TeraNova Dissemination Activities

IST- 511415

Period 4: 1st September 2007 – 28th February 2009

PLENARY, KEYNOTE OR INVITED TALKS

Aurele Adam – TU Delft, The Netherlands

Sub-Wavelength Measurements of the Near-Field of a Metal Aperture, 29th Conference on Lasers and Electro Optics (CLEO 2008) San Francisco, California, USA, May 2008.

Terahertz Near-Field Measurements of Small Metal Structures, The International Conference on Infrared, Millimeter and Terahertz Waves (IRMMW-THz), Pasadena, California, USA, September 2008.

Debra Barnes – Merops Consulting Ltd, UK

Terahertz – Emerging Markets, Terahertz Photonics 2007, Weetwood Hall, Leeds, 29-30 October, 2007.

Exploitation of THz, "Mind the Gap" – Millimetre Wave and THz Conference organised by Electronics Knowledge Transfer Networks (UK Technology Strategy Board), London, 24th January 2008.

Current and Developing Markets for Terahertz, Terahertz Systems and Industrial Applications*,* Royal Society, London, UK, 25th February, 2009.

Stefano Barbieri – TeraView/ Paris VII

Beam Shaping and Ultrafast modulation of THz Quantum Cascade Lasers, THz workshop. EUMW2007: European Microwave Week 2007, Munich, Germany, 10th October, 2007.

Andrew Burnett – Leeds University, UK

Broadband Terahertz Time-Domain and Raman Spectroscopy and Their Use in the Analysis of Compounds of Security Relevance, A.D. Burnett, W.H. Fan, P.C. Upadhya, J.E. Cunningham, H.G.M. Edwards, J. Kendrick, T. Munshi, M. Hargreaves, E.H. Linfield and A.G. Davies, Terahertz Photonics 2007, Weetwood Hall, Leeds, 29-30 October, 2007.

Martyn Chamberlain – Durham University, UK

THz Pulse Reconstruction, Joint 32nd Infrared and Millimetre Waves and 15th IEEE International Terahertz Electronics Conference, Cardiff, September 2007.

Background to the Development of Terahertz Frequency Systems, Terahertz Photonics 2007, Weetwood Hall, Leeds, 29-30 October, 2007.

The TeraNova Integrated Project, Terahertz Photonics 2007, Weetwood Hall, Leeds, 29-30 October, 2007.

Overview of Terahertz Technology, Terahertz Systems and Industrial Applications, Royal Society, London, 25th February, 2009.

Juraj Darmo –TU Wien, Austria

Terahertz Semiconductor Gain Medium: Static Properties and Dynamic Behaviour, J. Darmo, J. Kröll, M. Martl, D. Dietze, S. Barbieri, C. Sirtori, and K. Unterrainer, CLEO/QELS and PhAST 2008, San Jose, California, USA, 4-9 May 2008.

Quantum Cascade Laser: between device physics and quantum optics, J. Darmo, J. Kröll, M. Martl, D. Dietze, K. Unterrainer, S. Barbieri, C. Sirtori, 15th International Winter School on New Developments in Solid-State Physics, Bad Hofgastein, Austria, 18-22 February 2008.

THz Quantum Cascade Lasers: THz time-domain spectroscopy study, J. Darmo, J. Kröll, K. Unterrainer, S.S. Dhillon, C. Sirtori, X. Marcadet, M. Calligaro, Conference ITQW 2007, Ambleside, UK, 9-14 September 2007.

Phase-resolved study of lasing in THz quantum cascade lasers, J. Darmo, J. Kröll, M. Martl, D. Dietze, W. Parz, S. Barbieri, C. Sirtori, K. Unterrainer, Plenary talk, European Optical Society Annual Meeting 2008, Paris, 29.Sept.-2.Oct. 2008.

Time Domain Spectroscopy of Gain, Loss and Coherence in Quantum Cascade Lasers, J. Darmo, J. Kröll, M. Martl, W. Parz, D. Dietze, S. Barbieri, C. Sirtori, K. Unterrainer, International Quantum Cascade Lasers School & Workshop, Monte Verita (Acsona), Switzerland, 14-19 September 2008.

