Software Update

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Content

- Technical progress and issues
- Expected progress for next ½ year
- Resource overview and needs
- Slow control considerations, interlocks.
- Lab space needs at BNL.

Progress

- No much progress since last meeting
  - Mainly due to QM efforts (fact not excuse!)

- Minor work for CD2/3 Q-A sessions
- Some progress on B-meson (+MTD) studies by MTD-people (see next slides)

- But effort ramps up quickly
  - Mainly due to redirecting of effort into HFT
  - Weekly meeting restarted, Software day on Monday

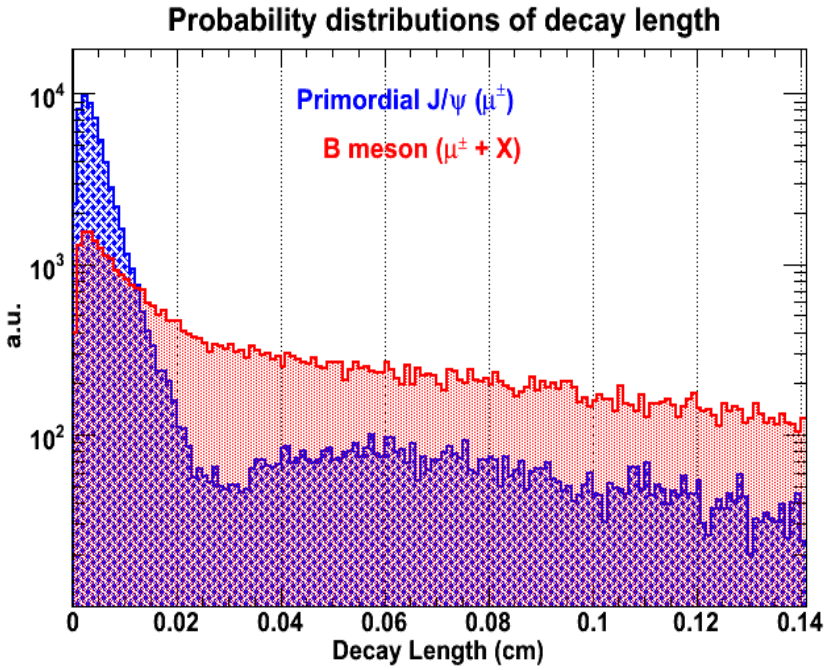
B -> J/ψ + K -> (μ+μ) + K

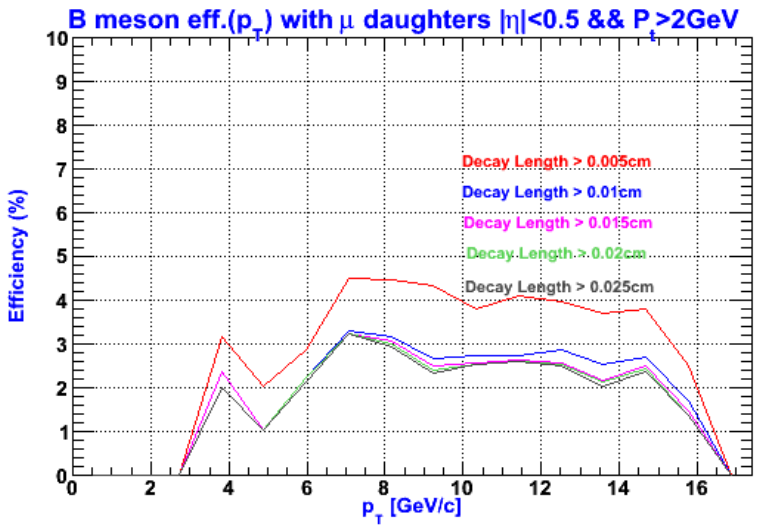
- Still work in progress
  - Hand calculations are encouraging
- **Yasser Mohammed** (Texas A&M) pursuing this (MTD group)

