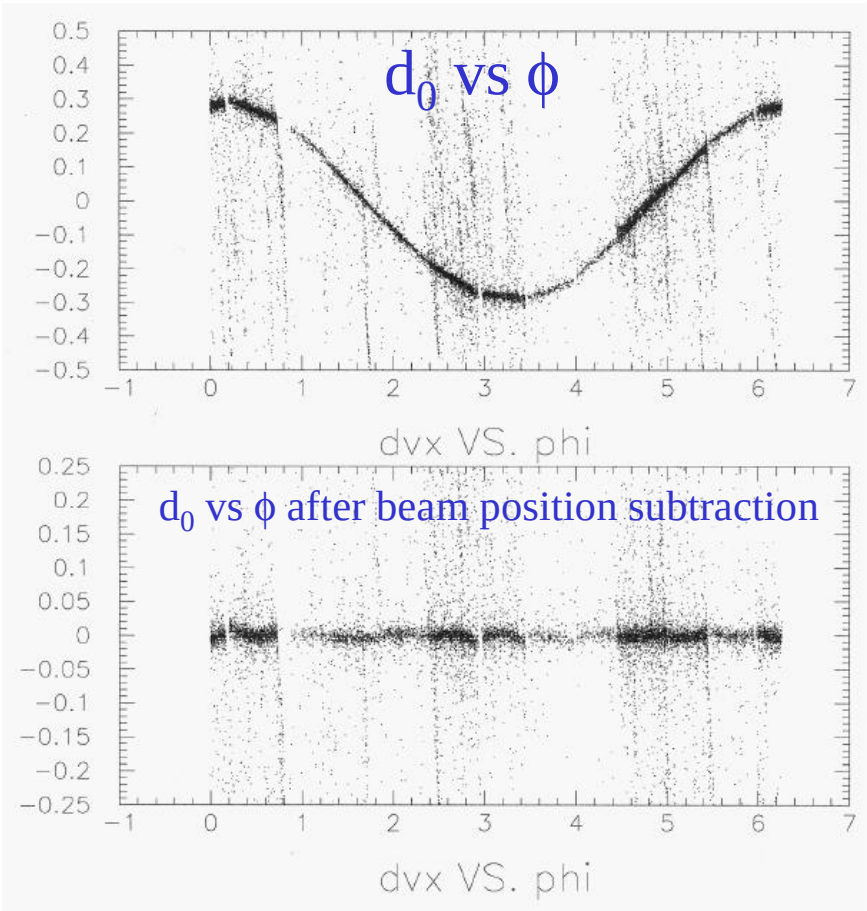
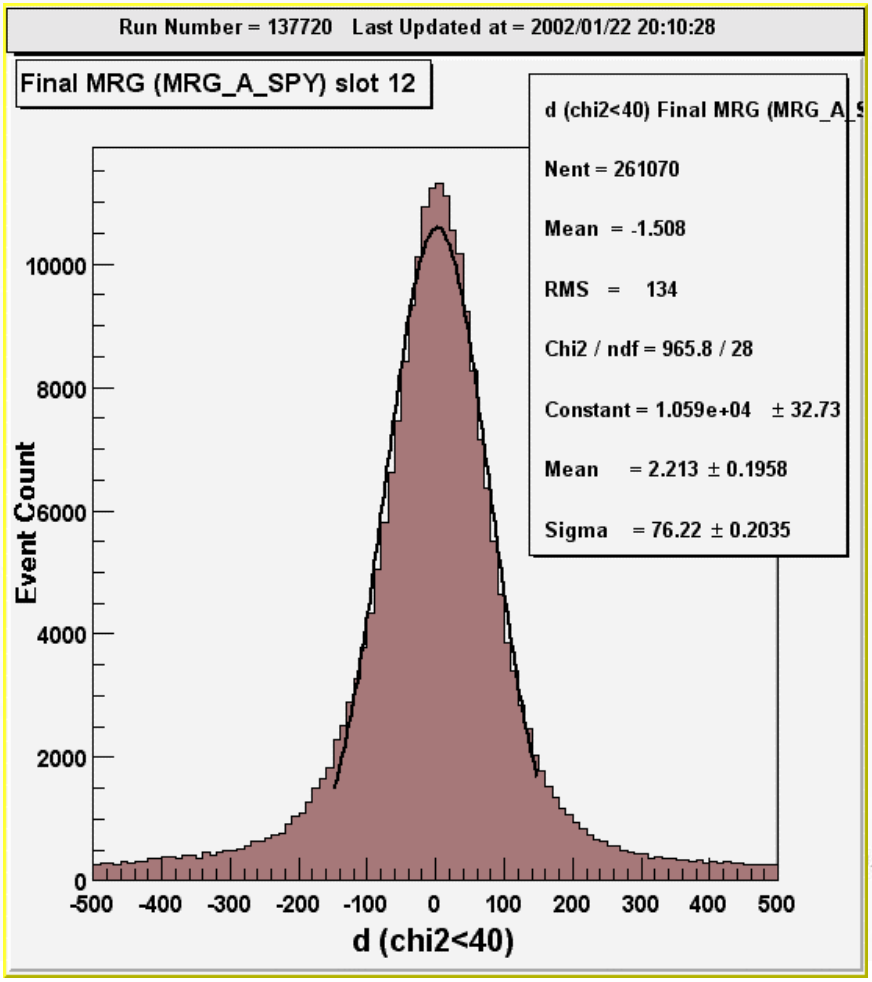
SVT status

