

# 5G ALLSTAR



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5G Agile and flexible integration of Satellite And cellular (5G-ALLSTAR)

## Deliverable D6.6

Report on standardization activities Y1

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## Abstract

The document reports the the standardization activities undergone by the 5G-ALLSTAR project partners over the 12 first months of the project.

## Keywords

*Multi-Connectivity, Standardization, 3GPP, ITU, V2X*

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## Executive Summary

5G-ALLSTAR WP6 includes standardization activities for inclusion of technologies developed by the project in the 5G system definition, mainly at 3GPP level.

The deliverable D6.5 “Standardization Action Plan” defines these activities and the associated actions to be undergone by the 5G-ALLSTAR consortium partners all along the 3 years of the project life.

This document is the first of a series of 3 reports that will be delivered and covers standardization activities lead by the 5G-ALLSTAR project team from M01 (July 2018) to M12 (June 2019).

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## List of Abbreviations

|              |   |
|--------------|---|
| <b>3GPP</b>  | 3 <sup>rd</sup> Generation Partnership Project                      |
| <b>5G</b>    | Fifth Generation of cellular network technology                     |
| <b>CRAT</b>  | Consortium for the Research in Automation and Telecommunication     |
| <b>DL</b>    | Downlink  |
| <b>eMBB</b>  | Enhanced Mobile BroadBand   |
| <b>ETRI</b>  | Electronics and Telecommunications Research Institute (South Korea) |
| <b>ETSI</b>  | European Telecommunication Standards Institute                      |
| <b>GEO</b>   | Geostationary Earth Orbit   |
| <b>IEEE</b>  | Institute of Electrical and Electronics Engineers                   |
| <b>IMT</b>   | International Mobile Telecommunications                             |
| <b>ITU</b>   | International Telecommunication Union                               |
| <b>ITU-R</b> | ITU Radio communication Sector                                      |
| <b>LEO</b>   | Low Earth Orbit   |
| <b>LLS</b>   | Low Latency Services  |
| <b>Mxy</b>   | Month xy  |
| <b>NR</b>    | New Radio   |
| <b>NTN</b>   | Non-Terrestrial Network   |
| <b>PRACH</b> | Physical Random Access CHannel                                      |
| <b>RAN</b>   | Radio Access Network  |
| <b>RRM</b>   | Radio Resource Management   |
| <b>SA</b>    | System Architecture   |
| <b>SG</b>    | Specification Group   |
| <b>SI</b>    | Study Item (SI)   |
| <b>TAS</b>   | Thales Alenia Space   |
| <b>TDOC</b>  | Technical Document  |
| <b>UE</b>    | User Equipment  |
| <b>V2X</b>   | Vehicle-to-everything   |
| <b>WI</b>    | Work Item (3GPP)  |
| <b>WP</b>    | Work Package  |
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## 1 Introduction

5G-ALLSTAR WP6 includes standardization activities for inclusion of technologies developed by the project in the 5G system definition, mainly at 3GPP.

One of the project's objectives is indeed to contribute to the definition of 5G system as part of the release 16 and beyond with the inclusion of 5G satellite access, mobile wireless backhaul and multiple access/connectivity.

The plan, as defined in D6.5 (Standardization Action Plan) is to leverage on going standardisation on eMBB and 5G satellite access. Additional standardization activities in bodies such as ETSI, IEEE and ITU, may possibly be carried in complement to 3GPP activities. Contributions will be provided to selected groups in order to support product adoption and interoperability developed in the context of the project.

Opportunities related to the project scope will be identified and the standardization strategy may be reconsidered correspondingly.

The Standardization Action Plan defines these activities and the associated actions to be undergone by the consortium all along the 3 years of project lifetime.

Every 12 months, a Standardization activity report is issued.

This document is the first of the 3 reports that will be delivered and covers standardization activities lead by the 5G-ALLSTAR project team from M01 (July 2018) to M12 (June 2019).



## 2 Standardization action plan reminder

This Standardization Action Plan (deliverable D6.5) proposes an action plan for standardization activities on the 5G-ALLSTAR project to support the inclusion of technologies developed by the project, in 5G systems definition. These activities will be mainly undergone at 3GPP.

