CERN-BINP workshop for young scientists in e+e- colliders



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## Fast Luminosity Monitoring and Beam Loss Studies at SuperKEKB in Japan

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The SuperKEKB e+e- collider aims to reach a very high luminosity of 8 10^35 cm-2 s-1, using ultra-low emittance bunches colliding every 4ns and focused to unprecedented small vertical sizes thanks to a new "nanobeam" technique. Fast luminosity monitoring is required for luminosity feedback and optimisation in the presence of dynamic errors. The aimed relative precision is 10-3 in 1ms, which can be achieved thanks to the very large cross-section of the radiative Bhabha process at vanishing scattering angle. Diamond, Cherenkov and scintillator sensors are used just outside the beam pipe, downstream of the interaction point in both electron and positron rings, at locations with event rates sufficient for the aimed precision and small enough contamination from single-beam particle losses induced by Beam-gas Bremsstrahlung, Touschek and Coulomb scattering. The SuperKEKB fast luminosity monitoring project will be presented. The initial configuration installed for the 2016 "phase 1" single beam commissioning will be described. Preliminary measurements and analysis of beam loss data collected with the luminosity monitors will be reported and compared with a detailed simulation, for several experimental conditions during the SuperKEKB commissioning. Similar luminosity monitoring and beam loss issues as those described in our report exist for future e+e- high luminosity colliders such as FCC-ee, CEPC and SCT.

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