Explanation of Session Codes

The first part of the code designates the day of the week (Monday=M, Tuesday=Tu, Wednesday=W).

The next part indicates the session within the particular day the talk is being given. Each day begins with the letter A and continues alphabetically.

The number on the end of the code signals the position of the talk within the session (first, second, third, etc.).

For example, a presentation numbered MA1 indicates that this paper is being presented on Monday during the 1st session (A) and that it is the first paper presented in session MA.

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**Sunday, June 3, 2007**

**Lodge Room Entry Foyer**

3:00 p.m.–6:00 p.m.

Registration Open

**Monday, June 4, 2007**

**Lodge Room Entry Foyer**

7:00 a.m.–5:00 p.m.

Registration Open

**MA • Meta I**

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**MA1 • 8:30 a.m.**

**Invited**

**Negative Refraction and Light Pressure**, Victor Veselago; Moscow Inst. of Physics and Technology, Russian Federation. The propagation of electromagnetic wave through transparent material is considered. It is shown that expression $P=nhk$ is not applicable for radiation inside the media.

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**MA2 • 9:10 a.m.**

**Photonic Chiral Metamaterials**, Vassili A. Fedotov; Eric Plum, Alexander S. Schiavoncicke, Yifang Chen, Vyacheslav V. Khardikov, Sergey L. Pestivinni, Nikolay I. Zhelevin; “Optoelectronics Res. Ctr., Univ. of Southampton, UK, 7Central Microstructure Facility, Rutherford Appleton Lab, UK, 7Inst. of Radio Astronomy, Natl. Acad. of Sciences of Ukraine, Ukraine. We report first results on the development of photonic planar and layered 2D- and 3D-chiral metamaterials with intriguing properties including giant rotary power and asymmetric transmission.

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**MA3 • 9:30 a.m.**

**Double Negative Index Metamaterial: Simultaneous Negative Permeability and Permittivity at 812 nm**, Uday K. Chettiar, Alexander V. Kildishev, Hsiao-Kuan Yuan, Wenshan Cai, Shumin Xiao, Vladimir P. Drachev, Vladimir M. Shalaev; Purdue Univ., USA. A negative index metamaterial demonstrating $n=1.0+0.8i$ with both negative effective permittivity and permeability at 813 nm of linearly polarized light is fabricated. It also exhibits a negative refractive index at 772 nm for orthogonal polarization.
MA4 • 9:50 a.m.
Metamagnetics for Visible Wavelengths (491 - 754 nm), Hsiao-Kuan Yuan1, Wenshan Cal1, Uday K. Chettiar2, Vavisha De Silva3, Alexander V. Kildishev1, Alexandra Boltasseva1, Vladimir P. Drachev1, Vladimir M. Shalaev1; 1School of Electrical and Computer Engineering and Birck Nanotechnology Ctr., Purdue Univ., USA, 2Dept. of Communications, Optics and Materials, Technical Univ. of Denmark, Denmark. We designed, fabricated and experimentally validated a representative number of periodic arrays of magnetically resonant silver nanostraps. Our studies confirmed that the coupled-strip design can provide controllable magnetic responses in the entire visible range.

Pavilion
10:10 a.m.–10:40 a.m.
Coffee Break

MB • Random Media I

MB1 • 10:40 a.m. Invited
Random Laser Modes, Ad Lagendijk; FOM Inst. for Atomic and Molecular Physics, Netherlands. Abstract not available.

MB2 • 11:20 a.m. Invited
Anderson Localization in Open Random Media, Sergey E. Skipetrov, N. Chernorut, B. A. van Tiggelen; Ctr. Natl. de la Recherche Scientifique, France. Self-consistent theory of localization is applied to study time- and position-dependent transport coefficients for waves in open random media. We propose new experiments that should give a better insight into the Anderson localization of light.

MB3 • 12:00 p.m.
Light Transport through Mie Resonances in Photonic Glasses, Riccardo Sapienza1, David P. D. Garcia1, Maria Dolores Martin1, Jacopo Bertolotti1, Alvito Blanco1, Stefano Gottardo1, Luis Vila1, Diederik S. Wiersma1, Ciferino Lopez1; 1Inst. de Ciencia de Materiales, Spain, 2Dept. de Física de Materiales, Univ. Autónoma de Madrid, Spain, 3European Lab for Nonlinear Spectroscopy, Italy. We present novel photonic materials, photonic glasses, as solid, disordered assemblies of monodisperse dielectric spheres, and the first measurements of resonances in the energy velocity of the diffused light, mean free paths and diffusion constant.

MB4 • 12:20 p.m.
Anderson Localization, Wave Diffusion and the Effect of Nonlinearity in Randomized Photonic Lattices, Yoav Lahini1, Assaf Avidan1, Francesca Pozzi2, Marc Sorel2, Roberto Morandotti2, Yaron Silberberg1; 1Weizmann Inst. of Science, Israel, 2Univ. of Glasgow, UK, 3Inst. Natl. de la Recherche Scientifique, Canada. We present direct experimental measurements of Anderson localized modes and of the different regimes of transport in randomized photonic lattices. In particular, we investigate the effect of nonlinearity on Anderson localization.

