Jun 06 - **Thursday**

08:00 - 09:40

▼ **TH1A** : Power Amplifier Devices and Circuit Techniques (@ 608/609) **Technical** |

Venue : 608/609

Chair : Debasis Dawn, North Dakota State University

Co-Chair : Raghu Mallavarpu, Raytheon

Abstract : This session is focused on the development of novel device technologies and circuit design techniques in implementing power amplifiers for multi-band mobile communication and high-speed data communication applications.

▼ Stacked FET Structure for Multi-Band Mobile Terminal Power Amplifier Module (@ 608/609) **Paper** |

Part of technical session - ***Power Amplifier Devices and Circuit Techniques*** on Jun,06 08:00 - 09:40

Venue : 608/609

Authors : H. Motoyama1, Y. Jingu1, T. Kimura1, A. Lawrenson2, J. C. Clifton2, 1Sony Corporation, Kanagawa, Japan, 2Sony Corporation, Basingstoke, United Kingdom

Abstract : A multi-band PHEMT 5 x 7 mm2 PA module for mobile applications is described based upon a stacked FET structure. The PA has 28.5 dBm linear output power and over 40 % PAE with -38 dBc ACLR for a 3.2 V supply voltage, covering a wide frequency range of 698-915 MHz, 1430-1450 MHz and 1710-1980 MHz. A Stacked FET structure and the method to align voltage phase of stacked FETs are described. The module contains two PA chips, one output switch and MIPI RFFE interface compatible PA and SW controller. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Design Considerations for Stacked Class-E-like mmWave High-Speed Power DACs in CMOS (@ 608/609) **Paper** |

Part of technical session - ***Power Amplifier Devices and Circuit Techniques*** on Jun,06 08:00 - 09:40

Venue : 608/609

Authors : A. Chakrabarti, H. Krishnaswamy, Columbia University, New York, United States

Abstract : This work describes design considerations for realizing mmWave power DACs with high efficiency under modulation based on switching-PA DAC cells. A stacked Class-E-like SOI CMOS PA is turned ON/OFF by means of digital circuitry to sustain high-speed 1-bit ASK modulation, while high average efficiency is achieved by means of supply switching. A 47GHz 45nm SOI CMOS prototy .2 dBm with a peak PAE of 15.3%. High-speed ASK modulation is shown with high average efficiency. less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

Please Login to view Discussions

▼ Enhanced Linearity of CMOS Power Amplifier using Adaptive Common Gate Bias Control (@ 608/609) **Paper** |

Part of technical session - ***Power Amplifier Devices and Circuit Techniques*** on Jun,06 08:00 - 09:40

Venue : 608/609

Authors : S. Jin, B. Park, K. Moon, Y. Cho, D. Kim, H. Jin, J. Park, B. Kim, Pohang University of Science and Technology (POSTECH), Pohang, Republic of Korea

Abstract : This paper presents a linear CMOS power amplifier (PA) with an adaptive gate bias circuit in Common-Gate amplifiers. The bias circuit is proposed to achieve a high linearity with deep class-AB biasing of Common-Source stage. The proposed PA including the bias circuit is fabricated using CMOS technology. The adaptive gate bias circuit improves the evolved universal terrestrial radio ACLR about 7 dB at a mid power region and 2.5 dB at a high power over a constant bias for the same LTE signal. less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

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A Half-kW Capable 28-V LDMOS RF Power Transistor in a Small-Footprint Package (@ 608/609)

Paper | | |

Part of technical session - ***Power Amplifier Devices and Circuit Techniques*** on Jun,06 08:00 - 09:40

Venue : 608/609

Authors : L. Wang, H. A. Rueda, W. H. Brakensiek, C. P. Dragon, K. J. Foxx, Freescale Semiconductor Inc., Tempe, United States

Abstract : This paper presents a half-kW capable 28-V LDMOS single-ended RF power transistor designed in an air cavity ceramic package for 2.1 GHz applications. Compared to other existing products in the market with similar power levels, this transistor has its package size reduced by ~30% and demonstrates to date the highest power density per unit area in industry. The transistor is designed using the latest generation of Freescaleâs Airfastâ¢ LDMOS technology with 2 dB higher gain than its precedent. less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

Please Login to view Discussions

TH1B : Advances in Graphene RF and THz Nanoelectronics (@ 606/607)

Special | |

Venue : 606/607

Chair : Luca Pierantoni, Marche Polytechnic University

Co-Chair : Alberto Valdes Garcia, IBM T. J. Watson Research Center

Abstract : This Focus Session addresses the state of the art and the future potential of graphene-based electronic devices for radio- f lectronics (e.g. f ld effect transistors), and novel graphene devices on flexible substrate. Furthermore, it provides an introduction into recent and novel graphene-based, two-dimensional materials for ubiquitous electronics. less

Graphene Technology for RF and THz Applications (@ 606/607)

Paper | | |

Part of special session - ***Advances in Graphene RF and THz Nanoelectronics*** on Jun,06 08:00 - 09:40

Venue : 606/607

Authors : A. Valdes-Garcia, F. Xia, S. Han, D. B. Farmer, C. Dimitrakopoulos, S. Oida, H. Yan, Y. Wu, C. M. Hedges, K. A. Jenkins, D. Pfeiffer, A. Grill, P. Avouris, W. Haensch, IBM, Yorktown Heights, United States

Abstract : This work presents advances in the development of graphene technology for various applications from RF to THz frequencies. Large-scale graphene synthesis methods are reviewed. Graphene FETs suitable for RF applications are then presented along with their DC/RF characteristics. The challenges and current progress toward wafer-scale integration of graphene-based RFICs are also discussed including measurement results up to 200C. Finally . less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

Advances in Graphene-based High-Dynamic-Range RF Electronics (@ 606/607)

Paper | | |

Part of special session - ***Advances in Graphene RF and THz Nanoelectronics*** on Jun,06 08:00 - 09:40

Venue : 606/607

Authors : J. Moon1, K. Gaskill2, P. Asbeck3, 1HRL Laboratories LLC, Malibu, United States, 2Naval Research Laboratory (NRL), Washington, United States, 3University of California at San Diego, La Jolla, United States

Abstract : We present recent progress in graphene material, graphene FETs, heterostructures, graphene NEMS, and potentially disruptive RF applications of GFETs such as linear mixers and high dynamic range radiometers. Continuous development of emerging graphene would potentially improve existing RF systems with integration with standard Si/III-V RFICs similar to DARPA heterogeneous integration (DAHI) efforts, and enable a new generation of high performance 3D-RFICs. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ Flexible Graphene Field-Effect Transistors for Microwave Electr 7) **Paper** | | |

Part of special session - ***Advances in Graphene RF and THz Nanoelectronics*** on Jun,06 08:00 - 09:40

Venue : 606/607

Authors : I. Meric, N. Petrone, J. Hone, K. L. Shepard, Columbia University, New York, United States

Abstract : The high-f f graphene FETs has received significant interest due the very high carrier velocities in graphene. In addition to excellent electronic performance, graphene possesses exceptional mechanical properties such as high flexibility and strength. Here, we demonstrate the potential of flexible-GFETs and show that the combination of electrical and mechanical advantages of graphene result in gigahertz-frequency operation at strain values up to 2%. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Two-Dimensional Materials for Ubiquitous Electronics (@ 606/607) **Paper** | | |

Part of special session - ***Advances in Graphene RF and THz Nanoelectronics*** on Jun,06 08:00 - 09:40

Venue : 606/607

Authors : H. Wang, L. Yu, X. Zhang, B. Mailly . Mackin, J. Kong, T. Palacios, Massachusetts Institute of Technology (MIT), Cambridge, United States

Abstract : The last few years have witnessed a tremendous research effort on two-dimensional materials for electronic applications. Graphene was the first of these materials, followed by boron nitride, di-chalcogenites and other compounds. They constitute building blocks of a new generation of electronics that could be integrated everywhere. We discuss our recent results achieved on MoS2 electronics, including the development of the first RF transistors, integrated circuits and memory devices. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

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▼ **TH1C** : Advanced Concepts in Communication Receivers and Millimeterwave Radars (@ 602/604) **Technical** | |

Venue : 602/604

Chair : Jeffrey Nanzer, Johns Hopkins University

Co-Chair : Martin Vossiek, Universitaet Erlangen-Nuernberg

Abstract : A self-mixing receiver concept with a low-complexity phase demodulation starts the session. The following five papers deal with millimeterwave radars. T ly FMCW techniques for high resolution. One paper deals with embedding a MMIC chip in a 16-element automotive radar. An interferometer concept for measuring the angular velocity of moving objects is presented. The session concludes with a 155 GHz 'synthesizer-f . less

▼ Regenerative Sampling Self-Mixing Receiver: A Novel Concept for Low Complexity Phase Demodulation (@ 602/604) **Paper** | | |

Part of technical session - ***Advanced Concepts in Communication Receivers and Millimeterwave Radars*** on Jun,06 08:00 - 09:40

Venue : 602/604

Authors : C. Carlowitz, A. Esswein, R. Weigel, M. Vossiek, University of Erlangen-Nuremberg, Erlangen, Germany

Abstract : A novel low complexity receiver concept for high-order differential phase demodulation is introduced for the first time. With a first hardware demonstrator at 5.5 GHz with 8-DPSK, a high data rate of 300 Mbit/ t a bit error rate below 1e-3 without synthesizer for downconversion. A phase sensitive regenerative sampling approach is employed that integrates both LNA and AGC using a free running switched injection-locked oscillator in combination with quadrature self-mixing. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ A Multimode-Beamforming 77-GHz FMCW Radar System (@ 602/604) **Paper |** | |

Part of technical session **-** ***Advanced Concepts in Communication Receivers and Millimeterwave Radars*** on Jun,06 08:00 **-** 09:40

Venue : 602/604

Authors : C. Pfeffer1, R. Feger1, C. Wagner2, A. Stelzer1, 1Johannes Kepler University, Linz, Austria, 2DICE GmbH & Co KG, Linz, Austria

Abstract : In this work a multimode-beamforming 77-GHz f -modulated continuous-wave radar system is presented. Simultaneously it combines the high angular resolution of FDMA MIMO radars and the high-gain and steerable beam of PA transmit antennas. Several measurements were carried out to show the potential benefits of using this concept for a linear antenna array with four antennas and methods of digital beamforming in the receive path. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ A 16-Element 77â81 GHz Phased Array for Automotive Radars with Â±50-Deg Beam-Scanning Capabilities (@ 602/604) **Paper |** | |

Part of technical session **-** ***Advanced Concepts in Communication Receivers and Millimeterwave Radars*** on Jun,06 08:00 **-** 09:40

Venue : 602/604

Authors : B. Ku1, P. Schmalenberg2, S. Kim3, C. Kim4, O. Inac1, J. Lee2, K. Shiozaki2, G. M. Rebeiz1, 1University of California at San Diego, La Jolla, United States, 2Toyota Research Institute of North America, Ann Arbor, United States, 3Marvell Semiconductor, Inc., Santa Clara, United States, 4Chungnam National University, Daejeon, Republic of Korea

Abstract : This paper presents the first 16-element 77â81 GHz phased array receiver for automotive radars. The silicon IC is packaged using very low-cost techniques,and is attached to a 16-element linear microstrip antenna array. The packaging is designed to result in -28dB coupling between the channels even with wirebonds. The measured patterns show scanning to Â ±50?. The phased array receiver has been implemented with a transmitter and shows detailed images of targets and scenes in outdoor driving scenarios. less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

Please Login to view Discussions

▼ A 29.5 GHz Radar Interferometer for Measuring the Angular Velocity of Moving Objects (@ 602/604) **Paper |** | |

Part of technical session **-** ***Advanced Concepts in Communication Receivers and Millimeterwave Radars*** on Jun,06 08:00 **-** 09:40

Venue : 602/604

Authors : J. A. Nanzer1, K. L. Kammerman2, K. S. Zilevu1, 1Johns Hopkins University, Laurel, United States, 2Syracuse University, Syracuse, United States

Abstract : The design of a 29.5 GHz wide field-of-v terferometer system for directly measuring the angular velocity of moving objects is presented, along with the first wide field-of-v lar velocity of moving point targets. Interferometr llows the direct measurement of the angular velocity of moving objects via a simple frequency analysis. Measurements are presented herein that, for the first time, verify theoretical analyses of the wide field-of-v t. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ A 240 GHz Ultra-Wideband FMCW Radar System with On-Chip Antennas for High Resolution Radar Imaging (@ 602/604) **Paper |** | |

Part of technical session **-** ***Advanced Concepts in Communication Receivers and Millimeterwave Radars*** on Jun,06 08:00 **-** 09:40

Venue : 602/604

Authors : T. Jaeschke1, C. Bredendiek1, N. Pohl2, 1Ruhr-University Bochum, Bochum, Germany, 2Fraunhofer, Wachtberg, Germany

Abstract : A SiGe MMIC based 240GHz radar with 60GHz bandwidth is presented. It consists of a MMIC including the high-frequency components and a digital control module. The antenna is realized by on-chip patch antennas, which are focused using a dielectric lens. The radar allows fast and highly linear frequency sweeps from 204GHz to 265GHz with an max output power of -1 dBm EIRP (patch only). A phase noise of -65 dBc/Hz (1 kHz offset) is achieved over the complete bandwidth. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ A 155 GHz 220mW Synthesizer-free Phase Based Radar System in 65nm CMOS Technology (@ 602/604) **Paper** | | | |

Part of technical session **- *Advanced Concepts in Communication Receivers and Millimeterwave Radars*** on Jun,06 08:00 - 09:40

Venue : 602/604

Authors : A. Tang1, G. V la2, H. Wu2, M. F. Chang2, 1Jet Propulsion Laboratory (JPL), Pasadena, United States, 2University of California at Los Angeles, Los Angeles, United States

Abstract : This paper presents a complete phase-based radar system operating at 155 GHz which employs a non-coherent approach to ranging, offering the major advantage that frequency synthesizers are not needed in the Tx and Rx. This enables the possibility of multi-pixel radar systems through a 51% reduction of total system power vs. similar coherent radar. The proposed radar system achieves sub-centimeter target position accuracy and consumes only 220mW per radar channel. less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

Please Login to view Discussions

▼ **TH1D** : Novel Circuits and Techniques for Signal Processing up to GHz Frequencies (@ 605/610) **Technical** | |

Venue : 605/610

Chair : Boss Hermann, Rohde & Schwarz

Co-Chair : Konczykowska Agnieszka, III-V Lab

Abstract : This session presents five papers addressing state-of-the-art direct digital f), oversampling based software defined radio approach, real-time spectrum analysis and an interference cancellation technique. The DDFS papers focus on compression techniques and hopping time optimization. The software defined radio paper proposes oversampling technique using hybrid filtering to improve the system dynamic range. The spectrum analysis work focuses on the design of integrated delay lines with transversal f lter structure. Finally, the canceller work addresses interference modeling at baseband and its experimental validation. less

▼ A 4-GHz 32-bit Direct Digital Frequency Synthesizer Using GaAs HBT Technology (@ 605/610) **Paper** | | | |

Part of technical session **- *Novel Circuits and Techniques for Signal Processing up to GHz Frequencies*** on Jun,06 08:00 - 09:40

Venue : 605/610

Authors : X. Y. Liu, J. Wu, J. W. Chen, D. Y. Wu, L. Zhou, F. Jiang, Z. Jin, Chinese Academy of Sciences, Beijing, China

Abstract : A 4-GHz 32-bit DDFS using ROM-based piecewise linear approximation is presented. An enhanced ROM compression technique is proposed. The ROM is compressed by the coarse-fine decomposition technique. The coarse ROM size is further reduced by introducing a nonlinear DAC,which efficiently reduces the sine function amplitude. A prototype chip has been fabricated in 1.4um GaAs HBT technology. The spurious free-dynamic-range was measured to be 52.07 dBc at a 4.0 GHz clock. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

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▼ An 800 MSPS Quadrature DDFS and Integrated Nonlinear DAC-Filter with < 15 ns Instantaneous Frequency Hopping Time (@ 605/610) **Paper** | | | |

Part of technical session **- *Novel Circuits and Techniques for Signal Processing up to GHz Frequencies*** on Jun,06 08:00 - 09:40

Venue : 605/610

Authors : S. Subramanian, H. Hashemi, University of Southern California, Los Angeles, United States

Abstract : An 800 MSPS quadrature Direct Digital Frequency Synthesizer (DDFS) with an integrated 13-bit nonlinear DAC and a 200 MHz spur-rejection filter is presented. The system consists of a ROM-less DDFS and a sine-weighted, current-steering DAC. A 200 MHz active OTA-RC spur-rejection filter follows the DDFS-DAC giving 60 dB rejection at 600 MHz with an IIP3 of 25 dBm. The system achieves an SFDR of 33 dB and a total instantaneous hopping time of 15 ns, while consuming 420 mW of power. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

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▼ Oversampled Hybrid Filter Banks for High-Dynamic-Range Cognitive-Radio/Software-Defined-Radio Receivers (@ 605/610) **Paper** | | |

Part of technical session **- *Novel Circuits and Techniques for Signal Processing up to GHz Frequencies*** on Jun,06 08:00 - 09:40

Venue : 605/610

Authors : J. P. Magalhaes1, J. N. Vieira1, R. Gomez-Garcia2, N. B. Carvalho1, 1University of Aveiro, Aveiro, Portugal, 2University of Alcala, Alcala de Henares, Spain

Abstract : An oversampled Hybrid-Filter-Bank (HFB) receiver architecture for Cognitive-Radio (CR) and Software-Defined Radio (SDR) applications is presented in this paper. With this novel receiver configuration, improved dynamic range in relation to that of a conventional single-band receiver is attainable even when using lower-resolution analog-to-digital converters (ADCs). less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

Please Login to view Discussions

▼ On-Chip Demonstr tion of Real Time Spectrum Analysis (RTSA) Using Integrated Dispersive Delay Line (IDDL) (@ 605/610) **Paper** | | |

Part of technical session **- *Novel Circuits and Techniques for Signal Processing up to GHz Frequencies*** on Jun,06 08:00 - 09:40

Venue : 605/610

Authors : B. Xiang1, X. Wang2, A. B. Apsel3, 1Intel Corporation, Hillsboro, United States, 2Massachusetts Institute of Technology (MIT) Lincoln Laboratory, Lexington, United States, 3Cornell University, Ithaca, United States

Abstract : This paper reports the first on-chip demonstration of GHz range real time spectrum analysis (RTSA) using an integrated dispersive delay line (IDDL). The IDDL is implemented in a standard 0.13 Âµm CMOS process and can operate from 0.4 GHz to 4 GHz with 1.2 ns dispersion. The IDDL provides a frequency-to-time mapping which can be utilized to generate a time domain representation of the frequency components. We demonstrate that the IDDL is capable of real time spectrum analysis of signals. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

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▼ Interference Cancellation for Odd Harmonics of Envelope Tr lifier Systems (@ 605/610) **Paper** | | |

Part of technical session **- *Novel Circuits and Techniques for Signal Processing up to GHz Frequencies*** on Jun,06 08:00 - 09:40

Venue : 605/610

Authors : M. Omer1, R. Rimini2, P. Draxler2, J. S. Kenney1, 1Georgia Institute of Technology, Atlanta, United States, 2Qualcomm Technologies Inc., San Diego, United States

Abstract : This paper looks at the problem of modeling the third harmonic emission from an envelope tracking amplifier. It derives the nonlinear kernel for estimating such interference. This kernel has been rigorously expanded to show its correlation with the third harmonic and its effectiveness in predicting the harmonic content. An envelope amplifier test-bench experiment captures and cancels the third harmonic yielding excellent agreement with theory and provides a validation of the system and concept. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

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TH1E : Terahertz System Characterization and Measurement (@ 615/617)

Technical | |

Venue : 615/617

Chair : Goutam Chattopadhyay, "NASA-JPL, Caltech"

Co-Chair : James Buckwalter, University of California - San Diego

Abstract : This session presents on-wafer probe techniques for the 500-750 GHz band and characterization of 77 GHz imaging systems. It provides an insight as to how on-chip probe measurement of devices lead to better device modeling at THz frequencies. This session also presents papers describing temperature dependence of array beams in W-band imaging systems and its effects on system performance. less

Integrated Strain Sensor for Micromachined Terahertz On-Wafer Probe (@ 615/617)

Paper | | |

Part of technical session - ***Terahertz System Characterization and Measurement*** on Jun,06 08:00 - 09:40

Venue : 615/617

Authors : Q. Yu, M. Bauwens, C. Zhang, A. W. Lichtenberger, R. M. Weikle, N. S. Barker, University of Virginia, Charlottesville, United States

Abstract : This paper introduces an improved method for monitoring and controlling the contact condition of terahertz on-wafer probes. This method enables accurate contact force measurement without modification to the standard probe station. Repeatable probe contact force is crucial for RF measurement repeatability and can be achieved by properly monitoring and controlling the strain generated at designated positions on the terahertz probe due to probe deformation induced by contacting the test substrate. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

