International Conference on Space Optical Systems and Applications 2011

May 11-13, 2011
Le Merigot Marriott, Santa Monica, California, USA

Chairman's Welcome Message

Space-based optical systems, in general, and their use in communication and tracking, in particular, are gaining rapid popularity. Low mass, excellent resolution and the vast optical spectrum are among the reasons for the attractiveness of optical devices and systems for many uses. Applications encompass a number of disciplines and vary from imaging to remote sensing, from information transmission to tracking, from interferometry to lidar, etc.

The International Conference on Space Optical Systems and Applications (ICSOS) is a forum for the exchange of information with emphasis on new developments, services and applications in this field, particularly in the area of laser communications. The domain of the conference includes both deep space and near Earth applications. Conference sponsors are the IEEE Communications Society and the IEEE Photonics Society, as well as the National Institute of Information and Communications Technology (NICT, Japan) and the Jet Propulsion Laboratory (JPL, USA).

The venue is Santa Monica, California, a small and attractive seaside community adjacent to Los Angeles with a temperate climate throughout the year. Santa Monica enjoys an average of 310 days of sunshine a year. The conference site, Le Marigot Marriott, is an elegant beachfront hotel with a magnificent view of the Pacific Ocean and can be reached from the Los Angeles International Airport in 30 minutes. The conference is a two-day event followed by a half-a-day tour of the Jet Propulsion Laboratory in the foothills of San Gabriel Mountains, about 35 miles (~50 km) from the site of the conference.

The conference organizers look forward to meeting you and making your visit an enjoyable one.

Faramaz Davarian
Conference Chair

Program

Tuesday, May 10

5:30 PM - 7:00 PM

Registration

Registration Desk Open

Wednesday, May 11

7:45 AM - 9:00 AM

Registration

Registration Desk Open

9:00 AM - 9:15 AM

Welcome and Introduction to the Conference

Chair: Faramaz Davarian (Jet Propulsion Laboratory, USA)

9:15 AM - 10:45 AM

C1: Common I

Chair: Hamid Hemmati (Jet propulsion Laboratory (JPL) & California Institute of Technology, USA)

Free Space Optical Network
Vincent Chan (Massachusetts Institute of Technology, USA)

Research and development of free-space laser communications and quantum key distribution technologies at NICT
Morio Toyoshima (National Institute of Information and Communications Technology, Japan); Takashi Sasaki (The University of Electro-Communications, Japan); Hideki Takenaka (National Institute of Information and Communications Technology (NICT), Japan); Yozo Shoji (National Institute of Information and Communications Technology, Japan); Yoshihisa Takayama (National Institute of Information and Communications Technology, Japan); Yoshisada Koyama (National Institute of Information and Communications Technology, Japan); Hiroo Kunimori (NICT, Japan); Maki Akioka (National Institute of Information and Communications Technology, Japan); Mikio Fujiwara (NICT, Japan); Masahide Sasaki (NICT, Japan)
pp. 1-7

Deep Space Science Downlinks via Optical Communication
Robert Daddato (European Space Agency, Germany); Klaus-Juergen Schulz (European Space Agency, Germany); Igor Zayer (European Space Agency, Germany)
pp. 8-13

11:00 AM - 12:00 PM

AT: Atmospherics

Chair: Morio Toyoshima (National Institute of Information and Communications Technology, Japan)

Recent Developments on Free Space Optical Links and Wavelength Analysis
Thomas Plank (TU Graz, Austria); Erich Leitgeb (TUG, Austria); Markus Loeschnigg (University of Technology, Graz, Austria)
pp. 14-20

Characterization of Maritime RF/FSO Channel
Mark Gregory (University of Kiel, Germany); Sabah Badri-Hoeher (University of Kiel, Germany)
pp. 21-27

Experimental Analysis of the Time Dynamics of Coherent Communication Through Turbulence: Markovianity and Channel Prediction
Andrew Puryear (Massachusetts Institute of Technology, USA); Rui Jin (MIT, USA); Etty Lee (Massachusetts Institute of Technology, USA); Vincent Chan (Massachusetts Institute of Technology, USA)
pp. 28-37

FD: Flight Demos and Planned Flight Demos

Chair: Peter Kinman (California State University Fresno & Jet Propulsion Laboratory, USA)

