The Cut Disk Structure Parameters

for Medium Proton Energy Range.

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Poster THP059

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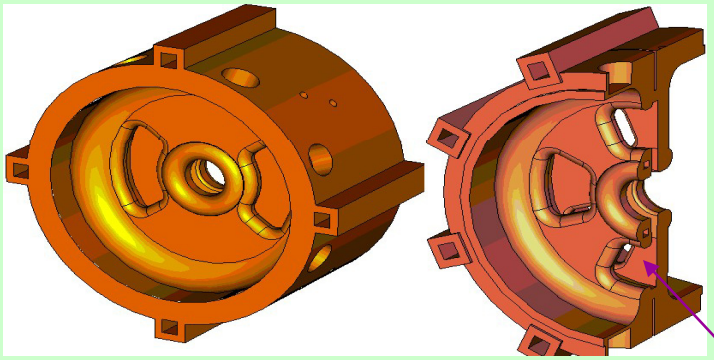
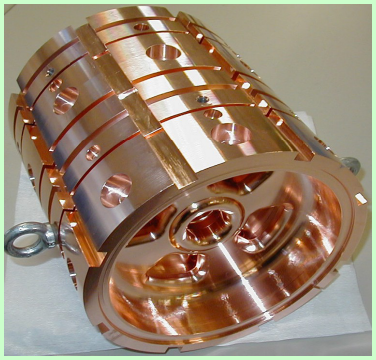
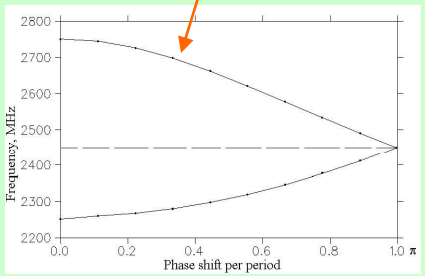
Originally, the Cut Disk Structure – CDS, was proposed for high energy (β~1) linac , L-band or S-band frequency.
CDS realize a concept – magnetic field of coupling mode has no own space and penetrates into accelerating cell.
Advantages – high coupling (~0.20), high Ze, small diameter. Further development – CDS2W into CDS4W.

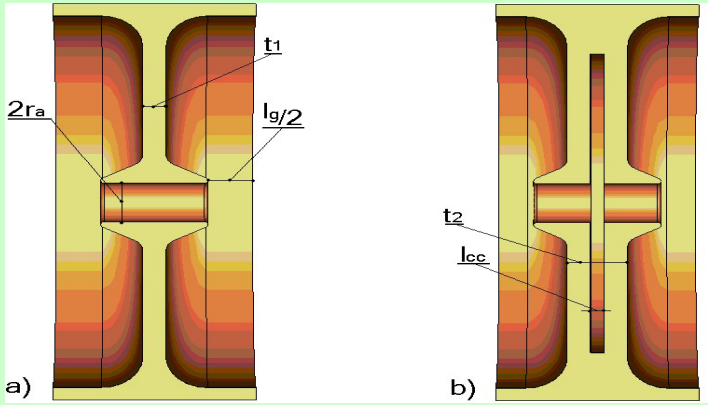






For low β~0.4 loses in Ze due to thick septum.

