



UNIVERSITÀ
DI TORINO



Istituto Nazionale di Fisica Nucleare
SEZIONE DI TORINO

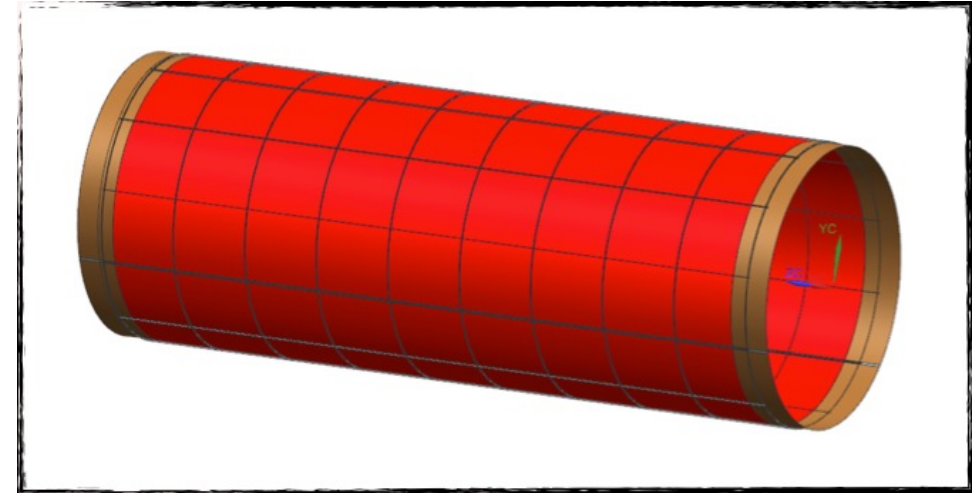
Towards a CGEM-IT review software-based

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The full geometry must be completed and characterized

Layer 3 design is ready, it needs to be implemented (now)



- Radiation length studies
 - ✓ X_0 as a function of θ , φ , θ vs φ
 - ✓ The tools are (almost) ready, just matter of implementing the geometry
- Check the effects on EMC reconstruction
 - ✓ Already done, needs to be repeated with the final geometry
- Run complete reconstruction with the full geometry

Digitization chain is almost complete...

- Parameters tuning is ongoing
- Electronic noise is missing

... but results still not understood (top/bottom left/right asymmetry)

Results need to be fully validated

Is run17@2020 enough to validate digitization?

- Firmware problems (loss of events, not optimal efficiency)
- Not optimal setup
 - ✓ Unwanted dead materials (pole)
 - ✓ Some uncertainties on the trigger (scintillator positions?)

I presume we need digitization validation with new data

Different scenarios

➤ Single layer acquisition

- ✓ Pros: easy to do, in theory, just needed to mount scintillator rods
- ✓ Cons: no tracking for good event selection – maybe we could use thin rods?

➤ Layer 1+2 acquisition

- ✓ Pros: similar to run17 (comparison)
- ✓ Pros: earlier than with 3 layers together
- ✓ Cons: needed operations (and risks) to install the two layers together

➤ Layer 1+2+3 acquisition

- ✓ Pros: the best setup, better tracking, better everything
- ✓ Cons: maybe too late

- ✓ Code based on **Hough Transform** validated mainly with single particles, and $J/\psi\pi^+\pi^-$
 - ✓ Code based on **track following** under development, to reconstruct tracks with displaced vertices
 - ✓ New **QA** for tracking available, for “standard” validation
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- ✓ Missing a merging of the two tracking algorithms
 - ✓ Needed more detailed validation, with a set of **different physics channels**
 - Efficiency, resolution, vertexing...
 - ✓ So far **ideal digitization** and **toy clustering** used for characterization, i.e. position smearing with $130\mu\text{m}$ resolution, no strip information, efficiency 100%, no charge thresholds
 - ✓ Needed to use **realistic digitization** and **cluster reconstruction**

- ✓ Final validation with the full setup
- ✓ Obviously, the last thing that can be done

What is needed:

- ✓ Alignment with three layers – should work, but never done before
- ✓ Full understanding of time signals – complete time calibration
- ✓ Characterization: resolution, efficiency, multiplicity, size...
- ✓ * would be good also a noise characterization * - MVA rejection ongoing

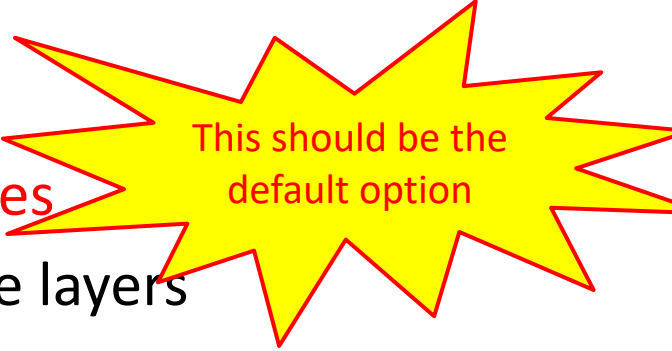
Open issues at the moment:

- Single layer not optimal efficiency - new firmware will increase it?
- Position resolution and multiplicity - pole removal will help?
- Time reconstruction, still not optimal – distributions not fully understood, neither resolution

Two possible options

One complete review including software development and performances

- ✓ Early 2024, after several months of the start of data taking with three layers



This should be the default option

OR

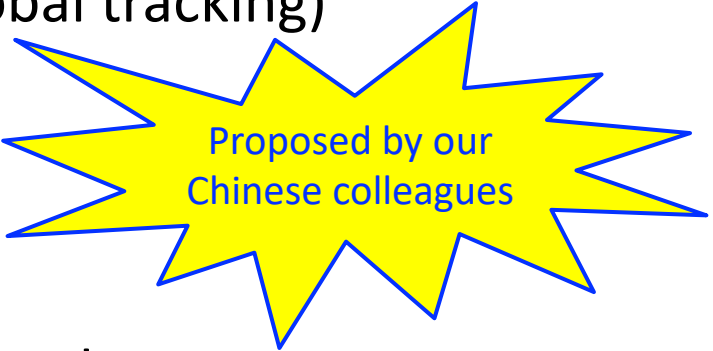
One review based on software developments

- Studies based on simulation (geometry, digitization with run17, global tracking)
- 2nd half of 2023?

AND

One review based on performances

- Early 2024, after several months of the start of data taking with three layers



Proposed by our Chinese colleagues

- Scarce
- Geometry should be (hopefully) straightforward – Isabella is working on it
- Hopefully new students from IHEP for digitization and global tracking?
 - ⇒ The student who is currently working on digitization should finish soon
 - ⇒ For tracking at present Liangliang is alone, no other IHEP people involved
- For the cosmics I believe we Italians will be alone, hopefully help from Aiqiang for alignment
 - ⇒ The usual known faces in FE and TO

too many “hopefully” in this slide

That's all folks!