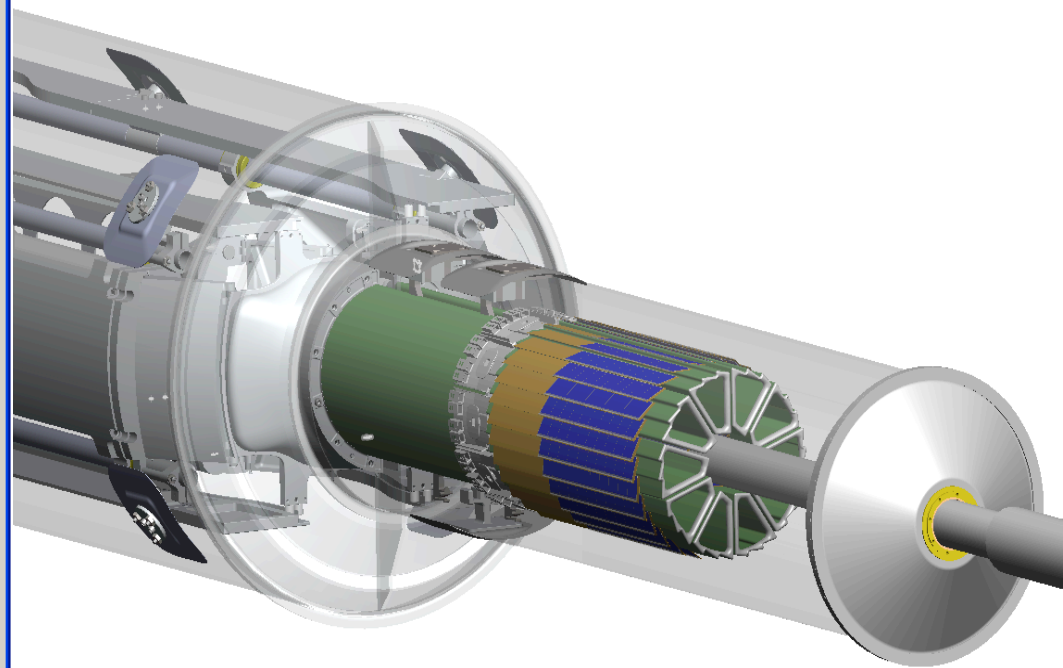
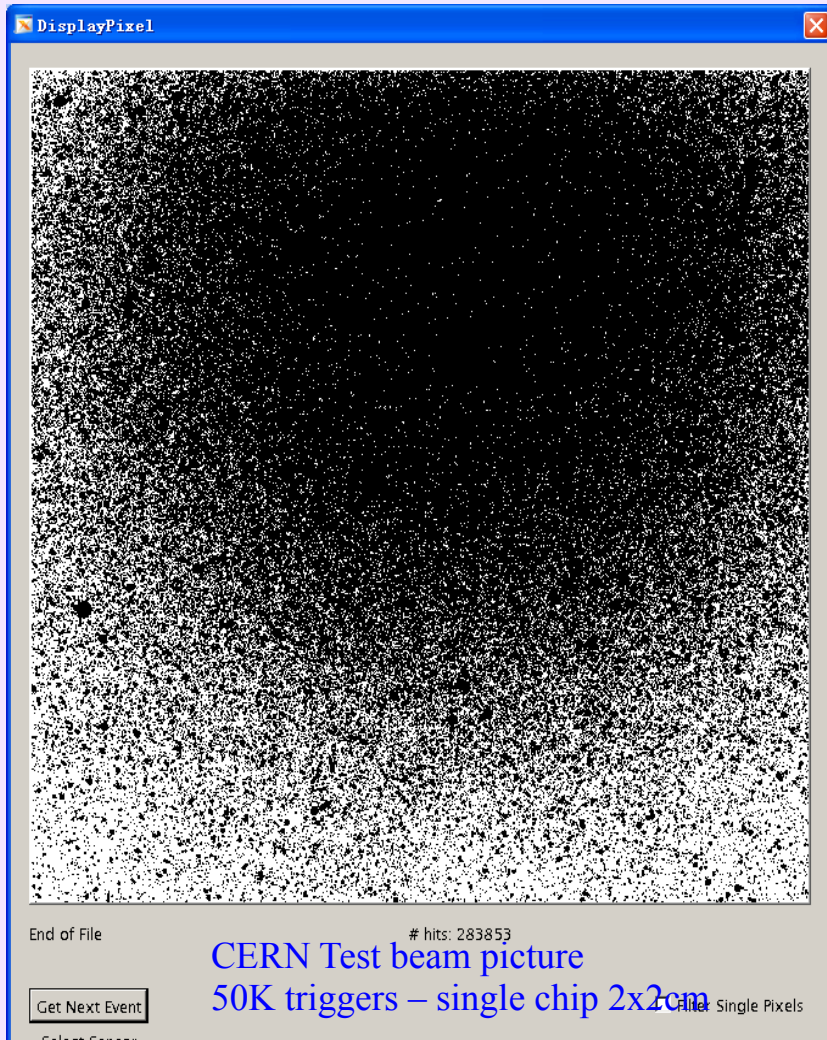


HFT Software

S. Margetis, KSU



Outline

- Task overview and schedule
- Expected progress until next Fall (prototype) and beyond

The goal of this talk is to make the Collab. aware that HFT is around the corner

Introductory comments

- HFT Software team effort so far concentrated on Physics simulations, CD 0-1-2/3
 - This is over as of September (project's final approval)
 - Physics performance/simulation work moved to HF forum
- Effort is aiming at **~Day-1** operational software
 - Online/offline
- Dates that drive the priorities/schedule are:
 - *PIXEL prototype* installation next Fall (2012) for Run-13
 - 2-4 PXL re-configurable sectors
 - *NO SSD/IST*
 - *Full HFT installation* in Fall-2013 for Run-14 data taking

Task Overview and FTE needs

FTEY

2

0.2

0.2

0.5

2

1

1.1

0.8

0.5

Software task	
Offline	
Hit Reconst.	IST
	Pixel
Tracking	
Event Vertex	
Decay Vertex	
Calibration Db	SSD
	IST
	PXL
Alignment	SSD
	IST
	PXL
Simulation	
Geometry	SSD
	IST
	PXL
Fast/Slow Sim.	SSD
	IST
	PXL
Embed./Pileup	IST
Assoc/Analysis	

Total= 8.3

- List is for Offline tasks only
- FTE estimates do not include BNL-core group contributed effort in tracking/vertexing/calibrations etc
- Numbers are on the under-estimate side
- It comes down to about 4 FTE/year for ~two years
 - We now have less than half of that

Schedule (critical activities only)

