BCM1F BASIC HARDWARE

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OUTLINE

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3. Patch Panels
4. Optical Transmission of Signals
5. Distribution in S1
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DESIGN CONSTRAINTS

Situation 2007:

Use of *existing* (spare) components in CMS

cables, fibres, space inside the tracker volume

➔ planned infrastructure of BCM1L and PLT:

- 2 supply cables with two unused pairs of wires each
- 2 optical cables (12 fibres each)
- No cooling possible
- No data connection (in/out)
- Mounting onto BCM1L support

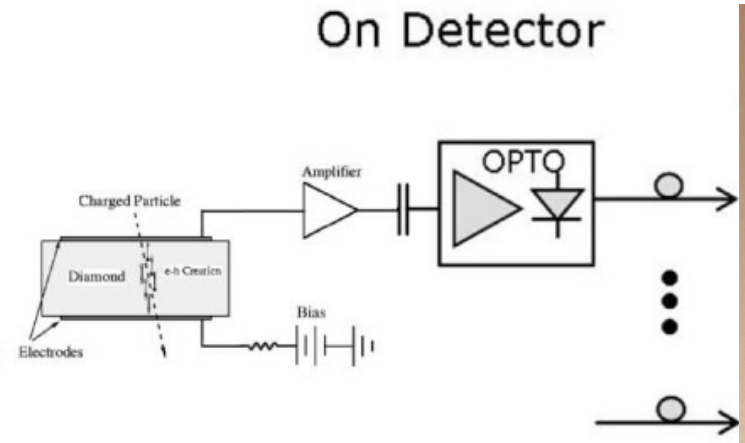
SOLUTIONS

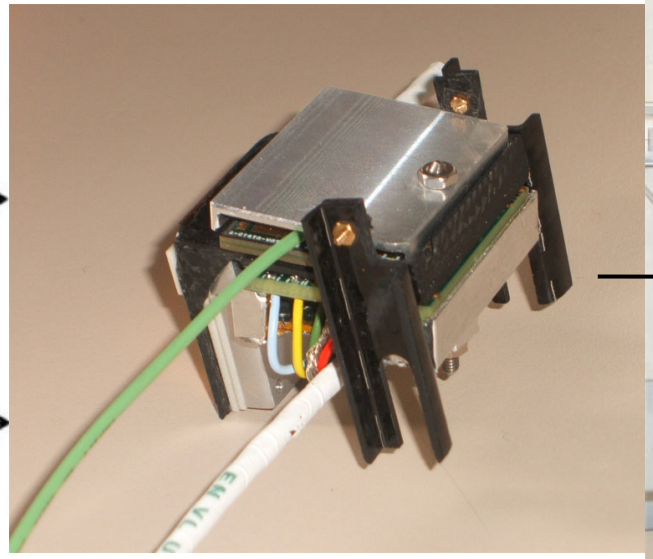
Design (2007):

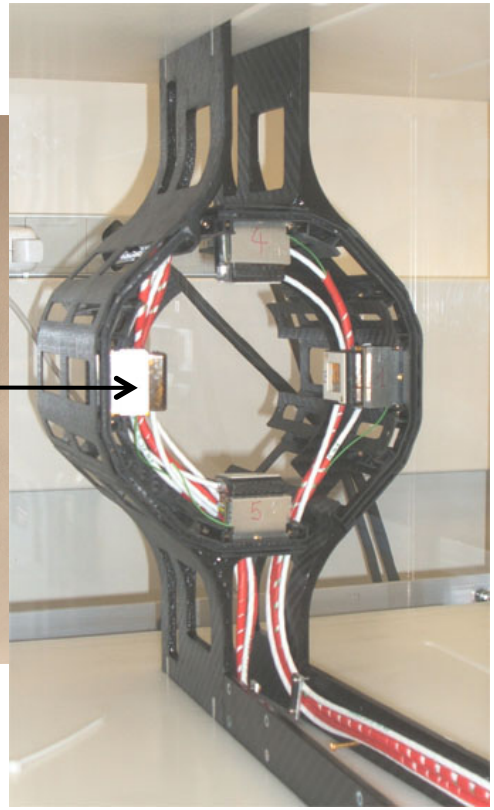
- Combination of frontend with existing BCM1L
- “Modules” plug into supports “half shell”
- Use of radhard components
  - scCVD diamond sensor, preamp JK16,
    Laser driver, laser diode with pigtail
- Supplied with low voltage, high voltage, test pulse
- Output signal transmitted via optical fibre

MODULES

- Two planes $+Z$ and $-Z$ at 1.8 m from IP, r ~ 5 cm
- 4 modules in one plane (top, near, far, bottom)

