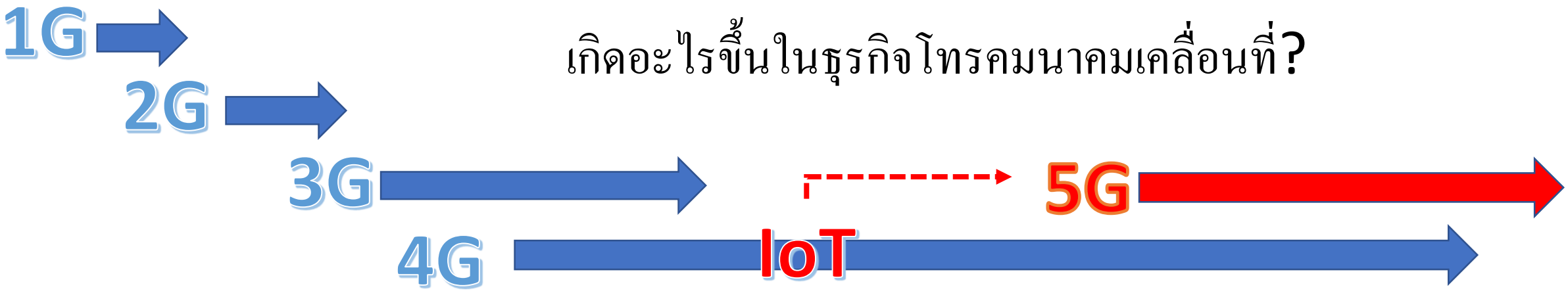
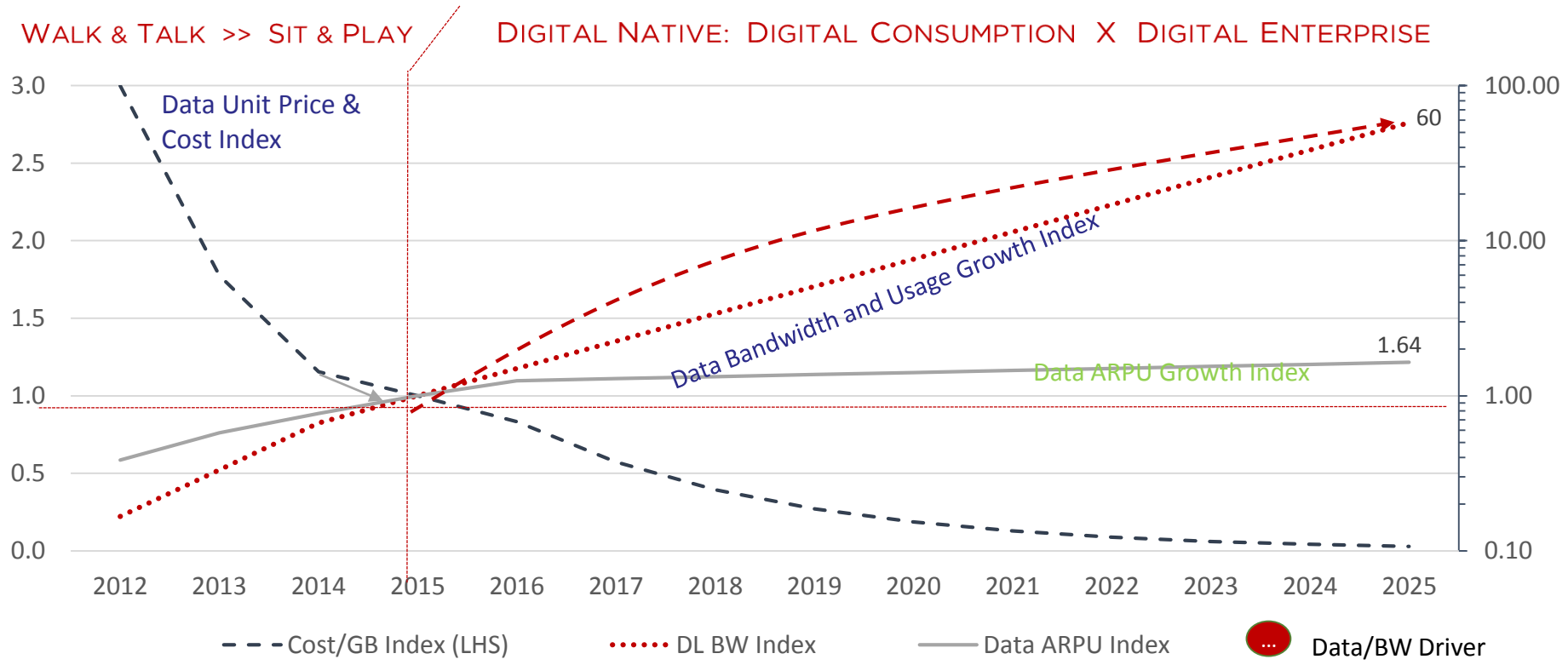
แนวทางการจัดสรรความถี่และประมูลคลื่นเพื่อรองรับบริการ 5G

