5G enabling vertical industries digital transformation: towards a disruptive ecosystem

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http://5g-ppp.eu/

Governance Model (5G IA **represents the Private Side and** European Commission |**the Public Side)**
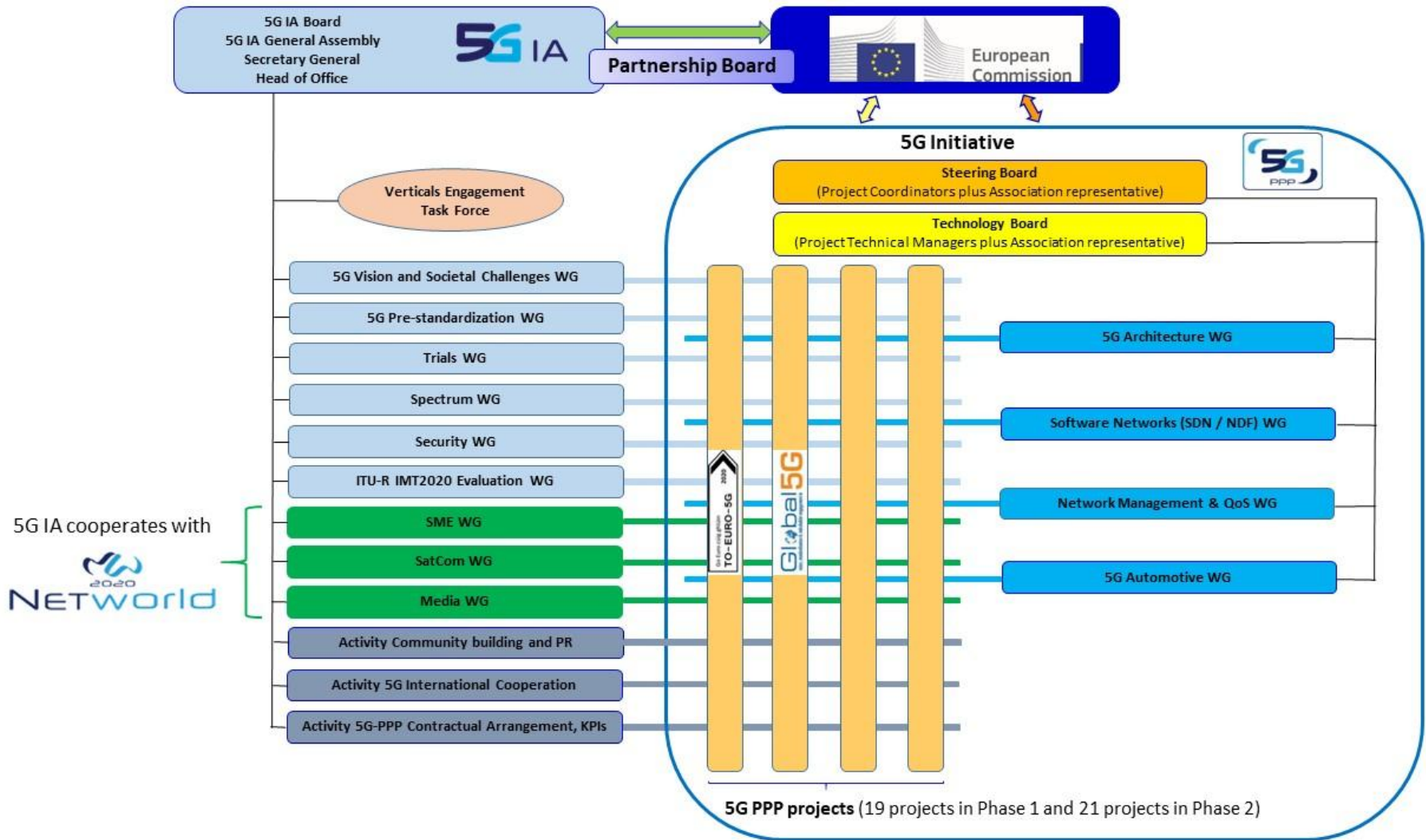
Overall 5G PPP Architecture