- What's available *out of the box*
- Beam
- Hardware
- Software
- Tracking Performance
- Efficiency

Alessandro Cerri for the SVT group

The “out of the box” SVT





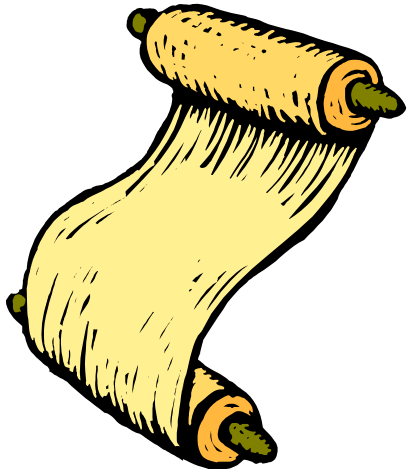
In other words…

- Beam Width ≈70μm after on-line beam subtraction
- ≈90% (?) 4 hits detection efficiency in Si ×

  50-80% Si coverage ×

  60-70% Tracking Algorithm Efficiency

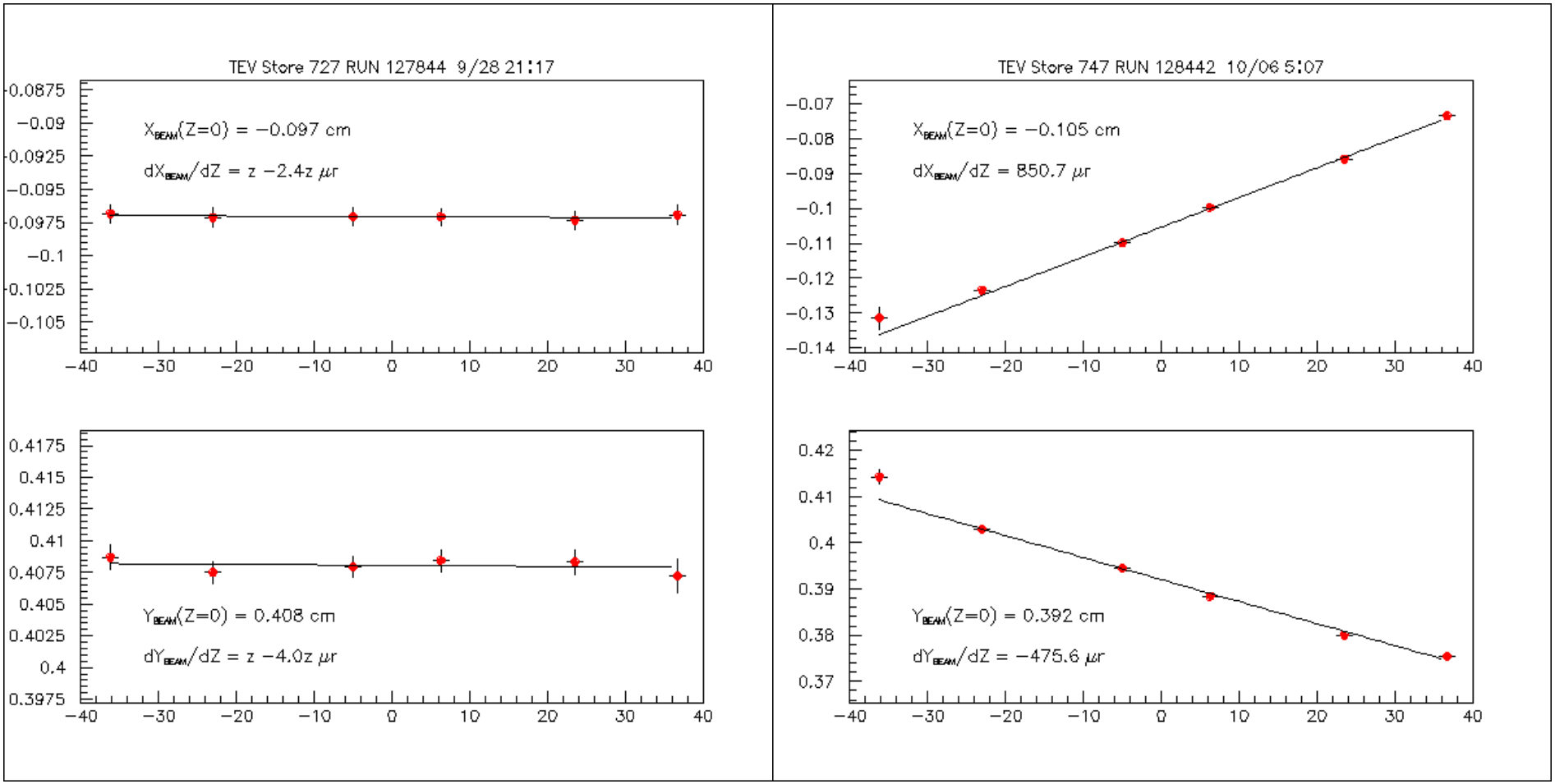
= 30-50% single track efficiency



