



2010 Asia-Pacific Radio Science Conference

AP-RASC'10

Toyama International Conference Center, Toyama, Japan, September 22-26, 2010

PROGRAM

Sponsored by:

- International Union of Radio Science (URSI)
- The Institute of Electronics, Information and Communication Engineers (IEICE)

In cooperation with:

- Association for Promotion of Electrical, Electronic and Information Engineering
- Science Council of Japan
- The Institute of Electrical Engineers of Japan (IEEEJ)
- Toyama City
- Toyama Prefectural University
- Toyama Prefecture
- University of Toyama



Oral Sessions on Sunday, September 26 (10:30-12:10)

AFGa: Time and frequency transfer **Room 1** (ATF2010 joint session)

Chairs : Y. Liu, *National Metrology Centre, Agency for Science, Singapore*
S. Hama, *NICT, Japan*

1. IMPROVEMENT OF LORAN-C TIME TRANSFER

S.-H. Yang¹, C. B. Lee¹, J. K. Lee¹, S. J. Lee², ¹KRISS, *South Korea*, ²CNU, *South Korea*

2. GPUGPS - A GPS RECEIVER RUNNING ON AN OFF-THE-SHELF GRAPHICS CARD

T. Hobiger, T. Gotoh, J. Amagai, T. Kondo, Y. Koyama, *National Institute of Information and Communications Technology, Japan*

4. IMPROVED CALIBRATION METHOD USING NIM GPS TRAVELING RECEIVERS FOR THE LINK BETWEEN NIM AND PTB

K. Liang, A. Zhang, X. Gao, *National Institute of Metrology (NIM), China (CIE)*

5. OPTICAL FREQUENCY TRANSFER OVER URBAN TELECOM FIBER LINK IN TOKYO

M. Fujieda, M. Kumagai, S. Nagano, Y. Li, T. Ido, *National Institute of Information and Communications Technology, Japan*

J2a: Millimeter- and sub-millimeter-wave telescope and array **Room 2**

Chair : S. Iguchi, *NAOJ, Japan*

1. THE ARRAY FOR MICROWAVE BACKGROUND ANISOTROPY (AMIBA) (Invited)

P. M. Koch, *ASIAA, China (SRS)*

2. THE ATACAMA SUBMILLIMETER TELESCOPE EXPERIMENT (ASTE) (Invited)

R. Kawabe¹, K. Kohno², ¹National Astronomical Observatory of Japan, *Japan*, ²University of Tokyo, *Japan*

3. NANTEN/NANTEN2 PROJECT: MILLIMETER AND SUBMILLIMETER STUDIES OF THE INTERSTELLAR MEDIUM IN THE GALAXY AND NEARBY GALAXIES (Invited)

Y. Fukui, *Nagoya University, Japan*

4. THE 3M SUBMILLIMETERWAVE TELESCOPE PROTOTYPE - 3MSTEP (Invited)

R. Balasubramanyam, *Raman Research Institute, India*

5. CORRELATOR-BEAMFORMER-IMAGER FOR THE ALLEN TELESCOPE ARRAY

H. Jiang¹, W.-C. Hsieh¹, J. Manley², J. Landon³, D. C. Backer⁴, A. Parsons⁴, M. C. H. Wright⁴, G. C. Bower⁴, D. R. Werthimer⁵, J. Glenn⁶, ¹Academia Sinica, *Institute of Astronomy and Astrophysics, China (SRS)*, ²Karoo Array Telescope, *South Africa*, ³Brigham Young University, *United States*, ⁴Radio Astronomy Lab, *UC Berkeley, United States*, ⁵Space Sciences Lab and Radio Astronomy Lab, *UC Berkeley, United States*, ⁶California Institute of Technology, *United States*

CBH: Wireless power transmission from space **Room 3**

Chairs : N. Shinohara, *Kyoto University, Japan*
B. Shishkov, *Bulgarian Academy of Sciences, Bulgaria*

1. SIMULATIONS OF PLASMA INSTABILITIES IN THE INNER MAGNETOSPHERE (Invited)

V. K. Jordanova, *Los Alamos National Laboratory, United States*

2. PLASMA WAVES AND HIGH ENERGY PARTICLES IN THE EARTH'S RADIATION BELTS (Invited)

Y. Omura, *Kyoto University, Japan*

3. REVISED UBIQUITOUS POWER SOURCE WITH MICROWAVE POWER TRANSMISSION (Invited)

K. Hashimoto, T. Ishikawa, T. Mitani, N. Shinohara, *Kyoto University, Japan*

4. A STUDY ON A PHASED ARRAY ANTENNA INCLUDING IMBALANCED LOSS OF DIGITAL PHASE SHIFTERS FOR MICROWAVE POWER TRANSMISSION

