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A balloon-borne X-ray polarimeter for the study of bright astronomical sources RAMANATH COWSIK, Washington University in St. Louis — Through astronomical X-ray polarimetry we can probe the extreme conditions of gravity near black holes, the intense magnetic fields near neutron stars and magnetars, the presence of very high energy particles in the shocks associated with supernova remnants, and a variety of exotic astrophysical processes such as Thomson scattering in the hot atmospheres above accretion disks and inverse Compton scattering of polarized synchrotron photons. In this paper we discuss an instrument suitable for balloon borne observations. This instrument consists of an azimuthally symmetric collimator with a trapezoidal response, which reduces the required pointing accuracies, and a position sensitive proportional counter which has external resistors distributed in series with the high voltage anode wire. This latter characteristic allows position of the scattered photon to be determined in angular steps through charge division and minimizes the on-board electronics and telemetry. A full analysis of the response of the instrument, including the competing effects of photoelectric absorption in the scattering target is presented. We show that the polarization of about a dozen astronomical x-ray sources may be probed effectively with this instrument during a long duration balloon flight from Antarctica.

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