

Absorber design, layout and impedance

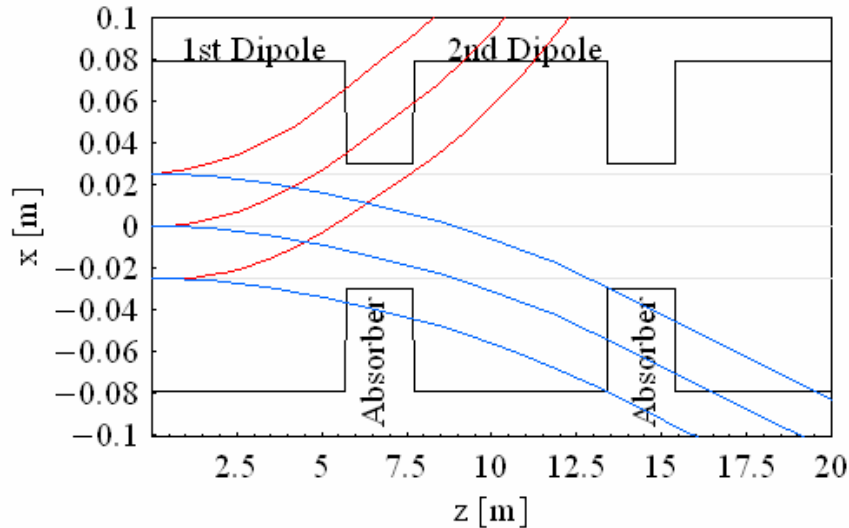
E. Wildner, CERN, AT

E. Jensen, CERN, AB

4th beta beam task meeting, CERN, 30/10/06

- Absorber Layout
- Impedance calculations
- Further work and improvements
- Conclusion

