SEVENTH FRAMEWORK PROGRAMME
Theme ICT-2009.1.1
The network of the future

Deliverable D6.3

Work Package 6 – Exploitation and Dissemination

D6.3 Final exploitation and dissemination report

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Revision history

Version	Author	Comments
0.1	István Z. Kovács	First draft and ToC
0.2	All	Inputs
0.3	István Z. Kovács	Combine inputs and clean-up
0.4	István Z. Kovács	Add 2nd IWPC text (by Guillaume)
0.5	Michael Dieudonné	Review and edits
1.0	István Z. Kovács	Final edit.

EXECUTIVE SUMMARY

The document addresses the most relevant achievements of the SAMURAI project under the main dissemination topics of: *Project website creation and maintenance*, *Industrial exploitation of results*, *Standardization and Intellectual Property*, *Industrial Dissemination and Exploitation*, *Scientific Dissemination* and *Academic Didactic Activities*.

The *project website* has been upgraded in November 2011 to use a new platform which allows better structuring of the information and management of the documents. The new project website had a relatively high number of visits per day during the Year 3.

In terms of *industrial dissemination and exploitation* all the industrial partners have contributed to various fora, internal and external, presenting the results and main findings of the SAMURAI project. In Year, 3 special focus has been given to the demonstrator platforms and their showcasing. Industrial partners have also participated in two workshops organized by the International Wireless Industry Consortium (IWPC) to further disseminate the joint SAMURAI project work and results.

In terms of *scientific dissemination*, several conference papers and journal papers have been generated by the project partners. In addition to technical presentations, the SAMURAI project has also showcased all three demonstrator platforms during the FUNEMS and WCNC workshops.

The timely research topics of the project have been the basis of several B.Sc., M.Sc. and Ph.D. student activities and theses at various academic partners of the consortium.

DISCLAIMER

The work associated with this report has been carried out in accordance with the highest technical standards and the SAMURAI partners have endeavoured to achieve the degree of accuracy and reliability appropriate to the work in question. However since the partners have no control over the use to which the information contained within the report is to be put by any other party, any other such party shall be deemed to have satisfied itself as to the suitability and reliability of the information in relation to any particular use, purpose or application.

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1 Introduction

This deliverable summarizes the Year 3 SAMURAI dissemination and exploitation activities. The Year 3 technical project deliverables contain the main findings and summary of the SAMURAI achievements [1]-[4].

The document is structured following the main task described in the project Technical Annex. Section 2 is dedicated to the description of the SAMURAI home page. Section 3 summarizes the main industrial exploitation activities with focus on the standardization and industrial dissemination. Section 4 lists the main publications generated by the project partners, submitted and/or accepted for publication in various IEEE conference papers or journals. Finally, Section 5 contains the workshops, exhibitions and cooperative actions that took place during the reporting period.

2 Project website creation and maintenance

The project website has been maintained and updated periodically at the URL http://www.ict-samurai.eu.

The layout of the SAMURAI portal contains:

- List of all partners
- Contact details
- List and short description of key achievements
- Project description
- News
- List of SAMURAI publications
- Deliverables, with download link to public ones
- Link to internal content management system (BSCW).

The website is maintained and updated by Eurecom. Usage statistics can be found in Figure 2-1 and Table 1.

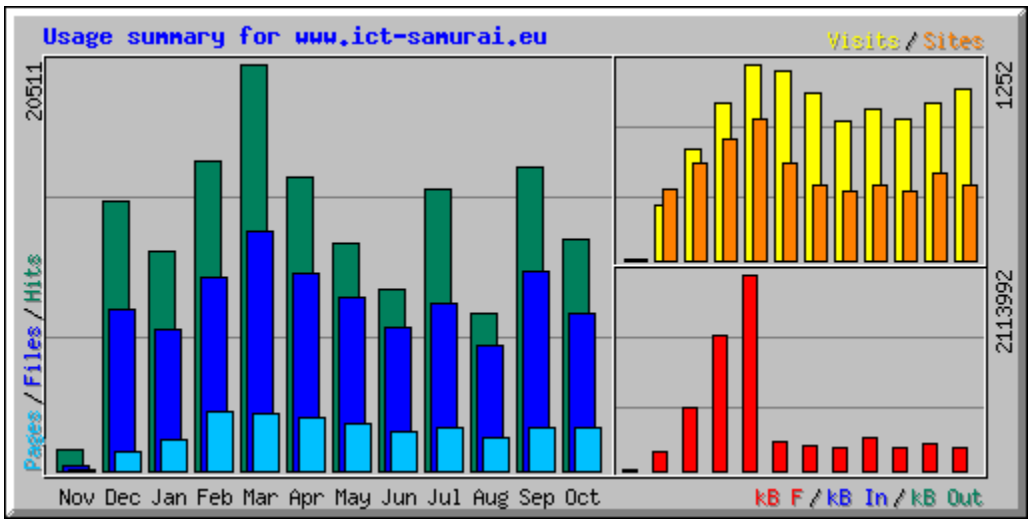

Figure 2-1: Usage Statistics for ict-samurai.eu for the period November 2011 – October 2012.

