DAB and 5G:
the opportunities and threats

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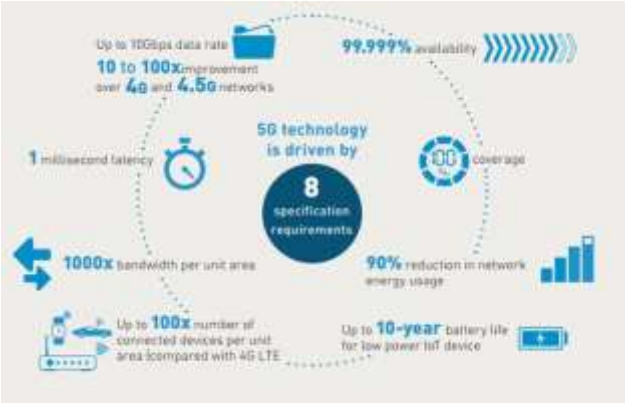
5G A quick recap

What is 5G?

5G technology specification requirements

- Up to 10Gbps data rate - > 10 to 100x improvement over 4G and 4.5G networks
- 1 millisecond latency
- 1000x bandwidth per unit area
- Up to 100x number of connected devices per unit area (compared with 4G LTE)
- 99.999% availability
- 100% coverage
- up to 10 year battery life
- 90% reduction in network energy usage



5G A quick recap

What is 5G?

"5G" is really a marketing term

- "5G" is an evolution from 4G / LTE-Advanced using several revolutionary technologies.
  - These new technologies are gradually being rolled into the existing LTE/4G mobile ecosystem
    - They will allow significant improvements in:
      - Maximum data speed for enhanced Mobile BroadBand (eMBB) connections
      - Improvements in reliability and latency for Internet of Things (IoT) applications
      - Improvements in Quality of Service (QoS) for a range of applications

The proposed structure of the improved New Radio (NR) air interface includes :

- MIMO technologies (originally introduced in Rel 8 in 2008)
- Beamforming techniques (originally introduced in Rel 12, 2015)
- Carrier Aggregation (originally introduced in Rel 12, 2015)

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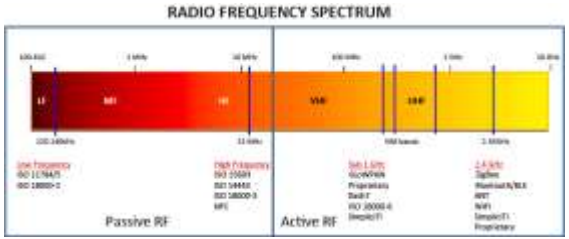
5G A quick recap

What is 5G?



5G retains the basic spectral efficiency of current 4G – max of approx 5 bps/Hz.

- High connection speeds are possible by using more spectrum
  - Carrier Aggregation (CA)

- the highest speeds requires the use of the 3.6 GHz frequency band and the millimetre Wave (mmW) frequency band 26/39 GHz.
  - ACMA auction of 3.6 GHz spectrum in Australia has been completed
    - Raised $853m

Source: 1 - ACMA - Telstra 143 lots of 5 MHz @ $386m, TPG/VHA 131 lots @ $263m, Optus 47 lots @ $185m, Dense Air 29 lots @ $18m), 2 - Ericsson

