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UNITED STATES DISTRICT COURT

SOUTHERN DISTRICT OF CALIFORNIA

DAINGEAN TECHNOLOGIES LTD.,

Plaintiff,

v.

APPLE INC.,

Defendant.

Case No. **'23CV1560 BEN JLB**

COMPLAINT FOR PATENT INFRINGEMENT

DEMAND FOR JURY TRIAL

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Attorneys for Plaintiff Daingean Technologies Ltd.

Daingean Technologies Ltd. ("Daingean" or "Plaintiff") hereby submits this Complaint for patent infringement against Defendant Apple Inc. ("Apple" or "Defendant") and states as follows:

THE PARTIES

1. Daingean Technologies Ltd., ("Daingean" or "Plaintiff") is a company duly organized and existing under the laws of Ireland with its principal place of business at The Hyde Building, Suite 23, The Park, Carrickmines, Dublin 18, Ireland.

2. Upon information and belief, Defendant Apple is a company organized and existing under the laws of the State of California with its principal place of business at One Apple Park Way, Cupertino, CA 95014.

3. Apple designs, manufactures, makes, uses, imports into the United States, sells, and/or offers for sale in the United States 5G-capable devices such as iPhones and iPads ("Accused Devices"). Apple's Accused Devices are marketed, used, offered for sale, and/or sold throughout the United States, including within this district.

NATURE OF THE ACTION

4. This is a civil action for infringement of U.S. Patent No. 10,484,976, U.S. Patent No. 10,841,958, U.S. Patent No. 10,932,207, U.S. Patent No. 11,134,400, and U.S. Patent No. 11,196,509 (collectively, the "Asserted Patents"), arising under the patent laws of the United States, 35 U.S.C. § 1 *et seq*.

JURISDICTION AND VENUE

5. This Court has subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a) because this action arises under the patent laws of the United States, 35 U.S.C. §§ 101 *et seq.*

6. This Court has personal jurisdiction over Apple because it is organized and exists under the laws of California.

7. Venue is proper in this Court pursuant to 28 U.S.C. §§ 1391 and 1400(b).

8. Venue is appropriate under 28 U.S.C. § 1400(b) at least because Apple is incorporated in California and because Apple has committed acts of infringement and has a regular and established place of business in this district.

9. Apple's acts of infringement in this district include but are not limited to sales of the Accused Devices at Apple Store locations in this district, including but not limited to 7007 Friars Road, San Diego, CA 92108 and 4305 La Jolla Village Drive, San Diego, CA 92122.

10. On information and belief, Apple's operations in the Southern District of California are substantial and varied, as detailed further below.

11. As of 2019, Apple's Apple Stores in San Diego County employed approximately 600 people.[1] On information and belief, Apple currently employees close to 1,000 people in San Diego and plans to expand its workforce in San Diego to at least 5,000 by 2026.[2] Apple has been recognized as "one of the top technology employers in the greater San Diego area."[3]

12. Additionally, Apple has a regular and established place of business in University City, San Diego, including a "100,000 square-foot research/office building" and

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[1] *See* https://www.sandiegouniontribune.com/business/technology/sd-fi-apple-hiring-san-diego-20190306-story.html (last visited Aug. 3, 2023).

[2] *See* https://www.sandiegouniontribune.com/business/story/2021-04-26/apple-to-expand-san-diego-engineering-hub-boosting-workforce-to-5-000-over-five-years (last visited 8/3/2023); https://www.nbcsandiego.com/news/local/apple-to-add-5k-new-jobs-in-san-diego-by-2026/2587748/ (last visited Aug. 3, 2023).

[3] *See* https://www.sandiegouniontribune.com/pomerado-news/business/story/2022-06-15/apple-grows-presence-in-rancho-bernardo-now-largest-tech-tenant-in-the-market (last visited Aug. 3, 2023).

a second 204,000 square-foot building employing thousands of Apple employees.[4] Apple states that the San Diego "location has plans for extensive growth throughout this area."[5]

13. According to San Diego records, Apple's corporate office addresses include at least 12220 Scripps Summit Dr, San Diego, CA 92131-3698[6]; 9779 Towne Centre Dr, San Diego, CA 92121-1968[7]; 4445 Eastgate Mall, San Diego, CA 92121-1979[8]; 16620 W Bernardo Dr, San Diego, CA 92127-1900[9]; and 9455 Towne Centre Dr, San Diego, CA 92121-3079[10].

14. Last year, as part of Apple's explosive growth in the District, Apple purchased a seven-building research and development space of over 67 acres in the Rancho Vista Corporate Center in San Diego for $445 million.[11]

15. Since 2019, Apple has been the employer of at least 740 recipients of H-1B visas who work and reside in San Diego.[12] Several of those jobs are relevant to the 5G technology implemented in the Accused Devices. For example, jobs titles include"4G 5G Physical Layer Firmware Verification Engineer," "5G 4G Cellular Layer 1 Control Firmware Engineer," "Cellular 4G 5G Firmware Verification Architect," "Cellular 4G 5G Firmware Verification Engineer," and "Embedded 5G 4G Cellular RF Software Firmware Engineer," as well as several RF-related job titles.

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[4] *See* https://www.sandiegouniontribune.com/business/technology/story/2019-11-13/apple-inks-deal-for-second-utc-building-as-part-of-san-diego-expansoin (last visited Aug. 3, 2023).

[5] *See* https://www.apple.com/careers/us/work-at-apple/san-diego.html (last visited Aug. 3, 2023).

[6] *See* https://opengovus.com/san-diego-business/2021009134 (last visited Aug. 3, 2023).

[7] *See* https://opengovus.com/san-diego-business/2021009129 (last visited Aug. 3, 2023).

[8] *See* https://opengovus.com/san-diego-business/2021009136 (last visited Aug. 3, 2023).

[9] *See* https://opengovus.com/san-diego-business/2021009126 (last visited Aug. 3, 2023).

[10] *See* https://opengovus.com/san-diego-business/2021009137 (last visited Aug. 3, 2023).

[11] *See* https://appleinsider.com/articles/22/07/27/apple-buys-new-campus-for-445-million-for-vast-san-diego-expansion (last visited Aug. 3, 2023).

[12] *See* https://h1bdata.info/index.php?em=apple+inc&city=san+diego (last visited Aug. 3, 2023).

16. Apple is currently advertising over 470 open positions in San Diego, with over 300 positions relating to the development and/or design of iPads and/or iPhones.[13]

17. As detailed above, Apple has numerous employees who work in the State of California and in this judicial district.

18. Apple has solicited business in the State of California, transacted business within the State of California, and attempted to derive financial benefit from residents of the State of California, including benefits directly related to the instant patent infringement cause of action set forth herein.

19. Apple has manufactured, used, sold, and/or offered for sale the Accused Devices, including iPhones and iPads, in the State of California and this judicial district.

20. Apple derives benefits from its presence in this federal judicial district, including, but not limited to, sales revenue. For example, Apple receives revenue from its corporate stores in this district by selling the Accused Devices.

21. On information and belief, Apple has also established minimum contacts with this judicial district and regularly transacts and does business within this District, including advertising, promoting, and selling products and/or services that infringe the asserted patents in its stores, over the internet, through intermediaries, representatives, and/or agents located within this judicial district. On further information and belief, Apple has purposefully directed activities at citizens of this State, including those located within this judicial district. On information and belief, Apple derives substantial revenue from the goods and services it provides to individuals in the state of California and in this judicial district.

22. On information and belief, Apple has purposefully and voluntarily placed its products and/or services into the stream of commerce with the expectation that they will

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[13] *See* https://jobs.apple.com/en-us/search?location=san-diego-SDO (last visited Aug. 3, 2023); https://jobs.apple.com/en-us/search?location=san-diego-SDO&product=ipad-IPAD+iphone-IPHN (last visited Aug. 3, 2023).

be purchased and used by customers located in the State of California and the Southern District of California. On information and belief, Apple's customers in the Southern District of California have purchased and used and continue to purchase and use Apple's products and/or services.

23. Apple has also litigated in the Southern District of California, taking advantage of the forum for Apple's own offensive patent litigations as well as defensive patent litigations. For example, Apple sued Qualcomm and Motorola Mobility LLC for patent infringement in this District in 2017 and 2012, respectively.[14] Apple has also sought to transfer patent cases to the Southern District of California, taking advantage of the forum for its defensive patent litigations.[15]

BACKGROUND

24. Apple advertises that its products are capable of operating on 5G networks. For instance, Apple claims that "5G on iPhone lets you download movies, stream higher-quality video, and FaceTime in HD at impressive speeds."[16] Additionally, Apple claims that "iPad models with 5G let you download movies, stream higher-quality video, and use FaceTime in HD at superfast speeds."[17]

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[14] *Apple Inc. v. Qualcomm Inc.*, No. 3:17-cv-108 (S.D. Cal. Jan. 20, 2017); *Apple Inc. v. Motorola Mobility, Inc.*, No. 3:12-cv-355 (S.D. Cal. Feb. 10, 2012).

[15] *See, e.g.*, *Fastvo LLC v. Apple Inc. et al.*, No. 3:16-cv-385, ECF No. 75 (S.D. Cal. Feb. 17, 2016) (transferring case from Eastern District of Texas); *Wi-LAN USA, Inc. et al. v. Apple Inc.*, No. 3:13-cv-00798-DMS-BLM, ECF No. 39 (S.D. Cal. Feb. 20, 2013) (transferring case from Southern District of Florida based on Apple's argument that "SD Cal is clearly more convenient for Apple" and emphasizing that California courts have state-wide subpoena power).

[16] *See* https://www.apple.com/iphone/cellular/ (last visited Aug. 3, 2023).

[17] *See* https://www.apple.com/ipad/cellular/networks/ (last visited Aug. 3, 2023).

25. Apple claims that "5G technology is shaping the future of next-generation consumer electronics—and Apple is spending tens of billions of dollars to develop this field in the U.S."[18]

26. 5G is the telephony system defined by the 3rd Generation Partnership Project ("3GPP") standards setting organization from Release 15.[19] 3GPP defines "not only the air interface but also the entire mobile system: call and session control, mobility management, service provisioning, etc."[20] 5G is further defined in several phases, with Release 15 specifying "5G phase 1, which introduces a new radio transmission technique and other key concepts such as an industry-grade reliability, an extended modularity, or a faster response time."[21]

27. On information and belief, Apple's Accused Devices comply with 3GPP 5G standards (*e.g.*, 38 Series, see https://www.3gpp.org/dynareport?code=38-series.htm), 3GPP E-UTRA standards that have been updated to be 5G-aware (*e.g.*, 36 Series, see https://www.3gpp.org/dynareport?code=36-series.htm), and 3GPP standards regarding multi-radio operation (*e.g.*, 37 Series, see https://www.3gpp.org/dynareport?code=37-series.htm) including, for example: TS 38.211, TS 38.212, TS 38.213, TS 38.214, TS 38.321, TS 38.300, TS 38.331, TS 36.300, TS 36.331, and TS 37.340.

COUNT I: INFRINGEMENT OF U.S. PATENT NO. 10,484,976

28. Daingean hereby incorporates and re-alleges paragraphs 1 through 27 as if fully set forth herein.

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[18] *See* https://www.apple.com/newsroom/2023/05/apple-announces-multibillion-dollar-deal-with-broadcom/ (last visited 8/3/2023).

[19] *See, e.g.*, https://www.3gpp.org/technologies/5g-system-overview (last visited Jul. 11, 2023).

[20] *See, e.g.*, https://www.3gpp.org/technologies/5g-system-overview (last visited Jul. 11, 2023).

[21] *See, e.g.*, https://www.3gpp.org/technologies/5g-system-overview (last visited Jul. 11, 2023).

29. On November 19, 2019, the United States Patent and Trademark Office ("USPTO") duly and legally issued U.S. Patent No. 10,484,976 (the "'976 Patent"), titled "Signaling, Procedures, User Equipment and Base Stations for Uplink Ultra Reliable Low Latency Communications."

30. The '976 Patent is generally directed toward uplink transmission management to address latency and reliability requirements and potential coexistence issues. The '976 Patent generally discloses transmitting and receiving "a radio resource control message including first information used for configuring a periodicity for an uplink data transmission" and transmitting and receiving on a physical downlink control channel "second information used for indicating an activation for the uplink data transmission." *See* '976 Patent at Abstract. The '976 Patent further discloses transmitting and receiving "confirmation information Medium Access Control (MAC) Control Element (CE) for the second information" and transmitting and receiving "uplink data on the physical uplink shared channel based on the first information and second information." *Id.* As disclosed in the '976 Patent, the system receives on the physical downlink control channel "third information used for indicating a deactivation for the uplink data transmission." *Id.*

31. Daingean holds all rights, title, and interest in and to the '976 Patent, including the right to bring this suit and recover all past, present, and future damages for infringement of the '976 Patent. Apple is not licensed to the '976 Patent, either expressly or implicitly, nor does it enjoy or benefit from any other rights in or to the '976 Patent whatsoever. As such, Apple's infringement described below has injured, and continues to injure, Daingean.

32. On information and belief, Apple has infringed directly and continues to infringe directly the '976 Patent through its manufacture, use, sale, importation, and/or offer for sale of Accused Devices that are capable of transmitting or receiving DCI format that may be used for activating and/or deactivating an uplink data transmission on 5G networks.

33. For example, the Accused Devices practice and/or are capable of practicing representative Claim 1 of the '976 Patent, which is directed to a UE equipment, such as

those provided by Apple for operation on 5G networks. The following paragraphs provide details regarding one example of Apple's infringement, and only as to a single patent claim. Plaintiff reserves its right to provide greater detail and scope via its Infringement Contentions at the time required under any applicable scheduling order.

34. Claim 1 of the '976 Patent states:

> 1. A user equipment (UE) that communicates with a base station apparatus, comprising:
>
> receiving circuitry configured to receive a radio resource control (RRC) message comprising first information used for configuring a periodicity,
>
> the receiving circuitry configured to receive a RRC message comprising second information used for configuring a numerology,
>
> the receiving circuitry configured to detect in a common search space, a physical downlink control channel for a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology; and
>
> transmitting circuitry configured to transmit confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI,
>
> the transmitting circuitry configured to perform, based on a detection of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology, wherein
>
> the transmitting circuitry is configured to transmit confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, and
>
> the confirmation information MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID),
>
> the confirmation information MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the

LCID, and

the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information.

'976 Patent at 38:32-39:12.

35. The Accused Devices implement at least Claim 1 of the '976 Patent.

36. On information and belief, the Accused Devices include hardware and/or software that is configured to be capable of transmitting or receiving DCI format that may be used for activating and/or deactivating an uplink data transmission on a 5G network. On information and belief, the Accused Devices conform to and implement the technical specifications of the 3GPP 5G Standard, including the portions of the specifications referenced below.

