



**216715 NEWCOM⁺⁺
DI2.2**

**WPI.2 - Higher Education in Wireless Communications
Report on the co-tutorship initiatives, courses, summer/winter schools and
emerging topic workshop organised in the second year**

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Editor(s), (names and affiliations): Lorenzo Vangelista (CNIT)

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Contributors: (names) Lorenzo Vangelista (CNIT)

Internal Reviewer(s) (names and affiliations): Luis M. Correia (IST-TUL), Adrian Kliks (PUT), Alberto zanella (CNIT)

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Abstract: This WP deals with activities dedicated to the education of young researchers and PhD students participating to NEWCOM⁺⁺. It is organised in six Tasks, working in parallel on separate aspects. This yearly report describes the activities done during the second year. An important goal addressed by the WP is related to the cooperation with other research WPs to support the integration actions for higher education in wireless communications. Among the outcomes achieved in the second year by the WP we can list: the organisation of some successful summer/winter schools and an Emerging Topic Workshop, the organization of one PhD course based on distance learning, a complete survey of positions available for both Double Ph.D. title and Doctor Europeus title as well as students exchange positions, detailed with topics and dates.

Keyword list: PhD Courses, PhD student mobility, Schools, Emerging topic workshop.

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LIST OF ACRONYMS

ASIP	Application-Specific Instruction-set Processor
BOC	Binary Offset Carriers
DVB-T2	Digital Video Broadcasting – Terrestrial 2
EM	Expectation Maximisation
ESR	Early Stage Researchers
GNU	recursive acronym for “GNU's not Unix!”
GPS	General Positioning System
ICI	Intercell Interference
ICT	Information and Communication Technologies
LDPC	Low Density Parity-Check
LP	Linear Programming
LTE	Long-Term Evolution
MAP	Maximum a Posteriori Provability
MIMO	Multi Input Multi Output
OFDM	Orthogonal Frequency Division Multiplexing
SD	Sphere Decoding
SINR	Signal to Interference and Noise Ratio
SFN	Single Frequency Network

SECTION 1 – INTRODUCTION

Higher education in wireless communications is part of a more general action of coordination and integration among the different post-graduate programmes in partners' schools. This action is done following different strategies:

- promotion of students and researchers exchanges programmes, at different levels, including the double Ph.D. Title;
- organization of distance learning courses;
- organization of summer/winter schools and workshops on “Emerging Topics”.

The WPI.2 is organized in six Tasks, each of them in charge of a specific action for higher education:

- TI.2.1 – *PhD Courses by Distance Learning*
- TI.2.2 – *PhD Students Mobility*
- TI.2.3 – *Co-tutored PhD title*
- TI.2.4 – *Emerging Topics Workshops*
- TI.2.5 – *Summer/Winter Schools*
- TI.2.6 – *Participation to other EC projects to support student mobility*

The first three Tasks are mainly devoted to PhD students and are also open to students enrolled at universities which are not involved in NEWCOM⁺⁺. Tasks TI.2.4 and TI.2.5 are devoted to the organisation of events attracting young researchers and PhD students within NEWCOM⁺⁺ and outside; such events were structured as Summer/Winter Schools and an Emerging Topic Workshop. Finally, Task TI.2.6 is a push to increase PhD students and young researchers mobility within the research topics developed in NEWCOM⁺⁺.

The responsible of this WP was initially Prof. Silvano Pupolin, CNIT; in February he handed off for personal motivations to Prof. Lorenzo Vangelista, CNIT.

The aim of this report is to present the activities performed during the second year of the NEWCOM⁺⁺ lifetime within the framework of WPI.2. In particular, it is dedicated to the education of young researchers and PhD students participating to NEWCOM⁺⁺. An important goal addressed by this WP is related to the cooperation with other research WPs to support the integration actions for higher education in wireless communications. Moreover, among all the outcomes the particular attention will be paid on the following achievements:

- the organisation of some successful summer/winter schools and an Emerging Topic Workshop,
- the organization of one PhD course based on distance learning,
- a complete survey of positions available for both Double Ph.D. title and Doctor Europeus title as well as students exchange positions, detailed with topics and dates.

The report is organised as follows: Section 2 describes the activities done in the second year, detailed for each task, while Section 3 draws the conclusions regarding the activities performed.

