

Attività di Gruppo III

F. Noferini

News

Il 23 settembre 2023 scadrà il mandato di Gilda come coordinatore di Gruppo III (4+3 anni) non più rinnovabile.

È stato eletto il nuovo coordinatore locale (F. Noferini) che prenderà servizio dal 23 settembre 2023.

A nome di tutto il Gruppo III ringraziamo GILDA per il grande e paziente lavoro di tutti questi anni!!!

Esperimenti di G3 a B0

Linee di ricerca di CSN3 (*esperimenti a Bologna*):

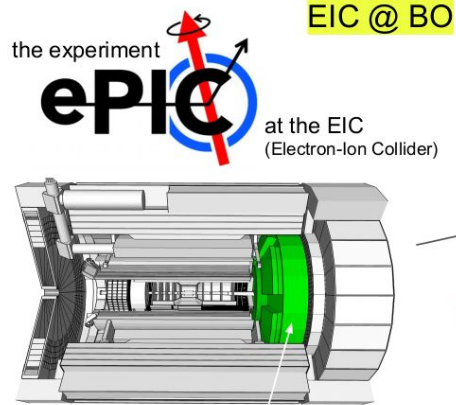
- 1) Quark and Hadron Dynamics (**EIC_NET**)
- 2) Phase Transitions of Nuclear and Hadronic Matter (**ALICE**)
- 3) Nuclear Structure and Reaction Dynamics
- 4) Nuclear Astrophysics and Interdisciplinary Researches (**n_TOF, PANDORA**)
- 5) Symmetries and Fundamental Interactions (**FAMU**)
- 6) Applications and societal benefits (**FOOT**)

FTE (totali): 33.5

FTE (afferenti): 30.9

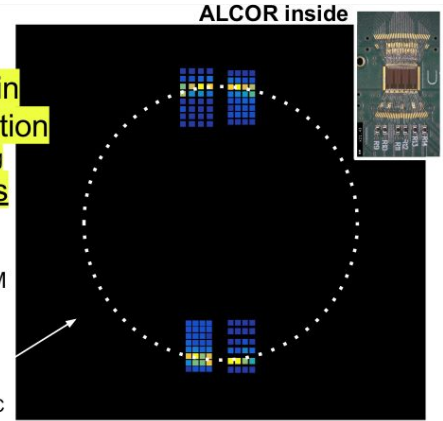
Aggiornamenti per PANDORA, EIC_NET, ALICE, n_TOF, FOOT
FAMU → è in presa dati in questo momento!

EIC_NET



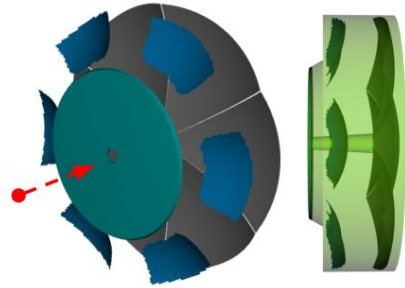
main BO activity:
SiPM R&D for use in single-photon application
Cherenkov RICH imaging
two R&D highlights

successful operation of SiPM for Cherenkov imaging at CERN-PS
full readout chain SiPM + ALCOR ASIC



dual RICH detector → **INFN leadership**

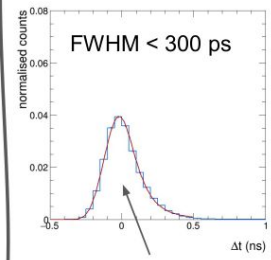
compact solution for broad momentum coverage at forward rapidity



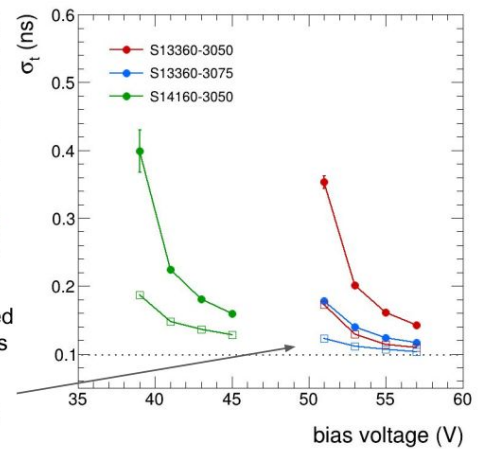
strong BO responsibilities

- EIC-NET RN (P.Antonioli)
- Photodetector (R.Preghenella)
- Data acquisition (P.Antonioli)
- growing BO team (> 3 FTE)

