# D2.2: Intermediate Standardization and Dissemination Activity Report

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## Abstract

This deliverable presents a public summary of the dissemination and standardization achievements for the first year of the SPEED-5G project, and the plan for the remaining part of the project.
Document revision history

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Executive Summary

This deliverable presents the public summary of the dissemination and standardization achievements during the first year of the SPEED-5G project lifetime, and plan for the remaining part of the project. The main achievements with regard to dissemination, standardization and regulatory bodies during the first year are:

- SPEED-5G has launched the project website which serves as a central source of information for partners, target audiences, and as an interface to the general public. SPEED-5G has published two newsletters, and social media presence is achieved through Twitter, Facebook, and Google+ page.

- SPEED-5G effectively disseminated scientific and technical results through publications in high-impact international journals and conferences. Four articles have been published in major IEEE journals, eight papers in IEEE conferences, and two standardization contributions, along with several Special Issues, workshops, and talks.

- Regarding regulatory bodies, SPEED-5G has defined a list of regulatory bodies to engage with during the lifetime of the project. Therefore, during the first year, SPEED-5G has had meetings with Ofcom (UK) and Ofcom (Switzerland).

- In the remaining part of the project, we will organize a summer school for PhD students and research engineers, in which individual project partners will give advanced tutorials on their respective areas of expertise within the research topics investigated by SPEED-5G. We will continue to publish in IEEE Journals, at conference, and contribute to standardization.

- The alignment of SPEED-5G's concepts and technologies with the potentially ongoing parallel work in relevant standardization bodies.

- The proposing of modifications and enhancements to regulatory requirements based on the results of the project.
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## Abbreviations

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<th>Description</th>
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<tr>
<td>3GPP</td>
<td>The 3rd Generation Partnership Project</td>
</tr>
<tr>
<td>ANFR</td>
<td>Agence nationale des fréquences</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
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<tr>
<td>ECC</td>
<td>Electronic Communication Committee</td>
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<tr>
<td>FBMC</td>
<td>Filter Bank MultiCarrier</td>
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<tr>
<td>HetNets</td>
<td>Heterogeneous Networks</td>
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<tr>
<td>IP</td>
<td>Internet Protocol</td>
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<tr>
<td>MNO</td>
<td>Mobile Network Operator</td>
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<td>NESCOM</td>
<td>New Standard Committee</td>
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<tr>
<td>OFDM</td>
<td>Orthogonal Frequency Multiplexing</td>
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<tr>
<td>RAN</td>
<td>Radio Access Network</td>
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<tr>
<td>SA</td>
<td>Service and system Aspect</td>
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<tr>
<td>SDOs</td>
<td>Standards Developing Organisations</td>
</tr>
<tr>
<td>SON</td>
<td>Self-Optimizing Networks</td>
</tr>
<tr>
<td>WG</td>
<td>Work Group</td>
</tr>
<tr>
<td>WRC</td>
<td>World Radio Communication Conference</td>
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</table>
1 Dissemination

1.1 Public Dissemination

The SPEED-5G partners are committed to disseminating information on the SPEED-5G activities and results to the interested public throughout the duration of the project. In this effort, the project partners particularly aim at a number of relevant target audiences, supporting the overall impact of the project.

These target audiences include, but are not limited to, the 5G PPP community, including other related 5G projects, the ICT network community, and regulatory bodies. Any type of publicity, including conferences, seminars and promotional material, specify that the project has received EC research funding and display the EU emblem.

Publications and other dissemination material include a statement, as acknowledgement that the work was generated with the financial support of the EC.

As channels for dissemination, the project has been using both online and offline communication channels.

1.1.1 Project website

The project’s website is available at: https://speed-5g.eu/. The website serves as a central source of information for partners, target audiences and as an interface to the general public.

The project’s website is being developed and regularly updated throughout the project and contains announcements of workshops and other events where we are presenting our results, information about project meetings, publishing delivered public reports, etc. All publishable material and reports are made available online, as they are produced.
1.1.2 Newsletters, Printed and Online Press

Throughout the duration of the project we will publish a bi-annual newsletter, containing information on relevant project activities, results achieved as well as past and upcoming events.

By July 2016, SPEED-5G had already published two e-mail newsletters, in December 2015 and June 2016, which are available for download in pdf format via the newsletter page on the SPEED-5G website at https://speed-5g.eu/news/newsletter/.

Furthermore, the SPEED-5G team makes an effort in contacting relevant media in order to inform the press about major results and events.

As industrial partners are involved in the project, dedicated articles in professional magazines will be published in the future as the project progresses; these articles will be referred to via the Publications page of the SPEED-5G website at https://speed-5g.eu/.
1.1.3 Information Material

Short video clips will be created throughout the project simulation and testbed demonstrations. Video material made will be used as dissemination material, communicating SPEED-5G results at different events.

Dissemination material (leaflets, brochures and posters) are being created so we can distribute it when we attend different conferences, workshops, relevant meetings etc. The project’s flyer [2] serves the purpose of introducing the SPEED-5G project to the public: its motivation, vision, objectives, SPEED-5G architecture and relevant information about the consortium.

For distribution of project information material, EU channels can be used as well to increase visibility of our project (EU publications, press briefings, EU webs, newsletters etc.). Success stories of SPEED-5G can be published with the help of CORDIS Technology Market place as well.

