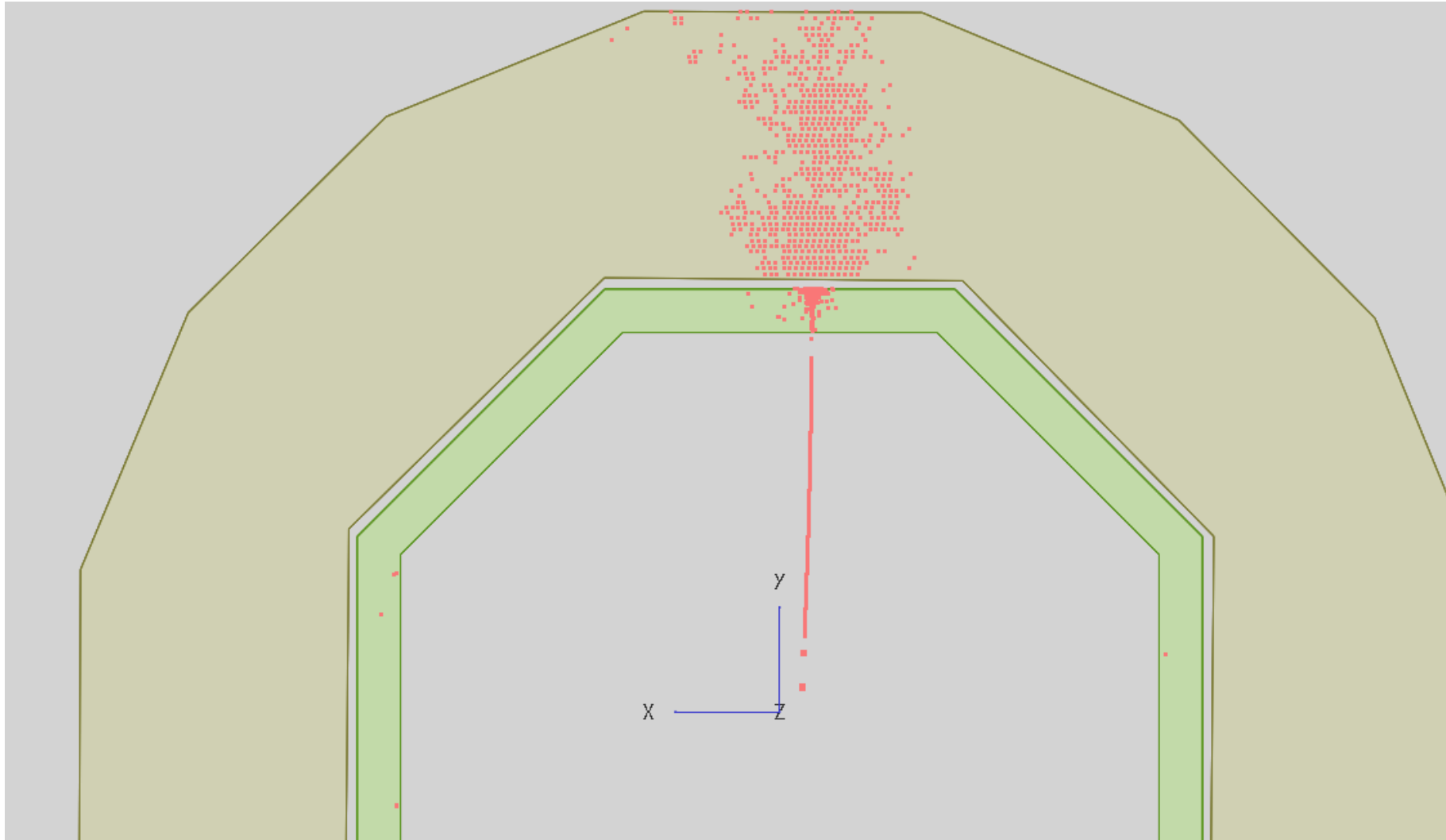


Pion showers in the ECAL + HCAL system

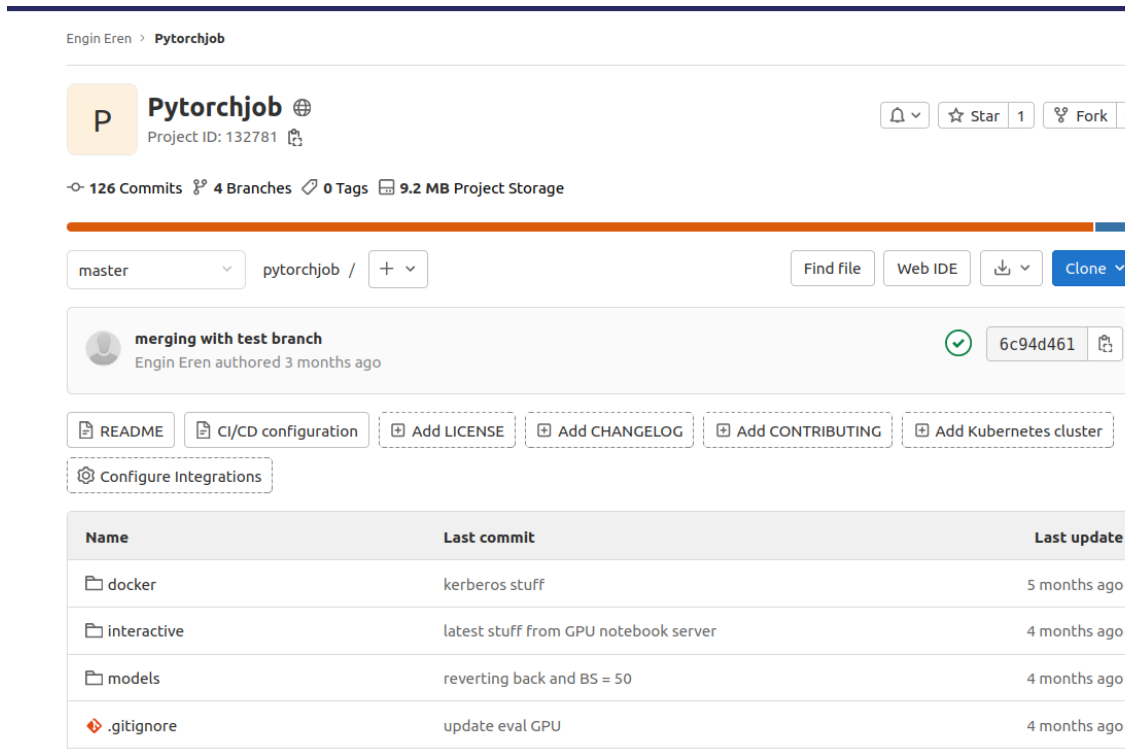


Combined dataset is ready with 3 single point energies (40, 50 and 60 GeV)

