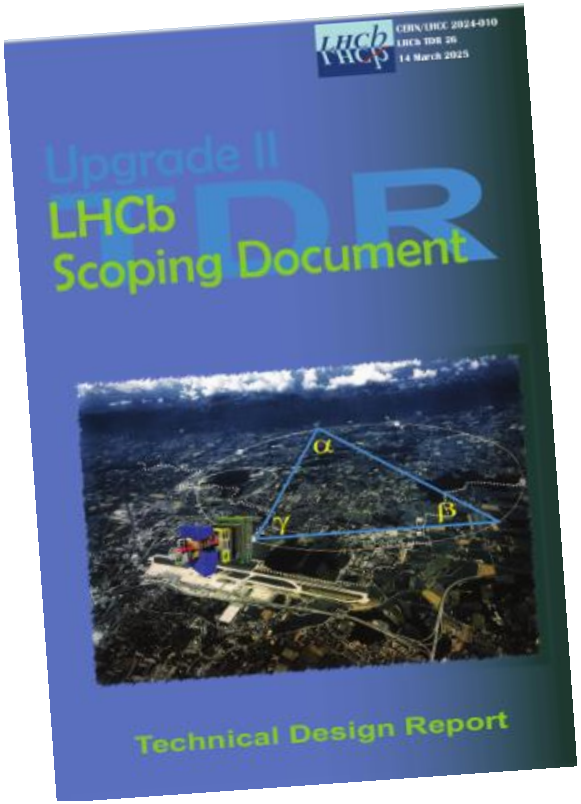
Attività, anagrafica e richieste servizi LHCb

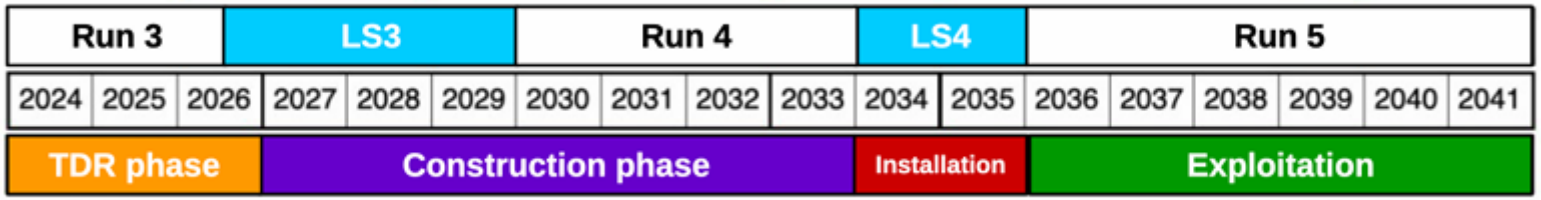
LHCb upgrade phase II



- **Scoping document finalized and submitted to LHCC in Sept. 2024**
- **March 2025: LHCC review concluded, final version of the document public on CDS: https://cds.cern.ch/record/2903094**
- **19 March 2025: RB meeting**
- **29 April 2025: RRB meeting**
- **Positive response, recommendation to proceed with the *Middle scoping scenario***

LHCb upgrade phase II

Updated LHCb schedule



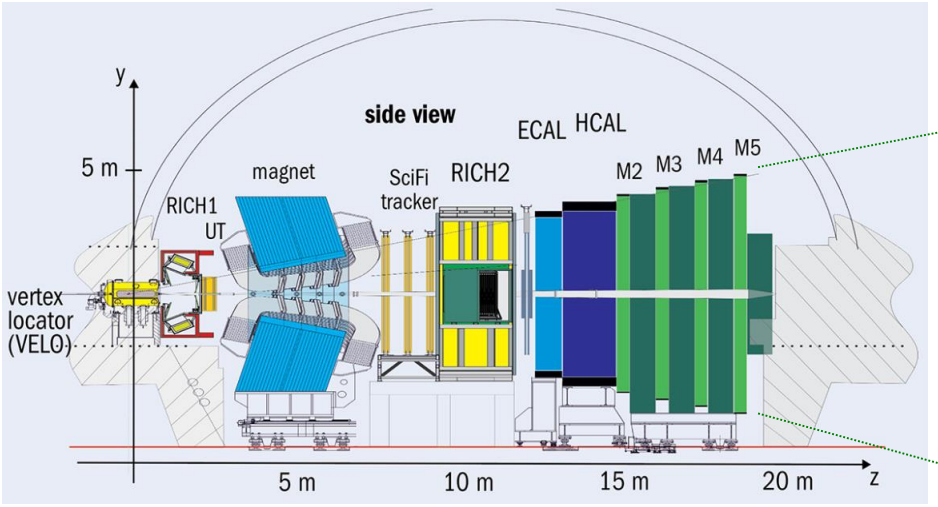
- **TDRs to be finalized by 2026 (Data Processing TDR only in 2030)**
- **Construction: 6 ys -> 7 ys**
- **Run: 6 ys**

