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Information Sharing on ITU-R WP4B IMT-2020 Satellite Radio Interface Evaluation

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WP 4B Organization

Chair: Mr. David E. WEINREICH (Globalstar),
Vice Chair: Ing. Fernando CARRILLO-VALDERRABANO (Echostar) and Dr. Sooyoung KIM (Jeonbuk National University, Korea)

Working Party 4B (WP 4B) - Systems, air interfaces, performance and availability objectives for the fixed-satellite service (FSS), broadcasting- satellite service (BSS) and mobile-satellite service (MSS), including IP-based applications and satellite news gathering.

SWG 4B1: Performance issues

Dr. Sooyoung Kim (Korea, Rep. of)

Considered a proposed modification to Recommendation ITU-R S.2131-0

A method for the determination of performance objectives for satellite hypothetical reference digital paths using adaptive coding and modulation.

SWG 4B2: Satellites in Next generation Access Technologies

Ms. Donna Bethea-Murphy (Inmarsat)

Task 1: To create a new report ITU-R M.[XYZ.ABC] on Vision and requirements for satellite radio interface(s) of IMT-2020

Task 2: To make progress on defining the timeline for IMT-2020 detailed specifications for the satellite radio interfaces.

SWG 4B3: Internet of Things and network issues

Mr. David Weinreich (Globalstar)

Internet of Things and network issues.

Technical methods for improving performance and efficiency of FSS and MSS systems with machine-to-Machine/Internet of Things (M2M/IoT) applications.

The SWG is temporarily established based on the input contributions and will change before each WP 4B meeting

ITU-R WP 4B IMT-2020 satellite component evaluation

- Background
  - The IMT-2020 satellite component evaluation process is like the terrestrial IMT-2020 evaluation process in WP5D.
  - To define satellite radio interface technologies for the satellite component of IMT-2020 in a new report ITU-R M.[XYZ.ABC]
- Meetings:
  - WP4B #49 in 2021 July
  - 2 CGs in 2021 September
  - WP4B #50 in 2021 October

- Progress
  - *Task 1: To create and progress the new report ITU-R M.[XYZ.ABC] on Vision and requirements for SRIs of IMT-2020*
    - The vision and use cases were reviewed and reached preliminary consensus. Open for further discussion.
  - *Task 2: To make progress on defining the timeline for IMT-2020 detailed specifications for the SRIs.*
    - The discussion for the timeline was very controversial.

Future Meeting Schedule

Meeting	Meeting Date
CG Meeting #1	27 January 2022
CG Meeting #2	10 March 2022
CG Meeting #3	7 April 2022
WP 4B meeting #51	May 2022
CG Meeting …	…
WP 4B meeting #52	September 2022

Task 1: IMT-2020 satellite vision and requirement report structure

- Controversial issues
  - Use case: eMBB (?), mMTC, uRLLC (?)
  - Transparent and regenerative system architecture: SRI?
  - Integrate and/or interoperate between the satellite and terrestrial interfaces
  - Candidate spectrum type

