Astrophys Space Sci (2012) 338:157–161
DOI 10.1007/s10509-011-0912-6

ORIGINAL ARTICLE

# Spin down of rotating compact magnetized strange stars in general relativity

**B.J. Ahmedov · B.B. Ahmedov · A.A. Abdujabbarov**

Received: 13 August 2011 / Accepted: 28 October 2011 / Published online: 15 November 2011


**Abstract** We find that in general relativity slow down of the pulsar rotation due to the magnetodipolar radiation is more faster for the strange star with comparison to that for the ordinary neutron star of the same mass. Comparison with astrophysical observations on pulsars spindown data may provide an evidence for the strange star existence and, thus, serve as a test for distinguishing it from the neutron star.

**Keywords** Compact stars · Strange star · General relativity · Spin down

## 1 Introduction

The study of electromagnetic fields of magnetized compact objects is an important task for several reasons. First one can obtain information about such stars through their observable characteristics, which are closely connected with electromagnetic fields inside and outside the relativistic stars. Magnetic fields play an important role in the life history of majority astrophysical objects especially of compact relativistic stars which possess surface magnetic fields of $10^{12}$ G and $\sim 10^{14}$ G in the exceptional cases for magnetars (see e.g. Ginzburg and Ozernoy 1964; Duncan and Thompson 1992; Thompson and Duncan 1993). The strength of compact star's magnetic field is one of the main quantities determining their observability, for example as pulsars through the magneto-dipolar radiation. Electromagnetic waves radiated from the star determine energy losses from the star and therefore may be related with such observable parameters as period of pulsar and it's time derivative.

The second reason is that one may test various theories of gravitation through the study of compact objects for which general relativistic effects are especially strong. Considering different matter for the stellar structure one may investigate the effect of the different phenomena on evolution and behavior of stellar interior and exterior magnetic fields. Then these models can be checked through comparison of theoretical results with the observational data. The third reason may be seen in the influence of stellar magnetic and electric field on the different physical phenomena around the star, such as gravitational lensing and motion of test particles.

The majority of neutron stars are known to have large angular velocities, and in the case of radio pulsars one can directly measure their speed of rotation. It is also observed that, on average, their rotation tends to slow down with time, a phenomenon that is explained by emission of electromagnetic waves or, in some conditions, by the emission of gravitational waves or other processes. This should be the case during most of the life of the neutron star when it is observed as pulsar. Since 1967 (Hewish et al. 1968)

B.J. Ahmedov · A.A. Abdujabbarov (✉)
Institute of Nuclear Physics, Ulughbek, Tashkent 100214, Uzbekistan
e-mail: ahmadjon@astrin.uz

B.J. Ahmedov · B.B. Ahmedov · A.A. Abdujabbarov
Ulugh Begh Astronomical Institute, Astronomicheskaya 33, Tashkent 100052, Uzbekistan

B.J. Ahmedov
International Centre for Theoretical Physics, Strada Costiera 11, 34151 Trieste, Italy

B.B. Ahmedov
National University of Uzbekistan, Tashkent 100174, Uzbekistan

B.B. Ahmedov
Universidad de Granada, 18071 Granada, Spain

A.A. Abdujabbarov
ZARM, University Bremen, Am Fallturm, 28359 Bremen, Germany