Summary by Month										
Month	Daily Avg					Monthly Totals				
	Hits	Files	Pages	Visits	Sites	kB F	Visits	Pages	Files	Hits
Oct 2012	486	329	89	45	482	248128	1095	2151	7907	11686
Sep 2012	510	335	71	33	550	283667	1004	2137	10071	15311
Aug 2012	256	204	54	28	438	254208	895	1685	6335	7955
Jul 2012	456	273	68	31	475	349006	965	2138	8474	14165
Jun 2012	305	239	64	29	442	255920	886	1924	7189	9179
May 2012	371	280	75	34	475	271692	1067	2336	8699	11512
Apr 2012	493	331	90	40	617	316015	1203	2710	9948	14813
Mar 2012	661	390	94	40	900	2113992	1252	2920	12098	20511
Feb 2012	537	335	103	34	776	1465269	999	2996	9723	15573
Jan 2012	356	231	49	22	622	675024	711	1541	7164	11050
Dec 2011	564	340	40	14	458	209727	347	977	8181	13546
Nov 2011	44	9	2	0	5	3065	5	63	221	1024
Totals						**6445707**	**10429**	**23578**	**96010**	**146325**

Table 1: Detailed usage statistics of ict-samurai.eu for the period November 2011 – October 2012.

3 Industrial exploitation of results

3.1 Standardization and Intellectual Property

3.1.1 3GPP LTE-Advanced status

In Year 3 the SAMURAI project has not contributed to the 3GPP LTE standardization activities.

3.1.2 MU-MIMO in 3GPP

The SAMURAI MU-MIMO topics were not targeted for standardization in 3GPP LTE/LTE-Advanced. However, MU-MIMO is a key research focus of the project including implementation specific network scheduling algorithms, user equipment receiver solutions, PoC implementation and CSI imperfections studies.

3.1.3 Carrier Aggregation – Autonomous Component Carrier Selection in 3GPP LTE

The Carrier Aggregation work item was frozen with the release 10. During Year 3, the standard has almost completed LTE Release 11, and LTE Release 12 has started. With respect to Carrier aggregation, new bands and band combinations have appeared, especially in RAN4. The work undergone in SAMURAI is thus perfectly suited and anticipated this trend of considering more and more CA as an important topic.

3.1.4 MU-MIMO and CA in IEEE

Little traction from the market was identified, to upgrade the existing WiMAX network to WiMAX 2 (WirelessMAN-Advanced) [5] - corresponding more or less to 3GPP LTE Release 10 - except, possibly in Japan where the frequency band licensing and regulations could be technology specific. Therefore, SAMURAI did not put effort to contribute to IEEE or WiMAX forum, but still has monitored what was on-going in these bodies.

In the Year 3 of the project, the trend of WiMAX Operators was to envisage transition towards TD-LTE. Therefore, the work undergone in SAMURAI – almost agnostic with respect to FDD or TDD version of 3GPP LTE - would apply to those kind of operators too.

3.2 Industrial dissemination

3.2.1 Nokia Siemens Networks

Internally in Nokia Siemens Networks, the SAMURAI project is part of the general framework of long-term research projects. Regular internal project

meetings have been organized where the SAMURAI results and status have been shared with other research groups within the company.

During Year 3, Nokia Siemens Networks has continued to disseminate and raise awareness on the SAMURAI work in internal technical seminars. Several internal demonstrations and presentations of the ACCS PoC developed in WP5 have been presented in the first half of 2012 in order to get feedback from radio and standardization experts. Additionally, the SAMURAI ACCS demonstrator work has also been presented as part of a technical seminar, jointly organized with Aalborg University with the participation of the Nokia Siemens Networks Head of CTO, Hossein Moiin.

The final ACCS PoC demonstration to be presented in the final SAMURAI technical project review to the European Commission is aligned as much as possible with the current 3GPP LTE-Advanced Release 12 "Carrier Based HetNet ICIC" proposals.

3.2.2 Agilent Technologies

The SAMURAI project is part of a general framework for long-term research within Agilent Technologies around future cellular communication schemes and their evolution. A key question to be answered internally is the impact of this evolution on the test and the test procedures. Regular internal project meetings were conducted where the results and status of SAMURAI were shared with other research technical staff members within the company. Additionally, the SAMURAI work has been presented as part of technical seminar to the Agilent Research group in Aalborg, Denmark and in the Rotselaar, Belgium facility.
Externally, Agilent has contributed to several papers and presentations from the SAMURAI project. We will also publish soon guidance on the CA test and procedures.

