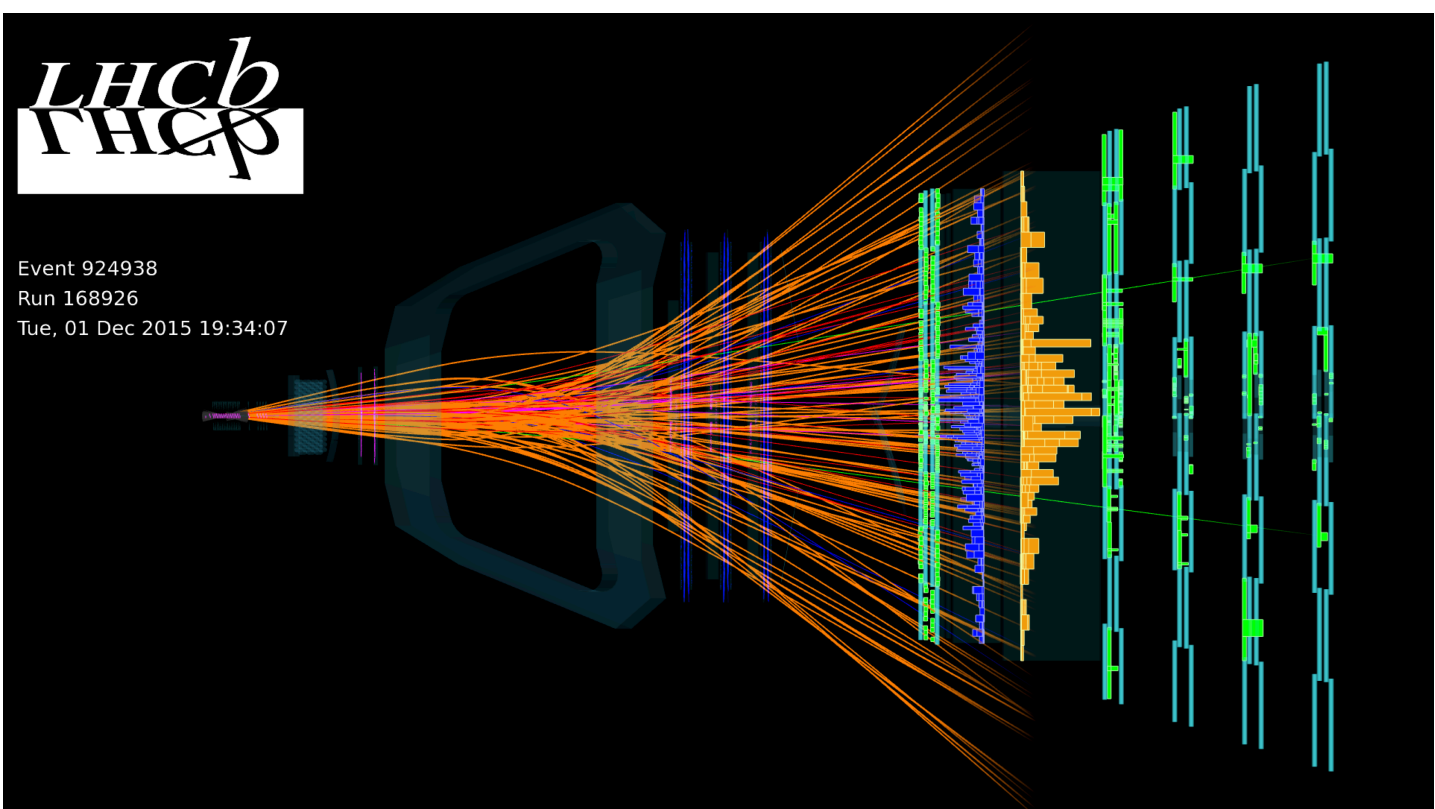




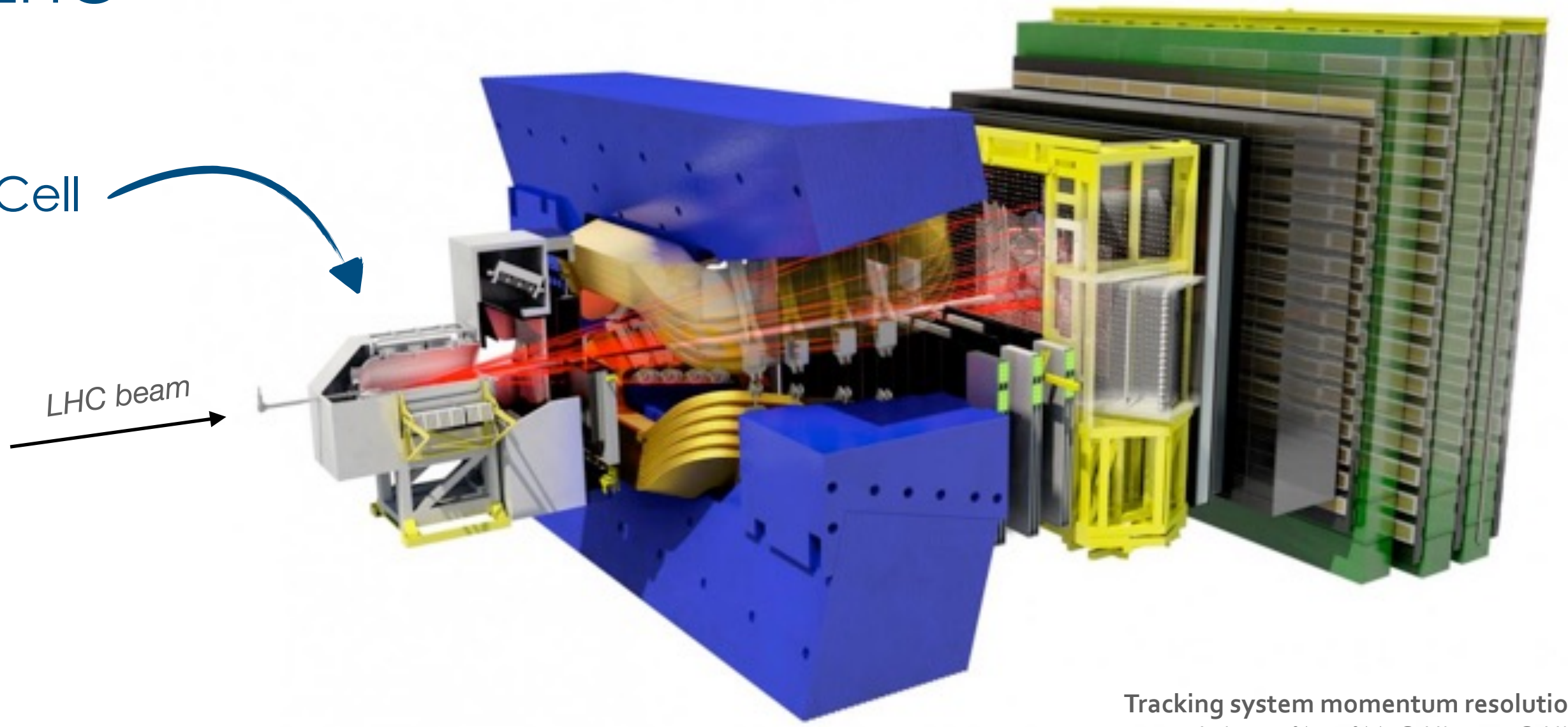
*Pasquale Di Nezza*