Generative Model is WGAN with 3 critics

We jointly update **both** generators ECAL and HCAL generators

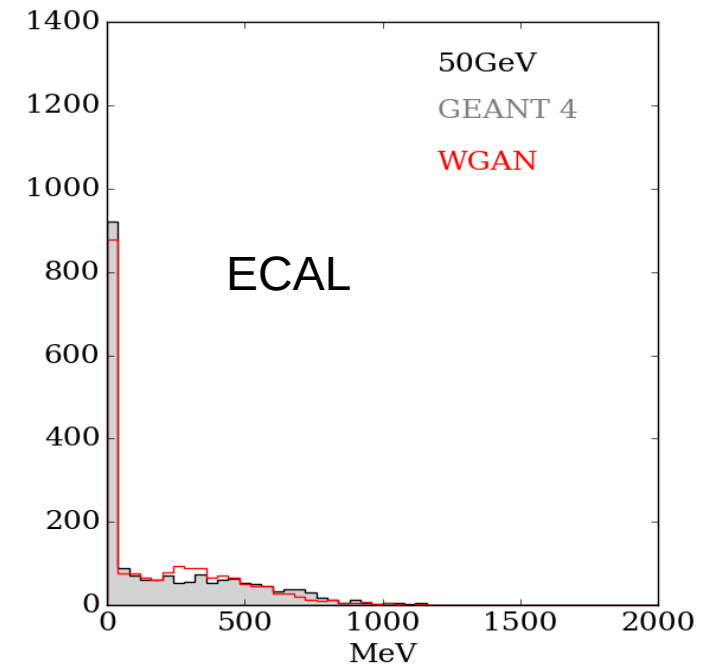
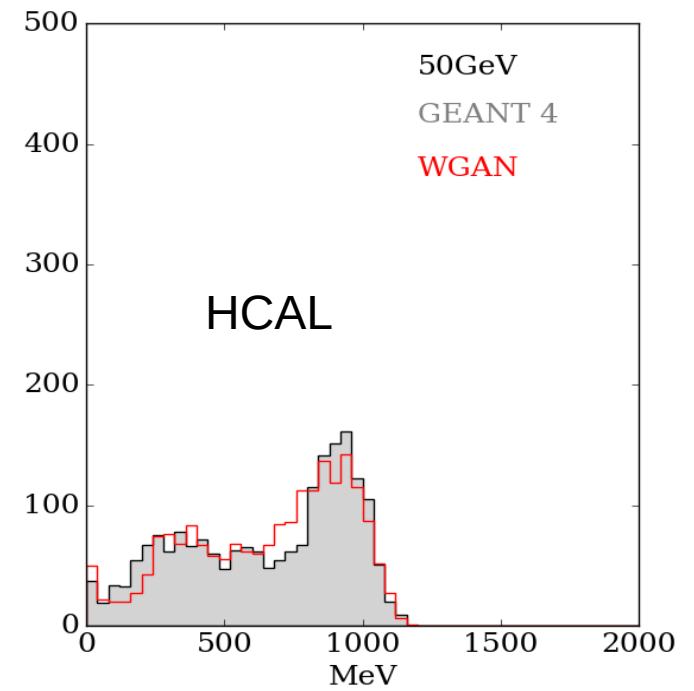
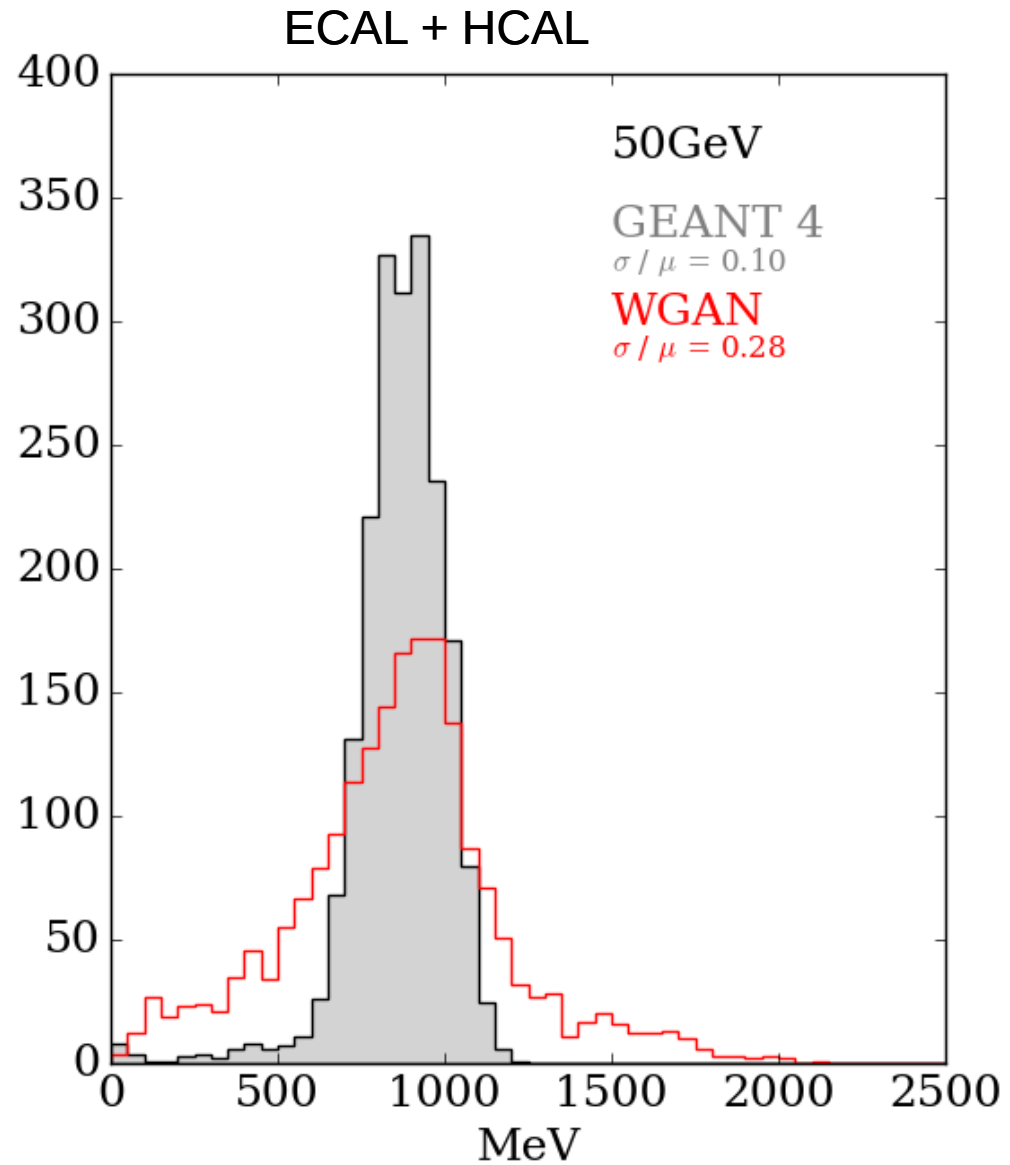
- 1) Critic and generator for ECAL
- 2) Critic and generator for HCAL
- 3) One critic to look at ECAL + HCAL and update both models



The screenshot shows the GitLab interface for the 'Pytorchjob' repository. At the top, it displays the repository name, project ID (132781), and statistics: 126 Commits, 4 Branches, 0 Tags, and 9.2 MB Project Storage. Below this, there's a section for 'merging with test branch' by Engin Eren, authored 3 months ago, with a commit hash of 6c94d461. A table lists the repository's files and their last commit details.

