

## **Tissue characterization with ballistic photons: counting scattering and/or absorption centres.**

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**Opto-Electronics Review.** Vol. 23 (1), 46–54,

DOI: 10.1515/oere-2015-0011

### **Abstract**

We describe a new method to separate ballistic from the scattered photons for optical tissue characterization. It is based on the hypothesis that the scattered photons acquire a phase delay. The photons passing through the sample without scattering or absorption preserve their coherence so they may participate in interference. We implement a Mach–Zehnder experimental setup where the ballistic photons pass through the sample with the delay caused uniquely by the sample indices of refraction. We incorporate a movable mirror on the piezoelectric actuator in the sample arm to detect the amplitude of the modulation term. We present the theory that predicts the path-integrated (or total) concentration of the scattering and absorption centres. The proposed technique may characterize samples with transmission attenuation of ballistic photons by a factor of  $10^{-14}$ .