

# Weekly Update

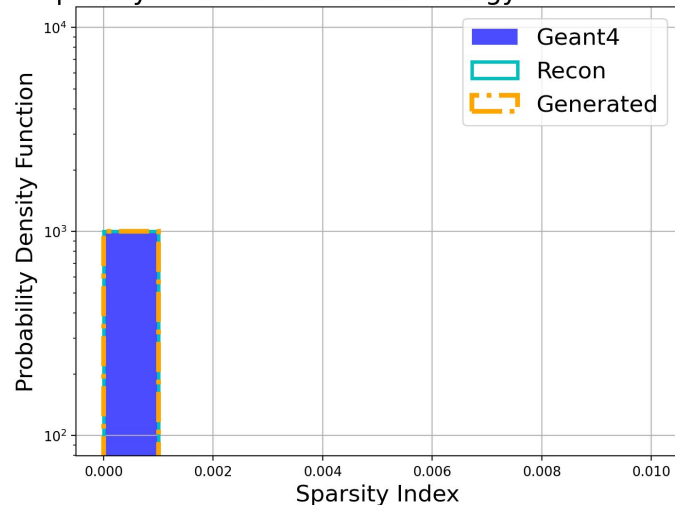
June 13, 2025

Leo Zhu, Denaisha Kraft

# Sparsity Issue

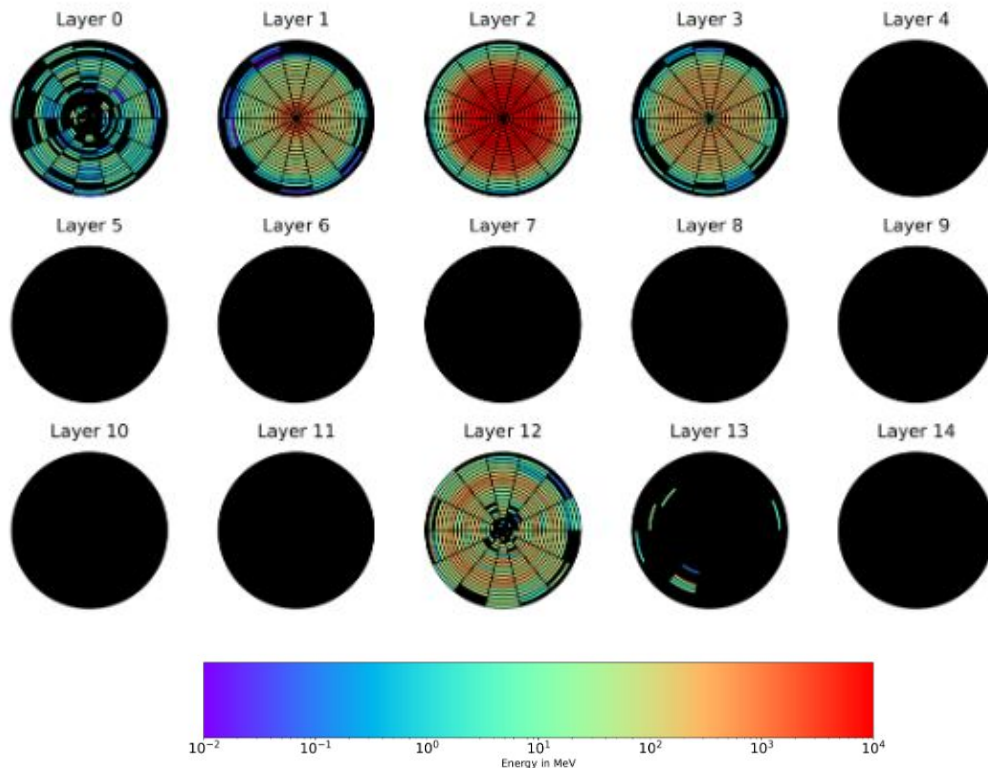
- For high incident energies the sparsity index was 0 for all events

Sparsity Index for Incidence Energy = 4194.3 GeV



- Looked at event displays to see if every voxel had energy deposited:

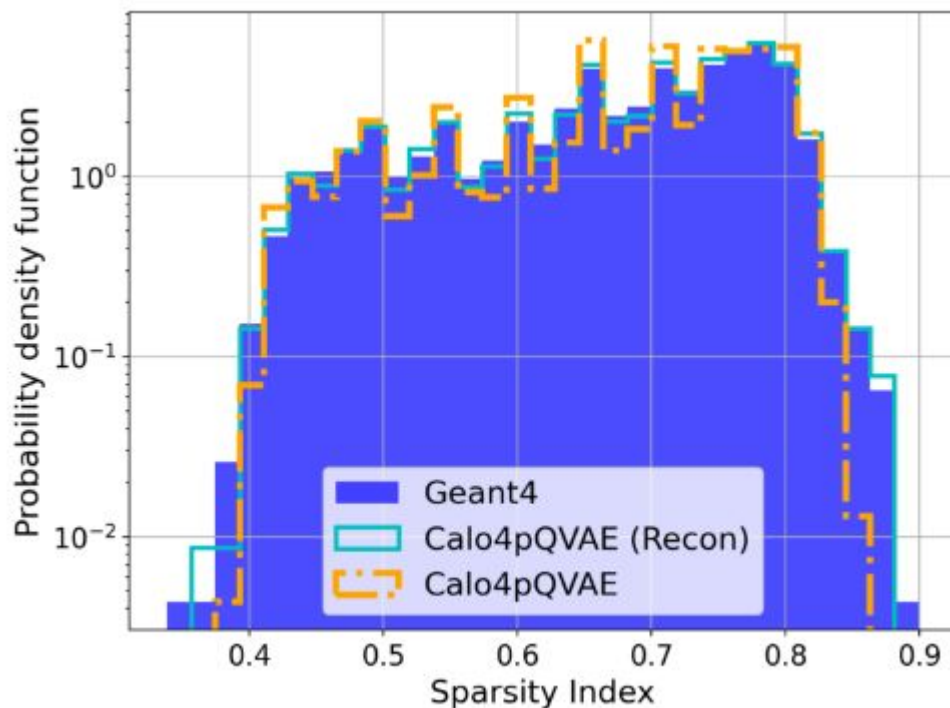
Calorimeter Layer Energy Diagram when  $E = 4194.30$  GeV



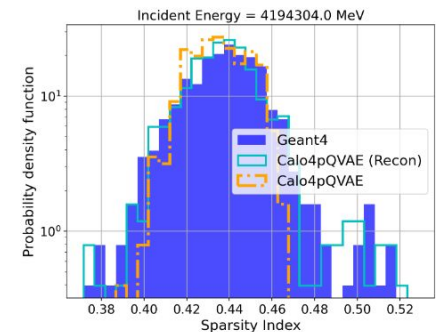
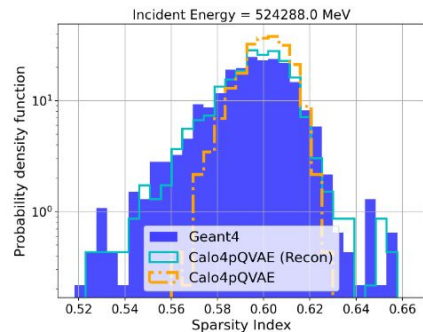
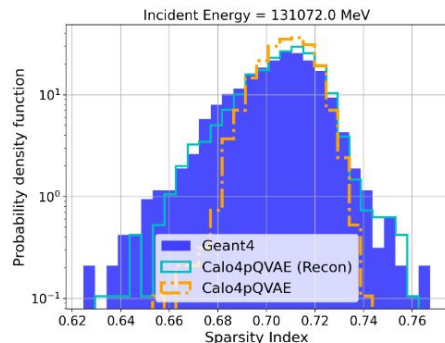
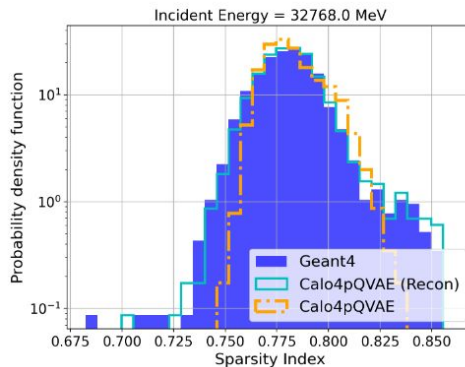
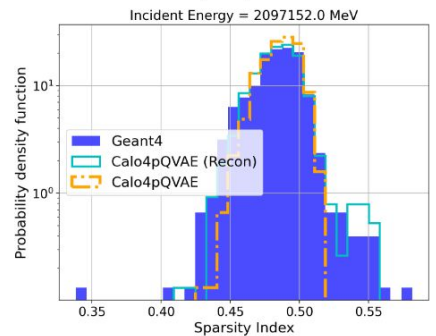
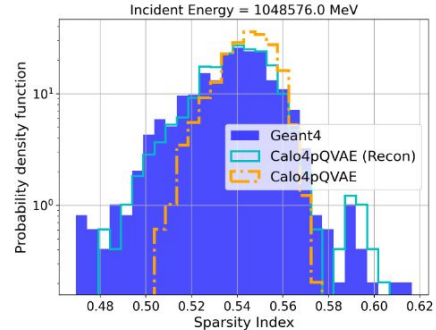
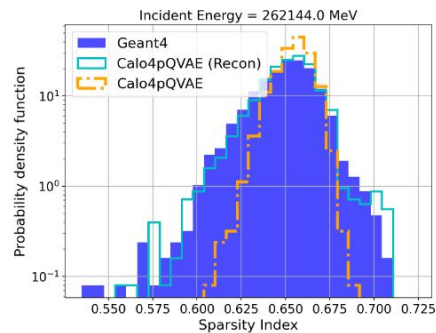
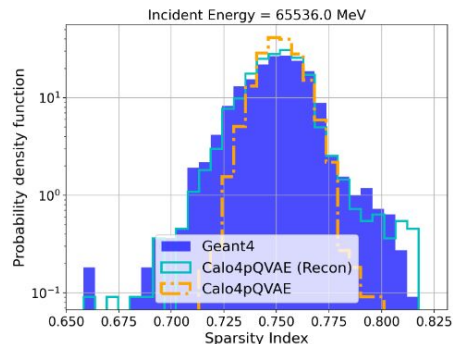
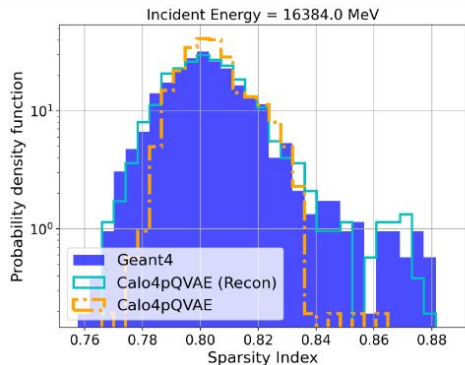
# Sparsity Issue

