

Detection and Remediation Technologies for Mines and Minelike Targets XI

Conference Chairs: **J. Thomas Broach**, U.S. Army RDECOM CERDEC NVESD; **Russell S. Harmon**, U.S. Army Research Office; **John H. Holloway, Jr.**, Naval Surface Warfare Ctr. Panama City

Program Committee: **Jerrell R. Ballard, Jr.**, U.S. Army Corps of Engineers; **Leslie M. Collins**, Duke Univ.; **Yogadhis Das**, Defence R&D Canada/Suffield (Canada); **Gerald J. Dobeck**, Naval Surface Warfare Ctr. Panama City; **Paul D. Gader**, Univ. of Florida; **John E. McFee**, Defence R&D Canada/Suffield (Canada); **Kevin A. O'Neill**, U.S. Army Corps of Engineers; **James M. Ralston**, Institute for Defense Analyses; **James M. Sabatier**, Univ. of Mississippi; **Hichem Sahli**, Vrije Univ. Brussel (Belgium); **H. M. Schleijsen**, TNO (Netherlands); **Waymond R. Scott, Jr.**, Georgia Institute of Technology; **Richard C. Weaver**, U.S. Army RDECOM CERDEC NVESD

Monday 17 April

SESSION 1

Room: Sanibel 1-2 Mon. 9:30 to 11:40 am

Electromagnetic Induction I

Chairs: **Yogadhis Das**, Defence Research and Development Canada (Canada); **Kevin A. O'Neill**, U.S. Army Engineer Research and Development Ctr.

9:30 am: **Time-domain response of a metal detector to a target buried in soil with frequency-dependent magnetic susceptibility**, Y. Das, Defence Research and Development Canada (Canada) [6217-01]

9:50 am: **Spectral representation: a core aspect of modeling the response characteristics of time-domain EMI mine detectors**, G. F. West, R. C. Bailey, Univ. of Toronto (Canada) [6217-03]

10:10 am: **Evaluation of SVM classification of metallic objects based on a magnetic dipole representation**, J. P. Fernández, Dartmouth College; B. E. Barrowes, K. Jones, K. A. O'Neill, U.S. Army Engineer Research and Development Ctr.; I. Shamatava, F. Shubitidze, K. Sun, Dartmouth College [6217-04]

Coffee Break 10:30 to 11:00 am

11:00 am: **Testing of a locating discriminating metal detector for landmine detection**, N. Davidson, M. Hawkins, R. J. Beech, Defence Science and Technology Lab. (United Kingdom) [6217-05]

11:20 am: **Moving belt metal detector (MBMD)**, C. V. Nelson, D. P. Mendat, T. B. Huynh, Johns Hopkins Univ. [6217-06]

Lunch Break 11:40 am to 1:30 pm

SESSION 2

Room: Sanibel 1-2 Mon. 1:30 to 2:50 pm

Electromagnetic Induction II

Chairs: **Carl Nelson**, U.S. Army Night Vision & Electronic Sensors Directorate; **Juan P. Fernández**, Dartmouth College

1:30 pm: **Dumbbell dipole model and its application in UXO discrimination**, K. Sun, Dartmouth College; K. A. O'Neill, B. E. Barrowes, U.S. Army Engineer Research and Development Ctr.; J. P. Fernández, F. Shubitidze, I. Shamatava, K. D. Paulsen, Dartmouth College [6217-07]

1:50 pm: **Application of SEA to UXO discrimination in geophysical environments producing EMI response**, F. Shubitidze, Dartmouth College; K. A. O'Neill, B. E. Barrowes, U.S. Army Engineer Research and Development Ctr.; I. Shamatava, K. Sun, J. P. Fernández, K. D. Paulsen, Dartmouth College [6217-08]

2:10 pm: **Use of EMI response coefficients from spheroidal excitation and scattering modes to classify objects via SVM**, B. Zhang, Massachusetts Institute of Technology; K. A. O'Neill, U.S. Army Engineer Research and Development Ctr. and Massachusetts Institute of Technology; T. M. Grzegorzczak, J. A. Kong, Massachusetts Institute of Technology [6217-09]

2:30 pm: **Electromagnetic induction sensor that uses a toroidal bucking transformer**, W. R. Scott, Jr., M. Malluck, Georgia Institute of Technology [6217-10]

Coffee Break 2:50 to 3:30 pm

SESSION 3

Room: Sanibel 1-2 Mon. 3:30 to 5:10 pm

Spectral Sensing I

Chairs: **Russell S. Harmon**, U.S. Army Research Office; **Nicola A. Playle**, Defence Science and Technology Lab. (United Kingdom)

3:30 pm: **Detection of landmines using hyperspectral imaging**, N. A. Playle, Defence Science and Technology Lab. (United Kingdom) [6217-11]

3:50 pm: **Remote detection of buried mines**, C. A. Hibbitts, Johns Hopkins Univ.; J. Bauer, Jet Propulsion Lab. [6217-12]

4:10 pm: **Laser polarization and reflectance characterization of selected target and background material**, H. H. Bennett, Jr., U.S. Army Engineer Research and Development Ctr.; Z. I. Derzko, U.S. Army Night Vision & Electronic Sensors Directorate; M. Fields, U.S. Army Engineer Research and Development Ctr. [6217-13]