37. The Accused Devices include "[a] user equipment (UE) that communicates with a base station apparatus." For example, Accused Devices operate as UEs within a 5G or New Radio (NR) network architecture. The following diagram illustrates how UEs interact with an NG-RAN within a 5G (or NR) cellular network.[22]

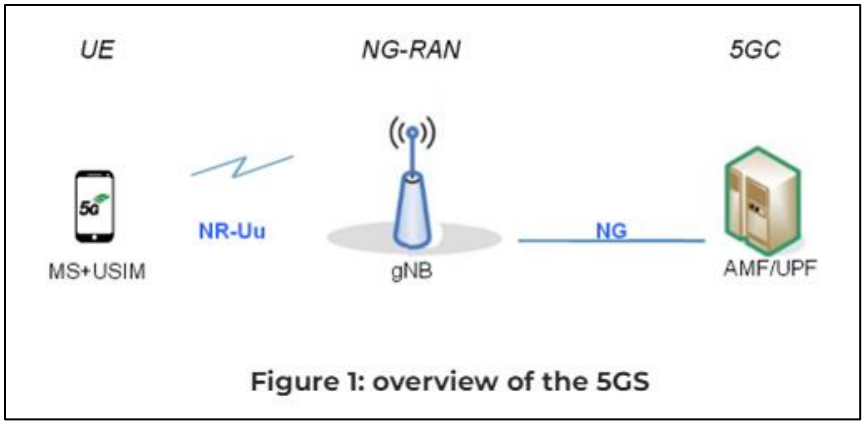

Figure 1: overview of the 5GS

38. The Accused Devices further comprise "receiving circuitry configured to receive a radio resource control (RRC) message comprising first information used for

[22] https://www.3gpp.org/technologies/5g-system-overview (last visited Aug. 4, 2023)

configuring a periodicity," as claimed. TS 38.321 provides for "Radio resource control" (RRC). Specifically, there are two types of uplink transmission without dynamic grant: "Type 1 where an uplink grant is provided by RRC, and stored as configured uplink grant" and "Type 2 where an uplink grant is provided by PDCCH, and stored or cleared as configured uplink grant based on L1 signaling indicating configured uplink grant activation or deactivation."[23] As provided in TS 38.321, when the Type 2 grant is configured, RRC configures the parameter: "periodicity: periodicity of the configured grant Type 2."

> 5.8.2 Uplink
>
> There are two types of transmission without dynamic grant:
>
> - configured grant Type 1 where an uplink grant is provided by RRC, and stored as configured uplink grant;
> - configured grant Type 2 where an uplink grant is provided by PDCCH, and stored or cleared as configured uplink grant based on L1 signalling indicating configured uplink grant activation or deactivation.
>
> Type 1 and Type 2 are configured by RRC for a Serving Cell per BWP. Multiple configurations can be active simultaneously only on different Serving Cells. For Type 2, activation and deactivation are independent among the Serving Cells. For the same Serving Cell, the MAC entity is configured with either Type 1 or Type 2.

> RRC configures the following parameters when the configured grant Type 2 is configured:
>
> - *cs-RNTI*: CS-RNTI for activation, deactivation, and retransmission;
> - *periodicity*: periodicity of the configured grant Type 2;
> - *nrofHARQ-Processes*: the number of HARQ processes for configured grant.

39. Similarly, TS 38.331 provides the RRC protocol specification and specifies the protocol data units, formats and parameters, including for the Radio Resource Control information elements. As provided in TS 38.331, the information element "*ConfiguredGrantConfig* is used to configure uplink transmission without dynamic grant according to two possible schemes" (*i.e.*, Type 1 or Type 2) and includes the "periodicity" parameter:

[23] TS 38.321, § 5.8.2.

– *ConfiguredGrantConfig*

The IE *ConfiguredGrantConfig* is used to configure uplink transmission without dynamic grant according to two possible schemes. The actual uplink grant may either be configured via RRC (*type1*) or provided via the PDCCH (addressed to CS-RNTI) (*type2*).

***ConfiguredGrantConfig* information element**

```
-- ASN1START
-- TAG-CONFIGUREDGRANTCONFIG-START

ConfiguredGrantConfig ::=           SEQUENCE {
```



```
    frequencyHopping                    ENUMERATED {intraSlot, interSlot}                                   OPTIONAL,   -- Need S
    cg-DMRS-Configuration               DMRS-UplinkConfig,
    mcs-Table                           ENUMERATED {qam256, qam64LowSE}                                     OPTIONAL,   -- Need S
    mcs-TableTransformPrecoder          ENUMERATED {qam256, qam64LowSE}                                     OPTIONAL,   -- Need S
    uci-OnPUSCH                         SetupRelease { CG-UCI-OnPUSCH }                                     OPTIONAL,   -- Need M
    resourceAllocation                  ENUMERATED { resourceAllocationType0, resourceAllocationType1, dynamicSwitch },
    rbg-Size                            ENUMERATED {config2}                                                OPTIONAL,   -- Need S
    powerControlLoopToUse               ENUMERATED {n0, n1},
    p0-PUSCH-Alpha                      P0-PUSCH-AlphaSetId,
    transformPrecoder                   ENUMERATED {enabled, disabled}                                      OPTIONAL,   -- Need S
    nrofHARQ-Processes                  INTEGER{1..16),
    repK                                ENUMERATED {n1, n2, n4, n8},
    repK-RV                             ENUMERATED {s1-0231, s2-0303, s3-0000}                              OPTIONAL,   -- Need R
    periodicity                         ENUMERATED {
                                            sym2, sym7, sym1x14, sym2x14, sym4x14, sym5x14, sym8x14, sym10x14, sym16x14, sym20x14,
                                            sym32x14, sym40x14, sym64x14, sym80x14, sym128x14, sym160x14, sym256x14, sym320x14, sym512x14,
                                            sym640x14, sym1024x14, sym1280x14, sym2560x14, sym5120x14,
                                            sym6, sym1x12, sym2x12, sym4x12, sym5x12, sym8x12, sym10x12, sym16x12, sym20x12, sym32x12,
                                            sym40x12, sym64x12, sym80x12, sym128x12, sym160x12, sym256x12, sym320x12, sym512x12, sym640x12,
                                            sym1280x12, sym2560x12
```

40. The Accused Devices further comprise "the receiving circuitry configured to receive a RRC message comprising second information used for configuring a numerology," as claimed. As provided in TS 38.331, the Radio Resource Control information elements include the *BWP* information element, which "is used to configure generic parameters of a bandwidth part." The *BWP* information element includes the parameter "subcarrierSpacing" which, as described, "[c]orresponds to subcarrier spacing according to TS 38.211."

– *BWP*

The IE *BWP* is used to configure generic parameters of a bandwidth part as defined in TS 38.211 [16], clause 4.5, and TS 38.213 [13], clause 12.

For each serving cell the network configures at least an initial downlink bandwidth part and one (if the serving cell is configured with an uplink) or two (if using supplementary uplink (SUL)) initial uplink bandwidth parts. Furthermore, the network may configure additional uplink and downlink bandwidth parts for a serving cell.

The uplink and downlink bandwidth part configurations are divided into common and dedicated parameters.

***BWP* information element**

```
-- ASN1START
-- TAG-BWP-START

BWP ::=                             SEQUENCE {
    locationAndBandwidth                INTEGER (0..37949),
    subcarrierSpacing                   SubcarrierSpacing,
    cyclicPrefix                        ENUMERATED { extended }                                             OPTIONAL    -- Need R
}


-- TAG-BWP-STOP
-- ASN1STOP
```

subcarrierSpacing
Subcarrier spacing to be used in this BWP for all channels and reference signals unless explicitly configured elsewhere. Corresponds to subcarrier spacing according to TS 38.211 [16], table 4.2-1. The value *kHz15* corresponds to μ=0, value *kHz30* corresponds to μ=1, and so on. Only the values 15 kHz, 30 kHz, or 60 kHz (FR1), and 60 kHz or 120 kHz (FR2) are applicable. For the initial DL BWP this field has the same value as the field *subCarrierSpacingCommon* in *MIB* of the same serving cell. Except for SUL, the network ensures the same subcarrier spacing is used in active DL BWP and active UL BWP within a serving cell.

41. The Accused Devices further comprise the claimed "the receiving circuitry configured to detect in a common search space, a physical downlink control channel for a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology." TS 38.213 provides physical layer procedures, including the procedure for determining physical downlink control channel assignment. As provided in TS 38.213, "[a] set of PDCCH candidates for a UE to monitor is defined in terms of PDCCH search space sets." These search space sets include "a Type3-PDCCH CSS set configured by *SearchSpace* in *PDCCH-Config* with *searchSpaceType* = *common* for DCI formats with CRC scrambled by . . . CS-RNTI(s)."

> 10.1 UE procedure for determining physical downlink control channel assignment
>
> A set of PDCCH candidates for a UE to monitor is defined in terms of PDCCH search space sets. A search space set can be a CSS set or a USS set. A UE monitors PDCCH candidates in one or more of the following search spaces sets
>
> - a Type3-PDCCH CSS set configured by *SearchSpace* in *PDCCH-Config* with *searchSpaceType* = *common* for DCI formats with CRC scrambled by INT-RNTI, SFI-RNTI, TPC-PUSCH-RNTI, TPC-PUCCH-RNTI, or TPC-SRS-RNTI and, only for the primary cell, C-RNTI, MCS-C-RNTI, or CS-RNTI(s), and

42. When the configured grant Type 2 transmission is configured, the radio resource control configures the parameter "cs-RNTI," which is a configured scheduling radio network temporary identifier. As provided in TS 38.321, the parameter "cs-RNTI" is used for indicating "activation, deactivation and retransmission" for an uplink data transmission.

> 5.8.2 Uplink
>
> There are two types of transmission without dynamic grant:
>
> - configured grant Type 1 where an uplink grant is provided by RRC, and stored as configured uplink grant;
> - configured grant Type 2 where an uplink grant is provided by PDCCH, and stored or cleared as configured uplink grant based on L1 signalling indicating configured uplink grant activation or deactivation.
>
> RRC configures the following parameters when the configured grant Type 2 is configured:
>
> - *cs-RNTI*: CS-RNTI for activation, deactivation, and retransmission;
> - *periodicity*: periodicity of the configured grant Type 2;
> - *nrofHARQ-Processes*: the number of HARQ processes for configured grant.

43. As provided in TS 38.214, for "Type 2 PUSCH transmissions with a configured grant, the resource allocation follows the higher layer configuration according to [10, TS 38.321], and UL grant received on the DCI."

> 6.1.2.3 Resource allocation for uplink transmission with configured grant
>
> When PUSCH resource allocation is semi-statically configured by higher layer parameter *configuredGrantConfig* in *BWP-UplinkDedicated* information element, and the PUSCH transmission corresponding to a configured grant, the following higher layer parameters are applied in the transmission:
>
> - For Type 2 PUSCH transmissions with a configured grant: the resource allocation follows the higher layer configuration according to [10, TS 38.321], and UL grant received on the DCI.
>
> The UE shall not transmit anything on the resources configured by *configuredGrantConfig* if the higher layers did not deliver a transport block to transmit on the resources allocated for uplink transmission without grant.
>
> A set of allowed periodicities *P* are defined in [12, TS 38.331].

44. The Accused Devices further comprise the claimed "transmitting circuitry configured to transmit confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI." TS 38.321 provides the Medium Access Control (MAC) protocol procedures for the uplink data transfer. As provided in TS 38.321, if the MAC entity has a CS-RNTI, it triggers configured uplink grant confirmation "MAC CE" when the PDCCH contents indicate configured grant Type 2 activation.

> 5.4.1 UL Grant reception
>
> Uplink grant is either received dynamically on the PDCCH, in a Random Access Response, or configured semi-persistently by RRC. The MAC entity shall have an uplink grant to transmit on the UL-SCH. To perform the requested transmissions, the MAC layer receives HARQ information from lower layers.
>
> If the MAC entity has a C-RNTI, a Temporary C-RNTI, or CS-RNTI, the MAC entity shall for each PDCCH occasion and for each Serving Cell belonging to a TAG that has a running *timeAlignmentTimer* and for each grant received for this PDCCH occasion:
>
> 1> else if an uplink grant for this PDCCH occasion has been received for this Serving Cell on the PDCCH for the MAC entity's CS-RNTI:
>
> 2> else if the NDI in the received HARQ information is 0:
>
> 3> if PDCCH contents indicate configured grant Type 2 deactivation:
>
> 4> trigger configured uplink grant confirmation.
>
> 3> else if PDCCH contents indicate configured grant Type 2 activation:
>
> 4> trigger configured uplink grant confirmation;
>
> 4> store the uplink grant for this Serving Cell and the associated HARQ information as configured uplink grant;
>
> 4> initialise or re-initialise the configured uplink grant for this Serving Cell to start in the associated PUSCH duration and to recur according to rules in clause 5.8.2;
>
> 4> stop the *configuredGrantTimer* for the corresponding HARQ process, if running;

45. The Accused Devices further comprise the claimed "the transmitting circuitry configured to perform, based on a detection of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology." As provided in TS 38.214, "[f]or Type 2 PUSCH transmissions with a configured grant: the resource allocation follows the higher layer configuration according to [10, TS 38.321], and UL grant received on the DCI."

> 6.1.2.3 Resource allocation for uplink transmission with configured grant
>
> When PUSCH resource allocation is semi-statically configured by higher layer parameter *configuredGrantConfig* in *BWP-UplinkDedicated* information element, and the PUSCH transmission corresponding to a configured grant, the following higher layer parameters are applied in the transmission:
>
> - For Type 2 PUSCH transmissions with a configured grant: the resource allocation follows the higher layer configuration according to [10, TS 38.321], and UL grant received on the DCI.
>
> The UE shall not transmit anything on the resources configured by *configuredGrantConfig* if the higher layers did not deliver a transport block to transmit on the resources allocated for uplink transmission without grant.
>
> A set of allowed periodicities *P* are defined in [12, TS 38.331].

46. TS 38.321 further provides that "if an uplink grant for this PDCCH occasion has been received for this Serving Cell on the PDCCH for the MAC entity's CS-RNTI," and "if the PDCCH contents indicate configured grant Type 2 activation" then the MAC entity stores the uplink grant for the Serving Cell and the associated HARQ information as configured uplink grant. Under TS 38.321, "[f]or each Serving Cell and each configured uplink grant, if configured and activated, the MAC entity shall . . . deliver the configured uplink grant and the associated HARQ information to the HARQ entity."

> 5.4 UL-SCH data transfer
>
> 5.4.1 UL Grant reception
>
> Uplink grant is either received dynamically on the PDCCH, in a Random Access Response, or configured semi-persistently by RRC. The MAC entity shall have an uplink grant to transmit on the UL-SCH. To perform the requested transmissions, the MAC layer receives HARQ information from lower layers.
>
> If the MAC entity has a C-RNTI, a Temporary C-RNTI, or CS-RNTI, the MAC entity shall for each PDCCH occasion and for each Serving Cell belonging to a TAG that has a running *timeAlignmentTimer* and for each grant received for this PDCCH occasion:
>
> 3> else if PDCCH contents indicate configured grant Type 2 activation:
>
> 4> trigger configured uplink grant confirmation;
>
> 4> store the uplink grant for this Serving Cell and the associated HARQ information as configured uplink grant;
>
> 4> initialise or re-initialise the configured uplink grant for this Serving Cell to start in the associated PUSCH duration and to recur according to rules in clause 5.8.2;
>
> 4> stop the *configuredGrantTimer* for the corresponding HARQ process, if running;
>
> For each Serving Cell and each configured uplink grant, if configured and activated, the MAC entity shall:
>
> 1> if the PUSCH duration of the configured uplink grant does not overlap with the PUSCH duration of an uplink grant received on the PDCCH or in a Random Access Response for this Serving Cell:
>
> 2> set the HARQ Process ID to the HARQ Process ID associated with this PUSCH duration;
>
> 2> if the *configuredGrantTimer* for the corresponding HARQ process is not running:
>
> 3> consider the NDI bit for the corresponding HARQ process to have been toggled;
>
> 3> deliver the configured uplink grant and the associated HARQ information to the HARQ entity.

47. The Accused Devices further comprise "the transmitting circuitry is configured to transmit confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI," as claimed. As provided in TS 38.321, "if an uplink grant for this PDCCH occasion has been received for

this Serving Cell on the PDCCH for the MAC entity's CS-RNTI" and "if PDCCH contents indicate configured grant Type 2 deactivation," the MAC entity triggers configured uplink grant confirmation "MAC CE."

