NEWSLETTER

http://www.ic1004.org

Cooperative Radio Communications for Green Smart Environments

Number 11, September 2015 (final newsletter)

Newsletter Editor: Alain Sibille, Telecom ParisTech, France

COST IC1004 Chairman: Narcis Cardona, Univ. Politecnica Valencia, Spain

Editorial

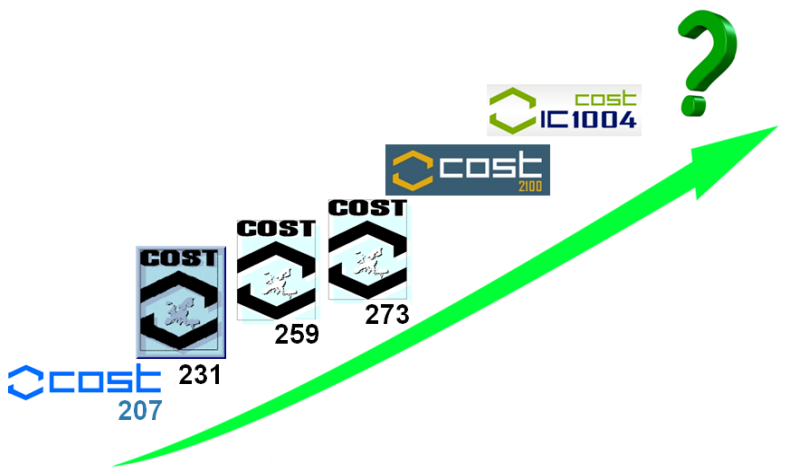
Dear colleagues,

It is for me both relieving and frustrating to write this last editorial of the IC1004 newsletter. Relieving indeed since trying in a few pages to summarize and extract the most juicy matter after each meeting, after seeing over 80 valuable works presented, after hearing several invited speakers with topical and original messages, after participating in many discussions about existing projects or anticipated outcomes, after arguing about the next workshop or training school, after debating about ways to encourage and support young researchers and, last but not least, after trying to sort out all the many enthusiastic proposals and initiatives of IC1004 supporters and members, was far from easy. Frustrating because this comes to an end, and we do not know the future.

In this NL, you will find the last four selected TDs of the final Valencia meeting, some highlights from the latest working group activities, a summary of two recent workshops, one training school and one special session in an URSI conference, and announcements for upcoming events or outputs of IC1004, such as the Joint IC1004-NEWCOM Workshop and follow-up meeting in next October. Let me conclude here, since the shortest speeches are often the best. I have participated in the three last COST Actions of the sort, which are COST 273, COST 2100 and COST IC1004, and always been happy to be there, participating to nearly all of the 3 meetings / year since 2001, trying to contribute in a way or another. What I have observed is the extraordinary stability of these Actions, in terms of numbers (people) but also of motivation and willingness to be there, in spite of the regular renewal of members and the arrival of “new blood”. This is a strong sign of adult health, which I can hope to be preserved in the coming years, if the “God of COST Actions” looks favorably down upon us.

This is my personal wish to you readers, together with my goodbye.

Alain Sibille



The success story of COST Actions in wireless and mobile communications and its open future

Chairman's Address

Dear reader,

The COST IC1004 Action formally ended last 17th of May. It has been a pleasure to serve this network of researchers during these 4 years, and I would like to express my sincere gratitude to all the MC members and participants for their continuous commitment to COST. I think there is no other framework in the world comparable to COST. It is impossible to find any activity where duties are not paid, most travels are not granted, no monetary profit is demanded and no single cent is gained when a meeting is organised, which at the same time accounts with high level scientific papers to discuss, plenty of results to share, increasing number of people attending from industries and academia, and getting significant impact in its technology field.
Many times in IC1004 we have talked about the fact that getting no budget means raising no partnership conflicts, and this may be the basis for the success of networking, ...but this is only the joke. The reality is that the altruistic contribution of many people to this network (of knowledge) makes the Action run and gives it the necessary content for COST to be attractive to more and more colleagues who come with the same aim: contribute to -and receive from- the "COSTware" [1].

It is my personal impression, and I guess this is shared by many of the IC1004 colleagues, that the Action has reached the limits of what can be achieved within this framework, not because the group couldn't be even larger, or the scientific level of our discussions increased, but because COST is intended to promote networking, although not prepared to manage the success of the networking results. I was sure that this limitation was understood by the managers of COST, the DG, the Commission ...but H2020 came without any significant news about COST Actions, and nothing has changed so far. We proposed some ideas, like defining a follow-up instrument for the continuity of successful Actions, which we called "Network of Knowledge" [2], a real step beyond the current approach. No, dear Commissioners, it is not (only) a matter of budget, but to properly manage the successes!

