**3GPP TSG RAN Meeting #109 RP-252814**

**Beijing, China, September 15-18, 2025 (revision of RP-252804)**

**Agenda Item: 8.2.1.4**

**Source: Moderator (CMCC)**

**Title:** **Moderator's summary for RAN led 6G SI: Requirements of new and existing services**

**Document for: Report**

1. **Overview**

There are total 63 contributions submitted under agenda 8.2.1.4 before deadline (3rd Sep.). In following table, the contributions are summarized per topics.

|  |  |  |
| --- | --- | --- |
| Topic | Tdoc | Company |
| Massive Communication | RP-252656  （REVISION OF RP-251951） | Ericsson, AT&T, BT, CHTTL, Deutsche Telekom, FirstNet, Fujitsu, Intel Corporation, KDDI, KT Corp., NTT DOCOMO, OPPO, Semtech, Sequans, SK Telecom, Sony, Spark NZ, Telstra, Thales, T-Mobile USA, Verizon, Vodafone, Bell Mobility, LG Electronics |
| RP-251959 | Samsung |
| RP-251969 | Guangdong OPPO Mobile Telecom. |
| RP-251996 | NTT DOCOMO, INC. |
| RP-252005 | vivo |
| RP-252095 | CMCC |
| RP-252136 | Huawei, HiSilicon |
| RP-252142 | CATT |
| RP-252182 | Qualcomm Incorporated |
| RP-252197 | Xiaomi |
| RP-252316 | Intel Corporation |
| RP-252327 | AT&T, Ericsson, FirstNet, KT Corp., MediaTek Inc., Nokia, Nordic Semi, NTT DOCOMO, Qualcomm, Rakuten, Sequans, Spark NZ, SONY, T-Mobile USA, Verizon |
| Sensing | RP-251989 | T-Mobile USA Inc. Ericsson, Nokia, AT&T, SK Telecom |
| RP-252063 | SK Telecom |
| RP-252028 | ZTE Corporation, Turk Telekom, Verizon, China Telecom, China Unicom, Telecom Italia, CAICT, ETRI, Queens University Belfast, Pengcheng Laboratory, Shanghai Jiao Tong University, Sanechips, CATT |
| RP-252096 | CMCC |
| RP-252133 | Huawei, HiSilicon, CAICT, China Telcom, China Unicom, KT Corp., LG Uplus, SK Telecom |
| RP-252174 | MediaTek Inc. |
| RP-252203 | Xiaomi, Panasonic |
| RP-252221 | Apple |
| RP-252316 | Intel Corporation |
| RP-252006 | vivo |
| Aerial | RP-252660 (REVISION OF RP-251948) | Ericsson, AT&T, BDBOS, CATT, CHTTL, China Telecom, CMCC, Erillisverkot, FirstNet, Fujitsu, Intel, KDDI, KT Corp., Motorola Solutions, NIST, Nkom, NTT DOCOMO, Softil, Spark, Spreadtrum, SyncTechno Inc, Telstra, Thales, The Netherlands Police, Verizon, Voda |
| RP-251996 | NTT DOCOMO, INC. |
| RP-252101 | CMCC |
| RP-252316 | Intel Corporation |
| NTN | RP-251949 | Ericsson, CHTTL, CMCC, ESA, FirstNet, KT Corp., Nokia, T-Mobile USA, Telstra |
| RP-251969 | Guangdong OPPO Mobile Telecom. |
| RP-251982 | Thales, ESA, Airbus DS, Fraunhofer IIS, Fraunhofer HHI, Eutelsat, Iridium, Gatehouse Satcom, TNO, Novamint, ST Engineering iDirect |
| RP-252063 | SK Telecom |
| RP-252100 | CMCC |
| RP-252134 | Huawei, HiSilicon |
| RP-252162 | KT Corp., Thales, Iridium |
| RP-252182 | Qualcomm Incorporated |
| RP-252319 | Rakuten Mobile, Inc |
| Ease of operation and Self Organization | RP-251996 | NTT DOCOMO, INC. |
| RP-252212 | Deutsche Telekom, Vodafone, Orange, Telecom Italia, Turkcell, Spark NZ, Odido, BT, Bouygues Telecom, Telefonica, Telia Company, KPN, Rakuten Mobile, CK Hutchison, Telstra, Telenor, KDDI |
| RP-252225 | Ericsson, NTT DOCOMO, CHTTL, China Unicom, T-Mobile USA, Deutsche Telekom |
| Network sharing | RP-252211 | Deutsche Telekom, Vodafone, Orange, Telecom Italia Turkcell, Spark NZ, KT Corp., Odido, BT, SK Telecom, Bouygues Telecom, Telefonica, Telia Company, KPN, Rakuten Mobile, CK Hutchison, Telenor, KDDI |
| Resilience | RP-251946 | Ericsson, BDBOS, Deutsche Telekom, Erillisverkot, FirstNet, Motorola Solutions, Nkom, Nokia, Softil, SyncTechno Inc, Telstra, Thales, The Netherlands Police, T-Mobile USA, Verizon |
| AI | RP-251984 | T-Mobile USA Inc. Ericsson, Nokia, Sk Telecom, Telstra |
| RP-251985 | T-Mobile USA Inc. Ericsson, Nokia, SK Telecom, Telstra |
| RP-252063 | SK Telecom |
| RP-252098 | CMCC |
| RP-252099 | CMCC |
| RP-252132 | Huawei, HiSilicon, CAICT, CMCC, China Unicom |
| RP-252196 | Xiaomi |
| RP-252221 | Apple |
| RP-252316 | Intel Corporation |
| RP-252326 | AT&T, Ericsson |
| Critical Communication service | RP-252669 (REVISION OF RP-251950) | Ericsson, AT&T, BDBOS, DISA, Erillisverkot, FirstNet, Motorola Solutions, NIST, Nkom, Softil, SyncTechno Inc, Telstra, The Netherlands Police, T-Mobile USA |
| RP-252316 | Intel Corporation |
| Observability | RP-252227 | Ericsson, NTT DOCOMO, SK Telecom, CHTTL, Nokia, T-Mobile USA, Verizon, China Unicom, Deutsche Telekom, AT&T |
| Time Critical Communication | RP-251947 | Ericsson, AT&T, CMCC, FirstNet, T-Mobile USA, Telstra, Verizon |
| voice | RP-251969 | Guangdong OPPO Mobile Telecom. |
| RP-252097 | CMCC |
| RP-252206 | T-Mobile USA Inc., AT&T, Ericsson, Nokia |
| Service Aware | RP-251986 | T-Mobile USA Inc. Ericsson, Nokia, AT&T, Telstra, Verizon |
| Vehicular | RP-252176 | ROBERT BOSCH GmbH, Toyota ITC, BMW AG, Volkswagen AG, Continental Automotive, Fraunhofer IIS |
| data collection for sensing and AI (to be merged with sensing/AI) | RP-252031 | ZTE Corporation, Sanechips |
| RP-252146 | CATT, CICTCI |
| RP-252154 | Spreadtrum, UNISOC |
| RP-252204 | Samsung, NTT DOCOMO INC. |
| immersive communication | RP-252131 | Huawei, HiSilicon |
| RP-252182 | Qualcomm Incorporated |
| RP-252221 | Apple |
| RP-252230 | Meta USA |
| RP-252231 | Meta USA |
| RP-252316 | Intel Corporation |
| FWA | RP-251983 | T-Mobile USA Inc. Ericsson, Nokia |
| RP-252316 | Intel Corporation |
| Positioning | RP-251996 | NTT DOCOMO, INC. |
| RP-252182 | Qualcomm Incorporated |
| RP-252316 | Intel Corporation |
| Unlicensed | RP-251992 | T-Mobile USA Inc. Nokia |
| Slicing | RP-251996 | NTT DOCOMO, INC. |
| HRLLC | RP-251996 | NTT DOCOMO, INC. |
| NDT | RP-252102 | CMCC |
| asymmetric UL/DL services | RP-252179 | Pengcheng Laboratory |

