BK21플러스사업 단기해외연수
국제학술대회 점검 기준표

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4. 총 참여 국가(발표자의 소속국가) : 40 개국 (미국, 독일, 중국, 일본.....)

5. 총 발표 논문 수

구두발표 수	포스터 발표 수	총 발표 논문 수
4222	1125	5347

6. 구두논문 중 외국인 발표자 비율

한국인 비율 (건수)	외국인 비율 (건수)	전체 논문
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CONFERENCE 10900
LOCATION: ROOM 203 (SOUTH LEVEL TWO)

Sunday–Tuesday 3–5 February 2019 • Proceedings of SPIE Vol. 10900

High-Power Diode Laser Technology XVII

Conference Chair: **Mark S. Zediker,** NUBURU, Inc. (USA)

Program Committee: **Friedrich G. Bachmann,** FriBa LaserNet (Germany); **Stefan W. Heinemann,** TRUMPF Photonics (USA); **Volker Krause,** Laserline GmbH (Germany); **Robert Martinsen,** nLIGHT Corp. (USA); **Erik P. Zucker,** Erik Zucker Consulting (USA)

SUNDAY 3 FEBRUARY

SESSION 1
LOCATION: ROOM 203 (SOUTH LEVEL TWO) . . . . . .SUN 8:00 AM TO 11:30 AM

High Power Visible Laser Technology

Session Chair: **Friedrich G. Bachmann,** FriBa LaserNet (Germany)

8:00 am: **High-brightness laser-based White light sources for automotive lighting applications** *(Invited Paper)*, Abdelmalek Hanafi, Helmut Erdl, BMW Group Forschungs- und Innovationszentrum (Germany); Paul Rudy, James Raring, SLD Laser (USA) . . . . . [10900-1]

8:30 am: **500 Watt blue laser system for welding applications**, Mark S. Zediker, Matthew Silva Sa, Jean Phillipe Feve, Mathew Finuf, Robert Fritz, Jean-Michel Pelaprat, NUBURU, Inc. (USA) . . . . . .[10900-2]

8:50 am: **1000 W blue fiber-coupled diode-laser emitting at 450 nm**, Anne Balck, Markus Baumann, Jörg Malchus, Rony Vincent Chacko, Sören Marfels, Ulrich Witte, Deepak Dinakaran, Sörn Ocylok, Matthias Weinbach, Charley Bachert, Arnd Kösters, Volker Krause, Laserline GmbH (Germany); Harald König, Alfred Lell, Bernhard Stojetz, Muhammad Ali, Uwe Strauss, OSRAM Opto Semiconductors GmbH (Germany) . . . . .[10900-3]

9:10 am: **High brightness fiber coupled diode lasers at 450nm**, Tobias P. Könning, Simon Drovs, Michael Stoiber, Philipp Koenig, Heiko Kissel, Bernd Köhler, Jens Biesenbach, DILAS Diodenlaser GmbH (Germany); Harald König, Alfred Lell, Bernhard Stojetz, Muhammad Ali, Uwe Strauss, OSRAM Opto Semiconductors GmbH (Germany) . . . . .[10900-4]

9:30 am: **High-power and brightness 105-micron fiber coupled blue laser diode modules**, Martina Riva, Politecnico di Torino (Italy); Giammarco Rossi, Francesco Pescarmona, Andrea Braglia, OPI Photonics s.r.l. (Italy); Guido Perrone, Politecnico di Torino (Italy) . . . . . .[10900-5]

Coffee Break. . . . . Sun 9:50 am to 10:20 am

10:20 am: **Low-cost laser light enabling more applications** *(Invited Paper)*, William F. Mackenzie, Ushio America, Inc. (USA) . . . . . .[10900-6]

10:50 am: **High-power-class QCW red laser bars and stacks for pump and direct application**, Markus Niemeyer, Dominik Martin, Johannes Pohl, Markus Weyers, Andrea Knigge, Paul Crump, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany); Heiko Kissel, Jens Biesenbach, DILAS Diodenlaser GmbH (Germany) . . . . . .[10900-7]

