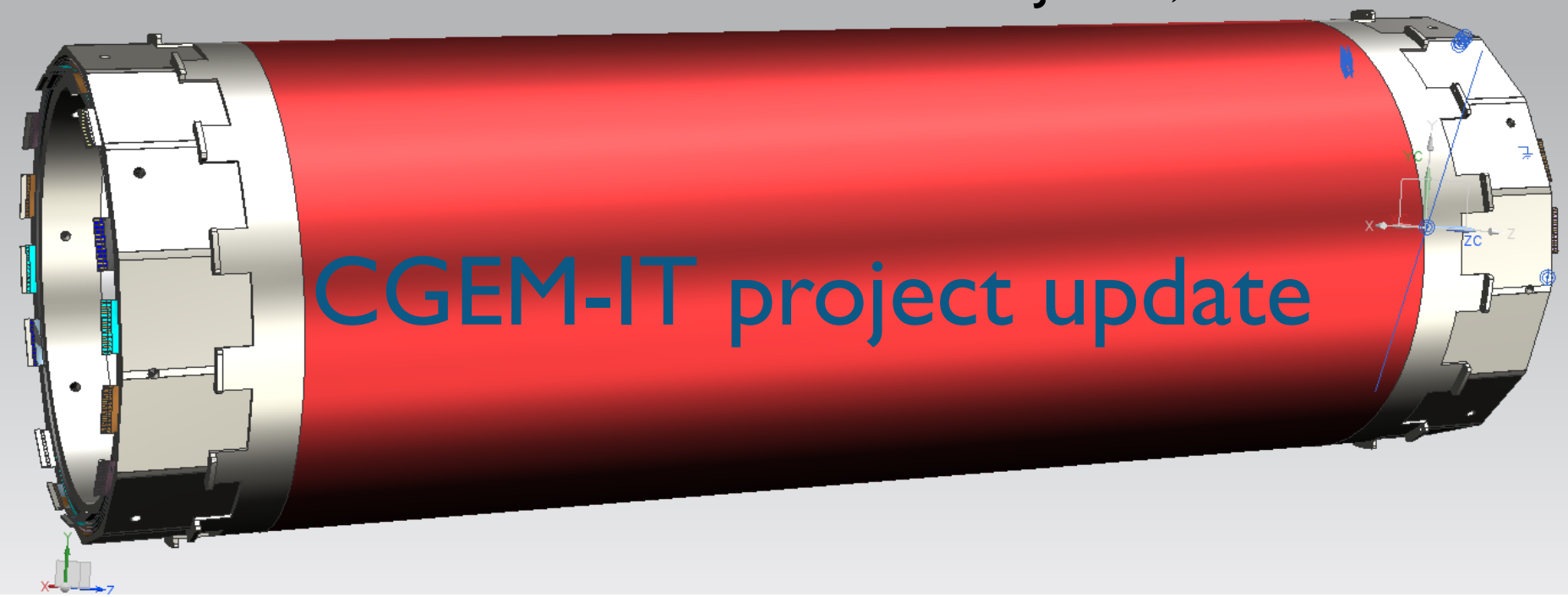
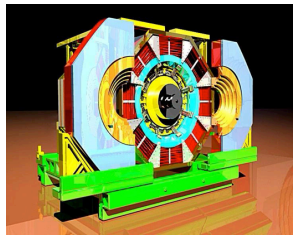
CGEM Meeting
Laboratori Nazionali Frascati - Jan 29, 2014



# CGEM-IT project update

*Gianluigi Cibinetto*
on behalf of the Ferrara group



# Outline

- Status of layer 2 mechanical design
  - part I: closing on the construction tooling, cathode and GEM design
  - part II: opening the discussion on the anode design
  - part III: summary of other important ongoing issues (integration)
- Construction plan and schedule review
- 2014 construction budget review
- CDR status for the mechanical design (postponed to the afternoon session)

# Status of layer 2 mechanical design

**Part I: closing on the construction tooling, cathode and GEM design**

- The layer 2 mechanical design has completed at executive drawing level (except for the anode).

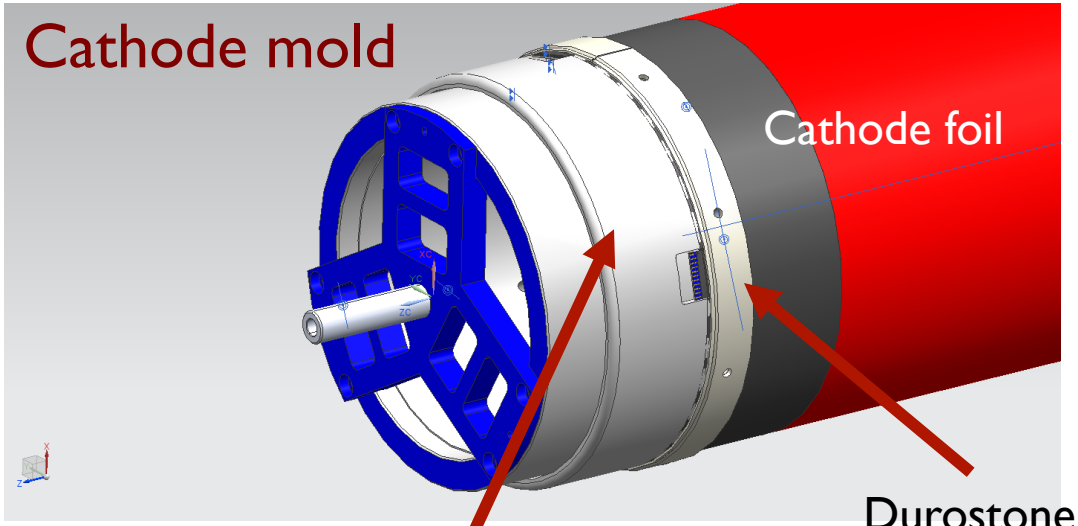
- In particular we delivered drawings for:
  - molds and other construction tools
  - GEM and cathode foils drawings
  - Durostone supporting rings

- All the drawings have been validated by the Ferrara group: waiting for another green light to go on with the orders.
  - the durostone rings will be reviewed also by people from Bari

# Construction tooling

- Order placed at the end of 2013 to CECOM, the factory is waiting for the drawings.
- They need about three months to have the work done.
- This must be our highest priority: about one or two weeks.
- Then we will go to the factory to explain them the details of the drawings.

# Molds for layer 2 construction

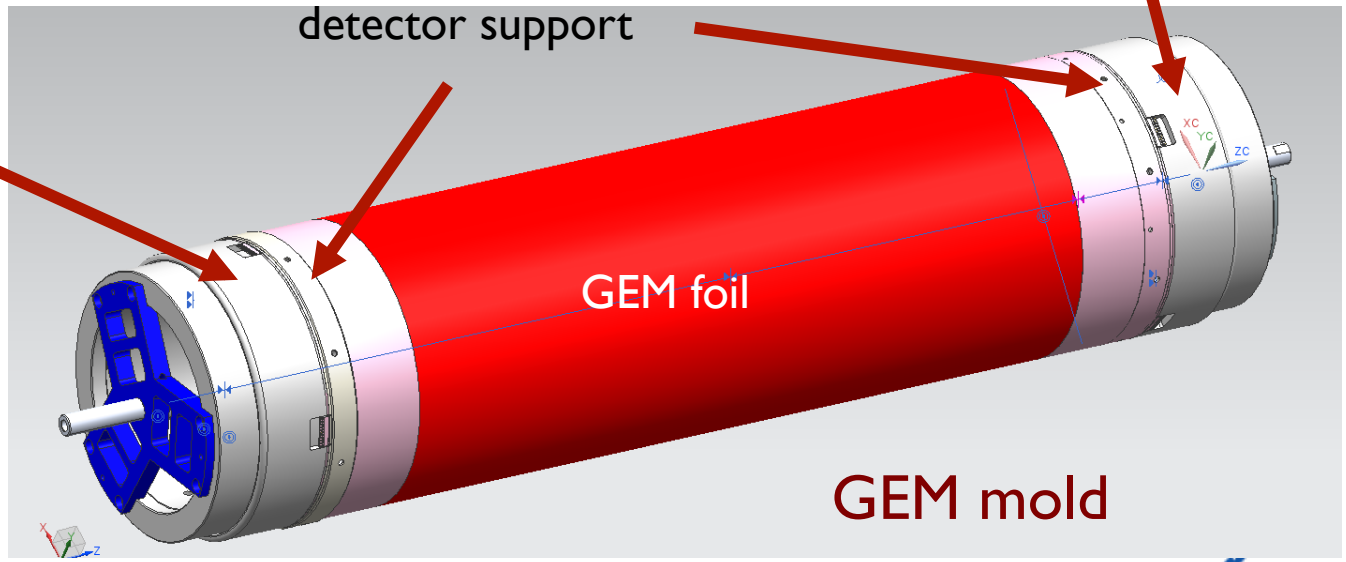



- Each of the five detector skins (cathode + 3 GEMs + anode) is pre-assembled on an aluminum mold.
- Each skin has its own mold

