Migration to 5g

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5G use cases

Broadband

Mobile broadband

Fixed wireless

Media delivery

Massive MTC

SMART BUILDING

LOGISTICS, TRACKING AND FLEET MANAGEMENT

SMART METER

SMART AGRICULTURE

CAPILLARY NETWORKS

Critical MTC

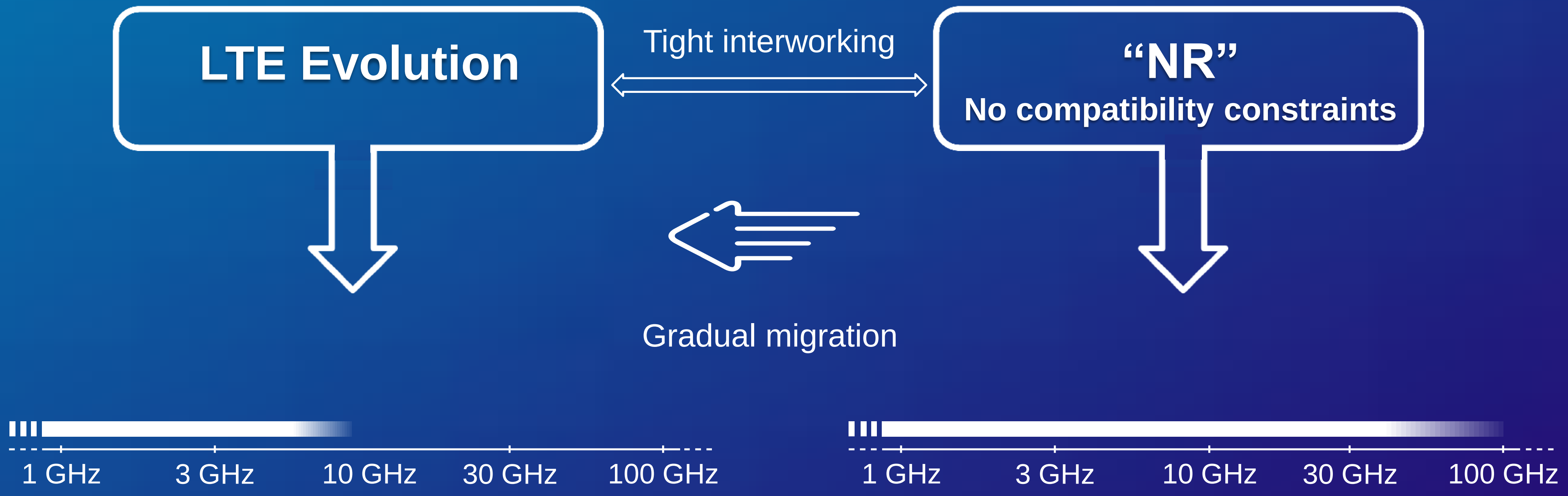
REMOTE HEALTH CARE

TRAFFIC SAFETY & CONTROL

REMOTE MANUFACTURING, TRAINING, SURGERY

INDUSTRIAL APPLICATION & CONTROL

5G radio access



3GPP RAN 5g timeplan

LTE Rel-15

Enhance mobile broadband

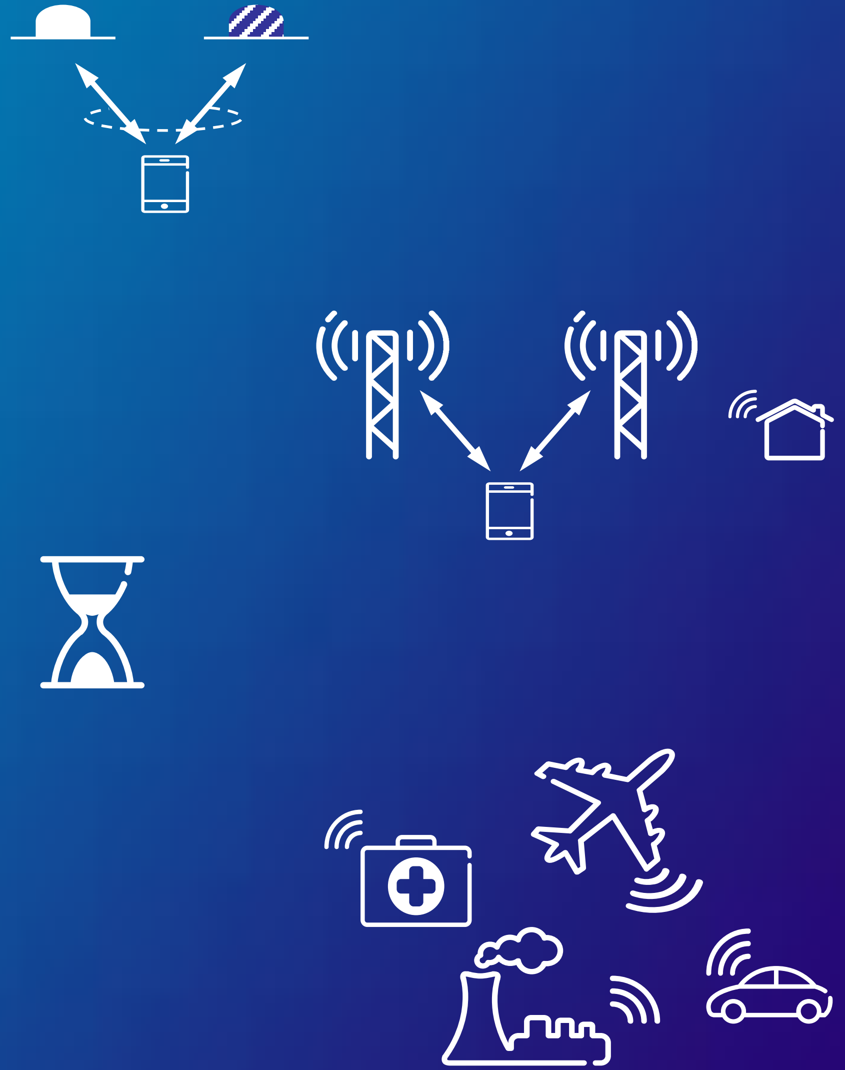
- Further Enhanced Licensed-Assisted Access
- Coordinated Base Stations
- (Network based CRS reduction)

