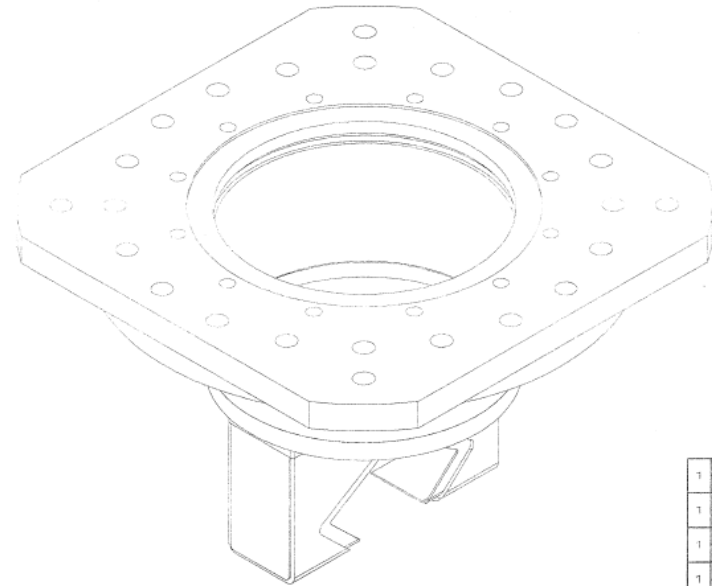
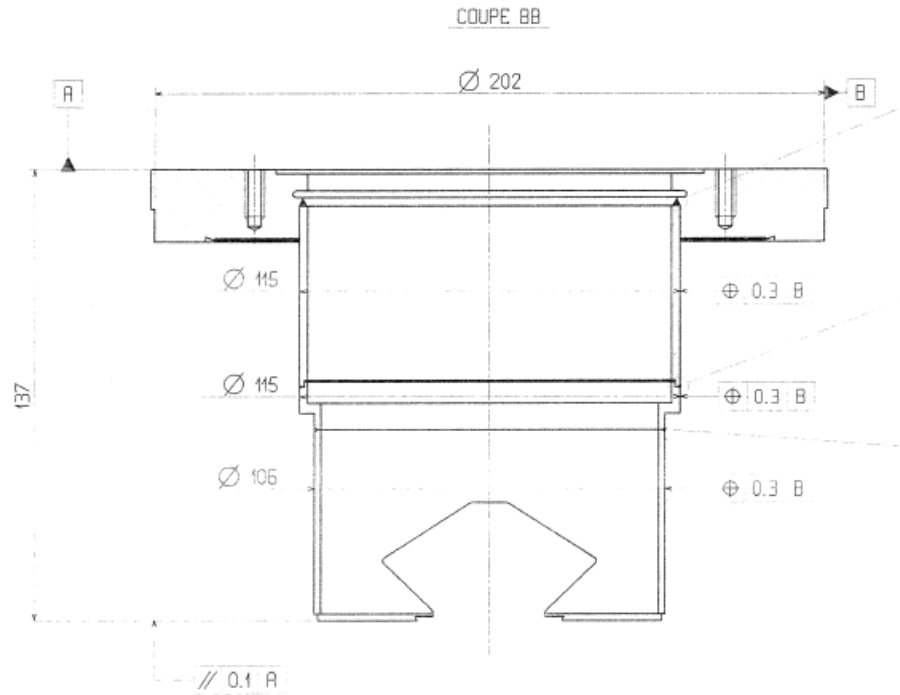


Fiber hodoscope

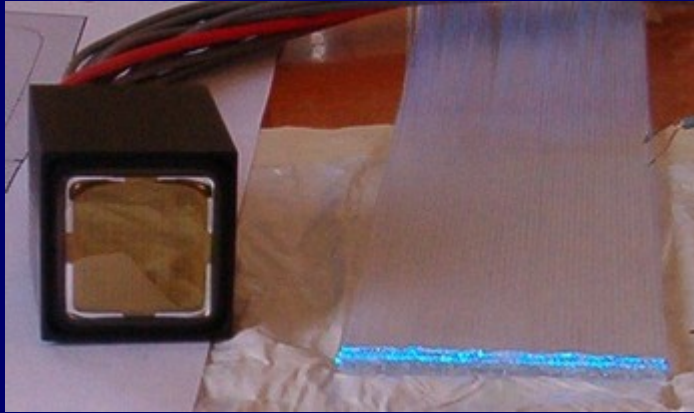
P. Valente

Roman pot



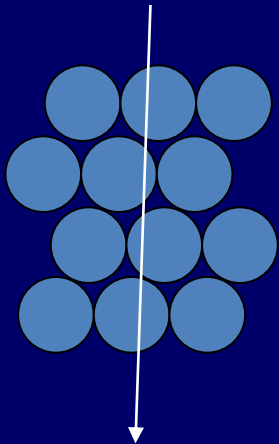
1	Bride carree	4
1	Tube Ø 110.3/114.3	3
1	Pièce intermédiaire	2
1	Assemblage support membrane	1
QUANT	DESCRIPTION	POS
ENS / ASS.	Roman Pot (TOTEM)	

