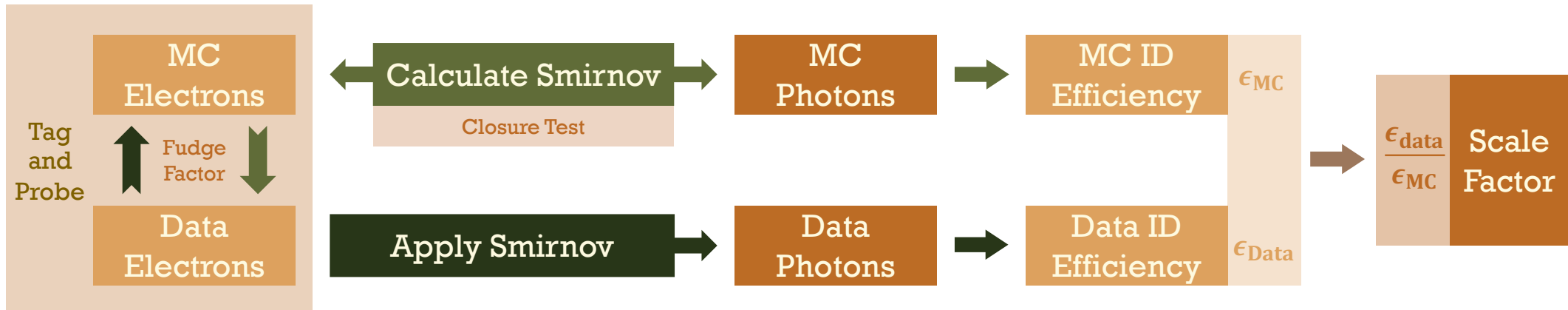
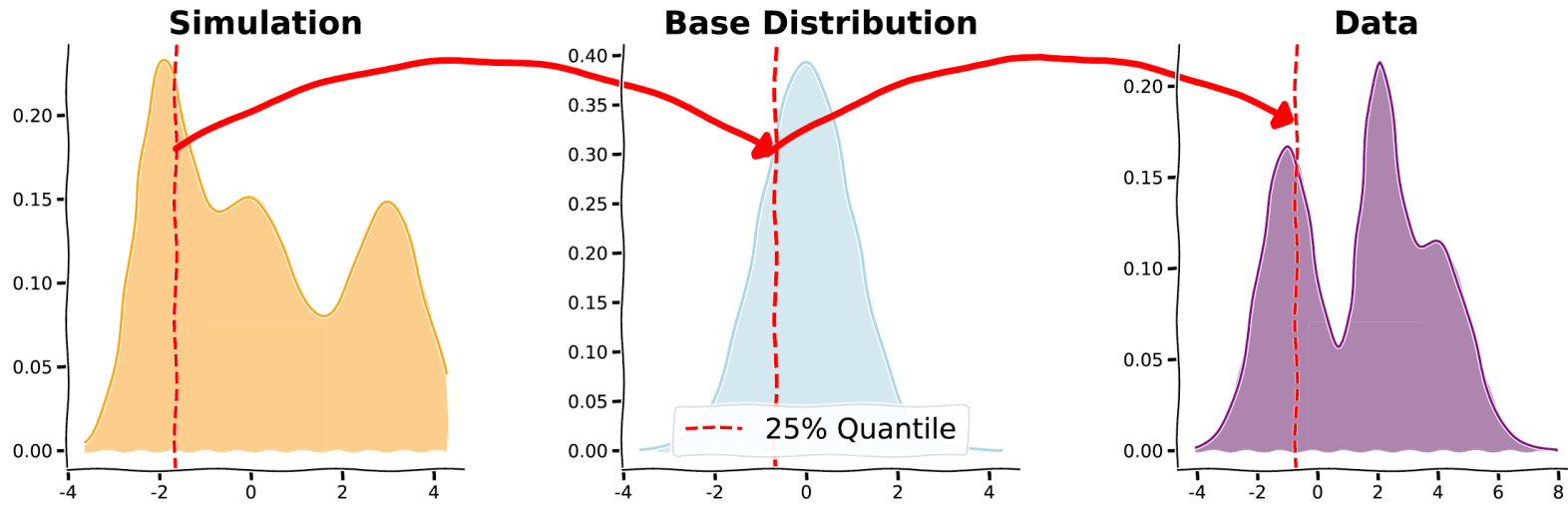
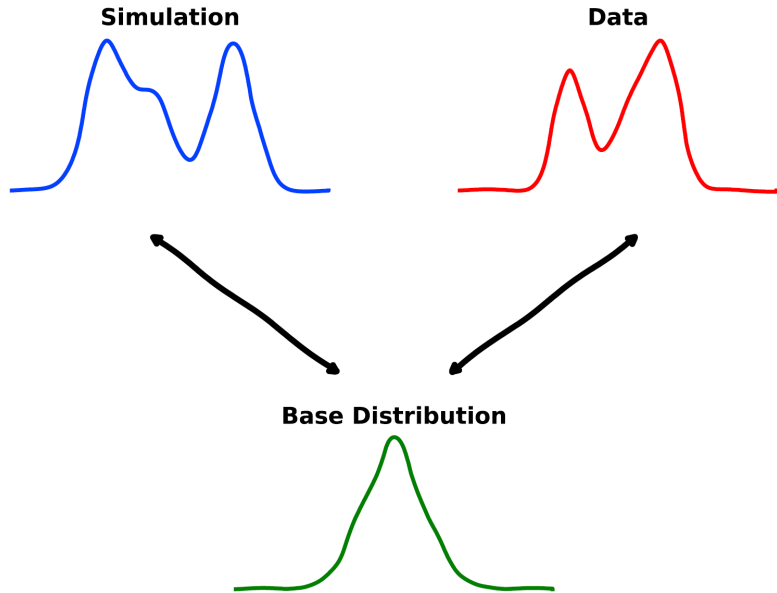


