

Temporal and Spatial Variation of Synchrotron X-ray Stripes in Tycho's Supernova Remnant

The synchrotron X-ray “stripes” discovered in Tycho's supernova remnant (SNR) by Eriksen et al. (2011) is an intriguing structure in which protons might be accelerated up to PeV. However, its origin is still open. In this talk, we will explain an analysis of Chandra data taken in 2003, 2007, 2009, and 2015 of the stripes in the southwestern region of the SNR (Okuno, Matsuda, et al., 2020; Matsuda et al., 2020). We discover time variabilities of synchrotron X-rays in each stripe from a comparison of images obtained at different epochs. Our spectral analysis shows a strong correlation between the surface brightness and photon indices. The spectra of stripes have photon indices of $\Gamma = 2.1$ – 2.6 , which are significantly harder than those of the outer rim of the SNR in the same region with $\Gamma = 2.7$ – 2.9 . These findings indicate that the magnetic field is substantially amplified, suggesting that particle acceleration may work in the stripes through a stochastic process.

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