Status and developments of the dummy septum TPS15 for the CERN PS Multi-Turn Extraction

Beam Observation Discussions

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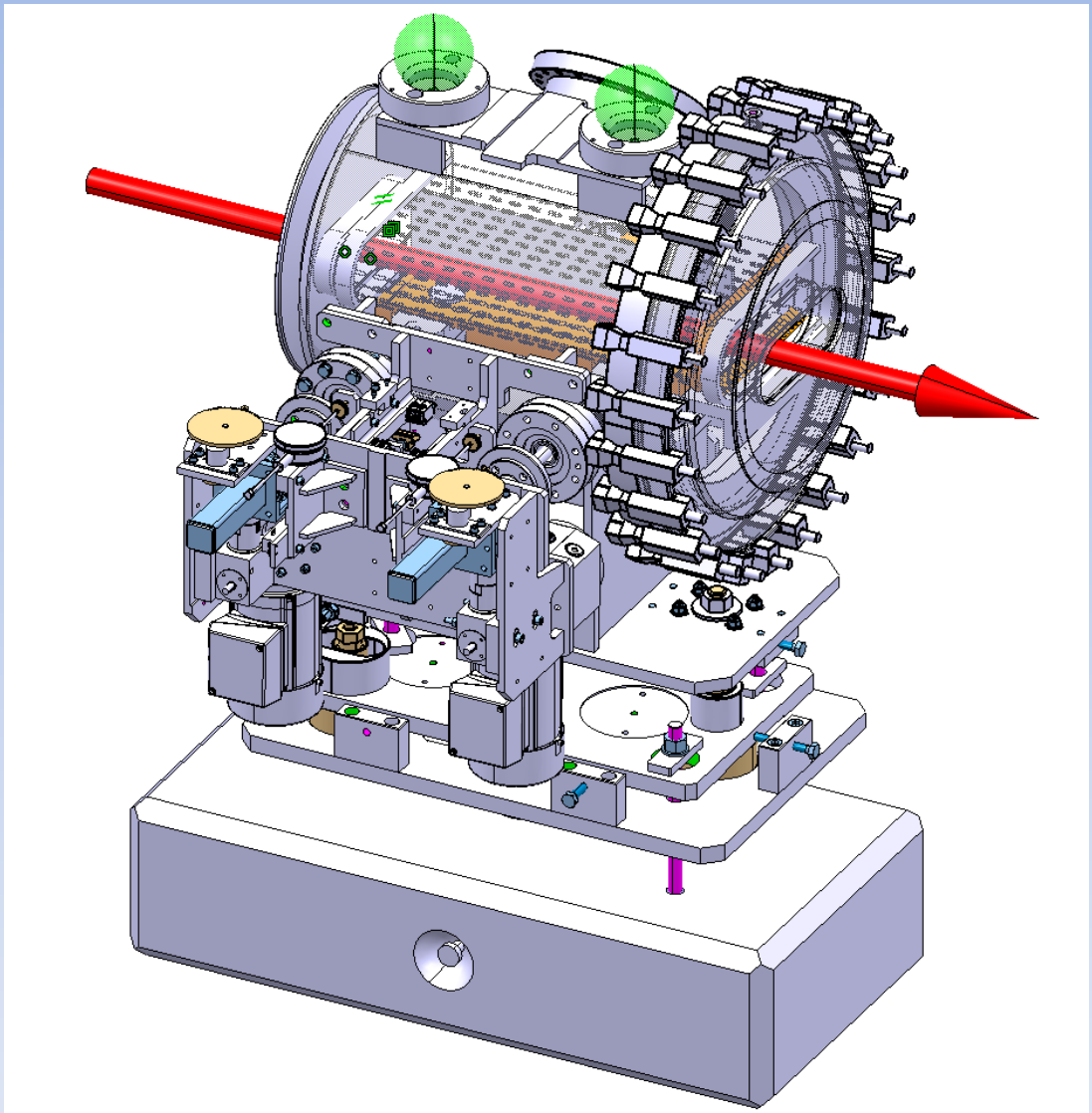
Project description

- ....High-activation of the extraction magnetic septum of the CERN PS machine was observed due to the losses of the continuous beam extracted via the Multi-Turn Extraction (MTE) method. The resulting activation is however incompatible with safe operation so a mitigation measure had to be found : the installation of a dummy septum to shield the actual one seems to provide the required reduction in activation in the extraction area. The dummy septum should, in fact, absorb the particles during the rise time of the MTE extraction kickers, reducing the impacts on the thick blade of the magnetic extraction septum. The principle of the proposed modifications of the PS layout will be presented together with the studies aimed at finalising the new configuration.

