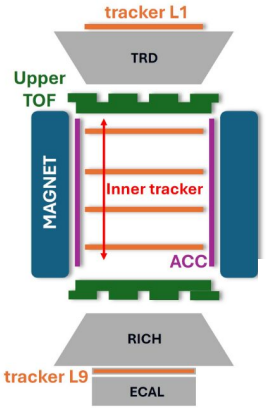
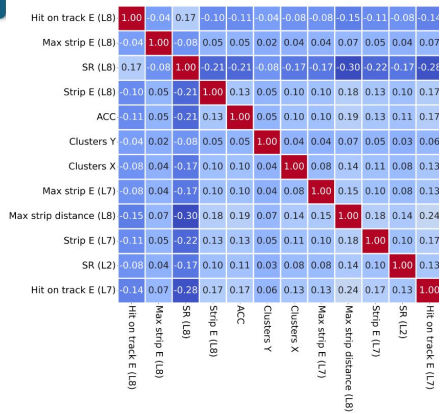
Contribution of INFN/TIFPA to AMS02 in 2025

Main task: development of an analysis for anti-He (F. Rossi PhD. supervised by P. Zuccon)

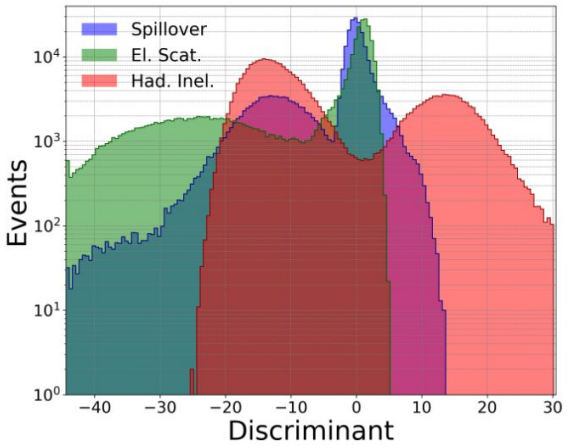


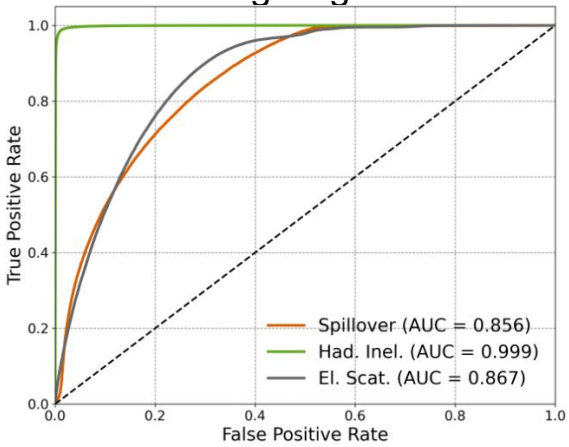
	He	$\overline{He}$
TRD		
TOF		
TRK		
ACC		
RICH		
ECAL		

identified
12 features:



approach: FCNN, trained over diverse sources of charge sign confusion





+ contribution to data taking (shifts of 6days @ CERN POCC)

(8/11 shifts done in 2025)

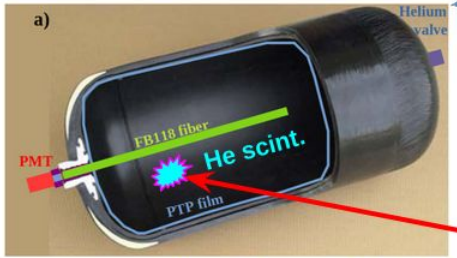
PHeSCAMI PRIN2022

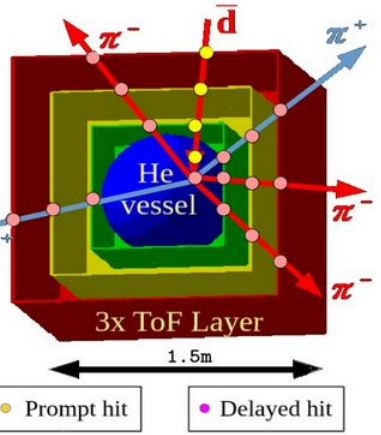
Study of a novel approach to search for anti-nuclei in CR (project sinegic to AMS-02)
(F. Nozzoli PI for TIFPA and P. Zuccon PI for UniTN. Project will end in February 2026)

"Pressurized Helium Scintillating Calorimeter for AntiMatter Identification"

new antimatter identification signature:
- delayed annihilation of anti-d and anti-p (known μs metastable states in He)
- He is a good/fast scintillator

