IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

APEX BEAM TECHNOLOGIES, LLC, Plaintiff, v. ZTE CORPORATION, Defendant.	§ § § § § § § § § § § §	Case No. 2:22-cv-00031-JRG-RSP (LEAD CASE) **JURY TRIAL DEMANDED**
APEX BEAM TECHNOLOGIES, LLC, Plaintiff, v. SAMSUNG ELECTRONICS CO., LTD. and SAMSUNG ELECTRONICS AMERICA, INC., Defendants.	§ § § § § § § § § § § §	Case No. 2:22-cv-00188-JRG-RSP (MEMBER CASE) **JURY TRIAL DEMANDED**

JOINT CLAIM CONSTRUCTION AND PREHEARING STATEMENT

In accordance with Patent Local Rule 4-3, Plaintiff Apex Beam Technologies LLC ("Apex Beam" or "Plaintiff") and Defendants ZTE Corporation, Samsung Electronics Co. Ltd., and Samsung Electronics America, Inc. (collectively "Defendants") jointly submit this Joint Claim Construction and Prehearing Statement setting for the parties' proposed constructions for the herein identified terms, phrases, or clauses of U.S. Patent Nos. 10,462,767; 10,568,113; 10,912,081; 10,944,527; and 10,951,271 (collectively, "the Asserted Patents").

I. Agreed Constructions of Claim Terms, Phrases, or Clauses (P.R. 4-3(a)(1))

None.

II. Disputed Claim Terms, Phrases, or Clauses (P.R. 4-3(a)(2))

The parties' proposed constructions of each disputed claim term, phrase, or clause, and identification of evidence that supports these constructions are set forth below. Each party reserves the right to cite to intrinsic and extrinsic evidence cited by the other party.

#	Claim Term(s), Phrase(s), or Clause(s)	Plaintiff's Proposed Constructions and Support	Defendants' Proposed Constructions and Support
1	"X time intervals…wherein X is a positive integer" '767 Patent Claims 1 and 11	Plain and ordinary meaning **Intrinsic Evidence:** U.S. Patent No. 10,462,767: Abstract; 2:45-3:2, 3:43-51, 4:1-7, 6:45-8:46, 9:51-10:27, 14:59-15:49, 16:16-63, 18:49-19:21, 20:66-21:24, 21:59-22:19; FIGS. 1, 5 **Extrinsic Evidence:** "**time**: Its symbol is t. Its SI unit is the second. 1. A dimension that enables two otherwise identical events occurring at the same point in space to be distinguished. Time orders the sequence of these events. 2. A measure of the duration of one or more actions, processes, events, or the like. 3. A measure of the time (1) that elapses between actions, processes, events, or the like. 4. The instant at which a given action, process, event, or the like, occurs. 5. A specific instant within a day, based on a given parameter or phenomena. For example, standard time is based on a celestial parameter, and atomic time is based on the natural resonance	"plural, positive integer number of time intervals" **Intrinsic Evidence:** "In one embodiment, the first signaling is detected P times at most in each one of the X time intervals, P is a positive integer." ('767 patent, 2:45-47; *see also* '767 patent, 18:65-67.) "In one embodiment, any two of the X time intervals have an equal time length." ('767 patent, 2:48-49 *see also* '767 patent, 19:1-2.) "In one embodiment, two of the X time times [*sic*] have different time lengths." ('767 patent, 2:50-51; *see also* '767 patent, 19:3-4.) "In one embodiment, any one of the X time intervals is a slot." ('767 patent, 2:52-53; *see also* '767 patent, 19:5-6.) "In one embodiment, any two of the X time intervals have an equal time length, and the time length of each one of the X time intervals is correlated to the subcarrier spacing of

		frequencies of atoms." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004. "**interval**: 1. A space or separation between two points, locations, objects, or the like. For example, the distance between peaks of successive wave cycles. 2. A given range of values. For instance, an interval of frequencies or temperatures. Also, a specific range of values, such as the readings an instrument can display. 3. The time that elapses between the occurrence of two specified events, states, or instants. For example, the regular intervals at which AC voltage alternates, the irregular intervals at which a circuit with a loose connection might open and close, or the time within which a pulse rises from 0 to its maximum amplitude." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004. "**positive**: Its abbreviation is pos, or P. Its symbol is +. 1. Of, or pertaining to, a quantity or value above zero. For instance, a temperature greater than absolute zero, or a positive number. 2. Of, pertaining to, or the same as the charge or a multiple of the charge of a proton. For example, the plus one charge of a sodium ion. 3. Of, or pertaining to, a particle, material, or other entity which has a deficiency of electrons. For instance, a cation. 4. Of, or pertaining to, a quantity, value, entity, phenomenon, or concept which is considered the opposite of an	subcarriers included in the first subband." ('767 patent, 2:54-57; *see also* '767 patent, 19:7-10.) "In one embodiment, any one of the X time intervals comprises M Orthogonal Frequency Division Multiplexing (OFDM) symbols, M is a positive integer smaller than 14." ('767 patent, 2:58-60; *see also* '767 patent, 19:11-12.) "In one embodiment, any one of the X time intervals comprises M OFDM symbols, M is a positive integer smaller than 7." ('767 patent, 2:61-63; *see also* '767 patent, 19:13-15.) "In one embodiment, any two of the X time intervals are orthogonal in time domain, the orthogonality refers that there is no time unit that belongs to any two of the X time intervals simultaneously." ('767 patent, 2:64-67; *see also* '767 patent, 19:16-19.) "In one embodiment, two of the X time intervals are discrete in time domain." ('767 patent, 3:1-2; *see also* '767 patent, 19:20-21.) "In one embodiment, at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for the UE to determine the X time intervals." ('767 patent, 3:43-46.) "In one embodiment, at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for the UE to determine

		equivalent which would be described as a negative. For example, a positive electrode, positive image, positive peak, positive pole, and so on. 5. Same as positive image." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004. "**integer**: The set of numbers including zero, and all positive and negative whole numbers. Also called integral number." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004.	the X time intervals based on a given mapping rule." ('767 patent, 3:47-51.) "According to one aspect of the present disclosure, the above method is characterized in that any one of the X time intervals belongs to a first time window in time domain; The time length of the first time window is predefined; The first time window is divided into Y time intervals; The X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X; The subcarrier spacing of subcarriers included in the first subband is used for determining Y; A feature ID of a monitor of the first signaling is used for determining the X time intervals in the Y time intervals." ('767 patent, 3:64-4:7; *see also* '767 patent, 7:50-60, 10:3-22, 16:54-63, 18:55-64, 21:15-24, 22:10-19.) "In one embodiment, the feature ID of the monitor of the first signaling is used for the UE to determine the X time intervals in the Y time intervals." ('767 patent, 4:36-38.) "In one embodiment, the feature ID of the monitor of the first signaling is used for the UE to determine the X time intervals in the Y time intervals based on a given mapping relationship." ('767 patent, 4:39-42.) "In one embodiment, a physical cell ID of a cell transmitting the first signaling is used for determining the X time intervals in the Y time intervals." ('767 patent, 4:53-55.)

			"The UE U2 receives the second radio signal in S21, receives the second signaling in S22, monitors the first signaling in X time intervals in S23, and receives the first radio signal in S24." ('767 patent, 16:28-31.) "In embodiment 6, the UE#1 monitors a first signaling in X1 time intervals respectively. The frequency domain resource used for transmitting the first signaling belongs to the subband #1. The subband #1 includes a positive integer number of consecutive subcarriers in frequency domain. At least one of {location of the subband #1 in frequency domain, subcarrier spacing of subcarriers included in the subband #1} is used for determining the X1 time intervals. Any one of the X1 time intervals belongs to the time window #a in time domain. The time length of the time window #a is predefined. The time window #a is divided into Y1 time intervals. The X1 time intervals are X1 time intervals of the Y1 time intervals, Y1 being a positive integer not smaller than X1. The subcarrier spacing of subcarriers included in the subband #1 is used for determining Y1. A feature ID of the UE#1 is used for determining the X1 time intervals in the Y1 time intervals." ('767 patent, 17:55-18:4.) '767 patent, Claims 1, 2, 11, and 12.

2	"first subband" '767 Patent Claims 1-2, 4-5, 11-12, and 14-15	"first one of a plurality of subsets of a frequency band" **Intrinsic Evidence:** U.S. Patent No. 10,462,767: Abstract; 2:20-32, 3:26-51, 4:1-35, 5:24-9:3, 9:51-10:43, 14:39-22:38; FIG. 6 **Extrinsic Evidence:** "**subband**: An interval of frequencies which form part of a larger band. For example, a portion of the band of frequencies transmitted by a satellite antenna. Also spelled sub-band." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004.	"one of a plurality of subsets of a frequency band determined using a feature ID of a monitor of the first signaling" [This proposed construction is based on the statements Apex made in its Patent Owner Preliminary Response in the corresponding IPR, so the construction is only applicable here and not in the IPR. IPR2023-00598, Patent Owner's Preliminary Response at 4; *see, e.g.*, *CUPP Computing AS v. Trend Micro Inc.*, 53 F.4th 1376, 1383 (Fed. Cir. 2022).] **Intrinsic Evidence:** "According to one aspect of the present disclosure, the above method further includes the following: receiving a second signaling; Herein, the second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; The feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands." ('767 patent, 5:66-6:8.) "In one embodiment, the feature ID of the monitor of the first signaling is used for the UE to determine the first subband in the Q subbands." ('767 patent, 6:38-40.) "In one embodiment, the feature ID of the monitor of the first signaling is used for the UE

			to determine the first subband in the Q subbands based on a specific mapping relationship." ('767 patent, 6:41-44.) "Herein, the second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; The feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands." ('767 patent, 7:25-31.) "According to one aspect of the present disclosure, the above UE is characterized in that the first receiver module further receives a second signaling; The second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; The feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands." ('767 patent, 8:7-15.) "The second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; The feature ID of the monitor of the first signaling is used for determining the first subband in the Q

			subbands." ('767 patent, 10:38-43; *see also* '767 patent, 16:47-53.) "The subband #1 belongs to one of the Q subbands, Q being a positive integer. Any one of the Q subbands includes a positive integer number of consecutive subcarriers. The feature ID of the UE#1 is used for determining the subband #1 in the Q subbands." ('767 patent, 18:9-13.) "In one embodiment, the first receiver module 901 further receives a second signaling; The second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; The feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands." ('767 patent, 21:36-43.) '767 patent, Claims 1, 5, 11, and 15. "The specification of the '767 Patent defines the term subband to refer to one of a plurality of subsets of a frequency band by stating that '[h]erein, the second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; The feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands,' ('767 Patent, 6:2-8) and that

