SPIE. PHOTONICS WEST

TECHNICAL PROGRAM

Photonics West 2019

TECHNICAL PROGRAM

Conferences and Courses
2-7 February 2019

BIOS Expo
2-3 January 2019

Photonics West Exhibition
5-7 February 2019

The Moscone Center
San Francisco, USA

spie.org/pw

3:10 pm: **Laser radio transmitter,** Marco Piccardo, Michele Tamagnone, Harvard Univ. (USA); Benedikt Schwarz, Technische Univ. Wien (Austria); Paul Chevalier, Noah A. Rubin, Harvard Univ. (USA); Yongrui Wang, Texas A&M Univ. (USA); Christine A. Wang, Michael K. Connors, Daniel McNulty, Massachussetts Institute of Technology (USA); Alexey Belyanin, Texas A&M Univ. (USA); Federico Capasso, Harvard Univ. (USA) . . . . . [10917-10]

Coffee Break . . . . . Mon 3:30 pm to 4:00 pm

SESSION 3
LOCATION: ROOM 305 (SOUTH LEVEL THREE) . . . . . MON 4:00 PM TO 5:40 PM

THz Detection

Session Chairs: **Tianxin Yang,** Tianjin Univ. (China); **Laurence P. Sadwick,** InnoSys, Inc. (USA)

4:00 pm: **High-power single-mode terahertz quantum cascade lasers via resonator engineering** *(Invited Paper)*, Huan Zhu, Shanghai Institute of Technical Physics (China); Haiqing Zhu, Chenren Yu, Gaolei Chang, Shanghai Institute of Technical Physics (China) and Univ. of Chinese Academy of Sciences (China); Jianxin Chen, Shanghai Institute of Technical Physics (China); Raffaele Colombelli, Univ. Paris-Sud (France) and Univ. Paris-Saclay (France); Gangyi Xu, Li He, Shanghai Institute of Technical Physics (China) . . . . . [10917-11]

4:30 pm: **Semiconductor-based terahertz photonics for industrial applications** *(Invited Paper)*, Eui Su Lee, Kiwon Moon, Il-Min Lee, Dong Woo Park, Jeong-Woo Park, Hyun-Soo Kim, Kyung Hyun Park, Electronics and Telecommunications Research Institute (Korea, Republic of) . . . . . [10917-12]

5:00 pm: **High-sensitivity and broadband terahertz detection through nanocavity-coupled plasmonic nanoantenna arrays,** Nezih Tolga Yardimci, Deniz Turan, Semih Cakmakyapan, Mona Jarrahi, Univ. of California, Los Angeles (USA) . . . . . [10917-13]

5:20 pm: **Two-well THz quantum cascade laser optimized by non-equilibrium Green's function with a maximum operating temperature close to 200 K,** Lorenzo Bosco, Martin Franckié, Elena Mavrona, Giacomo Scalari, Mattias Beck, Jérôme Faist, ETH Zurich (Switzerland) . . . . . [10917-14]

TUESDAY 5 FEBRUARY

SESSION 4
LOCATION: ROOM 305 (SOUTH LEVEL THREE) . . . . . TUE 8:00 AM TO 10:00 AM

Special Session on THz Plasmonics and Novel Applications

Session Chairs: **René Beigang,** Technische Univ. Kaiserslautern (Germany); **Marco Rahm,** Technische Univ. Kaiserslautern (Germany)

8:00 am: **Graphene-based 2D-heterostructures for terahertz lasers and amplifiers** *(Invited Paper)*, Taiichi Otsuji, Tohoku Univ (Japan) . . . . . [10917-15]

8:30 am: **Spectrally narrow terahertz plasmonic resonances in three dimensional Dirac semimetals** *(Invited Paper)*, Berardi Sensale-Rodriguez, Univ of Utah (USA) . . . . . [10917-16]

9:00 am: **Terahertz generation and acceleration** *(Invited Paper)*, Franz X. Kärtner, Dongfang Zhang, Arya Fallahi, Michael Hemmer, Moein Fakhari, Yi Hua, Huseyin Cankaya, Anne-Laure Calendron, Luis Zapata, Nicholas Matlis, Deutsches Elektronen-Synchrotron DESY (Germany) . . . . . [10917-17]

9:30 am: **Near-field THz emission imaging and sensing system** *(Invited Paper)*, Masayoshi Tonouchi, Kazunori Serita, Kosuke Okada, Osaka Univ. (Japan) . . . . . [10917-18]