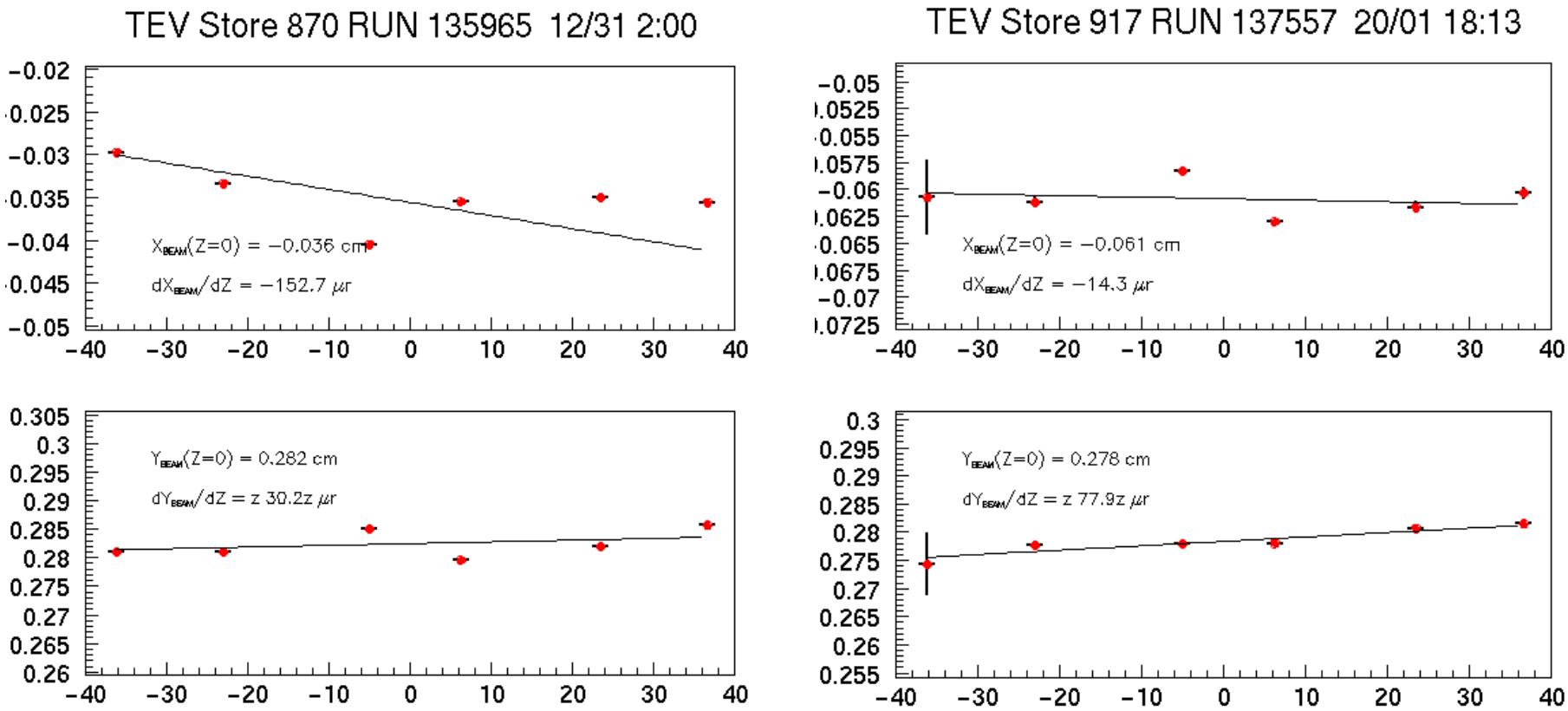
- Fixed hardware problems, among which:
  - behavior of a couple of wedges going out of sync
  - De-synchronization -> ok with occasional HaltRecoverRun
    - A faster mechanism could be quickly put in place
    - Mostly due to silicon readout problems
    - Otherwise a potential 50% data loss/silicon trips
  - apart from those, 100% bit-wise agreement with svtsim/cdfsoft2
- Can trigger!

