# Task 12.3: Simulation

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**CERN, EP-SFT**

**On behalf of Task 12.3**

**AIDAInnova WP12 General Meeting**

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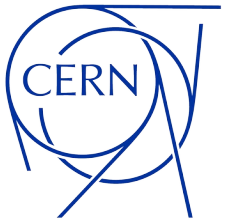
This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement No 101004761.

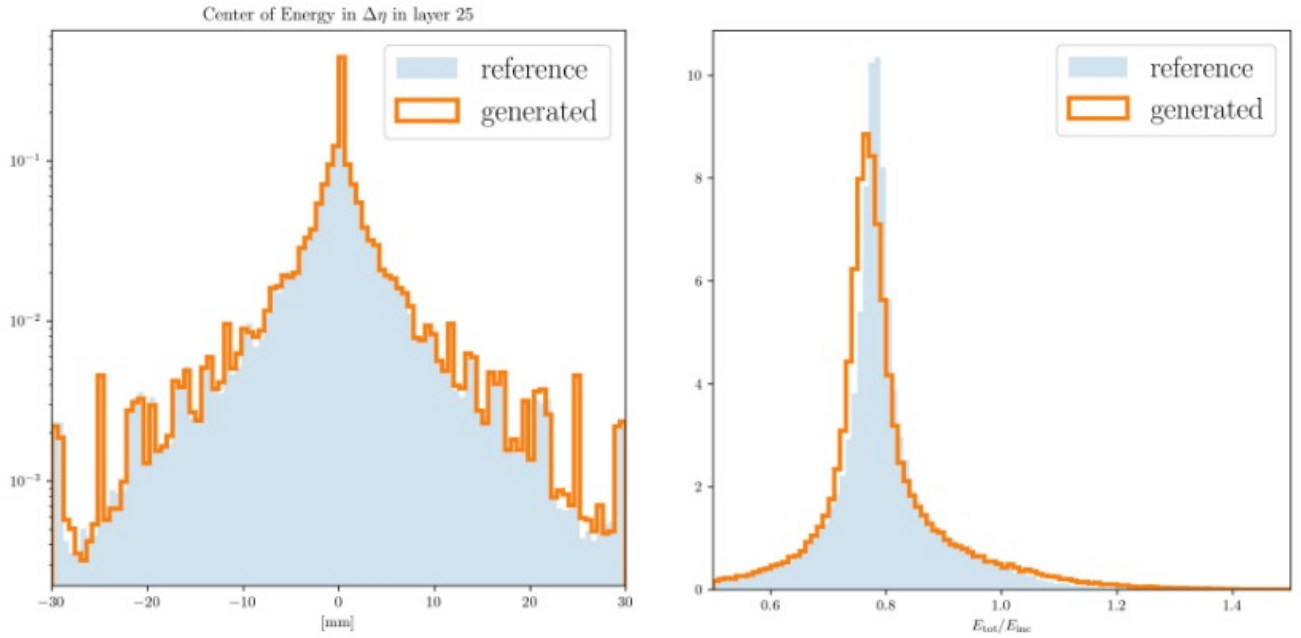






# CERN

- Returned to evaluation of updated CaloDiT model on CaloChallenge benchmarks
  - Training from scratch somewhat better than adaption
  - Suspect result of incident energy distribution (power spectrum vs flat)
- Including distillation, CaloDiT is competitive with other CaloChallenge models in terms of accuracy and speed




More details in Piyush's update

Rank comparing CaloChallenge Dataset-2 submissions

| Metric | AUC low-level | AUC high-level | AUC ResNet | FPD (x10^3) | KPD (x10^3) | CPU time (ms) | GPU time (ms) |
|---|---|---|---|---|---|---|---|
| **Value** | 0.5939 | **0.5598** | 0.6343 | **20.0617 ± 0.7407** | **0.0883 ± 0.0944** | 6349.02 ± 7.6 | 171.8 ± 0.13 |
| **Rank** | 3 | 2 | 1 | 1 | 2 | 10 | 8 |
| **Rank$** | 1 | 1 | 1 | 1 | 1 | - | - |

