COST Action TU1208
"Civil Engineering Applications of Ground Penetrating Radar"

Scientific Programme of the Sixth General Meeting and Practical Information Guide

Dates and Venue:
November 7-9, 2016

Faculty of Electrical Engineering, Mechanical Engineering
and Naval Architecture (FESB), University of Split,
R. Boškovica 32, 21 000 Split, Croatia

Meeting Chairs:

Dragan Poljak (University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, Split, Croatia),
Lara Pajewski (Department of Information Engineering, Electronics and Telecommunications, Sapienza University, Rome, Italy)

About COST

COST - European Cooperation in Science and Technology is an intergovernmental framework aimed at facilitating the collaboration and networking of scientists and researchers at European level. It was established in 1971 by 19 member countries and currently includes 36 member countries across Europe, and Israel as a cooperating state.

COST funds pan-European, bottom-up networks of scientists and researchers across all science and technology fields. These networks, called 'COST Actions', promote international coordination of nationally-funded research. By fostering the networking of researchers at an international level, COST enables break-through scientific developments leading to new concepts and products, thereby contributing to strengthening Europe's research and innovation capacities.

COST's mission focuses in particular on:

- building capacity by connecting high quality scientific communities throughout Europe and worldwide;
- providing networking opportunities for early career investigators;
- increasing the impact of research on policy makers, regulatory bodies and national decision makers as well as the private sector.

Through its inclusiveness, COST supports the integration of research communities, leverages national research investments and addresses issues of global relevance. Every year, thousands of European scientists benefit from being involved in COST Actions, allowing the pooling of national research funding to achieve common goals.

As a precursor of advanced multidisciplinary research, COST anticipates and complements the activities of EU Framework Programmes, constituting a "bridge" towards the scientific communities of emerging countries. In particular, COST Actions are also open to participation by non-European scientists coming from neighbour countries (for example Albania, Algeria, Armenia, Azerbaijan, Belarus, Egypt, Georgia, Jordan, Lebanon, Libya, Moldova, Montenegro, Morocco, the Palestinian Authority, Russia, Syria, Tunisia and Ukraine) and from a number of international partner countries. In addition, COST has signed Reciprocal Agreements with Argentina, New Zealand and South Africa as a pilot exercise to facilitate cooperation with researchers from these countries.

COST's nine key domains are: (i) Biomedicine and Molecular Biosciences; (ii) Food and Agriculture; (iii) Forests, their Products and Services; (iv) Materials, Physics and Nanosciences; (v) Chemistry and Molecular Sciences and Technologies; (vi) Earth System Science and Environmental Management; (vii) Information and Communication Technologies; (viii) Transport and Urban Development; (ix) Individuals, Societies, Cultures and Health. Trans-Domain Actions allow for multidisciplinary networks to strike across the nine scientific domains.

COST invites researchers throughout Europe to submit proposals for COST Actions through a continuous Open Call. The two collection dates a year are announced in the Official Journal of the European Union and on the COST website. Following a thorough evaluation and selection process, the decision for funding a proposal is taken by the COST Committee of Senior Officials (CSO), within eight months from the collection date. Successful proposals are approved to become COST Actions.

COST's budget for networking activities has traditionally been provided by successive EU RTD Framework Programmes. COST is currently part of Horizon2020 and the framework is governed by a Committee of Senior Officials (CSO) representing all its 36 member countries; 2014 marked a turning point for COST, with the establishment of the new implementing structure, the COST Association, and the transition from FP7 to Horizon 2020. More information about COST is available at www.cost.eu.

About COST Action TU1208 "Civil Engineering Applications of Ground Penetrating Radar" - A COST Success Story

The COST Action TU1208 focuses on the exchange of scientific-technical knowledge and experience of Ground Penetrating Radar (GPR) techniques in civil engineering, aiming as well at promoting a wider and more effective use of this inspection method throughout the Europe. The scientific activities of the Action are being developed within the frame of a unique approach based on the integrated contribution of University researchers, software developers, geophysics experts, Non-Destructive Testing equipment designers and producers, end users from private companies and public agencies.

In this interdisciplinary Action, advantages and limitations of GPR are being highlighted, leading to the identification of gaps in knowledge and technology. Protocols and guidelines for EU Standards are being developed, for an effective application of GPR in civil engineering. Novel GPR equipment is being designed and realised. Advanced electromagnetic-modelling and data-processing techniques are being developed. The understanding of relationships between geophysical parameters and civil engineering needs is being improved. Freeware software will be released at the end of the Action, useful for the monitoring of structures and infrastructures, shape reconstruction and estimation of electromagnetic parameters. A high level training program is being organised. Mobility of early career researchers is being encouraged. The project has already received the interest of key end users and excellent EU Institutions.

Four Working Groups (WGs) carry out the research activities: WG1 focuses on the design of innovative GPR equipment, on the building of prototypes, as well as on the testing and optimization of new systems; WG2 focuses on the GPR surveying of pavement, bridges, tunnels and buildings, as well as on the sensing of underground utilities and voids; WG3 deals with the development of electromagnetic forward and inverse scattering methods and of advanced data processing algorithms; and WG4 explores the use of GPR in fields different from civil engineering and the integration of GPR with other non-destructive testing techniques.

The Chair of the Action is Dr. Lara Pajewski ("Roma Tre" University, Italy), the Vice-Chair is Prof. Andreas Loizos (National Technical University of Athens, Greece). The Science Officer is Dr. Mickael Pero (COST Association, Belgium), the Administrative Officer is Ms. Carmencita Malimban (COST Association, Belgium). About 150 Institutions from 28 COST Countries (Austria, Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Latvia, Malta, Macedonia, The Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom) have joined the Action. Institutions from Albania, Armenia, Australia, Colombia, Egypt, Hong Kong, Israel, Jordan, Russia, Rwanda, Ukraine, and United States of America have joined the Action, too. The COST Action TU1208 is still open to new parties! For more information, please visit www.GPRadar.eu and www.cost.eu/domains_actions/tud/Actions/TU1208.