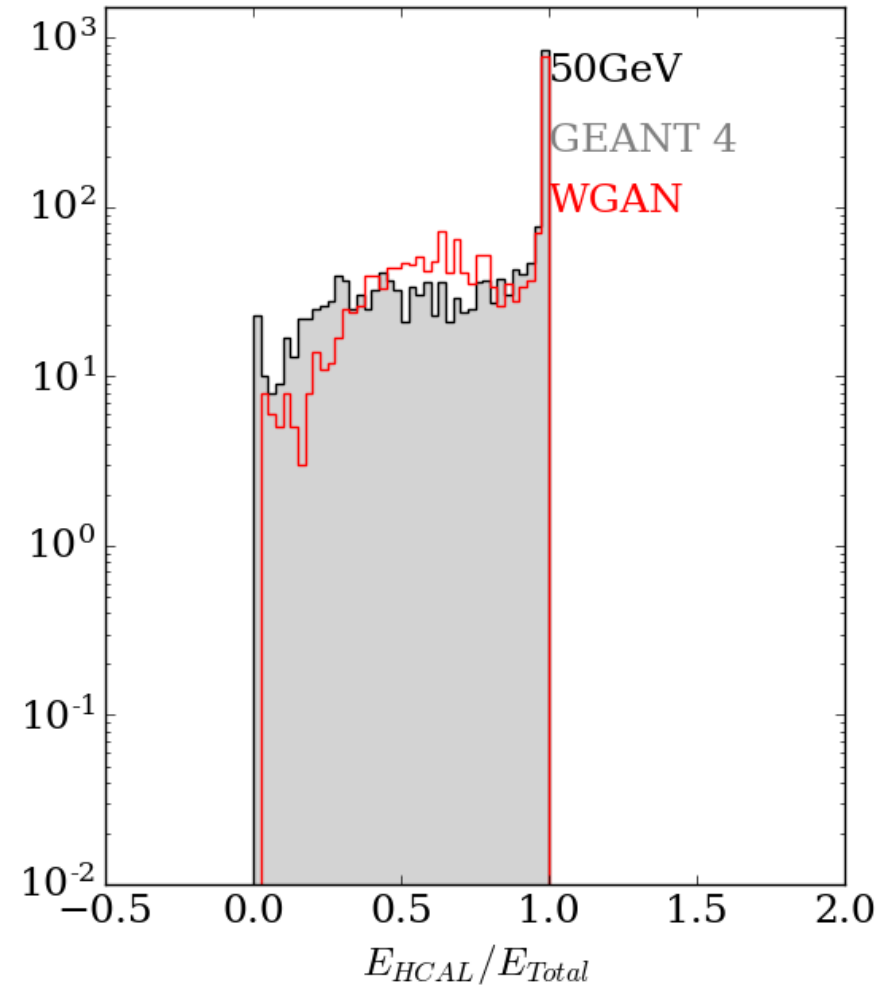
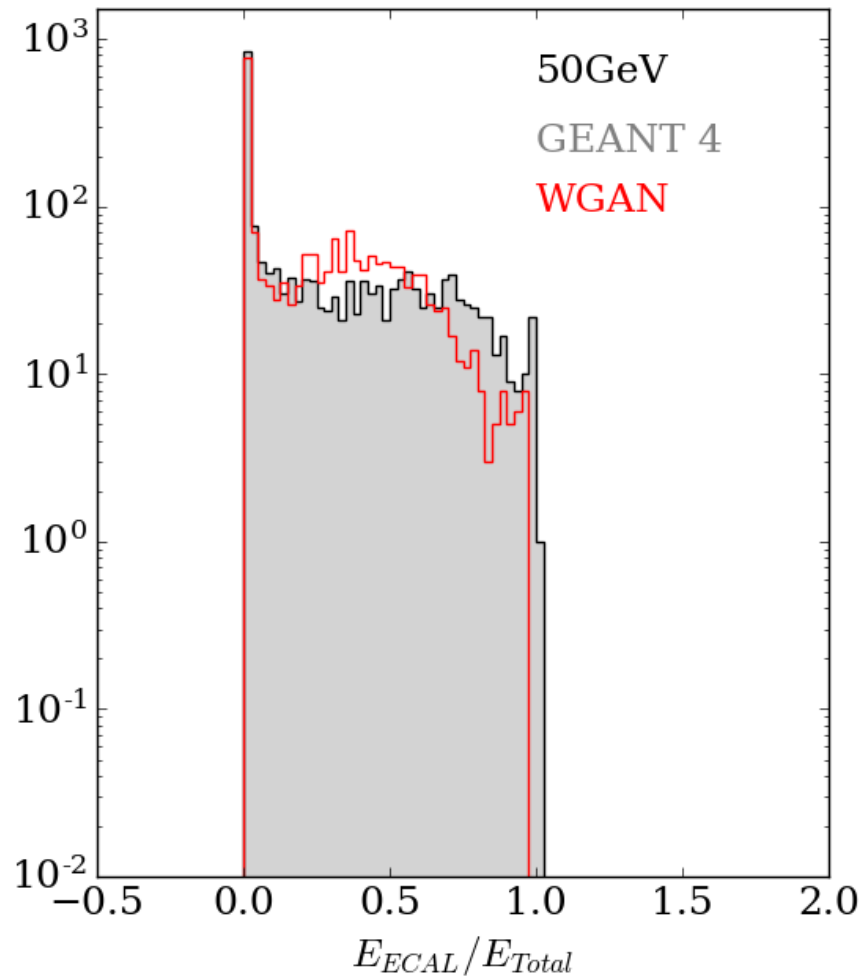
Name	Last commit	Last update
docker	kerberos stuff	5 months ago
interactive	latest stuff from GPU notebook server	4 months ago
models	reverting back and BS = 50	4 months ago
.gitignore	update eval GPU	4 months ago

Some results (Energy-sum)