Expand into new use cases

- Enhancements for Fixed Wireless Access
- Further Latency reduction
- Critical MTC
  - Ultra reliability
  - Optimized support for aerial vehicles
  - 3GPP V2X based on LTE (Phase 2)
- Further enhanced mMTC (eMTC & NB-IOT)

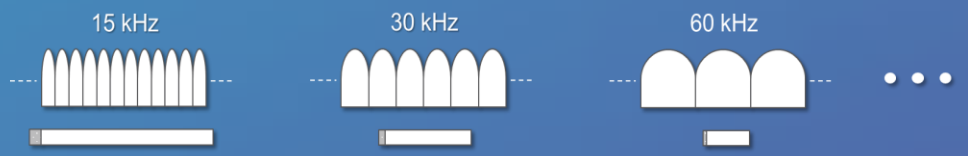
Further enhancements

- ...

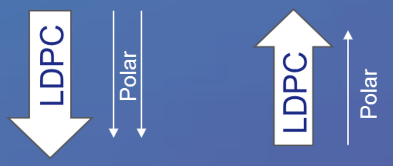


3GPP NR status

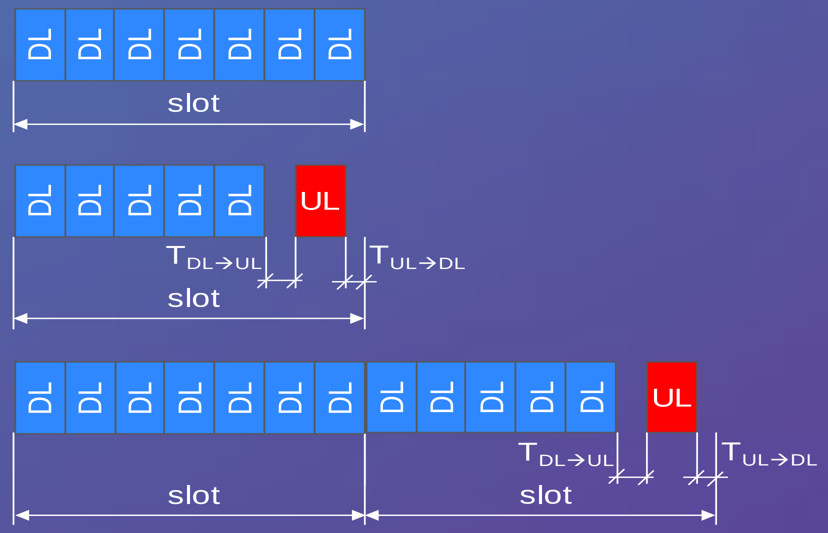
- › Current focus on Phase 1 topics (especially eMBB)
- › Decisions impacting hardware design prioritized
  - – Waveform, numerology, frame structure, channel coding
  - – Many (high level) decisions taken during the study item



