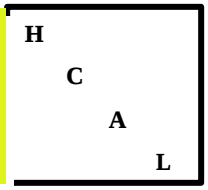
Readout Box (RBX)
PRR

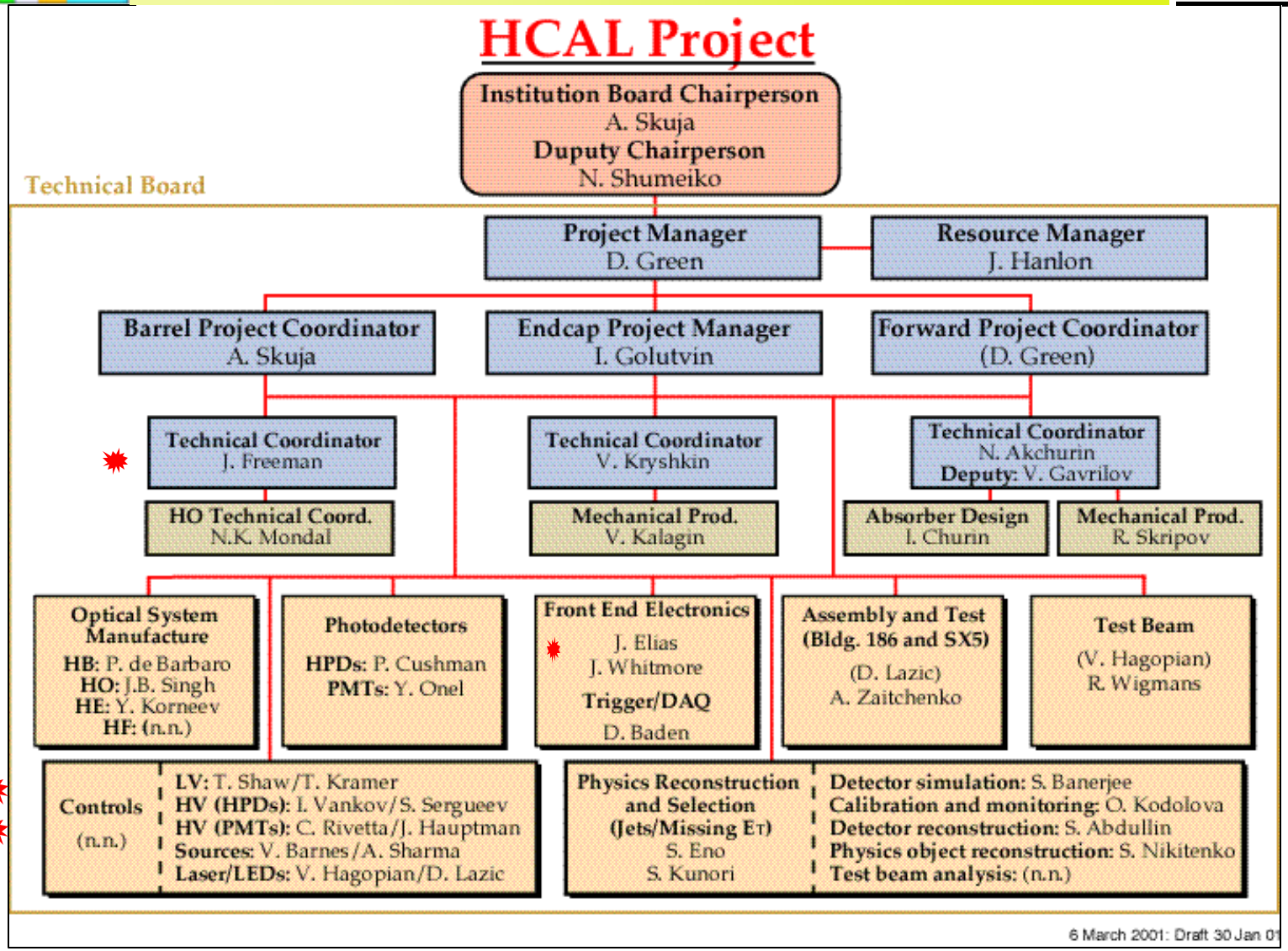
Dan Green
HCAL Project Manager

Outline



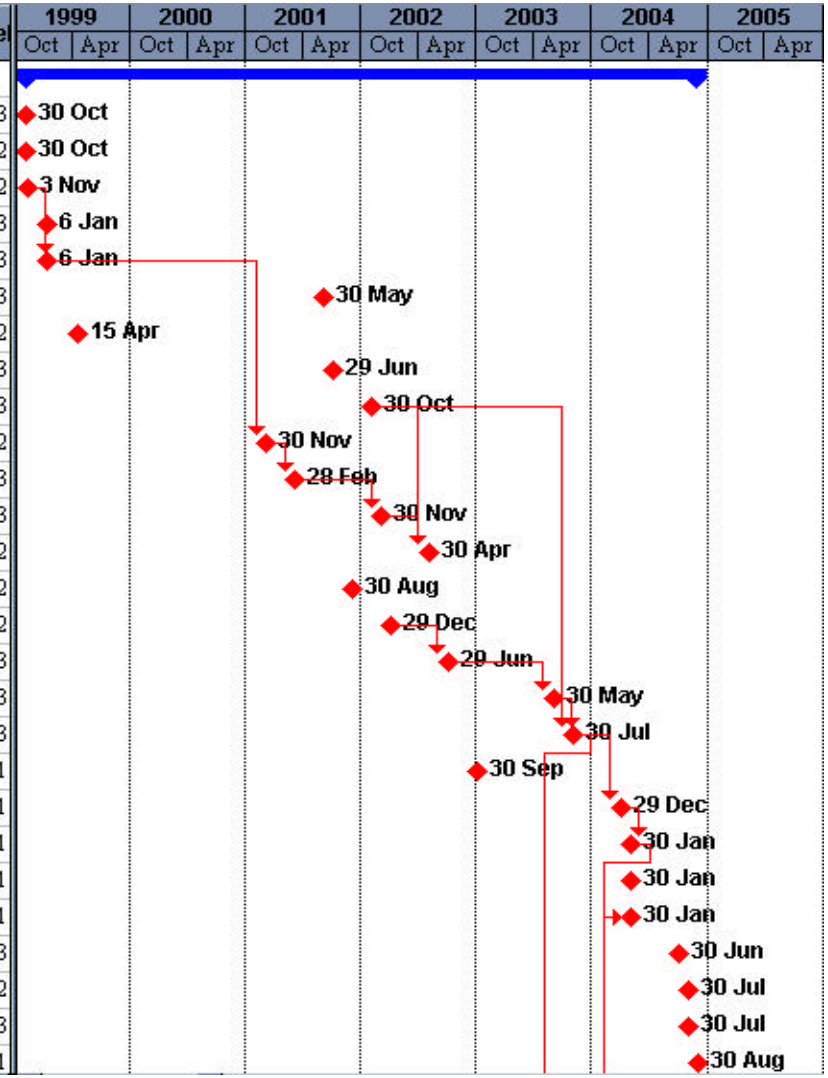
- **Schedule and Milestones**
- **R&D experience**
- **RBX components**
  - **shell**
  - **backplanes**
  - **ODU**
  - **HPD**
  - **Calib - laser, LED, sources**
  - **Services - HV, LV, cooling,**
  - **Controls**

HCAL Organization



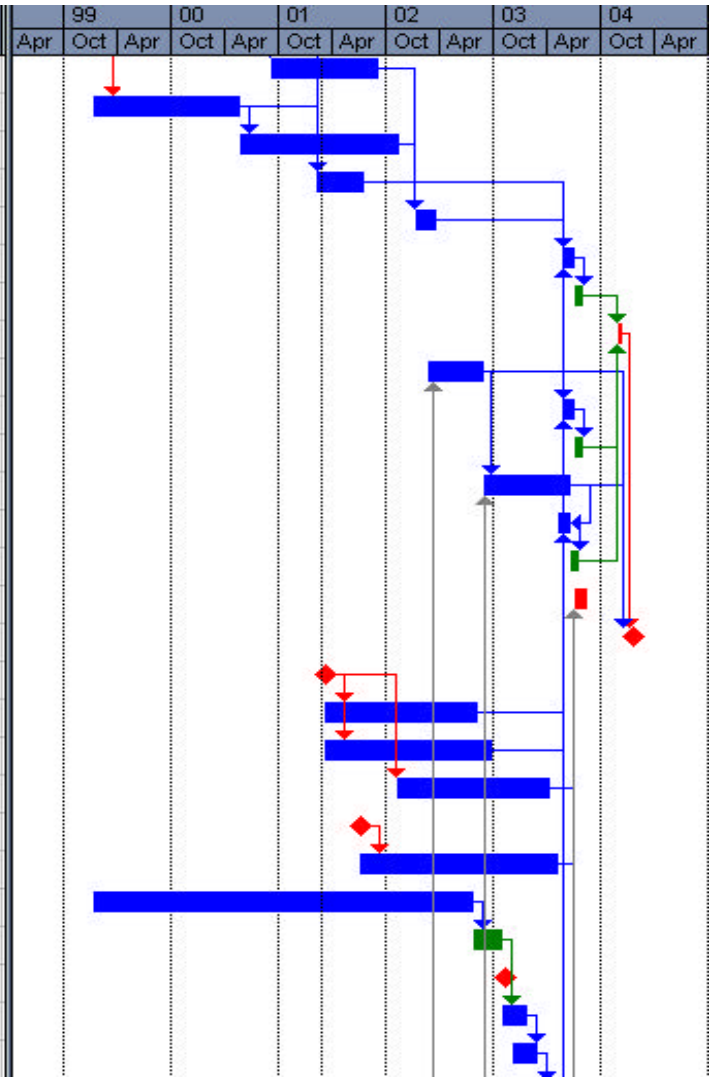
HCAL - ML, HB

Milestone	Level
Barrel (HB)	
CMS test beam motion table delivered to CERN	ML3
HB-PPP1 absorber delivered to CERN	ML2
HB Engineering Design Review complete	ML2
HB optics production start	ML3
HB absorber production start	ML3
HB readout box production start	ML3
HB-PPP2 absorber delivered to CERN	ML2
HB HPD procurement start	ML3
HB Front-end ASIC Production	ML3
HB- absorber delivered to CERN	ML2
HB optics installation in absorber start	ML3
HB readout box installation on absorber start	ML3
HB Calibration in H2 Test Beam - start	ML2
End Assembly of HB- in SX5	ML2
HB+ absorber delivered to CERN	ML2
HB optics installation in absorber complete	ML3
HB readout box installation on absorber complete	ML3
HB electronics installation in readout boxes complete	ML3
End Assembly of Hadron Barrel (HB) in SX5	ML1
End Trial Insertion of HB in Vac-tank	ML1
End Trial Mounting of EB Super Module on HB	ML1
Start Cool-down of Coil	ML1
Close Yoke, Start Magnet Test in SX5	ML1
HB lower to UX5 complete	ML3
HB installation in solenoid in UX5 complete	ML2
Install H1 Scintillator Complete	ML3
End Installation and Test of HB in UX5	ML1

