

Stefan Bathe

BHCal

Request

- 3 questions:
 - Impact on data flow, requested bandwidth and potential dead-time
 - Impact on detector performance
 - radiation/fluence damages (have)

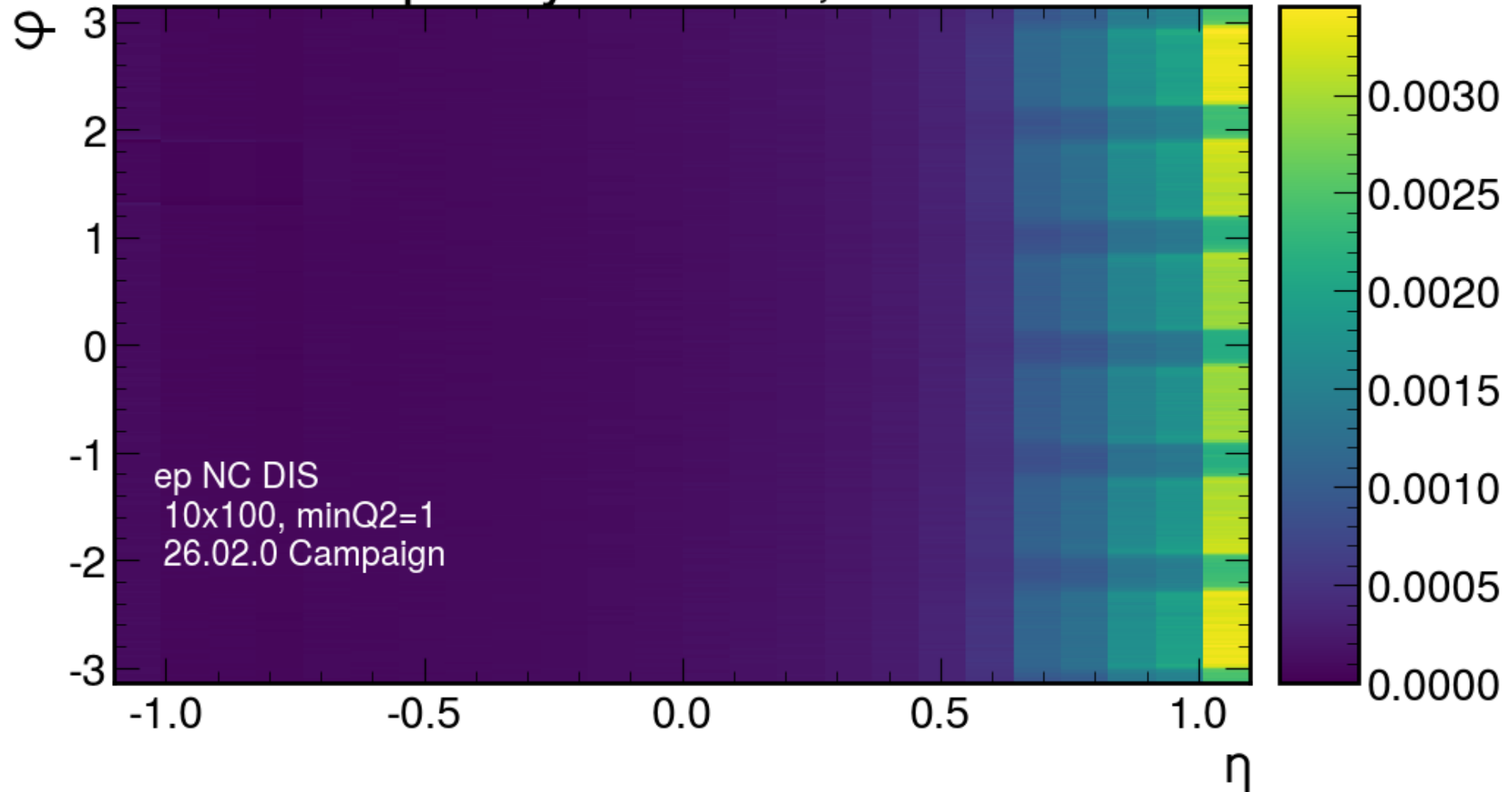
Occupancy and Rates with Backgrounds (Ravi Koka, Rutgers, April 10 BHCAL Meeting)