τ_{fast} <5ns LightYield≈10ph/keV
(mass of particle measured from E_k β)





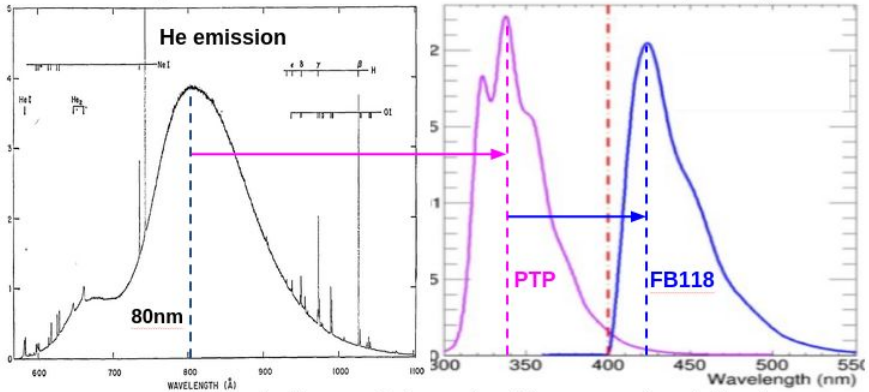
anti-D (stopping 50-150 MeV/n)

F. Nozzoli et al. https://doi.org/10.3390/instruments8010003

PHeSCAMI: Two-Stage WLS System

Approach (similar to LAr/DUNE): C. Brizzolari et al. 2021 JINST 16 P09027

1. PTP layer converts VUV (80 nm) → UV (330 nm)
2. FB118-doped PMMA fiber converts 330 nm → 430 nm (visible)



FB118: MMA doped with 2,5-Bis(5-tert-butyl-benzoxazol-2-yl)thiophene produced by Glass2Power Rovereto (TN) **Requirement: no scintillation**
(not obvious as EJ-286 WLS is also a scintillator)

We found that FB118 is a very efficient Cherenkov radiator and we plan to use it also in other astroparticle experiments.

Composizione preventivata AMS02 @ TIFPA

AMS02 gode della sinergia con la sigla AMBER
(CSN1 misura cross section p-bar di interesse astroparticle a CERN/SPS)

Battiston Roberto	**0.15 + 0.15 da sinergia Amber**
Francesco Nozzoli	**0.3 + 0.15 da sinergia Amber**
Paolo Zuccon	**0.3 + 0.15 da sinergia Amber**
Giordano Davide	**0.2 + 0.15 sa sinergia Amber (RTDA)**
Francesco Rossi	**0.5 + 0.15 da sinergia Amber (PhD al 3 anno)**
Cavazzini Leo	**0.5 + 0.15 da sinergia Amber (PhD al 3 anno)**
Luigi E. Ghezzer	**0.6 (PhD al 1 anno)**
Puccetti Niccolo	**0.3 (PhD al 1 anno)**
Bisht Aziz	**0.5 (ricercatore TD FBK)**

Supportano il gruppo (ma con 0 FTE): F. Dimccoli, I. Lazzizzera, W. Burger.

Totale: 3.35 FTE effettivi + 0.9 sinergici da AMBER

Pubblicazioni 2025:

- *“Properties of Cosmic Lithium Isotopes Measured by the Alpha Magnetic Spectrometer”*
Phys.Rev.Lett. 134 (2025) 20, 201001
-*“Antiprotons and Elementary Particles over a Solar Cycle: Results from the Alpha Magnetic Spectrometer”*
Phys.Rev.Lett. 134 (2025) 5, 051002
-*”Solar Modulation of Cosmic Nuclei over a Solar Cycle: Results from the Alpha Magnetic Spectrometer”*
Phys.Rev.Lett. 134 (2025) 5, 051001
- *“A novel approach for \bar{He} research in cosmic rays with neural networks”*
PoS ICHEP2024 (2025) 747
Pubblicazioni PHESCAMI 2025:
- *“Prototyping a Pressurized Helium Scintillating Calorimeter for AntiMatter Identification”*
in publication on **Centr. Eur. Astr. Bull.**
- *”Development of a Pressurized Helium Scintillating Calorimeter for AntiMatter Identification”*
PoS EXA-LEAP2024 (2025) 048
- *“Perspectives for antideuterons search in Cosmic Rays with a helium pressurized calorimeter”*
Nuovo Cim.C 48 (2025) 3, 153

Richieste 2026 (ancora preliminare)
Missioni: 20k per turni al CERN
Altri servizi: 2.5k per veicolo al CERN