

# PHENIX TOF Mini Review '96

*God-Father ; Richard Seto*

General Introduction

Progress of TOF Mechanical

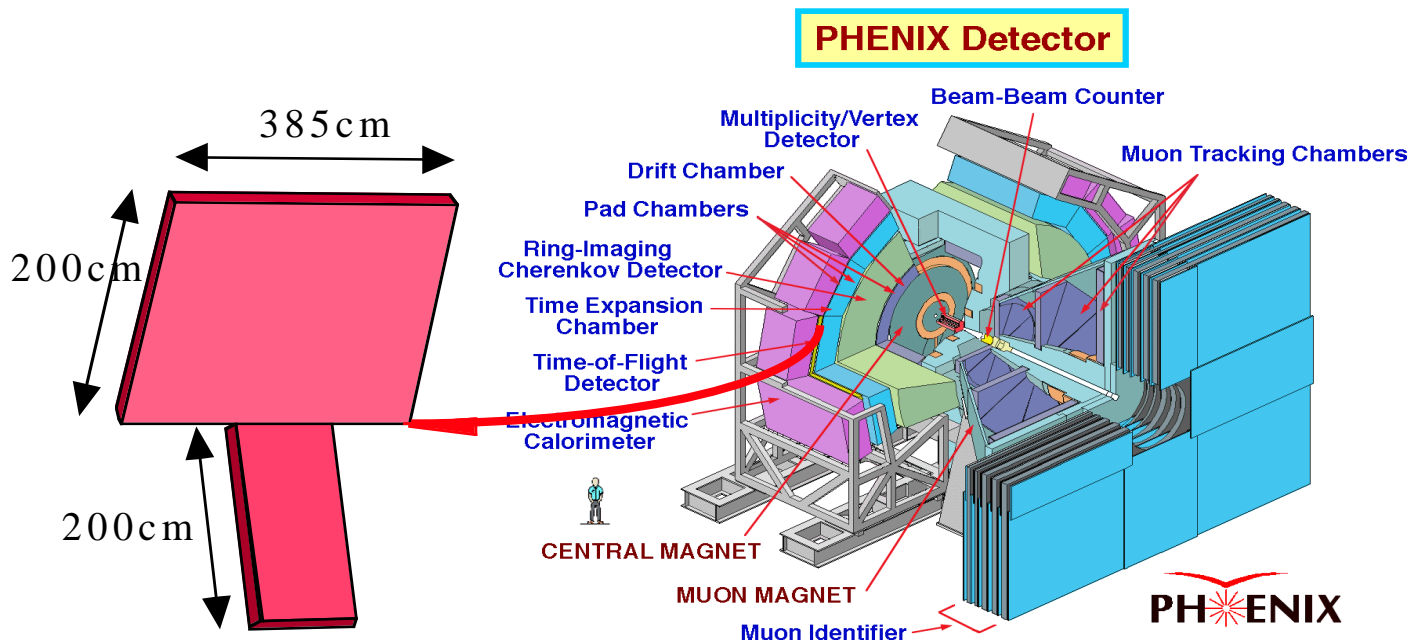
Laser Calibration System

Cost & Schedule

Recent Progress of FEE by Kazu KURITA

Backgrounds from PbGI by Akio KIYOMICHI

# General Introduction



- 5m from the vertex.
- Hadron Identifications from the TOF meas.

$$\sigma \sim 80 - 100 \text{ p s}$$

pion/kaon upto 2.0 - 2.5 GeV/c.

proton, anti-proton upto 4 GeV/c.

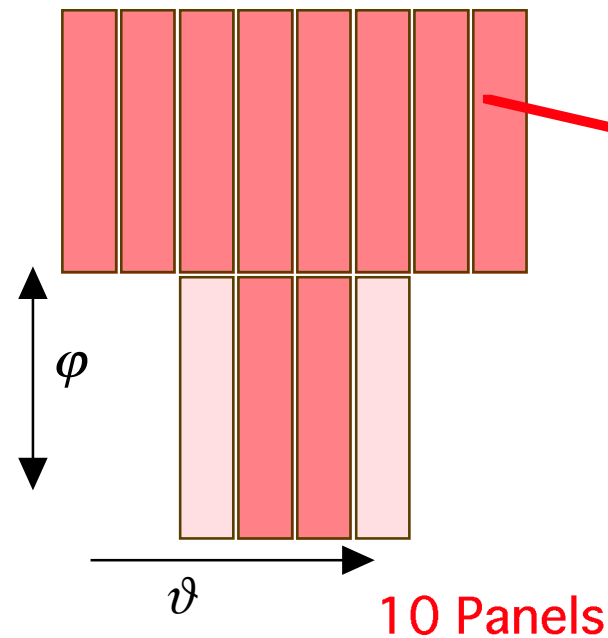
- Acceptance ; driven by HBT and phi meson

$$\Omega \sim 1 / 3 \text{ S r ; full in rapidity, 45 degree in phi}$$

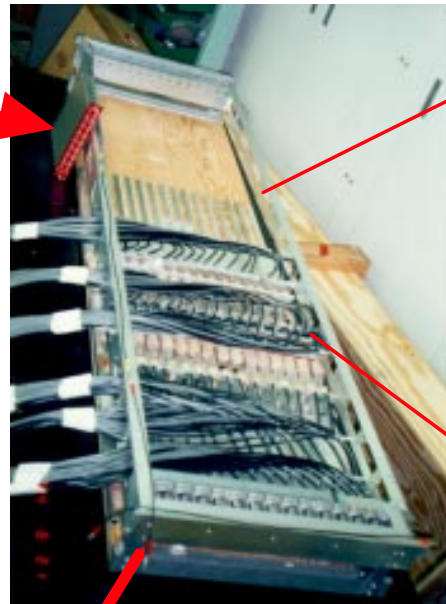
- Panel Structure

# Panel Structure

## View from Vertex



192 cm x 49 cm x 15.7 cm  
96 slats (192 PMT)

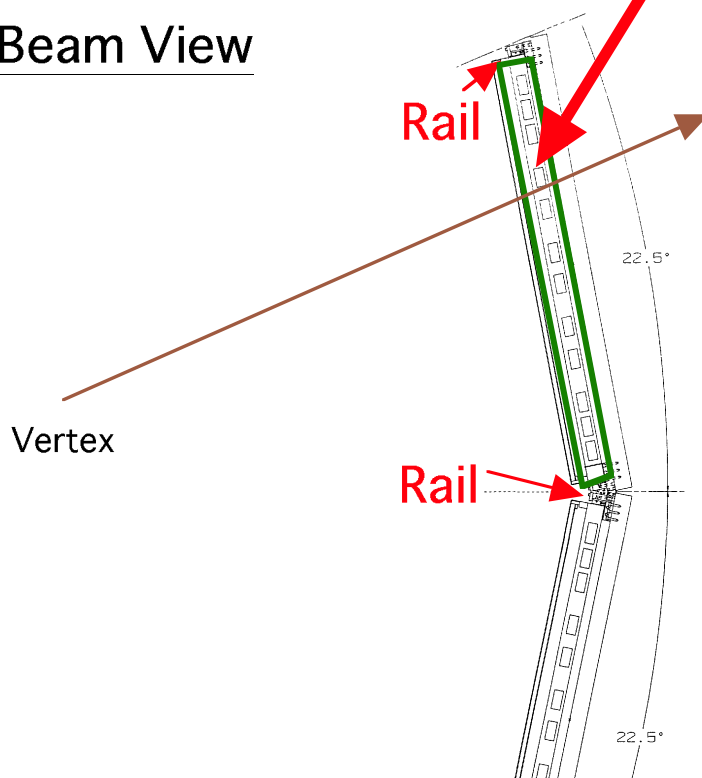


PMT

Plastic  
Scintillator  
(Bicron BC404)



## Beam View



One octant consists of  
8 panels which hang on  
the rail across z.

The rails are attached  
to the main structure.