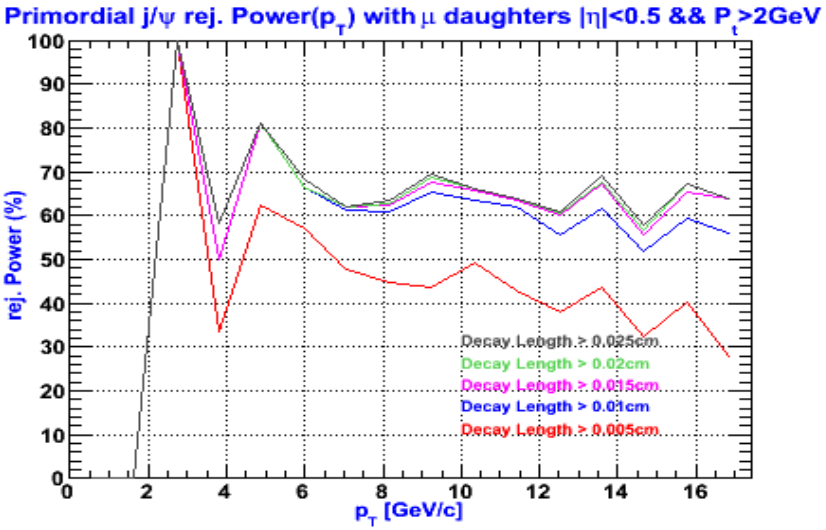
In the Last presentation we show the next

- The decay length of the primordial J/ψ vs J/ψ (B^+ decay)

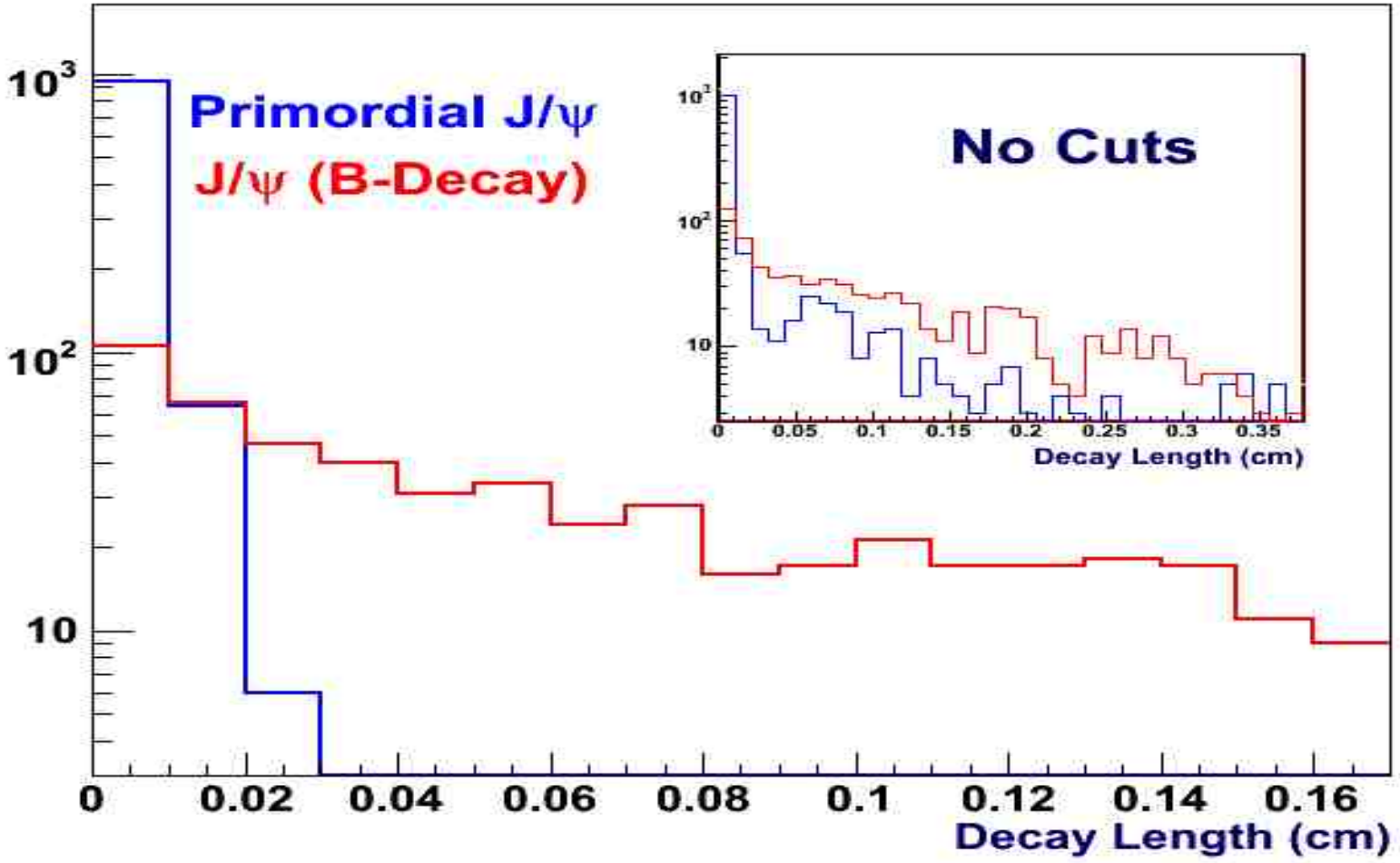
- The B meson efficiency and the Primordial J/ψ rejection power







