



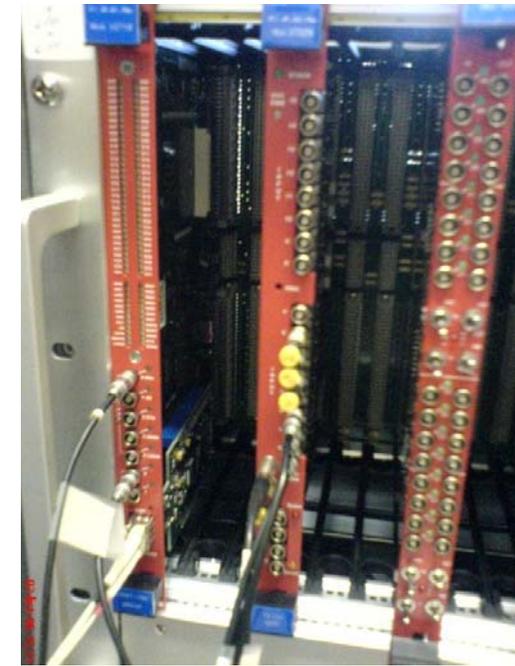
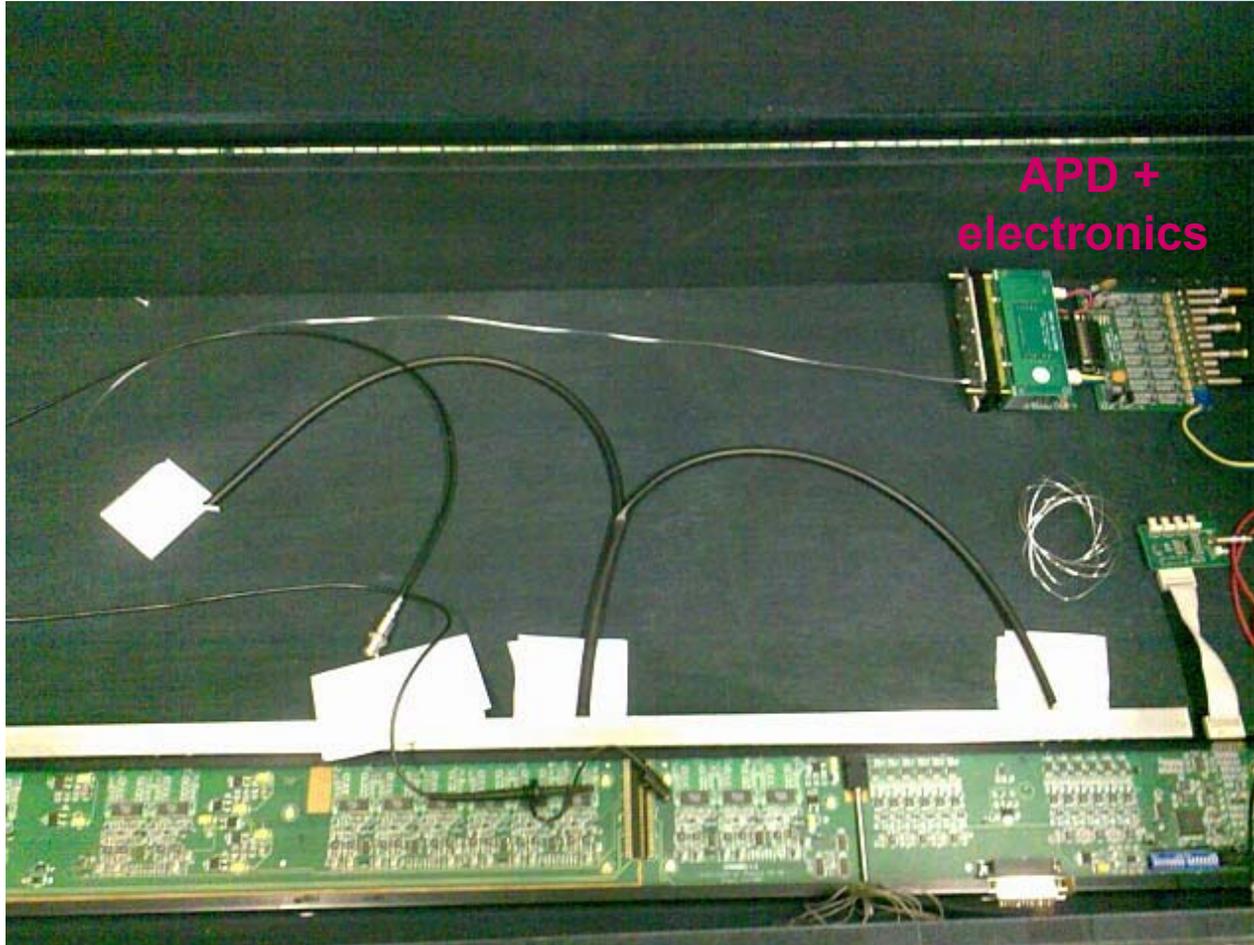
Long term test of LED pulsing