In September 2014, TU1208 has been recognised among the running Actions as a "COST Success Story" and praised with the following statement: "TU1208 'Civil engineering applications of Ground Penetrating Radar' (Chair: Lara Pajewski, Roma Tre University, IT) is an interdisciplinary Action and represents a milestone in GPR research, being the first European network ever existed in this field, in line with the spirit and goals of the ERA. In June 2014, it co-organised the 15th International Conference on Ground Penetrating Radar, the premier forum on GPR" ("The Cities of Tomorrow: The Challenges of Horizon 2020," September 17-19, 2014, Torino, IT - A COST strategic workshop on the development and needs of the European cities).

About the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, University of Split

The Faculty yesterday …

The history of the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture in Split (FESB shortly, in Croatian) begins in 1960 when the Faculty of Electrical Engineering becomes an entirely autonomous and independent unit of the University of Zagreb. Five years later the Mechanical and Technological Department was founded at the Faculty of Electrical Engineering in Split, offering two years of study in the area of Mechanical Engineering. Also, this study programme supported students to continue the mechanical engineering programme in Zagreb after the fourth semester.

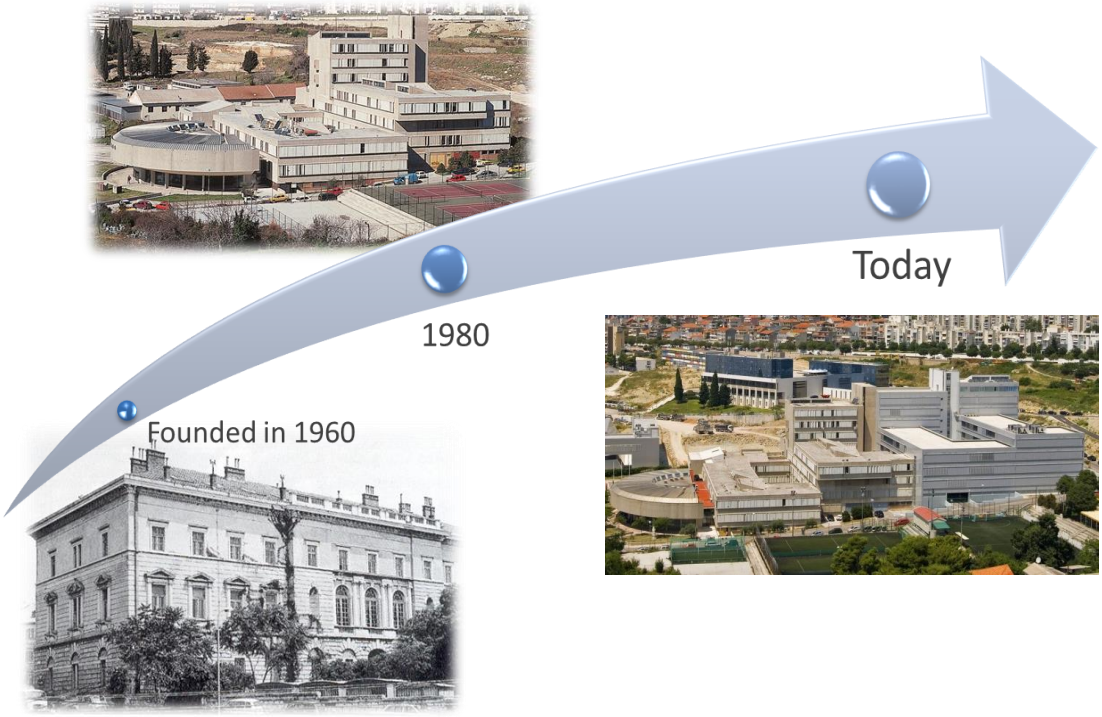
Subsequently, the Naval Architecture study programme was established at the Department of Mechanical Engineering in 1968. The Faculty was renamed as the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture in Split in 1971, while in 1974 the Faculty became a constituent part of the newly established University of Split. The Faculty is referred to be as one of the University founders. A full four-year Mechanical Engineering programme of study was established in 1976.

Two new undergraduate study programmes were established in 2002: Computer science and Industrial Engineering. The Bologna process activities regarding the harmonisation of higher education systems in Europe were intensified by the end of 2004 and the Faculty introduced new degree programmes at undergraduate and graduate levels in 2005. The ECTS (European Credit Transfer System) concept has been implemented, as well. Five new undergraduate study programmes have been organized and established taking into account the recommendations of the European accreditation agencies: Electrical Engineering and Information Technology, Computer Science, Mechanical Engineering, Naval Architecture and Industrial Engineering, as well as seven graduate programmes: Systems and Control, Electronics and Computer Engineering, Electrical Engineering, Communications and Information Technology, Computer Science, Mechanical Engineering and Industrial Engineering. In addition, four vocational study programmes have been established: Electrical Engineering, Mechanical Engineering, Naval Architecture and Computer Science. Finally, in 2006, two postgraduate study programmes for obtaining a Doctor of Science degree were established: Electrical Engineering & Information Technology and Mechanical Engineering.

… and today at a glance

The basic activities of the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture in Split involve teaching, research, development, professional work and innovation in the areas of basic and technical sciences, including electrical engineering, electronics, mechanical engineering, naval architecture, computer science, industrial engineering and natural sciences. With approximately 2600 students and about 240 employees, FESB has grown into a recognized and highly respectable educational and research institution dealing with the advanced technologies and, consequently, contributing to the development of the economy and society.

In particular, the robustness of FESB research capabilities has been confirmed through numerous successful competitive and other research and technological projects, a high number of scientific and professional papers published in peer-review journals, and through the continuous cooperation with internationally recognized research and academic institutions, respectively.



History of FESB, from 1960 to today.

