D7.5: Standardisation Final Report

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DATA: Data sets, microdata, etc.

DMP: Data management plan

ETHICS: Deliverables related to ethics issues.

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OTHER: Software, technical diagram, algorithms, models, etc.

EXECUTIVE SUMMARY

This deliverable aims at providing a summary of the activities conducted in the 5G-STARDUST project in the field of standardization. A standardization action plan (D.7.3) has been elaborated during the first phases of the project. The present deliverable examines the progress made regarding this work plan up to Q4 2025, concluding the work package WP 7.3.

In the first part of the deliverable, the main standardization activities relevant to NTN, which are taking place at the 3GPP standardization development body, are described. The 3GPP work on the support of hybrid terrestrial-satellite systems enabling NR services through satellites started with study items on NTN in Releases-15 and 16. The necessary features for the support of this NTN component have been specified as part of the 3GPP Release-17, completed in June 2022.

To support new scenarios covering deployments in frequency bands above 10 GHz and to introduce several performance optimization enhancements for NR NTN, normative work is being carried out as part of Release 18. Service continuity enhancements are also part of Release 18 for both NTN-TN and NTN-NTN mobility. The normative phase has been completed in June 2024 for both core and performance parts.

The Release 19 work item objectives have been approved in December 2023, which include the support of the regenerative payload, the support of Ku-band and TN-NTN mobility. The normative work has been concluded on December 2025.

6G studies started in August 2024 in SA1 for defining the requirements and use cases. The study work started in August 2025 in RAN1 for radio interface and in RAN2, 3 and 4 since October. The first discussions show an alignment to support NTN-TN integration in 6G from day 1, including radio interface harmonization and mobility.

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ABBREVIATIONS

3GPP	3rd Generation Partnership Project
5GC	5G Core
5G-Stardust	5G-Satellite and Terrestrial Access for Distributed, Ubiquitous, and Smart Telecommunications
ACK	Acknowledgment
AI/ML	Artificial Intelligence/Machine Learning
ATG	Air-to-Ground
ATSSS	Access Traffic Steering-Switching-Splitting
CHO	Conditional Handover
CT	Core and Terminals
CU	Centralized Unit
DAPS	Dual Access Protocol Stack
DL	Downlink
DMRS	DeModulation Reference Signal
DU	Distributed Unit
E2E	End-to-End
eMTC	Enhanced Machine Type Communication
FDD	Frequency Division Duplexing
FR	Frequency Range
gNB	Next generation NodeB, i.e. 5G NR base station
GNSS	Global Navigation Satellite System
GEO	Geostationary Earth orbit
GSO	Geostationary orbit
HAPS	High Altitude Platform System
HARQ	Hybrid Automatic ReQuest
HO	Handover
IMS	IP Multimedia Subsystem
ITU-R	Internal Telecommunication Union Radiocommunication sector
LEO	Low Earth Orbit
MBS	Multicast Broadcast System
MEO	Medium Earth Orbit
NB-IoT	Narrowband Internet-of-Things
NGSO	Non-Geostationary orbit
NR	New Radio (5G radio interface)
NTN	Non-Terrestrial Network
PBCH	Physical Broadcast CHannel
PDCCH	Physical Downlink Control CHannel
PDSCH	Physical Downlink Shared CHannel
PLMN	Public Land Mobile Network
PRACH	Physical Random Access CHannel
PRB	Physical Resource Block
PUCCH	Physical Uplink Control CHannel
PUSCH	Physical Uplink Shared CHannel
RACH	Random Access CHannel
RAN	Radio Access Network

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RRM	Radio Resource Management
RU	Radio Unit
SA	System Architecture
SAN	Satellite Access Network
SCS	Sub-carrier Spacing
SIB	System Information Block
SID	Study Item Description
SMTC	SSB Measurement Timing Configurations
SSB	Synchronization Signal Block
TDD	Time Division Duplexing
TEI	Technical Enhancement
TN	Terrestrial Network
TR	Technical Report
UE	User Equipment
UL	Uplink
VoIP	Voice over IP
VSAT	Very Small Aperture Terminal
WG	Working Group
WI	Work Item
WID	Work Item Description
WP	Work Package

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1 INTRODUCTION

This deliverable aims at providing a summary of the activities conducted in 5G-STARDUST in the field of standardization.

A standardization and regulatory action plan (D 7.3) was elaborated during the first phases of the project. The present deliverable examines the progress made with respect to this work plan in 2023 and mid-2024.

As a reminder, the 5G-STARDUST project objectives are:

- Study, design, a 5G-based satellite network, implementing onboard processing and storage capabilities towards effective networking and mobile computing in the sky
- Define, design data-driven management system components, building on AI/ML (Artificial Intelligence/Machine Learning) based solutions for resource allocation and service provision in highly dynamic integrated hybrid networks
- To define, design, and analyse a unified radio interface towards a cost-effective TN-NTN network integration
- Design, implement, and demonstrate E2E (end-to-end) services over a fully integrated TN-NTN advanced network architecture with regenerative space nodes
- Contribute to the development of a European Research and Technology roadmap to ensure strategic positioning and global competitiveness of Europe in integrated TN-NTN communications.

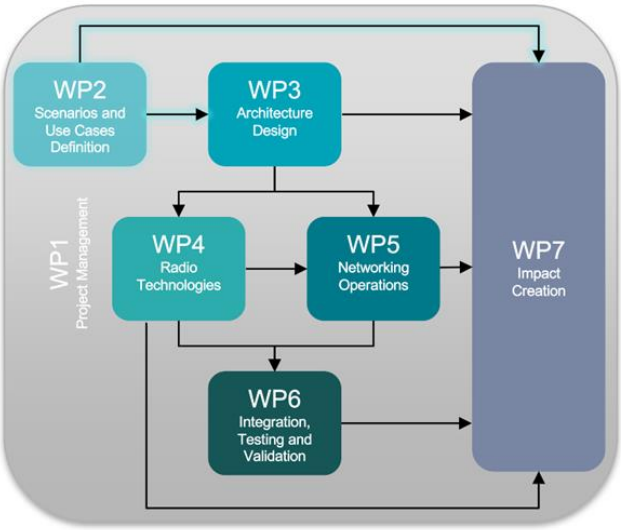

Figure 1: 5G-STARDUST WP flow chart

The scenarios and use case definition (WP2), the architecture design (WP3), the radio technologies studies (WP4) are used for task 7.3 in WP7 for the standardization effort as illustrated in Figure 1. The standardization effort addresses mainly the 3GPP (3rd Generation Partnership Project) standard, the standard that defines the 5G NTN technology.

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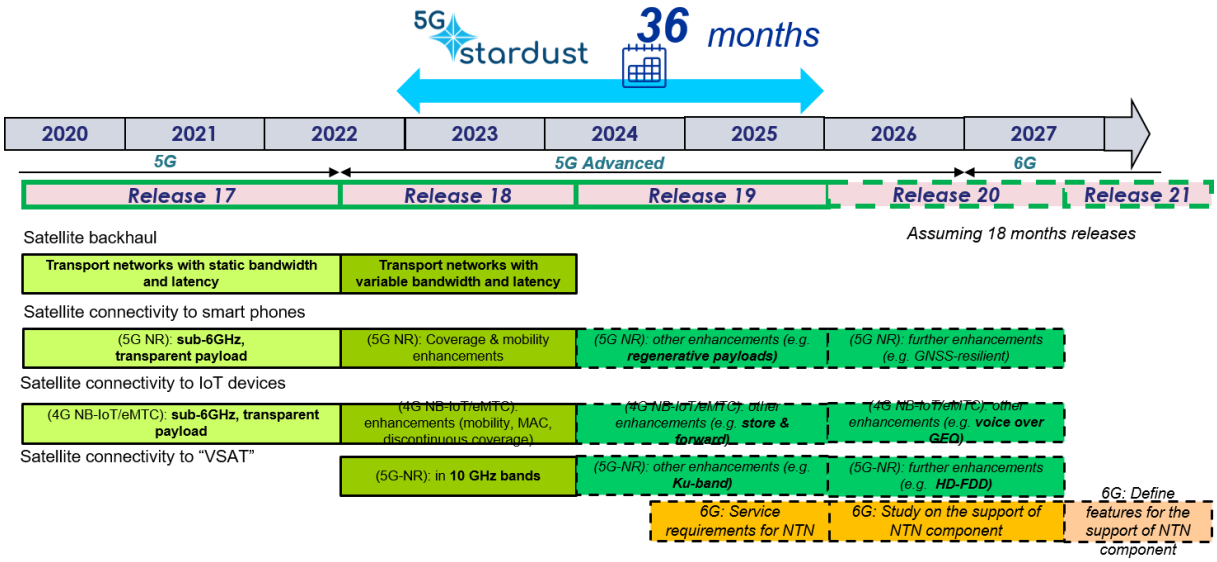

Figure 2: 3GPP timeline and 5G-STARDUST project

The 5G-STARDUST project covers the Release 18, the definition and the Release 19 and the preparation of Rel-20 and further (i.e. 6G) as shown in Figure 2. The content of the WI for Release 18 was already approved at the beginning of the project. Rel-19 contents was discussed and approved during the project execution.

The objectives for the standardization part to support scenarios defined in D2.1 involve:

- Support **regenerative payload architecture**
  - ✓ Support of regenerative payload architecture is part of the Rel-19 objective, where RAN WG2 (access procedures and protocols), RAN WG3 (RAN architecture), and SA WG2 (Network architecture and procedures) are involved.
- Enable **dual connectivity between TN** (Terrestrial Network) **and NTN** (Non-Terrestrial Network)
  - ✓ The dual connectivity between TN and NTN is not covered in Rel-18 nor Rel-19 (e.g. by the support of the dual access protocol stacks (DAPS)).
- Enhance **service continuity between TN and NTN**
  - ✓ The enhance service continuity is partially covered with enhanced TN-NTN mobility in Rel-18, by the TEI 19 in RAN WG2 (RAN2) related to TN and NTN mobility and also by the dual steer, switch and split over dual 3GPP access study in SA1.
- Support **VSAT** (Very Small Aperture Terminal) **in higher frequencies such as Ku/Ka bands**
  - ✓ Support of Ka band is part of the Rel-18 RAN WG4 work and Ku of the Rel-19.
- Enhance **NTN coverage**
  - ✓ The NTN coverage was improved in Rel-19, especially for the support of beam hopping as part of the downlink coverage enhancement objective in RAN1 and RAN2 and uplink capacity enhancement.

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2 STANDARDIZATION REPORT

2.1 3GPP STANDARDIZATION WORK ON NTN

The standardization work on the integration of satellite access in 3GPP ecosystem started in Rel-15 with a study on NR (New Radio, i.e. 5G radio interface) to support NTN (Non-Terrestrial Network, e.g. space-based network) in the RAN (Radio Access Network) WGs (Working Groups) and a study on using satellite access in 5G conducted in SA1 (System Architect working group 1).

In Release-16 several study items have been conducted in different WGs:

- In SA1, a study on using satellite access in 5G to identify the use cases for the provision of services when considering the integration of 5G satellite-based access components in the 5GS,
- System & service and performance requirements for 5G satellite access have been established by SA1,
- In SA2, a study on architecture aspects for using satellite access in 5G,
- In SA5, a study on management and orchestration aspects of integrated satellite components in a 5G network,
- In RAN, based on the outcomes of the Release 15 study item, RAN WGs have conducted a study on solutions for NR to support NTN, detailed in the technical report [1].

In Release-17, 3GPP conducted a normative work on NR NTN and IoT NTN:

- In SA2, WI on the integration of satellite in 5G architecture
- In CT1 (Core and Terminals), study and specification of the solutions related to the integration of satellite in 5G architecture and the support of PLMN (Public Land Mobile Network) selection for satellite access
- In RAN, 3GPP Release 17 WI on 5G NR to support NTN. Initial studies have been performed in Release-17 for IoT as well, followed by a normative work to specify both NB-IoT (Narrowband Internet-of-things) and eMTC (enhanced machine type communication) support for satellite access.

The first set of 3GPP technical specifications incorporating the necessary features and adaptations for 5G to support NTN have been completed in June 2022 as part of the Release-17 with the ASN.1 freeze in September 2022.

NTN Release 18, which started in May 2022, includes WI on further enhancements for NR and NB-IoT/ eMTC over NTN, respectively (they will be detailed in the next section). The release was concluded in June 2024, including core and performance parts.

NTN Release 19 started in March 2024 in RAN WG 1 after WI approval in December 2023. It includes evolutions for NR and NB-IoT/eMTC over NTN including the support of the regenerative payload.

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2.2 STANDARDISATION ACTIVITIES IN 3GPP REL-18

NOTE: The 5G-STARDUST project started after the definition of the Rel-18 objectives.

2.2.1 Release-18 WID Objectives

As part of Release 18, a new WI [2] is proposed to further optimize satellite access performance, address new bands with their specific regulatory requirements, and support new capabilities and services as 5G evolves.

Specifically, Release 18 WI defines enhancements for NG-RAN based NTNs in order to:

- Support new scenarios to cover deployments in frequency bands above 10 GHz.
- Offer optimized performance, especially when addressing handset terminals (including smartphones) with more realistic assumptions on antenna gains, rather than the 0 dBi antenna gain. The specific realistic antenna gain assumption will be determined at the working group level w.r.t. coverage, considering the NTN characteristics such as large propagation delay and satellite movement.
- Provide mobility and service continuity enhancements considering the NTN characteristics such as large propagation delay and satellite movement.
- Address requirements, which mandate the network operator to cross check the UE (User Equipment) location reported by the UE. This verification is essential to comply with the regulatory requirements such as lawful intercept, emergency call, PWS (Public Warning Systems). The network must verify the UE-reported location by estimating UE location at the network side and, if necessary, specify mechanisms to fulfil the regulatory requirements.

In the context of the 5G-STARDUST project, the service continuity and the new scenarios to cover Ka-Band are considered. The detailed Release-18 work item objectives that are relevant to 5G-STARDUST project are recalled hereafter:

The WI aims at specifying enhancements for NG-RAN based NTN according to the following assumptions with implicit compatibility to support HAPS (High altitude Platform System) and ATG (Air-to-Ground) scenarios:

- GSO and NGSO (NGSO includes LEO and MEO).
- Earth fixed tracking area. Earth fixed & Earth moving cells for NGSO
- FDD (Frequency Division Duplexing) mode
- UEs with GNSS (Global Navigation Satellite System, e.g. Galileo) capabilities
- Both “VSAT” devices with directive antenna (including fixed and moving platform mounted devices) and commercial handset terminals (e.g. Power class 3) are supported in FR1 (Frequency Range 1)
- Only “VSAT” devices with directive antenna (including fixed and moving platform mounted devices) are supported in above 10 GHz bands.

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Note 1: In Rel-17 WID, “VSAT” device with external antenna on moving platform is equivalent to a device that operate on platforms in motion, and this is referred to as ESIM.

Note 2: The Rel-17 NTN architecture is assumed.

This WI is adding functionality in Rel-18 to enhance features that were introduced in Rel-15/16/17.

Coverage enhancement

The Rel-18 NTN objectives are focused on the applicability of the “solutions developed by general NR coverage enhancement” (NR_cov_enh) to NTN, and identifying potential issues and enhancements if necessary, considering the NTN characteristics including large propagation delay and satellite movement. Only NTN-specific characteristics are to be included in this coverage enhancement work, otherwise it should be part of another WI (e.g., UL enhancement of coverage).

The following reference scenario is considered for the definition of uplink coverage enhancements for NTN: parameter set-1 for LEO-1200 (Low Earth Orbit at 1200 km) satellite operating at LOS and commercial smartphones with -5.5 dBi antenna gain and 3 dB polarisation loss (per antenna port).

Note: It is understood that the enhancements defined for LEO can also apply to GEO (Geostationary Earth Orbit) and MEO (Medium Earth Orbit) scenarios as appropriate. No additional work is expected for MEO/GEO.

The targeted services are VoIP (Voice over IP) using AMR 4.75 kbps and data transmission services with low data rate of 3 kbps.

The detailed objectives for NTN are:

- To specify PUCCH (Physical Uplink Control Channel) enhancements for Msg4 HARQ-ACK (HARQ Acknowledgment) (e.g. repetition) [RAN1, RAN4]

- To specify, if necessary, enhancements to the Rel-17 procedures for DMRS (Demodulation Reference Signal) bundling for PUSCH (Physical Uplink Shared Channel) taking into account NTN-specifics (e.g. time-frequency pre-compensation) [RAN1]

NR-NTN deployment in above 10 GHz bands

The following assumptions are taken as a baseline for this work:

- GSO (Geostationary orbit) and NGSO (Non-Geostationary orbit e.g. LEO, MEO) based satellite access to be considered.
    - ESIM scenarios for NGSO in Ka band are not considered in this WI.

- Targeted UE types: fixed and mobile VSAT. VSAT UE characteristics from TR38.821 to be considered in priority but additional NTN UE classes may be considered if justified.

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  - Regarding mobile VSAT, three types of terminals and scenario exist; airborne, maritime and land based ESIM. Which type(s) to be specified depending on the outcome of the regulation analysis and co-existence study.

- FDD mode is assumed for the service link (satellite – UE) of the satellite networks operating in above 10 GHz frequency bands, while TDD (Time Division Duplexing) mode is assumed for "terrestrial" mobile network (gNB – UE) operating in bands in FR2 (Frequency Range 2)

- The ITU-R harmonized Ka band will serve as reference

- Co-existence between overlapping NTN and TN (Terrestrial Network) band portions is out of scope of this WI. This aspect will be captured in the specification.

The objectives for NR-NTN deployment in above 10 GHz bands covers:

- Study and identify NTN example band: Analysis of regulations and adjacent channel co-existence scenarios. [RAN4]

  - Consider the satellite harmonized Ka band as the example band [DL: 17.7 - 20.2 GHz; UL: 27.5 – 30.0 GHz], according to ITU allocation; taking into account deployment type (e.g. VSAT, ESIM), scenarios, and ITU-R/regional regulations, define a set of NTN bands (n510, n511, n512) covering the example band suitable for development of generic 3GPP minimum performance requirements [RAN4].

  - Study implications of FDD operation in FR2 and derive requirements for the identified example band appropriately. Satellite bands introduced in 3GPP for NTN for FDD shall not impact the existing 3GPP TDD specifications for terrestrial bands adjacent to the NTN band (see note 3 of the approved way forward RP-211596 in RAN#92-e) [RAN4].

  - Relevant coexistence scenarios and analysis to be considered in RAN4, if and where applicable, to ensure that satellite bands introduced in 3GPP for NTN shall not impact the existing specifications and shall not cause degradation (in the sense of RAN4 co-existence studies) to networks in 3GPP specified terrestrial bands adjacent to the NTN band. In that, it is assumed that the NTN-TN adjacent band coexistence will be performed at the harmonized Ka band edges. The outcome is expected to be applicable to all NTN-TN adjacent band scenarios (if any) in the whole Ka band range where applicable and regulations allow [RAN4].

  - For all the above, RAN4 process as agreed for NTN in FR1 (see 3GPP TR 38.863) should be used for coexistence analysis in above 10 GHz bands [RAN4].

  - Definition of NTN band(s) above 10 GHz does not change the current frequency ranges definition, nor automatically apply to future terrestrial bands defined in this frequency region; (see proposal 2 of the approved way forward RP-211596 in RAN#92-e) [RAN4]

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- Specify Rx/Tx requirements for satellite access node and different VSAT UE class (not only 60 cm aperture) as appropriate for the identified example band [RAN4]

- Identify values for physical layer parameters chosen from the existing FR1 and FR2 sets. The following set of parameters to specify, but not necessarily limited to, are listed as follows [RAN4]:

    - time relationship related enhancement (e.g. K_offset)

    - subcarrier spacing for different UL/DL (Uplink/Downlink) signals/channels

    - PRACH (Physical Random Access Channel) configuration index for FDD above 10 GHz

- Specify necessary RRM (Radio Resource Management) requirements for electronically-steered beam UEs (Type 1) and mechanically-steered beam UEs (Type 2)

NTN-TN and NTN-NTN mobility and service continuity enhancements

This work considers existing methods from NR TN as well as outcome of Rel-17 NR NTN WI outcome as baseline for NTN-TN mobility.

- Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements [RAN2,RAN3,RAN4]

    - For NTN-NTN mobility, specify cell reselection enhancements for earth moving cell, the timing based and location-based cell reselection for quasi-earth fixed cell in Rel-17 can be considered as the starting point [RAN2, RAN3, RAN4].

    - Specify NTN-NTN handover enhancement for RRC_CONNECTED UEs in the quasi-earth-fixed cell and earth-moving cell to reduce the signalling overhead [RAN2, RAN3].

    - Specify cell reselection enhancements for RRC_IDLE/INACTIVE UEs to reduce UE power consumption (NTN-TN mobility is prioritized [RAN2, RAN3, RAN4].

