ISSN 0236-2457

ASTRONOMICHESKII TSIRKULYAR

Published by the Eurasian Astronomical Society
and Sternberg Astronomical Institute

No. 1609, 2014 March 31

ОБНАРУЖЕНИЕ ИМПУЛЬСНОГО РАДИОИЗЛУЧЕНИЯ ОТ SGR 0418+5729

Discovery of Radio Pulses from SGR 0418+5729

Abstract. Radio emission of PSR J0418+5732 associated with the low magnetic field magnetar SGR 0418+5729 at the frequency of 111 MHz has been discovered with the Large Phased Array at the Pushchino Radio Astronomy Observatory. The dispersion measure, radio emission flux density, and spectral index have been measured.

Резюме. На частоте 111 МГц с помощью Большой Синфазной Антенны обсерватории Пущино обнаружено импульсное радиоизлучение пульсара J0418+5732, связанного с SGR 0418+5729. Измерены мера дисперсии, плотность потока и спектральный индекс радиоизлучения.

Observations and results. We report the observations and detection of low-frequency radio emission at a frequency of 111 MHz from PSR J0418+5732 associated with the low magnetic field magnetar SGR 0418+5729. Observations have been carried out with the Large Phase Array (LPA) at the Pushchino Radio Astronomy Observatory during the period of April 4, 2013 – March 10, 2014 for 143 days. The effective area was about $3{\times}10^4$ m^2, and HPBW was $48.0'{\times}23.4'$. The duration of each observing session with the LPA was about 6 min. The sensitivity of the system came to $\sim$50 mJy in a frequency band of 1 Hz and at a time constant of 1 s. We used a digital 512-channel receiver with a bandwidth of 2.560 MHz and sampling time of 2.5 ms, where each individual channel has a bandwidth of 5 kHz. The system operation was checked by observing some strong pulsars. Impulsive RFI and bad channels were excluded from the data. The Fast Folding Algorithm (Kondratiev V.I. et al., ApJ, 2009, **702**, 692) was used to process the data. We find the radio period of PSR J0418+5732 to be 9.080 ± 0.002 s, which is in a good agreement with the period of the X-ray pulsar (Rea, N. et al., ApJ, 2013, **770**, 65). The determined dispersion measure is 50 ± 5 pc cm^{-3}, and the NE 2001 electron density model results in a distance to the pulsar of about 1.70 kpc. The PSR radio emission flux density was estimated to be 25 ± 5 mJy at the pulsar signal-to-noise ratio of 6 ± 0.5. The comparison of the flux densities S_ν at $\nu =$ 111 MHz (25 mJy), 820 MHz (<0.05 mJy), and 2 GHz (<0.02 mJy) (Rea, N. et al., ApJ, 2013, **770**, 65) results in spectral indices $\alpha < -3.1$ and < -2.5, respectively. Here $S_\nu \propto \nu^\alpha$.

Acknowledgments. This work was partially supported by the Basic Research Program of the Department of Physical Sciences of the Russian Academy of Sciences "Active Processes in Galactic and Extragalactic Objects."The authors thank G.S. Tsarevsky for useful discussions and L.A. Solovyova for help in preparing this report.

Pushchino Radio Astronomy Observatory, A.P. Glushak
Astro Space Center, P.N. Lebedev Physical Institute, D.V. Dumsky
Russian Academy of Sciences, B.Ya. Losovsky
Pushchino, Moscow Region, Russia
glushak@prao.ru
blos@prao.ru
Received March 24, 2014