

Highlights from the WP2 parallel session

Giovanni Marchiori (APC Paris)
On behalf of WP2

DRD-calorimetry Collaboration Meeting
1 November 2024

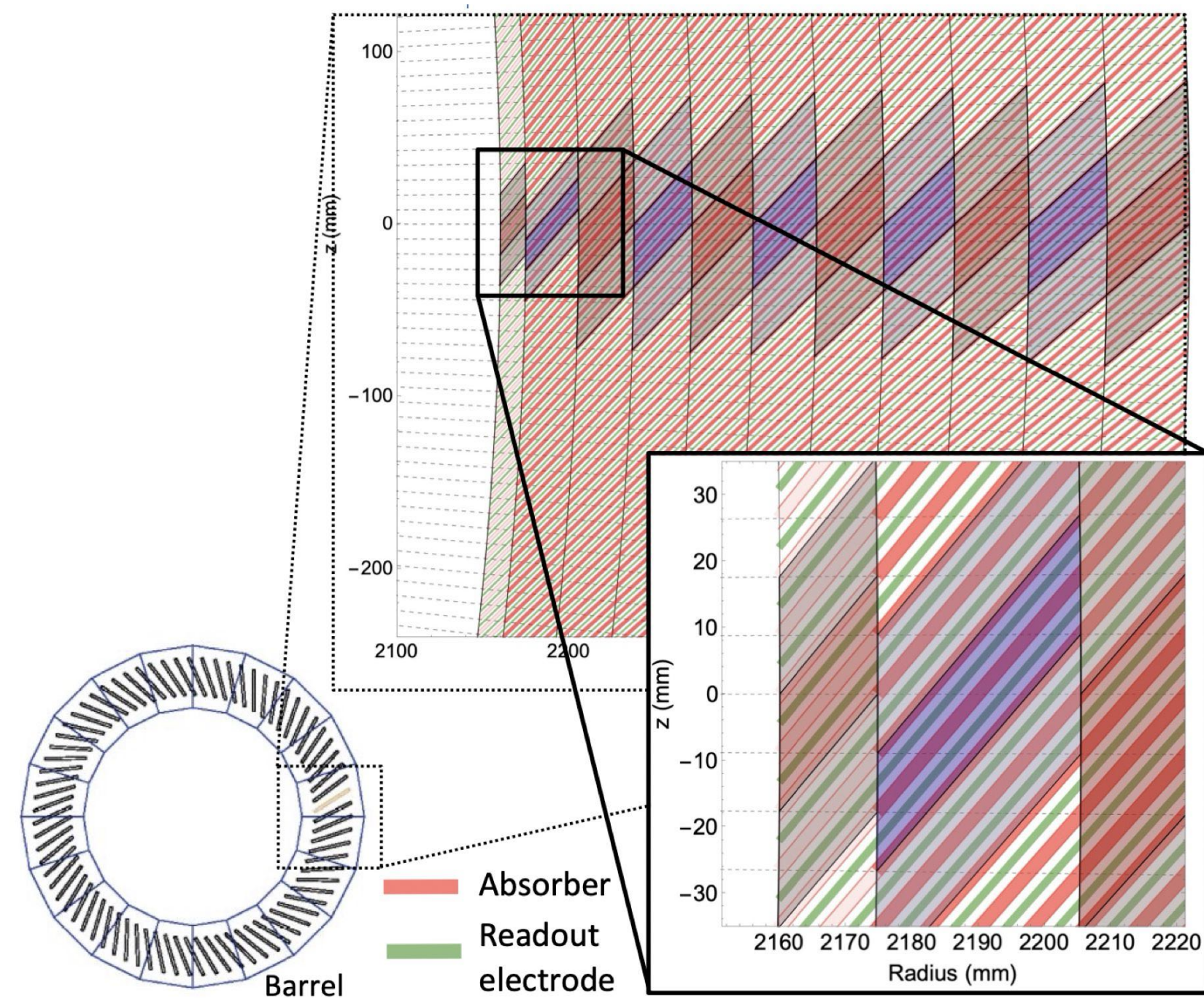


**NUCLÉAIRE
& PARTICULES**

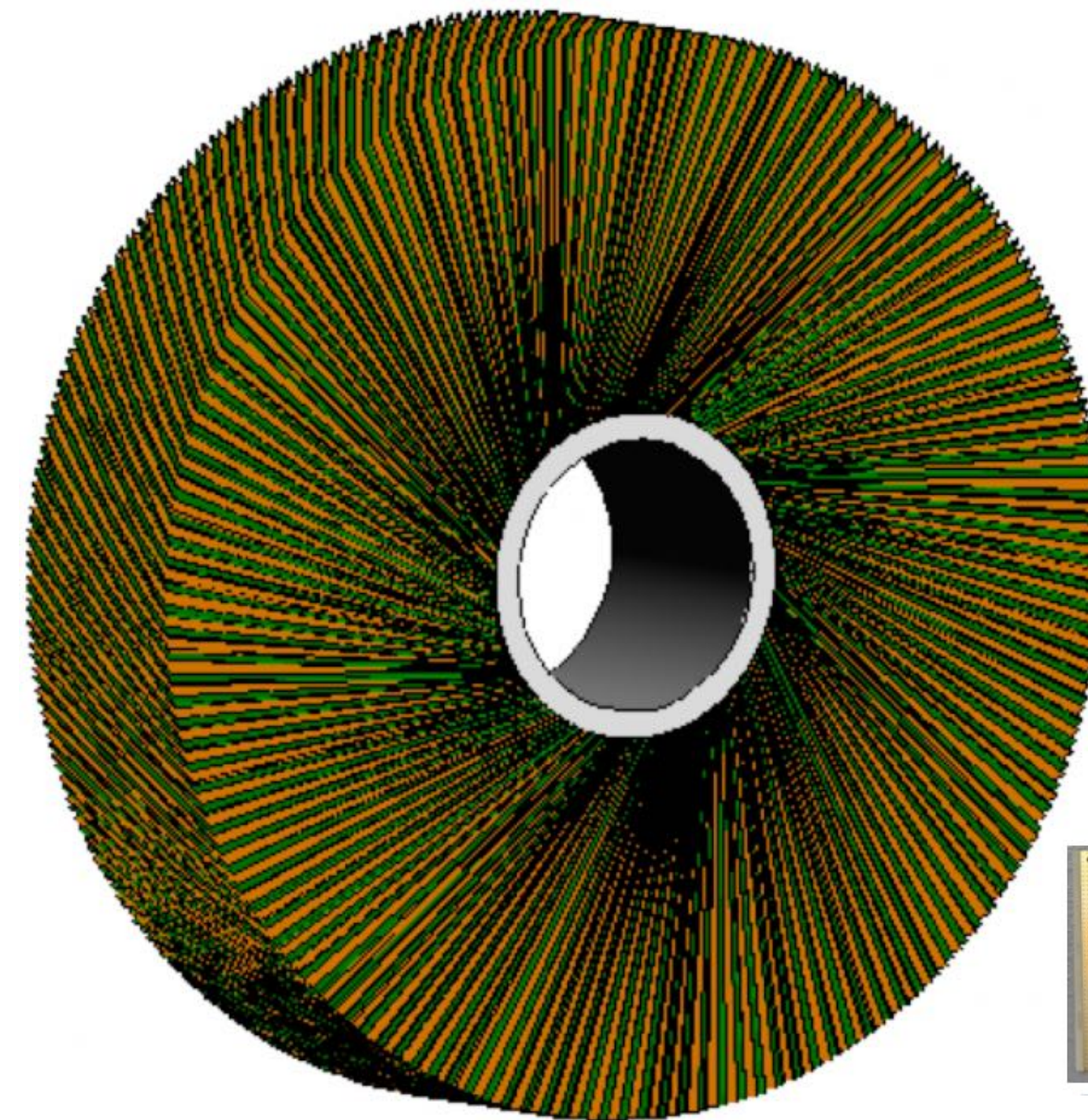


WP2 reminder

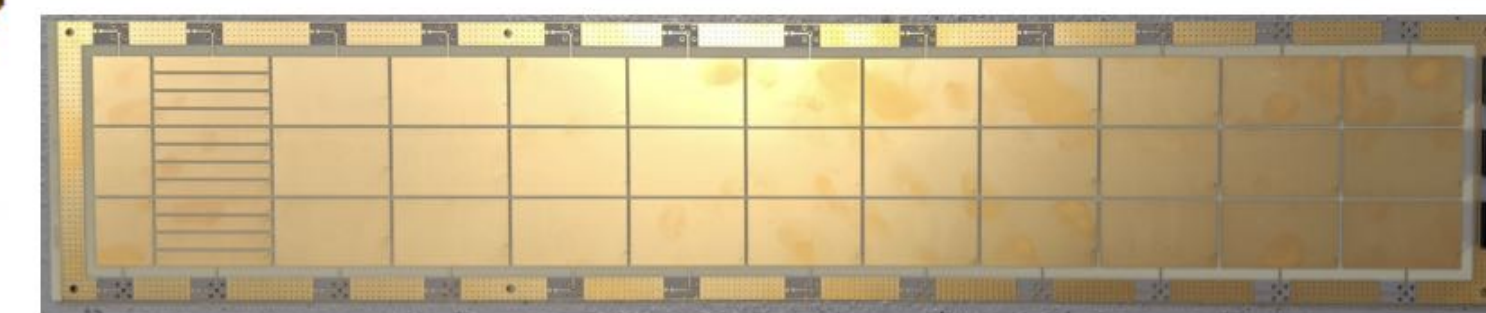
- Focused on R&D on noble-liquid calorimetry
- Main target on foreseeable future: sampling EM calorimeter for e+e- factories - one of key features of "ALLEGRO" detector concept for FCC-ee (<https://allegro.web.cern.ch/>)
 - highly granular calorimeter with absorbers planes inclined in r-phi (barrel) / arranged in turbine-like structure (endcap)
 - readout by segmented PCB planes alternated to Pb (or W) absorbers, gaps in between filled with LAr (or LKr)



barrel



endcap



PCB (readout)