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Characterization of Submillimeter-Wave Schottky Diodes in the 500-750 GHz Band using Micromachined On-Wafer Probes (@ 615/617)

Paper | | |

Part of technical session - ***Terahertz System Characterization and Measurement*** on Jun,06 08:00 - 09:40

Venue : 615/617

Authors : S. H. Hawasli, M. F. Bauwens, A. W. Lichtenberger, N. S. Barker, R. M. Weikle, University of Virginia, Charlottesville, United States

Abstract : Characterization of planar Schottky diodes using micromachined on-wafer probes operating from 500 to 750 GHz is described. The Schottky diodes have been integrated into a coplanar waveguide to allow direct measurement of the device calibrated scattering parameters using CPW probes. The measurements are used to establish and verify equivalent circuit models and parasitics for submillimeterwave diodes that, previously, were based solely on simulation or scaling of measurements at lower frequencies. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

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Temperature Sensitivity of Large Digital-Beamforming Multistatic mm-Wave Imaging Systems (@ 615/617)

Paper | | |

Part of technical session - ***Terahertz System Characterization and Measurement*** on Jun,06 08:00 - 09:40

Venue : 615/617

Authors : A. Schiessl1, S. S. Ahmed1, A. Genghammer1, L. Schmidt2, 1Rohde & Schwarz , Munich, Germany, 2University of Erlangen-Nuremberg, Erlangen, United States

Abstract : This work analyzes the effects caused by temperature changes on the imaging performance of a state-of-the-art mm-wave imaging system. The temperature dependent phase drift of a single measurement channel is characterized. A linearized model for the phase drifts is derived. This model is applied to simulate for systematic phase drifts at different temperature profiles. Afterwards, images are reconstructed. The degradation in the imaging performance due to temperature changes is presented. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ Low-Cost Implementation of a Millimeter Wave Imaging System Operating in W-Band (@ 615/617) **Paper** | | |

Part of technical session - ***Terahertz System Characterization and Measurement*** on Jun,06 08:00 - 09:40

Venue : 615/617

Authors : R. Feger, A. Fischer, A. Stelzer, Johannes Kepler University Linz, Austria

Abstract : In this paper a mm-wave imaging system operating in W-band is presented. Multiple used techniques lead to reduced system costs, increased application versatility and a simplified setup. These goals are achieved by using packaged 77-GHz devices including an antenna-in-package, substituting physical focusing elements with imaging algorithms, and a multiplier-based topology which allows realizing coherent measurement setups on standard FR4 printed circuit boards. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ **TH1F** : Advances in Passive Circuit Elements (@ 618/620) **Technical** | |

Venue : 618/620

Chair : Xun Gong, University of Central Florida

Co-Chair : Guoan Wang, University of South Carolina

Abstract : This session presents recent advances in passive devices including a single-pole six-throw waveguide switch, a substrate integrated waveguide 90 degree twist for dual-polarized antennas, a substrate integrated coaxial line dual-band directional coupler, a filter-based decoupling network to reduce mutual coupling between closely-spaced antennas, a dual-band impedance transformer for loads with complex impedance, and a miniaturized negative group delay circuit using defected ground plane. less

▼ Single-Pole Six-Thr tch Embedded in a Seven Port Loaded Junction (@ 618/620) **Paper** | | |

Part of technical session - ***Advances in Passive Circuit Elements*** on Jun,06 08:00 - 09:40

Venue : 618/620

Authors : J. A. Ruiz-Cruz1, M. M. Fahmi2, R. R. Mansour3, 1 Autonomous University of Madrid, Madrid, Spain, 2Nanowave Technologies. Inc, Etobicoke, Canada, 3University of Waterloo, Waterloo, Canada

Abstract : A waveguide switch with six states involving seven ports is presented.It consists of a common port that feeds perpendicularly six output routing branches placed in the same plane. The switch is based on actuating short circuit loads in six ridge waveguide branches. It avoids the use of complex rotary systems to provide path switching, resulting in an extremely compact profile. The experimental proof of this new switch integrates the transitions to SMA outputs and the short-circuit loads. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

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▼ SIW 90-Degree Twist for Substrate Integrated Circuits and Systems (@ 618/620) **Paper** | | |

Part of technical session - ***Advances in Passive Circuit Elements*** on Jun,06 08:00 - 09:40

Venue : 618/620

Authors : A. Doghri1, T. Djerafi1, A. Ghiotto2, K. Wu1, 1Ecole Polytechnique de Montreal, Montreal, Canada, 2 University of Bordeaux, Talence, France

Abstract : A 90-degree twist based on Substrate Integrated Waveguide (SIW) and using PCB building blocks is proposed for the first time. The fabricated component achieves a return loss of less than -18 dB and an insertion loss of better than 1 dB over the Ka-band. As an application example, a wideband dual-polarized end-fire antenna operating from 32 to 38 GHz is demonstrated based on the proposed 90-degree twist. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

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▼ A Broadband Coupled Resonator Decoupling Network for A Three-element Compact Array (@ 618/620) **Paper** | | |

Part of technical session - ***Advances in Passive Circuit Elements*** on Jun,06 08:00 - 09:40

Venue : 618/620

Authors : L. Zhao, K. Wu, The Chinese University of Hong Kong, Hong Kong, Hong Kong

Abstract : Compact antenna arrays are becoming popular in a communication terminal. To reduce the strong mutual coupling and spatial correlation between the elements, a coupled resonator decoupling network for three-element arrays is proposed for the first time in this paper. The network is effective and broadband. A three-port decoupling network with a three-monopole array is fabricated. Measured results demonstrated that the radiation efficiencies and envelope correlations show significantly improvement. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ High-Directivity Single- and Dual-Band Directional Couplers Based on Substrate Integrated Coaxial Line Technology (@ 618/620) **Paper** | | |

Part of technical session - ***Advances in Passive Circuit Elements*** on Jun,06 08:00 - 09:40

Venue : 618/620

Authors : J. Shen, Q. Liu, Y. Wu, Y. Liu, S. Li, C. Yu, G. Lin, Beijing University of Posts and Telecommunications, Beijing, China

Abstract : The high-directivity single- and dual-band directional couplers based on substrate integrated coaxial line (SICL) are first proposed in this paper. As the SICL structure features the propagation of TEM mode, the SICL coupler can keep its high-directivity compared with the microstrip one. The SICL coupler also characterizes a vias-shielded structure keeping it away from lateral leakage and cross-talk. Experiments are carried on a SICL 2.35GHz coupler and a SICL 0.8/2.35GHz coupler. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

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▼ Optimal Dual-band Impedance Transformers with Wide Bandwidths for Frequency Dependent Complex Loads (@ 618/620) **Paper** | | |

Part of technical session - ***Advances in Passive Circuit Elements*** on Jun,06 08:00 - 09:40

Venue : 618/620

Authors : Y. Liu1, R. Levy2, Y. Chen1, 1Nanjing University of Aeronautics and Astronautics, Nanjing, China, 2R Levy Associates, La Jolla, United States

Abstract : A new synthesis of dual-band impedance transformers for an RC ty f complex load is described. Compared to previous methods, it has the advantage of optimal performance for given bandwidths of the two passbands. The technique used is to apply a lowpass to dual-bandpass frequency transformation to the classical optimal lowpass prototy . Measured results have validated the feasibility of the method. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

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▼ Miniaturized Negative Group Delay Circuit Using Defected Microstrip Structure and Lumped Elements (@ 618/620) **Paper** | | |

Part of technical session - ***Advances in Passive Circuit Elements*** on Jun,06 08:00 - 09:40

Venue : 618/620

Authors : G. Chaudhary1, Y. Jeong1, J. Lim2, 1Chonbuk National University, Jeonju-si, Republic of Korea, 2Soonchunhyang University, Asan-si, Republic of Korea

Abstract : In this paper, a design of miniaturized NGDC using U-shaped DMS and lumped elements is presented. The resonant frequency and GD time are controlled by an external capacitor and resistor connected across the DMS slot.To verify the design concept, a single-stage NGDC is designed, fabricated and compared with the circuit simulation. To get wide bandwidth of GD, two stages NGDC is also demonstrated and the GD of -7 ns with the maximum insertion loss of 34 dB was obtained over 60 MHz bandwidth. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

TH1G : Novel RF Circuit and Component Technologies (@ 611/612) **Technical** |

Venue : 611/612

Chair : Cheng (CP) Wen, Peking University

Co-Chair : Ramesh K Gupta, LightSquared

Abstract : This session includes papers on novel RF technology topics, such as - RF shielding by artificial magnetic, Ink Jet printed microwave filter, and paper based printed tracking TAg, contactless test method for MEMS mechanical sensitivity, and micro-fluid cooling for GAN device on organic substrate. less

Compact Size High Gain AoC Using Rectangular AMC in CMOS for 60 GHz Millimeter Wave Applications (@ 611/612) **Paper** |

Part of technical session - ***Novel RF Circuit and Component Technologies*** on Jun,06 08:00 - 09:40

Venue : 611/612

Authors : A. Barakat1, A. Allam1, R. K. Pokharel2, H. Elsadek3, M. El-Sayed1, K. Yoshida2, 1Egypt-Japan University of Science and Technology, New Borg El-Arab, Egypt, 2Kyushu University, Fukuoka , Japan, 3Electronics Research Institute, Dokki, Egypt

Abstract : This paper presents a compact size, high gain triangular Antenna-on-Chip (AoC), designed and fabricated using a 0.18 Âµm CMOS process and optimized over different cellsâ configurations of rectangular artificial magnetic conductor (R-AMC). An AMC acts as a shield plane between the AoC and the lossy CMOS substrate. R-AMC shows better shielding characteristics than previously reported AMCs. Measurement results confirm the wide impedance bandwidth of the AoC. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

Integrated Microfluidic Cooling for GaN Devices on Multilayer Organic LCP Substr te (@ 611/612) **Paper** |

Part of technical session - ***Novel RF Circuit and Component Technologies*** on Jun,06 08:00 - 09:40

Venue : 611/612

Authors : O. Lemtiri-Chlieh, C. A. Donado Morcillo, S. Pavlidis, W. T. Khan, J. Papapolymerou, Georgia Institute of Technology, Atlanta, United States

Abstract : This paper presents, for the first time, an integrated microfluidic cooling scheme on LCP substrate for high power X-band GaN devices and amplifiers. The channel is micromachined on LCP and a mixture of water and ethylene glycol is used as a coolant. A 3D electro-thermal model of the microfluidic channel has been created, which illustrates the advantage of having a micro-channel beneath LCP in the case of a static and moving fluid. less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

Please Login to view Discussions

A Paper Based Inkjet Printed Real Time Location Tr **Paper** |

Part of technical session - ***Novel RF Circuit and Component Technologies*** on Jun,06 08:00 - 09:40

Venue : 611/612

Authors : M. F. Farooqui1, R. M. Bilal2, H. M. Cheema1, A. Shamim1, 1King Abdullah University of Science & Technology (KAUST), Thuwal, Saudi Arabia, 2National University of Sciences and Technology (NUST), Islamabad, Pakistan

Abstract : An inkjet printed, wearable,low-cost,light weight and miniaturized real time locating TAG on ordinary photo-paper is presented for the first time. The 29gms, 8cmÃ8cmÃ0.5cm TAG includes a novel monopole antenna with an L shaped slit to achieve the required circular polarization for the GPS band. The TAG can be tracked over internet. Field tests show an update interval of 15 sec, stationary position error of 4.7m and real time tracking error of 5.1m which is 4X better than the state-of-the-art. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

"A Novel, W-band Microwave Based Contactless Test Method for Mechanical Sensitivity Analysis of MEMS" (@ 611/612) **Paper** |

Part of technical session - ***Novel RF Circuit and Component Technologies*** on Jun,06 08:00 - 09:40

Venue : 611/612

Authors : F. Oesterle, G. V , R. Weigel, A. Koelpin, University of Erlangen-Nuremberg, Erlangen, Germany

Abstract : The functionality of Micro Electro Mechanical Systems (MEMS) suffers from the influence on the nominal stress level of the mechanical components. Therefore, appropriate methods for testing mechanical parameters of MEMS is a key issue. This article presents a novel method for contactless testing of mechanical sensitivity of MEMS devices based on W-band microwave interferometry. The excellent detection of the test parameter verifies the feasibility and enormous potential of this proposed method. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ Hairpin Bandpass Filter on Liquid Crystal Polymer Substrate using Inkjet Printing Technology (@ 611/612) **Paper** | | |

Part of technical session - ***Novel RF Circuit and Component Technologies*** on Jun,06 08:00 - 09:40

Venue : 611/612

Authors : H. Kao1, C. Cho1, X. Dai2, C. Yeh1, X. Zhang2, L. Chang3, H. Chiu1, 1Chang Gung University, Tao-Yuan, Taiwan, 2South China University of Technology, Guangzhou, China, 3Ming Chi University of Technology, Taipei, Taiwan

Abstract : Inkjet-printing technology is utilized to fabricate a bandpass filter on a Liquid Crystal Polymer (LCP) substrates. Silver nanoparticle colloidal solution is used as the printing ink. The conductivity and thickness of silver film are 1~2x10^7 Siemens/m and 3.6 um, respectively. The hairpin bandpass filter has been developed using inkjet printing technology. Bending effect causes frequency shift and insertion loss reduction due to material deformation while bending the LCP substrate. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ **TH1H** : New Applications for Periodic Structures (@ 613/614) **Technical** | |

Venue : 613/614

Chair : Gayle Collins, MaXentric Technologies

Co-Chair : Tapan Sarkar, Syracuse University

Abstract : Periodic structures have wide application. In this session novel periodic structures are introduced for a variety of radiating, waveguiding, and spatial-filtering applications. Specific applications include a non-squinting leaky-wave antenna, a comparison of directive EBG antennas, a simple CAD approach for frequency selective surfaces, a polarization converter, and an artificial planar lens. Both theoretical and experimental results are presented. less

▼ Design of Nonreciprocal CRLH Metamaterial for Non-squinting Leaky-Wave Antenna (@ 613/614) **Paper** | | |

Part of technical session - ***New Applications for Periodic Structures*** on Jun,06 08:00 - 09:40

Venue : 613/614

Authors : A. Porokhnyuk1, T. Ueda1, Y. Kado1, T. Itoh2, 1Kyoto Institute of Technology, Kyoto, Japan, 2University of California at Los Angeles, Los Angeles, United States

Abstract : The resonant-t I CRLH leaky-wave antenna design provides gain and directivity enhancement, as well as lower beam squinting, compared to conventional leaky-wave antennas. However a method for complete beam-squinting elimination was not available at the moment. Based on the analysis of dispersion, a new approach to design of nonreciprocal metamaterial for non-squinting resonant-type leaky-wave antennas is proposed and validated experimentally. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ Directive Propagation in Two EBG Structures: a Comparison (@ 613/614) **Paper** | | |

Part of technical session - ***New Applications for Periodic Structures*** on Jun,06 08:00 - 09:40

Venue : 613/614

Authors : S. Ceccuzzi, L. Pajewski, C. Ponti, G. Schettini, Roma Tre University, Rome, Italy

Abstract : Two methods for the enhancement of directive propagation in two-dimensional EBG structures, consisting of either

square or triangular lattices of dielectric rods, are compared. In one case a line source is inserted in between an EBG cover and a ground plane, while, in the other, the same source is embedded within an EBG material, working near its band-gap edge. The favourable configurations of the two methods are identified together with their strengths and weaknesses. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Analytical Circuit Model for Dipole Frequency-Selective Surfaces (@ 613/614) **Paper** | | |

Part of technical session - ***New Applications for Periodic Structures*** on Jun,06 08:00 - 09:40

Venue : 613/614

Authors : R. Rodriguez-Berral1, F. Mesa1, F. Medina1, M. Garcia-Vigueras2, 1University of Seville, Seville, Spain, 2Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland

Abstract : This contribution provides a fully analytical transmission-line circuit model for the transmission/reflection of an obliquely incident plane wave by a periodic array of printed dipoles. The topology of the equivalent circuit is rigorously derived in the analysis. In contrast with previously reported circuit models, the proposed approach accounts for dynamical effects that enable the application of the model in a very wide frequency range. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Linear-to-Circular Polarization Convertor Based on a Two-Dimensional Periodic Array of Inhomogenously Filled Waveguide (@ 613/614) **Paper** | | |

Part of technical session - ***New Applications for Periodic Structures*** on Jun,06 08:00 - 09:40

Venue : 613/614

Authors : H. Ren, Z. Shen, B. Li, Nanyang Technological University, Singapore, Singapore

Abstract : This paper presents a new linear-to-circular polarization converter based on a two-dimensional periodic array of inhomogeneously filled waveguide. Its operation principle is explained using the different propagation constants of two modes excited in the rectangular waveguide filled with a dielectric slab. An experimental prototype operating at 9 GHz is designed and constructed. Measured and simulated results are presented. It is shown that 3dB axial ratio bandwidth of 27% is achieved. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ Automatic Design and Fabrication of Broadband Circular-Polarized Gradient Index Metamaterial Lens (@ 613/614) **Paper** | | |

Part of technical session - ***New Applications for Periodic Structures*** on Jun,06 08:00 - 09:40

Venue : 613/614

Authors : R. Liu, F. Meng, J. Fu, G. Yang, K. Zhang, S. Li, Q. Wu, Harbin Institute of Technology, Harbin, China

Abstract : An automatic design and fabrication method for a broadband circular-polarized gradient index metamaterial (GIM) lens is proposed. There two key points: Firstly, the GIM lens consists of isotropic dielectric plate with deep-subwavelength through-holes, which have very little influence on the polarization states of incident waves; Secondly, the analytical formulas for the distribution rules of the through-holes on the plate is derived. This method is numerically and experimentally validated. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Quasi-Optical Multiplexing Using Leaky-Wave Near-Field Focusing Techniques in Substrate Integrated Waveguide Technology (@ 613/614) **Paper** | | |

Part of technical session - ***New Applications for Periodic Structures*** on Jun,06 08:00 - 09:40

Venue : 613/614

Authors : A. J. Martinez-Ros, J. L. Gomez-Tornero, Technical University of Cartagena (UPCT), Cartagena, Spain

Abstract : This work describes a quasi-optical multiplexing technique in substrate integrated waveguide (SIW) technology. It is based on the frequency dispersion response (spectral-spatial decomposition) of the fundamental SIW leaky mode, which emanates from the SIW and radiates inside the host dielectric substrate. Full-wave simulations in the 10GHz-20GHz band demonstrate that the rejection between channels can be increased and the insertion losses reduced by using near-f ld focusing techniques. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

10:10 - 11:50

▼ **TH2A** : Advances in Low Noise Amplifiers and Receivers (@ 608/609) **Technical** | | |

Venue : 608/609

Chair : Rahul Dixit, Raytheon

Co-Chair : James Whelehan, JJW Consulting Inc.