No faster **and** better model

**Inference times are biased, computed on a different machine compared to Claudius*

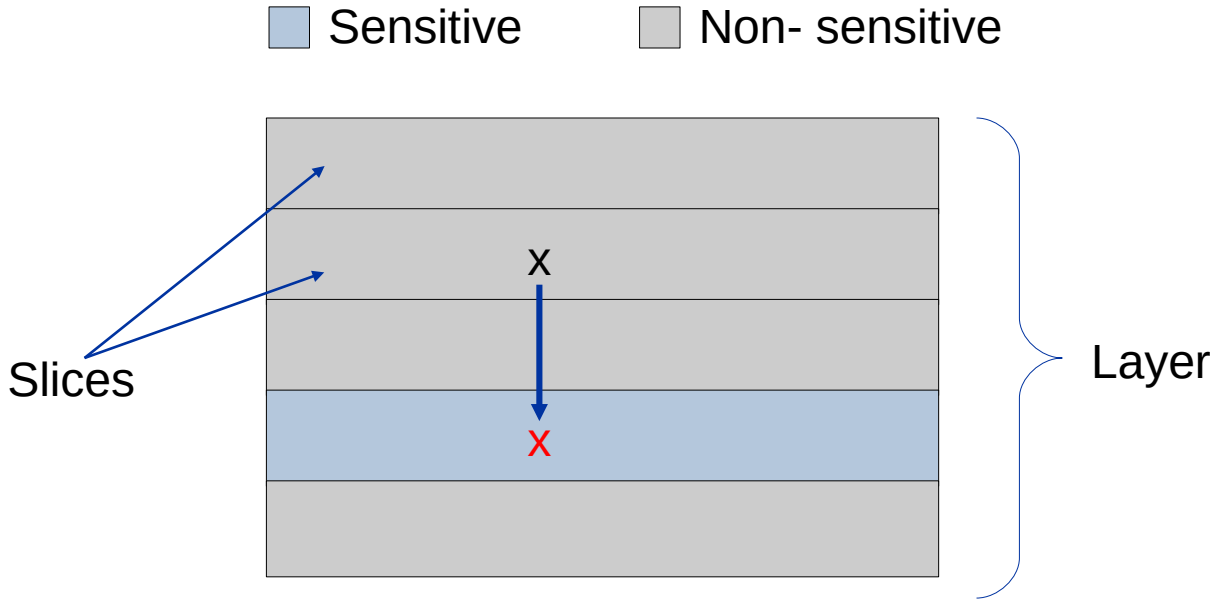
*$Rank considering all models faster than this one on CPU*

# DDFastShowerML Updates

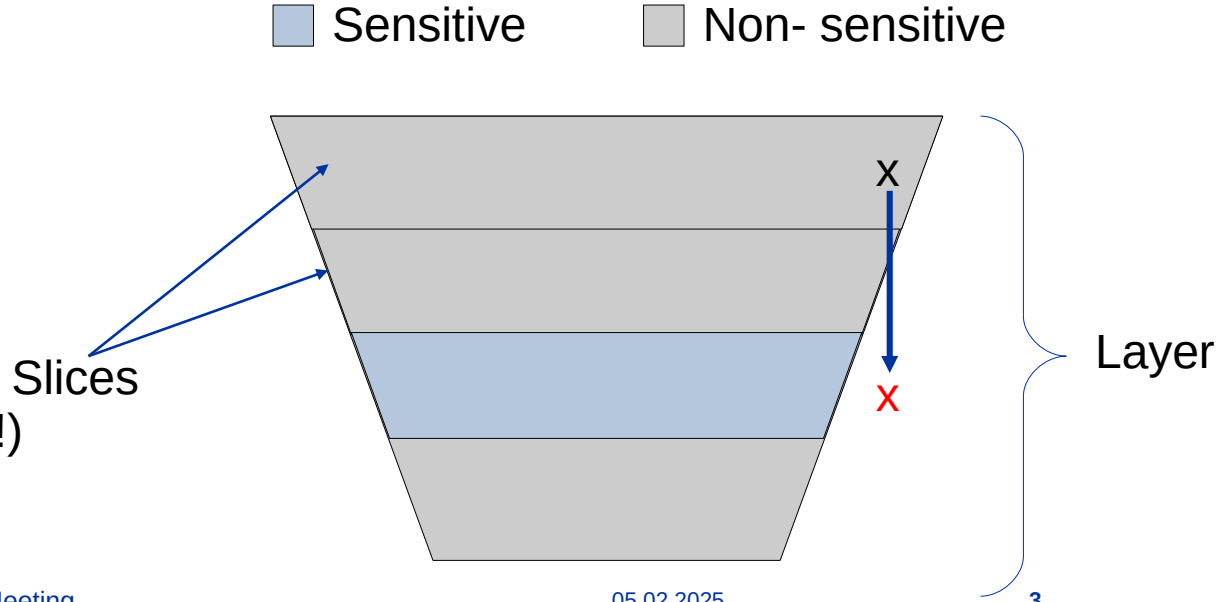
- Integration of Par04-like scoring meshes for DD4hep
  - Including placement into detector readout - branch
- Use ‘all active’ calorimeter
  - Modify cellID of fast hit such that it lands in sensitive
  - Thanks Andre for VolManager tips!