> 5.4.1 UL Grant reception
>
> Uplink grant is either received dynamically on the PDCCH, in a Random Access Response, or configured semi-persistently by RRC. The MAC entity shall have an uplink grant to transmit on the UL-SCH. To perform the requested transmissions, the MAC layer receives HARQ information from lower layers.
>
> If the MAC entity has a C-RNTI, a Temporary C-RNTI, or CS-RNTI, the MAC entity shall for each PDCCH occasion and for each Serving Cell belonging to a TAG that has a running *timeAlignmentTimer* and for each grant received for this PDCCH occasion:
>
> 1> else if an uplink grant for this PDCCH occasion has been received for this Serving Cell on the PDCCH for the MAC entity's CS-RNTI:
>
> 2> else if the NDI in the received HARQ information is 0:
>
> 3> if PDCCH contents indicate configured grant Type 2 deactivation:
>
> 4> trigger configured uplink grant confirmation.

48. The Accused Devices further comprise "the confirmation information MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID), the confirmation information MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information," as claimed. TS 38.321 provides the MAC Control Elements, including the Configured Grant Confirmation MAC CE. As provided in TS 38.321, "[t]he Configured Grant Confirmation MAC CE is identified by a MAC subheader with LCID as specified in Table 6.2.1-2."

> 6.1.3.7 Configured Grant Confirmation MAC CE
>
> The Configured Grant Confirmation MAC CE is identified by a MAC subheader with LCID as specified in Table 6.2.1-2.

6.2.1 MAC subheader for DL-SCH and UL-SCH

The MAC subheader consists of the following fields:

- LCID: The Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC CE or padding as described in Tables 6.2.1-1 and 6.2.1-2 for the DL-SCH and UL-SCH respectively. There is one LCID field per MAC subheader. The size of the LCID field is 6 bits;

Table 6.2.1-2 Values of LCID for UL-SCH

Index	LCID values
0	CCCH of size 64 bits (referred to as "CCCH1" in TS 38.331 [5])
1–32	Identity of the logical channel
33–51	Reserved
52	CCCH of size 48 bits (referred to as "CCCH" in TS 38.331 [5])
53	Recommended bit rate query
54	Multiple Entry PHR (four octets C_i)
55	Configured Grant Confirmation
56	Multiple Entry PHR (one octet C_i)
57	Single Entry PHR
58	C-RNTI
59	Short Truncated BSR
60	Long Truncated BSR
61	Short BSR
62	Long BSR
63	Padding

49. Because of the Accused Devices' conformance with the applicable 5G standards, on information and belief Apple directly infringes at least Claim 1 of the '976 patent.

50. In addition to direct infringement by making, using, and selling the Accused Devices, Apple also indirectly infringes the '976 patent claims. Apple has knowledge of the '976 Patent at least as of the filing and service of this Complaint and continues to make, use, sell, and/or offer for sale the Accused Devices. Where acts constituting direct infringement of the '976 patent are not performed by Apple, such acts constituting direct infringement of the '976 patent are performed by Apple's customers or end-users who act at the direction and/or control of Apple, with Apple's knowledge.

51. Daingean is informed and believes, and on that basis alleges, that Apple indirectly infringes at least Claim 1 of the '976 patent by active inducement in violation of 35 U.S.C. § 271(b), by at least manufacturing, supplying, distributing, selling, and/or

offering for sale the Accused Devices to its customers with the knowledge and intent that use of those products would constitute direct infringement of the '976 patent.

52. For example, Apple advertises to its customers that it sells products that comply with the 5G standards and affirmatively promotes the advantages of 5G support on its devices. *See supra* ¶ 24 (explaining the "impressive speeds" for 5G iPhones and "superfast speeds" for 5G iPads). Additionally, Apple helps its customers know whether their cellular carrier supports 5G.[24] "Following the introduction of 5G technology to Apple devices in 2020, Apple has helped expand and expedite 5G adoption across the country . . . ."[25] On information and belief, when an Apple customer with an Accused Device communicates with a 5G network, the customer's device will automatically implement the accused 5G functionality based upon the hardware and software provided in the Accused Devices.

53. The '976 Patent was cited by Examiners at the Patent Office during prosecution of three Apple patents: U.S. Patent Nos. 10,750,491; 11,089,651; and 11,564,249.

54. During prosecution of the first Apple patent (the '491 Patent), the Examiner cited to the '976 Patent publication (US 2018/0199334) as a relevant reference in the Notice of Allowance on April 8, 2020.

55. During prosecution of the second Apple patent (the '651 Patent), the Examiner cited to the '976 Patent publication (US 2018/0199334) as a relevant reference in a July 7, 2020 Nonfinal Office Action.

56. During prosecution of the third Apple patent (the '249 Patent), the Examiner cited to the '976 Patent publication (US 2018/019334) as a reference for an obviousness-

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[24] *See, e.g.*, https://support.apple.com/en-us/HT204039 (detailing carrier support for iPhones) (last visited 8/3/2023); https://support.apple.com/en-us/HT212278 (detailing carrier support for iPads) (last visited (8/3/2023).

[25] *See* https://www.apple.com/newsroom/2023/05/apple-announces-multibillion-dollar-deal-with-broadcom/ (last visited 8/3/2023).

based rejection of three claims within Apple's patent application (claims 2, 10, and 14) on November 12, 2020. This same rejection was repeated in several subsequent office actions on May 6, 2021 (Final), August 18, 2021 (Nonfinal), February 16, 2022 (Final), and June 17, 2022 (Nonfinal). In responding to first office action, on January 9, 2021, Apple stated: "The remaining references, ***Ying***; Chakraborty; Liu; Harada; and Bhorkar, were cited only in the rejection of dependent claims and ***also fail to disclose or suggest the foregoing claim limitations***." (emphasis added). Given Apple's duty of candor before the Patent Office, this representation confirms that, as of January 9, 2021, Apple had studied the '976 Patent publication and was fully aware of its teachings.

57. Apple also indirectly infringes by contributing to the infringement of, and continuing to contribute to the infringement of, one or more claims of the '976 Patent under 35 U.S.C. § 271(c) and/or 271(f) by selling, offering for sale, and/or importing into the United States, the Accused Devices. Apple knows, at least as of January 9, 2021, that the accused products and/or services include hardware components and software instructions that work in concert to perform specific, intended functions. Such specific, intended functions, carried out by these hardware and software combinations, are a material part of the inventions of the '976 Patent and are not staple articles of commerce suitable for substantial non-infringing use.

58. The acts of infringement by Apple have caused damage to Plaintiff, and Plaintiff is entitled to recover from Defendant the damages sustained by Plaintiff as a result of Defendant's wrongful acts in an amount subject to proof at trial. The infringement of the '976 Patent by Apple has damaged and will continue to damage Plaintiff.

COUNT II: INFRINGEMENT OF U.S. PATENT NO. 10,841,958

59. Daingean hereby incorporates and re-alleges paragraphs 1 through 58 as if fully set forth herein.

60. On November 17, 2020, the USPTO duly and legally issued United States Patent No. 10,841,958 (the "'958 Patent"), titled "Access Node, a Method for an Access Node, a Wireless Terminal, and a Method for a Wireless Terminal."

61. The inventions disclosed in the '958 Patent provide methods and apparatuses that "use a value tag in conjunction with transmission and/or processing of system information in a wireless communication network, especially in conjunction with second type system information or non-essentially type system information. In certain example embodiment and modes, an access node (22) may initiate broadcasting second type system information when its content gets updated, in order to avoid many on-demand delivery requests from wireless terminals." '958 Patent, Abstract. These inventions provide technological solutions to the network-centric problem of signaling essential and non-essential system information, managing the allocation of network resources for use by a plurality of user devices in a broadcast or on-demand fashion, and providing updates to user devices when such information changes. *See id.* Prior to the claimed invention, "the eNB periodically broadcasts all SIBs relevant for offered services, not just SIBs that are required for access to the system. [] this approach may result in wasting valuable radio resources . . . ." '958 Patent at 1:34-58. The '958 Patent teaches embodiments in which a base station may broadcast just a first type of essential SIB that indicates which other second-type non-essential SIBs are available, whether those other SIBs have changed, and whether they are available via broadcast or on-demand, and enable the UE to request on-demand delivery of second-type SIBs on an as-needed basis. These examples, along with the other claimed improvements of the '958 Patent, solve the particular network-oriented problems associated with system information signaling, bandwidth scarcity, and efficient network functioning. The claimed inventions of the '958 Patent thereby improve the functioning of wireless network devices participating in a network.

62. Daingean holds all rights, title, and interest in and to the '958 Patent, including the right to bring this suit and recover all past, present and future damages for infringement of the '958 Patent. Apple is not licensed to the '958 Patent, either expressly or implicitly, nor does it enjoy or benefit from any other rights in or to the '958 Patent whatsoever. As such, Apple's infringement described below has injured, and continues to injure, Daingean.

63. On information and belief, Apple has infringed directly and continues to infringe directly the '958 Patent through its manufacture, use, sale, importation, and/or offer for sale of Accused Devices that practice or implement the asserted claims, including for example, wireless network devices that generate, transmit, and/or receive the claimed SIB blocks and associated information.

64. For example, the Accused Devices practice and/or are capable of practicing representative claim 5 of the '958 Patent. The following paragraphs provide details regarding only one example of Apple's infringement, and only as to a single patent claim. Plaintiff reserves its right to provide greater detail and scope via its Infringement Contentions at the time required under this Court's scheduling order.

65. Claim 5 of the '958 Patent states:

> 5. A wireless terminal of a radio access network that communicates over a radio interface with an access node of the radio access network comprising:
>
> receiver circuitry configured to:
>
> receive a message that triggers reception of a first type system information block (SIB); and
>
> receive, based on the reception of the message, the first type SIB comprising information and a value tag, the information indicating whether one or more associated second type SIBs are provided by broadcast or on-demand, the value tag being updated upon a change of a corresponding second type SIB, the first type SIB being used to perform an initial access to the radio access network; and
>
> processor circuitry configured to determine that a second type SIB has changed, based on a value tag, associated with the second type SIB, stored in the wireless terminal, and the value tag included in the first type SIB corresponding to the second type SIB;
>
> wherein receiver circuitry is configured to perform reception of the second type SIB based on the information associated with the second type system information block, in a case that the second type SIB has change; and
>
> wherein in a case that the second type SIB was provided on-demand before the change, the information associated with the second type SIB included in the first type SIB indicated that the second type SIB is provided by broadcast.

'958 Patent at 28:19-47.

66. As alleged and shown above, Apple's Accused Devices comply with the 5G standard, including at least 3GPP release version 15 and/or later releases and/or versions of the 3GPP standards.

67. The Accused Devices possess the recited capabilities of Claim 5. The Accused Devices comprise "[a] wireless terminal of a radio access network that communicates over a radio interface with an access node of the radio access network," as claimed.

68. The Accused Devices include receiver circuitry configured with the recited capabilities of '958 Claim 5.

69. The Accused Devices comprise the claimed receiver circuitry configured to "receive a message that triggers reception of a first type system information block (SIB)." For example, the 3GPP specification states "the SIB1 is transmitted on the DL-SCH with a periodicity of 160 ms . . . ." TS 38.331 § 5.2.1.

70. Additionally, the Accused Devices receive short messages that trigger the reception of SIB1. For example, TS 38.331 describes the Short Message that triggers acquisition of SIB1:

5.2.2.2.2 SI change indication and PWS notification

A modification period is used, i.e. updated SI (other than for ETWS and CMAS) is broadcasted in the modification period following the one where SI change indication is transmitted. The modification period boundaries are defined by SFN values for which SFN mod m = 0, where m is the number of radio frames comprising the modification period. The modification period is configured by system information. The UE receives indications about SI modifications and/or PWS notifications using Short Message transmitted with P-RNTI over DCI (see clause 6.5). Repetitions of SI change indication may occur within preceding modification period.

UEs in RRC_IDLE or in RRC_INACTIVE shall monitor for SI change indication in its own paging occasion every DRX cycle. UEs in RRC_CONNECTED shall monitor for SI change indication in any paging occasion at least once per modification period if the UE is provided with common search space on the active BWP to monitor paging, as specified in TS 38.213 [13], clause 13.

ETWS or CMAS capable UEs in RRC_IDLE or in RRC_INACTIVE shall monitor for indications about PWS notification in its own paging occasion every DRX cycle. ETWS or CMAS capable UEs in RRC_CONNECTED shall monitor for indication about PWS notification in any paging occasion at least once every *defaultPagingCycle* if the UE is provided with common search space on the active BWP to monitor paging.

For Short Message reception in a paging occasion, the UE monitors the PDCCH monitoring occasion(s) for paging as specified in TS 38.304 [20] and TS 38.213 [13].

If the UE receives a Short Message, the UE shall:

1> if the UE is ETWS capable or CMAS capable, the *etwsAndCmasIndication* bit of Short Message is set, and the UE is provided with *searchSpaceOtherSystemInformation* on the active BWP or the initial BWP:

2> immediately re-acquire the *SIB1*;

2> if the UE is ETWS capable and *si-SchedulingInfo* includes scheduling information for *SIB6*:

3> acquire *SIB6*, as specified in sub-clause 5.2.2.3.2, immediately;

2> if the UE is ETWS capable and *si-SchedulingInfo* includes scheduling information for *SIB7*:

3> acquire *SIB7*, as specified in sub-clause 5.2.2.3.2, immediately;

2> if the UE is CMAS capable and *si-SchedulingInfo* includes scheduling information for *SIB8*:

3> acquire *SIB8*, as specified in sub-clause 5.2.2.3.2, immediately;

NOTE: In case *SIB6*, *SIB7*, or *SIB8* overlap with a measurement gap it is left to UE implementation how to immediately acquire *SIB6*, *SIB7*, or *SIB8*.

1> if the *systemInfoModification* bit of Short Message is set:

2> apply the SI acquisition procedure as defined in sub-clause 5.2.2.3 from the start of the next modification period.

TS 38.331, § 5.2.2.2.2 (highlighting added).

> 5.2.2.3 Acquisition of System Information
>
> 5.2.2.3.1 Acquisition of *MIB* and *SIB1*
>
> The UE shall:
>
> 1> if the UE is in RRC_CONNECTED while T311 is running:
>
> 2> if *ssb-SubcarrierOffset* indicates *SIB1* is transmitted in the cell (TS 38.213 [13]) and if *SIB1* acquisition is required for the UE:
>
> 3> acquire the *SIB1*, which is scheduled as specified in TS 38.213 [13];

TS 38.331, § 5.2.2.3.1 (highlighting added).

71. The Accused Devices are configured to "receive, based on the reception of the message, the first type SIB comprising information and a value tag, the information indicating whether one or more associated second type SIBs are provided by broadcast or on-demand, the value tag being updated upon a change of a corresponding second type SIB, the first type SIB being used to perform an initial access to the radio access network," as claimed. This is shown, for example in the following portions of the 3GPP specifications, TS 38.331 and TS 38.300:

> 5.2.1 Introduction
>
> System Information (SI) is divided into the *MIB* and a number of SIBs where:
>
> - the *MIB* is always transmitted on the BCH with a periodicity of 80 ms and repetitions made within 80 ms (TS 38.212 [17], clause 7.1) and it includes parameters that are needed to acquire *SIB1* from the cell. The first transmission of the *MIB* is scheduled in subframes as defined in TS 38.213 [13], clause 4.1 and repetitions are scheduled according to the period of SSB;
>
> - the *SIB1* is transmitted on the DL-SCH with a periodicity of 160 ms and variable transmission repetition periodicity within 160 ms as specified in TS 38.213 [13], clause 13. The default transmission repetition periodicity of *SIB1* is 20 ms but the actual transmission repetition periodicity is up to network implementation. For SSB and CORESET multiplexing pattern 1, *SIB1* repetition transmission period is 20 ms. For SSB and
>
> CORESET multiplexing pattern 2/3, *SIB1* transmission repetition period is the same as the SSB period (TS 38.213 [13], clause 13). *SIB1* includes information regarding the availability and scheduling (e.g. mapping of SIBs to SI message, periodicity, SI-window size) of other SIBs with an indication whether one or more SIBs are only provided on-demand and, in that case, the configuration needed by the UE to perform the SI request. *SIB1* is cell-specific SIB;
>
> - SIBs other than *SIB1* are carried in *SystemInformation* (SI) messages, which are transmitted on the DL-SCH. Only SIBs having the same periodicity can be mapped to the same SI message. Each SI message is transmitted within periodically occurring time domain windows (referred to as SI-windows with same length for all SI messages). Each SI message is associated with an SI-window and the SI-windows of different SI messages do not overlap. That is, within one SI-window only the corresponding SI message is transmitted. An SI message may be transmitted a number of times within the SI-window. Any SIB except *SIB1* can be configured to be cell specific or area specific, using an indication in *SIB1*. The cell specific SIB is applicable only within a cell that provides the SIB while the area specific SIB is applicable within an area referred to as SI area, which consists of one or several cells and is identified by *systemInformationAreaID*;

TS 38.331, § 5.2.1 (highlighting added).

