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Ground Penetrating Radar Technologies in Ukraine

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Transient electromagnetic fields are of great interest in Ukraine. The following topics are studied by research teams, with high-level achievements all over the world: (i) Ultra-Wide Band/Short-pulse radar techniques (IRE and LLC "Transient Technologies", for more information please visit http://applied.ire.kharkov.ua/radar%20systems_their%20components%20and%20relevant%20technologies_e.html and http://viy.ua); (ii) Ground Penetrating Radar (GPR) with stepped frequency sounding signals (IRE); (iii) Continuous-Wave (CW) radar with phase-shift keying signals (IRE); and (iv) Radio-wave interference investigation (Scientific and Technical Centre of The Subsurface Investigation, http://geophysics.ua).

GPR applications are mainly in search works, for example GPR is often used to search for treasures. It is also used to identify leaks and diffusion of petroleum in soil, in storage areas, as well as for fault location of pipelines. Furthermore, GPR is used for the localization of underground utilities and for diagnostics of the technical state of hydro dams. Deeper GPR probing was performed to identify landslides in Crimea. Rescue radar with CW signal was designed in IRE to search for living people trapped under the rubble of collapsed buildings. The fourth version of this radar has been recently created, showing higher stability and noise immunity. Radio-wave interference investigation allows studying the soil down to tens of meters. It is possible to identify areas with increased conductivity (moisture) of the soil.

LLC "Transient Technologies" is currently working with Shevchenko Kyiv University on a cooperation program in which the construction of a test site is one of the planned tasks. In the framework of this program, a GPR with a 300 MHz antenna was handed to the geological Faculty of the University. Employees of "Transient Technologies" held introductory lectures with a practical demonstration for students majoring in geophysics.

The authors participated to GPR projects on the delineation of a diamond deposit in Karelia, on the localisation of unauthorized penetrations in product pipelines, and others. Since 2007, in close cooperation with researchers from V. N. Karazin Kharkiv National University (www.univer.kharkov.ua/en) and Kharkiv National Automobile and Highway University (www.khadi.kharkov.ua), we have been developing a GPR to monitor road conditions. The main objective is the creation of an equipment suitable to determine the strength characteristics of pavements. A GPR allowing to measure thicknesses of asphalt pavement layers with an accuracy better than 3 mm has already been created; it was transferred to services responsible for maintaining roads in good condition.

Specific standards and guidelines for the use of GPR has not been adopted in Ukraine, yet. GPRs are rarely used by public services. Nevertheless, recently the Ukrainian government has funded several projects on GPR technologies.

Ukrainians seek to maintain old and to establish new relationships with colleagues around the world. We were partners of the Ultrawideband Radar Working Group, which developed the standard "IEEE P1672 TM Ultrawideband Radar Definitions." LLC "Transient Technologies" has cooperation agreements with more than a dozen of GPR companies all over the world. A group of scientists from IRE is working in cooperation with researchers from Italy, Holland, Turkey, Brazil, Russia and Ukraine on the project of FP-7-PEOPLE-2010-IRSES no 269157 "Active and Passive Microwaves for Security and Subsurface Imaging" (for more details, please visit www.irea.cnr.it/en/index.php?option=com_k2&view=item&id=342:progetto-amiss&Itemid=165).

In recent years, many representative companies have appeared, offering GPRs of foreign production on the market of Ukraine.

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