1. **Massive Communication**

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| --- | --- | --- |
| **Tdoc** | **Company** | **Proposal** |
| **[RP-252656（REVISION OF RP-251951）](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-251951.zip)** | Ericsson, AT&T, BT, CHTTL, Deutsche Telekom, FirstNet, Fujitsu, Intel Corporation, KDDI, KT Corp., NTT DOCOMO, OPPO, Semtech, Sequans, SK Telecom, Sony, Spark NZ, Telstra, Thales, T-Mobile USA, Verizon, Vodafone, Bell Mobility, LG Electronics | 5.4.x Minimum requirements for Massive Communication  The 6GR and 6G RAN architecture shall support the following minimum requirements for Massive Communication:   * Massive Communication shall be supported in FR1. * The minimum number of UE receive antennas is 1. * The minimum PHY peak data rate is [5~10] Mbps in DL and [5~10] Mbps in UL. * The required UE bandwidth for the lowest-tier UE is [3-5] MHz at least for FDD bands. The UE can support operation in a carrier bandwidth different from the UE bandwidth. * Half-duplex FDD operation is supported. * Capabilities of devices for massive communication shall be signaled to the 6G RAN. * UE energy efficiency and coverage targets are FFS. * Coexistence with NB-IoT (all deployment modes) and eMTC shall be ensured. |
| [**RP-251959**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-251959.zip) | Samsung | **5.4.x Device type and UE capability signalling**  To avoid unnecessary fragmentation in device implementations while allowing implementation of different functionalities depending on the market need, 6G Radio shall define   * a set of device types with a corresponding set of capabilities (e.g., smartphone, FWA, wearable, IoT); and * UE capability signalling for each device type.   5.4.y UE bandwidth  6G Radio shall define 5, 20, and 50 MHz as the UE minimum channel bandwidth for FR1, the frequency range between FR1 and FR2-1, and FR2-1, respectively and 3, 6, 12, and 24 MHz as the SSB bandwidth for 15, 30, 60, and 120 kHz SCS.  For 6G IoT device, the UE maximum RF channel bandwidth shall be 20 MHz and the UE minimum BB bandwidth shall be 5 MHz.  5.4.z Minimum number of UE RX antennas  6G Radio shall be designed assuming the existence of UEs with one RX antenna for cost reduction of IoT devices. Means for minimizing the impact on the overall system performance has to be considered. |
| [**RP-251969**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-251969.zip) | Guangdong OPPO Mobile Telecom. | **Proposal 1 The 6G RAN shall support eMBB types of services like voice, data, and cellular IoT with high priority and better CAPEX and OPEX control mechanisms.** |
| [**RP-251996**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-251996.zip) | NTT DOCOMO, INC. | **5.4.u IoT**  6G RAT shall support IoT service fulfilling following requirements:  - common framework between eMBB and IoT, which is scalable for various targets;  - the maximum supported UE RF bandwidth should be [3~5] MHz, at least for low FR1 bands with 15kHz SCS;  - the minimum PHY peak data rate should be [1~5] Mbps in DL and UL;  - single antenna/layer for 6G IoT UE should be considered for the minimum number of antenna/MIMO layer;  - at least half-duplex FDD should be considered for duplex scheme;  - the target coverage should be at least equivalent to that for non-IoT UE; |
| [**RP-252005**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-252005.zip) | vivo | **5.4.x Massive Communication**  The 6GR shall support the following minimum requirements for Massive Communication:   * Massive communication shall be supported at least in FR1 (including around 7GHz) * Maximum UE bandwidth is 20MHz for both TDD and FDD bands. The UE can operate in a network with smaller channel bandwidth (e.g. around 3~5MHz). * UE data rate is [5~10Mbps] for UL and DL * The number of UE antennas is 1T1R or 1T2R * A UE supports either Half-duplex or full duplex FDD * The target coverage is [154dB MCL] with data rate [no less than 1kbps]. * Long battery life is supported. |
| [**RP-252095**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-252095.zip) | CMCC | 5.4.x Minimum requirements for Massive Communication  The 6GR and 6G RAN architecture shall support the following minimum requirements for Massive Communication:  - Massive Communication shall be supported in FR1. UE half-duplex FDD operation is supported in FDD band at least for the lowest-tier UE.  - The minimum number of UE receive antennas is 1.  - The required UE bandwidth for the lowest-tier UE is [5] MHz. The UE can support operation in a carrier bandwidth different from the UE bandwidth.  - The minimum PHY peak data rate is [1~2] Mbps in DL and [1~2] Mbps in UL.  - Battery-life of [10] years is supported at least for the lowest-tier UE, with the traffic model of e.g. hour-level periodical report.  - Coverage enhancement of [10] dB is supported at least for the lowest-tier UE, comparing to immersive communication.  - The end-to-end latency is relaxed to e.g. [10] seconds for the lowest-tier UE.  - Handover is supported by all the 6GR UEs for voice communication. |
| [**RP-252119**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-252119.zip) | Sony Europe Limited, Nordic Semiconductor ASA | The 6GR and 6G RAN architecture shall support the following minimum requirements for massive Communication:   * The minimum number of UE receive antennas shall be 1, at least for FR1 bands. * The supported UE channel bandwidth shall be 3 MHz, at least for low FR1 bands. * Half-duplex FDD operation shall be supported. * Support global operation in multiple bands with minimum incremental device complexity, e.g., device with single stock-keeping unit (SKU) design. * The coexistence between 4G IoT and 6G shall be supported. |
| [**RP-252136**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-252136.zip) | Huawei, HiSilicon | ***Proposal 1: Multiple device types shall be studied in 6G, addressing requirements from both existing and emerging services:***   * ***IoT*** * ***eMBB*** * ***new services, e.g., AI agents, collaborative robots with higher performance requirements***   ***Proposal 2: Capabilities for each device type shall be studied with consideration on whether form-factor limitation applies.***  ***Proposal 3: 6G IoT devices support 20 MHz in maximum as the channel bandwidth for both RF and baseband.***  ***Proposal 4: Extreme coverage extension, e.g., 164dB MCL, is not considered in 6G Day One design, and the corresponding applications can continue to be supported by NB-IoT.***  ***Proposal 5: Moderate coverage extension (e.g., around 10dB) for IoT devices can be studied to address market demands, with performance impact on eMBB services to be evaluated.*** |
| [**RP-252142**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-252142.zip) | CATT | Proposal 1: Two device types, i.e. MBB and IoT, are defined in 6G  • For each device type, potential sub-types/categories can be defined if needed, based on non-negligible  division in terms of transmission capability, cost/complexity, characteristics of operation environment, etc.  • Proposal 2: Consider the following table of capability & requirement for each device type/sub-type/categories |
| RP-252153 | Spreadtrum, UNISOC | ac685adf-1b51-495b-9c3a-997c8a77b7bd |
| [**RP-252154**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-252154.zip) | Spreadtrum, UNISOC | Proposal 1: 6G should define a limited a set of device type for both IoT and eMBB in day 1. Only one device type is suggested for 6G eMBB.  Proposal 2: 6G should consider only basic communication capabilities (e.g. BW, peak data rate, and number of antenna, etc.) to define 6G device type with the following “6G device type” Table 1 as the starting point.  **Table 1: 6G device type**   |  |  |  | | --- | --- | --- | | **6G Device** | **UE/Device type** | **Type** | | 6G IoT device | Ambient IoT | Not 6GR air interface | | Low tier 6G IoT device | **Type 1** (e.g. LPWA) | | High tier 6G IoT device | **Type 2** (e.g. RedCap) | | 6G eMBB device | 6GR eMBB device | **Type 3** | | Other 6G device | 6GR 2Rx XR device | **Type X** | | FWA CPE/VSAT… | FFS: to define different type | |
| [**RP-252182**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-252182.zip) | Qualcomm Incorporated |  |
| [**RP-252197**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-252197.zip) | Xiaomi | Proposal 1: 6GR should support diverse device types, including IoT devices, with single framework from Day 1.  Proposal 2: To satisfy diverse IoT requirements, following aspects need to be considered:   * The smallest maximum bandwidth for the 6GR lowest-tier IoT device should be no less than 5MHz   + It is up to RAN1 to further discuss whether the RF and BB UE BW are same or different. * Half-duplex FDD should be considered for 6G IoT devices and TDD can also be considered * Peak data rate, e.g., 5~10 Mbps can be studied for 6G IoT design to satisfy diverse requirements from industry, and avoid the impact on system performance * Energy efficiency, such as power saving mechanism and energy charging based on RF resource, can be considered and studied as a supplementary method to extend the battery life of IoT devices. |
| [**RP-252316**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-252316.zip) | Intel Corporation | Proposal #4: 6G shall support Massive Communication IoT services with detailed requirements outlined in RP-252656（REVISION OF RP-251951）  Proposal #12: 6G should provide support for diverse set of device types   * + - 6G should address the needs of diverse device types while maintaining a unified system design and avoiding unnecessary fragmentation.     - 6G should provide support for both existing and new device types.     - 6G should enable efficient operation of these devices without requiring additional infrastructure investments or introducing significant system overhead.     - 6G should adopt a scalable PHY design that can accommodate the needs of diverse device types, while minimize RAN-specific optimizations for individual device categories, and instead reusing common baseband functionalities wherever possible to avoid fragmentation in chip design and leverage economies of scale.   RANP to further discuss and provide recommendations on the set of device types to be supported for the initial version of 6G technology including the device-specific requirements on form factor, minimum number of Tx/Rx chains, minimum supported bandwidth, expected data rates (maximum and minimum), supported power classes. |
| [**RP-252327**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-252327.zip) | AT&T, Ericsson, FirstNet, KT Corp., MediaTek Inc., Nokia, Nordic Semi, NTT DOCOMO, Qualcomm, Rakuten, Sequans, Spark NZ, SONY, T-Mobile USA, Verizon | **5.x​ 6G RAN support for diverse device types and massive machine-type communications (mMTC)**  The 6G RAN and 6G Radio should be designed bottom-up, meaning a single RAT is scaled from a minimum set of KPIs, and resources are allocated upwards to the most demanding ones. The 6G RAN and 6G Radio should enable a platform comprising one set of specifications that support all use cases with minimum customization and large degrees of economy of scale. Because crucial design questions can most efficiently be decided in the first release of 6G, 6G massive IoT must be specified in the first release of 6G. 6G massive IoT here refers to the evolution of 5G eMTC as specified in 3GPP, and KPIs should meaningfully differ from (e)RedCap. Solutions should be designed to last across technology generations in the core network, the RAN, and in overlapping spectrum with significantly improved efficiency compared to DSS between 5G and eMTC. |
| [**RP-252198**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-252198.zip) | Nokia | Proposal: The minimum 6GR channel bandwidth all UEs are at least required to support is as listed in Table 1 below:  Table 1: Minimum channel bandwidth size for 6GR; all UEs are required to support at least this BW   |  |  | | --- | --- | | SCS (kHz) | Min CBW (MHz) | | 15 | 5 (3\*) | | 30 | 10 | | 60 (if supported) | 20 | | 120 | 100 |   \* Supported for certain bands and sync raster points only in deployments, 3 MHz as the maximum CBW is allowed only for UEs that can only access 3 MHz cells |
| [**RP-252205**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-252205.zip) | Deutsche Telekom, Vodafone, Orange, Telecom Italia, Turkcell, Spark NZ, Odido, Bouygues Telecom, Telefonica, Telia Company, KPN, CK Hutchison, Telenor, KT Corp. | **5.3.2** **Diverse device types**   * 6G RAT shall define a limited set of diverse UE classes * 6G UE shall support a device design of 5 MHz bandwidth for initial access in the first release * 6G eMBB UEs shall meet the following minimum requirements:   + bandwidth of at least >= 20 MHz in bands 600/700/800/900, incl. operation in all channel bandwidths   + bandwidth of at least >= 40 MHz in bands 1500/1800/2100/2600, incl. operation in all channel bandwidths   + bandwidth of at least >= 200 MHz in bands like n78 incl. operation in all channel bandwidths   + bandwidth of at least >= 200 MHz in bands u6GHz, incl. operation in all channel bandwidths     - 6G eMBB UEs shall support following minimum requirements:2 DL MIMO layers / 2 Rx for bands < 1 GHz     - 1 UL MIMO layer / 1 Tx for bands < 1 GHz     - 4 DL MIMO layers / 4 Rx for bands > 1 GHz     - 2 UL MIMO layers / 2 Tx for bands > 1 GHz |
| [**RP-252320**](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_109/Docs/RP-252320.zip) | Rakuten Mobile, Inc | **Proposal 1:** RAN1 is invited to agree to study and define a 3 MHz-contained NB-Initial-Access (NB-IA) profile at 15 kHz SCS/FDD for selected low FR1 bands, comprising:   1. NB-SSB/NB-PBCH with reduced span for low-SINR detection; 2. NB-CORESET#0/PDCCH sufficient for RAR/SIB1 entirely within 3 MHz (no puncturing); 3. Measurement & discovery handling on NB-SSB and neighbor search across NB-IA rasters.   **Proposal 2:** The NB-IA study is band-specific, with no impact to 30/60 kHz FR1 or 120 kHz FR2 designs and no change to the generic “all-UE” minimum-bandwidth assumption. |

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| Agreement in RAN1#112 meeting   * Study the following smallest maximum supported RF and BB UE BW without spectrum aggregation for at least one low-tier device type supported by 6GR framework from physical layer perspective, subject to further discussion and confirmation in RAN   + Opt1: 3MHz   + Opt2: 5MHz   + Opt3: 10MHz   + Opt4: 20MHz   + FFS: the UL bandwidth may be different to the DL bandwidth   + FFS: the bandwidth value may be different for different SCS, duplex modes, and bands.   + FFS: whether RF and BB UE BW are same or different |

## Frequency

About 25 companies propose 6G Massive Communication service shall be supported in FR1.

**Proposal 1-1: 6G Massive Communication shall be supported for FR1.**

## Data rate

All companies support the peak data rate of 6G massive communication should be no less than 1Mbps. About 27 companies propose the minimum PHY peak data rate is [5-10]Mbps in DL and UL, 1 company propose [1-5] Mbps in DL and UL, 1 company propose [1-2] Mbps in DL and UL.

