWPs. However, applicant strongly believes that *Yiu* still fails to teach or suggest Applicant's novel features of "receiving, from a base station, UL control channel resource set configuration information for UL control" of the above-emphasized feature i).

Furthermore, the combination of *Hooli* and *Yiu* is not possible, because *Hooli* basically performs determination of a set of uplink control channel resources out of a plurality of predetermined sets of uplink control channel resources, before receiving a user device-specific configuration from FIG. 5 as follows.



Namely, *Hooli* performs the determination of a set of uplink control channel resources with predetermined sets, and without receiving configuration information, and *Yiu* performs signaling to set or configure BWPs. Therefore, the signaling of *Yiu* is not applicable to *Hooli* because the performing of the determination of *Hooli* does not need to receive configuration information.

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Further, regarding the above-emphasized feature ii), which is "determining one of UL control channel resource sets contained in the received UL control channel resource set configuration information", Applicant wishes to point out that *Hooli* fails to teach or suggest the above-emphasized feature ii). That is, *Hooli* does not disclose the determination of one (i.e., a UL control channel resource set) in the received UL control channel resource set configuration information.

Moreover, in order to emphasize and clarify the reception of the UL control channel resource set configuration information, the above-emphasized feature iii), which is "the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling" has been added into the independent claim 16. This newly added feature is also not explicitly taught by the combination of *Hooli* and *Yiu*.

Accordingly, Applicant respectfully submits that independent claim 16 is patentable over the combination of *Hooli* and *Yiu* because it does not teach or suggest all of the features of the amended claim 16. Also, Applicant respectfully submits that independent claim 16 is patentable over the combination of *Hooli, Yiu* and *AHN* as well, because it does not teach or suggest all of the features of the amended claim 16.

Independent claims 20 and 24 contain similar features as amended claim 16. Therefore, Applicant respectfully submits that independent claims 16, 20 and 24 are all patentable over the cited reference for the above reason set forth above with regards to amended claim 16.

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Regarding claims 17, 21 and 25, Applicant respectfully submits that these claims are patentable for at least the reasons set forth above due to their respective dependencies.

Allowable subject matter

Applicant thanks Examiner for indicating that dependent claims 18, 19, 22, 23, 26, and 27 contain allowable subject matter.

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: June 21, 2021

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Electronic Acknowledgement Receipt

EFS ID:	43034205
Application Number:	16826482
International Application Number:	
Confirmation Number:	6363
Title of Invention:	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	126667
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	KT21-0115D1
Receipt Date:	21-JUN-2021
Filing Date:	23-MAR-2020
Time Stamp:	03:25:19
Application Type:	Utility under 35 USC 111(a)

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		P20170764USD1_KT21-0115D1_NFOA_response.pdf	96510 ee5352245530ae151c5f2585116d890d9aaaa8b6	yes	12

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	5
	Applicant Arguments/Remarks Made in an Amendment	6	12
Warnings:			
Information:			
	Total Files Size (in bytes):	96510	

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 NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/826,482	03/23/2020	Kyujin PARK	KT21-0115D1	6363

126667 7590 04/16/2021

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EXAMINER
HO, CHUONG T

ART UNIT	PAPER NUMBER
2412	

NOTIFICATION DATE	DELIVERY MODE
04/16/2021	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

Office Action Summary	Application No. 16/826,482	Applicant(s) PARK, Kyujin	
	Examiner CHUONG T HO	Art Unit 2412	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 02/03/2021.

☐ 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) 16-27 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) 16-17,20-21 and 24-25 is/are rejected.

8) ☑ Claim(s) 18-19,22-23 and 26-27 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 03/23/2020 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. 1020170128.

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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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.

This office action is in response to the Terminal Disclaimer and the amendment filed on 02/03/2021.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 01/19/2021 was filed after the mailing date of the Non Final Rejection on 11/05/2020. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Priority

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119 (a)-(d). The certified copy has been filed in parent Application No. REPUBLIC OF KOREA 10-2017-0128188, filed on 09/29/2017.

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119 (a)-(d). The certified copy has been filed in parent Application No. REPUBLIC OF KOREA 10-2017-0162728, filed on 11/30/2017.

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119 (a)-(d). The certified copy has been filed in parent Application No. REPUBLIC OF KOREA 10-2018-0077270, filed on 07/03/2018.

Response to Arguments

Applicant's arguments with respect to claim(s) 16-27 have been considered but are moot because the new ground of rejection does not rely on any reference applied in the prior rejection of record for any teaching or matter specifically challenged in the argument.

Claim Rejections - 35 USC § 103

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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.

Claims 16, 17, 24, 25 is/are rejected under 35 U.S.C. 103 as being unpatentable over 20180324786 (6250255) in view of 20190044689 (62564787), and further in view of 20190268123.

Regarding to claim 16, 20180324786 teaches a method of transmitting uplink (UL) control information by a user equipment, the method comprising:

Receiving, from a base station, UL control channel resource set information for UL control information transmission (determining or selecting, by a user device, a set of uplink control channel resources out of a plurality of predetermined sets of uplink control channel resources) [see Figure 5, step 510 and Paragraphs 0006 & 0007 & 0028 & 0029 & 0036 & 0045 & 0055 & 0057] ;

determining one of UL control channel resource sets contained in the UL control channel resource set information (determines or select a set of uplink control channel resources out of a plurality of predetermined sets of uplink control channel resources) [see Paragraph 0055] (select uplink control channel (e.g., PUCCH) resource set out a plurality of predetermined uplink control channel resource sets) [see Paragraph 0057];

determining one of UL control channel resources contained in the determined UL control channel resource set (select a resource within a resource set) [see Paragraph 0058] [see Figure 5, step 520, selecting, by the user device, an uplink control channel resource of the determined set of uplink control channel resources];

transmitting UL control information through the determined UL control channel resource (transmitting, by the user device, control information via the selected uplink control channel resource) [see Figure 5, step 530].

However, 20180324786 does not explicitly teach UL control channel resource set configuration.

20190044689, from the same or similar fields of endeavor, teaches the user equipment (UE) receives, from the base station, UL BWP configurations, RRC configuration of BWP) [see Figure 5 and Figure 6 and Paragraphs 137-152].

Thus, it would have been obvious to one of ordinary skill in the art before the effective filing data of the claimed invention to modify the system of 20180324786 in view of 20190044689 because 20190044689 suggests that what are needed are techniques to facilitate the allocation and use of bandwidth for wireless communication systems.

However, 20180324786 (6250255) and 20190044689 (62564787) do not explicitly teach wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information.

20190268123, from the same or similar fields of endeavor, teaches wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information (selecting one of a plurality of sets of PUCCH resources based on a payload size of uplink control information (UCI)) [see Abstract and claim 1 and claim 6].

Thus, it would have been obvious to one of ordinary skill in the art before the effective filing data of the claimed invention to modify the combined system (20180324786 (6250255) and 20190044689 (62564787)) and further in view of 20190268123 because 20190268123 suggests that With an increase in the number of serving cells supported in the CA environment, a greater number of PUCCH formats

with different payload sizes are required. In addition, how the terminal selects and uses the various PUCCH formats is an issue to be considered.

Regarding to claim 17, 20180324786 and 20190044689 and 20190268123 teach the limitations of claim 16 above.

However, 20180324786 does not explicitly teach wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the user equipment.

20190044689, from the same or similar fields of endeavor, teaches wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the user equipment (UL bandwidth part) [see Figure 5 and Figure 6 and Paragraphs 137-152].

Thus, it would have been obvious to one of ordinary skill in the art before the effective filing data of the claimed invention to modify the system of 20180324786 in view of 20190044689 because 20190044689 suggests that what are needed are techniques to facilitate the allocation and use of bandwidth for wireless communication systems.

Regarding to claim 24, 20180324786 teaches a user equipment for transmitting uplink (UL) control information, comprising:

A receiver configured to receive, from a base station, UL control channel resource set information for UL control information transmission (determining or selecting, by a user device, a set of uplink control channel resources out of a plurality of predetermined sets of uplink control channel resources) [see Figure 5, step 510 and Paragraphs 0006 & 0007 & 0028 & 0029 & 0036 & 0045 & 0055 & 0057] ;

A controller configured to determine one of UL control channel resource sets contained in the UL control channel resource set information (determines or select a set of uplink control channel resources out of a plurality of predetermined sets of uplink control channel resources) [see Paragraph 0055] (select uplink control channel (e.g., PUCCH) resource set out a plurality of predetermined uplink control channel resource sets) [see Paragraph 0057];

determine one of UL control channel resources contained in the determined UL control channel resource set (select a resource within a resource set) [see Paragraph 0058] [see Figure 5, step 520, selecting, by the user device, an uplink control channel resource of the determined set of uplink control channel resources];

a transmitter configured to transmit UL control information through the determined UL control channel resource (transmitting, by the user device, control information via the selected uplink control channel resource) [see Figure 5, step 530].

However, 20180324786 does not explicitly teach UL control channel resource set configuration.

20190044689, from the same or similar fields of endeavor, teaches the user equipment (UE) receives, from the base station, UL BWP configurations, RRC configuration of BWP) [see Figure 5 and Figure 6 and Paragraphs 137-152].

Thus, it would have been obvious to one of ordinary skill in the art before the effective filing data of the claimed invention to modify the system of 20180324786 in view of 20190044689 because 20190044689 suggests that what are needed are techniques to facilitate the allocation and use of bandwidth for wireless communication systems.

However, 20180324786 (6250255) and 20190044689 (62564787) do not explicitly teach wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information.

20190268123, from the same or similar fields of endeavor, teaches wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information (selecting one of a plurality of sets of PUCCH resources based on a payload size of uplink control information (UCI)) [see Abstract and claim 1 and claim 6].

Thus, it would have been obvious to one of ordinary skill in the art before the effective filing data of the claimed invention to modify the combined system (20180324786 (6250255) and 20190044689 (62564787)) and further in view of 20190268123 because 20190268123 suggests that With an increase in the number of serving cells supported in the CA environment, a greater number of PUCCH formats

with different payload sizes are required. In addition, how the terminal selects and uses the various PUCCH formats is an issue to be considered.

Regarding to claim 25, claim 25 is rejected the same limitations of claim 17 above.

Claims 20, 21 is/are rejected under 35 U.S.C. 103 as being unpatentable over 20180324786 (6250255) in view of 20190044689 (62564787), and further in view of 20190268123.

Regarding to claim 20, 20180324786 teaches a method of receiving uplink (UL) control information by a base station, the method comprising:
Determining, by a user device, UL control channel resource set (determines or selects a set of uplink control channel resource out of a plurality of predetermined sets of uplink control channel resources) [see Paragraphs 0055 and Figure 5, steps 510, 520]
information for transmitting UL control information to a user equipment; and
receiving the UL control information through one of UL control channel resources of one of UL control channel resource sets contained in UL control channel resource set information (transmitting, by the user device, control information via the selected uplink control channel resource) [see Paragraph 0055 and Figure 5, step 530].

However, 20180324786 does not explicitly teach transmitting UL control channel resource set configuration information for transmitting UL control information to a user equipment.

20190044689, from the same or similar fields of endeavor, teaches transmitting UL control channel resource set configuration information for transmitting UL control information to a user equipment (a base station transmits PUCCH resource set configuration information to a user equipment) [see Figure 5 and Figure 6 and Paragraphs 137-152].

Thus, it would have been obvious to one of ordinary skill in the art before the effective filing data of the claimed invention to modify the system of 20180324786 in view of 20190044689 because 20190044689 suggests that what are needed are techniques to facilitate the allocation and use of bandwidth for wireless communication systems.

However, 20180324786 (6250255) and 20190044689 (62564787) do not explicitly teach wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information.

20190268123, from the same or similar fields of endeavor, teaches wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information (selecting one of a plurality of sets of PUCCH resources based on a payload size of uplink control information (UCI)) [see Abstract and claim 1 and claim 6].

Thus, it would have been obvious to one of ordinary skill in the art before the effective filing data of the claimed invention to modify the combined system (20180324786 (6250255) and 20190044689 (62564787)) and further in view of 20190268123 because 20190268123 suggests that With an increase in the number of serving cells supported in the CA environment, a greater number of PUCCH formats

with different payload sizes are required. In addition, how the terminal selects and uses the various PUCCH formats is an issue to be considered.

Regarding to claim 21, 20180324786 and 20190044689 teach the limitations of claim 20 above.

However, 20180324786 does not explicitly teach wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the user equipment.

20190044689, from the same or similar fields of endeavor, teaches wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the user equipment (UL bandwidth part) [see Figure 5 and Figure 6 and Paragraphs 137-152].

Thus, it would have been obvious to one of ordinary skill in the art before the effective filing data of the claimed invention to modify the system of 20180324786 in view of 20190044689 because 20190044689 suggests that what are needed are techniques to facilitate the allocation and use of bandwidth for wireless communication systems.

Allowable Subject Matter

Claims 18, 19, 22, 23, 26, 27 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHUONG T HO whose telephone number is (571)272-3133. The examiner can normally be reached on 7:30-4:00.

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, Charles C Jiang can be reached on 571-270-7191. 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.

/CHUONG T HO/
Examiner, Art Unit 2412

Notice of References Cited	Application/Control No. 16/826,482	Applicant(s)/Patent Under Reexamination PARK, Kyujin	
	Examiner CHUONG T HO	Art Unit 2412	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-20190268123-A1	08-2019	AHN; Joonkui	H04L5/0053	1/1
	B					
	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)
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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/826,482	PARK, Kyujin
	Examiner	Art Unit
	CHUONG T HO	2412

CPC - Searched*		
Symbol	Date	Examiner
(H04W72/0413 or H04W72/042 or H04L5/0053 or H04W72/0453	04/12/2021	CH

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
370	329,330	04/12/2021	CH

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 102 of 595

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/826,482	PARK, Kyujin
	Examiner	Art Unit
	CHUONG T HO	2412

Search Notes		
Search Notes	**Date**	**Examiner**
(H04W72/0413 or H04W72/042 or H04L5/0053 or H04W72/0453 (Text search only - see search history printout)	04/12/2021	CH
370/329,330 (Text search only - see search history printout)	04/12/2021	CH
Claims search - see search history printout	04/12/2021	CH
Interference search - see search history printout.	04/12/2021	CH
Inventor and Assignee search in EAST and PALM - see search history printout.	04/12/2021	CH
IEEE search - see search history printout.	04/12/2021	CH
EAST search (USPAT, USPGPUB, EPO, USOCR, FERS, JPO, DERWENT, IBM_TDB) see search history printout.	04/12/2021	CH

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
	Interference search - see search history printout	04/12/2021	CH
370	329, 330	04/12/2021	CH

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 103 of 595

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/826,482	PARK, Kyujin
	Examiner	Art Unit
	CHUONG T HO	2412

✓	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	11/01/2020	04/12/2021							
	1	-	-							
	2	-	-							
	3	-	-							
	4	-	-							
	5	-	-							
	6	-	-							
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	11	-	-							
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	13	-	-							
	14	-	-							
	15	-	-							
1	16	✓	✓							
2	17	✓	✓							
3	18	✓	O							
4	19	✓	O							
5	20	✓	✓							
6	21	✓	✓							
7	22	✓	O							
8	23	✓	O							
9	24	✓	✓							
10	25	✓	✓							
11	26	✓	O							
12	27	✓	O							
	28									
	29									
	30									

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 104 of 595

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BIB DATA SHEET

CONFIRMATION NO. 6363

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
16/826,482	03/23/2020 **RULE**	370	2412	KT21-0115D1

APPLICANTS
KT CORPORATION, Gyeonggi-do, KOREA, REPUBLIC OF;

INVENTORS
Kyujin PARK, Seoul, KOREA, REPUBLIC OF;

** **CONTINUING DATA** **************************
This application is a DIV of 16/147,530 09/28/2018 PAT 10638463

** **FOREIGN APPLICATIONS** **************************
REPUBLIC OF KOREA 10-2017-0128188 09/29/2017
REPUBLIC OF KOREA 10-2017-0162728 11/30/2017
REPUBLIC OF KOREA 10-2018-0077270 07/03/2018

** **IF REQUIRED, FOREIGN FILING LICENSE GRANTED** **
04/01/2020

		STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
Foreign Priority claimed ☑ Yes ☐ No 35 USC 119(a-d) conditions met ☑ Yes ☐ No Verified and Acknowledged ______ Examiner's Signature	☑ Met after Allowance CH Initials	KOREA, REPUBLIC OF	9	12	3

ADDRESS

INVENSTONE PATENT, LLC
14291-A Brushwood way
Centreville, VA 20121
UNITED STATES

TITLE

APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO

FILING FEE RECEIVED		
1720	FEES: Authority has been given in Paper No.____________ to charge/credit DEPOSIT ACCOUNT No.____________ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other ________________ ☐ Credit

BIB (Rev. 05/07).

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	16826482
Filing Date	2020-03-23
First Named Inventor	Kyujin PARK
Art Unit	2412
Examiner Name	HO, CHUONG T
Attorney Docket Number	811.0206

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/CH/	1	20160338041	A1	2016-11-17	Yingyang LI et al.	
/CH/	2	20130128826	A1	2013-05-23	Yanan Lin et al.	

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/CH/	1	106301720	CN	A	2017-01-04	BEIJING SAMSUNG TELECOM R&D CT et al.		☒
/CH/	2	2017/075787	WO	A1	2017-05-11	HUAWEI TECHNOLOGIES CO., LTD.		☒

EFS Web 2.1.17

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /CH/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16826482
	Filing Date	2020-03-23
	First Named Inventor	Kyujin PARK
	Art Unit	2412
	Examiner Name	HO, CHUONG T
	Attorney Docket Number	811.0206

/CH/	3	102014510	CN	A	2011-04-13	DATANG MOBILE COMMUNICATIONS EQUIPMENT CO., LTD.		☒
/CH/	4	102088341	CN	A	2011-06-08	DATANG MOBILE COMMUNICATIONS EQUIPMENT...		☒
/CH/	5	102438319	CN	A	2012-05-02	TELECOM SCIENCE AND TECHNOLOGY INSTITUTE		☒
/CH/	6	102014505	CN	A	2011-04-13	DATANG MOBILE COMMUNICATIONS EQUIPMENT CO., LTD.		☒

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/CH/	1	SAMSUNG, "PUCCH resource configuration for bandwidth restricted UE", R1-1714539, 3GPP TSG RAN WG1 Meeting #90, Prague, Czechia 21st – 25th August 2017, pp. 1-14	☒
/CH/	2	STATE INTELLECTUAL PROPERTY OFFICE OF PEOPLE'S REPUBLIC OF CHINA, Office Action of corresponding CN Patent Application No. 201811148762.0, December 17, 2020	☒

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EXAMINER SIGNATURE

Examiner Signature	/CHUONG T HO/	Date Considered	04/13/2021

*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.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16826482
	Filing Date	2020-03-23
	First Named Inventor	Kyujin PARK
	Art Unit	2412
	Examiner Name	HO, CHUONG T
	Attorney Docket Number	811.0206

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	/Linus Park/	Date (YYYY-MM-DD)	2021-01-19
Name/Print	Linus Park	Registration Number	45261

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.**

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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:

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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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/826,482	03/23/2020	Kyujin PARK	KT21-0115D1

CONFIRMATION NO. 6363

126667
INVENSTONE PATENT, LLC
14291-A Brushwood way
Centreville, VA 20121

POA ACCEPTANCE LETTER

OC000000123460512

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**.

/ggasgedom/

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/826,482	03/23/2020	Kyujin PARK	811.0206

CONFIRMATION NO. 6363

76277
IP LEGAL SERVICES, LLC
P.O. Box 651325
Sterling, VA 20165

POWER OF ATTORNEY NOTICE

OC000000123460465

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**.

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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Kyujin PARK

Application No./Patent No.: 16/826,482 Filed/Issue Date: 03-23-2020

Titled: APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO

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 052192, Frame 0276, 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: _____

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2. From: _____ To: _____

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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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STATEMENT UNDER 37 CFR 3.73(c)

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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:	41951134
Application Number:	16826482
International Application Number:	
Confirmation Number:	6363
Title of Invention:	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	126667
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	KT21-0115D1
Receipt Date:	17-FEB-2021
Filing Date:	23-MAR-2020
Time Stamp:	20:49:12
Application Type:	Utility under 35 USC 111(a)

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-KT21-0115D1.pdf	112789 286308fe887c64e63478038d6d028e252bbebb3c	no	3

Warnings:

Information:	
Total Files Size (in bytes):	112789

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.

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	16/826,482
Filing Date	March 23, 2020
First Named Inventor	Kyujin PARK
Title	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO
Art Unit	2412
Examiner Name	HO, CHUONG T
Attorney Docket Number	KT21-0115D1

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)
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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-Kyu 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.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	41928400
Application Number:	16826482
International Application Number:	
Confirmation Number:	6363
Title of Invention:	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	76277
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	811.0206
Receipt Date:	16-FEB-2021
Filing Date:	23-MAR-2020
Time Stamp:	11:11:15
Application Type:	Utility under 35 USC 111(a)

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-KT21-0115D1_POA.pdf	579144 a1fd93e04229beaeee8e54ce06fe55d518f0c144	no	2
Warnings:					

Information:	
Total Files Size (in bytes):	579144

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
16/826,482	03/23/2020	Kyujin PARK	811.0206

CONFIRMATION NO. 6363

IMPROPER CFR REQUEST

76277
IP LEGAL SERVICES, LLC
P.O. Box 651325
Sterling, VA 20165

OC000000123328004

Date Mailed: 02/12/2021

RESPONSE TO REQUEST FOR CORRECTED FILING RECEIPT

Power of Attorney, Claims, Fees, System Limitations, and Miscellaneous

In response to your request for a corrected Filing Receipt, the Office is unable to comply with your request because:

- Any request to correct or update the name of the applicant must include an application data sheet (ADS) in compliance with 37 CFR 1.76 specifying the correct or updated name of the applicant in the applicant information section. Any request to change the applicant after an original applicant has been specified under 37 CFR 1.46(b) must include a new ADS in compliance with 37 CFR 1.76 specifying the applicant in the applicant information section and comply with 37 CFR 3.71 and 3.73. See 37 CFR 1.46(c).

