eRHIC Interaction Region Design Status

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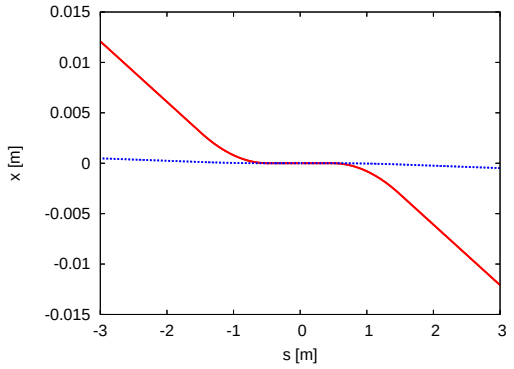
Parameters

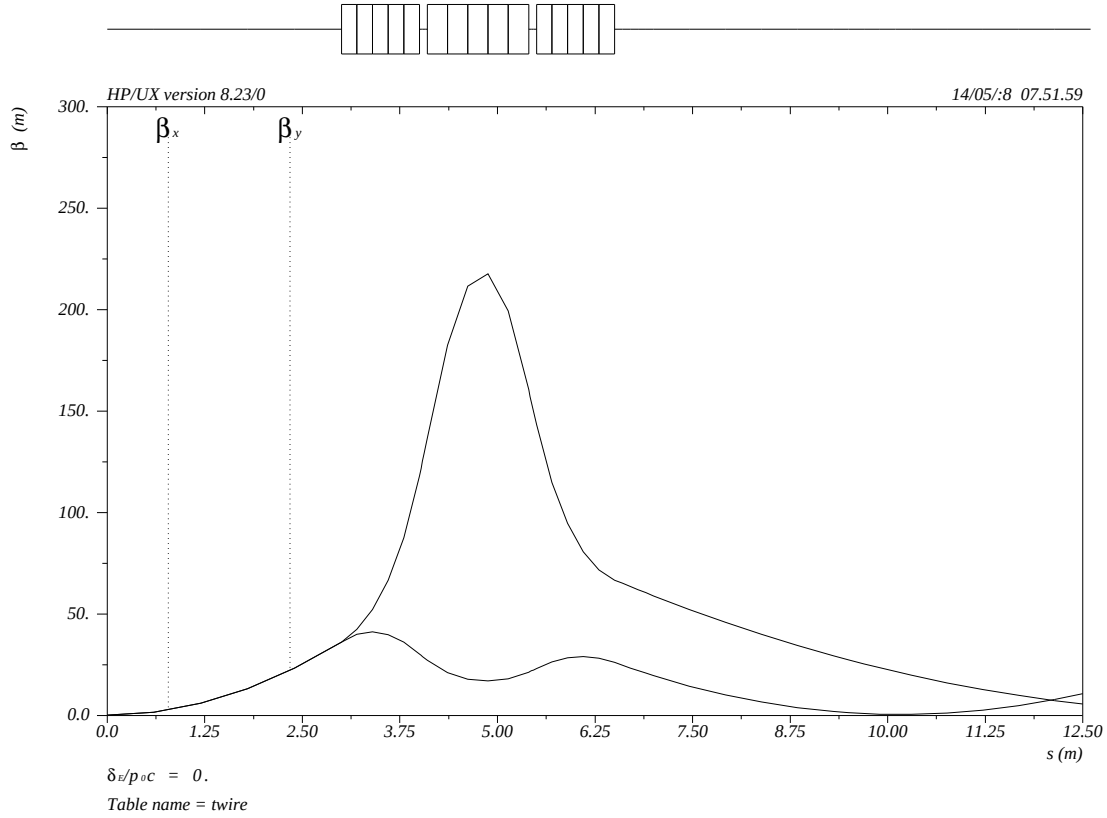
	p	e
energy [GeV]	250	10
rms emittance [nm]	3.8	4.0
β^* [cm]	26	25
rms bunch length [cm]	20	1
peak luminosity [$10^{33}\,\mathrm{cm}^{-2}\mathrm{sec}^{-1}$]	2.6	