10/2011

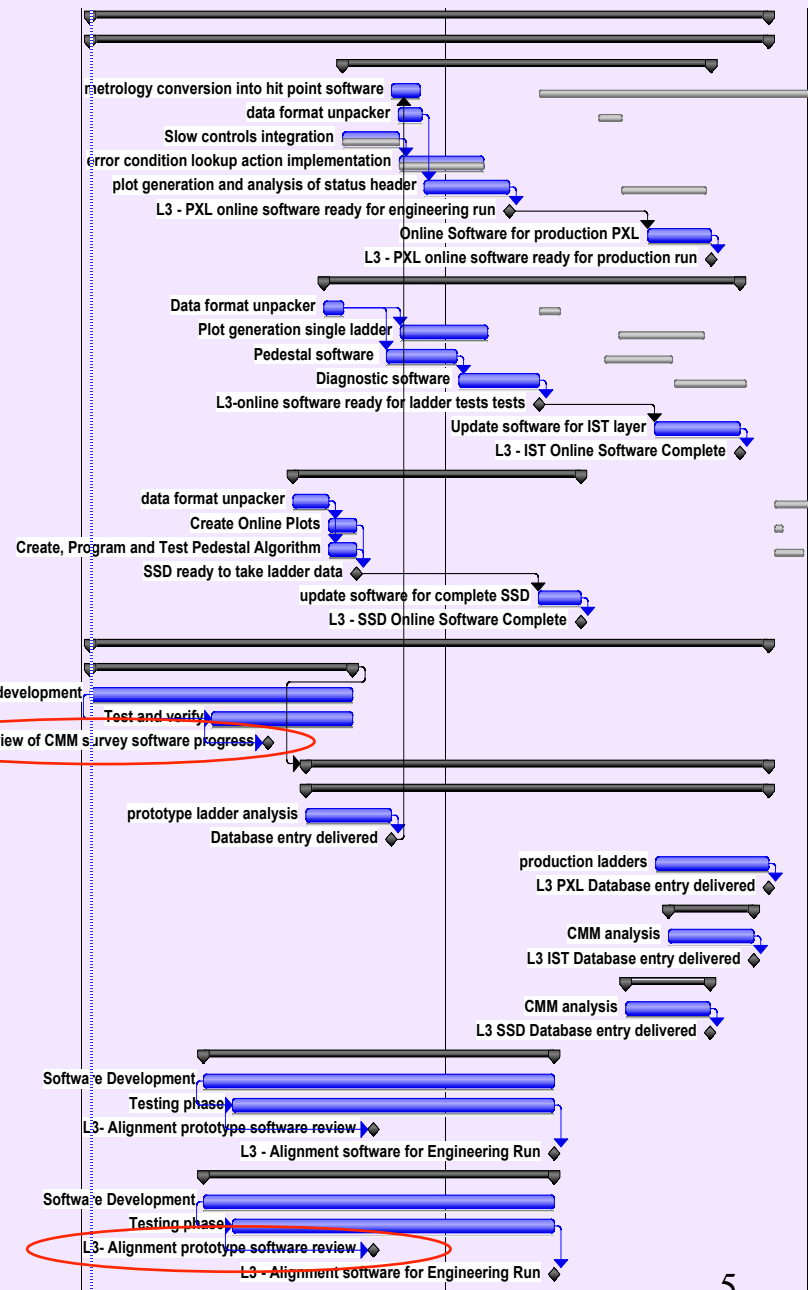
10/2012

10/2013

1.6	Software	0%	464 days
1.6.1	Online	0%	464 days
1.6.1.1	PXL	0%	251 days
1.6.1.1.1	metrology conversion into hit point software	0%	20 days
1.6.1.1.2	data format unpacker	0%	17 days
1.6.1.1.3	Slow controls integration	0%	40 days
1.6.1.1.4	error condition lookup action implementation	0%	60 days
1.6.1.1.5	plot generation and analysis of status header	0%	60 days
1.6.1.1.6	L3 - PXL online software ready for engineering run	0%	0 days
1.6.1.1.7	Online Software for production PXL	0%	45 days
1.6.1.1.8	L3 - PXL online software ready for production run	0%	0 days
1.6.1.2	IST	0%	284 days
1.6.1.2.1	Data format unpacker	0%	14 days
1.6.1.2.2	Plot generation single ladder	0%	61 days
1.6.1.2.3	Pedestal software	0%	50 days
1.6.1.2.4	Diagnostic software	0%	50 days
1.6.1.2.5	L3-online software ready for ladder tests tests	0%	0 days
1.6.1.2.6	Update software for IST layer	0%	60 days
1.6.1.2.7	L3 - IST Online Software Complete	0%	0 days
1.6.1.3	SSD	0%	195 days
1.6.1.3.1	data format unpacker	0%	25 days
1.6.1.3.2	Create Online Plots	0%	1 mon
1.6.1.3.4	Create, Program and Test Pedestal Algorithm	0%	20 days
1.6.1.3.5	SSD ready to take ladder data	0%	0 days
1.6.1.3.7	update software for complete SSD	0%	30 days
1.6.1.3.8	L3 - SSD Online Software Complete	0%	0 days
1.6.1.4	Calibration and alignment	0%	464 days
1.6.1.4.1	Survey Software	0%	180 days
1.6.1.4.1.2	CMM analysis software development	0%	9 mons
1.6.1.4.1.1	Test and verify	0%	5 mons
1.6.1.4.1.9	Internal Review of CMM survey software progress	0%	0 days
1.6.1.4.5	CMM analysis	0%	318 days
1.6.1.4.5.1	Analysis of PXL	0%	318 days
1.6.1.4.5.1.10	prototype ladder analysis	0%	3 mons
1.6.1.4.5.1.11	Database entry delivered	0%	0 days
1.6.1.4.5.1.12	production ladders	0%	4 mons
1.6.1.4.5.1.13	L3 PXL Database entry delivered	0%	0 days
1.6.1.4.5.2	Analysis of IST	0%	60 days
1.6.1.4.5.2.5	CMM analysis	0%	3 mons
1.6.1.4.5.2.6	L3 IST Database entry delivered	0%	0 days
1.6.1.4.5.3	Analysis of SSD	0%	60 days
1.6.1.4.5.3.1	CMM analysis	0%	3 mons
1.6.1.4.5.3.2	L3 SSD Database entry delivered	0%	0 days
1.6.1.6	Global Alignment	0%	240 days
1.6.1.6.1	Software Development	0%	12 mons
1.6.1.6.2	Testing phase	0%	11 mons
1.6.1.6.3	L3- Alignment prototype software review	0%	0 days
1.6.1.6.4	L3 - Alignment software for Engineering Run	0%	0 days
1.6.1.8	Self Alignment	0%	240 days
1.6.1.8.9	Software Development	0%	12 mons
1.6.1.8.10	Testing phase	0%	11 mons
1.6.1.8.11	L3- Alignment prototype software review	0%	0 days
1.6.1.8.12	L3 - Alignment software for Engineering Run	0%	0 days