- Long time LED system stability measurement
- Aging of part of optical system
- Future plans

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Setup: in-box view

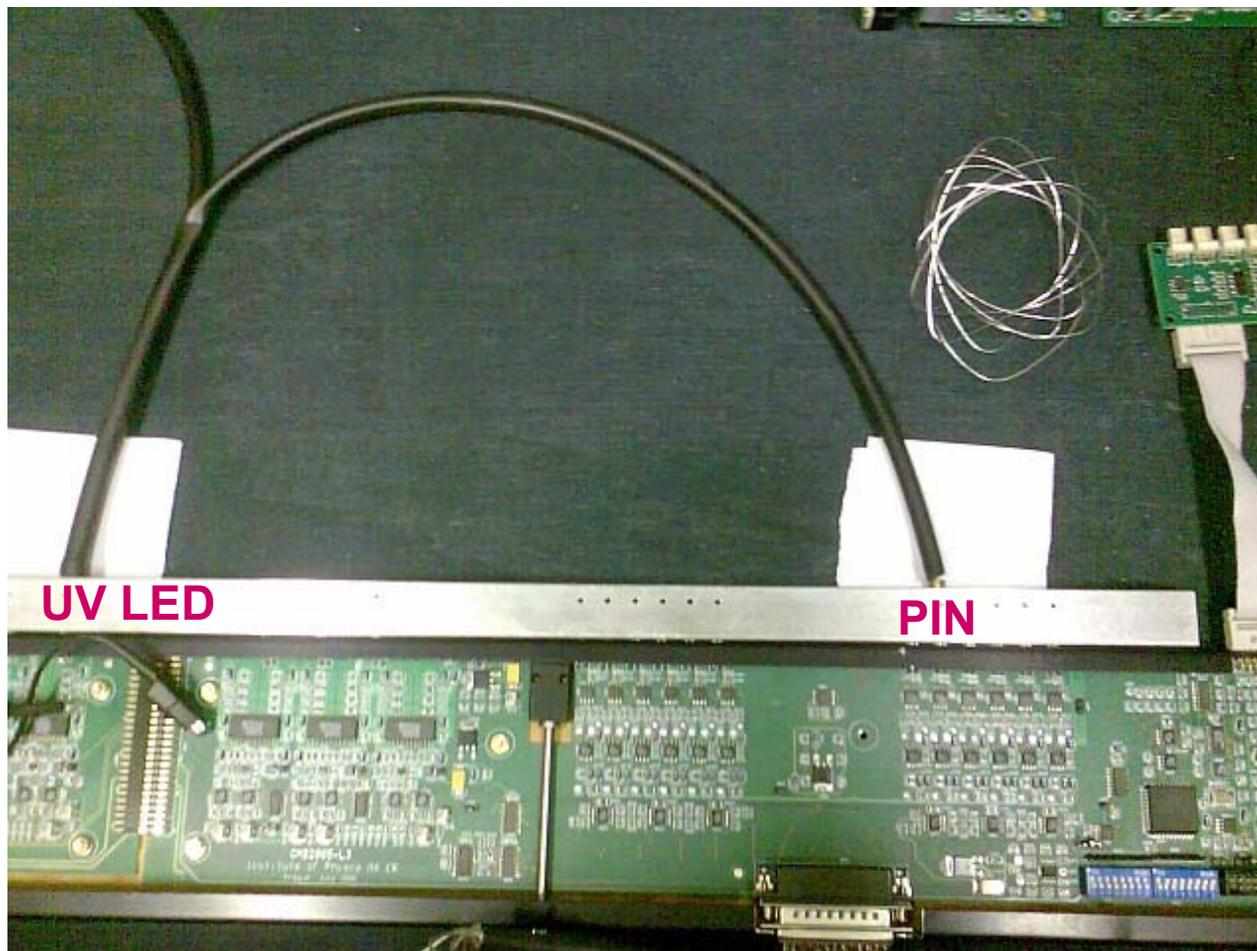
black box



