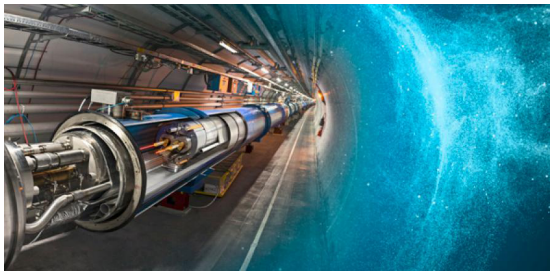

Contribution ID: **65** Type: **not specified**

ALP-Photon interaction in magnetized environment of a compact star

Tuesday, 22 March 2022 15:00 (15 minutes)

The spin zero, very light bosons like scalar (dilaton) and pseudoscalar (axion) collectively grouped into the term axion like particle (ALP). Dilatons are postulated in extended theory of standard model of particles to cure the scale invariance of the field theory while the axions have been introduced to resolve the $U_A(1)$ anomaly in Quantum field theory. These ALPs also show their presence in higher dimensional theories as K K particle in Kaluza Klein theory, moduli in String theory and chameleons in cosmology.

ALPs hold a special place amongst the possible candidates of dark matter therefore their detection as well as identification have become a part of the central theme of particles detector projects. The direct experimental detection of these particles in ground based laboratories are still far from reach of existing–sensitivity of the detectors. However recent advancements in the area of their indirect detection by searching the imprints of their interactions with non-thermal photons coming through the magnetosphere of the compact stars, motivates to carry out the investigations into that direction. Previously the similar kind of investigations had been practiced by several groups [1]-[5] on relevant issues, however our investigation includes another non-trivial aspect that has not been effectively considered important in such investigations; that is background dependence of the mixing dynamics of these particles (dilaton/axion) with electromagnetic radiation.
In this work we focus on evaluating statistically good signal strength of spectro-polarimetric variables like ellipticity angle, linear polarization angle and degree of linear polarization of the photons interacted with ALP using the Stokes parameters.
It has been shown that the obtained magnitudes of the variables fall into the detectable range of the detectors that would be helpful in designing the future detectors. In addition to that we have also looked for the implications of this dimension five interactions to explain the anomalous behaviour in luminosity time relation of stars like Betelgeuse.

Bibliography

[1] J. P. Conlon, and M. C. David Marsh,
Excess Astrophysical Photons from a 0.1-1 keV Cosmic Axion Background,
Phys. Rev. Lett. 111, 151301 (2013).

[2] L. Maiani, R. Petronzio, and E. Zavattini,
Effects of nearly massless, spin-zero particles on light propagation in a magnetic field,
Phys. Lett. B 175, 359 (1986).

[3] G. Raffelt, and L. Stodolsky,
Mixing of the photon with low-mass particles,
Phys. Rev. D 37, 1237-1249 (1988).

[4] N. J. Craig, and S. Raby, Modulino dark matter and teh INTEGRAL 511 keV Line
arXiv:0908.1842v2.

[5] P. Sikivie,
Invisible Axion Search Methods,
Rev. Mod. Phys. 93, 015004 (2021).

Primary authors: CHAUBEY, Ankur (Banaras Hindu University, Varanasi, India); Dr GANGULY, Avijit K. (Banaras Hindu University)

Presenter: CHAUBEY, Ankur (Banaras Hindu University, Varanasi, India)

Session Classification: Parallel Session III, Astro-Particle