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Project Acronym: AMISS

Project Full Name: Active and Passive MIcrowaves for Security and Subsurface imaging

Marie Curie Actions

Mid-term Report

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Mid-term Report

PROJECT MID-TERM REPORT

Grant Agreement number:	269157
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1. GENERAL PROGRESS OF THE PROJECT

The project has fully achieved its objectives and technical goals for the mid- term period;

Qualitative indicators of progress and success in line with workplan and milestones (description of progress towards milestones and deliverables)

The activities of the project are in line with the expected outcomes as far as the milestones and the deliverables, mostly expected after the first periodic report.

The milestones was achieved in the period according to the expected plan and listed in the following.

M1.2 Prototype of a novel holographic system for the detection of concealed objects in charge of BMSTU and expected on 24th Month. The prototype has been designed and realized and the a preliminary evaluation of the performances has been carried out. Delivery of Deliverable D1.4

M2.1 Design of UWB antennas, impulse generators and electronic devices for UWB, multichannel array mode GPR in charge of YTU and expected on 21st Month. The design of novel antennas, generators and electronics for GPR systems has been finalised. Delivery of Deliverables D2.1 and 2.2

M2.2 Inversion approaches for differential GPR and holographic radar, in charge of CNR and expected at 24th Month. The inversion approaches have been finalised and the reconstruction performances has been investigated with synthetic and experimental data. Delivery of Deliverable D2.5

M2.3 Linear and non linear imaging approaches for UWB, multichannel array mode GPR in charge of TUDELFT and expected at 24th Month. Several linear and non linear inversion approaches have been implemented and their performances have been evaluated in the frame of qualitative and quantitative subsurface monitoring. Delivery of Deliverable D2.7

M3.1 Prototypes of Bioradar in charge of BMSTU and expected at 21st Month. Two prototypes of bioradar system have been designed and realized at BMSTU and CNR, respectively. The performances of the two bioradar systems have been evaluated and compared. Delivery of Deliverable D3.1

M4.3 Yearly project meeting in charge of the Coordinator and expected at 24th Month. Definition of the annual plan of exchange/activities and updating of the secondments ,according to the evaluation outcomes of the periodic report at 18th month.

About technical activities, the details of the progress towards the achievements of deliverables and milestones are given for each Work-package-

WP1 Microwave and Millimetre wave imaging systems for security

In the second part of the project, the planned activities in WP1 have been continued with technical cooperation between YTU and IRE, SRC and BMSTU.
On this scope;
• The dielectric loaded compact ridged horn antenna was designed at YTU for ultra-wide band (UWB) microwave through-wall imaging system in order to provide adaptive ranging and better resolution performance for RASCAN system developed by BMSTU group.
• An adaptive UWB SAR algorithm has been developed by YTU group and TWI SAR laboratory test measurements have been performed for human-like targets at the distance of 2-3 meters from the radar platform. It is expected to apply this reconstruction algorithm to the data collected by the fully holographic RASCAN system developed by BMSTU.
• 3 GHz impulse generator based on RF switch-transistor has been designed and realized by YTU group in cooperation with IRE.

• YTU, in cooperation with SRC, has completed the numerical design of waveguide and horn array fed parabolic reflector antenna for radiometric passive millimetre wave imaging system developed by SRC.
• The performance of the two radiometric passive imaging at SRC (33 GHz and 84 GHZ9 have been enhanced thanks to the data processing developed at CNR. The aims of the data processing are the mitigation of the clutter and the improvement of the resolution for the radiometric images. The data processing approach performance has been evaluated thanks to the data collected by the two systems at 33 and 94 GHz.

WP2 Development of GPR technologies for subsurface sensing and critical infrastructure monitoring

In this second part of the project, the activities in WP2 have been ongoing and several activities have finished.

Technical cooperation between YTU and IRE concerning the connected Tasks 2.1 and 2.2 has finished together with the deliverables D2.1 and D2.2 (Turk, A.S., A.K. Keskin, M. Dagcan Senturk, A. Magat, M.B. Ozakin, S. Aksoy (2013) Ultra wide band TEM horn and reflector antenna designs for down and forward looking ground penetrating radars, Proceedings of the International workshop on advanced ground-penetrating radar, IWAGPR2013, Nantes, France, July 2-5, 2013, 6 pages.).