VME DAQ
controlled with PC

CMB - LED driver + PIN ampl + temp sensors

Setup: CMB – LED + PIN

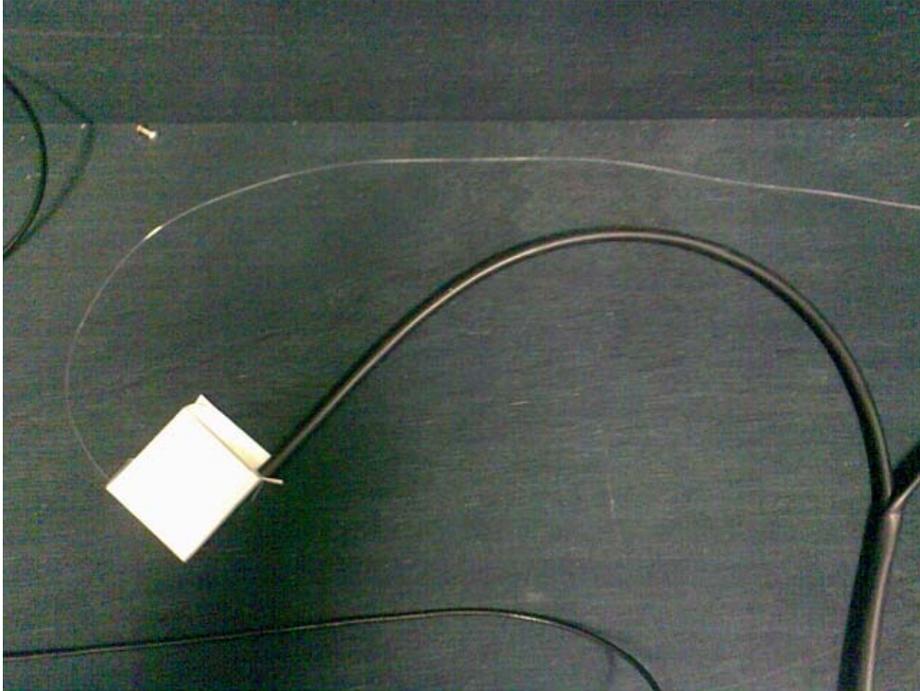


CAN bus
V-calib + T-calib
signals

High LED light
intensity

