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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	126099-8021.US00
	Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
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☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Xiaobo		ZHANG	

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

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City	Shanghai	State/Province	
Postal Code	200032	**Country** [i]	CN

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

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Application Information:

Title of the Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION		
Attorney Docket Number	126099-8021.US00	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	9	**Suggested Figure for Publication (if any)**	

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

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

Publication Information:

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

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in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

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Customer Number	70416		

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This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
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Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	126099-8021.US00
	Application Number	
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Foreign Priority Information:

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

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Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
201710686330.4	CN	2017-08-11	

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

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

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Applicant 1 Remove

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

Clear

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

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

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Shanghai Langbo Communication Technology Company Limited		
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City	Shanghai	**State/Province**	
Country	CN	Postal Code	200032
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Email Address			

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Assignee 1

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Organization Name	Shanghai Langbo Communication Technology Company Limited

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	Room E3, Floor 8, JunYao Building		
Address 2	No.789 ZhaoJiaBang Road, XuHui District		
City	Shanghai	**State/Province**	
Country i	CN	Postal Code	200032
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See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Aaron Wininger, Reg. No. 45,229/			Date (YYYY-MM-DD)	2018-08-09
First Name	Aaron	Last Name	Wininger	Registration Number	45229

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METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION

CROSS REFERENCE TO RELATED APPLICATION

[001] This application claims the priority benefit of Chinese Patent Application Serial Number 201710686330.4, filed on August 11, 2017, the full disclosure of which is incorporated herein by reference.

BACKGROUD

TECHNICAL FIELD

[002] The present disclosure relates to transmission schemes of radio signals in wireless communication systems, and in particular to a method and a device for a User Equipment (UE) to autonomously determine transmission of information.

RELATED ART

[003] Massive Multi-Input Multi-Output (MIMO) becomes a research hotspot of next-generation mobile communications. In the massive MIMO, multiple antennas experience beamforming to form a relatively narrow beam which points to a particular direction to improve the quality of communication.

[004] In 3rd Generation Partner Project (3GPP) New Radio discussion, there is some company proposing that a UE should conduct a measurement on a service beam during the communication process and that, when the quality of the service beam is found degraded, a Physical Uplink Control Channel (PUCCH) and a Physical Random Access Channel (PRACH) like contention-free channel should be used by the UE to transmit a beam recovery request to a base station, which then changes the service beam.

SUMMARY

[005] The inventor finds through researches that: if a UE, after using one channel to transmit a beam recovery request, cannot transmit the beam recovery request again during the time window of waiting a response, then a time-frequency resource configured within the time window of waiting the response to transmit a beam recovery request cannot be used by the UE to transmit a beam recovery request, which consequently results in a low utilization of the time-frequency resource configured for transmitting the beam recovery request.

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[006] In view of the above problems, the present disclosure provides a solution. It should be noted that the embodiments of the present disclosure and the characteristics in the embodiments may be mutually combined if no conflict is caused. For example, the embodiments of the UE of the present disclosure and the characteristics in the embodiments may be applied to the base station, and vice versa.

[007] The present disclosure provides a method in a UE for wireless communication. The method includes the following steps of:

[008] receiving a target radio signal;

[009] transmitting a first radio signal on a first channel;

[010] transmitting a second radio signal on a second channel; and

[011] monitoring a third radio signal in a first time window.

[012] Herein, a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

[013] In one embodiment, the above method is advantageous in improving the utilization of the aerial resources configured to transmit a report request that is determined autonomously by the UE.

[014] In one embodiment, the target radio signal is transmitted on a physical layer control channel (that is, a physical layer channel capable of transmitting control information only).

[015] In one embodiment, the target radio signal carries Downlink Control Information (DCI).

[016] In one embodiment, the target radio signal is transmitted on a physical layer data channel (that is, a physical layer channel capable of transmitting data information only) or a physical layer shared channel (that is, a physical layer channel used for transmitting data or control information).

[017] In one embodiment, the target radio signal is a reference signal.

[018] In one embodiment, the target radio signal is a Demodulation Reference Signal (DMRS)

of a physical layer control channel.

[019] In one embodiment, the target radio signal is a DMRS of a physical layer shared channel.

[020] In one embodiment, the target radio signal is a Channel State Information Reference Signal (CSI-RS) used for conducting a channel quality measurement of a physical layer control channel.

[021] In one embodiment, the target radio signal is a Synchronization Signal (SS) used for conducting a channel quality measurement of a physical layer control channel.

[022] In one embodiment, the multi-antenna related transmitting of a physical layer control channel is related to the multi-antenna related transmitting of the target radio signal.

[023] In one embodiment, an antenna port used for transmitting a physical layer control channel is spatially related to an antenna port used for transmitting the target radio signal.

[024] In one embodiment, an antenna port used for transmitting a physical layer control channel is spatially Quasi Co-Located (QCL) with an antenna port used for transmitting the target radio signal.

[025] In one embodiment, an analog transmitting beam used for transmitting a physical layer control channel is used for transmitting the target radio signal.

[026] In one embodiment, an analog receiving beam used for receiving a physical layer control channel is used for receiving the target radio signal.

[027] In one embodiment, the multi-antenna related transmitting of a physical layer shared channel is related to the multi-antenna related transmitting of the target radio signal.

[028] In one embodiment, an antenna port used for transmitting a physical layer shared channel is spatially Quasi Co-Located (QCL) with an antenna port used for transmitting the target radio signal.

[029] In one embodiment, an analog transmitting beam used for transmitting a physical layer shared channel is used for transmitting the target radio signal.

[030] In one embodiment, an analog receiving beam used for receiving a physical layer shared channel is used for receiving the target radio signal.

[031] In one embodiment, the being spatially related refers to using the same analog beam to

transmit signaling or data.

[032] In one embodiment, the being spatially related refers to being QCL.

[033] In one embodiment, the being spatially related refers to being spatially QCL.

[034] In one embodiment, the being spatially related refers that channel characteristics are the same or similar.

[035] In one embodiment, the being spatially related refers that at least one of {Delay Spread, Doppler Spread, Doppler Shift, average of Angle of Arrival (AoA), and average of Angle of Departure (AoD)} is the same or similar. The being similar refers that the difference between the two is less than a first threshold.

[036] In one subembodiment, the first threshold is default.

[037] In one subembodiment, the first threshold is preconfigured.

[038] In one subembodiment, the first threshold is configured by a base station.

[039] In one embodiment, the analog beam refers to a beam formed when a beamforming vector is applied to a phase shifter at the radio frequency part of equipment.

[040] In one embodiment, the analog beam is formed when an analog beamforming vector is applied to on an analog device.

[041] In one embodiment, the antenna port is formed by multiple physical antennas through antenna virtualization superposition. A mapping coefficient of the antenna port to the multiple physical antennas constitutes a beamforming vector, which is applied to the antenna virtualization to form a beam.

[042] In one embodiment, one antenna port is used for transmitting one reference signal.

[043] In one embodiment, different antenna ports are used for transmitting different reference signals.

[044] In one embodiment, a physical layer control channel is used for transmitting the first radio signal.

[045] In one embodiment, the first radio signal carries Uplink Control Information (UCI).

[046] In one embodiment, Forward Error Correction (FEC) is used in generating the first radio signal.

[047] In one embodiment, the first radio signal is used for determining a beam recovery request.

[048] In one embodiment, the first radio signal is used for determining that an antenna port used for transmitting the third radio signal is spatially unrelated to an antenna port used for transmitting the target radio signal.

[049] In one embodiment, the being spatially unrelated refers to being not QCL spatially.

[050] In one embodiment, the being spatially unrelated refers to using different analog beams.

[051] In one embodiment, the being spatially unrelated refers that at least one of {Delay Spread, Doppler Spread, Doppler Shift, average of Angle of Arrival (AoA), and average of Angle of Departure (AoD)} is not similar. The being not similar refers that the difference between the two is higher than a second threshold.

[052] In one subembodiment, the second threshold is default.

[053] In one subembodiment, the second threshold is preconfigured.

[054] In one subembodiment, the second threshold is configured by a base station.

[055] In one embodiment, a first bit block generates the first radio signal through FEC, and the value of the first bit block is used for determining the multi-antenna related transmitting of the third radio signal.

[056] In one embodiment, a physical layer control channel is used for transmitting the second radio signal.

[057] In one embodiment, the second radio signal carries one UCI.

[058] In one embodiment, a first signature sequence is used for generating the second radio signal, and at least one of {the sequence number of the first signature sequence in Q signature sequences, a frequency domain resource occupied by the first signature sequence, a time domain resource occupied by the first signature sequence} is used for determining the multi-antenna related transmitting of the third radio signal.

[059] In one embodiment, the second radio signal is a preamble.

[060] In one embodiment, FEC is not used in generating the second radio signal.

[061] In one embodiment, the second radio signal is not transmitted on a physical layer control channel.

[062] In one embodiment, a physical layer channel used for transmitting the second radio signal has higher reliability than a physical layer channel used for transmitting the first radio signal.

[063] In one embodiment, a physical layer control channel is used for transmitting the third radio signal.

[064] In one embodiment, the third radio signal carries one DCI.

[065] In one embodiment, the third radio signal is terminal specific.

[066] In one embodiment, the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal.

[067] In one embodiment, the antenna port group includes one antenna port only.

[068] In one embodiment, the antenna port group includes multiple antenna ports.

[069] In one embodiment, the first radio signal is used for determining a first antenna port group.

[070] In one subembodiment, an analog transmitting beam used for the first antenna port group is used for transmitting the third radio signal.

[071] In one subembodiment, an analog receiving beam used for receiving the first antenna port group is used for monitoring the third radio signal.

[072] In one embodiment, the second radio signal is used for determining a second antenna port group.

[073] In one subembodiment, an analog transmitting beam used for the second antenna port group is used for transmitting the third radio signal.

[074] In one subembodiment, an analog receiving beam used for receiving the second antenna port group is used for monitoring the third radio signal.

[075] In one embodiment, the monitoring refers to blind decoding.

[076] In one embodiment, the monitoring refers that, before successful decoding, it is not determined whether the third radio signal is transmitted.

[077] In one embodiment, the monitoring refers that, before successful detection, it is not determined whether the third radio signal is transmitted.

[078] In one embodiment, the UE monitors the third radio signal on the physical layer control channel in the first time window.

[079] In one embodiment, a measurement for the target radio signal obtains a target measurement value.

[080] In one subembodiment, the target measurement value, when less than a target threshold, is used for triggering the transmission of the first radio signal and the second radio signal.

[081] In one subembodiment, the target measurement value is at least one of {Reference Signal Receiver Power (RSRP), Signal-to-Noise Ratio (SNR), Signal-to-Interference-plus-Noise Ratio (SINR)} that are obtained by a measurement of the target radio signal.

[082] In one subembodiment, the target measurement value is at least one of {equivalent Reference Signal Receiver Power (RSRP), equivalent SNR, equivalent SINR} that are obtained when the target radio signal is mapped to a physical layer control channel.

[083] In one subembodiment, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal. The target measurement value refers to at least one of {Bit Error Rate (BER), Block Error Rate (BLER)} that are obtained when the target radio signal is mapped to a physical layer control channel.

[084] In one subembodiment, the target measurement value is used for determining the quality of the channel through which the target radio signal passes.

[085] In one subembodiment, the target measurement value is used for determining the channel quality of a physical layer control channel corresponding to the target radio signal.

[086] In one embodiment, a time resource occupied by the second radio signal is before the start time of the first time window.

[087] In one embodiment, a time resource occupied by the second radio signal is behind the start time of the first time window.

[088] In one embodiment, the offset between the start time of the first time window and the time domain resource occupied by the first radio signal is preconfigured.

[089] In one embodiment, the offset between the start time of the first time window and the time domain resource occupied by the first radio signal is configured by default.

[090] In one embodiment, the offset between the start time of the first time window and the time domain resource occupied by the first radio signal is configured by a base station.

[091] In one embodiment, the offset between the end time of the first time window and the time domain resource occupied by the first radio signal is preconfigured.

[092] In one embodiment, the offset between the end time of the first time window and the time domain resource occupied by the first radio signal is configured by default.

[093] In one embodiment, the offset between the end time of the first time window and the time domain resource occupied by the first radio signal is configured by a base station.

[094] In one embodiment, the time interval between the first radio signal and the second radio signal in time domain is used for determining the length of the first time window.

[095] According to one aspect of the present disclosure, the above method is characterized in that: at least one of {the first radio signal, the second radio signal} is used for determining the multi-antenna related transmitting of the third radio signal.

[096] In one embodiment, at least one of {the first radio signal, the second radio signal} is related to the multi-antenna related receiving of the third radio signal.

[097] In one embodiment, the first radio signal and the second radio signal both carry second information, and the second information is used for determining the multi-antenna related transmitting of the third radio signal.

[098] In one subembodiment, the second information is used for determining an analog transmitting beam used for transmitting the third radio signal.

[099] In one subembodiment, the second information is used for determining a first antenna port group. The first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal.

[100] In one subembodiment, the second information is used for determining a first antenna port group. The first antenna port group is spatially QCL with an antenna port used for

transmitting the third radio signal.

[101] In one subembodiment, the second information is used for determining a first antenna port group. An analog transmitting beam used for the first antenna port group is used for transmitting the third radio signal.

[102] In one subembodiment, the second information is related to the multi-antenna related receiving of the third radio signal.

[103] In one subembodiment, the second information is used for determining a first antenna port group. A receiving beam used for receiving the first antenna port group is used for monitoring the third radio signal in the first time window.

[104] In one embodiment, a first time interval refers to a time interval between a time domain resource occupied by the first radio signal and a time domain resource occupied by the second radio signal.

[105] In one subembodiment, the first radio signal is used for determining the multi-antenna related transmitting of the third radio signal in the first time interval.

[106] In one subembodiment, the first radio signal is related to the multi-antenna related receiving used for monitoring the third radio signal in the first time interval.

[107] In one subembodiment, the UE does not detect the third radio signal in the first time interval.

[108] In one embodiment, a time domain resource occupied by the second radio signal is within the first time window.

[109] In one embodiment, the first time window is divided into a second time interval and a third time interval. The first radio signal is used for determining the multi-antenna related transmitting of the third radio signal in the second time interval. The second radio signal is used for determining the multi-antenna related transmitting of the third radio signal in the third time interval. The second time interval is before the third time interval. The third time interval is behind a time domain resource occupied by the second radio signal.

[110] In one subembodiment, the start time of the second time interval is the start time of the first time window.

[111] In one subembodiment, the end time of the third time interval is the end time of the

first time window.

[112] In one subembodiment, the end time of the second time interval is the start time of the third time interval.

[113] In one subembodiment, the end time of the second time interval is a time domain resource occupied by the second radio signal.

[114] In one subembodiment, the end time of the second time interval is before a time domain resource occupied by the second radio signal.

[115] In one subembodiment, the end time of the second time interval is behind a time domain resource occupied by the second radio signal.

[116] In one subembodiment, the first radio signal is related to the multi-antenna related receiving of the third radio signal in the second time interval, and the second radio signal is related to the multi-antenna related receiving of the third radio signal in the third time interval.

[117] In one subembodiment, the first radio signal is used for determining a second antenna port group, and the second antenna port group is spatially related to an antenna port group used for transmitting the third radio signal in the second time interval.

[118] In one subembodiment, the first radio signal is used for determining a second antenna port group; in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval.

[119] In one subembodiment, the first radio signal is used for determining a second antenna port group; in the second time interval, an analog transmitting beam used for the second antenna port group is used for transmitting the third radio signal in the second time interval.

[120] In one subembodiment, the first radio signal is used for determining a second antenna port group; in the second time interval, an analog receiving beam used for the second antenna port group is used for receiving the third radio signal in the second time interval.

[121] In one subembodiment, the second radio signal is used for determining a third antenna port group, and the third antenna port group is spatially related to an antenna port group used for transmitting the third radio signal in the third time interval.

[122] In one subembodiment, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an

antenna port group used for transmitting the third radio signal in the third time interval.

[123] In one subembodiment, the second radio signal is used for determining a third antenna port group; in the third time interval, an analog transmitting beam used for the third antenna port group is used for transmitting the third radio signal in the third time interval.

[124] In one subembodiment, the second radio signal is used for determining a third antenna port group; in the third time interval, an analog receiving beam used for the third antenna port group is used for receiving the third radio signal in the third time interval.

[125] In one embodiment, the multi-antenna related transmitting refers to a transmitting beam.

[126] In one embodiment, the multi-antenna related transmitting refers to an analog transmitting beam.

[127] In one embodiment, the multi-antenna related receiving refers to a receiving beam.

[128] In one embodiment, the multi-antenna related receiving refers to an analog receiving beam.

[129] According to one aspect of the present disclosure, the method is characterize in that: the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal

[130] In one embodiment, the above method is advantageous in making full use of aerial resources to report more information.

[131] In one embodiment, the first radio signal and the second radio signal together are used for determining an analog transmitting beam used for transmitting the third radio signal.

[132] In one embodiment, the first radio signal and the second radio signal together are used for determining a fourth antenna port group. The fourth antenna port group is spatially related to an antenna port group used for transmitting the third radio signal.

[133] In one subembodiment, an analog transmitting beam used for the fourth antenna port group is used for transmitting the third radio signal.

[134] In one subembodiment, a receiving beam used for receiving the fourth antenna port group is used for receiving the third radio signal.

[135] In one subembodiment, the first radio signal and the second radio signal together are

used for determining the index value of the fourth antenna port group in K antenna port groups, wherein K is positive integer greater than 1.

[136] In one subembodiment, the first radio signal and the second radio signal are used for determining the values of different bit positions in a first bit block respectively, and the value of the first bit block is equal to the index value of the fourth antenna port group in K antenna port groups, wherein K is positive integer greater than 1.

[137] According to one aspect of the present disclosure, the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

[138] In one embodiment, the above method is advantageous in that different types of physical layer channels are used to report user requests and the diversity effect is increased.

[139] In one embodiment, the first type of physical layer channel is a physical layer control channel.

[140] In one embodiment, the second type of physical layer channel is a physical layer random access channel.

[141] In one embodiment, the second type of physical layer channel is a contention-free physical layer random access channel.

[142] In one embodiment, information transmitted on the first type of physical layer channel is subjected to FEC.

[143] In one embodiment, information transmitted on the second type of physical layer channel is not subjected to FEC.

[144] In one embodiment, to transmit the information about the multi-antenna related transmitting of the third radio signal, the second type of physical layer channel has higher reliability than the first type of physical layer channel.

[145] In one embodiment, a time-frequency resource occupied by the first type of physical layer channel is dynamically configured.

[146] In one embodiment, a time-frequency resource occupied by the second type of physical layer channel is statically or semi-statically configured.

[147] In one embodiment, a time-frequency resource occupied by the first type of physical layer channel is configured by physical layer control information.

[148] In one embodiment, a time-frequency resource occupied by the second type of physical layer channel is configured by a higher layer signaling.

[149] In one embodiment, a time-frequency resource occupied by the second type of physical layer channel is configured by a Radio Resource Control (RRC) signaling.

[150] According to one aspect of the present disclosure, the above method is characterized in that: the first channel is a physical layer control channel.

[151] In one embodiment, the first radio signal is used for not only determining the multi-antenna related transmitting of the third radio signal, but also determining at least one of {Scheduling Request (SR), Hybrid Automatic Repeat Request-Acknowledgement (HARQ/ACK), Precoding Matrix Indicator (PMI), Channel Quality Indicator (CQI), Rank Indicator (RI), Beam Recovery Request, CSI-RS Resource Indicator (CRI)} .

[152] In one embodiment, the first channel is a PUCCH.

[153] In one embodiment, the first channel is a Short PUCCH (sPUCCH).

[154] In one embodiment, the second channel is also a physical layer control channel.

[155] In one embodiment, the second channel is not a physical layer control channel.

[156] In one embodiment, the second channel is a physical layer random access channel.

[157] In one embodiment, the second channel is a contention-free physical layer random access channel.

[158] In one embodiment, the multi-antenna related transmitting used for the first channel and the multi-antenna related transmitting used for the second channel are different.

[159] According to one aspect of the present disclosure, the above method is characterized in that: a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window.

[160] In one embodiment, a time domain resource occupied the first radio signal is used for determining the start time of a second time window.

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[161] In one embodiment, the start time of the second time window is equal to the time domain resource occupied the first radio signal plus a second offset.

[162] In one subembodiment, the second offset is configured by default.

[163] In one subembodiment, the second offset is preconfigured.

[164] In one subembodiment, the second offset is configured by a base station.

[165] In one embodiment, the start time of the second time window and the start time of the first time window are the same.

[166] In one embodiment, the length of the second time window is configured by default.

[167] In one embodiment, the length of the second time window is preconfigured.

[168] In one embodiment, the length of the second time window is configured by a base station.

[169] In one embodiment, a time domain resource occupied by the second radio signal is a time domain resource in a first time domain resource pool.

[170] In one subembodiment, the first time domain resource pool is configured by a higher layer.

[171] In one subembodiment, the first time domain resource pool is configured by an RRC signaling.

[172] According to one aspect of the present disclosure, the above method is characterized in that: a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window.

[173] In one embodiment, a time domain resource occupied by the second radio signal is used for determining the start time of a third time window.

[174] In one embodiment, the start time of the third time window is equal to the time domain resource occupied by the second radio signal plus a third offset.

[175] In one subembodiment, the third offset is configured by default.

[176] In one subembodiment, the third offset is preconfigured.

[177] In one subembodiment, the third offset is configured by a base station.

[178] In one embodiment, the second time window and the third time window are used for determining the first time window.

[179] In one embodiment, the length of the first time window is equal to the time interval between the start time of the second time window and the time domain resource on which the second radio signal is located plus the time interval between the time domain resource on which the second radio signal is located and the end time of the third time window.

[180] In one embodiment, the end time of the third time window and the end time of the first time window are the same.

[181] In one embodiment, the length of the third time window is configured by default.

[182] In one embodiment, the length of the third time window is preconfigured.

[183] In one embodiment, the length of the third time window is configured by a base station.

[184] In one embodiment, a second time interval refers to a time interval from the start time of the first time window to the start time of the third time window, and the first radio signal is used for the multi-antenna related transmitting of the third radio signal in the second time interval.

[185] In one subembodiment, the first time window consists of the second time interval and the third time window.

[186] In one embodiment, the first radio signal is used for determining a first antenna port group. An analog transmitting beam used for the first antenna port group is used for transmitting the third radio signal in the second time interval.

[187] In one embodiment, the first radio signal is used for determining a first antenna port group. An analog receiving beam used for the first antenna port group is used for monitoring the third radio signal in the second time interval.

[188] In one embodiment, the second radio signal is used for determining the multi-antenna related transmitting of the third radio signal in the third time window.

[189] In one embodiment, the second radio signal is used for determining a second antenna port group. An analog transmitting beam used for the second antenna port group is used for transmitting the third radio signal in the third time window.

[190] In one embodiment, the second radio signal is used for determining a second antenna port group. An analog receiving beam used for the second antenna port group is used for monitoring the third radio signal in the third time window.

[191] The present disclosure provides a method in a base station device for wireless communication. The method includes the following steps of:

[192] transmitting a target radio signal;

[193] receiving a first radio signal on a first channel;

[194] receiving a second radio signal on a second channel; and

[195] transmitting a third radio signal in a first time window.

[196] Herein, a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

[197] In one embodiment, the third radio signal is not a response to the first radio signal, but a response to the second radio signal.

[198] In one subembodiment, the base station device does not receive the first radio signal correctly, but receives the second radio signal correctly.

[199] In one subembodiment, the base station device receives the first radio signal and the second radio signal correctly in sequence.

[200] In one subembodiment, the first radio signal is not used for determining the multi-antenna related transmitting of the third radio signal, but the second radio signal is used for determining the multi-antenna related transmitting of the third radio signal.

[201] In one embodiment, the base station device receives the first radio signal and the second radio signal correctly in sequence, and the third radio signal is a response to the first radio signal and the second radio signal.

[202] In one subembodiment, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

[203] In one embodiment, the base station device transmits the third radio signal after a time domain resource occupied by the second radio signal.

[204] According to one aspect of the present disclosure, the above method is characterized in that: at least one of {the first radio signal, the second radio signal} is used for determining the multi-antenna related transmitting of the third radio signal.

[205] According to one aspect of the present disclosure, the above method is characterized in that: the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

[206] According to one aspect of the present disclosure, the above method is characterized in that: the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

[207] According to one aspect of the present disclosure, the above method is characterized in that: the first channel is a physical layer control channel.

[208] According to one aspect of the present disclosure, the above method is characterized in that: a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window.

[209] According to one aspect of the present disclosure, the above method is characterized in that: a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window.

[210] The present disclosure provides a UE for wireless communication. The UE includes:

[211] a first receiver module, to receive a target radio signal;

[212] a second transmitter module, to transmit a first radio signal on a first channel;

[213] a third transmitter module, to transmit a second radio signal on a second channel; and

[214] a fourth receiver module, to monitor a third radio signal in a first time window.

[215] Herein, a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio

signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

[216] In one embodiment, the above UE is characterized in that: at least one of {the first radio signal, the second radio signal} is used for determining the multi-antenna related transmitting of the third radio signal.

[217] In one embodiment, the above UE is characterized in that: the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

[218] In one embodiment, the above UE is characterized in that: the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

[219] In one embodiment, the above UE is characterized in that: the first channel is a physical layer control channel.

[220] In one embodiment, the above UE is characterized in that: a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window.

[221] In one embodiment, the above UE is characterized in that: a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window

[222] The present disclosure provides a base station device for wireless communication. The base station device includes:

[223] a first transmitter module, to transmit a target radio signal;

[224] a second receiver module, to receive a first radio signal on a first channel;

[225] a third receiver module, to receive a second radio signal on a second channel; and

[226] a fourth transmitter module, to transmit a third radio signal in a first time window.

[227] Herein, a measurement for the target radio signal is used for triggering the transmission

of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

[228] In one embodiment, the above base station device is characterized in that: at least one of {the first radio signal, the second radio signal} is used for determining the multi-antenna related transmitting of the third radio signal.

[229] In one embodiment, the above base station device is characterized in that: the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

[230] In one embodiment, the above base station device is characterized in that: the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

[231] In one embodiment, the above base station device is characterized in that: the first channel is a physical layer control channel.

[232] In one embodiment, the above base station device is characterized in that: a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window.

[233] In one embodiment, the above base station device is characterized in that: a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window.

[234] In one embodiment, compared with the prior art, the present disclosure has the following technical advantages:

[235] the allocated aerial resources are fully utilized, and the utilization of the aerial resources configured to transmit a report request that is determined autonomously by the UE is improved; and

[236] the robustness of the request reporting is increased.

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BRIEF DESCRIPTION OF THE DRAWINGS

[237] Other features, purposes and advantages of the present disclosure will become more apparent from the detailed description of non-restrictive embodiments taken in conjunction with the following drawings.

[238] FIG 1 is a flowchart of a target radio signal, a first radio signal, a second radio signal and a third radio signal according to one embodiment of the present disclosure.

[239] FIG 2 is a diagram illustrating a network architecture according to one embodiment of the present disclosure.

[240] FIG 3 is a diagram illustrating a radio protocol architecture of a user plane and a control plane according to one embodiment of the present disclosure.

[241] FIG 4 is a diagram illustrating an evolved node B and a given UE according to one embodiment of the present disclosure.

[242] FIG 5 is a flowchart illustrating the transmission of a radio signal according to one embodiment of the present disclosure.

[243] FIG 6 is a diagram illustrating a first time window, a second time window and a third time window according to one embodiment of the present disclosure.

[244] FIG 7 is a diagram illustrating the multi-antenna related transmitting and receiving of a target radio signal and a third radio signal according to one embodiment of the present disclosure.

[245] FIG 8 is a structure block diagram illustrating a processing device in a UE according to one embodiment of the present disclosure.

[246] FIG 9 is a structure block diagram illustrating a processing device in a base station according to one embodiment of the present disclosure.

DESCRIPTION OF THE EMBODIMENTS

[247] The technical scheme of the present disclosure is described below in further detail in conjunction with the drawings. It should be noted that the embodiments in the present disclosure and the characteristics of the embodiments may be arbitrarily combined if no conflict is caused.

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[248] Embodiment 1

[249] Embodiment 1 illustrates an example of a flowchart of the transmission of a target radio signal, a first radio signal, a second radio signal and a third radio signal according to the present disclosure, as shown in FIG. 1. In FIG. 1, each box represents a step. In Embodiment 1, the UE in the present disclosure receives a target radio signal, transmits a first radio signal on a first channel, monitors a third radio signal in a first time window, and transmits a second radio signal on a second channel, in sequence, wherein a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

[250] In one embodiment, the target radio signal is used for conducting a channel quality measurement of a physical layer control channel transmitted on a first frequency domain resource.

[251] In one embodiment, the target radio signal is a downlink reference signal used for channel measurement.

[252] In one embodiment, if the result of the channel measurement is less than a target threshold, the transmission of the first radio signal and the second radio signal is triggered.