With regard to Task 2.3 YTU has started the development of the novel system with IRE according to the plan for deliverables D2.3 and D2.4, expected at PM 30. In particular, YTU has developed novel ultra-wide band TEM horn antenna pair, which have been connected to the GPR system designed by IRE.

Tasks 2.4-2.6 have been completed and deliverables D2.5-D2.7 were issued as five conference proceeding papers on developing tomographic and other inversion methodologies dedicated to data coming holographic radar for subsurface imaging.
(Ivashov, S.I., A.S. Bugaev, A.S. Turk, A.V. Zhuravlev (2013), An Algorithm for Detection of Hidden Objects by Passive/Active Radiometer, Proceedings of the IET International Radar Conference, 14-16 April 2013, Xi'an, China, paper D0121.
Slob E. and K. Wapenaar (2013a), GPR wave field decomposition, synthesis and imaging for lossless layered vertically transverse isotropic media, Proceedings of the International workshop on advanced ground-penetrating radar, IWAGPR2013, Nantes, France, July 2-5, 2013 pp. 21-26.
Slob, E. and K. Wapenaar, (2013b), Coupled Marchenko equations for electromagnetic Green's function retrieval and imaging, SEG 83rd Annual Meeting, Houston, September 2013, 1863-1867.
Slob, E. and K. Wapenaar, (2014), Data-driven inversion of GPR surface reflection data for lossless layered media, Proceedings of the 8th European Conference on Antennas and Propagation, April 2014, to be published.)
Zhuravlev, A.V., S.I. Ivashov, V.V. Razevig, I.A. Vasiliev, A.S. Türk, and A. Kizilay (2013a), Holographic Microwave Imaging Radar for Applications In Civil Engineering, Proceedings of the IET International Radar Conference, 14-16 April 2013, Xi'an, China, paper A0065.
Zhuravlev, A.V., S.I. Ivashov, V.V. Razevig, I.A. Vasiliev, A.S. Bugaev (2013b), Holographic Subsurface Radar RASCAN-5, Proceedings of the International workshop on advanced ground-penetrating radar, IWAGPR2013, Nantes, France, July 2-5, 2013 pp. 289-294.)
In Tasks 2.5 through 2.8 preparations are made for Task 2.9 and Deliverable 2.8.

WP3 Radar technologies for remote detection and registration of vital signs

During this second part of the project, WP3 has achieved the objectives and technical goals foreseen in the AMISS workplan.
In particular, the technical cooperation between BMSTU and YTU concerning Task 3.1, which was slightly delayed during the first term, has been started and successfully completed.
In addition, the technical cooperation between CNR and BMSTU concerning Task 3.2 has continued from the first term.
The activities concerning Task 3.3, in which both BMSTU and CNR-IREA are involved, have also

started.
For Task 3.1, the involved institutions have completed the literature review and also tackled the issues of BioRadar systems design in the frequency band of interest. This activity has been the subject of the visiting period of Prof. Turk from YTU at BMSTU. The technical details of this activity and its outcomes are collected in the deliverable D3.1 “Report on prototypes of designed bio-radars that operate in different part of the overall frequency band 4-15 GHz”.
As far as Task 3.2 is concerned, the processing methodologies, independently developed by CNR and BMSTU during the first term, have been further applied to process laboratory controlled data independently collected at both BMSTU and CNR-IREA. It is worth noting that the observed results have shown that these two independent processing tools are suitable for integration, as they provide comparable information achieved through different elaborations. The software and their validation will provide the material for deliverable D3.2, which will be produced at the end of the project.
Finally, as far as Task 3.3 is concerned, the feasibility study has started exploiting the outcome of Task 3.1 and the methodologies developed in Task 3.2. In this framework, one important step has been the work carried out during the secondment of two researchers from BMSTU at CNR-IREA. In this visiting period, the visiting researchers and the resident one have jointly carried out a measurement campaign with a bioradar prototype developed at CNR-IREA (starting from the guidelines of BMSTU and YTU). The aim is to both compare the results of the two systems and compare the results of the two processing methodologies applied to data collected with different systems. Also, the effect of possible differences in the measurement protocols adopted at BMSTU and CNR-IREA has been considered. This is the material that will constitute the backbone of deliverable 3.3, which will be produced at the end of the project.