Phase and amplitude resolved time domain study of terahertz quantum cascade lasers, J. Darmo, J. Kröll, M. Martl, W. Parz, D. Dietze, K. Unterrainer, S. Barbieri, C. Sirtori, Wilhelm und Else Heraeus-Seminar "Novel Light Sources and Applications", Obergurgl, Austria, 3-9 February 2008.

Time resolved THz QCL measurements for THz amplification, J. Darmo, J. Kröll, M. Martl, S. S. Dhillon, X. Marcadet, M. Calligaro, C. Sirtori, K. Unterrainer, THz Photonics, Leeds, UK, 29-30 October 2007.

Terahertz for Characterising Semiconductor Wafers, Terahertz Systems and Industrial Applications, Royal Society, London, UK, 25th February, 2009.

Daniel Dolfi – Thales R&T, France

Continuous Wave THz Generation Based on a Dual-frequency Laser and a LTG - InGaAs Photomixer, R. Czarny, M. Alouini, X. Marcadet, S. Bansropun, J.L. Doualan, R. Moncorgé, J.F. Lampin, M. Krakowski & Daniel Dolfi, Terahertz Photonics 2007, Weetwood Hall, Leeds, 29-30 October, 2007.

Jerome Faist - ETH Zurich, Switzerland

Quantum Cascade laser at subterahertz frequencies, International Conference on the physics of Semiconductors, Rio de Janeiro, Brazil, 27th July - 1st August, 2008.

Terahertz quantum cascade lasers, CLEO, Conference on Lasers and Electro-Optics, San José, CA, 4-9 May, 2008.

Peter Haring Bolívar – Univerisitaet Siegen, Germany

Terahertz biosensors based on double split ring arrays, C. Debus, P. Haring Bolívar, Photonics Europe, SPIE, Strasbourg, 9th April, 2008.

Small Scale Terahertz – Lab-on-a-chip and Biosensors, Terahertz Systems and Industrial Applications, Royal Society, London, UK, 25th February, 2009.

Peter Uhd Jepsen, DTU, Denmark

Ingredients analysis of aqueous solutions and food products with THz reflection spectroscopy, Frontiers in Optics/Laser Science 2007, San Jose, California, 19-23 September 2007.

Terahertz Time-domain Spectroscopy - Sensing Applications, Terahertz Photonics 2007, Weetwood Hall, Leeds, 29-30 October, 2007.

Ab-initio investigation of terahertz vibrational modes in molecular crystals, Ohio State University 63rd International Symposium on Molecular Spectroscopy, Columbus, Ohio, 15-18 June, 2008.

Drugs & Alcohol: THz time-domain investigations of solids and liquids, Physics Colloquium, University of Alberta, 7 March 2008.

Reflection THz-TDS for characterization of bottled liquids, ICOOPMA 2008, Edmonton, Alberta, Canada, 20-25 July 2008.

Optical Terahertz Science and Technology, 18th Jyvaskyla Summer School, Jyvaskyla, Finland, 6-22 August 2008.

Terahertz Time-Domain Spectroscopy, European Optical Society Annual Meeting, Paris, France, 29 September – 2 November 2008.

Terahertz Spectroscopy, Terahertz Systems and Industrial Applications, Royal Society, London, UK, 25th February, 2009.

Edmund Linfield – University of Leeds, UK

The RCUK Terahertz Basic Technology Research Project/The ISIS Network of Excellence, Terahertz Photonics 2007, Weetwood Hall, Leeds, 29-30 October, 2007.

Terahertz Background & Overview, E.H. Linfield and J.M. Chamberlain, "Mind the Gap" – Millimetre Wave and THz Conference organised by Electronics Knowledge Transfer Networks (UK Technology Strategy Board), London, 24th January 2008.

Recent developments in terahertz quantum cascade lasers, E.H. Linfield and A.G. Davies, ICOOPMA 2008 conference, Edmonton Canada, 20 - 25 July 2008.

Terahertz quantum cascade laser, E.H. Linfield and A.G. Davies, Quantum Electronics and Photonics-18 Conference, Edinburgh, Scotland, 25-29 August 2008.

