Extraction Line Energy Measurements

IPBI Monthly Meeting

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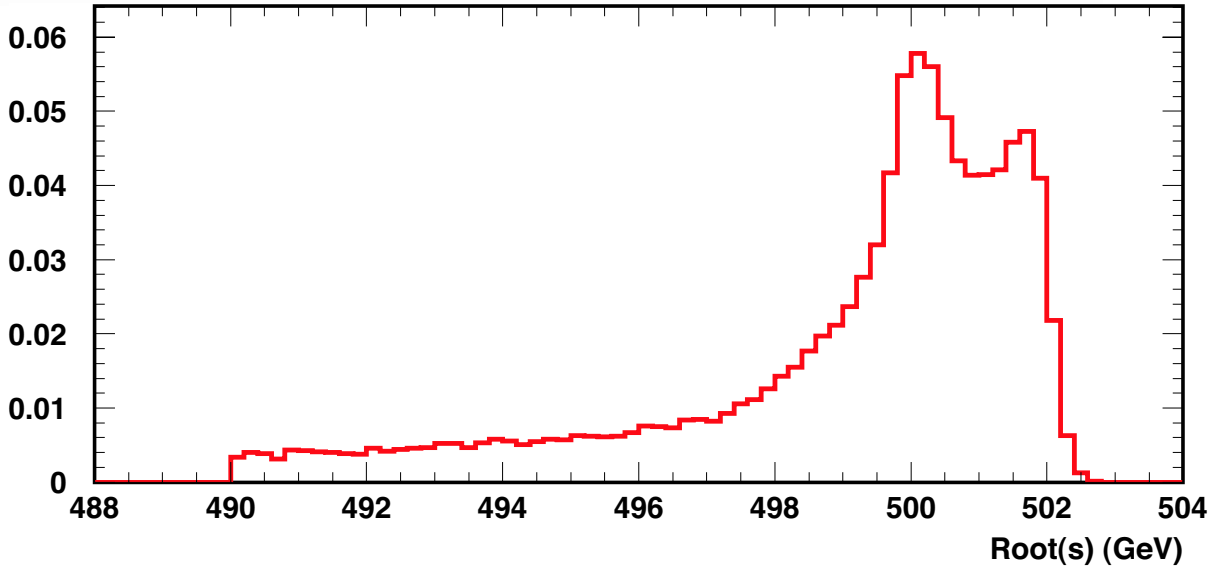
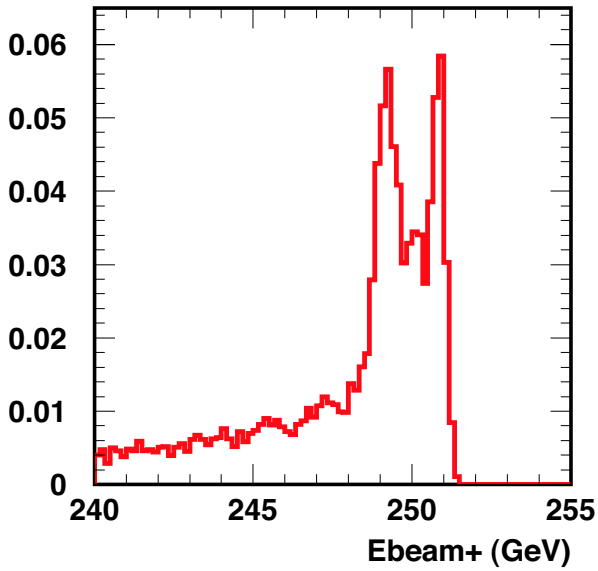
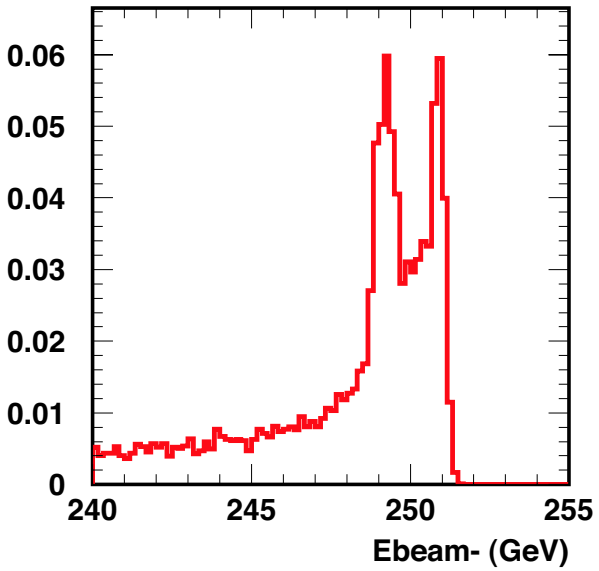
Overview







Downstream energy measurements allow the possibility to monitor beam-beam effects

But what can really be observed, and how?

Methodology

Guinea Pig Inputs

- Input NLC and TESLA TRC files
- Vary vertical offset by several nm

30 GP runs per machine

Some estimate of ‘realistic’ variations

Guinea Pig Outputs

- lumi.ee.dat - Lumi weighted $\sqrt{s}$ spectrum
- beam.dat - Disrupted beam files

