

Observations of PSR 0950 + 08 at 103 MHz

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Abstract. In this article we report the possible cause of an enormously large enhancement (burst) in the ratio flux of PSR 0950 + 08. The burst was observed by two radio telescopes at Rajkot and Thaltej separated by 20 km. Simple folded data and cross correlogram brings out clearly the period of pulsar and indicate that the radio pulses remained intact in spite of their passage through the interplanetary medium. We argue that this burst is intrinsic to the source and not caused by the intervening medium.

Key words : radio observations—pulsar

1. Introduction

The radio enhancement of PSR 0950 + 08 at 103 MHz on July 29, 1992 has been reported by Deshpande *et al.* 1992 (for details please see this paper and reference therein). Since the discovery of this pulsar, almost twenty five years ago, the reported enhancement is the largest for any pulsar observed so far. The observations of the pulsar were carried out simultaneously by two radio telescopes having collecting area of 5,000 m² and 20,000 m² situated at Rajkot and Thaltej respectively. The telescopes operate in radio interferometer mode using correlation receiver. The telescopes maintain a time accuracy of about 3 msec and the data is digitized on line with a sampling period of 48 msec.

2. Results

The radio signals from PSR 0950 + 08 recorded at Thaltej were folded by using variable data length. The folded data for all other length except 253 data points showed random patterns. Similarly spectrum analysis (as shown in figure 1) indicates a sharp peak at the frequency corresponding to the pulsar period. Here low frequency power represents the signal scattered in the interplanetary medium. Thus, the scattering though quite large, has not been able to randomize the intensity of the pulsar completely.

The cross-correlation of simultaneous observations of PSR 0950 + 08 on 29 July 1992 at Rajkot and Thaltej are shown in figure 2. The cross correlation curve has two distinct features, (1) fast oscillations with an average periodicity of 253 msec and (2) a slow variation maximizing at a lag of 0.33 sec, this peak corresponds to the solar wind and would provide a fictitious component ($V/\cos \theta$ where V and θ are solar wind velocity and the angle between

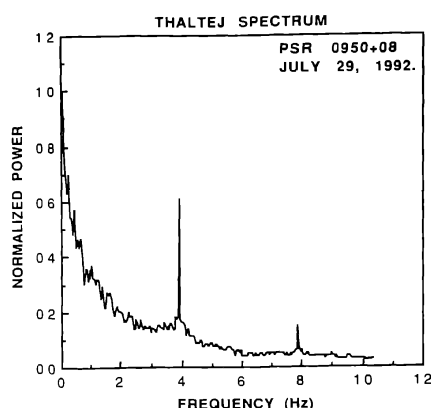


Figure 1. Power spectrum of radio signals of PSR 0950 + 08 on July 29, 1992. Please note a distinct peak at pulse frequency.

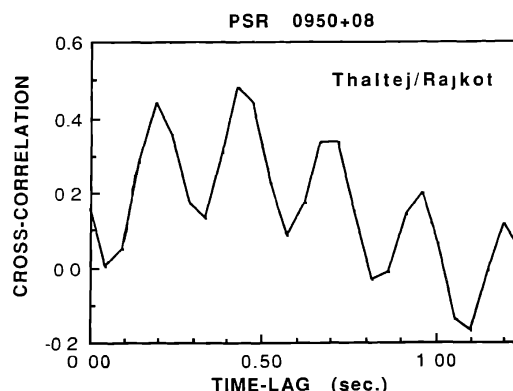


Figure 2. Cross-correlogram of radio signals from PSR 0950 + 08 simultaneously recorded by Thaltej and Rajkot radio telescopes.

wind direction and line joining the two radio telescopes respectively). The fast oscillations corresponds to the pulsar period and the slow variation is due to the solar wind in the interplanetary medium.

3. Discussions

Both the spectrum and cross-correlogram presented here show very clearly the pulse period of PSR 0950 + 08. Calculations show that the average radio luminosity during the burst is 3×10^{29} ergs/sec. It is quite worthwhile to argue out the possible propagation effects for this event on July 29, 1992. Since the burst is seen simultaneously at Rajkot and Thaltej with a large correlation coefficient, it cannot be caused due to a possible radio lens in the ionosphere. The observations of other radio sources by both the radio telescopes show no sign of enhancement either before or after the event and hence rule out the possibility of a radio lens in the interplanetary medium for the event. Since the magnitude of the enhancement is very large (80 times normal flux) and has lasted for a minimum period of 30 minutes (transit record length at Rajkot) but much less than a day indicates that the event is not caused by a radio lens in the interstellar medium. Thus the observed radio enhancement of PSR 0950 + 08 on July 29, 1992 is not a propagation effect. The event seems intrinsic to the pulsar.

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Reference

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