[253] In one embodiment, the first radio signal and the second radio signal are beam recovery requests.

[254] In one embodiment, an uplink physical layer control channel is used for transmitting the first radio signal.

[255] In one embodiment, a physical layer random access channel is used for transmitting the second radio signal.

[256] In one embodiment, a time domain resource occupied by the second radio signal is within the first time window.

[257] In one embodiment, the second radio signal is used for determining the multi-antenna related transmitting of the third radio signal.

[258] In one embodiment, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

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[259] In one embodiment, a time domain resource occupied by the second radio signal is used for determining the start time of a third time window. The end time of the third time window and the end time of the first time window are the same. A second time interval refers to a time interval from the start time of the first time window to the start time of the third time window. The first radio signal is related to the multi-antenna related receiving used for monitoring the third radio signal in the second time interval. The second radio signal is related to the multi-antenna related receiving used for monitoring the third radio signal in the third time window.

[260] In one embodiment, the first radio signal is used for determining a second antenna port group, an analog receiving beam used for receiving the second antenna port group is used for monitoring the third radio signal in the second time interval.

[261] In one embodiment, the second radio signal is used for determining a third antenna port group, an analog receiving beam used for receiving the third antenna port group is used for monitoring the third radio signal in the third time window.

[262] In one embodiment, the first radio signal and the second radio signal together are used for determining the third antenna port group.

[263] In one embodiment, the UE does not detect the third radio signal in the second time interval.

[264] In one embodiment, a downlink physical layer control channel is used for transmitting the third radio signal.

[265] Embodiment 2

[266] Embodiment 2 illustrates an example of a diagram of a network architecture according to the present disclosure, as shown in FIG. 2. FIG. 2 is a diagram illustrating a system network architecture 200 of NR 5G, Long-Term Evolution (LTE), Long-Term Evolution Advanced (LTE-A). The NR 5G or LTE network architecture 200 may be called an Evolved Packet System (EPS) 200 or some other appropriate terms. The EPS 200 may include one or more UEs 201, an NG-RAN 202, an Evolved Packet Core/5G-Core Network (EPC/5G-CN) 210, a Home Subscriber Server (HSS) 220 and an Internet Service 230. Herein, the EPS may be interconnected with other access networks. For simple description, the entities/interfaces are not shown. As shown in FIG. 2, the EPS provides packet switching services. Those skilled in the art are easy to understand that various concepts presented throughout the present disclosure can be

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extended to networks providing circuit switching services or other cellular networks. The NG-RAN includes an NR node B (gNB) 203 and other gNBs 204. The gNB 203 provides UE 201 oriented user plane and control plane protocol terminations. The gNB 203 may be connected to other gNBs 204 via an Xn interface (for example, backhaul). The gNB 203 may be called a base station, a base transceiver station, a radio base station, a radio transceiver, a transceiver function, a Basic Service Set (BSS), an Extended Service Set (ESS), a TRP or some other appropriate terms. The gNB 203 provides an access point of the EPC/5G-CN 210 for the UE 201. Examples of UE 201 include cellular phones, smart phones, Session Initiation Protocol (SIP) phones, laptop computers, Personal Digital Assistants (PDAs), Satellite Radios, Global Positioning Systems (GPSs), multimedia devices, video devices, digital audio player (for example, MP3 players), cameras, games consoles, unmanned aerial vehicles, air vehicles, narrow-band physical network equipment, machine-type communication equipment, land vehicles, automobiles, wearable equipment, or any other devices having similar functions. Those skilled in the art also can call the UE 201 a mobile station, a subscriber station, a mobile unit, a subscriber unit, a wireless unit, a remote unit, a mobile device, a wireless device, a radio communication device, a remote device, a mobile subscriber station, an access terminal, a mobile terminal, a wireless terminal, a remote terminal, a handset, a user proxy, a mobile client, a client or some other appropriate terms. The gNB 203 is connected to the EPC/5G-CN 210 via an S1/NG interface. The EPC/5G-CN 210 includes an MME/AMF/UPF 211, other MMEs/AMFs/UPFs 214, a Service Gateway (S-GW) 212 and a Packet Data Network Gateway (P-GW) 213. The MME/AMF/UPF 211 is a control node for processing a signaling between the UE 201 and the EPC/5G-CN 210. Generally, the MME/AMF/UPF 211 provides bearer and connection management. All user Internet Protocol (IP) packets are transmitted through the S-GW 212. The S-GW 212 is connected to the P-GW 213. The P-GW 213 provides UE IP address allocation and other functions. The P-GW 213 is connected to the Internet service 230. The Internet service 230 includes IP services corresponding to operators, specifically including Internet, Intranet, IP Multimedia Subsystems (IMSs) and Packet Switching Streaming Services (PSSs).

[267] In one embodiment, the UE 201 corresponds to the UE in the present disclosure.

[268] In one embodiment, the gNB 203 corresponds to the base station in the present disclosure.

[269] In one embodiment, the UE 201 supports multi-antenna transmission.

[270] In one embodiment, the UE 201 supports analog beamforming.

[271] In one embodiment, the gNB 203 supports multi-antenna transmission.

[272] In one embodiment, the gNB 203 supports analog beamforming.

[273] Embodiment 3

[274] Embodiment 3 illustrates an embodiment of a radio protocol architecture of a user plane and a control plane according to the present disclosure, as shown in FIG. 3. FIG. 3 is a diagram illustrating an embodiment of a radio protocol architecture of a user plane and a control plane. In FIG. 3, the radio protocol architecture of a UE and a gNB is represented by three layers, which are a layer 1, a layer 2 and a layer 3 respectively. The layer 1 (L1) 301 is the lowest layer and performs signal processing functions of the PHY layer. The layer 1 is called PHY 301 in this paper. The layer 2 (L2) 305 is above the PHY 301, and is in charge of the link between the UE and the gNB via the PHY 301. In the user plane, the L2 305 includes a Medium Access Control (MAC) sublayer 302, a Radio Link Control (RLC) sublayer 303, and a Packet Data Convergence Protocol (PDCP) sublayer 304. All the three sublayers terminate at the gNB of the network side. Although not described in FIG.3, the UE may include several higher layers above the L2 305, such as a network layer (i.e. IP layer) terminated at a P-GW of the network side and an application layer terminated at the other side of the connection (i.e. a peer UE, a server, etc.). The PDCP sublayer 304 provides multiplexing among variable radio bearers and logical channels. The PDCP sublayer 304 also provides a header compression for a higher-layer packet so as to reduce a radio transmission overhead. The PDCP sublayer 304 provides security by encrypting a packet and provides support for UE handover between gNBs. The RLC sublayer 303 provides segmentation and reassembling of a higher-layer packet, retransmission of a lost packet, and reordering of a packet to as to compensate the disordered receiving caused by Hybrid Automatic Repeat Request (HARQ). The MAC sublayer 302 provides multiplexing between logical channels and transport channels. The MAC sublayer 302 is also responsible for allocating between UEs various radio resources (i.e., resource block) in a cell. The MAC sublayer 302 is also in charge of HARQ operation. In the control plane, the radio protocol architecture of the UE and the gNB is almost the same as the radio protocol architecture in the user plane on the PHY 301 and the L2 305, but there is no header compression for the control plane. The control plane also includes a Radio Resource Control (RRC) sublayer 306 in the layer 3 (L3). The RRC sublayer 306 is responsible for acquiring radio resources (i.e. radio bearer) and configuring the lower layers using an RRC signaling between the gNB and the UE.

[275] In one embodiment, the radio protocol architecture in FIG. 3 is applicable to the UE in the present disclosure.

[276] In one embodiment, the radio protocol architecture in FIG. 3 is applicable to the base station device in the present disclosure.

[277] In one embodiment, the target radio signal in the present disclosure is generated by the PHY 301.

[278] In one embodiment, the first radio signal in the present disclosure is generated by the PHY 301.

[279] In one embodiment, the second radio signal in the present disclosure is generated by the PHY 301.

[280] In one embodiment, the third radio signal in the present disclosure is generated by the PHY 301.

[281] Embodiment 4

[282] Embodiment 4 illustrates a diagram of an evolved node B and a given UE according to the present disclosure, as shown in FIG. 4. FIG. 4 is a block diagram of a gNB 410 in communication with a UE 450 in an access network.

[283] The base station device 410 may include a controller/processor 440, a scheduler 443, a memory 430, a receiving processor 412, a transmitting processor 415, an MIMO transmitting processor 441, an MIMO detector 442, a transmitter/receiver 416 and an antenna 420.

[284] The UE 450 may include a controller/processor 490, a memory 480, a data source 467, a transmitting processor 455, a receiving processor 452, an MIMO transmitting processor 471, an MIMO detector 472, a transmitter/receiver 456 and an antenna 460.

[285] In Downlink (DL) transmission, processes relevant to the base station device 410 include the following.

[286] A packet from a higher layer is provided to the controller/processor 440. The controller/processor 440 provides header compression, encryption, packet segmentation and reordering, multiplexing and de-multiplexing between a logical channel and a transport channel, to implement the L2 protocol used for the user plane and the control plane. The packet from a higher layer may include data or control information, for example, Downlink Shared Channel (DL-SCH).

[287] The controller/processor 440 may be connected to the memory 430 that stores program

code and data. The memory 430 may be a computer readable medium.

[288] The controller/processor 440 notifies the scheduler 443 of a transmission requirement, the scheduler 443 is configured to schedule an aerial resource corresponding to the transmission requirement and notify the scheduling result to the controller/processor 440.

[289] The controller/processor 440 transmits, to the transmitting processor 415, the control information for downlink transmission obtained when the receiving processor 412 processes uplink receiving.

[290] The transmitting processor 415 receives a bit stream output from the controller/processor 440, and performs signal transmitting processing functions of an L1 layer (that is, PHY), including encoding, interleaving, scrambling, modulation, power control/allocation, generation of physical layer control signaling (including PBCH, PDCCH, PHICH, PCFICH, reference signal), etc.

[291] The MIMO transmitting processor 441 performs spatial processing (for example, multi-antenna precoding, digital beamforming) on data symbols, control symbols or reference signal symbols, and outputs a baseband signal to the transmitter 416.

[292] The MIMO transmitting processor 441 outputs an analog transmitting beamforming vector to the transmitter 416.

[293] The transmitter 416 is configured to convert the baseband signal provided by the MIMO transmitting processor 441 into a radio-frequency signal and transmit the radio-frequency signal via the antenna 420. Each transmitter 416 performs sampling processing on respective input symbol streams to obtain respective sampled signal streams. Each transmitter 416 performs further processing (for example, digital-to-analogue conversion, amplification, filtering, up conversion, etc.) on respective sampled streams to obtain a downlink signal. Analog transmitting beamforming is processed in the transmitter 416.

[294] In DL transmission, processes relevant to the UE 450 include the following.

[295] The receiver 456 is configured to convert a radio-frequency signal received via the antenna 460 into a baseband signal and provide the baseband signal to the MIMO detector 472. Analog receiving beamforming is processed in the receiver 456.

[296] The MIMO detector 472 is configured to perform an MIMO detection on the signal received from the receiver 456, and provide a baseband signal subjected to MIMO detection to

the receiving processor 452.

[297] The MIMO detector 472 outputs an analog receiving beamforming vector to the receiver 456.

[298] The receiving processor 452 performs signal receiving processing functions of an L1 layer (that is, PHY), including decoding, de-interleaving, descrambling, demodulation, extraction of physical layer control signaling, etc.

[299] The controller/processor 490 receives a bit stream output from the receiving processor 452, and provides header decompression, decryption, packet segmentation and reordering, multiplexing and de-multiplexing between a logical channel and a transport channel, to implement the L2 protocol used for the user plane and the control plane.

[300] The controller/processor 490 may be connected to the memory 480 that stores program code and data. The memory 480 may be a computer readable medium.

[301] The controller/processor 490 transmits, to the receiving processor 452, the control information for downlink receiving obtained when the transmitting processor 455 processes uplink transmission.

[302] The target radio signal in the present disclosure is generated through the transmitting processor 415. The MIMO transmitting processor 441 performs multi-antenna precoding on a baseband signal related to the target radio signal output by the transmitting processor 415. The transmitter 416 converts the baseband signal provided by the MIMO transmitting processor 441 into a radio frequency signal, performs analog transmitting beamforming, and transmits the radio frequency signal via the antenna 420. The receiver 456 receives the radio frequency signal via the antenna 460, performs analog receiving beamforming, obtains a radio frequency signal related to the target radio signal, and converts the radio frequency signal into a baseband signal and provides the baseband signal to the MIMO detector 472. The MIMO detector 472 performs an MIMO detection on the signal received from the receiver 456. The receiving processor 452 performs channel measurement on the baseband signal output by the MIMO detector 472.

[303] The third radio signal in the present disclosure is generated through the transmitting processor 415. The MIMO transmitting processor 441 performs multi-antenna precoding on a baseband signal related to the third radio signal output by the transmitting processor 415. The transmitter 416 converts the baseband signal provided by the MIMO transmitting processor 441 into a radio frequency signal, performs analog transmitting beamforming, and transmits the

radio frequency signal via the antenna 420. The receiver 456 receives the radio frequency signal via the antenna 460, performs analog receiving beamforming, obtains a radio frequency signal related to the third radio signal, and converts the radio frequency signal into a baseband signal and provides the baseband signal to the MIMO detector 472. The MIMO detector 472 performs an MIMO detection on the signal received from the receiver 456. The receiving processor 452 processes the baseband signal output by the MIMO detector 472 to obtain the third radio signal.

[304] In one embodiment, the receiving processor 412 extracts, from the second radio signal, information about the multi-antenna related transmitting of the third radio signal, and the information is transmitted by the controller/processor 440 to the transmitter 416 via the transmitting processor 415 and the MIMO transmitting processor 441 to perform analog transmitting beamforming for the third radio signal.

[305] In one embodiment, the receiving processor 412 extracts, from the first radio signal and the second radio signal, information about the multi-antenna related transmitting of the third radio signal, and the information is transmitted by the controller/processor 440 to the transmitter 416 via the transmitting processor 415 and the MIMO transmitting processor 441 to perform analog transmitting beamforming for the third radio signal.

[306] In Uplink (UL) transmission, processes relevant to the UE 450 include the following.

[307] The data source 467 provides a packet from a higher layer to the controller/processor 490. The controller/processor 490 provides header compression, encryption, packet segmentation and reordering, multiplexing and de-multiplexing between a logical channel and a transport channel, to implement the L2 protocol used for the user plane and the control plane. The packet from a higher layer may include data or control information, for example, Uplink Shared Channel (UL-SCH).

[308] The controller/processor 490 may be connected to the memory 480 that stores program code and data. The memory 480 may be a computer readable medium.

[309] The controller/processor 490 transmits, to the transmitting processor 455, the control information for uplink transmission obtained when the receiving processor 452 processes downlink receiving.

[310] The transmitting processor 455 receives a bit stream output from the controller/processor 490, and performs signal transmitting processing functions of an L1 layer (that is, PHY), including encoding, interleaving, scrambling, modulation, power

control/allocation, generation of physical layer control signaling (including PUCCH, Sounding Reference Signal (SRS)), etc.

[311] The MIMO transmitting processor 471 performs spatial processing (for example, multi-antenna precoding, digital beamforming) on data symbols, control symbols or reference signal symbols, and outputs a baseband signal to the transmitter 456.

[312] The MIMO transmitting processor 471 outputs an analog transmitting beamforming vector to the transmitter 457.

[313] The transmitter 456 is configured to convert the baseband signal provided by the MIMO transmitting processor 471 into a radio-frequency signal and transmit the radio-frequency signal via the antenna 460. Each transmitter 416 performs sampling processing on respective input symbol streams to obtain respective sampled signal streams. Each transmitter 456 performs further processing (for example, digital-to-analogue conversion, amplification, filtering, up conversion, etc.) on respective sampled streams to obtain an uplink signal.

[314] In UL transmission, processes relevant to the base station device 410 include the following.

[315] The receiver 416 is configured to convert a radio-frequency signal received via the antenna 420 into a baseband signal and provide the baseband signal to the MIMO detector 442. Analog receiving beamforming is processed in the receiver 456.

[316] The MIMO detector 442 is configured to perform an MIMO detection on the signal received from the receiver 416, and provide a symbol subjected to MIMO detection to the receiving processor 442.

[317] The MIMO detector 442 outputs an analog receiving beamforming vector to the receiver 416.

[318] The receiving processor 412 performs signal receiving processing functions of an L1 layer (that is, PHY), including decoding, de-interleaving, descrambling, demodulation, extraction of physical layer control signaling, etc.

[319] The controller/processor 440 receives a bit stream output from the receiving processor 412, and provides header decompression, decryption, packet segmentation and reordering, multiplexing and de-multiplexing between a logical channel and a transport channel, to

implement the L2 protocol used for the user plane and the control plane.

[320] The controller/processor 440 may be connected to the memory 430 that stores program code and data. The memory 430 may be a computer readable medium.

[321] The controller/processor 440 transmits, to the receiving processor 412, the control information for uplink transmission obtained when the transmitting processor 415 processes downlink transmission.

[322] The first radio signal in the present disclosure is generated through the transmitting processor 455. The MIMO transmitting processor 471 performs multi-antenna precoding on a baseband signal related to the first radio signal output by the transmitting processor 455. The transmitter 456 converts the baseband signal provided by the MIMO transmitting processor 471 into a radio frequency signal, performs analog transmitting beamforming, and transmits the radio frequency signal via the antenna 460. The receiver 416 receives the radio frequency signal via the antenna 420, performs analog receiving beamforming, obtains a radio frequency signal related to the first radio signal, and converts the radio frequency signal into a baseband signal and provides the baseband signal to the MIMO detector 442. The MIMO detector 442 performs an MIMO detection on the signal received from the receiver 416. The receiving processor 412 processes the baseband signal output by the MIMO detector 442 to obtain the first radio signal.

[323] The second radio signal in the present disclosure is generated through the transmitting processor 455. The MIMO transmitting processor 471 performs multi-antenna precoding on a baseband signal related to the second radio signal output by the transmitting processor 455. The transmitter 456 converts the baseband signal provided by the MIMO transmitting processor 471 into a radio frequency signal, performs analog transmitting beamforming, and transmits the radio frequency signal via the antenna 460. The receiver 416 receives the radio frequency signal via the antenna 420, performs analog receiving beamforming, obtains a radio frequency signal related to the second radio signal, and converts the radio frequency signal into a baseband signal and provides the baseband signal to the MIMO detector 442. The MIMO detector 442 performs an MIMO detection on the signal received from the receiver 416. The receiving processor 412 processes the baseband signal output by the MIMO detector 442 to obtain the second radio signal.

[324] In one embodiment, the UE 450 device includes at least one processor and at least one memory. The at least one memory includes computer program codes. The at least one memory and the computer program codes are configured to be used in collaboration with the at least one

processor. The UE 450 device at least receives a target radio signal, transmits a first radio signal on a first channel, transmits a second radio signal on a second channel, and monitors a third radio signal in a first time window, wherein a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

[325] In one embodiment, the UE 450 includes a memory that stores a computer readable instruction program. The computer readable instruction program generates an action when executed by at least one processor. The action includes receiving a target radio signal, transmitting a first radio signal on a first channel, transmitting a second radio signal on a second channel, and monitoring a third radio signal in a first time window, wherein a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

[326] In one embodiment, the gNB 410 device includes at least one processor and at least one memory. The at least one memory includes computer program codes. The at least one memory and the computer program codes are configured to be used in collaboration with the at least one processor. The gNB 410 at least transmits a target radio signal, receives a first radio signal on a first channel, receives a second radio signal on a second channel, and transmits a third radio signal in a first time window, wherein a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

[327] In one embodiment, the gNB 410 includes a memory that stores a computer readable instruction program. The computer readable instruction program generates an action when executed by at least one processor. The action includes transmitting a target radio signal, receiving a first radio signal on a first channel, receiving a second radio signal on a second channel, and transmitting a third radio signal in a first time window, wherein a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining

the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

[328] In one embodiment, the UE 450 corresponds to the UE in the present disclosure.

[329] In one embodiment, the gNB 410 corresponds to the base station in the present disclosure.

[330] In one embodiment, the transmitting processor 415, the MIMO transmitter 441, and the transmitter 416 are used for transmitting the target radio signal in the present disclosure.

[331] In one embodiment, the receiver 456, the MIMO detector 472, and the receiving processor 452 are used for receiving the target radio signal in the present disclosure.

[332] In one embodiment, the transmitting processor 455, the MIMO transmitter 471, and the transmitter 456 are used for transmitting the first radio signal in the present disclosure.

[333] In one embodiment, the receiver 416, the MIMO detector 442, and the receiving processor 412 are used for receiving the first radio signal in the present disclosure.

[334] In one embodiment, the transmitting processor 455, the MIMO transmitter 471, and the transmitter 456 are used for transmitting the second radio signal in the present disclosure.

[335] In one embodiment, the receiver 416, the MIMO detector 442, and the receiving processor 412 are used for receiving the second radio signal in the present disclosure.

[336] In one subembodiment, the transmitting processor 415, the MIMO transmitter 441, and the transmitter 416 are used for transmitting the third radio signal in the present disclosure.

[337] In one subembodiment, the receiver 456, the MIMO detector 472, and the receiving processor 452 are used for receiving the third radio signal in the present disclosure.

[338] Embodiment 5

[339] Embodiment 5 illustrates an example of a flowchart of the transmission of a radio signal according to the present disclosure, as shown in FIG. 5. In FIG. 5, the base station N1 is a maintenance base station for a serving cell of the UE U2.

[340] The base station N1 transmits a target radio signal in S11, receives a first radio signal on a first channel in S12, receives a second radio signal on a second channel in S13, and transmits a third radio signal in a first time window in S14.

[341] The UE U2 receives the target radio signal in S21, transmits the first radio signal on the first channel in S22, transmits the second radio signal on the second channel in S23, and monitors the third radio signal in the first time window in S24.

[342] In Embodiment 5, a measurement for the target radio signal is used by the U2 to trigger the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used by the N1 and U2 to determine the start time of the first time window; and a time resource occupied by the second radio signal is used by the N1 and U2 to determine the end time of the first time window.

[343] In one subembodiment, at least one of {the first radio signal, the second radio signal} is used by the N1 to determine the multi-antenna related transmitting of the third radio signal.

[344] In one subembodiment, the first radio signal and the second radio signal together are used by the N1 to determine the multi-antenna related transmitting of the third radio signal.

[345] In one subembodiment, the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

[346] In one subembodiment, the first channel is a physical layer control channel.

[347] In one subembodiment, a time domain resource occupied by the first radio signal is used by the N1 and U2 to determine a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window.

[348] In one subembodiment, a time domain resource occupied by the second radio signal is used by the N1 and U2 to determine a third time window, and the end time of the third time window is the end time of the first time window.

[349] If no conflict is caused, the above subembodiments can be arbitrarily combined.

[350] Embodiment 6

[351] Embodiment 6 illustrates an example of a first time window, a second time window and a third time window, as shown in FIG. 6.

[352] In Embodiment 6, a time domain resource occupied by a first radio signal is used for

determining the start time of a second time window, and a time domain resource occupied by a second radio signal is used for determining the start time of a third time window. The start time of the first time window and the start time of the second time window are the same. The time domain resource occupied by the second radio signal is within the second time window. The end time of the first time window and the end time of the third time window are the same. The UE conducts monitoring of the third radio signal in a time interval between the start time of the first time window and the time domain resource occupied by the second radio signal, but does not detect the third radio signal. The third radio signal is transmitted after the second radio signal.

[353] In one subembodiment, the base station does not transmit the third radio signal in the time interval between the start time of the first time window and the time domain resource occupied by the second radio signal.

[354] In one subembodiment, the second radio signal is used for determining a second antenna port group, an analog transmitting beam used for forming the second antenna port group is used for transmitting the third radio signal in the third time window.

[355] In one subembodiment, an analog receiving beam used for receiving the second antenna port group is used for monitoring the third radio signal in the third time window.

[356] In one subembodiment, the first radio signal is used for determining a first antenna port group, an analog receiving beam used for receiving the first antenna port group is used for monitoring the third radio signal in a time interval between the start time of the first time window and the start time of the third time window.

[357] In one subembodiment, a time domain resource occupied by the first radio signal is the start time of the second time window.

[358] In one subembodiment, the start time of the second time window is equal to the time domain resource occupied by the first radio signal plus an offset.

[359] In one subembodiment, a time domain resource occupied by the second radio signal is the start time of the third time window.

[360] In one subembodiment, the start time of the third time window is equal to the time domain resource occupied by the second radio signal plus an offset.

[361] Embodiment 7

[362] Embodiment 7 illustrates an example of the multi-antenna related transmitting and

receiving of a target radio signal and a third radio signal, as shown in FIG. 7.

[363] In Embodiment 7, a first transmitting beam is used for transmitting a target radio signal, and a first receiving beam is used for receiving the target radio signal; a second transmitting beam is used for transmitting a third radio signal, and a second receiving beam is used for receiving the third radio signal. The transmitting direction of the first transmitting beam is different from that of the second transmitting beam, and the receiving direction of the first receiving beam is different from that of the second receiving beam.

[364] In one subembodiment, the transmitting beam is an analog transmitting beam, and the receiving beam is an analog receiving beam.

[365] In one subembodiment, an analog beamforming vector is applied to a phase shifter of a radio frequency circuit to generate an analog beam.

[366] In one subembodiment, the UE conducts a channel measurement of the target radio signal, and the result of the channel measurement is less than a target threshold; the UE transmits a first radio signal, and the first radio signal is used for determining the second transmitting beam; and the UE monitors the third radio signal using the second receiving beam.

[367] Embodiment 8

[368] Embodiment 8 illustrates an example of a structure block diagram of a processing device in a UE, as shown in FIG. 8. In FIG. 8, the processing device 800 of the UE is mainly composed of a first receiver module 801, a second transmitter module 802, a third transmitter module 803, and a fourth receiver module 804.

[369] In Embodiment 8, the first receiver module 801 receives a target radio signal, the second transmitter module 802 transmits a first radio signal on a first channel, the third transmitter module 803 transmits a second radio signal on a second channel, and the fourth receiver module 804 monitors a third radio signal in a first time window.

[370] In Embodiment 8, a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

[371] In one subembodiment, at least one of {the first radio signal, the second radio signal} is

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used for determining the multi-antenna related transmitting of the third radio signal.

[372] In one subembodiment, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

[373] In one subembodiment, the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

[374] In one subembodiment, the first channel is a physical layer control channel.

[375] In one subembodiment, a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window

[376] In one subembodiment, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window.

[377] Embodiment 9

[378] Embodiment 9 illustrates an example of a structure block diagram of a processing device in a base station, as shown in FIG. 9. In FIG. 9, the processing device 900 of the base station is mainly composed of a first transmitter module 901, a second receiver module 902, a third receiver module 903, and a fourth transmitter module 904.

[379] In Embodiment 9, the first transmitter module 901 transmits a target radio signal, the second receiver module 902 receives a first radio signal on a first channel, the third receiver module 903 receives a second radio signal on a second channel, and the fourth transmitter module 904 transmits a third radio signal in a first time window.

[380] In Embodiment 9, a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

[381] In one subembodiment, at least one of {the first radio signal, the second radio signal} is

used for determining the multi-antenna related transmitting of the third radio signal.

[382] In one subembodiment, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

[383] In one subembodiment, the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

[384] In one subembodiment, the first channel is a physical layer control channel.

[385] In one subembodiment, a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window.

[386] In one subembodiment, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window.

[387] The ordinary skill in the art may understand that all or part steps in the above method may be implemented by instructing related hardware through a program. The program may be stored in a computer readable storage medium, for example Read-Only Memory (ROM), hard disk or compact disc, etc. Optionally, all or part steps in the above embodiments also may be implemented by one or more integrated circuits. Correspondingly, each module unit in the above embodiment may be realized in the form of hardware, or in the form of software function modules. The present disclosure is not limited to any combination of hardware and software in specific forms. The UE and terminal in the present disclosure include but not limited to unmanned aerial vehicles, communication modules on unmanned aerial vehicles, telecontrolled aircrafts, aircrafts, diminutive airplanes, mobile phones, tablet computers, notebooks, vehicle-mounted communication equipment, wireless sensor, network cards, terminals for Internet of Things, REID terminals, NB-IOT terminals, Machine Type Communication (MTC) terminals, enhanced MTC (eMTC) terminals, data cards, low-cost mobile phones, low-cost tablet computers, etc. The base station in the present application includes but not limited to macro-cellular base stations, micro-cellular base stations, home base stations, relay base station and radio communication equipment.

[388] The above are merely the preferred embodiments of the present disclosure and are not intended to limit the scope of protection of the present disclosure. Any modification, equivalent substitute and improvement made within the spirit and principle of the present disclosure are intended to be included within the scope of protection of the present disclosure.

