



5G Spectrum: The Portuguese context

The Standardization Perspective

IEEE 5G Lisbon Summit

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5G SPECTRUM

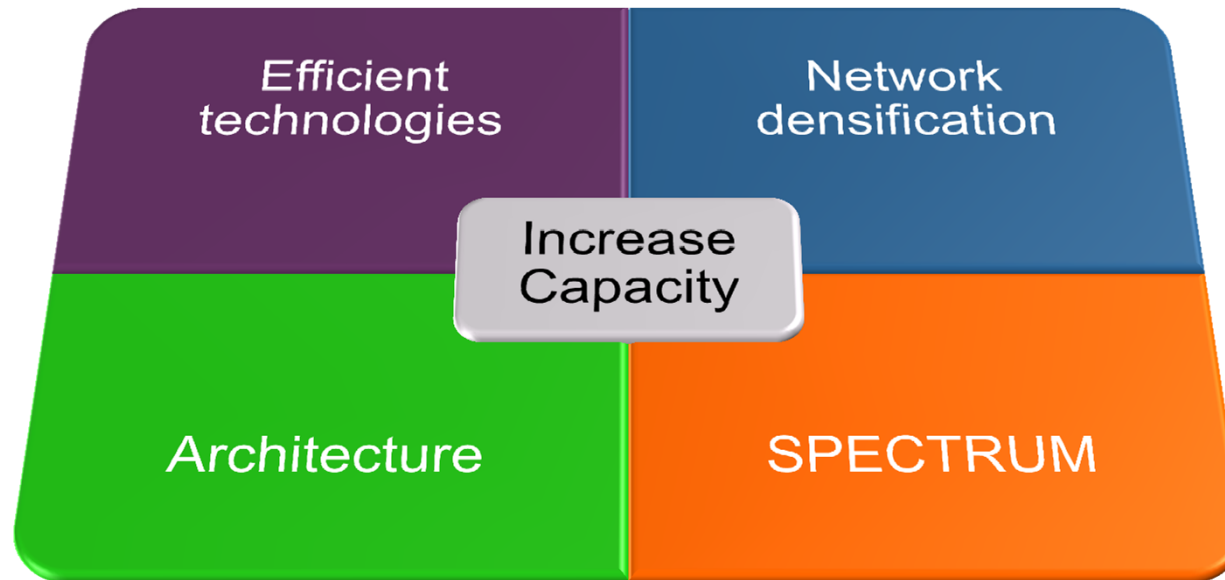
The Portuguese context

Agenda

- 1. Background**
- 2. 5G challenges**
- 3. Conclusions**

1. BACKGROUND

The “capacity crunch”



- More spectrum: between 1340 and 1960 MHz
- Contiguous spectrum and large blocks (currently < 6 GHz)
- In Portugal: around 1000 MHz allocated spectrum
- Radio Spectrum Policy Programme: targeting 1200 MHz

Mobile Spectrum

-  Terrestrial systems for electronic communications services
-  Or...IMT-2020
-  Or.. “5G”

