3GPP TSG-RAN WG2 Meeting #116 Electronic R2-211xxxx

**Online, 1st – 12th November, 2021**

**Agenda item: 8.11.6**

**Source: CATT**

**Title: [AT116-e][613][POS] BDS B2a and B3I signals (CATT)**

**WID/SID: NR\_pos\_enh-Core - Release 17**

**Document for: Discussion and Agreement**

# 1 Introduction

This document is to kick off the following email discussion:

* [AT116-e][613][POS] BDS B2a and B3I signals (CATT)

      Scope: Discuss the CRs in R2-2109485, R2-2109486, R2-2109487, and R2-2109488, collect any comments and produce updates if necessary for endorsement.

      Intended outcome: Endorsable CRs

      Deadline:  Friday 2021-11-05 1000 UTC (comments), Monday 2021-11-08 1100 UTC (output available)

In this email discussion the following contributions related with A-GNSS enhancements, i.e., including support of BDS B2a signal and BDS B3I signal to decide if these contributions or proposals in the contributions can be agreed.

1. [R2-2109485](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105143.zip) Introduction of B2a and B3I signal in BDS system in A-GNSS CATT, CAICT draftCR Rel-17 36.305 16.4.0 B NR\_pos\_enh-Core
2. [R2-2109486](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105143.zip) Introduction of B2a and B3I signal in BDS system in A-GNSS CATT, CAICT draftCR Rel-17 38.305 16.6.0 B NR\_pos\_enh-Core
3. [R2-2109487](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105143.zip) Introduction of B2a signal in BDS system in A-GNSS CATT, CAICT draftCR Rel-17 37.355 16.6.0 B NR\_pos\_enh-Core
4. [R2-2109488](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105143.zip) Introduction of B3I signal in BDS system in A-GNSS CATT, CAICT draftCR Rel-17 37.355 16.6.0 B NR\_pos\_enh-Core

# 2 Contact Information

Respondents to the email discussion are kindly asked to fill in the following table.

|  |  |
| --- | --- |
| Company | Contact: Name (E-mail) |
| Intel | Yi Guo (yi.guo@intel.com) |
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# 3 Discussion

## 3.1 Impacts of BDS B2a signal in TS 37.355

[R2-2109487](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105143.zip) introduces the global B2a signal in the network-assisted BDS System, as part of A-GNSS positioning methods in LTE and NR to support higher accuracy multiple-frequency global positioning service. And the following changes are proposed:

1. BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal B2a as the reference file is added into section 2 as reference.
2. The following IEs that are affected by the introduction of B2a signal in the GNSS assistance data elements are pointed out and the summarize the modified part:

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| **Data Elements and field** | **Impact description** |
| KlobucharModel2Parameter | KlobucharModel2Parameter can be reused for BDS B2a. The reference ICD file of B2a BDS-3 shall be added in description. |
| GNSS-EarthOrientationParameters | GNSS-EarthOrientationParameters can be reused for BDS B2a. The reference ICD file of B2a BDS-3 shall be added in description. |
| GNSS-NavigationModel | B2a health state is added in ‘GNSS to svHealth Bit String(8) relation’ table.  IOD of B2a is updated in ‘GNSS to iod Bit String(11) relation’ table. |
| BDS-ClockModel2 | bdsTgdB2ap-r17 is introduced for B2a BDS-3.  bdsIscB2ad-r17 is introduced for B2a BDS-3.  The reference ICD file of B2a BDS-3 shall be added in description. |
| NavModel-BDS-KeplerianSet2 | NavModel-BDS-KeplerianSet2 can be reused for BDS B2a. The reference ICD file of B2a BDS-3 shall be added in description. |
| GNSS-DataBitAssistance | gnss-DataBits of B2a is updated in ‘GNSS-DataBitAssistance fied descripeions’ table. |
| GNSS-Almanac | weekNumber and weekNumber-ext-r16 can be reused for BDS B2a. The reference ICD file of B2a BDS-3 shall be added in description. |
| AlmanacReducedKeplerianSet | AlmanacReducedKeplerianSet can be reused for BDS B2a. The reference ICD file of B2a BDS-3 shall be added in description. |
| AlmanacMidiAlmanacSet | AlmanacMidiAlmanacSet can be reused for BDS B2a. The reference ICD file of B2a BDS-3 shall be added in description. |
| GNSS-UTC-Model | GNSS-UTC-Model can be reused for BDS B2a. The reference ICD file of B2a BDS-3 shall be added in description. |
| UTC-ModelSet2 | UTC-ModelSet2 can be reused for BDS B2a. The reference ICD file of B2a BDS-3 shall be added in description. |
| GNSS-AuxiliaryInformation | satType-r16 can be reused for BDS B2a. The reference ICD file of B2a BDS-3 shall be added in description. |