Claims

WHAT IS CLAIMED IS:

1. A method in a User Equipment (UE) for wireless communication, comprising:

receiving a target radio signal;

transmitting a first radio signal on a first channel;

transmitting a second radio signal on a second channel; and

monitoring a third radio signal in a first time window;

wherein a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

2. The method according to claim 1, wherein at least one of {the first radio signal, the second radio signal} is used for determining the multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

3. The method according to claim 1, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

4. The method according to claim 1, wherein the first channel is a physical layer control channel.

5. The method according to claim 1, wherein a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window.

6. A method in a base station device for wireless communication, comprising:

transmitting a target radio signal;

receiving a first radio signal on a first channel;

receiving a second radio signal on a second channel; and

transmitting a third radio signal in a first time window;

wherein a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

7. The method according to claim 6, wherein at least one of {the first radio signal, the second radio signal} is used for determining the multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

8. The method according to claim 6, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

9. The method according to claim 6, wherein the first channel is a physical layer control channel.

10. The method according to claim 6, wherein a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window.

11. A UE for wireless communication, comprising:

a first receiver module, to receive a target radio signal;

a second transmitter module, to transmit a first radio signal on a first channel;

a third transmitter module, to transmit a second radio signal on a second channel; and

a fourth receiver module, to monitor a third radio signal in a first time window;

wherein a measurement for the target radio signal is used for triggering the transmission of

the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

12. The UE according to claim 11, wherein at least one of {the first radio signal, the second radio signal} is used for determining the multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

13. The UE according to claim 11, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

14. The UE according to claim 11, wherein the first channel is a physical layer control channel.

15. The UE according to claim 11, wherein a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window.

16. A base station device for wireless communication, comprising:

a first transmitter module, to transmit a target radio signal;

a second receiver module, to receive a first radio signal on a first channel;

a third receiver module, to receive a second radio signal on a second channel; and

a fourth transmitter module, to transmit a third radio signal in a first time window;

wherein a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window.

17. The base station device according to claim 16, wherein at least one of {the first radio signal, the second radio signal} is used for determining the multi-antenna related transmitting of the

third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

18. The base station device according to claim 16, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

19. The base station device according to claim 16, wherein the first channel is a physical layer control channel.

20. The base station device according to claim 16, wherein a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window.

Samsung Exhibit 1003, Page 50 of 222

ABSTRACT

A UE receives a target radio signal, transmits a first radio signal on a first channel, transmits a second radio signal on a second channel, and monitors a third radio signal in a first time window. A measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window. The application of the present disclosure can make full use of the allocated aerial resources, and improve the utilization of the aerial resources configured to transmit a report request that is determined autonomously by the UE.

Samsung Exhibit 1003, Page 51 of 222

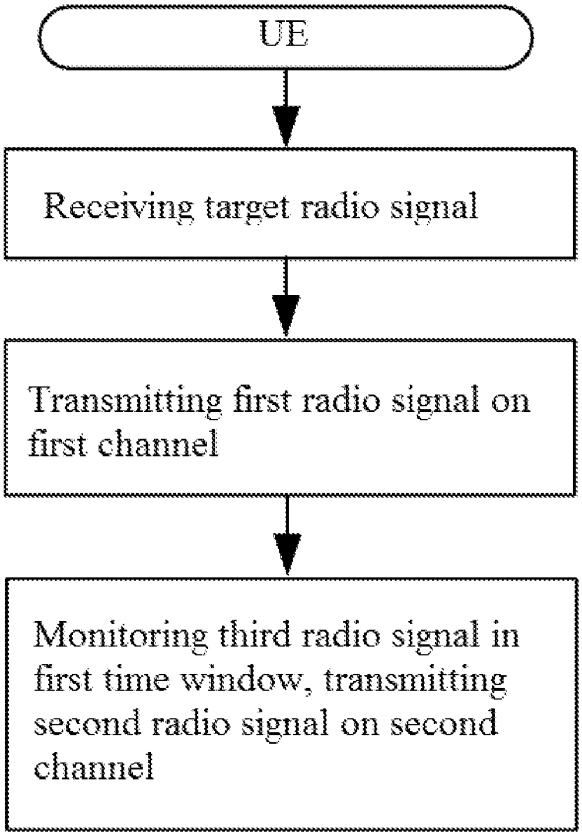

UE
Receiving target radio signal
Transmitting first radio signal on first channel
Monitoring third radio signal in first time window, transmitting second radio signal on second channel

FIG. 1

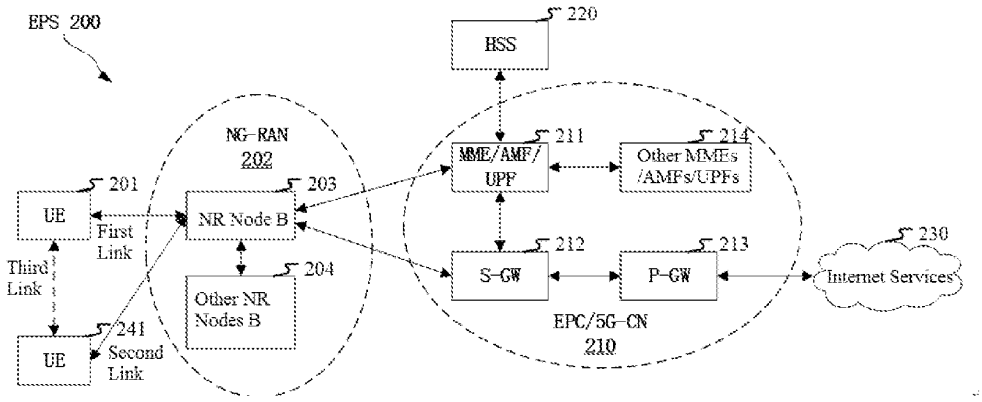

EPS 200
220
HSS
NG-RAN
202
211
MME/AMF/
UPF
214
Other MMEs
/AMFs/UPFs
201
UE
First
Link
NR Node B
203
Third
Link
204
Other NR
Nodes B
212
S-GW
213
P-GW
230
Internet Services
241
UE
Second
Link
EPC/5G-CN
210

FIG. 2

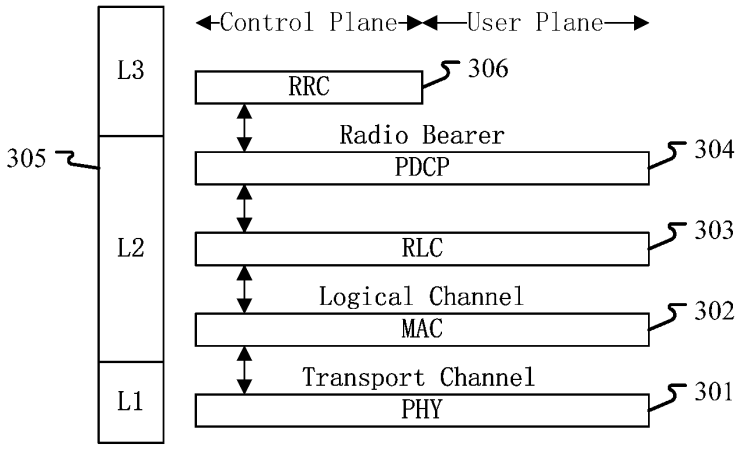

Control Plane
User Plane
L3
L2
L1
305
RRC
306
Radio Bearer
PDCP
304
RLC
303
Logical Channel
MAC
302
Transport Channel
PHY
301

FIG. 3

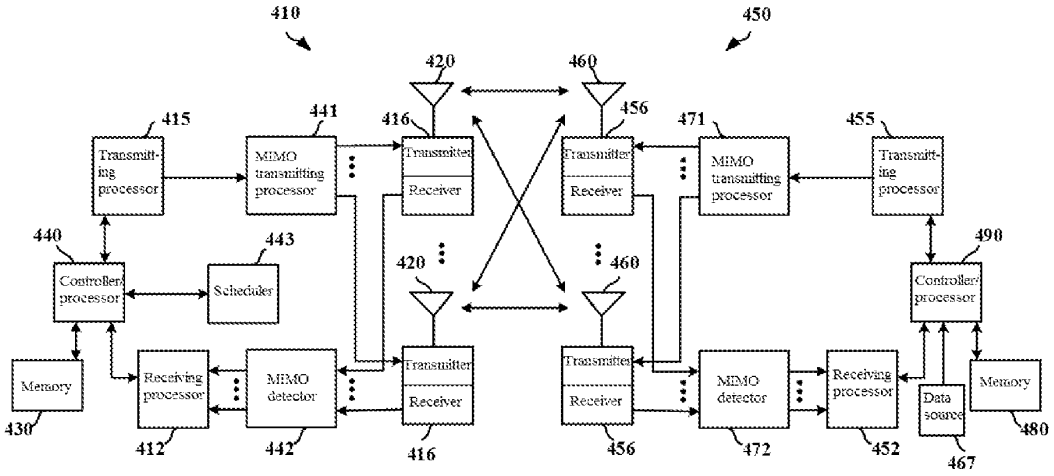

410
450
420
460
415
441
416
456
471
455
Transmitting processor
MIMO transmitting processor
Transmitter
Receiver
Transmitter
Receiver
MIMO transmitting processor
Transmitting processor
440
443
420
460
490
Controller processor
Scheduler
Controller processor
Memory
Receiving processor
MIMO detector
Transmitter
Receiver
Transmitter
Receiver
MIMO detector
Receiving processor
Data source
Memory
430
412
442
416
456
472
452
467
480

FIG. 4

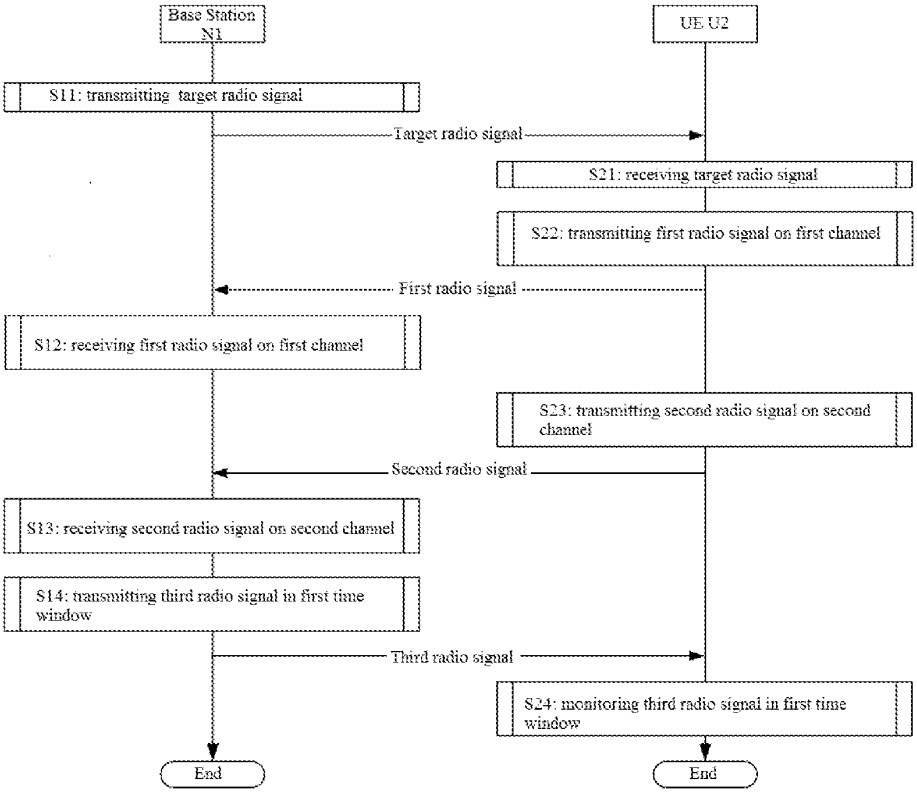

Base Station N1
UE U2
S11: transmitting target radio signal
Target radio signal
S21: receiving target radio signal
S22: transmitting first radio signal on first channel
First radio signal
S12: receiving first radio signal on first channel
S23: transmitting second radio signal on second channel
Second radio signal
S13: receiving second radio signal on second channel
S14: transmitting third radio signal in first time window
Third radio signal
S24: monitoring third radio signal in first time window
End
End

FIG. 5

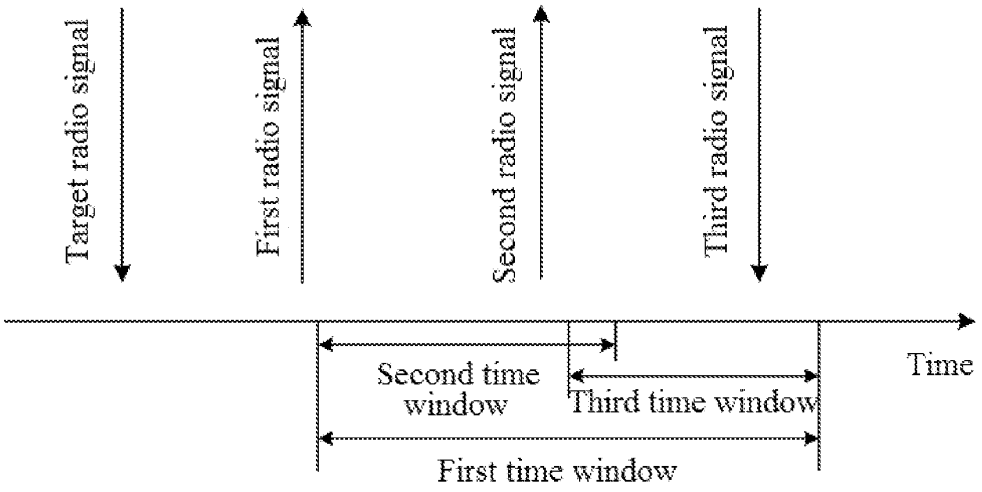

Target radio signal
First radio signal
Second radio signal
Third radio signal
Time
Second time window
Third time window
First time window

FIG.6

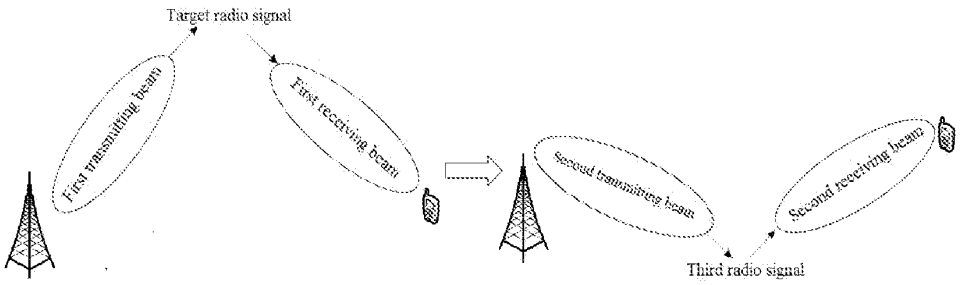

Target radio signal
First transmitting beam
First receiving beam
Second transmitting beam
Second receiving beam
Third radio signal

FIG. 7

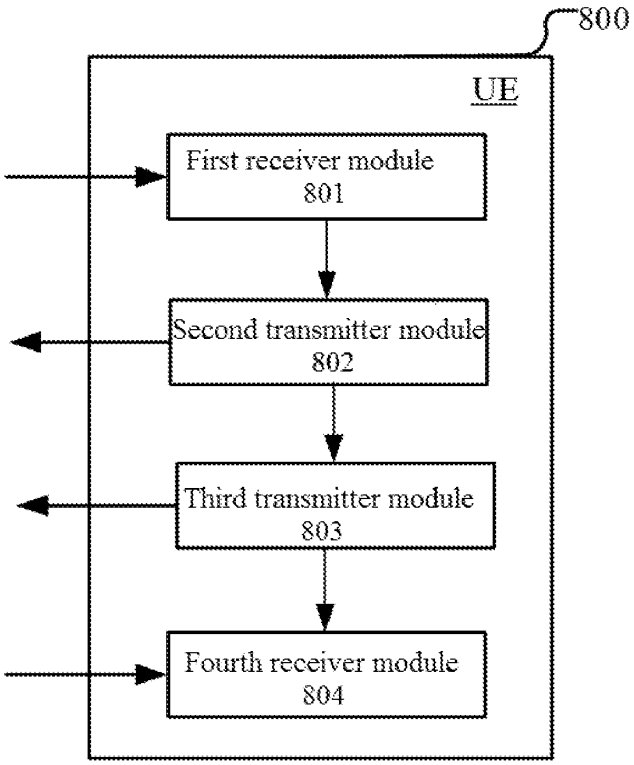

800
UE
First receiver module
801
Second transmitter module
802
Third transmitter module
803
Fourth receiver module
804

FIG. 8

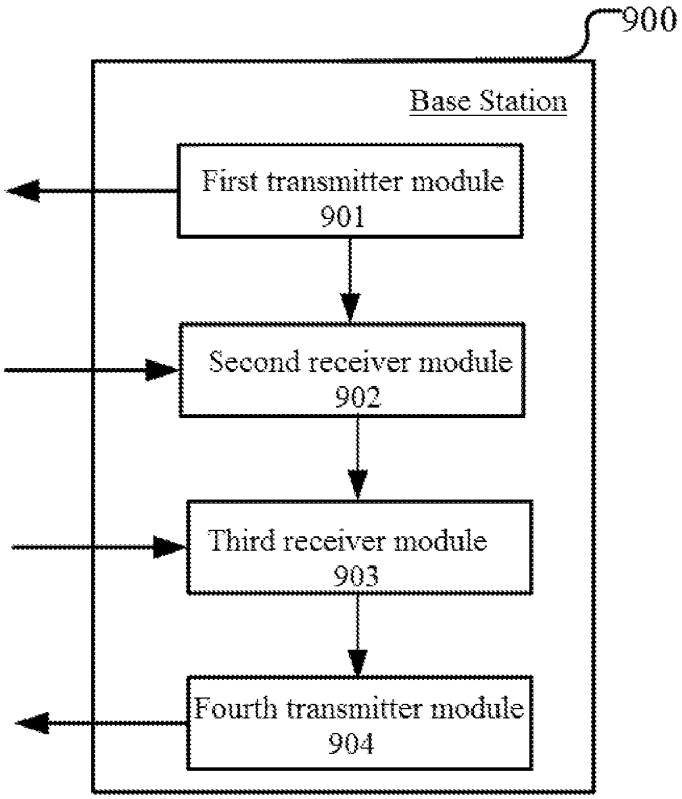

900
Base Station
First transmitter module
901
Second receiver module
902
Third receiver module
903
Fourth transmitter module
904

FIG. 9

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____.

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

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

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

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LEGAL NAME OF INVENTOR

Inventor: XiaoBo ZHANG Date (Optional): Aug. 07 2018

Signature: XiaoBo ZHANG

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

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

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

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Xiaobo ZHANG
Filer:	Aaron Richard Wininger
Attorney Docket Number:	126099-8021.US00

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	75	75
UTILITY SEARCH FEE	2111	1	330	330
UTILITY EXAMINATION FEE	2311	1	380	380
Pages:				
Claims:				
INDEPENDENT CLAIMS IN EXCESS OF 3	2201	1	230	230
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1015**

Electronic Acknowledgement Receipt	
EFS ID:	33417221
Application Number:	16059045
International Application Number:	
Confirmation Number:	5101
Title of Invention:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Xiaobo ZHANG
Customer Number:	70416
Filer:	Aaron Richard Wininger
Filer Authorized By:	
Attorney Docket Number:	126099-8021.US00
Receipt Date:	09-AUG-2018
Filing Date:	
Time Stamp:	02:52:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1015
RAM confirmation Number	080918INTEFSW02544600
Deposit Account	500665
Authorized User	Aaron Wininger
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	Application Data Sheet	1260998021US00ADS.PDF	1822969 739ff13fe8bb54359b97d82332333cc8b15c0b62	no	8
Warnings:					
Information:					
2		App.pdf	366985 e152fb860e6f105511e791c7cad7aca313fb36dc	yes	43

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Specification	1	38
	Claims	39	42
	Abstract	43	43

Warnings:					
Information:					
3	Drawings-only black and white line drawings	Drawings.pdf	299178 cec1f3731c7e2d94b25b8cd86298712d7c57d249	no	9
Warnings:					
Information:					
4	Oath or Declaration filed	Dec.pdf	754778 7f80f21e1937255d08988b6115dcf10feaef31fc	no	1
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	37025 5fc77208bd1661bfdfdfe9f46881672443d6c86c	no	2

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New International Application Filed with the USPTO as a Receiving Office

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/059,045

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	75		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	330		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	380		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*	x 50 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1	x 230 =	230			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	1015		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/059,045	08/09/2018	2649	1015	126099-8021.US00	20	4

CONFIRMATION NO. 5101

70416
Perkins Coie LLP - SHA General
Patent - SHA
P.O. Box 1247
Seattle, WA 98111-1247

FILING RECEIPT



Date Mailed: 08/28/2018

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Xiaobo ZHANG, Shanghai, CHINA;

Applicant(s)

Shanghai Langbo Communication Technology Company Limited, Shanghai, CHINA;

Assignment For Published Patent Application

Shanghai Langbo Communication Technology Company Limited, Shanghai, CHINA

Power of Attorney: None

Domestic Applications for which benefit is claimed - None.

A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
CHINA 201710686330.4 08/11/2017

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/059,045**
Projected Publication Date: 02/14/2019
Non-Publication Request: No
Early Publication Request: No
**** SMALL ENTITY ****
Title

METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION

Preliminary Class

455

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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证　明

本证明之附件是向本局提交的下列专利申请文件副本。

申　　请　　号：201710686330.4

申　请　类　型：发明专利

发明 创造 名称：一种用于无线通信的用户设备、基站中的方法和装置

申　　请　　日：2017 年 08 月 11 日

申　　请　　人：上海朗帛通信技术有限公司

发明人或设计人：张晓博

局长

申长雨

2018 年 09 月 20 日

2017106863304

权 利 要 求 书

1. 一种用于无线通信的用户设备中的方法，包括

- 接收目标无线信号；

- 在第一信道上发送第一无线信号；

- 在第二信道上发送第二无线信号；

- 在第一时间窗内监测第三无线信号；

其中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于确定所述第一时间窗的终止时刻。

2. 根据权利要求 1 所述的方法，其特征在于，{所述第一无线信号，所述第二无线信号}中的至少一个被用于确定所述第三无线信号的多天线相关的发送。

3. 根据权利要求 1 或 2 所述的方法，其特征在于，所述第一无线信号和所述第二无线信号被共同用于确定所述第三无线信号的多天线相关的发送。

4. 根据权利要求 1 至 3 中的任一权利要求所述的方法，其特征在于，所述第一信道是一个第一类物理层信道，所述第二信道是一个第二类物理层信道，所述第一类物理层信道和所述第二类物理层信道是两类不同的物理层信道。

5. 根据权利要求 1 至 4 中的任一权利要求所述的方法，其特征在于，所述第一信道是一个物理层控制信道。

6. 根据权利要求 1 至 5 中的任一权利要求所述的方法，其特征在于，所述第一无线信号所占用的时域资源被用于确定第二时间窗，所述第二无线信号所占用的时域资源在所述第二时间窗之内，所述第二时间窗在所述第一时间窗之内。

7. 根据权利要求 1 至 6 中的任一权利要求所述的方法，其特征在于，所述第二无线信号所占用的时域资源被用于确定第三时间窗，所述第三时间窗的终止时刻是所述第一时间窗的终止时刻。

8. 一种用于无线通信的基站设备中的方法，包括

- 发送目标无线信号；

- 在第一信道上接收第一无线信号；

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- 在第二信道上接收第二无线信号；

- 在第一时间窗内发送第三无线信号；

其中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于确定所述第一时间窗的终止时刻。

9. 根据权利要求 8 所述的方法，其特征在于，{所述第一无线信号，所述第二无线信号}中的至少一个被用于确定所述第三无线信号的多天线相关的发送。

10. 根据权利要求 8 或 9 所述的方法，其特征在于，所述第一无线信号和所述第二无线信号被共同用于确定所述第三无线信号的多天线相关的发送。

11. 根据权利要求 8 至 10 中的任一权利要求所述的方法，其特征在于，所述第一信道是一个第一类物理层信道，所述第二信道是一个第二类物理层信道，所述第一类物理层信道和所述第二类物理层信道是两类不同的物理层信道。

12. 根据权利要求 8 至 11 中的任一权利要求所述的方法，其特征在于，所述第一信道是一个物理层控制信道。

13. 根据权利要求 8 至 12 中的任一权利要求所述的方法，其特征在于，所述第一无线信号所占用的时域资源被用于确定第二时间窗，所述第二无线信号所占用的时域资源在所述第二时间窗之内，所述第二时间窗在所述第一时间窗之内。

14. 根据权利要求 8 至 13 中的任一权利要求所述的方法，其特征在于，所述第二无线信号所占用的时域资源被用于确定第三时间窗，所述第三时间窗的终止时刻是所述第一时间窗的终止时刻。

15. 一种用于无线通信的用户设备，包括

- 第一接收机模块，接收目标无线信号；

- 第二发射机模块，在第一信道上发送第一无线信号；

- 第三发射机模块，在第二信道上发送第二无线信号；

- 第四接收机模块，在第一时间窗内监测第三无线信号；

其中，针对所述目标无线信号的测量被用于触发所述第一无线信号和

所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于确定所述第一时间窗的终止时刻。

16. 一种用于无线通信的基站设备，包括

- 第一发射机模块，发送目标无线信号；
- 第二接收机模块，在第一信道上接收第一无线信号；
- 第三接收机模块，在第二信道上接收第二无线信号；
- 第四发射机模块，在第一时间窗内发送第三无线信号；

其中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于确定所述第一时间窗的终止时刻。

2017106863304

说 明 书

一种用于无线通信的用户设备、基站中的方法和装置

技术领域

本申请涉及无线通信系统中的无线信号的传输方案，特别是涉及用户设备自行确定信息发送的方法和装置。

背景技术

大规模（Massive）MIMO（Multi-Input Multi-Output）成为下一代移动通信的一个研究热点。大规模 MIMO 中，多个天线通过波束赋型，形成较窄的波束指向一个特定方向来提高通信质量。

在 3GPP(3rd GenerationPartner Project，第三代合作伙伴项目)新空口讨论中，有公司提出，UE（User Equipement，用户设备）在通信过程中应当对服务波束进行测量，当发现服务波束质量不好时，PUCCH（Physical Uplink Control Channel，物理层上行控制信道）和类似 PRACH（Physical Random Access Channel，物理层随机接入信道）的无竞争信道被 UE 用于向基站发送波束恢复请求（Beam Recovery Request），基站继而更换服务波束。

发明内容

发明人通过研究发现，如果 UE 在使用一个信道发送波束恢复请求后在等待响应的时间窗不能再次发送波束恢复请求，会导致被配置在等待响应的时间窗内的用于发送波束恢复请求的时频资源不能被 UE 用于发送波束恢复请求，从而造成用于发送波束恢复请求的时频资源较低的使用效率。

针对上述问题，本申请提供了解决方案。需要说明的是，在不冲突的情况下，本申请的实施例和实施例中的特征可以任意相互组合。例如，本申请的用户设备中的实施例和实施例中的特征可以应用到基站中，反之亦然。

本申请公开了一种用于无线通信的用户设备中的方法，包括

- 接收目标无线信号；

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- 在第一信道上发送第一无线信号；

- 在第二信道上发送第二无线信号；

- 在第一时间窗内监测第三无线信号；

其中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于确定所述第一时间窗的终止时刻。

作为一个实施例，上述方法的好处：提高被用于发送用户自行确定的上报请求的空口资源的利用效率。

作为一个实施例，所述目标无线信号在物理层控制信道（即只能被用于传输控制信息的物理层信道）上传输。

作为一个实施例，所述目标无线信号携带一个DCI（Downlink Control Information，下行控制信息）。

作为一个实施例，所述目标无线信号在物理层数据信道（即只能被用于传输数据信息的物理层信道）或者物理层共享信道（即被用于传输数据或者控制信息的物理层信道）上传输。

作为一个实施例，所述目标无线信号是参考信号。

作为一个实施例，所述目标无线信号是物理层控制信道的DMRS（Demodulation Reference Signal，解调参考信号）。

作为一个实施例，所述目标无线信号是物理层共享信道的DMRS。

作为一个实施例，所述目标无线信号是被用于针对物理层控制信道进行信道质量测量的CSI-RS（Channel State Information Reference Signal，信道状态信息参考信号）。