- Study and, if needed, specify enhancement to Xn[/NG] signalling to support feeder link switch-over, CHO, e.g. exchange of necessary information between gNBs (base stations) [RAN3]. Identify and if needed, define RRM enhancement in idle/inactive mode for autonomous SMTC (SSB Measurement Timing Configurations) shifting to address the effect of opposite satellite motion across adjacent orbital planes (RAN4)

2.2.2 Service continuity between TN and NTN

Rel-18 introduced mechanisms to facilitate the mobility from TN to NTN and from NTN to TN.

For the NTN to TN mobility, the NTN may broadcast TN cells coverage areas information via a new SystemInformationBlock (SIB), the SIB25. The SIB25 includes the coverage information consists in a list of geographical TN areas (AreaID, ReferenceLocation, DistanceRadius), with associated frequency information (SIB4, SIB5) of terrestrial cells. This information helps the UE to decide on which network to camp into.

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For the TN to NTN mobility, the TN can broadcast the SIB19 which contains NTN neighbour cell information. Thanks to that, the NTN-capable UE can know the existence of the NTN and perform measurements to switch between the two access technologies.

However, no procedure was introduced to have a seamless mobility between TN and NTN such as RACH-less (Random Access Channel) HO (Handover) or CHO (Conditional Handover). The usage of DAPS (Dual Access Protocol Stack) for seamless NT/NTN mobility was not in the WI scope.

The 5G-STARDUST partners where particularly active to propose solutions on RAN2 to support the TN information broadcast in NTN and was active to propose a solution for TN to NTN mobility.

2.2.3 Ka-band support

The Release-18 is the first to introduce bands above 10 GHz for NTN with the Ka Band. The bands 510, 511, 512 have been introduced as below with the associated duplex mode, SCS, bandwidth configurations:

Table 1 – NR NTN Ka bands [3].

NTN satellite operating band	UpLink (UL) operating band SAN receive / UE transmit $F_{UL,low}$ – $F_{UL,high}$	DownLink (DL) operating band SAN transmit / UE receive $F_{DL,low}$ – $F_{DL,high}$	Duplex mode	SCS (Subcarrier Spacing) supported (kHz)	Bandwidth supported (MHz)	Number of PRB (Physical Resource Block)
n512[1]	27.5 - 30.0 GHz	17.3 - 20.2 GHz	FDD	60	50	66
					100	132
					200	264
				120	50	32
					100	66
					200	132
					400	264
n511[2]	28.35 - 30.0 GHz	17.3 - 20.2 GHz	FDD	60	50	66
					100	132
					200	264

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				120	50	32
					100	66
					200	132
					400	264
n510[3]	27.5 - 28.35 GHz	17.3 - 20.2 GHz	FDD	60	50	66
					100	132
					200	264
				120	50	32
					100	66
					200	132
					400	264

NOTE 1: This band is applicable in the countries subject to CEPT ECC Decision (05)01 and ECC Decision (13)01.

NOTE 2: This band is applicable in the USA subject to FCC 47 CFR part 25.

NOTE 3: This band is applicable for Earth Station operations in the USA subject to FCC 47 CFR part 25. FCC rules currently do not include ESIM operations in this band (47 CFR 25.202).

Associated to spectrum-related Ka-band support, the NTN UE in FR2-NTN has been defined, especially in TS 38.101-5. The following NTN UE VSAT classes are defined associated to power requirements:

Table 2 - NTN VSAT types [3].

NTN VSAT class	NTN VSAT type	Type description
Fixed VSAT	1	Fixed VSAT communicating with GSO and LEO with mechanical steering antenna.
	2[2]	Fixed VSAT communicating with GSO and LEO with electronic steering antenna.

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	3	Fixed VSAT communicating with LEO only with electronic steering antenna.
Mobile VSAT	4	Mobile VSAT communicating with GSO with mechanical steering antenna.
	5[2]	Mobile VSAT communicating with GSO with electronic steering antenna.

Note 1: The NTN VSAT types are assuming NTN VSAT has only one antenna beam towards one satellite at a given time in this release.

Note 2: UE may need power reduction for meeting OFF-axis EIRP requirement defined in clause 9.2.2. Value is implementation dependent.

2.2.4 5G-Stardust partners participation to 3GPP Rel-18

Since January 2023, 5G-Stardust partners have participated to the following 3GPP RAN meeting for 5G NR NTN WI:

Table 3 - Participation of 5G-STARDUST to RAN plenary meetings for Rel-18

3GPP Meeting	Dates	Location
RAN#99	2023-03-20 / 2023-03-23	Rotterdam (NL)
RAN#100	2023-06-12 / 2023-06-14	Taiwan (TW)
RAN#101	2023-09-11 / 2023-09-15	Bangalore (IN)
RAN#102	2023-12-11 / 2023-12-15	Edinburgh (UK)
RAN#103	2024-03-18 / 2024-03-21	Maastricht (NL)
RAN#104	2024-06-17 / 2024-06-20	Shanghai (CN)

Since January 2023, 5G-STARDUST partners have participated to the following 3GPP RAN 1 meetings for 5G NR NTN WI:

Table 4 - Participation of 5G-STARDUST to RAN WG1 meetings for Rel-18

3GPP Meeting	Dates	Location
RAN1#112	2023-02-27 / 2023-03-03	Athens (GR)

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RAN1#112-bis-e	2023-04-17 / 2023-04-26	Electronic
RAN1#113	2023-05-22 / 2023-05-26	Incheon (KR)
RAN1#114	2023-08-21 / 2023-08-25	Toulouse (FR)
RAN1#114-bis	2023-10-09 / 2023-10-13	Xiamen (CN)
RAN1#115	2024-11-13 / 2024-11-17	Chicago (US)

Since January 2023, 5G-STARDUST partners have participated to the following 3GPP RAN 2 meetings for 5G NR NTN WI:

Table 5 - Participation of 5G-STARDUST to RAN WG2 meetings for Rel-18

3GPP Meeting	Dates	Location
RAN2#121	2023-02-27 / 2023-03-03	Athens (GR)
RAN2#121-bis-e	2023-04-17 / 2023-04-26	Electronic
RAN2#122	2023-05-22 / 2023-05-26	Incheon (KR)
RAN2#123	2023-08-21 / 2023-08-25	Toulouse (FR)
RAN2#123-bis	2023-10-09 / 2023-10-13	Xiamen (CN)
RAN2#124	2024-11-13 / 2024-11-17	Chicago (US)
RAN2#125	2024-02-26 / 2024-03-01	Athens (GR)

Since January 2023, 5G-STARDUST partners have participated to the following 3GPP RAN 3 meetings for 5G NR NTN WI:

Table 6 - Participation of 5G-STARDUST to RAN WG3 meetings for Rel-18

3GPP Meeting	Dates	Location
RAN3#119	2023-02-27 / 2023-03-03	Athens (GR)
RAN3#119-bis-e	2023-04-17 / 2023-04-26	Electronic
RAN3#120	2023-05-22 / 2023-05-26	Incheon (KR)

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RAN3#121	2023-08-21 / 2023-08-25	Toulouse (FR)
RAN3#121-bis	2023-10-09 / 2023-10-13	Xiamen (CN)
RAN3#122	2024-11-13 / 2024-11-17	Chicago (US)
RAN3#123	2024-02-26 / 2024-03-01	Athens (GR)

Since January 2023, 5G-STARDUST partners have participated to the following 3GPP RAN 4 meetings for 5G NR NTN WI:

Table 7 - Participation of 5G-STARDUST to RAN WG4 meetings for Rel-18

3GPP Meeting	Dates	Location
RAN4#106	2023-02-27 / 2023-03-03	Athens (GR)
RAN4#106-bis-e	2023-04-17 / 2023-04-26	Electronic
RAN4#107	2023-05-22 / 2023-05-26	Incheon (KR)
RAN4#108	2023-08-21 / 2023-08-25	Toulouse (FR)
RAN4#108-bis	2023-10-09 / 2023-10-13	Xiamen (CN)
RAN4#109	2024-11-13 / 2024-11-17	Chicago (US)
RAN4#110	2024-02-26 / 2024-03-01	Athens (GR)
RAN4#110-bis	2024-04-15 / 2024-04-19	Changsha (CN)
RAN4#111	2024-05-20 / 2024-05-24	Fukuoka (JP)

Table 8 - Participation of 5G-STARDUST to SA plenary meetings for Rel-18

3GPP Meeting	Dates	Location
SA#99	2023-03-20 / 2023-03-23	Rotterdam (NL)
SA#100	2023-06-12 / 2023-06-14	Taiwan (TW)
SA#101	2023-09-11 / 2023-09-15	Bangalore (IN)

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SA#102	2023-12-11 / 2023-12-15	Edinburgh (UK)
SA#103	2024-03-18 / 2024-03-21	Maastricht (NL)

Table 9 - Participation of 5G-STARDUST to SA WG2 meetings for Rel-18 [4].

3GPP Meeting	Dates	Location
SA2#155	2023-02-20 / 2023-02-24	Athens (GR)
SA2#156-e	2023-04-17 / 2023-04-21	Online
SA2#157	2023-05-22 / 2023-05-26	Berlin (DE)
SA2#158	2023-08-21 / 2023-08-25	Goteborg (SW)

The list of relevant contributions by the 5G-STARDUST partners is provided in Appendix A.1.

2.3 STANDARDISATION ACTIVITES IN 3GPP REL-19

During the preparation of the Rel-19 definition, 5G-STARDUST partners were actively participating at the discussion to introduce for support of regenerative payloads for NR, support of dedication notification/alert channel and NTN/TN mobility enhancement in connected mode (e.g. DAPS).

2.3.1 Release-19 WID Objectives

As part of Release 19, a new WI [5] is proposed to further optimize satellite access performance, address new bands with their specific regulatory requirements, and support new capabilities and services as the evolution of 5G continues.

Specifically, Release 19 WI defines enhancements for RAN based NTN in order to:

- Offer optimized performance for both system and link level, especially when addressing handset terminals (including smartphones with -5.5 dBi antenna gain) w.r.t. downlink coverage considering the NTN deployment constraints such as payload power limitation, large satellite footprint and limited feeder link bandwidth.
- Offer optimized capacity performance on uplink through multiplexing techniques.
- Address RedCap UE within FR1 NTN.
- MBS (Multicast Broadcast System) feature provides an important add-value for NR NTN system, leveraging the large coverage of the NTN compared to TN. Terrestrial MBS features are equally available for NR NTN in the 5G specifications, but for some cases the intended service area is expected to be smaller than the coverage of a Uu cell, some enhancements are required to notify the service area of a Broadcast service.

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- Support NTN architecture with 5G system functions on board the NTN vehicle (i.e. regenerative payloads).

The detailed Release-19 WI objectives that are relevant to 5G-STARDUST project are recalled hereafter:

Specify **downlink coverage enhancements** targeting support for additional reference satellite payload parameters covering both GSO and NGSO constellations operating in FR1-NTN or FR2-NTN

- Define additional reference satellite payload parameters assuming power sharing among satellite beams or different satellite beam patterns/size (i.e. wide or narrow) across the satellite footprint, such that satellite beams may not all be simultaneously active or may be active below the nominal EIRP density per satellite beam (see section 6.1.1 in TR 38.821) due to limited power and limited feeder link bandwidth.
- Define the corresponding power sharing assumptions and necessary link level and system level evaluation methodology and relevant KPIs for evaluations of the coverage, to allow for identification of physical channels/signals and system-level aspects that need enhancements and the corresponding needed improvements.
- Specify solutions, including link level enhancements for FR1-NTN and system level enhancements for FR1-NTN and FR2-NTN, allowing dynamic and flexible power sharing between satellite beams or different satellite beam patterns/size (i.e. wide or narrow) across the satellite footprint.
    - Link level enhancements are to be specified for the following channels:
        - PDCCH (Physical Downlink Control Channel) at least for CSS (except for Type-3) via PDCCH repetition
        - PDSCH (Physical Downlink Shared Channel) with Msg4 via PDSCH repetition
        - PDSCH with SIB1 via 2 PDSCH repetitions within 20 ms duration
    - System-level enhancements are to be specified for the following:
        - Support of extended periodicity of the half frames with SS/PBCH (Synchronization signal and physical broadcast channel) blocks assumed by UE during initial access.
            - The maximum of the additional default value (apart from the existing 20ms value) is 160 ms
- Notes for this objective:
    - SSB channel enhancement other than SSB periodicity extension is not considered
        - RAN1 should consider issues such as UE's cell search complexity and impact to initial cell selection, latency and success rate, for the above extension
    - The SSB periodicity enhancements potentially defined in this WID only apply to NTN operation
    - Antenna gain of UE shall be assumed to be -5.5dBi in case of smartphone in FR1-NTN, the UE is assumed to be a full duplex UE, and at least 2Rx are considered at the UE
    - NGSO to be considered in priority: LEO Set-1 @ 600 km

Uplink Capacity/Throughput Enhancement for FR1-NTN

- Study then specify, if beneficial, DFT-s-OFDM PUSCH enhancements via OCC
    - Determine the achievable capacity improvement to be targeted considering realistic impairments (e.g. Doppler, time variation, phase distortion, etc)
    - Specify necessary signalling, if needed
    - Update RF requirements, accordingly, if needed

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  - Note: The study can consider orthogonal cover codes across OFDM symbols, across slots, and/or within an OFDM symbol.
  - Note: the study phase is targeted to be completed by RAN#104
- Notes for this objective:
  - The enhancement is not targeting improvements/impacts of MU-MIMO capability
  - The enhancement is not targeted to PUSCH DMRS
  - No enhancement for initial access
  - Enhancements to PRACH are not in scope.
  - This feature may be applicable for UEs operating in terrestrial networks based on a common design

Support of regenerative payload

- Specify the support of gNB on board in TS 38.300
- Specify, if needed, any necessary enhancements related to the intra and inter-gNB mobility, especially for Xn interface over feeder link or over ISL. [RAN3]
- Note: if any additional necessary stage-3 specifications impact for e.g. NGAP is identified, RAN3 will handle it.

2.3.2 Regenerative payload

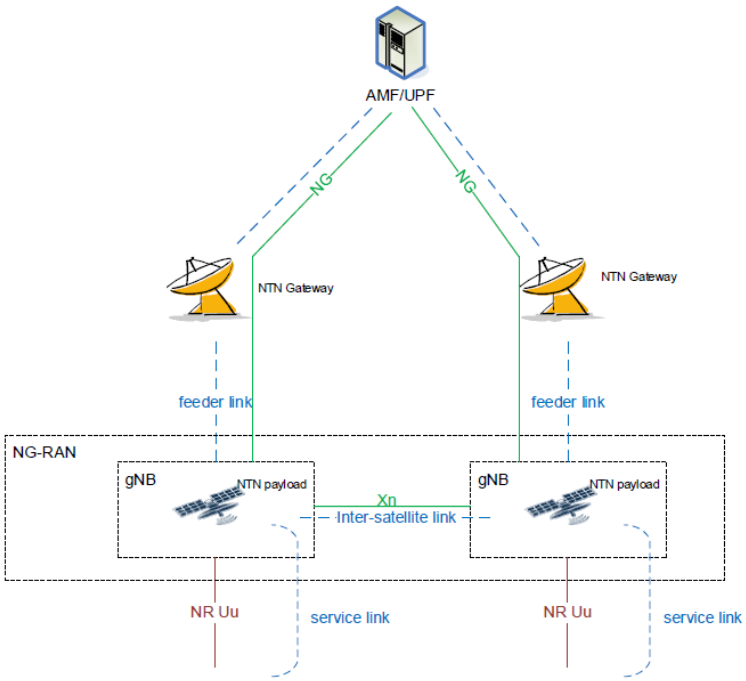

Figure 3: Regenerative payload architecture in Rel-19 [6].

In preparation of the Release 19, the regenerative payload architecture options were extensively discussed. The baseline adopted in SA2, RAN2 and RAN3 embarks the full gNB on-board and put the 5GC (5G Core) on the ground as illustrated on the figure above. The technical report [7] led by SA2 provides system solutions to support the mobility of the NG-RAN interfaces over the feeder link for NGSO.

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The other options are not prohibited by implementation, such as the different split options between RU (gNB Radio Unit), DU (gNB Distributed Unit) and CU (gNB Centralized Unit).

The 5G-STARDUST partners actively participated to the discussions in preparation to the Rel-19 to include regenerative payload support and to include different architecture options.

2.3.3 Downlink coverage enhancement

In addition to the NR NTN uplink coverage enhancement introduced in Rel-18, i.e. PUCCH repetition for Msg4 HARQ-ACK (for the initial access) and PUSCH DMRS bundling to improve channel estimation, new repetition to downlink messages are introduced in Rel-19 to improve NTN coverage in downlink.

The study RAN1 showed that PDCCH for CORESET common search space (downlink control information), PDSCH for Msg4 and PDSCH for SIB1 transmission limit the downlink coverage. So, it was defined repetitions mechanisms for these transmissions, thus, improving downlink coverage.

The satellite operation usually use beam hopping techniques to improve satellite coverage. At a given moment of time, the satellite power is shared between active beams to a cover a subset of the satellite coverage while the other part of the coverage is not served. The active beams change according to the dwelling policy. To support this, the SSB periodicity at which the SSB, an essential downlink signal for the synchronization and the initial access, is transmitted is increased from 20 ms to 160 ms. It means that a cell can be served for one frame (equal 10 ms), transmitting the SSB and SIB1 and turned off the rest of the time, so a beam can be active 0.0625% of the time.

The 5G-STARDUST partners were reporter for the study and normative phase on the downlink coverage enhancement.

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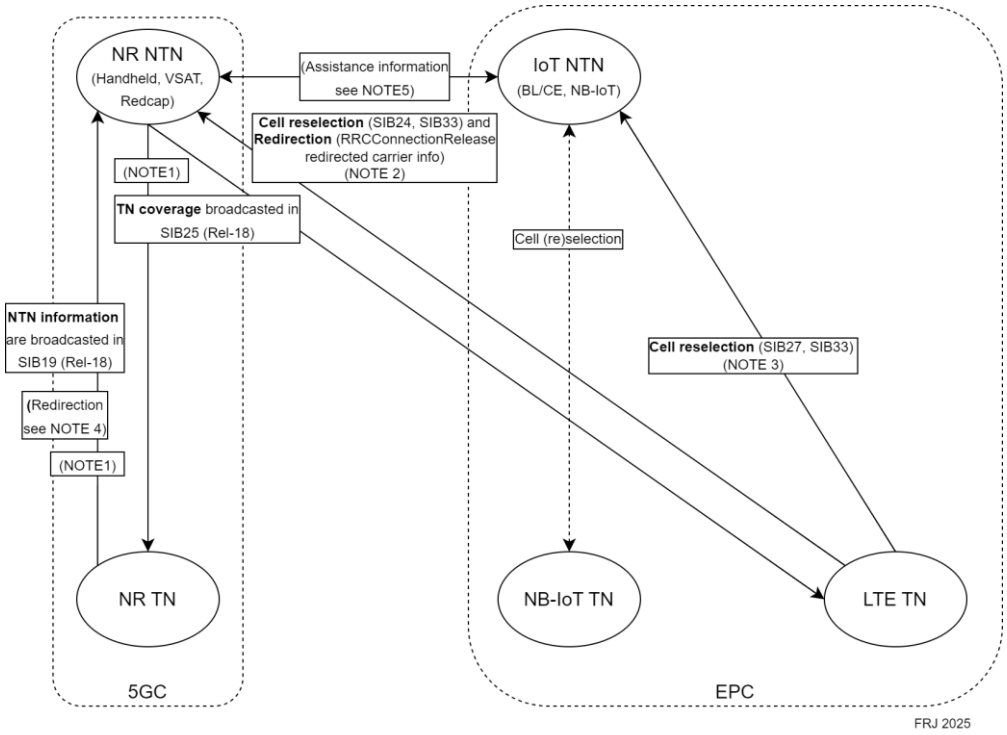
2.3.4 TN-NTN mobility



NOTES

NOTE1 : NTN TN mobility is implictly supported since Rel-17 but connected mode measurement are not considered supported as there are no RAN4 requirements. Dual connectivity is not supported.
NOTE2 : LTE TN to NR NTN Rel-19 (RP-240924). RRCConnectionRelease redirected carrier info and neighbour satellite information in SIB33
NOTE3 : TEI19 LTE TN to NB-IoT NTN mobility Rel-19 (see RAN2#128 meeting report)
NOTE4 : NR TN to NR NTN redirection in Rel-19 (see RAN2#130 meeting report) but not NR TN to IoT NTN
NOTE5 : TEI19 Inter-RAT assistance information in SIB (see RAN2#130 meeting report) for both direction

Figure 4: Inter-RAT mobility TN-NTN

Up to Rel-19, the TN-NTN inter-RAT mobility illustrated in Figure 5 are defined in the 3GPP system. They are of three types:

- Provide assistance information to the UE to enable the inter-RAT search (NR TN to NR NTN, NR NTN to NR TN, NR NTN to LTE TN, NR NTN to IoT NTN and IoT NTN to NR NTN)

- Provide information for the cell reselection (LTE TN to IoT NTN and LTE TN to NR NTN)

- Enable redirection, a type of mobility where the UE goes to IDLE mode and then move to the target cell (LTE TN to NR NTN, NR TN to NR NTN).

