Technical Sessions

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Technical Session Tu 14 ZG1 (Tuesday 30/10/2007, 14:30 – 16:00): Title: Optical Amplifiers

348 Invited (14:30-15:00);

Optical Gain-Clamped Erbium-doped Waveguide Amplifier and its Applications

K. Ennser, Swansea University, Swansea, United Kingdom

In this paper we review the research activities on optical gain control techniques of optical amplifier. Several configurations are explored to increase robustness to power transients. Optimized amplifier design with bidirectional operation is achieved. In particular we explore potentialities and limitations of Erbium-doped waveguide amplifier for optical networks. Note that all results are applicable for Erbium-doped fiber amplifiers once the parameters are properly scaled.

355 (15:00-15:15);

<u>A Comparative Analysis of Doubled-Pass Erbium Doped Fiber Amplifiers Considering</u> Different Signal-Return Schemes

R. A. Gomes, R. Silva, R. N. Carvalho, A. C. Bordonalli, University of Campinas, Campinas, Brazil

In this work, an experimental comparative analysis of doubled-pass erbium doped fiber amplifiers with different signal-return approaches is presented. The amplifier performance was investigated in terms of gain and noise figure as the signal under amplification was reflected back towards the erbium doped fiber by a mirror, filter, or circulator arrangement. Also, a semiconductor laser under single-facet optical injection locking was tried as an equivalent reflexive element.

120 (15:15-15:30);

Comparative Analysis of Optical Amplifiers for CWDM Networks

J. B. Rosolem¹, A. A. Juriollo¹, M. D. Dos Santos¹, M. A. Romero², ¹CPqD Foundation, Campinas, Brazil, ²University of Sao Paulo, Sao Carlos, Brazil

We present a cost-effective EDFA configuration for CWDM applications, using a combination of parallel and series circuits. The developed CWDM EDFA was characterized for gain and noise figure from 1490 to 1610 nm (S, C and L bands) and its systemic performance was evaluated in terms of BER for power and line applications. The obtained results are contrasted to those arising from the use of a CWDM SOA under the same experimental conditions.

171 (15:30-15:45);

<u>Measurement of Raman Gain Efficiency in a DCF and its application in optical</u> amplification for the O-band

L. A. Saito¹, J. F. de Freitas², C. J. de Matos¹, A. S. Gomes², E. A. De Souza¹, ¹Universidade Presbiteriana Mackenzie, Sao Paulo, Brazil, ²Universidade Federal de Pernambuco, Recife, Brazil

We measured the Raman gain efficiency for a DCF using a pump wavelength of 1240 nm and characterized the gain of a Raman amplifier in the O-band (1260-1360 nm) with a low pump power and a few kilometers of fiber. In addition, a spectral analysis of the fiber loss and Raman efficiency revealed that the increase in Raman gain efficiency towards short wavelengths can compensate for the increase in attenuation, with the obtainable gain for a 6-km fiber peaking at the O-band.

299 (15:45-16:00)

Four Wave Mixing Effects in Gain-Equalized Distributed Fiber Raman Amplifiers

R. Olivares, M. A. Soto, Universidad Tecnica Federico Santa Maria, Valparaiso, Chile

The degradation of the performance of distributed fiber Raman amplifiers (DFRAs) is shown to be dependent on the interaction between pump-pump FWM and stimulated Raman scattering (SRS), by means of numerical simulations. We verify that FWM processes, including depletion and parametric gain, generate new sources of SRS and a redistribution of the pump power along the fiber. Results show impairments on the performance of DFRAs such as reduction and loss of flatness on the net Raman gain.

Technical Session Tu 14 ZG2 (Tuesday 30/10/2007, 14:30 – 16:00): Title: Photonics Cristal Fibers and Bio Photonics

185 (14:30-14:45) <u>An Unique Design of Ultra-Flattened Dispersion Photonic Crystal</u> <u>Fibers</u>

N. H. Hai, Y. Namihira, University of the Ryukyus, Okinawa, Japan

We report that it is possible to control chromatic dispersion of Photonic Crystal Fibers in wide wavelength range by using elliptical air-holes located at core disposed perpendicular alternately. Using this arrangement, a newly PCFs with ultra-low and ultra-flattened dispersion are designed with flattened dispersion of 0.23[ps/km-nm] from 1.5mum to 1.8mum wavelength with the confinement loss is less than 10^-13 dB/m in the wavelength range shorter than 1.8mum.

260 (14:45-15:00) Fabrication and Analysis of Self-Assembled Photonic Crystals Structures

R. Bertholdo¹, A. O. Silva², M. G. Schiavetto¹, B. V. Borges², S. J. Ribeiro¹, Y. Messaddeq¹, M. A. Romero², ¹UNESP, Araraguara, Brazil, ²USP, Sao Carlos, Brazil

This paper presents the fabrication and analysis of a three-dimensional FCC photonic crystal (PhC) based on a self-assembly synthesis of monodispersive latex spheres. Experimental optical characterization, achieved by measurements of the specular reflectance under variable angles, indicated the clear presence of a Bragg diffraction pattern. Results are further explored by theoretical calculations based on the Finite Difference Time Domain (FDTD) method to determine the full PhC band structure.

308 (15:00-15:15) Experimental Tests on a Coaxial Bragg Reflector

P. J. de Castro, J. J. Barroso, J. P. Leite Neto, G. L. Pimentel, National Institute for Space Research - INPE, São José dos Campos, Brazil

The filtering characteristics of a coaxial Bragg reflector are studied experimentally. Made from stainless steel, this coaxial Bragg reflector incorporates a cylindrical inner rod with 10 disks 0.35 cm thick and 6.22 cm in diameter equally spaced by the periodic distance of 1.8 cm. Experimental results demonstrate a bandgap of 5.85 GHz centered at the 6.7 GHz design frequency in excellent agreement with 2D and 3D computer simulations.

321 (15:15-15:30) <u>Estimation the Electromagnetic Field Effects in Biological Tissues</u> through the Finite-Difference Time-Domain Method

S. G. Garcez, C. F. Galan, L. H. Bonani, V. Baranauskas, Unicamp, Campinas, Brazil

This work presents an analysis concerning the effects of iteration between electromagnetic fields and some kinds of biological tissues. In this regard, we design a routine based on the Finite-Difference Time-Domain (FDTD) method to estimate the electromagnetic field in 3D environments for biological tissues. Our research of electromagnetic field effects has focused on the concept of Specific Absorption Rate (SAR 1g and SAR 10g).

311 (15:30-15:45) Manipulating Gradient Forces on Optical Tweezers using Bessel Beams

L. A. Ambrosio¹, M. Zamboni-Rached², H. E. Hernández-Figueroa¹, ¹Faculdade de Engenharia Elétrica e de Computação (FEEC), Campinas, Brazil, ²Universidade Federal do ABC, Santo André, Brazil

We show how one can change the stable equilibrium of a particle trapped by optical tweezers through the intensity variation of superposed Bessel beams with different orders. The gradient forces on particles of different radii are determined, and the results indicate that it is possible to combine Bessel beams in such a way that a particle can be manipulated into or out the centre of the beam by exploiting their ringshaped intensity patterns, without any mechanical displacement of the lasers.

226 (15:45-16:00) <u>Numeric Method for Diagnosis of Electric Characteristics of Biological</u> <u>Materials in Microwaves Frequencies</u>

S. J. Florez, University of Quindio, Armenia, Colombia

A technique is presented to estimate the values of the permittivity complex dielectric of a biological material in microwaves frequencies, using the results of the measures of the scattering parameters, specifically of the coefficient of transmission S21. It is elaborated graphic of mapping for fast diagnosis of electric characteristics of the studied sample.

Technical .Session Tu 16 FP3 – (Tuesday 30/10/2007, 16:30 – 18:00): Title: INTERACTIVE FORUM 1 – Poster Session

Antennas Posters:

115 Analysis of Omnidirectional Dual-Reflector Antennas with Radomes

U. d. Resende^{1,2}, F. J. Moreira², O. M. Filho², ¹Federal Center of Technological Education of Minas Gerais - CEFET MG, Belo Horizonte, Brazil, ²Federal University of Minas Gerais - UFMG, Belo Horizonte, Brazil

This work investigate the influence of dielectric radomes on the electromagnetic performance of dual-reflector antennas suited for omnidirectional coverages. The dual-reflector systems are fed by a TEM coaxial horn. Accurate analyses are provided by surface integral equations numerically evaluated by the method of moments, taking into account all electromagnetic couplings among the several antenna elements.

153 A New reconfigurable Multi Band Patch Antenna

J. Costantine¹, C. G. Christodoulou¹, S. E. Barbin², ¹University of New mexico, Albuquerque, United States, ²Universidade de São Paulo, Sao Paulo, Brazil

A new reconfigurable multi band microstrip antenna is presented in this paper. The patch has the shape of a 6 armed star printed on a hexagonal substrate. The reconfigurability of the antenna is obtained by inserting small switches on rectangular slots cut in the patch. Different switch configurations were investigated and different functionalities of the antenna were obtained. The antenna has many practical applications, like in GSM, wireless LAN, WIMAX and many other systems.

164 CPW- fed Modified Rectangular Printed Monopole Antenna with Slot

Y. Ranga¹, K. P. Ray², ¹Flomerics India Pvt Ltd., Bangalore, India, ²SAMEER, Mumbai, India

This paper presents a CPW-fed modified rectangular printed monopole antenna. The configuration has semicircular base with circular slot cut inside the patch. The impedance and radiation characteristics of the proposed monopole are presented. The proposed CPW-fed printed monopole antenna has ultra broad bandwidth which covers almost all the communications channels starting from 916 MHz.

207 <u>Communication System Using Magnetic Antennas in Lines of Electrical</u> Transmission

S. A. Jaramillo, University of Quindio, Armenia, Colombia

This work describes the wireless transmission of data using antennas with ferrite nucleus that transmits information through the line of high voltage. The second ferrite antenna is the receiver one, to which is connected a circuit with detection stages and filtrate, besides the adaptation to the audio system. With this system one can have diversity of routing of the information that is sent among different substations remote using the lines of electric power transmission.

223 Miniaturized Circular Patch Antenna with Capacitors Loading

P. Ferrari, N. Corrao, D. Rauly, Imep, UMR 5130 CNRS / INPG / UJF, Grenoble, France

In this paper, we explore the possibility of using circular patch antennas loaded by capacitors allowing to reduce their size in a very significant way (30 %). We have encouraging experimental results relating to antennas functioning between 1,77 GHz and 2,52 GHz developed on low cost FR4 substrate with addition of surface-mount components. The suggested topology can lead in the long term to an integrated filter-antenna system, with reconfigurable property by means of loading varactors.

228 A New Approach for Vehicle Access Control using Active RFID Tags

A. G. Foina, S. E. Barbin, Universidade de São Paulo, São Paulo, Brazil

In this paper, results obtained from the use of an active RFID system for trucks access control will be presented. Using a directive antenna with a reader and a middleware with RSSI feature, it is possible to make the system much more accurate than in conventional approaches, avoiding most reading problems and making the system more robust. A comparison between the system with and without these resources is shown in the text.

258 Antenna Selection for a MIMO Wideband Measured Channels

R. . Vieira, R. F. Souto, Nokia Technology Institute, Brasilia, Brazil

We presented results of antenna selection for a MIMO wideband measurement campaign carried out in indoor scenario with a carrier

frequency of 2GHz. The amplitude and phase of the received signal were collected at 801 frequency values in the 200 MHz bandwidth. For each frequency, the best set of antennas and spatial selectivity were selected and verified respectively. Besides, the best antenna subsets and frequency was also jointly selected for different environments.

281 A New Quasi – Isotropic Antenna for Ultra – Wideband Application

E. S. Pires¹, G. Fontgalland¹, M. B. Melo¹, R. M. Valle¹, G. F. Aragão¹, T. P. Vuong², ¹Federal University of Campina Grande, Campina Grande, Brazil, ²École supérieure d'ingénieurs en systèmes industriels avancés Rhône-Alpes, Valence, France

In this paper, we propose a new ultra-wideband (UWB) antenna for UWB applications, capable of generate a quasi-isotropic radiation pattern. The proposed antenna is designed to operate from 2.17 to 2.68 GHz. Details of the proposed antenna design are presented and discussed. The experimental results have good agreement with the simulated, which were obtained with the help of the CST- Microwave Studio.

292 Spiral Microstrip Antenna

D. R. Ribeiro, L. A. Santanna, J. F. Almeida, Instituto de Estudos Superiores da Amazônia - IESAM, Belém, Brazil

This work deal with a microstrip in spiral geometry rectangular form which is based on the analysis of a spiral monopole. There is known that this configuration allows a wider bandwidth of operation around the central resonant frequency. The considered model is printed on a substrate, in the form of a microstrip antenna. So, is verified, for this type of microstrip, a considerable addition in the bandwidth.

338 Scattering of Stratified Lenses Illuminated by any Real Source

S. Rondineau¹, B. Fuchs², O. Lafond², M. Himdi², ¹University of Colorado, Boulder, United States, ²IETR - Universite de Rennes 1, Rennes, France

An analytical method to compute the scattering of spherically and hemispherically stratified lens antennas fed by any real source is described. A mode matching technique (MMT) based on spherical wave functions is first used to analyze the scattering by spherically stratified lens antennas. The farfield patterns and directivity obtained are in excellent agreement with commercial software simulations and measurements for a six-shell Luneburg lens at 6 GHz. This MMT is then extended to

236 <u>Employment of Parasite Element for Extending the Bandwidth of a Linear</u> Horizontal Spiral Monopole

N. F. Ramos, R. M. de Oliveira, C. L. Souza Sobrinho, Federal University of Pará, Belém, Brazil

Abstract – A proposal for extending the bandwidth of a Linear Horizontal Spiral Monopole is presented in this work. The proposal consists in the addition of an optimized rectangular loop over the antenna. It is used as a parasite element. A bandwidth of 60.87% was obtained. The analysis of the problem was numerically performed by the Finite-Difference Time-Domain method truncated by the Uniaxial Perfectly Matched Layers formulation.

Microwave Devices and Circuits Posters:

215 Tunable Impedance Matching Network

K. Brito², R. N. de Lima¹, ¹Universidade Federal da Bahia, Salvador, Brazil, ²Universidade Federal do Recôncavo da Bahia, Amargosa, Brazil

This work presents a RF tunable impedance matching circuit. It uses a quarter-wavelength transmission line loaded by a combination of switches, capacitors and inductors. With MEMS-based switches and inductors, the simulation results show that this circuit is capable of correction load reflection coefficients of up 0.5 to better than 0.38 with insertion loss between 0.74-2.11 dB at 2GHz.

246 RF Passive Components in MCM-D

L. B. Zoccal, S. D. Yamamoto, C. M. Cabreira, R. A. Flacker, E. A. Gomes, J. A. Diniz, J. W. Swart, Center for Semiconductor Components (CCS), Campinas, Brazil

Multilayer Multi Chip Module technology may be used for high quality RF passive components and circuits patterns. MCM-D structure is built with metallic and dielectric layers alternately deposited on alumina substrate by employing adapted techniques used for semiconductor integrated circuit manufacturing. Up to 10GHz on-wafer measurements were carried out on structures and shown good agreement with simulation indicating they are applicable on RF devices and modules for many wireless applications

252 <u>New Design Technique of N Sections Impedance Transformer using Geometric</u> Interpolation.

C. N. Marins², L. A. Beraldo², ¹INATEL, Santa Rita do Sapucaí, Brazil, ²INATEL, Santa Rita do Sapucaí, Brazil

The proposal of this article is to present the /4) sections impedance transformer using geometric λ new design technique of N (interpolation. The article compares the Geometric Interpolation technique with Binomial and Chebyshev Models. The increase of bandwidth and the easiness of design are factors that detach this technique of others, making possible the use of this model in projects of wide band RF circuits and systems.

279 <u>Superconducting sub-millimeter diplexer suitable for pixel-size two-band</u> bolometric detection

P. Camus¹, D. Rauly², O. Guillaudin³, A. Monfardini¹, F. Podevin², N. Al Cheikh², ¹Institut Neel, CNRS/UJF, Grenoble Cedex 9, France, ²Imep UMR 5130 CNRS/INPG/UJF, Grenoble, France, ³Lpsc, UMR 5821 CNRS/IN2P3 -UJF-INPG, Grenoble, France

The design of a diplexer, coupled to a planar bow-tie antenna for two-band Cosmic Microwave Background detection is proposed, using both HFSSTM and ADSTM softwares. The two photometric bands are centered on 150 GHz and 220 GHz respectively. The diplexer is composed of two three-elements distributed filtering circuits, taking into account the complex impedance of the antenna. The distributed elements are transmission lines Coplanar Strip Lines (CPS) and Broadside Coupled Lines (BCL).

306 Hysteresis in RF MEMS Shunt Switch: Simulation and Measurements.

P. F. Braghetto, L. C. Kretly, State University of Campinas-Unicamp, Campinas, Brazil

An intrinsic mechanical characteristic of MEMS switches, the hysteresis in ONOFF cycle of operation is presented. The hysteresis arises from the transition between stable and unstable equilibrium solutions of the force-balancing equations, due to different stresses suffered by the bridge of the switch during changing the two states. Finally, RF MEMS switch was constructed and its hysteresis voltages were modelled, measured and compared.