WP2 reminder: organisational structure

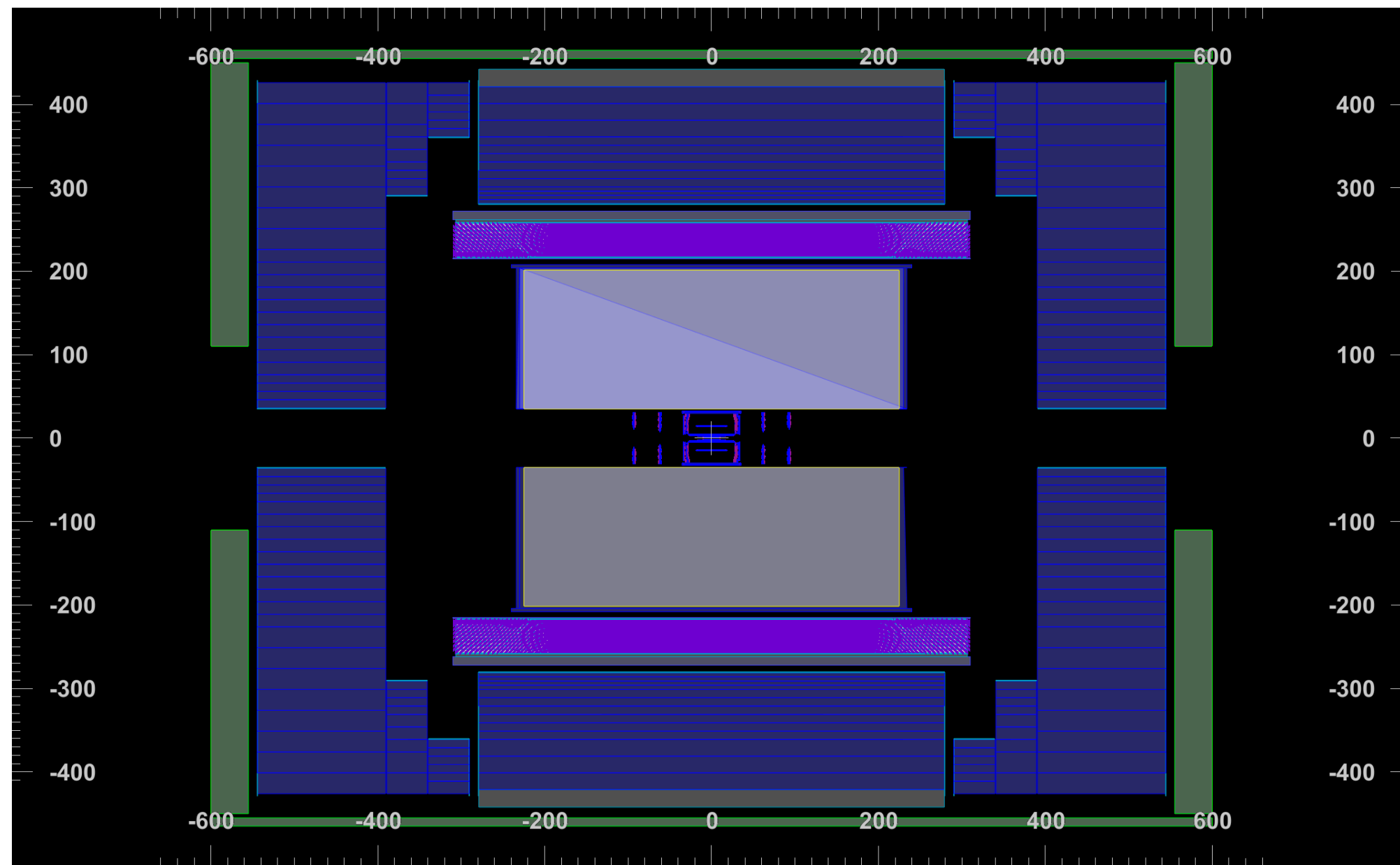
- **Currently** contributing institutes

- APC (Paris, France)
- BNL (Brookhaven, USA)
- Brown University (Providence, USA)
- CERN
- CPPM (Marseille, France)
- CUNI (Prague, Czech Republic)
- IFIN-HH + UNSTPB (Bucharest, Romania)
- IJCLab (Orsay, France)
- LAPP (Annecy, France)
- LPNHE (Paris, France)
- MPI Munich (Germany)
- NYU (NY, USA)
- Omega (Palaiseau, France)
- Southern Methodist University (Dallas, USA)
- Stony Brook University (USA)
- TU Dresden (Germany)
- U. Kosice (Slovakia)
- University of Arizona (USA)
- University of Columbia (NY, USA)
- UT Austin (USA)

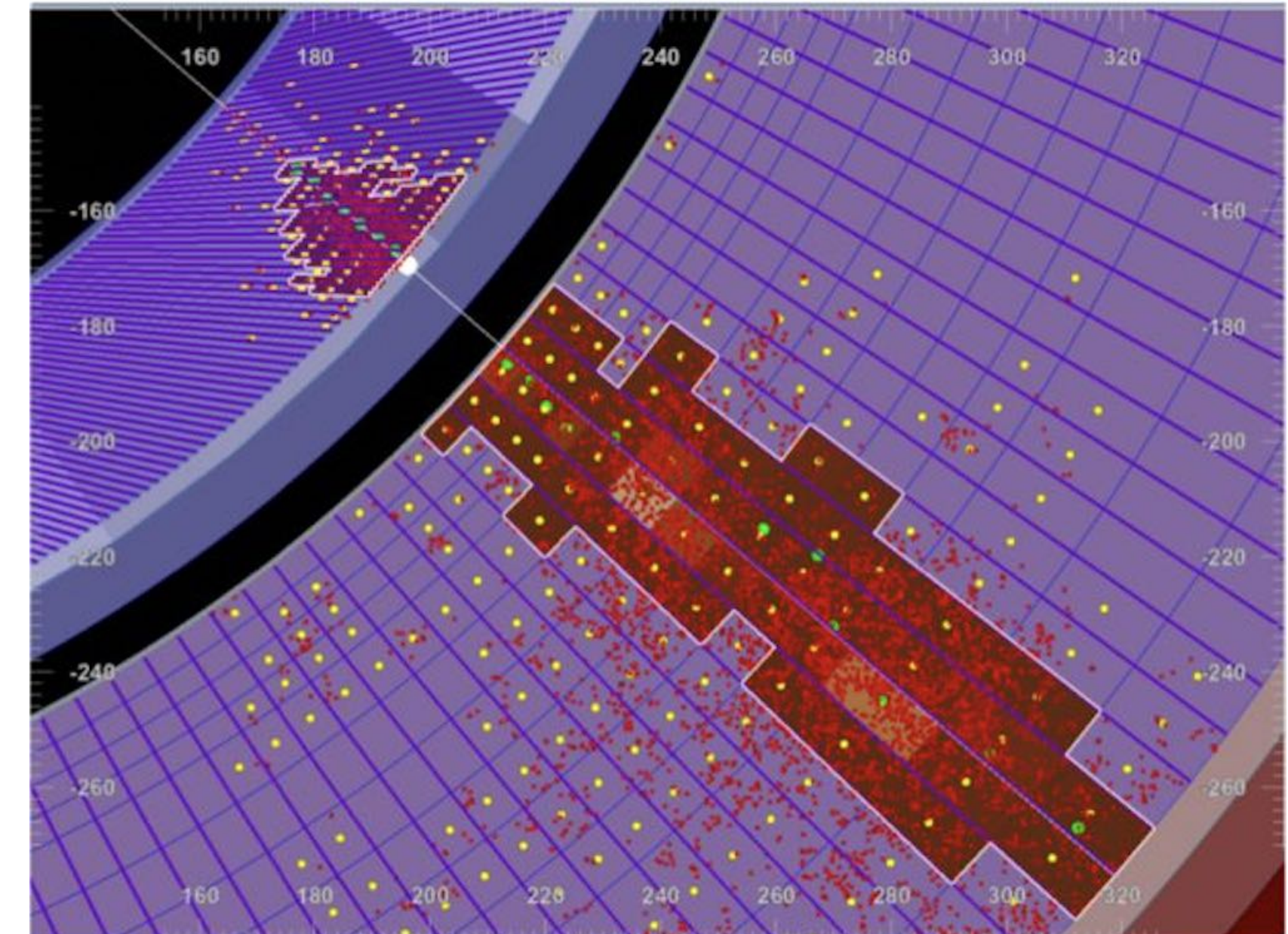


WP2 news: simulations

- **Full ALLEGRO detector model recently implemented in DD4hep**
 - ECAL barrel and endcap + other sub detectors (tracker, HCAL, muon tagger)
 - Important for having correct description of material in and upstream of ECAL & all ingredients for particle-flow
- Fixed-size sliding-window (SW) and topoclustering for ECAL, and ECAL+HCAL barrels already in place since some time - **work ongoing to implement clustering for ECAL endcap and combined ECAL + HCAL endcap SW & topoclustering**