CMM analysis software development

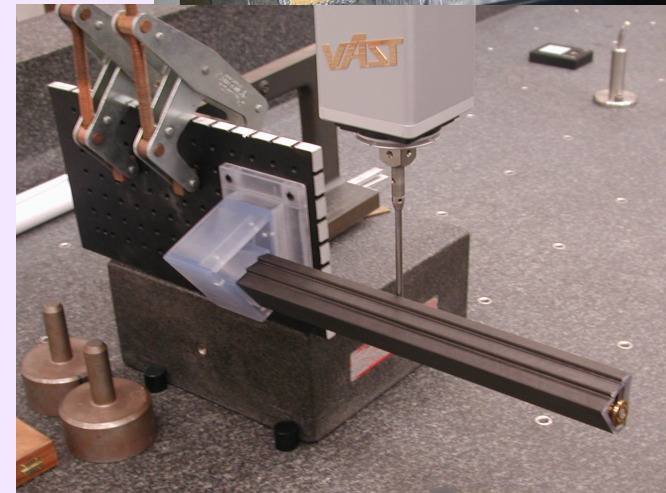
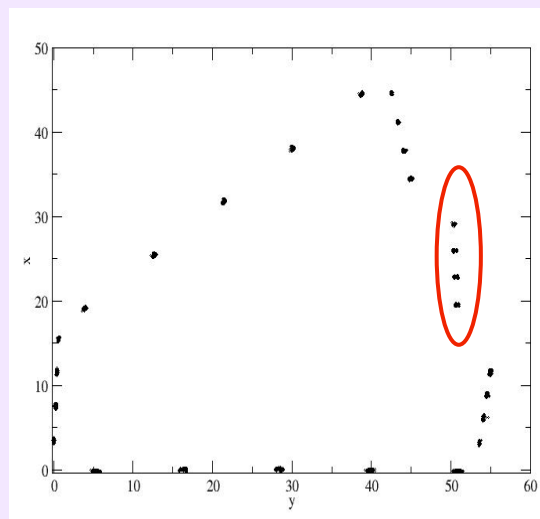
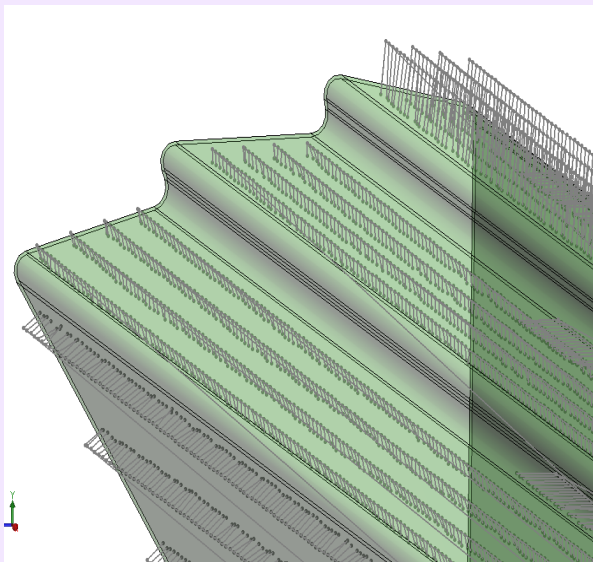
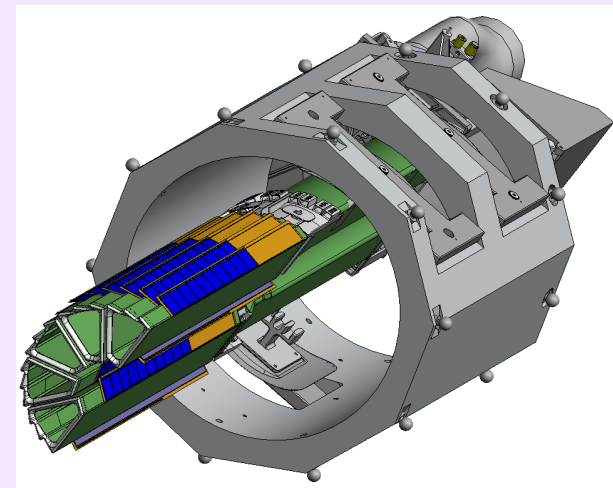
Internal Review of CMM survey software progress



Prioritized list of activities for the next year

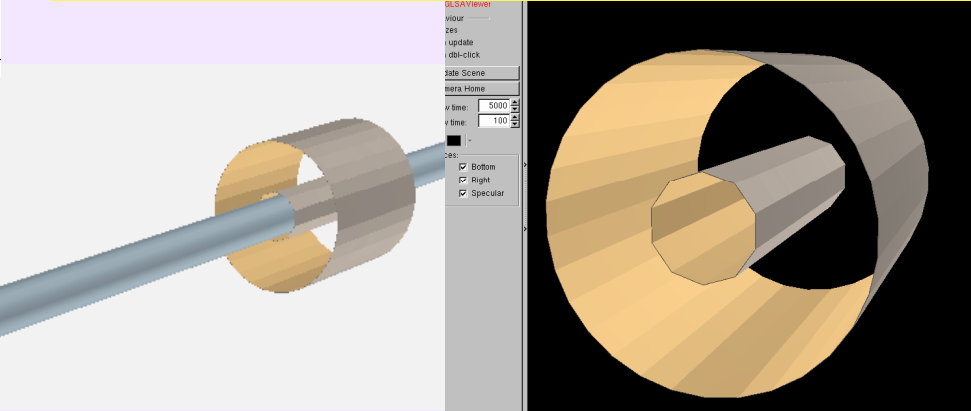
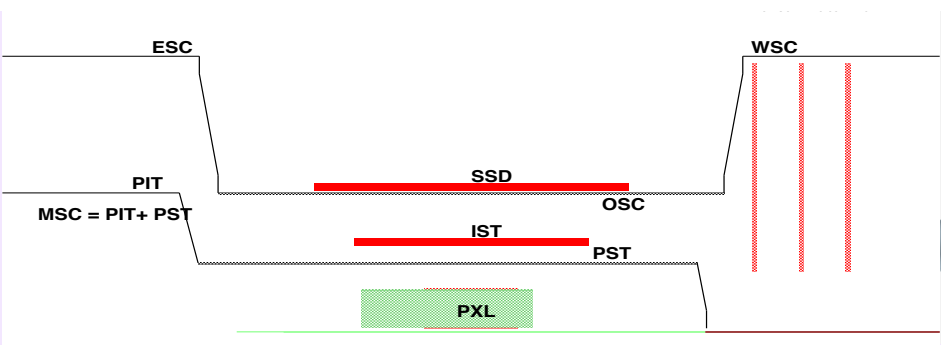
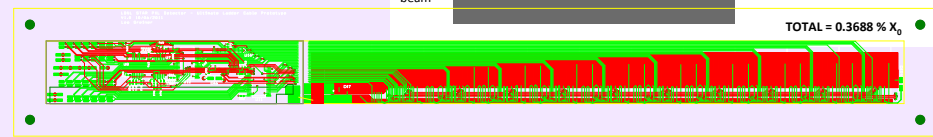
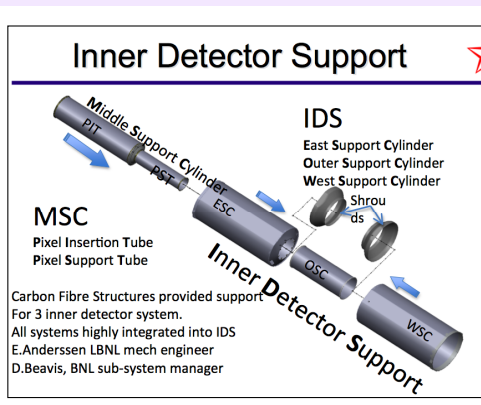
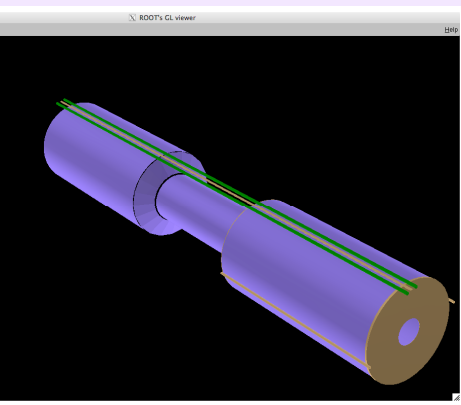
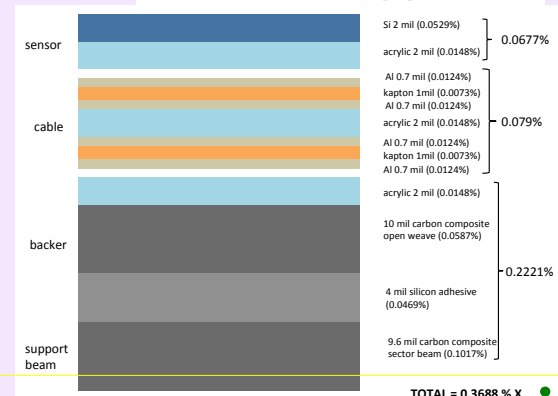
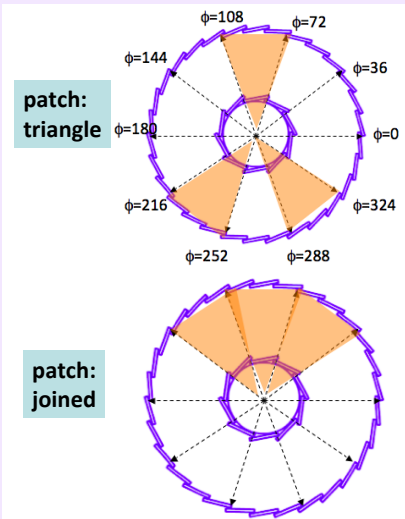
- Survey + related work
- HFT Geometry model (rebuild)
- 'online' data format/slow controls/online QA/Db considerations
- Slow/Fast PXL response simulation
- Prototype tracking
- -----
- Evaluation/Analysis framework
- -----
- Kalman fitter for decays
- Tests of new/old tracker
- **Hit reconstruction**
- Event vertex finders