- Found the issue was in the reduceinv step

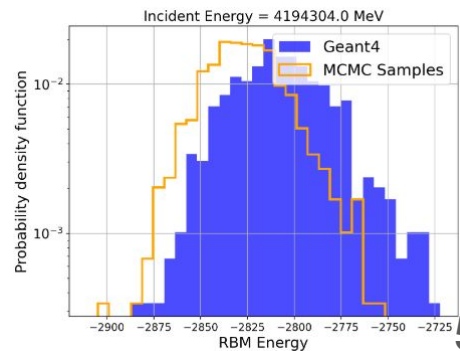
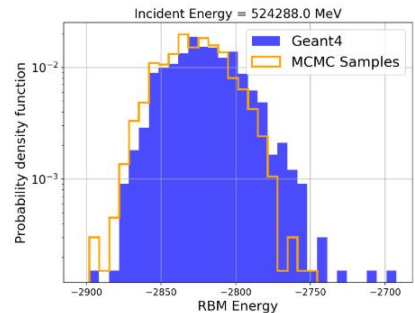
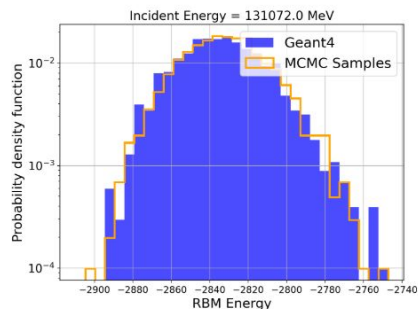
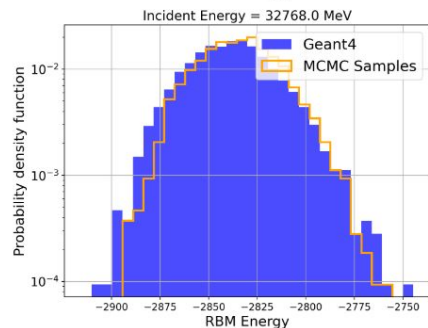
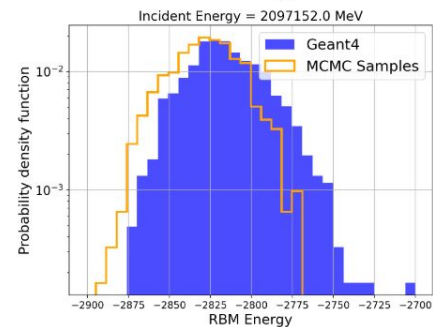
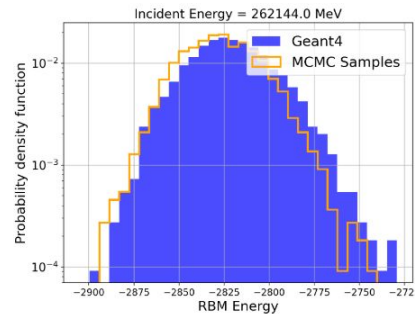
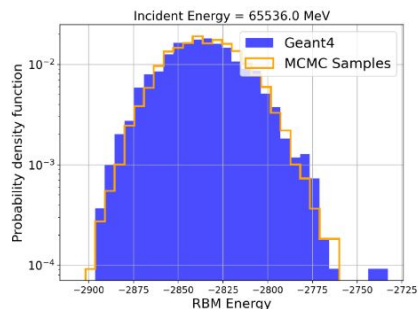
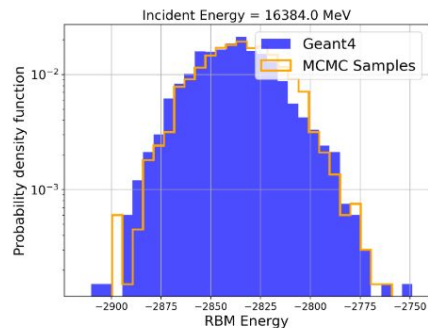
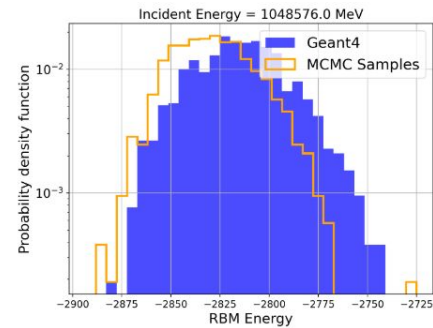
```
def _reduceinv(self, in_data, true_energy, R=1e-7):  
    """  
    CaloDiff Transformation Scheme  
    """  
    zero_mask = (in_data == 0.0)  
  
    x = (torch.sigmoid(in_data*self._std +  
    torch.log(torch.tensor([R/(1-R)]).to(in_data.device)) ) -  
    R)/(1-2*R) * true_energy  
  
    x[zero_mask] = 0.0  
  
    x[torch.isclose(x,  
    torch.tensor([0]).to(dtype=x.dtype, device=x.device)) ] =  
    0.0  
  
    return x
```