Updates on NL

2025-12-01

Some Recap



Code Analysis

Execution modes:

- ☐ Training
- ☐ Application
- ☐ Optimization

Input: H5 files with SSV tags

```
"data_file_name": "llg_signal_FS.h5",  
"sim_file_name": "llg_signal_AF3.h5"
```

Training commands:

```
python main.py \  
  --configpath config.json \  
  --inputpath inputs \  
  --mode train \  
  --no-weights \  
  --dsrange 0,200000 \  
  --outpath results/train_$(date +%Y%m%d_%H%M)
```

After training:

- *model/epoch_*.pth* plus a copied *best_model.pth* at the top level (best validation).
- *MeanAndStdSim.h5* containing the simulation mean/std used for normalization.

Code Analysis

Apply the flow:

```
python main.py \
  --configpath config.json \
  --inputpath inputs \
  --mode apply \
  --modelpath results/train_YYYYMMDD_HHMM/best_model.pth \
  --no-weights \
  --dsrange 0,200000 \
  --outpath results/apply_$(date +%Y%m%d_%H%M) \
  --stdpath results/train_*/MeanAndStdSim.h5
```

After application:

- correlation matrices,
- 2D heatmaps
- and comparisons before/after

Code Analysis

Optimize the flow:

```
python main.py \  
--configpath config.json \  
--inputpath inputs \  
--mode optimize \  
--no-weights \  
--dsrange 0,200000 \  
--outpath optuna_results
```

After optimization:

- optuna_results/all_trials.csv
- optuna_results/best_params.json

ROOT-H5 Conversion

/path/to/inputs/

user.<user>.<DSID>_***_AF3_ANALYSIS.root # or ..._FS_ANALYSIS.root

user.<user>.<DSID>_***_AF3_hist/ # sibling dir

 <anything>.hist-output.root # must contain a "SumOfWeights" object

user.<user>.<DSID>_***_FS_ANALYSIS.root

user.<user>.<DSID>_***_FS_hist/

 < *** >.hist-output.root

Start from Katerina's H5 Sample

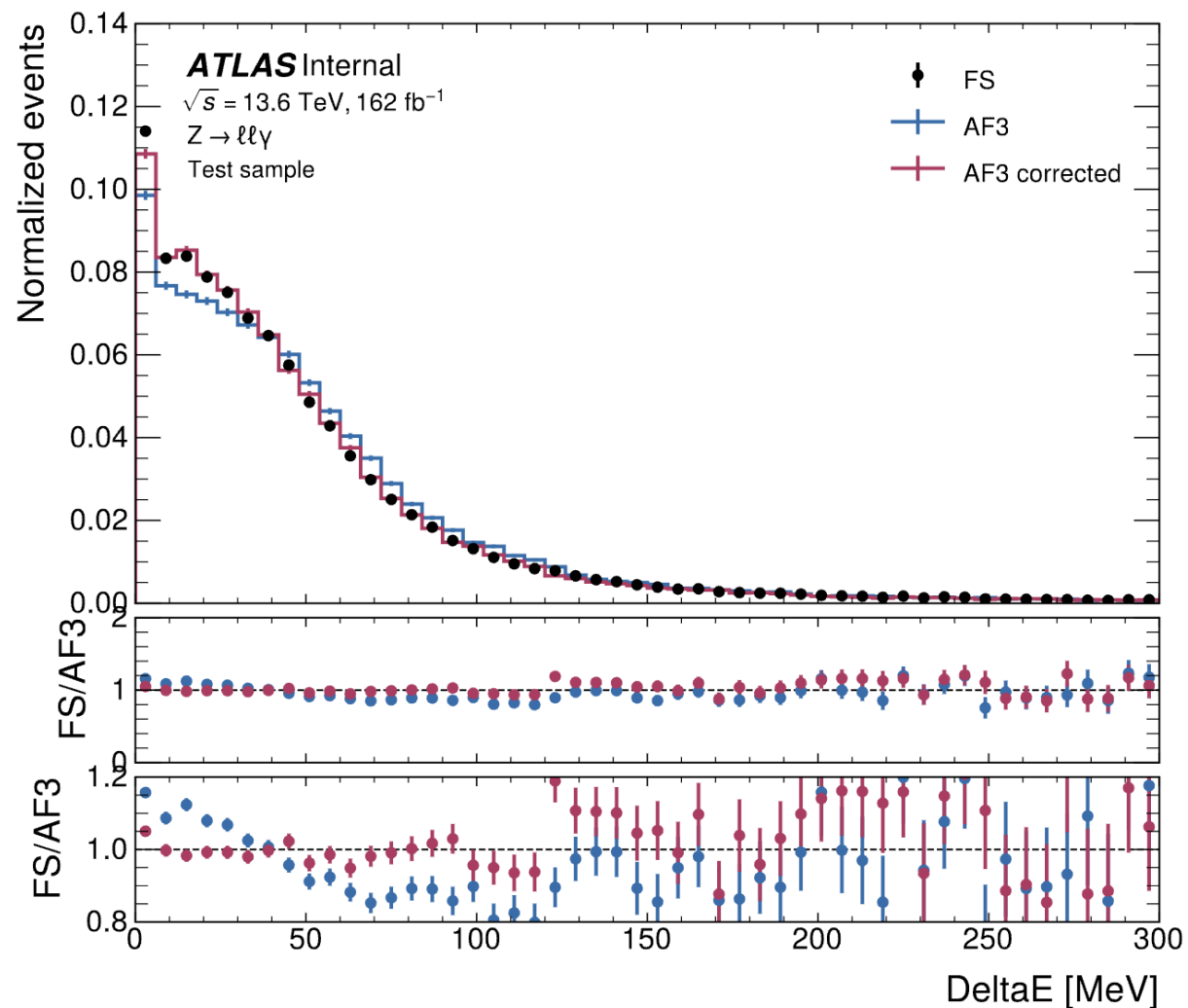
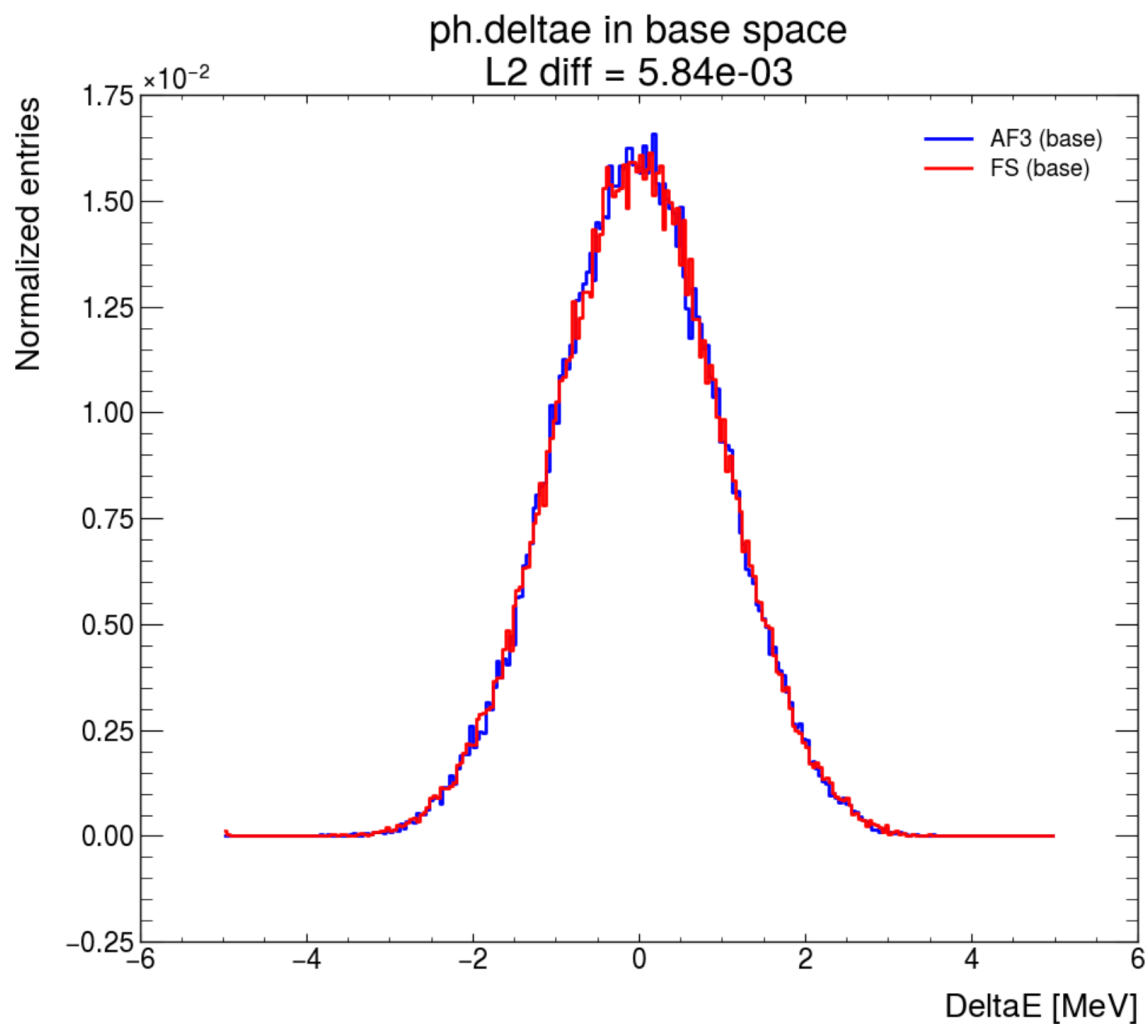
Framework Test

