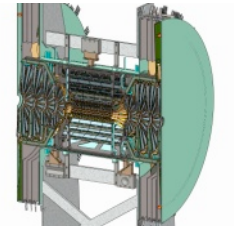


FVTX Homework Questions and Responses

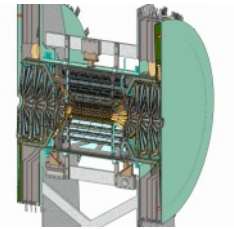


Question 1

“Give a step by step, task by task explanation of how we go from today to steady state wedge production?”

Components required for Wedge Assembly:

- **FPHX Chip Schedule :**
 - Oct 30, 2009 FPHX PR submitted
 - Dec 24, 2009 FPHX chips received (*“I believe 8 weeks is more reasonable.”* from Ray Yarema)
 - Feb 2, 2010 Tested and diced FPHX chips available (all), based on FNAL estimate
 - Feb 9, 2010 Attach 1st chips to wedge assemblies
- **Sensor Schedule :**
 - Nov 4, 2009 Sensor PR received by Hamamatsu
 - Jan 27, 2010 1st Partial delivery (Hamamatsu quote of 3 months)
 - Re-test sensors
 - Mar 2, 2010 Attach 1st sensors to wedge assemblies
 - Mar 30, 2010 Last sensors delivered



Question 1

Components required for Wedge Assembly:

- **Backplane Schedule (direct from Eric Anderssen):**

- Backplane Liaison Tue 9/29/09 Mon 12/7/09
- Backplane Tooling Tue 9/29/09 Mon 10/12/09
- Backplane Material Tue 9/29/09 Mon 12/7/09
- Backplane Fabrication Tue 12/8/09 Mon 3/29/10

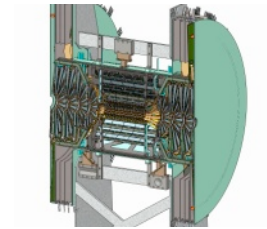
- **First partial delivery (Quotes from Eric Anderssen)**

“If this is to update a schedule with milestones that need to be met, **I will be necessarily conservative**. I will try to beat the schedule I'm about to quote, but there are several cycle times that are not under my control that I need to be mindful of if I'm required to meet a milestone; e.g. material delivery, Material qualification, then my shop schedule.”

“**I am unwilling to guarantee first delivery before week 6 (1-Feb) 2010.**

Preproduction articles may be available in December, but fully qualified production quality wedges I can't assure before week 6, but will obviously push at every quarter to beat this... **First batch will either be ~50 large wedges or ~120 small wedges** (or whatever mixture you prefer).”

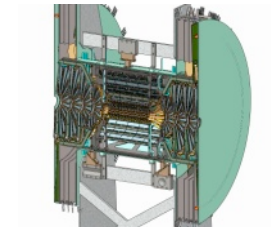
- Feb 2 2010 **Attach 1st HDIs to 1st backplanes**



Question 1

Components required for Wedge Assembly:

- **HDI Schedule:**
 - Nov 2009 Place 2nd prototype order – as soon as quote received (this week) and BNL can place PR
 - Jan 4 2010 Receive 2nd prototype (~6 weeks from today)
 - Jan 11 2010 Assemble wedge(s) with chips and sensor – 1 week
 - Jan 18 2010 Test wedge with chips and sensor – 1 week
 - If HDI works, use first batch (estimated to be 36 HDIs) to make wedge modules and give go-ahead on rest of production order. First HDIs available end of January
 - Feb 2 2010 Attach 1st HDIs to 1st backplanes
- **Basis for Schedule:**
 - All HDIs tested were fully functional (except for sensor biasing problems caused by holes drilled in prototypes)
 - 15-chip HDI with sensor fully tested, and with sensor bias
 - 13-chip HDI with sensor fully tested except bias not applied (with sensor bias for a week's testing)
 - 1-chip on HDI fully read out
 - Additional HDI fully tested electrically upon receipt (no more chips available at this point)
 - If further HDI redesign is required, expect another 6 weeks turn-around