$\sqrt{s}$ is what we care about

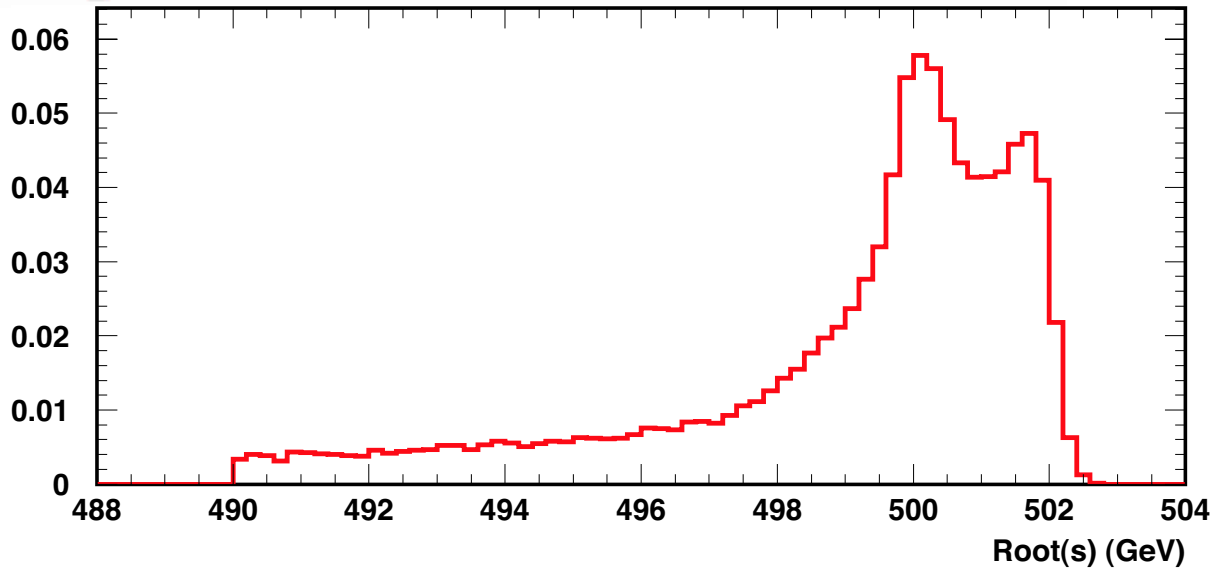
Disrupted beam is what we can measure

Analysis (so to speak...)

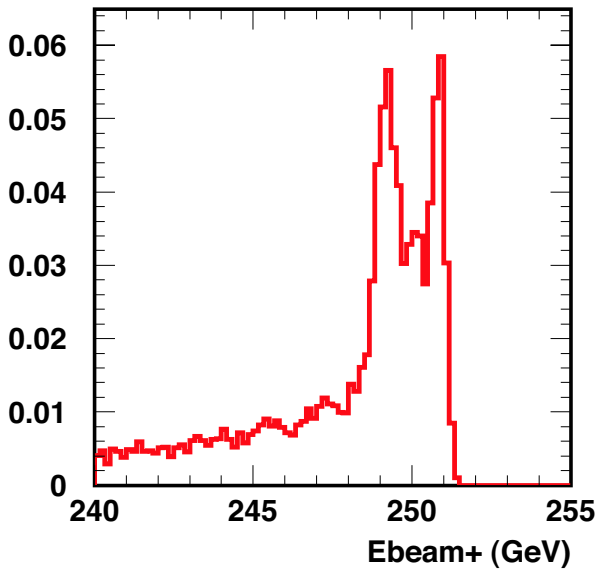
Compare $\langle \sqrt{s} \rangle$ to $\langle E_b^+ \rangle + \langle E_b^- \rangle$

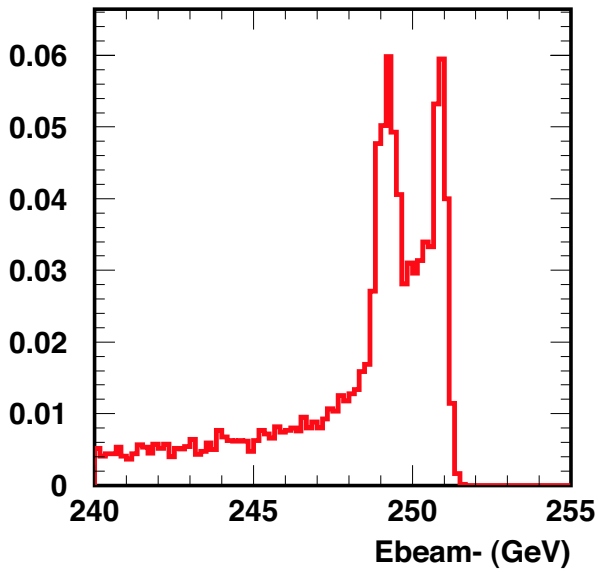
in truncated range +/- 10 GeV of peak

Too Simple?



