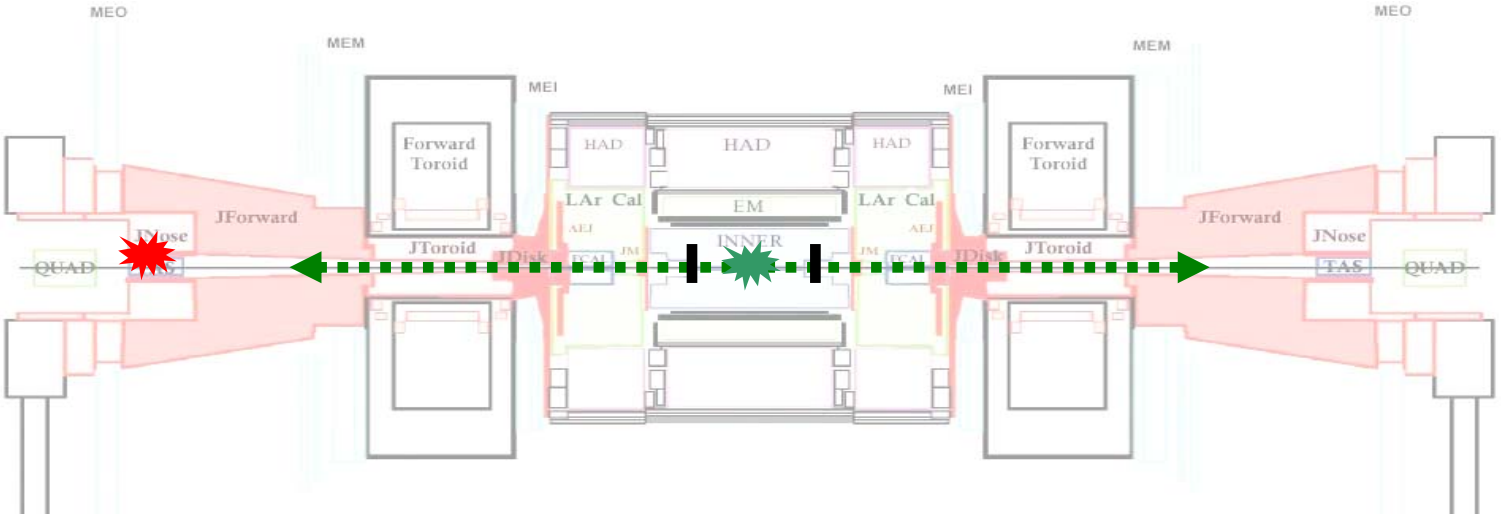
ATLAS **B**eam **C**ondition **M**onitor

Working principle

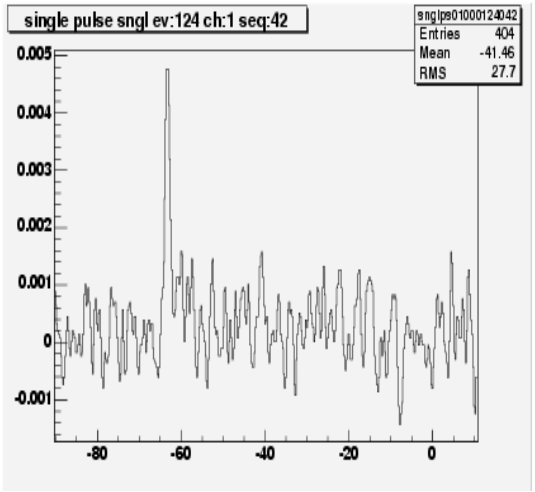
- **Distinguish interactions from background via time of flight**
- **With two symmetric stations at ±Δz/2**
  - **Interactions: in time**
  - **Background: out of time on one side by Δt = Δz/c**
- **At high luminosity expect about one hit for each bunch crossing**
  - **Interactions at Δt = 0, 25, 50 … ns**
  - **Optimally distinguished background at Δt = 12.5 ns ⇒ Δz = 3.8 m**


MEO
MEM
MEI
Forward Toroid
HAD
LAr Cal
EM
INNER
JForward
JNose
JToroid
JDisk
QUAD
TAS