- Data Samples:
 - epic:/RECO/26.02.0/epic_craterlake/DIS/NC/10x100/minQ2=1
 - epic:/RECO/26.02.0/epic_craterlake/Bkg_Exact1S_2us/GoldCt/10um/DIS/NC/10x100/minQ2=1
- Using branch HcalBarrelRecHits
- Avg. instantaneous lumi: $1.2 \cdot 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$
 - Taken from [Sergei Nagaitsev's COOL25 talk](#)
- Gen. cross section: 556009.402 pb

$$\text{hit rate per tile} = \underbrace{\frac{\text{hits per tile}}{N_{\text{rec. events}}}}_{\text{occupancy}} \cdot \underbrace{\sigma_{\text{gen}} \cdot \mathcal{L}_{\text{avg}}}_{\text{event rate}}$$

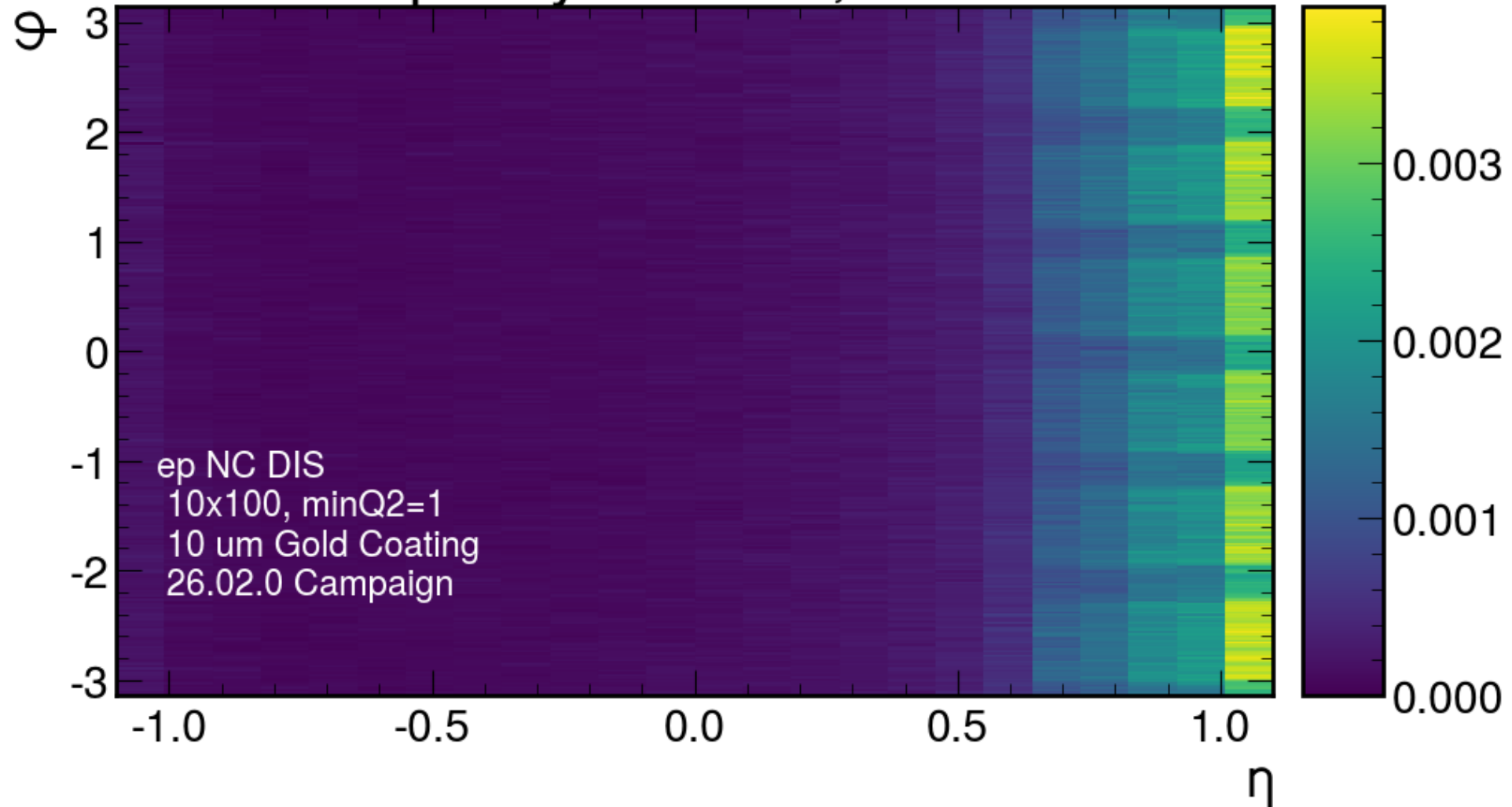
Without backgrounds: Occupancy

Occupancy: 10x100, minQ2=1

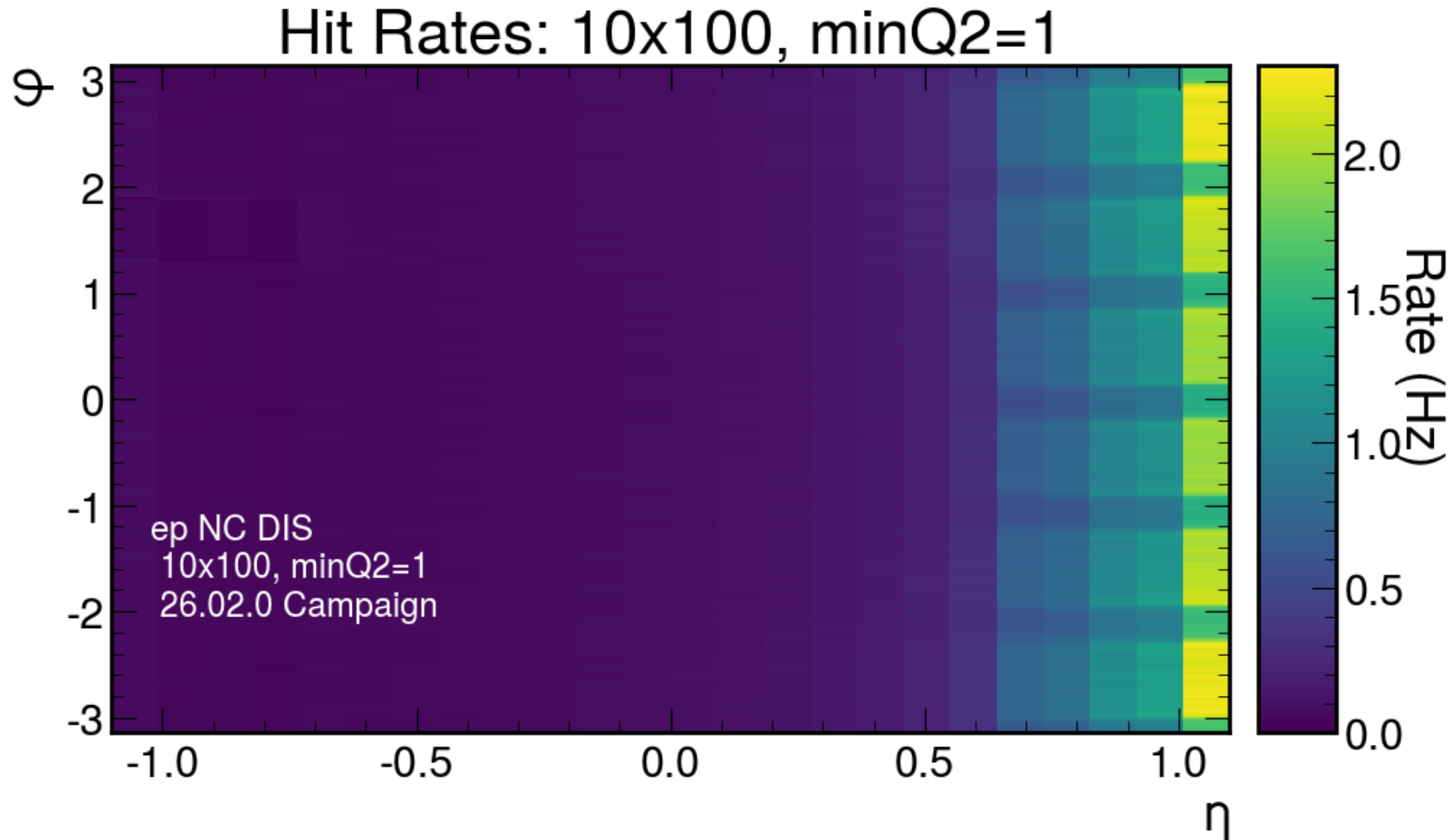


With backgrounds: Occupancy

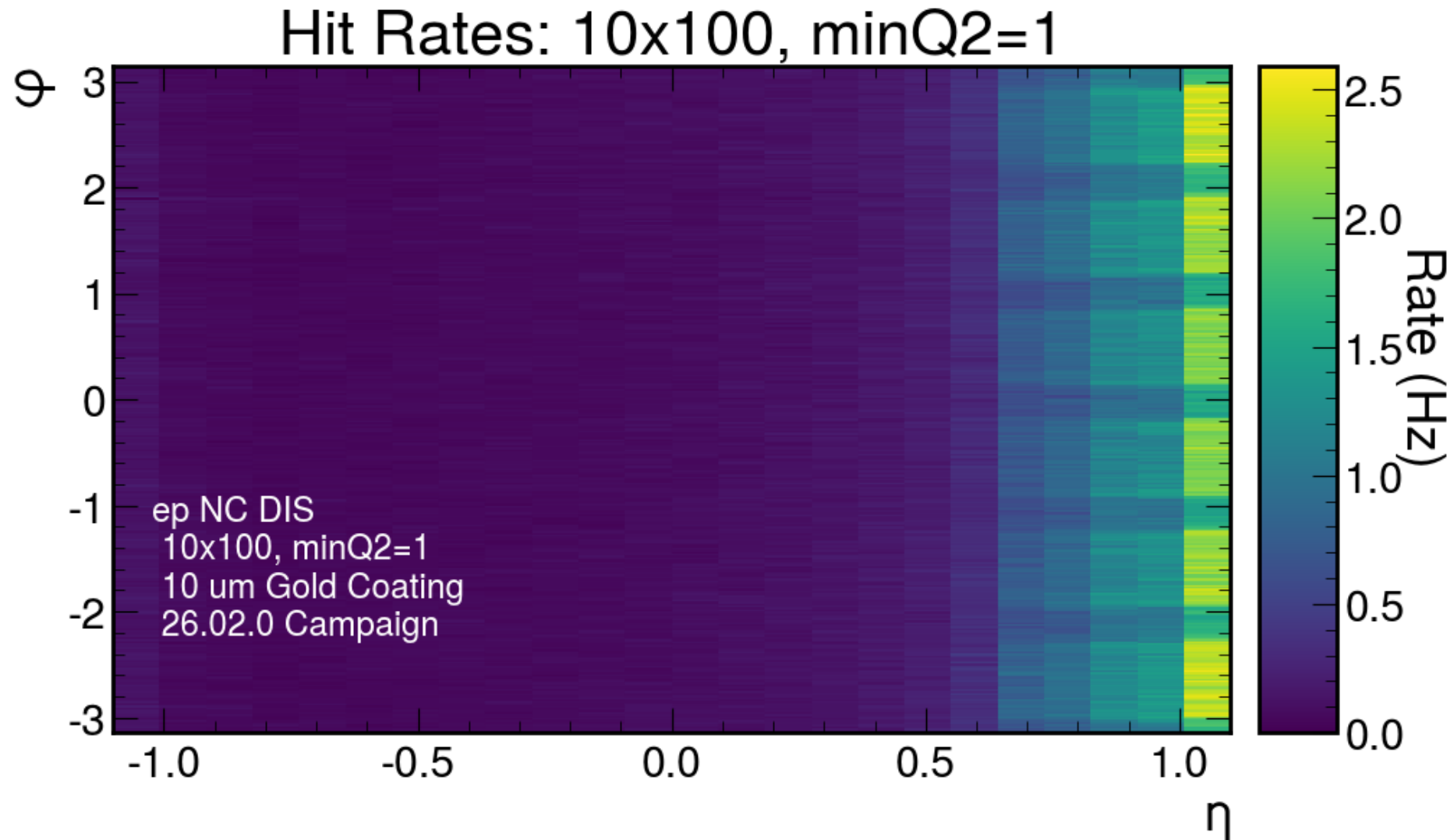