Aluminum rings for correct positioning during assembly

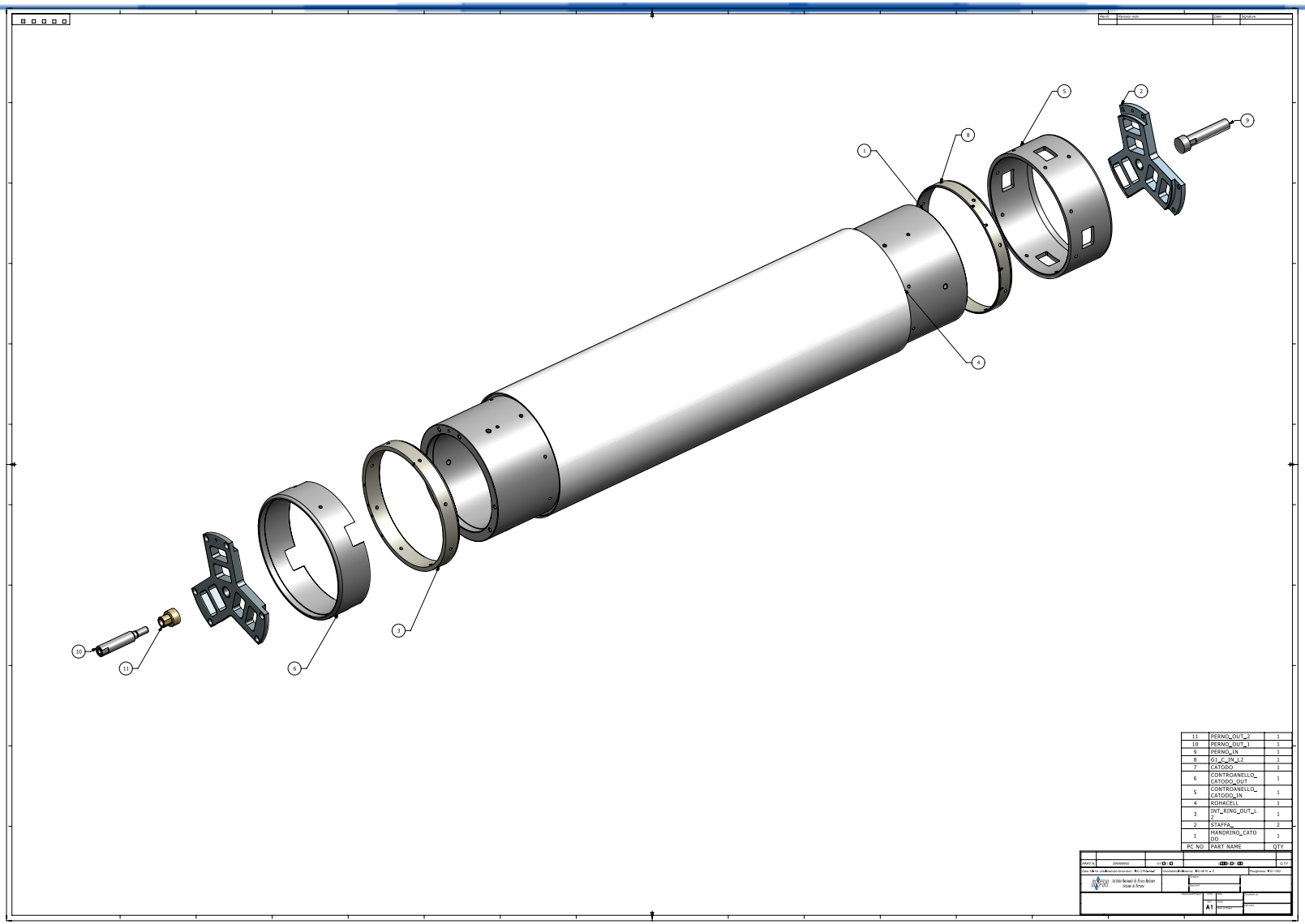
Durostone rings for detector support

Aluminum ring for assembly

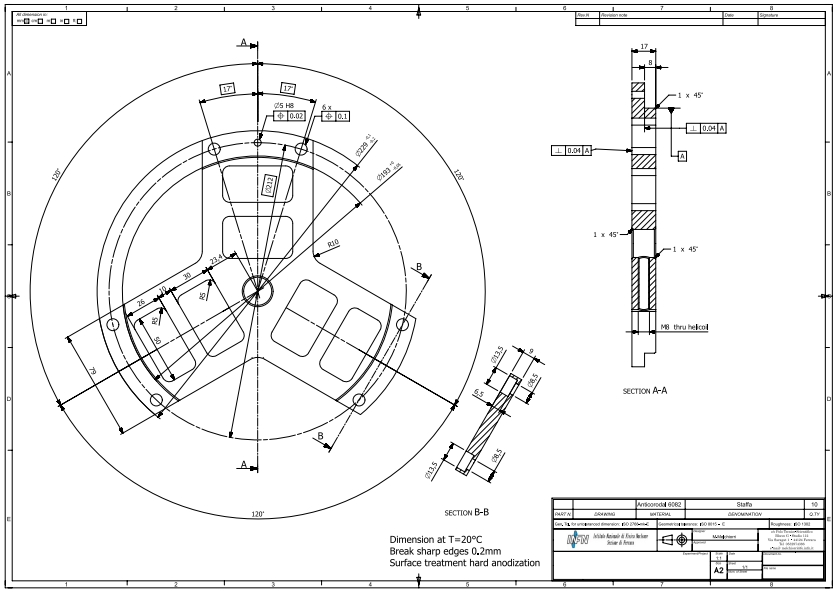


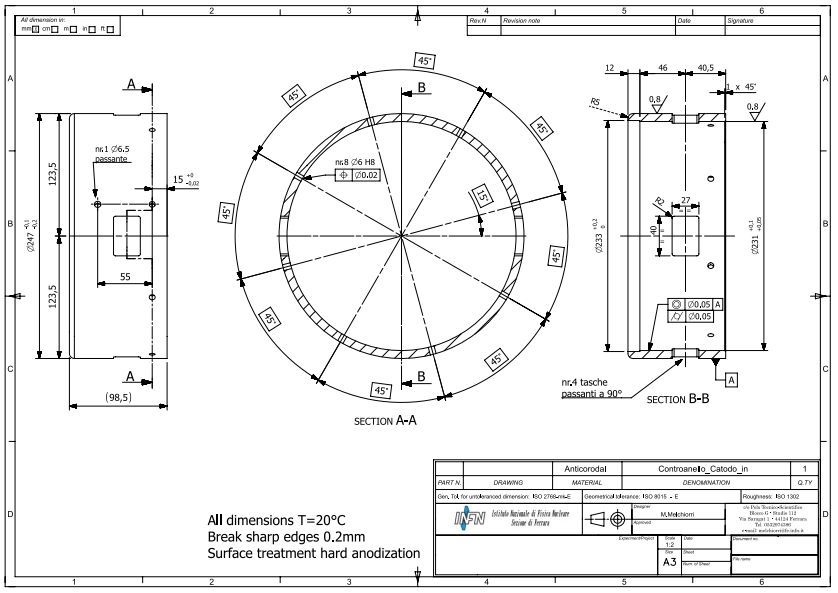

**Molds and aluminum ring design ready!**

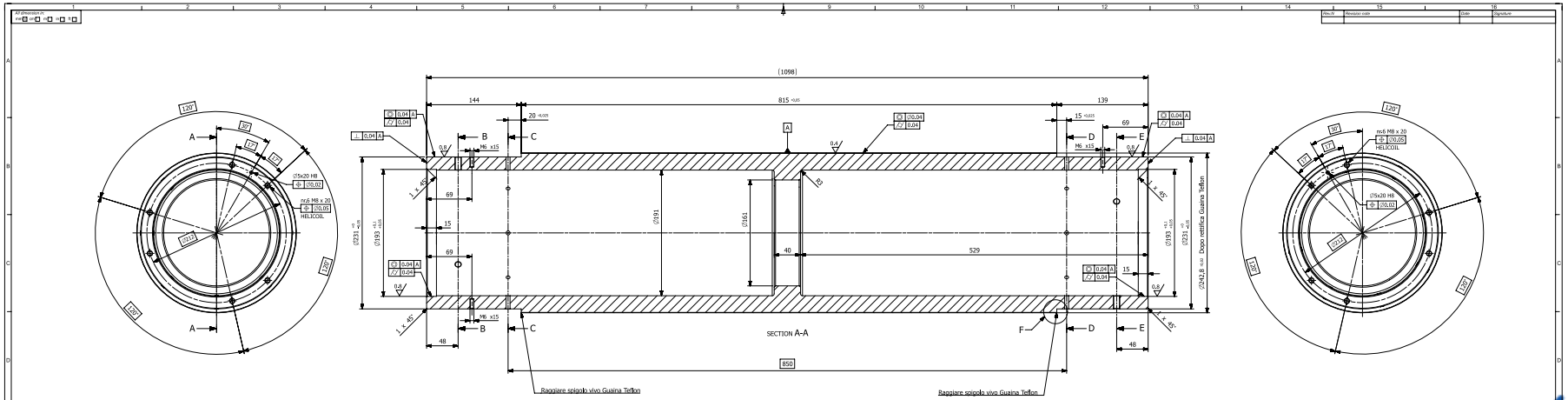
# Molds for layer 2 construction



# Three of the sixteen executive drawings



# GEM and cathode foils

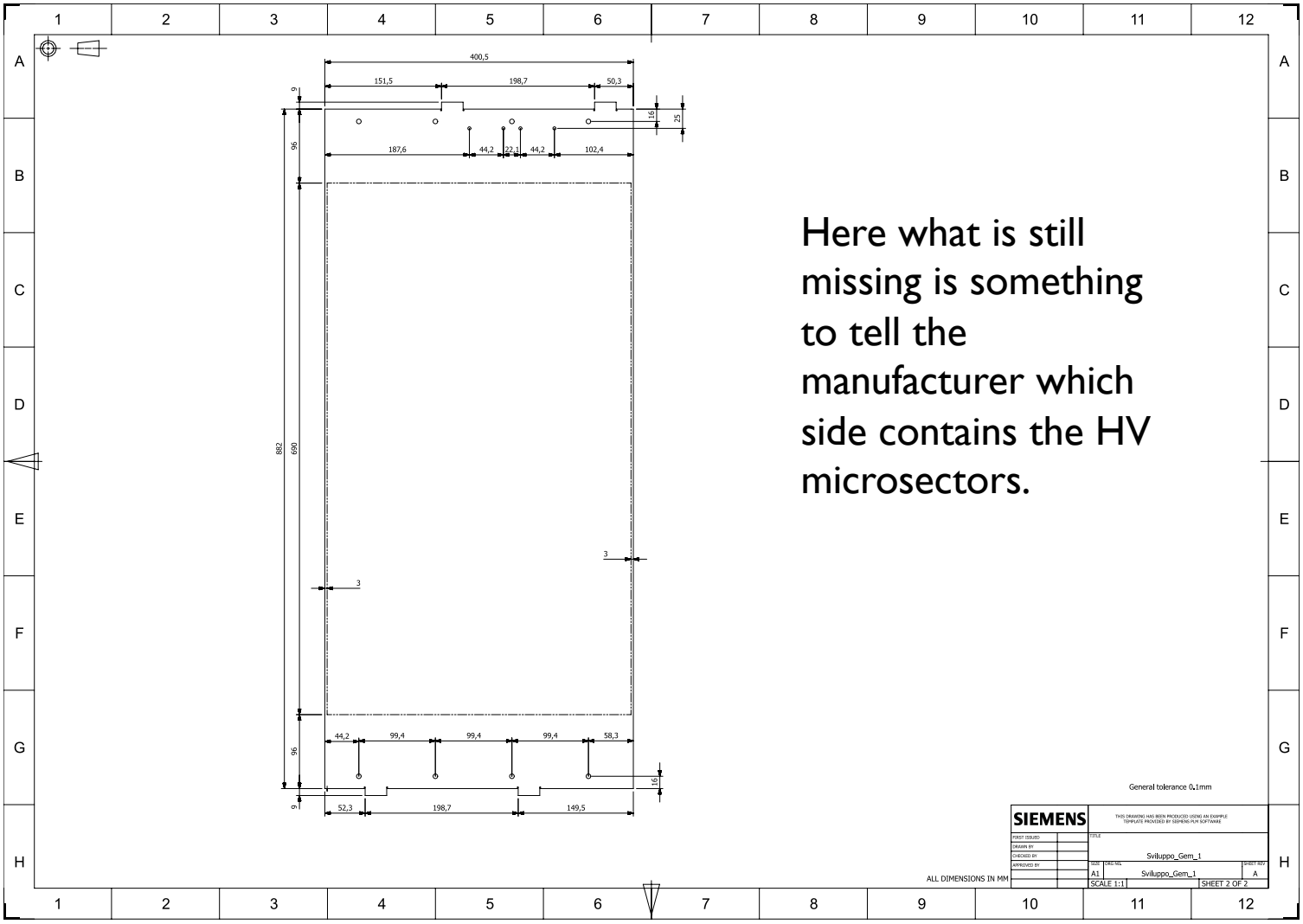
