$\gamma\gamma$ Luminosity Replaced by e^+e^- Luminosity

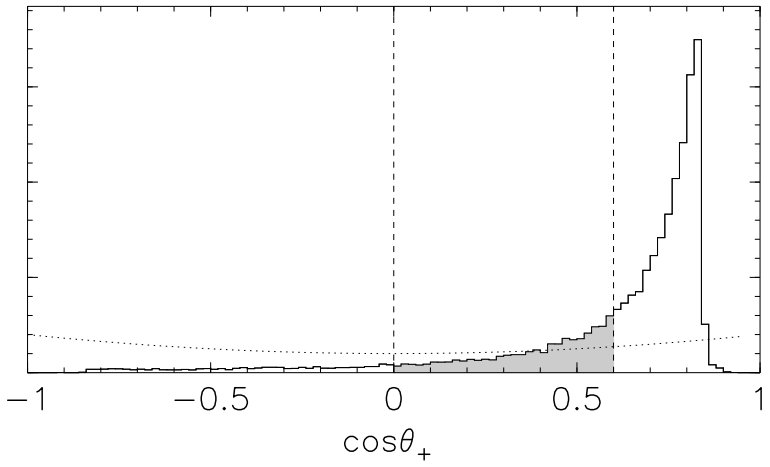
Why? Higher statistical precision, and I need that.

$\gamma\gamma$ is simpler because $\Upsilon \not\to \gamma\gamma$: just count $\gamma\gamma$ events and multiply by a constant for nb^{-1}.

e^+e^- count is contaminated by $\Upsilon \to e^+e^-$

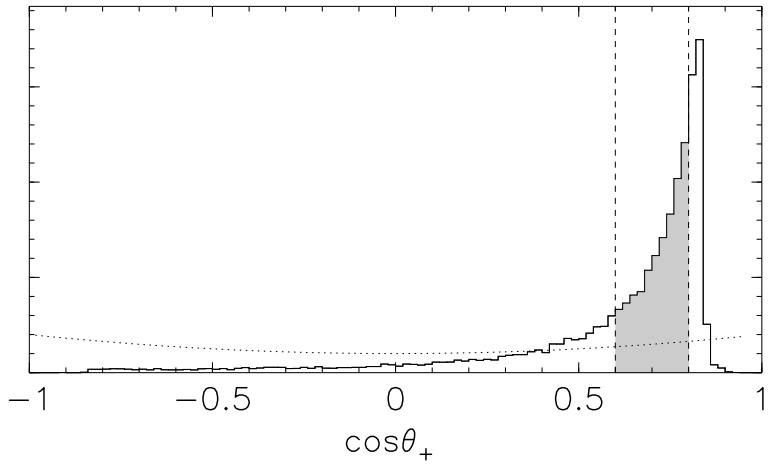
To gauge this, split the e^+e^- sample:

Inner e^+e^-



More contaminated by $\Upsilon \to e^+e^-$

Outer e^+e^-

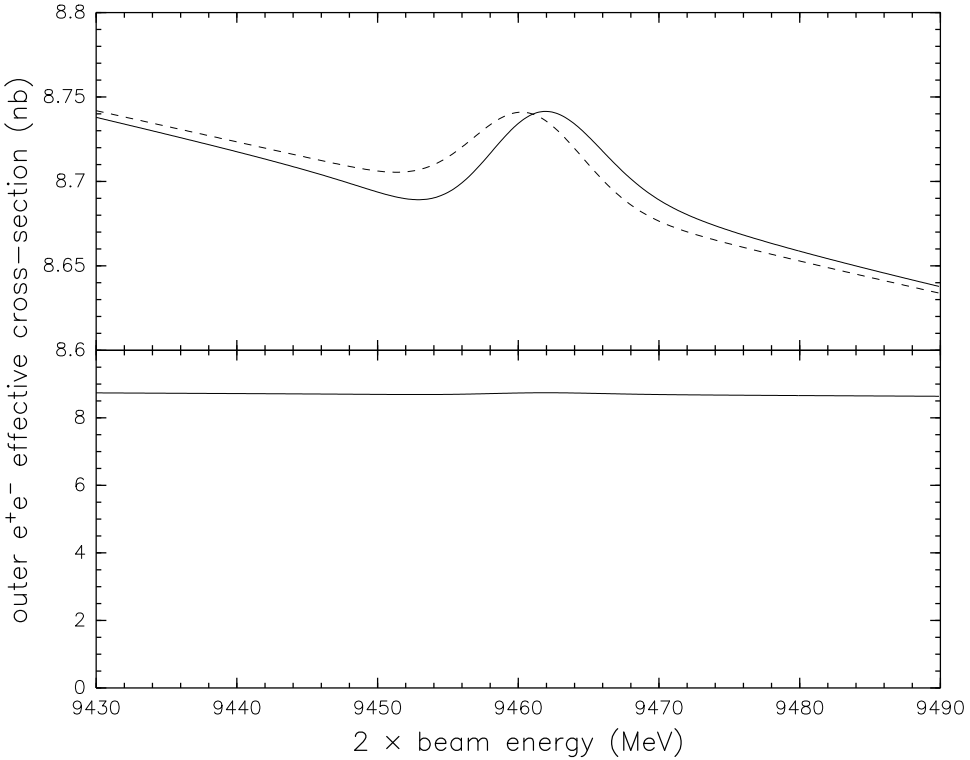


Less contaminated by $\Upsilon \to e^+e^-$

e^+e^- Correction

$$\#e^+e^- \text{ to subtract} = \sigma_\Upsilon(E)\ \mathcal{B}_{\mu\mu}\ \frac{\int_{0.6}^{0.8} \cos^2\theta\, d\cos\theta}{\int_{-1}^{1} \cos^2\theta\, d\cos\theta}\ \mathcal{L}_{\gamma\gamma}$$

$\sigma_\Upsilon(E)$ is the output of Karl's function (with appropriate normalization), which includes interference between a constant continuum process ($\mathcal{A}_{BB} = \sqrt{\sigma_{BB}}$) and the Breit-Wigner (+ beam energy spread convolution)



Systematic Uncertainties ($\Upsilon(1S)$)

	area (MeV nb)	χ^2/ndf
Gamgam fit	317.8 $\pm$ 2.2	214.1/(210-18) = 1.12
Inner Bhabha fit	324.00 $\pm$ 1.2	259.9/(210-18) = 1.35
Outer Bhabha fit	323.16 $\pm$ 0.95	257.2/(210-18) = 1.34
Restricted* Gamgam fit	321.4 $\pm$ 1.1	240.3/(210-2) = 1.16

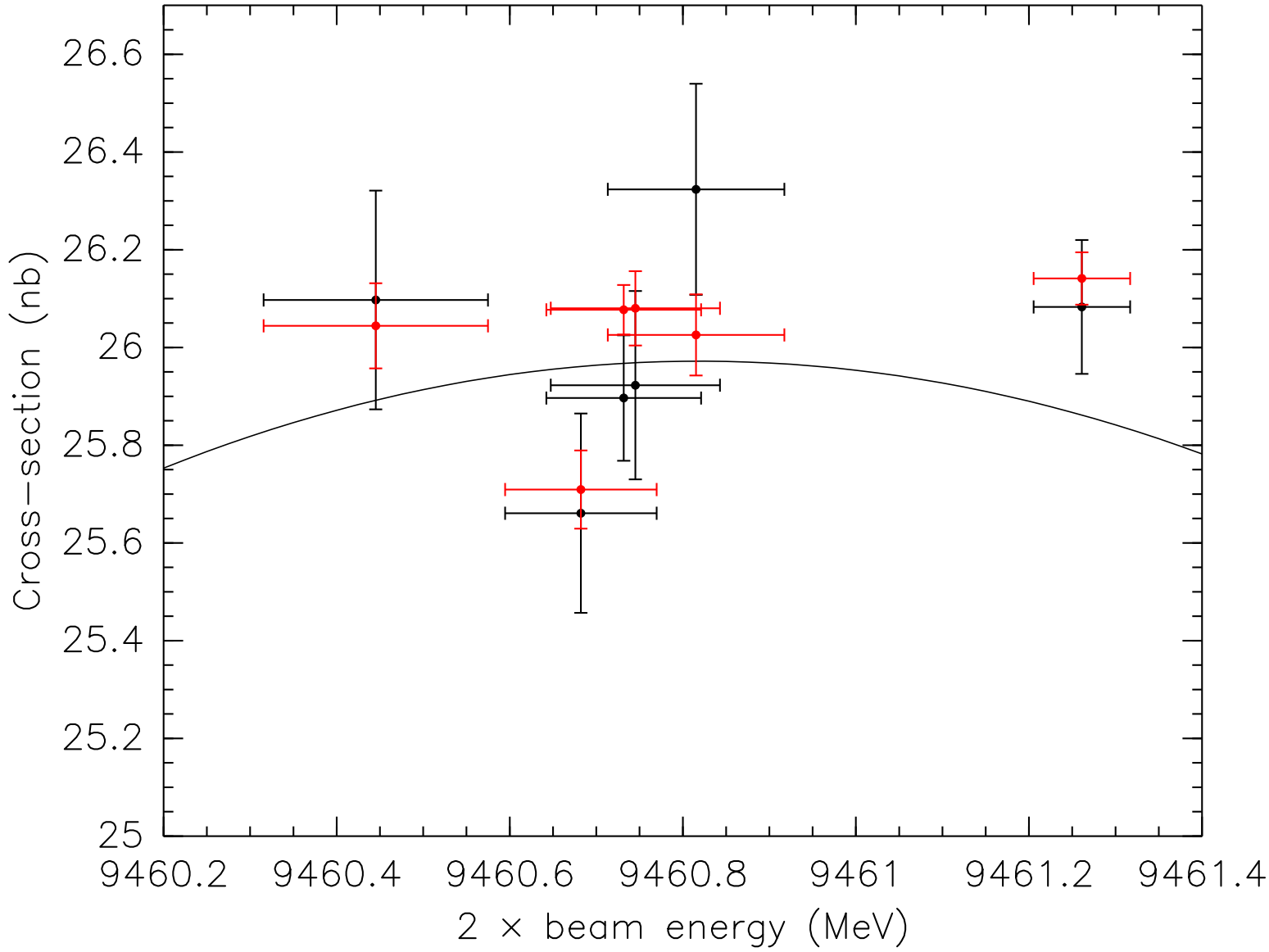
*Restricted fit doesn't allow week-by-week beam energy and beam energy spread corrections to float: they are fixed to the outer Bhabha values.

