## **Electroweak Precision Measurements at the FCC-ee**

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The FCC-ee program uniquely combines ultra-clean experimental conditions with precise center-of-mass energy calibration—from the Z pole through the top-quark pair threshold—and extraordinarily large event samples of Z and WW bosons. This combination unlocks both direct and indirect probes of physics beyond the standard model through:

- 1. High-precision electroweak measurements in neutral and charged currents, yielding unprecedented determinations of observables such as the effective weak mixing angle, W- and Z-boson masses, and the top-quark mass.
- 2. Direct extractions of fundamental couplings, including the strong coupling constant ( $\alpha_s$ ) and the finestructure constant ( $\alpha$ ), to levels of precision never before achieved.

To fully exploit the statistical precision, a concerted effort is underway to enhance detector performance, refine analysis strategies, and advance

theoretical calculations—thereby driving systematic uncertainties down to meet the tiny statistical uncertainties anticipated.

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