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Technologies for Optical Countermeasures X; and High-Power Lasers 2013: Technology and Systems

David H. Titterton
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Contents

- vii *Conference Committees*
- ix *Introduction to Part A: Technologies for Optical Countermeasures X*
- xi *Introduction to Part B: High-Power Lasers 2013: Technology and Systems*

Part A Technologies for Optical Countermeasures X

SESSION 1	KEYNOTE SESSION
8898 02	Quantum cascade lasers for defense and security (Keynote Paper) [8898-1] T. Day, M. Pushkarsky, D. Caffey, K. Cecchetti, R. Arp, A. Whitmore, M. Henson, E. B. Takeuchi, Daylight Solutions Inc. (United States)
SESSION 2	QUANTUM CASCADE AND HIGH-POWER DIODE LASERS
8898 05	Design issues and physics for high-performance quantum-cascade lasers (Invited Paper) [8898-4] W. T. Masselink, M. P. Semtsiv, M. Elagin, Y. V. Flores, G. Monastyrskiy, S. Kurllov, J. Kischkat, Humboldt-Univ. zu Berlin (Germany)
8898 07	Progress in efficiency-optimized high-power diode lasers (Invited Paper) [8898-6] A. Pietrzak, R. Hülsewede, M. Zorn, O. Hirsekorn, J. Sebastian, JENOPTIK Diode Lab GmbH (Germany); J. Meusel, P. Hennig, JENOPTIK Laser GmbH (Germany); P. Crump, H. Wenzel, S. Knigge, A. Maaßdorf, F. Bugge, G. Erbert, Ferdinand-Braun-Institut (Germany)
SESSION 3	TWO MICRON
8898 08	Mid-IR supercontinuum generation in ultra-low loss, dispersion-zero shifted tellurite glass fiber with extended coverage beyond 4.5 μm (Invited Paper) [8898-7] R. Thapa, D. Rhonehouse, D. Nguyen, K. Wiersma, C. Smith, J. Zong, A. Chavez-Pirson, NP Photonics, Inc. (United States)
8898 09	Compact high-power/high-energy 2 μm and mid-infrared laser sources for OCM (Invited Paper) [8898-8] C. Kieleck, A. Hildenbrand, M. Schellhorn, G. Stoeppler, M. Eichhorn, French-German Research Institute of Saint-Louis (France)

- 8898 0A **Average power and pulse energy scaling of 1.6 μ m resonantly-diode-pumped erbium lasers** [8898-10]
L. Galecki, M. Eichhorn, French-German Research Institute of Saint-Louis (France);
W. Zendzian, Military Univ. of Technology (Poland)

SESSION 4 MID-IR TRANSMISSION FIBRES

- 8898 0C **Maximizing the bandwidth while minimizing the spectral fluctuations using supercontinuum generation in photonic crystal chalcogenide fibers (Invited Paper)** [8898-12]
C. R. Menyuk, R. J. Weiblen, Univ. of Maryland, Baltimore County (United States); J. Hu, Baylor Univ. (United States); L. B. Shaw, J. S. Sanghera, U.S. Naval Research Lab. (United States); I. D. Aggarwal, Sotera Defense Solutions, Inc. (United States)
- 8898 0D **Low loss, wide transparency, robust tellurite glass fibers for mid-IR (2 - 5 μ m) applications** [8898-13]
D. L. Rhonehouse, J. Zong, D. Nguyen, R. Thapa, K. Wiersma, C. Smith, A. Chavez-Pirson, NP Photonics, Inc. (United States)

SESSION 5 MODELLING AND SIMULATION

- 8898 0E **Simulation of laser propagation through jet plumes using computational fluid dynamics** [8898-14]
M. Henriksson, H. Edefur, C. Fureby, O. Parmhed, S.-H. Peng, L. Sjöqvist, J. Tidström, S. Wallin, Swedish Defence Research Agency (Sweden)
- 8898 0F **Comparison of MODTRAN5 to measured data in the UV band** [8898-15]
L. Smith, M. Richardson, Cranfield Univ. (United Kingdom); R. Walmsley, Chemring Countermeasures Ltd. (United Kingdom)