SECTION 2 – ACTIVITIES DONE DURING THE SECOND YEAR OF THE NEWCOM⁺⁺ LIFETIME

2.1 Task TI.2.1 PhD Courses by distance learning

The responsible of this Task was initially Prof. Roberto Verdone, CNIT, who handed over to Prof. Lorenzo Vangelista on February.

General objectives – As general objective, the programme of PhD courses intends to:

- cover the various thematic areas addressed by the WPRs,
- integrate and complement the programme of summer/winter schools organised within NEWCOM⁺⁺
- offer to PhD students courses that they can select in order to complete the set of requirements defined at institution level (which often require that a given amount of hours of classes are followed during the years of the individual PhD programme).

With this goal in mind, it was decided to have a programme of at least 200 hours of remote teaching, covering the various disciplines within the framework of ICT research area.. It was also agreed that the modules might be provided by lecturers either online (i.e., interactively, following a precise schedule for lectures), offline (i.e., recording lectures, leaving the students to choose when to listen to them, and being available during specific time schedules for receiving questions and interacting with students), or as a mix of the two options. Certificates of participation and/or credits (upon a specific exam) for students are also available.

The technical problems encountered during the first year of the project, which were discussed in [DI21], caused a delay in the provision of the courses. As a result, only one course was given in 2009. That course entitled, "Key technologies for next generation digital video broadcasting standard", was given by CNIT, and the details related to this course can be found in **Table 1**.

Course title:	Key technologies for next generation digital video broadcasting standard
Author's name:	Stefano Tomasin, Lorenzo Vangelista and Nevio Benvenuto
Author's affiliation:	CNIT
Lesson's time slots	19-21-26-28 October and 2-4-9-11 November, between 10a.m. and 12a.m (C.E.T)
Recording type	Camstasia Studio Tool
Links to the Lessons	Educational Area of ViCE WiCom [DS41] http://www.vicewicom.eu/Educational-Area
Support material	DVB-T2 standard, books on physical layer technologies.
Course abstract:	As the European Telecommunications Standard Institute just standardised the next generation Digital Video Broadcasting standard (DVB-T2), the course aimed at providing an overview of technologies that will play a key role in the future of video broadcasting. Insights were provided on Orthogonal Frequency Division Multiplexing (OFDM), advanced coding (Low Density Parity Check codes, LDPC), and multi-antenna (Multiple Input Multiple Output, MIMO) systems applied to broadcast transmission over large areas and with a high spectral efficiency. Other topics included time/frequency synchronisation and channel estimation for OFDM, LDPC codes with decoding strategies, decoding of block space-time codes. The technologies were presented in the frame of the DVB-T2 standard and an overview of the standard was provided.

Table 1: Information on the course given in 2009.

The course was followed by 5 students. Three students took the exam.

The low number of courses offered in 2009 and the students' attendance highlights the partial success of the initiative. The reasons for this unsatisfactory result have been identified in

- the excessive duration (16 hours) of the course which has prevented many students from following the course,
- a scarce promotion activity; owing to the initial delay, promotion activity was limited to few days.

Some corrective actions to increase both students' participation and educational offer have been planned and will be described in the following sections.

Correction actions – In the third year, we plan to increase the effectiveness of the courses by means of the following actions:

- a) Enrich the flexibility of the educational offer by providing both 15-20 hour and 4-6 hour courses. The flexibility in the overall duration of the courses should make easier for the students to follow the courses. The next courses which will be given in the first months of 2010, will be organized as modules of 4-6 hours.
- b) Enrich the quantity of the educational offer by taking video-records of the lessons given at summer/winter schools. This action should increase the number of the courses available for Ph.D. students.
- c) Exploit featured of Vice WiCom, such as General forum, to promote courses. The use of different communication channels should allow the WP to reach a larger group of attendees.
- d) Provide regularly the list of planned courses to the Editor in Chief of NEWCOM⁺⁺ newsletter

2.2 Task TI.2.2. PhD students mobility

The responsible of this Task is Dr. Mario Chiesa, ISMB. During 2009, 12 PhD students have spent a period in another institution. The complete list of Ph.D. students is given in Table 2

Furthermore, a survey has been made to foster and make then publicly known open positions at the different institutions. The results have been very promising and a total of 13 positions are open, identified with tasks and objectives.