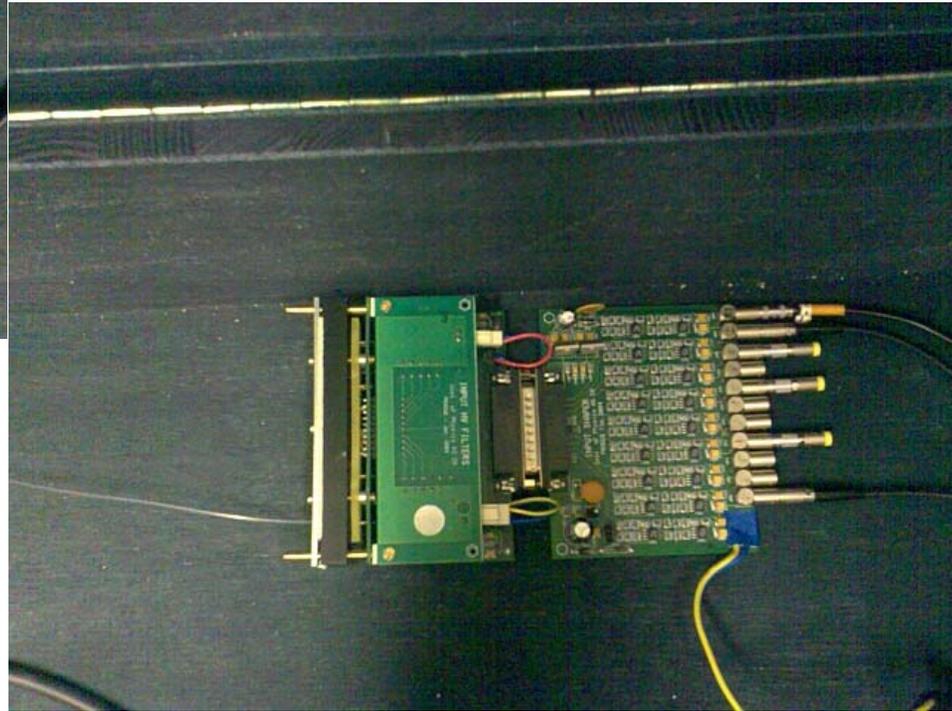
LED driver pulsing @ 1kHz

Fiber +APD detector

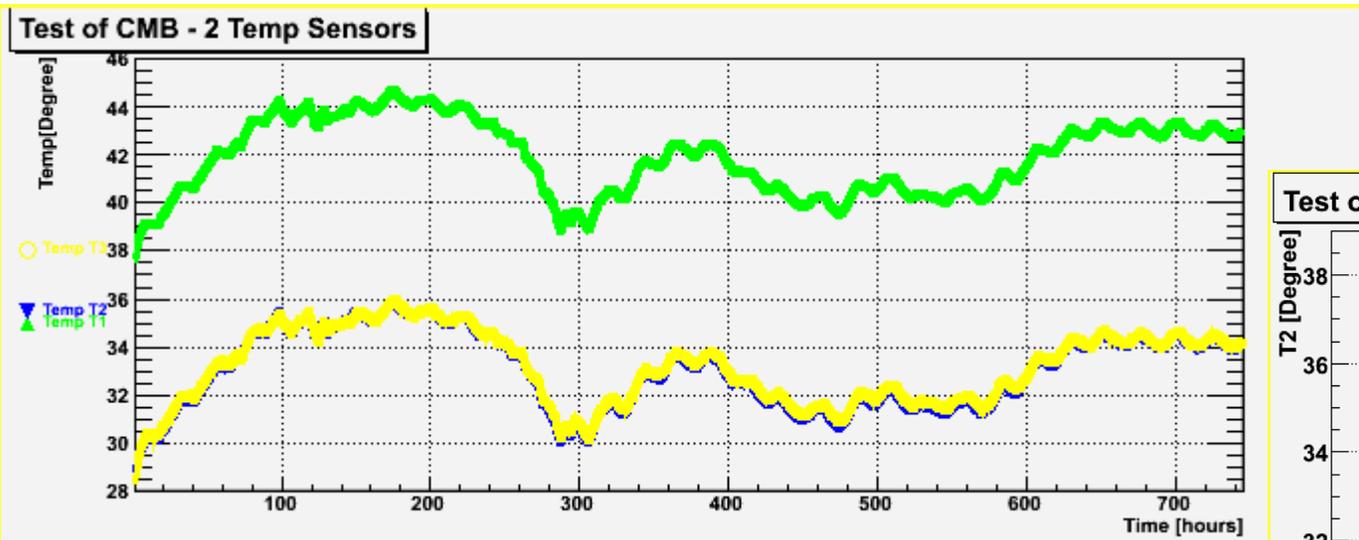


Scintillator tile w/ quarter circle groove
- air gap to attenuate height
of signal amplitude to APD

