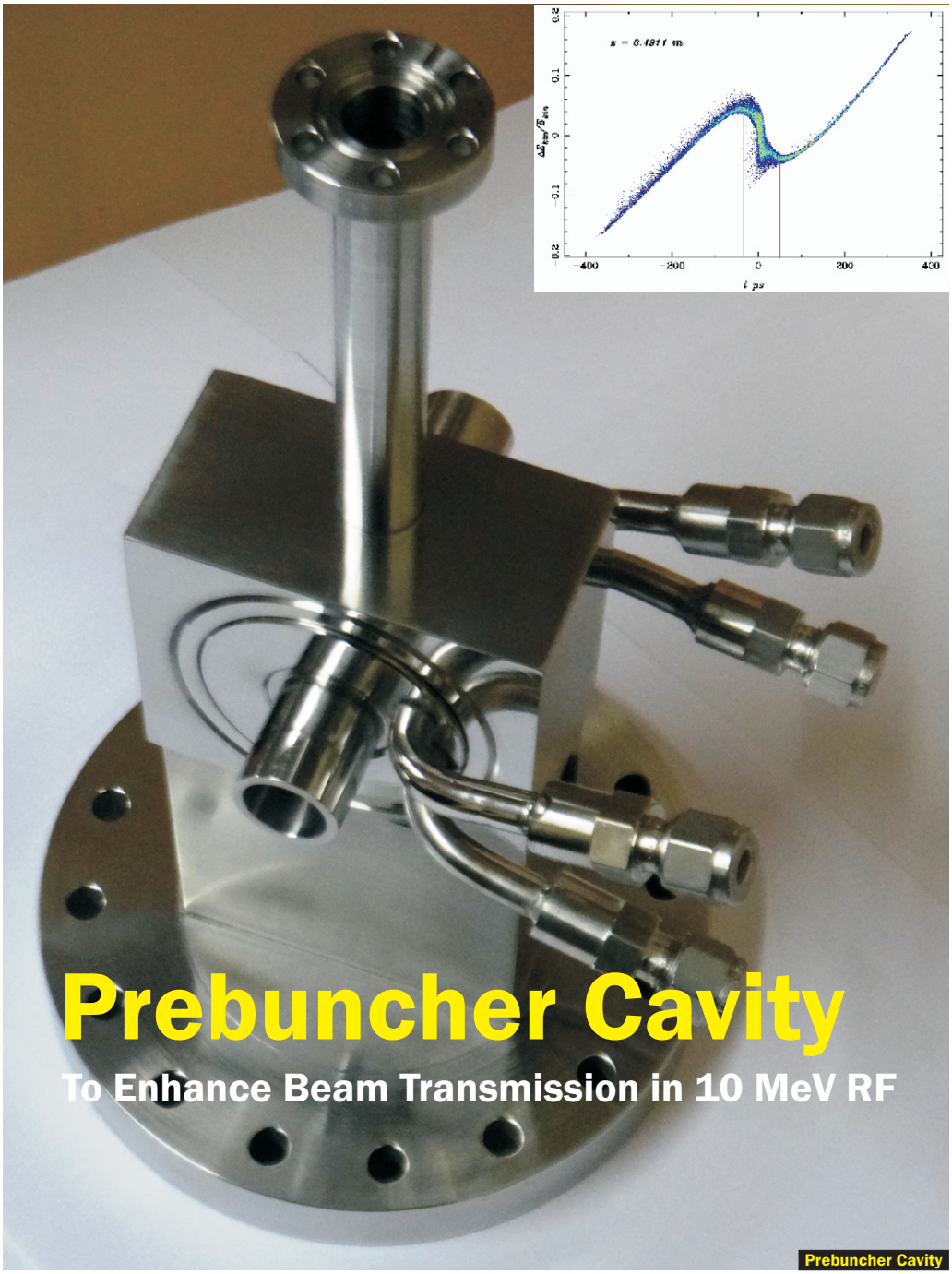

Prebuncher Cavity

To Enhance Beam Transmission in 10 MeV RF

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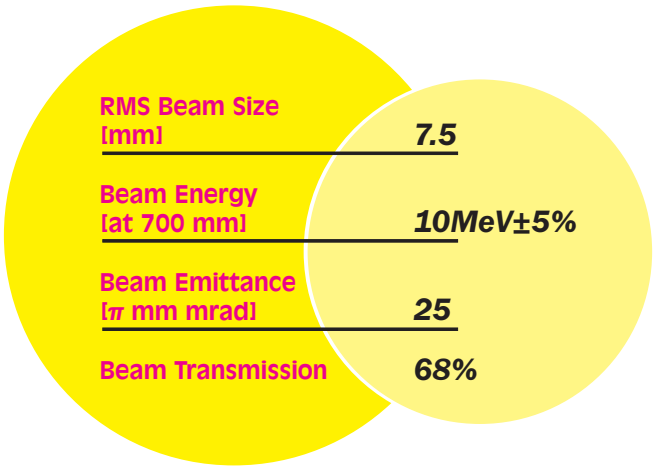
Electron Beam accelerators of up to 10 MeV energy have several industrial applications, including food irradiation, medical sterilization, cross linking of polymers for agriculture, cable and tyre based industries, semiconductor characteristics modifications, electronic waste management, radiation hardening studies etc. In EBC, Kharghar, a 10 MeV, 3 kW RF electron Linac is in operation, which works in both electron beam and X-ray modes. To enhance the throughput of industrial applications, a higher beam power machine in the range of 5–10 kW is desirable. In view of this, it is being planned to develop a 10 MeV, 5 kW machine in horizontal configuration at EBC, Kharghar. In the existing configuration of 10 MeV, 3 kW Linac, the electron beam from a LaB_6 cathode based thermionic electron gun (40–50 KeV) is directly injected into the 0.9 m long Linac cavity structure to achieve the final energy. A maximum beam transmission efficiency in the range of 20%–25% has been achieved.

In order to improve the beam transmission efficiency to 60% in the new horizontal Linac (10 MeV, 5 kW), a pre-buncher (PB) cavity along with low energy beam transport (LEBT) line has been introduced. Introduction of small energy modulation of the injected DC electron beam in PB cavity will ensure longitudinal bunching in the DC beam after traveling a certain drift distance from the PB cavity. This bunched electron beam, when injected into the main Linac will be able to capture electrons more efficiently, which will essentially result in higher beam transmission. The fabricated Prebuncher cavity is displayed predominantly in this article. The simulated output beam parameters of the 10 MeV Linac beam line with Prebuncher are presented in the infographic given below.



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