1) **Proposal from** Miquel Payaro Llisterra, e-mail: miquel.payaro@cttc.es, phone: +34933967170
Institution CTTC

Period: Jan-Jun 2010

Title Derivation of a new vector generalisation of Costa's entropy power inequality

Positions: 1

Description The scalar entropy power inequality unveiled by Costa two decades ago, has been recently generalised to the vector case in two different flavours. These two new information-theoretic results have already found multiple applications in the wireless communications field. However, there is still room for, at least, a further vector generalisation of the original Costa inequality, namely, the derivation of the concavity of the entropy power with respect to the covariance matrix of the added noise, which has not been proved yet and will be the objective of this study. Similarly as in the two previous cases, it is expected that many different applications stem from this more general result.

Name	Home institution	Hosting institution	From	To	WP
Alaus Laurent	CEA	CNRS	20/4/2009	30/4/2009	WPRC
David Gregoratti	CTTC	CNRS	1/7/2009	22/12/2009	WPR6
Javier Arribas	CTTC	CNIT	26/5/2009	29/5/2009	WPRB
Pablo Piantanida	CNRS	TECHNION	19/4/2009	24/4/2009	WPRA
Giulio Dainelli	CNIT	IASA	23/2/2009	27/2/2009	WPR8
Giulio Dainelli	CNIT	IASA	31/8/2009	4/9/2009	WPR8
Flavio Fabbri	CNIT	RWTH	12/1/2009	23/4/2009	WPR10-11
Pol Henarejos	UPC	CNIT	6/7/2009	22/7/2009	WPR8
Francesca Bassi	CNRS	CNIT	1/1/2009	30/4/2009	WPR7
Stefan Schwandter	FTW	CNRS	10/7/2009	21/7/2009	WPR4
Stefan Schwandter	FTW	CNRS	25/9/2009	20/12/2009	WPR4
George Athanasiou	IASA	CTTC	21/7/2009	23/7/2009	WPR10
Carla Oliveira	IST	UCL	25/5/2009	29/6/2009	WPR1
Antonio	IST	CNIT	22/6/2009	27/6/2009	WPR9

Table 2: List of Ph.D. students

2) **Proposal from** Carles Fernández-Prades, carles.fernandez@cttc.es, phone: +34936452909
Institution CTTC

Period: Jan-Jun 2010 (negotiable)

Positions: 1

Description This research activity will focus on new approaches for the acquisition and tracking of Binary Offset Carrier (BOC) signals, the new modulation introduced for Galileo and the modernisation of GPS.

3) **Proposal from** Carles Fernández-Prades, carles.fernandez@cttc.es, phone: +34936452909

Institution CTTC

Period: Jan-Jun 2010 (negotiable)

Positions: 1

Description This research activity will focus on the development of new nonlinear filtering techniques applied to navigation receivers and their hybridisation with wireless communication systems and/or INS.

4) **Proposal from** Carles Fernández-Prades, carles.fernandez@cttc.es, phone: +34936452909

Institution CTTC

Period: Jan-Jun 2010 (negotiable)

Positions: 1

Description This research activity will focus on the study of new synchronisation techniques for GPS & Galileo software receivers, addressing the implementation in the open-source GNU Radio framework.

5) **Proposal from** Roberto Verdone under responsibility of Prof. Giorgio Matteo Vitetta, roberto.verdone@unibo.it, phone: + 39 051 2093817

Institution CNIT

Period: Jan-Jun 2010

Positions: 1

Description Graph-based signal processing algorithms for digital receivers.

6) **Proposal from** Roberto Verdone under responsibility of Prof. Giorgio Matteo Vitetta, roberto.verdone@unibo.it, phone: + 39 051 2093817

Institution CNIT

Period: Jul-Dec 2010

Positions: 1

Description: Cooperative algorithms for localisation in UWB systems

7) **Proposal from** Roberto Verdone under responsibility of Prof. Prof. Monica Nicoli and Prof. Roberto Verdone, roberto.verdone@unibo.it, phone: + 39 051 2093817

Institution CNIT

Period: 4-6 months during year 2010

Positions: 2 (one under responsibility of Prof. Verdone and the other of Prof. Monica Nicoli)

Description: Energy-aware wireless sensor networks for monitoring applications.

8) **Proposal from** Roberto Verdone under responsibility of Prof. Prof. Monica Nicoli, roberto.verdone@unibo.it, phone: + 39 051 2093817

Institution CNIT

Period: Jul-Dec 2010

Positions: 1

Description: Distributed localisation in ad-hoc networks.

