MDI and IR Parameters

M. Sullivan

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Detector Constraints

- **±300 mrad physics acceptance from the nominal beam axis**
- **Smallest possible beam pipe radius (1 cm)**
- **Thinnest possible beam pipe wall**
- **Solenoidal detector magnetic field (1.5T)**
- **Low SR backgrounds (~100 times higher than PEP-II?)**
- **Low BGB (~10 times higher than PEP-II?)**
- **Low Radiative Bhabha backgrounds**

Accelerator IR Parameters

- **Very small spot size at IP (1 μm x 12 nm)**
  - **Beta functions (beam size) grow very rapidly away from the collision point**
  - **Small emittances are important**
  - **Last quad before the beams collide must be close (50 cm)**
- **Shared quadrupole**
  - **The last quad must be shared (at 50 cm the beam centers are 25 mm apart for ±25 mrad xing angle)**
  - **The beam envelopes (15 sigma) are 17 mm apart at 50 cm from the IP**
  - **A shared quad means the radiative bhabha bkgd has to be carefully studied**

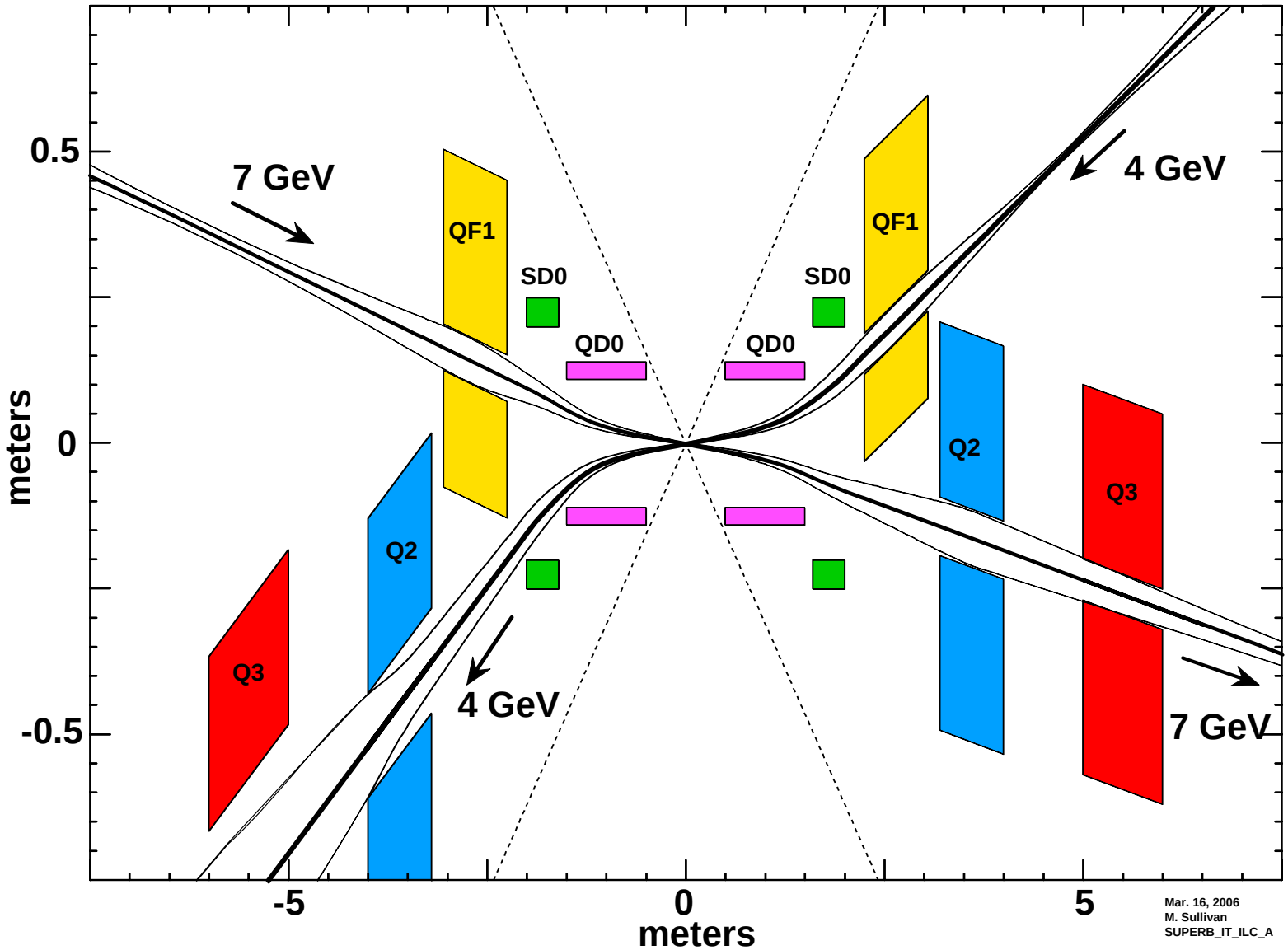
Accelerator IR Parameters (2)