Beaconless acquisition for ISL and SGL, summary of 3 years operation in space and on ground
Uwe Sterr (Germany, Germany); Mark Gregory (Tesat Spacecom, Germany); Frank Heine (Tesat-Spacecom, Germany)
pp. 38-43

5.625 Gbps Bidirectional Laser Communications Measurements Between the NFIRE Satellite and an Optical Ground Station
Renny Fields (The Aerospace Corporation, USA); David Kozlowski (The Aerospace Corporation, USA); Hal Yura (The Aerospace Corporation, USA); Robert Wong (The Aerospace Corporation, USA); Josef Wicker (The Aerospace Corporation, USA); Carl Lunde (The Aerospace Corporation, USA); Mark Gregory (Tesat Spacecom, Germany); Bernhard Wandernoth (Tesat Spacecom, Germany); Frank Heine (Tesat-Spacecom, Germany)
pp. 44-53

The Lunar Laser Communications Demonstration
Bryan Robinson (MIT Lincoln Laboratory, USA); Don Boroson (MIT Lincoln Laboratory, USA); Dennis Burianek (MIT Lincoln Laboratory, USA);

Daniel Murphy (MIT Lincoln Laboratory, USA)
pp. 54-57

1:30 PM - 2:50 PM

GS: Atmospherics and Ground Stations

Chair: Keith Wilson (JPL, USA)

Optical fading analysis considering spectrum of optical scintillation in terrestrial free-space optical channel
Kyung-Hwan Kim (Osaka University, Japan); Takeshi Higashino (Osaka University, Japan); Katsutoshi Tsukamoto (Osaka University, Japan); Shozo Komaki (Osaka University, Japan)
pp. 58-66

Studies on operation characteristics of triaxial telescope for satellite-ground laser communications
Yoshihisa Takayama (National Institute of Information and Communications Technology, Japan); Yoshisada Koyama (National Institute of Information and Communications Technology, Japan); Yozo Shoji (National Institute of Information and Communications Technology, Japan); Morio Toyoshima (National Institute of Information and Communications Technology, Japan)
pp. 67-71

Performance Analysis of Voice Transfer Using Multi-Transceiver Optical Communication Structures
Abdullah Sevincer (University of Nevada, Reno, USA); Hasan T Karaoglu (University of Nevada - Reno, USA); Murat Yuksel (University of Nevada - Reno, USA)
pp. 72-77

Design of a Ground-Based Optical Receiver for the Lunar Laser Communications Demonstration
Matthew Grein (MIT Lincoln Laboratory, USA); Andrew Kerman (MIT Lincoln Laboratory, USA); Eric Dauler (MIT Lincoln Laboratory, USA); Oleg Shatrovoy (MIT Lincoln Laboratory, USA); Richard Molnar (MIT Lincoln Laboratory, USA); Danna Rosenberg (MIT Lincoln Laboratory, USA); Jung Yoon (MIT Lincoln Laboratory, USA); Catherine DeVoe (MIT Lincoln Laboratory, USA); Daniel Murphy (MIT Lincoln Laboratory, USA); Bryan Robinson (MIT Lincoln Laboratory, USA); Don Boroson (MIT Lincoln Laboratory, USA)
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1:30 PM - 3:10 PM

PFD: Planned Flight Demos

Chair: William Weber (Jet Propulsion Laboratory, USA)

Downlink Synchronization for the Lunar Laser Communications Demonstration
Matthew Willis (MIT Lincoln Laboratory, USA); Bryan Robinson (MIT Lincoln Laboratory, USA); Mark Stevens (MIT Lincoln Laboratory, USA); Barry Romkey (MIT Lincoln Laboratory, USA); Jeffrey Matthews (MIT Lincoln Laboratory, USA); Joseph Greco (MIT Lincoln Laboratory, USA); Matthew Grein (MIT Lincoln Laboratory, USA); Eric Dauler (MIT Lincoln Laboratory, USA); Andrew Kerman (MIT Lincoln Laboratory, USA); Danna Rosenberg (MIT Lincoln Laboratory, USA); Daniel Murphy (MIT Lincoln Laboratory, USA); Don Boroson (MIT Lincoln Laboratory, USA)
pp. 83-87