4:30 pm: **Multi-optical mine detection: results from a field trial**, D. Letalick, S. K. Sjökvist, A. Linderhed, S. Nyberg, C. A. Grönwall, M. S. G. Uppsäll, H. Larsson, Swedish Defence Research Agency (Sweden) [6217-14]

4:50 pm: **Models for spectral properties of soil backgrounds**, J. M. Cathcart, Georgia Institute of Technology [6217-15]

Tuesday 18 April

Sessions 4-5 run concurrently with Sessions 8-9

SESSION 4

Room: Sanibel 3 **Tues. 8:00 to 10:00 am**

Spectral Sensing II

Chairs: **Gary Koh**, U.S. Army Engineer Research and Development Ctr.;
Miranda A. Schatten, U.S. Army Night Vision &
Electronic Sensors Directorate

8:00 am: **Surface and buried mine detection using MWIR images**, B. Ling, Migra Systems, Inc. [6217-16]

8:20 am: **Rainfall degradation of LWIR disturbed soil signature**, G. Koh, U.S. Army Engineer Research and Development Ctr.; E. M. Winter, Technical Research Associates, Inc.; M. A. Schatten, U.S. Army Night Vision & Electronic Sensors Directorate [6217-17]

8:40 am: **Spectral analysis of terrain infrared signatures**, J. M. Cathcart, B. Remesch, Georgia Institute of Technology [6217-18]

9:00 am: **Landmine casings discriminated using man-portable LIBS**, R. S. Harmon, U.S. Army Research Office; F. DeLucia, Jr., A. W. Miziolek, Army Research Lab.; A. La Pointe, U.S. Army Night Vision & Electronic Sensors Directorate [6217-19]

9:20 am: **MOMS: a multi-optical approach for landmine and UXO detection**, S. K. Sjökvist, Swedish Defence Research Agency (Sweden) [6217-20]

9:40 am: **Multispectral imaging and mine detection**, G. C. Mooradian, Apogon Technologies [6217-21]

Coffee Break 10:00 to 10:30 am

SESSION 5

Room: Sanibel 3 **Tues. 10:30 am to 12:10 pm**

Environmental Effects I

Chairs: **Yogadhis Das**, Defence Research and Development Canada (Canada); **Gary Koh**, U.S. Army Engineer Research and Development Ctr.

10:30 am: **Effect of magnetite on GPR detection of buried landmines: modeling and experiments**, R. L. Van Dam, B. Borchers, J. M. Hendrickx, New Mexico Institute of Mining and Technology [6217-22]

10:50 am: **Modeling soil magnetic susceptibility and frequency-dependent susceptibility to aid landmine clearance**, J. Hannam, Cranfield Univ. (United Kingdom); J. W. Dearing, The Univ. of Liverpool (United Kingdom) [6217-23]

11:10 am: **Physical model of soil and its implications for landmine detection interference**, J. Katsube, Natural Resources Canada (Canada); Y. Das, Defence Research and Development Canada (Canada); R. DiLabio, Natural Resources Canada (Canada); V. Singhroy, Canada Ctr. for Remote Sensing (Canada); P. Keating, J. Hunter, S. Connell-Madore, N. Scromeda, Natural Resources Canada (Canada) [6217-24]

11:30 am: **Electromagnetic response of soil samples: time and frequency domain**, A. M. Lewis, P. Ripka, M. A. Pike, European Commission (Italy) [6217-25]

11:50 am: **Magnetic soil properties at two arid to semi-arid sites in the Western United States**, R. L. Van Dam, J. B. J. Harrison, C. M. Rittel, J. M. Hendrickx, B. Borchers, New Mexico Institute of Mining and Technology [6217-26]

Lunch/Exhibition Break 12:10 to 1:10 pm

SESSION 8

Room: Sanibel 1-2 **Tues. 8:00 to 9:40 am**

Acoustics I

Chairs: **Steven S. Bishop**, U.S. Army Night Vision & Electronic Sensors Directorate; **Bradley W. Libbey**, U.S. Army Night Vision & Electronic Sensors Directorate

8:00 am: **High-frequency modulation approach for the nonlinear seismo-acoustic detection of buried landmines**, D. M. Donskoy, Stevens Institute of Technology; D. J. Fenneman, U.S. Army Engineer Research and Development Ctr.; A. N. Zagrai, M. Tsionskiy, N. Sedunov, Stevens Institute of Technology [6217-37]

8:20 am: **Nonlinear acoustic landmine detection: comparison of off-target soil background and on-target soil-mine nonlinear effects**, M. S. Korman, U.S. Naval Academy; J. M. Sabatier, The Univ. of Mississippi [6217-38]

8:40 am: **A study of the acoustic behavior of a plastic blast-hardened anti-tank landmine**, W. C. K. Alberts II, R. M. Waxler, J. M. Sabatier, The Univ. of Mississippi [6217-39]

9:00 am: **Influence of particle size on the vibration of plates loaded with granular material**, J. A. Turner, W. Kang, K. Rattanadit, L. Yang, F. Bobaru, Univ. of Nebraska/Lincoln [6217-40]

9:20 am: **Ground-contacting sensors for seismic landmine detection**, G. D. Larson, J. S. Martin, W. R. Scott, Jr., Georgia Institute of Technology [6217-42]

