# CALICE resolution studies
Stewart Boogert

- Luminosity spectrum measurement

    – Requires excellent angular resolution $(< 10^{-3})$

    – High energy particles (near beam energy)

    – High efficiency

    – Events in Endcap calorimeters

    – LC-ABD meeting non-pointing photons (8 mrad constant term)

- Electron samples generated

    – 5k events

    – Model :

        - TDR /D09M1

    – Polar region:

        - 6 - 35 degrees / 10 -170 degrees

    – Energy

        - 5 / 7.5 / 10 / 15 / 20 / 50 / 100 GeV

    – Flat angular distributions, from (0,0,0)

    – OpenPBS farm @ UCL!

Bhabha acollinearity
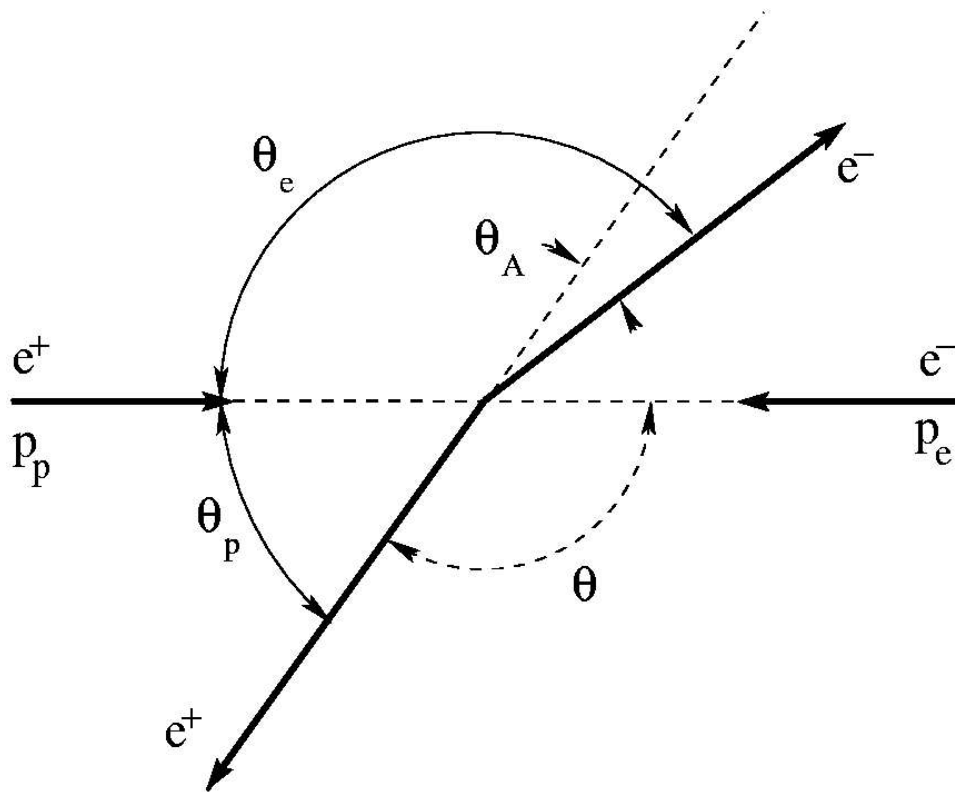
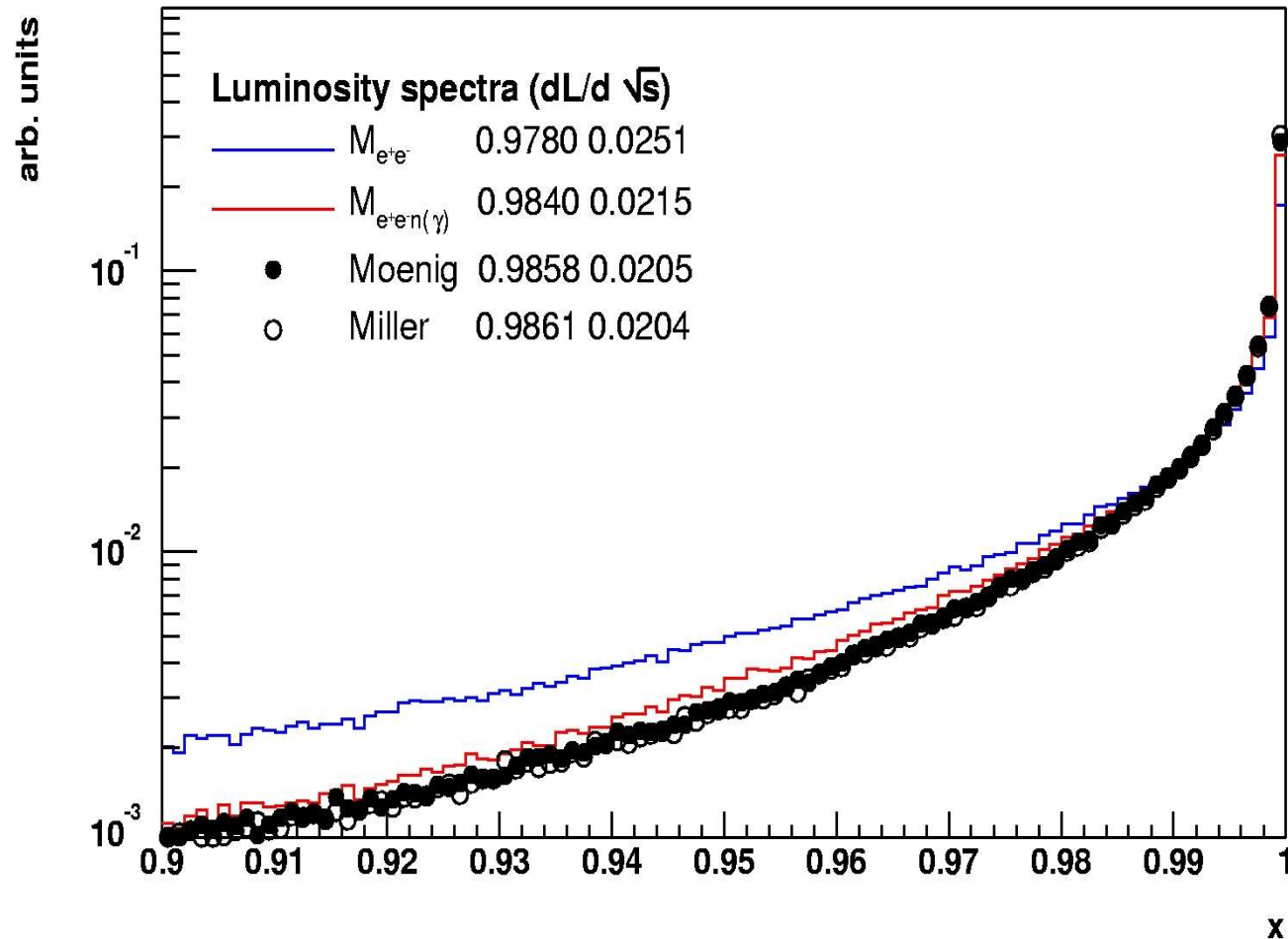- Two methods to reconstruct event energy, using different assumptions