6.2.2 Message definitions

– *SIB1*

SIB1 contains information relevant when evaluating if a UE is allowed to access a cell and defines the scheduling of other system information. It also contains radio resource configuration information that is common for all UEs and barring information applied to the unified access control.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channels: BCCH

Direction: Network to UE

***SIB1* message**

```
-- ASN1START
-- TAG-SIB1-START

SIB1 ::=        SEQUENCE {
    cellSelectionInfo                   SEQUENCE {
        q-RxLevMin                          Q-RxLevMin,
        q-RxLevMinOffset                    INTEGER (1..8)                                          OPTIONAL,   -- Need S
        q-RxLevMinSUL                       Q-RxLevMin                                              OPTIONAL,   -- Need R
        q-QualMin                           Q-QualMin                                               OPTIONAL,   -- Need S
        q-QualMinOffset                     INTEGER (1..8)                                          OPTIONAL    -- Need S
    }                                                                                               OPTIONAL,   -- Cond Standalone
    cellAccessRelatedInfo               CellAccessRelatedInfo,
    connEstFailureControl               ConnEstFailureControl                                       OPTIONAL,   -- Need R
    si-SchedulingInfo                   SI-SchedulingInfo                                           OPTIONAL,   -- Need R
    servingCellConfigCommon             ServingCellConfigCommonSIB                                  OPTIONAL,   -- Need R
    ims-EmergencySupport                ENUMERATED {true}                                           OPTIONAL,   -- Need R
    eCallOverIMS-Support                ENUMERATED {true}                                           OPTIONAL,   -- Cond Absent
    ue-TimersAndConstants               UE-TimersAndConstants                                       OPTIONAL,   -- Need R

    uac-BarringInfo                     SEQUENCE {
        uac-BarringForCommon                UAC-BarringPerCatList                                   OPTIONAL,   -- Need S
        uac-BarringPerPLMN-List             UAC-BarringPerPLMN-List                                 OPTIONAL,   -- Need S
        uac-BarringInfoSetList              UAC-BarringInfoSetList,
        uac-AccessCategory1-SelectionAssistanceInfo CHOICE {
            plmnCommon                          UAC-AccessCategory1-SelectionAssistanceInfo,
            individualPLMNList                  SEQUENCE (SIZE (2..maxPLMN)) OF UAC-AccessCategory1-SelectionAssistanceInfo
        }                                                                                           OPTIONAL    -- Need S
    }                                                                                               OPTIONAL,   -- Need R

    useFullResumeID                     ENUMERATED {true}                                           OPTIONAL,   -- Need R

    lateNonCriticalExtension            OCTET STRING                                                OPTIONAL,
    nonCriticalExtension                SEQUENCE{}                                                  OPTIONAL
}
```

TS 38.331, § 6.2.2 (highlighting added).

6.3.2 Radio resource control information elements

– *SI-SchedulingInfo*

The IE *SI-SchedulingInfo* contains information needed for acquisition of SI messages.

***SI-SchedulingInfo* information element**

```
-- ASN1START
-- TAG-SI-SCHEDULINGINFO-START

SI-SchedulingInfo ::=               SEQUENCE {
    schedulingInfoList                  SEQUENCE (SIZE (1..maxSI-Message)) OF SchedulingInfo,
    si-WindowLength                     ENUMERATED {s5, s10, s20, s40, s80, s160, s320, s640, s1280},
    si-RequestConfig                    SI-RequestConfig                                        OPTIONAL,  -- Cond MSG-1
    si-RequestConfigSUL                 SI-RequestConfig                                        OPTIONAL,  -- Cond SUL-MSG-1
    systemInformationAreaID             BIT STRING (SIZE (24))                                  OPTIONAL,   -- Need R
    ...
}

SchedulingInfo ::=                  SEQUENCE {
    si-BroadcastStatus                  ENUMERATED {broadcasting, notBroadcasting},
    si-Periodicity                      ENUMERATED {rf8, rf16, rf32, rf64, rf128, rf256, rf512},
    sib-MappingInfo                     SIB-Mapping
}

SIB-Mapping ::=                     SEQUENCE (SIZE (1..maxSIB)) OF SIB-TypeInfo

SIB-TypeInfo ::=                    SEQUENCE {
    type                                ENUMERATED {sibType2, sibType3, sibType4, sibType5, sibType6, sibType7, sibType8, sibType9,
                                                    spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1,... },
    valueTag                            INTEGER (0..31)                                         OPTIONAL, -- Cond SIB-TYPE
    areaScope                           ENUMERATED {true}                                       OPTIONAL -- Need S
}

-- Configuration for Msg1 based SI Request
SI-RequestConfig ::=                SEQUENCE {
    rach-OccasionsSI                    SEQUENCE {
        rach-ConfigSI                       RACH-ConfigGeneric,
        ssb-perRACH-Occasion                ENUMERATED {oneEighth, oneFourth, oneHalf, one, two, four, eight, sixteen}
    }                                                                                           OPTIONAL,   -- Need R
    si-RequestPeriod                    ENUMERATED {one, two, four, six, eight, ten, twelve, sixteen}   OPTIONAL,   -- Need R
    si-RequestResources                 SEQUENCE (SIZE (1..maxSI-Message)) OF SI-RequestResources
}

SI-RequestResources ::=             SEQUENCE {
    ra-PreambleStartIndex               INTEGER (0..63),
    ra-AssociationPeriodIndex           INTEGER (0..15)                                         OPTIONAL,   -- Need R
    ra-ssb-OccasionMaskIndex            INTEGER (0..15)                                         OPTIONAL    -- Need R
}

-- TAG-SI-SCHEDULINGINFO-STOP
-- ASN1STOP
```

TS 38.331, § 6.3.2 (highlighting added).

5.2.2.2 SIB validity and need to (re)-acquire SIB

5.2.2.2.1 SIB validity

The UE shall apply the SI acquisition procedure as defined in clause 5.2.2.3 upon cell selection (e.g. upon power on), cell-reselection, return from out of coverage, after reconfiguration with sync completion, after entering the network from another RAT, upon receiving an indication that the system information has changed, upon receiving a PWS notification; and whenever the UE does not have a valid version of a stored SIB.

When the UE acquires a *MIB* or a *SIB1* or an SI message in a serving cell as described in clause 5.2.2.3, and if the UE stores the acquired SIB, then the UE shall store the associated *areaScope*, if present, the first *PLMN-Identity* in the *PLMN-IdentityInfoList*, the *cellIdentity*, the *systemInformationAreaID*, if present, and the *valueTag*, if present, as indicated in the *si-SchedulingInfo* for the SIB. The UE may use a valid stored version of the SI except *MIB*, *SIB1*, *SIB6*, *SIB7* or *SIB8* e.g. after cell re-selection, upon return from out of coverage or after the reception of SI change indication.

NOTE: The storage and management of the stored SIBs in addition to the SIBs valid for the current serving cell is left to UE implementation.

The UE shall:

1> delete any stored version of a SIB after 3 hours from the moment it was successfully confirmed as valid;

1> for each stored version of a SIB:

2> if the *areaScope* is associated and its value for the stored version of the SIB is the same as the value received in the *si-SchedulingInfo* for that SIB from the serving cell:

3> if the first *PLMN-Identity* included in the *PLMN-IdentityInfoList*, the *systemInformationAreaID* and the *valueTag* that are included in the *si-SchedulingInfo* for the SIB received from the serving cell are identical to the *PLMN-Identity*, the *systemInformationAreaID* and the *valueTag* associated with the stored version of that SIB:

4> consider the stored SIB as valid for the cell;

2> if the *areaScope* is not present for the stored version of the SIB and the *areaScope* value is not included in the *si-SchedulingInfo* for that SIB from the serving cell:

3> if the first *PLMN-Identity* in the *PLMN-IdentityInfoList,* the *cellIdentity* and *valueTag* that are included in the *si-SchedulingInfo* for the SIB received from the serving cell are identical to the *PLMN-Identity,* the *cellIdentity* and the *valueTag* associated with the stored version of that SIB:

4> consider the stored SIB as valid for the cell;

TS 38.331, § 5.2.2.2 (highlighting added).

***SchedulingInfo* field descriptions**
areaScope
Indicates that a SIB is area specific. If the field is absent, the SIB is cell specific.
si-BroadcastStatus
Indicates if the SI message is being broadcasted or not. Change of *si-BroadcastStatus* should not result in system information change notifications in Short Message transmitted with P-RNTI over DCI (see clause 6.5). The value of the indication is valid until the end of the BCCH modification period when set to *broadcasting*.
si-Periodicity
Periodicity of the SI-message in radio frames. Value *rf8* corresponds to 8 radio frames, value *rf16* corresponds to 16 radio frames, and so on.

TS 38.331, § 6.3.2 (highlighting added).

7.3.3 SI Modification

Change of system information (other than for ETWS/CMAS, see clause 16.4) only occurs at specific radio frames, i.e. the concept of a modification period is used. System information may be transmitted a number of times with the same content within a modification period, as defined by its scheduling. The modification period is configured by system information.

When the network changes (some of the) system information, it first notifies the UEs about this change, i.e. this may be done throughout a modification period. In the next modification period, the network transmits the updated system information. Upon receiving a change notification, the UE acquires the new system information from the start of the next modification period. The UE applies the previously acquired system information until the UE acquires the new system information.

TS 38.300, § 7.3.3 (highlighting added).

7.3 System Information Handling

7.3.1 Overview

System Information (SI) consists of a MIB and a number of SIBs, which are divided into Minimum SI and Other SI:

- **Minimum SI** comprises basic information required for initial access and information for acquiring any other SI. Minimum SI consists of:
  - *MIB* contains cell barred status information and essential physical layer information of the cell required to receive further system information, e.g. CORESET#0 configuration. *MIB* is periodically broadcast on BCH.
  - *SIB1* defines the scheduling of other system information blocks and contains information required for initial access. SIB1 is also referred to as Remaining Minimum SI (RMSI) and is periodically broadcast on DL-SCH or sent in a dedicated manner on DL-SCH to UEs in RRC_CONNECTED.
- **Other SI** encompasses all SIBs not broadcast in the Minimum SI. Those SIBs can either be periodically broadcast on DL-SCH, broadcast on-demand on DL-SCH (i.e. upon request from UEs in RRC_IDLE or RRC_INACTIVE), or sent in a dedicated manner on DL-SCH to UEs in RRC_CONNECTED. Other SI consists of:

TS 38.300, § 7.3.1 (highlighting added).

5.2.2.2 SIB validity and need to (re)-acquire SIB

5.2.2.2.1 SIB validity

The UE shall apply the SI acquisition procedure as defined in clause 5.2.2.3 upon cell selection (e.g. upon power on), cell-reselection, return from out of coverage, after reconfiguration with sync completion, after entering the network from another RAT, upon receiving an indication that the system information has changed, upon receiving a PWS notification; and whenever the UE does not have a valid version of a stored SIB.

TS 38.331, § 5.2.2.2.1 (highlighting added).

> 5.2.2.4.2 Actions upon reception of the *SIB1*
>
> Upon receiving the *SIB1* the UE shall:
>
> 4> if the UE has not stored a valid version of a SIB, in accordance with sub-clause 5.2.2.2.1, of one or several required SIB(s), in accordance with sub-clause 5.2.2.1:
>
> 5> for the SI message(s) that, according to the *si-SchedulingInfo*, contain at least one required SIB and for which *si-BroadcastStatus* is set to broadcasting:
>
> 6> acquire the SI message(s) as defined in sub-clause 5.2.2.3.2;
>
> 5> for the SI message(s) that, according to the *si-SchedulingInfo*, contain at least one required SIB and for which *si-BroadcastStatus* is set to *notBroadcasting*:
>
> 6> trigger a request to acquire the SI message(s) as defined in sub-clause 5.2.2.3.3;

TS 38.331, § 5.2.2.4.2 (highlighting added).

72. As shown in the example above, a first type system information block comprising "SIB1" is received by the Accused Devices. This SIB1 block includes "information indicating whether one or more associated second type SIBs are provided by broadcast or on-demand," as claimed. Second type system information blocks are identified in the fields SIB-TypeInfo and/or SIB-Mapping of the SI-SchedulingInfo field. The field si-BroadcastStatus indicates whether one or more associated second type system information blocks are provided by broadcast or on-demand.

73. As shown in the example above, the SIB1 block includes "a value tag . . . the value tag being updated upon a change of a corresponding second type SIB," as claimed. The value tag for each second-type system information block is stored in the vector valueTag of the SI-SchedulingInfo field. When a second type SIB changes, its corresponding value tag is updated.

74. As shown in the example above, "the first type SIB [is] being used to perform an initial access to the radio access network," as claimed. SIB1 is part of the "Minimum SI" which is basic information required for initial access to the radio access network.

75. As shown in the example above, "in a case that the second type SIB was provided on-demand before the change, the information associated with the second type

SIB included in the first type SIB indicated that the second type SIB is provided by broadcast," as claimed. As shown above, "When the network changes (some of the) system information, it first notifies the UEs about this change… In the next modification period, the network transmits the updated system information." On information and belief, the si-BroadcastStatus field in SIB1 is modified to indicate that the corresponding second-type SIB is provided by broadcast.

76. In the Accused Devices, processor circuitry is configured "to determine that a second type SIB has changed, based on a value tag, associated with the second type SIB, stored in the wireless terminal, and the value tag included in the first type SIB corresponding to the second type SIB," as claimed. As shown in the examples above, under "5.2.2.2.1 SIB validity," the Accused Devices shall, for each stored version of a SIB, "if the . . . valueTag . . . included in the si-SchedulingInfo for the SIB received from the serving cell [is] identical to the . . . valueTag associated with the stored version of that SIB . . . consider the stored SIB as valid for the cell." As such, whether the second type SIB has changed is determined based on the state of the value tag stored at the wireless terminal and the state of the value tag in the SIB1 message.

77. Because of its conformance with the applicable 5G standards, on information and belief Apple directly infringes at least Claim 5 of the '958 patent.

78. In addition to direct infringement by making, using, and selling the Accused Devices, Apple also indirectly infringes the '958 patent claims. Apple has knowledge of the '958 Patent at least as of the filing and service of this Complaint and continues to make, use, sell, and/or offer for sale the Accused Devices. Where acts constituting direct infringement of the '958 patent are not performed by Apple, such acts constituting direct infringement of the '958 patent are performed by Apple's customers or end-users who act at the direction and/or control of Apple, with Apple's knowledge.