While we wait for the EU to set up this new instruments, the "RadioCOST" [3] group intends to keep the momentum of the IC1004 network by launching some follow-up initiatives, being the most imminent the organisation of a meeting in Barcelona, 14-15 October 2015, and the creation of a Working Group in the European Association EURACON.
IC1004 has ended, but the synergies of IC1004 won't get dissolved, and the networking effect of COST will remain for some time, hopefully for the long term. Yes, dear Commissioners, this old EU FP instrument still works!

Narcis Cardona

[1] See COST IC1004 Newsletter number 9, November 2014
[2] See COST IC1004 Position Paper on Horizon 2020, May 2012
[3] "RadioCOST" refers to the group of experts of IC1004, and previous actions COST2100, 273, 259, 231, 207.

What's next in RadioCOST

The groups of experts of IC1004, together with some of the partners of the network of excellence NEWCOM#, have agreed to join efforts and give continuity to the two communities networking activities. First action in this way is already set, and will be the joint Workshop event organized for the Final Meeting of NEWCOM# in Barcelona, 14-15 October 2016.

In addition, the proposal of a new COST Action in the field of Mobile Radio Communications has been submitted. It was agreed during the final meeting of IC1004 in Valencia, that the focus of such a proposal should go beyond the current discussions on 5G scenarios and technologies.

IC1004 participants at the gala dinner in the final COST IC1004 meeting, Valencia, may 2015

Indeed, COST is not a short-term focused project, and some of its potential is being unconstrained to specific deliverables, but open to any future long-term ideas and discussions. In this sense, the proposal focus the future radio communication scenarios beyond 2020, where the Mobile and Wireless Communications will serve not only very dense populations of mobile phones and nomadic computers, but also the expected multiplicity of devices and sensors located in machines, vehicles, personal healthcare sensors, city infrastructures and any other connected object. The addition of all these scenarios in Mobile Networks, will in particular require revolutionary approaches in Radio Access Technologies, Networks and Systems, in order to overcome the limitations of the current cellular deployments, the layered networking protocols, and the centralised management of spectrum, radio resources, services and content. The view of RadioCOST on how the Mobile Networks are evolving is summarised in the mentioned proposal under the concept of *Inclusive* Radio Communications, as any object is intended to get connected in the future "Wireless Internet of Everything".

Highlights on working group activities

In the course of the action, WG1 on « Radio Channels » has dealt with a number of topics, ranging from channel measurements to modeling. In the area of channel sounding, there was a clear trend to develop state-of-the-art sounders for higher frequency bands, in order to support the modeling activity required for upcoming 5G and beyond networks. Regarding physical channel modeling, significant efforts aimed at improving ray-tracing models. Because such models do provide the extensive, multidimensional channel characterization that is necessary to effectively design and deploy the incoming wideband, multi-gigabit radio systems, their use can be expected to become more common for both research and commercial purposes. In addition to ray-tracing tools, innovative full-wave models were developed. An important challenge now lies in their combination. Finally, WG1 in COST IC1004 brought further parameterization of the COST 2100 model for a larger range of scenarios and functionality, such as dense multipath, has been added to the publicly available source code. There have also been suggestions for extensions, ideas for further improvements of the model itself or for GSCMs in general, in particular for massive and distributed MIMO arrays.

A special Issue on “Theory and Applications of Characteristics modes” in the IEEE Transactions on Antennas and Propagation, the best journal in the field, has been launched and is being under active reviewing jointly by B. K. Lau (COST IC1004) and by Dirk Manteuffel (COST VISTA), following the submission deadline of 31 July 2015. The Special Issue is partly an outcome of the good contact between the two Actions, especially among researchers in both Actions who are actively working on the growing research topic.