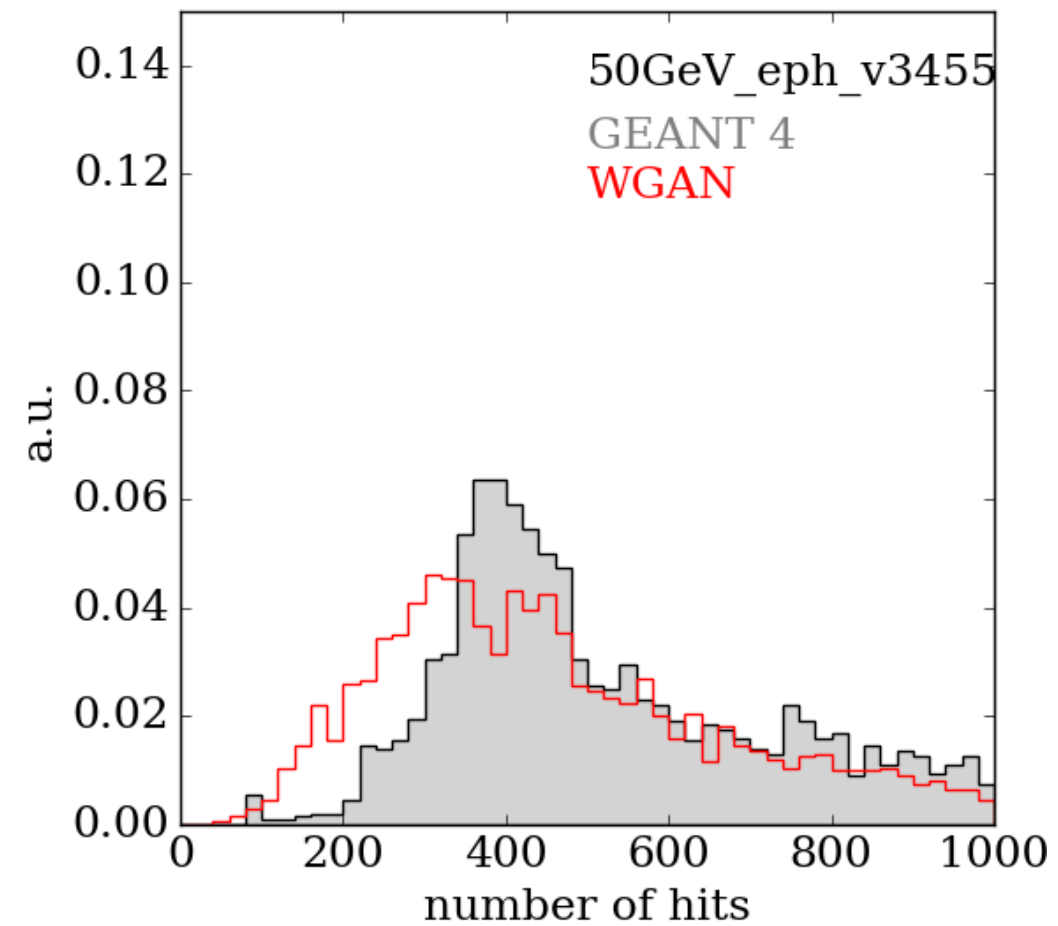
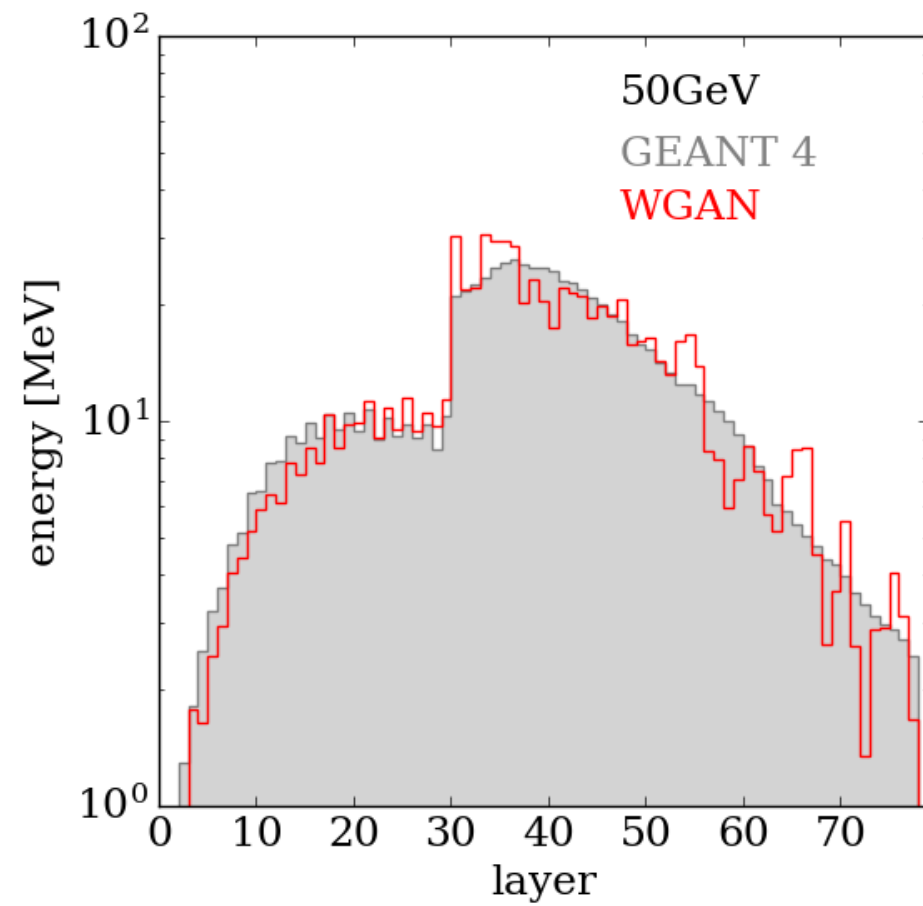