There is no seamless mobility from one RAT to another defined for NTN. For NR TN to NR NTN, the UE mandatory goes to IDLE mode before moving to NR NTN. However, the UE may be instructed with the satellite ephemerides (SIB19) and frequency (SIB3,4), so with a limited interruption time. For NR NTN to NR TN, the UE can since Rel-17 performs measurement in connected mode and so can report measurement to the network for inter-RAT mobility or for cell reselection (in IDLE mode). Furthermore, the UE may be informed of the TN coverage with SIB25 in NTN and decide to move TN.

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The 5G-STARDUST partners were reporter on LTE to NR NTN mobility and pushed during the Rel-19 discussion for a seamless NR NTN and TN mobility.

2.3.5 Dual steer

SA1 captured in [8] for Release 19 the use cases and potential service requirements related to 5G system support of traffic steering, splitting, and switching of UE's user data across two 3GPP access networks. Dual steering technics allow to ensure service continuity for a UE by using for instance TN and NTN (or different orbit of NTN, e.g. LEO and GEO). Dual Steer study can be used as a baseline for further study in Rel-20 by SA2 for new NTN/TN dual connectivity solutions. The following use cases describes the TN/NTN dual access:

- 5.1 and 5.10 for NTN maritime scenario, including LEO and GEO dual accesses
- 5.4 for inter-PLMN NTN/TN scenario
- 5.5 on NTN-based dual 3GPP access (both same and inter-PLMN)
- 5.6 on UE using TN and NTN for mobility scenarios
- 5.9 on dual steering through satellite and UAV (e.g. drone)
- 5.14 on inter-PLMN scenario with TN and multiple NTN accesses
- 5.17 on vehicle IoT devices steering via NTN and TN
- 5.18 on UAV UE connecting to TN and NTN

Following that, SA2 conducted a study in Rel-19 for the support of the dual steer and ATSSS (Access Traffic Steering-Switching-Splitting) that was published in December 2024 in the technical report [9]. According to the conclusion of this report, no normative phase was done for dual steer in Rel-19. Nothing additional is expected in Rel-20. For ATSSS, the normative phase was limited to the support of the multi-path QUIC (MPQUIC) steering functionality.

The 5G-STARDUST was leader on the definition of the dual steer use cases and requirements in SA1.

2.3.6 Ku-band support

The Ku-band is part of the Rel-19 after the RAN#104 meeting approval of the WI. In complement of FR2-NTN 510, 511, 512 for Ka-band, the objective of the WI is to introduce 4 new Ku-band between 10.70 and 14.5 GHz.

The particularity of the Ku-band in Rel-19 compared to Rel-18 is to support both FR1-NTN and FR2-NTN frequency range while FR1-NTN was only supported for <4 GHz and FR2-NTN only for >18 GHz. Therefore, 4 bands have been defined in the Ku-band, 2 for FR1-NTN and 2 for FR2-NTN. The different configurations are provided in the table below:

Table 10: NR NTN Ku bands [3].

NTN satellite	UpLink (UL) operating band	DownLink (DL) operating band	Duplex mode	SCS supported	Bandwidth supported	Number of PRB

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operating band	SAN receive / UE transmit $F_{UL,low}$ – $F_{UL,high}$	SAN transmit / UE receive $F_{DL,low}$ – $F_{DL,high}$		(kHz)	(MHz)	
n248[2,3]	14.0 - 14.5 GHz	10.7 - 12.75 GHz	FDD	15	10	52
					15	79
					25	133
					35	188
					50	270
				30	10	24
					20	51
					25	65
					35	92
					50	133
					70	189
					100	273
n247[2,3]	13.75 - 14 GHz	10.7 - 12.75 GHz	FDD	15	10	52
					15	79
					25	133
					35	188
					50	270
				30	10	24
					20	51

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					25	65
					35	92
					50	133
					70	189
					100	273
n509[2,3]	14.0 - 14.5 GHz	10.7 - 12.75 GHz	FDD	120	50	32
					100	66
					200	132
					400	264
n508[2,3]	13.75 - 14 GHz	10.7 - 12.75 GHz	FDD	120	50	32
					100	66
					200	132
					400 (DL only)	264
NOTE 2: For Region 2, the downlink is limited to 10700 – 12700 MHz						
NOTE 3: For the US, the downlink is limited to 10700 – 12200 MHz for Mobile VSAT.						

In addition to Table 13 introduced for VSAT in Ka-band, the following VSAT type has been introduced for Ku-bands:

Table 11: mobile VSAT Ku type [3].

NTN VSAT class	NTN VSAT type	Type description
Mobile VSAT	6[4]	Mobile VSAT communicating with LEO only with electronic steering antenna.

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NOTE 4: The NTN VSAT type 6 is only applicable to bands n509, n508 and n248, n247.

2.3.7 5G-STARDUST partners participation to 3GPP Rel-19

Since January 2023, 5G-STARDUST partners have participated to the following 3GPP RAN meetings for Rel-19:

Table 12 - Participation of 5G-STARDUST to RAN plenary meetings for Rel-19

3GPP Meeting	Dates	Location
RAN-Release 19 Workshop	2023-06-15 / 2023-06-16	Taiwan (TW)
RAN#102	2023-12-11 / 2023-12-15	Edinburgh (UK)
RAN#103	2024-03-18 / 2024-03-21	Maastricht (NL)
RAN#104	2024-06-17 / 2024-06-20	Shanghai (CN)
RAN#105	2024-09-09 / 2024-09-12	Melbourne (AU)
RAN#106	2024-12-09 / 2024-12-12	Madrid (ES)
RAN#107	2025-03-12 / 2025-03-14	Incheon (KR)
RAN#108	2025-06-09 / 2025-06-13	Prague (CZ)
RAN#109	2025-09-15 / 2025-09-18	Beijing (CN)
RAN#110	2025-12-08 / 2025-12-11	Baltimore (US)

Since January 2023, 5G-STARDUST partners have participated to the following 3GPP RAN 1 meetings for 5G NR NTN WI:

Table 13 - Participation of 5G-STARDUST to RAN WG1 meetings for Rel-19

3GPP Meeting	Dates	Location
RAN1#116	2024-02-26 / 2024-03-01	Athens (GR)
RAN1#116-bis	2024-04-15 / 2024-04-19	Changsha (CN)
RAN1#117	2024-05-20 / 2024-05-24	Fukuoka (JP)

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RAN1#118	2024-08-17 / 2024-08-23	Maastricht (NL)
RAN1#118-bis	2024-10-14 / 2024-10-18	Hefei (CN)
RAN1#119	2024-11-18 / 2024-11-22	Orlando (US)
RAN1#120	2025-02-17 / 2025-02-21	Athens (GR)
RAN1#120-bis	2025-04-07 / 2024-04-11	Wuhan (CN)
RAN1#121	2025-05-19 / 2025-05-23	Malta (MT)
RAN1#122	2025-08-25 / 2025-08-29	Bengaluru (IN)
RAN1#122-bis	2025-10-13 / 2025-10-17	Prague (CZ)
RAN1#123	2025-11-17 / 2025-11-21	Dallas (US)

Since January 2023, 5G-STARDUST partners have participated to the following 3GPP RAN 2 meetings for 5G NR NTN WI:

Table 14 - Participation of 5G-STARDUST to RAN WG2 meetings for Rel-19

3GPP Meeting	Dates	Location
RAN2#125-bis	2024-04-15 / 2024-04-19	Changsha (CN)
RAN2#126	2024-05-20 / 2024-05-24	Fukuoka (JP)
RAN2#127	2024-08-17 / 2024-08-23	Maastricht (NL)
RAN2#127-bis	2024-10-14 / 2024-10-18	Hefei (CN)
RAN2#128	2024-11-18 / 2024-11-22	Orlando (US)
RAN2#129	2025-02-17 / 2025-02-21	Athens (GR)
RAN2#129-bis	2025-04-07 / 2024-04-11	Wuhan (CN)
RAN2#130	2025-05-19 / 2025-05-23	Malta (MT)
RAN2#131	2025-08-25 / 2025-08-29	Bengaluru (IN)

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RAN2#131-bis	2025-10-13 / 2025-10-17	Prague (CZ)
RAN2#132	2025-11-17 / 2025-11-21	Dallas (US)

Since January 2023, 5G-STARDUST partners have participated to the following 3GPP RAN 3 meetings for 5G NR NTN WI:

Table 15 - Participation of 5G-STARDUST to RAN WG3 meetings for Rel-19

3GPP Meeting	Dates	Location
RAN3#123-bis	2024-04-15 / 2024-04-19	Changsha (CN)
RAN3#124	2024-05-20 / 2024-05-24	Fukuoka (JP)
RAN3#125	2024-08-17 / 2024-08-23	Maastricht (NL)
RAN3#125-bis	2024-10-14 / 2024-10-18	Hefei (CN)
RAN3#126	2024-11-18 / 2024-11-22	Orlando (US)
RAN3#127	2025-02-17 / 2025-02-21	Athens (GR)
RAN3#127-bis	2025-04-07 / 2024-04-11	Wuhan (CN)
RAN3#128	2025-05-19 / 2025-05-23	Malta (MT)
RAN3#129	2025-08-25 / 2025-08-29	Bengaluru (IN)
RAN3#129-bis	2025-10-13 / 2025-10-17	Prague (CZ)
RAN3#130	2025-11-17 / 2025-11-21	Dallas (US)

Since January 2023, 5G-STARDUST partners have participated to the following 3GPP RAN 4 meetings for 5G NR NTN WI:

Table 16 - Participation of 5G-STARDUST to RAN WG4 meetings for Rel-19

3GPP Meeting	Dates	Location
RAN4#111	2024-05-20 / 2024-05-24	Fukuoka (JP)
RAN4#112	2024-08-17 / 2024-08-23	Maastricht (NL)

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RAN4#112-bis	2024-10-14 / 2024-10-18	Hefei (CN)
RAN4#113	2024-11-18 / 2024-11-22	Orlando (US)
RAN4#114	2025-02-17 / 2025-02-21	Athens (GR)
RAN4#114-bis	2025-04-07 / 2024-04-11	Wuhan (CN)
RAN4#115	2025-05-19 / 2025-05-23	Malta (MT)
RAN4#116	2025-08-25 / 2025-08-29	Bengaluru (IN)
RAN4#116-bis	2025-10-13 / 2025-10-17	Prague (CZ)
RAN4#117	2025-11-17 / 2025-11-21	Dallas (US)

Since January 2023, 5G-STARDUST partners have participated to the following 3GPP SA plenary meetings for 5G NR NTN WI definition. The content of the Rel-19 was decided in SA#104 in June 2024:

Table 17 - Participation of 5G-STARDUST to SA plenary meetings for Rel-19

3GPP Meeting	Dates	Location
SA#99	2023-03-20 / 2023-03-23	Rotterdam (NL)
SA#100	2023-06-12 / 2023-06-14	Taiwan (TW)
SA#101	2023-09-11 / 2023-09-15	Bangalore (IN)
SA#102	2023-12-11 / 2023-12-15	Edinburgh (UK)
SA#103	2024-03-18 / 2024-03-21	Maastricht (NL)
SA#104	2024-06-17 / 2024-06-20	Shanghai (CN)
SA#105	2024-09-09 / 2024-09-12	Melbourne (AU)
SA#106	2024-12-09 / 2024-12-12	Madrid (ES)

Since January 2023, 5G-STARDUST partners have participated to the following 3GPP SA1 meetings:

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Table 18 - Participation of 5G-STARDUST to SA WG1 meetings for Rel-19

3GPP Meeting	Dates	Location
SA1#100 Adhoc	2023-01-16 / 2023-01-20	Electronic
SA1#101	2023-02-20 / 2023-02-24	Athens (GR)
SA1#102	2023-05-22 / 2023-05-26	Berlin (DE)
SA1#103	2023-08-21 / 2023-08-25	Goteborg (SW)
SA1#104	2024-11-13 / 2024-11-17	Chicago (US)
SA1#105	2024-02-26 / 2024-03-01	Athens (GR)
SA1#106	2024-05-27 / 2024-05-31	Jeju (KR)

Since January 2023, 5G-STARDUST partners have participated to the following 3GPP SA2 meetings for 5G Satellite phase 3 WI [10]:

Table 19 - Participation of 5G-STARDUST to SA WG2 meetings for Rel-19

3GPP Meeting	Dates	Location
SA2#157	2023-05-22 / 2023-05-26	Berlin (DE)
SA2#158	2023-08-21 / 2023-08-25	Goteborg (SW)
SA2#159	2023-10-09 / 2023-10-13	Xiamen (CN)
SA2#160	2024-11-13 / 2024-11-17	Chicago (US)
SA2#160-Ad hoc-e	2024-01-22 / 2024-01-29	Electronic
SA2#161	2024-02-26 / 2024-03-01	Athens (GR)
SA2#162	2024-04-15 / 2024-04-19	Changsha (CN)
SA2#163	2024-05-27 / 2024-05-31	Jeju (KR)
SA2#164	2024-08-19 / 2024-08-23	Maastricht (NL)

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SA2#166	2024-11-18 / 2024-11-22	Orlando (US)
SA2#166-Ad hoc-e	2025-01-20 / 2025-01-24	Online
SA2#167	2025-02-17 / 2025-02-21	Athens (GR)

The related contributions of 5G-STARDUST partners to 3GPP RAN and SA meetings for Rel-19 are listed in Appendix A.2.

2.4 5G-ADVANCED AND 6G IN REL-20

Release 20 is the first release for 6G and will cover the whole study before a normative phase in Release 21. However, some topics remain open for 5G advanced. For NR NTN in RAN, there is a study for GNSS-resilient operations (e.g. for temporary unavailability of GNSS or degraded GNSS signal), the introduction of LTE TN to NR NTN connected mobility, the support of High Power UE, Half-Duplex FDD UEs and intra-band intra-SAN (Satellite Access Network, e.g. NTN payload) downlink carrier aggregation in RAN4 and in SA2, the support of UE-Sat-UE communications (i.e. mesh connectivity) for non-IMS services (e.g. Ethernet and IP).

The 6G study started in SA1 in August 2024 for defining use cases [10]. The NTN is seen as a core element for energy-efficient, resilient, and ubiquitous 6G (see section 8 on ubiquitous connectivity). That is reflected in the RAN work, where NTN/TN integration and mobility are largely discussed on RAN1 and RAN2 working groups. 5G-STARDUST experiments on TN-NTN integration may contribute to the discussions on 6G.

5G-STARDUST partners promoted all these topics and contributed also to the 6G definition, in particular for the integration of the TN and NTN.

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3 CONCLUSION

Regarding satellite standardisation activities in 3GPP, the newly 3GPP-specified standard for NTN is the result of a joint effort between stakeholders of both the mobile and satellite industries and the leading role of 5G-STARDUST partners on 3GPP specifications in different working groups.

Integration of satellites with mobile systems is now possible with the 3GPP Release 17 NTN standard. This NTN standard has been designed to support the wide range of satellite network deployment scenarios covering any orbit, any frequency band, any device, any beam size and type. It is expected that this NTN standard will be welcomed by Telecommunication User groups (Public safety, transport, automotive, media and entertainment, defence, agriculture,…) calling for seamless combination of satellite and mobile systems, native support of 5G added value features across the access technologies (e.g. slicing, energy saving, mobility, 3rd party network management, application & service platforms), and multi-vendor interoperability preventing vendor lock associated to legacy proprietary satellite access technologies.

5G-STARDUST partners have been actively contributing to Rel-18 to enhance service continuity between TN and NTN and to support Ka-band scenarios. As part of the Rel-19, the partners contributed to defining the Rel-19 work items objectives, especially to support regenerative payload architecture.

By the end of 2025, the Rel-19 was completed, including support of regenerative payload and Ku-band. 5G-STARDUST partners (TASF, HSP, DLR, FHG) actively participate in the newly formed NTN forum led by ESA in the different working groups[1]. 5G-STARDUST outcomes on TN-NTN service continuity will be highly valuable for the 6G objective of unification of TN and NTN.

[1] WG1 : Standards; WG2 : Consolidation of vertical needs; WG3 : Experimentation; WG4 : Devices.

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[9] 3GPP, “TR 23.700-54 Study on Multi-Access,” 2024.

[10] 3GPP, “SP-220679 WI Study on satellite access - Phase 3,” December 2023.

[11] 3GPP, “TR 22.870 Study on 6G Use Cases and Service Requirements,” 2025.

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APPENDIX

A.1 REL-18 CONTRIBUTIONS

Table 20 - the contributions of 5G-STARDUST partners to 3GPP RAN meetings for Rel-18 NR NTN WI

Meeting	Tdoc	Contributors	Title
RAN#99	RP-230610	Apple, Thales, Hughes/EchoStar, Lockheed Martin, OPPO, Ligado, …	On Rel-18 NR NTN Downlink Coverage Enhancement
	RP-230629	Ericsson, Qualcomm, Thales	3GPP submission towards IMT-2020 Satellite
	RP-230630	Ericsson, Qualcomm, Thales	New SID: Study on Self-Evaluation towards IMT-2020 Satellite Radio Interface Submission
	RP-230728	Thales	Summary of offline discussion about NR NTN (Non-Terrestrial Networks) enhancements
	RP-230731	Ericsson, Qualcomm, Thales, MediaTek Inc.	New SID: Study on Self-Evaluation towards IMT-2020 Satellite Radio Interface Submission
	RP-230736	Ericsson, Qualcomm, Thales, MediaTek Inc.	New SID: Study on Self-Evaluation towards IMT-2020 Satellite Radio Interface Submission
	RP-230738	Thales	Draft LS to ITU-R WP4B on 3GPP submission towards IMT-2020 Satellite (to: SA; cc: -; contact: **Thales**)
	RP-230809	Thales	Revised WID: NR NTN (Non-Terrestrial Networks) enhancements
RAN#100	RP-230877	Thales	Revised WID: NR NTN (Non-Terrestrial Networks) enhancements
	RP-230878	Thales	Motivation to revise the Rel-18 WID NR_NTN_enh
	RP-231038	Thales	New WI: Extension to 30 MHz Channel Bandwidth for NR NTN in FR1
	RP-231320	MediaTek Inc., Qualcomm Inc., Ericsson, Thales	IMT-2020 submission of 3GPP satellite RITs
	RP-231437	Thales	New WI: Extension to 30 MHz Channel Bandwidth for NR NTN in FR1
	RP-231451	Thales	Way forward on WI NR_NTN_enh
	RP-231457	MediaTek Inc., Qualcomm Inc., Ericsson, Thales	IMT-2020 submission of 3GPP satellite RITs
	RP-231458	Thales	New WI: Extension to 30 MHz Channel Bandwidth for NR NTN in FR1
	RP-231482	Thales	Way forward on WI NR_NTN_enh
	RP-231484	Thales	Revised WID: NR NTN (Non-Terrestrial Networks) enhancements
	RP-231497	Thales	New WI: Extension to 30 MHz Channel Bandwidth for NR NTN in FR1
	RP-231499	Thales	New WI: Extension to 30 MHz Channel Bandwidth for NR NTN in FR1
RAN#101	RP-231565	Thales	Proposed RAN1/2/3 led topics for Rel-19 NTN evolution
	RP-231566	Thales	Consideration on RAN4 led NTN topics for Release 19
	RP-231957	Thales, Huawei, Ericsson	On Network Verified UE Location for Rel-18 NR NTN
	RP-232591	Thales	Characteristics template for 3GPP 5G NR satellite access RIT (Release 17 and beyond)
	RP-232647	Thales	Revised WID: 30 MHz Channel Bandwidth for NR NTN in FR1
	RP-232654	Thales	Way forward regarding NOTE in the network verified UE location objective in the NR NTN enhancement WID
	RP-232669	Thales	Revised WID: NR NTN (Non-Terrestrial Networks) enhancements
	RP-232694	Thales	Way forward on potential RRM objectives for NR-NTN deployment in above 10 GHz (NR-NTN-enh WID)
RAN#102	RP-234011	Thales	Revised WID: NR NTN (Non-Terrestrial Networks) enhancements
	RP-233958	Thales	WI exception: NR NTN (Non-Terrestrial Networks) enhancements
RAN#103	RP-240142	Thales, NTT Docomo	Rel-18 WI exception for NR NTN (Non-Terrestrial Networks) enhancements