Recursive Model

Service Level

E2E Secure Service Orchestrator

Slice #1: Automotive / Factory

AMF — SMF — UPF

Network Level

Slice #2: IoT

AMF — SMF — UPF

Network Operating System

Programmable Ctrl | Programmable Ctrl (SDN-C) | Programmable Ctrl

Resources & Functional Level

Wireless and fixed access — Edge Cloud — Wide Area Network — Core/Central Cloud

Secure Network and Service Management
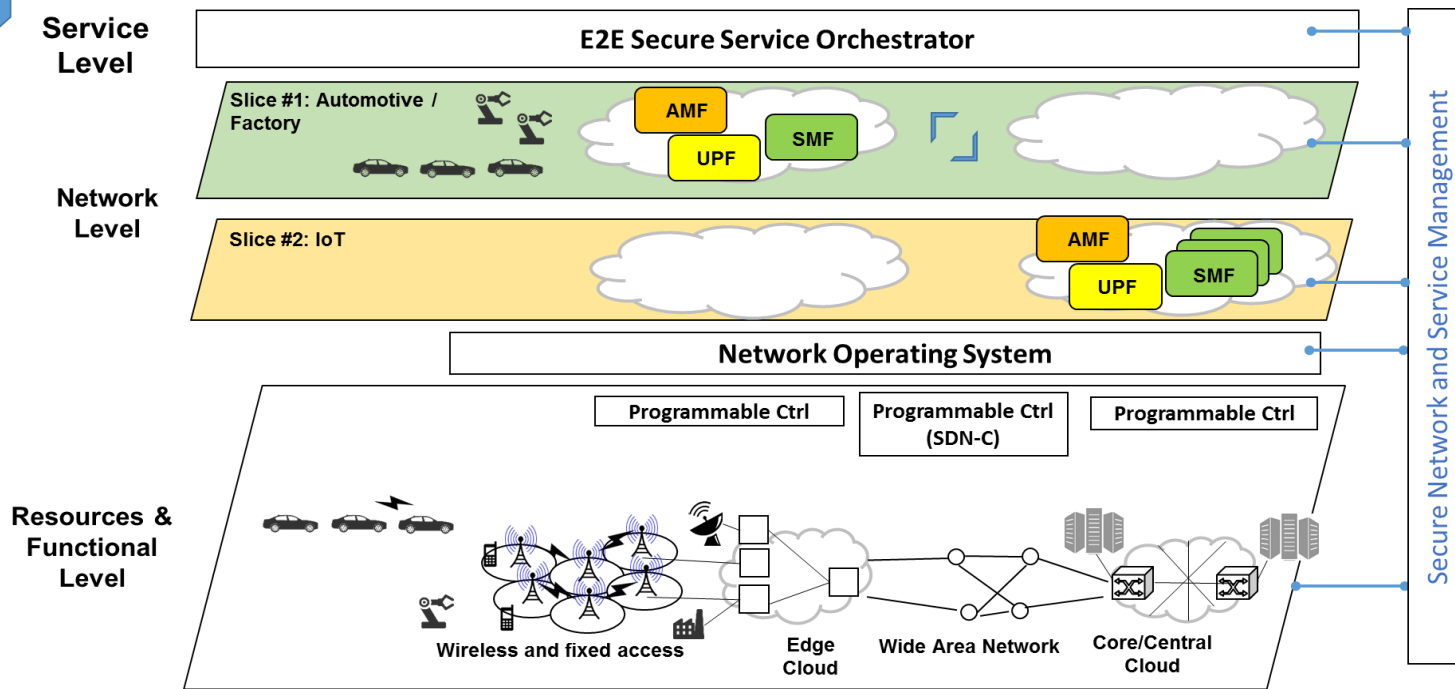
5G system aims at providing a **flexible network architecture**, enabling new business cases and models supporting vertical industries. **Network slicing** emerges as a promising future-proof framework and needs to be designed from an end-to-end perspective. Furthermore, **security architecture** shall be natively integrated into the overall architecture. **The support of verticals** is enabled also by a flexible function deployment and relocation based on the requirements in terms of capacity, latency and reliability.

