

# ePIC far forward electron beam gas simulation

Jaroslav Adam

Jakub Česka

Czech Technical University

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- **New simulation of electron beam gas conducted**

- ▶ .hepmc file located at  
`/gpfs02/eic/ceska/eic/simulation/beam_gas_ep_10GeV_foam_emin10keV_10Mevt_rotx.hepmc`
- ▶ 23.12.0 ePIC release with epic\_craterlake geometry used
- ▶ 2M events produced, analysed
- ▶ additional step added - EICrecon run on the .edm4hep.root files obtained from npsim
- ▶ per-channel readout based on the EICrecon structure
  - ★ readout structure different than for .edm4hep.root files
  - ★ last few detectors left to read out

- code being pushed to the eic organisation github

BOECalMaxChannel: 381.27, CellID = 139689  
BOTrackerMaxChannel: 3.17725, CellID = 85005662026875286  
BackwardMPGDEndcapMaxChannel: 0, CellID = 18446744073709551615  
EcalBarrelImagingMaxChannel: 4.76588, CellID = 5348051720095077  
EcalBarrelScFiMaxChannel: 6.35451, CellID = 112591897684371561  
EcalEndcapNMaxChannel: 65071.7, CellID = 36827495  
EcalEndcapPInsertMaxChannel: 4846.9, CellID = 30106746986  
EcalEndcapPMaxChannel: 255.769, CellID = 18446462637429522534  
EcalLumiSpecMaxChannel: 4120.9, CellID = 3670210  
ForwardMPGDEndcapMaxChannel: 0, CellID = 18446744073709551615  
HcalBarrelMaxChannel: 17.4749, CellID = 896111  
HcalEndcapNMaxChannel: 6721.48, CellID = 281466411975281  
HcalEndcapPInsertMaxChannel: 516.304, CellID = 25770135155  
LFHCALMaxChannel: 27.0067, CellID = 5062940532  
MPGDBarrelMaxChannel: 4.76588, CellID = 69876205935325501  
MPGDDIRCMMaxChannel: 0, CellID = 18446744073709551615  
OuterMPGDBarrelMaxChannel: 0, CellID = 18446744073709551615  
SiBarrelTrackerMaxChannel: 3.17725, CellID = 18424404677509583163  
SiBarrelVertexMaxChannel: 4.76588, CellID = 1584985576695124255  
SiEndcapTrackerMaxChannel: 6.35451, CellID = 15757531609361883718  
TOFEndcapMaxChannel: 11.1204, CellID = 2532701308453242  
ZDCEcalMaxChannel: 0, CellID = 18446744073709551615

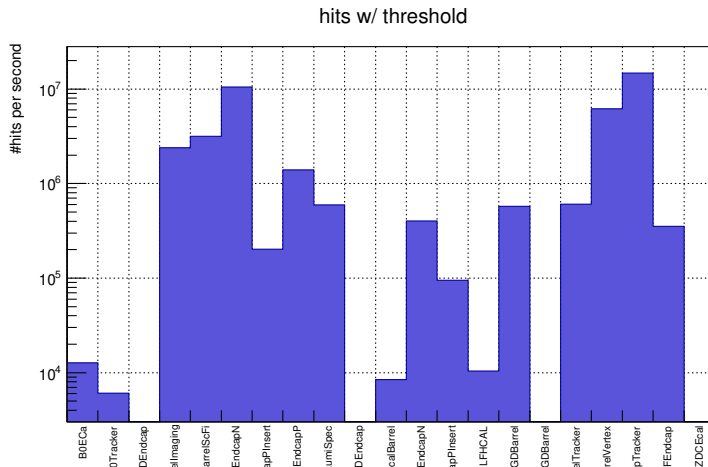


Figure 1: Rates for individual detectors with thresholds applied.

# xy hit distribution

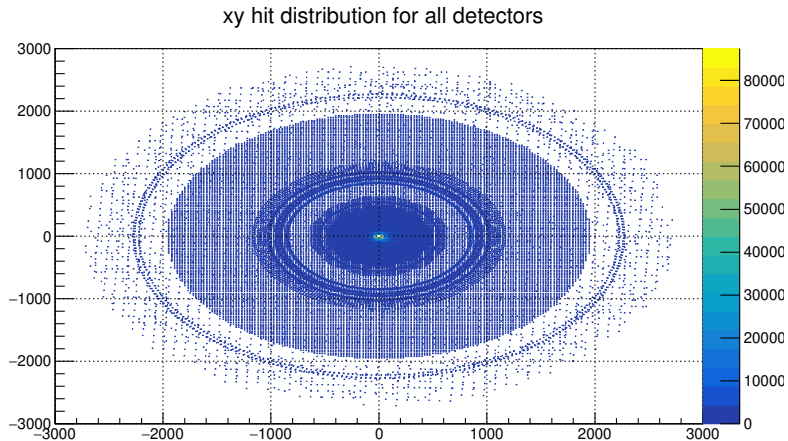


Figure 2: xy distribution of hits.

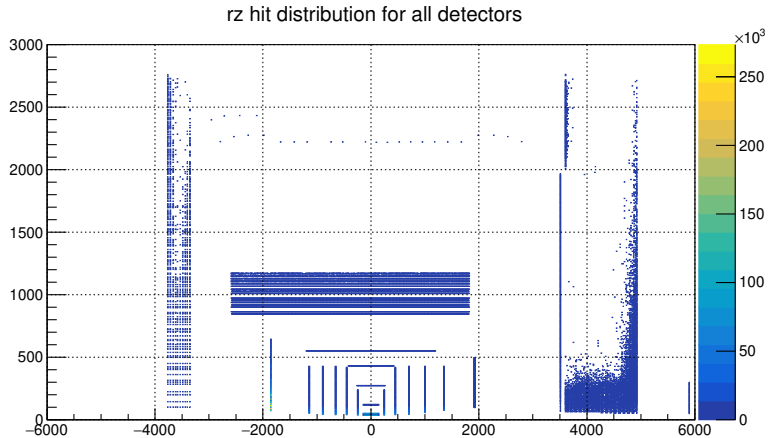


Figure 3: zr distribution of hits.

Thank you for your attention

# Hit rate

## Detector and beam parameters

- Total production rate for electron-beam gas due to bremsstrahlung for  $E_\gamma > 10$  keV calculated as 3.177 MHz
- Integration time for detector readout (information from Elke) -  $2 \mu s$ 
  - ▶  $3.177 \text{ MHz} * 2 \mu s \doteq 6.35$  bremsstrahlung interactions per integration time

## Simulation parameters

- $\sim 2\text{M}$  events (bremsstrahlung interactions) simulated
- number of hits in the most populated detector (*Tracker Endcap*)  $\sim 15\text{M}$ 
  - ▶  $15 \text{ M hits} / 2\text{M events} \doteq 7.5$  hits per simulated event/interaction

## Conclusion

- $7.5 \text{ (hits/interaction)} * 6.35 \text{ (interactions/integration time)} \doteq 47$  hits in the entire detector per readout time