COST is supported by the EU RTD
Framework Programme Horizon 2020

About the FESB Research Team for Electromagnetic compatibility (EMC) and numerical methods in electrical engineering

Research group info;

Group Leader:
DRAGAN POLJAK, Professor

Members of the Group:
Zoran Blažević, Professor
Vicko Dorić, Associate Professor
Silvestar Šesnić, Assisssstant Professor
Anna Šušnjara, PhD
Mario Cvetković, Postdoc
Maja Škiljo, Postdoc
Ivana Zulim, Postdoc

Research interests and topics:

- Electromagnetic compatibility
- Computational electromagnetics
- Magnetohydrodynamics and plasma physics
- Human exposure to electromagnetic fields
- Biomedical application of electromagnetic fields
- Ground penetrating radar (GPR)

The research group deals with advanced computational electromagnetics and related applications in different areas of Electromagnetic Compatibility (EMC), such as antennas and propagation, GPR, human exposure to electromagnetic fields, biomedical applications of electromagnetic fields, magnetohydrodynamics and plasma physics, and stochastic electromagnetics.
The group has established two research laboratories: Laboratory for EMC and Numerical Methods in Electrical Engineering and Laboratory for Antennas and EMC.

Contact info: dragan.poljak@fesb.hr, Phone: +385 (0)21 305 698, Fax: +385 (0)21 305 776

COST is supported by the EU RTD
Framework Programme Horizon 2020

The group at a glance:

The activities of the *Group for EMC and numerical methods in engineering* can be divided into the following areas of fundamental and applied research areas:

1. FUNDAMENTAL RESEARCH

- *Advanced formulations in electromagnetics*
  The group main activity is the development of advanced formulations in electromagnetics (classical electromagnetic field theory), based on space-frequency and space-time differential, variational, integral and integro-differential equations, respectively. Of particular interest are topics related to antenna theory, three-dimensional scattering, transmission line models and magnetohydrodynamics.

- *Advanced numerical methods in engineering*
  In this area of research, the main activities of the research group are concerned with the development of efficient schemes of Finite-Element, Boundary-Element and Finite-Difference Methods, for the solution of various types of differential and integral equations. Recently, the group has also had interest in the use of stochastic approaches in electromagnetics, such as stochastic collocation: several research codes and user-friendly software packages have been developed.

- *Radio-channel modeling*
  Channel models for various frequency bands have been analyzed. Besides classical wide-band modeling, based on deterministic methods, and channel statistics in mobile networks, the research group deals with narrow-band radio-channels for power transmission and has developed channel models based on the Spherical Mode Theory.

2. APPLIED RESEARCH

- *Electromagnetic compatibility of thin wire structures*
  Various antenna and transmission line models for antenna systems, overhead wires, lightning channel, lightning rods and buried cables have been developed in either frequency or time domain. These models are based on systems of integral equations. The corresponding equations of interest have been solved via originally developed numerical techniques based on Finite Element Methods, Boundary Element Methods and Finite Difference Methods.

- *Analysis and design of grounding system*
  Stationary and transient analyses of realistic grounding systems of highly complex geometries placed in inhomogeneous media have been carried out, with a particular emphasis to wind turbine grounding systems that are highly vulnerable to lightning strikes. Namely, to reduce potential damage that may occur due to lightning strike, it is necessary to design an efficient lightning protection system; to this aim, accurate electromagnetic modeling is of primary importance.

- *Human Exposure to electromagnetic fields*
  Many techniques of incident field dosimetry, as well as internal electromagnetic-thermal dosimetry methods, have been employed to assess human exposure to electromagnetic fields from extremely low frequencies (ELF) to the microwave range. A number of human body models, ranging from simplified canonical geometries to anatomically based realistic representations, have been developed.

- *Biomedical applications of electromagnetic fields*
  Some dosimetry methods for the analysis of biomedical applications of electromagnetic fields have been developed. Integral equation formulations and related numerical solution

methods have been used to study biomedical applications of electromagnetic fields related to transcranial magnetic stimulation and nerve fiber stimulation.

- *Stochastic electromagnetics*
  A number of deterministic-stochastic models, based on stochastic collocation method, have been developed to properly access relevant statistics about given responses. Specific applications are related to GPR, human exposure to electromagnetic fields, biomedical applications, and buried lines grounding systems.

- *Wireless power transmission*
  Analysis of wireless power transmission to moderate distances by electrically small antennas has been carried out, with a main focus on the possibilities of decreasing transmission frequency and antenna size. By means of an antenna model based on the spherical mode theory, it has been proved that the radiation efficiency is a decisive factor to achieve the best transmission performances. Hence, methods to increase the radiation efficiency of electrically small antennas, while maintaining proper antenna impedance and mode ratio, have been developed. The power transmission to multiple receivers and adjustment related problems are to be dealt with thoroughly.

INTERNATIONAL COLLABORATIONS

The Group has established contacts and developed long-term active cooperation with many international research groups. The most intensive on-going collaborations are achieved with the following institutions:

1. Université Blaise Pascal, Clermont-Ferrand, France (EMC of antenna systems and transmission lines; stochastic electromagnetics)
2. Wessex Institute of Technology, Southampton, United Kingdom (modeling of human body exposed to electromagnetic fields)
3. Technische Universität Ilmenau, Ilmenau, Germany (transcranial magnetic stimulation)
4. Ecole Polytechnique Fédéral de Lausanne, Lausanne, Switzerland (grounding systems)
5. Otto-von-Guericke Universität Magdeburg, Magdeburg, Germany (advanced formulations in electromagnetics)

New fruitful collaborations have started in the framework of COST Action TU1208.
Forms of collaboration include joint research work, publishing of scientific and professional papers, writing of bilateral and multilateral project proposals, organization of events, and more.