Detector concept



One or more layers of fibers:

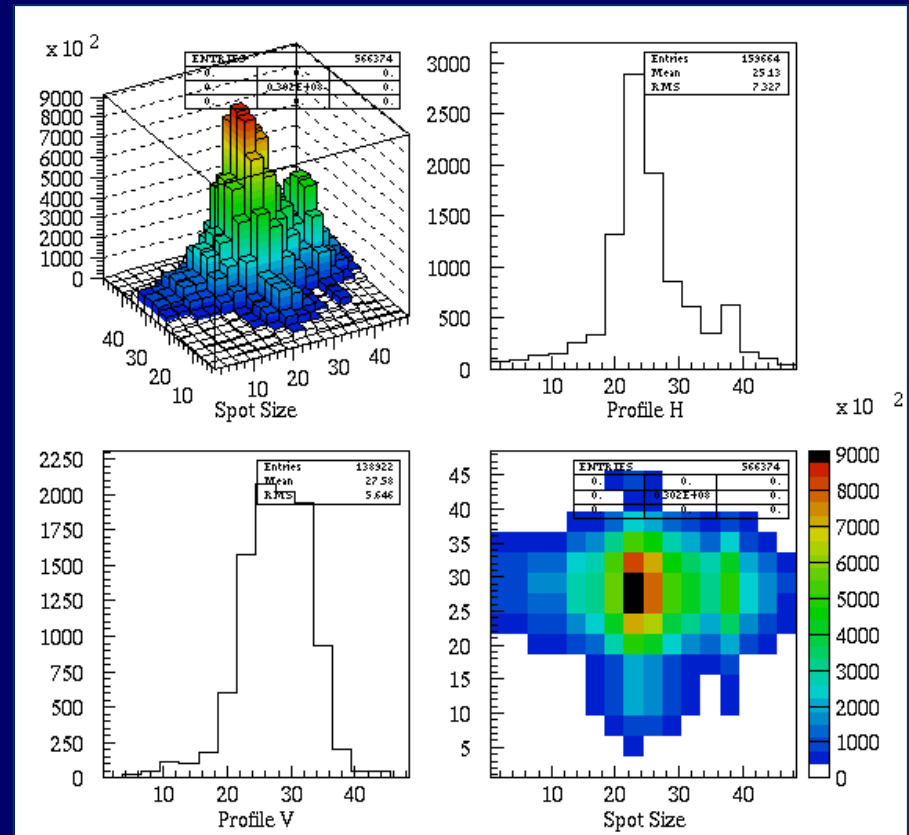
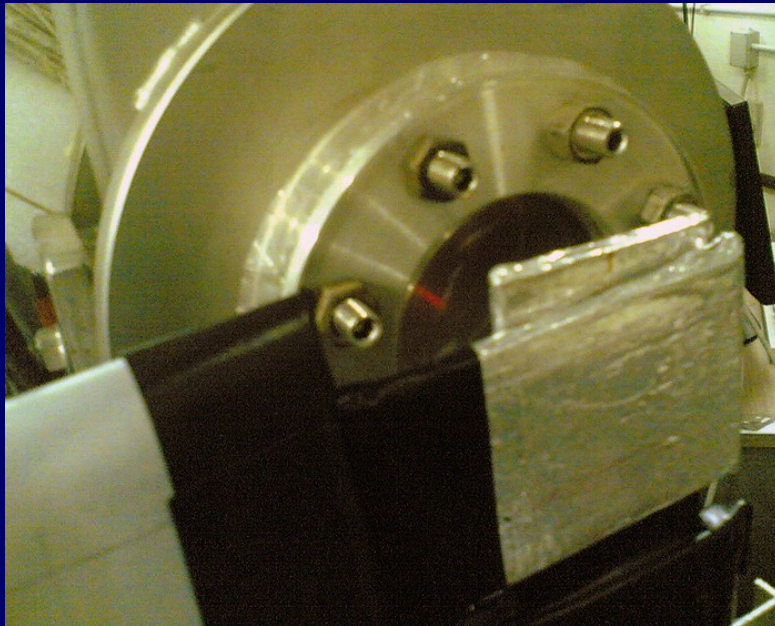
- Plastic (PMMA, polystyrene) fibers:
 - scintillation (blue)
 - $n_{\text{core}} \approx 1.6$, $n_{\text{cladding}} \approx 1.4$
 - Round or square fibers
 - Diameter/side from **200 μm** to few **mm**
- Quartz (SiO_2) fibers: Cerenkov emission
 - Different cladding materials (silica, hard plastic, PMMA)
 - Core diameter from **100 μm** to **2 mm**



