**3GPP TSG-RAN Meeting #100eR4-2115270**

**Electronic Meeting, August 16 – 27, 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** | **1** | **Current version:** |  |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Frequency bands for testing of A-GNSS sensitivity requirements | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Qualcomm Incorporated, Apple | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Perf, TEI16 | | | | |  | ***Date:*** | | | 2021-08-25 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | In EN-DC operation mode, the performance of the A-GNSS sensitivity test may be influenced by the bearer bands used for the test scenario. However, the A-GNSS test requirements and scenarios do not specify any band-combinations in which the test cases should be validated. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Only those EN-DC configurations that can generate second or third order intermodulation (IM) products falling into the GNSS reception bands need to be tested. 2. The EN-DC configurations are divided into groups with similar IMD level and risks. For each group, only one of the EN-DC configurations in the group need to be tested. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | It remains unclear which frequency band combinations should be used for verifying A-GNSS sensitivity requirements in EN-DC operation mode. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | B.1.13 (new) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR CR ... | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS/TR 37.571 CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | See R4-2100021 for additional background: "LS on Frequency Bands for testing of A-GNSS Sensitivity requirements in NR and LTE" (RAN5).  See R4-2108232 for RAN4 agreements: "WF on frequency bands for testing of A-GNSS Sensitivity requirements in NR and LTE". | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Revision of R4-2114208 | | | | | | | | |

## B.1.13 EN-DC band combinations for testing A-GNSS sensitivity

#### B.1.13.1 EN-DC band combination groups

For the A-GNSS sensitivity requirements in EN-DC operation mode with uplink assigned to E-UTRA and NR frequency bands, the requirements in clause 5.1 can be verified by one EN-DC band combination in each of the applicable Frequency Group Combination specified in Table B.1.13.1-1. The A-GNSS sensitivity requirements for the remaining applicable EN-DC band combinations in each Frequency Group Combination are considered to have been verified by using the one EN-DC band combination in each Frequency Group Combination. The Frequency Groups are defined in Table B.1.13.1-2.

The applicable EN-DC band combinations for verifying A-GNSS sensitivity requirements in EN-DC operation mode are specified in clause B.1.13.2.

Table B.1.13.1-1: EN-DC band combination groups for verifying A-GNSS sensitivity requirements in EN-DC operation mode