12:40 p.m.–2:30 p.m.
Lunch (on your own)

MC • Nanophotonics & PhC I

MC1 • 2:30 p.m. Invited
Using Surface Plasmons for Nanophotonics, Sergey I. Bozhevolnyi; Aalborg Univ., Denmark. Metal nanostructures supporting surface plasmon polariton (SPP) modes are considered for nanophotonic applications, including nano-sized strip and gap resonant antennas making use of slow SPPs and waveguide components using dielectric-loaded and channel SPPs.

MC2 • 3:10 p.m.
Initial Designs of Coated Nano-particle Lasers and Simulations of their Performance, Joshua A. Gordon1, Richard W. Ziolkowski1; 1College of Optical Sciences, Univ. of Arizona, USA, 2Electrical and Computer Engineering, Univ. of Arizona, USA. The optical properties of coated nanometer-sized spherical particles comprised of a gain medium core covered with a concentric plasmonic shell are investigated. Numerically predicted super-resonant radiative scattering suggests the possibility of realizing highly sub-wavelength lasers.

MC3 • 3:30 p.m.
Towards Anderson Localization of Light in Photonic Crystals, Costanza Toninelli1, D. S. Wiersma1, Sajeev John2, Nicolas Tétreault1, Geoffrey A. Ozin1; 1LENS, Italy, 2Dept. of Physics, Univ. of Toronto, Canada, 3Dept. of Chemistry, Univ. of Toronto, Canada. In this paper we present the measurement of the diffusion constant in a three-dimensional photonic crystal, possessing a full bandgap. The extremely small value reported can be ascribed to a renormalization by interference effects.

MC4 • 3:50 p.m.
Organic Photonic Crystal Microcavities for a Room-Temperature Single-Photon Source on Demand, Stelliana G. Lukishova1, Luke J. Bissel1, Vinod Menon1, Nikesh Valappil2, Robert W. Boyd1, Carlos R. Stroud1, Jr; 1Inst. of Optics, Univ. of Rochester, USA, 2Dept. of Physics, Queens College --CUNY, USA. A single-photon source based on single CdSe quantum-dot fluorescence in a chiral-photonic-bandgap liquid-crystal host manifests itself in observed fluorescence antibunching. Single-quantum-dot fluorescence imaging inside different types of organic photonic bandgap microcavities is also presented.

Pavilion
4:10 p.m.–4:40 p.m.
Coffee Break
MD • Super/Hyper-Lens

Lodge Room
4:40 p.m.–6:20 p.m.
MD • Super/Hyper-Lens
Victor G. Veselago; Moscow Inst. of Physics and Technology, Russian Federation, Presider

MD1 • 4:40 p.m. Invited
To Be Determined, Evgenii Narimanov; Princeton Univ., USA. Abstract not available.

MD2 • 5:20 p.m. Invited
Imaging Below Diffraction Limit Using Superlens and Hyperlens, Xiang Zhang; Univ. of California at Berkeley, USA. Abstract not available.

MD3 • 6:00 p.m.
Magnifying Superlenses in the Visible Frequency Range, Igor I. Smolyaninov, Yu-Ju Hung, Christopher C. Davis; Univ. of Maryland, USA. We demonstrate a magnifying superlens which can be integrated into a conventional far-field optical microscope. Our design is based on a multilayer plasmonic metamaterial consisting of alternating layers of positive and negative refractive index.
TuA1 • 8:30 a.m.  
**Invited**  
Anderson Localization in Disordered 2D Photonic Lattices,  
Tal Schwartz, Guy Bartal, Shmuel Fishman, Morancho Segor; Technion--Israel Inst. of Technology, Israel. We present the first observation of Anderson Localization in disordered photonic lattices. We study the combined effects of nonlinearity and disorder, under normal and anomalous dispersion.

TuA2 • 9:10 a.m.  
**Invited**  
Scaling Behavior of the Anderson Localization Transition of Light,  
C. M. Aegerter, M. Störzzer, S. Fiebig, W. Bährer, Georg Maret; Univ. of Konstanz, Germany. Pulsed transmission measurements on colloidal titania reveal a time dependent photon diffusion constant D(t)−tβ. The scaling of α and of the localization length with kF provides evidence for a transition to Anderson localization of light.

TuA3 • 9:50 a.m.  
Anderson Localization of Light in the Presence of Metamaterials,  
Ara A. Asatryan1, Lindsay C. Botten1, Michael A. Byrne1, Valentinn D. Freilikher1, Sergei A. Greeshkul1, Ross C. McPhedran1, Ilya V. Shadrivov1, Yuri S. Kivshar1; 1Univ. of Technology, Sydney, Australia. 2Bar-Ilan Univ., Israel, 3Ben Gurion Univ. of the Negev, Israel, 4Univ. of Sydney, Australia, 5Australian Natl. Univ., Australia. We consider localisation in 1D stacks of alternating normal and meta-material layers and show that at long wavelengths the localisation length is much longer than for corresponding homogeneous samples, and that transmission resonances are absent.

TuB2  
Statistics of Lasing Peaks and ASE Spikes from Amplifying Random Media, Xiaohua Wu, Hui Cao; Northwestern Univ., USA. We studied experimentally the ensemble-averaged spectral correlation functions and statistical distributions of spectral spacing and intensity of ASE spikes and lasing peaks from weakly scattering systems under local pumping. Their differences revealed distinct physical mechanisms.

TuB3  
Four-Wave Mixing in Negative Refractive Index Media, Aref Chouedjuriy, Marjan Sabotakin, John A. Tataronis; Bell Labs, Alcatel-Lucent, USA. We analyze four-wave mixing in negative refractive index media where at least one of the interacting waves has a negative index of refraction and explore some of the different perfectly phase matched regimes.