Handling of the panel

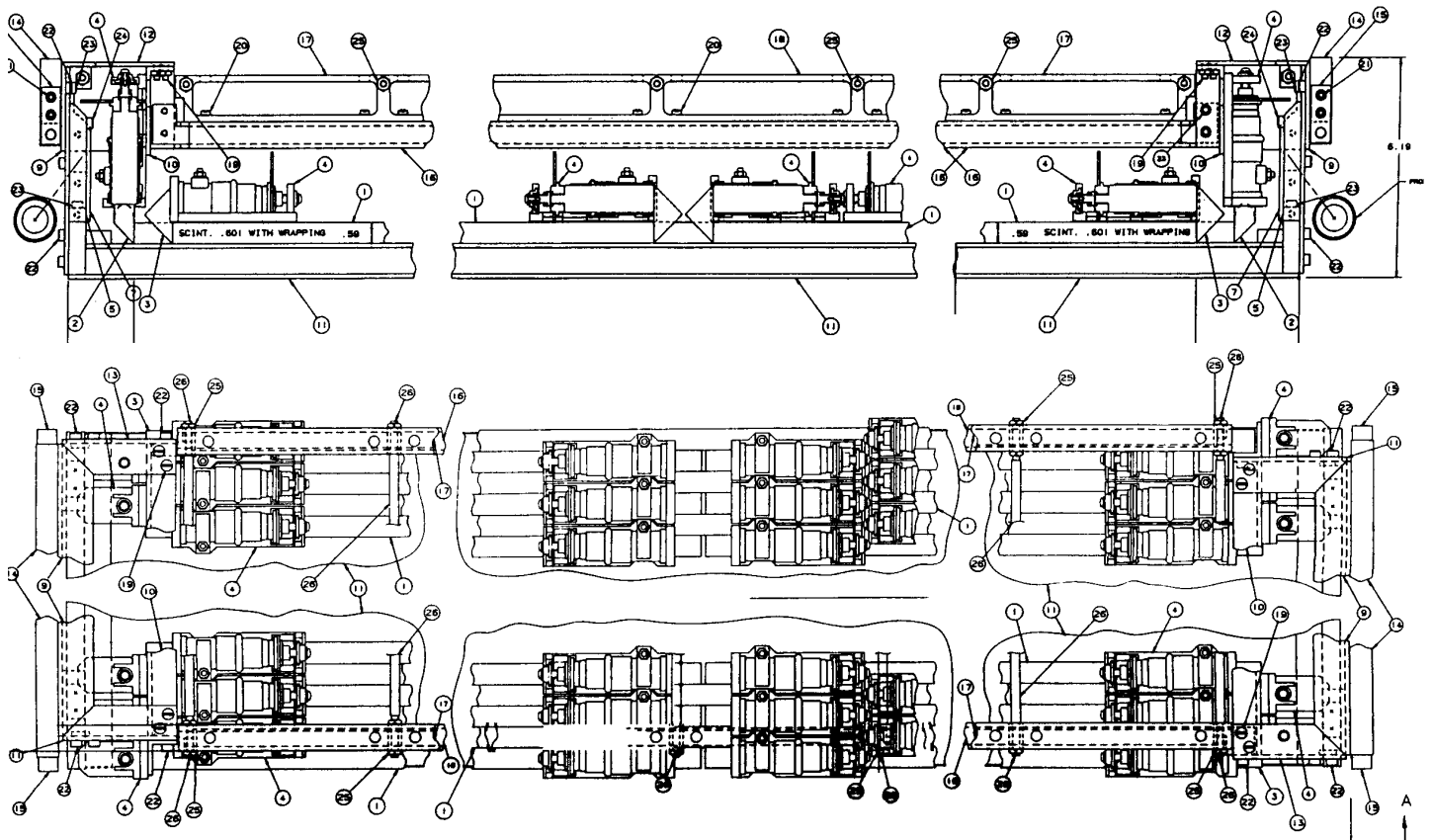
## Handling of the panel



- Two people can carry a panel w. no problem.

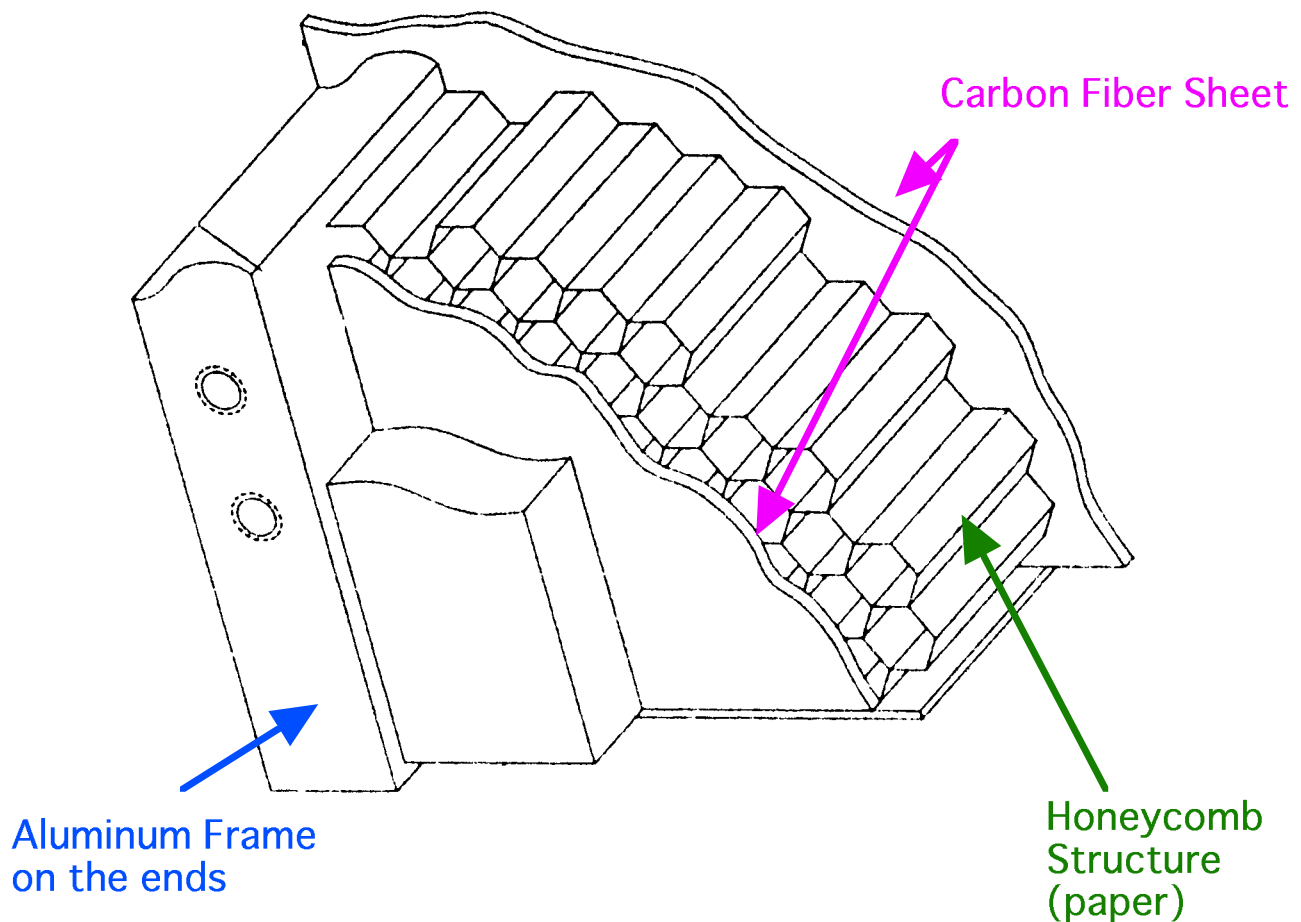
# Progress of TOF Mechanical

*Designed by Mar'94 by Yin Au (Nevis)*



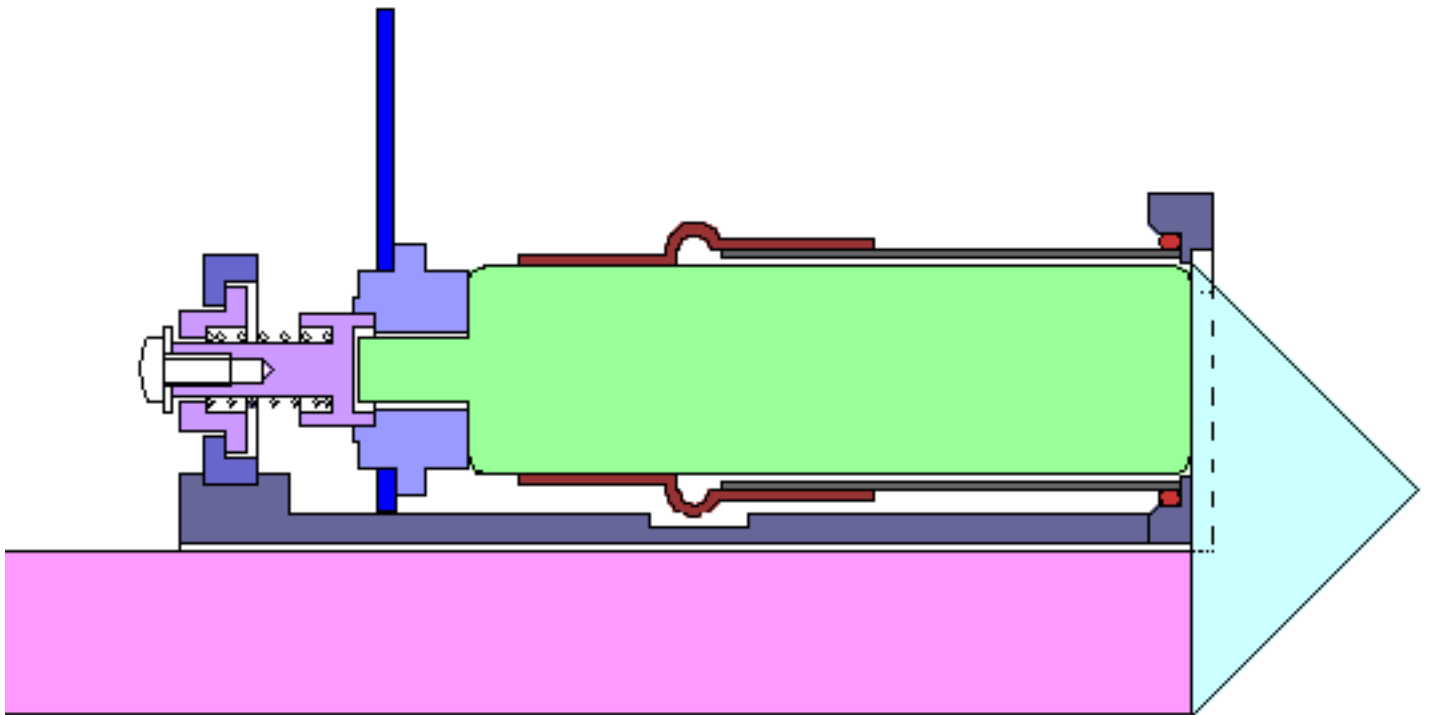
- Design based on the series of R&D efforts <93.
- Honeycomb Board
- PMT holder
- Mockup Test
- Prototype prod. & test
- Production of 5 panels
- Installed at WA98
- Operation at WA98
- HV system

