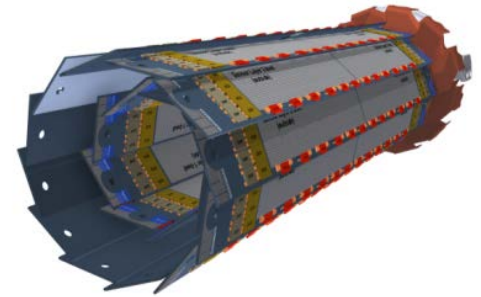
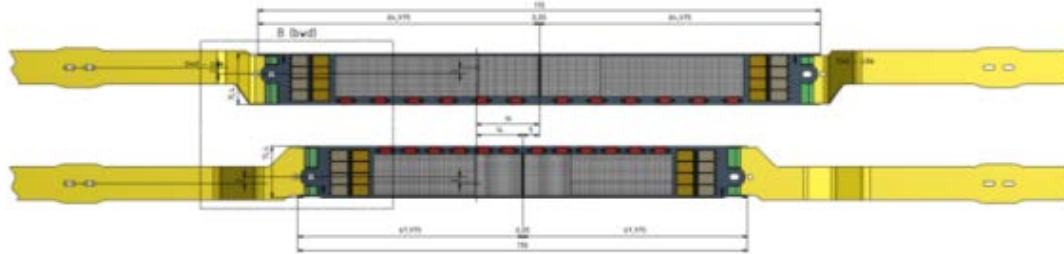
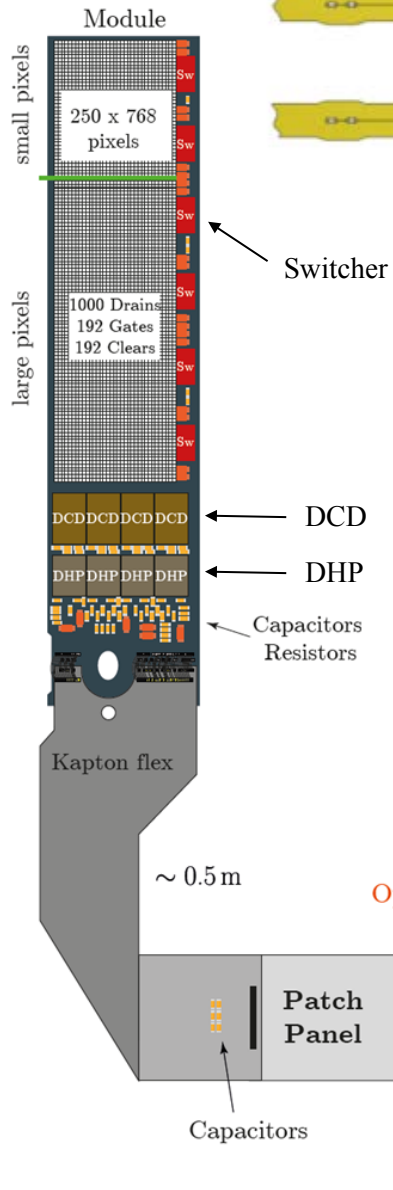
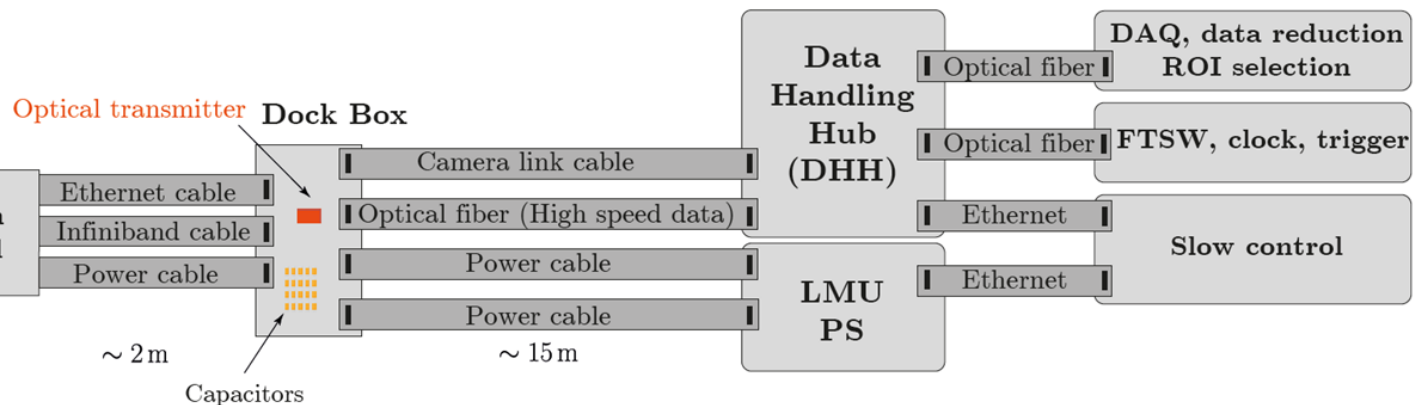


# **PXD Overview and Schedule**

# PXD System Overview

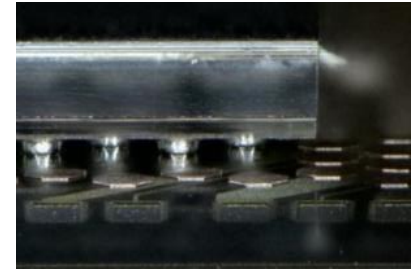


	Belle II PXD	
Radii	14, 22	mm
Sensitive length	90 (L1), 122 (L2)	mm
Sensitive width	12.5 (L1-L2)	mm
Number of ladders	8, 12	
Pixel size	55x50 & 60x50 (L1), 70x50 & 85x50 (L2)	$\mu\text{m}^2$
r/o time per frame	20	$\mu\text{s}$
Number of pixels	8	Mpix