- **Survey measurements + related work for PXL fixtures and prototype sectors**
- No hardware monitoring system. PXL by design has ~ 20 micron re-positioning envelope
- We need precise and detailed survey data
 - New hardware (CMM machine)
- Experience from SVT/SSD a big plus
 - but there are differences
- Some initial test are done. More work coming
 - Review in April 2012



HFT Geometry model

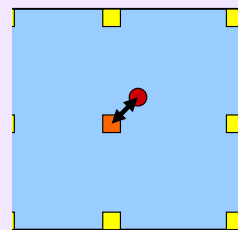
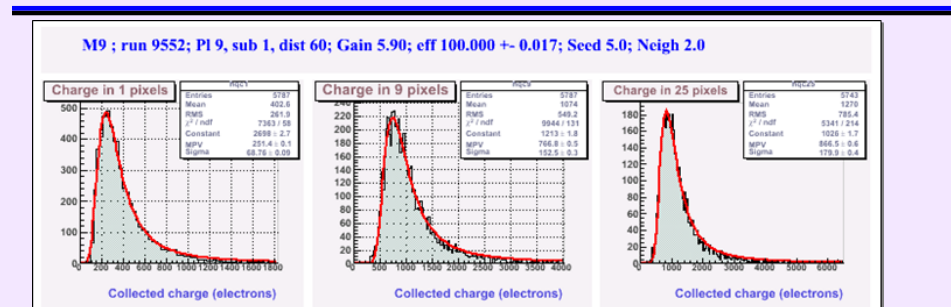
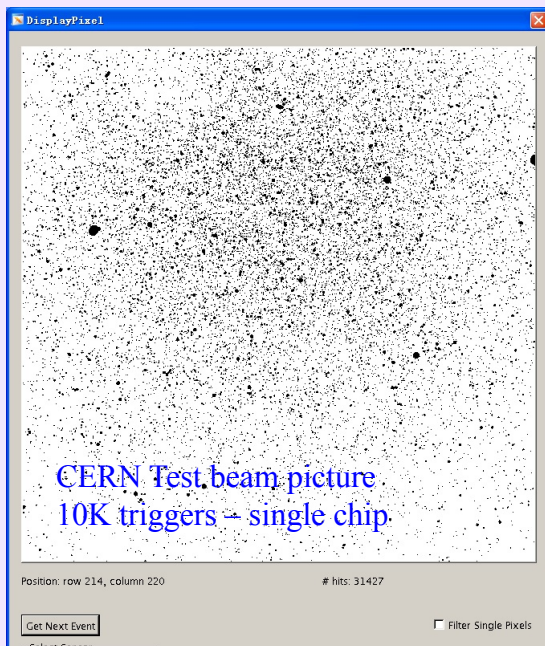
- Create initially Y2013a/b and then Y2014 geometries
- In new AgML framework
 - Jason's help invaluable
- We are gathering info on material for Y2013
 - What, how much XO
- Decide on what is the best way to move from eDrawing to AgML
- ...but manpower an issue (no skill required)



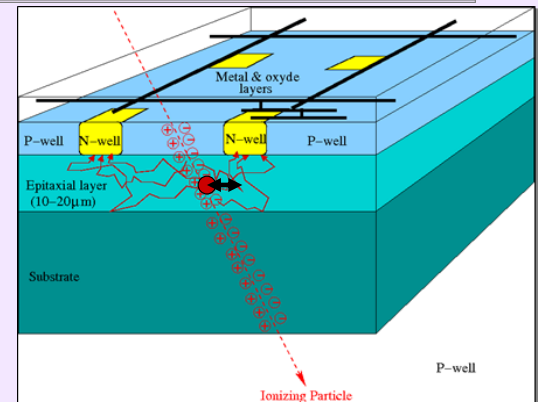
'Online' data format/slow controls/online QA/Db considerations

- Needs to be defined/clarified a.s.a.p.
- It was a '**Focus Subject**' on Monday's HFT meeting

- **Slow/Fast PXL response simulation**
- Initial work done earlier by Purdue
- Strasbourg is collaborating (huge experience)
 - Got their DIGMAPS code
 - they will help with noise simulation
- we got data (inclined incidence) during the CERN tests.
 - can fix most parameters
- Will collaborate to make an acceptably fast 'slow' simulator for the chain
- ...but manpower is thin



