Faraday Cups and Insertable Beam Stops

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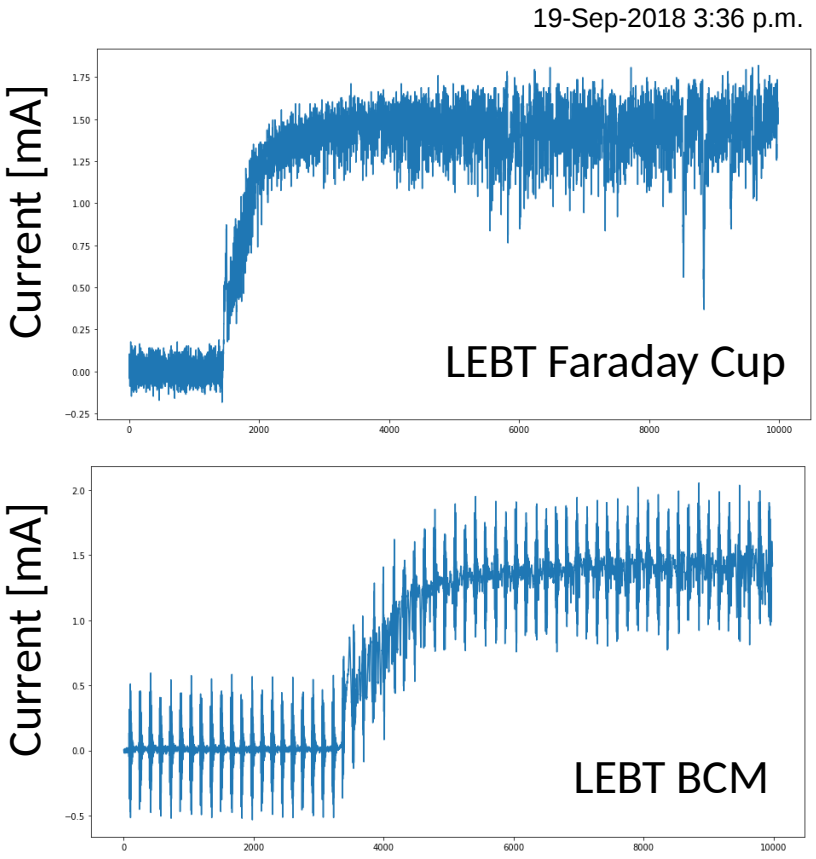
Outline

	Location	Status	Proton energy (MeV)	Shielding	
FARADAY CUPS	LEBT	Installed	0.075		
	MEBT	Tested with beam	3.6		
	DTL2	Design phase	21 – 39	X	
	DTL4		39 – 74	X	**NC**
INSERTABLE BEAM STOPS	LEDP	Design phase	74 - 90	X	**SC**
	MBL		90 – 360	X	

LEBT Faraday Cup

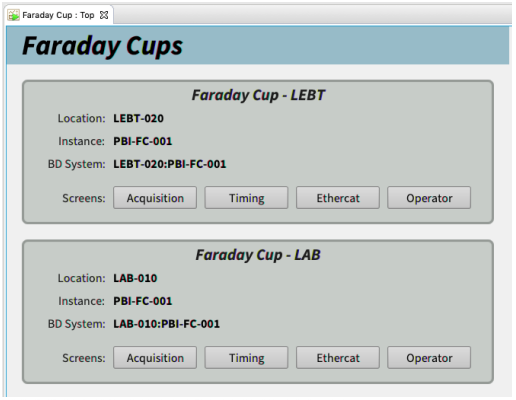
- Installed and verified w/o beam [GIN-895]
- TBD: Verification with beam in LCR