เจษฎา ศิวรักษ์

DIGITAL THAILAND
BIG BANG
2018

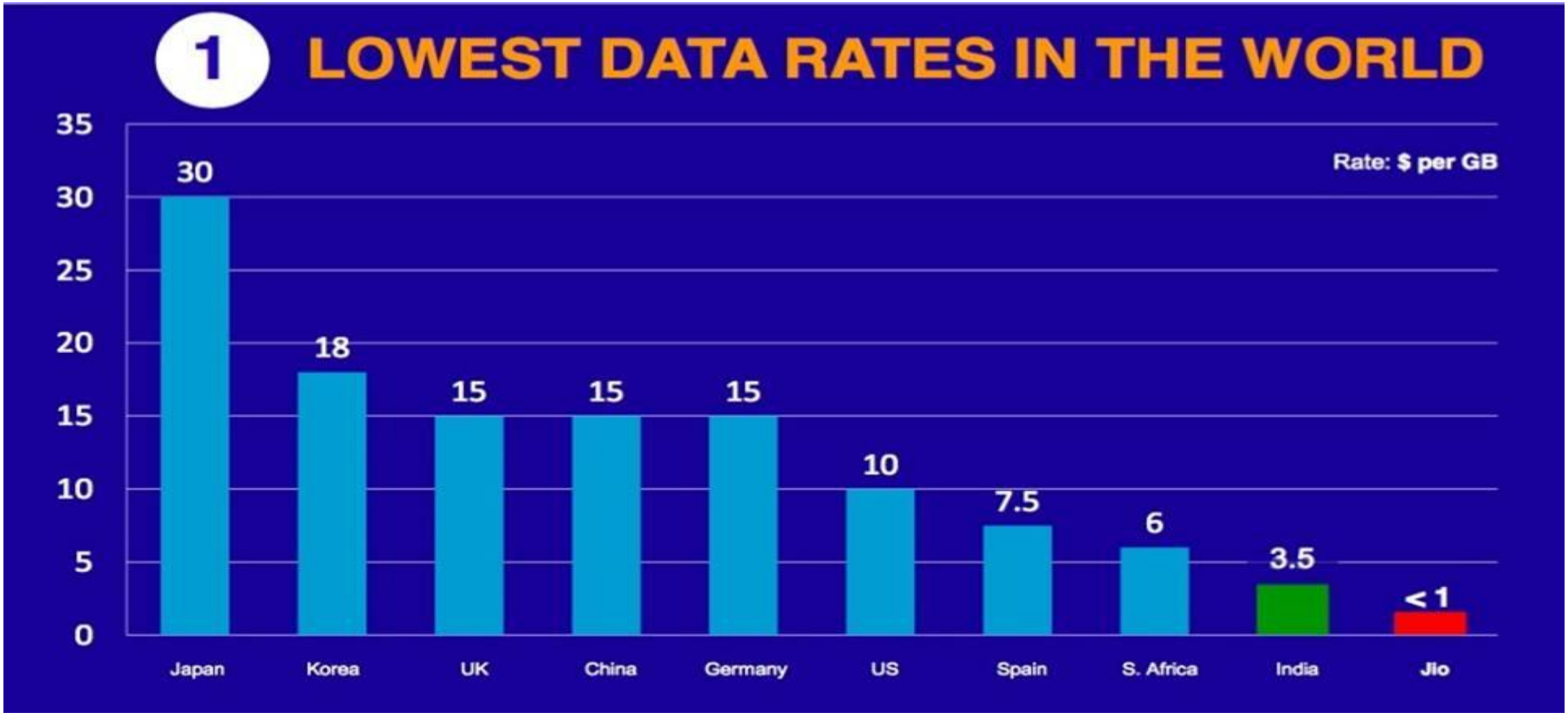
เกิดอะไรขึ้นในธุรกิจโทรคมนาคมเคลื่อนที่?





Cr. Dominic P Arena Group Chief Strategy and Marketing Officer, Axiata Group Berhad, Modified and Simplified from the detailed original Picture