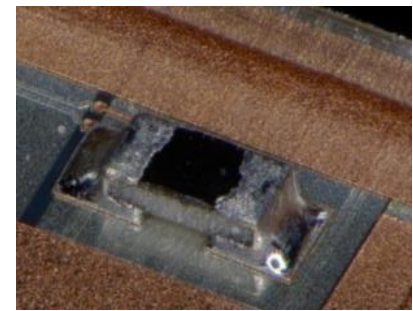
## 1. Flip Chip of ASICs (~240°C) at IZM, Berlin

- ▷ Bumped ASICs have the solder balls (SAC305 and AgSn)
  - ↳ DHP bumping at TSMC, DCD bumping via Europractice
  - ↳ SWB bumping on chip level at IZM Berlin



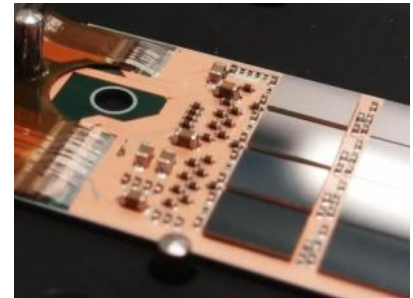
## 2. SMD placement (~200°C) at HLL, Munich

- ▷ Passive components (termination resistors, decoupling caps)
- ▷ Dispense solder paste/jetting of solder balls, pick, place and reflow
- ▷ **First module tests** on probe station possible at this stage already



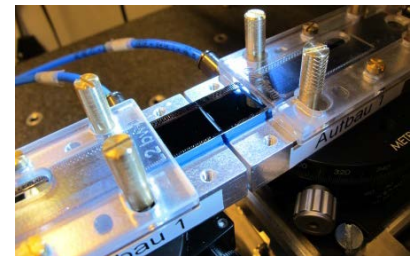
## 3. Kapton attachment (~170°C), wire bonding at MPP, Munich

- ▷ 4-layer flex/rigid technology with SMDs, ~40 cm long, Kaupke/MOS
- ▷ Solder paste printing on kapton, soldering
- ▷ Wire-bond, wedge-wedge, 32 µm Al bond wires
- ▷ **Full module characterization**



## 4. ladder gluing (RT) at MPP, Munich

- ▷ Dispense adhesive, align two modules, join two modules to ladder
- ▷ **ladder tests (verification of the functionality)**



# Feb BPAC: Status of Sensors and ASICs

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## Concerns:

The PXD schedule has little to no contingency left. Furthermore, the whole readout chain with final components remains to be exercised. Although the DESY test beam has proven to be invaluable, and further tests will continue to provide vital details on the performance of the system, they are no substitute for a true functionality test with final components in the final configuration. The schedule of the Belle II detector is, without reservation, vulnerable to any further delay in the PXD schedule, with no hedge.

## Recommendations:

Despite significant progress, no solution could be identified to address the vulnerability to the schedule. Given these conditions, the committee would like to iterate its previous observation that, with the upcoming DESY test beam, the pressures on the PXD group will not relent, where there is a massive set of tasks to be completed with limited manpower. The committee recommends that key priority tasks be identified and adequately staffed.

### Key priorities:

**Module production:** ASICs & Kaptons available, final production batch at IZM

**Module testing.** In order to catch up accumulated delay distribute mass testing to 4 different sites (MPP, HLL, GOE, BN)

**Ladder assembly:** resumed after identifying problem with test set-up  
(→ see talks by L.Andricek & C.Kiesling)

# Feb BPAC: Grounding

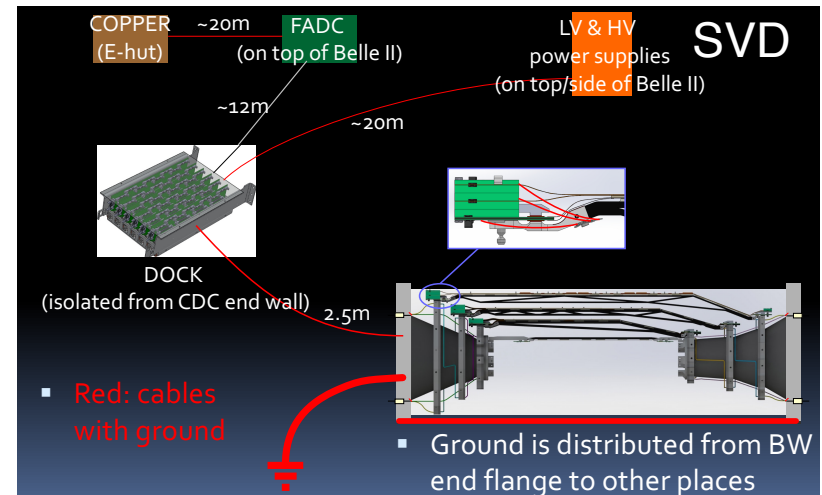
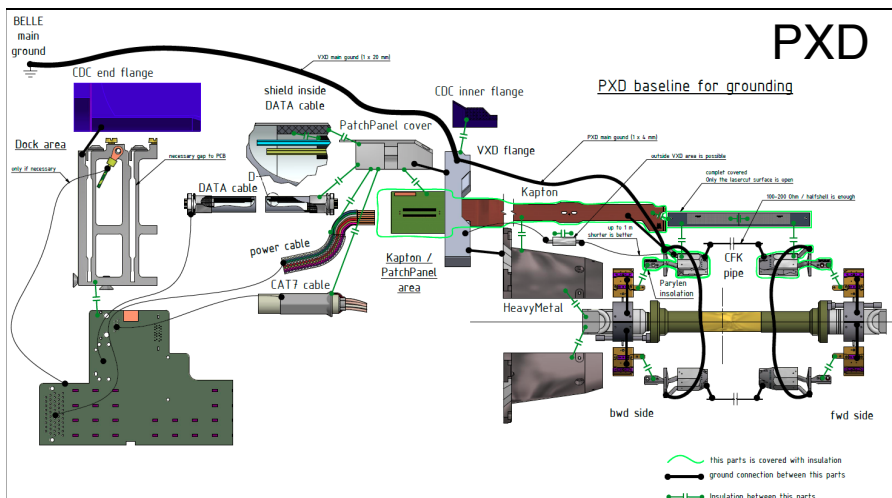
## Concerns:

Although safety, shielding and grounding policies are in place, it appears that there is no comprehensive review of the shielding and grounding scheme for each subsystem planned in order to make sure that the policies are completely implemented in the schematics and the real system.