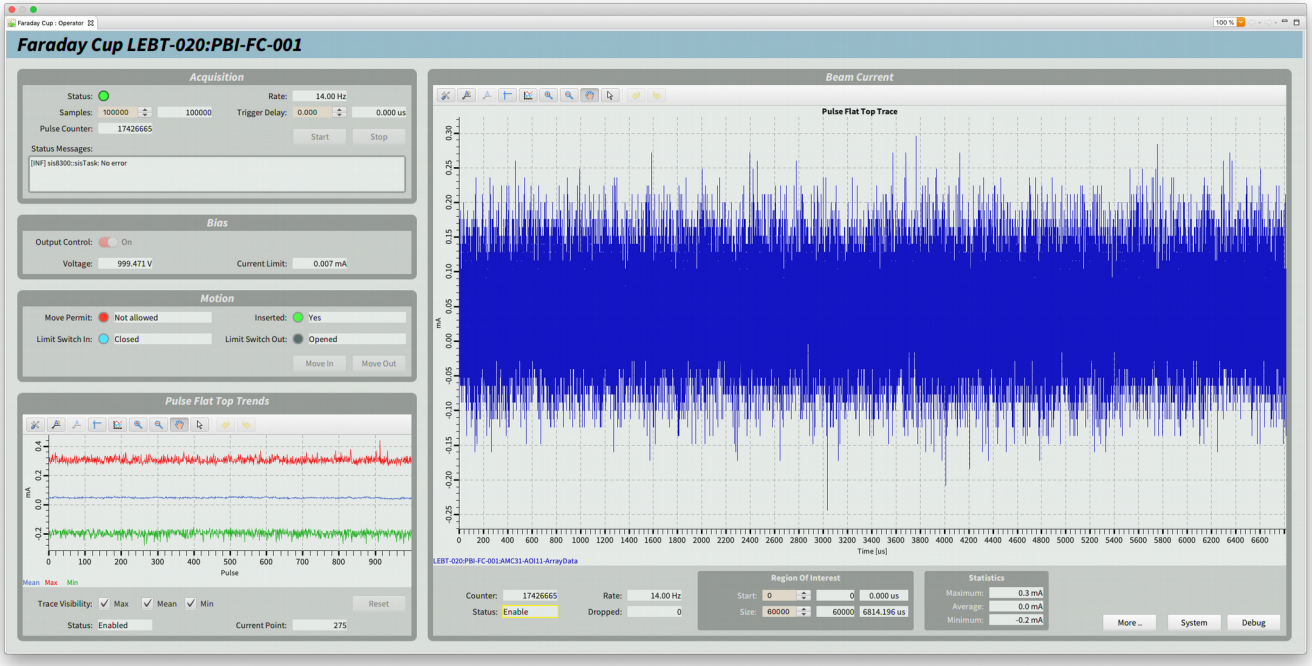


LEBT Faraday Cup

- .opi converted to Display Builder [CSSOPI-51]
→ CSS-OPI in jira - Contact: ICS/Claudio Rosati

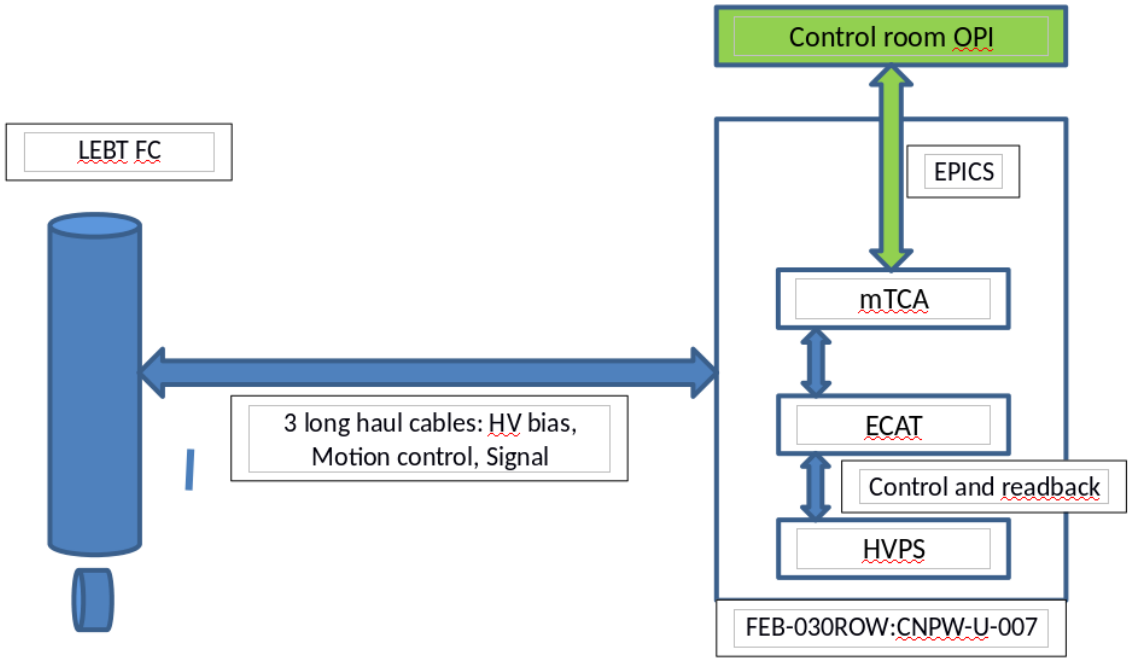
- Version 2.0: unified IOC for FC and BCM (Jan-19?)
→ Need for coordination between BPOD & ICS





FC system overview

- LEBT FC's electronics for all the FC systems
- At the back of RTM: surge arrester + protection diodes to avoid *burning digitizer*
- Rely on BCM firmware for differential measurements
- Low latency link DTL FC ← → BCM upstream (*beam loss*)