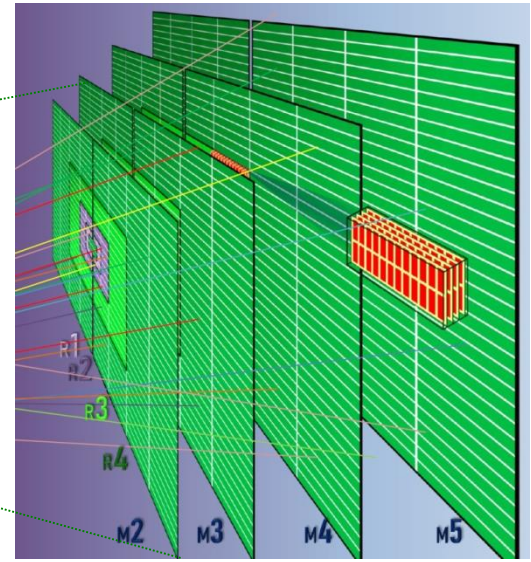
LHCb upgrade phase II: INFN side

INFN Scoping document (addendum to the Scoping document):

- **Submitted in December 2024, feedback from LHCb referees, final version submitted in February 2025**
- **Additional members (detector experts) in the review committee**
- **Current process to be completed by July 2025, then next steps (Giunta/CTS)**

LHCb upgrade phase II @Bari





- **Muon detector simulation studies**
- **Development of dedicated FE electronics for µRWell/GWell detectors**
- **Characterization of µRWell/GWell detectors**

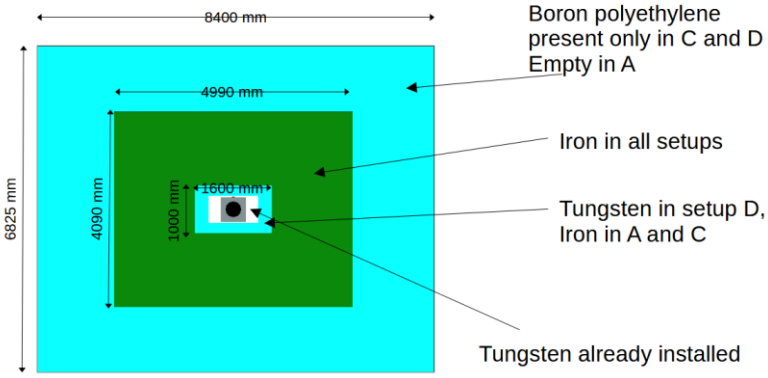
Muon detector simulation studies

F. Debernardis

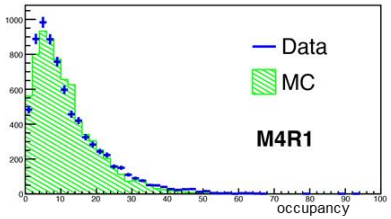
co-convener Muon software group

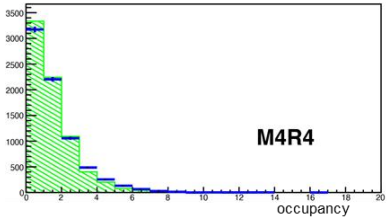
U2

- Implementation of the new geometry/detectors in the LHCb simulation framework
- Study of the dead time effects on the detector performance