1.1.4 Social media

Social media presence is achieved through Twitter, Facebook and Google+ pages. For now, they are used as dissemination channel for news about the project (e.g., dates of project meetings, etc.). We expect that in the future, Twitter or blog posts will also be used to disseminate relevant information, as well as a YouTube channel for short videos that will be produced throughout project demonstrations.

SPEED-5G has an active Twitter channel under https://twitter.com/speed_5g with currently 73 followers.
1.2 Target Groups

SPEED-5G’s target groups are closely related to the target audiences who shall be reached via dissemination activities. In order to achieve maximum impact with the given resources, SPEED-5G is focusing its dissemination activities on four main target audiences:

1. Standards developing organisations (SDOs)
2. Regulators
3. Companies in the ICT industry and in vertical sectors
4. Scientific community in the 5G/ICT domain

1.3 Dissemination Channels

The SPEED-5G consortium is disseminating its achievements within the academic community by pursuing publications in top journals and conferences, organizing special sessions and tutorials at high-level international conferences such as ICASSP, EUSIPCO, CROWNCOM, VTC, WCNC, DySPAN, ICC, GLOBECOM, EuCNC etc., and plans to launch special issues in well-known journals such as the IEEE Wireless Magazine, IEEE journal of IoT and the IEEE Journal on Selected Areas in Communications. In particular, the SPEED-5G consortium has published four articles in major scientific journals in the first year of the project and at least eight papers in some of the most renowned IEEE conferences as shown in Figure 4. Standardization contributions are foreseen. Moreover, SPEED-5G plans to co-organize a summer and/or winter school, e.g., for PhD students and
research engineers from the industry, to spread the outputs of the SPEED-5G project and establish links to more and more outside partners.

Disseminations by Type

![Disseminations by Type](image)

*Figure 4: Disseminations channel*

We also intend to explore our close links to industrial networks like the Small Cell Forum (former Femto Cell Forum) and the NGMN that can be used as platforms to promote the ideas of the SPEED-5G project within the industrial research community and to acquire first-hand relevant feedbacks. Further activities for promoting the results of the SPEED-5G project within the industrial research community include seminar talks that shall be held at project related industrial conferences as, e.g., the LTE world summit. The consortium plans to release two or more white paper contributions over the project duration, framing the technical problem addressed by SPEED-5G.

SPEED-5G has a specific strategy to hold project meetings at the premises of national regulators, when possible.

### 1.3.1 External relations

The SPEED-5G consortium is proactively fostering a tight collaboration with other research project working on similar areas, especially those project funded by the European Union within the FP7 and the H2020 programmes. SPEED-5G is also very keen on answering in a positive manner to all joint EU projects collaboration offers, and to participate in special sessions and workshops, seen as an opportunity to exchange research ideas and results with other projects working on similar topics.

Moving along this direction, in the first year of the project SPEED-5G organized a special session (held at the EUCNC2016 conference in June) and a workshop (planned in September at the IEEE ISWCS conference) together with the FP7-funded projects ADEL and SOLDER. The synergies with those projects have been very successful and triggered interesting technical discussing regarding the different approached that each project has with respect to dynamic spectrum allocation and sharing techniques.

Further collaborations with research project will take place in the co-organization of a summer/winter school in October focusing on dynamic spectrum allocation and sharing topics, co-organized with the ADEL project and probably also with SOLDER.
Finally, in collaboration with the ADEL project, SPEED-5G presented at EUCNC2016 at standardization meeting a discussion paper with the target of disseminating to the broadest possible audience the results of the work done by the project in the use case and scenarios WP.

More details on these actions are to be found in the following sections.

1.4 Dissemination achievements in the first year of the project

The dissemination of SPEED-5G results to the research community is one of the key goals of the consortium. To achieve this, SPEED-5G partners follow a dissemination strategy which encompasses a number of different means, in order to ensure the highest possible impact. The strategy aims, once any relevant intellectual property rights (IPR) issue is secured, to promote the project results and ensure project awareness within both the European information and communication technology (ICS) and the global research communities. The SPEED-5G dissemination approach and mechanism have already been presented in D2.1 [1].

The following sections describe the planned and performed dissemination activities by the SPEED-5G partners within the first year (M1-M12).

1.4.1 Journal and Book Contributions

SPEED-5G targets to achieve dissemination activities in journals and magazines of all the main editorial houses, namely IEEE, Association for Computing Machinery (ACM), Elsevier, Springer, and Wiley. Such dissemination activities require time (preparation of first version of submission, reception of review comments, preparation of revised versions, final outcome). SPEED-5G also targets the preparation and contribution of special issues in journals and chapters in books.

SPEED-5G members have achieved the following submissions to Journals and Books (Table 1). More publications are currently under preparation, in order to showcase the research done and results produced within SPEED-5G.