Sensors

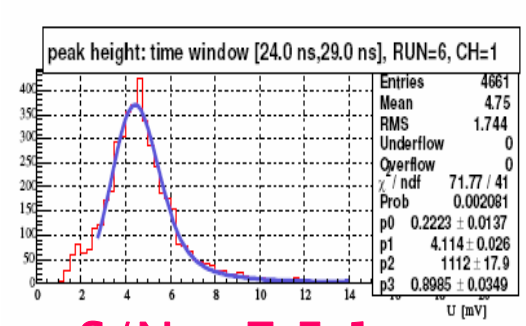
- Polycrystalline CVD diamond sensors chosen
  - Radiation hard – shown to work at > 10^{15} particles/cm^2
  - Fast signals – high velocity and cut-off due to trapping
  - Small leakage current – no cooling required
- Procurement in collaboration with CERN RD-42
  - Sensors produced and conditioned by Element Six Ltd.
  - Metallized with proprietary radiation hard process at OSU
- Sensor properties
  - Size 10 mm x10 mm, active 8 mm x 8 mm (metallization)
  - Thickness ~500 μm
  - Charge collection distance ~220 μm
  - Holds ~ 2 V/ μm, operating voltage 1000 V, current ~ nA

Measurements with β source:

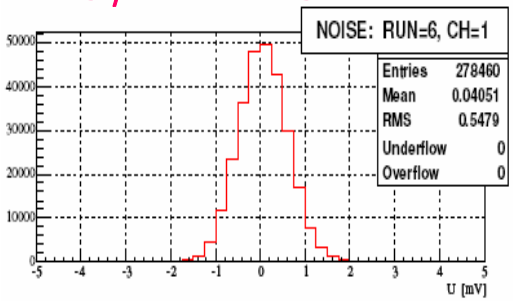


Typical MIP pulse

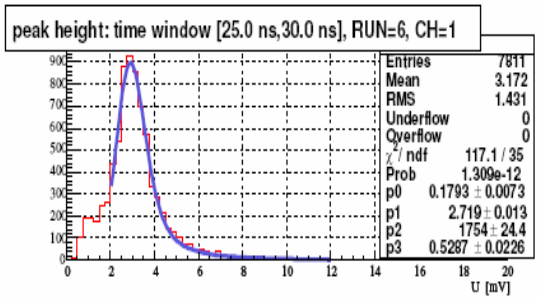
Fotec FE (500 MHz)



