

# 3GPP TSG RAN Rel-18 workshop

June 28 – July 02, 2021

Agenda: 4.2 Non-eMBB-driven Functional Evolution

TDOC: RWS-210200

For: discussion

## NTN Enhancements

Source: Rakuten Mobile



# NTN Direct Access for Smartphone

## Motivation:

- Release-17 focus on Handheld UE with 0dbi Gain in NTN WID. (TR 38.821 Sec.6.1.1.1-3)
- In reality, smartphones have around  $\sim$ -5dBi gain without any external antenna.
- There is a scope to improve link budget with enhancements like Uplink repetitions and increasing the satellite antenna gain to provide basic service directly to smartphone.

## Proposals:

1. We propose a RAN1 Study Item to re-evaluate the link budget for smartphone in NTN at least for Non-GSO (LEO, etc.)
2. Investigate further enhancements in link budget to enable direct access to smart phone.

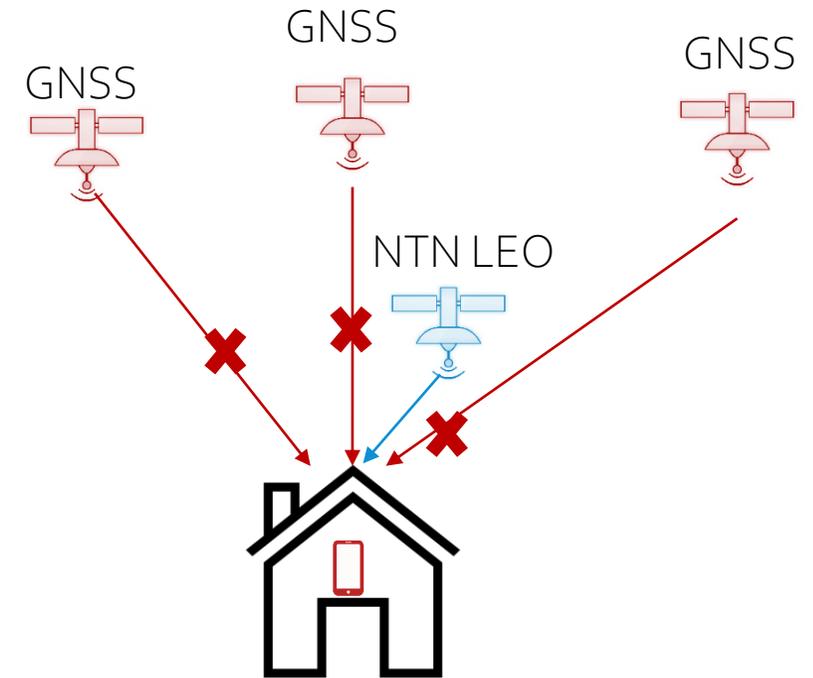
# NTN support for UEs without GPS capabilities

## Motivation:

- In Rel17, NTN based 5G access can only be provided to UEs that have already acquired GNSS location.
- GNSS capabilities are required to perform delay and doppler compensation for Time and Frequency Synchronization.
- Due to this limitation, NTN coverage is virtually limited to outdoor users.

## Proposals:

1. Support of UEs without GPS capabilities in NTN.
2. Compare GNSS Link budget required for location information with LEO Satellites
3. Further investigate how the UE without GNSS capabilities/location information can compensate delay and doppler.



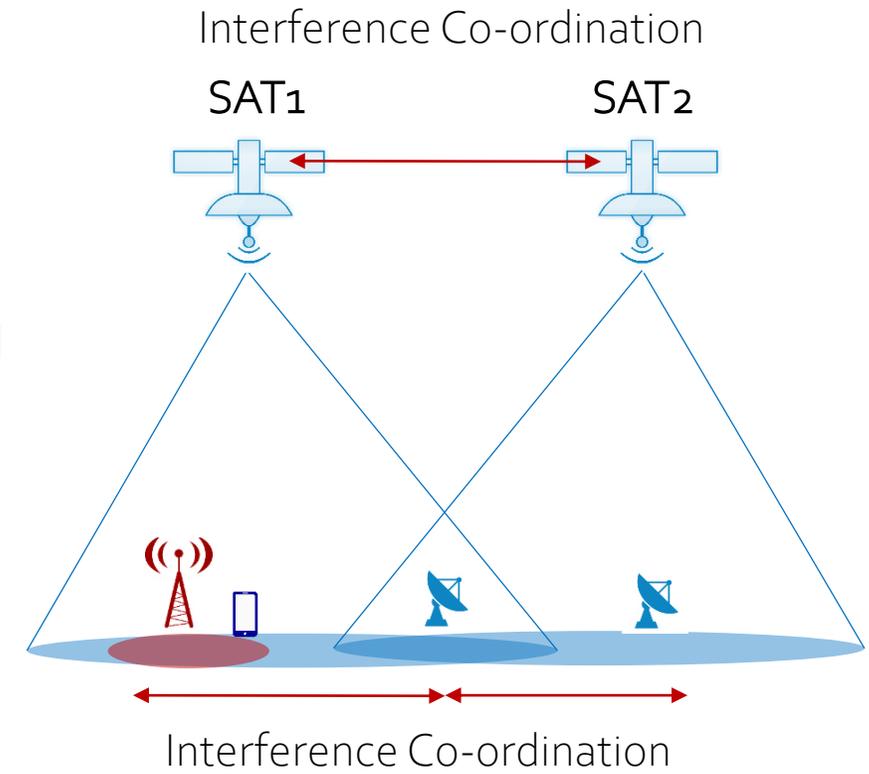
# Interference co-ordination enhancements for between NTN and NTN, and between NTN and TN