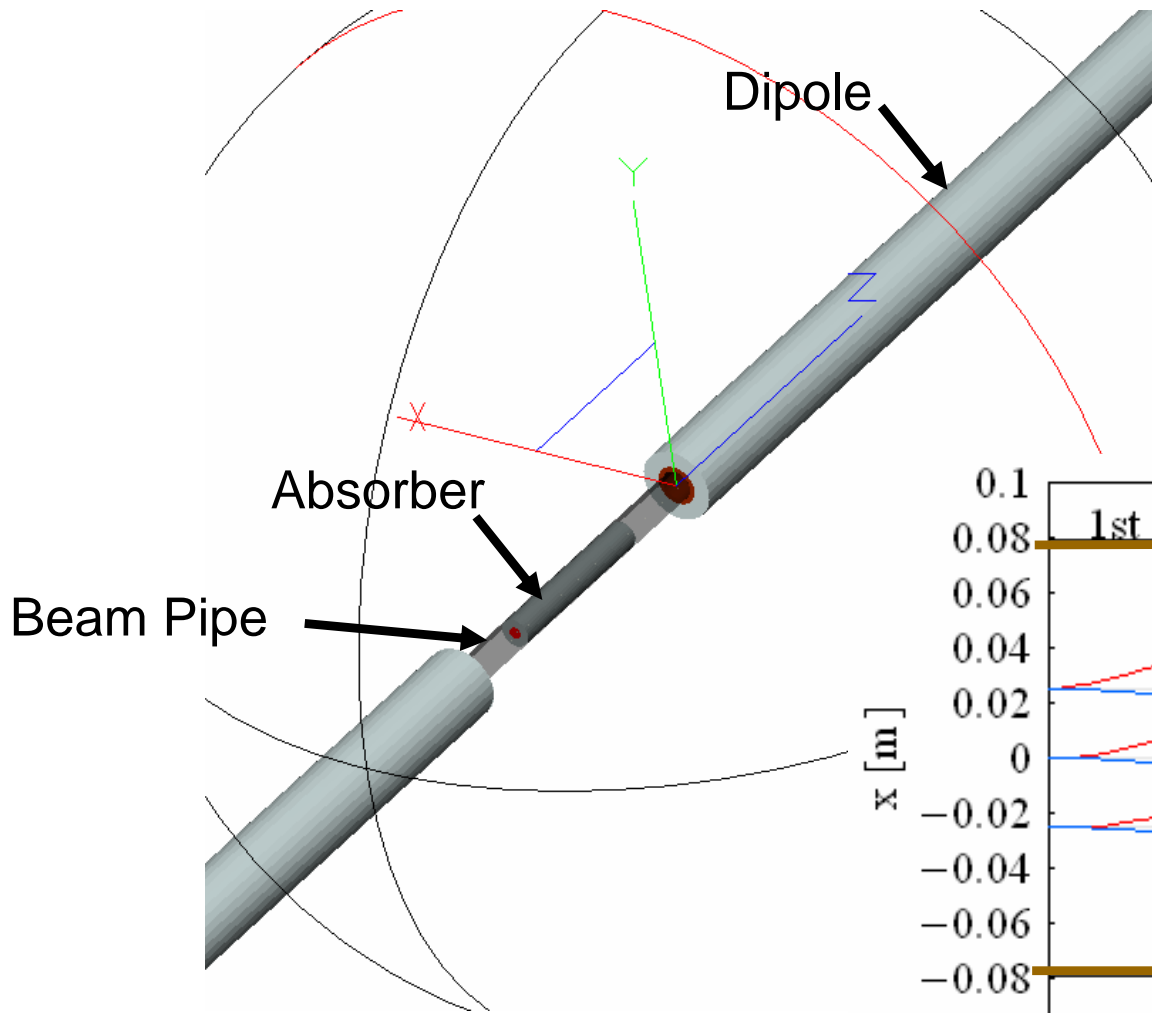
Absorbers for Heat Deposition



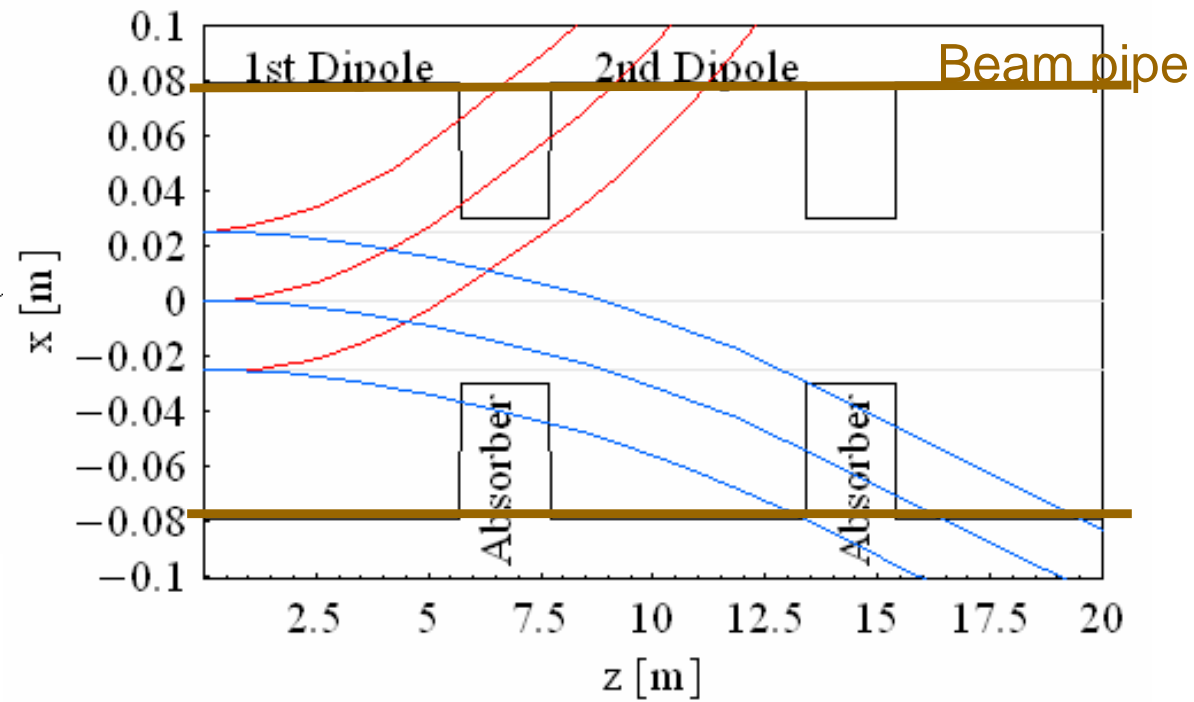
**"A. Chance J. Payet: Simulation of the Beam Losses by Decay in the Decay Ring for the Beta Beams",
28 April 2006**

