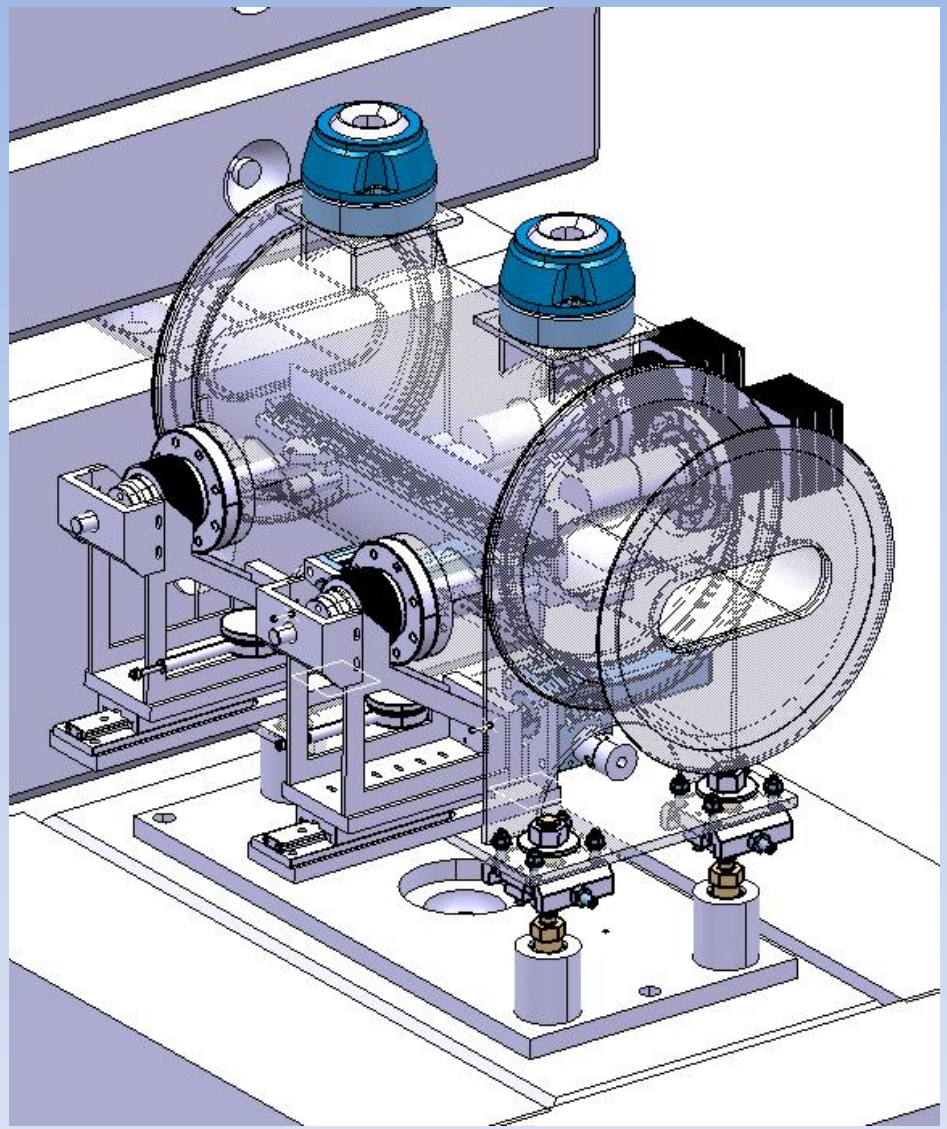
Proposal of a dummy septum to mitigate ring irradiation for the CERN PS Multi-Turn Extraction

Current Proposal

The new dummy septum, 40 cm long, 3.88 cm high and 3 mm thick blade inside the beam tube.
Tungsten

The wall thickness of the vacuum chamber is 3 mm, and the material is stainless steel 316 LN.



Current Proposition (Mike)

Diameter 262/256mm (Wall thickness 3 mm)

