High Frequency Beam Line Absorber

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When beam passes a cavity:

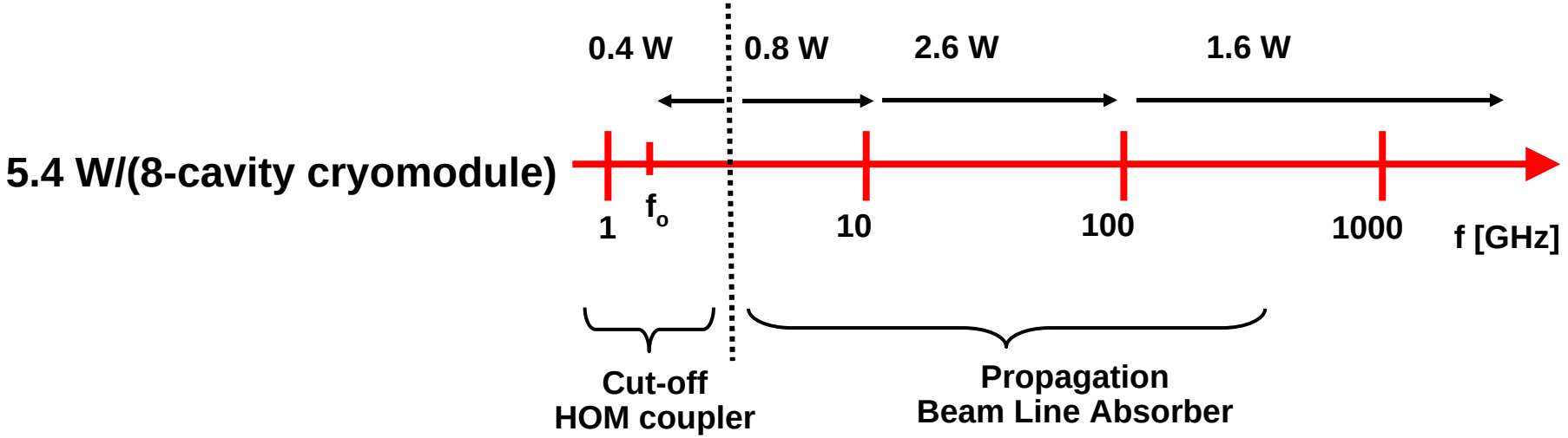
1. It gains energy from the accelerating mode
2. It loses fraction of energy to other cavity modes (Higher Order Modes)

This energy must be removed from cavities to keep good beam quality !!

How much HOM power we may expect ?

Bunch: σ_z = 25 µm (rms) @ 1 nC @ t_b = 200 ns

800 µs RF pulse repetition frequency: 10 Hz



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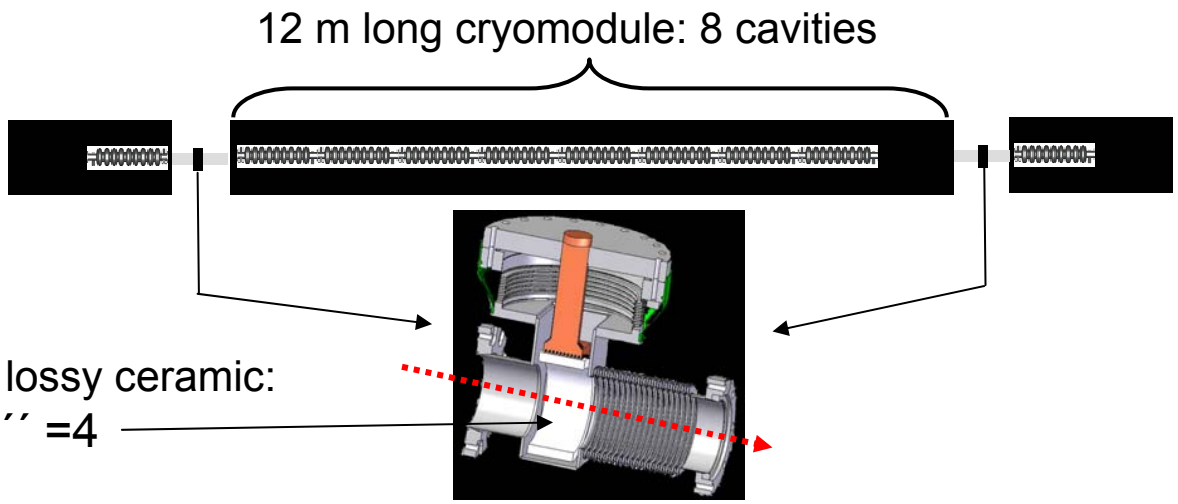