			'[h]erein, the second radio signal is used for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.' *Id.*, 5:27-30. These statements constitute lexicography, and require that, as used 'herein,' the term subband refers to one of Q subbands (using the plural, subbands), which are located in the frequency domain. This lexicography is consistent with embodiments and examples of subbands throughout the specification." (Patent Owner's Preliminary Response at 4-5, IPR2023-00598 (emphasis removed).)
3	"the first time window is divided into Y time intervals" '767 Patent Claims 2 and 12	Plain and ordinary meaning **Intrinsic Evidence:** U.S. Patent No. 10,462,767: 3:64-4:7, 6:63-7:6, 7:50-60, 8:36-46, 10:3-27, 16:54-63, 17:55-18:14, 18:55-64, 21:15-24, 22:9-19. **Extrinsic Evidence:** "**time**: Its symbol is t. Its SI unit is the second. 1. A dimension that enables two otherwise identical events occurring at the same point in space to be distinguished. Time orders the sequence of these events. 2. A measure of the duration of one or more actions, processes, events, or the like. 3. A measure of the time (1) that elapses between actions, processes, events,	"the first time window consists of Y number of time intervals" **Intrinsic Evidence:** "In one embodiment, any two of the Y time intervals have an equal time length." ('767 patent, 4:23-24; *see also* '767 patent, 19:36-37.) "In one embodiment, two of the Y time intervals have different time lengths." ('767 patent, 4:25-26.) "In one embodiment, Y is greater than X." ('767 patent, 4:27.) "In one embodiment, Y is proportional to the subcarrier spacing of subcarriers included in the

		or the like. 4. The instant at which a given action, process, event, or the like, occurs. 5. A specific instant within a day, based on a given parameter or phenomena. For example, standard time is based on a celestial parameter, and atomic time is based on the natural resonance frequencies of atoms." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004. "**interval**: 1. A space or separation between two points, locations, objects, or the like. For example, the distance between peaks of successive wave cycles. 2. A given range of values. For instance, an interval of frequencies or temperatures. Also, a specific range of values, such as the readings an instrument can display. 3. The time that elapses between the occurrence of two specified events, states, or instants. For example, the regular intervals at which AC voltage alternates, the irregular intervals at which a circuit with a loose connection might open and close, or the time within which a pulse rises from 0 to its maximum amplitude." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004. "**window**: 1. A time interval during which an activity may take place. Also, a time interval during which an activity must take place. 2. An interval of radio frequencies which pass through or are propagated via the atmosphere. For example, a radio window. Also, an interval of	first subband." ('767 patent, 4:28-29; *see also* '767 patent, 19:38-39.) "The time length of the time window #a is predefined. The time window #a is divided into Y1 time intervals. The X1 time intervals are X1 time intervals of the Y1 time intervals, Y1 being a positive integer not smaller than X1. The subcarrier spacing of subcarriers included in the subband #1 is used for determining Y1. A feature ID of the UE#1 is used for determining the X1 time intervals in the Y1 time intervals." ('767 patent, 17:64-18:4; *see* '767 patent, Fig. 6.) "FIG. 7 lists the index of X=1 time interval in the first time window according to different Y values and different UE feature IDs." ('767 patent, 18:52-54; *see* '767 patent, Fig. 7.) "In embodiment 7, the UE monitors a first signaling in X time intervals respectively. Any one of the X time intervals belongs to a first time window in time domain. The time length of the first time window is predefined. The first time window is divided into Y time intervals. The X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X. The subcarrier spacing of subcarriers included in the first subband is used for determining Y. The feature ID of the UE is used for determining the X time intervals in the Y time intervals." ('767 patent, 18:55-64.) '767 patent, Claims 2 and 12.

		frequencies which is transmitted through a given object or medium. 3. A transparent section of a material, such as glass or plastic, through which the inner portion of a device or apparatus can be viewed. For example, such a window on certain radiation detectors. 4. An area on a computer screen which defined boundaries, and within which information is displayed. Windows can be resized, maximized, minimized, placed side-by-side, overlaid, and so on. Each window can be that of a separate program, while a single program may have any number of windows open at a given moment. When two or more windows are open, only one is active, and the rest are inactive. Also called application window. 5. A hole or opening between two cavities or waveguides, the bars of a transformer, or the like. 6. A partial view of something such as that of a dial or of a file. The viewed section can be varied, so as to see different portions at different moments. 7. A material, such as foil, intended to interfere with radar operation." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004.	
4	"used for" '767 Patent Claims 11, 12, 13, and 15	Plain and ordinary meaning **<u>Intrinsic Evidence:</u>** <u>U.S. Patent No. 10,462,767</u>:	Indefinite **<u>Intrinsic Evidence:</u>** "The present disclosure discloses a method in a UE used for paging. The method includes the following:

		Abstract; 2:20-32, 3:43-4:62, 5:66-9:3; 9:51-10:43, 14:39-17:2, 17:44-18:14, 18:49-64, 19:51-22:38; FIGS. 2, 4, 5. **<u>Extrinsic Evidence:</u>** Expert Declaration of Miguel Gomez (see attached).	monitoring a first signaling in X time intervals; and receiving a first radio signal. Herein, X is a positive integer. The first signaling is used for determining scheduling information for the first radio signal. The scheduling information includes at least one of {occupied time-frequency resource, adopted Modulation Coding Scheme (MCS), subcarrier spacing of subcarriers in occupied frequency domain resource}. The first radio signal carries a paging message. The frequency domain resource used for transmitting the first signaling belongs to a first subband. The first subband includes a positive integer number of consecutive subcarriers in frequency domain. At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals." ('767 patent, 2:16-32; *see also* '767 patent, 6:45-62, 9:54-10:2, 16:17-44.) "The present disclosure discloses a UE used for paging. The UE includes: a first receiver module, to monitor a first signaling in X time intervals; and a second receiver module, to receive a first radio signal. Herein, X is a positive integer. The first signaling is used for determining scheduling information for the first radio signal; The

			scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; The first radio signal carries a paging message; The frequency domain resource used for transmitting the first signaling belongs to a first subband; The first subband includes a positive integer number of consecutive subcarriers in frequency domain; At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals." ('767 patent, 7:32-49; *see also* '767 patent, 8:16-35, 14:39-58, 14:59-15:9, 15:10-29, 15:30-49.) "Embodiment 8 illustrates an example of a diagram for a relationship among a first signaling, a first radio signal and a second radio signal according to one embodiment of the present disclosure, as shown in FIG. 8. In FIG. 8, the horizontal axis represents time, the vertical axis represents frequency, the rectangle filled by oblique lines represents a time-frequency resource occupied by the second radio signal, the rectangle filled by cross lines represents a time-frequency resource occupied by the first signaling, the rectangle filled by crossed oblique lines represents a time-frequency resource occupied by the first radio signal, and the dotted arrow represents a specific usage relationship.

			In embodiment 8, the first signaling is used for determining scheduling information for the first radio signal. The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}. The frequency domain resource used for transmitting the first signaling belongs to a first subband. The first subband includes a positive integer number of consecutive subcarriers in frequency domain. The second radio signal is used for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}." ('767 patent 19:51-20:7.) "Embodiment 9 illustrates an example of a structure block diagram for a processing device in a UE, as shown in FIG. 9. In FIG. 9, the processing device 900 for the UE is mainly composed of a first receiver module 901 and a second receiver module 902. The first receiver module 901 includes the transmitter/receiver 456 (including the antenna 460), the receiving processor 452 and the controller/processor 490 shown in FIG. 4. The second receiver module 902 includes the transmitter/receiver 456 (including the antenna 460), the receiving processor 452 and the controller/processor 490 shown in FIG. 4. In embodiment 9, the first receiver module 901 monitors a first signaling in X time intervals,

			and the second receiver module 902 receives a first radio signal, wherein X is a positive integer; The first signaling is used for determining scheduling information for the first radio signal; The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; The first radio signal carries a paging message; The frequency domain resource used for transmitting the first signaling belongs to a first subband; The first subband includes a positive integer number of consecutive subcarriers in frequency domain; At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals." ('767 patent, 20:55-21:14, 21:59-22:8.) "According to one aspect of the present disclosure, the above method is characterized in that any one of the X time intervals belongs to a first time window in time domain; The time length of the first time window is predefined; The first time window is divided into Y time intervals; The X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X; The subcarrier spacing of subcarriers included in the first subband is used for determining Y; A feature ID of a monitor of the first signaling is used for determining the X time intervals in the Y time intervals." ('767 patent, 3:64-4:7; *see*

			also ’767 patent, 7:50-60, 10:3-22, 16:54-63, 17:63-18:4, 18:55-64, 21:15-24, 22:10-19.) “According to one aspect of the present disclosure, the above method is characterized in that the first time window belongs to one of Z time windows, Z being an integer greater than 1; Z is predefined, or Z is configurable; Any two of the Z time windows have an equal time length; The feature ID of the monitor of the first signaling is used for determining the first time window in the Z time windows.” (’767 patent, 4:56-62; *see also* ’767 patent, 7:7-13, 7:61-67, 8:47-54, 10:22-27, 16:64-17:2, 18:4-9, 21:25-30, 22:20-25.) “According to one aspect of the present disclosure, the above method further includes the following: receiving a second signaling; Herein, the second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; The feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands.” (’767 patent, 5:66-6:8; *see also* ’767 patent, 6:38-44, 7:22-31, 8:7-15, 8:62-9:3, 10:35-43, 16:44-53, 18:9-13, 21:36-43, 22:31-38.) ’767 patent, Claims 11, 12, 13, and 15.

5	"used for" '113 Patent Claims 11, 12, and 15	Plain and ordinary meaning **Intrinsic Evidence:** U.S. Patent No. 10,568,113: Abstract; 1:60-2:65, 3:31-12:55, 13:42-14:41, 20:32-21:54, 22:47-25:9; FIGS. 2, 4, 5, 8, 9 File history for U.S. Patent No. 10,568,113: 11/20/2019 Response to Office Action 11/22/2019 Response to Office Action **Extrinsic Evidence:** Expert Declaration of Miguel Gomez (see attached).	Indefinite **Intrinsic Evidence:** "The present disclosure provides a method in a UE for wireless communication. The method includes the following steps of: 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. 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." ('113 patent, 1:60-2:7; *see also* '113 patent, 10:33-46, 11:36-51, 12:12-27.) "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)." ('113 patent, 2:18-22.) "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. 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. 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. 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. 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. In one embodiment, an analog transmitting beam used for transmitting a physical layer control channel is used for transmitting the target radio signal. In one embodiment, an analog receiving beam used for receiving a physical layer control

			channel is used for receiving the target radio signal. 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. 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. In one embodiment, an analog transmitting beam used for transmitting a physical layer shared channel is used for transmitting the target radio signal. In one embodiment, an analog receiving beam used for receiving a physical layer shared channel is used for receiving the target radio signal." ('113 patent, 2:30-65; *see also* '113 patent, 6:60-7:33.) "In one embodiment, one antenna port is used for transmitting one reference signal. In one embodiment, different antenna ports are used for transmitting different reference signals. In one embodiment, a physical layer control channel is used for transmitting the first radio signal. In one embodiment, the first radio signal carries Uplink Control Information (UCI).

			In one embodiment, Forward Error Correction (FEC) is used in generating the first radio signal. In one embodiment, the first radio signal is used for determining a beam recovery request. 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." ('113 patent, 3:31-46.) "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. In one embodiment, a physical layer control channel is used for transmitting the second radio signal. In one embodiment, the second radio signal carries one UCI. 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." ('113 patent, 3:62-4:10.)

			"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. In one embodiment, a physical layer control channel is used for transmitting the third radio signal. In one embodiment, the third radio signal carries one DCI. In one embodiment, the third radio signal is terminal specific. 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. In one embodiment, the antenna port group includes one antenna port only. In one embodiment, the antenna port group includes multiple antenna ports. In one embodiment, the first radio signal is used for determining a first antenna port group. In one subembodiment, an analog transmitting beam used for the first antenna port group is used for transmitting the third radio signal. In one subembodiment, an analog receiving beam used for receiving the first antenna port group is used for monitoring the third radio signal.

			In one embodiment, the second radio signal is used for determining a second antenna port group. In one subembodiment, an analog transmitting beam used for the second antenna port group is used for transmitting the third radio signal. In one subembodiment, an analog receiving beam used for receiving the second antenna port group is used for monitoring the third radio signal." ('113 patent, 4:16-48; *see also* '113 patent, 7:42-63.) "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." ('113 patent, 4:62-65.) "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. In one subembodiment, the target measurement value is used for determining the quality of the channel through which the target radio signal passes. 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." ('113 patent, 5:9-21.) "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. 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. 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. 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. In one subembodiment, the second information is used for determining an analog transmitting beam used for transmitting the third radio signal. 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.

			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. 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. In one subembodiment, the second information is related to the multi-antenna related receiving of the third radio signal. 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. 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. 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. 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. In one subembodiment, the UE does not detect the third radio signal in the first time interval. In one embodiment, a time domain resource occupied by the second radio signal is within the first time window. 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." ('113 patent, 5:46-6:39.) "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. 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." ('113 patent, 7:64-8:6.) "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)}." ('113 patent, 8:49-56.) "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. In one embodiment, a time domain resource occupied the first radio signal is used for determining the start time of a second time window." ('113 patent, 9:4-14.) "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.

