5G, beyond 5G, and 6G Activities Promoted by Member States

The voice of the European industry for the development and evolution of 5G

Carles Antón Haro, PhD, MBA

Member of the 6GIA Board – Chair SWG Member State Intiatives

Director R&D Programmes, CTTC

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Foreword

GOALS AND TARGET OUTPUTS

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Goals of the Member State Initiatives SWG, as per workplan 2021:

- To raise awareness on 5G/6G initiatives conducted at the national level (e.g., calls for R&D projects, events, pilots, deployment).
- To identify and liaise with National Authorities in relation with 5G/6G activities at the national level.

Target outputs, as per workplan 2021:

Member State 5G programs Subgroup

What/how	Milestones	Result
Revised and enlarged membership of the SWG to ensure a proper coverage of EU Member States	June 2021	Updated mailing list
5G and beyond related activities in Member States	December 2021	Presentation given to WG members

GOAL OF THIS DOCUMENT

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To report on various activities promoted by Member States, Associated and Candidate Countries which are relevant for the deployment of 5G communication networks and their evolution towards beyond 5G and 6G networks.

Focus is on activities stimulated by National and Regional Ministries, Public Agencies, Regulatory Bodies, Cities, etc.

Rapporteurs

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- Austria: Thomas Zemen (AIT)
- Belgium: Sophie Pollin (KU Leuven), Ingrid Moerman (IMEC-Ghent U.)
- Finland: Jyrki Huusko (VTT).
- France: Didier Bourse (Nokia)
- Germany: Valerio Frascolla (Intel)
- Greece: Panagiotis Demestichas, Yiouli Kritikou (WINGS ICT Solutions).
- Italy: Giovanna d'Aria (TIM)
- Luxembourg: Theodoros Rokkas, Ioannis Neokosmidis (inCITES)
- Netherlands: Toon Norp (TNO).
- Norway[1]: Hanne-Stine Hallingby and Hakon Lonsethagen (Telenor)
- Poland: Dawid Kuchta, Marcin Góralczyk (Microamp-solutions)
- Romania: Cristian Patachia (Orange)
- Serbia[2]: Lazar Berbakov (Pupin I.)
- Spain: C. Antón-Haro (CTTC), P. Merino (UMA).
- Sweden: Erik Strom (Chalmers)
- Turkey: Fatma Akdogan (Technarts), Nazly Guney, Mustafa Karakoc, Murat Unlusan (Turkcell)
- UK[3]: Mir Ghoraishi (Gigasys Solutions)

MANY THANKS

for your support !!

[1] Norway participates in EU's single market through the EEA agreement.
[2] As of Dec'21, Serbia holds a candidate state member status.
[3] The UK participates in H. Europe through the Trade and Coop. Agreement (TCA).

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5G/B5G/6G Activities

Promoted by Member States

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Austria

Gigabit Academy Roadmap

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- Description: Build up of know-how, networking of stakeholders, motivate Austrian Startups to use new 5G features, provide support for technical questions, discuss market chances within 5G to develop new business models

- Public bodies in charge:
  - FFG, Austrian Research Promotion Agency
  - BMLRT, Federal Ministry, Agriculture, Regions and Tourism

- Further information:
  - News at FFG webpage.

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Belgium

Allocation of Frequency Bands and Norms

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- Description: Agreement on the 5G auction in November 2021 [1], auction planned to be completed in 2022. In the mea ntime, temporal licenses are given for frequencies in the range 3.6-3.8 GHz [2]. There was a consultation for the use of 26 GHz, but no plans yet [3]. No plans to update environment norms although the regulator calls higher norms of at least 14,5 V/m up to 41,25 V/m [4].
- Further information:

[1] News on 'The Brussels Times': "Important step: Belgium to roll out 5G network next year"

[2] News on Belgian Institute for Postal Services and Telecommunications website "BIPT grants temporary 5G user rights to five operators".

[3] News on Belgian Institute for Postal Services and Telecommunications website "Consultation on the use of the 26 GHz band for 5G".

[4] News on Belgian Institute for Postal Services and Telecommunications website "BIPT publishes a technical report on the impact of the current radiation standards in Brussels on the deployment of mobile networks"

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Finland

Sustainable Growth Program

- Description: Related to EU Recovery and Resilience Facility (RRF) the launched Sustainable Growth Programs aims to develop competitiveness, investments, research and innovations. The key development areas include 6G, AI and quantum computing. The targets include e.g., modernizing national 5G test network towards 6G, enabling 5G/6G evolution, increase co-operation and engagement of Finnish companies. Project will be launched around end of 2022 or early 2023.

- Public bodies in charge:
  - Innovation Funding Agency Business Finland
- Further information:
  - Call opening at Business Finland website

5G Momentum (cont'd)

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- Description: 5G Momentum is an ecosystem initiative driven by The Finnish Transport and Communications Agency Traficom. The main target of the initiative is to promote and boost new trials and solutions in 5G. The ecosystem arranges and host networking events and worshops for e.g., vertical industry stakeholders to promote benefits and opportunities on 5G, linking together also other 5G related ecosystems in Finland. 5G Momentum provides also channel for discussion on frequency allocations and regulatory issues for e.g., 5G testbeds stakeholders and developers and vertical stakeholders with Traficom as a national licensing and regulation authority.

- Public body in charge:
  - Finnish Transport and Communications Agency Traficom
  - Finnish Meteorological Institute
  - Finnish Transport Infrastucture Agency
- Further information:
  - Traficom website

Frequency bands for 5G use, trials and pilots

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- Description: National regulatory body, Traficom, has allocated frequency bands for 5G networks including bands for private local radio networks as well as for testing and trialing purposes, e.g., 3400-3800 MHz and over 24 GHz millimeter wave bands. Stakeholders in testing, research and education can apply fixed term radio licenses for 5G frequencies from specific defined areas in Cities of Espoo, Oulu and Tampere.
- Public bodies in charge:
  - Finnish Transport and Communications Agency Traficom
- Further information:
  - Traficom website

5G Test Network Finland Ecosystem Initiative

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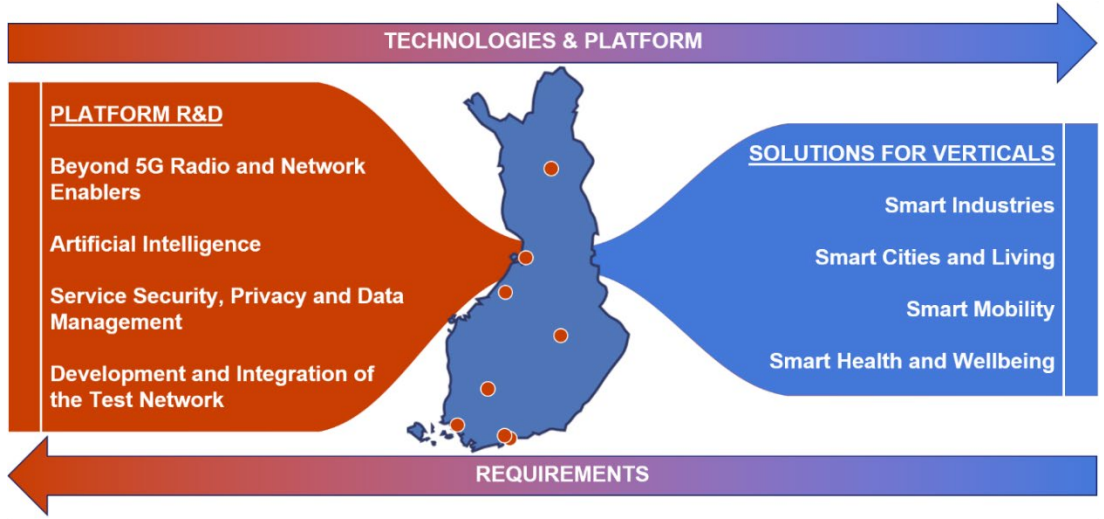
- Description: 5G Test Network Finland (5GTNF) open innovation ecosystem initiative supporting 5G and beyond technology research and validation, product developing, piloting and experiments is continuing. The ecosystem promotes the 5G technologies in vertical industry domains and support the activities for large scale trials and pre-commercial deployment of new communication technologies. The ecosystem partially funded by Finnish Government through Business Finland programmes. The 5GTNF is currently evolving towards 6G technologies.
  - Not-for-profit ecosystem
  - Over 40 industry and academic partner organizations
- Public body in charge:
  - VTT Ltd
- Further information:
  - 5GTNF website



Challenge Programs supporting 5G for verticals

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- Description: Finnish Ministry of Employment and the Economy controlled Business Finland agency is supporting development of 5G technology and applications for vertical segments e.g., through its challenge driven programmes including Digital Trust Finland and New Space Economy. New Space Economy promotes e.g., satellite, HAPS and ground station communications and solutions, and Digital Trust especially cybersecurity. In addition, different ecosystems supported by Business Finland have been established for example around logistics, harbour operations, mining, future city, autonomous vehicles and future factories.
  - Public bodies in charge:
    - Business Finland
  - Further information:
    - https://www.businessfinland.fi/en/for-finnish-customers/services/programs

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France

French Government National Strategy for B5G/6G

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Description

- French Government National Strategy launched on 06.07.21
  - 480 M€ of public funding to support priority projects by 2022
  - Up to 735 M€ by 2025
- Objective to strengthen the 5G/6G technological and industrial ecosystems via 4 axes
  1. Accelerate demand: Develop 5G uses for the benefit of territories and industry.
  2. Accelerate supply: Establish a sovereign offer on telecom networks by 2022-2023.
  3. Accelerate R&D: Support cutting-edge French R&D on future network technologies.
  4. Accelerate training: Reinforce the education and training programmes on future telecoms networks and attract foreign talents to France.
- National Strategy KPIs
  - 20.000 new jobs created by 2025 in France
  - Increase the export market share of French SMEs on telecom network (50% of their sales).
  - Increase the scientific excellence and the international visibility of the French R&D forces.

https://www.economie.gouv.fr/files/files/directions_services/plan-de-relance/20210706_DP_5G.pdf