Coffee Break 9:40 to 10:30 am

SESSION 9

Room: Sanibel 1-2 **Tues. 10:30 am to 12:10 pm**

Acoustics II

Chairs: **James M. Sabatier**, The Univ. of Mississippi; **Douglas J. Fenneman**, U.S. Army Night Vision & Electronic Sensors Directorate

10:30 am: **Large vibrometer arrays for seismic landmine detection**, W. R. Scott, Jr., J. O. Hamblen, J. S. Martin, G. D. Larson, Georgia Institute of Technology [6217-43]

10:50 am: **Optimal experiments with seismic sensors for the localization of buried landmines**, M. Alam, G. D. Larson, J. H. McClellan, W. R. Scott, Jr., Georgia Institute of Technology [6217-44]

11:10 am: **Ultrasound displacement sensing in the presence of random surface roughness**, P. Ratilal, C. M. Rappaport, Northeastern Univ.; D. J. Fenneman, U.S. Army Night Vision & Electronic Sensors Directorate [6217-45]

11:30 am: **Advanced LDV instruments for buried landmine detection**, A. K. Lal, V. Aranchuk, C. F. Hess, V. V. Doushkina, J. M. Kilpatrick, MetroLaser, Inc.; J. M. Sabatier, The Univ. of Mississippi [6217-46]

11:50 am: **Speckle noise in a continuously scanning multibeam laser Doppler vibrometer for acoustic landmine detection**, A. K. Lal, C. F. Hess, V. Aranchuk, Metrolaser, Inc.; J. M. Sabatier, The Univ. of Mississippi; R. D. Burgett, Planning Systems Inc.; I. Aranchuk, The Univ. of Mississippi; W. T. Mayo, Jr., Extended Vision, Inc. [6217-47]

Lunch/Exhibition Break 12:10 to 1:30 pm

Sessions 6-7 run concurrently with Session 10

SESSION 6

Room: Sanibel 3 **Tues. 1:10 to 3:10 pm**

Environmental Effects II

Chairs: **Adam M. Lewis**, European Commission Joint Research Ctr. (Italy); **Remke L. Van Dam**, New Mexico Institute of Mining and Technology

1:10 pm: **Soil compensation techniques for the detection of buried metallic objects**, L. R. Pasion, The Univ. of British Columbia (Canada); S. D. Billings, Sky Research Inc. (Canada); D. W. Oldenburg, The Univ. of British Columbia (Canada); Y. Li, Colorado School of Mines [6217-27]

1:30 pm: **Characterizing mine detector performance over difficult soils**, R. C. Bailey, G. F. West, Univ. of Toronto (Canada) [6217-28]

1:50 pm: **Effect of the soil on the metal detector signature of a buried mine**, P. M. P. Druyts, Royal Military Academy (Belgium); Y. Das, Defence Research and Development Canada (Canada); C. Craeye, Univ. Catholique de Louvain (Belgium); M. Acheroy, Royal Military Academy (Belgium) [6217-29]

2:10 pm: **Investigation of electromagnetic induction scattering from magnetically susceptible rough surfaces**, I. Shamatava, Dartmouth College; K. A. O'Neill, U.S. Army Engineer Research and Development Ctr.; F. Shubitidze, Dartmouth College; B. E. Barrowes, U.S. Army Engineer Research and Development Ctr.; J. P. Fernández, K. Sun, K. D. Paulsen, Dartmouth College [6217-30]

2:30 pm: **Electromagnetic soil properties variability in a minefield trial site in Cambodia and its effect on the detection of mine-like targets with the MINEHOUND dual-sensor system**, A. Ranada Shaw, A. Gorriti, Technische Univ. Delft (Netherlands); A. J. Schoolderman, J. B. Rhebergen, TNO-FEL (Netherlands); E. C. Slob, Technische Univ. Delft (Netherlands) [6217-31]

2:50 pm: **Electromagnetic soil properties variability in a minefield trial site in Cambodia**, A. Gorriti, A. Ranada Shaw, Technische Univ. Delft (Netherlands); A. J. Schoolderman, J. B. Rhebergen, TNO-FEL (Netherlands); E. C. Slob, Technische Univ. Delft (Netherlands) [6217-32]

Coffee Break 3:10 to 3:40 pm

SESSION 7

Room: Sanibel 3 **Tues. 3:40 to 5:00 pm**

Environmental Effects III

Chairs: **Christopher J. Black**, U.S. Army Night Vision & Electronic Sensors Directorate; **Larry N. Lynch**, U.S. Army Corps of Engineers

3:40 pm: **Comparison of two new portable magnetic susceptibility measurement systems**, R. E. North, U.S. Army Engineer Research and Development Ctr. [6217-33]

4:00 pm: **Empirical study of the effect of soil magnetic properties on a range of current-model metal detectors**, A. M. Lewis, M. A. Pike, D. M. Guelle, P. Ripka, European Commission (Italy); C. Craill, Consultant Defencetek CSIR (South Africa) [6217-34]

4:20 pm: **A controlled outdoor test site for evaluation of soil effects on landmine detection sensors: measurements under real field conditions**, J. M. H. Hendrickx, R. L. Van Dam, B. Borchers, J. Kleissl, H. Shannon, S. Hong, N. Alkov, New Mexico Institute of Mining and Technology [6217-35]