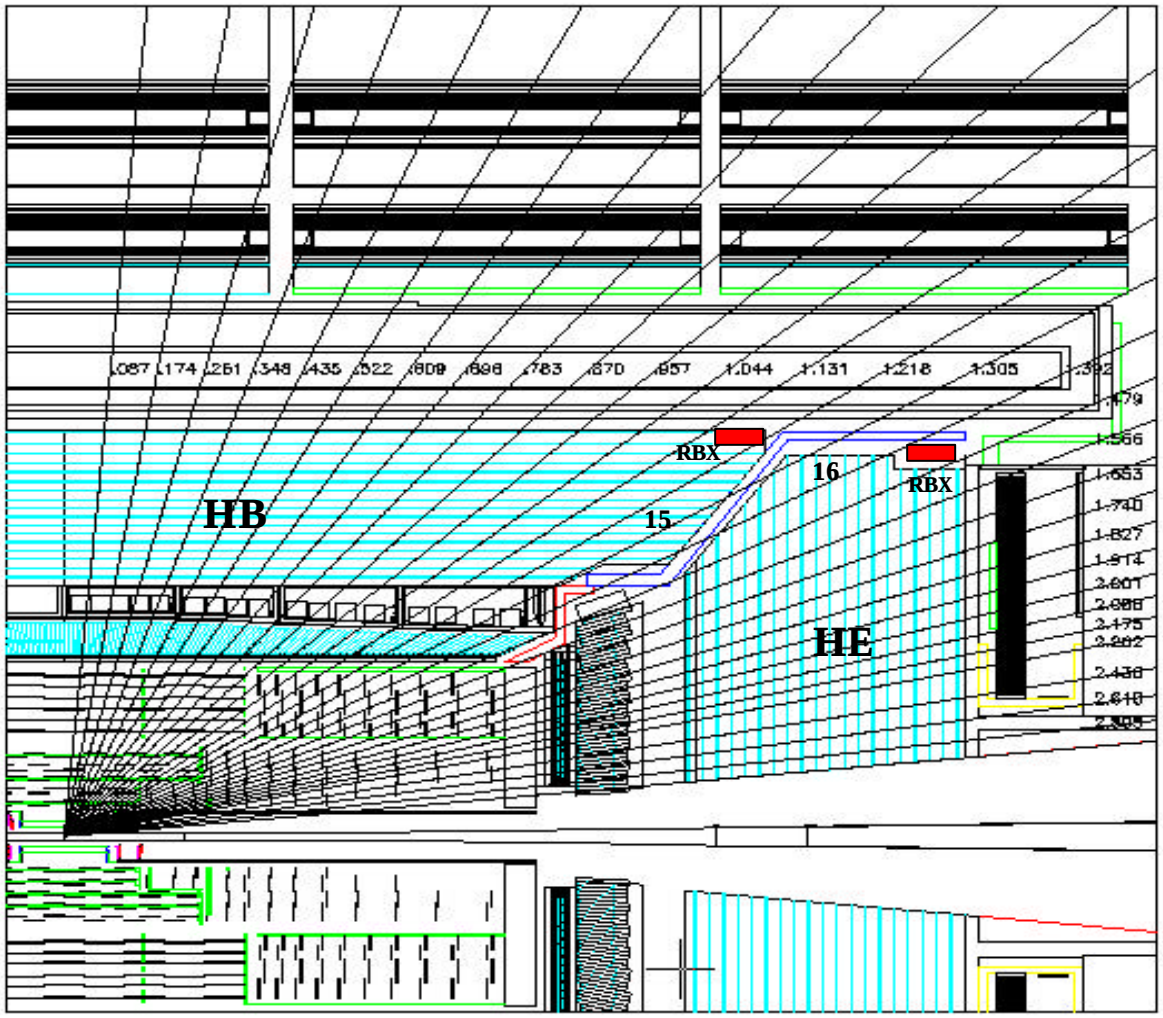


HCAL Critical Path and RBX

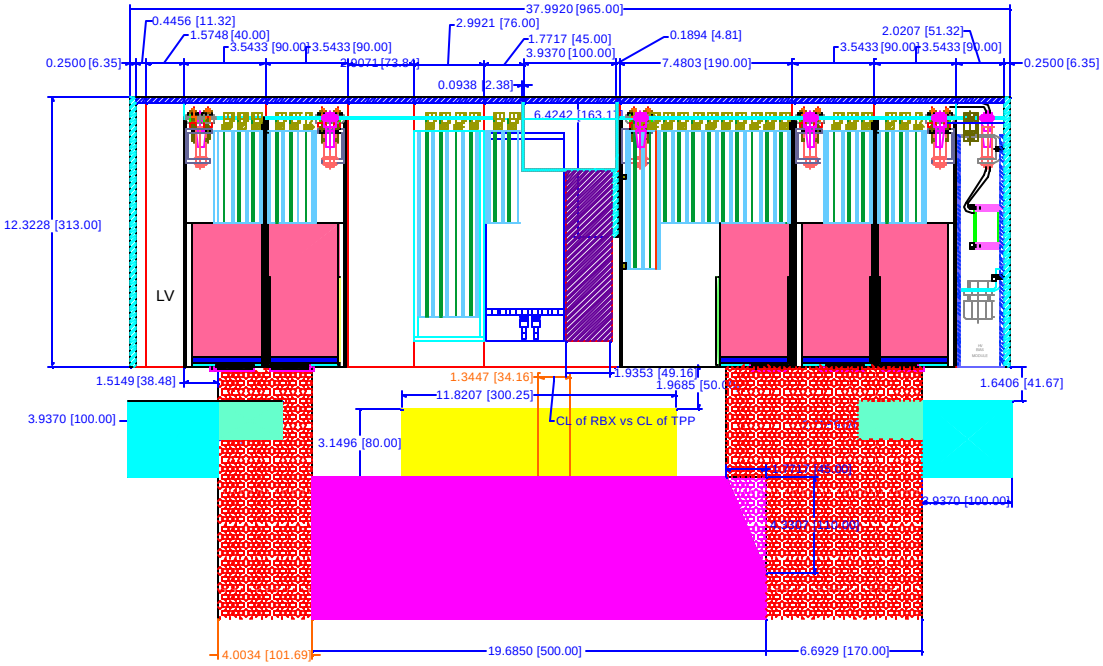
ML?	Task Name
	HB+1 Absorber Production
	HB-1 Optical Production
	HB+1 Optical Production
	Install Optics into HB-1
	Install Optics into HB+1
	HB-1, HB+1: ODU Installation on Absorber
	HB-1, HB+1: System Integration
	Trial Insertion of HB-1/HB+1 in Vacuum Tank
	Assemble HE-1 & Optics to YE-1
	HE-1: ODU Installation on Absorber
	HE-1: System Integration
	Assemble HE+1 & Optics to YE+1
	HE+1: ODU Installation on Absorber
	HE+1: System Integration
ML2	HO Optics Installation on YB Completed
ML1	Close Yoke and Start Magnet Test in SX5
ML3	HCAL Readout Box Production Start
