

Appendix E - Claim Chart for US Patent No. 10,951,271 Against Samsung Accused Products

Based on information presently available, Apex Beam Technologies LLC (“Apex Beam”) contends that Defendants Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, “Samsung”) infringe claims 1-5 and 11-15 (the “Asserted Claims”) of U.S. Patent No. 10,951,271 (the “271 Patent”) through the Accused Products which are manufactured, sold, offered for sale, used, imported into the United States, and/or exported from the United States by Samsung.

The Accused Products comprise all 5G mobile devices made, used, sold, offered for sale, imported into the United States, and/or exported from the United States or otherwise provided, after October 29, 2019. Apex Beam reserves the right to amend this list of Accused Products as discovery progresses.

Samsung directly infringes each of the Asserted Claims by using, importing, testing, selling, offering for sale, importing into the United States, and/or exporting from the United States the Accused Products in violation of 35 U.S.C. § 271(a).

Samsung indirectly infringes the Asserted Claims in violation of 35 U.S.C. § 271(b) by inducing third parties, including its users and/or customers, to directly infringe through their operation and use of the Accused Products. Samsung has knowingly and intentionally induced this direct infringement by, inter alia, (i) selling, offering to sell, importing, exporting, or otherwise providing the Accused Products to third parties with the intent that the Accused Products will be operated and used in a manner that practices the Asserted Claims; and (ii) marketing and advertising the Accused Products. Samsung’s marketing and promotional materials for the Accused Products are found, for example, on Samsung’s website, and on distributor websites on which the Accused Products are made available. For example, Samsung’s website offers customers downloadable User Manuals for the Accused Products that instruct customers to, among other things, use the accused services in the Accused Products. Samsung’s website also offers support to customers, including instruction to, among other things, to operate their devices on 5G networks. On information and belief, Samsung knows that its actions will result in infringement of the Asserted Claims, or subjectively believes that there is a high probability that its actions will result in infringement of the Asserted Claims but has taken deliberate actions to avoid learning these facts.

Samsung also contributorily infringes each of the Asserted Claims in violation of 35 U.S.C. § 271(c) by selling, importing, offering for sale, and otherwise providing the Accused Products, which when used directly infringe the Asserted Claims. The Accused Products constitute a material part of the Asserted Claims.

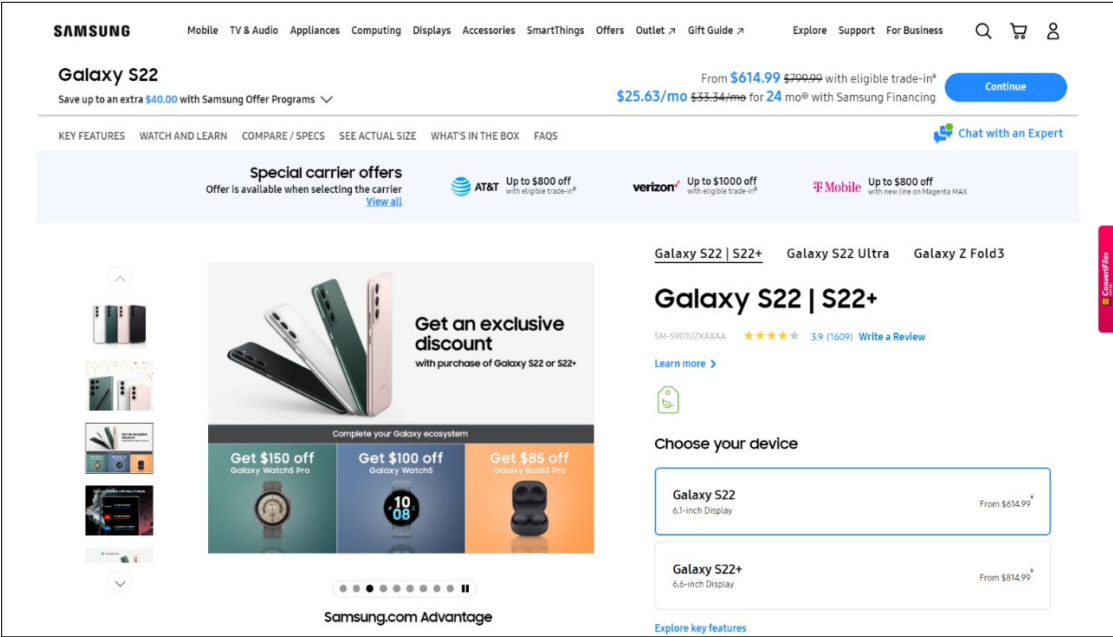
On information and belief, the charted version of the Samsung Galaxy S22 is representative of all versions of the Accused Products as all Samsung 5G devices implement the GSMA 3GPP 5G standards including, but not limited to, the Galaxy A13 5G, Galaxy A22 5G, Galaxy A32 5G, Galaxy A33 5G, Galaxy A42 5G, Galaxy A51 5G, Galaxy A52 5G, Galaxy A52s 5G, Galaxy A53 5G, Galaxy A71 5G, Galaxy A73 5G, Galaxy A90 5G, Galaxy Book Go 5G, Galaxy Book Pro 360 5G, Galaxy F42 5G, Galaxy F52 5G, Galaxy Fold 5G, Galaxy M32 5G, Galaxy M42 5G, Galaxy M52 5G, Galaxy Note 10 5G, Galaxy Note 10+ 5G, Galaxy Note 20 5G, Galaxy Note 20 Ultra 5G, Galaxy Quantum 2, Galaxy S10 5G, Galaxy S20 5G, Galaxy S20 FE 5G, Galaxy S20 Ultra 5G, Galaxy S20 UW, Galaxy S20+ 5G, Galaxy S21 5G, Galaxy S21 Ultra 5G, Galaxy S21+ 5G, Galaxy S22, Galaxy S22 5G, Galaxy S22 Ultra, Galaxy S22+, Galaxy Tab S7 5G, Galaxy Tab S7 FE 5G, Galaxy Tab S7+ 5G, Galaxy Tab S8+ 5G, Galaxy Z Flip 5G, Galaxy Z Flip3 5G, Galaxy Z Flip4, Galaxy Z Fold 2 5G, Galaxy Z Fold3 5G, and the Galaxy Z Fold4 (the “Accused Products”).

Apex Beam does not concede that any claims of the ’271 Patent that are not listed below are not infringed by the identified Accused Products. Moreover, the citations to certain documents and other information below are intended to be exemplary only and in no way foreclose Apex Beam from citing or relying on additional documents, information,

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source code, and/or testimony at a later time. These contentions are preliminary in nature, and an analysis of Samsung’s products, internal documentation, source code, and/or testimony from relevant witnesses may more fully and accurately describe the infringing features of its Accused Products. Accordingly, Apex Beam reserves the right to supplement, correct, modify, and/or amend these contentions once such additional information is made available to Apex Beam. Furthermore, Apex Beam reserves the right to supplement, correct, modify, and/or amend these contentions as discovery in this case progresses; in view of the Court’s claim construction order(s); in view of any positions taken by Samsung, including, but not limited to, positions on claim construction, invalidity, and/or non-infringement; and in connection with the preparation and exchange of expert reports.

The contents of every below claim cell on which another claim cell depends are expressly incorporated by reference in that dependent cell, as if set forth in their entirety therein.