Beam…

Back in October



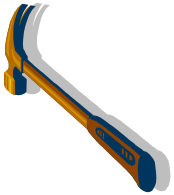
After the Shutdown



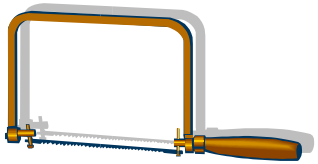
Beam Summary

	X_0 (mm)	Y_0 (mm)	dX/dZ (μrad)	dY/dZ (μrad)	
Before October	-1	4	850	-470	
	-0.3	2.8	-150	30	Right after October
Latest	-0.6	2.7	-14	78	

- Can live with offset
- No tilt feedback but proof that beam can be straightened enough

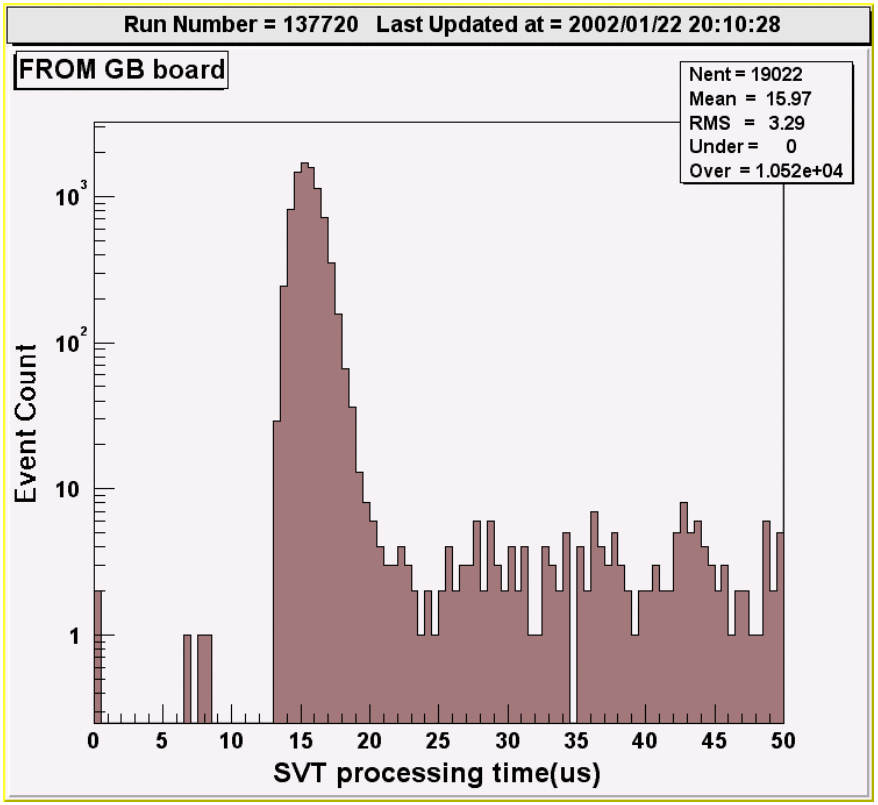


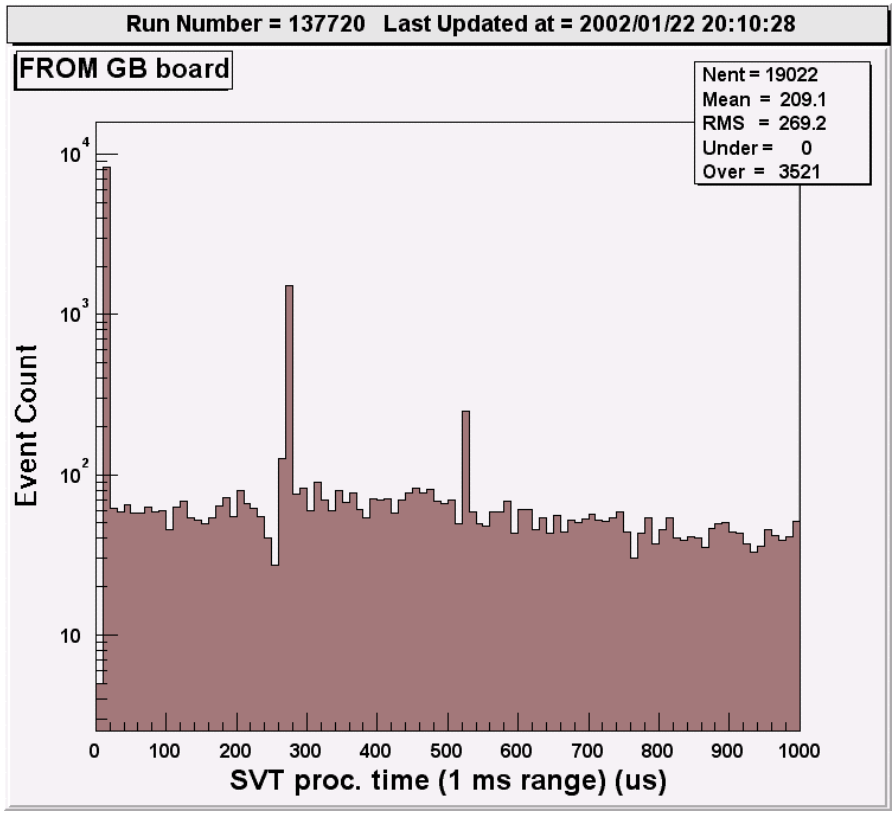
SVT Hardware

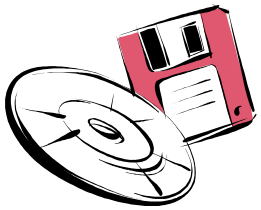


- All SVT in place since long time
- BUT new hardware under way for better performance (ghosts etc)
- Thanks to the great effort of our L2 friends, now SVT talks to the L2 alpha and can be (is) used for triggering!
- Now that we can have high statistics, minor bugs can be tracked down/fixed. Those currently include:
  - Sync errors (unknown source?)
  - HRR recovers them, but no HRR -> SVT potentially out of sync
  - Processing time on “clean” data is 16us