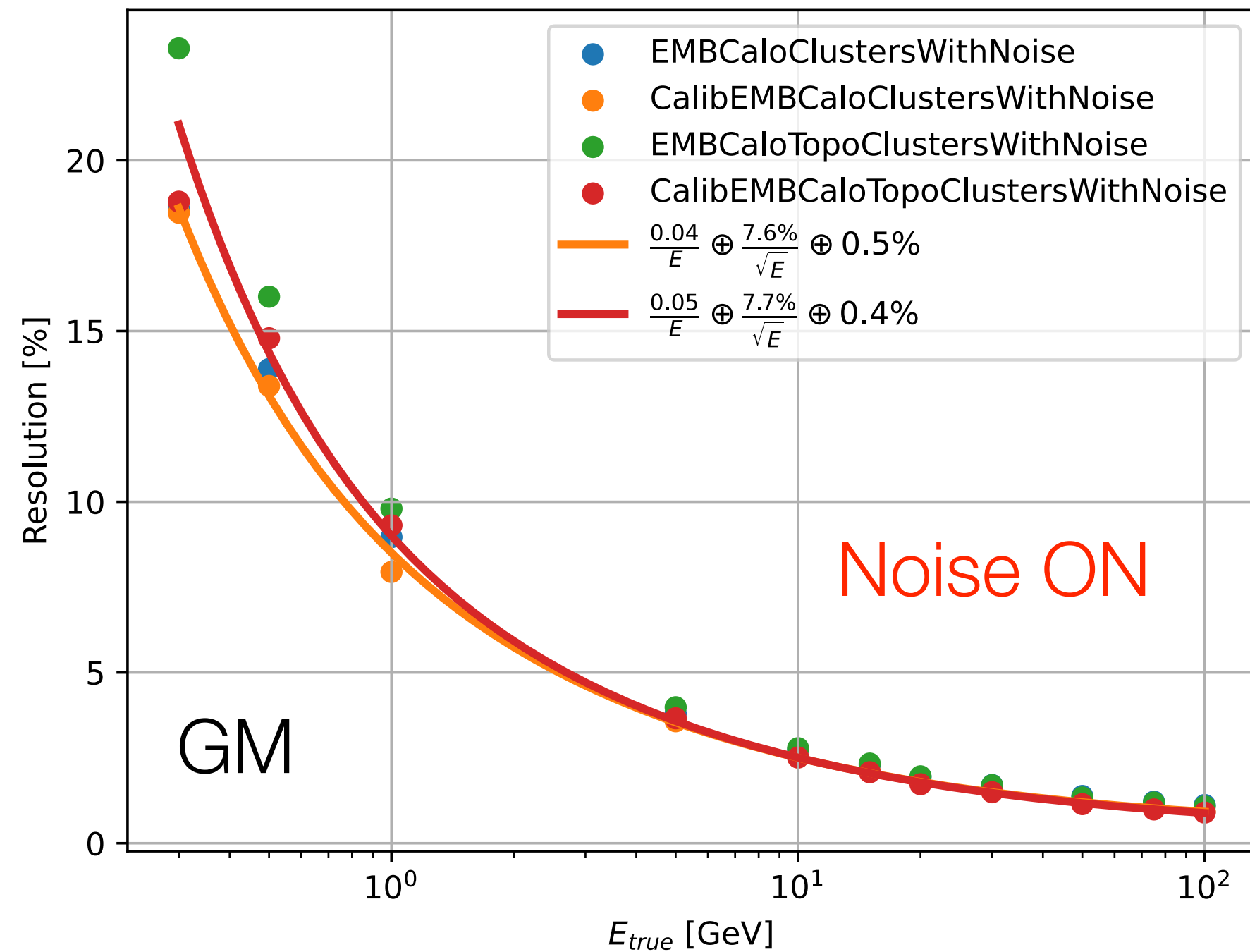
full detector in simulation



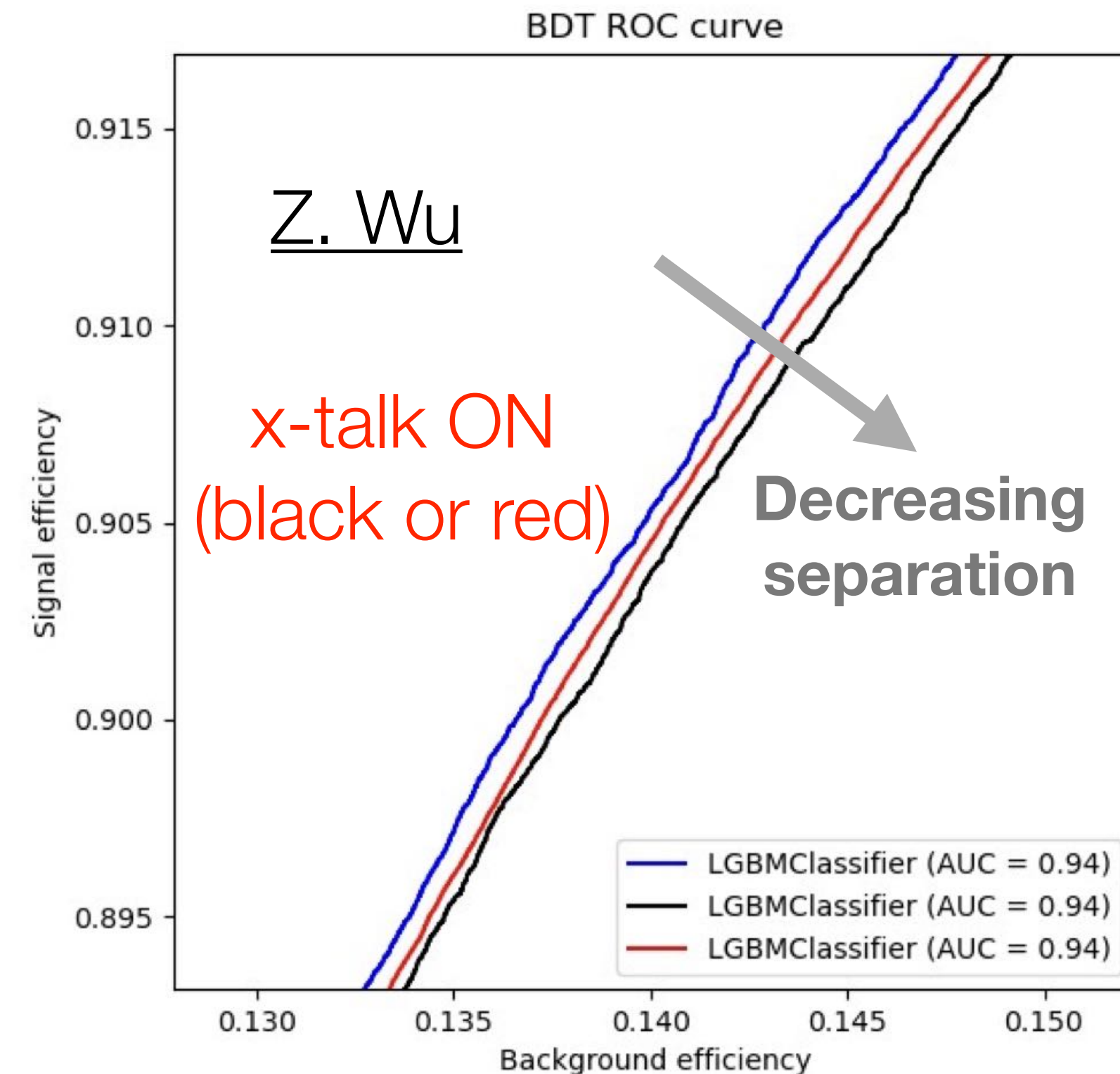
*clustering in ECAL (and HCAL) barrels;
now working on endcap clustering*

