

32nd AIAA International Communications Satellite Systems Conference 2014

Held at the AIAA Space Forum 2014

**San Diego, California, USA
4-7 August 2014**

ISBN: 978-1-63439-459-8

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

The contents of this work are copyrighted and additional reproduction in whole or in part are expressly prohibited without the prior written permission of the Publisher or copyright holder. The resale of the entire proceeding as received from CURRAN is permitted.

For reprint permission, please contact AIAA's Business Manager, Technical Papers. Contact by phone at 703-264-7500; fax at 703-264-7551 or by mail at 1801 Alexander Bell Drive, Reston, VA 20191, USA.

TABLE OF CONTENTS

AUGMENTING SATELLITE COMMUNICATIONS

| | |
|---|---|
| Recent Licensed Spectrum Sharing Development in Research and Regulation in Europe and US: The Incumbent Spectrum Users Perspective (AIAA 2014-4184) | 1 |
| <i>Marja Matinmikko, Miia Mustonen, Marko Hoyhtya</i> | |
| Energy Efficient Virtual Radio Access Networks for Public Safety (AIAA 2014-4185) | 9 |
| <i>Haesik Kim</i> | |

LEO COMMUNICATIONS NETWORKS

| | |
|---|----|
| Design and Performance Modeling of a LEO-GEO RF Cross Link (AIAA 2014-4186) | 17 |
| <i>Yash Vasavada, Channasandra Ravishankar, Rajeev Gopal, Xiaoling Huang</i> | |

COMMUNICATION SATELLITE SYSTEMS

| | |
|--|----|
| On the Design of Power and Propulsion Subsystems of All-Electric Telecommunication Satellites (AIAA 2014-4243) | 32 |
| <i>Atri Dutta, Suwat Sreesawet, Sainath Vijayan, Alex Foster</i> | |
| Why Not Satellite Phones for Disaster Recovery? A Challenge to the Satellite Community (AIAA 2014-4244) | 45 |
| <i>Eugene H. Kopp</i> | |
| Radiation Environment Analysis of Highly Elliptical Orbits for Satellite Based Broadband Communications to the Arctic (AIAA 2014-4245) | 49 |
| <i>Lars Loge</i> | |

RF PERFORMANCE MODELING AND OPTIMIZATION

| | |
|---|----|
| Development of On-board Output Filter for Wideband and High Output Power Transponder of 21GHz-band Broadcasting Satellite (AIAA 2014-4246) | 56 |
| <i>Masashi Kamei, Yoshifumi Matsusaki, Masafumi Nagasaka, Susumu Nakazawa, Shoji Tanaka, Tetsuomi Ikeda</i> | |
| Performance Analysis of Fractionally Spaced Equalization in Non-linear Multicarrier Satellite Channels (AIAA 2014-4247) | 63 |
| <i>Roberto Piazza, M. R. Bhavani Shankar, Tobias Berheide, Michael Graesslin, Stefano Cioni</i> | |
| Optimizing the Implementation of a Bessel-fourier Model-based Algorithm: Maximizing Accuracy While Minimizing Computation Time (AIAA 2014-4248) | 76 |
| <i>Francisco Javier De Pablos, Elena Godino, Luis Navarro</i> | |
| Multicarrier PIM Behavior and Testing in Communications Satellites (AIAA 2014-4249) | 93 |
| <i>Ali Shayegani, Jennifer Salmon, Robindra Singh</i> | |

NANOSATELLITE COMMUNICATIONS SYSTEMS

| | |
|---|-----|
| Strategic Vision, Infra-structure and Enhanced Configurations for Developing Cost-Effective Nano-satellites for Future Deep Space Missions (AIAA 2014-4250) | 103 |
| <i>Mohammed I. Rashed, Hyochoong Bang</i> | |
| Design of a Telemetry Link for Direct Communication between Femtosatellites in LEO and Earth Ground Stations (AIAA 2014-4251) | 119 |
| <i>Tracie R. Perez, Ben Harris</i> | |
| High Efficiency Transmitter Architecture Compatible with CCSDS and ECSS Standards for Nano-Satellite Missions (AIAA 2014-4252) | 126 |
| <i>Visweswaran Karunanithi, Chris Verhoeven, Waldemar Lubbers</i> | |
| A Microsatellite-Based Global Sensor Network (AIAA 2014-4253) | 145 |
| <i>Ian Dsouza, Jesse Eyer, Alex Grant, David Haley</i> | |