5G IA committed to verticals engagement

➡️ *5G is vertical driven, as a true differentiator, whereas previous "G" were more human/consumer driven*

➡️ *The move is on to create a dynamic European 5G ecosystem as platform for future innovation*

➡️ *5G trials are key to demonstrate 5G readiness and adaptation to use cases; interoperability and multivendor environments are key for verticals*

➡️ *Verticals expectations go beyond technical requirements, on top they want security & privacy, ultra-low latency, and sustainable business models to drive their digital transformation*

Real world Verticals are committed to 5G

LEONARDO "5G will provide the basis for relevant evolutions in vertical applications for **Security (Public Protection, Disaster Relief, Critical Infrastructures)**. Full integration of operational Narrowband Mission Critical Systems in the 5G ecosystem, and compliance with Security specific KPI, will need ad-hoc trials and tests with final users"

VOLKSWAGEN: "Automated Driving 2.0 will need **Dynamic Network Slicing and predicted QoS**, THE enabler for automotive 5G use cases…"

PEUGEOT: "Integration of 5G in automotive responds to global needs in **connectivity**, as well as requests for autonomous car with connections to networks and cloud, and V2X connectivity. Autonomous car will request hybrid architecture, sensors and femtocells networks for a **perfect virtual knowledge of the road…**"

BOSCH: « 5G may be disruptive for the manufacturing industry: **high reliability and low latency** are major requirements for new applications, such as mobile robots, factory automation, augmented reality and logistics »

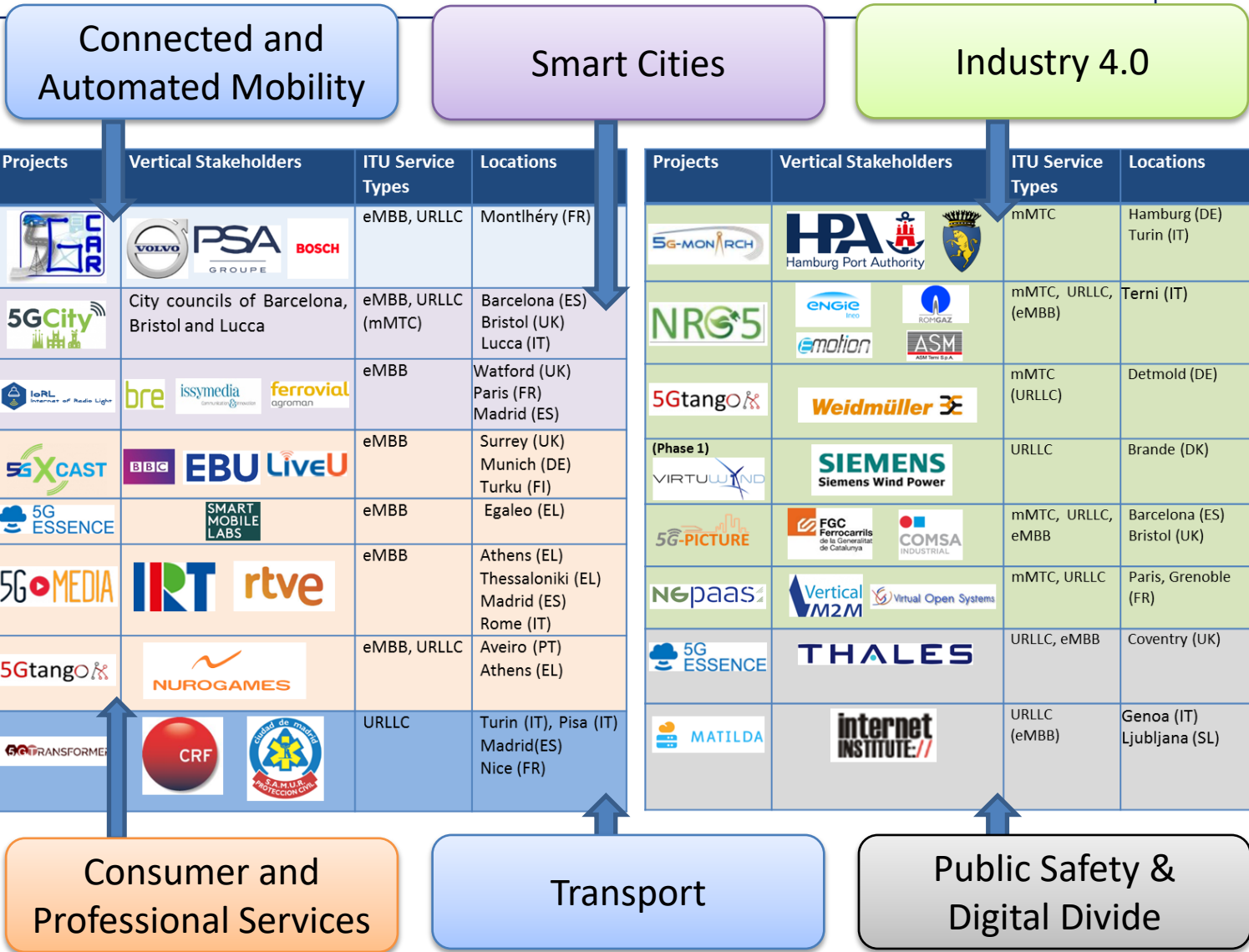**GLOBAL FORUM**

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5G PPP

5G IA Vertical Task Force (VTF)

