Energy Deposition in SC QD0 from Radiative Bhabha's for 2 mrad crossing

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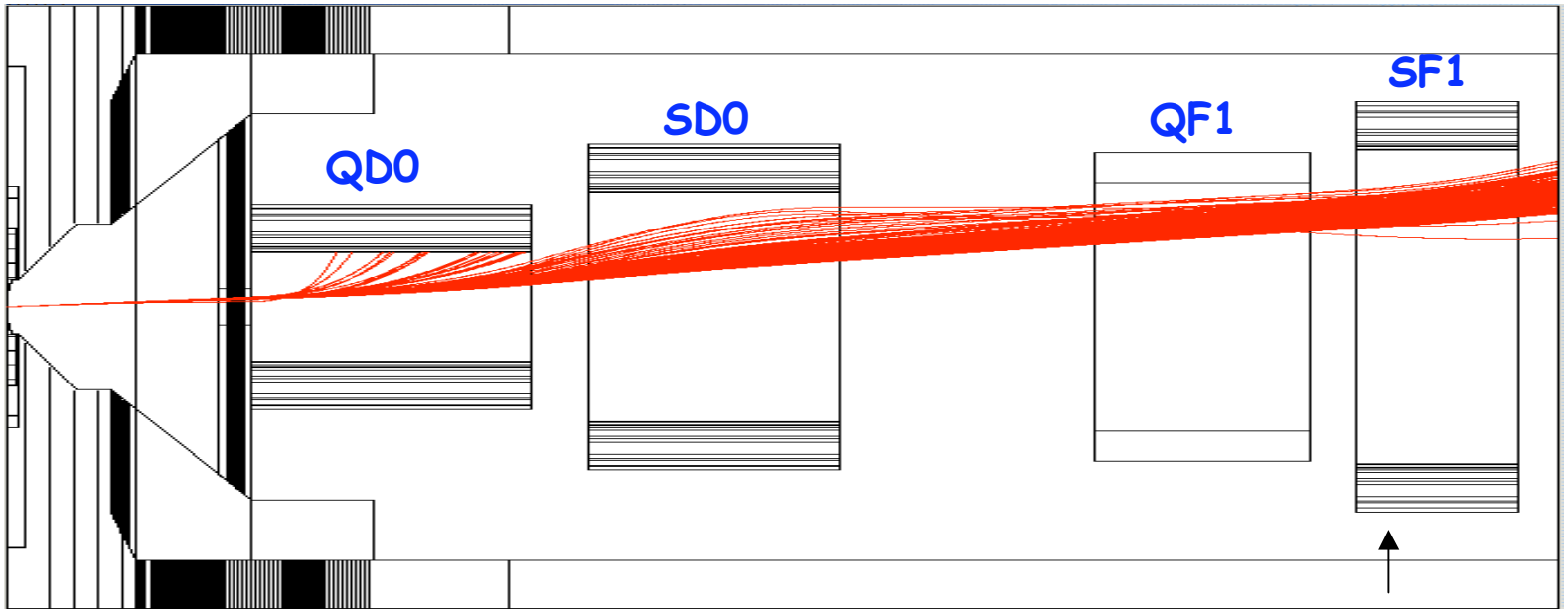
Radiative Bhabhas in 2 mrad