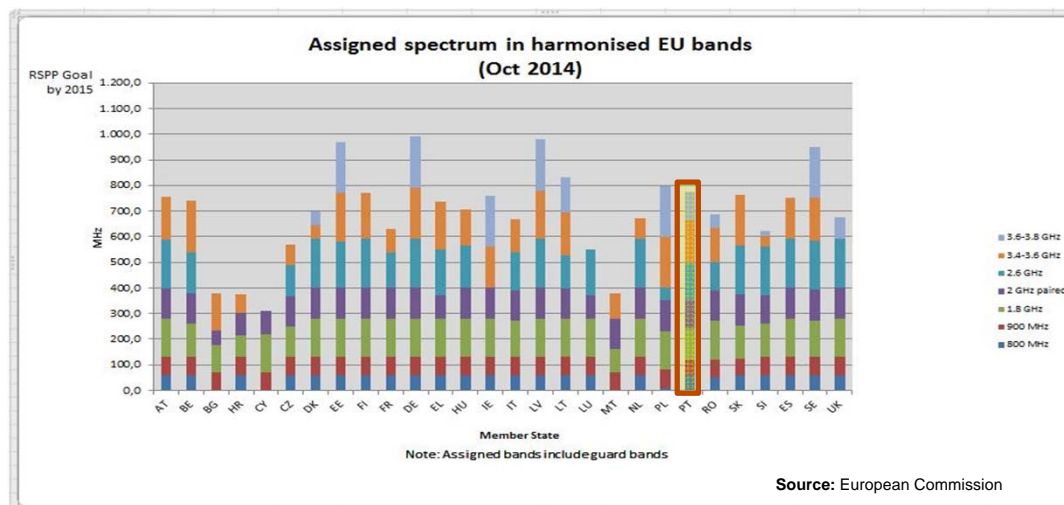
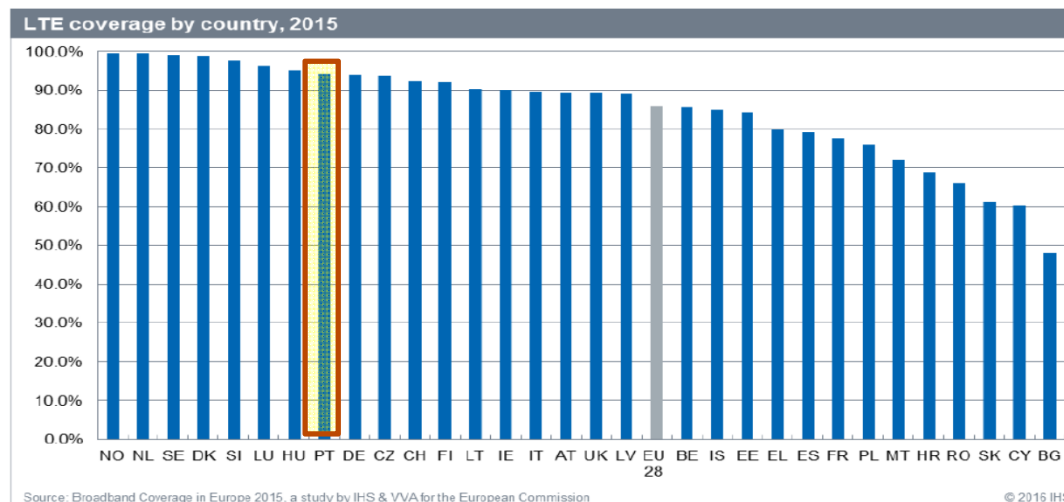
Spectrum Bands (MHz)	Relevant Radio Regulations Footnotes
	IMT
450-470	5.286AA
694-790	5.317A
790-960	5.317A
1 427-1 452	5.341A
1 452-1 492	5.346
1 492-1 518	5.341A
1 710-2 025	5.384A, 5.388
2 110-2 200	5.388
2 300-2 400	5.384A
2 500-2 690	5.384A
3 300-3 400	5.429A
3 400-3 600	5.430A, 5.432A, 5.432B, 5.433A

Wireless Broadband: Portugal in the EU

■ Digital Agenda objectives (*Agenda Portugal Digital*)

■ LTE development

■ Assigned spectrum

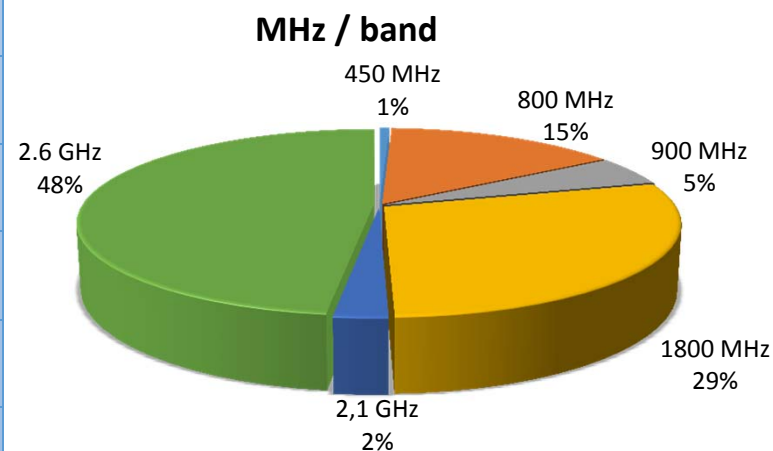


Spectrum awards in Portugal

■ BWA auction (2010): 3.4-3.8 GHz (9 regions, 4 blocks)