$\langle \sqrt{s} \rangle$ is probably close to what we want here



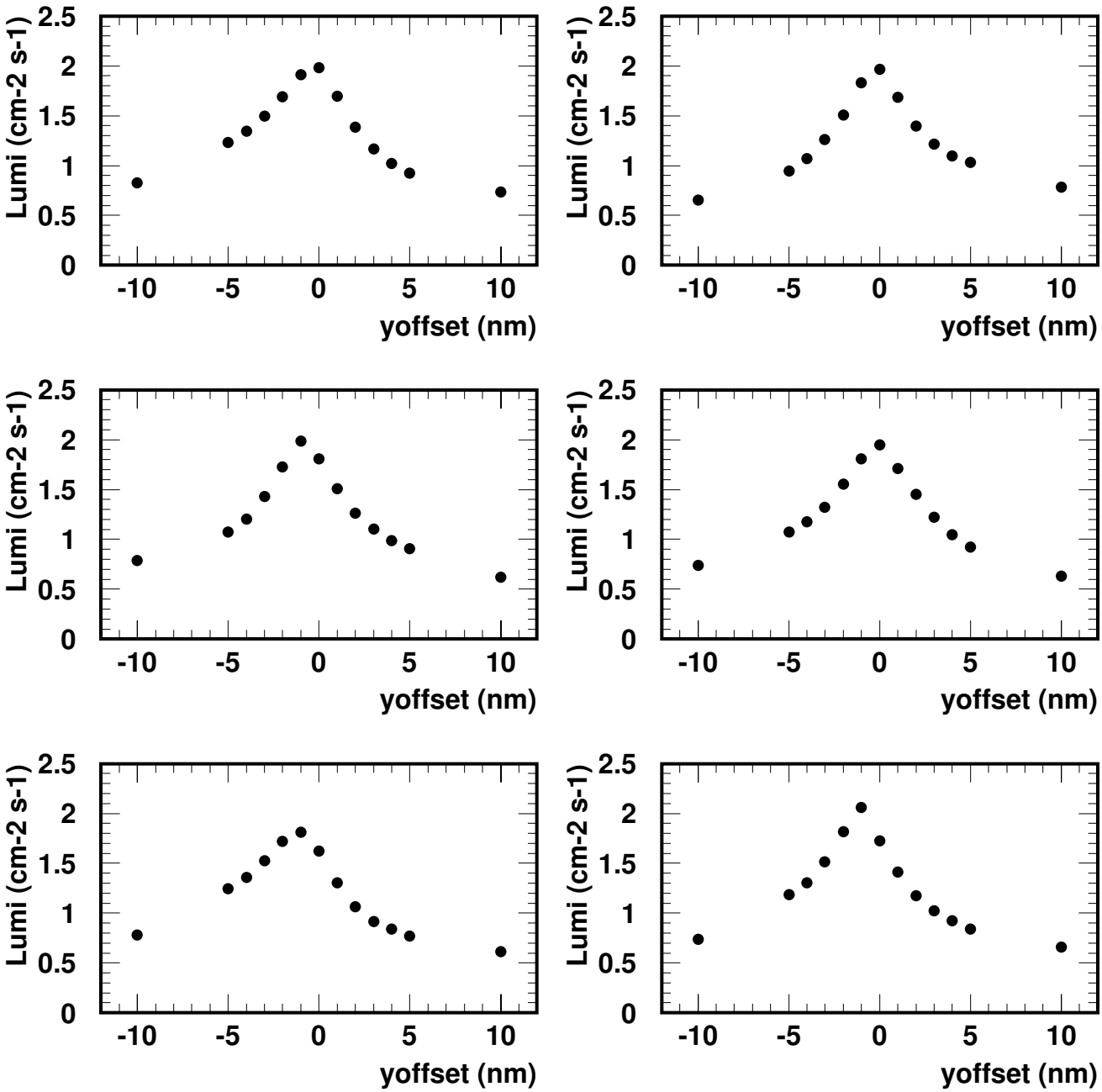


$\langle E_b^+ \rangle + \langle E_b^- \rangle$ is far too crude

(but very little incoming E_b variation)

