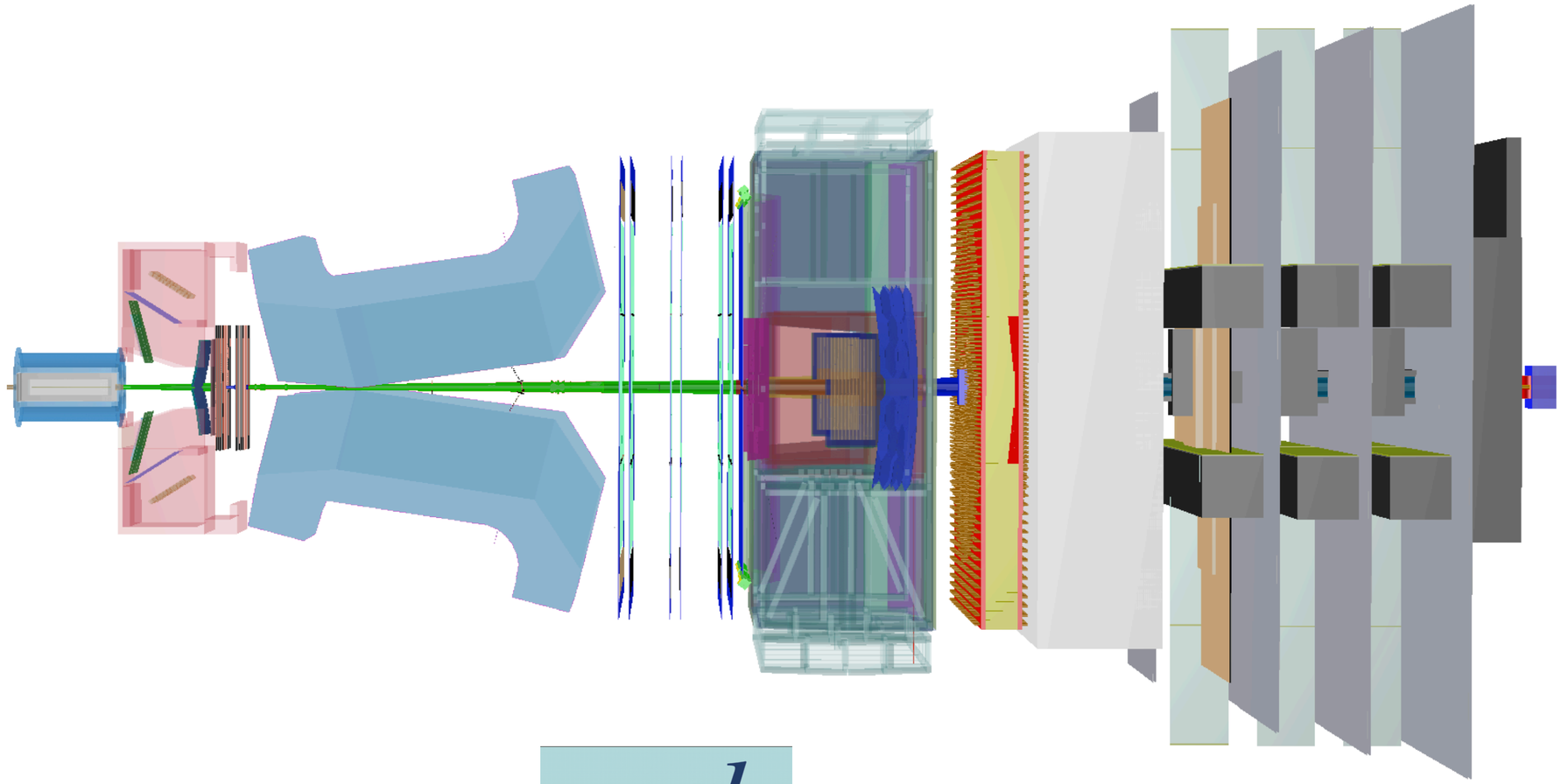

LHCb Upgrade II

Pasquale Di Nezza on behalf of the LHCb LNF group

LHCb Frascati is the largest group within LHCb Italia, and LHCb Italia, together with the UK groups, represents one of the two largest communities in LHCb.
Members from LNF hold several key responsibility, and are first authors of high impact publications

A selection of current local activities

LHCb Frascati is the largest group within LHCb Italia, and LHCb Italia, together with the UK groups, represents one of the two largest communities in LHCb.
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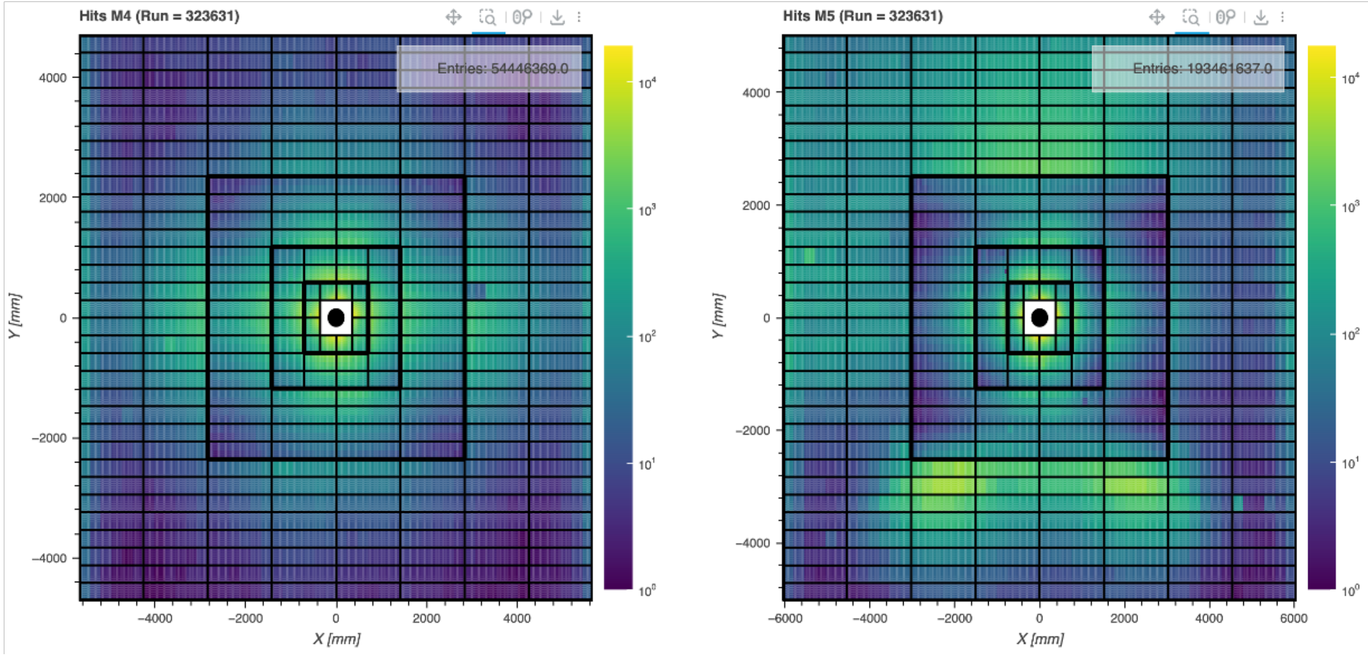
A selection of current local activities

