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) |
| CATT | Jianxiang Li (lijianxiang@datangmobile.cn) |
| Nokia | mani.thyagarajan@nokia.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:

|  |  |
| --- | --- |
| **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.

|  |  |
| --- | --- |
| 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? |
| CATT | Regarding Intel’s above comments:  We can confirm that the health state of B2a signal is used for both B1C and B2a signals according to the ICD files. So in the parameter *redAlmL5Health*  and*midiAlmL5Health* field descriptions, the first “B2a” should be kept. |
| Nokia | 1) GNSS-NavigationModel: If B2a signal is introduced in ICD [XX] only, why reference [39] also for ‘B2a Health’ in “GNSS to svHealth Bit String(8) relation” table?  2) BDS-ClockModel2: Why reference [39] in the field description for bdsTgdB2ap if B2a signal is introduced only in ICD in [XX]?  3) GNSS-AuxiliaryInformation: In field description for satType, it should say “[39] and [XX] respectively” |
| CATT | Regarding Nokia’s above comments:   1. According to the B1C and B2a ICD files, the parameter Sat Clock Health, B1C Health and B2a health are needed for both B1C and B2a signals at the same time. So the reference file should contain both two ICD. 2. Same as above, parameter bdsTgdB2ap is included in both B1C and B2a ICD files. 3. Corrected accordingly. |

## 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:

|  |  |
| --- | --- |
| 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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| Company | Comments |
| Nokia | 1) GNSS-NavigationModel: If B3I signal is introduced in ICD [XX] only, why reference [23] also for ‘B3I Health’ in “GNSS to svHealth Bit String(8) relation” table? |
| CATT | According to the B1I and B3I ICD files, the parameter Sat Clock Health, B1I Health and B3I health are needed for both B1I and B3I signals at the same time. So the reference file should contain both two ICD. |
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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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| Company | Comments |
| Nokia | It is unusual to have a NR WID for LTE specification (36.305) changes. Although the NR positioning WID do have a note saying the enhancement applies to E-UTRA also, it is not clear how this should be handled for the LTE CR. |
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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

In this contribution, we summarized the impacts on introduction of signal B2a and B3I, and we get the following proposals:

**Proposal 1: The global B2a signal in BDS-3 should be supported in 3GPP both LTE and NR in Rel-17.**

**Proposal 2: The global B3I signal in BDS-3 should be supported in 3GPP both LTE and NR in Rel-17.**

**Proposal 3: The field description for satType is updated as “[39] and [XX] respectively”.**

**Proposal 4: RAN2 is kindly requested to agree draft CRs in [3] [4] [6] and the updated draft CR of [5].**

# 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.