

IceCube:

DOM Requirements Workshop

- Icecube Collaboration Meeting
 - 22 June 2002

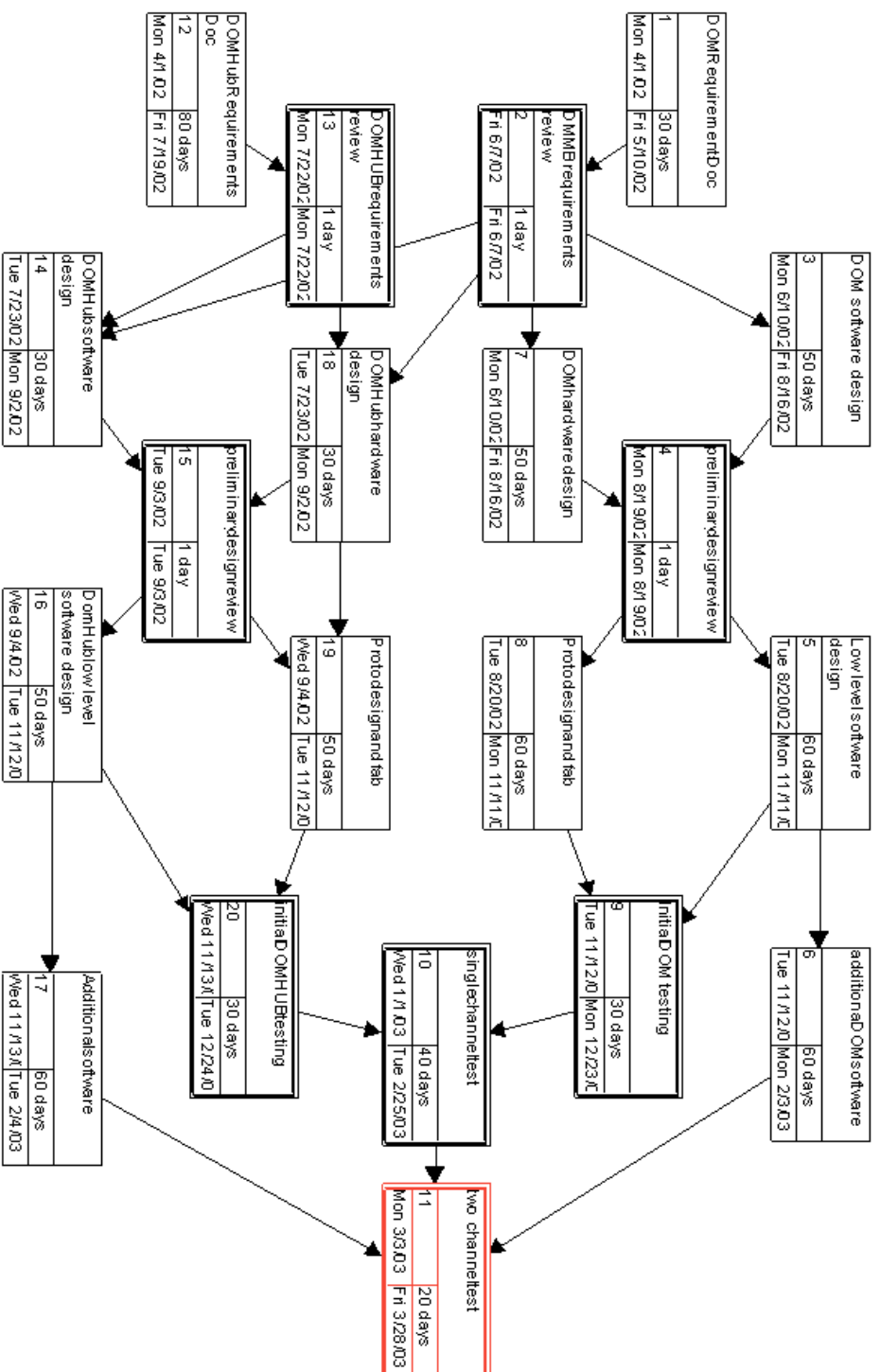
Introduction

- DOM Main Board Review 5 June 2002
- DOM HUB Requirements Workshop 22 June 2002

Development process

- (Conceptual Design and review)
- Requirements determined and reviewed.
- Initial design effort
- Preliminary Design Review
- Production Model (prototype) fabrication and testing
- Critical Design Review (Production Design Review)
- Production, testing Q/A
- Pre Installation Review

Development Schedule



DOM electronics Milestones:

- DOMMB Requirement Review
- Today's Requirement workshop for DOMHUB
- “Prototype” Design Review in August/September
- first card under test in November
- single channel test in January 2003
- two channel test in March 2003

Configuration management

- sample of method from STAR supplied to Icecube
- under consideration at Wisconsin
- requirement documents will be managed as “controlled icecube notes”