TuB4  
Effect of Local Pumping on Random Laser Modes, Xiaohua Wu, Jonathan Andresen, Hui Cao, Alexey Yamilov; 1Northwestern Univ., USA, 2Univ. of Missouri--Rolla, USA. We developed a numerical method to calculate the quasimodes and lasing modes in one-dimensional random systems. Local pumping could make the lasing modes differ drastically from the quasimodes of a weakly scattering system.

TuB5  
Two-Dimensional Dielectric and Metallo-Dielectric Periodic Photonic Structures, Ion Tiganu1, Eduard Monaico2, Vladimir Sergentu1, Veaceslav Ursakiitz, Michael Scalora1, 1Acad. of Sciences of Moldova, Republic of Moldova, 2Natl. Ctr. for Materials Study and Testing, Republic of Moldova, 3Charles M. Bowden Res. Ctr., USA. Nanotemplate fabrication on InP, GaP, and ZnSe is reported. We demonstrate the possibility to grow ordered arrays of metal nanowires and nanotubes using electrochemical deposition. Possible applications of developed 2D metallo-dielectric periodic structures are discussed.

TuB6  
Diffusion Approximation for Disordered Photonic Crystals, Lev I. Dejchhi, Mikhail Eremenchouk, Alexander Lisypanski; Hui Cao; 1Dept. of Physics, Queens College, USA, 2NanoScience Technology Ctr., Univ. of Central Florida, USA, 3Dept. of Physics and Astronomy, Northwestern Univ., USA. We develop a theoretical framework for description of diffusive radiative transport in disordered photonic crystals. We define an inhomogeneous equilibrium distribution of light intensity inside photonic crystals and derive the static limit of diffusion equation.

TuB7  
Analysis of ZnO Random Laser Spectra under Nanosecond Pumping, Mikhail Vladimirovich Ryazikov, Valery Mikhailovich Markushov, Charus’ Moiseevna Briskina, Hui Cao, Hongmei Zhong, Shao-Wei Wang, Wei Lu; 1Inst. of Radio Engineering and Electronics of RAS, Russian Federation, 2Northwestern Univ., USA, 3Shanghai Inst. of Ceramics, Chinese Acad. of Sciences, China, 4Shanghai Inst. of Technical Physics, Chinese Acad. of Sciences, China. Plausible origin of ZnO random laser spectra variations from shot to shot and its large line widths under nanosecond pumping are analyzed. Considered items are: spontaneous emission fluctuations and peculiarities of lasing time behavior.
TuB8
Guided Modes Supported by Nanoscale Metal-Dielectric Multilayers, Ivan Avrutsky1, Ilidar Salakhudinow2, Justin Elser2, Viktor Podolskiy; 1Wayne State Univ., USA, 2Oregon State Univ., USA. We discover that nanoscale metal-dielectric-multilayers support a family of guided modes strongly confined within the bulk of the multilayer - the bulk plasmon modes. We verify existence of bulk plasmons by measuring their modal indices.

TuB9
Negative Index Waveguide Arrays, Andrei I. Mainistron2, Natalia M. Litchinitser2, Ilidar R. Gabitov1; 1Moscow Engineering Physics Inst., Russian Federation, 2Univ. of Michigan, USA, 3Univ. of Arizona, USA. We investigate linear and nonlinear transmission properties of photonic lattices, or waveguide arrays, composed of waveguides filled with negative index material separated by positive index material layers. A wide range of initial conditions is investigated.

TuB10
Microwave Studies of Degenerate Band Edge Photonic Crystals, Andrey A. Chabanov; Univ. of Texas at San Antonio, USA. Novel photonic metamaterials have been engineered from spatially periodic, strongly birefringent dielectric materials and have been studied with microwaves to demonstrate extraordinary field amplitude growth within their structure at the photonic band edge transmission resonances.

TuB11
“Anti-Phase” Plasmonic and/or Metamaterial “Satellites” for Induced Transparency and Cloaking, Mário G. Silverininha, Andrea Ala; Nader Engheta; Univ. of Pennsylvania, USA. Instead of totally covering an object with properly designed plasmonic shells in order to achieve cloaking, here we discuss the idea of using “anti-phase” scatterers placed near an object to get to the same goal.

TuB12
TeraHerz Transmission through Aperiodic Aperture Arrays, Amit K. Agrawal1, Tatsunosuke Matsu2, Z. Valy Vardeny1, Ajay Nahata1; 1Dept. of Electrical and Computer Engineering, Univ. of Utah, USA, 2Physics Dept., Univ. of Utah, USA. We demonstrate that sharp, well-defined transmission resonances occur with various classes of aperiodic aperture arrays, including quasiperiodic and approximate quasiperiodic structures. The resonance frequencies may be directly obtained from the associated aperture array structure factor.

TuB13
Coherent Backscattering from Resonant Disordered Media, Jacopo Bertolotti1, Riccardo Sapienza2, P. David Garcia2, Cefe Lopez2, Diederik S. Wiersma2; 1European Lab for Non-Linear Spectroscopy and INFM-BEC, Italy, 2Inst. de Ciencia de Materiales de Madrid (CSIC) and CSIC-UVigo, Spain. The presence of Mie resonances in random assemblies of dense packed monodisperse polystyrene spheres is studied. Ambiguities in transmission measurements are discussed and backscattering cone is presented as an optimal tool to study Mie resonances.