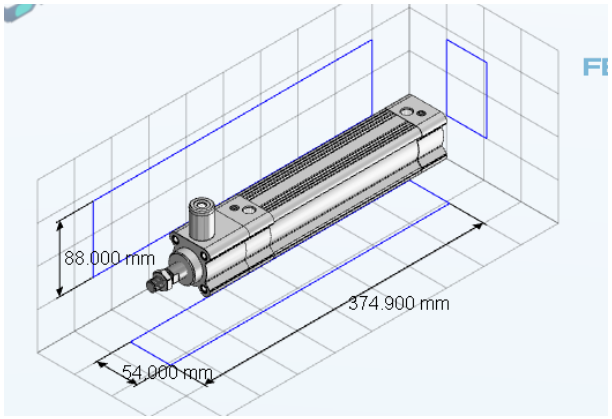


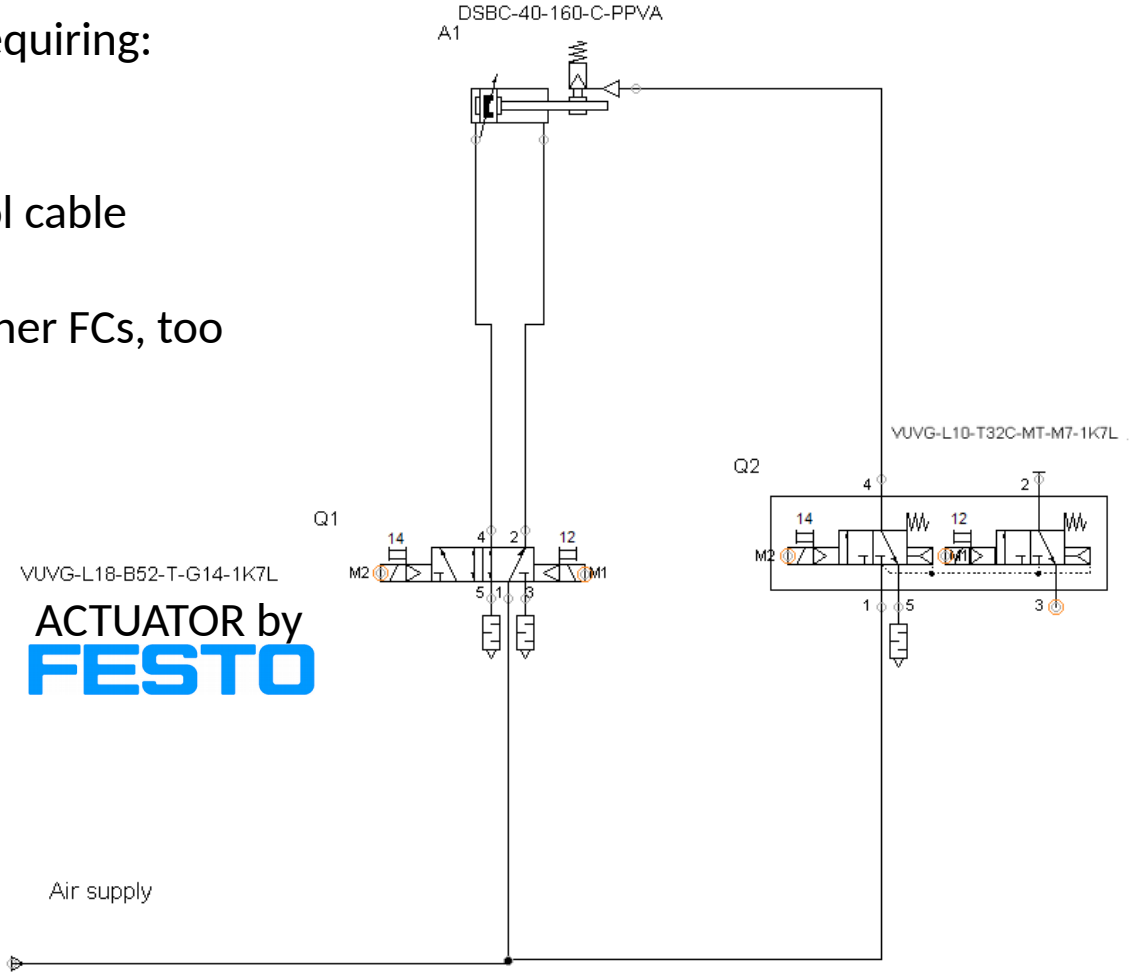
Component ID for all FC systems
AMC Struck SIS8300 KU
RTM Struck SIS8900 DC coupled
Timing receiver
Chassis
MicroTCA Carrier Hub
MicroTCA Power Supply
Ethercat crate
Ethercat modules
Rack patch panel
Rack
Sensor
High voltage power supply
Beam line patch panel

LEBT FC: proposed brake

Feedback from MPS: a ‘brake’ requiring:
- a longer actuator
- a valve change
- an additional line to the control cable