Research and Development of 40Gbps optical free space communication from satellite/airplane
Yoich Koishi (NEC, Japan); Yoshiaki Suzuki (NEC, Japan); Tamaki Takahashi (NEC, Japan); Ichiro Mase (NEC Corporation, Japan); Masahiro Jibiki (NEC Corporation, Japan); Yoichi Hashimoto (NEC Corporation, Japan); Shigeru Murata (NEC, Japan); Toshiaki Yamashita (NEC Corporation, Japan); Koichi Shiratama (NEC Toshiba Space Systems, Japan)
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Deep-Space Optical Terminals
Hamid Hemmati (Jet propulsion Laboratory (JPL), USA); William Farr (Jet propulsion Laboratory (JPL), USA); Abhijit Biswas (Jet propulsion Laboratory (JPL), USA); Kevin Birnbaum (Jet propulsion Laboratory (JPL), USA); William Roberts (Jet propulsion Laboratory (JPL), USA); Kevin Quirk (Jet Propulsion Laboratory (JPL), USA); Stephen Townes (Jet Propulsion Laboratory, USA)
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SOTA Small Optical Transponder for Micro-Satellite
Yoshisada Koyama (National Institute of Information and Communications Technology, Japan); Morio Toyoshima (National Institute of Information and Communications Technology, Japan); Yoshihisa Takayama (National Institute of Information and Communications Technology, Japan); Hideki Takenaka (National Institute of Information and Communications Technology (NICT), Japan); Koichi Shiratama (NEC Toshiba Space Systems, Japan); Ichiro Mase (NEC Corporation, Japan); Osamu Kawamoto (NEC Corporation, Japan)
pp. 93-97

Optical Communications Payload for the Mexican NanoSatellite Project SENSAT
Javier Mendieta (CICESE, Mexico); Arturo Arvizu (CICESE, Mexico); Ramon Muraoka (CICESE, Mexico); Enrique Pacheco (CICESE, Mexico); Juan Murrieta (ITSON, Mexico); Jorge Sanchez (VIVETEL, Mexico); Joctan Gutierrez (CICESE, Mexico)
pp. 98-104

3:25 PM - 5:05 PM

ATP: Planned Flight Demos and ATP Systems

Chair: Yoshihisa Takayama (National Institute of Information and Communications Technology, Japan)

Low-Impact Air-to-Ground Free-Space Optical Communication System Design and First Results
Alberto Carrasco-Casado (Carlos III University of Madrid, Spain); Ricardo Vergaz (Carlos III University of Madrid, Spain); Jose M. Sánchez-Pena (Carlos III University of Madrid, Spain); Eva Otón (Universidad Politecnica de Madrid, Spain); Morten Geday (Universidad Politecnica de Madrid, Spain); Jose M. Otón (Universidad Politecnica de Madrid, Spain)
pp. 105-108

Experiment plan for a small optical transponder onboard a 50 kg-class small satellite
Hideki Takenaka (National Institute of Information and Communications Technology (NICT), Japan); Morio Toyoshima (National Institute of Information and Communications Technology, Japan); Yoshihisa Takayama (National Institute of Information and Communications Technology, Japan); Yoshisada Koyama (National Institute of Information and Communications Technology, Japan); Maki Akioka (National Institute of Information and Communications Technology, Japan)
pp. 109-112

Deep Space Acquisition and Tracking with Single Photon Detector Arrays
William Farr (Jet propulsion Laboratory (JPL), USA); Suzana Sburlan (Jet Propulsion Laboratory, USA); Adit Sahasrabudhe (Jet Propulsion Laboratory, USA); Kevin Birnbaum (Jet propulsion Laboratory (JPL), USA)
pp. 113-117

The new Tracking Control System for Free-Space Optical Communications
Toshiaki Yamashita (NEC Corporation, Japan); Masaki Morita (NEC, Japan); Motoaki Shimizu (NEC, Japan); Daisuke Eto (NEC, Japan); Koichi Shiratama (NEC Toshiba Space Systems, Japan); Shigeru Murata (NEC, Japan)
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Development of Acquisition and Tracking Sensor for Next-generation Optical Inter-satellite Communication
Katsumasa Miyatake (Mitsubishi Electric Corporation, Japan); Yuta Fujii (Mitsubishi Electric Corporation, Japan); Masaki Haruna (Mitsubishi Electric Corporation, Japan); Jiro Suzuki (Mitsubishi Electric Corporation, Japan); Kazuhide Kodeki (Mitsubishi Electric Corporation, Japan); Shiro Yamakawa (Japan Aerospace Exploration Agency, Japan); Tatsuyuki Hanada (Japan Aerospace Exploration Agency, Japan)
pp. 128-131