Require agreement between Rec and MC Event Vertex to within 0.03 cm.



✓ **This cut reject the primordial J/ψ decay length tail**

To do list

- Plot the pseudo proper decay length figure for b-decay J/ψ vs primordial J/ ψ and investigating the long tail in the primordial decay length

- Estimate realistic input to calculate Actual background from Primordial J/ψ in B-meson measurement.

- Signal significance using HFT+MTD- need realistic backgrounds from hadron contamination (currently embedded output only includes decay products from simulated particles).

- Run simulation with MTD response (When available).

Issues

- Prioritized list of activities for the next year
  - CMM + related work (on-scope)
  - HFT Geometry model update
  - Slow/Fast PXL response simulation
  - ----------
  - Evaluation/Analysis framework
  - 'online' data format/slow controls/online QA/Db considerations
  - ----------
  - Kalman fitter for decays
  - Tests of new STV tracker
  - Hit reconstruction
  - Event vertex finders

CMM Measurement Plan at LBL

Introduction

These are some notes on the goals and tasks associated with the Survey of the Pixel detector and related support hardware like the prototype fixture.

Goals

The goals are:

1. Test-drive and machine and measure actual resolutions
2. Become familiar with the output. Prepare code to manipulate it and transform it to a 'standard' format (common to all subsystems)
3. Survey the *Prototype Fixture* and enter it into the Database
4. Build and Survey a prototype Pixel *Sector*. Depending on result decide on best Db-representation scheme. Decide on data density/volume per sector. Assess possible variations until Shell is installed *in-situ* due to transportation/handling.

Measurements

In order to achieve the above goals the following measurements are proposed to be performed at LBL some time soon. Please feel free to comment.

1. Survey a flat Silicon disk (300 or 50 um) with the Camera and with the Touch Probe when available. This relates to goals 1) and 2) above.
2. Survey a couple of spherical and rectangular objects several times. This also relates to goals 1) and 2) above.
3. Survey the *Prototype Fixture.* Then, analyze the data and enter it in the Db.
4. Survey a prototype Pixel *Sector*. If possible, simulate transportation/installation stresses/fatigue and re-survey it. Compare outputs, estimate margins and enter the data in the Db

Development of spatial map-Tools (2)

ZEISS: touch probe 2-3 μm (xyz) and visual 2-3 μm (xy) 50 μm (z)