	HB Readout Box Production
	HE Readout Box Production
	HO Readout Box Production
ML3	HCAL HPD Delivery & Testing Start
	HCAL HPD Procurement and Testing
	Front-End Electronics Production
	Front-end Electronics (Explicit Slack)
ML2	Complete Front-end Electronics Production
	ASIC Packaging and Testing
	Mount ASIC's on Boards, Checkout and Burn-In



Central HCAL

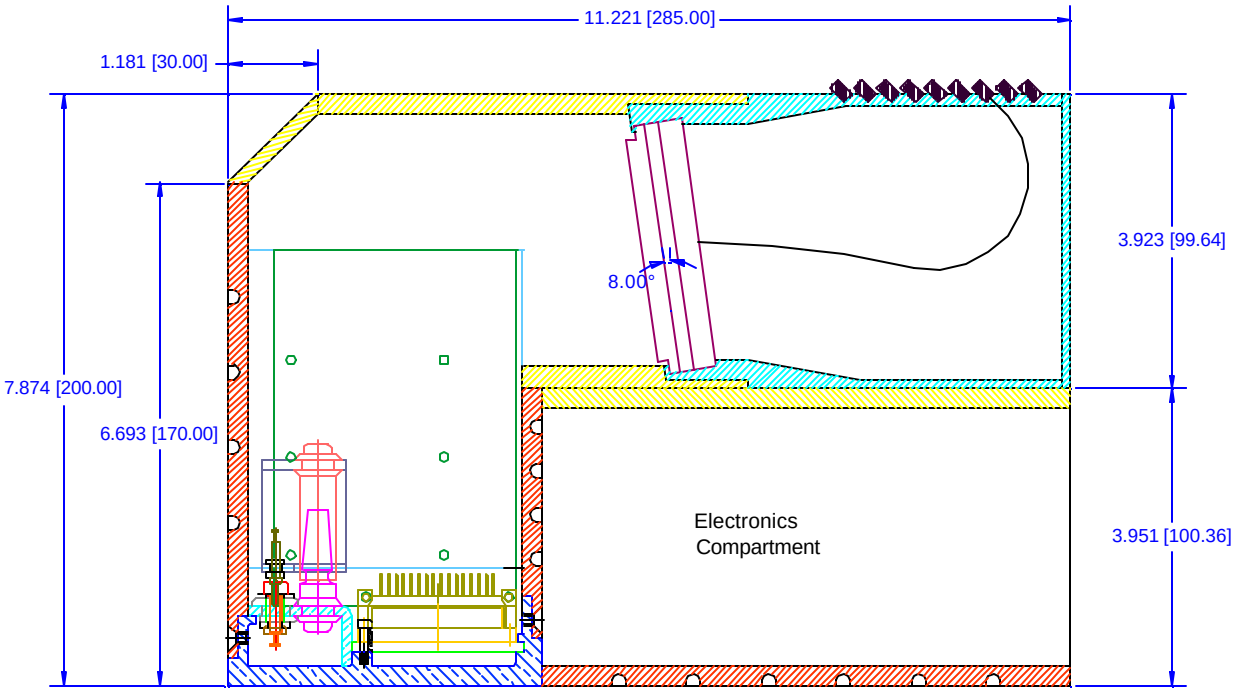


HB RBX Detail View



The issue for the RBX is the access to the HPD. There are integration issues with the tracker patch panel. A mockup was made and changes appear possible which will ease the problem. Schedule is such that the RBX is near to the critical path.