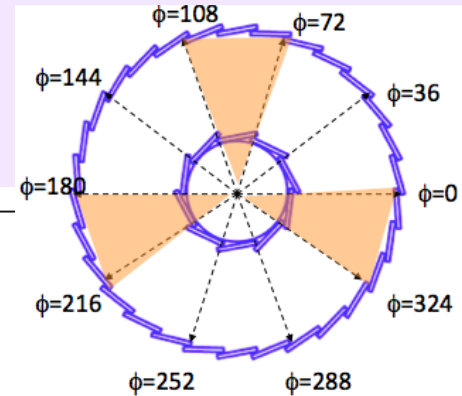
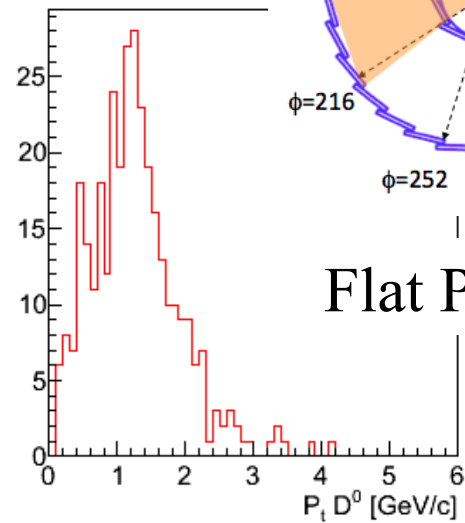
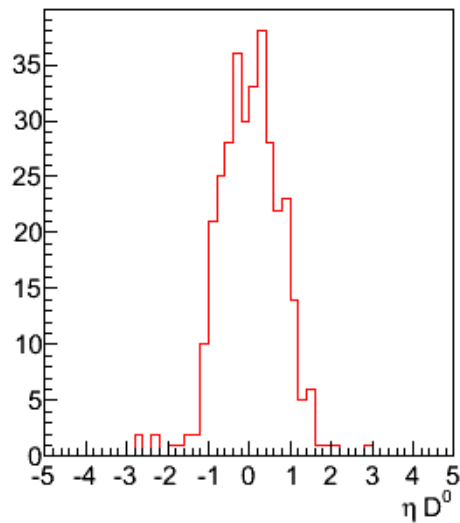
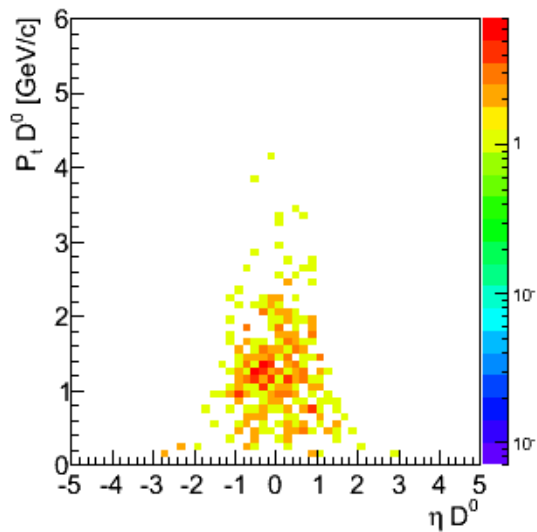
- = Collecting diodes
- = seed diode
- = Impact position
- = seed-impact distance



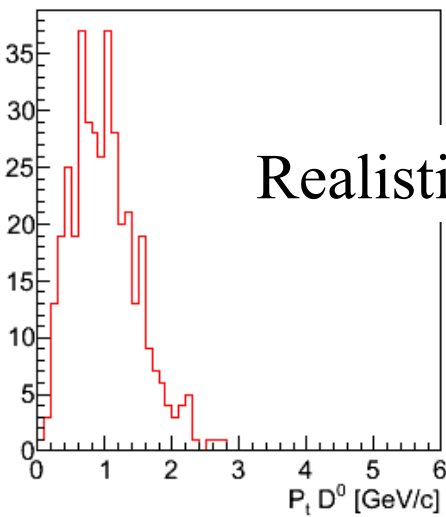
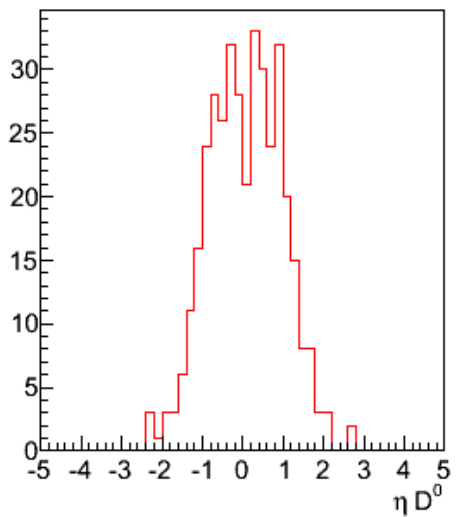
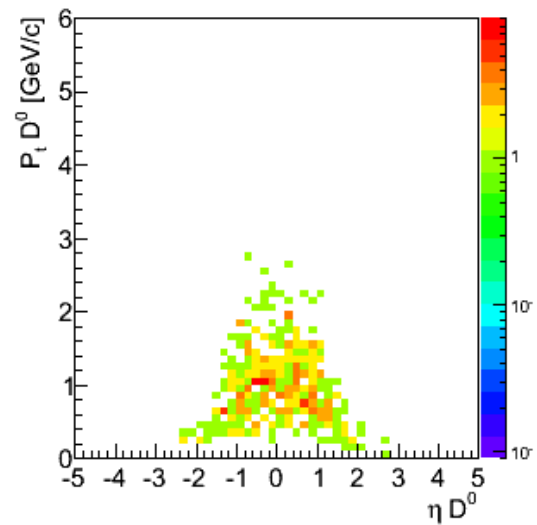
- **Tracking with TPC+PXL prototype?**
 - Can we do any physics with the prototype data?
 - Issues are the partial acceptance (only 2-4 sectors present) and the lack of intermediate tracking (SSD, IST)
 - Jonathan spends some time on this right now
 - Some initial results look not disappointing but...let's not celebrate yet.
 - For details see his talk at the HF group here:

<http://drupal.star.bnl.gov/STAR/meetings/star-collaboration-meeting-nov14-18-2011-lbnl-ca/heavy-flavor-parallel-sessions/pythia-evo>