SVT Timing


Run Number = 137720 Last Updated at = 2002/01/22 20:10:28
FROM GB board
Nent = 19022
Mean = 15.97
RMS = 3.29
Under = 0
Over = 1.052e+04
Event Count
SVT processing time(us)

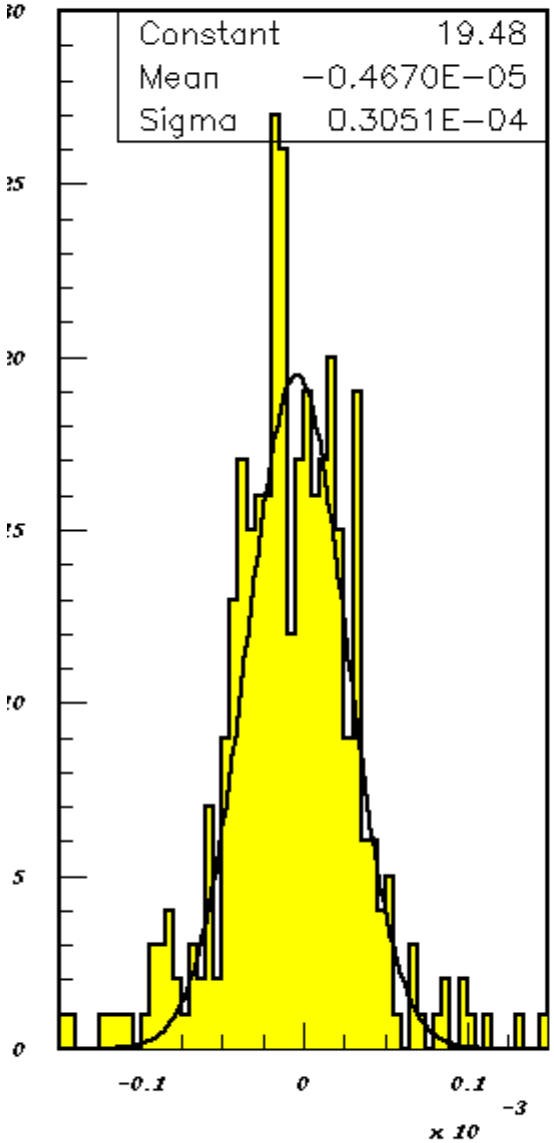

Run Number = 137720 Last Updated at = 2002/01/22 20:10:28
FROM GB board
Nent = 19022
Mean = 209.1
RMS = 269.2
Under = 0
Over = 3521
Event Count
SVT proc. time (1 ms range) (us)



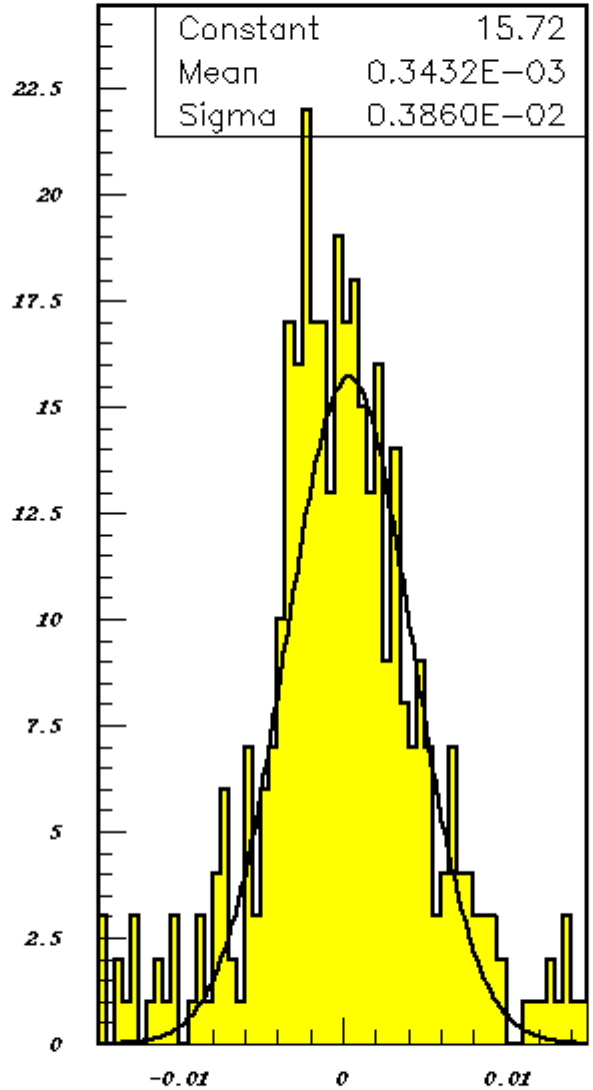
SVTSoft
(firmware/software)

- Database access working for the actual hardware, and for the offline simulator
- We need to balance efficiency vs processing time (i.e. fake rate) → optimize clustering/pattern recognition/fit
- We need make better use of the available silicon
- Nonlinearities are an important effect at O(mm) offsets → need to implement correction scheme already designed and tested (65-70 um → 45-50 um)
- Noisy strips?
- duplicate track removal (mandatory for 4/5)
- Layer 00
- 100% (i.e. bitwise) reproducibility of SVT output after beam correction
- Monitoring software is there with lots of plots: need to teach CO's what to look for!