Axis 1: Development of 5G uses for the benefit of territories and industry

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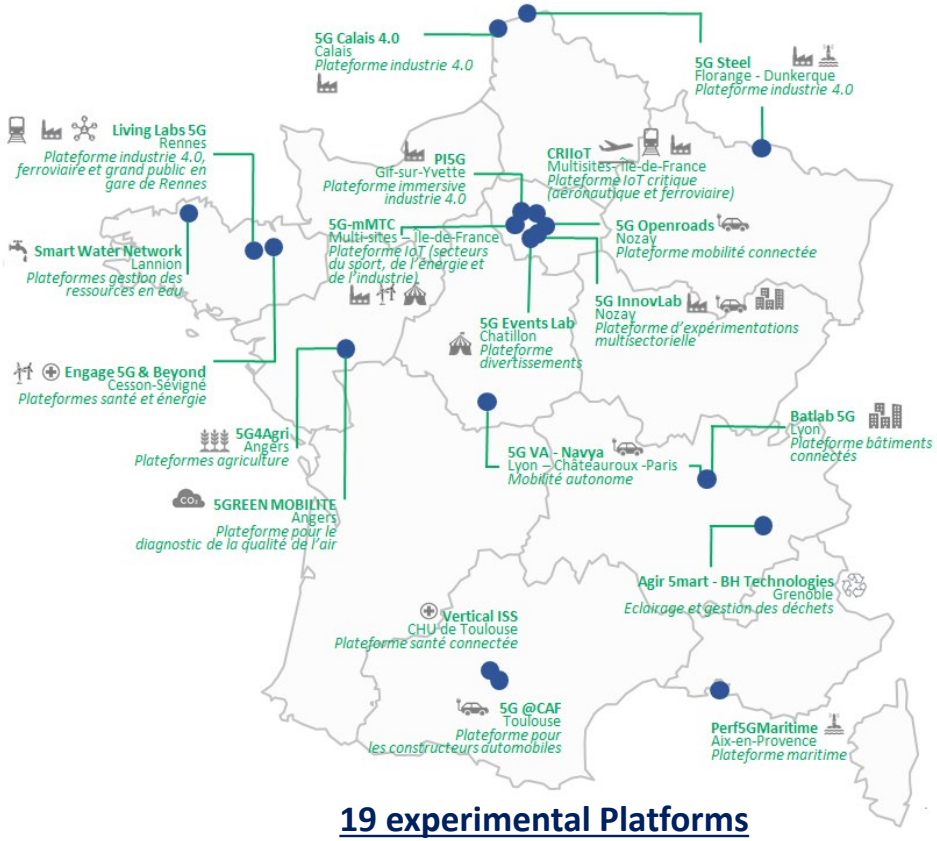
Description:

- September 2020 – September 2021 : Call for projects on the development of 5G use-cases
  - Total of 289 M€ investment, incl. 97 M€ public aid.
  - 69 entities supported.
  - 19 experimental platforms in 10 Sectors: Public Health, Aeronautics, Railway, Industry 4.0, Automotive, Connected Buildings and Territories, Maritime and Port, Energy, Culture and Entertainment, Agriculture and Environment.
- Today's challenges :
  - Create collaborations between the French 5G Platforms.
  - Open the Platforms to all players who want to test their solutions on a 5G networks.
- French Ministry also open to collaboration with other European platforms!



19 experimental Platforms

Further information:

- Contact: anh-tuc.nguyen@finances.gouv.fr

Axis 2 : Strengthen the development of a sovereign offer on telecom networks

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Description

- February 2021 – June 2022 : Call for projects on the development of 5G sovereign solutions
  - A priority is given to projects on the RAN, Core, Edge Cloud, Connected Terminals and Private Networks
  - 7 projects selected, a total of 53 ME of investments, including 28 ME of public aid, 33 entities supported
- May 2021 – September 2021 : Franco-German Call for Innovation projects on 5G Private Networks
- December 2021: Pre-notification of the IPCEI on Electronics and Connectivity
  - France has preselected 3 projects on Connectivity : Orange, Atos and Airbus

Further information:

- Contact: marie.jousset@finances.gouv.fr

https://www.economie.gouv.fr/files/files/directions_services/plan-de-relance/20210706_DP_5G.pdf

Axis 3 : Support cutting-edge R&D on future network technologies

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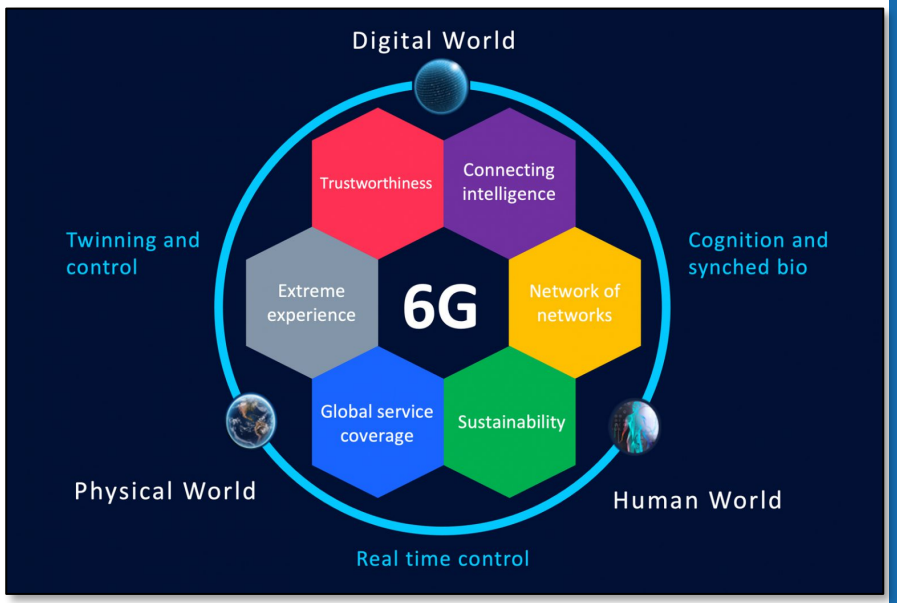
Description

- February 2021 – June 2022: Call for projects on the development of 5G sovereign solutions
  - Priority is given to the R&D/I projects on the new generation of efficient network and communication technologies for high bandwidth demand and critical traffic applications. Technical objectives such as reduction of the Environmental impact of telecom Equipment, Cybersecurity, Integration of AI, Virtualization, Cloudification, Interoperability for open Networks and heterogeneous Connectivity are highly expected
  - Relying on its academic and industrial ecosystem, strengthening the private public partnership and using the academic scientific excellence in all digital sciences (quantum, nano material, networks, signal processing, distributed systems, HPC…) with the industrial innovation
- Launch of a technological roadmap on 6G by 2024
  - In coordination with other European initiatives (SNS, Hexa-X…)
- End of 2021 : Ambitious Strategy on the Intellectual Property
  - A European approach needs to be taken in order to influence international standards



https://www.economie.gouv.fr/files/files/directions_services/plan-de-relance/20210706_DP_5G.pdf

Axis 4 : Reinforce the education and training programs on future telecoms networks

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Description

- To transform existing skills from fiber to 5G.
- To adapt the training on telecom to market needs.
- To ensure that the French telecom ecosystem remains attractive for national talents.
- To attract talents from abroad.

French National Strategy – Additional References

- Press release on the acceleration strategy on 5G and future networks
- Press kit on the acceleration strategy on 5G and future networks
- Stay updated on FR Ministry website.

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Germany

Funding opportunities for R&D projects

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Description:

- At the **national level** there are several sources of grants, e.g.,:
  - BMBF (German Federal Ministry of Education and Research)
  - BMWi (Federal Ministry for Economic affairs and Energy)
- Each **Land** (region) funds its own initiatives, e.g., in Bayern via:
  - STMWK: (Science and art ministry of Bavaria)
  - STMWI: (Bavarian ministry of economic affairs, regional development an energy)
- New calls for proposals are announced each quarter. It is possible to also propose own ideas and ask for money to work on it. Funding rate for industry is around 40%, higher for SME and research institutions.

Further information:

- BMBF website
- BMWi website
- STMWK website
- STMWI website

Bundesministerium für Wirtschaft und Energie

Bundesministerium für Bildung und Forschung

Bavarian Ministry of Economic Affairs, Regional Development and Energy

B5G / 6G Initiatives

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- On **B5G** there are a number of ongoing initiatives mainly driven by the Fraunhofer network of research centers.
- On **6G,** four so called **'6G Research Hubs'** were funded with 250 M€ by the BMBF and were launched in August 2021:
  - ***6G-life*** "Digitale Transformation und Souveränität künftiger Kommunikationsnetze" led by TU Munich and TU Dresden
  - ***6G-RIC*** "6G Research and Innovation Cluster " led by the Fraunhofer-Institut für Nachrichtentechnik, Heinrich-Hertz-Institut (HHI)
  - ***6GEM*** "6G-Forschungs-Hub für offene, effiziente und sichere Mobilfunksysteme" led by Aachen University
  - ***Open6GHub*** led by Deutsches Forschungszentrum für Künstliche Intelligenz GmbH (DFKI)
- The 6G Hubs are part of a broader program on 6G led by BMBF, which will invest in the next years a total of 700 M€

Quantum-related activities

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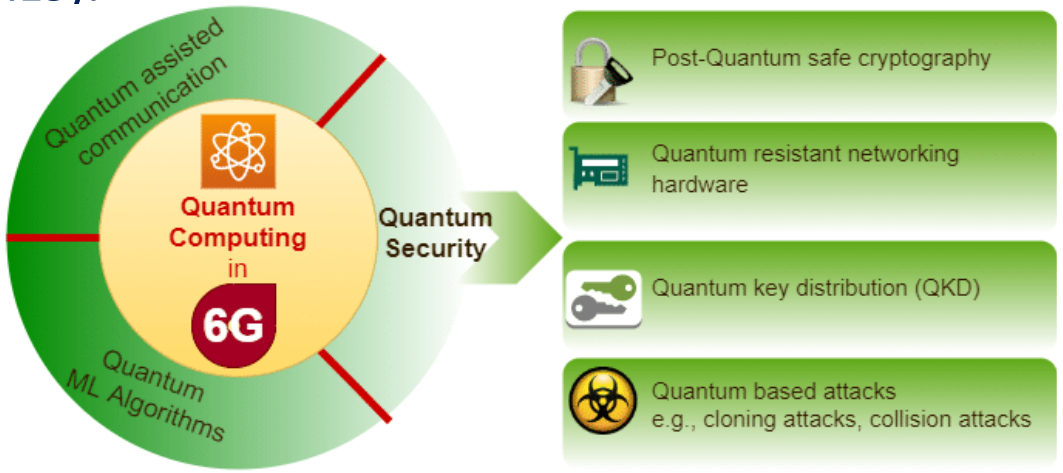
- Description:
  - Planned investment of 2 B€ (in addition to the 2 B€ already announced in 2018) on Quantum Computing and related technologies over 2021-2016 period, under a plan that dwarfs that of every other EU country, with the BMBF (education and research ministry) committing €1.1 B by 2025 for R&D, while the BMWi (economy ministry) will contribute €878 million to develop applications.
  - The quantum stream is tightly related to the HPC stream, which sees Germany at the forefront of EU research with three key national centers located in Garching (LRZ), Jülich (JSC) and Stuttgart (HRLS).