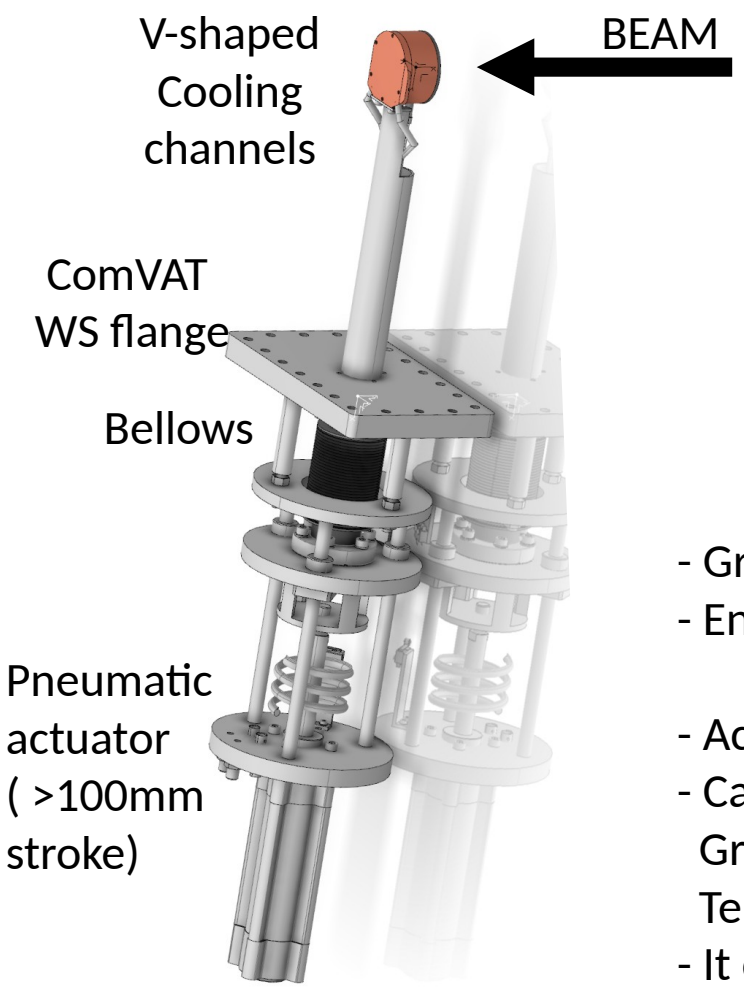
Understand if OK/needed for other FCs, too

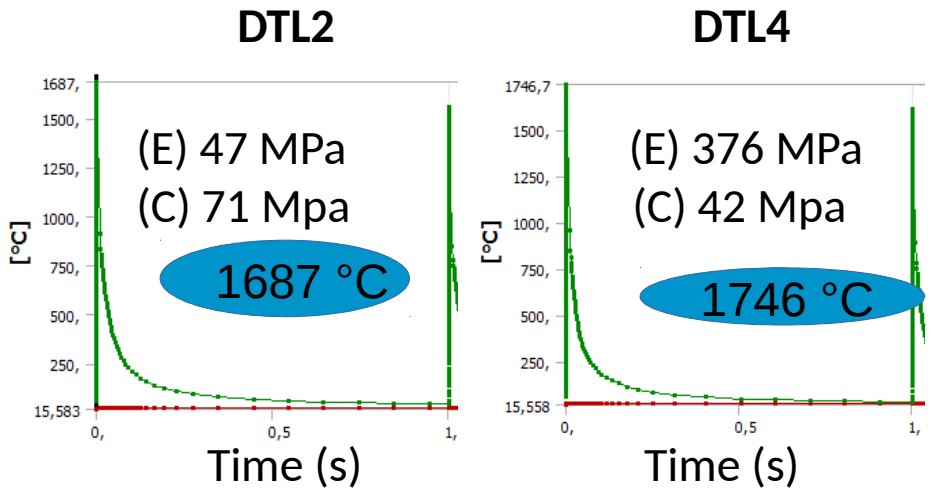




Images: (L) FESTO (R) V. Fred

DTL2 and DTL4 Faraday Cups





- Graphite core (C) + copper jacket
- Entrance foil (E): graphite and TZM, respectively

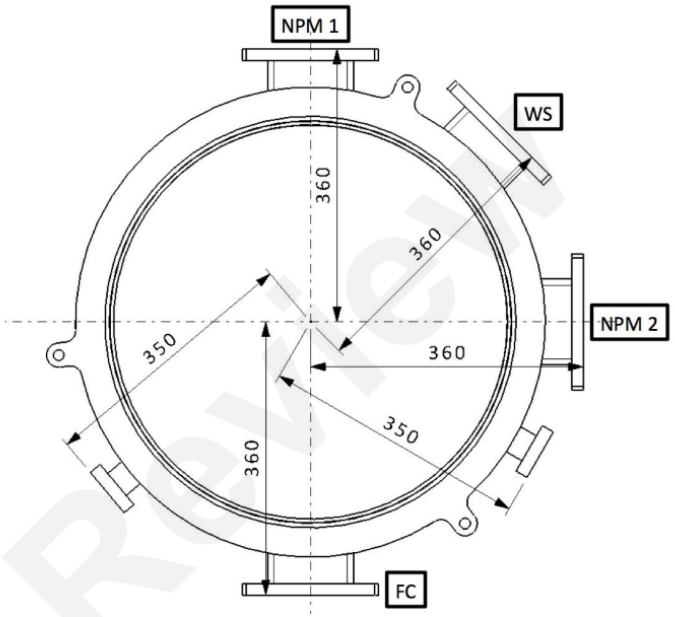
- Activation and thermo-mechanical calculations
- Case (65 mA, 50 µs at 1 Hz) to be compared with
  Graphite Evaporation @ 2400° C
  Tensile strength: graphite ~76 Mpa, Mo: 325 Mpa
- It can't withstand 4% duty cycle (2.857 ms @ 14 Hz)