Directly coupled to multi-channel photodetector (e.g. **multi-anode PMT**)

Scintillating fiber detector

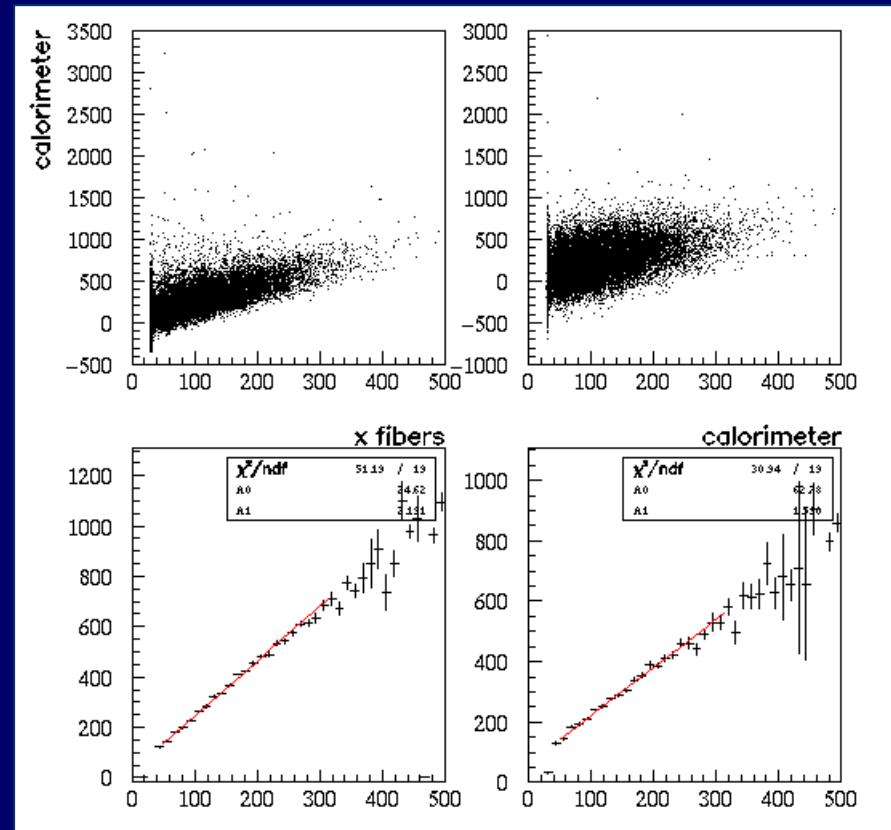
- Fiber detectors (x and y views, 4 layers, 1 mm diameter fibers)
- Working since 2003 at Frascati BTF