Absorbing ring made of lossy ceramic:
ε´ =15 and ε´´ =4

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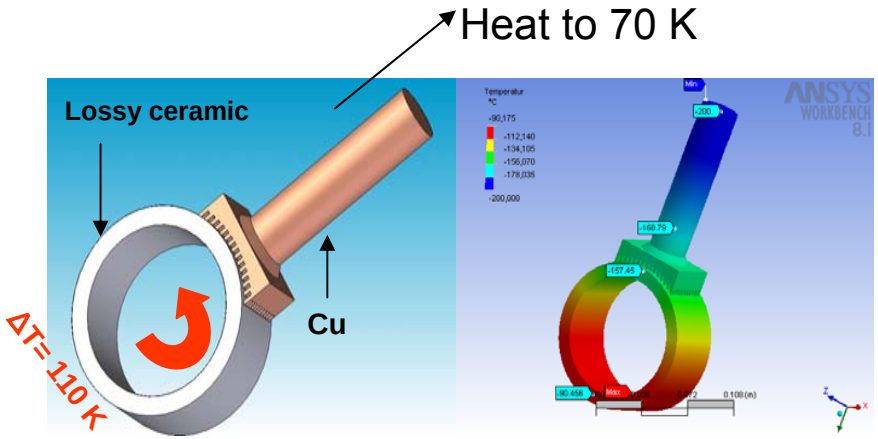
The thermal capability of the beam line absorber is 100W. For the nominal pulse operation dissipation is only 5.4 W.

Modeling:



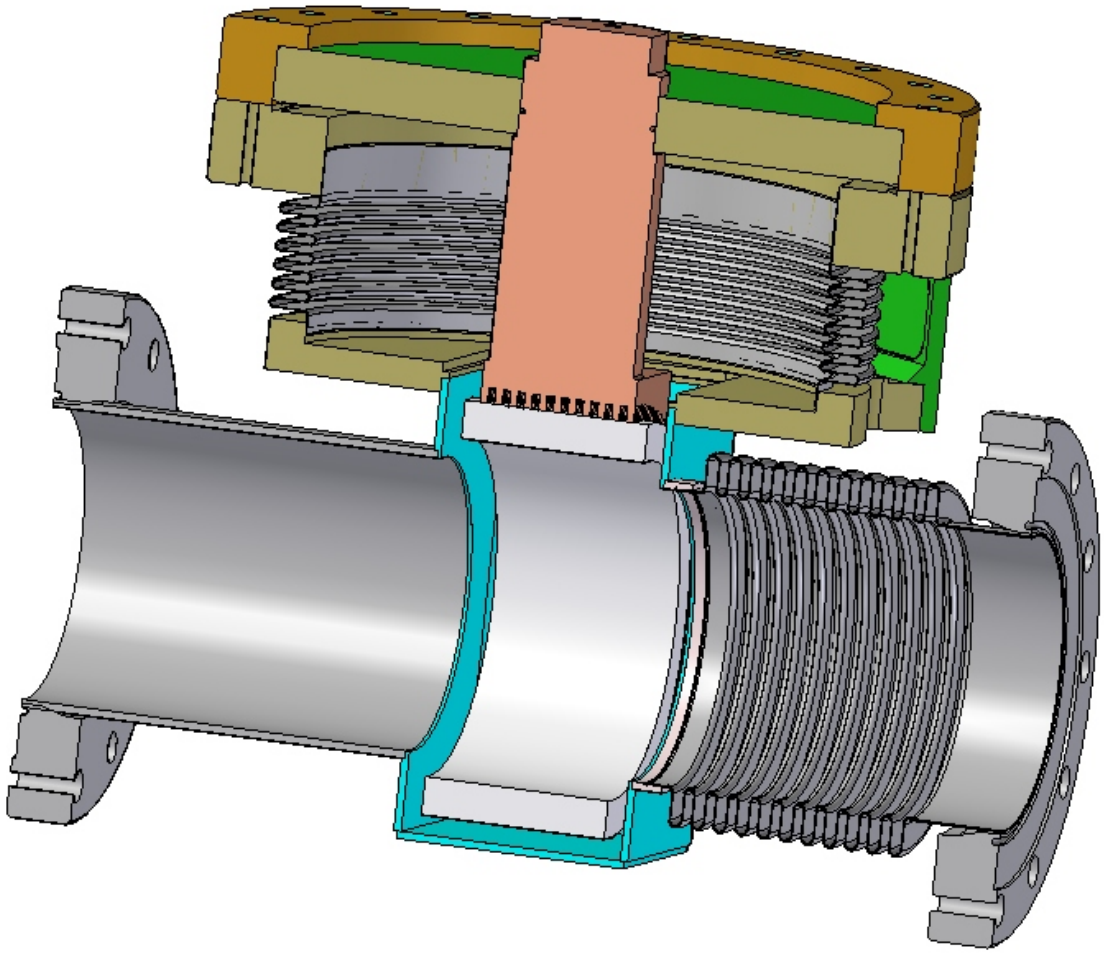
Tests:

Performed tests:

- ✓ 10 x fast cool-down to 4 K
- ✓ 110 k ΔT across the ceramic and stub
- ✓ several times cool-down to 70K

- Prototype ready in 2006
- Beam Test in TTF 2006 ?
- Expected absorption ~80%

The fabrication of the absorber is split into 2 parts:

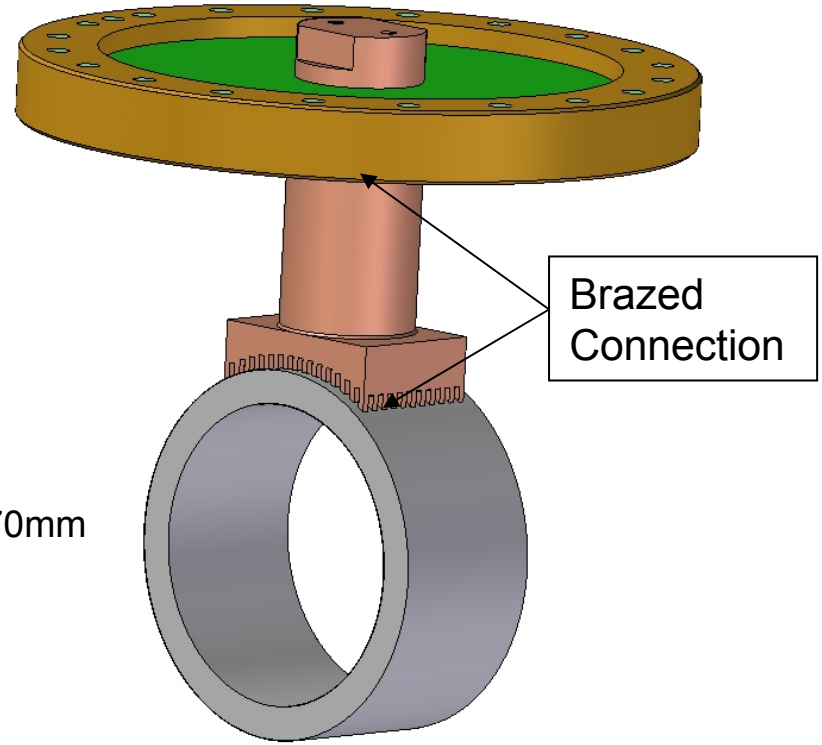


1.Part: Absorber Unit

CF 160 Flange

Copper Stamp