- GEM and cathode foils drawings have been prepared and validated by Bertrand Mehl (the person designated by Rui de Oliveira for our GEM production).

- Our drawings have been converted to their CAD files and double-checked: that will be the procedure once we validated our final drawings.

- These drawings are needed also to modify the aluminum table that will be used for the foils gluing in Frascati.

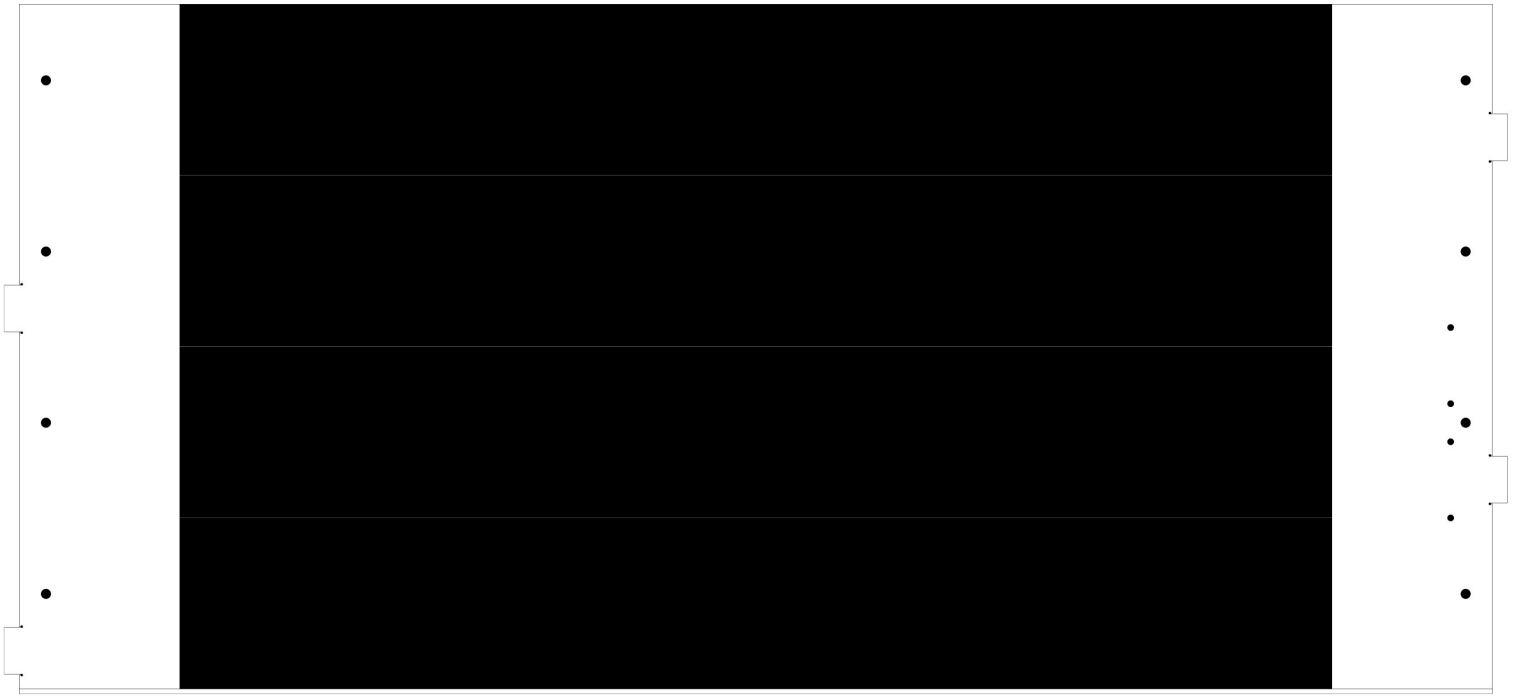
- Time for delivery?

# GEM-1 foil drawing




Here what is still missing is something to tell the manufacturer which side contains the HV microsectors.

