

# O espectro e a mobilidade conectada

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## *Desafios da mobilidade*

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Novas tecnologias para a mobilidade

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- Domínio vasto: rodoviário, ferroviário, automóvel, etc..
- O espectro como condição necessária
- Perspetiva abrangente:
  - Smart Society: *“vision of nation or region’s future plan to achieve an advanced information society” ; p.ex smart car, smart transportation,*
  - European Gigabit society: *“very high capacity networks” e “Gigabit connectivity”*
- Profundo impacto socio-económico:

<i>Verticals Benefits</i>	<b>Automotive (€ mn)</b>	<b>Healthcare (€ mn)</b>	<b>Transport (€ mn)</b>	<b>Utilities (€ mn)</b>	<b>Total (€ mn)</b>
Strategic	13,800	1,100	5,100	775	<b>19,770</b>
Operational	1,800	4,150	3,200	2,700	<b>11,850</b>
Consumer	13,900	207	-	3,000	<b>17,110</b>
Third Party	13,700	72	-	-	<b>13,770</b>
<b>Total</b>	<b>42,200</b>	<b>5,530</b>	<b>8,300</b>	<b>6,470</b>	<b>62,500</b>

**Fonte:** Estudo “Identification and quantification of key socio-economic data to support strategic planning for the introduction of 5G in Europe”

# Espectro – os grandes desafios!

- Brian May (“Queen”)
  - “*I want it all and I want it now*”!
- O espectro não dá para todos !



- Há incompatibilidades e... nem todos participam na discussão



## ■ “Automotive Radars”

- ▶ Faixas: 24 GHz e 79 GHz
- ▶ Faixa 76 GHz

## ■ “Road tolling” e “Smart Tachographs”

- ▶ 5795-5815 MHz

## ■ “Railways”

- ▶ 876-880 MHz/ 921-925 (GSM-R)
- ▶ FRMCS: adjacente ao GSM-R?

## ■ “Intelligent Transport Systems” (ITS)

- ▶ Faixa 63-64 GHz
- ▶ 5 875-5 905 MHz (safety-related)
- ▶ 5 855-5 875 MHz (non safety-related)

