

A BRIEF NOTE ON PSR 1848+04.

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Abstract

Average pulse profiles at three frequencies are presented for PSR 1848+04. A highly structured pulse profile is seen (three-component main pulse, complex interpulse), with the longitudinal position of the pulse components invariant with frequency.

Observations

PSR 1848+04, ($P = 0.284697$ s) was discovered during a search of COS-B γ -ray source error boxes at the Arecibo Observatory. It has a very complex profile as shown in figure 1. Detailed characteristics are given in Boriakoff, Buccheri and Fauci (1984), however, the period derivative is smaller than that quoted therein ($\dot{P} < 0.16 \times 10^{-17}$ s/s).

Discussion

The pulse profile shows four clearly defined components, a triple main pulse and an interpulse. The main pulse central component has a steeper spectral index than the main side pulses by 0.39 ± 0.05 between 1414 and 430 MHz and the interpulse spectral index is steeper by 0.75 ± 0.3 over the same frequency range. This suggests two emission mechanisms: one for the outer components of the main pulse and another for the interpulse and the main pulse center component. The interpulse may have emission components at both sides of it, most clearly seen at the lower frequencies. These components persist over integrations of different data sets.

We interpret the three-component pulse profile in terms of Rankin's core-cone mechanism (Rankin 1983a). It is generally assumed that the external components of the main pulse mark the longitude limits of the emission of the pulsar. In addition, the existence of an interpulse suggests that we see the two opposite poles of the neutron star magnetic field as it rotates. Perhaps the interpulse side components mirror image the side components of the main pulse. However, most inter pulsars have a very small duty cycle (*e.g.* PSR 0823+26), as compared with PSR 1848+04, where emission is observed over

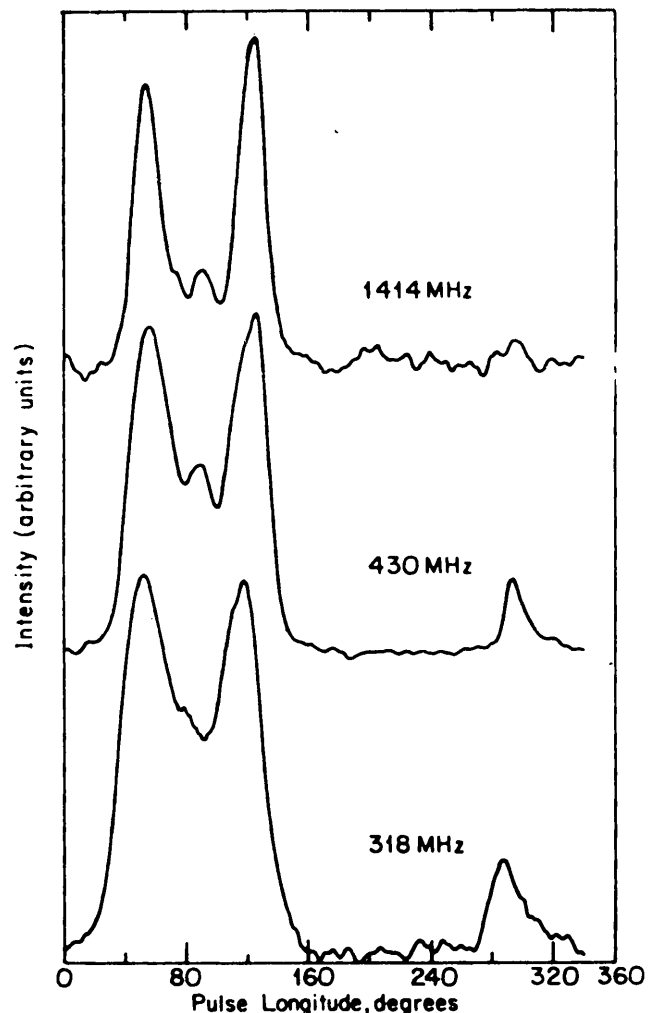


Figure 1 PSR 1848+08 average pulse profile at 1414 MHz (total intensity), 430 MHz (total intensity) and 318 MHz (single linear polarization) aligned at the main pulse center point. 94% of the period is shown.

180° longitude. In view of the large duty cycle an alternative interpretation is that, as in the case of PSR 0950+08 (Hankins and Cordes 1981), the rota-

tion axis is nearly aligned with the line of sight, so we see only one polar cap during a rotation period. However, in such cases a regular three component main pulse profile is not expected. Another noteworthy feature is that the separation between the peaks of the side components of the main pulse does not change with frequency, at 318 MHz it is in fact slightly less than at 430 or 1414 MHz. This could be the result of polarization differences between the total intensity of 430 MHz and the linear polarization of 318 MHz. The location of the interpulse also seems invariant with frequency.

Conclusions

PSR 1848+04 is a pulsar challenging standard interpretations of magnetospheric structures and it may provide some clues to their organization. Complex pulse profiles are common in pulsars (Rankin 1983a), however, PSR 1848+04 is of special interest because of the regularity of the components and the behavior of their features.

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