General Assembly



The complete assembly shall be installed on 3 pre adjusted sockets which have been aligned using surveyors.

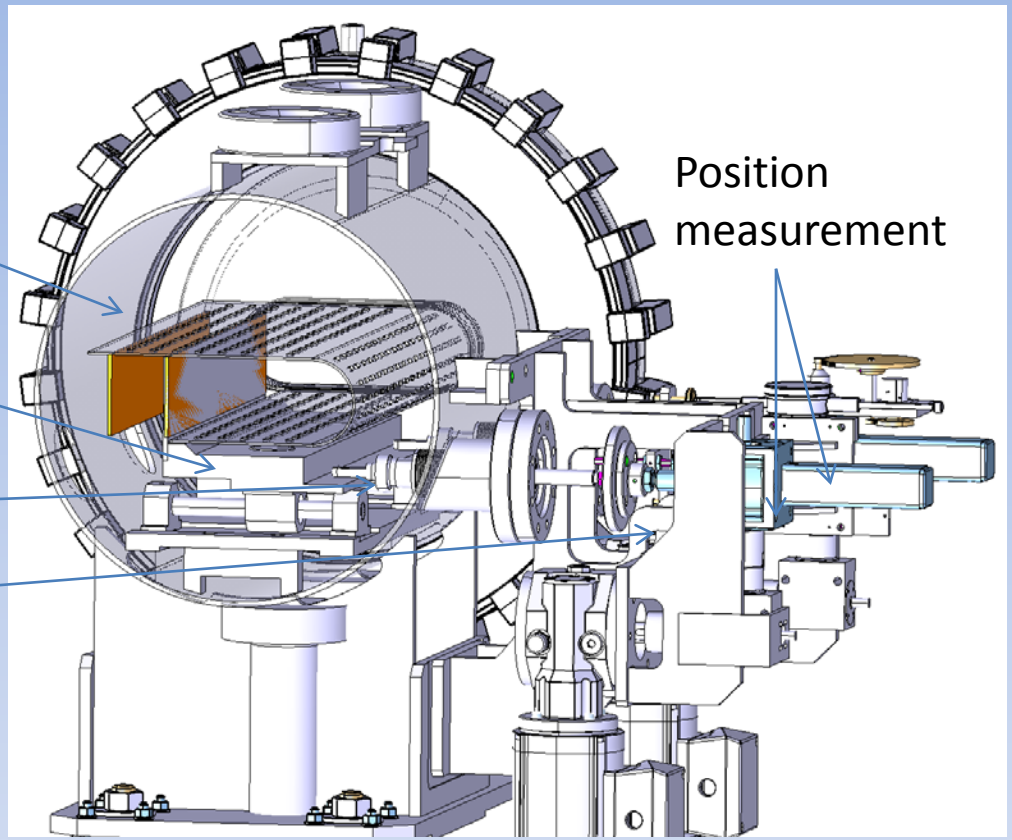
Detail of Assembly

Impedance screen to be studied

Copper Base (heat sink)