The document:

- Presents the rationale for a new standardization approach for Satcom based on the analysis of the current standardization context in Satcom market and the on-going standardization context for 5G;
- Proposes an approach to integrate satellite in the 5G related standards including the identification/justification of the potential standardization requirements arising from 5G-ALLSTAR;
- Gives a standardization action plan including the timeline, the Standardization Organizations and groups where 5G-ALLSTAR plans to contribute and the 5G-ALLSTAR members involved;

This plan may need to be revised during the course of the project to take into account the progress on the project, especially at architecture and research pillars (e.g. RRM) levels, as well as the evolving 5G standardization context.

The table below gives the list of all the standardization actions intended to be taken over the 5G-ALLSTAR project duration.

| Standardisation body/group | Action description   | Deadline   |
|----------------------------|--|------------|
| 3GPP RAN1                  | Contribute to the study of physical layer issues of NR V2X-based vehicle communication   | Early 2019 |
| ITU-R SG4 & SG5            | Inform relevant ITU-R Working Parties on activities in 3GPP  | Mid 2019   |
| 3GPP RAN3                  | Study procedures for hand-over/multi connectivity between 2 satellite accesses or between satellite and cellular access and identify/describe solutions                              | Mid 2019   |
| 3GPP RAN2 & 3              | Study enablers for coordinated radio resource management between satellite/cellular access   | Mid 2019   |
| 3GPP RAN1                  | Contribute to the study of issues associated to NR physical layer support non-terrestrial network  | End 2019   |
| 3GPP RAN1                  | Contribute to the specification of NR V2X physical layer design regarding vehicle communication  | End 2019   |
| 3GPP RAN2                  | Study access layer protocol impacts associated to hand-over/multi connectivity between 2 satellite accesses or between satellite and cellular access and identify/describe solutions | End 2019   |
| 3GPP RAN3                  | Specify procedures for hand-over/multi connectivity between 2 satellite accesses or between satellite and cellular access  | Mid 2020   |
| 3GPP RAN2                  | Specify NR access layer protocol modifications enabling support of hand-over/multi connectivity between 2 satellite accesses or between satellite and cellular access                | Mid 2020   |
| 3GPP RAN1                  | Specify NR physical layer protocol modifications enabling support of non-terrestrial network   | Mid 2020   |
| 3GPP RAN2 & 3              | Specify enablers for coordinated radio resource management between satellite/cellular access   | Mid 2020   |
| ITU-R SG4 & SG5            | Contribute to ITU-R Recommendation(s) on NTN integration in IMT-2020 networks  | Mid 2020   |

**Table 1 : Standardization actions list**

### 3 Standardization actions undergone over Year 1

#### 3.1 Activity at 3GPP level

The 5G-ALLSTAR partners are actively participating to the different 3GPP working groups for integration of Non Terrestrial Networks into future 5G Systems.

5G-ALLSTAR consortium contribution to 3GPP also includes some Technical Documents (TDOCs) submission on different topics in the relevant 3GPP working groups.

##### 3.1.1 Focus on RAN1 activities

A study item (SI) for NR V2X standardization (V2X phase 3) was approved in the RAN#80 meeting, and started its first meeting at RAN1#94 meeting in August of 2018. It officially ended at RAN1#96 meeting in March of 2019, and now the V2X group continues its standardization activities as work item (WI) since RAN1#96-Bis meeting of April 2019.

Based on the study outcome captured in TR 38.885, the WI is to specify radio solutions that are necessary for NR to support advanced V2X services (except the remote driving use case which was studied in TR 38.824) in addition to the services supported by LTE V2X.

Since 5G-ALLSTAR is developing a mmWave-band NR vehicular communications system, we participated in the following RAN1 meetings for both NR V2X SI and WI (see **Erreur ! Source du renvoi introuvable.**), and contributed our views on V2X sidelink design to the meetings at Physical Layer level.

|           | Meeting title          | Dates                      | Location   |
|-----------|------------------------|----------------------------|------------|
| NR V2X SI | ▪ RAN1#94 meeting      | 20 - 24 August 2018        | Gothenburg |
|           | ▪ RAN1#95 meeting      | 12 - 16 November 2018      | Spokane    |
|           | ▪ RAN1-AH-1901 meeting | 21 - 25 January 2019       | Taipei     |
|           | ▪ RAN1#96 meeting      | 25 February - 1 March 2019 | Athens     |
| NR V2X SI | ▪ RAN1#96bis meeting   | 8 - 12 April 2019          | Xi'an      |
|           | ▪ RAN1#97 meeting      | 13 - 17 May 2019           | Reno       |