- Further information:
  - News on BMBF website



German platform for Artificial Intelligence

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- Description: Among the several initiatives aiming at fostering a thriving ecosystem for research in Germany, one of the most important is the German platform for Artificial Intelligence, called *Lernende Systeme*. Its goal is to help develop the field of AI for the benefit of both individuals and society as a whole. Several working groups focus on topics relevant for B5G and 6G systems, among which:
  - Mobility and Intelligent Transport Systems
  - Hostile-to-life Environments
  - Health Care, Medical Technology, Care
  - Technological Enablers and Data Science

Lernende Systeme
GERMANY'S PLATFORM FOR ARTIFICIAL INTELLIGENCE

- Public body in charge:
  - National Academy of Science and Engineering, with the support of the Federal Ministry for Education and Research (BMBF)
- Further information:
  - Lernende Systeme website

German Platform for Industry 4.0

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- Description: Another important platform organized by the German government (BMBF and BFWi) is focusing on Industry 4.0, with the aim of shaping the digital transformation in manufacturing. The project has created a position paper on Industry 4.0 vision in 2030. This initiative fosters the applications of research proposals and is organized in 6 WGs, incl. 'Technology and Application Scenarios' and 'Security of Networked Systems'.

PLATTFORM INDUSTRIE4.0

- Public bodies in charge (as sponsors):
  - Federal Ministry for Education and Research (BMBF)
  - Federal Ministry of Economic Affairs and Energy (BMWi)
- Further information:
  - Industrie 4.0 website
  - 2030 Vision for Industrie 4.0: position paper

GAIA-X: A Federated Data Infrastructure for Europe

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- Description: The goal of the GAIA-X initiative is to create a proposal for the next generation of a data infrastructure for Europe: a secure, federated system that meets the highest standards of digital sovereignty while promoting innovation. Several Germany-based companies, supported by the German government, started the initiative some quarters ago. Then France joined the initiative as a second pillar of GAIA-X, which is currently extending its reach to all EU members.

GAIA-X

- Public body in charge:
  - Under the GAIA-X umbrella, and with German national funds, a set of funded project call was issued earlier this year by the Federal Ministry of Economic Affairs and Energy (BMWi)
- Further information:
  - GAIA-X webpage

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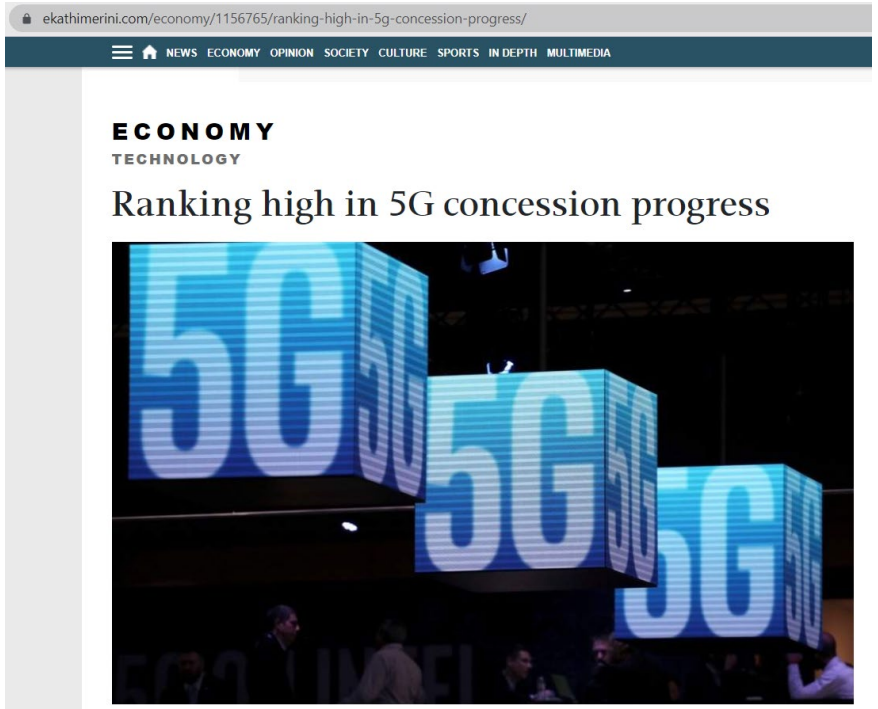
Greece

Allocation of frequency bands

- Description: Greece ranks second among European Union member-states in bandwidth concession for fifth-generation (5G) telecommunication network licenses. Greece has already assigned 83% of the bandwidth available for 5G networks.

- Public bodies in charge:
  - Hellenic Telecommunications & Post Commission
  - Ministry of Digital Governance (in Greek)

- Further information:
  - Greece ranks high in 5G concession progress



Creation of a favorable legislative regulatory environment for private investment in NextGen networks

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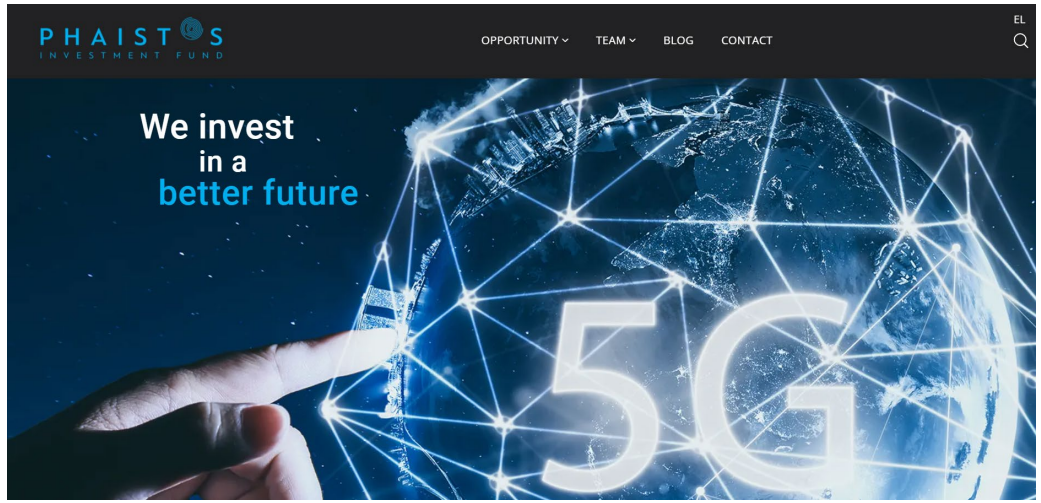
- Description:
  - The National Broadband Next Generation Access Plan foresees to receive investments of up to 2.5Beuros. The aim is to have high speed networks (100Mbps) and 5G networks until 2027.
  - The “Phaistos” investment (5G Ventures) fund has already raised funding from two investors: Deutsche Telekom (3Meuros) and Latsco Family Office (up to 5Meuros
- Public bodies in charge:
  - General Secretariat for Telecommunications and Post (GSTP), Ministry of Digital Policy, Telecommunications and Media.
- Further information:
  - National Broadband Next Generation Access Plan
  - “Phaistos” investment fund



Greece 2.0 plan: 5G corridors

- Description: Through the "Greece 2.0" plan, Greek Government announced that investments and reforms will be exploited in the country in the next 5 years. This fall under the umbrella of its *Pillar 2*: *Digital Transformation. 5G Corridors* which aims to develop 5G networks that will provide coverage of all Greek motorways that are part of the trans-European transport networks in order to serve the needs for Connected and Autonomous Mobility. The goal by 2025 is to have all urban areas and all major terrestrial transport paths with uninterrupted 5G coverage.
  - Public bodies in charge:
    - Prime Minister (official website)
  - Further information:
    - Greece 2.0
    - European Commission
    - eKathimerini

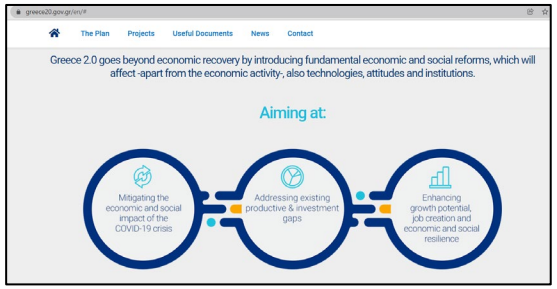
ECONOMY
TECHNOLOGY

Plan for 5G corridors on highways

George Georgakopoulos
12.10.2021 • 04:00

The "Greece 2.0" funds won't just cover the essential requirements of the country for its digital transition, they'll also provide for digital instruments, Digital Governance Minister Kyriakos Pierrakakis said on Monday.

Speaking at the **E-Kyklos conference "Greece After,"** he cited "5G corridors along national highways" for motorists as an example of desired tools.



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Italy

Piano Italia 5G (Plan Italia 5G)

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- Description: First public investment plan - with a financing of 2.02 billion euros - approved to support the development of the mobile market in Italy. It is part of the "National Strategy for Ultra-Broadband - Towards the Gigabit Society“ approved in May’21 by the Inter-ministerial Committee for Digital Transition (CITD).
- Objective: To encourage nationwide deployment of 5G mobile networks to ensure a significant leap in the quality of mobile radio connectivity through fiber-optic backhauling of radio base stations and the densification of network infrastructure (min. 150 Mbit/s downlink, 50 Mbit/s uplink data rate). In areas with no coverage in present time or unlikely in the next five years, any network should be capable of providing connectivity to 30 Mbit/s in typical peak traffic conditions.
- Current state:
  - June 2021: Consultation with MNOs to assess current coverage with 4G/5G mobile network and identify areas where public intervention is needed to fulfill such connectivity objectives.
  - November 2021: Public Consultation launched on both the Plan and the mapping results
- Public body in charge: MITD, Minister for Technological Innovation and digital transition.
- Further information: National Strategy for Ultra-Broadband - Towards the Gigabit Society

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Luxembourg

Luxembourg's 5G strategy

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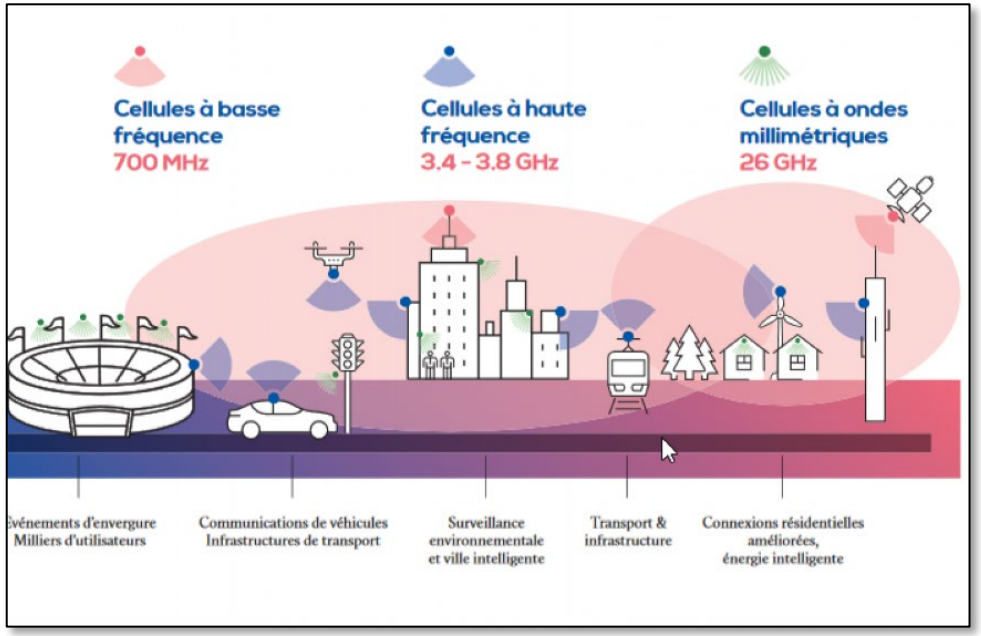
- Description: Luxembourg's 5G strategy was published at the end of 2018. It presents the importance of 5G, the role of public authorities, the plan for frequency auctions, regulatory aspects and the areas of importance for Luxembourg. Finally, it presents the roadmap for 5G deployment in Luxembourg.