$$Z_e \sim \sqrt{f}$$

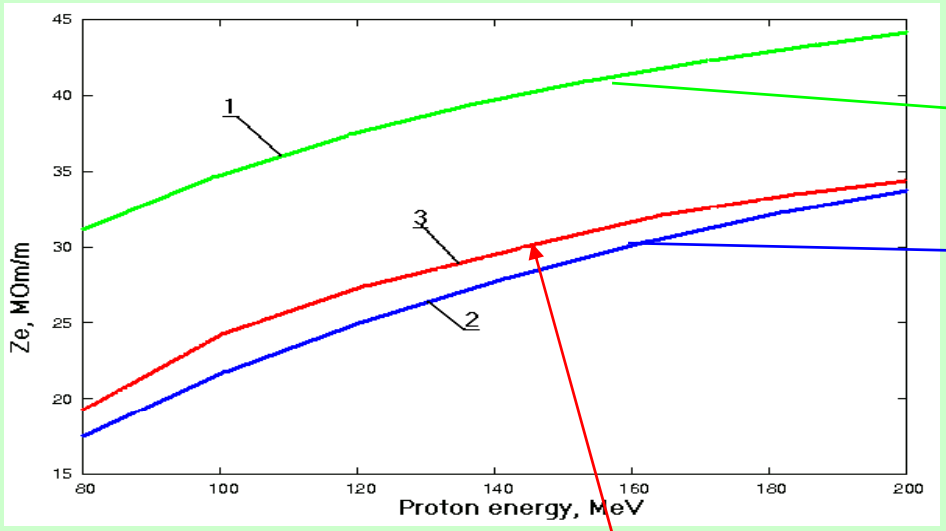


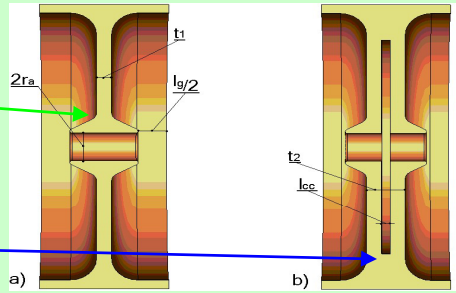
Well known relation, but it assumes scaling of all dimensions. Aperture radius Ra and septum thickness t should not be scaled directly.

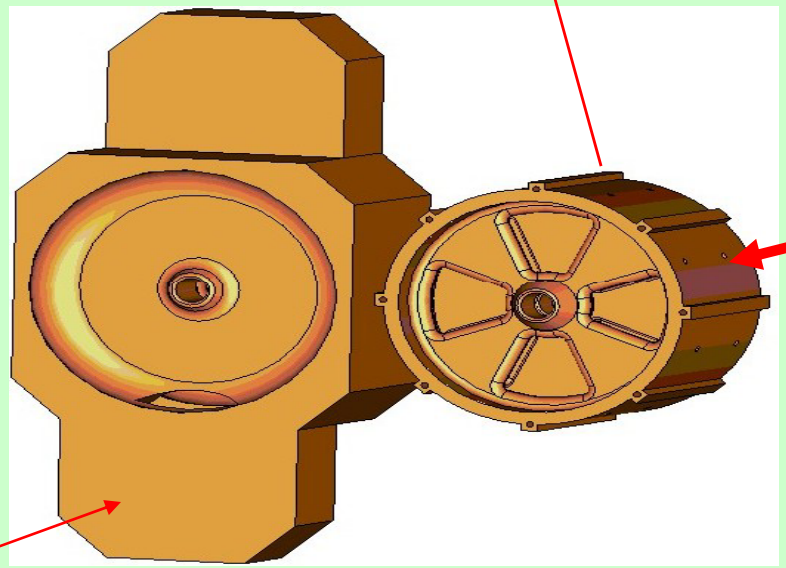
Ra/λ and t/λ decreases with frequency decreasing.

Operating frequency < 700 MHz.
Proton energy range 80 MeV – 200 MeV.

Medium frequency ~ 700 MHz.