1. The following IEs that are affected by the introduction of B2a signal in the common GNSS information elements are pointed out and the summarize the modified part:

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| Data Elements and field | Impact description |
| GNSS-FrequencyID | The frequency of B2a is added into the table ‘Value & Explanation relation’ |
| GNSS-SignalID | ‘B2a (D)’, ‘B2a (P)’ and ‘B2a (D+P)’ should be added in the table ‘System to Value & Explanation relation’. |
| GNSS-SignalIDs | ‘B2a (D)’, ‘B2a (P)’ and ‘B2a (D+P)’ should be added in table ‘interpretation of the bit map in gnssSignalIDs-Ext’. |

1. Definition of BDS B2a signal specific IE in TS 37.355

According to the group delay differential parameters definition for BDS B2a signal given in 7.6.1 in [1], we can find the clock model parameters for BDS B2a are different from the existing models. TGDB1Cp is already defined in the BDS-ClockModel2, but the definition of TGDB2ap and ISCB2ad are still missing. So, we suggest introducing parameter bdsTgdB2ap-r17 and bdsIscB2ad-r17 for BDS B2a signal.

**Rapporteur’s comments**: This is an essential correction for the introduction of BDS B2a signal in the TS 37.355. Network-assisted BDS positioning method provides assistant data to support a higher accuracy multiple-frequency global positioning service.

**Question 1**: Please provide comments below regarding the addition of the BDS B2a reference file and the description changes of the affected IEs in TS 37.355.

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| Company | Comments |
| Intel | Just for my clarification  *If GNSS-ID = BDS, this field indicates the B2a signal health state (the 6th bit) defined in table 7-14 [39] for BDS B1C and in table 7-14 [XX] for BDS B2a.*  Does that mean B2a signal health state is also used for B1C? or the first “B2a” should be deleted? |
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## 3.2 Impacts of BDS B3I signal in TS 37.355

[R2-2109488](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105143.zip) introduces the global B3I signal in the network-assisted BDS System, as part of A-GNSS positioning methods in LTE and NR to support higher accuracy multiple-frequency global positioning service. And the following changes are proposed:

1. BDS-SIS-ICD-B3I-1.0: "BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal B3I (Version 1.0)" as the reference file is added into section 2 as reference.
2. The following IEs that are affected by the introduction of B3I signal in the GNSS assistance data elements are pointed out and the summarize the modified part:

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| **Data Elements and field** | **Impact description** |
| KlobucharModelParameter | KlobucharModelParameter can be reused for BDS B3I. The reference ICD file of B3I BDS shall be added in description. |
| GNSS-NavigationModel | B3I health state is added in ‘GNSS to svHealth Bit String(8) relation’ table.  IOD of B3I is updated in ‘GNSS to iod Bit String(11) relation’ table. |
| BDS-ClockModel | BDS-ClockModel can be reused for BDS B3I. The reference ICD file of B3I BDS shall be added in description. |
| NavModel-BDS-KeplerianSet | NavModel-BDS-KeplerianSet can be reused for BDS B3I. The reference ICD file of B3I BDS shall be added in description. |
| GNSS-DataBitAssistance | gnss-DataBits of B3I is updated in ‘GNSS-DataBitAssistance fied descripeions’ table. |
| AlmanacBDS-AlmanacSet | AlmanacBDS-AlmanacSet can be reused for BDS B3I. The reference ICD file of B3I BDS shall be added in description. |
| BDS-DifferentialCorrections | BDS-DifferentialCorrections can be reused for BDS B3I. The reference ICD file of B3I BDS shall be added in description. |
| BDS-GridModelParameter | BDS-GridModelParameter can be reused for BDS B3I. The reference ICD file of B3I BDS shall be added in description. |

