First look into Bhabhas for beamstrahlung measurements

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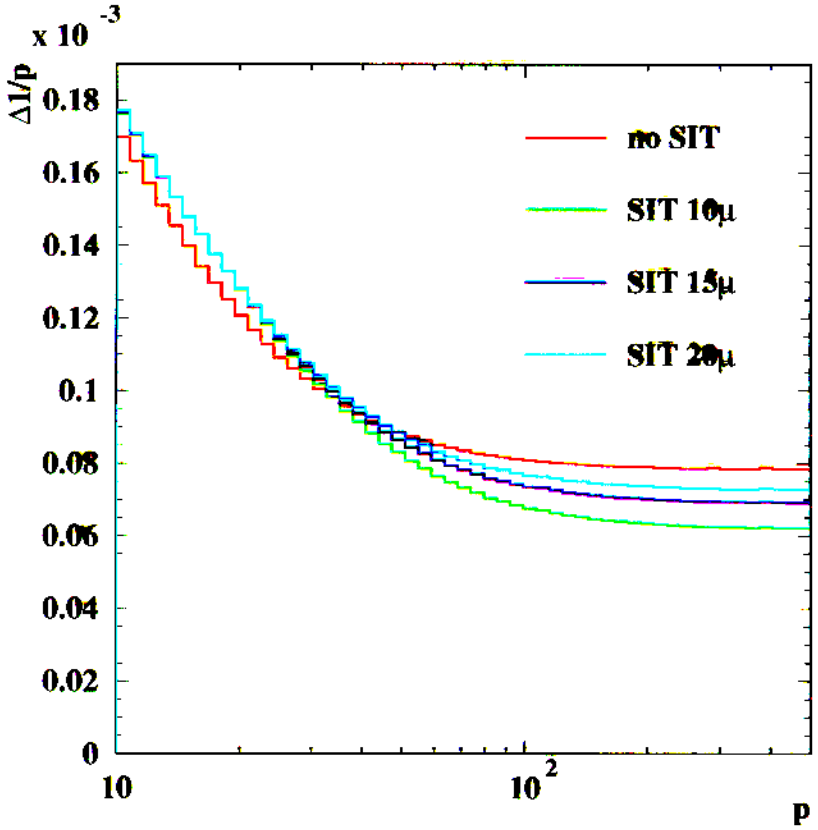
- The silicon intermediate tracker
- Forward tracking
- Bhabha studies

The silicon intermediate tracker

Include one layer of silicon between ITC and TPC

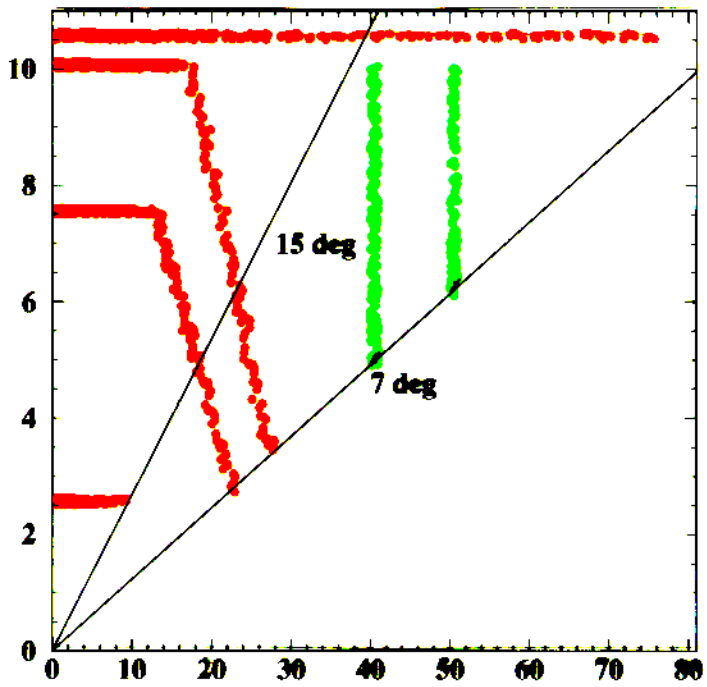
Effect on momentum resolution:



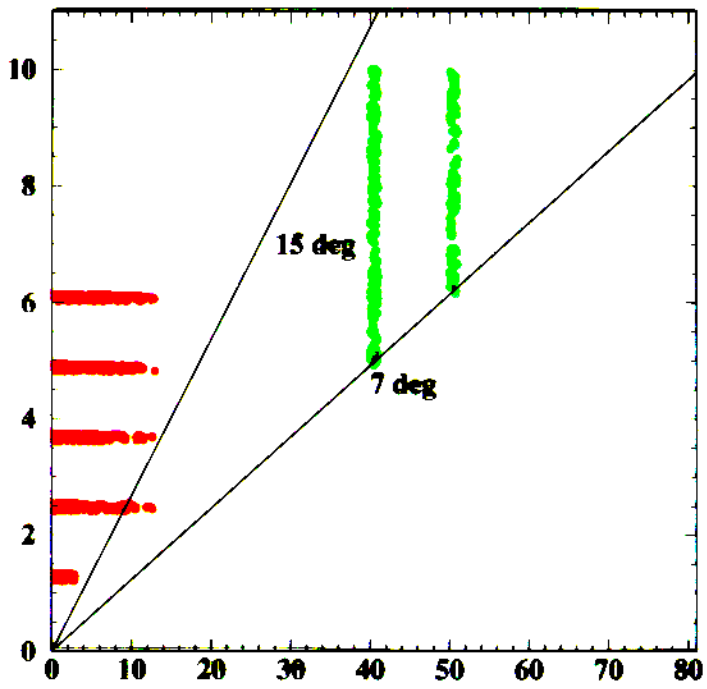
- With $10\mu m$ resolution $\sim$ 20% improvement at high momenta
- However small loss at low momenta due to multiple scattering
- Improvement vanishes quickly with worse SIT resolution
- Discussion should be within a global concept of ITC/SIT

Forward tracking

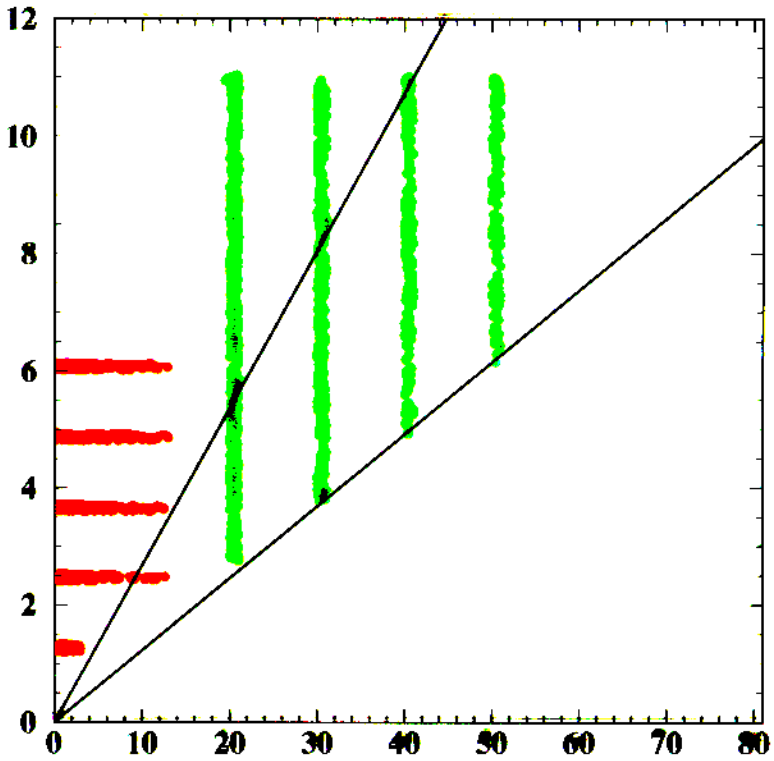
The current detector has up to 5 silicon planes before the ITC for the pixel option