- Public bodies in charge:
  - Department of Media, Telecommunications and Digital Policy (SMC)
  - Luxembourg Regulatory Institute (ILR)

- Further information:
  - Luxembourg's 5G strategy: website, document, experts report

INSTITUT LUXEMBOURGEOIS DE RÉGULATION

Broadband Strategy 2021-2025

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- Description: Luxembourg's Broadband Strategy for 2021-2025 has five distinctive objectives: (i) Making connectivity accessible to everyone; (ii) Accelerating the transition of households and businesses to more efficient and sustainable technologies; (iii) Accelerating the deployment of future-proof infrastructures; (iv) Improving transparency and strengthening consumer protection; and (v) Developing Luxembourg as the platform of choice for the ICT services of today and tomorrow. The broadband strategy complements the 5G next-generation mobile services strategy.


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- Public body in charge:
  - Department of Media, Telecommunications and Digital Policy (SMC)
- Further information:
  - Broadband Strategy, document.

5G Spectrum auctions

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- Description: In July 2020 Luxembourg Regulatory Institute (ILR) has allocated frequency bands for 5G networks in the 700 MHz and 3600 MHz bands. The licenses provide for a deployment schedule as well as coverage obligations which aim in particular to offer 5G services in the territory of the municipality of Luxembourg towards the end of 2020 and national 5G coverage no later than 2025. In October 2020, a public consultation was lunched to detect the needs, applications or possible constraints of the deployment of 26 GHz

- Public bodies in charge:
  - Luxembourg Regulatory Institute (ILR)

- Further information:
  - Frequency bands 700 MHz and 3.6 GHz: description
  - Frequency bands 26 GHz: description

INSTITUT LUXEMBOURGEOIS DE RÉGULATION

5G call for proposals

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- Description: To date, two calls for projects have been launched. In June 2019, the Department of Media, Telecommunications and Digital Policy (SMC) launched launched a call for projects within the framework of the national 5G strategy to which a great number of applicants submitted their projects. In 2021, in the framework of the national 5G strategy and of the conference «Connecting tomorrow - 5G, broadband and beyond» the Department of Media, Telecommunications and Digital Policy launched the second call for projects.

- Public body in charge:
  - Department of Media, Telecommunications and Digital Policy (SMC)
- Further information:
  - Call for proposals

Connecting tomorrow conference

- Description: Following the two successful conferences focusing on 5G, in October 2021 the Department of Media, Telecommunications and Digital Policy organized a third conference, covering many communications-related topics from 5G to broadband technologies and beyond (quantum key distribution, 6G,…). Each conference day was split into two parts. The morning sessions featured panel discussions, keynote speakers and Q&A's sessions. Workshops allowing participants to deep dive into specific subjects were held in smaller groups in the afternoons. Furthermore, an exhibition area was accessible all day long.

- Public body in charge:
  - Department of Media, Telecommunications and Digital Policy (SMC)
- Further information:
  - Conference website.

MyConnectivity GIE

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- Description: An economic interest group (GIE) was created in December 2021 in Luxembourg with the following objectives: (i) implement the new Broadband Strategy; (ii) accelerate and improve the connectivity of private households and businesses in the Grand Duchy of Luxembourg; and (iii) coordinate the 5G ecosystem in Luxembourg. The MyConnectivity G.I.E. was created jointly by the State, through the Media, Connectivity and Digital Policy Service, and by LU-CIX Management G.I.E., which provides contacts with players in the field of telecommunications and connectivity.

- Public body in charge:
  - Department of Media, Telecommunications and Digital Policy (SMC).
  - LU-CIX Management GIE
- Further information:
  - MyConnectivty website.

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The Netherlands

Memorandum Mobile Communication

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- Description: Dutch policy document on mobile communication. Specific plans related to 5G:
  - 700 MHz auction in 2020 (done)
  - 3,5 GHz first part in 2022
  - 3,5 GHz second part in 2026 (including 100 MHz for local use)
- Public bodies in charge:
  - Dutch Ministry of Economic Affairs and Climate
- Further information:
  - De Nota Frequentiebeleid

Future Network Services

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- Description: The Future Network Services (FNS) initiative was recently launched by TNO, the Dutch network operators (KPN, T-Mobile and VodafoneZiggo) and technical universities (TU Delft, TU Eindhoven, University of Twente) to stimulate precompetitive research and development in and with communication networks. FNS targets four areas:
  - Accelerate economic growth in sectors through digitalization and network innovations
  - Accelerate innovation in networks themselves
  - Create economic value through specific Dutch strengths in new network technology
  - Ensure active build-up of knowledge and experience for sovereignty and reliability

  The FNS partners are now extending the consortium with further organisations from the network industry and several economic sectors.

- Public bodies in charge:
  - The Topsector ICT/Team dutch digital delta coordinates the public-private collaboration in FNS at the request of the Ministry of Economic Affairs and Climate Policy
- Further information:
  - News on Digital Delta Website.

Team dutch digital delta
Future Network Services

dutch digital delta
connect and create

Proeftuin op de Noordzee

- Description: Off the coast of The Hague, just outside the port of Scheveningen, the Municipality of The Hague, KPN, TU Delft, TNO, Sailing Innovation Centre, Svašek Hydraulics and the Watersportverbond are working together on an advanced test area of 10 x 10 nautical miles. The exceptional environmental factors of water, wind and currents make this 'smartest part of the North Sea unique in the world. The field lab enables start-ups and SMEs to test and demonstrate innovative products outside the classical laboratory, in real practical conditions on the water and with end users!
- Public bodies in charge:
  - The Municipality of The Hague.
- Further information:
  - Proeftuin op de Noordzee website

Proeftuin op de Noordzee

5Groningen

The voice of the European industry for the development and evolution of 5G

- Description: The Economic Board Groningen initiated the 5Groningen programme to explore how 5G could create and accelerate new innovations. One of the main goals is to help SMEs in the north and center of the Groningen province to become leaders in their respective sectors by harnessing the potential of 5G. At the 5G Field Lab, entrepreneurs and non-profit organizations collaborate with experts from the telecom industry, knowledge institutes and government agencies to test applications of 5G.

- Public bodies in charge:
  - Economic Board Groningen
- Further information:
  - 5Groningen website
  - In 2018, 5Groningen embarked upon a close collaboration with the European Space Agency's (ESA) Business Applications unit. The partners are working together to test how 5G and satellite information can complement and enhance each other.

5GHub

The voice of the European industry for the development and evolution of 5G

- Description: 5G Hub in Brainport Eindhoven is a collaboration between Brainport Development, High Tech Campus, Ericsson, and VodafoneZiggo. This co-creation space researches and tests the possibilities of new technologies and stimulates innovative applications with its ecosystem of partners. This not only concerns 5G, but also, for example, artificial intelligence, virtual reality, augmented reality, blockchain and photonics.
- Public bodies in charge:
  - Brainport Development is the economic development company that stimulates innovation and growth in the region on behalf of the 21 municipalities in Southeast Brabant
- Further information:
  - 5G Hub website

The voice of the European industry for the development and evolution of 5G

Norway

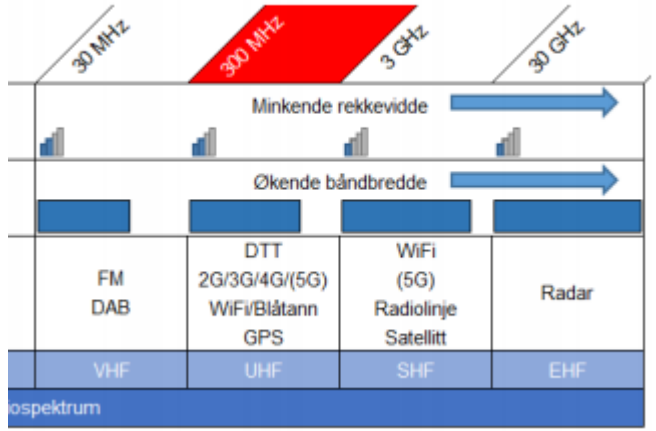
5G spectrum auctions

The voice of the European industry for the development and evolution of 5G

- Description: In Norway, the auctions for 3.6 GHz and 2.6 GHz were completed on 30 September 2021. The Norwegian government has decided that the four holders of 3.6 GHz frequencies shall meet requests from industries, and contribute to the establishment of local 5G-networks and services, offered as a service or spectrum leasing. A hearing has been carried out for allocation of frequencies to local and private 5G-networks in the 3.8-4.2 GHz band. Of the 2.3 frequency, 2301-2323 MHz is allocated for tests, until 31 December 2022.

- Public body in charge:
  - Norwegian Communication Authority (Nkom)

- Further information (in Norwegian):
  - News on Nkom website: “2021 auctions for 5G related frequencies and special regulations”.



Nkom, 2019, Frekvenskompass for mobil

Initiatives for Transnational Collaboration

The voice of the European industry for the development and evolution of 5G

Description:

- In 2021, Nordic and Baltic ministers for digitalisation promoted digital inclusion as part of digital transformation.
- In 2020, the Nordic Council of Ministers agreed on the Ministerial Declaration Digital North 2.0.
- In 2019, Nordic and Baltic ministers reinforced the initiative with another a Nordic-Baltic 5G strategy.
- In 2018, the Nordic prime ministers signed a 5G Letter of Intent.
- Topics for collaboration:
  - Enable 5G testing
  - Coordinate 5G frequency bands
  - Remove obstacles
  - Encourage certain sectors, e.g. transport, emergency

Foto: Statsministerens kontor

Further information:

- Letter of Intent - Development of 5G in the Nordic countries, 2018
- Nordic- Baltic 5G Strategy, 2019

Public funding 5G research and innovation

The voice of the European industry for the development and evolution of 5G

Description: Two publicly-funded research calls have led to 5G relevant research in Norway.