## Honeycomb Board



- Rigid structure with "no mass" in 2 m x 0.5 m
- Carbon fiber sheet + "honeycomb" structure
- Expensive : 3.5k\$/board

## PMT holder

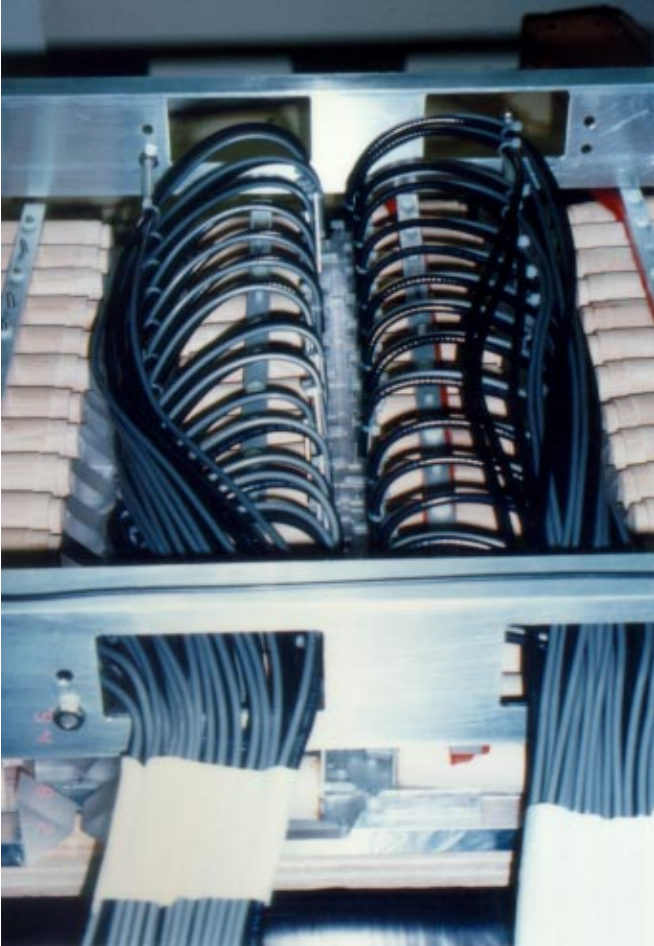


- Easy maintenance of PMT& bleeder.
- Easy light shield using rubber tube & ring



## Mockup Test

*May'94 at Nevis*

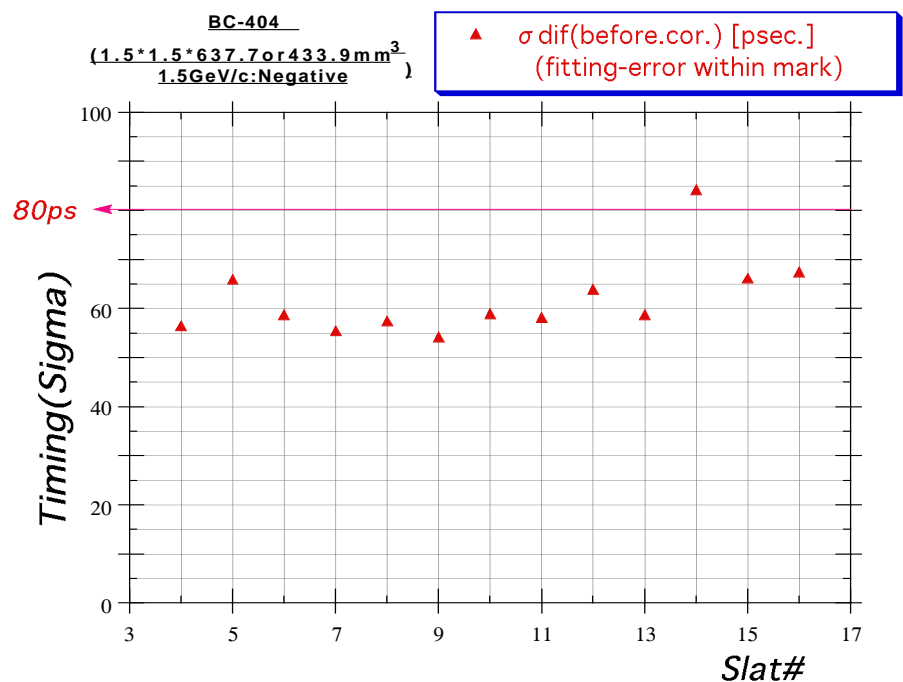
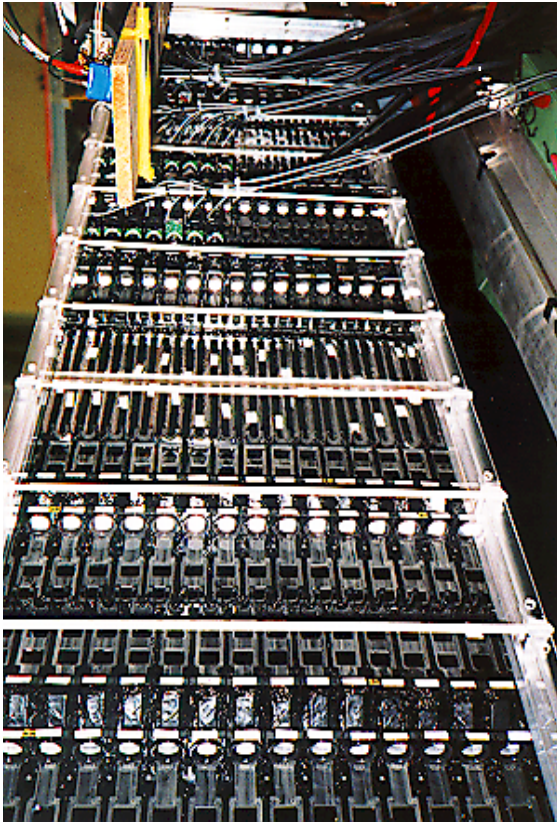


- Test of mechanical design
- Handling of massive coaxial cables
  - Make "flat cable" for each row of the panel
  - Make it neat mess



# Prototype prod. & test

Dec'94, Mar'95 at KEK



- 32 slats x 3 slat (490 mm x 1924 mm)
- Intrinsic timing resolution of 80 ps confirmed !

## Production of 5 panels

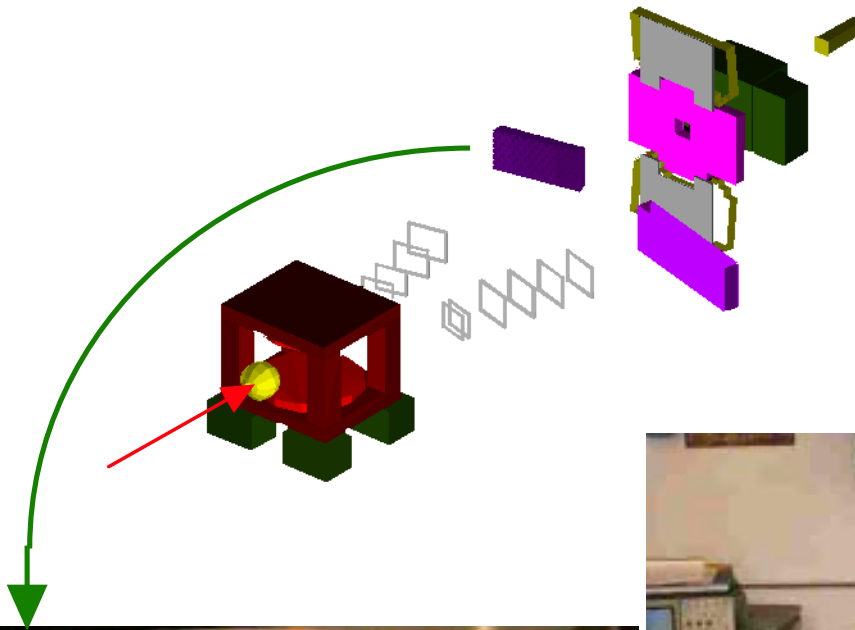
*5 panels completed by Dec. 95*



- 2 - 3 weeks/panel for assembly w these people.