Lumi vs. Vertical Offset

NLC500

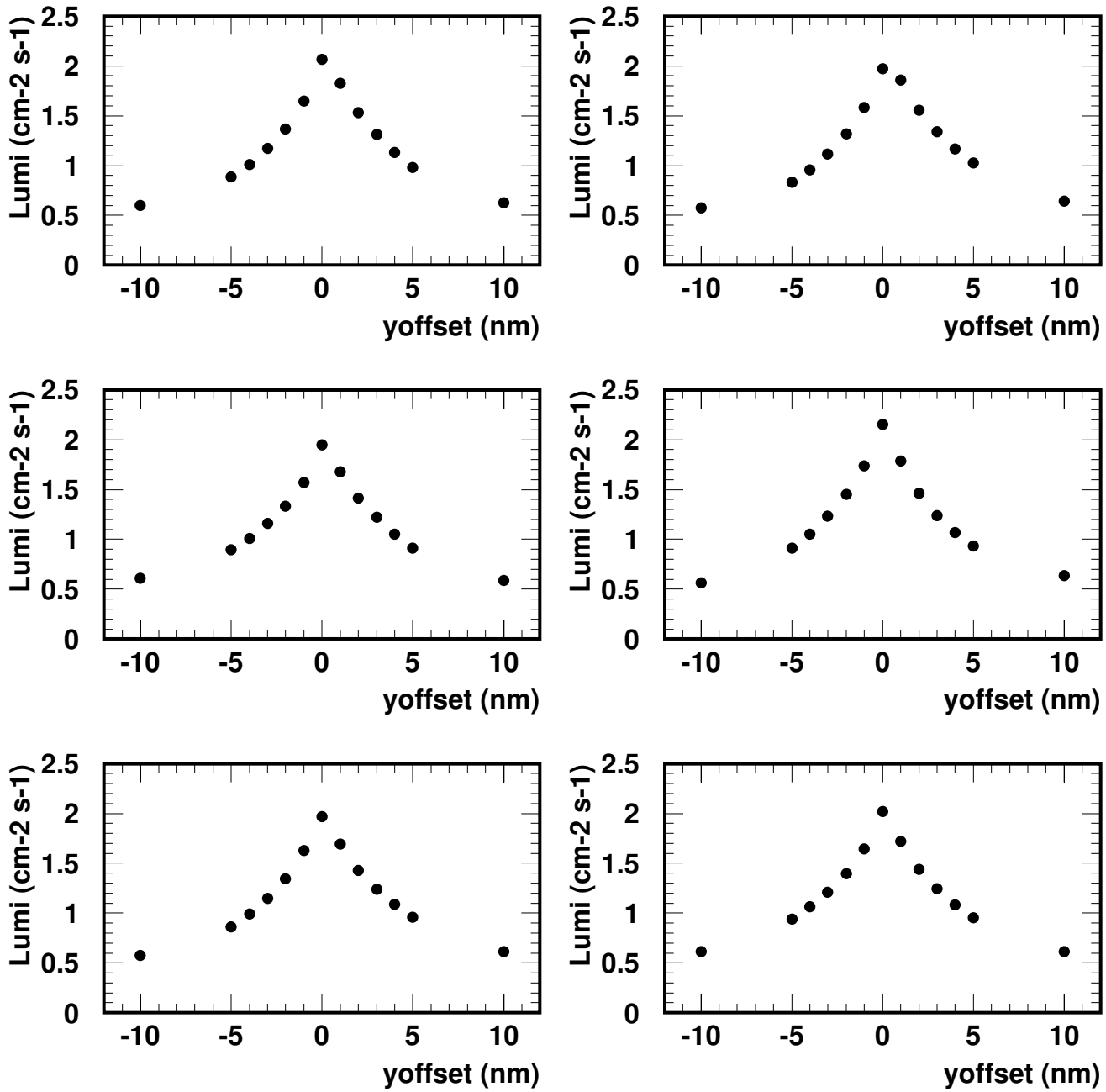


Note: Absolute Lumi numbers not correct

5 points from -2 to +2 nm used

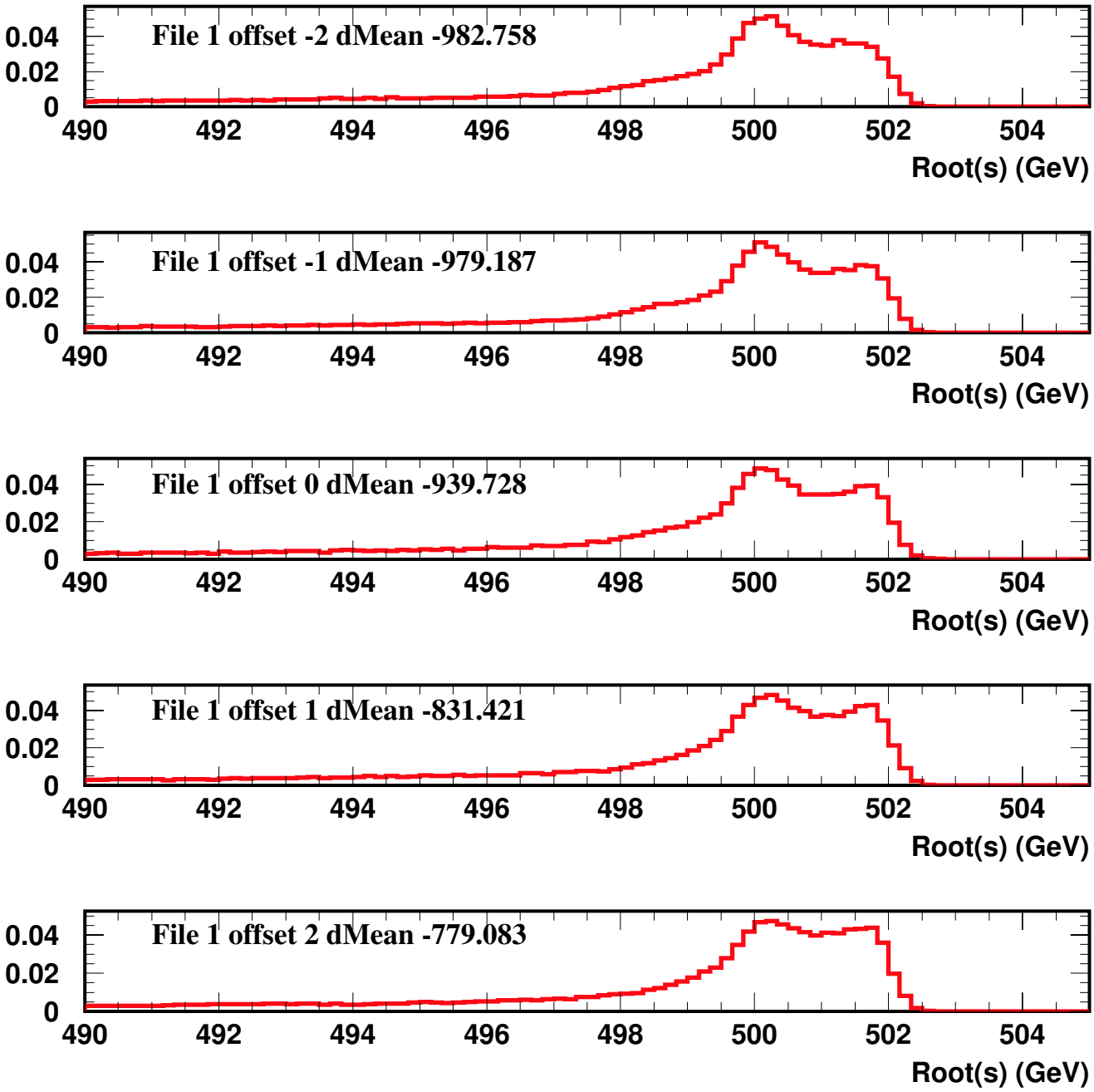
Lumi vs. Vertical Offset

TESLA500



Note: Absolute Lumi numbers not correct

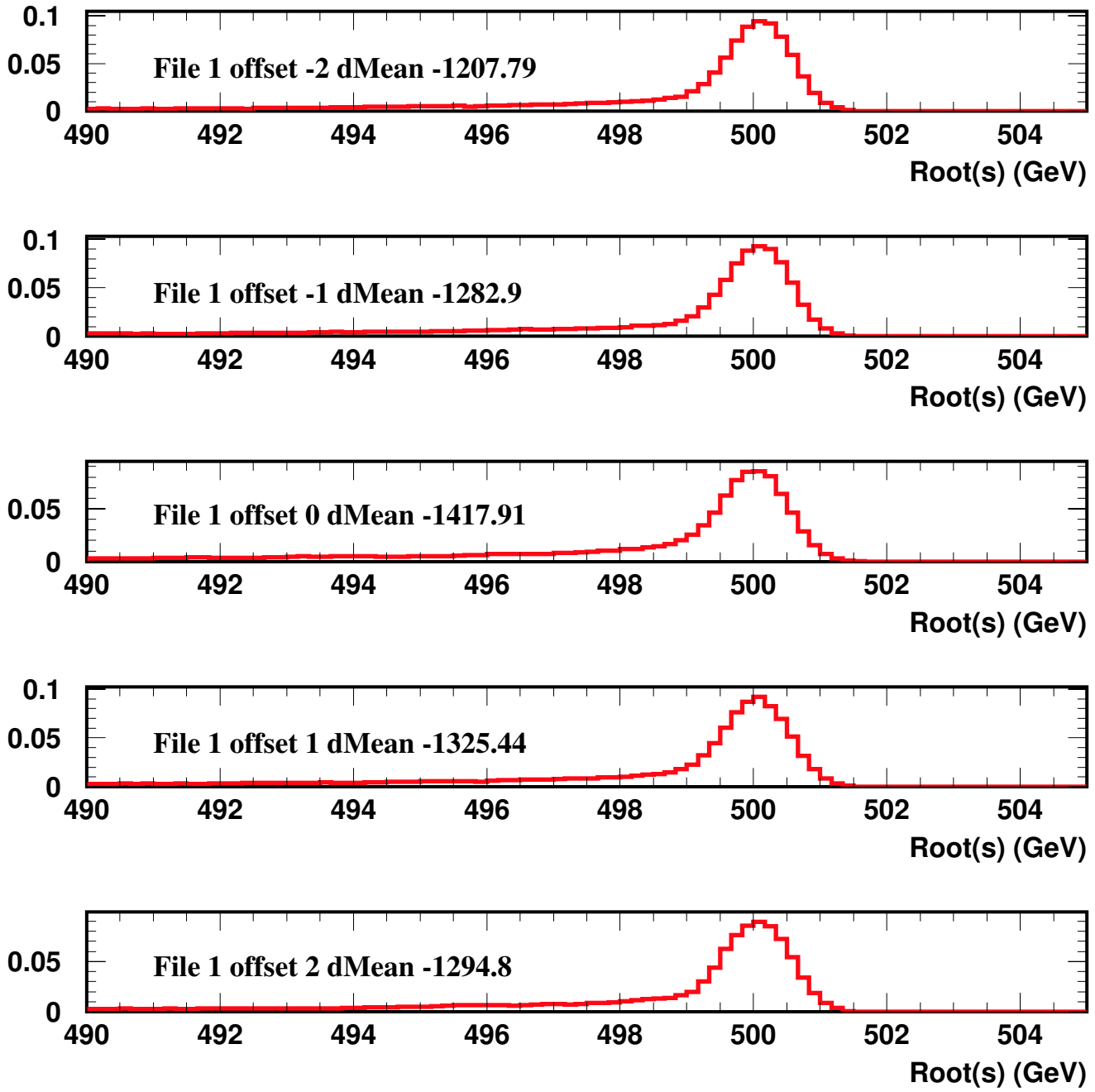
Raw Data (NLC 1)



