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## (I) Chiral Belle: Upgrading SuperKEKB with a Polarized Electron Beam

*Tuesday 7 June 2022 11:50 (25 minutes)*

Upgrading the SuperKEKB  $e^+e^-$  collider with polarized electron beams is under consideration as it opens a new program of precision electroweak physics at the  $\Upsilon(4S)$ . This Chiral Belle physics program includes determining  $\sin^2 \theta_W$  via separate left-right asymmetry ( $A_{LR}$ ) measurements in  $e^+e^-$  annihilations to pairs of electrons, muons, taus, charm and b-quarks using the Belle II detector. The precision that can be obtained matches that of the LEP/SLC world average and enables the probing of neutral current couplings with unprecedented precision in a manner sensitive to their running. At SuperKEKB, the measurements of the individual neutral current vector coupling constants to b-quarks, c-quarks and muons in particular will be substantially more precise than current world averages and the current  $3\sigma$  discrepancy between the SLC  $A_{LR}$  measurements and LEP  $A_{FB}^b$  measurements of  $\sin^2 \theta_W^{eff}$  can be addressed. It can also provide the highest precision measurements of neutral current universality ratios. In addition, having a polarized electron beam enables measurements of tau lepton properties, including the tau  $g-2$ , with unrivaled precision. This presentation will cover the physics motivation and status of the R&D necessary for the upgrades to achieve and measure the SuperKEKB  $e^-$  beam polarization.

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