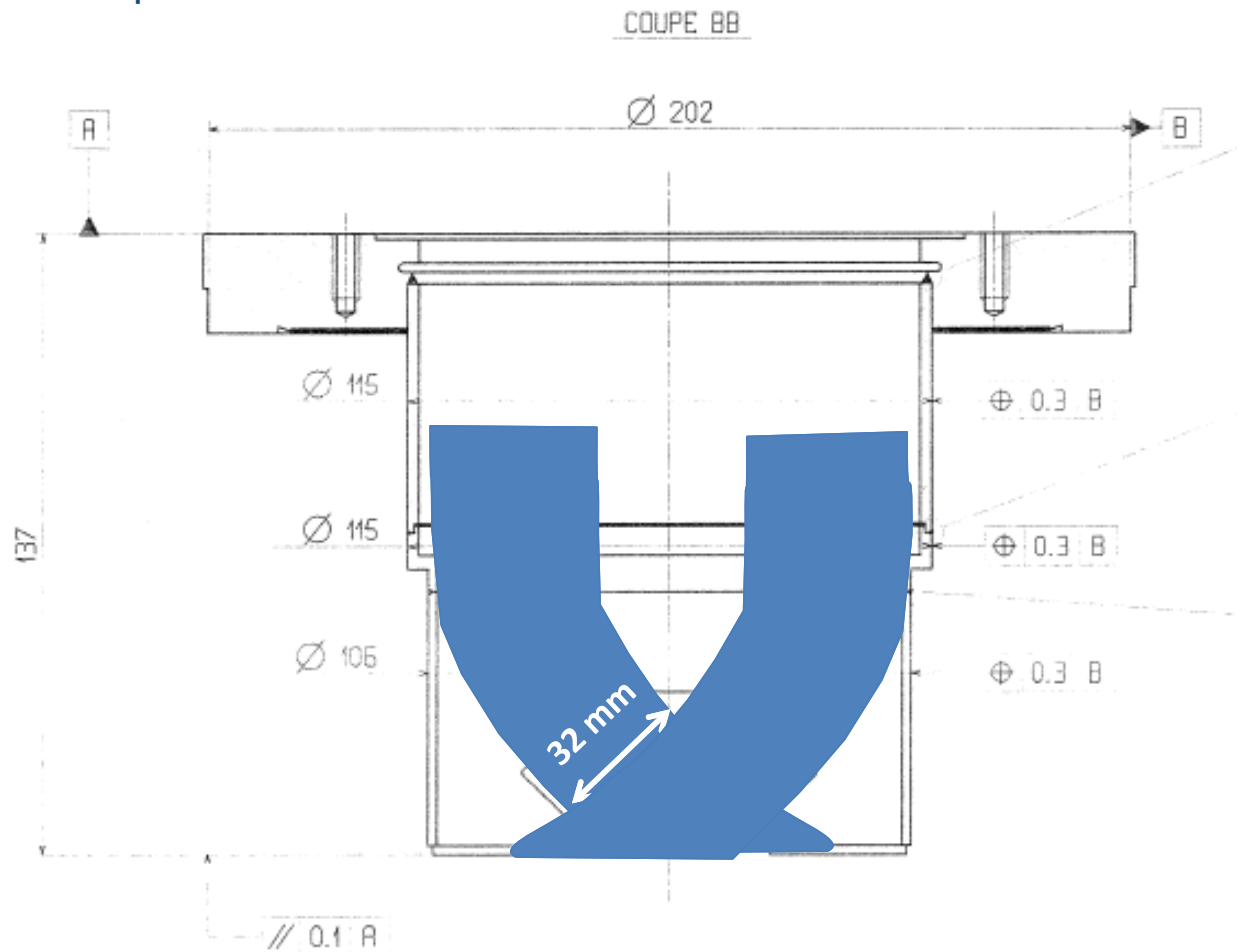
Scintillating fiber detector

Single particle sensitivity, response proportional to number of electrons in beam

≈ 1 photo-electrons/mm at 50 cm from PMT, 20% quantum efficiency

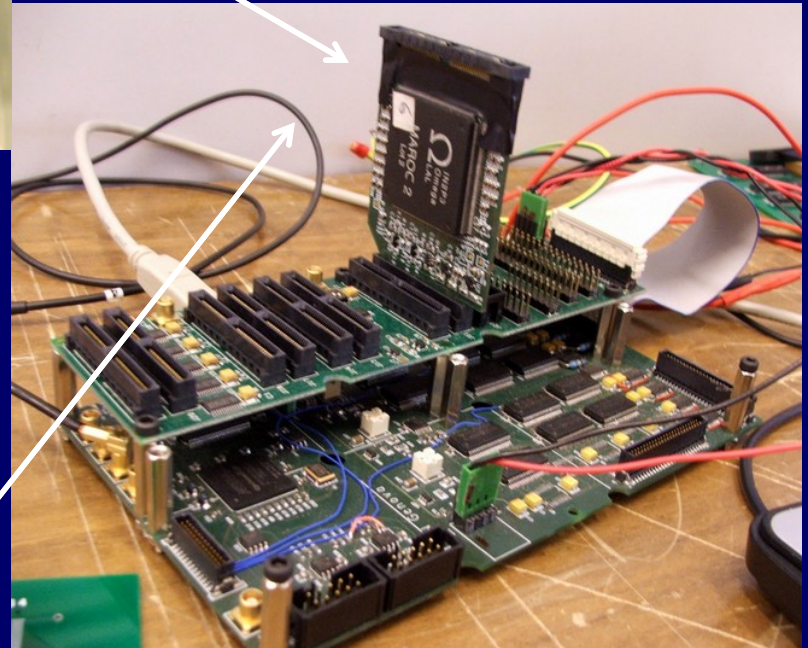
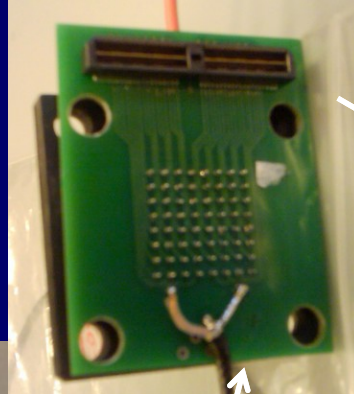
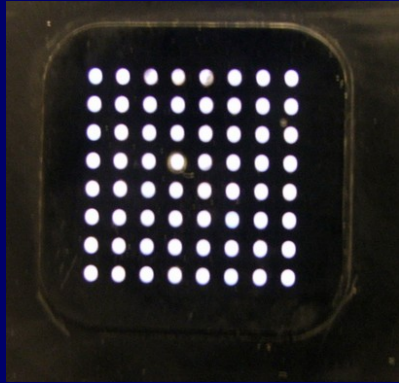