11:10 am: **Development of BLUE IMPACT, a 450nm-wavelength light source for laser processing**, Naoki Wakabayashi, Minoru Yamada, Shingo Uno, Naoya Ishigaki, Tomoyuki Hiroki, Masaya Suwa, Ryosuke Nishi, Koji Tojo, Shimadzu Corp. (Japan); Masahiro Tsukamoto, Osaka Univ. (Japan) . . . . . .[10900-8]

Lunch/BiOS Exhibition Break . . . . . Sun 11:30 am to 12:40 pm

SESSION 2
LOCATION: ROOM 203 (SOUTH LEVEL TWO) . . . . . .SUN 12:40 PM TO 3:00 PM

High Power Devices I

Session Chair: **Volker Krause,** Laserline GmbH (Germany)

12:40 pm: **High power 808nm to 1060nm CW and QCW laser diode bars**, Guoli Liu, Sami Lehkonen, Zuntu Xu, Jingwei Li, Heiko Winhold, Sergei V. Govorkov, Coherent, Inc. (USA); Heiko Kissel, Jens Biesenbach, Coherent DILAS (Germany) . . . . . [10900-31]

1:00 pm: **Towards 300 W high power laser bars**, Jürgen Müller, Rainer Bättig, Vinzenz Beer, Christian Blumer, Reinhard Brunner, Jarkko Telkkälä, Johanna Wolf, II-VI Laser Enterprise GmbH (Switzerland) . . . . . .[10900-9]

1:20 pm: **976nm high brightness fiber-coupled laser modules for Ytterbium fiber laser pumping,** David M. Hemenway, Zach Chen, Manoj Kanskar, Wolfram Urbanek, David Dawson, Ling Bao, Mark DeFranza, Mark DeVito, Kevin Fortier, Rob Martinsen, nLIGHT, Inc. (USA) . . . . . .[10900-10]

1:40 pm: **Advanced diode laser R&D**, Stephan G. Strohmaier, TRUMPF Laser GmbH (Germany); Götz Erbert, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany); Gerald Urban, Thomas Rataj, Gerd Hansen, TRUMPF Laser GmbH (Germany); Berthold Schmidt, TRUMPF Lasertechnik GmbH (Germany); Thorben Kaul, Matthias Karow, Martin Wilkens, Paul Crump, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany) . . . . . [10900-11]

2:00 pm: **Enhanced power conversion efficiency in 900-nm range single emitter broad stripe laser diodes maintaining high power operability**, Yoshikazu Kaifuchi, Kyohei Yoshida, Yuji Yamagata, Ryozaburo Nogawa, Fujikura Ltd. (Japan); Yumi Yamada, OPTOENERGY Inc. (Japan); Masayuki Yamaguchi, Fujikura Ltd. (Japan) . . . . . [10900-12]

2:20 pm: **Highly-efficient high-power pumps for QCW fiber lasers**, Alexander Ovtchinnikov, Nikolay Moshegov, Ivan Berezin, Alexey Komissarov, Pavel Trubenko, Igor Berishev, Dmitri Miftakhutdinov, Vadim Chuyanov, Nikolay Strougov, Valentin Gapontsev, IPG Photonics Corp. (USA) . [10900-13]

2:40 pm: **High brightness diodes and low SWaP fiber-coupled packages enabled by reduced-mode (REM) diodes**, Manoj Kanskar, Chendong Bai, Ling Bao, David Dawson, Mark DeFranza, Mark DeVito, Kevin Fortier, Mike Grimshaw, Xing Guan, David M. Hemenway, Shuang Li, Eric Martin, Rob Martinsen, Thomas Prunty, Wolfram Urbanek, Jim Zhang, Shiguo Zhang, nLIGHT, Inc. (USA) . . . . . [10900-14]

Coffee Break. . . . . Sun 3:00 pm to 3:30 pm

SESSION 3
LOCATION: ROOM 203 (SOUTH LEVEL TWO) . . . . . .SUN 3:30 PM TO 5:50 PM

High Power Devices II

Session Chair: **Stefan W. Heinemann,** TRUMPF Photonics (USA)

