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## Two new approaches of estimating the Polarization in High Energy Electron Storage Rings

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I give an overview of our analytical and numerical work on the spin polarization in high-energy electron storage rings including progress since our ICAP18 contributions (see: <https://bt.pa.msu.edu/ICAP18>) and our IAS contribution (see: <http://iasprogram.ust.hk/hep/2019/workshop-accelerator.php>). We study the possibility of polarization for FCC-ee and CEPC. Our work is based on the so-called Bloch equation for the polarization density introduced by Derbenev and Kondratenko in 1975. By finding a system of stochastic differential equations underlying the Bloch equation, we are able to approximate the Bloch equation analytically and to solve the latter numerically in an efficient way. We also give an outline of the standard approach, which is based on the Derbenev-Kondratenko formulas. We stress the differences and similarities between the Bloch-equation approach and the standard approach to estimating the polarization. We are supported by a DOE grant (Award Number: DE-SC0018008), titled: "Re-evaluation of Spin-Orbit Dynamics of Polarized  $e^+e^-$  Beams in High Energy Circular Accelerators and Storage Rings: Theory and Computation".

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