Full Gamgam fit has week-by-week parameter outputs which are consistent (some of them 2σ, I haven't done this carefully...) with Outer Bhabha fit— a subtlety not caught by MINOS?

(THIS SLIDE IS TOO LATE-BREAKING TO BE CONSIDERED FINAL)
I'M STILL THINKING ABOUT THIS.

What can we see with this high precision?

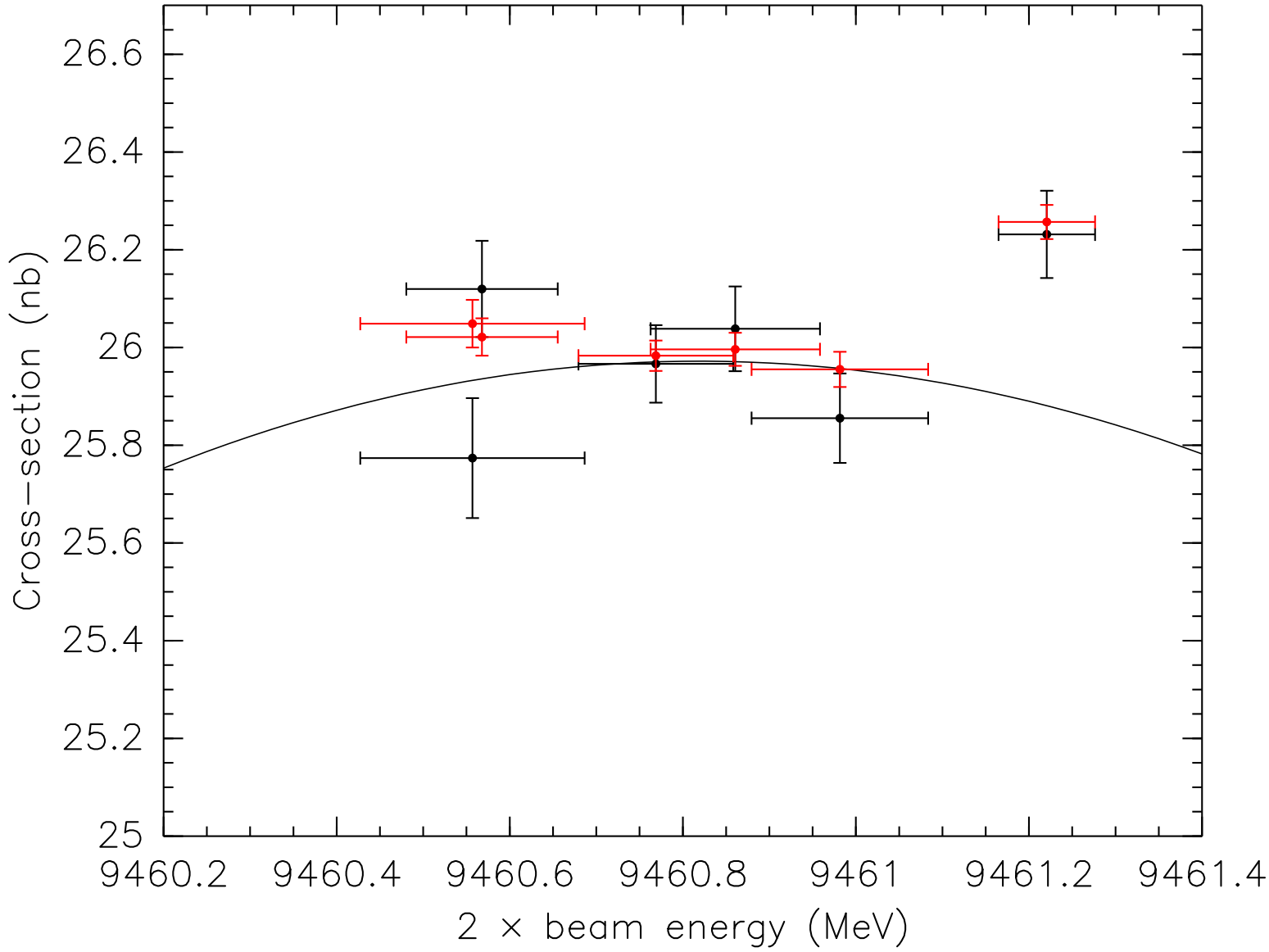
With all scan data near the $\Upsilon(1S)$ peak:



a 1.5% excess in April $\Upsilon(1S)$.

What can we see with this high precision?

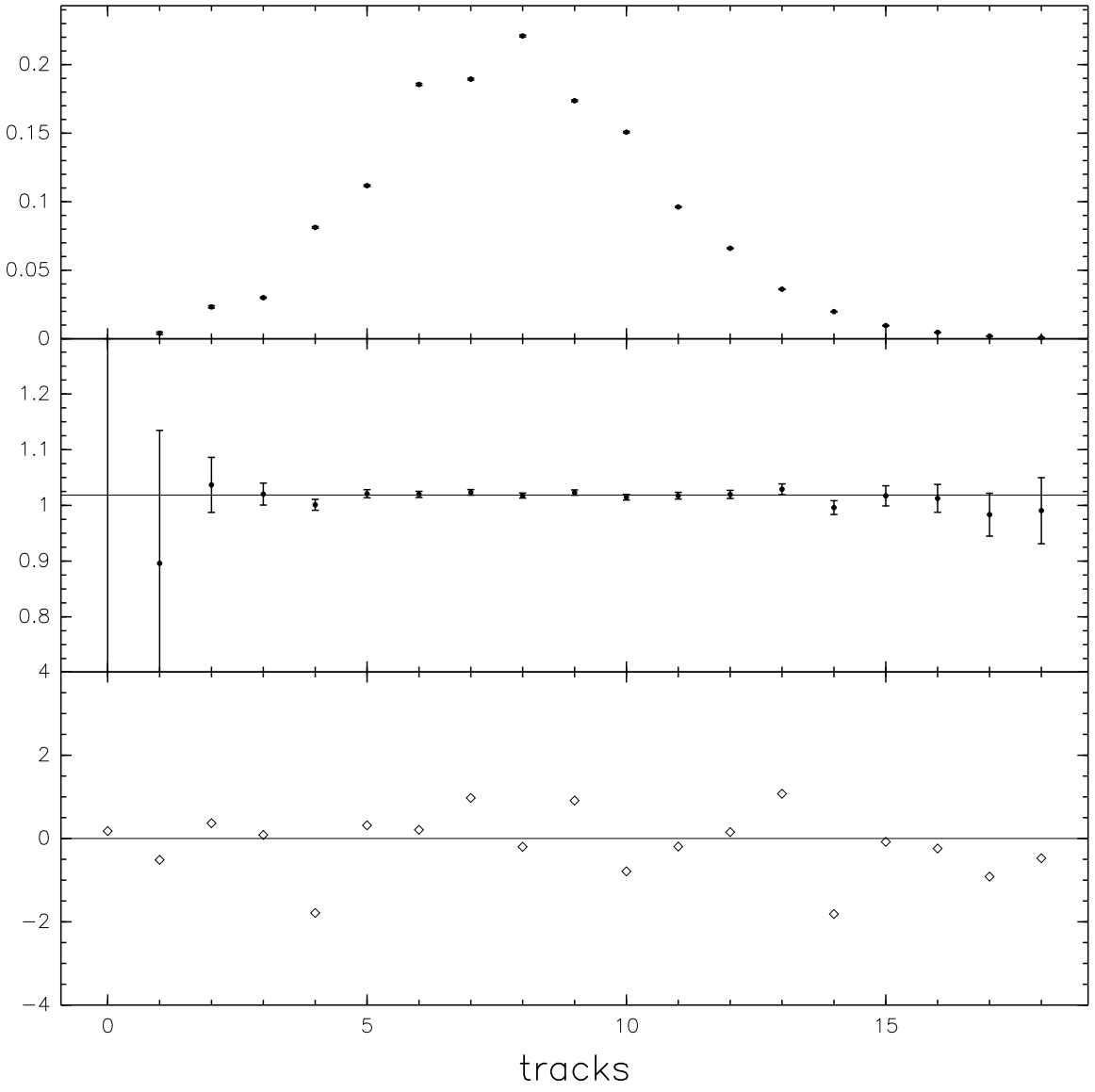
With all CLEO-III data near the $\Upsilon(1S)$ peak:



a clear 1.5% excess in April $\Upsilon(1S)$.

What does this excess look like?

In all distributions (visible energy is questionable), the excess is distributed like Υ events.

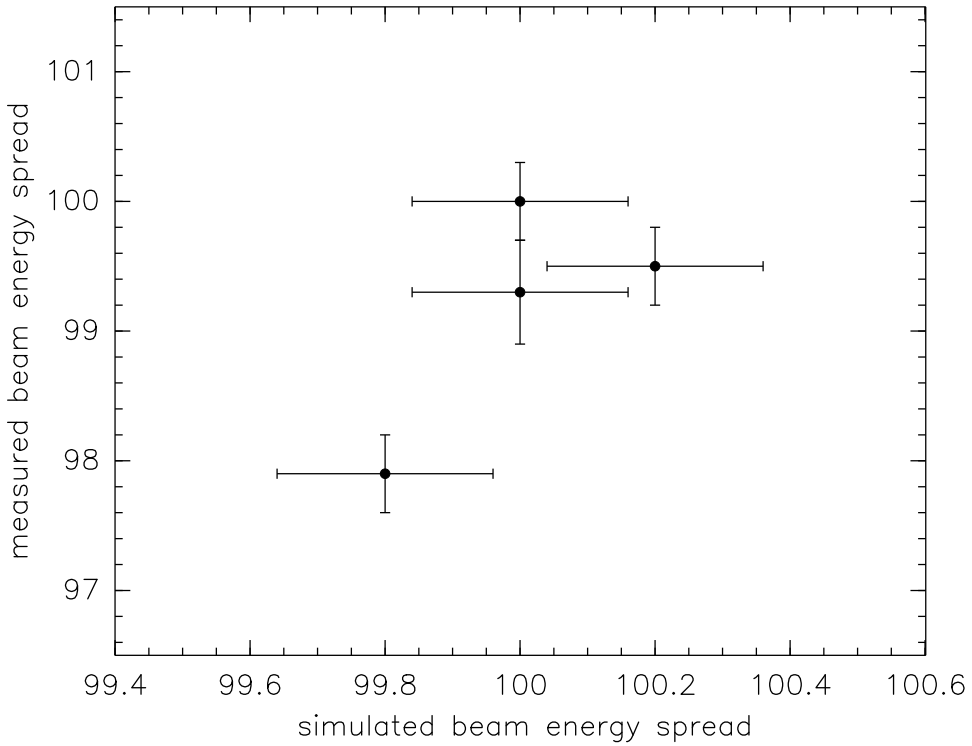


$\longrightarrow$ not an inefficiency or background, a narrowing of Υ beam energy spread?

CESRV simulations

Plausibly.

CESRV simulation of April vs. other weeks' savesets (0.93 correlation with measured beam energy spread)



CESRV simulation of April vs. other weeks' orbits (physical conditions) $\longrightarrow$ 1% discrepancy

So I will allow different beam energy spreads to float in different weeks (surveyed CESR e-log to find the best breakpoints)