5G – where does radio fit

The European Commission view

European Commission

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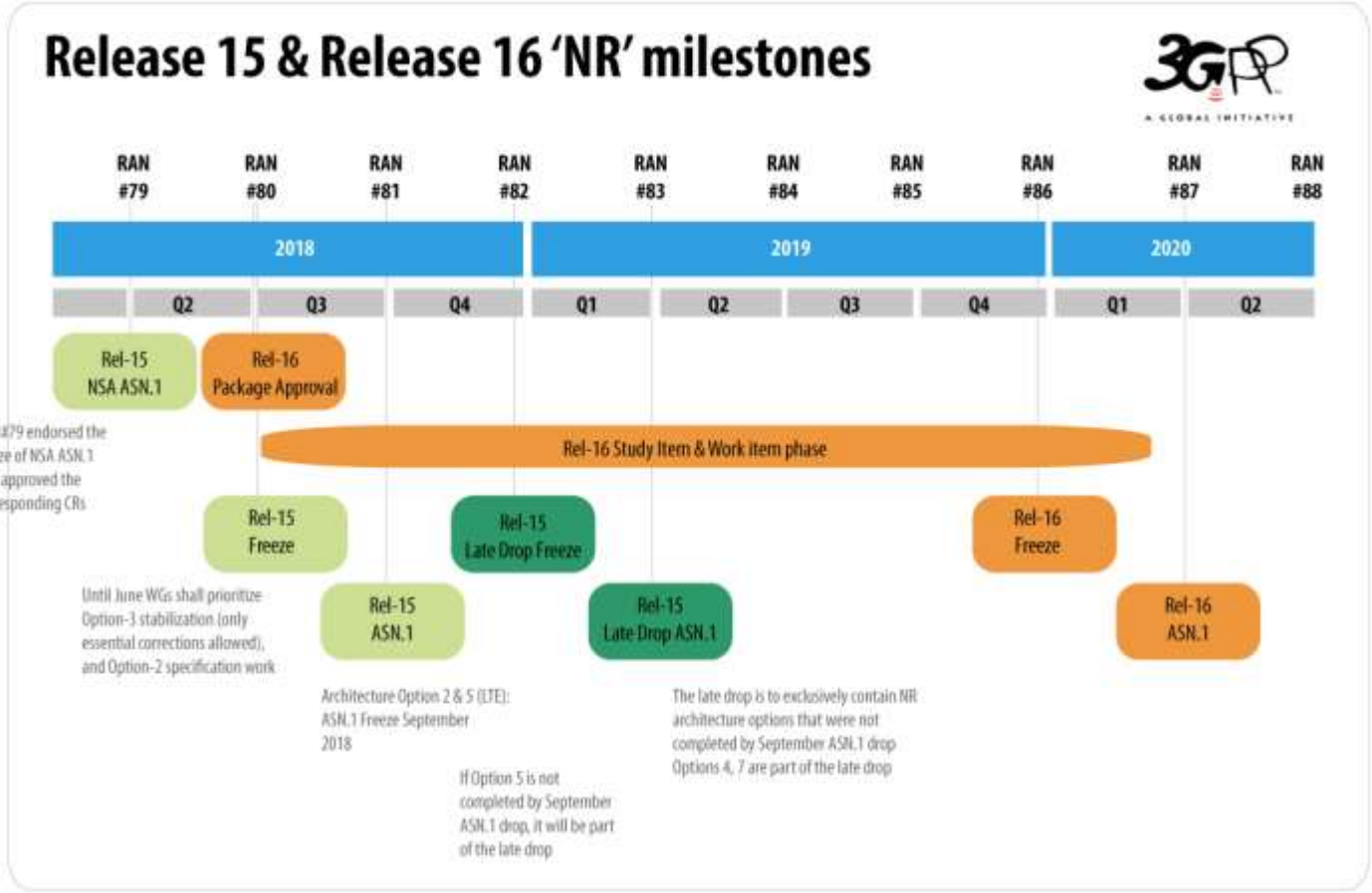
5G release schedule



Source: 3GPP

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5G and broadcasting

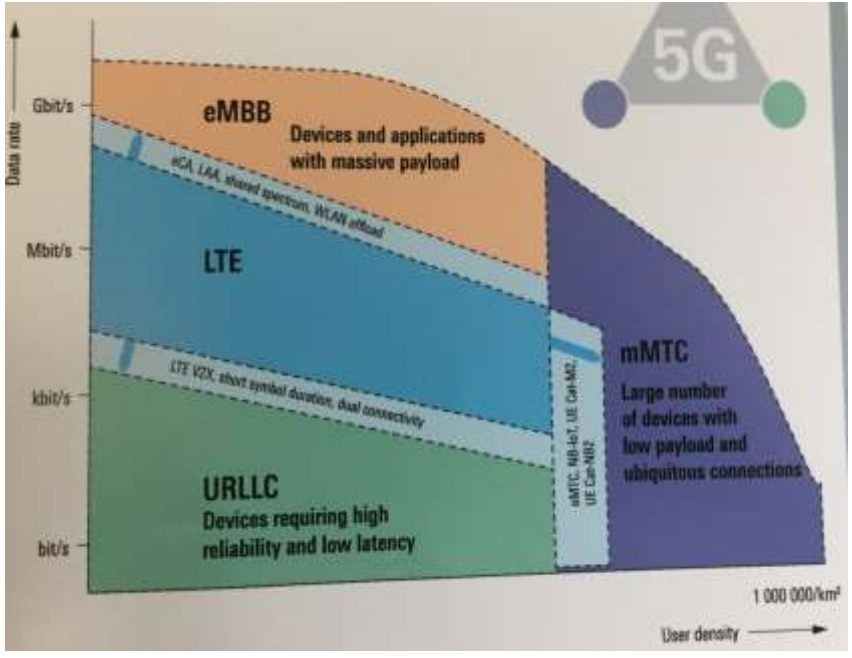
5G has some really good new capabilities…..