Abstract : In this session, six papers will be presented highlighting recent developments in low-noise GaN, SiGe, GaAs, and CMOS technologies. The session is devoted to the state-of-the-art in microwave/millimeter-wave low-noise amplifiers, and a sub-millimeterwave receiver. This includes a robust X-band low noise limiting amplifier, a linearized 60 GHz LNA, a 75 - 116 GHz cooled LNA, a 336 microWatt LNA, and a 60 GHz LNA with a built-in linearizer. The session concludes with an innovative 245 GHz sub-harmonic receiver in SiGe. less

▼ Robust X-Band Low Noise Limiting Amplifiers (@ 608/609) **Paper** | | |

Part of technical session - ***Advances in Low Noise Amplifiers and Receivers*** on Jun,06 10:10 - 11:50

Venue : 608/609

Authors : P. Schuh, R. Reber, Cassidian, Ulm, Germany

Abstract : GaN technology is today well established for power amplifiers but also for robust receiver components. In this paper we present the design and measurement results of two different robust LNAs with different limiter functionalities included. One version with 1.6 dB noise figure which survives 4W input power and with the included current limiter the maximum output power is only 17 dBm. The other version with input limiter survives more than 10W input power with a noise figure of 2 dB. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ Comparison of Two W-Band Low-Noise Amplifier MMICs with Ultra Low Power Consumption Based on 50 nm InGaAs mHEMT Technology (@ 608/609) **Paper** | | |

Part of technical session - ***Advances in Low Noise Amplifiers and Receivers*** on Jun,06 10:10 - 11:50

Venue : 608/609

Authors : F. Thome1, H. Massler1, S. Wagner1, A. Leuther1, I. Kallfass1, M. Schlechtweg1, O. Ambacher1, 1Fraunhofer, Freiburg, Germany, 2University of Freiburg, Freiburg, Germany

Abstract : Two low-noise amplifier MMICs operating in W-band frequency range are presented. The amplifiers were optimized for a minimum of DC power consumption. For optimized bias conditions LNA 1 achieved a gain of more than 16.4 dB and a noise figure of less than 2.8 dB over the whole W-band, whereas LNA 2 operates with a gain of over 14.5 dB and a noise figure of less than 3.3 dB. While consuming 0.9 mW of DC power best results are 8.9 dB gain and 3 dB noise figure. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ A 75-116-GHz LNA with 23-K Noise Temperature at 108 GHz (@ 608/609) **Paper** | | |

Part of technical session - ***Advances in Low Noise Amplifiers and Receivers*** on Jun,06 10:10 - 11:50

Venue : 608/609

Authors : M. Varonen1, R. Reeves2, P. Kangaslahti1, L. Samoska1, A. Akgiray2, K. Cleary2, R. Gawande2, A. Fung1, T. Gaier1, S. Weinreb2, A. C. S. Readhead2, C. Lawrence1, S. Sarkozy3, R. Lai3, 1Jet Propulsion Laboratory (JPL), Pasadena, United States, 2California Institute of Technology, Pasadena, United States, 3Northrop Grumman Corporation, Redondo Beach, United States

Abstract : We present an ultra-low-noise amplifier that is designed to cover the whole W-band and also an important astronomical band of 84 to 116 GHz. In a WR10 waveguide housing and fabricated using a 35-nm InP HEMT technology the amplifier achieves a record noise temperature of 23K at 108GHz when cryogenically cooled to 27K while providing better linearity and wider bandwidth than previously published W-band cryogenic LNAs. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ A 0.6-V 336-?W 5-GHz LNA using a Low-Voltage and Gain-Enhancement Architecture (@ 608/609) **Paper** | | |

Part of technical session - ***Advances in Low Noise Amplifiers and Receivers*** on Jun,06 10:10 - 11:50

Venue : 608/609

Authors : C. Hsieh1, M. Wu1, J. Cheng1, J. Tsai2, T. Huang1, 1National Taiwan University, Taipei, Taiwan, 2National Taiwan Normal University, Taipei, Taiwan

Abstract : A gm boosted low-noise ampli?er (LNA) with a low-voltage architecture is proposed. It is designed at 5-GHz using 0.18-?m CMOS process. By employing current-reused, and forward-body-bias techniques, LNA can operate at a reduced supply voltage. In addition, transformer-coupled gm boosted topology is utilized to further improve gain and noise factor . The LNA presents a gain of 10.0 dB and a noise figure of 4.8 dB at 4.8GHz. Under a supply voltage of 0.6 V, the dc power consumption is 336 ?W. less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

Please Login to view Discussions

▼ A 60 GHz Low Noise Amplifier with Built-in Linearizer (@ 608/609) **Paper** | | |

Part of technical session - ***Advances in Low Noise Amplifiers and Receivers*** on Jun,06 10:10 - 11:50

Venue : 608/609

Authors : C. Hsieh, Y. Lin, Y. Hsiao, H. Wang, National Taiwan University, Taipei, Taiwan

Abstract : A 57 to 66 GHz low noise amplifier (LNA) with built-in linearizer using 65-nm CMOS technology is presented in this paper. The source-sensed derivative superposition technique is applied to improve the linearity of the LNA at high frequency. The measurement results show that linearized LNA achieves 24 dB gain and 4.5 dB noise figure in the band of interest. Based on the proposed methodology, the improvement of IM3 is 14 dB at 60 GHz. less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

Please Login to view Discussions

▼ 245 GHz Subharmonic Receiver in SiGe (@ 608/609) **Paper** | | |

Part of technical session - ***Advances in Low Noise Amplifiers and Receivers*** on Jun,06 10:10 - 11:50

Venue : 608/609

Authors : Y. Mao1, K. Schmalz1, J. BorngrÃ¤ber1, J. C. Scheytt 2, C. Meliani1, 1Institute for High Performance (IHP) Microelectronics, Frankfurt , Germany, 2University of Paderborn, Paderborn, Germany

Abstract : A subharmonic receiver for 245 GHz spectroscopy sensor applications have been proposed. The receiver consists of a CB LNA, 2nd transconductance SHM and a 120 GHz push-push VCO with 1/64 divider. The receiver is fabricated in fT/fmax=300/500 GHz SiGe: C BiCMOS technology. Its measured single-ended gain is 14.3 dB at 245 GHz with tuning range of 15 GHz, and the single-side band noise figure is 17 dB. The input 1-dB compression point is at -24 dBm. The receiver dissipates a power of 200 mW. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ **TH2B** : Novel Planar Filter Techniques and Technologies (@ 606/607) **Technical** | |

Venue : 606/607

Chair : Kamal Samanta, Milmega Ltd

Co-Chair : Chi Wang, Orbital Science Cort

Abstract : This session features a range of novel planar filter techniques and technologies. Innovations include a substrate integrated waveguide diplexer analyzed using the mode matching technique, extraction of source/load coupling and the use of signal interference source/load coupling, a new miniaturized ring resonator-based filter, a differential f lter using stepped impedance resonators, a directional band reject filter, and a coupler-based 180 degree hybrid with a Chebyshev response. less

▼ Mode Matching Design of Substrate Integrated Waveguide Diplexers (@ 606/607) **Paper** | | |

Part of technical session - ***Novel Planar Filter Techniques and Technologies*** on Jun,06 10:10 - 11:50

Venue : 606/607

Authors : Z. Kordiboroujeni, J. Bornemann, University of Victoria, Victoria, Canada

Abstract : A K-band diplexer based on the Substrate Integrated Waveguide (SIW) technology is presented in this paper. The diplexer has input and output ports on opposite sides with bandwidths of 2.75 percent and 2.11 percent at 18.15 GHz and 19 GHz, respectively. The diplexer is designed using an efficient Mode-Matching Technique (MMT) and is prototyped. Measured results are in good agreement with theory and simulation results and show good isolation between the channels. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Deterministic Extraction of Direct Source/Load Coupling and Its Application to Multi-Mode Filter Designs Based on Transversal Array Network Theory (@ 606/607) **Paper** | | |

Part of technical session - ***Novel Planar Filter Techniques and Technologies*** on Jun,06 10:10 - 11:50

Venue : 606/607

Authors : M. Ohira, H. Aoyama, Z. Ma, Saitama University, Saitama, Japan

Abstract : This is the first report on quantitative evaluation of a direct source/load (S/L) coupling in physical filter models and its application to transversal array theory based filter designs. The precise prediction of S/L coupling by the proposed deterministic method enables one to generate transmission zeros at arbitrary frequencies, realizing both symmetric and asymmetric responses. The usefulness of the proposed method is confirmed through filter measurements as well as electromagnetic designs. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Microstrip Filters with Selectivity Improvement Using the New Concept of Signal-Interference Source/Load Coupling (@ 606/607) **Paper** | | |

Part of technical session - ***Novel Planar Filter Techniques and Technologies*** on Jun,06 10:10 - 11:50

Venue : 606/607

Authors : M. Sanchez-Renedo, R. Gomez-Garcia, R. Loeches-Sanchez, University of Alcala, Alcala de Henares, Spain

Abstract : An original and simple method to design high-performance microstrip bandpass filters (BPFs) is reported. It makes use of traditional low-order coupled-resonator BPF networks properly modified in base of signal-interference techniques. Thus, through these mixed coupled-resonator/signal-interference BPF schemes, high-selectivity bandpass filtering functions with low in-band group-delay variation are feasible. As experimental validation, several microstrip prototypes are developed and tested. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ New Miniaturized Ring Resonator Bandpass Filter With Wide Upper Stopband (@ 606/607) **Paper** | | |

Part of technical session - ***Novel Planar Filt Techniques and Technologies*** on Jun,06 10:10 - 11:50

Venue : 606/607

Authors : T. Lin1, J. Kuo2, S. Chung1, 1National Chiao Tung University, Hsinchu, Taiwan, 2Chang Gung University, Taoyuan, Taiwan

Abstract : A new configuration for ring resonator is proposed for filter design with size reduction and stopband extension. The

ring is twisted at its middle and a short CPW section is used for the interconnection. The resonator has two resonances and the filter possesses one zero. With a pair of open stubs attached to the ring, the circuit has an area of only 9.65% of that of the conventional ring resonator, and the upper stopband is extended up to five times the center frequency. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Design of a 180-Degree Hybrid with Chebyshev Filtering Response Using Coupled Resonators (@ 606/607) **Paper** | | |

Part of technical session **- *Novel Planar Filter Techniques and Technologies*** on Jun,06 10:10 **-** 11:50

Venue : 606/607

Authors : W. Liu1, T. Huang1, C. Chen2, T. Shen1, R. Wu1, 1National Taiwan University, Taipei, Taiwan, 2Tunghai University, Taichung, Taiwan

Abstract : A novel 180Â° hybrid with third-order Chebyshev filtering response is proposed in this paper. The coupling coefficients and the external quality factors can be synthesized from the theory of coupled resonator filter. The proposed idea is verified with experimental results, with good agreement between simulation and measurement. Comparing to the conventional rat-race coupler, 80% size reduction and filtering function with high frequency selectivity has been exhibited in the proposed structure. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Differential Bandpass Filters with Common-Mode Suppression based on Stepped Impedance Resonators (SIRs) (@ 606/607) **Paper** | | |

Part of technical session **- *Novel Planar Filt Techniques and Technologies*** on Jun,06 10:10 **-** 11:50

Venue : 606/607

Authors : P. Velez1, J. Naqui1, M. Duran-Sindreu1, A. Fernandez-Prieto2, J. Bonache1, J. Martel2, F. Medina2, F. Martin1, 1Autonomous University of Barcelona (UAB), Bellaterra, Spain, 2University of Seville, Sevilla , Spain

Abstract : A novel strategy for the design of common-mode suppressed differential (or balanced) filters, based on stepped impedance resonators (SIRs), patch capacitances and admittance inverters is presented. For the common mode, the SIR behaves as a shunt connected series resonator, providing a transmission zero. The equivalent circuit model of the proposed structure is validated through electromagnetic simulation and experimental data of order-3 and -5 Chebyshev differential bandpass filters. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Compact 4-pole BRF-Based Directional Filter with Even-Mode Matching Circuits for Sharp Cut-Off (@ 606/607) **Paper** | | |

Part of technical session **- *Novel Planar Filter Techniques and Technologies*** on Jun,06 10:10 **-** 11:50

Venue : 606/607

Authors : J. S. Sun1, A. Corona-Chavez2, J. Choi1, T. Itoh1, 1University of California at Los Angeles, Los Angeles, United States, 2National Institute of Astrophysics, Optics and Electronics (INAOE), Tonantzintla, Mexico

Abstract : The band-reject filter (BRF) based directional f lter (DF) structure is shown to have good filtering response. However, the prototype reported cascades resonators in the lateral direction. This leads to rapid oscillation in the stop-band and a lengthy structure with higher filter order. This work reports a 4-pole BRF based DF using direct-coupled filter. It is 30% smaller than previous prototypes, and achieves the highest order of DF reported without the rapid oscillation in the stop-band. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ **TH2C** : Advances in RFID Technologies (@ 602/604) **Technical** | |

Venue : 602/604

Chair : Kazuya Yamamoto, Mitsubishi Electric Corporation

Co-Chair : Vasileios Lakafosis, Cisco

Abstract : RFID is no longer a simple technology platform that facilitates inventory control and short-range communications. It is universally recognized as a necessary vehicle for device integration that is low power, low cost, and completely ubiquitous. In this session, papers are presented that best reflect the latest state-of-the-art trends in RFID Technologies. These cover applications ranging from sensing and localization to mm-Wave frequencies. In particular, emerging technologies that involve permittivity sensing, temperature sensing, backscattered modulation schemes, RF energy-harvesting, localization, and high-frequency transponder will be introduced. less

▼ Planar Sensors for RFID Wireless Complex-Dielectric-Permittivity Sensing of Liquids (@ 602/604) **Paper** | | | |

Part of technical session - ***Advances in RFID Technologies*** on Jun,06 10:10 - 11:50

Venue : 602/604

Authors : H. Lobato-Morales, A. Corona-Chavez, J. L. Olvera-Cervantes, National Institute of Astrophysics, Optics and Electronics (INAOE), Puebla, Mexico

Abstract : Two planar sensors for wireless RFID dielectric permittivity sensing of liquids are presented. The first sensor consists of a Substrate-Integrated-Waveguide (SIW) resonant cavity while the second one is composed by an SIW Epsilon-Near-Zero (ENZ) tunnel sensor. Both structures produce a notch resonance response at 4 GHz which is used for the characterization of the liquids using the Cavity-Perturbation-Technique. The proposed sensors present good sensitivity using a small amount of sample volume. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Enabling Self-Powered Autonomous Wireless Sensors with New-Generation I2C-RFID Chips (@ 602/604) **Paper** | | | |

Part of technical session - ***Advances in RFID Technologies*** on Jun,06 10:10 - 11:50

Venue : 602/604

Authors : D. DeDonno, L. Catarinucci, L. Tarricone, University of Salento, Lecce, Italy

Abstract : A self-powered autonomous RFID device with sensing and computing capabilities is presented in this paper. Powered by an RF energy-harvesting circuit in Silicon-on-Insulator technology and equipped with a microcontroller, the device exploits a novel I2C-RFID chip to deliver sensor data up to 5 meters of distance from the UHF RFID reader. To the best of our knowledge, this is the longest read range ever reported for passive RFID sensors compliant with the EPC Class-1 Generation-2 standard. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ A 60-GHz Semipassive MMID Transponder for Backscattering Communications (@ 602/604) **Paper** | | | |

Part of technical session - ***Advances in RFID Technologies*** on Jun,06 10:10 - 11:50

Venue : 602/604

Authors : T. Kiuru, P. Pursula, J. RajamÃ¤ki, T. VÃ¤hÃ¤-HeikkilÃ¤, VTT Technical Research Centre of Finland, Espoo, Finland

Abstract : This paper presents the design and measurements of a 60-GHz semipassive MMID transponder for high data rate applications. The transponder consists of an antenna array that is connected to a millimeter wave diode on liquid crystal polymer. The diode acts as a detector as well as a backscattering modulator. The measured diode sensitivity is 560 V/W. A signal-to-noise ratio of over 20 dB in the received backscattered signal is measured at a distance of 30 cm. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Time-coded Chipless RFID Temperature Sensor with Self-Calibration based on a Vivaldi Antenna (@ 602/604) **Paper** | | | |

Part of technical session - ***Advances in RFID Technologies*** on Jun,06 10:10 - 11:50

Venue : 602/604

Authors : A. Ramos, D. Girbau, A. Lazaro, R. Villarino, Rovira i Virgili University (URV), Tarragona, Spain

Abstract : This paper proposes a radio frequency identification (RFID) sensor based on an ultra-wide band (UWB) Vivaldi antenna loaded with two transmission lines. The time-domain response is composed by a structural and two tag (or antenna) mode reflections. Each transmission line generates its own tag mode. One tag mode is used to sense temperature, and the other is used to calibrate the sensor. Experimental results obtained with two reader approaches are presented to validate the system. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ Phase-of-Arrival-Based Localization of Passive UHF RFID Tags (@ 602/604) **Paper** | | |

Part of technical session - ***Advances in RFID Technologies*** on Jun,06 10:10 - 11:50

Venue : 602/604

Authors : M. Scherhaeufl1, M. Pichler1, D. Mueller2, A. Ziroff2, A. Stelzer3, 1Linz Center of Mechatronics GmbH (LCM GmbH), Linz, Austria, 2Siemens, Munich, Germany, 3Johannes Kepler University , Linz, Austria

Abstract : This paper introduces a novel 2D localization system for passive UHF RFID tags based on PoA evaluation of the backscattered tag signal received by several antennas. To improve localization accuracy and reduce disturbances caused by multipath propagation, we employ a FSCW approach. To achieve proof of concept, a local position measurement system demonstrator comprising an RFID reader, passive tags, several receivers, baseband hardware, and signal processing was used for measurements. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Accurate Indoor Ranging by Broadband Passive NLTL Tags (@ 602/604) **Paper** | | |

Part of technical session - ***Advances in RFID Technologies*** on Jun,06 10:10 - 11:50

Venue : 602/604

Authors : Y. Ma, E. C. Kan, Cornell University, Ithaca, United States

Abstract : Millimeter-precision, decameter-distance realâtime indoor ranging is challenging due to multipath reflections. We present a solution by passive broadband nonlinear transmission line (NLTL) tags. Via harmonic backscattering, reader self-jamming and errors caused by direct reflections can be greatly reduced. By the broadband property of NLTL, a simple, robust method by multi-frequency continuous wave (MFCW) is formulated to resolve the phase ambiguity and to further improve ranging accuracy. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ **TH2D** : Measurements Supporting Active Device Modeling (@ 605/610) **Technical** | |

Venue : 605/610

Chair : Nuno Borges Carvalho, University of Aveiro

Co-Chair : John T. Barr, Aligent Tech (retired)

Abstract : This group of papers includes characterization of active devices for high efficiency power amplifiers, large signal modeling of a mixed signal transmitter, a high frequency multisine signal source and an extremely low frequency active bias tee for active device characterization. Overall, many aspects of active device modeling are covered, and the session will be instructive to those active in the area. less

▼ Non-Intrusive Characterization of Active Device Interactions in High-Efficiency Power Amplifiers (@ 605/610) **Paper** | | |

Part of technical session - ***Measurements Supporting Acti*** ,06 10:10 - 11:50

Venue : 605/610

Authors : R. Hou1, M. Spirito1, J. Gajadharsing2, L. C. N. de Vreede1, 1Delft University of Technology, Delft, Netherlands, 2NXP Semiconductors, Nijmegen, Netherlands

Abstract : In this work, a non-intrusive near-field technique is applied to enable the characterization of active device interactions in

a 2.2-GHz 400-W LDMOS Doherty power amplifier (PA). Using the proposed technique, the individual behaviors of interacting power devices in a high-efficiency PA, in terms of their inter-dependent drain voltages, currents, power, efficiency and loading impedance, are experimentally quantified for the first time. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Synchronous Frequency Domain Measurements for the Extraction of X-parameters in Digital to Analog Transmitters (@ 605/610) **Paper** | | |

Part of technical session - ***Measurements Supporting Acti*** ***ling*** on Jun,06 10:10 - 11:50

Venue : 605/610

Authors : D. C. Ribeiro, P. M. Cruz, N. B. Carvalho, University of Aveiro, Aveiro, Portugal

Abstract : This paper presents an extraction procedure for behavioral model approximation of digital transmitters. A first explanation on how to extract X-parameters for a digital to analog device will be done, followed by a procedure for phase synchronization measurements. Finally I measurement example will be performed. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ A Precision Millimeter-Wave Modulated-Signal Source (@ 605/610) **Paper** | | |

Part of technical session - ***Measurements Supporting Active Device Modeling*** on Jun,06 10:10 - 11:50

Venue : 605/610

Authors : K. A. Remley, P. D. Hale, D. F. Williams, C. Wang, National Institute of Standards and Technology (NIST), Boulder, United States

Abstract : We develop and characterize a modulated-signal source for use at millimeter-wave frequencies. Components within the source are phase-locked by a 10 GHz reference source to minimize drift and improve synchronization. The complex frequency response of the source is characterized with a calibrated sampling oscilloscope. We illustrate use of the source by determining the phase error of a vector signal analyzer. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Extr ly Low-Frequency Measurements Using an Active Bias Tee (@ 605/610) **Paper** | | |

Part of technical session - ***Measurements Supporting Active Device Modeling*** on Jun,06 10:10 - 11:50

Venue : 605/610

Authors : A. Nalli1, A. Raffo1, G. Avolio2, V. VadalÃ 1, G. Bosi1, D. Schreurs2, G. Vannini1, 1University of Ferrara, Ferrara, Italy, 2KU Leuven, Leuven, Belgium

Abstract : An active bias tee suitable for small- and large-signal low-frequency (5 Hz to 400 kHz) characterization of electron devices has been designed and manufactured. Different experimental results, carried out on 0.25 Âµm GaAs and GaN HEMTs, confirm the validity of the proposed bias circuit. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ **TH2E** : Advanced MMICs for THz Applications (@ 615/617) **Technical** | |

Venue : 615/617

Chair : Imran Mehdi, JPL

Co-Chair : Jae-Sung Rieh, Korea University

Abstract : This session presents a number of novel and advanced MMIC approaches for building circuits and sub-systems above 100

GHz that can enable THz applications. Advanced CMOS is used to generate power via multiplication and power-combining. HEMT MMICs are demonstrated for cryogenic low noise and communication systems, and flexible MMICs are demonstrated via substrate removal. less

▼ An Integrated Multi-Port Driven Radiating Source (@ 615/617) **Paper** | | |

Part of technical session - ***Advanced MMICs for THz Applications*** on Jun,06 10:10 - 11:50