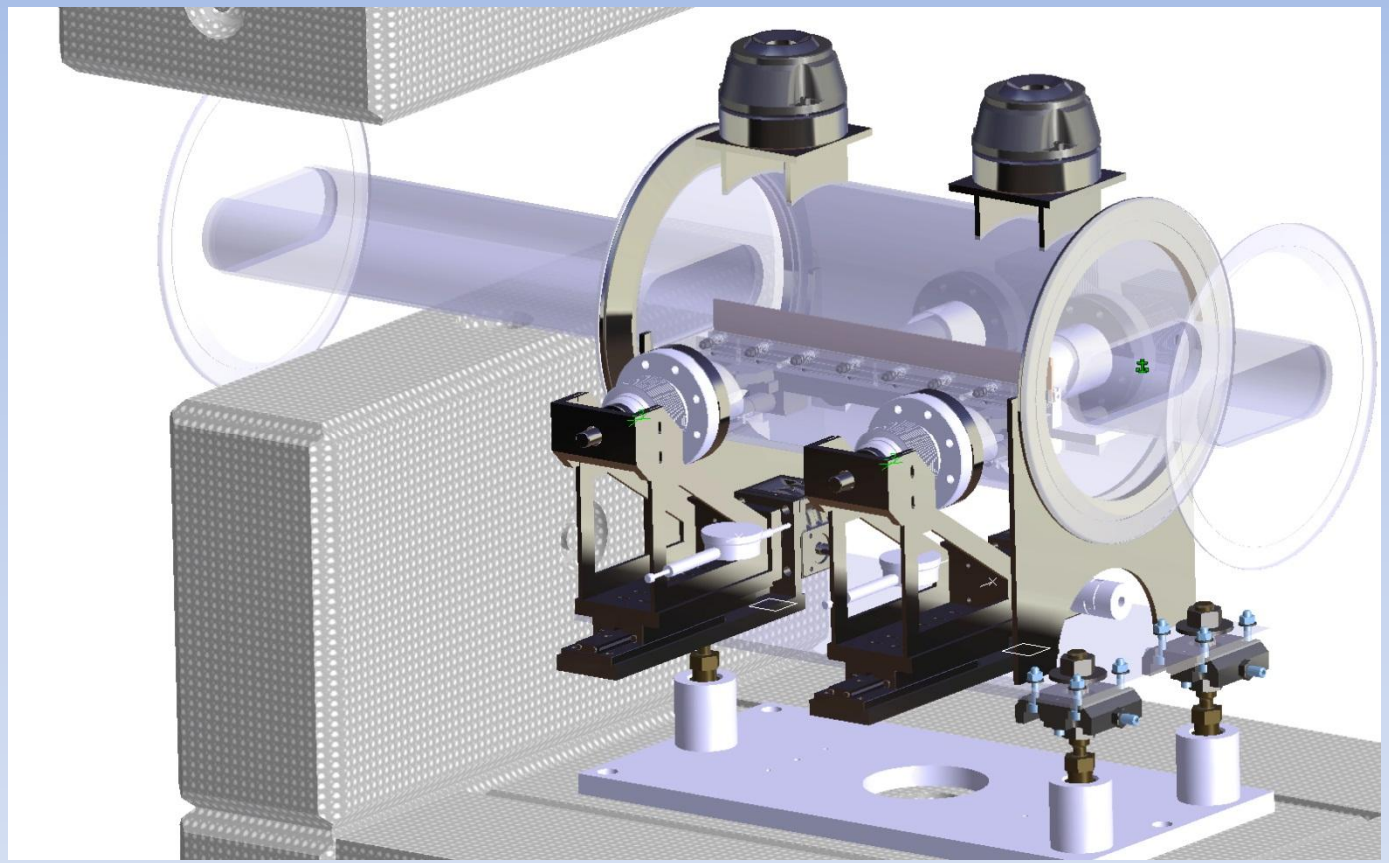
Available length for complete assembly 1040mm ?