Muon

V. Chulikov
M. Santimaria
B. Sciascia

The detector is under our full responsibility, including its operation, data quality, and maintenance.
We have been affected (and are still affected) by the leave of the Russian colleagues, with whom we previously shared these duties



First months into 2025 data taking show a detector in a very good shape:
- Detector easily time aligned (TAE data)
- Two sets of "special data" (very useful inputs for U2 studies)

A couple of papers (on preparation)

Responsibilities for the Run3 and Upgrade-II software, and in the Work Package on Detector Modeling for the Simulation Project

E. De Lucia, P. De Simone

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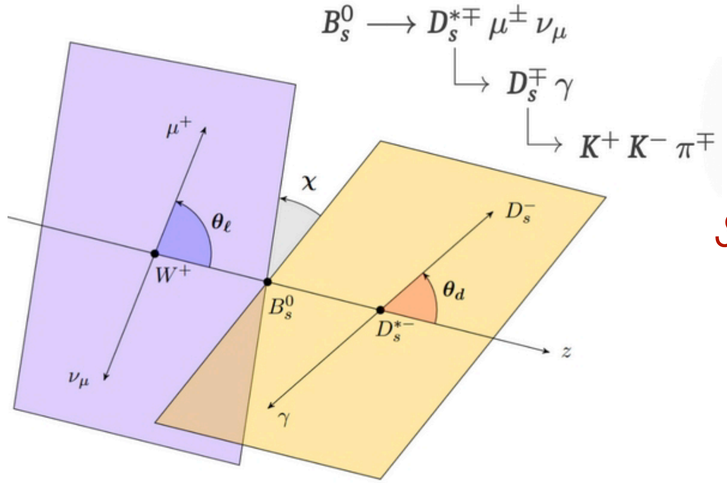
A selection of current local activities

M.Rotondo
P. De Simone
+ Tor Vergata
+ Barcelona U.

Semileptonic $B_S \to D_S(*)\, l\, \nu$ decays

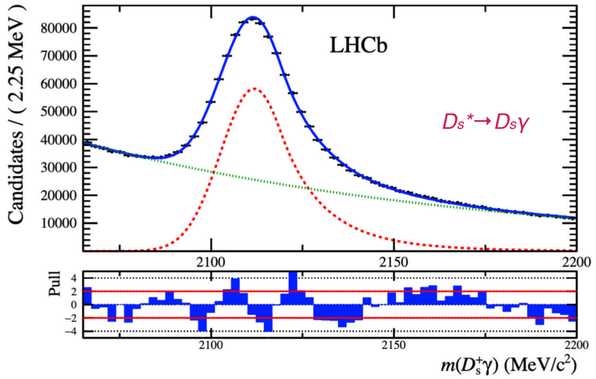
- *Model independent analysis: publish the full 4-D spectrum*
- *Test form factors calculations*
- *Sensitive to New Physics*



Sensitive to New Physics

Test of Lepton Flavor Universality Violation with $B_s \to D_s^*\, \tau\, \nu$

$$R(D_s^{*-}) = \frac{B_s^0 \to D_s^{*-}\tau^+\nu_\tau}{B_s^0 \to D_s^{*-}\mu^+\nu_\mu}$$



- *Persistent anomalies in R(D)-R(D*) world average, based on LHCb + B-Factories measurements*
- *This analysis may offers a novel prospective to understand the tension*

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A selection of current local activities

Measurement of b-hadron production fractions using (semi)inclusive semileptonic decays

E. Minucci
+ Syracuse U.

The goal is to measure two fragmentation fraction ratios:
$\bar{B}_s^0(f_s)$ **relative to the sum of** $B^-(f_u)$ **and** $\bar{B}^0(f_d)$

$\Lambda_b^0(f_{\Lambda_b^0})$ **relative to the sum of** B^- **and** $\bar{B}^0$

$$\bar{B}_s^0 \to D_s^+(\to K^+K^-\pi^+)\mu^-\nu X$$
$$\Lambda_b^0 \to \Lambda_c^+(\to pK^-\pi^+)\mu^-\nu X$$
$$B^- \to D^0(\to K^-\pi^+)\mu^-\nu X$$
$$B^- \to D^+(\to K^-\pi^+\pi^+)\mu^- X$$
$$\bar{B}^0 \to D^+(\to K^-\pi^+\pi^+)\mu^-\nu X$$
$$\bar{B}^0 \to D^0(\to K^-\pi^+)\mu^-\nu X$$

Best determination of b-hadron production fractions

New approach based on exclusive semileptonic $B_s \to D_s \mu \nu$ and $B \to D \mu \nu$ decays

M.Rotondo
P. De Simone
E. Minucci
+ Maastricht U.

$$\frac{N(B_s \to D_s^+ \mu\nu)}{N(B_d \to D^+ \mu\nu)} = \frac{f_s}{f_d} \cdot \frac{\tau_s}{\tau_d} \cdot \frac{\Gamma(B_s \to D_s^+ \mu\nu)}{\Gamma(B_d \to D^+ \mu\nu)} \cdot \frac{\epsilon_s}{\epsilon_d}$$