Claim	Accused Products
[1P]. A method for multi-antenna transmission in a user equipment (UE), comprising:	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice For example, the Accused Products practice a method for multi-antenna transmission in a User Equipment (UE). A screenshot of the Samsung US website for the Galaxy S22. The page shows the product name 'Galaxy S22' with a price of \$614.99, crossed out from \$700.00. It highlights a financing option of \$25.63/month for 24 months. Below this, there are sections for 'Special carrier offers' from AT&T, Verizon, and T-Mobile. A carousel features an 'exclusive discount' and 'Complete your Galaxy ecosystem' offers for Galaxy Watch Pro and Galaxy Buds Pro. On the right, there's a 'Choose your device' section listing the Galaxy S22 (6.1-inch Display) and Galaxy S22+ (6.6-inch Display) with their respective starting prices. The URL at the bottom is https://www.samsung.com/us/smartphones/galaxy-s22/buy/galaxy-s22-128gb-unlocked-sm-s901uzkaxaa/. https://www.samsung.com/us/smartphones/galaxy-s22/buy/galaxy-s22-128gb-unlocked-sm-s901uzkaxaa/

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Claim	Accused Products
	Compare / Specs Samsung Galaxy S22 Ultra Samsung Galaxy S22+ Samsung Galaxy S22  Colors    Battery 5,000 mAh¹ 4,500 mAh¹ 3,700 mAh¹ Wireless Powershare Yes Yes Yes Storage Options 128GB 256GB 512GB 1TB 128GB 256GB 128GB 256GB Processor Snapdragon 8 Gen 1 Snapdragon 8 Gen 1 Snapdragon 8 Gen 1 RAM Options 8GB 12GB 8GB 8GB S Pen Integrated N/A N/A Cellular & Wireless The latest network technology with the power of 5G.² The latest network technology with the power of 5G.² The latest network technology with the power of 5G.² https://www.samsung.com/us/smartphones/galaxy-s22/buy/galaxy-s22-128gb-unlocked-sm-s901uzkaxaa/

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Claim	Accused Products
	Release 1563GPP TS 38.214 V15.0.0 (2017-12) 1Scope The present document specifies and establishes the characteristics of the physical layer procedures of data channels for 5G-NR. 2References The following documents contain provisions which, through reference in this text, constitute provisions of the present document. [1]3GPP TR 21.905: "Vocabulary for 3GPP Specifications" [2]3GPP TS 38.201: " NR; Physical Layer – General Description" [3]3GPP TS 38.202: "NR; Services provided by the physical layer" [4]3GPP TS 38.211: "NR; Physical channels and modulation" [5]3GPP TS 38.212: "NR; Multiplexing and channel coding" [6]3GPP TS 38.213: "NR; Physical layer procedures for control" [7]3GPP TS 38.215: "NR; Physical layer measurements" [8]3GPP TS 38.101: "NR; User Equipment (UE) radio transmission and reception" [9]3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception" [10]3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification" [11]3GPP TS 38.133: "NR; Requirements for support of radio resource management" [12]3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification" [13]3GPP TS 38.306: "NR; User Equipment (UE) radio access capabilities" [14]3GPP TS 38.423: "NG-RAN; Xn signalling transport" TS38.214 V15.0.0

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Claim	Accused Products
	5.1.1 Uplink shared channel The physical-layer model for Uplink Shared Channel transmission is described based on the corresponding PUSCH physical-layer-processing chain, see Figure 5.1.1-1. Processing steps that are relevant for the physical-layer model, <u>e.g.</u> in the sense that they are configurable by higher layers, are highlighted in blue. - Higher-layer data passed to/from the physical layer - CRC and transport-block-error indication - FEC and rate matching - Data modulation - Mapping to physical resource - Multi-antenna processing - Support of L1 control and Hybrid-ARQ-related signalling The diagram illustrates the physical-layer model for UL-SCH transmission between gNode B and UE. On the gNode B side, a MAC scheduler provides channel state information to a HARQ block. The HARQ block sends transport blocks to a CRC block, which then feeds into Coding + RM, Data demodulation, Resource mapping, and finally Antenna mapping. On the UE side, transport blocks are received by a HARQ block, which feeds into a CRC block, followed by Coding + RM, Data Modulation, Resource mapping, and Antenna mapping. The diagram also shows the flow of error indications, ACK/NACK, and HARQ info between the two entities. The processing steps from CRC to Antenna mapping are highlighted in blue. Figure 5.1.1-1: Physical-layer model for UL-SCH transmission TS38.202 V15.1.0

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	Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[1A] receiving, by the UE, a first signaling originating from a base station;	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice receiving, by the UE, a first signaling originating from a base station. For example, the Accused Products practice receiving a first signaling (<i>e.g.</i>, CSI-ReportConfig) originating from a base station (<i>e.g.</i>, gNB). 5.2.1 Channel state information framework The time and frequency resources that can be used by the UE to report CSI are controlled by the gNB. CSI consists of Channel Quality Indicator (CQI), precoding matrix indicator (PMI), CSI-RS resource indicator (CRI), strongest layer indication (SLI), rank indication (RI) and/or and L1-RSRP. For CQI, PMI, CRI, SLI, RI, L1-RSRP, a UE is configured by higher layers with $N \geq 1$ <i>ReportConfig</i> Reporting Settings, $M \geq 1$ <i>ResourceConfig</i> Resource Settings, and a single <i>MeasConfig</i> measurement setting containing $L \geq 1$ Links. A <i>MeasConfig</i> contains a list of reporting configurations (<i>ReportConfigList</i>), a list of resource configurations (<i>ResourceConfigList</i>), a list of link configurations (<i>MeasLinkConfigList</i>) and a list of trigger states (<i>ReportTrigger</i>). TS38.214 V15.0.0 6.3.2 Radio resource control information elements – <i>CSI-ReportConfig</i> The IE <i>CSI-ReportConfig</i> is used to configure reports sent on L1 (<i>e.g.</i> PUCCH) on the cell in which the <i>CSI-ReportConfig</i> is included. TS38.331 V15.1.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.

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Claim	Accused Products
[1B] receiving, by the UE, a first wireless signal originating from the base station; and	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice receiving, by the UE, a first wireless signal originating from the base station. For example, the Accused Products receive a first wireless signal (<i>e.g.</i>, CSI-RS resources; SS/PBCH Block resources) originating from the base station (<i>e.g.</i>, gNB). For example, the first wireless signal comprises K CSI-RS resources and/or SS/PBCH block resources. More specifically, the first wireless signal comprises K CSI-RS resource and/or SS/PBCH block resources configured in a CSI resource setting (by a CSI-ResourceConfig IE) for channel measurement in a CSI-ReportConfig IE. 5.2.1 Channel state information framework The time and frequency resources that can be used by the UE to report CSI are controlled by the gNB. CSI consists of Channel Quality Indicator (CQI), precoding matrix indicator (PMI), CSI-RS resource indicator (CRI), strongest layer indication (SLI), rank indication (RI) and/or and L1-RSRP. For CQI, PMI, CRI, SLI, RI, L1-RSRP, a UE is configured by higher layers with $N \geq 1$ <i>ReportConfig</i> Reporting Settings, $M \geq 1$ <i>ResourceConfig</i> Resource Settings, and a single <i>MeasConfig</i> measurement setting containing $L \geq 1$ Links. A <i>MeasConfig</i> contains a list of reporting configurations (<i>ReportConfigList</i>), a list of resource configurations (<i>ResourceConfigList</i>), a list of link configurations (<i>MeasLinkConfigList</i>) and a list of trigger states (<i>ReportTrigger</i>). TS38.214 V15.0.0

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	5.2.1.2 Resource settings Each Resource Setting <i>ResourceConfig</i> contains a configuration of $S \geq 1$ CSI-RS Resource Sets (higher layer parameter <i>ResourceSetConfig</i>), with each Resource Set consisting of CSI-RS resources (higher layer parameters <i>NZP-CSI-RS-ResourceConfigList</i> and <i>CSI-IM-ResourceConfigList</i>) and SS/PBCH Block resources used for L1-RSRP computation (higher layer parameter <i>resource-config-SS-list</i>). Each Resource setting is located in the BWP identified by the higher layer parameter <i>BWP-info</i>, and all linked Resource Settings of a CSI Report Setting have the same BWP. TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[1C] transmitting, by the UE, first information to the base station;	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice transmitting, by the UE, first information to the base station. For example, the Accused Products transmit first information (<i>e.g.</i>, a single CSI report) to the base station (<i>e.g.</i>, gNB). 5.2.1 Channel state information framework The time and frequency resources that can be used by the UE to report CSI are controlled by the gNB. CSI consists of Channel Quality Indicator (CQI), precoding matrix indicator (PMI), CSI-RS resource indicator (CRI), strongest layer indication (SLI), rank indication (RI) and/or and L1-RSRP. For CQI, PMI, CRI, SLI, RI, L1-RSRP, a UE is configured by higher layers with $N \geq 1$ <i>ReportConfig</i> Reporting Settings, $M \geq 1$ <i>ResourceConfig</i> Resource Settings, and a single <i>MeasConfig</i> measurement setting containing $L \geq 1$ Links. A <i>MeasConfig</i> contains a list of reporting configurations (<i>ReportConfigList</i>), a list of resource configurations (<i>ResourceConfigList</i>), a list of link configurations (<i>MeasLinkConfigList</i>) and a list of trigger states (<i>ReportTrigger</i>). TS38.214 V15.0.0

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	5.2.1.4 Reporting configurations - if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance. TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[1D] wherein, K antenna port groups of the base station are used to transmit the first wireless signal;	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice wherein, K antenna port groups of the base station are used to transmit the first wireless signal. For example, K antenna port groups (<i>e.g.</i>, number of ports) of the base station are used to transmit the first wireless signal (<i>e.g.</i>, CSI-RS resources; SS/PBCH Block resources).