307 PCB-MEMS RF Switch: Parametric Analysis and Design Guide Lines.

M. B. Weber S, L. C. Kretly, State University of Campinas- Unicamp, Campinas, Brazil

We introduce a recent concept that applies MEMS technical procedures to Printed Circuit Boards (PCB). This is a novel technology for RF MEMS components. For comparison purposes with our previous work of MEMS switch on alumina substrates, we calculated the main parameters for practical design. We introduce a new technique for PCB-MEMS switch using copper as the metal at the bridge. Thus, we can construct a MEMS switch with the same material of the printed circuit board.

183 Analysis and Simulation of a 6.7 GHz Coaxial Bragg Reflector

J. J. Barroso, J. P. Leite Neto, P. J. Castro, G. L. Pimentel, National Institute for Space Research - INPE, São José dos Campos, Brazil

A coaxial line periodically loaded by circular disks on the inner conductor is designed to act as Bragg reflector in the 4.0-10.0 GHz frequency range. This is achieved by placing 10 disks (0.35 cm thick and 6.22 cm in diameter) equally spaced by the periodic distance of 1.8 cm on a coaxial waveguide with inner and outer diameters of 6.90 cm and 4.22 cm. Analytical discussion followed by 2D and 3D computer simulations demonstrate a bandgap of 5.6 GHz centered at the 6.7 GHz design frequency.

216 Lumped Element MIM Capacitor Model for Si-RFICs

D. Gruner¹, Z. Zhang¹, V. Subramanian¹, F. Korndoerfer², G. Boeck¹, ¹Berlin University of Technology, Berlin, Germany, ²IHP GmbH, Frankfurt (Oder), Germany

This work describes a lumped element based MIM capacitor model for frequencies up to 110 GHz. Several capacitors have been designed and fabricated in a five metal layer 0.25 um SiGe process. All structures are analyzed with a 2.5D EM simulator and the simulation results are compared with measurements. A lumped element model has been developed showing an excellent agreement with measurements until 110 GHz. The extracted model parameters suitable over the entire frequency range are tabulated.

Wireless Communications Posters:

271 QS-CDMA systems using concatenated ZCZ codes

T. A. Lopes, M. G. Rego, R. Baldini, Universidade Estadual de Campinas - UNICAMP, Campinas, Brazil

The authors propose a novel use of zero correlation zone (ZCZ) codes to increase the performance of quasi-synchronous code division multiple access systems. In this new approach, each spread sequence associated to a active user is a concatenation of two or more ZCZ sequences. In the receiver, each of the component sequences is separately correlated in order to recover the original information. A comparison to the convencional receiver is fulfilled by analyzing the performance of both schemes.

293 Improving 900 MHz outdoor measured wideband power delay profiles with wavelet denoising

M. H. Dias¹, G. L. Siqueira², ¹Military Institute of Engineering, Rio de Janeiro, Brazil, ²Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil

This work presents new results of wavelet-based denoising as an alternative processing scheme to improve measured power delay profiles (PDP). In a previous work, it has been successfully applied to real data from indoor environments, collected from wideband channel sounding surveys at 1.8 GHz. Here, the processed data sets were measured outdoors, with 900 MHz carriers, and harsher noise conditions. The improvement achieved was even clearer than the observed at the previous work.

336 Profile of the Modulation Instabilities in Different Environments

N. Reggiani, O. C. Branquinho, A. A. Goes, K. Oliveira, Pontificia Universidade Católica de Campinas, Campinas, Brazil

The coverage area of an WIMAX system operating with 2.5 GHz is analyzed according to the modulation used. The modulation of an antenna depends on the value of the power received and the attenuation of this power leads to regions of different modulations. We used the shadowing model to describe this attenuation. In this model, the different environments are described by different beta values and the distribution of the power values around the mean value is described by a statistical variable.

Microwave Active Circuits Posters:

186 Broad m SiGe Technologyuband Amplifier up to 30GHz with 0.25

J. A. Torres^{2,1}, J. L. Costa-Freire¹, ¹Instituto Superior Tecnico, Lisboa, Portugal, ²Instituto Militar dos Pupilos do Exercito, Lisboa, Portugal

In this paper the results on a study of using a low cost SiGe:C BiCMOS technology dedicated to few GHz applications up to 30GHz are discussed. Spiral inductors with SRF higher then 30GHz, not available at the foundry library, and a Q higher then 20 at 30GHz were obtained. The design, implementation and test of a broad band feedback resistive amplifier are also presented. It has a 3dB bandwidth from 12 to 32GHz and 1dB bandwidth of 11GHz, a maximum gain of 10dB and return losses better then 10dB.

344 Small Area Cross Type Integrated Inductor in CMOS technology

L. C. Moreira¹, W. A. Van Noije², A. Farfán², A. dos Anjos², ¹Universidade Católica de Santos, Santos, Brazil, ²Universidade de Sao Paulo, São Paulo, Brazil

The paper presents the design, using the SONNET tool, of a new inductor structure with crossed segments. In order to compare, the new and rectangular inductors were designed using a 0.35um CMOS technology. After the design the cross inductor presents an area of $120x140\mu$ m2, an inductance of 1.75nH and Q of 4.1 at 8GHz, while the square inductor presents an area of 180x180um2, an inductance of 1.65nH and Q of 5.5 at 8GHz. Thus, the square inductor occupies 92% more area than the cross inductor.

305 Input Noise Modeling Of Deep Submicron MOSFETs

S. Choudhary, S. Qureshi, Indian Institute of Technology, Kanpur, Kanpur, India

This paper presents a noise model using the channel length modulation (CLM) effect to calculate the total equivalent noise current, referred to the gate (input) of the MOSFET. Taking velocity saturation effect and carrier heating effect in the gradual channel region, complete thermal noise modeling of short-channel MOSFETs including the induced gate noise and its correlation coefficients is presented.

Interactive Forum: High-Speed Techniques and Microwave Photonics

101 <u>Sub-Nanosecond Pulsed Microwave Generation Technique by Signal Combination</u> in the Optical Domain C. S. Castelli, A. M. Ribeiro, R. F. Souza, E. Conforti, Unicamp - Universidade Estadual de Campinas, Campinas, Brazil

A novel technique for the generation of 280 picosecond risetime pulsed microwave waveform has been developed. It is based on the mixture of two arbitrary signals, an ultra-fast pulse train and a microwave CW signal, generated from different sources, combined in the optical domain and photodetected, with the maximum preservation of the spectral and temporal features. The technique's concepts and the setup used for the experimental validation are presented.

119 <u>Dispersion Optimization in Asynchronous Mode-Locking Erbium Fiber Laser at 10</u> GHz

E. S. Boncristiano, L. A. Saito, E. A. De Souza, Universidade Presbiteriana Mackenzie, Sao Paulo, Brazil We obtained a train of pulses with 390 fs at a repetition rate of 10 GHz from an asynchronous mode-locked Erbium fiber laser by optimizing the intracavity dispersion. The laser operates in a hybrid modelocking mechanism where an asynchronous phase modulation in conjunction with intracavity solitonic lead to a shorter pulse width.

Optical Networks Posters:

179 <u>Performance Evaluation of Advanced WDM Networks with Optical Codes and</u> Photonic Switching

F. R. Durand , L. Galdino , M. L. Abbade , E. Moschim , F. Rudge Barbosa , University of Campinas - Unicamp , Campinas , Brazil

We present performance evaluation of a hybrid technology using WDM and OCDM for optical burst switching (OBS) networks. An architecture for edge routers with fast circuit switching and virtual optical code/wavelength paths (VOCP/VWP) is described. We consider burst blocking probability (BBP) as a function of traffic load and various delays. Simulations show that increasing the number of optical codes per wavelength considerably decreases BBP and latency, and also increases network throughput.

325 FWM efficiency correlation with temperature in a dispersion-shifted fiber

M. Matos¹, A. L. Teixeira², P. S. André², ¹REN, Lisboa, Portugal, ²Instituto de Telecomunicações, Aveiro, Portugal

In this work, field trials are used to correlate the four wave mixing efficiency with the temperature variations that affect a buried dispersionshifted fiber private network. The trial results are used in conjunction with theoretical models to obtain the wavelength dispersion change.

202 <u>Novel Physical Impairments Aware Adaptative Weight Function for Routing in All</u> Optical Networks

D. A. Chaves¹, D. O. Aguiar¹, H. A. Pereira², C. J. Bastos-Filho³, J. F. Martins-Filho¹, ¹UFPE, Recife, Brazil, ²UPE, Recife, Brazil, ³UPE, Recife, Brazil

We propose a novel and fast physical impairment aware adaptative cost function. The main advantage of this approach is that it uses simple network parameters such as link availability and route length, instead of complex optical noise based weight functions. Amplifier gain and ASE saturations and OXC crosstalk were considered. We present simulation results for the network performance for our proposed routing scheme and for other ones. We compare the computation time of different routing schemes.

Optical Signal Processing Posters:

175 <u>Detuning Dependence of Four-Wave Mixing Between Picosecond Pulses in a</u> Multi-Quantum Well Semiconductor Optical Amplifier.

B. F. Kennedy¹, K. Bondarczuk², L. P. Barry², ¹Universidad de Santiago, Santiago, Chile, ²Dublin City University, Dublin, Ireland

Four-wave mixing is investigated experimentally using frequency resolved optical gating in a semiconductor optical amplifier. Demultiplexing is carried out from 80 GHz to 10 GHz using picosecond pulses. The probe phase is preserved in the four-wave mixing signal across the central portion of the pulse, as the pump-probe detuning is increased. Also, the effect of the pedestals in the probe pulse is measured. The impact of these pedestals increases as a function of the detuning.

255 <u>Four Wave Mixing Characterization of Semiconductor Optical Amplifiers with</u> Different Cavity Lengths

N. S. Ribeiro¹, C. M. Gallep², A. L. Cavalcante¹, E. Conforti¹, ¹Unicamp, Campinas, Brazil, ²Ceset, Limeira, Brazil

Experimental results of Four-Wave Mixing in linear and non-linear semiconductor optical amplifiers of various lengths are presented. The characterization involves variation of power, wavelength, detuning, and optical polarization. In addition, the relative efficiency of those optical amplifiers for wavelength conversion is analyzed.

317 <u>Spectral Gain Parameters Extraction with Noise Measurements in Semiconductor</u> Optical Amplifiers

A. L. Cavalcante¹, N. Ribeiro¹, C. Gallep², E. Conforti¹, ¹Unicamp, Campinas, Brazil, ²CESET, Limeira, Brazil

A technique to estimate semiconductor optical amplifiers gain parameters is presented based on spectral noise measurements. Theoretical results based on the extracted parameters were compared with experimental results using linear and non-linear semiconductor optical amplifiers of various lengths. The experimental data and the results produced by estimated parameters show good agreement, which validates the technique.

Optical Amplifiers Posters:

142 Analysis of Raman amplification in a practical, low-loss, photonic crystal fiber.

A. A. de Araujo, C. J. de Matos, Universidade Presbiteriana Mackenzie, São Paulo, Brazil

This paper analyses the use of an existing, low loss, photonic crystal fiber for Raman amplification over the wide low-loss window of silica fibers. We show that the low attenuation of the studied fiber would allow for high net gains to be achieved both in the O- and C-bands, enabling its use in commercial systems.

192 Broadband Raman Amplifier Analytical Model Under Experimental Validation

S. P. Cani¹, M. J. Pontes¹, M. E. Segatto¹, M. T. Giraldi², C. A. Procopio³, E. C. Souza³, A. P. Barbero³, ¹Universidade Federal do Espírito Santo, Vitória, Brazil, ²Instituto Militar de Engenharia, Rio de Janeiro, Brazil, ³Universidade Federal Fluminense, Niterói, Brazil

The experimental validation of a novel analytical model for broadband Raman amplifiers with multiple pump lasers is accomplished by confronting simulated and experimental results to counter-pumped distributed Raman amplifiers. Pump-pump and signal-pump interactions are included in the analytical formulation. A reduced computation time is observed to evaluate distributed or lumped Raman amplifiers. Gain ripple around 1 dB is obtained, since this is the value imposed by our experimental setup.

Optical Sensors and Bragg Circuits Posters:

182 <u>Linear Readout of Dynamic Phase Modulation Index in an Optical Voltage Sensor</u> Using the J1...J3 Spectral Method

L. A. Marçal, E. Vendramini, R. T. Higuti, C. Kitano, UNESP, Ilha Solteira, Brazil

A new J1...J3 method is applied to measure voltage in an optical voltage sensor. The J1...J3 is a recent optical method for linear readout of dynamic phase modulation index in homodyne interferometers. Based on the classical J1...J4 method, the new J1...J3 technique shows to be more stable to phase drift and simpler for implementation than the original one. The sensor dynamic range is enhanced. The agreement between theoretical and experimental results, based on 1/f noise, is demonstrated.

320 Optical System for Flashover Prediction in High Voltage Transmission Lines

S. C. Oliveira, E. Fontana, Universidade Federal de Pernambuco, Recife, Brazil

This paper describes the development of a leakage current sensor based on LED as well as the development of a processing module that detects and stores the most important components of the leakage current signal. The relative humidity is also detected and stored for further analysis. The sensor is constructed with a single LED coupled to an optical fiber. The processing module uses a PIC 16F877A microcontroller and can register leakage current peak rates during two months in three levels.

352 <u>Feasibility of the Modulation Spectroscopy Technique for Dissolved Gas Analysis</u> of Insulating Oils of High Voltage Transformers

E. Fontana, L. M. Urtiga, J. F. Martins-Filho, Universidade Federal de Pernambuco, REcife, Brazil

The deterioration level of high voltage transformer oil components can be inferred by the analysis of specific gases found dissolved in the insulating oil of the transformer. In order to detect very low concentrations, harmonic detection of spectral lines using DFB diode lasers can be employed. In this work the possibility of using this technique to implement a continuous surveillance system for early deterioration detection is investigated.

Nanomaterials and Devices Posters:

334 Impact of Si nanocrystals in a-SiOx Er in C-Band emission for applications in resonators structures

D. S. Figueira^{1,2}, D. Mustafa¹, L. R. Tessler¹, N. C. Frateschi^{2,1}, ¹Universidade Estadual de Campinas, Campinas, Brazil, ²Universidade Estadual de Campinas, Campinas, Brazil

Si nanocrystals (Si-NC) in a-SiOx Er were created by high temperature annealing. Si-NC samples have large emission in a broadband region, 700nm to 1000nm. Annealing temperature, annealing time, substrate type, and erbium concentration is studied to allow emission at 1550 nm for samples with erbium. Emission in the "C-Band" region is largely reduced by the presence of Si-NC.

Lasers and Photodetectors Posters:

359 Development of a New Photodetector Based on Two Dimensional Hole Gas

A. Cola¹, F. Quaranta¹, A. Persano¹, A. Taurino¹, E. Gallo², M. Currie³, X. Zhao², J. E. Spanier², B. Nabet², ¹Consiglio Nazionale delle Ricerche, Lecce, Italy, ²Drexel University, Philadelphia, United States, ³Naval Research Laboratory, Washington, United States, ⁴,

Previous work on two dimensional electron gas (2DEG) photodetectors have shown fast response and high sensitivity due to the collection of electrons in the 2DEG. Here we report the design, fabrication, and characterization of a photodetector device with a 2D hole gas (2DHG). Results show the effect of the 2DHG on device behavior, particularly on the time response, reducing the long tail that is due to the slow moving holes. The device also shows very high capacitance-voltage sensitivity.

BioPhotonics Posters:

100 Ultra-weak light emission of Daphnia similis stressed by K2Cr2O7 solutions

C. M. Gallep¹, D. C. Batista^{1,2}, C. A. Pereira^{1,2}, V. M. Oliveira^{1,2}, N. A. Siqueira¹, ¹CESET-Unicamp, Limeira, Brazil, ²CESET-Unicamp, Limeira, Brazil

The photon counting data of toxicological tests using Daphnia similis under K2Cr2O7 (potassium dichromate) are presented and discussed for five different series of experiments, showing very non-linear behavior in response to the chemical compound concentration. It is noted that counting distribution incidence can be distinguished from the control one by devising the right (higher) or left (lower) shifts. The results point to further explorations of photon-counting applications in toxicology.

Microstructured Devices Posters:

162 Coupling Characteristics of Step Index Holey Fiber

J. P. da Silva¹, V. F. Rodriguez-Esquerre², H. E. Hernádez-Figueroa³, ¹UFERSA, Mossoró, Brazil, ²CEFET, Salvador, Brazil, ³Unicamp, Campinas, Brazil

Coupling characteristics of dual-core step index holey fiber couplers are analyzed by a vectorial beam propagation method in conjunction with the finite element method. Here we considered the two cores to be separated by a distance d. The proposed structure exhibits a very simple geometry, and each fiber that composes the coupler is obtained through the inclusion of a very small air radius hole at the core of one conventional step index fiber.

Numerical Methods Posters:

231 The validation of models in an imaging infrared simulation

C. J. Willers¹, M. S. Wheeler², ¹Council for Scientific and Industrial Research (CSIR), PO Box 395, Pretoria, South Africa, ²Denel Dynamics (Pty) Ltd, PO Box 7412, Centurion, South Africa

Simulation models must be validated to ensure that the simulation reflects reality. The approach taken here is based on a well accepted framework that considers reality, the conceptual model and the computer model. The paper shows how these principles are applied to models in the infrared simulation and how the results are interpreted. The concepts discussed here are not bound to infrared systems, and can be applied to radar, in the environmental sciences and even in the human sciences.