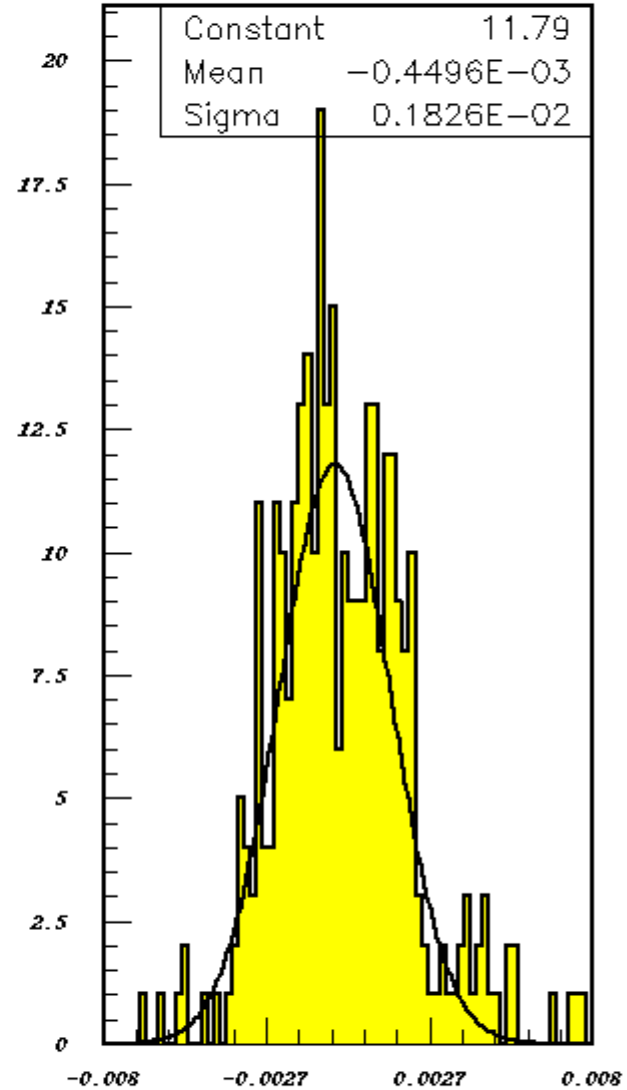
Tracking Performance



Δcurvature (svt−offline)



Δd_0 (svt−offline)



$\Delta\Phi_0$ (svt−offline)

Detector Coverage

	B0	B1	B2	B3	B4	B5		
W00	01 34	012 4	01234	01234	0123	01234	==>	4/6
W01	01 3	01234	01234	0123	0123	0123	==>	5/5
W02	01234	01 34	01234	01 34	1234	01234	==>	3/6
W03	01	1234	01234	0123	01 34	1	==>	2/4
W04	01234				012	01234	==>	2/2
W05	0 234	0123	123	01234	0123	012 4	==>	3/5
W06	1 4	1234	01 4	0123	01 34	01234	==>	2/4
W07	012 4		0 234	0 34	01 3	01234	==>	1/3
W08	012	01 34	1234	01234	0 34	01234	==>	2/4
W09	01234	01234	01 34	01234	1234	01 34	==>	3/6
W10	01234	01234	01234	01234	0123	01234	==>	6/6
W11	0 23	01234	01234	012 4	01234	1234	==>	3/5

total of 36 0123 wedges, 56 wedges with at least 4 layers

Detector Coverage ?

	B0	B1	B2	B3	B4	B5		
W00	01234	01234	01234	01234	01 34	01234	==>	5/6
W01	0123	01234	01234	0123	01234	01234	==>	6/6
W02	01234	01234	01234	01 34	01234	01234	==>	5/6
W03	0123	1234	01234	01234	01234	01 34	==>	4/6
W04	01234	0 4			01234	01234	==>	3/3
W05	01234	01234	0123	01234	01234	01234	==>	6/6
W06	12 4	01234	01234	01234	01234	01234	==>	5/5
W07	01234	01234	01234	01234	01234	01234	==>	4/5
W08	012 4	01234	01234	01234	01234	01234	==>	5/6
W09	01234	01234	01234	01234	01234	01234	==>	6/6
W10	01234	01234	01234	01234	01234	01234	==>	6/6
W11	0 234	01234	01234	01234	01234	01234	==>	5/6