## Installed at WA98

*By April '96, installation of 5 panels completed !*



5 panels standing at CERN-WA98

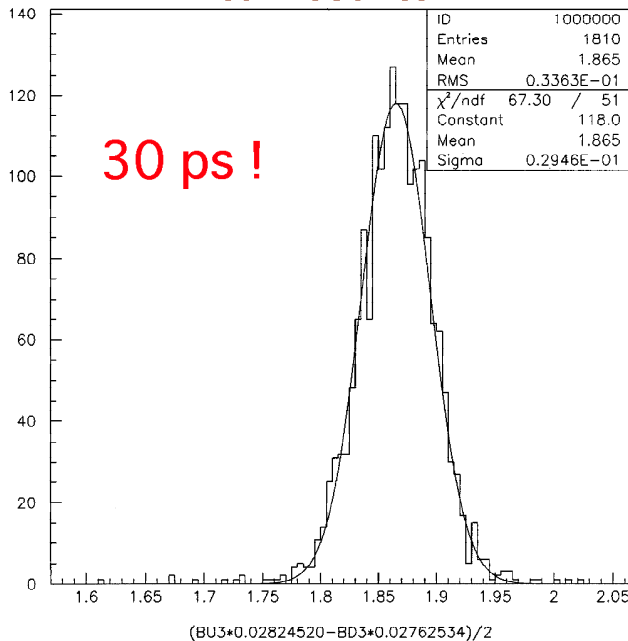


Hard working Grad. Students

# Operation at WA98

*By Nov. '96, all FEE installed !*

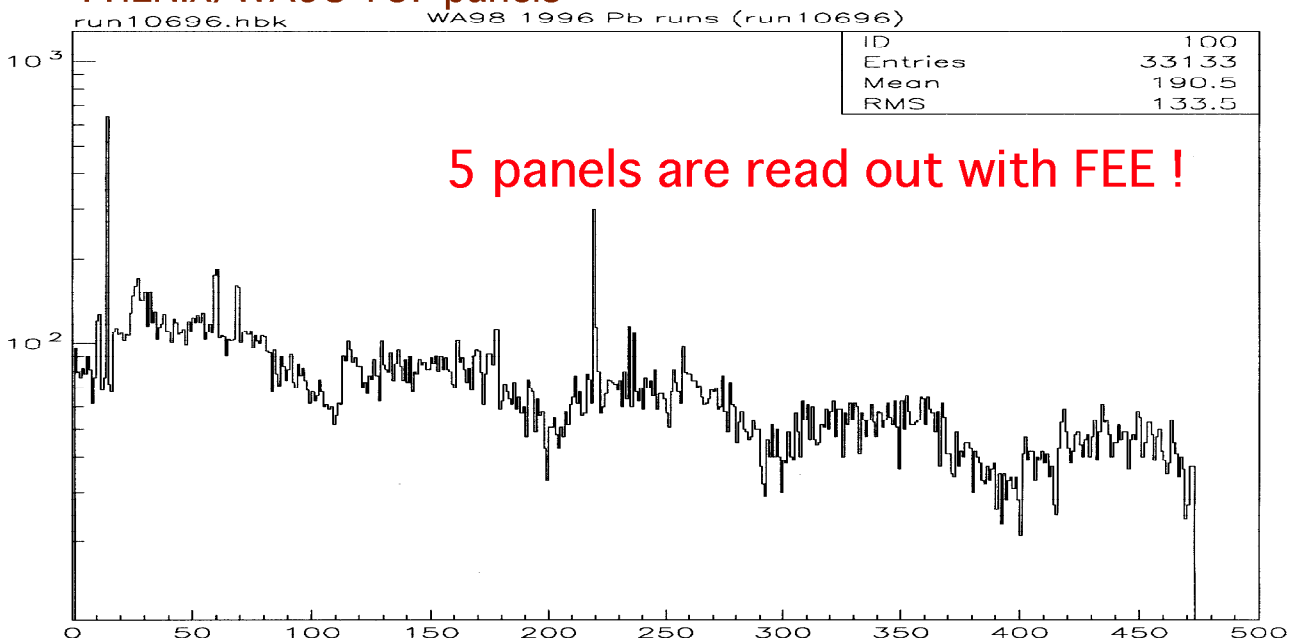
Beam counter



- Using FEE, resolution of 30 ps obtained for Beam Counter.
- Taking physics data using 160 GeV Pb Beam now.

PHENIX/WA98 TOF panels

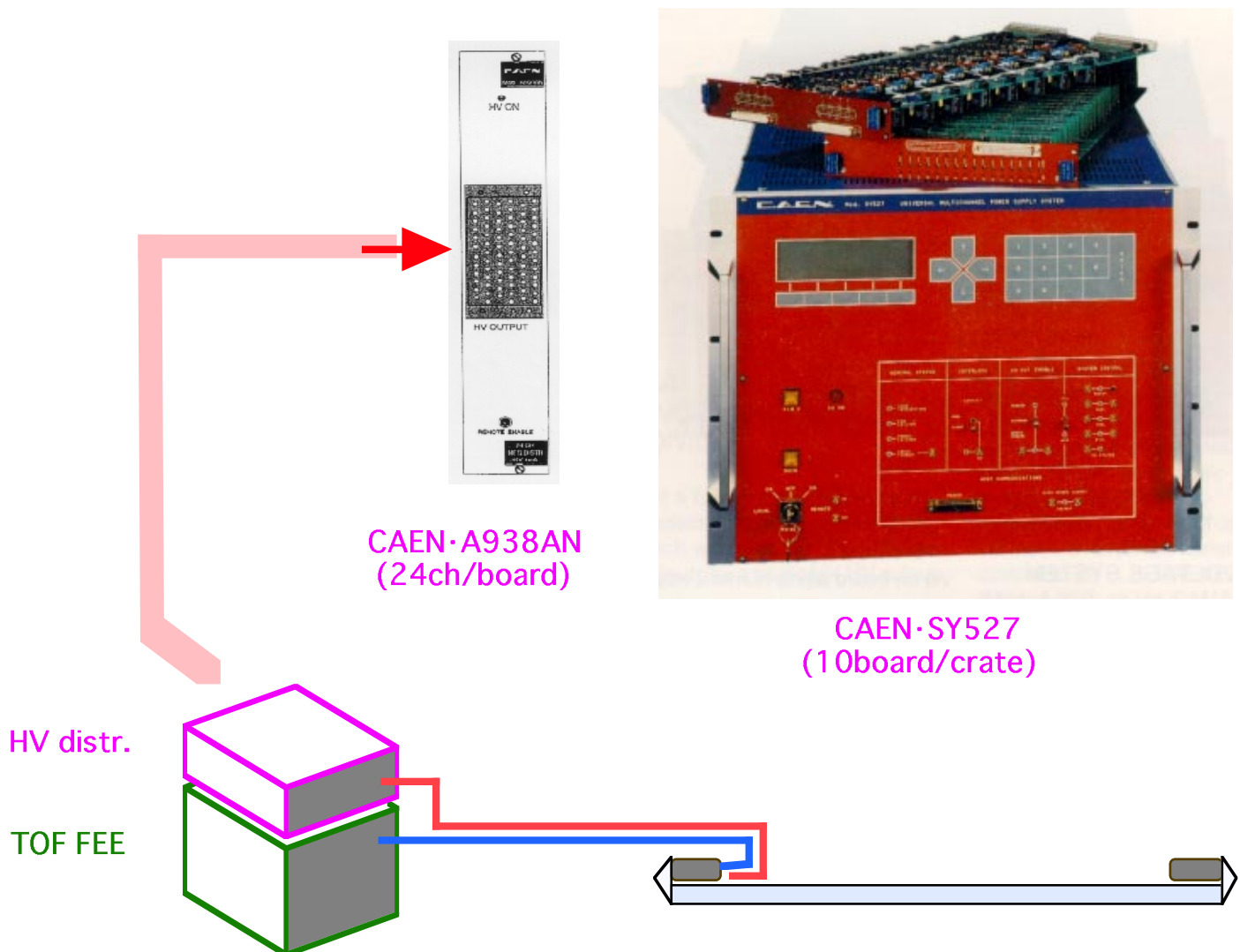
96/11/07 16.51



Slat No. -->

Detail story by Kazu

# HV system



- HV board (CAEN/A938AN)  
Modified version of A933AK (Super Kamiokande)  
1.2 mA/ch., 2200 Vmax --> 1ch for 2 PMT's
- HV crate (CAEN/SY527) ; Standard Main Frame  
CAENET control + RS232C terminal line
- Purchased & all delivered !



