Observable pulsed fractions of thermal emission from neutron stars with toroidal magnetic fields

J. A. Henderson[1*], D. Page

[1†] [1]Instituto de Astronomía, Universidad Nacional Autónoma de México, México

The observed spectra of many thermally emitting neutron stars (The "Magnificent Seven", High-Field Pulsars, etc.) suggest that the surface temperature distribution can be described by hot polar regions surrounded by a cooler equatorial belt. The hotter polar "caps" produce pulsed fractions (PF) in the x-ray emission that, in some cases, can be quite high (e.g. PSR J1119-6127 with $PF = 74 \pm 14\%$, [3]). In neutron stars, such a temperature distribution can be explained by the presence of a strong toroidal field in the crust ([1], [2]). An elegant description of the relationship between pulsed fraction and rg/R for compact stars with hot spots was first given by Beloborodov et al. [4]. In this study, the relationship between pulsed fraction and stellar radius (PF vs. R) for various configurations of hot spot position, beaming factor and observer angle for a 1.4 solar mass neutron star is explored. The pertinence of spot temperature and size is also examined.

References

[1] J.F. Pérez-Azorín, J.A. Miralles, J.A. Pons. A&A, 433, 275 (2006)

[2] U. Geppert, M. Kuker,D. Page. A&A, 457, 937 (2006)

[3] M.E. Gonzalez, V.M. Kaspi, F. Camilo, B.M. Gaensler, M.J. Pivovaroff. ApJ, 630, 489 (2005)

[4] A.M. Beloborodov. ApJ, 566, L85 (2002)

[†]E-mail: page@astroscu.unam.mx