# CERN drawings

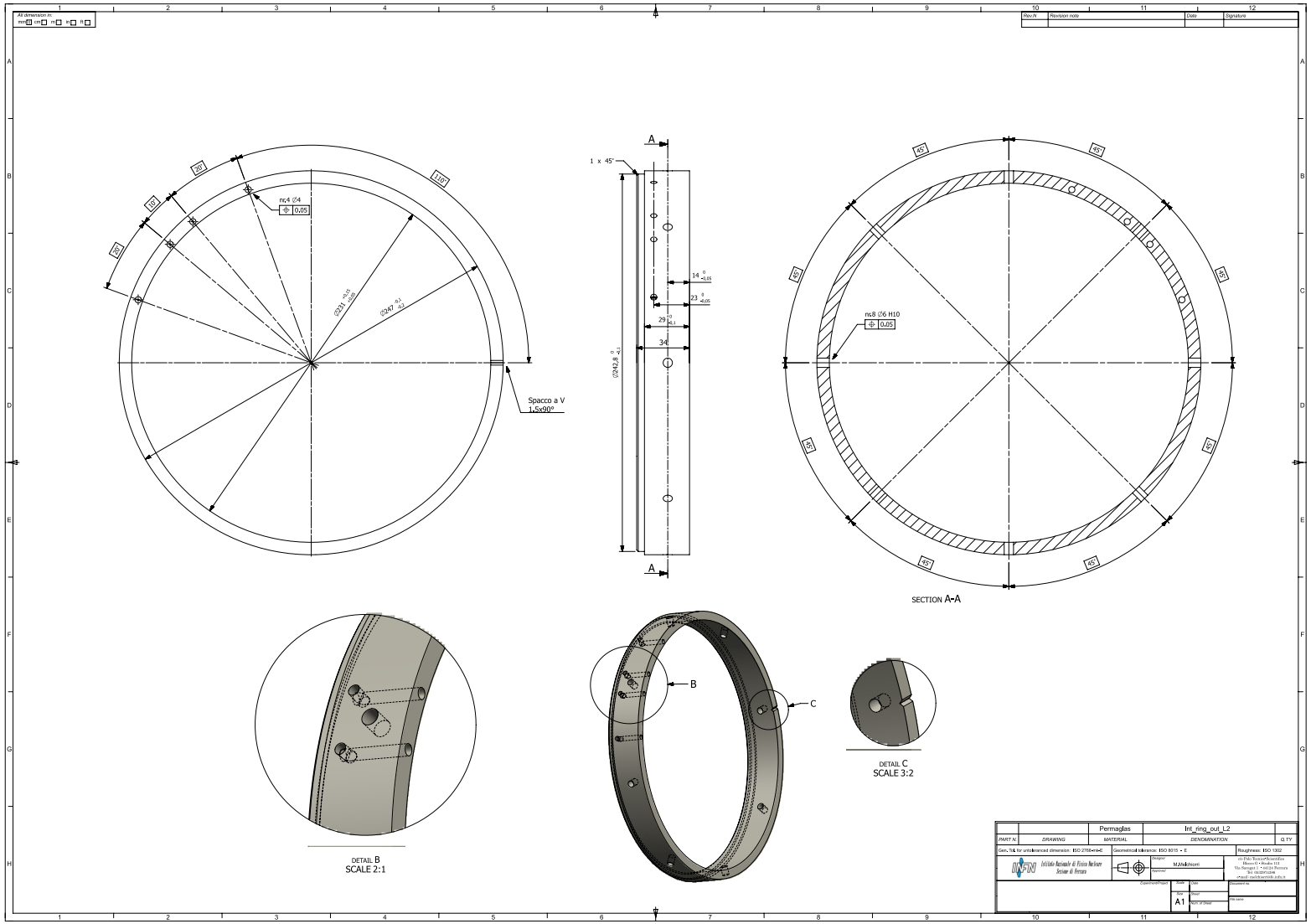


can we say that
we are going to reuse the same HV convention of Kloe and the same HV connectors.

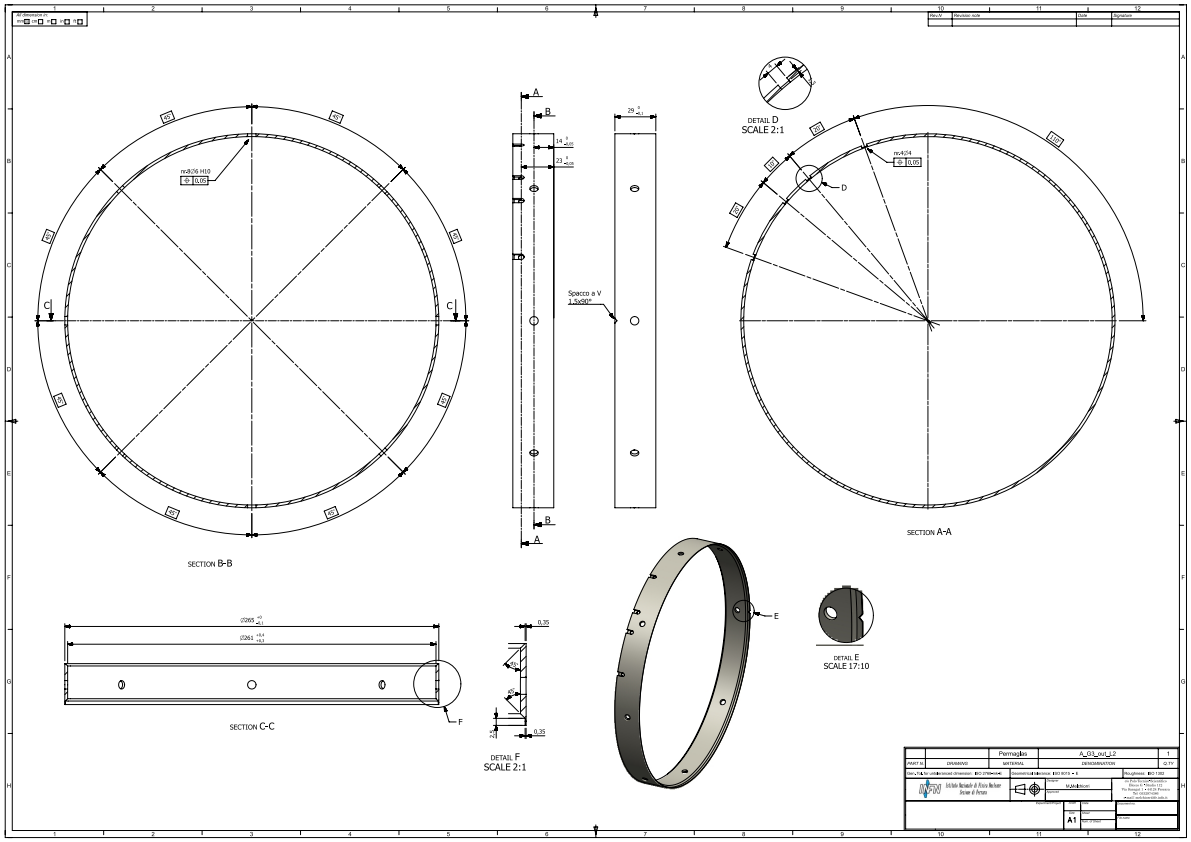
# Durostone rings

- The durostone supporting rings will be ordered by Resarm factory in Belgium.
- The same of Kloe, no time to do further investigation.
- Drawings have been prepared.
- Preliminary offer requested, the price is a little higher w.r.t. Kloe, but they bought them almost four years ago.
  - About 12 keuro for a complete layer
  - About 2 months to complete the work

# Cathode ring



# GEM rings


SECTION B-B
SECTION A-A
SECTION C-C
DETAIL D
SCALE 2:1
DETAIL E
SCALE 17:10
DETAIL F
SCALE 2:1


D

# What is missing

- Molds and tooling
  - validation
- GEM and cathode drawings
  - micro and macro-sectors placement
  - validation
- Durostone rings
  - validation
- We never checked the numbers given by Mingyi Dong in the presentation "Space available for CGEM installation" at the April 2013 workshop. I would be more comfortable doing a cross check.

# Anode design

# Motivation

- For a thousand of reasons it's of paramount importance to start the discussion on the anode design and implementation…
- …even if we don't know yet many details.
- We already have several information to start the gross of the design.
  - Strip pitch, number of channels, number of boards, stereo angle, active area.
  - We have a guess about the stratigraphy and thickness.
  - Shortly we'll have a also an idea of the ASIC board dimensions.

# Anode design: main issues

1. About 3 mm will be the distance between the readout plane and the ground plane
   - need to assemble ourselves the readout and ground planes in a robust structure.
   - need to merge, at some point, the ground and the signals in a single connector.