9) **Proposal from** Prof. Gerd Ascheid, Gerd.Ascheid@iss.rwth-aachen.de, phone: +49 241 8027883

Institution RWTH

Title: Resource allocation in multicell scenarios

Positions: 1

Description: In state of the art multiuser multicell communication systems, bandwidth is a limited resource and should, therefore, be reused in adjacent cells. A high spectral efficiency is achieved by a network-wide configuration with frequency reuse-1. In these so-called single frequency networks (SFN), intercell interference (ICI) emerges in the case of a unicast transmission as a critical limiting factor. An important optimisation criterion in network-design is a fair distribution of the throughput among the users while maximising the sum rate of the total network. This is a particular issue in SFN. A network wide maximisation of the signal to interference and noise ratio (SINR), which corresponds to mitigation of the intercell interference, can be achieved by an optimal assignment of users to base stations and scheduling slots jointly with a network-wide coordinated beam switching.

10) **Proposal from** Prof. Gerd Ascheid, Gerd.Ascheid@iss.rwth-aachen.de, phone: +49 241 8027883

Institution RWTH

Title: ASIP support for dynamic communication configuration on chip

Positions: 1

Description: With continuing increasing size of Systems-on-Chip, communication between the system components is becoming a more and more crucial factor influencing the system performance and cost. How to make efficient use of available communication resources for complicated application combinations and how to deal with unforeseen applications during runtime still remain challenging. Runtime configuration of the communication on chip, supported by application-specific instruction-set processors (ASIPs) with efficient scheduling algorithms, will be an attractive way to solve this problem.

11) **Proposal from** Prof. Gerd Ascheid, Gerd.Ascheid@iss.rwth-aachen.de,
phone: +49 241 8027883

Institution RWTH

Title: Convergence analysis on the iterative processing

Positions: 1

Description The significant performance gain can be achieved by performing the channel estimation, detection and decoding jointly. However, the required initialisation on such system for convergence and the optimum scheduling are still open issues. Therefore, the convergence analysis on all these "turbo principle" based iterative processing is highly interesting.

12) **Proposal from** Prof. Gerd Ascheid, Gerd.Ascheid@iss.rwth-aachen.de,
phone:+49 241 8027883

Institution RWTH

Title: Implementation Efficient Soft-Input, Soft-Output Sphere Decoding for Flexible, Energy Efficient Architectures

Positions: 1

Description Current MIMO implementations supporting Iterative Processing of Soft Information are still far from the theoretical performance limits since the system designers meet difficulties to manage their complexity and to meet the related energy consumption and latency requirements. One of the most computational intensive parts in MIMO iterative processing is the soft "demapper" which can be efficiently realised by means of Sphere Decoding (SD). Flexible, exact and/or approximate, SD algorithmic modifications exploiting structural characteristics (e.g., parallelism) and able to avoid "unnecessary" calculations are needed in order to develop energy-efficient, flexible architectures capable of providing near "theoretical" performance but also able to trade off performance for reducing the consumed energy.

13) **Proposal from** Prof. Nicolai Czink, czink@ftw.at, phone: +43 1 5052830 25

Institution FTW

Period: Jan-Jun 2010 (negotiable)

Positions: 1

Description Evaluation of distributed multi-user indoor-to-indoor and indoor-to-outdoor channel measurements.

The objective for the second year in this task has been excellently achieved. The next year target is to make full use of the opportunities highlighted above.

2.3 Task TI2.3: Co-Tutored Ph. Title

The responsible of this Task is Prof. Lorenzo Vangelista, CNIT.

There is an ongoing program to be finalised in the next few weeks and starting in 2010: Marco Maso from CNIT-UNIPD will enter a "co-tutelle de thesis" program between University of Padova and Supélec, with supervisors Prof. Lorenzo Vangelista and Prof. Mérouane Debbah.

A survey has then been conducted asking for both the co-tutelle de thesis and the Doctor Europeus title position, subdivided per quarter in 2010. The results are shown in Annex 1. The table has been distributed and the NEWCOM⁺⁺ participants can now contact the involved institutions.

The objective for the second year in this task has been excellently achieved. The next year target is to make full use of the opportunities highlighted above.

2.4 Task TI2.4: Emerging Topic Workshop

The responsible of this Task is Dr. Xavier Mestre, CTTC, with the cooperation of Prof. Erdal Panayirci, BILKENT.