3.2.3 IMC

At IMC, regular internal project meetings and discussions have been organized where the SAMURAI results and status have been shared with other groups within the company. In the last year of the project, IMC have continued to disseminate and raise awareness on the SAMURAI work in internal technical seminars and workshops. SAMURAI solutions and results have been presented to Intel 3GPPP standardization group for their feedback.

3.3 Industrial Exploitation

3.3.1 **Sequans**

Sequans Communications is a SME having the goal to deliver to the market innovative chipset solutions to enable 4G mobile systems. The outcome of SAMURAI project are planned to be exploited in future products, such as for instance within the SQN31x0 (first generation) and SQN32x0 family (second generation of LTE chipsets).
During the last year, SEQ completed its activities mainly in WP3 and WP4. WP3 outcomes provided much better knowledge of CQI generation from the UE standpoint and contributed to improve the current implementation. In that respect, part of the project outcome was integrated in Sequans' chipset.
Regarding WP4, the effort dedicated to prototyping carrier aggregation on an existing WiMAX board provided a lot of knowhow and experience, which is currently being used in the development of the 32x0 chipset family, which will support carrier aggregation.

3.3.2 **IMC**

One of IMC's major competencies is Mobile Phone Platforms. In addition to baseband processors, radio frequency transceivers and power management chips as the classical semiconductor components, the know-how spectrum covers platforms for mobile phones, including software solutions. Thus, the outcome of SAMURAI project are planned to be exploited in IMC future products.
During the third year, IMC participated in final development of a MU-MIMO proof-of-concept and in demonstration activities at Eurecom Open Air interface platform. With MU-MIMO block assessment and evaluation in WP5, IMC completed its activities in third year of the project.

3.3.3 **Agilent Technologies**

One of the important goals of Agilent technologies within the SAMURAI project is to deliver to the market innovative test and measurement solutions for 4G mobile communication systems. Innovation is needed where the current platforms are unable to deliver the characterization and measurement solution needed to have proper telecommunication systems working. The outcome of SAMURAI project will be exploited in both the current and future feature products that are designed to accommodate both carrier aggregation and multi-user MIMO scenarios.

In WP4, technical enablers to support carrier aggregation were under investigation and have been included in the current and future test and measurement products.
Several hardware products have and will be touched by the SAMURAI outcome:

- Agilent's PXB which is also considered for proof of concept demonstration within the SAMURAI project.
- Agilent's MXG signal generators, also used in the proof of concepts.
- Agilent's PXA signal analyzers.

Figure 3-1: Agilent PXB.

Figure 3-2: Agilent MXG.

Figure 3-3: Agilent PXA.

For the software products, both system vue and signal studio have been augmented to support carrier aggregation signals and schemes.

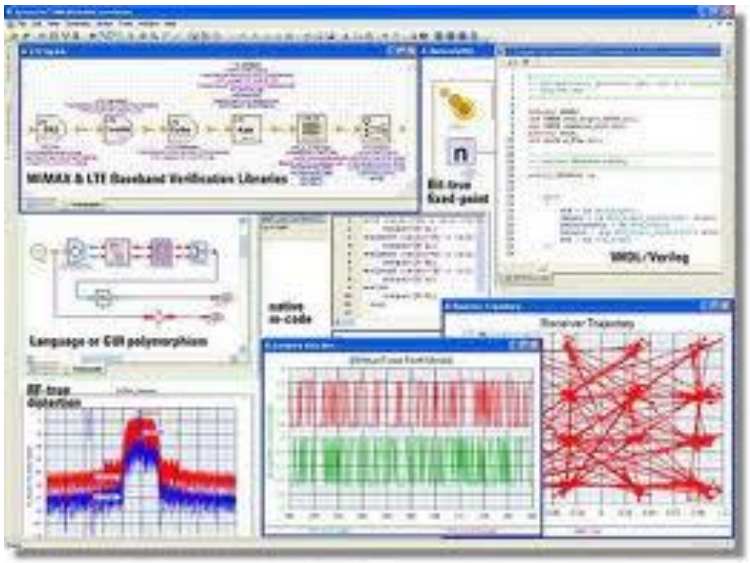

Figure 3-4: Agilent System vue software.