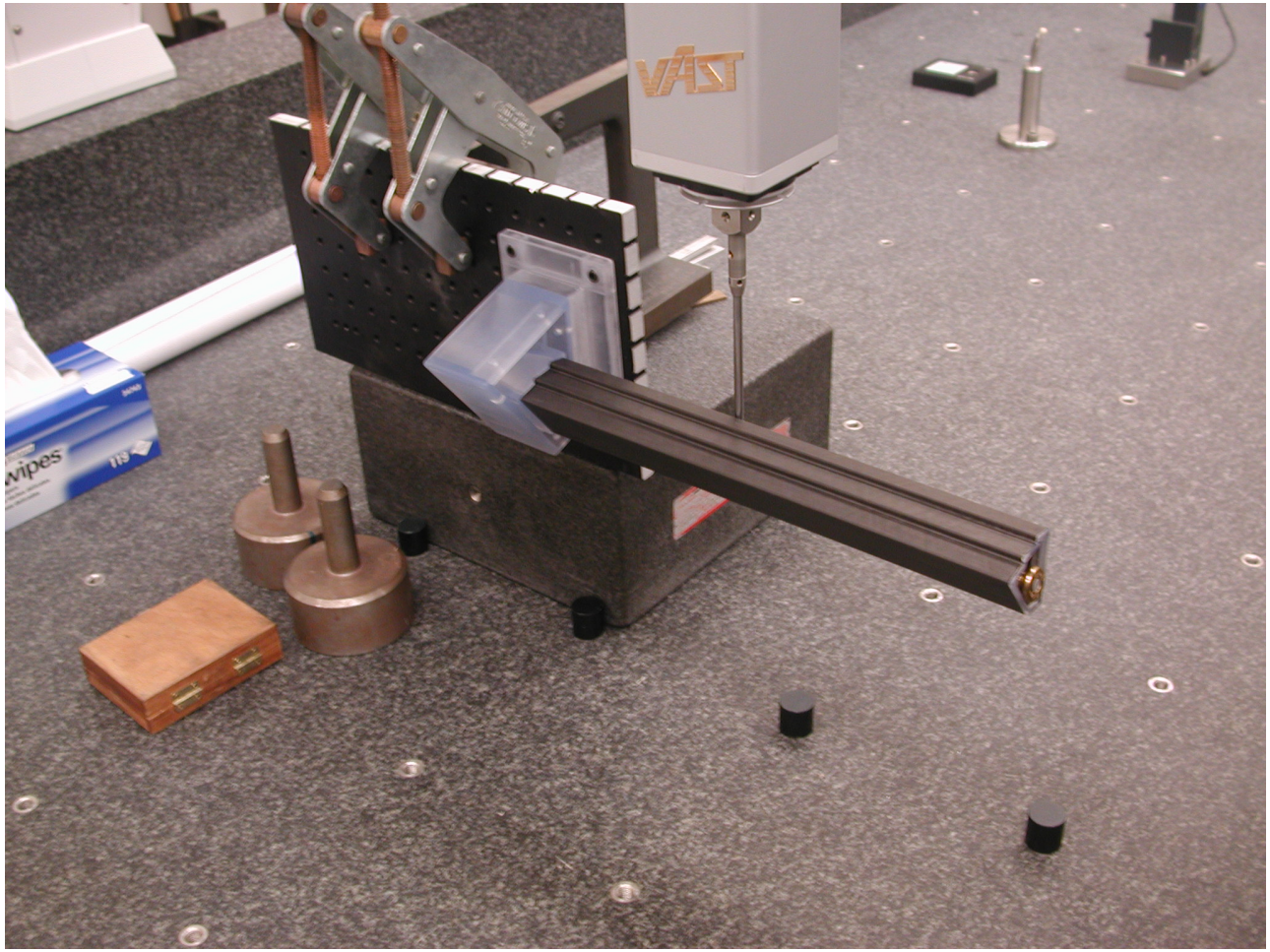
active volume: huge (SSD/IST)