T. Mitani, S. Tanaka, Y. Ebihara, *Kyoto University, Japan*

5. THE APPLICABILITY OF THE STUDY RESULTS OF ACTIVE PHASED ARRAY ANTENNAS TO A SOLAR POWER SATELLITE (Invited)

T. Takano¹, T. Yamada², Y. Kazama², K. Ikeda², S. Kawasaki³, N. Shinohara⁴, H. Toshiyoshi⁵, T. Suda⁶, ¹Japan Aerospace Exploration Agency and Japan Radio Co., *Ltd, Japan*, ²Japan Aerospace Exploration Agency, *Japan*, ³Kyoto University and Japan Aerospace Exploration Agency, *Japan*, ⁴Kyoto University, *Japan*, ⁵The University of Tokyo, *Japan*, ⁶Japan Radio Co., *Ltd, Japan*

HG1a: Advanced theory and computer simulations in space plasmas **Room 4**

Chairs : T. Nakamura, *Fukui Prefectural University, Japan*
T. Umeda, *Nagoya University, Japan*

1. EXCITATION OF WHISTLER MODES IN A LOSSY CYLINDRICAL MAGNETOPLASMA

V. A. Eskin, A. V. Kudrin, *University of Nizhny Novgorod, Russian Federation*

2. ELECTRON HYBRID SIMULATION OF NONLINEAR GROWTH OF WHISTLER-MODE WAVES IN THE EQUATORIAL REGION OF THE INNER MAGNETOSPHERE (Invited)

Y. Kato¹, Y. Omura², ¹Tohoku University, *Japan*, ²Kyoto University, *Japan*

3. THEORY OF VLF EMISSIONS AND CHORUS USING A VLASOV SIMULATION CODE

D. Nunn¹, Y. Omura², ¹Southampton University, *United Kingdom*, ²Kyoto University, *Japan*

4. ELECTROMAGNETIC PLASMA EMISSION DURING BEAM-PLASMA INTERACTION (Invited)

T. Umeda, *Nagoya University, Japan*

5. DISPERSION SOLVER BY RATIONAL FUNCTIONS

T. K. Nakamura, *Fukui Prefectural University, Japan*

KB2: EM theory for biomedical application **Room 5**

Chair : K. Ito, *Chiba University, Japan*

1. RECENT ADVANCES EM CANCER TREATMENT TOOLS AND APPLICATORS (Invited)

E. Neufeld¹, C. H. Li¹, M. Paulis³, M. Capstick¹, G. Van Rhoo³, N. Kuster¹, ¹IT'IS Foundation, *Switzerland*, ²Swiss Federal Institute of Technology (ETH), *Switzerland*, ³Erasmus MC - Daniel den Hoed Cancer Centre, *Netherlands*

2. EVALUATION ON PERFORMANCE OF DOPPLER RADAR FOR BREATH DETECTION BY DYNAMIC PHANTOM (Invited)

J. Yonebayashi¹, S. Takamatsu², K. Saito¹, M. Takahashi¹, K. Ito¹, ¹Chiba University, *Japan*, ²OMRON HEALTHCARE Co., *Ltd., Japan*

3. NUMERICAL ESTIMATION OF PACEMAKER EMI FROM MOBILE RADIO USED IN ELEVATORS USING EUROPEAN ANATOMICAL WHOLE-BODY HUMAN MODELS

R. Okamura, T. Hikage, T. Nojima, *Hokkaido University, Japan*

4. FDTD INDUCED CURRENT ANALYSIS OF CONDUCTING OBJECTS ON LOSSY FLAT EARTH

T. Arima¹, S. Watanabe², T. Uno³, ¹NICT/TAT, *Japan*, ²TAT, *Japan*, ³NICT, *Japan*

5. THREE-DIMENSIONAL SCATTERING ANALYSIS OF LOSSY/LOSSLESS DIELECTRICS USING CONSTRAINED INTERPOLATION PROFILE METHOD

J. Chakarothai, Q. Chen, K. Sawaya, *Tohoku University, Japan*

D2: Trends in electronic/photonic devices and circuits **Room 6**

Chairs : Y. Umeda, *Tokyo University of Science, Japan*
S. Fukushima, *Ehime University, Japan*