WP2 news: simulations

- **Noise and cross-talk simulation fully implented for EM barrel calorimeter, physics studies ongoing**
 - some very preliminary results:



photon energy calibration



photon/pi0 discrimination

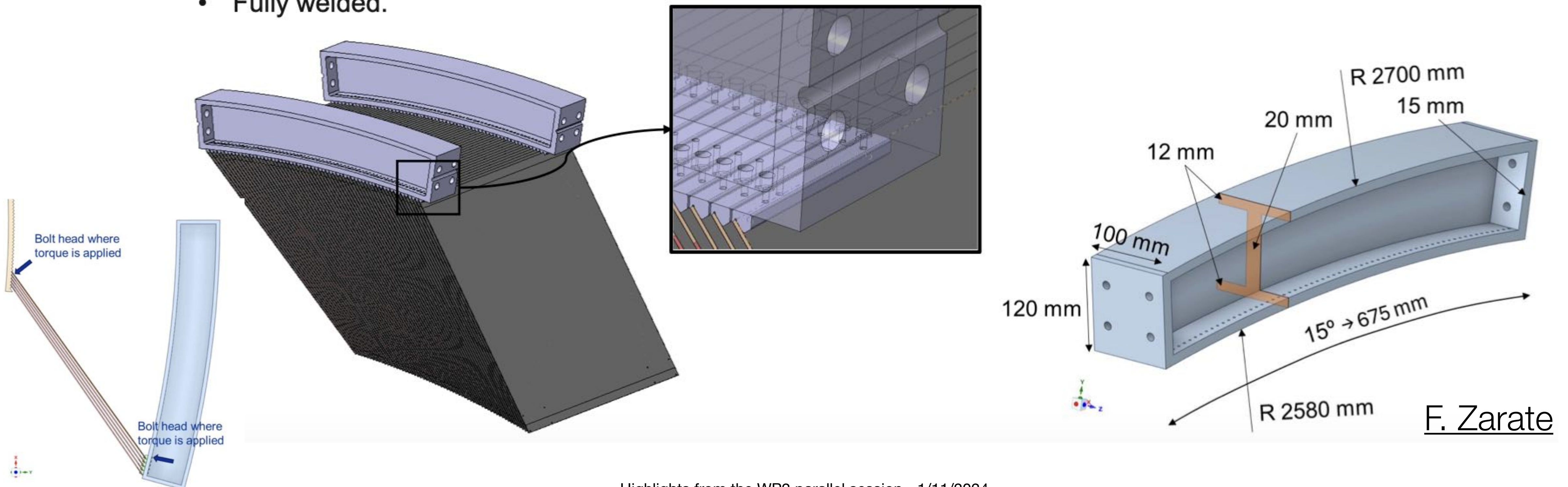
- Blue: No cross-talk in training or test.
- Black: Cross-talk in both training and test.
- Red: No cross-talk in training but cross-talk in test.

