New calculations of the background occupancies

Erik van der Kraaij
CERN LCD

Background channels

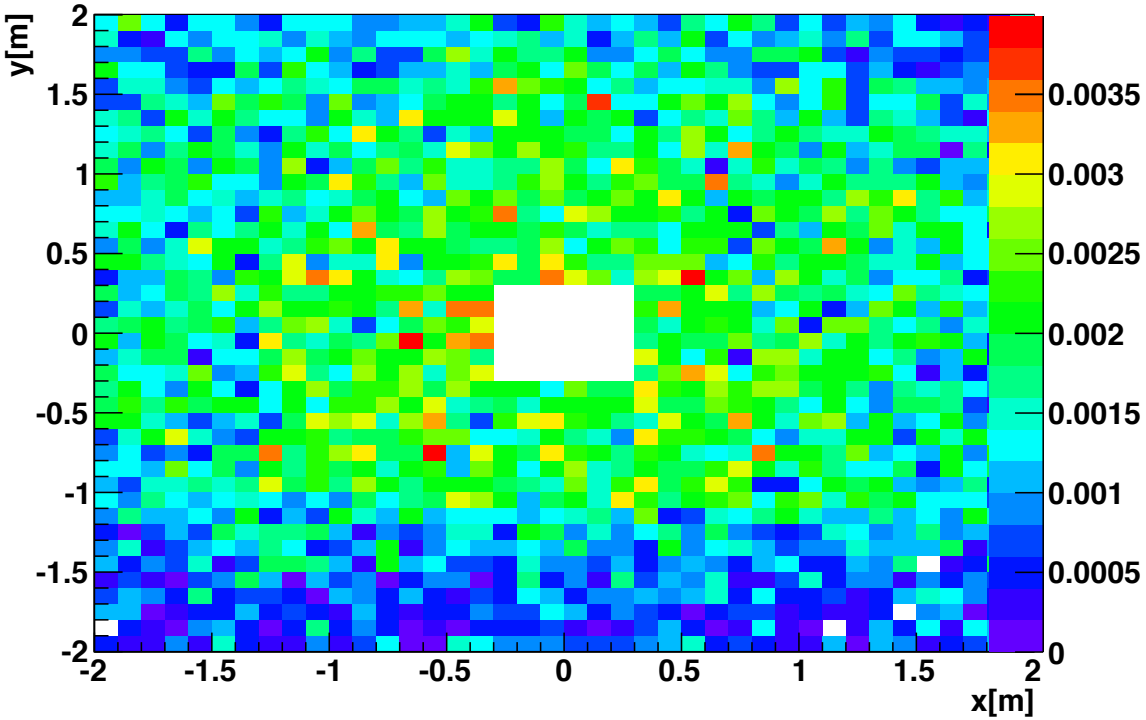
- Beam halo muons
  - Main source up to now
  - Yet from new results of Daniel Schulte, the assumption of 1 muon / BX was too high.
  - His results now show ~0.05 muons / BX.
    - Assuming a safety factor of 5 → 75 muons per train

- Incoherent pairs and gg to hadrons.
  - Neglected in studies for the muon system up to now, as considered to be extremely low.
  - This was fine. Yet with the lower beam halo occupancy, we now checked their rates.
    - As it's the tails in these showers which can make it to the muon system, we apply a safety factor of 5 to **both** channels.

