3GPP TSG-RAN WG2 Meeting #131 R2-250xxxx

Bengaluru, India, 25th – 29th August, 2025

**Agenda item: 8.19.1**

**Source: Samsung**

**Title: Report of [AT131][310][TEI19] NTN-related TEI19s**

**WID/SID: TEI19**

**Document for: Discussion and Decision**

# Introduction

The following document concerns the following offline:

** [AT131][301][TEI19] NTN related TEI19 (Samsung)**

      Scope: collect views on the NTN related TEI19 proposals (apart from [EUTRAN-to-NBIoTNTN] which is already endorsed), with the intention to prioritize the most important ones / merge / simplify the proposals

      Intended outcome: summary of the offline discussion (in R2-2506271)

      Offline time: Monday 2025-08-25 afternoon coffee break in room offline 1 (Amaryllis+Petunia)

      Deadline for offline discussion summary:  Wednesday 2025-08-27 14:00

In this offline we attempt to converge on NTN-related TEI19s, to see what CRs may already be agreeable and which proposals can be agreed or downprioritized.

# NTN-related TEI19 contributions to RAN2#131

**E-UTRAN to NB-IoT NTN mobility:**

*Note: This will not be discussed in this offline, as it has already been endorsed. If you have companies, please do directly reach out to the authors.*

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| [**R2-2505084**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2505084.zip) | Introduction of E-UTRAN to NB-IoT NTN Mobility UE Capability [EUTRAN-to-NBIoTNTN] | vivo, Samsung, Google, THALES, MediaTek Inc., Aalyria | **available** |
| [**R2-2505367**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2505367.zip) | Introduction of NB-IoT satellite information in E-UTRAN [EUTRAN-to-NBIoTNTN] | Google, Samsung, vivo, THALES, MediaTek Inc., Aalyria | **available** |
| [**R2-2505368**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2505368.zip) | Introduction of NB-IoT satellite information in E-UTRAN [EUTRAN-to-NBIoTNTN] | Google, Samsung, vivo, THALES, MediaTek Inc., Aalyria | **available** |

**Redirection from TN to NTN:**

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| [**R2-2505920**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2505920.zip) | Draft CR Introduction of redirection from NR TN to NR NTN to 38.331 | Samsung | **available** |
| [**R2-2505921**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2505921.zip) | Draft CR Introduction of redirection from NR TN to NR NTN to 38.306 | Samsung | **available** |
| [**R2-2505954**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2505954.zip) | Discussion on redirection from TN to IoT NTN and NR NTN | CMCC | **available** |

**New measurement events:**

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| [**R2-2506015**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2506015.zip) | Discussion on measurement events for inter-frequency scenarios with overlapping coverage in NR NTN | CSCN, ZTE Corporation, Sanechips, Huawei, HiSilicon, CATT | **available** |

**NB-IoT NTN<->NR NTN inter-RAT cell selection assistance:**

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| --- | --- | --- | --- |
| [**R2-2506098**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2506098.zip) | NB-IoT NTN to NR NTN Cell Selection | EchoStar, Qualcomm, Aalyria, Terrestar, Skylo, Sateliot | **available** |
| [**R2-2506099**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2506099.zip) | Asisstance for inter-RAT cell-selection from NB-IoT NTN to NR-NTN | EchoStar, Qualcomm, Aalyria, Terrestar, Skylo, Sateliot | **available** |
| [**R2-2506100**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2506100.zip) | NR-NTN to NB-IoT NTN Cell Selection | EchoStar, Qualcomm, Aalyria, Terrestar, Skylo | **available** |
| [**R2-2506101**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2506101.zip) | Asisstance for inter-RAT cell-selection from NR NTN to NB-IoT NTN | EchoStar, Qualcomm, Aalyria, Terrestar, Skylo, Sateliot | **available** |