- **Next step: implementation for EM endcap calorimeter**

WP2 news: mechanics

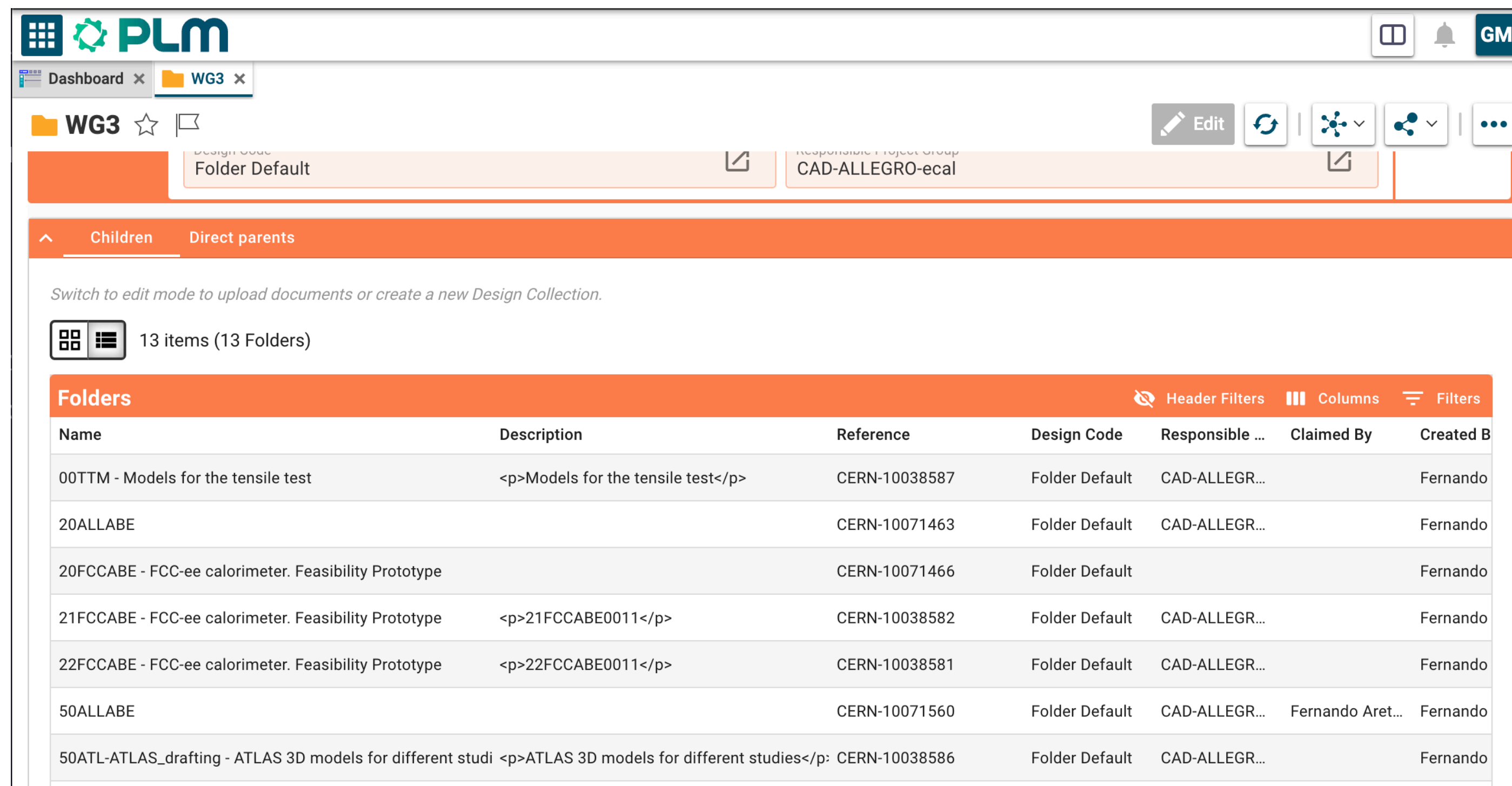
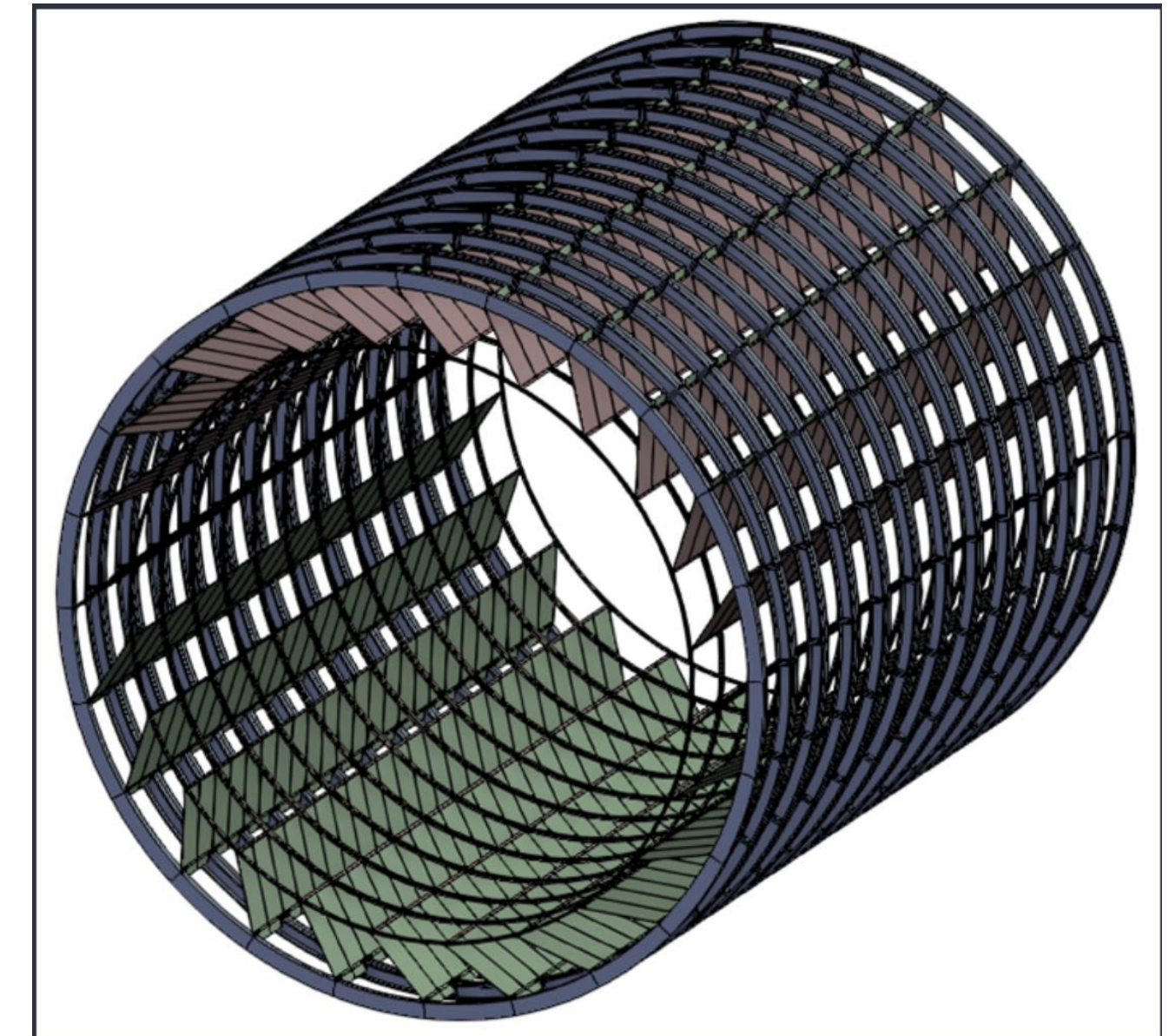
- **Progress on external support design**

- Concept developed for **intermediate part** between absorbers and rings, bolted first to absorber and then to ring
- **Models for construction** being done, 3 alternative production modes for ring possible, 1 **prototype** each to be produced
 - Fully machined.
 - Bending a straight H profile and welding the plates to join the sectors.
 - Fully welded.



WP2 news: mechanics

- **CAD models now stored online in Product Lifecycle Management (PLM) platform** ([link](#), requires Firefox or Chrome)
 - Everyone can upload a model
 - Everyone can visualise a 3D model, without needing a dedicated CAD software
 - Simple functionalities available
 - Useful for storing / sharing information on detector mechanical engineering