4:40 pm: **A new integrated approach for characterizing in real time the soil electromagnetic properties and detecting landmines using a hand-held vector network analyzer**, O. L. Lopera, Royal Military Academy (Belgium) and Univ. de Los Andes (Colombia); E. C. Slob, Technische Univ. Delft (Netherlands); M. Vanclooster, Univ. Catholique de Louvain (Belgium); S. Lambot, Technische Univ. Delft (Netherlands) [6217-36]

SESSION 10

Room: Sanibel 1-2 **Tues. 1:30 to 3:30 pm**

Acoustics III

Chairs: **Waymond R. Scott**, Jr., Georgia Institute of Technology; **Steven S. Bishop**, U.S. Army Night Vision & Electronic Sensors Directorate

1:30 pm: **Field testing of a small seismo/acoustic landmine confirmation sensor**, J. M. Sabatier, The Univ. of Mississippi [6217-48]

1:50 pm: **Dynamic analysis of mass loaded highway guardrails**, S. S. Bishop, U.S. Army Night Vision & Electronic Sensors Directorate; P. Tsopelas, T. Chen, Catholic Univ. of America; J. A. Judge, The Catholic Univ. of America .. [6217-49]

2:10 pm: **Compressional wave gradients within one meter of the ground surface**, C. J. Hickey, J. M. Sabatier, W. B. Howard, The Univ. of Mississippi [6217-50]

2:30 pm: **The study of climate and seasonal effects on soil properties by a nonlinear acoustic technique: the phase-shift method**, Z. Lu, J. M. Sabatier, Univ. of Mississippi [6217-51]

2:50 pm: **Contact-probe based excitation method for mine detection: application on a VS1.6 Italian landmine**, S. S. Bishop, U.S. Army Night Vision & Electronic Sensors Directorate; T. Chen, P. Tsopelas, J. A. Judge, The Catholic Univ. of America [6217-52]

3:10 pm: **Nonlinear detection of land mines using wide-bandwidth time-reversal technique**, A. M. Sutin, Artann Labs., Inc. and Stevens Institute of Technology; B. W. Libbey, U.S. Army Night Vision & Electronic Sensors Directorate; V. Kurtenoks, Artann Labs., Inc.; D. J. Fenneman, U.S. Army Night Vision & Electronic Sensors Directorate; A. Sarvazyan, Artann Labs., Inc. [6217-53]

Wednesday 19 April

Sessions 11-13 run concurrently with Sessions 15-16

SESSION 11

Room: Sanibel 3 **Wed. 8:20 to 10:20 am**

Littoral Studies I

Chairs: **Gerald J. Dobeck**, Naval Surface Warfare Ctr. Panama City;
Jason R. Stack, Naval Surface Warfare Ctr. Panama City

- 8:20 am: **Detailed investigation of cascaded Volterra fusion of processing strings for automated sea mine classification in very shallow water**, T. Aridgides, M. F. Fernandez, Lockheed Martin Corp. [6217-54]
- 8:40 am: **Application of fusion algorithms for computer-aided detection and classification of bottom mines to synthetic aperture sonar test data**, C. M. Ciany, W. C. Zurawski, Raytheon Co. [6217-55]
- 9:00 am: **Automated sea-mine detection and classification in high-resolution sonar imagery**, G. J. Dobeck, Naval Surface Warfare Ctr. [6217-56]
- 9:20 am: **Classification of buried underwater objects using the new BOSS and multichannel canonical correlation feature extraction**, M. R. Azimi-Sadjadi, J. Cartmill, B. Thompson, Colorado State Univ. [6217-57]
- 9:40 am: **Clutter reduction in low-resolution multifrequency sonar imagery**, J. R. Stack, R. T. Arrieta, Naval Surface Warfare Ctr. [6217-58]
- 10:00 am: **Advanced minefield detection algorithm development**, V. T. Holmes, B. Cadle, R. J. Hilton, Areté Associates; J. H. Holloway, Jr., Naval Surface Warfare Ctr. [6217-59]
- Extended Lunch/Exhibition Break 10:20 am to 1:30 pm

SESSION 13

Room: Sanibel 3 **Wed. 1:30 to 2:30 pm**

Littoral Studies III

Chairs: **Michael P. Strand**, Naval Surface Warfare Ctr. Panama City;
Gerald J. Dobeck, Naval Surface Warfare Ctr. Panama City

- 1:30 pm: **Broadband signal processing for detection, classification, and identification of underwater, bottomed, and buried targets in natural noise background of shallow waters, littoral regions, and ocean environments**, G. Goo, MicroTechnologies, Inc. [6217-63]
- 1:50 pm: **Acoustic seabed classification using fractional Fourier transform**, M. Barbu, E. J. Kaminsky, R. E. Trahan, Univ. of New Orleans [6217-65]
- 2:10 pm: **Phase coherence adaptive processor for automatic signal detection**, R. A. Wagstaff, The Univ. of Mississippi [6217-67]
- Coffee Break 2:30 to 3:30 pm

SESSION 15

Room: Sanibel 1-2 **Wed. 8:20 to 11:30 am**

Environmental Effects IV

Chairs: **Russell S. Harmon**, U.S. Army Research Office;
Rae A. Melloh, U.S. Army Engineer Research and Development Ctr.