OFDM with scalable sub-carrier spacing
(similar to LTE waveform)



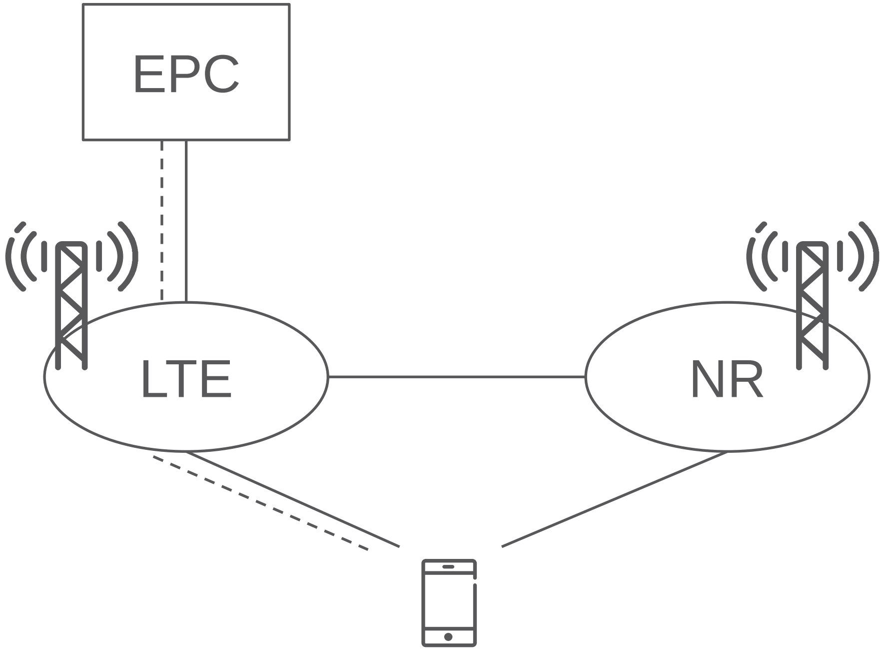
LDPC channel coding for data channels,
Polar coding for physical control channels



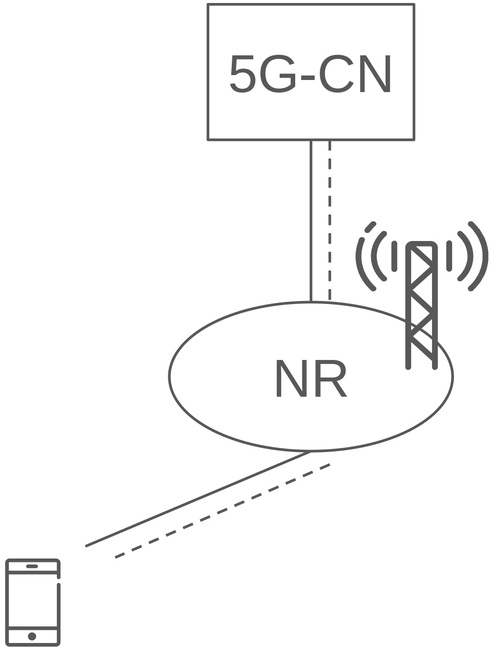
Optimized frame structure with quick HARQ feedback

NR connectivity options

- Non-standalone NR
  - Connected to Evolved Packet Core
  - Target completion: December 2017



- Standalone NR
  - Connected to 5G Core Network
  - Target completion: June 2018

