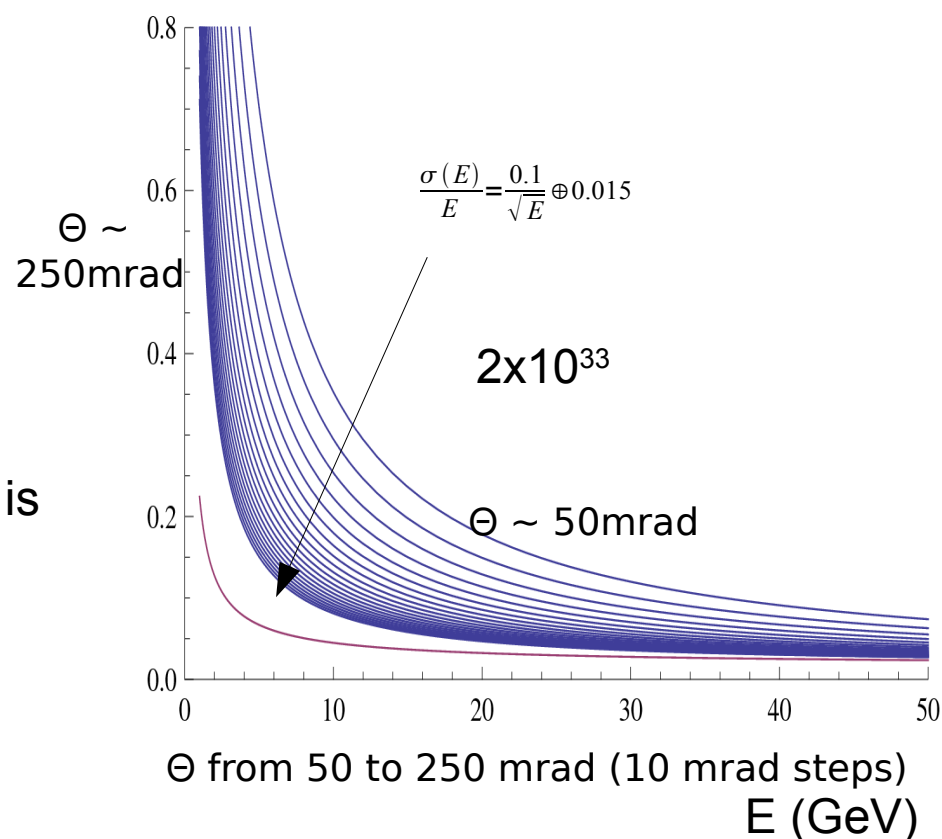
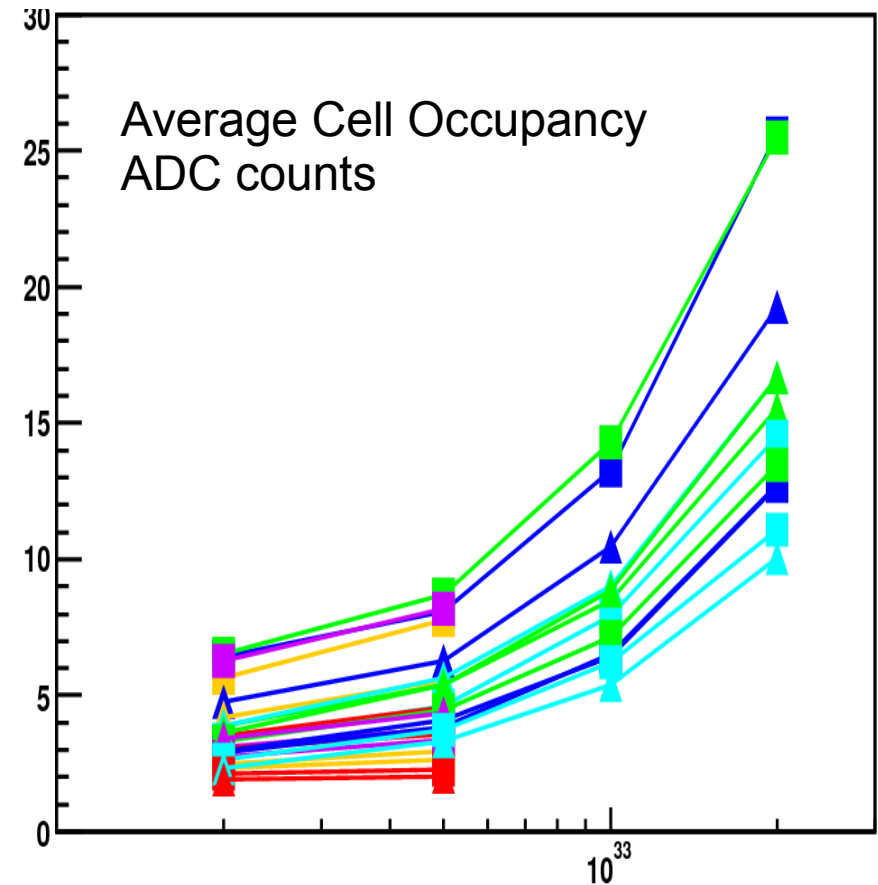
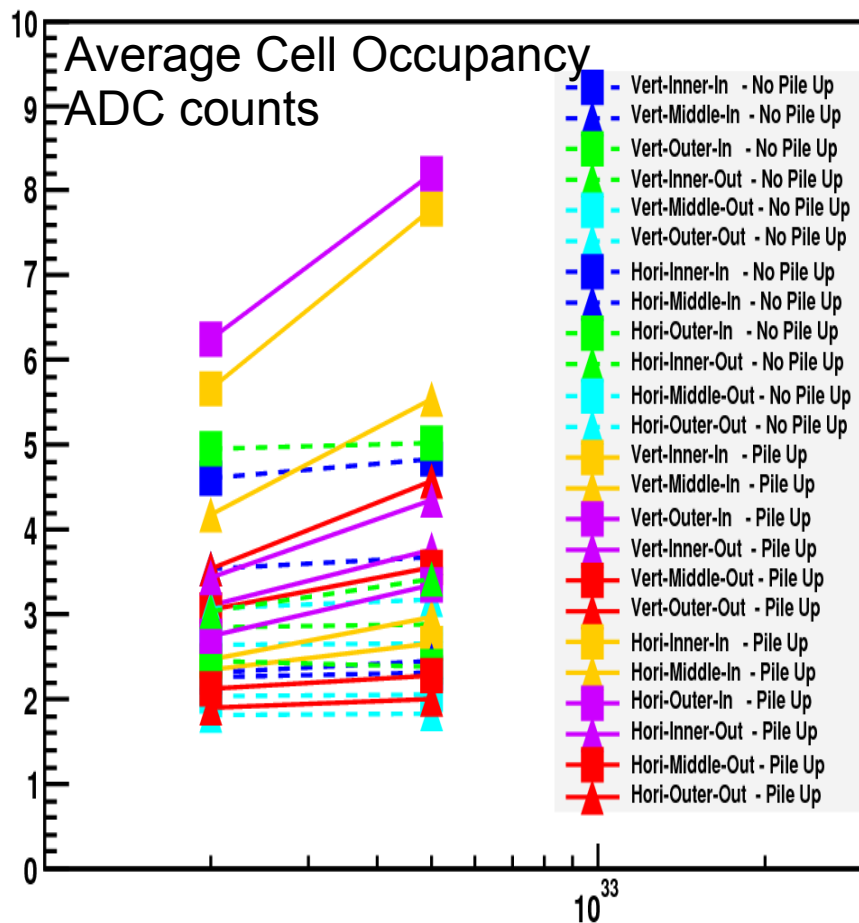