Venue : 615/617

Authors : S. M. Bowers, A. Hajimiri, California Institute of Technology, Pasadena, United States

Abstract : A multi-port driven (MPD) antenna allows for the removal of RF blocks for impedance matching, power combining, and power delivery by enabling efficient radiation from several output stages driving the antenna. A radiating source utilizing an 8-phase ring oscillator and eight power amplifiers to drive the MPD antenna at 161.4 GHz with a total radiated power of -2dBm and a single element EIRP of 4.6dBm is demonstrated in silicon with single lobe radiation patterns closely matching simulation. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ A 0.37-0.43 THz Wideband Quadrupler with 160 uW Peak Output Power in 45 nm CMOS (@ 615/617) **Paper** | | |

Part of technical session - ***Advanced MMICs for THz Applications*** on Jun,06 10:10 - 11:50

Venue : 615/617

Authors : F. Golcuk1, A. Fung2, G. M. Rebeiz1, 1University of California at San Diego, La Jolla, United States, 2Jet Propulsion Laboratory (JPL), Pasadena, United States

Abstract : This paper presents a wideband 45 nm CMOS SOI quadrupler at 370 to 430 GHz. The balanced multiplier results in a very low third harmonic component, and uses reflectors at the output port to reflect the fundamental and the second harmonic frequency into the quadrupler for improved efficiency. The measured output power is 100 uW at 370-430 GHz with a peak value of 150-160 uW at 390-415 GHz and a conversion loss of 19-20 dB. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Tr f an 8-PSK Modulated 30 Gbit/s Signal Using an MMIC-Based 240 GHz Wireless Link (@ 615/617) **Paper** | | |

Part of technical session - ***Advanced MMICs for THz Applications*** on Jun,06 10:10 - 11:50

Venue : 615/617

Authors : J. Antes1, S. Koenig2, D. Lopez-Diaz3, F. Boes2, A. Tessmann3, R. Henneberger4, O. Ambacher3, T. Z , I. Kallfass1, 1Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany, 2Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany, 3Fraunhofer , Freiburg, Germany, 4Radiometer Physics GmbH, Meckenheim, United States

Abstract : The transmission of complex modulated data signals with data rates up to 30 Gbit/s is successfully realized using a 240 GHz wireless link based on active MMIC components. The paper presents the transmission of QPSK and 8-PSK modulated signals over a distance of 40 m as well as a characterization of the RF frontend based on S-parameter measurements and back-to-back signal transmission. For a symbol rate of 10 GBd, a EVM measurement shows values of 10.3 % and 15.2 % for the QPSK and 8-PSK signal. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ First Demonstr tion of W-band Millimeter-Wave Flexible Electronics (@ 615/617) **Paper** | | |

Part of technical session - ***Advanced MMICs for THz Applications*** on Jun,06 10:10 - 11:50

Venue : 615/617

Authors : H. Sharifi1, J. May2, K. Shinohara1, M. Montes1, C. McGuire1, H. Kazemi3, 1HRL Laboratories, LLC, Malibu, United States, 2Malibu IQ, Malibu, United States, 3Nuvotronics, LLC., Radford, United States

Abstract : This paper presents a novel method to fabricate substrate-less flexible and printable electronics for microwave and millimeter-wave applications. InP HEMT technology is utilized in this work to demonstrate first W-band completely flexible low noise amplifier (LNA). 10dB gain per stage is achieved at 100GHz for a 2x25Âµm device as expected from the EEHEMT model with simulated noise figure (NF) of 2.0. The fabrication process and measurement results are discussed in detail. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ Low Noise Amplifiers for 140 GHz Wide-Band Cryogenic Receivers (@ 615/617) **Paper** | | |

Part of technical session - ***Advanced MMICs for THz Applications*** on Jun,06 10:10 - 11:50

Venue : 615/617

Authors : P. V. Larkoski1,2, P. Kangaslahti3, L. Samoska3, R. Lai4, S. Sarkozy4, S. E. Church1,2, 1Stanford University, Stanford, United States, 2Kavli Institute for Particle Astrophysics & Cosmology (KIPAC), Stanford, United States, 3Jet Propulsion Laboratory (JPL), Pasadena, United States, 4Northrop Grumman Corporation, Redondo Beach, United States

Abstract : We report S-parameter and noise measurements for three different InP 35 nm gate-length HEMT Low Noise Amplifier (LNA) designs operating in the 140 GHz frequency range. The LNAs have an average measured noise figure of 3-3.6dB over the 122-170GHz band. One LNA was cooled to 20K and a record low spot noise temperature of 46K was measured. These amplifiers can be used in receivers that operate in the 130-170GHz atmospheric window, which is an important band for astronomy and mm-wave imaging. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ **TH2F** : Advances In Transmission-Line Elements and Structures (@ 618/620) **Technical** | |

Venue : 618/620

Chair : George Eleftheriades, University of Toronto

Co-Chair : Atsushi Sanada, Yamaguchi University

Abstract : This session presents several novel transmission-line elements and structures along with their applications. The first paper presents a transmission-line based resistive compression network for matching applications of dc-dc converters and power harvesters. The second paper presents a very broadband 23:1 modified Marchand Balun on multilayer organic substrate. The third paper characterizes the attenuation of coplanar waveguides on lossy silicon for emerging sub-millimeter wave integrated circuits. The fourth paper highlights a special transition from microstrip line to substrate integrated waveguide with high characteristic impedance. The fifth paper presents an interesting tunable non-reciprocal ferrite loaded substrate-integrated-waveguide phase shifter. less

▼ A Transmission Line Based Resistance Compression Network (TRCN) for Microwave Applications (@ 618/620) **Paper** | | |

Part of technical session - ***Advances In Transmission-Line Elements and Structures*** on Jun,06 10:10 - 11:50

Venue : 618/620

Authors : J. Xu1, W. Tai2, D. S. Ricketts3, 1Massachusetts Institute of Technology (MIT), Cambridge, United States, 2Carnegie Mellon University, Pittsburgh, United States, 3North Carolina State University, Raleigh, United States

Abstract : A resistance compression network (RCN) based on lumped elements has demonstrated compressed impedance variation at 48 MHz [3]. At microwave frequencies, however, the RCN in [3] does not scale well. In this work we present a transmission line based RCN that operates at 5 GHz. The RCN consists of two microstrip lines with unequal length. We present the theory, the design and a prototype that shows the TRCN is able to compress a large load resistance variation ratio of 20:1 into a ratio of 3:1. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ A 23:1 Bandwidth Ratio Balun on Multilayer Organic Substrate (@ 618/620) **Paper** | | |

Part of technical session - ***Advances In Transmission-Line Elements and Structures*** on Jun,06 10:10 - 11:50

Venue : 618/620

Authors : H. H. Ta1, B. L. Pham1, A. Pham1, R. Leoni2, 1University of California at Davis, Davis, United States, 2Raytheon Company, Andover, United States

Abstract : We present a novel, super wide bandwidth balun implemented on a multilayer organic substrate. The balun has a measured bandwidth ratio of 23:1. Within the bandwidth, the balun achieves an input return loss of better than 10 dB, an insertion loss of better than 1 dB, a amplitude imbalance of better than 0.4 dB and a phase imbalance of better than 10 degree. The size of the balun is 0.22 ?g x 0.22 ?g. This balun achieves the largest bandwidth ratio reported to date on a printed circuit board. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Minimizing Attenuation of Coplanar Waveguide on Lossy Silicon Substrates up to 300 GHz (@ 618/620) **Paper** | | |

Part of technical session **-** ***Advances In Transmission-Line Elements and Structures*** on Jun,06 10:10 **-** 11:50

Venue : 618/620

Authors : R. Islam, R. Henderson, The University of Texas at Dallas, Richardson, United States

Abstract : The attenuation constant of coplanar waveguide (CPW), conductor backed CPW (CBCPW) and grounded CPW (GCPW) interconnects is compared up to 300 GHz. Spin-on benzocyclobutene (BCB) dielectric is deposited on low resistivity (10 ?-cm) silicon (Si) substrates to characterize the loss of interconnects at millimeter-wave (mm-wave) frequencies. CBCPW, GCPW fabricated on approximately 8 Âµm of BCB and CPW fabricated on 58 Âµm of BCB have similar attenuation of 1.9 dB/mm at 300 GHz. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ A Novel Transition fr te Integrated Waveguide with Higher Characteristic Impedance (@ 618/620) **Paper** | | |

Part of technical session **-** ***Advances In Transmission-Line Elements and Structures*** on Jun,06 10:10 **-** 11:50

Venue : 618/620

Authors : E. Diaz-Caballero1, A. Belenguer2, H. Esteban-Gonzalez1, O. Monerris-Belda3, V. Boria-Esbert1, 1Polytechnic University of Valencia, Valencia, Spain, 2University of Castilla-La Mancha, Cuenca, Spain, 3Val Space Consortium, Valencia, Spain

Abstract : Microstrip tapers are commonly used as the best solution when an interface between SIW and a microstrip line is needed. However, we show how the microstrip taper works much worse when the SIW has higher characteristic impedance than the microstrip, and how a transition made in SIW has better performance in this case. Field plots, simulations and measurements validate the proposed solution. Analytical equations for positioning the via holes forming the transition are obtained and tested. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Tunable Non-Reciprocal Ferrite Loaded SIW Phase Shifter (@ 618/620) **Paper** | | |

Part of technical session **-** ***Advances In Transmission-Line Elements and Structures*** on Jun,06 10:10 **-** 11:50

Venue : 618/620

Authors : S. Adhikari1, A. Ghiotto2, S. Hemour1, K. Wu1, 1Ecole Polytechnique de Montreal, Montreal, Canada, 2University of Bordeaux, Talence, France

Abstract : In this paper a tunable non-reciprocal Ferrite Loaded Substrate Integrated Waveguide (FLSIW) phase shifter is proposed. It is based on the non-reciprocal properties of an SIW line loaded with a single ferrite slab on one sidewall where the magnetic fields are strongest. An X-band non-reciprocal tunable phase shifter prototype is demonstrated. As an application of the non-reciprocal phase shifter an isolator is designed and fabricated. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ **TH2G** : Advances in Linear Component Modeling (@ 611/612) **Technical** | |

Venue : 611/612

Chair : Roni Khazaka, McGill Universtiy

Co-Chair : Q. J. Zhang, Carleton University

Abstract : This session focuses on advanced methodologies and their applications to synthesis, design, modeling and optimization of linear components and devices. The presented papers feature general synthesis algorithms, statistical space mapping, comparative modeling of through silicon vias, f l-order transmission line modeling for the THz range, and artificial magnetic conductors modeling. Application areas include microstrip circuits, semiconductor devices, CMOS on-chip interconnects, as well as equivalent circuit synthesis. less

▼ Brune's Algorithm for Circuit Synthesis (@ 611/612) **Paper** | | |

Part of technical session - ***Advances in Linear Component Modeling*** on Jun,06 10:10 - 11:50

Venue : 611/612

Authors : F. Mukhtar, P. Russer, Technical University Munich, Munich, Germany

Abstract : A general circuit synthesis algorithm for passive, reciprocal, lossy or lossless and symmetric or non-symmetric multi-port microwave circuits is presented. The algorithm is applied to the impedance matrix of the circuit given as a matrix of rational f lex frequency which is belonging to the class of matrices called positive real symmetric matrices. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ A Statistical Input Space Mapping Approach for Accommodating Modeling Residuals (@ 611/612) **Paper** | | |

Part of technical session - ***Advances in Linear Component Modeling*** on Jun,06 10:10 - 11:50

Venue : 611/612

Authors : Q. S. Cheng1, J. W. Bandler1, N. K. Nikolova1, S. Koziel3, 1McMaster University, Hamilton, Canada, 2Bandler Corporation, Dundas, Canada, 3Reykjavik University, Reykjavik, Iceland

Abstract : In this paper we discuss a statistical input space mapping method. Our initial surrogate (or mapping) is established through a standard space mapping modeling approach. We enhance the surrogate by including a statistical modeling technique to accommodate response residuals. We employ a simple LC circuit and a microstrip bend to demonstrate our approach. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Comparative Modeling Study of Single-Ended Through-Silicon Via Between the G-S and G-S-G Configuration (@ 611/612) **Paper** | | |

Part of technical session - ***Advances in Linear Component Modeling*** on Jun,06 10:10 - 11:50

Venue : 611/612

Authors : K. Lu, T. Horng, National Sun Yat-sen University (NSYSU), Kaohsiung, Taiwan

Abstract : This paper presents a comparative modeling of single-ended (SE) through silicon via (TSV) between the G-S and G-S-G configuration. The simulation based on a 3D quasi-static field solver indicates that the use of two ground TSVs produces greater parasitic capacitance and conductance in the silicon substrate. However, because of the increase of the parasitic capacitance, the parasitic inductance of the SE TSV is reduced to maintain the same phase velocity in silicon. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ A Fractional-Order RLGC Model for Terahertz Transmission Line (@ 611/612) **Paper** | | |

Part of technical session - ***Advances in Linear Component Modeling*** on Jun,06 10:10 - 11:50

Venue : 611/612

Authors : Y. Shang, W. Fei, H. Yu, Nanyang Technological University, Singapore, Singapore

Abstract : A causal and compact fractional-order transmission line model is developed for CMOS on-chip conductor at THz. With consideration of frequency-dependent dispersion loss and non-quasi-static effect at THz, the fractional-order model agrees well with measurement up to 110GHz in term of characteristic impedance, while traditional integer-order model can only match up to 10GHz. The model is deployed in design of CMOS on-chip standing-wave oscillator with largely improved amplitude accuracy. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Characterizing the In-phase Reflection Bandwidth Theoretical Limit of Artificial Magnetic Conductors with a Tr Line Model (@ 611/612) **Paper** | | |

Part of technical session - ***Advances in Linear Component Modeling*** on Jun,06 10:10 - 11:50

Venue : 611/612

Authors : Y. X . Fan1, Y. Chen1, J. D. Wilson2, R. N. Simons2, J. Q. Xiao1, 1University of Delaware, Newark, United States, 2National Aeronautics and Space Administration (NASA), Cleveland, United States

Abstract : We validate through simulation and experiment that artificial magnetic conductors (A ll characterized by a transmission line model. The theoretical bandwidth limit of the in-phase reflection can be expressed in terms of the effective RLC parameters from the surface patch and the properties of the substrate. It is found that the existence of effective inductive components will reduce the in-phase reflection bandwidth of the AMC. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ **TH2H** : Realizing Stable Non-Foster Circuits and their Application (@ 613/614) **Special** | |

Venue : 613/614

Chair : Jay S. Banwait, Northrop Grumman

Co-Chair : Stephen D. Stearns, Northrop Grumman

Abstract : In the past decade, interest in non-Foster circuits has emerged in a variety of fields ranging from circuits (antenna matching) to electromagnetics (active metamaterials) to mechanical systems (active suspensions for automobiles). In every case, how ... more

▼ Circuit Stability Theory for Non-Foster Circuits (@ 613/614) **Paper** | | |

Part of special session - ***Realizing Stable Non-Fo ts and their Application*** on Jun,06 10:10 - 11:50

Venue : 613/614

Authors : S. D. Stearns, Northrop Grumman Corporation, Mountain View, United States

Abstract : The successful design of non-Foster circuits requires stability tests that are accurate and reliable. A linear non-Foster counterexample circuit is shown that according to Rollettâs test and proviso is unconditionally stable yet is unstable with resistive termination. A second circuit shows other traditional stability tests are defective. A different approach has enabled stable non-Foster design. A stable non-Foster broadband impedance matching circuit for a small loop antenna is shown. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ A Nonlinear-Dynamics Based Approach to Stability Analysis of Non-Foster Networks with Electrically-Small Antennas (@ 613/614) **Paper** | | |

Part of special session - ***Realizing Stable Non-Foster Circuits and their Application*** on Jun,06 10:10 - 11:50

Venue : 613/614

Authors : J. F. McCann1, J. T. Aberle2, Y. Lai2, 1Air Force Research Laboratory (ARFL), Wright-Patterson AFB, United States, 2Arizona State University, Tempe, United States

Abstract : A non-Foster network is developed that includes a lumped-element model of an electrically-small monopole, shunt negative capacitance, and passive matching network. Stability of the network is analyzed under the assumption of ideal negative capacitor, and it is demonstrated that a change in antenna impedance can induce instability. Nonlinear differential equations are developed for general stability analysis of non-Foster networks. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ On the Stability of Non-Foster Monopole Antenna Arrays (@ 613/614) **Paper** | | |

Part of special session - ***Realizing Stable Non-Foster Circuits and their Application*** on Jun,06 10:10 - 11:50

Venue : 613/614

Authors : C. R. White, C. Tsen, HRL Laboratories, LLC, Malibu, United States

Abstract : A 2-element monopole array (length=15cm and spacing=3cm) whose self and mutual reactance is cancelled over 10â300 MHz employing three negative-capacitance Non-Foster Circuits (NFCs) has been realized. The analytical stability model is consistent with the experimental data; both series and interelement NFCs are necessary to cancel the reactance of both the even and odd modes. This is the first successful report of successfuly integration of NFCs into antenna arrays to the authors' knowledge. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ Time Domain Stability Analysis/Design of Negative Impedance Inverters and Converters (@ 613/614) **Paper** | | |

Part of special session - ***Realizing Stable Non-Foster Circuits and their Application*** on Jun,06 10:10 - 11:50

Venue : 613/614

Authors : A. Elf . Moussounda, R. G. Rojas, The Ohio State University, Columbus, United States

Abstract : Non-Foster circuits are attractive for microwave and antenna applications since they are not restricted by the gain-bandwidth product. Two topologies to implement these components are the Negative impedance converters and Inverters (NIC and NIIs). A problem with these circuits is the potential instability due to the presence of positive feedback. The stability properties of these circuits is discussed with a time domain technique that computes the Lyapunov exponents for the nonlinear system. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

12:00 - 14:00

▼ MTT-S Student Awards Luncheon (@ "Sheraton Seattle Hotel, Grand Ballroom C") **Social** | |

Venue : "Sheraton Seattle Hotel, Grand Ballroom C"

Detail : All students are invited to attend the luncheon which recognizes recipients of the MTT-S Undergraduate Scholarships, MTT-S Graduate Fellowships, IMS2013 Student Volunteers, IMS2013 Student Paper Awards and the participants/winners of the IMS2013 Student Design Competitions. less

Discussion (**0**) Attendees (**6**) Presentations (**0**)

Please Login to view Discussions

12:00 - 13:20

▼ The Death of GaAs? (@ 6A) **Panel** | |

Venue : 6A

Organizers : Eric Higham, Strategy Analytics

Panel Description : Initially nurtured by government research spending, GaAs has become an enabling device technology for a variety of military and commercial RF applications. Most notably, GaAs devices paved the way for the wireless communications revolution and this segment has powered the overall market to more than US $5 billion in revenue in 2012. Despite the GaAs device market hitting record revenues, silicon-based technologies like RF CMOS, SiGe and silicon-on-insulator are taking aim at opportunities in the high volume market segments. In conjunction with this assault on the high volume commercial markets, technologies like GaN are seeing wider deployment in aerospace and defense applications. GaN finally appears to be getting traction in commercial applications based on the high performance, high frequency and power characteristics of the technology. All of these market applications have long been the domain of GaAs-based devices. Since 2002, GaAs device revenue has more than doubled, growing at an average rate of more than 8% per year. Most of this growth has coincided with the advent of the wireless communications era and handsets will continue to be the driving force for this segment of the market. However, products using these competitive alternative technologies pose serious challenges to the growth and prosperity the GaAs industry has experienced. This panel will discuss the advantages and disadvantages of GaAs and the alternative technologies, along with device developments that threaten the GaAs device industry and the expected response. Industry experts will make projections on the future markets and semiconductor market shares. less

Discussion (**0**) Attendees (**10**) Presentations (**0**)

Please Login to view Discussions

13:30 - 16:00

▼ **THPA** : Interactive Forum (@ 6E) **Poster** | |

Venue : 6E

▼ On the Divergence Properties of the New Efficiency-Improved Divergence Preserved ADI-FDTD Method (@ 6E)

Poster | |

Part of poster session - ***Int*** ,06 13:30 - 16:00

Venue : 6E

Authors : S. Yang, Z. Chen, Y. Yu, S. Ponomarenko, Dalhousie University, Halifax, Canada

Abstract : In this paper, the new efficiency-improved divergence preserved ADI-FDTD method and its divergence property is presented. The efficiency-improved method is proven analytically to retain the expected divergence-f le having approximately 41.7% less floating point operation count in comparison with the original divergence-preserved ADI-FDTD method. Numerical example is provided to verify the theoretical proof. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ An Adaptive Basis Function for Meshless Simulation of Quantum Wave Packets at Optical Frequencies (@ 6E)

