



FOOT General Meeting

General info

La Biodola 4-5 Giugno 2018

Vincenzo Patera



FOOT : here we are

- Many thanks to Pisa group for the organization !!!!
- The quest for the beam is going on: CNAO is getting more and more difficult (for He and O beams), HIT seems a fortress (not too difficult to conquer, GSI could be our future nest
- The first FOOT paper has been submitted, the format (author list) could provide several common technical papers
- An intense HW and test beam activity is on-going.
- The calorimeter crystals saga has come to an positive end... A special thank to Nadia!!
- The FOOT paper still waiting... shame on you, in particular on the youngsters!!! C'mon, volunteers are welcome!!



Quest for the beam: ESA@GSI

ANNOUNCEMENT OF OPPORTUNITY FOR INVESTIGATIONS INTO BIOLOGICAL EFFECTS OF RADIATION USING THE GSI ACCELERATOR FACILITY (AO-2017-IBER)

- ✓ WE were approved for ESA-IBER-2017 call for GSI beam: 4 (2+2) shifts assigned with He and C beam at 700 MeV/u that can be used during 2018/2019
- ✓ First shift (4+ 4 hours) will be used in next autumn for an emulsion run together with Beam monitor & Start counter
- ✓ ESA will fund us for mission cost (40k?) through ASI agreement: very very long time needed and a lot of bureaucracy



Quest for the beam: again GSI

- In 2019 we should for sure exploit the full emulsion program and hopefully to have an engineering run with a preliminary electronic detector.
- On the other hand the GSI Director gave a boost to our experiment and assigned us
- We have option to integrate the ESA obtained beam time with the BIO-PAC beam time (even if we are in A- : reserve list



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Ion Research in Europe GmbH

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However, considering the relevance of the proposed experiment we are willing to grant 3 shifts of main and 4 shifts of parasitic beam time at SIS18 – if beam time becomes available (A-; reserve list).

Shifts:
3 main
4 parasitic



Quest for the beam:ESA@HIT?

- A similar application of the GSI one can be done for ESA at HIT:
 ^{12}C and ^{16}O beam at 400 MeV/u
- The HIT beam can be of use not only for radioprotection in space issues but also for CPT
- HIT is favorable to give beam through ESA call: they are paid for the beam

The screenshot displays the ESA website's navigation bar and research section. The navigation bar includes links for EUROPEAN SPACE AGENCY, ABOUT US, OUR ACTIVITIES, CAREERS AT ESA, FOR MEDIA, FOR EDUCATORS, and FOR KIDS. Below this, a banner for 'research human spaceflight and exploration' features the ESA logo. A secondary navigation bar lists categories: ESA, HUMAN SPACEFLIGHT, ASTRONAUTS, INTERNATIONAL SPACE STATION, RESEARCH (highlighted), and EDUCATION. The main content area shows a breadcrumb trail: 'About research in space' > 'ESA > Our Activities > Human Spaceflight > Research'. A search bar is located at the bottom right, and a 'Research areas' section is partially visible at the bottom left.

→ EUROPEAN SPACE AGENCY ABOUT US OUR ACTIVITIES CAREERS AT ESA FOR MEDIA FOR EDUCATORS FOR KIDS

research
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ESA > Our Activities > Human Spaceflight > Research

Search here

Research areas



FOOT physics program: that's it?

- Using C, C₂H₄ → cross sections on C and H
- Using C, C₂H₄, PMMA → cross sections on C, O and H

Phys	Beam	Target	Energy (MeV/u)	Inv/direct
Target Frag. PT	¹² C	C, C ₂ H ₄	200	inv
Target Frag. PT	¹⁶ O	C, C ₂ H ₄	200	inv
Beam Frag. PT	¹² C	C, C ₂ H ₄ , PMMA	350	dir
Beam Frag. PT	¹⁶ O	C, C ₂ H ₄ , PMMA	400	dir
Beam Frag. PT	⁴ He	C, C ₂ H ₄ , PMMA	250	dir
Rad. Prot.space	⁴ He	C, C ₂ H ₄ , PMMA	700	dir
Rad. Prot.space	¹² C	C, C ₂ H ₄ , PMMA	700	dir
Rad. Prot.space	¹⁶ O	C, C ₂ H ₄ , PMMA	700	dir

PMMA is a combination of C,O,H.

There is possibility to enlarge the “core” physics program?

Is possible to enlarge the energy range (70- 1500 MeV/u) ?

Is possible to use different targets/beams ?



Detector improvements....