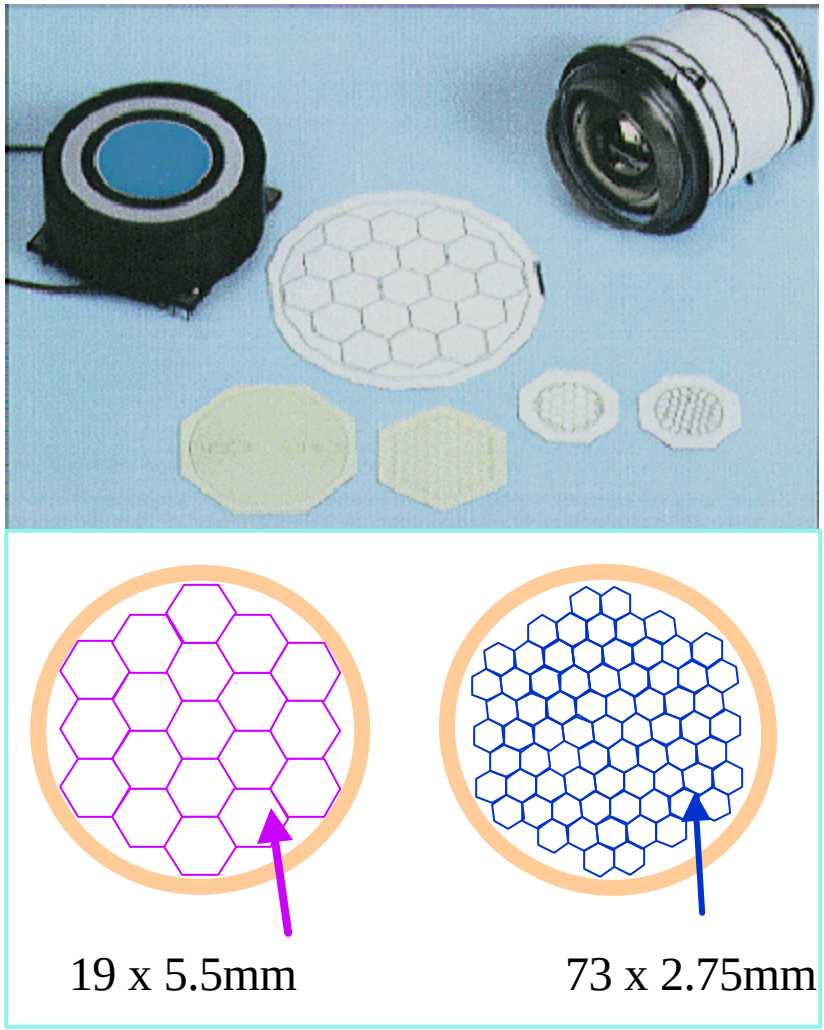
HE RBX Conceptual Design



HE can go ahead with the RBX, it appears, as the overlap of services and cables with other subsystems is not as severe as it is with HB.