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Table 21 - the contributions of 5G-STARDUST partners related to 5G-STARDUST project to 3GPP RAN WG1 meetings for Rel-18 NR NTN WI

Meeting	Tdoc	Contributors	Title
RAN1#112	R1-2300319	Thales	Discussion on network verified UE location in NR NTN
	R1-2300324	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3
	R1-2302182	Moderator (Thales)	Draft CR on the Type-1 HARQ-ACK codebook
	R1-2302229	Moderator (Thales), OPPO, NTT DOCOMO, Xiaomi, Samsung, Ericsson	CR on the Type-1 HARQ-ACK codebook
RAN1#112-bis-e	R1-2302401	Thales	Discussion on network verified UE location in NR NTN
	R1-2302406	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3
	R1-2302744	Thales	Draft CR on editorial correction on Common TA parameters
	R1-2302753	Thales	Draft CR on editorial correction on epoch time
RAN1#113	R1-2304610	Thales	Discussion on network verified UE location in NR NTN
	R1-2304615	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3
	R1-2306004	Rapporteur (Thales)	Initial input on higher layer parameters for Rel-18 NR NTN
	R1-2306005	Rapporteur (Thales)	RAN1 agreements for Rel-18 WI on NR NTN enhancements
	R1-2306253	Moderator (Thales)	Summary of offline discussion on RRC parameters for Rel-18 NR NTN enhancements
	R1-2306264	WI rapporteur (Thales)	RAN1 agreements for Rel-18 WI on NR NTN enhancements up to RAN1#113
RAN1#114	R1-2306404	Thales	Discussion on network verified UE location in NR NTN
	R1-2306408	Thales	Discussion on RAN4 LS on the system parameters for NTN above 10 GHz
	R1-2308480	Moderator (Thales)	Summary of offline discussion on RRC parameters for Rel-18 NR NTN enhancements
	R1-2308678	WI rapporteur (Thales)	RAN1 agreements for Rel-18 WI on NR NTN enhancements up to RAN1#114
RAN1#114-bis	R1-2308862	Thales	Maintenance on network verified UE location in NR NTN
	R1-2310221	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3
	R1-2310650	Moderator (Thales)	Rel-18 Higher Layer Parameters for NR NTN
	R1-2310687	WI rapporteur (Thales)	RAN1 agreements for Rel-18 WI on NR NTN enhancements up to RAN1#114-bis
RAN1#115	R1-2310935	Thales	Maintenance on network verified UE location in NR NTN
	R1-2310936	Thales	Considerations on the system parameters for FR2-NTN
	R1-2312246	Thales	TP for TS 38.300
	R1-2312424	Moderator (Thales)	Rel-18 Higher Layer Parameters for NR NTN
	R1-2312495	Moderator (Thales)	TP for TS 38.300
	R1-2312496	RAN1, Thales	LS on NR-NTN TP for TS 38.300
	R1-2312518	Moderator (Thales)	FLS#1 on NR-NTN TP for TS 38.300
	R1-2312625	Moderator (Thales)	FLS#2 on NR-NTN TP for TS 38.300
	R1-2312669	Moderator (Thales)	TP for TS 38.300
	R1-2312670	RAN1, Thales	LS on NR-NTN TP for TS 38.300
	R1-2312681	RAN1, Thales	LS on NR-NTN TP for TS 38.300
RAN1#116	R1-2400816	Thales	Considerations on the system parameters for FR2-NTN

Table 22 - the contributions of 5G-STARDUST partners related to 5G-STARDUST project to 3GPP RAN WG 2 meetings for Rel-18 NR NTN WI

Meeting	Tdoc	Contributors	Title
RAN2#121	R2-2301344	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3
	R2-2301445	Thales	Corrections to 38.300 related to Section Scheduling and Timing
	R2-2301436	Thales	Correction related to a missing description of a parameter of the number of HARQ processes
RAN2#121-bis-e	R2-2303162	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3
	R2-2304268	OPPO, Ericsson, Thales, Samsung	NTN stage-2 correction
	R2-2302765	Thales	Corrections to 38.300 related to Section Scheduling and Timing
	R2-2302755	Thales	Correction to 38.331 for kmac definition
RAN2#122	R2-2304761	OPPO, Ericsson, Thales, Samsung	NTN stage-2 correction
	R2-2305391	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3

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	R2-2305407	Thales	Stage 2 running CR for TS 38.300 for Rel-18 NTN
	R2-2305497	Intel Corporation, Qualcomm Inc., Nokia, MediaTek, OPPO, vivo, Xiaomi, Apple, Thales, Lenovo, Samsung	Different UE capability support between TN and NTN
	R2-2306655	OPPO, Ericsson, Thales, Samsung	NTN stage-2 correction
	R2-2306658	OPPO, LG Electronics, Qualcomm, CATT, Huawei, Lenovo, Thales	NTN stage-2 correction
	R2-2306661	Intel Corporation, Qualcomm Inc., Nokia, MediaTek, OPPO, vivo, Xiaomi, Apple, Thales, Lenovo, Samsung, Ericsson	Different UE capability support between TN and NTN
	R2-2306667	OPPO, Ericsson, Thales, Samsung, LG Electronics, Qualcomm, CATT, Huawei, Lenovo	NTN stage-2 correction
	R2-2306960	Thales (Rapporteur)	Stage 2 running CR for TS 38.300 for Rel-18 NTN enhancements
RAN2#123	R2-2307318	Thales (Rapporteur)	Stage 2 running CR for TS 38.300 for Rel-18 NTN enhancements
	R2-2307321	Thales	Discussion on mobility enhancements for VSAT
	R2-2307323	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3
	R2-2309329	Thales (Rapporteur)	Stage-2 running CR for TS 38.300 for Rel-18 NTN enhancements
RAN2#123-bis	R2-2311255	Thales (Rapporteur)	Stage-2 running CR for TS 38.300 for Rel-18 NTN enhancements
	R2-2310046	Thales	Discussion on mobility enhancements for VSAT
	R2-2310084	Thales	Remaining Issues on NR Non-Terrestrial Networks (NTN)
	R2-2310085	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3
	R2-2310192	Inmarsat, Viasat, Sateliot, Novamint, ESA, Thales	NB-IoT NTN Coarse UE location reporting
	R2-2311229	Ericsson, Thales	NTN neighbour cell information in TN cells
RAN2#124	R2-2312857	Thales	Remaining Issues on NR Non-Terrestrial Networks (NTN)
	R2-2312858	Thales	Introduction of NTN enhancements
	R2-2313506	Thales	Discussion on mobility enhancements for VSAT
	R2-2313530	Ericsson, Thales, Apple, Samsung, Deutsche Telekom, Qualcomm	NTN neighbour cell information in TN cells
	R2-2313552	LG Electronics France, Google Inc., Thales	Remaining issues on NTN-TN cell reselection enhancement
	R2-2313771	Thales (Rapporteur)	Introduction of NTN enhancements
	R2-2314001	R3 (Ericsson, CATT, Thales, Huawei, Samsung, ZTE, Nokia, Nokia Shanghai Bell, Qualcomm Incorporated, NEC)	Stage 2 CR for NR NTN
	R2-2402051	Thales (Rapporteur), Ericsson, Huawei, HiSilicon, Intel, Mediatek, Nokia, Nokia Shanghai Bell, Samsung	38.300 NR NTN Corrections
RAN2#125-bis	R2-2403773	Thales	Stage-2 corrections on NR NTN
RAN2#126	R2-2406115	Thales	Stage-2 corrections on NR NTN

Table 23 - the contributions of 5G-STARDUST partners related to 5G-STARDUST project to 3GPP RAN WG3 meetings for Rel-18 NR NTN WI

Meeting	Tdoc	Contributors	Title

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RAN3#119	R3-231060	Ericsson, CATT, Thales, Huawei, Samsung, ZTE, Nokia, Nokia Shanghai Bell, Qualcomm	Stage 2 BL CR for NR NTN
	R3-230059	Huawei, Ericsson, Thales, ZTE, Omnispace, TTP, Nokia, Nokia Shanghai Bell, CATT, Hughes, EchoStar, CMCC	XnAP BLCR on NTN Functionality
	R3-230435	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3
	R3-230436	Ericsson, Thales, Intelsat, Lockheed Martin, Hughes Network Systems, CATT, ESA	NGAP Support for Time-Based HO in NTN
	R3-230438	Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, CATT, ESA	Time-Based HO for NTN - NGAP Impacts
	R3-230441	Ericsson, Thales	Time Margin for CHO in NR NTN
RAN3#119-bis-e	R3-231139	Huawei, Ericsson, Thales, ZTE, Omnispace, TTP, Nokia, Nokia Shanghai Bell, CATT, Hughes, EchoStar, CMCC	XnAP BLCR on NTN Functionality
	R3-231140	Ericsson, CATT, Thales, Huawei, Samsung, ZTE, Nokia, Nokia Shanghai Bell, Qualcomm	(BLCR) Stage 2 BL CR for NR NTN
	R3-231364	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3
	R3-231417	Ericsson, Thales, Intelsat, Lockheed Martin, Hughes Network Systems, CATT, ESA	NGAP Support for Time-Based HO in NTN
	R3-231418	Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, CATT, ESA	Time-Based HO for NTN - NGAP Impacts
	R3-231419	Ericsson, Thales	Time Margin for CHO in NR NTN
	R3-232093	Ericsson, Thales, Intelsat, Lockheed Martin, Hughes Network Systems, CATT, ESA	NGAP Support for Time-Based HO in NTN
	R3-232159	Ericsson, Thales, Intelsat, Lockheed Martin, Hughes Network Systems, CATT, ESA	NGAP Support for Time-Based HO in NTN
RAN3#120	R3-233559	Ericsson, CATT, Thales, Huawei, Samsung, ZTE, Nokia, Nokia Shanghai Bell, Qualcomm Incorporated	(BLCR to 38.300) Stage 2 BL CR for NR NTN

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	R3-232541	Huawei, Ericsson, Thales, ZTE, Omnispace, TTP, Nokia, Nokia Shanghai Bell, CATT, Hughes, EchoStar, CMCC	XnAP BLCR on NTN Functionality
	R3-232826	Ericsson, CATT, Thales, Huawei, Samsung, ZTE, Nokia, Nokia Shanghai Bell, Qualcomm Incorporated	(BLCR to 38.300) Stage 2 BL CR for NR NTN
	R3-232947	Ericsson, Thales, Intelsat, Lockheed Martin, Hughes Network Systems, CATT, ESA, Nokia, Nokia Shanghai Bell	NGAP Support for Time-Based HO in NTN
	R3-232948	Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, ESA	Time-Based HO for NTN - NGAP Impacts
	R3-232967	Ericsson, Thales	Time Margin for CHO in NR NTN
	R3-233021	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3
	R3-233304	Ericsson, Thales, ESA	Time Margin for CHO in NR NTN
	R3-233309	Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, ESA	Time-Based HO for NTN - NGAP Impacts
	R3-233482	Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, ESA, Nokia, Nokia Shanghai Bell	Time-Based HO for NTN - NGAP Impacts
	R3-233494	Ericsson, Thales, Intelsat, Lockheed Martin, Hughes Network Systems, CATT, ESA, Nokia, Nokia Shanghai Bell, Huawei, ZTE, Qualcomm Incorporated	NGAP Support for Time-Based HO in NTN
	R3-233526	Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, ESA, Nokia, Nokia Shanghai Bell, Qualcomm, Samsung	Time-Based HO for NTN - NGAP Impacts
	R3-233560	Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, ESA, Nokia, Nokia Shanghai Bell,	NGAP BLCR on NTN Functionality

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		Samsung, Qualcomm Incorporated	
RAN3#121	R3-233751	Nokia, Nokia Shanghai Bell, Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, ESA, Samsung, Qualcomm Incorporated	NGAP BLCR on NTN Functionality
	R3-233773	Nokia, Nokia Shanghai Bell, CATT, Thales, Ericsson, Huawei, ZTE	(BLCR) Support for IoT NTN enhancements
	R3-233784	Ericsson, CATT, Thales, Huawei, Samsung, ZTE, Nokia, Nokia Shanghai Bell, Qualcomm Incorporated	(BLCR to 38.300) Stage 2 BL CR for NR NTN
	R3-233799	Huawei, Ericsson, Thales, ZTE, Omnispace, TTP, Nokia, Nokia Shanghai Bell, CATT, Hughes, EchoStar, CMCC	XnAP BLCR on NTN Functionality
	R3-233842	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3
	R3-234158	Ericsson, Thales, ESA	Time Margin for CHO in NR NTN
	R3-234159	Ericsson, ESA, Thales	Time Margin for CHO in NR NTN - XnAP Impact
	R3-234508	Ericsson, CATT, Thales, Huawei, Samsung, ZTE, Nokia, Nokia Shanghai Bell, Qualcomm Incorporated	(BLCR to 38.300) Stage 2 BL CR for NR NTN
	R3-234659	Nokia, Nokia Shanghai Bell, Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, ESA, Samsung, Qualcomm Incorporated	(BLCR to 38.413) BL CR for NR NTN
	R3-234660	Huawei, Ericsson, Thales, ZTE, Omnispace, TTP, Nokia, Nokia Shanghai Bell, CATT, Hughes, EchoStar, CMCC	(BLCR to 38.423) BL CR for NR NTN
	R3-234782	Huawei, Ericsson, Thales, ZTE, Omnispace, TTP, Nokia, Nokia Shanghai Bell, CATT, Hughes, EchoStar, CMCC	(BL CR to 38.423) for NR NTN
RAN3#121-bis	R3-235057	Ericsson, CATT, Thales, Huawei, Samsung, ZTE, Nokia, Nokia Shanghai Bell, Qualcomm Incorporated	(BL CR to 38.300) Stage 2 BL CR for NR NTN

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	R3-235063	Nokia, Nokia Shanghai Bell, Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, ESA, Samsung, Qualcomm Incorporated	(BL CR to 38.413) BL CR for NR NTN
	R3-235072	Huawei, Ericsson, Thales, ZTE, Omnispace, TTP, Nokia, Nokia Shanghai Bell, CATT, Hughes, EchoStar, CMCC	(BL CR to 38.423) BL CR for NR NTN
	R3-235221	Thales	R18 WI NR-NTN-enh work plan at RAN1, 2 and 3
	R3-235327	ZTE, Ericsson, ESA, Thales	(TP for IoT NTN BL CR 36.423) Location-Triggered CHO for IoT NTN
	R3-235494	Ericsson, Huawei, Thales	(TP to BL CR for TS 36.455) NTN Access Point Position
	R3-235497	Ericsson, Thales, ESA	Time Margin for CHO in NR NTN
	R3-235498	Ericsson, ESA, Thales	(TP to BL CR for TS 38.423) Time Margin for CHO in NR NTN - XnAP Impact
	R3-235499	Ericsson, ESA, ZTE, Thales, Inmarsat	(TP to BL CR for TS 38.423) Location-Triggered CHO for NR NTN
	R3-235696	Ericsson, ESA, ZTE, Thales, Inmarsat, Hughes	(TP to BL CR for TS 38.423) Location-Triggered CHO for NR NTN
	R3-235839	Nokia, Nokia Shanghai Bell, Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, ESA, Samsung, Qualcomm Incorporated	(BL CR to 38.413) BL CR for NR NTN
	R3-235840	Huawei, Ericsson, Thales, ZTE, Omnispace, TTP, Nokia, Nokia Shanghai Bell, CATT, Hughes, EchoStar, CMCC	(BLCR to 38.423) BL CR for NR NTN
	R3-235981	Nokia, Nokia Shanghai Bell, Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, ESA, Samsung, Qualcomm Incorporated	(BLCR to 38.413) BL CR for NR NTN
	R3-235982	Huawei, Ericsson, Thales, ZTE, Omnispace, TTP, Nokia, Nokia Shanghai Bell, CATT, Hughes, EchoStar, CMCC	(BLCR to 38.423) BL CR for NR NTN
RAN3#122	R3-237058	Ericsson, CATT, Thales, Huawei, Samsung, ZTE, Nokia, Nokia Shanghai Bell, Qualcomm Incorporated	(BLCR to 38.300) Stage 2 BL CR for NR NTN

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	R3-237059	Nokia, Nokia Shanghai Bell, Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, ESA, Samsung, Qualcomm Incorporated	(BLCR to 38.413) BL CR for NR NTN
	R3-237060	Huawei, Ericsson, Thales, ZTE, Omnispace, TTP, Nokia, Nokia Shanghai Bell, CATT, Hughes, EchoStar, CMCC	(BLCR to 38.423) BL CR for NR NTN
	R3-237697	Nokia, Nokia Shanghai Bell, Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, ESA, Samsung, Qualcomm Incorporated	(BLCR to 38.413) BL CR for NR NTN
	R3-238157	Ericsson, CATT, Thales, Huawei, Samsung, ZTE, Nokia, Nokia Shanghai Bell, Qualcomm Incorporated, NEC	Stage 2 CR for NR NTN
	R3-238158	Huawei, Ericsson, Thales, ZTE, Omnispace, TTP, Nokia, Nokia Shanghai Bell, CATT, Hughes, EchoStar, CMCC, Qualcomm Incorporated, NEC	CR for NR NTN
	R3-238159	Nokia, Nokia Shanghai Bell, Ericsson, Thales, ZTE, Omnispace, TTP, CATT, Hughes Network Systems, Huawei, Lockheed Martin, Intelsat, ESA, Samsung, Qualcomm Incorporated, NEC	CR for NR NTN
RAN3#123	R3-240152	Ericsson, Vodafone, Thales Alenia Space, Qualcomm Incorporated, Nokia, Nokia Shanghai Bell	Mobility Restrictions and NTN
	R3-240863	ZTE, Ericsson, Vodafone, Thales Alenia Space, Qualcomm Incorporated, Nokia, Nokia Shanghai Bell, CATT	Correction on handover restriction from NR TN to LTE NTN
	R3-240864	ZTE, Ericsson, Vodafone, Thales Alenia Space, Qualcomm Incorporated, Nokia,	Correction on handover restriction from NR TN to LTE NTN

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		Nokia Shanghai Bell, CATT	
	R3-240865	ZTE, Ericsson, Vodafone, Thales Alenia Space, Qualcomm Incorporated, Nokia, Nokia Shanghai Bell, CATT	Correction on handover restriction from NR TN to LTE NTN
	R3-240866	ZTE, Ericsson, Vodafone, Thales Alenia Space, Qualcomm Incorporated, Nokia, Nokia Shanghai Bell, CATT	Correction on handover restriction from NR TN to LTE NTN

Table 24 - the contributions of 5G-STARDUST partners related to 5G-STARDUST project to 3GPP RAN WG4 meetings for Rel-18 NR NTN WI

Meeting	Tdoc	Contributors	Title
RAN4#106	R4-2301482	Ericsson, Thales	CR to TS 38.108: OBUE and open issues clarifications
	R4-2302490	Thales	RAN4 ToR adding SAN
	R4-2302493	Thales	TP for TS 38.181 - Clause 4.1 Measurement uncertainties and test requirements
	R4-2302527	Thales, Inmarsat, Hispasat	NTN UE Terminal Types for above 10 GHz
	R4-2302535	Thales	NTN Simulation Parameters for above 10 GHz Coexistence Studies
	R4-2302643	Inmarsat, Hispasat, Thales	NTN Ka-band, clarifications on regulatory background
	R4-2302714	HISPASAT, Hughes Network Systems, Thales, ESA, Eutelsat, Lockheed Martin, Intelsat, Inmarsat, Airbus	Satellite broadband user equipment
	R4-2302864	Ericsson, Thales	CR to TS 38.108: OBUE and open issues clarifications
	R4-2302877	Thales, ZTE, Huawei	WF for SAN RF requirements on above 10GHz
	R4-2302998	Thales	WF for system parameters of above 10GHz NTN band
RAN4#106-bis-e	R4-2305831	Thales	Discussion on system parameters for above 10 GHz
	R4-2305832	Thales	Discussion on RAN LS to RAN1 for NTN above 10 GHz
	R4-2305834	Thales, Magister Solutions Ltd	NTN Simulation Parameters for above 10 GHz Coexistence Studies
	R4-2305844	Thales, Hughes/EchoStar	NTN UE terminal reference architecture for above 10 GHz
	R4-2305845	Thales	Discussion on RAN LS to RAN1 for NTN above 10 GHz
	R4-2305847	Thales, Magister Solutions Ltd	Updated NTN Simulation Parameters for above 10 GHz Coexistence Studies and Initial Simulation Results
	R4-2305856	Moderator (Thales)	Topic Summary [106bis-e][309] NR_NTN_enh_Part1
	R4-2305925	Thales	WF on NTN enhancement - [106bis-e][309] NR_NTN_enh_Part1
	R4-2305979	Moderator (Thales)	Topic Summary [106bis-e][309] NR_NTN_enh_Part1
RAN4#107	R4-2309700	Thales, Magister Solutions Ltd	Initial NTN calibration results for above 10 GHz Coexistence Studies
	R4-2309717	Thales	Updates for NTN UE terminal requirements discussion in above 10 GHz
	R4-2309722	Thales	Proposal for Extension to 30 MHz Channel Bandwidth for NR NTN FR1
	R4-2309725	Thales	New WID on the extension to 30 MHz Channel Bandwidth for NR NTN in FR1
	R4-2309729	Thales	Corrections to SAN TS 38.108
	R4-2309731	Thales	Corrections to SAN TS 38.181
	R4-2309766	Thales	WF for system parameters on Ka band
	R4-2309854	Thales	Corrections to SAN TS 38.181
	R4-2309870	Thales	Corrections to SAN TS 38.108
	R4-2310448	Moderator, Thales	Summary for [107][309] NR_NTN_enh_Part1
	R4-2310483	Thales	WF on UE RF requirements for NR NTN enhancement
RAN4#108	R4-2311598	CATT, Thales	CR for TS 38.108, Correction on out-of-band emissions