2. PROJECT ACHIEVEMENTS

Scientific highlights and research achievements:

The scientific activity and research achievements are given for each technical WP of the project as reported in the following.

WP1

- After technical discussions on wideband holographic GPR module between YTU and BMSTU; YTU group has designed a novel compact UWB antenna called “partial dielectric loaded ridged horn” to achieve higher range and resolution for practically useful TWI system development.
- 3-Dimensional Analytical Regularization Method (ARM) has been developed by YTU to perform fast and accurate design and analysis of waveguide array feeder of the parabolic reflector of SRC system. The main aim of this design is to obtain desired radiation characteristics for air and coastal microwave surveillance radars and radiometric passive millimeter wave imaging.
- The system design knowledge of 35 GHz passive radiometric imaging system and its sub-modules (i.e. antennas, receiver and image processing) were transferred from SRC to YTU. As further step, it is expected to realize a laboratory prototype of this system in YTU laboratory.
- An adaptive UWB SAR algorithm has been developed by YTU group and TWI SAR laboratory test measurements have been performed with human-like targets at the distance of 2-3 meters. The preliminary test performance results are prepared to submit to IRS 2014 conference, in Ukraine.
- 2N2222 model switch-transistor based 3 GHz band impulse generator was designed and fabricated by YTU and IRE. The performance results will be published in ACES 2014 conference, in USA.
- The performance of two radiometric passive imaging at SRC were enhanced thanks to the data processing developed at CNR regarding the mitigation of the clutter and an improvement of the resolution. The data processing has been evaluated thanks to the application to images collected by the two systems at 33 and 94 GHz. The results have been published on a Special Issue of International Journal of Antennas and Propagation.
- YTU and IRE have implemented GPR improvements so to improve the stability of the system sampling.

WP2

Milestone 2.1 has been successfully achieved .
(Turk, A.S., A.K. Keskin, M. Dagcan Senturk, A. Magat, M.B. Ozakin, S. Aksoy (2013) Ultra wide band TEM horn and reflector antenna designs for down and forward looking ground penetrating radars, Proceedings of the International workshop on advanced ground-penetrating radar, IWAGPR2013, Nantes, France, July 2-5, 2013, 6 pages).
Milestone 2.2 has been successfully achieved.
(Ivashov, S.I., A.S. Bugaev, A.S. Turk, A.V. Zhuravlev (2013), An Algorithm for Detection of Hidden Objects by Passive/Active Radiometer, Proceedings of the IET International Radar Conference, 14-16 April 2013, Xi’an, China, paper D0121.
Zhuravlev, A.V., S.I. Ivashov, V.V. Razevig, I.A. Vasiliev, A.S. Türk, and A. Kizilay (2013a), Holographic Microwave Imaging Radar for Applications In Civil Engineering, Proceedings of the IET International Radar Conference, 14-16 April 2013, Xi’an, China, paper A0065.
Milestone 2.3 has been successfully achieved.
Slob, E. and K. Wapenaar, (2014), Data-driven inversion of GPR surface reflection data for lossless layered media, Proceedings of the 8th European Conference on Antennas and Propagation, April 2014, to be published.)
GPR data were acquired at the IAG Controlled Site of Shallow Geophysics. GPR pseudo-3D profiles (2D parallel profiles) employing 200, 270 and 400MHz antennas for mapping interferences (pipelines, metallic and plastic drums). These data will be used to test algorithms in Task 2.9 and Deliverable 2.8, and achieve Milestone 2.4.
During the secondment of Prado (USP) at TUDelft GPR data are being processed that were collected at the field sites Campos de Jordão and São José dos Campos (Sao Paulo State – Brazil) for monitoring geotechnical and climatic variables for deployment of early warning systems for landslides in São Paulo. The data were acquired in April/May and July 2013. Numerical modeling is performed to help in the interpretation of the processed data.

