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## **COST Action TU1208 “Civil Engineering Applications of Ground Penetrating Radar”: first-year activities and results**

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This work aims at presenting the first-year activities and results of COST (European COoperation in Science and Technology) Action TU1208 “Civil Engineering Applications of Ground Penetrating Radar”. This Action was launched in April 2013 and will last four years. The principal aim of COST Action TU1208 is to exchange and increase scientific-technical knowledge and experience of GPR techniques in civil engineering, whilst simultaneously promoting throughout Europe the effective use of this safe and non-destructive technique in the monitoring of infrastructures and structures. Moreover, the Action is oriented to the following specific objectives and expected deliverables: (i) coordinating European scientists to highlight problems, merits and limits of current GPR systems; (ii) developing innovative protocols and guidelines, which will be published in a handbook and constitute a basis for European standards, for an effective GPR application in civil- engineering tasks; safety, economic and financial criteria will be integrated within the protocols; (iii) integrating competences for the improvement and merging of electromagnetic scattering techniques and of data- processing techniques; this will lead to a novel freeware tool for the localization of buried objects, shape-reconstruction and estimation of geophysical parameters useful for civil engineering needs; (iv) networking for the design, realization and optimization of innovative GPR equipment; (v) comparing GPR with different NDT techniques, such as ultrasonic, radiographic, liquid-penetrant, magnetic-particle, acoustic-emission and eddy-current testing; (vi) comparing GPR technology and methodology used in civil engineering with those used in other fields; (vii) promotion of a more widespread, advanced and efficient use of GPR in civil engineering; and (viii) organization of a high-level modular training program for GPR European users.

Four Working Groups (WGs) carry out the research activities. The first WG focuses on the design of innovative GPR equipment, on the building of prototypes and on the testing and optimisation of new systems. The second WG focuses on the GPR surveying of pavement, bridges, tunnels and buildings, as well as on the sensing of underground utilities and voids. The third WG deals with the development of electromagnetic forward and inverse scattering methods, for the characterization of GPR scenarios, as well as with data- processing algorithms for the elaboration of the data collected during GPR surveys. The fourth WG works on the use of GPR in fields different from the civil engineering, as well as on the integration of GPR with other non-destructive testing techniques. Each WG includes several Projects.

COST Action TU1208 is active through a range of networking tools: meetings, workshops, conferences, training schools, short-term scientific missions, dissemination activities. During the first year of activities, a First General Meeting was organized in Rome, in July 2013, a second meeting took place in Nantes, in February 2014, and the Second General Meeting is being held jointly with the 2014 EGU General Assembly. A training school on "Microwave Imaging and Diagnostics: Theory, Techniques, and Applications", held in March 2014, was co-organised with the European School of Antennas. Four Short-Term Scientific Missions were funded, allowing young researchers to spend a period of time in an institution abroad, in order to carry out a research project contributing to the scientific objectives of the Action. The Action's activities were disseminated in international conferences [1]-[4], as well as in further workshops and meetings. Two volumes were published [5]-[6], and several scientific papers on peer-reviewed journals. A Springer book presenting the state of the art on civil engineering applications of Ground Penetrating Radar is being prepared and is going to be published in summer 2014.

A COST Action is a wide bottom-up interdisciplinary science and technology network, open to researchers from universities, public and private research institutions, as well as to NGOs, industry and SMEs. At present, About 100 Institutions from 24 COST Member Countries (Austria, Belgium, Croatia, Czech Republic, Denmark,

Estonia, Finland, France, Germany, Greece, Italy, Latvia, Malta, Macedonia, The Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Switzerland, Turkey, United Kingdom) have already joined the Action, together with an Institution from Armenia (Near Neighbour Country, NNC). Beyond European borders, six Institutions from U.S.A., one from Rwanda and one from Australia have joined the Action. Further applications from two NNCs (Egypt and Ukraine) and International Partner Countries (Hong Kong and Japan) are under examination.

COST Action TU1208 is still open to the participation of new parties and it is possible to include, in the scientific work plan, new perspectives and activities. Scientists and scientific institutions willing to join COST Action TU1208 are encouraged to contact the Chair of the Action and to follow the procedure described at [http://www.cost.eu/participate/join\\_action](http://www.cost.eu/participate/join_action).

For more information on COST Action TU1208, please visit [www.GPRadar.eu](http://www.GPRadar.eu).

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