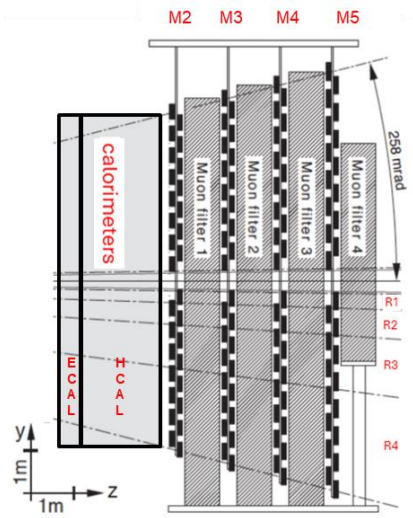


Study of the shielding
in front of the Muon detector





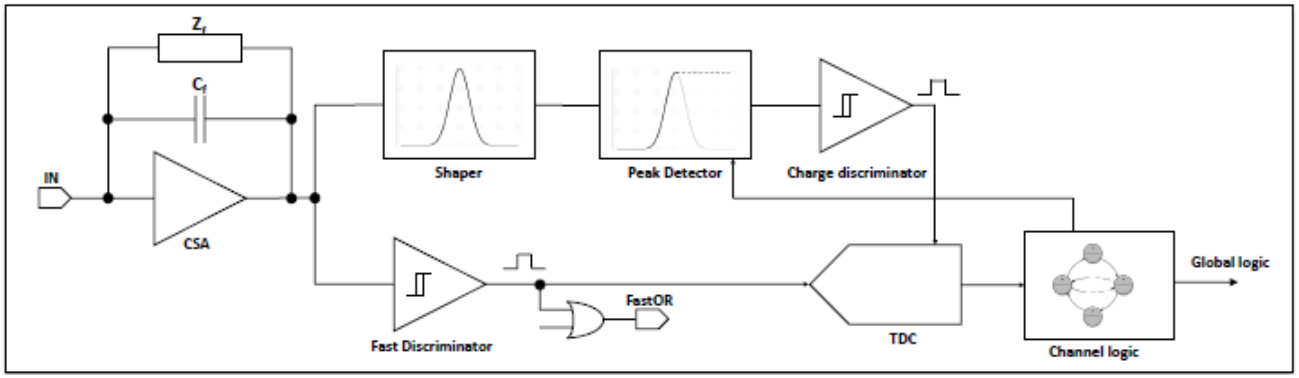
Not only upgrade II…

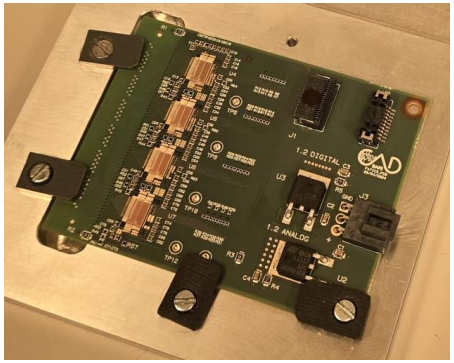


Development of FE electronics

FATIC3 ASIC

G. De Robertis, F. Licciulli, F. Loddo





- **Design of ASIC finalized in 2023**
- **Production of chips Jan. – Apr. 2024**
- **Design of FE boards finalized early 2024**
- **Production of FE boards completed end of Sept. 2024**
- **Chip bonding + test done in Bari Oct. 2024**

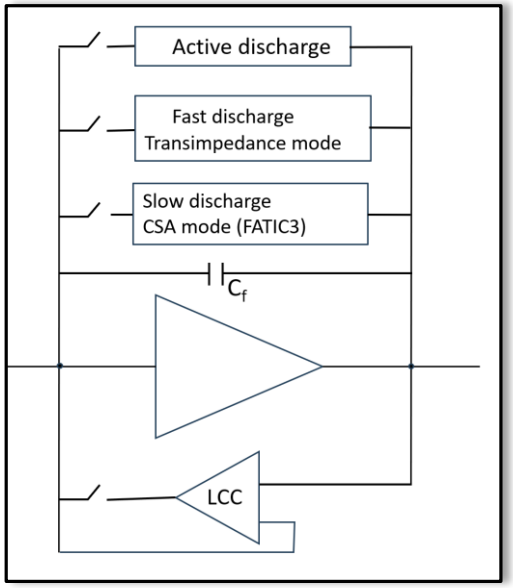
➢ **(Successfull!) Beam test at CERN in November 2024 (see next slides)**

Development of FE electronics

G. De Robertis, F. Licciulli, F. Loddo

PROGRAM FOR 2025-2026

- Design of FATIC4 ASIC in progress, to be finalized by 2025
- Chip production: end 2025 – early 2026
- Design and production of FATIC4 FEE (2025-2026)



Main limitation of FATIC3: dead time ~ 1μs

⇒ Two active discharge circuits to reduce the dead time to *O*(100 ns),

Leakage Current Compensation circuit to minimize the effect of ion tails

Development of FE electronics

G. De Robertis, F. Licciulli, F. Loddo

PROGRAM FOR 2025-2026

- Design of FATIC4 ASICS in progress, to be finalized by 2025
- Chip production: end 2025 – early 2026
- Design and production of FATIC4 FE boards (2025-2026)

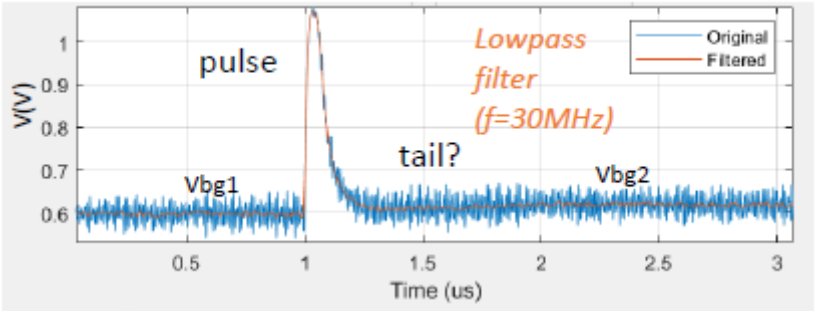
➢ Extensive tests (chamber prototypes instrumented with FATIC4) in 2026

