Contribution ID: **103** Type: **Oral**

VMB@CERN

Thursday 6 June 2019 18:00 (20 minutes)

Vacuum magnetic birefringence is a non-linear electrodynamic effect predicted as a consequence of the formulation of the Euler-Kockel-Heisenberg effective Lagrangian, first proposed in 1935, which takes into account electron-positron fluctuations. A direct laboratory observation of vacuum magnetic birefringence is still lacking today due to its value: Δn = 4x10e-24 @ B = 1T.
Key ingredients of a polarimeter for detecting such a small birefringence are a long optical path within an intense magnetic field and a time-dependent effect. To lengthen the optical path a Fabry-Perot cavity is generally used. Interestingly, there is a difficulty in reaching the predicted shot noise limit of such polarimeters: the cavity mirrors generate a birefringence-dominated noise whose ellipticity is amplified by the cavity itself limiting the maximum finesse capable of increasing the SNR.
The VMB@CERN collaboration proposes an experiment which overcomes this difficulty by using an LHC superconducting magnet together with a novel polarization modulation scheme for the polarimeter.

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Session Classification: Afternoon 42