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<th>Lead Partner</th>
<th>Contribution Title</th>
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<tr>
<td>IT, Portugal</td>
<td>Energy-efficient Interference Management in LTE-D2D Communication</td>
<td>IET Journal of Signal Processing</td>
<td>Published 2015-10-08</td>
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<td>WINGS</td>
<td>Resource Sharing in 5G Contexts: Current Status and Prospects</td>
<td>IEEE Vehicular Technology Magazine (VTM)</td>
<td>Accepted 2015-12-01</td>
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<tr>
<td>IT, Portugal</td>
<td>WiFi in Licensed Band (WiFi-Lic)</td>
<td>IEEE Communication Letter</td>
<td>Published 2016-02-01</td>
</tr>
<tr>
<td>UNIS</td>
<td>Licensed Spectrum Sharing Schemes for Mobile Operators: A Survey and tutorial</td>
<td>IEEE Communications Surveys &amp; Tutorials</td>
<td>Accepted 2016-06</td>
</tr>
<tr>
<td>EURESCOM</td>
<td>Quality of Service Provision and Capacity Expansion through Extended-DSA for 5G</td>
<td>Wiley “Transactions on Emerging Telecommunications Technologies”</td>
<td>Accepted</td>
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### Conference Contributions (Papers, Presentations, Posters)

The SPEED-5G partners have provided contributions and have presented their papers to major conferences. More specifically, the SPEED-5G conference contributions (papers, presentations and posters) that have been made so far are listed in Table 2.

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<th>Journal Name</th>
<th>Location</th>
<th>Date</th>
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<tr>
<td>UNIS</td>
<td>A Context-Aware User-Driven Framework for Network Selection in 5G Multi-RAT environments</td>
<td>IEEE Vehicular Technology Conference (VTC 2016-Fall)</td>
<td>Montreal, Canada</td>
<td>2016-09-18~21</td>
<td>Accepted 2016-07</td>
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<tr>
<td>CEA, LETI</td>
<td>IEEE 1900.7 Standard for White Space Dynamic Spectrum Access Radio Systems</td>
<td>2015 IEEE conference on Standards for Communications and Networking (CSCN)</td>
<td>Tokyo, Japan</td>
<td>2015</td>
<td>Published</td>
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<tr>
<td>EURESCOM</td>
<td>Quality of Service Provision and capacity Expansion through extended-DSA for 5G</td>
<td>Fourth International Workshop on Cloud Technologies and Energy Efficiency in Mobile Communication Networks (CLEEN 2016)</td>
<td>Grenoble, France</td>
<td>31 May 2016</td>
<td>Workshop Presentation Published</td>
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<tr>
<td>CEA, LETI</td>
<td>Dynamic spectrum</td>
<td>Fourth International</td>
<td>Grenoble, France</td>
<td>31 May 2016</td>
<td>Workshop Presentation</td>
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<td><strong>IT, Portugal</strong></td>
<td>Workshop on Cloud Technologies and Energy Efficiency in Mobile Communication Networks (CLEEN 2016)</td>
<td>Poitiers, France</td>
<td>17 July, 2016</td>
<td>Published</td>
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<td><strong>IT, Portugal</strong></td>
<td>Device-to-Device Assisted Mobile Cloud; Framework for 5G Networks</td>
<td>IEEE-INDIN 2016</td>
<td>Poitiers, France</td>
<td>Special Issue Accepted</td>
<td></td>
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<tr>
<td><strong>IT, Portugal</strong></td>
<td>Outage Probability Analysis for Device-to-Device System</td>
<td>IEEE ICC 2016</td>
<td>Kuala Lumpur</td>
<td>2016</td>
<td>Main track</td>
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<tr>
<td><strong>WINGS</strong></td>
<td>Flexible RRM/MAC solutions in a dense small cell environment: The SPEED-5G case</td>
<td>25th European Conference on Networks and Communications (EuCNC) 2016</td>
<td>Athens, Greece</td>
<td>27-30 June, 2016</td>
<td>Presented</td>
</tr>
<tr>
<td><strong>EURESCOM</strong></td>
<td>Quality of Service Provision and Capacity Expansion Through Extended-DSA for 5G</td>
<td>25th European Conference on Networks and Communications (EuCNC) 2016</td>
<td>Athens, Greece</td>
<td>27-30 June, 2016</td>
<td>Presented</td>
</tr>
<tr>
<td><strong>WINGS</strong></td>
<td>Interference and QoS Aware Channel Segregation for Heterogeneous Networks: A Preliminary Study</td>
<td>25th European Conference on Networks and Communications (EuCNC) 2016</td>
<td>Athens, Greece</td>
<td>27-30 June, 2016</td>
<td>Presented</td>
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Table 2: SPEED-5G conference activities