ODU - Optics for Layer-->Tower

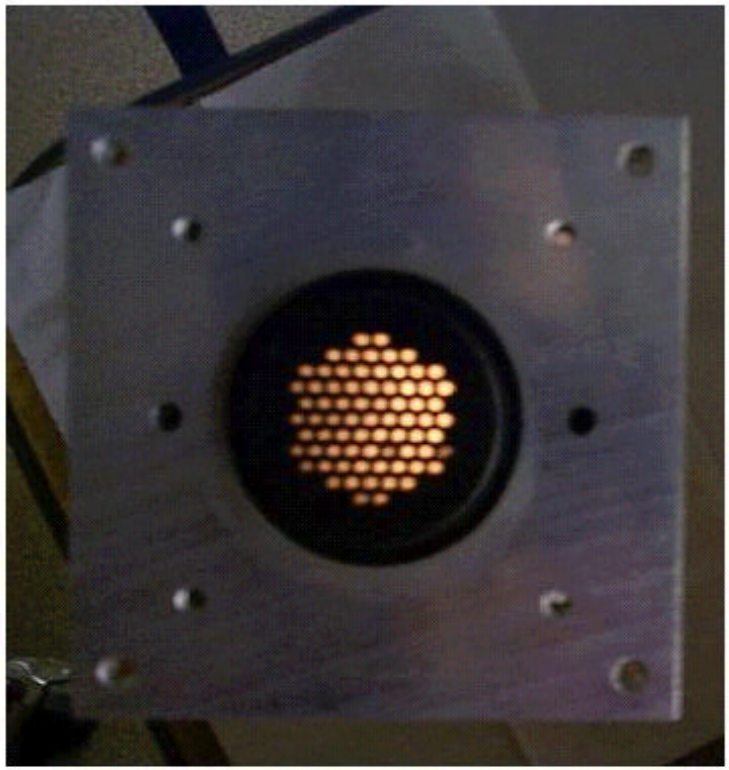
HPD



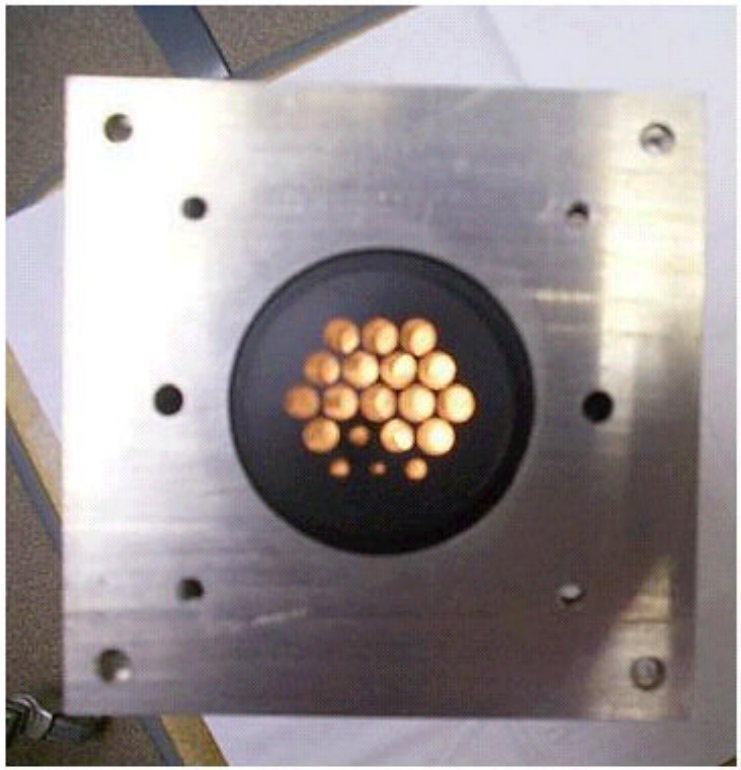
The HPD have had many problems which have been solved - sequentially. At present we specify an Al electrode and an anti-reflection coating. This "works" but the problem of low yields at the vendor must be solved.

H1 and H2 Layers

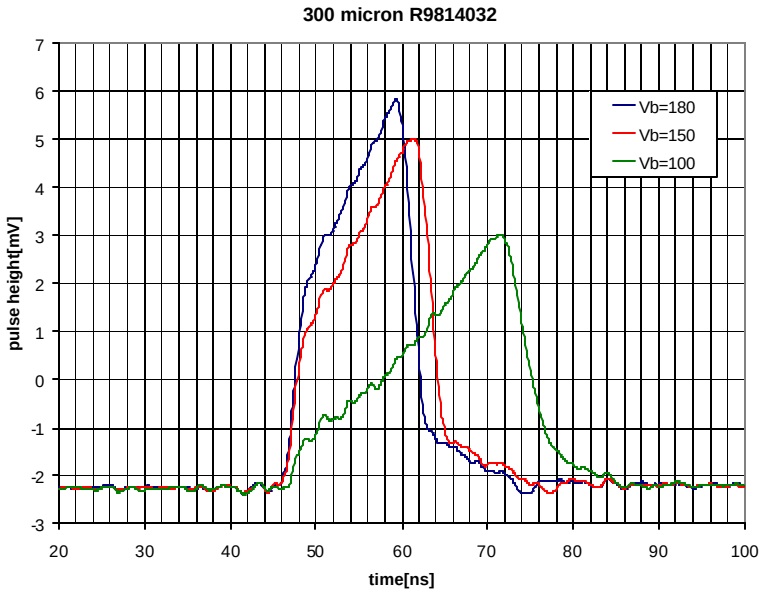
73-channel (HB)

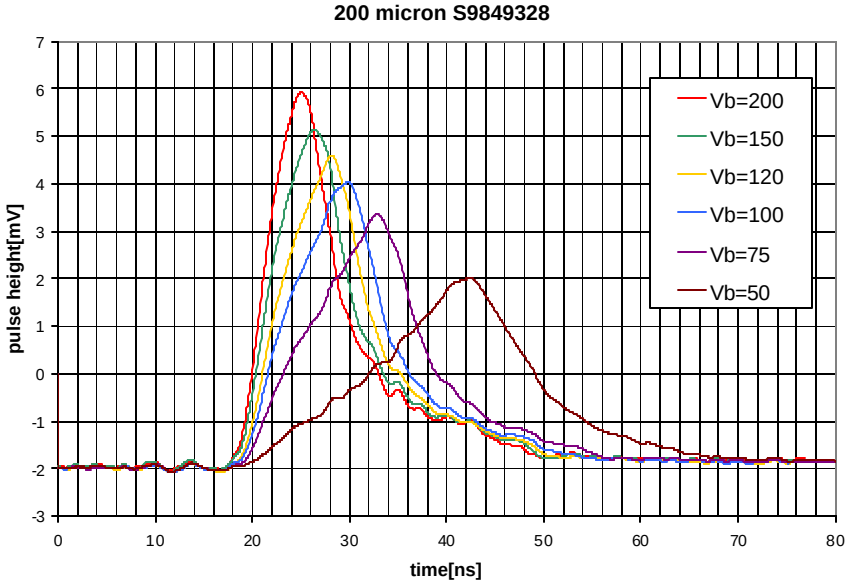


19-channel (HB right)