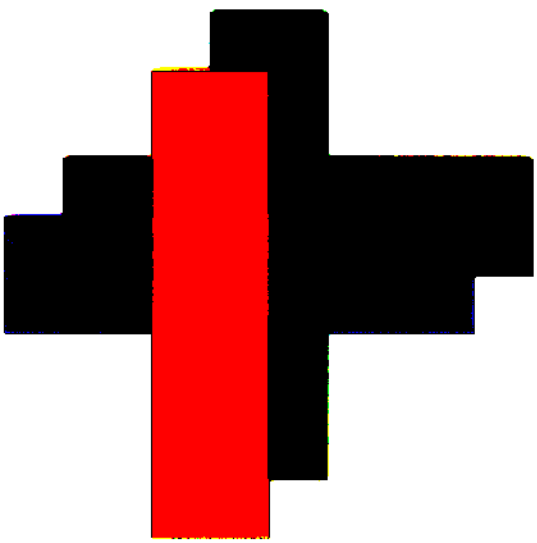
However only two planes for the CCD option



Propose to add two more FTD planes for the CCD option with larger outer radius

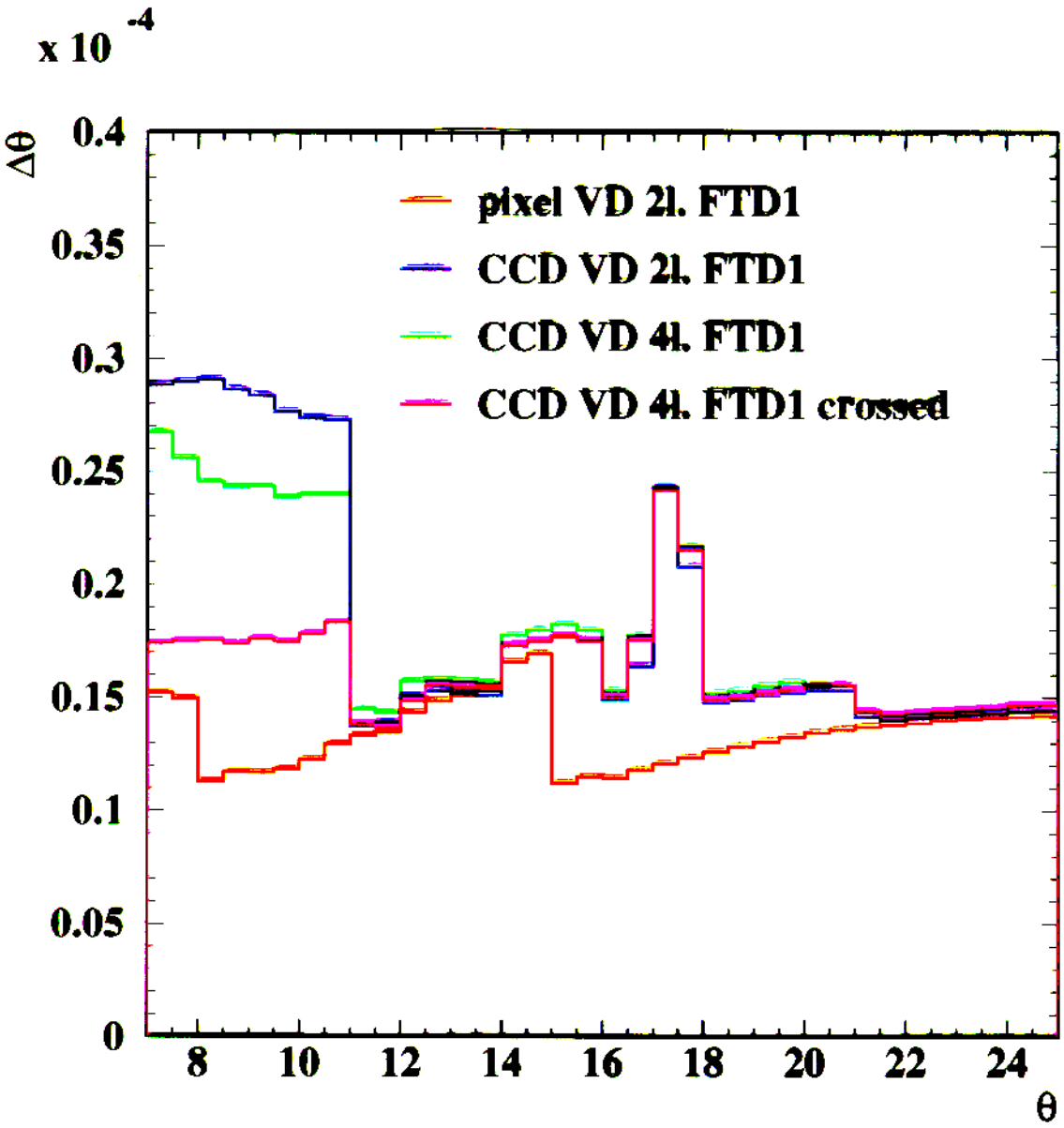


- Pixel have factor four different size in x and y
- Can install FTD layers with different pixel orientation