The generation and applications of terahertz frequency radiation, E.H. Linfield, A.G. Davies & J.E Cunningham, Nanoelectronics Days 2008 (http://www.cni-juelich.de/index.php?index=126), Aachen, Germany, May13-16 2008.

Growth, fabrication and measurement of terahertz quantum cascade laser, E.H. Linfield and A.G Davies, IRMMW, Cardiff, Wales, 2007.

Michael Nagel – RWTH Aachen, Germany

Terahertz Photoconductive Antenna Arrays, H.F. Tiedje, D. Saeedkia, M. Nagel, H.K. Haugen, Optical Scanning Techniques for Characterization of, IRMMW/THz2008, Pasadena, USA, 2008.

Paddy O'Kelly – Teraview Ltd, UK

Non-destructive Testing (NDT) with Terahertz, Terahertz Systems and Industrial Applications, Royal Society, London, UK, 25th February, 2009.

Paul Planken – TU Delft, The Netherlands

Terahertz near-field measurements, "Masterclass", KNAW Workshop on Terahertz Science, Amsterdam, the Netherlands, June 2007.

Near-field microscopy on metal structures, Congress on THz science and applications, Bordeaux, France, 29 May- 2 June, 2007.

Terahertz Sensing for Freeze Drying of Pharmaceutical Materials, Terahertz Systems and Industrial Applications, Royal Society, London, UK, 25th February, 2009 – with Jos Corver, IMA Edwards Drying Solutions.

Near-Field Microscopy of THz Fields near Metal Structures, Optical Terahertz Science and Technology conference, 2007, Orlando, Florida USA.

Giacomo Scalari – ETH Zurich, Switzerland

Magnetic confinement on THz quantum cascade structures, International Quantum Cascade School and Workshop, MonteVerità, Switzerland, September 14-19, 2008.

Carlo Sirtori – Paris 7, France

Terahertz & Communications, Terahertz Systems and Industrial Applications, Royal Society, London, UK, 25th February, 2009.

Andreas Stingl – Femtolasers GmbH, Austria

Contactless Semiconductor Wafer Scanner, Terahertz Photonics 2007, Weetwood Hall, Leeds, 29-30 October, 2007.
Femtosecond Lasers for Terahertz Generation, Terahertz Systems and Industrial Applications, Royal Society, London, UK, 25th February, 2009.

Peter Swift – Durham University, UK

Processing of Terahertz Pulses, Using a Reconstruction Method, Terahertz Photonics 2007, Weetwood Hall, Leeds, 29-30 October, 2007.

Alessandro Tredicucci- SNS, Pisa, Italy

Recent advances and future prospects of THz quantum cascade lasers, The joint 32nd International Conference on Infrared and Millimetre Waves and 15th International Conference on THz Electronics (IRMMW-THz 2007), Cardiff, Wales, September 2 – 7, 2007.

THz Photonics and Quantum Cascade Sources, Elettroottica 2008, Milan, Italy; June 10 – 12, 2008.

Engineering photonic structures for THz devices, 5th Regensburg Workshop on Quantum Heterostructures and THz Electronics, Regensburg, Germany; January 24, 2008.

Advancing technology of THz Quantum Cascade Lasers, Terahertz Photonics 2007, Leeds, UK; October 29 – 30, 2007.

Optical Terahertz Components: Devices & Quantum Cascade Lasers, Terahertz Systems and Industrial Applications, Royal Society, London, UK, 25th February, 2009.

Karl Unterrainer - TU Wien, Austria

THz Quantum Cascade Lasers: Microcavities and Photonic Crystal Devices, G. Fasching, A. Benz, Ch. Deutsch, W. Parz, A.M. Andrews, W. Schrenk, G. Strasser, K. Unterrainer, 15th Int. Conf. on Superlattices, Nanostructures and Nanodevices (ICSNN-15), 3.-8. Aug. 2008, Natal, Brazil.

Understanding intersublevel dynamics for device applications, K. Unterrainer, First SANDiE Workshop on Intersublevel studies in self-assembled semiconductor quantum dots, Paris, France, 2-3 April, 2008.

