

[RAN1-led] NTN NR further enhancements

[WI]

Motivation

[1/2]

It is important to focus effort on defining enhancements that *broaden the applicability* of NR NTN, rather than specifying alternatives to existing 3GPP solutions

DL coverage enhancements [RAN1, RAN2, RAN4]

- Further DL coverage enhancements were proposed in Rel-18, to overcome deep shadowing, but not agreed
- This work can be performed in Rel-19 but a study phase is needed to identify the appropriate DL SNR target.
- This work should consider both FR1 and >10GHz and consider also 1Rx UE for FR1.

>10GHz enhanced support [RAN4]

- Ka band was used as the baseline band for >10GHz op.
- Additional market value in also specifying Ku band for NR NTN in the following range:
[DL:10.7–12.75 GHz; UL 12.75–13.25 GHz & 13.75–14.5 GHz]

RedCap UE support [RAN4]

- While RedCap is largely supported implicitly in existing specifications, there are no UE RF requirements for 1Rx, or HD-FDD operation defined.
- Ensure “DL coverage enhancements” caters for 1Rx UE

3MHz channel bandwidth support [RAN4, RAN1]

- The need for a narrower channel bandwidth than 5MHz has been identified when considering frequency reuse deployment scenario within a satellite spectrum block.
- It seems feasible to reuse the solution specified in Rel-18 for NTN (NR_FR1_lessthan_5MHz_BW)

Motivation

[2/2]

It is important to focus effort on defining enhancements that **broaden the applicability** of NR NTN, rather than specifying alternatives to existing 3GPP solutions

Support for Regenerative payload incl. ISL [RAN3]:

- Rel-17~18 NR (and IoT) NTN only support transparent payload: this is a major limiting factor for NGSO NTN whereby coverage, service and QoS are reliant on the availability of a feeder link and its characteristics
- A regenerative payload w/ ISL addresses the above by
 - Lifting the reliance on the feeder link
 - Reducing latency
 - Increasing throughput
 - Increasing capacity
- Regenerative payload will enable NR NTN broadband at a global scale, competitive with proprietary systems

Proposal

Further enhance RAN support to broaden the applicability of NR NTN in terms of catered use cases and deployment scenarios.

- 1) Specify DL coverage enhancements for FR1 NR NTN [RAN1/2/4]
 - Initial study phase to identify the appropriate target DL SNR
 - The work shall cover 2Rx UE as well as 1Rx RedCap UE
- 2) Study and Specify RAN enhancements in coordination with SA2 to support regenerative architecture [RAN3]
- 3) Specify RedCap UE with 1Rx antenna and FD-FDD as well as HD-FDD operation [RAN4]
- 4) Specify NR NTN in Ku band in the range [Downlink :10.7 - 12.75 GHz; Uplink 12.75-13.25 GHz & 13.75-14.5 GHz] re-using requirements framework from Ka/FR1 band where applicable [RAN4]
 - Release independence from Rel-17 expected
- 5) Specify support for 3MHz channel bandwidth in FR1 satellite bands, reusing the Rel-18 specified solution in the work item "NR_FR1_less than_5MHz_BW" [RAN4]

Expected TU

RAN	2024												2025 [Calendar TBC at the time of writing]												2026		
	Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4			Q1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
	103			104			105			106			107			108			109			110			111		
R1	115b	116		116b	117			118		118b	119		119b	120		120b	121			122		122b	123		123b	124	
R2	124b	125		125b	126			127		127b	128		128b	129		129b	130			131		131b	132				
R3	122b	123		123b	124			125		125b	126		126b	127		127b	128			129		129b	130				
R4	109b	110		110b	111			112		112b	113		113b	114		114b	115			116		116b	117		117b	118	
R1		0.5		0.5	0.5			0.5		0.5	0.5			0.5		0.5	0.5										
R2				0	0			0		0	0			0.5		0.5	0.5			0.5							
R3				0	0			0		0	0			0.5		0.5	0.5			0.5							
R4 RD				N/A	N/A			N/A		N/A	N/A			N/A		N/A	N/A			N/A		0.25	0.25			0.25	
R4 RF				0	0			0.25		0.25	0.25			0.25		0.25	0.25			0.25							

Study TU

Feature TU

