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## *5G: European Roadmap, Global Impact*



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## Workshop Proposal

*2<sup>nd</sup> Edition of the 5GPPP Workshop on*

*5G PHY/ MAC Layers Design and Hardware*

*Aspects Below and Above 6 GHz*



- **Proposers' Names, Institutions, Emails, Phone Numbers**

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- **Proposers' CVs**

	<p><b>Dr. Frank Schaich, Nokia-Bell-Labs, Germany</b>          Frank Schaich received his Dipl.-Ing. degree in electrical engineering from the University of Stuttgart. 2007 he joined Alcatel-Lucent's wireless access physical layer group. Dr. Schaich served as work package leader for the European Union's FP7 projects PHYDYAS and ACCORDANCE. Recently he has been active on developing solutions for next generation of wireless communication systems in 5GNOW and METIS. Dr. Schaich acts as coordinator for the 5G-PPP project FANTASTIC-5G.</p>
	<p><b>Dr. Salah Eddine Elayoubi, Orange, France</b>          Salah Eddine Elayoubi received the Ph.D. and habilitation degrees from University Paris 6, France, in 2004 and 2009, respectively. Since 2004, he is working at Orange Labs. He acts as a work package leader in 5G PPP METIS-II project and he is also the technical manager of the 5G-PPP project FANTASTIC-5G. His current research interests include the design of the 5G network and the traffic management in mobile networks in general.</p>
	<p><b>Pd Dr. habil. Gerhard Wunder, Heinrich Hertz Institute, FU Berlin, Germany</b>          Gerhard Wunder received his graduate degree and Ph.D. degrees from TU Berlin in 1999 and 2003, respectively. In 2007, he also received the habilitation degree (venia legendi) and became a Privatdozent at the TU Berlin. Currently, he is also with the Fraunhofer Heinrich-Hertz-Institut in Berlin. Dr. Wunder is coordinator in the FP7 projects 5GNOW and PROPHYLAXE (<a href="http://www.ict-prophylaxe.de">www.ict-prophylaxe.de</a>). In 2011 he received the award for outstanding scientific publication by the German communication engineering society (ITG). Recently, he has become a Heisenberg fellow of the DFG, granted for the first time to a communication engineer, and heads the Heisenberg Communications and Information Theory Group at the FU Berlin.</p>

	<p><b>Dipl.-Ing. Michael Färber, Intel Deutschland, Deutschland</b></p> <p>Michael Färber received his degree from “FH der DBP” 1985, and joined Siemens as RF engineer. Michael started 1990 in ETSI SMG2 on GSM standardization. 1995 he did GPRS concept work and was elected vice-chairman of SMG2. 1998 he was chairman of the EDGE group. He served 10 years as vice-chairman for the GSM physical layer group. Since 2007 he was with NSN, active for HSPA evolution and LTE. Michael participated in EU FP7 ARTIST4G as WP leader. Michael joined Intel 2012. Michael is Intel’s Director EU wireless research for 5G EU activities, and coordinator of the FP 8 Flex5Gware project.</p>
	<p><b>Tapio Rautio, VTT, Finland</b></p> <p>Tapio Rautio received his M.Sc. degree in electrical engineering and Lic.Sc. degree in telecommunications from University of Oulu, Finland, in 1989 and 1994, respectively. He has been working at VTT Technical Research Centre of Finland in Oulu since 1994. He has participated and led a number of industrial contract research projects considering baseband processing and digital RF processing architecture design and evaluation for wireless products. He is leading the work package WP4 (Digital front-end and hardware/software function split) of Flex5Gware.</p>
	<p><b>Dr. Miquel Payaró, CTTC, Spain</b></p> <p>Miquel Payaró received the Ph.D. degree from the Universitat Politècnica de Catalunya in 2007. From February 2007 to December 2008 he was a Research Associate at the Hong Kong University of Science and Technology. Since January 2009 he is with CTTC where, in 2013, he became a Senior Researcher and was appointed the Head of the Communications Technologies Division. Miquel has led several research contracts with the industry and also has participated in publicly funded research projects (FP7, H2020), e.g., BuNGee, BeFEMTO or Newcom#. Miquel is serving as Technical Manager in the 5G-PPP project Flex5Gware.</p>
	<p><b>Dr. Valerio Frascolla, Intel Deutschland, Germany</b></p> <p>Valerio Frascolla received the PhD degree in Electronic Engineering from Ancona University, Italy, in 2004. Since then he worked in different roles at Ancona University, Comneon, Infineon and Intel, where he is funding and innovation manager. His main research interest is 5G system design, with main focus on mmWaves and Mobile Edge Computing technologies. Valerio is involved 5G standardization and pre-development as well as in several H2020 projects (mmMAGIC, 5G-MiEdge, SPEED-5G, FUTEBOL, 5G Champion) serving as consortium manager (dissemination-, WP-lead) and technical contributor.</p>