Poster | |

Part of poster session - ***Int*** ***Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : A. Afsari, M. Movahhedi, Shahid Bahonar University of Kerman, Kerman, Iran

Abstract : In this work, an adaptive and efficient basis function is presented by which the Schrodinger equation can be solved using meshless method in an accurate and fast approach. The base of this achievement is the quantum wave packet. The proposed basis function reduces time consumption of the meshless method, approximately to half. Also, it inherits the fundamental properties of wave packets. Therefore, an accuracy in simulation of wave function higher than some other numerical methods is obtained. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ **THPB** : Interactive Forum (@ 6E) **Poster** | |

Venue : 6E

▼ A Brune's Two-Port Process Applied to Lumped Element Filter Modeling (@ 6E)

Poster | |

Part of poster session - ***Interacti*** ***Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : J. A. Russer1, F. Mukhtar1, A. Gorbunova2, A. Baev2, Y. V. Kuznetsov2, P. Russer1, 1Technical University Munich, Munich, Germany, 2Moscow Aviation Institute, Moscow, Russian Federation

Abstract : A two-port Brune's process is applied to generate a lumped element equivalent circuit model of a Chebyshev filter of order 11 based on measured data. From the measured S parameters a rational function description is obtained by a vector fitting procedure applied on tabular data. From this the Brune's lumped element equivalent circuit is directly derived. The lumped element circuit model accounts also for the circuit losses and exhibits positive circuit elements only. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

THPC : Interactive Forum (@ 6E)

Poster |

Venue : 6E

Discontinuity at Origin in Volterra and Band-Pass Limited Models (@ 6E)

Poster |

Part of poster session **-** ***Interactive Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : J. Sombrin1, G. Soubercaze-Pun2, I. Albert2, 1Telecommunications for Space and Aeronautics (TeSA), Toulouse, France, 2National Centre for Space Studies (CNES), Toulouse, France

Abstract : Discontinuities at origin have been used to better approximate measured curves in recent papers. In this communication, we show that these discontinuities can be explained by physically acceptable discontinuities in the real physical device. We propose simple criteria to accept or reject these discontinuities.We show that models having such discontinuities are better for behavioral modeling of measured intermodulation products in passive devices, telephony base-station and RF transistors. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

A Semi-Empirical Lar -Signal Compact Model for RF Carbon Nanotube Field-Effect Transistors (@ 6E)

Poster |

Part of poster session **-** ***Interacti Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : M. Schroter1, M. Haferlach2, P. Sakalas1, M. Claus1, 1Technical University Dresden, Dresden, Germany, 2RFNano Corp., Newport Beach, United States

Abstract : A new compact large-signal model for RF CNTFETs is presented which overcomes the accuracy and discontinuity issues of existing models by using a semi-empirical formulation for the drain current and tube charge. The complete model is scalable towards multi-tube multi-finger RF CNTFET structures and includes the effects of metallic tubes, contact resistances, parasitic capacitances, self-heating and hysteresis. The experimental verification of the model is based on pulsed DC and RF measurements. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

THPD : Interactive Forum (@ 6E)

Poster |

Venue : 6E

2-D Nonlinearity Compensation Technique for Concurrent Dual-Band Wireless Transmitters (@ 6E)

Poster |

Part of poster session **-** ***Interacti Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : M. Cabarkapa1, N. Neskovic2, D. Budimir1, 1University of Westminster, London, United Kingdom, 2University of Belgrade, Belgrade, Yugoslavia

Abstract : A novel two dimensional (2-D) nonlinearity compensation digital predistortion (DPD) technique for concurrent dual-band transmitters is presented and experimentally verified. The technique improves an in-band and out-of-band performances of both signals. It does not depend on frequency separation between bands and has low memory requirements and computational complexity in comparison with state-of-the-art. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ A New Numerical Approach for the Efficient Computation of Floquet Multipliers Within the Harmonic Balance Technique (@ 6E)

Poster | | |

Part of poster session **-** ***Int*** - 16:00

Venue : 6E

Authors : F. L. Traversa1, F. Bonani2, F. Cappelluti2, 1Autonomous University of Barcelona (UAB), Barcelona, Spain, 2Polytechnic University of Turin, Turin, Italy

Abstract : We present a novel numerical approach to compute the Floquet eigenvalues and eigenvectors associated to LS periodic limit cycles within the framework of harmonic balance. Numerical efficiency is attained transforming the large eigenvalue problem into a sequence of second order nonlinear systems whose size is of the same order as the standard harmonic balance problem. Through this technique the automatic tracing of bifurcation curves is easily implemented by means of continuation methods. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ A New Large-Signal Intermodulation and Spurious Analysis Tool (@ 6E)

Poster | | |

Part of poster session **-** ***Interacti*** ***Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : J. C. Pedro, L. C. Nunes, P. M. Lavrador, University of Aveiro, Aveiro, Portugal

Abstract : The aim of this work is to present an approximate analytical tool, valid in both small and large signal regimes, able to reveal the nonlinear distortion and spurious sources and their possible interactions. For that, the nonlinearities are no longer approximated by Taylor polynomials, as in Volterra series, but in piecewise linear functions for which the Chebyshev transform is known in analytical form. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ **THPE** : Interactive Forum (@ 6E)

Poster | |

Venue : 6E

▼ Design of Compact Multi-Band Microstrip Bandpass Filter Having Simultaneously Excited Passbands by Using Open-Circuited Stubs (@ 6E)

Poster | | |

Part of poster session **-** ***Interactive Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : A. K. Gorur, C. Karpuz, Pamukkale University, Denizli, Turkey

Abstract : Novel multi-band bandpass filter is designed with a meander loop resonator using open-circuited stubs. Proposed resonator can be used to design bandstop filter with two notch bands or quad-band bandpass filter. Quad-band bandpass filter includes two dual-mode and two single mode passbands. Degenerate modes of dual-mode passbands can be excited by only one perturbation element. A quad-band filter was fabricated and tested. Measured and simulated results are in a very good agreement. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Wide-Stopband Microstrip Quadruplexer Using Asymmetric Stepped-Impedance Resonators (@ 6E)

Poster | | |

Part of poster session **-** ***Interactive Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : W. Hung, K. Hsu, W. Tu, National Central University, Taoyuan, Taiwan

Abstract : A wide-stopband microstrip quadruplexer is presented in this paper. The quadruplexer consists of asymmetric SIRs and a distributed common feeding line. In order to increase the stopband bandwidth, the higher order resonant f the asymmetric SIRs are staggered by properly selecting impedance ratio K and length ratio ?. The four channels of the quadruplexer are designed at 1.5, 1.8, 2.1, and 2.4 GHz. The rejection level is greater than 20 dB up to 17.1 GHz. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ "Highly Selective, Compact Ultra-Wide Band Bandpass Filter Using a Novel Multiple Resonances Resonator (MRR)" (@ 6E)

Poster | | |

Part of poster session **-** ***Interactive Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : S. Khalid, W. P. Wen, L. Y. Cheong, PETRONAS University of Technology, Tronoh, Malaysia

Abstract : In this paper a high selective compact UWB bandpass filter has been designed using a novel multiple resonances resonator (MRR). Equivalent circuit has been extracted for the proposed single order MRR where the filtering function was derived, showing the feasibility of a maximum of six transmission poles in the passband. Finite frequency transmission zero was introduced by having a mixed coupling in the MRR structure, resulting in a compact UWB filter with high selectivity filtering response. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Miniaturized Wide Stopband Bandpass Filter Using In-Resonator Stub (@ 6E)

Poster | | |

Part of poster session **-** ***Interactive Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : P. Chu1, W. Hong1, K. Wu1,2, L. Dai1, 1Southeast University, NanJing, China, 2Ecole Polytechnique de Montreal, Montreal, Canada

Abstract : This paper proposes a novel in-resonator stub technology on designing wide stopband bandpass filter with miniaturized size. On having the wide stopband character, without obviously interfering with the resonance character of the embedded resonator, the design complexity and flexibility of the filter using in-resonator stub is not significantly affected comparing with classical filter design. A series of wide stopband bandpass filter using in-resonator stub are designed, fabricated, and measured. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Miniaturization of Hairpin Resonator Filters with Improved Harmonic Suppression by Using Lumped Capacitors (@ 6E)

Poster | | |

Part of poster session **-** ***Int*** ***Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : H. Hsu, C. Chiang, Yuan Ze University, ChungLi, Taiwan

Abstract : In this paper, we present a miniaturization technique of the hairpin resonator filters using lumped capacitors. Up to 80% reduction in overall area can be obtained when the unloaded resonator resonates at three times the desired operating frequency. In addition to the reduction in the overall area, an improved suppression of spurious harmonic responses was also achieved attributed to the higher operation frequency of the unloaded resonators. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

THPF : Interactive Forum (@ 6E)

Poster |

Venue : 6E

Design of a Tunable Bandpass Filter With the Assistance of Modified Parallel-Coupled Lines (@ 6E)

Poster |

Part of poster session - ***Interacti*** ***Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : C. Tseng1, C. Tang1, S. Chang1, Y. Lin2, 1National Chung Cheng University, Chia-Yi, Taiwan, 2Metal Industries Research Development Centre, Kaohsiung, Taiwan

Abstract : A tunable bandpass filter with a wide tuning range is presented. The proposed filter is composed of two modified parallel-coupled lines and one varactor-loaded stub. The measured results show that a broad tuning range of 41.7%, from 0.95 to 1.45 GHz, was achieved. Within the tuning range, the insertion loss is from 2.4 to 2.9 dB and the return loss is greater than 15dB. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

Band-Selective Interferer Rejection for Cognitive Receiver Protection (@ 6E)

Poster |

Part of poster session - ***Int*** - 16:00

Venue : 6E

Authors : S. Scott1, C. D. Nordquist2, J. Custer2, D. Leonhardt2, T. S. Jordan2, C. T. Rodenbeck2, 1Purdue University, West Lafayette, United States, 2Sandia National Laboratories, Albuquerque, United States

Abstract : The concept for a new, frequency-selective limiting filter is presented. The filter is capable of automatically-rejecting high-powered interferers within its band, but is not affected by high-powered signals out-of-band. This element enables a new architecture of passive cognitive filter banks capable of automatically-rejecting interferers, yet allowing signals of interest to pass. Measurements are performed up to 25 W and over 16 dB of isolation is demonstrated. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

A Novel Concept for Post-Fabrication Tuning of Microwave Filters (@ 6E)

Poster |

Part of poster session - ***Interactive Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : A. R. Sereshkeh, S. S. Attar, M. Azizi, R. R. Mansour, University of Waterloo, Waterloo, Canada

Abstract : A novel method for global post-fabrication tuning of microwave filters is presented. The method is based on designing and adding a compensating passive circuit in parallel with the detuned filter. This concept has several advantages over traditional techniques for filter tuning that use screws. It can be employed to filter structures that are not easily amenable to the use of tuning screws such as planar filters. The experimental results obtained demonstrate the validity of this concept. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

THPG : Interactive Forum (@ 6E)

Poster |

Venue : 6E

RF-Power GaN Transistors with Tunable BST Pre-Matching (@ 6E)

Poster |

Part of poster session - ***Int*** ***Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : O. Bengtsson1, H. Maune2, A. Wiens2, S. A. Chevtchenko1, R. Jakoby2, W. Heinrich1, 1Ferdinand-Braun-Institut (FBH), Berlin, Germany, 2Technical University Darmstadt, Darmstadt, Germany

Abstract : A thick-film Barium-Strontium-Titanate (BST) varactor is evaluated as gate pre-matching element for integration in discrete RF-power GaN-HEMTs. The tunable pre-matching is connected to the gate of a 2 mm GaN cell and characterized by load-pull measurements in the 2 to 3 GHz range. The assembly shows large tunable impedance range with low impact on power performance. At 2.0 GHz gain is reduced by 3.6 dB to 20 dB. The saturated output power at more than 37.8 dBm and the linearity are unaffected. less

Discussion (**0**) Attendees (**4**) Presentations (**0**)

Please Login to view Discussions

▼ Switching Reliability of Tunable Ferroelectric Resonators and Filters (@ 6E)

Poster | | |

Part of poster session **-** ***Interacti*** ***Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : V. Lee, S. Lee, S. A. Sis, A. Mortazawi, University of Michigan, Ann Arbor, United States

Abstract : Ferroelectric bulk acoustic wave resonators and filters have recently been demonstrated for applications such as switchable and tunable RF circuits. By apply , ferroelectric resonators switch on. Here, the switching reliability of intrinsically switchable barium strontium titanate based resonators and filters are investigated for the first time. Results show the devices can be switched on and off more than one billion cycles using 10 V pulses without any performance degradation. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ Design of a Magnetization Gradient Ferrite Substrate Integrated Waveguide Isolator to Mitigate Higher Order Mode Effects (@ 6E)

Poster | | |

Part of poster session **-** ***Interactive Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : S. Beguhn, X. Yang, N. X. Sun, Northeastern University, Boston, United States

Abstract : We demonstrate a new magnetization gradient ferrite approach to mitigate the insertion loss degradation effects of higher order modes in a substrate integrated waveguide isolator. Using a layered gradient magnetization ferrite structure to form a saturation magnetization profile, insertion losses were decreased. Measured insertion losses of the gradient isolator were ~0.1-1 dB compared to 2-4 dB of insertion loss using the nominal isolator. Both simulated and measured results are shown. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ **THPH** : Interactive Forum (@ 6E)

Poster | |

Venue : 6E

▼ On/Off Micro-Electromechanical Switching of AlN Piezoelectric Resonators (@ 6E)

Poster | | |

Part of poster session **-** ***Int*** ,06 13:30 **-** 16:00

Venue : 6E

Authors : C. D. Nordquist1, R. H. Olsson III1, D. W. Branch1, T. Pluym1, S. M. Scott2, V. Yarberry1, 1Sandia National Laboratories, Albuquerque, United States, 2Purdue University, West Lafayette, United States

Abstract : We have demonstrated the first MEMS-switched acoustic resonator as a building block for a new class of adaptive and reconfigurable RF f lters. The filters use a MEMS capacitive switch device to switch between an on-state in which the electrodes are closely coupled to the piezoelectric film and an off-state where the electrodes are separated from the film. The current resonator shows a Q of 170 and switching of 13 dB, with ongoing work to improve the Q and switching ratio of the device. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ **THPJ** : Interactive Forum (@ 6E) **Poster** | |

Venue : 6E

▼ A Simplified Approach to Predicting Negative Resistance in a Microwave Transistor with Series Feedback (@ 6E)

Poster | |

Part of poster session - ***Interactive Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : C. R. Poole, I. Darwazeh, University College London, London, United Kingdom

Abstract : A simple closed form equation is presented that predicts the value of series feedback reactance most likely to generate negative resistance at the input of a transistor, based solely on 2-port S-parameters of the device. This provides new insight into the effect of series feedback, and leads us to propose a general rule, namely that the series feedback reactance required to generate negative resistance depends on the sign of the imaginary part of the sum of the device 2-port S-parameters. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Multi-Band Linear Chirp Generation Based on a Type-III PLL (@ 6E)

Poster | |

Part of poster session - ***Interactive Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : J. Velner1, E. Klumperink1, B. Nauta1, F. van Vliet2, 1University of Twente, Enschede, Netherlands, 2TNO Technical Sciences, Den Haag, Netherlands

Abstract : A type-III PLL is used to generate linear frequency ramps with 386 kHz RMS frequency error in L-band (3088 kHz in X-band) and 10% fractional bandwidth. Pulse durations can be as low as 10 ?s without performance degradation. The system covers the L-, S-, C- and X-bands. A programmable output driver delivering ?17.9 to +4.9 dBm differentially is included on chip. The system is fully integrated using a 250 nm SiGe BiCMOS process. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ The Impact of Layout Dependent Str te Resistance on High Frequency Performance and Noise in Multifinger and Donut MOSFETs (@ 6E)

Poster | |

Part of poster session - ***Interacti Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : C. Ku, K. Yeh, J. Guo, National Chiao Tung University, Hsinchu, Taiwan

Abstract : Multifinger devices suffer mobility and gm degradation originated from STI stress. Donut device layout is proposed to eliminate STI transverse stress and increase gm. Both NMOS and PMOS can benefit f t layout, with higher fT. However, the layout dependence of gm and Rg becomes a critical trade-off in determining high frequency performance other than fT like fmax and RF noise. The impact of layout dependent effects on fT, fmax, and NFmin can provide a useful guideline for CMOS RF design. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ A 25-Gbps 8-ps/mm Transmission Line Based Interconnect for On-Chip Communications in Multi-Core Chips (@ 6E)

Poster | | |

Part of poster session - ***Int*** ***Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : J. Hu, J. Xu, M. Huang, H. Wu, University of Rochester, Rochester, United States

Abstract : This paper presents a novel on-chip interconnect system for multi-core chips using transmission lines as shared media. It supports both point-to-point and broadcasting communications. It offers significant advantages in circuit complexity, energy efficiency and link latency. A chip prototype with two 20mm long transmission lines running in parallel and multiple Tx/Rx was implemented in a 130nm SiGe BiCMOS.The prototype can achieve a date rate of 25.4Gb/s with an energy efficiency of 1.67pJ/b. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ **THPK** : Interactive Forum (@ 6E)

Poster | | |

Venue : 6E

▼ X-Band MMIC GaN Power Amplifiers Designed for High-Efficiency Supply-Modulated Transmitters (@ 6E)

Poster | | |

Part of poster session - ***Int*** ***ti*** ***Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : S. R. Schafer1, M. P. Litchfield1, A. Zai1, C. Campbell2, Z. Popovic1, 1University of Colorado, Boulder, United States, 2TriQuint Semiconductor, Richardson, United States

Abstract : The design and measured performance of X-band power amplifier MMICs that utilize 0.15um GaN on SiC process technology are presented. These MMICs demonstrate PAE from 45% to 69% and output powers from 2.5-13W. Designed for drain modulated applications, the power amplifiers maintain good performance at reduced drain bias voltage. The output power of the two stage MMIC can be varied from 2W to 13W when the drain bias is varied between 7.5V and 20V while maintaining a PAE above 54%. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ A 40 dBm High Voltage Broadband GaN Class J Power Amplifier for PoE Micro-Basestations (@ 6E)

Poster | | |

Part of poster session - ***Interactive Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : R. Ma1, S. Goswami2, K. Yamanaka3, Y. Komatsuzaki3, A. Ohta4, 1Mitsubishi Electric Corporation, Cambridge, United States, 2Massachusetts Institute of Technology (MIT) Lincoln Laboratory, Cambridge, United States, 3Mitsubishi Electric Corporation, Kamakura, Japan, 4Mitsubishi Electric Corporation, Itami, Japan

Abstract : A broadband, efficient RF power amplifier for 4G multi-standard micro-basestations is presented. With an optimized Class-J matching network and a new commercially available high voltage 10W GaN HEMT, output power around 40.5dBm is measured across 1.65-2.70GHz with 55-72% drain efficiency at 1-dB compression point under CW stimulus. To the authorâs knowledge, this is the first Class-J prototype operating at 47V, enabling power over ethernet applications without any external voltage regulation. less

Discussion (**0**) Attendees (**4**) Presentations (**0**)

Please Login to view Discussions

▼ A 44 dBm 1.0-3.0 GHz GaN Power Amplifier with over 45% PAE at 6 dB back-off (@ 6E)

Poster | | |

Part of poster session - ***Int*** ***Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : D. Gustafsson1, C. M. Andersson1, R. Hellberg2, C. Fager1, 1Chalmers University of Technology, Gothenburg, Sweden, 2Ericsson, Stockholm, Sweden

Abstract : In this paper we present a 1.0-3.0 GHz GaN power amplifier with significant back-off PAE enhancement. By using linear multi-harmonic calculations, with a practical combining network, the PA design was optimized for high efficiency with a 6.6 dB PAPR WCDMA signal over 108% fractional bandwidth. Measurements on the assembled circuit demonstrated 44 +/- 0.9 dBm maximum output power, and a drain efficiency and PAE at 6 dB OPBO larger than 48% and 45%, respectively. less

Discussion (**0**) Attendees (**4**) Presentations (**0**)

Please Login to view Discussions

▼ **THPL** : Interactive Forum (@ 6E) **Poster** |

Venue : 6E

▼ A Concurrent Dual-band/Multi-carrier Transmitter Architecture for Power and Efficiency Enhancement (@ 6E)

Poster |

Part of poster session - ***Interactive Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : S. Yamanouchi, K. Kunihiro, M. Ikekawa, NEC Corporation, Kawasaki, Japan

Abstract : This paper demonstrated a dual-band (DB)/multi-carrier (MC) transmitters (Tx) architecture to enhance output power and power-eff . The proposed Tx was comprised of concurrent DB/single-carrier power amplifiers (PAs) while a conventional Tx was comprised of single-band/MC PAs. The measured results demonstrated that the propose Tx exhibited higher output power and power-eff l Tx by 2.2 dB and 1.24 times with 2-carrier WCDMA signals at DB, respectively. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Order Reduction of Wideband Digital Predistorters Using Principal Component Analysis (@ 6E)