- Validation for CLD (including with/without CaloDiT) currently underway

- Hadronic shower integration with PionClouds data from Anatolii (Using HDF5 loading) - branch
  - WIP – Debugging Region assignment across multiple sub-detectors
- Other activity:
  - MR (!22): Fixed debug-mode build issue (thanks Juan!)
  - MR (!23): Add L2LFlows – in progress (with Thomas+Thorsten)




What won’t work… layers with variable length slices

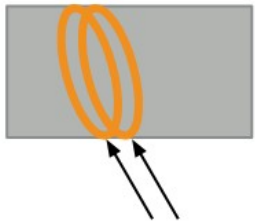


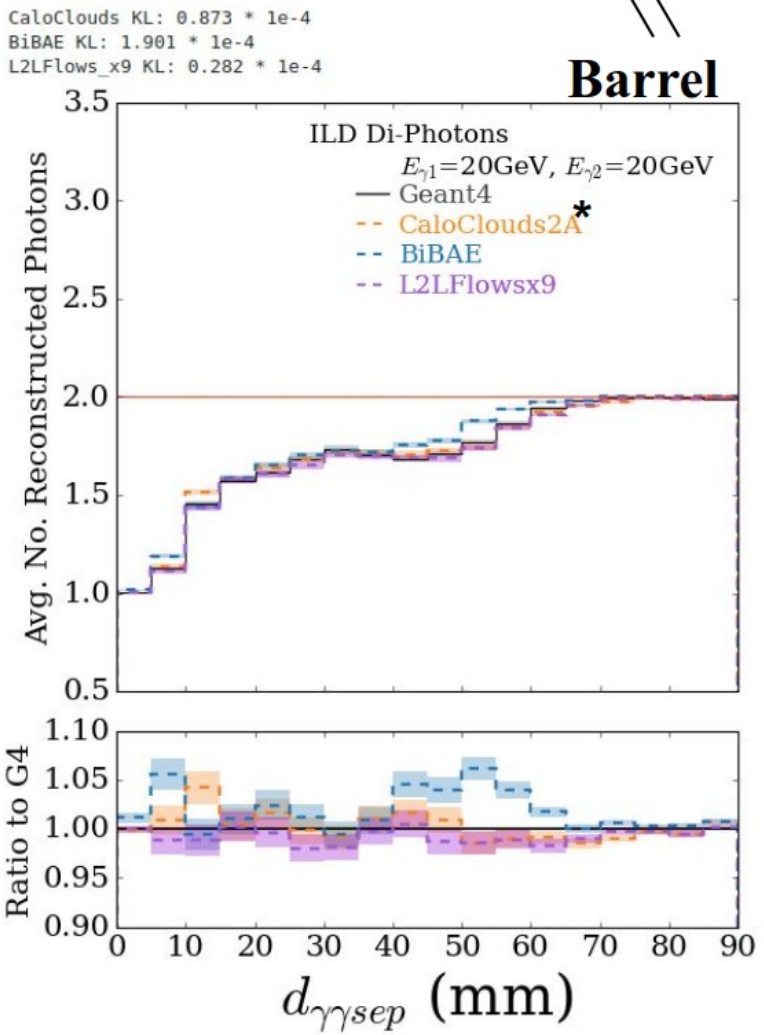
# DESY

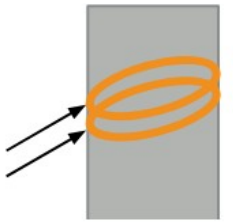
- Di-Photon benchmark extended to endcap (also studying effect of B-field)