- **Projects**

**FANTASTIC-5G** is the 5GPPP New Air interface project below 6GHz. It has been recently evaluated by the EC in the intermediate review with the highest possible outcome. FANTASTIC-5G has provided more than 30 significant contributions to the ongoing 5G standardization in 3GPP, more than 16 patents have been filed and the consortium and its partners have published more than 50 papers in the first half of the project.

**SPEED-5G** is a 5G-PPP project which aims to achieve a significantly better exploitation of heterogeneous wireless technologies in forthcoming 5G networks. To achieve this goal, SPEED-5G will develop new techniques for optimizing spectrum utilization, focusing on enhanced dynamic spectrum access techniques, and novel algorithms at the Radio Resource Management and MAC layers in both UE and small cells.

**Flex5GWare**’s main objective is to pin point specific implementation challenges for 5G hardware (HW) and software (SW) platforms targeting both network elements and devices. In particular, Flex5Gware is focusing on providing a proof-of-concept (PoC) of the key building blocks that 5G HW/SW platforms will be composed of. With its 11 PoCs, Flex5Gware covers the whole value chain of

5G platforms: starting from the antenna, RF modules and mixed signal stages and going up to digital HW and SW aspects.

- **Workshop Title**

*2ed Edition of the 5GPPP Workshop on 5G PHY/MAC Layers Design and Hardware Aspects Below and Above 6 GHz*

- **Motivation and Background**

The air interfaces for 2G, 3G, and 4G were all designed for specific use cases (limited only to voice and data communications) with a certain number of limited KPIs in mind (throughput, capacity, dropped/blocked call rates, etc.). However, 5G requires the support of a much broader class of services and consequently a very diverse family of devices and traffic characteristics.

The scope of this workshop is to present the major conclusions and results of the FANTASTIC-5G, SPEED-5G and Flex5GWare projects on the design of the new 5G air interface. This will specifically include the findings regarding 5G new waveforms, flexible air interface for the 5G vertical market, coexistence issues, flexible and adaptive novel MAC design, and a much more dynamic management of the available spectrum resources and advanced sensing techniques. In addition, the workshop will present enabling technology solutions for massive machine-type communication, ultra-reliable communications as well as mobile broadband with FDD and TDD providing 7-10x higher spectral efficiency over LTE 4x4! Eventually, the workshop will highlight implementation issues of the new 5G air interface for bands below and above 6 GHz, which will pose stringent requirements on the hardware platforms. For this reason, an important topic in this workshop is related to new concepts and solutions for highly performant, energy efficient and flexible hardware (both analogue and digital) in 5G networks.

- **Structure**

The workshop shall include

- 1-2 keynotes and invited speeches from the European industry and academia (outside 5GPPP)
- Technical paper presentations (oral and/or poster presentation, depending on the number of submissions)
- Panel discussion (members from industry and academia mainly outside 5GPPP to initiate **controversial discussions**)
- Potentially demonstrators (e.g. in the form of software visualization of 5G RAN design concepts). There will be an interaction with the **both presence** of the organizing projects.

- **Duration**

Half-day

- **TPC**

The TPC will be setup upon acceptance of the workshop proposal. It will be ensured that the TPC is well balanced in terms of industry and academia, as well as in terms of geographical distribution across Europe and projects.

- **Previous Editions**

There was a previous edition of this workshop at the EuCNC 2016 in Athens.

- **Specific Promotion**

The promotion of this workshop will be carried out through the big network of partners that are involved in the three 5G-PPP projects that organize this workshop (FANTASTIC-5G, SPEED-5G and Flex5Gware) and **by a specific website**. Specifically, each partner (and the researchers affiliated to it) will be requested to circulate the information related to this workshop among his/her contacts. Given, the wide coverage within Europe of the partners in these three projects, this will ensure that a big audience will be reached. In addition to the promotion made through the partners in the three organizing projects, the large companies involved in this workshop proposal (**Intel, Nokia, Orange**) and the key research institutions (**CTTC, HHI, VTT**) are and have been involved as key partners in many other research projects related to the topic of this workshop.