On September 7th and 8th, the “Physical Layer Security” Workshop took place. There were around 20 participants joining from Belgium, Germany, Israel and Italy who first enjoyed a clear full overview of the state of the art by M. Bloch from Georgia Tech Lorraine. In depth presentations on recent and specific research topics were then given by key specialist speakers. M. Kobayashi from Supélec talked about the compound multi-input multi-output (MIMO) broadcast channel with confidential messages (BCC), where one transmitter sends a common message to two receivers and two confidential messages respectively to each receiver and about a practical Vandermonde precoding for secured communication over frequency-selective fading channels; M. Rodrigues talked about filter design with secrecy constraints with focus on the degraded parallel Gaussian wiretap channel. R. Bustin reported her recent results on the MMSE approach and a closed form expression for the secrecy capacity and for the optimal input covariance matrix. N. Laurenti reported on the secrecy capacity when using OFDM modulations.

The workshop was fruitful for the speakers too who had the possibility to meet and share their views for possible future European project initiatives. The concluding panel (provocatively named “When will Physical Layer Security be implementable?”) gave rise to interesting discussions on the next steps to be addressed by the community. A proposal on a “Physical Layer Security White Paper” is also being considered.

The Organizing Committee was composed by: Mérouane Debbah, (Supélec, France), Lorenzo Vangelista (CNIT-Italy), Nicola Laurenti (CNIT-Italy).

Comments from participants’ were as follows:

- “The subject was very interesting and the lecturers were well prepared and the talks were all of very high quality. The only remark I can do is that due to this high quality it should have been better having a further day since some lecturers had to cut their presentation because time was not enough to explain everything.”
- “The workshop presentation quality and organisation was excellent. Very innovative arguments and theories in a rapidly growing research domain. My only comment regards the focus of the topic to information privacy aspects (day 1, I unfortunately missed day 2). Considering that information security typically deals with privacy, authentication and reliability (some physical security or “electronic warfare” workshops for example focus only to jamming and Denial of service) I would suggest adding an initial slide that explains the area of interest.”
- “Add to the programme also non-academic topics/presentation.”
- “Very well organised workshop! Very interesting subject.”
- “The topic was especially interesting, and although I knew nothing of it before the workshop, now I have a good basic knowledge. Fantastic speakers and excellent organisation. Very useful!”

The quantitative evaluation is given in **Table 3**.

		Marks					Total replies	Individual average grades
		Very bad	Bad	Average	Good	Very good		
Criteria	Content				4	4	8	4.50
	Quality				3	5	8	4.63
	Support			1		7	8	4.75
	Material		1	2	4	1	8	3.63
	Duration		5	3			8	2.38

Table 3: Quantitative evaluation of the Emerging Topic Workshop

Participants to the school were people from industry, researchers, Ph.D. Students, and members of academia in general, coming mainly from Italy with some people coming from Germany, Belgium and France.

The results achieved in this task are acceptable, especially considering the significant delay introduced by the handover. Regarding next year target, it is to have another Emerging topic workshop, on topics such as channel modelling, LTE, etc..

2.5 Task TI2.5: Summer/Winter schools

The responsible of this Task is Prof. Lorenzo Vangelista, CNIT.

Two schools (4 are already confirmed for next year) have been organised in 2009: a Winter “School on Flexible Radio and related technologies”, held in Aachen, from 3 to 6 February 2009, and a Summer school on “Mathematical Foundations of Complex Networked Information Systems” in Verres (IT), from 22 to 26 June 2009, organized by Fabio Fagnani, Politecnico di Torino and Sandro Zampieri, Università di Padova.

The Winter “School on Flexible Radio and related technologies”, which was held at the UMIC research center, had 14 speakers, the following talks were given

- Andreas Polydoros (NKUA), title of the talk: “Introduction to Flexible Radio”;
- Andreas Polydoros and Andreas Zalonis (NKUA), title of the talk: “General AMC design procedure”;
- Andreas Polydoros and S. Stefanatos (NKUA), title of the talk: “Flexible multicarrier Waveforms”;
- Andreas Polydoros (NKUA), title of the talk: “Flexible codes”;
- Fabien Clermidy (CEA), title of the talk: “NoC and MPSoC - programming and design”;
- Renato Negra (RWTH), title of the talk: “Power amplifiers and advanced transmitters for multistandard multiband applications”;
- Petri Mahonen (RWTH), title of the talk: “Introduction to Flexible Networks/Cognitive Radio”;
- Amer Baghdadi (ENST, Bretagne, tile of the talk “ASIP-based MPSoC for channel decoding”;
- Rainer Leupers (RWTH), title of the talk “MPSoC platform design methodologies and tools”;
- Ramon Agusti (UPC), title of the talk “Adaptive RRM Techniques”
- Heinrich Meyr (RWTH), Konstantinos Nikitopoulos (NKUA), title of the talk: “Algorithmic Design and Architectures for MPSoC Wireless Communications”;
- Raymond Knopp (EURECOM), title of the talk: “OpenAirInterface Simulation/Emulation demonstration”;