“Over the lifetime of COST IC1004, members of Sub-working Group 1.1 on “Antenna Systems Aspects” have been making steady and solid contributions in the research on several front. Notable research results that have presented and discussed in the group include: 1) a new no-duplexer RF front-end architecture enabled by separate narrowband transmitting and receiving antennas; 2) full-duplex architecture enabled by tunable electrically balanced duplexer together with analog cancellation; 3) efficient and wideband MIMO antenna design based on characteristic mode analysis; 4) Analysis and mitigation of distortion in radiation pattern measurements of millimeter wave antennas; 5) RFID and on-chip antenna design and measurement. Apart from technical contributions and collaborations through several short term scientific missions, group members has carried out several exciting initiatives, most prominently the organization of the highly successful Joint Workshop on “Terminal Antenna Systems for 4G and Beyond” with COST IC1102 (VISTA) in Ghent during Sep 2013, which was followed up by a Special Cluster in IEEE Antennas and Wireless Propagation Letters on the same topic. The focused research on characteristic mode analysis by several group members as well as our colleagues in COST

VISTA has also led to the creation of a Special Issue on the topic in IEEE Transactions on Antennas and Propagation, which is expected to be published during 2016. The group foresees emerging challenges relating to antenna system design and characterization, due to the need to better account for the interactions between the antennas and their surroundings in future systems. It is hoped that there will be further opportunities beyond COST IC1004 to interact in such a forum to address these topics!”

In the last MCM in Valencia, a total number of 13 technical documents were discussed, most of them jointly between WG3 and the urban Topical Working Group. Many papers. Seven of them addressing different optimization on LTE networks as the remote electrical tilts, self-tuning of scheduling parameters, SON and QoE as well as clustering and traffic balance for femtocells, Others were more oriented to Network planning explaining fundamental limits, the user behavior or a system-simulator using realistic scenarios.

One of the achievements of the TWG-U is the “IC 1004 Urban Hannover Scenario”. This “ready-to-use” simulation environment has been presented (TD(13)08054) during the Ghent Meeting. The scenario consists of a complete LTE network, which has been modelled and predicted with 3D path loss predictions for the entire city area of Hannover, Germany. In addition, sophisticated modelling approaches for user mobility patterns and data traffic have been employed. The goal of this activity is to provide a common scenario that ensures the comparability of simulation results, which are based on this scenario. Another goal of the TWG-U, again with respect to comparability, is an activity to compare and calibrate the ray-tracing tools of partners involved in the TWG-U. Here, a starting point for the planned comparison has been found (TD(15)13013) by specifying a file-format for collaboration, since one of the main limitations of ray-tracing systems is the lack of interoperability between different scenarios. Besides these two explicit achievements, the focus of the group has been on energy efficiency, heterogeneous networks, MIMO techniques, O2I and I2O propagation as well as on measurements in urban environments.

The activities of the indoor Topical Working Group were focused on channel modelling, millimeter wave systems and wireless localization. The Group is aware of critical importance of indoor channel and propagation modelling, as the old models do not fit scenarios for massive MIMO and Ultra Wideband systems. At the same time, having in mind growing demands for high wireless data rates, a large effort was done to characterize and evaluate millimeter wave systems that have potential to fit the future wireless system requirements. Finally, the Group foresees that localization will play a key role in the development of new wireless applications and accordingly performed a thorough analysis of a wide range of solutions, starting from RSS, UWB, to passive localization techniques and others.

IC1004 has organised two workshops on the 5th of May 2015, co-located with the final management committee meeting in Valencia, Spain. The presentations can be asked from the authors.:

Workshop on channel models for higher frequency bands

9:15 **"Millimeter-wave channel modeling - big challenges ahead".** Invited talk. Katsuyuki Haneda ; Aalto Univ., Finland

9:50 **5G radio access and channel modeling**; Fredrik Harrysson, Jonas Medbo and Henrik Asplund, Ericsson Research, Sweden

10:15 **Measured Wideband Characteristics of Indoor Channels at Centimetric and Millimetric Bands**; Wei Fan, Jesper Ø. Nielsen, Ines Carton Llorente, Kim Olesen and Gert F. Pedersen; Aalborg University, Denmark

10:40 **Item Level Characterization of mm-wave Indoor Propagation**; M.Zoli1, S.Häfner2, E.M.Vitucci1, R Müller2, F.Fuschini1, D.Dupleich2, M.Barbiroli1, J.Luo3, E.Schulz3, V. Degli-Esposti1, R. S. Thomä3 ; (1) Univ. of Bologna, (2) Ilmenau Univ. of Technology, (3) Huawei Technologies Dusseldorf GmbH, Munich)

11:35 **Quasi-Deterministic millimeter wave channel models for access and backhaul in MiWEBA**; R.J. Weiler, M. Peter, W. Keusgen [Fraunhofer HHI]; A. Maltsev, I. Karls, A. Pudeyev I. Bolotin [Intel]; I. Siaud, A.M. Ulmer-Moll [Orange]