- ICTplus (Norwegian).
  - Sequences and Their Applications, U. Bergen
  - 5G Management and Orchestration for Data and Network Integration, U. Stavanger
  - Cooperative Human Activity Recognition and Localization for Healthcare and Wellbeing, U. Agder
  - Lightweight Cryptography for Future Smart Networks, NTNU, Gjøvik
- National research infrastructure
  - Reconfigurable Radio Network Platform
  - Norwegian Infrastructure for drone-based research, mapping and monitoring in the coastal zone (5G-relevant)
  - Norwegian centre for Minimally invasive Image guided Therapy and medical technologies

Public body in charge:

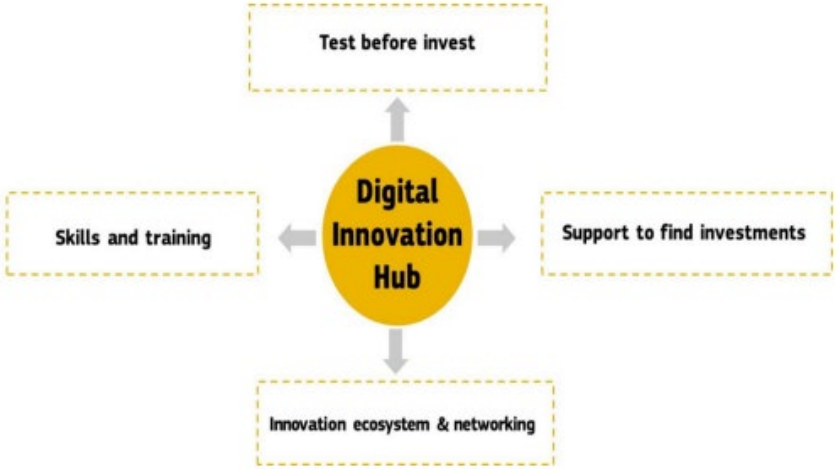
- The Norwegian Research Council

Foto: Jonas Bendiksen

Innovation Norway

- Description: As of October 2021, several clusters in Norway are positioned to apply for becoming a hub in the initiative European Digital innovation Hub. The hubs and initiatives belong to the backbone for Norwegian 5G development.

- Public body in charge:
  - Innovation Norway
- Further information:
  - Eight potential Norwegian hubs
  - Guide to Norwegian hub applications



EU, European Digital Innovation hubs

The voice of the European industry for the development and evolution of 5G

Poland

Poland: Frequency Bands for Trials and Tests

The voice of the European industry for the development and evolution of 5G

- **Description**: UKE has issued permits to MNOs, telecoms companies or technical universities to conduct 5G tests (normally for free) in the frequency bands:
  - ❑ 700 MHz (2x5 MHz);
  - ❑ 800 MHz (2x5 MHz);
  - ❑ 2100 MHz (2x14,8 MHz);
  - ❑ 3400-3800 MHz (block widths from 40 to 200 MHz);
  - ❑ 26 GHz (block widths from 100 to 200 MHz);
  - ❑ 28 GHz (block widths from 100 MHz to 1 GHz).
- **Public bodies in charge**:
  - Office of Electronic Communications (UKE)
- **Further information**:
  - https://bip.uke.gov.pl/

Poland: Commercial Frequency Bands

The voice of the European industry for the development and evolution of 5G

- **Description**: The following frequency bands are planned for 5G networks:
  - 3480-3800 MHz (auction in Q1/Q2 2022; blocks of 4x80 MHz);
  - 700 MHz (distribution process planned for Q3/Q4 2022);
  - 26 GHz (distribution process planned for 2023 depending on demand and availability of radio equipment; at least 1 GHz).

There are plans to consult the market in 2022 about the model for allocating dedicated spectrum to private 5G networks.

However, MNOs have already launched commercial 5G networks operating in the bands:

- 1800 MHz;
- 2100 MHz;
- 2600 MHz (FDD and TDD).

- **Public bodies in charge**:
  - Office of Electronic Communications (UKE)
- **Further information**:
  - https://bip.uke.gov.pl/

The voice of the European industry for the development and evolution of 5G

Romania

5G spectrum and strategy

The voice of the European industry for the development and evolution of 5G

- Description: Current allocation

5G spectrum auction: Long term licenses auction (2025 – 2045 validity) to be held mid 2022 for (i) 700MHz band FDD & SDL; (ii) 1500MHz band SDL; (iii) C-band: 3.4 – 3.8 GHz; and (iv) unsold spectrum 2.6GHz FDD (validity by 2029). C-band current spectrum license valid until 2025

- Public body in charge:
  - The National Authority for Management and Regulation in Communications (ANCOM).
- Further information:
  - 5G Strategy for Romania (2019).
  - 5G Law for Romania (2021).

The voice of the European industry for the development and evolution of 5G

Serbia

5G Spectrum auction 2022

The voice of the European industry for the development and evolution of 5G

- Description: Due to pandemic, the spectrum auction initially planned for 2020 was postponed to 2021. Public regulatory body asked all parties interested to submit expression of interest in using 5G radio frequencies in June 2021.
- Public bodies in charge:
  - Regulatory agency for electronic communications and postal services.
- Operators:
  - Telekom Serbia
  - Telenor
  - A1 Serbia
  - Serbia Broadband (SBB) – new operator in Serbia to provide mobile services.

	Name of the radio ferquency band	Available FDD	Available TDD
1.	700 MHz	2x30 MHz	15 MHz (SDL)
2.	900 MHz	2x1 MHz	
3.	2100 MHz	2x15 MHz	
4.	2600 MHz	2x70 MHz	30 MHz
5.	3500 MHz		400 MHz

5G current situation in Serbia

The voice of the European industry for the development and evolution of 5G

- Description:
  - Public 5G auction expected in early 2022.
  - 5G network deployment expected to start in 2022.
  - A1 Telekom Austria (operating also in Serbia, Slovenia, Croatia and Bulgaria) has chosen Nokia and Ericsson as network equipment vendors.
  - Public regulatory body has started the procedure of assigning 2500 – 2690 MHz band to 5G (currently used for Military purposes)
  - 694-790 MHz and 3400–3800 MHz are already available for exclusive use for 5G

The voice of the European industry for the development and evolution of 5G

Spain

UNICO I+D: R&D program in 6G and beyond 5G technologies

The voice of the European industry for the development and evolution of 5G

- Description: This program is aimed to fund R&D projects aligned with the strategic research agenda of the JU SNS in Spain, as well as to boost employment, public-private collaboration, especially with SMEs, and (inter)national talent promotion plans in beyond 5G and 6G technologies. In the 2021 call, 95 M€ were invested out of 230 M€. CTTC ranked first in this call, followed by U. Carlos III and i2CAT. This initiative is carried out with the support of EU's Recovery and Resilience Fund.
- Public body in charge:
  - Ministry of Economic Affairs and Digital Transformation
  - State secretary of telecommunications and Digital Transformation.
- Further information:
  - Press release on the outcome of UNICO call (MINECO).

Spain's Strategy for the Promotion of 5G (2021-2025)

- Description: The main strategic lines of the plan include (i) spectrum management & regulation aspects (allocation of 700 MHz and 26 GHz bands; reorganization of 3.5 GHz band); (ii) support to network and service deployment in cities, transport corridors and rural areas; and (iii) dynamization of regulatory aspects. An investment of 2.000 M€ is planned for the 2021-25 period.
- Public body in charge:
  - Ministry of Economic Affairs and Digital Transformation
- Further information:
  - Strategy for the Promotion of 5G (2021-2025)

Strategic Agenda: Digital Spain 2025

The voice of the European industry for the development and evolution of 5G

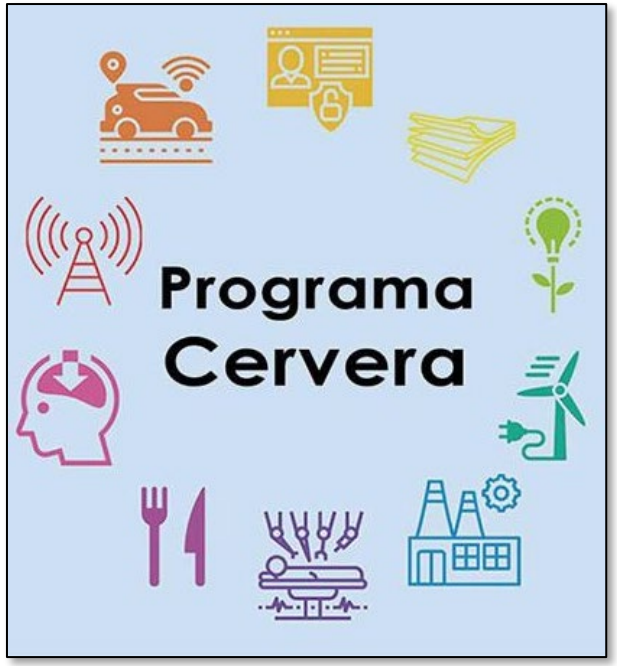
- Description: Measures, reforms and planned investments to achieve the following strategic goals: foster deployment of 5G technology (100% spectrum allocated), guaranteed digital connectivity/ bridge digital divide (100 Mbps for 100% pop.), strengthen digital competences (80% pop. basic), reinforce cybersecurity (+20.000 cybersec/AI/data experts), accelerate digital transformation public admin. & companies, launch of tractor projects for digital transformation (-10% emissions), etc.

- Public body in charge:
  - Ministry of Economic Affairs and Digital Transformation
- Further information:
  - Strategic Agenda:full document
  - Strategic Agenda: executive summary

Cervera Program: R&D projects for SMEs in B5G/6G technologies

The voice of the European industry for the development and evolution of 5G

- Description: This program is aimed to fund R&D projects carried out by SMEs in close collaboration with technological centers. One of the priority areas is beyond 5G/6G technologies. Topics include, *inter-alia*, edge computing technologies, network virtualization, LEO satellite communications, or integration of AI/ML paradigms in future mobile networks. Call is continuously open. Funding components: grants and low interest loans.
- Public body in charge:
  - Center for Industrial Technological Development (CDTI).
  - Ministry of Science and Innovation (MCI)
- Further information:
  - Home page of Programa Cervera



The voice of the European industry for the development and evolution of 5G

Sweden

Allocation of Frequency Bands for Local Use

The voice of the European industry for the development and evolution of 5G

- Description: PTS has released a call for application for local use of 5G spectrum in the 3760–3800 MHz and 24.25–25.1 GHz bands. The purpose of this is to meet demands for local 5G communication in industries, mines, warehouses and hospitals.

- Public body in charge:
  - Post- and telestyrelsen (PTS), PTS is a public authority reporting to the Ministry of Infrastructure, Energy and Digital Development.

- Further information:
  - News at PTS website: “PTS allows for the allocation of local licenses in the 3.7 GHz and 26 GHz bands”.

Plan for spectrum allocation for trials and tests

The voice of the European industry for the development and evolution of 5G

- Description: PTS has decided on a spectrum plan for 5G tests based on international documents, e.g., the EU Commission 5G Action Plan with timelines, Radio Spectrum Policy Group (RSPG) Opinion Strategic roadmap towards 5G for Europe, and ITU World Radio Conference (WRC-19) identification of frequency bands for IMT. PTS wants that it should be easy to continue trials at 3.4–3.6 GHz and 26,5–27,5 GHz, and to initiate tests at 3.6–4.2 GHz, 40.5–43.5 GHz, 45.5–47.0 GHz, 47.2–48.2 GHz and 66–71 GHz.
- Public body in charge:
  - Post- and telestyrelsen (PTS), PTS is a public authority reporting to the Ministry of Infrastructure, Energy and Digital Development.
- Further information:
  - News at PTS website: “Spectrum plan test activity for 5G”.