- 8:20 am: **Thermal modeling for landmine detection: efficient numerical methods and soil parameters estimation**, T. T. Nguyen, H. Dinh Nho, H. Sahli, Vrije Univ. Brussel (Belgium) [6217-73]
- 8:40 am: **Statistical analysis of spectral data for vegetation detection**, J. M. Cathcart, R. Love, Georgia Institute of Technology [6217-74]
- 9:00 am: **Water flow and distribution around buried landmines**, G. Koh, M. Ginsberg, S. Howington, U.S. Army Engineer Research and Development Ctr. [6217-75]
- 9:20 am: **Field measurement and model representation of soil property spatial variation**, R. A. Melloh, S. Howington, J. F. Peters, G. L. Mason, J. R. Ballard, Jr., U.S. Army Engineer Research and Development Ctr. ... [6217-76]
- 9:40 am: **Development of a multiscale packing methodology for evaluating fate and transport processes of explosive-related chemicals in soil physical models**, S. Rodriguez, V. Vargas, C. Torres, I. Y. Padilla, I. Santiago, Univ. de Puerto Rico Mayagüez [6217-77]
- Coffee Break 10:00 to 10:30 am
- 10:30 am: **Effects of flow reversal on two-dimensional transport of explosive chemicals near soil-atmospheric interfaces subjected to advection processes**, I. Y. Padilla, J. P. Gutierrez Marin, I. Santiago, S. Rodriguez, Univ. de Puerto Rico Mayagüez [6217-78]
- 10:50 am: **Transport of explosives from buried mines: 3D numerical approach**, M. Irrazábal-Aguilera, V. Florian, S. P. Hernández-Rivera, M. E. Castro-Rosario, J. G. Briano, Univ. de Puerto Rico Mayagüez [6217-79]
- 11:10 am: **Adsorption studies of TNT on clay minerals using HPLC**, N. Mina, R. Rivera, M. A. Muñoz, Univ. de Puerto Rico Mayagüez [6217-80]
- Lunch/Exhibition Break 11:30 am to 1:30 pm

SESSION 16

Room: Sanibel 1-2 **Wed. 1:30 to 3:10 pm**

Radar I

Chairs: **James M. Ralston**, Institute for Defense Analyses;
David J. Daniels, ERA Technology Ltd. (United Kingdom)

- 1:30 pm: **Ground-penetrating radar field evaluation in Angola**, R. Walls, U.S. Army Night Vision & Electronic Sensors Directorate; J. F. Clodfelter, M. Price, S. Lauziere, S. Laudato, NIITEK, Inc. [6217-81]
- 1:50 pm: **An experimental site with a complex of polarimetric combined active-passive sensors of of S-, C-, Ku-, and Ka-band of frequencies for soil and snow remote sensing and surveillance**, A. K. Arakelyan, ECOSERV Remote Observation Ctr. Co. Ltd. (Armenia) and Institute of Radiophysics & Electronics (Armenia) [6217-82]
- 2:10 pm: **Numerical parametric study of buried target ground-penetrating radar signature**, I. C. van den Bosch, P. M. P. Druyts, M. Acheroy, Royal Military Academy (Belgium); I. Huynen, Univ. Catholique de Louvain (Belgium) .. [6217-83]
- 2:30 pm: **Wideband radar for airborne minefield detection**, W. W. Clark, B. P. Burns, U.S. Army Night Vision & Electronic Sensors Directorate; G. J. Moussally, Mirage Systems, Inc.; M. Soumekh, U.S. Army Night Vision & Electronic Sensors Directorate [6217-84]
- 2:50 pm: **Neutralization and detection of buried landmines using a low-power microwave neutralization (LPMN) device**, H. G. Mende, Defence Research and Development Canada (Canada) [6217-86]
- Coffee Break 3:10 to 3:30 pm

Session 14 runs concurrently with Session 17

SESSION 14

Room: Sanibel 3 **Wed. 3:30 to 5:10 pm**

Explosives Detection I

Chair: Scott L. Grossman, U.S. Army Night Vision & Electronic Sensors Directorate

- 3:30 pm: **Interactions of α -RDX with siloxane site surface: a computational modeling approach**, N. Mina-Camilde, N. M. Hernández, Y. M. Colón-Lopez, L. F. Alzate, Univ. de Puerto Rico Mayagüez [6217-68]
- 3:50 pm: **An optical fiber based microsensor for explosives detection**, G. Walsh, C. Sun, H. Xiao, N. Liu, J. Dong, V. Romero, New Mexico Institute of Mining and Technology [6217-69]
- 4:10 pm: **Detection of chemical signatures from TNT buried in sand at various ambient conditions: phase II**, S. P. Hernández-Rivera, B. Baez, V. Florian, A. C. Cabanzo Olarte, J. G. Briano, M. E. Castro-Rosario, Univ. de Puerto Rico Mayagüez [6217-70]
- 4:30 pm: **Detection of TNT at a distance from analysis of backscattered radiation between 395 and 405 nm**, M. E. Castro-Rosario, C. A. Peroza, C. M. Osorio-Cantillo, M. Morales, S. P. Hernández-Rivera, Univ. de Puerto Rico Mayagüez [6217-71]
- 4:50 pm: **Ultrafast dynamics in TNT: kinetic energy distribution of NO_x fragments generated from TNT photolysis**, M. E. Castro-Rosario, C. M. Osorio-Cantillo, S. P. Hernández-Rivera, Univ. de Puerto Rico Mayagüez [6217-72]

