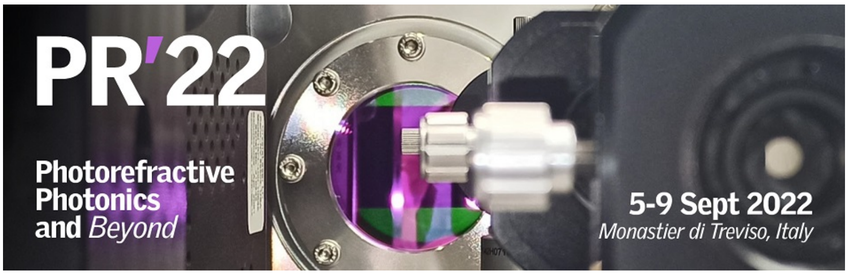

Contribution ID: **48** Type: **Regular Talk**

Optical coherent detection through scattering media by two-wave mixing in liquid crystal light valves

Wednesday, 7 September 2022 10:55 (25 minutes)

Coherent detection in optical beams requires measuring the optical phase with an interferometric setup, which implies superposing the optical wavefronts of the signal and reference beams. Because of its intrinsic nature, optical phase detection rapidly undergoes degradation if the interfering beams are not spatially uniform, as when propagating through scattering media. In this case a nonlinear medium can be employed instead of a conventional beam-splitter to recombine the reference and signal. Liquid crystal light valves (LCLV) are optically addressed spatial light modulators realized by associating a nematic liquid crystal with a photorefractive substrate. Here a LCLV is used to perform two-wave mixing (2WM) with a continuous reference (typical intensity of few mW/cm^2 in the green) and a very low intensity speckled signal beam. Thanks to its intrinsic nonlinear dynamics, the LCLV adjusts its properties following the phase and intensity changes of the interacting beams in the frequency bandwidth of its response. With the novel operating conditions of our LCLV at wavelength of 532 nm a sub-ms response time is measured, thus being compatible with a speckle decorrelation times also in the range of ms. Therefore, it is able to filter out low frequency modulations and noise effects. Based on these properties, optical coherent detection is achieved when the signal propagates through multiscattering media, as foam layers of various thicknesses. When an incident phase modulation is imposed on the speckled signal issued from the foam sample, this is transformed into intensity modulation after 2WM interaction in the LCLV. At the exit of the LCLV and due to Reference-Speckle signal two beam coupling, the modulation frequency is easily detected by measuring the intensity on the self-diffracted plane wave reference beam on a single detector.

Primary authors: Prof. RESIDORI, Stefania (HOASYS); BORTOLOZZO, Umberto (HOASYS); RAMAZ, François (Institut Langevin, ESPCI Paris, University PSL, CNRS); HUIGNARD, Jean-PIerre (Institut Langevin, ESPCI Paris, University PSL, CNRS)

Presenter: Prof. RESIDORI, Stefania (HOASYS)

Session Classification: Holography, optical processing and imaging

Track Classification: Holography, optical processing and imaging