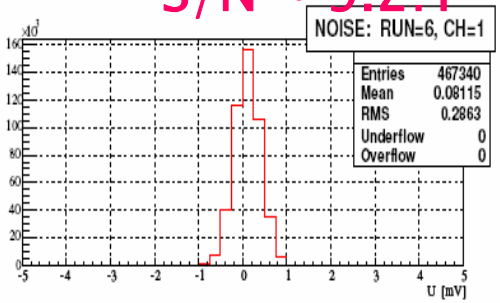
S/N ~ 7.5:1



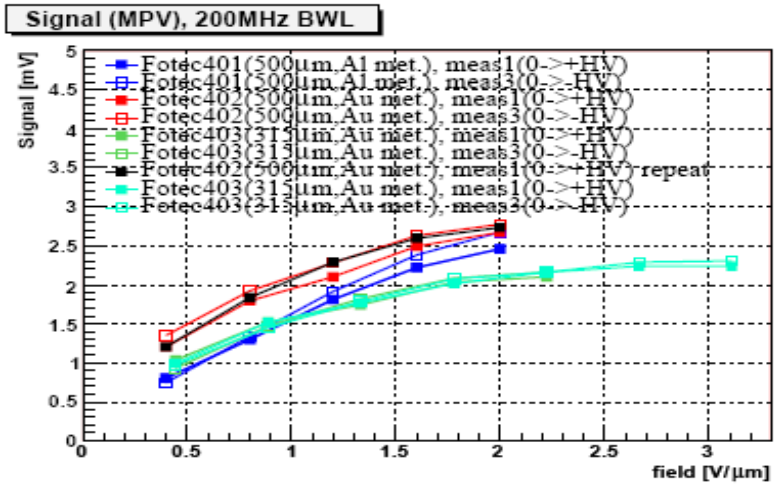
200 MHz BWL

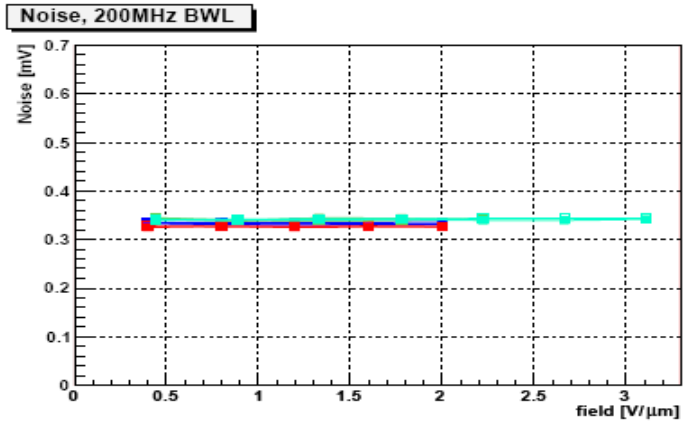


S/N ~ 9.2:1



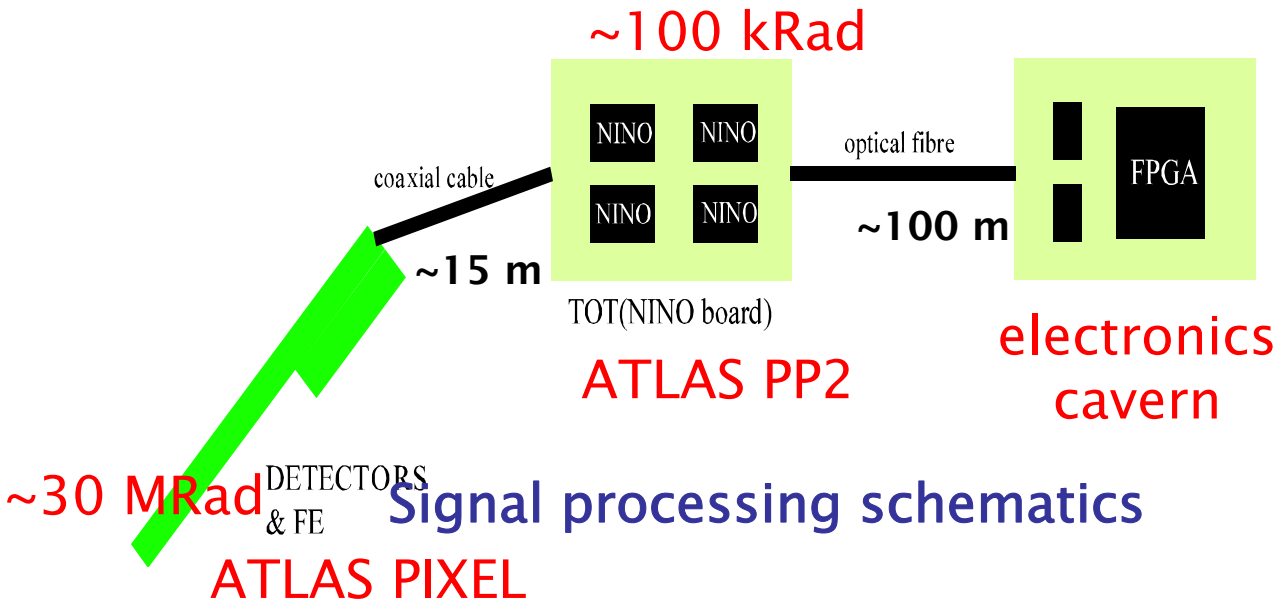
Measurements with β source:





NINO amplifier-discriminator tests

- Differential timing amplifier-discriminator (1 ns peak, 25 ns jitter)
- LVDS output with width proportional to time-over-threshold
- Radiation tolerant design by CERN-MIC
- Signal split 1:12 into two inputs to increase dynamic range
- Tests confirm suitability as **BCM** back-end chip



Signal processing schematics

Production status:

- 8 module boxes completed, equippped with sensors
- 2 spare boxes in production
- brackets produced
- 2 prototype NINO boards produced, measurements in beamtest running
- beamtest with microstrip telescope underway