N06a The Twin X-ray Pulsars 2S1145-619 & 1E1145.1-6141

P. Saraswat, T. Mihara (Riken), R. Corbet, K. Ebisawa (GSFC)

The pulsars, 2S1145-619 and 1E 1145.1-6141, were observed by ASCA on 23 August, 1993 when both sources were in a low intensity state, with intrinsic luminosities of 2.1×10^{34} and 1.4×10^{36} ergs s^{-1}, respectively. The phase averaged spectra could be described by a powerlaw attenuated at high energy by an exponential cutoff function. The Be star binary 2S1145-619 was observed at orbital phase 0.904 and the intrinsic source absorption was seen to be low. The source showed a complex behavior of the cutoff energy, E_C, which was found to be correlated with the source intensity. At the two pulse maxima, the cutoff energy was high at $\sim$ 5.5–6.0 keV, while it was low at about $\sim$ 1.7–2.0 keV at the pulse minimum. This source also showed the presence of a soft blackbody with a temperature of 0.108 keV and an intensity which varied inversely with the source intensity as a function of pulse phase. These features can be explained in terms of a shock deceleration of the matter (of a 'collisionless' type) in the pulsar column. The radiation is emitted as a fan beam and the blackbody emission is due to the high energy radiation being reprocessed in the outermost stellar layers surrounding the accretion column and is probably emitted as a broad pencil beam. We find that it is extremely important to include the effects of gravitational light bending in modeling the beam patterns as this can significantly change the visibility of the emitting region on the star's surface. The supergiant source 1E1145.1-6141 showed a weak soft excess which could be accounted for in terms of absorption by inhomogeneous clumped matter. The cutoff energy, E_C, was 6.2 keV and was constant across pulse phase. Using pulse phase spectroscopy we have been able to obtain the beam patterns of the two emission regions. We find that the radiation is emitted as a fan beam, with the height of the emitting column of the $\sim$ 500 m to 1 km. This estimate includes the effects of gravitational light bending, which is clearly seen to be of great importance. We also find that the two poles accrete at slightly unequal levels, with the further pole showing the higher accretion rate.