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MONITORING THERMAL NEUTRON BACKGROUNDS AT SUPERKEKB WITH ^3He PROPORTIONAL COUNTERS

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In early 2016, BEAST, a detector designed to monitor beam conditions for SuperKEKB, was deployed for 4 months during phase-1 of beam commissioning. The BEAST detector consisted of multiple sub-detectors including the ^3He proportional counters. During the beam commissioning the ^3He tubes were successful in monitoring thermal neutron backgrounds caused by collisions with beam gas and Touschek interactions. These background measurements were then compared with GEANT4 simulations. As these measurements were taken without the Belle-II detector in place, BEAST will be redeployed after the Belle-II roll-in scheduled for 2017. It is expected that electron-positron collisions will begin by early 2018 for phase-2 beam commissioning.

During the second phase of BEAST the ^3He tubes will continue to monitor thermal neutron rates. During phase-2 commissioning positron-electron collisions will begin which produces a large number of high energy by-products. These by-products could be damaging to sensitive components of the Belle-II detector, so the ^3He detectors will measure the thermal neutron rate and the rates will be extrapolated to higher collision rates and beam currents.

Installation of the majority of BEAST, including the ^3He tubes, is expected to occur in September 2017. Before the ^3He tubes are reinstalled they will be recalibrated at the University of Victoria, and the data acquisition system will be upgraded. In particular, the cabling will be replaced with zero-halogen components to meet requirements for high radiation environments. When phase-2 begins ^3He will be ready to provide useful insights into the SuperKEKB beam and the operating environment of Belle-II.

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