**Proposal 1-3: The minimum PHY peak data rate is [1~10] Mbps in DL and [1~10] Mbps in UL for lowest-tier device.**

## UE antenna numbers

About 29 companies propose the minimum number of UE receive antennas for massive communication service is 1, 2 companies mentioned 2Rx can also be supported.

**Proposal 1-2: The minimum number of UE receive antennas is 1 for lowest-tier device.**

## Duplex mode

About 29 companies propose half-duplex FDD operation should be supported for UE.

**Proposal 1-4: Half-duplex FDD operation is supported for UE**

## Bandwidth

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| Agreement in RAN1#112 meeting   * Study the following smallest maximum supported RF and BB UE BW without spectrum aggregation for at least one low-tier device type supported by 6GR framework from physical layer perspective, subject to further discussion and confirmation in RAN   + Opt1: 3MHz   + Opt2: 5MHz   + Opt3: 10MHz   + Opt4: 20MHz   + FFS: the UL bandwidth may be different to the DL bandwidth   + FFS: the bandwidth value may be different for different SCS, duplex modes, and bands.   + FFS: whether RF and BB UE BW are same or different |

About 25 companies support 3~5MHz as the lowest-tier device bandwidth. 1 company mentioned that bandwidth should not be less than 5MHz. 3 companies propose 20MHz as the maximum channel bandwidth, while 1 company propose RF bandwidth 20MHz and BB bandwidth 5MHz.

*Moderator note: The device related contributions are submitted under different agendas, here the intention is to only discuss the capability of lowest-tier device. I may miss some contributions submitted to other agendas, we can further discuss during the meeting.*

**Proposal 1-5:**

* **The smallest maximum UE bandwidth of the lowest-tier device for massive communication service is no less than [5] MHz at least for FDD.**
  + **FFS on whether to define [10MHz] as the maximum UE bandwidth for TDD**

## Coverage

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| Agreement in RAN1#122 meeting   * On enhanced overall coverage, identify coverage target(s) considering diverse use cases and device types |

The exact number coverage target of MCL (i.e. value in dB) should be discussed in RAN1. RAN plenary is suggested to discuss the coverage extension requirements for massive communication.

About 7 companies propose coverage extension of [10] dB for the lowest-tier UE compared to non-IoT UE, while 1 company propose at least equivalent coverage for non-IOT UE should be supported.

**Proposal 1-6: Massive communication should support coverage extension of up to [10]dB for the lowest-tier UE compared to non-IOT UE.**

## Co-existence

About 25 companies propose to support coexistence with NB-IoT (all deployment modes) and eMTC shall be ensured.

**Proposal 1-7: 6G Massive communication should support coexistence with NB-IoT (all deployment modes) and eMTC**

## Battery life/UE energy efficiency

About 30 companies mentioned UE energy efficiency and long battery life requirements for 6G massive communication. 3 companies propose to support at least 10 years battery-life for the lowest-tier UE.

**Proposal 1-8: Long battery life of [TBD] years is supported at least for the lowest-tier UE**

## Others

**Proposal 1-9: Discuss the following proposals if time allows**

1. **Capabilities of devices for massive communication shall be signaled to the 6G RAN. [Ericsson, AT&T, BT, CHTTL, Deutsche Telekom, FirstNet, Fujitsu, Intel Corporation, KDDI, KT Corp., NTT DOCOMO, OPPO, Semtech, Sequans, SK Telecom, Sony, Spark NZ, Telstra, Thales, T-Mobile USA, Verizon, Vodafone, Bell Mobility, LG Electronics]**
2. **The end-to-end latency is relaxed to e.g. [10] seconds for the lowest-tier UE. [CMCC]**
3. **Handover in 6G of voice communication is supported for massive communication. [CMCC]**
4. **Support global operation in multiple bands with minimum incremental device complexity, e.g., device with single stock-keeping unit (SKU) design [Sony Europe Limited, Nordic Semiconductor ASA]**
5. **Sensing**

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| --- | --- | --- |
| **Tdoc** | **Company** | **Proposal** |
| RP-251989 | T-Mobile USA Inc. Ericsson, Nokia, AT&T, SK Telecom | **5.x Support of sensing in 6G**  The 6GR and 6G RAN architecture shall support detection and/or tracking of passive objects, in the air and on the ground. Passive objects to detect and/or track could include UAVs, pedestrians, cars, traffic obstacles, AGVs/AMRs in industries. The supported sensing modes include TRP mono-static and TRP-TRP bi-/multi-static.  *Editor’s Note: Additional sensing modes can be added after the study of them is completed.* |
| RP-252063 | SK Telecom |  6G radio shall support sensing capabilities such as object detection, localization, and tracking, while being tightly integrated with RAN functionalities and AI-driven processing.  ─ All sensing modes shall be studied in rel-20 SI, and then 6G radio shall support the mode(s) justified based on the outcome of RAN WG SI. |
| RP-252028 | ZTE Corporation, Turk Telekom, Verizon, China Telecom, China Unicom, Telecom Italia, CAICT, ETRI, Queens University Belfast, Pengcheng Laboratory, Shanghai Jiao Tong University, Sanechips, CATT | For 6G ISAC, in addition to 5G-A use cases (UAV, Pedestrian, Vehicle, AGV) the following promising new use cases and the corresponding scenarios should be included in TR38.914 for their strong industrial and public safety benefits:   * + Ship detection   + Infrastructure collapse monitoring   + Structural health monitoring |
| RP-252096 | CMCC | All six sensing modes, including TRP mono-static, TRP-TRP bi-static, TRP-UE bi-static, UE-TRP bi-static, UE mono-static and UE-UE bi-static, should be studied.  At least the following use cases for sensing in 6G should be included:  – UAV  – Automotive  – Human  – Environment awareness/reconstruction to assist communication |
| RP-252133 | Huawei, HiSilicon, CAICT, China Telcom, China Unicom, KT Corp., LG Uplus, SK Telecom | 6G RAN shall support use cases and corresponding performance requirements as defined in TR 22.870   * use case of target detection and tracking, e.g. road digitization * use case of digital twin and environment reconstruction   6G RAN shall study cooperative sensing mechanism involving multiple UEs and base stations to ensure target sensing performance.  6G RAN shall enable efficient measurement feedback and usage of the measurements obtained by sensing, to improve communication performance and/or enable new ISAC services/applications.  6G RAN shall enable efficient resource utilization by considering trade-off between sensing and communication performance. |
| RP-252174 | MediaTek Inc. | The 6G system should efficiently support sensing, and the study should cover at least the following aspects:  - Use cases: The use cases to be addressed shall include, but not be limited to:  - Detection/tracking of UAV/automobile/pedestrian/AGV  - Human health and motion monitoring  - Intrusion detection (smart home, highway/railway)  - Sensing modes: TRP monostatic, TRP-TRP bistatic, TRP-UE bistatic, UE-TRP bistatic, UE monostatic, and UE-UE bistatic should all be studied.  NOTE: Uu for UE-UE sensing is expected.  - Coexistence aspects: Efficient resource utilization, including resource allocation and signal design, to achieve the required sensing performance for the served use case(s) while the same spectrum is also serving 6G communication. |
| RP-252203 | Xiaomi, Panasonic | Proposal 1: To facilitate requirement definition for sensing as a new service in 6G, RAN selects a subset of use cases from TR 22.837 with focus on the most feasible and promising applications for the near future.  Proposal 2: It is preferred to focus on use cases for object detection/tracking for ISAC in 6G studies.  Proposal 3: To facilitate requirement definition for sensing as a new service in 6G, RAN prioritizes the following use cases   * UAV related use cases * Human related use cases * Automotive related use cases   Proposal 4: For RAN requirement definition to support sensing services in 6G, all sensing modes, i.e., TRP monostatic, TRP-TRP bistatic, UE monostatic, TRP-UE bistatic, UE-TRP bistatic, UE-UE bistatic (Uu based) can be considered.   * Involving the UE in the sensing procedure should be studied. * Cooperative sensing and/or multi-static sensing can be included in 6G studies.   Proposal 5: For supporting 6G sensing services, the following requirements can be considered as a guidance,   * Sensing Performance (e.g. accuracy, coverage, latency) should be guaranteed * Impact on communication shall be minimized.   + Meeting given sensing requirements should not cause unacceptable degradation of communication KPIs (e.g. throughput, latency, reliability) * Radio resources should be used efficiently   + Sensing resources should not be over-provisioned.   + Reuse of existing communication signals (SSB, CSI-RS, DMRS) for sensing where possible * Scalability/Flexibility   + ISAC should scale with target density and sensing demand, without requiring dedicated infrastructure everywhere.   + Support for distributed transmitters and receivers without overwhelming coordination overhead * Interoperability   + At least bistatic sensing operations should support multi-vendor environments. Hence, standardized sensing data formats and signaling procedures should be developed.   + Support for distributed transmitters and receivers without overwhelming coordination overhead * Interoperability   + At least bistatic sensing operations should support multi-vendor environments. Hence, standardized sensing data formats and signaling procedures should be developed. |
| RP-252221 | Apple | Proposal 2.3: For ISAC in the 6G first release, use cases that involve the UE as a sensing transmitter and/or receiver, support network-based, UE-based and UE-centric modes of operation and allow for all network nodes as sensing output consumers are essential. Consider at least the following use cases in TR22.837  • Sensing Aided Communications Use cases for both the network and the UE e.g. R19 SA1 ISAC Use Case 5.21  • Privacy focused use cases for sensing data/entity privacy e.g. R19 SA1 ISAC Use Case 5.16  • Public Safety Use cases for both the target and subscriber e.g. R19 SA1 ISAC Use Case 5.27  • Intruder Detection use cases for home e.g. R19 SA1 Use Case 5.1 and 5.6 |
| RP-252316 | Intel Corporation | Proposal #5: 6G shall support ISAC services with the following requirements   ISAC KPIs/requirements can be defined on a use case basis (i.e., object detection and tracking, environment monitoring, motion monitoring) and initial 6G targets can be based the requirements outlined in TS 22.137   6G ISAC shall provide coverage and operation across both wide-area and local deployments, leveraging existing communication infrastructure.   6G ISAC solutions should be designed for efficient integration into existing radio architectures, with minimal additional overhead in signaling and processing.   6G ISAC operations should avoid significant impact on network and device power consumption. |
| RP-252006 | vivo | Proposal 1: The following ISAC use case should be  supported for 6G.  • Object (UAV, Human, AGV and Vehicle) detection and tracking  • Micro doppler related use cases including human respiration, blade rotation of UAV, motion  • Sensing-assisted communication |

## Use cases

Almost all companies propose should support the following 5G-A sensing use case.