作为一个实施例，所述目标无线信号是被用于针对物理层控制信道进行信道质量测量的SS（Synchronization Signal，同步信号）。

作为一个实施例，物理层控制信道的多天线相关的发送与所述目标无线信号的多天线相关的发送有关。

作为一个实施例，被用于发送物理层控制信道的天线端口与被用于发送所述目标无线信号的天线端口在空间上相关。

作为一个实施例，被用于发送物理层控制信道的天线端口与被用于发送所述目标无线信号的天线端口在空间上QCL（Quasi Co-Located，类共

址）。

作为一个实施例，被用于发送物理层控制信道的模拟发送波束被用于发送所述目标无线信号。

作为一个实施例，被用于接收物理层控制信道的模拟接收波束被用于接收所述目标无线信号。

作为一个实施例，物理层共享信道的多天线相关的发送与所述目标无线信号的多天线相关的发送有关。

作为一个实施例，被用于发送物理层共享信道的天线端口与被用于发送所述目标无线信号的天线端口在空间上 QCL（Quasi Co-Located，类共址）。

作为一个实施例，被用于发送物理层共享信道的模拟发送波束被用于发送所述目标无线信号。

作为一个实施例，被用于接收物理层共享信道的模拟接收波束被用于接收所述目标无线信号。

作为一个实施例，所述在空间上相关是指使用相同的模拟波束传输信令或数据。

作为一个实施例，所述在空间上相关是指 QCL（Quasi Co-Located，类共站）。

作为一个实施例，所述在空间上相关是指在空间上 QCL。

作为一个实施例，所述在空间上相关是指信道特征相同或近似。

作为一个实施例，所述在空间上相关是指{延迟扩展，多普勒扩展，多普勒位移，平均离开角，平均到达角}中至少之一相同或近似。所述近似是指两者之间的差值低于第一阈值。

作为一个上述实施例的一个子实施例，所述第一阈值是缺省的。

作为一个上述实施例的另一个子实施例，所述第一阈值是预配置的。

作为一个上述实施例的再一个子实施例，所述第一阈值是基站配置的。

作为一个实施例，所述模拟波束是指在设备的射频部分通过将波束赋型向量作用于移相器而形成的波束。

作为一个实施例，所述模拟波束通过将模拟波束赋型向量作用于模拟器件形成。

作为一个实施例，所述天线端口由多根物理天线通过天线虚拟化

（Virtualization）叠加而成。所述天线端口到所述多根物理天线的映射系数组成波束赋型向量用于所述天线虚拟化，形成波束。

作为一个实施例，一个天线端口被用于发送一个参考信号。

作为一个实施例，不同的天线端口被用于发送不同的参考信号。

作为一个实施例，物理层控制信道被用于发送所述第一无线信号。

作为一个实施例，所述第一无线信号携带一个 UCI（Uplink Control Information，上行控制信息）。

作为一个实施例， FEC（Forward Error Correction，前向纠错）被用于生成所述第一无线信号。

作为一个实施例，所述第一无线信号被用于确定波束恢复请求。

作为一个实施例，所述第一无线信号被用于确定被用于发送所述第三无线信号的天线端口和被用于发送所述目标无线信号的天线端口在空间上无关。

作为一个实施例，所述在空间上无关是指在空间上不 QCL。

作为一个实施例，所述在空间上无关是指使用不同的模拟波束。

作为一个实施例，所述在空间上无关是指{延迟扩展，多普勒扩展，多普勒位移，平均离开角，平均到达角}中至少之一不近似。所述不近似是指两者之间的差值高于第二阈值。

作为一个上述实施例的一个子实施例，所述第二阈值是缺省的。

作为一个上述实施例的一个子实施例，所述第二阈值是预配置的。

作为一个上述实施例的一个子实施例，所述第二阈值是基站配置的。

作为一个实施例，第一比特块经过 FEC 生成所述第一无线信号，所述第一比特块的值被用于确定所述第三无线信号的多天线相关的发送。

作为一个实施例，物理层控制信道被用于传输所述第二无线信号。

作为一个实施例，所述第二无线信号携带一个 UCI。

作为一个实施例，第一特征序列被用于生成所述第二无线信号，{所述第一特征序列在 Q 个特征序列中的序号，所述第一特征序列所占用的频域资源，所述第一特征序列所占用的时域资源}中的至少之一被用于确定所述第三无线信号的多天线相关的发送。

作为一个实施例，所述第二无线信号是一个前导序列（preamble）。

作为一个实施例，FEC 不被用于生成所述第二无线信号。

作为一个实施例，所述第二无线信号不在物理层控制信道上传输。

作为一个实施例，被用于传输所述第二无线信号的物理层信道的可靠性高于被用于传输所述第一无线信号的物理层信道的可靠性。

作为一个实施例，物理层控制信道被用于传输所述第三无线信号。

作为一个实施例，所述第三无线信号携带一个DCI。

作为一个实施例，所述第三无线信号是终端特定的。

作为一个实施例，所述第一无线信号被用于确定第一天线端口组，所述第一天线端口组和被用于发送所述第三无线信号的天线端口组在空间上相关。

作为一个实施例，所述天线端口组只包括一个天线端口。

作为一个实施例，所述天线端口组包括多个天线端口。

作为一个实施例，所述第一无线信号被用于确定第一天线端口组。

作为上述实施例的一个子实施例，用于所述第一天线端口组的模拟发送波束被用于发送所述第三无线信号。

作为上述实施例的一个子实施例，用于接收所述第一天线端口组的模拟接收波束被用于监测所述第三无线信号。

作为一个实施例，所述第二无线信号被用于确定第二天线端口组。

作为上述实施例的一个子实施例，用于所述第二天线端口组的模拟发送波束被用于发送所述第三无线信号。

作为上述实施例的一个子实施例，用于接收所述第二天线端口组的模拟接收波束被用于监测所述第三无线信号。

作为一个实施例，所述监测是指进行盲检（Blind Decoding）。

作为一个实施例，所述监测是指在成功译码之前不确定是否发送。

作为一个实施例，所述监测是指在成功检测之前不确定是否发送。

作为一个实施例，所述用户设备在所述第一时间窗内的物理层控制信道上监测所述第三无线信号。

作为一个实施例，针对所述目标无线信号的测量得到目标测量值。

作为上述实施例的一个子实施例，所述目标测量值低于目标阈值被用于触发所述第一无线信号和所述第二无线信号的发送。

作为上述实施例的一个子实施例，所述目标测量值是指对所述目标无线信号进行测量得到的{RSRP（Reference Signal Receiver Power，参考

信号接收功率），SNR（Signal-to-Noise Ratio，信噪比），SINR（Signal-to-Interference-plus-Noise Ratio，信干噪比）}中的一种。

作为上述实施例的一个子实施例，所述目标测量值是将所述目标无线信号映射到物理层控制信道后的{等效RSRP（Reference Signal Receiver Power，参考信号接收功率），等效SNR（Signal-to-Noise Ratio，信噪比），等效SINR（Signal-to-Interference-plus-Noise Ratio，信干噪比）}中的一种。

作为上述实施例的一个子实施例，所述目标测量值高于目标阈值被用于触发所述第一无线信号的发送。所述目标测量值是指将所述目标无线信号映射到物理层控制信道后的{BER（Bit Error Rate，误比特率），BLER（Block Error Rate，误块率）}中的一种。

作为上述实施例的一个子实施例，所述目标测量值被用于确定所述目标无线信号所经历的信道质量。

作为上述实施例的一个子实施例，所述目标测量值被用于确定所述目标无线信号所对应的物理层控制信道的信道质量。

作为一个实施例，所述第二无线信号所占用的时间资源在所述第一时间窗的起始时刻之前。

作为一个实施例，所述第二无线信号所占用的时间资源在所述第一时间窗起始时刻之后。

作为一个实施例，所述第一时间窗的起始时刻和所述第一无线信号所占用的时域资源之间的偏移量是预配置的。

作为一个实施例，所述第一时间窗的起始时刻和所述第一无线信号所占用的时域资源之间的偏移量是缺省配置的。

作为一个实施例，所述第一时间窗的起始时刻和所述第一无线信号所占用的时域资源之间的偏移量是基站配置的。

作为一个实施例，所述第一时间窗的终止时刻和所述第一无线信号所占用的时域资源之间的偏移量是预配置的。

作为一个实施例，所述第一时间窗的终止时刻和所述第一无线信号所占用的时域资源之间的偏移量是缺省配置的。

作为一个实施例，所述第一时间窗的终止时刻和所述第一无线信号所占用的时域资源之间的偏移量是基站配置的。

作为一个实施例，所述第一无线信号和所述第二无线信号在时域上的时间间隔被用于确定所述第一时间窗的长度。

根据本申请的一个方面，其特征在于，{所述第一无线信号，所述第二无线信号}中的至少一个被用于确定所述第三无线信号的多天线相关的发送。

作为一个实施例，{所述第一无线信号，所述第二无线信号}中的至少一个与所述第三无线信号的多天线相关的接收有关。

作为一个实施例，所述第一无线信号和所述第二无线信号都携带第二信息，所述第二信息被用于确定所述第三无线信号的多天线相关的发送。

作为上述实施例的一个子实施例，所述第二信息被用于确定用于发送所述第三无线信号的模拟发送波束。

作为上述实施例的一个子实施例，所述第二信息被用于确定第一天线端口组。所述第一天线端口组和被用于发送所述第三无线信号的天线端口组在空间上相关。

作为上述实施例的一个子实施例，述第二信息被用于确定第一天线端口组。所述第一天线端口组和被用于发送所述第三无线信号的天线端口在空间上 QCL。

作为上述实施例的一个子实施例，所述第二信息被用于确定第一天线端口组，被用于所述第一天线端口组的模拟发送波束被用于发送所述第三无线信号。

作为一个上述实施例的一个子实施例，所述第二信息和所述第三无线信号的多天线相关的接收有关。

作为一个上述实施例的一个子实施例，所述第二信息被用于确定第一天线端口组，被用于接收所述第一天线端口组的接收波束被用于在第一时间窗内监测所述第三无线信号。

作为一个实施例，第一时间间隔是所述第一无线信号所占的时域资源和所述第二无线信号所占的时域资源之间的时间间隔。

作为上述实施例的一个子实施例，所述第一无线信号被用于确定在所述第一时间间隔中所述第三无线信号的多天线相关的发送。

作为上述实施例的一个子实施例，所述第一无线信号和被用于在所述第一时间间隔中监测所述第三无线信号的多天线相关的接收有关。

作为上述实施例的一个子实施例，所述用户设备没有在所述第一时间间隔中监测到所述第三无线信号。

作为一个实施例，所述第二无线信号所占用的时域资源在所述第一时间窗之内。

作为一个实施例，所述第一时间窗被划分为第二时间间隔和第三时间间隔。所述第一无线信号被用于确定在所述第二时间间隔中所述第三无线信号的多天线相关的发送，所述第二无线信号被用于确定在所述第三时间间隔中所述第三无线信号的多天线相关的发送。所述第二时间间隔在所述第三时间间隔之前。所述第三时间间隔在所述第二无线信号所占用的时域资源之后。

作为上述实施例的一个子实施例，所述第二时间间隔的起始时刻是所述第一时间窗的起始时刻。

作为上述实施例的一个子实施例，所述第三时间间隔的终止时刻是所述第一时间窗的终止时刻。

作为上述实施例的一个子实施例，所述第二时间间隔的终止时刻是所述第三时间间隔的起始时刻。

作为上述实施例的一个子实施例，所述第二时间间隔的终止时刻是所述第二无线信号所占用的时域资源。

作为上述实施例的一个子实施例，所述第二时间间隔的终止时刻在所述第二无线信号所占用的时域资源之前。

作为上述实施例的一个子实施例，所述第二时间间隔的终止时刻在所述第二无线信号所占用的时域资源之后。

作为上述实施例的一个子实施例，所述第一无线信号和所述第二时间间隔中所述第三无线信号的多天线相关的接收有关，所述第二无线信号和在所述第三时间间隔中所述第三无线信号的多天线相关的接收有关。

作为上述实施例的一个子实施例，所述第一无线信号被用于确定第二天线端口组，所述第二天线端口组和被用于在所述第二时间间隔中发送所述第三无线信号的天线端口组在空间上相关。

作为上述实施例的一个子实施例，所述第一无线信号被用于确定第二天线端口组，在所述第二时间间隔中，所述第二天线端口组和被用于在所述第二时间间隔中发送所述第三无线信号的天线端口组在空间上 QCL。

作为上述实施例的一个子实施例，所述第一无线信号被用于确定第二天线端口组，在所述第二时间间隔中，用于所述第二天线端口组的模拟发送波束被用于在所述第二时间间隔中发送所述第三无线信号。

作为上述实施例的一个子实施例，所述第一无线信号被用于确定第二天线端口组，在所述第二时间间隔中，用于所述第二天线端口组的模拟接收波束被用于在所述第二时间间隔中接收所述第三无线信号。

作为上述实施例的一个子实施例，所述第二无线信号被用于确定第三天线端口组，所述第三天线端口组和被用于在所述第三时间间隔中发送所述第三无线信号的天线端口组在空间上相关。

作为上述实施例的一个子实施例，所述第二无线信号被用于确定第三天线端口组，在所述第三时间间隔中，所述第三天线端口组和被用于在所述第三时间间隔中发送所述第三无线信号的天线端口组在空间上 QCL。

作为上述实施例的一个子实施例，所述第二无线信号被用于确定第三天线端口组，在所述第三时间间隔中，用于所述第三天线端口组的模拟发送波束被用于在所述第三时间间隔中发送所述第三无线信号。

作为上述实施例的一个子实施例，所述第二无线信号被用于确定第三天线端口组，在所述第三时间间隔中，用于所述第三天线端口组的模拟接收波束被用于在所述第三时间间隔中接收所述第三无线信号。

作为一个实施例，所述多天线相关的发送是指发送波束。

作为一个实施例，所述多天线相关的发送是指模拟发送波束。

作为一个实施例，所述多天线相关的接收是指接收波束。

作为一个实施例，所述多天线相关的接收是指模拟接收波束。

根据本申请的一个方面，其特征在于，所述第一无线信号和所述第二无线信号被共同用于确定所述第三无线信号的多天线相关的发送。

作为一个实施例，上述方法的好处在于，充分利用空口资源上报更多信息。

作为一个实施例，所述第一无线信号和所述第二无线信号被共同用于确定用于发送所述第三无线信号的模拟发送波束。

作为一个实施例，所述第一无线信号和所述第二无线信号被共同用于确定第四天线端口组。所述第四天线端口组和被用于发送所述第三无线信号的天线端口组在空间上相关。

作为上述实施例的一个子实施例，被用于所述第四天线端口组的模拟发送波束被用于发送所述第三无线信号。

作为上述实施例的一个子实施例，被用于接收所述第四天线端口组的接收波束被用于接收所述第三无线信号。

作为上述实施例的一个子实施例，所述第一无线信号和所述第二无线信号被共同用于确定所述第四天线端口组在 K 个天线端口组中的索引值，所述 K 是大于 1 的正整数。

作为上述实施例的一个子实施例，所述第一无线信号和所述第二无线信号被分别用于确定第一比特块中的不同的比特位的值，所述第一比特块的值等于所述第四天线端口组在 K 个天线端口组中的索引值，所述 K 是大于 1 的正整数。

根据本申请的一个方面，其特征在于，所述第一信道是一个第一类物理层信道，所述第二信道是一个第二类物理层信道，所述第一类物理层信道和所述第二类物理层信道是两类不同的物理层信道。

作为一个实施例，上述方法的好处在于：利用不同类型的物理层信道上报用户请求，增加分集效应。

作为一个实施例，所述第一类物理层信道是物理层控制信道。

作为一个实施例，所述第二类物理层信道是物理层随机接入信道。

作为一个实施例，所述第二类物理层信道是无竞争的物理层随机接入信道。

作为一个实施例，所述第一类物理层信道上传输的信息经过 FEC。

作为一个实施例，所述第二类物理层信道上传输的信息不经过 FEC。

作为一个实施例，对于传输针对所述第三无线信号的多天线相关的发送的信息，所述第二类物理层信道比所述第一类物理层信道的可靠性更高。

作为一个实施例，所述第一类物理层信道所占用的时频资源是动态配置的。

作为一个实施例，所述第二类物理层信道所占用的时频资源是静态或者半静态配置的。

作为一个实施例，所述第一类物理层信道所占用的时频资源是由物理层控制信息配置的。

作为一个实施例，所述第二类物理层信道所占用的时频资源是更高层

信令配置的。

作为一个实施例，所述第二类物理层信道所占用的时频资源是 RRC（Radio Resource Control，无线资源配置）信令配置的。

根据本申请的一个方面，其特征在于，所述第一信道是一个物理层控制信道。

作为一个实施例，所述第一无线信号不仅被用于确定所述第三无线信号的多天线相关的发送，还被用于确定{SR（Scheduling Request，调度请求），HARQ/ACK（Hybrid Automatic Repeat Request-Acknowledgement，混合自动重传/确认），PMI（Precoding Matrix Indicator，预编码指示），CQI（Channel Quality Indicator，信道质量指示），RI（Rank Indicator，秩数指示），波束恢复请求（Beam Recovery Request），CRI（CSI-RS Resource Indicator，信道状态信息参考信号资源指示）}中的至少之一。

作为一个实施例，所述第一信道是 PUCCH。

作为一个实施例，所述第一信道是 sPUCCH（Short PUCCH，短 PUCCH）。

作为一个实施例，所述第二信道也是一个物理层控制信道。

作为一个实施例，所述第二信道不是一个物理层控制信道。

作为一个实施例，所述第二信道是一个物理层随机接入信道。

作为一个实施例，所述第二信道是一个无竞争的物理层随机接入信道。

作为一个实施例，被用于所述第一信道的多天线相关的发送和被用于所述第二信道的多天线相关的发送不同。

根据本申请的一个方面，其特征在于，所述第一无线信号所占用的时域资源被用于确定第二时间窗，所述第二无线信号所占用的时域资源在所述第二时间窗之内，所述第二时间窗在所述第一时间窗之内。

作为一个实施例，所述第一无线信号在时域上的资源被用于确定第二时间窗的起始时刻。

作为一个实施例，所述第二时间窗的起始时刻等于所述第一无线信号所占用的时域资源加上第二偏移量。

作为上述实施例的一个子实施例，所述第二偏移量是缺省配置的。

作为上述实施例的一个子实施例，所述第二偏移量是预配置的。

作为上述实施例的一个子实施例，所述第二偏移量是基站配置的。

作为一个实施例，所述第二时间窗的起始时刻和所述第一时间窗的起

始时刻相同。

作为一个实施例，所述第二时间窗的长度是缺省配置的。

作为一个实施例，所述第二时间窗的长度是预配置的。

作为一个实施例，所述第二时间窗的长度是基站配置的。

作为一个实施例，所述第二无线信号所占用的时域资源是第一时域资源池中的时域资源。

作为上述实施例的一个子实施例，所述第一时域资源池是更高层配置的。

作为上述实施例的一个子实施例，所述第一时域资源池是 RRC 信令配置的。

根据本申请的一个方面，其特征在于，所述第二无线信号所占用的时域资源被用于确定第三时间窗，所述第三时间窗的终止时刻是所述第一时间窗的终止时刻。

作为一个实施例，所述第二无线信号在时域上的资源被用于确定第三时间窗的起始时刻。

作为一个实施例，所述第三时间窗的起始时刻等于所述第二无线信号所占用的时域资源加上第三偏移量。

作为上述实施例的一个子实施例，所述第三偏移量是缺省配置的。

作为上述实施例的一个子实施例，所述第三偏移量是预配置的。

作为上述实施例的一个子实施例，所述第三偏移量是基站配置的。

作为一个实施例，所述第二时间窗和所述第三时间窗被用于确定所述第一时间窗。

作为一个实施例，所述第一时间窗的长度等于所述第二时间窗的起始点到第二无线信号所在的时域资源之间的时间间隔加上所述第二无线信号所在的时域资源到所述第三时间窗的终止时刻之间的时间间隔。

作为一个实施例，所述第三时间窗的终止时刻和所述第一时间窗的终止时刻相同。

作为一个实施例，所述第三时间窗的长度是缺省配置的。

作为一个实施例，所述第三时间窗的长度是预配置的。

作为一个实施例，所述第三时间窗的长度是基站配置的。

作为一个实施例，第二时间间隔是所述第一时间窗的起始时刻到所述

第三时间窗的起始时刻之间的时间间隔，所述第一无线信号被用于所述第二时间间隔中的与所述第三无线信号的多天线相关的发送。

作为上述实施例的一个子实施例，所述第一时间窗由所述第二时间间隔和所述第三时间窗组成。

作为一个实施例，所述第一无线信号被用于确定第一天线端口组。用于所述第一天线端口组的模拟发送波束被用于在所述第二时间间隔上发送所述第三无线信号。

作为一个实施例，所述第一无线信号被用于确定第一天线端口组。被用于所述第一天线端口组的模拟接收波束在第二时间间隔上监测所述第三无线信号。

作为一个实施例，所述第二无线信号被用于确定所述第三时间窗内与所述第三无线信号的多天线相关的发送。

作为一个实施例，所述第二无线信号被用于确定第二天线端口组。用于所述第二天线端口组的模拟发送波束被用于在所述第三时间窗内发送所述第三无线信号。

作为一个实施例，所述第二无线信号被用于确定第二天线端口组。用于所述第二天线端口组的模拟接收波束被用于在所述第三时间窗内监测所述第三无线信号。

本申请公开了一种用于无线通信的基站设备中的方法，包括

- 发送目标无线信号；
- 在第一信道上接收第一无线信号；
- 在第二信道上接收第二无线信号；
- 在第一时间窗内发送第三无线信号；

其中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于确定所述第一时间窗的终止时刻。

作为一个实施例，所述第三无线信号不是对所述第一无线信号的相应，所述第三无线信号是对所述第二无线信号的响应。

作为上述实施例的一个子实施例，所述基站设备没有正确接收所述第

一无线信号，正确接收所述第二无线信号。

作为上述实施例的一个子实施例，所述基站设备依次正确接收所述第一无线信号和所述第二无线信号。

作为上述实施例的一个子实施例，所述第一无线信号不被用于确定所述第三无线信号多天线相关的发送，所述第二无线信号被用于确定所述第三无线信号多天线相关的发送。

作为一个实施例，所述基站设备依次正确接收所述第一无线信号和所述第二无线信号，所述第三无线信号是对所述第一无线信号和所述第二无线信号的响应。

作为上述实施例的一个子实施例，所述第一无线信号和所述第二无线信号共同被用于确定所述第三无线信号多天线相关的发送。

作为一个实施例，所述基站设备在所述第二无线信号所占用的时域资源之后发送所述第三无线信号。

根据本申请的一个方面，其特征在于，{所述第一无线信号，所述第二无线信号}中的至少一个被用于确定所述第三无线信号的多天线相关的发送。

根据本申请的一个方面，其特征在于，所述第一无线信号和所述第二无线信号被共同用于确定所述第三无线信号的多天线相关的发送。

根据本申请的一个方面，其特征在于，所述第一信道是一个第一类物理层信道，所述第二信道是一个第二类物理层信道，所述第一类物理层信道和所述第二类物理层信道是两类不同的物理层信道。

根据本申请的一个方面，其特征在于，所述第一信道是一个物理层控制信道。

根据本申请的一个方面，其特征在于，所述第一无线信号所占用的时域资源被用于确定第二时间窗，所述第二无线信号所占用的时域资源在所述第二时间窗之内，所述第二时间窗在所述第一时间窗之内。

根据本申请的一个方面，其特征在于，所述第二无线信号所占用的时域资源被用于确定第三时间窗，所述第三时间窗的终止时刻是所述第一时间窗的终止时刻。

本申请公开了一种用于无线通信的用户设备，包括

- 第一接收机模块，接收目标无线信号；

- 第二发射机模块，在第一信道上发送第一无线信号；

- 第三发射机模块，在第二信道上发送第二无线信号；

- 第四接收机模块，在第一时间窗内监测第三无线信号；

其中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于确定所述第一时间窗的终止时刻。

作为一个实施例，上述用户设备的特征在于，{所述第一无线信号，所述第二无线信号}中的至少一个被用于确定所述第三无线信号的多天线相关的发送。

作为一个实施例，上述用户设备的特征在于，所述第一无线信号和所述第二无线信号被共同用于确定所述第三无线信号的多天线相关的发送。

作为一个实施例，上述用户设备的特征在于，所述第一信道是一个第一类物理层信道，所述第二信道是一个第二类物理层信道，所述第一类物理层信道和所述第二类物理层信道是两类不同的物理层信道。

作为一个实施例，上述用户设备的特征在于，所述第一信道是一个物理层控制信道。

作为一个实施例，上述用户设备的特征在于，所述第一无线信号所占用的时域资源被用于确定第二时间窗，所述第二无线信号所占用的时域资源在所述第二时间窗之内，所述第二时间窗在所述第一时间窗之内。

作为一个实施例，上述用户设备的特征在于，所述第二无线信号所占用的时域资源被用于确定第三时间窗，所述第三时间窗的终止时刻是所述第一时间窗的终止时刻。

本申请公开了一种用于无线通信的基站设备，包括

- 第一发射机模块，发送目标无线信号；

- 第二接收机模块，在第一信道上接收第一无线信号；

- 第三接收机模块，在第二信道上接收第二无线信号；

- 第四发射机模块，在第一时间窗内发送第三无线信号；

其中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用

于确定所述第一时间窗的终止时刻。

作为一个实施例，上述基站设备的特征在于，{所述第一无线信号，所述第二无线信号}中的至少一个被用于确定所述第三无线信号的多天线相关的发送。

作为一个实施例，上述基站设备的特征在于，所述第一无线信号和所述第二无线信号被共同用于确定所述第三无线信号的多天线相关的发送。

作为一个实施例，上述基站设备的特征在于，所述第一信道是一个第一类物理层信道，所述第二信道是一个第二类物理层信道，所述第一类物理层信道和所述第二类物理层信道是两类不同的物理层信道。

作为一个实施例，上述基站设备的特征在于，所述第一信道是一个物理层控制信道。

作为一个实施例，上述基站设备的特征在于，所述第一无线信号所占用的时域资源被用于确定第二时间窗，所述第二无线信号所占用的时域资源在所述第二时间窗之内，所述第二时间窗在所述第一时间窗之内。

作为一个实施例，上述基站设备的特征在于，所述第二无线信号所占用的时域资源被用于确定第三时间窗，所述第三时间窗的终止时刻是所述第一时间窗的终止时刻。

作为一个实施例，相比现有公开技术，本申请具有如下技术优势：

- 充分利用被分配的空口资源，提高被用于发送用户自行确定的上报请求的空口资源的利用效率；
- 增加请求上报的鲁棒性。

附图说明

通过阅读参照以下附图所作的对非限制性实施例所作的详细描述，本申请的其它特征、目的和优点将会变得更加明显：

图 1 示出了根据本申请的一个实施例的目标无线信号，第一无线信号，第二无线信号和第三无线信号的流程图；

图 2 示出了根据本申请的一个实施例的网络架构的示意图；

图 3 示出了根据本申请的一个实施例的用户平面和控制平面的无线协议架构的示意图；

图 4 示出了根据本申请的一个实施例的演进节点和给定用户设备的示意图；

图 5 示出了根据本申请的一个实施例的无线信号传输流程图；

图 6 示出了根据本申请的一个实施例的第一时间窗，第二时间窗和第三时间窗的示意图。

图 7 示出了根据本申请的一个实施例的目标无线信号和第三无线信号的多天线相关的发送和接收的示意图；

图 8 示出了根据本申请的一个实施例的 UE 中的处理装置的结构框图；

图 9 示出了根据本申请的一个实施例的基站中的处理装置的结构框图。

具体实施方式

下文将结合附图对本申请的技术方案作进一步详细说明，需要说明的是，在不冲突的情况下，本申请的实施例和实施例中的特征可以任意相互组合。

实施例 1

实施例 1 示例了根据本申请的目标无线信号，第一无线信号，第二无线信号和第三无线信号的传输的流程图，如附图 1 所示。附图 1 中，每个方框代表一个步骤。在实施例 1 中，本申请中的所述用户设备依次接收目标无线信号，在第一信道上发送第一无线信号，在第一时间窗内监测第三无线信号并在第二信道上发送第二无线信号；其中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于确定所述第一时间窗的终止时刻。

作为一个实施例，所述目标无线信号被用于针对在所述第一频域资源上传输的物理层控制信道进行信道质量测量。

作为一个实施例，所述目标无线信号是被用于信道测量的下行参考信号。

作为一个实施例，所述信道测量的结果低于目标阈值，所述第一无线信号和所述第二无线信号的发送被触发。

作为一个实施例，所述第一无线信号和所述第二无线信号是波束恢复请求。

作为一个实施例，上行物理层控制信道被用于传输所述第一无线信号。

作为一个实施例，物理层随机接入信道被用于传输所述第二无线信号。

作为一个实施例，所述第二无线信号所占用的时域资源在所述第一时间窗内。

作为一个实施例，所述第二无线信号被用于确定所述第三无线信号的多天线相关的发送。

作为一个实施例，所述第一无线信号和所述第二无线信号被共同用于确定所述第三无线信号的多天线相关的发送。

作为一个实施例，所述第二无线信号所占用的时域资源被用于确定第三时间窗的起始时刻。所述第三时间窗的终止时刻和所述第一时间窗相同。第二时间间隔从所述第一时间窗的起始时刻到所述第三时间窗的起始时刻的时间间隔。所述第一无线信号和被用于在所述第二时间间隔上用于监测所述第三无线信号的多天线相关的接收有关。所述第二无线信号和被用于在所述第三时间窗上的用于监测所述第三无线信号的多天线相关的接收有关。