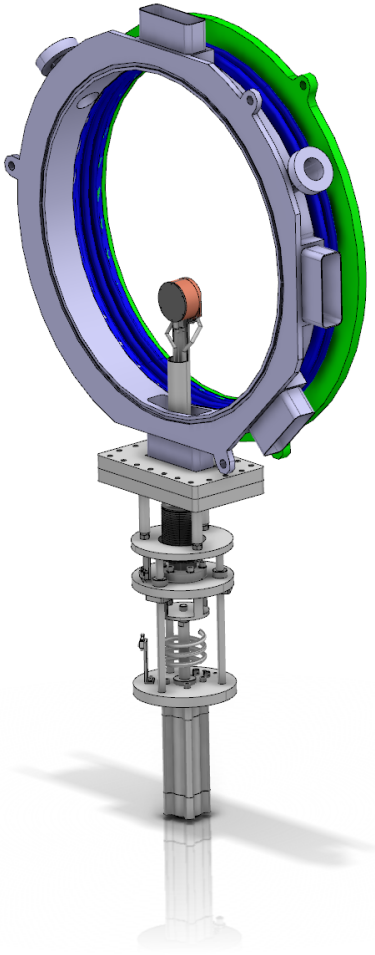
Image & plots: T. GRANDSAERT

DTL FCs: intertank

- DTL by in-kind collaborators in Legnaro
- **Inner aperture:**

Originally (110 mm x **36** mm)
Proposed (110 mm x **45** mm) in June
Approved (**113** mm x **45** mm) on Nov-20



