CURRICULUM ***Prof. SANDRO DE SILVESTRI***

Academic career

- Born in 1951 (Milan, Italy)
- Degree in Nuclear Engineering from Politecnico of Milan in 1976
- From 1977 to 1987 Researcher of the National Research Council
- In 1984-85 visiting scientist at MIT (Cambridge, USA)
- From 1988 to 1993 Faculty member of Politecnico of Milan, as Associate Professor in Physics
- Since 1994 Full Professor in Physics at the same University.

Key experiences

- Developments of picosecond lasers and applications to photo-physics and to photo-chemistry
- Resonator design of solid state lasers of high brightness
- Development of femtosecond lasers
- Femtosecond optical parametric amplifiers in the near infrared and in the visible
- Applications of ultrashort laser pulses to non-linear optics and to the study of ultrafast processes in polymers and quantum confined systems
- Pulse compression of high-energy femtosecond pulses by non-linear techniques
- Coherent vibrational dynamics in organic molecules
- High order harmonic generation for production of coherent radiation in the XUV
- Attosecond science

Main professional activities

- Member of the Optical Society of America and of the European Physical Society
- Topical Editor of Optics Letters in the area of "Ultrafast Phenomena" (1998-2003)
- Member of the steering committee of CLEO/Europe-EQEC conference since 1998, Program Co-chair of CLEO/Europe 1998 (Glasgow, UK) and General Co-chair of CLEO/Europe 2000 (Nice, France). Chairman of CLEO/Europe-EQEC steering committee from 2005 to 2009.
- Since 1998 member of the Board of the Quantum Electronics and Optics Division, which coordinates the activities in Europe in the field of optics; President of the same Board (2002-2004)
- Associated member to the Institute of Photonics and Nanotechnology of the National Research Council (in Milano).
- Director of the European Laser Facility "Centre for Ultrafast Science and Biomedical Optics" (CUSBO) at the Department of Physics of Politecnico of Milan. This Centre provides access to european research groups for performing research in a broad area of laser applications. CUSBO is part of the network of European Facilities "LASERLAB-Europe".
- Chairman of the International Scientific and Technical Advisory Committee (ISTAC) of ELI Delivery Consortium.
- Chairman of the Scientific Advisory Committee of ELI-ALPS.

Honours

- Fellow of the Optical Society of America
- Fellow of the European Physical Society

MAJOR SCIENTIFIC ACHIEVEMENTS

Sandro De Silvestri has made a number of significant contributions to the field of "Ultrafast Phenomena", extending for a period of over 30 years, in a variety of topics such as: (i) coherent vibrational spectroscopy; (ii) development of techniques for the generation of few optical cycle pulses either with high energy or tunable from near-IR to visible; (iii) study of ultrafast dynamics in organic and quantum confined systems; (iv) carrier envelope phase effects on strong field photoionization and high order harmonic generation; (v) generation of attosecond pulses. Hereafter, a summary of the most important achievements is given.

Coherent vibrational spectroscopy. Ultrashort pulses allow impulsive excitation of optical phonons with an oscillation period of the order of the pulse duration. Using a three pulse scattering geometry, "*impulsive stimulated Raman scattering"* was generated for the first time in 1985: a phase grating (oscillating at the phonon frequency) was induced in a molecular crystal by coherent excitation of optical phonons. Phonon oscillation and lifetime could be observed directly in time domain. This early demonstration has opened up the field of coherent vibrational spectroscopy, a complementary technique with respect to Raman spectroscopy, which is nowadays applied to a variety of systems. Study of vibrational dynamics was performed in polymers and proteins.