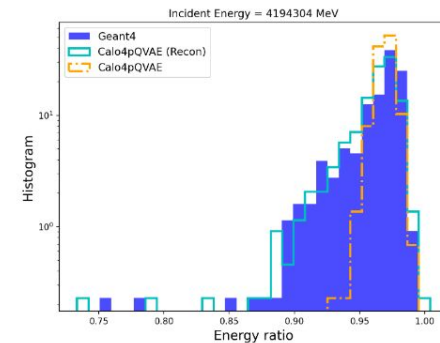
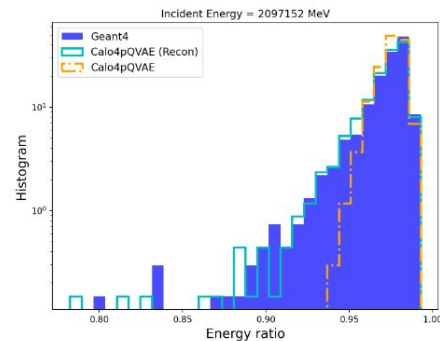
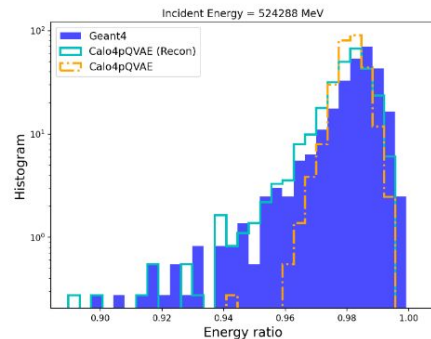
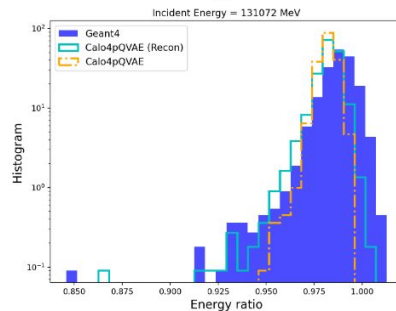
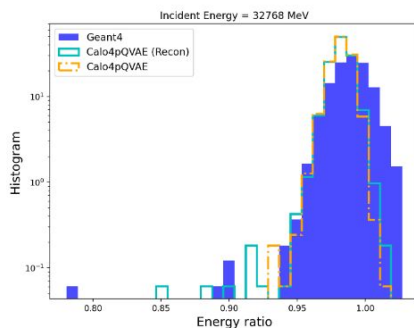
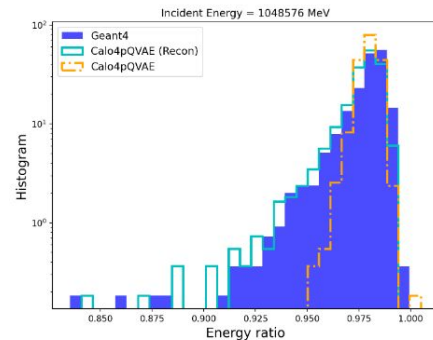
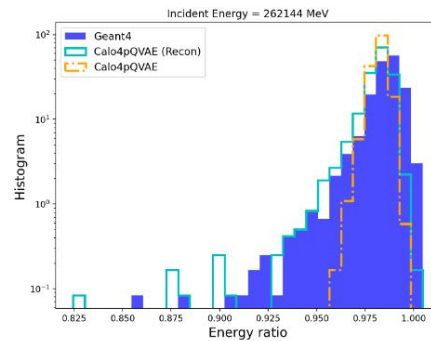
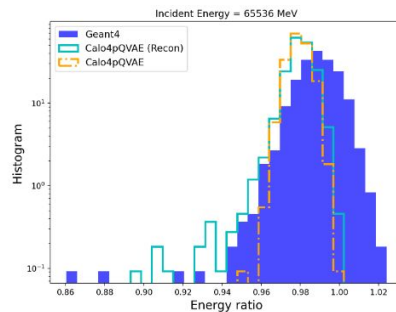
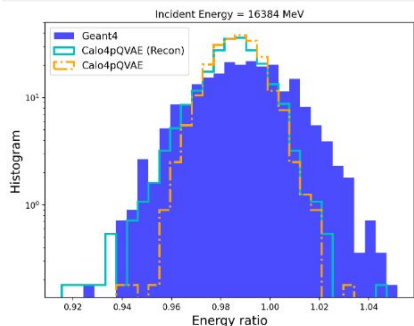
# Sparsity Index (epoch 300)



