Status of the LABM

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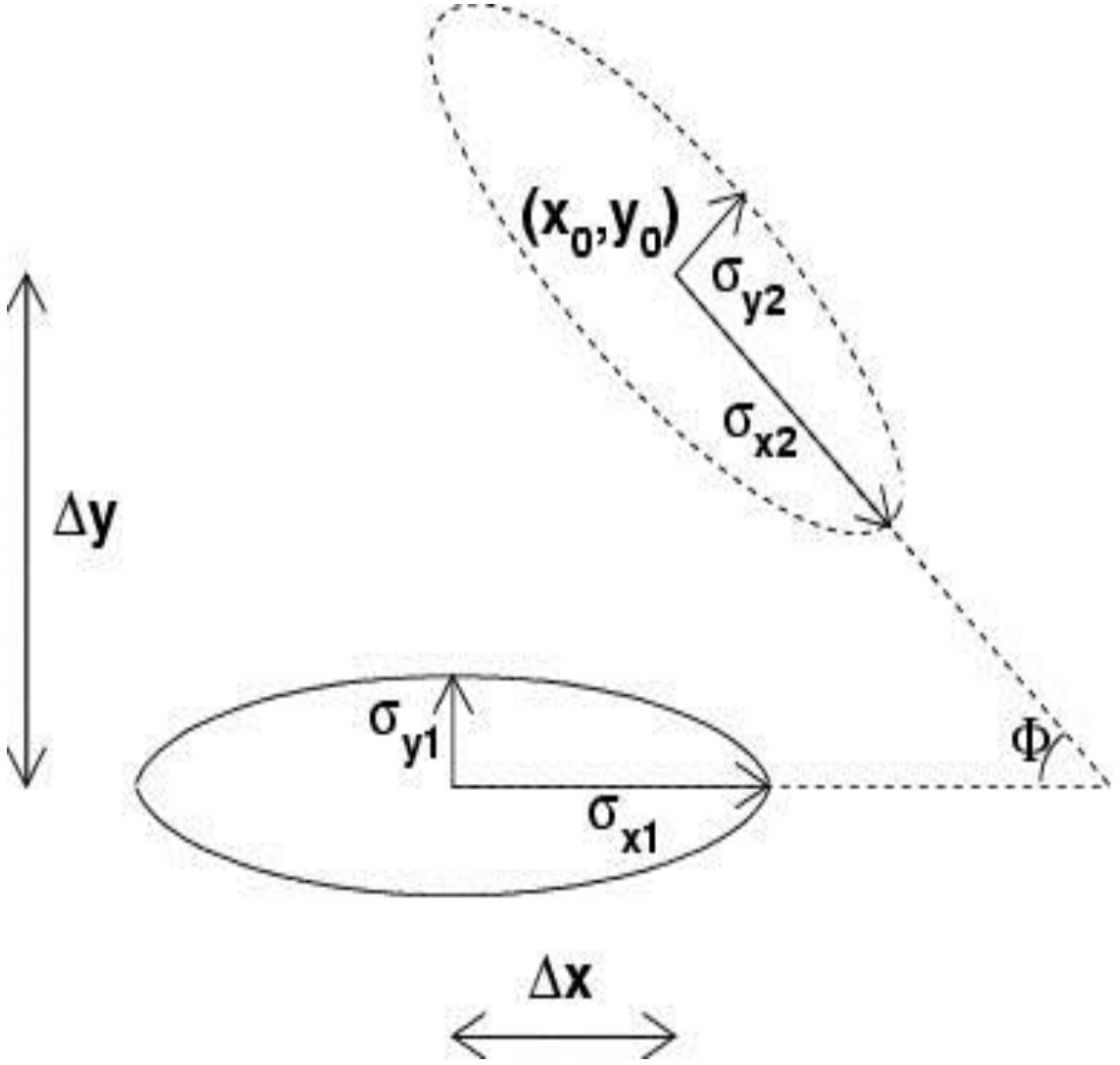
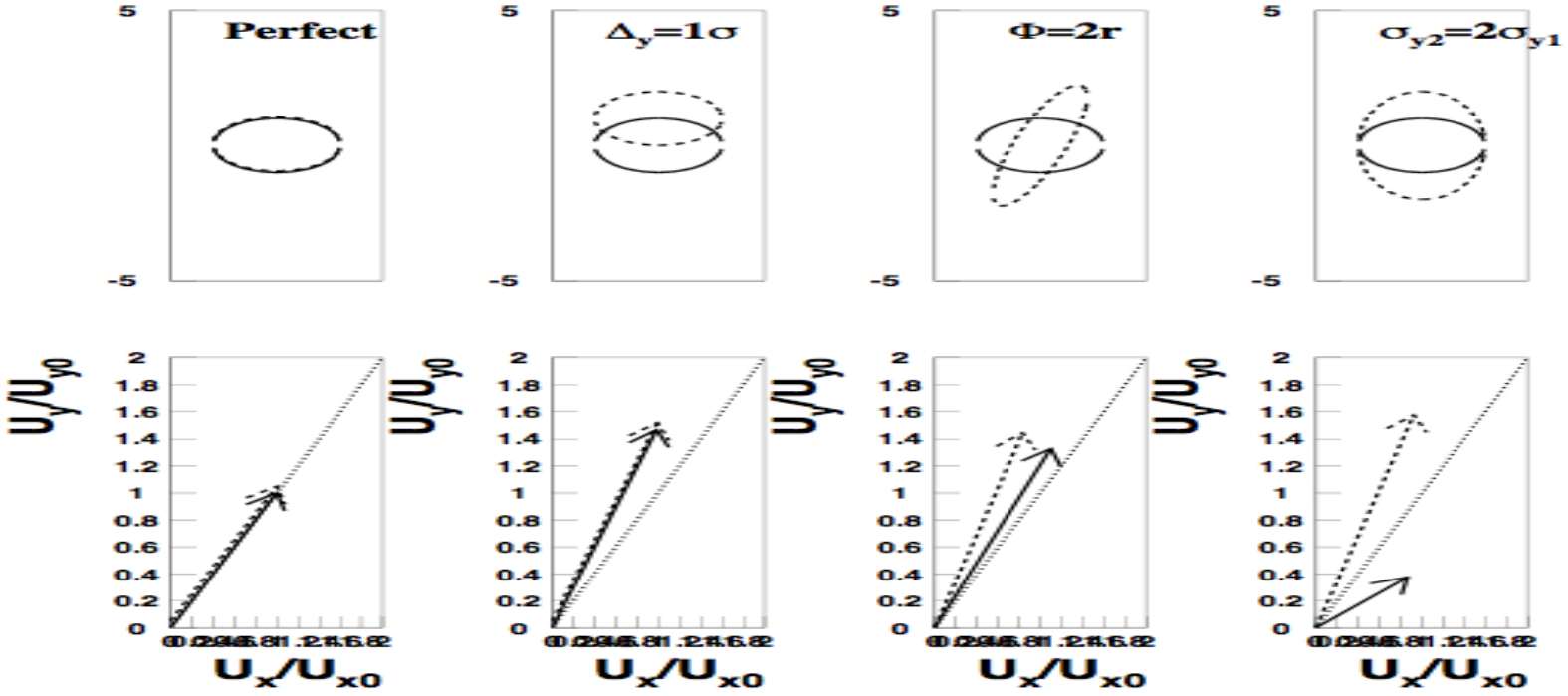
Outline

- Introduction
- Yields calculations for Phase I
- Installation overview
- Electronics
- Optical Alignment

Beam-beam interaction limits the achievable luminosity and has many d.o.f. (7 in the transverse plane)



Some examples of Large Angle BMST pattern recognition (collinear beams case)
3 asymmetries are defined (4 are possible)



Calculations of Phase I yields completed (11 pages of paper written)

Remarks

Novel method to calculate such integrals

We are aiming at first observation of LA beamstrahlung during spring 2016

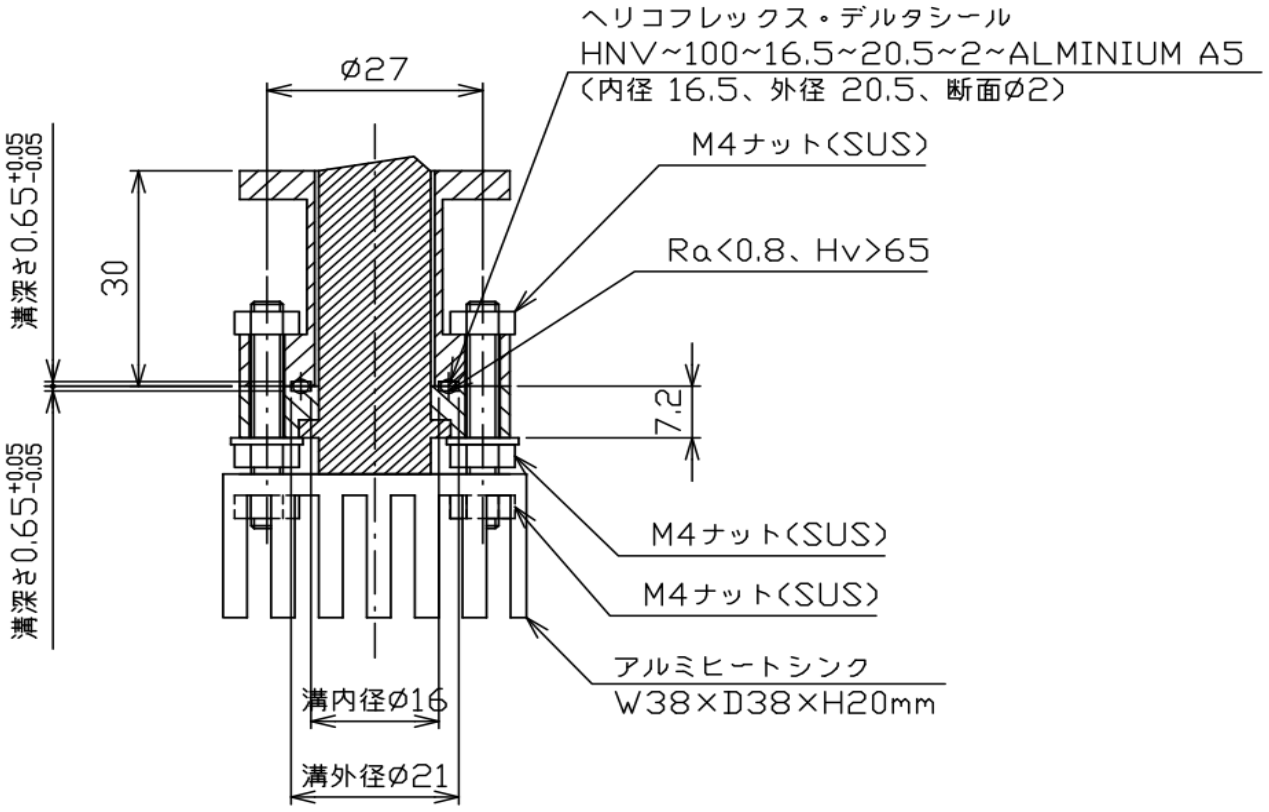
Expected photoelectrons yields of 22 and 27 kHz for HER and LER respectively

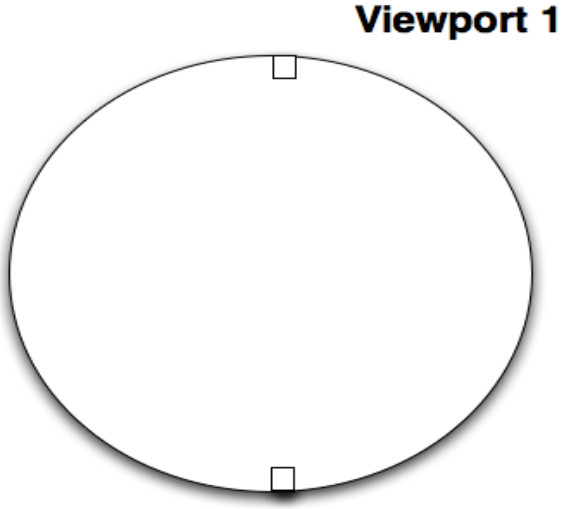
Sensitivity to beam asymmetries confirmed

