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Thu-Af-Po.01-09: Direct Wind corrector magnets for the FCC-ee interaction region

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The Interaction Regions (IR) for the FCC-ee collider as envisioned by the CERN FCC Feasibility Study requires a variety of superconducting correction coils that must be integrated with the main IR focusing quadrupoles. The present technological basis for these main quadrupoles is to wind superconductor supported in side-by-side slotted tubes, located deep inside the experimental detector solenoid as consistent with the FCC-ee IR crossing angle. Thus, the corrector coils, which are located radially outside these quadrupole coils, must be accommodated in very limited space and fabricating them also via a conductor in slots configuration would take up too much radial space. Our solution takes advantage of BNL's Direct Wind coil technology to essentially print multiple nested corrector layers, with small diameter superconductor wire, on a common support tube. As with the main quadrupole coils, because there is no magnetic yoke material between the side-by-side coils, these corrector coils must include a deliberate, longitudinally varying, admixture of field harmonics to self-consistently compensate for field crosstalk between neighboring coils. Here we present the design considerations for the two FCC-ee IR optics schemes currently being evaluated, along with the corrector coil design optimization procedure and our plans for fabricating a coil test prototype to validate the corrector design software.

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