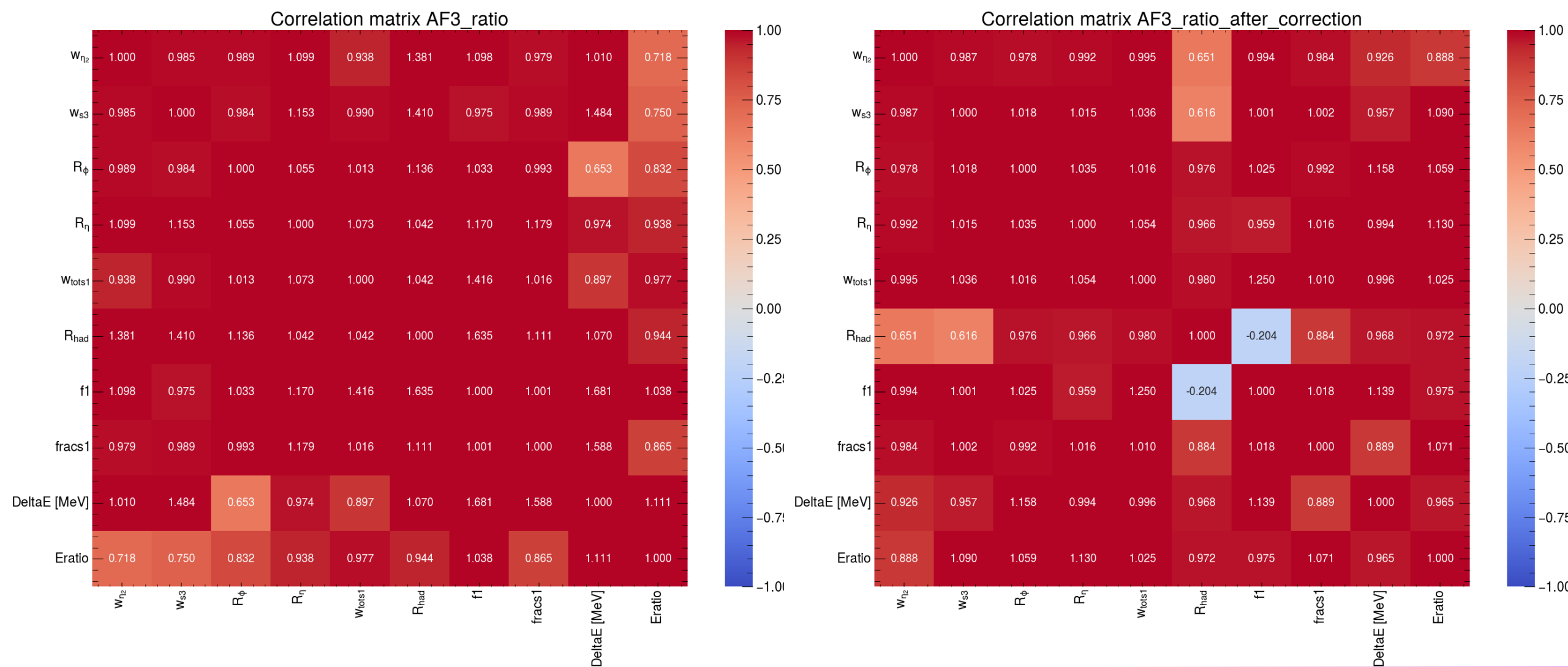
- Try to the same python environment as Katerina's: Python 3.10.6
 - Impossible to create a virtual environment based on exactly Python 3.10.6
 - -> always 3.10.19 the latest sub version
- Training based on **200K events** from Atlas Fast simulation (AF3) and Geant4 (Full Simulation, FS).
- Transformation from AF3 to FS shapes for the remaining events (10M in total).