Jio Case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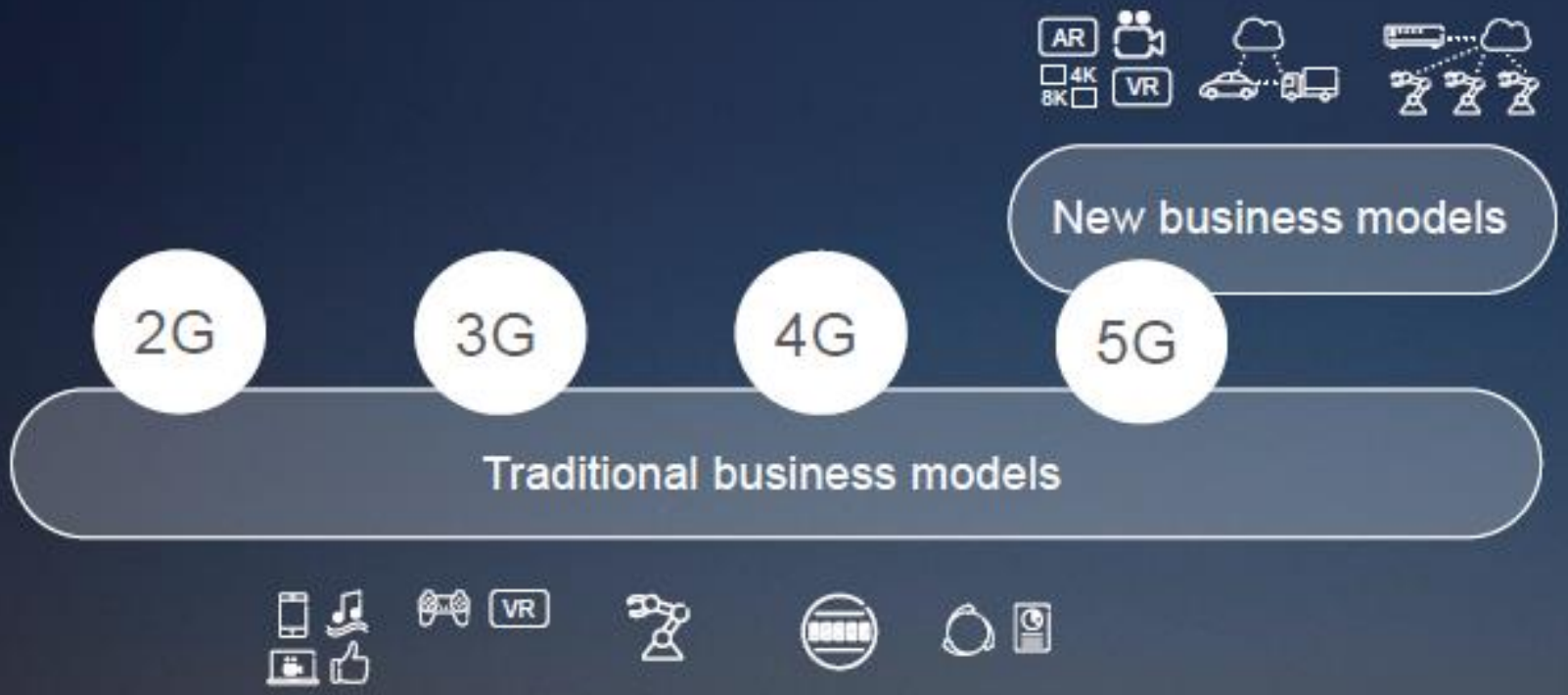
LOWEST DATA RATES IN THE WORLD
Rate: $ per GB
35
30
25
20
15
10
5
0
30
18
15
15
15
10
7.5
6
3.5
< 1
Japan
Korea
UK
China
Germany
US
Spain
S. Africa
India
Jio