**Proposal 2-1:** **The following 5G-A sensing use cases for detection and tracking shall be supported in 6G, including:**

* **UAV**
* **Human**
* **Automotive**
* **AGV**

In addition, some use cases from TR 22.837 and new use cases from TR 22.870 are proposed by companies, including

* Environment awareness/reconstruction to assist communication/Digital Twin
  + RP-252096 CMCC
  + RP-252133 Huawei, HiSilicon, CAICT, China Telcom, China Unicom, KT Corp., LG Uplus, SK Telecom
  + RP-252221 Apple
* Human health and motion monitoring
  + RP-252174 MediaTek Inc.
  + RP-252203 Xiaomi, Panasonic
  + RP-252006 vivo
* Intrusion detection for highway/railway, e.g. TR22.837 Use Case 5.7
  + RP-252174 MediaTek Inc.
  + RP-251989 (traffic obstacles) T-Mobile USA Inc. Ericsson, Nokia, AT&T, SK Telecom
* Road digitization, e.g. TR 22.870 Use Case 7.6
  + RP-252133 Huawei, HiSilicon, CAICT, China Telcom, China Unicom, KT Corp., LG Uplus, SK Telecom
* Privacy focused use cases for sensing data/entity privacy e.g. TR22.837 Use Case 5.16
  + RP-252221 Apple
* Public Safety Use cases for both the target and subscriber e.g. TR22.837 Use Case 5.27
  + RP-252221 Apple
* Intruder Detection use cases for home e.g. TR22.837 Use Case 5.1 and 5.6
  + RP-252221 Apple
  + RP-252174 MediaTek Inc.
* Ship detection, e.g. TR 22.870 Use Case 7.8
  + RP-252028 ZTE Corporation, Turk Telekom, Verizon, China Telecom, China Unicom, Telecom Italia, CAICT, ETRI, Queens University Belfast, Pengcheng Laboratory, Shanghai Jiao Tong University, Sanechips, CATT
* Infrastructure collapse monitoring, e.g. TR 22.870 Use Case 7.14
  + RP-252028 ZTE Corporation, Turk Telekom, Verizon, China Telecom, China Unicom, Telecom Italia, CAICT, ETRI, Queens University Belfast, Pengcheng Laboratory, Shanghai Jiao Tong University, Sanechips, CATT
* Structural health monitoring
  + RP-252028 ZTE Corporation, Turk Telekom, Verizon, China Telecom, China Unicom, Telecom Italia, CAICT, ETRI, Queens University Belfast, Pengcheng Laboratory, Shanghai Jiao Tong University, Sanechips, CATT

The above use cases can be classified as below:

* **Moving target detection and tracking**
  + Including road digitization, intrusion detection for highway/railway, ship detection etc.
* **Environment reconstruction**
  + Including RAN digital twin, environment awareness to assist communication etc.
* **Human health and motion monitoring**
* **Others**
  + Including privacy focused, public safety related cases etc.

**Proposal 2-1: Further study the following use cases:**

* **Moving target detection and tracking**
  + **Including road digitization, intrusion detection for highway/railway, ship detection etc.**
* **Environment reconstruction**
  + **Including RAN digital twin, environment awareness to assist communication etc.**
* **Human health and motion monitoring**
* **Others**
  + **Including privacy focused, public safety related cases etc.**

## Sensing mode

Almost all companies support all 6 sensing modes, including TRP monostatic, TRP-TRP bistatic, TRP-UE DL, UE-TRP UL, UE-UE bistatic, and UE monostatic.

**Proposal 2-2-1: 6GR should study the following sensing modes:**

* **TRP monostatic**
* **TRP-TRP bistatic,**
* **TRP-UE DL**
* **UE-TRP UL**
* **UE-UE bistatic**
* **UE monostatic**

2 contributions [RP-252133 Huawei, HiSilicon, CAICT, China Telcom, China Unicom, KT Corp., LG Uplu, SK Telecom] [RP-252203 Xiaomi, Panasonic] propose to support cooperative sensing mechanism.

**Proposal 2-2-2:** **6GR should study cooperative sensing/multi-static sensing mechanism involving multiple UEs and base stations.**

## Data Collection

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| **Tdoc** | **Company** | **Proposal** |
| RP-252031 | ZTE Corporation, Sanechips | * **It is suggested to support 6G AI and sensing related UE data collection and transfer, and including the following principles in TR 38.914.**    + 6G AI and sensing related UE data collection and transfer should be supported between UE and RAN, UE and CN.   + E2E QoS should be considered for 6G AI and sensing traffic.   + 6G AI and sensing related UE data should support security and privacy protection.   + Control plane and user plane can be considered as baseline for 6G AI and sensing related UE data collection and transfer. For 6G AI and sensing related UE data with big volume and/or frequent collection requirement, user plane should be used. |
| RP-252146 | CATT, CICTCI | **Principles:**  • New Radio Bearer type for data transmission of new services with flexible QoS requirements  • Flexible ending points for data transmission, e.g. data between UE and RAN node / CN / OAM, data  between RAN nodes / relay(s), and data routing via RAN nodes  • Unified design for data transmission of multiple use cases, and future-proof for use cases added in  later releases  • Coordination with SA2 core network design, e.g. Data Plane tunnel between CN and RAN  **Proposal: Support the data transfer design at least for AI and sensing services with above principles. Include the above principles in TR 38.914.** |
| RP-252204 | Samsung, NTT DOCOMO INC. | 5.4.x data collection framework  Unified data collection framework should be designed for various types of data (e.g., AI/ML, Sensing). The unified data collection framework supports large volume data transmission and different QoS requirements. Furthermore, the unified data collection framework should also be used for legacy services e.g. MDT-based data collection if applicable. |

3 companies propose 6G should design a unified data collection framework for multiple use cases, including AI/ML and sensing

**Proposal 2-3: 6G data collection framework should support various types of data, including AI/ML and sensing.**

1. **Aerial**

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| **Tdoc** | **Company** | **Proposal** |
| RP-252660 (REVISION OF RP-251948) | Ericsson, AT&T, BDBOS, CATT, CHTTL, China Telecom, CMCC, Erillisverkot, FirstNet, Fujitsu, Intel, KDDI, KT Corp., Motorola Solutions, NIST, Nkom, NTT DOCOMO, Softil, Spark, Spreadtrum, SyncTechno Inc, Telstra, Thales, The Netherlands Police, Verizon, Voda | 5.4.X Support for aerial UEs in 6G  The 6G Radio shall provide coverage and high-capacity connectivity for airborne UEs while fulfilling aviation and aerial-related spectrum regulations. The 6G Radio shall support mobility for airborne UEs. The 6G Radio shall allow for serving aerial UEs with both dedicated and non-dedicated deployments, with both public and non-public networks.  The 6G Radio and 6G RAN architecture shall support identifying the position, detection, identification, and management of airborne UEs, including interference management (to/from the networks, to/from land-based UEs, among aerial UEs, etc). |
| RP-251996 | NTT DOCOMO, INC. | 5.4.y Aerial communication  6G RAN shall support 6G radio connectivity services to aerial UEs. |
| RP-252101 | CMCC | 5.4.x Requirements for 6G UAV  The 6G system shall support of airborne UEs detection, identification,authorization, flight path information providing and management of drone UEs, including interference, altitude-based measurement and mobility. |
| RP-252316 | Intel Corporation | Proposal #7: 6G shall support aerial services with detailed requirements outlined in RP-252660 (REVISION OF RP-251948) |

27 companies propose to support Aerial communication services in 6G. It is recommended to discuss following merged text proposal based on RP-252660 and RP-252101.

## **Proposal 3-1: 6GR should support Aerial services, use following text proposal as starting point:**

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| **5.4.X Support for aerial communication** The 6G Radio shall provide coverage and high-capacity connectivity for airborne UEs while fulfilling aviation and aerial-related spectrum regulations. The 6G Radio shall support mobility for airborne UEs. The 6G Radio shall allow for serving aerial UEs with both dedicated and non-dedicated deployments, with both public and non-public networks.  The 6G Radio and 6G RAN architecture shall support identifying the position, detection, identification, authorization, flight path information providing and management of airborne UEs, including interference management (to/from the networks, to/from land-based UEs, among aerial UEs, etc). |

1. **NTN**

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| **Tdoc** | **Company** | **Proposal** |
| RP-251949 | Ericsson, CHTTL, CMCC, ESA, FirstNet, KT Corp., Nokia, T-Mobile USA, Telstra | **5.x.x Seamless operation under mobility**  The 6G RAN architecture shall support the seamless operation under mobility within and between terrestrial and non-terrestrial components of the network with minimum service disruption. The non-terrestrial components include at least GSO, MEO, LEO, multi-orbit and HAPS.  Mobility procedures shall be optimised to minimise UE battery life impact and time spent scanning for networks.  **5.x.x GNSS-free operations**  The 6G Radio design shall support GNSS-free operation for the non-terrestrial network.  **5.x.x Harmonized radio design**  The 6G Radio and 6G RAN architecture design for the TN and NTN RAT should be harmonized, and the design should be able to cover various use cases including e.g. eMBB and massive IoT. |
| RP-251969 | Guangdong OPPO Mobile Telecom. | Proposal 3 The 6G NTN may continue to evolve on the basis of 5G NTN and at the same time share the technical framework with 6G eMBB. |
| RP-251982 | Thales, ESA, Airbus DS, Fraunhofer IIS, Fraunhofer HHI, Eutelsat, Iridium, Gatehouse Satcom, TNO, Novamint, ST Engineering iDirect | **5.4.x Broadcast/multicast services via NTN**  The 6G Radio with a satellite access shall be able to provide broadcast services over an intended area.  The 6G Radio with a satellite access shall be able to provide multicast services to a group of user equipment distributed over an intended area.  **5.4.x PNT services via NTN**  The 6GR shall be able to provide, and improve if suitable, state-of-the-art positioning, navigation and timing (PNT) techniques, including 3GPP terrestrial and non-terrestrial positioning techniques, non-3GPP positioning techniques and their combination.  6GR PNT shall exploit the integration of terrestrial and non-terrestrial networks.  6GR shall be able to support regulatory positioning requirements.  6GR shall be able to support the demand for ultra-precise location services, the need for resilient alternatives to GNSS, and the expansion of PNT service areas.  The 6G Radio with a satellite access shall be able to provide RAT dependent GNSS independent Positioning, navigation and timing (PNT) services.  **5.4.x Public warning service via NTN**  The 6G Radio with a satellite access shall be able to support PWS services over an intended area. |
| RP-252063 | SK Telecom |  6G radio shall support IDLE and CONNECTED mode mobility between TN and NTN at least with 5G. Additionally, whether/how to support IDLE and CONNECTED mode mobility between TN and NTN with 4G shall be studied in rel-20 SI.   6G radio shall support NTN with enhanced capacity through mechanisms such as CA and satellite MIMO.   6G radio shall support TN protection from cross‑border satellite signal interference.   6G radio shall support IoT/NR-NTN coexistence through a TN harmonized 6G NTN design. |
| RP-252100 | CMCC | 5.4.x.x Features inherited from 5G  The features supported in 5G such as random access, HARQ, idle/inactive and connected mobility, etc. should be supported in 6G system .  5.4.x.x Coverage enhancement  The 6G system should support coverage enhancements for the non-terrestrial network.  5.4.x.x GNSS resilient/free  The 6G system should support GNSS resilient/free for the non-terrestrial network.  5.4.x.x Support of Voice  The 6G system should support voice for the non-terrestrial network.  5.4.x.x Seamless service continuity  The 6G system should support seamless service continuity for intra-TN, between TN and NTN.  5.4.x.x NTN-TN integration  The 6G system should support TN-NTN harmonized radio design including waveform, frame structure, RACH, HARQ operation, etc., which needs to consider the NTN specific characters such as large propagation delay, Doppler and high speed movement. And the 6G system should support TN-NTN coordination. |
| RP-252134 | Huawei, HiSilicon | Proposal 1: For handheld UE, 6G RAN design should support NTN services in the underserved area not covered by TN considering both sparse and dense (V)LEO constellation deployments including:  - LoS scenario  - Body loss/NLoS scenario  - Satellite-misaligned scenario.  Proposal 2: 6G NTN should support service continuity within NTN, considering (V)LEO constellations ranging from sparse to dense constellations and massive beams per satellite.  Proposal 3: For 6G NTN, GNSS-free operation can be considered in order to reduce the system access latency and power consumption. . |
| RP-252162 | KT Corp., Thales, Iridium | 5.4.x Change of preferred/priority radio access technology  Subject to operator’s policy, the 6G network shall be able to configure the UE to access the network via NTN as a preferred/priority radio access technology when TN coverage is not available due to disaster situations or TN temporary failure in a given area. |
| RP-252182 | Qualcomm Incorporated | Fully NTN-ready in Day-1 but no specific optimizations and noband support • 6G specification development should not interfere with planning of 5G NTN deployments • 6G specification of R4 requirements, bands, etc. as part of Rel-21 can be further discussed when getting closer to the date |
| RP-252319 | Rakuten Mobile, Inc | **5.x.x NTN–TN Mobility for service Continuity**  6G RAN shall support Idle and connected mode mobility between Non Terrestrial Networks and Terrestrial Networks, including:  - 6G NTN ↔ NR TN/NTN  - 6G NTN ↔ LTE TN  The Mobility between 6G NTN and inter RAT TN should minimize service interruption time; and achieving low handover failure rate in handheld scenarios.  **5.x.x NTN-TN Spectrum Sharing**  MRSS shall enable dynamic time/frequency partitioning and rate matching policies that:  - Protect terrestrial reference/signalling (e.g., SSB/PRS/legacy LTE RS) when co present;  - Accommodate NTN waveform/timing characteristics (Doppler/RTT) without degrading TN KPIs.  - MRSS operation between NTN -TN scenarios shall support interference mitigation and management techniques, including:  - Applicable spectral masks/PFD envelopes and power control for NTN transmissions in shared spectrum;  - Scheduling windows for TN/NTN separation of resources.  - Cross border interference avoidance shall be supported via geo constraints and coordination methods to protect adjacent terrestrial deployments across national borders.  **5.x.x Energy aware Coordination between NTN and TN**  6G RAN shall support energy aware coordination between NTN and TN with the objective of reducing network/device energy consumption without violating agreed QoS.  Energy aware coordination may include:  - load aware traffic steering between NTN and TN;  - coordinated idling/sleep windows across NTN/TN where service conditions permit; and  - Energy biased scheduling policies in shared spectrum operation. |