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**.

/yteferra/

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 121 of 595

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
16/826,482	03/23/2020	Kyujin PARK	811.0206

CONFIRMATION NO. 6363

IMPROPER CPOA LETTER

76277
IP LEGAL SERVICES, LLC
P.O. Box 651325
Sterling, VA 20165

OC00000012332788

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 power of attorney has not been accepted because the party who is giving power has not been identified. Power of attorney may only be signed by the applicant for patent (37 CFR 1.42) or the patent owner. A party who is not the applicant must become the applicant in accordance with 37 CFR 1.46(c) and appoint any power of attorney in compliance with 37 CFR 3.71 and 3.73. For a reissue application, reexamination proceeding, or supplemental examination proceeding, a patent owner who was not the applicant under 37 CFR 1.46 must appoint any power of attorney in compliance with 37 CFR 3.71 and 3.73. See 37 CFR 1.32(b)(4).

/yteferra/

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

Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 122 of 595

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
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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	16/826,482
Filing Date	March 23, 2020
First Named Inventor	Kyujin PARK
Title	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO
Art Unit	2412
Examiner Name	HO, CHUONG T
Attorney Docket Number	KT21-0115D1

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.

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Doc Code: PA..
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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-Ryul Yun		
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.

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Electronic Acknowledgement Receipt

EFS ID:	41883970
Application Number:	16826482
International Application Number:	
Confirmation Number:	6363
Title of Invention:	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO
First Named Inventor/Applicant Name:	Kyujin PARK
Customer Number:	76277
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	811.0206
Receipt Date:	10-FEB-2021
Filing Date:	23-MAR-2020
Time Stamp:	02:07:27
Application Type:	Utility under 35 USC 111(a)

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-KT21-0115D1_POA.pdf	564276 f0e4262393ef06a5427374c864b55b7a288cd328	no	2
Warnings:					

Information:	
Total Files Size (in bytes):	564276

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New International Application Filed with the USPTO as a Receiving Office

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PTO/SB/06 (09-11)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/826,482	Filing Date 03/23/2020	☐ 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

AMENDMENT	02/03/2021	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) 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

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) 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".	/JACQUELYN L WILLIAMS/
*** 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Kyujin PARK		Re: Attorney Docket No.: 811.0206	
Serial No.:	16/826,482	Group Art Unit:	2412
Filed:	03/23/2020	Examiner:	HO, CHUONG T
Matter No.:	811.0206	Conf. No.:	6363

For: APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO

REPLY TO OFFICE ACTION

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

Dear Sir:

In response to the non-final office action of 11/05/2020, Applicant respectfully submits that eTerminal Disclaimer is submitted and approved on 02/03/2021. Therefore, withdrawal of the nonstatutory double patenting rejection is respectfully requested.

Applicant believes that no extensions of time and fees are required at this time. However, if extensions of time are necessary to prevent abandonment of this application, such extensions of time are hereby petitioned for under 37 C.F.R. §1.136 (a). The Director is hereby authorized to charge any fees that may be required, or also credit any overpayment, to Deposit Account Number 60-2802.

Respectfully submitted,

Date: 3 February 2021

/Joung Kook Park/

Customer No. 76277
IP Legal Services, LLC
P.O. Box 651325
Sterling, VA 20165

Joung Kook Park, Reg. No. 69,192
Agent for Applicant
(571) 267-7183 (phone)

Electronic Acknowledgement Receipt

EFS ID:	41822920
Application Number:	16826482
International Application Number:	
Confirmation Number:	6363
Title of Invention:	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO
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:	811.0206
Receipt Date:	03-FEB-2021
Filing Date:	23-MAR-2020
Time Stamp:	12:11:52
Application Type:	Utility under 35 USC 111(a)

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	8110206ReplytoNFOA.pdf	88022 fb54e8f5a78bddb5c619dce4caf17b232ecbd1dd	no	1

Warnings:

Information:	
Total Files Size (in bytes):	88022

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.

Doc Code: DIST.E.FILE **Document Description: Electronic Terminal Disclaimer - Filed**	PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT**
Application Number	16826482
Filing Date	23-Mar-2020
First Named Inventor	Kyujin PARK
Attorney Docket Number	811.0206
Title of Invention	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO

☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
KT CORPORATION	100%

The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

10638463

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

◉ Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.

○ I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.	
Applicant claims the following fee status: ○ Small Entity ○ Micro Entity ◉ Regular Undiscounted I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.	
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: ◉ An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application Registration Number 69192 ○ A sole inventor ○ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ○ A joint inventor; all of whom are signing this request	
Signature	/Joung Kook Park/
Name	Joung Kook Park

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal

Application Number:	16826482
Filing Date:	23-Mar-2020
Title of Invention:	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO
First Named Inventor/Applicant Name:	Kyujin PARK
Filer:	Kyung Hee Kim/yujin Chun
Attorney Docket Number:	811.0206

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	1814	1	170	170
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		170

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 16826482

Filing Date: 23-Mar-2020

Applicant/Patent under Reexamination: PARK

Electronic Terminal Disclaimer filed on February 3, 2021

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt	
EFS ID:	41822727
Application Number:	16826482
International Application Number:	
Confirmation Number:	6363
Title of Invention:	APPARATUS AND METHOD OF UPLINK CONTROL CHANNEL RESOURCE ALLOCATION FOR NEW RADIO
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:	811.0206
Receipt Date:	03-FEB-2021
Filing Date:	23-MAR-2020
Time Stamp:	12:09:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$170
RAM confirmation Number	E202123C09482043
Deposit Account	602802
Authorized User	yujin Chun
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 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)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	33453 d56692a048ddfcdf125886be2b386432bb6314ac	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30133 15d0d1280e13014368bd05fbaa4850c49c9d5033	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	63586		

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
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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
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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	16826482
	Filing Date	2020-03-23
	First Named Inventor	Kyujin PARK
	Art Unit	2412
	Examiner Name	HO, CHUONG T
	Attorney Docket Number	811.0206

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
	1					

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

U.S.PATENT APPLICATION PUBLICATIONS Remove

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	20160338041	A1	2016-11-17	Yingyang LI et al.	
	2	20130128826	A1	2013-05-23	Yanan Lin 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] 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]
	1	106301720	CN	A	2017-01-04	BEIJING SAMSUNG TELECOM R&D CT et al.		☒
	2	2017/075787	WO	A1	2017-05-11	HUAWEI TECHNOLOGIES CO., LTD.		☒

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16826482
	Filing Date	2020-03-23
	First Named Inventor	Kyujin PARK
	Art Unit	2412
	Examiner Name	HO, CHUONG T
	Attorney Docket Number	811.0206

	3	102014510	CN	A	2011-04-13	DATANG MOBILE COMMUNICATIONS EQUIPMENT CO., LTD.		☒
	4	102088341	CN	A	2011-06-08	DATANG MOBILE COMMUNICATIONS EQUIPMENT...		☒
	5	102438319	CN	A	2012-05-02	TELECOM SCIENCE AND TECHNOLOGY INSTITUTE		☒
	6	102014505	CN	A	2011-04-13	DATANG MOBILE COMMUNICATIONS EQUIPMENT CO., LTD.		☒

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	SAMSUNG, "PUCCH resource configuration for bandwidth restricted UE", R1-1714539, 3GPP TSG RAN WG1 Meeting #90, Prague, Czechia 21st – 25th August 2017, pp. 1-14	☒
	2	STATE INTELLECTUAL PROPERTY OFFICE OF PEOPLE'S REPUBLIC OF CHINA, Office Action of corresponding CN Patent Application No. 201811148762.0, December 17, 2020	☒

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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16826482
	Filing Date	2020-03-23
	First Named Inventor	Kyujin PARK
	Art Unit	2412
	Examiner Name	HO, CHUONG T
	Attorney Docket Number	811.0206

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	/Linus Park/	Date (YYYY-MM-DD)	2021-01-19
Name/Print	Linus Park	Registration Number	45261

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.

Espacenet

Bibliographic data: CN106301720 (A) — 2017-01-04

Method and apparatus for transmitting uplink control information

Inventor(s): LI YINGYANG; WANG YI; FU JINGXING; ZHANG SHICHANG ± (李迎阳, ; 王轶, ; 付景兴, ; 张世昌)

Applicant(s): BEIJING SAMSUNG TELECOM R&D CT; SAMSUNG ELECTRONICS CO LTD ± (北京三星通信技术研究有限公司, ; 三星电子株式会社)

Classification: - international: *H04L1/00; H04L5/00*
- cooperative: **H04L1/0027 (CN); H04L1/0031 (CN); H04L1/1671 (EP, US); H04L1/1861 (EP, US); H04L1/1864 (EP, US); H04L5/001 (EP, US); H04L5/0016 (EP, US); H04L5/0055 (EP, US); H04L5/0057 (CN); H04L5/0064 (CN); H04L5/0087 (EP, US); H04W52/143 (US);** H04L1/0026 (CN); H04L5/0055 (CN); H04L5/006 (CN); H04L5/14 (EP, US); H04W52/545 (EP, US); H04W72/0413 (CN); H04W72/0446 (CN)

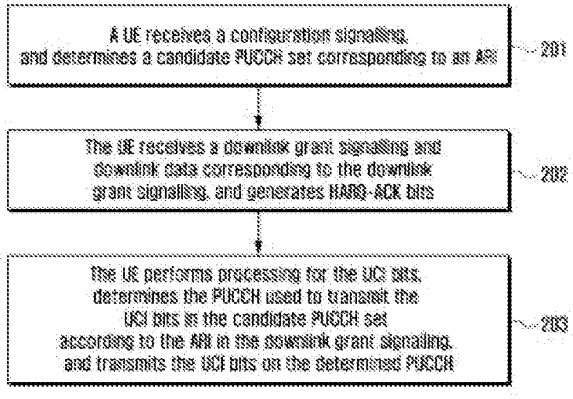
Application number: CN201510246773 20150514 Global Dossier

Priority number(s): CN201510246773 20150514

Also published as: CN106301720 (B) CN112187432 (A) EP3259867 (A1) EP3259867 (A4) US10158461 (B2) more

Abstract of CN106301720 (A)

The application discloses a method and apparatus for transmitting uplink control information (UCI). The method is characterized in that the method includes steps: user equipment (UE) receives and configures a signaling of an alternative PUCCH channel set corresponding to an ACK/NACK resource indication (ARI); the UE receives a downlink authorization signaling and corresponding downlink data and generates HARQ-ACK bits; and the UE processes UCI bits including the HARQ-ACK bits and performs transmission on a PUCCH channel indicated by the ARI. The application also discloses



Petitioners' Exhibit 1005
Ericsson Inc., et al. v. KT Corporation, et al.
Case No. IPR2025-00083; U.S. Patent No. 10,638,463
Page 142 of 595

a method for transmitting aperiodic CSI information (A-CSI). The method is characterized in that the method includes steps: the user equipment (UE) receives an uplink authorization signaling; the UE determines whether an A-CSI report is currently triggered according to a CSI request domain in the uplink authorization signaling; and the UE determines the to-be-updated CSI process and transmits the A-CSI information on an uplink CC for bearing the A-CSI report.

Petitioners' Exhibit 1005
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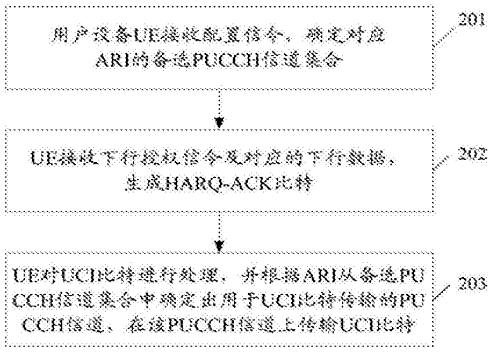
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(54)发明名称

传输上行控制信息的方法和设备

(57)摘要

本申请公开了一种传输上行控制信息UCI的方法，其特征在于，包括：用户设备UE接收配置对应ACK/NACK资源指示(ARI)的备选PUCCH信道集合的信令；UE接收下行授权信令及对应的下行数据，生成HARQ-ACK比特；UE对包括HARQ-ACK在内的UCI比特进行处理，并在ARI指示的PUCCH信道上传输。本申请还公开了一种传输非周期CSI信息(A-CSI)的方法，其特征在于，包括：用户设备UE接收上行授权信令；UE根据上行授权信令中的CSI请求域确定当前是否触发A-CSI报告；UE确定要更新的CSI过程并在承载A-CSI报告的上行CC上传输A-CSI信息。



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1.一种传输上行控制信息UCI的方法,其特征在于,包括:

用户设备UE接收配置信令,确定对应应答ACK/NACK资源指示ARI的备选PUCCH信道集合;

UE接收下行授权信令及对应的下行数据,生成混合自动请求重传应答HARQ-ACK比特;

UE对包括HARQ-ACK在内的UCI比特进行处理,并根据所述下行授权信令中包括的ARI从所述备选物理上行控制信道PUCCH信道集合中确定出用于UCI比特传输的PUCCH信道,在确定出的PUCCH信道上传输所述UCI比特。

2.根据权利要求1所述的方法,其特征在于,当所述UCI比特在PUCCH格式X的信道上传输时,所述UE对UCI比特进行处理并在PUCCH信道上传输包括:

对UCI比特经编码、速率匹配RM、加扰后,写入($R_{mux}\times C_{mux}$)矩阵,然后逐列读出,并在读出时将前$C_{mux,0}$列映射到所述PUCCH格式X信道的第一个时隙,后$C_{mux,1}$列映射到所述PUCCH格式X信道的第二个时隙;然后,对每一个时隙,经正交扩展码OCC扩展后映射到单载波频分多址接入SCFDMA符号上;

其中,根据PUCCH格式X的SCFDMA符号数和OCC长度,确定($R_{mux}\times C_{mux}$)矩阵的列数C_{mux},并根据PUCCH格式X信道支持传输的调制符号数目和每个调制符号允许携带的物理比特个数确定行数R_{mux},$C_{mux,0}+C_{mux,1}=C_{mux}$。

3.根据权利要求1所述的方法,其特征在于,当在所述UCI比特中包括P-CSI时,在所述ARI指示的PUCCH信道上传输包括所述P-CSI的UCI比特。

4.根据权利要求1所述的方法,其特征在于,所述根据ARI确定PUCCH信道包括:将所述ARI信息和其他控制信息一起处理后,映射到除了Pcell的仍然用于功率控制的下行授权信令的传输功率控制TPC域以外的其他下行授权信令的TPC域上;根据相应TPC域上映射的ARI信息确定所述PUCCH信道。

5.根据权利要求4所述的方法,其特征在于,所述ARI信息和其他控制信息的映射包括:除Pcell上的一个下行授权信令的TPC域仍然用于功率控制以外的其他下行授权信令中,基站发送的前N个连续下行授权信令中的TPC域用于映射ARI信息,剩余下行授权信令中的TPC域用于映射所述其他控制信息;其中N为大于等于4的整数。

6.根据权利要求5所述的方法,其特征在于,所述剩余下行授权信令中的TPC域用于映射所述其他控制信息包括:

利用所述剩余下行授权信令中的TPC域承载基站当前调度的下行授权信令的总数;

或者,利用所述剩余下行授权信令中的TPC域承载基站当前调度的TB的总数。

7.根据权利要求6所述的方法,其特征在于,所述下行授权信令的总数或TB的总数为时域计数的、频域计数的或时域和频域联合计数的。

8.根据权利要求1所述的方法,其特征在于,所述根据ARI确定PUCCH信道包括:

所述UE根据所述ARI信息确定PUCCH信道,并根据UCI的比特数选择PUCCH格式;或者,

所述UE根据所述ARI的取值确定当前使用的PUCCH格式和相应的PUCCH信道;其中,所述备选PUCCH信道集合中不同备选PUCCH信道的格式为相同或不同。

9.一种传输上行控制信息UCI的设备,其特征在于,包括:备选PUCCH信道集合确定单元、HARQ-ACK比特生成单元、UCI比特处理单元、PUCCH信道确定单元和发送单元;

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所述备选 PUCCH 信道集合确定单元，用于接收配置信令，确定对应 ACK/NACK 资源指示（ARI）的备选 PUCCH 信道集合；

所述 HARQ-ACK 比特生成单元，用于接收下行授权信令及对应的下行数据，生成 HARQ-ACK 比特；

所述 UCI 比特处理单元，用于对包括 HARQ-ACK 在内的 UCI 比特进行处理；

所述 PUCCH 信道确定单元，用于根据所述下行授权信令中包括的 ARI 从所述备选 PUCCH 信道集合中确定出用于 UCI 比特传输的 PUCCH 信道；

所述发送单元，用于在确定出的 PUCCH 信道上传输所述 UCI 比特。

10. 一种传输非周期 CSI 信息 A-CSI 的方法，其特征在于，包括：

用户设备 UE 接收上行授权信令；

UE 根据上行授权信令中的 CSI 请求域确定当前是否触发 A-CSI 报告；

在确定触发 A-CSI 报告后，UE 确定要更新的 CSI 过程并在承载 A-CSI 报告的上行 CC 上传输 A-CSI 信息。

11. 根据权利要求 10 所述的方法，其特征在于，所述根据上行授权信令中的 CSI 请求域确定当前是否触发 A-CSI 报告包括：对只配置了下行传输的 CC，UE 通过检测 DCI 格式 0 确定是否触发 A-CSI 报告；其中，所述 DCI 格式 0 的所述 CSI 请求域，用于触发 UE 对只配置下行传输的 CC 的 A-CSI 报告。

12. 根据权利要求 11 所述的方法，其特征在于，对于只配置下行传输的 CC，当根据所述 DCI 格式 0 确定触发 A-CSI 报告时，所述承载 A-CSI 报告的上行 CC 为：PCell、PScell 或者所述 DCI 格式 0 中指定比特所指示的上行 CC。

13. 根据权利要求 11 所述的方法，其特征在于，对于只配置下行传输的 CC：

利用独立高层信令配置所述 DCI 格式 0 的每个 CSI 请求域的值触发的 CSI 过程；

和 / 或，将所述 DCI 格式 0 中大于 2 比特的信息作为所述 CSI 请求域；

和 / 或，所述在承载 A-CSI 报告的上行 CC 上传输 A-CSI 信息包括：当 UE 在承载 A-CSI 报告的上行 CC 上没有调度上行数据传输时，按照所述 DCI 格式 0 确定所述上行 CC 的 PUSCH 信道的参数并传输 A-CSI；当 UE 在所述上行 CC 上调度了上行数据传输，且未触发其他 A-CSI 报告，按照所述上行 CC 的上行授权信令发送 PUSCH 并传输 A-CSI；当 UE 在所述上行 CC 上检测到上行授权信令并触发另一 A-CSI 时，所述 UE 仅传输所述上行 CC 的上行授权信令触发的 A-CSI，或者，UE 同时反馈两个 A-CSI 报告。

14. 根据权利要求 10 所述的方法，其特征在于，所述确定要更新的 CSI 过程包括：

当在一个子帧内触发多个 CG 的 A-CSI、且触发的 CSI 过程的总数 N 大于 UE 更新和报告 A-CSI 的能力 K 时，所述 UE 从 N 个 CSI 过程中选择 K 个优先级最高的 CSI 过程进行更新 CSI 并报告。

15. 根据权利要求 14 所述的方法，其特征在于，对应不同的 CSI 过程确定优先级的方式包括：

同时反馈 RI 和 CQI/PMI 的 CSI 过程的优先级高于采用默认 RI 只反馈 CQI/PMI 的 CSI 过程的优先级；和 / 或，

按照预先定义的各种用于 A-CSI 的 CSI 汇报模式的优先级，确定相应 CSI 过程的优先级；和 / 或，

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按照预先定义的各种下行传输模式的优先级，确定相应 CSI 过程的优先级；和 / 或，

根据 CSI 过程 ID 确定 CSI 过程的优先级；和 / 或，

对配置给所述 UE 的所有 CC 分别配置唯一的小区 ID，根据该小区 ID 确定 CSI 过程的优先级；和 / 或，

对配置给所述 UE 的所有 CC 配置小区 ID，该小区 ID 是在一个 CG 内的小区的索引，根据所述小区 ID 确定 CSI 过程的优先级；和 / 或，

根据 CG 索引确定 CSI 过程的优先级；和 / 或，

当一个 CG 被划分为多个反馈 A-CSI 的子组时，根据 A-CSI 子组的索引确定 CSI 过程的优先级；和 / 或，

根据小区是否承载 UCI 信息确定优先级，其中 Pcell 的优先级高于 PScell 的优先级，PScell 的优先级高于其他 Scell 的优先级；和 / 或，

许可频段小区的 CSI 过程的优先级高于免许可频段小区的 CSI 过程的优先级，或者，免许可频段小区的 CSI 过程的优先级高于许可频段小区的 CSI 过程的优先级；

16. 根据权利要求 14 所述的方法，其特征在于，在所述选择 K 个优先级最高的 CSI 过程时，对应一个 CG 的一个 A-CSI 报告，仅保留属于所述 K 个最高优先级的 CSI 过程的 CSI 信息，并据此确定 A-CSI 信息的总比特数。

17. 一种传输非周期 CSI 信息 A-CSI 的设备，其特征在于，包括：接收单元、A-CSI 报告触发单元和传输单元；

所述接收单元，用于接收上行授权信令；

所述 A-CSI 报告触发单元，用于根据所述上行授权信令中的 CSI 请求域确定当前是否触发 A-CSI 报告，并在确定触发 A-CSI 报告时通知所述传输单元；

所述传输单元，用于在接收到所述 A-CSI 报告触发单元的触发通知后，确定要更新的 CSI 过程并在承载 A-CSI 报告的上行 CC 上传输 A-CSI 信息。