1.4.3 Organization of Special Issues/Workshops/talks

- IT, BT, and Intel are organizing a Special issue on "DYNAMIC SPECTRUM MANAGEMENT FOR 5G" for the IEEE Wireless Magazine.
- IT and Intel co-organized the workshop “Novel Waveform and MAC Design for 5G” at the IEEE WCNC'2016 conference.
- SPEED-5G has co-organized together with the funded projects ADEL and SOLDER the workshop “Spectrum Aggregation and Sharing for 5G Networks” at the IEEE ISWCS 2016 conference, to be held in September in Poland. During the workshop some contributions are planned from SPEED-5G, e.g. the paper “System design and autonomic RRM functionality for QoS provision and capacity expansions in the context of 5G”, and a panel attendance.
- SPEED-5G has co-organized together with the funded projects ADEL and SOLDER the special session “Dynamic spectrum management, a building block for 5G networks - A joint special session of the SPEED-5G, ADEL and SOLDER projects” at the EUCNC2016 conference, held in Athens in June 2016. The special session, co-organized by the three most important EU-funded projects currently working on different aspects of dynamic spectrum management, aggregation and sharing technologies, brought together well-known experts from the mentioned research fields in order to give the audience an overview of the state-of-the art, to disseminate the latest developments, and to discuss the future of those enabling technologies, in particular their potential impact on the forthcoming 5G systems. SPEED-5G’s contributions to the special session focussed on:
  - the overall organization of the event,
  - the keynote speech “Hype vs. Reality of DSA use cases”,
  - two invited talks: “System design and autonomic RRM functionality for QoS provision and capacity expansions in the context of 5G” and “Centralised Radio Resource Management for 5G small cells as LSA enabler”,
  - The planned panel participation (skipped due to the too long discussion during the first part of the special session).
- The special session was attended by a numerous audience and an interesting discussion on the 5G-enabling technologies in focus took place. The discussion and the questions from the audience were so many, that the planned panel at the end was skipped, substituted by a longer part of questions and answers targeted at the presented contributions from the three projects.
• On 1st October 2015, SPEED-5G organised a panel session at IEEE DySPAN 2015, which took place in Stockholm, Sweden, from 29 September to 2 October 2015. The title of the panel was: “Spectrum crunch below 6GHz? 5G trends”. In the panel, key experts from 5G-PPP projects presented and discussed their approaches for tackling the 5G spectrum challenges from different angles.

• On 28-29 September 2015, the METIS-II project organised a 5G-PPP cross-project workshop at Ericsson in Kista, Sweden. The workshop was dedicated to scenarios, requirements, performance evaluation, spectrum and Radio Access Network (RAN) design assumptions. SPEED-5G contributed to the workshop discussions very actively.

• On 28 September 2015, the first workshop day, WINGS presented scenarios, use cases, and requirements of SPEED-5G. He explained that the main objective of the project is to achieve a significantly better exploitation of heterogeneous wireless technologies. The use cases he presented included massive IoT (indoor/outdoor), broadband wireless (indoor/outdoor), reliable communications (indoor/outdoor), and high-speed mobility, like, for example, in vehicles on highways or high-speed trains.

• On 29 September, the second workshop day, SPEED-5G project coordinator from Sistelbanda presented scenarios and models for 5G performance evaluation in SPEED-5G. He explained that defining a proper validation framework is highly relevant for the 5G-PPP programme, as it allows having a common approach for providing results and mapping them to the defined KPIs.

• At the ICT 2015 event, which took place in Lisbon, Portugal, on 20-22 October 2015, SPEED-5G was represented as part of the exhibition stand of the 5G Infrastructure Public Private Partnership (5G-PPP). The stand attracted a considerable number of interested visitors. SPEED-5G project manager from Eurescom attended the stand and answered questions by visitors.

• Also SPEED-5G co-organized the Fourth International Workshop on Cloud Technologies and Energy Efficiency in Mobile Communication Networks (CLEEN 2016), which took place on 31 May 2016 in Grenoble. Other supporting projects were 5G NORMA and FLEX5GWARE. The workshop was part of the 11th EAI International Conference on Cognitive Radio Oriented Wireless Networks (CROWNCOM).

• During NMLRG workshop which took place in Athens in conjunction with EuCNC 2016 a presentation related to “Mobile network state characterization and prediction”. The presentation focused on machine learning techniques for various problems, but in terms of SPEED-5G there was explicit information on machine learning and prediction based solution to the complex problem of extensions to Dynamic Spectrum Access and radio resource management (RRM).

• During the 35th meeting of WWRF in Copenhagen, a presentation related to “Resource Sharing in 5G Contexts: Current Status and Prospects” was given. Some initial results on the impact of certain resource management decisions to the network performance were shown and published as well.

1.4.4 Organization of Demonstrations

1.4.4.1 CES 2016

CEA participated to the Consumer Electronics Show (CES) in Las Vegas, NV, USA in January 2016 with a demonstration booth located at the Eureka Park. The very first implementation of the IEEE 1900.7 standard for a wide-area, wireless network using FBMC on TVWS has been demonstrated, based on work performed in WP5 and on the FBMC baseline we assume in SPEED-5G. The demonstration is represented in Figure 5, displaying the demonstrator and the CEA's booth at the Eureka Park. The
demonstration shows flexible usage of the spectrum and excellent adjacent-channel interference control of the FBMC modulation used in the IEEE 1900.7 standard. The demonstration also shows how FBMC technology outperforms classic broadband multicarrier technology (OFDM), mixing the FBMC or OFDM signal to a DVB-T modulated video stream and measuring the interference on the latter.

![Figure 5: CEA’s demonstration and booth in Eureka Park of CES 2016 in Las Vegas, NV, USA](image)

Although it was focusing on TVWS and the implementation of the standard for applications like rural broadband access, industrial hot spots or small scale home networks, the scope of the demonstration has been extended to the upcoming trend of shared spectrum in 5G, linking with the main stream of activities of the SPEED-5G project.

### 1.4.4.2 5G Huddle 2016

At the 5G Huddle 2016 event [5] in London, which took place on 26-27 of April 2016, the SPEED-5G project partner WINGS ICT Solutions presented some of the latest project results. It included a live demonstration of SPEED-5G’s RRM/MAC solutions and their benefits. Specifically, the demonstration included a performance evaluation for allocating the best possible channel of all the available channels to users. This dynamic Channel selection was performed based on the minimal interference of each channel and some preliminary results were also presented.