# SMOG2, the first (unpolarised) gas target at the LHC



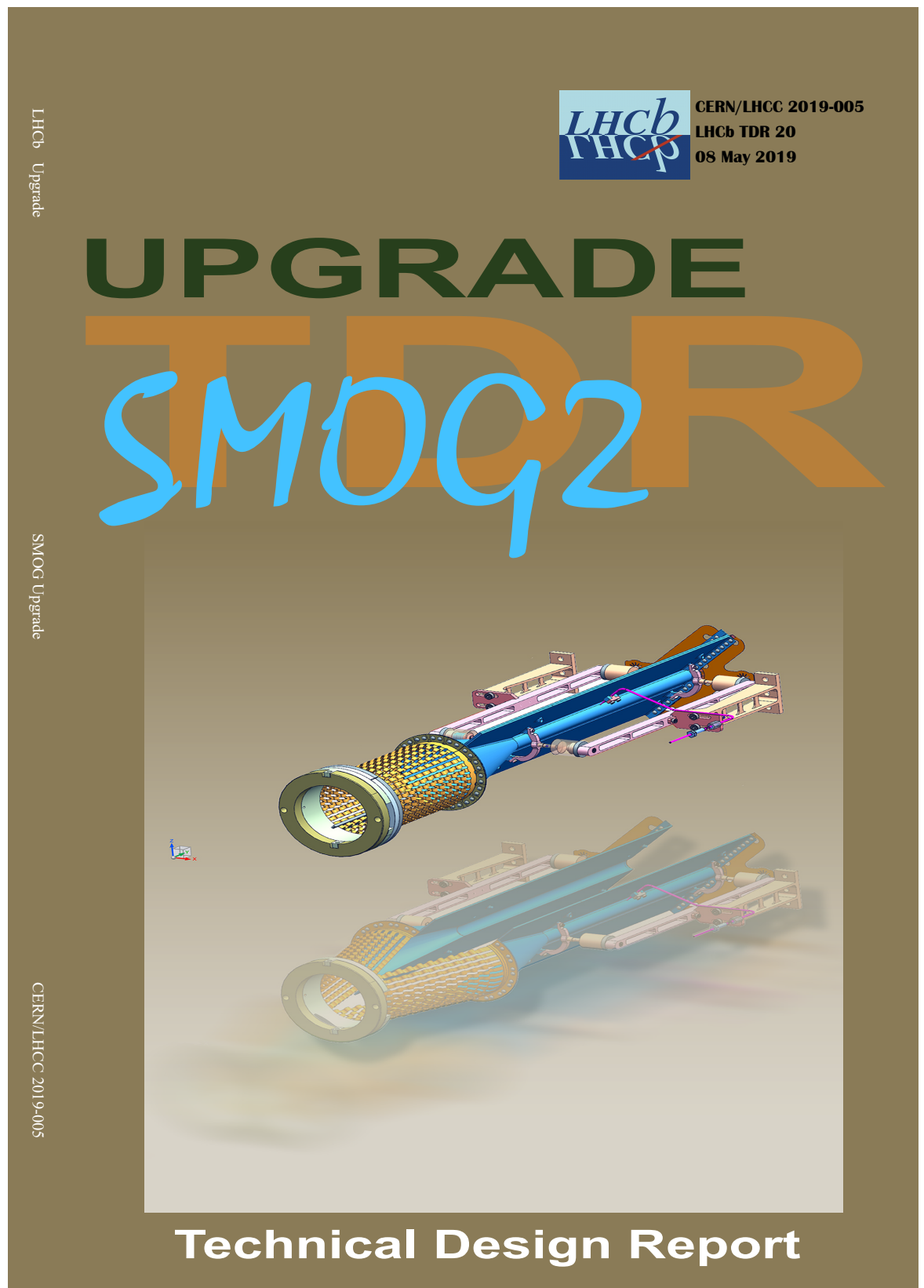
SMOG2 Storage Cell



Tracking system momentum resolution  
 $\Delta p/p = 0.5\% - 1.0\%$  (5 GeV/c – 100 GeV/c)

