Next meeting of the LEOS Scottish Chapter:

"Guided wave devices: New Dimensions"
sponsored by Newport Spectra-Physics Ltd

11th July, room EM 1.27 (SUPA Video Conference Room), Heriot-Watt University

Programme

1-2pm Registration and Table Top exhibition by Newport Spectra-Physics Ltd. (www.newport.com)

2-3pm Colin J. McKinstrie, Bell Laboratories "Parametric processing of optical signals"

3-4pm Cheese and Wine reception and Table Top exhibition by Newport Spectra-Physics Ltd.

4-5pm Bishnu Pal, Indian Institute of Technology Delhi, "Microstructured Optical Fibre: An emerging technology and its potentials"

The lectures may also be viewed live in all other SUPA Video Conference rooms

Colin J. McKinstrie (LEOS Distinguished Lecturer), "Parametric processing of optical signals"
Parametric devices based on four-wave mixing in fibers provide many functions that are required by optical communication systems. When operated in the linear regime, parametric devices provide amplification, frequency conversion and phase conjugation, all with high gain levels and broad bandwidths. They can also be used to buffer, monitor and switch optical signals. When operated in the nonlinear regime, parametric devices regenerate signals. They also produce entangled and squeezed states of light. In this talk recent research on parametric devices will be reviewed, and the implications of this research for classical and quantal communication systems will be discussed.

Bishnu Pal (LEOS Distinguished Lecturer), "Microstructured Optical Fibre: An emerging technology and its potentials"
Consequent to the mind boggling progress in high-speed optical telecommunication witnessed in late 1990s, it appeared that it would only be a matter of time before the huge theoretical bandwidth of 53 THz, offered by low-loss transmission windows in low water peak high-silica optical fibers would be tapped for telecommunication through dense wavelength division multiplexing techniques! In spite of this possibility, there has been a considerable resurgence of interest amongst researchers to develop application-specific specialty fibers, e.g. fibers in which transmission loss of the material would not be a limiting factor and in which nonlinearity and dispersion properties could be conveniently tailored to achieve transmission characteristics that are otherwise almost impossible to realize in conventional high-silica fibers. Research targeted at such fiber designs in the early 1990s gave rise to a new class of fibers, known as microstructured optical fibers

(MOFs), which are characterized with wavelength scale periodic refractive index features across its cross-section. The periodicity could be realized by having a two-dimensional periodic array of low and high refractive index regions e.g. air holes embedded in a solid dielectric like fused silica glass. These structures exhibit photonic bandgaps i.e. they forbid propagation of a certain band of wavelengths within them. If the frequency of incident light happens to fall within the photonic bandgap, which is characteristic of these fibers, then propagation of light is forbidden inside it. In contrast to the electronic bandgap, which is the consequence of a periodic arrangement of atoms/molecules in a semiconductor crystal lattice, a photonic bandgap arises due to a periodic distribution of refractive index in a PCF. However by introducing in the central region a defect to an otherwise periodic structure, light (within the bandgap) could be localized in the defect region thereby mimicking a fiber core. The defect region could be a medium of refractive index higher or lower (e.g. air) than the average refractive index of the surrounding layers. In the former case, light is guided by modified total internal reflection due to the average refractive index of the cladding being lower than the central defect region. In case of lower refractive index defect, the corresponding MOFs are known as photonic bandgap fibers (PBGFs). In contrast to a conventional optical fiber, in which light is guided by total internal reflection, Bragg scattering is responsible for effective wave guidance in such fibers, which led to the christening of these fibers as photonic bandgap guided optical fibers. In 1987 in the same issue of Physical Review Letters, Eli Yablonovitch and Sameer John independently proposed for the first time the possibility of controlling properties of light through the photonic bandgap effect in man-made photonic crystals. Microstructured optical fibers have been a fall out of that research. The talk would focus on basic functional principle of optical wave guidance in such fibers vis-a-vis conventional fibers. Details of propagation and design & technology of 1D photonic band gap Bragg fibers would be described, in which we have recently made some research contributions and our collaborators in Russian Academy of Science have succeeded in fabricating some of our designed fibers. Discussions on applications would include designs of dispersion compensating fibers, fibers for metro networks, nonlinear spectral broadening in them and generation of supercontinuum light.

Full LEOS Event Programme at http://www.st-andrews.ac.uk/~leosscot/programme06-07.htm

Dr Ajoy Kar
School of Engineering and Physical Sciences
Physics Department
David Brewster Building
Heriot Watt University
Edinburgh EH14 4AS
Tel: 00 44 131 451 3049
Fax: 00 44 131 451 3473
Mob:00 44 7732415862
email:a.k.kar@hw.ac.uk
http://nlo.eps.hw.ac.uk/