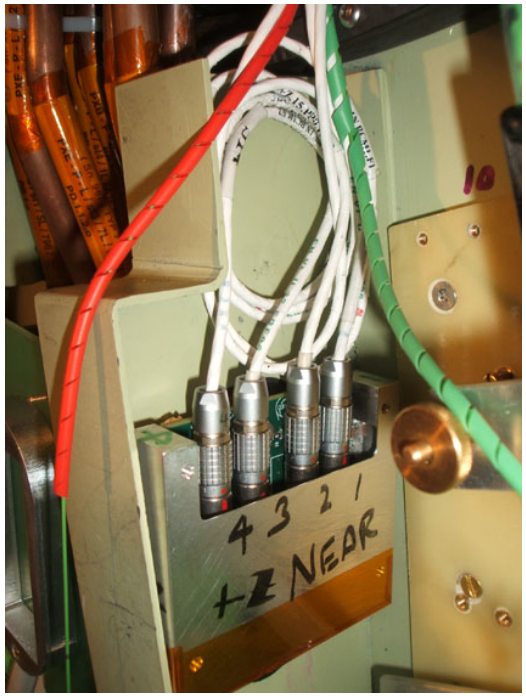


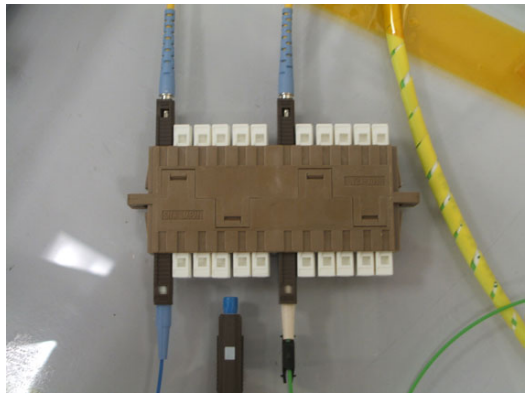




PATCH PANELS (inside Detector)

- 4 patch panels generate supply voltages, test pulses for two modules each
- BCM1L cables
- Two pairs used
- No regulation
- Pulse modulated and regenerated



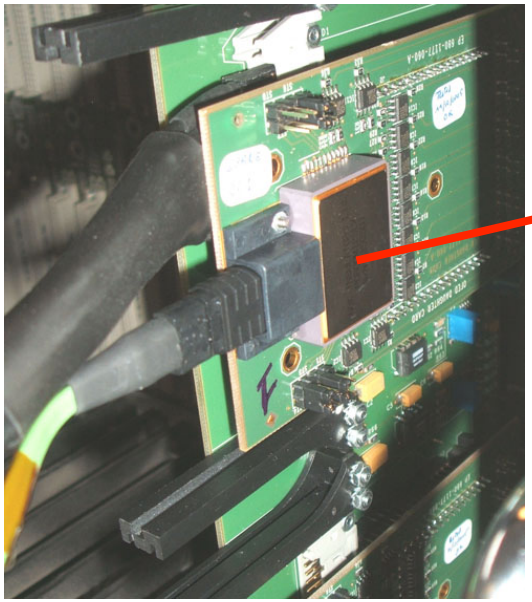


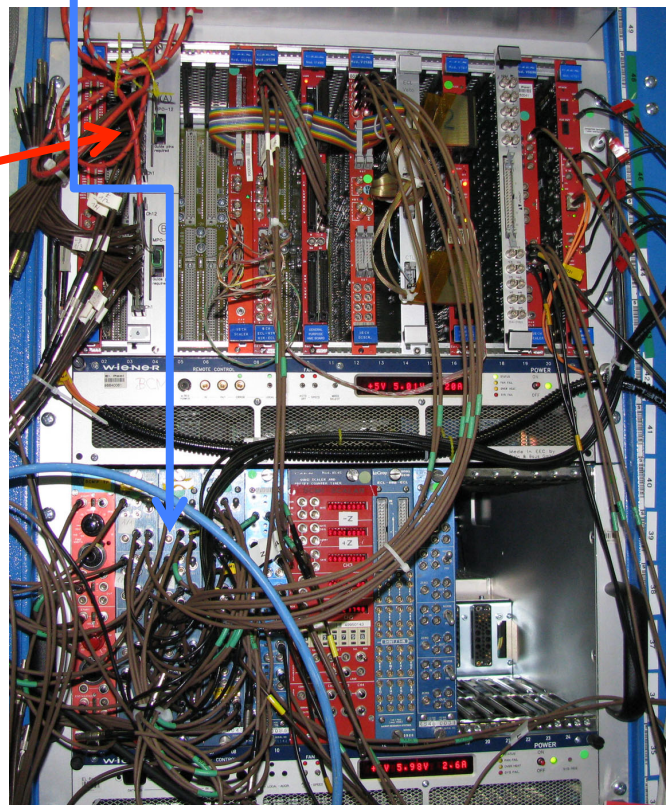
optical patch panel for fibres

OPTICAL RECEIVERS (S1)

