

REVIEW REPORT

on the PhD thesis entitled

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

by
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In the thesis, the candidate studies the generation of gamma rays on the surface of a neutron star and the propagation of radiation in its magnetosphere. He considered the generation of gamma quanta by the catalytic composition of Pb-Bi under the flow of neutrons produced in a nonequilibrium crust of a neutron star due to their diffusion. The propagation of gamma radiation in the magnetosphere of a neutron star is calculated using nonlinear electrodynamics.

First, the candidate examined the Pb-Bi cyclic under the flux of free neutrons in the crust of a neutron star and calculated gamma intensity released by the each isotopes and obtained the dependence of gamma radiation on the neutron flux.

Second, 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

Moreover, Manas Khassanov has visited University of Catania and INFN from August 27, until 24, November 2017. During this period he also participated in 9th European Summer School on "Experimental Nuclear Astrophysics" (Santa Tecla, Italy).

In conclusion, I believe that the PhD Thesis of Khassanov Manas «Generation and propagation of gamma rays in the magnetosphere of neutron stars» fully qualifies for the Degree Doctor of Philosophy (PhD), and the author is eligible of being awarded the degree under the program title «6D060500-Nuclear Physics».

Best regards.

Prof. Spitaleri Claudio

