3GPP TSG-RAN WG2 Meeting #114 Electronic R2-210xxxx

Online Meeting, May 19 – 27 2021

**Agenda item: 8.11.6**

**Source: CATT, Ericsson**

**Title: [AT114-e][613][POS] Rel-17 A-GNSS enhancements(CATT/Ericsson)**

**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:

 **[AT114-e][613][POS] Rel-17 A-GNSS enhancements (CATT/Ericsson)**

      Scope: Discuss the draft CR in R2-2105143 and impact analysis in R2-2105972 and collect company inputs.

      Intended outcome: Report in R2-2106581

      Deadline:  2021-05-27 0000 UTC

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

1. [R2-2105143](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 16.4.0 B NR\_pos\_enh-Core
2. [R2-2105972](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105972.zip) Impacts of NavIC in NR RRC Ericsson discussion Rel-17

# 2 Contact Information

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

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| --- | --- |
| Company | Contact: Name (E-mail) |
| Swift Navigation | Grant Hausler: grant@swiftnav.com |
| Intel | Yi.guo@intel.com |
| Huawei, HiSIlicon | yinghaoguo@huawei.com |
| ZTE | Liu.yansheng@zte.com.cn |
| CATT | lijianxiang@datangmobile.cn |
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# 3 Discussion

## 3.1 Impacts of BDS B2a signal in TS 37.355

[R2-2105143](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.  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’. |

**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.

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| Company | Comments |
| Swift Navigation | In the draft CR, for *BDS-ClockModel2,* we suggest to add the ISCB2ad field from the B2a ICD rather than reusing ISCB1Cd for B2a, as shown in track changes: **– *BDS-ClockModel2*** The IE *BDS-ClockModel2* is used for BDS B1C defined in [39] and BDS B2a defined in [XX].  -- ASN1START  BDS-ClockModel2-r16 ::= SEQUENCE {  bdsToc-r16 INTEGER (0..2047),  bdsA0-r16 INTEGER (-16777216..16777215),  bdsA1-r16 INTEGER (-2097152..2097151),  bdsA2-r16 INTEGER (-1024..1023),  bdsTgdB1Cp-r16 INTEGER (-2048..2047),  bdsIscB1Cd-r16 INTEGER (-2048..2047),  ... ,  [[ bdsTgdB2ap-r17 INTEGER (-2048..2047) OPTIONAL  bdsIscB2ad-r17 INTEGER (-2048..2047) OPTIONAL  ]]  }    -- ASN1STOP   |  | | --- | | ***BDS-ClockModel2* field descriptions** | | ***bdsToc***  Parameter Toc, Clock correction parameters reference time (seconds), see [39], 7.5.1 and [XX], 7.5.1.  Scale factor 300 seconds. | | ***bdsA0***  Parameter a0, Satellite clock time bias correction coefficient (seconds), see [39], 7.5.1 and [XX], 7.5.1.  Scale factor 2-34 seconds. | | ***bdsA1***  Parameter a1, Satellite clock time drift correction coefficient (sec/sec), see [39], 7.5.1 and [XX], 7.5.1.  Scale factor 2-50 sec/sec. | | ***bdsA2***  Parameter a2, Satellite clock time drift rate correction coefficient (sec/sec2), see [39], 7.5.1 and [XX], 7.5.1.  Scale factor 2-66 sec/sec2. | | ***bdsTgdB1Cp***  Parameter TGDB1Cp Group delay differential of the B1C pilot component (seconds), see [39], 7.6.1 and [XX], 7.6.1.  Scale factor is 2-34 seconds. | | ***bdsIscB1Cd***  In the case of  BDS B1C, Parameter parameter ISCB1Cd Group delay differential between the B1C data and pilot components (seconds), see [39], 7.6.1.  Scale factor is 2-34 seconds. | | ***bdsIscB2ad***  In the case of BDS B2a, parameter ISCB2ad Group delay differential between the B2a data and pilot components (seconds), see [XX], 7.6.1.  Scale factor is 2-34 seconds. | | ***bdsTgdB2ap***  Parameter TGDB2ap Group delay differential of the B2a pilot component (seconds), see [XX], 7.6.1.  Scale factor is 2-34 seconds. | |
| Qualcomm | BDS-ClockModel2:  The IE *GNSS-GenericAssistData* is provided for a GNSS as indicated by the *GNSS-ID*, not for a signal. Therefore, the description "in the case of  BDS B1C" or "in the case of  BDS B2a" does not make sense and cannot be understood/used by the device.  Essentially, agree with Swift's comment above. However, this means all TGD's are always provided (which should be O.K. – see e.g., GPS CNAV Clock Model). A UE can ignore the parameter not needed). |
| Huawei, Hisilicon | Generally ok with the correction.  For Swift’s comment, we don’t see there’s great need to add the ISCB2ad field from the B2a ICD, as the *satType* in IE *GNSS-AuxiliaryInformation* indicates the Satellite orbit type: |
| ZTE | We are ok for the CR and share the same view with Huawei. |
| CATT | Reply to Swift’s comments.  ISCB1Cd for B1C has been already added in the *BDS-ClockModel2* and the present condition of this field is mandatory. Therefore, if we don’t reuse *bdsIscB1Cd-r16* field, then in the case of B2a signal, we will have both *bdsIscB1Cd-r16* and *bdsIscB2ad-r17* at the same time which is not consistent with B2a ICD. If ignore the *bdsIscB1Cd-r16* field as QC suggested, it would cause additional signalling overhead which would waste the radio resource.  We are open to go on discussing this suggestion by collecting more comments from companies. |
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**Summary:**