			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." ('113 patent, 9:39-46; *see also* '113 patent, 11:24-35, 12:1-11, 12:45-55.) "In one embodiment, the second time window and the third time window are used for determining the first time window." ('113 patent, 9:55-56.) "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. In one subembodiment, the first time window consists of the second time interval and the third time window. 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. 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. 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. 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. 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." ('113 patent, 10:5-32.) "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." ('113 patent, 10:56-60; *see also* '113 patent, 11:4-8, 11:52-55, 12:28-31.) "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." ('113 patent, 10:65-67; *see also* '113 patent, 11:9-13, 11:56-59, 12:32-35.) "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. 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." ('113 patent, 13:42-62.) "In one embodiment, an uplink physical layer control channel is used for transmitting the first radio signal. In one embodiment, a physical layer random access channel is used for transmitting the second radio signal. In one embodiment, a time domain resource occupied by the second radio signal is within the first time window.

			In one embodiment, the second radio signal is used for determining the multi-antenna related transmitting of the third radio signal. 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. 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. 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. 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. In one embodiment, the first radio signal and the second radio signal together are used for determining the third antenna port group. In one embodiment, the UE does not detect the third radio signal in the second time interval. In one embodiment, a downlink physical layer control channel is used for transmitting the third radio signal." ('113 patent, 14:1-41.) "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)." ('113 patent, 16:63-4.) "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." ('113 patent, 17:59-64; *see also* '113 patent, 19:49-54.)

			"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)." ('113 patent, 18:59-67.) "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." ('113 patent, 20:32-46; *see also* '113 patent, 20:47-60.) "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." ('113 patent, 20:61-21:8; *see also* '113 patent, 21:9-23.) "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. 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.

			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. 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. 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. 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. 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. 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." ('113 patent, 21:28-54.) "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. 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. 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. 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. 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." ('113 patent, 22:47-23:12.) "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." ('113 patent, 23:32-41.) "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." ('113 patent, 23:48-54.) "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. 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. 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. 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. In one subembodiment, the first channel is a physical layer control channel. 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 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." ('113 patent, 24:3-32; '113 patent, 24:48-25:9.) '113 patent, Claims 11, 12, and 15.
6	"time window" '113 Patent Claims 1, 5, 11, and 15	"the time allocated to respond to a signal request" **Intrinsic Evidence:** U.S. Patent No. 10,568,113: Abstract; 1:43-2:7, 5:28-6:43, 9:4-10:46, 11:24-12:55, 13:42-14:24, 20:32-25:9; FIGS. 1, 5, 6 File history for U.S. Patent No. 10,568,113: 11/20/2019 Response to Office Action 11/22/2019 Response to Office Action **Extrinsic Evidence:** "**time**: Its symbol is t. Its SI unit is the second. 1. A dimension that enables two otherwise identical events occurring at the same point in space to be distinguished. Time orders the sequence of these events. 2. A measure of the duration of one or more actions, processes, events, or the like. 3. A measure of the time (1) that elapses between actions, processes, events, or the like. 4. The instant at which a given action, process, event, or the like, occurs. 5. A specific instant within a day, based on a given parameter or phenomena. For example, standard time is based on a celestial parameter, and atomic time is based on the natural resonance frequencies of atoms." Steven M. Kaplan,	"one or more intervals of time" **Intrinsic Evidence:** "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." ('113 patent, 1:43-52.) "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." ('113 patent, 5:46-48.) "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

		Wiley Electrical and Electronics Engineering Dictionary, 2004. "**window**: 1. A time interval during which an activity may take place. Also, a time interval during which an activity must take place. 2. An interval of radio frequencies which pass through or are propagated via the atmosphere. For example, a radio window. Also, an interval of frequencies which is transmitted through a given object or medium. 3. A transparent section of a material, such as glass or plastic, through which the inner portion of a device or apparatus can be viewed. For example, such a window on certain radiation detectors. 4. An area on a computer screen which defined boundaries, and within which information is displayed. Windows can be resized, maximized, minimized, placed side-by-side, overlaid, and so on. Each window can be that of a separate program, while a single program may have any number of windows open at a given moment. When two or more windows are open, only one is active, and the rest are inactive. Also called application window. 5. A hole or opening between two cavities or waveguides, the bars of a transformer, or the like. 6. A partial view of something such as that of a dial or of a file. The viewed section can be varied, so as to see different portions at different moments. 7. A material, such as foil, intended to interfere with radar operation." Steven M. Kaplan, Wiley	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." ('113 patent, 6:30-39.) "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." ('113 patent, 9:57-63.) "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. In one subembodiment, the first time window consists of the second time interval and the third time window." ('113 patent, 10:5-11.) "Embodiment 6 illustrates an example of a first time window, a second time window and a third time window, as shown in FIG. 6. 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

		Electrical and Electronics Engineering Dictionary, 2004.	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." ('113 patent, 22:44-61.) "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." ('113 patent, 23:7-13.) '113 patent, Figure 6. '113 patent, Claims 1, 5, 11, 15. **<u>Extrinsic Evidence:</u>** "window: 1. A time interval during which an activity may take place. Also, a time interval during which an activity must take place. 2. An interval of radio frequencies which pass through

			or are propagated via the atmosphere. For example, a radio window. Also, an interval of frequencies which is transmitted through a given object or medium. 3. A transparent section of a material, such as glass or plastic, through which the inner portion of a device or apparatus can be viewed. For example, such a window on certain radiation detectors. 4. An area on a computer screen which defined boundaries, and within which information is displayed. Windows can be resized, maximized, minimized, placed side-by-side, overlaid, and so on. Each window can be that of a separate program, while a single program may have any number of windows open at a given moment. When two or more windows are open, only one is active, and the rest are inactive. Also called application window. 5. A hole or opening between two cavities or waveguides, the bars of a transformer, or the like. 6. A partial view of something such as that of a dial or of a file. The viewed section can be varied, so as to see different portions at different moments. 7. A material, such as foil, intended to interfere with radar operation." (Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004.)
7	"time unit" '081 Patent Claims 1 and 9	Plain and ordinary meaning **<u>Intrinsic Evidence:</u>** <u>U.S. Patent No. 10,912,081</u>:	"a determinate quantity of time adopted as a standard of measurement"

		Abstract; 2:5-34, 3:37-48, 4:3-14, 5:35-45, 6:59-8:44, 9:66-10:3; 14:48-20:17; FIGS. 6-8 File history for U.S. Patent No. 10,912,081: 6/24/2020 Response to Office Action 10/23/2020 Amendment after Notice of Allowance **Extrinsic Evidence:** "**time**: Its symbol is t. Its SI unit is the second. 1. A dimension that enables two otherwise identical events occurring at the same point in space to be distinguished. Time orders the sequence of these events. 2. A measure of the duration of one or more actions, processes, events, or the like. 3. A measure of the time (1) that elapses between actions, processes, events, or the like. 4. The instant at which a given action, process, event, or the like, occurs. 5. A specific instant within a day, based on a given parameter or phenomena. For example, standard time is based on a celestial parameter, and atomic time is based on the natural resonance frequencies of atoms." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004. "**unit**: 1. An item, group, structure, or entity which is regarded as a single entity or whole. 2. A unit (1) which is a part of a larger item, group, structure, or entity. For example, a control unit, a data unit, a logic unit, or a crystal unit. 3. A piece, part, or assembly which can independently perform one or more functions. For instance, a radar unit, an amplifier, a power	**Intrinsic Evidence:** "In one embodiment, the first time unit is a subframe. In one embodiment, the subframe includes 14 Orthogonal Frequency Division Multiplexing (OFDM) symbols. In one embodiment, the first time unit is a time slot. In one embodiment, the time slot includes 7 OFDM symbols. In one embodiment, the first time unit is a Transmission Time Interval (TTI)." ('081 patent, 2:24-31.) "In one embodiment, the first time unit is composed of N1 multicarrier symbols in which the second radio signal is located and N2 multicarrier symbols. N2 is not smaller than G. The second radio signal is used for determining the G multicarrier symbols of the N multicarrier symbols. N1 and N2 are positive integers. In one embodiment, the first time unit is composed of N1 multicarrier symbols in which the second radio signal is located and G multicarrier symbols. The N1 multicarrier symbols are used for determining the G multicarrier symbols. N1 is a positive integer." ('081 patent, 4:3-14.) "In Embodiment 6, the first radio signal consists of G multicarrier symbols, the first time unit includes the G multicarrier symbols, the first

		pack, or a rectifier unit. 4. An amount or magnitude of a physical quantity, such as mass or distance, which is utilized as a standard to express such quantities or magnitudes. For example, the defined SI unit for mass is the kilogram, and the meter serves to express distances. Such units are also used in multiples to state values, as in picogram, or kilometer. Also called unit of measurement." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004.	time point is one time point within the first time unit, and the relative position of the first radio signal with respect to the first time point in time domain includes the three cases shown in FIG. 6." ('081 patent, 17:26-31.) "In one subembodiment, the time unit is a subframe. In one subembodiment, the time unit is a time slot." ('081 patent, 17:45-46.) "In Embodiment 7, both the first radio signal and the second radio signal are transmitted within the first time unit, the multicarrier symbols occupied by the second radio signal are before the multicarrier symbols occupied by the first radio signal in time domain, the first receiving beam is used for receiving the second radio signal, the second radio signal indicates the start time point of the first radio signal in the first time unit, and the start time point is used for determining the time domain resource occupied by the first radio signal in the first time unit. The first time point is one time point within the first time unit behind the multicarrier symbols occupied by the second radio signal." ('081 patent, 18:1-12.) '081 patent, Figures 6 and 7. '081 patent, Claims 1 and 9.

			Extrinsic Evidence: unit – "a determinate quantity (as of length, time, heat, or value) adopted as a standard of measurement" (*Merriam-Webster's Collegiate Dictionary*, Eleventh Edition (2008) (SAM-ABT_00043776–00043779).) unit – "a precise quantity in terms of which the magnitudes of other quantities of the same kind can be stated." (*The American Heritage College Dictionary* (2002) (SAM-ABT_00043780–43782).) "One Frame = 10 ms (10 sub-frames)" "One Sub-frame = 1 ms (10 slots)" "One Slot (TTI) = 100 us (24 symbols)" "One Symbol = 3.33 us (4096 FFT)" (WO 2017/083489 A1 (Lee) (PA-ABT_00004110–4207), e.g., at FIG. 2, [0095].) "Each radio frame is $T_f = 307200 \cdot T_s = 10\,\text{ms}$ long and consists of 10 subframes of length $30720 \cdot T_s = 1\,\text{ms}$, numbered from 0 to 9."