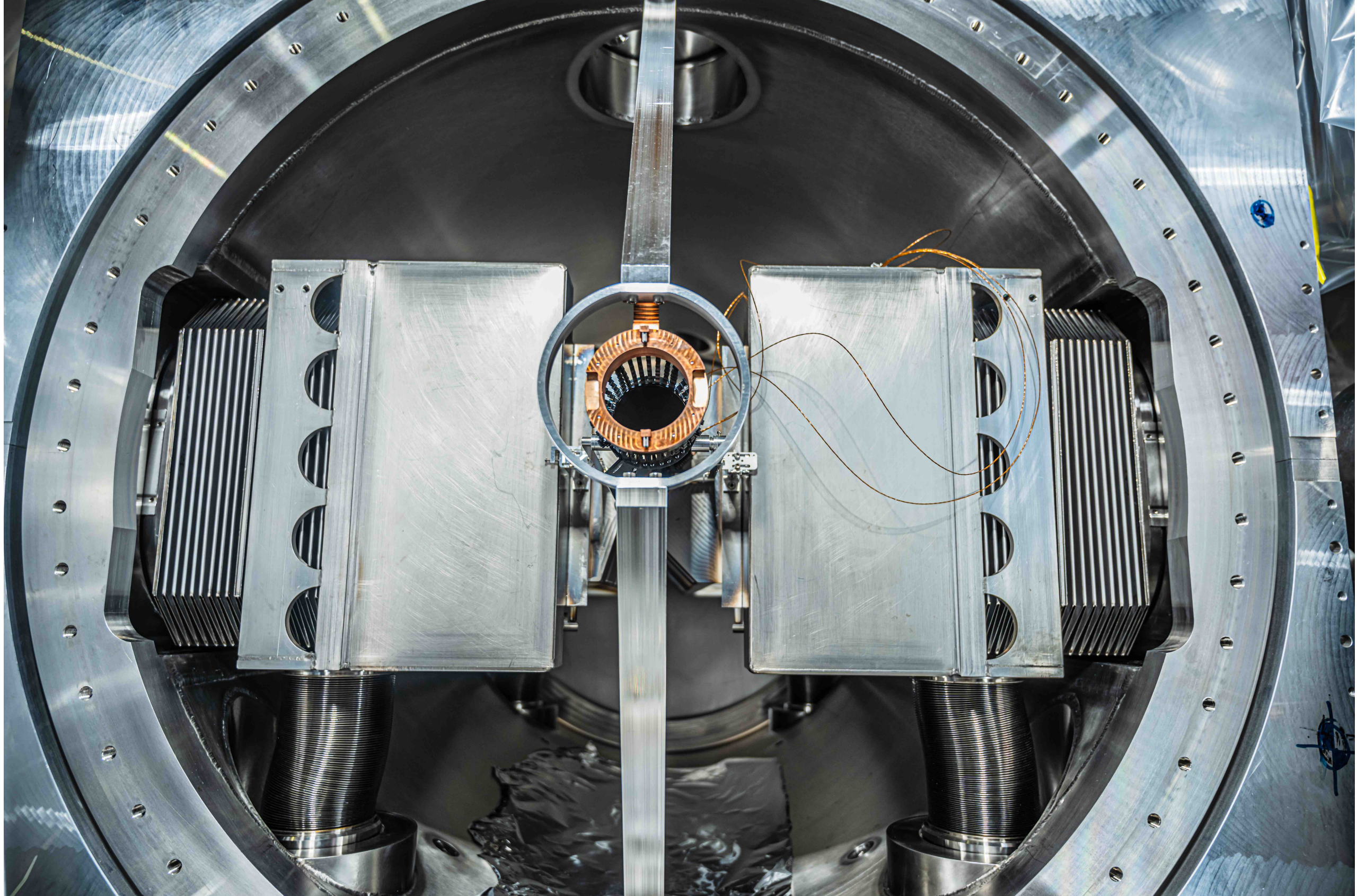