作为一个实施例，所述第一无线信号被用于确定第二天线端口组，被用于接收所述第二天线端口组的模拟接收波束被用于在所述第二时间间隔上监测所述第三无线信号。

作为一个实施例，所述第二无线信号被用于确定第三天线端口组，被用于接收所述第三天线端口组的模拟接收波束被用于在所述第三时间窗上监测所述第三无线信号。

作为一个实施例，所述第一无线信号和所述第二无线信号被共同用于确定所述第三天线端口组。

作为一个实施例，所述用户设备在所述第二时间间隔上没有监测到所述第三无线信号。

作为一个实施例，下行物理层控制信道被用于传输所述第三无线信号。

实施例 2

施例 2 示例了根据本申请的一个网络架构的示意图，如附图 2 所示。

图 2 是说明了 NR 5G，LTE(Long-Term Evolution，长期演进）及 LTE-A(Long-Term Evolution Advanced，增强长期演进)系统网络架构 200 的图。NR 5G 或 LTE 网络架构 200 可称为 EPS(Evolved Packet System，演进分组系统)200 某种其它合适术语。EPS 200 可包括一个或一个以上 UE(User Equipment，用户设备)201，NG-RAN(下一代无线接入网络)202，EPC（Evolved Packet Core，演进分组核心）/5G-CN(5G-Core Network,5G 核心网)210，HSS(Home Subscriber Server，归属签约用户服务器)220 和因特网服务 230。EPS 可与其它接入网络互连，但为了简单未展示这些实体/接口。如图所示，EPS 提供包交换服务，然而所属领域的技术人员将容易了解，贯穿本申请呈现的各种概念可扩展到提供电路交换服务的网络或其它蜂窝网络。NG-RAN 包括 NR 节点 B（ gNB ）203 和其它 gNB204。gNB203 提供面向 UE201 的用户和控制平面协议终止。gNB203 可经由 Xn 接口(例如，回程)连接到其它 gNB204。gNB203 也可称为基站、基站收发台、无线电基站、无线电收发器、收发器功能、基本服务集合（BSS）、扩展服务集合（ESS）、TRP（发送接收点）或某种其它合适术语。gNB203 为 UE201 提供对 EPC/5G-CN210 的接入点。UE201 的实例包括蜂窝式电话、智能电话、会话起始协议（ SIP ）电话、膝上型计算机、个人数字助理（ PDA ）、卫星无线电、全球定位系统、多媒体装置、视频装置、数字音频播放器（ 例如，MP3 播放器）、相机、游戏控制台、无人机、飞行器、窄带物理网设备、机器类型通信设备、陆地交通工具、汽车、可穿戴设备，或任何其它类似功能装置。所属领域的技术人员也可将 UE201 称为移动台、订户台、移动单元、订户单元、无线单元、远程单元、移动装置、无线装置、无线通信装置、远程装置、移动订户台、接入终端、移动终端、无线终端、远程终端、手持机、用户代理、移动客户端、客户端或某个其它合适术语。gNB203 通过 S1/NG 接口连接到 EPC/5G-CN210。EPC/5G-CN210 包括 MME/AMF/UPF 211、其它 MME/AMF/UPF214、S-GW(Service Gateway，服务网关)212 以及 P-GW(Packet Date Network Gateway，分组数据网络网关)213。MME/AMF/UPF211 是处理 UE201 与 EPC/5G-CN210 之间的信令的控制节点。大体上，MME/AMF/UPF211 提供承载和连接管理。所有用户 IP(Internet Protocal，因特网协议)包是通过 S-GW212 传送，S-GW212 自身连接到 P-GW213。P-GW213 提供 UE IP 地址分配以及其它功能。P-GW213 连接到因

特网服务 230。因特网服务 230 包括运营商对应因特网协议服务，具体可包括因特网、内联网、IMS(IP Multimedia Subsystem，IP 多媒体子系统)和 PS 串流服务(PSS)。

作为一个实施例，所述 UE201 对应本申请中的用户设备。

作为一个实施例，所述 gNB203 对应本申请中的基站。

作为一个实施例，所述 UE201 支持多天线传输。

作为一个实施例，所述 UE201 支持模拟波束赋型。

作为一个实施例，所述 gNB203 支持多天线传输。

作为一个实施例，所述 gNB203 支持模拟波束赋型。

实施例 3

实施例 3 示出了根据本申请的一个用户平面和控制平面的无线协议架构的实施例的示意图，如附图 3 所示。图 3 是说明用于用户平面和控制平面的无线电协议架构的实施例的示意图，图 3 用三个层展示用于用户设备（UE）和基站设备（gNB 或 eNB）的无线电协议架构：层 1、层 2 和层 3。层 1(L1 层)是最低层且实施各种 PHY(物理层)信号处理功能。L1 层在本文将称为 PHY301。层 2(L2 层)305 在 PHY301 之上，且负责通过 PHY301 在 UE 与 gNB 之间的链路。在用户平面中，L2 层 305 包括 MAC(Medium Access Control，媒体接入控制)子层 302、RLC(Radio Link Control，无线链路层控制协议)子层 303 和 PDCP(Packet Data Convergence Protocol，分组数据汇聚协议)子层 304，这些子层终止于网络侧上的 gNB 处。虽然未图示，但 UE 可具有在 L2 层 305 之上的若干上部层，包括终止于网络侧上的 P-GW 处的网络层(例如，IP 层)和终止于连接的另一端(例如，远端 UE、服务器等等)处的应用层。PDCP 子层 304 提供不同无线电承载与逻辑信道之间的多路复用。PDCP 子层 304 还提供用于上部层数据包的标头压缩以减少无线电发射开销，通过加密数据包而提供安全性，以及提供 gNB 之间的对 UE 的越区移交支持。RLC 子层 303 提供上部层数据包的分段和重组装，丢失数据包的重新发射以及数据包的重排序以补偿由于 HARQ 造成的无序接收。MAC 子层 302 提供逻辑与输送信道之间的多路复用。MAC 子层 302 还负责在 UE 之间分配一个小区中的各种无线电资源(例如，资源块)。MAC 子层 302 还负责 HARQ 操作。在控制平面中，用于 UE 和 gNB 的无线电协议架构对于

物理层 301 和 L2 层 305 来说大体上相同，但没有用于控制平面的标头压缩功能。控制平面还包括层 3(L3 层)中的 RRC(Radio Resource Control，无线电资源控制)子层 306。RRC 子层 306 负责获得无线电资源(即，无线电承载)且使用 gNB 与 UE 之间的 RRC 信令来配置下部层。

作为一个实施例，附图 3 中的无线协议架构适用于本申请中的用户设备。

作为一个实施例，附图 3 中的无线协议架构适用于本申请中的基站设备。

作为一个实施例，本申请中的所述目标无线信号生成于所述 PHY301。

作为一个实施例，本申请中的所述第一无线信号生成于所述 PHY301。

作为一个实施例，本申请中的所述第二无线信号生成于所述 PHY301。

作为一个实施例，本申请中的所述第三无线信号生成于所述 PHY301。

实施例 4

实施例 4 示出了根据本申请的一个基站设备和给定用户设备的示意图，如附图 4 所示。图 4 是在接入网络中与 UE450 通信的 gNB410 的框图。

在基站设备（410）中可以包括控制器/处理器 440，调度器 443，存储器 430，接收处理器 412，发射处理器 415，MIMO 发射处理器 441，MIMO 检测器 442，发射器/接收器 416 和天线 420。

在用户设备（UE450）中可以包括控制器/处理器 490，存储器 480，数据源 467，发射处理器 455，接收处理器 452，MIMO 发射处理器 471，MIMO 检测器 472，发射器/接收器 456 和天线 460。

在下行传输中，与基站设备（410）有关的处理可以包括：

- 上层包到达控制器/处理器 440，控制器 / 处理器 440 提供包头压缩、加密、包分段连接和重排序以及逻辑与传输信道之间的多路复用解复用，来实施用于用户平面和控制平面的 L2 层协议；上层包中可以包括数据或者控制信息，例如 DL-SCH(Downlink Shared Channel，下行共享信道)；
- 控制器 / 处理器 440 可与存储程序代码和数据的存储器 430 相关联。存储器 430 可以为计算机可读媒体；

- 控制器 / 处理器 440 通知调度器 443 传输需求，调度器 443 用于调度与传输需求对应的空口资源，并将调度结果通知控制器 / 处理器 440；
- 控制器/处理器 440 将接收处理器 412 对上行接收进行处理得到的对下行发送的控制信息传递给发射处理器 415；
- 发射处理器 415 接收控制器/处理器 440 的输出比特流，实施用于 L1 层(即物理层)的各种信号发射处理功能包括编码、交织、加扰、调制、功率控制/分配和物理层控制信令（包括 PBCH，PDCCH，PHICH，PCFICH，参考信号）生成等；
- MIMO 发射处理器 441 对数据符号，控制符号或者参考信号符号进行空间处理（比如多天线预编码，数字波束赋型），输出基带信号至发射器 416；
- MIMO 发射处理器 441 输出模拟发送波束赋性向量至发射器 416；
- 发射器 416 用于将 MIMO 发射处理器 441 提供的基带信号转换成射频信号并经由天线 420 发射出去；每个发射器 416 对各自的输入符号流进行采样处理得到各自的采样信号流；每个发射器 416 对各自的采样流进行进一步处理（比如数模转换，放大，过滤，上变频等）得到下行信号；模拟发送波束赋型在发射器 416 中进行处理。

在下行传输中，与用户设备（UE450）有关的处理可以包括：

- 接收器 456 用于将通过天线 460 接收的射频信号转换成基带信号提供给 MIMO 检测器 472；模拟接收波束赋型在接收器 456 中进行处理；
- MIMO 检测器 472 用于从接收器 456 接收到的信号进行 MIMO 检测，为接收处理器 452 提供经过 MIMO 检测后的基带信号；
- MIMO 检测器 472 输出模拟接收波束赋型向量至接收器 456；
- 接收处理器 452 实施用于 L1 层(即，物理层)的各种信号接收处理功能包括解码、解交织、解扰、解调和物理层控制信令提取等；
- 控制器 / 处理器 490 接收接收处理器 452 输出的比特流，提供包头解压缩、解密、包分段连接和重排序以及逻辑与传输信道之间的多路复用解复用，来实施用于用户平面和控制平面的 L2 层协议；
- 控制器 / 处理器 490 可与存储程序代码和数据的存储器 480 相关联。存储器 480 可以为计算机可读媒体；

- 控制器/处理器 490 将发射处理器 455 对上行发送进行处理得到的对下行接收的控制信息传递给接收处理器 452。

本申请中的目标无线信号通过发射处理器 415 生成。MIMO 发射处理器 441 对发射处理器 415 输出的所述目标无线信号相关的基带信号进行多天线预编码。发射器 416 将 MIMO 发射处理器 441 提供的基带信号转换成射频信号，进行模拟发送波束赋型，并经由天线 420 发射出去。接收器 456 将通过天线 460 接收，进行模拟接收波束赋型，得到和所述目标无线信号有关的射频信号，并转换成基带信号提供给 MIMO 检测器 472。MIMO 检测器 472 对从接收器 456 接收到的信号进行 MIMO 检测。接收处理器 452 对 MIMO 检测器 472 输出的基带信号进行信道测量。

本申请中的第三无线信号通过发射处理器 415 生成。MIMO 发射处理器 441 对发射处理器 415 输出的所述第三无线信号相关的基带信号进行多天线预编码。发射器 416 将 MIMO 发射处理器 441 提供的基带信号转换成射频信号，进行模拟发送波束赋型，并经由天线 420 发射出去。接收器 456 将通过天线 460 接收，进行模拟接收波束赋型，得到和所述第三无线信号有关的射频信号，并转换成基带信号提供给 MIMO 检测器 472。MIMO 检测器 472 对从接收器 456 接收到的信号进行 MIMO 检测。接收处理器 452 对 MIMO 检测器 472 输出的基带信号进行处理得到所述第三无线信号。

作为一个实施例，接收处理器 412 从所述第二无线信号中提取和所述第三无线信号多天线相关的发送相关的信息，被所述控制器/处理器 440 通过所述发射处理器 415 和 MIMO 发射处理器 441 传递给发射器 416 对所述第三无线信号进行模拟发送波束赋型。

作为一个实施例，接收处理器 412 从所述第一无线信号和所述第二无线信号中提取和所述第三无线信号多天线相关的发送相关的信息，被所述控制器/处理器 440 通过所述发射处理器 415 和 MIMO 发射处理器 441 传递给发射器 416 对所述第三无线信号进行模拟发送波束赋型。

在上行传输中，与用户设备（UE450）有关的处理可以包括：

- 数据源 467 提供上层包到控制器/处理器 490，控制器 / 处理器 490 提供包头压缩、加密、包分段连接和重排序以及逻辑与传输信道之间的多路复用解复用，来实施用于用户平面和控制平面的 L2 层协

议；上层包中可以包括数据或者控制信息，例如 UL-SCH（Uplink Shared Channel，上行共享信道）；

- 控制器 / 处理器 490 可与存储程序代码和数据的存储器 480 相关联。存储器 480 可以为计算机可读媒体；
- 控制器/处理器 490 将接收处理器 452 对下行接收进行处理得到的对上行发送的控制信息传递给发射处理器 455；
- 发射处理器 455 接收控制器/处理器 490 的输出比特流，实施用于 L1 层(即物理层)的各种信号发射处理功能包括编码、交织、加扰、调制、功率控制/分配和物理层控制信令（包括 PUCCH，SRS（Sounding Reference Signal，探测参考信号））生成等；
- MIMO 发射处理器 471 对数据符号，控制符号或者参考信号符号进行空间处理（比如多天线预编码，数字波束赋型），输出基带信号至发射器 456；
- MIMO 发射处理器 471 输出模拟发送波束赋型向量至发射器 457；
- 发射器 456 用于将 MIMO 发射处理器 471 提供的基带信号转换成射频信号并经由天线 460 发射出去；每个发射器 456 对各自的输入符号流进行采样处理得到各自的采样信号流。每个发射器 456 对各自的采样流进行进一步处理（比如数模转换，放大，过滤，上变频等）得到上行信号。模拟发送波束赋型在发射器 456 中进行处理。

在上行传输中，与基站设备（410）有关的处理可以包括：

- 接收器 416 用于将通过天线 420 接收的射频信号转换成基带信号提供给 MIMO 检测器 442；模拟接收波束赋型在接收器 416 中进行处理；
- MIMO 检测器 442 用于从接收器 416 接收到的信号进行 MIMO 检测，为接收处理器 442 提供经过 MIMO 检测后的符号；
- MIMO 检测器 442 输出模拟接收波束赋型向量至接收器 416；
- 接收处理器 412 实施用于 L1 层(即，物理层)的各种信号接收处理功能包括解码、解交织、解扰、解调和物理层控制信令提取等；
- 控制器 / 处理器 440 接收接收处理器 412 输出的比特流，提供包头解压缩、解密、包分段连接和重排序以及逻辑与传输信道之间的多路复用解复用，来实施用于用户平面和控制平面的 L2 层协议；
- 控制器 / 处理器 440 可与存储程序代码和数据的存储器 430 相关联。

存储器 430 可以为计算机可读媒体；

- 控制器/处理器 440 将发射处理器 415 对下行发送进行处理得到的对上行发送的控制信息传递给接收处理器 412；

本申请中的第一无线信号通过发射处理器 455 生成。MIMO 发射处理器 471 对发射处理器 455 输出的所述第一无线信号相关的基带信号进行多天线预编码。发射器 456 将 MIMO 发射处理器 471 提供的基带信号转换成射频信号，进行模拟发送波束赋型，并经由天线 460 发射出去。接收器 416 将通过天线 420 接收，进行模拟接收波束赋型，得到和所述第一无线信号有关的射频信号，并转换成基带信号提供给 MIMO 检测器 442。MIMO 检测器 442 对从接收器 416 接收到的信号进行 MIMO 检测。接收处理器 412 对 MIMO 检测器 442 输出的基带信号进行处理得到所述第一无线信号。

本申请中的第二无线信号通过发射处理器 455 生成。MIMO 发射处理器 471 对发射处理器 455 输出的所述第二无线信号相关的基带信号进行多天线预编码。发射器 456 将 MIMO 发射处理器 471 提供的基带信号转换成射频信号，进行模拟发送波束赋型，并经由天线 460 发射出去。接收器 416 将通过天线 420 接收，进行模拟接收波束赋型，得到和所述第二无线信号有关的射频信号，并转换成基带信号提供给 MIMO 检测器 442。MIMO 检测器 442 对从接收器 416 接收到的信号进行 MIMO 检测。接收处理器 412 对 MIMO 检测器 442 输出的基带信号进行处理得到所述第二无线信号。

作为一个实施例，所述 UE450 装置包括：至少一个处理器以及至少一个存储器，所述至少一个存储器包括计算机程序代码；所述至少一个存储器和所述计算机程序代码被配置成与所述至少一个处理器一起使用，所述 UE450 装置至少：接收目标无线信号,在第一信道上发送第一无线信号,在第二信道上发送第二无线信号,在第一时间窗内监测第三无线信号；其中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于确定所述第一时间窗的终止时刻。

作为一个实施例，所述 UE450 包括：一种存储计算机可读指令程序的存储器，所述计算机可读指令程序在由至少一个处理器执行时产生动作，所述动作包括：接收目标无线信号,在第一信道上发送第一无线信号,在第

二信道上发送第二无线信号,在第一时间窗内监测第三无线信号,其中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于确定所述第一时间窗的终止时刻。

作为一个实施例，所述 gNB410 装置包括：至少一个处理器以及至少一个存储器，所述至少一个存储器包括计算机程序代码；所述至少一个存储器和所述计算机程序代码被配置成与所述至少一个处理器一起使用。所述 gNB410 装置至少：发送目标无线信号,在第一信道上接收第一无线信号,在第二信道上接收第二无线信号,在第一时间窗内发送第三无线信号,其中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于确定所述第一时间窗的终止时刻。

作为一个实施例，所述 gNB410 包括：一种存储计算机可读指令程序的存储器，所述计算机可读指令程序在由至少一个处理器执行时产生动作，所述动作包括：发送目标无线信号,在第一信道上接收第一无线信号,在第二信道上接收第二无线信号,在第一时间窗内发送第三无线信号,其中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于确定所述第一时间窗的终止时刻。

作为一个实施例，UE450 对应本申请中的用户设备。

作为一个实施例，gNB410 对应本申请中的基站。

作为一个实施例，发射处理器 415，MIMO 发射器 441 和发射器 416 被用于发送本申请中的目标无线信号。

作为一个实施例，接收器 456，MIMO 检测器 472 和接收处理器 452 被用于接收本申请中的目标无线信号。

作为一个实施例，发射处理器 455，MIMO 发射器 471 和发射器 456 被用于发送本申请中的第一无线信号。

作为一个实施例，接收器 416，MIMO 检测器 442 和接收处理器 412 被

用于接收本申请中的第一无线信号。

作为一个实施例，发射处理器 455，MIMO 发射器 471 和发射器 456 被用于发送本申请中的第二无线信号。

作为一个实施例，接收器 416，MIMO 检测器 442 和接收处理器 412 被用于接收本申请中的第二无线信号。

作为一个子实施例，发射处理器 415，MIMO 发射器 441 和发射器 416 被用于发送本申请中的第三无线信号。

作为一个子实施例，接收器 456，MIMO 检测器 472 和接收处理器 452 被用于接收本申请中的第三无线信号。

实施例 5

实施例 5 示例了根据本申请的一个无线信号传输的流程图，如附图 5 所示。附图 5 中，基站 N1 是 UE U2 的服务小区的维持基站。

对于**基站 N1**，在步骤 S11 中发送目标无线信号，在步骤 S12 中在第一信道上接收第一无线信号，在步骤 S13 中在第二信道上接收第二无线信号，在步骤 S14 中在第一时间窗内发送第三无线信号。

对于 **UE U2**，在步骤 S21 中接收目标无线信号，在步骤 S22 中在第一信道上发送第一无线信号，在步骤 S23 中在第二信道上发送第二无线信号，在步骤 S24 中在第一时间窗内监测第三无线信号。

在实施例 5 中，针对所述目标无线信号的测量被 U2 用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被 N1 和 U2 用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于 N1 和 U2 确定所述第一时间窗的终止时刻。

作为一个子实施例，{所述第一无线信号，所述第二无线信号}中的至少一个被用于 N1 确定所述第三无线信号的多天线相关的发送。

作为一个子实施例，所述第一无线信号和所述第二无线信号共同被 N1 用于确定所述第三无线信号的多天线相关的发送。

作为一个子实施例，所述第一信道是一个第一类物理层信道，所述第二信道是一个第二类物理层信道，所述第一类物理层信道和所述第二类物理层信道是两类不同的物理层信道。

作为一个子实施例，所述第一信道是一个物理层控制信道。

作为一个子实施例，所述第一无线信号所占用的时域资源被 N1 和 U2 用于确定第二时间窗，所述第二无线信号所占用的时域资源在所述第二时间窗之内，所述第二时间窗在所述第一时间窗之内。

作为一个子实施例，所述第二无线信号所占用的时域资源被 N1 和 U2 用于确定第三时间窗，所述第三时间窗的终止时刻是所述第一时间窗的终止时刻。

不冲突的情况下，上述子实施例能够任意组合。

实施例 6

实施例 6 示例了第一时间窗，第二时间窗和第三时间窗，如附图 6 所示。

在实施例 6 中，第一无线信号所占用的时域资源被用于确定第二时间窗的起始时刻，第二无线信号所占用的时域资源被用于确定第三时间窗的起始时刻。第一时间窗的起始时刻与所述第二时间窗的起始时刻相同。所述第二无线信号所占用的时域资源在所述第二时间窗内。所述第一时间窗的终止时刻与所述第三时间窗的终止时刻相同。用户设备在所述第一时间窗的起始时刻到所述第二无线信号所占用的时域资源之间的时间间隔上监测第三无线信号，但是没有没有监测到所述第三无线信号。所述第三无线信号在所述第二无线信号之后发送。

作为一个子实施例，基站没有在所述第一时间窗的起始时刻到所述第二无线信号所占用的时域资源之间的时间间隔上发送所述第三无线信号。

作为一个子实施例，所述第二无线信号被用于确定第二天线端口组，用于形成所述第二天线端口组的模拟发送波束被用于在所述第三时间窗内发送所述第三无线信号。

作为一个子实施例，用于接收所述第二天线端口组的模拟接收波束被用于在所述第三时间窗内监测所述第三无线信号。

作为一个子实施例，所述第一无线信号被用于确定第一天线端口组，用于接收所述第一天线端口组的模拟接收波束被用于在所述第一时间窗的起始时刻到所述第三时间窗的起始时刻之间的时间间隔上监测所述第三无线信号。

作为一个子实施例，所述第一无线信号占用的时域资源是所述第二时

间窗的起始时刻。

作为一个子实施例，所述第二时间窗的起始时刻等于所述第一无线信号占用的时域资源加上一个偏移量。

作为一个子实施例，所述第二无线信号占用的时域资源是所述第三时间窗的起始时刻。

作为一个子实施例，所述第三时间窗的起始时刻等于所述第二无线信号占用的时域资源加上一个偏移量。

实施例 7

实施例 7 示例了目标无线信号和第三无线信号的多天线相关的发送和接收，如附图 7 所示。

在实施例 7 中，第一发送波束被用于发送目标无线信号，第一接收波束被用于接收所述目标无线信号；第二发送波束被用于发送第三无线信号，第二接收波束被用于接收所述第三无线信号。所述第一发送波束的发送方向不同于所述第二发送波束，所述第一接收波束的接收方向不同于所述第一接收波束。

作为一个子实施例，所述发送波束是模拟发送波束，所述接收波束是模拟接收波束。

作为一个子实施例，模拟波束赋型向量被作用于射频电路的移相器生成模拟波束。

作为一个子实施例，用户设备针对所述目标无线信号进行信道测量，所述信道测量的结果低于目标阈值；所述用户设备发送第一无线信号，所述第一无线信号被用于确定所述第二发送波束；所述用户设备使用第二接收波束监测所述第三无线信号。

实施例 8

实施例 8 示例了 UE 中的处理装置的结构框图，如附图 8 所示。附图 8 中，UE 处理装置 800 主要由第一接收机模块 801，第二发射机模块 802，第三发射机模块 803 和第四接收机模块 804 组成。

在实施例 8 中，第一接收机模块 801 接收目标无线信号，第二发射机模块 802 在第一信道上发送第一无线信号，第三发射机模块 803 在第二信

道上发送第二无线信号，第四接收机模块 804 在第一时间窗内监测第三无线信号。

在实施例 8 中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间资源被用于确定所述第一时间窗的终止时刻。

作为一个子实施例，{所述第一无线信号，所述第二无线信号}中的至少一个被用于确定所述第三无线信号的多天线相关的发送。

作为一个子实施例，所述第一无线信号和所述第二无线信号被共同用于确定所述第三无线信号的多天线相关的发送。

作为一个子实施例，所述第一信道是一个第一类物理层信道，所述第二信道是一个第二类物理层信道，所述第一类物理层信道和所述第二类物理层信道是两类不同的物理层信道。

作为一个子实施例，所述第一信道是一个物理层控制信道。

作为一个子实施例，所述第一无线信号所占用的时域资源被用于确定第二时间窗，所述第二无线信号所占用的时域资源在所述第二时间窗之内，所述第二时间窗在所述第一时间窗之内。

作为一个子实施例，所述第二无线信号所占用的时域资源被用于确定第三时间窗，所述第三时间窗的终止时刻是所述第一时间窗的终止时刻。

实施例 9

实施例 9 示例了基站中的处理装置的结构框图，如附图 9 所示。附图 9 中，基站处理装置 900 主要由第一发射机模块 901，第二接收机模块 902，第三接收模块 903 和第四发射机模块 904 组成

在实施例 9 中，第一发射机模块 901 发送目标无线信号，第二接收机模块 902 在第一信道上接收第一无线信号，第三接收机模块 903 在第二信道上接收第二无线信号，第四发射机模块 904 在第一时间窗内发送第三无线信号。

在实施例 9 中，针对所述目标无线信号的测量被用于触发所述第一无线信号和所述第二无线信号的发送；所述第一无线信号所占用的时间资源被用于确定所述第一时间窗的起始时刻；所述第二无线信号所占用的时间

资源被用于确定所述第一时间窗的终止时刻。

作为一个子实施例，{所述第一无线信号，所述第二无线信号}中的至少一个被用于确定所述第三无线信号的多天线相关的发送。

作为一个子实施例，所述第一无线信号和所述第二无线信号被共同用于确定所述第三无线信号的多天线相关的发送。

作为一个子实施例，所述第一信道是一个第一类物理层信道，所述第二信道是一个第二类物理层信道，所述第一类物理层信道和所述第二类物理层信道是两类不同的物理层信道。

作为一个子实施例，所述第一信道是一个物理层控制信道。

作为一个子实施例，所述第一无线信号所占用的时域资源被用于确定第二时间窗，所述第二无线信号所占用的时域资源在所述第二时间窗之内，所述第二时间窗在所述第一时间窗之内。

作为一个子实施例，所述第二无线信号所占用的时域资源被用于确定第三时间窗，所述第三时间窗的终止时刻是所述第一时间窗的终止时刻。

本领域普通技术人员可以理解上述方法中的全部或部分步骤可以通过程序来指令相关硬件完成，所述程序可以存储于计算机可读存储介质中，如只读存储器，硬盘或者光盘等。可选的，上述实施例的全部或部分步骤也可以使用一个或者多个集成电路来实现。相应的，上述实施例中的各模块单元，可以采用硬件形式实现，也可以由软件功能模块的形式实现，本申请不限于任何特定形式的软件和硬件的结合。本申请中的 UE 和终端包括但不限于无人机，无人机上的通信模块，遥控飞机，飞行器，小型飞机，手机，平板电脑，笔记本，车载通信设备，无线传感器，上网卡，物联网终端，RFID 终端，NB-IOT 终端，MTC（Machine Type Communication，机器类型通信）终端，eMTC（enhanced MTC，增强的 MTC）终端，数据卡，上网卡，车载通信设备，低成本手机，低成本平板电脑等设备。本申请中的基站包括但不限于宏蜂窝基站，微蜂窝基站，家庭基站，中继基站等无线通信设备。

以上所述，仅为本申请的较佳实施例而已，并非用于限定本申请的保护范围。凡在本申请的精神和原则之内，所做的任何修改，等同替换，改进等，均应包含在本申请的保护范围之内。