1. The following IEs that are affected by the introduction of B3I signal in the GNSS assistance data request elements are pointed out and the summarize the modified part:

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| Data Elements and field | Impact description |
| GNSS-DifferentialCorrectionsReq | GNSS-DifferentialCorrectionsReq can be reused for BDS B3I. BDS B3I signal shall be added in description. |

**Rapporteur’s comments**: This is an essential correction for the introduction of BDS B3I signal in the TS 37.355. Network-assisted BDS positioning method provides assistant data to support a higher accuracy multiple-frequency global positioning service.

**Question 2**: Please provide comments below regarding the addition of the BDS B3I reference file and the description changes of the affected IEs in TS 37.355.

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## 3.3 Impacts of BDS B3I and B2a signal in TS 36.305

[R2-2109485](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105143.zip) introduces the B2a and B3I signal in the network-assisted BDS System, as part of A-GNSS positioning methods in LTE and NR. And the following changes are proposed:

1. BDS-SIS-ICD-B3I-1.0 and BDS-SIS-ICD-B2a-1.0 as the reference files are added into section 2 as references
2. The reference ICD file of B3I BDS and B2a BDS shall be added in description of general description of GNSS positioning, ionospheric models and GNSS-GNSS time offsets.

**Rapporteur’s comments**: This is an essential correction for the introduction of BDS B2a and B3I signal in the TS 36.305. Network-assisted BDS positioning method provides assistant data to support a higher accuracy multiple-frequency global positioning service.

**Question 3**: Please provide comments below regarding the addition of the BDS B2a and B3I reference files and the description changes of the affected IEs in TS 36.305.

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## 3.4 Impacts of BDS B3I and B2a signal in TS 38.305

[R2-2109486](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105143.zip) introduces the B2a and B3I signal in the network-assisted BDS System, as part of A-GNSS positioning methods in LTE and NR. And the following changes are proposed:

1. BDS-SIS-ICD-B3I-1.0 and BDS-SIS-ICD-B2a-1.0 as the reference files are added into section 2 as references.
2. The reference ICD file of B3I BDS and B2a BDS shall be added in description of general description of GNSS positioning, ionospheric models and GNSS-GNSS time offsets.

**Rapporteur’s comments**: This is an essential correction for the introduction of BDS B2a signal in the TS 38.305. Network-assisted BDS positioning method provides assistant data to support a higher accuracy multiple-frequency global positioning service.

**Question 4**: Please provide comments below regarding the addition of the BDS B2a and B3I reference files and the description changes of the affected IEs in TS 38.305.

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# 4 Conclusion

TBD

# 5 References

1. BDS-SIS-ICD-B2a-1.0: "BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal B2a (Version 1.0)", December, 2017.
2. BDS-SIS-ICD-B3I-1.0: "BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal B3I (Version 1.0)", December, 2017.
3. R2-2109485, "Introduction of B2a and B3I signal in BDS system in A-GNSS", CATT, CAICT.
4. R2-2109486, "Introduction of B2a and B3I signal in BDS system in A-GNSS ", CATT, CAICT.
5. R2-2109487, " Introduction of B2a signal in BDS system in A-GNSS ", CATT, CAICT.
6. R2-2109488, " Introduction of B3I signal in BDS system in A-GNSS ", CATT, CAICT.