

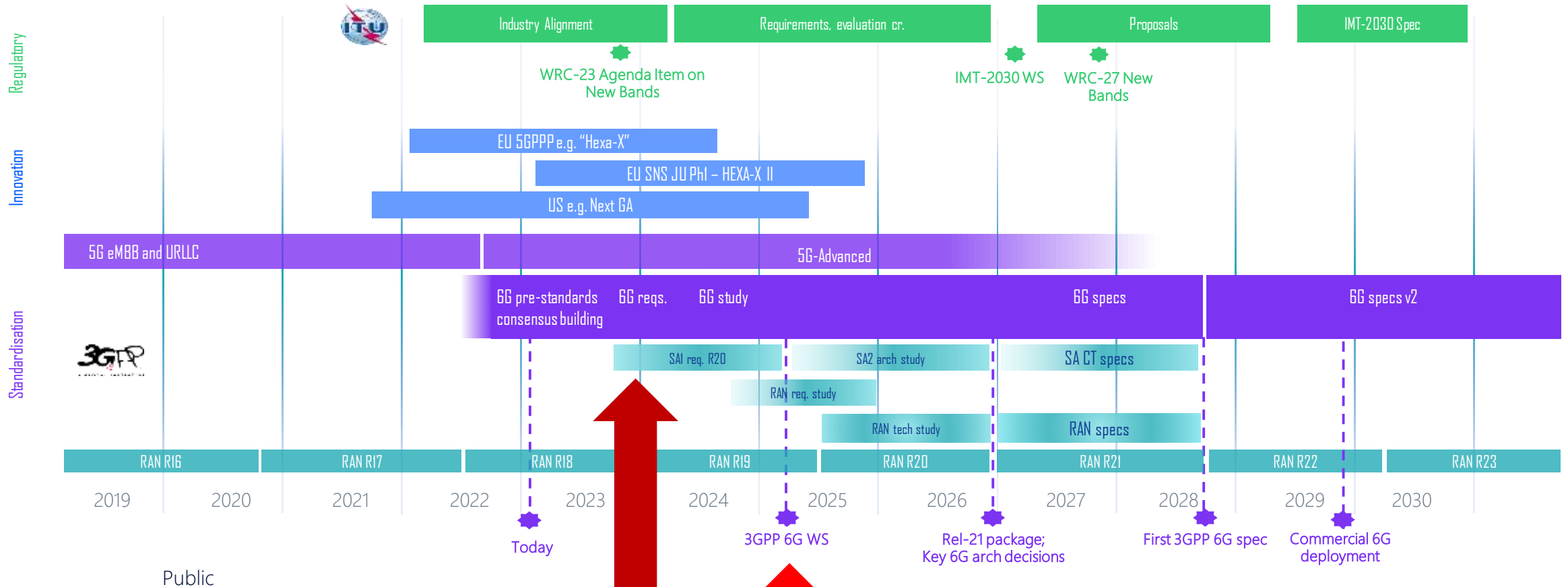
On 6G Standardization Timelines (3GPP) And Activities

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Nokia Standards

The Nokia logo is displayed in white, uppercase letters within a dark blue circular area. The background of the slide features a large, stylized graphic of two overlapping circles: a white outer ring and a dark blue inner circle, both set against a blue-to-green gradient background.

6G success depends on a global unified

approach
 Different regulatory, innovation, and standardization timelines to be brought in harmony



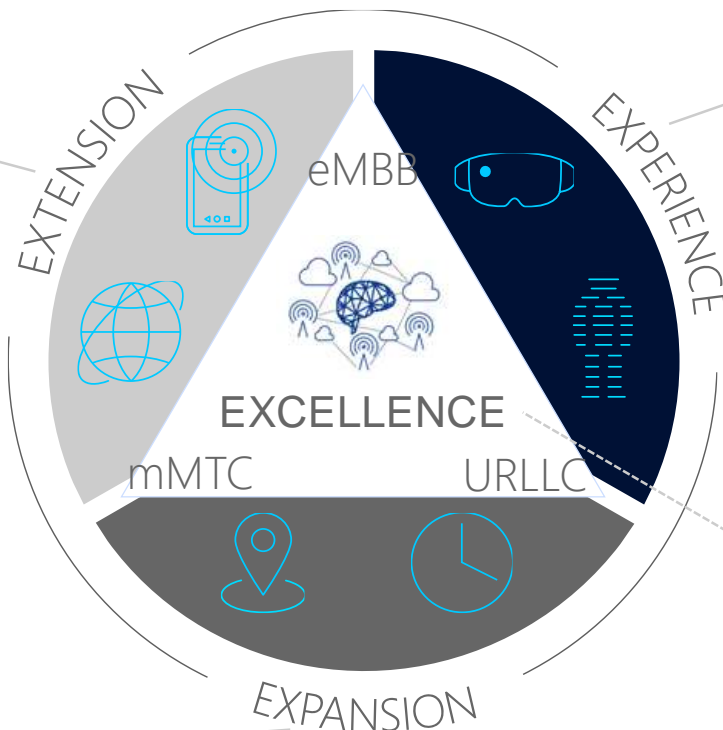
5G-Advanced provides new usage areas and services with boosted resiliency and operability