Highlights:

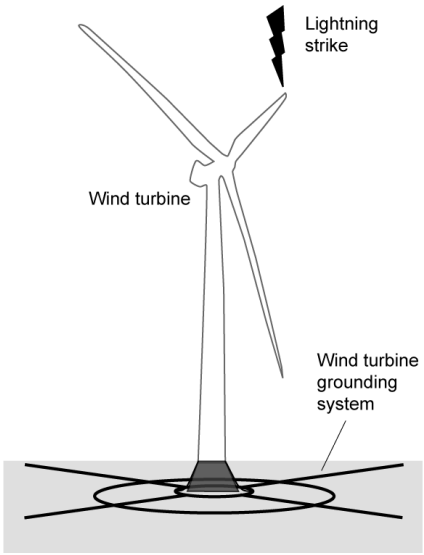
So far, the Group has been involved in three international, one national and two professional projects. There were two PhD Students in the period from 2013 to 2015: M. Cvetkovic and I. Zulim. Prof Poljak is chairing a new working group on 'Numerical Artifacts in Low-Frequency Dosimetry' under the IEEE Subcommittee 6 (SC6 - EMF Dosimetry Modeling). The goal of this working group is to resolve numerical uncertainties in the human models exposed to external extremely low frequency fields. The working group is expected to produce a white paper (or journal paper) that will guide the development and revision of human exposure limits and identify research needs.
In the period 2013-2016, several advances were achieved in modeling of complex wire configurations related to EMC problems (antennas, lines, cables, lightning channel, grounding systems), human exposure to electromagnetic fields, biomedical applications of electromagnetic fields, magnetohydrodynamics and plasma physics, GPR, wireless power transfer (WPT) and stochastic electromagnetics. Of particular importance are EMC aspects of the analysis and design of wind turbines (WTs), antenna modeling for GPR in both frequency and time domains, human brain modeling within the framework of transcranial magnetic stimulation, modeling of plasma

equilibrium in tokamak and deterministic-stochastic modeling of GPR systems. Sophisticated models pertaining to WT struck by lightning, grounding systems for WTs and electromagnetic impact of WT's for radar systems have been developed. Frequency- and time-domain analysis of dipole antenna radiation, by using integral equation methods, has been carried out within the framework of COST Action TU1208. Furthermore, realistic modeling of human eye and brain has been undertaken, based on boundary integral equation methods and with applications to medical therapy purposes, such as transcranial magnetic stimulation. Finite-element based techniques were developed, for the assessment of temperature increase in the brain and eye. A novel antenna model of the myelinated nerve fiber has been developed and applied to electrostimulation studies. Radio-channel models for WPT have been investigated and efficient antenna design for this purpose has been considered. Stochastic collocation was applied to the analysis of GPR antenna radiation, transient analysis of grounding systems, and electromagnetic-thermal response of human eye and brain.

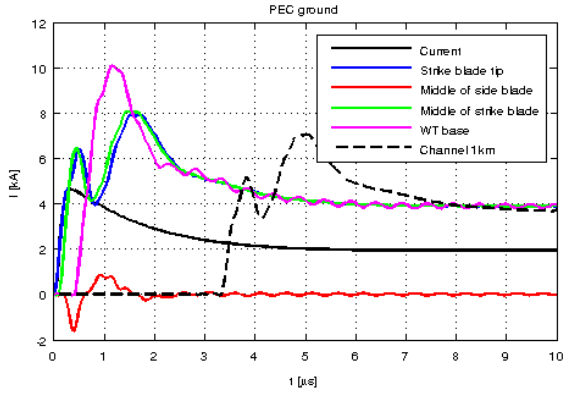
The Group has developed and upgraded several research codes:

- SoAPLinCS (Software for the Analysis of Power Line Communications Systems)
- STAGE (System for Transient Analysis of Grounding Electrodes)
  Note: These codes can be considered as extensions of the TWiNS (Thin Wire Numerical Solver) code developed in 2009 and published in UK and USA along with the related book.
- TrAnSolBS (Transient Analytical Solver for Buried Structures)
- SoHuBraD (Software for Human Brain Dosimetry)
- RSD (Diffraction Loss Calculations by Approximate Methods)

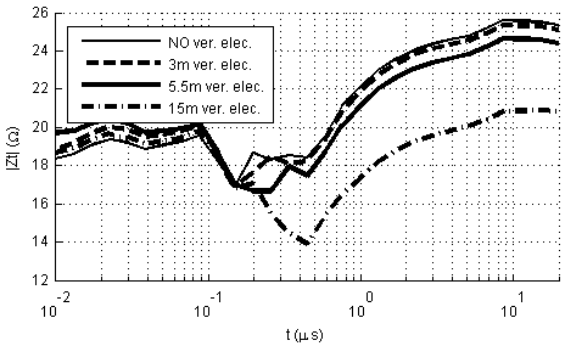
Intensive research activities are ongoing, in the area of magnetohydrodynamics based fusion. In particular, significant efforts of the group are devoted towards the efficient analytical and finite element solution of space-time dependent current diffusion equation and Grad-Shafranov equation for plasma equilibrium in tokamak.