MULTI-BEAM SATELLITE SYSTEMS I

| | |
|--|-----|
| Power Allocation for Space-Terrestrial Heterogeneous Networks with a Multibeam Satellite and Ground Relays (AIAA 2014-4319) | 151 |
| <i>Jihwan Choi, Changhee Joo, Ji-Woong Choi</i> | |
| New Generation Cooperative and Cognitive Dual Satellite Systems: Performance Evaluation (AIAA 2014-4320) | 159 |
| <i>Shree Krishna Sharma, Dimitrios Christopoulos, Symeon Chatzinotas, Bjorn Ottersten</i> | |
| Advantages and Capabilities of a Beamforming Satellite with Space-Based Digital Processor (AIAA 2014-4321) | 173 |
| <i>David Marshack, Jeffrey Freedman, Ted Kaplan, Erik Halvorson, David L. Milliner</i> | |

OPTIMIZING COMMUNICATIONS THROUGHPUT

| | |
|--|-----|
| Dynamic Allocation of a Spectrum Controlled Channel Applicable to Propagation Variation for SATCOM Systems (AIAA 2014-4322) | 180 |
| <i>Katsuya Nakahira, Jun Mashino, Jun-Ichi Abe, Takatoshi Sugiyama</i> | |
| Bandwidth Constrained Digital Predistortion for Multicarrier Transparent Satellite Payloads (AIAA 2014-4323) | 188 |
| <i>Noel Kelly, Michel Allegue-Martinez, Anding Zhu</i> | |
| Interference-Aware Uplink Power Control For Satellite Communications Networks (AIAA 2014-4324) | 198 |
| <i>Emiliano Re, Javier Perez-Trufero</i> | |

MULTI-BEAM SATELLITE SYSTEMS II

| | |
|--|-----|
| Model Ka Band Spot Beam Satellite Uplink Signal to Interferences plus Noise Ratio (AIAA 2014-4325) | 207 |
| <i>Liping Ai, Hermann Helgert</i> | |
| Non-Orthogonal Polarization Reuse in Multibeam Satellite Systems (AIAA 2014-4326) | 214 |
| <i>Emiliano Re, Piero Angeletti</i> | |
| Cognitive Radio for Ka Band Satellite Communications (AIAA 2014-4327) | 220 |
| <i>Sina Maleki, Symeon Chatzinotas, Shree Krishna Sharma, Alessandro Guidotti, Daniele Tarchi, Alessandro Vanelli-Coralli, Wichen Tang, Barry A. Evans, Joel Grotz, Konstantinos Liolis, Jens Krause, Nicolas Chuberre</i> | |

DIGITAL COMMUNICATIONS SYSTEMS

| | |
|--|-----|
| A 12b 1.5GSps ADC for Direct Down Conversion Communication Satellite Applications (AIAA 2014-4380) | 226 |
| <i>Andrew Glascott-Jones, Nicolas Chantier, Marc Wingender, Khaled Salmi, Pierre Coquelle, Francois Bore, Bill Righter</i> | |
| How Moore's Law is Enabling a New Generation of Telecommunications Payloads (AIAA 2014-4381) | 232 |
| <i>Stephen P. Brown, Chiok K. Leong, Paul S. Cornfield, Andrew M. Bishop, Robert J. Hughes, Charles Bloomfield</i> | |
| Flexible Payloads for Telecommunication Satellites - A Thales Perspective (AIAA 2014-4382) | 239 |
| <i>Nathalie Font, Cyrille Blosse, Patrick Lautier, Arnaud Barthère, Philippe Voisin</i> | |
| Reconfigurable Communications Processor Architecture (AIAA 2014-4383) | 246 |
| <i>Paul Murray, Ian Troxel</i> | |

HIGH THROUGHPUT SATELLITE SYSTEMS

| | |
|---|-----|
| High Throughput Satellite System with Q/V-Band Gateways and Its Integration with Terrestrial Broadband Communication Networks (AIAA 2014-4384) | 255 |
| <i>Javier Perez-Trufero, Barry G. Evans, Mathieu Dervin, Cedric Baudoin, Benoit Garnier, Argyrios Kyrgiakos</i> | |
| DVB-S2X: An Update to DVB-S2 (AIAA 2014-4385) | 265 |
| <i>Mustafa Eroz, Bassel Beidas, Rohit Iyer Seshadri, Lin-Nan Lee</i> | |
| Gateway Diversity for a Future High Throughput Satellite System (AIAA 2014-4386) | 270 |
| <i>Argyrios Kyrgiakos, Barry G. Evans, Paul T. Thompson, Cedric Baudoin, Mathieu Dervin</i> | |

| | |
|--|-----|
| The Many Facets of Eutelsat's HTS Missions (AIAA 2014-4387) | 280 |
| <i>Hector Fenech, Alessia Tomatis, Sonya Amos</i> | |