SA1: Ground Stations and Studies and Analysis

Chair: Peter Kinman (California State University Fresno & Jet Propulsion Laboratory, USA)

Deep-space Optical Terminals: Ground Laser Receiver
Kevin Birnbaum (Jet propulsion Laboratory (JPL), USA); Jeffrey R. Charles (Jet Propulsion Laboratory, USA); William Farr (Jet propulsion Laboratory (JPL), USA); Jonathan Gin (Jet Propulsion Laboratory (JPL), USA); Kevin Quirk (Jet Propulsion Laboratory (JPL), USA); William Roberts (Jet propulsion Laboratory (JPL), USA); Jeffrey Stern (Jet Propulsion Laboratory (JPL), USA); Yen-Hung Wu (Jet Propulsion Laboratory (JPL), USA)
pp. 132-137

Development of practical superconducting nanowire single photon detector system with high detection efficiency
Shigehito Miki (National Institute of Information and Communications Technology, Japan); Taro Yamashita (National Institute of Information and Communications Technology, Japan); Hirotaka Terai (NICT, Japan); Mikio Fujiwara (NICT, Japan); Masahide Sasaki (NICT, Japan); Zhen Wang (NICT, Japan)
pp. 138-143

Spanish Optical Link (SOL) Analysis Software Simulation Tool
Purificación Munuera (Ingeniería y Servicios Aeroespaciales, S. A., Spain); Juan Cabrero (Ingeniería y Servicios Aeroespaciales, S. A., Spain); Carlos Rivera (Ingeniería y Servicios Aeroespaciales, S. A., Spain); Fernando Aragón (Ingeniería y Servicios Aeroespaciales, S. A., Spain)
pp. 144-152

Dynamic Modeling Methodology
Kevin C. O'Keefe (Boeing, USA)
pp. 153-159

Optical Wireless Power transmission at Long Wavelengths
Aakash Sahai (Duke University, USA); David Graham (Powerbeam Inc, USA)
pp. 160-166

6:00 PM - 7:00 PM

P: Poster

Chair: Peter Kinman (California State University Fresno & Jet Propulsion Laboratory, USA)

Hybrid RF / Optical Communication Terminal with Spherical Primary Optics for Optical Reception
Jeffrey R. Charles (Jet Propulsion Laboratory, USA); Daniel Hoppe (JPL, USA); Asim Sehic (Jet Propulsion Laboratory, USA)
pp. 127-135

Satellite Laser Communication with Brandon Orbits
Paul Christopher (PFC Associates, USA)
pp. 167-176

Performance Analysis of Time-diversity scheme through atmospheric turbulence by using beam tracking antenna
Huilin Jiang (Changchun University of Science and Technology, P.R. China); Peng Liu (WASEDA University, Japan); Shoufeng Tong (Changchun University of Science and Technology, P.R. China)
pp. 177-181

A Free Space Optical Communications System An M-ary multi-pulse width modulation scheme with emphasis on optimizing transmit power
Eva M Kozachenko (San Diego State University, USA); Matt Anderson (San Diego State University, USA)
pp. 182-188

Sun at the Night
AnguSundaresh Krishnakumar (Anna University, India); Bala viknesh Nagamanickam (Anna University, India)
pp. 189-193

Laboratory test results for adaptive optics using image-based wavefront sensing for remote sensing
Norihide Miyamura (University of Tokyo, Japan)
pp. 194-199

A configuration-speed acceleration method for a sequential circuit using a negative logic implementation
Retsu Moriwaki (Shizuoka University, Japan); Minoru Watanabe (Shizuoka University, Japan)
pp. 200-204

2D tunable beam steering-lens device based on high birefringence liquid crystals
Eva Otón (Universidad Politecnica de Madrid, Spain); Alberto Carrasco-Casado (Carlos III University of Madrid, Spain); Ricardo Vergaz (Carlos III University of Madrid, Spain); Jose M. Otón (Universidad Politecnica de Madrid, Spain); Jose M. Sánchez-Pena (Carlos III University of Madrid, Spain); Xabier Quintana (Universidad Politecnica de Madrid, Spain); Morten Geday (Universidad Politecnica de Madrid, Spain)
pp. 160-161