- We need absorbers to intercept the decay products
- Absorber inside chamber
- Carbon, stainless steel or copper would protect coil

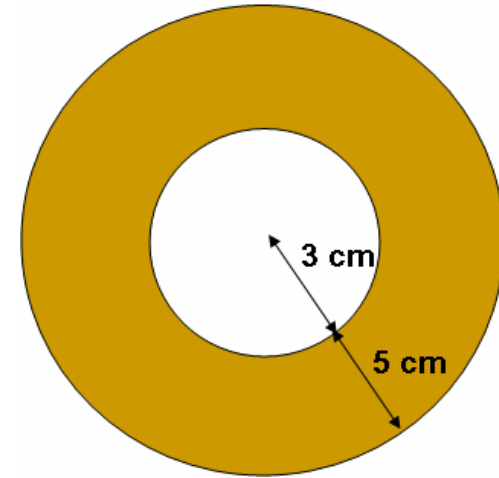
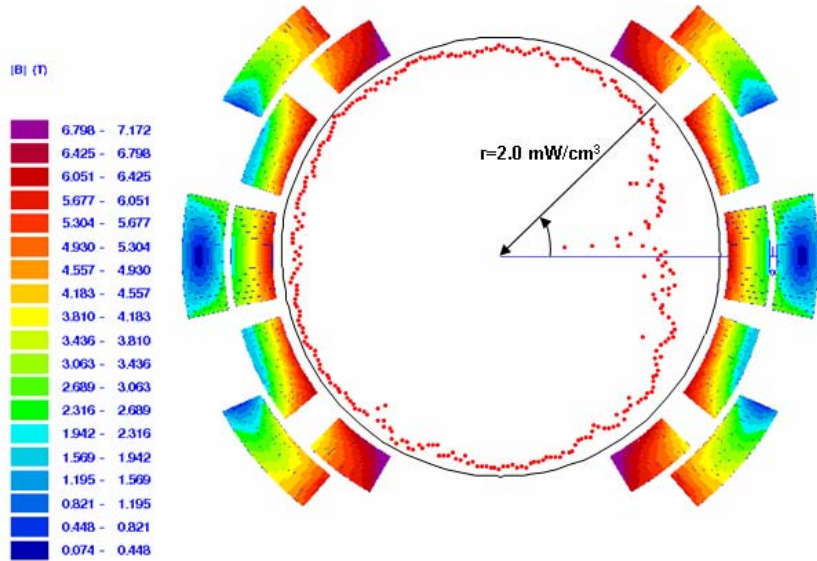
Absorber Layout



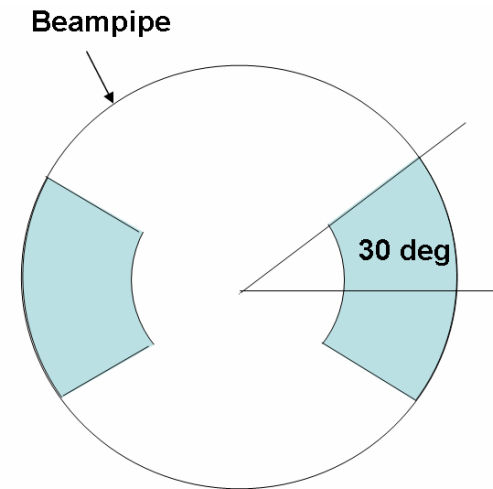
Dimensions:
Dipole 6 m
Absorber Length 2 m
Absorber thickness 5 cm



Impedance Calculations Spec



60 degrees is arbitrarily from the heat deposition.