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	5.2.1.2 Resource settings Each Resource Setting <i>ResourceConfig</i> contains a configuration of $S \geq 1$ CSI-RS Resource Sets (higher layer parameter <i>ResourceSetConfig</i>), with each Resource Set consisting of CSI-RS resources (higher layer parameters <i>NZP-CSI-RS-ResourceConfigList</i> and <i>CSI-IM-ResourceConfigList</i>) and SS/PBCH Block resources used for L1-RSRP computation (higher layer parameter <i>resource-config-SS-list</i>). Each Resource setting is located in the BWP identified by the higher layer parameter <i>BWP-info</i>, and all linked Resource Settings of a CSI Report Setting have the same BWP. For periodic and semi-persistent CSI Resource Settings, $S=1$. Each set s contains $K_s \geq 1$ CSI-RS resources (higher layer parameter <i>CSI-RS-ResourceConfig</i>) each of which includes at least mapping to REs, number of ports and time-domain behavior as described in Subclause 5.2.2.3.1. The allowable antenna port values and resource mapping patterns are given in Subclause 7.4.1.5 of [4, TS 38.211]. The time domain behavior of the CSI-RS resources which are part of sets within a CSI-RS Resource Setting are indicated by the higher layer parameter <i>ResourceConfigType</i> and can be aperiodic, periodic, or semi-persistent. TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[1E] 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 1;	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice 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 1. For example, the first signaling (<i>e.g.</i>, CSI-ReportConfig) is used by the Accused Products to determine the K antenna port groups (<i>e.g.</i>, number of ports – <i>nrofPorts</i>) transmitting the first wireless signal (<i>e.g.</i>, CSI-RS resources; SS/PBCH Block resources) received by the UE. K is a positive integer greater than 1. 6.3.2 Radio resource control information elements

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Claim

Accused Products

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CSI-ReportConfig

The IE *CSI-ReportConfig* is used to configure reports sent on L1 (e.g. PUCCH) on the cell in which the *CSI-ReportConfig* is included.

CSI-ReportConfig information element

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-- ASN1START
-- TAG-CSI-REPORTCONFIG-START
-- Configuration of a CSI-Report sent on L1 (e.g. PUCCH) (see 38.214, section 5.2.1)
CSI-ReportConfig ::= SEQUENCE {
    reportConfigId          CSI-ReportConfigId,

    -- Indicates in which serving cell the CSI-ResourceConfigToAddMod(s) below are to be found.
    -- If the field is absent, the resources are on the same serving cell as this report configuration.
    carrier                 ServCellIndex OPTIONAL, -- Need S

    -- Resources for channel measurement. csi-ResourceConfigId of a CSI-ResourceConfig included in the configuration of the serving cell
    -- indicated with the field "carrier" above. This CSI-ReportConfig is associated with the DL BWP indicated by bwp-Id in that CSI-ResourceConfig.
    resourcesForChannelMeasurement CSI-ResourceConfigId,
```

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6.3.2

Radio resource control information elements

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CSI-ResourceConfig

The IE *CSI-ResourceConfig* refers to one or more *NZP-CSI-RS-ResourceSet*, *CSI-IM-ResourceSet* and/or *CSI-SSB-ResourceSet*.

CSI-ResourceConfig information element

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-- ASN1START
-- TAG-CSI-RESOURCECONFIG-START

-- One CSI resource configuration comprising of one or more resource sets
CSI-ResourceConfig ::= SEQUENCE {

    -- Used in CSI-ReportConfig to refer to an instance of CSI-ResourceConfig
    csi-ResourceConfigId          CSI-ResourceConfigId,

    -- Contains up to maxNrofNZP-CSI-RS-ResourceSetsPerConfig resource sets if ResourceConfigType is 'aperiodic' and 1 otherwise.
    -- Corresponds to L1 parameter 'ResourceSetConfigList' (see 38.214, section 5.2.1.3.1)
    csi-RS-ResourceSetList        CHOICE {
        nzp-CSI-RS-SSB            SEQUENCE {
            nzp-CSI-RS-ResourceSetList SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourceSetsPerConfig)) OF NZP-CSI-RS-ResourceSetId OPTIONAL,
            -- List of SSB resources used for beam measurement and reporting in a resource set
            -- Corresponds to L1 parameter 'resource-config-SS-list' (see 38,214, section FFS_Section)
            csi-SSB-ResourceSetList SEQUENCE (SIZE (1..maxNrofCSI-SSB-ResourceSetsPerConfig)) OF CSI-SSB-ResourceSetId OPTIONAL
        },
        csi-IM-ResourceSetList      SEQUENCE (SIZE (1..maxNrofCSI-IM-ResourceSetsPerConfig)) OF CSI-IM-ResourceSetId
    },
}
```

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	6.3.2Radio resource control information elements –NZP-CSI-RS-ResourceSet The IE <i>NZP-CSI-RS-ResourceSet</i> is a set of Non-Zero-Power (NZP) CSI-RS resources (their IDs) and set-specific parameters. NZP-CSI-RS-ResourceSet information element <pre>-- ASN1START -- TAG-NZP-CSI-RS-RESOURCESET-START NZP-CSI-RS-ResourceSet ::= SEQUENCE { nzp-CSI-ResourceSetId NZP-CSI-RS-ResourceSetId, -- NZP-CSI-RS-Resources associated with this NZP-CSI-RS resource set. -- Corresponds to L1 parameter 'CSI-RS-ResourceConfigList' (see 38.214, section 5.2) -- For CSI, there are at most 8 NZP CSI RS resources per resource set nzp-CSI-RS-Resources SEQUENCE (SIZE (1..maxNrofNZP-CSI-RS-ResourcesPerSet)) OF NZP-CSI-RS-ResourceId,</pre> TS38.331 V15.1.0
	6.3.2Radio resource control information elements –CSI-SSB-ResourceSet The IE <i>CSI-SSB-ResourceSet</i> is used to configure one SS/PBCH block resource set which refers to SS/PBCH as indicated in <i>ServingCellConfigCommon</i>. CSI-SSB-ResourceSet information element <pre>-- ASN1START -- TAG-CSI-SSB-RESOURCESET-START CSI-SSB-ResourceSet ::= SEQUENCE { csi-SSB-ResourceSetId CSI-SSB-ResourceSetId, csi-SSB-ResourceList SEQUENCE (SIZE (1..maxNrofCSI-SSB-ResourcePerSet)) OF SSB-Index, ... }</pre> TS38.331 V15.1.0
	6.3.2Radio resource control information elements

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	-NZP-CSI-RS-Resource The IE <i>NZP-CSI-RS-Resource</i> is used to configure Non-Zero-Power (NZP) CSI-RStransmitted in the cell where the IE is included, which the UE may be configured to measure on (see 38.214, section 5.2.2.3.1). NZP-CSI-RS-Resource information element <pre>-- ASN1START -- TAG-NZP-CSI-RS-RESOURCE-START NZP-CSI-RS-Resource ::= SEQUENCE { nzp-CSI-RS-ResourceId NZP-CSI-RS-ResourceId, -- OFDM symbol location(s) in a slot and subcarrier occupancy in a PRB of the CSI-RS resource resourceMapping CSI-RS-ResourceMapping, -- Power offset of NZP CSI-RS RE to PDSCH RE. Value in dB. Corresponds to L1 parameter Pc (see 38.214, sections 5.2.2.3.1 and 4.1)</pre> TS38.331 V15.1.0 6.3.2Radio resource control information elements -CSI-RS-ResourceMapping The IE <i>CSI-RS-ResourceMapping</i> is used to configure the resource element mapping of a CSI-RS resource in time- and frequency domain. CSI-RS-ResourceMapping information element <pre>-- ASN1START -- TAG-CSI-RS-RESOURCEMAPPING-START CSI-RS-ResourceMapping ::= SEQUENCE { -- Frequency domain allocation within a physical resource block in accordance with 38.211, section 7.4.1.5.3 including table 7.4.1.5.2-1. -- The number of bits that may be set to one depend on the chosen row in that table. For the choice "other", the row can be determined from -- the parameters below and from the number of bits set to 1 in frequencyDomainAllocation. frequencyDomainAllocation CHOICE { row1 BIT STRING (SIZE (4)), row2 BIT STRING (SIZE (12)), row4 BIT STRING (SIZE (3)), other BIT STRING (SIZE (6)) }, -- Number of ports (see 38.214, section 5.2.2.3.1) nrofPorts ENUMERATED {p1,p2,p4,p8,p12,p16,p24,p32}, -- Time domain allocation within a physical resource block. The field indicates the first OFDM symbol in the PRB used for CSI-RS. -- Parameter l0 in 38.211, section 7.4.1.5.3. Value 2 is supported only when DL-DMRS-typeA-pos equals 3.</pre> TS38.331 V15.1.0