Halo muon occupancies – inner region of endcap

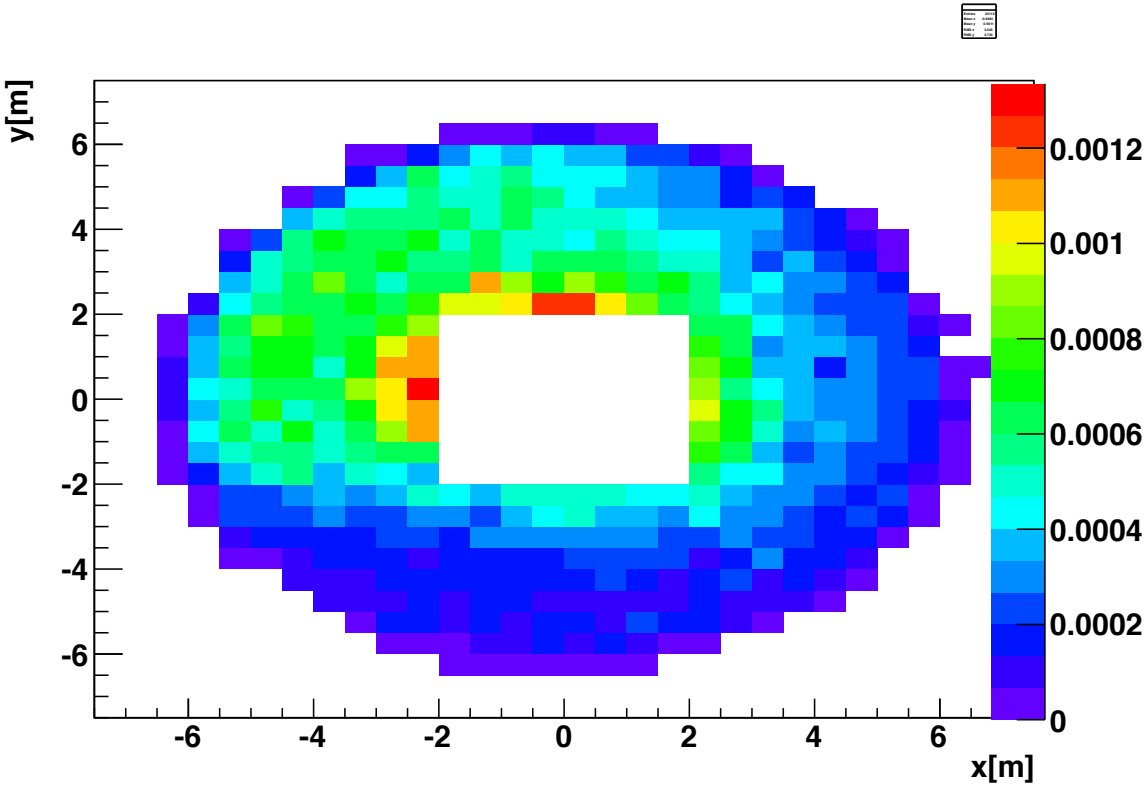
Assuming 75 muons per train (summing over both beams)

- This shows the occupancy per cell of 30x30 mm^2
  (even though the binsize is larger)
- At R=0.7 m, occupancy is ~0.003 muon / cell / train



Halo muon occupancies – outer region of endcap

- At a radius of the HCAL barrel, R = 2.0 m:
  - 0.001 mu / cell / train
- At a radius of the muon barrel system, R = 4.5 m:
  - 0.0005 mu / cell / train

