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12.25 Characterization of X-ray Spectrum of NRL/Mercury using Aerogel Cherenkov Detector

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The Aerogel Cherenkov Detector for Cygnus (ACD/C) is a time-dependent, x-ray spectral detector that uses SiO2 aerogels spanning an index of refraction (n = 1.02 − 1.07) corresponding to a 1.1 − 2.3 MeV x-ray energy threshold appropriate for pulsed power x-ray sources like Cygnus and Mercury. Aerogels sit between the capability of gas (> 3 MeV) and solids such as glass (0.3 MeV). The detector uses an aluminum converter to Compton scatter incoming x-rays and create relativistic electrons, which produce Cherenkov light in an aerogel or glass medium. The light is then coupled through parabolic mirrors to a photomultiplier located off axis of the incoming beam. ACD/C was fielded at the Naval Research Laboratory when Mercury was tuned to produce up to 5 MeV x-ray. Despite a high radiation and radio interference background, ACD/C was able to achieve high signal over noise across five aerogel densities and glass. ACDC observed time-resolved rise and fall times for different energy thresholds of the photon spectrum. Monte-Carlo (ACCEPT code) simulations of ACD/C's aerogel response curves were folded with theoretical Mercury's photon energy spectrums and agree within error to the observed result. The details of the Mercury run with ACD/C will be presented and discussed at the meeting.

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