The European School of Antennas within the ACE Network

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Abstract— **The Antenna Center of Excellence (ACE) is a Network of Excellence funded by the EC 6th Framework Program. This paper describes the activities on Training and Education within the network and in particular the organization of a European School of Antennas with short courses on different antenna related topics taught be recognized experts in the respective fields.**

I. Introduction

The European School of Antennas (EuSA) is a new model of distributed PhD school for post-graduate and PhD students. The school is funded by the European Union within the Sixth Framework Programme and it is part of a Network of Excellence called Antenna Center of Excellence (ACE). The EuSA, framed in the "Training and Education" Area of ACE, is supported by the Virtual Center of Excellence (VCE) [1] and by the Virtual Antenna Laboratory (VALab) [2] to extend the collective knowledge portfolio.

During the first year of work (2004), the primary task has been to organize the network of EuSA courses on the basis of an inventory of the PhD regular and temporary antenna courses available among the ACE partners. Other tasks are relevant to the definition of rules for distributing travel grants to students and the strategy to increase the industrial PhD participation. Other goals partially carried out and improved during the next year are the training of e-learning materials already developed by the partners, the planning of the mobility and scholarships for the students and of the mobility for instructors, as well as the identification of Universities willing to send their students to other Universities or Industries. Foreseen for the next year is the activation of the courses and the creation of the section European Virtual Antenna Courses within VCE using the collected e-learning materials.

The involved Institutions and reference people are shown in Table 1. At the time of writing (June 2005) we are evaluating the first 7 courses. The outcome has been good with an average of 22 students attending each course.

II. PhD Course inventory and ACE database

The basic step toward the organization of the EuSA was the inventory of PhD courses and a survey of undergraduate courses. A first PhD course inventory was done using the VALab web inventory form which led to 32 courses, classified in the categories shown in Table II.

The courses summary and the relevant support material are collected in a database on the ACE-VCE. This database, apart for giving input on the choice of the EuSA courses, help PhD students to find courses of interest given at other universities, which should facilitate restructuring of teaching and going research on antenna topics. Preliminary conclusions of the inventory are: courses about measurement are given in a few locations, at least in the framework of the ACE partners of the "Training and Education" Area, and that no course on reflector antennas and high frequency methods was reported. We have to some extent tried to fill this gap in the EuSA structure. Furthermore 50% of the courses are of basic cut which indicates that increased cooperation needs to help PhD students to learn more advanced topics. The inventory will be extended during 2005 to hopefully cover all of the university partners in ACE. The inventory of the undergraduate courses will be extended during 2005. The industry needs will be studied in detail, especially in emergent subjects as Ultra-Wide Band antennas and Wireless communication systems, linking more closely to data communications and Internet world.

III. The Short Courses Format of the European School of Antennas

The bulk of EuSA work is concerned with the organization of the short course network. The first step to this end was to agree on a common format and on the objectives for the courses. The partners of the Training and Education Area of ACE have agreed on the following points: 1) The courses should be on an advanced level suited for PhD students. 2) The courses should be held during a single week, with possible extra assignments for extra credits done at home after the course. 3) The format is typically 20-25 hours of lectures with an additional 10-20 hours of additional activities. 4) Each course should give 1.5-2 ECTS credits, or up to 3 credits in the event of additional home assignment, and the grading should be pass/fail. 5) The courses are free of charge, except for cost of material, dinners etc., for the ACE partners. 6) The mobility and the PhD title achievement in the framework of local PhD schools will be subject of a "Reciprocity agreement" to be signed in 2005.

For the external to ACE participants, it was decided that mobility expenses will be reimbursed by ACE funding. The next step was to agree on a selection of courses from the 20 submitted proposals. In this process, an important aspect was to combine proposals from different partners on similar topics. This not only led to a reduction in number, but also to a stronger set of courses and increased integration through the resulting collaborations. The final short course structure for 2005 is shown in "geographical form" in Fig. 1. Note that all

Institutions	Abbreviation	Reference people
University of Siena	UNISI	Stefano Maci (EuSA leader)
Royal Institute of Technology	KTH	Björn Lindmark (Training and Education Area leader)
University of Florence	UNIFI	Angelo Freni (VALab leader)
Université de la Marne La Vallee	UMLV	Marjorie Grzeskowiak
Universidad Politecnica de Valencia	UPV	Miguel Ferrando
Universidad Politecnica de Madrid	UPM	Manuel-Sierra Pérez
Universitat Politecnica de Catalunya	UPC	Lluis Jofre
Politecnico di Torino	POLITO	Giuseppe Vecchi
Helsinki University of Technology	HUT	Antii Räisänen
Chalmers University of Technology	CHALMERS (CHA)	Per-Simon Kildal
University of Roma "La Sapienza"	SAPIENZA (SAP)	Fabrizio Frezza
Institut National des Sciences Appliquées de Rennes	IETR	Kouroch Mahjoubi
Ecole Polytechnique Federale de Lausanne	EPFL	Anja Skrivervik
Netherland Organisation for Applied Scientifi c Research	TNO	Giampiero Gerini
Ticra Foundation	TICRA	Hans-Henrik Viskum
Technical University of Denmark	DTU	Olav Breimbjerg
THALES	THALES	C. Renard
IMST	IMST	D. Manteuffel
SATIMO	SATIMO	Lars Foged
ERICSSON	ERICSSON	J. Johansson

TABLE I
INSTITUTIONS INVOLVED IN EUSA.