Internal bellows

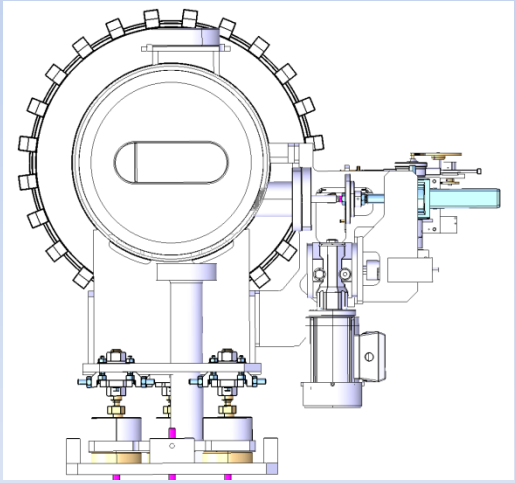
Drive system

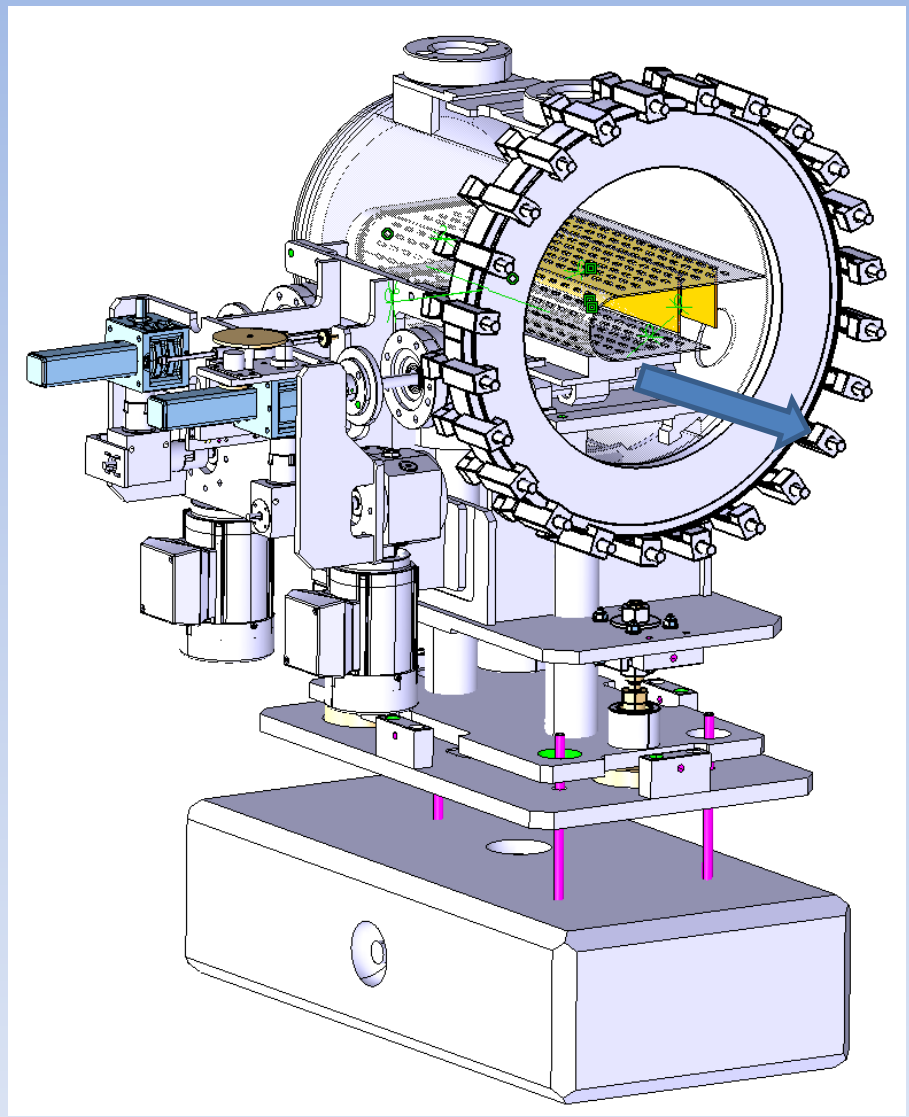


The new dummy septum, 40 cm long, 7 cm high and 4.2 mm thick blade inside the beam tube. Blade material Copper with conductive cooling to external heat sink. The wall thickness of the vacuum chamber is 4.8 mm, and the material is stainless steel 304L. Main tank length 574mm and downstream chamber of 470mm which in total is 1044 mm for the complete assembly. (2mm allowed for vacuum joints)