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传输上行控制信息的方法和设备

技术领域

[0001] 本发明涉及无线通信系统，更具体的说涉及LTE载波聚合系统，在一个上行信道上传输上行控制信息(UCI)的方法和设备。

背景技术

[0002] 在长期演进(LTE)系统中，通过组合多个单元载波(CC)来得到更大的工作带宽，构成通信系统的下行链路和上行链路，即载波聚合(CA)技术，从而支持更高的传输速率。到目前为止，已经支持各种类型的CA，即：被聚合的小区可以都是FDD小区，也可以都是TDD小区且这些TDD小区的TDD上下行配置相同，还可以都是TDD小区但是这些TDD小区的TDD上下行配置不同，此外，还支持FDD小区和TDD小区的聚合，并且TDD小区的上下行配置可以是半静态配置的或者动态变化。

[0003] 对一个UE，在配置了CA模式时，一个小区是主小区(Pcell)，而其他小区称为次小区(Scell)。按照LTE的方法，对Pcell和Scell基于混合自动重传请求(HARQ)机制来传输下行数据，相应地，UE需要反馈多个小区的HARQ-ACK信息。对FDD系统的一个小区，在一个上行子帧内只需要反馈一个下行子帧内的数据的HARQ-ACK信息；对TDD系统的一个小区，当其帧结构中的下行子帧数据多于上行子帧时，一般在一个上行子帧内需要反馈多个下行子帧内的数据的HARQ-ACK信息，所述多个下行子帧称为对应这个上行子帧的绑定窗口。例如，LTE TDD小区的绑定窗口的大小可以是1、2、3、4或者9。按照LTE的方法，是在Pcell的一个PUCCH信道上反馈所有配置的小区的HARQ-ACK信息。另外，各个小区的周期信道状态指示(P-CSI)也是映射到Pcell上传输，而非周期CSI(A-CSI)是映射到物理上行共享信道(PUSCH)上传输。

[0004] 按照LTE的方法，目前支持物理上行控制信道(PUCCH)格式3，其基本思想是对多个UCI比特信息，例如来自多个配置的小区的HARQ-ACK比特、调度请求(SR)和/或P-CSI信息进行联合编码，并映射到物理信道传输。PUCCH格式3最多可以支持传输22个比特。如图1所示，这里假设采用RM编码，UCI比特经RM信道编码后和加扰后，调制得到24个QPSK符号，并映射到一个PRB的上行资源上传输。其中，前12个QPSK符号映射到PUCCH格式3的第一个时隙中传输，而后12个QPSK符号映射到PUCCH格式3的第二个时隙中传输。这里，一个PUCCH格式3信道在两个时隙内映射的PRB位置相对于中心频率是镜像关系，从而获得频率分集增益。以第一个时隙为例，所述12个QPSK符号映射乘以长度为5的正交扩展码(OCC)的每一个元素后，分别映射到第一个时隙的5个符号上。

[0005] 目前3GPP标准化组织正在对聚合更多的小区的增强CA技术进行标准化工作，例如，聚合的小区数目可以达到32个。这时，对一个UE来说，可以是把所有配置的小区分成多个小区组(CG，Cell Group)，或者，也可以只有一个CG；并对每个CG，分别在一个小区的PUCCH上反馈UCI信息，这个反馈UCI的小区类似于现有CA技术中的Pcell。这里，每个CG的小区数目仍然可以超过现有CA技术支持的最大聚合小区个数。这里，当配置的小区个数较多，或者绑定窗的大小较大时，UE需要反馈的HARQ-ACK比特比较多，例如，大于22比特。

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另外，当配置的小区个数较多时，UE 需要反馈的 CSI 信息也相应地增加了。另外，UE 在上行方向还可能需要发送调度请求 (SR)。例如，大于 22 比特。相应地，为了支持超过 22 比特的 UCI 传输，需要定义一种新的 PUCCH 格式。因为引入了 PUCCH 格式 X，必然带来一系列的影响，相应地需要设计对 UCI 的具体的传输方法。

发明内容

[0006] 本申请提供一种传输 UCI 的方法和设备，能够支持超过 22 比特的 UCI 传输，并实现更高效的 A-CSI 信息的传输。

[0007] 为实现上述目的，本申请采用如下技术方案：

[0008] 一种传输上行控制信息 UCI 的方法，包括：

[0009] 用户设备 UE 接收配置信令，确定对应 ACK/NACK 资源指示 (ARI) 的备选 PUCCH 信道集合；

[0010] UE 接收下行授权信令及对应的下行数据，生成 HARQ-ACK 比特；

[0011] UE 对包括 HARQ-ACK 在内的 UCI 比特进行处理，并根据所述下行授权信令中包括的 ARI 从所述备选 PUCCH 信道集合中确定出用于 UCI 比特传输的 PUCCH 信道，在确定出的 PUCCH 信道上传输所述 UCI 比特。

[0012] 较佳地，当所述 UCI 比特在 PUCCH 格式 X 的信道上传输时，所述 UE 对 UCI 比特进行处理并在 PUCCH 信道上传输包括：

[0013] 对 UCI 比特经编码、速率匹配 (RM)、加扰后，写入 ($R_{mux} \times C_{mux}$) 矩阵，然后逐列读出，并在读出时将前 $C_{mux,0}$ 列映射到所述 PUCCH 格式 X 信道的第一个时隙，后 $C_{mux,1}$ 列映射到所述 PUCCH 格式 X 信道的第二个时隙；然后，对每一个时隙，经 OCC 扩展后映射到 SCFDMA 符号上；

[0014] 其中，根据 PUCCH 格式 X 的 SCFDMA 符号数和 OCC 长度，确定 ($R_{mux} \times C_{mux}$) 矩阵的列数 C_{mux}，并根据 PUCCH 格式 X 信道支持传输的调制符号数目和每个调制符号允许携带的物理比特个数确定行数 R_{mux}，$C_{mux,0}+C_{mux,1} = C_{mux}$。

[0015] 较佳地，当在所述 UCI 比特中包括 P-CSI 时，在所述 ARI 指示的 PUCCH 信道上传输包括所述 P-CSI 的 UCI 比特。

[0016] 较佳地，所述根据 ARI 确定 PUCCH 信道包括：将所述 ARI 信息和其他控制信息一起处理后，映射到除了 Pcell 的仍然用于功率控制的下行授权信令的 TPC 域以外的其他下行授权信令的 TPC 域上；根据相应 TPC 域上映射的 ARI 信息确定所述 PUCCH 信道。

[0017] 较佳地，所述 ARI 信息和其他控制信息的映射包括：除 Pcell 上的一个下行授权信令的 TPC 域仍然用于功率控制以外的其他下行授权信令中，基站发送的前 N 个连续下行授权信令中的 TPC 域用于映射 ARI 信息，剩余下行授权信令中的 TPC 域用于映射所述其他控制信息；其中 N 为大于等于 4 的整数。

[0018] 较佳地，所述剩余下行授权信令中的 TPC 域用于映射所述其他控制信息包括：

[0019] 利用所述剩余下行授权信令中的 TPC 域承载基站当前调度的下行授权信令的总数；

[0020] 或者，利用所述剩余下行授权信令中的 TPC 域承载基站当前调度的 TB 的总数。

[0021] 较佳地，所述下行授权信令的总数或 TB 的总数为时域计数的、频域计数的或时域

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和频域联合计数的。

[0022] 较佳地，所述根据 ARI 确定 PUCCH 信道包括：

[0023] 所述 UE 根据所述 ARI 信息确定 PUCCH 信道，并根据 UCI 的比特数选择 PUCCH 格式；或者，

[0024] 所述 UE 根据所述 ARI 的取值确定当前使用的 PUCCH 格式和相应的 PUCCH 信道；其中，所述备选 PUCCH 信道集合中不同备选 PUCCH 信道的格式为相同或不同。

[0025] 一种传输上行控制信息 UCI 的设备，包括：备选 PUCCH 信道集合确定单元、HARQ-ACK 比特生成单元、UCI 比特处理单元、PUCCH 信道确定单元和发送单元；

[0026] 所述备选 PUCCH 信道集合确定单元，用于接收配置信令，确定对应 ACK/NACK 资源指示（ARI）的备选 PUCCH 信道集合；

[0027] 所述 HARQ-ACK 比特生成单元，用于接收下行授权信令及对应的下行数据，生成 HARQ-ACK 比特；

[0028] 所述 UCI 比特处理单元，用于对包括 HARQ-ACK 在内的 UCI 比特进行处理；

[0029] 所述 PUCCH 信道确定单元，用于根据所述下行授权信令中包括的 ARI 从所述备选 PUCCH 信道集合中确定出用于 UCI 比特传输的 PUCCH 信道；

[0030] 所述发送单元，用于在确定出的 PUCCH 信道上传输所述 UCI 比特。

[0031] 一种传输非周期 CSI 信息（A-CSI）的方法，包括：

[0032] 用户设备 UE 接收上行授权信令；

[0033] UE 根据上行授权信令中的 CSI 请求域确定当前是否触发 A-CSI 报告；

[0034] 在确定触发 A-CSI 报告后，UE 确定要更新的 CSI 过程并在承载 A-CSI 报告的上行 CC 上传输 A-CSI 信息。

[0035] 较佳地，所述根据上行授权信令中的 CSI 请求域确定当前是否触发 A-CSI 报告包括：对只配置了下行传输的 CC，UE 通过检测 DCI 格式 0 确定是否触发 A-CSI 报告；其中，所述 DCI 格式 0 的所述 CSI 请求域，用于触发 UE 对只配置下行传输的 CC 的 A-CSI 报告。

[0036] 较佳地，对于只配置下行传输的 CC，当根据所述 DCI 格式 0 确定触发 A-CSI 报告时，所述承载 A-CSI 报告的上行 CC 为：PCell、PScell 或者所述 DCI 格式 0 中指定比特所指示的上行 CC。

[0037] 较佳地，对于只配置下行传输的 CC：

[0038] 利用独立高层信令配置所述 DCI 格式 0 的每个 CSI 请求域的值触发的 CSI 过程；

[0039] 和 / 或，将所述 DCI 格式 0 中大于 2 比特的信息作为所述 CSI 请求域；

[0040] 和 / 或，所述在承载 A-CSI 报告的上行 CC 上传输 A-CSI 信息包括：当 UE 在承载 A-CSI 报告的上行 CC 上没有调度上行数据传输时，按照所述 DCI 格式 0 确定所述上行 CC 的 PUSCH 信道的参数并传输 A-CSI；当 UE 在所述上行 CC 上调度了上行数据传输，且未触发其他 A-CSI 报告，按照所述上行 CC 的上行授权信令发送 PUSCH 并传输 A-CSI；当 UE 在所述上行 CC 上检测到上行授权信令并触发另一 A-CSI 时，所述 UE 仅传输所述上行 CC 的上行授权信令触发的 A-CSI，或者，UE 同时反馈两个 A-CSI 报告。

[0041] 较佳地，所述确定要更新的 CSI 过程包括：

[0042] 当在一个子帧内触发多个 CG 的 A-CSI、且触发的 CSI 过程的总数 N 大于 UE 更新和报告 A-CSI 的能力 K 时，所述 UE 从 N 个 CSI 过程中选择 K 个优先级最高的 CSI 过程进行更

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新 CSI 并报告。

[0043] 较佳地，对应不同的 CSI 过程确定优先级的方式包括：

[0044] 同时反馈 RI 和 CQI/PMI 的 CSI 过程的优先级高于采用默认 RI 只反馈 CQI/PMI 的 CSI 过程的优先级；和 / 或，

[0045] 按照预先定义的各种用于 A-CSI 的 CSI 汇报模式的优先级，确定相应 CSI 过程的优先级；和 / 或，

[0046] 按照预先定义的各种下行传输模式的优先级，确定相应 CSI 过程的优先级；和 / 或，

[0047] 根据 CSI 过程 ID 确定 CSI 过程的优先级；和 / 或，

[0048] 对配置给所述 UE 的所有 CC 分别配置唯一的小区 ID，根据该小区 ID 确定 CSI 过程的优先级；和 / 或，

[0049] 对配置给所述 UE 的所有 CC 配置小区 ID，该小区 ID 是在一个 CG 内的小区的索引，根据所述小区 ID 确定 CSI 过程的优先级；和 / 或，

[0050] 根据 CG 索引确定 CSI 过程的优先级；和 / 或，

[0051] 当一个 CG 被划分为多个反馈 A-CSI 的子组时，根据 A-CSI 子组的索引确定 CSI 过程的优先级；和 / 或，

[0052] 根据小区是否承载 UCI 信息确定优先级，其中 Pcell 的优先级高于 PScell 的优先级，PScell 的优先级高于其他 Scell 的优先级；和 / 或，

[0053] 许可频段小区的 CSI 过程的优先级高于免许可频段小区的 CSI 过程的优先级，或者，免许可频段小区的 CSI 过程的优先级高于许可频段小区的 CSI 过程的优先级；

[0054] 较佳地，在所述选择 K 个优先级最高的 CSI 过程时，对应一个 CG 的一个 A-CSI 报告，仅保留属于所述 K 个最高优先级的 CSI 过程的 CSI 信息，并据此确定 A-CSI 信息的总比特数。

[0055] 一种传输非周期 CSI 信息 (A-CSI) 的设备，包括：接收单元、A-CSI 报告触发单元和传输单元；

[0056] 所述接收单元，用于接收上行授权信令；

[0057] 所述 A-CSI 报告触发单元，用于根据所述上行授权信令中的 CSI 请求域确定当前是否触发 A-CSI 报告，并在确定触发 A-CSI 报告时通知所述传输单元；

[0058] 所述传输单元，用于在接收到所述 A-CSI 报告触发单元的触发通知后，确定要更新的 CSI 过程并在承载 A-CSI 报告的上行 CC 上传输 A-CSI 信息。

[0059] 由上述技术方案可见，本申请中，UE 接收配置信令，确定对应 ACK/NACK 资源指示 (ARI) 的备选 PUCCH 信道集合；UE 接收下行授权信令及对应的下行数据，生成 HARQ-ACK 比特；UE 对包括 HARQ-ACK 在内的 UCI 比特进行处理，并在 ARI 指示的 PUCCH 信道上传输。通过上述处理，能够支持超过 22 比特的 UCI 传输。

[0060] 本申请中还给出了一种传输非周期 CSI 信息 (A-CSI) 的方法，UE 接收上行授权信令；UE 根据上行授权信令中的 CSI 请求域确定当前是否触发 A-CSI 报告；当确定触发 A-CSI 报告后，UE 确定要更新的 CSI 过程并在承载 A-CSI 报告的上行 CC 上传输 A-CSI 信息。通过上述处理，能够实现更高效的 A-CSI 信息的传输。

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附图说明

[0061] 图 1 为 PUCCH 格式 3 的示意图。

[0062] 图 2 为本申请中 UCI 传输方法的基本流程示意图；

[0063] 图 3 为本申请中 PUCCH 格式 X 的示意图；

[0064] 图 4 为本申请中 UCI 传输设备的基本结构示意图；

[0065] 图 5 为本申请中 A-CSI 传输方法的基本流程示意图；

[0066] 图 6 为本申请中 A-CSI 传输设备的基本结构示意图。

具体实施方式

[0067] 为了使本申请的目的、技术手段和优点更加清楚明白，以下结合附图对本申请做进一步详细说明。

[0068] 本申请中给出了 UCI 的传输方法，下面分别进行介绍。首先给出本申请中 UCI 传输方法的具体实现。图 2 为本申请中 UCI 传输方法的基本流程示意图。如图 2 所示，该方法包括：

[0069] 步骤 201，用户设备 UE 接收配置信令，确定对应 ACK/NACK 资源指示（ARI）的备选 PUCCH 信道集合。

[0070] 具体地，预先通过 RRC 等信令半静态配置备选 PUCCH 信道集合，该信道集合对应于 ARI。当在一个子帧内需要反馈 HARQ-ACK 信息时，根据下行授权信令中的 2 比特 ARI 信息可以动态指示备选 PUCCH 信道集合中的一个 PUCCH 信道用于 HARQ-ACK 和其他 UCI 传输。

[0071] 步骤 202，UE 接收下行授权信令及对应的下行数据，生成 HARQ-ACK 比特。

[0072] 在 UE 接收的下行授权信令中包括用于指示 PUCCH 信道的 ARI。

[0073] 步骤 203，UE 对包括 HARQ-ACK 在内的 UCI 比特进行处理，并根据下行授权信令中包括的 ARI 从备选 PUCCH 信道集合中确定出用于 UCI 比特传输的 PUCCH 信道，在确定出的 PUCCH 信道上传输 UCI 比特。

[0074] 以下描述本发明的实施例。

[0075] 实施例一

[0076] 在 CA 系统中，PUCCH 格式 3 只能支持最多 22 比特的 UCI 信息传输。为了支持在 PUCCH 上反馈更多比特的 UCI 信息，需要定义新的 PUCCH 格式，以下称为 PUCCH 格式 X。本实施例中给出采用 PUCCH 格式 X 进行 UCI 信息传输时的具体方式，也就是上述图 2 所示流程中采用 PUCCH 格式 X 时步骤 203 的一种实现方法。

[0077] PUCCH 格式 X 信道可以是基于 PUCCH 格式 3 扩展得到的。一种可能的方法是仍然保持 PUCCH 格式 3 的 OCC 扩展结构不变，即 OCC 的长度不变，通过增加在频域占用的 PRB 个数来支持更多的比特，例如，假设扩展之后的信道占用 N 个 PRB，则它可以承载大约 22N 个 UCI 比特。另一种扩展方法是保持频域仍然占用一个 PRB，而是减少 OCC 的长度，例如，采用 OCC 长度为 2 来支持更多的 UCI 比特。或者，也可以是同时增加占用的 PRB 个数和减小 OCC 长度，从而支持更多的 UCI 比特。采用上述三种方法的共同特点是对 UCI 比特经编码、速率匹配（RM）、加扰和调制以后，调制符号都是经过 OCC 扩展之后才映射到上行单载波频分多址接入（SCFDMA）符号上。

[0078] 如图 3 所示，假设 UCI 比特经信道编码、RM、加扰之后，等分成 C_{mux} 部分，可以表示为

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C_{mux}列。其中，$C_{mux,0}$列经调制和OCC扩展后映射到第一个时隙的上行SCFDMA符号上，$C_{mux,1}$列经调制和OCC扩展后映射到第二个时隙的上行SCFDMA符号上，$C_{mux,0}+C_{mux,1}=C_{mux}$。通常$C_{mux,0}$和$C_{mux,1}$相等或者相差1，从而最大化频率分集增益。假设OCC的长度和一个时隙内用于承载调制符号的SCFDMA符号个数相等，则$C_{mux,0}=C_{mux,1}=1$。假设OCC长度小于一个时隙内用于承载调制符号的SCFDMA符号个数，则$C_{mux,0}$和$C_{mux,1}$可以大于1。在图3中，只表示出对一个UCI的编码、RM和加扰的流程，它可以是代表对多种不同类型的UCI进行联合编码；或者，通过简单扩展，可以支持对多种UCI分别编码、RM和加扰，然后一起映射为C_{mux}列。在图3中，划分C_{mux}列是在调制模块之前，或者，划分C_{mux}列的操作也可以位于调制模块之后。

[0079] 基于LTE的PUCCH信道结构，一个PUCCH格式X信道在子帧的两个时隙内映射的PRB位置相对于中心频率是镜像关系。这样，综合在两个时隙内传输的信号可以获得频率分集增益。但是，如果只观察一个时隙内的信号，因为是局限在一个PRB内，所以基本没有频率分集效果。另一方面，记UCI信息为c_k，$k=0,1,\ldots,K-1$，K是UCI比特数，采用LTE的卷积编码方法，对应其三个生成多项式的输出比特分别记为$d_k^{(0)}$、$d_k^{(1)}$和$d_k^{(2)}$。采用LTE的速率匹配(RM)方法，对比特序列$d_k^{(0)}$、$d_k^{(1)}$和$d_k^{(2)}$分别进行交织，然后级联得到RM的循环缓存。即，循环缓存的前K个比特对应$d_k^{(0)}$，然后K个比特对应$d_k^{(1)}$，最后的K个比特对应$d_k^{(2)}$。这样，RM操作之后的输出比特也保持类似的结构，即连续的K个是对应$d_k^{(0)}$、$d_k^{(1)}$或者$d_k^{(2)}$之一。为了使对应每个生成多项式的K个比特，即$d_k^{(0)}$、$d_k^{(1)}$或者$d_k^{(2)}$，都能够均匀的获得频率分集增益，应该把这K个比特均匀的映射到两个时隙的资源上。根据图3所示的PUCCH格式X的结构，一种处理方法是把加扰之后的比特序列q_k写入($R_{mux}\times C_{mux}$)矩阵，然后逐列读出，前$C_{mux,0}$列映射到第一个时隙，后$C_{mux,1}$列映射到第二个时隙；然后，对每一个时隙，经OCC扩展后映射到SCFDMA符号上。这里，根据PUCCH格式X的SCFDMA符号数和OCC长度，可以得到($R_{mux}\times C_{mux}$)矩阵的列数C_{mux}，记根据PUCCH格式X信道支持传输的调制符号数目为H，每个调制符号能够携带Q_m个物理比特，则($R_{mux}\times C_{mux}$)矩阵的行数$R_{mux}=(H\cdot Q_m)/C_{mux}$，并记$R'_{mux}=R_{mux}/Q_m$。在图3中，只显示了$R'_{mux}$行，其中每个元素$y_k$实际上代表包含$Q_m$行的列向量。假设$q_k$逐行写入($R_{mux}\times C_{mux}$)矩阵，则$\underline{y}_k=[q_{p_0},q_{p_0+C_{mux}}\cdots q_{p_0+C_{mux}(Q_m-1)}]^T$，$p_0=Q_m\cdot C_{mux}\cdot\lfloor k/C_{mux}\rfloor+k \bmod C_{mux}$；或者，假设$q_k$以$Q_m$行为一组按组写入($R_{mux}\times C_{mux}$)矩阵，则$\underline{y}_k=[q_{Q_m k},q_{Q_m k+1}\cdots q_{Q_m k+Q_m-1}]^T$。采用这个方法，保证了对应每个生成多项式的K个比特，即$d_k^{(0)}$、$d_k^{(1)}$或者$d_k^{(2)}$，均匀映射到前$C_{mux,0}$列和后$C_{mux,1}$列，进而映射到PUCCH格式X信道的两个时隙，从而获得均匀的频率分集增益，提高PUCCH格式X信道的链路性能。