TuB14
Towards the Observation of the Photonic Hall Effect in Cold Atomic Clouds, Benoît Grénaud2, Dominique Delande1, Olivier Sigwa1; Christian Miniatura1; 1Lab Castiller Brosset, France, 2Inst. Non-Linéaire de Nice, France. Performing exact numerical simulations, the photonic Hall effect is found to exist in clouds of resonant Rayleigh scatterers in a magnetic field. Our results also suggest that it could be observed in cold atomic vapors.

TuB15
Photon Control by Plasmonic Metamaterials, Takuo Tanaka1,2, Satoshi Kawata1,3; 1RIKEN (The Inst. of Physical and Chemical Res.), Japan, 2JST PRESTO, Japan, 3Osaka Univ., Japan. Optical properties of split ring resonators is theoretically investigated. We also propose novel optical functional components that can transmit the light across the material boundary without any reflection at the interface.

TuB16
Nanoaperture Based Metamaterials, Carsten Rockstuhl2, Ekaterina Pshenay-Severini1, Jörg Pertsch1, Falk Lederer1, Thomas Zentgraf2, Todd P. Megrath3, Harald Giessen3; 1Friedrich Schiller Univ. Jena, Germany, 2Univ. of Stuttgart, Germany. We investigate metamaterials consisting of holes in thin metallic sheets that resemble nanocavities or nanoapertures. Resonances of these structures relate to modes localized inside the nanocavities. Their impact on effective material parameters is discussed.

TuB17
Giant Field Enhancement and Plasmon Localization in Two-dimensional Deterministic Aperiodic Arrays of Metal Nanoparticles, Ashvin Gopinath, Ning-Ning Feng, Luca Dal Negro; Boston Univ., USA. We investigate the near-field electromagnetic coupling and the collective plasmon modes of deterministically generated two-dimensional aperiodic arrays of metal nanoparticles. We show that deep sub wavelength-localized states and large field enhancement effects can be achieved.

TuB18
Dynamically Frequency Tunable TeraHerz Metamaterials, John F. O’Hara1, Hou-Tong Chen2, Antoinette J. Taylor3, Richard D. Averitt4, Willie J. Padilla1; 1Los Alamos Natl. Lab, USA, 2Boston Univ., USA, 3Boston College, USA. We present novel terahertz metamaterials that feature frequency tunable resonant responses. Tunability is achieved by selective patterning of semiconductor regions within split-ring resonator structures. Simulations reveal non-linear frequency tuning as a function of conductivity.

TuB19
Photo-Induced Voltage in Perforated Metal-Dielectric-Metal Multilayer Structure, Young-Geun Roh1, Yusaburo Segawa2, Sergei G. Tikhodeev2, Teruya Ishihara1,2; 1RIKEN, Japan, 2General Physics Inst., Russian Federation, 3Dept. of Physics, Tohoku Univ., Japan. We investigated photo-induced voltage across perforated metal-dielectric-metal layered structure in experimental and numerical manner. Reversal of the sign of the induced voltage revealed negative direction of energy flow at the negative refractive index frequency.
TuB20
Factorization of Mesoscopic Intensity Correlations, Alexey G. Yamilov1, Andrey A. Chabanov2, Azriel Z. Genack2, Hui Cai1; 1Univ. of Missouri-Rolla, USA, 2Univ. of Texas at San Antonio, USA, 3Queens College of CUNY, USA, 4Northwestern Univ., USA. Mesoscopic correlations of field intensity transmitted through disordered waveguides are shown to factorize into (i) the correlator of intensity normalized by the transmission, (ii) the correlator of transmission normalized by conductance, and (iii) the variance of dimensionless conductance.

TuB21
Paper Withdrawn

TuB22
Dynamics of Quasimodes in an Open and Dissipative Localized 1D Random Waveguide, Patrick H. Sebbah1,2, Bing Hu3, Jerome Klossner2, Azriel Z. Genack2; 1CNRS, France, 2Queens College, USA. The time response to an incident narrow bandwidth pulse is measured inside a localized random system. Distinct dynamics in the spectral vicinity of isolated long-lived localized and extended short-lived multi-peaked modes underlay averaged pulse transmission.

TuB23
Optical Negative Index Metamaterials with Low Losses: Nature-Inspired Methods for Optimal Design, Zhengtong Liu1, Uday K. Chettiar1, Alexander V. Kildishev1, Vladimir M. Shalaev1, Do-Hoon Kwon2, Zikri Bayraktar2, Douglas H. Werner1; 1Purdue Univ., USA, 2Pennsylvania State Univ., USA. The performance of an optical negative index metamaterial is optimized by simulated annealing, genetic algorithm, and particle swarm optimization methods. While these methods yield very similar designs, the particle swarm optimization shows the best performance.

TuB24
Novel Properties of Superconducting Metamaterials Investigated with Magneto-Optic and Scanning Laser Microscopies, Michael Ricci1, Alexander Zhuravel2, Alexey Ustinov1, Ruslan Prozorov1, Steven M. Anlage1; 1Univ. of Maryland, USA, 2B. Verkin Inst. for Low Temperature Physics and Engineering, Ukraine, 3Physics Inst. III, Univ. of Erlangen-Nuremberg, Germany, 4Ames Lab., Dept. of Physics and Astronomy, Iowa State Univ., USA. Low losses are required to demonstrate many unique properties of metamaterials. We have developed tunable and nonlinear superconducting metamaterials and demonstrated their low loss properties. We employ magneto-optic and scanning-laser microscopy to study their properties.