- *Will provide the first direct measurement of the fragmentation functions f_s/f_d, and also f_u/f_d*
- *Alternative approach with different source of uncertainties compared with inclusive approach*

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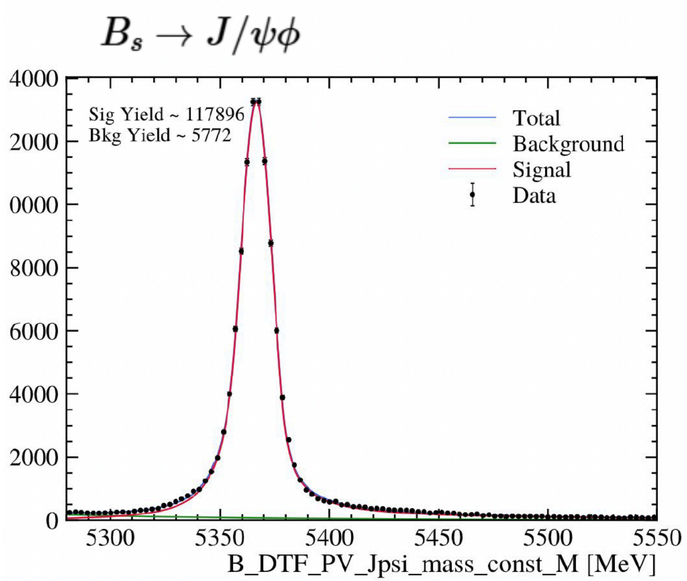
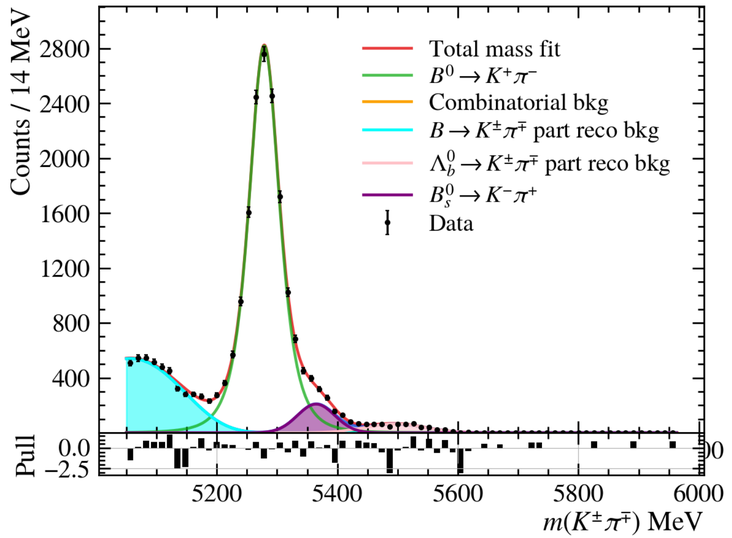
A selection of current local activities

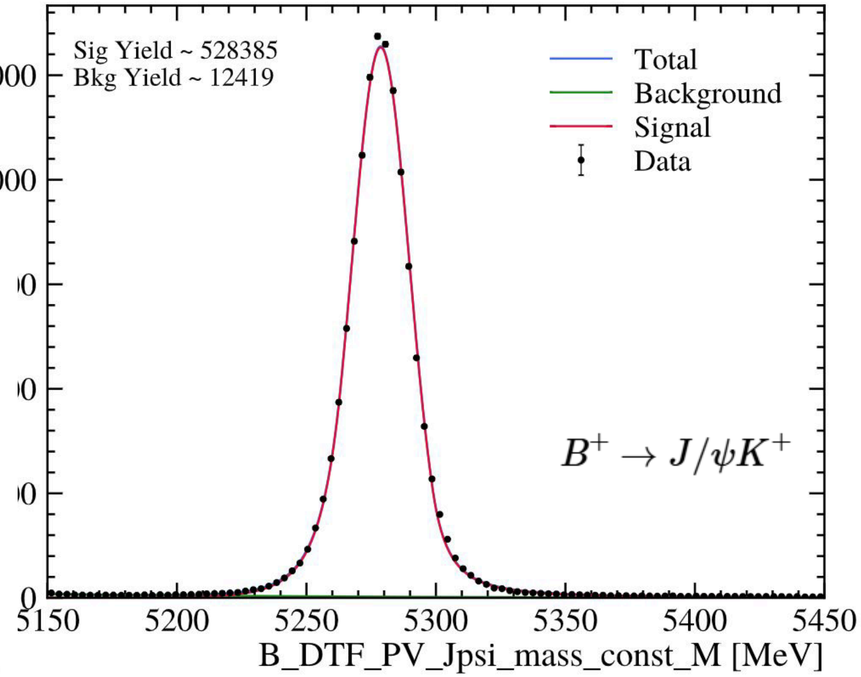
Run 3 $B^0_{(s)} \to \mu^+\mu^-$ analysis

M. Santimaria as analysis coordinator

Golden channel for new physics searches:
- $B_s \to \mu\mu$ measured with extreme precision only by LHCb and CMS
- $B^0_s \to \mu\mu$ never measured, but possible with Run3 data







Calculated value:

$$\frac{\mathcal{B}(B^0_s \to J/\psi\phi)\mathcal{B}(\phi \to K^+K^-)}{\mathcal{B}(B^+ \to J/\psi K^+)} = 0.441 \pm 0.015$$

Relative Branching ratio	Measured Value	PDG value
$\frac{\mathcal{B}(B^0_s \to K^+K^-)}{\mathcal{B}(B^0 \to \pi^+\pi^-)}$	(5.034 ± 0.308)	(5.065 ± 0.485)
$\frac{\mathcal{B}(B^0 \to K^+\pi^-)}{\mathcal{B}(B^0_s \to K^-\pi^+)}$	(2.439 ± 0.173)	(3.389 ± 0.408)

Literature value:

$$\frac{\mathcal{B}(B^0_s \to J/\psi\phi)\mathcal{B}(\phi \to K^+K^-)}{\mathcal{B}(B^+ \to J/\psi K^+)} = 0.501 \pm 0.022$$