[0080] 实施例二

[0081] 本实施例中，给出当UCI比特同时包括HARQ-ACK和P-CSI信息时，也就是需要同时传输HARQ-ACK和P-CSI信息时，本申请中的处理方式。

[0082] 在LTE系统中，当UE在上行子帧需要发送多种类型的信号，相应地分配了多个上行信道。例如，假设在一个子帧内需要传输P-CSI，则基站半静态为UE配置一个用于P-CSI信道。当P-CSI小于等于M比特时，例如M等于11，可以仍然是利用PUCCH格式2来反馈

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P-CSI。当P-CSI信息的比特数目较大时，P-CSI信道可以是PUCCH格式X信道。或者，当P-CSI比特总数小于等于N个比特时，例如，N等于22，可以配置PUCCH格式3信道用于P-CSI；而当P-CSI比特总数大于N个比特时，才采用PUCCH格式X信道。

[0083] 另外，当在一个子帧内需要反馈HARQ-ACK信息时，根据下行授权信令中的2比特ACK/NACK资源指示（ARI）信息可以动态指示一个PUCCH信道用于HARQ-ACK和其他UCI传输。这里，是通过RRC信令半静态配置4个备选PUCCH信道，从而用2比特ARI动态指示使用哪个PUCCH信道用于UCI传输。这个PUCCH信道可以是PUCCH格式3信道，从而支持最多22比特的UCI传输；或者，这个PUCCH信道也可以是PUCCH格式X信道，从而承载更大的UCI净荷。

[0084] 根据上面的分析，基站半静态配置的用于P-CSI的PUCCH信道，只需要考虑P-CSI的比特总数，所以比特数目较少。而对用ARI指示的PUCCH信道，这个信道可以是考虑了在一个CG的一个子帧内的所有需要反馈的UCI比特（包括HARQ-ACK和P-CSI，还可以包括SR），所以ARI指示的PUCCH信道需要承载更多的比特。这样，当在一个子帧内，需要反馈P-CSI也需要反馈HARQ-ACK时，分配用于P-CSI的PUCCH信道不一定可以承载所有UCI比特（包括HARQ-ACK和P-CSI，还可以包括SR），但是ARI指示的PUCCH信道一定可用。

[0085] 为了在各种不同的UCI反馈信息组合的情况下，保持一致的UE操作，本发明提出当需要在一个子帧内同时反馈P-CSI和HARQ-ACK时（还可以进一步包括SR），UE使用ARI动态指示的PUCCH信道来反馈上述UCI信息。

[0086] 采用这种方法，不管半静态配置的P-CSI信道是PUCCH格式2、PUCCH格式3或者PUCCH格式X，UE的操作都是使用ARI动态指示的PUCCH信道来反馈上述UCI信息，保持UE操作的一致性。当不存在ARI动态指示的PUCCH信道时，才使用半静态配置的P-CSI信道反馈上行信息。另外，当配置P-CSI的信道和ARI动态指示的信道是同一个类型的时候，因为ARI可以有多个取值，从而允许基站根据调度的UE的情况，动态调整PUCCH信道的分配，提供了基站分配PUCCH信道的灵活性。这里，基站实现上可以使半静态配置P-CSI的PUCCH信道是半静态配置的对应n比特ARI的备选PUCCH信道之一，例如n等于2，从而基站可以灵活地通过ARI选择PUCCH信道用于UCI传输，而且也避免造成额外的PUCCH开销。

[0087] 实施例三

[0088] 为进一步降低ARI信息的冗余比特，提高资源利用率，本申请中给出新的ARI信息的承载方式，继而UE根据该承载方式在下行授权信令中对应提取ARI，以确定用于传输UCI比特的PUCCH信道。通过本实施例的方式，还能够有效识别连续丢失绑定窗口中最后若干个下行授权信令的情况。

[0089] 在LTE系统中，需要在一个上行子帧内反馈多个CC的多个下行子帧的下行传输的HARQ-ACK信息。这里，把上述多个CC的多个下行子帧称为对应这个上行子帧的绑定窗口。为了帮助UE识别是否丢失了其绑定窗口内的一个或者多个下行传输，在LTE系统引入了下行分配索引（DAI）技术。具体的说，DAI是两比特信息，是一种纯计数器，用于指示到当前子帧位置，一共发送了多少个下行授权信令。但是，2比特DAI信息不能发现丢失连续的4个下行授权信令的情况，或者连续丢失最后的若干个下行授权信令的情况。上述两比特DAI是一种对检测性能和信令开销的折中。换句话说，在LTE系统中，认为丢失连续4个子帧的概率非常低，不需要去优化处理。

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[0090] 另外，在LTE系统中，当在一个子帧内需要反馈HARQ-ACK信息时，是根据下行授权信令中的2比特ACK/NACK资源指示(ARI)信息可以动态指示一个PUCCH信道用于HARQ-ACK传输。这里，是通过RRC信令半静态配置4个备选PUCCH信道，从而用2比特ARI动态指示使用哪个PUCCH信道用于HARQ-ACK传输。

[0091] 根据现有LTE系统中的方法，只有Pcell的DAI等于1的下行授权信令的传输功率控制(TPC)域仍然用于功率控制，而Pcell的其他下行授权信令和Scell的下行授权信令的TPC域都是用作ARI。当考虑为UE配置最多32载波，特别是对TDD系统时，导致有更多的下行授权信令中的TPC域被用作ARI信息。但是，实际上，所有的ARI信息都是相同的2比特信息，这造成大量的冗余比特。

[0092] 本发明提出，可以把ARI信息和其他控制信息（例如新定义的控制信息）一起处理后，映射到上述除了Pcell的仍然用于功率控制的下行授权信令的TPC域以外的其他下行授权信令的TPC域上。上述其他控制信息可以是指示当前分配那种PUCCH格式的信道、指示发送的下行授权信令总数、指示传输的TB总数或者作为DAI的扩展信息等。只要UE能够收到一定数目的上述其他下行授权信令，UE就有可能完成恢复出ARI信息和上述其他控制信息。

[0093] 根据上面的分析，LTE系统的DAI的设计不能发现丢失连续4个下行授权信令的情况，换句话说，丢失连续4个下行授权信令的情况不在LTE系统的优化范围之内。基于这个性质，有可能利用下行授权信令的TPC域承载更多的信息。这里DAI可以仍然是时域的，即对一个CC的各个子帧的下行授权信令的计数；或者，DAI可以是频域的，即对同一个子帧内的各个CC的下行授权信令的计数；或者，DAI可以是联合用于频域和时域的，即首先对一个子帧内的各个CC的下行授权信令的计数，然后对下一个子帧内的各个CC的下行授权信令继续计数。或者，DAI可以是频域的，即对同一个子帧内的各个CC的下行授权信令调度的TB个数进行计数；或者，DAI可以是联合用于频域和时域的，即首先对一个子帧内的各个CC的下行授权信令的调度的TB个数进行计数，然后对下一个子帧内的各个CC的下行授权信令的TB个数进行继续计数。

[0094] 一种可能的方法是，除Pcell上的一个下行授权信令的TPC域仍然用于功率控制以外，基站发送的前N个其他连续下行授权信令中的TPC域仍然指示ARI信息，N大于N_{min}，例如N_{min}等于4；而后续其他下行授权信令中的TPC域用于指示其他控制信息。这里，只有当UE丢失上述前N个连续的下行授权信令时，UE才没有可用的ARI信息，这样的概率非常小，不需要进行优化处理。以下描述处理第N个指示ARI的下行授权信令以后的其他下行授权信令的TPC域的处理方法。

[0095] 第一种处理方法是利用这些TPC域承载基站当前调度的下行授权信令的总数。进一步地，可以是对下行授权信令的个数模N_{min}，从而可以用$\log_2(N_{min})$比特来传输。例如N_{min}等于4，是用2个比特来传输当前调度的下行授权信令的总数。根据对下行授权信令中计数的DAI，UE已经可以发现除丢失最后若干个下行授权信令以外的丢失小于N_{min}个连续下行授权信令的情况。进一步地，基于这个方法，根据在TPC域中传输的这个下行授权信令的总数，UE可以判断他是否丢失了基站调度的最后1～N_{min}-1个下行授权信令。这样，综合DAI和TPC域传输的下行授权信令的总数，UE可以发现所有丢失大于等于N_{min}个连续下行授权信令以外的丢失情况。根据上面的分析，当N_{min}大于等于4时，不需要优化丢失连续N_{min}个

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下行授权信令的情况，所以 UE 可以推断出基站共计发送了多少个下行授权信令，并相应地设置 HARQ-ACK 的比特数。UE 可以根据当前子帧承载的 UCI 比特数目进一步确定 ARI 指示的是哪种 PUCCH 格式的 PUCCH 信道。上述 UCI 可以包括 HARQ-ACK、P-CSI 和 / 或 SR。

[0096] 采用这个方法，除 Pcell 的 TPC 域仍然用于功率控制的下行授权信令外，假设 UE 收到前 N 个指示 ARI 的下行授权信令以外的至少一个下行授权信令，即 UE 收到了在 TPC 域承载的当前调度的下行授权信令的总数，从而 UE 可以准确得到 HARQ-ACK 的比特总数，并按照这个比特总数在 ARI 指示的 PUCCH 信道上传输 HARQ-ACK 信息，这里，在 ARI 指示的 PUCCH 信道上可以同时反馈其他 UCI 信息。或者，除 Pcell 的 TPC 域仍然用于功率控制的下行授权信令外，假设 UE 仅收到前 N 个指示 ARI 的下行授权信令中的至少一个，UE 仍然获得了 ARI 信息，从而确定 PUCCH 信道，但是不能确切知道基站调度下行授权信令数目。UE 可以按照其能够检测到或者分析得到的下行授权信令的数目确定 HARQ-ACK 比特总数。或者，在这种情况下，UE 也可以是固定按照基站调度了 N 个下行授权信令来计算 HARQ-ACK 的比特数，例如 UE 固定反馈 2N 个 HARQ-ACK 比特。

[0097] 在基站侧，当基站实际调度至少 $N+N_{min}$ 个下行授权信令时，在不优化丢失连续 N_{min} 个下行授权信令的前提下，UE 一定收到了在 TPC 域承载的当前调度的下行授权信令的总数，基站可以假设 UE 准确知道 HARQ-ACK 比特总数，从而不需要盲检测。当基站实际调度大于 N 个但是小于 $N+N_{min}$ 个下行授权信令时，因为 UE 可能丢失最后面的最多 $N_{min}-1$ 个下行授权信令，导致 UE 未能收到在 TPC 域承载的当前调度的下行授权信令的总数，从而 UE 有可能不知道准确的 HARQ-ACK 数目；或者，当基站实际调度小于等于 N 个下行授权信令时，即基站未能利用 TPC 域承载的当前调度的下行授权信令的总数，导致 UE 不知道准确的 HARQ-ACK 数目。这时，如果 UE 的操作是按照其能够检测到或者分析得到的下行授权信令的数目确定 HARQ-ACK 比特总数，基站可以是盲检测多种可能的 HARQ-ACK 比特总数来完成 HARQ-ACK 的接收；或者，基站仅按照其实际调度的下行数据传输对应的 HARQ-ACK 比特数来进行 HARQ-ACK 的接收。或者，如果 UE 在没有收到 TPC 域承载的当前调度的下行授权信令的总数的情况下，是固定按照基站调度了 N 个下行授权信令来计算 HARQ-ACK 的比特数，例如 UE 固定反馈 2N 个 HARQ-ACK 比特。基站可能需要盲检测两个净荷大小，即基站实际调度对应的 HARQ-ACK 比特数和 2N 比特。

[0098] 第二种处理方法是利用这些 TPC 域承载基站当前调度的 TB 的总数。进一步地，可以是对 TB 总数模 B_{min}，从而可以用 $\log_2(B_{min})$ 比特来传输。例如 B_{min} 等于 8，上述 $\log_2(B_{min})$ 比特信息经处理后需要映射到多个下行授权信令的 TPC 域上。根据下行授权信令中的对 TB 进行计数的 DAI，UE 已经可以发现除丢失最后若干个 TB 以外的丢失连续小于 B_{min} 个 TB 的情况。进一步地，基于这个方法，根据在 TPC 域中传输的这个 TB 总数，UE 可以判断他是否丢失了基站调度的最后 1 ～ $B_{min}-1$ 个 TB。这样，综合 DAI 和 TPC 域传输的 TB 总数，UE 可以发现所有丢失大于等于 B_{min} 个连续 TB 以外的丢失情况。根据上面的分析，不需要优化丢失连续 4 个下行授权信令的情况，当 B_{min} 等于 8 时，丢失 B_{min} 个连续 TB 相当于丢失连续大于等于 4 个下行授权信令，即不需要优化，所以 UE 可以推断出基站共计发送了多少个 TB，并相应地设置 HARQ-ACK 的比特数。UE 可以根据当前子帧承载的 UCI 比特数目进一步确定 ARI 指示的是哪种 PUCCH 格式的 PUCCH 信道。上述 UCI 可以包括 HARQ-ACK、P-CSI 和 / 或 SR。

[0099] 采用这个方法，除 Pcell 的 TPC 域仍然用于功率控制的下行授权信令外，假设 UE

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收到前 N 个指示 ARI 的下行授权信令以外的至少一个下行授权信令，即 UE 收到了在 TPC 域承载的当前调度的 TB 总数，从而 UE 可以准确得到 HARQ-ACK 的比特总数，并按照这个比特总数在 ARI 指示的 PUCCH 信道上进行 HARQ-ACK 传输，这里，在 ARI 指示的 PUCCH 信道上可以同时反馈其他 UCI 信息。或者，除 Pcell 的 TPC 域仍然用于功率控制的下行授权信令外，假设 UE 仅收到前 N 个指示 ARI 的下行授权信令中的至少一个，UE 仍然获得了 ARI 信息，从而确定 PUCCH 信道，但是不能确切知道基站调度下行授权信令数目。UE 可以按照其能够检测到或者分析得到的 TB 数目确定 HARQ-ACK 比特总数。或者，在这种情况下，UE 也固定按照基站调度了 B 个 TB 来计算 HARQ-ACK 的比特数，例如 UE 固定反馈 B 个 HARQ-ACK 比特。

[0100] 在基站侧，当基站实际调度至少 $N+N_{min}$ 个下行授权信令时，在不优化丢失连续 N_{min} 个下行授权信令的前提下，UE 一定收到了在 TPC 域承载的当前调度的 TB 的总数，基站可以假设 UE 准确知道 HARQ-ACK 比特总数，从而不需要盲检测。当基站实际调度大于 N 个但是小于 $N+N_{min}$ 个下行授权信令时，因为 UE 可能丢失最后面的最多 $N_{min}-1$ 个下行授权信令，导致 UE 未能收到在 TPC 域承载的当前调度的 TB 总数，从而 UE 有可能不知道准确的 HARQ-ACK 数目；或者，当基站实际调度小于等于 N 个下行授权信令时，即基站未能利用 TPC 域承载的当前调度的 TB 总数，导致 UE 不知道准确的 HARQ-ACK 数目。这时，如果 UE 的操作是按照其能够检测到或者分析得到的 TB 数目确定 HARQ-ACK 比特总数，基站可以是盲检测多种可能的 HARQ-ACK 比特总数才能完成 HARQ-ACK 的接收；或者，基站仅按照其实际调度的下行数据传输对应的 HARQ-ACK 比特数来接收 HARQ-ACK 的接收。或者，如果 UE 在没有收到 TPC 域承载的当前调度的 TB 总数的情况下，是固定按照基站调度了 B 个下行授权信令来计算 HARQ-ACK 的比特数，即 UE 固定反馈 B 个 HARQ-ACK 比特。基站可能需要盲检测两个净荷大小，即基站实际调度对应的 HARQ-ACK 比特数和 B 比特。

[0101] 实施例四

[0102] 在本实施例中，给出根据 ARI 信息确定 PUCCH 信道和相应的 PUCCH 格式的具体方式。

[0103] 在 LTE 系统中，需要在一个上行子帧内反馈多个 CC 的多个下行子帧的下行传输的 HARQ-ACK 信息。这里，把上述多个 CC 的多个下行子帧称为对应这个上行子帧的绑定窗口。对参考 HARQ 定时是 FDD 定时的情况，绑定窗口包括一个子帧内的多个 CC 的资源；对参考 HARQ 定时 TDD 定时的情况，则绑定窗口包括多个 CC 的多个子帧内的资源。当可以配置 UE 的 CC 数目很多时，相应地 HARQ-ACK 的比特数目也越多。例如，假设配置了 32CC，每个 CC 的绑定窗口都包括 4 个子帧，则即使在考虑了空间绑定 (spatial bundling) 的情况下，HARQ-ACK 的比特数也达到 128。

[0104] 但是，通常情况下，基站不会调度绑定窗口内所有配置的 CC 的所有子帧给同一个 UE。有些情况下，基站可能仅在绑定窗口内调度了很少的下行数据，有效的 HARQ-ACK 比特数小于等于 N1 比特，例如 N1 等于 22，则在考虑资源利用率时，应该分配 PUCCH 格式 3 信道给 UE。在另一些情况下，基站调度了较多的下行数据，导致有效的 HARQ-ACK 比特数大于 N1，则需要分配 PUCCH 格式 X 信道给 UE。进一步的，PUCCH 格式 X 信道还可以是支持多种净荷比特数，例如，当需要反馈的 HARQ-ACK 比特数大于 N1 但是小于等于 N2 比特时，例如 N2 等于 66，UE 可以按照承载 N2 比特的情况处理 PUCCH 格式 X 信道；当需要反馈的 HARQ-ACK 比特数大于 N2 比特时，UE 可以按照承载 N3 比特的情况处理 PUCCH 格式 X 信道，例如 N3 等于

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130。为了在保证基站调度灵活性的前提下，尽可能优化 PUCCH 的传输性能，提高上行资源利用率，UE 需要动态转换采用的 PUCCH 信道。例如，以 N1 比特为界，转换 PUCCH 格式 3 信道和 PUCCH 格式 X 信道；或者，以 N1 比特和 N2 比特为界，转换 PUCCH 格式 3 信道、净荷较小的 PUCCH 格式 X 信道和净荷较大的 PUCCH 格式 X 信道。

[0105] 另外，在 LTE 系统中，当在一个子帧内需要反馈 HARQ-ACK 信息时，是根据下行授权信令中的 2 比特 ACK/NACK 资源指示（ARI）信息可以动态指示一个 PUCCH 信道用于 HARQ-ACK 传输。这里，是通过 RRC 信令半静态配置 4 个备选 PUCCH 信道，从而用 2 比特 ARI 动态指示使用哪个 PUCCH 信道用于 HARQ-ACK 传输。

[0106] 这里，本发明提出 ARI 的一个值动态指示用于 UCI 传输的 PUCCH 信道格式，并进一步动态指示出 UE 当前使用的 PUCCH 信道。具体的说，记 ARI 是 N 比特信息，例如 N 等于 2，通过 RRC 信令半静态配置 2^N 个备选，并分别配置这 2^N 个备选的 PUCCH 信道格式和对应的 PUCCH 信道。不同备选 PUCCH 信道的格式可以是相同的或者不同的。然后，可以用下行授权信令中的 N 比特 ARI 动态指示用于 UCI 传输的 PUCCH 信道格式和 PUCCH 信道。UE 根据检测到的 ARI 信息确定 PUCCH 信道格式以及使用的 PUCCH 信道。采用这种方法，提供基站动态指示 PUCCH 格式的灵活性，但是，在不增加 ARI 比特数目的情况下，它也意味着对应一种特定 PUCCH 格式的备选信道数目减少了。

[0107] 上述即为本申请中传输 UCI 方法的具体实现。本申请还提供一种传输 UCI 的设备，可以用于实施上述本申请的 UCI 传输方法。图 4 为该设备的基本结构示意图，如图 4 所示，该设备包括：备选 PUCCH 信道集合确定单元、HARQ-ACK 比特生成单元、UCI 比特处理单元、PUCCH 信道确定单元和发送单元。

[0108] 其中，备选 PUCCH 信道集合确定单元，用于接收配置信令，确定对应 ACK/NACK 资源指示（ARI）的备选 PUCCH 信道集合。HARQ-ACK 比特生成单元，用于接收下行授权信令及对应的下行数据，生成 HARQ-ACK 比特。UCI 比特处理单元，用于对包括 HARQ-ACK 在内的 UCI 比特进行处理。PUCCH 信道确定单元，用于根据下行授权信令中包括的 ARI 从备选 PUCCH 信道集合中确定出用于 UCI 比特传输的 PUCCH 信道。发送单元，用于在确定出的 PUCCH 信道上传输包括 HARQ-ACK 在内的 UCI 比特。

[0109] 下面针对 UCI 信息中的 A-CSI 传输方法和设备进行介绍。图 5 为本申请中传输 A-CSI 信息的方法基本流程图。如图 5 所示，该方法包括：

