DESIGN OF THE FINAL FOCUS OF THE PROTON BEAM FOR A NEUTRINO FACTORY

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J. Pasternak[3], M. Aslaninejad[3], K. Gollwitzer[2], H.G Kirk[1], K.T. McDonald[4]

[1]BNL, Upton, NY 11973, USA, [2]Fermilab, Batavia, IL 60510, USA,

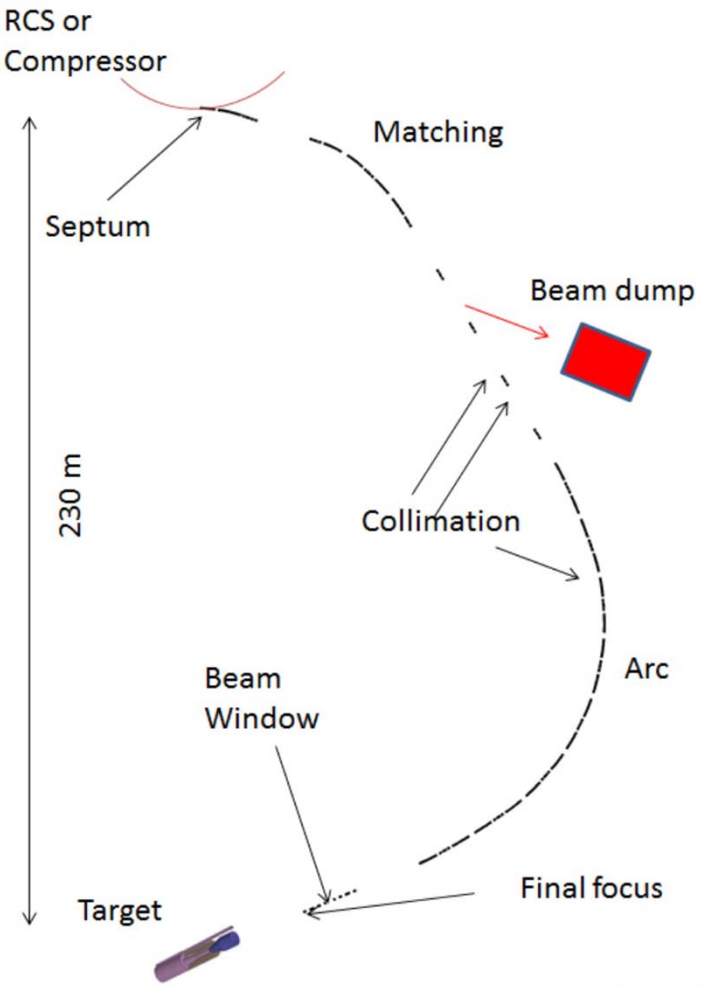
[3]Imperial College, London SW7 2AZ, UK, [4]Princeton University, Princeton, NJ 08544, USA

The ~ 8-GeV, 4-MW proton beam that drives a Neutrino Factory has a nominal 50-Hz macropulse structure with 2-3 micropulses ~ 100 ns apart.

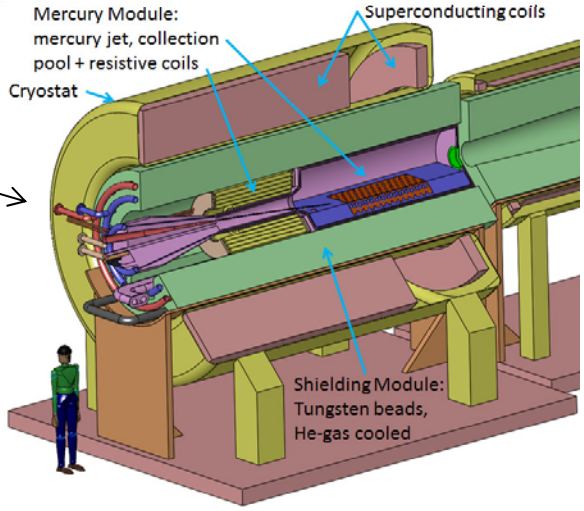
The nominal geometric beam emittance is 5 μm, and the desired rms beam radius at the liquid-metal-jet target is 1.2 mm.

A quadrupole-triplet focusing system to deliver this beam spot is described.

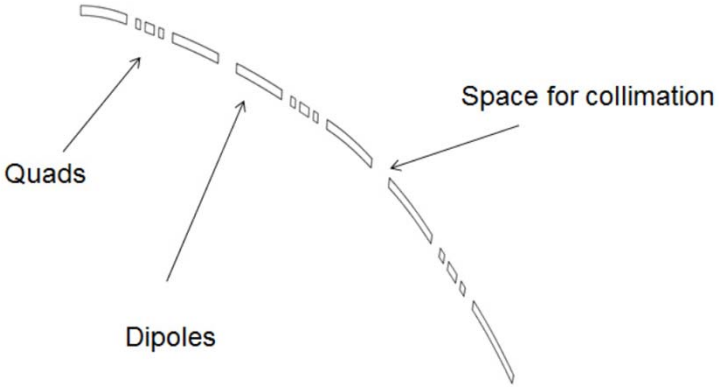
Proton-beam transport from Compressor Ring to the Target System:



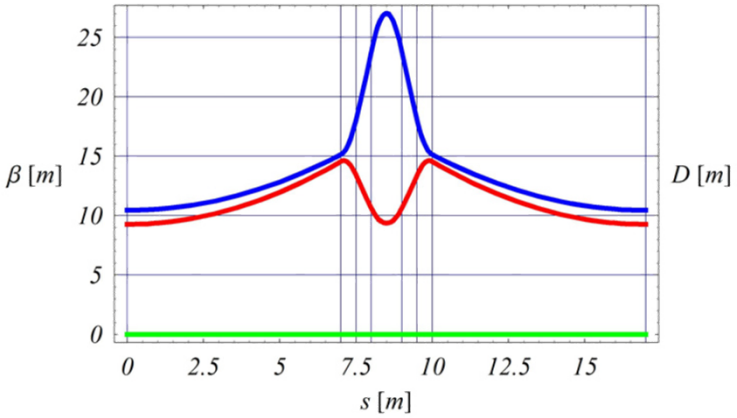
Target System



The ~ 250-m-long arc system maintains the 2-ns proton-bunch length without RF cavities:



β-Function and Dispersion of a 17-m-long cell of the arc system:



β-Function of the last 70 m of a Final-Focus system with 5-m gap between last quad and target (which is at *s* = 70 m):