Example: 64 channels



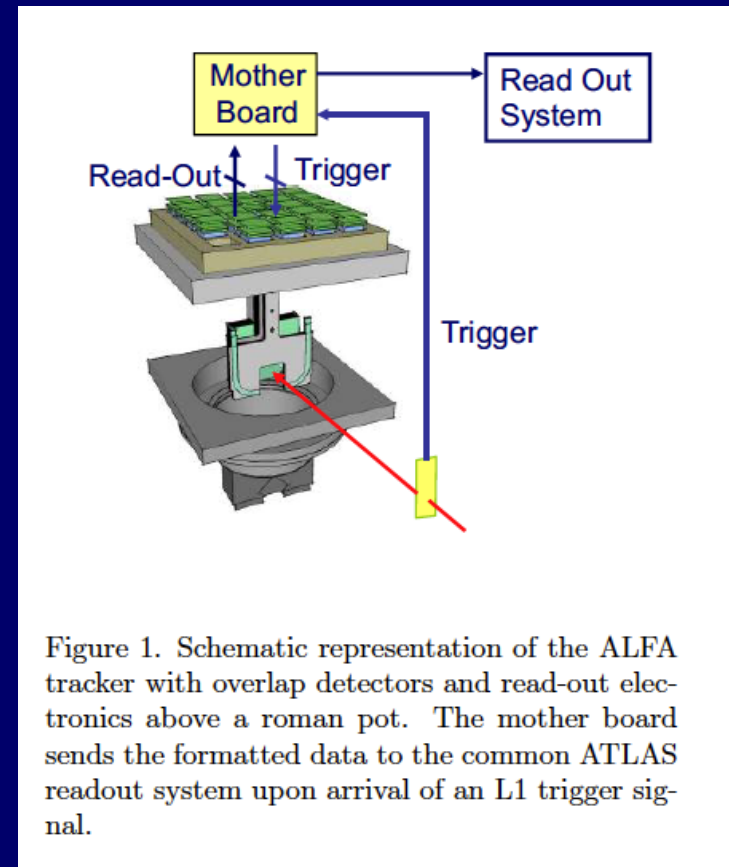
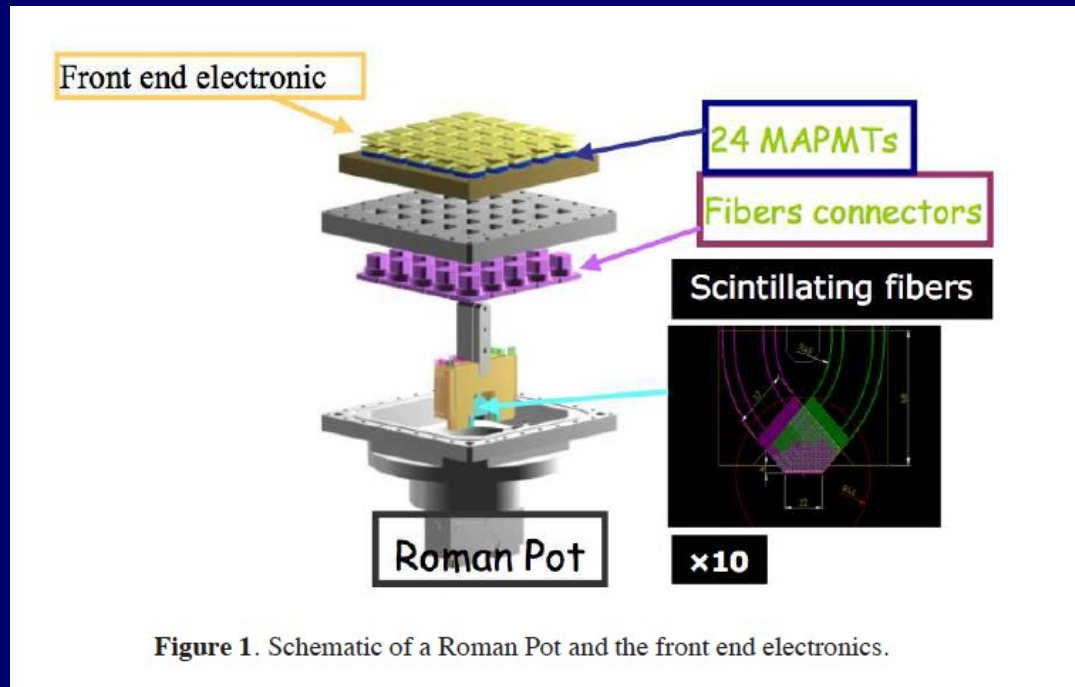
32×1 mm fibers