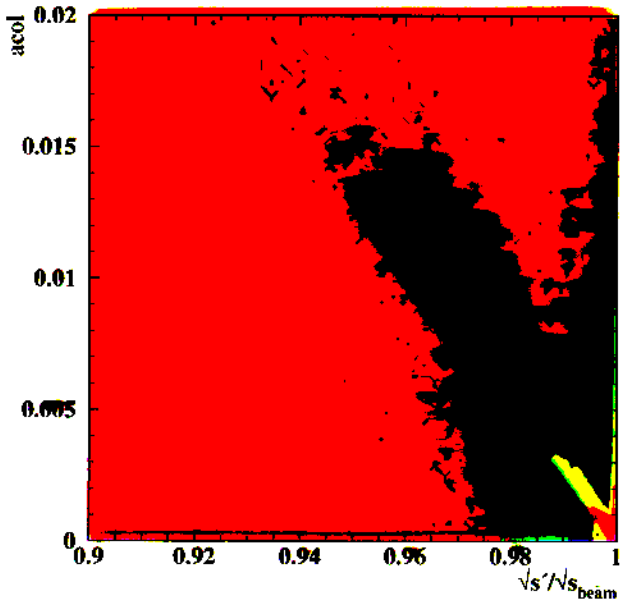
Polar angle resolution

- Below 11° large difference between pixel and CCD option
- Number of FTD layers more relevant for pattern recognition than for resolution
- Rotated option improves a lot without decreasing momentum resolution