- The positive end of the BGO saga left us with some budget free for improvement
- The TOF performance obtained and the first positive results of the Aachen calorimeter test seems to indicate the tracking as the less performing subdetector
- The referees agree that an upgrade of the magnet budget from 85 -> 150 kEuro can be reasonable
- The upgrade can help a lot in extending the FOOT physics program



FOOT & FOOTNOTE

FOOT spin off : 2017 PRIN application:

FOOTNOTE (Forward NeutrOn producTion Experiment)

- Relevant issues for future long duration space missions: need for shielding from Galactic Cosmic Ray induced dose. A significant role is played **by neutron production in nuclear fragmentation interactions on the shielding material**
- The FOOTNOTE project aims to measure neutron production in the range of interest for radioprotection in space.
- Double setup: an electronic apparatus for the measurements in the forward kinematic region and a setup, dedicated to large angle emission, based on the “Emulsion Cloud Chambers” technique



FOOTNOTE

- 6 Units: Università di ROMA "La Sapienza", Università di PISA, Università di BOLOGNA, Università di TRENTO, Università di Napoli Federico II, Istituto Nazionale di Fisica Nucleare
- Budget requested : **1.199.938,67**

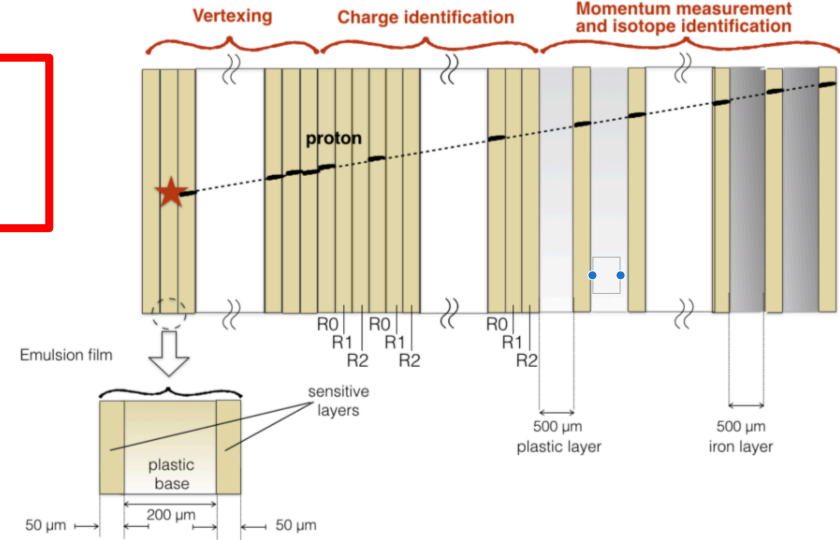


Fig9: Schematic view of the ECC detector

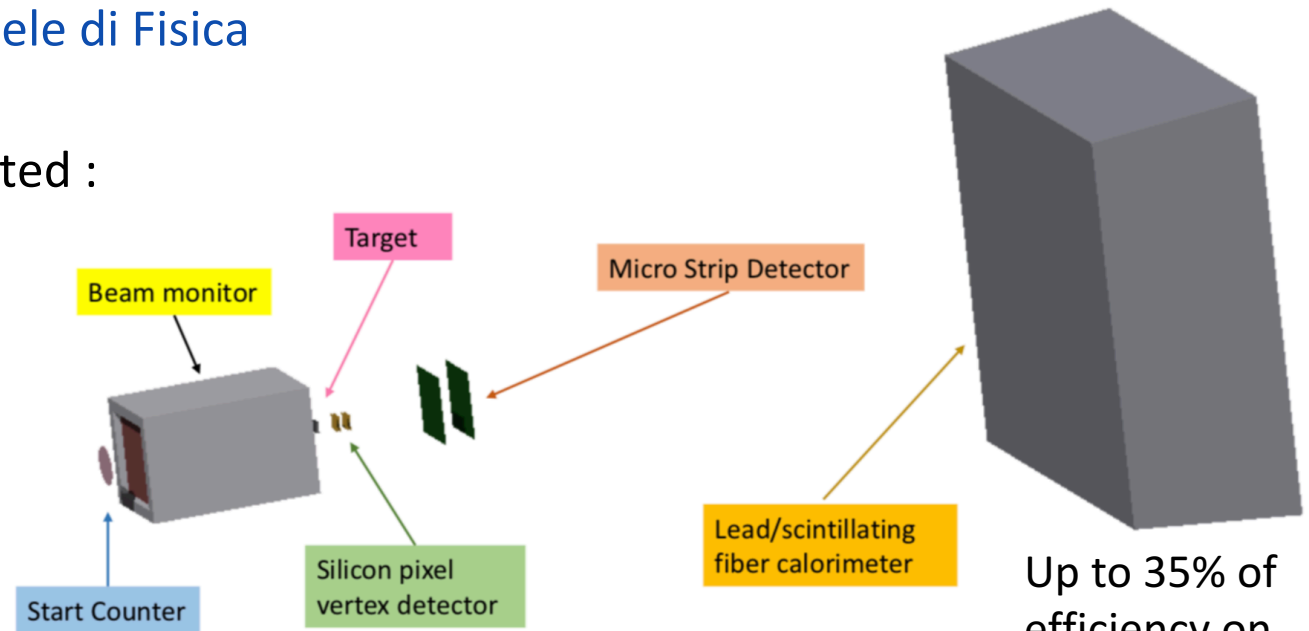


Fig.7 : Schematic view of the FOOTNOTE electronic setup



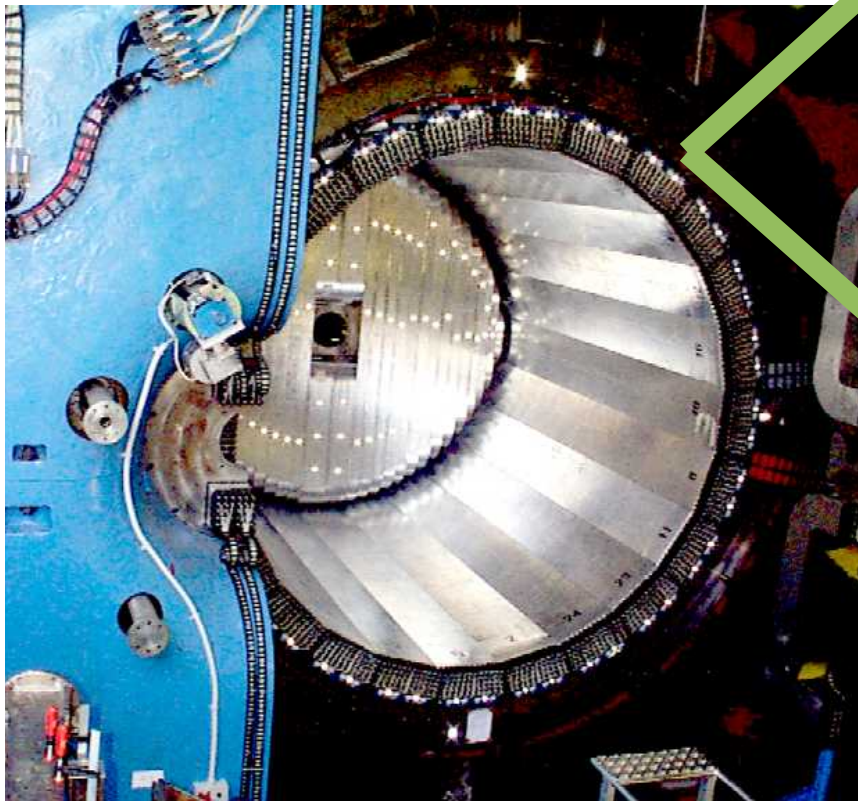