During the period since the last report some activities related to the study of the microwave tomography applied to forensic issues were developed. The data were acquired in Brazil and microwave tomography allows for accurate determination of the target dimensions and location. The microwave tomography also allowed locating the grave itself, due to an improvement on the visualization of the clutter caused by soil disturbances (Almeida, E.R., I. Catapano, J.L. Porsani, F. Sodovieri (2013), Ground Penetrating Radar and microwave tomography for forensic imaging, International workshop on forensic science and archaeology, 22-23 November 2013, Rome, Italy.). Some reconstructed profiles are shown in Figure 1.
In this period an analysis was developed also on the inversion of GPR data. This activity aims to retrieve the electromagnetic properties of the medium using a global search method in order to avoid the problems caused by the non-linearity of the inverse problem in GPR. To do this, the Ant Colony Optimization for Continuous Domains (ACO_R) was implemented. So far the studies are focused on a simple case using data acquired in a fixed-offset, off-ground configuration to retrieve the properties of a slab in free space. After several statistical analyses the optimization was able to provide very accurate results the estimation of the relative permittivity, conductivity and thickness of the slab.
A novel ultra-wide band Vivaldi shaped TEM fed dielectric loaded ridged horn design has been implemented by YTU, as antenna head for Ground Penetrating Impulse Radar designed by IRE. The technological aim of this study is to achieve high antenna gain, narrow beam and low input reflection characteristics over an ultra-wide band for high resolution impulse GPR. This antenna is connected to the GPR system designed by IRE according to the plan for deliverables D2.3 and D2.4. The measurement results are presented in G.P. Pochanin, V.P. Ruban, P.V. Kholod, A.A. Shuba, A.G. Pochanin, A.A Orlenko "Enlarging of power budget of ultrawideband radar" (Proc. of the 6th International Conference on "Recent Advances in Space Technologies-RAST2013" June 12 14, 2013. Istanbul (Turkey). – P. 213-216.
WP3
The first main achievement has been the completion of the design stage of the bioradar prototypes by YTU and BMSTU, and the validation of the bioradar signal processing methods developed by CNR and BMSTU.
A second main achievement has been the measurement campaign carried out during the BMSTU researchers' visit at CNR-IREA, since this activity has provided data for a more comprehensive comparison involving not only the processing tools but also the developed prototypes.
Finally, also in the framework of the above mentioned visiting, new possible applications of bioradar have been devised, such as for instance adoption of radar systems for hematoma detection and imaging. These topics will be also further explored during the visit of Italian researchers from CNR-IREA at BMSTU, and will hopefully provide further opportunities of cooperation among the two institutions, which can go beyond the AMISS project.

Transfer of knowledge and Training activities (workshops):

The transfer of knowledge is below detailed for the technical WPs.

WP1
The transfer of knowledge activity which has continued in this WP is between YTU and BMSTU to understand and enhance the operating principles of holographic GPR at BMSTU for its adaptation and UWB development for TWI SAR system at YTU.
The other transfer of knowledge activity has been continued between YTU and SRC concerning the antenna and sub-modules designs for radiometric passive millimetre wave imaging system, to modify it for a possible EU-Horizon 2020-Security coastal surveillance project.

WP2
Knowledge transfer has taken place on imaging and inversion strategies and algorithms. The main transfer has concerned the setting up of the most suitable acquisition geometry for measurements at the USP geophysical test-site on which data of the developed processing technologies will be applied. This is the overall goal of WP2 (Task 2.9 and D2.8).

WP3
The interaction between BMSTU and YTU on prototypes design and the one between CNR-IREA and BMSTU on processing methods have obviously been an occasion for a mutual transfer of knowledge and training on respective expertise.

During the visiting of BMSTU researchers at IREA, several seminars and talks have been help in order to illustrate the available expertise and facilities not only with respect to AMISS activities (which have been the focus in any case), but also on a broader perspective. As mentioned, this has indeed suggested further topics for future cooperation.

Moreover, the experimental campaign jointly carried out at CNR-IREA has been an opportunity to practically share and harmonize the different measurement protocols and processing strategies.

Dissemination of results (conferences, publications...):

The dissemination of the results is going with participation to the conferences and publication of the paper related to the project's scientific outcomes.
In the following, we report only the journal papers and conference proceedings/presentation that contain the explicit acknowledgments to AMISS project. Of course, these documents are not fully exhaustive of the dissemination of AMISS activities, which are the subject of many other papers and presentations.