Coffee Break . . . . . Tue 10:00 am to 10:30 am

SESSION 5
LOCATION: ROOM 305 (SOUTH LEVEL THREE) . . . . . TUE 10:30 AM TO 12:30 PM

Special Session on THz Communication

Session Chairs: **René Beigang,** Technische Univ. Kaiserslautern (Germany); **Marco Rahm,** Technische Univ. Kaiserslautern (Germany)

10:30 am: **Suitable bands for terahertz wireless communication: the viewpoint of device, system, and standardization** *(Invited Paper)*, Iwao Hosako, National Institute of Information and Communications Technology (Japan) . . . . . [10917-19]

11:00 am: **300-GHz-band CMOS transceiver for ultrahigh-speed terahertz communication** *(Invited Paper)*, Minoru Fujishima, Hiroshima University (Japan) . . . . . [10917-20]

11:30 am: **Long distance THz pulses propagation in the atmosphere and applications of outdoor gas sensing** *(Invited Paper)*, Tae-In Jeon, Korea Maritime and Ocean Univ (Korea, Republic of) . . . . . [10917-21]

12:00 pm: **Ultrabroadband terahertz detectors based on field-effect transistors** *(Invited Paper)*, Hartmut G. Roskos, Goethe-Univ. Frankfurt am Main (Germany); Alvydas Lisauskas, Vilnius Univ. (Lithuania); Maris Bauer, Dovile Cibiraite, Florian Ludwig, Hui Yuan, Goethe-Univ. Frankfurt am Main (Germany); Viktor Krozer, Goethe-Univ. Frankfurt am Main (Germany) and Ferdinand-Braun-Institut (Germany); Serguei A. Chevtchenko, Adam Rämer, Wolfgang Heinrich, Ferdinand-Braun-Institut (Germany) . . . . . [10917-22]

Lunch/Exhibition Break . . . . . Tue 12:30 pm to 2:00 pm

SESSION 6
LOCATION: ROOM 305 (SOUTH LEVEL THREE) . . . . . TUE 2:00 PM TO 3:40 PM

Terahertz Sources

Session Chairs: **Daniel Molter,** Fraunhofer-Institut für Techno- und Wirtschaftsmathematik (Germany); **Laurence P. Sadwick,** InnoSys, Inc. (USA)

2:00 pm: **Efficient terahertz generation using Fe/Pt spintronic emitters pumped at different wavelengths** *(Invited Paper)*, Laura Scheuer, Technische Univ. Kaiserslautern (Germany); Garik Torosyan, Photonik-Zentrum Kaiserslautern e.V. (Germany); Valynn K. Mag-usara, Univ. of Fukui (Japan); Sascha Keller, Evangelos Papaloannou, Technische Univ. Kaiserslautern (Germany); Masahiko Tani, Univ. of Fukui (Japan); René Beigang, Technische Univ. Kaiserslautern (Germany) . . . . . [10917-23]

2:30 pm: **High-sensitivity broadband terahertz spectrometry using plasmonic photomixers** *(Invited Paper)*, Mona Jarrahi, Univ. of California, Los Angeles (USA) . . . . . [10917-24]

3:00 pm: **Bias-free telecommunication-compatible plasmonic photoconductive terahertz source,** Deniz Turan, Nezih Tolga Yardimci, Zixuan Rong, Dingkun Ren, Hyunseok Kim, Univ. of California, Los Angeles (USA); Diana Huffaker, Cardiff Univ. (United Kingdom); Mona Jarrahi, Univ. of California, Los Angeles (USA) . . . . . [10917-25]

3:20 pm: **Terahertz (THz) radiation generation driven by the frequency-chirped laser pulse in magneto-active plasma,** Alka Mehta, Niti Kant, Lovely Professional Univ. (India) . . . . . [10917-26]

Coffee Break . . . . . Tue 3:40 pm to 4:10 pm

SESSION 7
LOCATION: ROOM 305 (SOUTH LEVEL THREE) . . . . . TUE 4:10 PM TO 6:10 PM

Terahertz Sources and Detectors Based on Nonlinear Optics and Photonic Crystals

Session Chairs: **Daniel Molter,** Fraunhofer-Institut für Techno- und Wirtschaftsmathematik (Germany); **Laurence P. Sadwick,** InnoSys, Inc. (USA)

4:10 pm: **Optical heterodyne detection based on parametric up-conversion in the terahertz region at room temperature,** Shin'ichiro Hayashi, Shingo Saito, Norihiko Sekine, National Institute of Information and Communications Technology (Japan) . . . . . [10917-27]