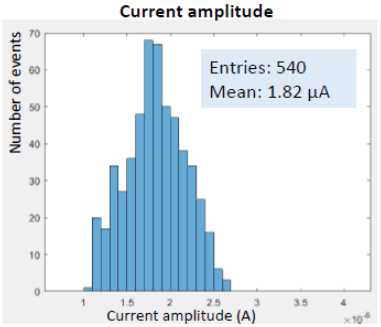
Characterization of µRWell/GWell detectors

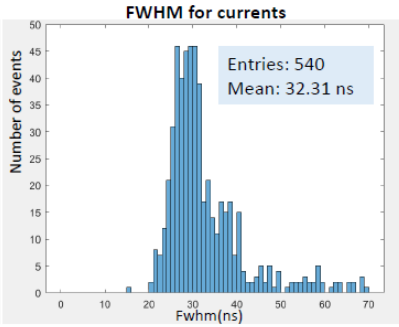
L. Congedo, C. Divincenzo (Master student), F. Debernardis, G. De Robertis, M. De Serio, A. Pastore

µRWELL with
6mm gas gap and
50µm prepreg
readout by FATIC3

Study of the detector performance in our lab and in dedicated beam tests (next slide)





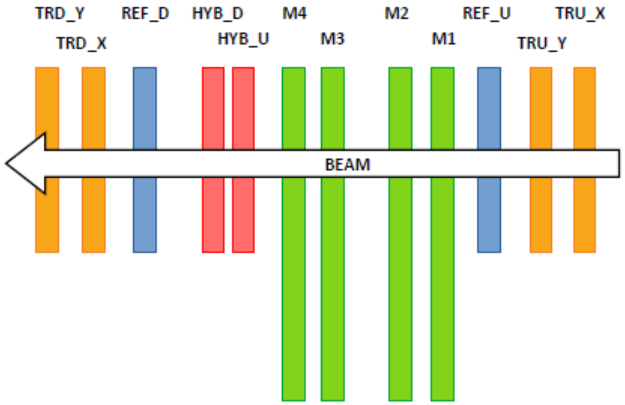


Characterization of µRWell/GWell detectors

Beam test @CERN – Nov. 2024

