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(G*) Measurement of Beam Polarization with Tau Polarimetry for a Potential SuperKEKB Upgrade

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A polarized electron beam is being considered as an upgrade for the SuperKEKB accelerator. Having a polarized beam at Belle II opens a new precision electroweak physics program, as well as improving sensitivity to dark sector and lepton flavour violating processes. In order to achieve a polarized beam at SuperKEKB a variety of hardware and technical challenges are being studied. The limiting factor on the precision of these future measurements is expected to be the uncertainty in the beam polarization achieved at the interaction point. The average beam polarization can be measured with high precision by making use of the relationship between beam polarization and the kinematics of tau decays.
In order to develop the tau polarimetry measurement technique, in preparation for a polarized electron beam at SuperKEKB, the data collected by BaBar is being analyzed. BaBar has a enough data to make a polarization measurement with a subpercent statistical uncertainty. This allows the dominant systematic uncertainties to be identified and studied, and the limiting factors for the precision of tau polarimetry to be established. As Belle II is similar in design to BaBar it is expected a similar or better level of precision can be achieved with sufficient data and the installation of polarized beams further motivated. This presentation will be the first time the results using the BaBar data are presented publicly.

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