(summing up all absorbers for the total machine)

At 1Ghz to be scaled with f^2 :

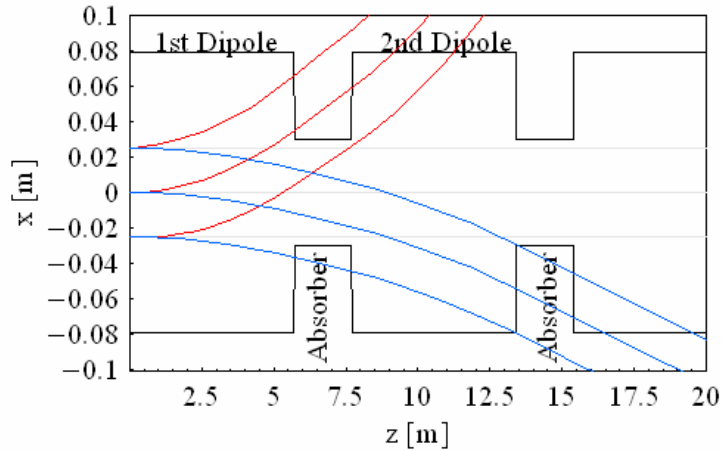
Material	Re (Ohm)	Im (Ohm)
C	217	217
Ss	54	54
Cu or Cu coated	8	8

To compare: the whole beam pipe (3 cm radius, 6.9 km) in

Aluminum: $(1+j) 374 \Omega$, in SS: $(1+j) 2.2 \text{ k}\Omega$

 Cu a safe choice

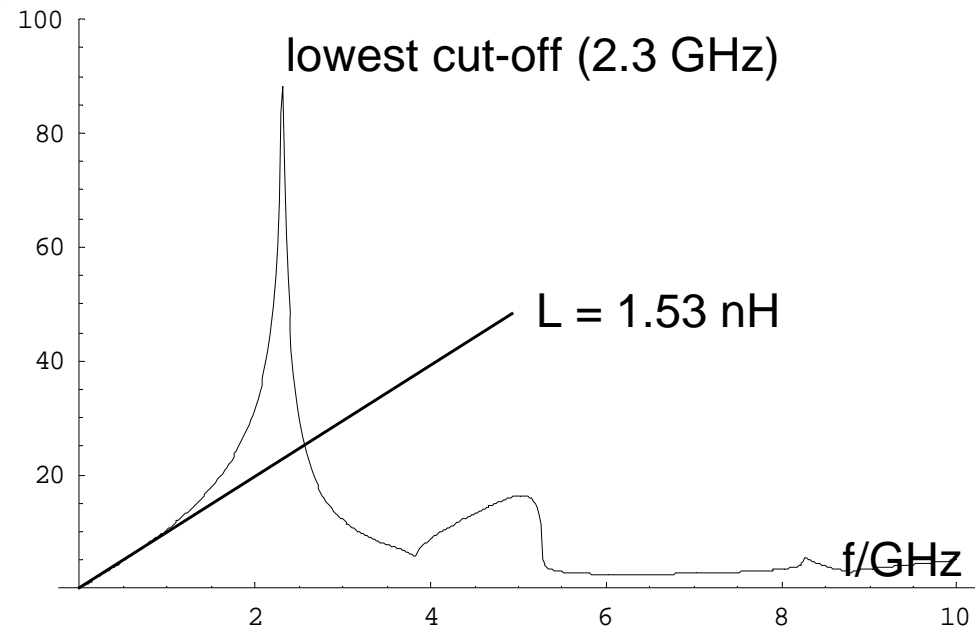
Step in beam chamber



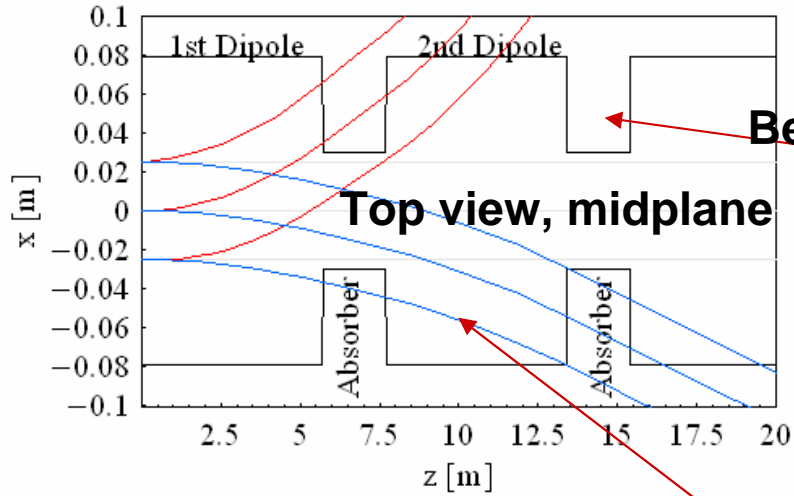
Below 2.3 GHz, a total of 340 steps (170 absorbers) would add up to 0.5 μH , which seems really high.