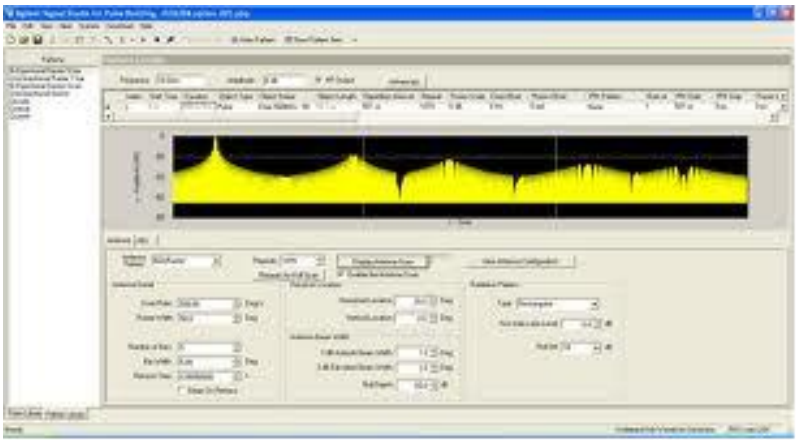

Figure 3-5: Agilent Signal studio.

3.3.4 Nokia Siemens Networks

The carrier aggregation feature is an important building block in LTE-Advanced (Release 10-12). Nokia Siemens Networks aims to provide advanced LTE network optimization and radio resource management solutions which take full advantage of carrier aggregation transmission

schemes in both downlink and uplink while minimizing the required radio signalling and user equipment energy consumption. Traffic management and load balancing mechanisms are envisioned to utilize the carrier aggregation schemes as an overall enabling feature.

Specifically targeting the large scale small-cell deployments, as part of the foreseen heterogeneous networks (HetNet) deployments, the carrier based ICIC schemes will be further developed and promoted by Nokia Siemens Networks. The learning from the SAMURAI ACCS studies and the PoC development jointly with Aalborg University will be used as references for the newly proposed schemes and solutions in 3GPP LTE Release 12.

4 Scientific Dissemination

4.1 Publications

4.1.1 Conference papers

4.1.1.1 Papers in proceedings, presented at conference

- Cattoni, Andrea Fabio; Nguyen, Hung Tuan; Duplicy, Jonathan; Tandur, Deepaknat; Badic, Biljana; Balraj, R.; Kaltenberger, Florian; Latif, Imran; Bhamri, Ankitt; Vivier, Guillame; Kovacs, Istvan; Horvat, Peter "Multi-User MIMO and Carrier Aggregation in 4G Systems: the SAMURAI Approach", *IEEE Wireless Communications and Networking Conference (WCNC 2012)*, Paris, France, April 2012. Workshop on 4G Mobile Radio Access Networks.
- Biljana Badic Rajarajan Balraj, Tobias Scholand, Zijian Bai, Stanislaus Iwelski "Impact of Feedback and User Pairing Schemes on Receiver Performance in MU-MIMO LTE Systems", IEEE Wireless Communications and Networking Conference (WCNC 2012), Paris, France, April 2012
- Imran Latif, Florian Kaltenberger, Raymond Knopp "Link Abstraction for Multi-User MIMO in LTE using Interference-Aware Receiver", IEEE Wireless Communications and Networking Conference (WCNC 2012), Paris, France, April 2012
- Biljana Badic Rajarajan Balraj, Tobias Scholand, Zijian Bai, Stanislaus Iwelski "Analysis of CQI prediction for MU-MIMO in LTE Systems", IEEE Vehicular Technology Conference (VTC2012-Spring), Yokohama, Japan, May, 2012
- Nguyen, Hung Tuan; Kovács, István Z. "Downlink Radio Resource Management for LTE-Advanced System with Combined MU-MIMO and Carrier Aggregation Features" , IEEE Vehicular Technology Conference (VTC2012-Spring), Yokohama, Japan, May, 2012

4.1.1.2 Papers presented at COST workshops

- Imran Latif, Florian Kaltenberger, Raymond Knopp, Joan Olmos, "Low Complexity Link Abstraction for Retransmission in LTE/LTE-Advanced with IR-HARQ", COST IC1004 scientific meeting, Sept. 24-26, Bristol, UK.
- Berardinelli, G., Tavares, F., Tonelli, O., Cattoni, A.F., Sørensen, T.B., Mogensen, P.E. (2012). Addressing practical challenges of DSA experimentation with URSP boards. Presented at the 3rd International Workshop of the COST Action IC0902: "Cognitive Radio and Networking for Cooperative Coexistence of Heterogeneous Wireless Networks", Ohrid, Macedonia.
- Buthler, J.L., Buhl, M., Le Moullec, Y., Berardinelli, G., Cattoni, A.F. (2012). Implementation of a FFT module on the FPGA of USRP2 boards. Presented at the 3rd International Workshop of the COST Action IC0902: "Cognitive Radio and Networking for Cooperative Coexistence of Heterogeneous Wireless Networks", Ohrid, Macedonia.