Same input file, different GP run

Take mean in range [490, 505] GeV

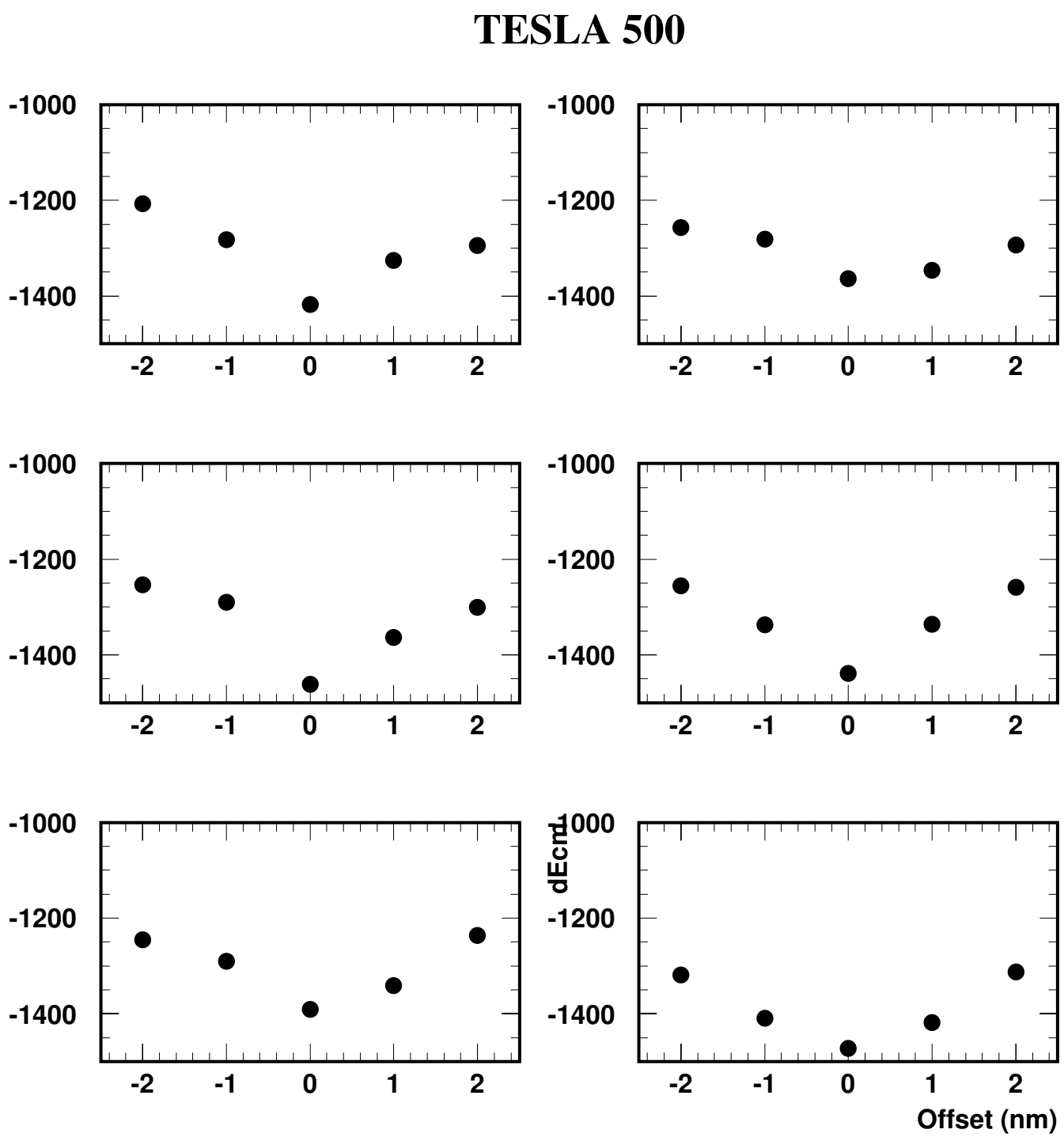
Raw Data (Tesla 1)