- Service and Technical requirement

Task 1: Vision on satellite radio interface

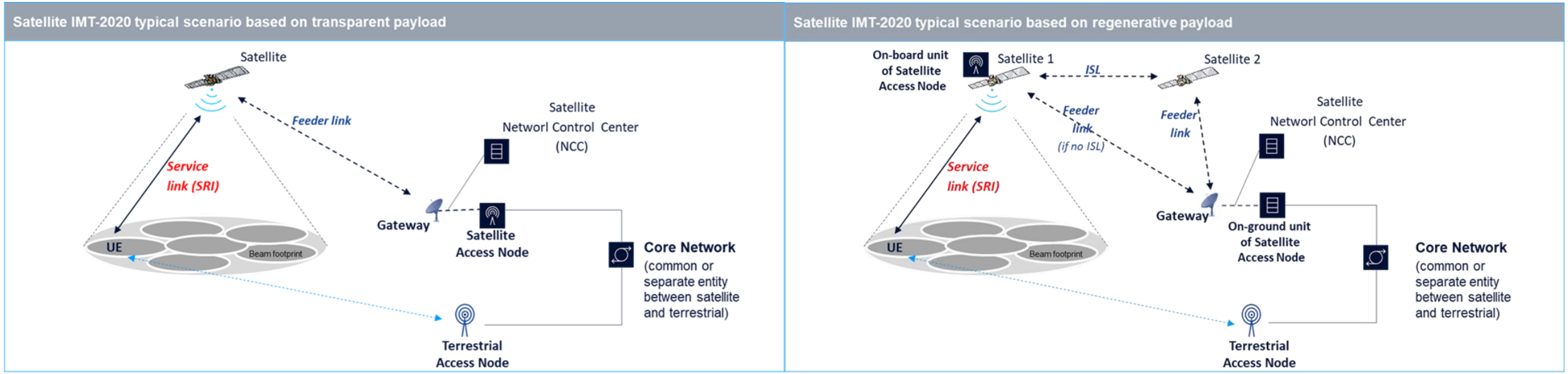
- The satellite radio interface should have a high degree of commonality with, the IMT-2020 terrestrial radio interface, including:
  - support service continuity
  - support key features such as end-to-end network slicing
  - prevent performance degradation with the IMT-2020 security framework.

- For the definition of the satellite radio interfaces of IMT-2020, re-use full or part of the IMT-2020 terrestrial radio interfaces should be considered.
  - Recommendation ITU-R M.2150 provides detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2020 (IMT-2020).

Task 1: Discussion on system architecture for transparent and regenerative

Transparent

Regenerative

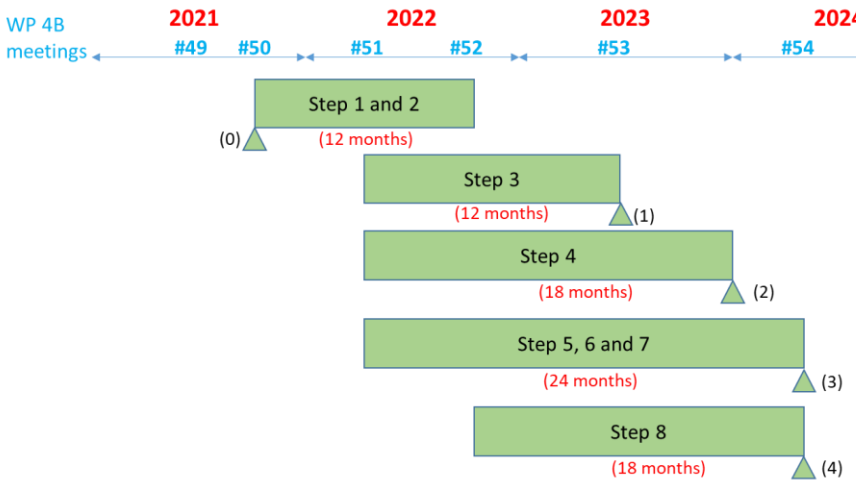


Task 1: Technical Requirements for Handheld Terminal

Parameter	USA	Echostar and Inmarsat	Russia	China
Peak data rate		DL [25 Mbps] UL [2 Mbps]		Terminal types Handheld with 30MHz BW DL 75 Mbps UL 36 Mbps
Peak spectral efficiency		DL [1.5] bit/s/Hz UL [1] bit/s/Hz		DL 2.5 bit/s/Hz UL 1.2 bit/s/Hz
User experienced data rate	Dense Urban – eMBB test environment: DL 100 Mbit/s. UL 50 Mbit/s.	DL [2] Mbps UL [0.25] Mbps		DL 1 Mbps UL 100 kbps
5th percentile user spectral efficiency		DL [0.1] bit/s/Hz UL [0.05] bit/s/Hz		suggest to remove this requirement
Average spectral efficiency		DL [0.5] bit/s/Hz UL [0.33] bit/s/Hz		DL 1.1 bit/s/Hz UL 0.7 bit/s/Hz
Latency	The minimum requirements for user plane latency are: - 4 ms for eMBB - 1 ms for URLLC assuming unloaded conditions (i.e., a single user) for small IP packets (e.g., 0 byte payload + IP header), for both downlink and uplink.	User plane latency should be less than 4 ms + 2 x propagation delay. Contribution of propagation delay to the Max Round Trip Delay: 541.46 ms for GEO, 95.19 ms for MEO, 25.77 ms for LEO 600, 41.77 ms for LEO 1 200	max round trip delay : Transparent payload (service and feeder links) 15.46 ms (300 km) 48.62 ms (1500km) Regenerative payload (service link) 7.73 ms (300km) 24.31 ms (1500km)	
Connection density		Up to [1] per km2 for eMBB		
Reliability				to support reliability as high as 1-10^{-3} assuming availability of the service.
Mobility		Max speed 250 km/h (on board high speed car)		
Bandwidth	considering that possible satellite IMT bands are 1 980 to 2 010 MHz and 2 170 to 2 200 MHz for the return and forward links, respectively	The RIT/SRIT should support a scalable bandwidth at least up to and including 30 MHz.		The RIT/SRIT should support a scalable bandwidth at least up to and including 30 MHz for the handheld terminal.