- Ramon Agusti (UPC), title of the talk “Dynamic Spectrum Access”;
- Torsten Kempf (RWTH), title of the talk: “Heterogeneous MPSoCs as the enabler of Software Defined Radios”
- Hanna Bogucka (PUT), title of the talk: “Game Theory approach to flexible RRM and spectrum sharing”

The results of the participants’ evaluation are shown in **Table 4**.

		Marks					Total replies	Individual average grades
		Very bad	Bad	Average	Good	Very good		
Criteria	Content			3	12	2	17	3.94
	Quality		1	5	4	7	17	4.00
	Support		1	5	6	5	17	3.88
	Material			3	11	3	17	4.00
	Duration	1		6	4	6	17	3.82

Table 4: Aachen’s Winter school quantitative results.

The summer school held in Verres had 4 speakers:

- a) Béla Bollobàs, University of Cambridge and University of Memphis, who talked about “Random graphs”:
 - Probabilistic tools and the classical models. We shall introduce some of the tools used to study random graphs, concentrating on correlation and isoperimetric inequalities. Turning to random graphs, some of the basic models are defined, and their basic properties proven.
 - Sharp thresholds and properties of random graphs. One of the surprising phenomena discovered by Erdős and Renyi is the sudden emergence of various monotone properties. Given a monotone property of graphs, there is some function $m^*(n)$ such that a typical graph with n vertices and a little fewer than $m^*(n)$ edges does not have this property, but one with a little more than $m^*(n)$ edges does. In the past few years rather sophisticated results have been proved about the sharp thresholds or sharp phase transitions: some of these results are presented and applied to various properties.
 - Random geometric graphs: the Gilbert disc model and ad hoc sensor networks. For us, a geometric graph will be one whose vertices are in the plane or space, or in some metric space. For example, a planar network of sensors is modelled by a geometric graph in which two vertices joined by an edge if their sensors can communicate with each other. Choosing the points at random with some probability distribution, we have a random geometric graph. For example, in the Gilbert disc model two points are joined if their distance is no more than some parameter r . In the lectures some recent results about these networks are proven.
- b) P.R. Kumar, University of Illinois, who talked about “Mathematical foundations of wireless networks”:
 - Capacity of Deterministic Wireless Networks
 - Capacity of random wireless networks
 - A brief introduction to classical information theory.
 - Synchronising clocks in wireless networks.
- c) Martin Wainwright, Berkeley, who talked about “Graphical models and distributed algorithms: Message-passing and relaxations”:
 - Basics of graphical models. Directed models, undirected models, factor graphs. Marginalisation, MAP problem, parameter/structure learning. Junction tree formalism

- Exponential families and maximum entropy. Maximum entropy problem. Conjugate duality. Mean parameters and global validity.
 - Bethe-Kikuchi, sum-product, and expectation-propagation. Bethe approximation and belief propagation. Kikuchi clustering and generalisation. Expectation-propagation
 - Mean field methods and learning. Naive and structured mean Field. Variational EM and Bayes
 - LP relaxations and max-product. Basic tree-based LP relaxation. Reweighted max-product and LP duality. Higher-order LP relaxations.
 - Other convex relaxations. Second-order cone programming and relation to LPs. Semidefinite relaxations.
- d) Riccardo Zecchina, Politecnico di Torino, who talked about “Statistical physics of constraint satisfaction networks”:
- Introduction to statistical physics: Combinatorial interpretation. Phase transition in the Ising problem. Phase transitions in spin glasses.
 - Statistical Physics of random Constraint Satisfaction Problems Random k-xor-sat phase diagram and its rigorous derivation Statistical mechanics of random k-sat and colouring. The phase diagram from the cavity method. Clustering of solutions Rigorous results on clustering.
 - Message-passing algorithms. From the cavity method to Survey Propagation (SP) algorithms. Some applications to coding, networks and computational biology.
 - Perspectives and open problems.