Offsets are larger, because peak is more symmetric

Tesla Offsets

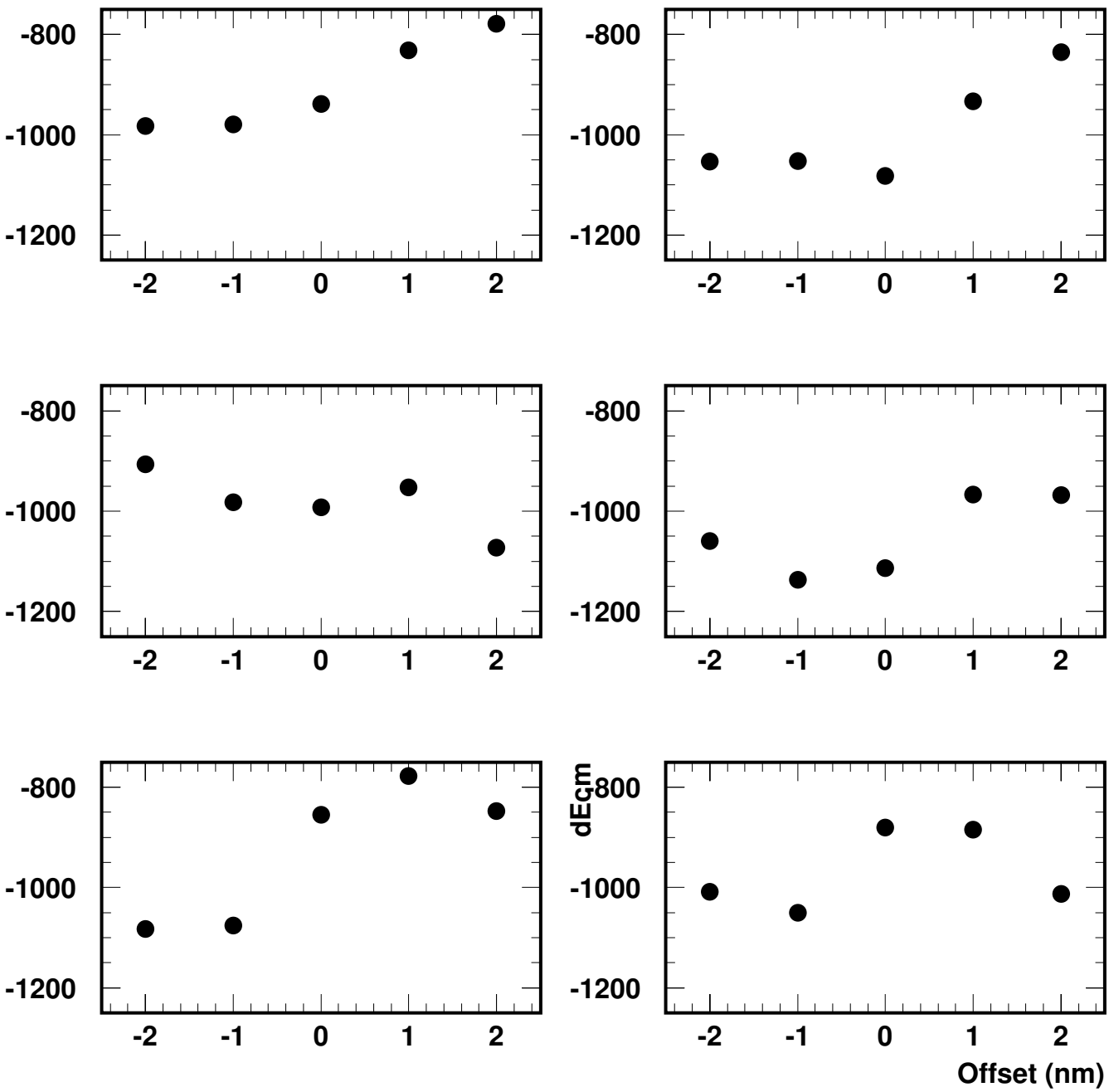
$\langle \sqrt{s} \rangle$ (MeV) vs. Vertical Offset (nm)



NLC Offsets

$\langle \sqrt{s} \rangle$ (MeV) vs. Vertical Offset (nm)