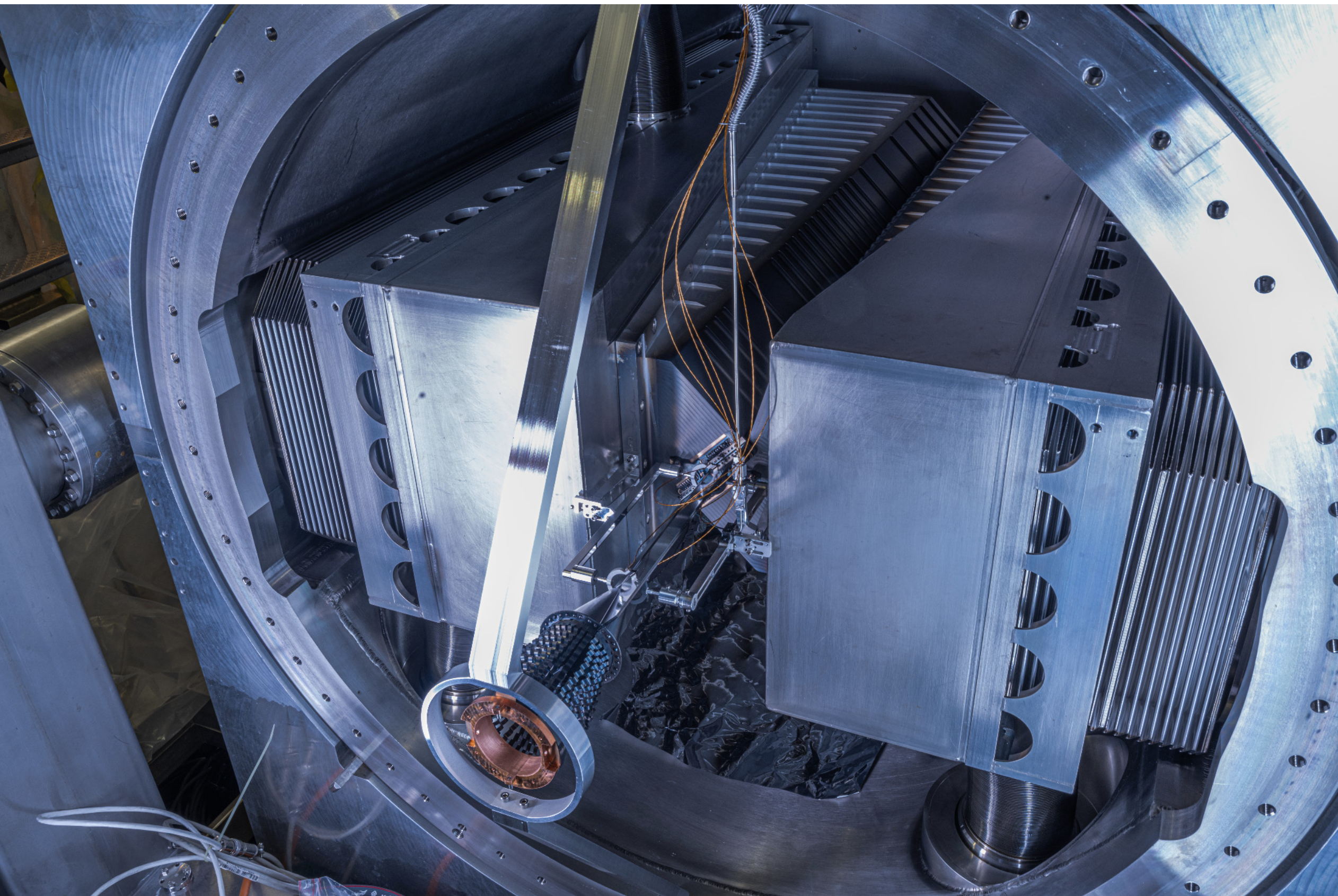
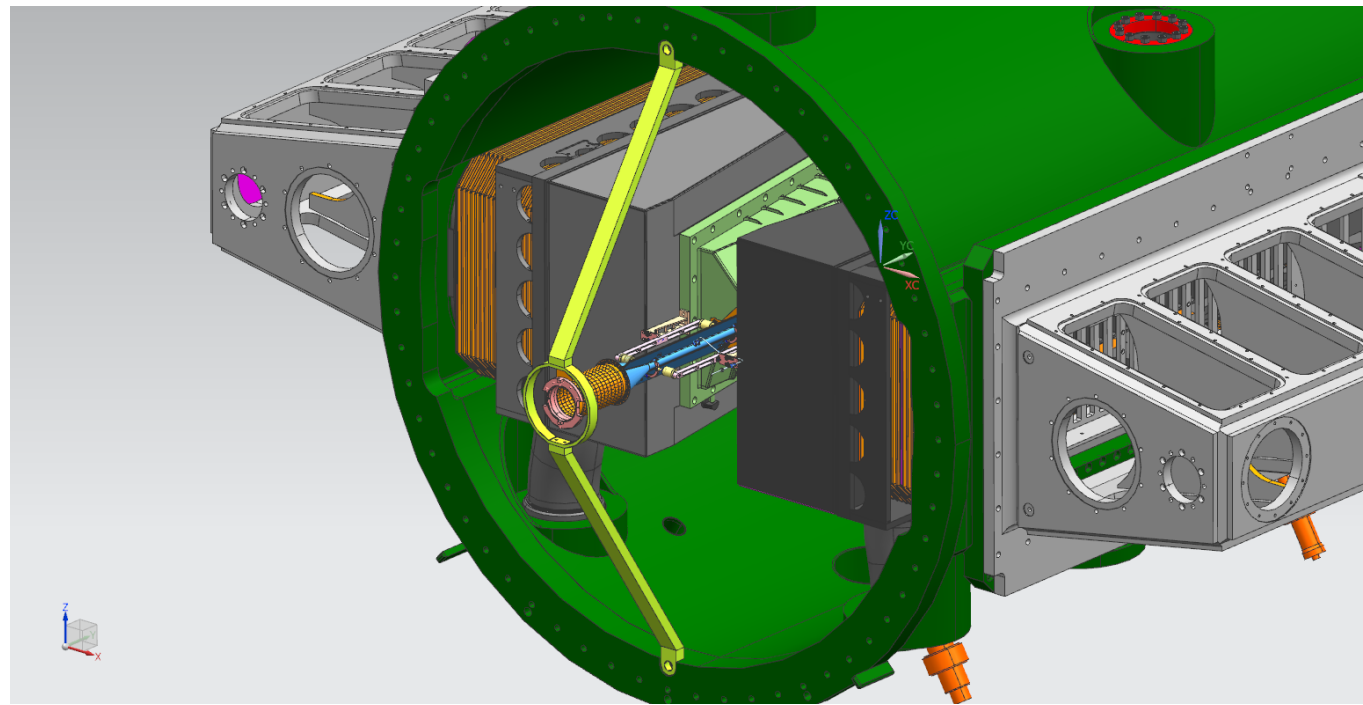
Forward acceptance:  $2 < \eta < 5$

