Report on the R&D as for the 5G Mobile Communications Technologies in Europe

(Summary)

NICT Europe Center
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General Summary

PART I : the R&D promotion policy for 5G in Europe - 5G-PPP and 5GIC -

5G-PPP (5G Public and Private Partnership) has strongly promoted the 5G R&D in EU level, while “national” R&D promotion policies for 5G are not as remarkable as 5G-PPP in Europe. For instance, in France, there are calls for 5G R&D by ANR (L’Agence Nationale de la Recherche), the French research promotion organization, but the French government has not taken strong initiative for 5G R&D yet. In Britain, a big research centre for 5G, 5G Innovation Centre (5GIC), was founded in 2012 (before 5G-PPP) in the University of Surrey with a huge grant from the Higher Education Funding Council for England and some global companies (about 60 million pounds). But 5GIC also might be under 5G-PPP. So, 5G-PPP is very influential in Europe.

Founded in December 2013, 5G-PPP is a 1.4 billion euro (700 million euro from the European Union side and 700 million euro from private side) joint initiative between the European Commission and 5G infrastructure Association (composed by European and International big IT companies, telecom operators, research organisations and SMEs), for aiding 5G R&D in Europe through Horizon 2020 (2014 -2020), a European large research promotion program. Most of 5G-PPP partners, which are telecom operators and ICT vendors, have also participated into METIS project (from November 2012 to April 2015) financed by FP7 (the Seventh Framework Program : 2007 - 2013), the last European large research promotion program. So, 5G-PPP is profoundly related to METIS project. In addition to European companies, non-European ones, for example, Japanese, Korean and American ones, are also partners of 5G-PPP and METIS project. So, 5G-PPP is very international 5G R&D promotion policy. However, so far, many European research organizations haven’t participated into 5G-PPP.

There are not only positive opinions to 5G-PPP. Some European researchers criticize that the European Commission has given too much power to big companies in Horizon 2020 compared to FP7. They have blocked 5G-PPP, and there is not enough place for SMEs and research organizations. So, it is very difficult to propose other projects than ones proposed by big companies, and it will prevent a diversity of 5G R&D in Europe. The big companies succeeded in lobbying for the European Commission, which doesn’t trust European research institutions. So, 5G-PPP is very powerful, but it’s also possible to say that 5G R&D is not completely unified by 5G-PPP in Europe.

In 5GIC, the University of Surrey, international companies, European telecom operators, BBC and OFCOM work together to develop 5G technologies and standards. 5GIC is a big European research project for 5G like FP7 METIS project. This British research centre has seven research areas (Content and User/Network Context, New Physical Layer, Light MAC and RRM, Multi-cell Joint Processing, Antennas and Propagation, System Architecture and Coexistence and Test-bed & Proof of Concept). It has not participated into METIS and 5G-PPP, but it might join in 5G-PPP in near future.

PART II : the 5G R&D situation in Europe – the R&D activities for 5G in Telecom Paris Tech and FP7 projects for 5

In Telecom Paris Tech, which is a very famous French organization for higher education and research in telecommunication sector, Dr. Marceau Coupechoux is conducting research on 5G, for example, performance evaluation of future cellular networks (performance evaluation for cellular relay, communication in 28 GHz bands etc), spectrum management and cognitive radio technologies (License Shared Access and sensing technologies), spectrum resource management for cellular networks (interference problem in small cell networks), green cellular networks (including sustainable energy, in particular solar energy), quality of video in wireless communication networks. According to him, cognitive radio technologies will have a leading role for 5G.

In February of 2013, The European Commission considered several projects of FP7 like METIS, 5GNOW, iJOIN, MCN, COMBO, MOTO and PHYLAWS as 5G or beyond 4G research projects.

Project title acronyme	Research period	Total budget (EU contribution)	Coordinator	The number of participant
METIS	November 2012 – April 2015 (30 months)	26,753,537 euro (15,885,000 euro)	Ericsson (Sweden)	28
MiWaveS	January 2014 – December 2016 (36 months)	11,349,195 euro (7,358,113 euro)	CEA-LETI (France)	14
MOTO	November 2012 – October 2015 (36 months)	4,386,408 euro (2,872,000 euro)	Thales communications & security (France)	11
5GNOW	September 2012 – February 2015 (30 months)	3,526,991 euro (249,0997 euro)	Fraunhofer - Gesellschaft (Germany)	6
iJOIN	November 2012 – April 2015 (30 months)	5,714,635 euro (3,6890,00 euro)	IMDEA Networks (Spain)	12
MAMMOET	January 2014 - December 2016 (24 months)	4,384,904 euro (3,047,000 euro)	Technikon (Austria)	8
MCN	November 2012 – October 2015 (36 months)	15,700,000 euro (10,400,000 euro)	SAP (Germany)	18
COMBO	January 2013 – December 2015 (24 months)	11,171,419 euro (7,449,000 euro)	JCP Consult (France)	16
PHYLAWS	November 2012 – October 2015 (36 months)	4,066,970 euro (2,810,186 euro)	Thales communications & security (France)	5

PART III : 5G and energy consumption

ICT and energy consumption have two kinds of relationship. On the one hand, ICT is now an only sector where energy consumption keeps increasing, on the other hand, ICT can contribute to reduce energy consumption by monitoring it thanks to Smart Home, Smart City and Smart Grid technologies. In Europe, energy consumption is one of the big issues for 5G R&D. In the KPIs (Key Performance Indicators) for 5G defined by 5G-PPP, the second one is "Saving up to 90% of energy per service provided. The main focus will be in mobile". And reducing energy consumption is a very important target in Horizon 2020. In France, there was an international workshop for green wireless networks in October 2014, where European stakeholders talked about their vision and research for 5G and energy consumption.

PART IV : the Spectrum Policy for 5G in Europe

Data traffic is increasing, and will go on increasing because of new communication technologies, for example, Internet of Things. So, the use of higher than 6 GHz bands and the introduction of new spectrum use systems are considered for 5G in the world. As regards the use of higher bands, many European researchers think the use of higher than 6 GHz bands is necessary for 5G, and they have already started their research for these bands, for example, millimetres wave bands. As regards new spectrum use systems, the combination of exclusive license, spectrum use without license like WiFi and spectrum sharing (License Shared Access) is under examination for 5G in Europe. Some European researchers think spectrum sharing is a political, legal or business solution rather than technical one. In November 2014, there was a first EU workshop on spectrum planning for 5G. The use of higher than 6 GHz bands is a common opinion among European stakeholders, however, many problems have not been resolved yet, for example, consecutive spectrum bloc for 5G, digital divide, License Shared Access etc. Spectrum harmonization for 5G has just started in Europe, and it will accelerate after the World Radio Conference in 2015 (WRC-15) organised by ITU (the International Telecommunication Union).