Coupling ~0.14-0.12

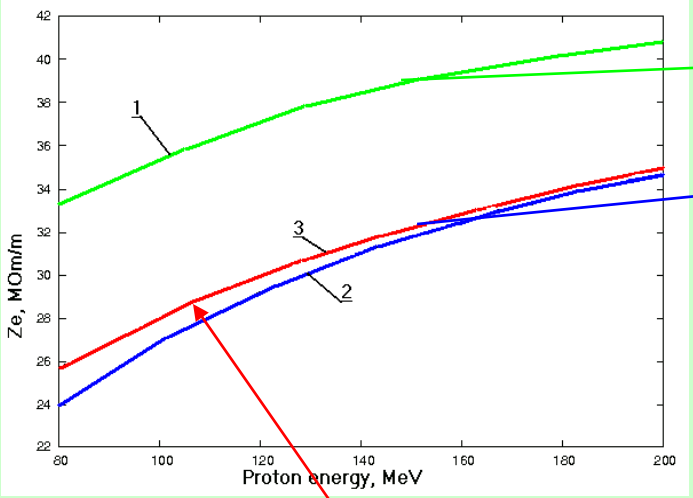
Inner diameter ~ 310 mm

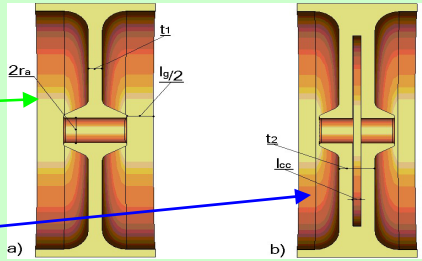
Ze ~ (19 – 34) MOm/m,

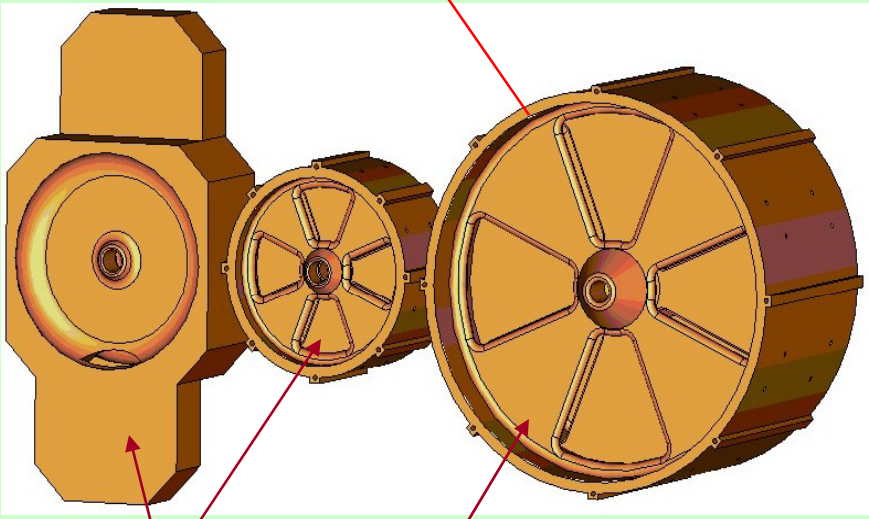
still 10% lower as for SCS.

SCS coupling 0.03

Low frequency ~ 350 MHz







Coupling ~0.13

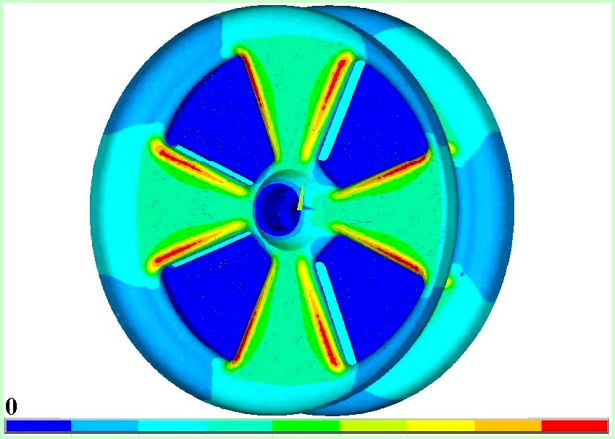
Inner diameter ~ 590 mm

Ze ~ (26 – 35) MOm/m,

compare with ?