## Motivation:

- Operators may provide NTN based NR services using the same spectrum as the one already allocated to terrestrial network.
- LTE based schemes like eICIS, ABS could be used as baseline for interference co-ordination and mitigation between NR NTN and TN networks.

## Proposals:

1. Study potential interference avoidance mechanisms between NTN and NTN, and between NTN and TN.
2. Scope should include both transparent and regenerative payload cases.



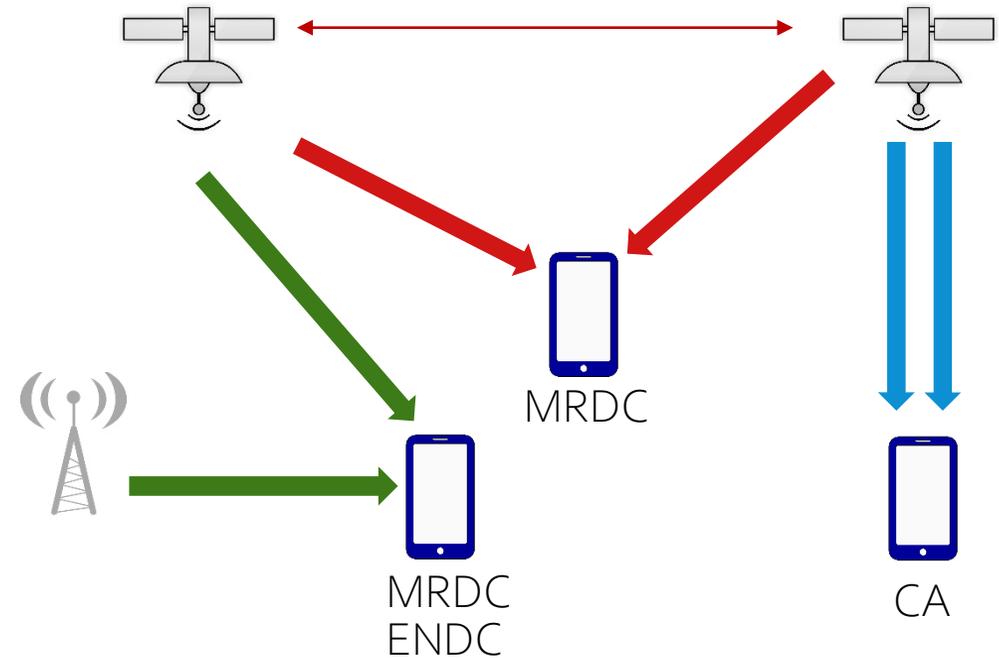
# EN-DC, MR-DC and CA-Support for NTN

## Motivation:

- There have been a strong demand to support more bandwidth and reliability from NTN.

## Proposals:

1. Support multi-connectivity for NTN including EN-DC, MR-DC and CA



#	Aggregation Type	Applicable Scenarios	Priority Architecture type	X2/Xn Link	Use Case
1	MR DC	Inter/Intra Satellite	Transparent	Terrestrial	Throughput, Reliability
2	MR DC	Inter Satellite	On Board CU	Inter satellite Link	Throughput, Reliability
3	MR DC	Inter NTN - TN	Transparent	Terrestrial	Reliability
4	EN DC	Inter NTN - TN	Transparent	Terrestrial	Reliability
5	CA	Intra Satellite	Transparent or On Board CU	On Board	Throughput

# Conclusions

We propose to work on the following NTN enhancements in Rel18.

1. Initiate RAN1 Study Item to improve the link budget to provide direct access from/to smartphone. 3GPP should ensure specification requirements to support NTN direct access to smartphone.
2. Initiate RAN1 Study Item to investigate co-channel interference suppression and avoidance techniques between NTN and NTN, and between NTN and TN.
3. Support UEs without GNSS capability
4. Support EN-DC, MR-DC and CA for NTN