[0110] 步骤 501，UE 接收上行授权信令。

[0111] 步骤 502，UE 根据上行授权信令中的 CSI 请求域确定当前是否触发 A-CSI 报告。

[0112] 步骤 503，在确定触发 A-CSI 报告后，UE 确定要更新的 CSI 过程，并在承载 A-CSI 报告的上行 CC 上传输 A-CSI 信息。

[0113] 下面通过两个具体实施例说明 A-CSI 的具体传输方式。

[0114] 实施例五

[0115] 在 LTE 系统中，可以触发 A-CSI 报告，并且是映射到 PUSCH 信道上传输。在上行授权信令中包含 1 比特或者 2 比特的 CSI 请求域，它用于触发 UE 的 A-CSI 报告。以 2 比特 CSI 请求域为例，值“0,0”指示不触发 A-CSI；值“0,1”指示上行授权信令调度的上行 CC 对应的下行 CC 的 A-CSI，这里的对应关系是根据系统信息块 SIB2 确定的；值“1,0”和“1,1”具体触发那些 CSI 报告是用 RRC 信令配置的，所以可以是配置触发任何一个 CC 的 A-CSI，具

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有最大的灵活性。但是，对值“0,1”，因为典型的CA配置都是非对称的，只有配置了对应的上行CC的那些下行CC才能用值“0,1”来触发A-CSI。特别地，UE可以是配置了32个下行CC，而只配置1个上行CC，这在很大程度上限制了值“0,1”的可用性。

[0116] 为了充分利用值“0,1”，本实施例提出对只配置了下行传输的CC，仍然要求UE检测DCI格式0，从而利用DCI格式0来触发UE对这样的只配置下行传输的CC的A-CSI报告。这里，UE检测DCI格式0并不增加盲检测次数，这时因为DCI格式0和DCI格式1A的比特数目相等，并且UE在盲检测调度下行传输的下行授权信令时一定会检测DCI格式。

[0117] 这里，因为只配置了下行传输的CC实际上不能进行上行传输，触发的A-CSI信息只能在其他配置了上行带宽的CC上。这个CC可以固定是Pcell；或者，这个CC可以是对应这个只配置下行传输的CC的反馈UCI的CC，即PScell；或者，可以是对DCI格式0的一些比特进行重新定义，从而指示UE从多个配置的上行CC中选择一个用于A-CSI反馈。

[0118] 这种对应只配置下行传输的CC的DCI格式0可以是仅用于触发A-CSI，或者也可以同时触发对只配置下行传输的CC的A-CSI和调度反馈A-CSI的CC上的上行数据传输。

[0119] 这种对应只配置下行传输的CC的DCI格式0可以是只有值“0,1”用于触发A-CSI，或者也可以是值“0,1”、“1,0”和“1,1”都可以用于触发A-CSI。对值“0,1”、“1,0”和“1,1”，其触发的A-CSI对应的CSI过程是用高层信令配置的，可以与其他支持上行传输的CC的配置相同，或者，也可以是不同的。

[0120] 这种对应只配置下行传输的CC的DCI格式0可以仍然是只有两个比特用于CSI请求，或者也可以是把更多的比特用于CSI请求，从而可以用RRC信令配置更多的不同的A-CSI信息的集合。例如，假设只配置下行传输的CC的DCI格式0不调度上行数据，则DCI格式中的一些域是无用的，可以用来增加CSI请求的比特数。

[0121] 当用只配置下行传输的CC的DCI格式0触发了A-CSI，并且UE在反馈A-CSI的CC上没有调度上行数据传输时，按照这个DCI格式0确定反馈A-CSI的CC的PUSCH信道的相关参数并传输A-CSI。当用只配置下行传输的CC的DCI格式0触发了A-CSI，并且UE在反馈A-CSI的CC上也调度了上行数据传输时，但是在反馈A-CSI的CC上没有额外触发A-CSI报告，则按照反馈A-CSI的CC的上行授权信令来确定PUSCH信道的相关参数，然后在这个PUSCH信道上传输只配置下行传输的CC的DCI格式0触发的A-CSI。当用只配置下行传输的CC的DCI格式0触发了A-CSI，并且UE在反馈A-CSI的CC检测到上行授权信令并额外触发了A-CSI时，即UE同时在一个子帧内收到至少两个A-CSI触发，UE可以认为这种情况是配置错误；或者，UE可以仅传输反馈A-CSI的CC的上行授权信令触发的A-CSI，即丢掉只配置下行传输的CC的DCI格式0触发的A-CSI；或者，UE可以对同时反馈两个A-CSI报告，特别地，UE可以是反馈两个A-CSI的并集，即对两个A-CSI的重复的CSI过程，仅需要传输一次。

[0122] 实施例六

[0123] 在LTE系统中，可以触发A-CSI报告，并且是映射到PUSCH信道上传输。在上行授权信令中包含1比特或者2比特的CSI请求域，它用于触发UE的A-CSI报告。以2比特CSI请求域为例，值“0,0”指示不触发A-CSI；值“0,1”指示上行授权信令调度的上行CC对应的下行CC的A-CSI，这里的对应关系是根据SIB2确定的；值“1,0”和“1,1”具体触发那些CSI报告是用RRC信令配置的，所以可以是配置触发任何一个CC的A-CSI，具有最大的灵

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活性。

[0124] 另外，在 LTE 系统中，可以为 UE 配置了多个小区组 (CG，Cell Group)，并且对一个 CG，在这个 CG 的一个小区上反馈这个 CG 的各个小区的 UCI 信息。特别地，可以是对每个 CG 分别用 RRC 信令配置 A-CSI 报告的 CSI 过程集合，并用上行授权信令来分别触发 UE 的 A-CSI 报告。但是，从 UE 能力上讲，不管是否配置了多个 CG，UE 在一个子帧内能够更新和反馈 A-CSI 的 CSI 过程数目是不变的，记为 K 个 CSI 过程。对各个 CG，CSI 请求域所触发的 A-CSI 报告是独立配置的，即，对一个 CG，允许对应 CSI 请求域的一个码字配置包含最多 K 个 CSI 过程的 A-CSI 报告。这可能会导致在同一个子帧内，当基站在多个 CG 内都触发了 A-CSI 报告时，多个 CG 触发的 CSI 过程的总数可以超过 UE 更新和反馈 A-CSI 的能力。这时，一种处理方法是让 UE 认为这是一种配置错误，但是这造成对基站触发 A-CSI 的限制。另一个处理方法是依赖于 UE 实现来处理这种情况。因为不同的制造商可能有不同的实现方法，这导致基站不确定 UE 到底报告的哪 K 个 CSI 过程是最新的，这也不利于基站调度。实际上，在一些情况下，基站可以是故意使一个子帧内在多个 CG 触发的 A-CSI 过程总数大于 K，仅需要定义一定的优先级规则，就可以控制 UE 只更新一部分高优先级的 CG 的 A-CSI ；或者，控制 UE 只更新各个 CG 的优先级较高的 CSI 过程，这样的可以更新的 CSI 过程的集合不是通过 RRC 信令配置的，从而在不变化 RRC 信令的情况下，增加了触发 A-CSI 的集合数目。

[0125] 本实施例提出，当基站在一个子帧内触发多个 CG 的 A-CSI，并且触发的 CSI 过程的总数大于 UE 更新和报告 A-CSI 的能力 K 时，记触发的 CSI 过程的总数为 N，则 UE 从上述 N 个 CSI 过程中选择 K 个优先级最高的 CSI 过程进行更新 CSI 并报告。

[0126] 对 CSI 信息，可以从以下几个方面来处理优先级。

[0127] 对 A-CSI，其设计原则是一次反馈完成的 CSI 信息，即，在 RI 信息是默认为特定值的情况下，例如 RI 等于 1，报告所有相关的 CQI/PMI 信息 ；或者，UE 需要在一个 PUSCH 上报告 RI 信息和所有 CQI/PMI 信息。这样，区分 RI 和 CQI/PMI 两种 CSI 报告类型的方法不能直接适用于 A-CSI。一种简单的方法是不在使用 CSI 报告类型作为 A-CSI 优先级的依据。或者，定义同时反馈 RI 和 CQI/PMI 的 CSI 过程的优先级高于采用默认 RI 从而只反馈 CQI/PMI 的 CSI 过程。或者，可以是定义各种用于 A-CSI 的 CSI 汇报模式的优先级。或者，可以是定义各种下行传输模式的优先级。

[0128] CSI 过程 ID 仍然可以作为判断 A-CSI 优先级的一个依据。例如，CSI 过程 ID 较小的 CSI 过程优先。对 TM1 ～ 9，LTE 系统没有定义 CSI 过程，但是可以按照只配置一个 CSI 过程并且 CSI 过程 ID 为 0 来处理。

[0129] 对小区 ID，可以有两种定义方法。第一种方法是 UE 的所有配置的 CC 分别配置唯一的小区 ID，这样，可以根据小区 ID 来判断不同 CG 的 CSI 过程的优先级，并且因为不同 CG 的小区 ID 不同，一定可以选出优先级更高的 CSI 过程，从而也就不需要再比较其他参数。或者，第二种方法是配置小区 ID 是在一个 CG 内的小区的索引，即不同的 CG 内的小区可以有相同的用于 A-CSI 优先级的小区 ID，这样，当两个 CG 内的 CSI 过程的小区 ID 都相同时，可以进一步比较 CSI 子帧集索引，例如，CSI 子帧集索引较小的 CSI 过程优先 ；或者，当两个 CG 内的 CSI 过程的小区 ID 相同时，可以进一步比较 CG 的索引，例如，CG 索引较小的 CSI 过程优先 ；或者也可以进一步把 CSI 子帧集索引和 CG 索引都作为优先级准则。

[0130] CG 索引可以作为判断 A-CSI 优先级的一个依据。例如，CG 索引较小的 CSI 过程优

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先。采用这个方法，可以实现 Pcell 所在的 CG 优先级最高，从而保护 Pcell 所在的 CG 的下行传输性能。

[0131] 假设一个 CG 可以进一步划分多个反馈 A-CSI 的子组，即一个 A-CSI 触发的 A-CSI 是局限在一个子组内的 CC 上，则可以把 A-CSI 子组的索引可以作为判断 A-CSI 优先级的一个依据。例如，A-CSI 子组的索引较小的 CSI 过程优先。这里可以是跨越 CG，对所有 A-CSI 子组一起排序，从而一定可以按照 A-CSI 子组索引区分优先级。这里，一般需要保证 Pcell 所在 CG 内的 A-CSI 子组具有更低的索引。或者 A-CSI 子组的索引是在每个 CG 内部定义的，即多个 CG 内的 A-CSI 子帧的索引可以是相等的。

[0132] 为了尽可能保证用于承载 UCI 信息的 CC 的下行传输性能，可以是定义下面的优先级顺序，即 Pcell 的优先级 >PScell 的优先级 > 其他 Scell 的优先级。这里，如果有多个 PScell，认为其优先级相同，如果有多个其他 SCell，也认为其优先级相同；或者，如果有多个 PScell，可进一步按照其索引排序；如果有多个其他 Scell，是按照其索引排序。

[0133] 可以把小区所在的许可频段或者免许可频段作为一个准则，例如，许可频段的小区优先级高于免许可频段的小区，这时因为许可频段的小区的 CSI 测量肯定是可用的，但是对免许可频段的小区，即使触发了 A-CSI 报告，但是如果这个小区已经长时间没有占有信道，其 A-CSI 的有效性很低。或者，也可以定义免许可频段的小区优先级高于许可频段的小区，这时因为免许可频段的一次 CSI 汇报如果不能及时报告并利用，可能导致基站在很长时间内没有 CSI 信息可用，而许可频段上的 CSI 报告则经常可以报告，即汇报的机会更多。

[0134] 采用本发明上面的方法，当基站在多个 CG 触发的 A-CSI 的 CSI 过程数大于 K 时，UE 根据上述优先级规则确定更新其中的 K 个 CSI 过程的 CSI 信息。因为这种优先级规则同时作用于基站和 UE，没有不确定性，UE 可以在上行方向只传输对应上述 K 个 CSI 过程的 A-CSI 信息，即，对应一个 CG 的一个 A-CSI 报告，仅保留属于上述 K 个最高优先级的 CSI 过程的 CSI 信息，并据此确定 A-CSI 信息的总比特数，并相应地在对应这个 CG 的这个 A-CSI 报告的上行信道上传输。采用这个方法，因为去除了未更新的 A-CSI 的无效比特，减小对一般上行数据传输的影响，提高上行资源利用率。

[0135] 以上描述了分别多种处理 A-CSI 优先级的参数，实际的优先级准则可以是联合使用上述优先级的一种或者多种参数。例如，采用四种参数并且按照优先级别从高到低的顺序依次为，CSI 报告类型 >CSI 过程 ID> 小区 ID>CSI 子帧集索引。在联合采用了多种参数的情况下，只有当高级别的参数不能判断优先级的情况下，才进一步比较低一级的参数。

[0136] 上述即为本申请中 A-CSI 的传输方法的具体实现。本申请还提供了一种 A-CSI 的传输设备。图 6 为该设备的基本结构示意图，如图 6 所示，该设备包括：接收单元、A-CSI 报告触发单元和传输单元。

[0137] 其中，接收单元，用于接收上行授权信令。A-CSI 报告触发单元，用于根据上行授权信令中的 CSI 请求域确定当前是否触发 A-CSI 报告，并在确定触发 A-CSI 报告时通知传输单元。传输单元，用于在接收到 A-CSI 报告触发单元的触发通知后，确定要更新的 CSI 过程并在承载 A-CSI 报告的上行 CC 上传输 A-CSI 信息。

[0138] 以上所述仅为本发明的较佳实施例而已，并不用以限制本发明，凡在本发明的精神和原则之内，所做的任何修改、等同替换、改进等，均应包含在本发明保护的范围之内。

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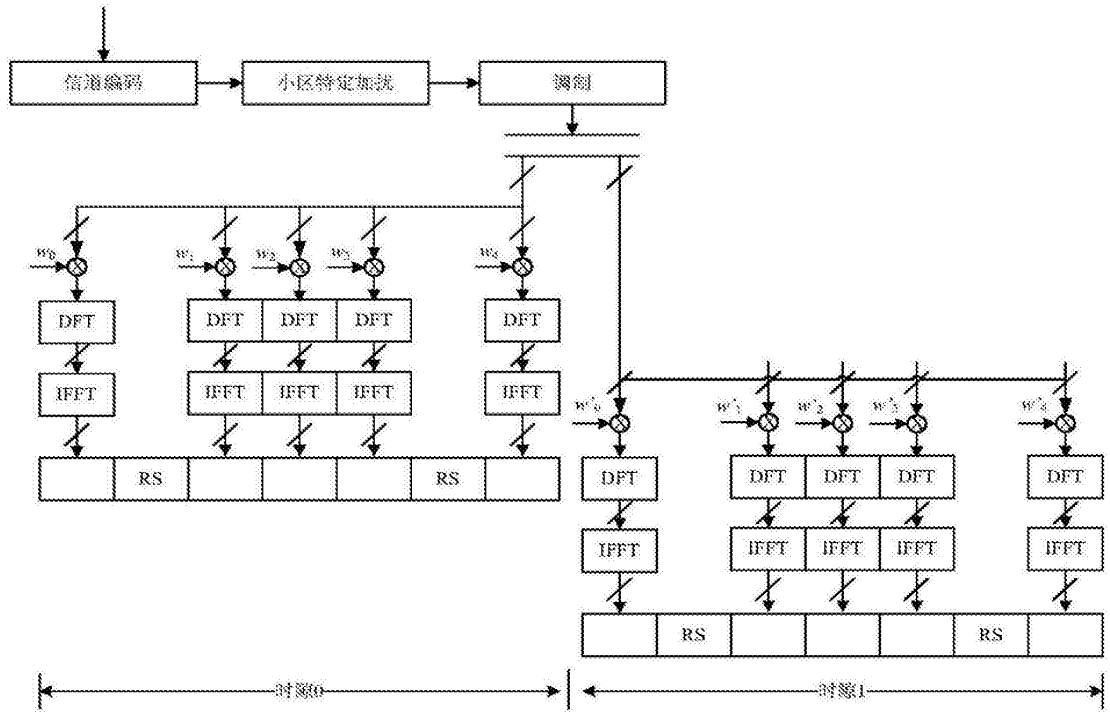


图 1

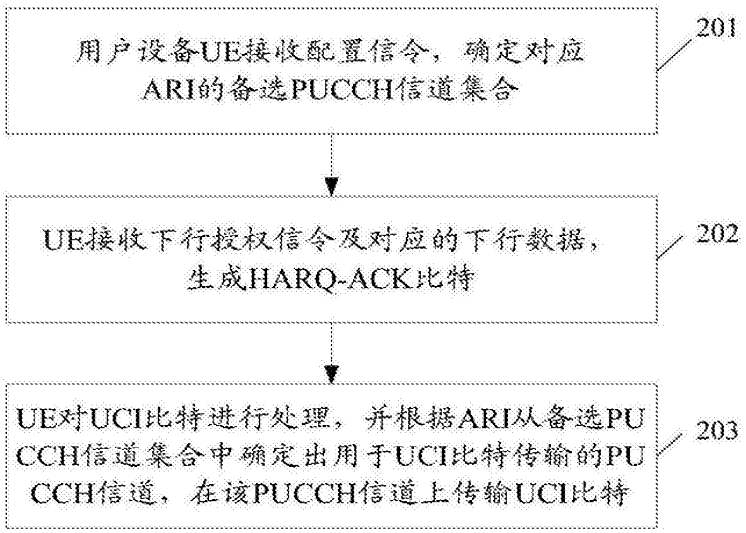


图 2

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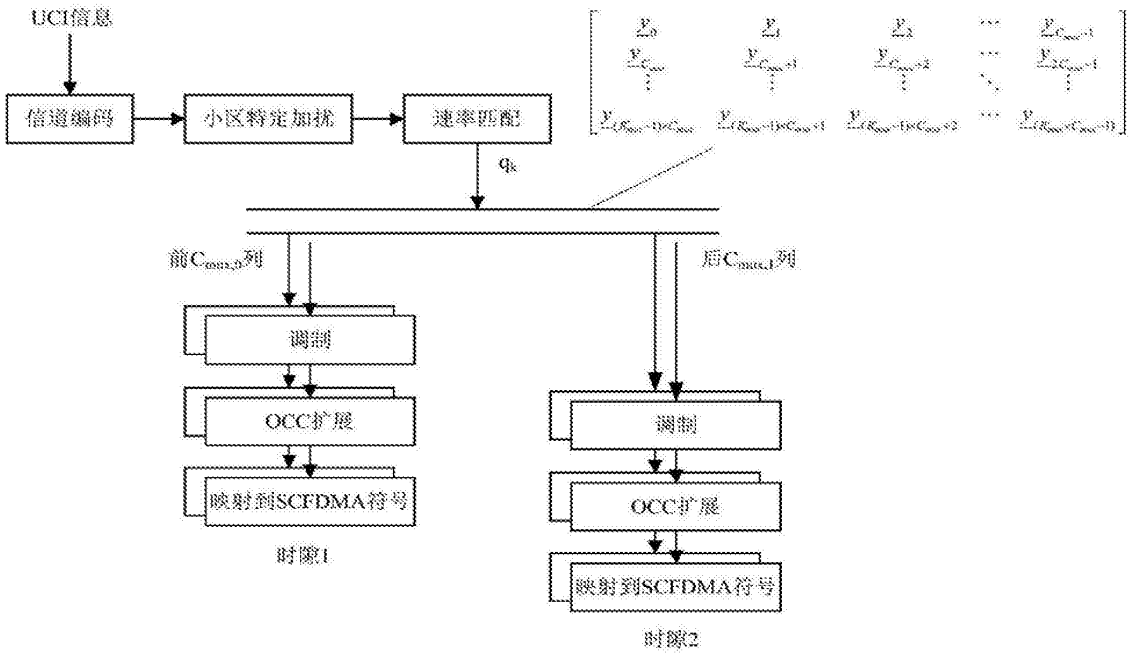


图 3

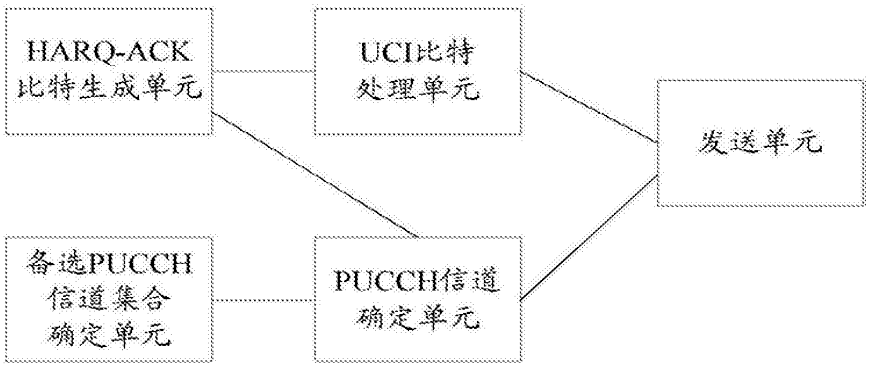


图 4

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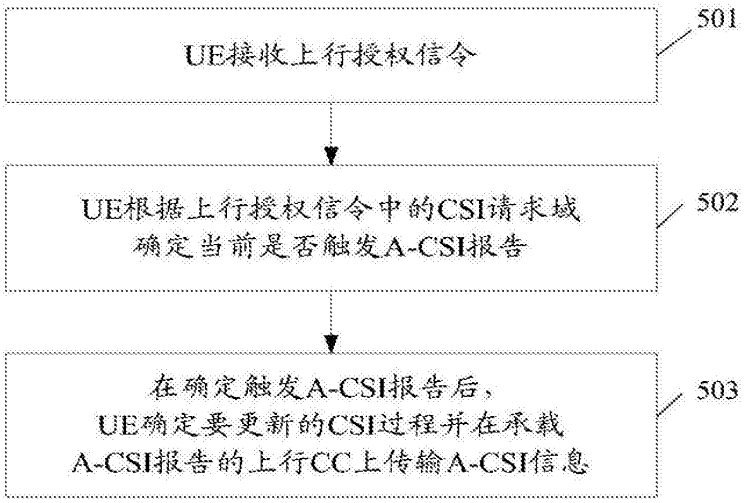


图 5

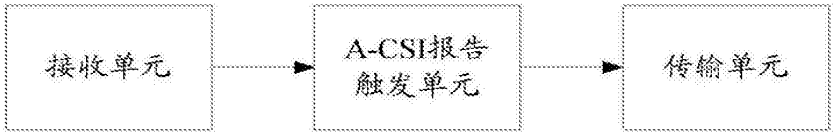


图 6

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(81) 指定国 (除另有指明，要求每一种可提供的国家保护): 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, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, 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。

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根据细则 4.17 的声明:
— 关于申请人有权申请并被授予专利(细则 4.17(ii))

本国际公布:
— 包括国际检索报告(条约第 21 条(3))。

(54) **Title**: USER EQUIPMENT, ACCESS NETWORK DEVICE, METHOD AND DEVICE FOR TRANSMITTING AND RECEIVING UPLINK CONTROL INFORMATION

(54) **发明名称** : 用户设备、接入网设备、上行控制信息的收发方法及装置

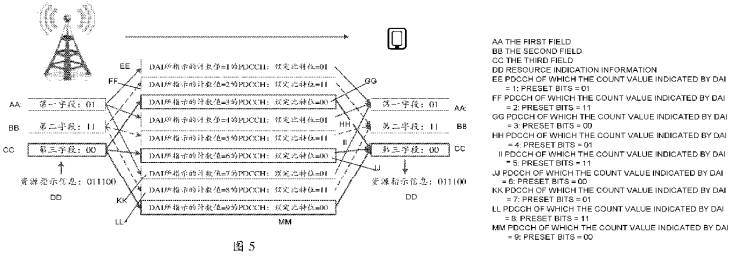


图 5

(57) **Abstract**: Embodiments of the present invention provide a user equipment, an access network device, and a method and device for transmitting and receiving uplink control information, relating to the field of communications. The method comprises: an access network device divides resource indication information into at least two fields, wherein each field is carried by downlink control information of a physical downlink control channel set, each physical downlink control channel set comprises multiple physical downlink control channels corresponding to downlink data received in secondary carriers; a user equipment determines the resource indication information according to the at least two fields. The present invention solves the problem that an access network device can indicate to a user equipment the uplink channel resource used in this application only after the number of bits occupied by predetermined bits in downlink control information is increased, and achieves the effect of determining an uplink channel resource used for transmitting uplink control information in the manner that the access network device respectively indicates one field to the user equipment by means of the downlink control information in each of multiple physical downlink control channel sets and the user equipment obtains resource indication information by determining the various fields of the resource indication information.

