ILC/CLIC comparison

ILC 1 TeV SCHEME 14

- σ_x/σ_y = 320/2.5 nm

- $\gamma\varepsilon_x/\gamma\varepsilon_y$ =10/0.3 nm

- Incoh pairs=680,000**

- Coh pairs=818 (quoted)

- Luminosity=7×10^{34} cm^{-1}s^{-2}

** Tor's document says 1.4 million

CLIC 3 TeV

- σ_x/σ_y = 53/1 nm

- $\gamma\varepsilon_x/\gamma\varepsilon_y$ =660/20 nm

- Incoh pairs=387,000

- Coh pairs=5×10^8

- Luminosity=5×10^{34} cm^{-1}s^{-2}

Geant TOF signal and noise histograms

- we have to balance signal against noise by taking into account the fraction of the image charge on each strip

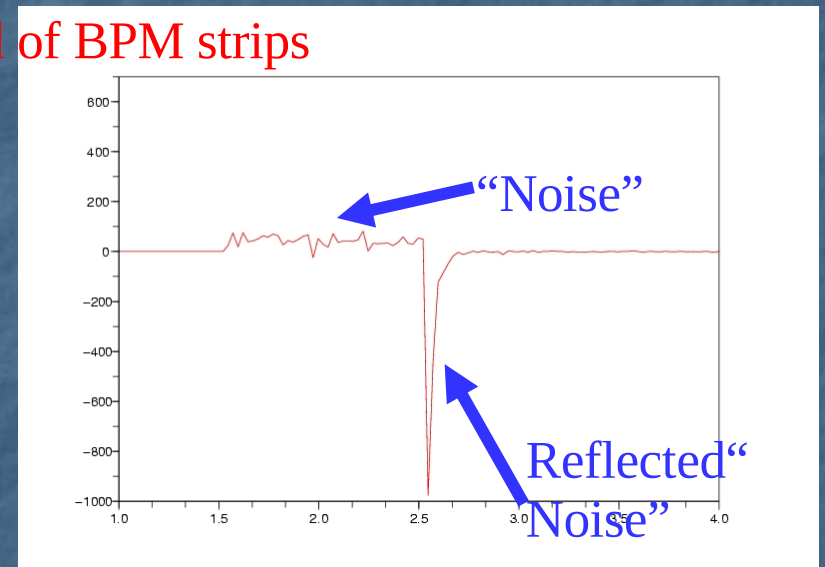- Reflected noise -ve peak diminishes the reflected signal +ve peak

- Noise is weighted by taking into account angle of approach

- **Rough Rule of thumb:**

- **ERROR**~8*(weighted net charge in strip)
    (spent beam charge)

Reflected "signal" after round trip of 30cm/c = 1.0 ns
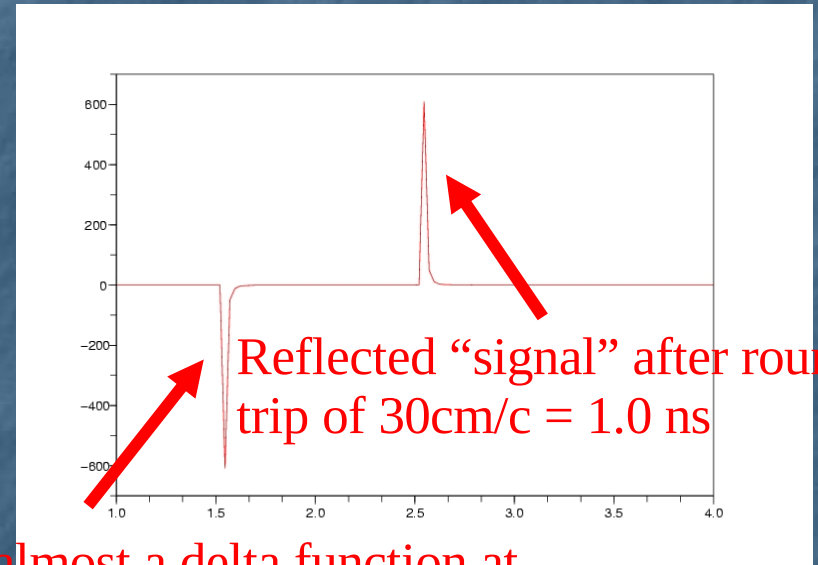
"signal" is almost a delta function at upstream end of BPM strips

"Noise"

Reflected "Noise"

BPM Signal/Noise with CLIC parameters

- Guinea-Pig++ with σ_x/σ_y=53/1 nm, $\gamma\varepsilon_x/\gamma\varepsilon_y$=660/20 nm rad gives $3.68\text{x}10^5$ incoherent pairs and $5\text{x}10^8$ coherent pairs

- ILC worst case has $6.8\text{x}10^5$ incoh+coh pairs

- Run CLIC coh pairs through generic extraction line with 20mrad crossing angle and L*=3.5m

- Net charge~ -1x10^8 in each strip, but 25% random variation bunch-to-bunch

- Therefore uncertainty in position measurement due to secondary emission on striplines is ~5%

Full polarization mods - pair background results

Background generator	CAIN 2.35	Guinea-Pig++	CAIN Full Pol
Bethe-Heitler pairs	216214	238105	186830
Landau-Lifshitz pairs	101838	128445	48392
Bremsstrahlung pairs	149545	152649	149580
Breit-Wheeler pairs	1164	1252	1358
INCOHERENT PAIRS TOTAL	468761	520451	386160
COHERENT PAIRS	5.126×10^8	5×10^8	5.126×10^8

Results
- Landau-Lifshitz pairs reduced by 50%
- Bremsstrahlung yet to be adjusted
- Overall, incoherent pairs reduce by 20%
- Breit-Wheeler pairs increase but from low starting point
- Coherent pairs unchanged

..but there are changes to coherent processes

Modifications to coherent processes

- Coherent cross-section assumes that bunch fields are only transverse, however....beamstrahlung photons pass through highly "pinched" bunches, field may aquire significant longitudinal components varying the cross-section

- 2nd order process can increase coherent pairs significantly at both ILC and CLIC

- Any work done in this regards will benefit both ILC and CLIC!