Contribution ID: **90** Type: **Contributed**

Studying the importance of possible oscillations of photons into axion-like particles in pulsars

Thursday, 15 April 2021 08:15 (15 minutes)

Axion-like particles (ALPs) are hypothetical very light neutral spin-zero bosons predicted by superstring theory which can oscillate into photons in the presence of external magnetic fields. ALPs are attracting increasing interest in the high- and very-high-energy (VHE) astrophysics, since they can explain several issues: they mitigate Universe transparency at VHE, explain why flat spectrum radio quasars emit above 20 GeV (first hint for ALP existence), solve for the redshift dependence of blazar spectra (second hint for ALP existence). Since pulsars are characterized by a very strong magnetic field (10ˆ{11} –10ˆ{13} G at the neutron star (NS) surface and even much greater than the critical magnetic field (4.41*10ˆ{13} G) in the case of magnetars), a natural question arises: is the magnetosphere of NSs and/or their outer region such as the pulsar wind nebula a good environment for photon-ALP oscillations? The very strong magnetic field could suggest a positive answer, since the strength of the photon-ALP interaction is linked to the intensity of the magnetic field. Yet, quantum one-loop vacuum polarization effects –which become very important and even dominant in the presence of very strong magnetic fields –can drastically reduce the photon-ALP conversion efficiency. Thus, we want to study for which kind of NSs and in which regions of their magnetosphere photon-ALP oscillations can possibly lead to measurable effects by modifying the observed pulsar spectra and/or their light curves.

Primary author: Dr GALANTI, Giorgio (INAF, Osservatorio Astronomico di Brera)

Presenter: Dr GALANTI, Giorgio (INAF, Osservatorio Astronomico di Brera)

Session Classification: Exploring the Galaxy: Pulsars and Pulsar Wind Nebulae

Track Classification: Pulsar