# Laser Calibration System

*On going R&D project*



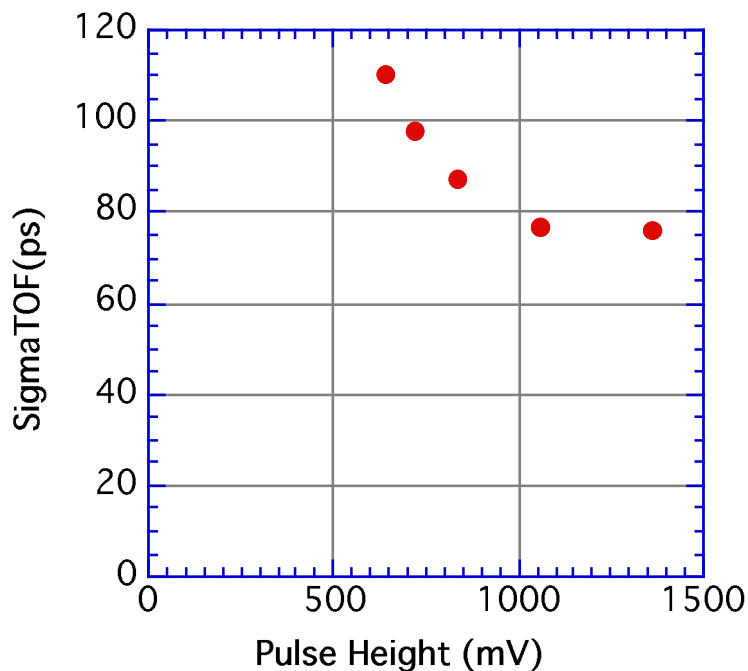
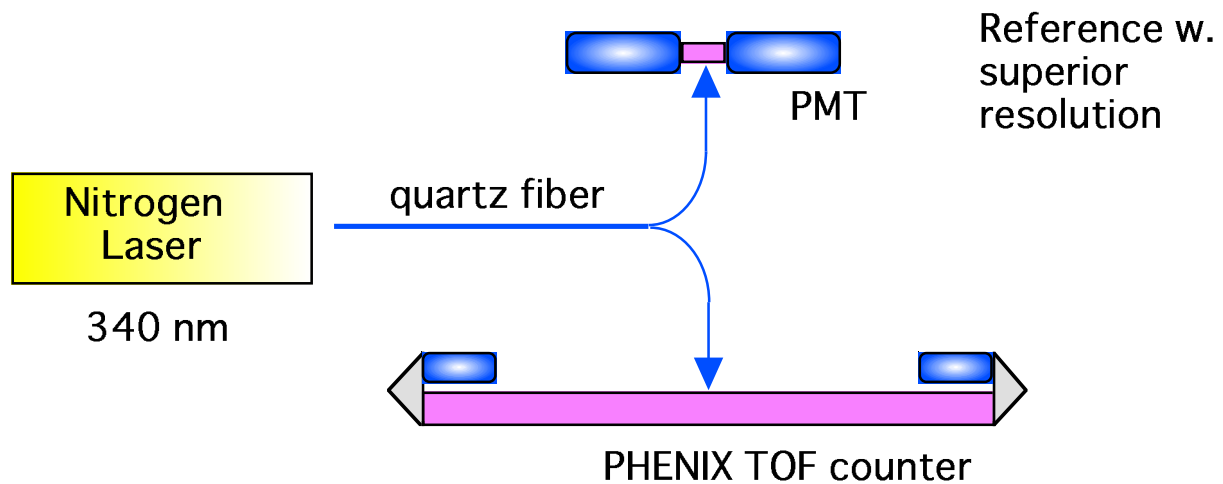
Daisuke MIURA

Sachiko URASAWA

- Calibration of relative timing  
at the level of  $<50$  ps
- Timing Resolution
- Cable Arrangement
- Fiber Arrangement
- Fiber distribution scheme



## Timing Resolution



- UV pulse introduced to the scintillator w fiber.
- Scintillation light is excited by UV light pulse.

Same pulse shape as

- Timing resolution of <80 ps can be obtained.

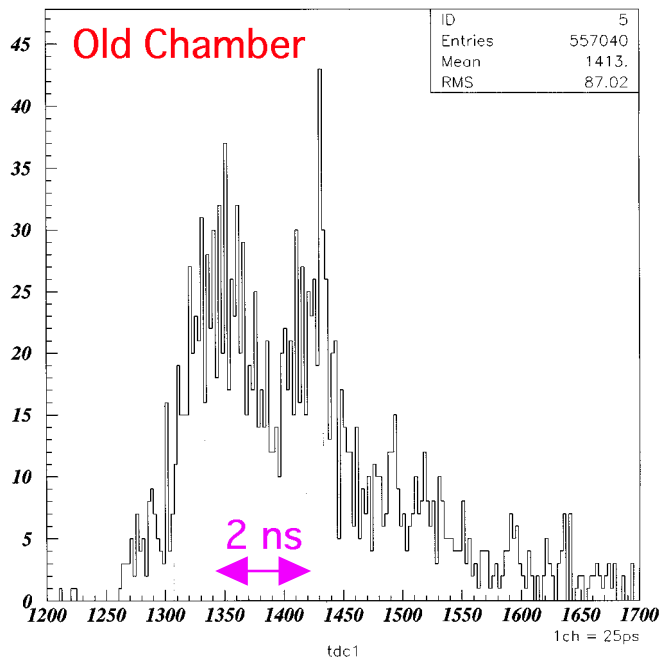
Resolution of centroid is good enough.

- Long term stability?  
of Nitrogen laser

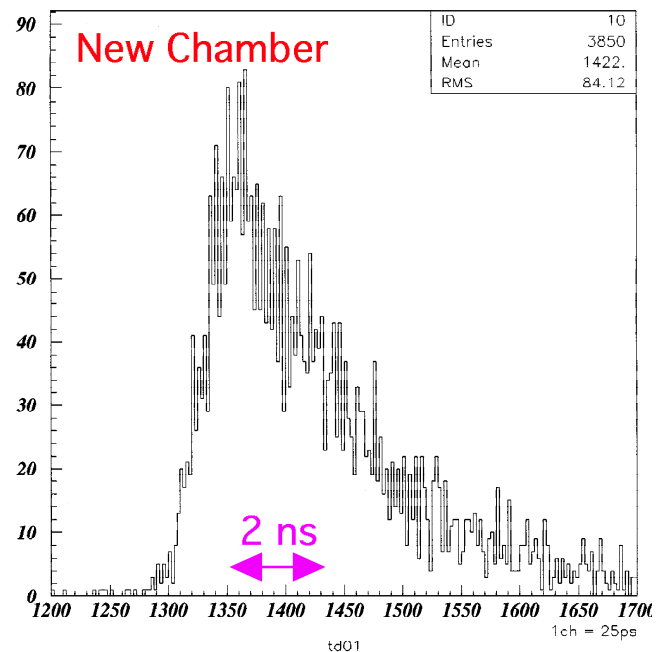
# Long term stability? of Nitrogen laser

*Light emission envelope compared*

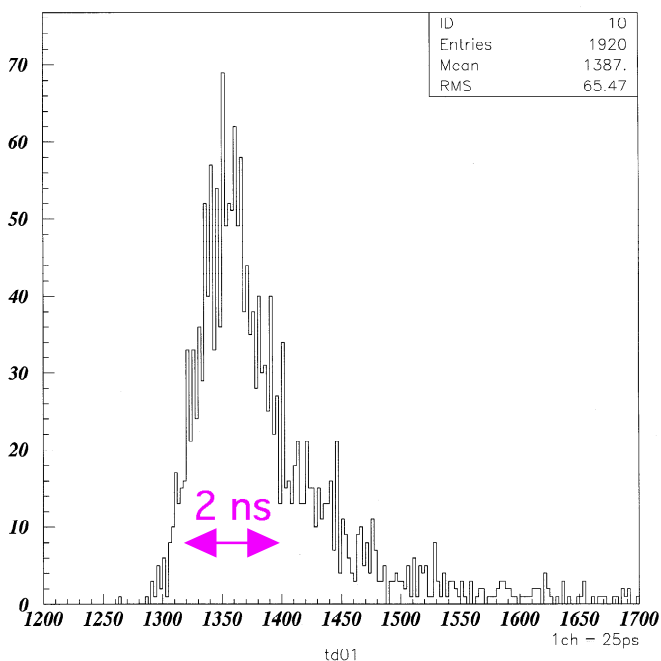
VSL337 Before Exchanging plasma chamber



VSL337 Pulse Shape (run6450)



LN120C Pulse Shape (run6260)

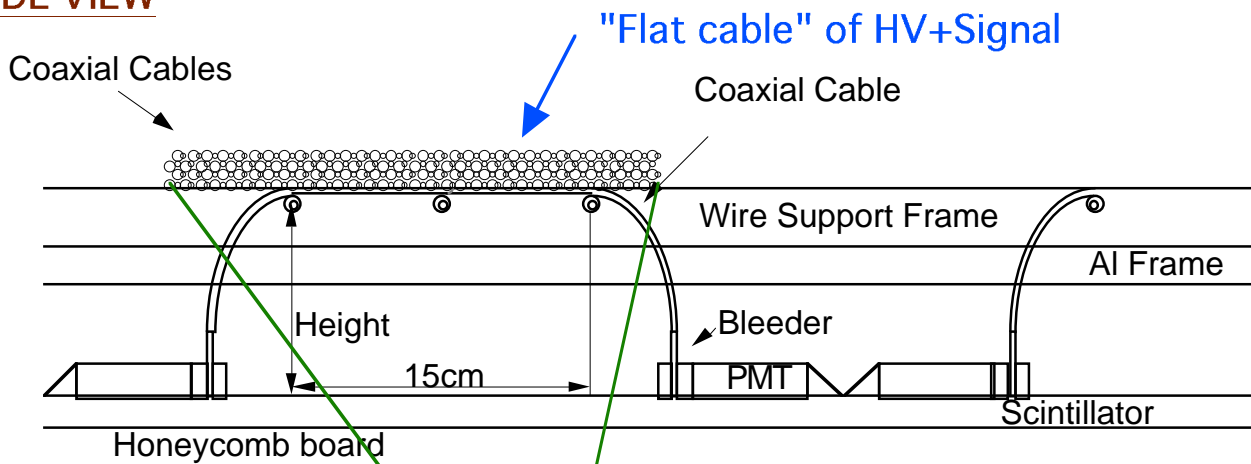


- Aging of the discharge chamber affects the pulse width.
- YAG laser is preferable