TuB25
Statistics of Phase Singularities in Electromagnetic Waves Transmitted through Random Media, Sheng Zhang, Azriel Z. Genack; Queens College of City Univ. of New York, USA. Phase singularities in the speckle patterns of transmitted wave from random media are measured. We find that the statistics of phase variation around the phase singularities is universal, while the vorticities reflect the mesoscopic fluctuations.

TuB26
Statistical Properties of Single Molecule Fluorescence in Disordered Media, Luis S. Froufe-Pérez1, Romain Pierrat4, Juan Jose Saenz3, Rémi Carminati1; 1Lab EM2C, Ecole Centrale Paris, Ctr. Natl. de la Recherche Scientifique, France, 2Dept. Fisica de la Materia Condensada, Univ. Autonoma de Madrid, Spain. Statistics of fluorescence signals of single emitters in disordered clusters of nanoparticles are analyzed. We show that lifetime fluctuations are sensitive to local absorption and structure and that fluorescence signals can probe volume speckle patterns.

TuB27
Steady State and Dynamic Correlation of Localized Waves, Jing Wang1, Andrey A. Chabanov2, Azriel Z. Genack2; 1Dept. of Physics, Queens College of the City Univ. of New York, USA, 2Dept. of Physics and Astronomy, The Univ. of Texas at San Antonio, USA. The mesoscopic contribution to intensity correlation of localized microwave radiation with polarization rotation of the detector dwarfs the field factorization contribution but has the same form for diffusive and localized waves.

TuB28
Plasmonic Band Gap Materials for the Terahertz Spectral Region, Benjamin Reinhard1, Garik Torosyan2, René Beigang3,4; 1Univ. of Kaiserslautern, Germany, 2Fraunhofer Inst. Physical Measurement Techniques, Germany. Surface plasmon polaritons are excited with fs THz-pulses in 2- and 3-dimensional periodic metallic structures. Transmission properties are analyzed in terms of band gap models and good agreement between experiments and theory was found.

TuB29
Sub-wavelength Discrete Solitons in Nonlinear Metamaterials, Guy Bartal, Yongmin Liu, Dentcho A. Genov, Xiang Zhang; Univ. of California at Berkeley, USA. We present the first theoretical prediction of sub-wavelength discrete solitons in nonlinear periodic metamaterials. These solitons result from the three-fold interplay between periodicity, nonlinearity, and surface plasmons tunneling in nano-scaled nonlinear metallic waveguide array.

TuB30
3D Tunable Hexagonal Photonic Crystal in the Ultraviolet Range, Xiaohong Sun, Xiaoming Tao; Hong Kong Polytechnic Univ., Hong Kong. A top-cut hexagon prism is designed for fabrication 3D hexagonal PhC structures in HPDLC films. The PBG along z direction is in the UV range. Far-field diffraction patterns and electrical switching characteristics have been investigated.

TuB31
Spectral Phase Control of Remote Surface-Plasmon-Mediated Two-Photon-Induced Luminescence, Jess M. Gunn, Melinda Ewald, Marcos Dantus; Michigan State Univ., USA. We demonstrate and quantify the use of spectral phase modulation to control surface-plasmon-mediated two-photon-induced luminescence at distances tens of micrometers from the focal spot of a femtosecond laser.
TuB32  
**Weak Localization Effects in Second-Harmonic Light Scattering,** Claudio I. Valencia1, Eugenio R. Méndez; 1Facultad de Ciencias, Univ. Autonoma de Baja California, Mexico, 2CICESE, Div. de Fisica Aplicada, Mexico. We report calculations that show the presence of coherent backscattering effects in the second-harmonic light scattered by random systems of particles. The scattering intensity distributions presents an intensity dip in the backscattering direction.

TuB33  
**Embedded, Gap, and Surface Soliton Trains in 2D Photonic Lattices,** Xiaosheng Wang1, Cibo Lou1,2, Alex Samodurov1, Jingfui Xu1, Zhigang Chen1,2, Jianke Yang1,2; 1San Francisco State Univ., USA, 2TEDA Applied Physical School, Nankai Univ., China, 3Univ. of Vermont, USA, 4Zhou Pei-Yuan Ctr. for Applied Mathematics, Tsinghua Univ., China. Nonlinear propagation of 1D quasi-plane-waves in 2D photonic lattices leads to first observations of embedded and gap soliton-trains arising from modes at band-edges or non-band-edges. Surface soliton-trains as periodic nonlinear Tamm states are also demonstrated.

TuB34  
**Negative Index Materials Based on Rods with Refractive Index Profile,** Eugen Foca1, Juergen Carstensen1, Helmut Foell1, Vladimir V. Sergentu1, Veaceslav V. Ursaki1, Ion M. Tiginyanu1, Frank Daschner1, Reinhard Kneusch1; 1Christian-Albrechts-Univ. of Kiel, Germany, 2Inst. of Applied Physics, Moldavian Acad. of Sciences, Republic of Moldova. Negative index materials can be fabricated using cylinders with a special distribution of the dielectric constant. We present the theoretical approach for building such materials as well as a experimental proof of the corresponding principle.