Wind turbine subjected to a lightning strike

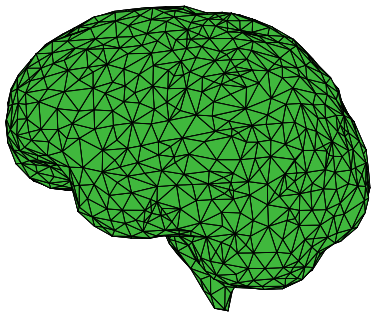


Current waveforms at different points of WT for perfectly-conducting ground

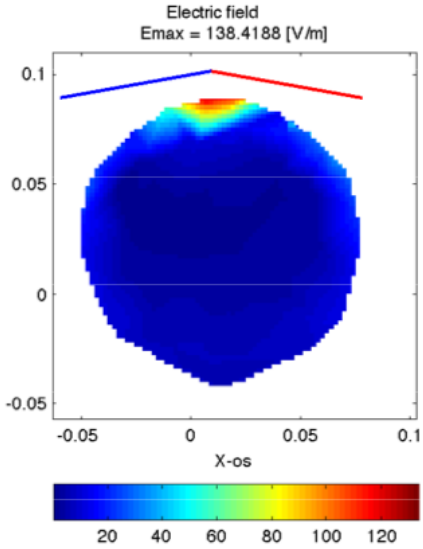


Transient impedance for different lengths of additional vertical electrodes

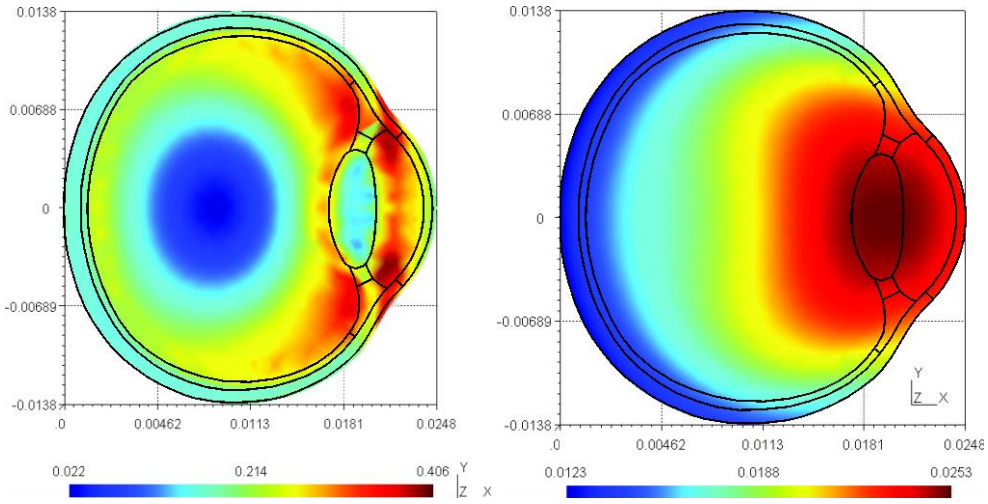
COST is supported by the EU RTD
Framework Programme Horizon 2020



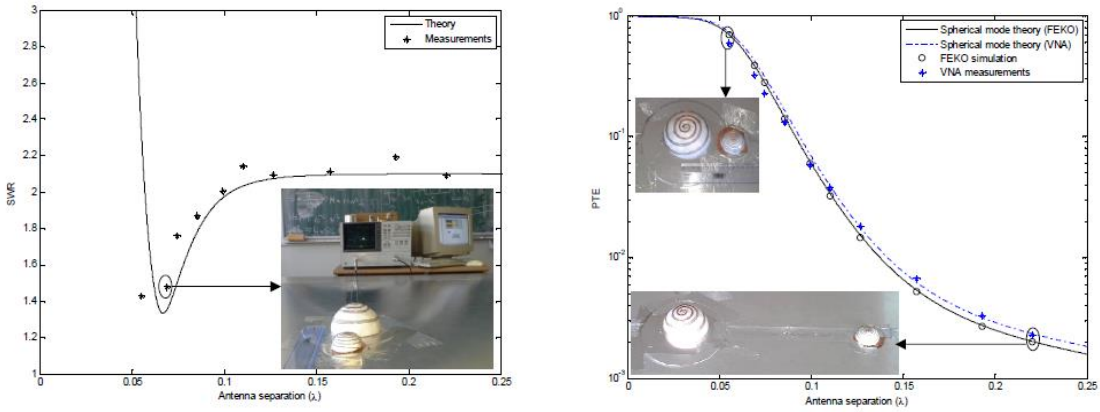
Human brain model



Electric field distribution in the model of a human brain, due to TMS



SAR and temperature increase in the eye due to EM waves with power density 10 W/m^2 at: f=1 GHz.



Measurement of wireless transmission between spherical helical monopole antennas at 163 MHz vs. theory and numerical simulations: standing-wave ratio (left) and power transmission performance (right) for 50-Ω vector network analyser loading

Recognitions and awards:

Anna Susnjara, PhD student, won the best paper award for the best student poster presentation at the BioMED 2016 conference, held in Ghent, Belgium in June 2016. Prof. Dragan Poljak is a recipient of the IEEE award (IEEE Croatian section) for the substantial achievement in engineering education in the area of development and application of numerical methods in electromagnetics for year 2016.

Selected references:

1. Cvetković, Mario; Lallechere, Sebastien; Drissi, Khalil El Khamlichi; Bonnet, Pierre; Poljak, Dragan. Stochastic Sensitivity in Homogeneous Electromagnetic-Thermal Dosimetry Model of Human Brain, *Applied Computational Electromagnetics Society journal*. 31 (2016), 6; 644-652.
2. Cvetković, Mario; Poljak, Dragan; Rogić Vidaković, Maja; Đogaš, Zoran. Transcranial magnetic stimulation induced fields in different brain models. *Journal of electromagnetic waves and applications*. 30 (2016), 14; 1820-1835.
3. Antonijevic, Sinisa; Poljak, Dragan. A Novel Time-Domain Reflection Coefficient Function: TM Case. *IEEE Transactions on electromagnetic compatibility*. PP (2013), 99; 1-7.
4. Poljak, D.; Antonijevic, S.; Sesnic, S.; Lallechere, S.; El Khamlichi Drissi, K. On deterministic-stochastic time domain study of dipole antenna for GPR applications. *Engineering analysis with boundary elements*. 73 (2016); 14-20.
5. Poljak, Dragan; Šesnić, Silvestar; Drissi, Khalil El-Khamlichi; Kerroum, Kamal; Tkachenko, Sergey.Transient Electromagnetic Field Coupling to Buried Thin Wire Configurations: Antenna Model versus Transmission Line Approach in the Time Domain. *International Journal of Antennas and Propagation*. 2016 (2016); 1-11.
6. Šesnić, Silvestar; Lalléchère, Sébastien; Poljak, Dragan; Bonnet, Pierre; El Khamlichi Drissi, Khalil. A Stochastic Analysis of the Transient Current Induced along the Thin Wire Scatterer Buried in a Lossy Medium. *International Journal of Antennas and Propagation*. 2016 (2016); 1-12.
7. Cavka, Damir; Poljak, Dragan, Magnetic current loop as a source model for finite thin-wire antennas. *International journal of numerical modelling-electronic networks devices and fields*. 28 (2015); 189-200.
8. Chouki, Makhlouf; Nekhoul, Bachir; Poljak, Dragan; Kerroum, Kamal; Drissi, Khalil El Khamlichi. Simplified dipole concept for the assessment of transient electromagnetic field in the vicinity of grounding grid. *International journal of numerical modelling-electronic networks devices and fields*. 28 (2015), 4; 404-418.
9. Cvetković, Mario; Poljak, Dragan, .Electromagnetic-thermal dosimetry comparison of the homogeneous adult and child brain models based on the SIE approach. *Journal of electromagnetic waves and applications*. 29 (2015), 17; 2365-2379.
10. Cvetković, Mario; Poljak, Dragan; Haueisen, Jens. Analysis of Transcranial Magnetic Stimulation Based on the Surface Integral Equation Formulation. *IEEE Transactions on biomedical engineering*. 62 (2015), 6; 1535-1545.
11. Poljak, Dragan; Šesnić, Silvestar; Čavka, Damir; Drissi, Khalil El Khamlichi. On the use of the vertical straight wire model in electromagnetics and related boundary element solution. *Engineering analysis with boundary elements*. 50 (2015); 19-28.
12. Šesnić, Silvestar; Garma, Tonko; Poljak, Dragan; Tkachenko, Sergey V., Comparison of the antenna model and experimental analysis of an impulse impedance of the horizontal grounding electrode. *Electric power systems research*. 125 (2015); 159-163.
13. Čavka, Damir; Rachidi, Farhad; Poljak, Dragan, On the Concept of Grounding Impedance of Multipoint Grounding Systems. *IEEE Transactions on electromagnetic compatibility*. 56 (2014), 6; 1540-1544.
14. Dodig, Hrvoje; Lallechere, S.; Bonnet, P.; Poljak, Dragan; El Khamlichi Drissi, K., Stochastic sensitivity of the electromagnetic distributions inside a human eye modeled with a 3D hybrid BEM/FEM edge element method. *Engineering analysis with boundary elements*. 49 (2014); 48-62.
15. Nekhoul, Bachir; Poljak, Dragan; Sekki, D.; Čavka, Damir; Harrat, B.; Kerroum, Kamal; Drissi, Khalil El Khamlichi, An efficient transient analysis of realistic grounding systems : Transmission line versus antenna theory approach. *Engineering analysis with boundary elements*. 48 (2014); 14-23.
16. Poljak, Dragan; Čavka, Damir; Dodig, Hrvoje; Peratta, Cristina; Peratta, Andres. On the use of the boundary element analysis in bioelectromagnetics. *Engineering analysis with boundary elements*. 49 (2014) ; 2-14.