Task 2: Discussion on Timeline (highly compressed)

Input from France



Steps in radio interface development process:

Step 1: Issuance of the circular letter

Step 2: Development of candidate RITs and SRITs

Step 3: Reception of the RIT and SRIT submissions and acknowledgement of receipt : May 2023

Step 4: Evaluation of candidate RITs and SRITs by evaluation groups

Step 5: Review and coordination of outside evaluation activities

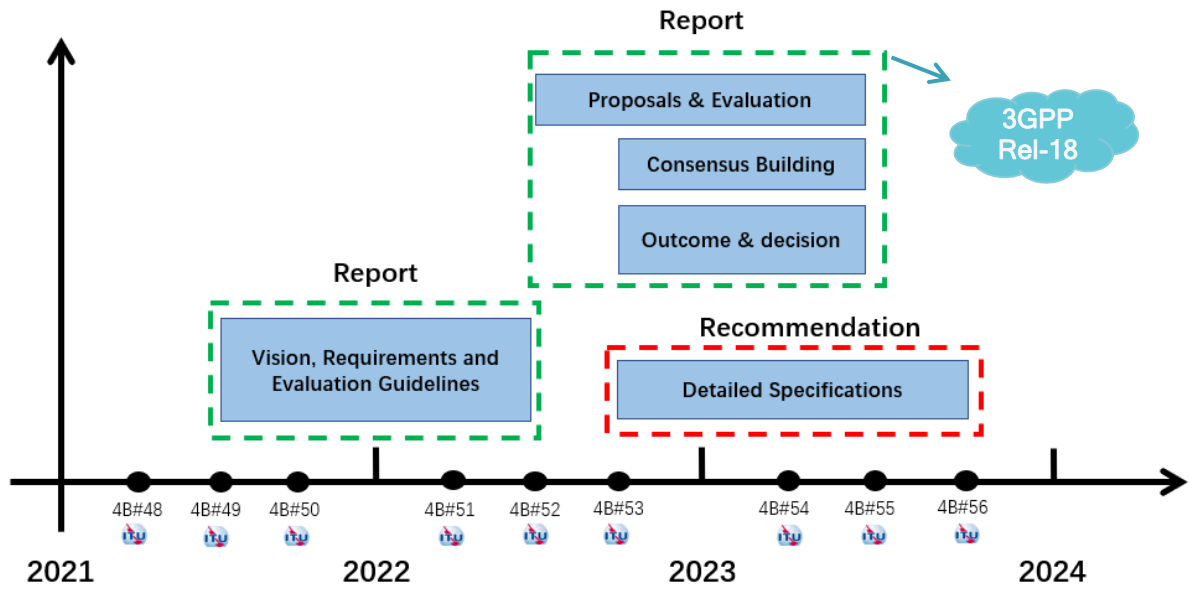
Step 6: Review to access compliance with minimum requirements

Step 7: Consideration of evaluation results, consensus building and decision

Step 8: Development of radio interface Recommendation(s) : **May 2024**

3GPP Rel-18

Input from China



In general, the timeline can be divided into three phases i.e., vision and requirement, standards development and standards publishment.
The specification of SRI of IMT-2020 will be completed no later than the year 2024.

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Thank you

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