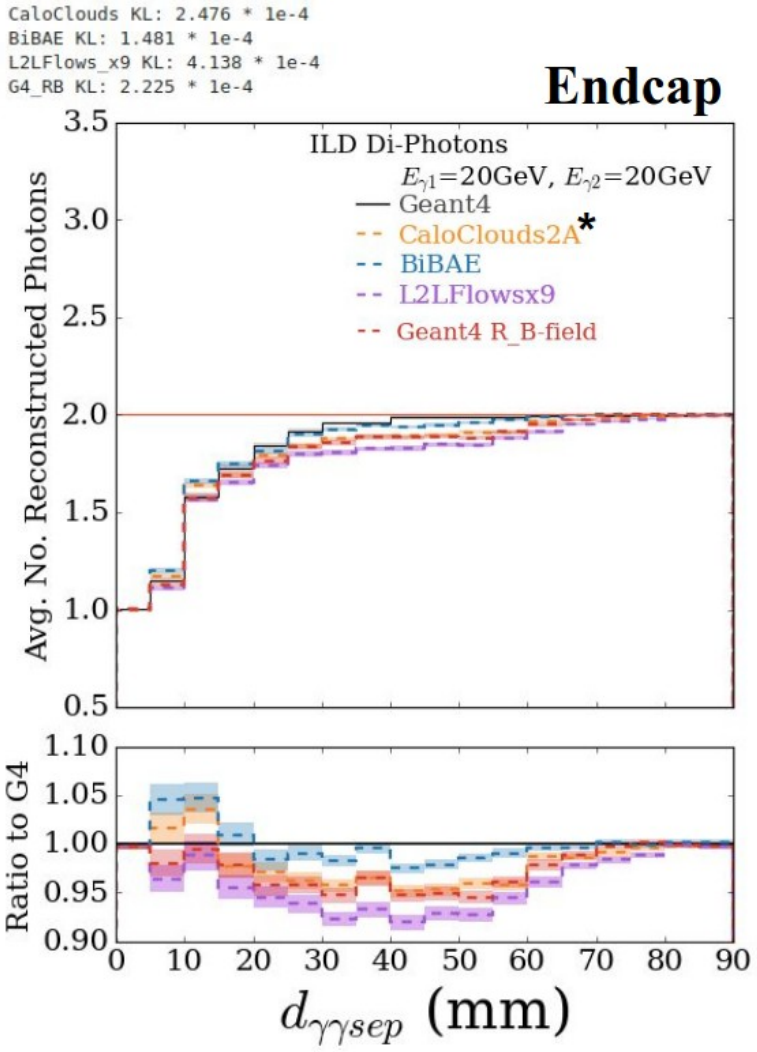
- In both barrel and endcap: adjusted to take into account flight from IP (assumed by Pandora)