SESSION 17

Room: Sanibel 1-2 **Wed. 3:30 to 5:10 pm**

Radar II

Chairs: Brian P. Burns, U.S. Army Night Vision & Electronic Sensors Directorate; William W. Clark, U.S. Army Night Vision & Electronic Sensors Directorate

- 3:30 pm: **Millimeter-wave imaging system for the detection of non-metallic buried objects**, T. W. Du Bosq, J. M. Lopez-Alonso, D. E. Mullally, Jr., G. Boreman, College of Optics and Photonics/Univ. of Central Florida; D. Dillery, J. W. Grantham, D. R. Muh, Northrop Grumman Corp. [6217-87]
- 3:50 pm: **Application of multistatic inversion algorithms to landmine detection**, A. C. Gurbuz, T. Counts, K. Kim, J. H. McClellan, W. R. Scott, Jr., Georgia Institute of Technology [6217-88]
- 4:10 pm: **Application of pre-stack depth migration to SAR-GPR for landmine detection in rough ground area**, X. Feng, T. Kobayashi, M. Sato, Tohoku Univ. (Japan) [6217-89]
- 4:30 pm: **The results of spatio-temporally combined microwave active-passive measurements of bare and vegetated soil at 37 GHz**, A. Arakelyan, ECOSERV Remote Observation Ctr. Co. Ltd. (Azerbaijan) [6217-90]
- 4:50 pm: **Ray analysis and mine imaging**, G. P. Tricoles, Consultant .. [6217-91]

Thursday 20 April

Session 18 runs concurrently with Session 20

SESSION 18

Room: Sanibel 3 **Thurs. 8:30 to 10:10 am**

Explosives Detection II

Chairs: Samuel P. Hernández-Rivera, Univ. de Puerto Rico Mayagüez; Aaron La Pointe, U.S. Army Night Vision & Electronic Sensors Directorate

- 8:30 am: **Nitro explosive detection: from basic science to detection at a distance**, M. E. Castro-Rosario, C. M. Osorio-Cantillo, C. A. Peroza, S. P. Hernández-Rivera, Univ. de Puerto Rico Mayagüez [6217-92]
- 8:50 am: **Investigation of the fragmentation of explosives by femtosecond laser mass spectroscopy**, C. McEnnis, Y. Dikmelik, T. J. Cornish, M. D. Antoine, P. Demirev, J. B. Spicer, Johns Hopkins Univ. [6217-93]
- 9:10 am: **Femtosecond laser-induced breakdown spectroscopy of explosives**, Y. Dikmelik, C. McEnnis, J. B. Spicer, Johns Hopkins Univ. [6217-94]
- 9:30 am: **Feasibility of landmine detection using transgenic plants**, M. Deyholos, Univ. of Alberta (Canada); A. A. Faust, Defence Research and Development Canada (Canada); M. Miao, D. A. Donahue, R. Montoya, Univ. of Alberta (Canada) [6217-95]
- 9:50 am: **Feasibility of fast neutron analysis for detection of buried landmines**, A. A. Faust, J. E. McFee, Defence Research and Development Canada (Canada); H. R. Andrews, H. Ing, Bubble Technologies Industries, Inc. (Canada) [6217-96]
- Coffee Break 10:10 to 10:40 am

SESSION 20

Room: Sanibel 1-2 **Thurs. 8:00 to 10:00 am**

Multisensor I

Chairs: John E. McFee, Defence Research and Development Canada (Canada); David J. Daniels, ERA Technology Ltd. (United Kingdom)

- 8:00 am: **Sensor fusion for airborne landmine detection**, M. A. Schatten, U.S. Army Night Vision & Electronic Sensors Directorate; P. D. Gader, J. Bolton, Univ. of Florida [6217-102]
- 8:20 am: **Canadian Forces ILDS: a militarily fielded multisensor vehicle-mounted teleoperated landmine detection system**, J. E. McFee, K. L. Russell, R. H. Chesney, A. A. Faust, Y. Das, Defence Research and Development Canada (Canada) [6217-104]
- 8:40 am: **Vehicle-mounted SAR-GPR and its evaluation**, M. Sato, T. Kobayashi, K. Takahashi, Tohoku Univ. (Japan); J. Fujiwara, Tokyo Gas Co., Ltd. (Japan); X. Feng, Tohoku Univ. (Japan) [6217-105]
- 9:20 am: **Autonomous mine detection sensors (AMDS)**, F. Navish III, U.S. Army Night Vision & Electronic Sensors Directorate [6217-106]
- 9:20 am: **An optimal technology for detection of vegetation-obscured tripwires**, C. L. Liao, L. Carter, Univ. of Auckland (New Zealand) [6217-107]
- Coffee Break 9:40 to 10:30 am

Session 19 runs concurrently with Session 21

SESSION 19

Room: Sanibel 3 **Thurs. 10:40 am to 12:20 pm**

Explosives Detection III

Chairs: **Pablo J. Prado**, GE Security; **Stephen F. Schaedel**, U.S. Army Night Vision & Electronic Sensors Directorate