Mercedes configuration

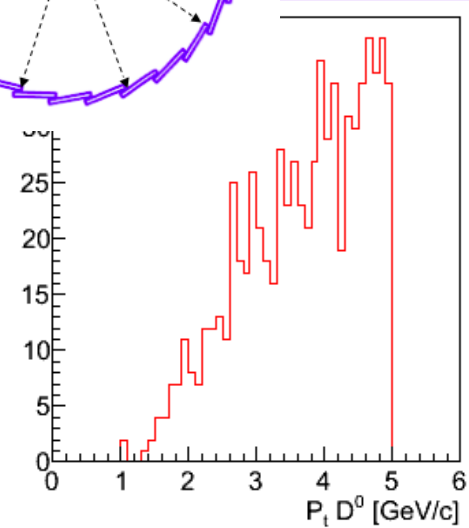
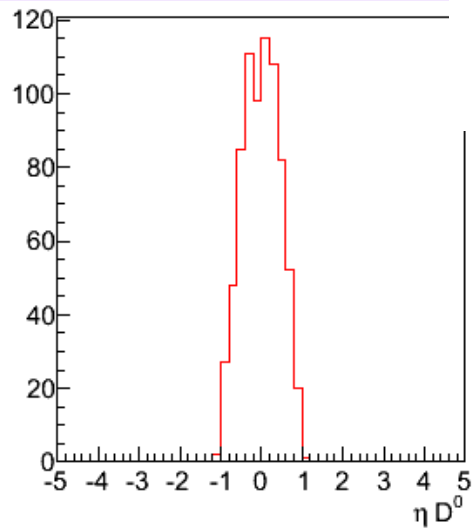
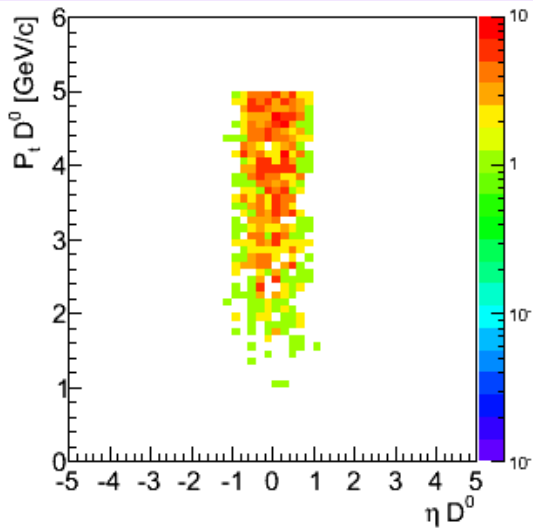
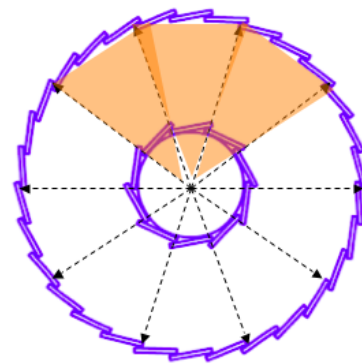


Flat Pt input

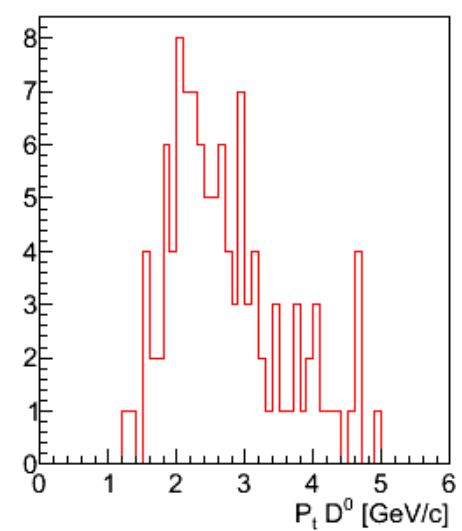
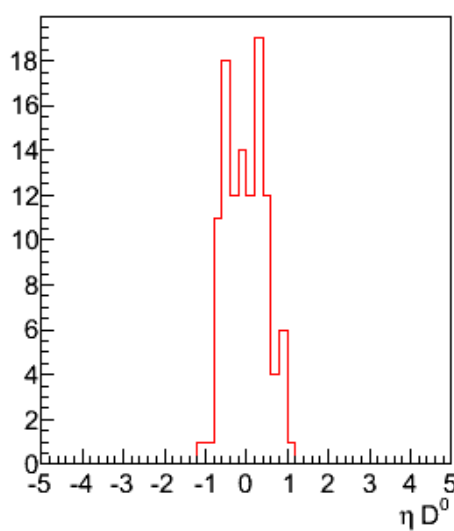
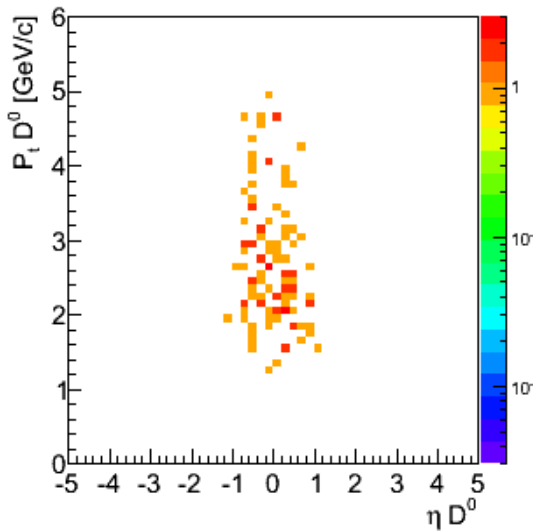


Realistic Pt input

Joined configuration

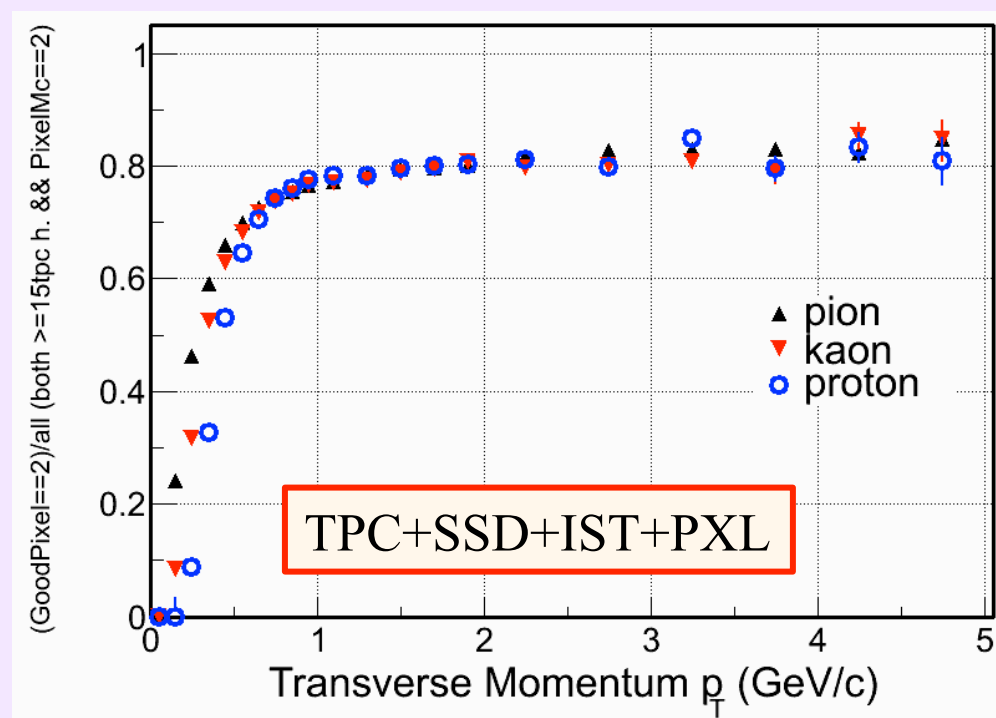
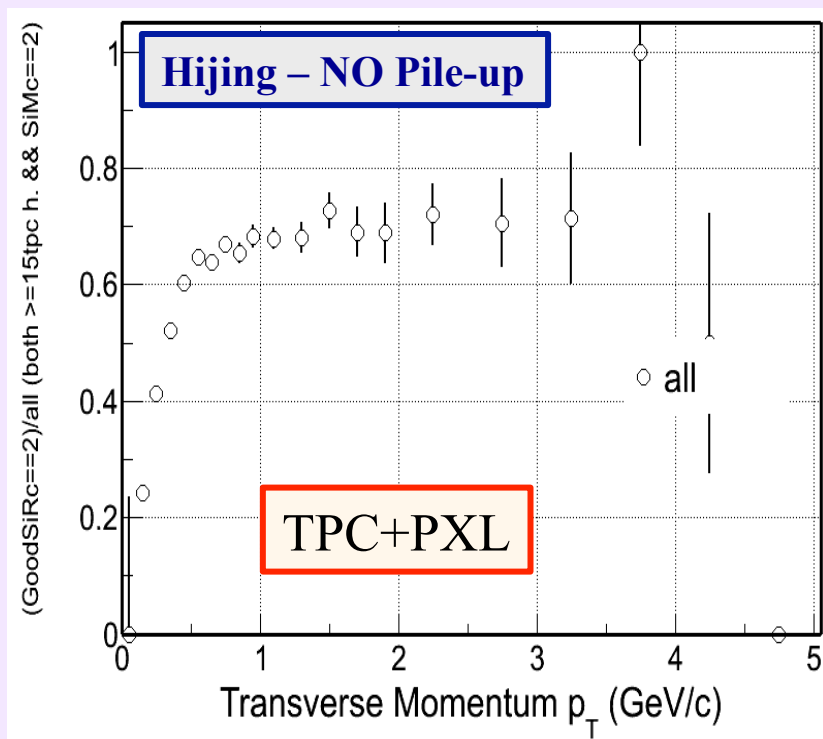