Poster |

Part of poster session - ***Interactive Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : P. L. Gilabert1, G. Montoro1, D. LÃ³pez2, N. Bartzoudis2, E. Bertran1, M. PayarÃ³2, A. Hourtane3, 1 Polytechnic University of Catalonia (UPC), Castelldefels, Spain, 2Centre Tecnologic de Telecomunicacions de Catalunya (CTTC), Castelldefels, Spain, 3Aviat Networks, Santa Clara, United States

Abstract : This paper presents how to apply order reduction in wide-band digital predistortion (DPD) linearizers using the principal component analysis (PCA) technique. By apply l parameters can be significantly reduced. Moreover, a strategy to minimize the computational cost of finding the optimal coefficients is also presented. A test-bed for evaluating the DPD linearization performance when PCA is applied was deployed to obtain the experimental result . less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Behavioral Modeling of Outphasing Amplifiers Considering Memory Effects (@ 6E)

Poster |

Part of poster session - ***Int ti Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : P. N. Landin1, J. Fritzin2,3, A. Alvandpour2, T. Eriksson4, 1University of Gavle, Gavle, Sweden, 2Linkoping University, Linkoping, Sweden, 3Ericsson, Stockholm, Sweden, 4Chalmers University of Technology, Gothenburg, Sweden

Abstract : Behavioral models for outphasing amplifiers are proposed and performance is evaluated on a class-D CMOS device. Performance compared with models found in the literature shows improvements in ACEPR of 5 dB by including memory. The proposed models are also linear in the parameters, unlike earlier models. The lower model errors enable the use and design of improved predistorters taking memory effects in outphasing amplifiers into account, and improves the understanding of the distortions. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ **THPM** : Interactive Forum (@ 6E) **Poster** |

Venue : 6E

▼ A Noise-Reducing 0.48 nJ/bit Interference-Robust Non-Coherent Energy Detection IR-UWB Receiver for Wireless Sensor Networks (@ 6E)

Poster |

Part of poster session - ***Interactive Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : S. Pourbagheri, K. Mayaram, T. Fiez, Oregon State University, Corvallis, United States

Abstract : A non-coherent interference-tolerant energy detection (ED) IR-UWB receiver with a front-end noise reduction technique is presented. By relaxing the LNA noise requirement, a reduction in power consumption is achieved without sacrificing performance. The fabricated prototype in a 130 nm CMOS process, achieves the best energy efficiency of 0.48 nJ/bit for ED receivers reported to date. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ A Novel Extraction Procedure to Determine the Noise Parameters of On-Wafer Devices (@ 6E)

Poster |

Part of poster session - ***Interactive Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : L. Boglione, Naval Research Laboratory (NRL), Washington, United States

Abstract : A new procedure for the extraction of noise parameters of on-wafer devices is presented. The procedure is based on the noise figure measurement of similar devices of different size and biased at constant drain current density Jds and constant VDS. Key to its implementation is a scalable noise model identified in the Pospieszalski noise model. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Parametric Conversion with Distributedly Modulated Capacitors (DMC) for Low-Noise and Non-Reciprocal RF Front-Ends (@ 6E)

Poster |

Part of poster session - ***Int ti Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : S. Qin, Y. E. Wang, University of California at Los Angeles, Los Angeles, United States

Abstract : Transmission lines with time-varying reactance exhibit parametric amplification and mixing. In this paper, such a transmission line realized with distributedly modulated capacitors (DMC) is demonstrated with its active conversion gain, low noise figure and non-reciprocity. Simulations show that 9 dB gain with below 0.5 dB noise figure over the input signal f
le. Experiments verify that greater than 13 dB isolation can be achieved from 0.5 ~ 1.8 GHz. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ **THPN** : Interactive Forum (@ 6E) **Poster** |

Venue : 6E

▼ AlGaN/GaN-based Variable Gain Amplifiers for W-band Operation (@ 6E)

Poster | | |

Part of poster session - ***Interactive Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : S. Diebold1, D. M ller1, D. Schwantuschke2, S. Wagner2, R. Quay2, T. Z , I. Kallfass3, 1Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany, 2Fraunhofer, Freiburg i. Br., Germany, 3University of Stuttgart, Stuttgart, Germany

Abstract : In this paper three versions of a variable gain amplifier MMIC are presented. They make use of 100nm gate-length AlGaN/GaN-based HEMTs grown on SiC. The MMICs operate at a centre-frequency of 94 GHz. Different phase compensation techniques are applied and their suitability for high frequency application is evaluated. We propose an additional phase compensation means leading to the best VGA version providing a high gain tuning range, a low phase variation and good power linearity. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ "A Reflected Power Isolator for a 10 kW, 28 GHz Gyrotron" (@ 6E)

Poster | | |

Part of poster session - ***Interacti Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : P. P. Woskov, Massachusetts Institute of Technology (MIT), Cambridge, United States

Abstract : An eff t reflected power isolator has been built for a 10 kW, 28 GHz gyrotron for operation with a circularly polarized beam. It makes use of a one-dimensional copper grill linear polarizer in a 4-port waveguide cross and a grooved mirror in a miter bend for transformations between linear and circular polarizations. The polarizers are implemented in 76 mm diameter corrugated aluminum waveguide with water loads. Backward power isolation is 25 dB with an insertion loss of ~0.3 dB. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ **THPP** : Interactive Forum (@ 6E)

Poster | |

Venue : 6E

▼ Tunable Photonic RF Generator for Dynamic Allocation and Multicast of 1.25 Gbps Channels in the 60 GHz Unlicensed Band (@ 6E)

Poster | | |

Part of poster session - ***Interactive Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : A. Lebedev, X. Pang, J. J. Vegas-Olmos, I. Tafur-Monroy, S. Forchhammer, Technical University of Denmark, Kongens Lyngby, Denmark

Abstract : We propose an approach for RF multicast and dynamic channel allocation inside the 60 GHz band. Channels can be allocated either in the optical remote node (RN) or in the central office (CO). We perform the replication of the original channel for multicast purposes where RN serves as a photonic RF generator for both channel allocation and multicast. Experimental demonstration is presented with bit error rate performance below 10^-9 after transmission through 22.8 km of standard single mode fiber. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Radio-Over-Fiber Technologies for Future Mobile Backhaul Supporting Cooperative Base Stations (@ 6E)

Poster | | |

Part of poster session - ***Interacti Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : Y. Yang, F. Li, C. Lim, A. Nirmalathas, The University of Melbourne, Parkville, Australia

Abstract : We propose and investigate radio-over-f logies for future mobile network incorporating base station cooperation schemes (CoMP). We experimentally demonstrate mobile backhauls for CoMP based on three previously proposed RoF technologies: traditional analog RF-over-fiber, digitized IF-over-f ling OBSAI/CPRI and digitized RF-over-fiber based on bandpass sampling. Experimental results demonstrate that 2 dB gain can be achieved for cell edge users. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

THPQ : Interactive Forum (@ 6E)

Poster |

Venue : 6E

Quantization Noise Cancelation Scheme for Digital Quadrature RF Pulse Encoding (@ 6E)

Poster |

Part of poster session **- *Int*** ***Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : H. A. Ruotsalainen, H. Arthaber, G. Magerl, Vienna University of Technology, Vienna, Austria

Abstract : Quadrature type digital radio frequency transmitters suffer from center frequency dependent quantization noise folding. In this paper, a new noise cancellation scheme is proposed that ideally mitigates the harmful distortion completely. In addition, a practical solution easily embedable in an existing modulator is given. The measurement results show up to 7 dB improvement in signal-to-noise-and-distortion ratio over a center frequency tuning range of 160 MHz using a 20 MHz LTE signal. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

THPR : Interactive Forum (@ 6E)

Poster |

Venue : 6E

Ultra-Wideband Microwave Ablation Therapy (UMAT) (@ 6E)

Poster |

Part of poster session **- *Interacti*** ***Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : E. E. Colebeck, E. Topsakal, Mississippi State University, Starkville, United States

Abstract : We present an alternative microwave (MW) ablation therapy, Ultra-wideband Microwave Ablation Therapy (UMAT), that can be used for treatment of various cancers. The technology relies on small sized ultra-wideband antennas that deliver power to the tissue with more than 90% power transmission efficiency from beginning to the end of the procedure. This technology provides superior results in terms of power usage, ablation time and zones. To validate the system we provide ex vivo animal experiments. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

A Ku-Band Miniaturized Microwave Ablation System Integrated on a Micromachined Silicon Applicator (@ 6E)

Poster |

Part of poster session **- *Interactive Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : K. Kim, N. Kim, S. Hwang, T. Seo, S. Lee, Y. Kim, Y. Kwon, Seoul National University, Seoul, Republic of Korea

Abstract : A fully integrated thermal ablation system on a micromachined applicator is developed for low-power hyperthermia at Ku-band. The applicator was fabricated using MEMS technology for miniaturization and integration with active circuits. A source module (VCO, driver, HPA) was implemented in MMICâs and integrated on the applicator platform together with a coupler and power detectors. In-vitro and in-v lation experiments have demonstrated effective heat generation for hyperthermia. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ **THPS** : Interactive Forum (@ 6E) **Poster** | | |

Venue : 6E

▼ Silicon Radio-Frequency Planar Nanofluidic Channels (@ 6E) **Poster** | | |

Part of poster session **-** ***Int*** ***Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : C. Song, J. Sun, Y. He, P. Wang, Clemson University Iemson, United States

Abstract : Ten-nanometer deep planar nanofluidic channels are designed, fabricated and characterized. Silicon microstrip lines are incorporated with nanofluidic channels to provide broadband radio frequency measurement capabilities so that materials in the channels can be investigated in a label-free and non-invasive manner. Deionized water in the 10 nm channels is tested to demonstrate operation of the devices. The techniques are promising to address electrical sensing and signal transduction issues. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Coplanar Waveguides with Sub-10 nm Gold Films (@ 6E) **Poster** | | |

Part of poster session **-** ***Interactive Forum*** on Jun,06 13:30 **-** 16:00

Venue : 6E

Authors : Y. He1, S. Wang1, R. Divan2, D. Rosenmann2, P. Wang1, 1Clemson University, Clemson, United States, 2Argonne National Laboratory, Argonne, United States

Abstract : Coplanar waveguides (CPWs) with sub-10 nm gold films are fabricated and characterized up to 40 GHz. Such film thickness is much thinner than the electron mean free path (MFP) of bulk gold. Pressure-induced surface deformation technique is developed to form 7 nm continuous films, which are thinner than the nominal percolation threshold of gold (i.e. 8 nm). The measured results show that such CPWs have less dispersion, but high loss when compared with thick metal CPWs. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Design and Assessment of Carbon-Nanotube-based Remote Links to Nanodevices (@ 6E) **Poster** | | |

Part of poster session **-** ***Int*** **-** 16:00

Venue : 6E

Authors : P. Franck2, D. Baillargeat1, B. K. Tay3, 1CINTRA, Singapore, Singapore, 2XLIM, Limoges Cedex, France, 3Nanyang Technological University, Singapore, Singapore

Abstract : We use 3D FEM simulation to study realistic designs of electrically-short carbon-nanotube-based antennas and their application to wireless on-chip communication. We describe a feasible planar dipole antenna made of carbon nanotubes aligned over a quartz substrate and our preliminary fabrication results. We extensively study the parameters involved in its design. From this study, an appropriate design is selected and studied in an antenna-to-antenna transmission link. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Graphene Etching by a Near-Field Scanning Microwave Microscope (@ 6E) **Poster** | | |

Part of poster session - ***Int*** ***Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : T. Monti1, A. DiDonato1, D. Mencarelli1, G. Venanzoni1, A. Morini1, I. Vlassiouk2, A. Tselev2, M. Farina1, 1Marche Polytechnic University, Ancona, Italy, 2Oak Ridge National Laboratory, Oak Ridge, United States

Abstract : We present a study of graphene flakes, deposited on copper foils by Chemical Vapor Deposition. We exploited a Near-Field Scanning Microwave Microscope, and investigated the impact of microwave power on the sample. From preliminary data, we found the possibility of inducing a localized destruction of the graphene by means of the Near-Field microwave probe. Through this effect we created a recognizable pattern on a flake. A discussion of the roles of concurrent physical phenomena is also presented less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ **THPT** : Interactive Forum (@ 6E) **Poster** | |

Venue : 6E

▼ Development of a Remote Wake Up System to Drastically Reduce Standby Power of Electronic Devices (@ 6E)

Poster | | |

Part of poster session - ***Interacti*** ***Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : F. Fezai1, C. Menudier1, M. Thevenot1, C. Vollaire2, V. Marian2, T. Monediere1, 1XLIM, Limoges, France, 2Ampere Laboratory, Lyon, France

Abstract : In this article we present a new concept to minimize standby power of electronic devices. The proposed technology is based on RF energy transfer and DC conversion to wake up an electronic device (T , home automation systems, etc.). In this work we present an integrated emitter and a receiver with suitable performances for home or industrial applications. This system covers the entire Industrial, Scientific and Medical (ISM) band between 2.4GHz and 2.48GHz. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Highly Efficient Wireless Energy Harvesting System using Metamaterial based Compact CP Antenna (@ 6E)

Poster | | |

Part of poster session - ***Interactive Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : K. Agarwal1, T. Mishra1, M. F. Karim2, N. Nasimuddin2, M. O. Chuen2, Y. X. Guo1, S. K. Panda1, 1National University of Singapore, Singapore, Singapore, 2A*STA , Singapore, Singapore

Abstract : This paper presents a highly efficient 2.4 GHz wireless energy harvesting system comprising of a metamaterial based circularly polarized (CP) antenna and a power management circuit. The measured axial ratio (boresight) is below 3-dB for the entire 2.40-2.48 GHz band and the 10-dB return loss band is from 2.35-2.49 GHz. The gain (boresight) of the antenna is around 4.6 dBic at 2.44 GHz. The overall efficiency of the proposed energy harvesting system is above 28%. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ **THPU** : Interactive Forum (@ 6E) **Poster** | |

Venue : 6E

▼ Random-Space Dimensionality Reduction Scheme for Expedient Analysis of Microwave Structures with Manufacturing Variability (@ 6E)

Poster | | |

Part of poster session - ***Interacti*** ***Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : J. S. Ochoa, A. C. Cangellaris, University of Illinois at Urbana-Champaign, Urbana, United States

Abstract : A dimensionality reduction scheme is presented for the expedient statistical analysis of microwave structures exhibiting manufacturing variability in geometric and electrical parameters. In the proposed approach, the computational complexity of the high-dimensional random space that is often necessary to describe the stochastic electromagnetic boundary-value problem is mitigated by employing a principal component analysis with sensitivity assessment. less

Discussion (**0**) Attendees (**0**) Presentations (**1**)

Please Login to view Discussions

▼ On-Orbit Verification of an LTCC Double Flip-Chip Packaging Concept in an S-/K-Band Satellite Transponder (@ 6E)

Poster | | |

Part of poster session - ***Int ti Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : S. Brosius1, C. Friesicke1, T. Baras2, A. Molke3, A. F. Jacob1, 1Technical University of Hamburg-Harburg, Hamburg, Germany, 2Cassidian, Ulm, Germany, 3Vectron International, Teltow, Germany

Abstract : The on-orbit verification of a double flip-chip packaging concept using low temperature co-f (LTCC) technology is presented. Modules based on this concept were designed, fabricated, and assembled as a transparent satellite transponder system. The success of the satellite mission is demonstrated by the presented result live communication link between the ground station and the experimental payload. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Millimeter-wave Multi-Chip Module for GaN MMIC Tr Itilayer Ceramics Technology (@ 6E)

Poster | | |

Part of poster session - ***Interacti Forum*** on Jun,06 13:30 - 16:00

Venue : 6E

Authors : S. Masuda, M. Yamada, Y. Kamada, S. Ozaki, K. Makiyama, N. Okamoto, K. Imanishi, T. Kikkawa, H. Shigematsu, Fujitsu Laboratories Ltd., Atsugi, Japan

Abstract : This paper presents a multi-chip module (MCM) suitable for GaN monolithic microwave integrated circuit transceivers. The MCM has an embedded heat sink and novel radio frequency interface structure fabricated using multilayer ceramics technology. The novel interface widens the bandwidth and improves insertion loss operating up to millimeter-wave frequencies. A fabricated transceiver MCM occupying only 12 Ã 36 mm2 is also demonstrated with a GaN power amplifier. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

13:50 - 15:30

▼ **TH3A** : Efficiency Enhancement Techniques for Single and Multi-Mode Power Amplifiers (@ 608/609) **Technical** | |

Venue : 608/609

Chair : Wayne Kennan, "M/A COM Technology Solutions, Inc."

Co-Chair : Yusuke Tajima, Auriga Microwave

Abstract : In this session we demonstrate state of the art power amplifier performance using several techniques such as Doherty, Class D amplification, Carrier Phase-Burst transmission, and Envelope Tracking.

▼ GaN MMIC Doherty Power Amplifier Solutions for Backhaul Microwave Links (@ 608/609) **Paper** | | |

Part of technical session - ***Efficiency Enhancement Techniques for Single and Mult -Mode Power Amplifiers*** on Jun,06 13:50 - 15:30

Venue : 608/609

Authors : V. Camarchia1, P. Colantonio2, T. Emanuelsson3, G. Ghione1, F. Giannini2, R. GiofrÃ¨2, L. Piazzon2, M. Pirola1, R. Quaglia1, T. Wegeland3, 1Polytechnic University of Turin, Torino, Italy, 2University of Rome Tor Vergata, Roma, Italy, 3Ericsson , M Indal, Sweden

Abstract : Two 5W power amplifier solutions for microwave backhaul at 7 GHz are presented. They are based on 0.25 um GaN on SiC MMIC technology, and rely on advanced Doherty schemes. The first solution maximizes the back-off eff frequency, reaching a value around 50% at 7dB OBO. The second is optimized for a wideband behavior, with efficiency exceeding 40% on a 15% bandwidth. Characterization results and system level behavior of the two proposed MMICs are compared and discussed. less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

Please Login to view Discussions

▼ Design of a Concurrent Quad-band GaN-HEMT Doherty Power Amplifier for Wireless Applications (@ 608/609) **Paper** | | |

Part of technical session **- *Efficiency Enhancement Techniques for Single and Mult*** ,06 13:50 - 15:30

Venue : 608/609

Authors : X. A. Nghiem, R. Negra, RWTH Aachen University, Aachen, Germany

Abstract : The paper presents the design and measured results of a quad-band Doherty power amplifier for concurrent operation in the 900 MHz, 1.5 GHz, 2.1 GHz and 2.6 GHz frequency bands. In this work, a newly developed multiband IIN is introduced, enabling the realisation of multiband DPAs. The design concept can theoretically be applied for a large number of f . To the best of our knowledge, this is the first time a quad-band concurrent DPA has been successfully designed and implemented. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ A Dual-Band Voltage-Mode Class-D PA for 0.8/1.8 GHz Applications (@ 608/609) **Paper** | | |

Part of technical session **- *Efficiency Enhancement Techniques for Single and Mult -Mode Power Amplifiers*** on Jun,06 13:50 - 15:30

Venue : 608/609

Authors : A. Wentzel, S. Chevtchenko, P. Kurpas, W. Heinrich, Ferdinand-Braun-Institut (FBH), Berlin, Germany

Abstract : This paper presents a compact dual-band voltage-mode class-D PA module suitable for the LTE frequency bands at 0.8/1.8 GHz. It uses a GaN PA MMIC and a hybrid dual-band filter. The PA can handle various pulse-mode or digital modulation schemes. For a PWM input signal the PA achieves a maximum Pout of 5.4 W at 0.85 GHz and 4.3 W at 1.8 GHz. Peak drain efficiency is 84% and 54% for 0.85 GHz and 1.8 GHz, respectively. At 6 dB back-off, efficiencies of 40% (0.85 GHz) and 25% (1.8 GHz) are obtained. less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

Please Login to view Discussions

▼ RF Carrier Phase-Burst Transmitter (@ 608/609) **Paper** | | |

Part of technical session **- *Efficiency Enhancement Techniques for Single and Multi-Mode Power Amplifiers*** on Jun,06 13:50 - 15:30

Venue : 608/609

Authors : S. C. Pires, P. M. Cabral, J. C. Pedro, University of Aveiro, Aveiro, Portugal

Abstract : RF carrier-burst T transistor implementation, often in Class-D. We report a significant change to this traditional architecture. Now the phase modulated carrier is always on â and thus allowing a single transistor implementation â but where the amplitude is impressed into the carrier phase according to a bi-phase code. A proof-of-concept prototype tested with a CDMA2000 signal achieved 59% of average efficiency and more than 34dBc of ACPR for an integrated output power of 24.7 dBm. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ A Digitally-Controlled Hybrid Envelope Amplifier for LTE Envelope Tr lar Tr ters (@ 608/609) **Paper** | | |