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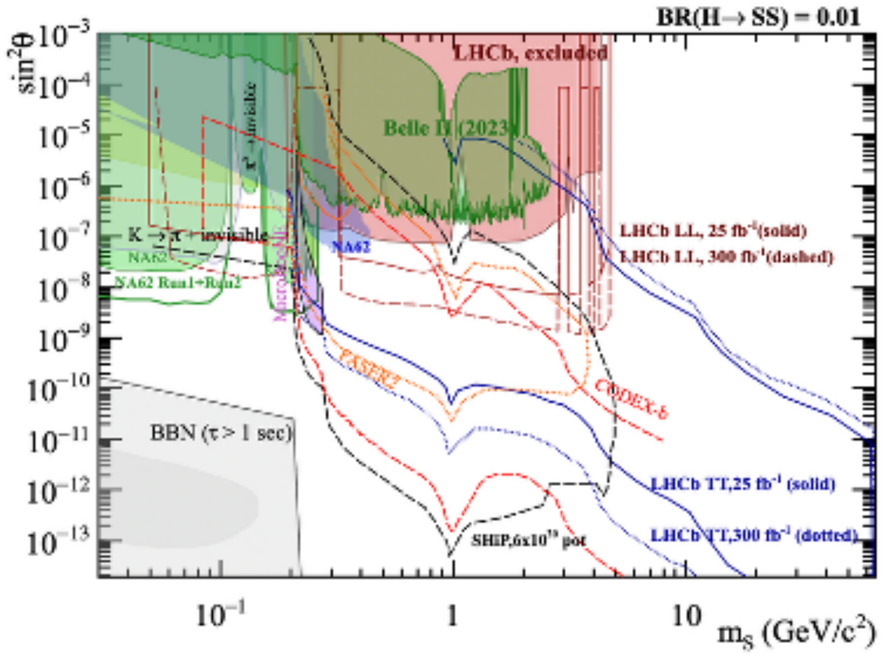
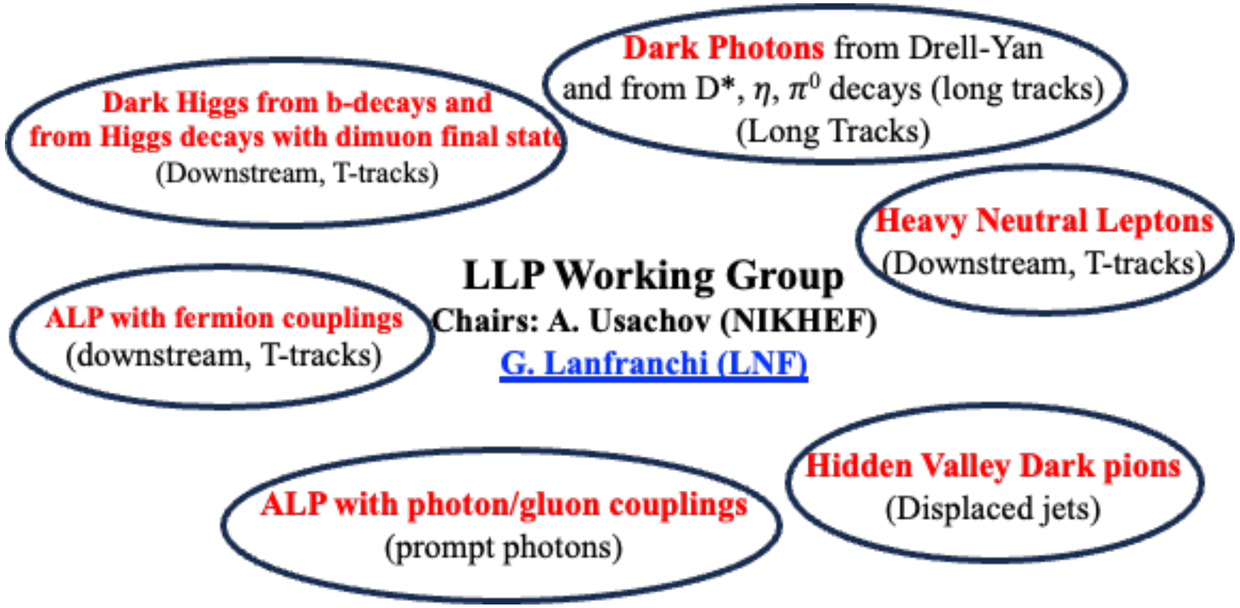
A selection of current local activities

The new LHCb Long-Lived Particles Working Group:

The new software trigger will make LHCb one of the main players in the search for Dark Sector (or Long-Lived) Particles worldwide. A new Working Group has been created in order to exploit this potential.

An example of the LHCb sensitivity:
the Dark Higgs





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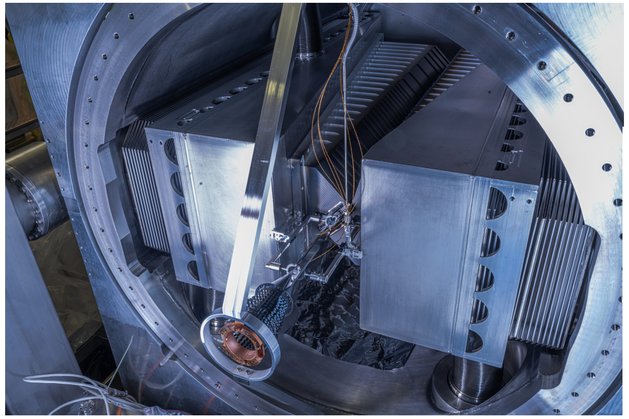
A selection of current local activities