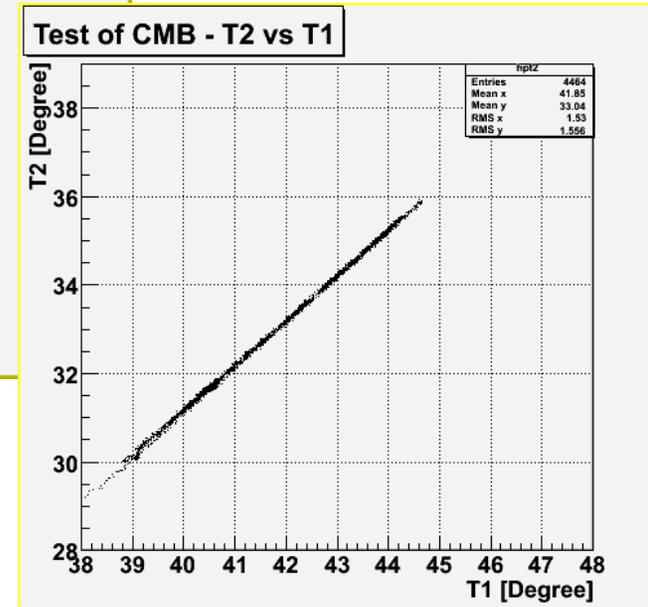
APD Ubias = 270V
very low gain (~3)
↔ pin diode



Measurement: temperature

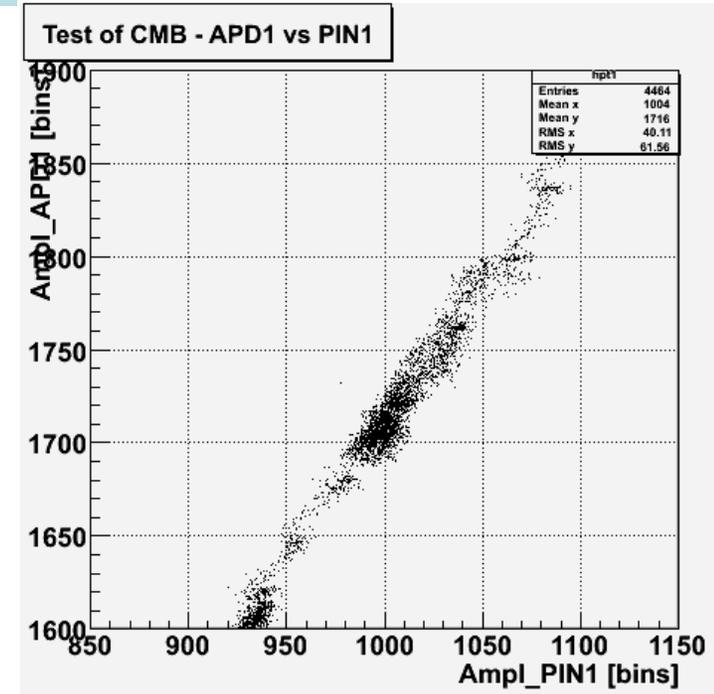
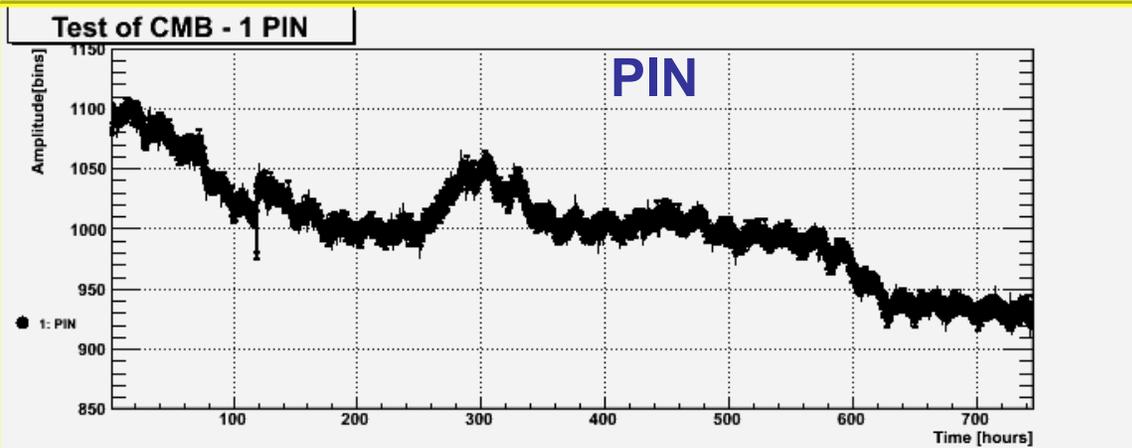
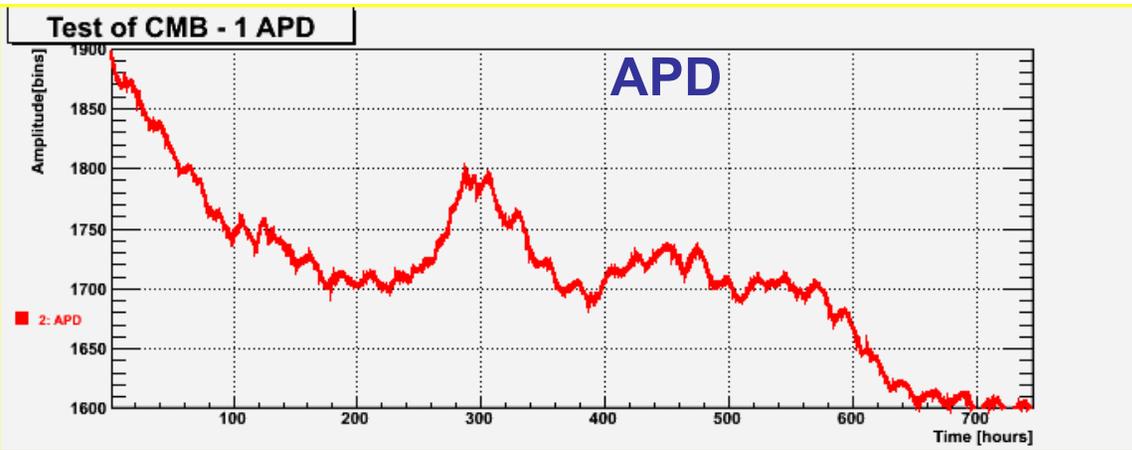