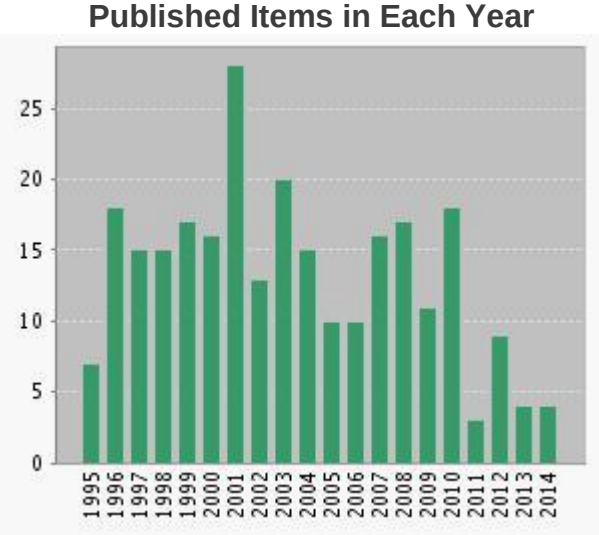
Generation of high-energy few-optical cycle pulses. In 1996 a new technique, known as *hollow fiber compression*, was proposed and demonstrated, which allowed to compress mJ optical pulses (130 fs) down to 10 fs. The use of this technique in 1997, in collaboration with the University of Vienna, allowed to obtain a duration record of 4,5 fs and then in 2003, in collaboration with ETH-Zurich, by cascading two hollow fibers pulse duration was further shortened to 3.8 fs. The availability of pulses of high-energy comprising few optical cycle pulses has opened the field known as "*extreme nonlinear optics"*, a regime where the electric field of a light pulse, rather than the intensity profile, is relevant (high order harmonic generation, strong-field photoionization, attophysics, etc.).

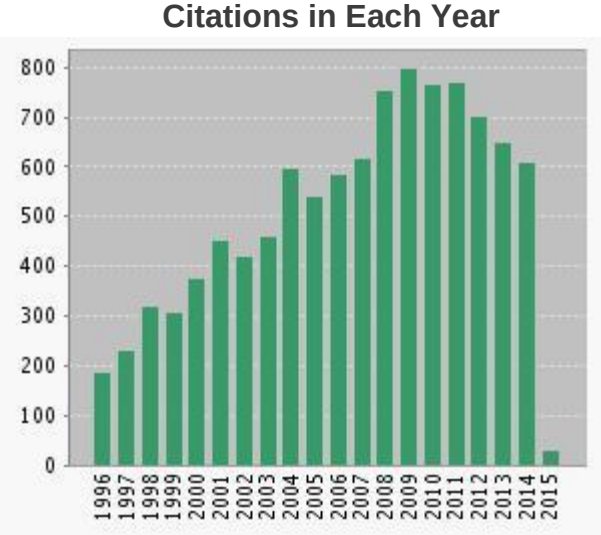
Optical parametric amplification: tunable single-cycle pulses and applications. A variety of parametric amplifiers has been developed using innovative phase matching schemes. Considerable work has been performed in the near-IR, where pulse duration down to 14 fs at 1.5 μm has been achieved. In the visible, non-collinear phase matching geometry was exploited, which allowed the generation of tunable sub-8-fs pulses. These pulses have been used for a variety of pump-probe experiments performed in semiconductors and organic materials. An extended investigation has been done on carotenoids, where the existence of a new intermediate state in the internal conversion process has been demonstrated, which is relevant for photosynthetic light harvesting systems. Recently by using the technique of frequency difference generation phase- stabilized few-optical cycle pulses have been achieved in the near-infrared, using novel configurations.

Signatures of carrier envelope phase effects in extreme non-linear optics. A key parameter of the light pulse electric field, which significantly influences the strong-field interaction, is the phase of the carrier frequency with respect to the envelope. The first experimental evidence of the effect of the carrier envelope phase (CEP) has been obtained in a strong-field photoionization experiment. Depending on the CEP, the generation of photoelectrons by high-energy few-cycle pulses violates inversion symmetry as indeed observed with 5 fs pulses. CEP effects were also observed in the high order harmonic generation process either with single-cycle and multi-cycle excitation pulses.

Generation of attosecond pulses. Generation of single-cycle isolated attosecond pulses at 36 eV using phase-stabilized 5-fs driving pulses with modulated polarization state has been demonstrated. Using a complete temporal characterization technique, compression of the generated pulses down to

the record value of 130 as, corresponding to less than 1.2 optical cycles, has been achieved. The availability of single-cycle isolated attosecond pulses opens the way to a new regime in ultrafast physics, where the strong-field electron dynamics in atoms and molecules is driven by the electric field of the attosecond pulses rather than by their intensity profile.





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LIST OF SELECTED PUBLICATIONS

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