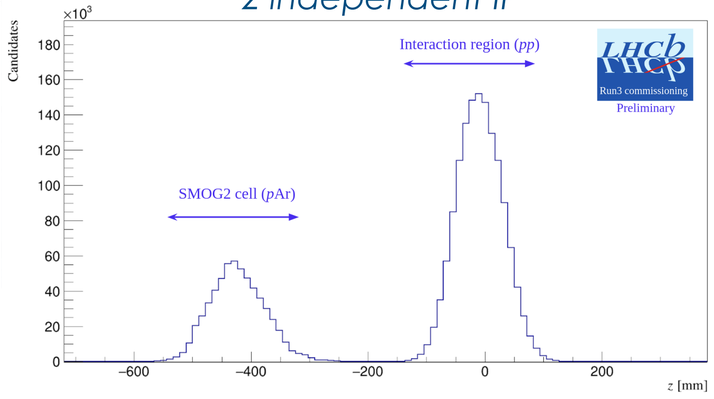
P. Di Nezza
M. Santimaria

SMOG2

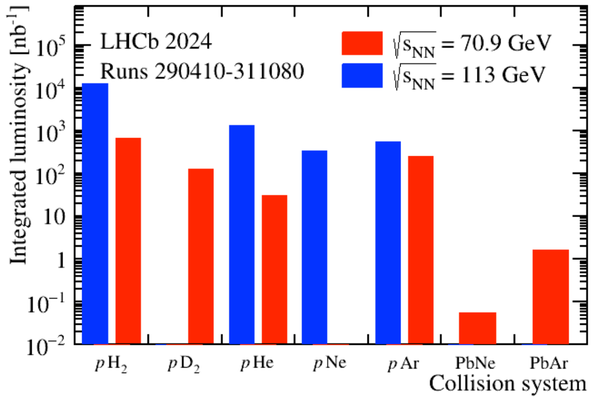
The fixed target for LHCb - Project entirely INFN (Frascati, Ferrara, Firenze), PDN PL, the WG-LHCb has >100 members, numerous paper published with high citations+ PhD theses



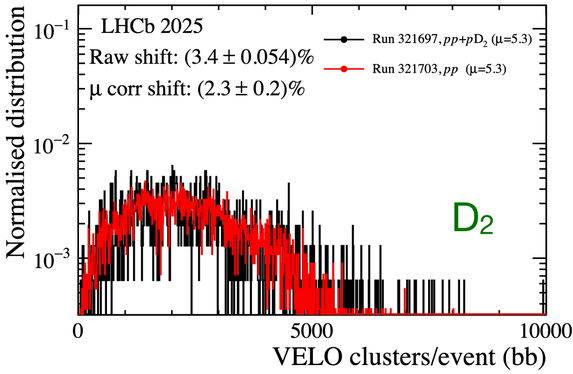
2 independent IP



Statistics collected in 2024



Increase in the occupancy

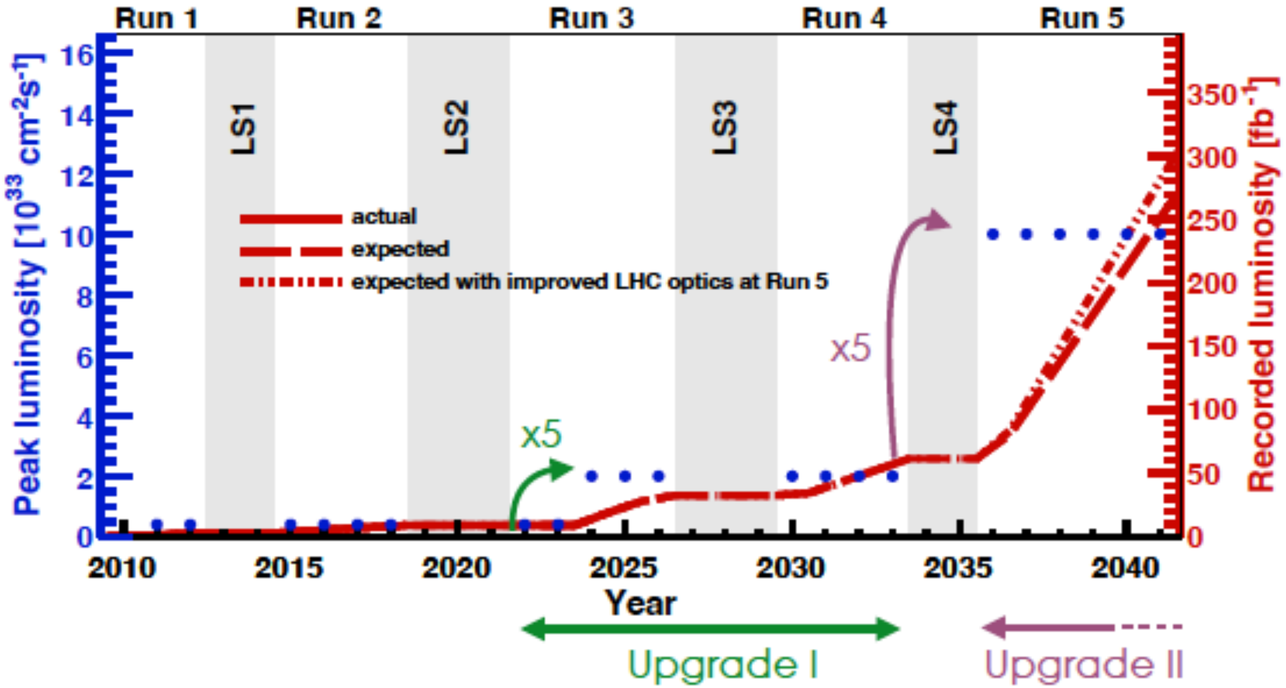


Latest LNF papers:

- Measurement of ϕ(1020) meson production in fixed-target pNe collisions at~√sNN~=~68.5 GeV, JHEP 2503 (2025) 151
- High-density gas target at the LHCb experiment, PHYSICAL REVIEW ACCELERATORS AND BEAMS 27, 111001 (2024)
- Transverse polarization measurement of Λ hyperons in pNe collisions at √sNN = 68.4 GeV with the LHCb detector, JHEP 2409 (2024) 082

LHCb is developing a proposal for the high lumi Upgrade-2

A main 'Scoping document' (https://cds.cern.ch/record/2903094) has been produced, along with an addendum from the INFN community as part of the the funding request.
The proposal is currently under evaluation by the INFN CSN1 referees, supported by external reviewers. No major issues have been addressed so far. Soon the review output will go to the INFN Giunta and CTS.



CERN-LHCC-2017-013
CERN-LHCC-2018-027
CERN-LHCC-2021-012
CERN-LHCC-2024-010
CERN-LHCC-2023-005
CERN-LHCC-2024-001

LHCb experiment
- Run 1-2 [2010-2018]
- collected 9 fb^{-1}

LHCb Upgrade I
- Run 3-4 [2022-]
- expect to collected 50 fb^{-1}
- detector enhancement (ECAL, RICH) in LS3

LHCb Upgrade II
- Run 5-6 [2034-]
- expect to collected 300 fb^{-1}

Outcome of LHCC week

V. Vagnoni's slide at the LHCb week

Tuesday, June 3rd
Meeting with LHCb

Executive summary

LHCC congratulates LHCb on the great work during the YETS and smooth and efficient start of 2025 datataking.