**Satellite switch with resync for NB-IoT NTN:**

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| [**R2-2505933**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2505933.zip) | TEI19] Introduction of Satellite Switch with Resynchronization support for IoT NTN | Skylo Technologies, Lockheed Martin, EchoStar, Sateliot | **available** |
| [**R2-2505934**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2505934.zip) | SatSwitchwithReSync support for NB-IoT NTN | Skylo Technologies, Lockheed Martin, EchoStar, Sateliot | **available** |
| [**R2-2505938**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2505938.zip) | SatSwitchwithReSync support for IoT NTN | Skylo Technologies, Lockheed Martin, EchoStar, Sateliot | **available** |
| [**R2-2505939**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2505939.zip) | SatSwitchwithReSync support for IoT NTN | Skylo Technologies, Lockheed Martin, EchoStar, Sateliot | **available** |

**Redirection from IoT NTN NR NTN:**

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| [**R2-2506178**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2506178.zip) | Introduction of RRC Release with Redirection for NB-IoT NTN to NR-NTN | Aalyria | **available** |
| [**R2-2506179**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_131/Docs/R2-2506179.zip) | CR to TS 36.331 - Introduction of RRC Release with Redirection for NB-IoT NTN to NR-NTN | Aalyria | **available** |

# Discussions

## Redirection from TN to NTN

**Redirection from NR TN to NR NTN**

In the last meeting, there was a disucssion and agreements on redirection from TN to NTN:

*R2-2504094     Redirection from TN to IoT NTN and NR NTN   Samsung, Google                discussion             Rel-19    TEI19*

*Observation 1: A lot of effort have been put in mobility enhancements for NTN, but TN to NTN mobility is still not fully supported.*

*Observation 2: Redirection from LTE TN to NR NTN is supported in Release 19.*

*Observation 3: Redirection from NR TN to NR NTN cannot really be considered supported without procedural clarification and a capability in Release 19.*

*Observation 4: In the current IoT NTN capability framework, the UE reports capabilities according to network type, making redirection to NTN difficult.*

*Proposal 1: RAN2 to discuss options to support redirection to NR NTN:*

*Option A: UE uses the frequency received in redirectedCarrierInfo and matches it to frequencies in SIB19 to determine whether the frequency is an NTN band and its associated NTN assistance information. A new capability is introduced to support this for the NTN bands UE indicates support of.*

*Option B: The UE is configured with an indicator whether the frequency is NTN and and/or with NTN assistance information. A new capability is introduced to support this for the NTN bands the UE indicates support of.*

*Option C: The UE is configured with satellite ephemeris in the release message. This serves as an indication of NTN band and a new capability is introduced to support this for the NTN bands the UE indicates support of.*

*-       QC supports option B*

*-       Huawei/Nokia/CATT supports A*

***RAN2 agrees to cover the needed changes to support NR TN to NR NTN redirection in Rel19 via a TEI19 change. Come back in the next meeting with a TP***

*Option D: The UE is configured with an indicator whether the frequency is NTN. If SIB19 is present the UE uses the frequency received in the redirection messages and matches it to the frequency in SIB1*

For this meeting two draft CRs were submitted to capture option A:

R2-2505920 Draft CR Introduction of redirection from NR TN to NR NTN to 38.331 Samsung draftCR Rel-19 38.331 18.6.0 B TEI19

R2-2505921 Draft CR Introduction of redirection from NR TN to NR NTN to 38.306 Samsung draftCR Rel-19 38.306 18.6.0 B TEI19

As can be seen from RAN2#130, there were in general 3 different options: 1) similar solution as in LTE TN to NR NTN, 2) Signal full satellite ephmeris in release message, 3) only send an indication of NTN frequency, without a satellite ephemeris. All solutions have technical merit and may work better or worse in some scenario, but it is not desirable to have 3 different solutions when LTE TN to NR NTN has already agreed on a solution.