4:30 pm: **A gain-boosted terahertz-wave parametric generator in high frequency tuning range via pulse-seed injection,** Longhuang Tang, Degang Xu, Yuye Wang, Chao Yan, Yixin He, Changzhao Li, Jianquan Yao, Tianjin Univ. (China) . . . . . [10917-28]

4:50 pm: **Broadband terahertz generation near the reststrahlen band in $LiNbO_3$ waveguides,** Brett N. Carnio, Abdul Elezzabi, Univ. of Alberta (Canada) . . . . . [10917-29]

Selective extraction of refractive index in the ambient atmosphere using terahertz time-domain spectroscopy
Paper 10917-5
Time: 12:00 PM - 12:20 PM
Author(s): Jinwoo Lee, Seung Ryeol Oh, Minseok Seo, Kyung-Soo Kim, Soohyun Kim, KAIST (Korea, Republic of)
Add To My Schedule

Lunch Break 12:20 PM - 1:40 PM

Session 2:
3D Printing and Microwave to Millimeter GHz Advances

Monday 4 February 2019
1:40 PM - 3:30 PM
Location: Room 305 (South Level Three)

Session Chairs: Laurence P. Sadwick, InnoSys, Inc. (United States) ; Robert H. Giles, Univ. of Massachusetts Lowell (United States)

3D-printed millimeter-wave devices and circuits for system-in-a-package applications *(Invited Paper)*
Paper 10917-6
Time: 1:40 PM - 2:10 PM
Author(s): Jing Wang, Univ. of South Florida (United States)
Add To My Schedule

3D printed metamaterials for high-frequency applications
Paper 10917-7
Time: 2:10 PM - 2:30 PM
Author(s): Aydin Sadeqi, Hojatollah Rezaei Nejad, Sameer Sonkusale, Tufts Univ. (United States)
Add To My Schedule

Broadband on-chip silicon-photonics-enabled optical single sideband generation
Paper 10917-8
Time: 2:30 PM - 2:50 PM
Author(s): Awanish Pandey, Vadivukkarasi Jeyaselvan, Shankar Kumar Selvaraja, Indian Institute of Science (India)
Add To My Schedule

Photonically synchronized radar for advanced driver assistance systems
Paper 10917-9
Time: 2:50 PM - 3:10 PM
Author(s): Stefan Preussler, Fabian Schwartau, Joerg Schoebel, Thomas Schneider, Technische Univ. Braunschweig (Germany)
Add To My Schedule

Laser radio transmitter
Paper 10917-10
Time: 3:10 PM - 3:30 PM
Author(s): Marco Piccardo, Michele Tamagnone, Harvard Univ. (United States); Benedikt Schwarz, Technische Univ. Wien (Austria); Paul Chevalier, Noah A. Rubin, Harvard Univ. (United States); Yongrui Wang, Texas A&M Univ. (United States); Christine A. Wang, Michael K. Connors, Daniel McNulty, Massachussetts Institute of Technology (United States); Alexey Belyanin, Texas A&M Univ. (United States); Federico Capasso, Harvard Univ. (United States)
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Since the days of Hertz, radio transmitters have evolved from rudimentary circuits emitting around 50 MHz to modern ubiquitous Wi-Fi devices operating at gigahertz radio bands. As wireless data traffic continues to increase there is a need for new communication technologies capable of high-frequency operation for high-speed data transfer. Here we give a proof of concept of a new compact radio frequency transmitter based on a semiconductor laser frequency comb. Taking advantage of the time-dependent electronic gratings of laser combs, a quantum cascade laser can be transformed into an FM radio transmitter operating at 5.5 GHz - a carrier frequency defined by the comb repetition rate and potentially scalable to the sub-terahertz range. Etching a gap in the top electrode of the device allows one to exploit the phases of the internal microwave oscillatory grating enabling wireless emission into the far field through an integrated dipole antenna. In addition, wireless injection locking of the laser beat note to an external microwave oscillator is demonstrated, opening the possibility of remote control of laser frequency combs.

Coffee Break 3:30 PM - 4:00 PM

Session 3:
THz Detection

Monday 4 February 2019
4:00 PM - 5:40 PM
Location: Room 305 (South Level Three)

Session Chairs: Tianxin Yang, Tianjin Univ. (China) ; Laurence P. Sadwick, InnoSys, Inc. (United States)

High-power single-mode terahertz quantum cascade lasers via resonator engineering *(Invited Paper)*
(Canceled)
Paper 10917-11