

Axion Electrodynamics in Strong Magnetic Backgrounds

S VILLALBA-CHÁVEZ¹, A E SHABAD^{2,3}, AND C MÜLLER¹

¹*Institut für Theoretische Physik I, Heinrich-Heine-Universität Düsseldorf, 1, Universitätsstraße, 40225, Düsseldorf, Germany. Contact Phone: ++49(0)2118113124*

²*Lebedev Physical Institute, 53, Leninsky prospect, 119991, Moscow, Russia*

³*Tomsk State University, 36, Lenin Prospekt, 634050, Tomsk, Russia*
Contact Email: selymv@gmail.com

The overcritical regime of axion-electrodynamics (AED) is investigated. For magnetic fields larger than the characteristic scale linked to AED, quantum vacuum fluctuations due to axion-like fields can dominate over those associated with the electron-positron fields. This hypothetical regime of the dominance of AED over QED is predicted to induce a strong screening on a static point-like electric charge. We show that the running QED coupling depends on the magnetic field strength, and for certain energy regimes, it could be screened almost to zero, making the QED building blocks very weakly interacting between each other. The impact of this phenomenon on the radiation mechanism of pulsars is discussed [1].

References

- [1] S Villalba-Chávez, A E Shabad and C Müller, Eur. Phys. J. C **81**, 331 (2021)