Synchrotron-radiation background studies

Update

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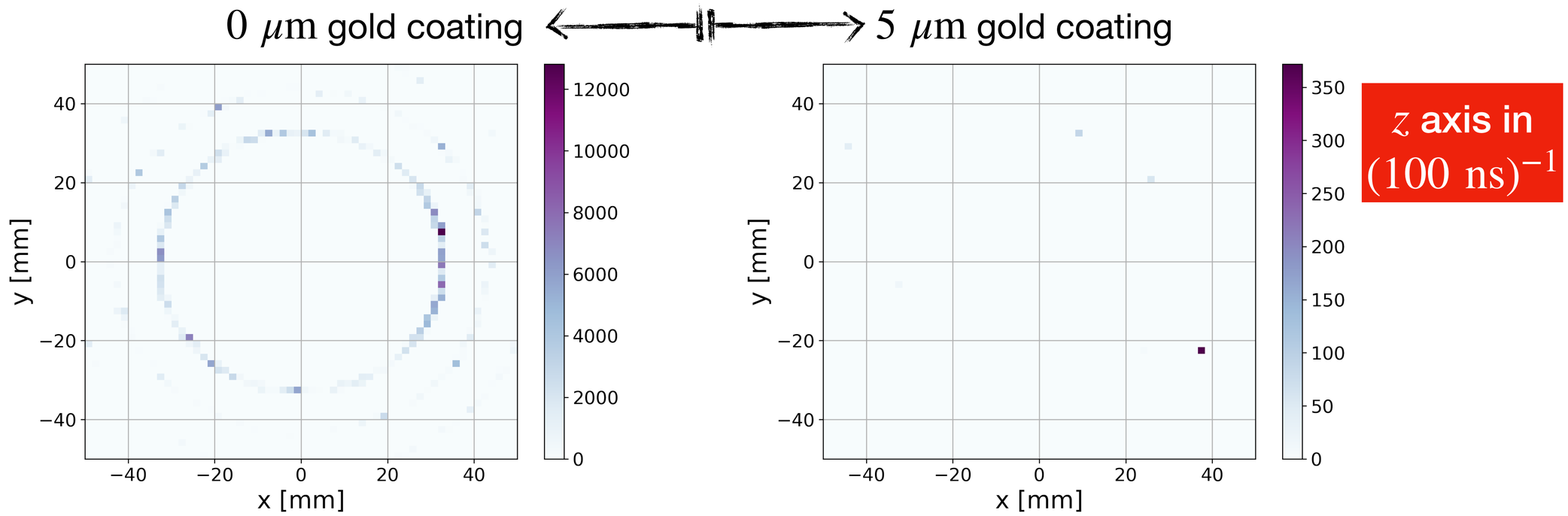
To recap

