Pixel Mechanics Fabrication/Assembly/Installation Key Milestones

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Fabrication(Mostly) Milestones

Item	Completion	Need Date	Float(months)	Comments
Staves	07-Jul-03	01-Dec-03	4.9	
Sectors	19-Aug-02	01-Dec-03	15.6	
Layer 1 Shell	21-Jan-03	01-Sep-03	7.4	If used in trial assembly
Layer 2 Shell	13-Apr-04	14-Apr-04	0.0	Change schedule?
B-layer Shell	02-Sep-03	01-Oct-03	1.0	If used in trial assembly
Disk Rings	19-Nov-02	09-Apr-03	4.7	Drill frame, trial assembly
Barrel Support/Endcones	08-Apr-03	01-Jul-03	2.8	
Disk Support	01-Dec-02	09-Apr-03	4.3	Fab disk sections first
Endplates	08-Apr-03	11-Dec-03	8.2	Change schedule?
B-layer Support	17-Sep-03	01-Oct-03	0.5	If used in trial assembly
Pixel Support/Mounts	03-Sep-03	01-Jun-04	9.1	Float is 3 months if trial assembly
Support Tube	03-Sep-03	01-Jun-04	9.1	Float is 3 months if trial assembly
Endplugs	03-Sep-03	01-Oct-04	13.1	Float is 5.5 months if trial assembly
Barrel Support Tube Mounts	03-Sep-03	01-Jun-04	9.1	Break out in schedule, change?
End Support Tube Mounts	03-Sep-03	01-Dec-04	15.2	Break out in schedule, change?
Bare Services Panels	06-Aug-03	01-Oct-04	14.1	Float is 6 months if trial assembly
Internal Services	18-Feb-04	09-Apr-04	1.7	
Loaded Service Panel	09-Jun-04	01-Oct-04	3.8	
Beam Pipe Support	03-Sep-03	01-Dec-04	15.2	Break out in schedule, change?

- Clearly need to break out items in current global schedule, which is not detailed enough
- Check schedule for red items. Potentially not enough float. Should have at least 3-4 months on most items at this stage.

Trial Assembly

Item	Start Date	Tooling Need Date	End Date	Required End Date	Float(months)	Comments
Disks into disk support frame	4/9/03	12/10/02	7/1/03	12/1/03	5.1	Includes drilling frame?
Barrel Frame to Disk Frame	4/9/03	12/10/02	9/23/03	12/1/03	2.3	6 months without disk rings
Barrel shell/B-layer to Barrel Frame	9/18/03	5/21/03	12/10/03	3/15/04	3.2	
Frame into Barrel Support Tube	12/1/03	8/3/03	3/31/04	6/15/04	2.5	When SCT needs PST?
Ship Barrel Frame to CERN	4/1/04	12/3/03	4/8/04	6/1/04	1.8	
Barrel shell to Barrel Frame at CERN	4/15/04	12/17/03	5/15/04	9/1/04	3.6	
Service Panels into End Support Tube	4/1/04	12/3/03	5/1/04	10/8/04	5.3	
Ship Service Panels to CERN	5/2/04	1/3/04	5/9/04	10/8/04	5.1	
Trial Assy into Installation Tube at CERN	6/1/04	2/2/04	7/1/04	9/15/04	2.5	

- Prototype of PP0 and PP1 regions like trial assembly but not included above
- What is realistic scope of trial assembly of local supports to intermediate supports? Not included above.
- For disks, plan on dry fit of all bare sectors, associate sectors with rings and positions if necessary(designed to not be necessary but…)
- What is realistic for staves and shells? There is time in ‘03 for substantial trial assembly.

Trial Assembly Comments(1)

- Pixel detector trial assembly should include
  - Barrel frame
  - Endcones
  - One outer layer shell(Layer 2 currently)
  - B-layer shell/support
  - Disk frame
  - Disk rings
  - Endplates
  - Insertion into barrel support tube section, test mounting scheme
- At LBL.
- Scope needs to be carefully defined if to include anything beyond “does it fit” eg. survey or deflection measurements.

Trial Assembly Comments(2)

- Trial assembly of PST and related should include
  - Fit up of barrel sections to both end sections
  - Check of SCT mounting(dummy SCT barrel interlink
  - Tests of rails with dummy pixel detector and service panels first
  - Insertion of real frame with mounts into barrel section
  - Insertion of real service panels into end sections. Special tooling needed for this? Service panel “injector”?
  - Fit up of endplug regions
  - Test of end supports?
- At LBL

Trial Assembly at CERN

- Trial assembly at CERN should include the items below.
- Assembly of “third hit” shell(currently Layer 1) into barrel frame using final tooling to practice.
- Insertion of barrel frame into “installation and test tube”(ITT)
- Insertion of services panels into ITT.
- Can beam pipe be early enough for trial assembly into ITT?
- Practice installation in pit with empty ITT? Is there time in installation schedule for this relatively early?
- ITT provides
  - table and support for tooling for assembly of complete pixel detector, with services and beam pipe
  - thermal and EMI shielding(removable easily)
  - installation vehicle to be craned into place for final pixel insertion into the PST.

Final Assembly/Installation

		Tooling		Required				
Item	Start Date	Need Date	End Date	End Date	Float(months)			
Layer 1	28-Mar-05	28-Nov-04	12-Aug-05	09-Sep-05	0.9			
Layer 2	14-Apr-04	16-Dec-03	10-Sep-04	24-Sep-04	0.5	Needs to be advanced		
B-Layer	29-Sep-04	01-Jun-04	21-Dec-04	01-Jan-05	0.4			
Initial Disks	05-Jan-04	07-Sep-03	10-Sep-04	24-Sep-04	0.5			
Complete Disks	25-Apr-05		26-Aug-05	09-Sep-05	0.5			
Barrel	27-Sep-04	30-May-04	05-Nov-04	05-Nov-04	0.0			
Disk Sections	27-Sep-04	30-May-04	05-Nov-04	05-Nov-04	0.0			
Barrel+Disks	08-Nov-04	11-Jul-04	31-Dec-04	31-Dec-04	0.0			
Insert Beam Pipe	03-Jan-05	05-Sep-04	04-Jan-05	04-Jan-05	0.0	Do beam pipe first?		
Insert B-layer	05-Jan-05	07-Sep-04	18-Jan-05	18-Jan-05	0.0			
Service Panel/Engplug Connect	08-Nov-04	11-Jul-04	28-Jan-05	28-Jan-05	0.0			
Surface System Test	31-Jan-05	03-Oct-04	16-Mar-05	16-Feb-05	-0.9	Relative to TC requirement		
Installation	16-Jun-05	16-Feb-05	28-Jul-05	28-Jul-05	0.0			

- This is very rough, needs more detail.
- But there is practically no float in final assembly at any stage.
- TC-required nominal 4 month float violated but in reality uncertainties surely more than 1 month.
- If LHC schedule holds, very tight planning and PRACTICE required for final assembly, survey, test, installation steps!!

Other Comments

- Current initial detector is Layer 2, B-Layer and 2 x Disks 1 and 3 => make Layer 2 shell first. Current Layer 2 schedule is too tight.
- Disk final assembly and test will be done at LBL and tooling shipped to CERN.
- Layer 2 and B-Layer assembly will happen in parallel at two sites and tooling shipped to CERN. Same for Layer 1 later.