- 10:40 am: **Evaluation of PELAN as a landmine confirmation sensor**, G. Vourvopoulos, Science Applications International Corp. [6217-97]
- 11:00 am: **Identification of obscured IEDs by the detection of gamma rays produced by fast neutrons**, T. R. Witten, U.S. Army Night Vision & Electronic Sensors Directorate; A. Vaucher, M. Muniruzzaman, B. Maglich, HiEnergy Technologies, Inc. [6217-98]
- 11:20 am: **Frequency selective detection of nuclear quadrupole resonance spin echoes**, S. D. Somasundaram, King's College London (United Kingdom); A. Jakobsson, Karlstad Univ. (Sweden); J. A. S. Smith, K. Althoefer, King's College London (United Kingdom) [6217-99]
- 11:40 am: **Theoretical and experimental investigations into landmine detection using nuclear quadrupole resonance (NQR)**, S. F. Schaedel, U.S. Army Night Vision & Electronic Sensors Directorate and Defence Science and Technology Lab. (United Kingdom) [6217-100]
- 12:00 pm: **False alarm reduction during landmine detection**, P. J. Prado, J. Chepin, G. A. Barrall, H. Robert, P. J. Turner, GE Security [6217-101]

SESSION 21

Room: Sanibel 1-2 **Thurs. 10:30 am to 12:00 pm**

Multisensor II

Chairs: **Francis Navish III**, U.S. Army Night Vision & Electronic Sensors Directorate; **Richard Walls**, U.S. Army Night Vision & Electronic Sensors Directorate

- 10:30 am: **Handheld standoff mine detection system (HSTAMIDS) field evaluation in Namibia (Invited Paper)**, R. Walls, S. P. Burke, R. Cresci, P. Ngan, U.S. Army Night Vision & Electronic Sensors Directorate; R. C. Doherty, Office of Assistant Secretary of Defense [6217-110]
- 11:00 am: **Development of handheld dual-sensor ALIS and its evaluation**, M. Sato, Tohoku Univ. (Japan); J. Fujiwara, Tokyo Gas Co., Ltd. (Japan); X. Feng, K. Takahashi, T. Kobayashi, Tohoku Univ. (Japan) [6217-108]
- 11:20 am: **Migration interpolation for the handheld GPR MD sensor system (ALIS)**, X. Feng, T. Kobayashi, T. Kazunori, Tohoku Univ. (Japan); J. Fujiwara, Tokyo Gas Co. Ltd. (Japan); M. A. Hafez, National Research Institute of Astronomy and Geophysics (Egypt); M. Sato, Tohoku Univ. (Japan) ... [6217-109]
- 11:40 am: **Minehound trials in Cambodia, Bosnia, and Angola**, D. J. Daniels, P. Curtis, ERA Technology Ltd. (United Kingdom) [6217-111]
- Lunch/Exhibition Break 12:00 to 1:10 pm

SESSION 22

Room: Sanibel 1-2 **Thurs. 1:10 to 2:50 pm**

Signal Processing I

Chairs: **Paul D. Gader**, Univ. of Florida; **Peter Howard**, U.S. Army Night Vision & Electronic Sensors Directorate

- 1:10 pm: **Improving spectral features from GPR by exploring the depth information**, D. K. C. Ho, Univ. of Missouri/Columbia; P. D. Gader, J. N. Wilson, Univ. of Florida [6217-112]
- 1:30 pm: **Statistical methods for detection of antipersonnel landmines with multistatic full-polarimetric ground-penetrating radar**, V. Kovalenko, Technische Univ. Delft (Netherlands) [6217-113]
- 1:50 pm: **A waveform-based algorithm for landmine detection using GPR**, V. Kovalenko, Technische Univ. Delft (Netherlands) [6217-114]
- 2:10 pm: **Image processing of ground-penetrating radar for landmine detection**, K. Long, Defence Science and Technology Lab. (United Kingdom); P. Liatsis, City Univ. (United Kingdom) [6217-115]
- 2:30 pm: **Comparison of pattern recognition approaches for multisensor detection and discrimination of anti-personnel and anti-tank landmines**, P. A. Torrione, L. M. Collins, Duke Univ. [6217-117]
- Coffee Break 2:50 to 3:30 pm

SESSION 23

Room: Sanibel 1-2 **Thurs. 3:30 to 5:10 pm**

Signal Processing II

Chairs: **Richard C. Weaver**, U.S. Army Night Vision & Electronic Sensors Directorate; **Peter A. Torrione**, Duke Univ.