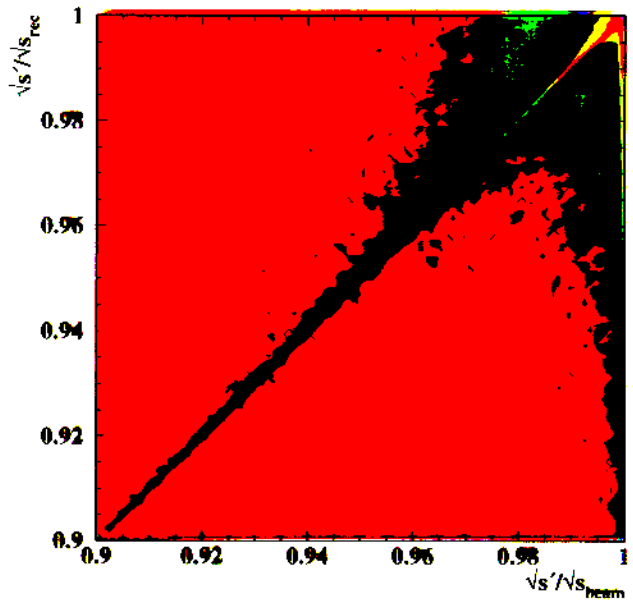


Bhabha studies

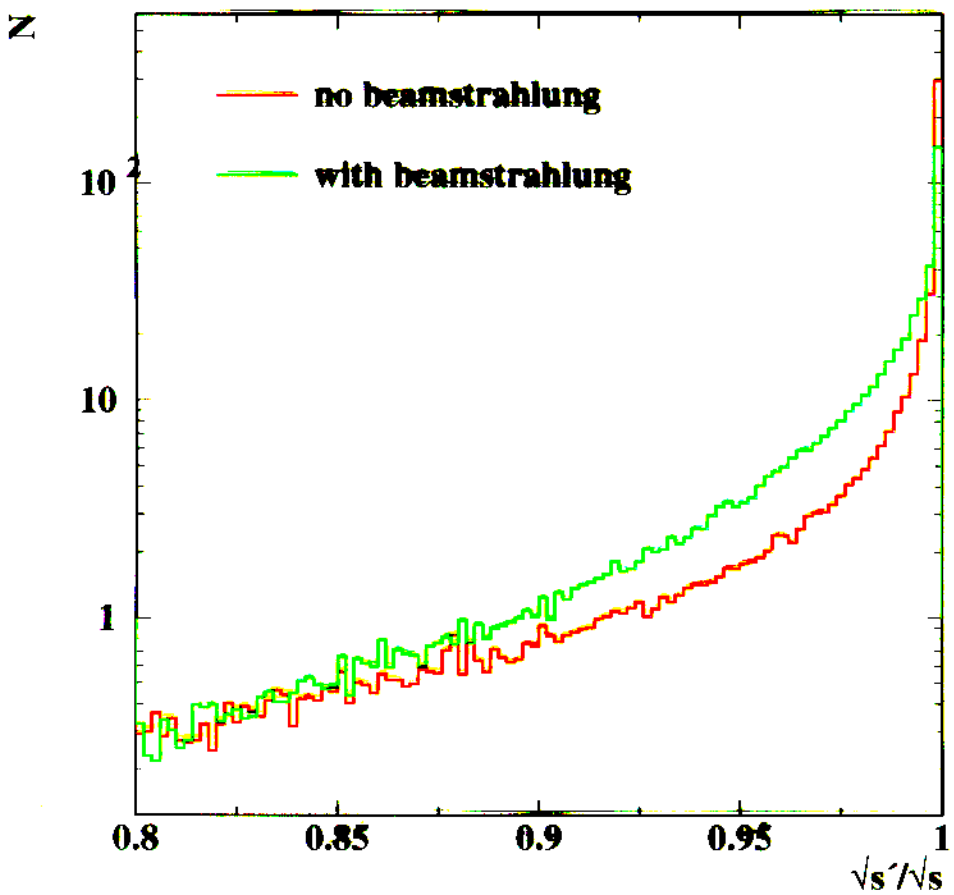
General idea: If one photon is radiated at zero angle acolinearity is a function of the effective s'