SESSION 6 LASER EFFECTS

- 8898 0G **Non-lethal laser dazzling as a personnel countermeasure (Invited Paper)** [8898-16]
D. C. Shannon, Consultant (United States)
- 8898 0H **Laser dazzling impacts on car driver performance** [8898-17]
O. Steinvall, S. Sandberg, U. Hörberg, R. Persson, F. Berglund, K. Karlsson, J. Öhgren, Swedish Defence Research Agency (Sweden); Z. Yu, P. Söderberg, Uppsala Univ. (Sweden)
- 8898 0I **Effects of high power illuminators on vision through windscreens and driving behavior** [8898-18]
A. Toet, J. W. A. M. Alferdinck, TNO (Netherlands)

SESSION 7 THREAT DETECTION AND DISCRIMINATION

- 8898 0J **Detection of dim targets in multiple environments (Invited Paper)** [8898-19]
G. M. Mirsky, M. Woods, R. J. Grasso, Northrop Grumman Corp. (United States)

- 8898 OK **Target discrimination strategies in optics detection (Invited Paper)** [8898-20]
L. Sjöqvist, L. Allard, M. Henriksson, P. Jonsson, M. Petterson, Swedish Defence Research Agency (Sweden)
- 8898 OL **Optical countermeasures against CLOS weapon systems** [8898-21]
A. Toet, K. W. Benoist, J. N. J. van Lingen, H. R. M. A. Schleijpen, TNO (Netherlands)

Part B High-Power Lasers 2013: Technology and Systems

SESSION 8	DEMONSTRATIONS AND SYSTEMS
8898 ON	50 kW laser weapon demonstrator of Rheinmetall Waffe munition (Invited Paper) [8898-25] K. Ludewigt, T. Riesbeck, A. Graf, M. Jung, Rheinmetall Waffe Munition GmbH (Germany)
8898 OO	Latest developments on the Er³⁺:YAG solid state heat-capacity laser (Invited Paper) [8898-26] S. Bigotta, T. Ibach, M. Eichhorn, Institut Franco-Allemand de Recherches de Saint-Louis (France)
8898 OP	Recent developments in high power thin disk lasers at TRUMPF Laser [8898-27] T. Gottwald, V. Kuhn, S.-S. Schad, C. Stolzenburg, A. Killi, TRUMPF Laser GmbH & Co. KG (Germany)
SESSION 9	FIBER AND SEMICONDUCTOR LASER TECHNOLOGY
8898 OS	Single-element beam shaper for conversion of a fiber laser beam into a near-diffraction-limited dark hollow beam [8898-31] H. Ma, H. Hu, W. Xie, G. Jiang, X. Xu, National Univ. of Defense Technology (China)
8898 OU	High-power diode lasers between 1.8μm and 3.0μm for military applications [8898-33] S. Hilzensauer, C. Giesin, J. Schleife, J. Gilly, m2k-laser GmbH (Germany); S. Patterson, DILAS Diode Laser, Inc. (United States); M. T. Kelemen, m2k-laser GmbH (Germany)
SESSION 10	ADVANCED GAS LASERS
8898 OV	DPAL: historical perspective and summary of achievements (Invited Paper) [8898-34] B. V. Zhdanov, R. J. Knize, U.S. Air Force Academy (United States)
8898 OW	Model calculations of kinetic and fluid dynamic processes in diode pumped alkali lasers [8898-36] B. D. Barmashenko, S. Rosenwaks, K. Waichman, Ben-Gurion Univ. of the Negev (Israel)
8898 OX	What can we gain from supersonic operation of diode pumped alkali lasers: model calculations [8898-35] S. Rosenwaks, B. D. Barmashenko, K. Waichman, Ben-Gurion Univ. of the Negev (Israel)