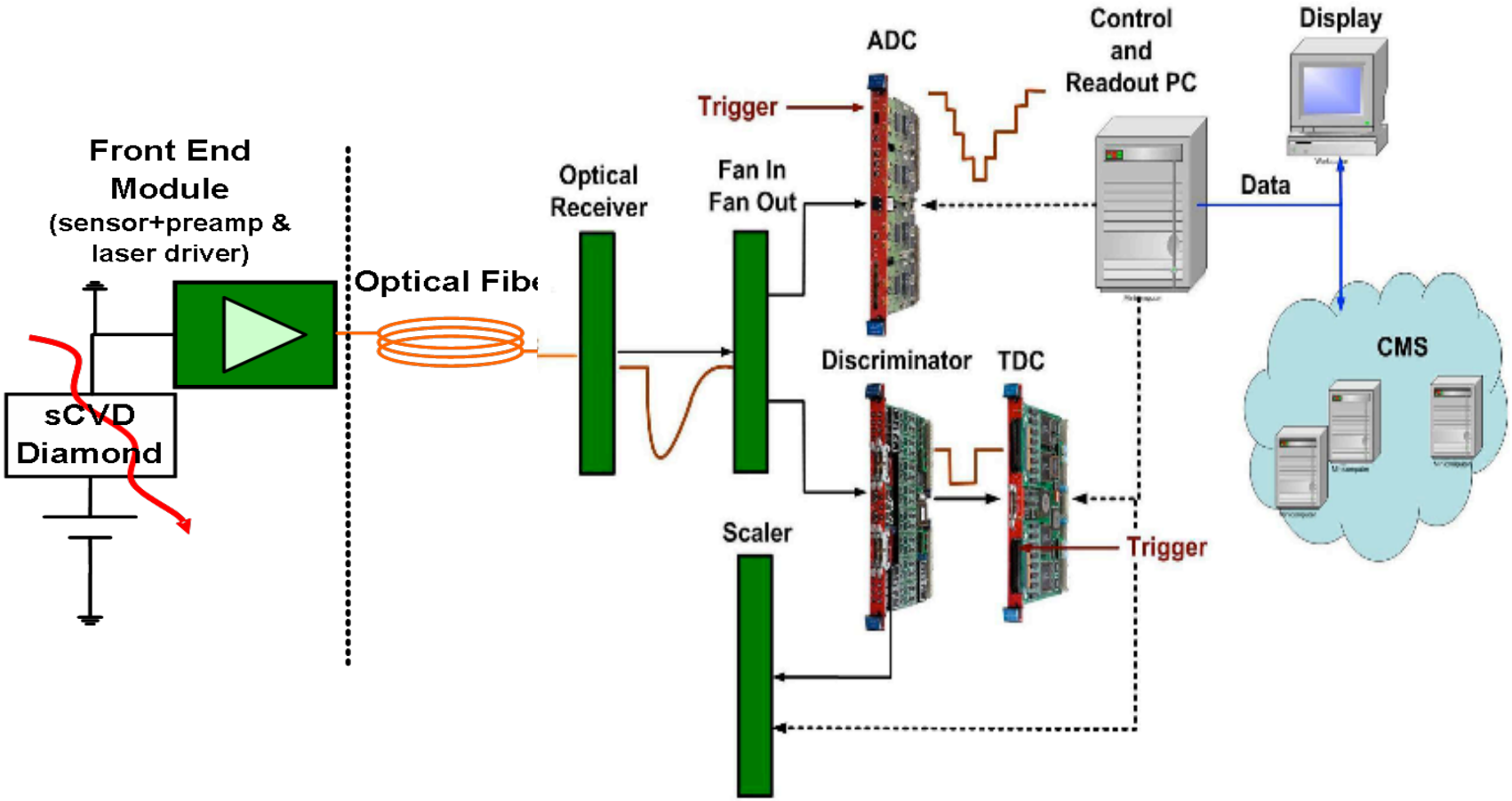
Optical Receiver:

- 2 separate 12-fold receivers
- Voltage followers into fanouts
  - ➛ analog and digital signal processing