NLC 500

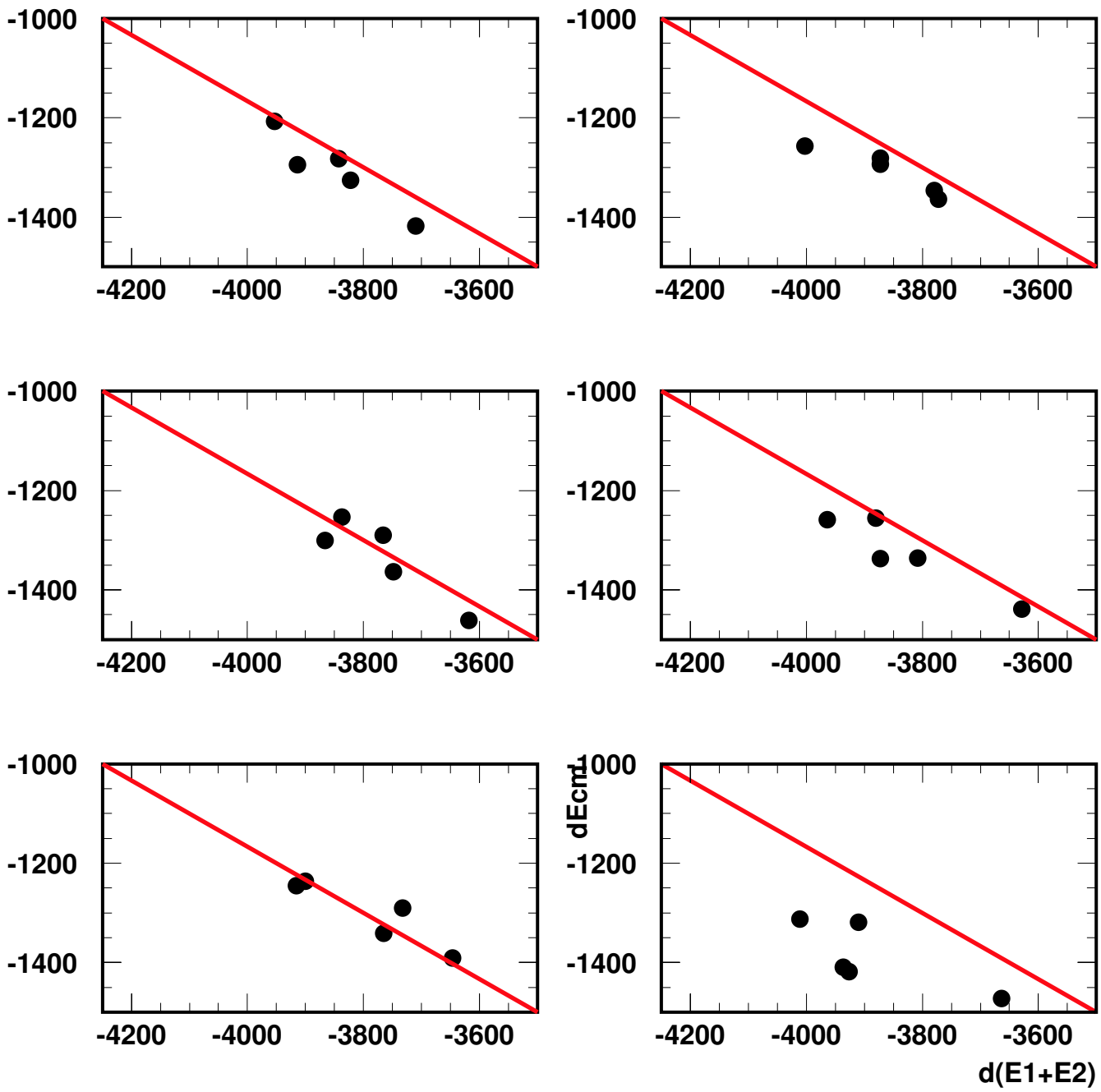


Should be checked ...

Correlate with Beam Energy

$\langle \sqrt{s} \rangle$ (MeV) vs. $\langle E_b^+ \rangle + \langle E_b^- \rangle$ (MeV)