Preliminary assessment of the atmospheric optical channel at Goldstone (CA)
Sabino Piazzolla (JPL, USA); Janet Wu (JPL, USA); Manuel Franco (JPL, USA); Daniel Hoppe (JPL, USA)

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Remote full-axis deformation sensing using multi-zeros optical beam: Interference of two multi-zeros beam
Yulan Qi (The University of Tokyo, P.R. China); Toru Kurihara (the University of Tokyo, Japan); Shigeru Ando (University of Tokyo, Japan)
pp. 215-218

Optical Frequency Optimization of a High Intensity Laser Power Beaming System Utilizing VMJ Photovoltaic Cells
Daniel E. Raible (NASA John H. Glenn Research Center, USA); Dragos Dinca (NASA John H. Glenn Research Center, USA); Taysir Nayfeh (Cleveland State University, USA)
pp. 219-225

GaN-based technology for MQW modulating retro-reflectors operating in the visible and ultraviolet spectral ranges
Carlos Rivera (Ingeniería y Servicios Aeroespaciales, S. A., Spain); Juan Cabrero (Ingeniería y Servicios Aeroespaciales, S. A., Spain); Purificación Munuera (Ingeniería y Servicios Aeroespaciales, S. A., Spain); Fernando Aragón (Ingeniería y Servicios Aeroespaciales, S. A., Spain)
pp. 226-231

Digital Coherent Optical Receiver for Satellite Laser Communication
Takashi Sasaki (The University of Electro-Communications, Japan); Morio Toyoshima (National Institute of Information and Communications Technology, Japan); Hideki Takenaka (National Institute of Information and Communications Technology (NICT), Japan)
pp. 232-234

Experimental Characterization of Space Optical Communications With Disruption-Tolerant Network Protocols
Joshua Schoolcraft (Jet Propulsion Laboratory, USA); Keith Wilson (JPL, USA)
pp. 235-239

A 16-laser array for an optically reconfigurable gate array
Takahiro Watanabe (Shizuoka University, Japan); Minoru Watanabe (Shizuoka University, Japan)
pp. 240-245

An Interleaver-based Atmospheric Optical Multiple Access Scheme: Capacity and BER Performance
Weiwei Zhang (Fudan University, P.R. China); Xiaolin Zhou (Fudan University, P.R. China); Weijie Shen (Fudan University, P.R. China)
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6:30 PM - 7:30 PM

Welcome Reception

Thursday, May 12

9:00 AM - 10:20 AM

Q: Quantum Communications and Coherent Technologies

Chair: Hamid Hemmati (Jet propulsion Laboratory (JPL) & California Institute of Technology, USA)

Hybrid entanglement photon pair source for fiber-space flexible QKD network
Mikio Fujiwara (NICT, Japan); Morio Toyoshima (National Institute of Information and Communications Technology, Japan); Masahide Sasaki (NICT, Japan); Ken-ichiro Yoshino (NEC Corporation, Japan); Yoshihiro Nambu (NEC Corporation, Japan); Akihisa Tomita (Hokkaido University, Japan)
pp. 251-255

On Approaching the Ultimate Limits of Photon-Efficient and Bandwidth-Efficient Optical Communication
Sam Dolinar (Jet Propulsion Laboratory, USA); Kevin Birnbaum (Jet propulsion Laboratory (JPL), USA); Baris I Erkmen (Jet Propulsion Laboratory, USA); Bruce Moision (Jet Propulsion Laboratory, USA)
pp. 256-265

Homodyne BPSK receiver with Doppler shift compensation for inter satellite optical communication
Toshiyuki Ando (Mitsubishi Electric Corporation, Japan); Eisuke Haraguchi (Mitsubishi, Japan); Kenichi Tajima (Mitsubishi, Japan); Yoshihito Hirano (Mitsubishi Electric Corporation, Japan); Tatsuyuki Hanada (Japan Aerospace Exploration Agency, Japan); Shiro Yamakawa (Japan Aerospace Exploration Agency, Japan)
pp. 266-272

Coherent detection of low light level pulses
Frank Heine (Tesat-Spacecom, Germany); Hartmut Kämpfner (Tesat-Spacecom, Germany); Peter Greulich (Tesat Spacecom, Germany); Stefan Seel (Tesat Spacecom, Germany)
pp. 273-276