TuB35  
**Evaluation of Effective Electric Permittivity and Magnetic Permeability in Metamaterial Parallel Slab and Importance of the Skin Effect,** Yosuke Minowa1, Masaya Naga1, Koichiro Tanaka1, Takashi Fuji1, Kazuyuki Hira1; 1Dept. of Physics, Kyotou Univ., Japan, 2Murata Manufacturing Co., Ltd., Japan, 3Dept. of Material Chemistry, Kyoto Univ., Japan. We evaluate effective optical constants of the phosphor bronze wire grid using the terahertz time-domain spectroscopy. Evaluated results show a Drude-like electric permittivity with a plasma frequency reduced by 10⁻⁵, and an unexpected magnetic permeability.

TuB36  
**Non Periodic Structures for Nonlinear Light Generation,** Xavier Vidal1,2, Jordi Martorell1,2; 1Inst. de Ciencies Fotoniques (ICFO), Spain, 2Departament de Fisica i Enginyeria Nuclear, Univ. Politècnica de Catalunya, Spain. We show that to partially phase match second harmonic generation is possible in structures of randomly oriented domains. In certain conditions making the dispersion in domain size large has no negative effect for such generation.

TuB37  
**Frozen Mode Regime in Bounded Photonic Crystals,** Alex Figotin, Ilya Vitebskiy, Univ. of California at Irvine, USA. Light incident on periodic structure with special dispersion relation can be converted into a frozen mode with huge amplitude and vanishing group velocity. We consider how this spectacular phenomenon is modified in bounded photonic crystals.

TuB38  
**Analog Experiments in Quantum Chaos,** Steven M. Anlage, Sameer Hemmady, Edward Ott, Thomas Antonsen; Univ. of Maryland, USA. Wave chaotic analog experiments have proven very fruitful for examining important predictions of random matrix and related theories. We present results using a microwave cavity analog to study universal conductance fluctuations in chaotic quantum dots.

TuB39  
**Light Propagation and Localization in Active Optical Fibers with Disorder,** Elena I. Chaikina, Noemi Lizarraga, Eugenio R. Méndez; CICESE, Mexico. We present a study of the propagation of light through fibers with random Bragg gratings. The fabricated samples were implemented as random laser system. Lasing spectrum was studied as a function of the pumping.

TuB40  
**Second Harmonic Generation of Self-Organized Gold Nanowires on Dielectric Substrate,** Alessandro Belardini1, Maria Cristina Luciriprete1, Eugenio Fazio1, Concita Sibilia1, Mario Bertolotti2; 1A. Tomasi, D. Chiappe2, C. Boragno1, Francesco Buatter de Mongeot1; 2Dept. di Energetica, Univ. di Roma La Sapienza, Italy, 3Dept. di Fisica, Univ. degli Studi di Genova, Italy. Ordered arrays of size selected nanorods and nanowires are useful for applications in fields ranging from spintronics or plasmonic waveguides. As we investigated the second order optical properties of self-organised gold nanowires on glass.

12:40 p.m.–2:30 p.m.  
**Lunch (on your own)**

TuC  
**Nanophotonics & PhC II**

2:30 p.m.–4:10 p.m.  
**TuC • Nanophotonics & PhC II**  
Yuriy Vlasov; IBM, TJ Watson Res. Ctr., USA, Presider

**TuC1 • 2:30 p.m. Invited**  
**What is the Smallest Volume in which Light can be Focused Efficiently?** Josh Conway, Shantha Vedantam, Hyejune Lee, Iapek Tang, Eli Yablonovitch; Electrical Engineering Dept., Univ. of California at Los Angeles, USA. We find that the limit of focusing is reached when the electromagnetic plasmonic group velocity v₆ becomes as slow as the electron Fermi velocity, v₁.

**TuC2 • 3:10 p.m. Invited**  
**To Be Determined,** Axel Scherer; Caltech, USA. Abstract not available.

**TuC3 • 3:50 p.m.**  
**Metal/Dielectric Photonic Crystal with Broadband Transparency for Propagating and Evanescent Waves,** Mark Bloomer1, Giuseppe D’Aguanno1, Nadia Mattiucci1, Domenico de Ceglia1, Michael Scalora1, Neset Akозbek1; 1US Army Res., Development and Engineering Command, USA, 2Time Domain Corp, USA. Strongly coupled metal/dielectric cavities with anti-reflection coatings at the entrance and exit faces provide a very broad transmission band for both the evanescent and propagating waves. Power lost through the super-resolution process is also examined.
Pavilion
4:10 p.m.–4:40 p.m.
Coffee Break

TuD • Meta & Cloaking

Lodge Room
4:40 p.m.– 6:20 p.m.
TuD • Meta & Cloaking
Martin Wegener; Karlsruhe Univ., Germany, Presider

TuD1 • 4:40 p.m. Invited
Cloaking: A New Phenomenon in Electromagnetism and Elasticity,
Graeme W. Milton; Univ. of Utah, USA. We show how collections of
polarizable dipoles become cloaked (invisible) to time harmonic
electromagnetic fields when placed in the proximity of a low loss
superlens, and how transformation based approaches to cloaking
extend to elasticity.

TuD2 • 5:20 p.m.
Optical Cloak of Invisibility, Wenshan Cai, Uday K. Chettiar,
Alexander V. Kildishev, Vladimir M. Shalaev; Purdue Univ., USA. We
present the design and analysis of an optical cloak of invisibility with
non-magnetic metamaterials. The general recipe for the
implementation of such a device is provided. The cloaking
performance is illustrated with finite-element simulations.

