SR Backgrounds in SuperB

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For

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Outline

- IR design parameters
- SR power in the cryostat
- SR power and backgrounds near central beam pipe
- Summary

Parameters used in the IR designs

Parameter	HER	LER
Energy (GeV)	6.70	4.18
Current (A)	1.89	2.45
Beta X* (mm)	26	32
Beta Y* (mm)	0.253	0.205
Emittance X (nm-rad)	2.00	2.46
Emittance Y (pm-rad)	5.0	6.15
Sigma X (μm)	7.21	8.87
Sigma Y (nm)	36	36
Crossing angle (mrad)	+/- 30	

General IR Design Features

- Crossing angle is +/- 30 mrads
  - Tried 33 mrad – total crossing angle of 66 mrad – but found that SR backgrounds from large transverse (high sigma) orbits caused too much background on the detector beam pipe
- Cryostat has a complete warm bore
  - Both QD0 and QF1 are super-conducting
  - Also the extra focusing quadrupoles for the HER (QD0H and QF1H)

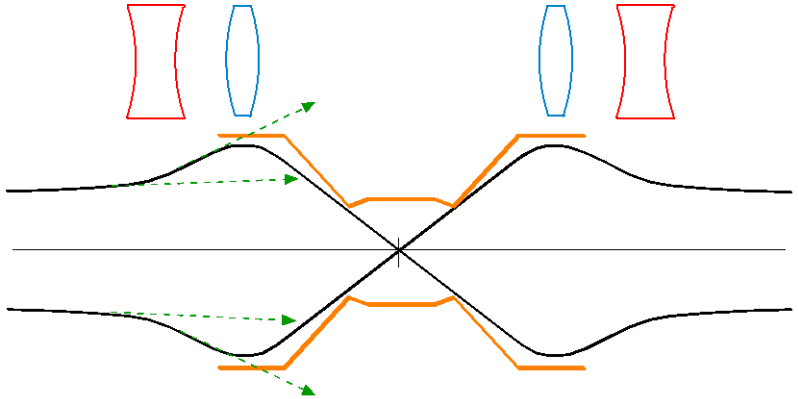
More general details

- PM in front of QD0
  - The magnet strength is as high as reasonable in order to get the most focusing in as close as possible to the IP
  - Also makes the beam pipe size 6mm radius under these magnets
- Soft upstream bend magnets
  - Reduce the SR power in IP area as much as possible. This applies especially to the inside walls of the cryostats.

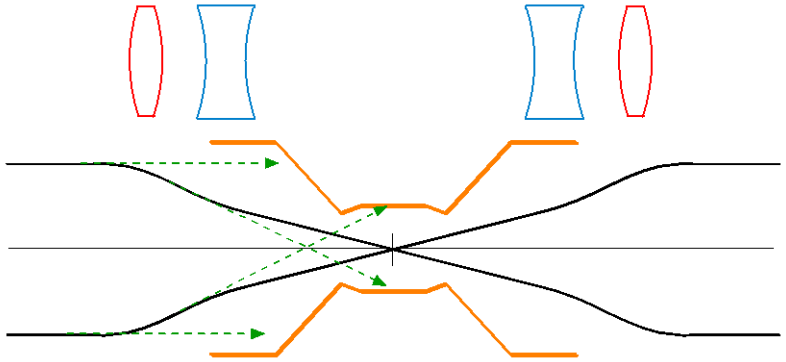
General details (3)

- BSC to 30σ in X and 100σ in Y (7σ fully coupled)
  - This is as large as we could make it. Need at least 10-15 sigma for injection aperture and in this case larger is better especially since injection is continuous
- SR scanned to 20σ in X and 45σ in Y
  - There is a gap between the SR scanned area and the BSC. Presently assume that collimators will block most beam particles in this region (20 to 30 sigmas). This will need to be modeled further.