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	R4-2311677	MediaTek inc., Airbus, Eutelsat, SES, Thales	Discussion on RRM requirements for NTN above 10 GHz bands
	R4-2312120	Thales	Updates for NTN UE terminal requirements and NF in above 10 GHz
	R4-2312219	Thales	Specific NTN in above 10 GHz working hypothesis for RRM requirements
	R4-2312369	Thales	Discussion on RAN5 LS to RAN4 - R5-233672 LS on clarifications for Non-Terrestrial Networks
	R4-2312443	Thales, Magister Solutions Ltd	Updates on NTN calibration and coexistence simulation results for above 10 GHz
	R4-2312758	Thales	SAN requirements and NF in above 10 GHz
	R4-2313500	Thales	CR for TS 38.133 - Correction of satellite access Clause for Timing Advance adjustment
	R4-2313561	Thales, ZTE, CATT	CR for TS 38.108 – Adding 30 MHz CBW for SAN
	R4-2313574	Thales, ZTE, CATT	CR for TS 38.101-5 – Adding 30 MHz CBW for NTN UE
	R4-2313635	Keysight Technologies UK Ltd, Thales	Clarifications for Non-Terrestrial Networks LS response to RAN5
	R4-2313637	Keysight Technologies UK Ltd, Thales	Clarifications to 38.101-5 (Rel-18)
	R4-2313638	Keysight Technologies UK Ltd, Thales	Clarifications to 36.102
	R4-2313639	Keysight Technologies UK Ltd, Thales	New Annex B.8 definition for High level test procedure for SAN RRM tests
	R4-2313640	Keysight Technologies UK Ltd, Thales	Reply LS on clarifications for Non-Terrestrial Networks
	R4-2313862	Keysight Technologies UK Ltd, Thales	Reply LS on clarifications for Non-Terrestrial Networks
	R4-2313864	Thales	WF for NTN general part
	R4-2313865	Thales	WF for NTN co-existence study
	R4-2313987	Thales	WF for LS to RAN5 on NTN testing
	R4-2314001	Keysight Technologies UK Ltd, Thales	Reply LS on clarifications for Non-Terrestrial Networks
	R4-2314003	Keysight Technologies UK Ltd, Thales	Clarifications to 38.101-5 (Rel-18)
	R4-2314202	Moderator (Thales)	Topic summary for [108][120] NR_NTN_channel_30MHz
	R4-2314245	Moderator (Thales)	Topic summary for [108][309] NR_NTN_enh_Part1
	R4-2314268	Moderator (Thales)	Topic summary for [108][332] LS_NTN_R5-233672
	R4-2314366	Thales, Qualcomm	LS on RAN4 RRM work scope for NR NTN Ka band
	R4-2314471	Thales	CR for TS 38.133 - Correction of satellite access Clause for Timing Advance adjustment
	R4-2314484	Thales, Qualcomm	LS on RAN4 RRM work scope for NR NTN Ka band
	R4-2314654	Thales, ZTE, CATT, Ericsson, CAICT	CR for TS 38.101-5 – Adding 30 MHz CBW for NTN UE
	R4-2314655	Thales, ZTE, CATT, Ericsson, CAICT	CR for TS 38.108 – Adding 30 MHz CBW for SAN
	R4-2314929	Keysight Technologies UK Ltd, Thales	Clarifications to 38.101-5 (Rel-17)
	R4-2314930	Keysight Technologies UK Ltd, Thales	Clarifications to 36.102
RAN4#108-bis	R4-2316854	Keysight Technologies UK Ltd, Thales	Clarifications for Non-Terrestrial Networks LS response to RAN5
	R4-2316868	Thales, Magister Solutions Ltd	Initial coexistence simulation results for above 10 GHz and related requirements
	R4-2316870	Thales, Magister Solutions Ltd	Calibration updates for above 10 GHz and related information
	R4-2316871	Thales	Mapping NTN UE terminal requirements on NTN types
	R4-2316872	Thales	Clarification on the NTN RRM testing procedure configuration
	R4-2316875	Thales	RRM Requirements for Type 2 UE Terminal in above 10 GHz
	R4-2316885	Thales	On NTN testing work for NGSO deployments and related configuration
	R4-2316888	Thales	Draft CR on TS 38.108 for Clause 5 - Operating bands and channel arrangement
	R4-2316889	Thales	Draft CR on TS 38.108 for Clause 9.2 - Radiated transmit power and Clause 9.3 - OTA Satellite Access Node output power
	R4-2316891	Thales	Draft CR on TS 38.108 for Clause 9.6 - OTA transmitted signal quality
	R4-2317649	Thales	WF on DMRS bundling for NTN
	R4-2317767	Thales	WF on DMRS bundling for NTN
RAN4#109	R4-2318200	Moderator (Thales)	Topic summary for [109][308] NR_NTN_enh_Part1

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	R4-2318294	CATT, Thales, China Telecom, NEC, Ericsson	CR for TS 38.108, Correction on out-of-band emissions
	R4-2318412	Apple, Ligado Networks, Inmarsat, Viasat, Globalstar, Thales, Hughes/Echostar	Enhanced channel raster for NTN bands
	R4-2319580	Ericsson, Huawei, Thales	NTN enhancement: Running CR to TS 38.108 NTN Ka-band
	R4-2320333	ZTE Corporation , Thales, Samsung, Ericsson, Huawei	Joint contribution for NTN VSAT RF requirements in Ka-band
	R4-2320900	Thales	Details on NTN UE terminal requirements based on different NTN UE types
	R4-2320903	Thales	Draft CR to TS 38.101-5: NTN UE in Ka-band
	R4-2320917	Thales	Draft CR on TS 38.108 for Clause 9.7 - OTA unwanted emissions
	R4-2320949	Thales	Draft CR proposal to add Doppler and Delay variation examples as a function of time for NGSO and GSO in a new Annex
	R4-2320952	Thales	Draft TP for TR 37.911 - Study on self-evaluation towards the IMT-2020 submission of the 3GPP Satellite Radio Interface Technology
	R4-2320970	Thales, Magister Solutions Ltd	NTN-TN co-existence simulation results in above 10 GHz bands
	R4-2320971	Thales	On the NTN UL Timing Accuracy for above 10 GHz
	R4-2320972	Thales	Remaining issues for SAN RF requirements in above 10 GHz
	R4-2320973	Thales	VSAT and Satellite parameters for Ku-band Scenario
	R4-2320975	Thales	Summary of SIB19/SIB31 parameters for NGSO and GSO NTN UE/NTN IoT testing
	R4-2321031	Ericsson, Huawei, Thales	NTN enhancement: Running CR to TS 38.108 NTN Ka-band
	R4-2321151	Thales	Draft CR on TS 38.108 for Clause 9.7 - OTA unwanted emissions
	R4-2321973	Thales	Draft CR to TS 38.101-5: NTN UE in Ka-band
RAN4#110	R4-2400152	Apple, Ligado Networks, Inmarsat, Viasat, Globalstar, Thales, Hughes/Echostar	Enhanced channel raster for NTN FR1 bands
	R4-2400153	Apple, Ligado Networks, Inmarsat, Viasat, Globalstar, Thales, Hughes/Echostar	Mandating enhanced channel raster for the NTN FR1 bands
	R4-2400235	Apple, Ligado Networks, Inmarsat, Hughes/Echostar, Globalstar Inc., Skyworks Solutions Inc., Viasat, Thales	Motivation for New WID on High-power classes for NTN NR FR1 bands
	R4-2400927	Thales	Candidate non spectrum related NTN topics for Rel-19 work plan
	R4-2401118	Samsung Electronics, Thales	CR on TR38.863 Addition of simulation assumptions in above 10GHz
	R4-2402332	Ericsson, Thales	NTN enhancement: draft CR to TS 38.101-5 NTN Ka-band - Tx spurious
	R4-2402523	ZTE Corporation , Thales	Joint contribution for NTN VSAT RF requirements in Ka-band
	R4-2402645	Moderator (Thales)	Topic summary for [110][305] NR_NTN_enh_Part1
	R4-2402762	Ericsson, Thales	NTN enhancement: draft CR to TS 38.101-5 NTN Ka-band - Tx spurious
	R4-2402924	Thales	Draft CR for 38101-5
	R4-2402928	Thales	Reply LS on the system parameters for NTN above 10 GHz
	R4-2402930	Thales	Remaining issues on NTN UL Timing Accuracy for above 10 GHz
	R4-2402933	Thales, Magister Solutions Ltd	Remaining issues on VSAT UE requirements for above 10 GHz
	R4-2403644	Thales	Draft CR for 38101-5
RAN4#110-bis	R4-2404163	Apple, Ligado Networks, Inmarsat, Viasat, Globalstar, Thales, Hughes/Echostar, Omnispace, Terrestar	Clarification for the mandatory support of enhanced channel raster for the NTN bands

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	R4-2404941	Ericsson, Thales	NTN enhancement: draft CR to TS 38.101-5 NTN Ka-band - additional Tx updates to the running CR
	R4-2404942	Ericsson, Thales	NTN enhancement: draft CR to TS 38.101-5 NTN Ka-band - additional Rx updates to the running CR
	R4-2405555	Ericsson, Thales	Draft CR for TS 38.181: FR2 intro in clause 4.1 MUs
	R4-2405556	Ericsson, Thales	Draft CR for TS 38.181: FR2 intro in clause 4.7 test config
	R4-2405557	Ericsson, Thales	Draft CR for TS 38.181: FR2 intro in clause 9.4 output power dynamics
	R4-2405558	Ericsson, Thales	Draft CR for TS 38.181: FR2 intro in clause 9.7.5 spurious emissions
	R4-2405825	Moderator (Thales)	Topic summary for [110bis][305] NR_NTN_enh_Part1
	R4-2405835	Moderator (Thales)	Topic summary for [110bis][315] NR_NTN_Ph3
	R4-2405972	Thales, Magister Solutions Ltd, Eutelsat Group, ESA, Inmarsat, Viasat, Novamint, EchoStar, Amazon	On the ACS requirement issue for VSAT UE in above 10 GHz
	R4-2405976	Thales	CR for TR 38.863 regulatory update after WRC-23
	R4-2405977	Thales	CR for correction of SAN ACS value in TS 38.108
	R4-2405994	Thales	CR for TR 38.863 regulatory update after WRC-23
	R4-2405995	Huawei, Thales	Way Forward for [110bis][305] NR_NTN_enh_Part1 Doppler pre-compensation into the guard band
	R4-2405999	Ericsson, Thales	Draft CR for TS 38.181: FR2 intro in clause 4.1 MUs
	R4-2406000	Ericsson, Thales	Draft CR for TS 38.181: FR2 intro in clause 4.7 test config
	R4-2406001	Ericsson, Thales	Draft CR for TS 38.181: FR2 intro in clause 9.4 output power dynamics
	R4-2406109	Thales	Way Forward for [110bis][315] NR_NTN_Ph3
	R4-2406113	Thales	CR for correction of SAN ACS value in TS 38.108
	R4-2406602	Ericsson, Thales	NTN enhancement: draft CR to TS 38.101-5 NTN Ka-band - additional Tx updates to the running CR
	R4-2406606	Huawei, HiSilicon, Ericsson, Thales	Draft CR for 38.101-5 to introduce clause 10.1~10.3
RAN4#111	R4-2407043	Apple, Globalstar, Thales, Inmarsat, Viasat, Terrestar	Clarification for applicability of DSS for NTN FR1 bands
	R4-2407045	Apple, Globalstar, Thales, Inmarsat, Viasat, Terrestar	Clarification for applicability of DSS for NTN FR1 bands
	R4-2407049	Apple, Ligado Networks, Inmarsat, Viasat, Globalstar, Thales, Hughes/Echostar, Omnispace, Terrestar	Clarification for the mandatory support of enhanced channel raster for the NTN bands
	R4-2408696	Ericsson, CATT, Thales	NTN enhancement - Running CR to TS 38.181
	R4-2408697	Ericsson, Thales, CATT, Huawei, ZTE, NEC	NTN enhancement - Running CR to TS 38.108
	R4-2408700	Ericsson, Thales	NTN enhancement: draft CR to TS 38.101-5 NTN Ka-band - additional Tx updates to the running CR - subclause 9.6
	R4-2408708	Inmarsat, Viasat, Omnispace, Terrestar Solutions, Thuraya, Ligado Networks, EchoStar, Thales, Skyworks, Apple	(TEI18) CR to 36.102 In-band NB-IoT NTN deployment with NR from Rel-18 [TEI_NTN]
	R4-2408710	Inmarsat, Viasat, Omnispace, Terrestar Solutions, Thuraya, Ligado Networks, EchoStar, Thales, Skyworks, Apple	(TEI18) CR to 36.108 In-band NB-IoT NTN deployment with NR from Rel-18 [TEI_NTN]
	R4-2409117	Ericsson, Thales	Draft CR for TS 38.181: FR2 intro in clause 9.7.5 spurious emissions
	R4-2409668	Thales, Ericsson	DraftCR for TS 38.181: FR2-NTN introduction in Clause 9.2 Radiated transmit power
	R4-2409670	Thales, Ericsson	DraftCR for TS 38.181: FR2-NTN introduction in Clause 9.3 OTA SAN output power
	R4-2409674	Thales	DraftCR for TS 38.181: FR2-NTN introduction in Clause 9.6 OTA transmitted signal quality

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	R4-2409735	Thales	DraftCR for TS 38.181: FR2-NTN introduction in Clause 9.7.4 OTA out-of-band emissions
	R4-2409737	Thales	DraftCR for TS 38.181: FR2-NTN introduction in Clauses 9.7.1 General 9.7.2 OTA occupied bandwidth 9.7.3 ACLR
	R4-2409758	Thales, Ericsson	Tx Corrections to TS 38.101-5
	R4-2409777	Thales	Corrections to EIRPmax in TS 38.101-5
	R4-2409817	Ericsson, Thales, CATT, Huawei, ZTE, NEC	NTN enhancement - Running CR to TS 38.108
	R4-2409820	Ericsson, CATT, Thales	NTN enhancement - Running CR to TS 38.181
	R4-2410580	Ericsson, Thales	NTN enhancement: draft CR to TS 38.101-5 NTN Ka-band - additional Tx updates to the running CR - subclause 9.6
	R4-2410581	Thales, Ericsson	Tx Corrections to TS 38.101-5
	R4-2410612	Samsung, Thales	Big CR to TS 38.101-5
	R4-2410673	Apple, Globalstar, Thales, Inmarsat, Viasat, Terrestar	Clarification for applicability of DSS for NTN FR1 bands

Table 25 - the contributions of 5G-STARDUST partners related to 5G-STARDUST project to 3GPP SA WG2 meetings for Rel-18 Sat arch phase 3 WI

Meeting	Tdoc	Contributors	Title
SA2#154-AH-e	S2-2300273	Thales, Xiaomi, Novamint, TNO	Revised WID: 5GC/EPC enhancement for satellite access Phase 2 (5GSAT_Ph2).
SA2#155	S2-2303668	Thales, Xiaomi, Novamint, TNO	Revised WID: 5GC/EPC enhancement for satellite access Phase 2 (5GSAT_Ph2).
SA2#156-e	S2-2303993	Intel, Thales	Standardization of Satellite Coverage Availability (SCA) information
	S2-2303994	Intel, Thales	Satellite Coverage Availability Function (SCAF) services
	S2-2303995	Intel, Thales	Satellite Coverage Availability Function (SCAF) services
	S2-2303996	Intel, Thales	Introduction of Satellite Coverage Availability Function (SCAF)
	S2-2303997	Intel, Thales	Introduction of Satellite Coverage Availability Function (SCAF)

A.2 REL-19 CONTRIBUTIONS

Table 26 - the contributions of 5G-STARDUST partners related to 5G-STARDUST project to 3GPP RAN meetings for Rel-19 NR NTN WI

Meeting	Tdoc	Contributors	Title
Rel-19 Workshop	RWS-230048	Thales, Hughes, SES, Inmarsat, Ligado, Eutelsat, TTP, Lockheed, Novamint, Airbus, Lockheed Martin, ST Engineering, Sateliot, CeWIT, TNO, JSAT, Gatehouse, Omnispace, ESA, Intelsat, OneWeb, Fraunhofer IIS, Fraunhofer HHI, TNO, IRT Saint Exupery, Hispasat, G	Consideration on RAN1/2/3 led NTN topics for Release 19
	RWS-230049	Thales, Hughes, Fraunhofer IIS, Inmarsat, Sateliot, Ligado, Omnispace, Lockheed Martin, Novamint, Eutelsat, TTP, Terrestar, ESA, Intelsat, OneWeb, Airbus, JSAT, TNO, IRT Saint Exupery,	Consideration on RAN4 led NTN topics for Release 19

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		Hispasat, Gilat, Gatehouse, Magister solutions, OQ Technology	
RAN#102	RP-232859	Thales	WI exception: NR NTN (Non-Terrestrial Networks) enhancements
	RP-232860	Thales	Candidate topics for a Rel-19 NR-NTN-evolution Work Item
	RP-232861	Thales	Candidate topics for a Rel-19 IoT-NTN-evolution WI
	RP-233230	Thales	Candidate topics for RAN4 led Rel-19 NR-NTN-evolution WI(s)
	RP-233237	Thales	Candidate topics for RAN4 led Rel-19 IoT-NTN-evolution WI(s)
	RP-233944	MediaTek Inc., Ericsson, Qualcomm Incorporated, Thales	TP for TR 37.911 - IMT-2020 satellite RIT evaluation
	RP-233948	Hughes, Thales, Terrestar, OQ Technology, TTP, Gatehouse, Lockheed Martin, Airbus, Inmarsat, Viasat, OmniSpace, SES	Response to questions of RP-233795 on "What is Notification/Alert in NTN?"
	RP-233949	Ericsson, MediaTek, Qualcomm, Thales	pCR to TR 37.911 collecting inputs from RAN WGs for the Study on self-evaluation towards the IMT-2020 submission of the 3GPP Satellite Radio Interface Technology
	RP-233952	MediaTek Inc., Ericsson, Qualcomm Incorporated, Thales	TP for TR 37.911 (section 7 & 8) - IMT-2020 satellite RIT evaluation
	RP-233967	Ericsson, MediaTek, Qualcomm, Thales	pCR to TR 37.911 collecting inputs from RAN WGs for the Study on self-evaluation towards the IMT-2020 submission of the 3GPP Satellite Radio Interface Technology
	RP-233979	Ericsson, MediaTek, Qualcomm, Thales	pCR to TR 37.911 collecting inputs from RAN WGs for the Study on self-evaluation towards the IMT-2020 submission of the 3GPP Satellite Radio Interface Technology
RAN#103	RP-240060	Thales	WI summary for NR NTN (Non-Terrestrial Networks) enhancements
	RP-240061	Thales, CATT	New WID: Inter RAT mobility enhancements from E-UTRAN to NR-NTN
	RP-240062	Thales	Candidate non spectrum related NTN topics for Rel-19 work plan
	RP-240079	Eutelsat Group, Fraunhofer IIS, Fraunhofer HHI, Airbus, ESA, Novamint, MediaTek, Sharp, Thales, SyncTechno Inc., Continental Automotive, TTP, Lockheed Martin, Robert Bosch GmbH	Motivation to support mobile VSAT in NGSO deployment scenarios
	RP-240089	Thales	Candidate RAN4 led spectrum related NTN topics for Release 19
	RP-240091	Thales, CATT	Status report for New WID: Non-Terrestrial Networks (NTN) for NR Phase 3
	RP-240098	Thales, CATT	Revised WID: Rel-19 WI Non-Terrestrial Networks (NTN) for NR Phase 3
	RP-240143	Thales	Revised WID: NR NTN (Non-Terrestrial Networks) enhancements
	RP-240509	Apple, Ligado Networks, Inmarsat, Hughes/Echostar, Globalstar Inc., Skyworks Solutions Inc., Viasat, Thales	High-power classes UE for NTN NR FR1 bands
	RP-240775	Thales, CATT	Revised WID: Rel-19 WI Non-Terrestrial Networks (NTN) for NR Phase 3
	RP-240777	Thales	WI summary for NR NTN (Non-Terrestrial Networks) enhancements
	RP-240779	Thales	Revised WID: NR NTN (Non-Terrestrial Networks) enhancements
	RP-240814	Thales, CATT	New WID: Inter RAT mobility enhancements from E-UTRAN to NR-NTN
	RP-240843	Thales, CATT	New WID: Inter RAT mobility enhancements from E-UTRAN to NR-NTN
	RP-240844	EchoStar, Thales	Award for 3GPP NTN as Technology of the Year
	RP-240846	Thales, CATT	New WID: Inter RAT mobility enhancements from E-UTRAN TN to NR NTN
RAN#104	RP-240921	Thales	NR-NTN-enh for RAN104
	RP-240922	Thales	NR-NTN-enh
	RP-240923	Thales	NR-NTN-ph3

