

Linear fit method :

1) We define $\langle x \rangle = \text{Sum}(E_i \cdot x_i) / \text{Sum}(E_i)$ $\langle y \rangle = \text{Sum}(E_i \cdot y_i) / \text{Sum}(E_i)$

2) x_{MC} = true position, 2 definitions

=> x_{MC_nosc} : assuming there is no scattering in front of the calorimeter,

it is simply the extrapolation from the vertex position = generated particle direction (=along z)

=> x_{MC_scat} : if scattering, defined as the mean (x,y) obtained thanks to the position of the hits in the last DC layer touched before entering the calorimeter (z ~ -700 mm), but keeping for now the generated particle direction.

3) $Dx = \langle x \rangle - x_{MC}$, $Dy = \langle y \rangle - y_{MC}$

4) Error matrix $(E_{ij}) = \text{cov}(D_{ui}, D_{uj})_{(u=x,y)} \Rightarrow (W_{ij}) = (E_{ij})^{-1}$

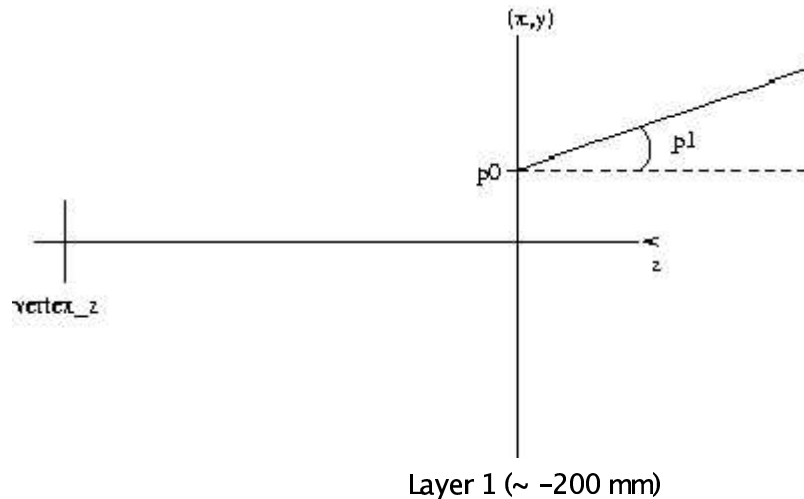
5) No correlation between x and y, we separate both variables.

5) Linear fit : $\langle x \rangle = p_0x + p_1x \cdot z$

$\langle y \rangle = p_0y + p_1y \cdot z$

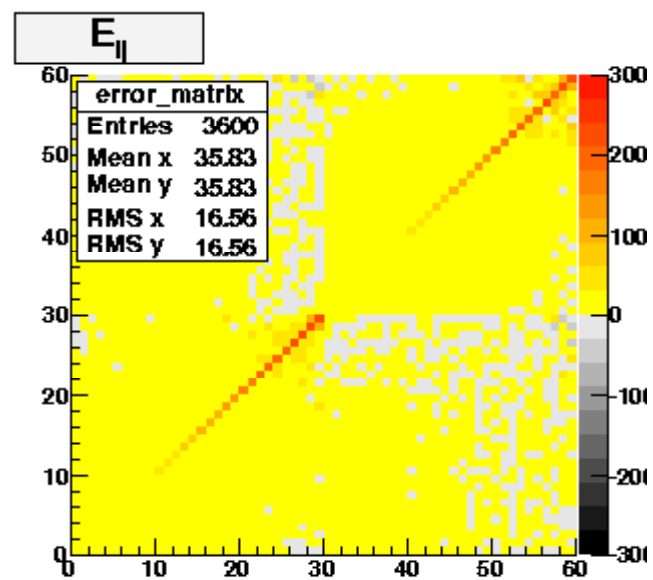
6) Minimization of corresponding $\chi^2 \Rightarrow V(p_x)$ and $V(p_y)$, error matrix of linear fit parameters,

=> expected position resolution (σ_x , σ_y) and angular resolution (α_x , α_y).