JIO Case

MOBILE TECHNOLOGIES

Coexistence and continuous growth



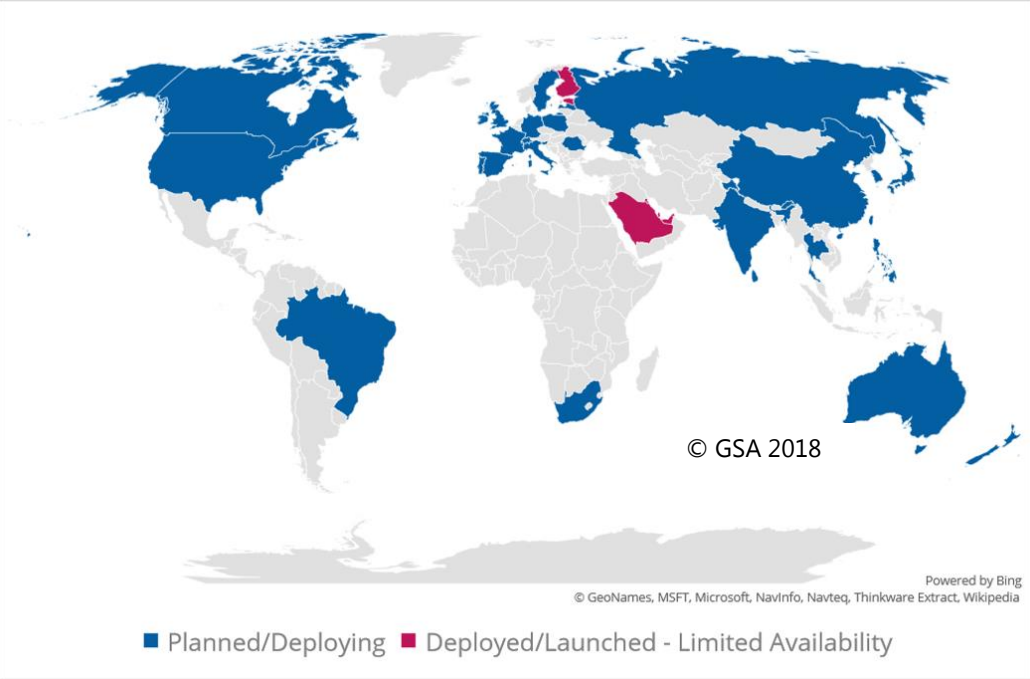
› Platform for innovation

› Continuous business growth

GLOBAL 5G STATUS – SNAPSHOT JULY 2018

Launches and planned launches

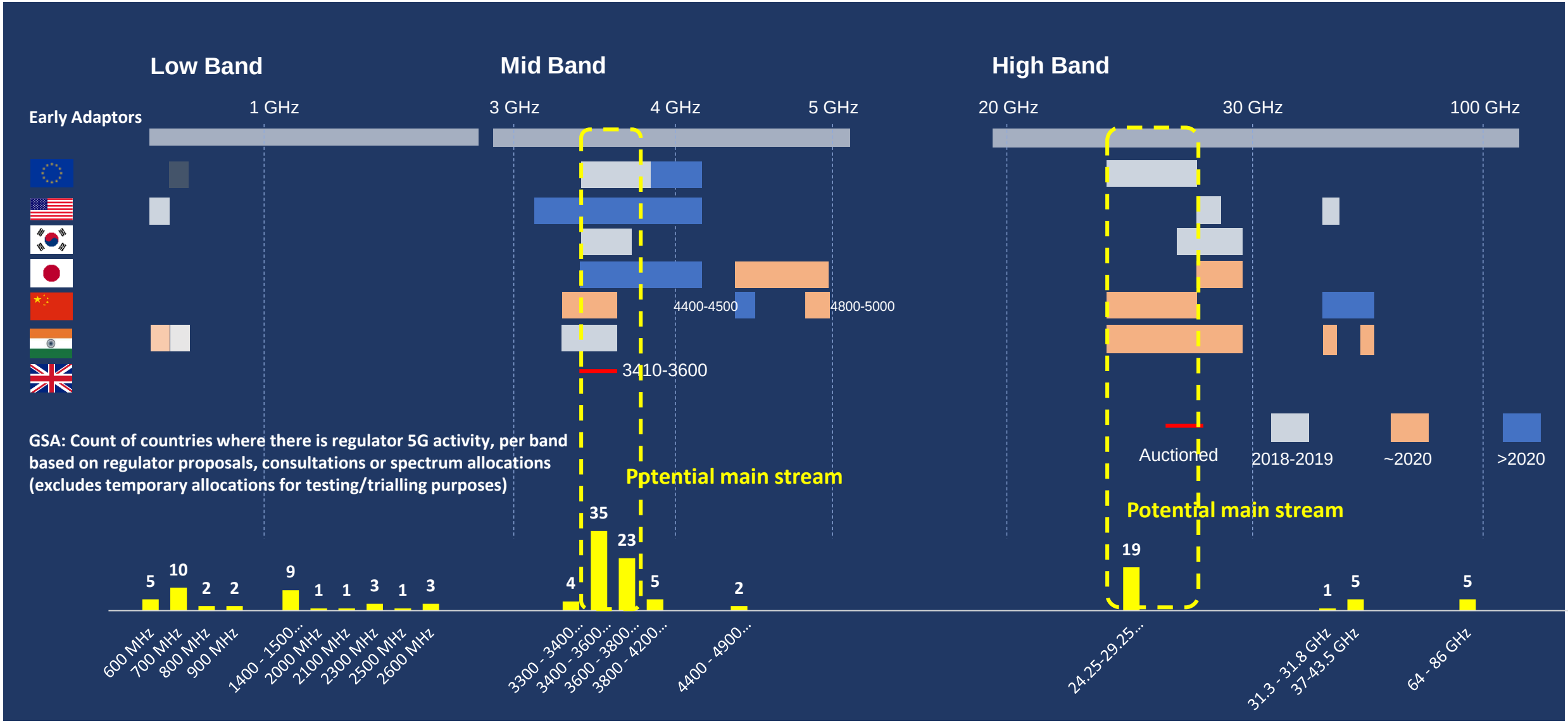
Countries that have launched/deployed 5G networks, are planning launches or are in the process of deployment



These slides contain extracts from the GSA report *"Global Progress to 5G - Trials, Deployments and Launches"* available from the GSA website at www.gsacom.com