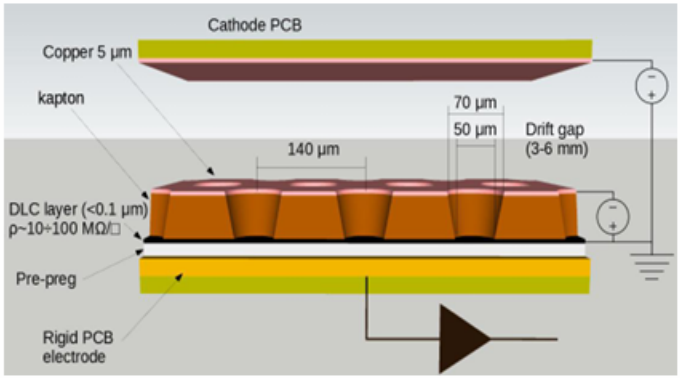
Bari, LNF, Roma2

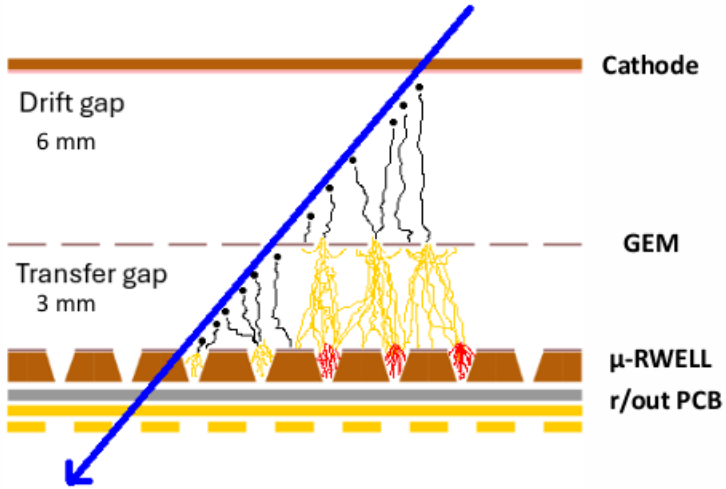
Resp. Bari: elettronica, software

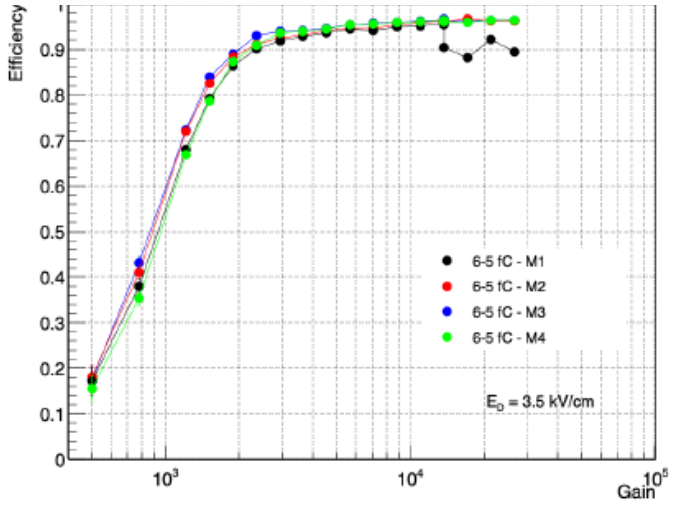


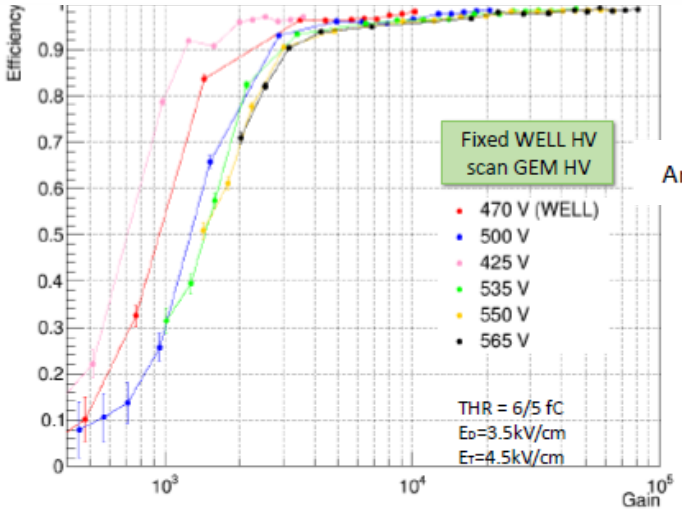
Characterization of µRWell/GWell detectors

Beam test @CERN – Nov. 2024





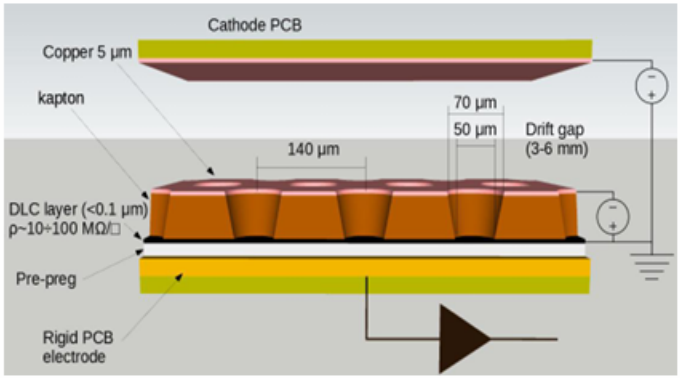


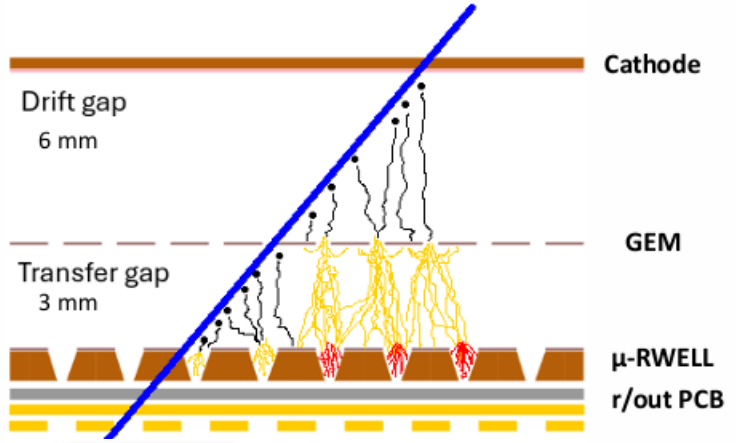


$Ar/CO_2/CF_4 = 45/15/40$

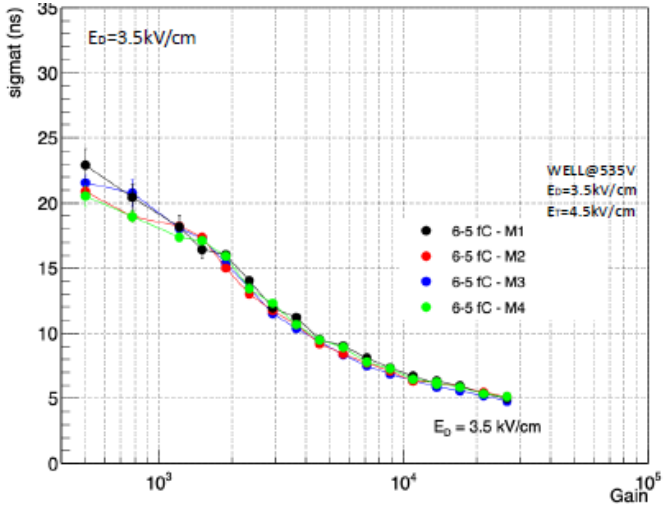
Characterization of µRWell/GWell detectors

