

3GPP RAN Rel-19 Workshop

RWS-230173

June 15th-16th, 2023, Taipei, Taiwan

Agenda Item: 5

Channel Modeling for New Spectrum

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Channel modeling for new spectrum

RANP | Rel-19 SI

Description

- Emerging new spectrums and new use cases, including
 - Upper mid-band (7GHz - 24 GHz, a.k.a. FR3) for both base coverage and capacity boosting,
 - Sub-THz for extremely high throughput
- Although current 3GPP channel model in TR 38.901 supports frequencies from 0.5 GHz to 100 GHz, it cannot meet the needs for these emerging new spectrums and new use cases.
 - 38.901 assumes plane wave propagation and stationarity. Spherical wave propagation and non-stationarity in spatial-dimension may need to be modeled for upper mid-band and Sub-THz and/or large aperture size
 - E.g., the Rayleigh distance for a typical FR3 gNB antenna array is around 100m - plane wave assumption is invalid for majority of UEs.
 - E.g., the aperture size may exceed the stationary region (e.g., 10λ).

Objectives

- Study and characterize propagation and penetration loss measurements, if available.
- Study methods to model spherical wave propagation.
- Study channel model enhancements for new use cases such as sensing.
- Develop channel models that support upper mid-band, sub-THz frequencies, spherical wave propagation, non-stationarity in spatial-domain

Related topics

- Rel-16 Study on 7 - 24 GHz frequency range in NR (RAN4-led, TR38.820)

