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Measurement of soft X-rays from neutron radiative decay THOMAS GENTILE, National Institute of Standards and Technology, RDK II COLLABORATION — In the RDK II experiment, photons with energies between 5 keV and the 782 keV endpoint from neutron radiative decay were detected using an array of 12 bismuth germanate (BGO) crystals, each coupled to an avalanche photodiode (APD). Since the experiment was performed in the bore of a superconducting magnet, APDs were preferable to photomultiplier tubes. Simultaneously we detected soft X-ray photons in the energy range from 0.3 keV to 20 keV with three larger APDs. We found that for soft X-ray detection near 77 K the APD must be oriented with its electric field parallel to the magnetic field, otherwise there is substantial distortion of the response. Extraction of the soft X-ray radiative decay spectrum required studies of the response of the APD. We performed measurements of the APD response for monochromatic X-ray beams between 0.35 keV and 1.5 keV on the U3C beam line at the NSLS at BNL. The data were used to model the APD pulse height spectrum as a function of X-ray energy using a profile for the depth-dependent efficiency for collection of electron-hole pairs. This model was validated using a continuum spectrum at the NIST SURF III. We will describe the construction of the detector, discuss the results of the magnetic field, BNL and SURF studies, and present preliminary results of determination of the radiative decay spectrum in the soft X-ray range.

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