Function depends on polar angle and can be folded out



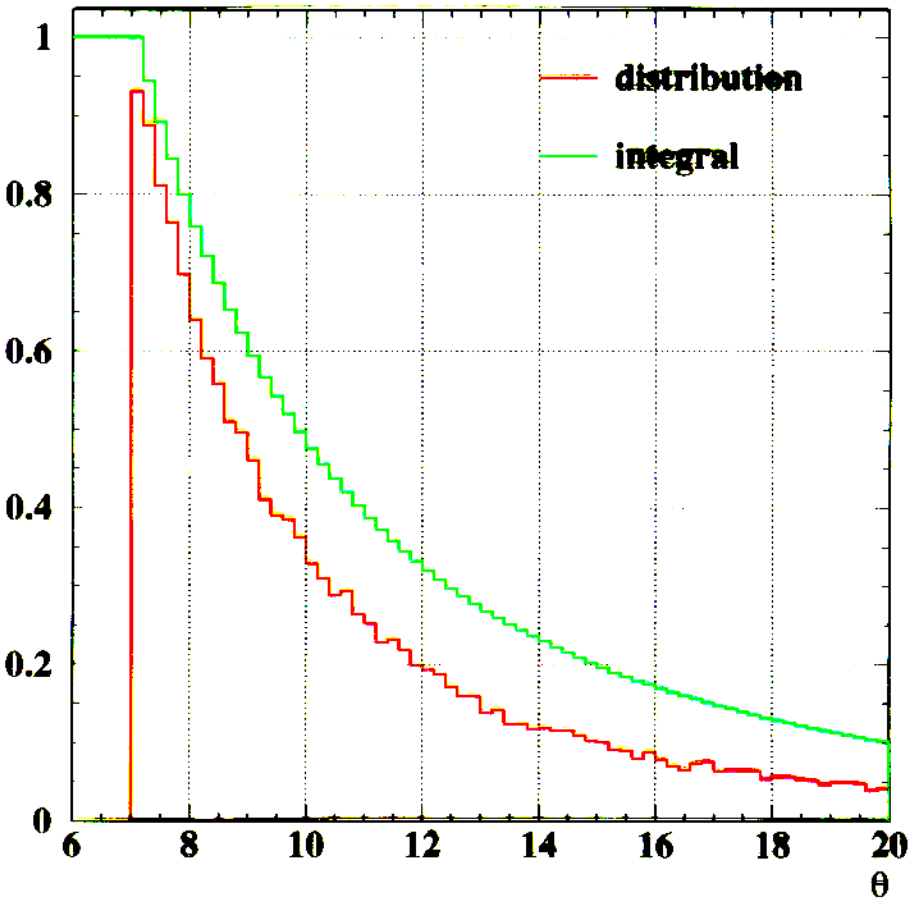
However radiation from beamstrahlung and normal ISR compete



ISR needs to be calculated theoretically

Why Bhabhas

- two-body final state
- Large cross section
  (0.3 nb for $\sqrt{s} = 500\text{GeV}$, $\theta > 7°$)
- smooth $\sqrt{s}$ dependence
- However, largely peaking forward