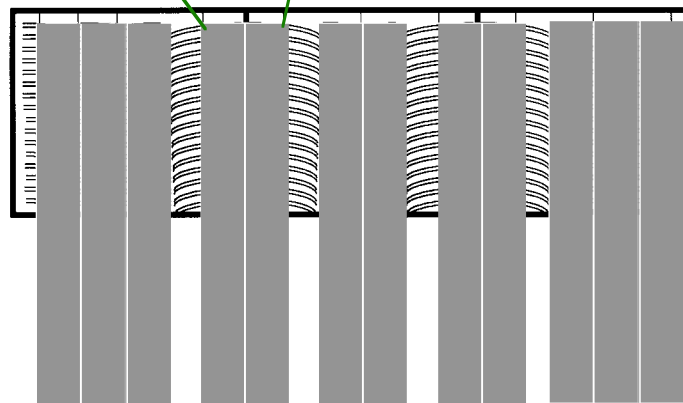
# Cable Arrangement

*New for PHENIX. Not a problem in WA98*

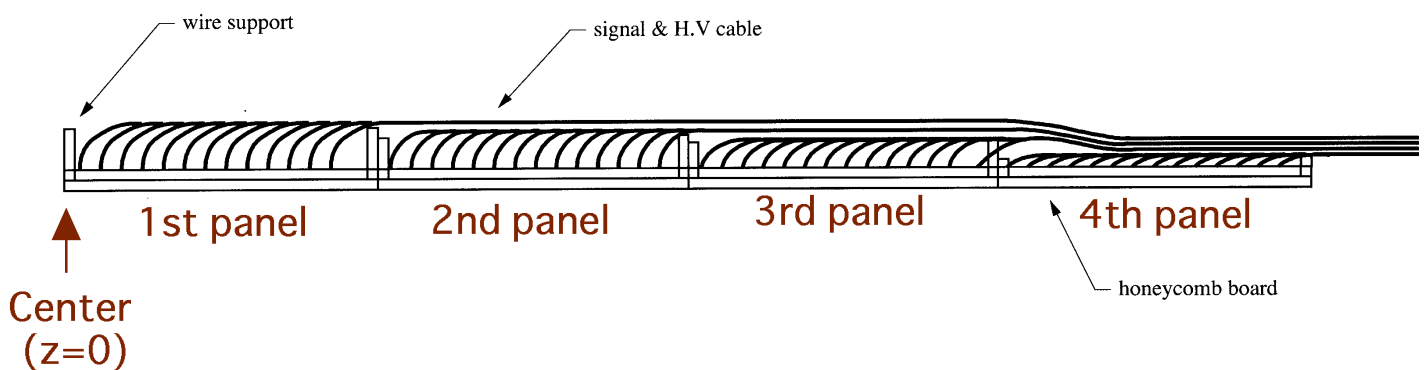
## SIDE VIEW



## TOP VIEW



## BOTTOM VIEW



- Lay "flat cable"s on the top

## Fiber Arrangement



- Quartz fibers for laser calibration

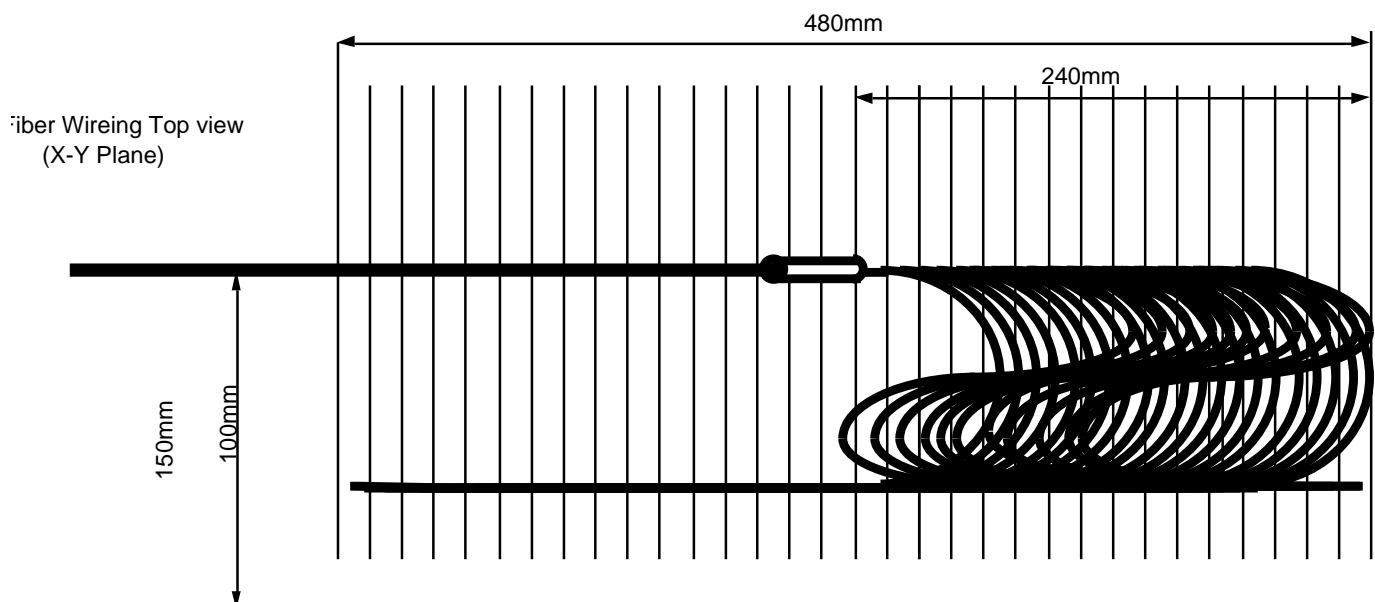
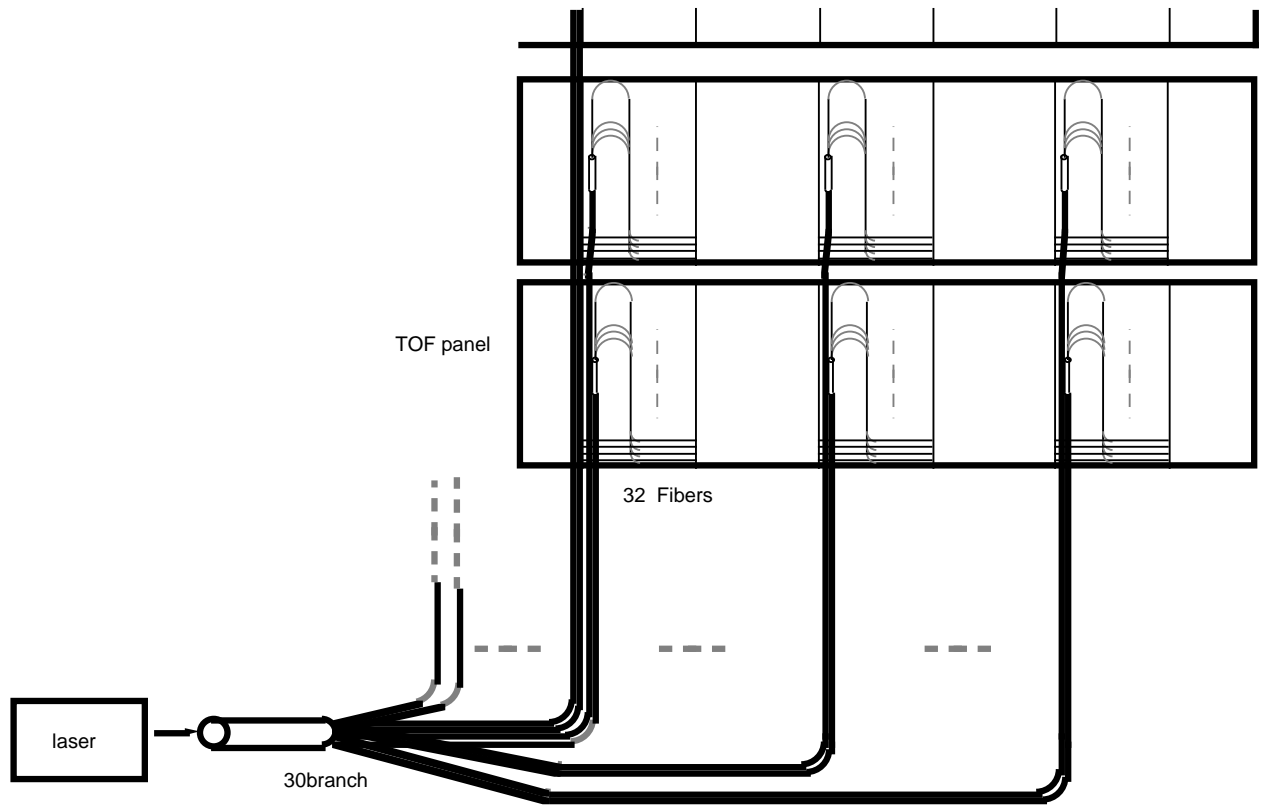
Very fragile