- 3:30 pm: **On the confidence level fusion of IR and forward-looking GPR**, T. Wang, J. M. Keller, M. Busch, Univ. of Missouri/Columbia; P. D. Gader, C. E. Hawkins, J. McElroy, Univ. of Florida; D. K. C. Ho, Univ. of Missouri/Columbia [6217-118]
- 3:50 pm: **The effects of uncertainty and uncertainty modeling on information-based sensor management performance**, M. P. Kolba, L. M. Collins, Duke Univ. [6217-119]
- 4:10 pm: **Confirmation sensor scheduling using a reinforcement learning approach**, J. A. Marble, D. Blatt, A. O. Hero III, Univ. of Michigan [6217-120]
- 4:30 pm: **An analysis of sweep patterns for a handheld demining system**, J. N. Wilson, Univ. of Florida; D. K. C. Ho, Univ. of Missouri/Columbia; P. D. Gader, Univ. of Florida [6217-121]
- 4:50 pm: **Constrained filter optimization for subsurface landmine detection**, P. A. Torrione, L. M. Collins, Duke Univ. [6217-122]

✓ **Posters-Thursday**

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **X-band radar cross-section model and analysis of a typical 155 munition mounted behind a highway guardrail**, S. S. Bishop, U.S. Army Night Vision & Electronic Sensors Directorate [6217-131]
- ✓ **Macro-sorption of explosives related chemicals in soil under variable environmental conditions**, M. D. Hernandez, Univ. de Puerto Rico Mayagüez [6217-132]
- ✓ **UV Raman detection of 2,4-DNT in contact with sand particles**, S. P. Hernández-Rivera, A. Blanco, J. I. Jerez-Rozo, N. Mina-Camilde, M. E. Castro-Rosario, Univ. de Puerto Rico Mayagüez [6217-134]
- ✓ **Transport of explosive-related chemicals in 3D lab-scale soil tank under variable environmental conditions**, P. J. Tarafa, I. Y. Padilla, Univ. de Puerto Rico Mayagüez [6217-135]
- ✓ **Spatial distribution of TNT on soil determined from electron microscopy measurements**, M. E. Castro-Rosario, A. C. Cabanzo Olarte, O. L. Rizo Vivas, T. Luna Pineda, S. P. Hernández-Rivera, Univ. de Puerto Rico Mayagüez [6217-136]
- ✓ **Field study of the fate and transport of explosive chemicals in soil lysimeters subject to variable environmental conditions**, D. D. Pérez-Ruiz, I. Y. Padilla, Univ. de Puerto Rico Mayagüez [6217-137]
- ✓ **FT-IR signatures of TNT on montmorillonite-clay particles**, S. P. Hernández-Rivera, G. M. Herrera-Sandoval, L. M. Ballesteros-Rueda, N. Mina-Camilde, J. G. Briano, Univ. de Puerto Rico Mayagüez [6217-138]
- ✓ **Sampling of explosives in unsaturated soils using porous cup samplers and multiphase extraction techniques**, A. C. Padilla Jiménez, I. Y. Padilla, Univ. de Puerto Rico Mayagüez [6217-139]
- ✓ **Spectroscopic signatures of PETN part II: detection in clay**, S. P. Hernández-Rivera, L. M. Ballesteros-Rueda, G. M. Herrera-Sandoval, N. Mina-Camilde, Univ. de Puerto Rico Mayagüez [6217-140]
- ✓ **Design tradeoffs for a UAV-based minefield detection system**, S. Agarwal, S. Agarwal, Univ. of Missouri/Rolla; A. H. Trang, U.S. Army Night Vision & Electronic Sensors Directorate [6217-142]
- ✓ **Change detection for route reconnaissance and IED detection**, T. J. Woodard, S. Agarwal, Univ. of Missouri/Rolla; A. H. Trang, U.S. Army Night Vision & Electronic Sensors Directorate [6217-143]

Friday 21 April

SESSION 24

Room: Sanibel 1-2 Fri. 8:20 to 11:30 am

Signal Processing III

Chairs: **Paul D. Gader**, Univ. of Florida;
Hichem Frigui, Univ. of Louisville

- 8:20 am: **Multiband anomaly detection using signal subspace processing**, K. I. Ranney, H. Kwon, Army Research Lab.; M. Soumekh, SUNY/Univ. at Buffalo [6217-123]
- 8:40 am: **An EM-IMM based abrupt change detector for landmine detection**, V. Venkatasubramanian, H. Leung, Univ. of Calgary (Canada) [6217-124]
- 9:00 am: **A scale space approach to detect a class of side-attack landmines from SWIR video sequences**, M. Busch, J. M. Keller, Univ. of Missouri/Columbia; P. D. Gader, Univ. of Florida [6217-125]
- 9:20 am: **Predicting GPR target locations using time-delay differences**, A. C. Gurbuz, J. H. McClellan, W. R. Scott, Jr., Georgia Institute of Technology [6217-126]
- 9:40 am: **Region processing algorithm for HSTAMIDS**, P. Ngan, S. P. Burke, R. Cresci, U.S. Army Engineer Research and Development Ctr.; J. N. Wilson, Univ. of Florida; D. K. C. Ho, Univ. of Missouri/Columbia [6217-127]
- Coffee Break 10:00 to 10:30 am
- 10:30 am: **Detection and discrimination of landmines in ground-penetrating radar based on edge histogram descriptors**, H. Frigui, Univ. of Louisville; P. D. Gader, Univ. of Florida [6217-128]
- 10:50 am: **Using the adjoint method for solving the nonlinear GPR inverse problem**, L. M. van Kempen, H. Dinh Nho, H. Sahli, Vrije Univ. Brussel (Belgium) [6217-129]
- 11:10 am: **Visual detection, recognition, and classification of surface-buried UXO based on soft-computing decision fusion**, A. H. Shirkhodaie, H. Rababaah V, Tennessee State Univ. [6217-130]