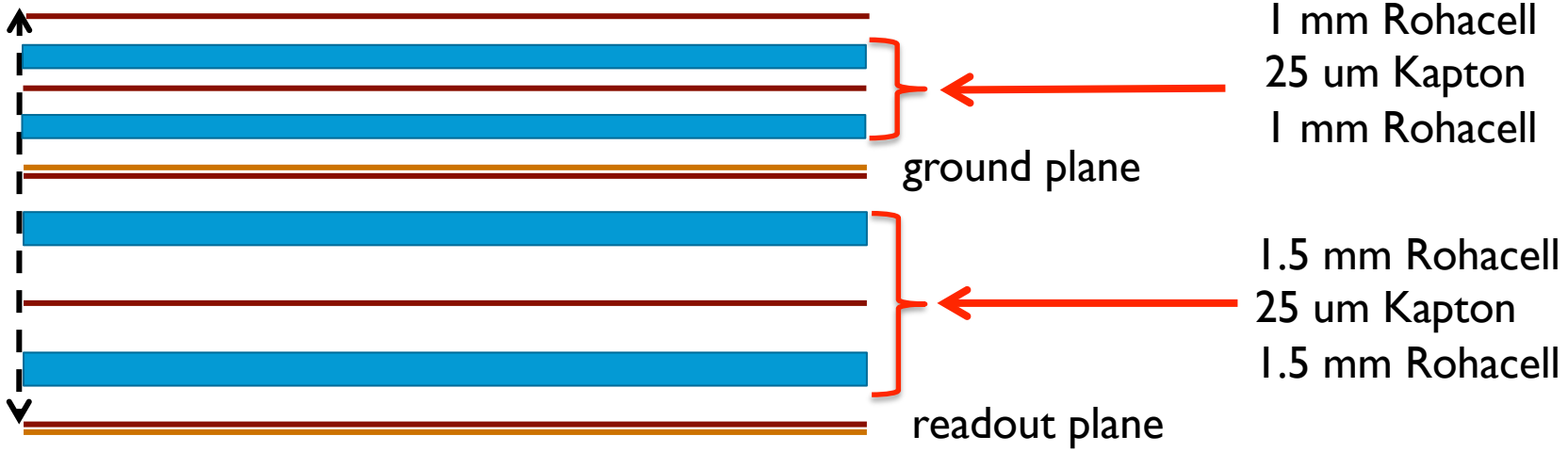
2. Lack of space in z direction
   - but a lot of unused space between the active area and the edge of the chamber.

- Not an easy task.

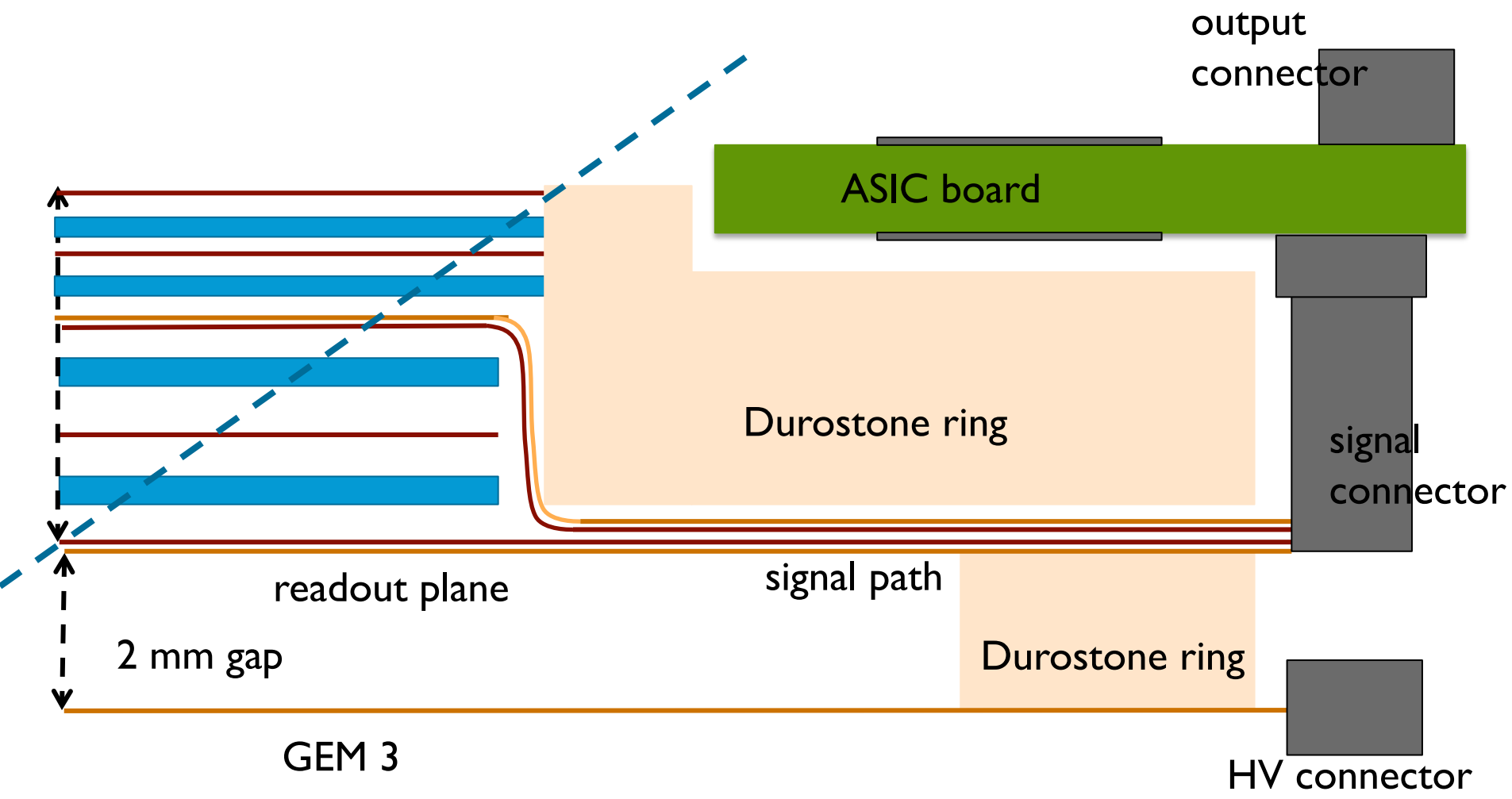
# Proposed stratigraphy

- This could be the layer configuration with a Compass-like readout plane at 3 mm from the ground.