Programme – Monday, November 7th, 2016

Location & time	Activity
09.00 – 09.30 **Aquarium**	Registration & Breakfast
A100 09:30 – 09:50 09:50 – 10:10 10:10 – 11:00	**Opening Session of the Sixth General Meeting** Session Chairs: Dragan Poljak (University of Split, Croatia) & Lara Pajewski (Sapienza University, Italy) Session Rapporteur: Alessandro Fedeli (University of Genoa, Italy) *Welcome by Authorities, introduction to the meeting and practical information for participants* Sven Gotovac (Dean, University of Split, FESB, Croatia) Alen Soldo (Vice-rector, University of Split, Croatia) Vicencije Biuk (Split-Dalmatian County, Croatia) TBD, representative of town Split Dragan Poljak (University of Split, Croatia) *COST Action TU1208: short Progress Report* Lara Pajewski (Sapienza University of Rome, Italy) ***Keynote Lecture 1*** *– Human Exposure to Electromagnetic Fields: Adverse Health Effects and Biomedical Applications* Dragan Poljak (University of Split, Croatia)
11:00 – 11:30 **Aquarium**	Tea & Coffee Break
A100 11:30 – 12:15 12:15 – 12:30 12:30 – 13:00	**Plenary Session 1** Session Chairs: Dragan Poljak & Lara Pajewski Session Rapporteur: Alessandro Fedeli **Interaction with other COST Actions** *COST Action BM1309: European network for innovative uses of electromagnetic fields (EMFs) in biomedical applications EMF-MED* Antonio Šarolić (University of Split, Croatia) ***Discussion on GPR emissions and regulatory limits*** **Presentation of new Members** 1. Motti Haridim (Holon Institute of Technology, Israel – MC Member) – 10 min 2. Lai Bun Lok (University College London, United Kingdom – WG Member) – 10 min 3. Melda Kucukdemirci (Istanbul University, Turkey – WG Member) – 10 min

13:00 – 14:00 **Aquarium**	Lunch
	Parallel Sessions
B319	**Working Group 2** ***(attended also by WG4 Members)***
14:00 – 15:00	***Guidelines for roads: Progress Report and Discussion*** Coordinated by Simona Fontul (LNEC, Portugal) & Lara Pajewski
15:00 – 16:00	***Guidelines for utilities & voids: Progress Report and Discussion*** Coordinated by Aleksandar Ristic (University of Novi Sad, Serbia) & Lara Pajewski
A100	**Working Group 1** ***(attended also by WG3 Members)*** Session Chair: Silvestar Šesnić (University of Split, Croatia) Session Rapporteur: Patrizio Simeoni (National Transport Authority, Ireland)
14:00 – 14:20	*Testing of a new lightweight radar system for tomographical reconstruction of circular structures* – **STSM outcome** Alessandro Fedeli, Jana Jezova, Sébastien Lambot (University of Genoa, Italy & Université catholique de Louvain, Belgium)
14:20 – 14:40	*Ultra-wideband Parabolic Bicone Antenna for GPR* Maja Skiljo, Zoran Blazevic & Dragan Poljak (University of Split, Croatia)
14:40 – 15:00	*Design, realisation and testing of antennas for GPR* Motti Haridim (Holon Institute of Technology, Israel)
15:00 – 15:20	*Time Domain and Frequency Domain Integral Equation Method for the Analysis of GPR Antennas* Anna Šušnjara, Dragan Poljak, Silvestar Šesnić & Vicko Dorić (University of Split, Croatia)
15:20 – 15:40	*Design and realisation of radar systems for geophysics and environmental sciences* Lai Bun Lok (University College London, United Kingdom
15:40 – 16:00	*Comparison of Generalized Telegrapher Equations Approach and Circuit Model for Wireless Power Transfer* Zoran Blažević, Maja Škiljo, Dragan Poljak (University of Split, Croatia)
16:00 – 16:30 **Aquarium**	Tea & Coffee Break