Phase and amplitude resolved time domain study of terahertz quantum cascade lasers, J. Darmo, J. Kröll, M. Martl, W. Parz, D. Dietze, K. Unterrainer, S. Barbieri, C. Sirtori, Wilhelm und Else Heraeus-Seminar "Novel Light Sources and Applications", Obergurgl, Austria, 3.-9 February 2008.

THz time-domain spectroscopy of THz quantum cascade lasers, K. Unterrainer, Workshop on Quantum Heterostructures and THz Electronics, Regensburg, Germany, 24 January 2008.

Time resolved THz QCL measurements for THz amplification, J. Darmo, J. Kröll, M. Martl, S. S. Dhillon, X. Marcadet, M. Calligaro, C. Sirtori, K. Unterrainer, THz Photonics, Leeds, UK, 29-30 October 2007.

From few-cycle THz pulses to Terahertz Quantum Cascade Lasers, G. Fasching, A. Benz, J. Kröll, J. Darmo, Ch. Deutsch, A.M. Andrews, W. Schrenk, G. Strasser, K. Unterrainer, ICECOM 2007, 19th Int. Conference on Applied Electromagnetics and Communications, Dubrovnik, Croatia, 24-26 Sep. 2007.

THz time-domain spectroscopy of THz quantum cascade lasers, J. Darmo, J. Kröll, M. Martl, S. S. Dhillon, X. Marcadet, M. Calligaro, C. Sirtori, K. Unterrainer, IRMMW THz 2007, Cardiff, Wales, 2-7 September 2007.

OTHER CONFERENCE PRESENTATIONS

1. *Ultrafast Spectroscopy as a Probe of Light-Matter interaction in a mid-infrared Quantum Cascade Laser",* W. Parz, T. Müller, J. Darmo, M. Austerer, G. Strasser, K. Unterrainer, L. R. Wilson, J. W. Cockburn, A. B. Krysa, and J. S. Roberts: International Conference on the Physics of Semiconductors (ICPS) 2008, Rio de Janeiro, Brazil, 27.07.2008 – 01.08.2008.

2. *Microcavity quantum-cascade lasers: Confinement and coupling in the terahertz spectral range*, G. Fasching, A. Benz, Ch. Deutsch, A. M. Andrews, R. Zobl, P. Klang, W. Schrenk, V. Tamosiunas, and K. Unterrainer: Institute for Quantum and Complex Dynamics, University of California Santa Barbara, USA; 2 May 2008.

3. *Current and gain in terahertz quantum cascade lasers,* A. Benz, G. Fasching, Ch. Deutsch, A. M. Andrews, K. Unterrainer, P. Klang, W. Schrenk, G. Strasser, T. Kubis, P. Vogl; 15th International Winter School on New Developments in Solid State Physics, Bad Hofgastein, Austria, 18-22 February 2008.

4. *Effects of doping on terahertz quantum-cascade lasers,* A. Benz, G. Fasching, C. Deutsch, A.M. Andrews, K. Unterrainer, P. Klang, W. Schrenk; IRMMW-THz 2007, Cardiff, UK; 3-7 September 2007.

5. *Time-resolved photocurrent measurements of terahertz QCLs,* R. P. Green, A. Tredicucci, N. Q. Vinh, B. Murdin, C. Pidgeon, H. E. Beere, D. A. Ritchie, ITQW 2007, Ambleside, UK; 9-14 September 2007.

6. *Vertically emitting microdisk lasers,* L. Mahler, A. Tredicucci, R. P. Green, F. Beltram, C. Walther, Jerôme Faist, H. E. Beere, D. A. Ritchie, CLEO/QELS 2008, San Jose, USA; May 4-9, 2008.

7. *Tuneable THz Quantum Cascade Lasers with external cavity"* J. Xu, L. Mahler, R. Green, C. Mauro, T. Losco, A. Tredicucci, F. Beltram, H. E. Beere, D. A. Ritchie, SPIE Europe Security & Defence 2007, Florence, Italy; 17-20 September, 2007.

8. *Terahertz quantum cascade lasers with quasi-periodic resonators* (Poster), L. Mahler, A. Tredicucci, R. P. Green, F. Beltram, H. E. Beere, D. A. Ritchie, ITQW 2007 Ambleside, UK; September 9-14, 2007.