- Six telecom operators in six countries claim they have launched 5G networks in the past two months. These are Elisa Finland, Elisa Estonia, Ooredoo Kuwait, Ooredoo Qatar, STC Saudi Arabia and Etisalat United Arab Emirates. A seventh operator – Zain Kuwait – claims it has deployed and is commercially piloting a 5G network in selected locations.
- The lack of commercial 5G devices is hindering operators' efforts to properly launch services. Elisa (Finland and Estonia) and STC (Saudi Arabia) responded to enquiries from GSA confirming limited device availability; our understanding is that the other operators are waiting for 5G devices.
- **Sixty-six** telecom operators in **37** countries have announced intentions of making 5G available to their customers from 2018 onwards.
- There are **10** launches planned to take place by the end of 2018. At least **17** more 5G networks are scheduled for launch in 2019.

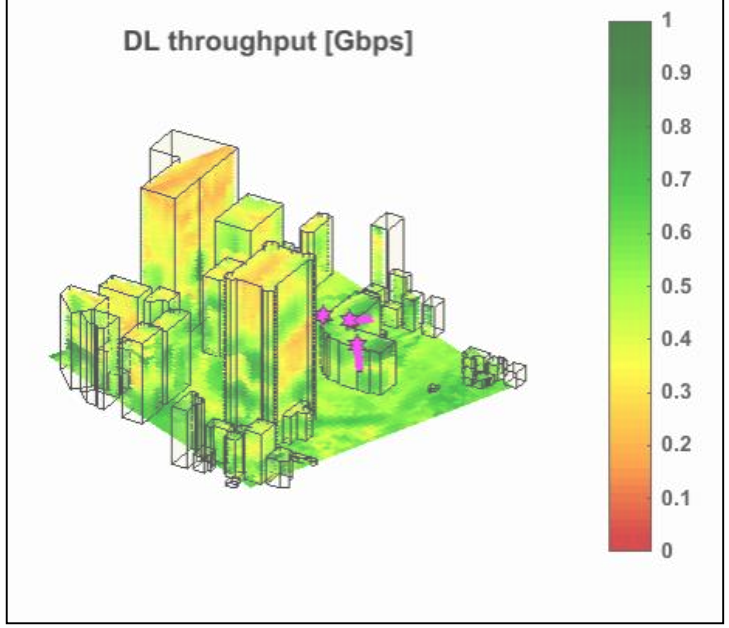
Making 5G a reality : Step 1 – Spectrum Consideration



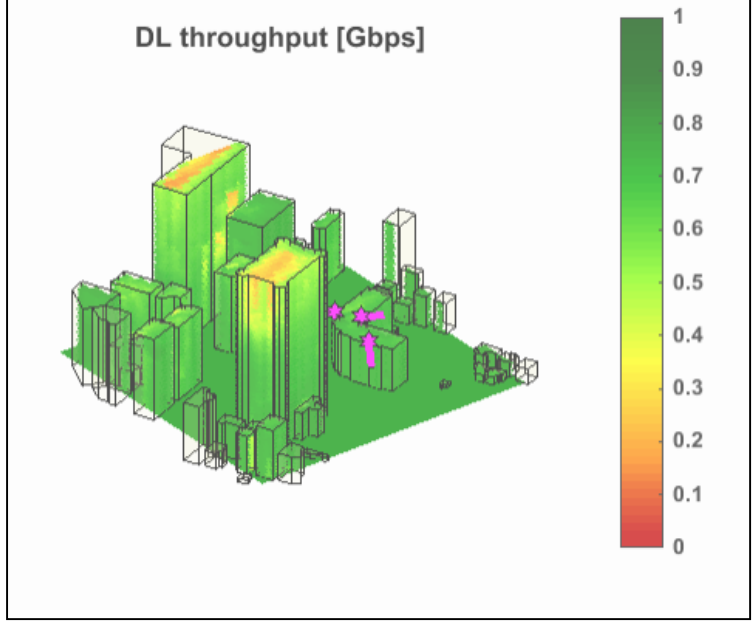
Key Considerations on 5G Spectrum (Coverage)