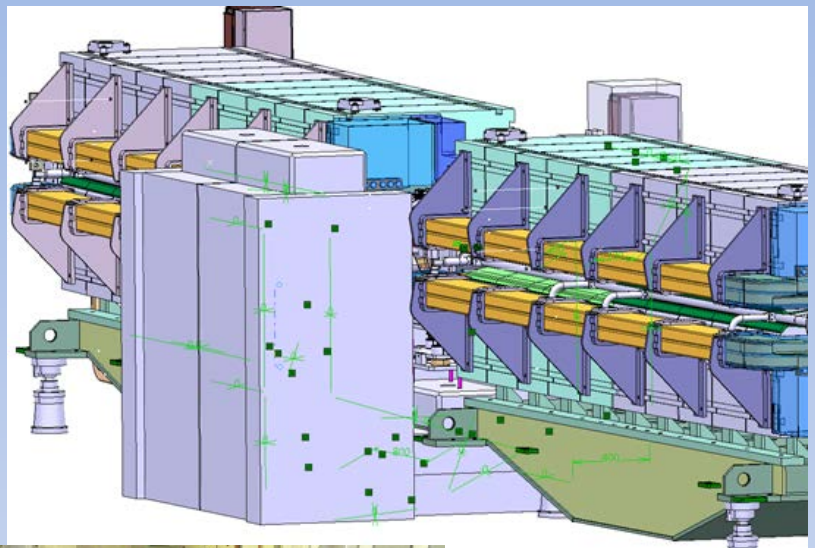
Tank Design

Tank dimensions have been fixed.
Downstream end of tank has full size demountable cover and upstream end is sealed.
All active mechanisms are on inside of ring (Less radiation)
Motors, drive system, position measurement and interlock switches have been determined.
Standard rotary potentiometers and precision linear potentiometers have been included.