700 MHz **350 MHz**

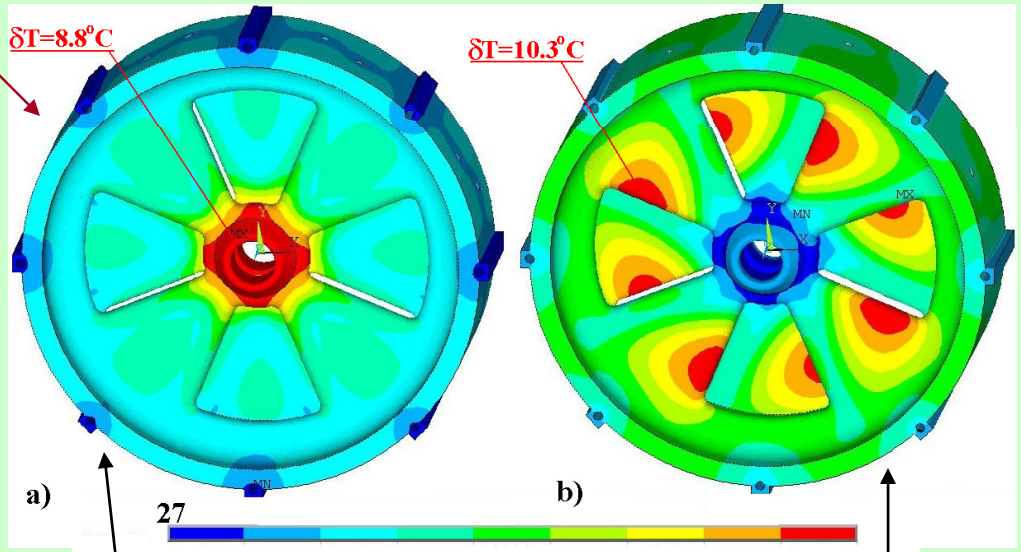
Cooling

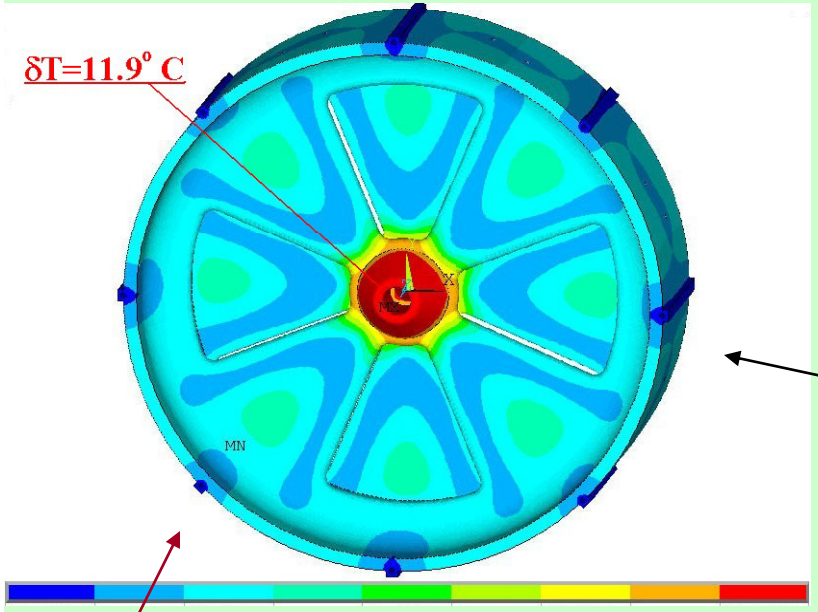


RF loss distribution

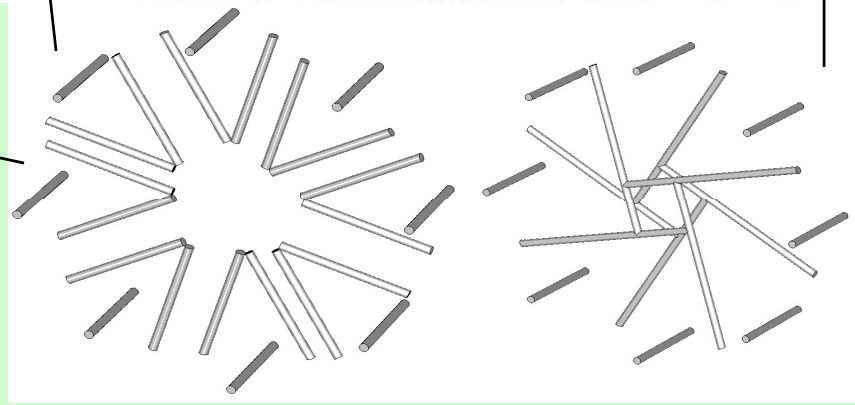
700 MHz

Eo=4 MV/m, duty factor 4%.





