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Measuring the Higgs boson properties with unprecedented precision at TLEP

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After the Higgs boson discovery by the CMS and ATLAS experiments at 126 GeV, Higgs factory concepts get a lot of attention towards a detailed study of the properties of this remarkable particle.
TLEP is a high-luminosity circular e⊠e⊠ collider to be fit in an 80-100 km tunnel as precursor and companion of a 100-TeV pp collider (VHE-LHC), as part of a possible long-term vision for High-Energy Physics. The machine covers the energy range from the Z pole up to above the top quark pair threshold. The luminosity at √s = 240GeV (Higgs factory) is 5.1034 /cm2/s at each of four collision points, yielding 2 Million Higgs decays in 5 years through the e+e- ⊠ ZH process.
This sample opens the possibility of sub-per-cent precision measurement of the Higgs boson couplings to light fermions and to gauge-bosons, and of the Higgs boson width. These precision measurements are sensitive to multi-TeV new physics interacting with the scalar sector. The ZH production mechanism also gives access to the invisible or exotic branching ratios down to a few per mil.
The luminosity expected at the top pair production threshold (√s ˜ 340-350 GeV) further improves some of these figures by a factor of two, and is sensitive to the Higgs boson coupling to the top quark. Besides the direct search for new physics up to a scale of several tens of TeV, the upgrade to VHE-LHC allows the measurement of the Higgs boson coupling to the top quark and the triple Higgs-boson self-coupling to the per-cent and few per-cent levels, respectively, hence completing the Higgs boson study with unrivaled precision.

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