135 A Multiobjective Approach for Optimizing Electrooptic Modulators

A. Muraro Junior¹, A. Passaro¹, N. M. Abe¹, A. J. Preto², S. Stephany², ¹Institute for Advanced Studies, Sao Jose dos Campos, Brazil, ²National Institute for Space Research, Sao Jose dos Campos, Brazil

This work presents preliminary results of a multiobjective approach for optimization of some design parameters of Mach-Zehnder-based lithium niobate modulators. This process uses a genetic algorithm to iteratively refine candidate sets of parameters and the characterization of the modulators is performed by the Finite Elements Method. Test cases include optimization of a conventional Mach-Zehnder modulator and a variation of this kind of device using additional floating electrodes.

146 <u>Surface Plasma Analysis on a Palladium Cylindrical Shell Covering Weakly</u> Guided Silica Optical Fiber

A. R. Sapienza¹, R. A. Rocha¹, J. P. Faria¹, F. S. Ferrari¹, A. Paterno², ¹Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil, ²Centro Federal de Educação de Educação Tecnológica - PR, Curitiba, Brazil

The surface plasmon modes on a thin palladium film covering a weakly guided silica optical fiber and limited on the outside by air with an hydrogen saturation are investigated. The attenuation is estimated for several wavelengths and the original results obtained are interesting to understand the plasmon modes behavior in this type of structure. The validation of the developed model is made by comparing the results with those on an international publicated article, with a silver metallic film.

176 <u>The Influence of Material Parameters on the Frozen Modes of Magnetic Photonic</u> Crystals

G. M. Portela, V. A. Dmitriev, L. D. Alcantara, University Federal of Para, Belem, Brazil Using the transfer matrix method, we study the influence of various physical and geometrical parameters on the frozen modes of Magnetic Photonic Crystals.

193 Novel UTD Coefficients for Lossy Conducting Wedges

D. N. Schettino, F. J. Moreira, C. G. Rego, UFMG, Belo Horizonte, Brazil

This paper presents novel UTD coefficients for the analysis of electromagnetic scattering by lossy conducting wedges. The new heuristic coefficients are based in previously proposed ones that. With minor modifications, the new coefficients good results for arbitrary transmitter and receiver positions. The diffraction by lossy conducting wedges is investigated and the new approach results are compared with accurate Maliuzhinets analysis.

205 Design of Frequency Selective Surfaces Using a Novel MoM-ANN-GA Technique

P. F. Silva¹, P. Lacouth², G. Fontgalland², A. S. Campos³, A. G. D'Assunção⁴, ¹Centro Federal de Educação Tecnológica da Paraíba, João Pessoa, Brazil, ²Universidade Federal de Campina Grande, Campina Grande, Brazil, ³Centro Federal de Educação Tecnológica do Rio Grande do Norte, Natal, Brazil, ⁴Universidade Federal do Rio Grande do Norte, Natal, Brazil

The main objective of this work is show a new way to apply Genetic Algorithm (GA) or design of Frequency Selective Surfaces (FSS). The innovation is the use of Artificial Neural Network (ANN) trained with a database created from Method of Moments (MoM) simulations as fitness function. The advantages of design these devices through genetic algorithms and neural networks are discussed and results are presented to validate the paper.

Industrial Applications Posters:

103 Thermal characterization of etched FBG for applications in oil and gas sector

R. C. Kamikawachi^{1,2}, I. Abe², H. J. Kalinowski^{1,2}, J. L. Fabris¹, J. L. Pinto², ¹Federal University of Technology - Paraná, Curitba, Brazil, ²University of Aveiro, Aveiro, Portugal In this work, we study the thermal sensitivity of etched FBG immersed in four different commercial petroleum hydrocarbon samples with

different refractive index and negative thermo-optic coefficient. The results show that when the surrounding refractive index increases a nonlinear behaviour in the grating wavelength shift becomes noticeable. This nonlinear behaviour is owing to a non constant thermal sensitivity of the device.

184 Microwave Drying of Zinc Sulfate

L. A. Jermolovicius, J. T. Senise, R. B. Nascimento, Instituto Mauá de Tecnologia, São Caetano do Sul, Brazil

An exploratory test of drying zinc sulfate heptahydrate was performed to compare the efficiency of a microwave drier and an infrared drier. Both equipments were laboratory models. The moisture content was determined by titrating with EDTA the level of zinc in the sample. Results show that the microwave drier is more efficient than the infrared one. A reduction of 95% in the time of drying and a removal of water 7% higher than with infrared drying was achieved with microwave drying.

212 <u>Model for Estimation ADSL Service Area in presence of Losses in the Channel and</u> Electromagnetic Coupling due to HDSL Services.

P. C. Portela¹, C. G. Rego², S. C. Monteiro¹, ¹UnB – University of Brasilia, Brasilia, Brazil, ²University of Minas Gerais – UFMG, Belo Horizonte, Brazil

The presented work proposes a model for evaluation of the ADSL service area, considering the losses on the channel and the eletromagnetic induction from HDSL services. The availation is made with the maximum distance from Central Office that the ADSL signal can reach with a specific bit rate. The models parameters is gotten from real measures on the principal types of the cables. Some simulations are made with the presented model to analyze the service area for ADSL signals.

Technical .Session We09 FP2 (Wednesday 31/10/2007, 09:00 – 10:30): Title: Workshop on Defense

110 (09:15-09:30);

Electrodynamic Properties of Reentrant Klystron Cavities

J. J. Barroso, J. P. Leite Neto, National Institute for Space Research, São José dos Campos, Brazil

It is examined how the resonance frequency and the electrical Q factor relate to the geometrical shape of the coaxial insert in reentrant klystron cavities. Through proper selection of the geometry of the coaxial inner conductor (either circular cylinders or truncated cones), a tuning coefficient of 25.0 MHz/µm can be obtained at resonance frequencies around 1.0 GHz with cylindrical cavities of 8.0 cm in diameter and 2.0 cm high.

111 (09:30-09:45);

Modeling Transit-Time Microwave Tubes

J. J. Barroso, National Institute for Space Research, São José dos Campos, Brazil

An excitation model for TM-mode cylindrical cavities driven by a modulated electron beam with application in transit-time microwave tubes is developed. It is shown that the slowly time varying amplitude of the self-sustained oscillations is described by a reduced form of the classical van der Pol equation.

189 (09:45-10:00),

A Large Signal Analysis of a Power Traveling-Wave Tube

C. C. Motta, Centro Tecnológico da Marinha em São Paulo, São Paulo, Brazil

The large-signal or nonlinear behavior of a helix traveling-wave tube (TWT) is calculated in this paper by numerical integrating of a set of electron equations of motion, including the space-charge repulsion forces between the electrons and the coupling between the slow wave structure and the electron beam. The simulations were conducted for typical parameter values of a power TWT. The RF voltage amplitude, the electron phase, the phase lag, and the electron overtaking path plots are presented.

191 (10:00-10:15);

Analysis of the Sloped-Ring Slow-Wave Structure for High-Power Traveling-Wave Tubes

D. T. Lopes, C. C. Motta, Centro Tecnologico da Marinha em São Paulo, São Paulo, Brazil

A sloped-ring (also called v-shaped) helix slow-wave structure is analyzed in order to obtain its dispersion and interaction impedance characteristics. A mathematical model was developed for predicting the dispersion and the interaction impedance characteristics. Plots of

these two curves varying some constructing parameters are shown. Measurements of these characteristics are to be performed and they will be included in the final version of this manuscript.

217 (10:15-10:30)

Construction and Tests of an Injection Gun for A 6.7 GHz Monotron

J. J. Barroso, J. O. Rossi, P. J. Castro, J. A. Gonçalves, E. Del Bosco, INPE, São José dos Campos, Brazil

We describe the construction and emission tests of an electron gun used to accelerate and inject a hollow electron beam in to a cylindrical cavity to produce high-power microwaves at 6.7 GHz, a frequency suitable for communications, medical and industrial applications. In addition to the monotron components, a hard-tube pulser with three tetrodes in parallel is also discussed.

Technical .Session We09 FP1 (Wednesday 31/10/2007, 09:00 – 10:30): Title: Antennas I

366 (invited 09:00-09:30);

Restructuring the Antenna Research in Europe: The Antenna Centre of Excellence (ACE)

P. Ingvarson¹, J. R. Mosig², ¹SAAB, Goteborg, Sweden, ²LEMA, Lausanne, Switzerland

ACE, the Antenna Centre of Excellence, is a Network of Excellence under the European Commission's 6th framework program, created to improve the efficiency of antenna research in Europe. Starting 1 Jan. 2004, it has a duration of 4 years and 51 participants from 17 European countries; 323 researchers and 130 PhD students are involved. The activities focus on mm-wave and integrated antennas, wideband and multiband antennas, small and smart antennas, active and passive planar and conformal arrays.

128 (09:30-09:45);

<u>Multi-Physics Design and Performance of a Surface-Micromachined Ka-Band Cavity</u> Backed Patch Antenna

M. V. Lukic, K. Kim, Y. Lee, Y. Saito, D. S. Filipovic, University of Colorado, Boulder, United States

A rectangular coaxial line fed cavity backed patch antenna element for a Ka-band phased array at 36GHz is presented in this paper. The antenna is fabricated by a sequential microfabrication surface micromachining process with ten structural layers. The patch is 2.8mm long and 3.2mm wide and has two slits for impedance matching and six holes for releasing the sacrificial photoresist. It is supported with the feeding probe and two metallic posts located in the plane with zero E-field.

283 (09:45-10:00),

Near-field bow-tie antennas for microwave cryogenic applications

D. Bouis, E. Saurel, P. Febvre, University of Savoie, Le Bourget du Lac, France

Printed bow-tie antennas have been designed to operate in X-band in near-field configuration in order to transmit signals over very short distances for cryogenic applications. Transmission between two bow-tie antennas directly placed across from each other has been simulated and measured for different configurations. It is shown that, by placing back-reflecting planes at a proper distance behind each bow-tie antenna, a transmission with losses below 3 dB can be achieved in the 8.0-9.7 GHz range.

288 (10:00-10:15);

Optimizing Amorphous-Shape Microstrip Antennas

T. V. Barra¹, C. Junqueira^{1,2}, F. J. Von Zuben¹, ¹University of Campinas, Campinas, Brazil, ²Institute of Aeronautics and Space, São José dos Campos, Brazil

The automatic design of microstrip antennas involves a series of continuous parameters to be optimized and multiple objectives to be simultaneously fulfilled. When the shape of the patch is admitted to be amorphous, discrete parameters are added in optimization stage. Here, we are proposing a hybrid-coded genetic algorithm to implement the search engine. The design process incorporates a comparative analysis of the electromagnetic properties and the response produced by the physical prototype.

218 (10:15-10:30)

On the Miniaturization of Printed Rectangular Microstrip Antenna for Wireless Applications

R. Kumar, Defence Institute of Advanced Technology(Deemed University), Pune, India

This paper presents the miniaturization of microstrip patch antenna. The antenna has been designed on $\epsilon r = 4.3$, thickness 1.53mm with dimension 36.08x29.6mm and simulated using FDTD code. In Patch, the slot dimension of 10x5mm, 10x12mm, and 10x15mm has been created. These slots shifts the resonant frequency lower side at 1.91GHz, 1.49GHz and 1.19GHz respectively in comparison to conventional fr 2.33 GHz. This indicates of size reduction 50% with fr 1.19GHz in comparison to original antenna.

Technical .Session We09 ZG1 (Wednesday 31/10/2007, 09:00 – 10:30): Title: Optical (Photonics) Networks I

254 (09:00-09:15);

BER Estimation in DPSK Systems Using the Differential Phase Q Taking into Account the Electrical Filtering Influence

N. M. Costa^{1,2}, A. V. Cartaxo^{1,2}, ¹Instituto Superior Técnico, Lisboa, Portugal, ²Instituto de Telecomunicações, Lisboa, Portugal

A novel method to estimate the bit-error ratio in differential phase-shift keying systems, taking into account the receiver electrical filtering influence is proposed. This method assumes a Gaussian distribution for the "equivalent" differential phase. The validity of the proposed method is assessed in systems where the amplified spontaneous noise is the prevalent noise source by comparison with results from direct error counting, showing good agreement.

161 (09:15-09:30);

Polarization Coded Quantum Key Distribution through Telecom Single Mode Optical Fibers: Problems and Solutions

G. B. Xavier, G. V. de Faria, J. von der Weid, PUC-Rio, Rio de Janeiro, Brazil

Abstract—In this paper we briefly comment some technological limitations of the implementation of quantum cryptography employing polarization coding. We perform an experiment to demonstrate a compensation scheme for polarization coded QKD. We then apply a procedure to characterize an APD working as a photon counter operating in the single-photon regime. We finally perform a polarization coding photon counting experiment.

121 (09:30-09:45);

Intelligent Optical Monitoring System for Integrated Management of DWDM Networks

J. R. Rosolem , C. Floridia, J. A. Matiuso, J. R. De Oliveira , R. F. Da Silva , J. C. Martins , R. Arradi , A. Paradisi , CPqD Foundation, Campinas, Brazil

In this work we describe the development of an intelligent performance monitoring system of optical layer which permits full DWDM system management. Three activities lines are described: optical channel monitor, analysis algorithm and demonstration software. The results obtained in laboratory and field tests show that this tool can be very important to telecom companies in order to manage their short and long distance optical plants which use DWDM systems.

132 (09:45-10:00);

Optical Packet/Burst Switching Node Architecture with WDM Hierarchical Issues

L. H. Bonani, F. R. Barbosa, E. Moschim, State University of Campinas, Campinas, Brazil

Applications with optical packet switching (OPS and OBS) offer potentially large capacity due to significant increase in optical channel granularity and use. Simulation studies on OPS/OBS switching node architectures, as presented here, are an important strategy to evaluate new designs, joined with provision of quality of service (QoS). This work presents an innovative node architecture for both OPS/OBS optical nodes, which has issues on WDM for the hierarchical network core integration.

136 (10:00-10:15);

Cost-Benefit Analysis of WDM Optical Network Simultaneously Using Waveband Grooming and Wavelength Conversion

H. M. Neto, E. M. Queiroz, A. C. César, University of São Paulo, São Carlos, Brazil

In this paper we present a cost-benefit analysis of WDM optical network based on the cost of node architecture and on the quantity of successful connection requests. The network nodes are capable of performing all optical waveband grooming and wavelength conversion and electronic traffic grooming. The approach includes a connection admission control based on the bandwidth capacity of connection requests and on the first-fit algorithm.

198 (10:15-10:30)

Joint Minimization of Congestion and Hop Distance in Design of Optical Networks

K. D. Assis, H. Waldman, UFABC, Santo André, Brazil

In this paper, we investigate a multicriteria formulation to compute the set of solutions from static Virtual Topology Design of the optical networks with two objective functions to: 1) minimize the maximum congestion and 2) minimize the average hop distance. The approach permits the decision maker to have a better perception of the gain and the loss of choosing any given solution. We report some computational results which fully justify the interest of carrying out a multicriteria study.

Technical .Session We09 ZG2 (Wednesday 31/10/2007, 09:00 – 10:30): Title: Optical Sensors and Bragg Circuits

303 (09:00-09:15);

Tunable, grating-assisted single-ring laser mirrors

C. Vázquez¹, O. Schwelb^{2,2}, ¹Universidad Carlos III, Leganés, Spain, ²Concordia University, Montreal, Canada

Two configurations based on Bragg grating assisted single-ring microresonators are analyzed and numerically simulated. Device characteristics such as bandwidth, sensitivity to loss, effect of external coupling and tunability are simulated. The relationship between the resonator mode number and the grating parameters and the selection rules for appropriate mode numbers are discussed. Parametrized reflection characteristics illustrate the analytical results.

241 (09:15-09:30);

Characterization of an EDF Fiber Laser Strain-Tuned by Two High-Strength Fiber Bragg Gratings

N. Haramoni, A. S. Paterno, J. C. Silva, H. J. Kalinowski, Federal University of Technology - Paraná - Laboratory of Optics and Optoelectronics, Curitiba, Brazil

The characterization of a tunable erbium-doped fiber laser with a linear cavity used for fiber Bragg grating sensors interrogation is described. The laser is mechanically tuned by two highly-stretchable fiber gratings that can be connected to the laser cavity at a time. The scanning laser signal features significant relaxation oscillations after the grating switching, which are investigated with reference to the laser optical pump power and the pump ratio r.

341 (09:30-09:45);

Design and Fabrication of polymer waveguide resonator with distributed Bragg reflectors

T. Liu, R. R. Panepucci, Florida International University, Miami, United States

We design a polymer waveguide resonator made up of 1D distributed Bragg reflectors (DBR) with air and polymer alternating layers by 3D FDTD and BPM simulations. The optimization of polymer ridge waveguide, the reflectance of DBR reflectors and the characteristics of the cavity are shown. The microcavity with quality factor Q-2000 and length 10um can be achieved at resonant wavelength 1.55um. Initial fabrication results using direct electron-beam lithography are demonstrated.