optimised for studying particles containing c- and b-quarks



LHCb is the only experiment able to run both in collider and in fixed-target mode ... simultaneously!

It is the only complex object in the LHC primary vacuum



The Storage Cell has been successfully installed last summer

Openable cell



10x faster than normal

Gas Feed System





Core of the project:  
Vito Carassiti, Giuseppe Ciullo, Pasquale Di Nezza, Paolo Lenisa, Saverio Mariani, Luciano Pappalardo, Stefano Squerzanti, Erhard Steffens



In close collaboration with:  
Luca Barion, Massimiliano Ferro-Luzzi, Giacomo Graziani, Enrico Manosperti, Pascal Sainvitu, Benoit Salvant, Freek Sanders, Josef Sestak, Giuseppe Tagliente, Anna Zemanek

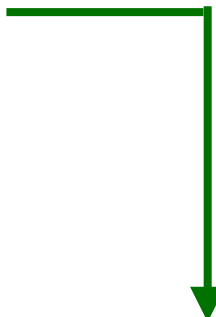


arXiv:1901.08002

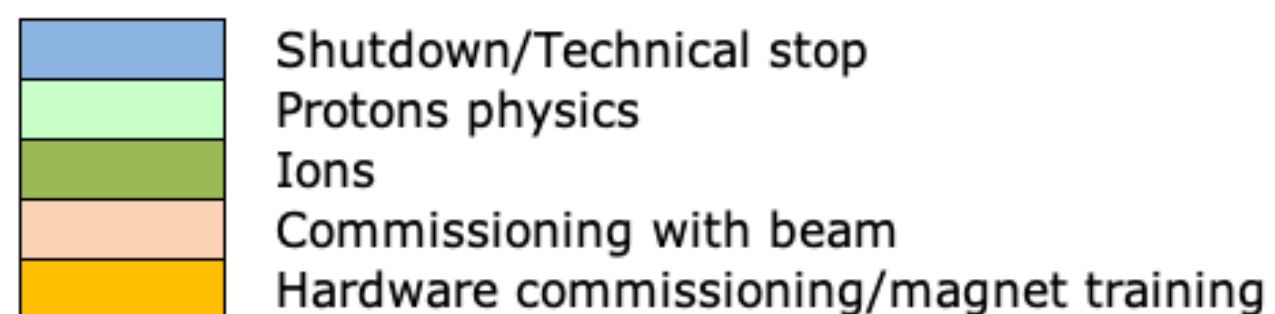
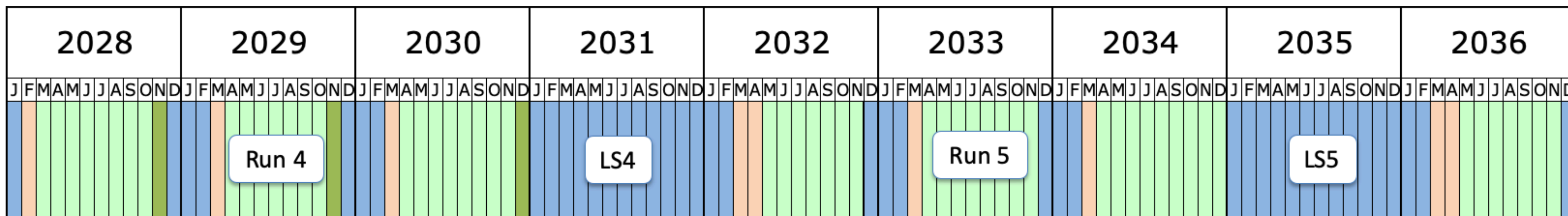


The SMOG2 unpolarized gas storage cell is not only a very interesting project itself, but represents an ideal test-bench for the R&D for the polarized target

# Long term LHC schedule

Here we are 

Dead line to install LHCspin 



# The case for LHC Fixed Target

Concluding slide from C. Vallée (convener of the *PBC* forum) at EPS 2019 (ECFA session)



## THE MAIN PBC MESSAGES TO THE EPPSU FOR CERN PROJECTS

**LHC Fixed-Target opens a worldwide unique domain to both SF and QGP measurements**  
*Requires support for full exploitation of its potential on the LHC lifetime*