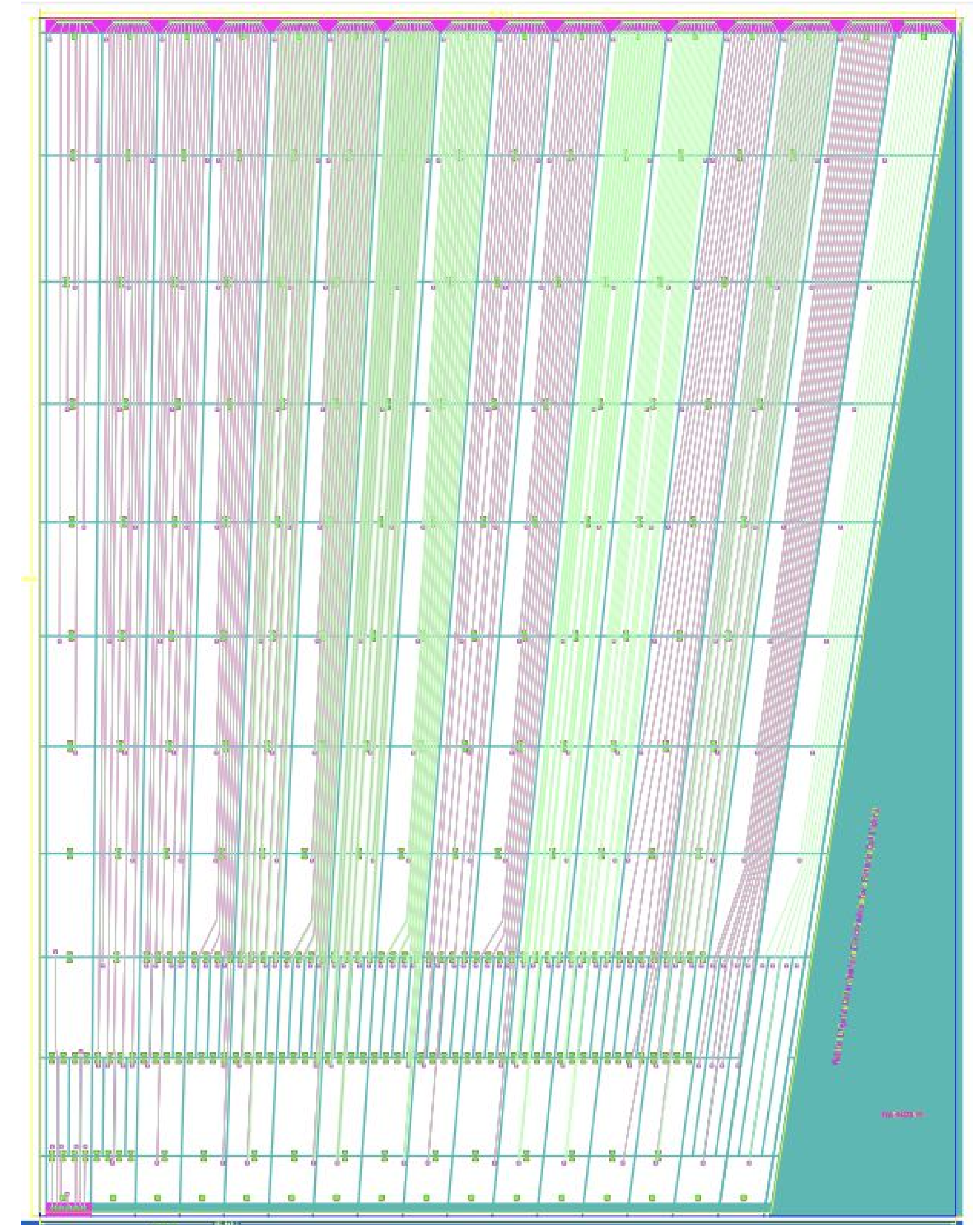
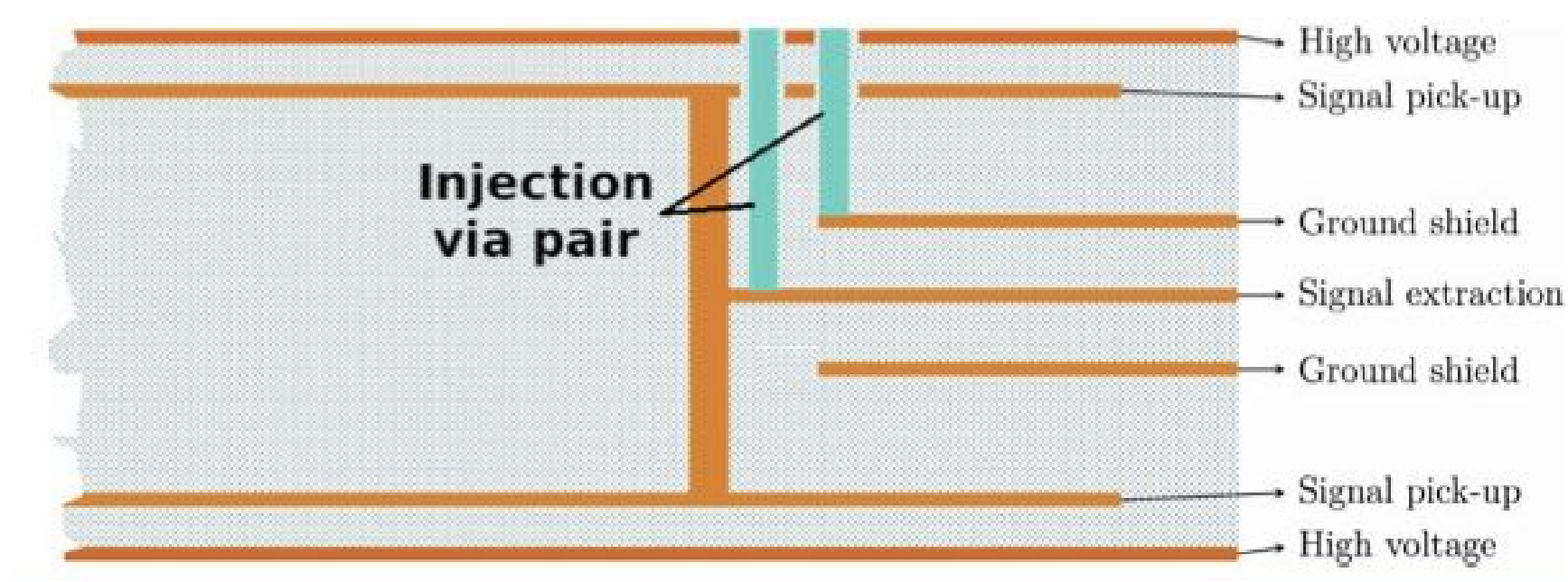