- The only indications on the pile up at high luminosity come from an approximative simulation of the effect
  - Use Boole generated events at  $2 \times 10^{32} \text{cm}^{-1} \cdot \text{s}^{-2}$ 
    - Select single collision events
    - Extract occupancy for specific cells in ADC counts for min-bias events
  - Generate a MC event at any luminosity by « adding » the contributions of N « single collision events »
    - Event per event get an appropriate random N (depends on the luminosity)
      - Take into account the LHC bunch structure (identical to nominal)
    - Extract random occupancy according to Boole MC probability densities
- The conclusion is that the photon resolution is degraded by the pile up. The effect is not negligible

$$\frac{\sigma(E)}{E} = \frac{0.1}{\sqrt{E}} \oplus 0.015 \oplus \frac{0.175}{E \theta} (\text{Pileup}) \oplus \frac{0.010}{E \theta} (\text{Electronics})$$



# Comparing predictions up to $5 \times 10^{32} \text{ cm}^{-2} \cdot \text{s}^{-1}$



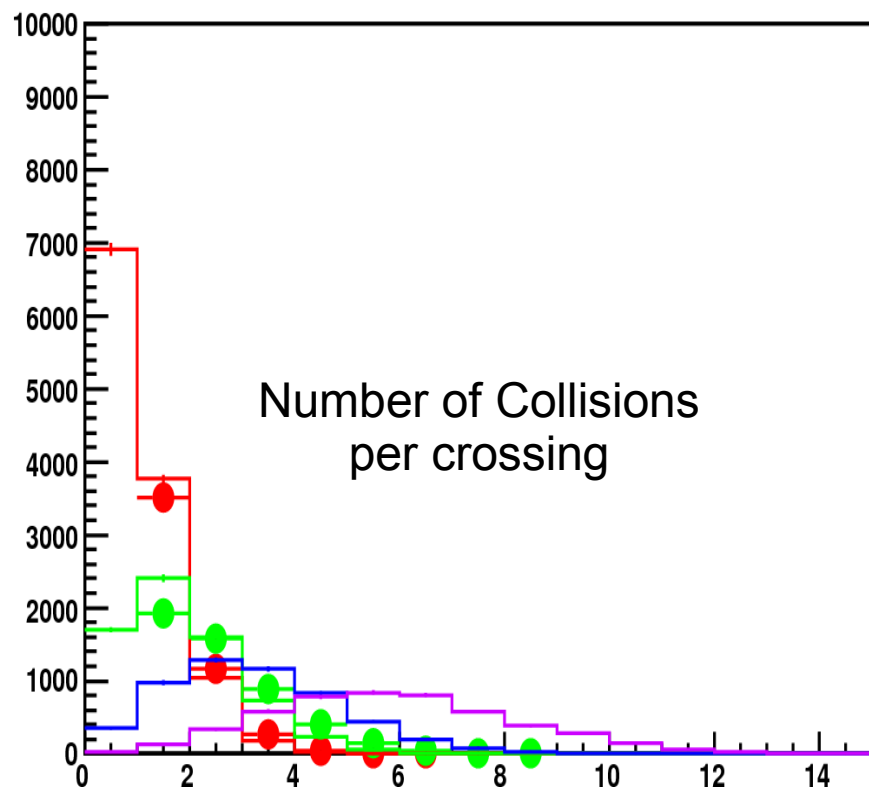
Signal in 12 cells on the ECAL surface  
Min-bias events (Gauss)