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	RP-240924	Thales	Inter RAT mobility support from E-UTRAN TN to NR-NTN
	RP-240925	Thales	Inter RAT mobility support from E-UTRAN TN to NR-NTN
	RP-241036	Thales	Non-Terrestrial Networks (NTN) for NR Phase 3
	RP-241037	Thales	Non-Terrestrial Networks (NTN) for NR Phase 3 revisions - rational
	RP-241690	Intelsat, Eutelsat Group, Thales, CHTTL, Hispasat	New WID on Introduction of Ku Band for NR NTN
RAN#105	RP-241741	THALES, CATT	Status report for WI Core part: Inter RAT mobility support from E-UTRAN TN to NR-NTN
	RP-241742	THALES, CATT	Status report for WI Non-Terrestrial Networks (NTN) for NR Phase 3
	RP-241756	Inmarsat, Viasat, Terrestar Corporation, Omnispace, Thuraya, Thales, SK Telecom, ETRI, Novamint, ESA	Revised WID Inter RAT mode mobility support from E-UTRAN TN to NR-NTN
	RP-241787	THALES	Some clarifications about Non-Terrestrial Networks
	RP-241789	THALES	Non-Terrestrial Networks (NTN) for NR Phase 3
	RP-241839	THALES	Considerations on new bands for NTN
	RP-242202	EchoStar, Thales	NTN for NR Phase 3 – Satellite stakeholders' view on SSB Periodicity Extension
	RP-242333	THALES, CATT	Status report for WI Non-Terrestrial Networks (NTN) for NR Phase 3
RAN#106	RP-242462	THALES, CATT	Status report for WID: Non-Terrestrial Networks (NTN) for NR Phase 3
	RP-242463	THALES, CATT	Status report for WID: Inter RAT mobility support from E-UTRAN TN to NR-NTN
	RP-242464	THALES, CATT	Revised WID: Non-Terrestrial Networks (NTN) for NR Phase 3
	RP-242588	THALES	Ku band NTN proposed way forward
	RP-242590	THALES	Proposed way forward on the introduction of IoT-NTN TDD mode
	RP-242638	Airbus, Thales, Novamint, FirstNet, Robert Bosch GmbH, SyncTechno Inc.	Market considerations on Mobile VSAT operating with NGSO/GSO from verticals point view
	RP-242663	THALES, Airbus	New WID on Mobile VSAT with NGSO
	RP-242901	Apple, Thales, Inmarsat, Viasat, Globalstar	Revised WID on Enhanced requirements and conductive test methodology for NR NTN and IoT NTN
	RP-242997	Rapporteur (MediaTek Inc.), CATT, Sateliot, Thales, ZTE	Motivation paper for Revised WI: Non-Terrestrial Networks (NTN) for Internet of Things (IoT) Phase 3
	RP-243114	CATT, Thales, Deutsche Telekom, Inmarsat, Viasat, SK Telecom, ETRI, Fraunhofer IIS, Fraunhofer HHI, BMW, CBN, vivo	Support of "E-UTRA TN to NR NTN" connected mode mobility
	RP-243115	CATT, Thales, Inmarsat, Viasat	Revised WID - R19 E-UTRAN to NR-NTN mob enh
	RP-243242	Novamint, Thales	DRAFT Reply LS to ITUR_WP4B_TEMP_13 = RP-243201 on 3GPP "5G-NTN" material for Recommendation ITU-R M.[IMT 2020 SAT.SPECS] -SRIT (to: SA; cc: -; contact: Novamint)
	RP-243243	Novamint, Thales	DRAFT Reply LS to ITUR_WP4B_TEMP_13 = RP-243201 on 3GPP "5G-NTN" material for Recommendation ITU-R M.[IMT 2020 SAT.SPECS] - RIT (to: SA; cc: -; contact: Novamint)
	RP-243262	THALES, CATT	Revised WID: Non-Terrestrial Networks (NTN) for NR Phase 3
	RP-243283	Airbus, Thales, Novamint, FirstNet, Robert Bosch GmbH, SyncTechno Inc.	Market considerations on Mobile VSAT operating with NGSO/GSO from verticals point view
	RP-243294	Airbus, THALES	New WID on Mobile VSAT with NGSO
	RP-243300	THALES, CATT	Revised WID: Non-Terrestrial Networks (NTN) for NR Phase 3
RAN#107	RP-250041	THALES	Status report for WID: Non-Terrestrial Networks (NTN) for NR Phase 3
	RP-250042	THALES	Status report for WID: Inter RAT mobility support from E-UTRAN TN to NR-NTN
	RP-250043	THALES	Candidate RAN2 led IoT-NTN topics for Rel-20 5GA
	RP-250044	THALES	Candidate RAN1/2/3 NR-NTN topics for Rel-20 5GA

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	RP-250302	Thales, Hispasat, Iridium, Sateliot, EchoStar, Omnispace, Eutelsat Group, Thuraya, SES, Viasat, Terrestar, Ligado, Intelsat, Skylo, JSAT, Novamint	3GPP NTN roll-out status
	RP-250457	THALES	Candidate RAN4 led NTN topics for Rel-20 5G Advanced
RAN#108	RP-251003	THALES, CATT	Status report for WI: Non-Terrestrial Networks (NTN) for NR Phase 3
	RP-251004	THALES, CATT	Status report for WI: Core part: Inter RAT mobility support from E-UTRAN TN to NR-NTN
RAN#109	RP-251931	THALES, CATT	Status report for WID: Non-Terrestrial Networks (NTN) for NR Phase 3
	RP-251932	THALES, CATT	Status report for WI Core part: Inter RAT mobility support from E-UTRAN TN to NR-NTN
	RP-251954	THALES, CATT	Non-Terrestrial Networks (NTN) for NR Phase 3
	RP-251974	THALES, CATT	Revised WID: Inter RAT mobility support from E-UTRAN TN to NR-NTN
	RP-252587	Eutelsat, MediaTek Inc, SES, Thales, Airbus, CHTTL, Gilat, ESA, Fraunhofer IIS, BMW, ST Engineering iDirect, Lockheed Martin, Robert Bosch GmbH	Motivation for HD-FDD operation for NR NTN in bands above 10 GHz
	RP-252846	Thales	WI summary for WI Core part: Inter-RAT mode mobility support from E-UTRAN TN to NR NTN
	RP-252886	Thales, CATT	WI summary for WI Core part: Non-Terrestrial Networks (NTN) for NR Phase 3
RAN#110	RP-253156	THALES, CATT	Status report for WID: Non-Terrestrial Networks (NTN) for NR Phase 3

The following are the contributions of 5G-STARDUST partners to 3GPP RAN 1 meetings for Rel-19 NR NTN WI:

Table 27 - the contributions of 5G-STARDUST partners related to 5G-STARDUST project to 3GPP RAN WG1 meetings for Rel-19 NR NTN WI

Meeting	Tdoc	Contributors	Title
RAN1#116	R1-2400303	THALES	Discussion on NR NTN Downlink coverage enhancements
	R1-2401730	THALES, CATT	Work plan for NR_NTN_Ph3
	R1-2401844	Moderator (THALES)	FL Summary #2: NR-NTN downlink coverage enhancements
	R1-2401845	Moderator (THALES)	FL Summary #3: NR-NTN downlink coverage enhancements
RAN1#117	R1-2404202	THALES	FL Summary #1: NR-NTN downlink coverage enhancements
	R1-2404203	THALES	FL Summary #2: NR-NTN downlink coverage enhancements
	R1-2404204	THALES	FL Summary #3: NR-NTN downlink coverage enhancements
	R1-2404205	THALES	Work plan for Rel-19 NR_NTN_Ph3
	R1-2405342	THALES, Magister	Discussion on NR NTN Downlink coverage enhancements
	R1-2405730	Moderator (THALES)	FL Summary #4: NR-NTN downlink coverage enhancements
RAN1#118	R1-2406434	THALES	Discussion on NR NTN Downlink coverage enhancements
	R1-2406435	Moderator (THALES)	FL Summary #1: NR-NTN downlink coverage enhancements
	R1-2406436	Moderator (THALES)	FL Summary #2: NR-NTN downlink coverage enhancements
	R1-2406437	Moderator (THALES)	FL Summary #3: NR-NTN downlink coverage enhancements
	R1-2406439	THALES	Work plan for Rel-19 NR_NTN_Ph3
RAN1#118-bis	R1-2407766	THALES	NR NTN Downlink coverage enhancements
	R1-2407767	THALES	FL Summary #1: NR-NTN downlink coverage enhancements
	R1-2407768	THALES	FL Summary #2: NR-NTN downlink coverage enhancements
	R1-2407769	THALES	FL Summary #3: NR-NTN downlink coverage enhancements
	R1-2407770	THALES	FL Summary #4: NR-NTN downlink coverage enhancements
	R1-2407771	THALES, CATT	Work plan for Rel-19 NR_NTN_Ph3
	R1-2408396	THALES	Discussion on the LS on common TA in a regenerative payload scenario
	R1-2408397	THALES	Draft reply LS on common TA in a regenerative payload scenario
	R1-2408949	EchoStar, Eutelsat Group, Thales, Terrestar	Discussion on NTN System Level Downlink Coverage Enhancement

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	R1-2409288	Moderator (THALES)	Draft Reply LS on DL coverage enhancements
RAN1#119	R1-2409434	THALES	NR NTN Downlink coverage enhancements
	R1-2409435	THALES	FL Summary #1: NR-NTN downlink coverage enhancements
	R1-2409436	THALES	FL Summary #2: NR-NTN downlink coverage enhancements
	R1-2409438	THALES	FL Summary #4: NR-NTN downlink coverage enhancements
	R1-2409439	THALES, CATT	Work plan for Rel-19 NR_NTN_Ph3
	R1-2409473	EchoStar, Thales, Terrestar, Eutelsat	Discussion on NTN System Level Downlink Coverage Enhancement
RAN1#120	R1-2500037	THALES	NR NTN Downlink coverage enhancements
	R1-2500039	THALES	FL Summary #1: NR-NTN downlink coverage enhancements
	R1-2500040	THALES	FL Summary #2: NR-NTN downlink coverage enhancements
	R1-2500041	THALES	FL Summary #3: NR-NTN downlink coverage enhancements
	R1-2500042	THALES	FL Summary #4: NR-NTN downlink coverage enhancements
	R1-2500043	THALES	Work plan for Rel-19 NR_NTN_Ph3
	R1-2500387	THALES	Draft reply LS on Ku band numerology
RAN1#120-bis	R1-2501723	THALES	NR NTN Downlink coverage enhancements
	R1-2501725	Moderator (THALES)	FL Summary #1: NR-NTN downlink coverage enhancements
	R1-2501726	Moderator (THALES)	FL Summary #2: NR-NTN downlink coverage enhancements
	R1-2501727	Moderator (THALES)	FL Summary #3: NR-NTN downlink coverage enhancements
	R1-2501728	Moderator (THALES)	FL Summary #4: NR-NTN downlink coverage enhancements
	R1-2501729	THALES, CATT	Work plan for Rel-19 NR_NTN_Ph3
	R1-2501842	Rapporteur (THALES)	RAN1 agreements for NR NTN Phase 3 up to RAN1#120
	R1-2502566	Rapporteur (THALES)	Initial RRC parameters list for Rel-19 NR NTN Phase 3
	R1-2502931	Rapporteur (THALES)	Initial UE features list for Rel-19 NR NTN Phase 3
	R1-2503127	Moderator (Thales)	Summary#1 of discussions on RRC parameters for Rel-19 NR NTN Phase 3
	R1-2503128	Moderator (Thales)	Summary#2 of discussions on RRC parameters for Rel-19 NR NTN Phase 3
RAN1#121	R1-2503687	THALES	NR NTN Downlink coverage enhancements
	R1-2503689	Moderator (THALES)	FL Summary #1: NR-NTN downlink coverage enhancements
	R1-2503690	Moderator (THALES)	FL Summary #2: NR-NTN downlink coverage enhancements
	R1-2503691	Moderator (THALES)	FL Summary #3: NR-NTN downlink coverage enhancements
	R1-2503692	Moderator (THALES)	FL Summary #4: NR-NTN downlink coverage enhancements
	R1-2503693	Rapporteur (THALES)	RRC parameters list for Rel-19 NR NTN Phase 3
	R1-2503701	Rapporteur (THALES)	TP on RAN1 additions to CR for TS 38.300
	R1-2503702	Rapporteur (THALES)	RAN1 agreements for NR NTN Phase 3 up to RAN1#120-bis
	R1-2504715	Moderator (Thales)	List of companies' proposals on NR-NTN downlink coverage enhancement
	R1-2504931	Moderator (THALES)	Summary of discussions on higher-layers parameters for Rel-19 NR NTN
	R1-2504932	Moderator (THALES)	Summary of discussions on TP for RAN1 additions to CR for TS 38.300
	R1-2504933	Moderator (THALES)	Draft LS on NR-NTN TP for TS 38.300
	R1-2504934	RAN1, THALES	LS on NR-NTN TP for TS 38.300
	R1-2504935	Moderator (THALES)	Draft LS on Msg4 PDSCH repetition
	R1-2504936	RAN1, THALES	LS on Msg4 PDSCH repetition
	R1-2504953	Moderator (Thales)	FL Summary #5: NR-NTN downlink coverage enhancements
	R1-2504954	Moderator (Thales)	Summary of discussions on higher-layers parameters for Rel-19 NR NTN
RAN1#122	R1-2505360	THALES	Maintenance on NR-NTN downlink coverage enhancement
	R1-2506442	Moderator (Thales)	FL Summary #1 - maintenance on NR-NTN downlink coverage enhancements
	R1-2506443	Moderator (Thales)	FL Summary #2 - maintenance on NR-NTN downlink coverage enhancements
	R1-2506444	Moderator (Thales)	FL Summary #3 - maintenance on NR-NTN downlink coverage enhancements
RAN1#122-bis	R1-2508065	Moderator (Thales)	FL Summary #1 - Maintenance on NR-NTN downlink coverage enhancements
	R1-2508066	Moderator (Thales)	FL Summary #2 - Maintenance on NR-NTN downlink coverage enhancements
	R1-2508067	Moderator (Thales)	FL Summary #3 - Maintenance on NR-NTN downlink coverage enhancements
	R1-2508070	Moderator (Thales)	FL Summary #1 - Impact from RAN4-led work
	R1-2508071	Moderator (Thales)	FL Summary #2 - Impact from RAN4-led work items
	R1-2508072	Moderator (Thales)	FL Summary #3 - Impact from RAN4-led work items

The following are the contributions of 5G-STARDUST partners to 3GPP RAN 2 meetings for Rel-19 NR NTN WI:

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Table 28 - the contributions of 5G-STARDUST partners to 3GPP RAN WG2 meetings for Rel-19 NR NTN WI

Meeting	Tdoc	Contributors	Title
RAN2#125-bis	R2-2402357	CATT, Thales	Work plan for Rel-19 NR_NTN_Ph3
	R2-2403066	Telit Communications S.p.A. ; Thales	Support for LTE to NR-NTN idle mode mobility
	R2-2403275	Thales	Discussion on MBS broadcast additional features for NR NTN Evolution
	R2-2403276	Thales	Discussion on RAN2 Aspects for Downlink Coverage Enhancements in NR NTN evolution
	R2-2403606	Thales, CATT, Huawei, ZTE, Inmarsat, Viasat	Regenerative NTN payload support in NR NTN Evolution
RAN2#126	R2-2404198	Telit Communications S.p.A. ; Thales	Support for LTE to NR-NTN idle mode mobility
	R2-2404207	CATT, Thales	Updated work plan for NR NTN Ph3
	R2-2405239	Thales	Discussion on MBS broadcast additional features for NR NTN Evolution
	R2-2405240	Thales	Discussion on RAN2 Aspects for Downlink Coverage Enhancements in NR NTN evolution
	R2-2405241	Thales	Regenerative NTN payload support in NR NTN Evolution
RAN2#127	R2-2406606	Thales	Discussion on MBS Broadcast service area signaling
RAN2#127-bis	R2-2408488	Thales	Discussion on MBS Broadcast service area signaling
RAN2#128	R2-2410870	THALES	Discussion on RAN2 Aspects for system-level Downlink Coverage enhancements
	R2-2410871	THALES	Discussion on MBS Broadcast service area signaling
	R2-2411085	Google, Samsung, MediaTek Inc.,Inmarsat, Viasat, Thales, Nordic Semiconductor	Inclusion of the NB-IoT satellite information in E-UTRAN
RAN2#129	R2-2500937	THALES	Draft Reply LS on Ku band numerology
	R2-2501265	DLR, ESA, Toyota ITC, Inmarsat, Viasat, Thales, Aalyria Technologies, Echostar, Eutelsat Group Sateliot, Novamint	Implicit pointer for locating CB-Msg3 DSA replicas
	R2-2501321	THALES (Rapporteur)	Introduction of NTN Ph3 enhancements
RAN2#129-bis	R2-2501781	vivo, Samsung, Google, THALES, MediaTek Inc.	Introduction of LTE TN to NB-IoT NTN Mobility UE Capability
	R2-2502192	THALES	Stage 2 Running CR for NR NTN phase 3
	R2-2502195	THALES	Discussion on cell barring for NR NTN downlink coverage enhancements
	R2-2502605	vivo, Ericsson, Nokia, Nokia Shanghai Bell, ZTE Corporation, Sanechips, THALES, Aalyria, Samsung	Correction on RACH-less HO in NR-NTN
	R2-2502803	Google, Samsung, vivo, THALES	36331CR for the inclusion of NB-IoT satellite information in E-UTRAN
	R2-2502804	Google, Samsung, vivo, THALES	36300CR for the inclusion of NB-IoT satellite information in E-UTRAN
RAN2#130	R2-2503369	vivo, Samsung, Google, THALES, MediaTek Inc.	Introduction of LTE TN to NB-IoT NTN Mobility UE Capability
	R2-2503829	Google, Samsung, vivo, THALES, MediaTek Inc.	36331CR for the inclusion of NB-IoT satellite information in E-UTRAN
	R2-2503832	Google, Samsung, vivo, THALES, MediaTek Inc.	36300CR for the inclusion of NB-IoT satellite information in E-UTRAN
	R2-2504366	CATT, Google, Sateliot, Thales	Discussion on RAN2 impacts due to MME-configured satellite list
	R2-2504630	THALES	Discussion on NTN MBS broadcast description in Stage 2 CR
	R2-2504632	THALES	Discussion to align NR NTN k-Mac with IoT NTN TDD k-Mac
	R2-2504761	THALES	Stage 2 Running CR for NR NTN phase 3