|  |  |
| --- | --- |
| Frequency Group Combination | EN-DC Band Combinations |
| Group VHF-VHF | NA |
| Group VHF-LB | NA |
| Group VHF-MLB | NA |
| Group VHF-MB | NA |
| Group VHF-HB | NA |
| Group VHF-UHB1 | NA |
| Group VHF-UHB2 | NA |
| Group LB-VHF | NA |
| Group LB-LB | DC\_5A\_n12A  DC\_5A\_n71A  DC\_8A\_n20A  DC\_8A\_n28A  DC\_12A\_n5A  DC\_20A\_n8A  DC\_20A\_n28A  DC\_28A\_n5A  DC\_28A\_n8A  DC\_71A\_n5A  DC\_20A\_n83A |
| Group LB-MLB | DC\_20A\_n50A  DC\_20A\_n51A  DC\_28A\_n51A  DC\_28A\_n50A |
| Group LB-MB | DC\_5A\_n2A  DC\_5A\_n66A  DC\_8A\_n1A  DC\_8A\_n3A  DC\_8A\_n34A  DC\_8A\_n39A  DC\_12A\_n2A  DC\_12A\_n25A  DC\_12A\_n66A  DC\_18A\_n3A  DC\_20A\_n1A  DC\_20A\_n3A  DC\_26A\_n25A  DC\_28A\_n3A  DC\_71A\_n66A  DC\_8A\_n80A  DC\_20A\_n80A |
| Group LB-HB | DC\_5A\_n7A  DC\_5A\_n38A  DC\_5A\_n40A  DC\_8A\_n40A  DC\_8A\_n41A  DC\_12A\_n7A  DC\_12A\_n38A  DC\_12A\_n41A  DC\_20A\_n7A  DC\_20A\_n38A  DC\_20A\_n41A  DC\_26A\_n41A  DC\_28A\_n7A  DC\_28A\_n40A  DC\_28A\_n41A  DC\_71A\_n38A |
| Group LB-UHB1 | DC\_5A\_n48A  DC\_5A\_n78A  DC\_8A\_n77A  DC\_8A\_n78A  DC\_12A\_n78A  DC\_18A\_n77A  DC\_18A\_n78A  DC\_19A\_n77A  DC\_19A\_n78A  DC\_20A\_n77A  DC\_20A\_n78A  DC\_26A\_n77A  DC\_26A\_n78A  DC\_28A\_n77A  DC\_28A\_n78A  DC\_71A\_n48A  DC\_71A\_n78A |
| Group LB-UHB2 | DC\_5A\_n79A  DC\_8A\_n79A  DC\_18A\_n79A  DC\_19A\_n79A  DC\_26A\_n79A  DC\_28A\_n79A |
| Group MLB-VHF | NA |
| Group MLB-LB | DC\_11A\_n28A |
| Group MLB-MLB | NA |
| Group MLB-MB | DC\_11A\_n3A |
| Group MLB-HB | NA |
| Group MLB-UHB1 | DC\_11A\_n77A  DC\_11A\_n78A  DC\_21A\_n77A  DC\_21A\_n78A |
| Group MLB-UHB2 | DC\_11A\_n79A  DC\_21A\_n79A |
| Group MB-VHF | NA |
| Group MB-LB | DC\_1A\_n5A  DC\_1A\_n8A  DC\_1A\_n20A  DC\_1A\_n28A  DC\_1A\_n71A  DC\_2A\_n5A  DC\_2A\_n12A  DC\_2A\_n71A  DC\_3A\_n5A  DC\_3A\_n8A  DC\_3A\_n20A  DC\_3A\_n28A  DC\_3A\_n71A  DC\_66A\_n5A  DC\_66A\_n12A  DC\_66A\_n71A  DC\_3A\_n82A |