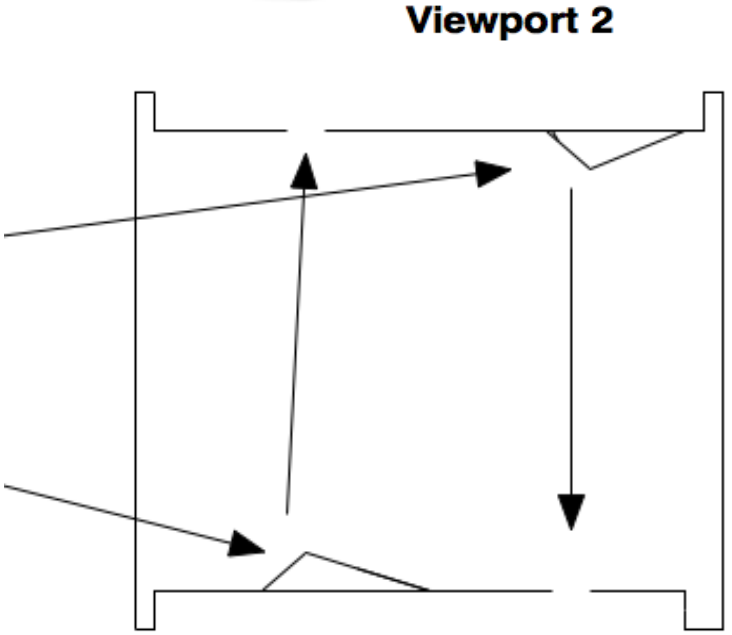
σx	1mm	1mm
σy	6μm	6μm
σz	6mm	6mm
I(A)	1.3	1.8
f	125 MHz	125 MHz
Yield	31kHz	22kHz

Beam pipe insert

- View port location at ±90 degrees minimizes backgrounds, polarization measurement errors, and provides redundancy against beam orbit errors
- Mirrors are 2X2.8 mm2, Be
- Located at 3850 mm (LER) and 4900 (HER) from IP (9.9<q<10.4 mrad for LER, 7.8<q<8.2 mrad for HER)







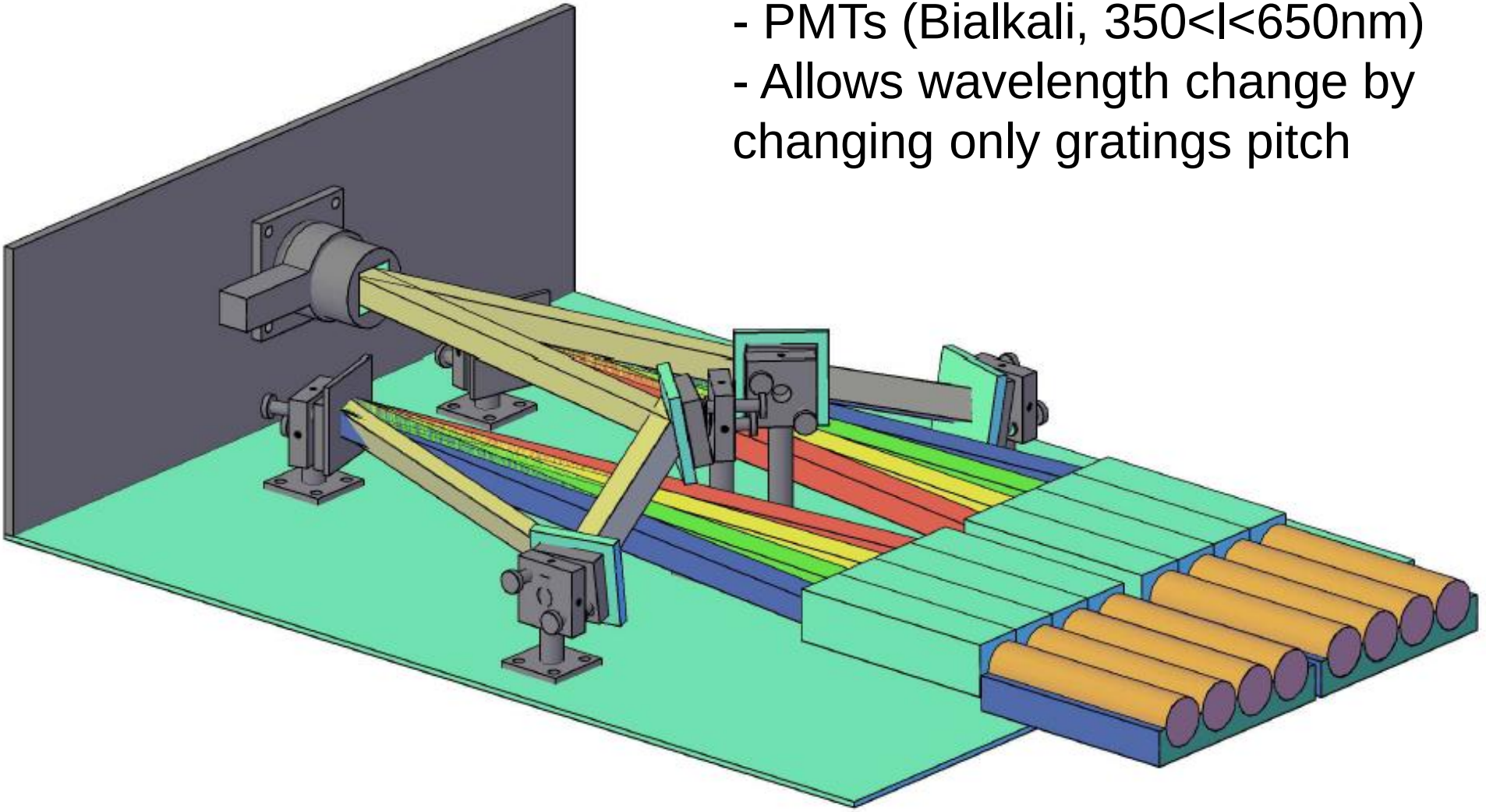
Optical channel NIKKO side (I)

Optical Channel NIKKO side (II)

Half Optics Box

HIGHLIGTHS

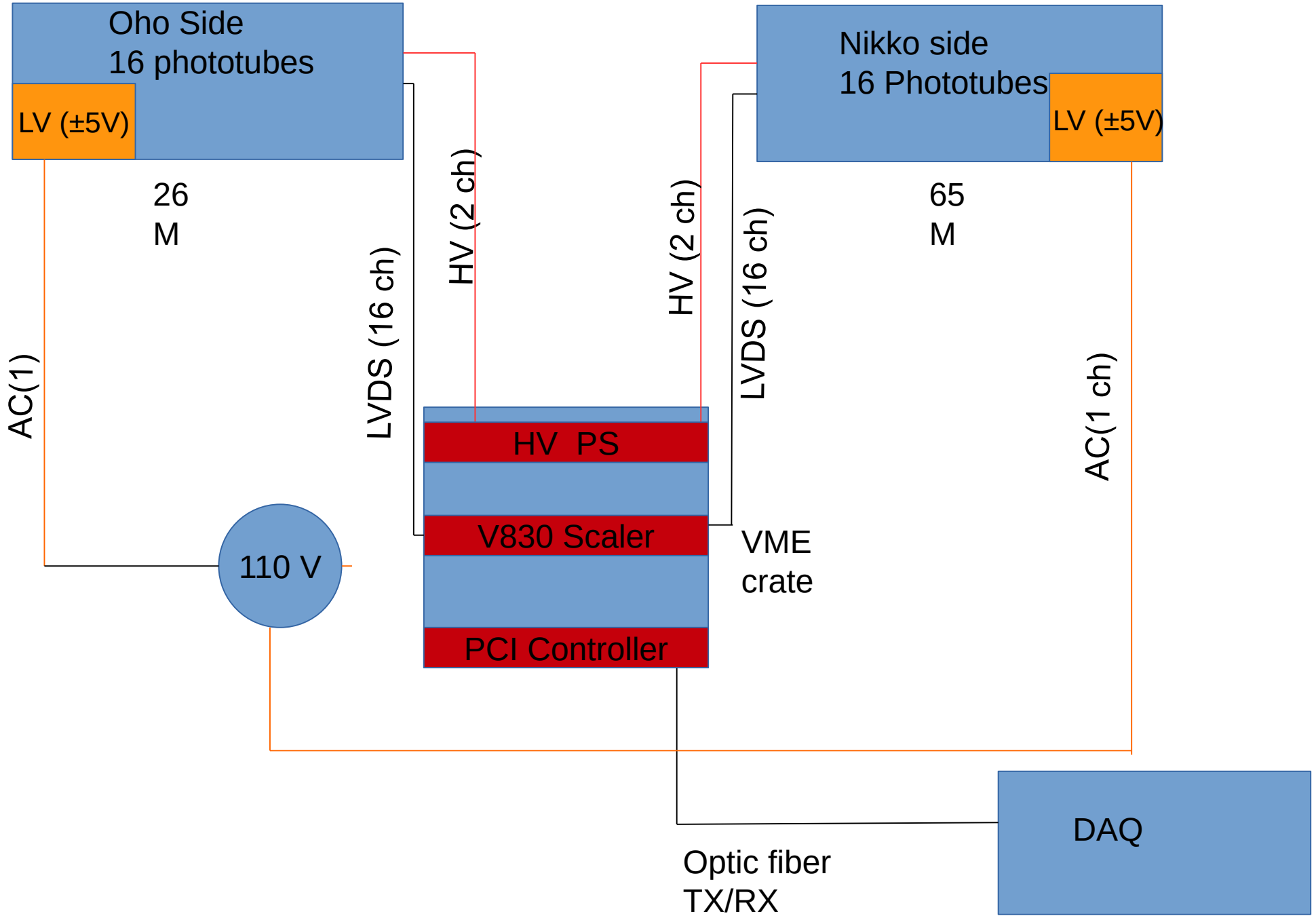
- Wollaston prism
- Ruled gratings
- Light collectors
- PMTs (Bialkali, 350<l<650nm)
- Allows wavelength change by changing only gratings pitch



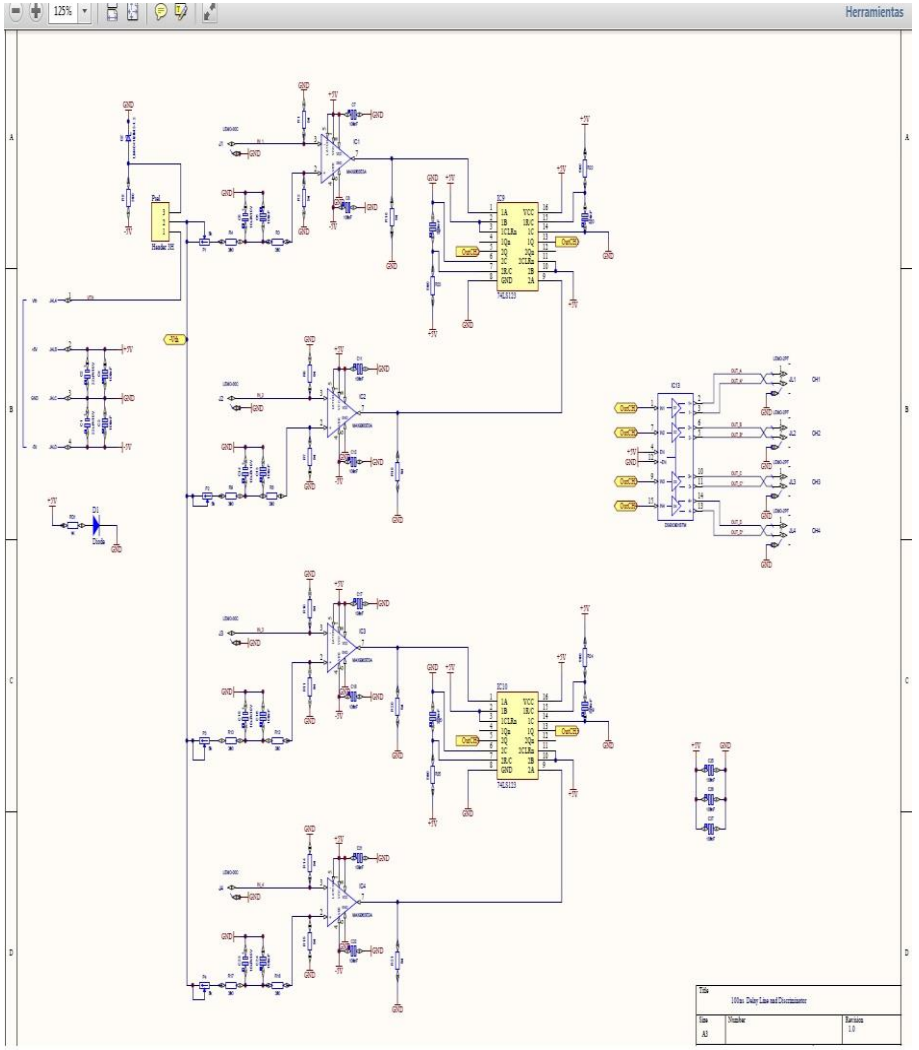
Electronics

- LABM Data description
- Electronics card
- Scaler Calibration
- Slow control
- DAQ

