

Status of test 1cmX1cm APD

Tamaki Hirai/Kenkichi Miyabayashi

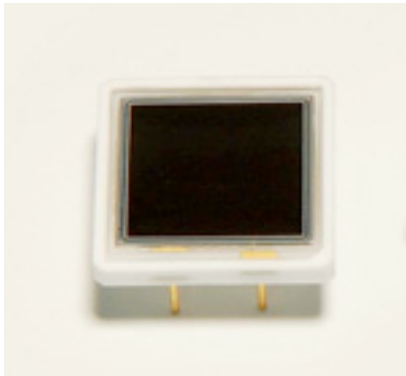
@ECL parallel session

2008 July 4th

Photon sensor for Pure CsI

- Phototetrode/Photopentode is a baseline option.
- Semiconductor device is compact, intrinsically immune for magnetic field.
- PIN-PD unusable(QE@330nm, no amplification, i.e. can not compensate smaller scintillation).
- Large area APD(5mmX5mm for CMS, 1cmX1cm on HPK catalog) got available.

Hamamatsu “Reversed type” APD

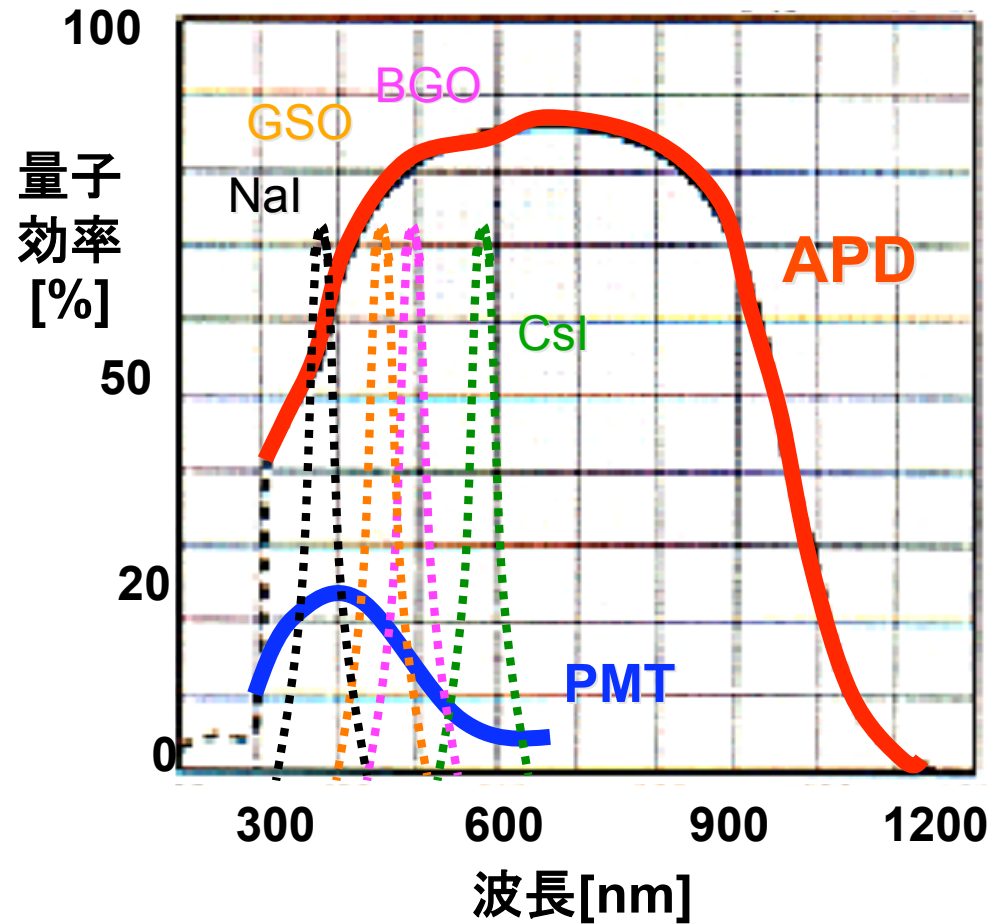


S8664-1010 on catalog

- 1cmX1cm area.
- Typical Gain=50 at 350V.
- Current at room temp.=5nA.
- Capacitance=270pF at gain=50.
(cf. 1cmX2cm PIN-PD:80pF)