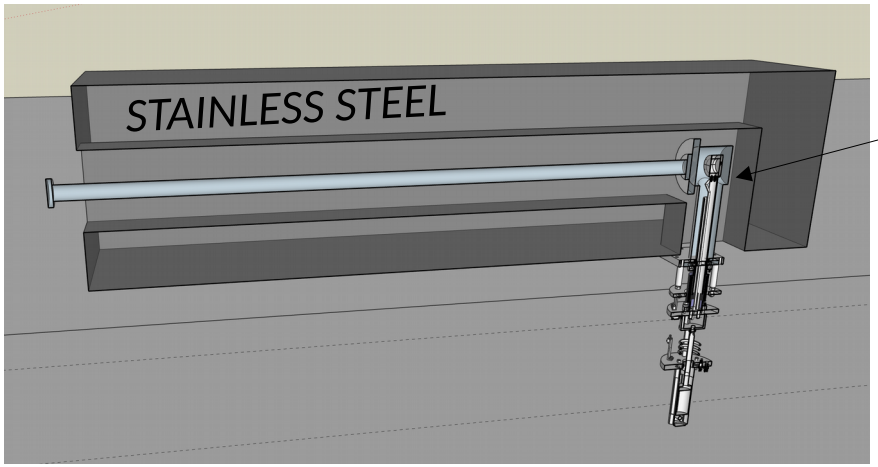


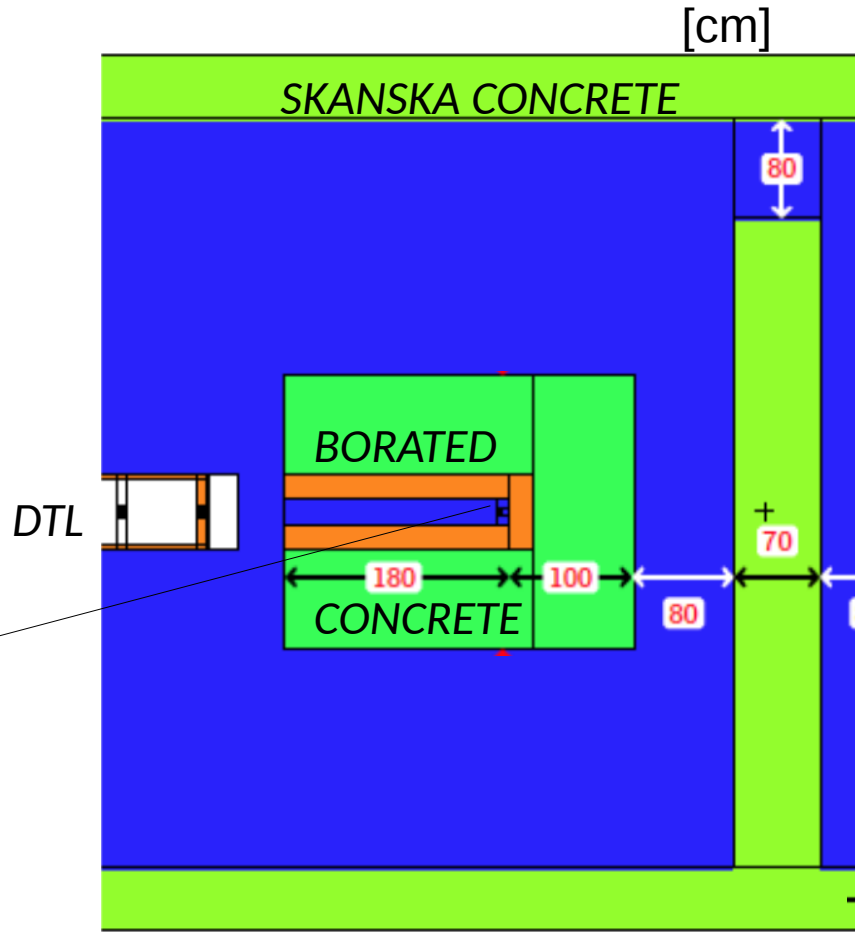
Images: T. GRANDSAERT, M. NENNI

DTL FCs: shielding

- NC Commissioning vs. SC installation
- Non movable shielding
- ½ shielding, FC+VC, ½ shielding
- SSL core + concrete bricks (1brick ~ 600 kg)

- DTL, walls and ceiling close-by
- FC installation, minimizing gaps
- Vacuum chamber & alignment