![Figure 6: WINGS ICT Solutions simulation tool running SPEED-5G’s RRM/MAC solution](image)
Figure 6 illustrates the simulation tool running the specific RRM/MAC algorithm that was presented in the workshops/demonstrations session of the conference from WINGS. In addition, WINGS also participated in the panel which discussed the demonstrated outcomes of SPEED-5G and other demonstrators.

During the two-day conference, participants discussed the work that needs to be done in order to make the 5G vision a reality. The conference offered a platform to assess the outcomes of the recent World Radiocommunication Conference (WRC-15) in November 2015, and the spectrum that is needed to fuel 5G. Participants also sought to identify the unique challenges that lay ahead as we move towards wide-scale rollout by 2020.

![Image of Andreas Georgakopoulos and Ioannis-Prodromos Belikaidis from WINGS ICT Solutions presenting the SPEED-5G demonstration at 5G Huddle 2016.]

**Figure 7:** Andreas Georgakopoulos (left) and Ioannis-Prodromos Belikaidis (both from WINGS ICT Solutions), presenting the SPEED-5G demonstration at 5G Huddle 2016.

### 1.4.4.3 EuCNC 2016

SPEED-5G had also a demonstration booth in the EuCNC 2016 conference which took place in Athens, Greece, from 27th to 30th June 2016. Participants of the conference had the opportunity to acquire more information about the project and see the live demonstration on dynamic channel assignment. A project flyer, showing the most important project results achieved in the first year of the project, was printed in several copies that were at disposal of the booth visitors.

![Image of SPEED-5G booth in EuCNC 2016 Athens, Greece (27-30 June).]

**Figure 8:** SPEED-5G booth in EuCNC 2016 Athens, Greece (27-30 June).
1.4.5 SPEED-5G Referencing and Vision Propagation

SPEED-5G Project Management Team is analysing the project impact and the worldwide propagation of the vision. Three sources have been identified so far:

- References to SPEED-5G in articles, forum reports;
- References to SPEED-5G papers/authors in papers (e.g., IEEE papers);
- Consultation and access to SPEED-5G website.

It is expected that the SPEED-5G public website is referenced by:

- SPEED-5G partners’ portal;
- Research outcomes produced within the SPEED-5G.

1.4.5.1 SPEED-5G Public and Private Websites

The SPEED-5G website contains a public part that is accessible to all web users and always provides current information on the progress of the project to external community, and a private part dedicated the SPEED-5G consortium partners and only accessible using specific credentials.

The project website (https://speed-5g.eu/) was launched in July 2015. It displays the project goals, approach, achievements, dissemination documents, public deliverables, press releases, and all late-breaking progress and information to be easily and widely publicized. The SPEED-5G website front page is depicted in Figure 9.

Figure 9: SPEED-5G Public Website – Home Page

The SPEED-5G private platform, restricted to the consortium partners, is available directly at
https://bscw.5g-ppp.eu/pub. It has been online since July 2015. As displayed in Figure 10, the home page provides access to various folders (may evolve in the future) each containing data relating to the overall project management and operation. From this menu each user can browse and upload/download information.

![Image of SPEED-5G Information Management Platform – Front Page in BSCW](image)

**Figure 10: SPEED-5G Information Management Platform – Front Page in BSCW**

### 1.5 Dissemination plan for the remaining part of the project

1) Academic targets:
   - The partners plan to continue to disseminate their accomplishments within SPEED-5G through scientific publications in top journals and conferences. In case that it may take a long time before the papers are formally published in journals, they will be made public on the open access website arxiv.org. In general, special attention will be given to public access to these publications, through the project website.
   - Organize special sessions/workshops and tutorials in reputed international conferences
   - In the second year of the project, we will organize a summer school for PhD students and research engineers, in which individual project partners will give advanced tutorials on their respective areas of expertise within the research topics investigated by SPEED-5G.
   - Launch special issues in most influencing journals such as the IEEE Wireless Magazine and the IEEE Journal on Selected Areas in Communications.
   - Good opportunities for disseminating part of the SPEED-5G work will be: IEEE DySPAN 2017, Mobile World Congress 2017, VTC-Spring 2017 and the 2017 edition of the European Conference on Networks and Communications (EUCNC’2017). In order to increase SPEED-5G visibility, during 2017 we intend to submit papers to the most respected conferences focusing on dynamic spectrum access topics, e.g. CROWNCOM and IEEE ICC.

2) Participation to European events:
   - We will continue to contribute to dissemination efforts at European events such as the EuCNC or RAS Cluster meetings, events that are organized by the Commission to exhibit the research results in ICT projects.

3) Communication to the general public:
   - We will work on communicating the project’s accomplishments and aspirations to the general public. This goal will be pursued through articles in the national press, interviews
with radio stations and participation to industrial exhibitions and general public science fairs.

- Some SPEED-5G academics might get solicited for interviews on topics of their specialization that appear in national specialized magazines, on national radio and even on national TV.
2 Standardization and regulatory bodies activities

Regarding standardisation bodies, the industry will play the major role in the 5GPPP Infrastructure with respect to the necessary long-term investment in global standardization and the integration of technological contributions into complex interoperable systems. The results of the SPEED-5G project will be suitable for global standardization in bodies like 3GPP, IEEE, IETF and industry forums like Small Cell Forum.

