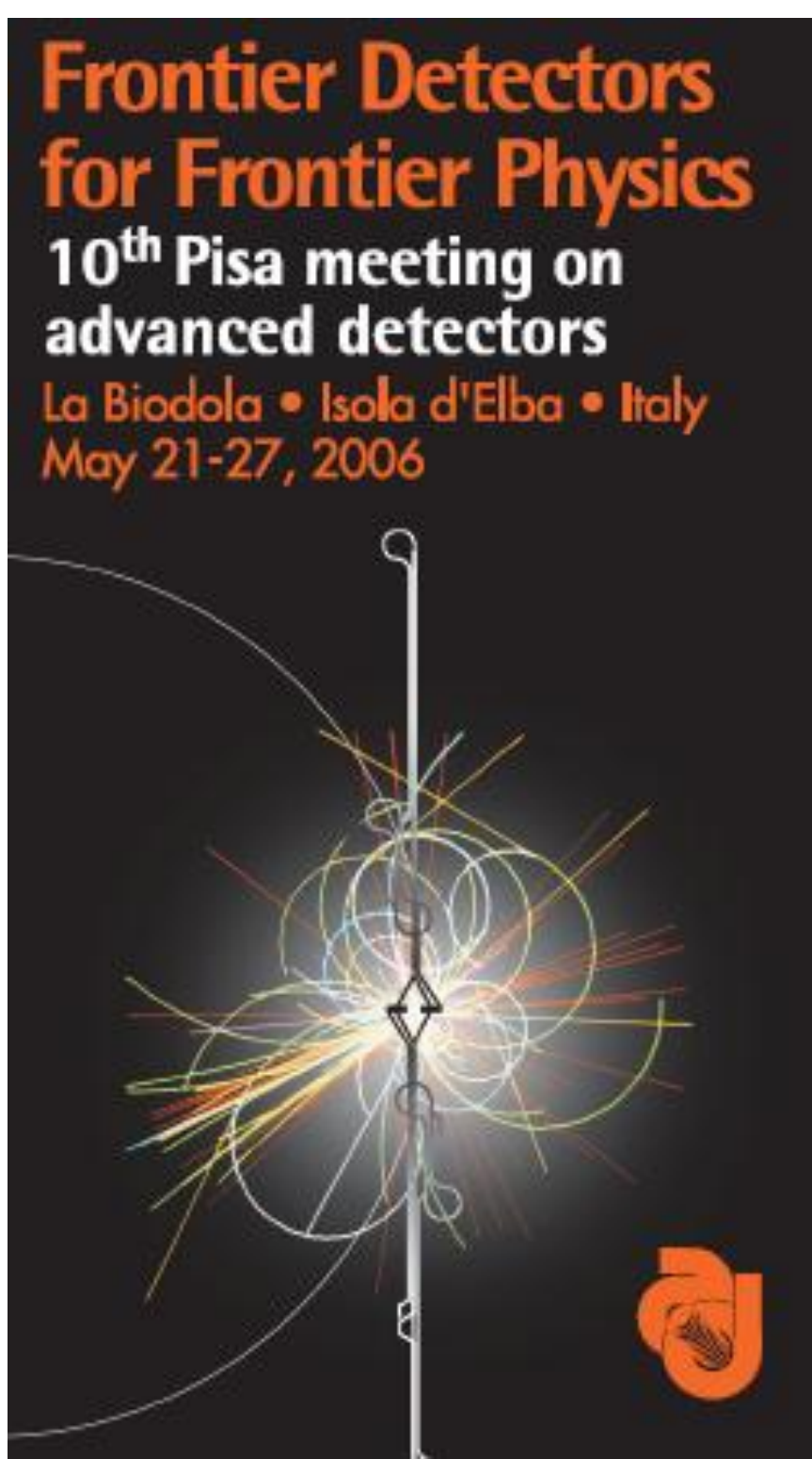


# SiPM reading scintillating fibers as a trigger system for the AMADEUS