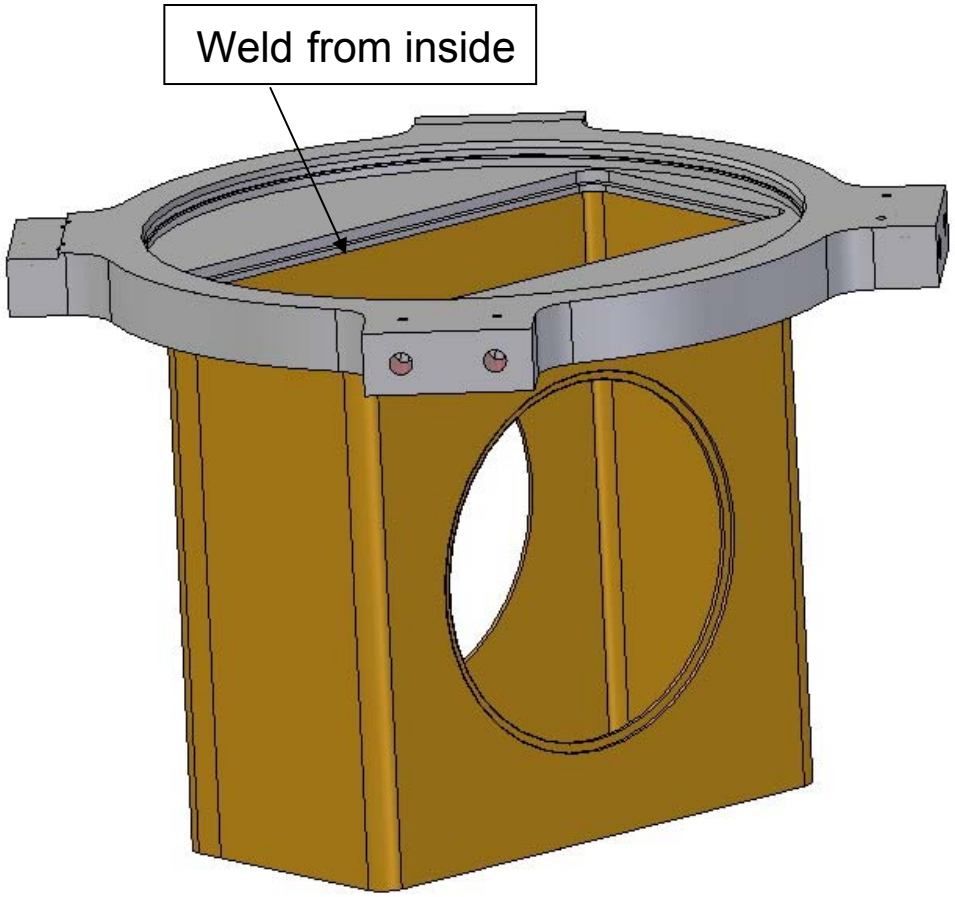
Ceramic Ø = 90mm; length = 70mm
thickness = 10 mm



2. Part: Vacuum chamber

First step:

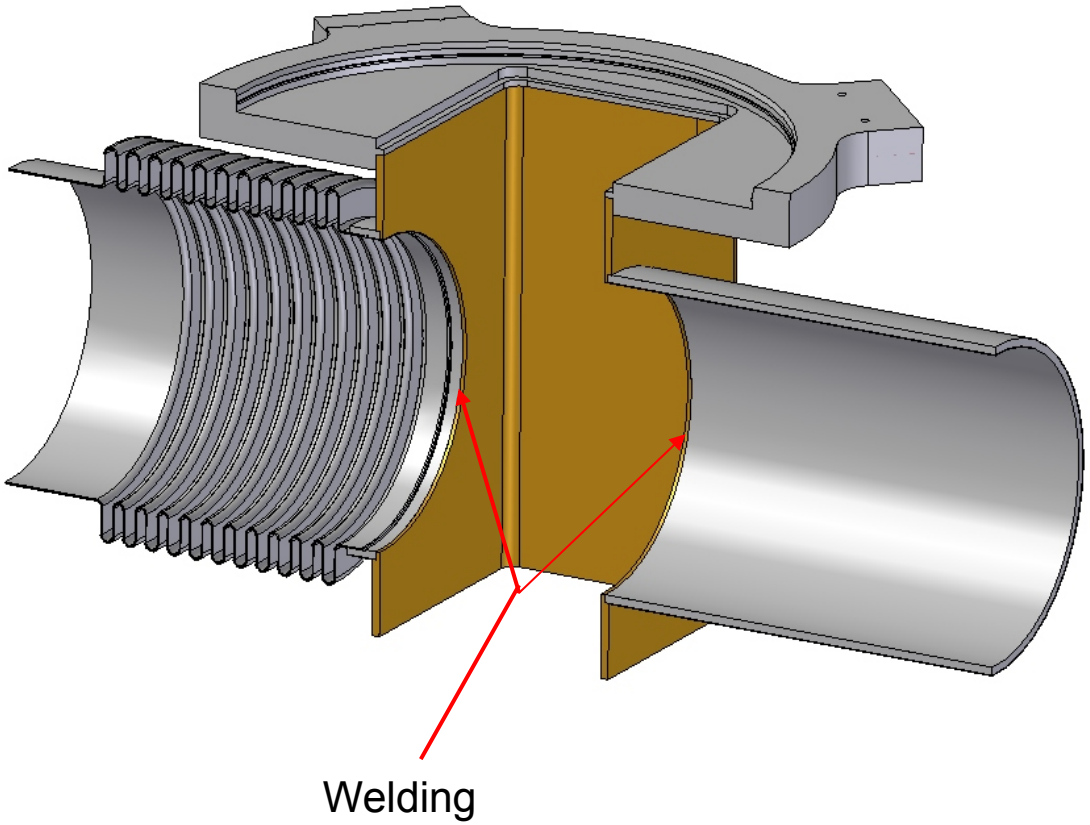
- Manufacturing of the rectangular metal body without the big bore
- Manufacturing of the top plate
- Welding of the metal body into the top plate.
- Drilling of the big bore for beam tube.