Dense macro example, LTE 2600MHz, ISD 200m

LTE only

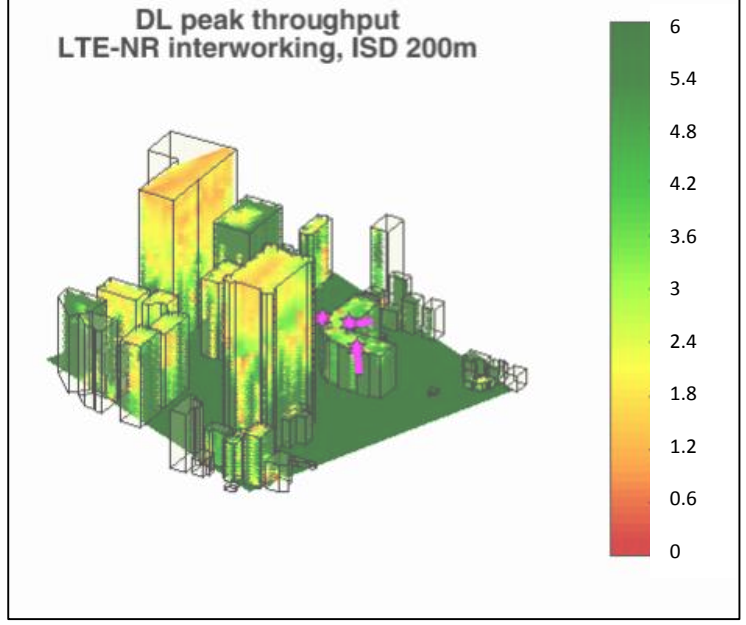


LTE + NR 3.5GHz



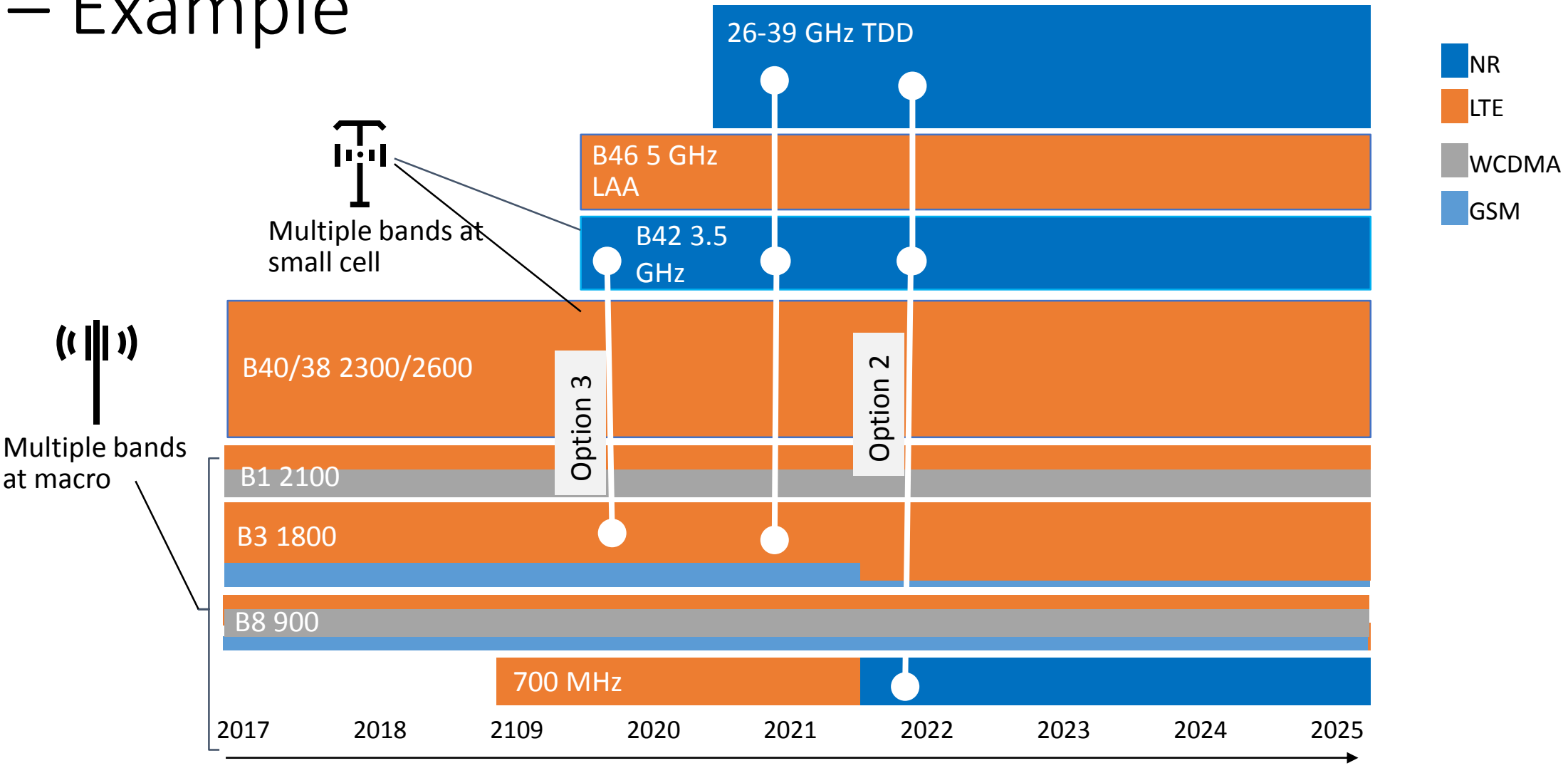
95% of the DL traffic is carried by NR@3.5GHz

