

Direct Search for Dark Photons and Dark Higgs with the SeaQuest Spectrometer at Fermilab

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The SeaQuest experiment has been in operation since 2011 and is designed to study nuclear dependent Drell-Yan productions in the dimuon channel using the high intensity 120 GeV proton beam from the Main Injector on various thin nuclear targets (about ~ 0.1 nuclear interaction lengths each). It provides an ideal setting for dark photon and dark Higgs search in a parameter space of great interest. In this energy, through kinetic mixing, the postulated low-mass ($\sim < 10$ GeV) dark photon (and/or dark Higgs) particles could be produced in the Drell-Yan like $q + \bar{q}$ (or $g + g$) fusion processes in high energy proton + nucleus collisions, mostly in the beam dump ($p + Fe$) and decay into dimuons (or di-electrons). For this search, a dedicated displaced-vertex trigger detector was built, installed and commissioned with upgraded DAQ in 2017. This trigger uses two planes of extruded scintillators to identify dimuons originating far downstream of the target, and is sensitive to dark photons (dark Higgs) that travel deep inside the beam dump before decaying to dimuons. We successfully took one week worth of production data parasitically with the E906 experiment in 2017. We will continue taking additional data parasitically alongside the upcoming SeaQuest polarized proton target physics program (E1039) for several years. In this talk we will present the latest status of the preliminary dark photon search from 2017 data and also discuss future opportunity.

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Collaboration name

SeaQuest

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