*from ESPP Update 2020*



### Physics Briefing Book

CERN-ESU-004  
30 September 2019

*Input for the European Strategy for Particle Physics Update 2020*

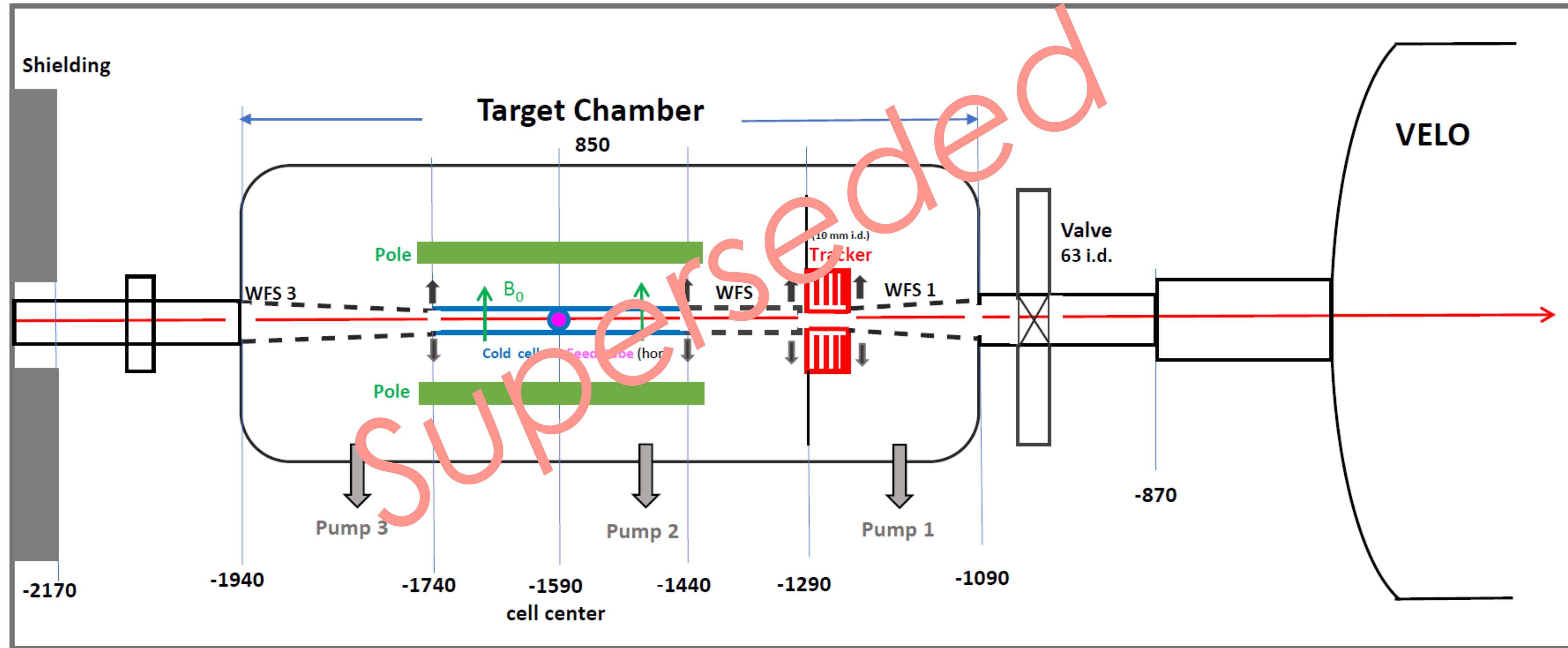
The multi-TeV LHC proton- and ion-beams allow for the most energetic fixed-target (LHC-FT) experiments ever performed opening the way for unique studies of the nucleon and nuclear structure at high  $x$ , of the spin content of the nucleon and of the nuclear-matter phases from a new rapidity viewpoint at seldom explored energies [117, 118].

On the high- $x$  frontier, the high- $x$  gluon, antiquark and heavy-quark content (e.g. charm) of the nucleon and nucleus is poorly known (especially the gluon PDF for  $x \gtrsim 0.5$ ). In the case of nuclei, the gluon EMC effect should be measured to understand that of the quarks. Such LHC-FT studies have strong connections to high-energy neutrino and cosmic-ray physics.

The physics reach of the LHC complex can greatly be extended at a very limited cost with the addition of an ambitious and long term LHC-FT research program. The efforts of the existing LHC experiments to implement such a programme, including specific R&D actions on the collider, deserve support.



# Polarised Gas Target (PGT) topology – a schematic view



## Reasons:

- the kinematic space covered is in large part already covered by other experiments (still uniqueness of the rare probes)
- degraded tracking resolution, additional trackers needed
- the LHCb upstream area is becoming crowded with new detectors

Later we will discuss the possibility/opportunity that this meeting will be followed by a “white paper”

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There is a joint SMOG2+LHCspin weekly meeting each Thursday at 3.30 p.m. ... everybody is welcome. Just let me know if you wish to participate

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*HAPPY Meeting !!!*