MULTIFREQUENCY SPECTRAL STUDIES OF SNRS

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1. Introduction

Radio supernova remnants(SNRs) of large angular diameter are obvious objects for multifrequency spectral studies from long wavelengths to short wavelengths, as resolutions at low frequency are usually about several arcminutes. An international cooperation[1] consists of MRAO, BAO, DRAO, MPI, and astronomers from Beijing University, Beijing Normal University, China and Calgary University, Canada. This international collaboration is also a part of the Panorramic Spectral Imaging of the Milky Way (PI R. Taylor). Some results on HB21, G78.2+2.1, and HB9 are presented in this paper.

2. Results

HB21

The integral flux density of HB21 at 232 MHz is about 390 ± 30 Jy measured from the new data. By combining this integral flux with that measured at 408 MHz (290 ± 20Jy) and 4750 MHz(110 ± 5Jy) from the maps of Tatematsu(1990) and

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Reich(1983), integral spectral indices of $-0.41 \pm .02$ and $-0.39 \pm .02$ at frequency pairs of 232-4750 MHz and 408-4750 MHz are obtained respectively. A good linear fitting with the three flux densities together can be obtained.

T-T plot method was used to derive further the integral spectral index and spectral variations over the remnant. This method is independent of base level and is sensitive only to the variation of the temperature of object. The integral spectral index derived by this method is $-0.43 \pm .02$ between 232 - 4750 MHz and $-0.44 \pm .02$ between 408 – 4750 MHz. All maps used here were convolved to resolution of $5.2' \times 4.7'$.

The mean spectral index is 2.55 at southeast, falling to 2.35 at northwest. A ring-shape structure of steeper spectra is found from the calculated results. It surrounds the central flat spectrum area which contains the X-ray emission area. This is an interesting result to be discussed some where else.

G78.2+2.1

By using the same T-T plot method, the integral spectral indices of G78.2+2.1 and the mean indices in 12 boxes within the remnant were calculated respectively. From these results, two conclusions can be derived. The first is that spectral indices in each box in frequency range 232 - 2695 MHz are almost same as that in same box in frequency range 408 - 4750 MHz. The maximum diffusion of the spectral indices to their mean value is 0.12 in the box 9, while the mean-diffusion is 0.05.

The numbers suggest that the indices measured by this method are true, because of the small diffusion. The second conclusion is that, for the most case, spectral indices of frequency pairs 232 - 1420 MHz and 1420 - 4750 MHz in each box show flat-steep-relationships. Also the variations of spectral indices in low frequency range, 232 - 1420 MHz, show some distribution which is more far from the galactic plane, more flat spectra are found, whereas the spectral indices in frequency range 1420 - 4750 MHz do not show the tendency. Same phenomenon is also found in the field of HB21. The reason may be same. That is more far from the galactic plane more less the contribution of the galactic background emission which has property of steep spectrum.

HB9

Spectral index distribution of HB9 were calculated in three frequency pairs, i.e. 151 - 1420 MHz, 232 - 2695 MHz, and 408 - 4750 MHz. The maps used here has been convolved to $8' \times 8'$ beam size and maps were divided into 16 boxes which are same to that in the paper of Leahy D.A. and Roger R.(1991). Spectrum of HB9 in the boxes J,K,P have different property from other region. In the east and south of the remnant spectrum is steeper than that in west and north part. The diffusion of spectral indices of the three frequency pairs are also large in west and north region of the remnant.

References

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