Contribution ID: **145** Type: **not specified**

SAPPHiRE: a Small gamma gamma Higgs Factory

A new particle with mass ˜ 125 GeV that resembles the Higgs boson has recently been discovered by ATLAS and CMS. We propose a low-energy gamma gamma collider as a cost- and time-efficient option for a Higgs factory capable of studying this particle in detail. In the past, this option has been suggested as a possible application of the CLIC two-beam accelerator technology (the CLIC Higgs Experiment, CLICHE) or as an option for the ILC. Here we propose a design based on a pair of ˜ 10 GeV recirculating Linacs (Small Accelerator for Photon-Photon Higgs production using Recirculating Electrons, SAPPHiRE) similar in design to those proposed for the LHeC. We present parameters for the e- beams and sketch a laser backscattering system capable of producing a gamma gamma peak luminosity of 0.36 X 10ˆ{34}/cm2/s with ECM(gamma gamma) ˜ 125 GeV. A gamma gamma collider with such a luminosity could be used to measure accurately the mass, bbar b, WW*, and gamma gamma decays of the Higgs boson. We also comment on possible synergies with other projects such as LHeC, the ILC or CLIC, and on other physics prospects in gamma gamma and e- gamma collisions.

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