Part of technical session - ***Efficiency Enhancement Techniques for Single and Mult lifiers*** on Jun,06 13:50 - 15:30

Venue : 608/609

Authors : M. Hassan1, U. Saeed2, 1Qualcomm Technologies Inc., San Diego, United States, 2General Electric Company, Florence, United States

Abstract : A wideband CMOS envelope amplifier to improve the overall efficiency of envelope tracking RF PAs is presented. It consists of parallel linear and switching amplifiers. To maximize the overall efficiency, time delay between linear and switching amplifier currents is minimized using digital control working along with analog hysteretic feedback control. Implemented in 0.18? m CMOS process, it achieves an efficiency of 79% at 29 dBm average output power for 20MHz 6.9dB PAPR LTE signal. less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

Please Login to view Discussions

▼ **TH3B** : Non-Planar Filters (@ 606/607) **Technical** | |

Venue : 606/607

Chair : Simone Bastioli, RS Microwave Company

Co-Chair : Miguel Laso, Public University of Navarre

Abstract : Unique non-planar filters and multiplexers are presented in this session. Advanced synthesis and implementation techniques are discussed. Directional filters, pseudoelliptic evanescent mode filters using nonresonating modes, as well as high power handling waveguide filters with wide spurious free stopband are introduced. The session includes complex systems employing multiple filters for satellites and base stations, as well as spatial f ltering structures for antenna radome applications. Also, new technologies such as the groove gap waveguide are introduced for the design of high frequency filters. less

▼ Transversal Directional Filters for Channel Combining (@ 606/607) **Paper** | | |

Part of technical session - ***Non-Planar Filters*** on Jun,06 13:50 - 15:30

Venue : 606/607

Authors : I. C. Hunter1, E. Musonda1, R. Parry2, M. Guess2, M. Meng1, 1University of Leeds, Leeds, United Kingdom, 2Radio Design Ltd, Shipley, United Kingdom

Abstract : A new concept for the design of power combiners based on matched directional filters is presented. The directional filters consist of individual balanced sections corresponding to a pole of an all-pass function composed of the sum of S11 and S12 of the desired filter transfer function. A simple synthesis method is presented. The filter combiner has advantages of ease of tunability and that no cross couplings are required to realize finite frequency transmission zeros. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ Evanescent Mode Filters Using Strongly-Coupled Resonator Pairs (@ 606/607) **Paper** | | |

Part of technical session - ***Non-Planar Filters*** on Jun,06 13:50 - 15:30

Venue : 606/607

Authors : S. Bastioli, R. V. Snyder, RS Microwave Company Inc, Butler, United States

Abstract : A new technique for the realization of evanescent mode filters with in-line configuration and pseudoelliptic response is presented in this paper. The basic element of the proposed filters is the strongly-coupled resonator pair (SCRP) embedded between two outer standard resonators. The experimental result of a 9th order filter employing two SCRPs for the realization of as many transmission zeros validates the proposed approach. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Ka-Band Dual Multiplexer with a Connected Channel (@ 606/607)

Paper | | |

Part of technical session - ***Non-Planar Filters*** on Jun,06 13:50 - 15:30

Venue : 606/607

Authors : Q. Shi, M. Yu, COM DEV Ltd, Cambridge, Canada

Abstract : A new Ka-band dual multiplexer is presented, in which a channel f lter is connected with two manifolds. The synthesis uses a network model combined with space mapping optimization technique with EM tools. The design procedures are included in this paper. The optimized dimensions and the simulated results are presented. The dual multiplexer is fabricated and tested. The tested results are in very good agreement with the simulated results. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Design and Realization of Filtering Units in a Triple-Band Mast Head Amplifier System for BTS of Mobile Communications (@ 606/607) **Paper** | | |

Part of technical session - ***Non-Planar Filt*** - 15:30

Venue : 606/607

Authors : S. Tamiazzo1, G. Macchiarella2, 1Commoscope, Agrate Brianza, Italy, 2Polytechnic University of Milan, Milano, Italy

Abstract : In this paper the design and realization of the filters included into a Mast Head Amplifier (MHA) for base stations (BTS) is discussed. This device allows to improve the overall noise figure of the BTS transceiver by connecting the low noise amplifier at the antenna output, so eliminating the contribute of noise produced by the feeding cable. The task of the filtering units is to separate/recombine TX and RX paths at the antenna port, allowing the use of a single antenna by the transceiver less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ A Novel Band-Pass Filter Topology for Millimeter-Wave Applications Based on the Groove Gap Waveguide (@ 606/607) **Paper** | | |

Part of technical session - ***Non-Planar Filters*** on Jun,06 13:50 - 15:30

Venue : 606/607

Authors : A. DelOlmo-Olmeda, M. Baquero-Escudero, V. Boria-Esbert, A. Valero-Nogueira, A. J. Berenguer-Verdu, Polytechnic University of Valencia, Valencia, Spain

Abstract : In this paper a new type of band-pass filters for high frequency applications (40 GHz and beyond), with very good electrical performance and enhanced manufacturing flexibility, is demonstrated. These filter structures are based on the recently proposed groove gap waveguide. This means that neither electrical contact nor alignment between the two metal blocks are required. A 4th order band-pass filter operating at 40 GHz has been designed, manufactured and verified with experimental result . less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ An Alternative Technique in Designing a Low-Profile Two-Pole Bandpass Fr lective Surface (FSS) using Aperture Coupling Interlayer (@ 606/607) **Paper** | | |

Part of technical session - ***Non-Planar Filt*** - 15:30

Venue : 606/607

Authors : J. Choi, J. S. Sun, T. Itoh, University of California at Los Angeles, Los Angeles, United States

Abstract : This paper presents an alternative design approach for low-profile, two-pole bandpass FSS using an aperture-coupling interlayer. In addition to this proposed method in providing close spacing between the FSS layer, miniaturized complementary Jerusalem cross shaped FSS is used to further maintain a robust filtering response to oblique-angled plane waves. The proposed technique is not limited to a particular FSS shape and can be applied for arbitrary separation between the FSS layers. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Multipactor-Resistant Low-Pass Harmonic Filter th Wide-Band Higher-Order Mode Suppression (@ 606/607) **Paper** | | |

Part of technical session **-** ***Non-Planar Filters*** on Jun,06 13:50 **-** 15:30

Venue : 606/607

Authors : I. Arregui1, F. Teberio1, I. Arnedo1, A. Lujambio1, M. Chudzik1, D. Benito1, T. Lopetegi1, R. Jost2, F. J. GÃ¶rtz2, J. Gil3, C. Vicente3, B. Gimeno4, V. Boria-Esbert5, D. Raboso6, M. A. G. Laso1, 1Public University of Navarre, Pamplona, Spain, 2Tesat-Spacecom , Backnang, Germany, 3 Aurora Software and Testing, S. L., Valencia, Spain, 4University of Valencia, Valencia, Spain, 5Polytechnic University of Valencia, Valencia, Spain, 6European Space Agency, Valencia, Spain

Abstract : A multipactor analysis of a new type of high-power low-pass harmonic filter in rectangular waveguide technology with suppression of the fundamental and all higher-order modes over a wide band is performed. Although much larger minimum mechanical gaps than the ones achieved with classical techniques can be accomplished, the smooth profile of the novel filter is enough to obtain a dramatic increase in the power-handling capability. This is proved by high-power simulations and measurements. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ **TH3C** : Active and Passive Integrated Apertures for Phased-Array Antennas and Power Combiners (@ 602/604) **Technical** | |

Venue : 602/604

Chair : Ethan Wang, UCLA

Co-Chair : Roberto Vincenti Gatti, University of Perugia

Abstract : This session presents the most recent advances in reconfigurable antennas and phased arrays. Novel active integrated arrays on the wafer scale and key components and modules in phased array systems over a broad range of f ll be reported as well as innovative architectures and implementations of passive antenna arrays. The utilization of new manufacturing technologies will be emphasized. less

▼ A Two-Dimensional Direct-Coupled Standing-Wave Oscillator Array (@ 602/604) **Paper** | | |

Part of technical session **-** ***Active and Passive Integrated Apertu*** **-** 15:30

Venue : 602/604

Authors : Y. Chen, T. Chu, National Tsing Hua University, Hsinchu, Taiwan

Abstract : This paper presents a 2-D direct-coupled standing wave oscillator (SWO) array implemented in a 90nm CMOS technology with 61.5GHz oscillation frequency. The SWO array can provide synchronous signals with identical frequencies, amplitudes, and phases at multiple locations over a chip. The reported SWO array is a reticular structure in a plane, and therefore it can be extended in two dimensions periodically in a CMOS process. Wireless measurement is utilized to verify the synchronicity of the SWO. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ An RF Module Including a Signal Generator for a Flexible and Accurate APAA (@ 602/604) **Paper** | | |

Part of technical session **-** ***Active and Passive Integrated Apertures for Phased-Array Antennas and Power Combiners*** on Jun,06 13:50 **-** 15:30

Venue : 602/604

Authors : H. Nakamizo, K. Tajima, Y. Takahashi, T. Owada, E. Taniguchi, K. Kawakami, M. Shimozawa, M. Hieda, R. Hayashi, M. Nakayama, Y. Hirano, I. Chiba, Mitsubishi Electric Corporation, Kamakura, Japan

Abstract : This paper presents an RF module including a signal generator for an APAA. By generating an RF signal independently in each module and sharing them among antenna arrays, the APAA realizes multi-f lti-modulation beam forming simultaneously. The RF module measures the output RF signal of itself to compensate errors of output timing, amplitude and phase of the RF signals between multiple RF modules. The proposed RF module is fabricated with SiGe-ICs and evaluated by measurements. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ A Novel Miniaturized Polarization Orthogonalizing Active Retrodirective Antenna Array for Satellite Use (@ 602/604) **Paper** | | |

Part of technical session - ***Active and Passive Integrated Apertures for Phased-Array Antennas and Power Combiners*** on Jun,06 13:50 - 15:30

Venue : 602/604

Authors : C. M. Wu1, J. Choi1, S. Kawasaki2, T. Itoh1, 1University of California at Los Angeles, Los Angeles, United States, 2Japan Aerospace Exploration Agency, Chu-oh Sagamihara, Japan

Abstract : In this work, we propose an active retrodirective antenna (RDA) array with polarization orthogonalizing features that uses only single antenna to transmit and receive in unit element. Hence this arrangement substantially reduces the size of the RDA and makes it feasible to be further implemented into a 2D array. The RDA array is able to retransmit the signal to the interrogator location with the signal that is orthogonally polarized to the interrogating signal. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ Ultra-Wideband Dual-Circularly Polarized Array with Simple Cost-Effective Feeding Network (@ 602/604) **Paper** | | |

Part of technical session - ***Active and Passive Integrated Apertures for Phased-Array Antennas and Power Combiners*** on Jun,06 13:50 - 15:30

Venue : 602/604

Authors : M. A. Elmansouri, D. S. Filipovic, University of Colorado, Boulder, United States

Abstract : A dual-circularly polarized hexagonal array operating over multi-octave bandwidth with cost-effective feeding network is presented. A four-arm spiral antenna with two planar Klopfenstein microstrip feeds is used as a unit cell. The 7-element array is fed by two 7-way power dividers and a single 90Â° hybrid. The used feeding network in conjunction with fundamental properties of a four-arm spiral supports left and right hand circularly polarized operation over more than 3:1 bandwidth. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ 60 GHz Circularly-Polarized Smart Antenna System for High Throughput Two-Dimensional Scan Cognitive Radio (@ 602/604) **Paper** | | |

Part of technical session - ***Active and Passive Integrated Apertures for Phased-Array Antennas and Power Combiners*** on Jun,06 13:50 - 15:30

Venue : 602/604

Authors : A. B. Guntupalli, K. Wu, Ecole Polytechnique de Montreal, Montreal, Canada

Abstract : This work presents a novel technique to design fixed beam-forming smart antenna with four independent orthogonal beams. Vertical interconnect proposed in substrate integrated waveguide (SIW) technology is used to design the space saving beam-forming network. For each input port, 60 GHz right hand circularly polarized smart antenna gain is measured as 13 dBc.The designed V-band smart antenna system with scanned patterns will satisfy todayâs cognitive radio front-end requirements. less

Discussion (**0**) Attendees (**4**) Presentations (**0**)

Please Login to view Discussions

▼ A Liquid-Metal Reconfigurable Yagi-Uda Monopole Array (@ 602/604) **Paper** | | |

Part of technical session - ***Active and Passive Integrated Apertures for Phased-Array Antennas and Power Combiners*** on Jun,06 13:50 - 15:30

Venue : 602/604

Authors : C. K. Y. Kitamura, A. M. Morishita, T. F. Chun, W. G. Tonaki, A. T. Ohta, W. A. Shiroma, University of Hawaii at Manoa, Honolulu, United States

Abstract : A liquid-metal reconfigurable Yagi-Uda monopole array is presented. The three-element array consists of driven and parasitic elements whose lengths can be tuned with pressure-driven liquid metal, resulting in an array in which directors can be transformed into reflectors, and in which elements can be tuned to different frequencies. The measured radiation patterns demonstrate single-axis beam steering at multiple operational f .95 to 4.11 GHz. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ Synthesis of a Tr lling Wave Slotted Substr te Integrated Waveguide (SIW) Array with Dual-Circular Polarization (@ 602/604) **Paper** | | |

Part of technical session - ***Active and Passive Integrated Apertures for Phased-Array Antennas and Power Combiners*** on Jun,06 13:50 - 15:30

Venue : 602/604

Authors : S. Yang1, A. E. Fathy1, S. Suleiman2, 1The University of Tennessee, Knoxville, United States, 2Winegard Company, Burlington, United States

Abstract : A synthesis procedure for travelling wave slotted SIW array design is introduced, where the optimum slot parameter combination and number of slots per radiating SIW can be derived for a given beam tilt angle and slot coupling factor numerically using a step-by-step approximate recipe. Slot lengths tapered with optimum distribution can provide almost the same gain and significant improvement in side lobe levels as compared to the uniform slot array. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ **TH3D** : Innovative Measurements Across the Spectrum (RF to THz) (@ 605/610) **Technical** | |

Venue : 605/610

Chair : David Blackham, Agilent Technologies

Co-Chair : Michael Janezic, NIST

Abstract : This session begins with a focus on nondestructive and free-space measurement techniques for measuring the dielectric properties of materials at microwave and millimeter-wave frequencies. The first paper summarizes a unique multi-angle reflection ellipsometer to measure materials at W-band, and the second paper investigates how improved measurements of resonant frequency and quality factor can lead to more accurate material measurements. The second half of the session focuses on non-traditional applications of reflectometers. In one case, a seven-port reflectometer is demonstrated at 300 GHz, while the other paper outlines how a dual-tone six-port reflectometer can be used to extend the measurement range. less

▼ Space-Resolved Measurement and 2D-Mapping of Material Parameters Using Multi-Angle Reflection Ellipsometry in W-Band (@ 605/610) **Paper** | | |

Part of technical session - ***Innovati ts Across the Spectrum (RF to THz)*** on Jun,06 13:50 - 15:30

Venue : 605/610

Authors : A. Cenanovic, L. P. Schmidt, University of Erlangen-Nuremberg, Erlangen, Germany

Abstract : A free-space method is presented for space-resolved measurement of the relative permittivity and thickness of dielectric sheets in the W-band. The reflection of parallel and perpendicularly polarized waves from the sample is measured with a polarimetric linear array. Synthetic aperture focusing of the raw data is performed, in order to obtain space-resolved reflection coefficients, from which the material parameters are determined using spectroscopic multi-angle reflection ellipsometry. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Accurate Permittivity Measurements with a Coaxial Resonator Independently of Coupling Level (@ 605/610) **Paper** | | |

Part of technical session - ***Innovati ts Across the Spectrum (RF t z)*** on Jun,06 13:50 - 15:30

Venue : 605/610

Authors : B. Garcia-Banos, A. J. Canos, J. M. Catala-Civera, P. J. Plaza-Gonzalez, Polytechnic University of Valencia, Valencia, Spain

Abstract : A new method to deembed the unloaded resonance frequency of a coaxial resonator is described, which allows to correct the effects of the feeding network. The adequate resolution of the coupling network effect leads to accurate results for

materials in a wide range of permittivities and losses, without any restriction in the coupling factor applied. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Terahertz 7-port Reflectometer for S-parameter Measurements (@ 605/610) **Paper** | | |

Part of technical session - ***Innovative Measurements Across the Spectrum (RF to THz)*** on Jun,06 13:50 - 15:30

Venue : 605/610

Authors : J. Yao, M. C. Wah, A*STA

7-port structure for terahertz reflectometer is proposed and analyzed. Our structure for 7-port reflectometer can be designed and fabricated more easily at terahertz, as compared with traditional 6 or 7 port reflectometers and achieved near-perfect phasor distribution. Our 300 GHz reflectometer was fabricated and validated with performances with VNA. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Dual Tone Approach for Unambiguous Six-Port Based Interferometric Distance Measurements (@ 605/610) **Paper** | | |

Part of technical session - ***Innovative Measurements Across the Spectrum (RF t THz)*** on Jun,06 13:50 - 15:30

Venue : 605/610

Authors : S. Lindner, G. Vinci, F. Barbon, S. Mann, R. Weigel, A. Koelpin, University of Erlangen-Nuremberg, Erlangen, Germany

Abstract : This publication shows an approach for absolute, unambiguous distance measurement with a Six-Port radar at 24GHz. Such an interferometric radar has the drawback of ambiguity problem concerning phase, limiting the measuring distance to half of the RF wavelength. This can be solved with the presented two-tone system using a beat frequency between two tones to determine a position within several wavelengths. This system will be presented along with simulations and measurements proving the concept. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ **TH3E** : Emerging Integrated Circuit Technologies for Millimeter-wave and THz Applications (@ 615/617) **Technical** | |

Venue : 615/617

Chair : Shahed Reza, Raytheon Company

Co-Chair : Theodore Reck, Jet Propulsion Laboratory (JPL)

Abstract : This session includes papers demonstrating new integrated circuit technologies for millimeter-wave and THz applications. The session begins with a pair of papers that present millimeter-wave transitions between microstrip and substrate-integrated waveguides on LCP and LTCC, respectively. The session then moves up in frequency to W-band with the development of a high responsivity detector integrated with a folded-dipole antenna. The session ends with micromachined couplers and phase shifters from 200 to 700 GHz. less

▼ A Millimeter-Wave Tr former between Microstrip Line and Flexible Post-Wall Waveguide on Liquid Crystal Polymer Substrates (@ 615/617) **Paper** | | |

Part of technical session - ***Emerging Integrated Circuit Technologies for Millimeter-wave and THz Applications*** on Jun,06 13:50 - 15:30

Venue : 615/617

Authors : Y. Uemichi1, R. Hosono2, N. Guan2, J. Hirokawa3, M. Ando3, 1Fujikura Ltd., Sakura, Japan, 2Fujikura Ltd., Sakura, Japan, 3Tokyo Institute of Technology, Meguro-ku, Japan

Abstract : We propose a simple?transformer between microstrip line and flexible post-wall waveguide fabricated on liquid-crystal polymer substrates. Matching to 50 ? impedance is accomplished by a combination of blind-via and microstrip-elements. The estimated loss of the transformer associated with the mode conversion and the measured loss of the PWW is 0.6 dB and 0.9 dB/mm at 60 GHz, respectively. We also found out that the transmission property of the PWW for bending remains unchanged. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ SIW Based Multilayer Transition and Power Divider in LTCC Technology (@ 615/617) **Paper** | | |

Part of technical session - ***Emerging Integrated Circuit Technologies for Millimeter-wave and THz Applications*** on Jun,06 13:50 - 15:30

Venue : 615/617

Authors : H. Abuzaid2, A. Doghri1, K. Wu1, A. Shamim2, 1 Ecole Polytechnique de Montreal, Montreal, Canada, 2King Abdullah University of Science & Technology (KAUST), Thuwal, Saudi Arabia

Abstract : A multilayer transition and balanced power divider are presented for millimeter-wave systems. They operate at Ka-band (35 GHz) and exploit the substrate integrate waveguide (SIW) technology with its shielding characteristics and the Low-temperature co-fired ceramics (LTCC) technology for its high density integration. A coupling slot has been used to perform vertical integration, which can be easily optimized through its length. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Highly Responsive Planar Millimeter Wave Zero-Bias Schottky Detector with Impedance Matched Folded Dipole Antenna (@ 615/617) **Paper** | | |

Part of technical session - ***Emerging Integrated Circuit Technologies for Millimeter-wave and THz Applications*** on Jun,06 13:50 - 15:30

Venue : 615/617

Authors : M. Hoefle1,2, K. Haehnsen1, I. Oprea2, O. Cojocari2, A. Penirschke1, R. Jakoby1, Technical University Darmstadt, Darmstadt, Germany, 2ACST GmbH, Darmstadt, Germany

Abstract : A compact highly responsive planar zero-bias Schottky detector is proposed for uni-planar and low-cost fabrication. Various zero-bias Schottky diodes are investigated, in particular the optimization of impedance matching by the antenna design itself. The realized folded dipole based detector demonstrates an outstanding system voltage responsivity of 7,079 mV/mW at 86 GHz without lenses or pre-amplification. less

Discussion (**0**) Attendees (**2**) Presentations (**0**)

Please Login to view Discussions

▼ A 330-500GHz Micro-Machined Directional Coupler (@ 615/617) **Paper** | | |

Part of technical session - ***Emerging Integrated Circuit Technologies for Millimeter-wave and THz Applications*** on Jun,06 13:50 - 15:30

Venue : 615/617

Authors : J. T. Do1, Q. Yu2, J. L. Hesler1, N. S. Barker2, 1Virginia Diodes Inc., Charlottesville, United States, 2University of Virginia, Charlottesville, United States

Abstract : A 330-500GHz directional coupler is demonstrated. The coupling is achieved by parallel quarter-wavelength gold beams suspended in air over a silicon substrate. The circuit was designed in an 'H' shape in order to transition to low loss rectangular waveguide. We present the design, fabrication and analysis of a WR2.2 coupler with 4dB insertion loss, 10dB coupling factor and 20dB minimum isolation. The techniques we describe can be employed to design high performance, low cost THz components. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ A Tandem Coupler for Terahertz Integrated Circuits (@ 615/617) **Paper** | | |

Part of technical session - ***Emerging Integrated Circuit Technologies for Millimeter-wave and THz Applications*** on Jun,06 13:50 - 15:30

Venue : 615/617

Authors : T. J. Reck1, B. Gorespe2, W. Deal2, G. Chattopadhyay1, 1Jet Propulsion Laboratory (JPL), Pasadena, United States,

2Northrop Grumman Corporation, Redondo Beach, United States

Abstract : A coplanar waveguide 3 dB quadrature coupler operating from 500 to 700 GHz is designed, fabricated and measured. On-wafer measurements demonstrate an amplitude balance of Â±2 dB and phase balance of Â±20 deg.