Physics output of LHCb is as usually exceptional, with a new paper accepted to Nature as a flagship.

LHCC is happy to see all subdetectors fully performing with performances better than in 2024.
LHCC especially greets stable DAQ performance of the UT and completely recovered performance of VELO.

High level triggers are fully operational within expectations. LHCC encourages LHCb to perform the fine tunning of HLT2 with the aim of lowering the bandwidth while keeping high efficiency. LHCC advises LHCb to monitor the slightly worrying situation regarding the data storage space.

LHCC acknowledges the focus of LHCb regarding the future upgrades to preparation of TDR's for upgrade II, and recognizes the need for a swift composition of expert review groups to help in upgrade roadmap of ASICs required for the upgrades of ALICE and LHCb, and the installation schedule of both experiments.

LHCC recommends the schedules for LS3 enhancements, prepared in the corresponding TDR's, to be updated to accommodate changes due to the LS3 prologation.

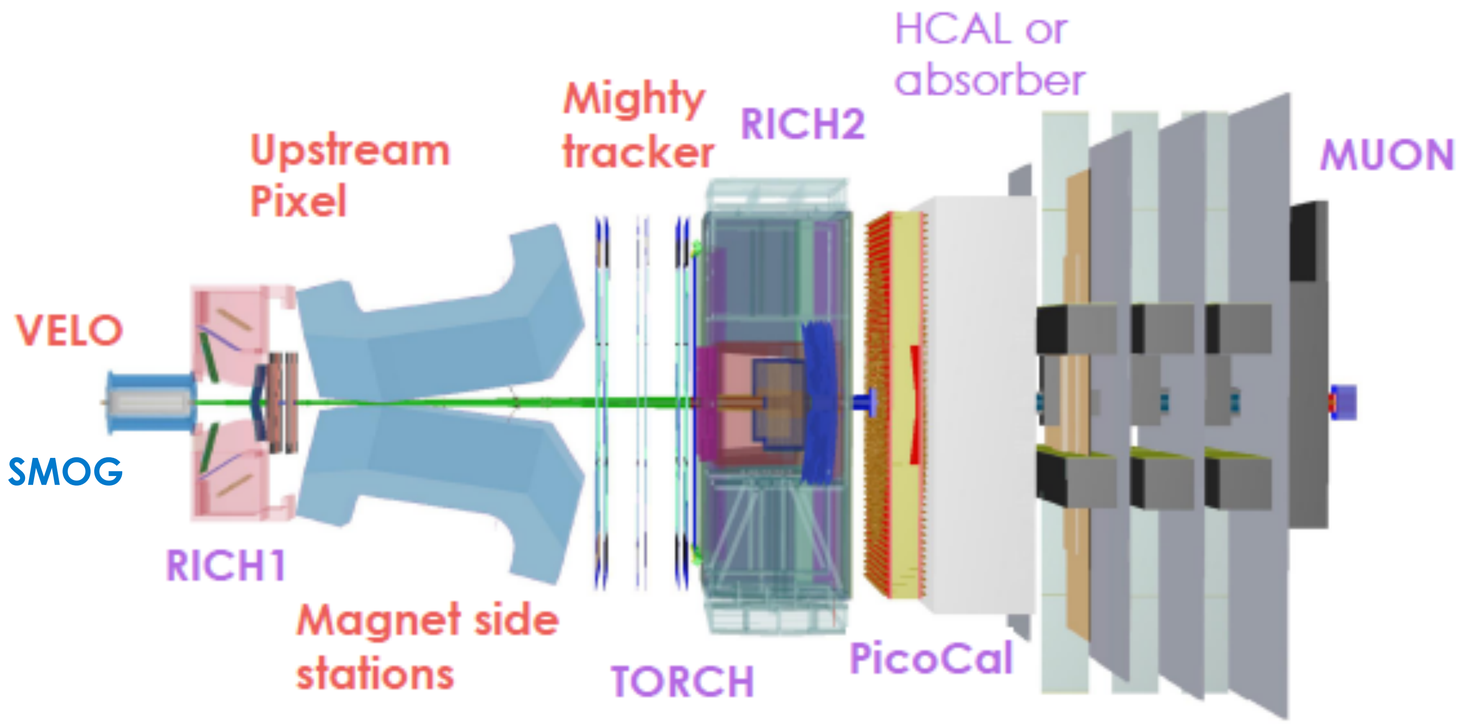
(LHCC discussed the space situation in the LHCb cavern and understands that the positioning of CODEX-b experiment there is not feasible.)

Why Upgrade-II … in a nutshell

Upgrade LHCb detector from $L = 2 \cdot 10^{33}\ cm^{-2}s^{-1} \longrightarrow \sim 10^{34}\ cm^{-2}s^{-1} = \int L = 300\ fb^{-1}$

LHCb Upgrade II offers a unique physics program with exceptional sensitivity to BSM phenomena, enabling measurements otherwise inaccessible for decades—reaching sensitivities up to ~10^5 TeV

The upgrade addresses key technological challenges essential for future high energy physics projects, including high granularity, fast timing, high throughput, and extreme radiation hardness. It also defines a technological roadmap that supports the wider detector R&D community



Same layout and magnet as Upgrade-I, but brand new detectors!