Due to this, the draft CRs are drafted to follow the solution introduced for redirection for LTE TN to NR NTN, adapted to how NR NTN signals satellite assistance. In this case, if the carrier frequency in RRC Release matches with the carrier frequency in SIB19 neighbour NTN cell list, then the UE uses the satellite assistance information to perform cell selection on the NR NTN frequency.

**Q1. For NR TN to NR NTN redirection, do companies agree with the solution in R2-2505920/5921, i.e that frequency in release message is used to match with neighbour NTN frequencies in SIB19 to perform cell selection on NR NTN frequency (Option A in R2-2504094)?**

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| **Company** | **Yes/No/Other** | **Comments** |
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Offline discussion:

Rapporteur Q to all: who is not fine with the solution as suggested in R2-2505920/R2-2505921?

Xiaomi: Concern on if frequency on TN and NTN is the same.

Qualcomm: satellite ID or ephmeris itself. Ephmeris and frequency would be needed.

Apple: Similar concern as Xiaomi. Band indicator

Nokia: Band+frequency would be enough to solve issue as mentioned by Xiaomi.

Xiaomi: For HAPS this does not work. Band indicator does not. Xiaomis preference is on Ephemeris info or ntn indicator.

QC: If TN does not broadcast SIB19, then we need ephemeris.

Ericsson: Redirectcarrierfreq info, which is an IE specifically for TN->NTN. Implicit indication. Ephemeris could be optional.

Huawei: Including ehpemeris can be optional, do not need explicit ephmeris. Want to make sure no RAN4 impact, i.e no requirements.

Nokia: Useful to have ephemeris, explicit ephemeris.

QC: Need capability.

ZTE: We prefer implicit ephmeris, but we acknowledge QC’s view, so explicit ephmeris can be optional.

Summary after F2F offline discussion:

It may be agreeable to optionally have explicit ephemeris. If explicit ephemeris not present, the UE uses implicit ephemeris. This is can be implemented in a specific information element used only for redirection from TN to NTN so that there is no confusion regarding TN/NTN if TN and NTN shares the same frequency.

Final summary:

...

**(Optional) Q2. Any other comments on 38.331 (R2-2505920)/38.306 (R2-2505921) draft CR or other potential open issues?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We believe we need to clarify in section 5.2.6 Selection of cell at transition to RRC\_IDLE or RRC\_INACTIVE state. What does the UE which cannot find a suitable cell in the frequency do? Does it continue with TN or NTN access? |
|  |  |
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Offline discussion:

**Redirection from IoT TN to IoT NTN**

Addressing the scenario for redirecting a UE from a terrestrial IoT network to an IoT NTN is discussed in:

R2-2505954 Discussion on redirection from TN to IoT NTN and NR NTN CMCC discussion Rel-19 TEI19

**Proposal 5: RAN2 support redirection from IoT TN to IoT NTN in Release 19.**

**Proposal 6: To support TN to IoT NTN redirection, the LTE TN to NR NTN solution may be reused for the following aspect:**

**(1) IoT NTN frequency and a satellite ID list in per frequency may be contained in redirectedCarrierInfo in the RRCConnectionRelease message in a TN cell;**

**(2) the new IE for IoT satellite assistance information and separate neighbour satellite information list to provide the IoT satellite information in SIB4 or SIB19 may be reused for TN to IoT NTN redirection;**

**(3) TN that broadcasts IoT satellite assistance information in SIB4 or SIB19 may configure dedicated priority for an IoT NTN frequency, only if it receives this capability common to TN to IoT NTN redirection.**

**Proposal 7: To support TN to NR NTN redirection, the new capability signaling for LTE TN to NR NTN redirection purpose may be reused by introducing a new UE capability which indicates UE supporting the redirection from IoT TN to IoT NTN.**

**Proposal 8: The new UE capability which indicates UE supporting the redirection from TN to IoT NTN may be the supported bands for performing the redirection from TN to IoT NTN.**

LTE TN to NR NTN idle mode mobility solution is based on sending a list of satellite IDs in the RRCConnectionRelease message, which is then used to match with corresponding list elements in SIB33.