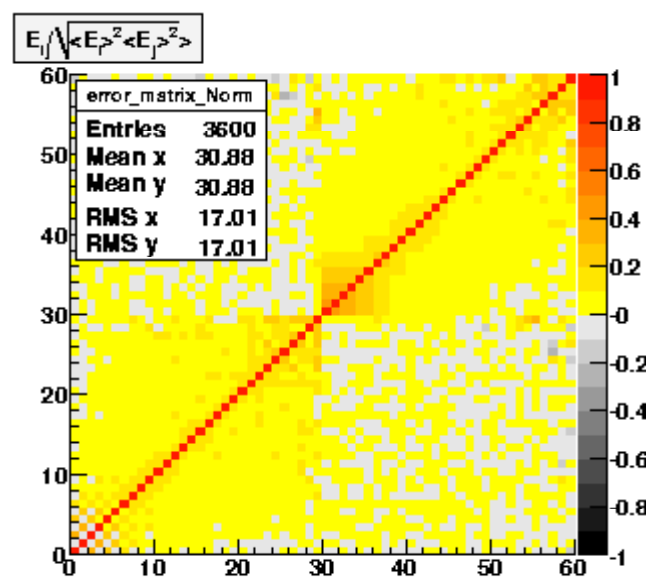
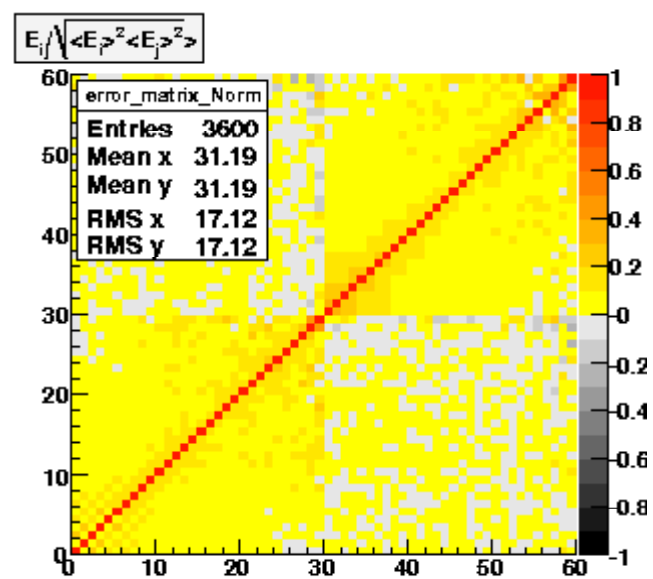
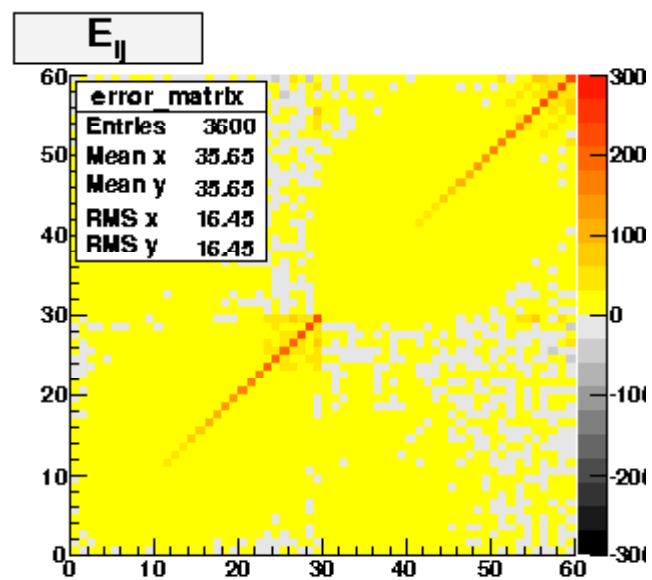