LTE + NR 28GHz



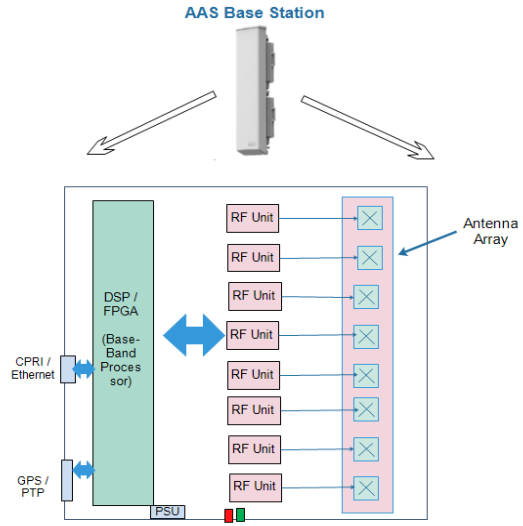
59% of the DL traffic is carried by NR@28GHz

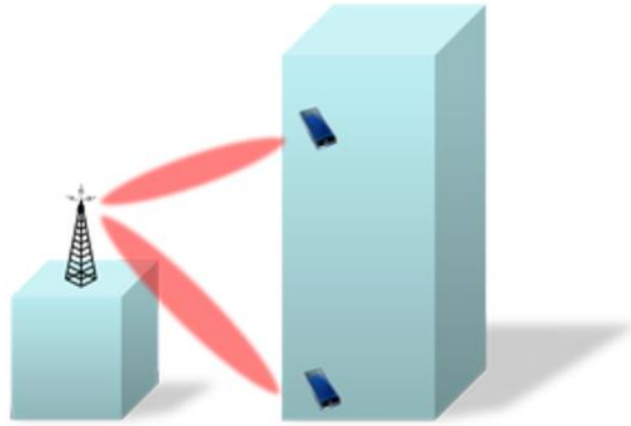
Spectrum Evolution towards 5G – Example



ACTIVE ANTENNA SYSTEM (AAS)

An active antenna is an antenna that contains active electronic components like antenna-integrated radio designs place the RF module next to the passive antenna to reduce cable losses





AAS is integrated into the antenna so as to offer possibilities for finer grained digital control of the beamforming weight of each individual subelement within the antenna

On the downlink (DL) side, for the same total maximum conducted power, adopting larger number of antennas at BS may lead to high values of peak equivalent isotropic radiated power (EIRP), although the total radiated power (TRP) will remain unchanged

The Total Radiated Power (TRP) is a measure of how much power the antenna actually radiates, when non-idealities such as mismatch and losses in the antenna are accounted for. It is defined as the integral of the power transmitted in different directions over the entire radiation sphere.

Spectrum Licensing

refers to the ‘rights of use for radio frequencies’ in the context of the directives.

Spectrum Licensed Mode

Licensed Spectrum

enables the regulator to provide guarantees to the licensee, about the sharing situation in a given frequency band. For example, the regulator may deliver an exclusive license to an operator to deploy a network in a specific frequency block.

License-exempt Spectrum

enables the regulator to allow access to spectrum for as many users as possible. For example, the regulator may permit any user to access a specific frequency band based on some minimum technical requirements that enable the sharing without unacceptable interference.

Licensed Spectrum – High range Propagation

Benefit the licensee has perfect control of the interference within its spectrum block. For example, in the case of mobile phones this enables the mobile operator to be able to plan coverage, capacity and provide different levels of quality of service with certainty.

Drawback licensing is that it restricts users from having access to spectrum and that it requires a process to deliver such licenses

Reality

Spectrum licensing is very rarely absolutely exclusive, and in any case interference can occur from services using adjacent bands. As such, licensing corresponds more to managing interference than preventing interference.

Nationwide

License-exempt Spectrum – Short range Propagation

Benefit any user can access the spectrum, reducing spectrum scarcity and enabling immediate deployment of wireless services.