Name	Description	Reference	Design Code	Responsible ...	Claimed By	Created B
00TTM - Models for the tensile test	<p>Models for the tensile test</p>	CERN-10038587	Folder Default	CAD-ALLEGR...		Fernando
20ALLABE		CERN-10071463	Folder Default	CAD-ALLEGR...		Fernando
20FCCABE - FCC-ee calorimeter. Feasibility Prototype		CERN-10071466	Folder Default			Fernando
21FCCABE - FCC-ee calorimeter. Feasibility Prototype	<p>21FCCABE0011</p>	CERN-10038582	Folder Default	CAD-ALLEGR...		Fernando
22FCCABE - FCC-ee calorimeter. Feasibility Prototype	<p>22FCCABE0011</p>	CERN-10038581	Folder Default	CAD-ALLEGR...		Fernando
50ALLABE		CERN-10071560	Folder Default	CAD-ALLEGR...	Fernando Aret...	Fernando
50ATL-ATLAS_drafting - ATLAS 3D models for different studi	<p>ATLAS 3D models for different studies</p>	CERN-10038586	Folder Default	CAD-ALLEGR...		Fernando

F. Zarate

WP2 news: electronics

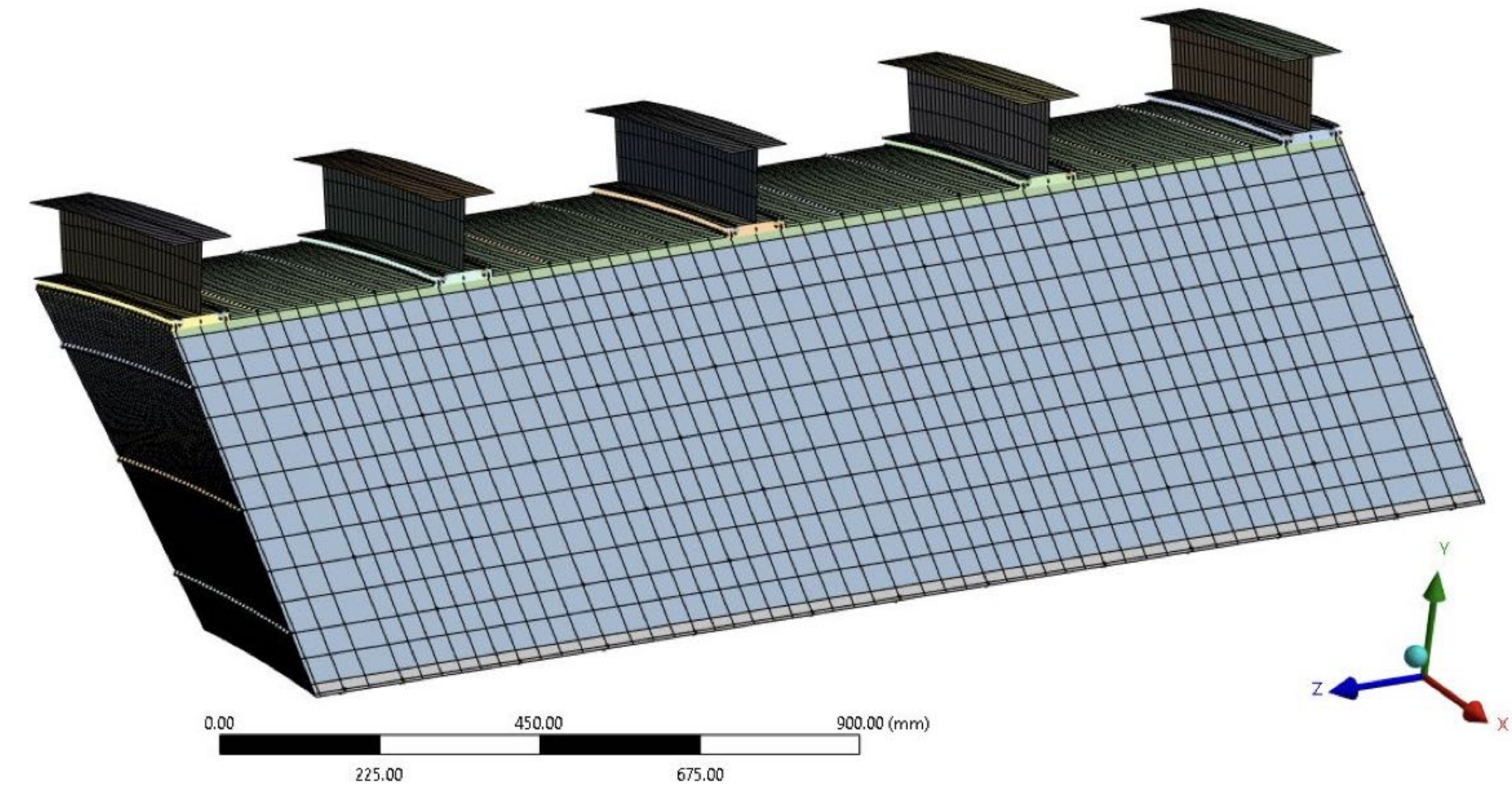
- **New PCB prototype design implemented, now ~frozen**
 - Projective cells in cells, 11 layers - matching current model in full sim
 - Readout from back, to reduce material budget upstream
 - Ground shields connected inside PCB
 - Multiple variations of parameters e.g.
 - Position of strip cells (2nd, 3rd or 2nd+3rd layer)
 - Configuration of lateral shields to reduce capacitive x-talk
 - Trace ordering (-> inductive x-talk)
 - Injection pairs added to some cells for injection studies
- **Next: ~2 weeks for polishing/verification of drawings, 1 month of production at CERN PCB lab (3 prototypes to start with)**



J. Pekkanen

WP2 news: further work on mechanics and electronics

- Mechanics
 - **Thermomechanical study (ANSYS) of latest design ongoing**
 - **Starting soon: study of heat transfer problem of cold electronics**
- Electronics
 - **Readout electronics development ramping up at two sites (Omega Lab & BNL)**



Discussion on EOs

WP2 Parallel Meeting, 31/10/2024

Nicolas **Morange**, *IJCLab*



- **General consensus to contribute to two Eols, one ECAL-only related (2-4) pages and one teaming up with interested parties on full ALLEGRO detector concept with noble-liquid ECAL (3-6 pages)**
 - ECAL-only: centered on baseline design (current barrel/endcap designs with Pb/Lar, with list of alternative options to study e.g. active/passive material, cold/warm electronics, endcap/endplugs geometry ..)
 - ALLEGRO: noble-liquid ECAL at its core, and open for several options for all other sub-detectors - come talk to us if you're interested !

Conclusion

- Progress in all main areas of WP2
 - Simulation & reconstruction, mechanics, electronics
- Clear ideas about next main steps in all areas
- Limited person power, but growing - though lots of possibilities for newcomers on all kinds of activities, depending on interests & expertise
- Busy schedule ahead with deadlines for ESPPU Eols on top of already planned R&D work

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