3 to 12 millimetre studies of dense gas towards the western rim of supernova remnant RX J1713.7-3946

Nigel I. Maxted, Gavin P. Rowell, Bruce R. Dawson, Michael G. Burton, Brent P. Nicholas, Yasuo Fukui, Andrew J. Walsh, Akiko Kawamura, Hirotaka Horachi, Hidetoshi Sano

(Submitted on 20 Feb 2012)

The young X-ray and gamma-ray-bright supernova remnant RXJ1713.7-3946 (SNR G347.3-0.5) is believed to be associated with molecular cores that lie within regions of the most intense TeV emission. Using the Mopra telescope, four of the densest cores were observed using high-critical density tracers such as CS(J=1-0,J=2-1) and its isotopologue counterparts, NH3(1,1) and (2,2) inversion transitions and N2H+(J=1-0) emission, confirming the presence of dense gas >10^4cm^-3 in the region. The mass estimates for Core C range from 40M_{\odot} (from CS(J=1-0)) to 80M_{\odot} (from NH3 and N2H+), an order of magnitude smaller than published mass estimates from CO(J=1-0) observations. We also modelled the energy-dependent diffusion of cosmic-ray protons accelerated by RXJ1713.7-3946 into Core C, approximating the core with average density and magnetic field values. We find that for considerably suppressed diffusion coefficients (factors \chi=10^{-3} down to 10^{-5} the galactic average), low energy cosmic-rays can be prevented from entering the inner core region. Such an effect could lead to characteristic spectral behaviour in the GeV to TeV gamma-ray and multi-keV X-ray fluxes across the core. These features may be measurable with future gamma-ray and multi-keV telescopes offering arcminute or better angular resolution, and can be a novel way to understand the level of cosmic-ray acceleration in RXJ1713.7-3946 and the transport properties of cosmic-rays in the dense molecular cores.

Comments:	17 pages, 13 figures and 5 tables. Accepted for publication in MNRAS 2012 February 17
Subjects:	**High Energy Astrophysical Phenomena (astro-ph.HE)**; Galaxy Astrophysics (astro-ph.GA)
Cite as:	**arXiv:1202.4217 [astro-ph.HE]**
	(or **arXiv:1202.4217v1 [astro-ph.HE]** for this version)

Submission history

From: Nigel Maxted [view email]
[v1] Mon, 20 Feb 2012 04:04:53 GMT (5573kb)

Which authors of this paper are endorsers?