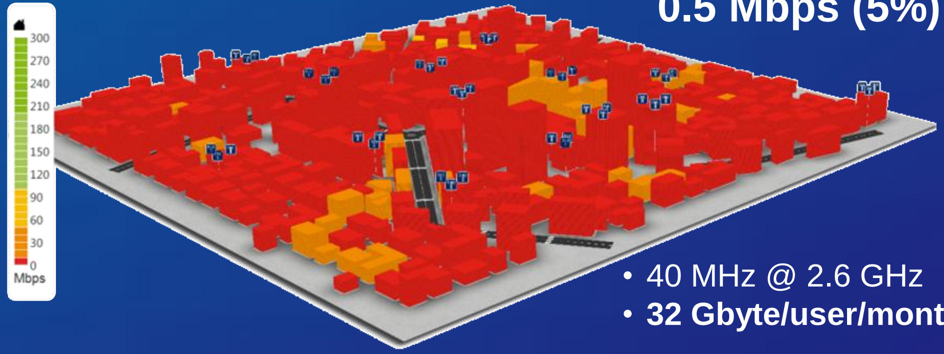


LTE + NR performance

66 Mbps (5%)

- 40 MHz @ 2.6 GHz
- 4 Gbyte/user/month

0.5 Mbps (5%)



- 40 MHz @ 2.6 GHz
- **32 Gbyte/user/month**

18.5 Mbps (5%)

- **100 MHz @ 15 GHz**
- 32 Gbyte/user/month
- LTE sites reused

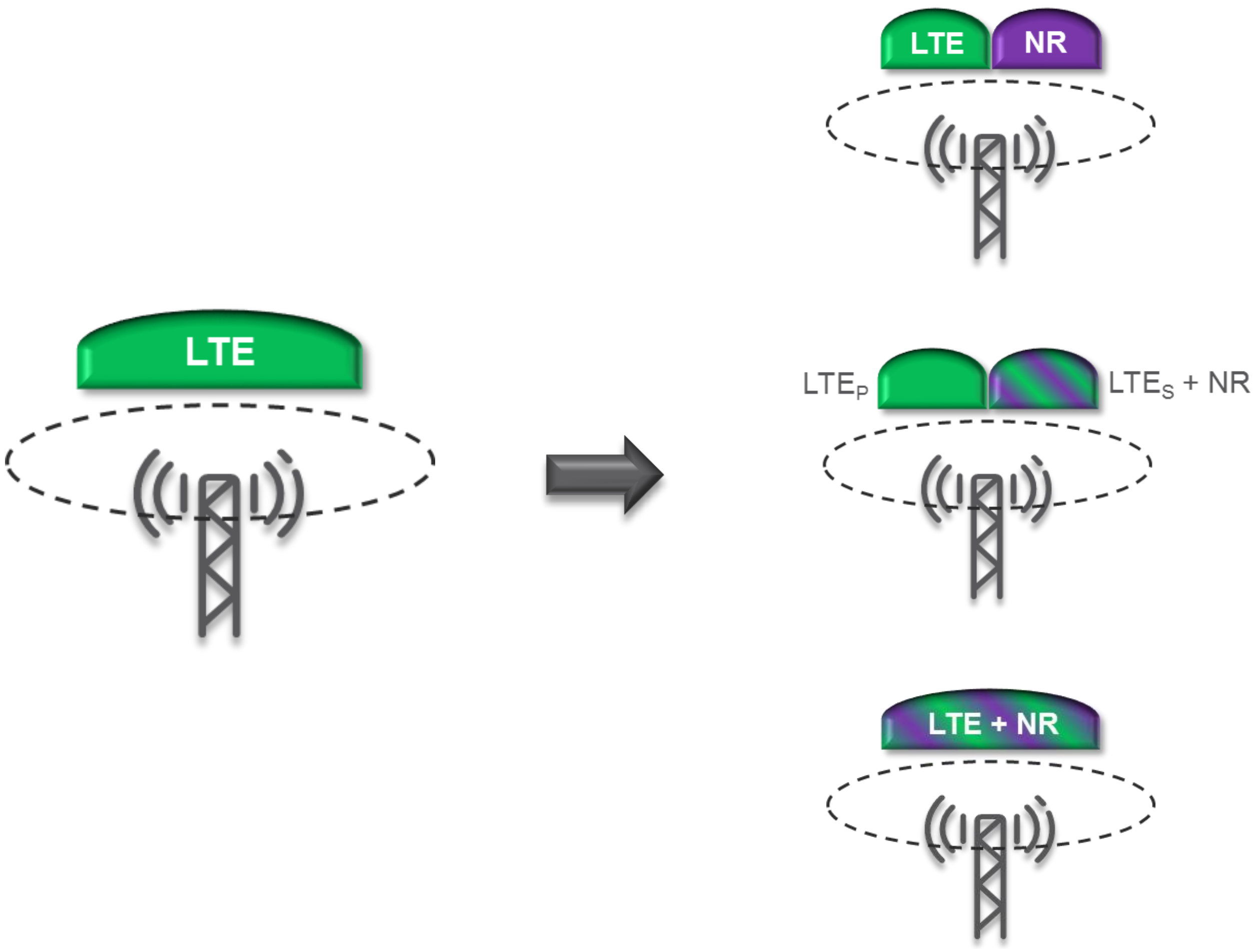
98 Mbps (5%)