Source: 5G Infrastructure Association: 5G Empowering vertical industries. White Paper, 2016, https://5g-ppp.eu/wp-content/uploads/2016/02/BROCHURE_5PPP_BAT2_PL.pdf.

- ❑ Dedicated Board Task Force to make engagement more effective
- ❑ **Strategy document** created:
  - ❑ **Priority Vertical Sectors**
  - ❑ **Industry fora to be addressed**
  - ❑ **Relevant B2B industry events**
- ❑ Bottom up activities on verticals recorded in a **Tracker** document to trigger future top down actions – "one stop shop" document on all vertical related activities in 5G PPP
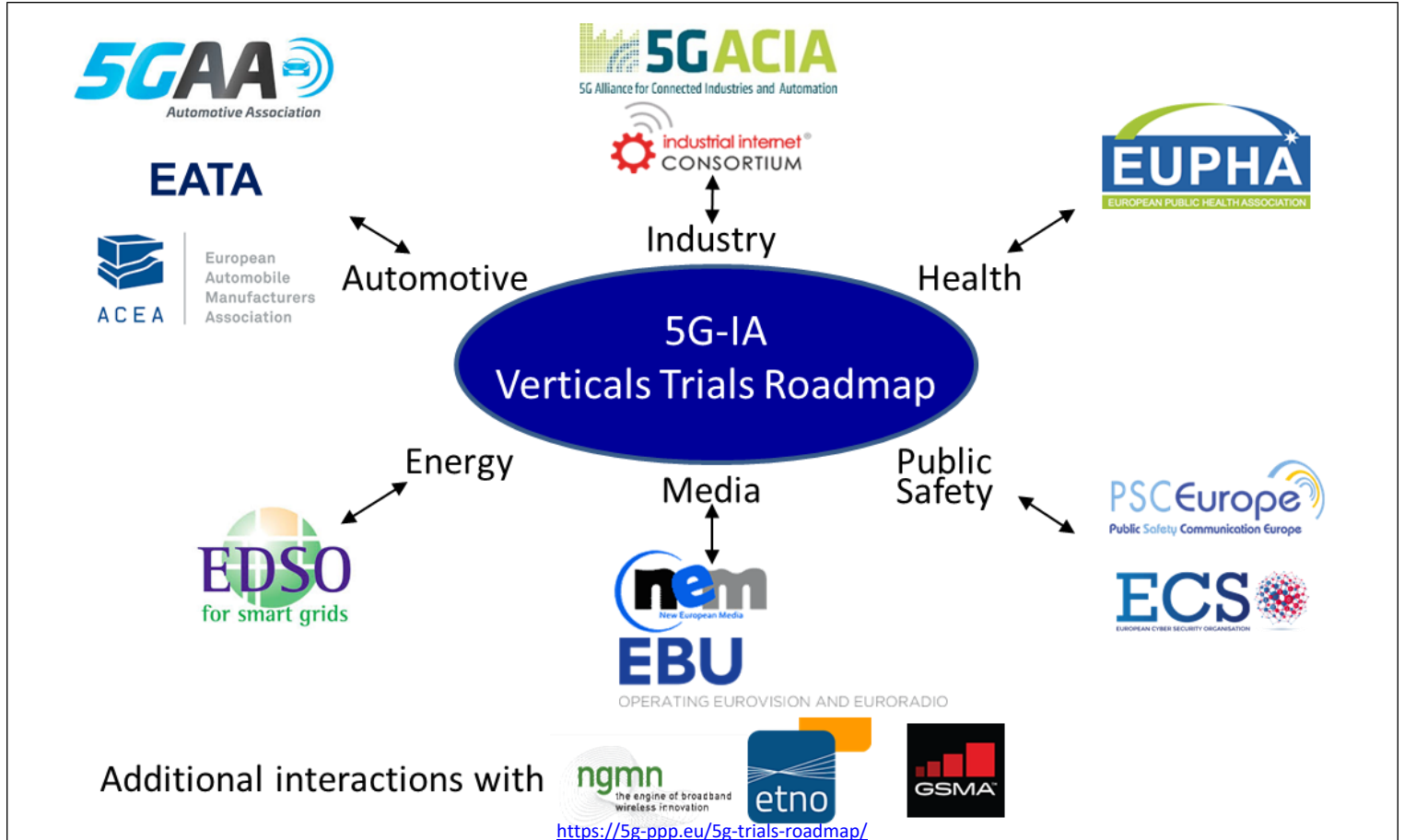
5G PPP Phase 2 – Vertical Trials & Pilots