16:30 – 19:00	**WORKING TEAMS**
B319	**1. WG2 Guidelines** **1.1 Roads** Salih Sergan Altagan (Turkey), Francesco Benedetto (Italy), **Simona Fontul (Portugal – coordinator of the WT)**, Pekka Hanninen (Finland), Melda Kucukdemirci (Turkey), Tatjana Rukavina (Croatia), Mercedes Solla (Spain), Carl Van Geem (Belgium)
B319	**1.2 Utilities & Voids** Jean-Paul Balayssac (France), Vladislav Borecky (Czech Republic), **Miro Govedarica (Serbia – coordinator of the WT),** Aleksandar Ristic (Serbia), Hannes Tonisson (Estonia), Damir Varevac (Croatia)
A100	**2. Education Pack** Lai Bun Lok (United Kingdom), Antonios Giannopoulos (United Kingdom), Andrej Gosar (Slovenia), Motti Haridim (Israel), Daniel Novak (Slovakia), Vega Perez-Gracia (**Spain – coordinator of the WT)**, Santo Prontera (Italy), Hamza Reci (Albania), Viviana Sossa (Spain), Maria Svecova (Slovakia)
A100	**3. Proceedings of Action's events** Zoran Blažević (Croatia), Alexandru Chelmus (Romania), Michal Dabrowski (Poland), Alessandro Fedeli (**Italy – coordinator of the WT**), Dragan Poljak (Croatia), Silvestar Sesnic (Croatia), Maja Skiljo (Croatia), Anna Šušnjara (Croatia),
TBD	4. **Shooting interviews** Coordinated by Lara Pajewski (Italy) & Patrizio Simeoni (Ireland) 16:30 – 17:00: preparation 17:00 – 17:20: interview to Michal Dabrowski (Poland) 17:20 – 17:40: interview to Hannes Tonisson (Estonia) 17:40 – 18:00: interview to Simona Fontul (Portugal) 18:00 – 18:20: interview to Antonios Giannopoulos (UK) 18:20 – 18:40: interview to Mercedes Solla (Spain) 18:40 – 19:00: interview to Alessandro Fedeli (Italy) **Trainees of and Local Participants are welcome to join a WT of their choice among 1 to 3.**

Programme – Tuesday, November 8th, 2016

Location & time	Activity
A100 09:30 – 10:20 10:20 – 10:45 10:45 – 11:00	**Plenary Session 2** Session Chairs: Dragan Poljak & Lara Pajewski Session Rapporteur: Mercedes Solla (University of Vigo, Spain) ***Keynote Lecture 2*** *– GPR signal processing: from theory to smartphones* Francesco Benedetto (Roma Tre University, Italy) *Numerical artifacts in electromagnetic simulations (IEEE International Committee on Electromagnetic Safety – WG2 report)* Dragan Poljak ***GPR Road Show*** *Dissemination events on GPR in Estonia* - Hannes Tonisson (Institute of Ecology at Tallinn, Estonia)
11:00 – 11:30 **Aquarium**	Tea & Coffee Break
A100 11:30 – 12:15 12:15 – 13:00	**Plenary Session 3** Session Chairs: Dragan Poljak & Lara Pajewski Session Rapporteur: Mercedes Solla ***Intellectual property in Horizon2020*** Nikola Balić (European IPR Helpdesk Ambassador, Technology Transfer Office, University of Split, Croatia) ***How to apply and get funding in Horizon2020*** Ana Bedalov (Research, development and innovation center, University of Split, Croatia)
13:00 – 14:00 **Aquarium**	Lunch
A100 14:00 – 14:50	**Plenary Session 4** Session Chair: Simona Fontul; Rapporteur: Hannes Tonisson ***GPR system performance compliance: Progress Report and Discussion*** *(4 tests; 15 min per test)* - Coordinated by Xavier Derobert (IFSTTAR, France) & Lara Pajewski

	Talks by Trainees attending the school *EM techniques for GPR*
14:50 – 15:05	*Research activities on GPR in the Institute of Geology, Taras Shevchenko National University of Kyiv* Anatolii Chernov (Taras Shevchenko National University of Kyiv, Ukraine)
15:05 – 15:20	*Ground-penetrating radar techniques for root phenomics* Alfredo Delgado & Iliyana Dobreva (Texas A&M University, United States)
	Parallel Sessions
B315	**Working Group 2 (attended also by WG4 Members)**
15:20 – 15:35	*Use of GPR to assess the compaction degree and voids content in roads: a review* - Xavier Derobert The purpose of this talk is to decide whether the application is mature enough to be included in the guidelines for roads
15:35 – 16:00	***Guidelines for buildings: Progress Report and Discussion*** Coordinated by Vega Pérez Gracia (Polytechnic University of Catalonia, Spain)
A100	**Working Group 3 (attended also by WG1 Members)**
15:20 – 15:40	*Stochastic post-processing of the deterministic boundary element modelling of the transient electric field from GPR dipole antenna propagating through lower half-space* D. Poljak, S. Sesnic, S. Lallechere, K. El Khamlichi Drissi (University of Split, Croatia & Université Blaise Pascal, France)
15:40 – 16:00	*2 Short Talks:* *- Stochastic Sensitivity in Thermal Dosimetry for the Homogeneous Human Brain Model* Anna Šušnjara, Mario Cvetković, Dragan Poljak, Sebastien Lallechere & Khalil El Khamlichi Drissi (University of Split, Croatia & Université Blaise Pascal, France) *(best paper award at the BioMED 2016 conference in Ghent)* *- Stochastic Collocation Method Applied to Transcranial Magnetic Stimulation Analysis* *Mario Cvetković, Anna Šušnjara, Dragan Poljak, Sebastien Lallechere & Khalil El Khamlichi Drissi* (University of Split, Croatia & Université Blaise Pascal, France)
16:00 – 16:30 **Aquarium**	Tea & Coffee Break

16:30 – 18:00 **B315** **A100** **A100** **TBD**	**WORKING TEAMS** 1. **WG2 Guidelines** Same participants of Day 1, plus Xavier Derobert 2. **Education Pack** Same participants of Day 1 3. **Proceedings of Action's events** Same participants of Day 1 4. **Shooting interviews** 16:30 – 17:00: preparation 17:00 – 17:20: interview to Xavier Derobert (France) 17:20 – 17:40: interview to Salih Sergan Altagan (Turkey) 17:40 – 18:00: interview to Tatjana Rukavina (Croatia)

18:30: **Guided Tour and Common Dinner in the Diocletian's palace**

Programme – Wednesday, November 9th, 2016

09:00 – 12:30 Management Committee Meeting

This meeting can be attended only by TU1208 MC Members and WG Members.