FF SR background sources

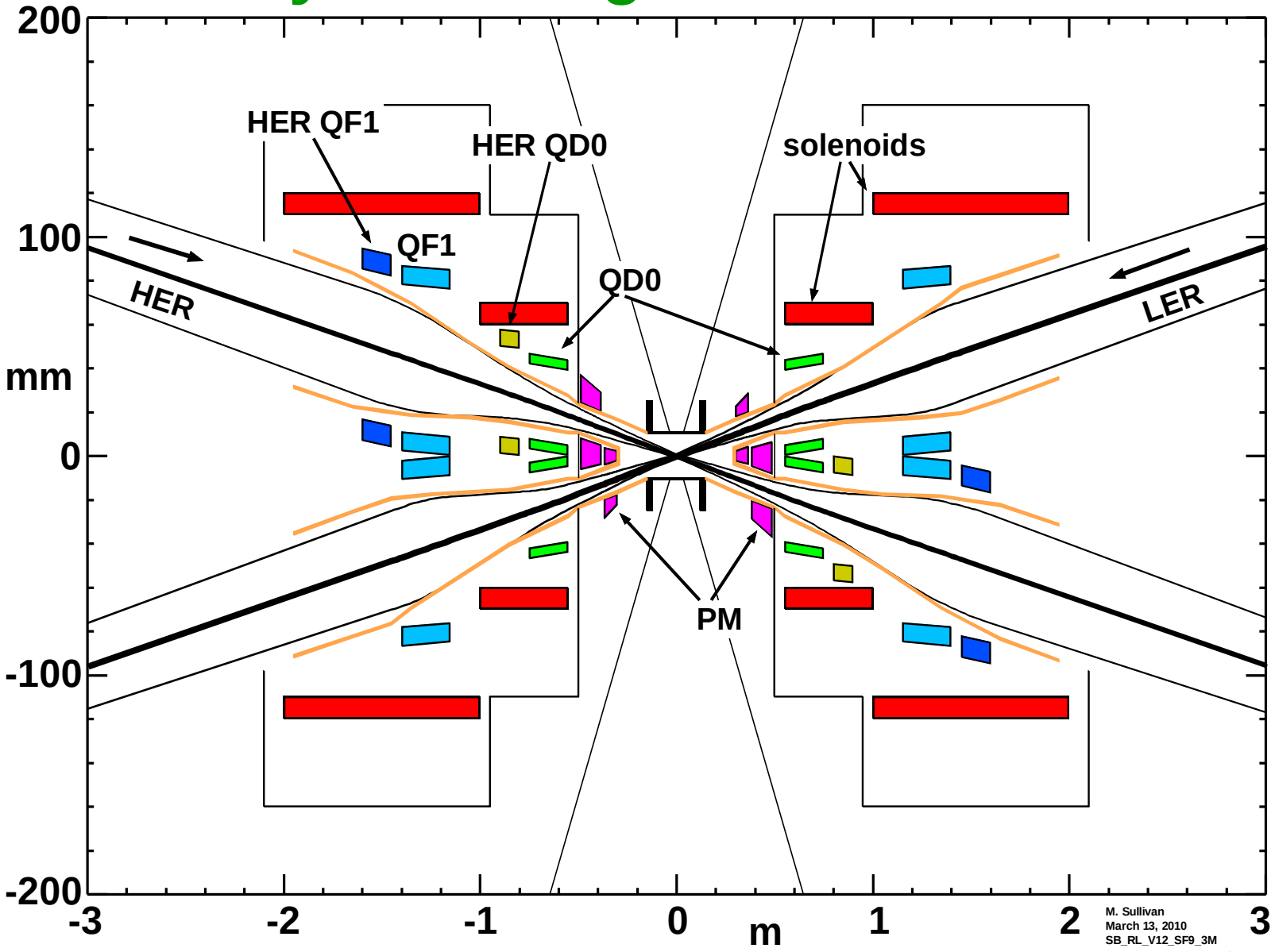


Vertical beam focusing
(side view)

