Astrophysics > Solar and Stellar Astrophysics

Obliquely rotating pulsars: current screening

D. B. Melrose, Rai Yuen

(Submitted on 1 Jul 2011)

Pulsar electrodynamics has been built up by taking ingredients from two models, the vacuum-dipole model, which ignores the magnetosphere but includes the inductive electric field due to the obliquely rotating magnetic dipole, and the corotating-magnetosphere model, which neglects the inductive electric field and assumes a corotating magnetosphere. We argue that the inductive field can be neglected only if it is screened by a current, ${\bi J}_{\rm sc}$, which we calculate for a rigidly rotating magnetosphere. Screening of the parallel component of the inductive field can be effective, but the perpendicular component cannot be screened in a pulsar magnetosphere. The incomplete screening of the electric field implies an electric drift that has not been included in any pulsar model. This drift implies that the magnetosphere is not corotating. We suggest that this drift offers a natural explanation for the drifting of subpulses. More generally, the inclusion of the inductive electric field requires a substantial rethinking of pulsar electrodynamics, including acceleration in the outer magnetosphere resulting in pulsed gamma-ray emission.

Comments: 27 pages, 6 figures
Subjects: **Solar and Stellar Astrophysics (astro-ph.SR)**
Cite as: **arXiv:1107.0100v1 [astro-ph.SR]**

Submission history

From: Rai Yuen [view email]
[v1] Fri, 1 Jul 2011 04:11:19 GMT (185kb)

Which authors of this paper are endorsers?