说 明 书 附 图

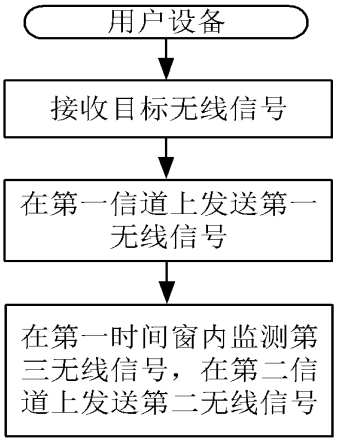


图 1

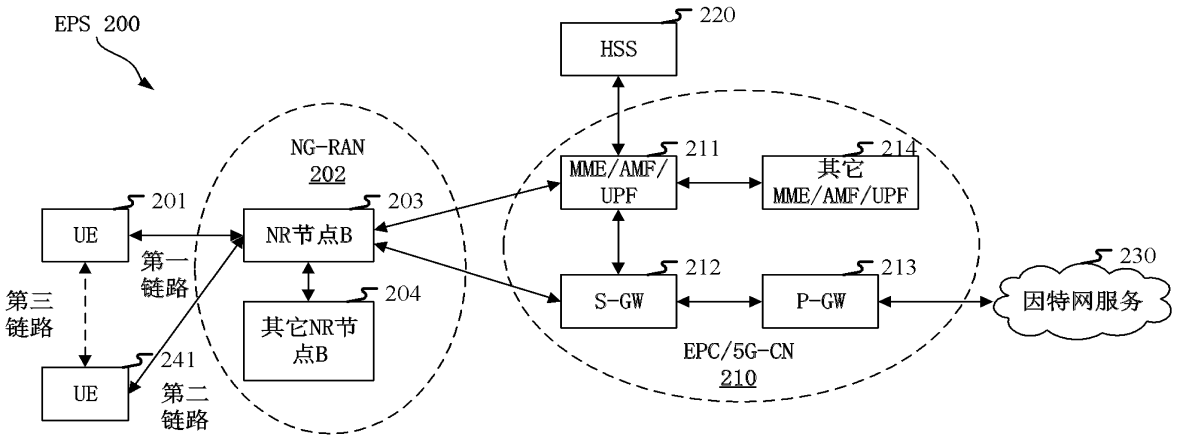


图 2

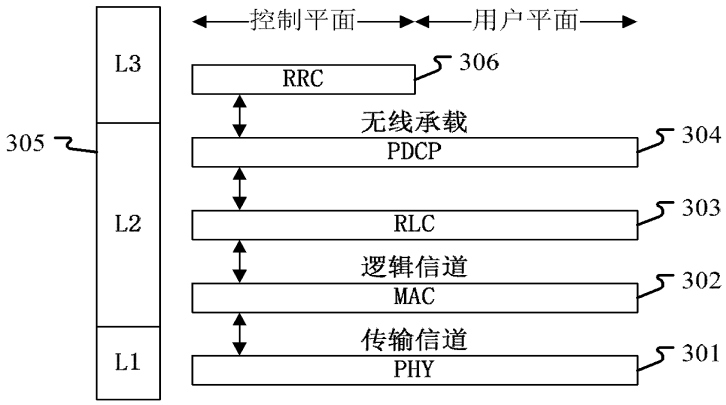


图 3

说 明 书 附 图

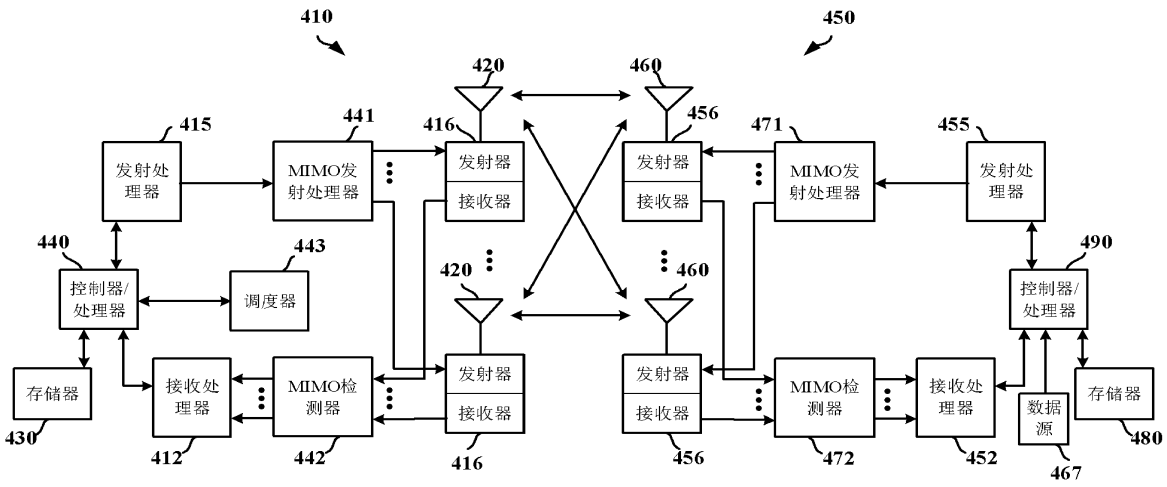

410
450
420
460
415
441
416
456
471
455
发射处理器
MIMO发射处理器
发射器
接收器
发射器
接收器
MIMO发射处理器
发射处理器
440
443
420
460
490
控制器/处理器
调度器
控制器/处理器
存储器
接收处理器
MIMO检测器
发射器
接收器
发射器
接收器
MIMO检测器
接收处理器
数据源
存储器
430
412
442
416
456
472
452
467
480

图 4

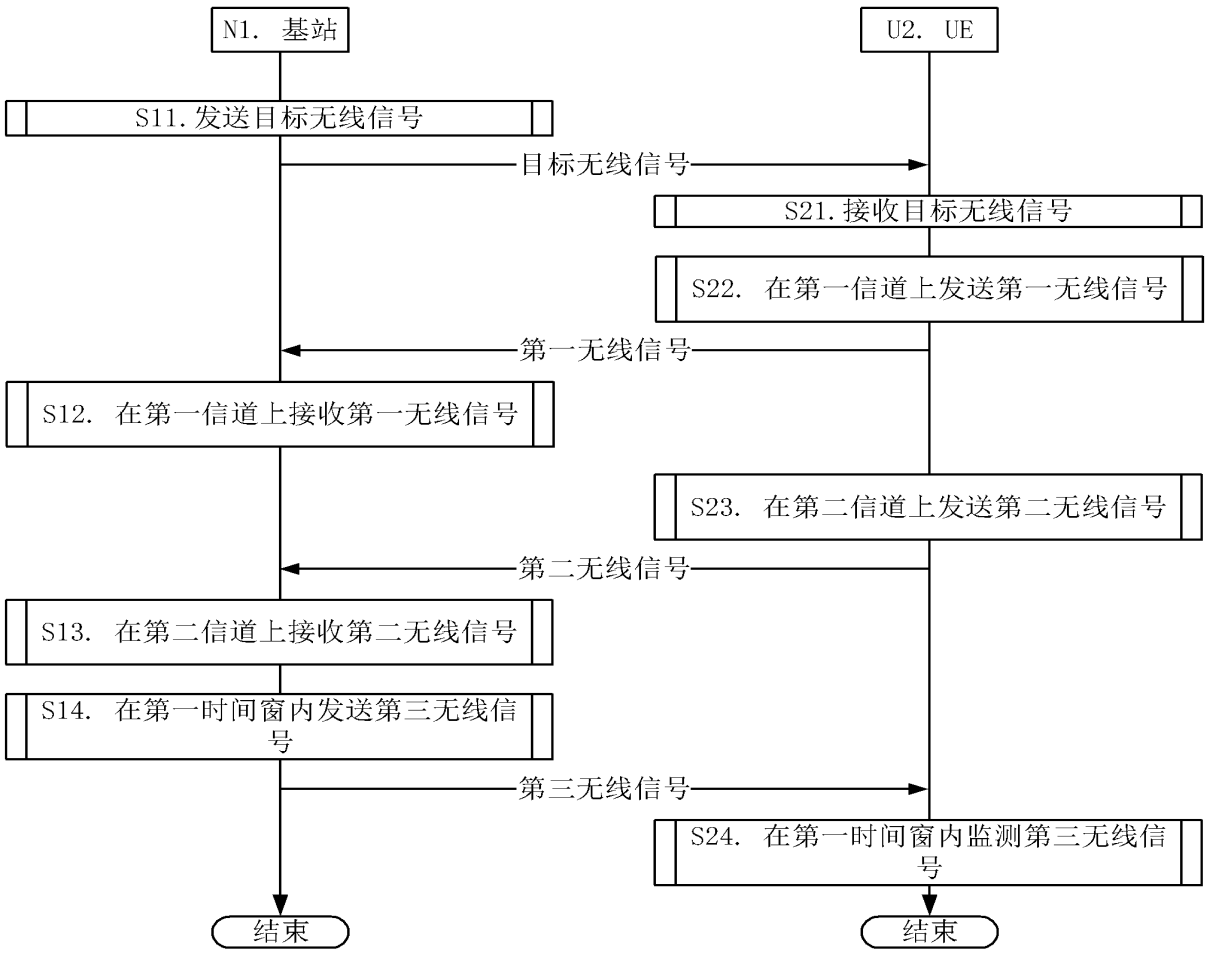

N1. 基站
U2. UE
S11. 发送目标无线信号
目标无线信号
S21. 接收目标无线信号
S22. 在第一信道上发送第一无线信号
第一无线信号
S12. 在第一信道上接收第一无线信号
S23. 在第二信道上发送第二无线信号
第二无线信号
S13. 在第二信道上接收第二无线信号
S14. 在第一时间窗内发送第三无线信号
第三无线信号
S24. 在第一时间窗内监测第三无线信号
结束
结束

图 5

说 明 书 附 图

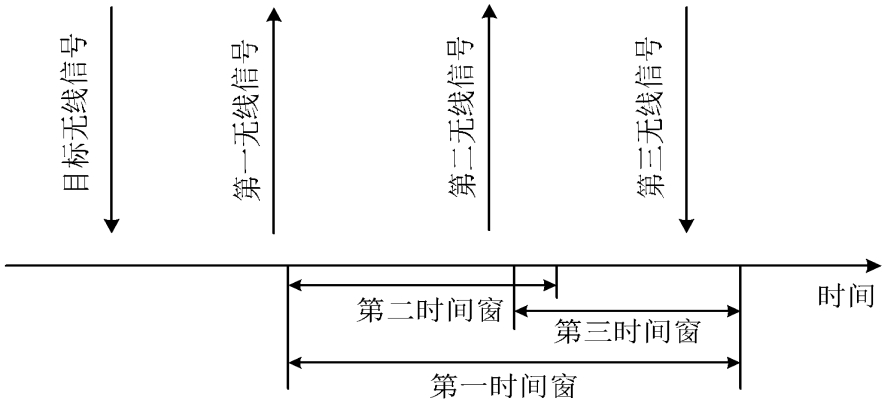


图 6

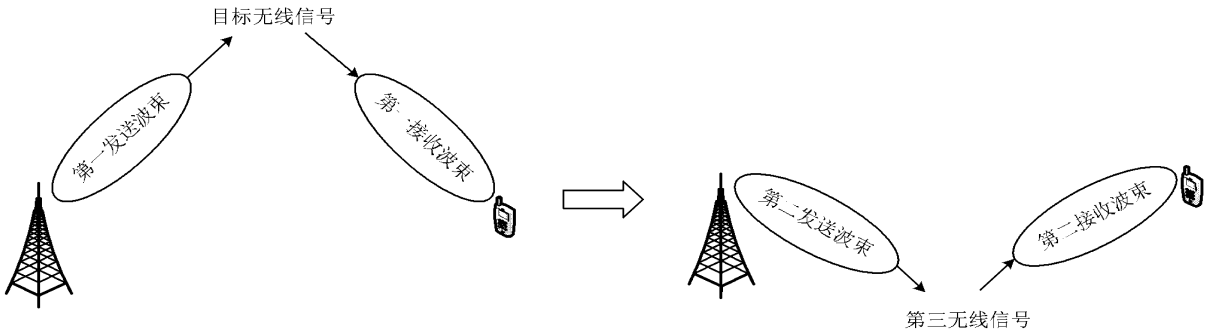


图 7

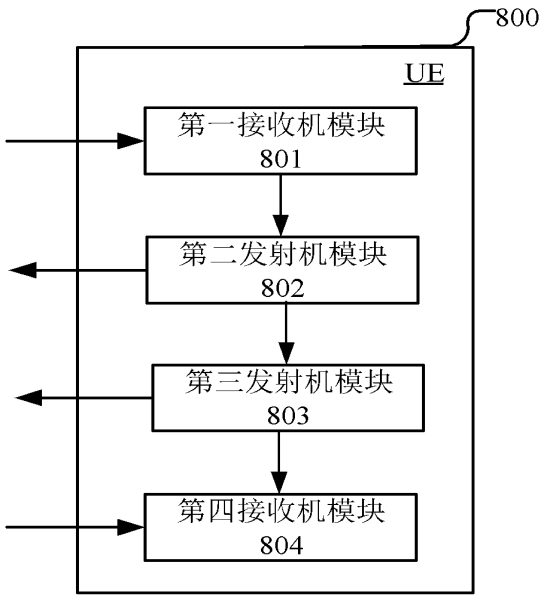


图 8

说 明 书 附 图

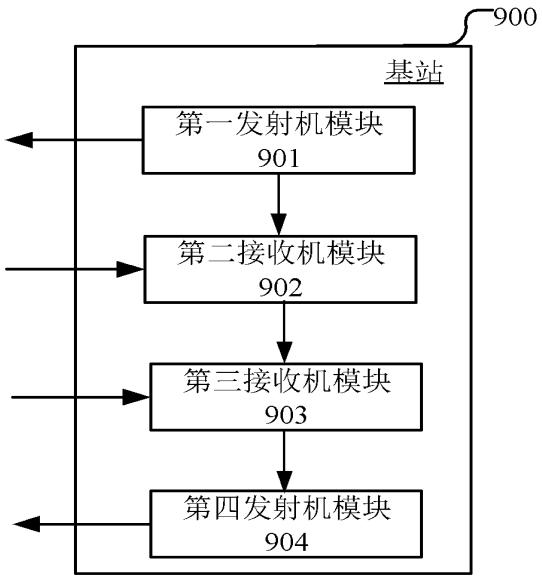


图 9

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B or equivalent) to identify the application to which the Power of Attorney directed, in accordance with 37 CFR 1.5. If the Power of Attorney by Applicant form is not accompanied by this transmittal form or an equivalent, the Power of Attorney will not be recognized in the application.

Application Number	16/059,045		
Filing Date	August 9, 2018		
First Named Inventor	Xiaobo Zhang		
Title	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION		
Art Unit	2649		
Examiner Name			
Attorney Docket Number	S3876.10019US01		
SIGNATURE of Applicant or Patent Practitioner			
Signature	/R. Burns Israelsen/	**Date**	February 1, 2019
Name	R. Burns Israelsen	**Telephone**	(435) 252-1360
Registration Number	42685		

MASCHOFF BRENNAN, PLLC
1389 Center Drive, SUITE 300
PARK CITY, UTAH 84098, USA

POWER OF ATTORNEY BY APPLICANT

[Assignee, Legal Representative or Person with Proprietary Interest]

I hereby revoke all previous powers of attorney given in the application identified in the attached Transmittal for Power of Attorney form.

■ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter:

97149

Please recognize or change the correspondence address for the above-identified patent to:

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

I am the Applicant:

- [X] Assignee or Person to Whom the Inventor is Under an Obligation to Assign
- [ ] Legal Representative of a Deceased or Legally Incapacitated Inventor
- [ ] Person Who Otherwise Shows Sufficient *Proprietary* Interest (*e.g.*, a petition under 37 CFR 1.46 (b)(2) was granted in the application or is concurrently being filed with this document)

SIGNATURE of Applicant for Patent

The individual whose signature and title is supplied below is authorized to act on behalf of the Applicant

Signature	Xiaobo ZHANG	Date	January 23, 2019
Name	Xiaobo ZHANG	Telephone	
Company	SHANGHAI LANGBO COMMUNICATION TECHNOLOGY COMPANY LIMITED	Title	CTO

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

*Total of forms are submitted.

MASCHOFF BRENNAN, PLLC
1389 Center Drive, SUITE 300
PARK CITY, UTAH 84098, USA

Electronic Acknowledgement Receipt	
EFS ID:	35031003
Application Number:	16059045
International Application Number:	
Confirmation Number:	5101
Title of Invention:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Xiaobo ZHANG
Customer Number:	70416
Filer:	Robert Burns Israelsen/Vanessa Mangum
Filer Authorized By:	Robert Burns Israelsen
Attorney Docket Number:	126099-8021.US00
Receipt Date:	01-FEB-2019
Filing Date:	09-AUG-2018
Time Stamp:	11:40:15
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	S3876-10019US01_POA.pdf	1036194 c93a148aa0f97b54713ea9b4fc94b0bbdf75798c	no	2

Warnings:

Information:	
Total Files Size (in bytes):	1036194

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
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/059,045	08/09/2018	Xiaobo ZHANG	S3876.10019US01

CONFIRMATION NO. 5101

97149
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

POA ACCEPTANCE LETTER

OC000000105631596

Date Mailed: 02/06/2019

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/01/2019.

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**.

/snguyen/

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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/059,045	08/09/2018	Xiaobo ZHANG	S3876.10019US01

CONFIRMATION NO. 5101

97149
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

PUBLICATION NOTICE

OC000000105915429

Title:METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION

Publication No.US-2019-0053258-A1
Publication Date:02/14/2019

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/059,045	08/09/2018	Xiaobo ZHANG	S3876.10019US01	5101

97149 7590 08/20/2019

Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

EXAMINER	
LIN, WILL W	

ART UNIT	PAPER NUMBER
2412	

NOTIFICATION DATE	DELIVERY MODE
08/20/2019	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):

bisraelsen@mabr.com
docket@mabr.com

Office Action Summary	Application No. 16/059,045	Applicant(s) ZHANG, Xiaobo	
	Examiner WILL W LIN	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 08/09/2018.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-20 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-20 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 08/09/2018 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☑ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☑ All b)☐ Some** c)☐ None of the:

1.☑ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

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.

DETAILED ACTION

1. This office action is in response to the application filed on 08/09/2018.

2. Claims 1-20 are currently pending.

3. Claims 1-20 are rejected.

4. Claims 1, 6, 11 and 16 are independent claims.

Claim Interpretation

5. The following is a quotation of 35 U.S.C. 112(f):

> (f) Element in Claim for a Combination. – An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The following is a quotation of pre-AIA 35 U.S.C. 112, sixth paragraph:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

6. The claims in this application are given their broadest reasonable interpretation using the plain meaning of the claim language in light of the specification as it would be understood by one of ordinary skill in the art. The broadest reasonable interpretation of a claim element (also commonly referred to as a claim limitation) is limited by the description in the specification when 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is invoked.

As explained in MPEP § 2181, subsection I, claim limitations that meet the following three-prong test will be interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph:

(A) the claim limitation uses the term "means" or "step" or a term used as a substitute for "means" that is a generic placeholder (also called a nonce term or a non-structural term having no specific structural meaning) for performing the claimed function;

(B) the term "means" or "step" or the generic placeholder is modified by functional language, typically, but not always linked by the transition word "for" (e.g., "means for") or another linking word or phrase, such as "configured to" or "so that"; and

(C) the term "means" or "step" or the generic placeholder is not modified by sufficient structure, material, or acts for performing the claimed function.

Use of the word "means" (or "step") in a claim with functional language creates a rebuttable presumption that the claim limitation is to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites sufficient structure, material, or acts to entirely perform the recited function.

Absence of the word "means" (or "step") in a claim creates a rebuttable presumption that the claim limitation is not to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim

limitation is not interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites function without reciting sufficient structure, material or acts to entirely perform the recited function.

Claim limitations in this application that use the word "means" (or "step") are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action. Conversely, claim limitations in this application that do not use the word "means" (or "step") are not being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action.

7. This application includes one or more claim limitations that do not use the word "means," but are nonetheless being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, because the claim limitation(s) uses a generic placeholder that is coupled with functional language without reciting sufficient structure to perform the recited function and the generic placeholder is not preceded by a structural modifier. Such claim limitations are: transmitter module and receiver module in claims 11 and 16.

Because this/these claim limitation(s) is/are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, it/they is/are being interpreted to cover the corresponding structure described in the specification as performing the claimed function, and equivalents thereof.

If applicant does not intend to have this/these limitation(s) interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, applicant may: (1) amend the claim limitation(s) to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA

35 U.S.C. 112, sixth paragraph (e.g., by reciting sufficient structure to perform the claimed function); or (2) present a sufficient showing that the claim limitation(s) recite(s) sufficient structure to perform the claimed function so as to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph.

8. It would have been obvious to one of ordinary skill in the art to conclude that the transmitter module is a transmitter; the receiver module is a receiver. Therefore, the transmitter module and receiver module are definite.

Claim Rejections - 35 USC § 112

9. Claim 2, 7, 12 and 17 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

10. Claims 2, 7, 12 and 17 each recites the limitation "the multi-antenna related transmitting" in line 2. There is insufficient antecedent basis for this limitation in the claims.

Claim Rejections - 35 USC § 103

11. 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.

12. 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 of this title, 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.

13. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

14. Claims 1-4, 6-9, 11-14 and 16-19 are rejected under 35 U.S.C. 103 as being unpatentable over Hyun Woo Lee et al. (US 2013/0034071 A1), hereinafter Lee, in view of Min Wu et al. (US 2018/0048164 A1), hereinafter Wu.

For claim 1, Lee teaches **a method in a User Equipment (UE) for wireless communication, comprising:**

receiving a target radio signal (Lee, Fig. 7 step S710 and paragraph 107 teach an eNB may transmit resource information (i.e., SR resource information)

required for a shared dedicated scheduling request (D-SR) and resource information (i.e., CB resource information) of a contention based uplink channel to one or more UEs (S710).);

transmitting a first radio signal on a first channel(Lee, Fig. 7 step S720 and paragraph 110 teach hen one or more UEs have UL data to be transmitted, each of the UEs may transmit a Scheduling Request (SR) to the eNB in order to be allocated an uplink resource through which the UL data is to be transmitted (S720));

transmitting a second radio signal on a second channel (Lee, Fig. 7 step S730 and paragraph 111 teach The UE may transmit uplink data (i.e., a Transport Block (TB)) to the eNB without awaiting a UL grant in response to SR transmission (S730).); **and**

monitoring a third radio signal in a first time window (Lee, paragraph 80 teaches in order to transmit a physical uplink shared channel (PUSCH) signal to the eNB, the UE needs to perform blind decoding on a PDCCH signal including related information. The UE may perform blind decoding on a DCI format according to the type of a specific RNTI (e.g., C-RNTI or SI_RNTI) that is to be used for CRC scrambling. See also paragraph 63.);

wherein a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; (Lee, Fig. 7 step S710 and paragraph 107 teach an eNB may transmit resource information (i.e., SR resource information) required for a shared dedicated scheduling request (D-SR) and

resource information (i.e., CB resource information) of a contention based uplink channel to one or more UEs (S710).).

Wu further teaches **a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window** (Wu, Fig. 4 and paragraph 69 teach in step S401, the wireless communication device 200 (user equipment) receives control information carried by the physical downlink channel, and the control information includes a time interval indication. In step S402, the wireless communication device 200 (user equipment) determines information of uplink resource associated with the wireless communication device 200 or a starting subframe of a scheduling window (user equipment) based on the time interval indication and an ending subframe of the physical downlink channel.).

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the method taught in Lee with a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window taught in Wu in order to improve the channel estimation performance [Wu: paragraph 117].

For claim 2, Lee and Wu further teach the method according to claim 1, wherein **at least one of {the first radio signal, the second radio signal} is used for determining the multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal** (Lee,

Fig. 14 and paragraph 239 teach he UE and the eNB may include transmission modules (Tx modules) 1440 and 1450 and reception modules (Rx modules) 1460 and 1470 for transmitting and receiving information, data, and/or messages, respectively, and may include antennas 1400 and 1410 for transmitting and receiving information, data, and/or messages, respectively.).

For claim 3, Lee and Wu further teach the method according to claim 1, wherein **the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels** (Lee, Fig. 7 and paragraph 108 teach In step S710, the SR resource information indicates information regarding a PUCCH resource that the UE uses in order to send a scheduling request to the eNB and the CB resource information indicates information regarding a PUSCH resource for contention based uplink data transmission. In other words, the first type of physical layer channel is the PUCCH and the second type of physical layer channel is the PUSCH).

For claim 4, Lee and Wu further teach the method according to claim 1, wherein **the first channel is a physical layer control channel** (Lee, Fig. 7 and paragraph 108 teach In step S710, the SR resource information indicates information regarding a PUCCH resource that the UE uses in order to send a scheduling request to the eNB and the CB resource information indicates information regarding a PUSCH resource for contention based uplink data transmission. In other words, the first type of physical layer channel is the PUCCH).

For claim 6, Lee teaches **a method in a base station device for wireless communication, comprising:**

transmitting a target radio signal (Lee, Fig. 7 step S710 and paragraph 107 teach an eNB may transmit resource information (i.e., SR resource information) required for a shared dedicated scheduling request (D-SR) and resource information (i.e., CB resource information) of a contention based uplink channel to one or more UEs (S710).);

receiving a first radio signal on a first channel (Lee, Fig. 7 step S720 and paragraph 110 teach hen one or more UEs have UL data to be transmitted, each of the UEs may transmit a Scheduling Request (SR) to the eNB in order to be allocated an uplink resource through which the UL data is to be transmitted (S720));

receiving a second radio signal on a second channel (Lee, Fig. 7 step S730 and paragraph 111 teach The UE may transmit uplink data (i.e., a Transport Block (TB)) to the eNB without awaiting a UL grant in response to SR transmission (S730).); **and**

transmitting a third radio signal in a first time window (Lee, paragraph 80 teaches in order to transmit a physical uplink shared channel (PUSCH) signal to the eNB, the UE needs to perform blind decoding on a PDCCH signal including related information. The UE may perform blind decoding on a DCI format according to the type of a specific RNTI (e.g., C-RNTI or SI_RNTI) that is to be used for CRC scrambling. See also paragraph 63. See also Fig. 7 step S740);

wherein a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal (Lee, Fig. 7 step

S710 and paragraph 107 teach an eNB may transmit resource information (i.e., SR resource information) required for a shared dedicated scheduling request (D-SR) and resource information (i.e., CB resource information) of a contention based uplink channel to one or more UEs (S710).).

Wu further teaches **a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window** (Wu, Fig. 4 and paragraph 69 teach in step S401, the wireless communication device 200 (user equipment) receives control information carried by the physical downlink channel, and the control information includes a time interval indication. In step S402, the wireless communication device 200 (user equipment) determines information of uplink resource associated with the wireless communication device 200 or a starting subframe of a scheduling window (user equipment) based on the time interval indication and an ending subframe of the physical downlink channel.).

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the method taught in Lee with a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window taught in Wu in order to improve the channel estimation performance [Wu: paragraph 117].

For claim 7, Lee and Wu further teach the method according to claim 6, wherein **at least one of {the first radio signal, the second radio signal} is used for determining the multi-antenna related transmitting of the third radio signal; or,**

the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal (Lee, Fig. 14 and paragraph 239 teach he UE and the eNB may include transmission modules (Tx modules) 1440 and 1450 and reception modules (Rx modules) 1460 and 1470 for transmitting and receiving information, data, and/or messages, respectively, and may include antennas 1400 and 1410 for transmitting and receiving information, data, and/or messages, respectively.).

For claim 8, Lee and Wu further teach the method according to claim 6, wherein **the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels** (Lee, Fig. 7 and paragraph 108 teach In step S710, the SR resource information indicates information regarding a PUCCH resource that the UE uses in order to send a scheduling request to the eNB and the CB resource information indicates information regarding a PUSCH resource for contention based uplink data transmission. In other words, the first type of physical layer channel is the PUCCH and the second type of physical layer channel is the PUSCH).

For claim 9, Lee and Wu further teach the method according to claim 1, wherein **the first channel is a physical layer control channel** (Lee, Fig. 7 and paragraph 108 teach In step S710, the SR resource information indicates information regarding a PUCCH resource that the UE uses in order to send a scheduling request to the eNB and the CB resource information indicates information regarding a PUSCH resource for

contention based uplink data transmission. In other words, the first type of physical layer channel is the PUCCH).