An equally important part in an effective 5G systems deployment is played by regulatory bodies Here again industrial partners will play a key role in ensuring a fruitful engagement with relevant regulatory bodies, by asking for meetings during which it will be explained and presented the main achievements of the SPEED-5G project.

2.1 Contributions to Standards

The main targets for engaging and impacting standards bodies in the first year of the project have been the Small Cell Forum, the 3GPP (The 3rd Generation Partnership Project) bodies and the IEEE group 1900.7.

2.1.1 Small Cell Forum

SPEED-5G is monitoring and attending to Small Cell Forum activities focusing on 5G. For example, last September, at the 3GPP 5G workshop in Phoenix, the Small Cell Forum identified priorities that will be critical in shaping the roadmap for 5G networks. The Forum outlined the issues, options and requirements on which its members are working, and which could smooth the path to the introduction of 5G. The workshop was organized by the 3GPP RAN group, the standardization body responsible for mobile network specifications across 2G, 3G, 4G/LTE, and upcoming 5G standards.

The Small Cell Forum recommended that 3GPP leverage the Small Cell Forum learnings that address potential solutions to existing barriers to the commercialisation of 4G Heterogeneous Networks (HetNets):

- 5G needs flexible options for multi-vendor access virtualization over medium latency (2-6 ms) and high latency (10-30 ms) transport networks
- Recommend to architect a multi-operator/neutral host support in 5G for an accelerated deployment
- 5G needs to evolve the established API/service framework to enable a faster time to market and an effective commercialisation of new or enhanced services

In this sense the Small Cell Forum has been working actively in guiding the deployment of HetNets, as well as proposing a suitable and effective migration path to 5G systems. As result a Small Cell Forum Release 7 document was published in June 2016 [6]. Release 7 focuses on HetNet and SON (self-optimizing networks), which mobile operators have identified as central capabilities of their next generation networks. A recent research [7] indicates that over 80% of MNOs will deploy non-residential small cells and SON by 2020, as part of a HetNet program, and over 40% will start during 2016. The Release 7 provides a detailed technical and commercial blueprint for deploying a HetNet – which the Forum defines as a “multi-x environment – multi-technology, multi-domain, multi-spectrum, multi-operator and multi-vendor” [6]. It provides tools and best practices to ease the path to this multi-x network, and to start implementing technologies which will also be part of 5G. HetNets and 5G are inherently based around density and small cells and the Forum’s members have unrivalled experience in this areas. Over 14 million small cells have been deployed to date and roll-out is accelerating with enterprise and urban densification, to support rising data usage and new MNO revenue models.
2.1.2 3GPP (The 3rd Generation Partnership Project)

Regarding 3GPP Service and System Aspects (SA) groups, at the latest 3GPP SA Work Group (WG) 1 standardization meeting #74, held in Venice on 9-13 May 2016, Intel presented on behalf of the SPEED-5G consortium the document S1-161308 [8], a discussion paper entitled “Enhanced spectrum access use cases for 5G systems: the vision of the European funded projects ADEL and SPEED-5G”. It is linked to the just finished in June 2016 Release 14 Feasibility Study Item called SMARTER (New Services and Markets Technology Enablers) [9]. The discussion paper was devised and created as a collaboration among the two EU-funded projects SPEED-5G and ADEL, and it aimed at disseminating the work done in SPEED-5G on 5G use cases, scenarios and related KPIs, providing some useful insights and details also on deployment scenarios.

The document was well received by the 3GPP group. It was noted in the meeting minutes, and several interesting discussions followed offline, mainly focusing on clarifying some aspects of the proposed deployment scenarios.

2.1.3 IEEE 1900.7

SPEED-5G has actively participated in the publication of the first standard on radio interface for whitespace dynamic spectrum access using FBMC physical layer where CEA has provided a major contribution both on the specifications of PHY and MAC layers. The standard has been approved in December 2015 and published on February 2016 ([10]).

Provided the WG has completed the first standardisation cycle with this publication of IEEE, there has been an opportunity to start a new cycle with the proposal of an amendment so that the current standard could be improved. Thanks to the CEA attendance, SPEED-5G has proposed an amendment to modify mostly the MAC layer of the standard in order to allow for QoS support. Different QoS classes have been defined, along the SPEED-5G scenarios on IoT, Extreme Mobile Broadband and Ultra-Reliable Communications and proposals of standard modifications have been put across. A Project Authorisation Request (PAR, see the IEEE process [11]) has been proposed by CEA, which has been accepted by the WG on February 24th 2016 [12]. The IEEE DYSSPAN committee has also accepted the PAR. In the IEEE process, the PAR has to be proposed by DYSSPAN committee to the IEEE-SA Standards Board for its acceptance by the New Standard Committee (NESCO). As of today, we still do not know the status of this ongoing process.

In the next months, the standardisation activities which are currently still in an early stage in defining the 5G systems, like 3GPP and IEEE, will increase the speed of work and therefore there might be more opportunities for SPEED-5G to demonstrate its main obtained results in 5G relevant areas, especially regarding RAN activities.

2.2 Contributions to Regulations

Regarding regulatory bodies, SPEED-5G has defined a list of regulatory bodies to engage with during the lifetime of the project. The main selected targets have been ECO, Ofcom (UK) and ANFR (FR). Others possible regulatory bodies are now under discussion at the consortium (e.g. Ficora (FI), Spanish regulatory body etc).