What (not) to Wear in front of a Camera: Some tips on how to look your best in your interview

(from the 2014 COST Strategic Workshop "Cities of Tomorrow" practical information guide)

Clothes: What NOT to wear

- Clothing containing logos, slogans, or other distractions such as bold strips or large designs.
- Busy, intricate patterns: no stripes, checks, small flowers, herringbones etc.. If you wear them the camera will make the patter 'swim' and this makes the viewers dizzy.
- For most people, it is better to avoid short sleeves since the skin takes the attention away from the face.
- Bright yellows, reds and oranges or any other colour that changes your skin tone too much. Wearing these colours, even as an accent colour only (e.g. tie) may change your skin tone (this you can check at home) since it will 'bleed' with the neutral colour next to it (e.g. white) and may look your skin look flushed. Also avoid any colours that 'draw' colour from your skin tone (e.g. pinks if you are light- skinned, brown if your skin is dark etc.).
- Collars: Avoid shirts with a different colour collar than the body part. It makes your neck float. Avoid the same effect with jewellery (e.g. chokers).
- Shiny fabrics.
- Best to avoid linen since it wrinkles easily and shows perspiration quickly.

Safe bets

- Cool blues, natural tones, pastels.
- Black, but make sure to break it with another colour if worn close to the face.
- White, especially close to the face as accent colour. For white suits be aware of unexpected transparency issues or stains showing when the light goes on.
- Solids (in terms of patterns).
- Comfortable clothes! You need to be able to move (e.g. if you stretch your arm and your shoulder pads move up that does not look good on camera).
- Clothes that breathe (so that your face doesn't become all sweaty (think cotton rather than wool!)

Also ideal…

- If you wear glasses, ideally the frames and lenses should be glare-proof. Alternatively, you could take your glasses off (if possible) or wear contact lenses (if possible).

- For people intending to wear clothes with a V-neck, check if the skin tone is not too different from the skin tone of your face (e.g. sun burn, non-tanned area, hair growth). If it is, wear a different top or wear an undershirt.

Make-up

- Make sure to de-shine e.g. by using oil-blotting tissues.
- Use matte-finish make up.
- Natural make up works best (see also colours above).

Hair

- Try to keep it under control.
- Avoid shiny hair products.

PLEASE NOTE:

During the meeting we will take photos. These will be published on the Action webpages (Action website and Facebook page) and/or on the proceedings of the event. Should you wish NOT TO BE PHOTOGRAPHED, please notify Mr. Santo Prontera before the conference.

Internet connection

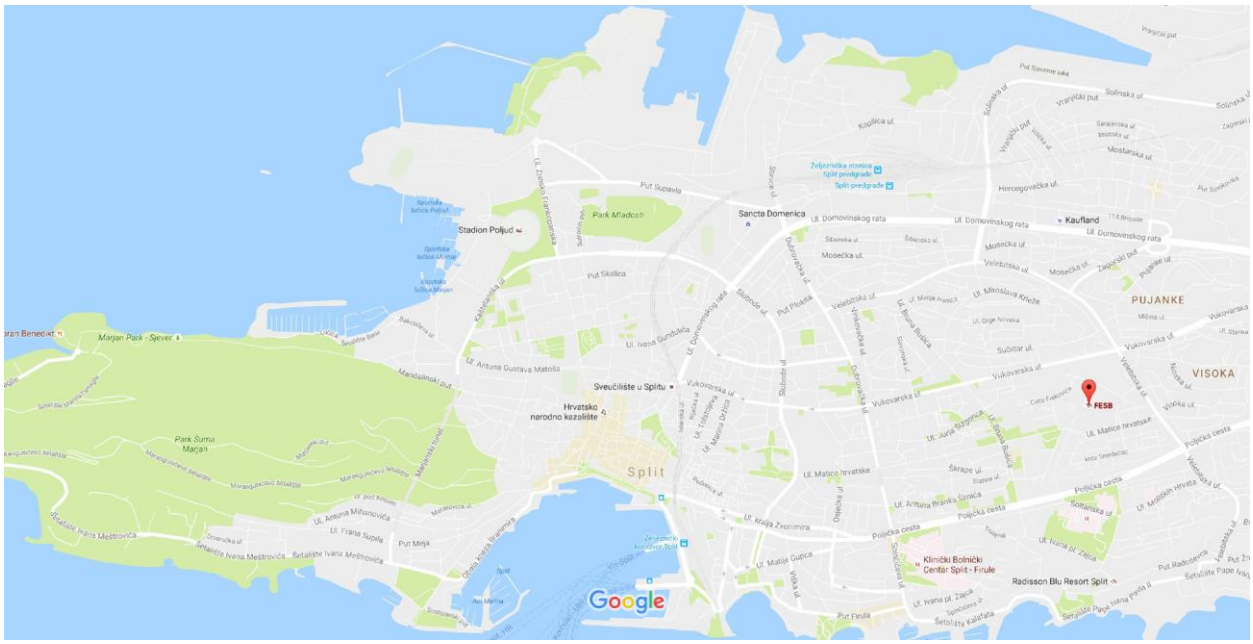
Eduroam internet connection is available through the building.

Additional WiFi connection is established as "COST" with the password "cost2016".

Location maps

Maps for the Meeting Venue

Google Maps FESB



Map data ©2016 Google 1000 ft

Google Maps FESB

Rudera Boskovica 32, 21000 Split, Croatia

Imagery ©2016 Google, Map data ©2016 Google 100 ft

COST is supported by the EU RTD Framework Programme Horizon 2020

Entrance of the building

COST is supported by the EU RTD
Framework Programme Horizon 2020