For claim 11, Lee teaches **a UE for wireless communication, comprising:**

a first receiver module (Lee, Fig. 7 item 1460, Rx module)**, to receive a target radio signal** (Lee, Fig. 7 step S710 and paragraph 107 teach an eNB may transmit resource information (i.e., SR resource information) required for a shared dedicated scheduling request (D-SR) and resource information (i.e., CB resource information) of a contention based uplink channel to one or more UEs (S710).)**;**

a second transmitter module (Lee, Fig. 7 item1440, Tx module)**, to transmit a first radio signal on a first channel** (Lee, Fig. 7 step S720 and paragraph 110 teach hen one or more UEs have UL data to be transmitted, each of the UEs may transmit a Scheduling Request (SR) to the eNB in order to be allocated an uplink resource through which the UL data is to be transmitted (S720))**;**

a third transmitter module (Lee, Fig. 7 item 1440, Tx module)**, to transmit a second radio signal on a second channel** (Lee, Fig. 7 step S730 and paragraph 111 teach The UE may transmit uplink data (i.e., a Transport Block (TB)) to the eNB without awaiting a UL grant in response to SR transmission (S730).)**; and**

a fourth receiver module (Lee, Fig. 7 item1460, Rx module)**, to monitor a third radio signal in a first time window** (Lee, paragraph 80 teaches in order to transmit a physical uplink shared channel (PUSCH) signal to the eNB, the UE needs to perform blind decoding on a PDCCH signal including related information. The UE may perform

blind decoding on a DCI format according to the type of a specific RNTI (e.g., C-RNTI or SI_RNTI) that is to be used for CRC scrambling. See also paragraph 63.);

wherein a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; (Lee, Fig. 7 step S710 and paragraph 107 teach an eNB may transmit resource information (i.e., SR resource information) required for a shared dedicated scheduling request (D-SR) and resource information (i.e., CB resource information) of a contention based uplink channel to one or more UEs (S710).).

Wu further teaches **a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window** (Wu, Fig. 4 and paragraph 69 teach in step S401, the wireless communication device 200 (user equipment) receives control information carried by the physical downlink channel, and the control information includes a time interval indication. In step S402, the wireless communication device 200 (user equipment) determines information of uplink resource associated with the wireless communication device 200 or a starting subframe of a scheduling window (user equipment) based on the time interval indication and an ending subframe of the physical downlink channel.).

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the method taught in Lee with a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for

determining the end time of the first time window taught in Wu in order to improve the channel estimation performance [Wu: paragraph 117].

For claim 12, Lee and Wu further teach the UE according to claim 11, wherein **at least one of {the first radio signal, the second radio signal} is used for determining the multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal** (Lee, Fig. 14 and paragraph 239 teach he UE and the eNB may include transmission modules (Tx modules) 1440 and 1450 and reception modules (Rx modules) 1460 and 1470 for transmitting and receiving information, data, and/or messages, respectively, and may include antennas 1400 and 1410 for transmitting and receiving information, data, and/or messages, respectively.).

For claim 13, Lee and Wu further teach the UE according to claim 11, wherein **the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels** (Lee, Fig. 7 and paragraph 108 teach In step S710, the SR resource information indicates information regarding a PUCCH resource that the UE uses in order to send a scheduling request to the eNB and the CB resource information indicates information regarding a PUSCH resource for contention based uplink data transmission. In other words, the first type of physical layer channel is the PUCCH and the second type of physical layer channel is the PUSCH).

For claim 14, Lee and Wu further teach the UE according to claim 11, wherein **the first channel is a physical layer control channel** (Lee, Fig. 7 and paragraph 108 teach In step S710, the SR resource information indicates information regarding a PUCCH resource that the UE uses in order to send a scheduling request to the eNB and the CB resource information indicates information regarding a PUSCH resource for contention based uplink data transmission. In other words, the first type of physical layer channel is the PUCCH).

For claim 16, Lee teaches **a base station device for wireless communication, comprising:**

a first transmitter module (Lee, Fig. 7 item 1450, Tx module)**, to transmit a target radio signal** (Lee, Fig. 7 step S710 and paragraph 107 teach an eNB may transmit resource information (i.e., SR resource information) required for a shared dedicated scheduling request (D-SR) and resource information (i.e., CB resource information) of a contention based uplink channel to one or more UEs (S710).)**;**

a second receiver module (Lee, Fig. 7 item 1470, Rx module)**, to receive a first radio signal on a first channel** (Lee, Fig. 7 step S720 and paragraph 110 teach hen one or more UEs have UL data to be transmitted, each of the UEs may transmit a Scheduling Request (SR) to the eNB in order to be allocated an uplink resource through which the UL data is to be transmitted (S720))**;**

a third receiver module (Lee, Fig. 7 item 1470, Rx module)**, to receive a second radio signal on a second channel** (Lee, Fig. 7 step S730 and paragraph 111 teach The UE may transmit uplink data (i.e., a Transport Block (TB)) to the eNB without awaiting a UL grant in response to SR transmission (S730).)**; and**

a fourth transmitter module (Lee, Fig. 7 item 1450, Tx module)**, to transmit a third radio signal in a first time window** (Lee, paragraph 80 teaches in order to transmit a physical uplink shared channel (PUSCH) signal to the eNB, the UE needs to perform blind decoding on a PDCCH signal including related information. The UE may perform blind decoding on a DCI format according to the type of a specific RNTI (e.g., C-RNTI or SI_RNTI) that is to be used for CRC scrambling. See also paragraph 63. See also Fig. 7 step S740)**;**

wherein a measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal (Lee, Fig. 7 step S710 and paragraph 107 teach an eNB may transmit resource information (i.e., SR resource information) required for a shared dedicated scheduling request (D-SR) and resource information (i.e., CB resource information) of a contention based uplink channel to one or more UEs (S710).).

Wu further teaches **a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window** (Wu, Fig. 4 and paragraph 69 teach in step S401, the wireless communication device 200 (user equipment) receives control information carried by the physical downlink channel, and the control information includes a time interval indication. In step S402, the wireless communication device 200 (user equipment) determines information of uplink resource associated with the wireless communication device 200 or a starting subframe of a scheduling window (user equipment) based on the time interval indication and an ending subframe of the physical downlink channel.).

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the method taught in Lee with a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window taught in Wu in order to improve the channel estimation performance [Wu: paragraph 117].

For claim 17, Lee and Wu further teach the base station device according to claim 16, wherein **at least one of {the first radio signal, the second radio signal} is used for determining the multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal** (Lee, Fig. 14 and paragraph 239 teach he UE and the eNB may include transmission modules (Tx modules) 1440 and 1450 and reception modules (Rx modules) 1460 and 1470 for transmitting and receiving information, data, and/or messages, respectively, and may include antennas 1400 and 1410 for transmitting and receiving information, data, and/or messages, respectively.).

For claim 18, Lee and Wu further teach the base station device according to claim 16, wherein **the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels** (Lee, Fig. 7 and paragraph 108 teach In step S710, the SR resource information indicates information regarding a PUCCH resource that the UE uses in order to send a scheduling request to the eNB and the CB resource

information indicates information regarding a PUSCH resource for contention based uplink data transmission. In other words, the first type of physical layer channel is the PUCCH and the second type of physical layer channel is the PUSCH).

For claim 19, Lee and Wu further teach the base station device according to claim 16, wherein **the first channel is a physical layer control channel** (Lee, Fig. 7 and paragraph 108 teach In step S710, the SR resource information indicates information regarding a PUCCH resource that the UE uses in order to send a scheduling request to the eNB and the CB resource information indicates information regarding a PUSCH resource for contention based uplink data transmission. In other words, the first type of physical layer channel is the PUCCH).

15. Claims 5, 10, 15 and 20 are rejected under 35 U.S.C. 103 as being unpatentable over Hyun Woo Lee et al. (US 2013/0034071 A1), hereinafter Lee, in view of Min Wu et al. (US 2018/0048164 A1), hereinafter Wu, and Wataru Ouchi et al. (US 2014/0247796 A1), hereinafter Ouchi.

For claim 5, Lee and Wu further teach all the limitations of parent claim 1. Lee and Wu do not explicitly teach wherein a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window.

However, Ouchi explicitly teaches wherein **a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window** (Ouchi, Fig. 7 and paragraph357 teach The base station apparatus 101 controls the terminal apparatus 102 such that the transmission of an uplink signal to the base station apparatus 101 and the transmission of an uplink signal to the RRH 103 are separated from each other in the time domain. That is, the base station apparatus 101 configures transmission timing of each uplink signal (PUSCH, PUCCH (CQI, PMI, SR, RI, or Ack/Nack), UL DMRS, SRS, or PRACH) such that a timing at which the terminal apparatus 102 transmits each uplink signal to the base station apparatus 101 and a timing at which the terminal apparatus 102 transmits each uplink signal to the RRH 103 become different. In other words, the second time window is the transmission timing of PUCCH; the third time window is the transmission timing of PUSCH).

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the method taught in Lee and Wu with a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a

third time window, and the end time of the third time window is the end time of the first time window taught in Ouchi thereby total spectral efficiency (transmission capacity) in the area of coverage built by the base station apparatus 101 can be improved [Ouchi: paragraph 102].

For claim 10, Lee and Wu further teach all the limitations of parent claim 6. Lee and Wu do not explicitly teach wherein a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window.

However, Ouchi explicitly teaches wherein **a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window** (Ouchi, Fig. 7 and paragraph357 teach The base station apparatus 101 controls the terminal apparatus 102 such that the transmission of an uplink signal to the base station apparatus 101 and the transmission of an uplink signal to the RRH 103 are separated from each other in the time domain. That is, the base station apparatus 101 configures transmission timing of each uplink signal (PUSCH, PUCCH (CQI, PMI, SR, RI, or Ack/Nack), UL DMRS, SRS, or PRACH) such that a

timing at which the terminal apparatus 102 transmits each uplink signal to the base station apparatus 101 and a timing at which the terminal apparatus 102 transmits each uplink signal to the RRH 103 become different. In other words, the second time window is the transmission timing of PUCCH; the third time window is the transmission timing of PUSCH).

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the method taught in Lee and Wu with a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window taught in Ouchi thereby total spectral efficiency (transmission capacity) in the area of coverage built by the base station apparatus 101 can be improved [Ouchi: paragraph 102].

For claim 15, Lee and Wu further teach all the limitations of parent claim 11. Lee and Wu do not explicitly teach wherein a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window.

However, Ouchi explicitly teaches wherein **a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window** (Ouchi, Fig. 7 and paragraph357 teach The base station apparatus 101 controls the terminal apparatus 102 such that the transmission of an uplink signal to the base station apparatus 101 and the transmission of an uplink signal to the RRH 103 are separated from each other in the time domain. That is, the base station apparatus 101 configures transmission timing of each uplink signal (PUSCH, PUCCH (CQI, PMI, SR, RI, or Ack/Nack), UL DMRS, SRS, or PRACH) such that a timing at which the terminal apparatus 102 transmits each uplink signal to the base station apparatus 101 and a timing at which the terminal apparatus 102 transmits each uplink signal to the RRH 103 become different. In other words, the second time window is the transmission timing of PUCCH; the third time window is the transmission timing of PUSCH).

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the method taught in Lee and Wu with a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a

third time window, and the end time of the third time window is the end time of the first time window taught in Ouchi thereby total spectral efficiency (transmission capacity) in the area of coverage built by the base station apparatus 101 can be improved [Ouchi: paragraph 102].

For claim 20, Lee and Wu further teach all the limitations of parent claim 16. Lee and Wu do not explicitly teach wherein a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window.

However, Ouchi explicitly teaches wherein **a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window** (Ouchi, Fig. 7 and paragraph357 teach The base station apparatus 101 controls the terminal apparatus 102 such that the transmission of an uplink signal to the base station apparatus 101 and the transmission of an uplink signal to the RRH 103 are separated from each other in the time domain. That is, the base station apparatus 101 configures transmission timing of each uplink signal (PUSCH, PUCCH (CQI, PMI, SR, RI, or Ack/Nack), UL DMRS, SRS, or PRACH) such that a

timing at which the terminal apparatus 102 transmits each uplink signal to the base station apparatus 101 and a timing at which the terminal apparatus 102 transmits each uplink signal to the RRH 103 become different. In other words, the second time window is the transmission timing of PUCCH; the third time window is the transmission timing of PUSCH).

It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify the method taught in Lee and Wu with a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; or, a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window taught in Ouchi thereby total spectral efficiency (transmission capacity) in the area of coverage built by the base station apparatus 101 can be improved [Ouchi: paragraph 102].

Conclusion

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to WILL W LIN whose telephone number is (571)272-8749. The examiner can normally be reached on M-F 8:00-5:00.

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 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 http://pair-direct.uspto.gov. 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.

/WILL W LIN/
Primary Examiner, Art Unit 2412

Notice of References Cited	Application/Control No. 16/059,045	Applicant(s)/Patent Under Reexamination ZHANG, Xiaobo	
	Examiner WILL W LIN	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-20140247796-A1	09-2014	Ouchi; Wataru	H04L5/0053	370/329
*	B	US-20170331670-A1	11-2017	Parkvall; Stefan	H04W52/0274	1/1
*	C	US-20130163537-A1	06-2013	Anderson; Nicholas William	H04W72/1284	370/329
*	D	US-20180092085-A1	03-2018	Shaheen; Kamel M.	H04W28/08	1/1
*	E	US-20140036881-A1	02-2014	Kim; Hyungtae	H04L5/001	370/336
*	F	US-20130155990-A1	06-2013	Nishio; Akihiko	H04L5/0053	370/329
*	G	US-20130034071-A1	02-2013	Lee; Hyun Woo	H04W74/0866	370/329
*	H	US-20180049164-A1	02-2018	WU; Min	H04W72/042	1/1
	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.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/059,045	ZHANG, Xiaobo
	Examiner	Art Unit
	WILL W LIN	2412

CPC - Searched*		
Symbol	Date	Examiner
H04W72/1215 or H04B7/0413 or H04W24/10 or H04L1/1861 or H04L5/0055 or H04L1/1657	08/15/2019	WL

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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

Search Notes		
Search Notes	Date	Examiner
Inventor Name Search	08/15/2019	WL
Assignee Search	08/15/2019	WL
EAST Search	08/15/2019	WL

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/WILL W LIN/ Primary Examiner, Art Unit 2412	

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	10	((("Shanghai") near3 ("Langbo") near3 ("Communication") near3 ("Technology") near3 ("Company") near3 ("Limited"))).AS,AANM.	USPAT	OR	OFF	2019/08/05 12:15
S2	144	((("ZHANG") near3 ("Xiaobo"))).INV.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/08/05 12:25
S3	3	(S1 S2) and (target same (time adj1 window)).clm.	US-PGPUB; USPAT	OR	OFF	2019/08/05 12:26
S6	1964	(DCI DMRS CSI-RS (reference adj1 signal) (synchronization adj1 signal)) and (UCI FEC PUCCH (beam adj1 recovery adj1 request)) and (PUSCH RACH) and (RSRP SNR SINR BER BLER) and (blind adj1 decoding) and (period window)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/14 19:26
S7	629	S6 and ((H04W72/1215 or H04B7/0413 or H04W24/10 or H04L1/1861 or H04L5/0055 or H04L1/1657).cpc.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/14 19:28
S8	87	(DCI DMRS CSI-RS (reference adj1 signal) (synchronization adj1 signal)) same (UCI FEC PUCCH (beam adj1 recovery adj1 request)) same (PUSCH RACH) same (RSRP SNR SINR BER BLER) and (blind adj1 decoding) and (period window)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/14 19:28
S9	78	S8 and ((@ad or @prad or @ptad or @rlad)<"20170811")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/14 19:29
S10	1011	(blind adj1 decoding) with DCI same (DCI DMRS CSI-RS (reference adj1 signal) (synchronization adj1 signal)) and (UCI FEC PUCCH (beam adj1 recovery adj1 request)) and (PUSCH RACH) and (RSRP SNR SINR BER BLER)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 10:32
S11	38	(blind adj1 decoding) with DCI same (DCI DMRS CSI-RS (reference adj1 signal) (synchronization adj1 signal)) same (UCI FEC PUCCH (beam adj1 recovery adj1 request)) same (PUSCH RACH) and (RSRP SNR SINR BER BLER)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	OFF	2019/08/15 10:33

			IBM_TDB			
S12	37	S11 and ((@ad or @prad or @ptad or @rlad)< "20170811")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 10:34
S13	0	(blind adj1 decoding) with DCI same (measurement with (DCI DMRS CSI-RS PDCCH PDSCH (reference adj1 signal) (synchronization adj1 signal))) same (UCI FEC PUCCH (beam adj1 recovery adj1 request)) same (PUSCH RACH) and (RSRP SNR SINR BER BLER)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 10:48
S14	9	(blind adj1 decoding) with DCI same (measurement with (DCI DMRS CSI-RS PDCCH PDSCH (reference adj1 signal) (synchronization adj1 signal)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 10:49
S15	9	S14 and ((@ad or @prad or @ptad or @rlad)< "20170811")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 10:49
S16	0	(blind adj1 decoding) with DCI same (UCI FEC PUCCH (beam adj1 recovery adj1 request)) same (PUSCH RACH) and (RSRP SNR SINR BER BLER) same (t T)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 12:01
S17	23	(blind adj1 decoding) with DCI same (UCI FEC PUCCH signal (beam adj1 recovery adj1 request)) same (PUSCH RACH) and (RSRP SNR SINR BER BLER) same time	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 12:02
S18	23	S17 and ((@ad or @prad or @ptad or @rlad)< "20170811")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 12:04
S19	1	"20180049164"	US-PGPUB	OR	OFF	2019/08/15 12:43

8/ 15/ 2019 7:11:39 PM
C:\ Users\ wlin1\ Documents\ EAST\ Workspaces\ 16059045.wsp

Bibliographic Data

Application No: 16/059,045

Foreign Priority claimed: (•) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [ ] Met After Allowance

Verified and Acknowledged: /WILL W LIN/ Examiner's Signature [ ] Initials

Title: METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
08/09/2018	370	2412	S3876.10019US01
RULE			

APPLICANTS

Shanghai Langbo Communication Technology Company Limited, Shanghai, CHINA

INVENTORS

Xiaobo ZHANG Shanghai, CHINA

CONTINUING DATA

FOREIGN APPLICATIONS

CHINA 201710686330.4 08/11/2017

IF REQUIRED, FOREIGN LICENSE GRANTED**

08/24/2018

**** SMALL ENTITY ****

STATE OR COUNTRY

CHINA

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1389 Center Drive, Suite 300
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UNITED STATES

FILING FEE RECEIVED

$1,015

PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/059,045	Filing Date 08/09/2018	☐ 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 $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $230 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	11/20/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $50 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 4	= 0		x $230 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/STEFANIE A BRYCE/
*** 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	Xiaobo ZHANG	
Application No.:	16/059,045	Art Unit 2412
Filed:	August 9, 2018	
Conf. No.:	5101	
For:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION	
Examiner:	WILL W. LIN	
Customer No.:	97149	
Attorney Docket No.:	S3876.10019US01	

AMENDMENT AND RESPONSE TO NON-FINAL OFFICE ACTION DATED AUGUST 20, 2019

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

Dear Sir:

In response to the Non-Final Office Action dated August 20, 2019, please consider the following:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks begin on page 8 of this paper.

Electronic Acknowledgement Receipt	
EFS ID:	37809147
Application Number:	16059045
International Application Number:	
Confirmation Number:	5101
Title of Invention:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Xiaobo ZHANG
Customer Number:	97149
Filer:	Brian Lance Jensen/Debbie Evans
Filer Authorized By:	Brian Lance Jensen
Attorney Docket Number:	S3876.10019US01
Receipt Date:	20-NOV-2019
Filing Date:	09-AUG-2018
Time Stamp:	18:05:24
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		S3876_10019US01_Response_112019.pdf	65509 367a6c9c1f711e5c176da11d9486ef54a96e3e0c	yes	10

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	8	10
	Claims	2	7
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Warnings:			
Information:			
	Total Files Size (in bytes):	65509	

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.

REMARKS

Applicants respectfully request reconsideration of the application in view of the above amendments to the claims and the following remarks. Unless otherwise stated herein, amendments to the claims have been made at the discretion of the Applicants and not necessarily for reasons related to patentability.

Applicants reserve the right to pursue any previously pending claims or other claims that capture any subject matter supported by the present disclosure. Additionally, Applicants reserve the right, both during and after prosecution of this case, to modify or revoke the views expressed with regard to any cited reference.

The following remarks are not intended to exhaustively identify all distinctions between any cited reference and the claims. The term "Applicants" is used herein to refer to any entity with authority to prosecute this application.

35 U.S.C. § 112(f) ¶ 6 Interpretation

The Office Action interprets the terms "transmitter module" and "receiver module" of claims 11 and 16 under 35 U.S.C. § 112(f) ¶ 6. Applicants acknowledge such interpretation but do not necessarily agree that such interpretation is appropriate.

Rejections Under 35 U.S.C. § 112

The Office Action rejects claims 2, 7, 12, and 17 under 35 U.S.C. § 112 for some antecedent basis issues. Amendments to claims 2, 7, 12, and 17 correct these issues and thus render the rejections under 35 U.S.C. § 112 moot. Applicants therefore respectfully request that the Examiner withdraw the rejections of claims 2, 7, 12, and 17 under 35 U.S.C. § 112.

Rejections under 35 U.S.C. § 103

The Office Action rejects claims 1-4, 6-9, 11-14, and 16-19 under 35 U.S.C. § 103 over *Hyun Woo Lee et al.* (U.S. Patent Publication No. 2013/0034071) in view of *Min Wu et al.* (U.S. Patent Publication No. 2018/0048164) and rejects claims 5, 10, 15, and 20 under 35 U.S.C. § 103 over *Hyun Woo Lee* in view of *Min Wu* in further view of *Ouchi et al.* (U.S. Patent Publication No. 2014/0247796). Applicants respectfully submit that the cited references, alone or in combination, fail to disclose every element of the claims.

For example, amended claims 1, 6, 11, and 16 recite (emphasis added):

> a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resources(s)..

The Office Action relies on *Ouchi* to reject the claim elements related to the above-recited time windows. (Office Action, pp. 19-20). In particular, the Office Action equates the timing of uplink transmissions to a base station by a terminal apparatus in *Ouchi* with the second time window and equates the timing of uplink transmissions to an RRH by the terminal apparatus in *Ouchi* with the third time window. *Id.* However, *Ouchi* also specifically teaches that such uplink transmissions do not overlap. (*See, e.g., Ouchi*, para. [0357]). In contrast, amended claims 1, 6, 11, and 16 specifically recite that the second time window and the third time window have overlapping time domain resources. Therefore, *Ouchi* does not teach these elements as currently recited. The other cited references do not disclose these elements either.

For at least these reasons, Applicants respectfully submit that the cited references, alone or in combination, fail to disclose every element of independent claims 1, 6, 11, and 16. Applicants therefore respectfully request that the Examiner withdraw the rejections under 35 U.S.C. § 103 of claims 1, 6, 11, and 16; of claims 2-4, which depend from claim 1; of claims 7-9, which depend from claim 6; of claims 12-14, which depend from claim 11; and of claims 17-19, which depend from claim 16.

New Claims

New claims 21, 22, 23, and 24 depend from claims 1, 6, 11, and 16, respectively, which are allowable over the cited references as discussed above. As such, Applicants respectfully submit that new claims 21, 22, 23, and 24 are allowable over the cited references for at least the reasons that claims 1, 6, 11, and 16 are allowable and for additional subject matter recited therein.

Charge Authorization

The Commissioner is hereby authorized to charge payment of any of the following fees that may be applicable to this communication, or credit any overpayment, to Deposit Account No.

50-5394: (1) any filing fees required under 37 C.F.R. § 1.16; (2) any patent application and reexamination processing fees under 37 C.F.R. § 1.17; and/or (3) any post issuance fees under 37 C.F.R. § 1.20. In addition, if any additional extension of time is required, which has not otherwise been requested, please consider this a petition therefor and charge any additional fees that may be required to Deposit Account No. 50-5394.

CONCLUSION

In view of the foregoing, Applicants submit that the pending claims are allowable. In the event that Examiner finds remaining impediment to a prompt allowance of this application that may be clarified through a telephone interview or overcome by an Examiner's Amendment, Examiner is requested to contact the undersigned attorney.

Dated this 20th day of November, 2019.

Respectfully submitted,

/B. Lance Jensen/

B. Lance Jensen
Registration No. 68,022
Attorney for Applicants
Customer No. 97149
Telephone No. (435) 252-1360
Maschoff Brennan

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions and listings of claims in the application:

1. (Currently Amended) A method in a User Equipment (UE) for wireless communication, comprising:

receiving a target radio signal;

transmitting a first radio signal on a first channel;

transmitting a second radio signal on a second channel; and

monitoring a third radio signal in a first time window;

wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; ~~and a time resource occupied by the second radio signal is used for determining the end time of the first time window~~ a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resources(s).

2. (Currently Amended) The method according to claim 1, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used for determining [[the]] a multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

3. (Original) The method according to claim 1, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

4. (Original) The method according to claim 1, wherein the first channel is a physical layer control channel.

5. (Cancelled)

6. (Currently Amended) A method in a base station device for wireless communication, comprising:

transmitting a target radio signal;

receiving a first radio signal on a first channel;

receiving a second radio signal on a second channel; and

transmitting a third radio signal in a first time window;

wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; ~~and a time resource occupied by the second radio signal is used for determining the end time of the first time window~~ a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resources(s).

7. (Currently Amended) The method according to claim 6, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used for determining [[the]] a multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

8. (Original) The method according to claim 6, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

9. (Original) The method according to claim 6, wherein the first channel is a physical layer control channel.

10. (Cancelled)

11. (Currently Amended) A UE for wireless communication, comprising:

a first receiver module, to receive a target radio signal;

a second transmitter module, to transmit a first radio signal on a first channel;

a third transmitter module, to transmit a second radio signal on a second channel; and

a fourth receiver module, to monitor a third radio signal in a first time window;

wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; ~~and a time resource occupied by the second radio signal is used for determining the end time of the first time window~~ a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resources(s).

12. (Currently Amended) The UE according to claim 11, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used for determining [[the]] a multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

13. (Original) The UE according to claim 11, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

14. (Original) The UE according to claim 11, wherein the first channel is a physical layer control channel.

15. (Cancelled)

16. (Currently Amended) A base station device for wireless communication, comprising:

a first transmitter module, to transmit a target radio signal;

a second receiver module, to receive a first radio signal on a first channel;

a third receiver module, to receive a second radio signal on a second channel; and

a fourth transmitter module, to transmit a third radio signal in a first time window;

wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; ~~and a time resource occupied by the second radio signal is used for determining the end time of the first time window~~ a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resources(s).

17. (Currently Amended) The base station device according to claim 16, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used for determining [[the]] a multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

18. (Original) The base station device according to claim 16, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

19. (Original) The base station device according to claim 16, wherein the first channel is a physical layer control channel.

20. (Cancelled)

21. (New) The method according to claim 1, wherein the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being Quasi Co-Located ("QCL"); or, the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the third time interval.

22. (New) The method according to claim 6, wherein the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being Quasi Co-Located ("QCL"); or, the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the third time interval.

23. (New) The UE according to claim 11, wherein the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being Quasi Co-Located ("QCL"); or, the first time window is divided into a second time interval and a third

time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the third time interval.

24. (New) The base station device according to claim 16, wherein the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being QCL; or, the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the third time interval.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Xiaobo ZHANG	
Application No.:	16/059,045	Art Unit 2412
Filed:	August 9, 2018	
Conf. No.:	5101	
For:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION	
Examiner:	WILL W. LIN	
Customer No.:	97149	
Attorney Docket No.:	S3876.10019US01	

SUPPLEMENTAL AMENDMENT

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

Dear Sir:

Applicants respectfully request entry of the following supplemental amendment.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks begin on page 8 of this paper.

Electronic Acknowledgement Receipt

EFS ID:	37838966
Application Number:	16059045
International Application Number:	
Confirmation Number:	5101
Title of Invention:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Xiaobo ZHANG
Customer Number:	97149
Filer:	Brian Lance Jensen/Debbie Evans
Filer Authorized By:	Brian Lance Jensen
Attorney Docket Number:	S3876.10019US01
Receipt Date:	22-NOV-2019
Filing Date:	09-AUG-2018
Time Stamp:	18:29:31
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		S3876_10019US01_Supplemental_Amd_112219.pdf	45306 67cc2300fa1967a439d5c697593f0a7fbe0a014	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	8	8
	Claims	2	7
	Supplemental Response or Supplemental Amendment	1	1
Warnings:			
Information:			
	Total Files Size (in bytes):	45306	

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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.

REMARKS

The amendments made herein have been presented to correct some typographical errors in the claims. This amendment amends claims 1, 6, 11, and 16. Claims 5, 10, 15, and 20 were previously cancelled without prejudice. Claims 1-4, 6-9, 11-14, 16-19, and 21-24 remain pending. Applicant respectfully requests entry of the amendments herein prior to examination of the application and favorable consideration of the pending claims.

In the event that the Examiner finds remaining impediment to a prompt allowance of this application that may be clarified through a telephone interview or overcome by an Examiner's Amendment, the Examiner is requested to contact the undersigned attorney.

Dated this 22nd day of November, 2019.