Keep 'sacred' space just for fibers

- Mockup study being done

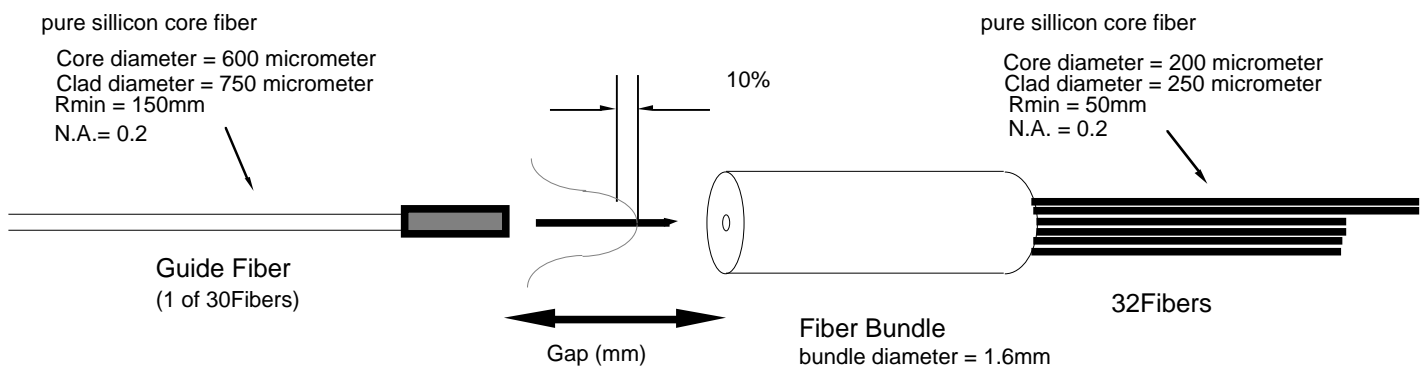
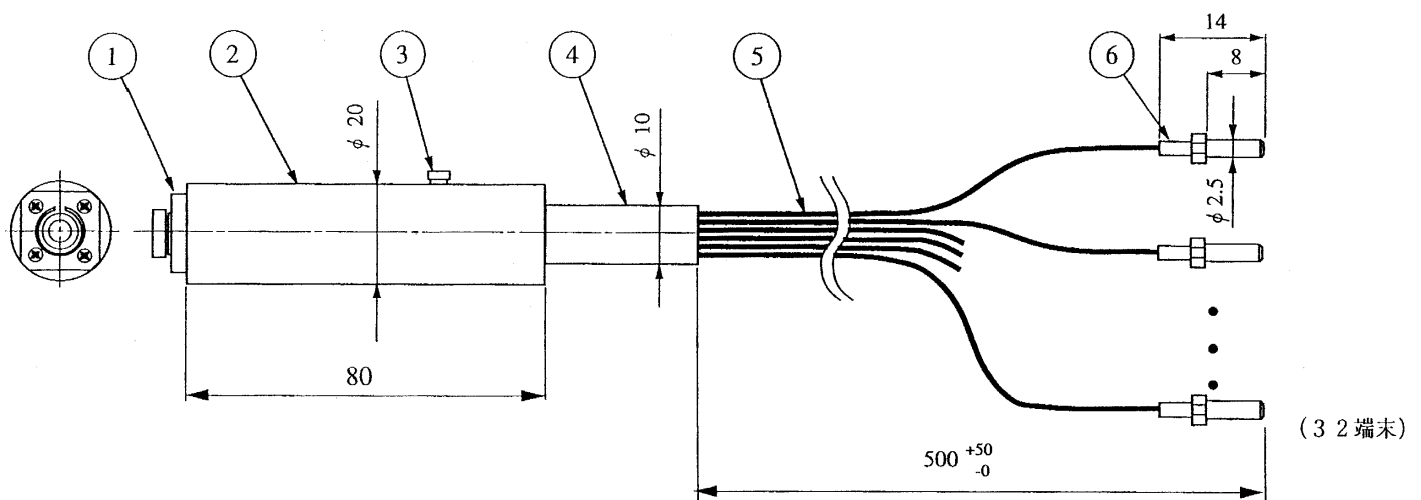


## Fiber distribution scheme



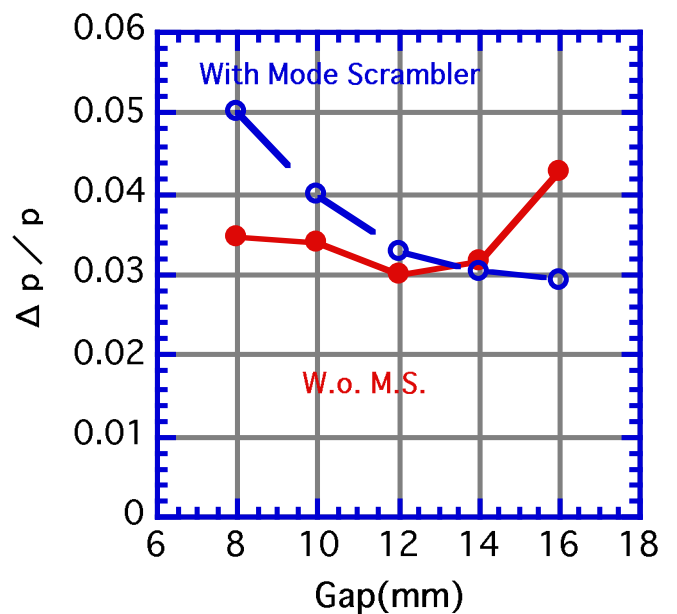
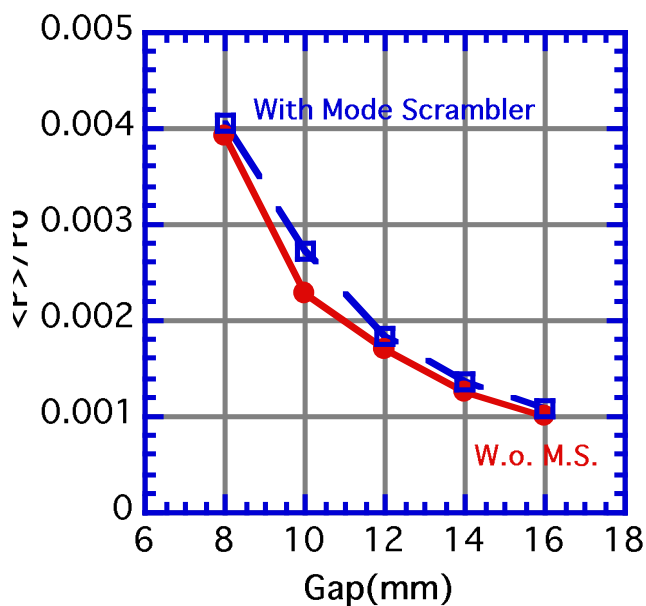
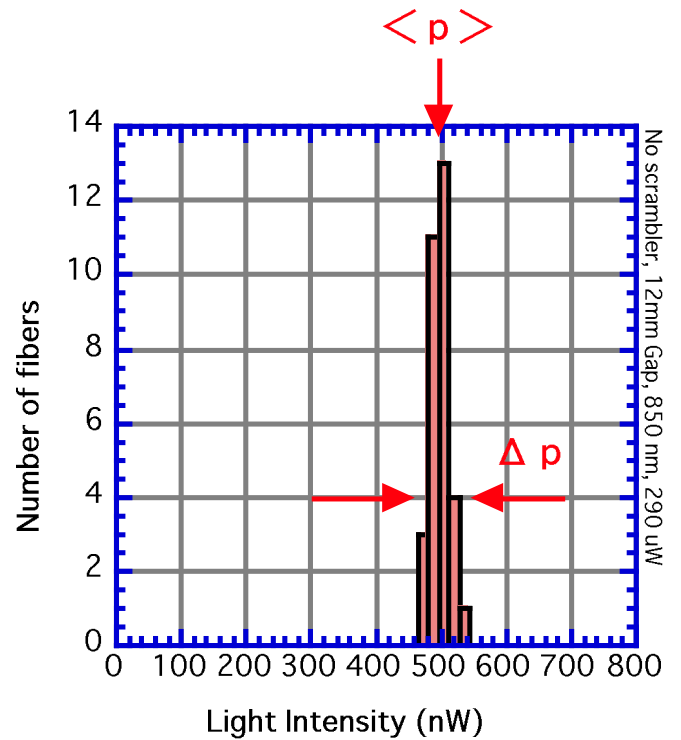
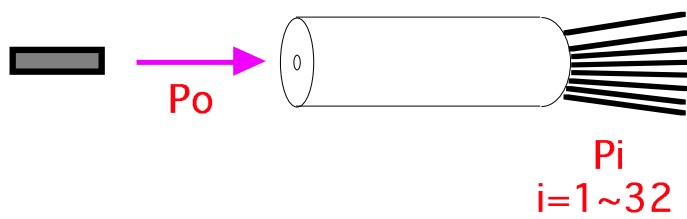
- Prototype of fiber bundle
- Uniformity Study

# Prototype of fiber bundle





# Uniformity Study



Further tests in progress

## Cost & Schedule

*Own fund for PHENIX/WA98-TOF*

	<i>Amount (M Yen)</i>	<i>Activities</i>
'94	68	PMT purchase, Prototype assembly & tests
'95	68	Production of 5 panels , FEE prototype assembly & tests
'96	68 + Bonus fund 130	Production of 5 panels, FEE production
'97	26	Sector test, Shipping to BNL
Total	220 + 130	

- Grant-in-Aid for Scientific Research

From '94 - '97, 2.2 M\$ (total)

To complete the TOF construction

- Bonus funding for education of grad.school.

