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Date Time: May 4, 2020 08:00 AM Eastern Time (US and Canada) Italy time 2:00 pm

Topic: Self-Mixing Interferometry: a Universal Yardstick to Measure Almost Everything

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Description: In this talk, we start with a theoretical introduction to mutual- and self-coupling phenomena in laser oscillator, and then describe in details the principle of operation of self-mixing interferometer, a new coherent configuration for the measurement of dimensional and kinematic quantities such as: displacement, distance, vibration amplitude, thickness, angle, and curvature, and also physical quantities like: coupling factors, line width, alfa-factor, and index of refraction. In the measurement arrangement, the laser undergoes self-injection at weak level, leading to an amplitude and frequency modulation driven by external optical path length. Then we will describe the developments of a displacement-measuring instrument, first by using the up/down counting of mode hops, then extending the principle of measurement to the case of a diffuse target, reflecting back a field affected by the speckle-pattern statistics. Third, we will report on the successful implementation of two-channel (or, referenced) vibrometer, based on analogue processing of the self-mix signal, in which the speckle-related amplitude errors are removed thanks to a servo-loop concept, and the instrument is capable of true differential operation, on diffuse surface, like a normal optical interferometer operates on legs ending with reflective surfaces. A survey of the performance achieved in different application areas will conclude the talk.

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