64 channels readout

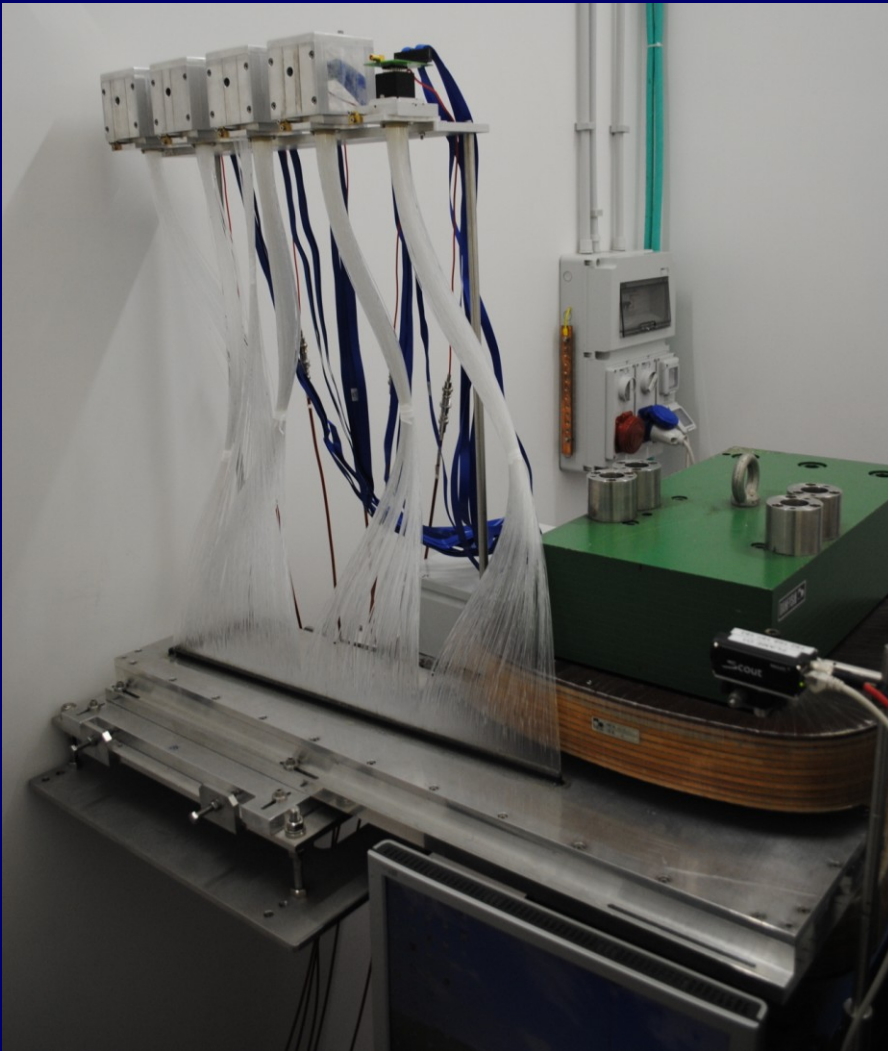


Possible readout

- MAROC2 chip, developed for scintillating fiber detector for ATLAS luminosity measurement (ALFA)