- Single photon radiation

$$x_{Moenig} = \sqrt{\cot\left(\frac{\theta_e}{2}\right)\cot\left(\frac{\theta_p}{2}\right)}$$

- Small angles
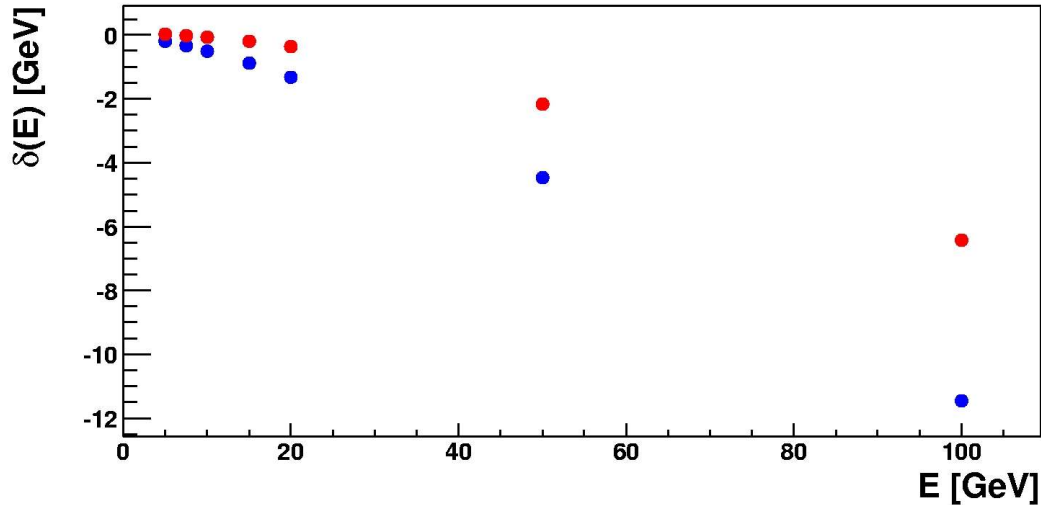
$$x_{Miller} = 1 - \frac{\theta_A}{2\sin(\bar{\theta})}$$

Luminosity spectrum

Luminosity spectra (dL/d $\sqrt{s}$)

—	$M_{e^+e^-}$	0.9780	0.0251
—	$M_{e^+e^-n(\gamma)}$	0.9840	0.0215
●	Moenig	0.9858	0.0205
○	Miller	0.9861	0.0204

- Bhabha event simulation (500k)

  – No detector effects yet...

  – Method assumptions break down

  – Low x

Energy resolution

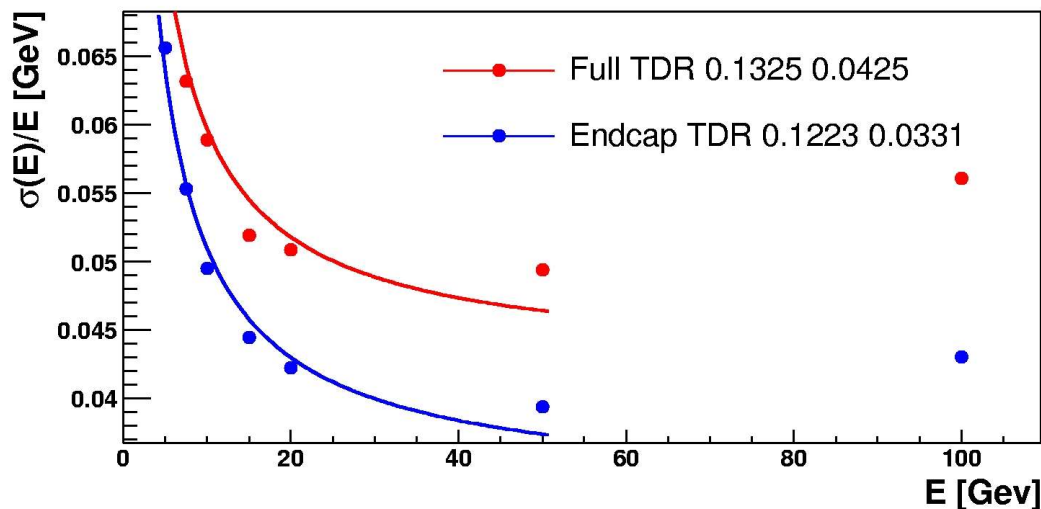$$E_e(GeV) = \alpha\left(\sum_{i=1,30} E_i(MeV) + 1.4\sum_{i=31,40} E_i(MeV)\right)$$