- Agrawal, Antonioli, Bellini
- Falchieri, Garbini, Giacalone, Noferini, Paladino, Preghenella, Rignanese, Rubini, Rath
- (+ 1 PhD, + 1 AdR in arrivo)

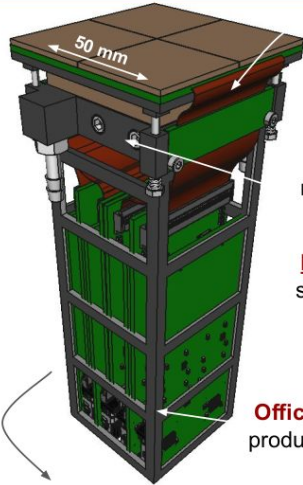


$\sigma_t \sim 100$ ps time resolution measured with single photons from laser
full readout chain SiPM + ALCOR ASIC



EIC_NET

dRICH prototype photodetector
256-channel SiPM array with
integrated cooling and electronics
BO leadership (R.Preghenella)



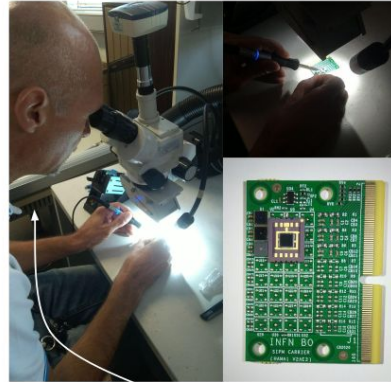
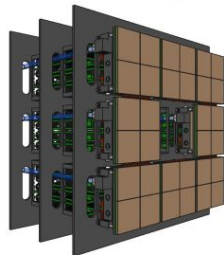
C. Baldanza (elettronica)
progettazione e sviluppo
SiPM carrier flex 256 ch.

Officina meccanica
produzione piastra di
raffreddamento liquido

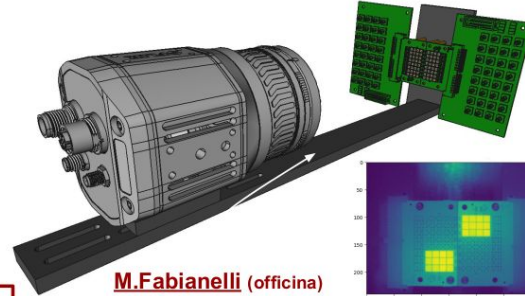
R. Michinelli (progettazione)
supporto alla progettazione
meccanica del prototipo e
disegno tecnico

Officina meccanica
produzione mini-crate

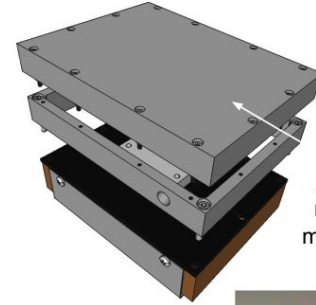
prototype photodetector wall
up to 2048 SiPM channels
test beam in October 2023



M. Zuffa (elettronica)
saldatura delicata sensori
SiPM prototipi Hamamatsu



M. Fabianelli (officina)
realizzazione sistema
allineamento termocamera



A. Zucchini (officina)
realizzazione scatola
modulo raffreddamento

EIC setup, laboratorio silici



progresso e successo del progetto
grazie al supporto dei servizi della Sezione

Composizione gruppo ALICE



ALICE

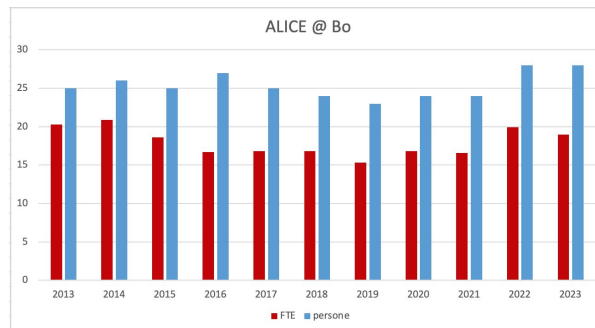
N. Agrawal**, A. Alici, P. Antonioli, S. Arcelli, F. Bellini, F. Carnesecchi*, L. Cifarelli, F. Cindolo, G. Clai, M. Colocci, F. Ercolessi, D. Falchieri, M. Giacalone, M. Guerzoni, D. Hatzifotiadou, N. Jacazio**, G. Malfattore**, A. Margotti, R. Nania, F. Noferini, O. Pinazza, R. Preghenella, R. Rath, G. Romanenko**, N. Rubini, E. Scapparone, G. Scioli, S. Strazzi, P. Veronesi, A. Zichichi.