Allocation of frequency bands for trials and tests

The voice of the European industry for the development and evolution of 5G

- Description: PTS has after an auction allocated 5G spectrum to four bidders: Hi3G Access AB (100 MHz at 3400–3500 MHz), Net4Mobility HB (100 MHz at 3620–3720 MHz), Telia Sverige AB (120 MHz at 3500–3620), and Teracom AB (80 MHz at 2300–2380 MHz) for a total cost of 2 317 MSEK. The spectrum is allocated for the time period Jan. 20, 2021 to Dec. 31, 2045.
- Public body in charge:
  - Post- and telestyrelsen (PTS), PTS is a public authority reporting to the Ministry of Infrastructure, Energy and Digital Development.
- Further information:
  - News at PTS website: “PTS makes available additional spectrum that enables large-scale 5G testing”.

The voice of the European industry for the development and evolution of 5G

Turkey

5G FREQUENCY AUCTIONS

The voice of the European industry for the development and evolution of 5G

- Description: There is no commercial 5G service in Turkey. Still a national frequency plan exists, which will be the basis for such auction. Information and Communication Technologies Authority (BTK) is the responsible public body for 5G auctions. The schedule for auction has not been announced yet. Following frequency bands are expected to be allocated: 3.4 – 3.6 GHz band; 24 – 26 GHz band; 700 MHz band; 3.7 – 3.8 GHz band for Mobile Private Network. Test licenses are granted on a temporary basis.

- Public body in charge:
  - Ministry of Transport and Infrastructure.
  - The Information and Communication Technologies Authority (BTK).
  - Telecom Operators (Turk Telecom, Turkcell, Vodafone).
  - Communication Technologies Clustering (HTK) & GTENT.
- Further information:
  - BTK has published a white book containing Turkey's priorities, strategy and roadmaps for 5G and beyond document.
  - The national frequency plan.
  - The full list of test licenses in Turkey.

BİLGİ TEKNOLOJİLERİ VE İLETİŞİM KURUMU

5G TRIALS, TESTS & APPLICATIONS FOR VERTICALS

The voice of the European industry for the development and evolution of 5G

- Description: By providing temporary frequency bands with time and location restrictions, BTK supports 5G R&D studies and test/trial activities such as remote surgery, transferring sports competitions to the audience with 360° VR experience. 5G Test Valley was established in the city Ankara to develop applications for vertical industries. In addition, companies in technology development zones develop software and solutions for vertical industries (health, agriculture, i4.0, IoT/smart cities, autonomous vehicles).
- Public body in charge:
  - Ministry of Transport and Infrastructure
  - The Information and Communication Technologies Authority (BTK)
- Further information:
  - 5G Test Valley news in BTK website

Türk Telekom

TURKCELL

vodafone

5G ECOSYSTEM & GOVERNMENT FUNDING

The voice of the European industry for the development and evolution of 5G

- Description: A 5G ecosystem has been established in Turkey. The Communication Technologies Cluster (HTK), which consists of communication-centric companies and has 160 members, is one of the main actors of 5G activities in the country. As a result of the 5G R&D project that started in 2018, GTENT company was established. GTENT develops the ecosystem further and is responsible for product commercialization after R&D. All telecom operators have been involved in R&D activities. As a result, E2E 5G prototypes (TRL 5 to 7) were developed (including 5G Core network, 5G BBU, 5G New Radio, MIMO Antenna, NFV and EMS). They are still being tested in different environments on each operators' premises. 5G & 6G projects are supported by different public bodies with various funds depending on TRL.
- Public body in charge:
  - Ministry of Industry and Technology – Productization & Commercialization Fund (HAMLE). Website
  - TUBİTAK – R&D Funds. Website
  - Ministry of Transport and Infrastructure -R&D Funds. Website
  - KOSGEB – Infrastructure Fund. Website

HTK HABERLEŞME TEKNOLOJİLERİ KÜMELENMESİ

GTENT

5GTR Forum

The voice of the European industry for the development and evolution of 5G

- Description: New Generation Mobile Communication Technologies Turkey Forum (5GTR Forum) was jointly set up in 2016 by the *Ministry of Transport and Infrastructure* and *Information and Communication Technologies Authority* to prioritize identifying objectives and roadmaps; establishing an environment for joint work and cooperation between all the institutions, organizations and companies in the ecosystem; providing a domestic environment for the production of high quality products and services, and creating a platform for exchange of information and experience in 5G and beyond communication technologies, in line with strategic goals of Turkey for localization of new generation technologies.
  - Public bodies in charge:
    - Ministry of Transport and Infrastructure
    - Information and Communication Technologies Authority (BTK)
  - Further information:
    - 5GTR Forum

5GTR Forum - Whitepaper

The voice of the European industry for the development and evolution of 5G

- Description: The initial work of the 5GTR Forum on the priorities, strategies and roadmaps of Turkey for 5G and beyond technologies are summarized in the whitepaper published in 2018. The content is structured to match the actual working principles of the forum, which has specific workgroups for (1) The Core Network (2) The Physical Network (3) Services and Applications (4) Standardization. Funding mechanisms discussion is also part of the publication.
  - Public bodies in charge:
    - Information and Communication Technologies Authority (BTK)
  - Further information:
    - 5GTR Forum Whitepaper

The voice of the European industry for the development and evolution of 5G

United Kingdom

UK Government Launches New £5bn 'Project Gigabit'

The voice of the European industry for the development and evolution of 5G

More than one million hard to reach homes and businesses will have next generation gigabit broadband built to them in the first phase of a £5 billion government infrastructure project.

Some details regarding the plan are:

- First areas to benefit from £5bn government funding for fastest broadband connections to help recovery from the pandemic, growth and levelling up
- Extra £210m worth of vouchers released to help those with slow speeds
- £110m to connect up to 7,000 rural GP surgeries, libraries and schools
- Call for evidence on using satellite and **5G technology to connect very hard to reach areas**

Information webpage

Project Gigabit Delivery Plan

Autumn 2021 Update

UK Government's 5G Testbeds and Trials Programme

- The government's nationally coordinated programme of investment in 5G
- Already completed **8 projects** and have over **30 more projects up** and running in 34 counties across 13 regions across the UK, with around **200 project partners**
- Supporting over **10** new and emerging **equipment vendors** and testing new access technologies in a range of trials to help broaden and secure the UK's telecom supply chain in line with the government's diversification strategy

- Further information: [UK Government Guidance page on 5G Testbeds and Trials Programme]

Digital Connectivity Infrastructure Accelerator

The voice of the European industry for the development and evolution of 5G

The accelerated rollout of advanced wireless networks, including 5G, will bring benefits to the UK economy and communities across the country. There are a number of challenges in deployment of wireless networks, and this project specifically explores those involved in using publicly owned infrastructure assets to support the roll out of advanced wireless connectivity.

Street lamps and bus shelters to help boost 5G roll out in £4 million trial

- £4m competition will explore ways to make it simpler and quicker for mobile companies to use publicly-owned buildings and curbside infrastructure - such as CCTV poles and traffic signals - to host 5G radio equipment
- Two-year project to ramp up use of street furniture and public buildings to host 5G radio kit
- Project could see CCTV poles, traffic signals and other roadside infrastructure used to boost coverage

Webpage link

Press release

The voice of the European industry for the development and evolution of 5G

5G/B5G/6G Activities conducted by Private Companies and Other Public Bodies

Belgium: 5G for vehicular and drone comms

- Description: Vehicular communication (EU and national funds). Various funded projects related to vehicular and drone communication use cases for 5G.

- Public body in charge: national funding agencies
  - FWO: www.fwo.be
  - VLAIO: www.vlaio.be

- Smart Highway
- SErVO

- More information: Drone communication (national funds):
  - Omnidrone, website
  - HAI-SCS, website
  - ICON 5GUARDS, website

Belgium: 5G H2020 projects awarded

The voice of the European industry for the development and evolution of 5G

- Description: Universities and research centra quite active in beyond 5G research: DEDICAT 6G; VITAL-5G; DAEMON; MARSAL; REINDEER; HERMES. Imec's research programme on 'above 100 GHz' [1]

- Public body in charge:
  - H2020
  - Imec.be

- More information:

[1] Scalable and energy-efficient 6G devices, research program

Belgium: 5G National projects

The voice of the European industry for the development and evolution of 5G

- Description: New Flemish collaborative initiatives between academic and industrial research partners for 5G research innovation starting in Q1 2022 [1] [2]:
  - **5GECO**: 5G intelligent radio and transport Edge network Cross-Optimization
  - **VaArch5G**: Validated Architectures using private 5G for teleoperation, collaborative operation for drones/AGVs
- Public body in charge:
  - ICON program imec [1]
  - ICON program Flanders Make [2]
- More information:

[1] https://www.imec-int.com/en/icon

[2] https://www.flandersmake.be/en/research/research-types/icon

Belgium: 5G deployments

- First 5G light network launched in 30 municipalities by Proximus
  - Refarming of 2.1 GHz bands
  - 10% of Flanders covered [1]

- Private & public 5G deployment in Brussels Airport
  - By CityMesh and Proximus

- 5G for the port of Antwerp
  - For drones, autonomous ships
  - By Orange

Port of Antwerp

[1] https://www.proximus.be/support/en/id_sfaqr_map_network_5g/personal/support/internet/internet-on-the-go/surf-on-5g-4g-or-3g/5g-network-coverage-map.html

Finland: 6G Flagship Ecosystem (cont'd)

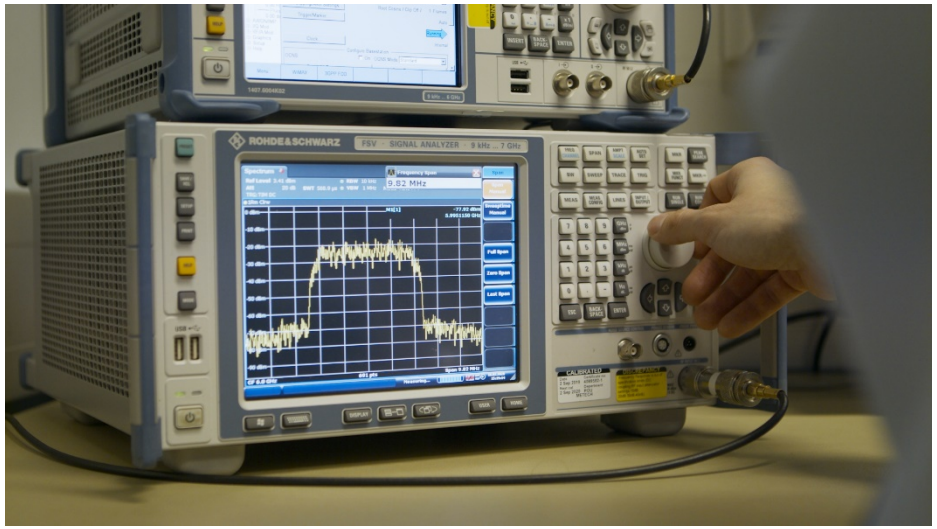
The voice of the European industry for the development and evolution of 5G