			"For subframes using $\Delta f = 7.5\,\text{kHz}$ or $\Delta f = 15\,\text{kHz}$, subframe i is defined as two slots, $2i$ and $2i+1$, of length $T_{\text{slot}} = 15360 \cdot T_{\text{s}} = 0.5\,\text{ms}$ each. For subframes using $\Delta f = 1.25\,\text{kHz}$, subframe i is defined as one slot, $2i$, of length $T_{\text{slot}} = 30720 \cdot \text{T}_{\text{s}} = 1\,\text{ms}$." (3GPP TS 36.211 V14.2.0 (PA-ABT_00015637–15832), e.g., at pp. 14-18.) "unit: 1. An item, group, structure, or entity which is regarded as a single entity or whole. 2. A unit (1) which is a part of a larger item, group, structure, or entity. For example, a control unit, a data unit, a logic unit, or a crystal unit. 3. A piece, part, or assembly which can independently perform one or more functions. For instance, a radar unit, an amplifier, a power pack, or a rectifier unit. 4. An amount or magnitude of a physical quantity, such as mass or distance, which is utilized as a standard to express such quantities or magnitudes. For example, the defined SI unit for mass is the kilogram, and the meter serves to express distances. Such units are also used in multiples to state values, as in picogram, or kilometer. Also called unit of measurement." (Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004.)
8	"used for"	Plain and ordinary meaning	Indefinite

	’081 Patent Claims 9 and 10	**Intrinsic Evidence:** U.S. Patent No. 10,912,081: Abstract; 1:49-2:38, 3:49-10:22, 14:48-15:28, 16:62-20:44; FIG. 2, 4, 5, 9, 10 File history for U.S. Patent No. 10,912,081: 6/24/2020 Response to Office Action 10/23/2020 Amendment after Notice of Allowance **Extrinsic Evidence:** Expert Declaration of Miguel Gomez (see attached).	**Intrinsic Evidence:** “In one embodiment, the inventor finds through research that cross-slot beam indication would result in reduction of dynamic of beam information, increase of overhead of control signaling, reduction of dynamic of scheduling, and other problems. A UE with high processing capacity can decode the PDCCH in a short time to obtain beam information that is used for receiving the PDSCH that is in the time slot of the PDCCH, and adjust a receiving beam to receive a multicarrier symbol in which the PDSCH is located. However, the delay in PDSCH transmission caused by decoding PDCCH would result in underutilization of system resources.” (’081 patent, 1:49-60.) “The present disclosure discloses a method in a UE used for wireless communication. The method includes the following steps: receiving a first radio signal. Herein, the first radio signal is transmitted within a first time unit, a first bit block is used for generating the first radio signal, and the first radio signal includes G multicarrier symbols. As for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time

			domain. The first time point is one time point within the first time unit. G is a positive integer." ('081 patent, 2:1-14; *see also* '081 patent, 6:59-7:5, 7:43-55, 8:24-38, 9:54-65, 14:48-63, 14:64-15:11, 18:60-19:2, 19:58-67.) "In one embodiment, the first time unit only includes a Downlink Control Information (DCI) that is used for indicating downlink assignment. In one embodiment, all bits in the first bit block are used for generating the first radio signal. In one embodiment, partial bits in the first bit block are used for generating the first radio signal." ('081 patent, 2:32-38.) "According to one aspect of the present disclosure, the method includes the following steps: receiving a second radio signal. The second radio signal is transmitted within the first time unit, and the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols." ('081 patent, 3:49-55; *see also* '081 patent, 7:6-12, 8:39-44, 9:66-10:3.) "In one embodiment, the first time unit is composed of N1 multicarrier symbols in which the second radio signal is located and N2 multicarrier symbols. N2 is not smaller than G. The second radio signal is used for determining the G multicarrier symbols of the N multicarrier symbols. N1 and N2 are positive integers.

			In one embodiment, the first time unit is composed of N1 multicarrier symbols in which the second radio signal is located and G multicarrier symbols. The N1 multicarrier symbols are used for determining the G multicarrier symbols. N1 is a positive integer. According to one aspect of the present disclosure, if the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used for determining the multi-antenna related receiving for the given multicarrier symbol; or, if the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal." ('081 patent, 4:3-23; *see also* '081 patent, 4:38-46, 7:13-21, 8:45-54, 10:4-12.) "In one embodiment, the above method is advantageous in that, before the first time point, the PDSCH receives the multicarrier symbol of the PDSCH before the first time point using the same beam used for receiving the PDCCH, thereby avoiding the problem of the delay in PDSCH transmission resulted from the delay in PDCCH decoding." ('081 patent, 4:32-37.) "According to one aspect of the present disclosure, the multi-antenna related receiving refers to a corresponding beamforming vector used for receiving; or, the multi-antenna related

			receiving refers to a corresponding antenna port used for transmitting. In one embodiment, the above method is advantageous in that the beam used for transmitting data is adjusted flexibly to improve the antenna array gain. In one embodiment, the index value of the receiving beam is used for indicating the beamforming vector used for receiving. In one embodiment, the index value of a first beam pair is used for indicating the beamforming vector used for receiving, and the first beam consists of a transmitting vector and a receiving vector." ('081 patent, 4:60-5:7; *see also* '081 patent, 7:22-26, 8:55-59.) "In one embodiment, the antenna port is formed by multiple physical antennas through antenna virtualization overlay. Mapping coefficients of the antenna port to the multiple physical antennas compose a beamforming vector, which is used for the antenna virtualization to form a beam. In one embodiment, a first reference signal is transmitted through the antenna port used for transmitting, a small-scale channel parameter experienced by the first reference signal is used for determining the small-scale channel parameter experienced by the first radio signal, the first reference signal is indicated associated with a second reference signal, a big-scale channel parameter experienced by the second

			reference signal is used for determining the big-scale channel parameter experienced by the first radio signal." ('081 patent, 5:14-27.) "According to one aspect of the present disclosure, the method includes the following steps: receiving first information. The first information is used for determining the first time point." ('081 patent, 5:31-35; *see also* '081 patent, 5:50-54, 7:27-31, 7:32-36.) "According to one aspect of the present disclosure, the method includes the following steps: receiving third information. The third information is used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols." ('081 patent, 6:1-6; *see also* '081 patent, 7:37-42.) "In one embodiment, the candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols includes multiple candidate beams used for receiving. In one embodiment, the candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols includes multiple candidate beamforming

			vectors used for receiving." ('081 patent, 6:30-37.) "In one embodiment, the third information is used for determining the multi-antenna related receiving corresponding to the second radio signal." ('081 patent, 6:50-52.) "In one embodiment, the above UE is characterized in that the first transceiver module is further configured to receive a second radio signal, the second radio signal is transmitted within the first time unit, and the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols. In one embodiment, the above UE is characterized in that if the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used for determining the multi-antenna related receiving for the given multicarrier symbol; or, if the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal. In one embodiment, the above UE is characterized in that the multi-antenna related receiving refers to a corresponding beamforming vector used for receiving; or, the multi-antenna related receiving refers to a

			corresponding antenna port used for transmitting. In one embodiment, the above UE is characterized in that the first transceiver module is further configured to receive first information, the first information being used for determining the first time point. In one embodiment, the above UE is characterized in that the first transceiver module is further configured to transmit second information, the second information being used for determining the first time point. In one embodiment, the above UE is characterized in that the first transceiver module is further configured to receive third information, the third information being used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols." ('081 patent, 7:56-8:23; 8:39-9:6; 10:13-18; 19:14-48; 20:12-44.) "In Downlink (DL) transmission, processes relevant to the base station device 410 include the following. 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). The controller/processor 440 is connected to a memory 430 that stores program code and data. The memory 430 is computer readable. The controller/processor 440 includes a scheduling unit used for transmission requirements. The scheduling unit is configured to schedule aerial resources corresponding to transmission requirements." ('081 patent, 13:57-14:7; *see also* '081 patent, 14:39-44.) "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 device at least transmits a first radio signal, wherein the first radio signal is transmitted within a first time unit, a first bit block is used for generating the first radio signal, and the first radio signal includes G multicarrier symbols; as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain; the first time point is one time point within the first time unit; and G is a positive integer.

			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 first radio signal, wherein the first radio signal is transmitted within a first time unit, a first bit block is used for generating the first radio signal, and the first radio signal includes G multicarrier symbols; as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain; the first time point is one time point within the first time unit; and G is a positive integer." ('081 patent, 15:12-43.) "In one subembodiment, the multi-antenna related receiving refers to a beamforming vector used for receiving corresponding to the U2. In one subembodiment, the multi-antenna related receiving refers to an antenna port used for transmitting corresponding to N1." ('081 patent, 16:62-67.) "In the first case of Embodiment 6, the first time point is one time point in the time domain in which the G multicarrier symbols are located. The first receiving beam is used for receiving the multicarrier symbols in the first radio signal before the first time point. The second receiving

			beam is used for receiving the multicarrier symbols in the first radio signal behind the first time point. In the second case of Embodiment 6, the first time point is behind the G multicarrier symbols, and the first receiving beam is used for receiving the G multicarrier symbols. In the third case of Embodiment 6, the first time point is before the G multicarrier symbols, and the second receiving beam is used for receiving the G multicarrier symbols. In one subembodiment, the time unit is a subframe. In one subembodiment, the time unit is a time slot. In one subembodiment, the second radio signal is a multicarrier symbol in which the PDSCH is located. In one subembodiment, different beamforming vectors are used for forming the first receiving beam and the second receiving beam." ('081 patent, 17:32-51.) "In Embodiment 7, both the first radio signal and the second radio signal are transmitted within the first time unit, the multicarrier symbols occupied by the second radio signal are before the multicarrier symbols occupied by the first radio signal in time domain, the first receiving beam is used for receiving the second radio signal, the second radio signal indicates

			the start time point of the first radio signal in the first time unit, and the start time point is used for determining the time domain resource occupied by the first radio signal in the first time unit. The first time point is one time point within the first time unit behind the multicarrier symbols occupied by the second radio signal. In Embodiment 7, the first receiving beam is used for receiving the second radio signal and the multicarrier symbols of the first radio signal before the first time point, and the second receiving beam is used for receiving the multicarrier symbols of the first radio signal behind the first time point. In one subembodiment, the second radio signal is a PDCCH, and the first radio signal is a PDSCH. In one subembodiment, the second radio signal is a DCI that is used for indicating downlink assignment, and the first radio signal is a PDSCH transmitted on the downlink resource indicated by the second radio signal. In one subembodiment, the second radio signal indicates the second receiving beam. In one subembodiment, the signaling before the first time unit is used for indicating the first receiving beam." ('081 patent, 18:1-28.) "In Embodiment 8, the UE transmits to the base station the second information to recommend a candidate for the first time point, according to the processing capacity of the UE; and the base

			station transmits to the UE the first information to indicate the first time point, according to the processing capacity of the UE and the system situation. The first time point is one time point within the first time unit. The first time point is not earlier than the recommended candidate for the first time point in time domain. The first time point is used for determining the multi-antenna related receiving corresponding to the first radio signal in the first time unit. The first radio signal includes G multicarrier symbols. As for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of the time-domain resource occupied by the given multicarrier symbol with respect to the first time point in time domain." ('081 patent, 18:34-50.) '081 patent, Claims 9 and 10.
9	"at least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group" '527 Patent Claims 1 and 11	Plain and ordinary meaning **<u>Intrinsic Evidence:</u>** <u>U.S. Patent No. 10,944,527</u>: Abstract; 1:53-2:38, 3:44-49, 4:47-5:21, 5:53-54, 6:48-7:8, 8:28-32, 9:23-28, 9:43-59, 10:62-11:13, 11:55-12:5, 12:56-61, 13:65-14:21, 17:21-40, 18:38-59, 19:46-20:25, 26:49-27:56 <u>File history for U.S. Patent No. 10,944,527</u>: 10/14/2020 Response to Office Action	"at least one of a first antenna virtualization vector is associated with the first antenna port group and at least one of a second antenna virtualization vector is associated with the first antenna port group" **<u>Intrinsic Evidence:</u>** "In one embodiment, a transmitter of the first signaling generates the transmitting analog beam corresponding to the first antenna port group by adopting the first antenna virtualization vector.