~ 5 mm total thickness

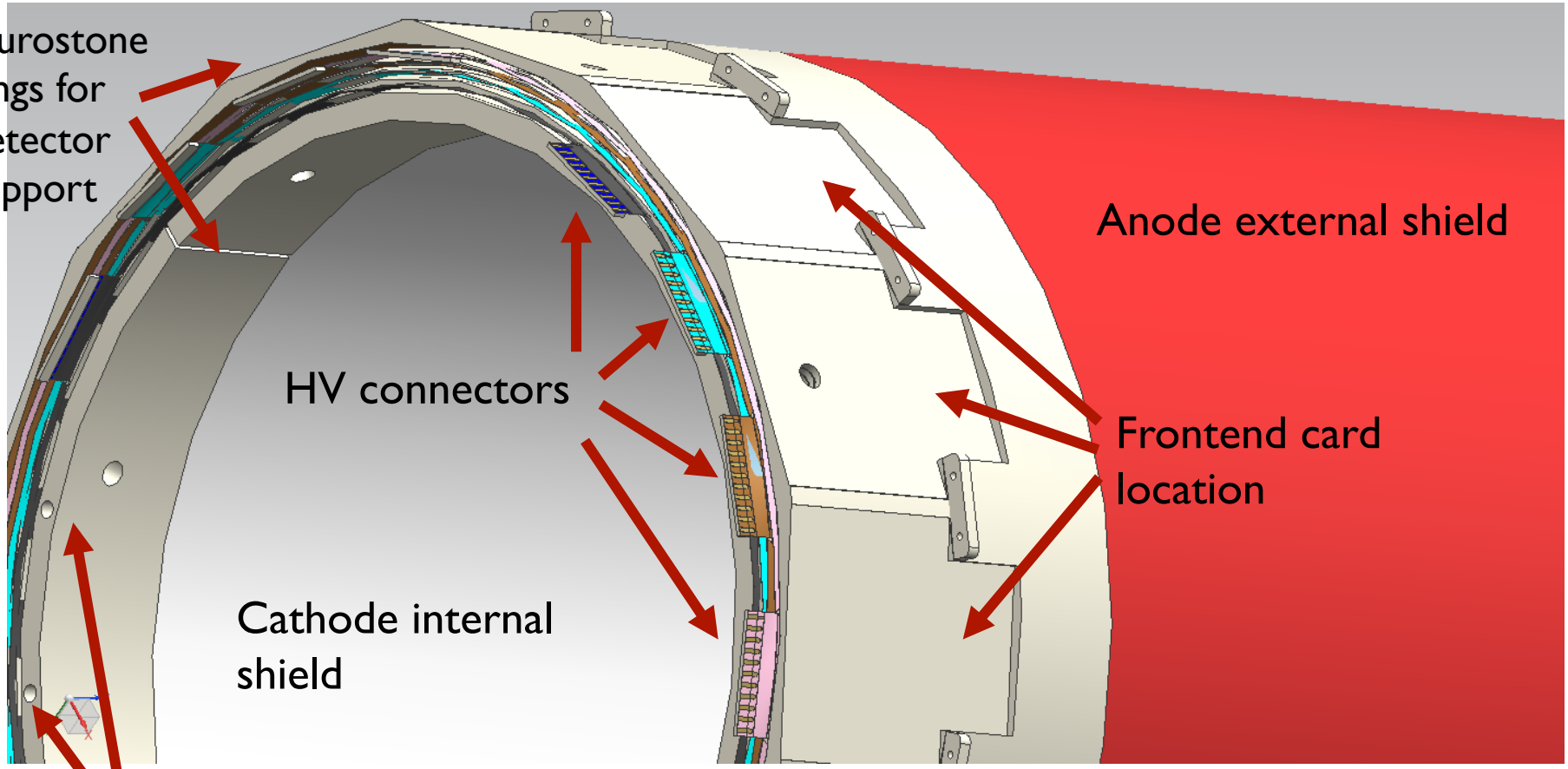


# Proposed layout

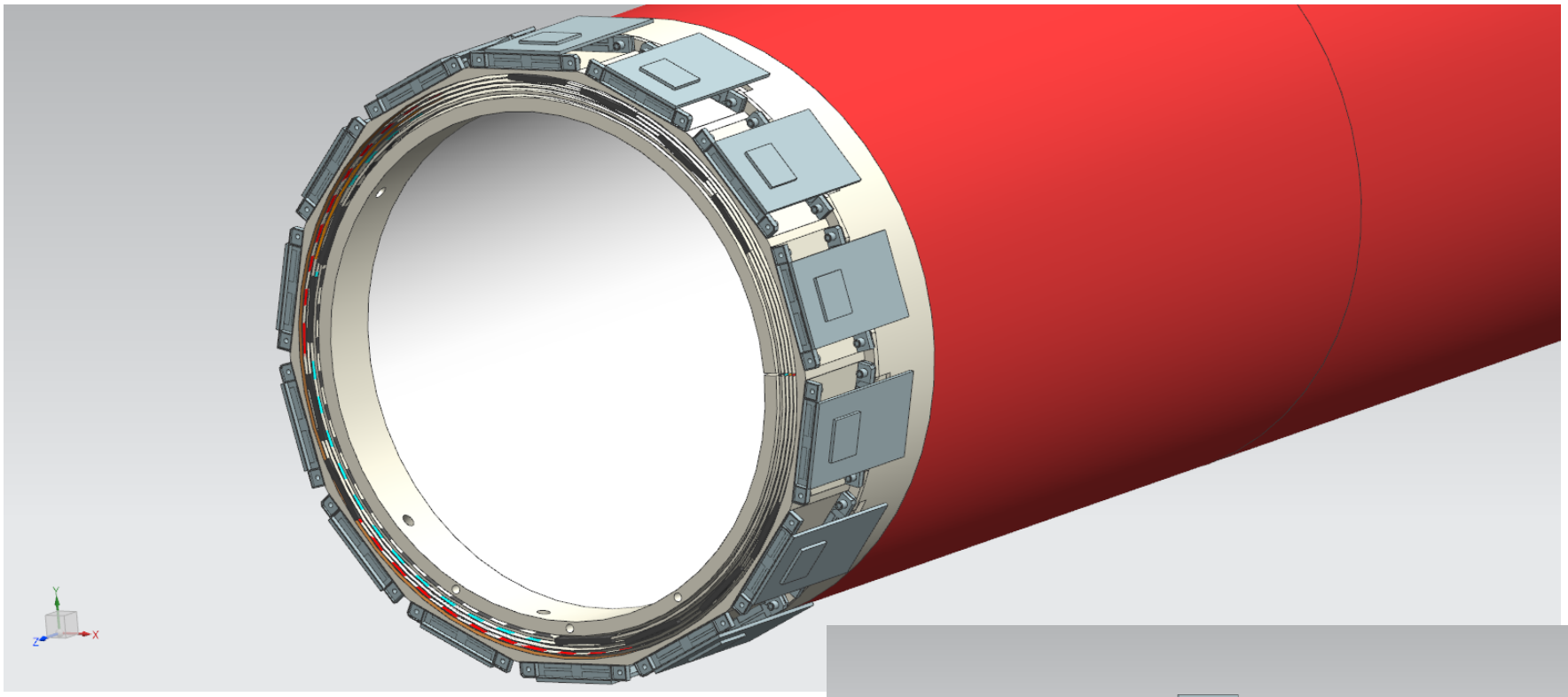


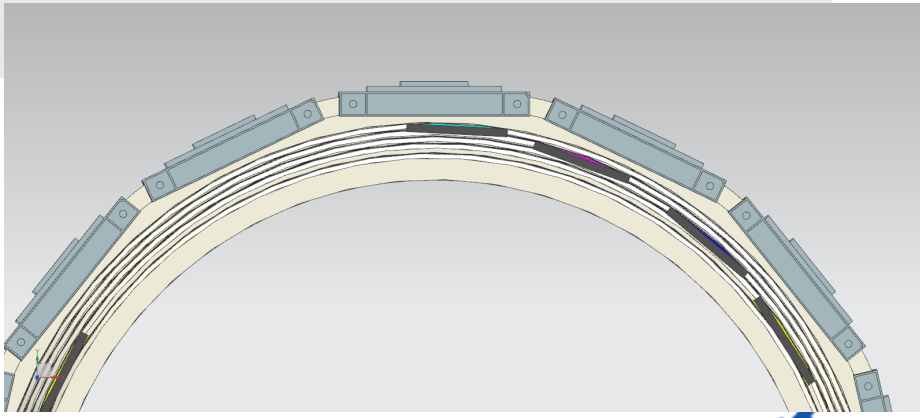
# Layer 2 mechanical design

Assembly of the layer composed by a cathode, 3 GEM foils and the anode, each independently pre-assembled.