2.2.1 Ofcom UK

A SPEED-5G delegation, composed of a subset of the consortium partners (Intel, WINGS, IT, BT, UNIS, Intracom Telecom, CEA, and SistelBanda) visited in February 2016 Ofcom’s premises in London. The meeting took more than half a day and was very fruitful. Ofcom personnel expressed the intention to engage a periodic alignment with the SPEED-5G consortium, especially as they recognized the importance of the topics addressed and the timely relevance of the issues in focus. A follow-up
meeting at the end of the project is currently planned, to be held in the second half of 2017 or beginning of 2018.

A list of 15 questions was shared beforehand with Ofcom, so to drive the discussing during the meeting towards topic areas of interest of SPEED-5G, as well as to both give Ofcom more information about what was the main interest of the consortium and to give them the time to prepare accordingly for a fruitful discussion. A comprehensive meeting report is available in the project internal website (available on request) [13]. Summarizing the main outcome of the discussion held, the following points can be listed:

- The main outcome of the World Radio Communication Conference (WRC) in November 2015 was to identify the bands for further studies.
- Goal of WRC2015 was to find an agreement among the players worldwide to find a common approach for economies of scale. The goal was not reached; discussions will go on at WRC19.
- Regarding mmWave bands, on bands above 6GHz, not all services will/can be deployed in mmWave bands. WRC2015 selected 7 bands for further studies in the next years, and in WRC2019 there will be a decision on which one to select for 5G access. Some regions (US and Korea) have been active proponents of other bands (28GHz) but no consensus could be found in WRC2015.
- Harmonization is important, at least in EU, as single countries are too small to be able to provide an impact by their own.
- mmWave bands versus under-6GHz bands: Ofcom is worried that main technology development will focus on mmWave, neglecting/putting at risk further innovation at bands below 6GHz.
- Ofcom has specific initiatives to investigate bands usage in 5G, internally and with international scope.

Finally, it is worth mentioning that several topics were found of common interest and a series of documents were exchanged between the SPEED-5G consortium and Ofcom.

2.2.2 Swiss Ofcom

Two consortium partners, BT and Intel, organized a conference call with the regulatory body of the Switzerland, called “Swiss Ofcom”. Among the several touched topics, spectrum management and harmonisation issues were discussed, where harmonisation between 6 and 28GHz was described as difficult but necessary.

An agreed-upon all the participants meeting minutes can be found in the following.

15 March 2016, 11am to noon CET.

On the call were Alexandre Kholod from Swiss Ofcom, Michael Fitch from BT, and Valerio Frascolla from Intel.

After introductions, we went through some questions that had been

1. With all the hype on mmWave bands, do you foresee close-future changes to the availability of bands below 6GHz? And to bands between 6GHz and 30 GHz?
   - The bands below 6 GHz will be still of interest for the mobile operators because of their propagation characteristics. Currently there is more opportunity to harmonize worldwide or regionally in the spectrum below 6GHz than there is between 6 and 30GHz, for example the C band 3.6 to 3.8GHz that is identified for IMT in Europe but not in RoW. Harmonisation between 6 and 24GHz is difficult.
2. Is there any specific initiative within your institution to investigate bands usage in 5G? Do you have an internal research group working on such topics or do you lean on external results?

- Ofcom Swiss has no research group on 5G, being a small administration they cannot cover all issues and often need to rely on studies by others. However, they have technical experts who evaluate studies. There is no specific activity on 5G at present.

3. In what ways can EU-funded projects help your institution? Is it possible to foresee a joint collaboration on any specific topic?

- EC-funded projects have proved to be useful, for example the QoSMOS project on cognitive radio, because they look at things from different aspects. But to increase the impact and reduce the regulatory barriers, the results need to be communicated to CEPT groups. We asked whether Ofcom Swiss would consider joining a project as an advisory board member, and the response was yes, if relevant.

4. The World Radio Communication Conference (WRC) was held in November 2015. What are the most important decisions taken from your perspective? What the major still open points that could affect 5G?

- One important outcome was to allocate spectrum to cover aspects of aircraft safety (ICAO issue). Another was the good harmonisation in L-band 1427 – 1518MHz and also in C band 3.4 – 3.6GHz. But the conference did not produce as much harmonised spectrum for IMT as requested. Open points for 5G include constraints to protect incumbents, and there are lots of them including the military.

5. What is the plan of work for the preparation of WRC2019? Do you see any chance to impact the plan with the projects coming out of projects like SPEED-5G?

- Again I would say that impact on regulation and WRC would be achieved by presenting the project results through CEPT, especially new approaches to spectrum sharing that would allow more incumbents to use the same bands.

6. Is License Shared Access allowed or foreseen by your institution and are there specific bands you are considering for that, besides the 2.3GHz bands put across by GSMA? What would be the regulatory conditions for using those bands?

- We already consider use of “LSA-type” approach across many bands, to improve sharing with military for example. Thoughts need to be given on regulatory requirements such as, for example, to stop transmitting if the band is needed for national emergencies etc. Our emergency services mainly use Tetrapol based network but there are ongoing discussions to allow them access to 700MHz band, more information is in ECC report 219.