79. Daingean is informed and believes, and on that basis alleges, that Apple indirectly infringes at least Claim 5 of the '958 patent by active inducement in violation of 35 U.S.C. § 271(b), by at least manufacturing, supplying, distributing, selling, and/or

offering for sale the Accused Devices to its customers with the knowledge and intent that use of those products would constitute direct infringement of the '958 patent.

80. For example, Apple advertises to its customers that it sells products that comply with the 5G standards and affirmatively promotes the advantages of 5G support on its devices. *See supra* ¶ 24 (explaining the "impressive speeds" for 5G iPhones and "superfast speeds" for 5G iPads). Additionally, Apple helps its customers know whether their cellular carrier supports 5G.[26] "Following the introduction of 5G technology to Apple devices in 2020, Apple has helped expand and expedite 5G adoption across the country . . . ."[27] On information and belief, when an Apple customer with an Accused Device communicates with a 5G network, the customer's device will automatically implement the accused 5G functionality based upon the hardware and software provided in the Accused Devices.

81. Apple also indirectly infringes by contributing to the infringement of, and continuing to contribute to the infringement of, one or more claims of the '958 Patent under 35 U.S.C. § 271(c) and/or 271(f) by selling, offering for sale, and/or importing into the United States, the Accused Devices. Apple knows at least as of the date of the filing and service of this Complaint (that the Accused Devices include hardware components and software instructions that work in concert to perform specific, intended functions. Such specific, intended functions, carried out by these hardware and software combinations, are a material part of the inventions of the '958 Patent and are not staple articles of commerce suitable for substantial non-infringing use.

82. The acts of infringement by Apple have caused damage to Plaintiff, and Plaintiff is entitled to recover from Defendant the damages sustained by Plaintiff as a result

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[26] *See, e.g.*, https://support.apple.com/en-us/HT204039 (detailing carrier support for iPhones) (last visited 8/3/2023); https://support.apple.com/en-us/HT212278 (detailing carrier support for iPads) (last visited (8/3/2023).

[27] *See* https://www.apple.com/newsroom/2023/05/apple-announces-multibillion-dollar-deal-with-broadcom/ (last visited 8/3/2023).

of Defendant's wrongful acts in an amount subject to proof at trial. The infringement of the '958 Patent by Apple has damaged and will continue to damage Plaintiff.

COUNT III: INFRINGEMENT OF U.S. PATENT NO. 10,932,207

83. Daingean hereby incorporates and re-alleges paragraphs 1 through 82 as if fully set forth herein.

84. On February 23, 2021, the USPTO duly and legally issued United States Patent No. 10,932,207 (the "'207 Patent"), titled "Terminal Apparatus, Base Station Apparatus, Communication Method, and Integrated Circuit."

85. The inventions disclosed in the '207 Patent describe "a radio access method and a radio network for cellular mobile communications" enabling communications between a base station and a user's device. '207 Patent at 1:16-17. More specifically, the '207 Patent describes a random access procedure that minimizes the number of exchanges required between the base station and the user terminal in order for the user terminal to access the cellular network. This procedure provides faster access to the network under appropriate circumstances. *See generally* '207 Patent at 13:17-14:7. This more efficient random access procedure is referred to in the '207 Patent as the 2-step random access procedure. In addition, the '207 Patent describes an alternative random access procedure (the 4-step procedure) that is implemented in the event that the more efficient technique is not available or if an error occurs during the 2-step procedure. *See, e.g.*, '207 Patent at 14:8-58.

86. Daingean holds all rights, title, and interest in and to the '207 Patent, including the right to bring this suit and recover all past, present, and future damages for infringement of the '207 Patent. Apple is not licensed to the '207 Patent, either expressly or implicitly, nor does it enjoy or benefit from any other rights in or to the '207 Patent whatsoever. As such, Apple's infringement described below has injured, and continues to injure, Daingean.

87. On information and belief, Apple has infringed directly and continues to infringe directly the '207 Patent through its manufacture, use, sale, importation, and/or offer for sale of Accused Devices that are capable of performing and do perform both a 2-

step contention based random access procedure and a 4-step contention based random access procedure for accessing a 5G network.

88. For example, the Accused Devices practice and/or are capable of practicing representative Claim 1 of the '207 Patent, which is directed to a wireless terminal device, such as the Accused Devices. The following paragraphs provide details regarding one example of Apple's infringement, and only as to a single patent claim. Plaintiff reserves its right to provide greater detail and scope via its Infringement Contentions at the time required under any applicable scheduling order.

89. Claim 1 of the '207 Patent states:

> 1. A terminal device comprising:
> control circuitry configured to control a 2-step contention based random-access procedure and a 4-step contention based random-access procedure; and
> transmission circuitry configured to transmit a physical random access channel with a random access preamble in a first step of the 2-step contention based random access procedure or in a first step of the 4-step contention based random-access procedure;
> wherein transmission power for the physical random access channel is given at least based on a PREAMBLE_RECEIVED TARGET POWER;
> for the 4-step contention based random access procedure, the PREAMBLE_RECEIVED_TARGET_POWER is given based at least on a preambleInitialReceivedTargetPower(0) and a powerRampingStep(0); and
> for the 2-step contention based random access procedure, the PREAMBLE_RECEIVED_TARGET_POWER is given based at least on a preambleInitialReceivedTargetPower(l) and a powerRampingStep(l).

'207 Patent at 36:9-28.

90. The Accused Devices include Apple wireless terminals (UEs) which operate within a 5G or New Radio (NR) network architecture. The following diagram illustrates how UEs interact with a an NG-RAN within a 5G (or NR) cellular network.[28]

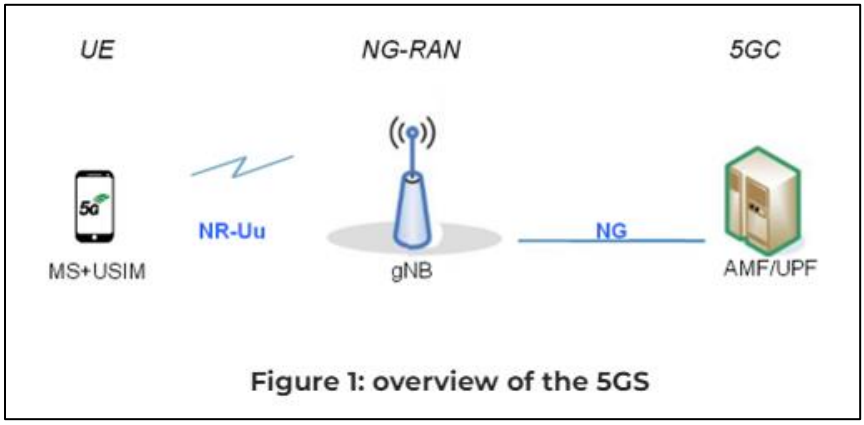

Figure 1: overview of the 5GS

91. On information and belief, the Accused Devices include hardware and/or software that is configured to control both a 2-step contention based random access procedure and a 4-step contention based random access procedure.

92. On information and belief, the Accused Devices conform to and implement TS 38.321 of the 3GPP 5G Standard. TS 38.321 provides the Medium Access Control protocol specification, which governs the operation of MACs within user equipment (UEs) devices that exchange communications with a base station on a 5G (or NR) network. The Accused Devices initiate a random access (RA) procedure with 5G base stations to support communication within a 5G network. The operation of these RA procedures is described in TS 38.321 at Section 5.1:

[28] https://www.3gpp.org/technologies/5g-system-overview (last visited Aug. 4, 2023)

> 5 MAC procedures
>
> 5.1 Random Access procedure
>
> 5.1.1 Random Access procedure initialization
>
> The Random Access procedure described in this clause is initiated by a PDCCH order, by the MAC entity itself, or by RRC for the events in accordance with TS 38.300 [2]. There is only one Random Access procedure ongoing at any point in time in a MAC entity. The Random Access procedure on an SCell shall only be initiated by a PDCCH order with *ra-PreambleIndex* different from 0b000000.

TS 38.321 at 16 (Release 16.2) (highlighting added).

93. On information and belief, as part of performing the RA procedure the Accused Devices operating on a 5G network use multiple variables for Random Access procedures, as defined below in TS 38.321:

> The following UE variables are used for the Random Access procedure:
>
> - *PREAMBLE_INDEX*;
> - *PREAMBLE_TRANSMISSION_COUNTER*;
> - *PREAMBLE_POWER_RAMPING_COUNTER*;
> - *PREAMBLE_POWER_RAMPING_STEP*;
> - *PREAMBLE_RECEIVED_TARGET_POWER*;
> - *PREAMBLE_BACKOFF*;
> - *PCMAX*;
> - *SCALING_FACTOR_BI*;
> - *TEMPORARY_C-RNTI*;
> - *RA_TYPE*;
> - *POWER_OFFSET_2STEP_RA*;
> - *MSGA_PREAMBLE_POWER_RAMPING_STEP*.

TS 38.321 at 18-19 (Release 16.2).

94. Consistent with the '207 Patent, the RA_TYPE variable can be set to either a 2-stepRA or a 4-stepRA in the UE devices, which corresponds to the 2-step contention based random-access procedure and a 4-step contention based random-access procedure. For example, TS 38.321 defines the following random access procedures which are some examples in which the RA_TYPE field is set to either a 2-stepRA or a 4-stepRA:

> 1> else if the BWP selected for Random Access procedure is configured with both 2-step and 4-step RA type Random Access Resources and the RSRP of the downlink pathloss reference is above *msgA-RSRP-Threshold*; or
>
> 1> if the BWP selected for Random Access procedure is only configured with 2-step RA type Random Access resources (i.e. no 4-step RACH RA type resources configured); or
>
> 1> if the Random Access procedure was initiated for reconfiguration with sync and if the contention-free Random Access Resources for 2-step RA type have been explicitly provided in *rach-ConfigDedicated* for the BWP selected for Random Access procedure:
>
> 2> set the *RA_TYPE* to *2-stepRA*.
>
> 1> else:
>
> 2> set the *RA_TYPE* to *4-stepRA*.
>
> 1> perform initialization of variables specific to Random Access type as specified in clause 5.1.1a;
>
> 1> if *RA_TYPE* is set to *2-stepRA*:
>
> 2> perform the Random Access Resource selection procedure for 2-step RA type (see clause 5.1.2a).
>
> 1> else:
>
> 2> perform the Random Access Resource selection procedure (see clause 5.1.2).

TS 38.321 at 20 (Release 16.2).

95. On information and belief, the Accused Devices include control circuitry configured to control a 2-step contention based random-access procedure and a 4-step contention based random-access procedure based on the RA_TYPE specified in RA procedure messages received from a UE.

96. On information and belief, the Accused Devices also include transmission circuitry that has been configured to transmit a physical random access channel transmission with a random access preamble as a first step of the 2-step contention based random-access procedure or as a first step of the 4-step contention based random-access procedure. The transmission power for the physical random access channel is provided based at least on a PREAMBLE_RECEIVED_TARGET_POWER.

97. The 5G (NR) Standard defines PRACH as a Physical Random Access Channel. *See* TS 38.300 at 13 (Release 16.2). On information and belief, the Accused Devices conform to and implement the NR Standard defined in TS 38.300. For the first step of the 2-step contention based random-access procedure, a UE device sends a MSGA transmission to the gNB:

> 5.1.2a Random Access Resource selection for 2-step RA type
>
> If the selected *RA_TYPE* is set to *2-stepRA*, the MAC entity shall:
>
> ....
>
> 1> perform the MSGA transmission procedure (see clause 5.1.3a).

TS 38.321 at 24-26 (Release 16.2) (highlighting added).

98. That transmission is performed using the Physical Random Access Channel (PRACH) and a corresponding PREAMBLE_RECEIVED_TARGET_POWER (e.g., PREAMBLE_RECEIVED_TARGET_POWER, msgA-PreambleReceivedTargetPower) as indicated in TS 38.321:

> 5.1.3a MSGA transmission
>
> The MAC entity shall, for each MSGA:
>
> ....
>
> 1> instruct the physical layer to transmit the MSGA using the selected PRACH occasion and the associated PUSCH resource of MSGA (if the selected preamble and PRACH occasion is mapped to a valid PUSCH occasion), using the corresponding RA-RNTI, MSGB-RNTI, *PREAMBLE_INDEX*, *PREAMBLE_RECEIVED_TARGET_POWER*, *msgA-PreambleReceivedTargetPower*, and the amount of power ramping applied to the latest MSGA preamble transmission (i.e. (*PREAMBLE_POWER_RAMPING_COUNTER* – 1) × *PREAMBLE_POWER_RAMPING_STEP*);

TS 38.321 at 28 (Release 16.2) (highlighting added).

99. The MSGA transmission includes the random access preamble for the first step of a 2-step contention based random-access procedure, as set forth in Claim 1 of the '207 Patent.

100. For the first step of the 4-step contention based random-access procedure, a UE device sends a Msg1 to the gNB. *See* TS 38.321 at 16 ("prach-ConfigurationIndex: the available set of PRACH occasions for the transmission of the Random Access Preamble for Msg1. These are also applicable to the to the MSGA PRACH if the PRACH occasions are shared between 2-step and 4-step RA types"). Section 5.1.2 of TS 38.321 describes the Random Access Resource selection:

> 5.1.2 Random Access Resource selection
>
> If the selected *RA_TYPE* is set to *4-stepRA*, the MAC entity shall:
>
> ....
>
> 1> perform the Random Access Preamble transmission procedure (see clause 5.1.3).

TS 38.321 at 22-24 (Release 16.2) (highlighting added).

101. The Random Access Preamble transmission is performed using the physical random access channel and a corresponding PREAMBLE_RECEIVED_TARGET_POWER as indicated in Section 5.1.3:

> 5.1.3 Random Access Preamble transmission
>
> The MAC entity shall, for each Random Access Preamble:
>
> ....
>
> 1> instruct the physical layer to transmit the Random Access Preamble using the selected PRACH occasion, corresponding RA-RNTI (if available), *PREAMBLE_INDEX*, and *PREAMBLE_RECEIVED_TARGET_POWER*.

TS 38.321 at 26 (Release 16.2) (highlighting added).

102. The Random Access Preamble (Msg1) comprises the random access preamble for the first step of a 4-step contention based random-access procedure.

103. For the 4-step contention based random access procedure, the PREAMBLE_RECEIVED_TARGET_POWER is provided based at least on a preambleInitialReceivedTargetPower (0) and a powerRampingStep (0). The parameters used for the 4-step RA procedure are provided in the Information Element (IE) RACH-ConfigGeneric, as indicated below:

> – *RACH-ConfigGeneric*
>
> The IE *RACH-ConfigGeneric* is used to specify the random-access parameters both for regular random access as well as for beam failure recovery.

TS 38.331 at 554 (Release 16.2) (highlighting added).

104. On information and belief, the Accused Devices conform to and implement TS 38.331.

105. The RACH-ConfigGeneric IE includes a preambleReceivedTargetPower entry as well as a powerRampingStep entry, corresponding to the preambleInitialReceived TargetPower (0) and powerRampingStep (0), respectively.

***RACH-ConfigGeneric* information element**

```
-- ASN1START
-- TAG-RACH-CONFIGGENERIC-START

RACH-ConfigGeneric ::=              SEQUENCE {
    prach-ConfigurationIndex            INTEGER (0..255),
    msg1-FDM                            ENUMERATED {one, two, four, eight},
    msg1-FrequencyStart                 INTEGER (0..maxNrofPhysicalResourceBlocks-1),
    zeroCorrelationZoneConfig           INTEGER(0..15),
    preambleReceivedTargetPower         INTEGER (-202..-60),
    preambleTransMax                    ENUMERATED {n3, n4, n5, n6, n7, n8, n10, n20, n50, n100, r
    powerRampingStep                    ENUMERATED {dB0, dB2, dB4, dB6},
    ra-ResponseWindow                   ENUMERATED {sl1, sl2, sl4, sl8, sl10, sl20, sl40, sl80},
    ...,
    [[
    prach-ConfigurationPeriodScaling-IAB-r16    ENUMERATED {scf1,scf2,scf4,scf8,scf16,scf32,scf64}
    prach-ConfigurationFrameOffset-IAB-r16      INTEGER (0..63)
    prach-ConfigurationSOffset-IAB-r16          INTEGER (0..39)
    ra-ResponseWindow-v1610                     ENUMERATED { sl60, sl160}
    prach-ConfigurationIndex-v1610              INTEGER (256..262)
    ]]
}
```

TS 38.331 at 554 (Release 16.2) (highlighting added).