(57) **摘要**:

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本发明实施例提供了一种用户设备、接入网设备、上行控制信息的收发方法及装置，涉及通信领域，所述方法包括：接入网设备通过将资源指示信息划分为至少两个字段，每个字段由一个物理下行控制信道集合中的下行控制信息携带，每个物理下行控制信道集合包括在辅载波中接收的下行数据对应的若干个物理下行控制信道，用户设备根据至少两个字段确定出资源指示信息；解决了接入网设备需要增加下行控制信息中预定比特位所占用的比特位后，才能向用户设备指示本次使用的上行信道资源的问题；达到了接入网设备通过多个物理下行控制信道集合中每一个集合的下行控制信息向用户设备分别指示一个字段，用户设备通过确定资源指示信息的各个字段得到资源指示信息，从而确定出用于发送上行控制信息的上行信道资源的效果。

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用户设备、接入网设备、上行控制信息的收发方法及装置

技术领域

本发明实施例涉及通信领域，特别涉及一种用户设备、接入网设备、上行控制信息的收发方法及装置。

背景技术

在通信系统中，用户设备（User Equipment，UE）需要向接入网设备发送上行控制信息（Uplink Control Information，UCI）。UE 通过接入网设备指示的上行信道资源发送 UCI。

在载波聚合（Carrier Aggregation，CA）场景中，接入网设备通过多个载波同时向 UE 发送下行数据，该多个载波包括一个主载波和多个辅载波。同时，UE 需要针对该多个载波向接入网设备反馈 UCI。在 UE 反馈 UCI 时，UE 需要从预配置的四个上行信道资源中，选择出本次使用的上行信道资源。UE 选择上行信道资源的方法包括：UE 从多个辅载波的物理下行控制信道（Physical Downlink Control Channel，PDCCH）中的下行控制信息（Downlink Control Information，DCI）中读取预定比特位上所携带的信息，根据预定比特位上所携带的信息确定出本次使用的上行信道资源。该预定比特位可以是物理上行控制信道发送功率控制命令（Transmisson Power Contral Command for Physical Uplink Control Channel，TPC Command for PUCCH）所对应的比特位。多个辅载波中的下行控制信息中的该预定比特位上携带有相同的信息，该预定比特位通常采用 2 个比特来表示。

比如，预定比特位上携带的信息为 00 时，则 UE 采用第一个上行信道资源发送 UCI；预定比特位上携带的信息为 01 时，则 UE 采用第二个上行信道资源发送 UCI；预定比特位上携带的信息为 10 时，则 UE 采用第三个上行信道资源发送 UCI；预定比特位上携带的信息为 11 时，则 UE 采用第四个上行信道资源发送 UCI。

在实现本发明实施例的过程中，发明人发现现有技术至少存在如下问题：在载波聚合场景下，接入网设备向 UE 预配置的用于发送 UCI 的上行信道资源

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可能为很多个，比如 16 个或 32 个。以预配置的上行信道资源是 16 个为例，接入网设备需要将预定比特位由 2 个比特位修改为 $\log_2 16=4$ 个比特位后，才能向 UE 指示本次使用的上行信道资源，将会对 PDCCH 信道造成较大的传输负担。

发明内容

为了解决在预配置的上行信道资源为很多个时，接入网设备需要增加 DCI 中预定比特位所占用的比特位后，才能向 UE 指示本次使用的上行信道资源的问题，本发明实施例提供了一种用户设备、接入网设备、上行控制信息的收发方法及装置。所述技术方案如下：

根据本发明实施例的第一方面，提供了一种上行控制信息的发送方法，该方法可由 UE 执行，该方法包括：

UE 确定资源指示信息，所述资源指示信息包括至少两个字段，每个所述字段分别由一个物理下行控制信道集合中的下行控制信息确定，每个所述物理下行控制信道集合包括辅载波中的下行数据所对应的若干个物理下行控制信道；

所述 UE 确定预配置的上行信道资源集合中与所述资源指示信息对应的上行信道资源；

所述 UE 在与所述资源指示信息的上行信道资源上发送 UCI。

本发明实施例通过将资源指示信息划分为至少两个字段，每个字段由一个物理下行控制信道集合中的下行控制信息携带，每个物理下行控制信道集合包括在辅载波中接收的下行数据对应的若干个物理下行控制信道；解决了预配置的上行信道资源为很多个时，接入网设备需要增加 DCI 中预定比特位所占用的比特位后，才能向 UE 指示本次使用的上行信道资源的问题；达到了接入网设备不需要增加 DCI 中预定比特位所占用的比特位，通过多个物理下行控制信道集合中每一个集合的下行控制信息向 UE 分别指示一个字段，在 UE 侧通过确定资源指示信息的各字段得到资源指示信息，从而准确确定出用于发送 UCI 的上行信道资源的效果。

在第一方面的第一种可能的实施方式中，所述 UE 确定预配置的上行信道资源集合中与所述资源指示信息对应的上行信道资源，包括：

根据第一对应关系在所述预配置的上行信道资源集合中，确定出与所述资

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源指示信息对应的上行信道资源，所述第一对应关系为预设的资源指示信息和所述上行信道资源集合中每个上行信道资源之间的对应关系。

本发明实施例通过第一对应关系来确定与资源指示信息对应的上行信道资源，具有对应关系简洁、计算量小、计算速度快的优点。

在第一方面的第二种可能的实施方式中，所述资源指示信息包括：第一指示信息和第二指示信息；

所述 UE 确定预配置的上行信道资源集合中与所述资源指示信息对应的上行信道资源，包括：

根据第二对应关系在若干个所述预配置的上行信道资源集合中，确定出与所述第一指示信息对应的上行信道资源集合作为第一上行信道资源集合，每个所述预配置的上行信道资源集合中的上行信道资源对应各自的最大发送比特数；

根据第三对应关系在所述第一上行信道资源集合中，确定出与所述第二指示信息对应的上行信道资源；

其中，所述第二对应关系为预设的第一指示信息和所述预配置的上行信道资源集合之间的对应关系，所述第三对应关系为预设的第二指示信息和所述第一上行信道资源集合中每个上行信道资源之间的对应关系。

本发明实施例中预配置的上行信道资源集合为多个集合，每个集合中的上行信道资源支持发送 UCI 的最大发送比特数不同，UE 可以根据待反馈的 UCI 的数据量大小，选择合适大小的上行信道资源集合中的上行信道资源发送 UCI，从而提高上行信道资源的利用效率。

结合第一方面的第一种可能的实施方式或第二种可能的实施方式，在第一方面的第三种可能的实施方式中，若所述 UE 在所述资源指示信息中的第 L 个字段对应的第 R 个物理下行控制信道集合中的所有物理下行控制信道上都没有检测到所述下行控制信息，则所述资源指示信息中的第 L 个字段由预定规则确定；

其中，所述预定规则包括：所述第 L 个字段为预定取值，或者，所述第 L 个字段为第 R'个物理下行控制信道集合中的所述物理下行控制信道上接收的所述下行控制信息中预定比特位上所指示的信息，$1 \leqslant L \leqslant M$，$1 \leqslant R \neq R' \leqslant M$，R 和 R'之间存在预设的对应关系。

本发明实施例还针对向 UE 发送的部分下行控制信息传输失败的场景，提

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供出一种资源指示信息的确定方式，使得即便部分下行控制信息传输失败，UE依然能够确定出资源指示信息，从而确定出用于发送UCI的上行信道资源的效果。

根据本发明实施例的第二方面，提供了一种上行控制信息的接收方法，该方法可由接入网设备执行，所述方法包括：

接入网设备确定资源指示信息，所述资源指示信息包括至少两个字段，所述资源指示信息用于指示用户设备UE在预配置的上行信道资源集合中确定出反馈上行控制信息时采用的上行信道资源；

所述接入网设备将每个所述字段通过一个物理下行控制信道集合中的下行控制信息向用户设备UE发送，每个所述物理下行控制信道集合包括辅载波中的下行数据所对应的若干个物理下行控制信道；

所述接入网设备接收所述UE根据所述资源指示信息确定的上行信道资源上发送的所述UCI。

在第二方面的第一种可能的实施方式中，所述接入网设备接收所述UE根据所述资源指示信息确定的上行信道资源上发送的所述上行控制信息，包括：

在所述资源指示信息所对应的上行信道资源上接收所述上行控制信息。

在结合第一方面或第二方面的一些可能的实施方式中，所述资源指示信息包括M个字段，M≥2；所述物理下行控制信道集合为M个；

所述资源指示信息中的第i个字段由M个所述物理下行控制信道集合中的第j个所述物理下行控制信道集合中的下行控制信息中的预定比特位上携带的信息所确定；

所述i和所述j之间存在预设对应关系。

在结合第一方面或第二方面的一些可能的实施方式中，每个所述物理下行控制信道集合中的所述物理下行控制信道中的DAI所指示的计数值相对于所述M的余数相同。

本发明实施例通过将每个物理下行控制信道集合中的物理下行控制信道中的DAI所指示的计数值相对于所述M的余数相同，能够使UE对每个物理下行控制信道所属的物理下行控制信道集合进行正确的划分。

在结合第一方面或第二方面的一些可能的实施方式中，每个所述物理下行控制信道集合中的所述物理下行控制信道中的所述预定比特位上所携带的信息相同。

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在结合第一方面或第二方面的一些可能的实施方式中，所述预定比特位是PUCCH 发送功率命令所对应的比特位。

根据本发明实施例的第三方面，提供了一种上行控制信息的发送方法，该方法可由 UE 执行，所述方法包括：

UE 确定第一上行子帧的 UCI，所述 UCI 包括混合自动重传请求反馈HARQ-ACK 和周期性信道状态信息 CSI；

所述 UE 确定预配置的若干个上行信道资源组成的第二上行信道资源集合；

所述 UE 确定资源指示信息；

所述 UE 确定第三上行信道资源集合中与所述资源指示信息对应的信道资源为第一上行信道资源，所述第三上行信道资源集合为所述第二上行信道资源集合的子集，且所述第三上行信道资源集合与所述 HARQ-ACK 的码本大小匹配；

所述 UE 在所述第一上行子帧的所述第一上行信道资源上发送所述 UCI 中的部分或全部信息。

根据本发明实施例的第四方面，提供了一种上行控制信息的接收方法，该方法可由接入网设备执行，所述方法包括：

接入网设备确定用户设备 UE 在第一上行子帧上的上行控制信息 UCI 的自动重传请求反馈 HARQ-ACK 的码本大小，所述 UCI 包括所述 HARQ-ACK 和周期性信道状态信息 CSI；

所述接入网设备向所述 UE 发送资源指示信息；

所述接入网设备确定向所述 UE 预配置的若干个上行信道资源组成的第二上行信道资源集合；

所述接入网设备确定第三上行信道资源集合中与所述资源指示信息对应的信道资源为第一上行信道资源，所述第三上行信道资源集合为所述第二上行信道资源集合的子集，且所述第三上行信道资源集合与所述 HARQ-ACK 的码本大小匹配；

所述接入网设备接收所述 UE 在所述第一上行子帧的所述第一上行信道资源上发送的所述 UCI 中的部分或全部信息。

本发明实施例中预配置的上行信道资源集合为多个，每个上行信道资源支持发送 UCI 的最大发送比特数相同或不同，UE 和接入网设备通过确定出与

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HARQ-ACK 的码本大小相匹配的一个上行信道集合集合作为第三上行信道资源集合，再在第三上行信道资源集合中确定出与资源指示信息对应的上行信道资源，使得 UE 可以根据待反馈的 UCI 的数据量大小，选择合适大小的上行信道资源集合中的上行信道资源发送 UCI，从而提高上行信道资源的利用效率。

在结合第三方面或第四方面的可选实施方式中，所述第三上行信道资源集合中的所述上行信道资源支持发送 UCI 的最大发送比特数和所述 HARQ-ACK 的码本大小匹配；或，所述第二上行信道资源集合中的各个子集集合和所述 HARQ-ACK 的码本大小之间存在预设的匹配关系。

本发明实施例中通过 UCI 中的 HARQ-ACK 的码本大小，选择出具有合适的最大发送比特数的上行信道资源集合作为第三上行信道资源集合，提高了上行信道资源的利用效率。

根据本发明实施例的第五方面，提供了一种上行控制信息的发送方法，该方法可由 UE 执行，所述方法包括：

UE 确定第二上行子帧的 UCI；

所述 UE 确定预配置的若干个上行信道资源组成的第四上行信道资源集合，所述第四上行信道资源集合中的上行信道资源支持发送 UCI 的最大发送比特数相同；

所述 UE 确定所述第四上行信道资源集合中的第二上行信道资源；

所述 UE 在所述第二上行信道资源上发送所述 UCI。

根据本发明实施例的第六方面，提供了一种上行控制信息的接收方法，该方法可由接入网设备执行，所述方法包括：

接入网设备确定向用户设备 UE 预配置的若干个上行信道资源组成的第四上行信道资源集合，所述第四上行信道资源集合中的上行信道资源支持发送 UCI 的最大发送比特数相同；

所述接入网设备确定所述第四上行信道资源集合中的第二上行信道资源；

所述接入网设备在所述第二上行信道资源上接收所述 UE 发送的 UCI。

在本发明实施例中，UE 或接入网设备通过事先约定的确定方式，从预配置的第四上行信道资源集合中确定出第二上行信道资源作为发送 UCI 的上行信道资源，不需要接入网设备向 UE 发送资源指示信息，节约了 UE 和接入网设备之间的信令资源。

在一些可能的实施方式中，所述第二上行信道资源包括以下任意一种：

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所述第四上行信道资源集合中资源索引号最小的上行信道资源，或者，

所述第四上行信道资源集合中资源索引号最大的上行信道资源，或者，

所述第四上行信道资源集合中频率最低的资源块中的索引号最小的上行信道资源，或者，

所述第四上行信道资源集合中频率最低的资源块中的索引号最大的上行信道资源。

根据本发明实施例的第七方面，提供了一种 UE，所述 UE 包括：处理器和发射器；所述处理器被配置为执行指令，所述发射器被配置为由所述处理器控制；所述处理器通过执行指令来实现上述第一方面或第三方面或第五方面中所提供的上行控制信息的发送方法。

根据本发明实施例的第八方面，提供了一种接入网设备，所述接入网设备包括：处理器、与处理器相连的发射器和与处理器相连的接收器；所述处理器被配置为执行指令，所述处理器通过执行指令来实现上述第二方面或第四方面或第六方面中所提供的上行控制信息的接收方法。

根据本发明实施例的第九方面，提供了一种 UE，所述 UE 包括至少一个单元，该至少一个单元用于实现上述第一方面或第三方面或第五方面中所提供的上行控制信息的发送方法。

根据本发明实施例的第十方面，提供了一种接入网设备，所述接入网设备包括至少一个单元，该至少一个单元用于实现上述第二方面或第四方面或第六方面中所提供的上行控制信息的接收方法。

根据本发明实施例的第十一方面，提供了一种通信系统，所述通信系统包括如第七方面提供的 UE 和第八方面提供的接入网设备。或者，所述通信系统包括如第九方面提供的 UE 和第十方面提供的接入网设备。

第十二方面，本发明实施例还提供了一种计算机可读介质，该计算机可读介质存储有用于实现第一方面或第三方面或第四方面所提供的上行控制信息的发送方法的指令，或者，该计算机可读介质存储有用于实现第二方面或第五方面所提供的上行控制信息的接收方法的指令。

附图说明

为了更清楚地说明本发明实施例中的技术方案，下面将对实施例描述中所需要使用的附图作简单地介绍，显而易见地，下面描述中的附图仅仅是本发明

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的一些实施例，对于本领域普通技术人员来讲，在不付出创造性劳动的前提下，还可以根据这些附图获得其他的附图。

图 1 是本发明一个示例性实施例提供的通信系统的结构示意图；

图 2 是本发明一个示例性实施例提供的 UE 的结构示意图；

图 3 是本发明一个示例性实施例提供的接入网设备的结构示意图；

图 4 是本发明一个示例性实施例提供的上行控制信息的收发方法的流程图；

图 5 是本发明一个示例性实施例提供的上行控制信息的收发方法的实施示意图；

图 6 是本发明另一个示例性实施例提供的上行控制信息的收发方法的流程图；

图 7 是本发明另一个示例性实施例提供的上行控制信息的收发方法的流程图；

图 8 是本发明另一个示例性实施例提供的上行控制信息的收发方法的流程图；

图 9 是本发明另一个示例性实施例提供的上行控制信息的收发方法的流程图；

图 10 是本发明另一个示例性实施例提供的上行控制信息的收发方法的流程图；

图 11 是本发明另一个示例性实施例提供的上行控制信息的发送装置的结构示意图；

图 12 是本发明另一个示例性实施例提供的上行控制信息的接收装置的结构示意图。

具体实施方式

为使本发明的目的、技术方案和优点更加清楚，下面将结合附图对本发明实施方式作进一步地详细描述。

在 CA 场景下，接入网设备可以通过一个主载波和多个辅载波来向 UE 发送下行数据。对于每个向 UE 发送下行数据的载波，接入网设备通过 PDCCH 向 UE 发送该下行数据对应的 DCI。该 DCI 中携带的信息包括：物理下行共享

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信道（Physical Downlink Shared Channel，PDSCH）的资源指示信息、下行分配索引（Downlink Assignment Index，DAI）和 TPC command for PUCCH 等。

其中，PDSCH 的资源指示信息用于告知 UE 在该载波的 PDSCH 中的哪些资源中接收下行数据。而 DAI 用于告知 UE 该 PDSCH 在向该 UE 发送的所有 PDSCH 中的计数值。例如向该 UE 发送的所有 PDSCH 共有 X 个，则该计数值为当前 PDSCH 为该 X 个 PDSCH 中的第几个 PDSCH。

比如，在频分双工（Frequency Division Dual，FDD）系统中，在一个传输时间间隔（Transmission Time Interval，TTI）内存在 M 个载波上有对 UE 发送的下行数据，假设该 M 个载波各自对应的载波序号从小到大分别为 N_0、N_1、……N_{M-1}，则该 M 个载波上发送的下行数据各自对应的 PDCCH 信道中的 DCI 的 DAI 所指示的计数值依次按照载波序号进行排序。例如：载波序号为 N_1 的载波上发送的下行数据对应的 PDCCH 信道中的 DCI 中的 DAI 所指示的计数值为 0，载波序号为 N_1 的载波上发送的下行数据对应的 PDCCH 信道中的 DCI 中的 DAI 所指示的计数值为 1，……载波序号为 N_{M-1} 的载波上发送的下行数据对应的 PDCCH 信道中的 DCI 中的 DAI 所指示的计数值为 M-1。

又比如，在时分双工（Time Division Duplexing，TDD）系统中，在一个上行反馈的 TTI 上对应的 L 个下行子帧中的每一个下行子帧都有多个载波对 UE 发送下行数据，则这些 L 个下行子帧的多个载波上发送的下行数据各自对应的 PDCCH 信道中的 DCI 的 DAI 所指示的计数值首先按照载波序号进行排序，然后按照子帧序号排序。以 L=2 为例，假设在第一个子帧的 M 个载波上存在对 UE 发送的下行数据、在第二个子帧的 K 个载波上存在对 UE 发送的下行数据。则第一个子帧的载波序号为 N_1 的载波上发送的下行数据对应的 PDCCH 信道中的 DCI 中的 DAI 所指示的计数值为 0，第一个子帧的载波序号为 N_1 的载波上下行数据对应的 PDCCH 信道中的 DCI 中的 DAI 所指示的计数值为 1，……第一个子帧的载波序号为 N_{M-1} 的载波上发送的下行数据对应的 PDCCH 信道中的 DCI 中的 DAI 所指示的计数值为 M-1、第二个子帧的载波序号为 N_1 的载波上发送的下行数据对应的 PDCCH 信道中的 DCI 中的 DAI 所指示的计数值为 M，第二个子帧的载波序号为 N_2 的载波上发送的下行数据对应的 PDCCH 信道中的 DCI 中的 DAI 所指示的计数值为 M+1，……第二个子帧的载波序号为 N_{K-1} 的载波上发送的下行数据对应的 PDCCH 信道中的 DCI 中的 DAI 所指示的计数值为 M+K-1。