Immigration to EE Workflow

- T&P ROOT to H5 conversion:
- ☐ Optimize model parameter based on MC electron and MC photon
- ☐ Training based on MC electron and MC photon
- ☐ MC electron-photon conversion using NF

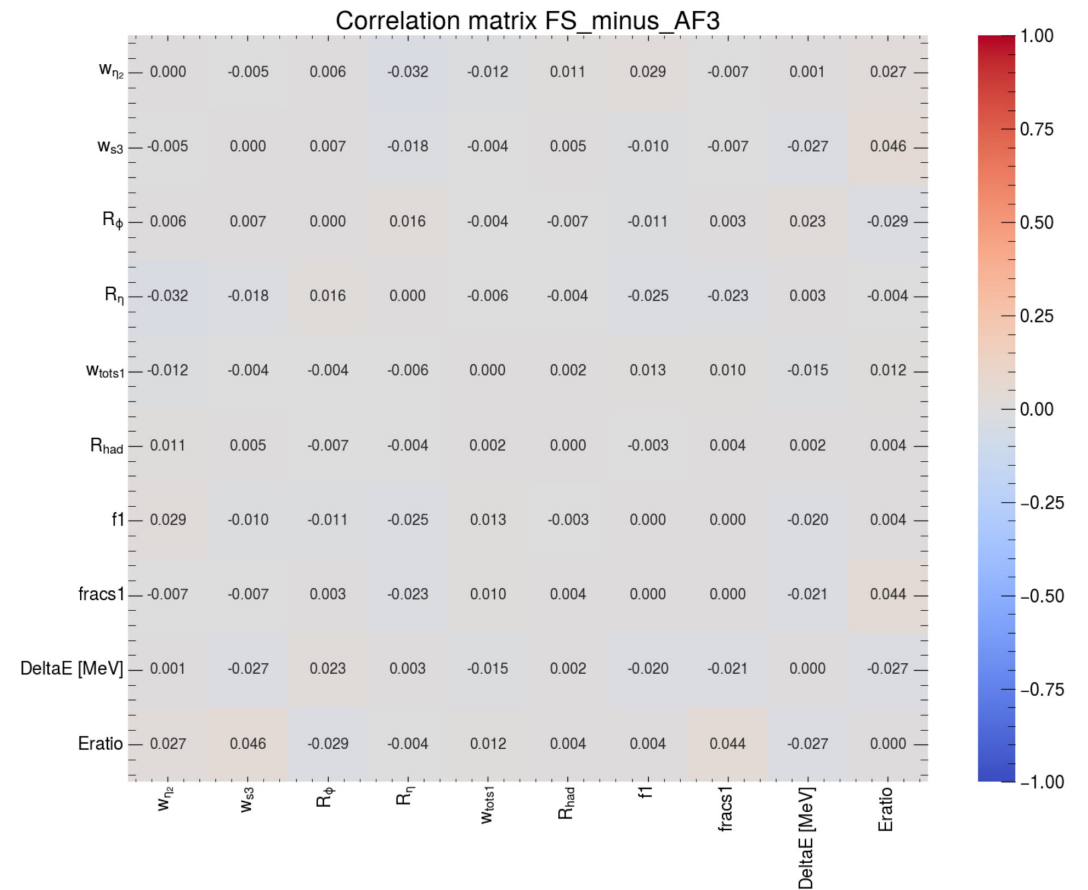
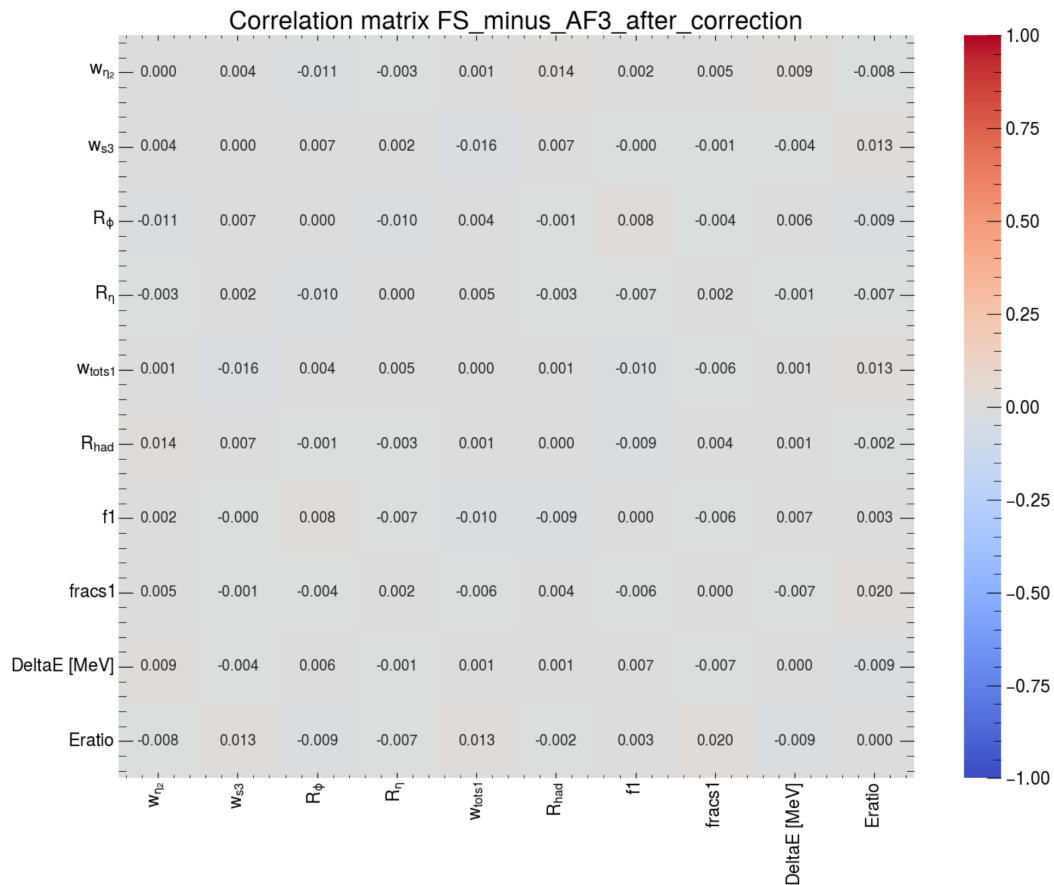
Training Results