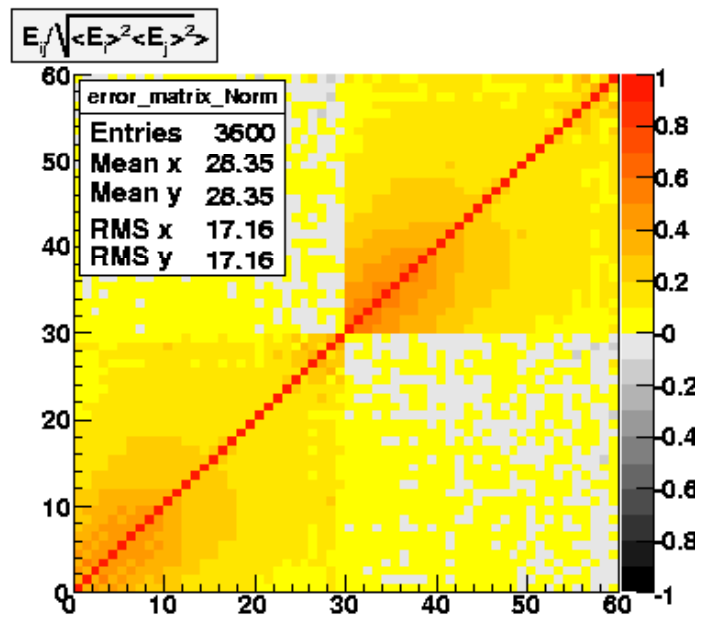
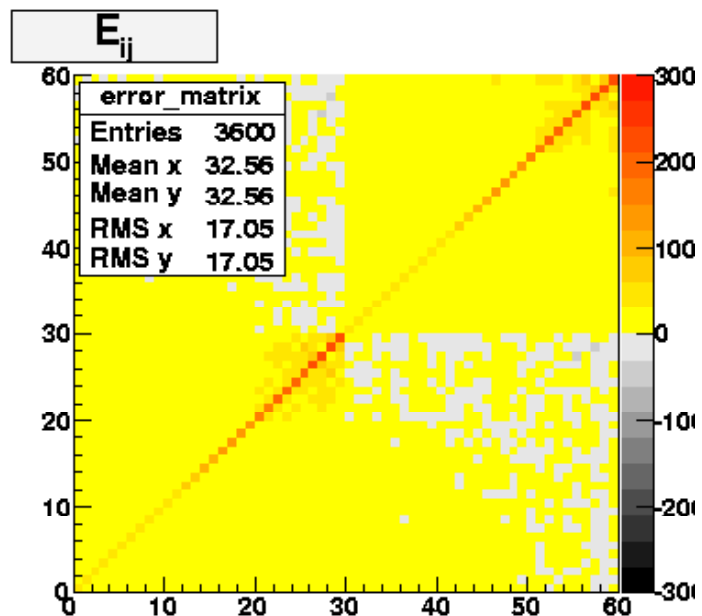
Generated conditions	sigma_x	sigma_y	alpha_x	alpha_y	
File 1 : Mokka 5.3, geant4.7, 50000 events e-, p=pz, vertex=(4+/-13,7+/-13,-10000) (mm) Only ECAL, VACUUM.	2.10 mm	2.48 mm	41 mrad	44 mrad	
File 2 : Mokka 5.5, geant4.8, 50000 events e-, p=pz, vertex=(0+/-10,0+/-10,-200) (mm) Only ECAL, AIR.	2.06 mm	2.54 mm	41 mrad	43 mrad	
File3 : Mokka5.5, geant4.8, 5,000 events e-, p=pz, vertex=(0,0,-10000) (mm) Only ECAL, AIR	11.6 mm	7.93 mm	44 mrad	48 mrad	
File4 : Mokka5.5, geant4.8, 5000 events e-, p=pz, vertex=(0,0,-210) (mm) Only ECAL, AIR	2.95 mm	2.75 mm	57 mrad	42 mrad	
File5a : Mokka5.5, geant4.8, 100,000 events e-, p=pz, vertex=(4,7,-10000) (mm) ECAL+TRACKER	12.20 mm	12.38 mm	41 mrad	44 mrad	
File5b : Mokka5.5, geant4.8, 100000 events e-, p=pz, vertex=(4,7,-10000) (mm) ECAL+TRACKER --- with xMC_scat	4.03 mm	4.30 mm	46 mrad	46 mrad	

File 1: Mokka5.3, VACUUM

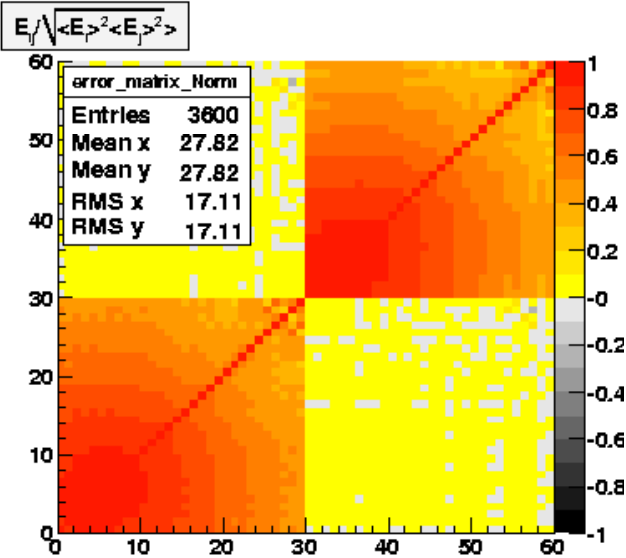
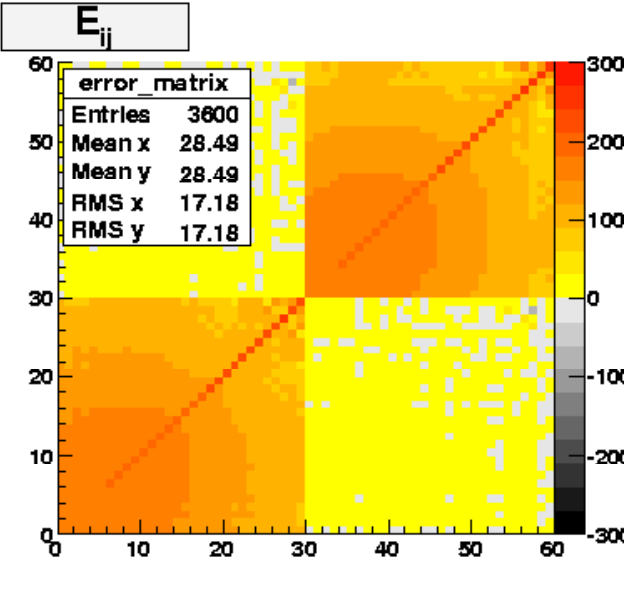


File 2: Mokka 5.5, AIR, beam -200 mm





File 5a - TRK but as if no scattering - 100,000 events



File 3 - 10m of AIR - 5,000 events