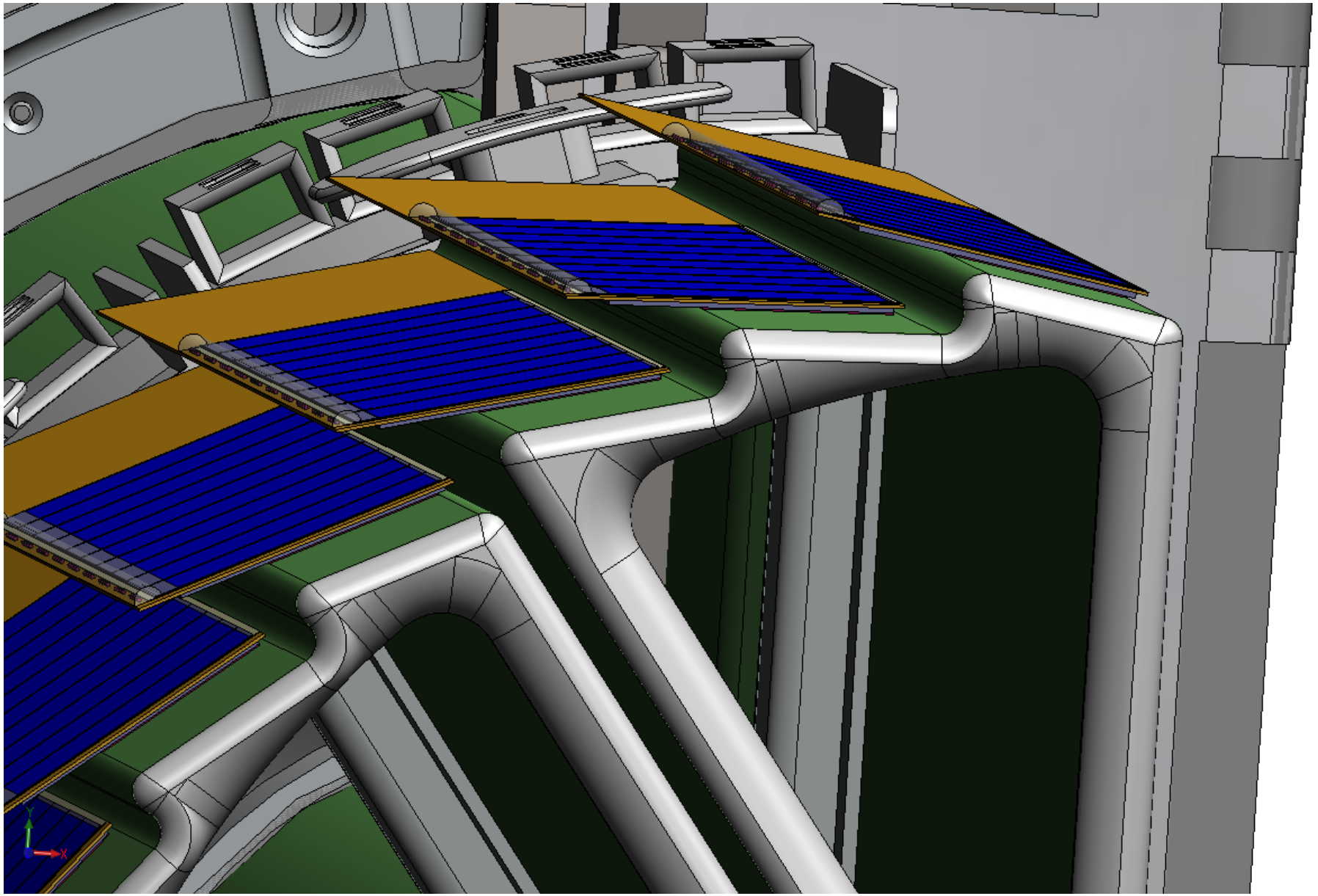
VIEW-300:visual sub micron (xyz) repeatability 5 μm accuracy over active volume

no touch probe (coming!)