- **40 MHz @ 2.6 GHz + 100 MHz @ 15 GHz**
- 32 Gbyte/user/month
- LTE sites reused

› Higher-frequency spectrum needed to satisfy future traffic demands

› Joint low / high frequency operation needed for full-area coverage

LTE/NR coexistence



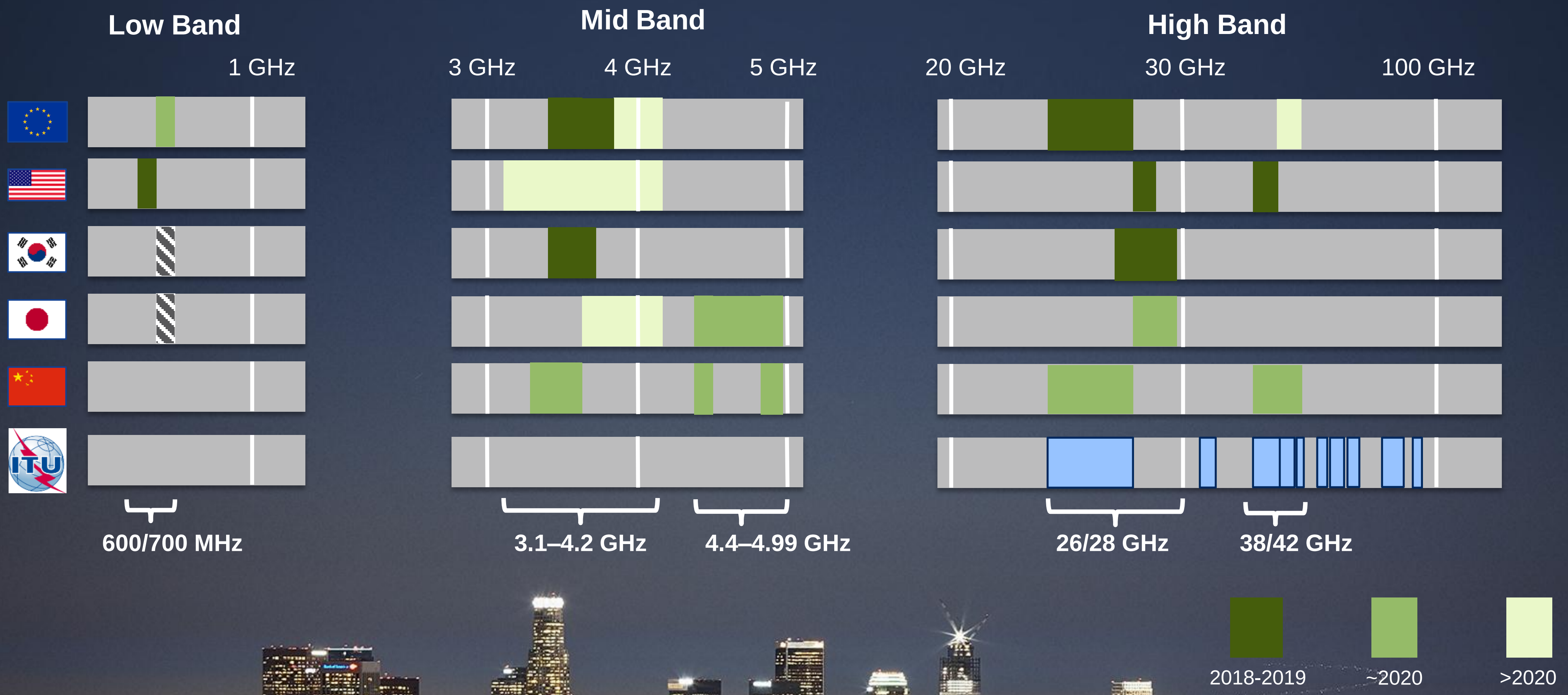
Frequency multiplexing

NR overlaid on LTE sCell

NR overlaid on LTE pCell

- NR in LTE MBSFN subframes
- NR unused LTE UL subframes
- …

Momentum for 5G spectrum convergence

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