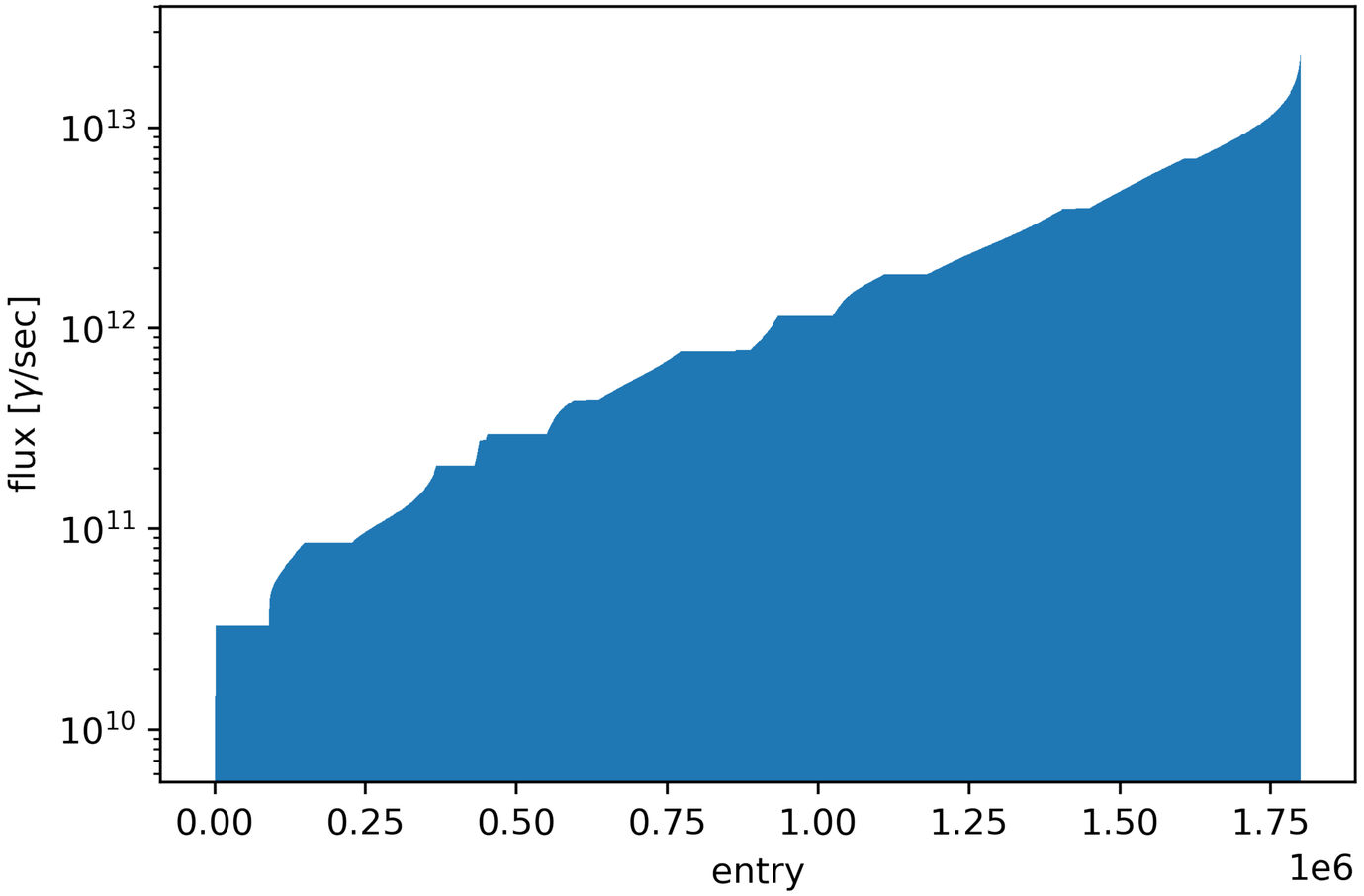
- We have 1.8M independent synchrotron-radiation photons, each with a normalization weight (γ/sec)
- Photons are in hepmc format
- Previously, we propagated each photon through the GEANT model of the ATHENA detector



- Need synchrotron-radiation EVENTS (not individual photons)

Generator

Sample consists of 1.8M photons, each with a flux (γ/sec) weight



x-axis: every photon in the sample (1 per bin)

Define an integration window (IW)

integral = 0

while integral < IW:

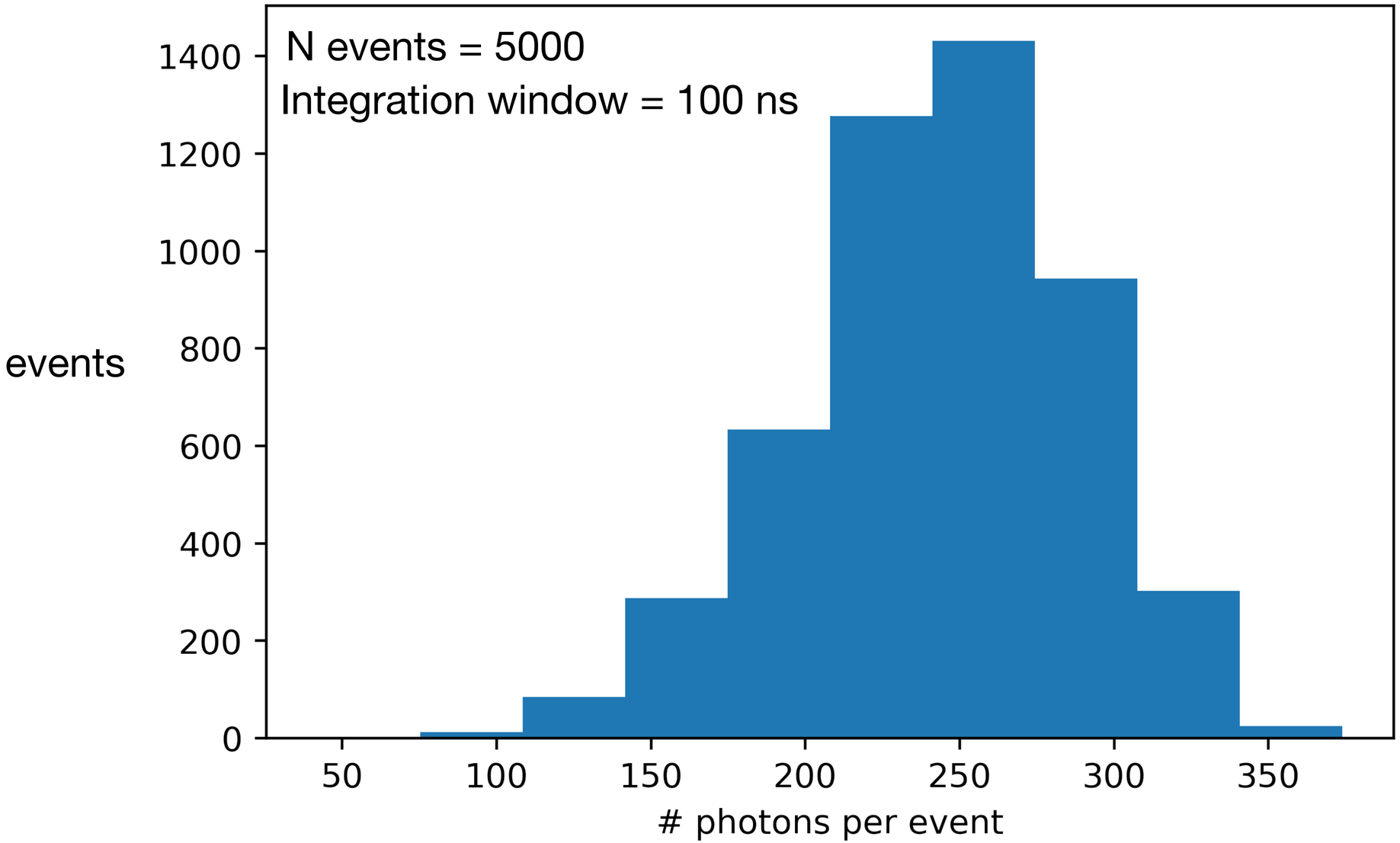
    Randomly sample photon, add it to event

    integral += 1/flux

return event

```
def generate_an_event(integration_window):
    event = []
    integrated_so_far = 0.
    while integrated_so_far < integration_window:
        x = h1_df.FindBin(h1_df.GetRandom())
        if x >= 1800000:
            continue
        photon = df.iloc[x]
        integrated_so_far += 1./photon['NormFact']
        event.append(photon)
    return event
```