IR concept



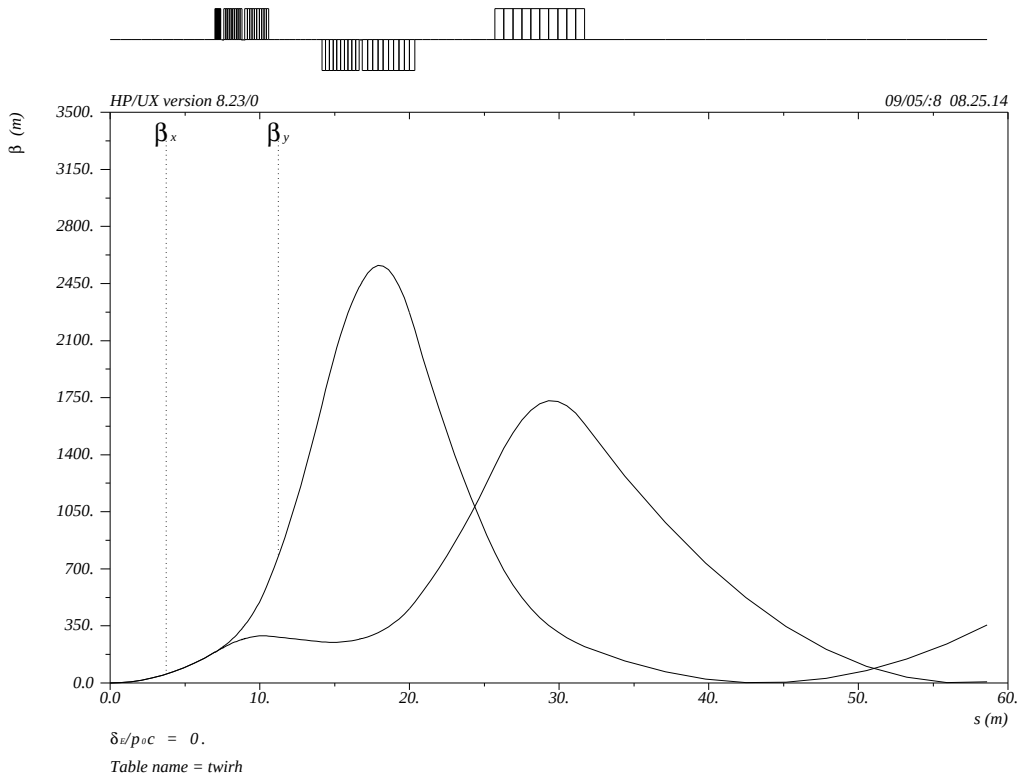
- Head-on collision scheme, "S"-shape
- $\pm 3\,\mathrm{m}$ element-free space
- $12\sigma_p$ minimum aperture for ions
- $10\sigma_e$ minimum aperture for electrons
- Accomodation of synchrotron radiation up to 5σ

Electron IR optics



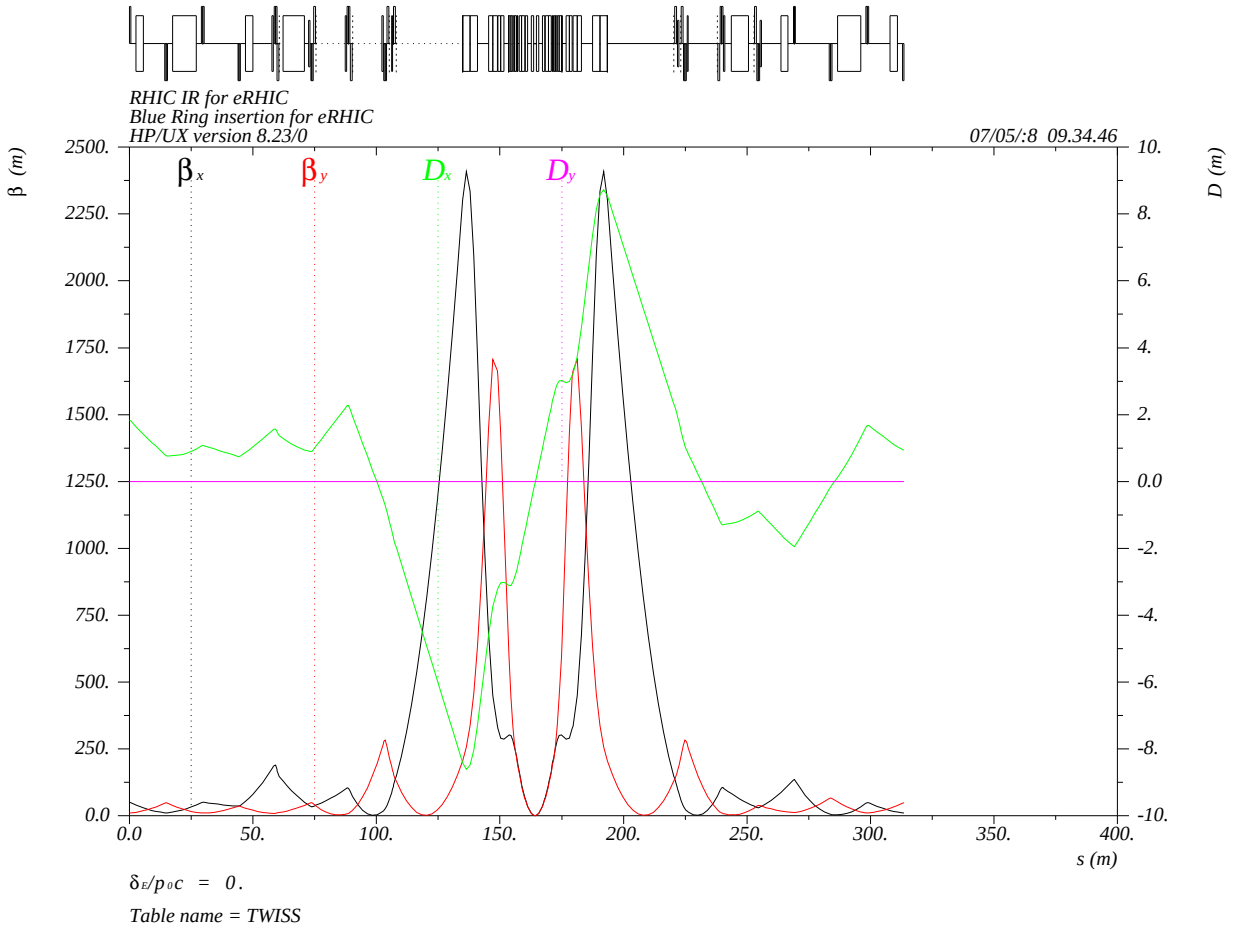
Low-β triplet (warm or cold), common to both beams.