Rapporteur strongly believes that if IoT TN to IoT NTN redirection is to be introduced in Release 19 timeframe, the RAN2 needs to follow the approach as introduced by LTE TN to NR NTN.

**Q3. Do companies agree to support IoT TN to IoT NTN redirection can be supported using LTE TN to NR NTN solution – i.e satellite IDs in RRCConnectionRelease that points to elements in SIB33?**

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| --- | --- | --- |
| **Company** | **Yes/No/Other** | **Comments** |
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Offline discussion:

QC: Similar as previous one.

Vivo: We agree with this scenario.

Summary after F2F offline discussion:

Most companies seem to be fine with the proposal. CR seems agreeable.

Final summary:

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For this purpose, rapporteur has uploaded a draft CR in the inbox to implement Q3 (with co-signing from supporting companies), where the LTE TN to NR NTN solution is reused. For eMTC, the same RRC structure can be used, while in NB-IoT new IEs need to be introduced. A capability CR will be introduced later as this is straightforward.

**(Optional) Q4. Comments on the draft CR or any other open issues related to Q3.**

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| --- | --- |
| **Company** | **Comments** |
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Offline discussion:

## New measurement events

This meeting there is a discussion on introducing new measurement events for NR:

R2-2506015 Discussion on measurement events for inter-frequency scenarios with overlapping coverage in NR NTN CSCN, ZTE Corporation, Sanechips, Huawei, HiSilicon, CATT discussion Rel-19 TEI19

**Observation 1: For the inter-frequency overlapping coverage scenario, legacy events D1/D2 are not suitable because serving cell-related configuration may hinder the UE from switching to a neighbor cell, especially for load balancing.**

**Observation 2: The new event D3/D4 mechanism is more straightforward and clearly defined, and it aligns with the legacy event A4 in TN.**

**Proposal 1: RAN2 should consider defining new event/condEvent D3 and D4 or enhancing the existing event/condEvent D1 and D2 for inter-frequency overlapping coverage in NR NTN in R19:**

* **event/condEvent D3 and D4: utilize a single referenceLocation and distanceThreshFromReference, and align with event A4 in TN.**
* **event/condEvent D1 and D2 enhancement: inform UE with an implicit indication: “In NTN scenarios, when distanceThreshFromReference1 for eventD1/D2 is configured as 1, or when distanceThreshFromReference1 for condEventD1/D2 is configured as 0, the UE shall invalidate serving cell related configuration information and trigger MR reporting based on the neighbour cell’s configuration only.”**

**Proposal 2: RAN2 should discuss whether it can also be applied in the early releases (i.e. R17 and R18).**

The issue discussed in the contribution is that current measurement events are not as flexible as needed for some scenarios and proposes to introduced a new event that is more simple compared to current event/condEvent D1/D2

**Q6. Do companies support to introduce new event/condEvent with single reference location and threshold as proposed in R2-2506015?**

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| --- | --- | --- |
| **Company** | **Yes/No/Comment** | **Comments** |
|  |  |  |
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Offline discussion:

ZTE: Event D1/D2 is not very appropriate for mobility. CSCN would like to improve the mobility by reporting the mobility when UE moves away or close to reference location.

QC: We do not think it is necessary. Very specific scenario. Issue seems to be minimum threshold. Periodic reporting can be used. D1/D2 should not be used only for mobility, RSRP also needed. Changin 50 m to 0 does not seem to make sense, 50 m is already close to 0. IT probably works.

ZTE: Event D4 can work together with RSRP/RSRQ event.

Nokia: We do not think necessary, existing measurement events can be used.

Huawei: beneficial due to current event is not flexibile in some scenarios.

Xiaomi: Good points in the paper. Issues with hysteresis, since it is min of 5 km. Something needs to be fixed.