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ A 200 GHz GaAs Schottky-Diode Phase Shifter Integrated on a Silicon-on-Insulator Substr te (@ 615/617) **Paper |** | |

Part of technical session - ***Emerging Integrated Circuit Technologies for Millimeter-wave and THz Applications*** on Jun,06 13:50 - 15:30

Venue : 615/617

Authors : N. Alijabbari, R. Weikle, University of Virginia, Charlottesville, United States

Abstract : A planar GaAs based Schottky-diode phase-shifter, fabricated on a silicon-on-insulator (SOI) substrate is described. To the best of the authorsâ knowledge, this is the first time an integrated Schottky diode circuit has been fabricated monolithically from GaAs and bonded to SOI. In this work, GaAs is bonded to SOI and processed to realize a fully integrated submillimeter wave phase shifter. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ **TH3F** : Tr -Line Metamaterial Elements and Applications (@ 618/620) **Technical |** |

Venue : 618/620

Chair : Victor Fouad Hanna, Universiy Pierre et Marie Curie - Sorbonne Univer.

Co-Chair : Jan Machac, Technical University of Prague

Abstract : This session presents several exciting elements based on or inspired by metamaterial transmission lines and their applications. The first paper in the session presents a method for realizing stable non-Foster elements using active negative-group-delay resonators and potential applications. The second paper presents novel metamaterial-based resonators loading a transmission line for angular motion sensing. The third paper presents a dual-band leaky-wave antenna based on a CRLH transmission line. The fourth paper outlines a novel quadruplexer based on a double-Lorentz transmission line. The fifth paper discusses a forward-wave coupled-line coupler with arbitrary coupling using artificial transmission lines. less

▼ Unilateral Non-Foster Elements Using Loss-Compensated Negative-Group-Delay Networks for Guided-Wave Applications (@ 618/620) **Paper |** | |

Part of technical session - ***Transmission-Line Metamaterial E ts and Applications*** on Jun,06 13:50 - 15:30

Venue : 618/620

Authors : H. Mirzaei, G. V. Eleftheriades, University of Toronto, Toronto, Canada

Abstract : An analogy is demonstrated between negative group delay (NGD) networks and non-Foster reactive elements in the way they influence a propagating wave. Based on this analogy, a novel method for the design of non-Foster elements using NGD networks is proposed which is based on wave propagation theory and dispersion engineering, as opposed to the traditional methods which are based on network theory. This method provides a way around the challenging stability problems of the traditional designs. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Transmission Lines Loaded with Bisymmetric Resonators and Applications (@ 618/620) **Paper |** | |

Part of technical session - ***Transmission-Line Metamaterial E ts and Applications*** on Jun,06 13:50 - 15:30

Venue : 618/620

Authors : J. Naqui, M. Duran-Sindreu, F. Martin, Autonomous University of Barcelona (UAB), Bellaterra, Spain

Abstract : This paper studies the symmetry properties of transmission lines loaded with bisymmetric resonators, that is, resonators that exhibit two orthogonal symmetry planes. The considered resonators exhibit orthogonal electric and magnetic walls at the fundamental resonance. Hence, the orientation of the symmetry planes relative to the line axis determines the

transmission/reflection characteristics of the loaded-lines. The considered structures can be useful as rotation or angular velocity sensors. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ Dual-band Leaky Wave Antenna with Filtering Capability Based on Extended-Composite Right/Left-Handed Transmission Lines (@ 618/620) **Paper |** | |

Part of technical session - ***Transmission-Line Metamaterial Elements and Applications*** on Jun,06 13:50 - 15:30

Venue : 618/620

Authors : M. DurÃ¡n-Sindreu1, J. Choi2, J. Bonache1, F. MartÃn1, T. Itoh2, 1Autonomous University of Barcelona (UAB), Bellaterra, Spain, 2University of California at Los Angeles, Los Angeles, United States

Abstract : A novel dual-band leaky wave antenna (LWA) with continuous backward to forward scanning capability for each band is presented. The structure is based on extended-composite right/left-handed transmission lines (E-CRLH TL) implemented in substrate integrated waveguide technology. As compared to other reported E-CRLH TL dual-band LWAs, circuit models that predict the structure behavior are presented, allowing better dispersion diagram controllability as well as controllable filtering capabilities. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Tri-band Isolation Circuits Using Both Stop-Band and Pass-Band of Double-Lorentz Transmission Lines for Quadruplexers (@ 618/620) **Paper |** | |

Part of technical session - ***Transmission-Line Metamaterial Elements and Applications*** on Jun,06 13:50 - 15:30

Venue : 618/620

Authors : H. Lee, T. Itoh, University of California at Los Angeles, Los Angeles, United States

Abstract : In this paper, novel method to use stop-band of a double-Lorentz transmission line (DL TL) for an isolation circuit is proposed. Combining this concept with conventional usage of a DL TL, design flexibility of a DL TL for an isolation circuit can be increased. Also, a designer could get a robust DL TL for an isolation circuit avoiding use of vicinity of stop-band but actively entering into the stop-band. The quadruplexer using the proposed method is designed and fabricated. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Miniaturized Quasi-Asymmetric Forward-Wave Coupled-Line Coupler with Arbitr ling Level (@ 618/620) **Paper |** | |

Part of technical session - ***Transmission-Line Metamaterial Elements and Applications*** on Jun,06 13:50 - 15:30

Venue : 618/620

Authors : J. Ha, Y. Lee, Yonsei University, Seoul, Republic of Korea

Abstract : A design method is demonstrated for quasi-asymmetric forward-wave coupled-line couplers. By loading a symmetric coupled line asymmetrically with shunt capacitors, a miniaturized forward-wave coupler is constructed with an arbitrary maximum coupling level. Most importantly limination of lengthy impedance transformers makes the method the most effective miniaturization method. Experimental result -dB coupler with a miniaturization rate of 92.9% at 5 GHz. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ **TH3G** : Advances in RF and Inkjet Printed Circuit Technologies (@ 611/612) **Technical |** |

Venue : 611/612

Chair : Telesphor Kamgaing, Intel Corporation

Co-Chair : Vijay Devabhaktuni, "EECS Department, The University of Toledo"

Abstract : This session will focus on novel advances and applications of Inkjet Printed Circuit Technologies. One paper introduces a unique wireless passive sensing platform combining RFID, microfluidics and inkjet printing technology. Another paper discusses a dual-band retro-directive reflector using substrate integrated waveguide and inkjet printing technologies on a flexible low cost substrate. T ther papers address the combination of inkjet printing with metamaterials for capacitive sensing as well as 3D printing techniques for the fabrication of microwave devices. Equivalent circuits for nanotechnology devices and power transmitters integrating a phase transition materials are also discussed. less

▼ Low-Cost Inkjet-Printed Fully Passive RFID Tags Using Metamaterial-inspired Antennas for Capacitive Sensing Applications (@ 611/612) **Paper** | | |

Part of technical session - ***Advances in RF and Inkjet Printed Circuit Technologies*** on Jun,06 13:50 - 15:30

Venue : 611/612

Authors : S. Kim1, Y. Kawahara2, A. Georgiadis3, A. Collado3, M. Tentzeris1, 1Georgia Institute of Technology, Atlanta, United States, 2University of Tokyo, Tokyo, Japan, 3Centre Tecnologic de Telecomunicacions de Catalunya (CTTC), Catalunya, Spain

Abstract : A fully passive, compact, and low-cost capacitive wireless RFID-enabled sensing system for capacitive sensing and other Internet of Things applications is proposed. The proposed RFID tag antenna based sensor consists of a closely spaced two-element dipole RFID tag antenna array with a printed capacitive sensor connected to one of the tags. A metamaterial-inspired resonator is used to improve isolation among the two antennas and optimize the size of the antenna structure. less

Discussion (**0**) Attendees (**5**) Presentations (**0**)

Please Login to view Discussions

▼ A Novel Inkjet-Printed Passive Microfluidic RFID-based Sensing Platform (@ 611/612) **Paper** | | |

Part of technical session - ***Advances in RF and Inkjet Printed Circuit Technologies*** on Jun,06 13:50 - 15:30

Venue : 611/612

Authors : B. S. Cook, J. R. Cooper, S. Kim, M. M. Tentzeris, Georgia Institute of Technology, Atlanta, United States

Abstract : This work demonstrates a wireless passive sensing platform combining RFID, microfluidics and inkjet printing that enables remote small-volume fluid analysis. The tag is fabricated using a rapid, low-cost, and low-temperature additive inkjet process. Even with its disposable nature, the tag exhibits repeatability and long term re-usabilitiy in accurately detecting water, various alcohols, and % content of water/alcohol mixtures. less

Discussion (**0**) Attendees (**4**) Presentations (**0**)

Please Login to view Discussions

▼ A Novel Circuit Model of Nanotechnology-Enabled Inkjet-Printed Gas Sensors Using Multi-Wall Carbon Nanotubes (@ 611/612) **Paper** | | |

Part of technical session - ***Advances in RF and Inkjet Printed Circuit Technologies*** on Jun,06 13:50 - 15:30

Venue : 611/612

Authors : R. DePaolis1,2, T. Le4, F. Coccetti1,2, G. Monti3, L. Tarricone3, M. M. Tentzeris4, R. Plana1, 1CNRS, Toulouse, France, 2University of Toulouse, Toulouse, France, 3University of Salento, Lecce, Italy, 4Georgia Institute of Technology, Atlanta, United States

Abstract : This paper presents a comprehensive electrical model of multi-walled carbon-nanotube based gas sensors patterned using low-cost inkjet printing. The obtained results are validated through measurements from 0.5 to 3 GHz and demonstrate sensing mechanisms through a significant shift of circuit resistive elements. The input impedance has been found to be significantly lower than that reported for metal oxide sensors, thus facilitating the integration in RF circuitry. less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

Please Login to view Discussions

▼ A Novel Dual-Band Retro-directive Reflector Array on Paper Utilizing Substrate Integrated Waveguide (SIW) and Inkjet Printing Technologies for Chipless RFID Tag and Sensor Applications (@ 611/612) **Paper** | | |

Part of technical session - ***Advances in RF and Inkjet Printed Circuit Technologies*** on Jun,06 13:50 - 15:30

Venue : 611/612

Authors : S. Kim1, B. Cook1, J. Cooper1, A. Traille2, A. Georgiadis3, H. Aubert2, M. Tentzeris1, 1Georgia Institute of Technology, Atlanta, United States, 2Laboratory for Analysis and Architecture of Systems (LAAS), Toulouse, France, 3Centre Tecnologic de Telecomunicacions de Catalunya (CTTC), Catalunya, Spain

Abstract : We propose the first dual-band retro-directive reflector array using Substrate Integrated Waveguide (SIW) and inkjet printed technologies on flexible low-cost substrates, such as paper, for operability around 3.6GHz and 5.8GHz. The proposed structure is significantly more compact compared to previously reported dual-band reflectarrays and a completely passive solution. less

Discussion (**0**) Attendees (**3**) Presentations (**0**)

Please Login to view Discussions

▼ A Novel Integrated Dielectric-and-Conductive Ink 3D Printing Technique for Fabrication of Microwave Devices (@ 611/612) **Paper** | | |

Part of technical session - ***Advances in RF and Inkjet Printed Circuit Technologies*** on Jun,06 13:50 - 15:30

Venue : 611/612

Authors : M. Ahmadloo, P. Mousavi, TRTech, Edmonton, Canada

Abstract : A novel combined 3D printing method is presented to simultaneously include conductive nano-particle ink printed together with dielectric material in an integrated procedure. This allows fabrication of geometrically complicated 3D microwave devices in an integrated process in order to save time and reduce the cost of prototyping and fabrication. A meander line dipole antenna on a V-shaped substrate is printed using customized ink and tested to demonstrate the efficiency of proposed technique. less

Discussion (**0**) Attendees (**4**) Presentations (**0**)

Please Login to view Discussions

▼ Pulsed Power Operation of Power Limiters Integrating a Phase Transition Material (@ 611/612) **Paper** | | |

Part of technical session - ***Advances in RF and Inkjet Printed Circuit Technologies*** on Jun,06 13:50 - 15:30

Venue : 611/612

Authors : A. Crunteanu1, E. Lemoine1, J. Leroy1, D. Passerieux1, P. Leveque1, P. Blondy1, C. Gaquiere2, D. Ducatteau2, J. Orlianges3, C. Champeaux3, 1XLIM , Limoges, France, 2Institute of Electronics, Microelectronics and Nanotechnology (IEMN), Lille, France, 3SPCTS , Limoges, France

Abstract : We present the operation of M limiters based on reversible phase transition of vanadium dioxide thin films integrated on coplanar waveguides submitted to incident pulsed peak power. During the pulse on-time, the fabricated devices can be reversibly driven by the incident pulsed signal f low-transmission level on a relatively short timescale (response times below 4 microseconds for incident peak powers of 35 dBm). less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ **TH3H** : Frequency Conversion Techniques (@ 613/614) **Technical** | |

Venue : 613/614

Chair : Carlos Saavedra, Queen's University

Co-Chair : Chinchun Meng, National Chiao Tung University

Abstract : The session demonstrates the latest frequency conversion techniques. T llimeter wave HBT mixers are presented demonstrating up-conversion and demodulation functionality. Two CMOS frequency dividers offer wider locking range. Finally a GaN Schottky diode with high cut-off frequency is presented. less

▼ A 31-61 GHz Linear Transconductance Up-Conversion Mixer with 15 GHz IF-Bandwidth (@ 613/614) **Paper** | | |

Part of technical session - ***Frequency Conversion Techniques*** on Jun,06 13:50 - 15:30

Venue : 613/614

Authors : M. Bao1, Y. Li1, H. Zirath2, 1Ericsson , Molndal, Sweden, 2Chalmers University of Technology, Gothenburg, Sweden

Abstract : A 31-61 GHz up-conversion transconductance mixer, consisting of a main and an auxiliary mixer, is designed and manufactured in a 0.25 um InP DHBT technology. At large input power, the conversion gain compression of the main mixer is compensated by the gain expansion of the auxiliary mixer; consequently, the linearity of the combined two mixers is improved. The measured OP1dB, is -2.2 dBm to -0.57 dBm in the frequency range. Moreover, the mixer also demonstrates a broad IF bandwidth of 0~15 GHz. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ A 25-to-70 GHz and Low LO Power Mixer using Modified SiGe NMOS-HBT Darlington Cell for Gigabit BPSK Demodulation (@ 613/614) **Paper** | | |

Part of technical session - ***Frequency Conversion Techniques*** on Jun,06 13:50 - 15:30

Venue : 613/614

Authors : W. Wang, S. Weng, H. Chang, National Central University, Jhongli City, Taiwan

Abstract : A BPSK demodulator using 0.18-?m SiGe process is presented. A modified NMOS-HBT Darlington cell is proposed for the circuit design. The driving LO power is further reduced as compared to the conventional Gilbert- and Darlington-cell mixers. This work exhibits a broad RF bandwidth from 25 to 70 GHz, a driving LO power of -1 dBm, and a maximum conversion gain of 0 dB. This is the first attempt to demonstrate a broadband low LO power mixer using SiGe NMOS-HBT Darlington cell for BPSK demodulation. less

Discussion (**0**) Attendees (**0**) Presentations (**0**)

Please Login to view Discussions

▼ A 53.6 GHz Direct In -locked Fr Technology (@ 613/614) **Paper** | | |

Part of technical session - ***Frequency Conversion Techniques*** on Jun,06 13:50 - 15:30

Venue : 613/614

Authors : W. Chen1, Y. J. Shiao1, H. Yen2, G. Huang1, H. Hsieh3, C. Jou3, F. Hsueh3, 1National Nano Device Laboratories, Hsinchu, Taiwan, 2National Tsing Hua University , Taiwan, 3Taiwan Semiconductor Manufacturing Company (TSMC), Hsinchu, Taiwan

Abstract : This study presents a 53.6 GHz wideband direct injection-locked frequency divider (DILFD) using 65 nm CMOS technology. By operating a RF input transistor in subthreshold region and changing its forward body bias, the proposed DILFD achieves a 28.6 GHz (72%) locking range with 6.7 mW power consumption and 1 V supply voltage. When varying the supply voltage from 0.9 V to 1.1 V or its physical temperature from 253 K to 373 K, the measured locking range remains more than 22 GHz. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

Please Login to view Discussions

▼ Dynamic Control to Enhance Locking Range of Divide-by-Five Prescaler for 24 GHz PLL (@ 613/614) **Paper** | | |

Part of technical session - ***Frequency Conversion Techniques*** on Jun,06 13:50 - 15:30

Venue : 613/614

Authors : C. Yang, T. Huang, C. Chiang, S. Yu, National Cheng Kung University, Tainan, Taiwan

Abstract : This paper presents a fully integrated low-power 24 GHz PLL by using divide-by-5 prescaler. A dynamic control is proposed to bias the Vtune of the ILFD according to the VCO frequency to expand the locking range of the high-division-ratio dividers. Compared with other PLLs with low phase noise, our proposed performance reached FOM of 190 dBc/Hz after optimization, the phase noise are -110.0 (dBc/Hz) at 1 MHz frequency offset, respectively. The locking range extends from 0.7 to 2.2 GHz. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

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▼ E-Beam Fabricated GaN Schottky Diodes: High-Frequency and Non-Linear Properties (@ 613/614) **Paper** | | |

Part of technical session - ***Frequency Conversion Techniques*** on Jun,06 13:50 - 15:30

Venue : 613/614

Authors : C. Jin1, M. Zaknoune1, D. Ducatteau1, D. Pavlidis2, 1Institute of Electronics, Microelectronics and Nanotechnology

(IEMN), Lille, France, 2Boston University, Boston, United States

Abstract : E-Beam processed GaN-based Schottky diodes for microwave, mm-wave power applications were characterized under both small- and large-signal conditions. A Large-Signal Network Analyzer was used and equivalent circuit models were obtained using large-signal time-domain waveform optimization. The impact of anode diameter size and layer design was investigated. Large-signal measurements allowed device non-linearity evaluation. less

Discussion (**0**) Attendees (**1**) Presentations (**0**)

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17:30 - 18:30

▼ IMS2013 Closing Reception (@ "Washington State Convention Center, Ballroom 6A") **Social** | |

Venue : "Washington State Convention Center, Ballroom 6A"

Detail : All Microwave Week attendees and exhibitors are invited to attend the Closing Reception hosted by IMS2013 in the Washington State Convention Center in Ballroom 6A.

Discussion (**0**) Attendees (**13**) Presentations (**0**)

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