LABM Data scheme



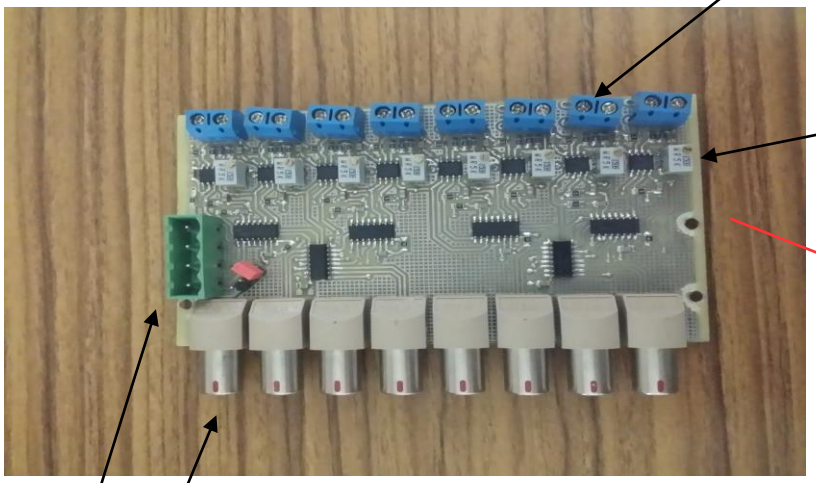
Electronics Cards: Guillermo Tejeda



Electronic Card

Oho Side
16 phototubes

Phototube signal is digitized two eight channels cards per box



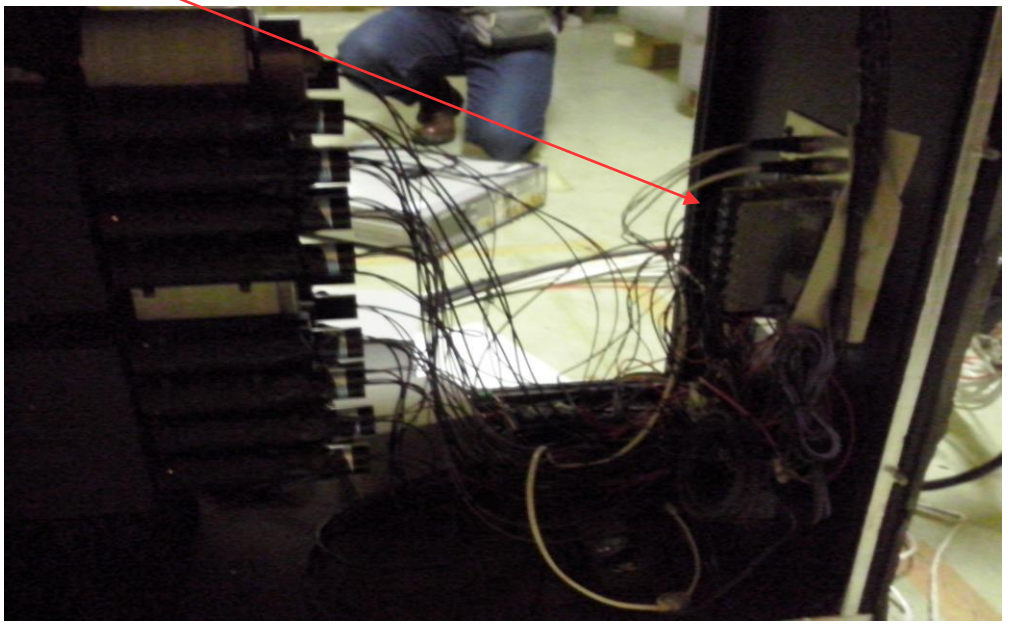
Phototube connection

Discriminator 10 mV

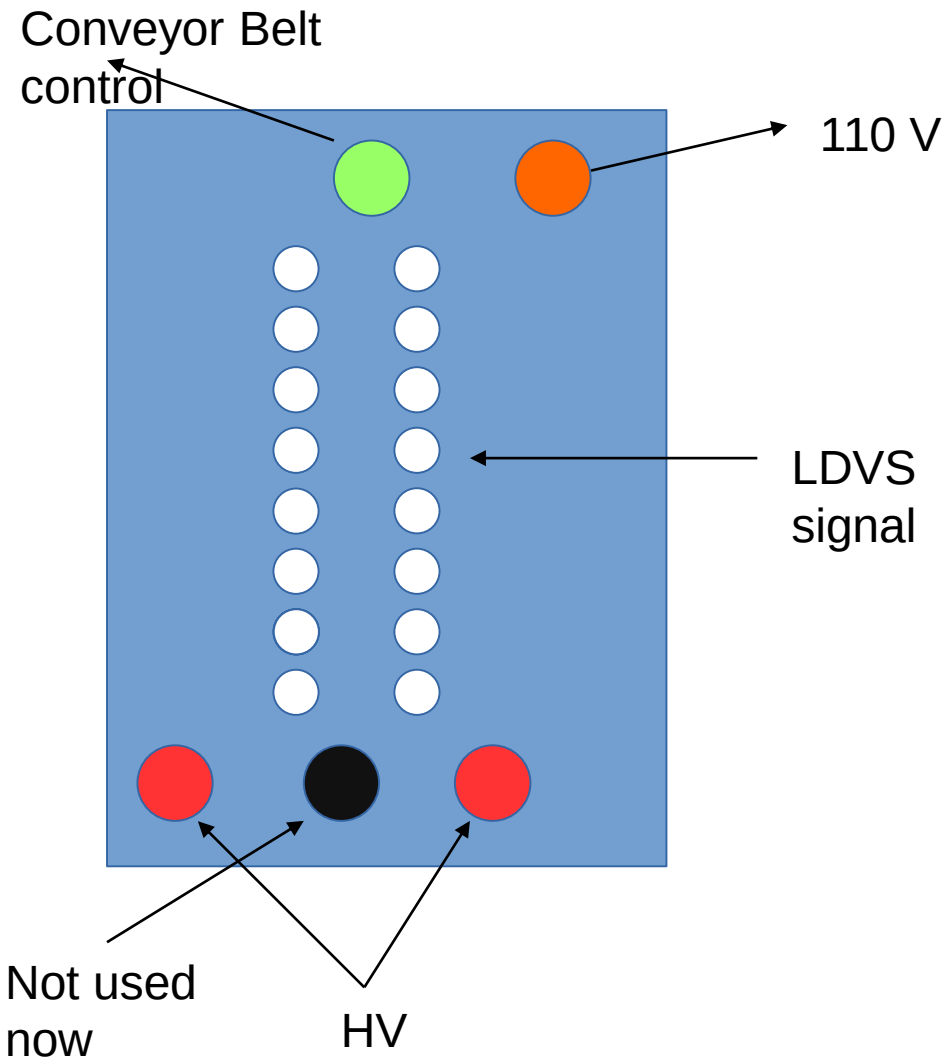
Connectors SuperLemo

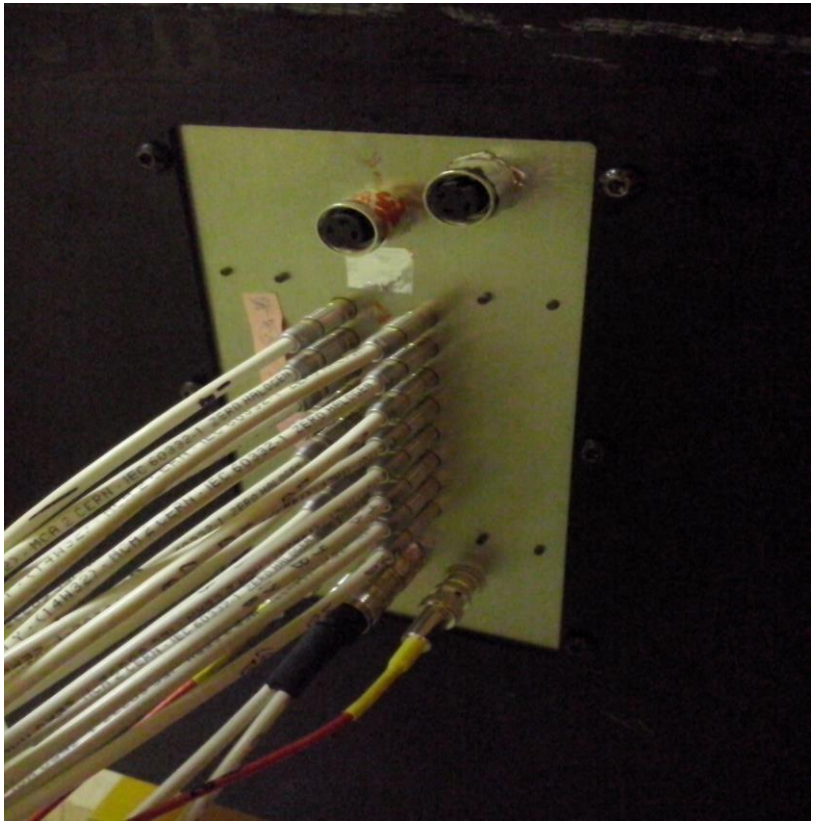
LV power +/- 5V

In total 4 cards, two spares



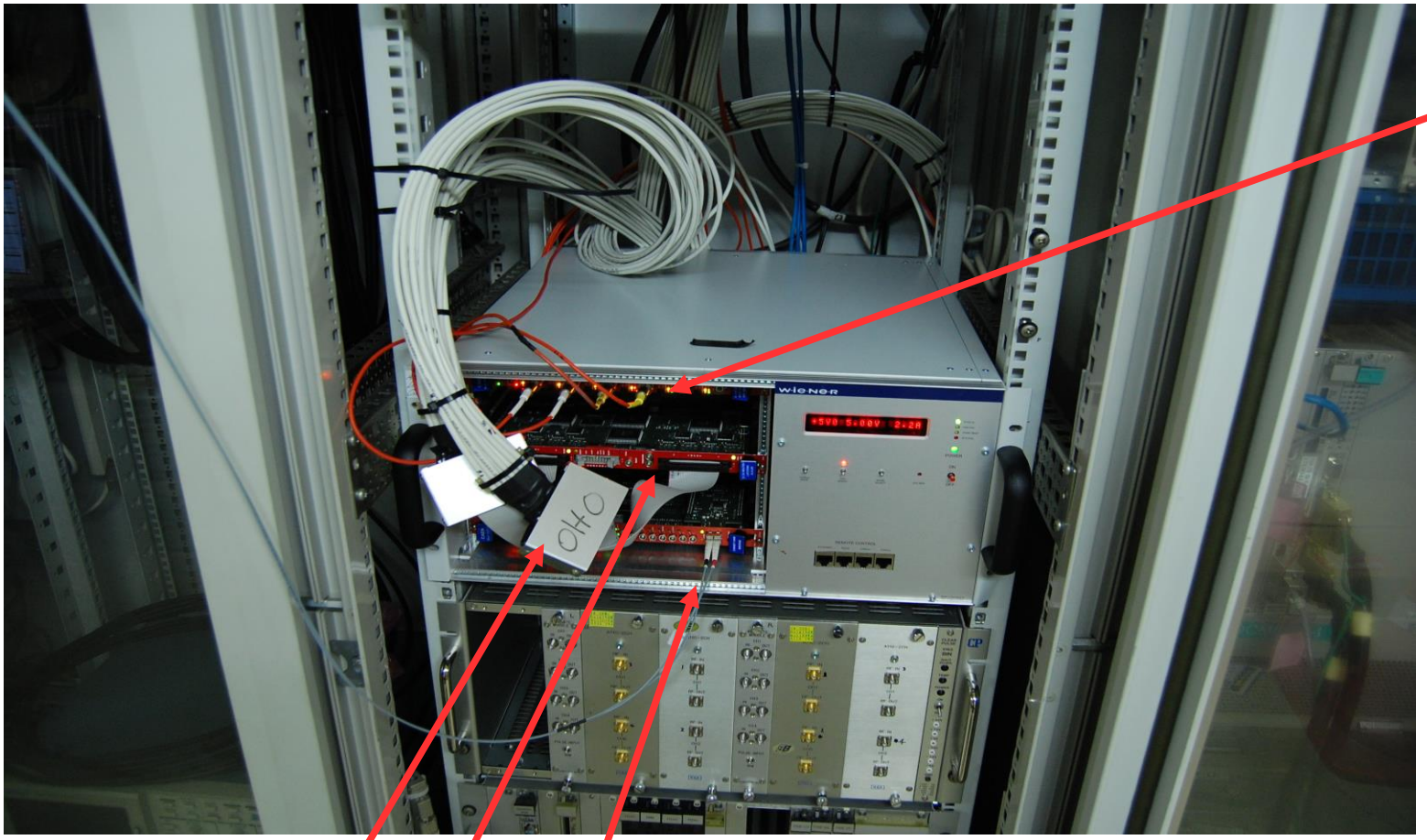
Patch panel





Patch panel was electrical isolated in order to prevent noise

VME for data acquisition and HV



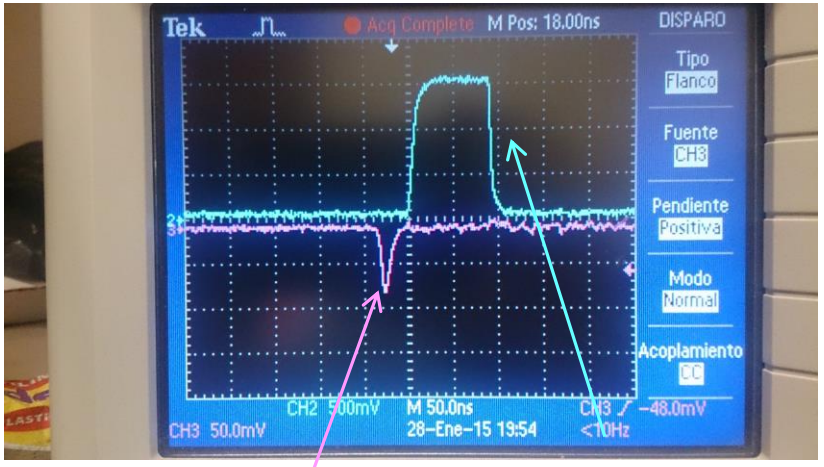
HV