Mobility is proposed by 13 companies. It is recommended to discuss following text proposal for mobility:

## **Proposal 4-1: Introduce ‘****Interworking and mobility’ for NTN, use following text proposal as starting point:**

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| **5.x.x Interworking and mobility**  The 6G RAN architecture shall support interworking and mobility within and between terrestrial and non-terrestrial components of the network with minimum service disruption. The non-terrestrial components include at least GSO, MEO, LEO, multi-orbit and HAPS. |

GNSS-free operation is proposed by 10 companies. It is recommended to discuss following text proposal for GNSS-free operation:

## **Proposal 4-2: Introduce ‘GNSS-Resilient/free operation’ for NTN, use following text proposal as starting point:**

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| **5.x.x GNSS-Resilient/free operations**  The 6G Radio design shall support resilient/free operation for the non-terrestrial network. |

Harmonized design between TN and NTN are proposed by 12 companies. It is recommended to discuss following text proposal:

## **Proposal 4-3: Introduce ‘Harmonized radio design’ for NTN, use following text proposal as starting point:**

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| **5.x.x Harmonized radio design**  The 6G Radio and 6G RAN architecture design for the TN and NTN should be harmonized, and the design should be able to cover various use cases including e.g. eMBB and massive IoT. |

The following services are proposed by satellite operators. It is recommended to discuss following proposal.

## **Proposal 4-4: Discuss whether Broadcast/multicast service, PNT services, and public warning service should be supported for NTN**

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| **5.4.x Broadcast/multicast services via NTN**  The 6G Radio with a satellite access shall be able to provide broadcast services over an intended area.  The 6G Radio with a satellite access shall be able to provide multicast services to a group of user equipment distributed over an intended area.  **5.4.x PNT services via NTN**  The 6GR shall be able to provide, and improve if suitable, state-of-the-art positioning, navigation and timing (PNT) techniques, including 3GPP terrestrial and non-terrestrial positioning techniques, non-3GPP positioning techniques and their combination.  6GR PNT shall exploit the integration of terrestrial and non-terrestrial networks.  6GR shall be able to support regulatory positioning requirements.  6GR shall be able to support the demand for ultra-precise location services, the need for resilient alternatives to GNSS, and the expansion of PNT service areas.  The 6G Radio with a satellite access shall be able to provide RAT dependent GNSS independent Positioning, navigation and timing (PNT) services.  **5.4.x Public warning service via NTN**  The 6G Radio with a satellite access shall be able to support PWS services over an intended area. |

## **Proposal 4-5: Discuss following proposals if time allows**

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| **5.4.x.x** **Coverage enhancement (CMCC)**  The 6G system should support coverage enhancements for the non-terrestrial network.  **5.4.x.x Support of Voice (CMCC)**  The 6G system should support voice for the non-terrestrial network.  **5.4.x .x Change of preferred/priority radio access technology (KT Corp., Thales, Iridium)**  Subject to operator’s policy, the 6G network shall be able to configure the UE to access the network via NTN as a preferred/priority radio access technology when TN coverage is not available due to disaster situations or TN temporary failure in a given area.  **5.x.x NTN-TN Spectrum Sharing (Rakuten Mobile, Inc)**  MRSS shall enable dynamic time/frequency partitioning and rate matching policies that:  - Protect terrestrial reference/signalling (e.g., SSB/PRS/legacy LTE RS) when co present;  - Accommodate NTN waveform/timing characteristics (Doppler/RTT) without degrading TN KPIs.  - MRSS operation between NTN -TN scenarios shall support interference mitigation and management techniques, including:  - Applicable spectral masks/PFD envelopes and power control for NTN transmissions in shared spectrum;  - Scheduling windows for TN/NTN separation of resources.  - Cross border interference avoidance shall be supported via geo constraints and coordination methods to protect adjacent terrestrial deployments across national borders.  **5.x.x Energy aware Coordination between NTN and TN (Rakuten Mobile, Inc)**  6G RAN shall support energy aware coordination between NTN and TN with the objective of reducing network/device energy consumption without violating agreed QoS.  Energy aware coordination may include:  - load aware traffic steering between NTN and TN;  - coordinated idling/sleep windows across NTN/TN where service conditions permit; and  - Energy biased scheduling policies in shared spectrum operation.  **5.x.x Capacity enhancement (SK Telecom)**  6G radio shall support NTN with enhanced capacity through mechanisms such as CA and satellite MIMO. |

1. **Ease of operation and Self Organization**

Moderator note: belong to operational requirements, i.e. section 5.3.4

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| **Tdoc** | **Company** | **Proposal** |
| RP-251996 | NTT DOCOMO, INC. | 5.4.z SON/MDT  6G RAN shall support SON/MDT to allow autonomous network operation. |
| RP-252212 | Deutsche Telekom, Vodafone, Orange, Telecom Italia, Turkcell, Spark NZ, Odido, BT, Bouygues Telecom, Telefonica, Telia Company, KPN, Rakuten Mobile, CK Hutchison, Telstra, Telenor, KDDI | 5.3.4 Ease of operation and Self Organization   6G RAT shall support automatic configuration and optimisation to the maximum extent possible   6G RAN architecture (Including RAN-CN Interface) shall support automatic configuration and optimisation to the maximum extent possible |
| RP-252225 | Ericsson, NTT DOCOMO, CHTTL, China Unicom, T-Mobile USA, Deutsche Telekom | 5.3.4 Ease of operation and Self Organization requirements  The 6G Radio and 6G RAN architecture shall be designed to fulfill the following requirements:  - RAN shall support the deployment of RAN SON functions, including inter-vendor interoperability, in a hybrid manner (distributed and centralized).  - Collaboration and coordination among RAN SON functions should be supported, when needed.  - RAN SON functions design should be agnostic to the type of algorithm (including AI based and non-AI based) used to realise the needed functionality.  - The data/customer privacy and integrity are important and should be ensured. |

1. **Network Sharing**

Moderator note: belong to operational requirements, i.e. section 5.3.3

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| **Tdoc** | **Company** | **Proposal** |
| RP-252211 | Deutsche Telekom, Vodafone, Orange, Telecom Italia Turkcell, Spark NZ, KT Corp., Odido, BT, SK Telecom, Bouygues Telecom, Telefonica, Telia Company, KPN, Rakuten Mobile, CK Hutchison, Telenor, KDDI | 5.3.3 RAN sharing   6G RAT shall support Network Sharing (i.e. MOCN, MORAN and their enhancements)   6G RAN architecture shall support network sharing of the RAN between multiple operators |