- Long time period: 1 month
→ >2 billion pulses
- Large variations in temperature within 7 K
- 3 sensors (2 @ CMB, 1 nearby APD)



- same time history
- full correlated

ADP + PIN response



- good correlation ADP-PIN response

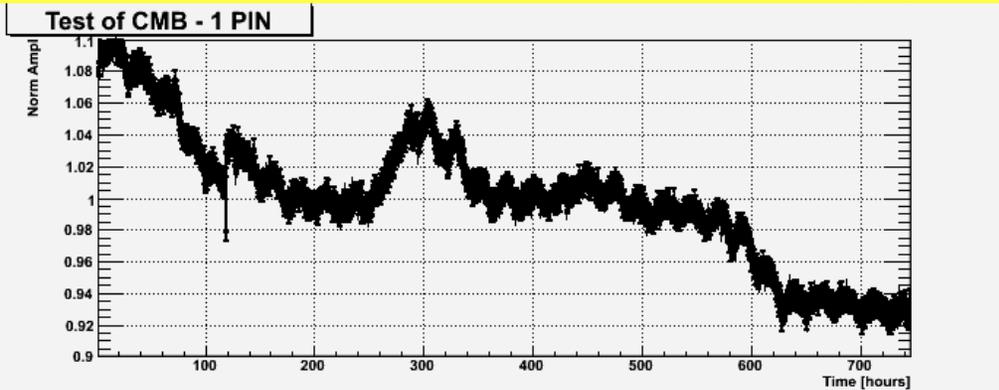
- very similar time response
- PIN more noisy due to low signal ampl

