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Modeling Low-Coherence Enhanced Backscattering (LEBS) using Photon random walk model of Light Scattering HARIHARAN SUBRAMANIAN, PRABHAKAR PRADHAN, YOUNG KIM, YANG LIU, VADIM BACKMAN, Northwestern University, Evanston, IL - 60208 — Enhanced backscattering (EBS) peak from a biological media with transport mean free path length (l_s^*) >> wavelength λ, is extremely small ($\sim 0.001^0$) making the experimental observation of such narrow peaks to be difficult. Hence, we developed a low coherence enhanced backscattering (LEBS) technique by combining the EBS measurements with low spatial coherence (LSC) illumination and low temporal coherence detection. LSC behaves as a spatial filter preventing longer path lengths and collects photons undergoing low orders of scattering. The experimental angular width of these LEBS peaks ($\sim 0.3^0$) are more than 100 times the width of the peak predicted by conventional diffusion theory. Here we present a photon random walk model of LEBS cones to further our understanding on the unprecedented broadening of the LEBS peaks. In general, the exit angles of the scattered photons are not considered while modeling EBS peaks in diffusion regime. We show that these photon exit angles are sensitive to the low orders of scattering, which plays a significant role in modeling LEBS peaks when the spatial coherence length of the light source is much smaller than l_s^*. Our results show that the model is in good agreement with experimental data obtained at different low spatial coherence illumination.

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