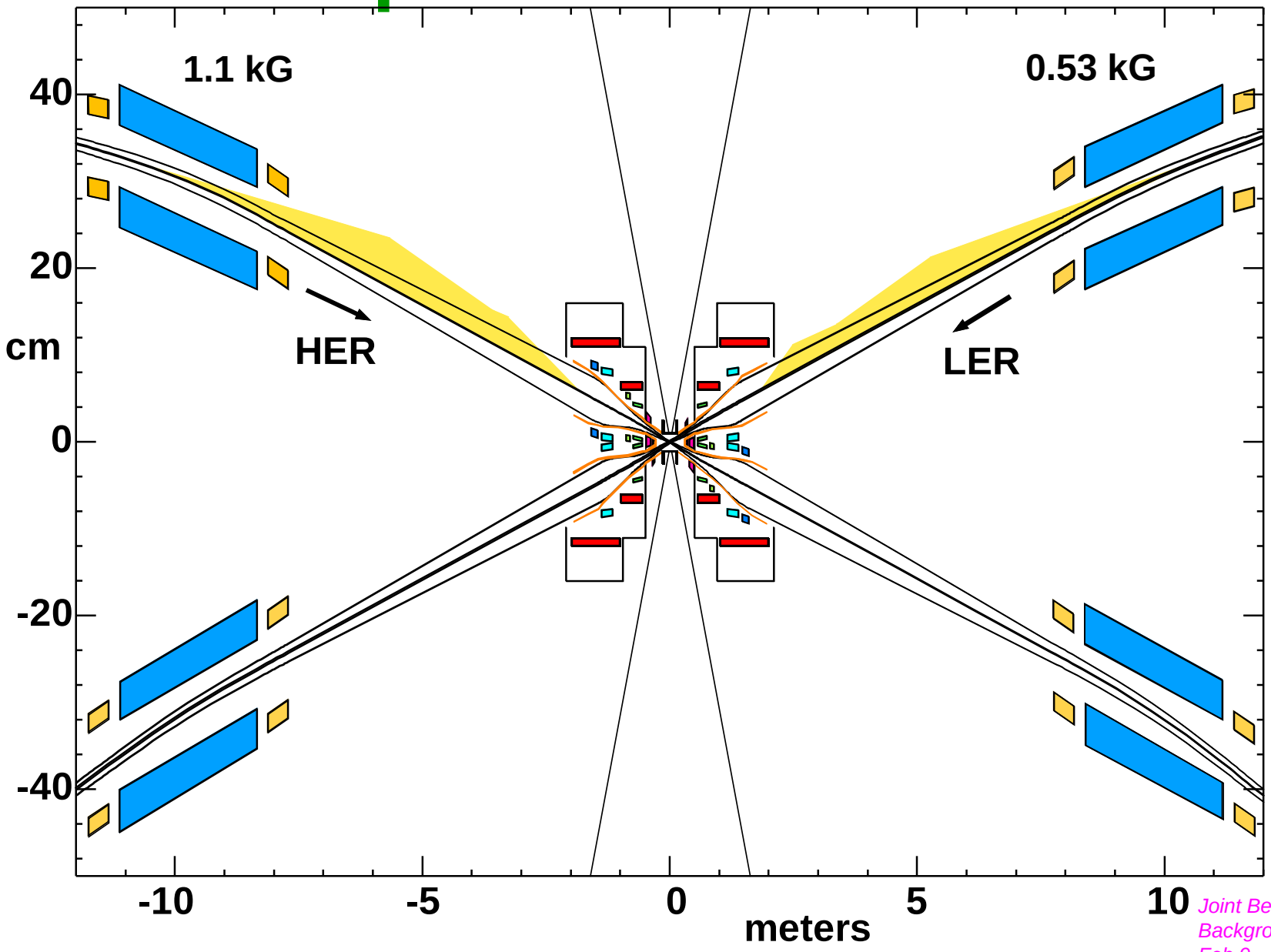


Horizontal beam focusing
(plan view)