| Group MB-MLB | DC\_1A\_n50A  DC\_1A\_n51A  DC\_3A\_n50A  DC\_3A\_n51A |
| Group MB-MB | DC\_1A\_n3A  DC\_2A\_n66A  DC\_3A\_n1A  DC\_3A\_n34A  DC\_66A\_n2A  DC\_66A\_n25A  DC\_1A\_n80A  DC\_2A\_n2A2  DC\_66A\_n66A2  DC\_3A\_n3A2  DC\_3A\_n84A |
| Group MB-HB | DC\_1A\_n7A  DC\_1A\_n38A  DC\_1A\_n40A  DC\_1A\_n41A  DC\_2A\_n7A  DC\_2A\_n38A  DC\_2A\_n41A  DC\_3A\_n7A  DC\_3A\_n38A  DC\_3A\_n40A  DC\_3A\_n41A  DC\_4A\_n38A  DC\_4A\_n41A  DC\_25A\_n41A  DC\_39A\_n40A  DC\_39A\_n41A  DC\_66A\_n7A  DC\_66A\_n38A  DC\_66A\_n41A |
| Group MB-UHB1 | DC\_1A\_n77A  DC\_1A\_n78A  DC\_2A\_n48A  DC\_2A\_n78A  DC\_3A\_n77A  DC\_3A\_n78A  DC\_4A\_n78A  DC\_39A\_n78A  DC\_66A\_n48A  DC\_66A\_n78A |
| Group MB-UHB2 | DC\_1A\_n79A  DC\_3A\_n79A  DC\_39A\_n79A |
| Group HB-VHF | NA |
| Group HB-LB | DC\_7A\_n5A  DC\_7A\_n8A  DC\_7A\_n20A  DC\_7A\_n28A  DC\_7A\_n71A  DC\_30A\_n5A  DC\_41A\_n28A |
| Group HB-MLB | DC\_7A\_n51A |
| Group HB-MB | DC\_7A\_n1A  DC\_7A\_n3A  DC\_7A\_n66A  DC\_30A\_n2A  DC\_30A\_n66A  DC\_40A\_n1A  DC\_41A\_n3A  DC\_7A\_n80A  DC\_38A\_n3A |
| Group HB-HB | DC\_7A\_n40A  DC\_40A\_n41A  DC\_7A\_n7A2  DC\_41A\_n41A |
| Group HB-UHB1 A(NOTE 1): | DC\_40A\_n77A  DC\_40A\_n78A |
| B(NOTE 2): | DC\_7A\_n78A  DC\_38A\_n78A  DC\_41A\_n78A |
| C(NOTE 3): | DC\_7A\_n77A  DC\_41A\_n77A |
| Group HB-UHB2 | DC\_40A\_n79A  DC\_41A\_n79A |
| Group UHB1-VHF | NA |
| Group UHB1-LB | NA |
| Group UHB1-MLB | NA |
| Group UHB1-MB | NA |
| Group UHB1-HB | NA |
| Group UHB1-UHB1 | NA |
| Group UHB1-UHB2 | NA |
| Group UHB2-VHF | NA |
| Group UHB2-LB | NA |
| Group UHB2-MLB | NA |
| Group UHB2-MB | NA |
| Group UHB2-HB | NA |
| Group UHB2-UHB1 | NA |
| Group UHB2-UHB2 | NA |
| NOTE 1: This sub-group generates second order intermodulation products.  NOTE 2: This sub-group generates third order intermodulation products.  NOTE 3: This sub-group generates second and third order intermodulation products. | |