MODULATION AND CODING TECHNIQUES

| | |
|--|-----|
| SC-OFDM, a Low-Complexity Technique for High Performance Satellite Communications (AIAA 2014-4388) | 285 |
| <i>Damien Castelain, Cristina Ciochina-Duchesne, Julien Guillet, Fumihiro Hasegwa</i> | |
| Ka-band Link Study and Analysis for a Mars Hybrid RF/Optical Software Defined Radio (AIAA 2014-4389) | 293 |
| <i>Daniel Zeleznikar, Jennifer Nappier, Joseph Downey</i> | |
| Frequency Recovery Algorithm using Distributed Unique Word for Satellite Poly-Polarization Multiplexing System with Experimental Results (AIAA 2014-4390) | 304 |
| <i>Julian Webber, Masanori Yofune, Kazuto Yano, Naoya Kukutsu, Kiyoshi Kobayashi</i> | |
| Computationally Efficient Combining of Phase Shifted Signal Sequences in Diversity Reception (AIAA 2014-4391) | 311 |
| <i>Galigekere R. Dattatreya</i> | |

NETWORK SIMULATION AND MODELING I

| | |
|---|-----|
| A Packet Level Simulator for Future Satellite Communications Research (AIAA 2014-4437) | 320 |
| <i>Jani Puttonen, Sami Rantanen, Frans Laakso, Janne Kurjeniemi, Kari Aho</i> | |
| Astrolink for Modeling, Simulation, and Operation of Aerospace Communication Networks (AIAA 2014-4438) | 334 |
| <i>Brian J. Barritt, Wesley M. Eddy</i> | |

OPTICAL COMMUNICATIONS NETWORK I

| | |
|--|-----|
| Optical LEO-GEO Data Relays: From Demonstrator to Commercial Application (AIAA 2014-4439) | 343 |
| <i>Daniel C. Troendle, Christoph Rochow, Patricia Martin-Pimentel, Herwig Zech, Frank F. Heine, Hartmut Kaempfner, Mark Gregory, Matthias Motzgembra, Uwe Sterr, Rolf Meyer, Michael Lutzer, Sabine D. Philipp-May</i> | |
| Networked Operations of Hybrid Radio Optical Communications Satellites (AIAA 2014-4440) | 348 |
| <i>Alan Hylton, Daniel E. Raible</i> | |

NAVIGATION AND HOSTED SYSTEMS

| | |
|---|-----|
| Optimum Communication Frequencies for Atmospheric Reentry Vehicles (AIAA 2014-4441) | 359 |
| <i>Paul Christopher</i> | |
| An Approach towards Future Commercial Space Communications and Navigation (AIAA 2014-4182) | 370 |
| <i>Eric G. Butte, Julie L. Miller</i> | |

NETWORK SIMULATION AND MODELING II

| | |
|--|-----|
| Space Link Extension (SLE) Emulation for High Data Rate Network Communication (AIAA 2014-4478) | 380 |
| <i>Robert Murawski, Nicole Tchorowski, Bert Golden</i> | |
| Optimum Resource Allocation with Fairness Using Opportunistic Channel Gain for LMS Channel (AIAA 2014-4479) | 388 |
| <i>Sungmin Ok, Joongham Kim, Jongyeop Kim, Jihwan Choi</i> | |
| Software Defined Satellite Networks (AIAA 2014-4480) | 396 |
| <i>Rajeev Gopal, Channasandra Ravishankar</i> | |

OPTICAL COMMUNICATIONS NETWORK II

| | |
|---|-----|
| Demonstration of Disruption Tolerant Networking across Lunar Optical Communications Links (AIAA 2014-4481) | 405 |
| <i>David J. Israel, Donald Cornwell, Gregory Menke, W. John Guineau</i> | |

**On the Physical Realizability of Hybrid RF and Optical Communications Platforms for Deep Space
Applications (AIAA 2014-4482).....** 411

*Daniel E. Raible, Robert R. Romanofsky, James M. Budinger, Jennifer Nappier, Alan Hylton, Aaron J. Swank,
Anthony L. Nerone*

Author Index