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	Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[1F] 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 values are Reference Signal Received Powers (RSRPs) or a Signal to Interference plus Noise Ratios (SINRs);	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice 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 values are Reference Signal Received Powers (RSRPs) or a Signal to Interference plus Noise Ratios (SINRs). For example, the K antenna port groups (<i>e.g.</i>, number of ports transmitting the first wireless signal) respectively correspond to K channel quality values (<i>e.g.</i>, Reference Signal Received Powers, L1-RSRP). The K channel quality values are K non-negative real numbers (<i>e.g.</i>, L1-RSRP are in Watts(W)). 5.2.1.2Resource settings Each Resource Setting <i>ResourceConfig</i> contains a configuration of $S \geq 1$ CSI-RS Resource Sets (higher layer parameter <i>ResourceSetConfig</i>), with each Resource Set consisting of CSI-RS resources (higher layer parameters <i>NZP-CSI-RS-ResourceConfigList</i> and <i>CSI-IM-ResourceConfigList</i>) and SS/PBCH Block resources used for L1-RSRP computation (higher layer parameter <i>resource-config-SS-list</i>). Each Resource setting is located in the BWP identified by the higher layer parameter <i>BWP-info</i>, and all linked Resource Settings of a CSI Report Setting have the same BWP. TS38.214 V15.0.0 5.1.1SS reference signal received power (SS-RSRP) Definition SS reference signal received power (SS -RSRP) is defined as the linear average over the power contributions (in [W]) of the resource elements that carry secondary synchronization signals (SS). The measurement time resource(s) for SS-RSRP are confined within SS/PBCH Block Measurement Time Configuration (SMTTC) window duration. TS38.215 V15.0.0

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Claim	Accused Products
	5.1.2 CSI reference signal received power (CSI-RSRP) Definition CSI reference signal received power (CSI-RSRP), is defined as the linear average over the power contributions (in [W]) of the resource elements that carry CSI reference signals configured for RSRP measurements within the considered measurement frequency bandwidth in the configured CSI-RS occasions. TS38.215 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[1G] 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;	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice 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. For example, the K1 antenna port groups of the K antenna port groups (<i>e.g.</i>, <i>nrofReportedRS</i>) correspond to K1 channel quality values of the K channel quality values (<i>e.g.</i>, L1-RSRP). the K1 is a positive integer less than or equal to the K. For example, the K1 channel quality values are K1 L1-RSRPs in W (watts). As shown in claim element 1[F], the linear L1-RSRP <i>i.e.</i>, RSRP of layer 1 signals such as SS or CSI RS are stated in W(watts). 5.2.1.4 Reporting configurations - if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance.

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Claim	Accused Products				
	TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.				
[1H] a first proportional sequence corresponds to a ratio(ratios) among the K1 channel quality values;	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice a first proportional sequence corresponds to a ratio(ratios) among the K1 channel quality values. For example, a first proportional sequence (<i>e.g.</i>, the differential L1-RSRP in dB) corresponds to a ratio(ratios) among the K1 channel quality values (<i>e.g.</i>, between linear L1-RSRPs in W). For example, the differential L1-RSRP in dB is equivalent to the ratio(ratios) between linear L1-RSRPs in W. The reported value in table 10.1.6.1-2 of TS 38.133 is in dB (decibels). W units can be converted into dB units because both represent power. <table><tr><td>5.2.1.4</td><td>Reporting configurations</td></tr><tr><td colspan="2"> - if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance. </td></tr></table> TS38.214 V15.0.0	5.2.1.4	Reporting configurations	- if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance.	
5.2.1.4	Reporting configurations				
- if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance.					

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Claim	Accused Products																																																			
	Table 10.1.6.1-2: Differential SS-RSRP and CSI-RSRP measurement (for L1 reporting) report mapping <table><tr><th>Reported value</th><th>Measured quantity value (difference in measured RSRP from strongest RSRP)</th><th>Unit</th></tr><tr><td>DIFFRSRP_0</td><td>$0 \geq \Delta \text{RSRP} > -2$</td><td>dB</td></tr><tr><td>DIFFRSRP_1</td><td>$-2 \geq \Delta \text{RSRP} > -4$</td><td>dB</td></tr><tr><td>DIFFRSRP_2</td><td>$-4 \geq \Delta \text{RSRP} > -6$</td><td>dB</td></tr><tr><td>DIFFRSRP_3</td><td>$-6 \geq \Delta \text{RSRP} > -8$</td><td>dB</td></tr><tr><td>DIFFRSRP_4</td><td>$-8 \geq \Delta \text{RSRP} > -10$</td><td>dB</td></tr><tr><td>DIFFRSRP_5</td><td>$-10 \geq \Delta \text{RSRP} > -12$</td><td>dB</td></tr><tr><td>DIFFRSRP_6</td><td>$-12 \geq \Delta \text{RSRP} > -14$</td><td>dB</td></tr><tr><td>DIFFRSRP_7</td><td>$-14 \geq \Delta \text{RSRP} > -16$</td><td>dB</td></tr><tr><td>DIFFRSRP_8</td><td>$-16 \geq \Delta \text{RSRP} > -18$</td><td>dB</td></tr><tr><td>DIFFRSRP_9</td><td>$-18 \geq \Delta \text{RSRP} > -20$</td><td>dB</td></tr><tr><td>DIFFRSRP_10</td><td>$-20 \geq \Delta \text{RSRP} > -22$</td><td>dB</td></tr><tr><td>DIFFRSRP_11</td><td>$-22 \geq \Delta \text{RSRP} > -24$</td><td>dB</td></tr><tr><td>DIFFRSRP_12</td><td>$-24 \geq \Delta \text{RSRP} > -26$</td><td>dB</td></tr><tr><td>DIFFRSRP_13</td><td>$-26 \geq \Delta \text{RSRP} > -28$</td><td>dB</td></tr><tr><td>DIFFRSRP_14</td><td>$-28 \geq \Delta \text{RSRP} > -30$</td><td>dB</td></tr><tr><td>DIFFRSRP_15</td><td>$-30 \geq \Delta \text{RSRP}$</td><td>dB</td></tr></table> TS38.133 V15.8.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.	Reported value	Measured quantity value (difference in measured RSRP from strongest RSRP)	Unit	DIFFRSRP_0	$0 \geq \Delta \text{RSRP} > -2$	dB	DIFFRSRP_1	$-2 \geq \Delta \text{RSRP} > -4$	dB	DIFFRSRP_2	$-4 \geq \Delta \text{RSRP} > -6$	dB	DIFFRSRP_3	$-6 \geq \Delta \text{RSRP} > -8$	dB	DIFFRSRP_4	$-8 \geq \Delta \text{RSRP} > -10$	dB	DIFFRSRP_5	$-10 \geq \Delta \text{RSRP} > -12$	dB	DIFFRSRP_6	$-12 \geq \Delta \text{RSRP} > -14$	dB	DIFFRSRP_7	$-14 \geq \Delta \text{RSRP} > -16$	dB	DIFFRSRP_8	$-16 \geq \Delta \text{RSRP} > -18$	dB	DIFFRSRP_9	$-18 \geq \Delta \text{RSRP} > -20$	dB	DIFFRSRP_10	$-20 \geq \Delta \text{RSRP} > -22$	dB	DIFFRSRP_11	$-22 \geq \Delta \text{RSRP} > -24$	dB	DIFFRSRP_12	$-24 \geq \Delta \text{RSRP} > -26$	dB	DIFFRSRP_13	$-26 \geq \Delta \text{RSRP} > -28$	dB	DIFFRSRP_14	$-28 \geq \Delta \text{RSRP} > -30$	dB	DIFFRSRP_15	$-30 \geq \Delta \text{RSRP}$	dB
Reported value	Measured quantity value (difference in measured RSRP from strongest RSRP)	Unit																																																		
DIFFRSRP_0	$0 \geq \Delta \text{RSRP} > -2$	dB																																																		
DIFFRSRP_1	$-2 \geq \Delta \text{RSRP} > -4$	dB																																																		
DIFFRSRP_2	$-4 \geq \Delta \text{RSRP} > -6$	dB																																																		
DIFFRSRP_3	$-6 \geq \Delta \text{RSRP} > -8$	dB																																																		
DIFFRSRP_4	$-8 \geq \Delta \text{RSRP} > -10$	dB																																																		
DIFFRSRP_5	$-10 \geq \Delta \text{RSRP} > -12$	dB																																																		
DIFFRSRP_6	$-12 \geq \Delta \text{RSRP} > -14$	dB																																																		
DIFFRSRP_7	$-14 \geq \Delta \text{RSRP} > -16$	dB																																																		
DIFFRSRP_8	$-16 \geq \Delta \text{RSRP} > -18$	dB																																																		
DIFFRSRP_9	$-18 \geq \Delta \text{RSRP} > -20$	dB																																																		
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DIFFRSRP_13	$-26 \geq \Delta \text{RSRP} > -28$	dB																																																		
DIFFRSRP_14	$-28 \geq \Delta \text{RSRP} > -30$	dB																																																		
DIFFRSRP_15	$-30 \geq \Delta \text{RSRP}$	dB																																																		
[11] the first information is used to determine the K1 antenna port groups and the first proportional sequence;	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice the first information is used to determine the K1 antenna port groups and the first proportional sequence. For example, the first information (<i>e.g.</i>, a single CSI report) is used to determine the K1 antenna port groups (<i>e.g.</i>, <i>nrofReportedRS</i>) and the first proportional sequence (<i>e.g.</i>, the largest L1-RSRP and differential L1-RSRP).																																																			