Mediatek: Similar view as Nokia.

Vivo: Similar views QC and Nokia. Some work, not too much benefit

Ericsson: Similar view as Vivo. Have not considered the scenario before.

Summary after F2F offline discussion:

Not enough support at this point. Recommend proponents to try to convince some companies that are against.

Final summary:

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## Cell selection NB-IoT NTN <-> NR NTN

Following discussion in the next meeting (without any agreements), CRs for cell selection enhancements from/to NB-IoT NTN to NR NTN have been submitted.

R2-2506098 NB-IoT NTN to NR NTN Cell Selection EchoStar, Qualcomm, Aalyria, Terrestar, Skylo, Sateliot CR Rel-19 36.331 18.6.0 5151 - B IoT\_NTN\_enh-Core

R2-2506099 Asisstance for inter-RAT cell-selection from NB-IoT NTN to NR-NTN EchoStar, Qualcomm, Aalyria, Terrestar, Skylo, Sateliot CR Rel-19 36.306 18.5.0 1923 - B IoT\_NTN\_enh-Core

R2-2506100 NR-NTN to NB-IoT NTN Cell Selection EchoStar, Qualcomm, Aalyria, Terrestar, Skylo CR Rel-19 38.331 18.6.0 5455 - B NR\_NTN\_enh-Core

R2-2506101 Asisstance for inter-RAT cell-selection from NR NTN to NB-IoT NTN EchoStar, Qualcomm, Aalyria, Terrestar, Skylo, Sateliot CR Rel-19 38.306 18.6.0 1340 - B NR\_NTN\_enh-Core

The CRs propose to introduce support for NB-IoT NTN to NR NTN cell selection and associated enhancements and support for NR NTN to NB-IoT NTN cell selection.

**Q7. Do companies support to introduce support for NB-IoT NTN to/from NR NTN inter-RAT cell selection with associated assistance signalling?**

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| **Company** | **Yes/No/Comment** | **Comments** |
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Offline discussion:

Huawei: WE wonder about the scenario, what type of device will support both.

Xiaomi: Same concern as Huawei. Why would a device implement both? We would like to understand who will implement such devices.

Vivo: A device is unlikely to implement both in our opinion.

OPPO: Similar view as HW, Xiamo, Vivol.

QC: Could be applicalbe to TN-NTN. Satellite constellations may not be the same, so useful.

Skylo: Smartphone can support both NB-IoT and NR NTN.

Xiaomi: We would like to hear UE vendor to implmente both.

Google: Support the proposal. This is reasonable.

Thales: WE understand Xiaomi comment, but we think constellation PoW it is valid scenario.

Ericsson: We acknowledge implementation is possible. Cell selection works by implementation.

Mediatek: Last meeting this can be done by UE implementation.

QC: The cell selection process is sped up, so useful.

Summary after F2F offline discussion:

The main argument against the proposal is that use case is questionaly. Propose the proponents to try to convince other companies about the use case.

Final summary:

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**(Optional) Q8. Comments on the CRs to Q7.**

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| **Company** | **Comments** |
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Offline discussion:

## Satellite switch with resync for NB-IoT NTN

A new proposal for this meeting is to introduce support for satellite switch with resync for NB-IoT NTN.

R2-2505933 TEI19] Introduction of Satellite Switch with Resynchronization support for IoT NTN Skylo Technologies, Lockheed Martin, EchoStar, Sateliot discussion Rel-19

**Proposal 1: It is proposed to discuss and agree the CRs [1-3] for TS 36.331, TS 36.300, and TS 36.321 to support this feature in Rel-19.**

**Proposal 2: It is proposed to agree the mirror CRs for TS 36.331 and TS 36.300 in Rel-18 for the “satellite switch with resynchronization” feature.**