1. **AI**

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| **Tdoc** | **Company** | **Proposal** |
| RP-251984 | T-Mobile USA Inc. Ericsson, Nokia, Sk Telecom, Telstra | **5.x 6G RAN support for evolving services**  6G radio access network (6G RAN) shall have means to address evolving service and regulatory requirements like AI application related requirements. 6G RAN shall be able to support real-time AI applications. To achieve this 6G RAN should be provided with application specific requirements and visibility of real time application performance (e.g., AI applications). |
| RP-251985 | T-Mobile USA Inc. Ericsson, Nokia, SK Telecom, Telstra | **5.x AI for 6G radio and RAN**  6G radio and 6G RAN shall be designed to fulfil the following requirements for UE side data collection and transfer:  - Data Security and Integrity: The collected data collected shall be secured, with full guarantees of data integrity and confidentiality during transfer.  - User Privacy and Consent: The system shall respect user privacy, ensuring anonymity and compliance with user consent requirements.  - MNO Control Over Data Transfer: MNOs shall have full control over the data collection process, including initiating, terminating, and managing the transfer of data to the server for UE-side data collection. This control shall not require a Service Level Agreement (SLA) to manage the transfer process.  - Visibility and Transparency: MNOs shall have full visibility over the standardized data, ensuring monitoring and management of the data collection process.  - Future-proof and Extensible Design: The design shall be flexible and scalable to adapt to future 6G AI use cases and evolving technology.  AI enablers for 6G radio and 6G RAN shall be designed to fulfil the following requirements for model transfer and delivery:  - Differentiation of Model Transfer Traffic: It shall be possible to differentiate traffic for model transfer and from regular user traffic. The priority for model transfer shall be configurable by the network, allowing for prioritization without impacting user traffic.  - Security of Model Transfer: Model transfer shall be done in a secure and network-aware manner, ensuring that untrusted or malicious models are prevented from being downloaded onto the network or UE.  - Initiation of Model Transfer: The UE shall be able to initiate model transfer while the network shall make the decision of when to transfer the model, providing flexibility and control over the process.  - Addressability of Models: Trained models shall be addressable so that the UE can request models to be transferred or delivered, enabling flexibility in model management. The network shall be able to enable or disable trained models on demand, based on operational needs.  - Network Control of Model Delivery: The network shall retain full control over when and how models are transferred or delivered to the UE.  - Monitoring of models in use: Sufficient monitoring and management information shall be available for each trained model, ensuring that MNOs can assess and manage the performance of models effectively. |
| RP-252063 | SK Telecom |  6G radio shall support use of AI for efficient/effective RAN operation including performance enhancement, NW optimization, and energy saving.  ─ How to ensure secure, efficient, and manageable model transfer and delivery shall be studied in rel-20 SI.   6G radio shall support enabling AI applications especially considering the orchestration of computing resources (e.g., xPU) shared by RAN and AI workload.   6G radio shall pursue the unified LCM framework for AI/ML that can be universally applied to the use cases, e.g., including collection, management, and distribution of data. |
| RP-252098 | CMCC | 5.2 Requirements for architecture and migration  *Editor note: 6G RAN architecture, 5G-6G migration*  5.4.X AI/ML for RAN  6G AI/ML LCM takes 5G-A LCM as starting point.  6G AI/ML considers 5G-A use cases as starting point if the corresponding non-AI technology is supported in 6G. Furthermore, other potential 6G new use cases could be identified and investigated, e.g. Joint source/channel coding (JSCC), DMRS design or AI receiver, AI/ML based mobility. |
| RP-252099 | CMCC | 5.4.X RAN for AI Service  A promising application of 6G RAN for AI is that the network provides the computing resources, RAN related information or AI data to trusted 3rd party or UE with limited capability, e.g. allowing the AI task offloads to the RAN side. On the other hand, RAN can jointly coordinate communication and computing resources in real time to guarantee the QoS requirements of AI services.  The following potential RAN for AI use cases are supported in 6G:  **AI Agent**  AI Agent refers to an intelligent entity capable of active thinking and action. It can work in a way similar to that of humans, including "understand" user’s needs through AI models, proactively "plan" to achieve goals, use various "tools" to complete tasks, and ultimately "act" to carry out these tasks. Different from traditional AI function, AI Agents have the ability to gradually achieve the given goals through independent thinking and by invoking tools. It can act as an intelligent intermediary, interpreting the text-based request, gathering necessary data, and returning a response or executing a task.  **XR/Immersive communication service**  Immersive communication service is one of the typical delay-sensitive AI applications that the computing capability of this kind of devices may be limited, but have strong requirements for computing. Offloading computing task to RAN side may address the issue that the devices with limited computing capability require a large amount of computing resources for AI services.  For XR service offloading the computing to RAN, XR devices may collect the information via sensors and transmit it to the RAN. RAN invokes computing resources for real-time rendering and generates the processed holographic information. After encoding and compression, RAN transmits the generated information to the XR devices through the downlink. By dynamically schedule communication and computing resources, the RAN can ensure a consistent end-to-end service experience.  **Token Communication**  Token Communication is a novel communication framework driven by Multi-modal Large Language Model. Its core concept involves converting multi-modal data such as text, images, and audio into "tokens". A token is the fundamental unit used by AI models to process and generate information, serving as the carrier for communication. Unlike traditional communication framework, Token Communication does not transmit raw data bitstream but rather token sequences enriched with semantic information, which have been deeply semantically understood and compressed. |
| RP-252132 | Huawei, HiSilicon, CAICT, CMCC, China Unicom | **5.4.x AI/ML Services**  6G RAN shall support efficient transmission for traffics relevant for AI applications, by taking into account of specific characteristics of AI traffics, e.g., token communication, error tolerance, etc.  6G RAN shall enable an E2E data collection and management framework to for operators to enable the data-driven services as described in TR 22.870.  6G RAN shall enable efficient utilization of local measurements for the support of new services and applications, e.g., by distributed and continuous AI/ML learning. |
| RP-252196 | Xiaomi | Proposal 1: 6G system should support flexible deployment of AI/ML-based processing in different network domains.  Proposal 2: Consistency check between training and inference should be supported to guarantee stable performance.  Proposal 3: 6G system should support smooth switch between non-AI/ML based processing and AI/ML based processing.  Proposal 4: Mechanisms to maintain high energy efficiency of AI/ML processing should be supported.  Proposal 5: User consent should be respected regarding NW side data collection.  Proposal 6: 6G system shall support forward compatible unified LCM.  Proposal 7: 6G system should support efficient data transmission for different types of data used for AI/ML services/use cases. |
| RP-252221 | Apple | Proposal 2.4: Native support of both AI/ML for NW and NW for AI/ML in 6G Day 1   * For NW for AI/ML   + Study the characteristic of the AI/ML traffic and focus on the potential enhancement that can improve the system operation capacity/efficiency * For AI/ML for NW   + Consider the principle of designing AI/ML as a toolbox for air interface with UE privacy safeguards in place. From UE perspective     - Limit UE ML complexity required by 3GPP     - Limit UE information leakage (privacy): device location, activity, context, usage     - For performance requirement, specify cellular KPIs without regard to whether AI/ML is used to achieve improved performance |
| RP-252316 | Intel Corporation | Proposal #3: 6G shall support two types of Computing and AI services 1) optimized handling for computing and AI traffic, and 2) computing and AI services for applications and mobile devices. 6GR shall support use case dependent computing/AI requirements, which generally involves new traffic models and new requirements on throughput, latency and reliability. RAN architecture and RAN-CN interface definition shall take into account requirements on computing and AI services. |
| RP-252326 | AT&T, Ericsson | 5.x AI/ML framework for 6G   * Define an integrated framework for AI/ML data management in 6G, based on the following design principles: * MNO visibility and control of AI/ML based data traffic (model transfer/delivery, data collection, model monitoring and management) * Universal framework to avoid fragmentation and per-use case specifications and ensure scalability to new AI/ML use cases * Support multiple termination points for AI/ML data within the network with MNO visibility * Differentiate AI/ML data traffic from user plane traffic and control plane traffic * Ensure data traffic security and privacy * Define a unified and flexible LCM framework for model management, model transfer, model training, and model testing |
| RP-252027 | ZTE Corporation, Sanechips | 6G design should support AI services including:   * Cross-layer information exchange needs to be supported, including the assistance application layer information sharing to RAN directly or via CN. * RAN should support a uniform mechanism to transfer AI related data/information to CN. * RAN should support AI related data collection and management in an efficient way.   RAN should support and guarantee the performance of intent-driven intelligent cooperation among devices. |

Considering the devise proposals in this meeting, it is recommended to discuss the following high level proposals first.

**Proposal 7-1-1:** **6G RAN shall support efficient transmission for traffics relevant for AI applications**

**Proposal 7-1-2: 6G RAN shall support an E2E data collection and management framework in collaboration with SA2.**

1. **Critical Communication**

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| **Tdoc** | **Company** | **Proposal** |
| RP-252669 (REVISION OF RP-251950) | Ericsson, AT&T, BDBOS, DISA, Erillisverkot, FirstNet, Motorola Solutions, NIST, Nkom, Softil, SyncTechno Inc, Telstra, The Netherlands Police, T-Mobile USA | x.x Critical Communication services The 6G RAN architecture shall support critical communication services, avoiding a different architecture or multiple architectural options.  The 6G Radio shall support the QoS framework in coordination with SA2, including e.g., prioritization, pre-emption, and access control mechanisms.  x.x.1 Public safety communications  The RAN design for the 6G Radio Access Technologies shall support Mission Critical Communications for diverse types of services (e.g. MCPTT, MCVideo, MCData).  x.x.2 Radio robustness  The 6G Radio shall provide mechanisms to enhance the privacy of radio transmissions of signals and channels.  The 6G Radio shall provide mechanisms to enhance the security of radio transmissions of system information (e.g., encryption, integrity protection, etc.).  x.x.3 Ad-hoc deployments  The 6G Radio and the 6G RAN architecture shall enable simple implementations of network equipment that can be quickly and efficiently deployed, for the purpose of providing coverage, capacity, etc. The support shall include ad-hoc deployments co-located with other network deployments (e.g., extending the coverage at cell edge; subject to radio interface) and isolated ad-hoc deployments (e.g., creating a separate coverage area, possibly connected to the public CN; etc.). The support shall cover stationary ad-hoc deployments as well as ad-hoc deployments that change over time (e.g., due to moving nodes).  The 6G RAN architecture shall make it possible to utilize backhaul solutions suitable for ad-hoc deployments (e.g., with capacity limitations, with longer latencies, etc.).  x.x.4 Public warning/emergency alert systems  The RAN design for the 6G Radio Access Technologies shall provide mechanisms to enable public warning services that provides warning/notifications to users meeting regional regulatory requirements.  x.x.5 Broadcast and multicast communications  The design of the 6G System shall allow for the 5G broadcast and multicast system to be reutilized, ensuring delivery to users of earlier generations and utilizing the spectrum resources in an efficient manner.  x.x.6 Device-to-device communications  The 6G system shall consider device-to-device communication for critical services (e.g., ProSe) in a way that ensures interoperability with 5G D2D users without using the spectrum resources in an inefficient manner (e.g., without duplicating traffic).  UE-to-NW multi-hop relaying involving 6G and/or 5G UEs and networks shall be supported.  UE-to-UE multi-hop relaying involving 6G and/or 5G UEs shall be supported. |
| RP-252316 | Intel Corporation | 6G should support emergency communications and public warning/emergency alert services required to meet regulatory requirements. Public Safety services should be supported over the Uu interface without introducing specific optimizations in the RAN, while use cases requiring sidelink should not be redefined in 6G and can rely on 5G solutions. |

**Proposal 8-1: Discuss whether to support the following critical communication services:**

* **Public safety communication**
* **Radio robustness**
* **Ad-hoc deployments**
* **Public warning/emergency alert systems**
* **Broadcast and multicast communications** **(reuse 5G)**
* **Device-to-device communications (reuse 5G)**

1. **Observability**

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| **Tdoc** | **Company** | **Proposal** |
| RP-252666  (revision of RP-252227) | Ericsson, NTT DOCOMO, SK Telecom, CHTTL, Nokia, T-Mobile USA, Verizon, China Unicom, Deutsche Telekom, AT&T, Jio Platforms | **5.x Observability in 6G** The 6G Radio and 6G RAN architecture shall support collecting measurements and data to enable real-time use cases (e.g., assurance of SLAs, failure detection triggering resilience procedures, network optimization, KPIs, AI traffic etc.) and offline use cases (e.g., AI/ML training, etc.). It shall be possible to combine and correlate measurements and data from different sources (e.g. UE and RAN).  The 6G Radio shall support monitoring the user plane between 3GPP endpoints, to collect measurements and statistics (e.g., average QoS metrics, distributions, etc.) of connectivity performance, including UE reports (e.g., for observed latency).  The 6G Radio shall support monitoring the condition of the user plane and the control plane (e.g., interruption of the control plane, radio link failure, etc.) to enable resiliency mechanisms.  The 6G RAN shall support monitoring the fulfilment of user obligations and restrictions associated with a connectivity service (e.g., user location, channel measurements, characteristics of the offered traffic, etc.). |