SESSION 11 LASER-INDUCED PLASMA EFFECTS

- 8898 0Z **Controlling plasma channels through ultrashort laser pulse filamentation** [8898-38]
A. A. Ionin, L. V. Seleznev, P.N. Lebedev Physical Institute (Russian Federation);
E. S. Sunchugasheva, P.N. Lebedev Physical Institute (Russian Federation) and Moscow
Institute of Physics and Technology (Russian Federation)

Author Index

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Part A: Technologies for Optical Countermeasures X

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Session Chairs

- 1 Keynote Session
Robert J. Grasso, Northrop Grumman Electronic Systems (United States)

- 2 Quantum Cascade and High-Power Diode Lasers
Hans Dieter Tholl, Diehl BGT Defence GmbH & Co. KG (Germany)
- 3 Two Micron
Ian F. Elder, SELEX ES Ltd. (United Kingdom)
- Panel Discussion: Attaining Closed Loop Countermeasures
Robert J. Grasso (Moderator), Northrop Grumman Electronic Systems (United States)
Mark A. Richardson (Moderator), Cranfield University (United Kingdom)
- 4 Mid-IR Transmission Fibres
Marc Eichhorn, Institut Franco-Allemand de Recherches de Saint-Louis (France)
- 5 Modelling and Simulation
David H. Titterton, Defence Science and Technology Laboratory (United Kingdom)
- 6 Laser Effects
David H. Titterton, Defence Science and Technology Laboratory (United Kingdom)
- 7 Threat Detection and Discrimination
Markus Henriksson, Swedish Defence Research Agency (Sweden)

Part B: High-Power Lasers 2013: Technology and Systems

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Session Chairs

- 8 Demonstrations and Systems
Willy L. Bohn, BohnLaser Consult (Germany)
- 9 Fiber and Semiconductor Laser Technology
Bryce N. Samson, Nufern (United States)
- 10 Advanced Gas Lasers
Salman Rosenwaks, Ben-Gurion University of the Negev (Israel)
- 11 Laser-Induced Plasma Effects
Andrey A. Ionin, P.N. Lebedev Physical Institute (Russian Federation)

Introduction to Part A: Technologies for Optical Countermeasures X

The purpose of this conference was to provide a technical forum for attendees to gain an increased awareness of the recent developments in optical countermeasure techniques and technologies for security and defence applications. Optical countermeasure techniques have been used for thousands of years to provide a force multiplier on the battlefield and current operations continue to exploit this remarkable technology. The use of optical techniques is attractive, as they frequently offer a simple and cost-effective method of defence, especially for protecting a range of platforms. Optical methods used for alternative security applications have been discussed in the past and in other conferences during this symposium.

The development of laser technology and its use in laser-based systems has offered dramatic changes to all aspects of warfare, but other more traditional, and usually cheaper, optical technologies have also proved to be invaluable. This conference offered the opportunity to consider the impact of laser technology, and other optical techniques, on a range of operations on the battlefield, as well as for other applications. Moreover, this symposium brought together the optical community at large and enabled a discussion of novel applications of emerging techniques and technologies. Optical devices and technologies are often "dual-use" technologies, as they may be used in medicine, manufacture and detection and identification of illegal items; some of these applications were discussed at other conferences held at this symposium.

Following a keynote speaker session considering state-of-the-art sources for a range of optical countermeasures, there was a significant and very enlightening session on quantum-cascade and high-power diode laser technologies, which offer many potential advantages for countermeasure applications. Laser technology has enabled very robust defeat mechanisms to be established, so that heat-seeking missile threats can be defeated rapidly, leading to enhanced platform protection. The invited paper gave an excellent overview of the "fibre-technology" status and the supporting papers provided very good details of the techniques being applied to fibre-based laser sources.

The theme of the third session was "two micron" solid-state laser technology, which gave an insight into the progress with the development of relatively novel techniques including super-continuum generation in this very important part of the spectrum. This session also had a paper describing the technological developments of 1.6 micron devices.