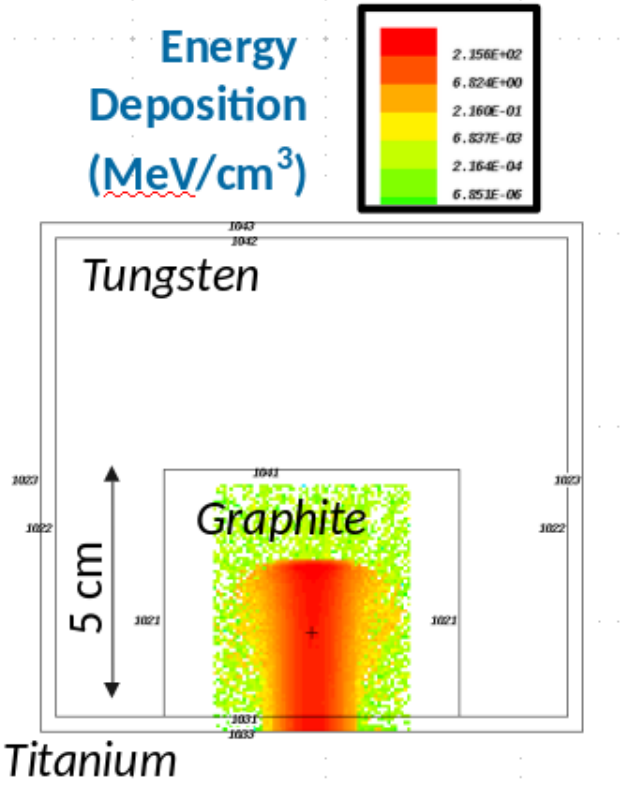


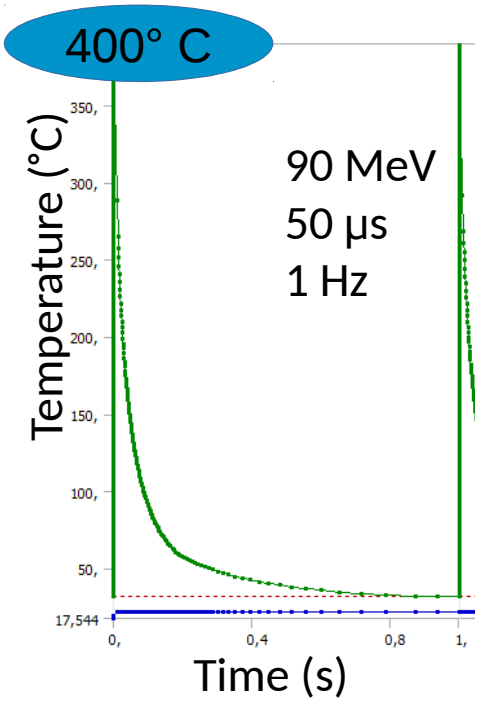


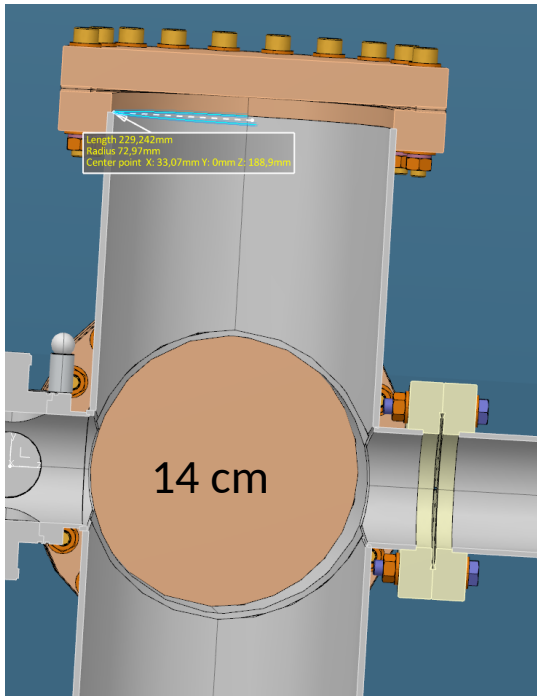
Images: (L) W. Hees, (R) ESS-0136227

LEDP IBS

- To avoid beam losses in the cold cavities during tuning and commissioning
- Energy deposition, fluxes and energy spectra, dose, dose eq., activation, dpa
- Cooling vs. Water activation

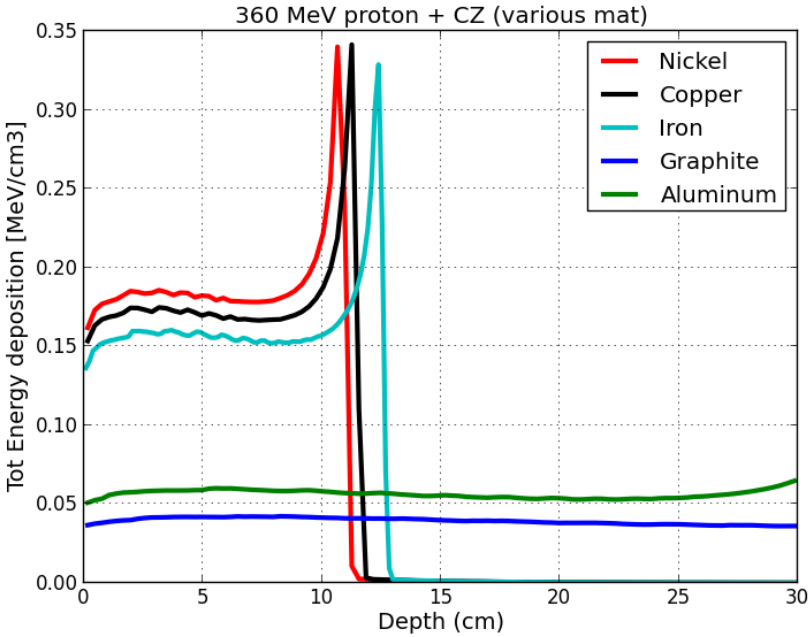


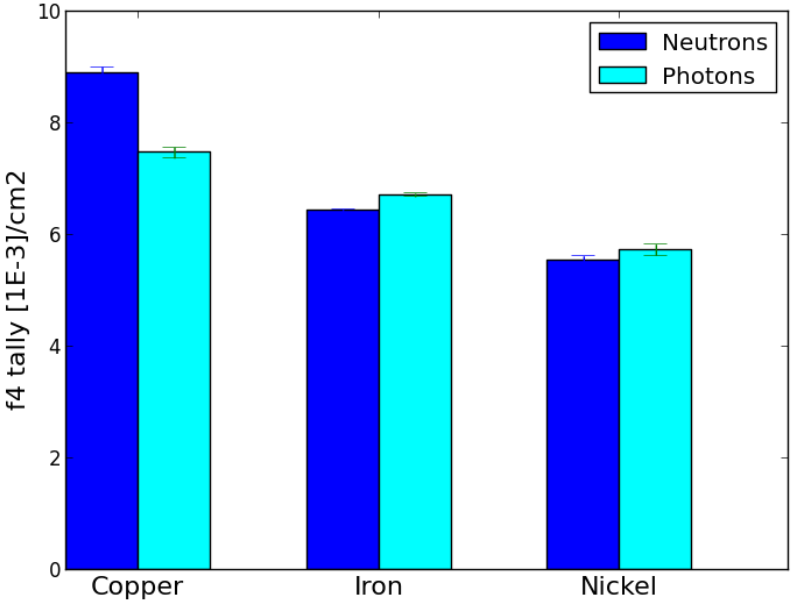




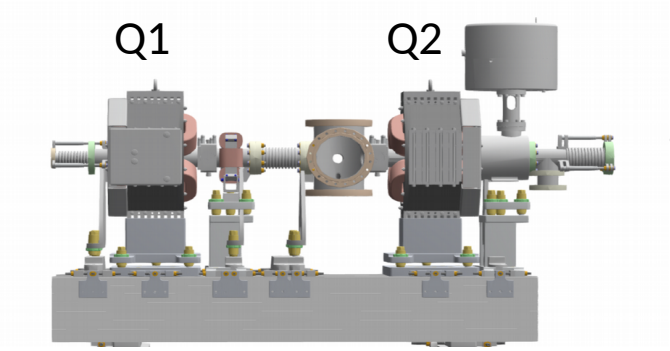
MBL IBS

- To avoid beam losses in the cold cavities during tuning and commissioning
- Energy deposition, fluxes and energy spectra, dose, dose eq., activation, dpa
- Cooling vs. Water activation