- **Shared sextuple**
  - The shared quad can be set for only one of the beams (or in between the two beam energies)
  - With a shared sextupole just outside of the shared quad and with the beams separated one can adjust the sextupole strength and offset so that the LER receives less total focusing and the HER receives more total focusing (Raimondi's idea)
  - This greatly helps in maintaining control of the beta functions and hence beam sizes)

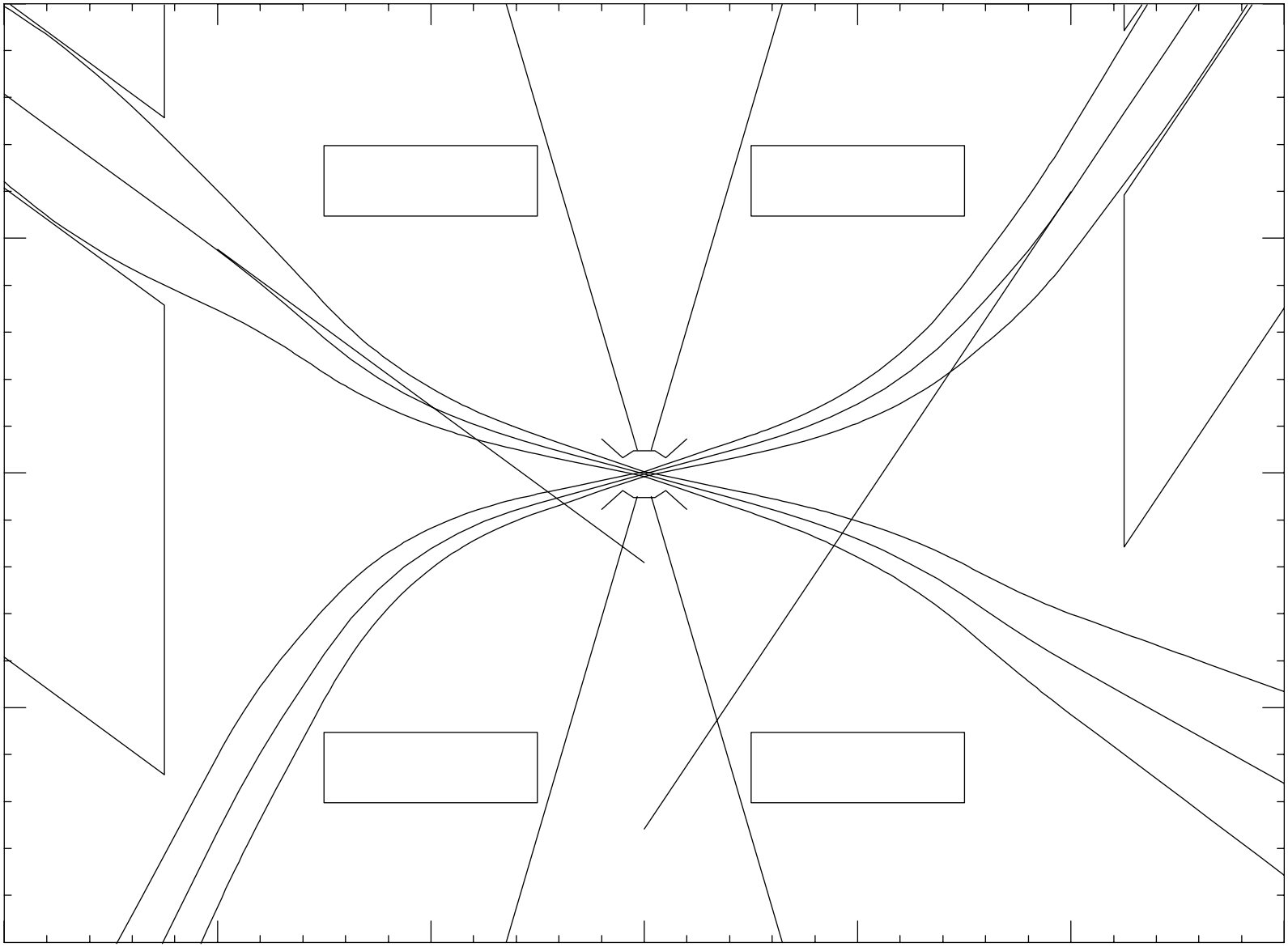
Some IP Parameters

	HER	LER
• Beta x (mm)	2.5	2.5
• Beta y (mm)	0.08	0.08
• Emittance x (nm-rad)	0.4	0.4
• Emittance y (nm-rad)	0.002	0.002
• Sigma x (μm)	2.67	2.67
• Sigma y (μm)	0.0126	0.0126
• Bunch spacing (m)	0.6	
• Crossing angle (mrad)	±25	
• Luminosity	0.8×10^{36}	

IR design from March Workshop



Close up of March IR design



Summary

- **Backgrounds**
  - **Synchrotron radiation backgrounds have to be controlled**
  - **BGB background should be acceptable with a good pumping design**
  - **Radiative bhabha bkgd will have to be controlled by designing in shielding right up front**
- **Beam pipe heating will have to be studied in light of the small radius and thinness of the wall**