# RBM Energy (epoch 300)

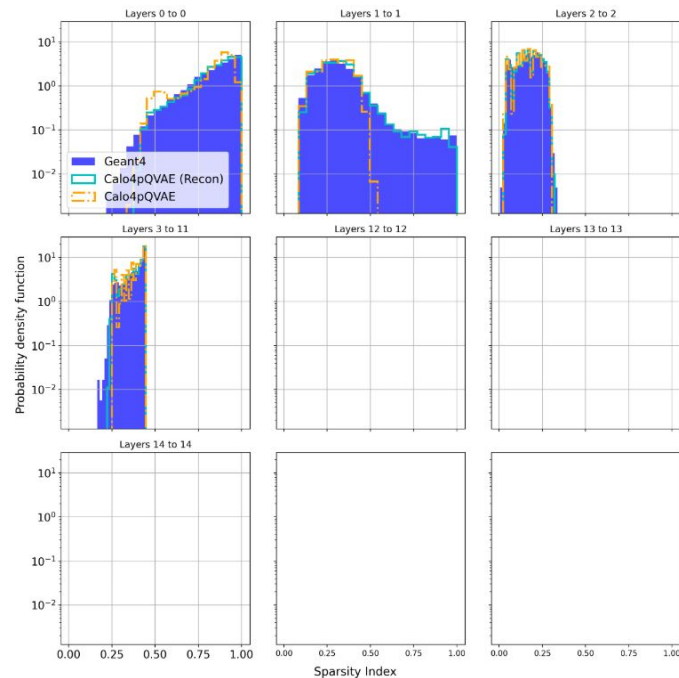
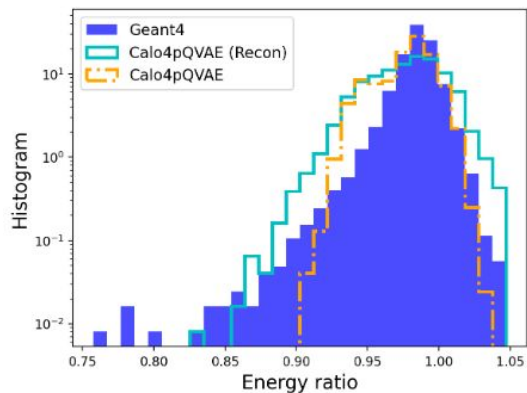
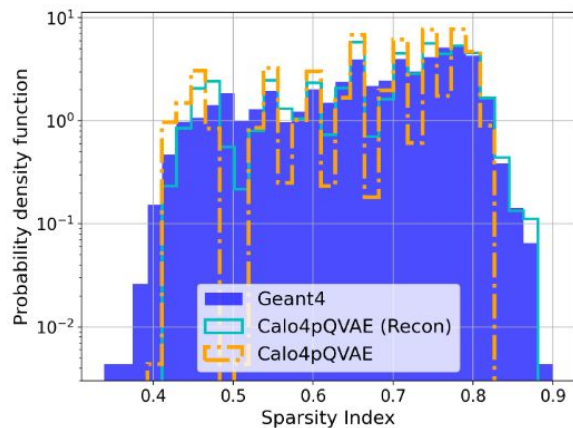
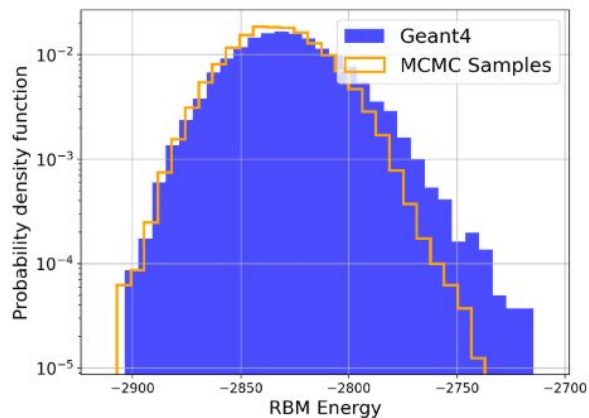