		Extrinsic Evidence: "**antenna**: a device that radiates and/or receives radio waves. The same antenna can usually be used for both transmission and reception. There are many types of antennas, their selection depending on the uses and operating frequencies desired. Also known as aerial." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004. "**vector**: 1. Same as vector quantity. 2. A graphical representation of a vector quantity. 3. A one-directional array, such as a single column. 4. A course or direction of an aircraft, such as that which is guided by radio-transmitted instructions. 5. In computer graphics, a line whose starting and ending points are identified by specific coordinates, such as Cartesian coordinates." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004. "**vector quantity**: A quantity, such as force or magnetic field strength, which has a magnitude and direction. A scalar quantity has only magnitude. Also called vector (1)." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004. "**port**: 1. A point or opening which provides an input, output, or interface. For example, an I/O port, a speaker port, or an input to an electric network. 2. An input, output, or other point where a signal or energy can be provided to, or	In one embodiment, the first antenna port group is used to transmit a first reference signal(s) group, and the first antenna virtualization vector is used to transmit the first reference signal(s) group. In one embodiment, the UE generates the receiving analog beam corresponding to the first antenna port group(s) by adopting the second antenna virtualization vector. In one embodiment, the second antenna virtualization vector is used to receive the first reference signal group(s)." ('527 patent, 4:43-55.) "In one embodiment, the first antenna virtualization vector and the second antenna virtualization vector are both associated with the first antenna port group." ('527 patent, 4:60-62.) "In one embodiment, the third radio signal is a radio signal transmitted in a time resource within the first time resource pool. The first antenna virtualization vector is used by a transmitter of the first signaling to transmit an analog beamforming of the third radio signal. In one embodiment, the third radio signal is a radio signal transmitted in a time resource within the first time resource pool. The second antenna virtualization vector is used by the UE to receive an analog beamforming of the third radio signal. In one embodiment, the third radio signal is a radio signal transmitted in a time resource

		taken from, a circuit or system. For instance, a point where a meter may be placed for readings. 3. An input, output, or interface between a computer or peripheral, another computer, or a network. For instance, a data port. 4. An input, output, or interface between a CPU and a peripheral. For example a USB port, or a serial port. Also called I/O port. 5. To modify a program so that it can function properly within a different system or architecture. 6. A carefully-dimensioned opening in a loudspeaker enclosure. It is employed for various purposes, but is mainly used to increase and extend the reproduction of low frequencies. Also called speaker port, duct (5), ducted port, or vent (3). 7. An opening in a waveguide through which energy can be fed to, or taken from. For example, an opening utilized to take measurements. Also called waveguide port." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004. "**group**: 1. A collection of things. Such a collection is usually located together, and/or regarded as a unit. For example, a family of chemical elements with similar properties arranged vertically within a periodic table. 2. In communications, a number of channels treated as a unit. For instance, a collection of associated voice channels in frequency-division multiplexing. 3. In computers, a collection of elements regarded as a unit. For example, a set of records in a database." Steven M. Kaplan,	within the first time resource pool. The first antenna virtualization vector is used by a transmitter of the first signaling to receive an analog beamforming of the third radio signal. In one embodiment, the third radio signal is a radio signal transmitted in a time resource within the first time resource pool. The second antenna virtualization vector is used by the UE to transmit an analog beamforming of the third radio signal." ('527 patent, 4:63-5:15.) "In one embodiment, the operation is receiving, and the first antenna virtualization vector is used to transmit an analog beamforming of the second radio signal. In one embodiment, the operation is receiving, and the second antenna virtualization vector is used to receive an analog beamforming of the second radio signal. In one embodiment, the operation is transmitting, and the first antenna virtualization vector is used to receive an analog beamforming of the second radio signal. In one embodiment, the operation is transmitting, and the second antenna virtualization vector is used to transmit an analog beamforming of the second radio signal." ('527 patent, 6:48-59.) "In one embodiment, the first antenna virtualization vector is used to transmit the second radio signal.

		Wiley Electrical and Electronics Engineering Dictionary, 2004.	In one embodiment, the second antenna virtualization vector is used to receive the second radio signal." ('527 patent, 7:5-8.) "In one embodiment, the first antenna virtualization vector is used for transmitting analog beamforming of the second signaling. In one embodiment, the second antenna virtualization vector is used for receiving analog beamforming of the second signaling." ('527 patent, 8:27-32.) "In one embodiment, the first antenna virtualization vector is used for transmitting analog beamforming of the first signaling. In one embodiment, the second antenna virtualization vector is used for receiving analog beamforming of the first signaling." ('527 patent, 9:23-28.) "The gain of multiple antennas is utilized by using the first antenna virtualization vector and the second antenna virtualization vector. The RF costs for multi-antenna systems is reduced by applying the first antenna virtualization vector and the second antenna virtualization vector to analog beamforming." ('527 patent, 12:56-61.) "In n a sub-embodiment 1 of Embodiment 1, the first antenna virtualization vector and the second antenna virtualization vector are both associated with the first antenna port group." ('527 patent, 14:17-21.)

			"The first signaling is used by the UE to determine the first time the resource pool. At least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group. The first antenna virtualization vector is an available antenna virtualization vector of the base station in the first time resource pool. The second antenna virtualization vector is an available antenna virtualization vector of the UE in the first time resource pool. The operation is receiving; or the operation is transmitting." ('527 patent, 17:24-33.) "In one embodiment, the first radio signal is K reference signal(s) groups respectively transmitted by the K antenna port groups. The first reference signal group(s) is(are) reference signal group(s) transmitted by the first antenna port group in the K reference signal group(s). The first antenna virtualization vector is used to form an analog transmitting beam for transmitting the first reference signal group, and the second antenna virtualization vector is used to form an analog receiving beam for receiving the first reference signal group(s)." ('527 patent, 19:66-20:8.) '527 patent, Claims 1, 2, 3, 4, 5, 11, 12, 13, 14, 15. "Kim (US20170195100A1) discloses at paragraphs 113 and FIG. 9, the FDM

			(frequency division multiplexing)+ TDM (time division multiplexing) scheme may group antenna ports of reference signals (RSs) transmitted to the same OFDM symbol, and may group physical antenna elements, such that the respective antenna ports contained in the antenna port group can transmit signals through the plurality of antenna elements of different antenna element groups ... further at paragraphs 119-120: the antenna port may be referred to as a virtual antenna, and the antenna element may be referred to as a physical antenna. The method for mapping each logical antenna port to the physical antenna element is of importance to the entire MIMO system design. As the antenna mapping scheme, not only the one-to-one mapping scheme in which a single antenna port is mapped to a single antenna element, but also the one-to-multiple mapping scheme in which a single antenna port is mapped to a plurality of antenna ports may be considered. The mapping from the antenna port to the antenna element may be denoted by a virtualization matrix (B) ... x may be a transmission signal at the antenna port, and z may be a Tx signal at the antenna element. Whereas the number of antenna ports may be less than the number of antenna elements, the number of antenna ports may be denoted by Nt. bn is a virtualization vector for indicating the relationship in which the n-th antenna port is mapped to the antenna elements…

			However, Kim does not disclose: ‘ ... the first antenna virtualization vector is an antenna virtualization vector available to the base station in the first time resource pool; the second antenna virtualization vector Is an antenna virtualization vector available to the user equipment in the first time resource pool …’” (November 17, 2020 Notice of Allowability, 3-4.) “Firstly, the underlined limitation of claim 1 of the instant application is used to determine first resource pool for both the first antenna vector and the second antenna vector. The underlined limitation of claim 1 of the reference application is used to determine first information of first antenna port set (equivalent to first resource pool for first antenna vector), and the same first resource pool is used to determine a second information (equivalent to first resource pool for second antenna vector). …

Claim Number	16429077 (instant application)	16/398,207 (reference application)
1	A method for multi-antenna transmission in a user equipment, comprising: receiving a first radio signal; and receiving a first signaling; wherein the first radio signal is transmitted by K antenna port groups; the antenna port group includes a positive integer number of the antenna port(s); a first antenna port group is one of the K antenna port groups; the first signaling is used to determine a first time resource pool; at least one first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group; the first antenna virtualization vector is an antenna virtualization vector available to a transmitter of the first signaling in the first time resource pool; the second antenna virtualization vector is an antenna virtualization vector available to the user equipment in the first time resource pool; the K is a positive integer greater than 1.	A method in a User Equipment (UE) for dynamic scheduling, comprising: receiving first information; receiving second information; and operating a first radio signal; wherein the first information comprises Q field(s), the Q field(s) corresponds(correspond) to Q target receiver(s) respectively, the UE is a target receiver out of the Q target receiver(s); a first field out of the Q field(s) corresponds to the UE, the first field is used to determine a first antenna port set, the first field is one of the Q field(s); the first antenna port set comprises a positive integer number of antenna port(s), the second information is transmitted by an antenna port within the first antenna port set; the first information and the second information are both dynamically configured; the Q is a positive integer; *the operating is receiving, or the operating is transmitting; the second information is used to determine scheduling information of the first radio signal, the scheduling information comprises at least one of time-frequency resources occupied, a transmitting antenna port set, a power control parameter, MCS, RV, NDI, or a HARQ Process Number; the transmitting antenna port set comprises a positive integer number of antenna port(s).*

" (July 20, 2020 Office Action, 4-5.)

"The Office Action rejects claims 1 and 2 under the judicially created doctrine of obviousness-type double patenting in view of Application Serial No. 16/398,207. Applicants submit herewith a terminal disclaimer relative to

			Application Serial No. 16/398,207, rendering the rejections moot. Applicants therefore respectfully request that Examiner withdraw the obviousness-type double patenting rejections of claims 1 and 2. Rejections Under 35 U.S.C. § 112(a) The Office Action rejects claims 1-20 under 35 U.S.C. § 112(a) as failing to comply with the written description requirement. In particular, the Office Action contends that the specification fails to provide a description for the limitation of 'the first antenna virtualization vector is an antenna virtualization vector available a transmitter of the first signaling in the first time resource pool; the second antenna virtualization vector is an antenna virtualization vector available to the target receiver [or user equipment] of the first signaling in the first time resource pool.' Applicants respectfully traverse these rejections for at least the reason that the specification, including the drawings, the detailed description, and the original claims provide adequate written description. First, Applicants have amended claims 1, 6, 11, and 16 to provide better clarification as to which devices are at play in this limitation. Further, Applicants respectfully submit that the specification provides ample discussion in paragraphs [0021], [0047], and [0073] - [0085] regarding what antenna virtualization vectors entail, how they are generally used, and how they may be

			specifically used by a base station and a user equipment. … In addition, with respect to the rejections of claims 4 and 14 and claims 9 and 19 regarding the use of 'or', Applicants note that such a use does not make such claims indefinite. The use of 'or' merely indicates that if either the transmitting or the receiving is performed, the claim limitation is satisfied. In other words, it merely indicates that both do not have to be performed, but one or the other, in order to infringe the claim." (October 14, 2020 Amendment and Response to Office Action, at 9-10.) "Petitioner argues that Patent Owner's infringement contentions do not require both the first antenna virtualization or second antenna virtualization vector. That is not true. The claim language and specification of the '527 Patent is clear that these two antenna virtualization vectors are complementary. The first vector is for transmitting the first signaling from the base station and the second vector is for receiving the first signaling at the UE. The two are complementary although at least one has to be associated with the first antenna port group." (Patent Owner's Preliminary Response at 19, IPR2023-00603.) "But Kang, like Kim, does not disclose both first and second antenna virtualizations that could be associated with the first antenna port

			group. Instead, Kang's Fig. 12 and the accompanying portion of Kang's specification discloses that none of the alleged antenna virtualization vectors ('virtual antennas') overlap to disclose 'at least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group,' which implies a possibility of both the first and second antenna virtualization vectors being associated with the first antenna port group. The disclosure in Kang does not contain this possibility." (Patent Owner's Preliminary Response at 20, IPR2023-00603.) "Because neither Kim, Zhang, nor Kang discloses the claimed 'first resource pool,' they cannot now obviate this claim limitation requiring 'associat[ion] with the first antenna port group,' which implicates both first and second antenna virtualization vectors with the first time resource pool." (Patent Owner's Preliminary Response at 23, IPR2023-00603.)
10	"used to" '527 Patent Claim 11	Plain and ordinary meaning **<u>Intrinsic Evidence:</u>** <u>U.S. Patent No. 10,944,527</u>: Abstract; 2:53-12:61, 13:51-14:17, 17:41-44, 19:47-20:25, 26:49-28:36; FIGS. 2, 3, 10, 11, 15 <u>File history for U.S. Patent No. 10,944,527</u>: 10/14/2020 Response to Office Action	Indefinite **<u>Intrinsic Evidence:</u>** "The present disclosure discloses a method for multi-antenna transmission in a user equipment (UE), comprising: receiving first radio signal; and receiving a first signaling;

		Extrinsic Evidence: Expert Declaration of Miguel Gomez (see attached).	wherein the first radio signal is transmitted by K antenna port groups; the antenna port group(s) include a positive integer number of the antenna port(s); a first antenna port group is one of the K antenna port groups; the first signaling is used to determine a first time resource pool; at least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group; the first antenna virtualization vector is an antenna virtualization vector available to a transmitter of the first signaling in the first time resource pool; the second antenna virtualization vector is an antenna virtualization vector available to the user equipment in the first time resource pool; the K is a positive integer greater than 1." ('527 patent, 1:53-2:2.) "The present disclosure discloses a method for multi-antenna transmission in a base station, comprising: Transmitting first radio signal; and transmitting a first signaling; wherein the first radio signal is transmitted by K antenna port groups; the antenna port group(s) includes a positive integer number of the antenna port(s); the first antenna port group is one of the K antenna port groups; the first signaling is used to determine a first time resource pool; at least one first antenna virtualization vector, and second antenna virtualization vector is associated with the first antenna port group; the first antenna

			virtualization vector is an antenna virtualization vector available to a transmitter of the first signaling in the first time resource pool; the second antenna virtualization vector is an antenna virtualization vector available to the user equipment in the first time resource pool; the K is a positive integer greater than 1." ('527 patent, 9:43-59.) "The UE U2 receives the first radio signal in step S21; transmits the second information in step S22; receives the first information in step S23; and receives the first signaling in step S24. In Embodiment 1, the first radio signal is transmitted by K antenna port groups, the antenna port group(s) includes a positive integer number of the antenna port(s); a first antenna port group is one of the K antenna port groups; the first signaling is used to determine a first time resource pool; at least one first antenna virtualization vector, and second antenna virtualization vector is associated with the first antenna port group; the first antenna virtualization vector is an antenna virtualization vector available to a transmitter of the first signaling in the first time resource pool; the second antenna virtualization vector is an antenna virtualization vector available to the user equipment in the first time resource pool; the K is a positive integer greater than 1. The first information is used to determine the first antenna port group." ('527 patent, 13:65-14:12.)