TuD3 • 5:40 p.m.
Multi-Frequency Cloaking with Metamaterial Layered Shells,
Andrea Alù, Nader Engheta; Univ. of Pennsylvania, USA. Exploiting the
anti-phase scattering properties of plasmonic materials, we have
recently explored the concept of electromagnetic cloaking with
plasmonic covers. Here we generalize this concept to multi-layered
covers, providing possibility of cloaking at multiple frequencies.

TuD4 • 6:00 p.m.
Electrical Control of Terahertz Metamaterials, Hou-Tong Chen1,
Willie J. Padilla2, Joshua M. O. Zide3, Arthur C. Gossard3, Antoinette J.
Taylor4, Richard D. Averitt4; 1Los Alamos Natl. Lab, USA, 2Boston College,
USA, 3Univ. of California at Santa Barbara, USA, 4Boston Univ., USA.
The metamaterials resonant response significantly enhances THz-
wave/material interaction. We demonstrated real-time switchable
THz metamaterial via external voltage bias to modify the
metamaterial capacitive elements, thereby achieved effective control
and manipulation of freely propagating terahertz waves.
• Wednesday, June 6, 2007 •

Lodge Room Entry foyer
7:30 a.m.–5:00 p.m.
Registration Open

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WA • Nanophotonics & Meta

Lodge Room
8:30 a.m.–10:10 a.m.
WA • Nanophotonics & Meta
Sergey I. Bozhevolnyi, Aalborg Univ., Denmark, Presider

WA1 • 8:30 a.m. Invited
Plasmonics: The Missing Link between Nanoelectronics and
Microphotonics, Mark Brongersma; Stanford Univ., USA. Abstract not
available.

WA2 • 9:10 a.m. Invited
Far-Field Subwavelength Focusing of Light and Plasmons by the
Talbot Effect, Fu Min Huang1, Mark Dennis1, F. Javier Garcia de Abajo2, Nikolay Zheludev3; Univ. of Southampton, UK, Inst. de Optica, Spain.
We demonstrate experimentally and theoretically that the Talbot
effect on arrays of nano-holes may be used to achieve
subwavelength localizations of optical and plasmonic fields.

WA3 • 9:50 a.m.
Patterning and Imaging at the Nanoscale with Far-field Optics via
Absorbance Modulation, Rajesh Menon, Hsin-Yu Tsai, Henry I. Smith;
MIT, USA. By illuminating an absorbance-modulation layer with a
null at one wavelength, and a focused spot at another wavelength, it
is possible to overcome the diffraction limit. We present preliminary
experimental results, and rigorous theoretical simulations.

Pavilion
10:10 a.m.–10:40 a.m.
Coffee Break

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WB • Meta & Superlens

Lodge Room
10:40 a.m.–12:40 p.m.
WB • Meta & Superlens
Evgenii Narimanov; Princeton Univ., USA, Presider

WB1 • 10:40 a.m. Invited
Magnetic, Double-Negative, Chiral and Nonlinear Photonic
Metamaterials, Martin Wegener1, S. Linden1, C. M. Soukoulies2,3; 1Karlsruhe Univ., Germany, 2 Ames Lab, Iowa State Univ., USA, 3Dept. of
Physics and Astronomy, Iowa State Univ., USA. We review recent
progress regarding photonic metamaterials with highly unusual
optical properties, including a negative index, magnetization waves,
and strong circular dichroism. Furthermore, we discuss experiments
on second- and third harmonic generation from magnetic
metamaterials.

WB2 • 11:20 a.m. Invited
Near-field Characterization of Photonic Nanostructures: From Hot
Spot Imaging to Superlens Studies, Rainer Hillenbrand; Max-Planck
Inst. fur Biochemie, Germany. We demonstrate nanoscale resolved
mapping of nanoparticle near-fields, surface polaritons and a SiC
superlens by employing scattering-type near-field optical
microscopy. Interferometric detection thereby yields both the local
near-field optical amplitude and phase.

WB3 • 12:00 p.m.
Molecular Scale Imaging with a Smooth Superlens, Pratik
Charttwedi1, Wei Wir1, Vijay Logeswaran1,2, Zhaoping Yu3, Yi Xiong4, 
Saei Islam1, Shih-Yuan Wang2, Xiang Zhang3, Nicholas Fang1; 1Univ. of
Illinois at Urbana-Champaign, USA, 2Quantum Science Res., Hewlett-
Packard Labs, USA, 3Dept. of Electrical and Computer Engineering, Univ.
of California at Davis, USA, 4NSF Ctr. for Nano-scale Science and
Engineering, Univ. of California at Berkeley, USA. We present the
progress of optical superlensing with 30 nm feature resolution or
one-twelfth of wavelength. This opens door to parallel and
molecular scale imaging by optical means.

WB4 • 12:20 p.m.
Single Molecule Fluorescence Lifetime Control through Slabs of
Metallic and Negative-Index Materials, Luis S. Froufe, Rémi
Carminati; Lab d’Energétique Moléculaire et Macroscopique, Ecole
Centrale Paris, Ctr. Natl. de la Recherche Scientifique, France. The
fluorescence dynamics of a single emitter can be controlled at large
distances through slabs of metallic and negative-index materials.
This is achieved by positioning a metallic nanoparticle in the vicinity
of the emitter image.