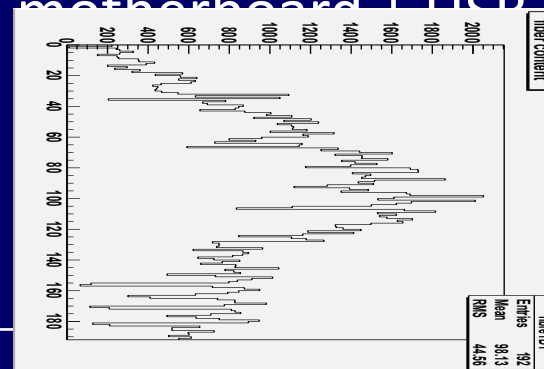


Another MAROC implementation

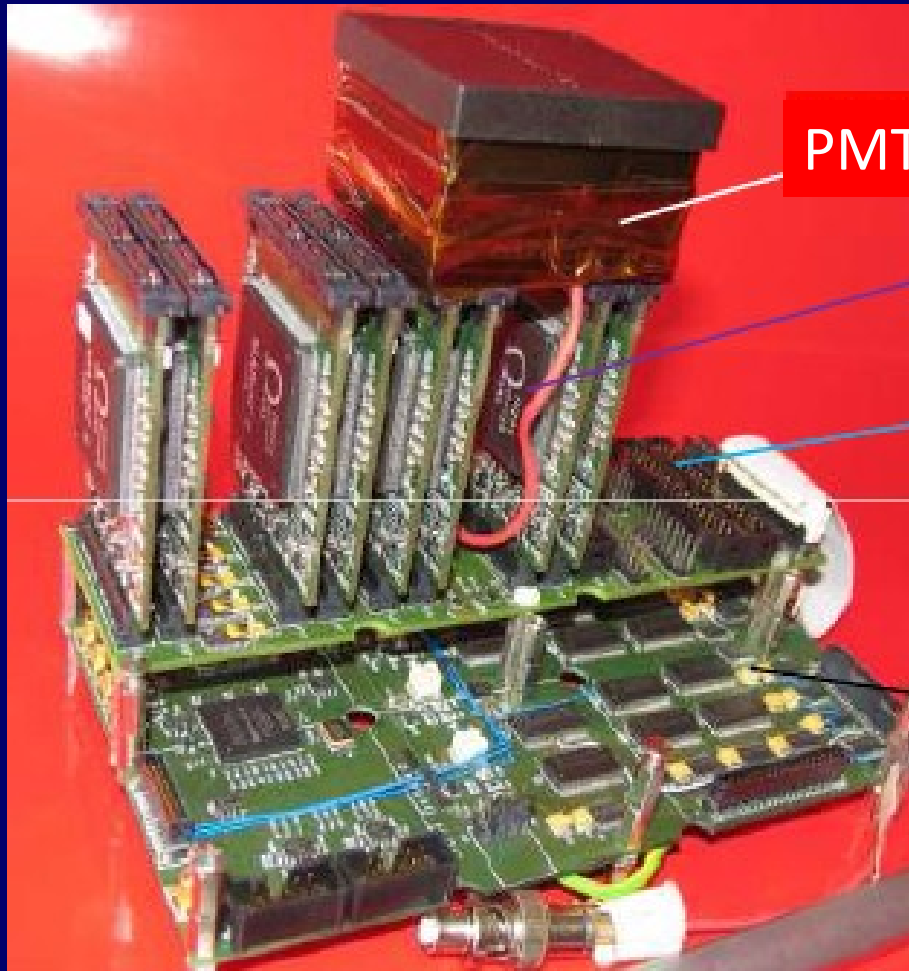


Scintillating fiber detector for electron spectrometer (laser-plasma acceleration experiment PLASMONX), now **working** in Frascati

5×64 channels readout
(Hamamatsu R5900 multi-anode)
with MAROC2 chips +
motherboard + USB readout