Coverage extension, new 5G usage areas:

- Uplink coverage
- IoT optimized RedCap
- Non-terrestrial networks (NTN)
- UAV optimization
- Sidelink enhancements
- Sub 5MHz for verticals
- Low power WUS

Expansion beyond connectivity:

- Positioning enhancements
- Timing Resiliency



Enhanced experience:

- Extended reality (XR)
- MIMO enhancements
- Mobility enhancements
- Duplex operations Study
- Edge computing

Operational excellence:

- AI/ML for NG-RAN
- AI/ML for Air Interface
- AI/ML in 5G Core
- Network energy efficiency
- Network-controlled Repeater
- Mobile IAB
- DSS enhancements
- Network slicing

Release 19 continues to complement 5G-Advanced

At the same time important preparation toward 6G



 For many areas vital to have solid foundation for 6G (coverage, AI/ML)



Complementing work already started in Release 18 (XR etc.)



Focus on implementable enhancements → better market success

6G Capability And Operational Efficiency Projection

Six network metrics stand out as key 6G technology enablers ⁽³⁾

	5G	5G Adv.	6G
1 Data rate ⁽¹⁾ (Gbps)	< 1 < 0.1 (avg.)	< 10 < 1 (avg.)	< 100 < 10 (avg.)
2 DL/UL Latency (ms)	> 0.5	< 0.5	< 0.1
3 Mobility (Km/h)	< 500	< 500 ⁽²⁾	< 1,000 ⁽²⁾
4 Reliability (%)	99.999 (5)	99.9999 (6)	99.99999 (7)
5 Position accuracy (meters)	> 3	3-0.1	< 0.1
6 Connections Density/Km ²	< 1,000	< 10,000	< 1M

Assumptions

- 5G performance parameters defined based on R17
- 5G Advanced performance parameters defined based R18 expectations (not yet frozen)
- R19 and R20 will primarily add functional rather than performance requirements
- 6G considered as anything beyond 5G Advanced

⁽¹⁾ Peak data rate, average data rate depends on number of active users and channel conditions. We assume an average data rate per user of 10% of the peak rate. The data rate indicated is the minimum of the downlink and uplink rates.

⁽²⁾ 5G-A aligns mobility for FR1 and FR2 (extra); 6G intends to increase the limit as current commercial aircrafts reach speeds close to 1000 kmph

⁽³⁾ Extreme attributes of performance may apply to specialized sub-networks only and all the requirements may not be achieved simultaneously.

Spectrum Efficiency

x3..4

Contribution to more efficient data transport over radio

6G target to be 3..4x more radio efficient as 5G/5GA to support higher data rates.

Potential to maintain the same grid with higher 6G frequencies (7.. 12 GHz)

MMIMO evolutions
(Distributed MIMO
Extreme MIMO)

Energy efficiency

> x2

Drive to maximal energy efficient mobile networks

Native AI/ML

AI/ML to become cheaper as no extra layer required

Important Steps for 6G Standardisation

Early Contributions to 6G Scenarios and Use-cases (SA1- Study Starts in Early 2024)

Pre-standardization work – For Radio aspects Study

Contributions to Radio Aspects Study activity / Architecture Aspects (Mid 2025)

6G Work Package contents (Rel-21) -Based on Study Outcome

Consistent Involvement in successive releases (First 2-3 releases of New G)

Role of SDO (TSDSI): Framework and Platform to Enable IM Contributions to Global Standard

Identification of India-specific use-cases /Requirements

Pre-standardization activities: Study , Identification of Key issues, Performance Requirements analysis

Post Standardisation: Applicability of Technology components and Features in India-Context.

Pre-Release Workshop for exchange of IM views and coordination for support for WP discussions (Rel-19 /Rel-20 /Rel-21)