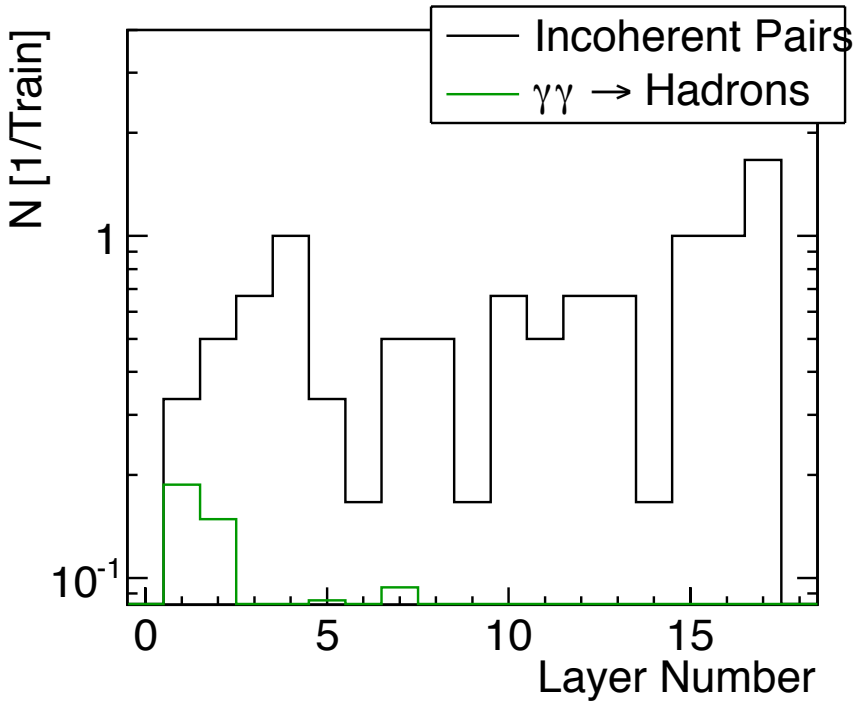


beamstrahlung

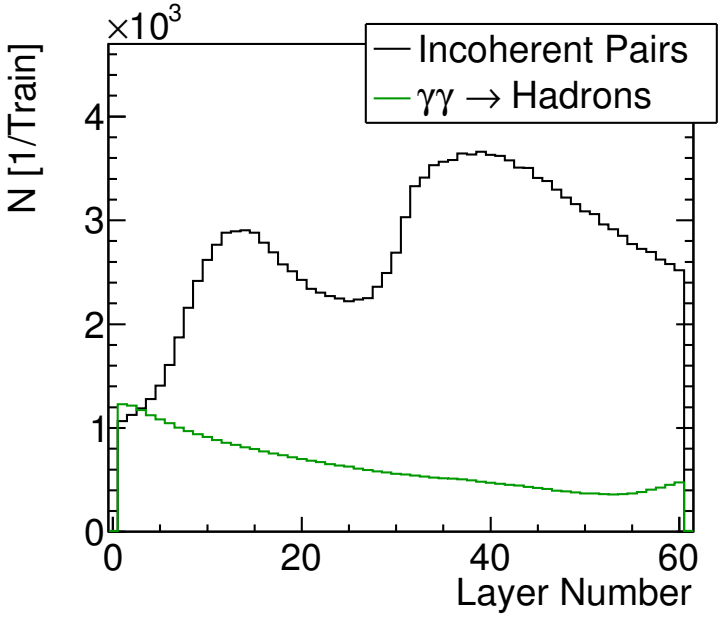
- Studied by André, similar to the occupancies for the HCAL.
- Layer 18 is omitted: has a higher occupancy, probably from backscattered neutrons, as in the simulation the beampipe extends up to +/- 10 m.

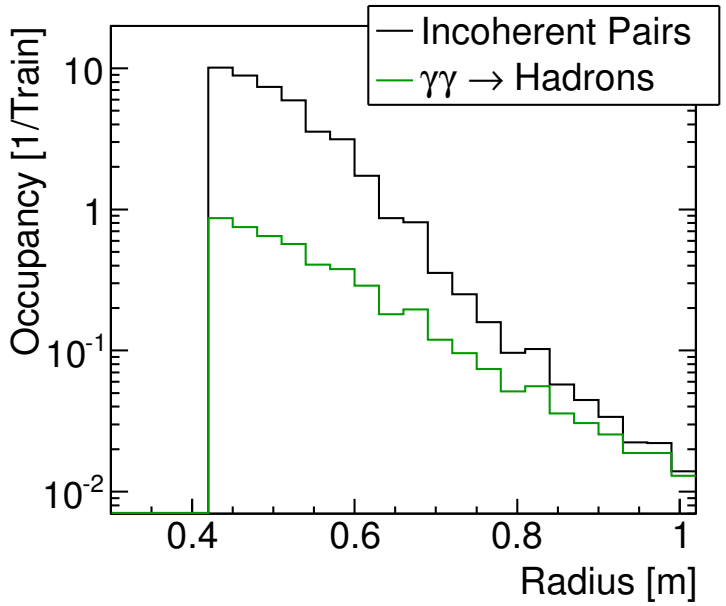
- Averaging over 67 trains, no safety factor included →

- Taking the same cuts as in the HCAL, 300 keV for hit threshold, there is no more than ~1 hit / train per layer.