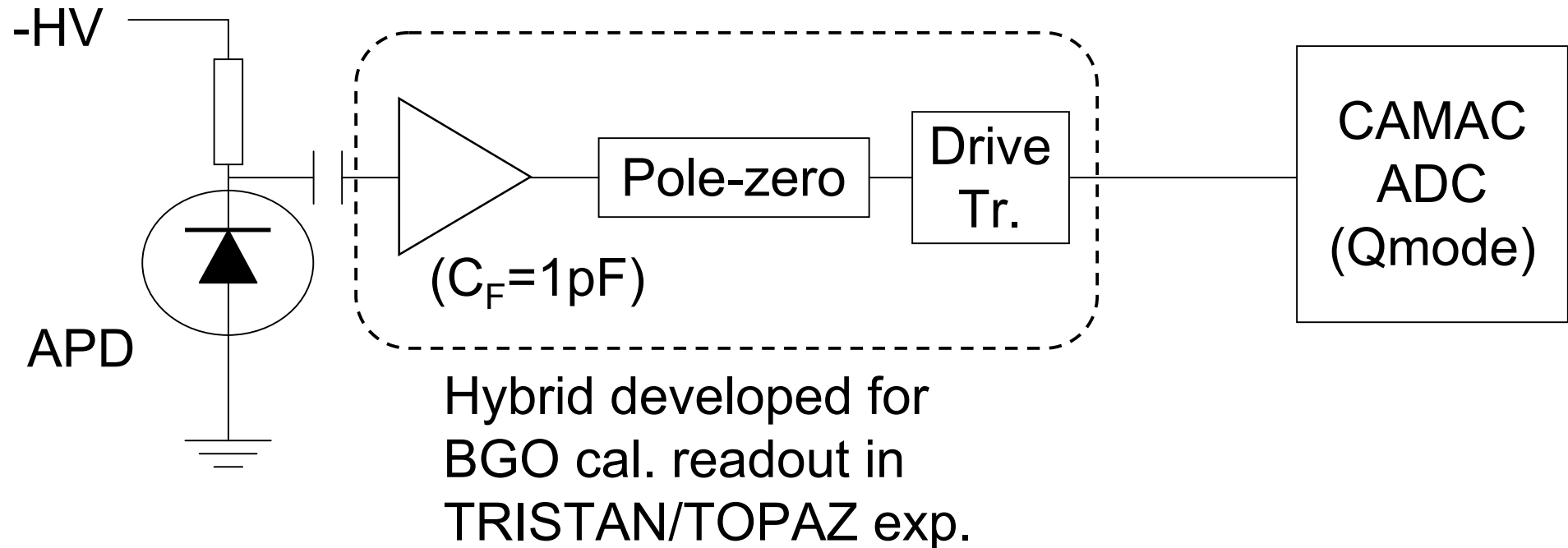
Huge number of pieces of 5mmX5mm type have been used for LHC/CMS lead-tungsten calorimeter readout.

Quantum efficiency



Around pure CsI's peak emission of 320nm, QE~40%.

Current setup



- APD response for pulsing LED seen on the scope.
- Comparing test-pulse response and pedestal width; currently noise is estimated to be ~ 5000 e/h pairs.

Rough estimation

- CsI(Tl) with 1cmX2cm PIN-PD(2pieces) gives 5000 e-h/MeV.
- L.O.=1/10, QE=40%/80%, Area=1/2, Gain=50 results in;
- $5000 \times (1/10) \times 0.5 \times (1/2) \times 50$
=6250 e-h/MeV \rightarrow ~0.8MeV eq.
- Note that electrical shielding/Grounding would be still improved.

Plan

- Improve setup(Grounding, etc.)
- ^{241}Am (60keV X-ray) irradiation to check charge collection factor.
- Attach APD(s?) on pureCsI crystal, check by cosmic ray($\sim 30\text{MeV}$ energy loss).
 - Plan to borrow Preamps and shaper(30ns)+FADC(40MHz) CAMAC module from BINP colleagues.