The detector would be a sector of the barrel module of KLOE calorimeter

Namely a 60 cm long part:

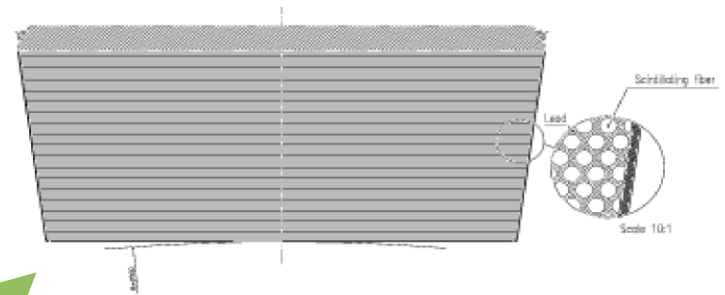
Dimension: $52 \times 60 \times 23 \text{ cm}^3$

Weight : 250 kg

The KLOE calorimeter



Calorimeter module



24 barrel modules

Trapezoidal section

$(52 - 59) \times 23 \text{ cm}^2$

length: 430 cm

Pb/Sci fibres structure

200 layers, lead foils +
glue + fibres





FOOT Milestones in 2018

Milestone	Date
test of the MSD with DAMPE electronics	30-09-2018
Test of the time resolution on 12C beam of TOF/DE prototype with WaveDream board	30-10-2018
Test of the INNER tracker ladder with MIMOSA 28 (50 μm) thick at BTF	15-11-2018
Complete the production of the ECC for FOOT	15-06-2018
Test of the version 0 for the reconstruction code on MC, included the tracking in realistic magnetic field	20-06-2018
Final choice of the BGO procurement	30-09-2018

Approaching....



Some final remarks

- ✓ We are all trying to forget, but in one month from now we have to present the funding request to INFN for 2019: we have to deal with final construction and some shifts of data taking @GSI
- ✓ We have to consider the General Meeting participation as fundamental, in particular for Students, PhD, post-docs. The mission money for the GM must be explicitly asked to CSN3
- ✓ A possibility would be to organize at Turin the next general meeting. We should have the meeting after the GSI data taking, maybe the first days of December could be the best choice





Let's start....



Please... be on time with your talk!!!!
Have a fruitful meeting ..