The school had a stunning success in terms of participants too, whose number surpassed seventy people. Comments from the participants were:

- “Thank you for the superior organisation of the summer school! It was very good! The Amount of lectures per day should be a bit smaller to make them easier to follow.”
- “I suggest that the hotel accommodation should be located in the same town of the lecture building, in order to avoid the daily travelling time, which took about 1h30m each day. Moreover, I would have liked to have Internet access for free at the hotel, also. About the programme, I suggest not having a speaker giving more than a lecture each day.”
- “As most of the students were from a diverse background, I think a lecture on applications of the topics would have been welcome. Also, a summarizing lecture on known results in this topic in math would have been far more useful than most detailed proofs, etc.”
- “Printed material provided before lessons would have been useful”
- “Just a slower rate of explanation during lectures: they were almost interesting, but in some of them lecturers faced topics in a too speedy way, in my opinion.”
- “In my opinion the materials should be provided before the start of the course, in that way it will be easier to follow the lectures. In addition, it would be nice these courses to have some test at the end, in that way we, and the lectures, can evaluate our knowledge.”
- “It was a very good idea to have the speakers teaching mostly at the blackboard instead of beamer presentations (but it would have been nice to distribute printed hand-outs with lecture notes). It was also a great idea to have few speakers, really teaching a mini-course, not just many short presentations in a workshop style.”
- “The school was great. The only drawback, in my opinion, was the schedule too “dense”. Some of the days it was hard to pay close attention to the lessons from 9 a.m. to 6 p.m., and we had essentially no time left to “think over” the problems discussed during the lectures. I would suggest including something like “one-hour exercise session” every four hours of lectures, in which teachers propose problems, students have some time to try to solve them, and then the solution is given”

- “In my opinion the materials should be provided before the start of the course, in that way it will be easier to follow the lectures. In addition, it would be nice these courses to have some test at the end, in that way we, and the lectures, can evaluate our knowledge.”
- “The course was well-organised, but more material (PPT presentations, papers or other references) should be provided in advance to students.”
- “When possible, the material regarding each lecture (ppt presentations, etc) should be provided in advance of the respective lecture, not necessarily in printed form but for sure in electronic form.”
- “The only problem I had been following the presentations/lectures without a copy of the presentation for me, I believe that having a printed presentation could have improved my experience of the school.”
- “In my opinion the summer school was good, but the material provided was not enough. The classroom was a corridor, be careful next time please!”
- “It might be helpful to provide a volume/book with all SS proceedings/lectures, especially prior to the lectures (when this is possible)”.
- “In general the course was meant to be very good, some of the lectures were a little bit to fast (for engineers) so one did not really get the point. The type of class that should be given should really be a tutorial rather than a lecture. I think the course of Martin Wainwright was actually very good, but of course, that depends on the background of the audience and the field of interest.”
- “I think that the choice of topics was well made but the main point of getting the electrical engineering and computer science under the umbrella of mathematics was not that smooth as it could have been. Focusing on core topics/problems (could be less in number) that are been common to all the fields and a consistent set of examples that tie all the fields together to finally move towards a set of efficient solutions would have been better. But this consistency and smoothness was supposed to be done by the speakers. I appreciate that professors still did a good job even though they probably did not have enough time to synchronise before. Thanks for everything, as at the end of the day I learnt some things.”
- “Provide some reading material in advance, so that it is easier to follow the lectures. The mode of having one basically topic per speaker was very good”
- “I enjoyed the atmosphere of this school. Although the research interests of the participants varied quite a lot, I thought there were some good interactions between theorists and engineers. I especially valued the opportunity to meet with the main speakers over (scrumptious) hors d'oeuvres and coffee. The setting in the Aosta Valley was very impressive and I hope to return to visit this region again for touristic purposes. I would appreciate a list of participants.”

The results of the participants' evaluation are shown in **Table 5**.

		Marks				Total replies	Individual average grades	
		Very bad	Bad	Average	Good			Very good
Criteria	Content			3	16	10	29	4.24
	Quality			3	10	14	29	4.31
	Support		1	2	7	19	29	4.52
	Material	1	2	10	11	5	29	3.59
	Duration			1	3	25	29	4.83

Table 5: Verres' Summer school quantitative results.

Participants to the school were researchers, Ph.D. students, and members of academia in general, coming from all over Europe.

The results achieved in this Task are considered excellent considering the feedback received as well. Regarding next year there are already 4 schools planned and the challenge is to coordinate them to ensure the possibility for everybody to participate.

2.6 Task TI2.6: Participation to other EC projects to support students mobility

The responsible of this Task is Lorenzo Vangelista, CNIT.