Ion IR lattice



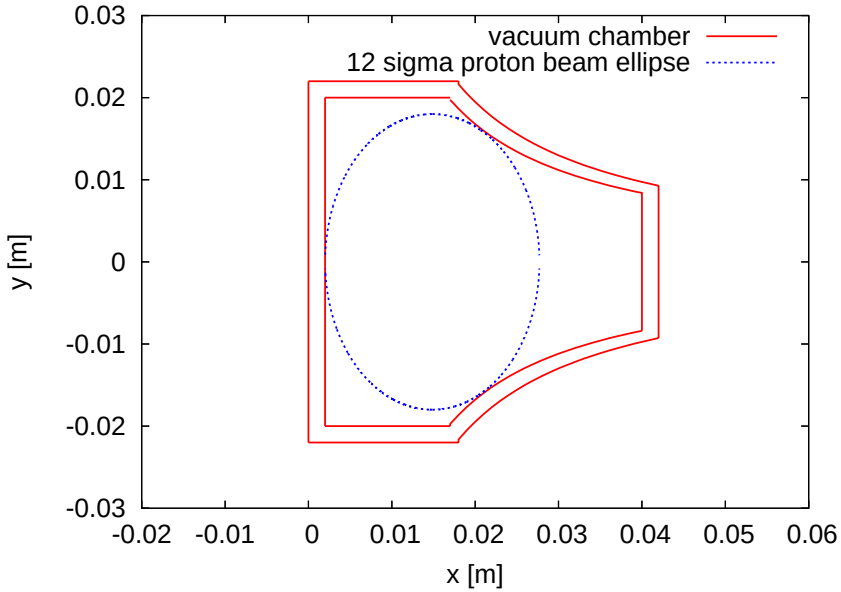
1 Tesla septum quadrupoles.

Effect of common electron IR triplet neglected.

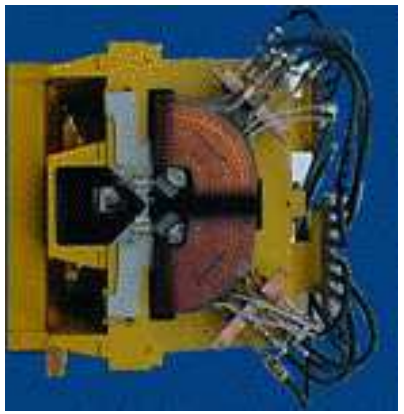


Matched solution, including common elements.