			"In Embodiment 4, the first time resource pool includes N1 time resources; the first signaling indicates the distribution of the first time resource pool in the time domain. The second radio signal is transmitted on the first time resource sub-pool. The first time resource sub-pool includes N2 time resources #k1-#km in the N1 time resources. The second signaling indicates the number #k1-#km of the N2 time resources in the N1 time resources." ('527 patent, 15:29-36.) "In the embodiment 10, the first radio signal is transmitted by K antenna port groups, and the antenna port group(s) includes a positive integer number of the antenna port(s). The K is a positive integer greater than 1. The first antenna port group is one of the K antenna port groups. The first signaling is used by the UE to determine the first time the resource pool. At least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group. The first antenna virtualization vector is an available antenna virtualization vector of the base station in the first time resource pool. The second antenna virtualization vector is an available antenna virtualization vector of the UE in the first time resource pool." ('527 patent, 17:21-33.) "In Embodiment 11, the first radio signal is transmitted by K antenna port groups, and the antenna port group(s) includes a positive integer

			number of the antenna port(s). The K is a positive integer greater than 1. The first antenna port group is one of the K antenna port groups. The first signaling is used by the UE to determine the first time the resource pool. At least one first antenna virtualization vector, and the second antenna virtualization vector is associated with the first antenna port group. The first antenna virtualization vector is an available antenna virtualization vector of the base station in the first time resource pool. The second antenna virtualization vector is an available antenna virtualization vector of a target receiver of the first signaling in the first time resource pool. The K is a positive integer greater than 1." ('527 patent, 18:38-52.) "Embodiment 12 illustrates a flow chart of the first radio signal and the first signaling, as shown in FIG. 12. In FIG. 12, each box represents a step. In Embodiment 12, the user equipment (UE) in the present disclosure sequentially receives a first radio signal and a first signaling; wherein the first radio signal is transmitted by the K antenna port groups; the antenna port group(s) includes a positive integer number of the antenna port(s); the first antenna port group is one of the K antenna port groups; the first signaling is used to determine a first time resource pool. At least one first antenna virtualization vector, and the second antenna virtualization vector is associated with the first antenna port group. The first antenna virtualization vector is an antenna virtualization

			vector available to a transmitter of the first signaling in the first time resource pool; the second antenna virtualization vector is an antenna virtualization vector available to a target receiver of the first signaling in the first time resource pool; the K is a positive integer greater than 1." ('527 patent, 19:47-65.) "In one embodiment, the UE 450 comprises: at least one processor and at least one memory, the at least one memory further comprising computer program codes; the at least one memory and the computer program code are configured to work in collaboration with the processor, the UE 450 at least: receives a first radio signal and a first signaling. The first radio signal is transmitted by K antenna port groups; the antenna port group(s) includes a positive integer number of the antenna port(s); the first antenna port group is one of the K antenna port groups; the first signaling is used to determine a first time resource pool; at least one first antenna virtualization vector, and second antenna virtualization vector is associated with the first antenna port group; the first antenna virtualization vector is an antenna virtualization vector available to a transmitter of the first signaling in the first time resource pool; the second antenna virtualization vector is an antenna virtualization vector available to the user equipment in the first time resource pool; the K is a positive integer greater than 1." ('527 patent, 26:49-67.)

			"In one embodiment, the UE 450 comprises a memory storing a computer readable instruction program, which generates an action when executed by at least one processor, and the action comprises: receiving first radio signal and a first signaling. The first radio signal is transmitted by K antenna port groups; the antenna port group(s) includes a positive integer number of the antenna port(s); the first antenna port group is one of the K antenna port groups; the first signaling is used to determine a first time resource pool; at least one of first antenna virtualization vector, and second antenna virtualization vector is associated with the first antenna port group; the first antenna virtualization vector is an antenna virtualization vector available to a transmitter of the first signaling in the first time resource pool; the second antenna virtualization vector is an antenna virtualization vector available to the user equipment in the first time resource pool; the K is a positive integer greater than 1." ('527 patent, 27:1-17.) "In one embodiment, the gNB 410 device comprises: at least one processor and at least one memory, the at least one memory comprises computer program codes; the at least one memory and the computer program code are configured to work in collaboration with at least one processor. The gNB 410 at least: transmits a first radio signal; and transmits a first signaling. The first radio signal is transmitted by K antenna port groups, the antenna port group(s)

			includes a positive integer number of the antenna port(s); and the first antenna port group is one of the K antenna port groups; the first signaling is used to determine a first time resource pool; at least one first antenna virtualization vector, and second antenna virtualization vector is associated with the first antenna port group; the first antenna virtualization vector is an antenna virtualization vector available to a transmitter of the first signaling in the first time resource pool; the second antenna virtualization vector is an antenna virtualization vector available to a target receiver of the first signaling in the first time resource pool; the K is a positive integer greater than 1." ('527 patent, 27:18-38.) "In one embodiment, the gNB 410 comprises: a memory storing a computer readable instruction program, which generates an action when executed by at least one processor, and the action comprises: transmitting first radio signal, transmitting the first signaling. The first radio signal is transmitted by K antenna port groups, the antenna port group(s) includes a positive integer number of the antenna port(s); and the first antenna port group is one of the K antenna port groups; the first signaling is used to determine a first time resource pool; at least one first antenna virtualization vector, and second antenna virtualization vector is associated with the first antenna port group; the first antenna virtualization vector is an antenna virtualization vector available to a transmitter of the first

			signaling in the first time resource pool; the second antenna virtualization vector is an antenna virtualization vector available to the user equipment in the first time resource pool; the K is a positive integer greater than 1." ('527 patent, 27:39-56.) '527 patent, Claim 11.
11	"target threshold" '271 Patent Claims 1 and 11	Plain and ordinary meaning **Intrinsic Evidence:** U.S. Patent No. 10,951,271: 1:59-2:22, 6:56-7:5, 8:1-27, 9:38-47, 10:12-35, 11:4-48, 12:18-25, 22:9-22, 25:23-35, 26:24-39; FIGS. 1, 5 File history for U.S. Patent No. 10,951,271: 9/30/2020 Response to Office Action 12/6/2020 Amendment after Notice of Allowance **Extrinsic Evidence:** "**target**: 1. Anything which is aimed at or which represents the objective of something. For example, a scanned object, a target electrode, particles subjected to bombardment, a target values in a control system, or a target language. 2. An object which reflects a sufficient amount of the energy beam emitted by a radar to produce a radar echo. Also called radar target, or scanned object. 3. In a TV camera tube, an electrode, surface, or other structure upon which	"a value for comparing to a ratio between two channel qualities (such as RSRP and SINR) for the UE to restrict the difference between the largest and smallest channel qualities in a UE report" **Intrinsic Evidence:** "Through research, the inventors found that in a massive MIMO system, the base station can perform beam scanning over a period of time resources. The UE selects and reports the beam. However, due to the limitation of air interface resources, the number of beams used for beam scanning and the number of beams reported by the UE are limited. In addition, due to the uncertainty of the UE location, the beam used for beam scanning does not necessarily include the beam that best serves the UE. How to use the information reported by the UE to form the best beam to serve the UE service is an urgent problem to be solved." ('271 patent, 1:40-50.)

		the image is stored, and which is scanned by an electron beam to produce the output signal. 4. A particle, group of particles, surface, object, material, or the like, which is subjected to impacts by high-energy particles, such as electrons, neutrons, or alpha particles. 5. In an X-ray tube, the electrode which is bombarded, and from which X-rays are emitted. 6. In computers, the file, disk, system, or the like, towards which something is transferred or otherwise sent." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004. "**threshold**: The point, level, or value of a quantity which must be exceeded to have a given effect, result, or response, such as detection, activation, or operation. For instance, the threshold of hearing, the minimum voltage or current necessary to activate a circuit, or the frequency beyond which a loudspeaker does not reproduce sound. Also called limen." Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, 2004.	"The present disclosure provides a method for multi-antenna transmission in a user equipment (UE), including: receiving a first signaling; . . . the first signaling is used to determine a target threshold; the target threshold is a non-negative real number; a first channel quality is a best channel quality value among the K1 channel quality values; a second channel quality is a worse channel quality value among the K1 channel quality values; a ratio between the second channel quality and the first channel quality is greater than or equal to the target threshold." ('271 patent, 1:59-2:16; *see also* '271 patent, 10:11-35.) "In the embodiment, the advantage of the foregoing method is that the base station may obtain a proportional relationship among reception qualities corresponding to multiple beams, and may generate a more accurate serving beam for the UE according to the proportional relationship, thereby improving transmission quality." ('271 patent, 2:17-22.) "In one embodiment, the channel quality value is one of instantaneous Reference Signal Received Power (RSRP), long-term RSRP, SINR or SNR." ('271 patent, 3:63-65.) "In one embodiment, the first signaling is also used to determine at least the last one of the K1, the K2 and the target threshold. A third channel quality is a best channel quality value of the K2

			channel quality values. A fourth channel quality is the worst channel quality value of the K2 channel quality values. The ratio between the fourth channel quality and the third channel quality is greater than or equal to the target threshold." ('271 patent, 6:56-63; *see also* '271 patent, 11:4-11.) "In the embodiments, the advantage of the above method is that the target threshold can be used to control the reporting overhead, thereby improving the reporting efficiency." ('271 patent, 6:64-67.) "In one embodiment, the unit of the target threshold is dB. In one embodiment, the first signaling explicitly indicates at least the last of the K1, the K2 and the target threshold. In one embodiment, the first signaling implicitly indicates at least the last of the K1, the K2 and the target threshold. In one embodiment, the first signaling is transmitted in a plurality of messages." ('271 patent, 7:1-7.) "The present disclosure provides a method for multi-antenna transmission in a base station, including: transmitting a first signaling; transmitting a first wireless signal; and receiving first information;

			wherein, K antenna port groups are used to transmit the first wireless signal; the first signaling is used to determine the K antenna port groups; the K is a positive integer greater than 1; the K antenna port groups respectively correspond to K channel quality values; the K channel quality values are K non-negative real numbers; K1 antenna port groups of the K antenna port groups correspond to K1 channel quality values of the K channel quality values; the K1 is a positive integer less than or equal to the K; a first proportional sequence corresponds to a ratio(ratios) among the K1 channel quality values; the first information is used to determine the K1 antenna port groups and the first proportional sequence; the first signaling is used to determine a target threshold; the target threshold is a non-negative real number; a first channel quality is a best channel quality value among the K1 channel quality values; a second channel quality is a worse channel quality value among the K1 channel quality values; a ratio between the second channel quality and the first channel quality is greater than or equal to the target threshold." ('271 patent, 8:3-27; *see also* '271 patent, 11:23-48.) "In one embodiment, the first signaling is further used to determine at least the last one of the K1, the K2, or the target threshold. A third channel quality is a best channel quality value among the K2 channel quality values. A fourth channel quality is a worse channel quality value among the K2 channel quality values. A ratio

			between the fourth channel quality and the third channel quality is greater than or equal to the target threshold." ('271 patent, 9:38-45; *see also* '271 patent, 12:18-25.) "In one embodiment, the base station controls reporting overhead by K1, the K2, and the target threshold." ('271 patent, 9:46-47.) "Compared with the prior art, the present disclosure has the following advantages: The service beam may be generated and used more flexibly through reporting channel quality ratios to increase beamforming gain. The robustness and flexibility of subsequent transmissions are increased by multiple sets of reports for varied receiving beamforming. The flexibility of multi-user scheduling of the base station is increased by the reporting of the best channel quality, combined with the reporting of the channel quality ratio." ('271 patent, 12:37-47.) "Embodiment 5 illustrates a flow chart of wireless transmission, as shown in FIG. 5. In FIG. 5, the base station N1 is a maintaining base station for the serving cell of the UE U2." ('271 patent, 21:32-35.) "For N1, the first signaling is transmitted in step S11; the first wireless signal is transmitted in step S12; the first information is received in step S13; and the second signal is transmitted in step S14.