NEWCOM⁺⁺ partners, together with COST2100 institutions, have set a proposal submitted to the Marie Curie action, in Dec. 22nd, 2009, named NEWCOST.

The proposal involved many NEWCOM⁺⁺ partner institutions, precisely: CNIT (leader), ISMB, CTTC, IST-TUL, EURECOM, UCL, KAU. The action foresees to recruit and train 24 Early Stage Researchers (ESRs); in all cases, the recruitment period is maximum, to achieve the highest level of scientific skill: 36 months. The number of ESRs involved within NEWCOM⁺⁺ is 16. Evaluation is still pending.

SECTION 3 – CONCLUSIONS

The WP as a whole, after an initial critical period mainly due to the change of the responsible, has achieved his main targets. The WP is in a good position to achieve the results for the next year in all Tasks. However **Task TI.2.6** *Participation to other EC projects to support student mobility* needs to management attention to ensure the success. Some concluding remarks, task by task are given below.

Task TI.2.1 *PhD Courses by distance learning* started in 2009 with one course. Several correction actions to obtain the original goals have been identified and will be implemented in 2010.

Task TI.2.2. *PhD students mobility* and **Task TI.2.3.** *Co-tutored PhD title* started as well, the positions available at each institution are known and spread and the plan for the next year is to fulfil these possibilities of students mobility. One double Ph.D. Title programme is already undergoing the formal approval and expected to start next year.

Task TI.2.4 *Emerging Topic Workshop* and **Task TI.2.5.** *Summer/Winter Schools* proceeded well despite the handover between the WP responsible and the plans for next year are to increase the number of schools; the increase is very much realistic as already 4 are booked.

Finally, **Task TI.2.6** *Participation to other EC projects to support student mobility* needs to be reinforced to achieve his goals, which seems feasible for next year. This will be on the top of the priority list for the WP management.

REFERENCES

- [DI21] NEWCOM⁺⁺, “Higher Educational in Wireless Communications”, IST-NEWCOM⁺⁺ Project, EC-IST Office, Brussels, Belgium, December 2008.
- [DS41] NEWCOM⁺⁺, “First release of the open collaborative space of ViCE-WiCom, IST-NEWCOM⁺⁺ Project, EC-IST Office, Brussels, Belgium, September 2008.

ANNEX 1

Given name and Family name	Institution	E-mail address	Are you interested in having someone to co-supervise a student from your institution?	Are you interested in co-supervise a student from another institution?	Are you interested in your students pursuing the "Doctor Europeus" title?	Are you available for hosting students pursuing the "Doctor Europeus" title?	Q1	Q2
Carles Anton-Haro	Centre Tecnologic de Telecomunicacions de Catalunya (CTTC)	carles.anton@cttc.es	yes	yes	yes	yes		2
Correia, Luis M	IST-TUL	luis.correia@lx.it.pt	yes	yes	yes	yes		1
Abraham, Gitta	Technion	gitta@ee.technion.ac.il	yes	yes	no	no		0
Hanna Bogucka	Poznan University of Technology	hbogucka(at)et.put.poznan.pl	no	yes	no	yes		0
Prof. Gerd Ascheid	ISS, RWTH-Aachen Uni.	gerd.acheid@iss.rwth-aachen.de	yes	yes	no	no		2
Vandendorpe, Luc	UCL	luc.vandendorpe@uclouvain.be	yes	yes	yes	yes		2
Deqli Esposti, Vittorio	CNIT-UNIBO2	v.deqliespsti@unibo.it	yes	yes	yes	yes		1
Giannetti, Filippo	CNIT-UNIFI	filippo.giannetti@iet.unipi.it	yes	yes	yes	yes		1
Verdone, roberto	CNIT-UNIBO1	roberto.verdone@unibo.it	yes	yes	yes	yes		0
Tralli, Velio	CNIT-UNIFE	vtralli@ing.unife.it	no	yes	yes	yes		1
Palazzo, Sergio	CNIT-UNICT	palazzo@diit.unict.it	yes	yes	yes	yes		0
Olmo, Gabriella	CNIT-POLITO	gabriella.olmo@polito.it	no	yes	no	yes		1
Vitetta, Giorgio Matteo	CNIT-UNIMORE	giorgio.vitetta@unimore.it	yes	yes	yes	yes		1
Nicoli, Monica	CNIT-POLIMI	nicoli@elet.polimi.it	yes	yes	yes	yes		0