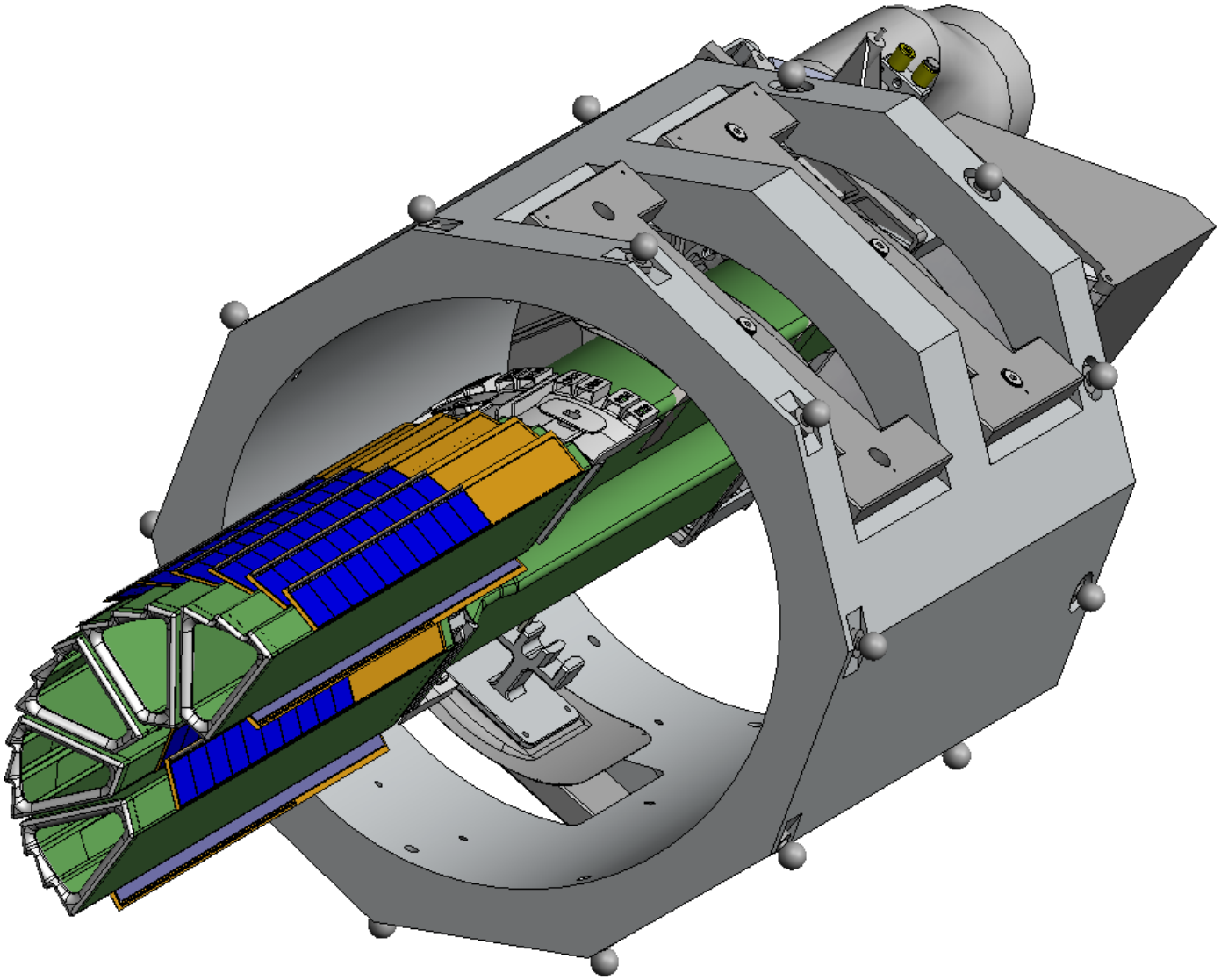
active volume:
30 in X 30 in X 12 in (PXL)

We want something like this with the chips glued on and measured in new machine





Prototype fixture…also used for supporting half cylinder for CMM mapping of PIXEL surfaces



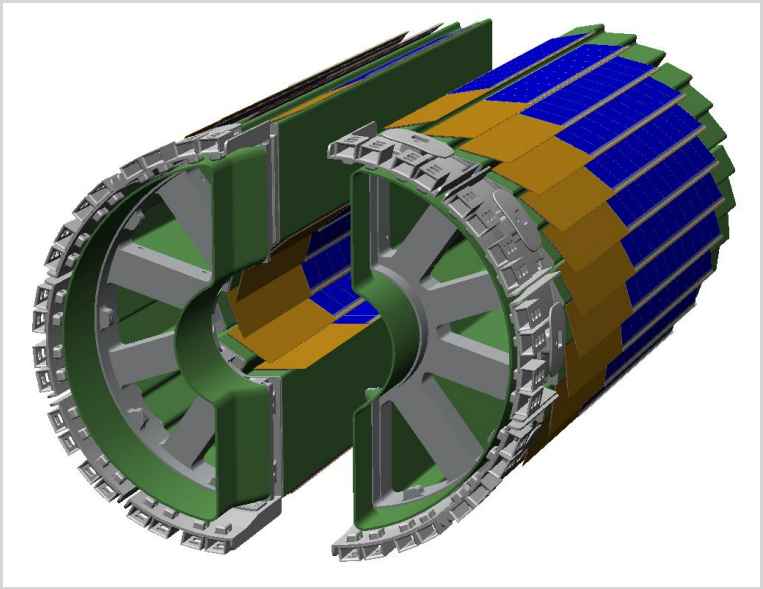
Summary (partial)