1. DATA CONVERTERS FOR WIRELESS COMMUNICATIONS (Invited)

T. Waho, *Sophia University, Japan*

2. HIGH SPEED CIRCUITS BASED ON RESONANT TUNNELING DIODES AND THEIR APPLICATION TO ANALOG DIGITAL CONVERTERS

K. Maezawa, S. Shibata, K. Takaoka, M. Mori, *University of Toyama, Japan*

3. RECENT TRENDS OF DYNAMICALLY RECONFIGURABLE PROCESSORS (Invited)

H. Amano, *Keio University, Japan*

4. CMOS-COMPATIBLE SILICON AVALANCHE PHOTODETECTORS (Invited)

W.-Y. Choi, M.-J. Lee, J.-S. Youn, *Yonsei University, South Korea*

5. INTEGRATED PLC MODULES FOR ULTRA-HIGH-SPEED PHOTONIC TRANSPORT NETWORKS (Invited)

I. Ogawa, H. Yamazaki, Y. Sakamaki, T. Yamada, T. Ohyama, S. Mino, *NTT Photonics Laboratories, Japan*

CMOS-Compatible Si Avalanche Photodetectors

Woo-Young Choi, Myung-Jae Lee, and Jin-Sung Youn

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Introduction

There is a growing interest in realizing high-speed optical interconnects for board-to-board, chip-to-chip applications. The interest stems from the fact that today's electronic appliances require larger and larger data transmission capacity which the conventional electrical interconnects find harder and harder to satisfy. For example, the CPU-memory interface is expected to require 100's GB/s data transmission for high-performance computing applications [1]. Although optical solutions developed for optical communication systems are fully capable of providing the required data rate, interconnect applications demand much tighter cost effectiveness. In order to achieve such cost-effective optical interconnects, various techniques have been pursued. We have investigated Si photodetectors that are fully comparable with the CMOS technology.

CMOS-Compatible Si Avalanche Photodetectors (CMOS-APDs)

We have investigated Si avalanche photodetectors fabricated with standard CMOS technology without any process modification or special substrates. The CMOS-APD can be realized using vertical P⁺/N-well junction to prevent the slow diffusion currents from the P-substrate region for high-speed operation. In addition, it has high responsivity using avalanche multiplication process. We have reported CMOS-APDs fabricated with 0.18- μm standard CMOS process having the photodetection bandwidth in the gigahertz range and the maximum avalanche gain larger than 1000 [2]. In addition, we have reported the equivalent circuit model of the CMOS-APD, which provides accurate impedance characteristics and photodetection frequency responses [3].

Monolithic Integrated Optical Receiver Front-End with CMOS-APD

We have also realized an integrated optical receiver having the CMOS-APD and transimpedance amplifier (TIA) monolithically fabricated with 0.13- μm standard CMOS process [4]. 4.25-Gb/s optical data was successfully detected at the input optical power of -5.5 dBm with bit-error rate (BER) less than 10^{-12} . In this receiver, the limited bandwidth of CMOS-APD is enhanced with smart TIA design. Details of our PD as well as our optical receiver will be presented.

References

- [1] E. Mohammed, A. Alduino, T. Thomas, H. Braunisch, D. Lu, J. Heck, A. Liu, I. Young, B. Barnett, G. Vandentop, and R. Mooney, "Optical Interconnect System Integration for Ultra-Short-Reach Applications," *Intel Technol. J.*, vol. 8, no. 2, pp. 115-127, May, 2004.
- [2] H.-S. Kang, M.-J. Lee, and W.-Y. Choi, "Si avalanche photodetectors fabricated in standard complementary metal-oxide-semiconductor process," *Appl. Phys. Lett.*, vol. 90, no. 15, 151118-1–151118-3, Apr. 2007.
- [3] M.-J. Lee, H.-S. Kang, and W.-Y. Choi, "Equivalent Circuit Model for Si Avalanche Photodetectors Fabricated in Standard CMOS Process," *IEEE Electron Device Lett.*, vol. 29, no. 10, pp. 1115-1117, Oct. 2008.
- [4] J.-S. Youn, H.-S. Kang, M.-J. Lee, K.-Y. Park, and W.-Y. Choi, "High-Speed CMOS Integrated Optical Receiver With an Avalanche Photodetector," *IEEE Photon. Technol. Lett.*, vol. 21, no. 20, pp. 1553-1555, Oct. 2009.