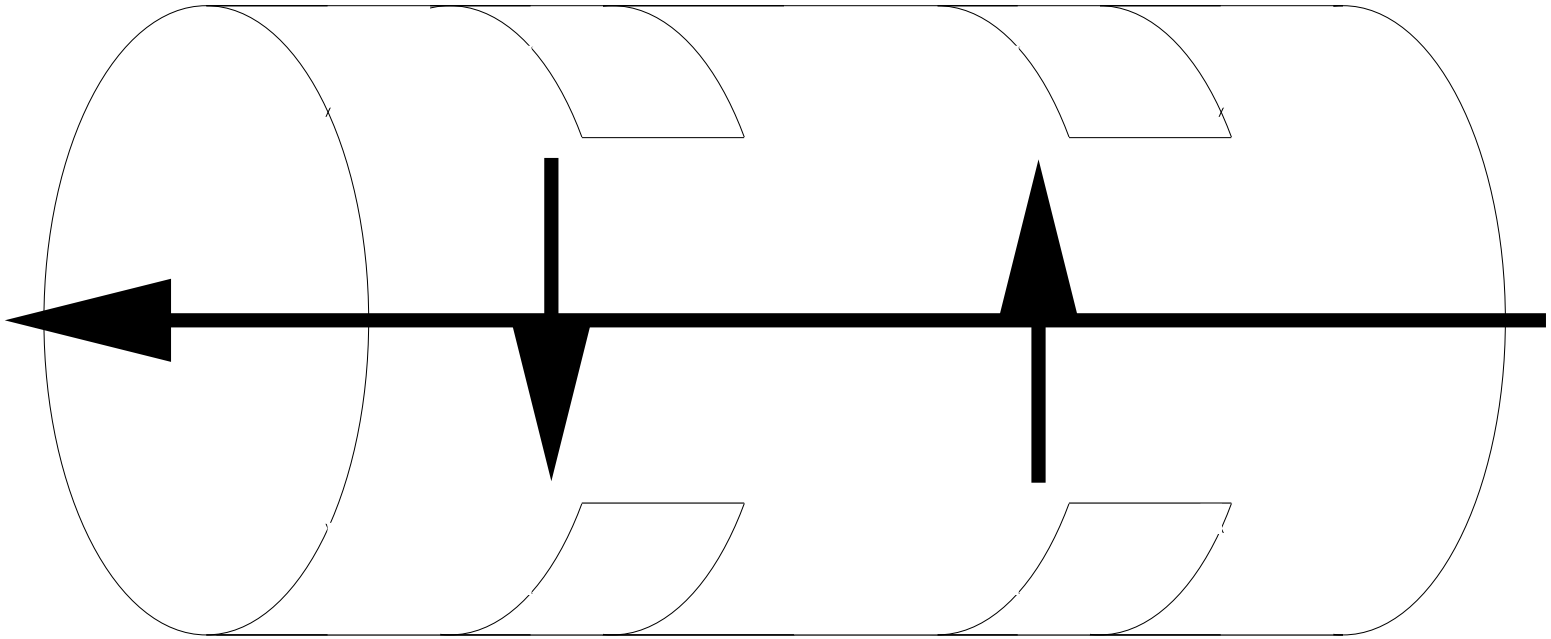
Ion IR septum quadrupole



HERA-type septum quadrupole magnet



Beam separation

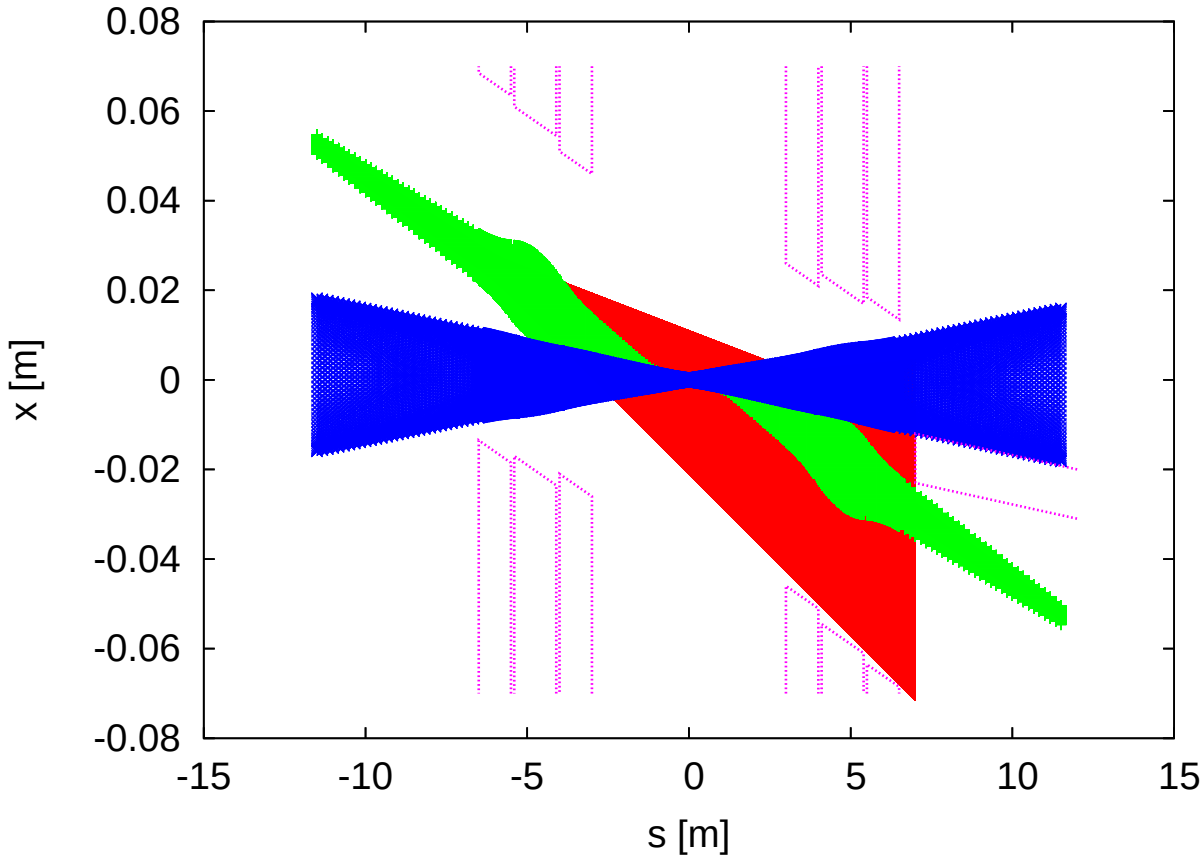


