Contribution ID: **207** Type: **poster**

Electron spin precession in the laser wakefield acceleration

Wednesday, 16 September 2015 19:30 (30 minutes)

The acceleration of highly polarized electron beams are widely used in state-of-the-art high-energy physics experiments. In this work, the dynamics of the electron spin precession in the process of laser wakefield electron acceleration in plasma channel is considered. The spin precession of an electron is described by the Thomas-Bargman-Michel-Telegdi equations taking into account the self-consistent nonlinear dynamics of the laser pulse propagation and wakefield generation. Modeling was carried out for different initial energies and injection phase of an electron depending on its transverse momentum. Based on the obtained data optimal parameters of injection were found to preserve the
initial polarization of an electron when it is accelerated in the laser wakefields. With these parameters, the evolution of the polarization of the electron bunch was investigated including the impact of beam emittance on its depolarization.

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Session Classification: Poster Session 2 (WG5-WG6-WG7) and Wine

Track Classification: WG5 - High-gradient plasma structures/Advanced beam diagnostics