Scope of DOM MB Review

- DOM Main Board Requirements
 - Hardware
 - Software
- Three Documents
 - DAQ System Requirements
 - DOMMB Hardware Requirements
 - DOMMB Software Requirements

DAQ System Requirements

- 3.1.1 Requirement: Muon Trajectory Direction Reconstruction
- 3.1.2 Requirement: Muon Energy Reconstruction
- 3.1.3 Requirement: Energy Calibration
- 3.1.4 Requirement: Electromagnetic Cascade & Hadronic Shower Reconstruction
- 3.1.5 Requirement: Single PhotoElectron Sensitivity
- 3.1.6 Requirement: Background Muon Rejection
- 3.1.7 Requirement: Deadtime
- 3.1.8 Requirement: Supernova Sensitivity
- 3.1.9 Requirement: ICETOP/ICECUBE Trigger Relationship

DOMMBB Hardware Requirements

- 3.1.1 Requirement: Time Resolution
- 3.1.2 Requirement: Time-Stamped Data
- 3.1.3 Requirement: Waveform Capture
- 3.1.4 Requirement: Instantaneous Dynamic Range
- 3.1.5 Requirement: Integral Dynamic Range
- 3.1.6 Requirement: PMT Gain stability, Linearity, and Calibration Accuracy
- 3.1.7 Requirement: PMT Noise Rate Measurement
- 3.1.8 Requirement: PMT Discriminator Threshold Stability
- 3.1.9 Requirement: Feature Extraction
- 3.1.10 Requirement: DOM MB Data Transmission

DOMMBB Hardware Requirements (contd)

- 3.1.11 Requirement: One or Two DOMs per Twisted Pair
- 3.1.12 Requirement: DOM MB Operation in Master/Slave Mode
- 3.1.13 Requirement: Robust Bootstrap Scenario
- 3.1.14 Requirement: Simultaneous DATA Acquire/Transmit
- 3.1.15 Requirement: Common-Mode Noise and EMI Rejection
- 3.1.16 Requirement: DOM MB Power Dissipation
- 3.1.17 Requirement: Local Clock Short-Term Stability
- 3.1.18 Requirement: Cable Length Measurement by RAP
- 3.1.19 Requirement: PMT HV Base Interface
- 3.1.20 Requirement: DOM MB Failure Rate

DOMMB Software Requirements

- 3.1 Data Acquisition:
 - 3.1.1 Requirement: Data Transport
 - 3.1.2 Requirement: Triggering and Digitizing
 - 3.1.3 Requirement: Data Overwrite
 - 3.1.4 Requirement: Supernova Detection/Background Noise Rate Storage
 - 3.2 Timing Calibration:
 - 3.2.1 Requirement: One-way Time Calibration
 - 3.3 Control and Monitoring:
 - 3.3.1 Requirement: Configuration Control
 - 3.3.2 Requirement: Monitoring Interrogation
 - 3.3.3 Requirement: Configuration Control During Data Taking
 - 3.3.4 Requirement: High Voltage Control

DOMMB Software Requirements (contd)

- 3.4 Communications:
- 3.4.1 Requirement: Data Rates
- 3.4.2 Requirement: Simultaneous Data Acquisition and Data Transmission
- 3.4.3 Requirement: Data Transmission Integrity
- 3.5 Test:
- 3.5.1 Requirement: Diagnostic Tests
- 3.5.2 Requirement: Light Emitter Control
- 3.5.3 Requirement: System Reliability Tests
- 3.6 Configuration Management:
- 3.6.1 Requirement: DOM ID Code
- 3.6.2 Requirement: Release Version stored on DOM
- 3.6.3 Requirement: Remote Loading of Programs
- 3.6.4 Requirement: Shut Down Mode

Support Documents

- <http://icecube.wisc.edu/tech/>
 - Preliminary Design Document (chapters 6 and 7)
- http://rust.lbl.gov/icecube/docs/ice3_daq_documents/
 - DAQ Workplan (Work_Plan_H_vsn1.2.doc)
 - DAQ Deliverables (Plan_B_Deliver_vsn1.2.doc)

Major Action Items :

- **Project level**
 - Top Level requirements
 - Lifetime
 - Failure rates/modes
 - System power consumption
 - EMI standards
- **DAQ level**
 - error budget
 - power budget
 - specifics for ICETOP
 - specifics for IN-ICE

DOM MB Review closeout

- Action item responses are being incorporated
- “re-review” after project requirements are set

DOM HUB Engineering Requirements Workshop

- Goal is to begin process to determine requirements
- Add to DAQ System Requirements as needed
- Create DOM HUB Hardware Requirements document
- Create DOM HUB Software Requirements document
- Create DOM - DOM HUB Hardware Interface document
- Create DOM- DOM HUB Software Interface Document
- Samples of each are starting point only
- requirements need discussion