- We are pretty familiar with the ZEISS machine and its measurements.
  - We still need to streamline the data translation code and put it in a final (CVS) place
  - The SSD/IST survey straightforward, but it has to happen sometime in the next 1-1.5 years.
- We are about to start playing with the VIEW 3000
  - Needs to happen before the end of the year
- Manpower involved is still thin but finite.

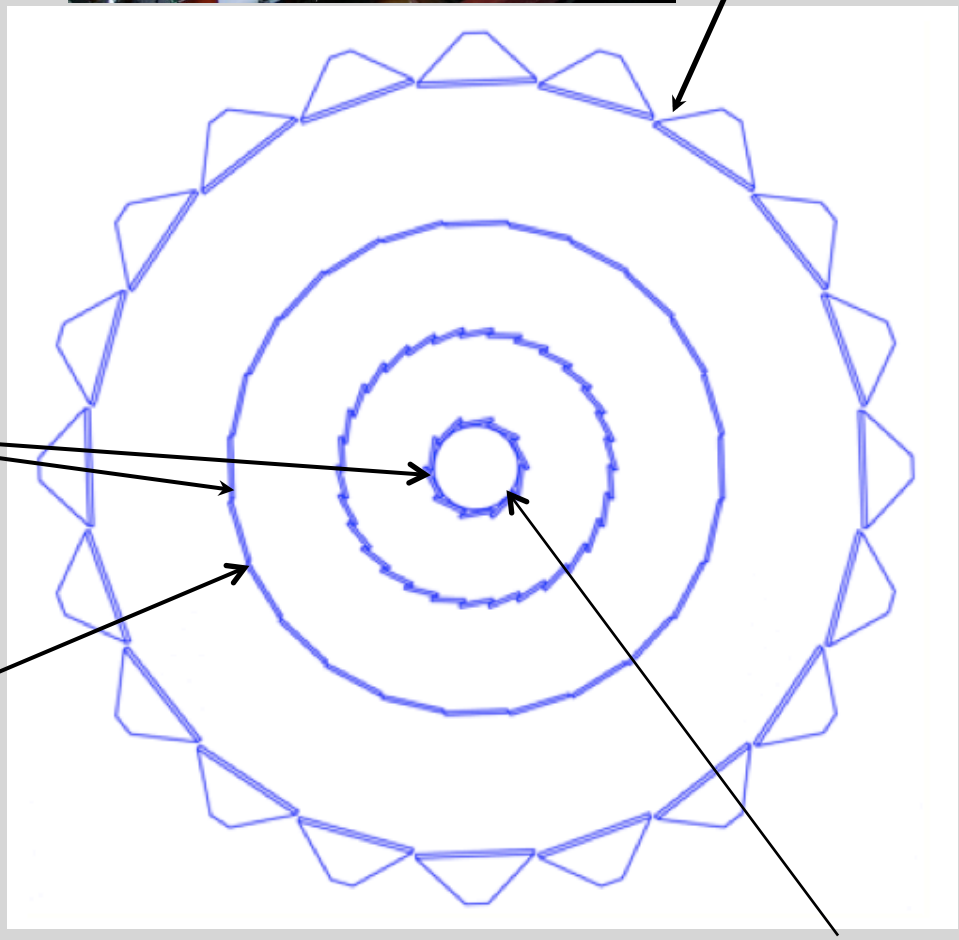
Geometry Model Update

HFT Elements

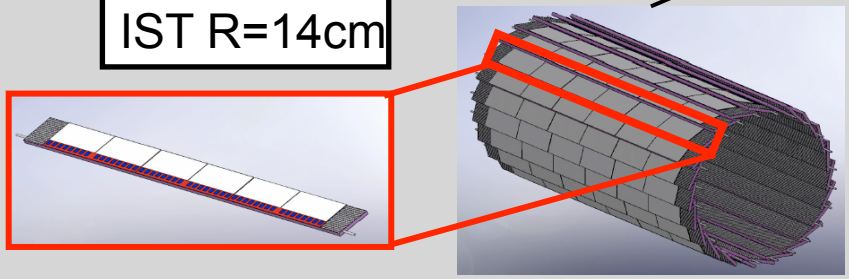
SSD+ R=22cm



Pixel 1-2 R=2.5, 8cm



IST R=14cm



New beam pipe

Summary (partial)

- We are ready to move on…and we will
- We need interaction with the engineers:
  - To get the design drawings
  - For $\langle X_0 \rangle$ estimates in sandwiched areas (glue etc)
  - Decide on appropriate abstraction level

- If 2-3 people devote 20-30% of their time to this I anticipate substantial progress in the next half year

PXL response simulators

- We can benefit from IPHC work on this
  - DIGIMAPS
- Adapt it to our needs (we do not shoot for 2 microns resolution etc etc)
- We will move on this quickly
  - Beam tests are important part of this, since it is a data driven model
  - Hard to give a timeline estimate right now

Outlook: implementing a digitizer in HFT-software

- DIGMAPS = Tool under development but allows already many studies:
  - sensor(s)/models with a digitised output
  - any other charge transport model
    - Optimize parametrized models for fast sim
  - Optimize ADCs/discris
    - N bits, dynamic range, Noise, etc.
  - clustering algorithms
    - chip occupancy
    - Hit separation performances
  - Zero suppression blocks, etc.
  - Study incident angle effects
  - CPU performances vs models
- HFT simulation (Fast/full simulation)