117 (09:45-10:00);

Fiber Bragg Grating Temperature Sensors used to Measure Flow in a Pipeline

L. Grabarski¹, J. C. Silva^{1,2}, E. Cação¹, A. S. Paterno^{1,3}, H. J. Kalinowski¹, ¹Universidade Tecnológica Federal do Paraná, Curitiba, Brazil, ²Universidade Tecnológica Federal do Paraná, Pato Branco, Brazil, ³Universidade Tecnológica Federal do Paraná, Cornélio Procópio, Brazil

This paper shows the feasibility of using fiber optic sensors to measure flow in pipelines. The technique consists of measuring the temperature variation on the external surface of a pipeline, with known dimensions, when a hot fluid traverses the system. In order to measure temperature, fiber Bragg grating (FBG) sensors and thermocouples are used. The experimental data is compared to data obtained with the mathematical modeling of the heat transfer in the pipeline.

116 (10:00-10:15);

Temperature independent electrical field optical grating based sensor for high voltage applications

C. Floridia¹, F. Borin¹, J. B. Rosolem¹, F. E. Nallin¹, U. H. Bezerra², A. A. Tupiassú³, ¹CPqD Foundation, Campinas, Brazil, ²Universidade Federal do Pará, Belém, Brazil, ³Centrais Elétricas do Pará S.A., Belém, Brazil

We propose a novel temperature independent electric field optical sensor using fiber Bragg gratings (FBG) attached to a piezoelectric material. The deformation on the piezoelectric material due to the presence of the electric field causes variation of the reflected wavelength. To compensate the temperature variations we used two FBGs attached to two pieces of the same piezoelectric substrate Configurations of fiber grating in parallel and series are also studied in this paper.

234 (10:15-10:30)

Optical Fibre Mach-Zehnder Microphone

L. Kruger, H. J. Theron, CSIR, P.O. Box 395, Pretoria, South Africa

An optical fibre "microphone" was realized by configuring and mounting the sensing arm of a fibre Mach-Zehnder interferometer such that the acoustic waves could be picked up in the most efficient way. The set-up employed a laser diode, two fibre couplers, single mode optical fibre, a photo detector/pre-amplifier unit and a sound recorder. There was a good comparison between the fibre microphone and a low-end dynamic microphone. Many applications are foreseen for this device.

Technical .Session We 11 FP2 (Wednesday 31/11/2007, 11:00 – 12:30):

Title: Workshop on Defense

368 (11:15-11:30);

A Simplified Technique to Estimate the Monostatic Radar Cross Section of Planar Array Antennas

F. D. Alves, R. A. Santos, Instituto Tecnológico de Aeronáutica, Sao Jose dos Campos, Brazil

The process of modeling and analyzing Radar Cross Section (RCS) can be very complex and very demanding concerning computational efforts. This paper presents a simplified technique to estimate the monostatic RCS of planar array antennas. It is used the APG-73 antenna to buildup and explain the model.

160 (11:30-11:45);

Implementation of an Active Noise Suppression System in C-Band Indoor RCS Measurements

M. A. Miacci, I. M. Martin, M. C. Rezende, ITA, São José dos Campos, Brazil

The present article shows the results of ongoing works at AMR/IAE/CTA in the configuration of an experimental setting necessary to determine the error sources in radar cross section (RCS) measurements and hence minimize them by means of a system developed to measure targets in C- Band (6.0 GHz), in a closed environment, using an anechoic chamber. Microwave circuit techniques were employed aiming at an active noise suppressing system, by use of the principle of phase canceling.

163 (11:45-12:00);

Radar Cross Section Measurements of Complex Targets (Missile Parts) in C-Band in Anechoic Chamber

M. A. Miacci, I. M. Martin, M. C. Rezende, ITA, São José dos Campos, Brazil

Assembly of an experimental setting necessary to measure the radar cross section (RCS) of simple and complex targets was accomplished in an anechoic chamber using an active noise suppression system, by using the C-band of frequencies (5.0 to 7.0 GHz). As results of this Brazilian pioneer work in the area of electromagnetic characterization, the diagrams of the radar cross section of a cylindrical body integrated to the square fins, here denominated as Hypothetical Missile, and a missile section.

219 (12:00-12:15);

Orientation of a Support Pylon Used in Radar Cross Section Measurements

M. A. Alves¹, G. G. Peixoto^{1,2}, M. C. Rezende¹, ¹Instituto de Aeronautica e Espaço, São José dos Campos, Brazil, ²Instituto Tecnológico de Aeronáutica, São José dos Campos, Brazil

Simulations of the radar cross section (RCS) of a four-column square-based support pylon were performed in order to find the orientation between a radar antenna and the pylon in which the radar return from the pylon is minimal. From RCS simulations at 2, 6 and 10 GHz it was found that the optimal positioning of pylon occurs when the side of the pylon is at an angle of about 20° with respect to the line-of-sight of the radar antenna.

139 (12:15-12:30);

Simulations of the Radar Cross Section of a Stealth Aircraft

M. A. Alves¹, R. J. Port^{1,2}, M. C. Resende¹, ¹Instituto de Aeronautica e Espaco, Sao Jose dos Campos, Brazil, ²Instituto Tecnologico de Aeronautica, Sao Jose dos Campos, Brazil

The Radar Cross Section (RCS) of a model of the bomber B-2 Spirit was simulated with the CADRCS software. Results from simulations with the model having a perfectly conducting surface and rotating about the yaw, pitch and roll axes are presented and compared with results of simulations where its surface was covered with a radar absorbent material (RAM). The objective of this study was to investigate how the shape can affect the RCS of an aircraft and how the use of RAM can reduce its RCS.

Technical .Session We 11 FP1 (Wednesday 31/10/2007, 11:00 – 12:30): Title: Antennas II

245 (11:00-11:15);

Reduction of Multipath Interference in Antenna Pattern using Matrix Pencil Method

F. C. Silva¹, M. B. Terada¹, W. A. Davis², ¹Universidade de Brasília, Brasília, Brazil, ²Virginia Polytechinic Institute and State University, Blacksburg, United States

In this paper the matrix pencil technique is applied to reduce interference caused by multipath signals in antenna patterns. The finite difference time domain method is used to get the time-domain signals as in free space and under interference. Then, the gating technique and the matrix pencil method are used to clean that interference. The results show the efficacy of the matrix pencil method when compared with the gating technique.

188 (11:15-11:30);

Effects of Mutual Coupling in Smart Antenna Arrays

M. J. Alves, M. S. Alencar, Federal University of Campina Grande, Campina Grande, Brazil

The radiation pattern in the H-plane of smart antenna arrays (SAA), which includes the effects of mutual coupling (MC) is examined. In an SAA the effects of MC and nonuniform spacing between the array elements are compensated with the use of a transformation matrix T. The weight vector of the array is updated by way of the least-mean-square (LMS) algorithm. A MatLab program was developed to verify the MC for a smart antenna array.

319(11:30-11:45);

Bandwidth and Size Optimisation of a Wide-Band E-Shaped Patch Antenna

A. C. Pedra^{1,2}, G. Bulla¹, C. R. Fernandez¹, G. Monser¹, A. A. Salles¹, ¹Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil, ²Serviço Nacional de Aprendizado Industrial - SENAI - RS, Porto Alegre, Brazil

Bandwidth and size optimisations of a single layer wide-band E-shaped patch antenna, fed through a coaxial probe are described. Maxwell equations are discretized and solved using the finite-difference time-domain (FDTD) method Simulations and measurements using capacitive feeding and shorting pins are presented. Using these techniques, the bandwidth can be improved up to 32% and the antenna area can be reduced up to 60% without significant change in the frequency band.

275(11:45-12:00);

Use of Square Parasite Elements to Increase the Bandwidth of Planar Monopole Antenna for UWB Systems

T. C. Martins, R. M. de Oliveira, C. L. Souza Sobrinho, Federal University of Pará, Belém, Brazil

Abstract — Abstract — This work presents planar monopole antennas for UWB systems operating in the range 3.1-10.6GHz. Initially an antenna with a width of 12 mm and a height of 20 mm was analyzed. The return loss characteristic and radiation pattern of this antenna was calculated by the FDTD method. Then, some techniques are presented with the purpose of to increase the antenna's bandwidth, such as using square parasite elements around the main radiator.

118(12:00-12:15);

High gain antenna for data downloading of LEO satellite

S. Chiocchetti, J. E. Conti, IAR (Institute of Radio Astronomy), Villa Elisa, Argentina

This paper describes the design, construction and measurement of a high gain antenna, prototype model, used for the SAOCOM satellite data downloading, whose fundamental purpose will be catastrophe prevention and monitoring. The antenna is a concentric spiral array with two rings, 18 elements and fed by a circular cavity.

337 (12:15-12:30)

Approximated Raising of the Curvature of a Double-Ridged Waveguide Horn Antenna in a Computational Model

C. H. dos Santos, R. S. Alípio, U. d. Resende, M. d. Schroeder, L. A. Santos, M. M. Afonso, Cefet mg, Belo Horizonte, Brazil

In this paper is studied the curvature and the shape of the double ridged horn antennas in its computational modeling, whose application is very significant for EMC/EMI tests. The ridges, curve structures inside the double ridged horn antennas, are an important structural parameter. Its curvature is described by a function, and this function needs a mathematical treatment when building its 3D geometry in a computational model.

Technical .Session We 11 ZG1 (Wednesday 31/10/2007, 11:00–12:30): Title: High Speed techniques and Microwave Photonics

367 (invited) (11:00-11:30);

Electro-Optic Performances of Novel Calcium Barium Niobate Thin Films

M. Ferrara, L. Razzari, R. Helsten, P. Ndione, M. Chaker, R. Morandotti, INRS, Varennes, Canada

The electro-optical coefficient r33 of a novel ferroelectric compound (Calcium Barium Niobate) is estimated using a single beam set-up in a reflection geometry on thin film samples. The quality of the electrode used to apply the exciting field was estimated as a critical parameter. Following an electrode quality optimization we estimated a lower bound for the r33 coefficient as large as 130 pm/V.

155 (11:30-11:45);

Optical Millimetter-Wave Frequency Conversion of Ultra Wide Band-Monocycle in

UWB-over-Fiber Down-Link System

Y. Le Guennec, R. Gary, Institute of Microelectronics Electromagnetism and Photonics, Grenoble, France

This paper investigates all-optical frequency up-conversion of ultra wide band monocycle using a simple radio-over fiber (ROF) system based on the use of an electro-optical modulator. An original method to generate quasi UWB monocycle from a pseudo-random pattern generator is explained. Up-conversion of UWB monocycle is then successfully demonstrated in the 18 GHz test band. Application of this all-optical up-conversion technique for generation of UWB waveforms in the 60 GHz band is discussed.

173 (11:45-12:00),

Continuous and Pulsed THz generation with molecular gas lasers and photoconductive antennas gated by femtosecond pulses

F. C. Cruz, G. T. Nogueira, L. F. Lamonier, R. C. Viscovin, N. C. Frateschi, D. Pereia, State University of Campinas, Campinas, Brazil

TeraHertz waves, associated with the far-infrared region of the electromagnetic spectrum, are gaining increasing interest in the past years due to promising applications in imaging, spectroscopy, and even communications. Here we report THz generation based on two systems: 1) continuous-wave (cw) laser generation in molecular gas lasers, and 2) short pulse generation in photoconductive antennas, gated by femtosecond near-infrared Ti:sapphire lasers.

210 (12:00-12:15);

Using photonic filters for tuning dispersion-induced microwave transmission windows on radio over fiber schemes

C. Gutierrez-Martinez, J. Santos-Aguilar, J. Torres-Fortiz, A. Morales-Diaz, Instituto Nacional de Astrofísica, Optica y Electronica, Puebla, Mexico

The frequency response of a radio over fiber system using a multi-longitudinal laser and dispersive optical fiber exhibits band-pass microwave transmission windows. The position of the microwave bands depends on the optical spectrum and also on the length of the optical channel. The frequency response can be modified by filtering the optical spectrum. The tuning of position and number of the microwave windows, when the optical spectrum is filtered by optical delays, is reported in this paper.

353 (12:15-12:30)

Modeling of A High Sensitivity Heterostructure Varactor with Optical Modulation Capability

X. Zhao¹, A. Cola², A. Persano², F. Quaranta², E. Gallo¹, J. E. Spanier¹, B. Nabet¹, ¹Drexel University, Phildalphia, United States, ²Consiglio Nazionale delle Ricerche, Lecce, Italy

We have developed an optically modulated high sensitivity heterostructure varactor whose Cmax/Cmin ratio of up to 113, and sensitivity of up to 35 are among the highest reported. The device has a modulation-doped heterojunction of AlGaAs/GaAs in a resonant cavity structure, thus operating as both a photodetector and a Varactor. We present a lumped parameter model that explains the observed behavior and verify it with experimental results as well as with simulation of the physical structure.

Technical .Session We 11 ZG2 (Wednesday 31/10/2007, 11:00– 12:30): Title: Nanomaterials and Devices

322 (11:00-11:15);

Flexible Waveguide Coupling Probe for Wafer-Level Optical Characterization of Planar Lightwave Circuits

A. J. Zakariya, T. Liu, J. G. Noel, R. R. Panepucci, Florida International University, Miami, United States A probe that enables optical coupling to planar lightwave circuits (PLCs) is described. A flexible waveguide is used to form a variable length directional coupler that extracts light from a waveguide. Varying the probe length enables optimal coupling to be achieved for a wide range of probe-to-waveguide gap and materials. The results indicate that this approach is ideal for characterizing PLC's as the 3dB bandwidth of the probe covers the 1.3-1.7 um fiber-optic telecommunication range.

327 (11:15-11:30);

Waveguide Features in Self-Patternable Amine Functionalized Organic-Inorganic Hybrids

M. R. Ferreira André, CICECO, Aveiro, Portugal

We report the use of organic-inorganic sol-gel derived poly(oxyehylene)/siloxane hybrid doped with methacrylic acid modified zirconium (IV) n-propoxide for the fabrication of low cost waveguides trough direct UV laser writing. The effective guiding region was identified and the number of modes was estimated via mode field analyses. A grating was successfully superimposed on the channel and the respective

reflection spectrum was measured.

156 (11:30-11:45);

Rewritable Grating Made of Metamaterial with Nanostructure

M. Saito, N. Ota, Y. Tsubokura, A. Fujiuchi, Ryukoku University, Otsu, Japan

A metamaterial was fabricated by capsulating photochromic solution in nanoholes of polycarbonate. Nanoholes provided sufficient free volume for dye molecules to isomerize, and prevented the solution to flow and disturb an optically-induced grating pattern. A grating pattern was written in the material by irradiating an interference fringe of green laser. This grating pattern could be erased by ultraviolet irradiation to write a grating with a different period.

230 (11:45-12:00),

Novel functionality of three-dimensional nanostructured devices fabricated with femtosecond pulse laser

W. Cai, A. Libertun, R. Piestun, University of Colorado at Boulder, Boulder, United States The optical properties of modulated three-dimensional periodic structures called computer generated volume holograms are studied and different encoding techniques are proposed. The structures are fabricated using femtosecond laser pulses to modify the refractive index in the

286 (12:00-12:15);

volume of dielectric materials.

Amplification of evanescent spatial harmonics and subwavelength imaging inside of a wire medium slab

Y. Zhao¹, P. Belov^{1,2}, Y. Hao¹, ¹Queen Mary University of London, London, United Kingdom, ²St. Petersburg State University of Information Technologies, Mechanics and Optics, St. Petersburg, Russian Federation

The amplification of evanescent spatial harmonics has been observed inside of a wire medium slab with half-wavelength thickness. The physics of the phenomenon are drastically different as compared to the amplification observed for the slabs of left-handed media. The opportunity of subwavelength imaging was revealed. The reported effect may be used for sub-surface imaging and creation of subwavelength imaging devices of new generation.

312 (12:15-12:30)

Silver Nanoparticles in Nonlinear Microscopy

D. J. Rativa¹, A. Gomes², S. Wachsmann-Hogiu³, D. Farkas³, R. E. de Araujo¹, ¹Federal University of Pernambuco, Recife, Brazil, ²Federal University of Pernambuco, Recife, Brazil, ³Cedars-Sinai Medical Center, Los Angeles, United States

Nanotechnology has led to the manufacture of nanometer-sized objects which can be explored in multiphoton microscopy. Metal nanoparticles (NPs) do not generate the multiphoton signal by itself, but rather it can enhance the nonlinear (NL) emission of fluorochromes. Here we have measured and analyzed the fluorescence of Tryptophan solution with and without silver nanoparticles. Due to the molecule interaction with the metallic NPs, fluorescence enhancement and quenching process were observed.

Technical .Session We 14 FP2 (Wednesday 31/11/2007, 14:30 – 15:45): Title: Workshop on Defense

290 (14:45-15:00);

Hybrid Multilayer Structures for Use as Microwave Absorbing Material

L. C. Folgueras^{1,2}, M. C. Rezende¹, ¹Comando-Geral de Tecnologia Aeroespacial, São José dos Campos, Brazil, ²Universidade de Taubaté, Taubaté, Brazil

This work is to processing of multilayer flexible from nonwoven substrates impregnated with the polyaniline. Processed materials with different parameters (monolayer and multilayer stacking) were evaluated considering the frequency of 8 to 12 GHz. The method of impregnation allow good anchorage of absorbing centers on the substrate, and the different structures that were obtained attenuated the radiation from 65 to 99%, which indicates that these materials can be used as microwave absorbers.