## Recommendations:

The committee recommends that the Grounding/EMC group should conduct in-depth reviews of the schematics to verify that the shielding and grounding policies are correctly implemented.

Detailed grounding schemes for PXD and SVD have been developed together with Fernando Arteche (ITA Zaragoza, Spain) and the GND/EMC group (M.Tanaka) → see talk by M.Friedl/L.Andricek



# Feb BPAC: Slow Control and Software

## Concerns:

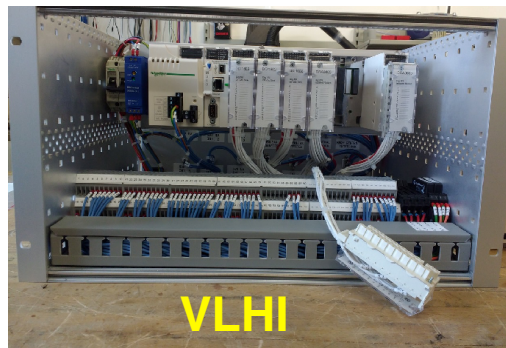
No specific concerns are raised on the Slow Control and on the interlock system, except for not having a complete definition of the latter. The steady work to move the software from PERSY to Beast Phase 2 and its extension for the integration tests and full detector operation should be continued to meet the schedule.

It was reported that VXDTF2 does not provide yet the performance of version 1, and it may not be available for the start of the physics run.

## Recommendations

The VXD interlock system should be defined and implemented in order to be tested during Phase 2 run.

See talk by L.Vitale



An effort should be made to complete the implementation and deployment of VXDTF2. If possible, it could be used for the processing of Phase 2 data, where also the alignment of a VXD slice and its stability can be checked.

See talk by E.Paoloni

# Feb BPAC: Ladder Mounting and Integration

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## Concerns

As it stands, the detector integration time will need to absorb any further delay in the assembly of PXD and SVD ladders. The current schedule provides for some commissioning and testing time and cosmic ray data-taking, that can be partly used as contingency. In addition, there is no contingency between the end of SVD ladder mounting and the start of VXD integration. It is important to be sure not to overestimate the effective time available for contingency.

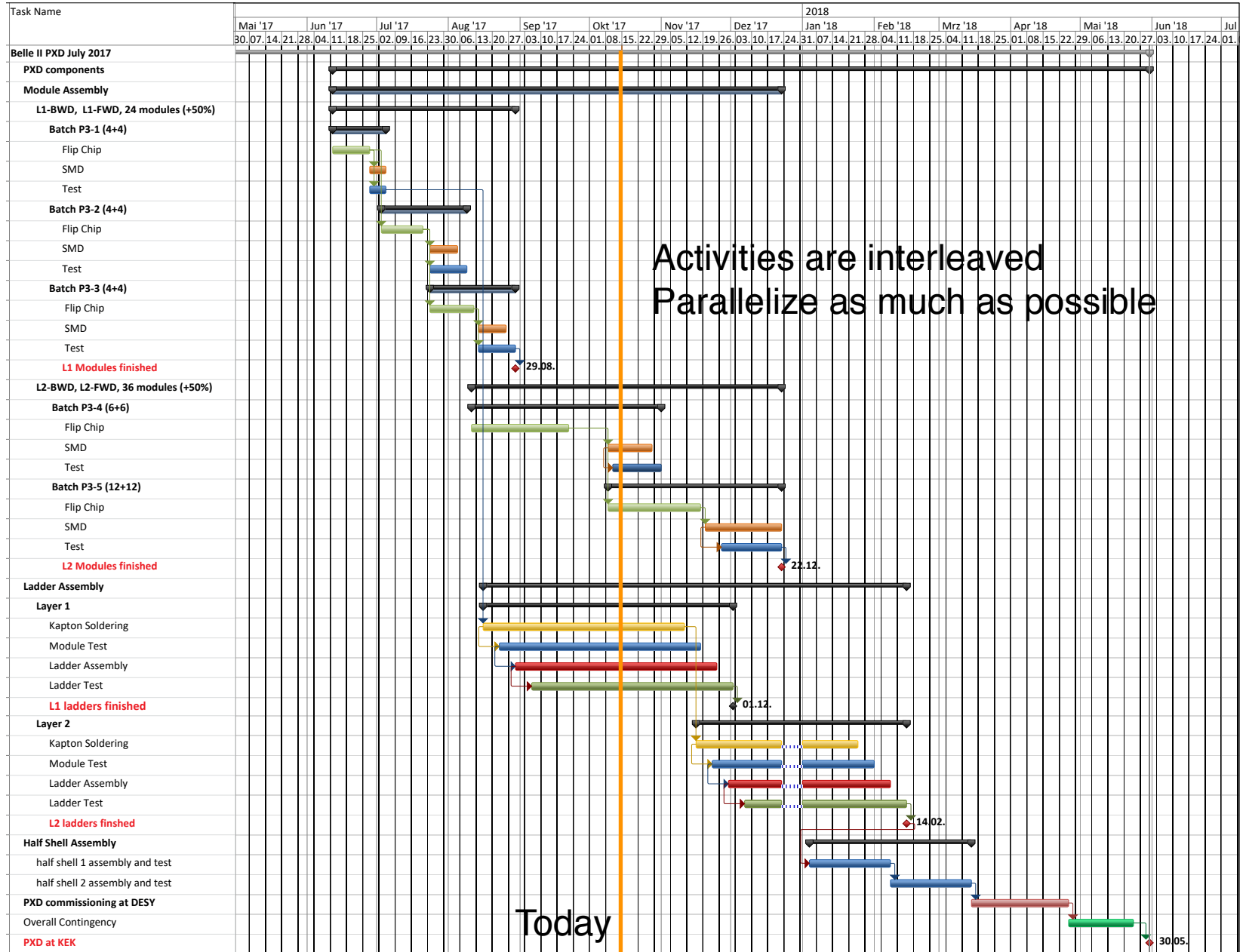
A prototype of the tooling for PXD ladder mounting is not available yet, and therefore testing of the mounting procedure has not been performed. If modifications or redesign of the tooling will be required, it may have a significant impact on the schedule.