LHCb input to European Strategy

The preparatory work for the Scoping Document has generated various inputs for the ESPP

#81 LHCb-PUB-2025-001, "Discovery potential of LHCb Upgrade II", arXiv:2503.23087

#82 LHCb-PUB-2025-002, "Technology developments for LHCb Upgrade II", arXiv:2504.03088

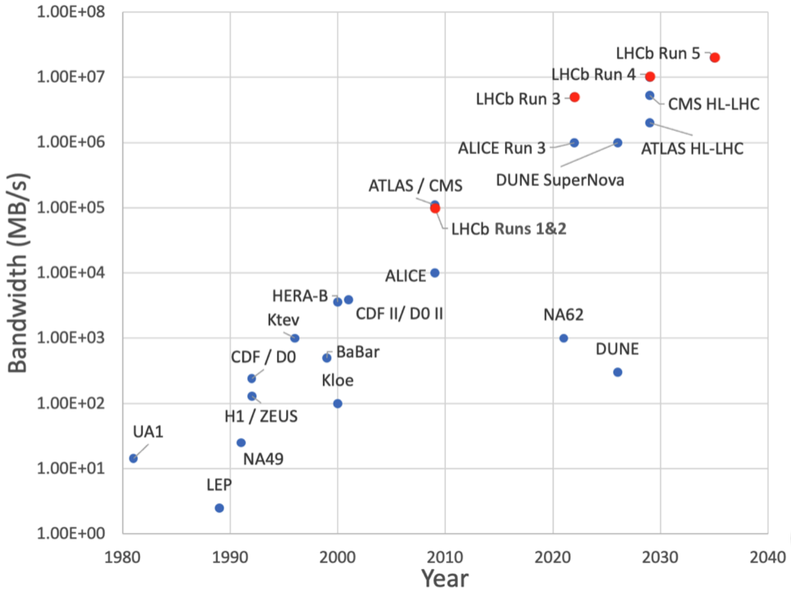
#127 LHCb-PUB-2025-004, "Computing and software for LHCb Upgrade II", arXiv:2503.24106

#148 LHCb-PUB-2025-003, "Heavy ion physics at LHCb Upgrade II", arXiv:2503.23093

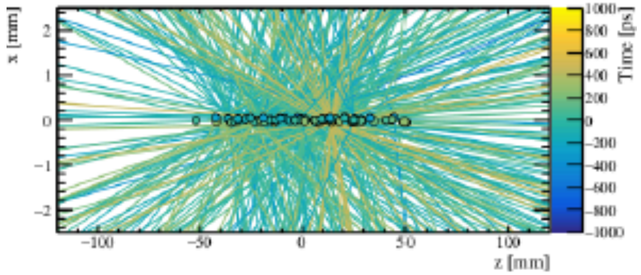
#213 "LHCspin: a Polarized Gas Target for LHC", arXiv:2504:16034

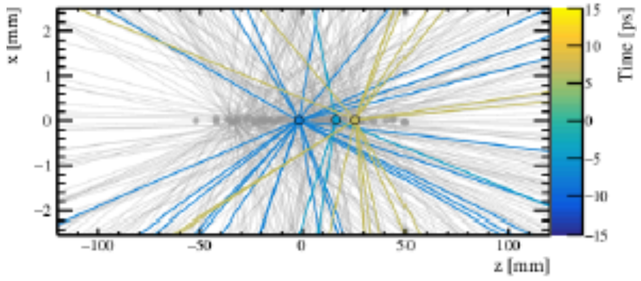
#223 "Projections for Key Measurements in Heavy Flavour Physics", arXiv:2503.24346

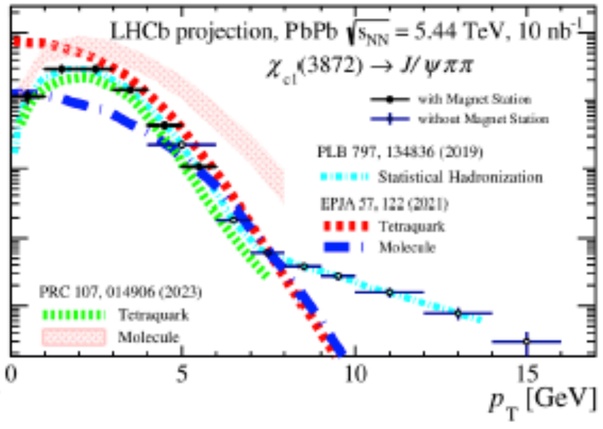
Observable	Current LHCb (up to 9 fb^{-1})	Upgrade I (23 fb^{-1})	Upgrade I (50 fb^{-1})	Upgrade II (300 fb^{-1})
CKM tests				
γ ($B \to DK$, *etc.*)	2.8°	1.3°	0.8°	0.3°
ϕ_s ($B_s^0 \to J/\psi\phi$)	20 mrad	12 mrad	8 mrad	3 mrad
$\lvert V_{ub}\rvert/\lvert V_{cb}\rvert$ ($\Lambda_b^0 \to p\mu^-\overline{\nu}_\mu$, *etc.*)	6%	3%	2%	1%
Charm				
ΔA_{CP} ($D^0 \to K^+K^-, \pi^+\pi^-$)	29×10^{-5}	13×10^{-5}	8×10^{-5}	3.3×10^{-5}
A_Γ ($D^0 \to K^+K^-, \pi^+\pi^-$)	11×10^{-5}	5×10^{-5}	3.2×10^{-5}	1.2×10^{-5}
Δx ($D^0 \to K^0_S\pi^+\pi^-$)	18×10^{-5}	6.3×10^{-5}	4.1×10^{-5}	1.6×10^{-5}
Rare decays				
$\mathcal{B}(B^0 \to \mu^+\mu^-)/\mathcal{B}(B_s^0 \to \mu^+\mu^-)$	69%	41%	27%	11%
$S_{\mu\mu}$ ($B_s^0 \to \mu^+\mu^-$)	—	—	—	0.2
$A_T^{(2)}$ ($B^0 \to K^{*0}e^+e^-$)	0.10	0.060	0.043	0.016
$S_{\phi\gamma}(B_s^0 \to \phi\gamma)$	0.32	0.093	0.062	0.025
$\alpha_\gamma(\Lambda_b^0 \to \Lambda\gamma)$	$^{+0.17}_{-0.29}$	0.148	0.097	0.038