Relative response

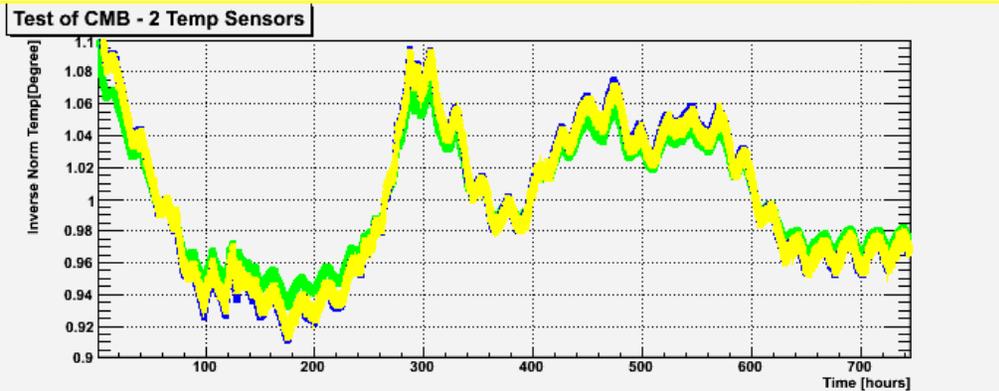
APD



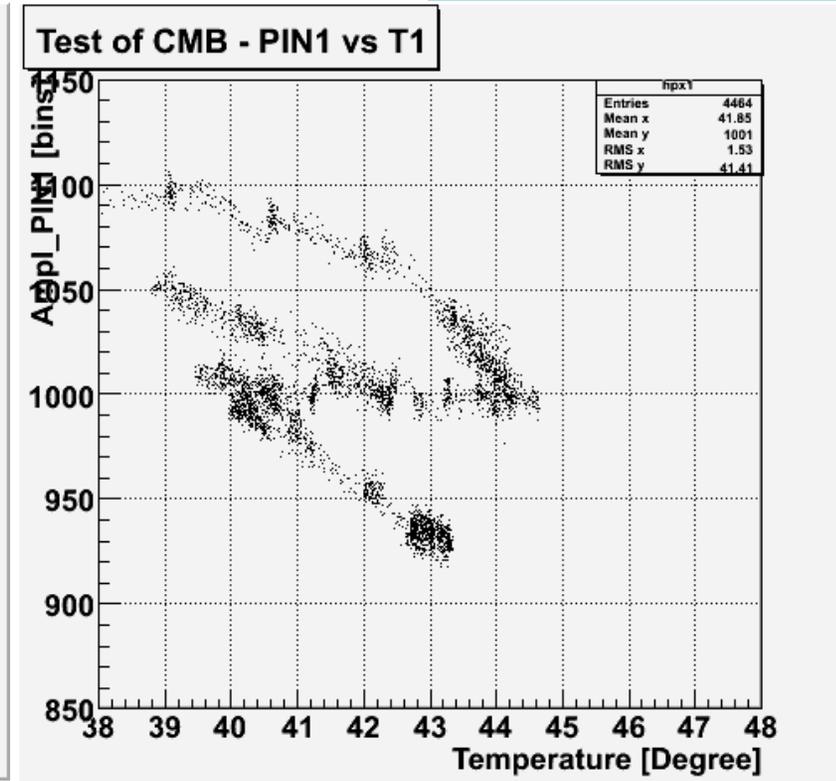
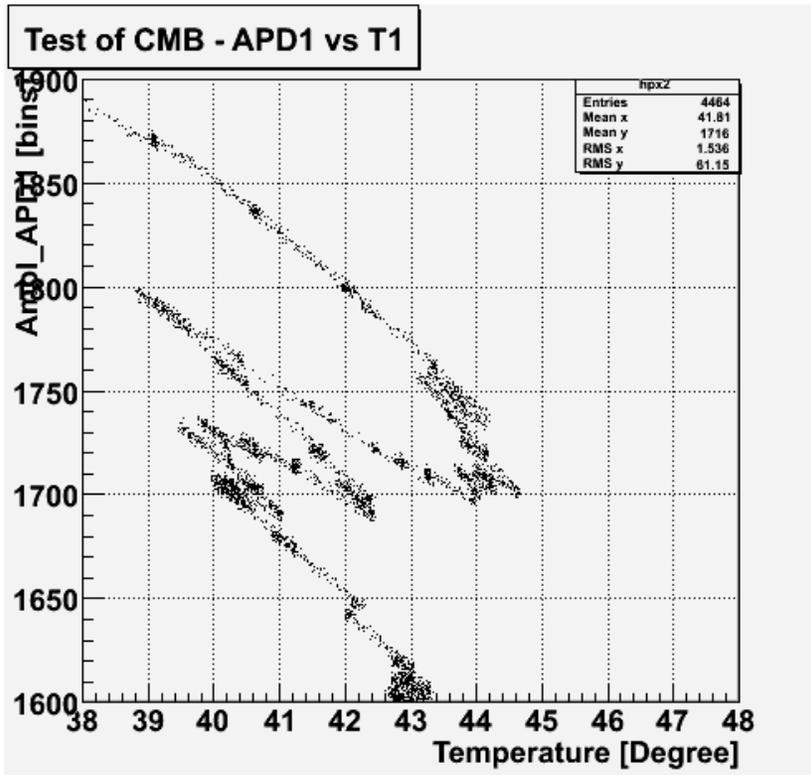
PIN