Staff: 17 (4 UniBO, 12 INFN, 1 ENEA)
1 RTDb, 1 RTDa, 1 INFN Fellow per stranieri, 2 Borse PostDoc
5 PhD

* CERN Applied Fellow
** contratti ERC CosmicAntiNuclei



FTE (esclusi tecnici) 18.8



RESPONSABILITA'

ALICE

Collaboration Board: **A. Alici** (Team Leader TOF)
Management Board: **P. Antonioli**
Editorial Board: **P. Antonioli**
Computing Board: **F. Noferini**
Outreach Coordinator: **D. Hatzifotiadou**
DPG Coordinator: **F. Noferini**
PWG Light Flavour Convener: **N. Jacazio**
PWG-LF Spectra Coordinator: **N. Jacazio**
PWG-MM Rivet and Generators Coordinator: **M. Giacalone**
Responsabile Nazionale Calcolo ALICE: **F. Noferini**

TOF

Project Leader: **A. Zichichi**
Deputy Project Leader: **L. Cifarelli, P. Antonioli**
Technical Coordinator: **G. Scioli**
System Run Coordinator: **M. Giacalone**

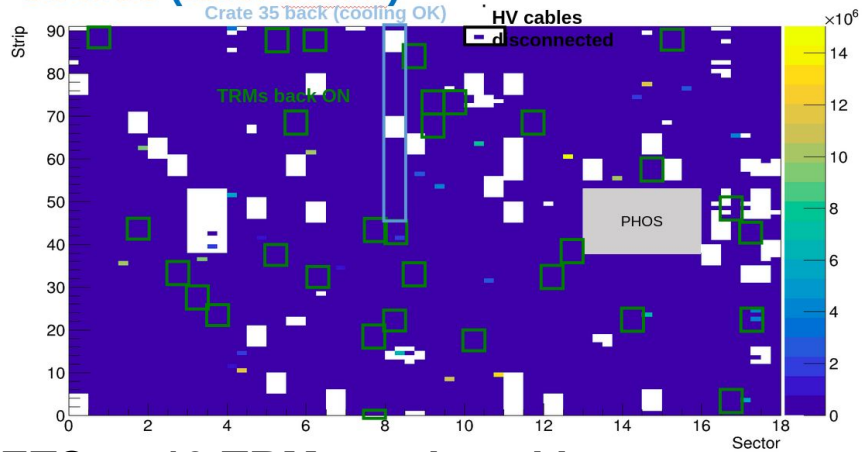
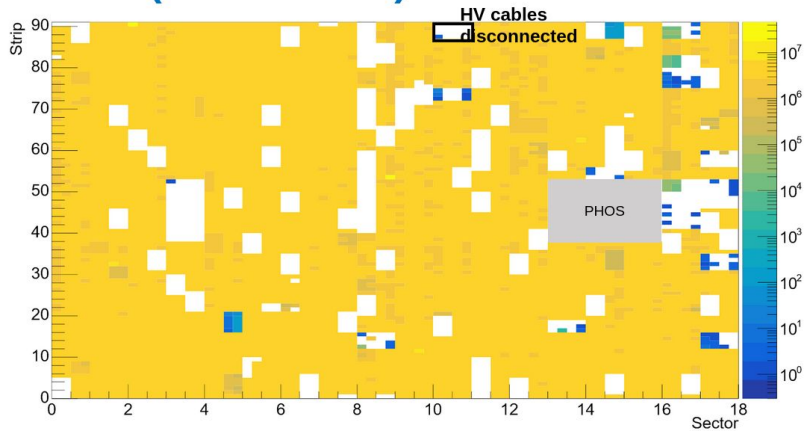
ALICE3 Working Groups

Time-of-Flight Coordinator: **M. Colocci**

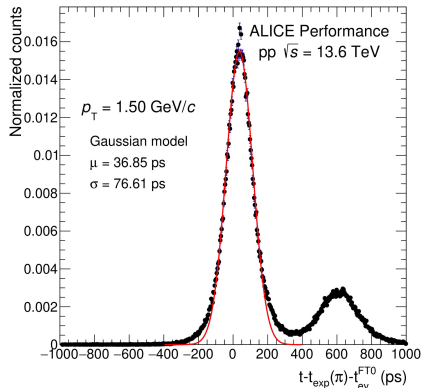


ALICE

Recent news



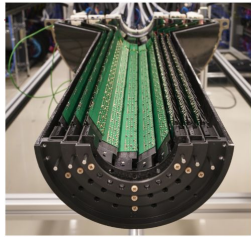
**31 TRMs re-included in acquisition during YETS → 19 TRMs replaced by spares
5% acceptance recovered (86% → 91%)**



TOF is performing well in Run 3. → 80 ps now reached...
still room of improvements in parallel with improvement on the reconstruction quality (tracking)

TOF performance highlighted also at the last LHCP 2023

Attività di R&D: ITS3, ALICE3, AIDAInnova, picoTDC...