experiment

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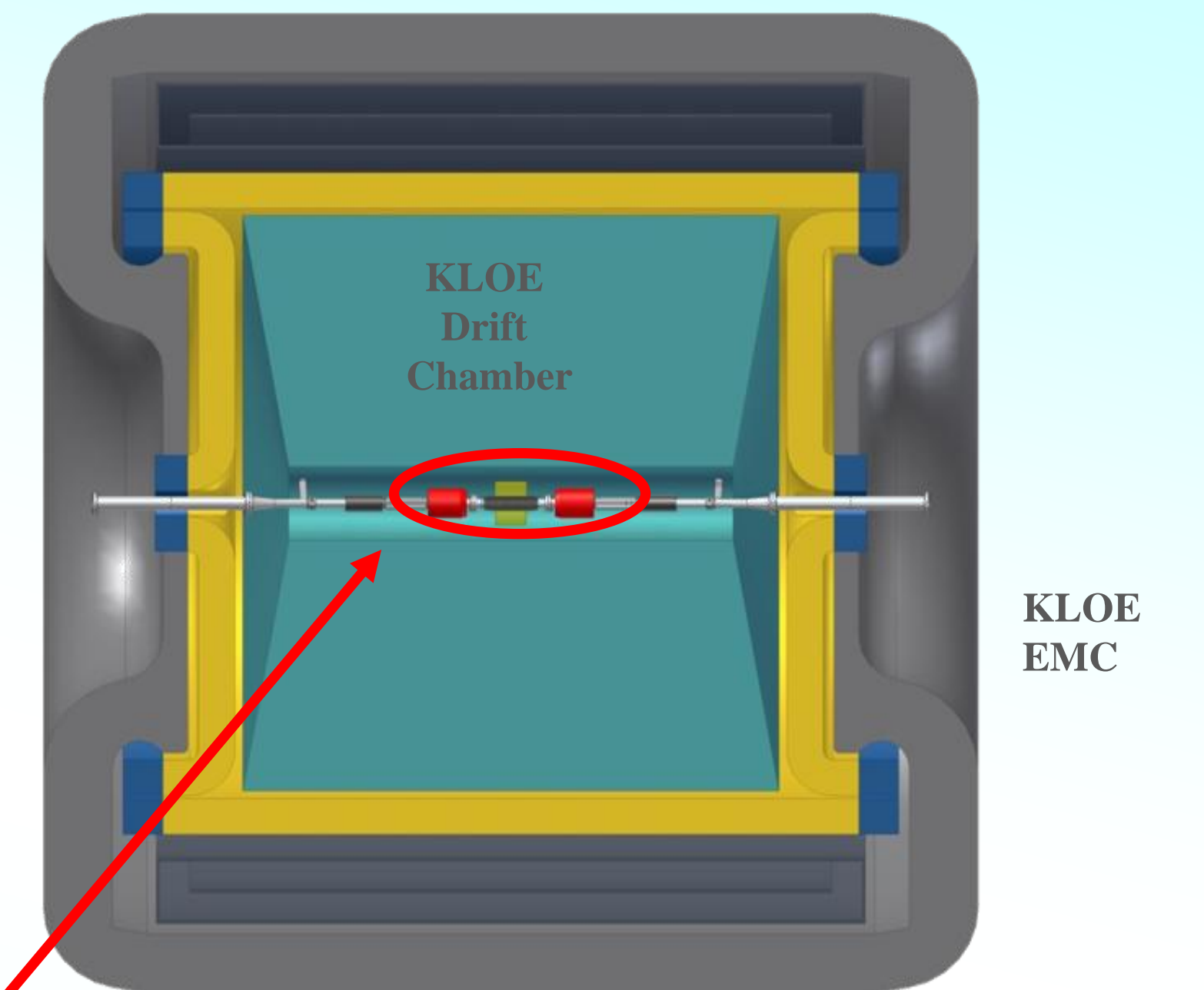