Temp
inverse

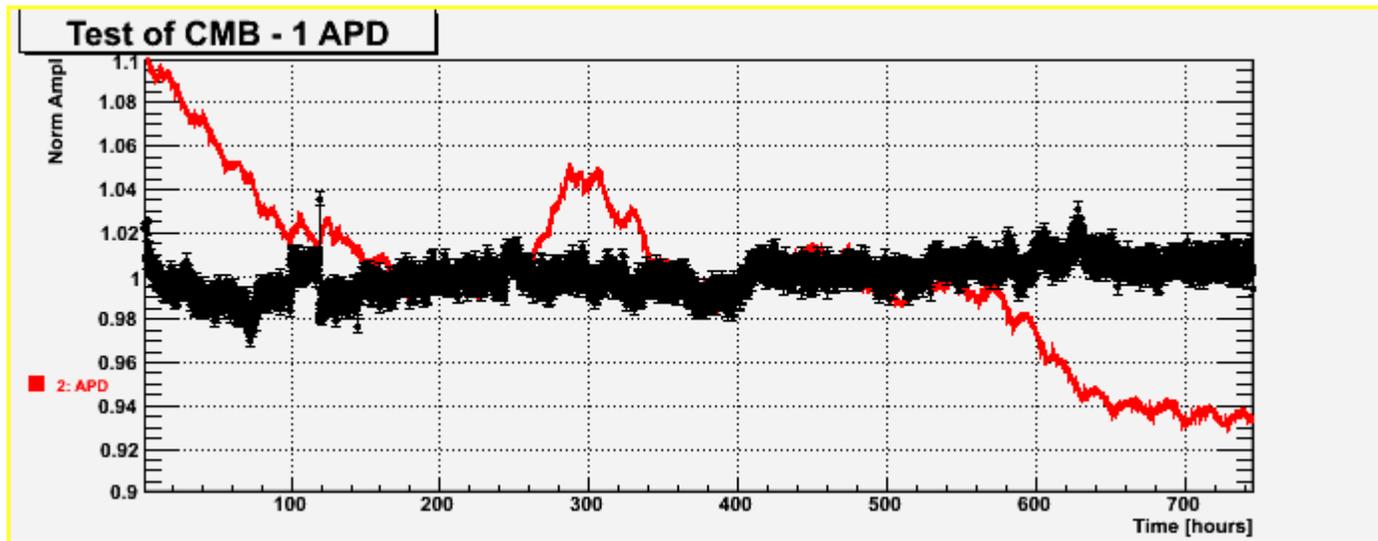


- normalized at average over whole time scale
- variation in response at level $\pm 10\%$
- visible time slope fall in PD responses
- light intensity decrease in time



- PIN / APD – Temperature correlation
- unexpected result -> time instability
- light intensity decrease in time – PIN & APD response decreasing

APD – PIN correction



- PIN correction (dividing responses) to APD signal as used in LED calibration procedure
- almost flat result $< 2\%$
- difference from uniformity \leftrightarrow
not same PIN / low gain APD temperature dependence
- small jumps in time = (probably PIN) electronics instability

- ❑ Long time stability of LED-PIN-APD electronic-optical system was measured over one month
- ❑ Large temperature variation cause big variations in response of optical system -> PIN – low gain APD and/or temperature dependence
- ❑ PIN-APD system can correct on long time instability of whole system
- ❑ Probably visible aging effects of optical fibers

- Test for two fibers with different lengths to study aging of fibers, avoiding possible aging of LED
- Setup prepared for future (EUDET) CMB with new LED driver
- Study of 'party' side-emitting fiber leading along many scintillator tiles with old/new LED driver