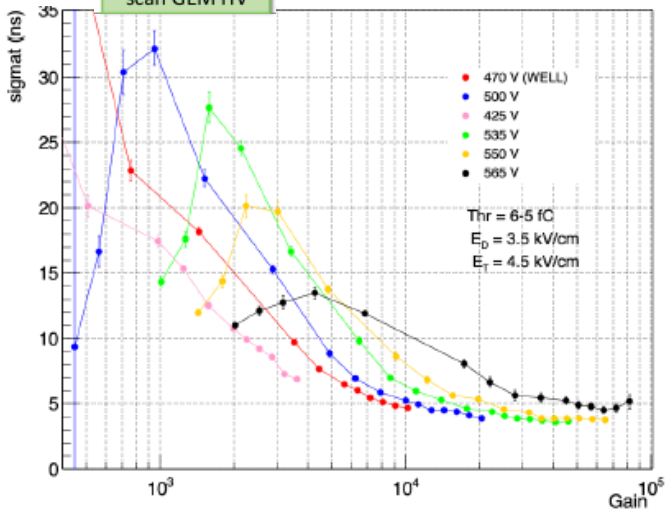
Beam test @CERN – Nov. 2024





Fixed WELL HV
scan GEM HV

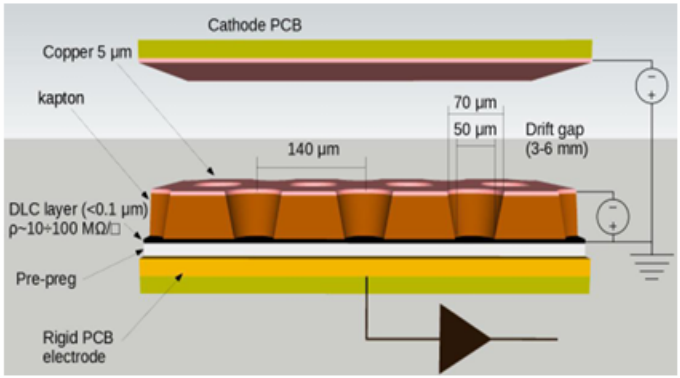


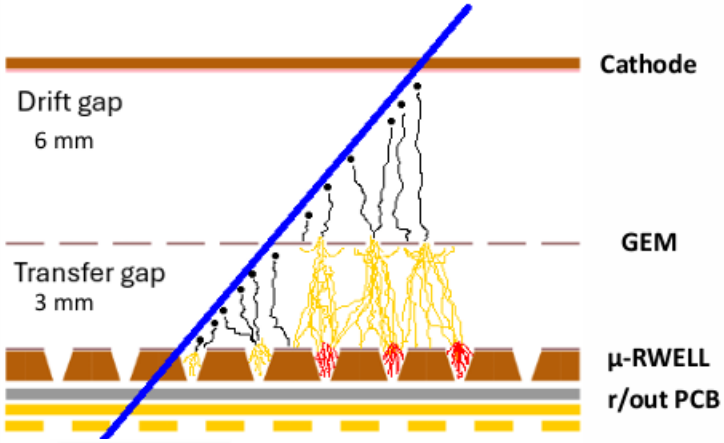


$Ar/CO_2/CF_4$ = 45/15/40

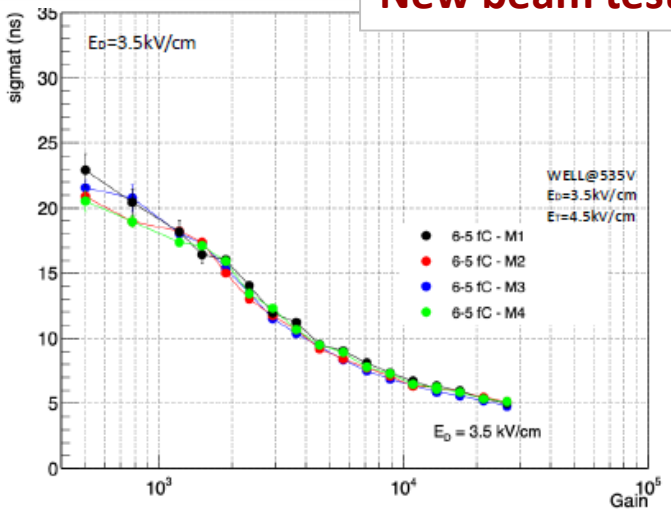
Characterization of µRWell/GWell detectors