LC-DET/2001-058

- $\alpha = 0.03125$

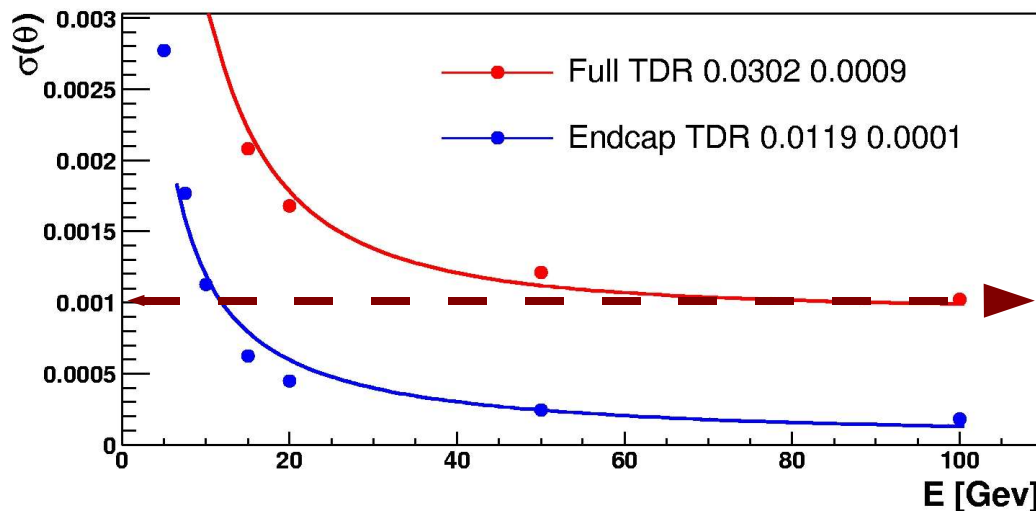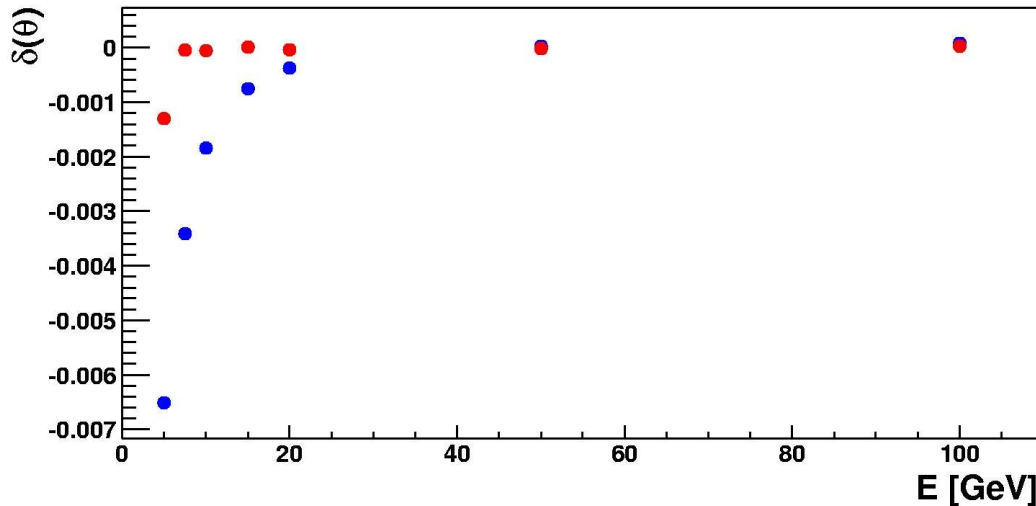**Resolution increases at high energy, leakage?**

Calorimeter resolution

- Stochastic ~14%

- Constant ~4%

- Not that far off TDR (11%, 1%)

Angular resolution

$$v_e = \alpha \left(\sum_{i=1,30} v_i E_i / E_e + 1.4 \sum_{i=31,40} v_i E_i / E_e \right)$$

Polar resolution

- Below 10^{-3} for endcap well before 175GeV

- Difference between endcap and whole calorimeter, endcap more projective for these events

- Scales as 1/E

- Trying angular weighted cells

Future work

- Angular resolution

  - Looks o.k for top studies

- Lumi spectrum related

  - Improve angle reconstruction

  - CGA material maps

  - Implement more dead material?

  - Vertex position resolution

  - Include D09M1 data

  - Full Bhabha simulation

- General calorimeter

  - Calibration

  - Leakage (HCAL?)

  - Clustering

- OpenPBS

  - Move scripts to AFS

  - Run "physics" samples for clustering

  - Prototype samples for test beam