All flanges are OD 332 mm and allow for 273mm diameter open aperture

Vacuum Chambers

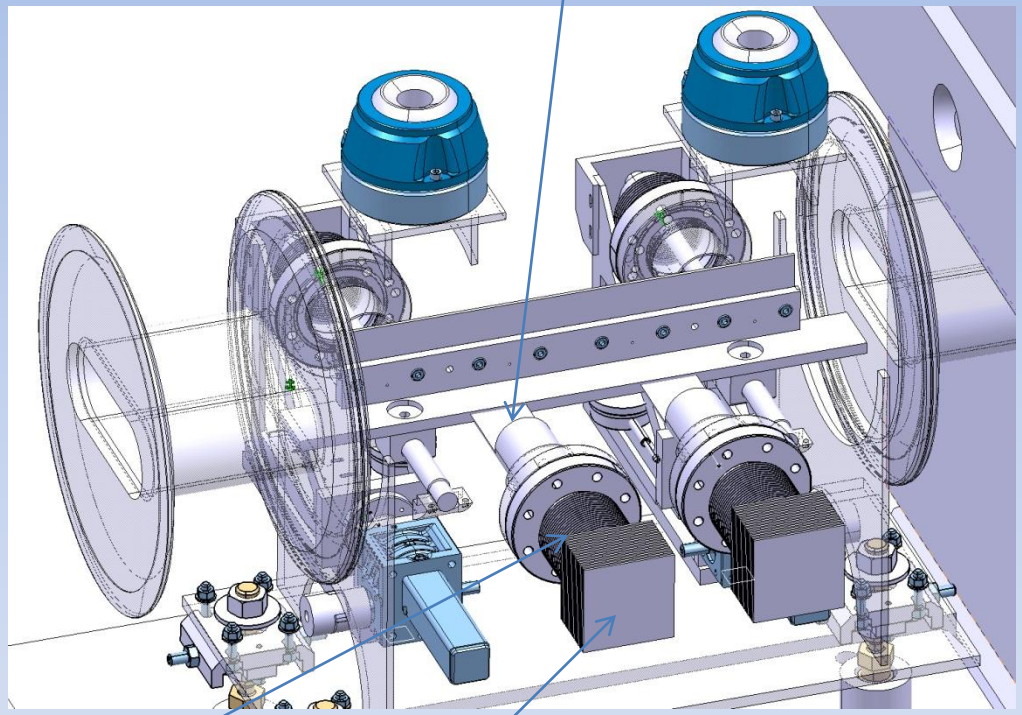
Upstream and downstream chambers have similar cross sections but can be optimised for beam impedance.

This allows for access to the vessel for installation and also allows for installation of more substantial shielding on downstream side.



Cooling

A novel method of cooling the blade is to use a pair of Heat pipes. To evacuate the heat whilst assuring the vacuum integrity, the heat pipes can be fitted to heat conduction tubes on the air side and vacuum bellows will form the separation between air and vacuum.

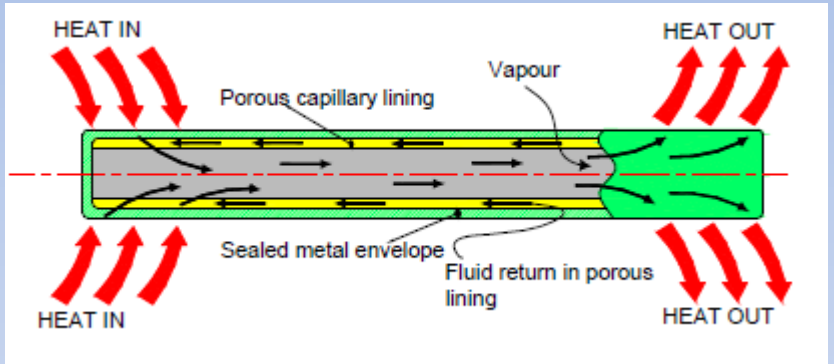


Cooling Proposition-Heat Pipe

OK so what is a heat pipe ?

How does a Heat-pipe work ?

The diagram opposite shows a sectioned heat-pipe metallic enclosure with the capillary action porous lining. Operating on the principle of latent heat of vaporisation a heat-pipe utilises a working fluid operating in an otherwise completely evacuated and sealed enclosure. In effect the fluid exists within the vessel as a saturated vapour. When heat is applied to any point along the external surface, the fluid inside the heat-pipe evaporates and then condenses again at any other point which is at a fractionally lower temperature. In doing so, the latent heat capacity of the working fluid is utilised to effect a very efficient energy transfer. The passive operation of heat-pipes requires no external motive power except that of the applied temperature differential "ΔT" of the thermal loading. Having no moving parts, they are silent in operation and extremely reliable. Heat-pipes produced by CRS Engineering are manufactured to exacting standards for superb conductive performance properties.Integrated heat-pipe assemblies incorporating cooling fins, thermal input and heat sink pads are built as modular units which have minimal thermal system resistance and are convenient to install.

