About the schedule of the SuperB project

LNF Scientific Committee

To date LHC experiments have found a boson with properties compatible with the Standard Model (SM) Higgs boson and no sign of new physics. The absence of experimental evidence for physics beyond the SM makes the physics case for the LHC energy upgrade and for further precision tests of the flavor sector stronger than ever.

The SuperB project consists of an e^+e^- collider with a general-purpose detector dedicated to the study of precision flavor physics. The scientific program of SuperB [1] includes a number of important measurements in the B_u, B_d , charm and τ sectors that will allow new physics to be probed with unprecedented precision. SuperB has a luminosity target of some 10^{36} cm^{-2} s^{-1} at the Υ(4S) energy and an integrated luminosity target of 75 ab^{-1} . Here the physics program of SuperB is compared with the possible findings of other HEP projects at the time the SuperB machine will be in production. The present SuperB schedule foresees the start of commissioning with beam at the beginning of 2019 [2].

The main competitor is the SuperKEKB/ Belle II project, another e^+e^- collider with a general-purpose detector dedicated to the study of precision flavor physics. SuperKEKB addresses a physics program which overlaps almost exactly with that of SuperB. The SuperKEKB machine is under construction and the plan is to start the commissioning at the end of 2015. This machine has a target peak luminosity of 8 10^{35} cm^{-2} s^{-1} which it is hoped will be reached by end of 2020 and a milestone peak luminosity of 4 10^{35} cm^{-2} s^{-1} in 2018. The plan for the integrated luminosity is to collect 10 ab^{-1} by 2019 and 50 ab^{-1} by 2022 [3].

The BELLEII detector has similar performance to the detector planned for SuperB and the target integrated luminosities of the two projects are comparable. SuperB has the possibility to run with a polarized electron beam, however we have not identified a flagship program in SuperB for which the beam polarization is essential[1].

We conclude that the physics reach of the SuperKEKB machine is the same of SuperB, within the errors of the extrapolation of the performances. However the SuperKEKB machine has a schedule that is three years ahead of that of SuperB. It is possible that SuperKEKB will collect the first 10 ab^{-1} and produce results on many important measurements related to the SuperB program before the first collisions

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1 Beam polarization permits to distinguish left from right handed currents in the Lepton Flavor Violation τ decays and represent an advantage in the measurement of the magnetic moment of the τ.

are commissioned in SuperB. These results will have a typical uncertainty within a factor of 2-3 from the final SuperB estimated precision.

The other competitor is the LHCb experiment which is dedicated to B physics studies at CERN's LHC. The LHCb experiment will probably collect 7 fb^{-1} until 2018. The upgraded LHCb experiment will continue data taking with much increased yield and fully software based triggers. By 2019, LHCb should collect 12 fb^{-1} and by 2025 35 fb^{-1}. The program of LHCb is complementary to that of SuperKEKB and SuperB. Examples are the measurements of super rare B_s->mm decay and the mixing phase ϕ_s of B_s oscillations. Both measurements are precisely predicted in the SM and therefore allow precision tests to be made. Several gold-plated measurements can be performed at both LHCb and at B-factories and compared to precise theory predictions. LHCb is well on target to measure the Unitary Triangle angle gamma with 3° precision by 2019, thus perfectly matching the accuracy of the SM prediction. SuperKEKB, SuperB and the LHCb upgrade should ultimately reach better than 1° precision. There are a few other competitive measurements where b factories and LHCb have similar reach and the cross-check among the experiments is guaranteed.

SuperB has an excellent physics program of precision tests of the SM. Comparing its schedule to other HEP projects, however, it is clear that there is a fair possibility that the physics program of SuperB will be scooped by earlier measurements performed at other facilities.

Frascati , November 21, 2012

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