7. Along with LSA, are there any other interesting spectrum sharing models from your perspective, like Collective Use of Spectrum for instance?

- As far as CUS is concerned, already several bands are used simultaneously by various services, Radio Spectrum Policy Group has issued a respective report on this at a European level in 2011.

8. Is there any possibility, in the close future, that we can have cloud based type licensed sharing between operators, rather than to lease them spectrum permanently? In that case operators may lease the cloud and use spectrum according to scenario and traffic, thus having less costs and more range of bands.

- Personally I like this innovative approach, and my first reaction is that a main challenge is regulation, and that it will require a paradigm change.

9. W.r.t. licensed devices now using 5GHz unlicensed band (e.g. using LAA/LTE_U), is there any possibility that non-IMT devices can also use licensed band in a protected way (white space in licensed band)? That would bring a win-win situation for both IMT and non-IMT devices.
• It would be possible for non-IMT devices to share licensed bands, but they would need to prove that they can co-exist without causing harmful interference to existing services even under fault conditions. A recent example is the use of unlicensed devices using TV bands in the white spaces.

10. Transmit power in each spectrum is fixed now, is there any chance to adaptively change the power on each spectrum band, e.g. depending on scenario and traffic demand?
• There is usually an upper limit only, but there is also the requirement to protect other users of the band – and even under fault conditions other services still need to be protected.

11. Based also on the results of WRC’15, which is the Ofcom view on the trend for 5G access frequencies? We understand that there is an action point for WRC’19 to identify access frequencies above 20GHz. If 5G access will move to the 26, 28, 32 GHz zone, will consequently backhaul move to 42, 60, 80 or even 90 GHz?
• I have no view with regard to 5G access frequencies, and I think it is too early to speak of mmWave on backhaul frequencies. Obviously they need to co-exist. I do remember the Technical School in Zurich doing a successful trial of 100GHz links on a 1km transmission path.

12. What is the Ofcom view on the Full Duplex regulatory status?
• Any improvement in spectrum efficiency is welcome.

2.2.3 Plan for the second year of the project

Standardization targets:
• Continue to disseminate (under the umbrella of CRS-i) the SPEED-5G proposals in ETSI RRS WG1 meetings, Small Cell Forum, 3GPP RAN and SA groups (when the case) and follow-up on the IEEE1900.7 WG status with respect to the PAR we proposed.
• Keep monitoring and impacting all other relevant Standards Developing Organizations.

Interaction with regulatory bodies:
• The SPEED-5G project is in conversations with ECO and ANFR to find the right dates for a meeting.
• Continue to closely collaborate with Ofcom to promote SPEED-5G goals and results and push for the inclusion of SPEED-5G’s research in the spectrum management standards under development.
• We will contact wireless telecom operators and will continue the cooperation with the national wireless spectrum regulator to both promote SPEED-5G’s goals and results.
• We plan to contact again the regulation representative in UK, and if the opportunity arises, organize a 2nd session of presentation of the eDSA as seen by SPEED-5G. In general the plan is to continue the discussion with the English regulatory body.
• We plan to organize a meeting on current spectrum trends and policies, with representatives of FCC and other US and EU regulatory and industry bodies. The meeting will be relevant for SPEED-5G research outcomes dissemination within the context of LSA.
3 CONCLUSIONS

In this deliverable, we have presented a summary of the dissemination, standardization and regulatory bodies impact and of the main results achieved during the first year of the SPEED-5G project lifetime. This work has been carried out as part of WP2, specifically of task 2.3 called “Dissemination”.

The main conclusions of this Deliverable are as follows:

- SPEED-5G coordinated and pursued the dissemination of the research outcomes of the project to the academic and industrial scientific communities, in order to ultimately create impact on future dynamic spectrum management standards and products. The project’s website enabled the project members to share information and coordinate their work but also allowed for communication with the general public.

- We have published widely in international research conferences and journals, organized special sessions/workshops at recognized international conferences and special issues in top journals.

- Regarding regulatory bodies, SPEED-5G has defined a list of regulatory bodies to engage with during the lifetime of the project. Therefore, during first year, SPEED-5G have achieved meeting with Ofcom (UK) and Ofcom (Swiss).

- In the remaining part of the project, we will organize a summer school for PhD students and research engineers, in which individual project partners will give advanced tutorials on their respective areas of expertise within the research topics investigated by SPEED-5G.

- We also plan to participate in some industry-oriented exhibitions such as the annual Mobile World Congress or the LTE World Summit, 2017. Furthermore, we will explore our contacts to the relevant industrial networking organisations related to the SPEED-5G project (such as the Small Cell Forum) in order to offer joint activities as tutorial talks and exhibitions.

- Relevant project results will also be presented to regulatory bodies authorities in order to, possibly, influence their rulemaking towards more efficient usage of available spectrum, especially in preparation of the WRC2019.

- SPEED-5G has launched the project website which serves as a central source of information for partners, target audiences and as an interface to the general public. SPEED-5G has published 2 newsletters and social media presence is achieved through Twitter, Facebook, and Google+ page.
References

[12] IEEE 1900.7 PAR on PHY/MAC amendment on IEEE 1900.7-2015 standard for enhanced Quality of Service support https://mentor.ieee.org/1900.7/dcn/16/7-16-0006-02-CNTR-draft-1900-7a-par.docx (members only), February 2016.
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