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Future Circular Collider - The Lepton Collider (FCC-ee)

This report contains the description of a novel research infrastructure based on a highest-luminosity energy frontier electron-positron collider (FCC-ee) to address the open questions of modern physics. It will be a general precision instrument for the continued in-depth exploration of nature at the smallest scales, optimised to study with high precision the Z, W, Higgs and top particles, with samples of $5 \cdot 10^{12}$ Z bosons, 10^8 W pairs, 10^6 Higgs bosons and 10^6 top quark pairs. FCC-ee offers unprecedented sensitivity to signs of new physics, appearing in the form of small deviations from the Standard Model, of forbidden decay processes or of production of new particles with very small couplings.

This collider will be implemented in stages, successively spanning the entire energy range from the Z pole over the WW threshold and H production peak to the $t\bar{t}$ threshold. Most of the infrastructure (e.g. underground structures, surface sites, electrical distribution, cooling & ventilation, RF systems) can be directly reused for a subsequent energy-frontier hadron collider (FCC-hh, see FCC conceptual design report volume 3), serving the world-wide particle-physics community in a highly synergetic and cost-effective manner throughout the 21st century.

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Track Classification: Large experiments and projects