## The AMADEUS experiment @ DAΦNE : Search for Deeply Bound Kaonic Nuclear States

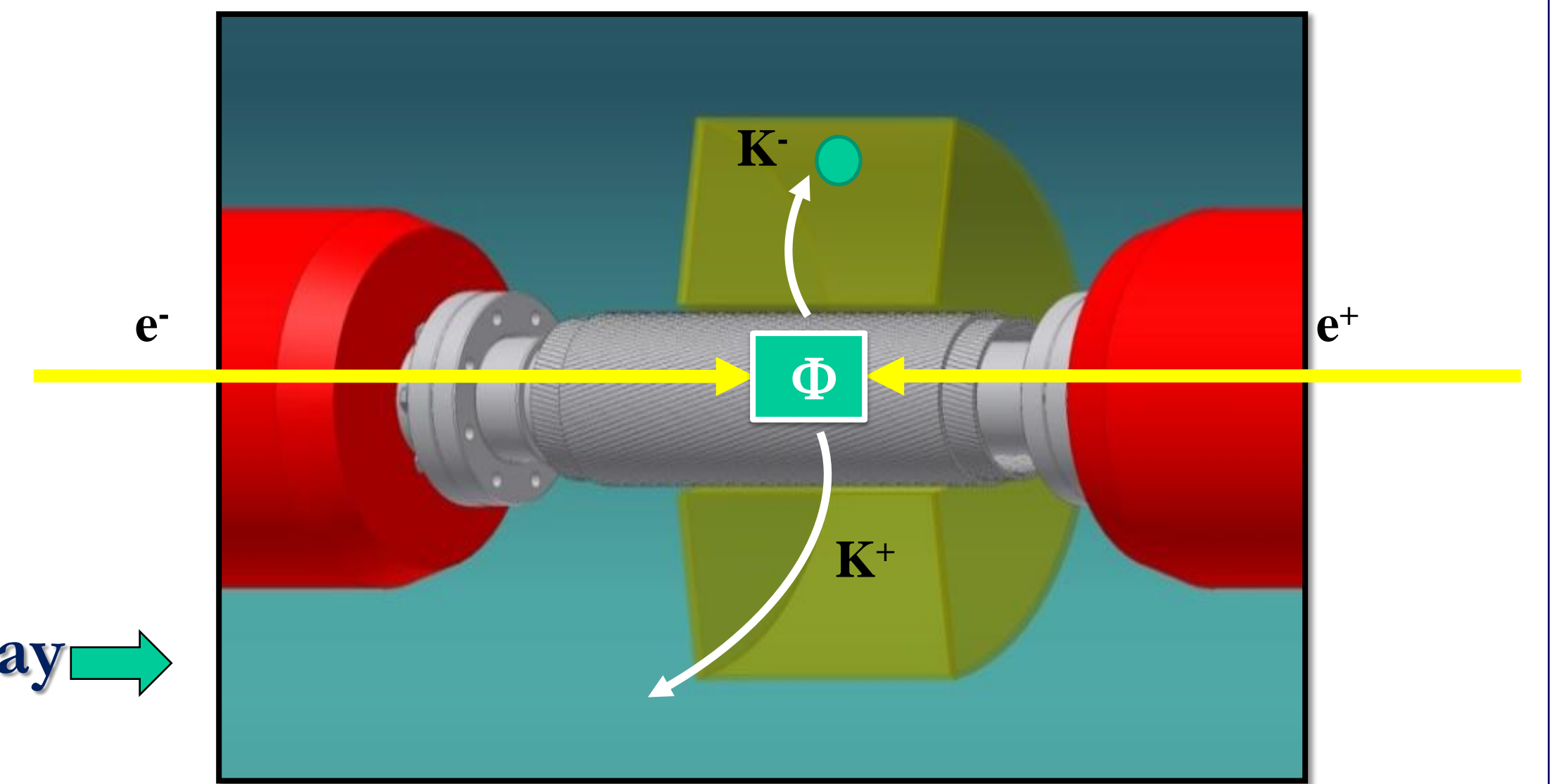
Φ factory: e<sup>+</sup>e<sup>-</sup> collider at Φ resonance energy  
→ monochromatic K<sup>+</sup>K<sup>-</sup> pairs (~ 127 MeV/c)



- Reactions used:  ${}^3\text{He}(K^-\text{stopped},n)ppK^-$   
 ${}^4\text{He}(K^-\text{stopped},n/p)ppnK^-/pnnK^-$
- Complete determination of all reaction and decay channels deducing binding energies, total and partial widths, etc
- Information on the modification of the kaon mass and on KN interaction in a nuclear medium, important for the further understanding of spontaneous and explicit symmetry breaking of QCD



- Implementation of the KLOE spectrometer with an inner AMADEUS setup in the 50 cm gap around the beam pipe.
- The AMADEUS setup consisting in:
  - Target: Low-mass cryogenic gaseous He target cell for a first phase
  - **Trigger:**
    - > 2 cylindrical layers of ScFi surrounding the interaction point.
    - > **Readout by SiPM**
    - > trigger K<sup>+</sup> K<sup>-</sup> in opposite directions from Φ decay →
  - TPC/GEM: a first tracking stage before the DC of KLOE (poster by M. Poli Lener)