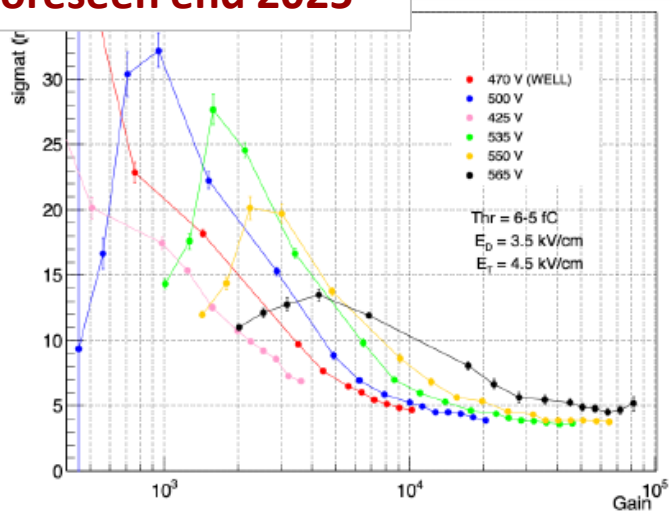
Beam test @CERN – Nov. 2024





New beam test foreseen end 2025





$Ar/CO_2/CF_4$ = 45/15/40

Physics analysis@Bari

Published papers only

JHEP01 (2025) 054

Amplitude analysis of $B^+ \to \psi(2S)K^+\pi^+\pi^-$ decays

P. d'Argent, E. Gersabeck, M. Pappagallo

PHYSICAL REVIEW D **111,** 092009 (2025)

Study of light-meson resonances decaying to $K^0_S K\pi$ in the $B \to (K^0_S K\pi)K$ channels

A. Palano, M. Martinelli

PHYSICAL REVIEW D **110,** 032001 (2024)

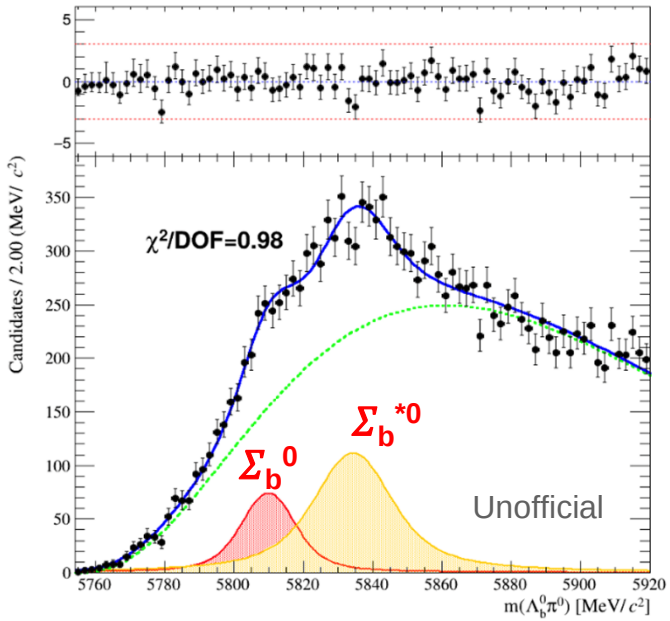
Search for prompt production of pentaquarks in charm hadron final states

Since no significant signals are found, upper limits are set on the pentaquark yields relative to that of the Λ_c^+ baryon in the $\Lambda_c^+ \to pK^-\pi^+$ decay mode. The known pentaquark states are also investigated, and their signal yields are found to be consistent with zero in all cases.

G. Robertson, M. Pappagallo, M. Needham

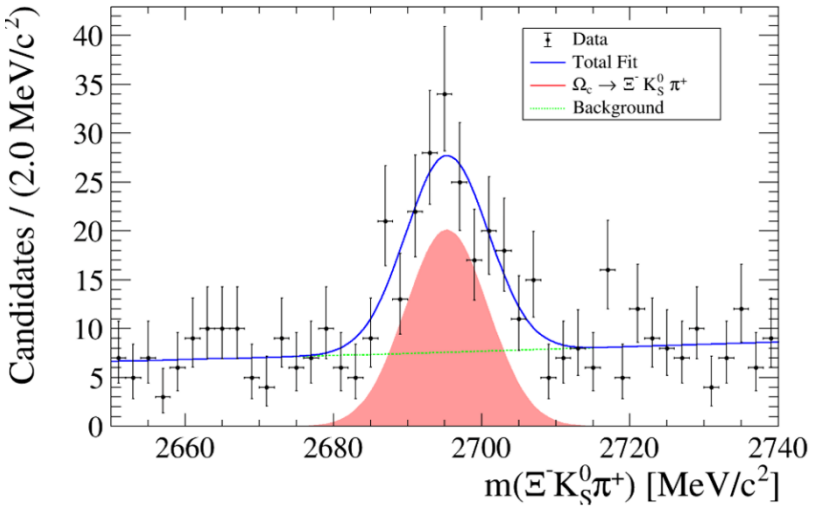
Physics analysis@Bari

Search for $\Sigma_c^{(*)+} \rightarrow \Lambda_c^+ \pi^0$ and $\Sigma_b^{(*)0} \rightarrow \Lambda_b^0 \pi^0$