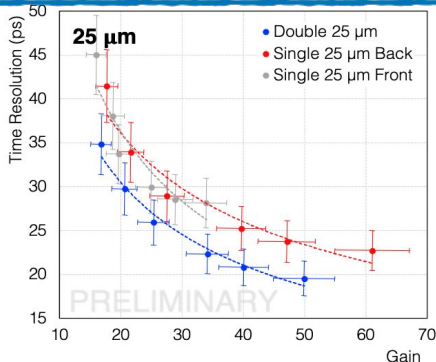
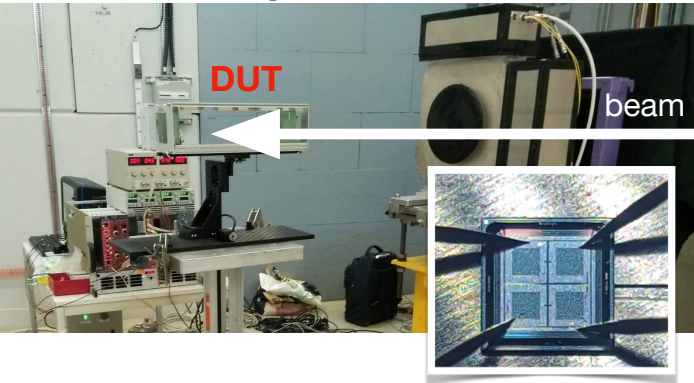


ITS3

New detector technology:

- three truly cylindrical Si pixel layers based on ultra-thin wafer-sized curved sensors (TPSCo 65 nm CIS technology)
- no external connections nor cooling
- new concept for future detectors

Sorgente di ^{55}Fe necessaria per le misure di calibrazione delle strutture di test a Bologna, un ringraziamento alla Sezione che si è adoperata per il suo acquisto.



ALICE 3

- **M. Colocci coordinatore** del CERN Working Group ALICE3 - TOF;
- Attività svolta nel Laboratorio Silici in V.le Berti

RINGRAZIAMENTI!!!

Daniele Cavazza → laboratorio Silici (e anche ai test beam al CERN PS)

Giovanni Torromeo → scheda adapter per VHDCI-picoTDC

Davide Falchieri → scheda picoTDC e scheda LIROC

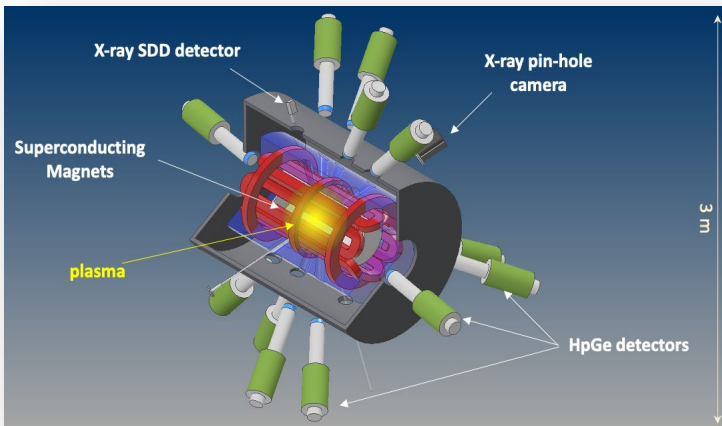
Andrea Paolucci → supporto sistemistico per macchine al CERN e a Bologna

Carlo Veri → scheda LIROC per SiPM (ALICE 3)

The PANDORA experiment

measuring nuclear β -decay lifetimes in magnetized plasmas

- A new approach to measure, for the first time, nuclear β -decay lifetimes in a plasma, under a high degree of ionization and in a hot and dense environment, simulating stellar-like conditions.
- a new “ECR Ion Trap” @ LNS is under construction



The Collaboration: **LNS**, LNL, PG, TIFPA, **Bologna**

Bologna activities:

Personnel (4 researchers, 1.4 FTE): M. Cuffiani (0.2 FTE), L. Malferrari (0.5 FTE), A. Mengoni (0.2 FTE), F. Odorici (0.5 FTE) local resp.