## Recommendations

Fabrication of all tooling and a full rehearsal of the assembly procedures should be completed as soon as possible, to reduce the impact on the schedule of any tuning of the procedures that might be needed. Training of critical personnel should occur to gain valuable experience with the installation procedures.

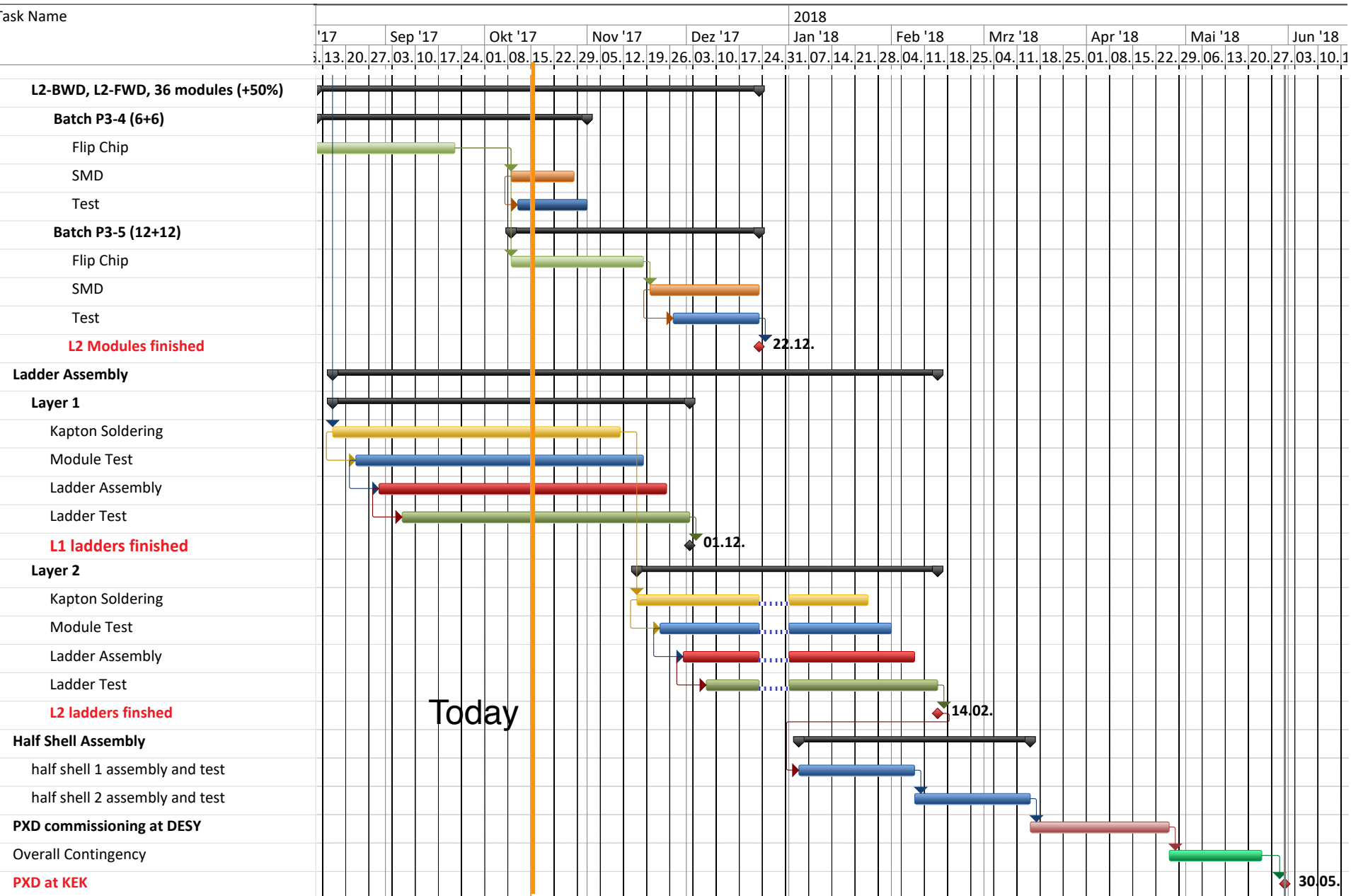
Procedures have been somewhat revised after taking experience from phase 2 assembly into account. Next step: production of tooling with highest priority  
(→ see talk by C.Kiesling)