SA2: Studies and Analysis II

Chair: Morio Toyoshima (National Institute of Information and Communications Technology, Japan)

Exploration Of A Free-Space Optical Communications System For Sounding Rocket Sub-Payloads
James Gealy (Orbital Science Corporation, USA); Marc Lessard (University of New Hampshire, USA); Paul Riley (University of New Hampshire, USA)
pp. 277-285

A Study Of An Optical Lunar Surface Communications Network With High Bandwidth Direct To Earth Link
Keith Wilson (JPL, USA); Abhijit Biswas (Jet propulsion Laboratory (JPL), USA); Joshua Schoolcraft (Jet Propulsion Laboratory, USA)
pp. 286-292

Wavelength Tracking Interferometer for DPSK Lasercom Links
Todd Rose (The Aerospace Corporation, USA); Charles Klimcak (The Aerospace Corporation, USA); David Kozlowski (The Aerospace Corporation, USA); George Sefler (The Aerospace Corporation, USA); Hal Yura (The Aerospace Corporation, USA); Andrew Walston (The Aerospace Corporation, USA); Nicolette Werner (The Aerospace Corporation, USA); Craig Mueller (The Aerospace Corporation, USA)
pp. 293-298

Comparison of Square and Radial Geometries for High Intensity Laser Power Beaming Receivers

Daniel E. Raible (NASA John H. Glenn Research Center, USA); Brian Fast (Rockwell Automation, USA); Dragos Dinca (NASA John H. Glenn Research Center, USA); Taysir Nayfeh (Cleveland State University, USA); Andrew Jalics (Qinetiq North America, USA)
pp. 299-304

10:35 AM - 11:55 AM

CT: Coherent Technologies and Modulation and Coding

Chair: William Farr (Jet propulsion Laboratory (JPL), USA)

Feasibility study of coherent LEO-Ground link system using an optical injection phase lock loop technique
Yozo Shoji (National Institute of Information and Communications Technology, Japan); Yoshihisa Takayama (National Institute of Information and Communications Technology, Japan); Morio Toyoshima (National Institute of Information and Communications Technology, Japan); Martyn Fice (University College London, United Kingdom); Alwyn Seeds (University College London, United Kingdom)
pp. 305-308

1W narrow linewidth semiconductor based laser module emitting near 1064 nm for the use in coherent optical communication in space
Stefan Spießberger (Ferdinand-Braun-Institut, Germany); Max Schiemangk (Humboldt Universität zu Berlin, Germany); Alexander Sahm (Ferdinand Braun Institut für Höchstfrequenztechnik, Germany); Andreas Wicht (Ferdinand-Braun-Institut, Germany); Hans Wenzel (Ferdinand-Braun-Institut, Germany); Götz Erbert (Ferdinand-Braun-Institut für Höchstfrequenztechnik, Germany); Günther Tränkle (Ferdinand-Braun-Institut für Höchstfrequenztechnik, Germany)
pp. 309-311

LDPC-Coded OAM Modulation and Multiplexing for Deep-Space and Near-Earth Optical Communications
Ivan B. Djordjevic (University of Arizona, USA)
pp. 312-320

Numerical evaluation of coherent signals for deep-space links
Atsushi Waseda (National Institute of Information and Communications Technology, Japan); Masahide Sasaki (NICT, Japan); Masahiro Takeoka (NICT, Japan); Mikio Fujiwara (NICT, Japan); Morio Toyoshima (National Institute of Information and Communications Technology, Japan); Antonio Assalini (University of Padua, Italy)
pp. 321-329

SA3: Studies and Analysis III

Chair: Zoran Sodnik (ESA, The Netherlands)

Optical System Architecture Design of Multiple Apertures Array Antenna for Satellite-to-ground Optical Communication
Jing Yi HE (Changchun University of Science and Technology, P.R. China)
pp. 330-332

A Novel RF Signal Beamforming Scheme over Optical Wireless Communications
Jiang Liu (Waseda University, Japan); Wasinee Noonpakdee (Waseda University, Japan); Hiroshi Takano (Waseda University, Japan); Shigeru Shimamoto (Waseda University, Japan)
pp. 333-337

Adaptive Channel Coding for maritime FSO channels with RF Feedback link
Mark Gregory (University of Kiel, Germany); Peter A. Hoeher (University of Kiel, Germany)
pp. 338-344