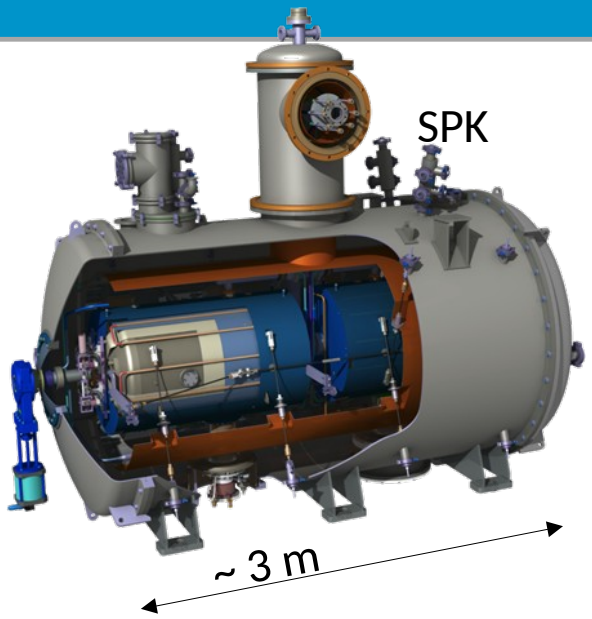


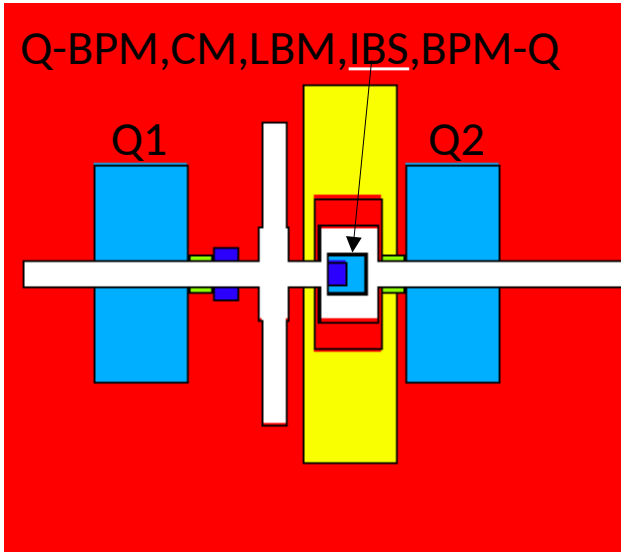


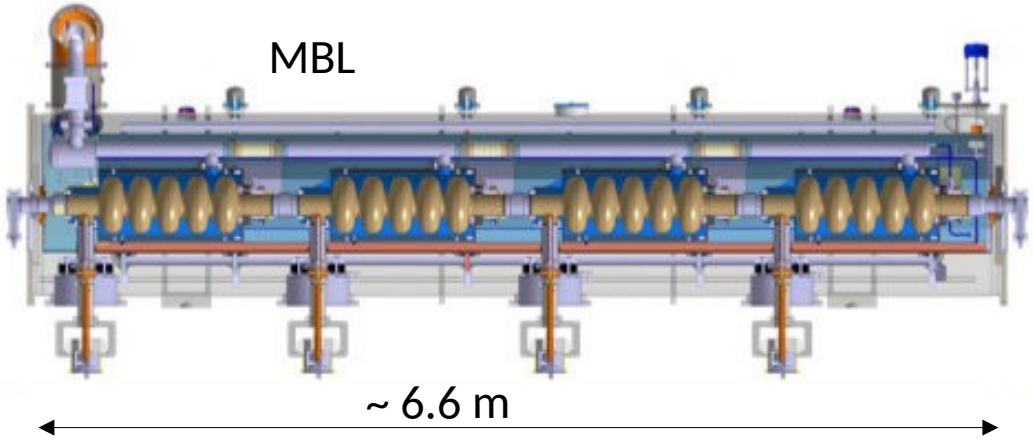
IBS: simplify & shield



- Simplify geo & materials for LWU & cryomodules in MCNPX simulations
- Shielding (lead or steel)
- Impact on Ni-cavities







Conclusion & Outlook

System	Location	Next steps
FARADAY CUPS	LEBT	Verification with beam (FC & BCM) [NCLIN-324]
	MEBT	Coming soon
	DTL2	CDR on 12-Dec-2018
	DTL4	CDR on 12-Dec-2018
INSERTABLE BEAM STOPS	Spk	Continue ANSYS calculations … And MCNPX for activation and shielding
	MBT	Continue to define with MCNPX geo and materials

EUROPEAN SPALLATION SOURCE

Thank you!

Questions?

Beam instrumentation forum #5

Lund, November 21th 2018

References

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CS-studio user's manual & training videos:
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