

PHOTONICS SEMINAR

Dr. Cesare Barbieri, University of Padova

*Aqueye and Iqueye: the Fastest Astronomical
Photometers*

Faculty Host: Dr. Alexander Sergineko

March 31, 2016

4-5 p.m.

Room 901

Photonics Center

8 Saint Mary's Street

Refreshments will be
served!

Two experiments demonstrating very high time and space resolution that are based on the use of some special properties of light that are not common in astronomical observations will be presented. The first example is a photometer that is capable of time tagging the arrival of each photon with a resolution of 25 picoseconds. It demonstrates very high stability of a few hundred picoseconds over several hours of continuous acquisition. Its dynamic range covers more than 6 orders of magnitude. The final goal for the use of such a detector is to build a 'quantum' photometer for extremely large telescopes (like the ESO E-ELT) that are capable of measuring second order correlation effects (according to Glauber's description) in the photon stream from celestial sources. Two units have already been built: one (Aqueye) for the Asiago 1.8m telescope and another one (Iqueye) for a 4m-class telescope, such as the ESO NTT in Chile. Both instruments are currently at the Asiago facility for installation of fibers to feed the light from the telescopes. Results obtained from optical pulsars will be discussed in detail. In addition, the photometers have also been used for lunar occultations, exo-planet transits and fast variable objects observation. The high spatial resolution measurement using Orbital Angular Momentum of light and associated Optical Vorticity has been investigated as an addition to Aqueye. The module, which is linked to a telescope via an adaptive optics device, will be described.

Cesare Barbieri is a Professor Emeritus in the Department of Astronomy at the University of Padova, Italy. He is a member of the Board of Scuola Galileiana di Eccellenza, Director of the Ph.D. School in Space Sciences and Technologies at the University of Padova. Professor Barbieri's ongoing research themes include diffuse sodium in the solar system (comets, Mercury, Io); spectrophotometry of comets and asteroids; telescopes and instrumentation; and quantum optics for astronomy. In addition, he received the NASA Group Award for FOC/HST, Gold Medal of Italian Ministry for Public Education for Education, Culture and Art.



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