			For U2, the first signaling is received in step S21; the first wireless signal is received in step S22; the first information is transmitted in step S23; and the second signal is received in step S24." ('271 patent, 21:36-43.) "As a sub-embodiment, the first signaling is further used to determine at least the last one of the K1, the K2, or the target threshold by U2. The target threshold is a non-negative real number. The first channel quality is the best channel quality value of the K1 channel quality values. The second channel quality is the worst channel quality value of the K1 channel quality values. The third channel quality is the best channel quality value of the K2 channel quality values. The fourth channel quality is the worst channel quality value of the K2 channel quality values. At least one of a ratio between the second channel quality and the first channel quality, or a ratio between the fourth channel quality and the third channel quality is greater than or equal to the target threshold." ('271 patent, 22:9-22.) "Embodiment 10 illustrates a block diagram showing the structure of a processing device in a UE. In FIG. 10, a UE 1000 is composed of a first receiver 1001, a second receiver 1002, and a third transmitter 1003." ('271 patent, 24:50-53.) "In Embodiment 10, the first receiver 1001 is configured to receive the first signaling." ('271 patent, 24:54-55.)

			"As a sub-embodiment, the first signaling is further used to determine at least the last one of the K1, the K2, or the target threshold. The target threshold is a non-negative real number. The first channel quality is a best channel quality value of the K1 channel quality values. The second channel quality is the worst channel quality value of the K1 channel quality values. The third channel quality is a best channel quality value of the K2 channel quality values. The fourth channel quality is the worst channel quality value of the K2 channel quality values. At least one of a ratio between the second channel quality and the first channel quality or a ratio between the fourth channel quality and the third channel quality is greater than or equal to the target threshold." ('271 patent, 25:23-35; *see also* '271 patent, 26:24-36.) '271 patent, Figures 5 and 10. '271 patent, Claims 1, 11. "For example, the target threshold in the present application and the claims is a threshold of a ratio between two channel qualities such as RSRP and SINR. By contrast, the threshold in *Nam* is a threshold of delay spread or Doppler. (*See, e.g.*, *Nam*, para. [0228]). Thus, the physical meanings of the target threshold in the present application and threshold discussed in *Nam* are different. Additionally, the purpose of the target threshold in the present application and claims is a restriction of channel quality report, i.e., to

			restrict the difference between the largest and smallest channel qualities in a UE report. By contrast, the purpose of the threshold in *Nam* appears to be to provide a condition for a UE to decide when to trigger a request for an MRS pattern change. (*See, e.g.*, *Nam*, para. [0227]).” (September 30, 2020 Amendment and Response to Office Action Under 37 C.F.R. § 1.111, at 11-12 (emphasis removed)). **<u>Extrinsic Evidence:</u>** “threshold 3b: a level, point, or value above which something is true or will take place and below which it is not or will not.” *Merriam-Webster's* (*Collegiate Dictionary*, Eleventh Edition (2008) (SAM-ABT_00043776–00043778).) “threshold *NOUN* **2** the point at which something begins to happen or to become significant.” (*Oxford Student's Dictionary*, Fourth Edition (2016) (SAM-ABT_00043767– 43769).) “threshold **5a** a level or point at which something would happen, would cease to happen, or would take effect, become true, etc.

			6a the minimum intensity or value of a signal, etc, that will produce a response or specified effect" (*Collins English Dictionary*, Twelfth Edition (2014) (SAM-ABT_00043773–43775).) "threshold **4.** The point that must be exceeded to begin producing a given effect or result or to elicit a response." (*The American Heritage Dictionary of the English Language*, Fifth Edition (2016) (SAM-ABT_00043770– 43772).)
12	"used to" '271 Patent Claims 11, 13, 14, and 15	Plain and ordinary meaning **<u>Intrinsic Evidence:</u>** <u>U.S. Patent No. 10,951,271</u>: Abstract; 1:59-2:39, 5:13-12:36, 13:25-14:63, 19:65-22:22, 24:10-26:46; FIGS. 1, 5, 6, 8-11 <u>File history for U.S. Patent No. 10,951,271</u>: 9/30/2020 Response to Office Action 12/6/2020 Amendment after Notice of Allowance **<u>Extrinsic Evidence:</u>** Expert Declaration of Miguel Gomez (see attached).	Indefinite **<u>Intrinsic Evidence:</u>** "The present disclosure provides a method for multi-antenna transmission in a user equipment (UE), including: receiving a first signaling; receiving a first wireless signal; and transmitting first information; wherein, K antenna port groups are used to transmit the first wireless signal; the first signaling is used to determine the K antenna port groups; . . . the first information is used to determine { the K1 antenna port groups, the first proportional sequence}; the first signaling is used to determine a target threshold; the target threshold is a non-negative real number; a first

			channel quality is a best channel quality value among the K1 channel quality values; a second channel quality is a worse channel quality value among the Kl channel quality values; a ratio between the second channel quality and the first channel quality is greater than or equal to the target threshold." ('271 patent, 1:59-2:16; *see also* '271 patent, 8:3-27; 10:11-35.) "In one embodiment, the antenna port corresponds to a reference signal. The reference signal is transmitted through the antenna port." ('271 patent, 2:56-58.) "In one embodiment, the first wireless signal is one beam sweep. The beam scanning is an operation of covering a spatial area by a transmitted or received beam in a predetermined manner over a period of time." ('271 patent, 3:18-21.) "In one embodiment, the K antenna port groups respectively correspond to K reference signal groups. The K reference signal groups are respectively transmitted through the K antenna port groups. The first wireless signal is composed of the K reference signal groups." ('271 patent, 3:22-26.) "In one embodiment, the time-frequency pattern and the Orthogonal Cover Code (OCC) of at least two reference signals of the K reference signal groups are the same in one time unit. The two reference signals are transmitted on different time resources." ('271 patent, 3:30-34.)

			"In one embodiment, the Kl beamforming vectors and the first proportional sequence respectively corresponding to the K1 antenna port groups are used to generate a service beam for data transmission with the UE. In one embodiment, the transmitter of the first wireless signal determines a correspondence between a service beam related to a relative position of the UE and a collection of the K1 antenna ports and the first proportional sequence according to the coverage space, and then determines the service beam according to the K1 antenna ports and the first proportional sequence reported by the UE." ('271 patent, 4:50-60.) "In one embodiment, K2 antenna port groups in the K antenna port groups correspond to K2 channel quality values in the K channel quality values; the K2 is a positive integer less than or equal to the K; a second proportional sequence corresponds to a ratio among the K2 channel quality values; a first receiving beamforming vector is used to receive signals transmitted through the K1 antenna port groups; a second receiving beamforming vector is used to receive signals transmitted through the K2 antenna port groups; the first receiving beamforming vector and the second receive beamforming vector are different; the first information is further used to determine the K2 antenna port groups and the second proportional sequence." ('271 patent, 5:46-57; *see also* '271 patent, 10:50-62.)

			"In the embodiments, the above methods have the advantages that multiple candidate service beams are generated for different receive beamforming vectors through different beamforming vectors and different proportional sequences of different antenna port groups respectively, thereby increasing the transmission diversity effects." ('271 patent, 5:59-64.) "The first transmitting beamforming vector and the first receiving beamforming vector are used for beamforming of data transmission over a first time window; the second transmitting beamforming vector and the second receiving beamforming vector are used for beamforming of data transmission over a second time window." ('271 patent, 6:5-11.) "In one embodiment, the first signaling is also used to determine at least the last one of the K1, the K2 and the target threshold. A third channel quality is a best channel quality value of the K2 channel quality values. A fourth channel quality is the worst channel quality value of the K2 channel quality values. The ratio between the fourth channel quality and the third channel quality is greater than or equal to the target threshold." ('271 patent, 6:56-63; *see also* '271 patent, 11:15-22.) "In one embodiment, the first information is further used to determine at least one of the first channel quality or the third channel quality." ('271 patent, 7:8-10; *see also* '271 patent, 9:46-50; 11:12-14; 12:26-28.)

			"In one embodiment, the method for multi-antenna transmission in a UE further comprises: receiving a second wireless signal; wherein a target antenna port group is used to transmit the second wireless signal; the target antenna port group is associated with the Kl antenna port groups and the first proportional sequence, or the target antenna port group is associated with the K2 antenna port groups and the second proportional sequence." ('271 patent, 7:30-35; *see also* '271 patent, 9:60-10:10; 11:12-22; 12:29-36.) "In one embodiment, when the transmitting beamforming vector corresponding to the K1 antenna port groups is used to generate a transmitting beamforming vector of the second signal, the first receiving beamforming vector is used to receive the second a wireless signal; when the transmitting beamforming vector corresponding to the K2 antenna port groups is used to generate a transmit beamforming vector of the second wireless signal, the second receiving beamforming vector is used for receive the he second wireless signal." ('271 patent, 7:51-60.) "In one embodiment, K2 antenna port groups in the K antenna port groups correspond to K2 channel quality values in the K channel quality values; the K2 is a positive integer less than or equal to the K; a second proportional sequence corresponds to a ratio among the K2 channel quality values; a first receiving beamforming

			vector is used to receive signals transmitted through the Kl antenna port groups; a second receiving beamforming vector is used to receive signals transmitted through the K2 antenna port groups; the first receiving beamforming vector and the second receive beamforming vector are different; the first information is further used to determine the K2 antenna port groups and the second proportional sequence." ('271 patent, 9:7-17; *see also* '271 patent, 10:50-62; 11:64-12:9.) "Embodiment 1 illustrates a flow chart of transmission of a first signaling, a first wireless signal, and first information in accordance with one embodiment of the present disclosure, as shown in FIG. 1. In FIG. 1, each box represents a step. In Embodiment 1, the user equipment in this disclosure receives a first signaling, receives a first wireless signal, and transmits a first information in sequence. K antenna port groups are used to transmit the first wireless signal. The first signaling is used to determine the K antenna port groups. The K is a positive integer greater than 1. The K antenna port groups respectively correspond to K channel quality values. The K channel quality values are K non-negative real numbers. K1 antenna port groups of the K antenna port groups correspond to K1 channel quality values of the K channel quality values the K1 is a positive integer less than or equal to the K. A first proportional sequence corresponds to a ratio(ratios) among the Kl channel quality values. The first information is