12:00 **Proposal on mmWave Channel Modeling for 5G Cellular System**; Sooyoung Hur, Sankyu Baek, Byungchul Kim and Jeongho Park; DMC R&D Center; Samsung Electronics, Suwon, Korea

12:25 **Channel sounding at Submillimeter Wave Frequencies**; Maria-Teresa Martinez-Ingles1, Davy P. Gaillot2, Juan Pascual-Garcia1, Jose-Maria Molina-Garcia-Pardo1, José-Víctor Rodríguez1, Lorenzo Rubio3 and Leandro Juan-Llácer1; (1) U.P. Cartagena, Spain; (2) U. of Lille , France; U.P. València, Spain

12:50 **Urban Microcellular Channel Characteristics at 11GHz;** Minseok Kim1, Jun-ichi Takada2, Yuyuan Chang2, Jiyun Shen3, Yasuhiro Oda3, Satoshi Suyama3; (1) Niigata University, Japan; (2) Tokyo Institute of Technology, Japan; (3) NTT Docomo, Japan

All presented communications have been invited to submit a journal version to a special issue of EURASIP Journal on Wireless Communications and Networking ; more information here

Workshop on"Evolution of Radio Access Network Technologies towards 5G"

14:35 **Towards User-Centric Operation in 5G Networks**; Jose F. Monserrat, Irene Alepuz, Jorge Cabrejas (iTEAM–U.P.Valencia); Vicente Osa, Javier López, María J. Domenech, Vicent Soler; (Astellia), Spain

15:00 **A Perspective on Virtual Radio Access Network**; Luisa Caeiro (EST Setubal, Portugal), Sina Khatibi, Lucio S. Ferreira, Luis M. Correia (IST/INOV – INESC, University of Lisbon), Portugal

15:25 **Green Oriented Multi-Techno Link Adaptation metric for 5G Multi-Techno Heterogeneous Networks**; Isabelle Siaud, Anne-Marie Ulmer-Moll, Orange Labs Rennes, France 16:10 **Invited Talk: 5G Channel Models by METIS Project**; Pekka Kyösti (Anite, Finland)

16:35 **Energy Harvesting Device-to-Device Communications for 5G**; Yan Zhang (Simula Research Laboratory), Norway

17:00 **The Effects of UE Location on Pilot Contamination in Collocated and Distributed Massive MIMO**; Paul Harris; Mark Beach, Simon Armour (University of Bristol), U.K.

17:25 **Location based distributed Failure Management for 5G Ultra-Dense Small Cell Networks**; S. Fortes, R. Barco, A. Aguilar (Univ. of Malaga), Spain

Selected scientific topic: "Hybrid Model for Reverberant Indoor Radio Channels using Rays and Graphs", by Gerhard Steinboeck, Mingming Gan, Paul Meissner, Erik Leitinger, Klaus Witrisal, Thomas Zemen and Troels Pedersen (TD(13)13017)

Ray-tracing allows to deterministically model the channel response. Several studies have shown that ray-tracing works well when the channel impulse response consists only a few distinct components. However, channel impulse responses measured in indoor environments exhibit a diffuse tail, see Fig. 1. This diffuse tail is difficult to include in ray-tracing tools due to the computational complexity. Furthermore, the simulation requirements for the diffuse tail are not as stringent as in ray-tracing.

In this temporary document we propose a hybrid model which includes deterministic components and the diffuse tail. The hybrid model combines ray-tracing with the propagation graph. The recursive structure of the propagation graph allows for a computationally efficient calculation of the channel transfer function considering infinitely many components. As typical for ray-tracing, a detailed geometric and electromagnetic description of the environment is needed. We utilize this description together with the theory of room electromagnetics to predict the decay rate of the diffuse tail, which is one of the parameters required by the propagation graph model. The remaining parameters of the propagation graph are obtained by intermediate ray-tracing results. Thus, the proposed hybrid model does not require new or additional parameters in comparison to ray-tracing. Simulation results, obtained without model fitting, show good agreement with measurements with respect to the inclusion of the diffuse tail in both the delay power spectrum and the azimuth delay power spectrum.