CAEN V6533
Six channels
4 being used

CAEN V2718 controller, optic fiber. A3818 pci adapter

V830 CAEN Scaler 32 channels ribbon connector

Adapter from 16 cable to ribbon 100 Ohm termination

Calibration I

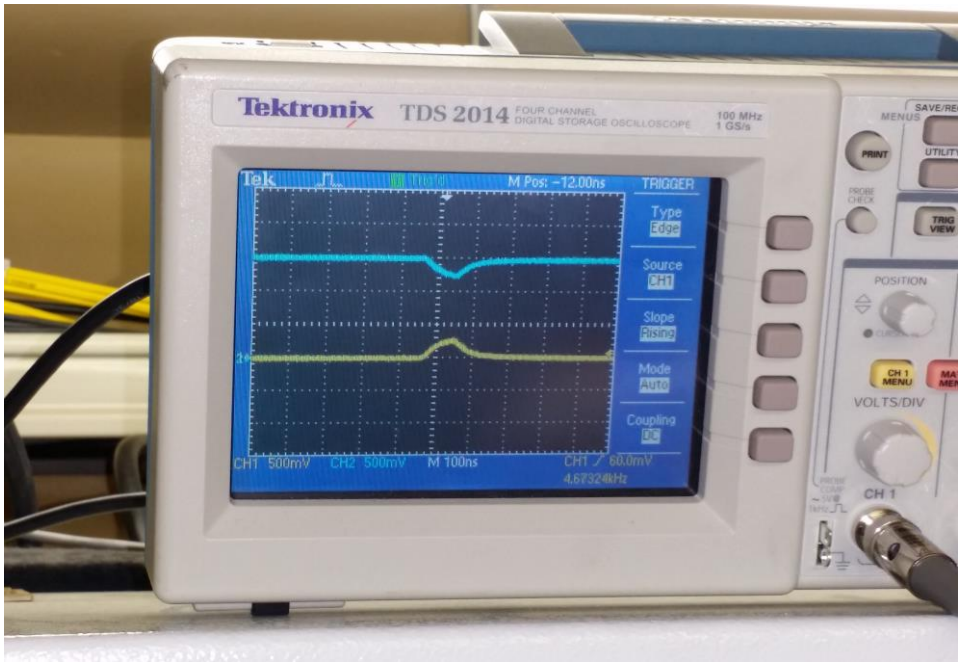


PMT signal

Output Signal

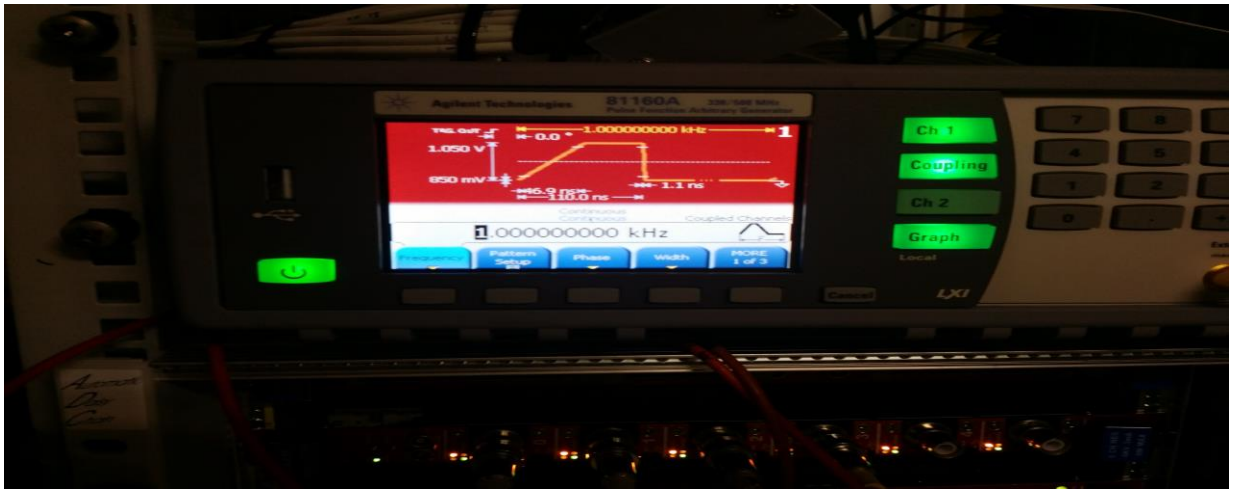
LVDS Signal as output of the card

LVDS Signal after traveling by cable and connectors.



Calibration II

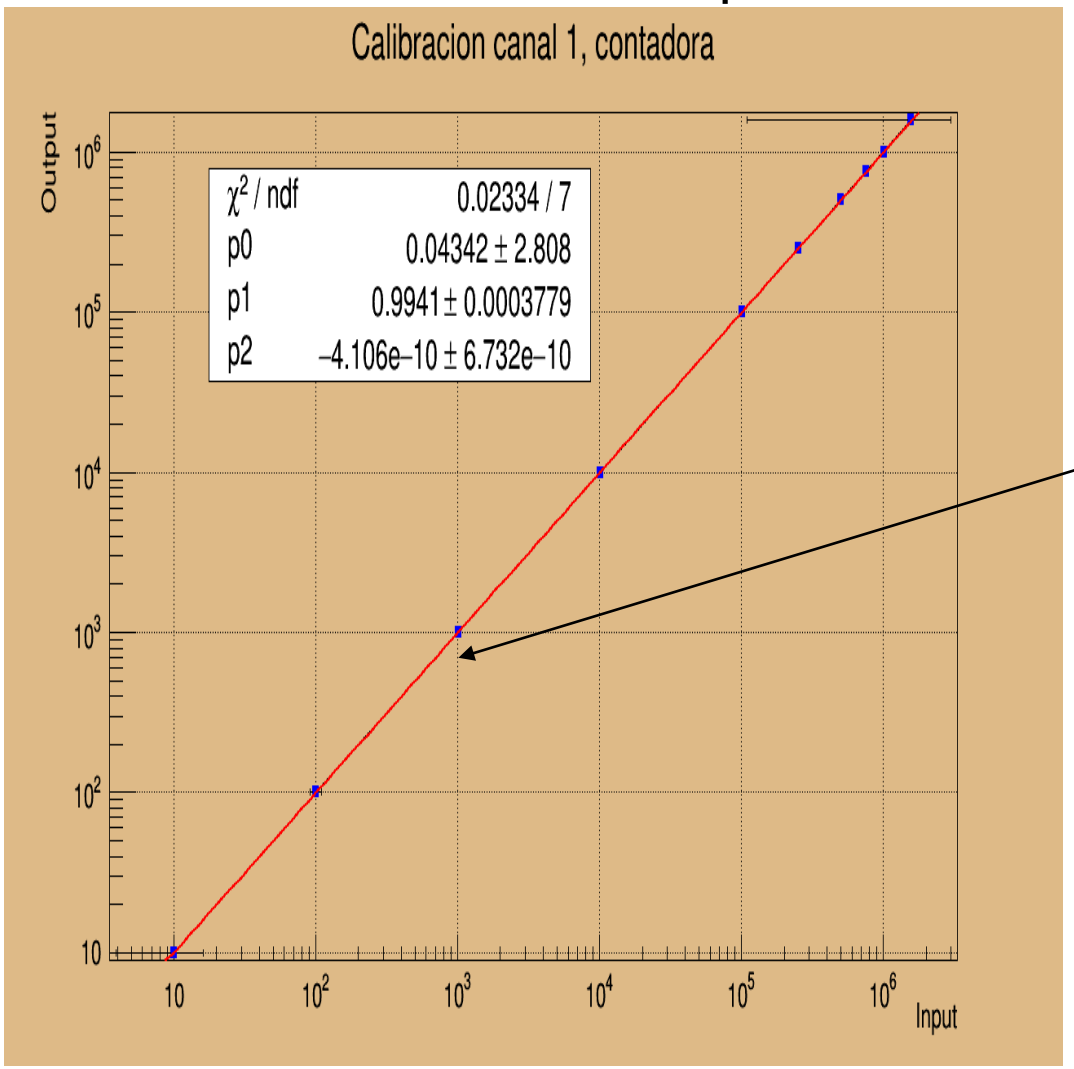
Use a wave generator to simulate the rates : Thank John Flannagan



- Width 110ns
- Lead Edge 46.9ns
- Trail Edge 1.1ns
- Amplitude 1.05V
- Low 850mV
- Lead Impedance 110ohm