# Revised PXD Production Schedule

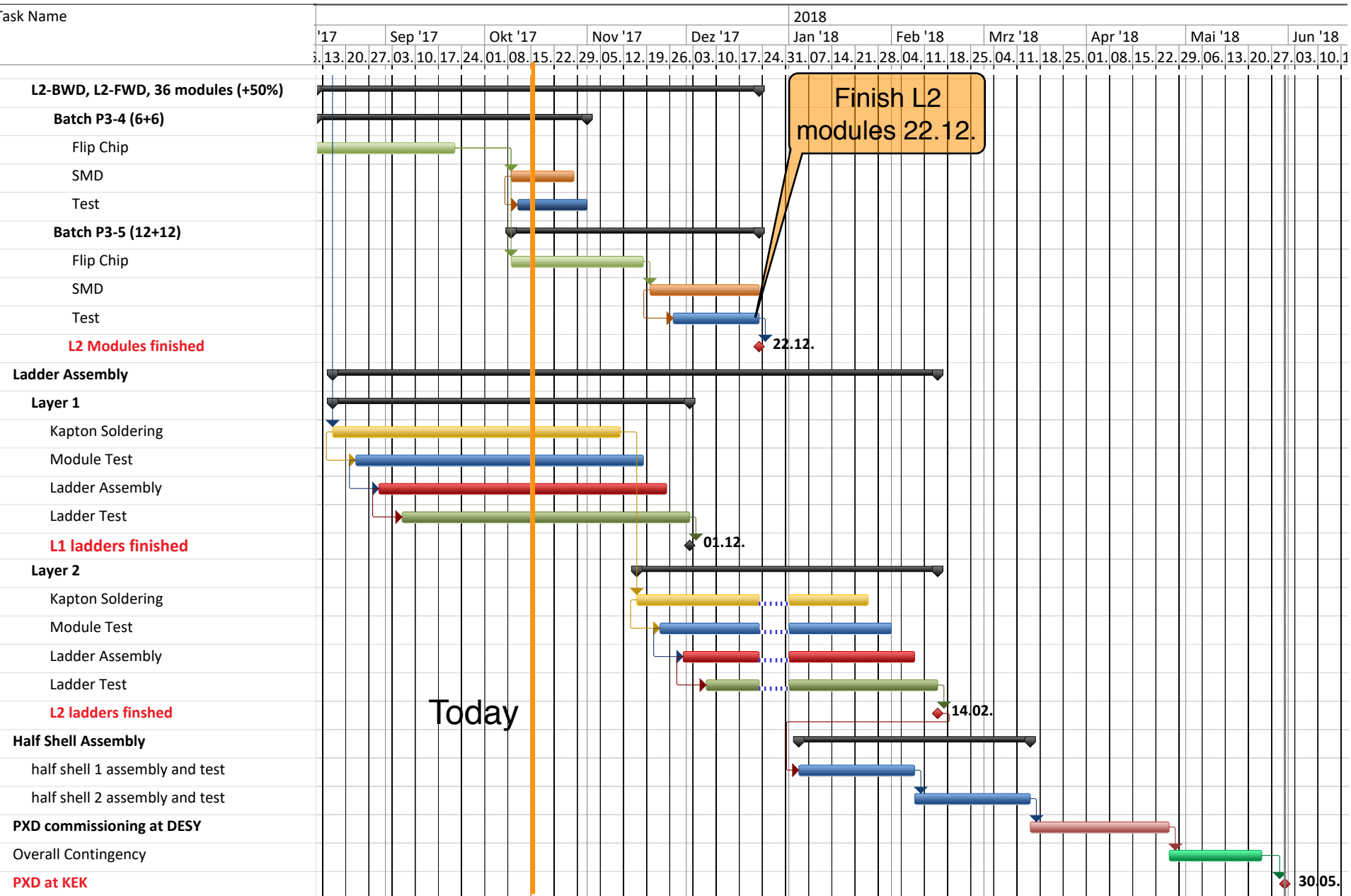




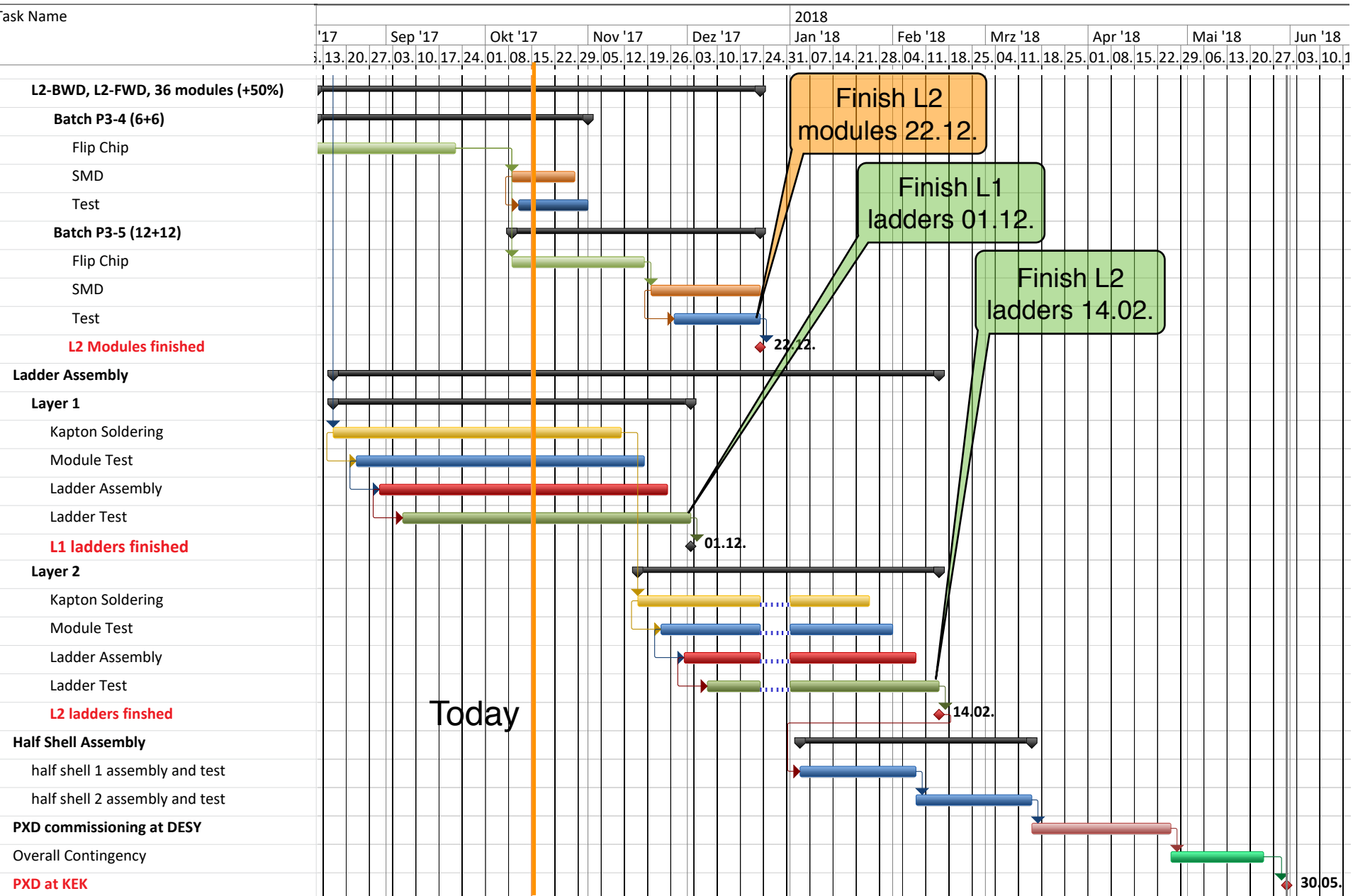
# PXD Production Schedule Details



# PXD Production Schedule Details

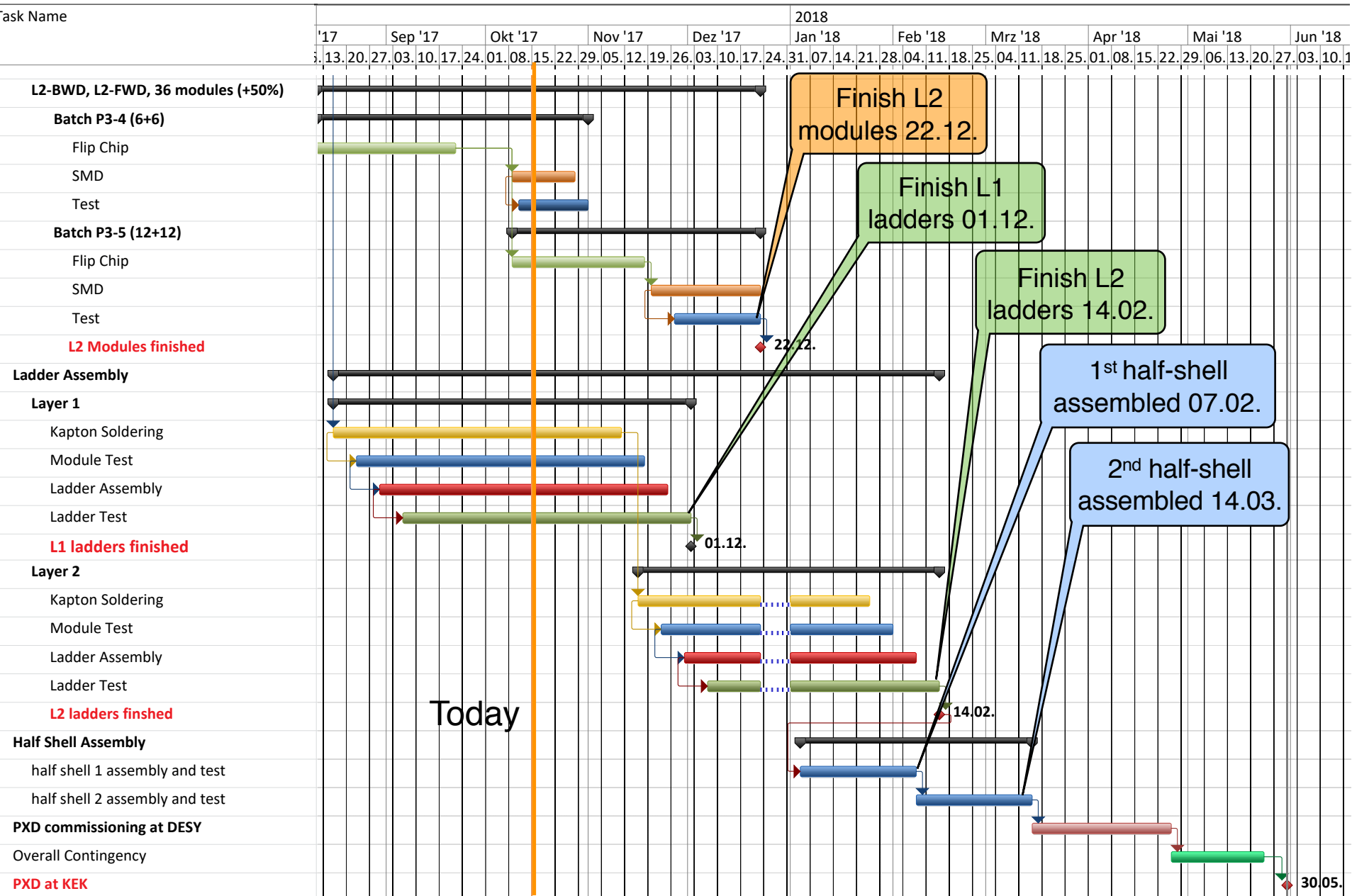


# PXD Production Schedule Details

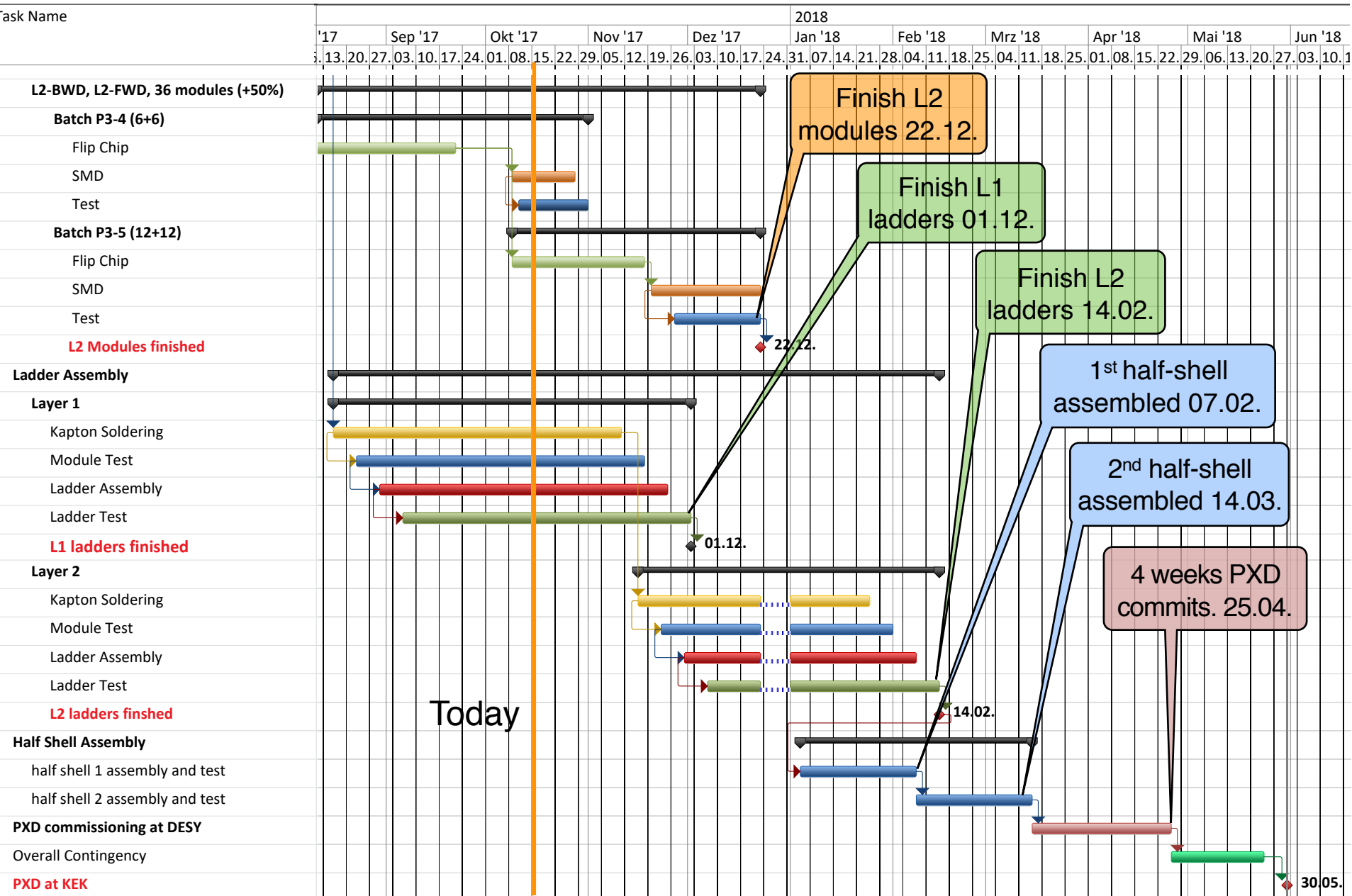


Today