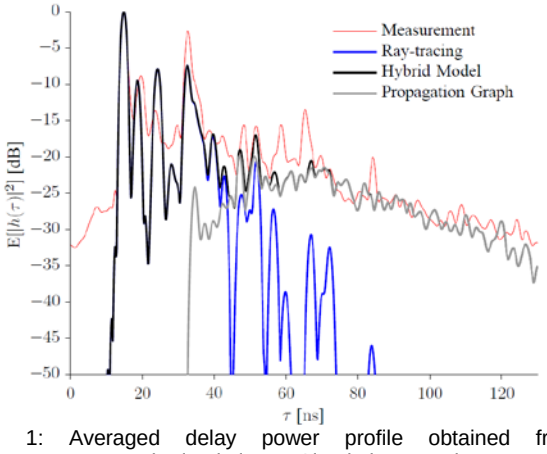


Fig. 1: Averaged delay power profile obtained from measurements and simulations. Simulation results are pure predictions and are obtained via standard settings used in ray-tracing without any tuning of parameters.

For more details please contact: gs@es.aau.dk

Selected scientific topic: "SiMoNe – Simulator for Mobile Networks: System-Level Simulations in the Context of Realistic Scenarios", by Dennis M. Rose, Johannes Baumgarten, Sören Hahn, Thomas Kürner (TD(15)13023)

Today's cellular radio networks offer so many parameters that can be configured, that it is virtually impossible to configure such a system manually. To overcome this problem, operators and vendors put their hope in self-organizing networks (SON). Nevertheless, most algorithms that have proved to work in over-simplified, regular geometries and uniform user distributions did not make it to live networks. One reason is the huge gap between these “hexagonal networks” and the real world and the fact that operators know that their networks are not so regular and uniform.

The Simulator for Mobile Networks (SiMoNe) is designed to work with real or realistic multi-technology network topologies, 3D pathloss predictions and time varying user distributions. Of course, it is also capable of performing simulations in standardized, flat scenarios, like those specified by 3GPP. It focuses strategies to optimally use the rare spectrum. Particularly, spatial and temporal aspects are of fundamental interest in dynamic simulations, since a well-balanced network at noon might be heavily unbalanced in the evening. Time variant cell Key Performance Indicators (KPIs) with respect to load are helping to identify potential bottlenecks or over-dimensioned areas in the network.

Based on the realistic “IC 1004 Urban Hannover Scenario”, where a complete LTE network for the entire city area of Hannover, Germany has been built, concepts and mechanisms to simulate such realistic network scenarios on system-level are given. Simulations based on time variant maps as well as for simulations with a large number of individual user traces, which follow different mobility patterns like vehicular or indoor mobility are supported.

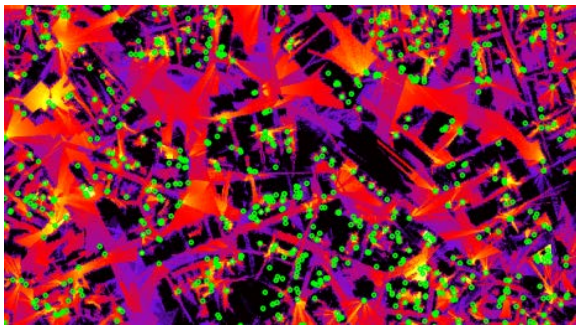


Fig. 1: Received power in a realistic hyper dense femto cell network at 2600 MHz. The scenario contains 1200 cells in an area of 2 by 2 km² around the central station

Fig. 2: Handover of a group of users moving along a railway track. The background image shows the central station of Hannover (OpenStreetMap)

For more details please contact: rose@ifn.ing.tu-bs.de

Selected scientific topic: "Over-the-Air (OTA) Testing of Base Stations ", by Tommi Jämsä, Alf Ahlström, Mattias Gustafsson, Mark Holm, Mats Högberg, Björn Sihlbom (TD(15)13039)

Traditionally, base station RF performance tests have been done by connecting coaxial RF cables to antenna ports. This method was seen to be adequate when antenna performance is well known and the number of antenna ports is limited. However, the position is changing rapidly due to very high number of antennas and advanced utilization of spatial channels (e.g. massive MIMO). Testing of these types of antennas with conventional conductive techniques is cumbersome and also not reflecting the air interface RF performance. Therefore, Over-the-air (OTA) test methods are crucial in terms of evaluating the performance of future radio base stations.

3GPP requires testing from each antenna port, but it becomes difficult in the case of a very high number of antenna elements, and in some cases poorly represents the performance of the BTS. For base station OTA testing, a currently ongoing WI in 3GPP RAN4 is a first attempt to define OTA requirements and consequent test procedures. The WI pursues only EIRP accuracy and OTA sensitivity. Most requirements on the active antenna systems are defined per connector, interfaces defined essentially for defining requirements normally set for BS. For replacing all conductive tests by OTA, a new set of test cases and method(s) is needed.

In addition to standardized tests, a number of additional tests might be needed to ensure good performance in the field. These performance tests require advanced test methods.