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RAN2#131	R2-2505084	vivo, Samsung, Google, THALES, MediaTek Inc., Aalyria	Introduction of E-UTRAN to NB-IoT NTN Mobility UE Capability [EUTRAN-to-NBIoTNTN]
	R2-2505367	Google, Samsung, vivo, THALES, MediaTek Inc., Aalyria	Introduction of NB-IoT satellite information in E-UTRAN [EUTRAN-to-NBIoTNTN]
	R2-2505368	Google, Samsung, vivo, THALES, MediaTek Inc., Aalyria	Introduction of NB-IoT satellite information in E-UTRAN [EUTRAN-to-NBIoTNTN]
	R2-2506175	THALES, Samsung	k-Mac extension for NR NTN
	R2-2506592	THALES (Rapporteur)	Introduction of NR NTN phase 3
RAN2#131-bis	R2-2507648	THALES	Report of [Post131][301][R19 NR NTN] Open issues for Stage2 (Thales)
	R2-2507779	THALES (Rapporteur)	Miscellaneous Stage 2 corrections for NR NTN phase 3
RAN2#132	R2-2508291	TOYOTA ITC, ESA, THALES	Way forward on RIL Y001 for DL coverage enhancements
	R2-2508763	THALES (Rapporteur)	Miscellaneous Stage 2 corrections for NR NTN phase 3
	R2-2508764	THALES, Huawei, HiSilicon, Vivo	Introduction of common PDCCH repetition (Rel-19 NTN) for TN [Common_PDCCH_rep_TN]
	R2-2508786	Eutelsat Group, Thales, Hispasat, Airbus	Linear polarization orientation RRC signalling for NR NTN
	R2-2508788	Eutelsat Group, Thales, Hispasat, Airbus	Linear polarization orientation RRC signalling for NR NTN
	R2-2508789	Eutelsat Group, Thales, Hispasat, Airbus	Linear polarization orientation RRC signalling for NR NTN
	R2-2509192	THALES (Rapporteur)	Miscellaneous Stage 2 corrections for NR NTN phase 3
	R2-2509358	THALES, Huawei, HiSilicon, Vivo	Introduction of common PDCCH repetition (Rel-19 NTN) for TN [Common_PDCCH_rep_TN]
	R2-2509375	THALES (Rapporteur)	Miscellaneous Stage 2 corrections for NR NTN phase 3

Table 29 - the contributions of 5G-STARDUST partners related to 5G-STARDUST project to 3GPP RAN WG3 meetings for Rel-19 NR NTN WI

Meeting	Tdoc	Contributors	Title
RAN3#123-bis	R3-241930	CATT, Thales	Work plan for Rel-19 NR_NTN_Ph3
	R3-242043	Ericsson, Thales	Service Area for a Broadcast Service in NR NTN
	R3-242044	Ericsson, Thales, Deutsche Telekom, Nokia	Support for Regenerative Payload in NR NTN
RAN3#124	R3-243412	Ericsson, Eutelsat Group, SES, Thales	MBS Service Area in NR NTN
	R3-243413	Ericsson, Thales, Deutsche Telekom, Nokia, ESA, CATT, ZTE, Sateliot, Huawei	Support for Regenerative Payload in NR NTN
	R3-243553	Thales	Discussion on MBS broadcast additional features for NR NTN Evolution
	R3-243671	CATT, Thales	Updated work plan for NR_NTN_Ph3
	R3-243866	Ericsson, Thales, Deutsche Telekom, Nokia, ESA, CATT, ZTE, Sateliot, Huawei	Support for Regenerative Payload in NR NTN
	R3-243949	Ericsson, Thales, Deutsche Telekom, Nokia, ESA, CATT, ZTE, Sateliot, Huawei, Dish Networks, Echostar, Eutelsat Group, Xiaomi, Samsung, CMCC, LG Electronics	Support for Regenerative Payload in NR NTN
RAN3#125	R3-244123	THALES	Way forward for MBS Broadcast intended service area discussion

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	R3-244375	Ericsson, Thales, SES, ESA, Sateliot	Further Discussion on NTN Regenerative Payload Issues in Rel-19
	R3-244516	THALES, Novamint, Sateliot	Discussion on Support of Store and Forward in NTN
	R3-244748	Thales	CB:#NRNTN2_RegenerativePayload
	R3-244856	Ericsson, Thales, Deutsche Telekom, Nokia, ESA, CATT, ZTE, Sateliot, Huawei, Dish Networks, Echostar, Eutelsat Group, Xiaomi, Samsung, CMCC, LG Electronics, NEC, Lenovo	(BL CR to 38.300) Support for Regenerative Payload in NR NTN
RAN3#125-bis	R3-245404	THALES	Discussion on interfaces mobility aspects for regenerative payload
	R3-245410	THALES	Discussion on UE-Sat-UE communications
	R3-245494	Ericsson, Thales, SES, ESA, Sateliot	Further Discussion on NTN Regenerative Payload Issues in Rel-19
	R3-245861	Ericsson, Thales, Deutsche Telekom, Nokia, ESA, CATT, ZTE, Sateliot, Huawei, Dish Networks, Echostar, Eutelsat Group, Xiaomi, Samsung, CMCC, LG Electronics, NEC, Lenovo, ETRI	(BL CR to 38.300) Support for Regenerative Payload and MBS broadcast in NR NTN
	R3-245863	CATT, Thales, Nokia, Nokia Shanghai Bell, Ericsson, Huawei, ZTE, Qualcomm, Samsung, Xiaomi, CMCC, China Telecom, Jio, LG Electronics, NEC, ETRI, SES, ESA	(BL CR to 38.413) Support for Regenerative Payload and MBS broadcast in NR NTN
RAN3#126	R3-247398	Huawei, Nokia, Nokia Shanghai Bell, Thales, CATT	(TP for BLCR for TS 38.300) Correction on stage 2
	R3-247461	Ericsson, Thales	Considerations on NG Interface Management over the Feeder Link
	R3-247462	Ericsson, Thales, ESA, Inmarsat, Viasat	Making the Case for Location-Based CHO in Rel-19
	R3-247463	Ericsson, Thales, ESA, Inmarsat, Viasat	Location-Based CHO in Rel-19 - XnAP Aspects
	R3-247934	Ericsson, Thales, Deutsche Telekom, Nokia, ESA, CATT, ZTE, Sateliot, Huawei, Dish Networks, Echostar, Eutelsat Group, Xiaomi, Samsung, CMCC, LG Electronics, NEC, Lenovo, ETRI	(BL CR to 38.300) Support for Regenerative Payload and MBS broadcast in NR NTN
	R3-247935	CATT, Thales, Nokia, Nokia Shanghai Bell, Ericsson, Huawei, ZTE, Qualcomm, Samsung, Xiaomi, CMCC, China Telecom, Jio, LG Electronics, NEC, ETRI, SES, ESA	(BL CR to 38.413) Support for Regenerative Payload and MBS broadcast in NR NTN

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RAN3#127	R3-250308	Ericsson, Huawei, Nokia, Nokia Shanghai Bell, Thales, CATT, Qualcomm Incorporated, LG Electronics	(TP for BL CR for TS 38.300) Stage 2 Corrections
	R3-250310	Ericsson, Thales, Huawei, Jio Platforms Limited, Intelsat, ESA	Considerations on NG Interface Management over the Feeder Link
	R3-250311	Ericsson, Thales, ESA, Inmarsat, Viasat, Jio Platforms Limited, Intelsat	Making the Case for Location-Based CHO in Rel-19
	R3-250312	Ericsson, Thales, ESA, Inmarsat, Viasat, Jio Platforms Limited, Intelsat	Location-Based CHO in Rel-19 - XnAP Impacts
	R3-250937	Ericsson, Thales, Deutsche Telekom, Nokia, ESA, CATT, ZTE, Sateliot, Huawei, Dish Networks, Echostar, Eutelsat Group, Xiaomi, Samsung, CMCC, LG Electronics, NEC, Lenovo, ETRI	(BL CR to 38.300) Support for Regenerative Payload and MBS broadcast in NR NTN
	R3-250938	CATT, Thales, Nokia, Nokia Shanghai Bell, Ericsson, Huawei, ZTE, Qualcomm, Samsung, Xiaomi, CMCC, China Telecom, Jio, LG Electronics, NEC, ETRI, SES, ESA	(BL CR to 38.413) Support for Regenerative Payload and MBS broadcast in NR NTN
RAN3#127-bis	R3-251712	CATT, Thales	Updated work plan for NR_NTN_Ph3
	R3-251902	Ericsson, Thales, Huawei, Jio Platforms Limited, Intelsat, ESA	Considerations on NG Interface Management over the Feeder Link
	R3-251903	Ericsson, Thales, ESA, Inmarsat, Viasat, Jio Platforms Limited, Intelsat	Making the Case for Location-Based CHO in Rel-19
	R3-251904	Ericsson, Thales, ESA, Inmarsat, Viasat, Jio Platforms Limited, Intelsat	Location-Based CHO in Rel-19 - XnAP Impacts
	R3-251905	Ericsson, Jio Platforms Limited, T-Mobile, BT, Thales, Telia Company, China Unicom, KT Corp.	Inactive UEs and NR NTN
	R3-252523	Ericsson, Thales, Deutsche Telekom, Nokia, ESA, CATT, ZTE, Sateliot, Huawei, Dish Networks, Echostar, Eutelsat Group, Xiaomi, Samsung, CMCC, LG Electronics, NEC, Lenovo, ETRI	(BL CR to 38.300) Support for Regenerative Payload and MBS broadcast in NR NTN

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	R3-252525	CATT, Thales, Nokia, Nokia Shanghai Bell, Ericsson, Huawei, ZTE, Qualcomm, Samsung, Xiaomi, CMCC, China Telecom, Jio, LG Electronics, NEC, ETRI, SES, ESA	Support for Regenerative Payload and MBS broadcast in NR NTN
RAN3#128	R3-253453	Ericsson, Thales, Huawei, Jio Platforms Limited, ESA	On NG Suspension for Hard Feeder Link Switch
	R3-254012	Ericsson, Thales, Deutsche Telekom, Nokia, ESA, CATT, ZTE, Sateliot, Huawei, Dish Networks, Echostar, Eutelsat Group, Xiaomi, Samsung, CMCC, LG Electronics, NEC, Lenovo, ETRI, Jio Platforms	(BL CR to 38.300) Support for Regenerative Payload and MBS broadcast in NR NTN
	R3-254013	CATT, Thales, Nokia, Nokia Shanghai Bell, Ericsson, Huawei, ZTE, Qualcomm, Samsung, Xiaomi, CMCC, China Telecom, Jio Platforms, LG Electronics, NEC, ETRI, SES, ESA	Support for Regenerative Payload and MBS broadcast in NR NTN
RAN3#129	R3-255506	Huawei, LG Electronics, Nokia, Nokia Shanghai Bell, Ericsson, Thales, Jio Platforms, CATT, Qualcomm Incorporated, Deutsche Telekom,Samsung	(TP for TS 38.413) NG Removal completion
	R3-255546	Ericsson, Thales, Huawei, Jio Platforms, Airbus, ESA, Sateliot, Deutsche Telekom	Downlink NG Transmission Suspend/Resume
	R3-255547	Ericsson, Thales, Huawei, Jio Platforms, Airbus, ESA, Sateliot, Deutsche Telekom	Downlink NG Transmission Suspend/Resume – Stage 2 TP
	R3-255548	Ericsson, Thales, Huawei, Jio Platforms, Airbus, ESA, Sateliot, Deutsche Telekom	Downlink NG Transmission Suspend/Resume – NGAP TP
	R3-255780	Ericsson, Huawei, Thales, Airbus, Jio Platforms, Deutsche Telekom, ESA	UE Retention at SCTP Path Failure
	R3-255947	Nokia, Nokia Shanghai Bell, Ericsson, Xiaomi, ZTE, Huawei, CATT, Thales, LG Electronics Inc.,	(TP to BL CR for TS 38.300) Clarification on the OAM requirements

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		Airbus, Jio Platforms, Samsung	
	R3-255949	Huawei, Ericsson, Thales, Jio Platforms, Deutsche Telekom, Airbus, LG Electronics Inc., CATT	(TP to BL CR for TS 38.300) Hard FLSO and AMF management
	R3-256008	Ericsson, Thales, Deutsche Telekom, Nokia, ESA, CATT, ZTE, Sateliot, Huawei, Dish Networks, Echostar, Eutelsat Group, Xiaomi, Samsung, CMCC, LG Electronics, NEC, Lenovo, ETRI, Jio Platforms	Support for Regenerative Payload and MBS broadcast in NR NTN
	R3-256010	CATT, Thales, Nokia, Nokia Shanghai Bell, Ericsson, Huawei, ZTE, Qualcomm, Samsung, Xiaomi, CMCC, China Telecom, Jio Platforms, LG Electronics, NEC, ETRI, SES, ESA	Support for Regenerative Payload and MBS broadcast in NR NTN
RAN3#129-bis	R3-256920	Ericsson, Jio Platforms, Thales, Huawei, ESA, Deutsche Telekom	Short Feeder Link Interruption and UE Retention
	R3-256921	Ericsson, Jio Platforms, Thales	UE Context Retention at SCTP Recovery
	R3-257196	Ericsson, Thales, Deutsche Telekom, ESA, Airbus	Response to R3-256631, R3-256734, R3-256842, R3-256614
	R3-257221	Ericsson, Thales, LG Electronics, Xiaomi, CATT, ZTE, Nokia, Nokia Shanghai Bell, Eutelsat Group, Deutsche Telekom, Qualcomm Incorporated, Airbus, Jio Platforms, Huawei, NEC, CMCC, Samsung	Adding Extended AMF Name to NG REMOVAL RESPONSE message
RAN3#130	R3-258049	Ericsson, Thales, LG Electronics, Xiaomi, CATT, ZTE, Nokia, Nokia Shanghai Bell, Eutelsat Group, Deutsche Telekom, Qualcomm Incorporated, Airbus, Jio Platforms, Huawei, NEC, CMCC, Samsung	Adding Extended AMF Name to NG REMOVAL RESPONSE message
	R3-258472	Ericsson, Aalyria, Thales, Airbus	Inter-Satellite Links and Transparent Payloads
	R3-258474	Ericsson, Aalyria, Thales, Airbus	Inter-Satellite Links and Transparent Payloads - NR NTN

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Table 30 - the contributions of 5G-STARDUST partners related to 5G-STARDUST project to 3GPP RAN WG4 meetings for Rel-19 NR NTN WI

Meeting	Tdoc	Contributors	Title
RAN4#111	R4-2409787	Thales	General aspects for NTN NR Phase 3
RAN4#112	R4-2411303	EchoStar, Dish Network, TerreStar, Thales, Gatehouse, Novamint	NTN MSS S-band band plan, regulations, and deployment scenarios
	R4-2411304	EchoStar, DISH Network, TerreStar, Thales, Gatehouse, Novamint	NTN MSS S-band band plan, regulations, and deployment scenarios
	R4-2411355	CATT, Thales	Updated work plan for NR_NTN_Ph3
	R4-2413333	THALES	Discussion on dynamic NTN testing for NGSO
	R4-2413352	THALES, Magister Solutions Ltd	Discussion on FR1-NTN High Power UE (HPUE)
	R4-2413353	THALES	General aspects for NTN NR Phase 3
RAN4#112-bis	R4-2416491	THALES	Discussion on the Choice of Numerology for Ku-Band
	R4-2416503	THALES	On the VSAT and Satellite Parameters for Ku-band Coexistence
	R4-2416520	THALES	Discussion on the RAN2 LS Reply on Common TA in a Regenerative Payload Scenario
RAN4#113	R4-2419724	THALES	Updates on the VSAT and Satellite Parameters for Ku-band Coexistence
	R4-2419727	THALES	Updates for the Discussion on the Choice of Numerology for NTN Ku-band
RAN4#114	R4-2502211	THALES	Discussion on Ku-band FR2-NTN configuration
	R4-2502283	NEC, THALES	Draft CR to TS 38.108: Introduction of regenerative payload
RAN4#114-bis	R4-2503139	Eutelsat Group, Thales, European Space Agency, Sharp, CHTTL, Airbus	Draft CR to 38.133 to modify uplink timing requirements to enable mobile VSAT served by NGSO
	R4-2504658	THALES	Considerations for reducing Ku-band coexistence configurations
	R4-2504706	NEC Europe Ltd, THALES, HUAWEI, CATT, Ericsson	Draft CR to TS 38.108: Correction of Regenerative Payload Figures
	R4-2504707	CATT, NEC, Thales, HUAWEI, Ericsson	DraftCR for TS 38.181, Introduction on SAN diagram for SAN supporting regenerative payload
RAN4#115	R4-2506977	Qualcomm Incorporated, THALES, Ericsson	(NR_NTN_enh-Core) CR for TS 38.101-5 to clarify Doppler shift issues - Cat A CR
	R4-2507434	CATT, NEC, Thales, HUAWEI, Ericsson	CR for TS 38.181, Introduction on SAN diagram for SAN supporting regenerative payload
	R4-2507767	THALES	SSB extension impact on UE cell search delay
	R4-2507873	THALES	On VSAT UE RF requirements for Ku-band
	R4-2508635	NEC, THALES, HUAWEI, CATT, Ericsson	CR to TS 38.108: Correction of Regenerative Payload Figures
RAN4#116	R4-2511582	THALES	(NR_NTN_enh-Core) Maintenance - Max Peak EIRP value for NTN UE in Ka-band – Cat A CR
	R4-2511599	THALES	Suggestions for improvement of VSAT UE RF requirements in Ku-band
	R4-2512638	THALES	(NR_NTN_enh-Core) Maintenance CR to TS 38.101-5 – Min Peak EIRP value for NTN UE in Ka-band – Cat A CR
	R4-2512662	THALES	Draft CR to TS38.108 – for transmit power and output power in NTN Ku bands
	R4-2512663	THALES	Draft CR to TS38.108 – for unwanted emission requirements for NTN Ku bands
	R4-2512695	Eutelsat, SES, Thales	Way Forward for Ku band ACLR and ACS specification
RAN4#116-bis	R4-2514113	Ericsson, Thales	SAN RF Conformance testing for Ku-bands
RAN4#117	R4-2522255	THALES, SES, EUTELSAT Group, ESA, HISPASAT, XIAOMI, CATT, ZTE, EchoStar, Airbus, Gilat, Aalyria, Fraunhofer IIS, Gatehouse Satcom,	Maintenance - Correction of Mobile VSAT with NGSO for the Ka-band

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		Novamint, Lockheed Martin, Tejas Networks, JSAT, MITRE, Kratos, SHARP, BMW, CSCN	
	R4-2522949	Thales	Way Forward for [117][308] Rel-19_BS_SAN_conf_Part2_NTN
	R4-2523037	LG Electronics, Thales	Max Peak EIRP value for NTN UE in Ka-band
	R4-2523039	LG Electronics, Thales	Min Peak EIRP value for NTN UE in Ka-band
	R4-2523048	LG Electronics, Thales	Max Peak EIRP value for NTN UE in Ku-band
	R4-2523050	Ericsson, Thales, CHTTL	(NR_NTN_Ku_bands-Core) CR to TS 38.101-5 - VSAT PFD limits
	R4-2523217	MediaTek, Thales, CHTTL, LG Electronics	CR for TS38.101-5 Corrections on NTN VSAT minimum requirements in Ku-band

Table 31 - the contributions of 5G-STARDUST partners related to 5G-STARDUST project to 3GPP SA WG1 meetings for Rel-19 Sat arch phase 3 WI

Meeting	Tdoc	Contributors	Title
SA1#101	S1-230156	Qualcomm, Thales, Futurewei, SyncTechno	Initial consolidation proposal
	S1-230450	ETRI, Novamint, Thales, Eutelsat, Lockheed Martin, KT Corporation,	Use case on service continuity for UE-to-UE communication across
	S1-230457	ETRI, Novamint, Thales, Eutelsat, Lockheed Martin, KT Corporation,	Use case on service continuity for UE-to-UE communication across
	S1-230645	ETRI, Novamint, Thales, Eutelsat, Lockheed Martin, KT Corporation,	Use case on service continuity for UE-to-UE communication across
	S1-230669	ETRI, Novamint, Thales, Eutelsat, Lockheed Martin, KT Corporation,	Use case on service continuity for UE-to-UE communication across
SA1#102	S1-231017	Thales, Lockheed Martin, SES, Avanti, Intelsat, CeWIT, Airbus, Hispasat, Inmarsat, Gilat, TNO, ESA, Qualcomm, Novamint	Use Case on supplementary downlink data via a second 3GPP network
	S1-231089	Novamint, China Telecom, Thales, Airbus, Avanti, CEWiT, ESA, ETRI, Eutelsat, GateHouse, Gilat, Hughes Network systems, IIIT Hyderabad, Inmarsat, Intelsat, IRT Saint Exup ry, Ligado, Lockheed Martin, Nokia, Omnispace, OneWeb, Sateliot, SES, ST Engineering iDirect Ireland, TNO, TTP	New WID: Satellite access - Phase 3
	S1-231201	Qualcomm, Nokia, Nokia Shanghai Bell, FirstNet, Verizon UK Ltd, Thales	New WID on Human readable name for network service