A. De Robertis (Master student)

Search for excited Ω^{**} in $\Omega_c^0 \rightarrow \Xi^- K^0_S \pi^+$ decays



F. De Gregorio (Master student)

First observation of Σ_b^0 and Σ_b^{*0} baryons

Supervisor: M. Pappagallo

Anagrafica LHCb-Bari 2026

M. De Serio (resp. loc.)	90%
R.A. Fini	100%
A. Palano	*0%*
M. Pappagallo	80%
A. Pastore	90%
S. Simone	100%
F. Debernardis	100%
L. Congedo	100%
G. De Robertis	30%
F. Licciulli	20%
F. Loddo	20%
TOT FTE	**7.3**

M. Pappagallo member of the Editorial Board (from 1st July 2024, 2-year mandate)

Richiesta servizi

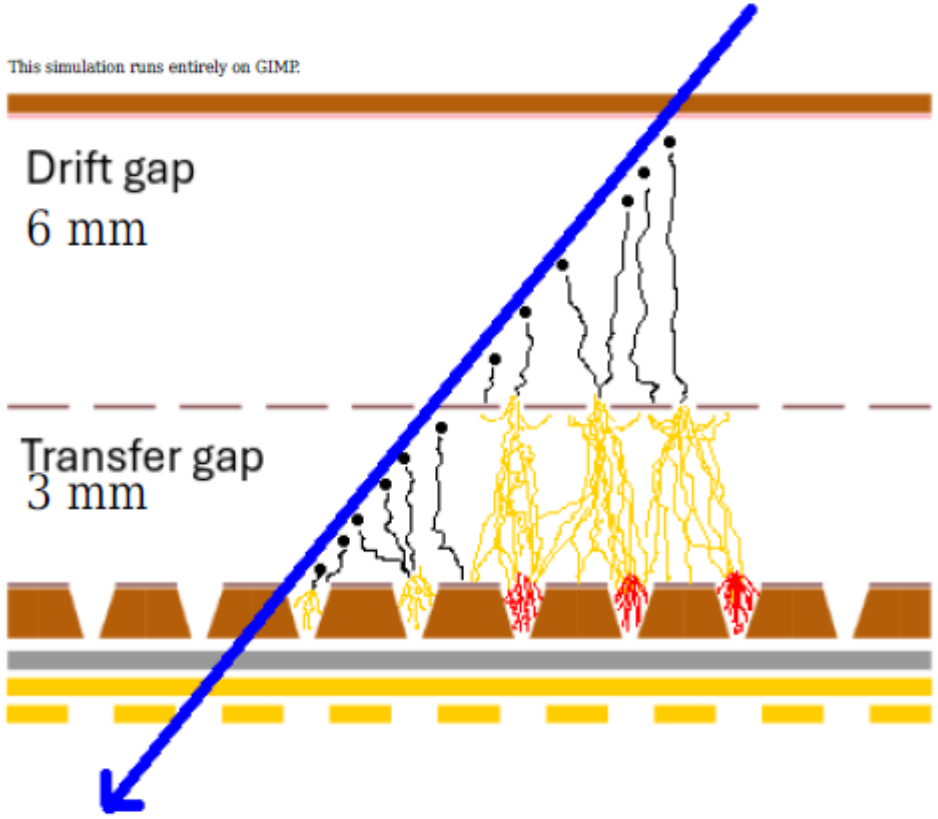
Servizio Elettronica:

- Disegno e assemblaggio scheda di test FATIC4
- Disegno scheda FE FATIC4 per muRwell
- Disegno nuova scheda concentratore FE->MOSAIC

Camera pulita:
- Incollaggio e bonding chip n. 200 chip FATIC4

Servizio Meccanica:
Progettazione e realizzazione box e struttura meccanica per muRwell

The Hybrid GEM + μ-RWELL detector: the G-RWELL



Ionisation

The particle ionises in both the drift gap and the transfer gap

GEM or RWELL

Electron from the drift gap
→ amplified from the **GEM**
Electrons from the transfer gap
→ amplified by the **WELL**

GEM + RWELL

After a drift time in the "Transfer gap", the electrons preamplified by the GEM reach the RWELL, and get amplified again.