Connected and Automated Mobility

Smart Cities

Industry 4.0

Projects	Vertical Stakeholders	ITU Service Types	Locations
5GCAR	VOLVO / PSA GROUPE / BOSCH	eMBB, URLLC	Montlhéry (FR)
5GCity	City councils of Barcelona, Bristol and Lucca	eMBB, URLLC (mMTC)	Barcelona (ES) Bristol (UK) Lucca (IT)
IoRL Internet of Radio Light	bre / issymedia / ferrovial agroman	eMBB	Watford (UK) Paris (FR) Madrid (ES)
5GXCAST	BBC EBU LiveU	eMBB	Surrey (UK) Munich (DE) Turku (FI)
5G ESSENCE	SMART MOBILE LABS	eMBB	Egaleo (EL)
5G MEDIA	IRT rtve	eMBB	Athens (EL) Thessaloniki (EL) Madrid (ES) Rome (IT)
5Gtango	NUROGAMES	eMBB, URLLC	Aveiro (PT) Athens (EL)
5GTRANSFORMER	CRF / T.A.M.U.R. PROTECCION CIVIL ciudad de madrid	URLLC	Turin (IT), Pisa (IT) Madrid(ES) Nice (FR)

Projects	Vertical Stakeholders	ITU Service Types	Locations
5G-MONARCH	HPA Hamburg Port Authority	mMTC	Hamburg (DE) Turin (IT)
NRG5	ENGIE Ineo / ROMGAZ / emotion / ASM ASM Terni S.p.A.	mMTC, URLLC, (eMBB)	Terni (IT)
5Gtango	Weidmüller	mMTC (URLLC)	Detmold (DE)
(Phase 1) VIRTUWIND	SIEMENS Siemens Wind Power	URLLC	Brande (DK)
5G-PICTURE	FGC Ferrocarrils de la Generalitat de Catalunya / COMSA INDUSTRIAL	mMTC, URLLC, eMBB	Barcelona (ES) Bristol (UK)
NGpaas	Vertical M2M / Virtual Open Systems	mMTC, URLLC	Paris, Grenoble (FR)
5G ESSENCE	THALES	URLLC, eMBB	Coventry (UK)
MATILDA	internet INSTITUTE://	URLLC (eMBB)	Genoa (IT) Ljubljana (SL)

Consumer and Professional Services

Transport

Public Safety & Digital Divide

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https://5g-ppp.eu/5g-trials-roadmap/

Spectrum: Support of pioneer bands

- Support the pioneer bands suggested by the Radio Spectrum Policy Group (RSPG) for trials and early commercial deployment:
  - 700 MHz, wide area and indoor coverage
  - 3.4 - 3.8 GHz, suitable for urban areas
  - 24.25 - 27.5 GHz, useful for hot spots

- Beside the high pioneer band of 26 GHz (24.25 - 27.5 GHz) support studies of all bands suggested up to 86 GHz, as of WRC-19 a.i. 13

Key spectrum issues and areas of study

- **RSPG draft 3rd Opinion on 5G implementation issues**
  http://rspg-spectrum.eu/wp-content/uploads/2013/11/RSPG18-036final-draft_opinion_on_5G.pdf

  - ❖ **I. Defragmentation of the 3.4-3.8 GHz frequency band**

  - ❖ **II. Ensure connectivity for vertical industries**

- **Technical issues related to 5G spectrum for Verticals**

- **Technologies and architectures to support spectrum sharing regimes, e.g., light licensing, dynamic spectrum access**

- **Frequency bands and solutions for indoor coverage @mmwave frequency bands (e.g., 26 GHz, above 50 GHz bands)**

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Thank you for your attention!

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