291(15:00-15:15);

Development, Characterization and Optimization of Dielectric Radar Absorbent Materials as Flexible Sheets for Use at X-band

L. C. Folgueras^{1,2}, M. A. Alves¹, M. C. Rezende¹, ¹Comando-Geral de Tecnologia Aeroespacial, São José dos Campos, Brazil, ²Universidade de Taubaté, Taubaté, Brazil

This paper presents a study of the dielectric properties of radar absorbent materials (RAMs). Two different RAMs were prepared from a conducting polymer. The RAMs were evaluated with respect to their absorption and reflectivity to electromagnetic waves, and permissivity. The evaluated materials attenuated the energy of the incident radiation from 30 to 65%. A hybrid optimization algorithm (HA) was used to find the optimal parameters for these materials for processing.

333(15:15-15:30);

A Study on RCS of Missile Models using the Method of Moments

M. B. Perotoni^{1,2}, S. E. Barbin¹, ¹Escola Politécnica da Universidade de São Paulo, Sao Paulo, Brazil, ²CST GmbH, Darmstadt, Germany

Design rules for reducing back-scattered signal by military aircrafts and vessels are presented. These procedures are based on the geometric optimization of the vehicle shape. A technique based on a modified Method of Moments was developed for simulating the electromagnetic problem in a conventional PC. This avoids the usual computational burden inherent to this type of design.

181 (15:30-15:45);

Harsh Environment Temperature and Strain Sensor Using Tunable VCSEL and Multiple Fiber Bragg Gratings

C. F. Mateus, C. L. Barbosa, Instituto de Estudos Avançados – IEAv/CTA, São José dos Campos, Brazil

Harsh environment applications, such as aerospace and oil extraction, require small, light and robust sensors. The new temperature and strain sensor presented here consists of a tunable VCSEL, circulator, multiple fiber Bragg gratings, and pin detectors. It has broad dynamic range, high sensitivity and a very simple detection scheme. When compared to other fiber Bragg grating approaches, it has the advantage of having its intelligence in the electrical domain, coupled to the optical devices.

Technical .Session We 14 FP1 (Wednesday 31/10/2007, 11:00 – 12:30): Title: Wireless Communication

158 (14:30-14:45);

European Project RESOLUTION- Local Positioning Systems based on Novel FMCW Radar

F. Ellinger¹, R. Eickhoff¹, A. Ziroff², J. Huettner², R. Gierlich², J. Carls¹, G. Boeck³, ¹Dresden University of Technology, Dresden, Germany, ²Siemens, Munich, Germany, ³Technische Universität Berlin, Berlin, Germany

This paper gives an overview of the EU project RESOLUTION (Reconfigurable Systems for Mobile Local Communication and Positioning). A FMCW radar principle for 3-D local positioing is employed and co-designed together with common WLAN systems operating around 5 GHz. At 140 MHz bandwidth, measurements demonstrate excellent positioning accuracies of better than 4 cm in an anechoic chamber, and 18 cm in a conference hall with strong multipath and area of 800 m2.

269 (14:45-15:00);

A Physical Layer Performance Simulation System for UMTS

J. S. Rocha^{1,2}, I. E. Fonseca^{3,2}, J. E. Farias^{1,2}, M. S. Alencar^{1,2}, ¹Institute for Advanced Studies in Communications, Campina Grande, Brazil, ²Federal University of Campina Grande, Campina Grande, Brazil, ³Federal University of the Semi-arid Region, Mossoró, Brazil

This paper presents an algorithm to evaluate the performance of the Universal Mobile Telecommunication System (UMTS), which will soon be deployed in Brazil. The proposed UMTS physical layer simulation system is described. The block diagram for the simulator architecture is presented. A functional description for some of the blocks is included and some results are presented.

296(15:00-15:15);

Improved Mobile PoC Registration for CDMA Systems

S. Nucci^{1,2}, S. E. Barbin², ¹VIVO S.A. and Universidade de São Paulo, São Paulo, Brazil, ²Universidade de São Paulo, São Paulo, Brazil

One of the most emergent services in mobile data communication is PoC. This service is used nowadays to provide a rapid and efficient solution to connect many users simultaneously. The advent of new packet-switching networks offered new possibilities to PoC deployment, such as Voice-Over-IP (VOIP) calls. Because networks do not have QoS capabilities, a lot of challenges are presented, such as mobile phone

registration procedure in a PoC platform, which is detailed in this paper.

331(15:15-15:30);

ZigBee for Building Control Wireless Sensor Networks

F. L. Zucatto, C. A. Biscassi, F. Monsignore, F. Carcass, S. Coutinho, M. L. Rocha, Engineerging School of São Carlos University of São Paulo, São Carlos, Brazil

ZigBee and IEEE 802.15.4 are standards protocols for wireless network applications. The IEEE defines the PHY and MAC layers. For ZigBee, an alliance worked to develop specifications for stack profiles. The stack profile is selected by the ZigBee coordinator and is chosen on the basis of application areas, such as Home Control. Aiming the development of a commercial ZigBee product, this paper describes important aspects of the standards and the stack main directives selected.

345 (15:30-15:45);

Analysis of Turbo Coded OFDM Systems employing Space-Frequency Block Code in Double Selective Fading Channels

I. R. Casella, Universidade Federal do ABC, Santo Andre, Brazil

Transmit diversity can be applied to Orthogonal Frequency Division Multiplexing (OFDM) systems by adopting Space-Frequency Block Coding (SFBC). To carry out simple linear decoding, it is usually assumed that the frequency response between two consecutive subcarriers is constant. However, this assumption is unreliable in a severe multipath environment. In this paper, we analyze a Turbo SFBC-OFDM system with comb-type frequency domain channel estimation to improve the performance of OFDM systems.

363 (15:45-16:00)

On Adaptive LCMV Beamforming for Multiuser Processing in Wireless Systems

D. Zanatta Filho¹, C. C. Cavalcante³, L. S. Resende², J. M. Romano¹, ¹State University of Campinas -Unicamp, Campinas, Brazil, ²Universidade Federal de Santa Catarina, Florianopolis, Brazil, ³Universidade Federal do Ceará, Fortaleza, Brazil

Multiuser processing using an antenna array increases capacity in wireless systems with a reduction of the multiuser interference. The use of a Linearly Constrained Minimum Variance (LCMV) criterion can optimize the antenna array weights. This work presents an unified view of LCMV beamforming, including a solution that avoids direction of arrival (DOA) estimation and is able to cope with angular spread. Moreover, we evaluate the performance of the proposed techniques in non-zero angular spread.

Technical Session We 14 ZG1 (Wednesday 31/11/2007, 14:30 – 16:00): Title: Optical (Photonics) Networks II

168 (invited) (14:30-16:00);

Optimization of Integrated Electro-Absorption Modulated Laser Structures for 100 Gbit/s Ethernet Using Electromagnetic Simulation

T. K. Johansen, C. Kazmierski, C. Jany, C. Jiang, V. Krozer, Technical University of Denmark, Kgs. Lyngby, Denmark

Very-high bit rate integrated electro-absorption modulated laser (EML) structures are investigated using electromagnetic simulation. An EM/circuit co-simulation approach is used to estimate the electrical to optical transmission bandwidth for the integrated EML structures. It is shown that a transmission bandwidth of 70 GHz seems feasible. The influence of electromagnetic cross-talk between components in the case of very short separation zones and the benefit of ground pillars are discussed.

257 (15:00-15:15);

Influence of Laser Chirp Parasitics on Optimized Dispersion-Managed Directly Modulated Systems Operating at 10 Gbit/s

J. A. P. Morgado, A. V. T. Cartaxo, Instituto de Telecomunicações, Lisboa, Portugal

The influence of laser chirp and parasitics on optimized dispersion maps (ODM) for multi-span directly-modulated/direct-detection systems (DD) operating at 10Gbit/s is assessed through numerical simulation. It is shown that the ODM uses under-compensation in the last span and, for higher laser chirp levels, in-line dispersion compensation requires over-compensation. However, if a reduction of laser chirp and parasitics is achieved, under-compensation levels are required.

323(15:15-15:30);

Impact of Physical Layer Impairments in All-Optical Networks

H. A. Pereira^{1,2}, D. A. Chaves², C. J. Bastos-Filho³, J. F. Martins-Filho², ¹State University of Pernambuco, Recife, Brazil, ²Federal University of Pernambuco, Recife, Brazil, ³State University of Pernambuco, Recife, Brazil

We investigate the impact of different physical impairments in the performance of all-optical networks. The physical impairments considered

are the gain saturation and amplified spontaneous emission noise depletion in amplifiers, homodyne crosstalk in optical switches, four wave mixing and polarization mode dispersion in the transmission fibers. Our simulation results are presented in terms of blocking probability of requested calls as a function of network device parameters.

169(15:30-15:45);

Performance of a 1310nm-based SCM WDM with Optical Carriers Separated by 0.56nm

L. Vieira, E. F. Obrzut, A. A. Pohl, Universidade Tecnológica Federal do Paraná, Curitiba, Brazil

This work presents results on the performance of a 1310nm based SCM WDM system that makes use of two optical carriers separated by 0.56nm. CNR, CSO and CTB are measured for the system carrying 40 RF subcarriers in each optical wavelength.

Technical .Session We 14 ZG2 (Wednesday 31/11/2007, 14:30 – 15:15): Title: Optical Signal Processing

324 (14:30-14:45);

Response Linearization of a 2D Optical Position-Sensitive Detector

L. P. Salles, P. Retes, E. M. Fernandes, D. W. Monteiro, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

This paper presents an alternative layout for a 2D optical PSD, namely a quad-cell, where the quantum efficiency of the central region is higher than that of the peripheral region. Simulation results show that this approach improves the linearity of the quad-cell response at the central region. A numerical model provides an optimal spot-radius range and experimental results present a good linearity for a spot within this range.

340 (14:45-15:00);

Broadband generation of cascaded Four-Wave Mixing products

A. C. Sodré Junior^{2,1}, J. M. Boggio¹, A. A. Rieznik^{3,1}, H. E. Hernandez-Figueroa², H. L. Fragnito¹, ¹Unicamp, Campinas, Brazil, ²Unicamp, Campinas, Brazil, ³Padtec Optical Components and Systems, Campinas, Brazil

A new method to efficiently generate broadband cascaded four-wave mixing (FWM) products is presented. It consists of launching two strong pump waves near the zero-dispersion wavelength of short optical fibers. The bandwidth of FWM products is width- and wavelength-tunable by adjusting the laser wavelengths and polarization states. This method has been applied to standard, dispersion-shifted and highly nonlinear fibers (HNLF). The maximum bandwidth of 300 nm has been obtained by using HNLF.

347(15:00-15:15);

<u>All-optical noise limiters based on saturated FOPAs: numerical and experimental study</u> on signal degradation

J. D. Marconi, A. Guimarães, H. L. Fragnito, Unicamp, Campinas, Brazil

Optical limiters based on saturated parametric optical amplifiers are studied through numerical simulations and experiments. Numerical results show that in such devices the noise suppression benefit exists within a signal input power range. This power range depends on fiber length and gets narrower if a higher Q factor is required. We confirmed those results with our experiments showing that an operational optical limiter must be carefully designed in order to work in all-optical networks.

Technical .Session We 16 FP3 – (Wedenesday 31/10/2007, 16:30 – 18:00): Ttitle: INTERACTIVE FORUM 2 – Poster Session

Propagation Posters:

134 <u>On the Simulation and Correlation Properties of Phase-Envelope Nakagami Fading</u> <u>Processes</u>

J. S. Santos Filho, M. D. Yacoub, Universidade Estadual de Campinas, Campinas, Brazil

We propose a general method for simulating both envelope and phase of Nakagami fading channels, allowing for arbitrary values of fading parameter and nonisotropic scenarios. The method complies with the newly-derived Nakagami phase-envelope distribution and Nakagami

envelope autocorrelation. Relying on the proposed scheme, we also derive precise closed-form approximations to the envelope, phase, and quadrature component autocorrelations and to the quadrature component crosscorrelation.

187 <u>FSO Systems: Rain, Drizzle, Fog and Haze Attenuation from Different Optical</u> Windows Propagation.

C. P. Colvero^{1,2}, M. R. Cordeiro², J. P. Weid², ¹Inmetro – National Institute of Metrology, Standardization and Industrial Quality, Duque de Caxias, Brazil, ²PUC-Rio - Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil

Experimental comparison of three optical transparency windows of the Earth's atmosphere from 12 months. Rain, drizzle, fog and haze scattering attenuation were simultaneously measurements in side by side parallel free space optical communication links, operating at 0.78 μ m, 1.55 μ m and 9.1 μ m. Results include a real time measurement of the optical signals received of the three wavelengths links used versus visual range and rainfall acquitted and a comparison with the Carbonneau relation.

266 <u>Numerical Analysis of the SIGAnatel Tool for Technical Feasibility Studies of TV</u> and FM Broadcast Channels

P. H. Silva, M. G. Passos, Federal Center of Technological Education of Paraíba, João Pessoa, Brazil

This paper describes the applications of the SIGAnatel tool to simulate technical feasibility studies of TV and FM broadcast channels. The numerical analysis was performed using point-to area field strength data and prediction methods based on Recommendation ITU-R P.1546-1. The SIGAnatel data bank on terrain roughness data was included in the simulations. Comparative studies between this work and SIGAnatel results were realized to verify the main parameters involved in the feasibility design.

268 <u>Measurements of Digital TV Signals in the UHF Band in the Metropolitan Region</u> of Sao Paulo

C. P. Colvero^{1,2}, R. S. Souza², P. G. Castellanos², L. A. Mello², ¹Inmetro – National Institute of Metrology, Standardization and Industrial Quality, Xerém, Brazil, ²Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil

This work describes a campaign of measures of the characteristics of the propagation channel for Digital TV on the metropolitan region of São Paulo to determine the propagation loss, the reception threshold and signal delay profiles in different situations of reception in urban environments. This paper presents preliminary results including the analysis of the propagation loss with in the distance in blockage and visibility conditions.

282 <u>A Novel Ray Tracing Acceleration Method Based On Bounding Volumes And</u> Prior Environment Processing

N. Sedaghat Alvar, A. Ghorbani, H. Amindavar, Amirkabir University Of Technology, Tehran, Iran

Ray Tracing has been successfully used in prediction of wave propagation models. Although this method has its own obvious benefits, it suffers from a big problem: slow performance. In this paper, a novel method is proposed in which the main focus is on reducing the number of ray-facet intersections. It combines a volume bounding algorithm and a light-weight pre-processing operation on the environment which is completely independent of the locations of source and target.

310 <u>Statistical Adjustment of Walfisch-Ikegami Model based in Urban Propagation</u> Measurements

E. O. Rozal¹, E. G. Pelaes², ¹Universidade Federal do Pará, Belém, Brazil, ²Universidade Federal do Pará, Belém, Brazil

In this paper, a statistical model that consists of an adjustment of Walfisch-Ikegami model accomplished trough linear regression is presented, considering the height and the distance of the buildings as random variables. The verification of the validity of the considered model was made from the comparison between simulated measures and gotten through a measurement campaign that was carried in an urban environment.

314 <u>Methodology for Analysis of the Coverage Probability of WLAN Using the Padé</u> Approximant S. d. Fraiha¹, J. d. Rodrigues^{2,3}, H. S. Gomes¹, G. P. Cavalcante¹, ¹Federal University of Pará, Belém, Brazil, ²Superior Studies Intitute of Amazonian, Belém, Brazil, ³Amazonian Technology Faculty, Belém, Brazil

A methodology was proposed to analyze a WLAN signal reception probability in an indoor environment. Using an access point as transmitter, and a notebook computer as receiver, 25 average power received values was collected being insufficient for statistically characterize the environment. These data was expanded using an ANN to calculate the propagation loss by a Padé Approximant model. Were include: number of obstacle and their respective loss. The results were compared to a classical model.

316 <u>A Proposal for Reformulation of Procedures for Radiated Powers Level of the TV</u> Stations

C. L. Guimarães^{1,2}, T. d. Guimarães², G. P. Cavalcante², J. C. Costa², ¹National Telecommunications Agency, Belém, Brazil, ²Federal University of Pará, Belém, Brazil

The ANATEL adhered the guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz) of the ICNIRP. Based in this guiding principle, a measurements campaign was carried out in residential environments near the TV stations in urban area of Belém. The objective was to evaluate the non-ionizing radiation levels that the populations are submitted. The results obtained suggest a reformulation, on the procedures for powers radiated levels project.

351 Coherence Bandwidth in a 1.8-GHz Urban Mobile Radio Channel

A. M. Ribeiro, C. S. Castelli, E. M. Barrientos, E. Conforti, State University of Campinas, Campinas, Brazil

Results of 1.8-GHz narrow band measurements in a suburban area to characterize the coherence bandwidth at 0.9 and 0.5 correlation are presented. The correlation coefficient between two frequency-spaced envelopes is found to be highly dependent on the receiver position. For coherence bandwidth, frequency separations less than 60 kHz and 136 kHz will guarantee correlation levels larger than 0.9 and 0.5, respectively, for 90% of the time.