Spectrum is critical for the success of wireless systems

Mobilizing all spectrum types and bands



Licensed spectrum

Exclusive use of spectrum that remains the industry's top priority



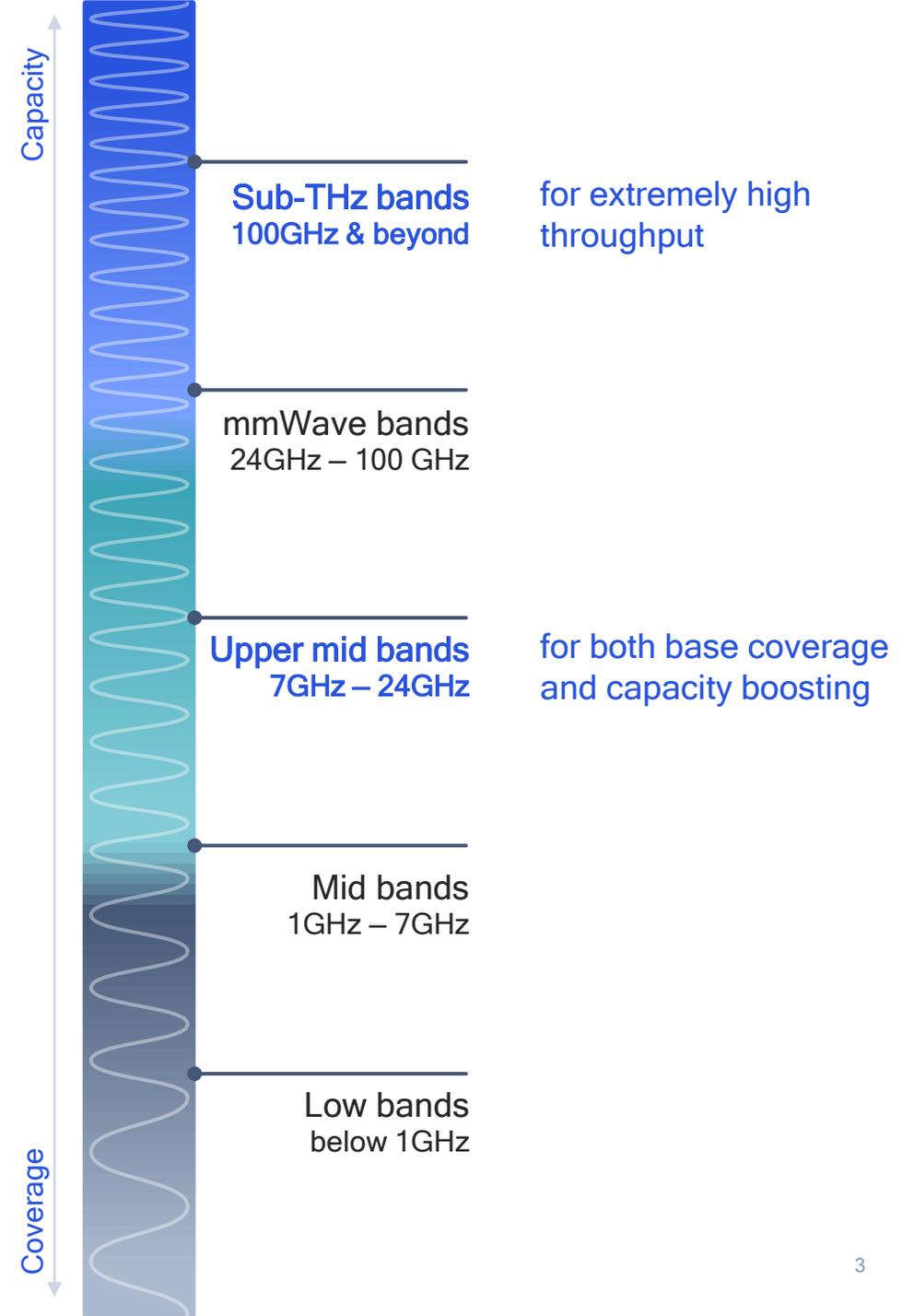
Unlicensed spectrum

Shared use of more available spectrum (e.g., sub-7/60 GHz)



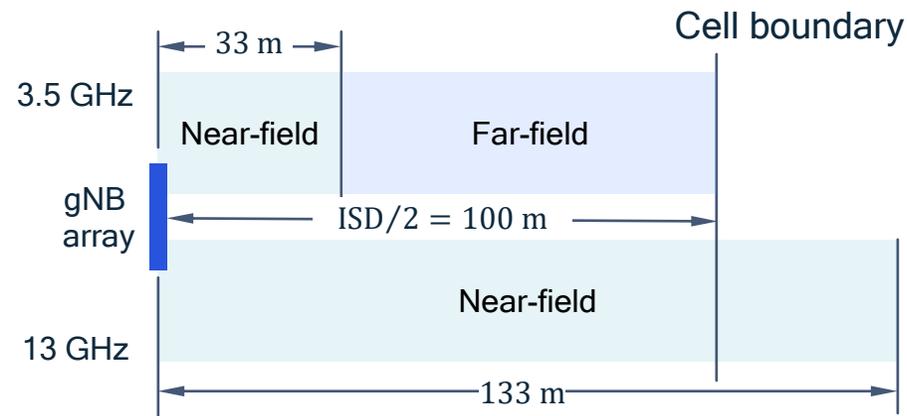
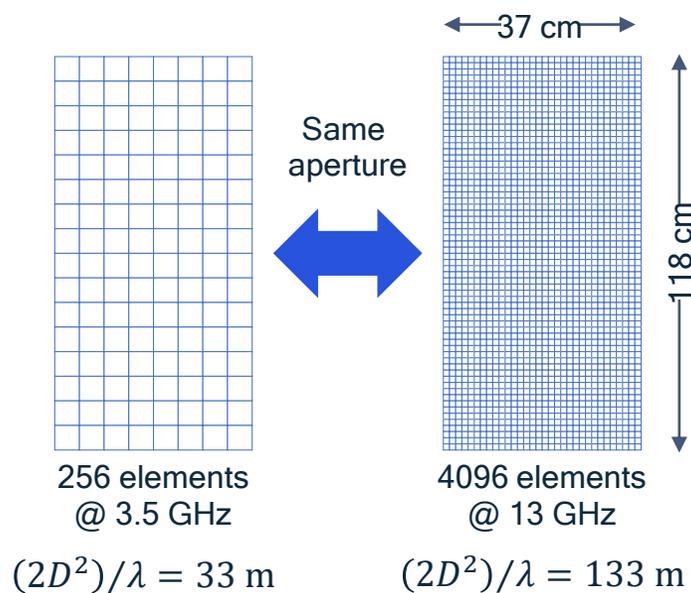
Shared spectrum