Official Responsibilities in PANDORA:

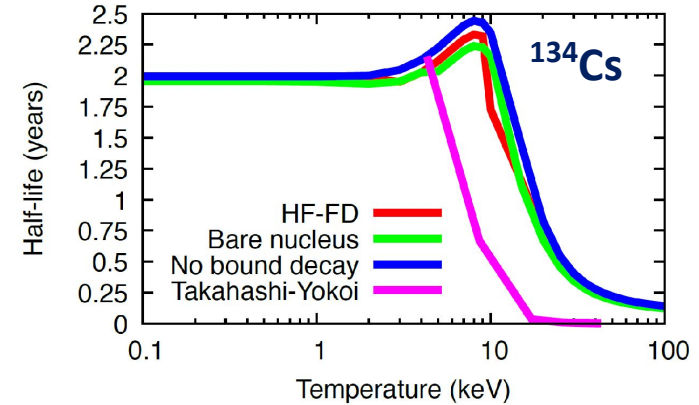
- Theory and Models
(«physics cases approver»)
- Inner Plasma Chamber
(design, construction & control)
- Auxiliary e-gun
(design, construction & control)

Services requests (2023):

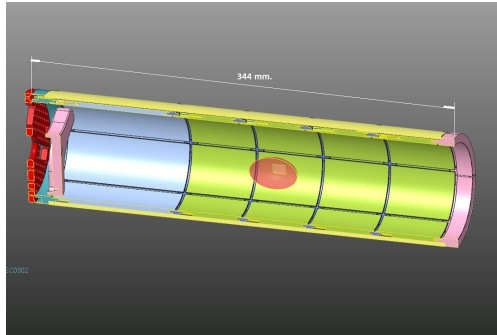
- Electronics: 1 month
- Mechanical design: 2 month
- Mechanical workshop: 2 month

Bologna activities in PANDORA (in past 12 months)

1) THEORETICAL MODELS - Estimation of lifetime variation as a function of kT : development of the computational codes necessary for modeling the nuclear structure for the description of the decay rates in the stellar environment (see example for ^{134}Cs). The code for calculating the half-lives for beta decay of excited nuclei was used to produce the results presented in various journal publications and contributions to int. conferences.

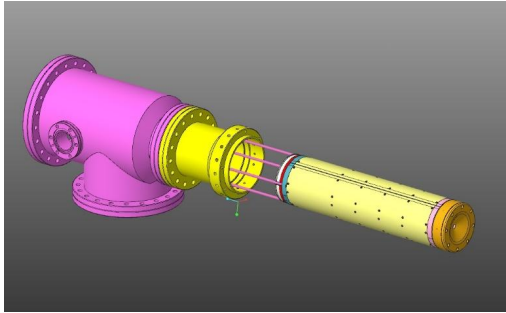


2) APPARATUS CONSTRUCTION – The Inner Plasma Chamber:



a reduced scale prototype (~1:3) of the Inner Plasma Chamber has been designed (within the IONS experiment in GR5) **to be tested on the AISHa ion source @ LNS**. The mech. design was done in close collaboration with LNS. **The construction has been completed in June-23. A pre-test of the inner chamber will be performed in August-23 in Bologna**, in order to verify degassing, mech. tolerances, thermal expansion and electrical insulation, by using a specially constructed dummy chamber identical to that of AISHa. **The physical tests on AISHa is foreseen by March-April 2024.**

Active segmented chamber: design & construction @ BO



From the valuable work of:

- Roberto Michinelli
- Michele Furini
- Cristiano Gessi

With the coordination of:

- Marco Guerzoni
- Anselmo Margotti



n_TOF Collaboration

n_TOF - ITALY

33 researchers
(INFN + University)
17.0 FTE

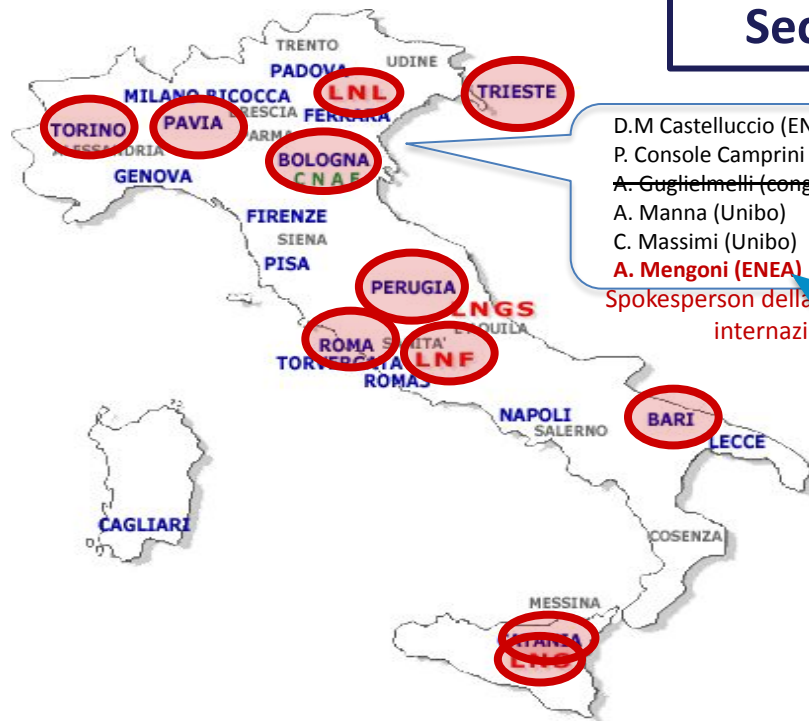
Close collaboration with
ENEA (Bologna, Frascati)
INAF (Teramo), **CNR** (Bari)



47 researchers
23.6 FTE

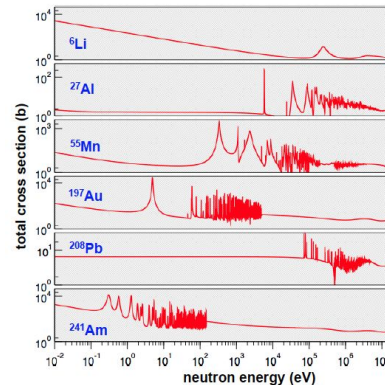
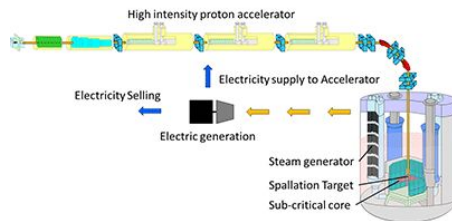
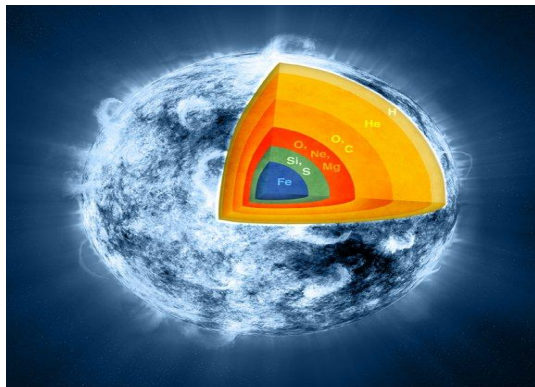
Responsabile Nazionale:
C. Massimi (Unibo, INFN-Bo)

11 INFN
Sections



D.M Castelluccio (ENEA)
P. Console Camprini (ENEA)
A. Ghisellini (congedo)
A. Manna (Unibo)
C. Massimi (Unibo)
A. Mengoni (ENEA)
Spokesperson della collaborazione internazionale

Research fields



Nuclear Astrophysics

- ✓ Nucleosynthesis of heavy elements
- ✓ Stellar evolution
- ✓ Big bang nucleosynthesis

Nuclear technology and medical application:

- ✓ Fission reactors (Gen-IV, ADS)
- ✓ Fusion
- ✓ Transmutation of nuclear waste
- ✓ Neutron capture therapy (adrontherapy)

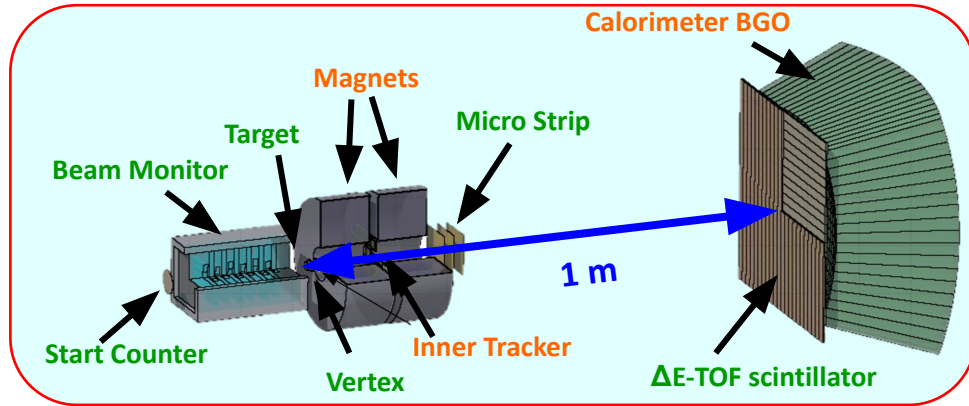
Basic Nuclear Physics

- ✓ Nuclear structure effects on fission
- ✓ Excited states (spin parity of resonances)
- ✓ Symmetries and fundamental interactions