- Tavares, F., Tonelli, O., Berardinelli, G., Cattoni, A.F., Mogensen, P.E. (2012). ASGARD: the Aalborg University Cognitive Radio Software Platform for DSA experimentation. Presented at the 3rd International Workshop of the COST Action IC0902: "Cognitive Radio and Networking for Cooperative Coexistence of Heterogeneous Wireless Networks", Ohrid, Macedonia.

4.1.1.3 Papers with pending acceptance notification (preparation in 2012)

- Biljana Badic Rajarajan Balraj, Tobias Scholand, Zijian Bai, Stanislaus Iwelski, Guido Bruch, Peter Jung, "Analysis of interference-aware receivers in heterogeneous LTE networks", submitted to WCNC 2012, Oct.2012
- Maxime Guillaud and Florian Kaltenberger, "Towards Practical Channel Reciprocity Exploitation: Relative Calibration in the Presence of Frequency Offset," submitted to WCNC 2012, Oct.2012
- Imran Latif, Florian Kaltenberger, Raymond Knopp, and Joan Olmos, "Low Complexity Link Abstraction for Incremental Redundancy HARQ in LTE," submitted to WCNC 2012, Oct.2012
- Oscar Tonelli, Gilberto Berardinelli, Fernando M. L. Tavares, Andrea F. Cattoni,István Z. Kovács, Troels B. Sørensen, Petar Popovski and Preben E. Mogensen, "Experimental validation of a distributed algorithm for dynamic spectrum access in local area networks," submitted to VTC Spring 2012, Oct.

4.1.2 Journal papers

- Imran Latif, Florian Kaltenberger, Raymond Knopp, "Link Performance Prediction for Multi-User MIMO in LTE with Interference Aware Receivers", submitted to IEEE Transactions on Wireless Communications, October 2012.

4.1.2.1 Published journal papers

- L. Garcia, I. Kovacs, K.I. Pedersen, G. Costa, P.E. Mogensen, "Autonomous Component Carrier Selection for 4G Femtocells - A fresh look at an old problem", accepted for publication in IEEE Journal on Selected Areas in Communications (JSAC), April 2012.
- L. Nagy, "Modified MIMO Cube for Enhanced Channel Capacity", accepted for International Journal of Antennas and Propagation, Volume 2012 (2012), Article ID 734896, 10 pages, doi:10.1155/2012/734896

4.2 Academic Didactic Activities

4.2.1 Student projects

AAU. During the last year one M.Sc. theses has been developed at AAU, consisting in the feasibility study for OFDM transceiver implementation in the firmware of the URSP2 HW platform.
BME. B.Sc. student Zoltán Szabó is currently finalizing his diploma thesis on the evaluation of some MU-MIMO scheduling mechanisms in LTE-A systems. Besides this, lecture material was created on LTE-A systems, mainly focusing on carrier aggregation and MU-MIMO (based on SAMURAI papers) and was added to the B.Sc. course "Mobile infocommunication systems".
EURECOM. Four interim M.Sc. student projects have been conducted:

- Gordan Markus: Linux Real-Time Signal Acquisition
- Luca Pecorella and Antonio Maniaci: Channel Simulation in OpenAirInterface
- Sandip Gankakhedar: INTEGRATION OF RESOURCE ALLOCATION STRATEGIES FOR MULTIPLE COMPONENT CARRIERS IN OpenAirInterface
- Shanu Suman and Sankari Thirunavukarsu: TIME VARIANT CHANNEL ESTIMATION FOR LTE

4.2.2 Ph.D. student projects

At **AAU** several activities at Ph.D. level have been carried out. The main one can be considered the involvement of Ph.D. students for developing the SAMURAI investigations and tools. Three Ph.D. students have spent several man-months of their Ph.D. projects in investigating the capabilities of ACCS and developing the ASGARD tool.
At **BME** former Ph.D. student Albert Mráz finished his Ph.D. thesis, one group of results are originating from SAMURAI project, about several channel estimation imperfection models and their effect on physical layer performance of MU-MIMO systems.
At **Eurecom**, Ankit Bhamri and Imran Latif are in the final year of their Ph.D. thesis.

4.2.3 Ph.D. courses

A Ph.D. course has been organized with the joint support of SAMURAI, the EU FP7 CREW project, the COST Action IC0902, and the COST Action IC0905. Such course, mainly focused on Cognitive Radio, featured both the presentation of the ACCS methodology and a live demonstration with the ASGARD test bed [6]. The course had an attendance of 40 Ph.D. students.

4.2.4 Online dissemination

Besides the traditional dissemination activities, special attention has been given to exploiting the new media for publishing information and news about the SAMURAI project.