Evolving spectrum sharing that allow fair and more efficient sharing

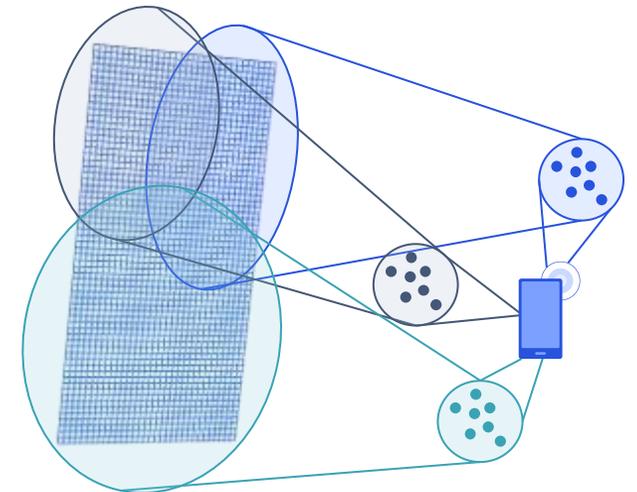


Upper mid-band - TR 38.901 may not meet the needs

- Although TR 38.901 supports frequencies from 0.5 GHz to 100 GHz, but it cannot meet the needs for these emerging new spectrums and new use cases
 - 38.901 assumes plane wave propagation and stationarity.
 - [Spherical wave propagation](#) and [non-stationarity in spatial-dimension](#) may need to be modeled for upper mid-band and Sub-THz and/or large aperture size.



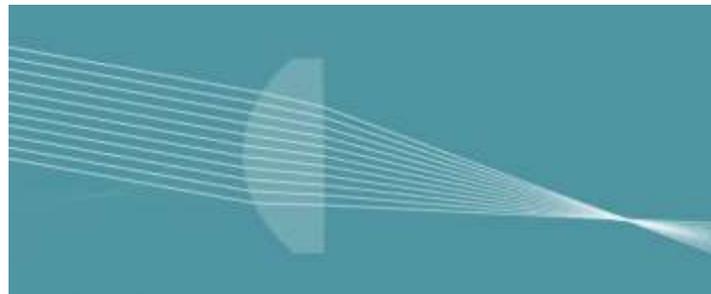
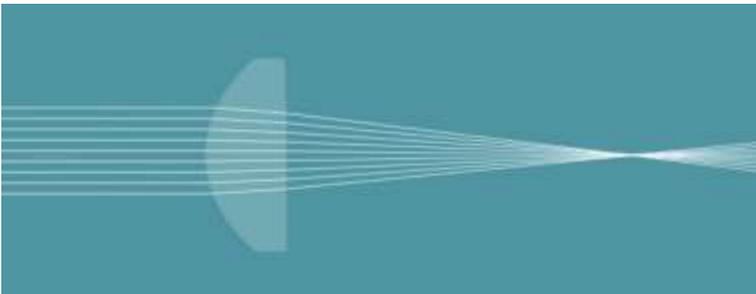
At 13 GHz, almost all UEs may be in near-field



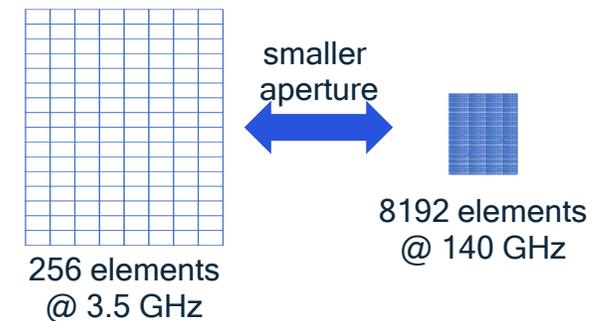
Sub-THz - TR 38.901 may not meet the needs

- TR 38.901 doesn't support frequencies above 100 GHz
- New channel measurements and modeling should be done for the Sub-THz bands (100GHz to 300GHz) with the consideration of the expected large BW support (above 10GHz)
 - Need to consider different channel models\blockers in an indoor (doors, wall, windows) and in an outdoor environments (foliage, concrete, cars, etc.)
 - Need to consider modeling new locations such as data center (which includes racks ordering and heat\cool tunnels)
 - Need to consider power efficient beamforming architectures such as:
 - Lens\Disc antenna (main candidate for power efficient beamformer as presented by various companies)
 - Spherical wave propagation and non-stationarity in spatial-dimension may need to be modeled for the Sub-THz as the lens\disc size can be large relative to the wavelength
 - Multiple lens\disc elements correlation model
 - Dense antenna array - expected to have 8K and above antenna elements to compensate for the high path loss
 - Multiple band array - model the Sub-THz channel connection to the lower frequencies for Non-Stand Alone deployment

Beam steering by feed position - Only one active element per beam direction



Dense antenna array





Thank you

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