MAROC2 readout system



PMT

MAROC chip

Interface board

Readout board

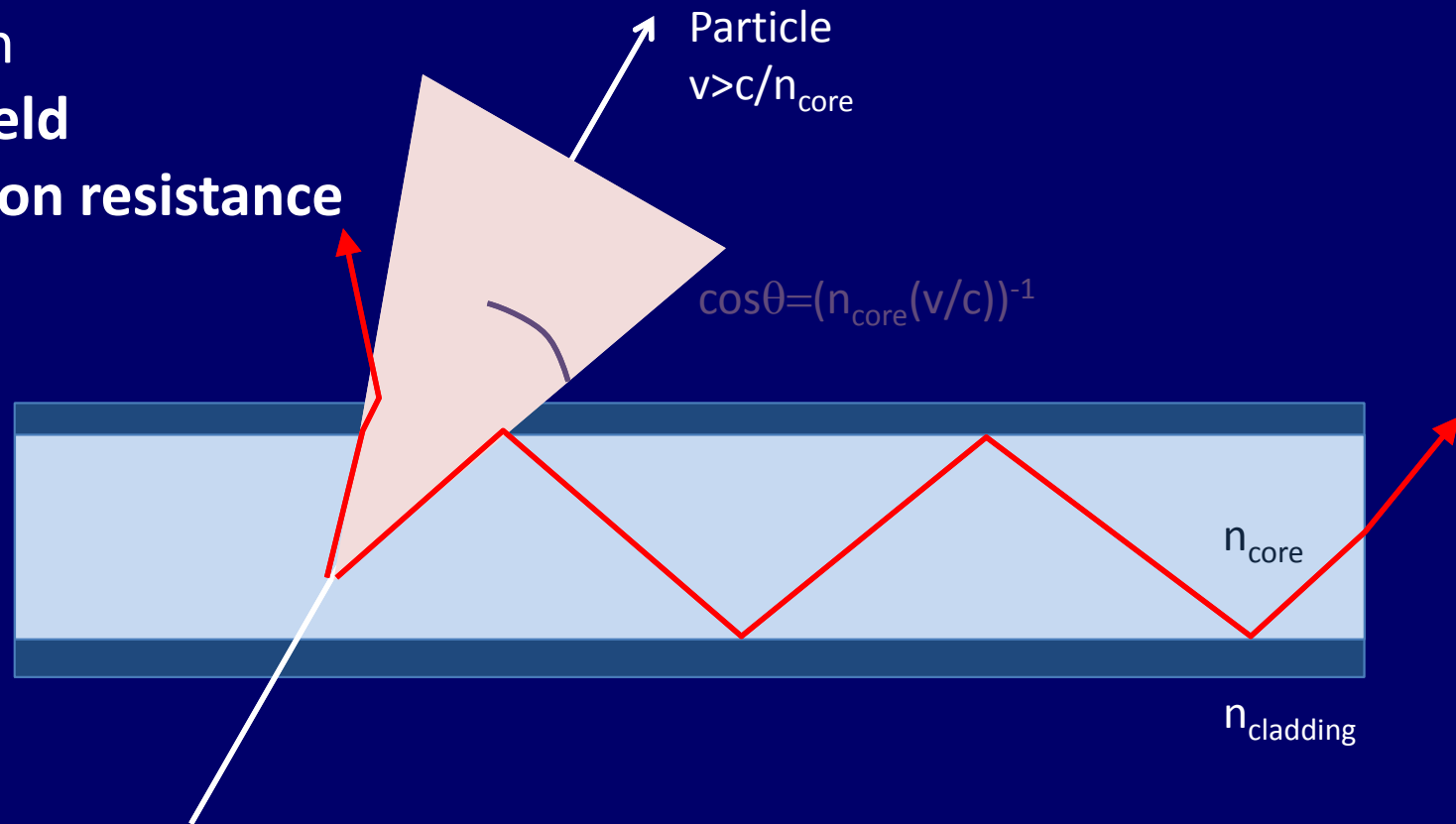
MAROC2 readout system

- ☹ Readout through USB interface **slow** (few Hz)
- ☹ Need for **external trigger**, few tens of ns before analog signal
- ☹ Radiation tolerance to be checked
- ☺ Wilkinson ADC for all channels with simple and compact system

Another possibility...

Quartz fibers:

- **Cerenkov** emission in place of scintillation
- lower **light yield**
- Better **radiation resistance**



- Scintillating fibers: **prototype** available for testing, some fibers for new detector are available
- Photodetectors: different multi-anode PMT's available
- Silica fibers: 100 m ordered (to be delivered in few weeks)
 - Then, build a prototype and possibly test it (e.g. at BTF)
- MAROC2 system can be borrowed by another experiment for testing, but cannot be installed permanently in UA9...
- Evaluate alternative readout electronics (ideas, suggestions?)