Some results

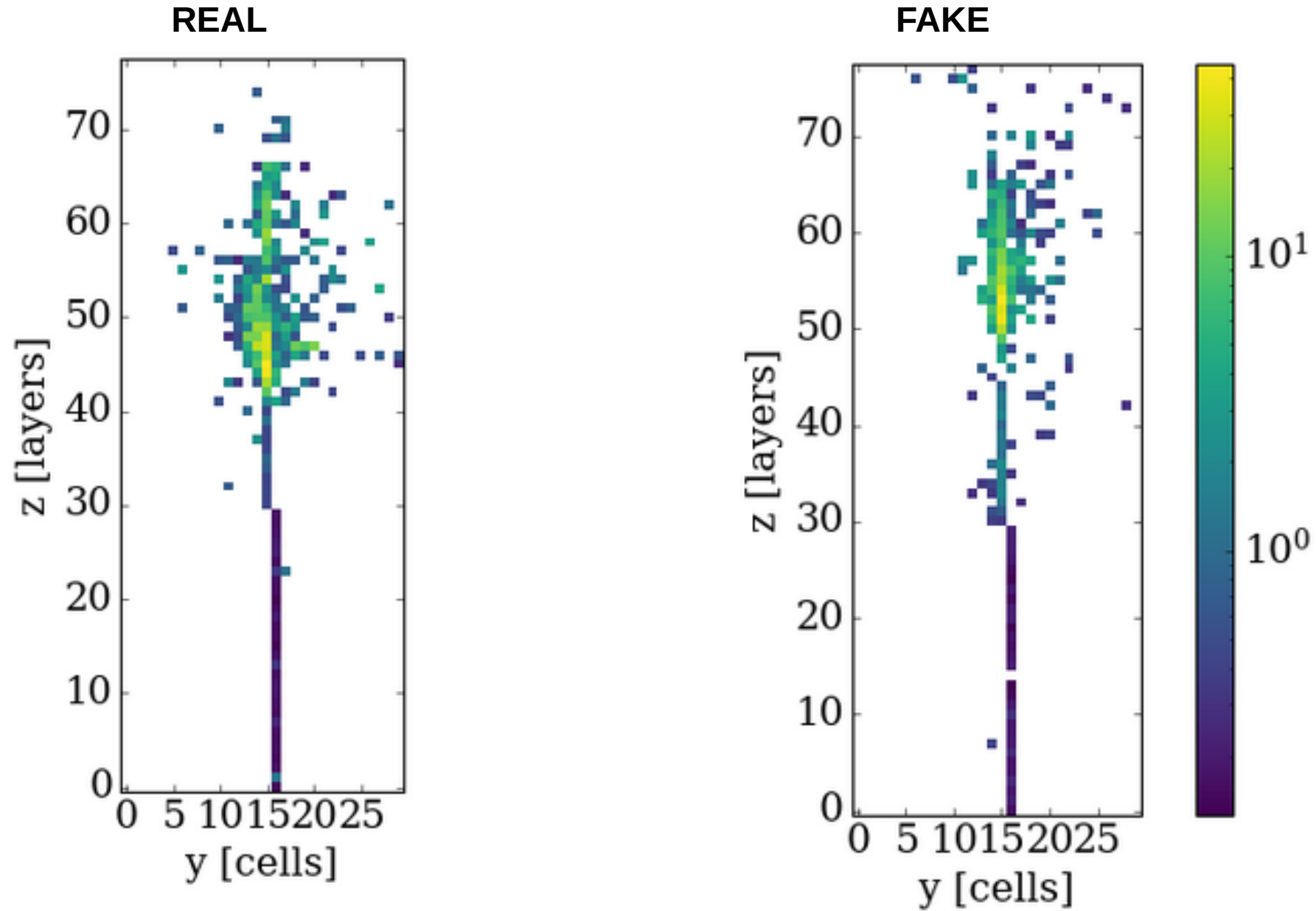
Fraction of energy in ECAL and HCAL



Some results

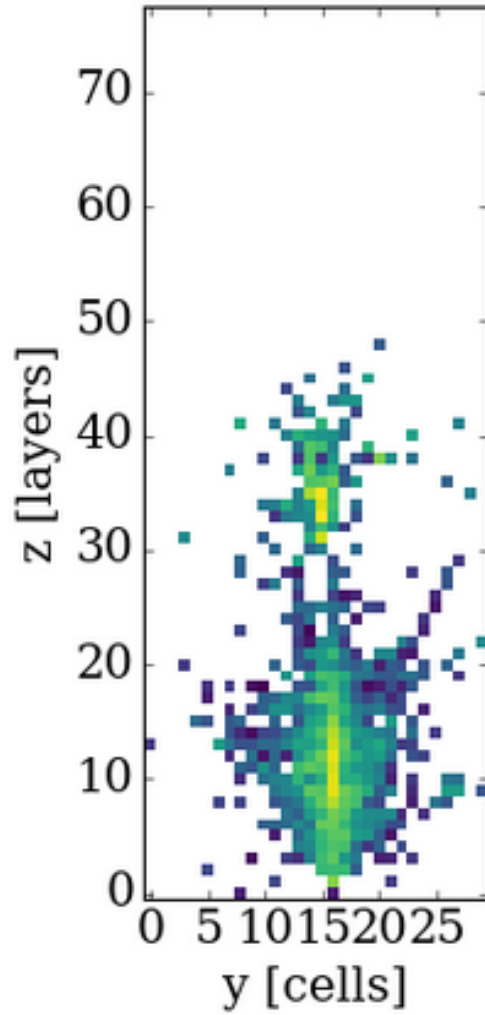


Some example images

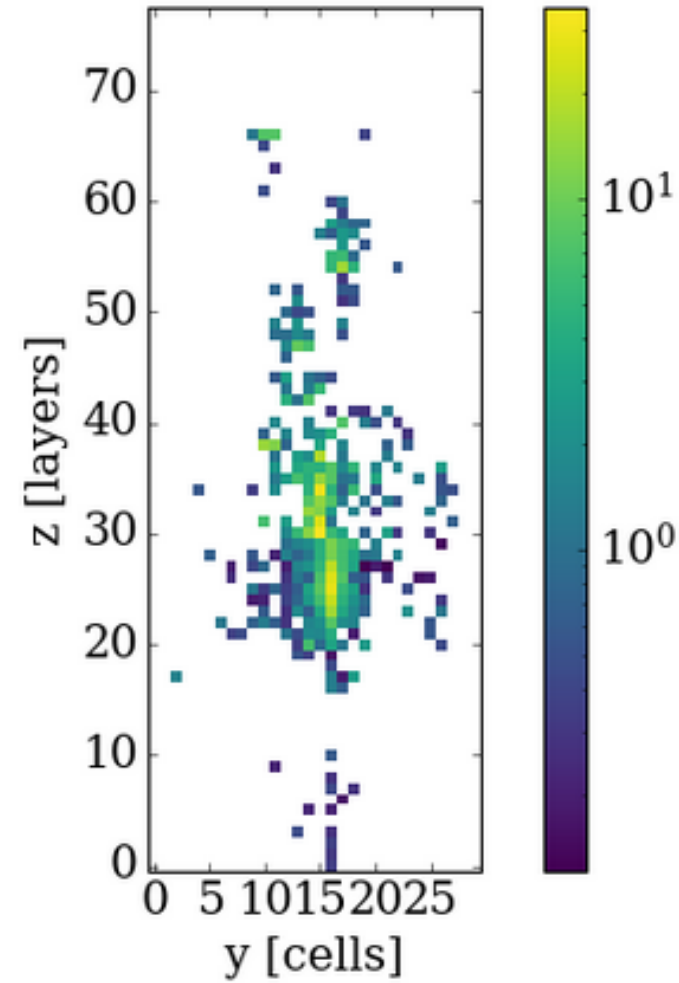


Some example images

REAL



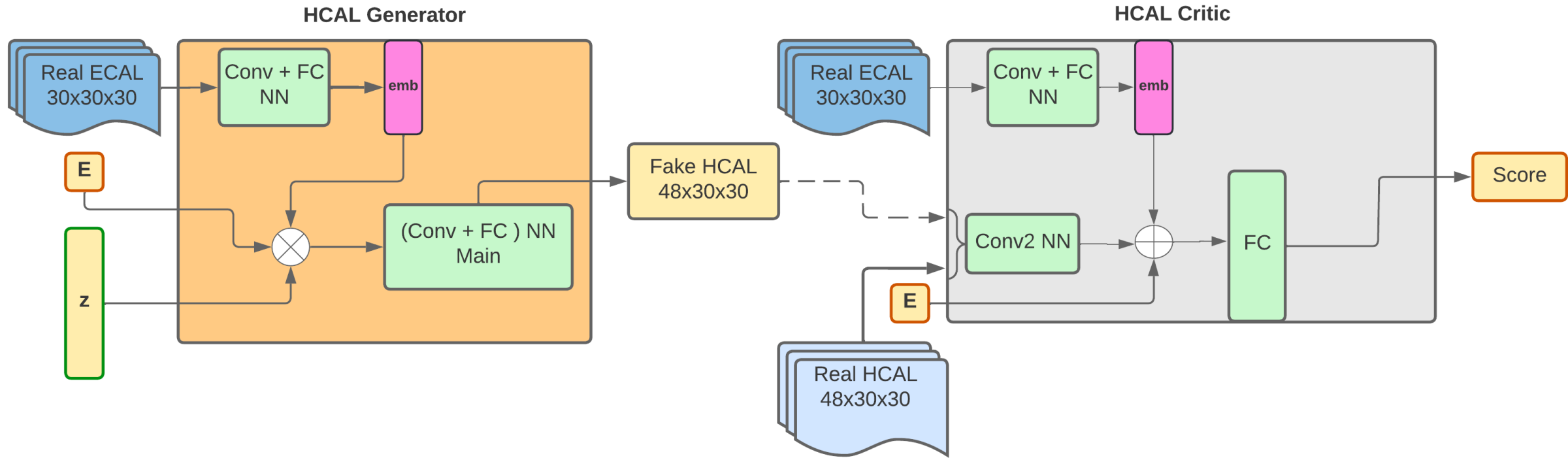
FAKE



Thank you

Pion showers in the ECAL + HCAL system

During the training:



During the total inference:

$$G_{ECAL}(z, E) + G_{HCAL}[G_{ECAL}(z, E), z, E]$$

Summary of pion showers in the ECAL + HCAL system

Case 1: Everywhere **Real ECAL**

...