9. *Frequency selective surface sensor for terahertz bio-sensing applications,*M. Nagel, G. Klatt, M. Awad, H. Kurz, A. Bartels and T. Dekorsy Ultrafast Phenomena 2008.

10. *Frequency Selective Surfaces and stretched DNA investigated by Time-Domain THz Spectroscopy based on ASOPS.* G. Klatt, M. Nagel, T. Fischer, T. Gisler, A. Bartels, G. Maret and T. Dekorsy, EOS Conference 2008, Paris, France 2008.

11. *Low Cost Thermopile Detectors for THz Imaging and Sensing*, IRMMW-THz 2008, F. Voltolina, A. Tredicucci, P. Haring Bolivar, Pasadena, USA, 15-19 September 2008.

12. *Broadband Terahertz Time-Domain Spectroscopy of Drugs-of-Abuse Mixtures and 'Street' Samples.* A. D. Burnett, W. Fan, P. Upadhya, J. E. Cunningham, H. G. M. Edwards, T. Munshi, M. Hargreaves, E. H. Linfield, A. G. Davies. IRMMW-THz 2008, 15th – 19th September 2008, Pasadena, USA.

13. *Broadband Terahertz Time-Domain and Raman Spectroscopy for the Analysis of Compounds of Security Relevance.* A. D. Burnett, W. Fan, P. Upadhya, J. E. Cunningham, H. G. M. Edwards, J. Kendrick, T. Munshi, M. Hargreaves, E. H. Linfield, A. G. Davies, Forensic Analysis 2007, 2nd – 4th September 2007, Lincoln, UK.

14. *Terahertz time-domain spectroscopy of a two-dimensional electron gas in GaAs/AlGaAs Heterostructures, D*. Dietze, J. Darmo and K. Unterrainer: Poster: 58. Jahrestagung der Österreichischen Physikalischen Gesellschaft, Leoben, Austria; 22-26 September 2008.

15. *Terahertz time-domain spectroscopy of a two-dimensional electron gas in GaAs/AlGaAs heterostructures* D. Dietze, J. Darmo and K. Unterrainer"; Poster: EOS Annual Meeting 2008, Paris-Nord Villepinte, France; 29.09.2008 - 02.10.2008.

16. *THz Ellipsometry in Theory and Experiment* D. Dietze, D. Kelly, J. Darmo and K. Unterrainer: Poster: 33rd International Conference on Infrared, Millimeter and Terahertz Waves, Pasadena, California, USA; 15-19 September 2008.

PUBLICATIONS IN REFEREED JOURNALS

[1] *Numerical sampling rules for paraxial regime pulse diffraction calculations*, D. P. Kelly, B. M. Hennelly, A. Grün, and K. Unterrainer, *J. Opt. Soc. Am.* A **25**, 2299-2308 (2008).

[2] *Ultrafast probing of light-matter interaction in a mid-infrared quantum cascade laser* , W. Parz, T. Müller, J. Darmo, K. Unterrainer, M. Austerer, G. Strasser, L. R. Wilson, J. W. Cockburn, A. B. Krysa, J. S. Roberts, *Applied Physics Letters*, **93,** 091105 (2008).

[3] *Doping dependence of LO-phonon depletion scheme THz quantum-cascade lasers*; A.M. Andrews, A. Benz, C. Deutsch, G. Fasching, K. Unterrainer, P. Klang, W. Schrenk, G. Strasser, *Materials Science and Engineering B*, **147**, S. 152 – 155 (2008).

[4] *Terahertz quantum cascade devices: from intersubband transition to microcavity laser,* K. Unterrainer, A. Benz, J. Darmo, Ch. Deutsch, G. Fasching, J. Kröll, D.P. Kelly, M. Martl, T. Müller, W. Parz, S.S. Dhillon, C. Sirtori, A.M. Andrews, W. Schrenk, G. Strasser, X. Marcadet, M. Calligaro, H.E. Beere, and D.A. Ritchie*, IEEE Journal of Selected Topics in Quantum, Electronics*, Vol. **14**, No. 2, 307 (2008).