■ Mutiband auction (2012)

Band	Number of Lots
450 MHz	1 lot of 2 × 1.25 MHz
800 MHz	6 lots of 2 × 5 MHz
900 MHz	2 lots of 2 × 5 MHz
1800 MHz	9 lots of 2 × 5 MHz
1800 MHz	3 lots of 2 × 4 MHz
2.1 GHz	2 lots of 5 MHz
2.6 GHz	14 lots of 2 × 5 MHz
2.6 GHz	1 lots of 25 MHz
2.6 GHz	1 lots of 25 MHz



■ around 400 MHz auctioned spectrum : 25% not awarded

Spectrum assigned in Portugal

- Different mobile systems are implemented (GSM, UMTS, LTE)
- Flexible use of the spectrum
- Technical conditions (LRTC) based on BEM (Block Edge Mask)
- Implemented in the 3,5 GHz, 2.6 GHz, 800 MHz and 2.1 GHz bands

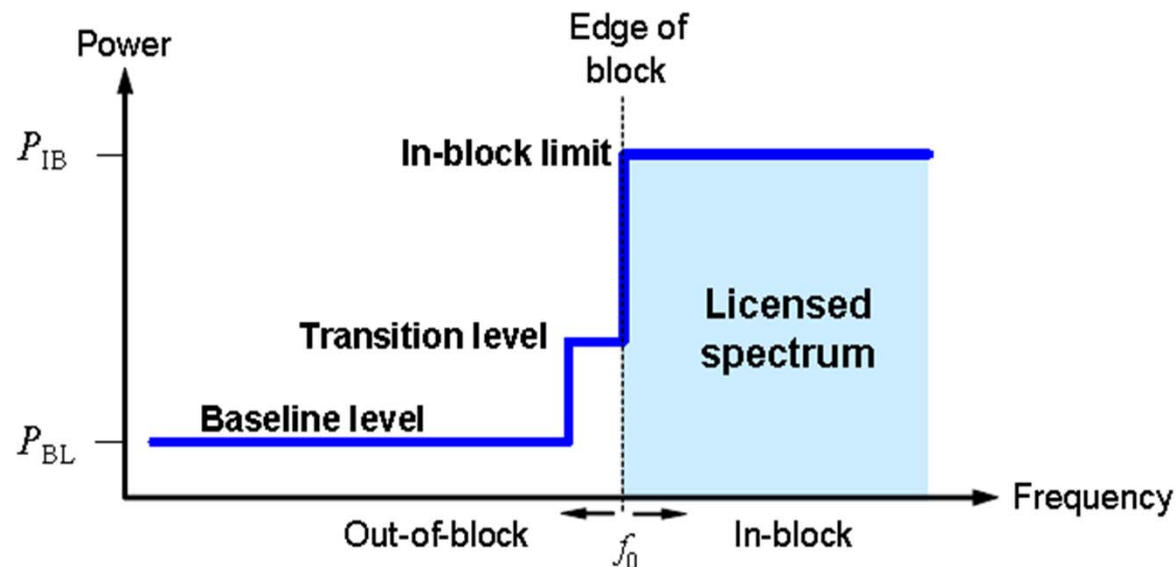


Figure 1: Illustration of a block-edge mask.