Different candidate methodologies for BTS OTA testing have been proposed: anechoic chamber, anechoic chamber plus channel emulator, reverberation chamber, reverberation chamber plus channel emulator, two-stage method, and near-field based methods. They are not necessarily mutually exclusive. Different methodologies may be optimal depending on the test cases.

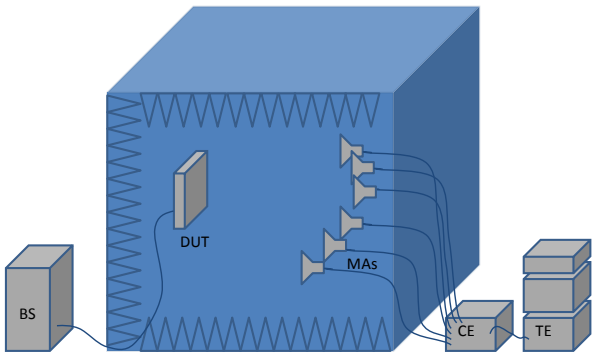


Fig. 1: An anechoic chamber with a channel emulator (BS = Base Station, DUT = Device Under Test, MA = Measurement Antenna, CE = Channel Emulator, TE = other Test Equipment).

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Selected scientific topic: "Tiny Integrated Network Analyzer (TINA) for Antenna Measurements Inside Mobile Phones", by Emil F. Buskgaard, Ben Krøyer, Ondrej Franek and Gert F. Pedersen (TD(15)13046)

As hand-held antenna systems are becoming more and more dynamic they acquire the ability to compensate for the adverse effects of the user. Such antenna systems cannot be tested sufficiently in a static measurement setup as this will not test the ability of the antenna tuning to correctly compensate for the user.

A novel measurement system is developed where a tiny integrated network analyzer (TINA) is built into a phone. This enables measurements without cables or fibers leaving the phone. Such a system is allowing the user to interact normally with the phone and thereby realistic data can be collected on the rate and range of change in the S-parameters of the phone – data that are normally only available to the phone manufacturer through the measurement receiver.

As a proof of concept the system is implemented in a commercially available phone. We achieved to fully disguise the measurement system inside the phone so that blind studies can be made. This further secures the integrity of the results. Preliminary results are presented from this setup. Additional verification of the calibration accuracy is presented. The data show good calibration stability over temperature and phone output power with less than 0.6 dB of amplitude error and less than 2 degrees of phase error for 90% of the calibrated points. The user test shows clear and predictable differences in S-parameters between the phone in free space, on a conductive surface and interacting with a user. Based on the results we conclude that the system can be used for user studies.

For more details please contact: eb@es.aau.dk

Fig. 1: The TINA (left), the standard iPhone 5 (middle) and the proof of concept phone (right). The measurement concept requires modifications to the phone battery and cabling to make room for the TINA.

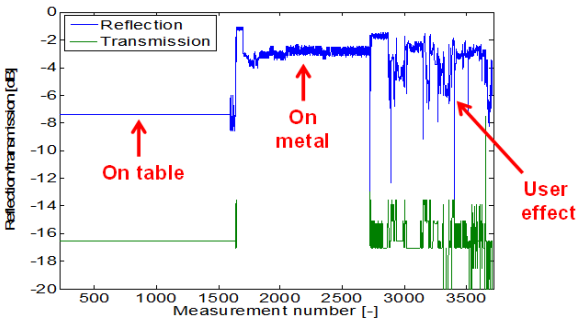


Fig. 2: User test example showing the capability of TINA to follow both fast and slow moving S-parameter changes.

Training school: "From HetNets to Cloud Radio Access Networks":
The 8th Training School organized by WG3 on "From HetNets to Cloud Radio Access Networks" took place between 21 and 23 April at the University of Luxembourg with 26 attendees, among them PhD students and EU researchers. Eight trainers have delivered lectures fostering the discussion with the attendees. The first day addressed challenges of today's RAN (I.Studer), the operators' point of view on C-RAN (D.Sabella) and the use of Software Defined Networks for Virtual Networks (Y.Haddad). During the second day the details of the Arquitecture of C-RAN (L.Dittman) as well as the Optical Transport Networks and Fronthaul (A.Pizzinat) were discussed. Last day was focused on the details of Virtual Networks (E.Schiller), the virtualization of Radio Resources (L.Correia) and the use of cooperative signal processing techniques for multicell C-RAN (S.Chatzinotas). The training school was organized by S.Chatzinotas, S.Ruiz and L.Studer from COST IC1004 and had the participation of Telecom Italia, Orange, University of Bern, Technical University of Denmark, Jerusalem College of Technology, IST/INOV-INESC and the University of Luxembourg as trainers.

