PERIOD AND DECLINATION OF PULSAR MP 0450

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A LARGE radio telescope recently put into operation at Ootacamund (Ooty) in South India has been used to determine the period, pulse shape and declination of pulsar MP 0450.

The radio telescope consists of a 530 m long and 30 m wide parabolic cylindrical antenna. It has been placed on a hill slope of 11° inclination with its long axis of rotation parallel to that of the earth enabling the radio telescope to track radio sources for 9½ hours per day. It is steered in declination by means of a phased array of 968 dipoles placed along the focal line of the parabolic cylinder. The Ooty radio telescope has an effective collecting area of 9000 m², an operating frequency of 326.5 MHz and a system temperature of about 350° K. The receiver system provides 12 simultaneous beams with separations of 3' arc in declination near the zenith. Each beam has a half-power width of 2° in right-ascension and 5'-6 arc in declination. An online computer (Varian 620-i) is available for digital analysis of the data.

The intensity of the pulsar MP 0450 at our operating frequency is such that individual pulses are seen only occasionally on a chart recorder connected to the receiver. The determination of the period was therefore carried out by a digital analysis using a 20 ms sampling interval. The receiver bandwidth was 4 MHz. About 109 pulses were integrated in the computer during every one minute period using a simple folding process. The integrated pulses obtained were about 8 times the r.m.s. noise fluctuations. Observations were made on 10 days between October 17 and November 5, 1970 for periods varying from 20 minutes to about 5 hours per day. Each observation was corrected for the various motions of the earth and the time of arrival of each average pulse, integrated over 1 minute, at the solar system barycenter was calculated. The right ascension (1950) was taken to be 04h 50m22s ± 2s given by Vaughan et al. The declination (1950) was measured by us as −18° 04' ± 0'.5. An approximate period was first determined by noting the drift in the phase of the response for 20 successive 1 minute values. By combining the observations at intervals of about 1, 2 and 4 hours on a day followed by those for successive days, the barycentric period was found to be 0°·54893509 ± (1°·10⁻⁸).
Morris et al.\(^3\) have quoted a period of \(0^s\text{-}549780\) with an estimated error of \(3^s \times 10^{-4}\). At the I.A.U. Symposium on the Crab Nebula held at Manchester in August 1970, the Jodrell Bank Observatory circulated a value of \(0^s\text{-}549690\) for the period of this pulsar. No errors were quoted for this measurement which agrees with that of Morris et al.\(^3\) within the error limits of the latter. Our value for the period lies outside these error limits and is higher than both these earlier measurements by about \(0\cdot8\) ms. To investigate the possibility that the discrepancy in the period determinations may be due to a star-quake, we have attempted to determine \(\Delta P/P\) for this pulsar. So far sudden changes in period have only been observed in the Crab and Vela pulsars with values of \(P = 0^s\text{-}033\) and \(0^s\text{-}089\) approximately and which have high values of \(\Delta P/P = 422 \times 10^{-15}\) and \(124 \times 10^{-15}\) respectively.\(^4\text{-}\text{5}\text{-}\text{6}\) Ruderman\(^7\) has suggested that sudden changes of period arise when there is an appreciable build-up of strain in the star crust as a result of slow down. From our measurements spanning a period of 18 days we estimate \(\Delta P/P = 7 \times 10^{-18}\) corresponding to a long period for build-up of strain. It seems unlikely that a sudden period change has been observed for this pulsar.

No large variations in the intensity of integrated pulses have been noted; the observed variations of \(\pm 30\%\) are about twice the receiver r.m.s. noise. The shape of the average pulse for MP 0450 has also been determined and is shown in Fig 1. For this measurement a bandwidth of \(0\cdot8\) MHz and a

![Pulse shape of MP 0450 integrated over 5 minute duration.](image)

receiver time constant of \(6\) ms were used. The pulse has a half-width of about \(30\) ms and an asymmetric shape with a suggestion of a small hump on the leading edge of the pulse.
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REFERENCES