Pulse Formation - Bias



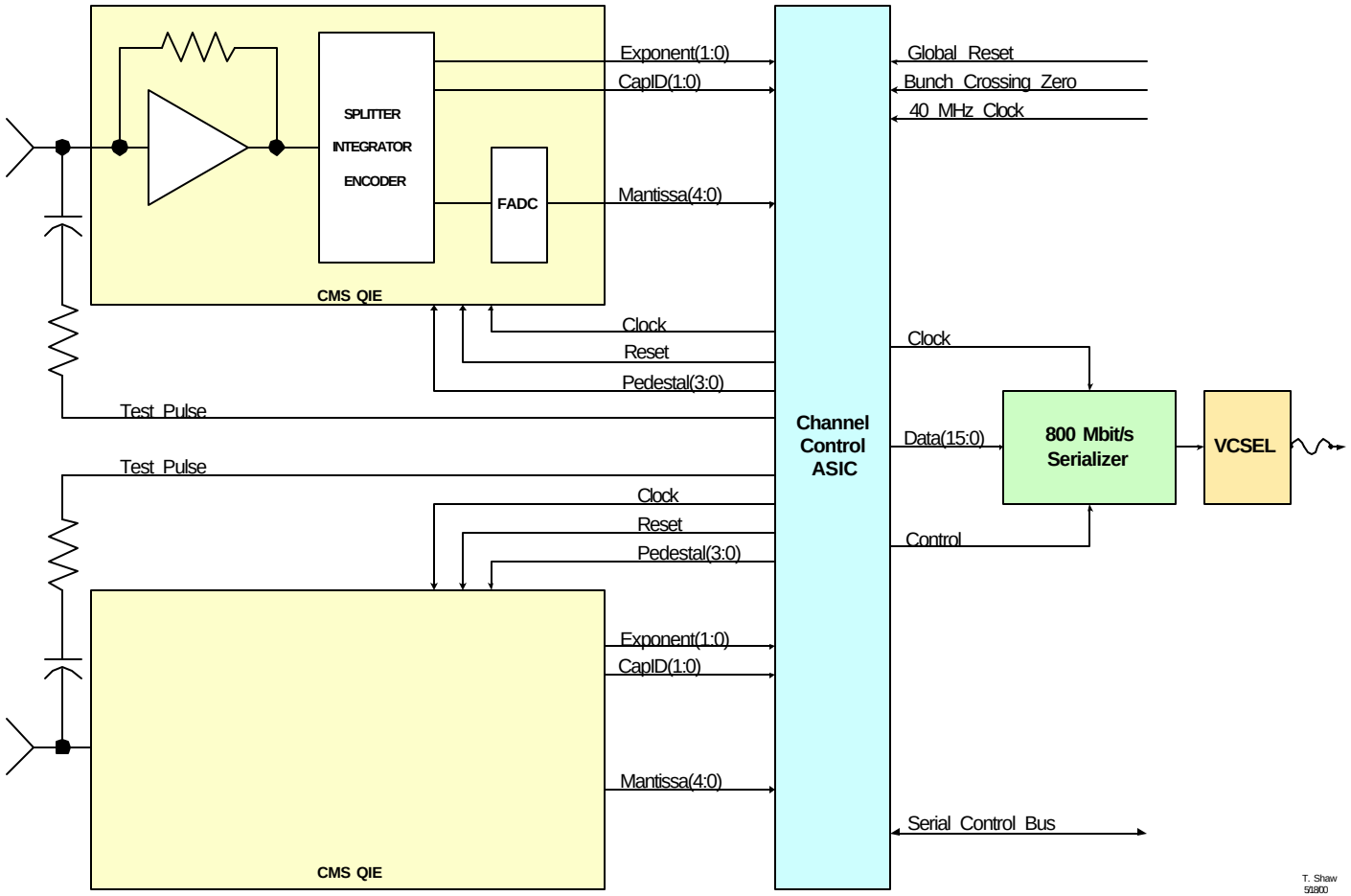


We have developed at fast diode which - with guard rings - can be run at very high bias.