1. **Time Critical Communication**

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| **Tdoc** | **Company** | **Proposal** |
| RP-251947 | Ericsson, AT&T, CMCC, FirstNet, T-Mobile USA, Telstra, Verizon | **5.x Time Critical Communications in 6G** (1) The 6G Radio shall support delivering connectivity for target latency and reliability, for a wide range of requirements, minimizing the need for dedicated features.  (2) The 6G Radio shall support mechanisms to monitor TCC traffic (e.g., UE and RAN reports with detailed enough information; etc.) and functionality for handling TCC traffic (e.g., scheduling based on service characteristics; link adaptation based on service characteristics; suitable RRM based on service characteristics; etc.). The monitoring capabilities shall allow for obtain a wide range of statistics regarding traffic conditions.  (3) The 6G Radio and 6G RAN architecture shall support delivery of accurate timing and synchronization information over the air. |

1. **Voice**

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| **Tdoc** | **Company** | **Proposal** |
| RP-251969 | Guangdong OPPO Mobile Telecom. | Proposal 1 The 6G RAN shall support eMBB types of services like voice, data, and cellular IoT with high priority and better CAPEX and OPEX control mechanisms. |
| RP-252097 | CMCC | **5.4.x Voice in 6G**  The 6G radio and 6G RAN architecture shall support Voice in 6G with the necessary support to ensure that emergency services like emergency call and lawful interception (LI). Voice fallback and handover are supported for Voice in 6G. Furthermore, NTN and LPWA support Voice in 6G. |
| RP-252206 | T-Mobile USA Inc., AT&T, Ericsson, Nokia | **5.x Voice in 6G**  The 6GR and 6G RAN architecture shall support Voice in 6G with the necessary support to ensure that emergency services like emergency location service, public warning systems (PWS), and Lawful Interception (LI) are fully supported. |
| RP-252027 | ZTE Corporation, Sanechips | 6GR RAN design shall provide mechanism to support other services, e.g. voice and FWA |

6 companies propose voice should be supported in 6G.

**Proposal 11-1: The 6G radio and 6G RAN architecture shall support Voice in 6G with the necessary support to ensure that emergency services like emergency call, emergency location service, public warning systems (PWS) and lawful interception (LI).**

**Proposal 11-2: Voice fallback and handover between 6G and 5G shall be supported.**

1. **Service Aware**

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| **Tdoc** | **Company** | **Proposal** |
| RP-251986 | T-Mobile USA Inc. Ericsson, Nokia, AT&T, Telstra, Verizon | **5.x Service aware 6G RAN**  6G radio access network (6G RAN) shall have means to address evolving and new services like immersive communication, AI traffic effectively and be adaptive to the applications. 6G RAN will need to obtain more visibility to application-level attributes (e.g., performance, requirements, etc.) to effectively allocate radio resources and utilize the different RAN resources to meet the applications minimum requirements while maintaining healthy overall system spectrum efficiency and utilization of RAN resources. |

1. **Vehicles**

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| **Tdoc** | **Company** | **Proposal** |
| RP-252176 | ROBERT BOSCH GmbH, Toyota ITC, BMW AG, Volkswagen AG, Continental Automotive, Fraunhofer IIS | **5.4.X Requirements of New and Existing Services for Connected Vehicles**  ***Editorial note:*** *To be captured as separate section or to be captured in the different respective service’s sections:*  Connected vehiclesrequire service continuity (see Note 1) of voice, data/eMBB, and URLLC services from Day-1 of 6G deployment. Wherein the service should be maintained during the long-life cycle (15+ years, see Note 2) of the vehicles.  The 6G should ensure service continuity of connected vehicles moving between 5G and 6G coverage areas with limited interruption time.  TN/NTN mobility should be included from 6G Day-1 guaranteeing also limited interruption time of service.  The 6G should also support advanced connected mobility services, e.g., connected autonomous driving, immersive infotainment, and advanced cockpits, utilizing a harmonized design with other UE types, including the following services with their respective TPR investigated in this Technical Report:   * Immersive Communication * HRLLC * Ubiquitous Connectivity with TN and NTN * AI Services   **Note 1:** for specific regions, some connectivity services could be mandated based on the regulatory requirements, e.g., voice and date.  **Note 2:** based on regulatory requirements in some regions and the typical development cycle. |

1. **Immersive Communication**

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| **Tdoc** | **Company** | **Proposal** |
| RP-252131 | Huawei, HiSilicon | Proposal 1: The 6G RAN design shall support different levels of the composite requirement for different use cases as follows:   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Level of composite requirement | Service data rate (Mbps) | RAN Latency (ms) | Packet success probability | Number of users ([/km2 or /TRxP]) | | UL | | | | | | Level 1 | 20 | 15 | 99% | TBD | | Level 2 | 60 | 15 | 99% | TBD | | Level 3 | 100 | 15 | 99% | TBD | | DL | | | | | | Level 1 | 100 | 10 | 99% | TBD | | Level 2 | 500 | 10 | 99% | TBD |   Proposal 2: 6G RAN design shall support consistent user experience for new services, e.g. immersive communication, by studying means to improve cell edge performance like multiple TRP and interference management.  Proposal 3: 6G RAN design shall support consistent user experience for new services, e.g. immersive communication, by studying means to provide real-time E2E latency measurement for delay budget adjustment among interfaces. |
| RP-252182 | Qualcomm Incorporated | Support XR service in DAY-1 |
| RP-252221 | Apple | Proposal 2.5: Immersive communication should be natively support in 6G Day 1, and its study should focus on improving both the single user performance and the system performance, considering the traffic characteristics and QoS requirement of immersive communication   * Study should aim at identifying the pain point of immersive communication using 5G study as starting point |
| RP-252230 | Meta USA | * Proposal 1: Multiple XR wearable device types should be studied in 6G to address the requirements driven by rapidly evolving agentic AI and immersive AR use cases. * Proposal 2: A range of form factor constraints shall be studied together with diverse AI and AR use case requirements for 6G XR wearable device types. * Proposal 3: The maximum requirements for XR wearable device types shall be specified as feasible ranges instead of fixed single values. * Proposal 4: All XR wearable devices shall benefit from a set of key XR features such as power saving mechanism (e.g., low power wakeup), XR latency reduction, UL spectral enhancement at cell edge for Agentic AI use cases and SBFD for flexible UL/DL. * Proposal 5: The UE capability defined for XR wearables shall support the technologies and configurations enabling size reduction such as half duplex, contiguous CA, or wider BW single carrier |
| RP-252231 | Meta USA | Proposal 1: 6G RAN shall support a flexible QoS framework with native RAN and XR awareness.  Proposal 2: 6G RAN shall support power and resource efficient transmission for AI/AR traffic, considering contextual awareness and latency-sensitive requirements.  Proposal 3: 6G RAN shall enable energy-efficient transmission of contextual AI timelines.  Proposal 4: 6G RAN shall enhance spectral efficiency, with emphasis on challenging uplink scenarios to ensure 5%-tile user experience.  Proposal 5: 6G RAN protocol stack shall be designed for further E2E latency reduction for latency sensitive XR services  Proposal 6: 6G RAN shall minimize the mobility interruption and provide seamless TN/NTN connectivity.  Proposal 7: 6G RAN shall support technology options for form-factor limited XR wearables |
| RP-252316 | Intel Corporation | Proposal #2: 6G shall support features required to enable eMBB evolving to Immersive Communication services including   *  High data rates aiming notable improvement over 5G in both cell average and cell edge performance. *  Low latency aiming same level of latency as of 5G. *  High reliability aiming same level of reliability as of 5G. |
| RP-252027 | ZTE Corporation, Sanechips | Proposal 3: 6G RAN design shall provide mechanisms to support Immersive communication service and consider the combination with positioning, sensing, computing and AI capabilities |

Considering the diverse proposals on immersive communication. It is recommended to agree on the following high level proposals. In the KPI discussion, there are requirements about spectrum efficiency, user experienced data, latency, as well as composite requirements. detailed requirements for immersive communication can wait for the conclusion of KPI.

**Proposal 14-1: Immersive communication should be natively support in 6G Day 1**

1. **FWA**

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| **Tdoc** | **Company** | **Proposal** |
| RP-251983 | T-Mobile USA Inc. Ericsson, Nokia | 5.x Fixed wireless access (FWA)  The 6GR and 6G RAN architecture shall support fixed wireless access (FWA).  4.x Evaluation environment for FWA  FWA enhancements shall be studied in relevant scenarios. These are created based on eMBB scenarios for relevant environments, with modifications on the UE side to reflect FWA. |

1. **Positioning**

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| **Tdoc** | **Company** | **Proposal** |
| RP-251996 | NTT DOCOMO, INC. | 5.4.n Positioning  6G RAN shall at least support E-CID based positioning. |
| RP-252182 | Qualcomm Incorporated | ECID support for regulatory requirements, RAT dependent positioning based on  communication signals and the use of AI/ML to reduce reliance on network calibration  and base station almanac |
| RP-252316 | Intel Corporation | Proposal #9: 6G shall support the minimum set of positioning requirements and techniques required to meet regulatory requirements and aim to maximize likelihood of large-scale deployment, emphasizing solutions that are simple to deploy, cost-effective, low in implementation complexity, power-efficient, and with minimal signaling or resource overhead. |
| RP-252027 | ZTE Corporation, Sanechips | Proposal 4: 6G RAN design shall provide mechanism to enable positioning techniques. |

3 companies propose 6GR shall support positioning, e.g. ECID. Discuss whether to support positioning in 6GR DAY-1.