ISSSE 2015 and AT-RASC

The ISSSE (International Symposium on Signals, Systems and Electronics) has been held as part of the AT-RASC Conference on May 18-22, 2015, in Gran Canaria, Spain.

.A special session issued from IC1004 has taken place on the topic "Smart and efficient wireless networks and technologies towards 5G and beyond"

Organizers: Sana salous (Durham university, UK) and Alain Sibille (Telecom ParisTech, France)

9:00 A power-gated sensor node microcontroller for security applications
G. Panic, T. Basmer, O. Schrape

9:20 (invited) linear physical-layer network coding for fifth generation radio access networks
A. G. Burr, D. Fang

9:40 On the sensitivity of candidate cognitive radio sensing engines
J. R. Kelly, S. Salous, M. Chwalisz

10:00 (invited) flexible duplex transceivers for 5G and beyond wireless access
M. A. Beach, L. Laughlin, C. Zhang, K. A. Morris, J. Haine, M. McCullagh

10:20 MIMO terminals performance evaluation in a local propagation context
A. Sibille

14:00 (invited) Extreme wideband arbitrary waveform generation by multiband signal combination
A. Czylwik

14:20 (invited) Energy efficiency – spectral efficiency optimization with distributed interference alignment strategies in 4g cellular networks and beyond
J. -M. Gorce, P. Ferrand, L. Cardoso

14:40 On the performance of massive multiuser MIMO with different transmit beamforming techniques and antenna selection
K. H. Moussa, S. E. El-Khamy

15:00 A brief survey on wireless MIMO switching
F. Wang

Final book

COST IC1004 will maintain the tradition, going back to COST 231, to publish its final report in the form of a book in the open literature. An agreement has been found with RIVER, according to which samples will be freely delivered to members of the Action, while it will be possible by anyone to purchase others at a reasonable price. The availability of the book for buying will be announced on the COST IC1004 web site.

EURACON

The aim of the European Association for Communications & Networking is to support, coordinate and develop on a non-profit basis, activities at European level related to research and education in the area of Communications and Networking. EURACON in particular can contribute to COST Actions acting as Grant Holder, managing resources and developing all related administrative and organisational tasks. EURACON will organise the joint IC1004-Newcom workshop to be held in Barcelona, Spain, on Oct. 14-15.

EURACON
European Association of Communications and Networking

Joint IC1004-NEWCOM Workshop and follow-up meeting

The Joint NEWCOM/COST Workshop on Wireless Communications (JNCW 2015) is organized on Oct. 14–15, 2015, in Barcelona, Spain.

This workshop will give NEWCOM# and COST IC1004 communities the opportunity to disseminate their research results, after 3-4 years of activity within the framework of the European FP7 research program. Participation and paper submission is open to anyone, member or not of these Actions.

The workshop program will be composed of invited talks, technical presentations, posters and demonstrations. The accepted contributions from the NEWCOM# and IC1004 "workshop" papers call will be published in the conference CD-ROM. To a limited number of papers, selected on the basis of their high quality, a full submission in the peer-reviewed journal "Advances in Electronics and Telecommunications" will be offered.

See more details here.

Newcom#

cost

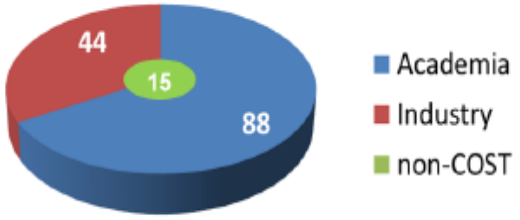
About COST IC1004

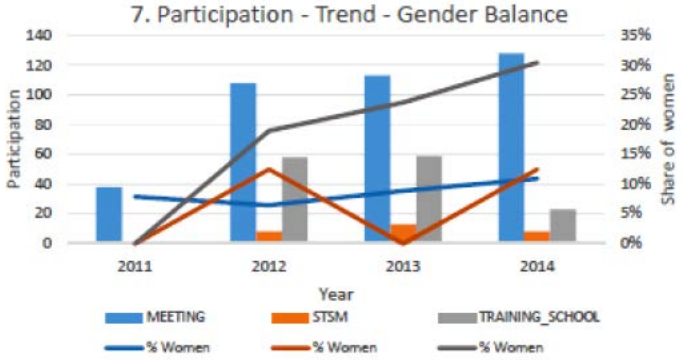
COST IC1004 is the Action on **"Cooperative Radio Communications for Green Smart Environments"**, belonging to the ICT Domain of the COST framework (see www.cost.eu). This Action addresses research issues in the field of cooperative radio communications to make our society cleaner, safer and more energy efficient. It started on January 2011 and will end on May 2015. Among many activities, 3 meetings and at least one training school are organized per year.