106. The TS 38.331 standard explains that the preambleReceveidTargetPower is the "target power level at the network receiver side," and the powerRampingStep is the "[p]ower ramping steps for PRACH." TS 38.331 at 555 (Release 16.2).

107. At initialization, the PREAMBLE_POWER_RAMPING_STEP UE variable is set to RACH-ConfigGeneric.powerRampingStep for the 4-step random access procedure as indicated in Section 5.1.1a of TS 38.321:

> 5.1.1a Initialization of variables specific to Random Access type
>
> The MAC entity shall:
>
> ....
>
> 1> else (i.e. *RA_TYPE* is set to *4-stepRA*):
>
> 2> set *PREAMBLE_POWER_RAMPING_STEP* to *powerRampingStep*;

TS 38.321 at 20-21 (Release 16.2) (highlighting added).

108. When sending the Random Access Preamble, the UE device will set the PREAMBLE_RECEIVED_TARGET_POWER based on the preambleInitial RecievedTargetPower(0) and powerRampingStep (0):

> 5.1.3 Random Access Preamble transmission
>
> The MAC entity shall, for each Random Access Preamble:
>
> ....
>
> 1> set *PREAMBLE_RECEIVED_TARGET_POWER* to *preambleReceivedTargetPower* + *DELTA_PREAMBLE* + (*PREAMBLE_POWER_RAMPING_COUNTER* – 1) × *PREAMBLE_POWER_RAMPING_STEP* + *POWER_OFFSET_2STEP_RA*;

TS 38.321 at 26 (Release 16.2) (highlighting added).

109. Within the Accused Devices and for the 2-step contention based random access procedure, the PREAMBLE_RECEIVED_TARGET_POWER is given based at least on a preambleInitialReceivedTargetPower (1) and a powerRampingStep (1). The parameters used for the 2-step RA procedure are provided in the IE called RACH-ConfigGenericTwoStepRA.

> – *RACH-ConfigGenericTwoStepRA*
>
> The IE *RACH-ConfigGenericTwoStepRA* is used to specify the 2-step random access type parameters.

TS 38.331 at 555-556 (Release 16.2) (highlighting added).

110. The RACH-ConfigGenericTwoStepRA IE includes a msgA-PreambleReceivedTargetPower-r16 entry and a msgA-PreamblePowerRampingStep-r16, corresponding to the preambleReceivedTargetPower(1) and powerRampingStep (1), respectively, as shown below:

***RACH-ConfigGenericTwoStepRA* information element**

```
-- ASN1START
-- TAG-RACH-CONFIGGENERICTWOSTEPRA-START

RACH-ConfigGenericTwoStepRA-r16 ::=     SEQUENCE {
    msgA-PRACH-ConfigurationIndex-r16       INTEGER (0..262)
    msgA-RO-FDM-r16                         ENUMERATED {one, two, four, eight}
    msgA-RO-FrequencyStart-r16                INTEGER (0..maxNrofPhysicalResourceBlocks-1)
    msgA-ZeroCorrelationZoneConfig-r16        INTEGER (0..15)
    msgA-PreamblePowerRampingStep-r16         ENUMERATED {dB0, dB2, dB4, dB6}
    msgA-PreambleReceivedTargetPower-r16      INTEGER (-202..-60)
    msgB-ResponseWindow-r16                   ENUMERATED {sl1, sl2, sl4, sl8, sl10, sl20, sl40, sl80

    preambleTransMax-r16                      ENUMERATED {n3, n4, n5, n6, n7, n8, n10, n20, n50, n10
    ...
}
```

TS 38.331 at 555-556 (Release 16.2) (highlighting added).

111. The 5G Standard explains that the msgA-PreambleReceivedTargetPower-r16 is the "target power level at the network receiver side," and msgA-PreamblePowerRampingStep-r16 is the "[p]ower ramping steps for msgA PRACH." TS 38.331 at 557. (Release 16.2)

112. At initialization, the PREAMBLE_POWER_RAMPING_STEP UE variable is set to RACH-ConfigGenericTwoStepRA.msgA-PreambleRecievedTargetPower-r16 for the 2-step random access procedure.

> **5.1.1a Initialization of variables specific to Random Access type**
>
> The MAC entity shall:
>
> 1> if *RA_TYPE* is set to *2-stepRA*:
>
> 2> set *PREAMBLE_POWER_RAMPING_STEP* to *msgA-PreamblePowerRampingStep*;

TS 38.321 at 20 (Release 16.2) (highlighting added).

113. In preparing to send the Random Access Preamble (MsgA), the UE will set the PREAMBLE_RECIEVED_TARGET_POWER based on the preambleInitial RecievedTargetPower(1) and powerRampingStep (1).

> **5.1.3a MSGA transmission**
>
> The MAC entity shall, for each MSGA:
>
> ....
>
> 1> set *PREAMBLE_RECEIVED_TARGET_POWER* to *msgA-PreambleReceivedTargetPower* + *DELTA_PREAMBLE* + (*PREAMBLE_POWER_RAMPING_COUNTER* – 1) × *PREAMBLE_POWER_RAMPING_STEP*;

TS 38.321 at 27 (Release 16.2) (highlighting added).

114. Because of its conformance with the applicable 5G standards for the MAC protocol (TS 38.321), Radio Resource Control (RRC) protocol (TS 38.331) and NR specification, on information and belief Apple directly infringes at least Claim 1 of the '207 patent.

115. In addition to direct infringement by making, using, and selling the Accused Devices, Apple also indirectly infringes the '207 patent claims. Apple has knowledge of the '207 Patent at least as of the filing and service of this Complaint and continues to make,

use, sell, and/or offer for sale the Accused Devices. Where acts constituting direct infringement of the '207 patent are not performed by Apple, such acts constituting direct infringement of the '207 patent are performed by Apple's customers or end-users who act at the direction and/or control of Apple, with Apple's knowledge.

116. Daingean is informed and believes, and on that basis alleges, that Apple indirectly infringes at least Claim 1 of the '207 patent by active inducement in violation of 35 U.S.C. § 271(b), by at least manufacturing, supplying, distributing, selling, and/or offering for sale the Accused Devices to its customers with the knowledge and intent that use of those products would constitute direct infringement of the '207 patent.

117. For example, Apple advertises to its customers that it sells products that comply with the 5G standards and affirmatively promotes the advantages of 5G support on its devices. *See supra* ¶ 24 (explaining the "impressive speeds" for 5G iPhones and "superfast speeds" for 5G iPads). Additionally, Apple helps its customers know whether their cellular carrier supports 5G.[29] "Following the introduction of 5G technology to Apple devices in 2020, Apple has helped expand and expedite 5G adoption across the country . . . ."[30] On information and belief, when an Apple customer with an Accused Device communicates with a 5G network, the customer's device will automatically implement the accused 5G functionality based upon the hardware and software provided in the Accused Devices.

118. Apple also indirectly infringes by contributing to the infringement of, and continuing to contribute to the infringement of, one or more claims of the '207 Patent under 35 U.S.C. § 271(c) and/or 271(f) by selling, offering for sale, and/or importing into the United States, the Accused Devices. Apple knows at least as of the date of the filing and

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[29] *See, e.g.*, https://support.apple.com/en-us/HT204039 (detailing carrier support for iPhones) (last visited 8/3/2023); https://support.apple.com/en-us/HT212278 (detailing carrier support for iPads) (last visited (8/3/2023).

[30] *See* https://www.apple.com/newsroom/2023/05/apple-announces-multibillion-dollar-deal-with-broadcom/ (last visited 8/3/2023).

service of this Complaint that the Accused Devices include hardware components and software instructions that work in concert to perform specific, intended functions. Such specific, intended functions, carried out by these hardware and software combinations, are a material part of the inventions of the '207 Patent and are not staple articles of commerce suitable for substantial non-infringing use.

119. The acts of infringement by Apple have caused damage to Plaintiff, and Plaintiff is entitled to recover from Defendant the damages sustained by Plaintiff as a result of Defendant's wrongful acts in an amount subject to proof at trial. The infringement of the '207 Patent by Apple has damaged and will continue to damage Plaintiff.

COUNT IV: INFRINGEMENT OF U.S. PATENT NO. 11,134,400

120. Daingean hereby incorporates and re-alleges paragraphs 1 through 119 as if fully set forth herein.

121. On September 28, 2021, the USPTO duly and legally issued United States Patent No. 11,134,400 (the "'400 Patent"), titled "User Equipment, Base Station, Related Methods."

122. Daingean holds all rights, title, and interest in and to the '400 Patent, including the right to bring this suit and recover all past, present, and future damages for infringement of the '400 Patent. Apple is not licensed to the '400 Patent, either expressly or implicitly, nor does it enjoy or benefit from any other rights in or to the '400 Patent whatsoever. As such, Apple's infringement described below has injured, and continues to injure, Daingean.

123. The inventions disclosed in the '400 Patent describe User Equipments (UE), base stations, and methods for use in each of UEs and base stations. In one claimed embodiment, a base station is a Master Cell group (MCG) base station communicating with UE over a MCG duplicated Signaling Radio bearer (SRB), which is associated with an MCG and a Secondary Cell group (SCG) and configured to be used for uplink transmission via the SCG. If an SCG failure is detected, the MCG duplicated SRB is reconfigured to be used for uplink transmission via the MCG. '400 Patent at 2:25-35. Configuring the base

station in this manner adds robustness to the cellular system and allows it to recover from an uplink failure more rapidly.

124. On information and belief, Apple has infringed directly and continues to infringe directly the '400 Patent through its manufacture, use, sale, importation, and/or offer for sale of the Accused Devices that are capable of supporting E-UTRAN and NR Dual Connectivity ("EN-DC") or Multi-Radio Dual Connectivity ("MR-DC") operations.

125. For example, the Accused Devices practice and/or are capable of practicing representative Claim 4 of the '400 Patent. The following paragraphs provide details regarding only one example of Apple's infringement, and only as to a single patent claim. Plaintiff reserves its right to provide greater detail and scope via its Infringement Contentions at the time required under this Court's scheduling order.

126. Claim 4 of the '400 Patent states:

> 4. User Equipment (UE), wherein the UE is configured with a first Master Cell Group (MCG) duplicated Signaling Radio Bearer (SRB) and a second MCG duplicated SRB, and the first MCG duplicated SRB is associated with an MCG and a Secondary Cell Group (SCG) and configured to be used for uplink transmission via the SCG, the UE comprising:
>
> a memory storing instructions; and
>
> a processor configured to execute the instructions to cause the UE to:
>
> detect an SCG failure;
>
> reconfigure the first MCG duplicated SRB to be used for uplink transmission via the MCG, or trigger an MCG failure; and
>
> reconfigure the second MCG duplicated SRB to be used for uplink transmission via the MCG.

'400 Patent at 16:61-17:9.

127. The Accused Devices include a UE "configured with a Master Cell Group (MCG) duplicated Signaling Radio Bearer (SRB) and a second MCG duplicated SRB," as claimed. The Accused Devices include UEs configured to operate within a 5G network

architecture. The following diagram illustrates how UEs interact with a an NG-RAN within a 5G (or NR) cellular network.[31]

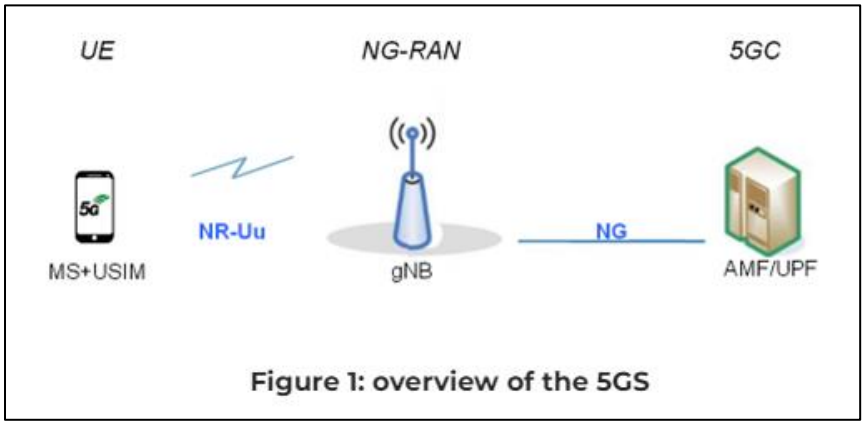

Figure 1: overview of the 5GS

128. On information and belief, the Accused Devices support Dual Connectivity (EN-DC or MR-DC). Aspects of Dual Connectivity are defined in various industry standards, including 3GPP TS 36.300 V16.7.0 (2021-12), titled "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall Description; Stage 2 (Release 16)"; 3GPP TS 37.340 V16.7.0 (2021-09), titled "Evolved Universal Terrestrial Radio Access (E-UTRA) and NR; Multi-Connectivity; Stage 2 (Release 16)"; and 3GPP TS 38.331 V16.7.0 (2021-12), titled "NR; Radio Resource Control (RRC) protocol specification (Release 16)."

129. Specifically, the Radio Protocol Architecture is defined in Section 4.9.2 of TS 36.300. In Dual Connectivity implementations, the radio protocol architecture used by a radio bearer depends upon the manner in which the bearer is set up. There are three bearer types: (i) MCG bearer; (ii) SCG bearer; and (iii) split bearer. Those three types of bearers are shown below in Figure 4.9.2-1:

[31] https://www.3gpp.org/technologies/5g-system-overview (last visited 8/4/2023)

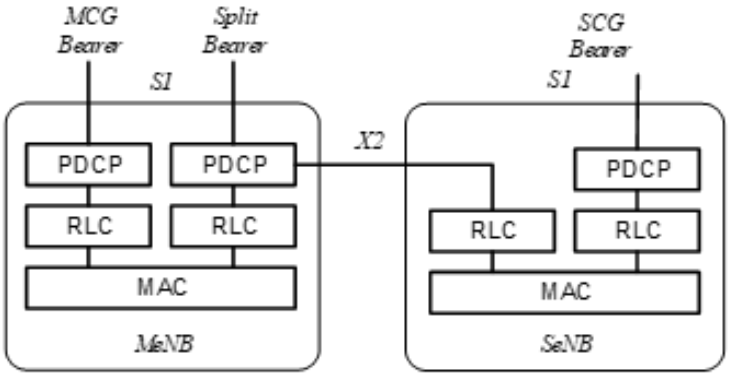

Figure 4.9.2-1: Radio Protocol Architecture for Dual Connectivity.

130. As provided in TS 36.300, "MCG Bearer" is defined as "in dual connectivity, a bearer whose radio protocols are only located in the MeNB to use the MeNB resources only." The term "MeNB" refers to the Master eNB. TS 36.300 further defines "SCG Bearer" as "in dual connectivity, a bearer whose radio protocols are only located in the SeNB to use SeNB resources." The term "SeNB" refers to the Secondary eNB, which "is providing additional radio resources for the UE but is not the Master eNB." Lastly, the term "Split Bearer" is defined as "in dual connectivity, a bearer whose radio protocols are located in both the MeNB and the SeNB to use both MeNB and SeNB resources."