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UE 可以根据 PDSCH 的资源指示信息接收下行数据。UE 还可以根据 DAI 的指示判断是否存在未接收到接入网设备发送的下行数据的情况。对于每个下行数据，若 UE 成功接收到该下行数据，则生成确认（ACK）信息，若 UE 未能成功接收到该下行数据，则生成非确认（NACK）信息，也即混合自动重传请求（Hybrid Automatic Repeat Request，HARQ）机制。其中，ACK 信息和 NACK 信息可统称为 HARQ-ACK，也即，混合自动重传请求反馈。

另外，UE 还需要向接入网设备上报各个处于激活状态的下行载波的周期性信道状态信息（Channel State Informtion，CSI）。UE 需要发送各个载波的周期 CSI 信息的时间是根据接入网设备对每个载波的周期性 CSI 的预配置信息确定的。

UCI 包括：HARQ-ACK 和周期性 CSI。为支持 UE 在特定的上行子帧上发送 UCI，接入网设备为 UE 预配置四个上行信道资源。在当前子帧上，UE 需要从这四个上行信道资源中确定出当前子帧中用于发送上行控制信息的上行信道资源，可选地，该上行信道资源是 PUCCH 资源。

需要说明的是，UE 通过与当前子帧对应的下行子帧中用于对该 UE 发送 PDSCH 的所有辅载波的 PDCCH 信道的 DCI 携带的信息“TPC command for PUCCH”控制位在预配置的四个上行信道资源中确定出在当前子帧上所使用的上行信道资源。这些 PDCCH 信道的 DCI 中“TPC command for PUCCH”均携带相同的信息。同时，UE 通过主载波上 PDSCH 对应的的 PDCCH 信道的 DCI 携带的的“TPC command for PUCCH”确定出发送 UCI 的 PUCCH 信道所使用的发送功率。

但在本发明实施例所涉及的一些 CA 场景下，接入网设备可以为 UE 配置更多的载波来向 UE 发送下行数据，比如：最多 16 个载波或 32 个载波。此时，由于在当前子帧上 UE 需要反馈的 HARQ-ACK 信息由与该当前子帧对应的下行子帧上为 UE 发送下行数据的载波个数确定。由于在各个下行子帧为 UE 发送下行数据的载波个数在很多个载波之间变化，所以在不同的上行子帧，该 UE 发送的 HARQ-ACK 信息的数据量的变化范围比较大。同时，根据接入网设备对每个载波的周期性 CSI 的预配置信息也决定了 UE 在不同的上行子帧中需要发送不同数目的周期性 CSI，所以在不同的上行子帧，该 UE 发送的周期 CSI 信息的数据量的变化范围也比较大。简而言之，UE 在不同的上行子帧中需要发送的 UCI 的数据量的变化范围比较大。

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为适应不同数据量的UCI反馈需求，接入网设备向UE预配置更多的上行信道资源，例如16个或32个。而PDCCH中DCI的“TPC command for PUCCH”控制位只有2个比特，不足以向UE指示用于在预配置的多个上行信道资源中确定出当前子帧中本次使用的上行信道资源。若接入网设备增加“TPC command for PUCCH”控制位所占用的比特数，又会给PDCCH带来较大的负担。为此，请参考本申请提供的如下实施例：

请参考图1，其示出了本发明一个示例性实施例提供的通信系统的结构示意图。该通信系统可以是长期演进（Long Term Evolution, LTE）系统。该通信系统是支持CA技术的通信系统。该通信系统包括：UE120和接入网设备140。

UE120可以是智能手机、平板电脑、电子书阅读器、MP3（英文：Moving Picture Experts Group Audio Layer III，简称：MP3）播放器、MP4（英文：Moving Picture Experts Group Audio Layer IV，简称：MP4）播放器和膝上型便携计算机等等。UE120能够接入通信系统所提供的移动通信网络。

UE120通过移动通信网络与接入网设备140相连。

接入网设备140是通信系统中用于与UE120进行交互的核心网网元。可选地，接入网设备140可以是基站（Node B）或者演进型基站（eVolution Node B， eNB）。

请参考图2，其示出了本发明一个示例性实施例提供的UE的结构示意图。该UE可以是图1中所示出的UE，该UE可以包括：处理器220和发射器240。本领域技术人员可以理解，图2中示出的UE结构并不构成对UE的限定，可以包括比图示更多或更少的部件，或者组合某些部件，或者不同的部件布置。比如，UE还包括存储器260和接收器280等。其中：

处理器220是UE的控制中心，利用各种接口和线路连接整个UE的各个部分，通过运行或执行存储在存储器260内的软件程序和/或模块，以及调用存储在存储器260内的数据，执行UE的各种功能和处理数据，从而对UE进行整体控制。可选的，处理器220可包括一个或多个处理核心；可选的，处理器220可集成应用处理器和调制解调处理器，其中，应用处理器主要处理操作系统、用户界面和应用程序等，调制解调处理器主要处理无线通信。可以理解的

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是，上述调制解调处理器也可以不集成到处理器 220 中，上述调制解调处理器可以单独实现成为一个基带芯片。

存储器 260 可用于软件程序以及模块。处理器 220 通过运行存储在存储器 260 的软件程序以及模块，从而执行各种功能应用以及数据处理。存储器 260 可主要包括存储程序区和存储数据区，其中，存储程序区可存储操作系统 261、确定模块 262、发送模块 263 和至少一个其它功能所需的应用程序 264 等；存储数据区可存储根据 UE 的使用所创建的数据（比如音频数据、电话本等）等。此外，存储器 260 可以由任何类型的易失性或非易失性存储设备或者它们的组合实现，如静态随机存取存储器（英文：Static Random Access Memory，简称：SRAM），电可擦除可编程只读存储器（英文：Electrically Erasable Programmable Read-Only Memory，简称：EEPROM），可擦除可编程只读存储器（英文：Erasable Programmable Read Only Memory，简称：EPROM），可编程只读存储器（英文：Programmable Read-Only Memory，简称：PROM），只读存储器（英文：Read Only Memory，简称：ROM），磁存储器，快闪存储器，磁盘或光盘。

发射器 240 可以包括射频发射组件，比如天线。发射器 240 用于将数据或信息承载在无线信号中进行发送。该无线信号可以是移动通信系统中的时频资源。

接收器 280 可以包括射频接收组件，比如天线。接收器 280 用于接收承载在无线信号中的数据或信息。该无线信号可以是移动通信系统中的时频资源。

尽管未示出，UE 还可选包括供电电源、摄像头、蓝牙模块等，在此不再赘述。

请参考图 3，其示出了本发明另一个示例性实施例示出的接入网设备的结构示意图。该接入网设备可以是图 1 中所示出的接入网设备，该接入网设备包括：处理器 320、与处理器 320 相连的发射器 340 和与处理器 320 相连的接收器 360。本领域技术人员可以理解，图 3 中示出的接入网设备结构并不构成对接入网设备的限定，可以包括比图示更多或更少的部件，或者组合某些部件，或者不同的部件布置。比如，接入网设备还包括存储器 380 和供电电源等。其中：

处理器 320 是接入网设备的控制中心，利用各种接口和线路连接整个接入网设备的各个部分，通过运行或执行存储在存储器 380 内的软件程序和/或模块，以及调用存储在存储器 380 内的数据，执行接入网设备的各种功能和处理

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数据，从而对接入网设备进行整体控制。可选的，处理器 320 可包括一个或多个处理核心；可选的，处理器 320 可集成应用处理器和调制解调处理器，其中，应用处理器主要处理操作系统、用户界面和应用程序等，调制解调处理器主要处理无线通信。可以理解的是，上述调制解调处理器也可以不集成到处理器 320 中，上述调制解调处理器可以单独实现成为一个芯片。

存储器 380 可用于软件程序以及模块。处理器 320 通过运行存储在存储器 380 的软件程序以及模块，从而执行各种功能应用以及数据处理。存储器 380 可主要包括存储程序区和存储数据区，其中，存储程序区可存储操作系统 381、确定模块 382、发送模块 383、接收模块 384 和至少一个其它功能所需的应用程序 385 等；存储数据区可存储根据接入网设备的使用所创建的数据（比如音频数据、电话本等）等。此外，存储器 380 可以由任何类型的易失性或非易失性存储设备或者它们的组合实现。

发射器 340 可以包括射频发射组件，比如天线。发射器 340 用于将数据或信息承载在无线信号中进行发送。该无线信号可以是移动通信系统中的时频资源。

接收器 360 可以包括射频接收组件，比如天线。接收器 360 用于接收承载在无线信号中的数据或信息。该无线信号可以是移动通信系统中的时频资源。

请参考图 4，其示出了本发明一个示例性实施例提供的上行控制信息的收发方法的流程图。本实施例以该方法应用于图 1 所示的通信系统中，该方法包括：

步骤 401，接入网设备确定资源指示信息，资源指示信息包括至少两个字段；

资源指示信息用于指示 UE 在预配置的上行信道资源集合中确定出用于发送上行控制信息的上行信道资源。在 LTE 系统中，该上行信道资源指的是 PUCCH 资源，该 PUCCH 资源具有特定的 PUCCH 格式和特定的时频位置。可选地，全部或部分预配置的上行信道资源还包括：支持发送 UCI 的最大发送比特数、发送 UCI 时可使用的最大编码速率之类的属性信息。

可选地，资源指示信息还可能被称之为其它名称，比如信道指示信息、信道标识信息或资源标识信息等，本实施例对此不加以限定。

资源指示信息包括 M 个字段，每个字段包括相同的比特位数或不同的比

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特位数，M≥2。比如，资源指示信息包括 3 个字段，每个字段包括 2 个比特，也即资源指示信息包括共 6 个比特。

步骤 402，接入网设备将每个字段通过一个 PDCCH 集合中的 DCI 向 UE 发送，每个 PDCCH 集合包括用于调度 UE 在辅载波中接收下行数据的若干个 PDCCH；

在 CA 场景中，接入网设备为 UE 配置多个下行载波，例如，为 UE 配置 16 个、32 个、或者更多个下行载波。这些下行载波包括一个主载波和多个辅载波。

接入网设备将用于调度 UE 在多个辅载波中接收下行数据的 PDCCH 分为 M 个 PDCCH 集合，每个 PDCCH 集合用于发送资源指示信息中的一个字段。

以辅载波为 9 个、资源指示信息包括 3 个字段为例，接入网设备将 DAI 所指示的计数值相对于 3 的余数为 1 的 3 个 PDCCH 划分为第一 PDCCH 集合，用于传输资源指示信息中第一个字段；将 DAI 所指示的计数值相对于 3 的余数为 2 的 3 个 PDCCH 划分为第二 PDCCH 集合，用于传输资源指示信息中的第二个字段；将 DAI 所指示的计数值相对于 3 的余数为 0 的 3 个 PDCCH 划分为第三 PDCCH 集合，用于传输资源指示信息中的第三个字段，如图 5 所示。

需要说明的是，同一个 PDCCH 集合中的每个 PDCCH 的 DCI 中携带的资源指示信息的字段相同。比如，DAI 所指示的计数值相对于 3 的余数为 0 的 3 个 PDCCH 中的 3 个 DCI 中均携带资源指示信息中第一个字段。

步骤 403， UE 确定资源指示信息，资源指示信息包括至少两个字段，每个字段分别由一个 PDCCH 集合中的 DCI 确定，每个 PDCCH 集合包括在辅载波中接收的下行数据所对应的若干个 PDCCH；

UE 接收接入网设备通过多个 PDCCH 集合发送的多个 DCI，UE 从每个 PDCCH 集合中的 DCI 中确定出资源指示信息中的各个字段，最终可确定出资源指示信息。

步骤 404，UE 确定预配置的上行信道资源集合中与资源指示信息对应的上行信道资源；

预配置的上行信道资源集合包括了至少两个 PUCCH 资源，UE 使用其中一个 PUCCH 资源向接入网设备发送 UCI。

UE 从预配置的上行信道资源集合中，确定出与资源指示信息对应的上行信道资源。

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步骤 405，UE 在与资源指示信息对应的上行信道资源上发送 UCI；

步骤 406，接入网设备接收 UE 在资源指示信息对应的上行信道资源上发送的 UCI。

综上所述，本实施例提供的上行控制信息的收发方法，通过将资源指示信息划分为至少两个字段，每个字段由一个 PDCCH 集合中的 DCI 携带，每个 PDCCH 集合包括 UE 的辅载波中接收的数据对应的若干个 PDCCH；解决了预配置的上行信道资源为很多个时，接入网设备需要增加预定比特位所占用的比特位才能向 UE 指示在当前子帧中用于发送 UCI 信息的上行信道资源的问题；达到了接入网设备不需要增加预定比特位所占用的比特位，通过多个 PDCCH 集合中每一个集合中的 DCI 分别向 UE 指示资源指示信息的一个字段，在 UE 侧，UE 通过确定将资源指示信息的各字段得到资源指示信息，然后准确确定在当前子帧发送 UCI 所使用的上行信道资源的效果。

在基于图 4 实施例提供的可选实施例中，资源指示信息包括 M 个字段，M ≥2，也即 M 为大于等于 2 的整数，物理下行控制信道集合为 M 个。资源指示信息中的第 i 个字段由 M 个物理下行控制信道集合中的第 j 个物理下行控制信道集合中的下行控制信息中的预定比特位上携带的信息所确定，其中，i 和 j 之间存在预设对应关系。

比如，资源指示信息包括 4 个字段，每个字段包含 2 个比特。PDCCH 集合也为 4 个，资源指示信息中的第 1 个字段由第 1 个 PDCCH 集合中的 DCI 中的预定比特位上携带的信息所确定；资源指示信息中的第 2 个字段由第 2 个 PDCCH 集合中的 DCI 中的预定比特位上携带的信息所确定；资源指示信息中的第 3 个字段由第 3 个 PDCCH 集合中的 DCI 中的预定比特位上携带的信息所确定；资源指示信息中的第 4 个字段由第 4 个 PDCCH 集合中的 DCI 中的预定比特位上携带的信息所确定。

又比如，资源指示信息包括 3 个字段，每个字段包含 2 个比特。PDCCH 集合也为 3 个，资源指示信息中的第 1 个字段由第 2 个 PDCCH 集合中的 DCI 中的预定比特位上携带的信息所确定；资源指示信息中的第 2 个字段由第 3 个 PDCCH 集合中的 DCI 中的预定比特位上携带的信息所确定；资源指示信息中的第 3 个字段由第 1 个 PDCCH 集合中的 DCI 中的预定比特位上携带的信息所确定。

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在基于图 4 实施例提供的可选实施例中，假设接入网设备为 UE 配置了 1 个主载波和 N 个辅载波。接入网设备和 UE 需要按照预定的划分策略对 N 个辅载波对应的 N 个 PDCCH 进行划分，以得到 M 个 PDCCH 集合，1≤M≤N。可选地，预定的划分策略为：根据每个 PDCCH 中携带的 DCI 中的 DAI 所指示的计数值相对于 M 的余数，将余数相同的 PDCCH 划分至同一 PDCCH 集合。

比如，第 1 个 PDCCH 中的 DAI 所指示的计数值为 0，第 2 个 PDCCH 中的 DAI 所指示的计数值为 1，第 3 个 PDCCH 中的 DAI 所指示的计数值为 2，第 4 个 PDCCH 中的 DAI 所指示的计数值为 3，第 5 个 PDCCH 中的 DAI 所指示的计数值为 4。若 M=2，则第 1 个 PDCCH、第 3 个 PDCCH 和第 5 个 PDCCH 中的 DAI 所指示的计数值相对于 2 的余数均为 0，划分至第一 PDCCH 集合；第 2 个 PDCCH 和第 4 个 PDCCH 中的 DAI 所指示的计数值相对于 2 的余数为 1，划分至第二 PDCCH 集合。

需要说明的一点是，划分策略不局限于上述的一种划分方式，只要接入网设备和 UE 采用相同的划分策略即可。

需要说明的另一点是，每个 PDCCH 集合中的 PDCCH 为至少 1 个，不同的 PDCCH 集合中的 PDCCH 数量相同或者不同，本实施例对此不加以限定。

需要说明的再一点是，每个 PDCCH 集合中的 PDCCH 中 DCI 的预定比特位中所携带的信息均相同，不同的 PDCCH 集合中的 PDCCH 中 DCI 的预定比特位所携带的信息相同或者不同，本实施例对此不加以限定。

可选地，该预定比特位是 PDCCH 中 DCI 中的“TPC Command for PUCCH”所占用的比特位，通常占用 2 个比特。

在基于图 4 实施例提供的可选实施例中，对于用于确定资源指示信息的每一个字段所对应的 PDCCH 集合，UE 都接收到该 PUCCH 集合中至少一个 PDCCH 信道中的 DCI，则上述实施例中的步骤 404 可被替代实现成为步骤 404a。如图 6 所示：

步骤 404a，UE 根据第一对应关系在预配置的上行信道资源集合中，确定出与资源指示信息对应的上行信道资源，第一对应关系为预设的资源指示信息和上行信道资源集合中每个上行信道资源之间的对应关系；

以资源指示信息包括 2 个字段，共 4 个比特，接入网设备为 UE 预配置了

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16 个 PUCCH 资源为例，表一示例性地示出了第一对应关系：

资源指示信息	上行信道资源
0000	第 1 个上行信道资源
0001	第 2 个上行信道资源
0010	第 3 个上行信道资源
…	…
1111	第 16 个上行信道资源

表一

对于接入网设备为 UE 预配置的每一个 PUCCH 资源，预配置信息中包含有该 PUCCH 资源的资源格式和时频位置等属性信息。可选地，预配置信息中还包含有该 PUCCH 资源的最大发送比特数和/或发送 UCI 可使用的最大编码速率等属性信息。最大发送比特数是指支持发送 UCI 的最大发送比特数。

若 UE 确定的资源指示信息为 0001，则与 0001 对应的上行信道资源为第 2 个上行信道资源，同时可以确定该上行信道资源对应的资源格式和时频位置。可选地，还可以确定该上行信道资源支持发送 UCI 的最大发送比特数，和/或，发送 UCI 时可使用的最大编码速率。

对应地，UE 在与该资源指示信息所对应的上行信道资源上发送 UCI。

综上所述，本发明实施例通过第一对应关系来确定与资源指示信息对应的上行信道资源，具有对应关系简洁、计算量小、计算速度快的优点。

在基于图 4 实施例提供的可选实施例中，预配置的上行信道资源集合包括两个或者两个以上的集合，UE 可以确定预配置的上行信道资源集合中的每个上行信道资源集合中的上行信道资源支持发送 UCI 的最大比特数。每个预配置的上行信道资源集合各自对应的支持发送 UCI 的最大比特数可以通过高层信令配置给 UE，也可以由 UE 通过每个上行信道资源集合中的资源格式所确定。例如：对于上行信道资源集合中的上行信道资源都是 PUCCH 格式 3 的集合，支持发送 UCI 的最大比特数为 22。本实施例对 UE 确定预配置的上行信道资源集合中的上行信道资源支持发送 UCI 的最大比特数的方式不做限定。

对应地，资源指示信息包括：第一指示信息和第二指示信息。第一指示信息用于确定预配置的上行信道资源集合中的两个或者两个以上的集合中的第一上行信道资源集合，第二指示信息用于确定第一上行信道资源集合中一个上

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行信道资源为用于发送 UCI 的上行信道资源，对应所述资源指示信息中的 R_1 个字段，$R_1 \geq 1$；第二指示信息对应所述资源指示信息中的 R_2 个字段，$R_2 \geq 1$。若资源指示信息包括 K 个比特，则第一指示信息由 A 个比特组成，第二指示信息由 K-A 个比特组成。此时，上述实施例中的步骤 404 可被替代实现成为步骤 404b 和步骤 404c。如图 7 所示：

步骤 404b，UE 根据第二对应关系在若干个预配置的上行信道资源集合中，确定出与第一指示信息对应的上行信道资源集合作为第一上行信道资源集合；

第二对应关系为预设的第一指示信息和预配置的至少两个上行信道资源集合之间的对应关系。以第一指示信息包括 2 个比特为例，表二示例性地示出了第二对应关系：

第一指示信息	上行信道资源集合
00	预配置的上行信道资源集合中的第 1 个上行信道资源集合
01	预配置的上行信道资源集合中的第 2 个上行信道资源集合
10	预配置的上行信道资源集合中的第 3 个上行信道资源集合
11	预配置的上行信道资源集合中的第 4 个上行信道资源集合

表二

其中，PUCCH 格式 X 可以是任何可能的 PUCCH 格式，比如将来出现的 PUCCH 格式 6。

可选地，第 1 个上行信道资源集合、第 2 个上行信道资源集合、第 3 个上行信道资源集合、第 4 个上行信道资源集合中的上行信道资源的资源格式分别是 PUCCH 格式 3、PUCCH 格式 4、PUCCH 格式 5、PUCCH 格式 X。其中，PUCCH 格式 X 可以是任何可能的 PUCCH 格式，比如将来出现的 PUCCH 格式 6。

若 UE 确定的资源指示信息为 0100，其中第一指示信息包含一个字段，为资源指示信息中的前两个比特位，则与第一指示信息 01 对应的上行信道资源集合为第 2 个上行信道资源集合，也即第一上行信道资源集合为第 2 个上行信道资源集合。