[5] *Phase-resolved measurement of stimulated emission in a laser*, J. Kröll, J. Darmo, S.S. Dhillon, X. Marcadet, M. Calligaro, C. Sirtori and K. Unterrainer; *Nature*, **449**(7163), 698-701 (2007).

[6] *Subwavelength Microdisk and Microring Terahertz Quantum-Cascade Lasers,* G. Fasching, V. Tamosiunas, A. Benz, A. M. Andrews, K. Unterrainer, R. Zobl, T. Roch, W. Schrenk, G. Strasser, *IEEE Journal of Quantum Electronics*, Vol. **43**, No. 8, 687 (2007).

[7] *Longitudinal spatial hole burning in terahertz quantum cascade lasers*, J. Kröll, J. Darmo, K. Unterrainer, S.S. Dhillon, C. Sirtori, X. Marcadet and M. Calligaro, *Appl. Phys. Lett.*, **91**, 161108 (2007).

[8] *Influence of doping on the performance of terahertz quantum-cascade lasers,* A. Benz, G. Fasching, A.M. Andrews, M. Martl, K. Unterrainer, T. Roch, W. Schrenk, S. Golka, G. Strasser, *Applied Physics Letters*, **90**, 101107 (2007).

[9] *Laser local oscillators for heterodyne receivers beyond 2 terahertz,* H.-W. Huebers, H. Richter, S. Pavlov, A. Semenov, A. Tredicucci, L. Mahler, H. E. Beere, D. A. Ritchie, *Frequenz* **62**, 111 (2008).

[10] *Terahertz quantum cascade lasers with quasi-periodic resonators,* Lukas Mahler, Alessandro Tredicucci, Richard P. Green, Fabio Beltram, Christoph Walther, Jérôme Faist, Harvey E. Beere, and David A. Ritchie, *Physica* E **40**, 2176 (2008).

[11] *THz quantum cascade designs for optimized injection* ,T. Losco, J.H. Xu, R.P. Green, A. Tredicucci, H.E. Beere, and D.A. Ritchie, *Physica* E **40**, 2207 (2008).

[12] *Line width enhancement factor of terahertz quantum cascade lasers,* Richard P. Green, Ji-Hua Xu, Lukas Mahler, Alessandro Tredicucci, Fabio Beltram, Guido Giuliani, Harvey E. Beere and David A. Ritchie, *Appl. Phys. Lett*. **92**, 071106 (2008).

[13] *Tuneable terahertz quantum cascade lasers with an external cavity,* Jihua Xu, Joel M. Hensley, D. B. Fenner, Richard P. Green, Lukas Mahler, Alessandro Tredicucci, Mark G. Allen, Fabio Beltram, Harvey E. Beere, and David A. Ritchie, *Appl. Phys. Lett.* **91**, 121104 (2007).

[14] *Amplification of terahertz radiation in quantum cascade structures,* Cosimo Mauro, Richard P. Green, Alessandro Tredicucci, Fabio Beltram, Harvey E. Beere, and David A. Ritchie, *J. Appl. Phys.* **102**, 063101 (2007).

[15] *Pulsed THz Signal Reconstruction,* J.R. Fletcher, G.P. Swift, Dechang Dai, J.M. Chamberlain and P.C. Upadhya, *Journal of Applied Physics* **102**, 113105 (2007).

[16] *Characterization of low temperature GaAs antenna array terahertz emitters.* M. Awad, M. Nagel, H. Kurz, J. Herfort, and K. Ploog, Appl. Phys. Lett. 91, 181124 (2007).

[17] *Advanced optoelectronics in III-V semiconductor compounds.* M. Först, M. Nagel, M. Awad, M. Wächter, T. Dekorsy, and H. Kurz, phys. stat. sol. (b) 244, 2971-2987 (2007).

[18] *Low-loss terahertz transmission through curved metallic slit waveguides fabricated by spark erosion.* M. Wächter, M. Nagel, and H. Kurz, Appl. Phys. Lett. 92, 161102 (2008).

[19] *T*erahertz and sub-THz quantum cascade lasers, G. Scalari, C. Walther, M. Fischer, R. Terazzi, H. Beere, D. Ritchie, J. Faist, *Lasers and Photonics Reviews*, Published on line September (2008).