Journal Papers

1. F. Soldovieri, E. Utsi, R. Persico, and A.M: Alani "Imaging of Scarce Archaeological Remains using Microwave Tomographic Depictions of Ground Penetrating Radar Data", International Journal of Antennas and Propagation, Volume 2012, Article ID 580454, 8 pages, doi:10.1155/2012/580454
2. F.Soldovieri, I. Catapano, L. Crocco, L. N. Anishchenko, S.I. Ivashov, "A feasibility study for Life Signs monitoring via a continuous wave radar", International Journal of Antennas and Propagation, Volume 2012, Article ID 420178, 5 pages, doi:10.1155/2012/420178.
3. O. M. Yucedag, A.S. Turk, "Parametric Design of Open Ended Waveguide Array Feeder with Reflector Antenna for Switchable Cosecant-Squared Pattern", ACES JOURNAL, VOL. 27, NO. 8, pp. 668-675, AUGUST 2012.
4. M.D. Alekhin, L.N. Anishchenko, A.V. Zhuravlev, S.I. Ivashov, L.S. Korostovtseva, Y.V Sviryaev. Evaluation of sleep disordered breathing using non-contact remote bio-radiolocation method. Sleep Medicine. 2013. Vol. 14., Suppl. 1. P. e58.
http://www.sleep-journal.com/article/S1389-9457(13)01320-8/pdf
5. Maksim Alekhin, Lesya Anishchenko, Alexander Tataraidze, et al., "A Novel Method for Recognition of Bioradiolocation Signal Breathing Patterns for Noncontact Screening of Sleep Apnea Syndrome," International Journal of Antennas and Propagation, vol. 2013, Article ID 969603, 8 pages, 2013. doi:10.1155/2013/969603, http://www.hindawi.com/journals/ijap/2013/969603/
6. Maksim Alekhin, Lesya Anishchenko, Alexander Tataraidze, Sergey Ivashov, Vladimir Parashin, and Alexander Dyachenko, "Comparison of Bioradiolocation and Respiratory Plethysmography Signals in Time and Frequency Domains on the Base of Cross-Correlation and Spectral Analysis," International Journal of Antennas and Propagation, vol. 2013, Article ID 410692, 6 pages, 2013, doi:10.1155/2013/410692, http://www.hindawi.com/journals/ijap/2013/410692/
7. Francesco Soldovieri, Antonio Natale, Vladimir Gorishnyak, Andrey Pavluchenko, Alexander Denisov, and Lijia Chen, "Radiometric Imaging for Monitoring and Surveillance Issues," International Journal of Antennas and Propagation, vol. 2013, Article ID 272561, 8 pages, 2013. doi:10.1155/2013/272561
8. M.D. Alekhin, L.N. Anishchenko, A.V. Zhuravlev, S.I. Ivashov, L.S. Korostovtseva, Y.V. Sviryaev, A.O. Konradi, V.B. Parashin, A.V. Bogomolov. Estimation of Information Value of Diagnostic Data Obtained by Bioradiolocation Pneumography in Non-contact Screening of Sleep Apnea Syndrome / Biomedical Engineering, Vol. 47, No. 2, July, 2013, pp. 96-99. Translated from Meditsinskaya Tekhnika, Vol. 47, No. 2, Mar.-Apr., 2013, pp. 36-38. doi: 10.1007/s10527-013-9343-8
9. Ilaria Catapano, Antonio Affinito, Gianluca Gennarelli, Francesco di Maio, Antonio Loperte, Francesco Soldovieri, Full three-dimensional imaging via ground penetrating radar: assessment in controlled conditions and on field for archaeological prospecting, Appl. Phys. A, DOI 10.1007/s00339-013-8053-0
10. Ilaria Catapano, Antonio Loperte, AntonioSatriani, Felice Larocca, Antonio Affinito, Francesco Soldovieri, Mariana Amato, Three-dimensional ground penetrating radar surveys at Grotte dell'Angelo, Pertosa, (SA), Southern Italy, Rend. Online Soc. Geol. It., 2013