but needs a reality check

5G Application space

5G provides improved solutions for

- Massive machine comms for IoT - mMTC
- Ultra reliable and low latency for IoT - URLLC
- Ultra high bit rate mobile broadband - eMBB



All extensions and capabilities are NOT available at the same time

Source: Rhode & Schwarz

5G – where does radio fit?

5G applications

"5G" is an evolution from 4G

New technologies are gradually being rolled into the existing LTE/4G mobile ecosystem to provide improvements in:

- Increased speed
- Improved reliability and QoS
- Lower latency

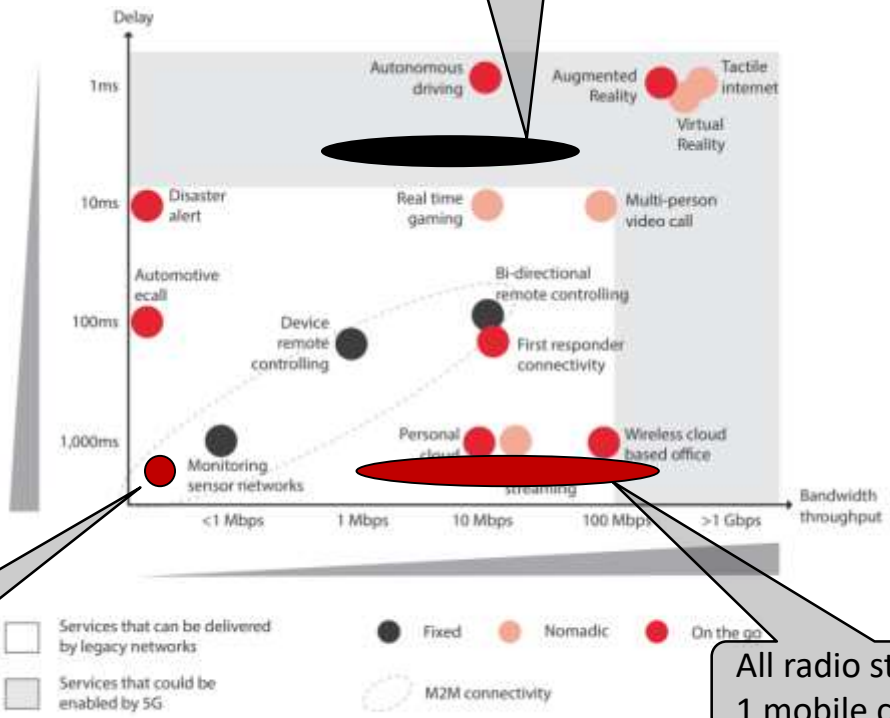