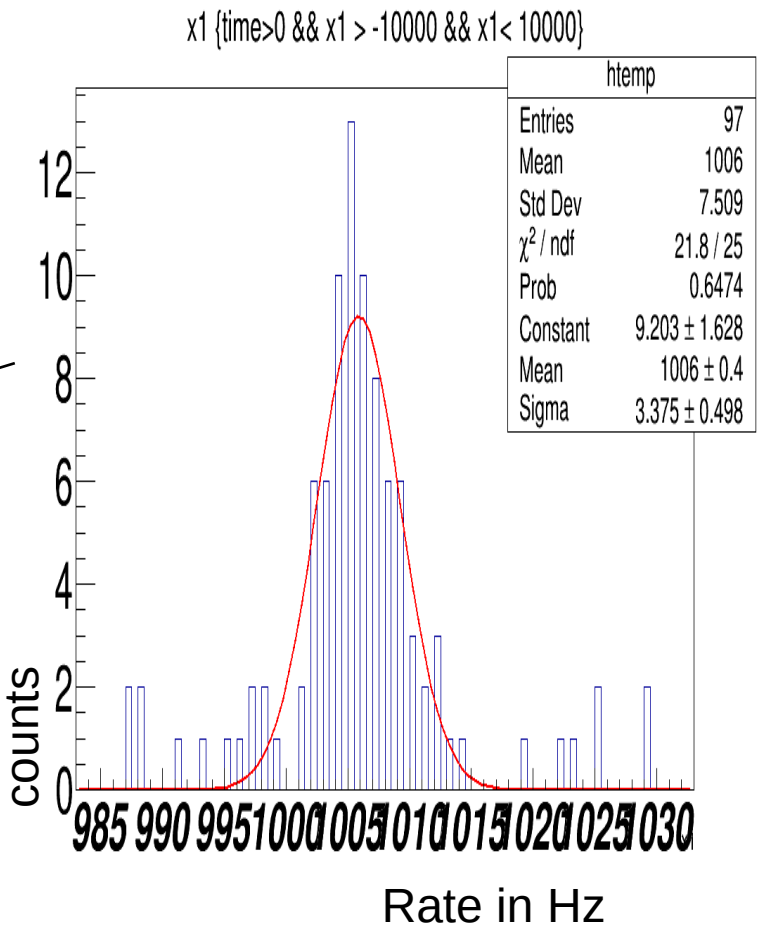
Calibration III

We found we can work up to 5.0 MHz



Output rate in Hz

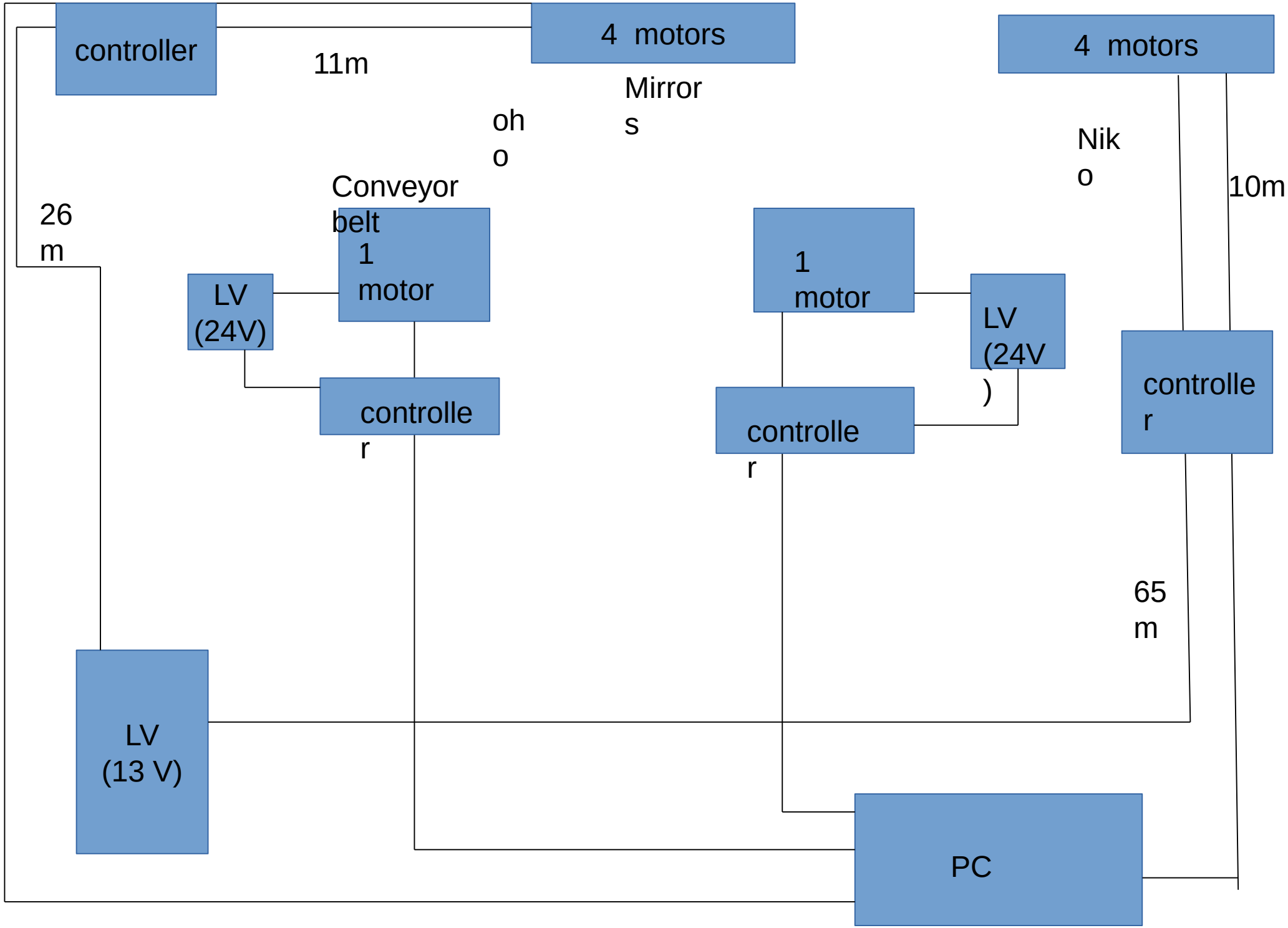
1000 Hz scaler counter



Rate in Hz

Input rate in Hz

We found one problematic channel, the spare is here , we need to test it.



SLOW CONTROL

Slow control

Mirror Control

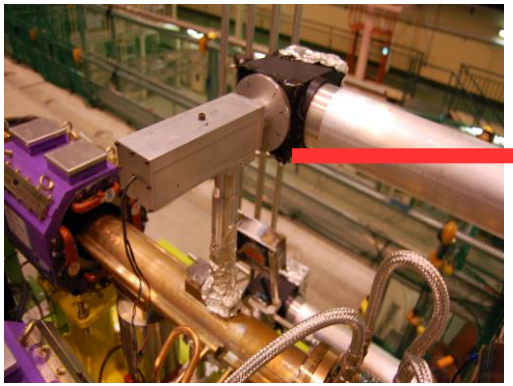
- All drivers for mirror are controlled by the single usb port, just change base address
- The routines for controlling the mirror and found the maximum are ready but have not been tested in full

Conveyor Control

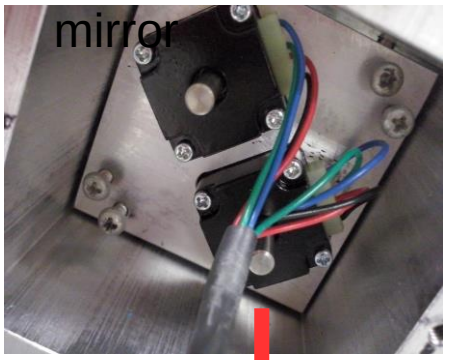
- Each drivers are controlled by one usb port, the routines for moving the conveyor belt are programed directly in the motor driver
- Already done and working

Primary mirror control

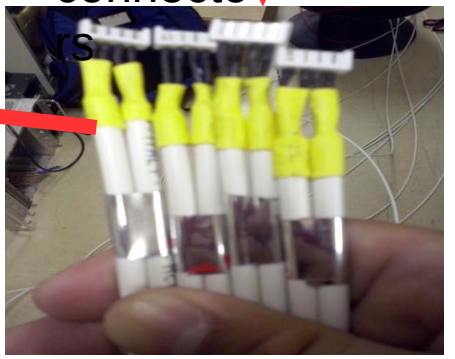
Primary mirror



2 motors per mirror

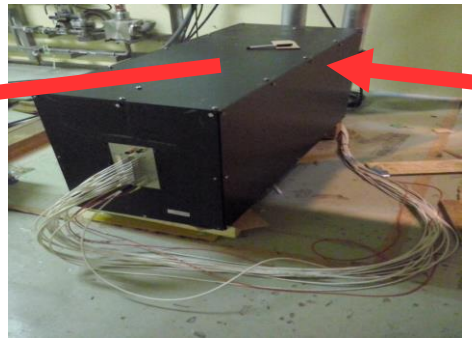


connectors

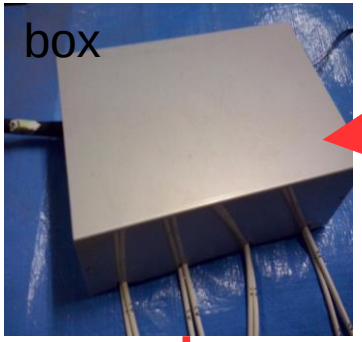


10 m

Labm optic box



Driver box



Motor Drivers

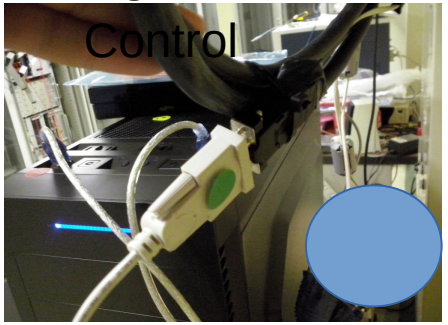
65 m (Niko)

25m (oho)

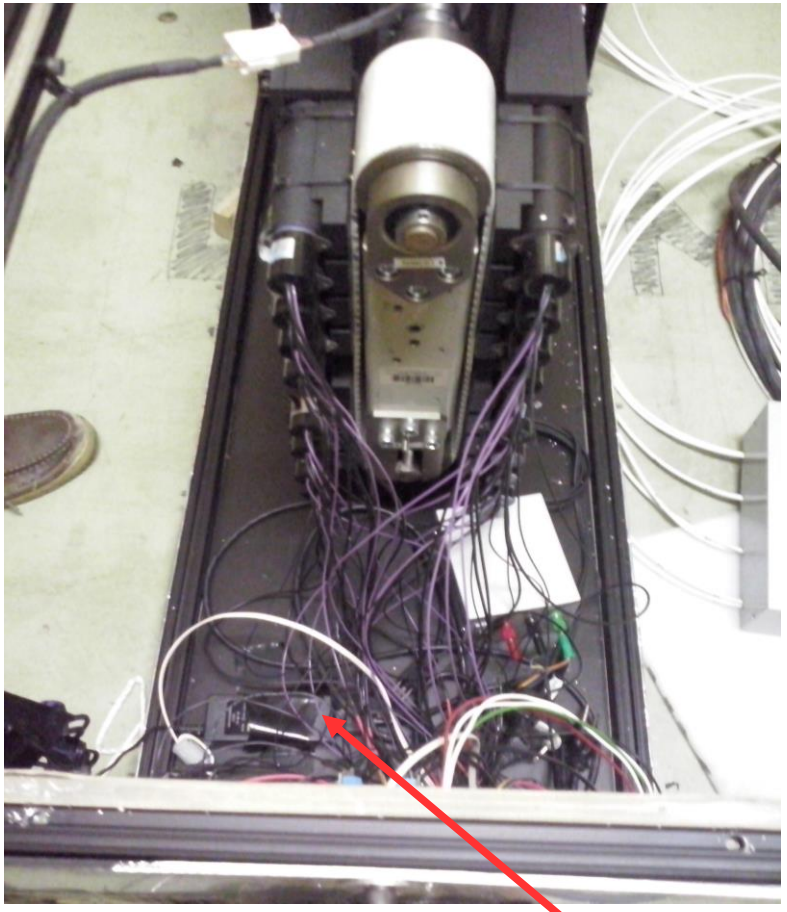
LV 13.8 V

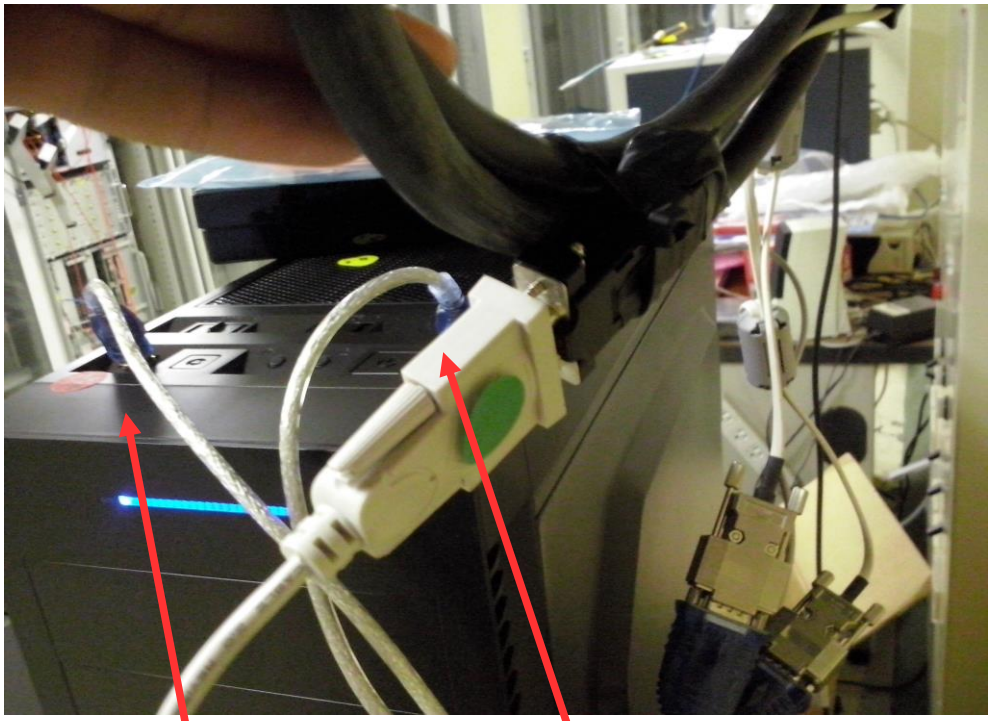
3 m

PC Control



Conveyor belt control





Oho

Nikko

Controller and 24 V power supply
Both need 110 V

DAQ

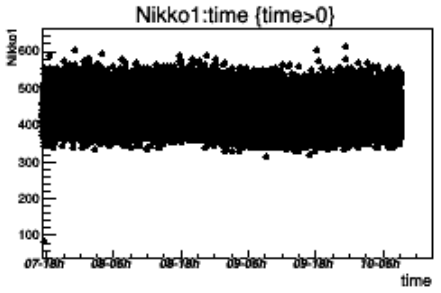
- The Scaler is read using c++ program and CAEN libraries
- The data is recorded as ASCII file 32 columns
- The Monitoring is done using ROOT