More details in
Anatolii's update





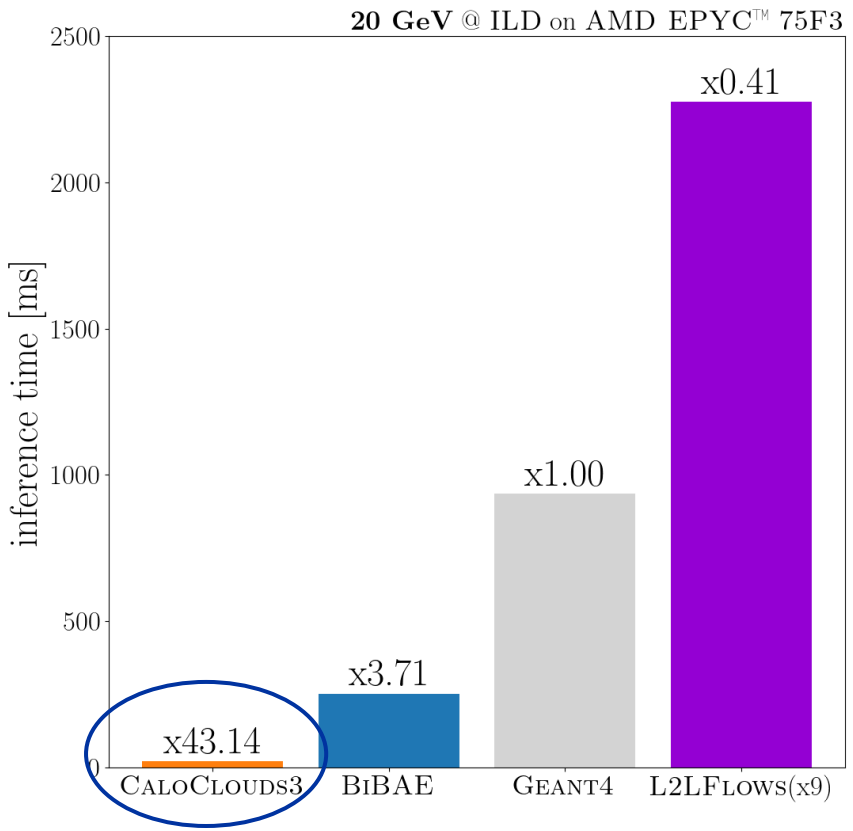


# DESY

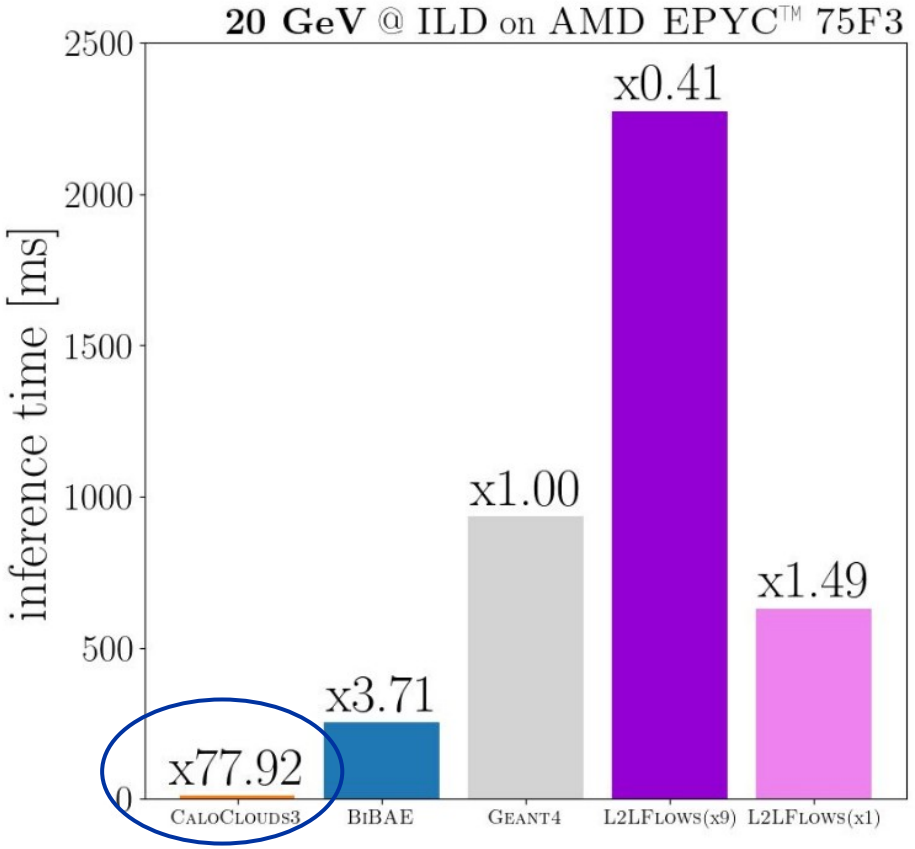
More details in
Anatolii's update

- More optimisations of Shower Flow and PointWise net in CaloClouds
- CaloClouds (run in DDFastShowerML, CPU) now 460x faster than Geant4 for 100 GeV photons!

Last Meeting




Currently...



# Summary and Outlook

- @CERN:
  - Updated CaloDiT model performance for CaloChallenge

  Next Steps:
  - Mixer models (lighter-weight attention) with IBM- trade of speed/accuracy
  - Soon: publication

- DDFastShowerML
  - Possible to run ‘Parallel world’ scoring meshes (a la Par04) in actual detector readout
    - Validation for CLD detector ongoing
    - In the future: also try for non-CALICE calorimeters (e.g. allegro)
  - Support for Hadronic showers is WIP

- @DESY:
  - Di-Photon benchmark added for endcap
  - Adjusted for Pandora particulars
  - CaloClouds becomes even faster

  Next Steps:
  - Studying theoretical optimum for choice of representation (regular grid/ high granularity clusters)
  - Work on Pion showers ongoing