350 MHz



Cooling channels

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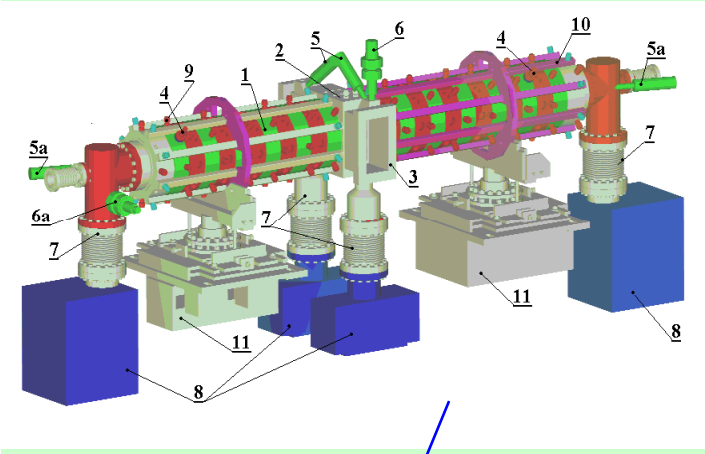
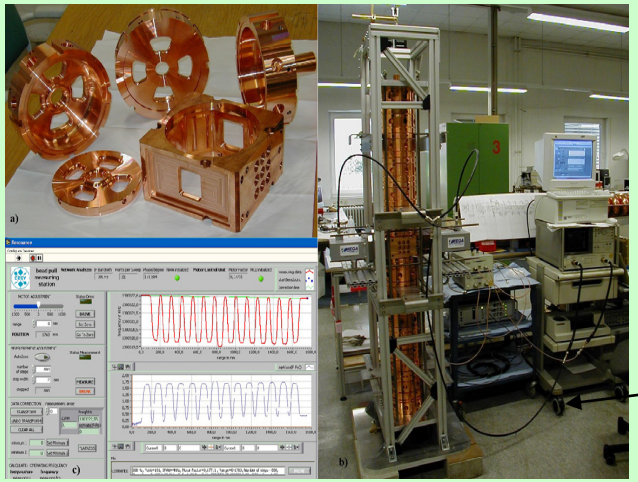
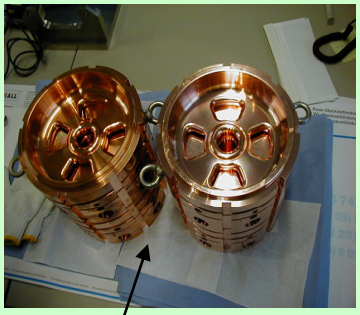
BESSY RF Gun,

F. Marhauser, EPAC06, p.68

Nearest high RF power test – PITZ booster cavity.



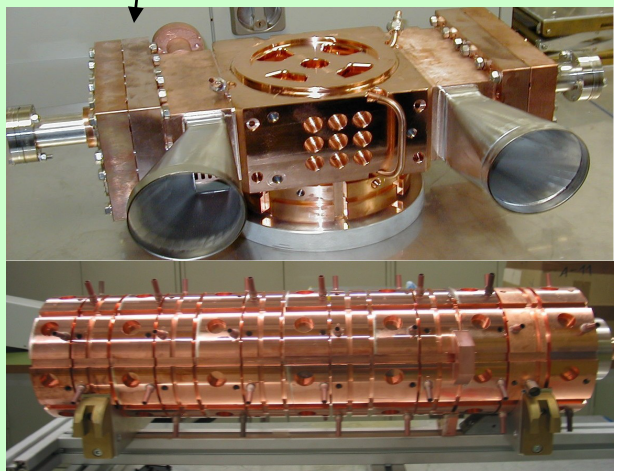




brazing test
low RF level tuning
intermediate brazing

Design parameters

Operating frequency	**- 1300 MHz,**
RF pulse length	**- up to 900 μs,**
RF pulse input power	**- up to 8.6 MW,**
Repetition rate	**- up to 5Hz,**
Accelerating gradient	**-up to 14 MV/m**
Energy gain	**- 22.8 MeV**



Conclusion.

Application at operating frequency ~ 700 MHz and lower smoothes CDS disadvantage in medium $\beta \sim 0.4$ range – the lower Ze value due to thick septum.

CDS advantages – the high coupling coefficient value, small transverse dimensions, come in front in escort of competitive Ze value.

At operating frequency 352 MHz there are no competitors inside $\pi/2$ group.

Only π–mode structures can be considered.

. But π-mode is π-mode!

Welcome to poster THP059!