- Dotted lines : 2 MC ( $2$  and  $5 \times 10^{32} \text{ cm}^{-2} \cdot \text{s}^{-1}$ ) asking for 1 collision per crossing only
- Lines : Same two MC samples without the collision constrain (pile up included).

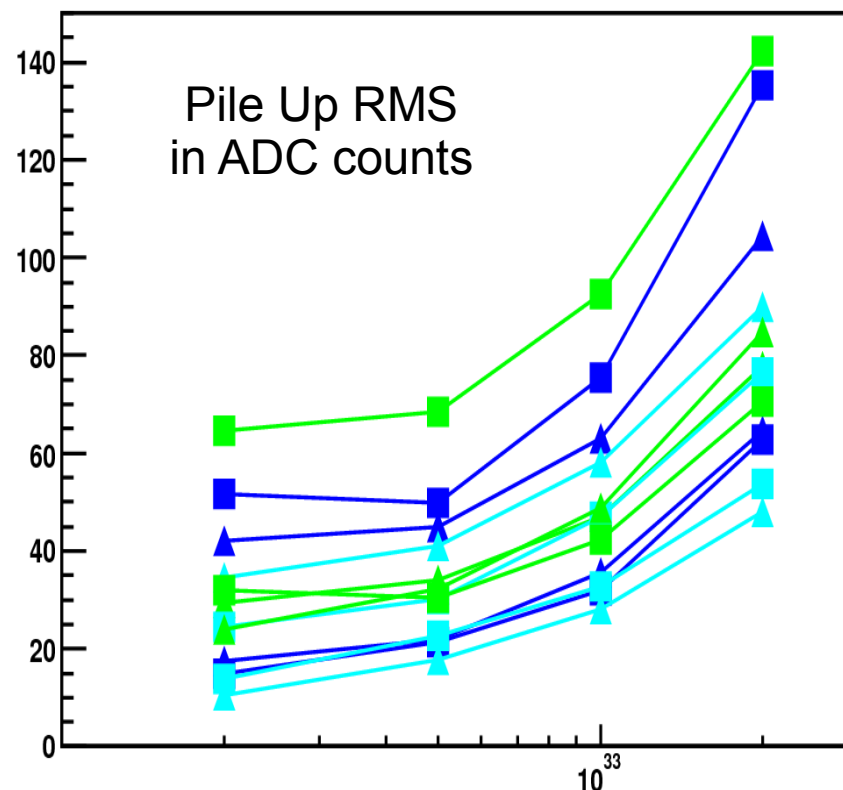
Signal in 12 cells on the ECAL surface  
Min-bias events

- The same pile up events as previously (Gauss – kept for comparison)
- The emulation of the pile up by adding up several single collision min-bias events (not Gauss and up to  $2 \times 10^{33}$ ).

# Comparing predictions up to $5 \times 10^{32} \text{ cm}^{-2} \cdot \text{s}^{-1}$



Number of collisions per crossing in the high luminosity simulation (private code) for  $2 \times 10^{32}$ ,  $5 \times 10^{32}$ ,  $10^{33}$  and  $2 \times 10^{33} \text{ cm}^{-2} \cdot \text{s}^{-1}$  (histo).  
 Number of collisions in the two Gauss MC samples at  $2 \times 10^{32}$  and  $5 \times 10^{32} \text{ cm}^{-2} \cdot \text{s}^{-1}$  (dots).



RMS of the signal/PileUp in 12 (3x3)-clusters on the ECAL surface (Min-bias events) for luminosities of  $2 \times 10^{32}$ ,  $5 \times 10^{32}$ ,  $10^{33}$  and  $2 \times 10^{33} \text{ cm}^{-2} \cdot \text{s}^{-1}$ .  
 This is evaluated around the 12 points by simulating 9 similar cells.