[20] T*erahertz quantum cascade lasers based on two-dimensional photonic crystal resonators*, L. Sirigu, R. Terazzi, M. I. Amanti, M. Giovannini , J. Faist L. A. Dunbar, R. Houdré, *Optics Express*, **16**, 5206-5217, (2008).

[21] *A terahertz quantum cascade laser grown by low-pressure metalorganic vapor phase epitaxy*, L. Sirigu, A. Rudra, E. Kapon, M. I. Amanti, G. Scalari, J. Faist, *Appl. Phys. Lett.* **92** 181111 (2008).

[22] *Advances in Fiber Delivery of Femtosecond Laser Pulses,* T. Le, M. Hofer, Z, Cheng, and A. Stingl, FemtoLasers Produktions GmbH (Austria); J. Darmo, D. P. Kelly, K. Unterrainer, Technische Univ. Wien (Austria); Laser 2008, San Jose, California, USA, *Proc. SPIE* Vol. **6871**, Solid State Lasers XVII: Technology And Devices (2008).

[23] *Absorption-Sensitive Diffuse Reflection Imaging of Concealed Powders Using a Terahertz Quantum Cascade Laser.* P. Dean, M. U. Shaukat, S. P. Khanna, S. Chakraborty, M. Lachab, A. D. Burnett, A. G. Davies, and E. H. Linfield. *Optics Express* **16**, 5997 – 6007 (2008).

[24] *Terahertz Spectroscopy of Explosives and Drugs.* A. G. Davies, A. D. Burnett, W. H. Fan, E.H. Linfield, J. Cunningham. *Materials Today* **11**, 18 – 26 (2008).

[25] *Excitation-Density-Dependent Generation of Broadband Terahertz Radiation in an Asymmetrically Excited Photoconductive Antenna.* P. C. Upadhya, W. H. Fan, A. D. Burnett, J. E. Cunningham, A. G. Davies, E. H. Linfield, J. Lloyd-Hughes, E. Castro-Camus, M. B. Johnston, and H. E. Beere. O*ptics Letters* **32**, 2297 – 2299 (2007).

[26] *Far-Infrared Spectroscopic Characterization of Explosives for Security Applications Using Broadband Terahertz Time-Domain Spectroscopy.* W. H. Fan, A. D. Burnett, P. C. Upadhya, J. E. Cunningham, E. H. Linfield, and A. G. Davies. Applied Spectroscopy **61**, 638 – 643 (2007).

[27] *Advanced terahertz electric near-field measurements at sub-wavelength diameter metallic apertures*, A. J. L. Adam *et al.*, *Opt. Express* **16**, 7407 (2008).

[28] *THz near-field measurements of metal structures*, A. J. L. Adam, J. M. Brok, P. C. M. Planken, M. A. Seo, and D. S. Kim, C. R. *Physique* **9**, 161 (2008).

[29] *Fourier-transform terahertz near-field imaging of one-dimensional slit arrays: mapping of electric-field-, magnetic-field-, and Poynting vectors*, M. A. Seo, A. J. L. Adam, J. H. Kang, J. W. Lee, S. C. Jeoung, Q. H. Park, P. C. M. Planken, and D. S. Kim, *Opt. Express* **15**, 11781 (2007).

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[31] *Frequency selective surfaces for high sensitivity terahertz sensing,* C. Debus, P. Haring Bolívar, *Applied Physics Letters*, Vol. **91**, no. 18, p. 184102 (2007).

[32] *Characterization of aqueous alcohol solutions in bottles with THz reflection spectroscopy,* P. Uhd Jepsen, J. K. Nielsen, and U. Møller, *Optics Express* **16,** 9318-9331 (2008).

[33] *Optical modulation of terahertz pulses in a parallel plate waveguide,* D. C. Cooke and P. Uhd Jepsen, *Optics Express* **16,** 15123-15129 (2008).

[34] *Routes to fiber delivery of ultra-short laser pulses in the 25 fs regime*, Tuan Le, Gabriel Tempea, Zhao Cheng, Martin Hofer, and Andreas Stingl, *Optics. Express* **17**, 1240-1247 (2009).