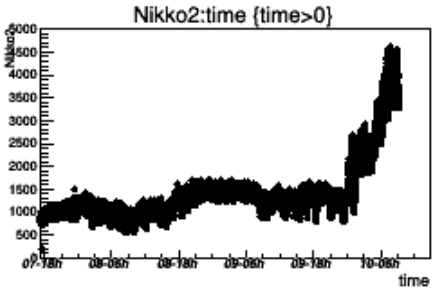
HV

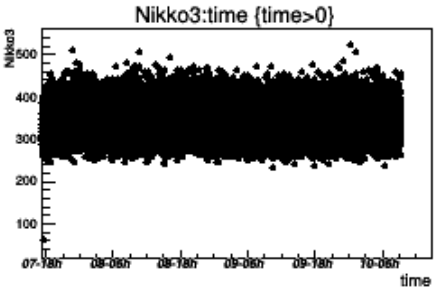
- HV is controlled using CAENGECCO

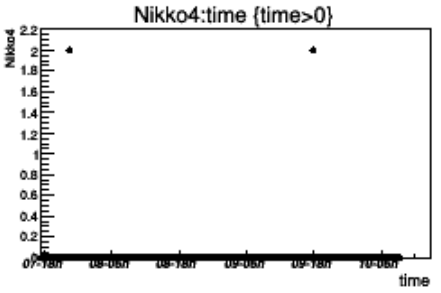
Run 589 for 63 hour finished on August 7- 9 9:15