**Impedance of one step
(diameter 6 to 10
cm or 10 to 6 cm):**

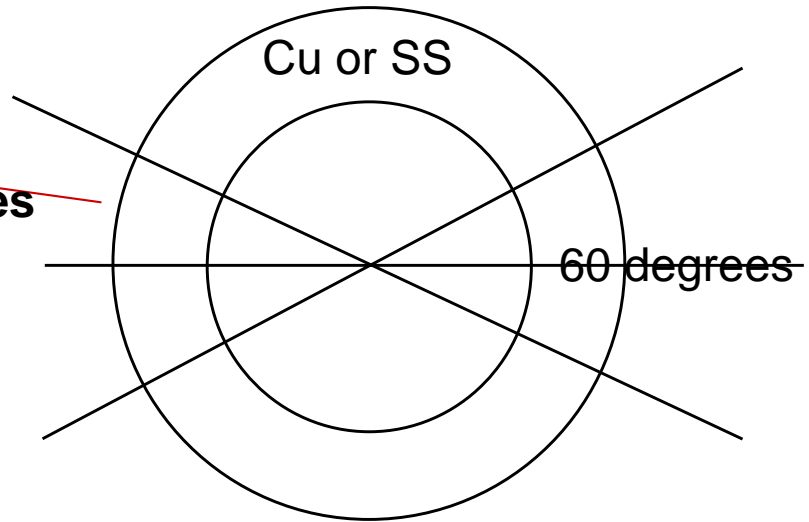
$$\text{Im}\{Z\}/\Omega$$



Possible new layout

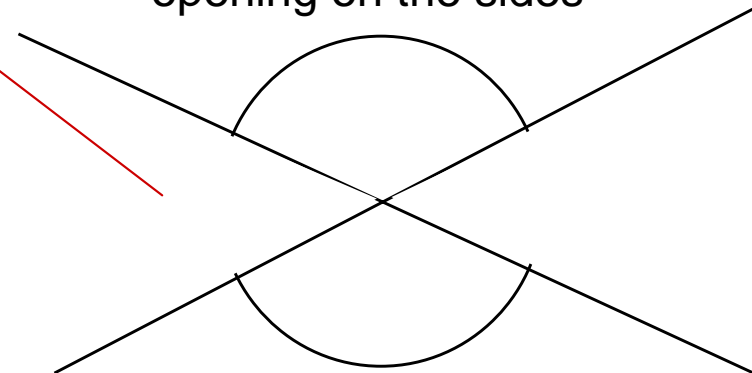
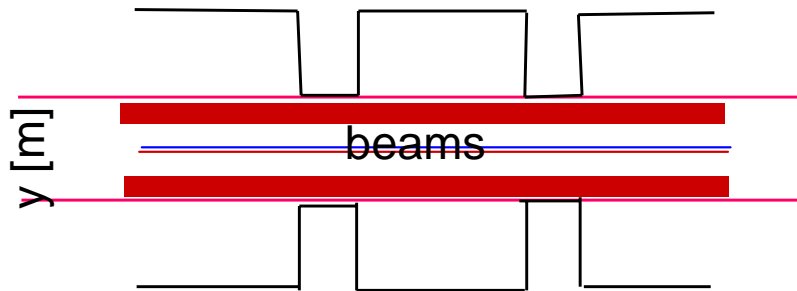


Between dipoles



In dipoles

Cu or SS sheets with 60 degrees opening on the sides



- Check the heat deposition for beam pipe inside
- Put absorber only 30 degrees around midplane and check heat deposition
- Make beam dynamics calculations with the estimated impedances.

- The steps in the beam pipe gives a considerable contribution to the impedances
- More work is needed to see if another layout can be made and also to calculate the effects on the beam.