## Scintillating fibers with SiPM readout trigger system



Characterization of different SiPM types:

- Hamamatsu
- Photonique
- etc

Test setup implemented with:

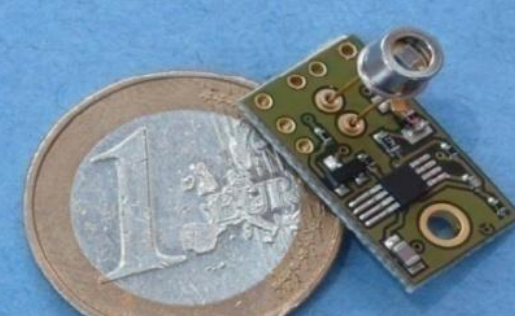
SiPM (HAMAMATSU U50) (400 pixels)  
Operating voltage ~70V



### Electronics: New CAMAC modules providing:

- Variable V<sub>bias</sub> for 5 channels with a stability for nominal voltages below 1 mV
- 2 output / channel:
  - Amplified (x20-x100) signal
  - Discriminated signal (variable threshold)

Designed by G. Corradi, D. Tagnani, C. Paglia

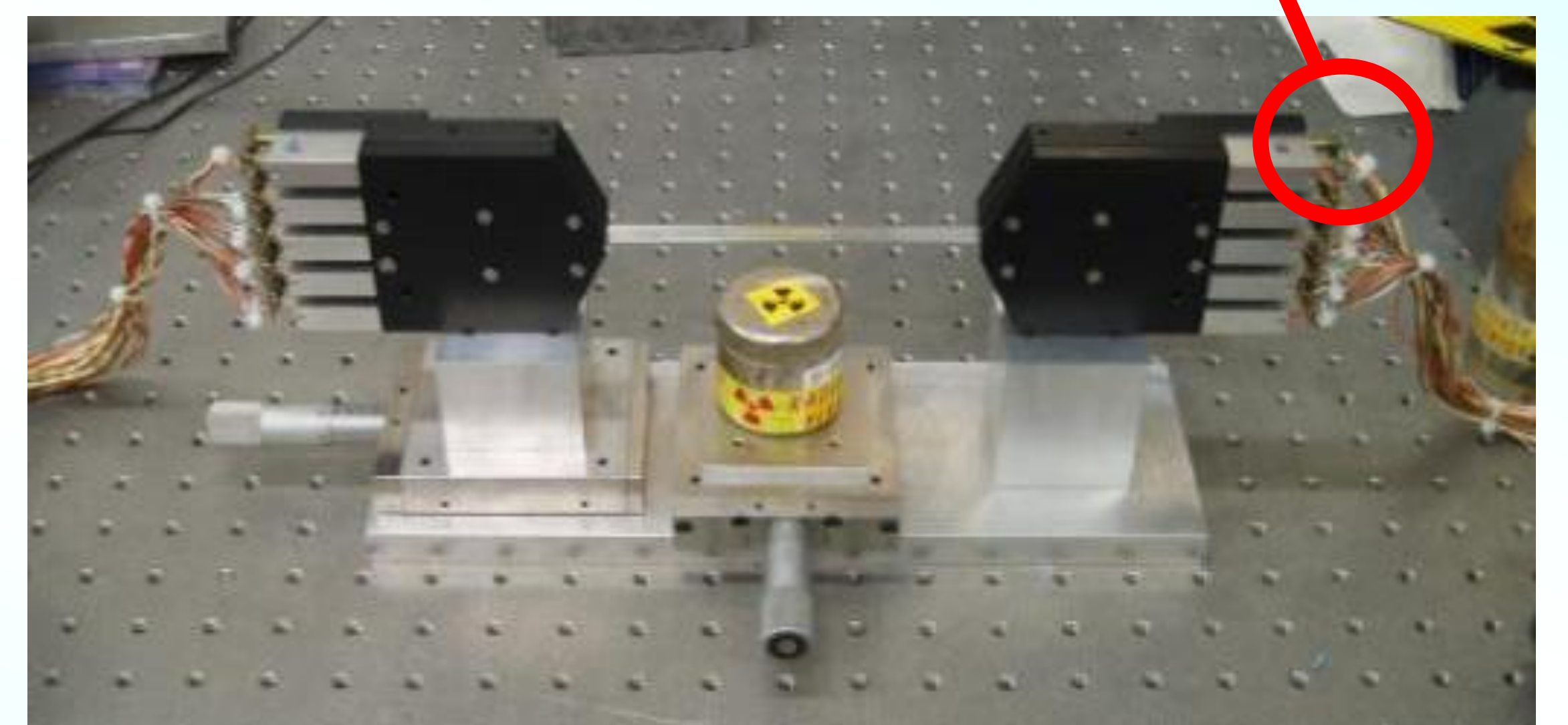
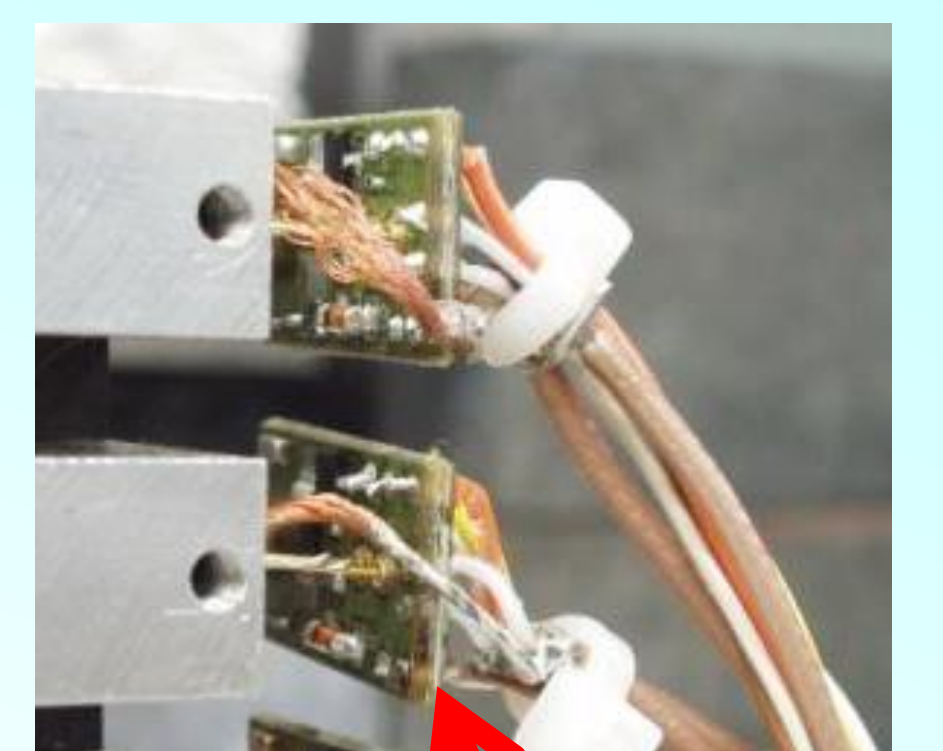