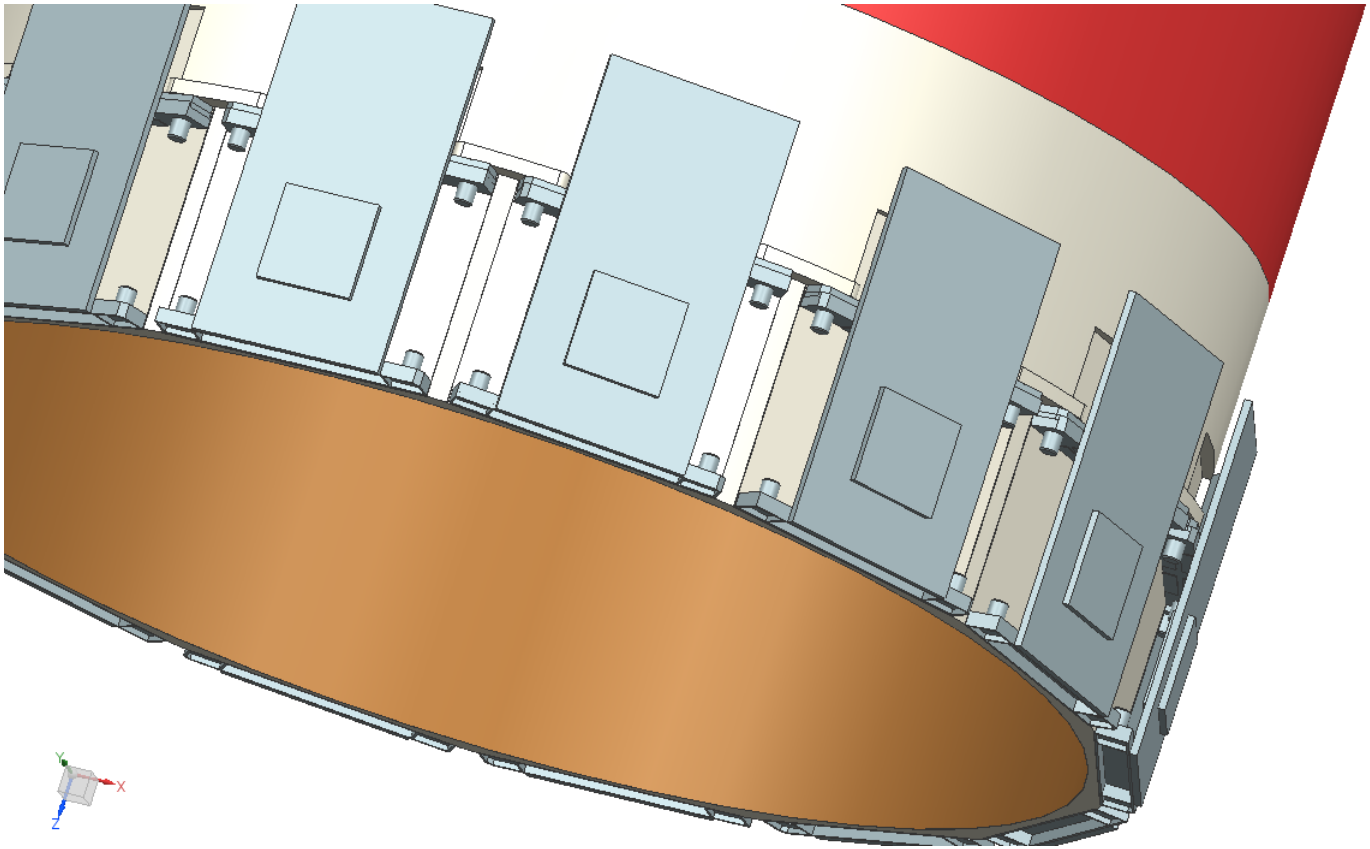


# The anode design





# The anode design



# Mechanical constraints and integration

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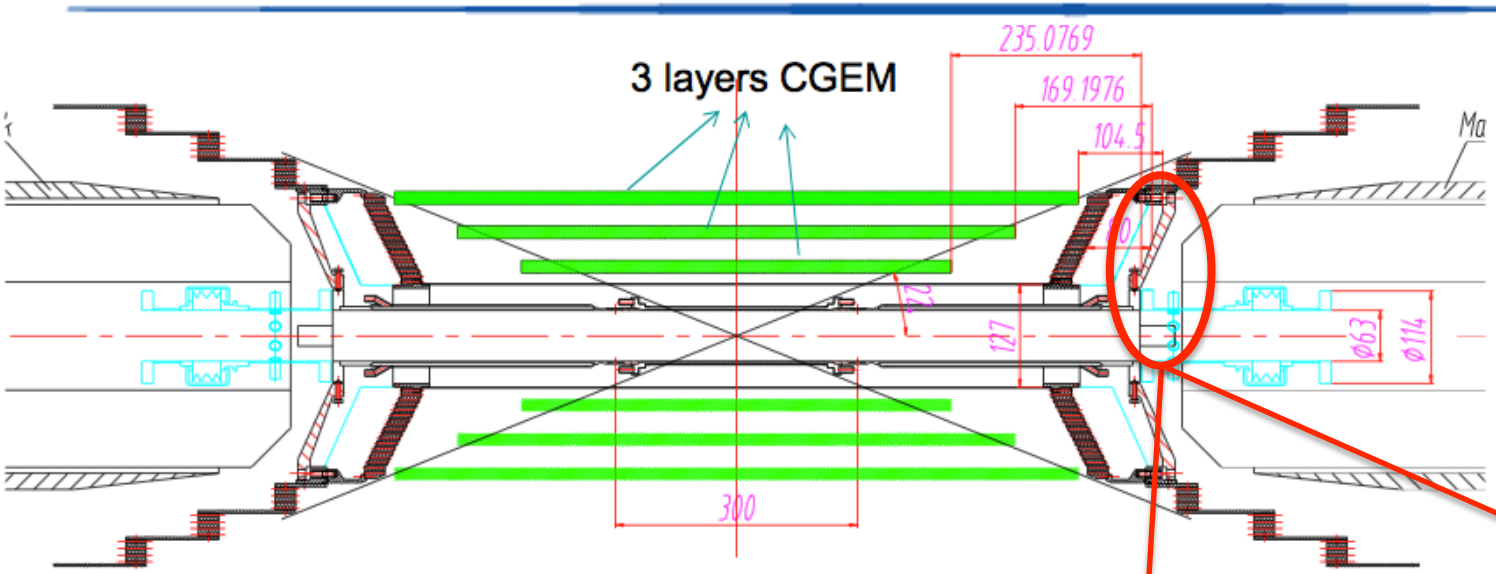
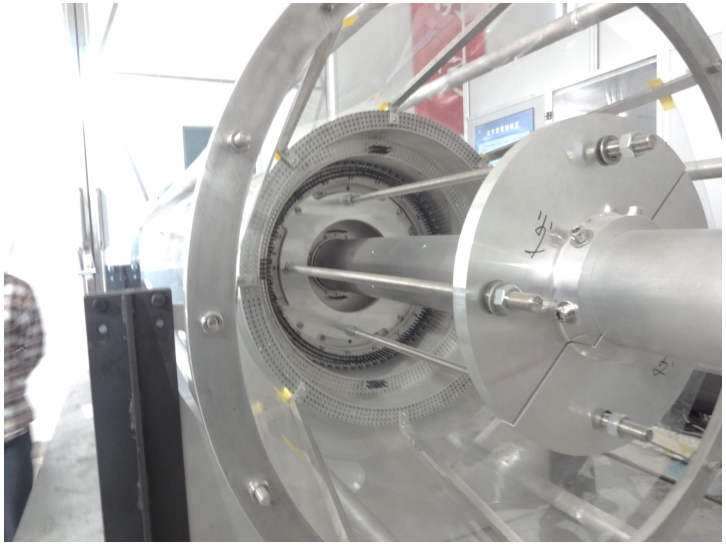
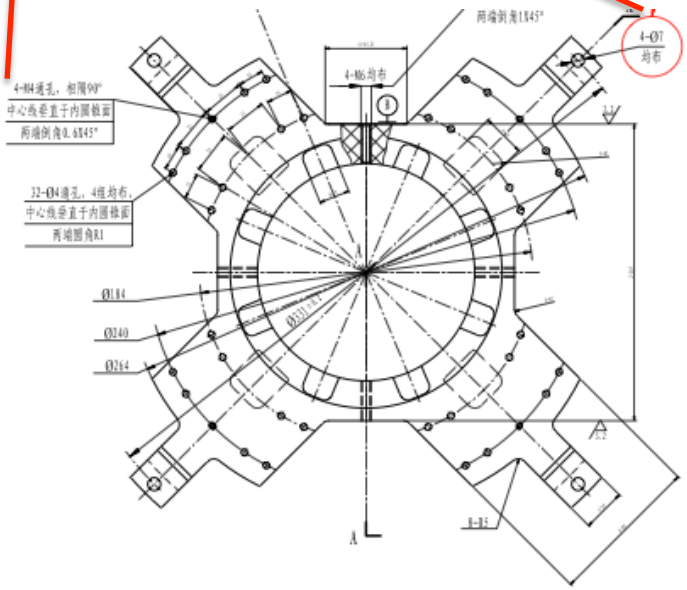
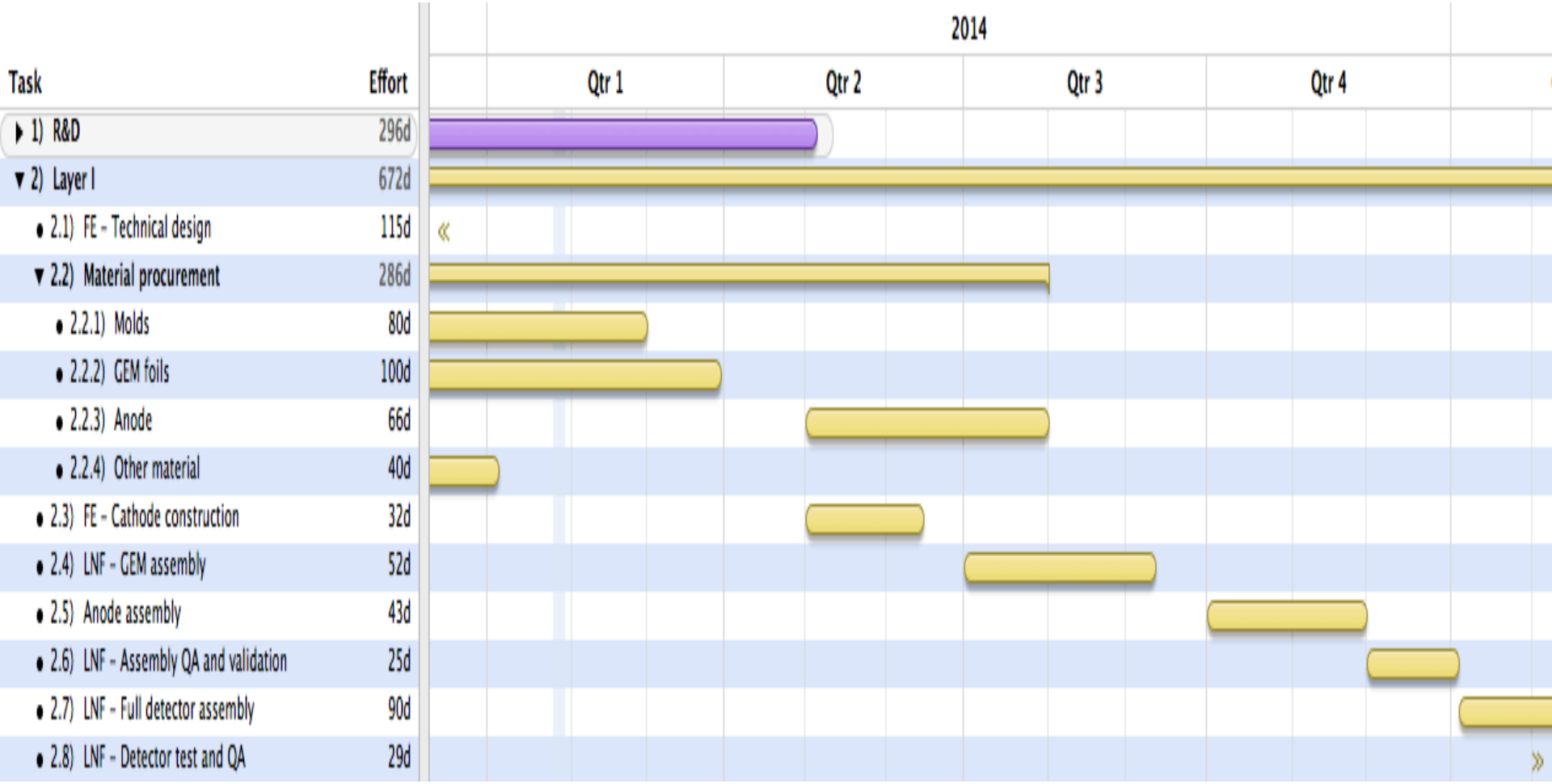




# Construction plans, schedule and budget for 2014

# 2014 construction schedule



# Additional mechanical tests

… not included in the schedulee

- A new cathode prototype: this time full scale, using a Kloe mold.