Critic:

1. REAL: **Real ECAL** + Real HCAL
2. FAKE: **Real ECAL** + Fake HCAL

Generator:

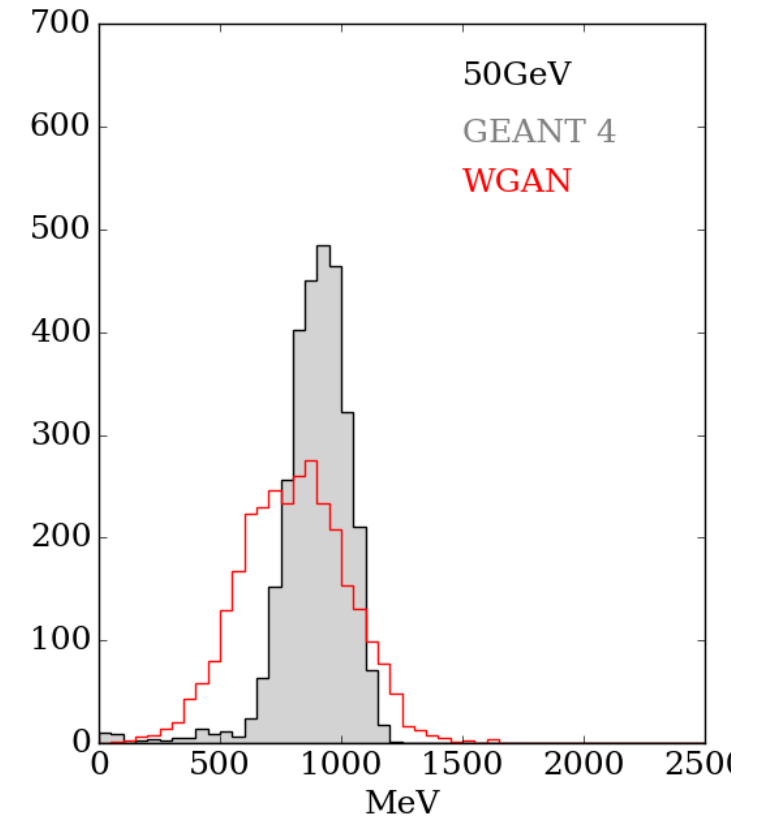
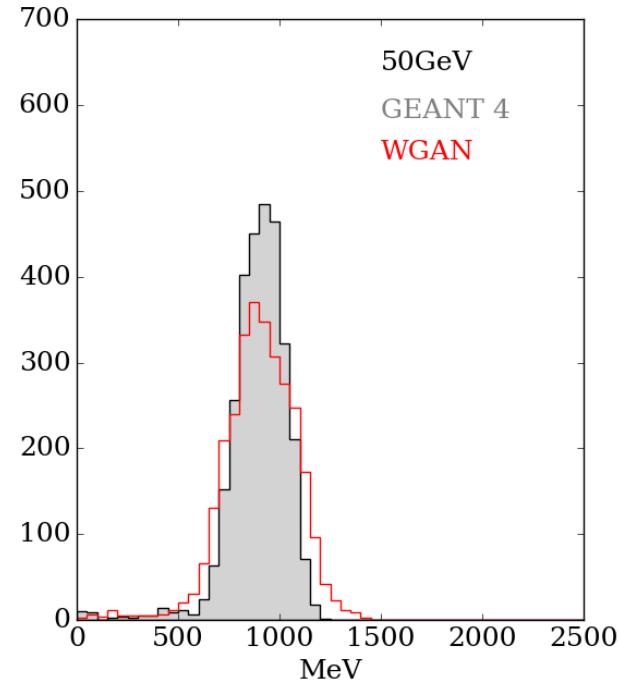
- **Real ECAL** + Fake HCAL