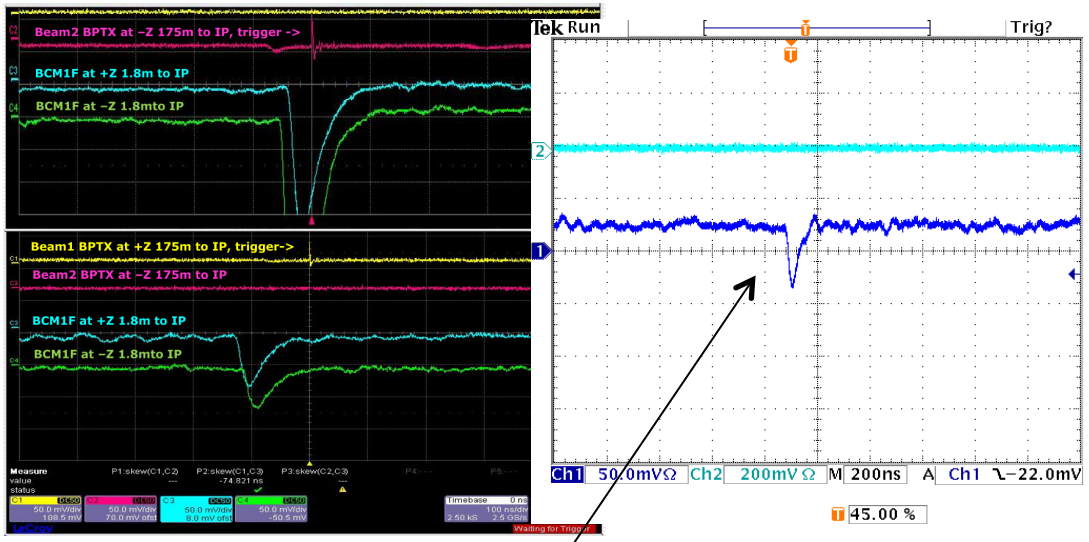


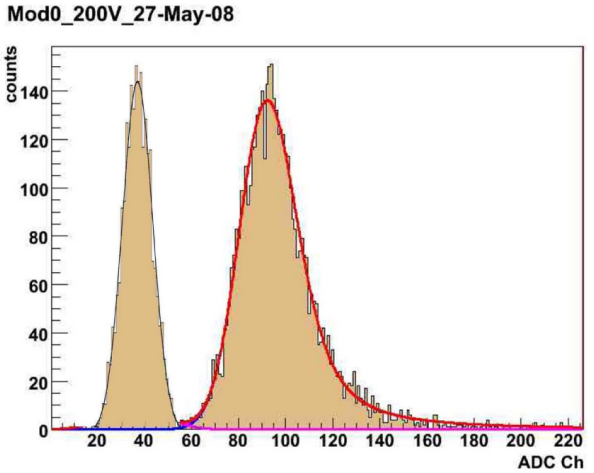


OVERVIEW

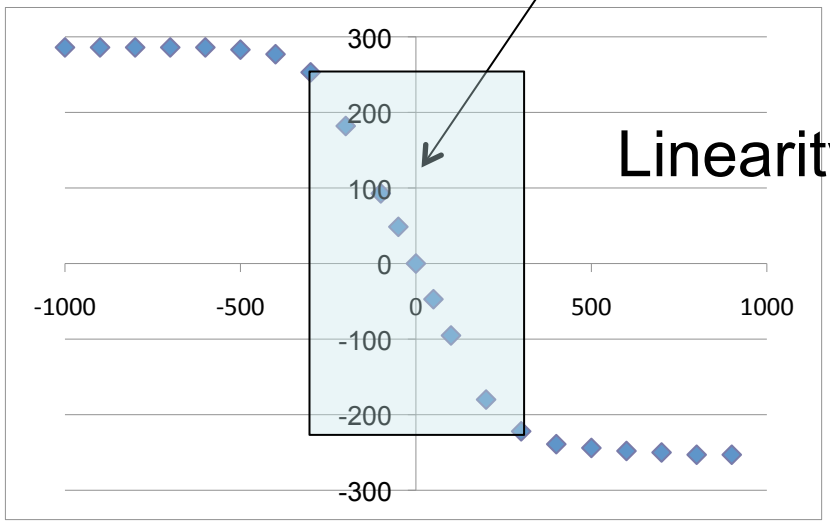

Front End
Module
(sensor+preamp &
laser driver)
sCVD
Diamond
Optical Fibe
Optical
Receiver
Fan In
Fan Out
Trigger
ADC
Control
and
Readout PC
Display
Data
CMS
Discriminator
TDC
Trigger
Scaler

SIGNALS, DYNAMIC RANGE





The pulse height distribution of the sCVD at 200V acquired throughout entire readout chain



Linearity: up to ± 5 MIP

Preamp: ± 10 MIP

Transmission: ± 5 MIP

KNOWN LIMITATIONS

- Positioning of modules, cabling
- patch panel: no extension possible, conflicts with PLT?
- supply voltages, temperature, operational points
  not controlled, laser ageing and rad damage “designed in”
- no protection (components sensitive to overvoltage)
- area of sensor small (5 x 5 mm^2)
- time resolution between subsequent pulses (~50 ns rise time)
  (pile up effects)
- dynamic range of signal transmission (max. 5 MIPs)
- no control of DC shifts ➛ threshold stability