

HOM Beam Based Diagnostics at FAST

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Superconducting RF cavities are high quality symmetric resonators that support many different modes of oscillation, with high precision signals and unsurpassable dynamic range. Owing to their approximate axial symmetry, modes can be identified according to their monopole, dipole and quadrupole nature. Higher Order Modes (HOM) excited by bunched beams in SRF cavities hence coupled respectively to the charge, position and size of the beam.

HOM-based diagnostics have already been used in various SRF accelerators like FLASH at DESY and FAST at Fermilab. However, the complete exploitation of their full potential in beam diagnostics and beam based tuning has not been realized, for instance in achieving minimal transverse wake kicks and transverse beam size measurement, in a non-invasive fashion.

We would like to explore and identify physics and engineering challenges in implementing HOM diagnostics using fully relativistic electron bunches through CM2 SRF cavities at FAST.

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