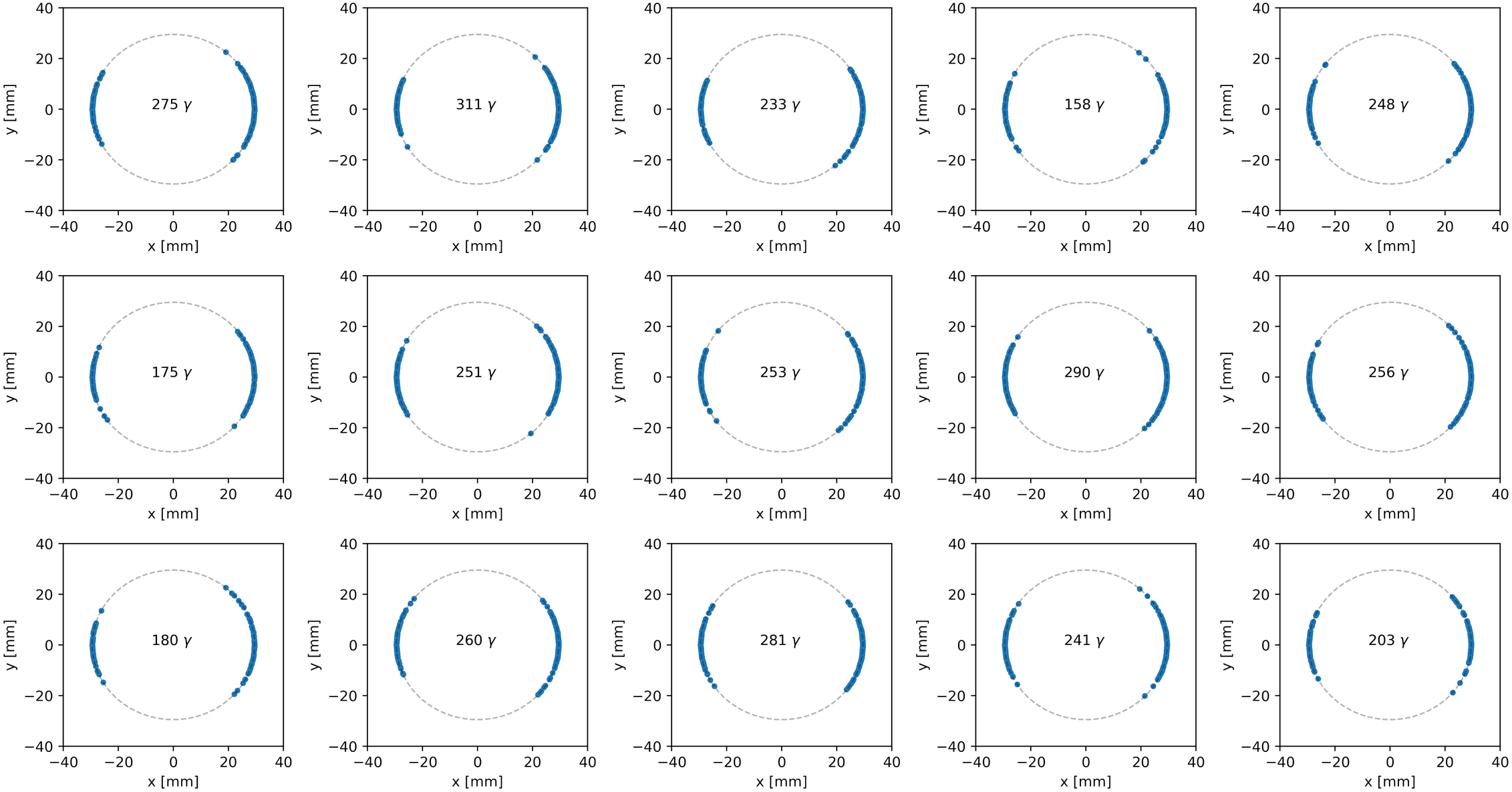
Resulting number of photons per event



before interaction with gold coating

For each photon in the event we have: p_x, p_y, p_z, x, y, z

Sample synchrotron-radiation background events



before interaction with gold coating

Integration window = 100 ns

Summary

- Wrote synchrotron-radiation background event generator based on the available Synrad+ simulations

- These are soft raw photon events before traversing the beampipe material. Their interaction with the gold coating as well as energy thresholds will significantly reduce the number of photons creating signal in the detectors

- Next steps: embed simulated “signals” into these background events and try, e.g. track finding

Thanks to Y.S. Lai for useful comments