The new version of the official SAMURAI website has been regularly updated in order to keep the community posted with the latest publications and dissemination activities news. Furthermore, both the ASGARD and the OpenAirInterface platforms have their own website/blog, constantly updated as well.

It the An AsgardAAU Youtube channel has also been created, containing dissemination and demonstration videos about the ACCS test bed and experiment. On the channel, also the PhD course is currently posted. The channel had in the last period around 600 views, distributed all over the world (including India, Egypt, US).

4.2.5 Open Source Software Release

One important outcome of the SAMURAI project is the availability of open source tools to the scientific and industrial communities.

OpenAirInterface has always been an open tool, released under the GPL license, but has benefitted from the SAMURAI project since the tool is nowadays more mature and it is almost compliant with LTE releases.

The ASGARD software platform was originally intended for SAMURAI demonstration purposes only. But considering the consistent effort put in it by the SAMURAI project, it would have been a waste of resources not to make the tool publicly available. Therefore the ASGARD platform has been officially released on the 1st of October 2012 for cooperative development [7]. Aalborg University has developed a unique type of license that enforces open cooperation among the parties that accept to work on ASGARD.

5 Workshops, exhibitions, demonstrations, liaisons

5.1 Workshops/special sessions in 2012

5.1.1 Workshop at WCNC 2012

The SAMURAI consortium organized jointly with the EU ICT projects BUNGEE, WHERE2 and ARTIST4G the "Workshop on 4G Mobile Radio Access Networks." The workshop took place on Sunday 1 April 2012 at WCNC 2012 in Paris.

5.2 Public demonstrations

5.2.1 FUNEMS 2012

The main demonstration opportunity of the SAMURAI project was the FUNEMS 2012 event. Therefore a booth was set up and used jointly together with LOLA project. The booth featured a set of posters presenting the results achieved as well as live demos obtained in the project's framework. Both carrier aggregation and multi-user MIMO concepts were presented as demonstrations to the audience. The attendance was quite satisfactory. The live demos were well appreciated by the audience and every visitor got a share of it. The booth was also visited by the project officer and other EU commission officers. Good contacts from both the industry and the academic worlds were established.

A picture of the demoed MU-MIMO testbed is shown in Figure 5-1. The testbed consisted of a EURECOM enhanced NodeB (eNB) and user equipment (UE). The downlink channel was emulated using an Agilent PXB MIMO channel emulator. The ExpressMIMO card of the eNB was connected to two EURECOM LIME RF frontends to modulate the baseband signal on a 1.9 GHz carrier. The signal of the two antennas were fed into two Agilent MXAs which downconverted the signals again and converted them into digital baseband signals compatible with the PXB's digital interface. At the output of the PXB we used the analog interface which was fed directly into the ExpressMIMO card at the UE. On the uplink, the ExpressMIMO cards of the UE were directly connected to the ExpressMIMO cards of the eNB using analogue baseband interfaces.

The setup showed MU-MIMO on the downlink with real-time feedback from the UE and the IA receiver at the UE. In this version, only the physical layer of the platform was activated. So the eNB would randomly generate traffic and schedule two PDSCH transmissions in transmission mode 5 one subframe every frame. The precoders used for user 1 were based on the

real-time feedback while the precoder for UE2 was using the opposite precoder.