12:40 p.m.–2:30 p.m.
Lunch (on your own)

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WC • Random Media III

Lodge Room
2:30 p.m.–4:10 p.m.
WC • Random Media III
Ad Lagendijk; FOM Inst for Atomic & Molecular Physics, Netherlands,
Presider

WC1 • 2:30 p.m. Invited
Speckle Pattern Evolution of Diffusive and Localized Waves, Azriel
Z. Genack1, S. Zhang1, B. Hu1, P. Sebbal1,2; 1Queens College of CUNY,
USA, 2Lab de Physique de la Matière Condensée, CNRS, Univ. de Nice
Sophia-Antipolis, France. While the phase statistics within speckle
patterns is generic, the statistics of the motion of phase singularities
differs substantially for diffusive and localized waves reflecting the
wave interaction with the underlying electromagnetic modes.

WC2 • 3:40 p.m. Invited
Zero-Point Momentum in Complex Media, Bart van Tiggelen1,2, Geert
L.J.A. Rikken1; 1CNRS/Lab de Physique et Modélisation, France,
2LCMP/INSA/INP, France. Zero-point fluctuations of the
electromagnetic field carry energy. We consider the possibility
whether they carry momentum, when external magnetic fields are
applied. We apply dimensional regularization to address a dielectric
sphere geometry.

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WC3 • 3:50 p.m.
Lasing with Resonant Feedback in Weakly Scattering Random Systems
Patrick H. Sebbah\(^1\), Christian Vanneste\(^2\), Hui Cao\(^3\); \(^1\)Lab de Physique de la Matière Condensée, CNRS, France, \(^2\)Northwestern Univ., USA. Laser action in active random media in the weak scattering regime is investigated. In this regime where the quasimodes are spatially and spectrally overlapped, single mode lasing occurs on single quasimodes of the passive system.

Pavilion
4:10 p.m. – 4:40 p.m.
Coffee Break

WD • Meta/Nanophotonics

Lodge Room
4:40 p.m. – 6:20 p.m.
WD • Meta/Nanophotonics
Nikolay Zheludev; Univ. of Southampton, UK, Presider

WD1 • 4:40 p.m. Invited
Silicon Nanophotonics for On-Chip Optical Interconnects
Yurii Vlasov; IBM, TJ Watson Res. Ctr., USA. Abstract not available.

WD2 • 5:20 p.m. Invited
Anomalous Refraction in Silicon-Based 2-Dimensional Photonic Crystal Structures, Won Park; Univ. of Colorado, USA. Silicon-based 2-dimensional slab photonic crystal structures were designed to exhibit anomalous refraction in the near-infrared region. Negative refraction and self-collimation were experimentally observed in the integrated device structures.

WD3 • 6:00 p.m.
Fabrication of 3D Metal/Polymer Fine Structures for 3D Plasmonic Metamaterials, Nobuyuki Takeyasu\(^1\), Takao Tanaka\(^2\), Satoshi Kavata\(^3\); \(^1\)RIKEN, Japan, \(^2\)JST PRESTO, Japan, \(^3\)Osaka Univ., Japan. Three-dimensional (3D) metallic fine structures were fabricated with nano/micrometer resolution. 3D polymer structures were firstly prepared by two-photon absorption polymerization, and silver was deposited on the polymer templates through electrochemical metal deposition.
Analytical Coffee

Lumped Transmission

Localization

conventional

and

Transmitted

Xiang Zhang; Univ. of California at Berkeley, USA, presented.

Nonlinear Awards, Arizona, USA, 1Univ. of Wisconsin-Stevens Point, USA, 2Purdue Univ., USA.

Extraordinary properties of parametric amplification and of quantum interference which enable compensation of losses and of cavity-free generation of counter-propagating entangled right- and left-handed photons controlled by an external laser are investigated.

Nonlinear Optical Switching from Lossy to Amplifying Negative-Index Metamaterials, Alexander K. Popov2, Vladimir M. Shalaev1; 1University of Wisconsin-Stevens Point, USA, 2Purdue University, USA. Optical nonlinearities in metamaterials enable the enhancement of light-matter interaction and nontrivial light manipulation on the subwavelength scale. However, the required high-intensity light sources remain a great challenge. Here we demonstrate self-priming amplification in a lossy metamaterial that is capable of generating a high-intensity light source and is expected to find application in manipulating light in metamaterials at a nanoscale.

Transmission and Reflection at the Interface Containing a Nonlinear Thin Film of Optical Metamaterial, Natalia M. Litchinitser1, Andrei I. Mainistron2, Ildar Gabitov1; 1University of Wisconsin-Stevens Point, USA, 2University of Michigan, USA. We theoretically investigate some peculiar temporal and spectral characteristics of optical pulses reflected and transmitted through a thin film of metamaterial with nonlinear polarization and magnetization placed at the interface of two conventional linear dielectrics.

Localization of Sound in an Open Three-Dimensional System, John H. Page1, Hefei Hui2, Sergey Skipetrov1, Bart A. van Tiggelen2; 1University of Manitoba, Canada, 2Université Joseph Fourier, France. We report signatures of the localization of ultrasonic waves in a disordered 3D network of aluminum beads. We measure both intensity statistics and time-dependent transmission, and compare with theoretical predictions for the dynamics of localization.

Coffee Break

Coffee Break

Presider to Be Announced