2. 5G CHALLENGES

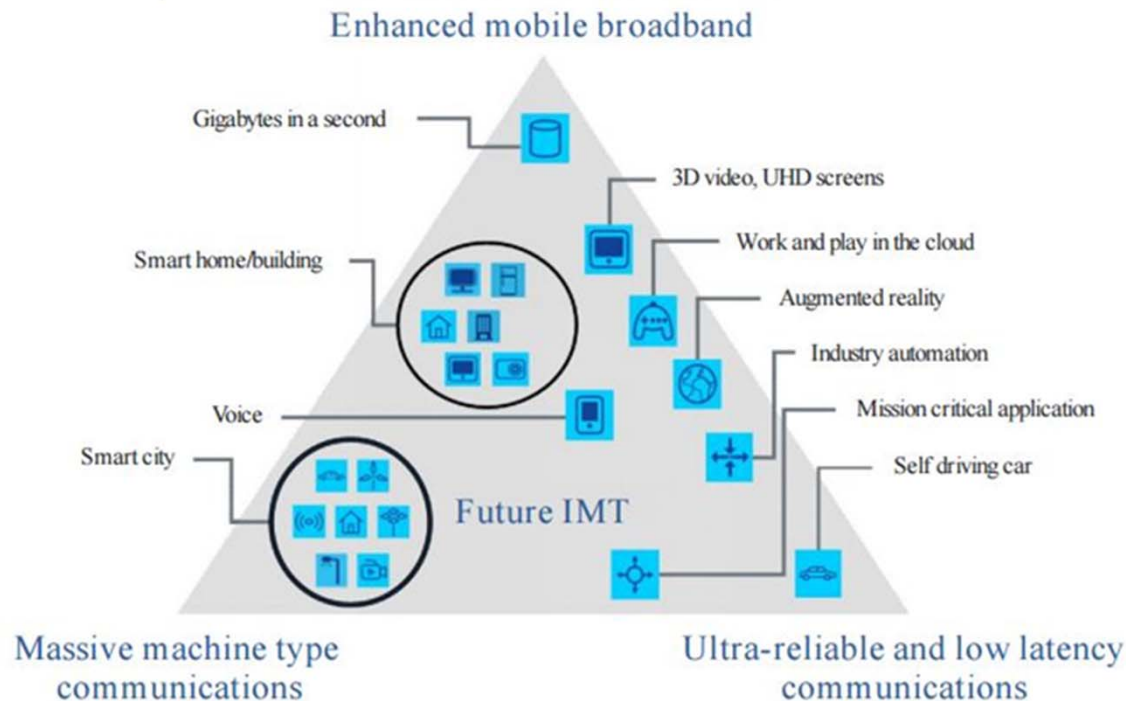
5G capabilities and use cases

IoT (*Internet of Things*):

- ▶ M2M, NFC, RFID, USN, MTC, WASN, Smart***..

The use cases

Different requirements



Source: ITU-R Rec. M.2083

- “Gigabit society”- availability and take-up of very high capacity networks, which will enable the widespread use of products, services and applications in the digital single market: 2025 target date

- Action Plan for “5G”
 - ▶ 2025: uninterrupted 5G coverage for all urban areas and major terrestrial transport paths
 - ▶ 2020: 5G connectivity to be available as a fully-fledged commercial service in at least one major city in each Member State

The next steps for 5G spectrum

■ EU focus:

- ▶ “C band”: 3.4-3.8 GHz
- ▶ 26 GHz

■ WRC-19 “5G” (> 24 GHz)

Agenda item (1.13)	Mobile Allocation
24.25-27.5 GHz	(MS)
31.8-33.4 GHz	(no MS)
37-40.5 GHz	(MS)
40.5-42.5 GHz	(no MS)
42.5-43.5 GHz	(MS)
45.5-47 GHz	(MS)
47-47.2 GHz	(no MS)
47.2-50.2 GHz	(MS)
50.4-52.6 GHz	(MS)
66-76 GHz	(MS)
81-86 GHz	(MS)

- ▶ Protect existing uses (fixed, satellite, passive, SAP/SAB,..)
- ▶ Spectrum sharing (LSA?LAA?CR?)

3. CONCLUSIONS

- 5G spectrum: spectrum above 6 GHz and ...below
- Harmonized, contiguous and large bandwidths needed
- Machine-to-Machine spectrum requirements
- The strategy for the 700 MHz band
- Cognitive technology and new sharing solutions
- Spectrum should also be made available for specific areas, e.g. Galileo, GMES, PPDR, RFID, PMSE
- Standardization and global harmonization is key

THANK YOU!

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