Conference Proceedings and Abstracts

1. I. Catapano, M. Bavusi, A. Loperte, L. Crocco, and F. Soldovieri, “On the combined use of radar systems for multi-scale imaging of transport infrastructures”, European Geophysical Union General Assembly 2012, April 2012, (ORAL PRESENTATION)
2. F. Soldovieri, “AMISS - Active and passive MIcrowaves for Security and Subsurface imaging”, in Abstract Booklet of People 2012 Conference, Nicosia, Cyprus, Nov. 2012, ISBN 978-9963-700-55-4, (POSTER PRESENTATION)
3. L.N. Anishchenko, S.I. Ivashov, F. Soldovieri, I. Catapano, L. Crocco, “COMPARISON STUDY OF TWO APPROACHES FOR BIORADAR DATA PROCESSING”, IET Radar Conference 2013, Xi'an, China, April 2013 (POSTER PRESENTATION).
4. L.Crocco, E. Slob, A.S. Turk, I. Catapano, F.Soldovieri, “Active and Passive Microwaves for Security and Subsurface Imaging (AMISS)” in CONFERENCE PROCEEDINGS PEOPLE 2012 Marie Sk#odowska-Curie Actions In Horizon 2020, pp. 56-65, CYPRUS, 5-6 November 2012 (POSTER PRESENTATION).
5. E. Slob and K. Wapenaar, “GPR wavefield decomposition, synthesis, and imaging for lossless layered vertically transverse isotropic media”, IN PRINT IN Proceedings of the International Workshop on Ground Penetrating Radar July 2013, Nantes, France, doi: 10.1109/AGPR.2005.1487870
6. M.D. Alekhin, L.N. Anishchenko, A.V. Zhuravlev, A.B. Tataraidze, V.V. Razevig, I.A. Vasilyev, V.B. Parashin, S.I. Ivashov, A.S. Bugaev, “Verification of Bio-radiolocation Method with Respiratory Plethysmography for Non-contact Remote Breathing Monitoring”, (Paper #1012 – ORAL PRESENTATION at Session EuMC38) - European Microwave Conference, October 2013.
7. Alekhin M.D., Anishchenko L.N., Zhuravlev A.V., Ivashov S.I., Korostovtseva L.A., Sviryaev Y.V Evaluation of sleep disordered breathing using non-contact remote bio-radiolocation method(Paper #1458 – ORAL PRESENTATION at Session Technical) - World Congress on Sleep Medicine 2013.
8. R. Persico, F. Soldovieri, I.Catapano G. Pochanin, V. Ruban, O.Orlenko. “Experimental results of a Microwave Tomography approach applied to a Differential Measurement Configuration”, 7th International Workshop on Advanced Ground Penetrating Radar Conference Proceedings, Nantes, France, July 2013, doi: 10.1109/IWAGPR.2013.6601530
9. L. Anishchenko, S. Ivashov , I.Catapano. L. Crocco, G. Gennarelli, F. Soldovieri, “Radar for vital signs characterization: a comparison between two different frequency band systems”, 7th International Workshop on Advanced Ground Penetrating Radar Conference Proceedings, Nantes, France, July 2013, doi: 10.1109/IWAGPR.2013.6601536
10. I. Catapano, A. Affinito, Lorenzo Crocco, Gianluca Gennarelli, Francesco Soldovieri, “A Fully 3-D Electromagnetic Subsurface Imaging using Ground Penetrating Radar”, 7th International Workshop on Advanced Ground Penetrating Radar (IWAGPR), 2-5 July 2013, doi: 10.1109/IWAGPR.2013.6601505.
11. I. Catapano, L. Crocco, F. Di Matteo, A.S. Turk, E. Slob, F. Soldovieri and the AMISS Team, “AMISS - Active and passive MIcrowaves for Security and Subsurface imaging”, abstract in Proceedings of European Geophysical Union General Assembly 2013, Wien, Austria, April 2013 (POSTER PRESENTATION).
12. I.Catapano, L. Crocco, A. Affinito, G. Gennarelli, and F. Soldovieri “Monitoring by holographic radar systems”, abstract in Proceedings of European Geophysical Union General Assembly 2013, Wien, Austria, April 2013 (EGU2013-12450) (POSTER PRESENTATION).
13. I. Catapano, A. Affinito, F. Soldovieri, “A user friendly interface for microwave tomography enhanced GPR surveys”, abstract in Proceedings of European Geophysical Union General Assembly 2013, Wien, Austria, April 2013 (POSTER PRESENTATION).
14. E. Slob, “Non-destructive monitoring of layered infrastructure using GPR data”, abstract in Proceedings of European Geophysical Union General Assembly 2013, Wien, Austria, April 2013 (ORAL PRESENTATION).
15. I. Catapano, L. Crocco, A. Affinito, Gi. Gennarelli, V. Razevig, I. A. Vasiliev, S. I. Ivashov, F. Soldovieri, “On the Holographic Radar as A Tool for structural monitoring”, in print in Proceedings of 4th Workshop on Cultural and Natural Heritage, 6-7 June 2013 - Matera, Italy, (POSTER PRESENTATION).
16. F. Soldovieri, I. Catapano, “Close sensing radar systems enhanced by Microwave Tomography for IED detection and localization”, Proc. of Resilient Threat Management 2013, European Defence Agency, 4-6 March 2013, Brussels, Belgium (POSTER PRESENTATION)