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Claim	Accused Products
	For example, the first proportional sequence depends upon the K1 channel quality values. As shown in the mapping the K1 antenna port groups are determined via CSI RS/SS resources comprising of first information. The Accused Products use the largest L1-RSRP and differential L1-RSRP which are quantized to a 7-bit value in the range [-140, -44] dBm and 4-bit value respectively as shown in section 5.2.1.4.3 TS38.214 V15.3.0. The quantized value is the first proportional sequence. 5.2.1.4Reporting configurations - if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance. TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[1J] 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	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice 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. For example, the first signaling (<i>e.g.</i>, CSI-ReportConfig) is used to determine a target threshold (<i>e.g.</i>, $Q_{inL,R}$). $Q_{inL,R}$ is a non-negative real number.

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Claim	Accused Products
the first channel quality is greater than or equal to the target threshold.	For example, the first channel quality (<i>e.g.</i>, best L1=RSRP) is a best channel quality value among the K1 channel quality values. A second channel quality is a worse channel quality value (<i>e.g.</i>, worst L1=RSRP) 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 (<i>e.g.</i>, $Q_{inL,R}$). The threshold, $Q_{inL,R}$, corresponds to the channel quality measurements. For example, the first signaling indicates $nrofReportedRS$. With $nrofReportedRS$, and fixed values of (see TS38.214 v.15.0.0 – clause 5.2.1.4) the number of bits per differential L1-RSRP and the step size of differential L1-RSRP, the minimum value (i.e. the target threshold) of the ratio between the worst L1-RSRP and the best L1-RSRP (i.e., the first channel quality) can be obtained as $Th = -(N_{RS} - 1) \cdot 2^{N_{bit}} \cdot 2 \text{ (dB)}$ with Th the target threshold, $N_{RS} = nrofReportedRS$, N_{bit} = number of bits per differential L1-RSRP. For example, the ratio between any L1-RSRP other than the bestL1-RSRP (the second channel quality) and thebest L1-RSRP (i.e., the first channel quality) is no smaller than the target threshold. 6.3.2 Radio resource control information elements – CSI-ReportConfig The IE <i>CSI-ReportConfig</i> is used to configure reports sent on L1 (e.g. PUCCH) on the cell in which the <i>CSI-ReportConfig</i> is included. CSI-ReportConfig information element <pre>-- ASN1START -- TAG-CSI-REPORTCONFIG-START -- Configuration of a CSI-Report sent on L1 (e.g. PUCCH) (see 38.214, section 5.2.1) CSI-ReportConfig ::= SEQUENCE { reportConfigId CSI-ReportConfigId, ... groupBasedBeamReporting CHOICE { enabled NULL, disabled SEQUENCE { -- The number (N) of measured RS resources to be reported per report setting in a non-group-based report. -- N <= N_max, where N_max is either 2 or 4 depending on UE capability. -- FFS: The signaling mechanism for the gNB to select a subset of N beams for the UE to measure and report. -- FFS: Note: this parameter may not be needed for certain resource and/or report settings -- FFS_ASN1: Change groupBasedBeamReporting into a CHOICE and include this field into the "no" option? -- (see 38.214, section FFS_Section) -- When the field is absent the UE applies the value 1 nrofReportedRS ENUMERATED {n1, n2, n3, n4} } }, </pre> TS38.331 V15.1.0

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Claim	Accused Products
	5.2.1.4 Reporting configurations - if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance. TS38.214 V15.0.0 As further examples, Apex Beam also identifies the following portions of the standard:

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Claim	Accused Products
	8.5Link Recovery Procedures 8.5.1Introduction The UE shall assess the downlink link quality of a serving cell based on the reference signal in the set $\bar{q}_0$ as specified in TS 38.213 [3] in order to detect beam failure instance. The RS resources in the set $\bar{q}_0$ can be periodic CSI-RS resources and/or SSBs. UE is not required to perform beam failure detection outside the active DL BWP. On each RS resource in the set $\bar{q}_0$, the UE shall estimate the radio link quality and compare it to the threshold Q_{out_LR} for the purpose of accessing downlink radio link quality of the serving cell. The threshold Q_{out_LR} is defined as the level at which the downlink radio level link cannot be reliably received and shall correspond to the $BLER_{out}[TBD]$ block error rate of a hypothetical PDCCH transmission. For SSB based beam failure detection, $Q_{out_LR_SSB}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.5.2.1-1. For CSI-RS based beam failure detection, $Q_{out_LR_CSI-RS}$ is derived based on the hypothetical PDCCH transmission parameters listed in Table 8.5.3.1-1. The UE shall perform L1-RSRP measurements based on the reference signal in the set $\bar{q}_1$ as specified in TS 38.213 [3] in order to detect candidate beam. The RS resources in the set $\bar{q}_1$ can be periodic CSI-RS resources and/or SSBs. UE is not required to perform candidate beam detection outside the active DL BWP. On each RS resource in the set $\bar{q}_1$, the UE shall perform L1-RSRP measurements and compare it to the threshold Q_{in_LR} for the purpose of selecting new beam(s) for beam failure recovery. The threshold Q_{in_LR} corresponds to the value of higher layer parameter <i>candidateBeamThreshold</i>. TS 38.133 V15.3.0

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Claim	Accused Products
	8.5.6 Requirements for CSI-RS based candidate beam detection 8.5.6.1 Introduction The requirements in this section apply for each CSI-RS resource in the set $\overline{q}_1$ configured for a serving cell, provided that the CSI-RS resources configured for candidate beam detection are actually transmitted within UE active DL BWP during the entire evaluation period specified in section 8.5.6.2. 8.5.6.2 Minimum requirement UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set $\overline{q}_1$ estimated over the last $T_{\text{Evaluate_CBD_CSI-RS}}$ [ms] period becomes better than the threshold $Q_{\text{in_LR}}$ within $T_{\text{Evaluate_CBD_CSI-RS}}$ [ms] period. The value of $T_{\text{Evaluate_CBD_CSI-RS}}$ is defined in Table 8.5.6.2-1 for FR1. The value of $T_{\text{Evaluate_CBD_CSI-RS}}$ is defined in Table 8.5.6.2-2 for FR2 with N=FFS. TS 38.133 V15.3.0