- Description: The Academy of Finland funded 6G Flagship project is part of Finnish Flagship Programme. The 6G Flagship is focusing on development of wireless technologies, exploring the implementation 5G and development of the technologies to enable 6G and 6G standard. The Flagship goals include to support speeding up the digitalization in society and industry in bringing the 5G standard to the commercialisation stage by carrying out large pilots with a test network. The 6G Flagship is led by University of Oulu and public ecosystem partners include Aalto University, BusinessOulu, Oulu University of Applied Sciences and VTT Ltd.
- Public bodies in charge:
  - Finnish Academy
  - University of Oulu
- Further information:
  - 6G Flagship initiative, website

Finland: Future Wireless Research Infra Initiative

The voice of the European industry for the development and evolution of 5G

- Description: FUWIRI (FUture Wireless Research Infrastructure) is research infrastructure development initiative for Beyond 5G and 6G research. The funded development project support investments for education, research and development platform for future wireless technologies, and is partially funded by the Academy of Finland together with participating organizations, Aalto University, Tampere University, University of Oulu and VTT Ltd.
- Public bodies in charge:
  - Aalto University
  - Tampere University
  - University of Oulu
  - VTT Ltd
- Further information:
  - Research Infrastructures programme



Germany: 5G Deployment, update since 2020

The voice of the European industry for the development and evolution of 5G

- In Germany 5G bands are available for commercial use since two years. In particular:
  - **700 MHz band** Telefonica (O2), Vodafone.
  - **1.8 GHz Band (new in 2021)** Telefonica (O2), Vodafone.
  - **2.1 GHz Band (new in 2021)** DT.
  - **3.5 GHz band** Telefonica (O2), DT, Vodafone.

- 3G networks from Vodafone and DT have been switched off
- Coverage (area and % of the population) varies depending on the operator, the claim is that 80% of the population will be covered by 5G services at the end of 2021.
- In 2021 the first 5G Stand-alone networks have been launched.

Germany: Non-Public Networks (LTE & 5G)

The voice of the European industry for the development and evolution of 5G

- According to a recent report from GSA*, Germany can account for the 14.3% (i.e., 110 out of the 775) of the worldwide number of entities that are listed to have deployed an LTE or a 5G private networks; those 110 can be split according to the sectors as follows:
  - 10 Utility
  - 20 Academia and research centers
  - 25 Communication
  - 25 Manufacturing
  - 30 Others

  Figures above do stress the importance of NPN deployment in Germany, among the first countries to allocated dedicated NPN spectrum in the world.

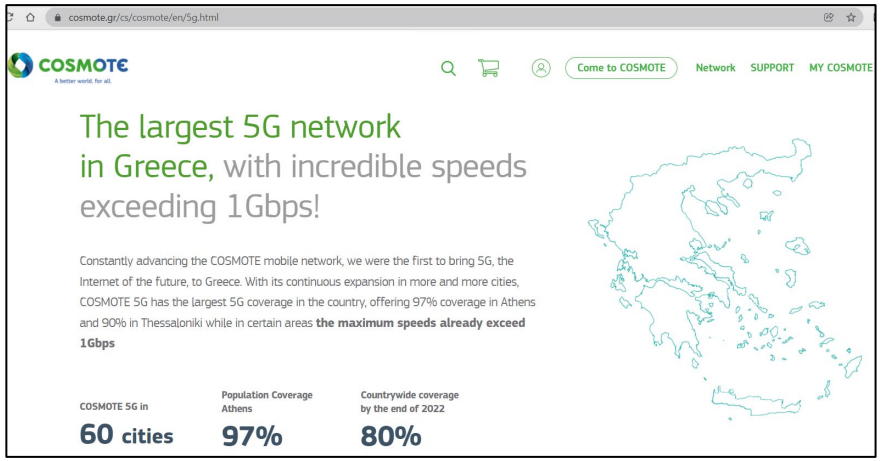
* Source: “Private Mobile Networks: Members report“ (Nov 2021), GSA, available at: gsacom.com

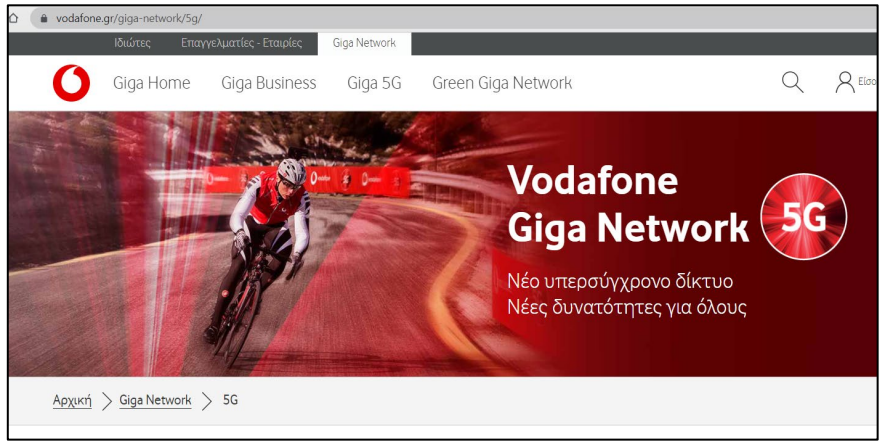
Greece: 5G deployment status

The voice of the European industry for the development and evolution of 5G

- Description: All three telecommunication providers have advanced their networks, bringing 5G in Greece.
  - 5G is currently provided in large Greek cities, through 5G devices.

- Further information:
  - Cosmote
  - WIND
  - Vodafone



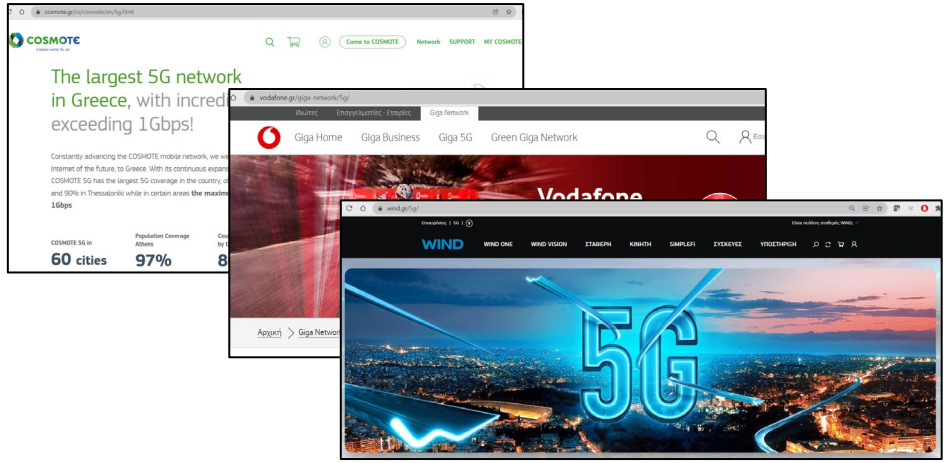


Greece: 5G deployment status (cont'd)

The voice of the European industry for the development and evolution of 5G

- Description:
  - Cosmote has converted 60% of their network in 5G in Greece (2021), aiming at reaching 80% by the end of 2022.
    - Athens' 5G network has been 97% 5G converted.
    - Thessaloniki's 5G network has been 90% 5G converted.
  - Vodafone aims at reaching 40% 5G coverage by March 2022
    - 23 major Greek cities have been 5G converted.
  - WIND aims at releasing the entire 5G spectrum by the end of 2022.
    - The company will start the process of 5G transition in June 2022.

- Further information:
  - Cosmote
  - WIND
  - Vodafone



Poland: private 5G deployments

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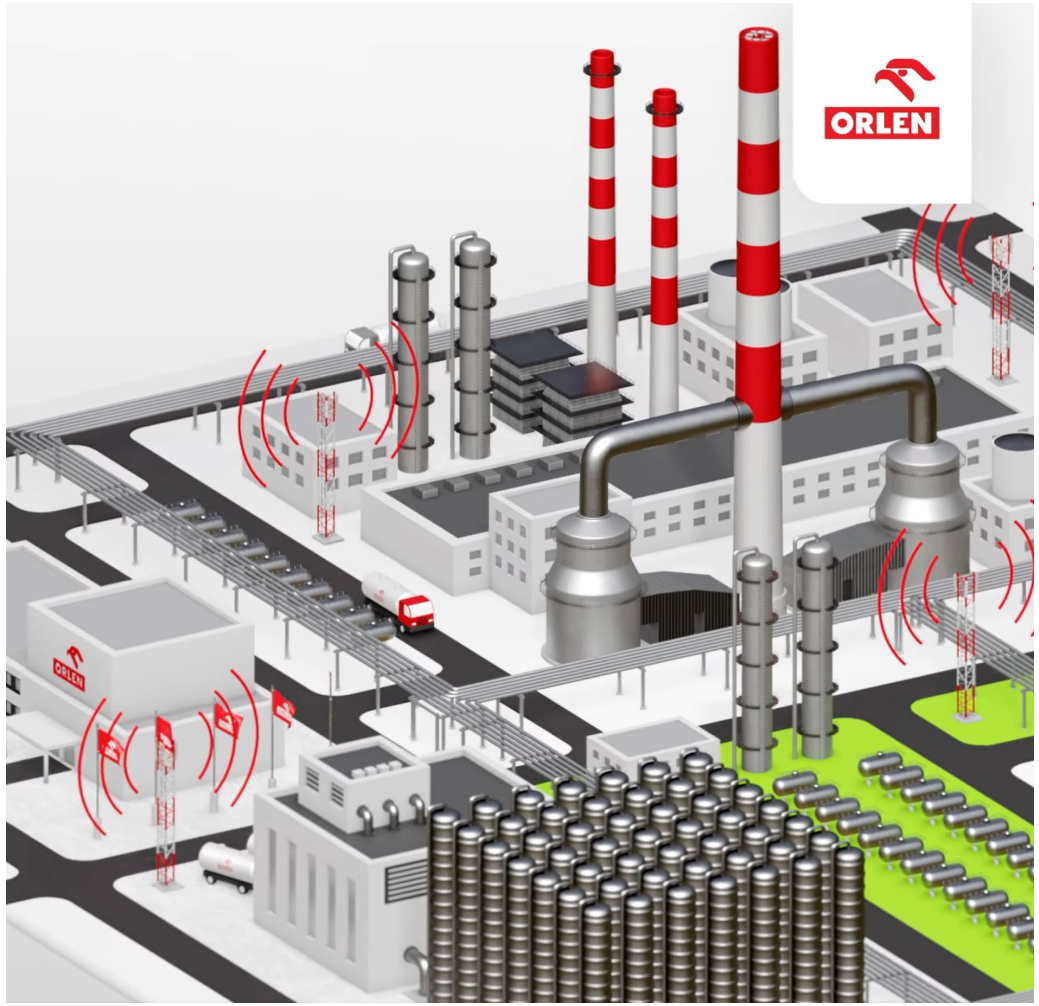
- PKN Orlen is testing the first private (industrial) 5G network in Poland