			used to determine the K1 antenna port groups and the first proportional sequence." ('271 patent, 13:25-43; *see also* '271 patent, 19:65-20:33.) "The first information is used to determine the K1 antenna port groups and the first proportional sequence." ('271 patent, 13:41-43; *see also* '271 patent, 14:37-39.) "The first signaling in the present disclosure may be generated by the transmitting processor 415 or transmitted to the controller/processor 440 by higher layer signaling. The scheduler 443 schedules the air interface resources occupied by the first signaling. The MIMO transmission processor 441 performs multi-antenna precoding processing on the symbols output by the transmission processor. The transmitter 416 converts the baseband signal provided by the MIMO transmitting processor 441 into a radio frequency signal and transmits the radio frequency signal via the antenna 420. The receiver 456 converts the radio frequency signal received by the antenna 460 and the first signaling into a baseband signal and provides the baseband signal to the MIMO detector 472. The MIMO detector 472 performs MIMO detection on the signal received from the receiver 456. The receiving processor 452 processes the baseband 35 signal output by the MIMO detector 472 to obtain the first signaling or transmits the baseband signal to the controller/processor 440 for further processing

			related to a higher layer to obtain the first signaling." ('271 patent, 18:19-38.) "The first wireless signal in the present disclosure is K reference signal groups generated by the transmitting processor 415. The MIMO transmitting processor 441 performs beamforming processing on the K reference signal groups output by the transmitting processor, and transmits the K reference signal groups to the K antenna port groups for transmission. The transmitter 416 converts the baseband signal provided by the MIMO transmitting processor 441 into a radio frequency signal and transmits the radio frequency signal via the antenna 420. The receiver 456 converts the radio frequency signal received by the antenna 460 and the first radio signal into a baseband signal and provides the first radio signal to the MIMO detector 472. The MIMO detector 472 performs MIMO detection on the signal received from the receiver 456. The receiving processor 452 performs channel measurement based on the baseband signal output by the MIMO detector 472 and the K reference signal groups to obtain the K channel quality values." ('271 patent, 18:39-56.) "As a sub-embodiment, the UE 450 includes: a memory storing a computer readable instruction program that, when executed by at least one processor, performs operations. The operations include: receiving a first signaling; receiving a first wireless signal; and transmitting first

			information; wherein, K antenna port groups are used to transmit the first wireless signal; the first signaling is used to determine the K antenna port groups; the K is a positive integer greater than 1; the K antenna port groups respectively correspond to K channel quality values; the K channel quality values are K non-negative real numbers; K1 antenna port groups of the K antenna port groups correspond to K1 channel quality values of the K channel quality values; the K1 is a positive integer less than or equal to the K; a first proportional sequence corresponds to a ratio(ratios) among the K1 channel quality values; the first information is used to determine the K1 antenna port groups and the first proportional sequence." ('271 patent, 20:17-33; *see also* '271 patent, 20:53-21:2.) "In Embodiment 5, K antenna port groups are used to transmit the first wireless signal the first signaling is used to determine the K antenna port groups by U2. The K is a positive integer greater than 1. The K antenna port groups respectively correspond to K channel quality values. The K channel quality values are K non-negative real numbers. K1 antenna port groups of the K antenna port groups correspond to K1 channel quality values of the K channel quality values the K1 is a positive integer less than or equal to the K. A first proportional sequence corresponds to a ratio(ratios) among the K1 channel quality values. The first information is used to determine the K1 antenna port groups and the first proportional sequence." ('271

			patent, 21:44-56; *see also* ’271 patent, 24:15-19; 24:50-25:3.) “As a sub-embodiment, K2 antenna port groups in the K antenna port groups correspond to K2 channel quality values in the K channel quality values. The K2 is a positive integer less than or equal to the K a second proportional sequence corresponds to a ratio among the K2 channel quality values. A first receiving beamforming vector is used to receive signals transmitted through the K1 antenna port groups by U@. A second receiving beamforming vector is used to receive signals transmitted through the K2 antenna port groups by U2. The first receiving beamforming vector and the second receiving beamforming vector are different; the first information is further used to determine the K2 antenna port groups and the second proportional sequence.” (’271 patent, 21:57-22:2; *see also* ’271 patent, 22:28-47; 25:4-16; 26:5-17.) “As a sub-embodiment, the first signaling is further used to determine at least the last one of the K1, the K2, or the target threshold by U2. The target threshold is a non-negative real number. The first channel quality is the best channel quality value of the K1 channel quality values. The second channel quality is the worst channel quality value of the K1 channel quality values. The third channel quality is the best channel quality value of the K2 channel quality values. The fourth channel quality is the worst channel quality value of the K2 channel quality

			values. At least one of a ratio between the second channel quality and the first channel quality, or a ratio between the fourth channel quality and the third channel quality is greater than or equal to the target threshold. As a sub-embodiment, the first information is further used by U2 to determine at least one of the first channel quality or the third channel quality. As a sub-embodiment, the target antenna port group is used by Nl to transmit the second wireless signal." ('271 patent, 22:9-27; *see also* '271 patent, 24:10-46; 25:23-45; 26:24-46.) "Embodiment 8 illustrates a schematic diagram of K1 antenna port groups and K2 antenna port groups, as shown FIG. 8. In Embodiment 8, the K antenna port groups are used to transmit the first wireless signal. The K analog beamforming vectors are used for transmitting analog beamforming of the K antenna port groups respectively. The K antenna port groups respectively correspond to K channel quality values. The best K1+K2 channel quality values of the K channel quality values respectively correspond to the first receive beamforming vector and the second receive beamforming vector. The first receiving beamforming vector performs receiving analog beamforming on the signals transmitted through the Kl antenna port groups. The second receiving beamforming vector performs receiving analog beamforming on the signals transmitted through the K2

			antenna port groups." ('271 patent, 23:58-24:6; *see also* '271 patent, 25:49-26:4.) '271 patent, Figures 1, 4, 5, 8, 9, 10, and 11. '271 patent, Claims 11, 13, 14, 15. "The following is an examiner's statement of reasons for allowance: The prior art of record, considered individually or in com bi nation, appears to fail to fairly show or suggest a claimed invention comprising, among other limitations, novel and unobvious limitations of 'transmitting first information; wherein, K antenna port groups of the base station are used to transmit the first wireless signal; the first signaling is used by the UE to determine the K antenna port groups transmitting the first wireless signal received by the UE; the K is a positive integer greater than t; the K antenna port groups respectively correspond to K channel quality values; the K channel quality values are K non-negative real numbers; the K channel quality value is a Reference Signal Received Power (RSRP) or a Signal to Interference plus Noise Ratio (SINR); K1 antenna port groups of the K antenna port groups correspond to K1 channel quality values of the K channel quality values; the K1 is a positive integer less than or equal to the K; a first proportional sequence corresponds to a ratio(ratios) among the K1 channel quality values; the first information is used to determine the K1 antenna port groups and the first proportional sequence; the first signaling is used

			to determine a target threshold; the target threshold is a non-negative real number; a first channel quality is a best channel quality value among the K1 channel quality values; a second channel quality is a worse channel quality value among the K1 channel quality values; a ratio between the second channel quality and the first channel quality is greater than or equal to the target threshold,' as recited in group claims 1-5 and 11-15; and "receiving, by the base station, first information from the UE; wherein, K antenna port groups of the base station are used to transmit the first wireless signal; the first signaling is used by the UE to determine the K antenna port groups; the K is a positive integer greater than t; the K antenna port groups respectively correspond to K channel quality values; the K channel quality values are K non-negative real numbers; the K channel quality value is a Reference Signal Received Power (RSRP) or a Signal to Interference plus Noise Ratio (SINR); K1 antenna port groups of the K antenna port groups correspond to K1 channel quality values of the K channel quality values; the K1 is a positive integer less than or equal to the K; a first proportional sequence corresponds to a ratio(ratios) among the K1 channel quality values; the first information is used to determine the K1 antenna port groups and the first proportional sequence; the first signaling is used to determine a target threshold; the target threshold is a non-negative real number; a first channel quality is a best channel quality value

			among the K1 channel quality values; a second channel quality is a worse channel quality value among the K1 channel quality values; a ratio between the second channel quality and the first channel quality is greater than or equal to the target threshold," as recited in group claims 6-10 and 16-20, structurally and functionally interconnected in a manner as recited in the claims." (November 3, 2020 Notice of Allowability, 2-3 (alteration removed).)

III. Claim Construction Briefing and Hearing (P.R. 4-3(a)(3), P.R. 4-3(a)(4))

A. Length of Time for the Hearing

The parties anticipate that the claim construction hearing will run about four hours in length.

B. Witnesses

The parties do not anticipate calling any witnesses at the Markman hearing in support of the parties' respective claim construction arguments.

Dated: September 22, 2023

Respectfully submitted,

/s/ *Alfred R. Fabricant*

Alfred R. Fabricant
NY Bar No. 2219392
Email: ffabricant@fabricantllp.com
Peter Lambrianakos
NY Bar No. 2894392
Email: plambrianakos@fabricantllp.com
Vincent J. Rubino, III
NY Bar No. 4557435
Email: vrubino@fabricantllp.com
Enrique W. Iturralde
NY Bar No. 5526280
Email: eiturralde@fabricantllp.com
Jacob Ostling
NY Bar No. 5684824
Email: jostling@fabricantllp.com
FABRICANT LLP
411 Theodore Fremd Avenue,
Suite 206 South
Rye, New York 10580
Telephone: (212) 257-5797
Facsimile: (212) 257-5796

Samuel F. Baxter
Texas State Bar No. 01938000
sbaxter@mckoolsmith.com
Jennifer L. Truelove
Texas State Bar No. 24012906
Email: jtruelove@mckoolsmith.com

MCKOOL SMITH, P.C.
104 E. Houston Street, Suite 300
Marshall, Texas 75670
Telephone: (903) 923-9000
Facsimile: (903) 923-9099

ATTORNEYS FOR PLAINTIFF
APEX BEAM TECHNOLOGIES LLC

/s/ Benjamin R. Schlesinger
Melissa R. Smith
Texas State Bar No. 24001351
GILLAM & SMITH LLP
303 South Washington Ave.
Marshall, TX 75670
903.934.8450 (Telephone)
903.934.9257 (Facsimile)
melissa@gillamsmithlaw.com

Frank A. DeCosta, III
frank.decosta@finnegan.com
Parmanand K. Sharma (pro hac vice)
parmanand.sharma@finnegan.com
Christopher T. Blackford (pro hac vice)
christopher.blackford@finnegan.com
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, LLP
901 New York Avenue, N.W.
Washington, D.C. 20001-4413
(202) 408-4000
Charles H. Suh (pro hac vice)
charles.suh@finnegan.com
Yi Yu (pro hac vice)
yi.yu@finnegan.com
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, LLP
1875 Explorer Street, 8th Floor
Reston, VA 20190-6023
(571) 203-2700

Benjamin Schlesinger (pro hac vice)
benjamin.schlesinger@finnegan.com
Robert K. High (pro hac vice)
robert.high@finnegan.com

Shawn S. Chang (pro hac vice)
shawn.chang@finnegan.com
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, LLP
271 17th St. NW Suite 1400
Atlanta, GA 30363-6209
(404) 653-6400

ATTORNEYS FOR DEFENDANTS SAMSUNG ELECTRONICS CO., LTD. & SAMSUNG ELECTRONICS AMERICA, INC.

/s/ Charles M. McMahon
Charles M. McMahon
Thomas M. DaMario
MCDERMOTT WILL & EMERY LLP
444 West Lake Street, Suite 4000
Chicago, IL 60606
(312) 372-2000
cmcmahon@mwe.com
tdamario@mwe.com

ATTORNEYS FOR DEFENDANT ZTE CORPORATION

CERTIFICATE OF SERVICE

The undersigned hereby certifies that on September 22, 2023, a true and correct copy of the above and foregoing document has been served on all counsel of record who are deemed to have consented to electronic service via the Court's CM/ECF system per Local Rule CV-5(a)(3).

/s/ Alfred R. Fabricant
Alfred R. Fabricant

CERTIFICATE OF CONFERENCE

The undersigned hereby certifies that Plaintiff's counsel has met and conferred with counsel for Defendants, and all parties have agreed to the submission of the P.R. 4-3 Claim Construction and Prehearing Statement submitted herewith.

/s/ Alfred R. Fabricant
Alfred R. Fabricant