Respectfully submitted,

/B. Lance Jensen/

B. Lance Jensen
Registration No. 68,022
Attorney for Applicants
Customer No. 97149
Telephone No. (435) 252-1360
Maschoff Brennan

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions and listings of claims in the application:

1. (Currently Amended) A method in a User Equipment (UE) for wireless communication, comprising:

receiving a target radio signal;

transmitting a first radio signal on a first channel;

transmitting a second radio signal on a second channel; and

monitoring a third radio signal in a first time window;

wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resource(s) ~~resources(s)~~.

2. (Previously Presented) The method according to claim 1, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used for determining a multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

3. (Original) The method according to claim 1, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

4. (Original) The method according to claim 1, wherein the first channel is a physical layer control channel.

5. (Cancelled)

6. (Currently Amended) A method in a base station device for wireless communication, comprising:

transmitting a target radio signal;

receiving a first radio signal on a first channel;

receiving a second radio signal on a second channel; and

transmitting a third radio signal in a first time window;

wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resource(s) ~~resources(s)~~.

7. (Previously Presented) The method according to claim 6, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used for determining a multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

8. (Original) The method according to claim 6, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

9. (Original) The method according to claim 6, wherein the first channel is a physical layer control channel.

10. (Cancelled)

11. (Currently Amended) A UE for wireless communication, comprising:

a first receiver module, to receive a target radio signal;

a second transmitter module, to transmit a first radio signal on a first channel;

a third transmitter module, to transmit a second radio signal on a second channel; and

a fourth receiver module, to monitor a third radio signal in a first time window;

wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resource(s) ~~resources(s)~~.

12. (Previously Presented) The UE according to claim 11, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used for determining a multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

13. (Original) The UE according to claim 11, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

14. (Original) The UE according to claim 11, wherein the first channel is a physical layer control channel.

15. (Cancelled)

16. (Currently Amended) A base station device for wireless communication, comprising:

a first transmitter module, to transmit a target radio signal;

a second receiver module, to receive a first radio signal on a first channel;

a third receiver module, to receive a second radio signal on a second channel; and

a fourth transmitter module, to transmit a third radio signal in a first time window;

wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resource(s) ~~resources(s)~~.

17. (Previously Presented) The base station device according to claim 16, wherein at least one signal of the following set of signals: {the first radio signal, the second radio signal} is used for determining a multi-antenna related transmitting of the third radio signal; or, the first radio signal and the second radio signal together are used for determining the multi-antenna related transmitting of the third radio signal.

18. (Original) The base station device according to claim 16, wherein the first channel is a first type of physical layer channel, the second channel is a second type of physical layer channel, and the first type of physical layer channel and the second type of physical layer channel are two different types of physical layer channels.

19. (Original) The base station device according to claim 16, wherein the first channel is a physical layer control channel.

20. (Cancelled)

21. (Previously Presented) The method according to claim 1, wherein the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being Quasi Co-Located ("QCL"); or, the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the third time interval.

22. (Previously Presented) The method according to claim 6, wherein the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being Quasi Co-Located ("QCL"); or, the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the third time interval.

23. (Previously Presented) The UE according to claim 11, wherein the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being Quasi Co-Located ("QCL"); or, the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the

third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the third time interval.

24. (Previously Presented) The base station device according to claim 16, wherein the first radio signal is used for determining a first antenna port group, and the first antenna port group is spatially related to an antenna port group used for transmitting the third radio signal, the being spatially related refers to being QCL; or, the first time window is divided into a second time interval and a third time interval, the second time interval is before the third time interval, the third time interval is behind a time domain resource occupied by the second radio signal, the first radio signal is used for determining a second antenna port group, in the second time interval, the second antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the second time interval, the second radio signal is used for determining a third antenna port group; in the third time interval, the third antenna port group is spatially QCL with an antenna port group used for transmitting the third radio signal in the third time interval.

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97149 7590 11/27/2019

Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

EXAMINER
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ART UNIT	PAPER NUMBER
2412	

DATE MAILED: 11/27/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/059,045	08/09/2018	Xiaobo ZHANG	S3876.10019US01	5101

TITLE OF INVENTION: METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	02/27/2020

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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.

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(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/059,045	08/09/2018	Xiaobo ZHANG	S3876.10019US01	5101

TITLE OF INVENTION: METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	02/27/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
LIN, WILL W	2412	370-252000

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. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/059,045	08/09/2018	Xiaobo ZHANG	S3876.10019US01	5101

97149 7590 11/27/2019

Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

EXAMINER
LIN, WILL W

ART UNIT	PAPER NUMBER
2412	

DATE MAILED: 11/27/2019

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.

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. 16/059,045	Applicant(s) ZHANG, Xiaobo	
	Examiner WILL W LIN	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 amendments filed on 11/22/2019.
   ☐ 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 1-4,6-9,11-14,16-19 and 21-24 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☑ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☑ All b) ☐ Some *c) ☐ None of the:

   1. ☑ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/WILL W LIN/
Primary Examiner, Art Unit 2412

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.

DETAILED ACTION

Allowable Subject Matter

1. Claims 1-4, 6-9, 11-14, 16-19 and 21-24 are allowed.

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

The instant invention is related to a UE receives a target radio signal, transmits a first radio signal on a first channel, transmits a second radio signal on a second channel, and monitors a third radio signal in a first time window. A measurement for the target radio signal is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; and a time resource occupied by the second radio signal is used for determining the end time of the first time window. The application of the present disclosure can make full use of the allocated aerial resources, and improve the utilization of the aerial resources configured to transmit a report request that is determined autonomously by the UE.

Prior art was found for the independent claims as follows:

- Hyun Woo Lee et al. (US 2013/0034071 A1)
- Min Wu et al. (US 2018/0048164 A1)

Applicant uniquely claimed the below distinct features in independent claims 1, 6, 11 and 16 of the instant invention, which are not found in the prior art, either singularly or in combination:

Claim 1:

A method in a User Equipment (UE) for wireless communication, comprising:

receiving a target radio signal;

transmitting a first radio signal on a first channel;

transmitting a second radio signal on a second channel; and

monitoring a third radio signal in a first time window;

wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resource(s).

Claim 6:

A method in a base station device for wireless communication, comprising:

transmitting a target radio signal;

receiving a first radio signal on a first channel;

receiving a second radio signal on a second channel; and

transmitting a third radio signal in a first time window;

wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resource(s).

Claim 11:

A UE for wireless communication, comprising:

a first receiver module, to receive a target radio signal;

a second transmitter module, to transmit a first radio signal on a first channel;

a third transmitter module, to transmit a second radio signal on a second channel; and

a fourth receiver module, to monitor a third radio signal in a first time window;

wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resource(s).

Claim 16:

A base station device for wireless communication, comprising:

a first transmitter module, to transmit a target radio signal;

a second receiver module, to receive a first radio signal on a first channel;

a third receiver module, to receive a second radio signal on a second channel; and

a fourth transmitter module, to transmit a third radio signal in a first time window;

wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold, is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the

second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resource(s).

These features, as well as the combination of all the limitations within the independent claims, are not found or suggested in the prior art.

The dependent claims further limit the independent claims and are considered allowable on the same basis as the independent claims as well as for the further limitations set forth.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to WILL W LIN whose telephone number is (571)272-8749. The examiner can normally be reached on M-F 8:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles 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 http://pair-direct.uspto.gov. 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.

/WILL W LIN/
Primary Examiner, Art Unit 2412

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/059,045	ZHANG, Xiaobo
	Examiner	Art Unit
	WILL W LIN	2412

CPC							
Symbol						Type	Version
H04W	/	72	/	1215		F	2013-01-01
H04L	/	1	/	1657		I	2013-01-01
H04L	/	1	/	1861		I	2013-01-01
H04W	/	24	/	10		I	2013-01-01
H04L	/	5	/	0055		I	2013-01-01
H04L	/	5	/	0023		I	2013-01-01
H04L	/	5	/	0053		I	2013-01-01
H04L	/	5	/	0082		I	2013-01-01
H04L	/	5	/	0094		I	2013-01-01
H04B	/	7	/	0413		I	2013-01-01
H04L	/	5	/	0048		A	2013-01-01

CPC Combination Sets								
Symbol						Type	Set	Ranking	Version
	/		/						

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/WILL W LIN/ Primary Examiner, Art Unit 2412	24 November 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	5

U.S. Patent and Trademark Office — Part of Paper No.: 20191124

Samsung Exhibit 1003, Page 183 of 222

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/059,045	ZHANG, Xiaobo
	Examiner	**Art Unit**
	WILL W LIN	2412

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04W	/	72	/	12

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/WILL W LIN/ Primary Examiner, Art Unit 2412	24 November 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	5

U.S. Patent and Trademark Office — Part of Paper No.: 20191124

Samsung Exhibit 1003, Page 184 of 222

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/059,045	ZHANG, Xiaobo
	Examiner	**Art Unit**
	WILL W LIN	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	1	12	12	15	23										
2	2	13	13	20	24										
3	3	14	14												
4	4	16	16												
6	6	17	17												
7	7	18	18												
8	8	19	19												
9	9	5	21												
11	11	10	22												

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/WILL W LIN/ Primary Examiner, Art Unit 2412	24 November 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	5

U.S. Patent and Trademark Office Part of Paper No.: 20191124

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/059,045	ZHANG, Xiaobo
	Examiner	Art Unit
	WILL W LIN	2412

CPC - Searched*		
Symbol	Date	Examiner
H04W72/1215 or H04B7/0413 or H04W24/10 or H04L1/1861 or H04L5/0055 or H04L1/1657	08/15/2019	WL

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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

Search Notes		
Search Notes	Date	Examiner
Inventor Name Search	08/15/2019	WL
Assignee Search	08/15/2019	WL
EAST Search	08/15/2019	WL
EAST Search	11/24/2019	WL
NPL Search (Google patents, IP.com)	11/24/2019	WL

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	See Interference Search History Report	11/24/2019	WL

/WILL W LIN/ Primary Examiner, Art Unit 2412	

EAST Search History

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L10	0	(target and (time adj1 window) and (target adj1 measurement adj1 value) and (time adj1 domain adj1 resource)).clm.	US-PGPUB; USPAT	OR	OFF	2019/11/24 19:44
L11	0	(target and (time adj1 window) and (target adj1 measurement) and (time adj1 domain adj1 resource)).clm.	US-PGPUB; USPAT	OR	OFF	2019/11/24 19:45
L12	0	(target and (time adj1 window) and (target adj1 measurement) and (time adj1 domain)).clm.	US-PGPUB; USPAT	OR	OFF	2019/11/24 19:45
L13	7	(target and (time adj1 window) and measurement and (time adj1 domain)).clm.	US-PGPUB; USPAT	OR	OFF	2019/11/24 19:45

11/24/2019 7:47:56 PM
C:\Users\wlin1\Documents\EAST\Workspaces\16059045.wsp

Bibliographic Data

Application No: 16/059,045

Foreign Priority claimed: (•) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [ ] Met After Allowance

Verified and Acknowledged: /WILL W LIN/ Examiner's Signature [ ] Initials

Title: METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
08/09/2018	370	2412	S3876.10019US01
RULE			

APPLICANTS

Shanghai Langbo Communication Technology Company Limited, Shanghai, CHINA

INVENTORS

Xiaobo ZHANG Shanghai, CHINA

CONTINUING DATA

FOREIGN APPLICATIONS

CHINA 201710686330.4 08/11/2017

IF REQUIRED, FOREIGN LICENSE GRANTED**

08/24/2018

**** SMALL ENTITY ****

STATE OR COUNTRY

CHINA

ADDRESS

Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098
UNITED STATES

FILING FEE RECEIVED

$1,015

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	17	((("Shanghai") near3 ("Langbo") near3 ("Communication") near3 ("Technology") near3 ("Company") near3 ("Limited"))).AS,AANM.	USPAT	OR	OFF	2019/11/24 19:00
L2	186	((("ZHANG") near3 ("Xiaobo"))).INV.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/11/24 19:00
L3	4	(L1 L2) and (target same (time adj1 window)).clm.	US-PGPUB; USPAT	OR	OFF	2019/11/24 19:00
L4	98	(DCI DMRS CSI-RS (reference adj1 signal) (synchronization adj1 signal)) same (UCI FEC PUCCH (beam adj1 recovery adj1 request)) same (PUSCH RACH) same (RSRP SNR SINR BER BLER) and (blind adj1 decoding) and (period window)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/11/24 19:01
L5	81	L4 and ((@ad or @prad or @ptad or @rlad)<"20170811")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/11/24 19:01
L6	42	(blind adj1 decoding) with DCI same (DCI DMRS CSI-RS (reference adj1 signal) (synchronization adj1 signal)) same (UCI FEC PUCCH (beam adj1 recovery adj1 request)) same (PUSCH RACH) and (RSRP SNR SINR BER BLER)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/11/24 19:03
L7	40	L6 and ((@ad or @prad or @ptad or @rlad)<"20170811")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/11/24 19:03
L8	26	(blind adj1 decoding) with DCI same (UCI FEC PUCCH signal (beam adj1 recovery adj1 request)) same (PUSCH RACH) and (RSRP SNR SINR BER BLER) same time	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/11/24 19:25
L9	25	L8 and ((@ad or @prad or @ptad or @rlad)<"20170811")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	OFF	2019/11/24 19:25

			IBM_TDB			
S1	10	((("Shanghai") near3 ("Langbo") near3 ("Communication") near3 ("Technology") near3 ("Company") near3 ("Limited"))).AS,AANM.	USPAT	OR	OFF	2019/08/05 12:15
S2	144	((("ZHANG") near3 ("Xiaobo"))).INV.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/08/05 12:25
S3	3	(S1 S2) and (target same (time adj1 window)).clm.	US-PGPUB; USPAT	OR	OFF	2019/08/05 12:26
S6	1964	(DCI DMRS CSI-RS (reference adj1 signal) (synchronization adj1 signal)) and (UCI FEC PUCCH (beam adj1 recovery adj1 request)) and (PUSCH RACH) and (RSRP SNR SINR BER BLER) and (blind adj1 decoding) and (period window)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/14 19:26
S7	629	S6 and ((H04W72/1215 or H04B7/0413 or H04W24/10 or H04L1/1861 or H04L5/0055 or H04L1/1657).cpc.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/14 19:28
S8	87	(DCI DMRS CSI-RS (reference adj1 signal) (synchronization adj1 signal)) same (UCI FEC PUCCH (beam adj1 recovery adj1 request)) same (PUSCH RACH) same (RSRP SNR SINR BER BLER) and (blind adj1 decoding) and (period window)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/14 19:28
S9	78	S8 and ((@ad or @prad or @ptad or @rlad)<"20170811")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/14 19:29
S10	1011	(blind adj1 decoding) with DCI same (DCI DMRS CSI-RS (reference adj1 signal) (synchronization adj1 signal)) and (UCI FEC PUCCH (beam adj1 recovery adj1 request)) and (PUSCH RACH) and (RSRP SNR SINR BER BLER)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 10:32
S11	38	(blind adj1 decoding) with DCI same (DCI DMRS CSI-RS (reference adj1 signal) (synchronization adj1 signal)) same (UCI FEC PUCCH (beam adj1 recovery adj1 request)) same (PUSCH RACH) and (RSRP SNR SINR BER BLER)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 10:33
S12	37	S11 and ((@ad or @prad or @ptad or @rlad)<"20170811")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 10:34
S13	0	(blind adj1 decoding) with DCI same	US-PGPUB;	OR	OFF	2019/08/15

		(measurement with (DCI DMRS CSI-RS PDCCH PDSCH (reference adj1 signal) (synchronization adj1 signal))) same (UCI FEC PUCCH (beam adj1 recovery adj1 request)) same (PUSCH RACH) and (RSRP SNR SINR BER BLER)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			10:48
S14	9	(blind adj1 decoding) with DCI same (measurement with (DCI DMRS CSI-RS PDCCH PDSCH (reference adj1 signal) (synchronization adj1 signal)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 10:49
S15	9	S14 and ((@ad or @prad or @ptad or @rlad)<"20170811")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 10:49
S16	0	(blind adj1 decoding) with DCI same (UCI FEC PUCCH (beam adj1 recovery adj1 request)) same (PUSCH RACH) and (RSRP SNR SINR BER BLER) same (t T)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 12:01
S17	23	(blind adj1 decoding) with DCI same (UCI FEC PUCCH signal (beam adj1 recovery adj1 request)) same (PUSCH RACH) and (RSRP SNR SINR BER BLER) same time	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 12:02
S18	23	S17 and ((@ad or @prad or @ptad or @rlad)<"20170811")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2019/08/15 12:04
S19	1	"20180049164"	US-PGPUB	OR	OFF	2019/08/15 12:43

11/24/2019 7:47:35 PM
C:\Users\wlin1\Documents\EAST\Workspaces\16059045.wsp

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of :	Xiaobo ZHANG	
Application No.:	16/059,045	Art Unit 2412
Filed:	August 9, 2018	
Conf. No.:	5101	
For:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION	
Examiner:	Will W Lin	
Customer No.:	97149	
Attorney Docket No.:	S3876.10019US01	

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicant acknowledges Examiner's statements of Reasons for Allowance of the above-referenced patent application and agrees that the claimed subject matter is patentable. However, Applicant takes no position regarding the Reasons for Allowance presented by the Examiner other than the positions Applicant may have previously taken during prosecution. Therefore, the Examiner's Reasons for Allowance should not be attributed to Applicant as an indication of the basis for Applicant's belief that the claims are patentable. Furthermore, Applicant respectfully asserts that there may also be additional reasons for patentability of the claimed subject matter not explicitly stated in this record and Applicant does not waive its rights to such arguments by not further addressing such reasons herein.

Dated this 3rd day of January, 2020.

Respectfully submitted,

/R. Burns Israelsen, Reg. No. 42685/
Registration No. 42685
Attorney for Applicant
Customer No. 97149
Telephone No. (435) 252-1360

Electronic Patent Application Fee Transmittal

Application Number:	16059045
Filing Date:	09-Aug-2018
Title of Invention:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Xiaobo ZHANG
Filer:	Robert Burns Israelsen/Kaelee Cale
Attorney Docket Number:	S3876.10019US01

Filed as Small 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	2501	1	500	500

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**500**

Electronic Acknowledgement Receipt	
EFS ID:	38183015
Application Number:	16059045
International Application Number:	
Confirmation Number:	5101
Title of Invention:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Xiaobo ZHANG
Customer Number:	97149
Filer:	Robert Burns Israelsen/Kaelee Cale
Filer Authorized By:	Robert Burns Israelsen
Attorney Docket Number:	S3876.10019US01
Receipt Date:	03-JAN-2020
Filing Date:	09-AUG-2018
Time Stamp:	16:46:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$500
RAM confirmation Number	E202013G47239387
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

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)	S3876-10019US01_Issue_Fee_Transmittal.pdf	839824 7de728e26a65ce9f62bd38f0ff3f1b9297e94561	no	1
Warnings:					
Information:					
2	Miscellaneous Incoming Letter	S3876-10019US01_Comments.pdf	121524 c615e2e8eab686d971126e635763604e143a5d93	no	1
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30725 9d45ac72ca160a37b2cfdd402765b885a45b024b	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	992073		

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.

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)

97149 7590 11/27/2019
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

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.
16/059,045	08/09/2018	Xiaobo ZHANG	S3876.10019US01	5101

TITLE OF INVENTION: METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	02/27/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
LIN, WILL W	2412	370-252000

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 Maschoff Brennan
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: SHANGHAI LANGBO COMMUNICATION TECHNOLOGY COMPANY LIMITED

(B) RESIDENCE: (CITY and STATE OR COUNTRY): SHANGHAI, CHINA

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. 50-5394

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 /R. Burns Israelsen, Reg. No. 42685/ Date January 3, 2020

Typed or printed name R. Burns Israelsen Registration No. 42685

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

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.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/059,045	02/18/2020	10568113	S3876.10019US01	5101

97149 7590 01/29/2020

Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

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.

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

Xiaobo ZHANG, Shanghai, CHINA;
Shanghai Langbo Communication Technology Company Limited, Shanghai, CHINA;

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.

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

PTO/AIA/82A (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL 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	16/059,045
Filing Date	08-09-2018
First Named Inventor	Xiaobo ZHANG
Title	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION
Art Unit	2412
Examiner Name	LIN, WILL W
Attorney Docket Number	ZL0205-0006-US

SIGNATURE of Applicant or Patent Practitioner

Signature	/Jialin Zhong/	Date (Optional)	
Name	Jialin Zhong	Registration Number	62937
Title (if Applicant is a juristic entity)	Registered Patent Attorney		
Applicant Name (if Applicant is a juristic entity)	APEX BEAM TECHNOLOGIES LLC		

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 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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

PTO/AIA/82B (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY BY APPLICANT

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

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 155075

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):

APEX BEAM TECHNOLOGIES LLC

☐ 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	Deepak Kumar Sharma	Date (Optional)	11/10/2021
Name	Deepak Sharma		
Title	Managing Director		

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 1 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.

Privacy Act Statement

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

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

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

PTO/AIA/96 (08-12)
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: APEX BEAM TECHNOLOGIES LLC

Application No./Patent No.: 16/059,045 Filed/Issue Date: 08-09-2018

Titled: METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION

APEX BEAM TECHNOLOGIES LLC, a Limited Liability Company

(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 _____, Frame _____, 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: XIAOBO ZHANG To: SHANGHAI LANGBO COMMUNICATION TECHNOLOGY COMPANY LIMITED

   The document was recorded in the United States Patent and Trademark Office at
   Reel 046590, Frame 0969, or for which a copy thereof is attached.

2. From: SHANGHAI LANGBO COMMUNICATION TECHNOLOGY COMPANY LIMITED To: APEX BEAM TECHNOLOGIES LLC

   The document was recorded in the United States Patent and Trademark Office at
   Reel 058068, Frame 0338, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. 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 displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Jialin Zhong/	November 11, 2021
Signature	Date
Jialin Zhong	62,937
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:	44267662
Application Number:	16059045
International Application Number:	
Confirmation Number:	5101
Title of Invention:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Xiaobo ZHANG
Customer Number:	97149
Filer:	Jialin Zhong/Eddie Rowell
Filer Authorized By:	Jialin Zhong
Attorney Docket Number:	S3876.10019US01
Receipt Date:	12-NOV-2021
Filing Date:	09-AUG-2018
Time Stamp:	12:10:00
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	Application Data Sheet	ZL0205-0006-US_Marked-UP_ADS.pdf	1727512 638c76c302a48b1f0a3d519778c7562ede15f2f4	no	8

Warnings:

Information:					
This is not an USPTO supplied ADS fillable form					
2	Power of Attorney	ZL0205-0006-US_82A.pdf	264309 9c2dcab03bf56dbc02e479600cb124eec361a90c	no	1
Warnings:					
Information:					
3	Power of Attorney	POA82B_Apex_ex.pdf	1100582 d420eaec9e65ed86bfe977d519b96e062166a185	no	2
Warnings:					
Information:					
4	Assignee showing of ownership per 37 CFR 3.73	ZL0205-0006-US_3_73c.pdf	121240 ee5bc33d13e8d009043d27b4e8308fceb845f0d9	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	3213643		

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 Data Sheet 37 CFR 1.76	Attorney Docket Number	126099-8021.US00
	Application Number	16/059,045
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION	

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

Secrecy Order 37 CFR 5.2:

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

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Xiaobo		ZHANG	

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

City	Shanghai	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	Room E3, Floor 8, JunYao Building
Address 2	No.789 ZhaoJiaBang Road, XuHui District

City	Shanghai	State/Province	
Postal Code	200032	**Country** [i]	CN

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

Correspondence Information:

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

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

Customer Number	70416		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION		
Attorney Docket Number	126099-8021.US00	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	9	**Suggested Figure for Publication (if any)**	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	126099-8021.US00
	Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION	

Filing By Reference:

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

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

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

Publication Information:

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

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

Representative Information:

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

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	70416		

Domestic Benefit/National Stage Information:

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

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)

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

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	126099-8021.US00
	Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION	

Foreign Priority Information:

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

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
201710686330.4	CN	2017-08-11	

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

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

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	126099-8021.US00
	Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION	

Authorization or Opt-Out of Authorization to Permit Access:

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

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

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

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

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

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

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

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

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

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

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	126099-8021.US00
	Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION	

Applicant Information:

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

Applicant 1 Remove

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

Clear

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

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

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	~~Shanghai Langbo Communication Technology Company Limited~~ APEX BEAM TECHNOLOGIES LLC		
Mailing Address Information For Applicant:			
Address 1	~~Room E3, Floor 8, JunYao Building~~ 104 EAST HOUSTON STREET		
Address 2	~~No.798 ZhaojiaBang Road, Xuhui District~~ SUITE 180		
City	~~Shanghai~~ MARSHALL	**State/Province**	TX
Country	~~CN~~ US	Postal Code	~~200032~~ 75670
Phone Number		Fax Number	
Email Address			

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

Assignee Information including Non-Applicant Assignee Information:

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

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	126099-8021.US00
	Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION	

Assignee 1

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

Remove

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

Organization Name	~~Shanghai Langbo Communication Technology Company Limited~~ APEX BEAM TECHNOLOGIES LLC

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	~~Room E3, Floor 8, JunYao Building~~ 104 EAST HOUSTON STREET		
Address 2	~~No.789 ZhaoJiaBang Road, XuHui District~~ SUITE 180		
City	~~Shanghai~~ MARSHALL	**State/Province**	TX
Country i	~~CN~~ US	Postal Code	~~200032~~ 75670
Phone Number		Fax Number	
Email Address			

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

Signature:

Remove

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

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

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

Signature	~~/Aaron Wininger, Reg. No. 45,229/~~ /Jialin Zhong/			Date (YYYY-MM-DD)	~~2018-08-09~~ 2021-11-12
First Name	~~Aaron~~ Jialin	Last Name	~~Wininger~~ Zhong	Registration Number	~~45229~~ 62937

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

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	126099-8021.US00
	Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR WIRELESS COMMUNICATION	

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

Privacy Act Statement

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

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

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

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

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

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

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

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

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

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

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

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
16/059,045	08/09/2018	Xiaobo ZHANG	ZL0205-0006-US

CONFIRMATION NO. 5101

155075
Zhong Law, LLC
100 Connell Drive
Suite 2300
Berkeley Heights, NJ 07922

POA ACCEPTANCE LETTER

OC000000129834195

Date Mailed: 11/18/2021

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/12/2021.

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**.

/agizaw/

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/059,045	08/09/2018	Xiaobo ZHANG	S3876.10019US01

CONFIRMATION NO. 5101

97149
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

POWER OF ATTORNEY NOTICE

OC000000129834157

Date Mailed: 11/18/2021

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/12/2021.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. 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**.

/agizaw/

AO 120 (Rev. 08/10)

TO:	**Mail Stop 8** **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Eastern District of Texas, Marshall Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:21-cv-00438	11/30/2021	for the Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
APEX BEAM TECHNOLOGIES LLC	TCT Mobile International Limited, TCL Electronics Holdings Limited, TCL Technology Group Corporation, TCLCommunication Limited, and TCL Communication Technology Holdings Limited

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	10,462,767	10/29/2019	Apex Beam Technologies LLC
2	10,568,113	2/18/2020	Apex Beam Technologies LLC
3	10,912,081	2/2/2021	Apex Beam Technologies LLC
4	10,944,527	3/9/2021	Apex Beam Technologies LLC
5	10,951,271	3/16/2021	Apex Beam Technologies LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

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AMENDED

AO 120 (Rev. 08/10)

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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:22-cv-00031	02/01/2022	for the Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
APEX BEAM TECHNOLOGIES LLC	ZTE CORPORATION

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	10,462,767	10/29/2019	Apex Beam Technologies LLC
2	10,568,113	2/18/2020	Apex Beam Technologies LLC
3	10,912,081	2/2/2021	Apex Beam Technologies LLC
4	10,944,527	3/9/2021	Apex Beam Technologies LLC
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In the above---entitled case, the following patent(s)/ trademark(s) have been included:

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AO 120 (Rev. 08/10)

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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:22-cv-00032	02-01-2022	for the Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
APEX BEAM TECHNOLOGIES LLC	ONEPLUS TECHNOLOGY (SHENZHEN) CO., LTD.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	10,462,767	10/29/2019	Apex Beam Technologies LLC
2	10,568,113	2/18/2020	Apex Beam Technologies LLC
3	10,912,081	2/2/2021	Apex Beam Technologies LLC
4	10,944,527	3/9/2021	Apex Beam Technologies LLC
5	10,951,271	3/16/2021	Apex Beam Technologies LLC

In the above---entitled case, the following patent(s)/ trademark(s) have been included:

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AO 120 (Rev. 08/10)

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DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:22-cv-000188	06-01-2022	for the Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
APEX BEAM TECHNOLOGIES LLC	SAMSUNG ELECTRONICS CO., LTD. and SAMSUNG ELECTRONICS AMERICA, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	10,462,767	10/29/2019	Apex Beam Technologies LLC
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5	10,951,271	3/16/2021	Apex Beam Technologies LLC

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AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

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2:22-cv-000188	06-01-2022	for the Eastern District of Texas, Marshall Division

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