1. **Others**

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| **Topic** | **Tdoc** | **Company** | **Proposal** |
| Unlicensed | RP-251992 | T-Mobile USA Inc. Nokia | To meet increasing uplink traffic demands of new and extended services like XR, FWA and device AI, as well as technological advancements like use of edge computing, the 6G system shall be able to support 6G uplink operation using mainstream 6G radio design on unlicensed spectrum, such as U-NII-7, which allows standard power operation. |
| Slicing | RP-251996 | NTT DOCOMO, INC. | 6G RAN shall support slicing to be aware of service type to allow differentiated treatment depending on each customer requirements |
| HRLLC | RP-251996 | NTT DOCOMO, INC. | 6G RAN shall support a communication service that supports deterministic communication and/or isochronous communication with high reliability and availability. |
| RP-252027 | ZTE Corporation, Sanechips | 6G RAN design shall provide mechanisms to support HRLLC service, and consider combination with positioning, sensing, computing and AI capabilities |
| NDT | RP-252102 | CMCC | Proposal 1: NDT should be introduced into RAN to provide accurate near real-time prediction, pre-validation of network policies, and proactive policy iteration and updates, so as to effectively enhance network performance.  Proposal 2: Standardized interfaces between NDT and RAN network elements shall be defined to support efficient data collection, enabling real-time synchronization from the physical network to NDT.  Proposal 3: Standardized interfaces between NDT and RAN network elements shall support real-time or near-real-time policy delivery to enable timely policy control from NDT to the physical network.  Proposal 4: 6G RAN should standardize the functions and invocation interfaces of various twin models.  Proposal 5: 6G RAN shall deploy a shared NDT across multiple geographically proximate RAN nodes, to allow cross-vendor optimization. |
| asymmetric UL/DL services | RP-252179 | Pengcheng Laboratory | The 6G Radio Access Network (RAN) shall support asymmetric UL/DL services in vertical scenarios, such as smart factory/IoT and low-altitude communication. To achieve this, the 6G RAN shall support flexible designs, such as UL/DL decoupling, to realize efficient spectrum utilization and cost-efficient deployment in these services. |

1. **Online Agreements**

**Proposal 1:** 6G Massive Communication (IoT) shall be supported for FR1.

* 6GR should have a common/scalable design that supports the above usage scenario in addition to eMBB
  + Prioritize 6GR design for eMBB
* The above usage scenario should not overlap with Ambient IoT and NB-IoT

**Proposal 2**: For 6G Massive Communication (IoT), the minimum number of UE receive/transmit antenna is 1 for lowest-tier device

- Reflect this agreement in the device type section of the TR

1. **For Wednesday offline discussion**

Discuss whether to include following new and existing services into TR 38.914 section 5.4

* Immersive Communication
* Massive Communication (IoT)
* Sensing
* AI
* Non-Terrestrial Network
* Aerial
* Voice
* Observability
* FWA
* Vehicles
* Critical Communication
* Positioning
* Others

Followings are already agreed to be captured in TR 38.914 section 5.3 as operational requirements

* Ease of operation and Self Organization
* Network sharing

‘Service Aware’ will be captured in TR 38.914 section 5.2 as architecture requirements

**Reference**

1. RP-251946 Resiliency requirements in 6G Ericsson, BDBOS, Deutsche Telekom, Erillisverkot, FirstNet, Motorola Solutions, Nkom, Nokia, Softil, SyncTechno Inc, Telstra, Thales, The Netherlands Police, T-Mobile USA, Verizon
2. RP-251947 Requirements for supporting time-critical communications in 6G Ericsson, AT&T, CMCC, FirstNet, T-Mobile USA, Telstra, Verizon
3. RP-252660 (REVISION OF RP-251948) Requirements for supporting aerial UEs in 6G Ericsson, AT&T, BDBOS, CATT, CHTTL, China Telecom, CMCC, Erillisverkot, FirstNet, Fujitsu, Intel, KDDI, KT Corp., Motorola Solutions, NIST, Nkom, NTT DOCOMO, Softil, Spark, Spreadtrum, SyncTechno Inc, Telstra, Thales, The Netherlands Police, Verizon, Voda
4. RP-251949 3GPP specific requirements on NTN Ericsson, CHTTL, CMCC, ESA, FirstNet, KT Corp., Nokia, T-Mobile USA, Telstra
5. RP-252669 (REVISION OF RP-251950) Requirements for supporting critical communications services in 6G Ericsson, AT&T, BDBOS, DISA, Erillisverkot, FirstNet, Motorola Solutions, NIST, Nkom, Softil, SyncTechno Inc, Telstra, The Netherlands Police, T-Mobile USA
6. RP-252656（REVISION OF RP-251951） Minimum requirements for Massive Communication for IoT Ericsson, AT&T, BT, CHTTL, Deutsche Telekom, FirstNet, Fujitsu, Intel Corporation, KDDI, KT Corp., NTT DOCOMO, OPPO, Semtech, Sequans, SK Telecom, Sony, Spark NZ, Telstra, Thales, T-Mobile USA, Verizon, Vodafone, Bell Mobility, LG Electronics
7. RP-251959 Requirements for Supporting Diverse Services Samsung
8. RP-251969 Discussion on requirements of 6G new and existing services Guangdong OPPO Mobile Telecom.
9. RP-251982 Specific requirements for NTN THALES
10. RP-251983 Fixed Wireless Access for 6G T-Mobile USA Inc. Ericsson, Nokia
11. RP-251984 6G Requirements on 6G RAN for AI T-Mobile USA Inc. Ericsson, Nokia, Sk Telecom, Telstra
12. RP-251985 6G Requirements on AI for 6G RAN T-Mobile USA Inc. Ericsson, Nokia, SK Telecom, Telstra
13. RP-251986 6G Requirement on Service Aware 6G RAN T-Mobile USA Inc. Ericsson, Nokia, AT&T, Telstra, Verizon
14. RP-251987 6G Requirements on Spectrim T-Mobile USA Inc. Ericsson, Nokia
15. RP-251989 6G Sensing T-Mobile USA Inc. Ericsson, Nokia, AT&T, SK Telecom
16. RP-251992 Unlicensed operations for 6G T-Mobile USA Inc. Nokia
17. RP-251996 Views on supporting existing services for 6G Day1 NTT DOCOMO, INC.
18. RP-252005 Discussion on requirements for 6G IoT vivo
19. RP-252006 Discussion on requirements for 6G ISAC vivo
20. RP-252027 Requirements for 6GR services ZTE Corporation, Sanechips
21. RP-252028 Views on 6G ISAC use cases and requirements ZTE Corporation, Turk Telekom, Verizon, China Telecom, China Unicom, Telecom Italia, CAICT, ETRI, Queens University Belfast, Pengcheng Laboratory, Shanghai Jiao Tong University, Sanechips, CATT
22. RP-252031 Views on 6G system data collection and transfer ZTE Corporation, Sanechips
23. RP-252063 Views on 6G Requirements of New and Existing Services SK Telecom
24. RP-252095 Requirements for massive communication in 6G CMCC
25. RP-252096 Consideration on 6G Sensing Services CMCC
26. RP-252097 Consideration on 6G Voice CMCC
27. RP-252098 Requirement of AI for 6G RAN CMCC
28. RP-252099 Requirement of 6G RAN for AI CMCC
29. RP-252100 Scenarios and Requirements for 6G NTN CMCC
30. RP-252101 Views on 6G UAV CMCC
31. RP-252102 Requirements for Network Digital Twin in 6G RAN CMCC
32. RP-252119 6G Massive IoT Requirements Sony Europe Limited, Nordic Semiconductor ASA
33. RP-252131 Consideration on supporting immersive communication services for 6G Huawei, HiSilicon
34. RP-252132 Consideration on supporting new AI services for 6G Huawei, HiSilicon, CAICT, CMCC, China Unicom
35. RP-252133 Consideration on supporting ISAC services for 6G Huawei, HiSilicon, CAICT, China Telcom, China Unicom, KT Corp., LG Uplus, SK Telecom
36. RP-252134 Consideration on supporting NTN services for 6G Huawei, HiSilicon
37. RP-252136 Consideration on support of diverse device types for various services Huawei, HiSilicon
38. RP-252142 Views on 6G device types CATT
39. RP-252146 Views on data transfer design CATT, CICTCI
40. RP-252154 Views on 6G diverse device types Spreadtrum, UNISOC
41. RP-252162 NTN preferred/priority mode for 6G KT Corp., Thales, Iridium
42. RP-252174 Sensing Requirements MediaTek Inc.
43. RP-252176 Text proposal for Requirements of New and Existing Services for Vehicular Use Cases ROBERT BOSCH GmbH, Toyota ITC, BMW AG, Volkswagen AG, Continental Automotive, Fraunhofer IIS
44. RP-252179 Discussion on supporting asymmetric UL/DL services Pengcheng Laboratory
45. RP-252182 Qualcomm's views on requirements for new and existing services Qualcomm Incorporated
46. RP-252196 Requirements of supporting AI services Xiaomi
47. RP-252197 Discussion on the requirements for IoT towards 6G Xiaomi
48. RP-252203 Requirements of Integrated Sensing And Communication (ISAC) Xiaomi, Panasonic
49. RP-252204 Requirements for data collection Samsung, NTT DOCOMO INC.
50. RP-252206 On support of Voice in 6G T-Mobile USA Inc., AT&T, Ericsson, Nokia
51. RP-252211 TP on Network Sharing in 6G for TR 38.914 Deutsche Telekom, Vodafone, Orange, Telecom Italia Turkcell, Spark NZ, KT Corp., Odido, BT, SK Telecom, Bouygues Telecom, Telefonica, Telia Company, KPN, Rakuten Mobile, CK Hutchison, Telenor, KDDI
52. RP-252212 TP on Ease of operation and Self Organization in 6G for TR 38.914 Deutsche Telekom, Vodafone, Orange, Telecom Italia, Turkcell, Spark NZ, Odido, BT, Bouygues Telecom, Telefonica, Telia Company, KPN, Rakuten Mobile, CK Hutchison, Telstra, Telenor, KDDI
53. RP-252221 Views on requirements of new and existing services for 6G Apple
54. RP-252225 On Self-Organizing Networks Requirements in 6G Ericsson, NTT DOCOMO, CHTTL, China Unicom, T-Mobile USA, Deutsche Telekom
55. RP-252666 (revision of RP-252227) Observability Requirements in 6G Ericsson, NTT DOCOMO, SK Telecom, CHTTL, Nokia, T-Mobile USA, Verizon, China Unicom, Deutsche Telekom, AT&T, Jio Platforms
56. RP-252230 Requirements for Diverse XR Wearable Device Types for XR Services Meta USA
57. RP-252231 Meta's Views on Requirements of XR Services Meta USA
58. RP-252233 Requirements of new and existing services FUTUREWEI
59. RP-252316 Views on 6G requirements for new and existing services and support of diverse device types Intel Corporation
60. RP-252319 Requirements for 6G NTN interworking with TN Rakuten Mobile, Inc
61. RP-252326 AI/ML Framework for 6G AT&T, Ericsson
62. RP-252327 On 3GPP Support of Massive IoT in 6G AT&T, Ericsson, FirstNet, KT Corp., MediaTek Inc., Nokia, Nordic Semi, NTT DOCOMO, Qualcomm, Rakuten, Sequans, Spark NZ, SONY, T-Mobile USA, Verizon
63. RP-252006 Discussion on requirements for 6G ISAC vivo

Late tdocs

1. RP-252043 ISAC for Digital Twin to assist communications ZTE Corporation, Sanechips
2. RP-252175 AI/ML Service Requirements MediaTek Inc.
3. RP-252342 Requirements of New and Existing Services for 6G Google
4. RP-252372 Requirements of new and existing services in 6G CEWiT
5. RP-252457 Updated Qualcomm's views on requirements for new and existing services Qualcomm Incorporated
6. RP-252641 On the support of ISAC in 6G Google
7. RP-252753 Requirements for Intelligent Transmission in 6G RAN Pengcheng Laboratory, BUPT, ZGC Institute of Ubiquitous-X Innovation and Application
8. RP-252756 Requirements on the Integration of AI and 6G RAN BUPT, Pengcheng Laboratory, ZGC Institute of Ubiquitous-X Innovation and Application