# Energy Ratio (epoch 300)

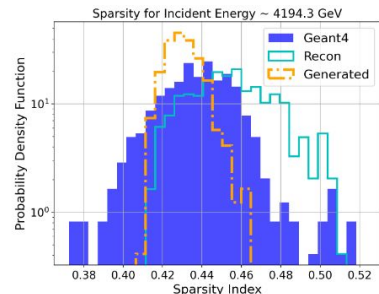
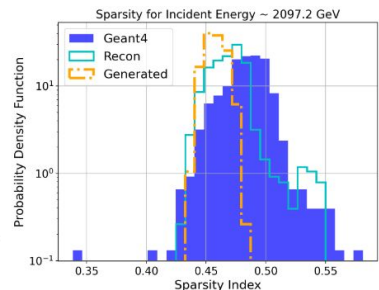
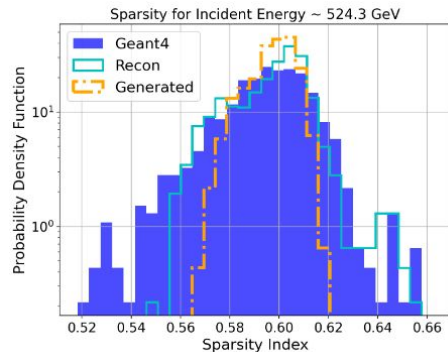
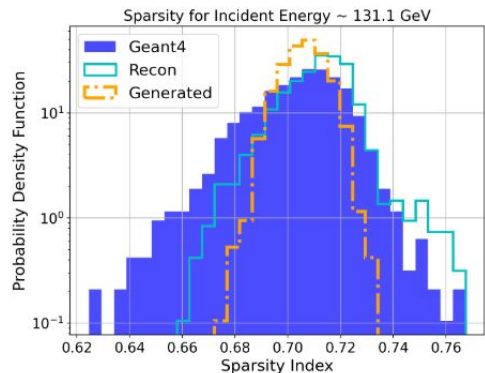
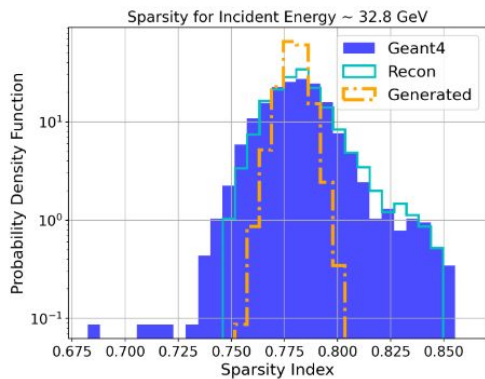
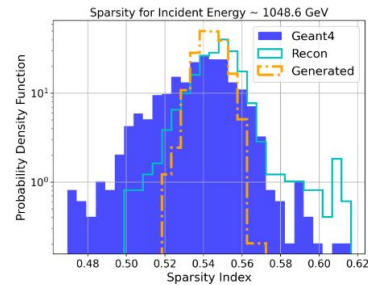
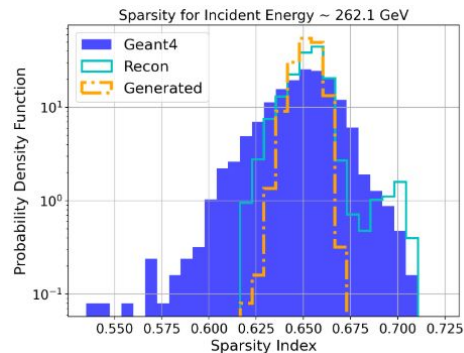
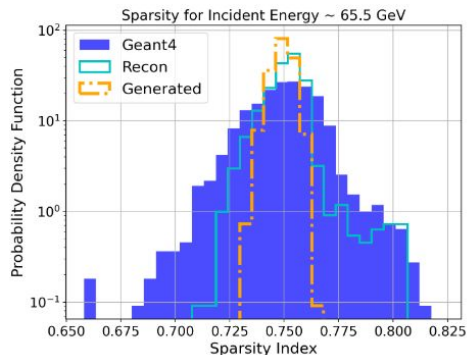
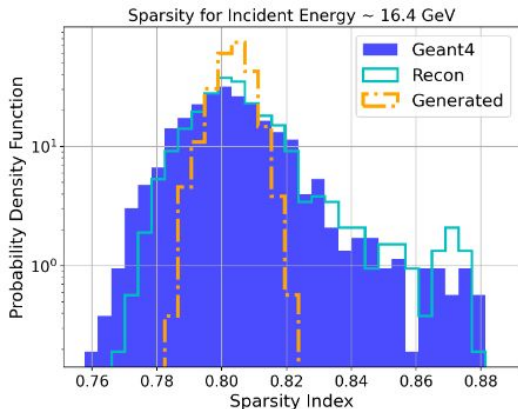