Detector-integrated dipoles: dipole coils as part of detector solenoid

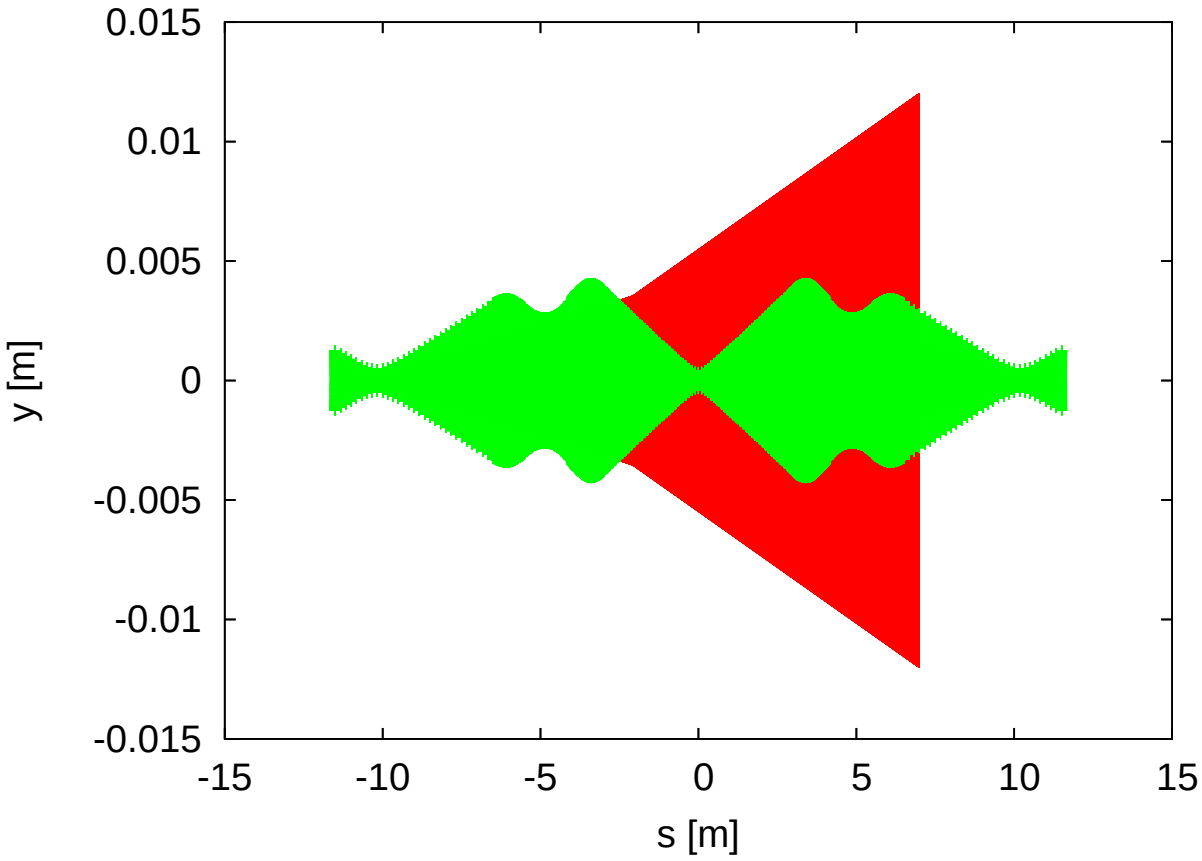
$\rightarrow$ Separation very close to the IP, without compromising detector volume and acceptance