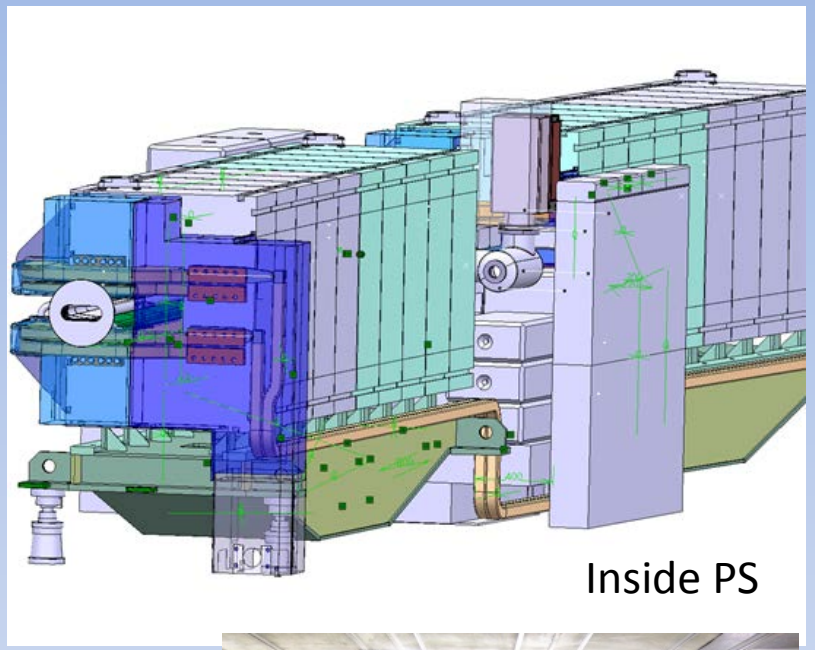




Integration & Shielding SS15



Outside PS



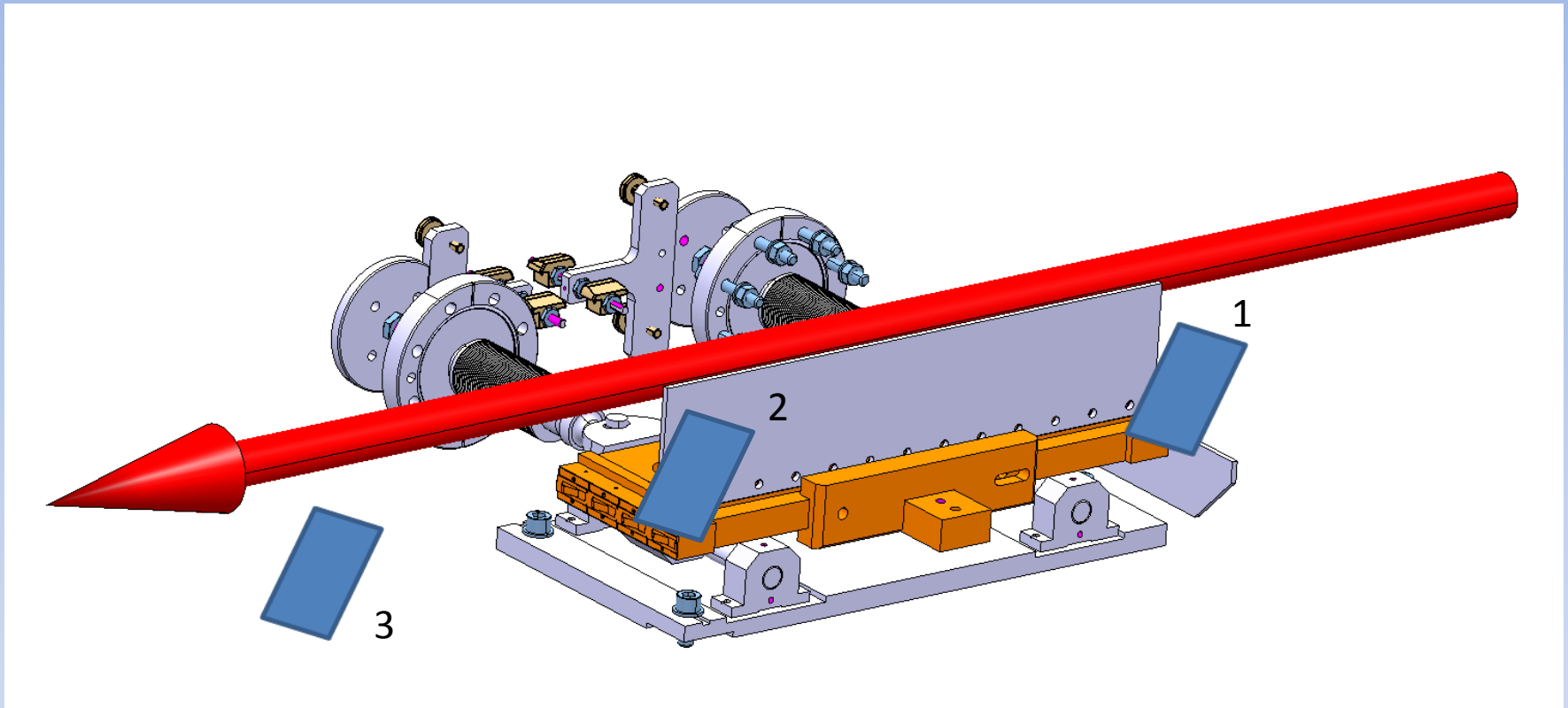
Inside PS

- First study on shielding configuration
- Busbars kept accessible and max shielding on downstream

Beam Instrumentation

- What type of system is required ?
  - Screen, wire etc?
- Where shall it be positioned
  - In the main vacuum chamber or in the dummy tube downstream of the blade?
- Where is the support
  - On the blade moving table or independent?

Screen (Observation) options



Observation could be fitted at entry/exit (1/2) to blade or in the dummy chamber downstream of the main vacuum vessel (3). The observation shall be on the ejected beam side of the blade and shall not impinge on the PS circulating beam.
Can be fixed to the moving table or independent movement system-choice to be made.