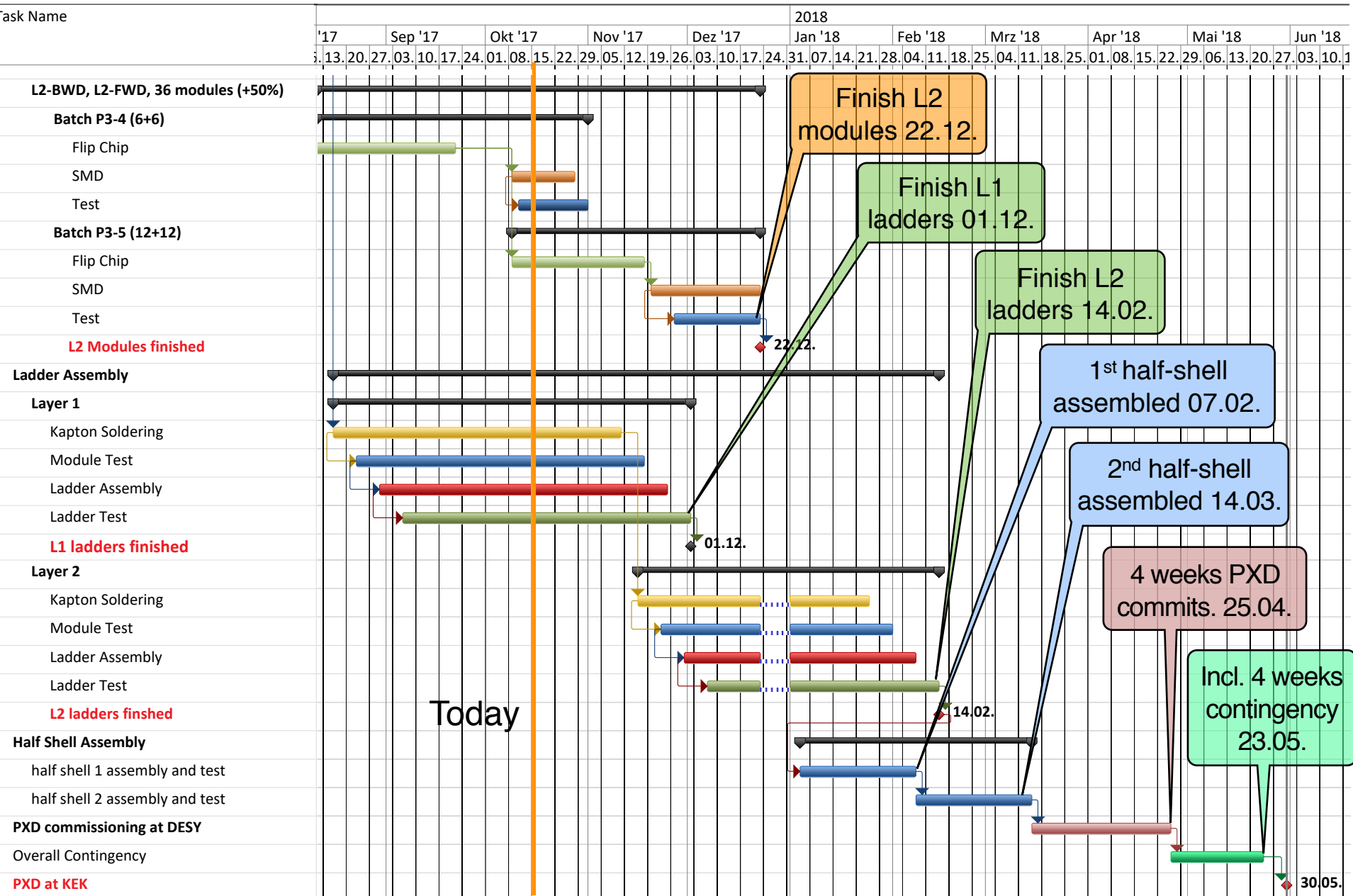
# PXD Production Schedule Details



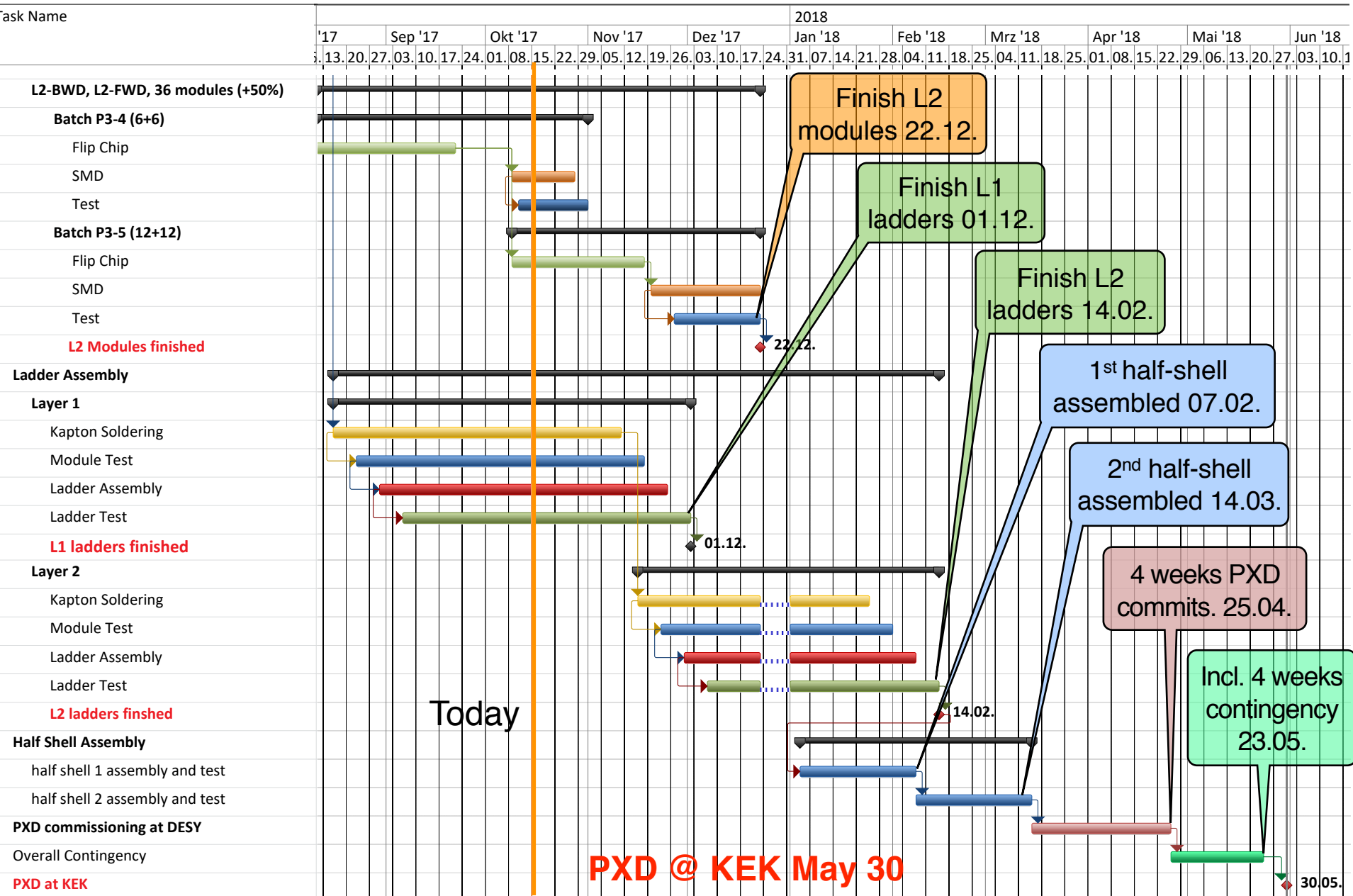
# PXD Production Schedule Details



# PXD Production Schedule Details



# PXD Production Schedule Details



# Summary

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- Since the BPAC review in February several issues - some of which caused additional delay - could be overcome
  - instability of high speed links
  - quality of kaptons from production run
  - problems during tests of assembled ladders
- Module testing is on the critical path for finalizing the PXD
- In order to catch up with some of the additional delay mass testing will be distributed over **4 sites**
- With the successful completion of two functional L1 ladders the uncertainty in the updated PXD production schedule is significantly reduced
- Nevertheless we explicitly add back a month of contingency for safety
- => PXD will arrive at KEK by end of May