J. Astrophys. Astr. (2014) **35,** 549–551

Observations of Binary and Millisecond Pulsars at Xinjiang Astronomical Observatory

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Abstract. We present the first results of radio timing observations of binary and millisecond pulsars in China. We have timed four binary pulsars for 9 years, using Nanshan 25-m radio telescope. The long time span has enabled us to determine their rotation and orbital parameters.

Key words. Star: neutron stars—pulsars: binaries—millisecond.

1. Observations and analysis

Regular timing observations of the four binary pulsars using Nanshan 25-m radio telescope commenced in 2002 January. The cryogenic receiver system consisted of a dual-channel receiver with band pass centred at 1540 MHz. The filter bank systems were used. The details of the observation system and data analysis are described in Yuan *et al.* (2010).

2. Results

Results of the timing analysis including spin and Keplerian parameters for the pulsars are presented in Table 1. The total intensity profiles of the four pulsars are shown in Fig. 1.

Table 1. The parameters for four binary pulsars.

Parameters	B0820 + 02	J1022 + 1001	B1820 − 11	J2145 − 0750
ν (s^{-1})	1.15623932742(1)	0.06077944891258(2)	3.57360798091(5)	0.06229588880530(5)
$\dot{\nu}$ (10^{-16})	−1.399(1)	−1.591(7)	−175.890(4)	−1.146(7)
Epoch (MJD)	54062	54028	54013	54811
Data Range (MJD)	52473–54880	52473–55584	52494–55533	54067–55555
Binary	BT	ELL1	BT	ELL1
PB (d)	1232.4035(7)	7.805130161(7)	357.76184(7)	6.838902(2)
T0 (MJD)	54145.72(5)		53700.2596200	
A1 (lt-s)	162.1456(6)	16.76541(4)	200.6722(16)	10.1645(2)
OM, ω (deg)	332.043(15)		99.1710(15)	200.6000(3)
ECC	0.011865(8)	0.00009.729	0.794640(14)	(1.928E-5)
TASC		53998.86628(1)		54399.5608(3)
EPS1		0.000096(1)		−0.0000079(23)
EPS2		−0.0000133(12)		−0.000014(2)

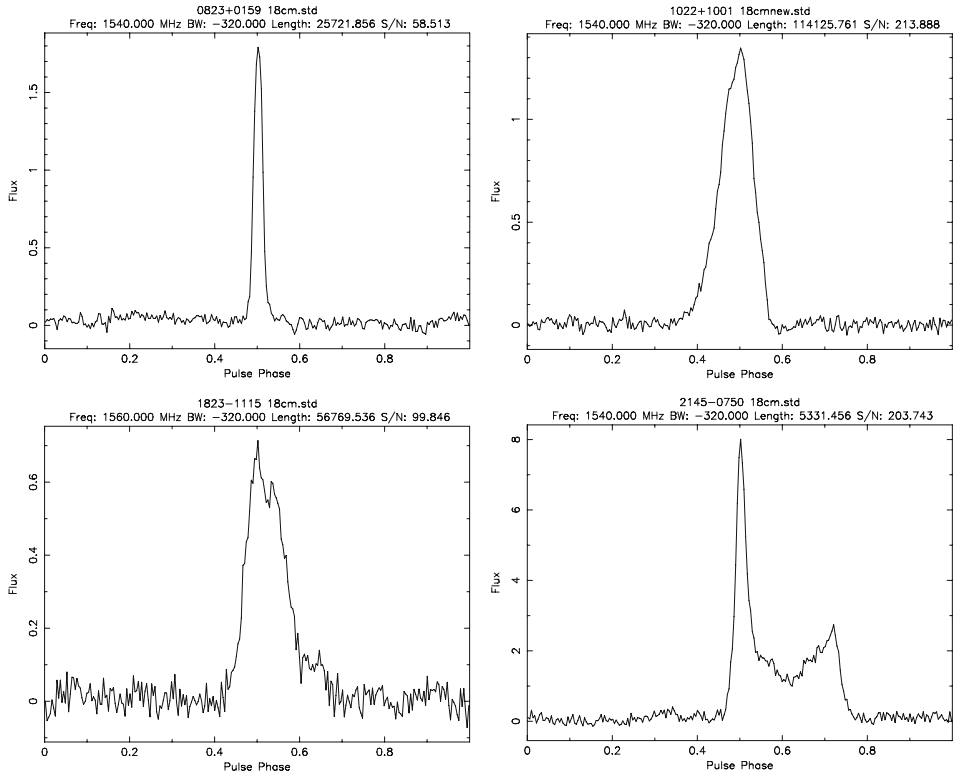

Figure 1. The total intensity pulse profiles of the four pulsars.

The binary pulsar PSR B0820 + 02 has a very long orbital period of 1232.5 days, spin period $P = 0.8648$ s, and derivative $P = 1.039 \times 10^{16}$. The inferred magnetic field $B = 3 \times 10^{11}$ G is likewise unusually large for this class. As shown in Fig. 1, the average pulse profile for PSR B0820 + 02 at 1540 MHz is a simple and almost Gaussian shape. PSR J1022 + 1001 is a millisecond pulsar with a period of ∼16 ms. It orbits once every 7.8 days with an eccentricity of 10^{-4}. The profile at 1405 MHz consists of two peaks, separated by about 0.05 phase units and joined by a bridge of emission (Hotan *et al.* 2004). However, as shown in Fig. 1, only the leading peak is visible at 1540 MHz. PSR B1820−11 is in a wide and highly eccentric orbit. It has a spin period of ∼279.8 ms and moderate period derivative of 1.36×10^{-15}. The orbital period is ∼357.7 days with an eccentricity of 0.79. PSR J2145−0750 is a 16 ms pulsar in a 6.84-day circular binary orbit. The pulse profile is dominated by two components separated by 0.2 of the pulse period in phase. The small period derivative of 2.97×10^{-16} indicates that the pulsar is very old, with a characteristic age of $\sim 10^{10}$ yr.

Acknowledgements

This work is supported by the National Basic Research Programme of China (973 Program 2012CB821800), NSFC projects (Nos 11173041, 11173042 and 11203063), West Light Foundation of CAS (Nos XBBS201021 and XBBS201322).

References

Hotan, A. W., van Straten, W., Manchester, R. N. 2004, *PASA*, **21**, 302.
Yuan, J. P., Wang, N., Manchester, R. N., Liu, Z. Y. 2010, *MNRAS*, **404**, 289.