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Neutrino radiation by neutron superfluid vortex and its effects pulsar spin down and pulsar kicks

Our theory proposed in 1982 that decisive factor for spin down of pulsars with longer period (p>0.5 sec) is the neutrino radiation by neutron superfluid vortexes inside neutron stars has been confirmed by the recent observed ( ) diagram (2018) of pulsars which deviates seriously from the model of magnetic dipole radiation (the "standard model"). Based on the idea of the neutrino radiation by neutron superfluid vortexes, we proposed (at 2003) a gradual acceleration neutrino jet rocket model for pulsar kicks. The analysis based on the latest observational data published very recently for the 248 pulsars whose space velocities have already been determined reveals that pulsars probably are in a state of continuous acceleration. In other words, it is not very likely that the huge pulsar kicks are all received at once during a short period of time (less than a year) after their birth. Instead, the observed large kick velocities are probably gradually accumulated by continuous acceleration in a long period of time. On the basis of the neutrino emission from the superfluid vortexes in the neutron star interior, we propose a rocket model of neutrino jet for gradual acceleration of pulsars. We have contributed acceleration scenario of pulsars with different initial period. It is shown by the comparing the theory with the observation that our model is successful. By the neutron superfluid vortex model for pulsar kicks, we not only can explain naturally the continuous acceleration of the nascent pulsars, but also can predict very nicely the huge natal kicks of neutron stars exceed 1000 Km/s. Addition to, the observed alignment of the pulsar kicks with their spinning axes may be interpreted as the most convincing astrophysical evidence for the subtle manifestation of parity non-conservation in the deep space outside of our solar system.

Biography

Qiu-he Peng graduated from Department of Astronomy, Nanjing University at 1960 firstly teached at Peking University for 18 years and then is teaching at Nanjing University. He is mainly engaged in nuclear astrophysics , particle astrophysics and galactic astronomy research. In the field of nuclear astrophysics, Peng's researches involve neutron stars (pulsars), the supernova explosion mechanism and the thermonuclear reaction inside the star, the synthesis of heavy elements and interstellar radioactive element such as the origin of celestial 26Al and where he has published 225 papers.

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