Defense Posters:

137 <u>Simulations of the Radar Cross Section of a Generic Air-to-Air Missile Covered</u> with Radar Absorbent Materials

M. A. Alves¹, G. G. Peixoto^{1,2}, M. C. Resende¹, ¹Instituto de Aeronautica e Espaco, Sao Jose dos Campos, Brazil, ²Instituto Tecnológico de Aeronautica, Sao Jose dos Campos, Brazil

Simulations of the radar cross section of an air-to-air missile model were performed with the CADRCS software. In these simulations at a frequency of 10 GHz, the surface of the missile was considered to be a perfect conductor and also to be covered with radar absorbent materials (RAM). The comparison of the results from the simulations shows how parts of the missile contribute to the radar cross section (RCS). Also, it is shown how the RCS of the missile is reduced with the use of RAMs.

138 Design of Single-Layer Microwave Absorbers with a Hybrid Algorithm

M. A. Alves¹, R. J. Port^{1,2}, J. M. Gonçalves¹, A. M. Gama¹, M. C. Resende¹, ¹Instituto de Aeronautica e Espaco, Sao Jose dos Campos, Brazil, ²Instituto Tecnologico de Aeronautica, Sao Jose dos Campos, Brazil

An hybrid algorithm (HA) that combines the properties of genetic algorithms (GA) and simulated annealing (SA) was implemented and used in the design of single-layer microwave absorbers. The HA incorporates the selection criteria of SA into a basic GA structure. SA ability in searching for and selecting the fittest candidate solutions is assimilated into the crossover stage of the GA. With this procedure the GA selection process no longer needs a complete population of candidate solutions.

204 A dual band steerable cell phones jammer

D. S. Araujo, J. C. Santos, M. H. Dias, Military Institute of Engineering, Rio de Janeiro, Brazil

Efficient jamming of cell phones is highly demanded by security authorities in Brazil. In this context, a dual band steerable jammer structure is proposed in this work. A single spatial filter was designed to operate simultaneously on both cell phone frequency bands, based on the methodology of null steering beamforming. Hardware and software issues of the proposed jammer are addressed. The jammer directional performance is illustrated by simulated beampatterns, with acceptable results.

Microwave Active Circuits Posters:

144 Analysis of Buck-Converters for Efficiency Enhancements in Power Amplifiers for

Wireless Communication

F. Haßler, F. Ellinger, J. Carls, Dresden University of Technology, Dresden, Germany

An analysis procedure is presented allowing the systematic optimisation of buck-converters, which are required for the efficiency enhancement of power amplifiers in back off mode. All relevant parasitics are included. Based on this model the performance of the envelope following and tracking approaches are investigated for common communication standards such as GSM, UMTS and WLAN. Efficiency enhancements of above 100 % are shown.

201 Monolithic Active Balun Integrated with a 2.4GHz Low-Noise Amplifier

F. S. Azevedo^{1,2}, F. A. Fortes^{1,2}, M. J. Rosário^{3,2}, ¹Instituto Superior de Engenharia de Lisboa, Lisboa, Portugal, ²Instituto de Telecomunicações, Lisboa, Portugal, ³Instituto Superior Técnico/Universidade Técnica de Lisboa, Lisboa, Portugal

Design of an innovative monolithic active balun integrated with LNA. The IC was implemented in a 0.35um AMS CMOS standard technology. The simulations were performed with BSIM3 model. The complete circuit presents 21dB differential power gain at 2.4GHz, a phase and a transducer gain magnitude errors less than 0.2° and 0.04dB, respectively, in a 1GHz span around 2.4GHz, a 3.7dB noise figure, a 2dBm output 1dB compression point, 50ohm input and output match, while drawing 11mA at 3V.

263 <u>A Fully Integrated 2.5GHz Band CMOS Low Noise Amplifier with Multiple</u> Switched Inputs for Diversity Wireless Communications

C. E. Capovilla, A. A. Tavora, L. C. Kretly, State University of Campinas -UNICAMP, Campinas, Brazil

For wireless communications using antenna diversity, a fully integrated LNA (Low Noise Amplifier) in a $0.35 \,\mu$ m foundry CMOS process with four input channels and diversity function is presented. The performance characteristics of the LNA such as gain, noise figure and input impedance are shown in this work. The specifications and performance are in close agreement, validating the compact design.

Electromagnetic Compatibility Posters:

177 Statistical Evaluation of Non-Canonical Reverberation Chambers

D. Weinzierl^{1,4}, M. A. Santos Jr.^{2,4}, M. B. Perotoni³, C. A. Sartori⁴, J. R. Cardoso⁴, A. Kost⁵, ¹Centro Universitário de Jaraguá do Sul, Jaraguá do Sul, Brazil, ²Centro Tecnológico da Marinha, São Paulo, Brazil, ³Technische Universität Darmstadt, Darmstadt, Germany, ⁴Universidade de São Paulo, São Paulo, Brazil, ⁵Brandenburgische Technische Universität Cottbus, Cottbus, Germany

Reverberation Chambers are often used to perform EMC tests. However, the conventional method is only effective at high frequencies. To extend the operation frequency a new method of excitation has been proposed, which is achieved by placing wires in the chamber. Since these wires support a TEM wave, they are capable of exciting the fields with no low frequency limitation. The proposed approach is simulated using the Finite Integration Technique to verify the E-field distribution in the chamber.

Industrial Applications Posters:

220 <u>Analysis of Electromagnetic Well Logging Tools for Oil and Gas Exploration using</u> <u>Finite Volume Techniques</u>

M. S. Novo¹, L. C. da Silva¹, F. L. Teixeira², ¹Pontificia Universidade Catolica do Rio de Janeiro, Rio de Janeiro, Brazil, ²The Ohio State University, Columbus, United States

We analyze the response of logging-while-drilling tools for oil exploration in complex 3-D borehole environments using finite-volumes (FV) algorithms in cylindrical coordinates. Both eccentric boreholes and dipping beds scenarios are considered. We implement two distinct FV approaches, viz., the direct-field formulation and the coupled vector-scalar potentials formulation. The numerical results show that both FV approaches provide accurate results for the examples considered.

High-Speed Techniques and Microwave Photonics Posters:

122 <u>Photonic Microwave Harmonic Generator driven by an Optoelectronic Ring</u> Oscillator

M. Varon Duran, A. Le Kernec, J. Mollier, Ecole Nationale Superieure de l'Aeronautique et de l'Espace - SUPAERO, Toulouse, France

We describe a new architecture to generate microwave signals by optical means. Our system has the advantages of two techniques. First, frequency multipliers allow to obtain high frequencies, nevertheless, a very good quality reference signal is necessary to drive these systems. Consequently, we use a loop oscillator that generate the required signal with good performance in terms of phase noise and linewidth. We present the theory related to those techniques and the experimental data obtained.

180 Optical frequency comb for high-resolution and precision metrology

G. T. Nogueira, F. C. Cruz, Universidade Estadual de Campinas, Campinas, Brazil

In this work we describe two optical frequency comb systems based on homemade high-repetition rate mode-locked Ti:sapphire lasers. One of them uses a laser that has the spectrum broadened with a microstructure fiber to cover a whole optical octave. The other system is based in a ultra-broadband Ti:sapphire laser whose spectrum covers a range from 585 nm to 1200 nm at 20 dB below the maximum. These systems will be used in a Calcium atomic clock based on the intercombination transition at 457 THz.

Optical NetworksPosters:

250 <u>Dispersion Map Design for XPM Suppression in NRZ 10 Gbit/s Pre-compensated</u> WDM links using Standard-fibre and 50 GHz of channel spacing

T. Alves^{1,2}, A. Cartaxo^{1,2}, ¹Instituto Superior Técnico, Lisbon, Portugal, ²Instituto de Telecomunicações, Lisbon, Portugal

It is shown that XPM degradation can be minimized using two different amounts of residual dispersion per span (RDPS) and that the optimum post-compensation dispersion is linearly dependent on the (RDPS). Moreover, both optimum (RDPS)and optimum post-compensation dispersion amount are almost independent of the pre-compensation dispersion. It is also shown that the pre-compensation dispersion has a low influence on the XPM-induced degradation when the post-compensation dispersion is optimized.

261 <u>Dependence of optimum residual dispersion per span on the number of spans for</u> various signaling formats over 43 Gbit/s SSMF transmission system

N. B. Pavlović, A. V. Cartaxo, Instituto de Telecomunicações, Lisbon, Portugal

The dispersion map optimization of duobinary, carrier-suppressed return-to-zero (CS-RZ), and duobinary CS-RZ formats for 43Gb/s systems with standard single-mode fiber is analyzed through numerical simulation for various number of spans. It is shown that the optimum precompensation dispersion for those formats follow the same rule shown elsewhere for other formats. Simple relation between the optimum residual dispersion per span and the number of spans is for the first time demonstrated.

318 <u>3G Radio Distribution based on Directly Modulated Lasers over Passive</u> Transparent Optical Networks

A. Brízido^{1,2}, M. Lima^{1,2}, R. Nogueira^{1,3}, P. André^{1,3}, A. Teixeira^{1,2}, ¹Instituto de Telecomunicações, Aveiro, Portugal, ²Universidade de Aveiro, Aveiro, Portugal, ³Universidade de Aveiro, Aveiro, Portugal In this work the feasibility of 3G transmission when the RF signal is directly applied to a Laser is studied. The directly modulated light is transmitted over a Passive Optical Network and the transmission is evaluated in terms of the Error Vector Magnitude for several types of Laser chirp.

Optical Signal Processing Posters:

297 <u>Time Resolved Chirp Measurements of Fast Electro-Optical Switches based on</u> <u>Semiconductor Optical Amplifiers</u>

N. Melnikoff¹, A. L. Toazza^{1,2}, C. M. Gallep³, E. Conforti¹, ¹Unicamp, Campinas, Brazil, ²Universidade de Passo Fundo, Passo Fundo, Brazil, ³CESET - Unicamp, Limeira, Brazil

Abstract — A time resolved chirp measurement technique is introduced to measure optical carrier frequency fluctuations during the subnanosecond off-on and on-off transition of electro-optical switches based on semiconductor optical amplifiers. A periodic injected current signal was used for the switching action and a high performance optical bandpass filter for frequency discrimination. The results show a chirp peak of 3 GHz for injected current excursion of 80 mA.

154 <u>Sampled Fiber Gratings for High-Resolution and high-Speed Photonic Signal</u> Processing

M. Shen^{1,1}, K. Alameh^{2,2}, ¹Shenzhen Institute of Advanced Technology, Shenzhen, China, ²Edith Cowan University, Joondalup, Australia

A novel sampled grating for high-resolution, high-speed signal processing is presented. Simulation based on Sinc2 sampled and rational sampled fiber grating modeling show that a large number of sub-ps time delay steps are attainable, corresponding to a sampling frequency in excess of 1THz. Design method is described for deriving sampling functions that meet specific true-time-delay profile requirements.

270 <u>Fiber Bragg Grating Signal Processing Using Artificial Neural Networks, an</u> Extended Measuring Range Analysis

A. C. Zimmermann, C. L. Nickel Veiga, L. Soliz Encinas, Federal University of Santa Catarina - UFSC, Florianopolis, Brazil

This paper describes and discusses the application of Artificial Neural Networks (ANN) in Fiber Bragg Gratings (FBG) signal processing that use narrow band filters as demodulation paradigm to extend the measuring range. Experimental results are presented for two different cases of a temperature measuring application. These situations consider the relative superposition effect of the concatenation process done to extend the measuring range.

289 <u>Wavelength Converters Evaluation of Four Wave Mixing and Cross-Gain in</u> <u>Semiconductor Optical Amplifiers</u>

N. S. Ribeiro¹, C. M. Gallep², H. Bierwagen¹, E. Conforti¹, ¹Unicamp, Campinas, Brazil, ²Ceset, Limeira, Brazil

Experimental results of wavelength conversion based on four-wave mixing and cross-gain modulation for different semiconductor optical amplifiers are presented. The efficiencies of these converters are compared. In addition, the obtained eye diagrams are presented, showing Q-factor results.

Optical Amplifiers Posters:

301 <u>Triple C, L and U-band wide amplification system by means of Rayleigh</u> backscattering control

S. L. Stevan Jr.^{1,2}, A. Teixeira^{1,2}, P. André^{1,2}, T. Silveira^{1,5}, G. M. Tosi Beleffi³, A. Pohl⁴, ¹University of Aveiro, Aveiro, Portugal, ²Instituto de Telecomunicações, Aveiro, Portugal, ³ISCOM - Italian Communication Ministry, Rome, Italy, ⁴UFTPr, Curitiba, Brazil, ⁵Siemens Networks S.A, Amadora, Portugal

A system to induce Raman gain in C, L and U-band based in an E-band pump, a dispersion compensation fiber and a set of Fiber Bragg grattings was presented. This approach possibility in line distributed wide amplification. Experimental Gain and Noise Figure are presented.

329 <u>An EDFA Hybrid Gain Control Technique for Extended Input Power and Dynamic</u> Gain Ranges with Suppressed Transients

J. C. de Oliveira^{1,2}, S. M. Rossi¹, R. F. Silva¹, J. B. Rosolem¹, A. C. Bordonalli², ¹CPqD Foundation, Campinas, Brazil, ²University of Campinas - School of Electrical and Computer Engineering, Campinas, Brazil

A new approach for a hybrid gain control scheme based on an improved overlap of the all-optical and electrical feedforward gain control techniques for a single EDFA is presented. A wide input power operation range and a multi-level dynamic gain range are possible, enabling efficient gain control performance and allowing EDFA operation as pre, in line or booster amplifier.

Optical Sensors and Bragg Circuits Posters:

124 Nonlinear Thermal Sensitivity of a Long-Period Grating

R. Z. Costa, R. C. Kamikawachi, G. R. Possetti, M. Muller, J. L. Fabris, Federal University of

Technology - Paraná, Curitiba, Brazil

This work shows the thermal sensitivity of a long period grating immersed in six different external media, with refractive indices ranging from 1.0000 to 1.4315. Changes of thermal sensitivity from negative to positive values were quantified, with behaviors transitioning from linear to non-linear, depending on the refractive index of surroundings. Values for grating refractive index sensitivity and coupling thermo-optic coefficient are also determined.

357 <u>Automated Reflectometer for Surface Plasmon Resonance Studies in the Infrared</u> and its Application for the Characterization of Pd Films

G. O. Cavalcanti, M. A. de Luna, E. Fontana, Universidade Federal de Pernambuco, Recife, Brazil Development of an automated reflectometer for SPR studies in the infrared is reported. The system is computer controlled, operates in the angle scan measurement scheme, and motion control is driven by a tracking algorithm that allows maintaining the laser footprint stationary on the sample during angle scan measurements. Application of the reflectometer for the characterization of Pd films for development of hydrogen sensors is demonstrated.

Microstructured Devices Posters:

233 <u>Novel Microstructured Optical Fiber Design for Broadband Dispersion</u> Compensation

D. H. Spadoti, B. V. Borges, M. A. Romero, University of São Paulo, São Carlos, Brazil

This paper investigates a novel microstructured optical fiber (MOF) geometry for broadband dispersion compensation. This geometry, defined as D-shaped MOF, or simply D-MOF, is shown to present wideband dispersion characteristics, covering two entire telecommunication bands, namely C- and L-bands. The dispersion value obtained for 1550nm is around -550 ps/(nm.km). In addition, the high birefringence of the D-MOF fibers (approximately 10-2) can be explored for polarization maintaining applications

235 <u>Effects on Photonic Band Gaps Caused by Electrical Permittivity and by Filling</u> Constants in Periodic Structures

D. B. Pinheiro, R. M. de Oliveira, C. L. Sobrinho, Federal University of Pará, Belém, Brazil

Abstract — in this work, a study about the influence of the electrical characteristics and of the filling constants of a periodic structure on photonic band gaps (PBGs) is performed. The band gaps are analyzed through the transmission coefficient of the scattering matrix. This open scattering problem was numerically solved through the Finite Differences Time Domain Method (FDTD) and truncated by implementing the Uniaxial Perfectly Matched Layers (U-PML) Formulation.

Biophotonics Posters:

209 <u>Rhythmicities in the spontaneous photon emission of wheat seedlings</u>

C. d. Gallep, T. A. Moraes, G. O. Julião, S. R. Santos, CESET, Limeira, Brazil

The photon-counts of two series of wheat seeds germinating in distilled water are studied in respect to germination efficiency and spontaneous photon (biophoton) emission, with clear indications of day- and month-like patterns in the analyzed data.

Numerical Methods Posters:

206 <u>Spectrum Behavior of a BG-AOM under Variation of Design and Driving</u> <u>Parameters</u>

R. A. Oliveira, P. d. Neves Jr, A. A. Pohl, J. T. Pereira, Universidade Tecnológica Federal do Paraná, Curitiba, Brazil

We report simulation results on a BG-AOM designed using a combined Finite Elements and Matrix Transfer method. Simulations were performed when a harmonic load, with and without preload, is applied to the whole structure (horn, taper and grating). Spectra were calculated by changing frequencies, the silica horn dimensions and the load amplitude.

248 <u>A Novel Inductor on Slow-Wave Substrate: Single Layer with Periodic Rectangular</u> Compact Coil on Ground Plane.

P. Lagoia Jr., L. C. Kretly, State University of Campinas -UNICAMP, Campinas , Brazil

A new slow-wave substrate to improve planar inductor performance is investigated by simulations. The structure consisting of conventional inductor on the substrate top surface, and a 2-D rectangular compact coils etched in the ground plane. Others slow-wave structures use complex multilayer, periodic via holes through the substrate. We propose a simple structure without those requirements. It is shown the effect produced by the rectangular compact coils on the inductance -30%-, Q-factor -16%.

