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Low background optical system R&D for the Scintillating Bubble Chamber (SBC) detector

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The Scintillating Bubble Chamber (SBC) experiment is a novel low-background technique used to directly detect low-mass WIMPs and coherent elastic neutrino nuclear scattering of reactor neutrinos (CEvNS). The detector combines the strengths of bubble chambers with those of scintillation detectors. Nucleation of bubbles due to nuclear recoil of target fluid atoms provide information about the interaction between WIMP-like particles and target fluid. Imaging of the bubbles growth is an essential criteria in this type of detector. A CMOS sensor type camera from BASLER is used with high frame per second (164 fps) and 2.3 MP resolution to image these bubbles. Radioactive backgrounds from the cameras enhance the number of background events, decreasing the WIMP detection sensitivity. It is therefore critical to move the cameras away from the detector while maintaining the bubble imaging parameters (resolution, light collection efficient, field of view). Several options are currently being explored, such as videoscope, rigid borescope, lens system, and lens with nano guide, at the Univ. of Alberta. Background counting of these various setups, and ongoing research activity will be presented.

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