Use **Fake ECAL** during the inference

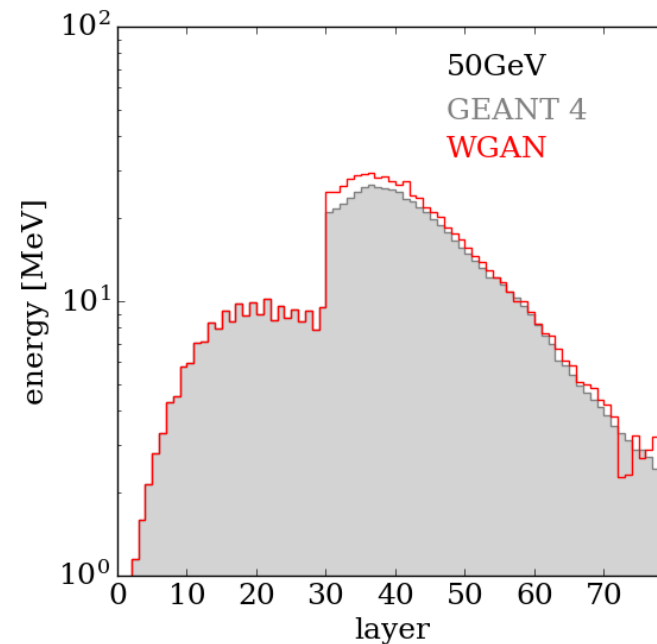
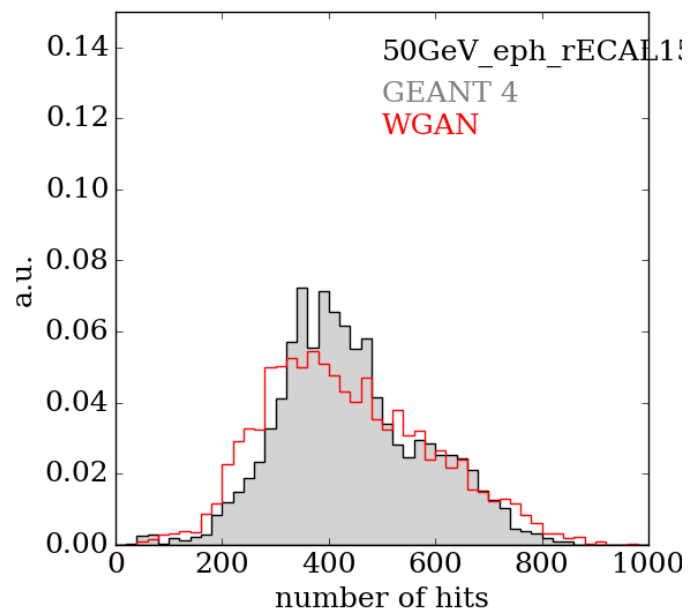
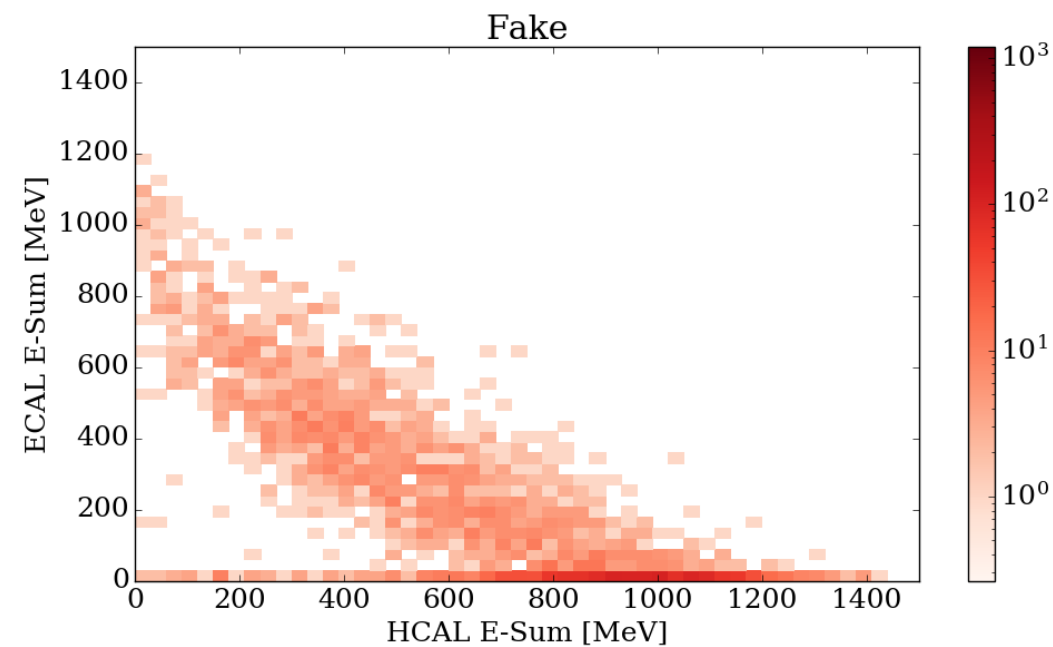
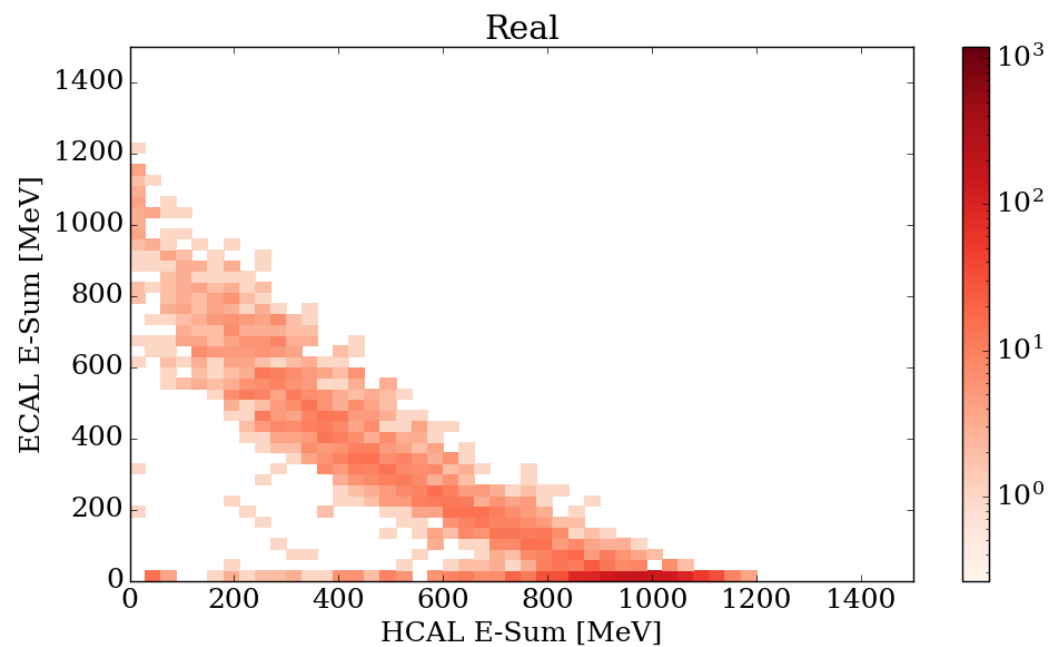
Use **real ECAL** during the inference

$$\cancel{G_{ECAL}(z, E)} + G_{HCAL}[\cancel{G_{ECAL}(z, E)}, z, E]$$

Real ECAL Real ECAL



Pion showers in the ECAL + HCAL system



Summary of pion showers in the ECAL + HCAL system

Case 1: Everywhere Real ECAL



....

Critic:

1. REAL: Real ECAL + Real HCAL
2. FAKE: Real ECAL + Fake HCAL

Generator:

- Real ECAL + Fake HCAL

Case 2: Fake ECAL only in generator



....

Critic:

1. REAL: Real ECAL + Real HCAL
2. FAKE: Real ECAL + Fake HCAL

Generator:

- Fake ECAL + Fake HCAL

Case 3: Fake ECAL in both



....

Critic:

1. REAL: Real ECAL + Real HCAL
2. FAKE: Fake ECAL + Fake HCAL

Generator:

- Fake ECAL + Fake HCAL

Case 4: Fake ECAL everywhere



....

Critic:

1. REAL: Fake ECAL + Real HCAL
2. FAKE: Fake ECAL + Fake HCAL

Generator:

- Fake ECAL + Fake HCAL

Summary of pion showers in the ECAL + HCAL system

Case 1: Everywhere **Real ECAL**

...

Critic:

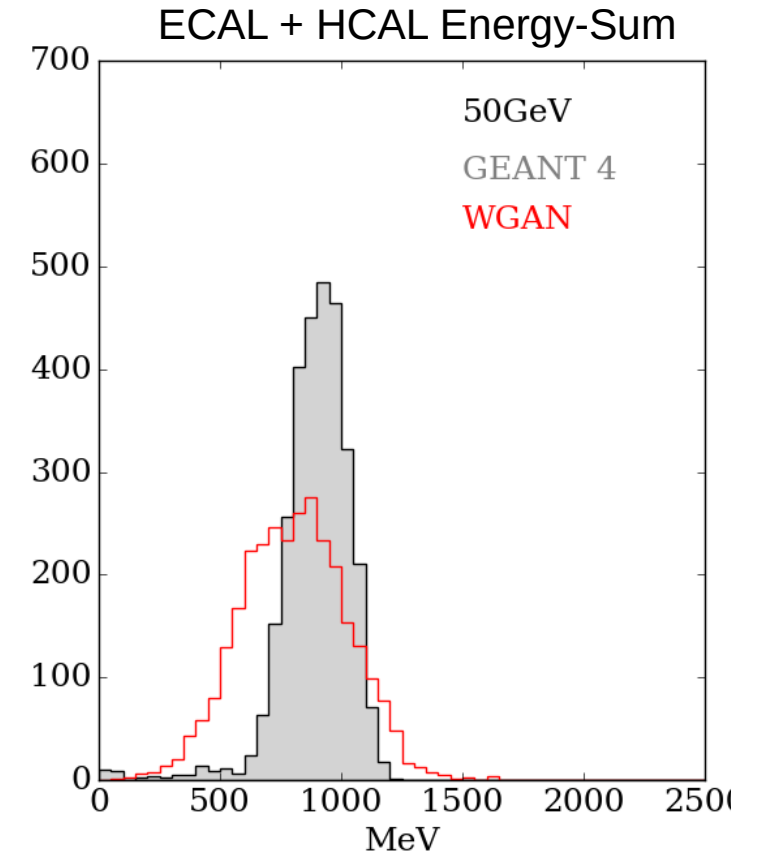
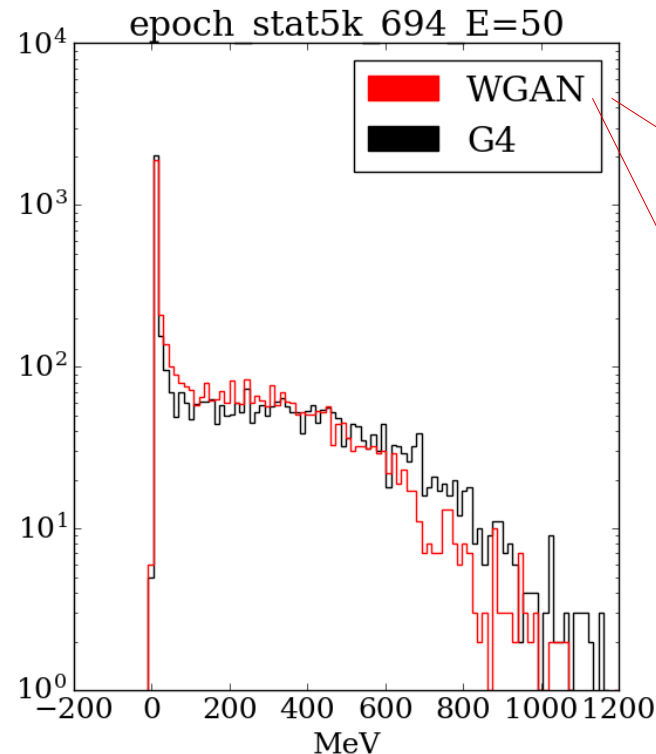
1. REAL: **Real ECAL** + Real HCAL
2. FAKE: **Real ECAL** + Fake HCAL

Generator:

- **Real ECAL** + Fake HCAL

Use **Fake ECAL** during
the **inference**

ECAL-only generator
(Pre-trained model)

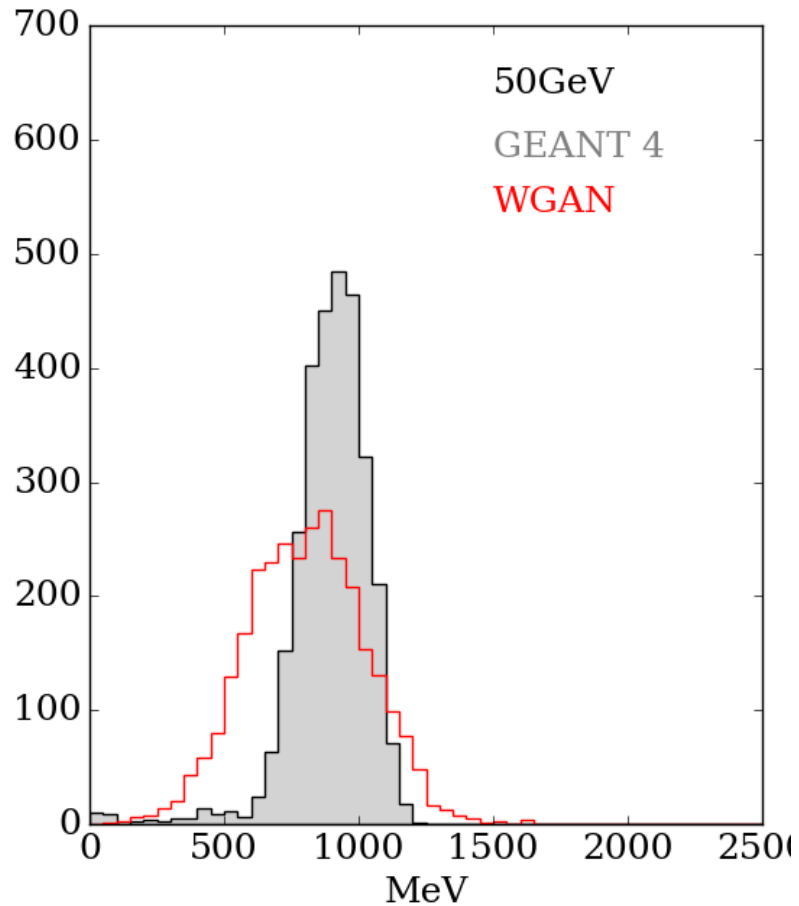


$$G_{ECAL}(z, E) + G_{HCAL}[G_{ECAL}(z, E), z, E]$$

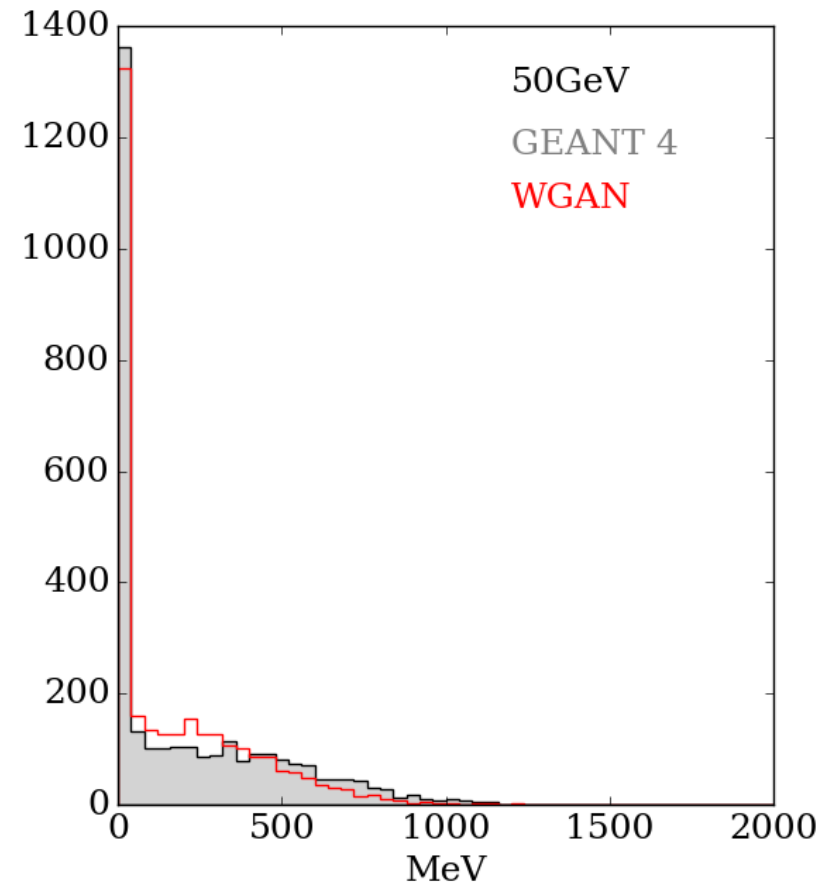
Pion showers in the ECAL + HCAL system

Some preliminary results with current best epoch
Cell energies > 0.25 MeV

Total Energy Sum



ECAL



HCAL