PKN Orlen – the largest oil & gas company in CEE region

- 5G NSA (80 MHz n78 + 5 MHz B20) launched: October 2021
- 5G SA (80 MHz n78 + 5 MHz n20) to be launched soon



Poland: 5G/B5G/6G Initiatives

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- **#Polish 5G**: The concept of establishing one wholesale operator of a nationwide PPDR (Public Protection and Disaster Relief) network in the 5G standard, operating in the 700 MHz band. The project is lead by EXATEL S.A.

  www.exatel.pl/en/

- **5G Competence Centre:** The 5G Competence Centre has been established at Lodz University of Technology. It will provide support to enterprises in working on new services and technologies. A pilot network, funded by the Ministry of Development was launched in May this year at the Lodz University of Technology.

  https://centrumkompetencji5g.pl/en/

- **5G lab in Łódź**: In the Lodz Special Economic Zone (SEZ) the first 5G campus for start-ups in Poland has been created. Thanks to it, young technology companies can take advantage of modern infrastructure, which was created by the Lodz SEZ in cooperation with partners: Orange, Ericsson, UKE.

  www.startupspark.io

Romania: 5G Lab in Bucharest

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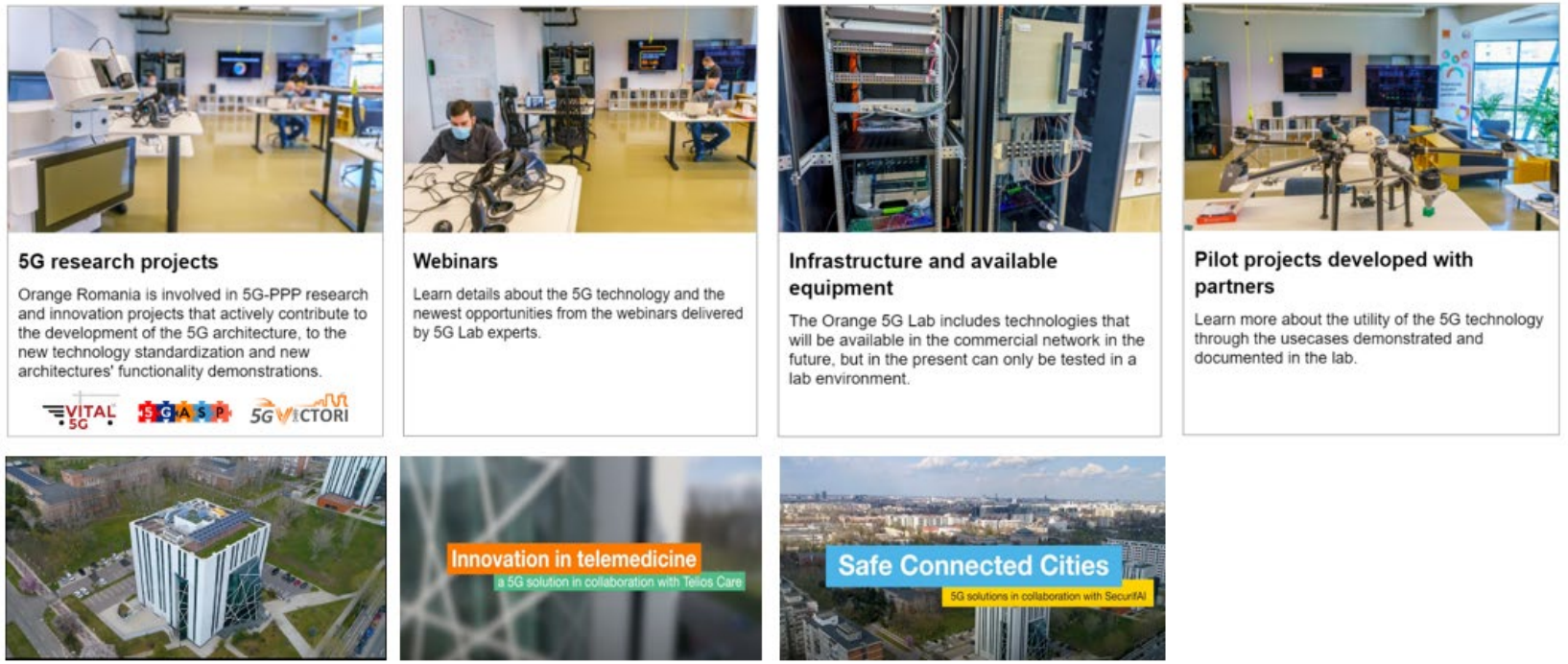
- Description: Targeting academic research labs, start-ups, SMEs and large companies that design and develop innovative services and solutions, using the benefits of 5G developed in partnership with the UPB CAMPUS Research Institute



- Further information:
  - 5glab.orange.ro , futurenetworks.upb.ro

Romania: verticals piloting 5G services & NetApps

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- Description:

Continental Automotive
Autonomous driving in order to reduce distance between trucks, and reduce the fuel consumption by 25%

PROTV 4K media live broadcast @ Euro 2020 trophy tour
5G live transmissions from crowded areas like concerts & stadiums, or on the go.

Bosch Romania C-V2X
teams up with OBS to test custom features for automated vehicles using C-V2X communication via 5G commercial network

Navrom @ Galati port Data-enabled assisted navigation in severe weather/water conditions
Remote inspection, fraud detection, insurance. KPIs: Increased safety, electronic map accuracy
VITAL-5G: Vertical Innovations in Transport And Logistics over 5G experimentation facilities (H2020, GA #101016567)

Alba Iulia Municipality Safety and security in public transport
Real time infotainment services in mobile environment, AI recognition and identification of emergency situation, prioritized communication to C&CC
5G-VICTORI: Vertical demos over common large scale field Trials for rail, energy and media industries (H2020, GA #857201)

Sweden: 5G for Health Care in North Sweden

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Description: A project funded by EU Regional Development Fund, Region Norbotten, and Luleå Municipalties is exploring the use of wireless technologies, in particular, 5G to support innovation. Among the initiatives is 5G for Health Care in North Sweden, with the aim to develop end test health care applications powered by 5G

Public body in charge:

- Luleå Technical University
- Centrum för distans-överbyggande teknik

Further information:

- https://wirelessinnovationarena.se/english-41316771
- https://wirelessinnovationarena.se/5g-f%C3%B6r-v%C3%A5rd-omsorg-43832653

Turkey: 5G Valley Open Test Site

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- Description: Information and Communication Technologies Authority (BTK), jointly with the academia (Middle East Technical University, Bilkent University and Hacettepe University) and the mobile network operators (Turkcell, Vodafone and Turk Telekom), set up an open test site in Ankara, where the R&D, product developments and tests of new communication technologies can be conducted.
  - The aim is offer a platform, which creates R&D opportunities and enables public, university, operator and industry collaborations for all parties like academics, researchers, Ph.D. students and start-ups that work on 5G and Beyond Technologies.
  - A «5G and beyond joint graduate support programme» is launched to serve as an examplary industry-academy collaboration within the valley, whereby outstanding graduate students from the universities are employed and mentored by the three operators throughout their graduate studies.
- Public bodies in charge:
  - Information and Communication Technologies Authority (BTK)
- Further information:
  - 5G Valley Open Test Site

UK: Testbeds and Trials Funded Projects

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CoMP-O-RAN

- A consortium led by *Dense Air Limited* succeeded in securing funding from the '*Future RAN competition – Diversifying the 5G Supply Chain' run by the Department of Digital, Culture, Media and Sport (DCMS)'*
- This was the latest open competition from 5G Testbeds and Trials Program, allocating £30 million of R&D funding to projects that support the goals of the government's **5G Supply Chain Diversification Strategy**
- The competition aimed at helping to incentivise industry to create new products and services to unlock the full potential of Open RAN.
- Funding: £4,732,473.

Best of British RAN (Radio Access Network)

- Aim: Demonstrating a commercial and technically viable RAN architecture designed, developed and manufactured in the UK.
- Serving private, local gvt. and industrial owned networks which operate shared and local access spectrum through the development of a small cell within a disaggregated Open RAN network.
- Around 150 units will be deployed to deliver a range of 5G services in existing test and trial locations in Liverpool, the Chalke Valley and other suburban/rural test beds established in earlier 5G RCC and Create projects as well as sites with commercially delivered backhaul seeking improved mobile connectivity.
- Funding: £4,957,149

Further information on funded projects by UK Govt's Testbeds and Trials Program on *UK5G Innovation Network webpage*

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Conclusions and Key Takeaways

Highlights and Key Takeaways

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- Additional 5G auctions planned/conducted: Belgium (2022), Serbia (2022), Norway (2021), Poland (2022, 2023), Romania (2022), The Netherlands (2022).
- Spectrum auctions for private networks have taken place/are being considered for the 3800 MHz and/or 25 GHz bands (e.g., Sweden, Germany, Norway, Turkey). Consultations planned in others (e.g., Poland).
- Allocation of frequency bands for trials and tests, non-commercial use, and R&D activities often available free-of-charge and on a temporary basis.
- All Member States have developed strategies/roadmaps for 5G deployment, and their evolution towards B5G/6G networks in the 2020-2025 timeframe. In some cases (e.g., Nordic countries, Franco-German Calls), transnational collaboration is envisaged.
- Several R&D programmes on 6G/B5G networks already launched with the support of EU's Recovery Funds (e.g., UNICO I+D, Spain; Sustainable Growth Program, Finland); or national funds (e.g., 6G Research Hubs, Germany; Turkey).

Highlights and Key Takeaways

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- Calls for Proposals aimed to strengthen telecom network sovereignty and Important Projects of Common EU Interest launched (e.g., in France), and to boost deployment in hard-to-reach areas or publicly-owned infrastructure (e.g., UK, Italy).
- Funding aimed to support 5G start-ups and SMEs available in some countries (e.g., Greece, Spain).
- 5G open innovation ecosystems, technological clusters, platforms 5G cities and digital innovation hubs supported by/planned in many countries (e.g., Finland, Spain, France, Norway, Germany, Netherlands, Turkey, Luxembourg), with strong participation of vertical industries.
- New initiatives for raising awareness, networking, know-how exchange foresight: Gigabit Academy (Austria), Connecting Tomorrow conference (Luxemborug), 5GTR Forum (Turkey), Strategy for the Promotion of 5G (Spain).
- Very high number of R&D projects, testbeds, and labs addressing beyond 5G networks in combination with AI, and IoT supported national/EU funding. Large involvement of both private companies and public bodies.

Thank you for your attention!

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