- Anode prototype need to be assemble as well.

# Setup of the construction area

# To have it done we need:

- Second half of the Rohacell order (2.0 kE)
- Kapton roll (2.0 kE)
- Copper coated Kapton (3.0 kE)
- Durostone rings (12 kE)

**should be part of the MAE 2014 assignment possibility to do a partial order now (just to start): ~3kE**

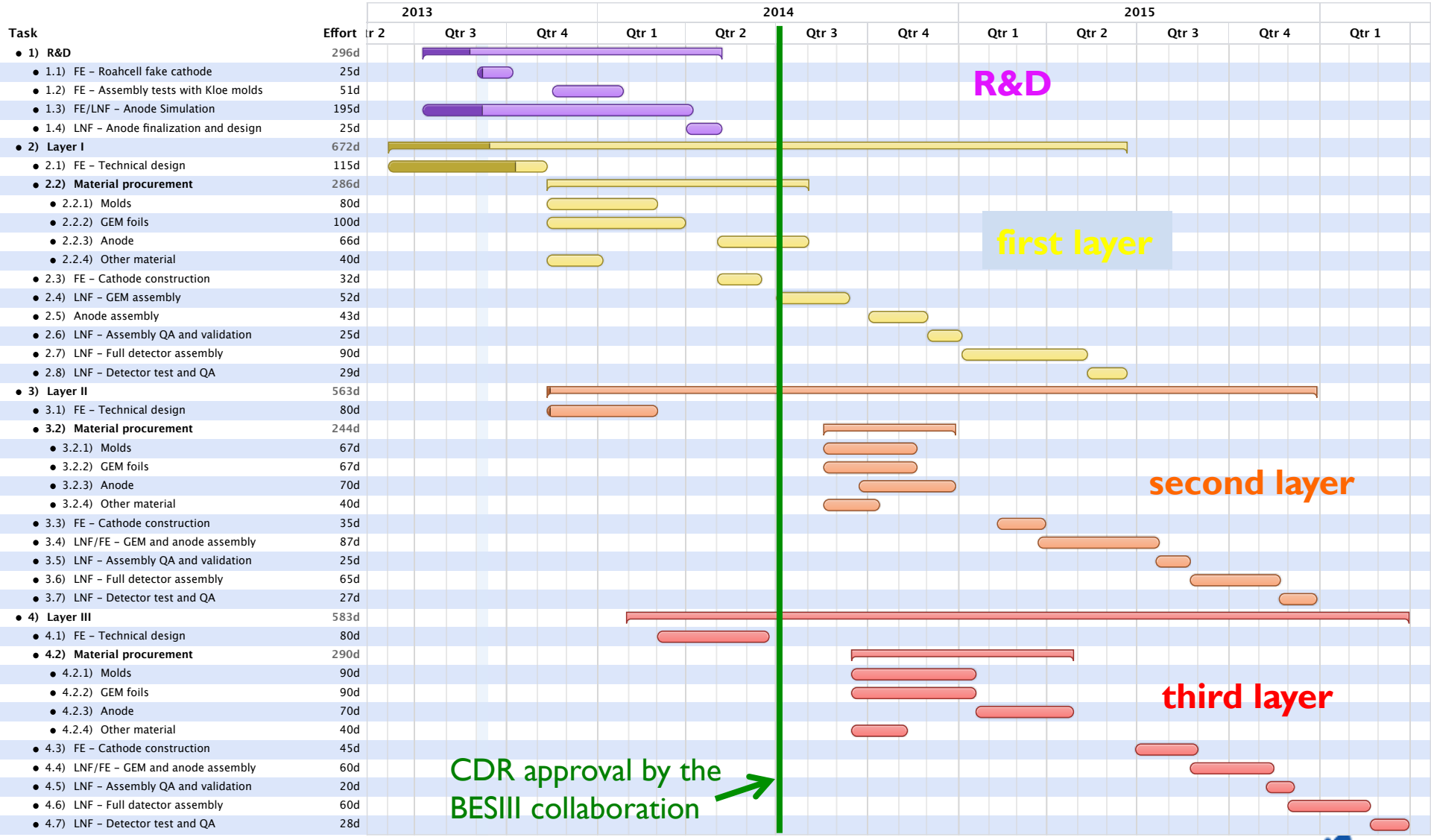
- Other minor but useful stuff (2-3 kE)

# Review of 2014 construction budget

| | LNF (kE) (INFN+MAE) | LNF (kE) (CSN1) | FE (kE) (CSN1) | TO (kE) (CSN1) |
|---|---|---|---|---|
| Catodo e gems 2t | | 11 | | |
| Catodo e gems 3t | | 11 | | |
| Anodo 1t | 13 | | | |
| HV schedine 1t | 5 | | | |
| Consumi gas e altro | 8 | | | |
| Lavori e materiali assemblaggio 1t | 30 | | | |
| Elettronica provvisoria 1t | 15 | | | |
| HV System (pw sup e distribuzione) | 22 | | | |
| | | | | |
| Anodo 2t | | | 10 | |
| Anodo 3t | | | 10 | |
| Mandrini 2t | | | 9(14) | |
| Accessori mandrini 2t | | | 6(10) | |
| Rohacell 2t | | | 2 | |
| Consumo 2t | | | 1 | |
| Attrezzatura laboratorio | | | 4 | |
| Licenza 1y ANSIS Maxwell Edu | | | 4,5 | |
| | | | | |
| I Fonderia ASIC (sj) | | | | 38 |
| PCB per test ASIC | | | | 5 |
| consumo ASIC | | | | 2 |
| Licenza Cadence | | | | 0,5 |
| 2 PC per sviluppo ASIC | | | | 4 |
| | | | | |
| Somma | 80 | 22 | 57,5(66.5) | 49,5 |


Thanks

# Schedule for detector construction




| Task | Effort |
|---|---|
| 1) R&D | 296d |
| 1.1) FE – Roahcell fake cathode | 25d |
| 1.2) FE – Assembly tests with Kloe molds | 51d |
| 1.3) FE/LNF – Anode Simulation | 195d |
| 1.4) LNF – Anode finalization and design | 25d |
| 2) Layer I | 672d |
| 2.1) FE – Technical design | 115d |
| 2.2) Material procurement | 286d |
| 2.2.1) Molds | 80d |
| 2.2.2) GEM foils | 100d |
| 2.2.3) Anode | 66d |
| 2.2.4) Other material | 40d |
| 2.3) FE – Cathode construction | 32d |
| 2.4) LNF – GEM assembly | 52d |
| 2.5) Anode assembly | 43d |
| 2.6) LNF – Assembly QA and validation | 25d |
| 2.7) LNF – Full detector assembly | 90d |
| 2.8) LNF – Detector test and QA | 29d |
| 3) Layer II | 563d |
| 3.1) FE – Technical design | 80d |
| 3.2) Material procurement | 244d |
| 3.2.1) Molds | 67d |
| 3.2.2) GEM foils | 67d |
| 3.2.3) Anode | 70d |
| 3.2.4) Other material | 40d |
| 3.3) FE – Cathode construction | 35d |
| 3.4) LNF/FE – GEM and anode assembly | 87d |
| 3.5) LNF – Assembly QA and validation | 25d |
| 3.6) LNF – Full detector assembly | 65d |
| 3.7) LNF – Detector test and QA | 27d |
| 4) Layer III | 583d |
| 4.1) FE – Technical design | 80d |
| 4.2) Material procurement | 290d |
| 4.2.1) Molds | 90d |
| 4.2.2) GEM foils | 90d |
| 4.2.3) Anode | 70d |
| 4.2.4) Other material | 40d |
| 4.3) FE – Cathode construction | 45d |
| 4.4) LNF/FE – GEM and anode assembly | 60d |
| 4.5) LNF – Assembly QA and validation | 20d |
| 4.6) LNF – Full datector assembly | 60d |
| 4.7) LNF – Detector test and QA | 28d |