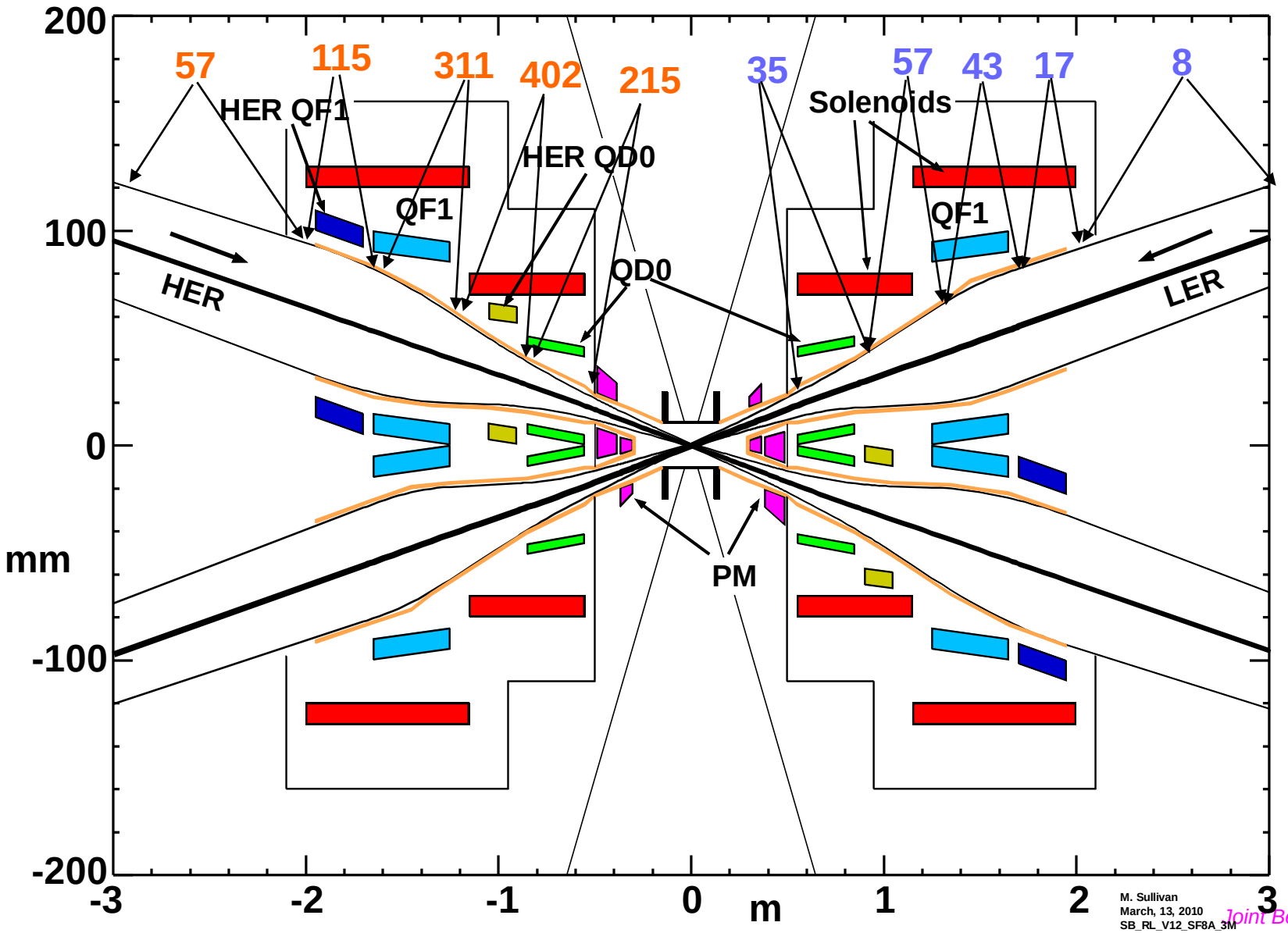
Cryostat Magnets and PMs



Upstream SR fans

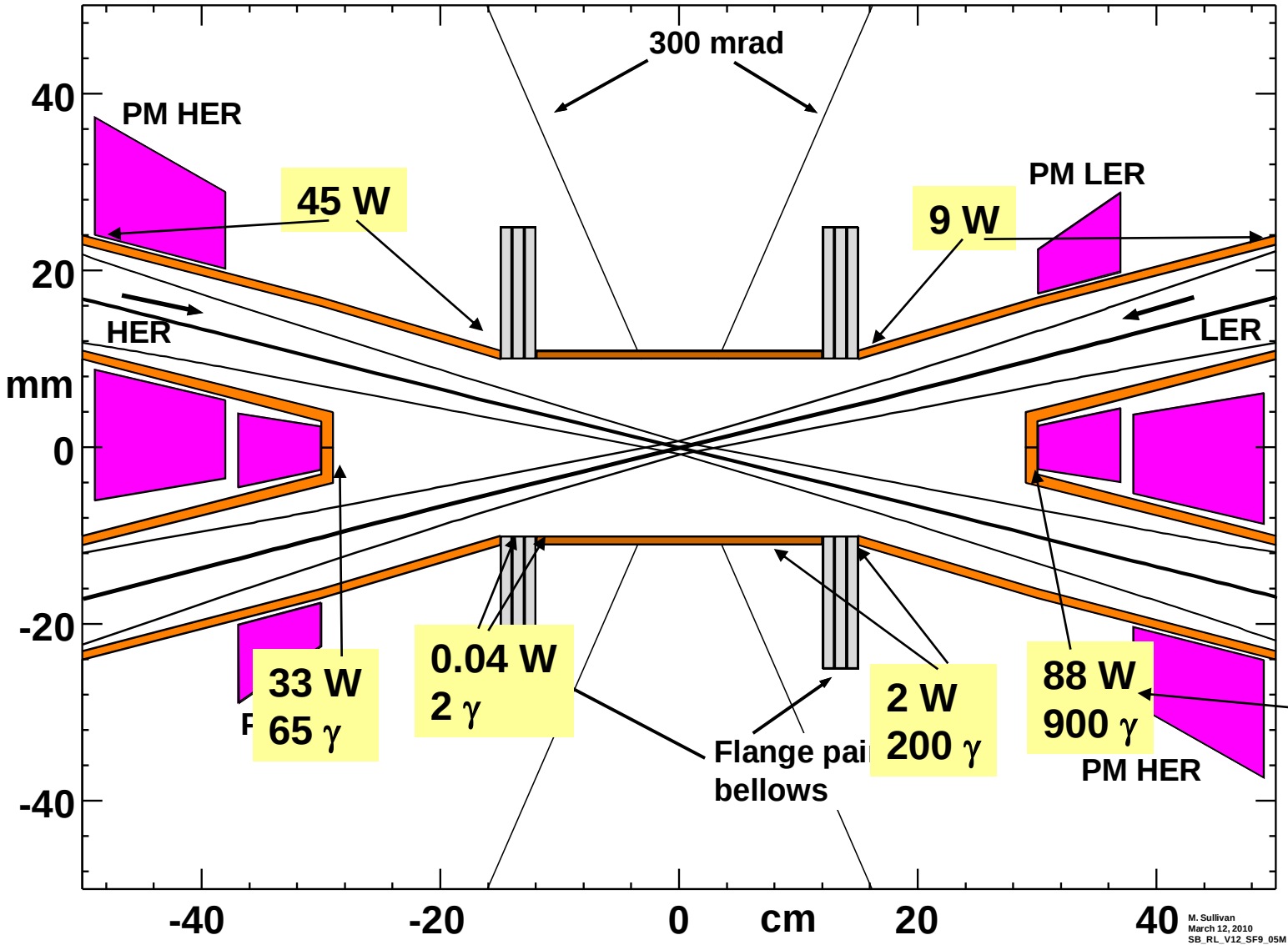


SR power inside the Cryostat



Beam pipe close up

A little out of date



Surface design work needed

Summary

- The SR backgrounds have been studied fairly carefully and backgrounds look to be under control. Studies need to be continued.

- The SR power levels are manageable and ordinary water cooling of the beam pipes should be adequate for controlling the temperature of the beam pipes. The exact engineering details need to be worked out. This has already been done for the central beam pipe.