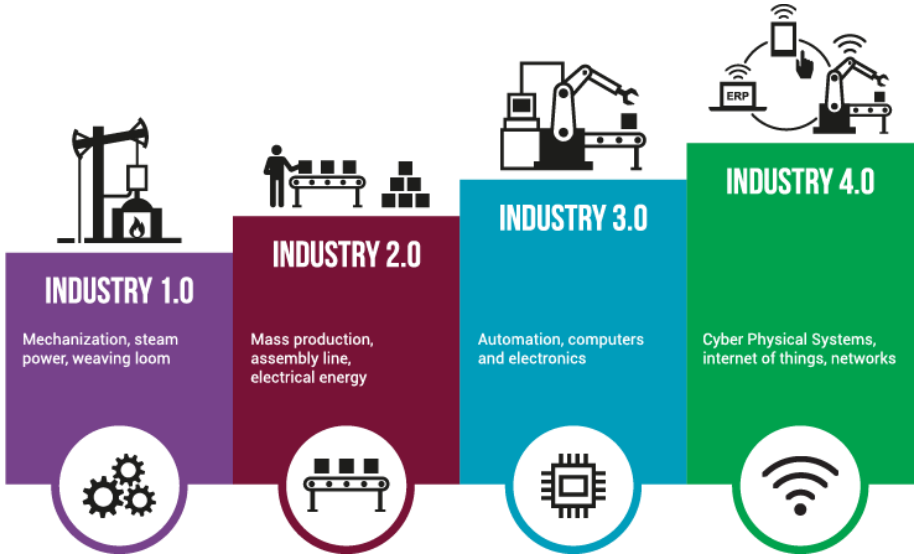
Drawback the impossibility to control the interference with certainty

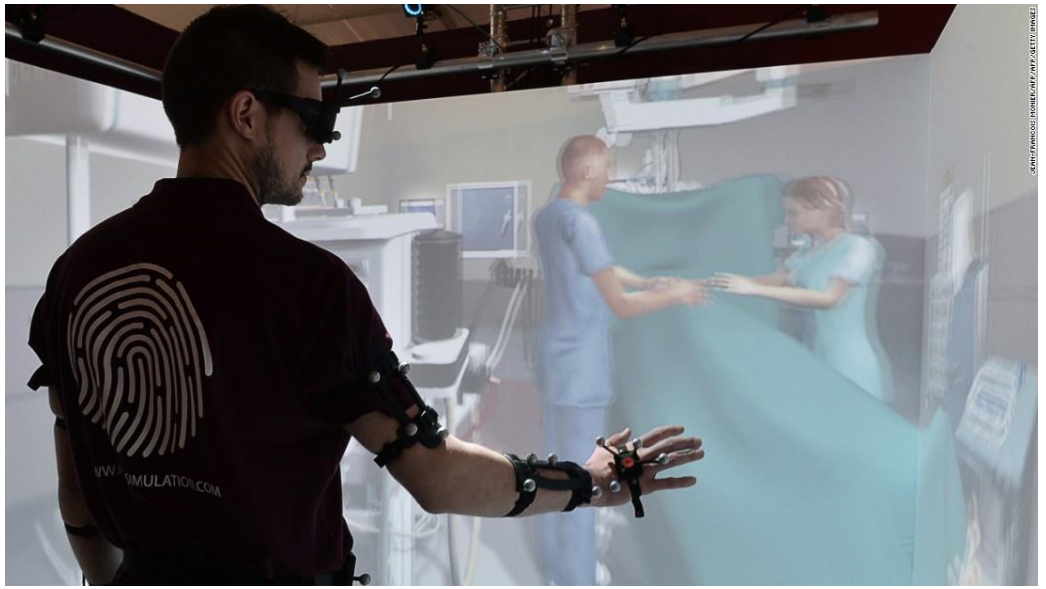
Reality

the technical conditions attached to a license-exempt band typically reduce the usability of the band for many prospective users.

Localized Usage

The demand for quality spectrum on local/temporal basis





Low latency Communication

Spectrum Sharing

enables several users to get access to spectrum, thus optimising its usage.

Challenge: need to ensure that both users can get access to spectrum without unduly interfering with each other, to avoid that the spectrum becomes unusable by either user.

HORIZONTAL SHARING

occurs between users that have no inherent priority over each other

Example – wireless LAN users can deploy independently several wireless LAN networks, which may be based on different technologies – LBT(Listen before talk) technology for horizontal sharing

VERTICAL SHARING

occurs when one application has higher priority over the other application.

Example - 470-694 MHz band between terrestrial broadcasting and PMSE applications. PMSE applications can access the band only use the spectrum which is not used by terrestrial broadcasting, with no guarantee whatsoever.

LICENSING MECHANISMS: THE PITFALLS OF **SPECTRUM AUCTIONS**

- one operator maximising its producer surplus does not guarantee that this option maximises the society's consumer surplus
- auctions do not guarantee that spectrum will be put to use quickly

- view auctions favourably as a source of revenue to balance budgets.
- reduces the funds available for investments in the infrastructure
- due to their transparency, to prevent future legal challenges.

As 5G network will become a critical infrastructure for the economy, it is paramount for governments to select spectrum award procedures that favour investment.

Auction mechanisms should not just be based on spectrum fee but also on commitment to invest.

Spectrum Access innovations

Licensed Shared Access (LSA)

Concurrent licensing

Citizens Broadband Radio Service (CBRS)

‘Use it or lease it’

Licensed Assisted Access (LAA)

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