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10.24 Secondary Electron Emission Detectors for Neutral Beam Characterization on C-2W

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Heating, current drive, and partial fueling from neutral beam injection are essential to the sustainment of C-2W field-reversed configuration (FRC) plasmas. C-2W has eight 1.7 MW neutral beams (total of 13.6 MW), each capable of providing an elliptically-shaped beam of 15 keV hydrogen neutrals for 30 ms. To maximize the effectiveness of neutral beam injection, duct losses must be minimized. Maintaining beam alignment and optimizing beam current for minimum divergence achieve this. Each beam terminates on a vertical and horizontal array of secondary electron emission (SEE) detectors (eight in the vertical, six in the horizontal, and one in the middle). The molybdenum detectors are spatially separated to characterize the beam size and alignment. With knowledge of the geometry of vacuum ducts and two beam profiles from test stand measurements, the focal length, divergence and power loss were calculated. Through characterization, the set of neutral beams are optimized to inject up to ~13 MW of power into the confinement vessel throughout the plasma discharge.

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