R2-2505934 SatSwitchwithReSync support for NB-IoT NTN Skylo Technologies, Lockheed Martin, EchoStar, Sateliot CR Rel-19 36.300 18.5.0 1429 - B IoT\_NTN\_Ph3-Core

R2-2505938 SatSwitchwithReSync support for IoT NTN Skylo Technologies, Lockheed Martin, EchoStar, Sateliot CR Rel-19 36.321 18.4.0 1594 - B IoT\_NTN\_Ph3-Core

R2-2505939 SatSwitchwithReSync support for IoT NTN Skylo Technologies, Lockheed Martin, EchoStar, Sateliot CR Rel-19 36.331 18.6.0 5149 - B IoT\_NTN\_Ph3-Core

This is a new proposal based on satellite switch with sync introduced for NR NTN. It may need to be considered whether introducing this solution requires input from RAN1/RAN4.

**Q9. Do companies support to introduce enhancements for supporting satellite switch with resync for NB-IoT NTN?**

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| --- | --- | --- |
| **Company** | **Yes/No/Comment** | **Comments** |
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Offline discussion:

Skylo: This makes earthfixed implementation feasible for NB-IoT NTN

Viasat: Reasonable proposal, we support.

CMCC: We support the proposal. L1 re-sync, so do not re-establishemnt

Rapporteur: Does this have impact on RAN1? CMCC: No impact on RAN1.

Vivo: Exclude soft switch. Hard switch case, is this practical? PSS/SS will they always be overlapping? Feasibility neds to be evaluated.

Mediatek: In NR NTN it was discussed a lot, this cannot be done in a TEI19. No connected mode mobility in NB-IoT.

Xiaomi: For NR NTN, RAN4 defined corresponding RRM requirements. Not feasible.

QC: Requrements were mainly for soft satellite swithc. Is this need for hard sat swith? The feature can be useful. Good clarify impact on other working groups.

Skylo: We are fine with hard switch.

Ericsson: Feature originally is for RRC connected. But for NB-IoT it should mostly be in idle, so we do not so it to be useufl.

Skylo: NB-IoT NTN not only used for IoT, but now voice is being introduced.

Ericsson: Voice over GEO

Rapporteur: Maybe difficult to do this at the end of Rel-19. If enough companies can be convinced, then maybe it makes more sense for Rel-20?

Summary after F2F offline discussion:

Does not seem to be a lot of support for the proposal.

Final summary:

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## Redirection from NB-IoT NTN to NR NTN

For this meeting, CRs to support redirection from NB-IoT NTN to NR NTN have been submitted:

R2-2506178 Introduction of RRC Release with Redirection for NB-IoT NTN to NR-NTN Aalyria discussion Rel-19 IoT\_NTN\_Ph3, IoT\_NTN\_Ph3-Core

1. Introduce support for Inter-RAT RedirectedInfo IE part of RRC Release and EDT Data Complete in NB-IoT (at least from NB-IoT NTN to NR NTN)
2. Introduce support for inter-RAT redirection from NR-NTN to NB-IoT NTN

R2-2506179 CR to TS 36.331 - Introduction of RRC Release with Redirection for NB-IoT NTN to NR-NTN Aalyria CR Rel-19 36.331 18.6.0 5154 - B IoT\_NTN\_enh-Core, TEI19

**Q10. Do companies support to introduce enhancements for supporting NB-IoT NTN to NR NTN redirection?**

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| **Company** | **Yes/No/Comment** | **Comments** |
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Offline discussion:

Not discussed due to limited time.

# Conclusion

In this offline discussion, we have the following proposals:

**Proposal 1: ...**

**Proposal 2: ...**

# Reference

1. RP-243293, Revised WID for introduction of IoT NTN TDD mode, Iridium Satellite LLC, RAN#106, Madrid, Spain, December 2024.
2. R1-2504676, Updated RAN1 UE features list for Rel-19 LTE after RAN1 #121, RAN1, St. Julians, Malta, May, 2025.

# CR examples