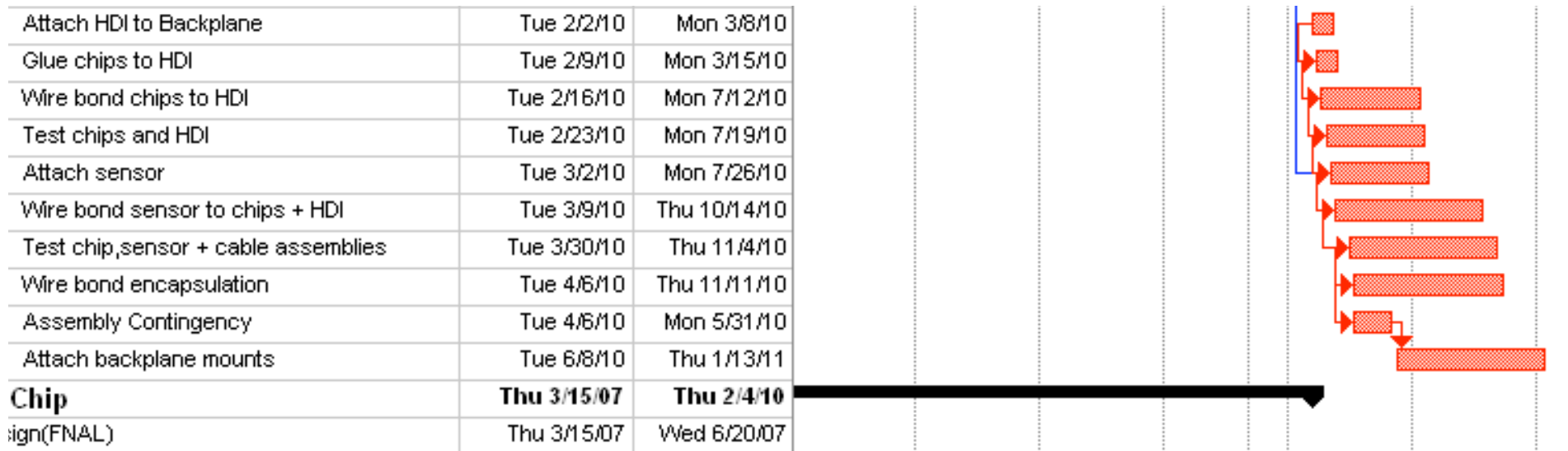
Question 1

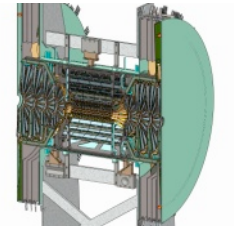
Steady-State Wedge Assembly:

Attach HDI to Backplane:	2/2/10 - 3/29/10
Wirebond FPHX to HDI	2/16/10 - 7/12/10
Wirebond sensor to FPHX	3/9/10 - 10/14/10
Encapsulation	4/6/10 - 11/11/10
Attach BP mounts	6/8/10 - 1/13/11

Parts Delivery

2/2 - 3/29/10
2/10/10
1/27 - 3/30/10



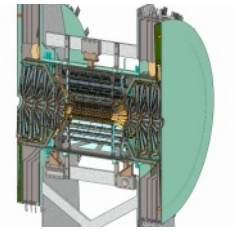


Question 2

“What bench tests can be done on fully completed cages outside the IR?”

- If we populate our LV power distribution crates outside the IR we will be able to power one or more full half-cages at a time, using a portable cooling unit.
- We will have the ability to bias the sensors using the production version of the bias distribution system.
- Interlock system should be reproduced
- With a fully powered half-cage(s), we will connect to the production FEMs, and the full PHENIX electronics chain will be available to readout the FEMs.
- Test 1: Use the calibration system to pulse the system -- this tests everything but the sensors. Requires timing of the calibration pulse with respect to digitization time. The whole readout chain is tested in this way.
- Test 2: Cosmic ray tests --- tests also the sensors themselves. This can be done with or without a cosmic ray trigger, but the use of a trigger is preferred because this is the normal way in which we will operate in PHENIX.

Mini strips active	>80%
Hit efficiency	>85%
Radiation length per wedge	< 2.4 %
Detector hit resolution	< 25 μm
Random noise hits/chip	<0.1%
Level-1 latency	4 μs
Level-1 Multi-Event buffer depth	4 events
Read-out time	< 40 μs
Read-out rate	> 10 kHz



Question 3

"Give us a step by step, task by task explanation of the project progression from access to the VTX at the end of the Run-11 to the FVTX installed in the VTX enclosure and meeting the FVTX project deliverables?"

1. Integrated FVTX/VTX support systems, and FVTX cable plants should be installed in the IR prior to Run 11. Detector must be fully exercised with PHENIX DAQ prior to installation in enclosure (as in Question 2).
2. The East and West PHENIX carriages must be separated. The VTX support systems (dry air, cooling fluid, bias supplies, power supplies, fiber optics) must be disconnected. Then the VTX can be removed.
3. The VTX/FVTX enclosure has two halves, East and West, and these will be placed in the detector test/assembly area in 1008.
4. The FVTX half-cages will be installed in the East and West enclosures. **1 week**
5. The FVTX half-cages should be surveyed to be sure their location within the enclosure is within specification. **1 week**
6. The enclosures should be returned to the IR and installed in the East and West carriages. **1 week**
7. Survey of the VTX and FVTX in the carriages is needed. **1 week**
8. Connection and testing of the VTX and FVTX support systems, calibration and testing with cosmic rays will likely require iteration among the tasks. **4 weeks if (1) is fulfilled**