> **Master Cell Group**: in dual connectivity, a group of serving cells associated with the MeNB, comprising of the PCell and optionally one or more SCells.
>
> **Master eNB**: in dual connectivity, the eNB which terminates at least S1-MME.
>
> **MBMS-dedicated cell**: cell dedicated to MBMS transmission.
>
> **MBMS/Unicast-mixed cell**: cell supporting both unicast and MBMS transmissions.
>
> **MCG bearer**: in dual connectivity, a bearer whose radio protocols are only located in the MeNB to use MeNB resources only.

> **SCG bearer**: in dual connectivity, a bearer whose radio protocols are only located in the SeNB to use SeNB resources.
>
> **Secondary Cell Group**: in dual connectivity, a group of serving cells associated with the SeNB, comprising of PSCell and optionally one or more SCells.
>
> **Secondary eNB**: in dual connectivity, the eNB that is providing additional radio resources for the UE but is not the Master eNB.

> **Split bearer**: in dual connectivity, a bearer whose radio protocols are located in both the MeNB and the SeNB to use both MeNB and SeNB resources.

TS 36.300, § 3.1.

131. Split Signaling Radio Bearer (SRB) is supported for all Multi-Radio Dual Connectivity (MR-DC) options. It allows duplication of Radio Resource Control (RRC) Packet Data Units (PDUs) generated by the Master Node (MN), via both a direct path and via the Secondary Node (SN). Split SRB uses New Radio (NR) Packet Data Convergence Protocol (PDCP). A split SRB is a duplicated SRB between the MCG and the SCG as shown in Figure 4.9.2-1, above. *See also* TS37.340 V16.8 (2021-12) (Release 16) at Sections 3.1 and 4.2.1

132. For the Accused Devices, "the first MCG duplicated SRB is associated with an MCG and a Secondary Cell Group (SCG) and configured to be used for uplink transmission via the SCG." The Accused Devices are configured for use with a split Signaling Radio Bearer (SRB), which enables transmission of Radio Resource Control (RRC) signaling via the MCG and/or SCG. MCG duplicated SRBs can be used for both SRB1 and SRB2, as detailed below:

> 4.2.2 Signalling radio bearers
>
> "Signalling Radio Bearers" (SRBs) are defined as Radio Bearers (RBs) that are used only for the transmission of RRC and NAS messages. More specifically, the following SRBs are defined:
>
> - SRB0 is for RRC messages using the CCCH logical channel;
> - SRB1 is for RRC messages (which may include a piggybacked NAS message) as well as for NAS messages prior to the establishment of SRB2, all using DCCH logical channel;
> - SRB2 is for NAS messages and for RRC messages which include logged measurement information, all using DCCH logical channel. SRB2 has a lower priority than SRB1 and may be configured by the network after AS security activation;
> - SRB3 is for specific RRC messages when UE is in (NG)EN-DC or NR-DC, all using DCCH logical channel;
> - SRB4 is for RRC messages which include application layer measurement report information, all using DCCH logical channel. SRB4 can only be configured by the network after AS security activation.
>
> In downlink, piggybacking of NAS messages is used only for one dependant (i.e. with joint success/failure) procedure: bearer establishment/modification/release. In uplink piggybacking of NAS message is used only for transferring the initial NAS message during connection setup and connection resume.
>
> NOTE 1: The NAS messages transferred via SRB2 are also contained in RRC messages, which however do not include any RRC protocol control information.
>
> Once AS security is activated, all RRC messages on SRB1, SRB2, SRB3 and SRB4, including those containing NAS messages, are integrity protected and ciphered by PDCP. NAS independently applies integrity protection and ciphering to the NAS messages, see TS 24.501 [23].
>
> Split SRB is supported for all the MR-DC options in both SRB1 and SRB2 (split SRB is not supported for SRB0 and SRB3).
>
> For operation with shared spectrum channel access, SRB0, SRB1 and SRB3 are assigned with the highest priority Channel Access Priority Class (CAPC), (i.e. CAPC = 1) while CAPC for SRB2 is configurable.

TS 38.331 V15.17.0 (2022-03), § 4.2.2 (highlighting added). Additionally, the split SRBs can be configured for uplink via the SCG. *See* TS 37.340 V16.7.0 (2021-09), § 7.6 ("For the split SRB, the selection of transmission path in downlink depends on network implementation. ***For uplink, the UE is configured via MN RRC signaling*** whether to use MCG path or ***duplicate the transmission on both MCG and SCG***." (emphasis added)).

133. Section 7.7 of the TS 37.340 Standard identifies the instances and manner in which Secondary Cell group (SCG) failures are handled. Specifically, this Standard provides that if SCG failure is detected by the UE, it "reports *SCGFailureInformation* to the Main Node (MN) instead of triggering re-establishment."

7.7 SCG/MCG failure handling

RLF is declared separately for the MCG and for the SCG.

The following SCG failure cases are supported:

- SCG RLF;
- SN addition/change failure;
- For EN-DC, NGEN-DC and NR-DC, SCG configuration failure or CPC configuration failure (only for messages on SRB3);
- For EN-DC, NGEN-DC and NR-DC, SCG RRC integrity check failure (on SRB3);
- For EN-DC, NGEN-DC and NR-DC, consistent UL LBT failure on PSCell;
- For IAB-MT, reception of a BH RLF indication from SCG;
- CPC execution failure.

Upon SCG failure, if MCG transmissions of radio bearers are not suspended, the UE suspends SCG transmissions for all radio bearers and reports the *SCGFailureInformation* to the MN, instead of triggering re-establishment. If SCG failure is detected while MCG transmissions for all radio bearers are suspended, the UE initiates the RRC connection re-establishment procedure.

TS 37.340, § 7.7 (highlighting added).

134. This same Section 7.7 of the TS 37.340 Standard also indicates that "The UE includes in the *SCGFailureInformation* message the measurement results available according to current measurement configuration of both the MN and the SN. The MN handles the *SCGFailureInformation* message and may decide to keep, change, or release the SN/SCG. In all the cases, the measurement results according to the SN configuration and the SCG failure type may be forwarded to the old SN and/or to the new SN."

135. The *SCGFailureInformation* message is described in the Standard, 3GPP TS 38.331 as a message to provide reconfiguration:

5.7.3 SCG failure information

5.7.3.1 General

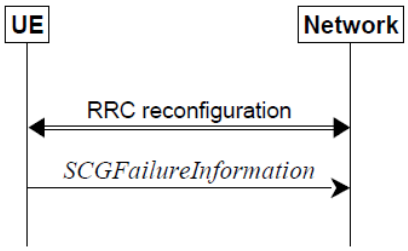

Figure 5.7.3.1-1: SCG failure information

The purpose of this procedure is to inform E-UTRAN or NR MN about an SCG failure the UE has experienced i.e. SCG radio link failure, failure of SCG reconfiguration with sync, SCG configuration failure for RRC message on SRB3, SCG integrity check failure, and consistent uplink LBT failures on PSCell for operation with shared spectrum channel access.

5.7.3.2 Initiation

A UE initiates the procedure to report SCG failures when neither MCG nor SCG transmission is suspended and when one of the following conditions is met:

1> upon detecting radio link failure for the SCG, in accordance with clause 5.3.10.3;

1> upon detecting beam failure of the PSCell while the SCG is deactivated, in accordance with TS 38.321[3];

1> upon reconfiguration with sync failure of the SCG, in accordance with clause 5.3.5.8.3;

1> upon SCG configuration failure, in accordance with clause 5.3.5.8.2;

1> upon integrity check failure indication from SCG lower layers concerning SRB3.

TS 38.331, § 5.7.3.

136. TS 38.331 indicates that if the UE is (NG)EN-DC, the UE will initiate transmission of the *SCGFailureInformation* message according to Section 5.7.3.5 unless it initiates transmission of the *SCGFailureInformationNR* message. Section 5.7.3.5 of TS 38.331 provides:

> 5.7.3.5 Actions related to transmission of *SCGFailureInformation* message
>
> The UE shall set the contents of the *SCGFailureInformation* message as follows:
>
> 1> if the UE initiates transmission of the *SCGFailureInformation* message due to T310 expiry:
>
> 2> set the *failureType* as *t310-Expiry*;
>
> 1> else if the UE initiates transmission of the *SCGFailureInformation* message due to T312 expiry:
>
> 2> set the *failureType* as *other* and set the *failureType-v1610* as *t312-Expiry*;
>
> 1> else if the UE initiates transmission of the *SCGFailureInformation* message to provide reconfiguration with sync failure information for an SCG:
>
> 2> set the *failureType* as *synchReconfigFailureSCG*;

TS 38.331, § 5.7.3.5 (highlighting added).

137. Similarly, if the failure type determination is for (NG)EN-DC and the failure message is *SCGFailureInformationNR*, then:

> 5.7.3.3 Failure type determination for (NG)EN-DC
>
> The UE shall set the SCG failure type as follows:
>
> 1> if the UE initiates transmission of the *SCGFailureInformationNR* message due to T310 expiry:
>
> 2> set the *failureType* as t310-Expiry;
>
> 1> else if the UE initiates transmission of the *SCGFailureInformationNR* message due to T312 expiry:
>
> 2> set the *failureType* as any value and set the *failureType-v1610* as t312-Expiry;
>
> 1> else if the UE initiates transmission of the *SCGFailureInformationNR* message to provide reconfiguration with sync failure information for an SCG:
>
> 2> set the *failureType* as *synchReconfigFailureSCG*;

TS 38.331, § 5.7.3.3 (highlighting added).

138. As TS 38.331 indicates, if the UE initiates transmission of *SCGFailureInformation* or *SCGFailureInformationNR* to provide reconfiguration, then the *failuretype* is set to *synchReconfiguFailureSCG*. Through these *SCGFailureInformation* messages, the UE provides the Master Node (MN) with information about the SCG failure for the purpose of causing a reconfiguration upon SCG sync failure, which would involve reconfiguration of duplicated or split radio bearers SRB1 and/or SRB2 to receive uplink transmission via the MCG. *See* TS 38.331, § 5.3.5.

139. Because of its conformance with the applicable 5G standards discussed above, on information and belief, Apple's Accused Devices directly infringe at least Claim 4 of the '400 patent.

140. In addition to direct infringement by making, using, and selling the Accused Devices, Apple also indirectly infringes the '400 patent claims. Apple has knowledge of the '400 Patent at least as of the filing and service of this Complaint and continues to make, use, sell, and/or offer for sale the Accused Devices. Where acts constituting direct infringement of the '400 patent are not performed by Apple, such acts constituting direct infringement of the '400 patent are performed by Apple's customers or end-users who act at the direction and/or control of Apple, with Apple's knowledge.

141. Daingean is informed and believes, and on that basis alleges, that Apple indirectly infringes at least Claim 4 of the '400 patent by active inducement in violation of 35 U.S.C. § 271(b), by at least manufacturing, supplying, distributing, selling, and/or offering for sale the Accused Devices to its customers with the knowledge and intent that use of those products would constitute direct infringement of the '400 patent.

142. For example, Apple advertises to its customers that it sells products that comply with the 5G standards and affirmatively promotes the advantages of 5G support on its devices. *See supra* ¶ 24 (explaining the "impressive speeds" for 5G iPhones and "superfast speeds" for 5G iPads). Additionally, Apple helps its customers know whether their cellular carrier supports 5G.[32] "Following the introduction of 5G technology to Apple devices in 2020, Apple has helped expand and expedite 5G adoption across the country . . . ."[33] On information and belief, when an Apple customer with an Accused Device communicates with a 5G network, the customer's device will automatically

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[32] *See, e.g.*, https://support.apple.com/en-us/HT204039 (detailing carrier support for iPhones) (last visited 8/3/2023); https://support.apple.com/en-us/HT212278 (detailing carrier support for iPads) (last visited (8/3/2023).

[33] *See* https://www.apple.com/newsroom/2023/05/apple-announces-multibillion-dollar-deal-with-broadcom/ (last visited 8/3/2023).

implement the accused 5G functionality based upon the hardware and software provided in the Accused Devices.

143. Apple also indirectly infringes by contributing to the infringement of, and continuing to contribute to the infringement of, one or more claims of the '400 patent under 35 U.S.C. § 271(c) and/or 271(f) by selling, offering for sale, and/or importing into the United States, the Accused Devices. Apple knows at least as of the date of the filing and service of this Complaint that the Accused Devices include hardware components and software instructions that work in concert to perform specific, intended functions. Such specific, intended functions, carried out by these hardware and software combinations, are a material part of the inventions of the '400 patent and are not staple articles of commerce suitable for substantial non-infringing use.

144. The acts of infringement by Apple have caused damage to Plaintiff, and Plaintiff is entitled to recover from Defendant the damages sustained by Plaintiff as a result of Defendant's wrongful acts in an amount subject to proof at trial. The infringement of the '400 Patent by Apple has damaged and will continue to damage Plaintiff.

COUNT V: INFRINGEMENT OF U.S. PATENT NO. 11,196,509

145. Daingean hereby incorporates and re-alleges paragraphs 1 through 144 as if fully set forth herein.

146. On December 7, 2021, the USPTO duly and legally issued United States Patent No. 11,196,509 (the "'509 Patent"), titled "Terminal, Apparatus, Base Station Apparatus, and Communication Method."

147. Daingean holds all rights, title, and interest in and to the '509 Patent, including the right to bring this suit and recover all past, present, and future damages for infringement of the '509 Patent. Apple is not licensed to the '509 Patent, either expressly or implicitly, nor does it enjoy or benefit from any other rights in or to the '509 Patent whatsoever. As such, Apple's infringement described below has injured, and continues to injure, Daingean.

148. The inventions disclosed in the '509 Patent describe base stations "capable of efficiently performing uplink and/or downlink communication." '509 Patent at 1:53-61,

5:48-51. More specifically, the '509 Patent teaches subdividing a Transport Block ("TB") into multiple Code Blocks ("CB") and then grouping those CBs into Code Block Groups ("CBGs"). *Id.* at 1:66-2:17. The CBs and CBGs can be of different sizes. *Id.* This subdividing and grouping process allows the Hybrid Automatic Repeat Request ("HARQ") procedure to be performed on a more granular basis. *Id.* Instead of performing HARQ on an entire TB basis (*e.g.*, sending a NACK signal corresponding to the entire TB that requires retransmitting the entire TB when just a single CBG within that TB is not properly received), the '509 Patent granular HARQ approach permits performing HARQ on a CBG basis (*e.g.*, sending a NACK signal with a bit corresponding each CBG so that when just one CBG is not properly received, only that CBG is retransmitted). *Id.*; *see also id.* at 35:40-62.

149. Annotated Figure 11b of the '509 Patent illustrates a preferred embodiment. *See* '509 Patent at 23:7-12, 22-25. The TB is subdivided into 11 CBs (CB#1 to CB#11), and those CBs are grouped into four CBGs (CBG#1 to CBG#4). *Id*. The CBs have two different sizes: a first CB size, colored white ("First CB") and a second CB size, colored black ("Second CB"). *Id*. And the CBGs also have different sizes: CBGs#1-3 have a first size with three CBs each, blue box ("First CBGs"), while CBG#4 has a second size with only two CBs, red box ("Second CBGs"). *Id*. Of the First CBGs, CBG#1 has the most Second CBs.