**Table 2 : 3GPP RAN1 meeting for NR V2X**

**NR V2X SI meetings:** In the meeting, 5G-ALLSTAR discussed NR V2X sidelink design by making technical observations and proposals, mainly focusing the following areas:

- NR sidelink waveform
- NR sidelink transmission with multi-beam operations
- NR sidelink design under different numerologies
- Subchannelization of NR sidelink
- NR V2X sidelink synchronization mechanism design

**NR V2X WI meetings:** In the meeting, 5G-ALLSTAR discussed NR V2X sidelink design by making technical observations and proposals, mainly focusing the following areas:

- HARQ feedback mechanism for NR sidelink groupcast
- Retransmission mechanism for NR sidelink groupcast
- NR V2X sidelink synchronization mechanism design

Meanwhile, RAN1 discussions about NR adaptations to NTN are still too general to really be impacted by such specific use cases. Nonetheless, all the following described actions can be considered as relevant for 5G services to Vehicular/Mobile Terminals via NTN.

**RAN1#96bis (April 2019):** NR NTN solutions was discussed on line during 2 hours and in particular system level simulations assumptions as well as hypothesis for uplink timing advance/RACH procedure and more delay-tolerant re-transmission mechanisms.

**RAN1#97 (May 2019):**

- Agreement on system and link level simulation assumptions (satellite parameters, UE characteristics, beam layout definition and parameters for single satellite simulations, assumptions for calibration and performance evaluation, impairments due to satellite payload and satellite movement, LLS parameters for DL synchronization, PRACH and data transmission performance evaluation)
- Agreement on initial hypothesis regarding physical layer control procedures, uplink timing advance/RACH procedure, and more delay-tolerant re-transmission mechanisms.

### 3.1.2 Focus on RAN3 activities

In-line with 5G-ALLSTAR Standardization Action Plan, a contribution on Multi-Connectivity to 3GPP TR 38.821 “Solutions for NR to support non-terrestrial networks” release 16 was issued by the project Korean and European partners (mainly ETRI, TAS and CRAT) in the first half of this year and recently accepted at the RAN Working Group 3 meeting session #104 (Reno, 13-17<sup>th</sup> May 2019).

The objectives for the TR38.321 document are, based on the outcomes of the 3GPP TR 38.811, to study a set of necessary features/adaptations enabling the operation of the New Radio (NR) protocol in non-terrestrial networks for 3GPP Release 16 with a priority on satellite access.

The studied items are the following:

- Consolidation of potential impacts on the physical layer and definition of related solutions if needed
- Performance assessment of NR in selected deployment scenarios (LEO based satellite access, GEO based satellite access) through link level (Radio link) and system level (cell) simulations
- Study and define related solutions if needed on NR related Layer 2 and 3
- Study and define related solutions if needed on RAN architecture and related interface protocols

Multi-connectivity is treated in this document which is the main output document of the RAN Study Item of the same name.

The new contribution introduced a series of architectures descriptions involving multiple connectivity with simultaneous use of radio access combining terrestrial and non-terrestrial access to meet the 5G targeted service performances in terms of data rate and/or reliability.

### **3.2 Activity at ITU-R level**

At 3GPP RAN Meeting #84 (Newport Beach USA, June 3-6 2019), a liaison document on the integration of satellite solutions into 5G networks, was drafted to be sent to ITU-R Working Party 4B in response to ITU expressed interest to continue collaboration with 3GPP on this topic.

ITU requested to be kept updated on any related study and normative standardization work that may be useful to the Working Party 4B work on the topic SP-170849 "The integration of satellite solutions into IMT-2020 networks".

The liaison document mentioning all the activities lead at this level by both RAN and SA Technical Specification Groups was co-signed in particular by TAS and ITU-R WP4B is invited to take it as an inputs for the SAT-NSAT report it will issue.

This action is fully in line with 5G-ALLSTAR Standardization Action Plan objective of informing ITU-R by mid-2019 on 3GPP activities and may appear as an opportunity to discuss further frequency band sharing between Terrestrial and Non Terrestrial Networks at ITU level.

**END OF DOCUMENT**