Occupancy: 10x100, minQ2=1



Without backgrounds: Hit Rates



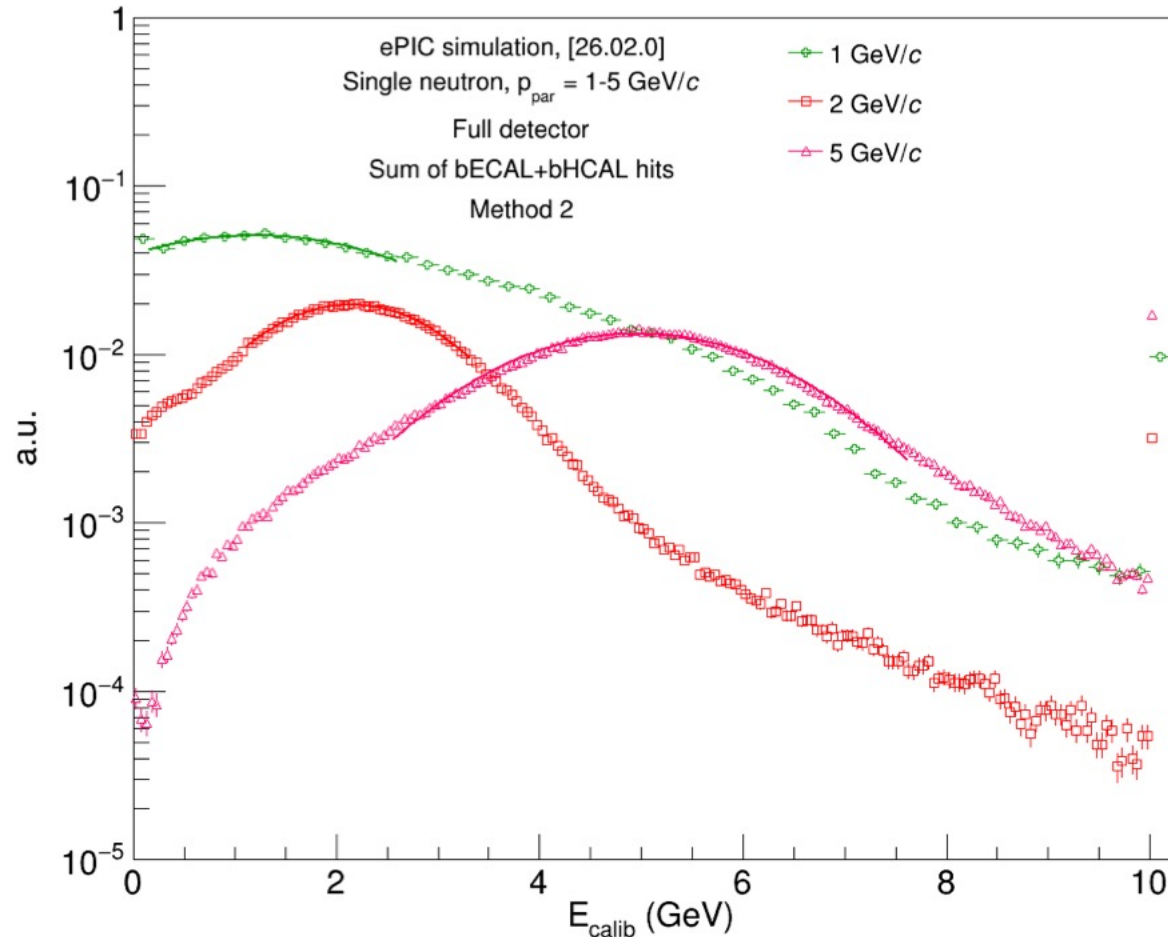
With backgrounds: Hit Rates



Conclusion: Hit Rate

- Maximum hit rate increases only marginally from 2.2 to 2.5 Hz
- CALOROC limit 50 kHz (Norbert Novitzky, ORNL)

