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Radio and Optical Observations of the Crab Pulsar

A pulsar is a highly magnetised neutron star. Misalignment of the rotation and magnetic field axes means electromagnetic radiation is visible from Earth just once per rotation, resulting in characteristic periodicity in observed brightness. Most commonly observed at radio frequencies, the Crab pulsar (PSR B0531+21) is one of only six pulsars known to emit in both the optical and radio frequencies and has a rotation period of 33.502ms [1].

This pulsar has been observed with the 2.4m Thai National Observatory (TNO) telescope at Doi Inthanon 05/02/20 and the 4.5m Small Radio Telescope (SRT) at NARIT Astropark Chiang Mai 08/10/20, where the expected signal-to-noise (SNR) ratios are 90.6 and 8.6, respectively. FFT processing of the output voltage data yields a peak at ˜30Hz, corresponding to the 33.502ms period of the pulsar, although there was evidence of extensive radio frequency interference (RFI) across the full frequency range. Applying the same process to the optical data did not produce a significant peak at the expected value.

Pulse folding is a process that involves 'binning'and summing the data in order to improve the SNR. Applying the technique to the optical data returns the characteristic double-peak profile of the Crab Pulsar though with an unexplained dependence on the chosen bin-width. The same algorithm applied to the radio date did not yield a significant peak.

[1] R. N. Manchester, "The Australia Telescope National Facility Pulsar Catalogue," Astronomical Journal, 2005.

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