Minimum maintenance and reliability - essential

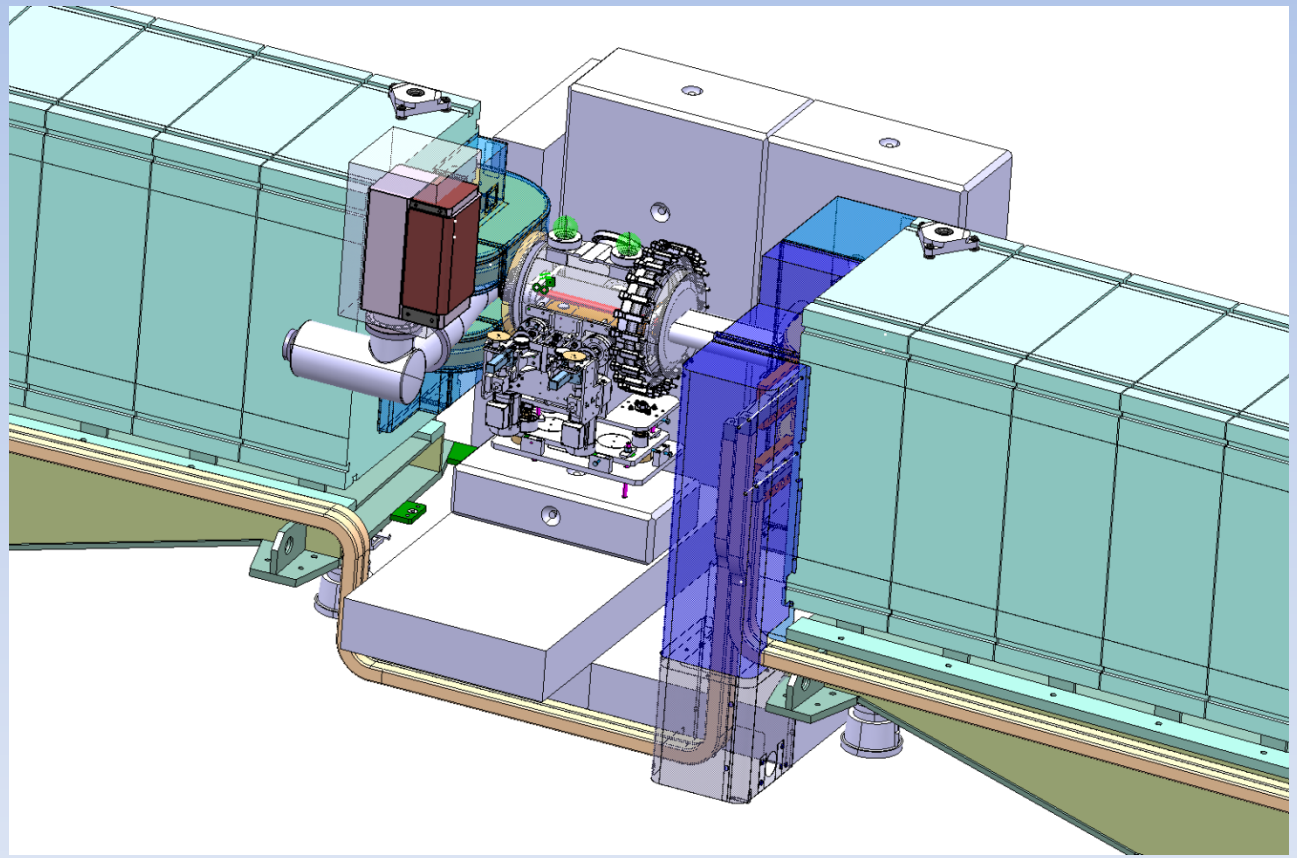
Remember ALARA principle,
All interventions shall be rapid and involve the minimum amount of personnel,
Hence design for reliability and long lifetime,

Before any intervention on the TPS assembly,

Removal of roof shielding

Removal of inner ring shielding

Interventions are expected to be time limited



Possible intervention Scenarios

- Electrical problem
  - Drive and/or control system,
- Vacuum Leak
  - Tank, downstream chamber, drive system, beam observation, etc
- Catastrophic Failure
  - Replacement of dummy 15 or downstream chamber
- Replacement of..

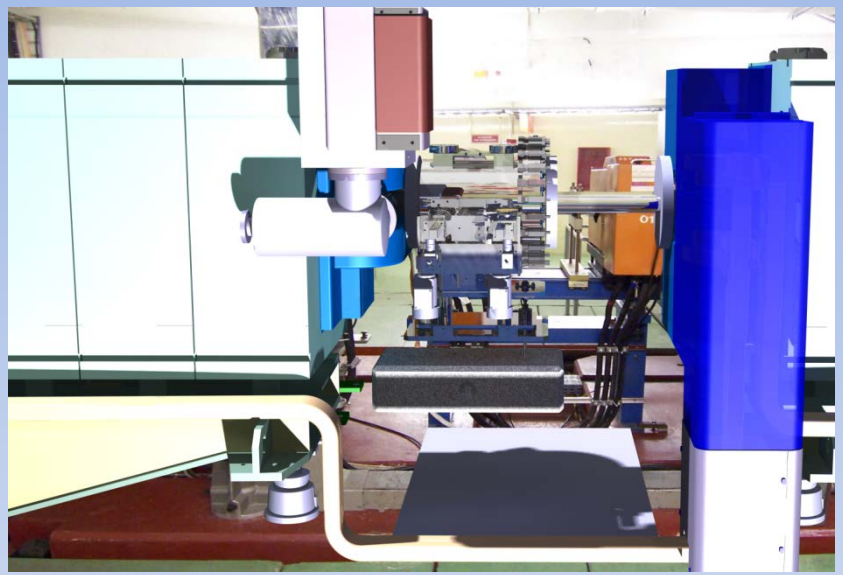
Summary

The type of beam observation system has to be defined,

Where and how will it be fixed?

Remaining issues to be addressed are:

- Beam Impedance Screen
- Shielding layout



Questions ??

Failure	Classification	Operation	Intervention time	Comments
Blade	Catastrophic	Replacement of complete assembly		Dismantling of roof and inner ring shielding
Vacuum Leak	Serious			
Drive & control				