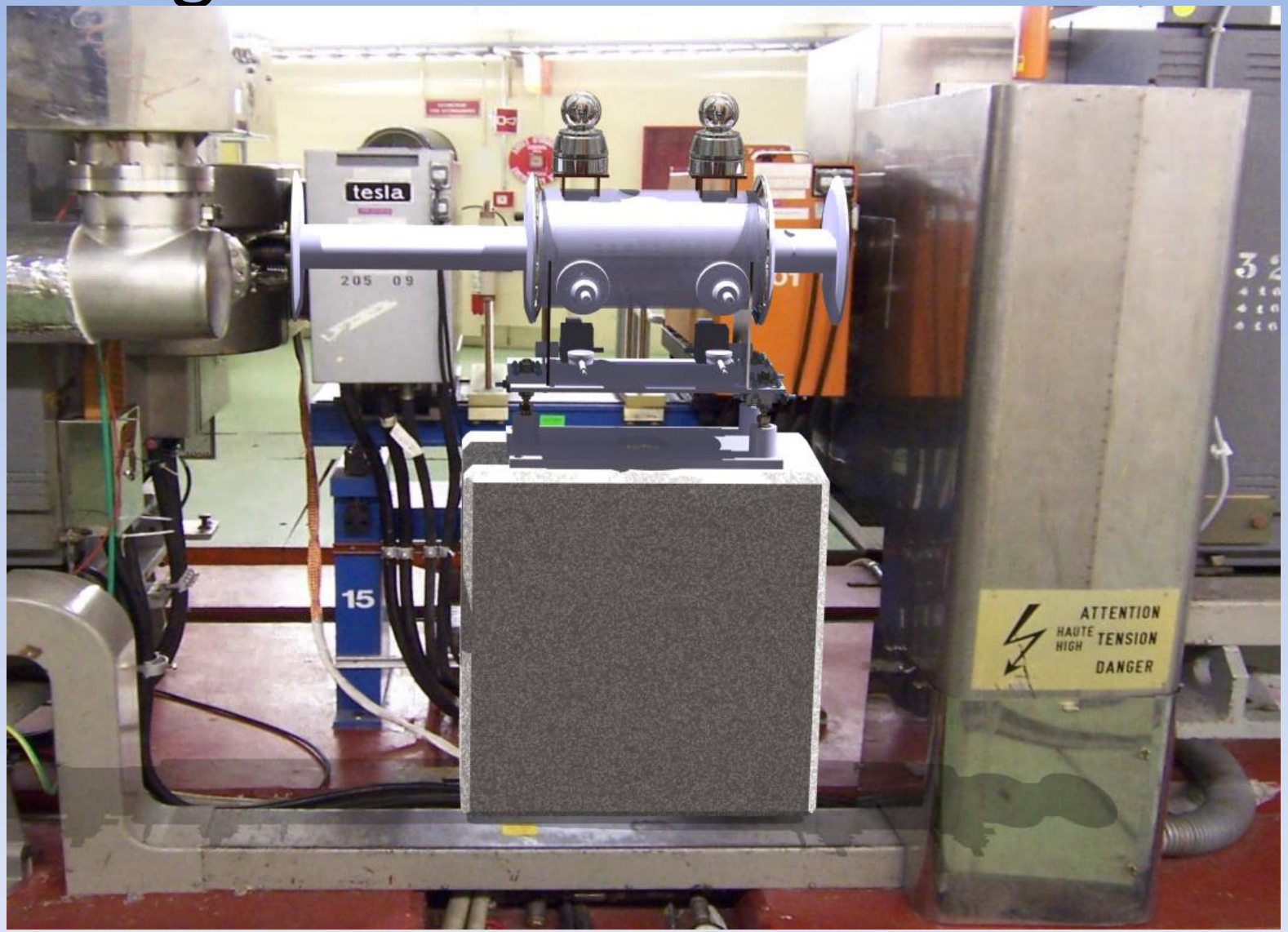


Diameter (+ 0.0 / -0.1mm)	Length (+ 0.0 / -0.5 mm)											
	50	60	70	80	100	125	150	175	200	250	300	350
2.0	★	★	★	★	★	★						
2.5	★	★	★	★	★	★						
3.0	★	★	★	★	★	★	★	★				
4.0	★	★	★	★	★	★	★	★	★			
5.0	★	★	★	★	★	★	★	★	★			
6.0		★	★	★	★	★	★	★	★	★		
8.0					★	★	★	★	★	★		
10.0							★	★	★	★	★	★
12.0							★	★	★	★	★	★

CRS- 5000 Series	Maximum Power Handling Capability (Watts)				
	@ +20° C	@ +40° C	@ +60° C	@ +80° C	@ +120° C
2.0	9.0	11.0	12.0	13.0	14.0
2.5	12.5	16.0	17.5	19.5	21.5
3.0	16.0	23.5	24.5	26.5	29.0
4.0	22.0	27.5	30.5	32.0	37.0
5.0	50.0	58.0	63.0	65.0	68.0
6.0	72.0	86.0	93.0	98.0	108.0
8.0	90.0	108.0	115.0	122.0	134.0
10.0	112.0	134.0	143.0	152.0	169.0
12.0	148.0	178.0	186.0	197.0	218.0

The type and size of the heat pipe can be selected from a series of “off the shelf” standard pipes.

“…integration in section 15”



Summary

Blade Material- Tungsten

3 separate chamber sections-allows for access,

Cooling by Heat Pipe?

Standard Shielding

Increased displacement required ?

Questions ??