Table B.1.13.1-2: Definition of Frequency Groups

|  |  |
| --- | --- |
| Frequency Group | Frequency Range (MHz) |
| VHF | 400.0 – 458.0 |
| LB | 662.0 – 916.0 |
| MLB | 1426.0 – 1518.0 |
| MB | 1626.0 – 2025.0 |
| HB | 2300.0 – 2690.0 |
| UHB1 | 3300.0 – 4201.0 |
| UHB2 | 4400.0 – 5000.0 |

#### B.1.13.2 Applicable EN-DC band combinations for verifying A-GNSS sensitivity requirements

The A-GNSS sensitivity requirements in clause 5.1 when in EN-DC operation mode shall be verified for EN-DC band combinations that can generate second or third order intermodulation products falling into the following GNSS receiver bands for the particular GNSS (where supported by the UE):

- GPS L1 C/A: 1574.3970 – 1576.4430 MHz

- Galileo E1 / GPS L1C: 1573.3740 – 1577.4660 MHz

- GLONASS G1: 1597.5515 – 1605.8860 MHz

- BDS B1I: 1559.0520 – 1563.1440 MHz

For each frequency group combination in Table B.1.13.2-1 only one EN-DC band combination needs to be tested for the supported GNSS.

Table B.1.13.2-1: EN-DC band combinations for verifying A-GNSS sensitivity requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Group Combination | EN-DC band combinations | | |
| GPS L1 / Galileo E1 | GLONASS G1 | BDS B1 |
| Group LB-LB | DC\_20A\_n28A  DC\_28A\_n5A  DC\_20A\_n83A | DC\_8A\_n28A  DC\_20A\_n28A  DC\_28A\_n8A  DC\_20A\_n83A | DC\_5A\_n12A  DC\_12A\_n5A  DC\_20A\_n28A  DC\_28A\_n5A  DC\_20A\_n83A |
| Group LB-MLB | NA | NA | NA |
| Group LB-MB | NA | NA | NA |
| Group LB-HB | DC\_5A\_n40A  DC\_28A\_n40A | DC\_8A\_n41A  DC\_28A\_n40A | DC\_5A\_n40A  DC\_28A\_n40A |
| Group LB-UHB1 | DC\_8A\_n77A  DC\_8A\_n78A  DC\_20A\_n77A  DC\_20A\_n78A | DC\_5A\_n78A  DC\_8A\_n77A  DC\_8A\_n78A  DC\_20A\_n77A  DC\_20A\_n78A  DC\_26A\_n77A  DC\_26A\_n78A | DC\_8A\_n77A  DC\_8A\_n78A |
| Group LB-UHB2 | NA | NA | NA |
| Group MLB-LB | NA | NA | NA |
| Group MLB-MLB | NA | NA | NA |
| Group MLB-MB | NA | NA | NA |
| Group MLB-HB | NA | NA | NA |
| Group MLB-UHB1 | NA | NA | NA |
| Group MLB-UHB2 | DC\_11A\_n79A  DC\_21A\_n79A | DC\_11A\_n79A  DC\_21A\_n79A | DC\_11A\_n79A  DC\_21A\_n79A |
| Group MB-LB | NA | NA | NA |
| Group MB-MLB | NA | NA | NA |
| Group MB-MB | DC\_1A\_n3A  DC\_2A\_n66A  DC\_3A\_n1A  DC\_66A\_n2A  DC\_66A\_n25A  DC\_1A\_n80A  DC\_3A\_n84A | DC\_1A\_n3A  DC\_2A\_n66A  DC\_3A\_n1A  DC\_66A\_n2A  DC\_66A\_n25A  DC\_1A\_n80A  DC\_3A\_n84A | DC\_1A\_n3A  DC\_2A\_n66A  DC\_3A\_n1A  DC\_66A\_n2A  DC\_66A\_n25A  DC\_1A\_n80A  DC\_3A\_n84A |
| Group MB-HB | DC\_1A\_n40A | DC\_1A\_n7A | DC\_1A\_n7A |
| Group MB-UHB1 | DC\_1A\_n77A  DC\_1A\_n78A  DC\_2A\_n78A  DC\_3A\_n77A  DC\_3A\_n78A  DC\_4A\_n78A  DC\_39A\_n78A  DC\_66A\_n78A | DC\_1A\_n77A  DC\_1A\_n78A  DC\_2A\_n78A  DC\_3A\_n77A  DC\_3A\_n79A  DC\_4A\_n78A  DC\_39A\_n78A  DC\_66A\_n78A | DC\_1A\_n77A  DC\_1A\_n78A  DC\_2A\_n78A  DC\_3A\_n77A  DC\_3A\_n79A  DC\_4A\_n78A  DC\_39A\_n78A  DC\_66A\_n78A |
| Group MB-UHB2 | DC\_3A\_n79A | NA | DC\_3A\_n79A |
| Group HB-LB | NA | DC\_7A\_n8A | NA |
| Group HB-MLB | NA | NA | NA |
| Group HB-MB | DC\_40A\_n1A | DC\_40A\_n1A | DC\_40A\_n1A |
| Group HB-HB | NA | NA | NA |
| Group HB-UHB1 A: | DC\_40A\_n77A | DC\_40A\_n77A | DC\_40A\_n77A |
| B: | DC\_7A\_n78A  DC\_38A\_n78A  DC\_41A\_n78A | DC\_7A\_n78A  DC\_38A\_n78A  DC\_41A\_n78A | DC\_7A\_n78A  DC\_38A\_n78A  DC\_41A\_n78A |
| C: | DC\_7A\_n77A  DC\_41A\_n77A | DC\_7A\_n77A  DC\_41A\_n77A | DC\_7A\_n77A  DC\_41A\_n77A |
| Group HB-UHB2 | NA | NA | NA |

#### B.1.13.3 Test frequencies for EN-DC band combinations

For verifying the sensitivity requirements in clause 5.1 in EN-DC operation mode, the E-UTRA and NR frequency and channel configuration shall be selected to ensure the intermodulation products fall into the GNSS receiver bands as defined in clause B.1.13.2 for the particular GNSS.