264 EBG Unilateral Fin Line Resonator

H. C. Fernandes, D. B. Brito, J. L. Medeiros, Federal University of Rio Grande do Norte, Natal, Brazil The fin line resonator with EBG - electromagnetic band gap substrate, is analyzed using the TTL – transverse transmission line – method. Compared to other full wave methods, the TTL is an efficient tool to determine the resonance frequency, making possible a significant algebraic simplification of the equations involved in the process. New results obtained for this application and the conclusions are presented.

220 <u>Analysis of the Lagrange Multiplier Method using the Technique of Analytical</u> Integration Applied the Waveguides

M. M. Filho^{2,2}, P. R. Alves^{2,2}, ¹University of Brasilia, Brasilia, Brazil, ²University of Brasilia, Brazil

The cut frequencies of the rectangular waveguides are calculated using the technique of the Multipliers of Lagrange. The application of the technique of analytical integration is made with the integrals written in the homogeneous coordinates of the finite element. The final system badly conditional, symmetrical and is not defined positive. We present a form to become the symmetrical system in defined positive.

229 Photonic Crystal Band Gap Optimization by Genetic Algorithms

G. N. Malheiros-Silveira, V. F. Rodriguez-Esquerre, Federal Center of Technological Education of Bahia CEFET-BA, Salvador, Brazil

Genetic algorithms in combination with the finite element method are used for the optimization of the band gap of infinite photonic crystals in square and triangular lattices. The unitary cell is composed by air and a dielectric material. The band gap has been calculated at the nodes of the first Brillouin region. The proposed scheme has been validated with previously published results and an excellent agreement has been found and results for the optimization of band gaps are presented

326 <u>Analysis of Electromagnetic Structures Using Vectorial and Orthogonal Finite</u> Elements Method

A. C. Bordonalli, M. S. Gonçalves, H. E. Hernández-Figueroa, University of Campinas - School of Electrical and Computer Engineering, Campinas, Brazil

New three-dimension orthogonal basis functions for finite element solution of the vectorial wave equation are presented. These functions, based on the Whitney's edge elements, maintain the properties of conventional basis functions, naturally generating diagonal matrices that enhance numerical performance.

232 Iterative Decoding for Serial Concatenation With Wavelet Encoding

L. G. Júnior¹, L. F. de Q. Silveira², F. M. de Assis¹, E. L. Pinto³, ¹Universidade Federal de Campina Grande, Campina Grande, Brazil, ²Centro Federal de Educação Tecnológica do Rio Grande do Norte, Natal, Brazil, ³Instituto Militar de Engenhari, Rio de Janeiro, Brazil

An iterative decoder for serial concatenations that have a wavelet encoder as the inner encoder is presented in this article. In particular, a novel soft-input soft-output wavelet decoder is proposed, which is based on a soft demodulation mapping recently proposed for wavelet-coded wireless communication systems. Preliminary results of performance evaluation are presented, where a concatenation with a convolutional encoder over a flat-fading channel is investigated.

Technical .Session Th 09 ZG1 (Thursday 01/11/2007, 09:00–10:30): Title: Workshop on Numerical Methods I

361 (invited) (invited 9:00-09:30);

Applications of Multiscale Waves Concept Iterative Procedure

H. Baudrand¹, N. Raveu¹, N. Sboui², G. Fontgalland³, ¹Lab LAME, Toulouse, France, ²Faculté des Sciences de Tunis, Tunisi, ³Universidade Federal de Campina Grande, Campina Grande, Brazil A multiscale approach for planar antennas and circuits is used in the scope of Wave Concept Iterative Procedure (W.C.I.P.). This wave formulation is improved for large scale structure through connections of subdomains in the spectral domain. for some circuits elements – via holes, air bridge – particular models are introduced to ease their integration in 2.5D circuits. For example, via-holes are treated with the longitudinal components.

170 (09:30-09:45);

Analytical Model of Planar Double Split Ring Resonator

V. Zhurbenko, T. Jensen, V. Krozer, P. Meincke, Technical University of Denmark, Kgs. Lyngby, Denmark

This paper focuses on accurate modelling of microstrip double split ring resonators. The impedance matrix representation for coupled lines is applied for the first time to model the SRR, resulting in excellent model accuracy over a wide frequency range. Phase compensation is implemented to take into account the curved shape of the resonators. The presented results show that the accuracy better than 1% for the first four resonances. Analysis of an EBG stopband structure is presented.

238 (09:45-10:00),

Efficient Extraction of Statistical Moments in Electromagnetic Problems Solved with the Method of Moments

L. R. de Menezes^{1,2}, A. Ajayi^{2,1}, C. Christopoulos^{2,1}, P. Sewell^{2,1}, G. A. Borges^{1,2}, ¹Universidade de Brasilia, Brazil, ²University of Nottingham, Nottingham, United Kingdom

This work presents the combination of the Unscented Transform (UT) with the Method of Moments (MoM). This combination allows the modeling of uncertainty in electromagnetic computations. The procedure shows results with accuracy similar to the Monte Carlo approach, but using a much smaller number of simulations. This work uses standard MoM based solvers. The validation of the technique used frequency domain tests. The results show good agreement compared to Monte Carlo with reduced simulator use.

240 (10:00-10:15);

Finite aperture realization of the Diffraction-Attenuation resistant beams in absorbing media

M. Z. Rached¹, L. Ambrosio², H. H. Figueroa², ¹Universidade Federal do ABC, Santo André, Brazil, ²Universidade Estadual de Campinas, Campinas, Brazil

In this work, by making numerical simulations of the Rayleigh-Sommerfeld diffraction integral, we show the finite aperture realization of the recently discovered diffraction-attenuation resistant beams in absorbing media.

253 (10:15-10:30)

A Proposal of Random Excitation for the Elements of a Circular Array

F. G. Silva, V. F. Esquerre, J. M. Araújo, A. C. de Castro, E. T. Santos, Federal Center of Technological Education of Bahia, Salvador, Brazil

The study about generation methods of antennas array coefficients presents two importants goals. The variation excitation coefficients intensity and the analysis of the computational effort to generate these coefficients. The proposed method for circular array have already gone studied in linear. Both variation of the excitation coefficients and the computational effort were suitable. The method is applied on the circular array and the results compared with the Dolph- Chebyschev method.

Technical .Session Th 09 FP1 (Thursday 01/11/2007, 09:00–10:30): Title: Microwave Active Circuits I

239 (9:00--9:30);

Emerging Technologies for Wireless Handsets

S. Pacheco, B. Keser, L. Liu, J. Abrokwah, Freescale Semiconductor, Inc., Tempe, United States This paper will discuss three emerging disruptive technologies that have the potential to simplify front-end module designs. Integrated Passives Devices (IPD) is an approach to provide high quality integrated passives using semiconductor processing. Redistributed Chip Packaging (RCP) is a novel technique to integrate heterogeneous die while providing unmatched density. RF MEMS technology is at the cusp of providing a paradigm shift in front-end module architecture.

129(09:30-09:45);

A CMOS Low Noise Amplifier for 5 to 6 GHz Wireless Applications

V. Subramanian¹, G. Boeck¹, S. Spiegel², R. Eickhoff³, ¹Berlin University of Technology, Berlin, Germany, ²RIO Systems, Tel Aviv, Israel, ³Dresden University of Technology, Dresden, Germany

This work demonstrates the design of a wideband LNA in 0.13 um CMOS technology. Important design aspects and influence of circuit elements on various LNA target parameters are analyzed. Simulated and measured LNA results are presented. At 5.5 GHz, 13.5 dB gain, 3.9 dB noise figure -9.5 dB and -13.5 dB input and output return loss and IP1dB of -8.5 dBm and from 5 GHz to 6 GHz a gain drop of less than 1 dB and an average noise figure of 4dB and IP1dB better than -8.5 dBm have been measured.

222 (09:45-10:00),

A 1.7V Wideband CMOS Low Noise Amplifier with Linear Digital Gain Control

F. S. Azevedo^{1,2}, F. A. Fortes^{1,2}, J. C. Vaz², M. J. Rosário², ¹Instituto Superior de Engenharia de Lisboa, Lisboa, Portugal, ²Instituto Superior Técnico/Universidade técnica de Lisboa, Lisboa, Portugal

Design and simulation of a wideband LNA, with balun and gain control integrated. Has 6 bit DAC and a 4 bi logic control, allowing the response to have linear approximation with 16 dynamic levels. Was implemented in a 0.35um AMS CMOS standard technology and simulated with BSIM3 model. Presents a 16dB dynamic gain variation in a 1.4-1.7GHz, errors less than 1.6° and 0.2dB, 1.24dB NF, -23dBm IR_1dB_CP, 50ohm input/output match, while drawing less than 7.5mA from a 1.7V power supply.

157 (10:00-10:15);

Design of a C-Band CMOS Class AB Power Amplifier for an Ultra Low Supply Voltage of 1.9 V

J. Carls¹, F. Ellinger¹, R. Eickhoff¹, P. Sakalas¹, S. von der Mark³, S. Wehrli², ¹Dresden University of Technology, Dresden, Germany, ²Swiss Federal Institute of Technology, Zurich, Switzerland, ³Technische Universitaet Berlin, Berlin, Germany

Present day power amplifier (PA) design struggles with the fact that applicable supply voltages are continuously shrinking for short channel MOS transistors. This work develops a Class AB PA with an optimized load impedance for maximum output power with the help of a systematic load-pull analysis. The presented PA, realized in CMOS, shows a measured output power of 19.8 dBm at 5.8 GHz for a supply voltage of 1.9 V. The drain efficiency at the 1 dB compression point reaches 28.1 %.

159 (10:15-10:30)

6 GHz SiGe Power Amplifier with On-Chip Transformer Combining

D. Gruner, G. Boeck, Berlin University of Technology, Berlin, Germany

The design synthesis of an innovative power amplifier topology is presented. It consists of two efficient push-pull stages whose output powers are combined by a monolithic three-port transformer. The integrated power amplifier is targeted for a 0.25 um SiGe HBT technology. It achieves a power added efficiency of 43.5 % and an output power of 28.3 dBm at a frequency of 6 GHz. The advantages of the proposed architecture over a conventional push-pull power amplifier are clearly shown.

Technical .Session Th 09 ZG2 (Thursday 01/11/2007, 09:00–10:30): Title: Propagation I

104 (9:00-09:15);

<u>A Simple and Accurate \$\alpha\$-\$\mu\$ Approximation to Crossing Rates in EGC and</u> <u>MRC Receivers Undergoing Nakagami-\emph{m} Fading</u>

D. Benevides da Costa¹, M. D. Yacoub², ¹State University of Campinas, Campinas, Brazil, ²State University of Campinas, Campinas, Brazil

In this paper, using an approach based on moment estimators, we propose highly accurate closed-form approximations for the level crossing rate of multibranch equal-gain and maximal-ratio combiners operating on independent non-identically distributed Nakagami-\emph{m} fading channels. As the exact solutions, for both combiners, are given in terms of multifold integrals, our approximate results provide more computational efficiency, mainly when the number of diversity branches increases.

105 (9:15-9:30);

On the Second Order Statistics of \$\eta\$-\$\mu\$ Fading Channels in Diversity Systems D. Benevides da Costa¹, M. D. Yacoub², ¹State University of Campinas, Campinas, Brazil, ²State

University of Campinas, Campinas, Brazil

In this paper, general exact expressions for the level crossing rate and average fade duration of pure selection combining (PSC), equal-gain combining (EGC), and maximal-ratio combining (MRC) receivers operating on independent non-identically distributed \$\eta\$-\$\mu\$ fading channels are derived. The analytical results are fully validated by reducing them to particular cases for which the solutions are known and, more generally, by means of Monte Carlo simulation.

147(09:30-09:45);

Exact Bit Error Probability of M-QAM Modulation Over Flat Rayleigh Fading Channels

W. T. Lopes¹, W. J. Queiroz², F. Madeiro³, M. S. Alencar⁴, ¹Faculdade ÁREA1, Salvador, Brazil, ²Universidade de Fortaleza, Fortaleza, Brazil, ³Universidade de Pernambuco, Recife, Brazil, ⁴Universidade Federal de Campina Grande, Campina Grande, Brazil

In this paper we derive a general and closed-form expression for the bit error probability of square M-ary quadrature amplitude modulation (M-QAM) for a Rayleigh fading channel.

149 (09:45-10:00),

Bit Error Probability of M-QAM and IxJ-QAM Modulation Schemes in Nakagami Fading

W. J. Queiroz^{1,5}, W. T. Lopes^{2,5}, F. Madeiro^{3,5}, M. S. Alencar^{4,5}, ¹Universidade de Fortaleza, Fortaleza, Brazil, ²Faculdade ÁREA1, Salvador, Brazil, ³Escola Politécnica de Pernambuco, Recife, Brazil, ⁴Universidade Federal de Campina Grande , Campina Grande, Brazil, ⁵Instituto de Estudos Avançados em Comunicações, Campina Grande , Brazil

In this paper closed-form expressions for the bit error probability of M-QAM and IxJ-QAM modulation schemes in Nakagami fading are derived. The classical optimun detector for signals under additive white Gaussian noise and the bit mapping conssistency of QAM signals submitted to Gray mapping are considered.

174 (10:00-10:15);

On the Multivariate Nakagami-m Distribution With Arbitrary Correlation and Fading Parameters

R. A. Souza¹, M. D. Yacoub², ¹Instituto Nacional de Telecomunicações, Santa Rita do Sapucaí, Brazil, ²Universidade Estadual de Campinas, Campinas, Brazil

In this paper, a new closed-form formula for the multivariate Nakagami-m joint probability density function (PDF) generated from correlated Gaussian random variables is derived allowing for an arbitrary correlation matrix and different fading parameters. The formulation is general and exact and contains all of the other joint Nakagami-m PDFs published in the literature.

262 (10:15-10:30)

Narrowband Fading Characterization in Brasilia to Aid in the Design of Public Safety Communication Systems

E. P. Almeida, J. P. Leite, P. H. Carvalho, R. G. Oliveira, R. M. Muniz, UnB - Universidade de Brasília, Brasília, Brazil

This paper presents a set of software tools developed to aid in the design of public safety communication systems, based on porpagation environmet characterization. A set of measurements were made to extract the narrowband fading over a mobile environment on the UHF band at the city of Brasilia. A sampling method is defined making possible the analysis for long term and short term fading components. A GIS-based software was developed to store and automatically process the collected data.

Technical .Session Th 11 ZG1 (Thursday 01/11/2007, 11:00 – 12:30): Title: Workshop on Numerical Methods II

294 (11:00-11:15);

Application of Particle Swarm Optimization to Ultra-Wideband Multistatic Radar Used for Protection of Indoor Environment

R. Farias, V. Dmitriev, R. Oliveira, Federal University of Para, Belem, Brazil

A numeric simulation of a multistatic radar using the finite-difference time-domain (FDTD) method and particle swarm optimization (PSO) is implemented in order to localize an intruder inside a laboratory complex.

295 (11:15-11:30);

Unified characterization of UWB antennas in time and frequency domains: an approach based on the Singularity Expansion Method

C. G. Rego, J. S. Nunes, M. N. de Abreu Bueno, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

In this work, an approach based on the Singularity Expansion Method is employed to obtain a semi-analytical representation for the effective length operator and a transfer function of UWB antennas. This operator can be employed in the calculation of some important parameters related to UWB antennas. Some preliminary results of the construction of impulsional induced currents, from which the effective length operators can be derived, are presented for antennas comprising thin wires.

364 (11:30-11:45);

<u>Analysis of Current Density Distributions over the Cross-Section of OPGW Cables</u> Using an Analytical Model and the FEM Numerical Method

J. T. Pinho¹, V. Dmitriev¹, K. Q. da Costa¹, L. Gonzalez¹, S. Colle², M. A. Andrade³, J. C. da Silva³, M. Bedia³, ¹Federal University of Para (UFPa), Belem, Brazil, ²Federal University of Santa Catarina (UFSC), Florianopolis, Brazil, ³Prysmian Telecomunicações, Cabos e Sistemas do Brasil S.A. Sorocaba, Brazil

Multiconductor OPGW cables have a double function: they serve for lightning protection and as a communications channel. In this work, we present some results of the analysis of current density distributions in these cables obtained by an analytical method and using the FEMLAB software.

109 (11:45-12:00);

Image Reconstruction for a Partially Immersed Conducting Cylinder by Transverse Electric Wave Illumination

C. Chien-Ching, C. Chien-Ching, Tamkang University, Taipei county, Taiwan

In this paper, we investigated the imaging of a partially immersed metallic cylinder by the steady-state genetic algorithm (SSGA). A conducting cylinder of unknown shape scatters the incident transverse electric (TE) wave. The imaging problem is reformulated into an optimization problem. An improved SSGA is employed to search for the global extreme solution. Numerical results demonstrate that, even when the initial guess is far away from the exact one, good reconstruction can be obtained.