total of 60 0123 wedges, 67 wedges with at least 4 layers

SVT Efficiency

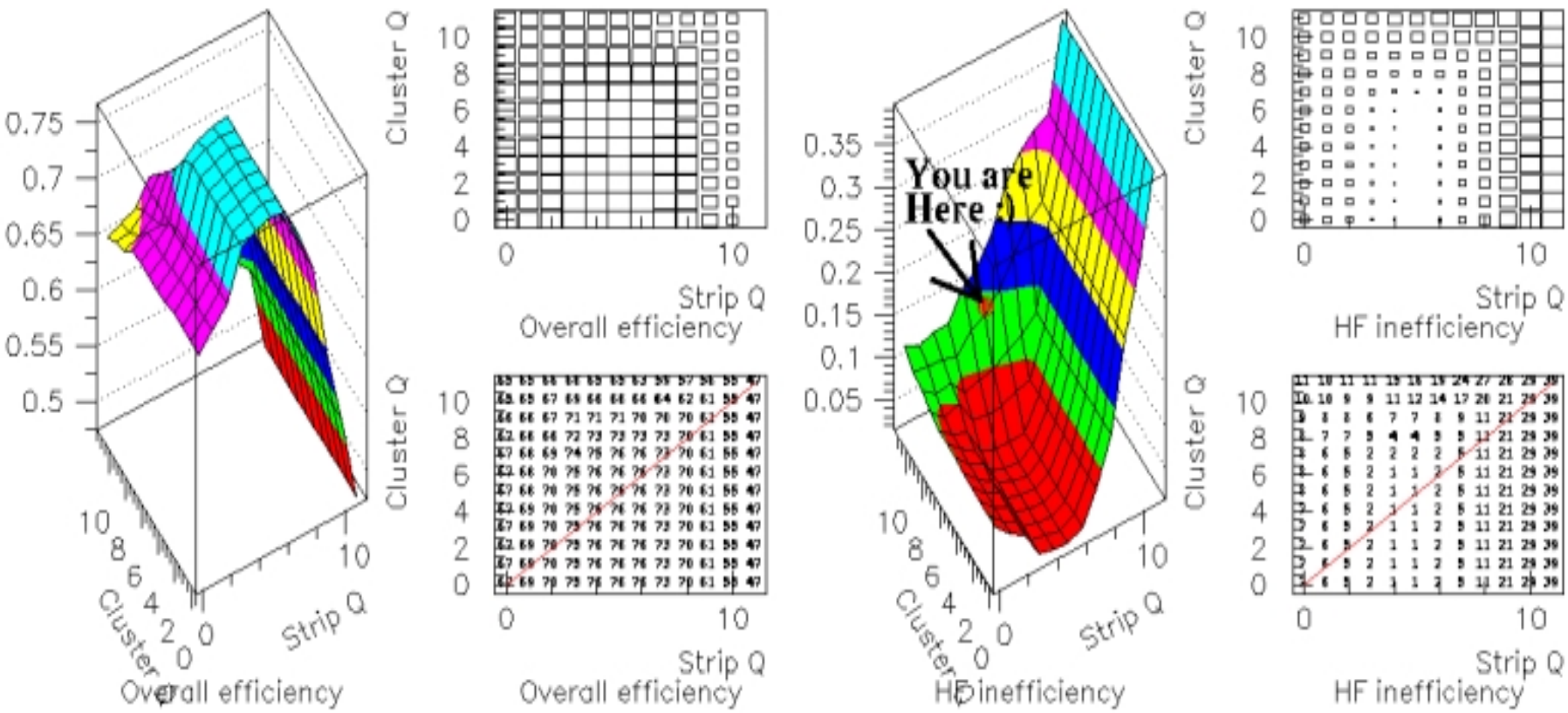
- SVT against emulation
- SVT against offline (mostly clustering)
- SVT against physics (≈200 Jpsis from stream A)

➢ε before the shutdown ≈60-70%

- 90% from clustering parameters → Optimize clustering
- 85-90% from pattern recognition ≈ → Improve patterns
- 90% from track fitting → Implement Nonlinearity fix

Hit Finding

Thanks to the J/Psi group and the new skimming recipes, we can measure the SVT tracking efficiency against the offline on a real physics sample: a great tool for the SVT tuning!