TESLA 500

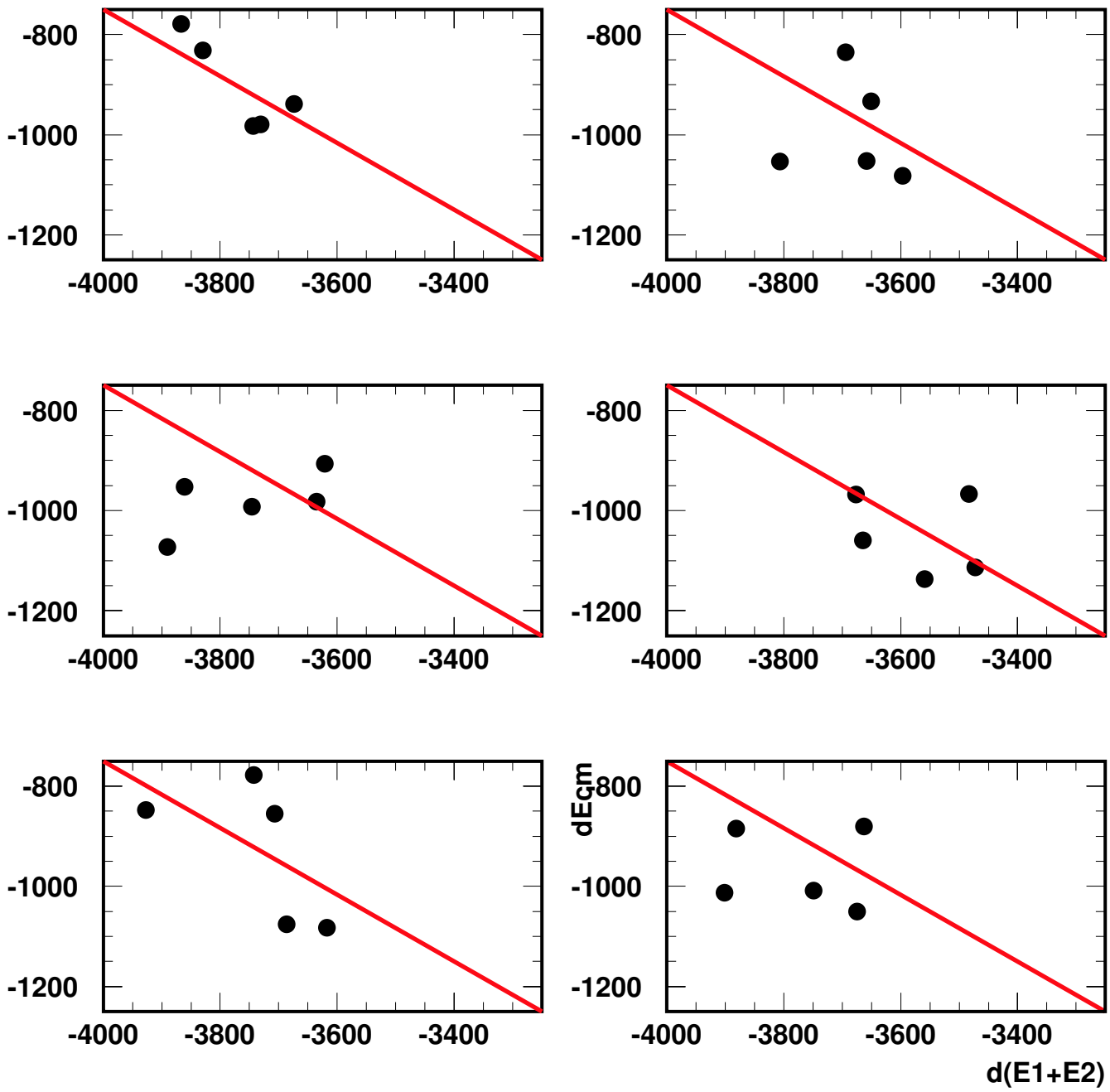


Line is NOT a fit, but the correlation is clear

Correlate with Beam Energy

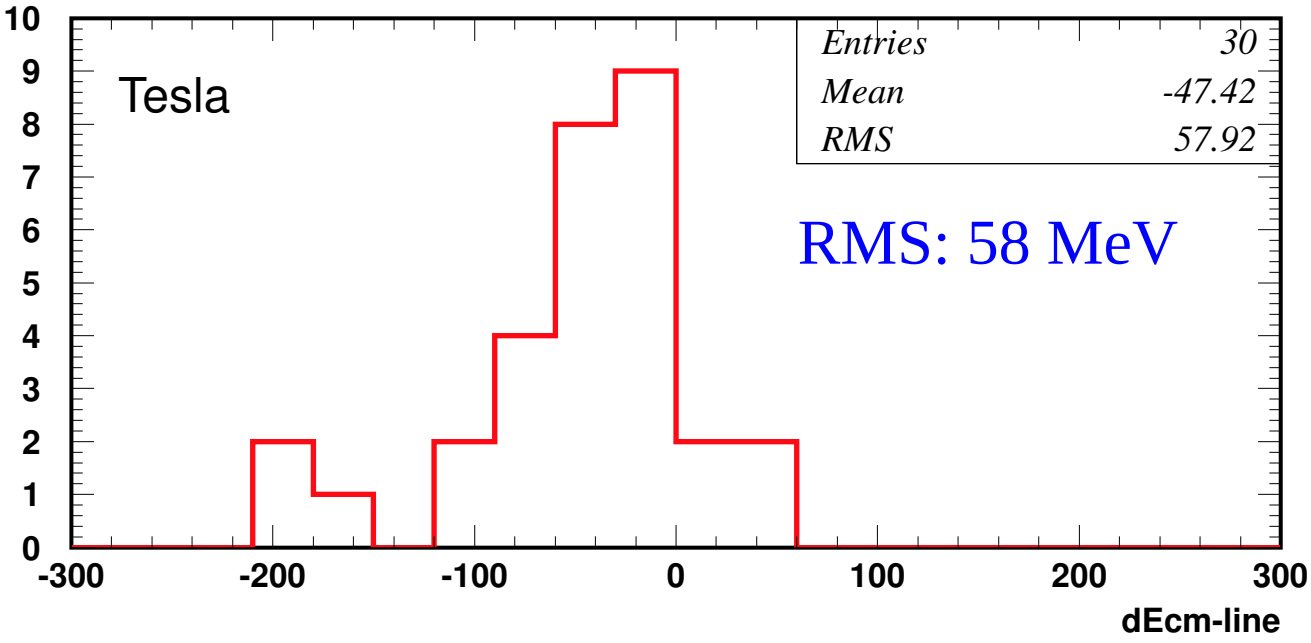
$\langle \sqrt{s} \rangle$ (MeV) vs. $\langle E_b^+ \rangle + \langle E_b^- \rangle$ (MeV)

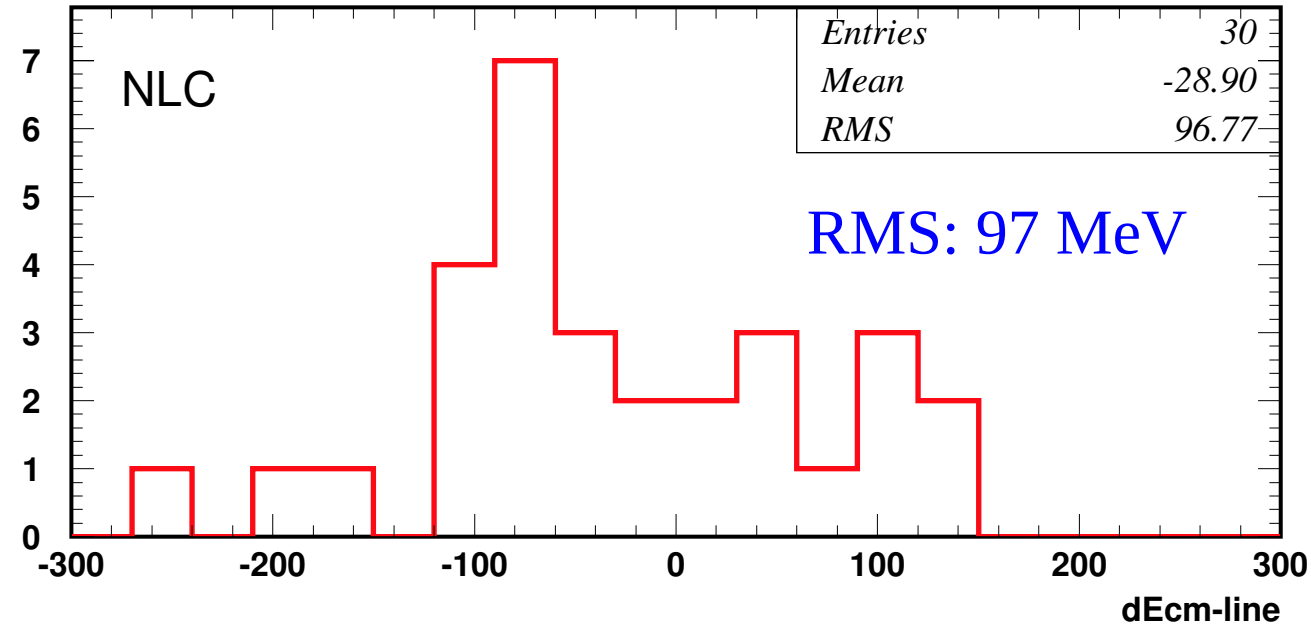
NLC 500



Correlation not as strong, but still there

Residuals





Probably not a terribly meaningful comparison

Observations

Using generator truth information

a correlation exists between $\langle \sqrt{s} \rangle$ and $\langle E_b^+ \rangle + \langle E_b^- \rangle$

The two are anti-correlated

Higher $\langle \sqrt{s} \rangle$ results in more disruption???

Better correlation for Tesla files

More effects present in NLC collisions,
or simply need better observables?

Incoming beam energy changes are (obviously)

positively correlated with $\langle \sqrt{s} \rangle$

Must be able to separate these two effects
(peak vs. tail)

Should find more parameters to vary...