# Smeared Dataset (epoch 300)



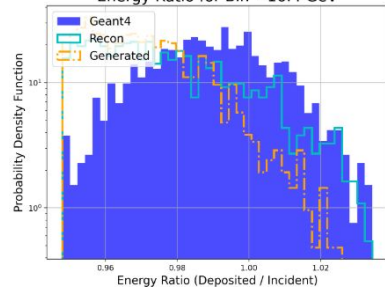
# Conditioned Samples (epoch 300)



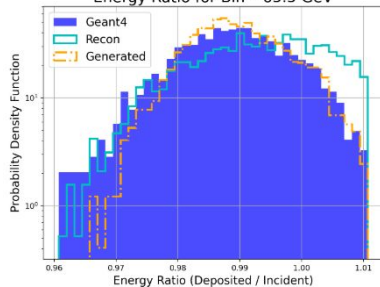


# Conditioned Samples (Energy Ratio)

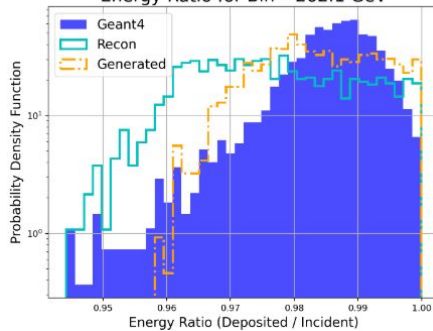
Energy Ratio for Bin ~16.4 GeV



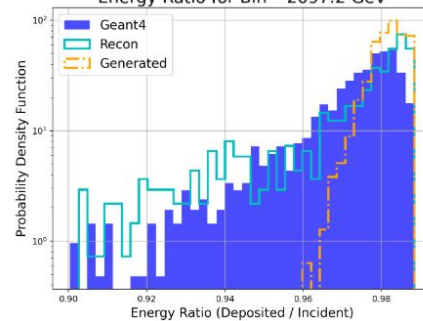
Energy Ratio for Bin ~65.5 GeV



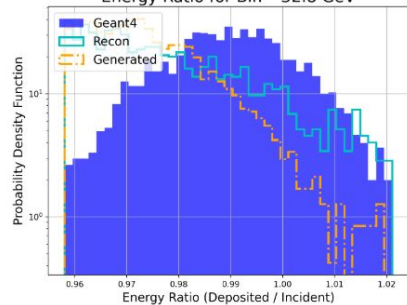
Energy Ratio for Bin ~262.1 GeV