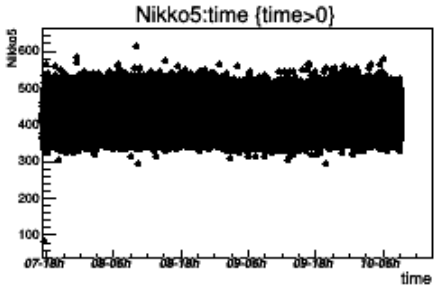
Nikko rates

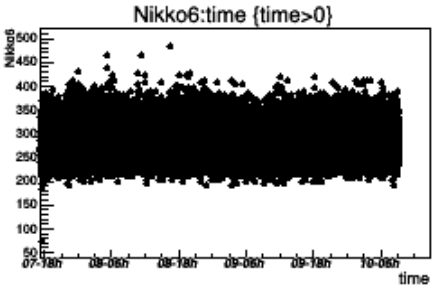


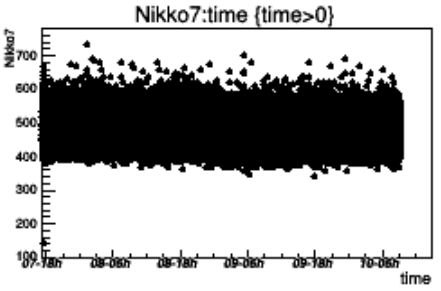


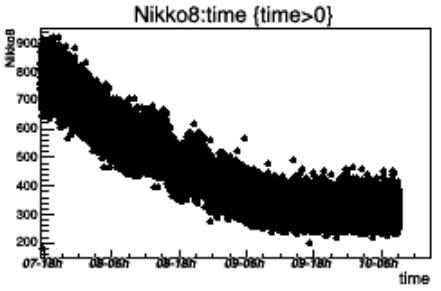


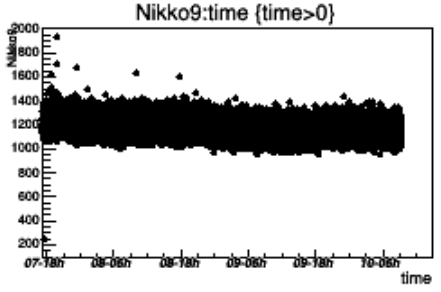


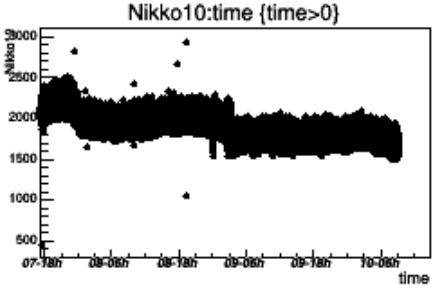


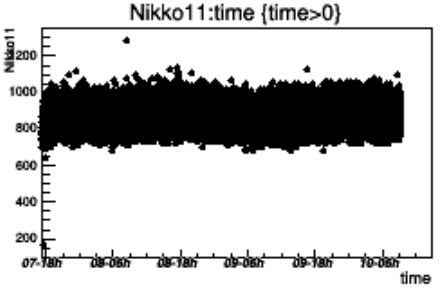


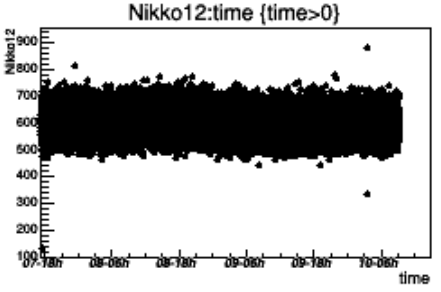


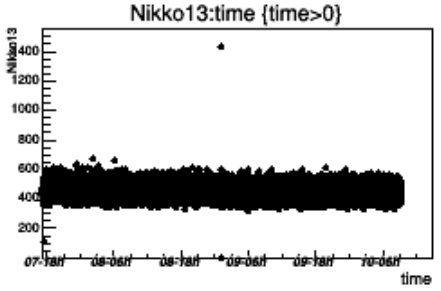


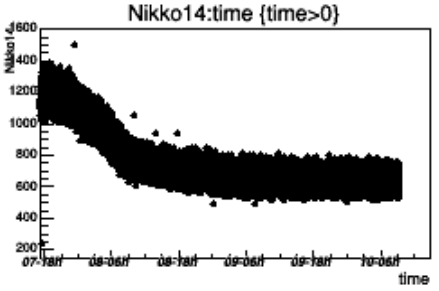


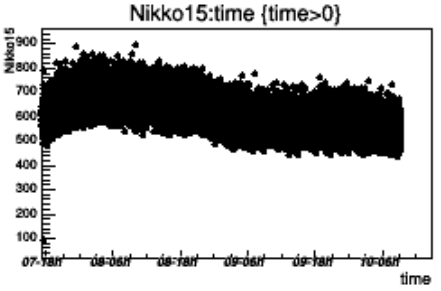


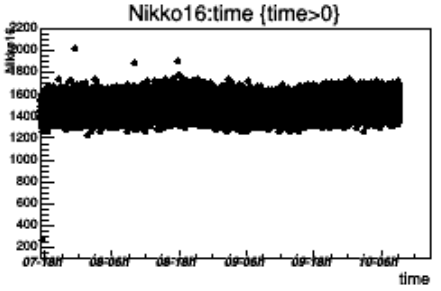




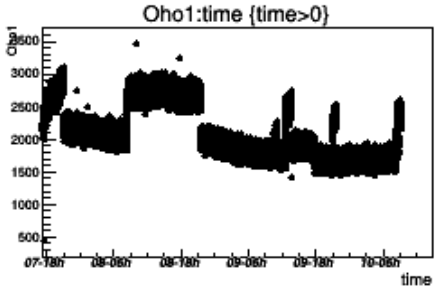


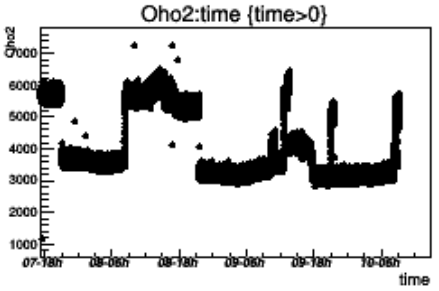


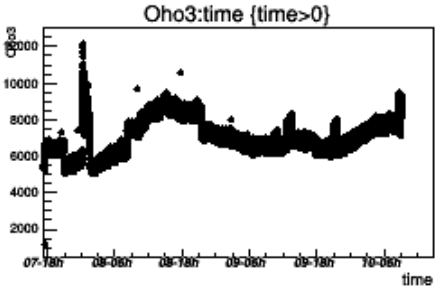


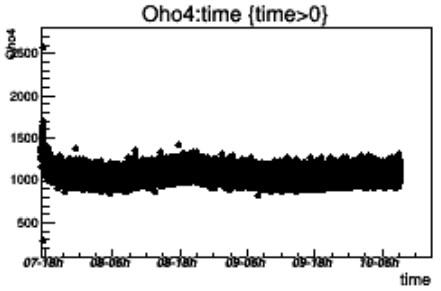


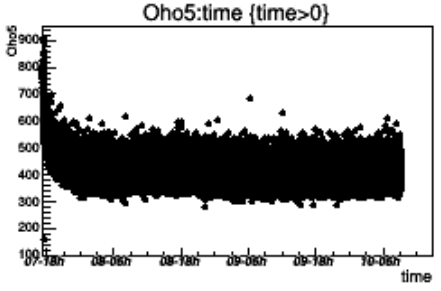
Oho rates run 589

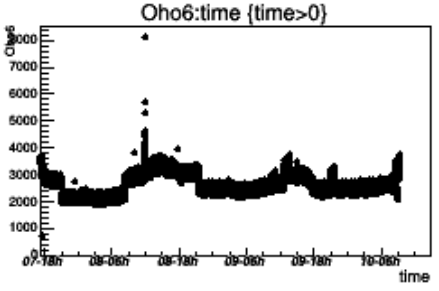


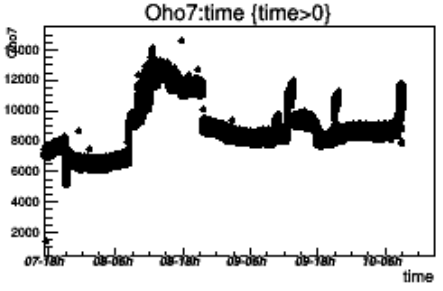


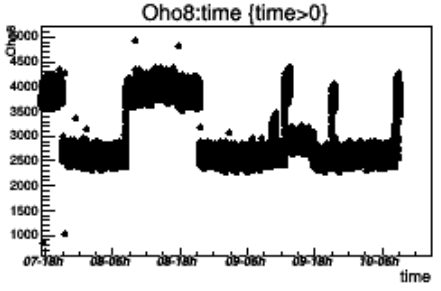


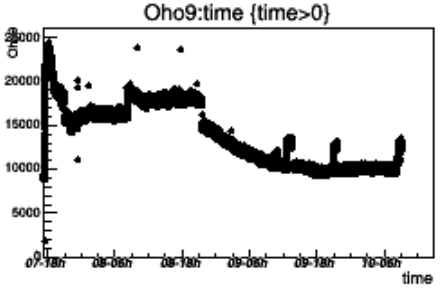


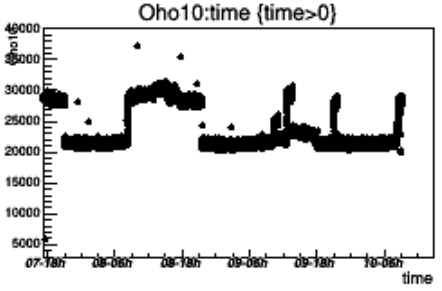


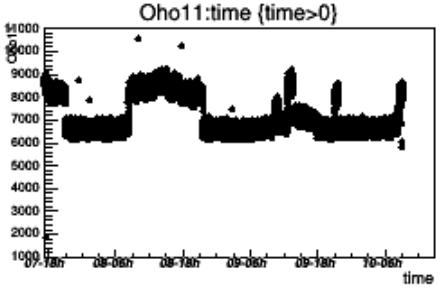


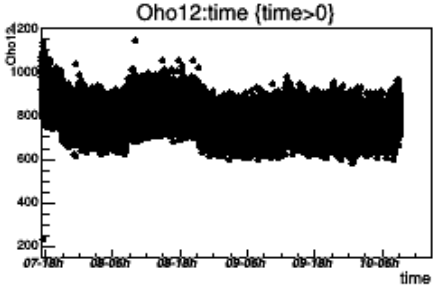


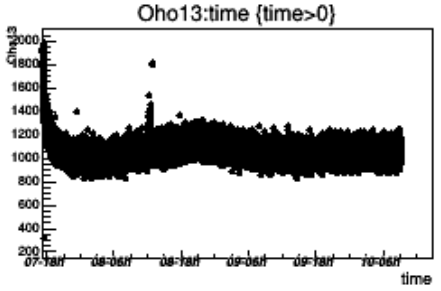


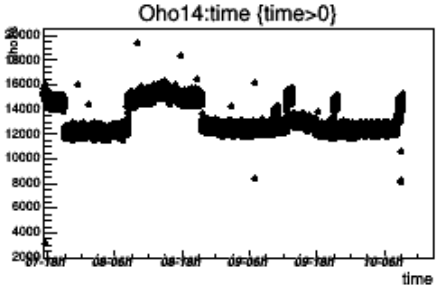


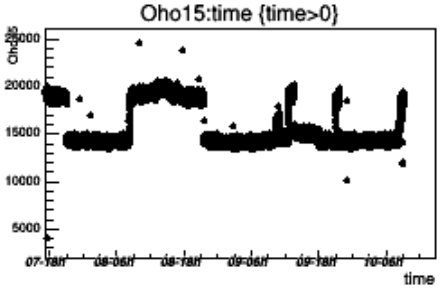


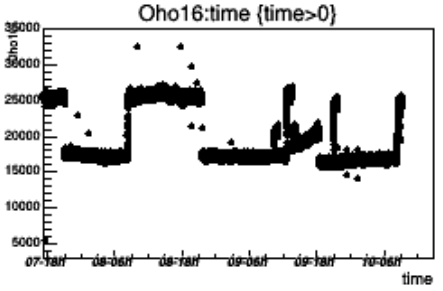












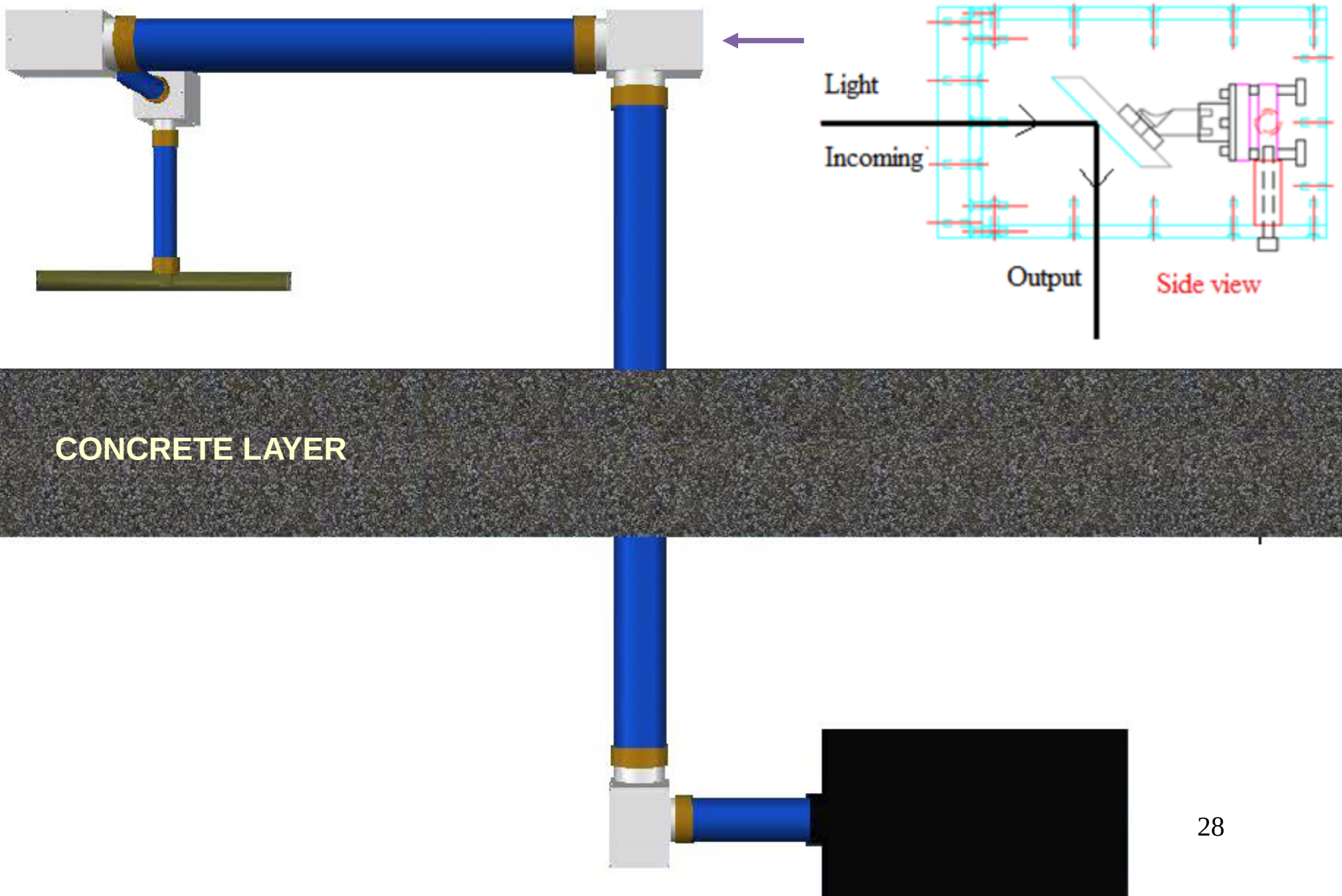
Optical channels alignment for LABM

Salvatore Di Carlo WSU

Outline

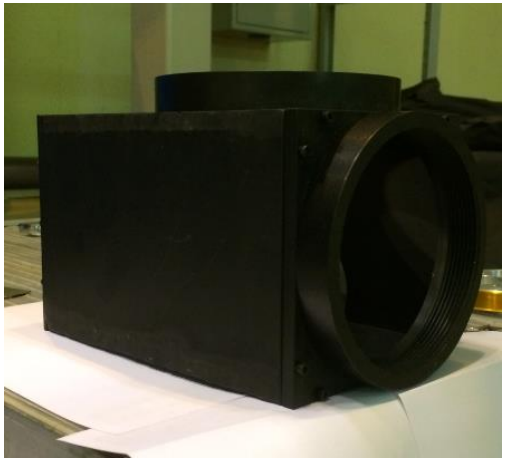
- Optical channels
- Elbows alignment
- Box alignment