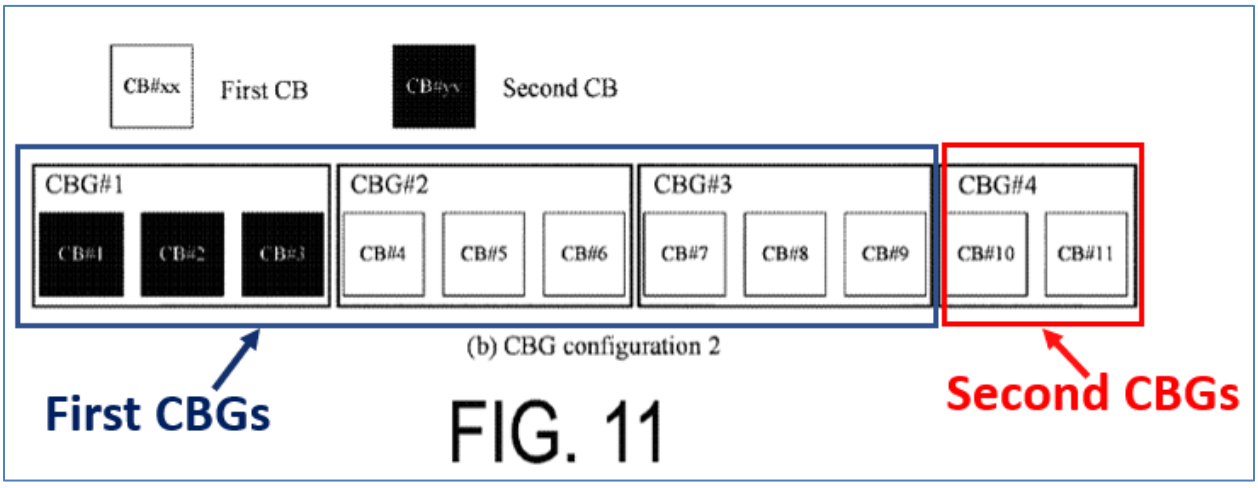

FIG. 11

150. On information and belief, Apple has infringed directly and continues to infringe directly the '509 Patent through its manufacture, use, sale, importation, and/or offer for sale of Accused Devices that implement the 5G Code Block Segmentation and CBG-based HARQ-ACK functionality, as described in 3GPP 5G standards such as TS 38.212 (Multiplexing and channel coding), 3GPP TS 38.213 (Physical layer procedures for control), 3GPP TS 38.214 (Physical layer procedures for data), and 3GPP TS 38.331 (Radio Resource Control Protocol).

151. For example, the Accused Devices practice and/or are capable of practicing representative Claim 1 of the '509 Patent. The following paragraphs provide details regarding only one example of Apple's infringement, and only as to a single patent claim. Plaintiff reserves its right to provide greater detail and scope via its Infringement Contentions at the time required under this Court's scheduling order.

152. Claim 1 of the '509 Patent states:

> 1. A terminal apparatus comprising:
> a receiver configured to receive a transport block;
> a decoding unit configured to decode multiple CBs included in the transport block; and
> a transmitter configured to transmit HARQ-ACKs corresponding to multiple CBGs, wherein
> the multiple CBs include one or more first CBs and one or more second CBs,
> a first size of a first CB of the one or more first CBs is greater than a second size of a second CB of the one or more second CBs,
> each of the multiple CBs is included in any one of the multiple CBGs,
> the multiple CBGs include one or more first CBGs and one or more second CBGs,
> a first total number of the one or more first CBs and the one or more second CBs included in each of the one or more first CBGs is greater than a second total number of the one or more first CBs and the one or more second CBs included in each of the one or more second CBGs, and
> a first CBG of the one or more first CBGs includes a greatest number of the one or more second CBs.

'509 Patent at 46:64-47:19.

153. 3GPP TS 38.212 generally "specifies the coding, multiplexing and mapping to physical channels for 5G NR." 3GPP TS 38.212 at § 1. Clause 7.2.3 of 3GPP TS 38.212 generally explains the code block segmentation for 5G NR. As shown below, the 5G transport block includes *B* bits, and its code blocks are segmented according to the algorithm in clause 5.2.2 of 3GPP TS 38.212:

> **7.2.3 Code block segmentation and code block CRC attachment**
>
> The bits input to the code block segmentation are denoted by $b_0, b_1, b_2, b_3, \ldots, b_{B-1}$ where B is the number of bits in the transport block (including CRC).
>
> Code block segmentation and code block CRC attachment are performed according to Clause 5.2.2.

3GPP TS 38.212 at § 7.2.3. Specifically, clause 5.2.2 of 3GPP TS 38.212 details how to determine the total number of code blocks *C* within a transport block:

> Total number of code blocks C is determined by:
>
> if $B \le K_{cb}$
>
> $L = 0$
>
> Number of code blocks: $C = 1$
>
> $B' = B$
>
> else
>
> $L = 24$
>
> Number of code blocks: $C = \lceil B/(K_{cb} - L) \rceil$.
>
> $B' = B + C \cdot L$
>
> end if

3GPP TS 38.212 at § 5.2.2.

154. Clause 7.2.4 of 3GPP TS 38.212 explains how those code blocks are coded:

> **7.2.4 Channel coding**
>
> Code blocks are delivered to the channel coding block. The bits in a code block are denoted by $c_{r0}, c_{r1}, c_{r2}, c_{r3}, \ldots, c_{r(K_r-1)}$, where r is the code block number, and K_r is the number of bits in code block number r. The total number of code blocks is denoted by C and each code block is individually LDPC encoded according to Clause 5.3.2.
>
> After encoding the bits are denoted by $d_{r0}, d_{r1}, d_{r2}, d_{r3}, \ldots, d_{r(N_r-1)}$, where the values of N_r is given in Clause 5.3.2.

3GPP TS 38.212 at § 7.2.4.

155. Clause 5.1.7 of 3GPP TS 38.214 explains how those code blocks are grouped into code block groups:

> **5.1.7.1 UE procedure for grouping of code blocks to code block groups**
>
> If a UE is configured to receive code block group (CBG) based transmissions by receiving the higher layer parameter *codeBlockGroupTransmission* for PDSCH, the UE shall determine the number of CBGs for a transport block reception as
>
> $$M = \min(N, C),$$
>
> where N is the maximum number of CBGs per transport block as configured by *maxCodeBlockGroupsPerTransportBlock* for PDSCH, and C is the number of code blocks in the transport block according to the procedure defined in Clause 7.2.3 of [5, TS 38.212].
>
> Define $M_1 = \mathrm{mod}(C, M)$, $K_1 = \left\lceil \frac{C}{M} \right\rceil$, and $K_2 = \left\lfloor \frac{C}{M} \right\rfloor$.
>
> If $M_1 > 0$, CBG m, $m = 0,1,\ldots,M_1 - 1$, consists of code blocks with indices $m \cdot K_1 + k, k = 0,1,\ldots,K_1 - 1$. CBG m, $m = M_1, M_1 + 1,\ldots,M - 1$, consists of code blocks with indices $M_1 \cdot K_1 + (m - M_1) \cdot K_2 + k, k = 0,1,\ldots,K_2 - 1$.

3GPP TS 38.214 at § 5.1.7.1.

156. Finally, clause 9.1.1 of 3GPP TS 38.213 explains the CBG-based HARQ-ACK procedure:

> **9.1.1 CBG-based HARQ-ACK codebook determination**
>
> If a UE is provided *PDSCH-CodeBlockGroupTransmission* for a serving cell, the UE receives a PDSCH scheduled by DCI format 1_1, that includes code block groups (CBGs) of a transport block. The UE is also provided *maxCodeBlockGroupsPerTransportBlock* indicating a maximum number $N_{\text{HARQ-ACK}}^{\text{CBG/TB, max}}$ of CBGs for generating respective HARQ-ACK information bits for a transport block reception for the serving cell.
>
> For a number of C code blocks (CBs) in a transport block, the UE determines a number of CBGs M according to clause 5.1.7.1 of [6, TS 38.214] and determines a number of HARQ-ACK bits for the transport block as $N_{\text{HARQ-ACK}}^{\text{CBG/TB}} = M$.
>
> The UE generates an ACK for the HARQ-ACK information bit of a CBG if the UE correctly received all code blocks of the CBG and generates a NACK for the HARQ-ACK information bit of a CBG if the UE incorrectly received at least one code block of the CBG. If the UE receives two transport blocks, the UE concatenates the HARQ-ACK information bits for CBGs of the second transport block after the HARQ-ACK information bits for CBGs of the first transport block.
>
> The HARQ-ACK codebook includes the $N_{\text{HARQ-ACK}}^{\text{CBG/TB, max}}$ HARQ-ACK information bits and, if $N_{\text{HARQ-ACK}}^{\text{CBG/TB}} < N_{\text{HARQ-ACK}}^{\text{CBG/TB,max}}$ for a transport block, the UE generates a NACK value for the last $N_{\text{HARQ-ACK}}^{\text{CBG/TB,max}} - N_{\text{HARQ-ACK}}^{\text{CBG/TB}}$ HARQ-ACK information bits for the transport block in the HARQ-ACK codebook.
>
> If the UE generates a HARQ-ACK codebook in response to a retransmission of a transport block, corresponding to a same HARQ process as a previous transmission of the transport block, the UE generates an ACK for each CBG that the UE correctly decoded in a previous transmission of the transport block.
>
> If a UE correctly detects each of the $N_{\text{HARQ-ACK}}^{\text{CBG/TB}}$ CBGs and does not correctly detect the transport block for the $N_{\text{HARQ-ACK}}^{\text{CBG/TB}}$ CBGs, the UE generates a NACK value for each of the $N_{\text{HARQ-ACK}}^{\text{CBG/TB}}$ CBGs.

3GPP TS 38.213 at § 9.1.1.

157. As shown above, the Accused Devices receive transport blocks and decode those transport blocks into multiple code blocks ("CB") of different sizes that are grouped into code block groups ("CBG") of different sizes. Thus, the 3GPP segmentation and coding algorithms described above "decode multiple CBs included in the transport block" as claimed. *See* 3GPP TS 38.212 at §§ 7.2.3, 7.2.4, 5.2.

158. Further, the 3GPP segmentation and coding algorithm described above provides that "the multiple CBs include one or more first CBs and one or more second CBs" and "a first size of a first CB of the one or more first CBs is greater than a second size of a second CB of the one or more second CBs," as claimed. *See* 3GPP TS 38.212 at §§ 7.2.3, 7.2.4, 5.2.

159. Further, the 3GPP segmentation and coding algorithm described above ensures that "each of the multiple CBs is included in any one of the multiple CBGs" and "the multiple CBGs include one or more first CBGs and one or more second CBGs," as claimed. *See* 3GPP TS 38.212 at §§ 7.2.3, 7.2.4, 5.2; 3GPP TS 38.214 at § 5.1.7.1.

160. Further, the 3GPP segmentation and coding algorithm described above confirms that "a first total number of the one or more first CBs and the one or more second CBs included in each of the one or more first CBGs is greater than a second total number of the one or more first CBs and the one or more second CBs included in each of the one or more second CBGs" and "a first CBG of the one or more first CBGs includes a greatest number of the one or more second CBs," as claimed. *See* 3GPP TS 38.212 at §§ 7.2.3, 7.2.4, 5.2; 3GPP TS 38.214 at § 5.1.7.1.

161. Finally, the 3GPP CBG-based HAR-ACK algorithm described above shows that, after the Accused Devices "receive a transport block," that UE will "transmit HARQ-ACKs corresponding to multiple CBGs," as claimed. *See* 3GPP TS 38.213 at § 9.1.1.

162. Because of the Accused Devices' conformance with the applicable 5G standards, on information and belief Apple directly infringes at least Claim 1 of the '509 patent.

163. In addition to direct infringement by making, using, and selling the Accused Devices, Apple also indirectly infringes the '509 patent claims. Apple has knowledge of the '509 Patent at least as of the filing and service of this Complaint and continues to make, use, sell, and/or offer for sale the Accused Devices. Where acts constituting direct infringement of the '509 patent are not performed by Apple, such acts constituting direct infringement of the '509 patent are performed by Apple's customers or end-users who act at the direction and/or control of Apple, with Apple's knowledge.

164. Daingean is informed and believes, and on that basis alleges, that Apple indirectly infringes at least Claim 1 of the '509 patent by active inducement in violation of 35 U.S.C. § 271(b), by at least manufacturing, supplying, distributing, selling, and/or offering for sale the Accused Devices to its customers with the knowledge and intent that use of those products would constitute direct infringement of the '509 patent.

165. For example, Apple advertises to its customers that it sells products that comply with the 5G standards and affirmatively promotes the advantages of 5G support on its devices. *See supra* ¶ 24 (explaining the "impressive speeds" for 5G iPhones and "superfast speeds" for 5G iPads). Additionally, Apple helps its customers know whether their cellular carrier supports 5G.[34] "Following the introduction of 5G technology to Apple devices in 2020, Apple has helped expand and expedite 5G adoption across the country . . . ."[35] On information and belief, when an Apple customer with an Accused Device communicates with a 5G network, the customer's device will automatically implement the accused 5G functionality based upon the hardware and software provided in the Accused Devices.

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[34] *See, e.g.*, https://support.apple.com/en-us/HT204039 (detailing carrier support for iPhones) (last visited Aug. 3, 2023); https://support.apple.com/en-us/HT212278 (detailing carrier support for iPads) (last visited Aug. 3, 2023).

[35] *See* https://www.apple.com/newsroom/2023/05/apple-announces-multibillion-dollar-deal-with-broadcom/ (last visited Aug. 3, 2023).

166. Apple also indirectly infringes by contributing to the infringement of, and continuing to contribute to the infringement of, one or more claims of the '509 Patent under 35 U.S.C. § 271(c) and/or 271(f) by selling, offering for sale, and/or importing into the United States, the Accused Devices. Apple knows at least as of the date of the filing and service of this Complaint that the Accused Devices include hardware components and software instructions that work in concert to perform specific, intended functions. Such specific, intended functions, carried out by these hardware and software combinations, are a material part of the inventions of the '509 Patent and are not staple articles of commerce suitable for substantial non-infringing use.

167. The acts of infringement by Apple have caused damage to Plaintiff, and Plaintiff is entitled to recover from Defendant the damages sustained by Plaintiff as a result of Defendant's wrongful acts in an amount subject to proof at trial. The infringement of the '509 Patent by Apple has damaged and will continue to damage Plaintiff.

JURY DEMAND

168. Plaintiff hereby demands a trial by jury on all issues.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff prays for the following relief:

169. A judgment in favor of Plaintiff that Apple has infringed and is infringing one or more claims of the '976 Patent, either literally or under the doctrine of equivalents;

170. A judgment in favor of Plaintiff that Apple has infringed and is infringing one or more claims of the '958 Patent, either literally or under the doctrine of equivalents;

171. A judgment in favor of Plaintiff that Apple has infringed and is infringing one or more claims of the '207 Patent, either literally or under the doctrine of equivalents;

172. A judgment in favor of Plaintiff that Apple has infringed and is infringing one or more claims of the '400 Patent, either literally or under the doctrine of equivalents;

173. A judgment in favor of Plaintiff that Apple has infringed and is infringing one or more claims of the '509 Patent, either literally or under the doctrine of equivalents;

174. An award of damages pursuant to 35 U.S.C. §§ 284, 285, 286, and 287 adequate to compensate Daingean for Apple's infringement of the Asserted Patents in an amount according to proof at trial (together with prejudgment and post-judgment interest), but no less than a reasonable royalty, including but not limited to a post-judgment running royalty in lieu of a permanent injunction;

175. A judgment that Apple's infringement has been willful since at least the filing of this Complaint and enhancing damages pursuant to 35 U.S.C. § 284;

176. An award of costs and expenses pursuant to 35 U.S.C. § 284 or as otherwise permitted by law;

177. An award of attorneys' fees pursuant to 35 U.S.C. § 285 or as otherwise permitted by law; and

178. Such other and further relief, whether legal, equitable, or otherwise, to which Plaintiff may be entitled or which this Court may order.

Dated: August 24, 2023

Respectfully submitted,

/s/ Jennifer M. French

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**pro hac vice* application forthcoming

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