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Synchrotron Radiation Diagnostics for Transverse Profile Measurements at FCC-ee

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Beam profile diagnostics will play a crucial role in the commissioning and efficient operation of the electron– positron Future Circular Collider (FCC-ee). Non-invasive techniques are essential to avoid beam perturbations during regular physics operations. As is customary in high-energy lepton colliders, transverse diagnostics at FCC-ee will primarily rely on synchrotron radiation. Given the picometer-level emittances expected, diagnostics in the x-ray domain are the most suitable choice. Optimal locations for transverse beam monitoring have already been identified in the current collider lattice design.

Pinhole cameras have been selected as the baseline solution, offering robust and precise beam size monitoring from the early stages of commissioning. Additionally, more advanced techniques based on synchrotron radiation interferometry are being investigated to further enhance diagnostic accuracy. As the project moves toward the Technical Design Report stage, the main objective for the study of transverse diagnostics is the engineering design and integration of the synchrotron radiation extraction lines.

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