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	6Link recovery procedures A UE can be provided, for a serving cell, with a set $\bar{q}_0$ of periodic CSI-RS resource configuration indexes by higher layer parameter <i>failureDetectionResources</i> and with a set $\bar{q}_1$ of periodic CSI-RS resource configuration indexes and/or SS/PBCH block indexes by higher layer parameter <i>candidateBeamRSList</i> for radio link quality measurements on the serving cell. If the UE is not provided with higher layer parameter <i>failureDetectionResources</i>, the UE determines the set $\bar{q}_0$ to include periodic CSI-RS resource configuration indexes with same values as the RS indexes in the RS sets indicated by higher layer parameter <i>TCI-states</i> for respective control resource sets that the UE uses for monitoring PDCCH. The UE expects the set $\bar{q}_0$ to include up to two RS indexes and, if there are two RS indexes in a TCI state, the set $\bar{q}_0$ includes RS indexes with QCL-TypeD configuration for the corresponding TCI states. The UE expects single port RS in the set $\bar{q}_0$. The thresholds $Q_{out,LR}$ and $Q_{in,LR}$ correspond to the default value of higher layer parameter <i>rimInSyncOutOfSyncThreshold</i>, as described in [10, TS38.133] for Q_{out}, and to the value provided by higher layer parameter <i>rsrp-ThresholdSSB</i>, respectively. The physical layer in the UE assesses the radio link quality according to the set $\bar{q}_0$ of resource configurations against the threshold $Q_{out,LR}$. For the set $\bar{q}_0$, the UE assesses the radio link quality only according to periodic CSI-RS resource configurations or SS/PBCH blocks that are quasi co-located, as described in [6, TS 38.214], with the DM-RS of PDCCH receptions monitored by the UE. The UE applies the $Q_{in,LR}$ threshold to the L1-RSRP measurement obtained from a SS/PBCH block. The UE applies the $Q_{in,LR}$ threshold to the L1-RSRP measurement obtained for a CSI-RS resource after scaling a respective CSI-RS reception power with a value provided by higher layer parameter <i>powerControlOffsetSS</i>. The physical layer in the UE provides an indication to higher layers when the radio link quality for all corresponding resource configurations in the set $\bar{q}_0$ that the UE uses to assess the radio link quality is worse than the threshold $Q_{out,LR}$. The physical layer informs the higher layers when the radio link quality is worse than the threshold $Q_{out,LR}$ with a periodicity determined by the maximum between the shortest periodicity among the periodic CSI-RS configurations and/or SS/PBCH blocks in the set $\bar{q}_0$ that the UE uses to assess the radio link quality and 2 msec. Upon request from higher layers, the UE provides to higher layers the periodic CSI-RS configuration indexes and/or SS/PBCH block indexes from the set $\bar{q}_1$ and the corresponding L1-RSRP measurements that are larger than or equal to the $Q_{in,LR}$ threshold. TS 38.213 V15.3.0 5.1.1Random Access procedure initialization

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	RRC configures the following parameters for the Random Access procedure: - <i>prach-ConfigurationIndex</i>: the available set of PRACH occasions for the transmission of the Random Access Preamble for Msg1. These are also applicable to the MSGA PRACH if the PRACH occasions are shared between 2-step and 4-step RA types; - <i>prach-ConfigurationPeriodScaling-LAB</i>: the scaling factor defined in TS 38.211 [8] and applicable to IAB-MTs, extending the periodicity of the PRACH occasions baseline configuration indicated by <i>prach-ConfigurationIndex</i>; - <i>prach-ConfigurationFrameOffset-LAB</i>: the frame offset defined in TS 38.211 [8] and applicable to IAB-MTs, altering the ROs frame defined in the baseline configuration indicated by <i>prach-ConfigurationIndex</i>; - <i>prach-ConfigurationSOffset-LAB</i>: the subframe/slot offset defined in TS 38.211 [8] and applicable to IAB-MTs, altering the ROs subframe or slot defined in the baseline configuration indicated by <i>prach-ConfigurationIndex</i>; - <i>msgA-prach-ConfigurationIndex</i>: the available set of PRACH occasions for the transmission of the Random Access Preamble for MSGA in 2-step RA type; - <i>preambleReceivedTargetPower</i>: initial Random Access Preamble power for 4-step RA type; - <i>msgA-PreambleReceivedTargetPower</i>: initial Random Access Preamble power for 2-step RA type; - <i>rsrp-ThresholdSSB</i>: an RSRP threshold for the selection of the SSB for 4-step RA type. If the Random Access procedure is initiated for beam failure recovery, <i>rsrp-ThresholdSSB</i> used for the selection of the SSB within <i>candidateBeamRSList</i> refers to <i>rsrp-ThresholdSSB</i> in <i>BeamFailureRecoveryConfig</i> IE; - <i>rsrp-ThresholdCSI-RS</i>: an RSRP threshold for the selection of CSI-RS for 4-step RA type. If the Random Access procedure is initiated for beam failure recovery, <i>rsrp-ThresholdCSI-RS</i> is equal to <i>rsrp-ThresholdSSB</i> in <i>BeamFailureRecoveryConfig</i> IE; - <i>msgA-RSRP-ThresholdSSB</i>: an RSRP threshold for the selection of the SSB for 2-step RA type; - <i>rsrp-ThresholdSSB-SUL</i>: an RSRP threshold for the selection between the NUL carrier and the SUL carrier; - <i>msgA-RSRP-Threshold</i>: an RSRP threshold for selection between 2-step RA type and 4-step RA type when both 2-step and 4-step RA type Random Access Resources are configured in the UL BWP; - <i>msgA-TransMax</i>: The maximum number of MSGA transmissions when both 4-step and 2-step RA type Random Access Resources are configured; TS 38.321 V16.1.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.

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Claim	Accused Products
[2P]. The method according to claim 1,	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice the method according to claim 1. <i>See</i> claim 1.
[2A] wherein the K channel quality values are broadband channel quality values; or	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice wherein the K channel quality values are broadband channel quality values. For example, the K channel quality values are broadband channel quality values. For example, according to the definition of CSI-RS RSRP in TS38.215 v.15.0.0 – clause 5.1.2, the RSRP is averaged over the power contributions of REs carrying CSI RSs within the measurement frequency bandwidth. When the measurement frequency is broadband, the RSRP is also broadband. 5.2.1.4Reporting configurations - if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance. TS38.214 V15.0.0 5.1.2CSI reference signal received power (CSI-RSRP) Definition CSI reference signal received power (CSI-RSRP), is defined as the linear average over the power contributions (in [W]) of the resource elements that carry CSI reference signals configured for RSRP measurements within the considered measurement frequency bandwidth in the configured CSI-RS occasions.

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Claim	Accused Products
	TS38.215 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[2B] the first proportional sequence comprises K1 positive real numbers less than or equal to 1, and the first proportional sequence comprises at least one 1; or	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice the first proportional sequence comprises K1 positive real numbers less than or equal to 1, and the first proportional sequence comprises at least one 1. For example, the first proportional sequence (<i>e.g.</i>, the largest L1-RSRP and differential L1-RSRP) comprises K1 positive real numbers less than or equal to 1. The first proportional sequence comprises ratios between the K1 channel quality values and the largest one of the K1 channel quality values, which are positive real numbers less than or equal to 1. For example, the ratio between the largest one of the K1 channel quality values to itself is: 1.
	5.2.1.4 Reporting configurations
	- if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance.
	TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.