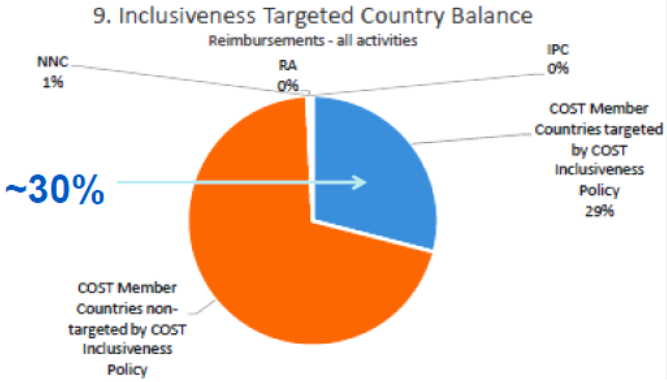
The Action goals are:

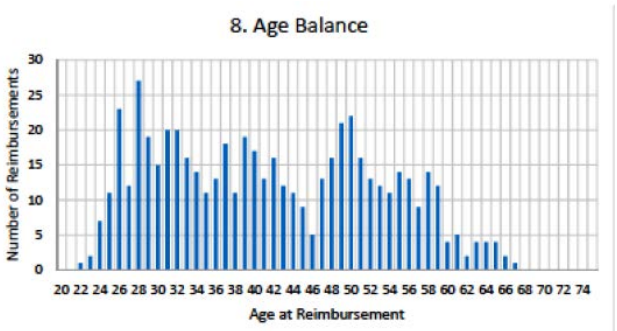
- to increase knowledge of cooperative communications applied to Green SEs (GSEs), by exploring and developing new methods, models, techniques, strategies and tools, in a context enriched by deep industry-academia links
- to play a supporting role to European industry through the focused interest of Working Groups
- to train young researchers in the field of cooperative radio communications for GSEs

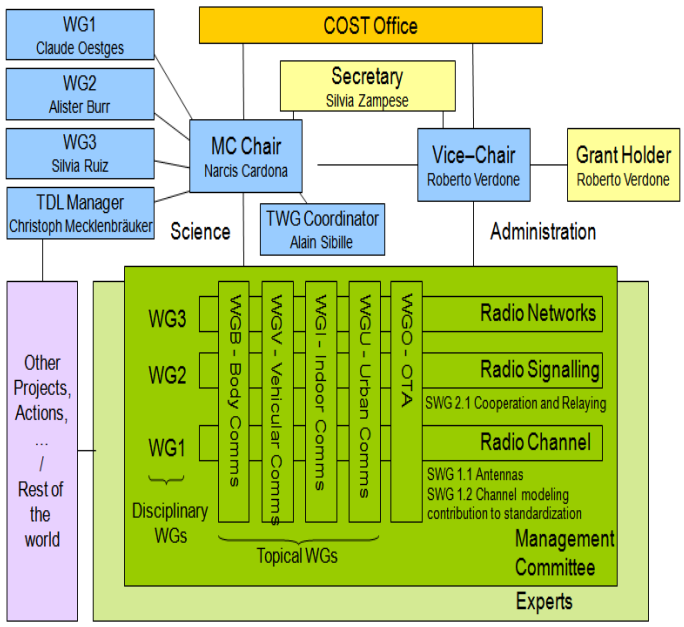
The MoU and all information can be found at http://www.ic1004.org or by contacting the secretariat at secretary@ic1004.org











Facts & Figures

Number of signatory countries: **30**
Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom.

Number of COST International Partner Countries: **6**
Australia, Canada, China, Colombia, Japan, USA

Number of COST country entities (institutes, etc.) currently participating: **141**

Number of non-COST entities currently participating: **20**
(*including Montenegro as COST near neighbour country*)

Number of MC Members: **56** (+ Chair)

Number of registered experts: > **600**

Number of meetings / year: **3**

Number of training schools / year: **≥1**

Number of completed STSM: **22**

Number of presented TD/workshop papers: **629**

Average number of participants / meeting: **120**