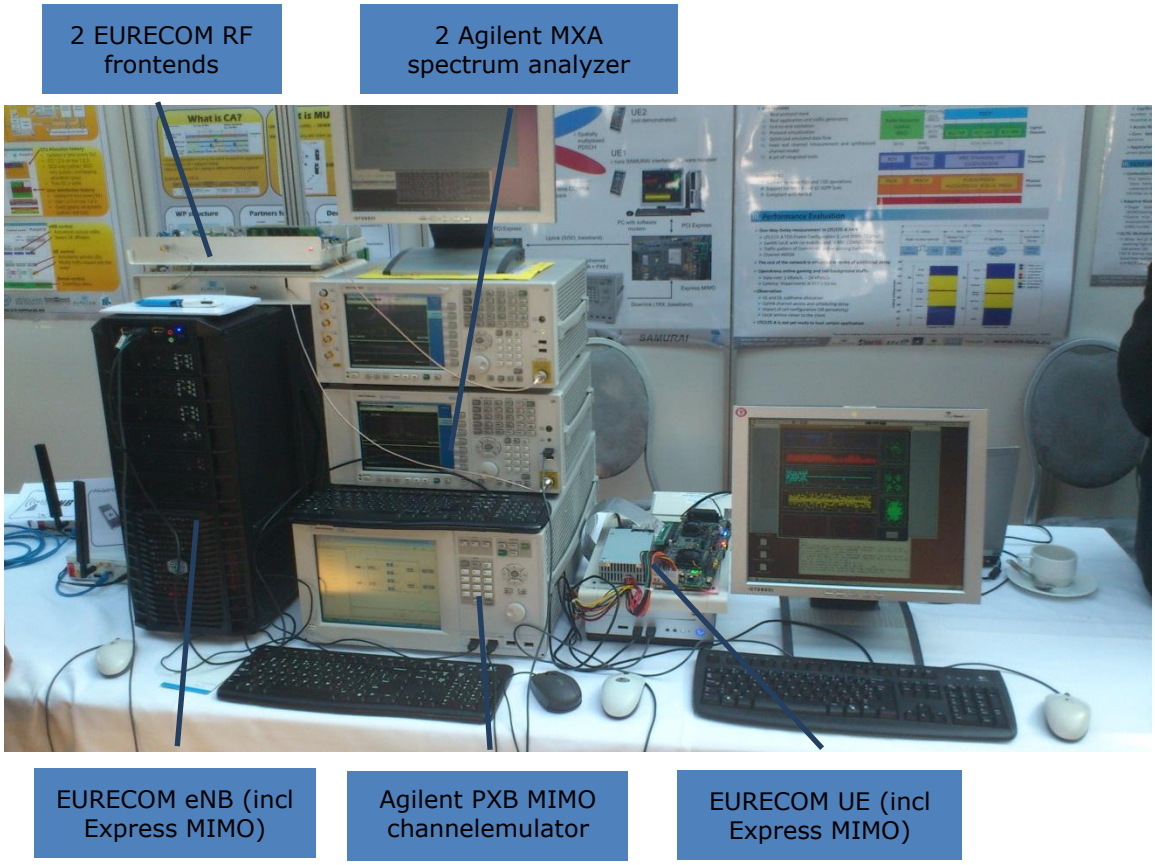

Figure 5-1: Real-time MU-MIMO Testbench.

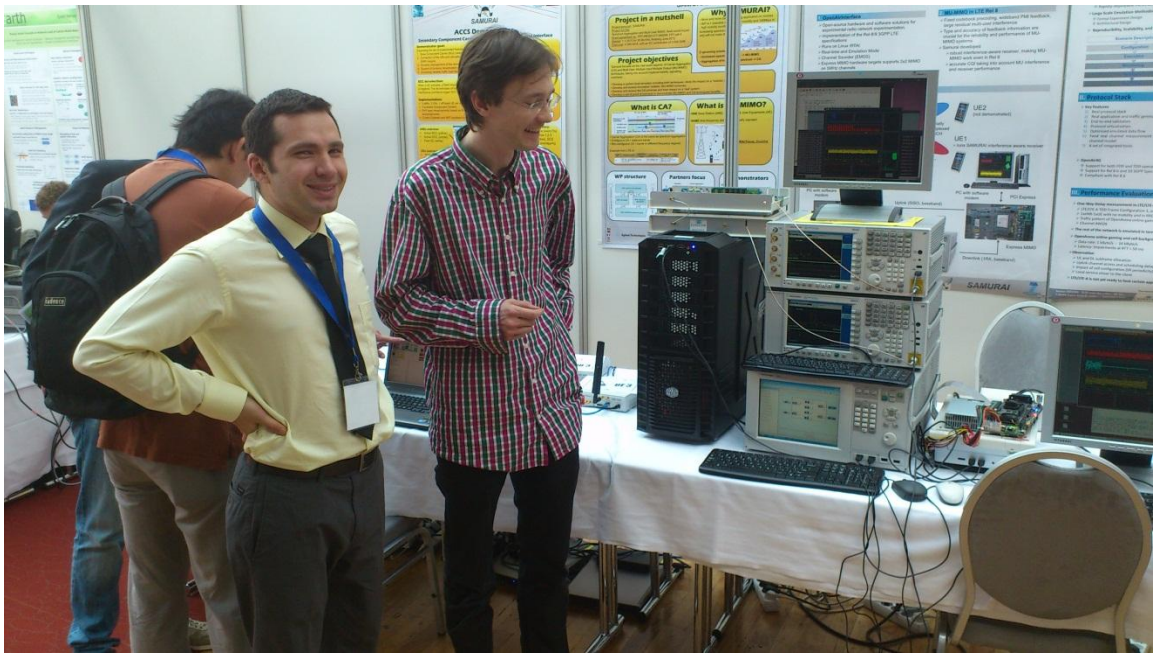

Figure 5-2: Jonathan Duplicy (right) representing the SAMURAI project leader Agilent with the SAMURAI project officer Petru Ciudin (left).