Near Term HPD R&D

DEP=red
Canberra=yellow
MN=green

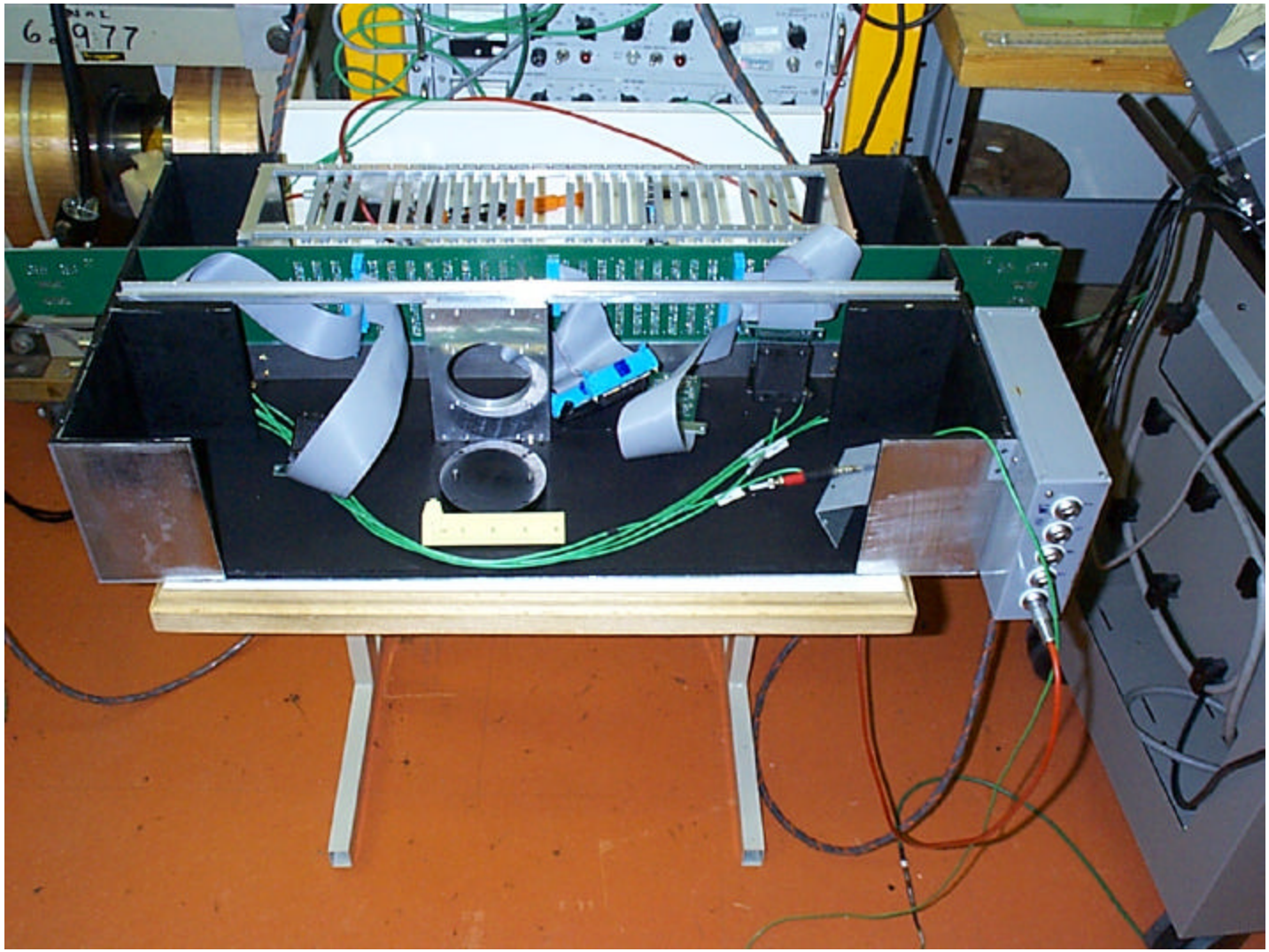
HCAL QIE-based Front End



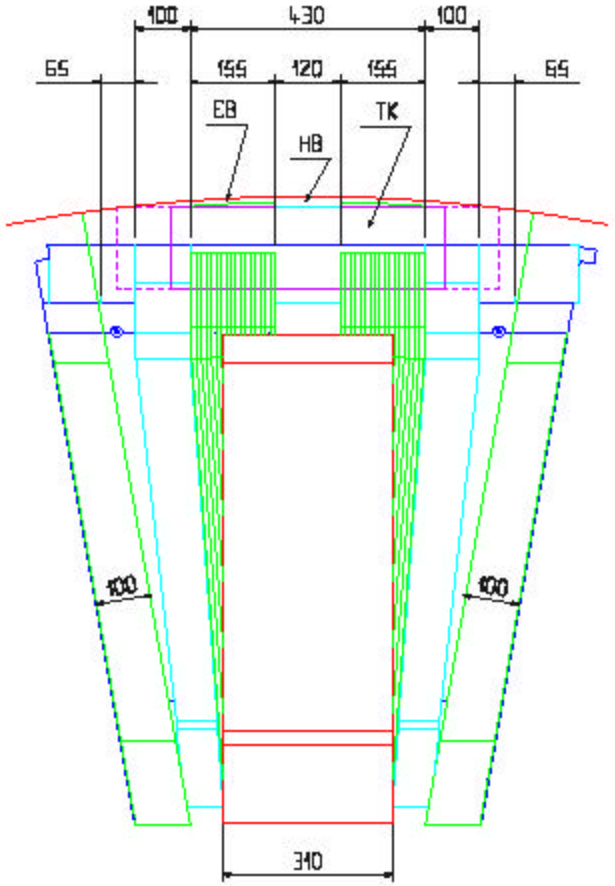
CMS QIE Solution

QIE Schedule

Decoder Box, Test Beam R&D



Access to FE Electronics



53 degree end of HB wedge.

Blue = HCAL services

Green = ECAL

Red = Tracker

End of HB wedges obscured by cables and services from HB, EB, tracker. Servicing electronics nontrivial.

Goals

- We have a ~ final design which has been on hold for 6 months.
- The schedule for RBX is near to the critical path.
- The design has been sent to CMS for evaluation and optimization.
- We need approval of the RBX - optical cables, ODU, shell, etc. The HPD and QIE are not yet ready for prime time.