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	S1-231202	Qualcomm, Nokia, Nokia Shanghai Bell, FirstNet, Verizon UK Ltd, Thales	Human readable name for network service
	S1-231361	Qualcomm, Nokia, Nokia Shanghai Bell, FirstNet, Verizon UK Ltd, Thales, Xiaomi, KDDI	New WID on Human readable name for network service
	S1-231571	Novamint, China Telecom, Thales, Airbus, Avanti, CEWiT, ESA, ETRI, Eutelsat, GateHouse, Gilat, Hughes Network systems, IIIT Hyderabad, Inmarsat, Intelsat, IRT Saint Exup ry, Ligado, Lockheed Martin, Nokia, Omnispace, OneWeb, Sateliot, SES, ST Engineering iDirect Ireland, TNO, TTP	New WID: Satellite access - Phase 3
	S1-231602	Thales, Lockheed Martin, SES, Avanti, Intelsat, CeWIT, Airbus, Hispasat, Inmarsat, Gilat, TNO, ESA, Qualcomm, Novamint, Lenovo, Ericsson, IRT Saint Exupery, JSAT, Ligado, Sateliot, Omnispace, Gatehouse, EchoStar, Viasat, Cobham Satcom, SA catapult, Eutelsat, Leonardo, OneWeb, Forsway	Use Case on supplementary downlink data via a second 3GPP network
	S1-231621	Qualcomm, Lenovo, CableLabs, Xiaomi, Comcast Corporation, Verizon UK Ltd, Tencent, Thales, Charter Communications, SyncTechno Inc., InterDigital, KDDI, Nokia, Nokia-Shanghai Bell, Vivo, Lockheed Martin, Sennheiser, Viasat, KPN, LG Electronics, Apple, Novamint, Futurewei, NEC, ETRI, IRT Saint Exupery, CATT, DSIT, Ericsson	pCR for FS_DualSteer Consolidated requirements
	S1-231706	Thales, Lockheed Martin, SES, Avanti, Intelsat, CeWIT, Airbus, Hispasat, Inmarsat, Gilat, TNO, ESA, Qualcomm, Novamint, Lenovo, Ericsson, IRT Saint Exupery, JSAT, Ligado, Sateliot, Omnispace, Gatehouse, EchoStar,	Use Case on supplementary downlink data via a second 3GPP network

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		Viasat, Cobham Satcom, SA catapult, Eutelsat, Leonardo, OneWeb, Forsway, China Telecom, ETRI, ST Engineering iDirect,	
	S1-231707	Qualcomm, Lenovo, CableLabs, Xiaomi, Comcast Corporation, Verizon UK Ltd, Tencent, Thales, Charter Communications, SyncTechno Inc., InterDigital, KDDI, Nokia, Nokia-Shanghai Bell, Vivo, Lockheed Martin, Sennheiser, Viasat, KPN, LG Electronics, Apple, Novamint, Futurewei, NEC, ETRI, IRT Saint Exupery, CATT, DSIT, Ericsson	pCR for FS_DualSteer Consolidated requirements
	S1-231738	Novamint, China Telecom, Thales, Airbus, Avanti, CEWiT, ESA, ETRI, Eutelsat, GateHouse, Gilat, Hughes Network systems, IIIT Hyderabad, Inmarsat, Intelsat, IRT Saint Exup ry, Ligado, Lockheed Martin, Nokia, Omnispace, OneWeb, Sateliot, SES, ST Engineering iDirect Ireland, TNO, TTP	New WID: Satellite access - Phase 3
	S1-231800	Thales, Lockheed Martin, SES, Avanti, Intelsat, CeWIT, Airbus, Hispasat, Inmarsat, Gilat, TNO, ESA, Qualcomm, Novamint, Lenovo, Ericsson, IRT Saint Exupery, JSAT, Ligado, Sateliot, Omnispace, Gatehouse, EchoStar, Viasat, Cobham Satcom, SA catapult, Eutelsat, Leonardo, OneWeb, Forsway, China Telecom, ETRI, ST Engineering iDirect,	Use Case on supplementary downlink data via a second 3GPP network
SA1#103	S1-232035	Thales, Lockheed Martin, SES, Avanti, Intelsat, CeWIT, Airbus, Hispasat,	Use Case on supplementary downlink data via a second 3GPP network
	S1-232239	Qualcomm, Lenovo, CableLabs, Xiaomi, Comcast Corporation, Verizon UK Ltd, Tencent, Thales, Charter	DualSteer_Normative requirements

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		Communications, SyncTechno Inc., InterDigital, KDDI, Nokia, Nokia-Shanghai Bell, Vivo, Lockheed Martin, Sennheiser, Viasat, KPN, LG Electronics, Apple, Novamint, Futurewei, NEC, ETRI, IRT Saint Exupery, CATT, DSIT, Ericsson	
	S1-232257	Thales	DualSteer Normative requirements
	S1-232288	Thales	DualSteer Normative requirements
	S1-232337	Thales, Lockheed Martin, SES, Avanti, Intelsat, CeWIT, Airbus, Hispasat,	Use Case on supplementary downlink data via a second 3GPP network
	S1-232371		DualSteer Normative requirements
SA1#104	S1-233033	Thales, Novamint, Eutelsat	Clarifications to the Use Case on NTN-based dual 3GPP access
	S1-233106	Qualcomm, ETRI, Verizon UK Ltd, US Cellular, Apple, NEC, Thales,	New WID on Upper layer traffic steering and switching over dual 3GPP
	S1-233107	Qualcomm, ETRI, Verizon UK Ltd, US Cellular, Apple, NEC, Thales, Novamint, Viasat, CeWIT, JSAT, Ligado, Omnispace, SA Catapult, Avanti, Hughes, Gilat, Terrestar Solutions, Inmarsat, Sateliot, TTP, ESA, Intelsat, Gatehouse, University of Surrey, SES, Hispasat, Airbus, Eutelsat, MITRE, Nokia, Nokia Shanghai Bell, SyncTechno, InterDigital, Lockeed Martin, IRT Saint Exupery, Tencent	DualSteer Normative requirements
	S1-233201	NOVAMINT, Thales, Airbus, Eutelsat, Fraunhofer, TNO,	Satellite Access: Next Steps - Motivation for study in Rel-20 and beyond
	S1-233301	Thales, Novamint, Eutelsat, TNO, Lockheed Martin	Clarifications to the Use Case on NTN-based dual 3GPP access
	S1-233336	Qualcomm, ETRI, Verizon UK Ltd, US Cellular, Apple, NEC, Thales,	New WID on Upper layer traffic steering and switching over dual 3GPP
	S1-233337	Qualcomm, ETRI, Verizon UK Ltd, US Cellular, Apple, NEC, Thales, Novamint, Viasat, CeWIT, JSAT, Ligado, Omnispace, SA Catapult, Avanti, Hughes, Gilat, Terrestar Solutions, Inmarsat, Sateliot, TTP, ESA, Intelsat, Gatehouse, University of Surrey,	DualSteer Normative requirements

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		SES, Hispasat, Airbus, Eutelsat, MITRE, Nokia, Nokia Shanghai Bell, SyncTechno, InterDigital, Lockeed Martin, IRT Saint Exupery, Tencent	
	S1-233345	Qualcomm, ETRI, Verizon UK Ltd, US Cellular, Apple, NEC, Thales,	New WID on Upper layer traffic steering and switching over dual 3GPP
	S1-233347	Qualcomm, ETRI, Verizon UK Ltd, US Cellular, Apple, NEC, Thales, Novamint, Viasat, CeWIT, JSAT, Ligado, Omnispace, SA Catapult, Avanti, Hughes, Gilat, Terrestar Solutions, Inmarsat, Sateliot, TTP, ESA, Intelsat, Gatehouse, University of Surrey, SES, Hispasat, Airbus, Eutelsat, MITRE, Nokia, Nokia Shanghai Bell, SyncTechno, InterDigital, Lockeed Martin, IRT Saint Exupery, Tencent, vivo, Lenovo	DualSteer Normative requirements
	S1-233348	Thales, Novamint, Eutelsat, TNO, Lockheed Martin	Clarifications to the Use Case on NTN-based dual 3GPP access
	S1-233371	Qualcomm, ETRI, Verizon UK Ltd, US Cellular, Apple, NEC, Thales, Novamint, Viasat, CeWIT, JSAT, Ligado, Omnispace, SA Catapult, Avanti, Hughes, Gilat, Terrestar Solutions, Inmarsat, Sateliot, TTP, ESA, Intelsat, Gatehouse, University of Surrey, SES, Hispasat, Airbus, Eutelsat, MITRE, Nokia, Nokia Shanghai Bell, SyncTechno, InterDigital, Lockeed Martin, IRT Saint Exupery, Tencent, vivo, Lenovo	DualSteer Normative requirements
	S1-233372	Qualcomm, ETRI, Verizon UK Ltd, US Cellular, Apple, NEC, Thales,	New WID on Upper layer traffic steering and switching over dual 3GPP
SA1#105	S1-240052	Novamint, Thales, Airbus, Eutelsat Group, Fraunhofer IIS, TNO, ESA, SES, ETRI,	New SID: Study on satellite access - Phase 4

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	S1-240053	NOVAMINT, Thales, Airbus, Eutelsat Group, Fraunhofer IIS, TNO, ESA, SES, ETRI, vivo, SKY Perfect JSAT, Sateliot, Lockheed Martin, Hughes Network systems, CATT, Nokia, Nokia Shanghai Bell, OQ Technology, China Telecom	Motivation for a Study on satellite access - Phase 4
	S1-240064	SES, Thales, Ligado, Novamint, Inmarsat, Viasat, Avanti, Airbus, ESA, Hispasat,	Use Cases motivations for 5G MBS over NTN study
	S1-240070	Hughes Network Systems, Dish Network, Novamint, Hispasat, Thales,	Mini WID on Robust Notification Alert for 5G system with satellite access
	S1-240071	Hughes Network Systems, DISH Network, Novamint, Hispasat, OQ Technology, OmniSpace, SES, TTP Plc, Thales	Robust Notification Alert for 5G satellite acsess to notify UE of missed paging call(s) when normal paging fails
	S1-240130	Nokia, Nokia Shanghai Bell, KDDI, SK Telecom, Rakuten Mobile, Spark NZ, Reliance Jio, KT Corp., LG Uplus, ETRI, Thales, Novamint, Sateliot	Structure considerations for SA1 Rel-20 Part B study
	S1-240210	Novamint, Thales, Airbus, Eutelsat Group, Fraunhofer IIS, TNO, ESA, SES, ETRI,	New SID: Study on satellite access - Phase 4
	S1-240211	NOVAMINT, Thales, Airbus, Eutelsat Group, Fraunhofer IIS, TNO, ESA, SES, ETRI, vivo, SKY Perfect JSAT, Sateliot, Lockheed Martin, Hughes Network systems, CATT, Nokia, Nokia Shanghai Bell, OQ Technology, China Telecom	Motivation for a Study on satellite access - Phase 4
	S1-240235	Novamint, Thales, Airbus, Eutelsat Group, Fraunhofer IIS, TNO, ESA, SES, ETRI,	New SID: Study on satellite access - Phase 4
	S1-240258	Novamint, Thales, Airbus, Eutelsat Group, Fraunhofer IIS, TNO, ESA, SES, ETRI,	New SID: Study on satellite access - Phase 4
	S1-240290	Novamint, Thales, Airbus, Eutelsat Group, Fraunhofer IIS, TNO, ESA, SES, ETRI,	New SID: Study on satellite access - Phase 4
	S1-240298	Novamint, Thales, Airbus, Eutelsat	New SID: Study on satellite access - Phase 4

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		Group, Fraunhofer IIS, TNO, ESA, SES, ETRI,	
	S1-240312	Novamint, Thales, Airbus, Eutelsat Group, Fraunhofer IIS, TNO, ESA, SES, ETRI,	New SID: Study on satellite access - Phase 4
SA1#106	S1-241017	NOVAMINT, SES, Thales, ESA	Motivation for revising FS_5GSAT_Ph4 SID to add Reliable Multicast Use Cases for NTN
	S1-241041	Thales	Views on 6G SA1 study item(s)
	S1-241183	NOVAMINT, SES, Thales, ESA, Inmarsat, Viasat	Revised SID: Study on satellite access - Phase 4
	S1-241235	Thales, TNO, Airbus, Novamint, CEWiT	Views on 6G SA1 study item(s)
	S1-241251	Novamint, SES, Thales, ESA, Inmarsat, Viasat, EchoStar, JSAT, TNO, Gilat,	Revised SID: Study on satellite access - Phase 4
	S1-241275	EchoStar, Dish Network, Novamint, SES, Thales, Vivo	5G system with satellite access to support Robust Notification Alert
	S1-241285	EchoStar, Dish Network, Novamint, SES, Thales, Vivo, Sateliot	5G system with satellite access to support Robust Notification Alert
	S1-241290	EchoStar, Dish Network, Novamint, SES, Thales, Vivo, Sateliot,	5G system with satellite access to Resilient/Robust support Robust
	S1-241352	Novamint, SES, Thales, ESA, Inmarsat, Viasat, EchoStar, JSAT, TNO, Gilat,	Revised SID: Study on satellite access - Phase 4
	S1-241369	EchoStar, Dish Network, Novamint, SES, Thales, Vivo, Sateliot,	5G system with satellite access to support Robust Resilient Notification
	S1-241393	Novamint, SES, Thales, ESA, Inmarsat, Viasat, EchoStar, JSAT, TNO, Gilat,	Revised SID: Study on satellite access - Phase 4
	S1-241411	EchoStar, Dish Network, Novamint, SES, Thales, Vivo, Sateliot,	5G system with satellite access to support Resilient Notification

Table 32 - the contributions of 5G-STARDUST partners related to 5G-STARDUST project to 3GPP SA WG2 meetings for Rel-19 Sat arch phase 3 WI

Meeting	Tdoc	Contributors	Title
SA2#157	S2-2306693	Qualcomm Incorporated, CableLabs, Lockheed Martin, Futurewei, Thales, Novamint	Supporting material for DualSteer study item proposal
	S2-2306896	Thales, Novamint, CATT	New SID on Study on Integration of satellite components in the 5G architecture Phase III.
SA2#158	S2-2308445	Thales (moderator, Q3 NWM process)	New SID on Study on Integration of satellite components in the 5G architecture Phase III
	S2-2308448	Thales	SA WG2 Rel. 19 SID, Satellite architecture enhancement Q3 NWM discussion moderator report
	S2-2309631	Thales	New SID on Study on Integration of satellite components in the 5G architecture Phase III.
	S2-2310027	Thales (moderator, Q3 NWM process)	New SID on Study on Integration of satellite components in the 5G architecture Phase III

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SA2#159	S2-2310455	CATT, Thales	FS_5GSAT_ARCH_Ph3 TR Skeleton.
	S2-2310457	CATT, Thales	FS_5GSAT_ARCH_Ph3 TR Scope.
	S2-2310458	CATT, Thales	FS_5GSAT_ARCH_Ph3 TR architectural assumptions.
	S2-2310459	CATT, Thales	FS_5GSAT_Ph3_ARCH_Key issue for WT#1.
	S2-2310460	CATT, Thales	FS_5GSAT_ARCH_Ph3_Key issue for WT#2.
	S2-2310461	CATT, Thales	FS_5GSAT_ARCH_Ph3_Key issue for WT#3.
	S2-2311379	CATT, Thales	FS_5GSAT_ARCH_Ph3 TR Skeleton.
	S2-2311382	CATT, Thales	FS_5GSAT_ARCH_Ph3 TR Scope.
	S2-2311553	CATT, Thales	FS_5GSAT_ARCH_Ph3 TR Scope.
	S2-2311603	CATT, Thales	FS_5GSAT_ARCH_Ph3 TR Scope.
	S2-2311913	CATT, Thales	FS_5GSAT_ARCH_Ph3 TR Skeleton.
SA2#160	S2-2312146	Thales	Example network and satellite configurations for WT3 in FS_5GSAT_ARCH_Ph3.
	S2-2312461	CATT, Thales, Novamint, Samsung, Airbus, Eutelsat, TNO, IRT Saint-Exupery, Apple	FS_5GSAT_ARCH_Ph3_Key issue for WT#3.
	S2-2312988	CATT, Thales, Novamint, China Telecom, Spreadtrum, vivo	FS_5GSAT_Ph3_ARCH_Key issues for WT#1.
	S2-2313027	Novamint, CATT, Thales, Sateliot, Gatehouse	FS_5GSAT_ARCH_Ph3_Key issue for WT#2.
	S2-2313364	CATT, Thales, Novamint, China Telecom, Spreadtrum, vivo, TNO, Eutelsat, Nokia, Nokia Shanghai Bell, NEC	FS_5GSAT_Ph3_ARCH_Key issues for WT#1.
	S2-2313365	Novamint, CATT, Thales, Sateliot, Gatehouse, TNO	FS_5GSAT_ARCH_Ph3_Key issue for WT#2.
	S2-2313367	CATT, Thales, Novamint, Samsung, Airbus, Eutelsat, TNO, IRT Saint-Exupery, Apple, Nokia,Nokia Shanga Bell	FS_5GSAT_ARCH_Ph3_Key issue for WT#3.
	S2-2313368	Thales	Example network and satellite configurations for WT3 in FS_5GSAT_ARCH_Ph3.
	S2-2313623	CATT, Thales, Novamint, China Telecom, Spreadtrum, vivo, TNO, Eutelsat, Nokia, Nokia Shanghai Bell, NEC, Xiaomi, SAMSUNG, OPPO, Deutsche Telekom, Airbus	FS_5GSAT_Ph3_ARCH_Key issues for WT#1.
	S2-2313624	Novamint, CATT, Thales, Sateliot, Gatehouse, TNO, Airbus, Deutsche Telekom, Oppo, Vivo, Xiaomi, CEWiT, Hughes Network Systems, Skylo, Samsung, NEC	FS_5GSAT_ARCH_Ph3_Key issue for WT#2.
	S2-2313625	Vivo, Samsung, Huawei, HiSilicon, Thales, Deutsche Telekom	FS_5GSAT_ARCH_Ph3 Architecture assumption updates UE-satellite-UE communications.
	S2-2313626	CATT, Thales, Novamint, Samsung, Airbus, Eutelsat, TNO, IRT Saint-Exupery, Apple, Nokia, Nokia Shanga Bell, Xiaomi, OPPO, Vivo, Motorola Solutions	FS_5GSAT_ARCH_Ph3_Key issue for WT#3.
	S2-2313627	Thales	Example network and satellite configurations for WT3 in FS_5GSAT_ARCH_Ph3.
	S2-2313702	Novamint, CATT, Thales, Sateliot, Gatehouse, TNO, Airbus, Deutsche Telekom, Oppo, Vivo,	FS_5GSAT_ARCH_Ph3_Key issue for WT#2.

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		Xiaomi, CEWiT, Hughes Network Systems, Skylo, Samsung, NEC, LGE, Nokia, Nokia Shanghai Bell, Huawei	
	S2-2313703	Vivo, Samsung, Huawei, HiSilicon, Thales, Deutsche Telekom	FS_5GSAT_ARCH_Ph3 Architecture assumption updates UE-satellite-UE communications.
	S2-2313704	CATT, Thales, Novamint, Samsung, Airbus, Eutelsat, TNO, IRT Saint-Exupery, Apple, Nokia, Nokia Shanga Bell, Xiaomi, OPPO, Vivo, Motorola Solutions, NEC	FS_5GSAT_ARCH_Ph3_Key issue for WT#3.
	S2-2313861	Thales	Example network and satellite configurations for WT3 in FS_5GSAT_ARCH_Ph3.
SA2#160-Ad Hoc-e	S2-2401663	FS_5GSAT_Ph3_ARCH Rapporteur (Thales)	WI Status Report for Study on Integration of satellite components in the 5G architecture Phase 3 (FS_5GSAT_Ph3_ARCH)
SA2#161	S2-2402093	Thales	New SID on Study on Integration of satellite components in the 5G architecture Phase 3.
SA2#162	S2-2405630	Rapporteur (Thales)	WI Status report for Study on Integration of satellite components in the 5G architecture Phase 3
SA2#163	S2-2406505	Thales	New WID on Integration of satellite components in the 5G architecture Phase III.
	S2-2406526	Thales(rapporteur)	Introduction for conclusions on the architecture principles following the NWM discussions, for KI1.
	S2-2406529	Thales(rapporteur)	Introduction for conclusions on the architecture principles following the NWM discussions, for KI2.
	S2-2406530	Thales(rapporteur)	Introduction for conclusions on the architecture principles following the NWM discussions, for KI3.
	S2-2406905	Huawei, HiSilicon, Intel, NTT DOCOMO, Thales	KI#1 Conclusion: For regenerative-based satellite access.
	S2-2407160	Huawei, HiSilicon, Intel, NTT DOCOMO, Thales, Samsung, China Telecom, vivo, OPPO, Ericsson	KI#1 Conclusion: For regenerative-based satellite access.
	S2-2407293	Rapporteur (Thales)	WI Status report for Study on Integration of satellite components in the 5G architecture Phase 3
	S2-2407368	Thales	New WID on Integration of satellite components in the 5G architecture Phase III.
SA2#164	S2-2409353	Rapporteur (Thales)	WI Status report for Study on Integration of satellite components in the 5G architecture Phase 3
SA2#165	S2-2411120	Rapporteur (Thales)	WI Status report for Integration of satellite components in the 5G architecture Phase III (5GSAT_Ph3_ARCH)

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