步骤 404c，UE 根据第三对应关系在第一上行信道资源集合中，确定出与第二指示信息对应的上行信道资源；

第三对应关系为预设的第二指示信息和第一上行信道资源集合中每个上行信道资源之间的对应关系。以第二指示信息包括 2 个比特为例，表三示例性

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地示出了第三对应关系：

第二指示信息	第一上行信道资源集合
00	第 1 个上行信道资源
01	第 2 个上行信道资源
10	第 3 个上行信道资源
11	第 4 个上行信道资源

表三

若 UE 确定的资源指示信息为 0100，其中第二指示信息包含一个字段，为资源指示信息中的后 2 个比特位，则与第二指示信息 00 对应的上行信道资源为第一上行信道资源集合中的第 1 个上行信道资源，也即资源指示信息对应的上行信道资源为第 2 个上行信道资源集合中的第 1 个上行信道资源。

综上所述，本发明实施例中预配置的上行信道资源集合由至少两个集合组成，所述至少两个集合中每个集合中上行信道资源各自对应的支持发送 UCI 的最大比特数不同，UE 可以根据第一指示信息和第二指示信息确定上行信道资源集合中的上行信道资源发送 UCI，从而提高上行信道资源的利用效率。

由于接入网设备发送的 PDCCH 中的 DCI 在 UE 侧存在接收失败的可能性，可能存在 UE 成功接收到了用于调度部分辅载波上的下行数据所对应的 PDCCH，而未成功接收到用于调度另一部分辅载波上的下行数据所对应的 PDCCH 的场景。在此场景下，若 UE 在资源指示信息中的第 L 个字段对应的第 R 个物理下行控制信道集合中的所有物理下行控制信道上都没有检测到下行控制信息，则资源指示信息中的第 L 个字段由预定规则确定。其中，预定规则包括：第 L 个字段的信息为预定取值，或者，将第 L 个字段的信息为第 R' 个物理下行控制信道集合中的物理下行控制信道上接收的下行控制信息中预定比特位上所指示的信息，$1 \leqslant L \leqslant M$，$1 \leqslant R \neq R' \leqslant M$，R 与 R'存在预定的对应关系。

也即，上述实施例中的步骤 403 可被替代实现成为步骤 403a 和步骤 403b。如图 8 所示：

步骤 403a，UE 确定资源指示信息信息中的至少一个字段，所述至少一个字段中的每个字段由和该字段对应的 PDCCH 集合中的 DCI 确定，所述每个 PDCCH 集合包括辅载波中接收的数据对应的若干个 PDCCH；

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比如，资源指示信息包括 2 个字段，UE 根据第一 PDCCH 集合中的 PDCCH 中的下行控制信息中的预定比特位 01 确定资源指示信息的第一字段，但 UE 在资源指示信息中的第二字段对应的第二 PDCCH 集合中的所有 PDCCH 上都没有检测到下行控制信息。

步骤 403b，UE 确定资源指示信息信息中的第 L 个字段的信息，UE 在第 L 个字段对应的 PDCCH 集合中的所有 PDCCH 上都没有检测到 DCI， UE 确定其他字段的信息为预设值，或者，UE 确定第 L 个字段的信息为第 R'个 PDCCH 集合中的 PDCCH 上接收的 DCI 中预定比特位上所指示的信息，R 和 R'之间存在预设的对应关系。

比如，UE 确定第二个字段的信息为预定取值，预定取值为 01。

又比如，UE 确定第二个字段的信息为 UE 在第一 PDCCH 集合中的 PDCCH 中的下行控制信息中的预定比特位接收的信息 01，最终 UE 确定出资源指示信息为 0101。

综上所述，本发明实施例还针对 UE 没有正确接收所述资源指示信息的部分字段所对应的 PDCCH 集合中的所有 PDCCH 的场景，提供出一种资源指示信息的确定方式，使得即便部分字段所对应的 PDCCH 集合中的所有 PDCCH 都没有被 UE 正确接收，UE 依然能够确定出资源指示信息的这些字段，从而确定出所述资源指示信息，然后用于确定发送 UCI 的上行信道资源的效果。

可选地，在辅载波中有下行数据的载波总数较少时，与辅载波中的下行数据对应的 PDCCH 的总数较少，UE 没有正确接收资源指示信息的部分字段所对应的 PDCCH 集合中的所有 PDCCH 的可能性更大。此时，接入网设备确定的资源指示信息中的各个字段均相同，以便 UE 基于预定规则确定出部分字段后的资源指示信息与接入网设备发送的资源指示信息是相同的。

可选地，步骤 404a 示出的第一对应关系中，对于各个字段上的信息均相同的资源指示信息，其对应的上行信道资源为具有 PUCCH 格式 3 的信道资源，或者，步骤 404c 示出的第三对应关系中，对于各个字段的信息均相同的第二指示信息，其对应的上行信道资源为具有 PUCCH 格式 3 的信道资源。

需要说明的是，本申请中所述的 PUCCH 格式 3、格式 4、格式 5 具体为：

PUCCH 格式 3：将原始比特信道编码和调制后的符号，分别放到一个子帧的两个时隙中。这样，每个时隙上有 12 个调制符号，并且这 12 个调制符号放在一个时隙的一个时域符号上的 12 个连续子载波上，即占用一个资源块

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（Resource Block，RB）中的一个时域符号上的 12 个子载波。然后，针对每个时隙，在时域用序列 w 进行长度为 5 的正交掩码(Orthogonal Cover Code，OCC)扩频，一个时隙占一个 RB 内的 5 个时域符号，不同的 UE 可以在一个 RB 上通过不同的正交码进行码分复用，其余两个符号用来承载参考信号（Reference Signal，RS）。然后，对扩频后的进行离散傅里叶变换(Discrete Fourier Transform，DFT）预编码以及快速傅里叶逆变换（Inverse Fast Fourier Transform，IFFT）。另外，在配置了探测参考信号的子帧的第二个时隙使用一个长为 4 的正交码进行码分复用，即至多支持 4 个 UE 复用(此时的 PUCCH 格式为缩短 PUCCH 格式 3，和非缩短的 PUCCH 格式 3 统称为 PUCCH 格式 3)。

PUCCH 格式 4：PUCCH 信道占用一个 RB 或者多个 RB，且在正常循环前缀（Normal Cyclic Prefix，正常 CP）的情况下，PUCCH 信道对应的每个时隙中只有中间一个时域符号承载解调参考信号，在扩展循环前缀（Extended Cyclic Prefix，扩展 CP）的情况下，每个时隙的第三个时域符号承载解调参考信号；依据卷积码编码的方式对上行控制信息进行编码并在 PUCCH 信道中发送；或者 PUCCH 信道可承载的上行控制信息的最大比特数大于 22 比特。

PUCCH 格式 5：PUCCH 信道占用一个 RB，且在正常循环前缀的情况下，PUCCH 信道对应的每个时隙中只有中间一个时域符号承载解调参考信号，在扩展循环前缀的情况下，每个时隙的第三个时域符号承载解调参考信号，PUCCH 信道中可以通过码分方式发送至少两个 UE 的上行控制信息；依据卷积码编码的方式对上行控制信息进行编码并在 PUCCH 信道中发送；或者 PUCCH 信道可承载的上行控制信息的最大比特数大于 22 比特。

请参考图 9，其示出了本发明另一实施例提供的上行控制信息的收发方法的流程图。本实施例以该上行控制信息的收发方法应用于图 1 所示出的通信系统中来举例说明。本实施例也以接入网设备采用多个载波向 UE 发送下行数据的场景来进行举例说明。该方法包括：

步骤 901，接入网设备向 UE 发送资源指示信息；

该资源指示信息用于指示 UE 在预配置的上行信道资源集合中确定出用于发送 UCI 的上行信道资源。在 LTE 系统中，该上行信道资源指的是 PUCCH 资源，该 PUCCH 资源具有特定的 PUCCH 格式和特定的时频位置。可选地，全部或部分预配置的上行信道资源还包括：支持发送 UCI 的最大发送比特数、发

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送 UCI 时可使用的最大编码速率之类的属性信息。

可选地，资源指示信息还可能被称之为其它名称，比如信道指示信息、信道标识信息或资源标识信息等，本实施例对此不加以限定。

该资源指示信息可以仅包括一个字段，或者，该资源指示信息包括两个或两个以上的字段。当该资源指示信息仅包括一个字段时，接入网设备可以采用如背景技术所示出的发送方法向 UE 发送该资源指示信息；当该资源指示信息包括两个或两个以上的字段时，接入网设备可以采用如图 4 所示实施例提供的发送方法向 UE 发送该资源指示信息，本实施例对此不加以限定。

对应地，UE 根据接收的物理下行控制信道中的预设字段确定该资源指示信息或者确定该资源指示信息中的各个字段。

步骤 902， UE 确定第一上行子帧的 UCI，UCI 包括 HARQ-ACK 和周期性 CSI；

UE 根据接收的多个下行数据、以及多个下行数据和对应的 HARQ-ACK 之间的时序关系，可以确定在第一上行子帧是否需要发送 HARQ-ACK，以及 HARQ-ACK 的码本大小。

UE 还根据被配置的每个载波的周期性 CSI 反馈的时间信息、以及每个载波的激活和去激活状态确定在第一上行子帧是否需要发送周期性 CSI，以及发送周期性 CSI 信息的比特数或者个数。如果 UE 确定第一上行子帧需要发送的 UCI 包括 HARQ-ACK 和周期性 CSI，则执行以下步骤。

步骤 903，UE 确定预配置的若干个上行信道资源组成的第二上行信道资源集合；

接入网设备为 UE 预配置有若干个上行信道资源。UE 确定预配置的若干个上行信道资源组成的第二上行信道资源集合。

步骤 904，UE 确定资源指示信息；

当资源指示信息仅包括一个字段时，UE 根据所有辅载波中的下行数据所对应的 PDCCH 中的 DCI 中的预定比特位上所指示的信息，确定出资源指示信息。

当资源指示信息包括两个或两个以上的字段时，UE 接收接入网设备通过辅载波中的下行数据所对应多个 PDCCH 集合发送的多个 DCI，UE 从每个 PDCCH 集合中的 DCI 中确定出资源指示信息中的各个字段，最终确定出资源指示信息。

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步骤 905，UE 确定第三上行信道资源集合中与资源指示信息对应的信道资源为第一上行信道资源，第三上行信道资源集合为第二上行信道资源集合的子集，且第三上行信道资源集合与 HARQ-ACK 的码本大小匹配；

所述第二上行信道资源集合包括至少两个上行信道资源集合，UE 首先确定其中的一个上行信道资源为第三上行信道资源集合，第三上行信道资源集合与待发送的 UCI 中的 HARQ-ACK 的码本大小匹配。

以第二上行信道资源集合包括两个上行信道资源集合：上行信道资源集合 A 和上行信道资源集合 B 为例，如果上行信道资源集合 A 中的上行信道资源中支持发送的 UCI 的比特数的范围为 $[P_{A1}, P_{A2}]$，上行信道资源集合 B 中的上行信道资源的中支持发送的 UCI 的比特数的范围为 $[P_{B1}, P_{B2}]$，待发送的 HARQ-ACK 的码本大小为 Q。如果 Q 在 $[P_{A1}, P_{A2}]$ 的范围内，则第三上行信道资源集合为上行信道资源集合 A；如果 Q 在 $[P_{B1}, P_{B2}]$ 的范围内，则第三上行信道资源集合为上行信道资源集合 B。简而言之，第三上行信道资源集合中的上行信道资源支持发送的 UCI 的比特数的范围或者比特数的最大值和 HARQ-ACK 的码本大小匹配。

或者，

HARQ-ACK 的码本大小和第二上行信道资源集合中的各个上行信道资源集合之间存在预设的匹配关系，例如 HARQ-ACK 的码本大小为 Q 在第一取值范围内时，和其匹配的上行信道资源集合是第二上行信道资源集合中的第一个上行信道资源集合；HARQ-ACK 的码本大小为 Q 在第二取值范围内时，和其匹配的上行信道资源集合是第二上行信道资源集合中的第二个上行信道资源集合等。所述第一取值范围和第二取值范围不重叠。

优选地，对于第二上行信道资源集合包括的至少两个上行信道资源集合中的每一个集合来说，该集合中的上行信道资源具有相同的资源格式，例如该集合中的上行信道资源都是 PUCCH 格式 3 的资源，或者该集合中的上行信道资源都是 PUCCH 格式 4 的资源。这样，UE 可以根据 HARQ-ACK 信息的码本大小确定与其对应的 PUCCH 格式，然后根据确定的 PUCCH 格式确定第二上行信道资源集合中的第三上行信道资源集合。例如，上行信道资源都是 PUCCH 格式 3 的上行信道资源集合和 HARQ-ACK 信息的码本不大于 22 的 UCI 对应，上行信道资源都是 PUCCH 格式 4 的上行信道资源集合和 HARQ-ACK 信息的码本大于 22 的 UCI 对应。

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步骤 906，UE 在第一上行子帧的第一上行信道资源上发送 UCI 中的部分或全部信息。

UE 确定第一上行信道资源后，UE 在第一上行子帧的第一上行信道资源上发送 UCI。如果第一上行信道资源支持发送的上行控制信息的最大比特数小于待发送的 UCI 的总比特数，则 UE 按照预设的优先级规则丢弃其中的部分周期性 CSI 信息，使得在第一上行信道资源中发送的 UCI 信息不大于第一上行信道资源支持发送的上行控制信息的最大比特数；如果第一上行信道资源支持发送的上行控制信息的最大比特数不小于待发送的 UCI 信息的总比特数，则 UE 在第一上行信道资源中发送的 UCI 的全部信息。

步骤 907，接入网设备确定 UE 在第一上行子帧上的 UCI 的 HARQ-ACK 的码本大小；

UCI 包括 HARQ-ACK 和周期性 CSI。

接入网设备根据向 UE 发送的多个下行数据、以及多个下行数据和对应的 HARQ-ACK 之间的时序关系，确定出 UE 在第一上行子帧上的 UCI 的 HARQ-ACK 的码本大小。

步骤 908，接入网设备确定向 UE 预配置的若干个上行信道资源组成的第二上行信道资源集合；

本步骤与步骤 903 类似。

步骤 909，接入网设备确定第三上行信道资源集合中与资源指示信息对应的信道资源为第一上行信道资源，第三上行信道资源集合为第二上行信道资源集合的子集，且第三上行信道资源集合与 HARQ-ACK 的码本大小匹配；

本步骤与步骤 905 类似；

步骤 910，接入网设备接收 UE 在第一上行子帧的第一上行信道资源上发送的 UCI 中的部分或全部信息。

需要说明的是，本实施例对步骤 907 至步骤 909 的执行顺序不加以限定，步骤 907 至步骤 909 中的全部或部分可以在步骤 906 之前执行。

综上所述，本发明实施例中通过 UCI 中的 HARQ-ACK 的码本大小，选择出具有合适的最大发送比特数的上行信道资源集合作为第三上行信道资源集合，再从第三上行信道资源集合中确定出与资源指示信息对应的信道资源为第一上行信道资源，提高了上行信道资源的利用效率。

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请参考图 10，其示出了本发明再一个实施例提供的上行控制信息的收发方法的流程图。本实施例以该方法应用于图 1 所示出的通信系统中来举例说明。该方法包括：

步骤 1001，UE 确定第二上行子帧的 UCI；

UE 根据接收的多个下行数据、以及多个下行数据和对应的 HARQ-ACK 之间的时序关系，可以确定在第二上行子帧是否需要发送 HARQ-ACK，以及 HARQ-ACK 的码本大小。

UE 还根据被配置的每个载波的周期性 CSI 反馈的时间信息、以及每个载波的激活和去激活状态确定在第二上行子帧是否需要发送周期性 CSI，以及发送周期性 CSI 信息的比特数或者个数。

步骤 1002，UE 确定预配置的若干个上行信道资源组成的第四上行信道资源集合，第四上行信道资源集合中的上行信道资源支持发送的 UCI 的最大比特数相同；

接入网设备为 UE 预配置有若干个上行信道资源。在 LTE 系统中，该上行信道资源指的是 PUCCH 资源，该 PUCCH 资源具有特定的 PUCCH 格式和特定的时频位置。可选地，全部或部分预配置的上行信道资源还包括：支持发送 UCI 的最大发送比特数、发送 UCI 时可使用的最大编码速率之类的属性信息。

例如，接入网设备通过高层信令配置用于发送 UE 的各个服务小区的周期性 CSI 的 PUCCH 格式 2 的上行信道资源。对于发送每个服务小区的周期性 CSI 的 PUCCH 格式 2 的上行信道资源，其配置信息中包括有 PUCCH 资源的索引号“*cqi-PUCCH-ResourceIndex*”，对于主载波来说，该索引号取值范围为 0~1185，对于辅载波来说，该索引号取值范围为 0~1184。根据该索引号和 PUCCH 的其它配置信息，可以确定出 PUCCH 资源所对应的时频位置、以及所使用的序列资源。这些 PUCCH 格式 2 的资源上最大可以发送的 UCI 的最大比特数为 11。或者对于其它格式的 PUCCH 资源，在对 PUCCH 资源的配置信息中还可选包括：支持发送 UCI 的最大比特数、发送 UCI 时可使用的最大编码速率的信息等。

步骤 1003，UE 确定第四上行信道资源集合中的第二上行信道资源；

UE 需要确定第四上行信道资源集合中的第二上行信道资源，该第二上行信道资源用于发送第二上行子帧的 UCI。如果第四上行信道资源集合中的上行信道资源支持发送的 UCI 的最大比特数相同，则第二上行信道资源为以下任意

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一种：

第一，第四上行信道资源集合中资源索引号最小的上行信道资源，或者，

第二，第四上行信道资源集合中资源索引号最大的上行信道资源，或者，

以第四上行信道资源集合中的信道资源为 PUCCH 格式 2 的资源为例。如果第二上行子帧的 UCI 包括至少两个服务小区的周期性 CSI 信息，则第二上行信道资源是为至少两个服务小区配置的各个 PUCCH 资源中，“*cqi-PUCCH-ResourceIndex*”索引号取值范围最小的上行信道资源，或者为“*cqi-PUCCH-ResourceIndex*”索引号取值范围最大的上行信道资源。

第三，第四上行信道资源集合中上行信道资源的资源块低位索引最小的上行信道资源，或者，

第四，第四上行信道资源集合中上行信道资源的资源块低位索引最大的上行信道资源。

以第四上行信道资源集合中的信道资源为 PUCCH 格式 2 的资源为例。如果第二上行子帧的 UCI 信息包括至少两个服务小区的周期性 CSI 信息，则第二上行信道资源是为至少两个服务小区配置的各个 PUCCH 资源中，资源块低位索引最小的上行信道资源，或者资源块低位索引最大的上行信道资源。举例来说，为至少两个服务小区中第一个服务小区配置的 PUCCH 资源所在的资源块索引是 $Q_1 \sim Q_2$，其中 $Q_2 \geq Q_1$，为至少两个服务小区中第二个服务小区配置的 PUCCH 资源所在的资源块索引是 $Q_3 \sim Q_4$，其中 $Q_4 \geq Q_3$，如果 $Q_3 > Q_1$ 则上行信道资源的资源块索引最小的上行信道资源是为第一个服务小区配置的 PUCCH 资源，上行信道资源的资源块索引最大的上行信道资源是为第二个服务小区配置的 PUCCH 资源。

步骤 1004，UE 在第二上行信道资源上发送 UCI。

步骤 1005，接入网设备确定向 UE 预配置的若干个上行信道资源组成的第四上行信道资源集合，第四上行信道资源集合中的上行信道资源支持发送 UCI 的最大发送比特数相同；

本步骤与步骤 1002 类似。

步骤 1006，接入网设备确定第四上行信道资源集合中的第二上行信道资源；

本步骤与步骤 1003 类似。

步骤 1007，接入网设备在第二上行信道资源上接收 UE 发送的 UCI。

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需要说明的是，本实施例对步骤 1004 与步骤 1005 之间的先后顺序不加以限定，步骤 1005 可以在步骤 1004 之前执行；本实施例对步骤 1004 与步骤 1006 之间的先后顺序不加以限定，步骤 1006 可以在步骤 1004 之前执行。

综上所述，在本发明实施例中，UE 或接入网设备通过事先约定的确定方式，从预配置的第四上行信道资源集合中确定出第二上行信道资源为本次使用的上行信道资源，不需要接入网设备向 UE 发送资源指示信息，节约了 UE 和接入网设备之间的信令资源。

需要说明的是，上述各个方法实施例中有关 UE 的步骤，可以由 UE 的处理器调用 UE 的存储器中的对应模块来实现。同时，由 UE 执行的步骤可以单独实现成为 UE 一侧的上行控制信息的发送方法。

还需要说明的是，上述各个方法实施例中有关接入网设备的步骤，可以由接入网设备的处理器调用接入网设备的存储器中的对应模块来实现。同时，由接入网设备执行的步骤可以单独实现成为接入网设备一侧的上行控制信息的接收方法。

请参考图 11，其示出了本发明一个实施例示出的上行控制信息的发送装置的结构示意图。该上行控制信息的发送装置可由硬件或者软硬件的集合实现成为上述 UE 的全部或一部分。所述装置包括：

确定单元 1120 用于实现上述方法实施例中的步骤 403、步骤 404、步骤 404a、步骤 404b 和步骤 404c 中至少一个步骤的功能。

发送单元 1140 用于实现上述步骤 405 的功能，相关细节可结合参考上述方法实施例。

请参考图 12，其示出了本发明一个实施例示出的上行控制信息的接收装置的结构示意图。该上行控制信息的接收装置可由硬件或者软硬件的集合实现成为上述接入网设备的全部或一部分。所述装置包括：

确定单元 1220，用于实现上述步骤 401 的功能；

发送单元 1240，用于实现上述步骤 402 的功能；

接收单元 1260，用于实现上述步骤 406 的功能，相关细节可结合参考上述方法实施例。

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