flat



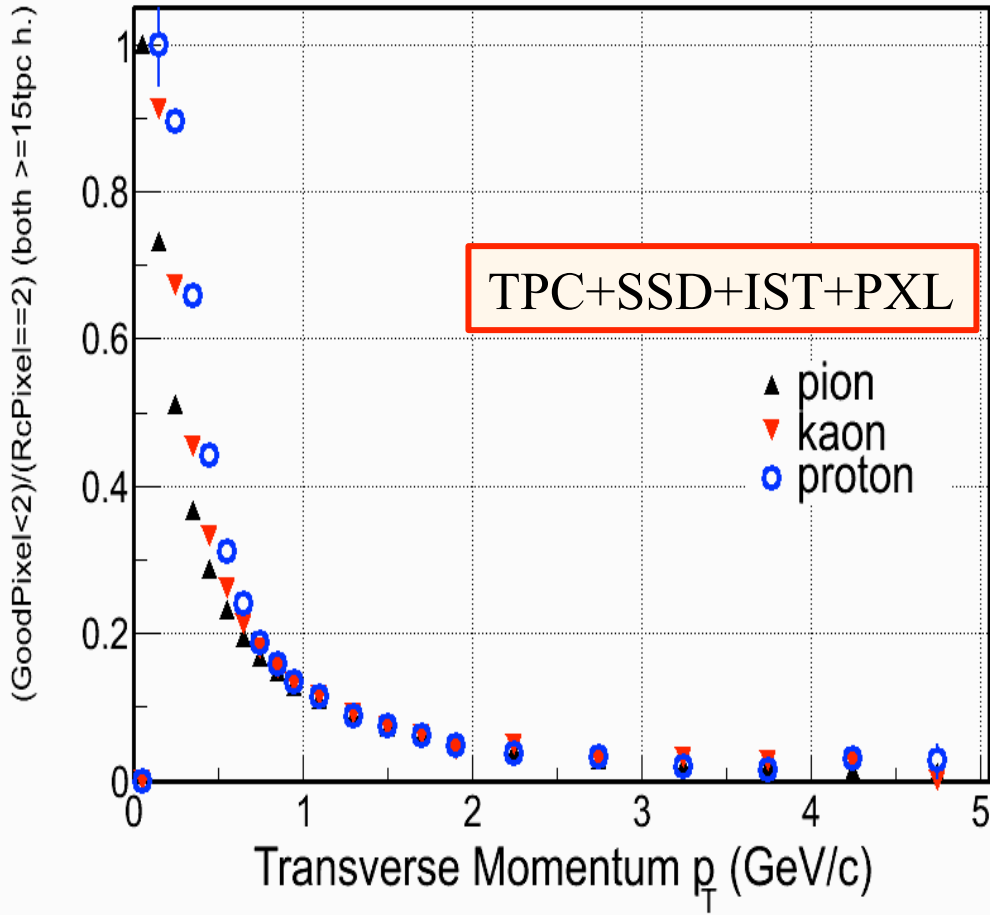
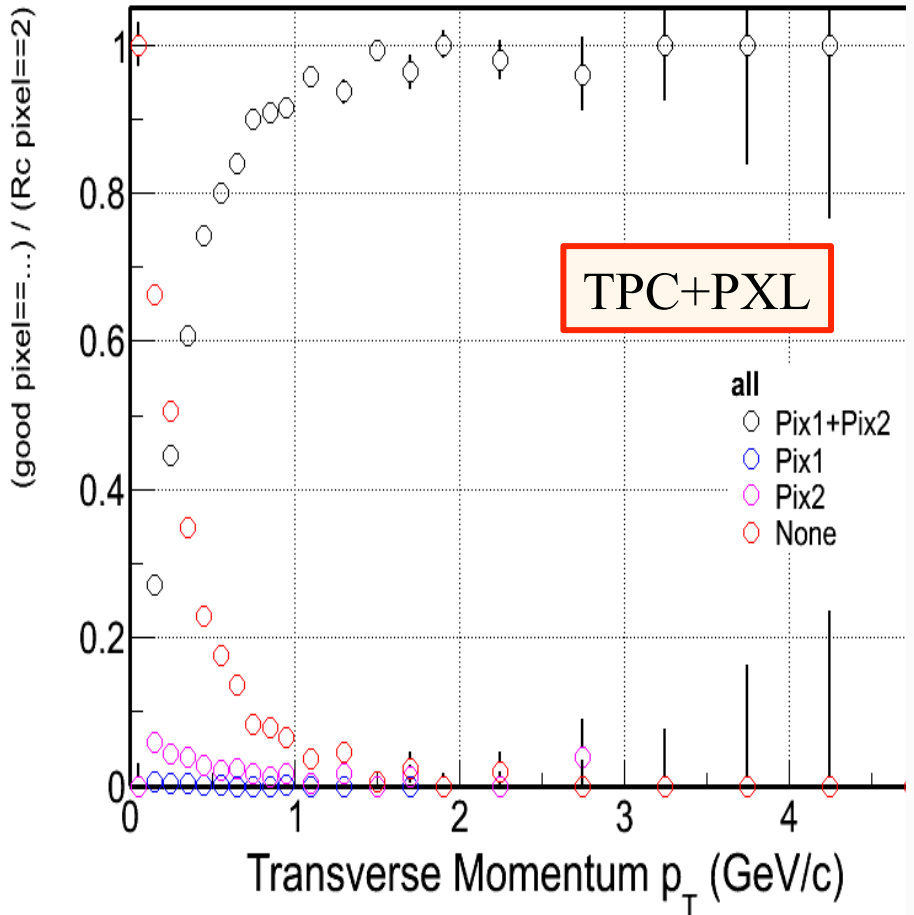
real