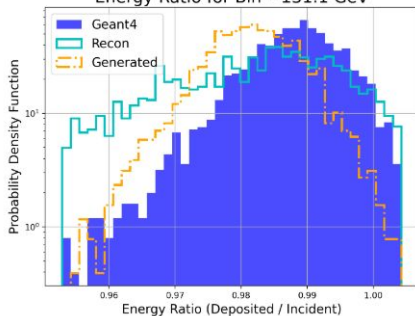
Energy Ratio for Bin ~2097.2 GeV



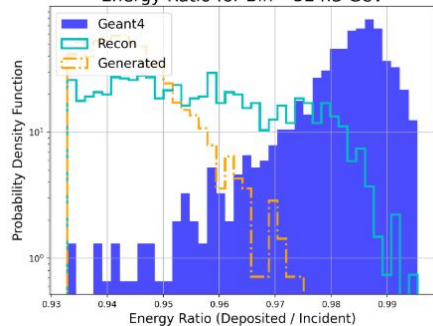
Energy Ratio for Bin ~32.8 GeV



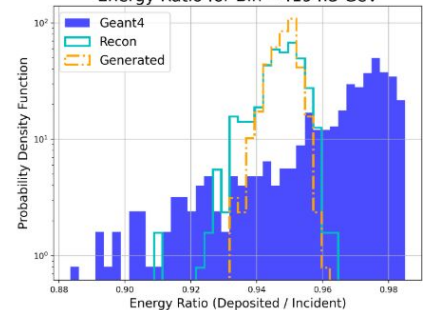
Energy Ratio for Bin ~131.1 GeV



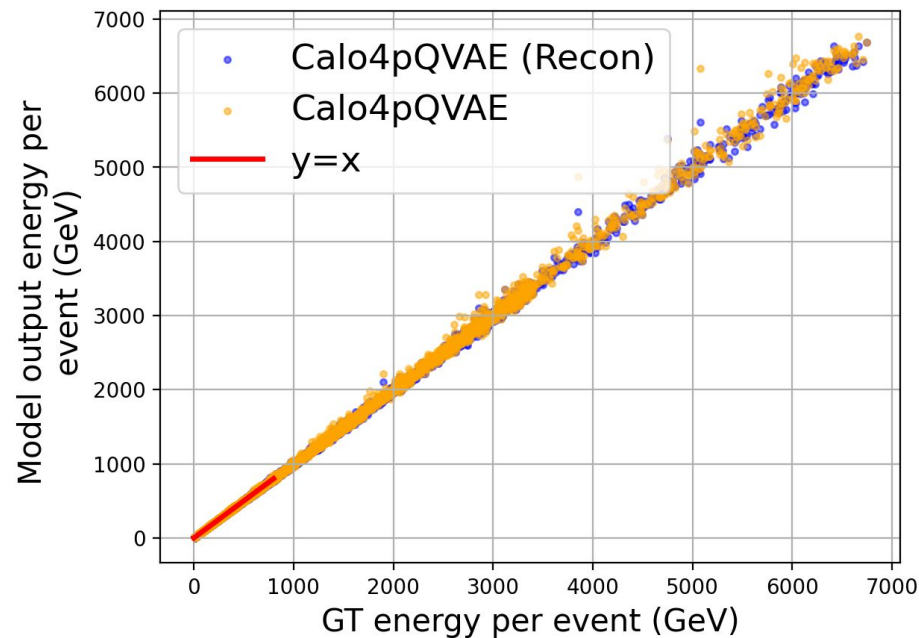
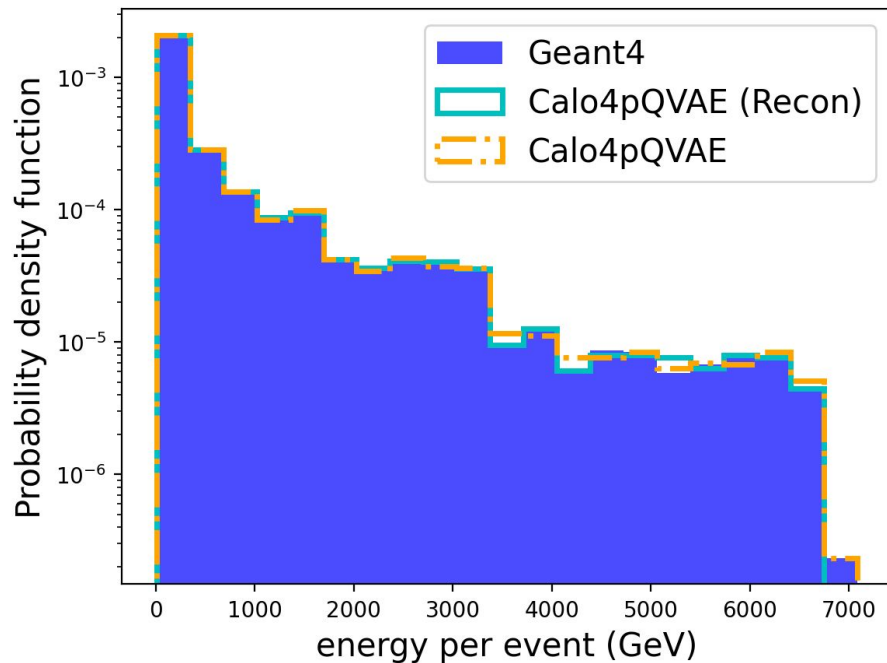
Energy Ratio for Bin ~524.3 GeV



Energy Ratio for Bin ~4194.3 GeV



# Smeared Eta 0.30 (Epoch 220)



# Smeard (Epoch 220)