Design and Evaluation of an IDMA Cooperative Relay Free-Space Optical System
Jingyuan Fan (Fudan University, P.R. China); Xiaolin Zhou (Fudan University, P.R. China); Jun Liu (Fudan University, P.R. China)
pp. 345-349

1:30 PM - 2:10 PM

MC2: Modulation and Coding II

Chair: Yoshihisa Takayama (National Institute of Information and Communications Technology, Japan)

Multi-rate low density generator matrix code for satellite laser communications
Eiji Okamoto (Nagoya Institute of Technology, Japan); Yozo Shoji (National Institute of Information and Communications Technology, Japan); Morio Toyoshima (National Institute of Information and Communications Technology, Japan); Yoshihisa Takayama (National Institute of Information and Communications Technology, Japan)
pp. 350-354

Blocking Losses on an Optical Communications Link
Bruce Moision (Jet Propulsion Laboratory, USA); Sabino Piazzolla (JPL, USA)
pp. 355-364

1:30 PM - 2:30 PM

OS: Optics in Space

Chair: Yozo Shoji (National Institute of Information and Communications Technology, Japan)

Developments of the light source for DECIGO and DPF
Mitsuru Musha (University of Electro-Communications, Japan); Ken'ichi Nakagawa (University of Electro-communications, Japan); Ken-ichi Ueda (University of Electro-communications, Japan)
pp. 365-367

Micro-integrated ECDLs for precision spectroscopy in space
Erdenetsetseg Luvsandamdin (Ferdinand Braun Institut Leibniz Institut für Hoechstfrequenztechnik, Germany); Gregor Mura (Ferdinand Braun Institut Leibniz Institut für Hoechstfrequenztechnik, Germany); Andreas Wicht (Ferdinand-Braun-Institut, Germany); Alexander Sahm (Ferdinand Braun Institut für Höchstfrequenztechnik, Germany); Stefan Spießberger (Ferdinand-Braun-Institut, Germany); Hans Wenzel (Ferdinand-Braun-Institut, Germany); Götz Erbert (Ferdinand-Braun-Institut für Höchstfrequenztechnik, Germany); Günther Tränkle (Ferdinand-Braun-Institut für

Höchstfrequenztechnik, Germany)
pp. 368-370

Future Planetary Optical Access Links
Abhijit Biswas (Jet propulsion Laboratory (JPL), USA); Joseph Kovalik (Jet Propulsion Laboratory (JPL), USA); Martin Regehr (JPL, USA)
pp. 371-375

2:45 PM - 5:15 PM

C2: Common II

Chair: Naoto Kadowaki (National Institute of Information and Communications Technology, Japan)

R&D Status of the Next Generation Optical Communication Terminals in JAXA
Shiro Yamakawa (Japan Aerospace Exploration Agency, Japan); Tatsuyuki Hanada (Japan Aerospace Exploration Agency, Japan); Hiroki Kohata (Japan Aerospace Exploration Agency, Japan)

Satellite quantum key distribution
Richard Hughes (Los Alamos National Laboratory, USA); Jane Nordholt (Los Alamos National Laboratory, USA)

Light-wave antenna: Is it a simple extension of optical telescopes?
Tadashi Takano (Nihon University, Japan)
pp. 376-384

Scintillation Index of the Free Space Optical Channel: Phase Screen Modelling and Experimental Results
Kerry Mudge (Defence Science Technology Organisation, Australia); K. K. M. B. Dilusha Silva (University of Western Australia, Australia); Bradley Clare (Defence Science and Technology Organisation, Australia); Kenneth Grant (Defence Science and Technology Organisation, Australia); Brett Nener (The University of Western Australia, Australia)
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Deep-Space Optical Communications
Robert Cesarone (Jet Propulsion Laboratory, USA); Douglas Abraham (Jet Propulsion Laboratory, USA); Shervin Shambayati (Jet Propulsion Laboratory, USA); John Rush (NASA, USA)
pp. 392-405

5:15 PM - 5:30 PM

Concluding Remarks for Conference

Chairs: Faramaz Davarian (Jet Propulsion Laboratory, USA), Naoto Kadowaki (National Institute of Information and Communications Technology, Japan)

6:30 PM - 8:00 PM

Banquet

Friday, May 13

7:30 AM - 1:00 PM

JPL Tour