TECHNISCHE UNIVERSITÄT WIEN
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FUTURE TECHNOLOGY LECTURES

LASER FEST
CELEBRATING 50 YEARS OF LASER INNOVATION

The science and technology of Quantum Cascade Lasers

Federico Capasso
Robert Wallace Professor of Applied Physics
School of Engineering and Applied Sciences, Harvard University

Quantum Cascade Lasers (QCLs) are revolutionary light sources due to their radical conceptual departure from solid-state lasers and in particular conventional semiconductor lasers and the fact that they are the first lasers in which the wavelength can be designed to cover almost the entire infrared spectrum from a few micron to hundreds of micron wavelength, with the additional advantage of unprecedented tuning range. As such they are having a major influence on spectroscopy, trace gas analysis and chemical sensing impacting areas such as chemical physics, atmospheric chemistry and a wide range of applications, which has led to full scale commercial effort by large and small companies. QCLs represent a triumph of nanotechnology and of quantum design: an entire new class of nanostructured laser materials is engineered bottom up using the laws of quantum mechanics and fabricated using state of the art commercially available ultrathin crystalline layer deposition technique. The talk will conclude with the applications of plasmonics to beam shaping of QCLs which has enabled the realization of highly collimated sources, multi-beam lasers and laser with controlled near field for sub-wavelength imaging and controlled polarization.

Federico Capasso is the Robert Wallace Professor of Applied Physics at Harvard University, which he joined in 2003 after a 27 years career at Bell Labs where he was researcher, became Bell Labs Fellow and held several management positions including Vice President for Physical Research.

His research has spanned a broad range of topics from applications to basic science in the areas of electronics, photonics, mesoscopic physics, nanotechnology and quantum electrodynamics. He is a co-inventor of the quantum cascade laser, a fundamentally new light source, and in recent years has been involved in fundamental studies of the Casimir force, including the first measurement of a repulsive Casimir force, and in the applications of plasmonics to new light sources.

He is a member of the National Academy of Sciences, the National Academy of Engineering, a fellow of the American Academy of Arts and Sciences and an Honorary Member of the Franklin Institute. His awards include the King Faisal International Prize for Science, the American Physical Society Arthur Schawlow Prize, the IEEE Edison Medal, the Wetherill Medal of the Franklin Institute, the Optical Society of America Wood Prize, the Materials Research Society Medal, the Rank Prize in Optoelectronics, the IOP Duddell Medal, the Willis Lamb Medal, the IEEE David Sarnoff Award, the IEEE-LEOS Streifer Award, the LVMH Leonardo Da Vinci Prize, the Welker Medal. He is a Fellow of OSA, APS, IEEE, SPIE, IOP and AAAS.

Host: K. Unterrainer

Thursday, March 16th, 2010 16:00 hrs. c.t.

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