

**ABSTRACT:** PSR B1259-63, a rotation-powered radio pulsar with a  $\sim$  48 millisecond spin period, is in a highly eccentric (e  $\sim$  0.87) 3.4 year orbit around the massive Be star SS 2883. We report the results of XMM-Newton observations performed between 2001 and 2004. The distance of the system determined by optical photometric observations of the companion Be star is 1.5 kpc (Johnston et al. 1994). The measured period derivative of 2.3 x 10<sup>-15</sup> ss<sup>-1</sup> implies a high spin-down energy of 8.2 x 10<sup>35</sup> erg/s, a characteristic age of 3.3 x 10<sup>5</sup> year, and a dipole surface magnetic field of B = 3.3 x 10<sup>11</sup> G (Manchester et al. 1995). Combining the XMM-Newton observations with the previous results from ASCA, we found that the best-fit power law models in the 1.0–10.0 keV energy band show long term variations in the photon indices from  $\sim$ 1.11 to  $\sim$  1.95. The X-ray flux is observed to increase by a factor of > 10 from periastron to apastron. No X-ray pulsation at the pulsar's spin period was found in any observation so far. A model invoking the interaction between the pulsar and the stellar wind is likely to explain the observed orbital phase-dependent time variability in the X-ray flux and spectrum. This is in line with the results derived recently by Chernyakova et al. 2006.



Figure 1. XMM and ASCA observations of the PSR B1259-63/SS 2883 system and their coverage of the binary orbit. The elliptical dash line shows the orbit of PSR B1259-63.



Figure 2. Time variation of the X-ray flux in the 1.0-10.0 keV energy band taking the results from the XMM-Newton and ASCA observations into account. The x-axis is the orbital phase in unit of degrees. The zero degree of the orbit phase is at periastron. The error bars represent the 90% confidence interval uncertainties. For most XMM observed fluxes, the errors are smaller than the plotted dot.

Figure 3. The orbital variation of the photon index in the 1.0-10.0 keV energy band as it results from our reanalysis of the XMM-Newton and ASCA observations. The x-axis shows the orbital phase measured from periastron. The error bars indicate the 90% confidence interval uncertainties.

## Reference:

 Chernyakova, M., Neronov, A., Lutovinov, A., Rodriguez, J., Johnston, S., 2006, MNRAS, 367, 1201

• Cominsky, L., Roberts, M., Johnston, S., 1994, ApJ, 427, 978C

• Hirayama, M., Cominsky, L. R., Kaspi, V. M., Nagase, F., Tavani, M., Kawai, N., Grove, J. E., 1999, ApJ, 521, 718H

•Kaspi, V. M., Tavani, M., Nagase, F., Hirayama, M., Hoshino, M., Aoki, T., Kawai, N., Arons, J., 1995, ApJ, 453, 424K