Fabrication

Second step:

Inside welding of the bellows
and the tube (Ø 78mm)
into the chamber!

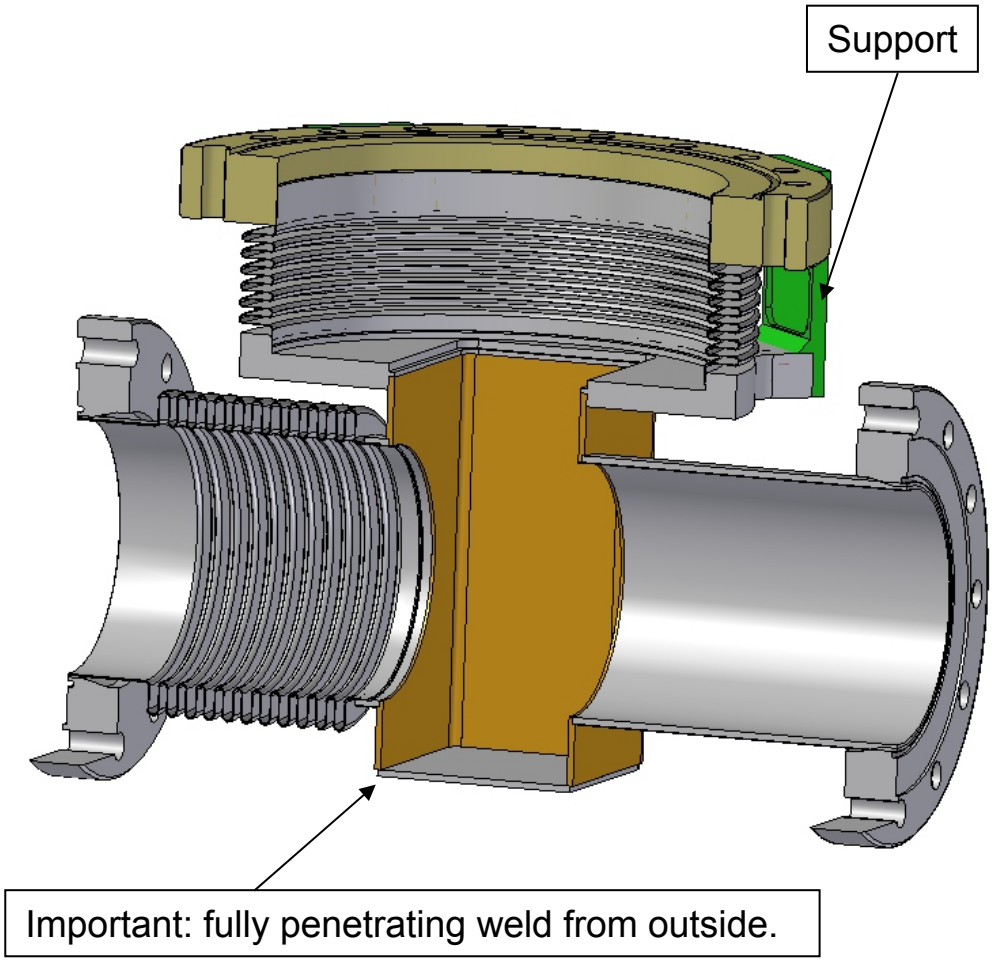


Fabrication

Last Steps:

- Welding of the beam flanges
- Inside welding of the insulating bellows into top flange and top plate
- Assembling of the support
- Outside welding of the ground plate

After mechanical manufacturing the beam chamber must be copper coated (thickness 12 µm)



Fabrication

General Information:

Number of pieces	120 + Reserve
Materials vacuum chamber:	All chamber parts SS 1.4404 or 1.4435 All flanges 1.4429 Copper stamp 2.0070 (OFHC)
Ceramic:	Zr10CB5 (Ceradyne)
Tolerances:	Center ceramic ring to center beam tube ± 1,00 mm