3:30 pm: **High yield, highly manufacturable high-power wavelength stabilized DBR diode laser**, Roberto Paoletti, Simone Codato, Claudio Coriasso, Fabio Gaziano, Paola Gotta, Alberto Maina, Giancarlo Meneghini, Giuliana Morello, Pier De Melchiorre, Giulia Pippione, Irene Rigo, Ezio Riva, Marzia Rosso, Alessandro Stano, Maurizio Gattiglio, Prima Electro S.p.A. (Italy). . . . . [10900-15]

3:50 pm: **Ultra-short pulse NIR and SWIR laser diode illuminators for automotive LiDAR**, Robert Walker, Prabhu Thiagarajan, Eric Ruben, Jean-Michel Maillard, John Goings, Linda West, Lasertel, Inc. (USA) . . . . . [10900-16]

4:10 pm: **Development of highly-efficient laser diodes emitting around 1060nm for medical and industrial applications**, Agnieszka Pietrzak, Martin Zorn, Ralf Huelsewede, Juergen Sebastian, JENOPTIK Diode Lab GmbH (Germany); Jens Meusel, JENOPTIK Laser GmbH (Germany) [10900-17]

4:30 pm: **940nm high-power laser diode based on AlGaAs/InGaAs GRIN-SCH and asymmetric structure**, Seunghyeon Seong, QSI Co., Ltd. (Korea, Republic of) . . . . . [10900-18]

4:50 pm: **Current spreading suppression by O- and Si-implantation in high power broad area diode lasers**, Dominik Martin, Pietro Della Casa, Tim Adam, Christian Goerke, Andreas Thies, Karl Häusler, Olaf Brox, Hans Wenzel, Paul Crump, Markus Weyers, Andrea Knigge, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany) . . . . .[10900-19]

5:10 pm: **Dependence of high-power laser diode performance on emitter width**, Jung-Tack Yang, Younghyun Kim, Yonsei Univ. (Korea, Republic of); Jae Bong Lee, Dong-Soo Bang, Tae-Kyung Kim, QSI Co., Ltd. (Korea, Republic of); Woo-Young Choi, Yonsei Univ. (Korea, Republic of). . .[10900-20]

5:30 pm: **Recent progress in brightness scaling by coherent beam combining of tapered amplifiers for efficient high power frequency doubling**, Philipp Albrodt, Lab. Charles Fabry (France); Muhammad T. Jamal, Anders K Hansen, Ole B. Jensen, DTU Fotonik (Denmark); Markus Niemeyer, Gunnar Blume, Katrin Paschke, Paul Crump, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany); Patrick Georges, Gaëlle Lucas-Leclin, Lab. Charles Fabry (France) . . . . . [10900-21]

Dependence of High-Power Laser Diode Performance on Emitter Width

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ABSTRACT

975-nm laser diodes (LDs) are of great demand as pumping sources for Yb-doped fiber lasers. They should provide high output power with high efficiency and good beam quality. In order to satisfy these requirements, the LD structure should be carefully designed. In this paper, we report the results of our investigation in which the influence of the LD emitter width on the maximum output power, power-conversion efficiency (PCE) and beam parameter product (BPP) are analyzed with self-consistent electro-thermal-optical simulation of LDs. In order to establish the accuracy of our simulation, we carefully determine the numerical values of key LD parameters by fitting the simulation results to the measured results for a fabricated 975-nm LD. The device has 15-nm-thick tensile-strained InGaAsP single quantum well with asymmetric AlGaAs separate confinement heterostructure layers, 90-μm wide ridge, and 4-mm long cavity. With the parameter values obtained, LDs having various emitter widths are simulated and their maximum output powers, PCEs, and BPPs are determined as well as the temperature profiles inside the device. The results show that the device with the smaller emitter width has both of thermal roll-over, thermal blooming at the lower output power, mostly due to higher series resistance. However, it provides better BPP. These results are useful for optimizing LD array structures so that the optimal structure for each array element can be determined that can provide the highest possible output power with the best BPP.

Keywords: High-power laser diode, emitter width, power-conversion efficiency (PCE), beam parameter product (BPP_