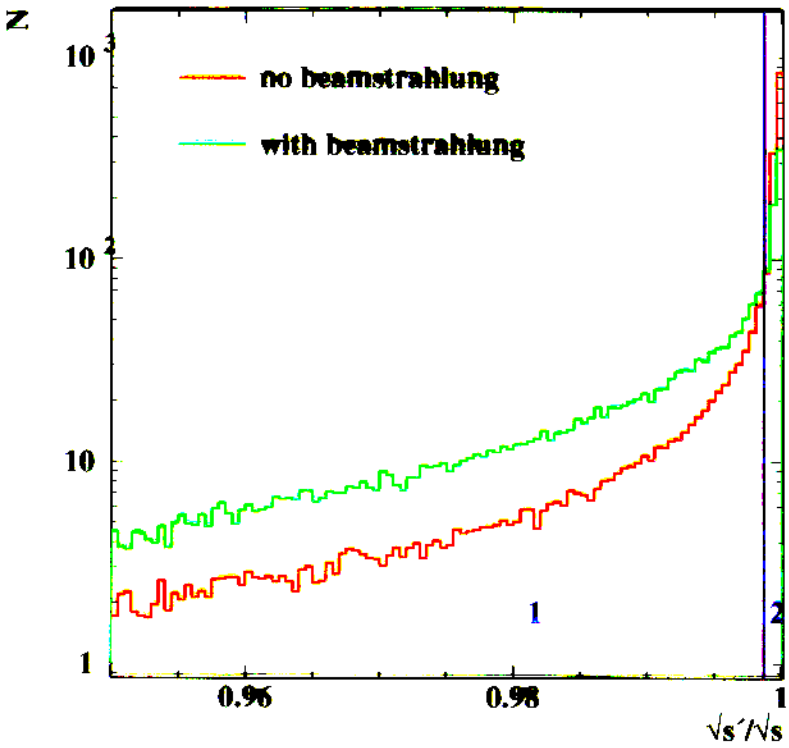


- and electrons shower in the detector

First analysis

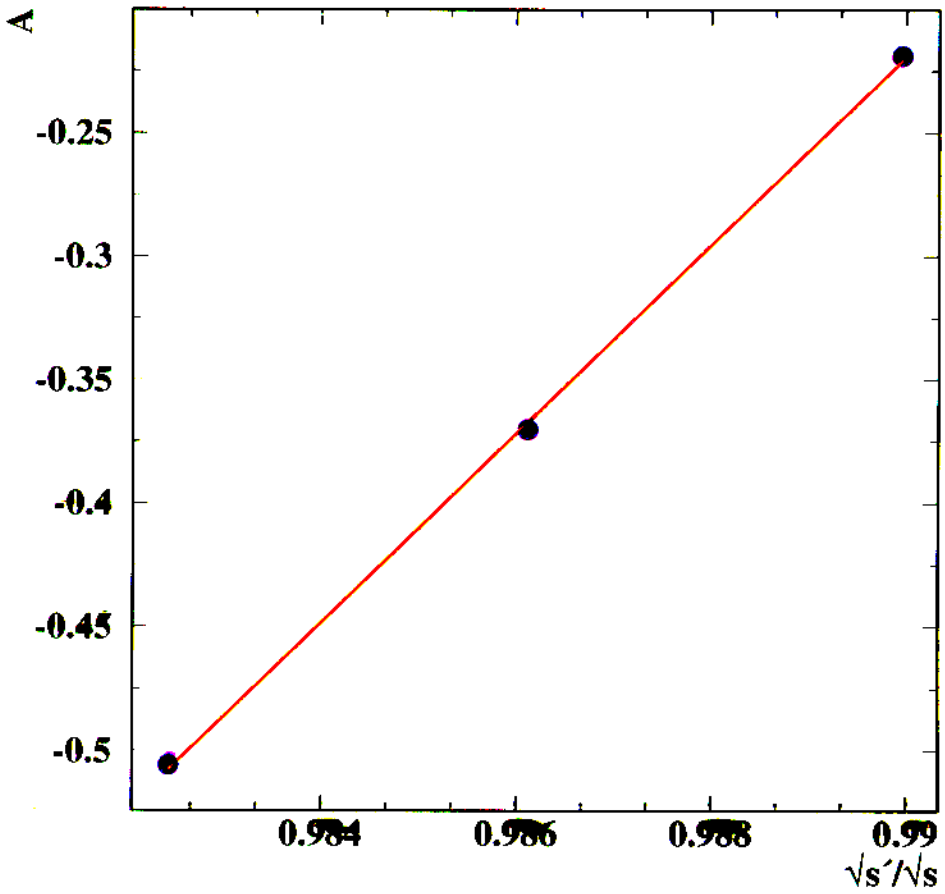
(Physics teams and machine people have to state what is really needed)

- Spectrum is smooth with a large peak at $\sqrt{s'/s} = 1$
- Assume for the moment that smooth part is known and fraction in peak is uncertain
- calculate asymmetry between "peak" and "rest"



$$A = \frac{2-1}{2+1}$$

Asymmetry is a linear function of $\langle\sqrt{s'/s}\rangle$



Statistical error:

$$\Delta\langle\sqrt{s'/s}\rangle = \frac{1}{30\sqrt{N}}$$

- statistical error for 100 fb^{-1} $\Delta\langle\sqrt{s'/s}\rangle = 6\cdot10^{-6}$
- detector resolution completely irrelevant for this analysis
- However need input from physics/machine which parameters are really needed