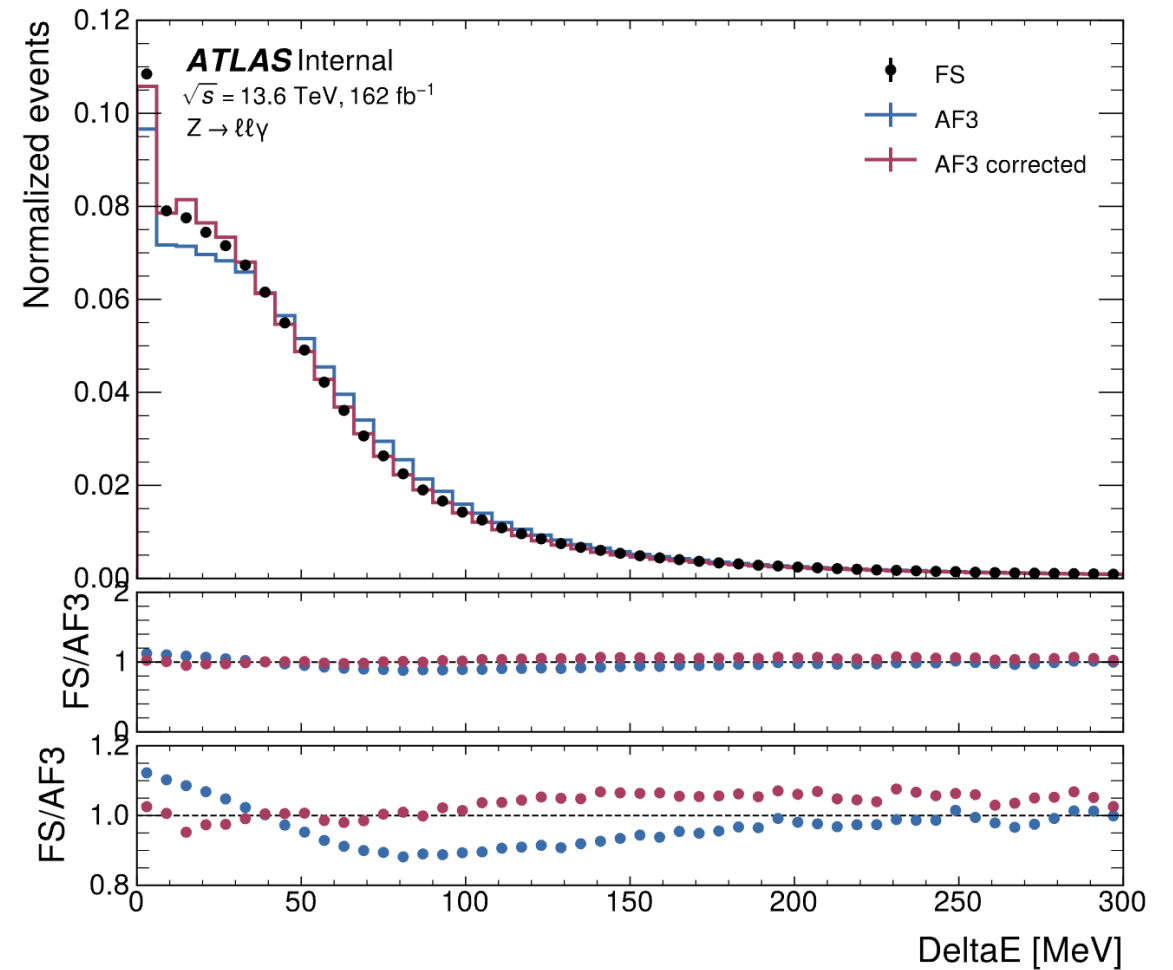
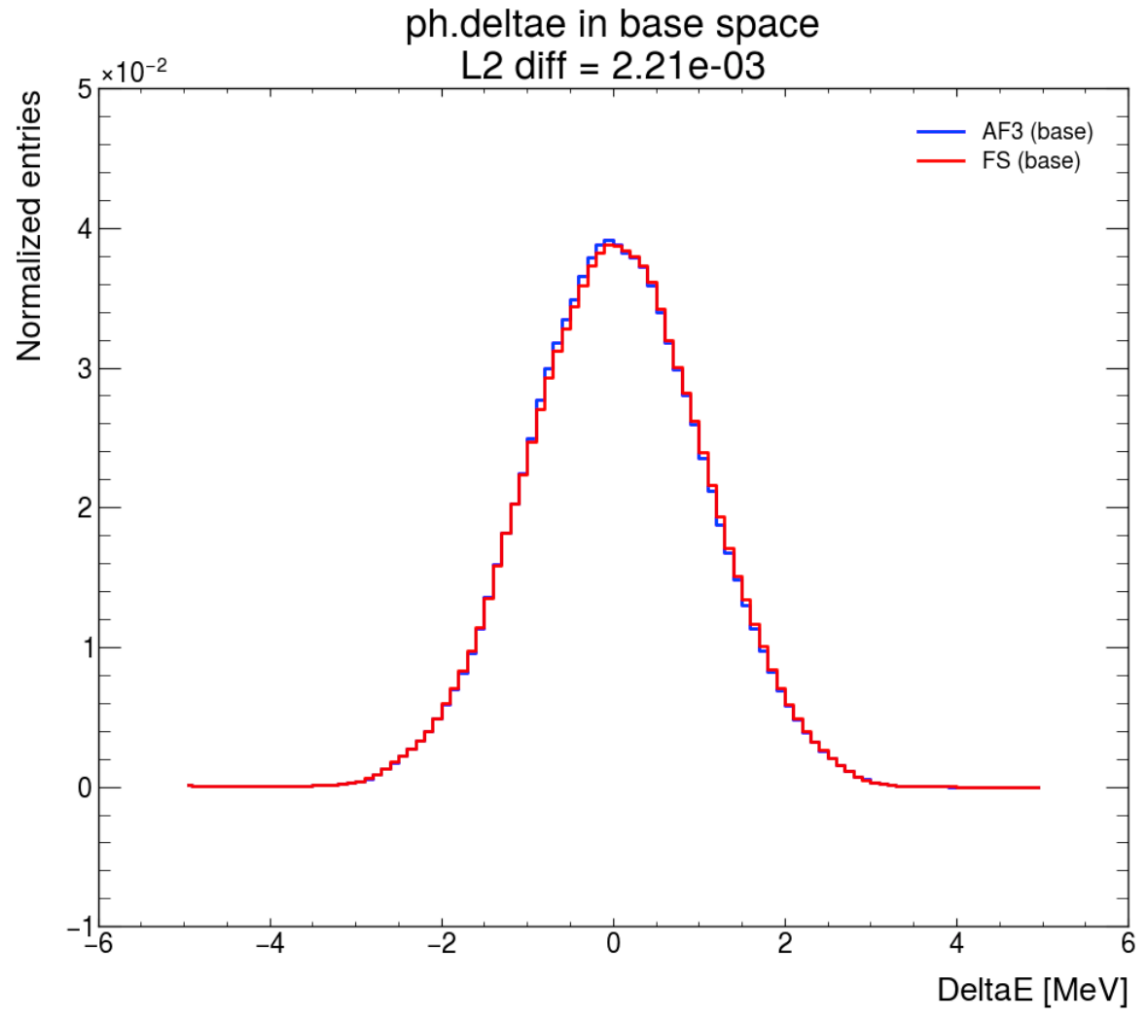