Drawing of the 4 optical channels

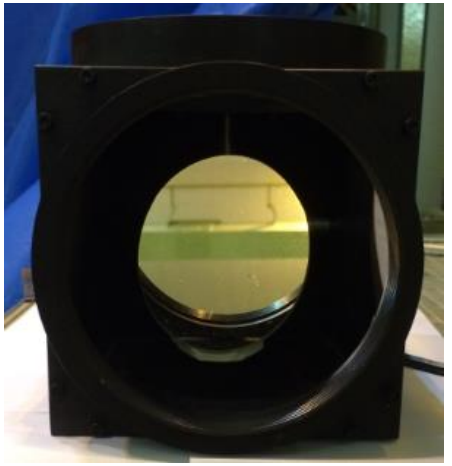


Details of the elbows

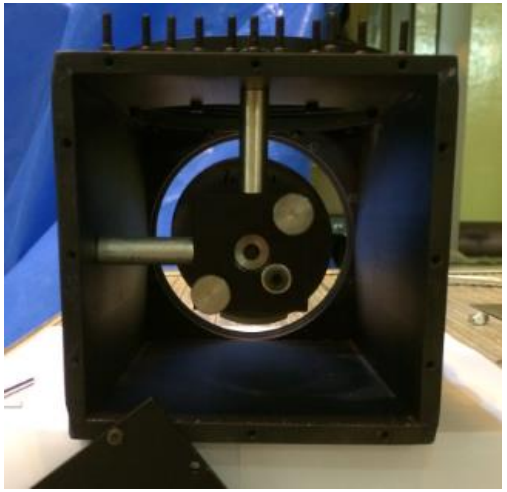
Elbow



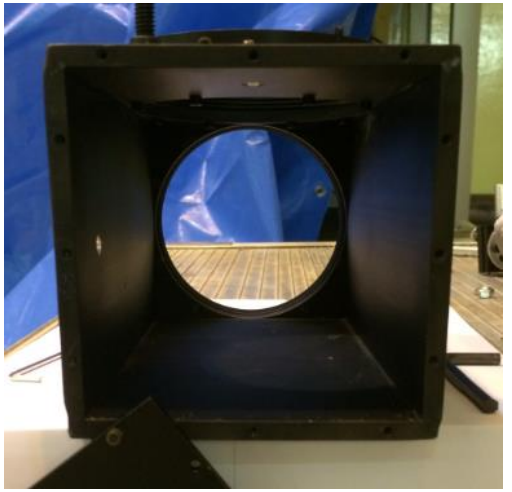
Front view



Back view



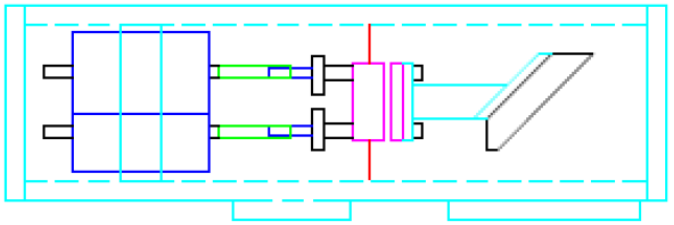
Without mirror



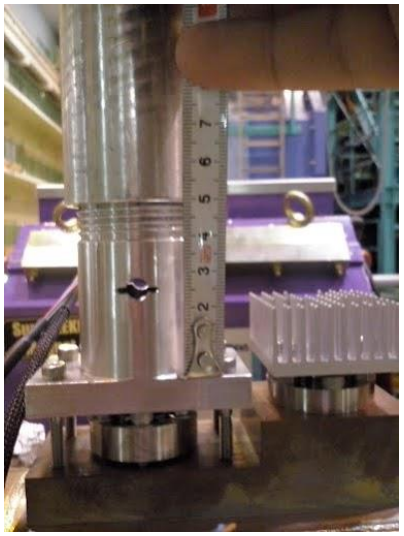
Elbows alignment procedure

Elbow with removed mirror

Side view



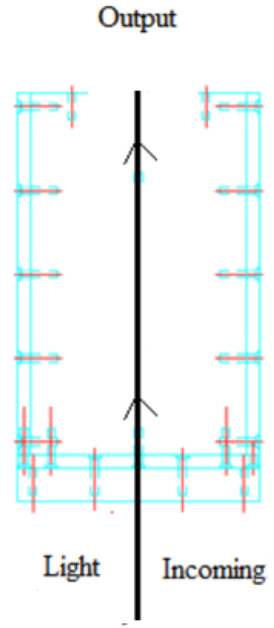
Remotely controlled primary mirror

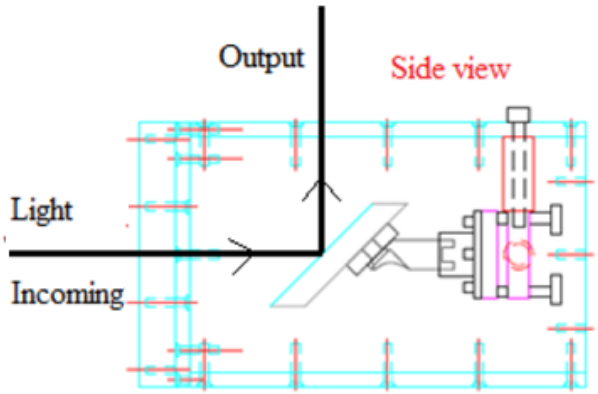


Window for light source

Elbow whose mirror needs to be aligned

Side view



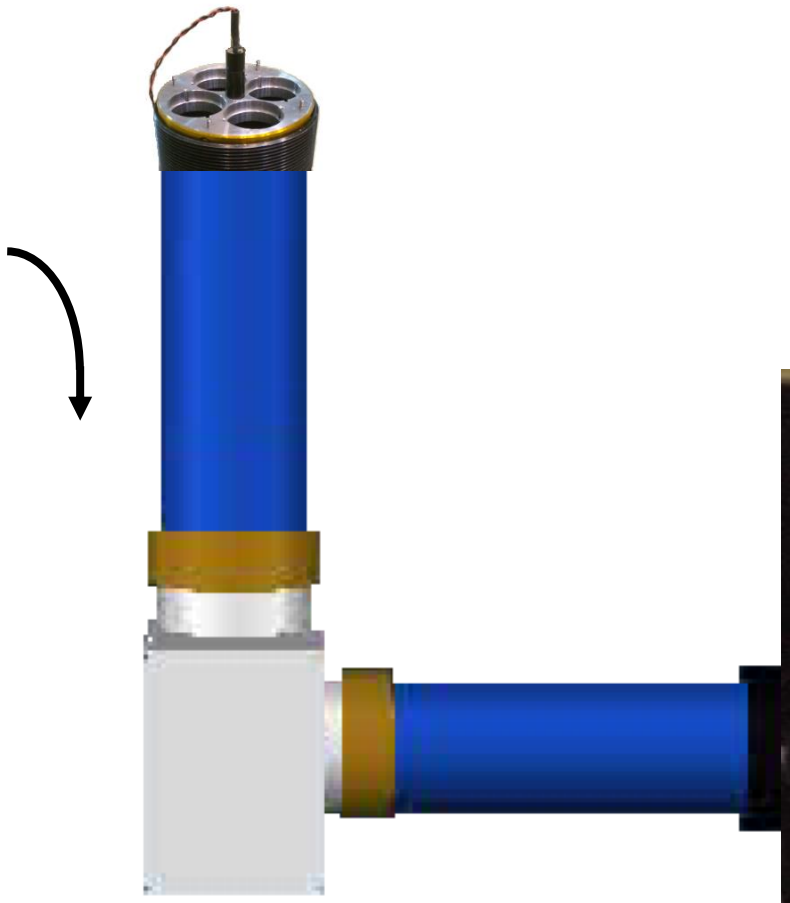


Box alignment 1

Laser source
parallel to the pipe

Optical components
to align

Photomultiplier

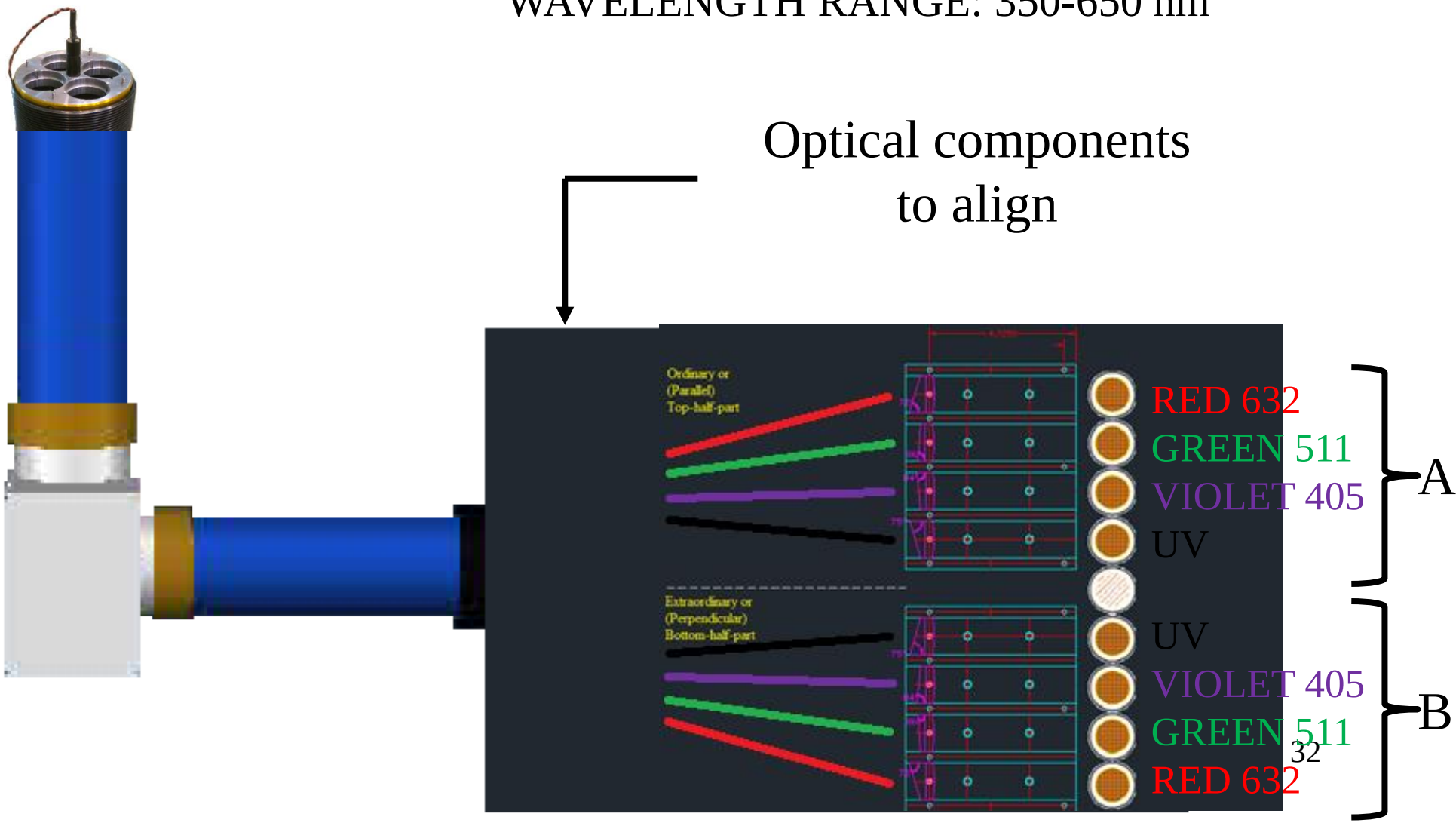


Box alignment 2

Lasers of different colors

SET A: ORIZONTAL POLARIZATION
SET B: VERTICAL POLARIZATION
WAVELENGTH RANGE: 350-650 nm

Optical components to align



Conclusions

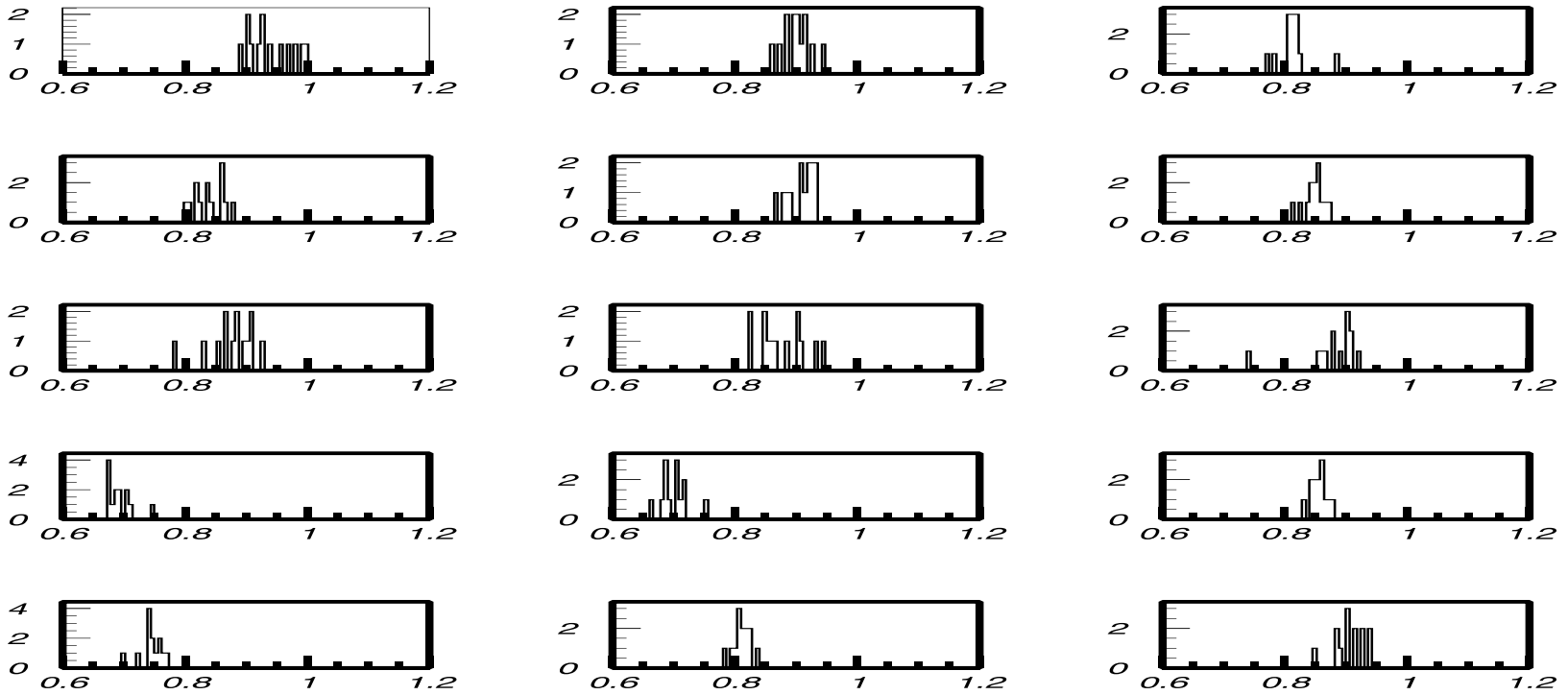
- We had 2 days access Aug. 6 and 7. Aug. 6 spent reinstalling the Oho device and alignment (it takes 1.5 hours to disassemble both sides, 16 hours to assemble and align both sides)

- We took Oho-side data with attenuated laser light placed on an emitter directly above(below) the Beam Pipe vacuum window. 13 runs of 12 conveyor belt rotations each.

- Numerous mistakes the first time, most notably we allowed a lot of ambient light. Also lots of traffic in the area that day, so the shadows changed the ambient light.

-Data fit for pedestals, view port fluxes, relative PMT efficiencies, 47 parameters total (31 fit parameters after pedestals are extracted by an independent method). 124 significant measurements per run.

Relative efficiency results (Oho side, first try) – measured to 1.5 -4% - PMT rotation calibration appears to work (results on our Twiki page)



Plans and schedule I

- Calibrate the spare VME 830 card
  (Beginning of September 2015)

- Test the mirror and code
  (October 2015)

- Improve the DAQ and monitoring
  (September 2015 ongoing)

- Improve the HV monitoring
  (October 2015 ongoing)

- Test EPICS

Plans and schedule II

- Numerous parts (spacers, dark covers and light blockers, new set of remotely controlled mirrors, Box supports, more better collimator for alignment and data taking) built and installed. Reinstall detector in late October. (October 2015)

- Take data with well covered calibration holes, polarized data, filter data, hot lamp data, laser data to characterize the detector response (October 2015)

- SuperKEKB note on LABM performance to be completed after calibration data. We strive for 1% relative calibration of device (September 2015)

- Publish calculation paper