148 (12:00-12:15);

Analysis of H-Plane Waveguide Discontinuities Using Hybrid Multimode Contour Integral and Mode Matching Techniques

A. Hashemi^{1,2}, A. Banai^{2,1}, ¹Azad University, Esfahan, Iran, ²Sharif University of Technology, Tehran, Iran

A new hybrid method based on multimode contour integral and mode matching techniques for analyzing any H-plane waveguide discontinuity will be introduced. We use the multimode contour integral method to analyze the blocks including irregular shape H-plane discontinuities. It considers the effects of higher order modes (TEn0) excited by discontinuities on wave ports. The mode matching technique will be used to analyze the connecting blocks which can be easily treated by modal expansion.

112 (12:15-12:30);

One-Dimension Local Interpolation Algorithm for Fast Computation of Translation Operators in MLFMA

P. H. Zhao, J. Hu, P. Z. Nie, University of Electronic Science and Technology of China, Chengdu, China Based on the distance symmetry of the translation operators in multi-level fast multipole algorithm (MLFMA), this paper presents a onedimension local interpolation algorithm for fast computation of translators. Theoretical analysis and numerical results show that the presented method is about three times faster than the two-dimension interpolation method.

Technical .Session Th 11 FP1 (Tuesday 30/10/2007, 11:00 – 12:30): Title: Microwave Active Circuits II

107 (11:00-11:15);

Analytical Expression for Signal Propagation Delay of Off-Chip Interconnection for SIP Application

A. Owzar, E. Baykal, R. Stephan, M. Helfenstein, NXP Semiconductors, Zuerich, Switzerland

A new analytical expression is propossed for the calculation of the delay time for off-chip interconnection. This includes all the line and the load parameters for CMOS based circuits. The classical on-chip analytical formulations available in the literature has been reviewed. Spice simulation is applied to compare the accuracy of the proposed expression. Measurement results has been used for the determination of the accuracy of the spice line model.

108 (11:15-11:30);

HBT Dynamic Charging Modeling using EH_VBIC and Waveform Verification

C. Wei, S. Sprinkle, G. Tkachenko, Skyworks Incorporation, Woburn, United States

Dynamic charging has impact on power, PAE of power-amplifiers. It has been a controversial issue and cann't be predicted by commercial HBT models. This study presents a novel time-domain characterization method, to reveal dynamic charge effects of HBTs. A modified EH_VBIC model can excellently account for those effects without unreasonable setting BC diode parameters.

172 (11:30-11:45);

Extraction of Microwave FET Noise Parameters Using Frequency Dependent Equivalent Noise Temperatures

W. Ciccognani¹, F. Giannini¹, E. Limiti¹, A. Nanni¹, A. Serino¹, C. Lanzieri², M. Peroni², ¹University of Rome Tor Vergata, Rome, Italy, ²Selex Sistemi Integrati S.p.A., Rome, Italy

A method for determining the noise parameters of high frequency FETs is presented. It has been developed by expressing the chain correlation matrix of the device as a function of its H parameters and two frequency dependent equivalent noise temperatures. Such temperatures are determined utilizing the H parameters and the 50 Ohm noise figure of the device measured at a number of frequency points. The extraction of the small signal equivalent circuit model of the device is therefore not required.

143 (11:45-12:00);

Adaptive LDMOS Power Amplifier with Constant Efficiency

N. Kumar¹, T. Tan¹, J. Lee¹, G. Boeck², ¹Motorola Technology, Bayan Lepas, Malaysia, ²Berlin University of Technology, Berlin, Germany

Maintaining constant high efficiency is important in adaptive power amplifier design. This paper highlights the achievement of constant efficiency across wide power levels for power amplifiers with tuned drain supply while having a fixed load impedance network. Due to the non-linear behavior of the trans-conductance at lower drain voltage, class AB bias scheme is implemented. Constant efficiency of 43 % across a wide range of power levels (1.2 to 5.3 W) is demonstrated experimentally.

114 (12:00-12:15);

Ultra low power Wakeup Detector for Sensor Networks

S. von der Mark, G. Boeck, Technische Universität Berlin, Berlin, Germany

Special ultra-low-power wakeup receivers have been postulated repeatedly throughout publications in the sensor network community. This paper presents a fully integrated zerobias detector in BiCMOS technology, which can be used for construction of a wakeup-receiver with - 50dBm sensitivity at a standby current consumption in the order of 100 nA. Operating frequency examined here was 2.4 GHz.

342 (12:15-12:30);

On Nonlinearity and Noise Trade-off in a Low Power 2.45 GHz CMOS LNA-Mixer Design

A. Ayala¹, E. Roa², W. A. Van Noije¹, ¹São Paulo University, São Paulo, Brazil, ²Industrial University of Santander, Bucaramanga, Colombia

A detailed nonlinearity and noise analysis for a Low Noise Amplifier and Mixer design for 2.45 GHz Bluetooth applications is presented. As a result, the trade-off between noise, linearity, power consumption and impedance matching was considered as a design guide. A 2.45 GHz LNA-Mixer has been designed and simulated in a 0.35um 4M2P CMOS technology to demonstrate the trade-off. Some performance results obtained through simulations are: NF=7.9dB, Voltage Gain=27dB, PIIP3=-14.4dBm and PD=15.6mW.

Technical .Session Th 11 ZG2 (Tuesday 30/10/2007, 11:00 – 12:30): Title: Propagation II

272 (11:00-11:15);

Local Digital Radio in the 26 MHz Band Using DRM - Results of the Brasilia Field Trials

R. G. Neves¹, I. Peña², F. F. Lima¹, H. Abdalla¹, P. Angueira², L. M. Silva¹, ¹University of Brasilia, Brasilia, Brazil, ²University of the Basque Country, Bilbao, Spain

The DRM Consortium has proposed the use of the 26 MHz band for local digital audio broadcasting using the DRM system. This paper presents the results of the field trials performed in Brasilia, Brazil, in 2006. The objective was to find in which conditions the DRM signal reception will be successful. Stationary and mobile tests were performed in different reception environments, in order to verify the influence of the surroundings in the signal reception.

280 (11:15-11:30);

UHF Digital TV Radio Propagation Measurements: Fixed Reception Coverage Studies

G. L. Siqueira, J. B. Cavalcanti, R. M. Silva, PUC-Rio, Rio de Janeiro, Brazil

This paper presents the results of a extensive measurement campaign used to address the coverage study for a UHF signal to be used on the deployment of digital TV reception in Brazil. An experimental measurement setup was assembled and the received signal from a transmitter installed on the roof top of a 70 meter height building was measured in several points of the test environment. The results were compared with models and have shown which one of them presented the best behavior.

287(11:30-11:45);

Variability Studies for Mobile Digital TV Reception at UHF

G. L. Siqueira, J. B. Cavalcanti, F. Jardim, R. E. Piazza, R. M. Silva, PUC-Rio, Rio de Janeiro, Brazil

This paper presents results of propagation measurements carried out using a 641 MHz signal transmitted over a suburban area of Rio de Janeiro. With a mobile receptor, the variability characteristics of the received signal were analyzed on different routes and speeds of the measurement environment. Large and small scale fading of the received signal envelope were measured and compared with some known probability functions in the UHF band. Statistics of the level crossing rate were also measured.

315(11:45-12:00);

Evaluation of Radio Propagation Parameters for Field Strength Prediction Using Neural Network

B. G. Monteiro¹, G. P. Cavalcante¹, H. S. Gomes¹, D. M. Rosário¹, F. F. Lima², H. A. Junior², ¹Federal University of Pará, Belém, Brazil, ²University of Brasilia, Brasília, Brazil

This work utilizes artificial neural network to determine the electrical characteristics of the ground. For that, a campaign of measurements of the received electric field strength was carried out in around of Brasília city. The results of the electric parameters of the ground were found as: 4.23 mS/m for conductivity and 15 for relative permittivity. These results allow concluding that the electrical characteristics of the ground cannot translate the reality for the area studied in Brasilia.

259(12:00-12:15);

Space-Time Channel Characterization based on MIMO Channel Measurements

R. D. Vieira¹, J. Brandão², G. L. Siqueira², ¹ Nokia Technology Institute, Brasilia, Brazil, ² Puc Rio, Rio de Janeiro, Brazil

In this paper we present the results of a MIMO wideband measurement campaign carried out in hallways (indoor scenario) with a carrier frequency of 2GHz. The wideband and narrowband channel capacity and MIMO channel characteristics were evaluated. The correlation between channel capacity and physical parameters as Azimuth Spread (AS) and Delay Spread (DS) was analyzed. Besides, the channel characterization was also analyzed through Power Delay Profile (PDP) and Power Azimuth Spectrum (PAS).

284 (12:15-12:30)

<u>New Method for the Prediction of Rain Attenuation in Terrestrial Links Using the</u> Concept of Effective Rainfall Rate

L. A. Silva Mello, M. S. Pontes, R. S. Souza, PUC-Rio, Rio de Janeiro, Brazil

A semi-empirical method for the prediction of rain attenuation in terrestrial links is presented in this paper. The proposed method is simple to apply and uses the concept of an effective rainfall rate and the full rainfall rate cumulative probability distribution to predict the attenuation distribution. Test results indicate that the proposed method provides significant improvement over the current ITU-R method and other methods available in the literature.

Technical .Session Th 14 ZG1 (Thursday 01/11/2007, 14:30 – 16:00): Title: Workshop on Numerical Methods III

309 (14:30-14:45);

Propagation, Filamentation, and Coalescence of Singular Optical Pulses in Air

V. Skarka¹, N. B. Aleksić^{2,1}, V. I. Berezhiani³, ¹University of Angers, Angers, France, ²Institute of Physics, Belgrade, Yugoslavia, ³Institute of Physics, Tbilisi, Georgia

We consider propagation in air of intense short laser pulse with a phase singularity. Such a pulse can propagate in a self-created plasma channel filamenting and coalescing in a controlled way. Input pulse close enough to the equilibrium state evolves towards vortex soliton. Below breakup power coalesced ring is split into two bright solitons flying off tangentially. Above breaking power a vortex soliton is generated in equilibrium.

330 (14:45-15:00);

Numerical Analysis of Surface Plasmon Polariton Interference in a Single Mode Dielectric Waveguide for TM modes.

C. E. Rubio-Mercedes¹, V. F. Rodriguez-Esquerre², ¹State University of Mato Grosso do Sul, Dourados, Brazil, ²Federal Center of Technological Education of Bahia, Salvador, Brazil

By using the finite element method (FEM) we have performed numerical analysis of the interference of the Surface Plasmon Polariton (SPP) excitation in the propagation of the electromagnetic filed in a single mode dielectric waveguide. We observe that this interference can extinguish the mode in the waveguide core when electrodes are placed reasonably near of the dielectric waveguide. The transmission through the metal electrode waveguide is analyzed as a function of the electrode spacing.

178(15:00-15:15);

Software Tools for the Design and Analysis of Quantum Well, Quantum Wire and Quantum Dot Devices

R. Y. Tanaka¹, A. Passaro¹, N. M. Abe¹, J. M. Villas-Bôas¹, G. S. Vieira¹, S. Stephany², ¹Institute for Advanced Studies, São José dos Campos, Brazil, ²National Institute for Space Research, São José dos Campos, Brazil

In this work we present a set of computer codes based either on the Finite Element Method or on the expansion of the Hamiltonian in a defined basis intended to help the design and the analysis of infrared photo-detectors based on semiconductor quantum wells and quantum dots. Our codes are capable of handling both arbitrary potential and effective mass profiles. They take into account the strain induced by lattice mismatch between different materials.

298(15:15-15:30);

Axicons in FSO Systems

L. A. Ambrosio¹, M. Zamboni-Rached², C. H. S. Santos¹, H. E. Hernández-Figueroa¹, ¹Faculdade de Engenharia Elétrica e de Computação, Campinas, Brazil, ²Universidade Federal do ABC, Santo André, Brazil

This paper studies the possibility of using axicons in Free Space Optics (FSO) systems. The behavior of the pseudo-Bessel beams generated by "logarithmic" and "linear" axicons, with or without stops, was analyzed through the Huygens-Fresnel integral of diffraction in cylindrical coordinates. We also show that GRIN (Gradient Index) axicons could be used in order to choose the intensity pattern along the propagation axis, which could be a new technique for the alignment equipment.

167 (15:30-15:45);

Parallel Modified Electric Field Integral Equation with GMRES Solver for Efficient Solution of Scattering from Electrically Large Open Structures

H. P. Zhao, J. Hu, Z. P. Nie, University of Electronic Science and Technology of China, Chengdu, China

This paper presents a parallel modified electric field integral equation (MEFIE) with GMRES solver. GMRES is applied in solving the MEFIE, which improves the computing efficiency greatly. Then, a parallel scheme for MEFIE is developed and conjuncted with the parallel GMRES and MLFMA. Numerical results show the strong ability of the proposed parallel scheme in solving scattering from electrically large open structures.

141 (15:45-16:00)

A Simplified Near-Field Preconditioner Based on Multi-level Fast Multipole Algorithm

H. P. Zhao, J. Hu, Z. P. Nie, University of Electronic Science and Technology of China, Chengdu, China

Abstract ! This paper presents a simplified near-field preconditioner based on multi-level fast multipole algorithm (MLFMA). The preconditioner attains a low computation complexity, has no influence on memory requirement and is easy to be parallelized. It shows good performance in numerical experiments and is applied in solving a very large scale problem.

Technical .Session Th 14 FP1 (Thursday 01/11/2007, 14:30 – 16:00): Title: Microwave Passive Circuits

102 (14:30-14:45);

Dual-Mode Elliptic-Function Triangular-Patch Bandpass Filters Using Capacitive-Coupling Slot Technique

H. Liu^{2,1}, R. Knoechel^{2,1}, K. Schuenemann^{2,2}, ¹Kiel University, Kiel, Germany, ²Technology University Hamburg-Harburg, Hamburg, Germany

A new triangular-patch bandpass filter (BPF) using a pair of V-shape slots is presented in this paper. The pair of the V-shape slots can provide capacitive coupling which produces a dual-mode elliptic-function response. A theoretical analysis of capacitive-coupling characteristics of the dual-mode BPF with different slot dimensions is presented. Also, a set of simple equations is developed to determine the dimensions of the triangular-patch resonator based on the resonant frequency, f0.

166 (14:45-15:00);

A novel compact suspended stripline bandpass filter using open-loop resonators technology with transmission zeroes

J. M. Pham¹, P. Jarry¹, E. Kerhervé¹, E. Hanna¹, ¹IMS Laboratory UMR 5218 CNRS, Bordeaux, France, ²IMS Laboratory UMR 5218 CNRS, Bordeaux, France, ³IMS Laboratory UMR 5218 CNRS, Bordeaux, France

This paper presents a technique for an transmission zero implementation into the suspended stripline bandpass filters characteristic. Two 3rd order filters using the open-loop resonators based on a meandered half-wavelength line topology have been fabricated in order to illustrate these results. Transmission zeroes on both sides of the passband can be achieved.

328(15:00-15:15);

A Miniaturized Bandpass Filter with Two Transmission Zeros Using a Novel Square Patch Resonator

A. L. Serrano^{1,2}, F. S. Correra¹, ¹Escola Politécnica, University of São Paulo, São Paulo, Brazil, ²Omnisys Eng. Ltda., São Caetano do Sul, Brazil

This paper presents a miniaturized square patch resonator with two different pairs of slots for bandpass filter applications. The slots split the fundamental degenerate modes of the resonator and allow the control of central frequency and bandwidth, providing filter design flexibility. Two- and four-pole filters centered at 2.4 GHz were designed and fabricated. Experimental results of the two-pole filter: bandwidth of 14%, return loss better than 18 dB, and minimum insertion loss of 0.6 dB.

360(15:15-15:30);

A Novel Asymmetric Defected Ground Structure for Implementation of Elliptic Filters

S. K. Parui, S. Das, Bengal Engineering and Science University, Shibpur, India

An asymmetric defected ground structure (DGS) with respect to a microstrip line is proposed. Its unit cell consists of two square headed slots connected with a rectangular slot under microstrip line transversely. Both EM-simulation, experimental measurement and equivalent circuit responses are presented for modified unit which produces 2nd order elliptical bandstop characteristics. The two-cell structure gives deeper attenuation without appreciable change in pole frequencies.

349(15:30-15:45);

Compact Microstrip Bandpass Filters with Enhanced Stopband Performances

I. A. Romani², A. M. Soares², H. Abdalla, Jr.¹, ¹University of Brasilia, Brasilia, Brazil, ²University of Brasilia, Brazil

This work is focused on the development of new microwave filter structure for high selectivity applications. The idea presented in this article is based on pentagonal open-loop resonators, with the addition of tapped input/output (I/O) lines, to construct a high performance bandpass filter. The proposed filter was designed, fabricated and tested. The results of the tests showed that responses had a good agreement with the theoretical predictions.

356 (15:45-16:00)

Microstrip Diplexer for GSM and UMTS Integration Using Ended Stub Resonators

S. T. Bezerra¹, M. T. de Melo¹, ¹UFPE, Recife, Brazil, ²Recife, Brazil, ³Recife, Brazil

A novel microstrip diplexer design for UMTS and GSM ranges is presented. This device was implemented by using microstrip resonator with serial coupling. The modified gap structure allows to adjust the operating frequency of the filters and reduces the dimensions of the device as it will be presented. Device has been simulated on Duroid RT6010 substrate of thickness 0.61mm. A new diplexer can be used for sharing radiating system of both UMTS and GSM platforms.

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