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Claim	Accused Products
[2C] the first proportional sequence comprises quantized values corresponding to K1 positive real numbers; or	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice the first proportional sequence comprises quantized values corresponding to K1 positive real numbers. For example, the first proportional sequence (<i>e.g.</i>, the largest L1-RSRP and differential L1-RSRP) comprises quantized values (<i>e.g.</i>, step size) corresponding to K1 positive real numbers.
	5.2.1.4 Reporting configurations
	- if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance. TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[2D] the first proportional sequence comprises K1-1 positive real number(s), and the K1-1 positive real number(s) is(are) a ratio(ratios) between a channel quality value(s) other than the best channel quality value among the K1	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice the first proportional sequence comprises K1-1 positive real number(s), and the K1-1 positive real number(s) is(are) a ratio(ratios) between a channel quality value(s) other than the best channel quality value among the K1 channel quality values and the best channel quality value. For example, the first proportional sequence (<i>e.g.</i>, differential L1-RSRP reporting) comprises K1-1 positive real number(s) (<i>e.g.</i>, differential L1-RSRP values), and the K1-1 positive real numbers is(are) a ratio(ratios) (<i>e.g.</i>, with a reference) between a channel

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Claim	Accused Products
channel quality values and the best channel quality value; or	quality value(s) other than the best channel quality value among the K1 channel quality values and the best channel quality value (e.g., largest L1-RSRP). 5.2.1.4 Reporting configurations - if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance. TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[2E] the first proportional sequence comprises quantized values corresponding to K1-1 positive real number(s).	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice the first proportional sequence comprises quantized values corresponding to K1-1 positive real number(s). For example, the first proportional sequence (e.g., differential L1-RSRP reporting) comprises quantized values (e.g., 2 dB step size) corresponding to K1-1 positive real numbers (e.g., differential L1-RSRP values). 5.2.1.4 Reporting configurations

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Claim	Accused Products
	- if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance. TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[3P] The method according to claim 1,	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice the method according to claim 1. <i>See</i> claim 1.
[3A] wherein 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;	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice wherein 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. For example, the K2 antenna port groups (<i>e.g.</i>, <i>nrofReportedRS</i>) in the K antenna port groups correspond to K2 channel quality values (<i>e.g.</i>, largest L1-RSRP and differential L1-RSRP based reporting) in the K channel quality values; the K2 is a positive integer less than or equal to the K. For example, according to TS38.214 V15.0.0 - Clause 5.2.1.4.1 and TS38.331 V15.1.0 - Clause 6.3.2, one trigger state can be associated with multiple ReportConfigs, with each ReportConfig having a ReportQuantity set to CRI/RSRP. The K2 antenna port groups and the K1 antenna ports correspond respectively to two different ReportConfigs triggered by the same trigger state. The K

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Claim	Accused Products
	antenna port groups comprise antenna port(s) of K CSI RS resources and/or SS/PBCH block resources in the two different ReportConfigs. For example, in this case, the first wireless signal comprises the CSI-RS resource and/or SS/PBCH block resources configured in CSI resource settings for channel measurement in two different CSI ReportConfigs triggered by a same trigger state. 5.2.1.4.1Resource Setting configuration Each trigger state configured using the higher layer parameter <i>ReportTrigger</i> is associated one or multiple <i>ReportConfig</i> where each <i>ReportConfig</i> is linked to periodic, or semi-persistent, or aperiodic resource setting(s): TS38.214 V15.0.0 6.3.2Radio resource control information elements –<i>CSI-AperiodicTriggerStateList</i> The <i>CSI-AperiodicTriggerStateList</i> IE is used to configure the UE with a list of aperiodic trigger states. Each value from 1 to 2^{reportTriggerSize} of the DCI field "CSI request" field is associated with one trigger state. Upon reception of the value associated with a trigger state, the UE will perform measurement of aperiodic CSI-RS (reference signals) and aperiodic reporting on L1 according to all entries in the <i>associatedReportConfigInfoList</i> for that trigger state. CSI-AperiodicTriggerStateList information element <pre>-- ASN1START -- TAG-CSI-APERIODICTRIGGERSTATELIST-START CSI-AperiodicTriggerStateList ::= SEQUENCE (SIZE (1..maxNrOfCSI-AperiodicTriggers)) OF CSI-AperiodicTriggerState CSI-AperiodicTriggerState ::= SEQUENCE { associatedReportConfigInfoList SEQUENCE (SIZE(1..maxNrOfReportConfigPerAperiodicTrigger)) OF CSI-AssociatedReportConfigInfo, ... } CSI-AssociatedReportConfigInfo ::= SEQUENCE { -- The reportConfigId of one of the CSI-ReportConfigToAddMod configured in CSI-MeasConfig reportConfigId CSI-ReportConfigId,</pre> TS38.331 V15.1.0

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Claim	Accused Products
	5.2.1.4 Reporting configurations - if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance. TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[3B] a second proportional sequence corresponds to a ratio(ratios) among the K2 channel quality values;	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice a second proportional sequence corresponds to a ratio(ratios) among the K2 channel quality values. For example, a second proportional sequence (<i>e.g.</i>, largest L1-RSRP and differential L1-RSRP based reporting) corresponds to a ratio(ratios) (<i>e.g.</i>, with reference to) among the K2 channel quality values. For example, see [1H]. 5.2.1.4 Reporting configurations

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Claim	Accused Products
	- if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance. TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[3C] 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;	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice 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. For example, the K2 antenna port groups and the K1 antenna port groups correspond respectively to two different ReportConfigs triggered by the same trigger state. CSI-RS resources and or SS/PBCH block resources configured for the two different ReportConfigs are not necessarily QCLeD. For example, when the RS resources in each ReportConfig are QCLeD and the RS resources in the two different ReportConfigs are not QCLeD, the UE can use a same receiving beam forming vector to receive RS resources in one ReportConfigs and different receiving beam forming vectors (<i>i.e.</i>, the first beam forming vector and the second beamforming vector) to receive RS resource in the two different ReportConfigs. Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.

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Claim	Accused Products
[3D] the first information is further used to determine the K2 antenna port groups and the second proportional sequence.	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice the first information is further used to determine the K2 antenna port groups and the second proportional sequence. For example, the first information (<i>e.g.</i>, a single CSI report) is further used to determine the K2 antenna port groups (<i>e.g.</i>, <i>nrofReportedRS</i>) and the second proportional sequence (<i>e.g.</i>, largest L1-RSRP and differential L1-RSRP). 5.2.1.4 Reporting configurations - if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance. TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[4P] The method according to claim 3,	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice the method according to claim 3. See claim 3.
[4A] wherein any two antenna ports in the K1 antenna port groups are co-located or quasi-co-located (QCL), and any two antenna ports in the K2 antenna port	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice wherein any two antenna ports in the K1 antenna port groups are co-located or quasi-co-located (QCL), and any two antenna ports in the K2 antenna port groups are co-located or quasi-co-located (QCL); or any

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groups are co-located or quasi-co-located (QCL); or any two antenna ports in the K1 antenna port groups are on a same carrier, and any two antenna ports in the K2 antenna port groups are on a same carrier; or	two antenna ports in the K1 antenna port groups are on a same carrier, and any two antenna ports in the K2 antenna port groups are on a same carrier. For example, any two antenna ports in the K1 antenna port groups (<i>e.g.</i>, all linked Resource Settings of a CSI Report Setting) are on a same carrier (<i>e.g.</i>, have the same BWP), and any two antenna ports in the K2 antenna port groups (<i>e.g.</i>, all linked Resource Settings of a CSI Report Setting) are on a same carrier (<i>e.g.</i>, have the same BWP). 5.2.1.2 Resource settings Each Resource Setting <i>ResourceConfig</i> contains a configuration of $S \geq 1$ CSI-RS Resource Sets (higher layer parameter <i>ResourceSetConfig</i>), with each Resource Set consisting of CSI-RS resources (higher layer parameters <i>NZP-CSI-RS-ResourceConfigList</i> and <i>CSI-IM-ResourceConfigList</i>) and SS/PBCH Block resources used for L1-RSRP computation (higher layer parameter <i>resource-config-SS-list</i>). Each Resource setting is located in the BWP identified by the higher layer parameter <i>BWP-info</i>, and all linked Resource Settings of a CSI Report Setting have the same BWP. TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[4B] the first signaling is further 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 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, and	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice the first signaling is further 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 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. For example, the first signaling (<i>e.g.</i>, CSI-ReportConfig) is further used to determine at least the last one of the K1, the K2, and the target threshold. In one example, the first signaling (<i>e.g.</i>, the CSI-ReportConfig IE). In this case, the first signaling is only used to determine the K1. In another example, the first signaling (<i>e.g.</i>, the CSI-AperiodicTriggerState List IE). In this case, the first signaling is used to determine two CSI-ReportConfig IEs, which in turn are used respectively to determine the K1 and the K2. For example, when K1=K2, a ratio