5.2.2 WCNC 2012

A first demonstration of MU-MIMO has been given at the WCNC in Paris in March 2012. The demonstration setup shows the downlink of an LTE-Advanced system, where the enhanced NodeB (eNB) is emulated by Agilent equipment end the user equipment (UE) is based on Eurecom's Express MIMO hardware platform and the OpenAirInterface software modem. The MU-MIMO PoC shows the implementation of the interference aware receiver in operation. The PoC can be seen as a first stage of the final PoC, which will include also the feedback link.

Figure 5-3: Demonstration setup of OpenAirInterface Express MIMO platform and Agilent PXB.

A first demonstration of CA has been given at the WCNC in Paris in March 2012. The demonstration setup is identical to the one that was used for MU-MIMO (see Figure 5-3) with the difference that two RF boards were used to tune to the two different carriers. It shows the reception of two 5MHz component carriers spaced 10MHz apart generated with the Agilent PXB. This PoC was originally planned with the Sequans boards, but was shifted to the Eurecom Express MIMO board for technical reasons.

5.3 Industrial fora

5.3.1 IWPC 2012

SAMURAI project contributed to 2 *International Wireless Industry Consortium* (IWPC) events. This forum groupsindustry in dedicated technical topics delivering unfiltered real time insight into vital technology, market and ecosystem evolution. SAMURAI presentations during these workshops were particularly well appreciated as they provided neutral and high technical standpoint on hot topics.

- During the "LTE Small Cell Deployment Strategies" workshop, May 2012 [8], SAMURAI presented to the audience the ACCS demo, which received a strong interest for showing live what the project was developing.

Figure 5-4: The ACCS demo in Dresden, Germany, at the IWPC "Small cells" workshop.

- In June 2012, SAMURAI was invited to give a presentation in a workshop organized by IWPC entitled "LTE Global Roaming Multi-Band Multi-Mode Devices" [9]. This workshop was hosted by the NGMN alliance which provided a very high visibility to operators. The presentation was very well received. The balance between high level conclusions and technical details was appreciated. The fact that the project addressed the issues of MU-MIMO and CA both from simulation / "academic" perspective and practical aspects (closer to implementation) was appreciated too.

5.4 Collaborations with other research activities

5.4.1 COST IC0902

The SAMURAI consortium contributed with its ACCS related topics and some particular research and developments in COST Action IC0902, through its presence at the Second and Third International Workshops in Barcelona, Spain and Ohrid, Macedonia. Several contributions related to the analysis and development of the USRP firmware and the design of multicarrier OFDM PHY based on USRP boards were presented. Furthermore, in Ohrid, the release of the ASGARD software as open source was officially announced. Besides technical presentations, a spectrum coexistence experimental demonstration was held in Barcelona. This was a good opportunity for dissemination of

SAMURAI results towards a wide audience from more than 60 different institutions. This also set the base for further project level cooperation.

5.4.2 LOLA project

SAMURAI project was cooperating with LOLA project through the common booth at FUNEMS 2012. Through the common partner Eurecom, and the common platform used by both projects, the cooperation is continuous.

5.4.3 CREW project

The CREW project provided, during the last period, support for the joint organization of the PhD course at AAU. The support consisted in the presence of a lecturer and material for one of the lectures on test-bed development.

5.4.4 EU coordination events

The SAMURAI partners took part at most of the concertation and RAS cluster meetings along the course of the project. Two technical presentations were notably delivered. In February 2011, we discussed advances in MU-MIMO while in February 2012, the emphasis was put on the demonstrators.
At last, it is worth mentioning SAMURAI's participation to the FlexSUS workshop where Agilent's presented the consortium point of view about cognitive aspects in wireless networks.

5.4.5 COST Action IC0905

The Action project provided, during the last period, support for the joint organization of the Ph.D. course at AAU. The support consisted in the presence of a lecturer and dissemination support for making the event visible.

6 References

[1] FP7-INFSO-ICT-248268 SAMURAI – Work Package 2, "D2.3 Final System Level Evaluation Report ", October 2012.

[2] FP7-INFSO-ICT-248268 SAMURAI – Work Package 3, "D3.3 MU-MIMO implementation report", January 2012.

[3] FP7-INFSO-ICT-248268 SAMURAI – Work Package 4, "D4.4 SA schemes and implementation report ", January 2012.

[4] FP7-INFSO-ICT-248268 SAMURAI – Work Package 5, "D5.2 Blocks assessment and system evaluation", October 2012.

[5] WiMAX Forum (wimaxforum.org), October 15, 2012.

[6] Aalborg University, "Ph. D. Course - Introduction to Cognitive Radio ", http://www.youtube.com/user/AsgardAAU , September 17, 2012.

[7] Aalborg University, "ASGARD - Cognitive radio Experimentation Platform", http://asgard.lab.es.aau.dk, October 29, 2012.

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