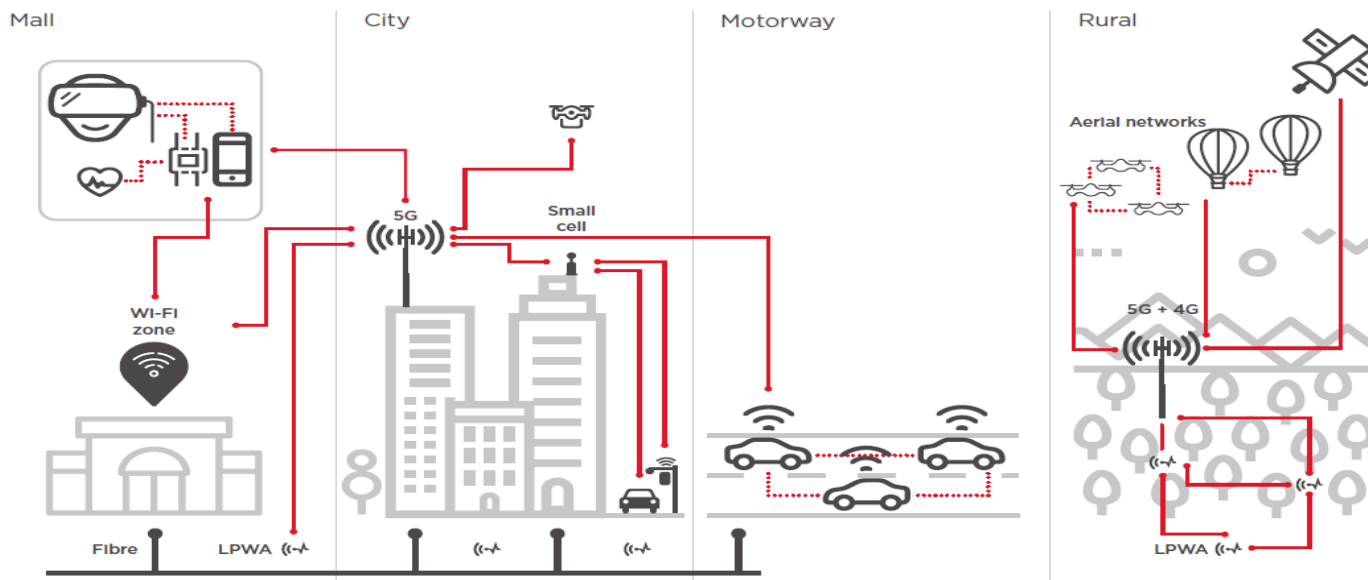
## RLANs em veículos

Frequency band	On-board aircraft	Cars (passenger cars, lorries, buses)	Trains
2400 - 2483.5 MHz	Ok	Ok	Ok
5150 - 5250 MHz	Ok	Note 2	Ok, Note 4
5250 - 5350 MHz	Note 5	Note 1, Note 2	Note 1, Note 4
5470 - 5725 MHz	Note 5	Note 1	Note 1
5725 - 5875 MHz	Ok	Ok, Note 3	Ok
<b>Summary of spectrum:</b>	<b>333.50 MHz</b>	<b>233.50 MHz, Note 3</b>	<b>333.50 MHz</b>
<b>Remarks:</b> <b>Note 1:</b> RLAN operation while in motion may not allow a proper application of the DFS mechanism. If the bands 5250-5350 MHz and 5470-5725 MHz were envisaged in the future for the "cars" and "trains" cases, DFS efficiency to ensure protection of radiodetermination systems would need to be clarified on European level. <b>Note 2:</b> Not possible because of indoor restriction. <b>Note 3:</b> The outstanding results of the technical studies as mentioned above (regarding road tolling systems and ITS) could have an impact on the amount of available spectrum. <b>Note 4:</b> Possible if railway operators provide additional information providing evidence that there is sufficient attenuation from the inside to the outside of trains in general, so that this case could be considered equivalent to the use case on-board aircrafts. <b>Note 5:</b> See ECC Report 140 and its conclusions.			

## Mandato da Comissão Europeia à CEPT sobre ITS

- 5,9 GHz
- Várias em tecnologias em causa:
  - IEEE 802.11p (ETSI G5)
  - 3GPP LTE V2X
  - Urban Rail / CBTC
- Neutralidade tecnológica (?)

## Perspetiva lata



Fonte: GSMA

## O papel do 5G

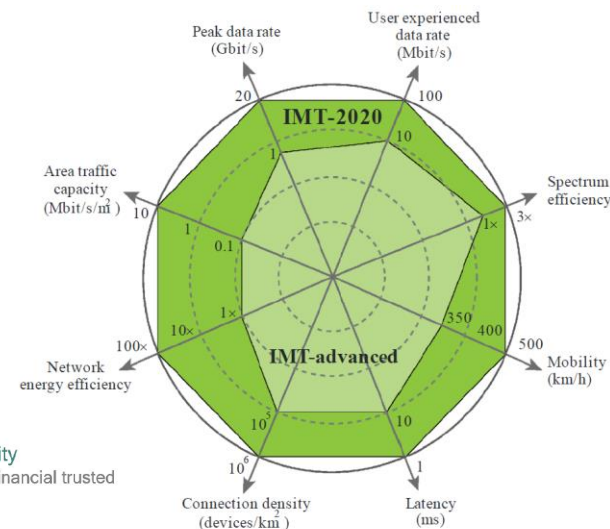
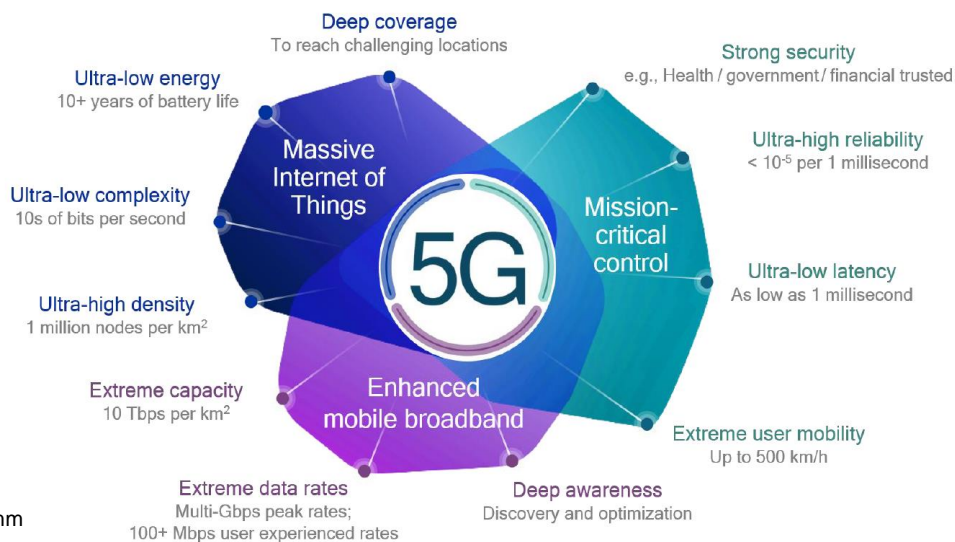


Fonte: Ericsson



## A evolução para o “5G” – IMT. 2020

## Os “use cases”



Fonte: ITU-R Rec. M.2083

## Tema da WRC-19 - Conferência Mundial de Radiocomunicações

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# Obrigado!

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**Lisboa, Novembro 2017**