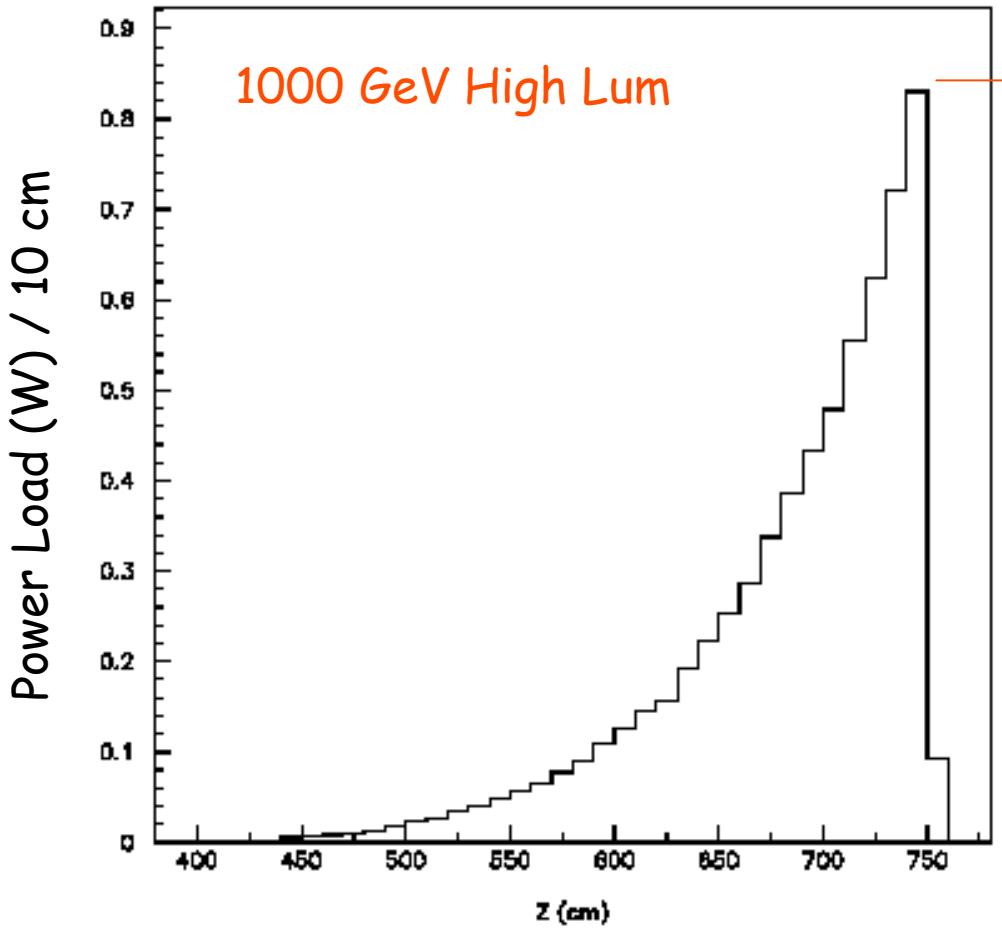


500 GeV
Nominal

	⟨ E ⟩ (GeV)	# loss/bx*	Power (mW)*
QD0	30	8500	580
SD0	60	340	45
QF1	58	58	8

* One side

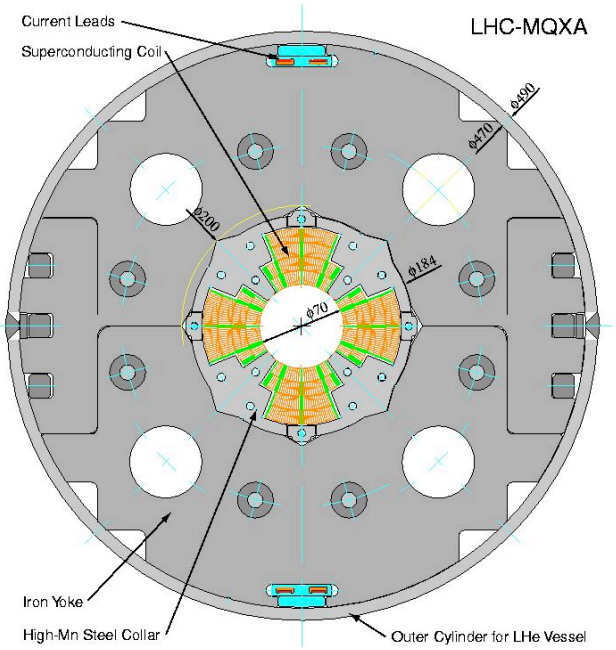
Power Load in “long” QD0



~0.8 W / 10 cm
but $\Delta y \sim 50\mu m$

Power density
$\sim 16\ W/cm^2$

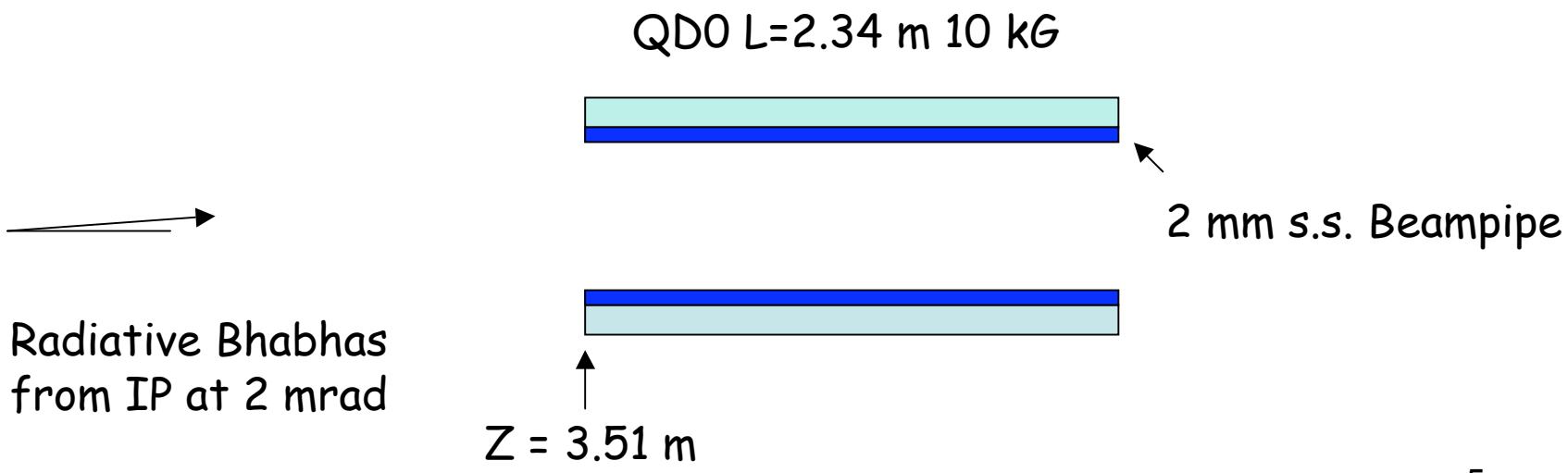
SC QD0



- SC coil quench limit (from Markiewicz)
  - N. Mokhov quotes 1.5 mW/g as the measured quench limit.
  - LHC management insisted a x3 safety factor for design. → 0.5 mW/g

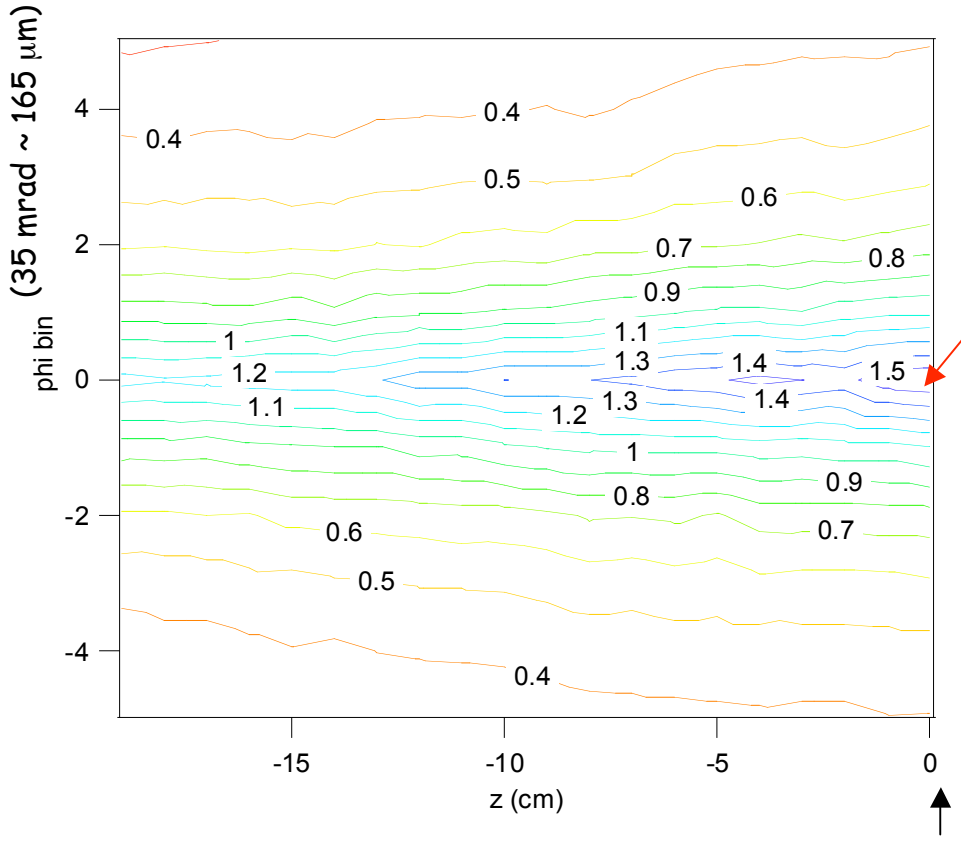
Energy deposition in SC QD0

- L. K. initiated the calculation using EGS4 and a preliminary estimate indicated x10 larger deposition (later corrected) than the quench limit.
- T. M. setup Geant3 and FLUKA for independent check.



Energy deposition in SC QD0

500 GeV Nominal



Z = 585 cm

Peak power density:

EGS4 - 1.7 mW/g
Geant3- 1.4 mW/g
FLUKA - 1.6 mW/g

Energy deposition in SC QD0

- 1 TeV Nominal 3.2 mW/g
- Long(4m) QD0 + 500 GeV Nominal
  3.8 mW/g

- Include 3 mm-thick tungsten liner inside the beampipe (2.3m QD0 + 500 GeV N.)
  - EGS4 0.06 mW/g
  - FLUKA 0.17 mW/g

Conclusions

- Energy deposition in SC QD0 from radiative Bhabha's is at least 3 times larger than the quench limit design goal.
- EGS4, Geant3 and FLUKA estimations are consistent.
- 3 mm-thick tungsten liner can reduce the power density by more than x10.