n_TOF @ BO – 2022/2023

- Supporto attività della facility e Misure (aprile - novembre) → Alice Manna @ CERN
- Misura di $^{nat}\text{Er}(n,\gamma)$ (Erbio) -> Collaborazione con ENEA, Guglielmelli
- Analisi dati della misura $^{94,95,96}\text{Mo}(n,\gamma)$ (Molibdeno)
- Analisi dati di misure di attivazione condotte alla stazione NEAR
- Caratterizzazione di un rivelatore per misure diffusione elastica (n,n) → Collaborazione con INFN-Catania
- Sviluppo di un rivelatore per tracciamento di neutroni veloci (RIPTIDE) → Collaborazione con FOOT
- Analisi dati relative alla caratterizzazione di rivelatori di neutroni (basati su BC501 e BGO) → sinergia con FOOT

FOOT: general information



- ❑ **Magnets:**
 - ❑ Will arrive in July in Frascati
- ❑ **Inner Tracker:**
 - ❑ Complete in July, test @CNAO in October
- ❑ **Calorimeter**
 - ❑ Complete in July, test @CNAO in October

❑ FTE FOOT in BOLOGNA:

- ❑ 2023: **6.85**
- ❑ 2024: **4.75**

❑ Service Requests (MU):

- ❑ ELEC: 2
- ❑ STG: 0.5
- ❑ CCL: 2
- ❑ OFF: 2

❑ DATA TAKING in 2023:

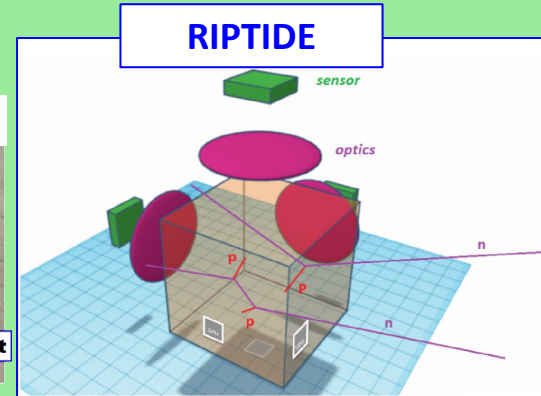
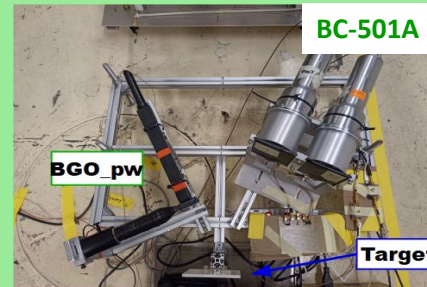
- ❑ 2 slots @CNAO (October & November)

❑ THESIS in FOOT BOLOGNA:

- ❑ 2022: 15
- ❑ 2023: 17 (by the end of 2023)

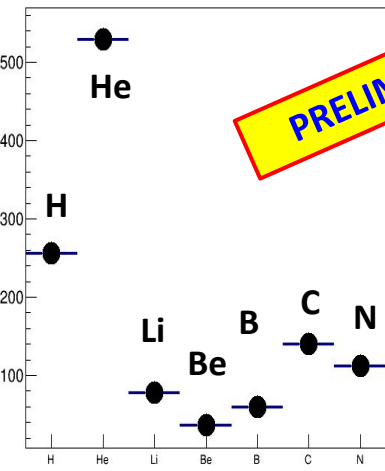
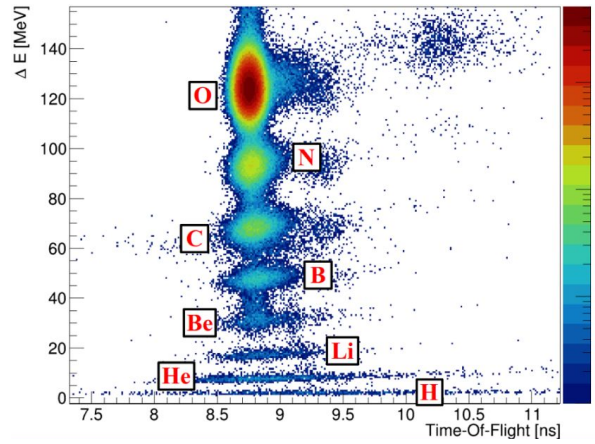
❑ NEW ACTIVITIES (n detection):