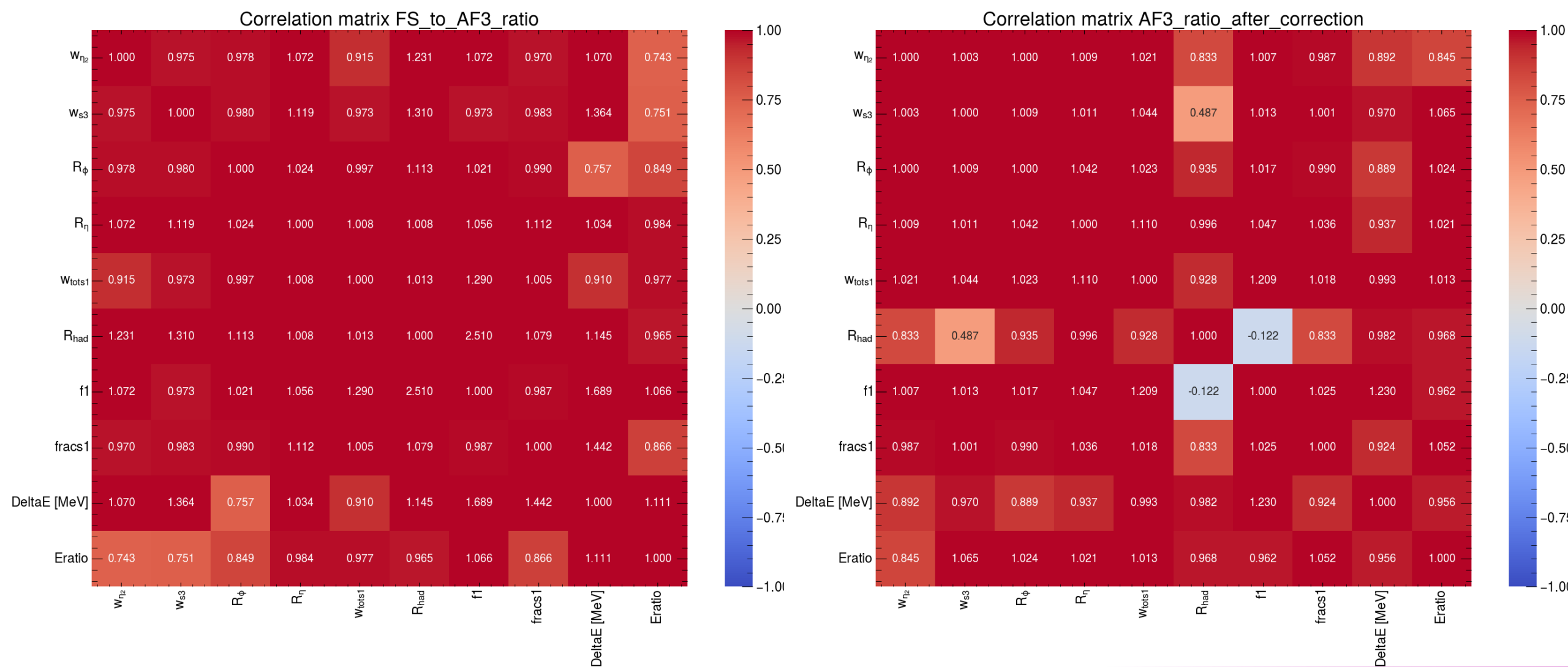
Ratio Correlation Matrix: Before and After Correction

Closure Test



Transformation Results





Ratio Correlation Matrix: Before and After Correction

New ROOT-H5 Converter

- From hard-coded input path to external filelist
 - --filelist: command-line argument
 - Consecutive lines into are collected into (ntuple, hist) directory pairs
 - Within each pair it matches each *.ANALYSIS.root to a corresponding *.hist-output.root by filename.
- Copy only mandatory physics branches
 - mandatory branch names are listed in the branches TXT.
 - Only these are read and kept; all others are dropped.
- Post-conversion renamer
 - NF-required keys are hard-coded in NF_REQUIRED_KEYS.
 - Enforces that len(branches) == len(NF_REQUIRED_KEYS).
 - mapping input branch names → output keys is defined purely by order, so any naming change is captured by updating this TXT (no code change).
 - Output H5 plugs directly into current normalizing-flow framework.