17. Ilaria Catapano, L. Bertolla,, J. L. Porsani and F. Soldovieri,, “PIPELINES MONITORING VIA MICROWAVE TOMOGRAPHY ENHANCED GPR SURVEYS”, SOLICITED for the oral presentation at Seventeenth International Water Technology Conference (IWTC- XVII), 5-7 November 2013, Istanbul, Turkey.
18. G.P. Pochanin, V.P. Ruban, P.V. Kholod, A.A. Shuba, A.G. Pochanin, A.A Orlenko "Enlarging of power budget of ultrawideband radar", Proc. of the 6th International Conference on "Recent Advances in Space Technologies-RAST2013" June 12 14, 2013. Istanbul (Turkey). pp. 213-216.
19. G.P. Pochanin, V.P. Ruban, P.V. Kholod, A.A. Shuba, A.G. Pochanin, A.A. Orlenko "IMPROVEMENT OF ENERGETIC PROPERTIES OF GPR." is sent to the EGU General Assembly 2014
20. Conference paper Francesco Soldovieri, Gianluca Gennarelli and Liudmyla A. Varianytsia-Roshchupkina "Microwave Tomography Of The Conducting Objects In Free Space for Two Differential GPR Systems" is going to be submitted to the 15th International Radar Symposium in Ukraine, will be held in Lviv (June 18-20, 2014). Date of submission is February 14, 2014.
21. Almeida, E.R., I. Catapano, J.L. Porsani, F. Sodovieri (2013), Ground Penetrating Radar and microwave tomography for forensic imaging, International Workshop on Forensic Science and Archaeology 2013.
November 22-23, 2013, Rome, Italy
22. L. Anishchenko et al., "Comparison study of two approaches for bioradar data processing," IET International Radar Conference 2013, pp.1,4, 14-16 April 2013; doi: 10.1049/cp.2013.0110
23. M.D. Alekhin, L.N. Anishchenko, A.V. Zhuravlev, A.B. Tataraidze, V.V. Razevig, I.A. Vasilyev, V.B. Parashin, S.I. Ivashov. Verification of Bio-radiolocation Method with Respiratory Plethysmography for Non-contact Remote Breathing Monitoring // Proc. of the 43rd European Microwave Conference. Nuremberg (Germany). 2013, p. 704-707.
24. Ilaria Catapano, Lorenzo Crocco, Antonio Affinito, Gianluca Gennarelli, Vladimir Razevig, Igor A. Vasiliev, Sergey I. Ivashov and Francesco Soldovieri, On The Holographic Radar as a Tool for Structural Monitoring, 4th EARSeL Workshop on Cultural and Natural Heritage, 6-7 June 2013, Matera, Italy
25. Slob, E. and K. Wapenaar, GPR wave field decomposition, synthesis and imaging for lossless layered vertically transverse isotropic media, In proceedings of the 7th International Workshop on Advanced Ground Penetrating Radar (IWAGPR), Nantes, July 2013, 21-26.
26. Slob, E., High-resolution imaging and inversion of 3D GPR data for layered media, poster presentation at the EGU General Assembly, Vienna, April 7-12, 2013.
27. Slob, E., Data-driven inversion of 3D GPR data for layered media, poster presentation at the AGU Fall Meeting, San Francisco, December 9-12, 2013.

EGU GA is the largest Conference in the fields of the geophysical science and it is a good platform for the dissemination of scientific activities.
IWAGPR is one of the most impotent conferences dealing with GPR scientific technological advances, which is held whit a biennial timeline. IWTC represents a good dissemination opportunity of the AMISS outcomes in the field of water monitoring and protection at Mediterranean Countries (Egypt, Turkey, Algeria,..)