- ❑ RIPTIDE (plastic scintillator)
- ❑ BC-501A (liquid scintillator)

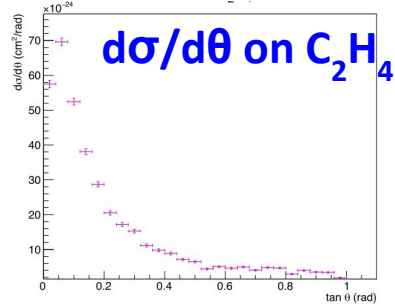
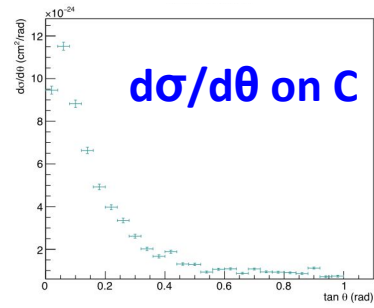


Elemental Integral $\sigma(Z)$ mbarn

Charge Identification



Total Production cross section



Elemental $d\sigma/d\theta$ (mbarn/rad) [Energy integrated]

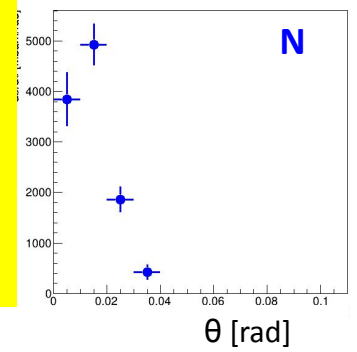
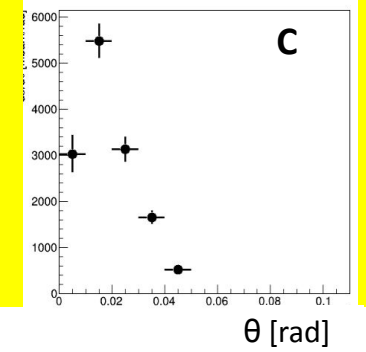
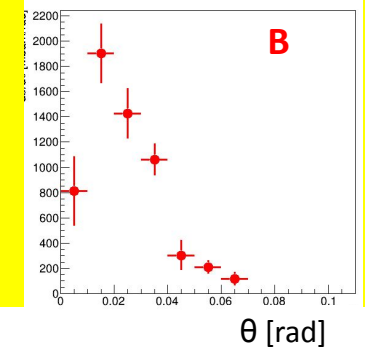
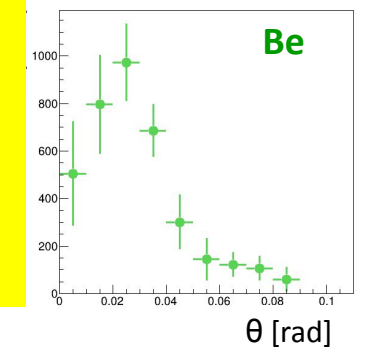
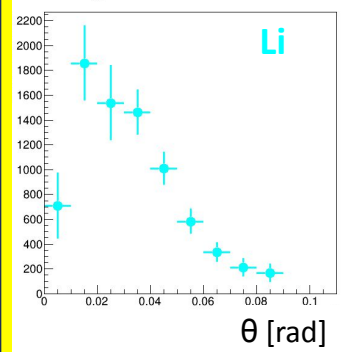


Tabella riassuntiva richieste ai servizi Gr-III

ESPERIMENTO	LAB. ELET. (MU)	STG(MU)	OFFICINA(MU)	PROGETTAZIONE(MU)	CCL(MU)	TECNOLOGIE AVANZATE (MU)	TOT
ALICE	7	0	0	0	0,5	7	14,5
EIC_NET	8	0	2	2	0	2	14
XENON	0	3	0	1	0	0	4
FAMU	0	0	0	0	0	0	0
FOOT	2	0,5	2	0	2	0	6,5
PANDORA	1	0	2	2	0	0	5
n_TOF	0,5	0,5	1	0,5	1	0	2,5
MESI UOMO	18,5	4	7	5,5	3,5	9	46,5