The BESIII Current Status

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MDC

- **Expected Performance:**
  Single wire spatial resolution 130μm, dE/dx 6%

- **Finished Work**
  - The study of characteristic of glue, airproof, aging and radiation performance
  - The study of wire aging, tension, line density, break...
  - Wiring techniques
  - Tension uniformity
  - Tension measurement instrument
  - Study of beforehand stress
  - The study of Feed-through
Finished beam test at Japan

\( \sigma \sim 93 \, \mu m \)
Finished equipment

The wiring machine

feed-through

carbon fiber outer skin
Front end electronic card install in prototype

- High Voltage System
- The install techniques of front end electronic card
- The test of various cables which used for BESIII MDC

FEC install

Finished
The machining of end plate

- Aluminum plate, diameter 1.8m, more than 30k holes \( \phi = 3.2 \text{mm} \), position precision \( \sim 50 \mu \text{m} \)
- Many times machining position precision >100\( \mu \text{m} \)
- Finished first plate, position precision \( \sim 50 \mu \text{m} \), the maximum \( \sim 100 \mu \text{m} \)

![Graphs showing signal wire and field wire counts](image)`
MDC Electronics

Finished:
1. FEC and main board product in miniature
2. Prototype of MQT module
3. Calibration module
4. Readout control module
5. Fan-in, fan-out module and other assistant function modules
CsI Electromagnetic Calorimeter

- **Expected Performance:**
  - Energy Resolution: 2.5% @ 1GeV
  - Position Resolution: 0.6cm @ 1GeV
Finished

• 1/3 crystal have received
• Constructing the equipment of crystal light output and uniformity testing, crystal size measure equipment
• The R&D of fiber monitor system
• Finalized the design of the calorimeter mechanical structure
electric charge sensitive prefix amplifier

* Design index:
  yawp: 1000e/crystal detect cell, equivalent yawp energy ~220 KeV?

* Experiment result:
  yawp = 820e, equivalent yawp energy = 160 KeV?
EMC electronics system module

1. front amplifier
2. primary amplifier
3. Q module
4. controller
5. fan-out
6. electrical source
TOF

- **Expected Performance**: 80-90ps

- **finish**:  
  - Electronics model test  
  - Front amplifier test, high voltage system test  
  - Radiation test  
  - PMT wave analysis and feasibility of TOT technique  
  - PMT single photoelectron transit time  
  - PMT performance under magnetic field  
  - Attenuation length experiments
Beam test study: different type scintillator, packing material, thickness,…

The result shown: can be achieve the design target
Radiation test

1000 rad/year Radiation,
Scintillator dose not obvious damaged
HPTDC Test Result; Time Resolution < 25ps

- Very High Resolution with INL Compensation
- Subtraction with Two Pulse’s Measure
- The RMS Value for one Pulse: 25.5859ps/√2~18.09ps
MUON Counter

• **R&D**
  1. Finished neutron radiation test, electron and photon radiation test at beam target room, no obvious affect for RPC performance
  2. Long term test (one year)
  3. Finished the study of resistance of the resistive plate changes versus temperature
  4. Finished the study of RPC performance versus the resistance of the resistive plate and the environment factors

• **Product**
  1. The muon identifier prototype has been appraised on May 2004
  2. All of the Endcap RPCs have been produced before 2004
  3. 1/2 barrel RPCs have been produced
RPC production in the clean room
special techniques ensured the surface smoothness without Linseed oil, super performance.

Babar w/o oil

Babar w/ thick Linseed oil coating

IHEP w/o oil
R&D: under neutron radiation

Tested for more than one month after 100000 rad neutron radiation, the RPC performances have recovered.
Performance of prototypes

Graph 1: Efficiency vs. High Voltage (V)

Graph 2: Counting Rate (Hz/sq cm) vs. High Voltage (V)

Graph 3: Dark Current (μA) vs. High Voltage (V)

Graph 4: Average Pulse Height (mV) vs. High Voltage (V)
the effect of bakelite resistivity to RPC performance

Resistivity $10^{10} \sim 10^{13}$
The effect of temperature and humidity to RPC performance

- The effect of temperature to RPC performance is more evidence,
  1. the resistivity is affected by temperature
  2. the discharge of gas is affected by temperature
- The effect of humidity to RPC performance no obvious
Endcap RPC Products

- The eligibility rate of products is more than 95%.
- at 7.5kV (Only training 1 week)

The efficiency plateaus started from approximately 7.0 kV, more than 96% RPCs’ efficiencies are more than 90%

More than 90% RPCs’ counting rate are less than 0.4Hz/cm².