SESSIONS
In the frame of AMISS activities, Francesco Soldovieri (CNR) has organized and convened the sessions at European Geophysical Union General Assembly 2013
- From Artefact to Historical Site : Geoscience and Non-Invasive Methods for the Study and Conservation of Cultural Heritage, Conveners: Nicola Masini,Monica Alvarez de Buergo , Lev Eppelbaum , and Francesco Soldovieri.
- Electromagnetic sensing techniques and geophysical methods for critical and transport infrastructures monitoring and diagnostics. Conveners: Jean Dumoulin, Francesco Soldovieri, Lorenzo Bigagli, Sven Nordebo.
In these two sessions, the presentations of four works related to AMISS activities were given.

AWARD
The paper L.N. Anishchenko, S.I. Ivashov, F. Soldovieri, I. Catapano, L. Crocco, “COMPARISON STUDY OF TWO APPROACHES FOR BIORADAR DATA PROCESSING”, has been awarded as the Best Poster at IET International Radar Conference 2013, Xi'an, China, April 2013 .

Special issues
F. Soldovieri has been Editor of two Special Issues on International Journal of Antennas and Propagation (http://www.hindawi.com/journals/ijap/) regarding the thematics of AMISS and where several AMISS papers have been published.
- R. Pierri, J.C: Bolomey, Q:H: Liu, and F. Soldovieri, "Inverse Scattering and Microwave Tomography in Safety, Security, and Health," International Journal of Antennas and Propagation, vol. 2013, Article ID 589598, 2 pages, 2013. doi:10.1155/2013/589598

- D. Erricolo, F. Soldovieri, and W.C. Chew, "Propagation Models and Inversion Approaches for Subsurface and Through-Wall Imaging," International Journal of Antennas and Propagation, vol. 2012, Article ID 821263, 2 pages, 2012. doi:10.1155/2012/821263

The project AMISS has been quoted in the article "Special report Microwaves in Europe: Winning ways" on Microwave Journal, vol. 55, no.9, pp. 86-102,September 2102.
The text is below reported.
"As its title suggests, the results of the Active and Passive Microwaves for Security and Subsurface imaging (AMISS) project will be two-fold – ground penetrating radar for subsurface sensing and critical infrastructure diagnostics and passive and active microwave imaging systems for security applications. The proposal is for two lines of research. The first is concerned with the development, characterization and performance evaluation of new systems, sensors and configurations able to mitigate the clutter, and increase information content and redundancy, for both passive and active microwave imaging, while the second considers the development, implementation and performance evaluation of processing tools."

3. PROJECT MANAGEMENT

Overview of the activities carried out by the partnership; Identification of problems encountered and corrective action taken:

The management activities were carried out without any significant problem, with the collaboration of all partners. Management activities were aimed at ensuring the execution of all the planned activities and the timely delivery of the expected products.
A new secondment plan has been agreed among the partners and submitted to the REA.
The secondments have been initialised according to this plan.
All the partners provided the administrative support in order to facilitate the feasibility of the secondments, with reference to the VISAs, the invitation procedure, the staying of the seconded persons.
The financial reporting was submitted on time by the Coordinator on EC Participant Portal in complying with the FP7 reporting rules. The paper C forms were collected and promptly provided to the REA.
The periodic report was submitted on time by the Coordinator on EC Participant Portal in complying with the FP7 reporting rules.
Frequent communications between the Coordinator and the partners were exchanged aimed at a constant monitoring of the project activities.
A continuous flow of information has been activated between the AMISS management and the Project Officer with the main aim to have clear information about mobility modalities in response to the issues raised by the partners.

Project results have been disseminated through the project website and in several international conferences and workshops. Also some results have been published in international peer reviewed journals.

The list of publications referred to the AMISS project have been uploaded on the EC participant portal.

The continuous updating of the website in ensured according to the information provided by all the partners.

4. ADDITIONAL INFORMATION

Additional information, which may be considered useful to assess the work done during the reporting period:

We want to stress the fact that several of the partners involved in AMISS are also partners of the COST Action TU1208 “Civil Engineering Applications of Ground Penetrating Radar”. This represents a good opportunity to continue the cooperation beyond AMISS’s life. In addition, the assessed cooperation among AMISS partners can be important in view of the project opportunities offered in Horizon 2020

Attachments	amiss_journal_papers_midreport2_v1.zip

Date:

Person in charge of the project for the beneficiary(ies):