Comparing and checking with HCAL





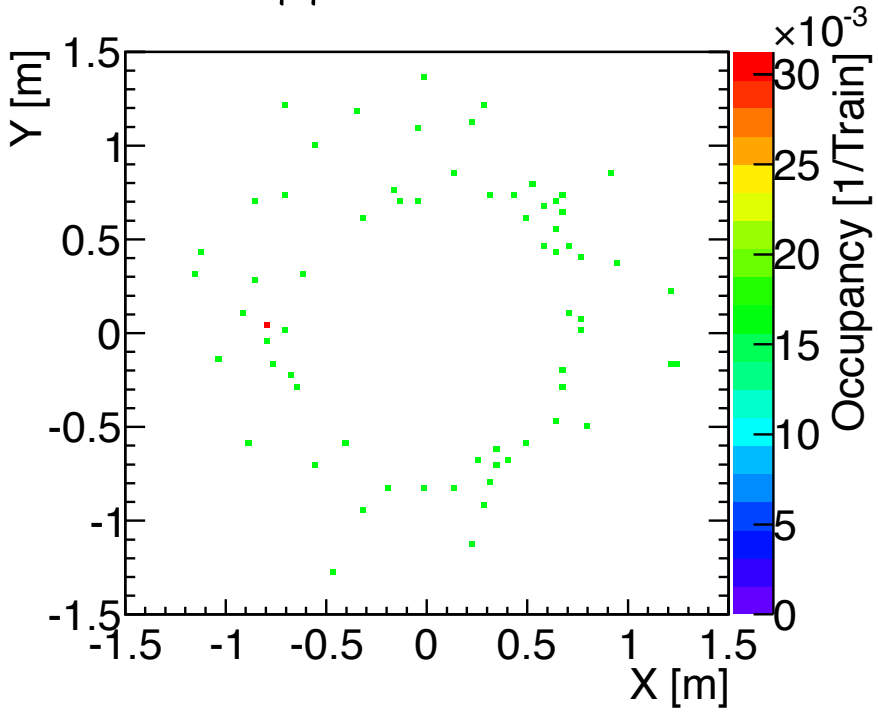
- The muon system starts immediately after the HCAL, with a plug (30 cm deep) still present in the simulation.
  - Inner radius of the yoke is 70 cm.
- Extending the HCAL occupancy, you might expect 2.10^3 *0.01 ~ 20 hits in the first layer.

beamstrahlung – inner region of endcap

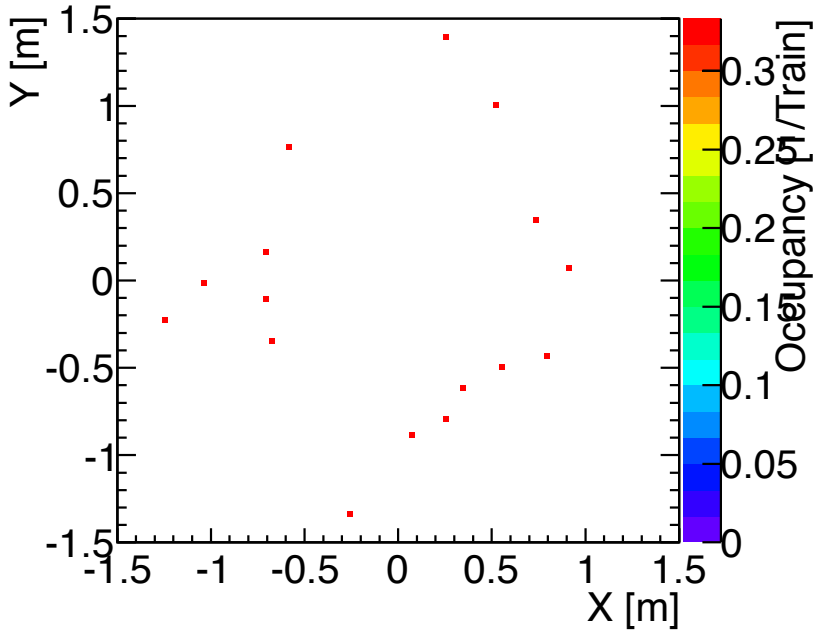
- Projection of all hits, in all layers

→ At higher radius there is no beamstrahlung background.

$\gamma\gamma$ → hadrons



Inc. pairs



Occupancies

- The 0.06 halo muons per cell become 0.003 mu / cell / train.
- The beamstrahlung events result in ~5 hits in the first muon endcap layer per train. (incl. safety factor of 5)
  - Most of these are no further than ~ 1.0 m.
  - This results in 0.003 hit / cell / train.

→ Even for the inner most region, no more than 1% occupancy per train.

→ Could suggest strip detector readout for entire endcap, with multihit readout capability in inner most region.

→ That would give 5% occupancy per time window of 25 ns (for 1 m long strips)