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Novel Wavelength Shifting Collection Systems for Vacuum Ultraviolet Scintillation Photons in in Noble Gas Detectors VICTOR GEHMAN, Lawrence Berkeley National Laboratory — Detection of vacuum ultraviolet (VUV) photons presents a challenge because this band of the electromagnetic spectrum has a short enough wavelength to scatter off of most (though not all) materials, but is not energetic enough to penetrate into the bulk of a detector (so cannot be treated calorimetrically like x rays or γ rays). This is exactly the band in which noble gasses (which make excellent media for radiation detectors) scintillate. VUV photon detection usually involves shifting them to visible wavelengths with a fluorescent molecule deposited on an optically clear surface viewed by a photosensor. Such techniques, while comparatively efficient and simple to fabricate, have high cost and complexity per unit coverage area making them prohibitively expensive and complicated to scale up to the very large sizes necessary for the next generation of neutrino, dark matter, and other rare event search experiments. We present several lines of inquiry attempting to address this problem, focusing on solutions that are directly applicable to a variety of current or next generation noble gas detectors. This line of R&D is a potentially fruitful avenue capable of furthering the goals of many experiments with a broad portfolio of fundamental and applied research.

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