Figure 1: Bandwidth and latency requirements of potential 5G use cases

Source: GSMA Intelligence

Studio links

Individual radio streaming

All radio streaming in 1 mobile cell

5G Application space - radio

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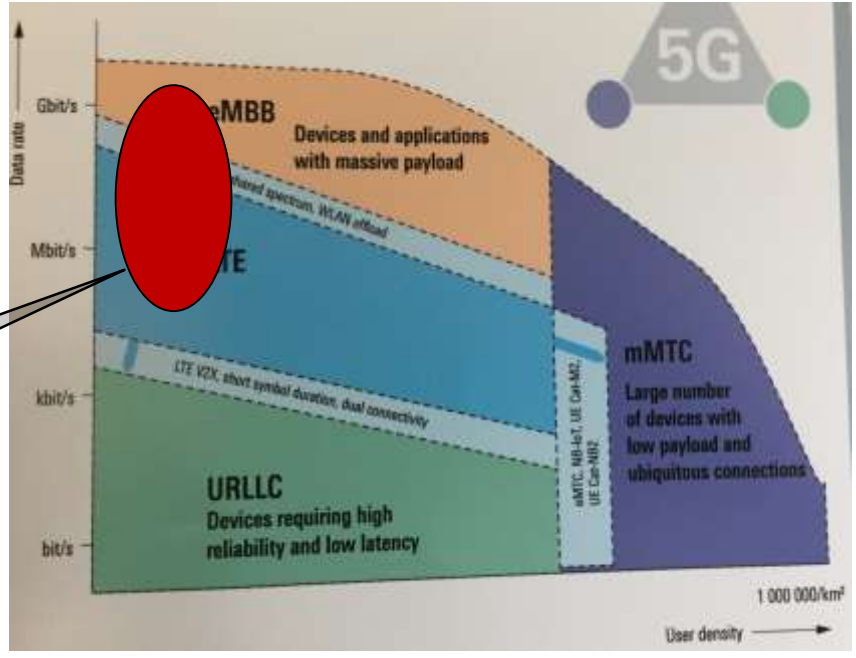

radio streaming

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Spectrum implications

$$P_R = \frac{P_T G_T G_R \lambda^2}{(4\pi d)^2} \qquad FSPL = \left(\frac{4\pi df}{c}\right)^2$$

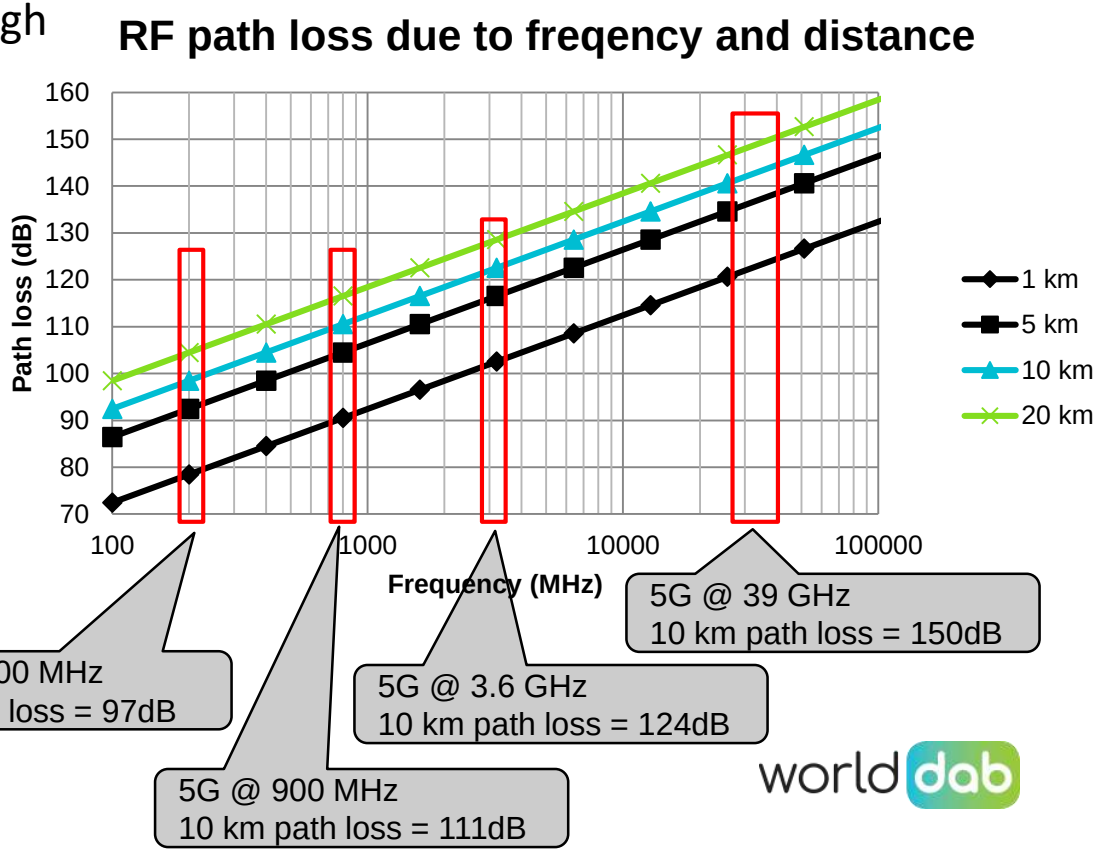
Significant distance loss impact at high frequencies and long distances