1.3 M\$ in '96

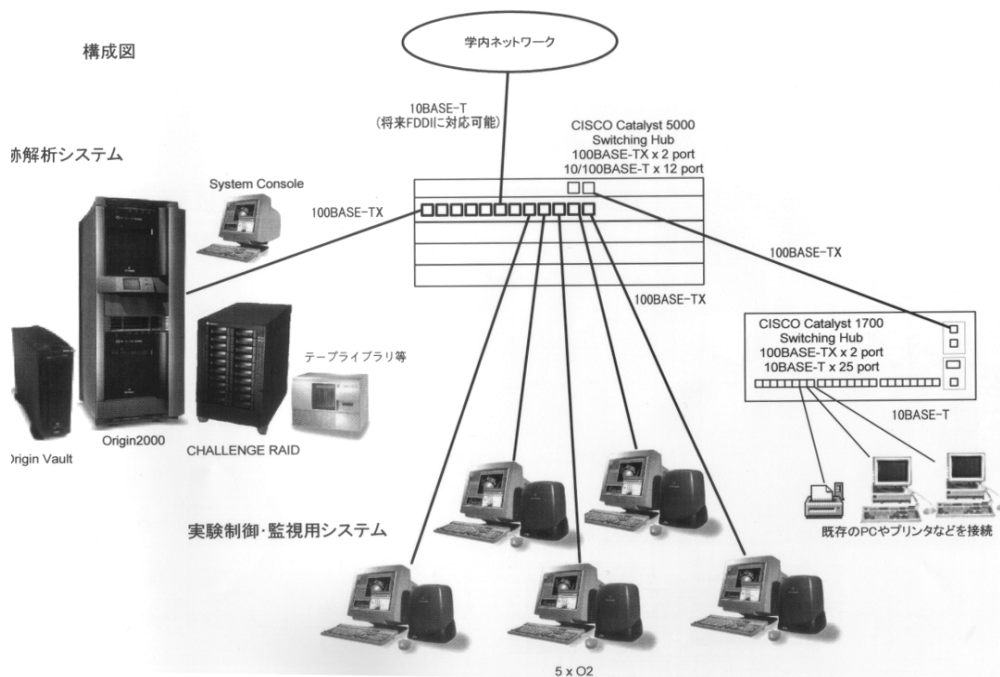
Tsukuba Computer farm

- Cost Details

- Major Milestones of TOF mechanical

# Tsukuba Computer farm

*As part of PHENIX-CC-J*



Server	SGI Origin2000 (12CPU)
Performance	102 SPECint95/ 187 SPECfp95
Memory	2 GB
Disk	140 GB
Tape Drive	DLT4700(7tapes)
Work station	5 SGI O2(R10000)
Performance	8.0SPECint 95/ 10.0SPECfp95 for each WS
Memory	128 MB for each
Disk	8 GB for each

- Operational by April '97.
- Data analysis of WA98 & E866
- Simulation efforts for PHENIX

Close contact w Charlie et. al.

## Cost Details

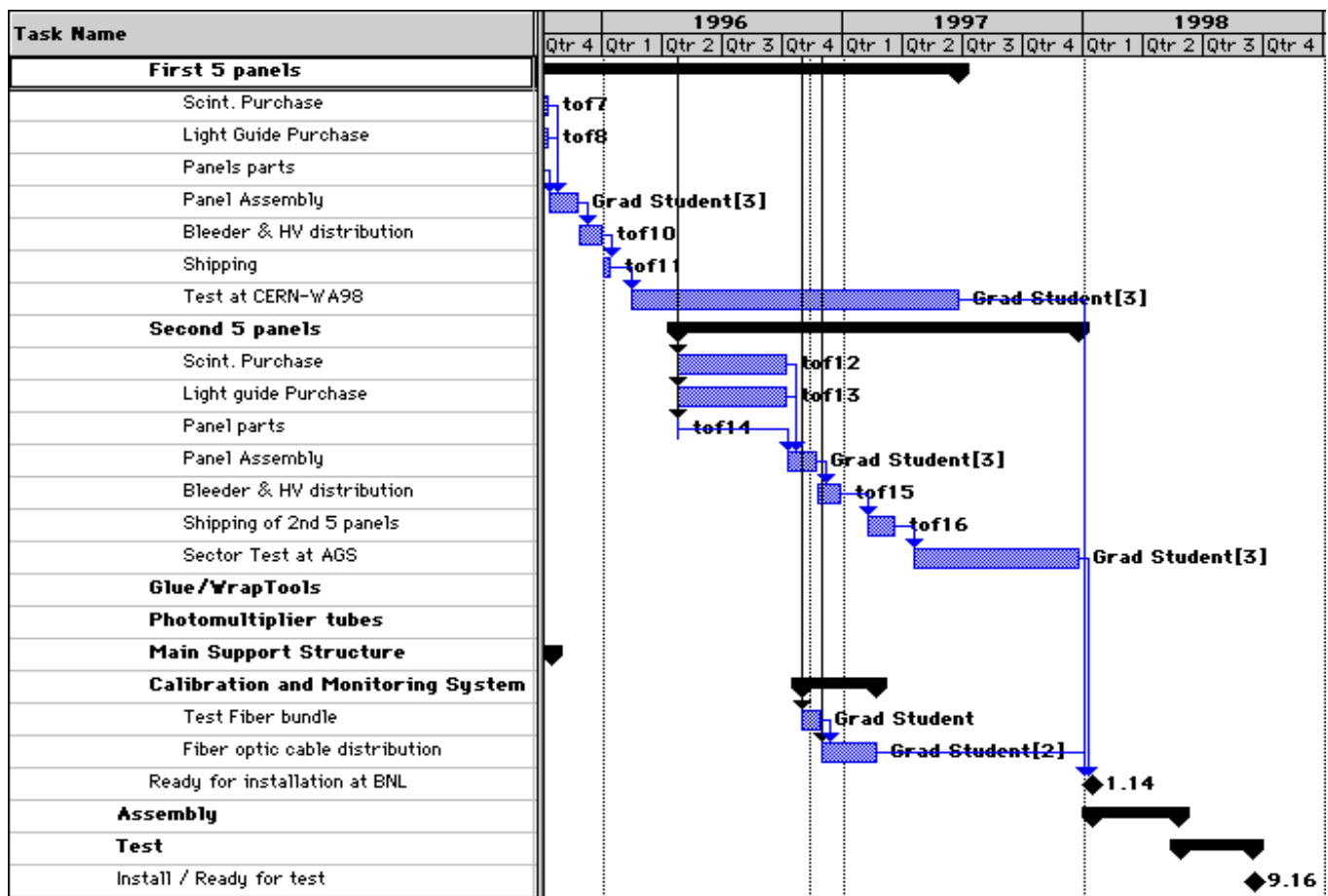
<i>Description</i>	<i>Unit Price</i>	<i>#/panel</i>	<i>Cost/panel</i>
Scint. (short)	12,360	32	395,520
Scint. (long)	12,669	64	810,816
PMT holder (180 type)	2,300	192	441,600
PMT holder (90-1)	2,600	8	20,800
PMT holder (90-2)	650	32	20,800
PMT holder (90-3)	650	32	20,800
PMT holder (90-4)	200	32	6,400
rubber tube	36	192	6,912
rubber ring	36	192	6,912
spring holder	206	192	39,552
spring	20	192	3,840
Myu metal shield	906	192	173,952
light guide(180)	2,000	160	320,000
light guide(90)	2,000	32	64,000
glueing	900	192	172,800
bleeder board	3,000	192	576,000
bleeder sig cable	1,300	192	249,600
bleeder HV cable	500	192	96,000
mechanical parts	30,000	1	30,000
HV distribution box w cable	50,000	4	200,000
Shipping	400,000	1	400,000
<i>Cost per TOF panel</i>			4,056,304

- Cost of PMT's (2000tubes) ; 90 M Yen
- Cost of Panels (10 panels) ; 40 M Yen
- Total of Mechanical 130 M Yen

Close enough to the WBS estimate

- First 5 Panels constructed in '95
- Another 5 panels being done in '96

# Major Milestones of TOF mechanical



- Mechanical Design (Mar '94) Done
- Preliminary Design Review (Aug '94) Done
- Prototype construction & Test (Dec '94) Done
- First 5 Panels shipped to CERN (Jan '96) Done
- Another 5 Panels shipped to BNL (Feb '97)
- Installation for the sector test (May '97)
- Ready for Installation (Jan '98)