REVIEW REPORT

on the PhD thesis entitled

GENERATION AND PROPAGATION OF GAMMA RAYS IN THE MAGNETOSPHERE OF NEUTRON STARS

by

KHASSANOV MANAS

The PhD thesis of Khassanov M.K is devoted to the investigation of generation of gamma rays on the surface of a neutron star and the propagation of radiation in its magnetosphere. The candidate examined the generation of gamma rays due to nuclear reactions occurring in the nonequilibrium crust of a neutron star; he also considered the propagation of gamma radiation in the magnetosphere of a neutron star calculated using nonlinear electrodynamics.

Due to changes in the density and chemical composition of the substance, as well as due to the presence of free neutrons in the nonequilibrium crust, cyclic nuclear reactions can occur, which leads to the release of heat, which is transmitted by heat conduction to the outside and radiated, and partially transferred to the inside and heats the star. Khassanov M.K studied the cyclic reaction of Pb-Bi occurring inside the nonequilibrium crust and calculated the gamma rays intensity.

As a second part of work, the candidate studies the nonlinear effect of the magnetic dipole and quadruple fields on the propagation of gamma rays in the Eikonal approximation of the parameterized post-Maxwell electrodynamics of the vacuum. In collaboration with other researchers they show that the forward part and the "tail" by length $c\Delta t$ of any hard radiation pulse due to the nonlinear electromagnetic influence of the magnetic dipole and quadruple fields turn out to be linearly polarized in mutually perpendicular planes, and the remaining part of the pulse must have elliptical polarization. This result is new and was published in peer reviewed journal.

Effect of nonlinear electrodynamics of vacuum in the magnetic quadruple field of a pulsar, Monthly Notices of the Royal Astronomical Society Volume 481, Issue 1, 21 November 2018 Pages 36-43

As a scientific adviser, I confirm that the PhD thesis of Manas Khassanov contains original research and new results. The thesis satisfies all the highest requirements for the doctoral dissertations, and the author of the dissertation certainly deserves to be awarded the degree of Doctor of Philosophy (PhD) in the specialty "6D060500 – Nuclear Physics"

Scientific advisor,
associate professor of
Al-Farabi Kazakh National University Abishev M.E.

ЗАВЕРЯЮ
Начальник управления подготовки и аттестации
научных кадров КазНУ им. аль-Фараби
Р.Е. Кудайбергенова
«____» _____ 20____ж./г.