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PATENTS

Alessandro Tredicucci – SNS, Pisa

"*Laser Circolari a Semiconduttore con Reticoli per Emissione Verticale*", PI/2008/A/000039, Italian Patent. Deposited 5th May 2008.

Michael Nagel, RWTH Aachen

Herstellungs-verfahren fuer einen Oberflaechensensor, Sytem und Verwendung eines Oberflaechensensors", German Patent.

OTHER TECHNICAL VISITS/ MEETINGS

Edmund Linfield – University of Leeds, UK

Japan Visit, January 2008 - THz research at Tohoku University, Tokyo University, and NICT, as part of the British Embassy in Japan's Anglo-Japanese THz Collaboration.

PUBLIC UNDERSTANDING OF SCIENCE

Karen Steenson – University of Leeds, UK

The Importance of Dissemination in Framework Projects – TeraNova, EC Project Manager's Association (ECPMA), St James' Hospital, Leeds, UK, 9th May and 25th July 2008.

CONFRENCES ORGANIZED

The Ninth International Conference on Intersubband Transitions in Quantum Wells, ITQW 2007, Ambleside, UK; September 9-14, 2007 (Edmund Linfield, Organising Committee).

Terahertz Photonics 2007, Weetwood Hall, Leeds, UK, 29th-30th October 2007 (Martyn Chamberlain, Edmund Linfield & Karen Steenson, Organising Committee).

Mind the Gap – Millimetre Wave and THz Conference organised by Electronics Knowledge Transfer Networks (UK Technology Strategy Board), London, 24th January 2008 (Debra Barnes & Edmund Linfield, Organising Committee).

First topical meeting of the *European Focus Group on THz Science and Technology*, under the auspices of the European Optical Society, Paris, 29th September 29 to 1st October, 2008 (Paul Planken, Programme Chair and Organising Committee).

Terahertz Systems and Industrial Applications, Royal Society, London, UK, 25th February, 2009 (Debra Barnes, Martyn Chamberlain & Karen Steenson).

EXHIBITIONS / TRADE FAIRS

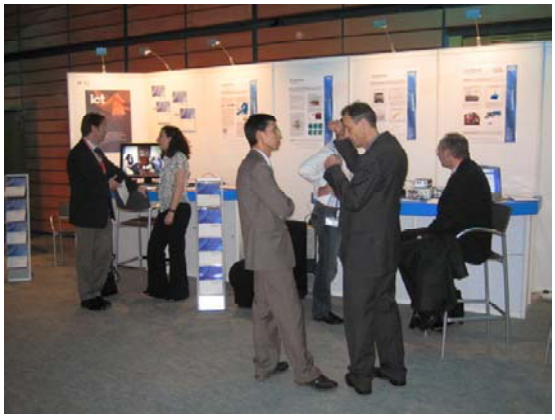
The University of Siegen, represented the *TeraNova* Consortium at the opening of the Iberian Nanotechnology Institute in Braga, Portugal, on the 20th & 21st November 2007 - Exhibit No. 8 on 'THz Technologies'.

The *TeraNova* Consortium was represented by Alpes Lasers, Durham University, Femtolasers, University of Leeds, and TU Wien, at the ICT2008 Exhibition, Lyon, France, 25th to 27th November 2008.

Exhibition/Trade Fairs *continued*

Peter Haring Bolivar representing TeraNova, at the opening of the Iberian Nanotechnology Institute in Braga, Portugal, 20th & 21st November 2007 - Exhibit No. 8 on 'THz Technologies'.

Peter Haring Bolivar meeting Viviane Reding, EU Commissioner for Information Society and Media, At the opening of the Iberian Nanotechnology Institute Braga, Portugal.



Visitors at the TeraNova stand, ICT2008 Exhibition, Lyon, France, 25th to 27th November 2008.

Dr Lubos Hvozdara, from Alpes Lasers S.A., demonstrates a THz Quantum Cascade Laser Imager to EU Officials at the ICT2008 Exhibition.

TeraNova Posters at the Royal Society, London, UK: Meeting on Terahertz Systems and Industrial Applications, 25th February 2009 - organised by Debra Barnes, Martyn Chamberlain & Karen Steenson.