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Claim	Accused Products
	between the fourth channel quality and the third channel quality is greater than or equal to the target threshold. 6.3.2Radio resource control information elements – <i>CSI-ReportConfig</i> The IE <i>CSI-ReportConfig</i> is used to configure reports sent on L1 (e.g. PUCCH) on the cell in which the <i>CSI-ReportConfig</i> is included. <i>CSI-ReportConfig</i> information element <pre>-- ASN1START -- TAG-CSI-REPORTCONFIG-START -- Configuration of a CSI-Report sent on L1 (e.g. PUCCH) (see 38.214, section 5.2.1) CSI-ReportConfig ::= SEQUENCE { reportConfigId CSI-ReportConfigId,</pre> ... <pre>groupBasedBeamReporting CHOICE { enabled disabled SEQUENCE { -- The number (N) of measured RS resources to be reported per report setting in a non-group-based report. -- N <= N_max, where N_max is either 2 or 4 depending on UE capability. -- FFS: The signaling mechanism for the gNB to select a subset of N beams for the UE to measure and report. -- FFS: Note: this parameter may not be needed for certain resource and/or report settings -- FFS_ASN1: Change groupBasedBeamReporting into a CHOICE and include this field into the "no" option? -- (see 38.214, section FFS_Section) -- When the field is absent the UE applies the value 1 nrofReportedRS ENUMERATED {n1, n2, n3, n4} } },</pre> TS38.331 V15.1.0 6.3.2Radio resource control information elements

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Claim	Accused Products
	– <i>CSI-AperiodicTriggerStateList</i> The <i>CSI-AperiodicTriggerStateList</i> IE is used to configure the UE with a list of aperiodic trigger states. Each value from 1 to $2^{\text{reportTriggerSize}}$ of the DCI field "CSI request" field is associated with one trigger state. Upon reception of the value associated with a trigger state, the UE will perform measurement of aperiodic CSI-RS (reference signals) and aperiodic reporting on L1 according to all entries in the <i>associatedReportConfigInfoList</i> for that trigger state. <i>CSI-AperiodicTriggerStateList</i> information element <pre>-- ASN1START -- TAG-CSI-APERIODICTRIGGERSTATELIST-START CSI-AperiodicTriggerStateList ::= SEQUENCE (SIZE (1..maxNrOfCSI-AperiodicTriggers)) OF CSI-AperiodicTriggerState CSI-AperiodicTriggerState ::= SEQUENCE { associatedReportConfigInfoList SEQUENCE (SIZE(1..maxNrofReportConfigPerAperiodicTrigger)) OF CSI-AssociatedReportConfigInfo, ... } CSI-AssociatedReportConfigInfo ::= SEQUENCE { -- The reportConfigId of one of the CSI-ReportConfigToAddMod configured in CSI-MeasConfig reportConfigId CSI-ReportConfigId,</pre> TS38.331 V15.1.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[4C] the first information is further used to determine at least one of the first channel quality and the third channel quality.	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice the first information is further used to determine at least one of the first channel quality and the third channel quality. For example, the first information (<i>e.g.</i>, a single CSI report) is further used to determine at least one of the first channel quality and the third channel quality (<i>e.g.</i>, L1-RSRP). 5.2.1.4 Reporting configurations

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Claim	Accused Products
	- if the UE is configured with the higher layer parameter <i>group-based-beam-reporting</i> set to 'OFF', the UE is not required to update measurements for more than 64 [CSI-RS and or SSB] resources, and the UE shall report in a single report <i>nrofReportedRS</i> (higher layer configured) different [CRI and SSBRI (SSB Resource Indicator)] for each report setting. If the higher layer parameter <i>nrofReportedRS</i> is configured to be one, the reported L1-RSRP value is defined by a 7-bit value in the range [-140, -44] dBm with 1dB step size. If the higher layer parameter <i>nrofReportedRS</i> is configured to be larger than one, the UE shall use largest L1-RSRP and differential L1-RSRP based reporting, where the largest value of L1-RSRP uses a 7-bit value and the differential L1-RSRP uses a 4-bit value. The differential L1-RSRP values are computed with 2 dB step size with a reference to the largest L1-RSRP value which is part of the same L1-RSRP reporting instance. TS38.214 V15.0.0 Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
5. The method according to claim 3, further comprising: 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 K1 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.	Samsung infringes this claim, either directly or indirectly, either literally or under the doctrine of equivalents, as set forth below. For example, Samsung and the Accused Products practice 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 K1 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. <i>See</i> claims 1-3. Plaintiff reserves the right to amend or supplement these contentions after the inspection of source code, after the issuance of any claim construction order, and for any other reason as permitted by the Court.
[11P] A user equipment (UE) for multi-antenna transmission comprising:	<i>See</i> element [1P].

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Claim	Accused Products
[11A] a first receiver at the UE, receiving a first signaling originating from a base station;	<i>See element [1A].</i>
[11B] a second receiver at the UE, receiving a first wireless signal originating from the base station; and	<i>See element [1B].</i>
[11C] a third transmitter at the UE, transmitting first information to the base station;	<i>See element [1C].</i>
[11D] wherein, K antenna port groups of the base station are used to transmit the first wireless signal;	<i>See element [1D].</i>
[11E] 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 1;	<i>See element [1E].</i>
[11F] 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 values are Reference Signal Received Powers (RSRPs) or Signal to Interference plus Noise Ratios (SINRs);	<i>See element [1F].</i>
[11G] 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;	<i>See element [1G].</i>

Appendix E - Claim Chart for US Patent No. 10,951,271 Against Samsung Accused Products

Claim	Accused Products
[11H] a first proportional sequence corresponds to a ratio(ratios) among the K1 channel quality values;	<i>See element [1H].</i>
[11I] the first information is used to determine the K1 antenna port groups and the first proportional sequence;	<i>See element [1I].</i>
[11J] 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.	<i>See element [1J].</i>
[12P] The user equipment to claim 11,	<i>See claim 2.</i>
[12A] wherein the K channel quality values are broadband channel quality values; or	<i>See element [2A].</i>
[12B] the first proportional sequence comprises K1 positive real numbers less than or equal to 1, and the first proportional sequence comprises at least one 1; or	<i>See element [2B].</i>
[12C] the first proportional sequence comprises quantized values corresponding to K1 positive real numbers; or	<i>See element [2C].</i>
[12D] the first proportional sequence comprises K1-1 positive real number(s),	<i>See element [2D].</i>

Appendix E - Claim Chart for US Patent No. 10,951,271 Against Samsung Accused Products

Claim	Accused Products
and the K1-1 positive real number(s) is(are) a ratio(ratios) between a channel quality value(s) other than the best channel quality value among the K1 channel quality values and the best channel quality value; or	
[12E] the first proportional sequence comprises quantized values corresponding to K1-1 positive real number(s).	See element [2E].
[13P] The user equipment to claim 11,	See claim 3.
[13A] wherein 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;	See element [3A].
[13B] a second proportional sequence corresponds to a ratio(ratios) among the K2 channel quality values;	See element [3B].
[13C] 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 receiving beamforming vector are different;	See element [3C].
[13D] the first information is further used to determine the K2 antenna port groups and the second proportional sequence.	See element [3D].

Appendix E - Claim Chart for US Patent No. 10,951,271 Against Samsung Accused Products

Claim	Accused Products
[14P] The user equipment to claim 13,	
[14A] wherein any two antenna ports in the K1 antenna port groups are co-located or quasi-co-located (QCL), and any two antenna ports in the K2 antenna port groups are co-located or quasi-co-located (QCL); or any two antenna ports in the K1 antenna port groups are on a same carrier, and any two antenna ports in the K2 antenna port groups are on a same carrier; or	See element [4A].
[14B] the first signaling is further 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 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, and	See element [4B].
[14C] the first information is further used to determine at least one of the first channel quality and the third channel quality.	See element [4C].
15. The user equipment to claim 13, wherein the second receiver further receives a second wireless signal; wherein a target antenna port group is used to transmit the second wireless signal; the target antenna port group is	See claim 5.

Appendix E - Claim Chart for US Patent No. 10,951,271 Against Samsung Accused Products

Claim	Accused Products
associated with the K1 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.	