Dedicated fast pre-amplifiers design  
Gain x20 – x100  
Small size

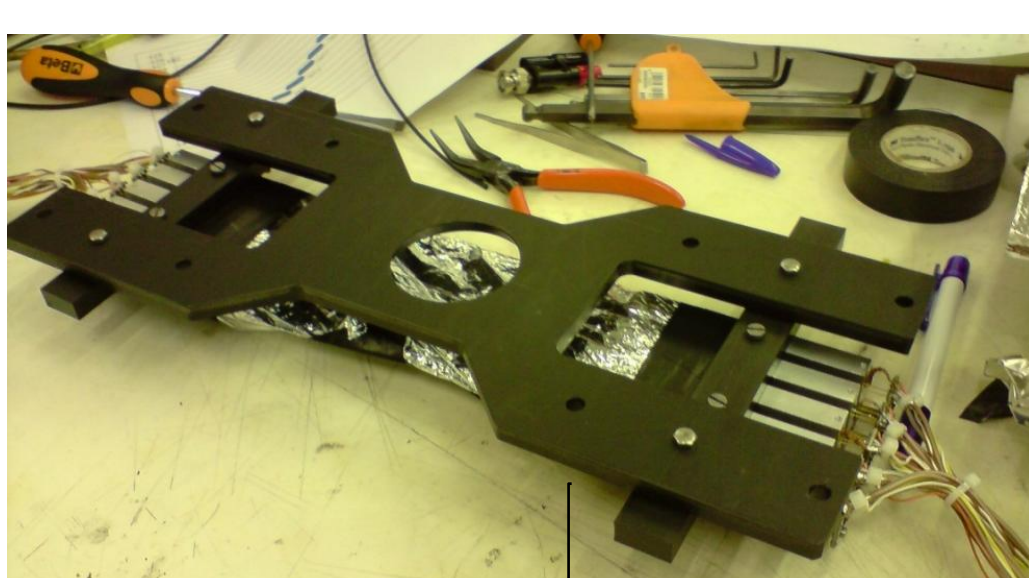
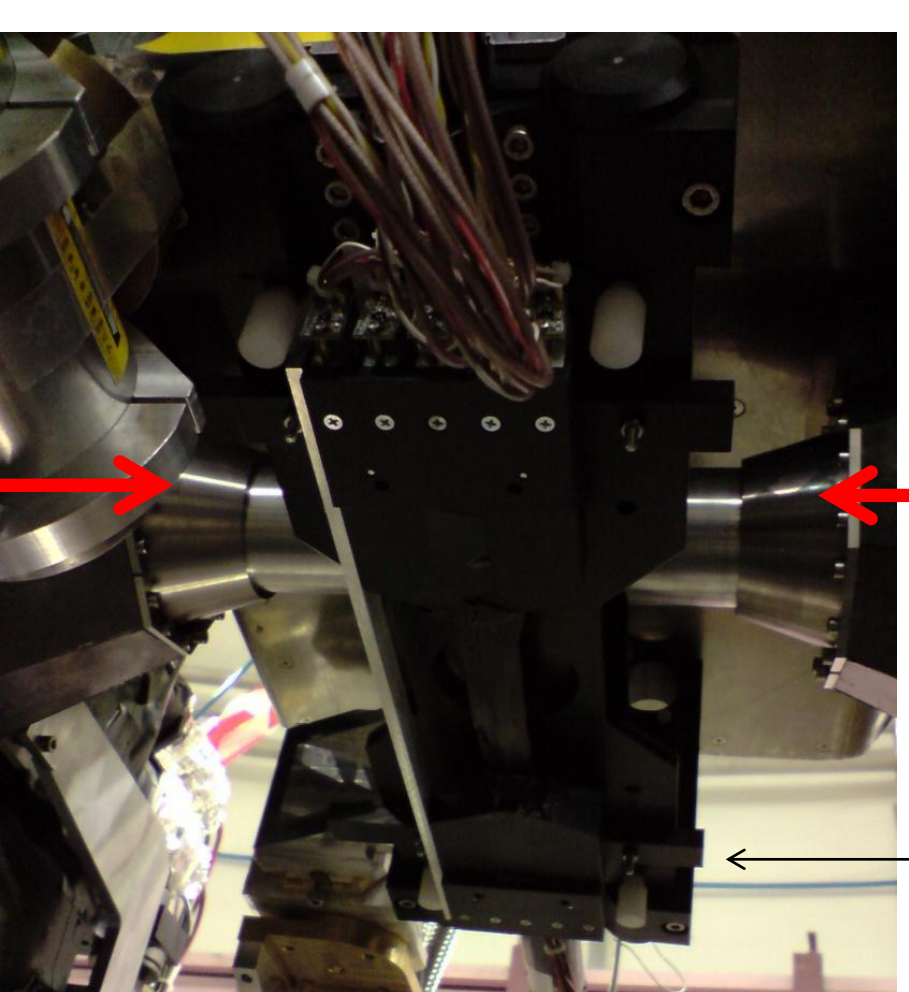
Test setup mechanical support for 5 ScFi read from both sides  
10 SiPM + readout card

### Instrumented fibers:

- Pol.Hi.Tech 46 (Blue )
- Saint Gobain BCF- 10 single cladding:
  - Emission peak 432 nm
  - Decay time 2,7 ns
  - 1/e 2.2 m
  - 80000 ph./MeV



Installation under SIDDHARTA setup



Dafne beam pipe

Kaon monitor masks from SIDDHARTA used as support

## Installation of AMADEUS trigger test setup in DAΦNE

- 10 fibers test setup read both sides by SiPMs
- Positioned under the SIDDHARTA setup
- Sincronized with kaon monitor from SIDDHARTA
- Detection of mips and kaons from the IP
- Identification of Kaons through amplitude signal and TOF
- Time difference between mips/kaons ~ 1ns

Kaon peak around ch 1600 (adc):  
10x mips signals as expected from simulation