26/39 GHz is limited to micro / pico cells with max range of approx. 0.5 km

3.6 GHz micro cells with range up to a few km max

Sub 1 GHz band still needed for macro cells and wide area coverage

Increased demand due to push for higher bit rates



Spectrum implications

- There will be discussion on the acquisition of sub-700 MHz spectrum in the World Radio Conference 2019 – WRC19
  - Current mobile frequency bands of operation are listed from 450 MHz and higher
  - The implication is further compression of terrestrial DTV into UHF
    - Spectrum sharing
    - Pushing DTV into VHF bands
- VHF Band III spectrum is very valuable.

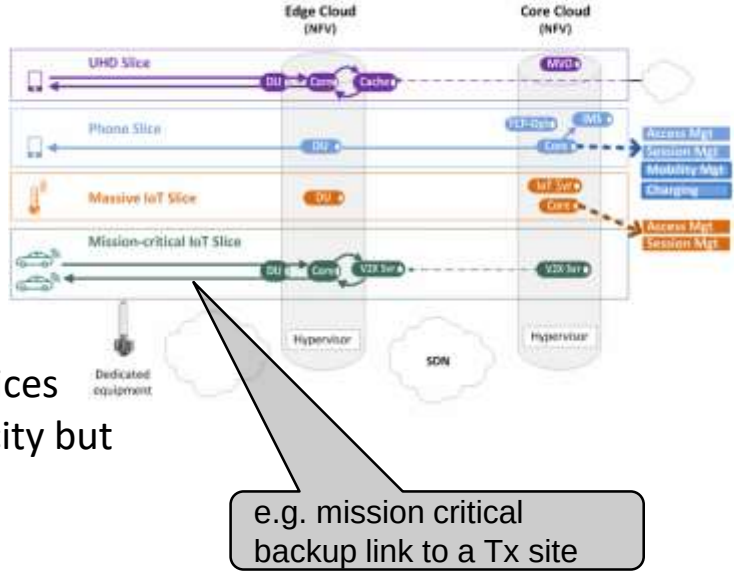
- It is likely that cells using frequencies below 1 GHz will mainly use existing 4G radio technology plus some networking enhancements are likely to be included overtime.
- Compression of UHF bands threatens the ability of DTV to both increase content offerings and video resolution – strong competition from UHD IP services.
- The loss of spectrum for terrestrial DTV has potential to threaten the capacity available for DAB+ in VHF Band III

5G – the opportunities

Network slicing and QoS guarantee

- Will provide improved delivery of specified QoS for broadcasters links
  - Outside broadcasts
  - Backup links to transmission sites and for main services
  - Initial services provide in Australia in 2018 for capacity but no QoS guarantee

  but
  - need business model with QoS from Telcos



Higher link bit rates

- Great improvement
  - More capacity provides more opportunities for multimedia via mobile for OBs etc

  but
  - Need to be careful of the distance to the eNB distance for very high capacity in mmWave cells due to range and channel variation issues

5G – the opportunities

Bitrate / volume usage prices should come down in areas where the higher capacity cells are deployed

- Good for listeners on mobile delivery

but

- Telcos will need to recover 5G costs
- Need feedback from Telcos on pricing expectations

FeMBMS

- is good for venuecast situations – football stadiums, events/shows, games, golf…
- but
- Not currently considered to be viable for wide area coverage, i.e. replacement of broadcast
  - business model is unclear / non-existent
  - QoS needs to be guaranteed via Network Slicing
  - Need to provide the same content on all Telco networks simultaneously

Broadcast and 5G

There is a European project studying the viability of HPHT FeMBMS

5G-Xcast

- is a 5GPPP Phase II project focused on **Broadcast and Multicast Communication Enablers For the Fifth Generation of Wireless Systems**.
- Currently in requirements phase
- Mainly focused on AV – this may include multimedia radio

EBU

- 5G Deployments
- 5G in content production
- 5G is an opportunity

Conclusions

5G will provide new capabilities for broadcasters to deliver feature rich multimedia radio services

Broadcasters need to understand the capabilities and trade-off of new 5G features

Broadcasters need to protect VHF Band III for DAB+ radio

DAB+ with 5G : the most cost effective delivery of multimedia radio offers exciting new functionality and interactivity for listeners and advertisers

Thank You

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