

THE GEOMETRIC STUDY OF DRIFTING SUBPULSES

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We use the polarization parameters to improve the geometric investigation of drifting subpulses. According to the geometry of the hollow cone emission, there exist certain relations between some parameters ($R, \Gamma, \alpha, G, \phi, \vartheta, \beta$), here R and $\Gamma/2$ are the half angular width of the emission cone of the integrated pulse and drifting subpulse, respectively, α and G are the apparent beam width of the integrated pulse and drifting subpulse, respectively, ϕ is the maximum of the gradient of the position angle of the linear polarization, ϑ is the angle between the sight line and rotation axis, β is the magnetic inclination. Some interesting results we get are as follows:

a) The values of Γ and R change with β , but the parameter $Q_r (\Gamma/2R)$ is almost independent of β . Roughly, the Q_r can be determined from the observational data.

b) Estimation of curvature radius: Comparing the ϑ_{\min} and ϑ_{\max} given by the R-S model with parameters R and $\Gamma/2$, we can get $\vartheta_{\min} \leq R - \Gamma/2$ and $\vartheta_{\max} \geq R + \Gamma/2$

$$Q_{cr} = \vartheta_{\min} / \vartheta_{\max} = P^{53/42} B_{12}^{10/7} \rho_6^{-47/21} \omega_{10}^{2/3}$$

$$(Q_r)_{ob} = (\Gamma/2R)_{ob} \leq (1 - Q_{cr}) / (Q_{cr} + 1) = (Q_r)_{RS}$$

where P and ω_{10} are observed data, B_{12} can be obtained from P and \dot{P} . We can get the lower limit values of curvature radius for ten pulsars. There is a tight correlation between the curvature radius (ρ_6) and period (P).

c) Observational check of pulsars' classification: We can obtain the values of Q_{cr} and Q from observational data. Q is a position parameter of sight line ($Q = (\vartheta - \beta) / R$). If $Q > (Q_{cr})_{ob}$, the integrated pulse profile belongs to a simple class (S). If $Q < (Q_{cr})_{ob}$, it belongs to a double peak class (C). The results show that there are 9 pulsars conforming to this criterion except PSR 1919+21, but the integrated pulse profile of this pulsar is much similar to class S rather than class C.