- **Tracking with TPC+PXL prototype?**
 - Good tracking efficiency (but no pile-up yet)

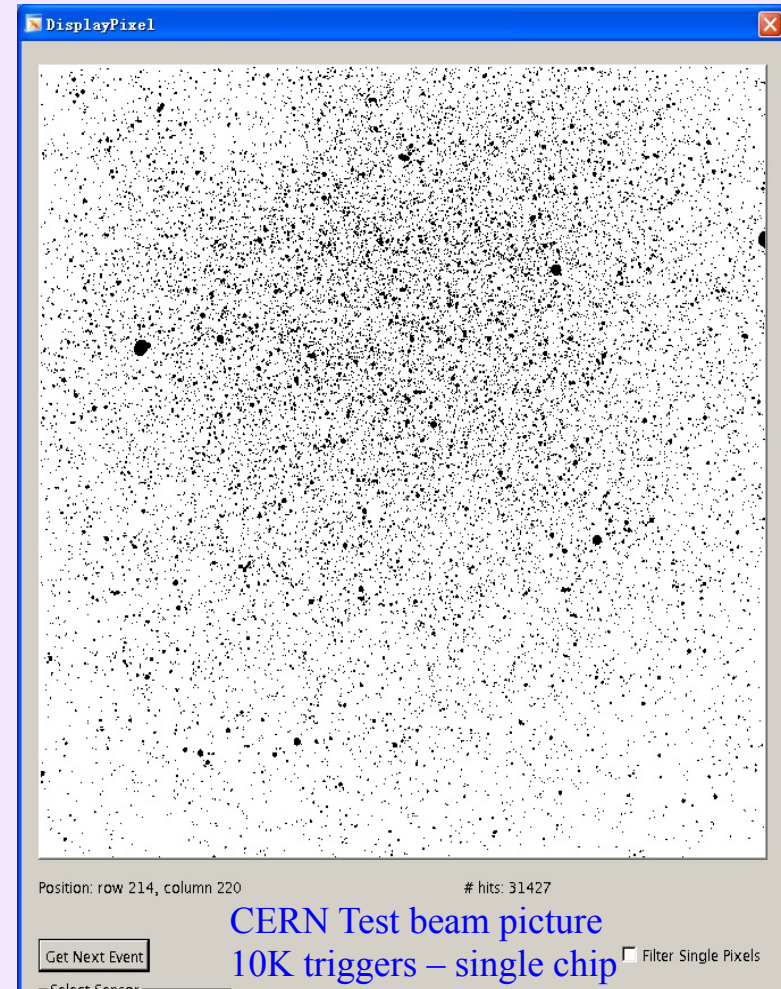


- Tracking with TPC+PXL prototype?
 - Low Ghosting

Hijing – NO Pile-up



- **Analysis of CERN test data**
- Fix simulator parameters
- Check clustering/tracking
- get a 'feeling' of PXL environment



OtherTasks

- For the next 2 years
 - -----
 - Evaluation/Analysis framework
 - -----
 - Tests/evaluation of tracker
 - **Hit reconstruction software**
 - Event vertex finder evaluation

Summary

- Things started moving but pace is not the desirable one mainly due to low number of people involved
 - We need to change this.
 - We need to make the Collaboration aware of the coming HFT
- We started interacting with the S&C group and expect an increasing interaction with the BNL-core group
 - Started with Jason on geometry but will expand to all areas like Calibration, Tracking etc
- The HFT is around the corner. If your physics interests are in HF or if you can benefit from precision tracking assign your student's service time to this group

Spares

WBS task dictionary and schedule has been developed

WBS 1.6 (Software): Schedule (Template)

1.6 Software

The Software deliverables contain all software modules necessary to produce physics results. The tools are divided into two broad categories: Online and Offline. The modules needed will monitor, calibrate, reconstruct, analyze and evaluate acquired data samples.

1.6.1 Online

The online software primarily ensures the data integrity during data acquisition, appropriate detector monitoring and sample event reconstruction. Online software is detector specific and is a deliverable of the corresponding sub-system.

1.6.2 Offline

The offline environment consists of the event reconstruction software packages. This starts with the raw data as input and through proper calibrations it produces detector cluster/hit finding, integrated tracking, event-vertex and secondary vertex finding and event information writing on DSTs.

Hit Reconstruction

The Cluster/Hit finder is the first piece of code applied to the pedestal subtracted raw information from the IST and PXL detectors and its task is to deliver reconstructed space points to tracking software. The software modules associated with this task are outlined below (grouped by detector):

1) SSD: The SSD is an existing (refurbished) detector in STAR. Its behavior is well understood and there are hit reconstruction modules already in place. The only software tasks left are dead-strip mapping (a calibration/Db issue) and the update/testing of the hit finder routine with the new configuration. We also list here an unfinished/untested single-side hit finder as a prospective hit-finder update provided the manpower to finish it.

1.1 Test/Certify/Update the existing SSD cluster/hit finder with the new configuration. 0.5 FTE for a period of 6(2) months is needed for this task completion.

1.2 Test/Evaluate the single-side hit finder based on the Root function TFSpectrum initiated by BNL/Nantes. 0.5 FTE for a period of 6(2) months is needed for this task completion. The deliverable would be a replacement cluster/hit finder for the SSD and perhaps the IST.

Institutions responsible: [KSU, BNL, other]

2) IST: The IST hit finder can either be a modified version of the SSD one (since the

1.6 Software

ID	Task-name	Duration	Begin-Date	Predecessors	Resources ¹
1.6.1	Hit Reconstruction	24 months	09/01/2011		3.0 FTE
1.6.1.1	PIXEL Hit Reconstruction	24 months	09/01/2011		1.5 FTE
1.6.1.1.1	Develop/Test	6 months	09/01/2011	1.6.7.1	
1.6.1.1.2	Evaluate/Tune	4 months	09/01/2011	1.6.7.1	
1.6.1.2	IST Hit Reconstruction	24 months	09/01/2011		0.5 FTE
1.6.1.2.1	Develop/Test/Eval.	6 months	09/01/2012	1.6.7.2	
1.6.1.3	SSD Hit Reconstruction	24 months	09/01/2011		1.0 FTE
1.6.1.3.1	Update/Test/Eval.	6 months	09/01/2012	1.6.7.3	
1.6.2	Tracking	36 months	09/01/2011		2.0-4.0 FTE
1.6.2.1	Update/Test/Evaluate	36 months	09/01/2011	1.6.8/1.6.7.1-3	
1.6.2.2	Alternative Track. Eval.	24 months	06/01/2011	1.6.8/1.6.7.1-3	

¹ See detailed breakdown in Appendix