Background influence on energy measurement (Jan Vanek, U New Hampshire, April 10 BHCAL Meeting)

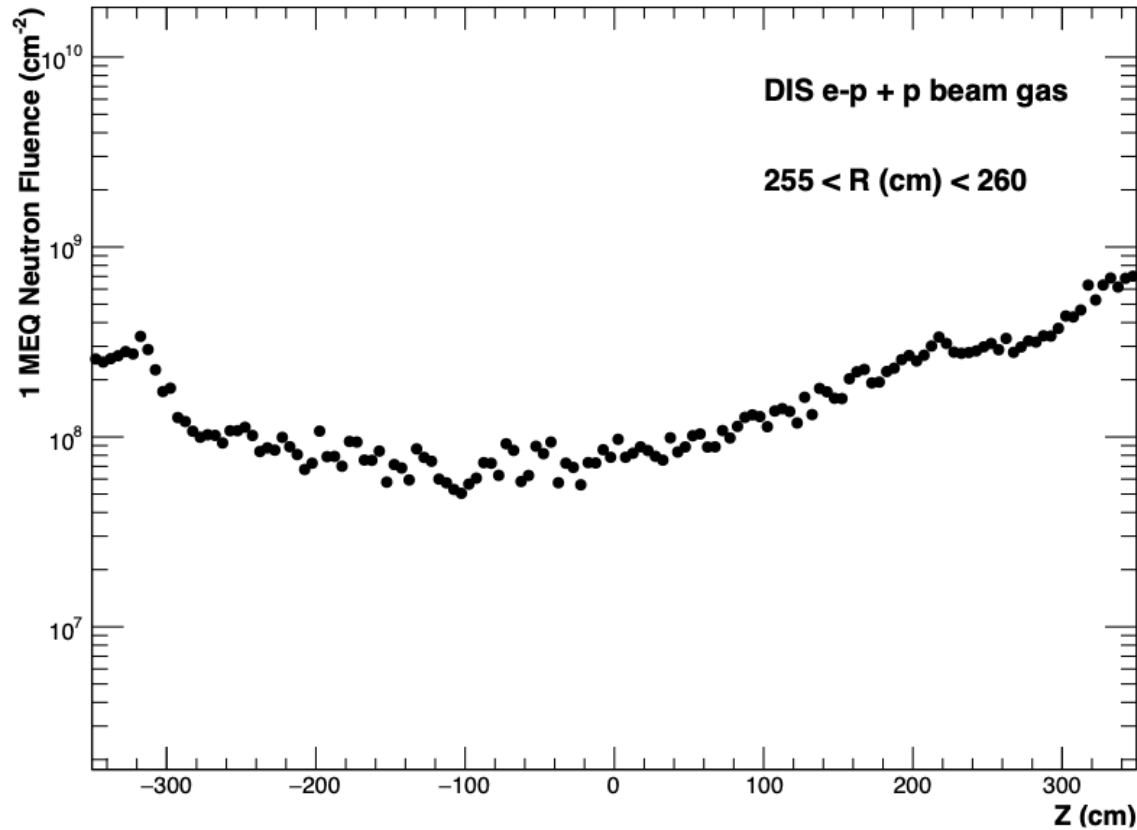


- Studying neutron energy measurement (calibration) based on bECAL and bHCAL information
- So far based on single neutron simulation
- Plan to explore full DIS events and DIS events + background to assess influence of background

Conclusion: Neutron energy measurement

- In progress
- Expect minimal effect from background in BHCaI

Radiation Damage from Neutron Fluence



from draft preTDR (originally from Friederike Bock, presented at 9/19/25 BHCAL Meeting)

- At the BHCAL, the radiation level will be orders of magnitude lower than, e.g., at the LHCAL
- As for another comparison, sPHENIX expects $\sim 7 \times 10^{10} \text{cm}^{-2}$ at its SiPMs over its operational lifetime
- sPHENIX experience has shown that while increased leakage current from neutron damage does reduce the ability to observe single photo-electron peaks, it does not significantly impact the calorimeter's signal performance. Therefore, better behavior is expected for the BHCAL in ePIC.