  - Simulating charge transport can be CPU time consuming
    - You should define which amount of complexity/computing you can afford.
  - A lot of possible algorithms/approachs
    - DIGMAPS can help to decide which precision you want
    - Multiplicity vs incident angle/charge deposition/impact position = difficult to parametrize
  - Nevertheless, building a physical model is out of reach
    - Data driven approach
    - Use test beam data as input/guideline is the key

Resources/Needs

FTEY	Software task		BNL	IPHC	UCLA	KSU	NPI	MIT	LBL	Purdue	USTC
	Offline										
2	Hit Reconst.	IST						X			
		Pixel							X	X	
2	Tracking		X	X							
2	Event Vertex		X	X		X	X				
1.5	Decay Vertex		X	X		X	X				X
4.7	Calibration Db	SSD	X			X			X		
		IST	X					X			
		PXL	X						X	X	
2	Alignment	SSD	X			X			X		
		IST	X			X		X			
		PXL	X			X			X	X	
	Simulation										X
1.1	Geometry	SSD	X			X			X		
		IST	X					X			
		PXL	X						X		
0.8	Fast/Slow Sim.	SSD				X			X		
		IST				X		X			
		PXL		X					X	X	
0.5	Embed./Pileup	IST				X		X	X	X	X
	Assoc/Analysis		X			X	X				

BNL	IPHC	UCLA	KSU	NPI	MIT	LBL	Purdue	USTC

- BNL: Infra, Tracking, support
- UIC: New hire is expected to fill 'MIT' in software(?)
- UCLA: Student (part time) to work on Geometry
- Purdue: Mustafa (part time) on Simulators
- China: Student to work on SSD slow controls + Yifei's contributions (expect the equivalent of 1+ FTEY)
- LBL: Postdoc (fraction) on HFT
- IPHC: 'Lost" Postdoc position. We will get support on simulators.
- KSU: Jonathan + 1 Student (part time)
- NPI: Need to clarify

At November's Collaboration meeting Institutions willing/need to shift some effort should be approached/encouraged to join.

Summary

To paraphrase Flemming's statement:

Software is ramping up