## 3.2 Impacts of NavIC in NR RRC

[R2-2105972](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105972.zip) provides the solution related with the support of NaVIC in NR RRC protocol. The following two SIBs are suggested to be added in the PosSystemInformation-r16-IEs, PosSI-SchedulingInfo and DedicatedSIBRequest:

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| *posSibType2-24* | *NavIC-DifferentialCorrections* |
| *posSibType2-25* | *NavIC-GridModelParameter* |

**Rapporteur’s comments**:

The changes impacting RRC is primarily to add the NaVIC SIBs for broadcast.

**Proposal 1:** **RAN2 to review the above NaVIC posSIB additions in RRC.**

**Question 2**: please provide your views on proposal 1 of whether to add the above NaVIC posSIB additions in RRC.

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| Company | Comments |
| Qualcomm | O.K. |
| Intel | Yes, we should add NaVIC posSIB in NR RRC. |
| Huawei, Hisilicon | Ok to introduce NaVIC posSIB in RRC. |
| CATT | Ok to add NaVIC posSIB in NR RRC. |
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**Summary:**

## 3.3 Any other comments

**Question 3**: please provide any additional comment; e.g. any additional impacts foreseen

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| Company | Comments |
| Swift Navigation | Presently the CR introduces support for B2a. However B2I is also included in the GNSS Signal ID tables in LPP and the draft CR, but the TGD2 parameter for B2I is not yet added (refer to BDS Version 2.0 ICD). We suggest to add the TGD2 parameter to the BDS-ClockModel data element in LPP so that B2I signals can be used from the active BDS-2 satellites in LPP, alongside the B2a signals from newer BDS-3 satellites. For example, TGD2 is also available in the RTCM BDS ephemeris message. Suggested text in track changes: **– *BDS-ClockModel*** The IE *BDS-ClockModel* is used for BDS B1I defined in [23].  -- ASN1START    BDS-ClockModel-r12 ::= SEQUENCE {  bdsAODC-r12 INTEGER (0..31),  bdsToc-r12 INTEGER (0..131071),  bdsA0-r12 INTEGER (-8388608..8388607),  bdsA1-r12 INTEGER (-2097152..2097151),  bdsA2-r12 INTEGER (-1024..1023),  bdsTgd1-r12 INTEGER (-512..511),  ... ,  [[ bdsTgd2-r17 INTEGER (-512..511), OPTIONAL  ]]  }    -- ASN1STOP   |  | | --- | | ***BDS-ClockModel* field descriptions** | | ***bdsAODC***  Parameter Age of Data, Clock (AODC), see [23], Table 5-6. | | ***bdsToc***  Parameter Toc, Time of clock (seconds) [23].  Scale factor 23 seconds. | | ***bdsA0***  Parameter a0, Clock correction polynomial coefficient (seconds) [23].  Scale factor 2-33 seconds. | | ***bdsA1***  Parameter a1, Clock correction polynomial coefficient (sec/sec) [23].  Scale factor 2-50 sec/sec. | | ***bdsA2***  Parameter a2, Clock correction polynomial coefficient (sec/sec2) [23].  Scale factor 2-66 sec/sec2. | | ***bdsTgd1***  Parameter Equipment group delay differential TGD1 [23].  Scale factor is 0.1 nanosecond. | | ***bdsTgd2***  Parameter Equipment group delay differential TGD2 [23].  Scale factor is 0.1 nanosecond. | |
| CATT | Reply to Swift’s comments.  B2I is not officially introduced in LPP and only this IE would bring confusion to readers, so it can be considered in later release if needed. |
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# 4 Conclusion

TBD