Synchrotron radiation

Top view

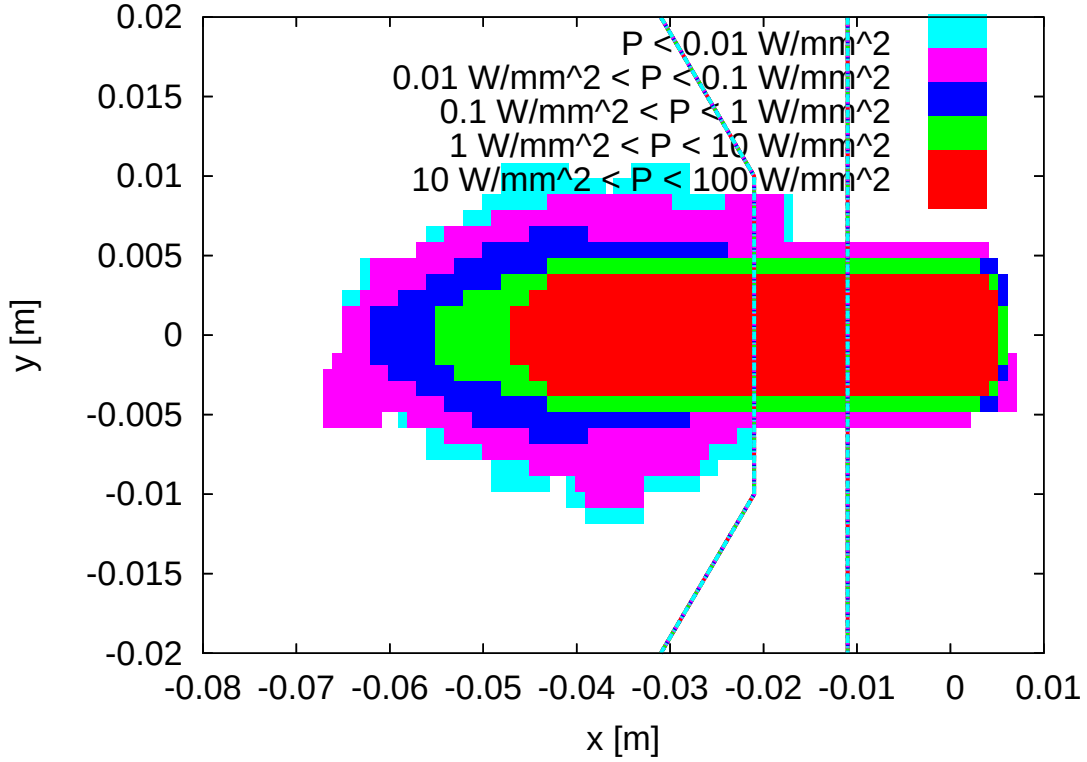


Side view



D-F-D focussing sequence minimizes SR fan height at septum.

SR fan at the septum



$P_{\text{total}} = 1.8\,\text{kW}$
$P_{\text{septum}} = 0.5\,\text{kW}$
$E_{\text{critical}} = 11.1\,\text{keV}$

Instead of a Summary

To-do list:

- Detailed study of synchrotron radiation background
- Detector integration, including Roman Pots
- Beam-gas background study
- Determine alignment tolerances
- Determine positions of BPMs and orbit correctors
- Magnet design