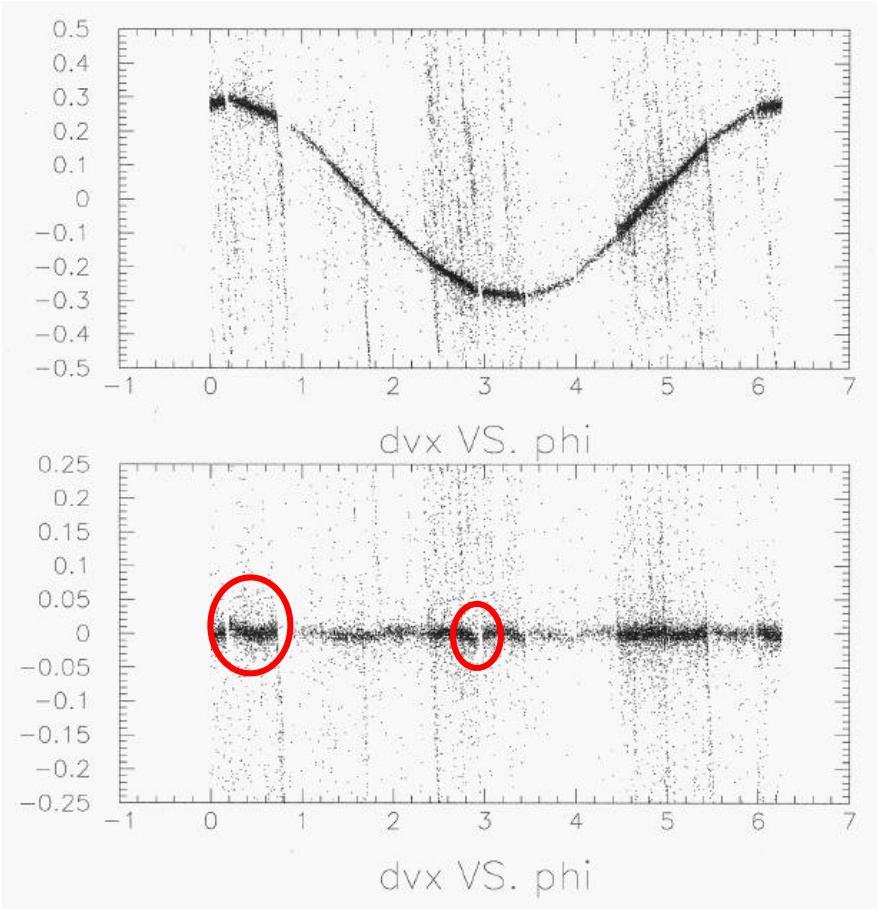
Pattern Coverage

- Started with a pattern set sensitive on a spot 5mm wide about (0,0):
  - Better acceptance for beam movement
  - But lower efficiency (≈80%), higher fake multiplicity
- Switched to “narrower” pattern set (1.2 mm wide):
  - Better efficiency (≈90%)
  - More sensitive to beam movements O(0.5mm)

Detector Coverage II

- We can improve the SVT performance switching to layers other than 0123
- Tested this on entire wedges in phi (0134/0124) in 4/12 wedges:
    - The framework works great
    - Pattern efficiency seems lower (bug?)

Track Fitting



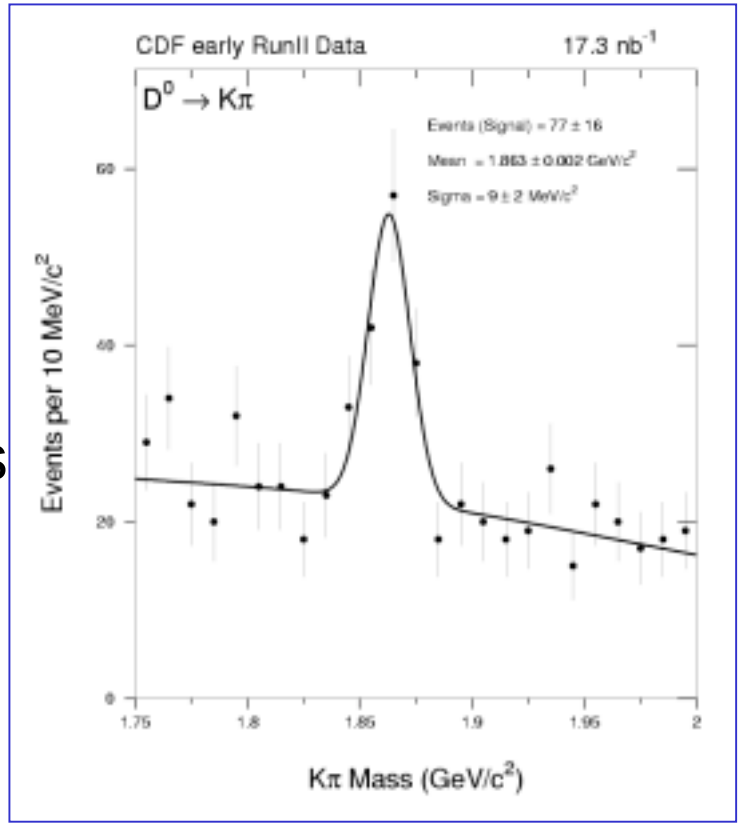
- We know that nonlinearities are there
- Have a recipe to fix them

  (phi-dependent correction

  To curvature, ϕ_0 and d_0)
- Expect small but significant improvement
- Fakes are still present due mostly to intra-pattern noise and XFT fakes: GhostBusters are starting their job!

SVT to-do list

- ❑Better figure of merit to optimize performance (?)
- ❑Better pattern ε (month)
- ❑Fix non-linearity (a. Week, b. Month)
- ❑Noisy strips (FIB pedestals?) (?)
- ❑Timing tails (days)
- ❑Get shift crew involved (1-2 weeks)
- ❑GhostBusting (now)
- ❑H/r/r too often (days)

Summary

- All the necessary hardware and software SVT tools are in place
- Some improvements for better coverage/rejection under way
- We are fine-tuning the SVT configuration for better tracking performance (efficiency, resolution)
- SVT can be used "as-is" for physics
- First encouraging physics results (see Stefano's talk in the physics session)