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Enhanced partial wave spectroscopy (EPWS) for nanoscale sensitive structural disorder measurement in weakly disordered media[1] HUDA ALMABADI, PEEYUSH SAHAY, PRABHAKAR PRADHAN, Univ of Memphis — Based on mesoscopic physics approach, partial wave spectroscopy (PWS) technique was introduced earlier for the measurement of the nanoscale structural disorder in very weakly disordered optical media, such as biological cells. We describe a modification and further improvement of this technique, by introducing an enhanced back reflection system to further increase the measurement sensitivity of the PWS technique. As a result, a nanoscale level of fluctuation or nanoscale alteration in a disordered medium can be measured with even higher sensitivity and accuracy. In this enhanced-PWS (EPWS) technique, semi-transparent metallic thin films are used to create a cavity like structure that holds the sample; this leads to an increased back reflected light intensity, which eventually results in high sensitivity in the nanoscale structural disorder measurements. Reflection coefficients of the backscattered signal obtained from the simulated disordered media, within the cavity, with varying refractive index fluctuation values, were statistically analyzed using mesoscopic physics approach. The results, of a sample with and without metallic cavity inside the system show a significantly high back reflected intensity with the metallic cavity case. We also discuss the possible applications of the developed technique in ultra-sensitive detection of cancer by the characterization of nanoscale fluctuations in biological cells.

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