General antenna courses	19(4 advanced)
Numerical methods/mathematics	4
Measurement	2
Smart antenna/MIMO	3
Other	4

TABLE II
OUTPUT OF THE INVENTORY COURSE AMONG THE ACE PARTNER BELONGING TO THE TRAINING AN EDUCATION AREA.

courses have teachers from more than one partner. The figure also shows the type of courses which are divided between Analysis, Design, Analysis/Design, and Measurement. The registration of the courses will be done using the ACE-VCE web service.

IV. VIRTUAL ANTENNA LABORATORY

The EuSA will be supported by a Virtual Antenna Laboratory. For a high quality education in antenna design, the availability of numerical tools is extremely helpful, since it provides an increased understanding of the physics behind an antenna problem and also reduces the need for expensive and bulky antenna measurement equipment. Therefore, ideally a comprehensive antenna education, which includes different tools that today are being developed with little coordination among different institutions and research centers, should be of great value.

The key feature of the VALab is to develop something more than a regular website where the student or/and the researcher can download only static pages, despite the fact that they can move from one to the other using hyperlinks. Moreover, the idea is to provide them the possibility of integrating some executable modules, already available among the ACE network, into their own codes. In the virtual laboratory all the material that the partners have decided to share with the other participants should be available for the researchers, according to the restrictions that the owners have indicated.

V. CONCLUSION

A new model of PhD school oriented to antenna topics has been presented. The school is geographical distributed and the mobility expenses is supported by EU funding within the

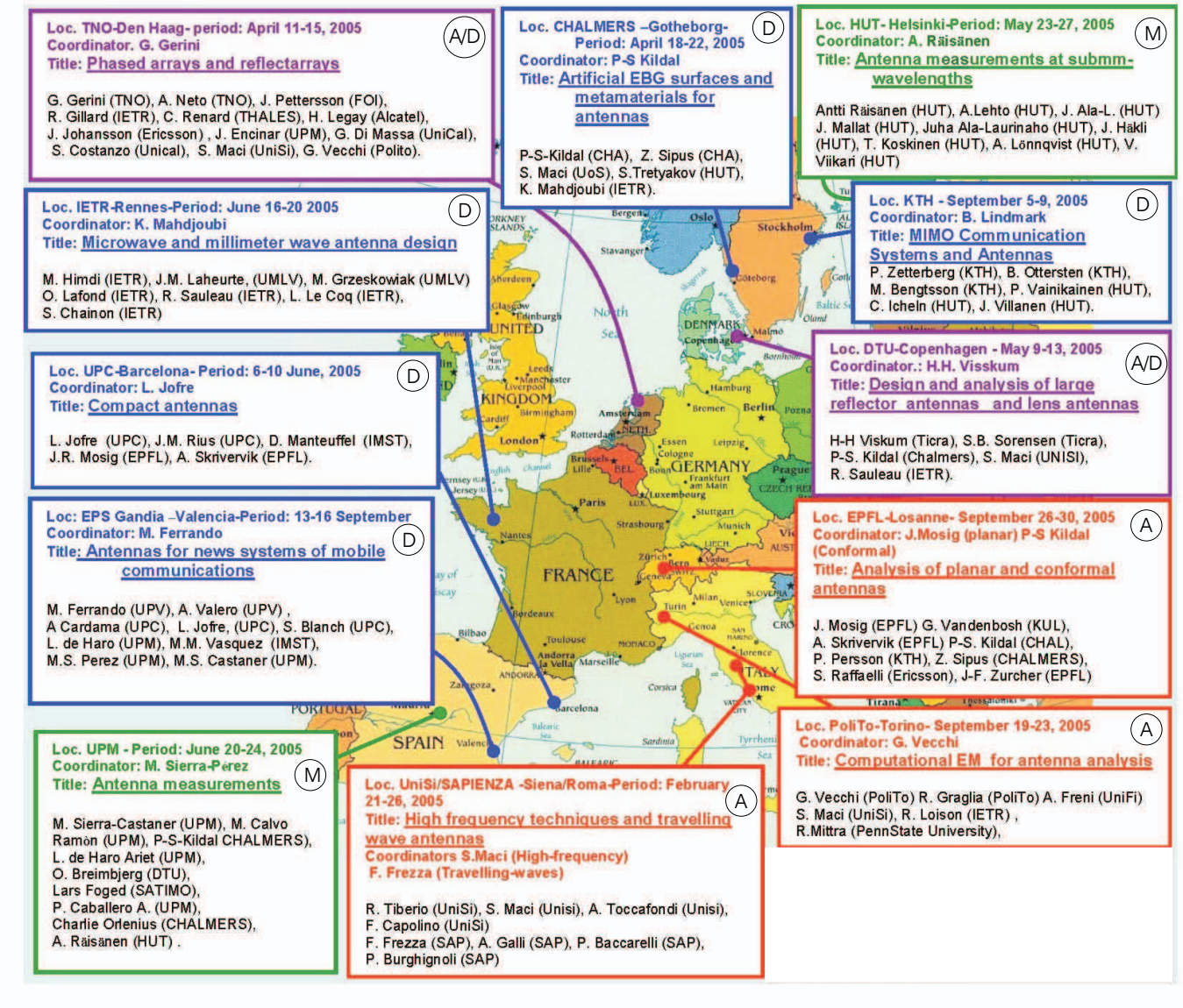

Fig. 1. Geographical overview of the short courses to be given during 2005 within the ACE network. The capital letter inside a circle in the course's box means: A: Analysis; D: Design; A/D: Analysis/Design; M: Measurements

framework of the ACE network of excellence. The school has the aim to improve the educational cooperation at European level and to increase the knowledge on established and new antenna topics at advanced level. At the time of writing the evaluation of the first 7 short courses is taking place and the results will be presented to the commission at the end of June 2005.

REFERENCES

[1] http://www.antennasvce.org
[2] http://valab.det.unifi .it/new/valab/