More than 95% RPCs’ dark current are less than 10µ A/m²
Muon system Electronic

- Passed the second appraised,
- Finished produce
- Finished the aging experiment
- The module test have in hand.
Signed stock contract of SC cable with Hitachi, the cable has been checked and accepted. “Cable Short-sample Test Fitting” was designed, developed and made?
Finished the primary design of magnet vacuum system.
Finished quench protection scheme.
Finished Power Supply prototype R&D.

Begin roll coil
Cooling tube test
Fabrication of power supply prototype

At low voltage: DC3250A, 0.3voltage, within 24 hours
Result: stability $6.5 \times 10^{-5}$
LN2 barrel arrived

Uphold barrel arrived

Uphold barrel ship out to Tangshan

Uphold barrel welding in Beijing
Trigger System

• Finished simulation.
• Main trigger subsystem hardware layout has gone into details.
• Finished study of fiber transmission experiment.
• Set up checking system.
Trigger System Hardware Structure

Scaler System

- TDC: Trigger condition disposal
- Trigger table judge
- Main Trigger control
- Trigger signal Fan-out and drive
- RD TCL BUS

6UVME

- Trigger signal Fan-out
- Crate line
- Trigger control
- CLK input
- Crate CLK

NIM crate

- Timer fan-out

To electronics fibers

From front-end electronics

Total:
Four 9UVME
One 6UVME
One NIM crate
One PC

Scaler System:
- From front-end electronics
- Custom bus
- Board line
- Trigger condition
- Trigger control
- Crate line
- CLK input
- Crate CLK

Scaler System:
- 6UVME
- 9UVME

To electronics fibers

From front-end electronics

Total:
Four 9UVME
One 6UVME
One NIM crate
One PC
DAQ System

- BESIII DAQ system key technology problems have solved basically (VME backboard bus speed, CPU, network, ...)

Design indexes: ~ 50Mb/s,
Event Rate ~ 4000 Hz
Design Goals

- Finished data readout and storage in C-center perpetual medium. Data processing includes format conversion, histogram fill, event sort and online filtration, etc.
  
  L1 event triggering rate: 4000Hz, average event data length: 12Kb, data rate: 50Mbps

- High reliability, provided with failure auto-resume function
  For HEP experiments continuous long-time running

- Blocking design, easy to extend and upgrade
  • Adopt commercial low-cost high-performance computer and network equipment
Based on ATLAS online software framework, transplanted to our environment

- **Intercross compiling environment:**
  Sun Solaris 5.4
  Tonardo2.0
  VxWorks5.4
  Gcc2.7.2

- **Transplant status:**
  ATLAS Online total 29 packages, 17 correlative, currently 16 packages passed compiling, of those 11 packages passed single test, 3 as library package, the last 3 packages not tested.
  Five core parts finished, succeed to combine with Linux main program
BESIII Offline System

Finished

- BESIII software development and management environment Base on CMT
- Base on GAUDI 3 versions software framework
- Base on GEANT4 detector primary simulation program
- Mostly sub-detectors primary reconstruction programs have finished
- Base on MYSQL offline calibration system and parameter management system
BES III Offline Software System

Simulation
  - Generator
  - Event Display
  - Digitization
  - Calibration

Reconstruction
  - Physics Analysis
  - Event Display
  - Calibration

Metadata (persistent)
  - MySQL database
  - CalibUtil services
  - Gaudi services
  - Gaudi client

Pre-tracking
  - Cal-MDC
  - Cal-TOF
  - Fast-track
  - Event-T0
  - MDC-track
  - EMC(B/E)
  - TOF(B/E)
  - MUID

Post-tracking
  - V0FIND
  - Phys-tracking
  - EVERTEX
  - DST Made

Detector-Geo
  - Exp. data
  - MC data
  - Cal-Data
  - Control-Data

Calibration & Database

CalibUtil Services
  - Register, write
  - Search
  - Read

FACS

Gaudi
  - Simulation
  - Calibration
  - Reconstruction
  - Physics Analysis

Pre-tracking & Post-tracking

Calibration
  - Calibration
  - Database
BES III Offline software package

BossCvs

Current directory: [BESIII] / BossCvs

File

- BcmCxxPolicy/
- BcmExamples/
- BcmFortranPc/
- BcmPolicy/
- BcmROOT/
- BcmRelease/
- Calibration/
- Calorimeter/
- Control/
- Database/
- DetectorDescription/
- Disp/
- Event/
- EventDisplay/
- EventFilter/
- External/
- Generator/

BES III Offline CVS

Over 100 software packages
4 p - tracks in BESIII

\[ p = 0.5 \text{--} 1.5 \text{GeV} \]

\[ |\cos\theta| < 0.9 \]

pion punch-through

Hits in end-cap TOF
Summary
In past year, there are many problems for us, but most of them have been solved, for example, the MDC end plate machining, SC cooling pipe,…. I think, in front of us, there are many problems which also wait us, and I believe we can solve them again.