There was a panel discussion considering the merits of closed-loop IRCM techniques and the perceived challenges. This was a well-attended session and produced a number of interesting debates. This technique is seen as the "holy grail" for robust countermeasure techniques, but is still very demanding technically.

The session on low-loss mid IR optical fibres opened with an outstanding review of the recent progress in the technology base and the current state-of-the-art for this critical part of the spectrum. The other invited talk in this session covered the theoretical consideration of effective super-continuum generation. The contributed paper provided a most valuable insight into the recent advances in tellurite optical fibres.

Mathematical modelling and simulation techniques provide an important tool in the definition of countermeasure approaches, enabling promising techniques to be defined for further rigorous investigation and validation in the laboratory and during field trials. The topics covered in this session included consideration of the impact of zones of extreme optical turbulence on the beam propagation characteristics and the estimate of optical transmission in the ultra-violet part of the spectrum, which is of increasing interest to countermeasure engineers.

The laser effects session was extremely well attended and the audience were provided with three outstanding papers covering laser dazzle techniques and effects. This session covered devices and the impact on potential adversaries attacking check points.

The final session, which was also well attended, covered the topics of threat detection and discrimination. The papers discussed detection of dim targets in "multiple environments", including hostile fire detection, target discrimination using optical methods and optical countermeasures against command to line-of-sight guidance.

We were very pleased to receive papers from nine nations, making it a truly international conference, which gave a strong indication of the united approach to enhancing all aspects of security and defence across the USA and Europe. We wish to thank our programme committee members for encouraging a range of interesting and relevant papers from the presenters. Moreover, we are very grateful to all of the authors for the very interesting papers they presented, which were of a very high standard enabling this to be an excellent conference. Finally, our thanks go to the session chairmen who ran the whole conference extremely well.

David H Titterton
Mark A. Richardson
Robert J. Grasso

Introduction to Part B: High Power Lasers 2013: Technology and Systems

This was the second high-power laser conference and although the attendance to this conference was lower than last year the quality of the papers was still high and very innovative. In addition, intensive discussions and exchange of ideas took place among the experts in all sessions of the conference. It provided an excellent forum for attendees, specialists and newcomers, in the areas of lasers demonstrations and systems, fiber and semiconductor lasers and advanced gas lasers.

The first invited paper of the Demonstrations and Systems session was a highlight of the achievements in fiber based laser weapon systems in Europe and was also presented in the Security + Defense plenary session. This paper provided a most valuable insight into the development of a laser directed-energy weapon system and its potential value as a novel weapon system. For disk lasers, advances in high power lasers were presented, with special emphasis on the world record for fundamental mode operation. This was followed by a progress report on "eye-safe" laser technology, addressing an erbium Heat Capacity laser in the multi-kW range.

The Fiber and Semiconductor Laser Technology session was dominated by the outstanding advances in high power 2 μ m fiber technology. The specific advantages of thulium and holmium-doped materials were highlighted and impressively demonstrated in numerous experiments. Hereby the narrow band capability is of primary importance for further scaling using laser coupling technologies.

The session on Advanced Gas Lasers was exclusively devoted to the diode pumped alkali laser (DPAL). Since waste heat removal is the major issue of all high power lasers a supersonic gas flow concept was presented and discussed with detailed simulation support. This may lead the way to further power scaling of this laser scheme.

Finally, an excellent overview was given in laser-induced breakdown of optical coatings followed by a state-of-the-art review of plasma channel generation and filamentation control.

All of the sessions were well attended, and as indicated above, the discussion was most valuable. These discussions provided an invaluable insight into the way the high-power source technology is evolving and being applied to meet military capability requirements.

This conference was particularly “badly hit” by the current fiscal constraints and consequently many papers were withdrawn prior to the start of the conference. Despite this impediment, this was still a viable conference.

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Willy L. Bohn