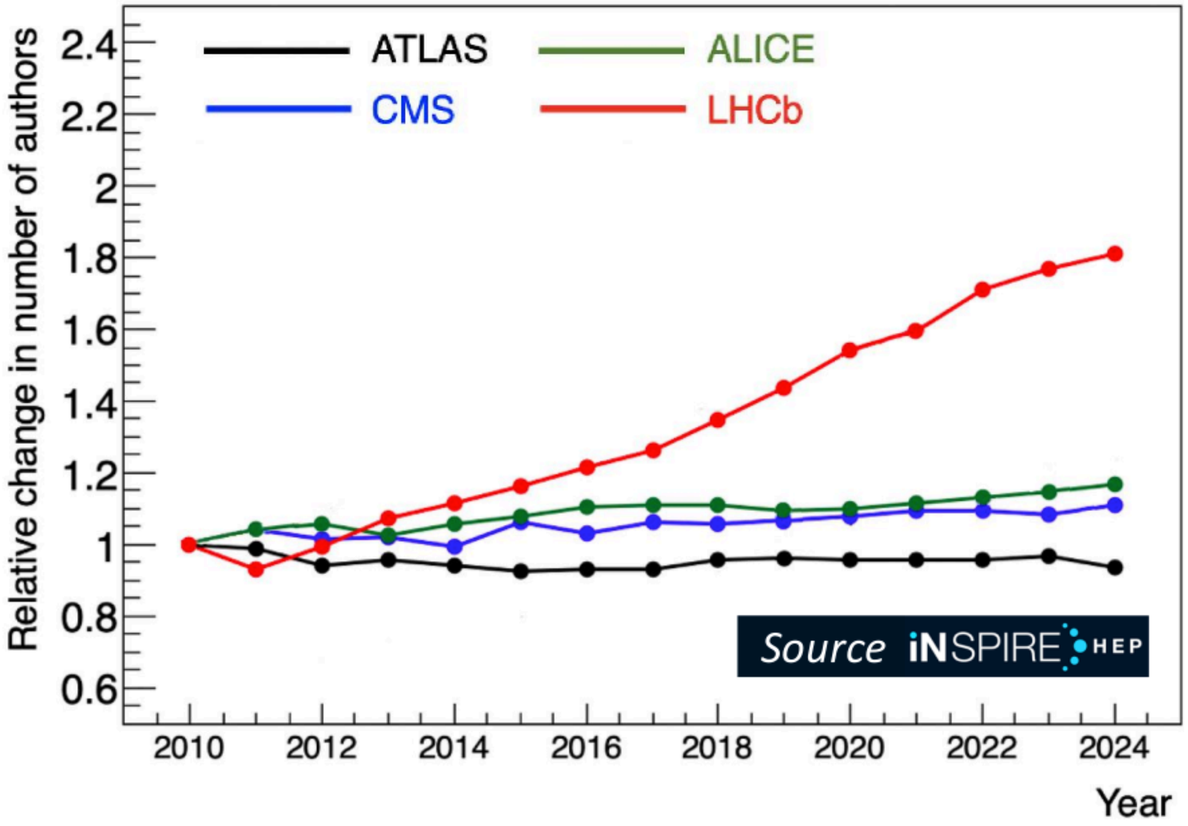
$\nu \sim 60$

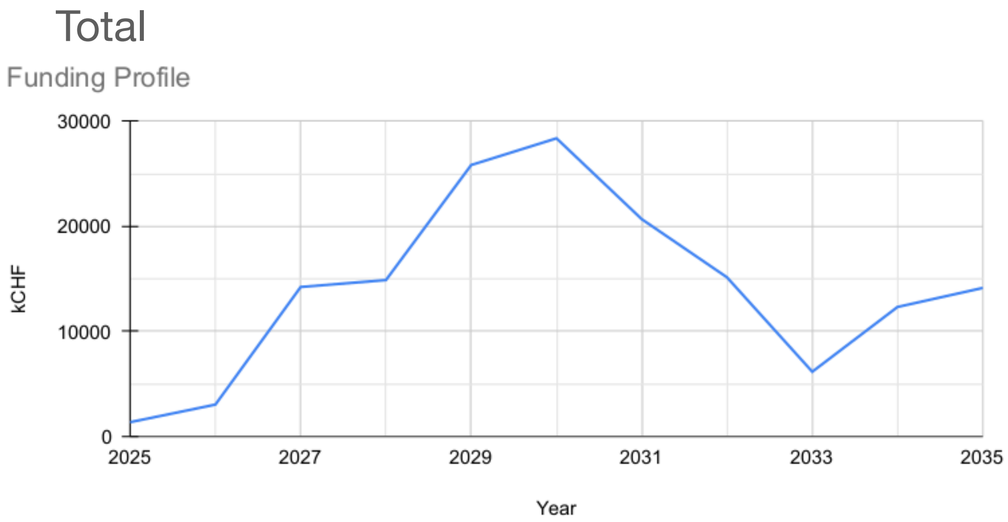


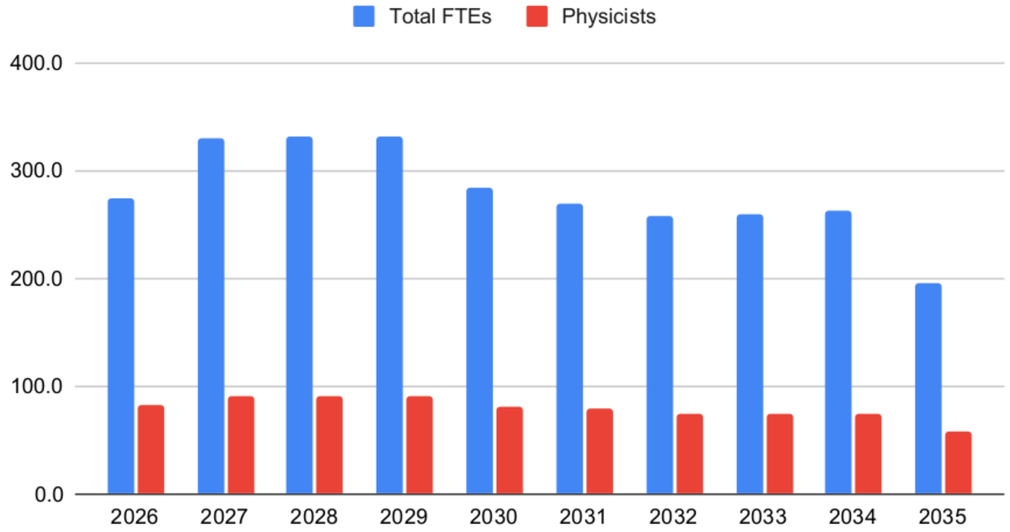




An encouraging current situation



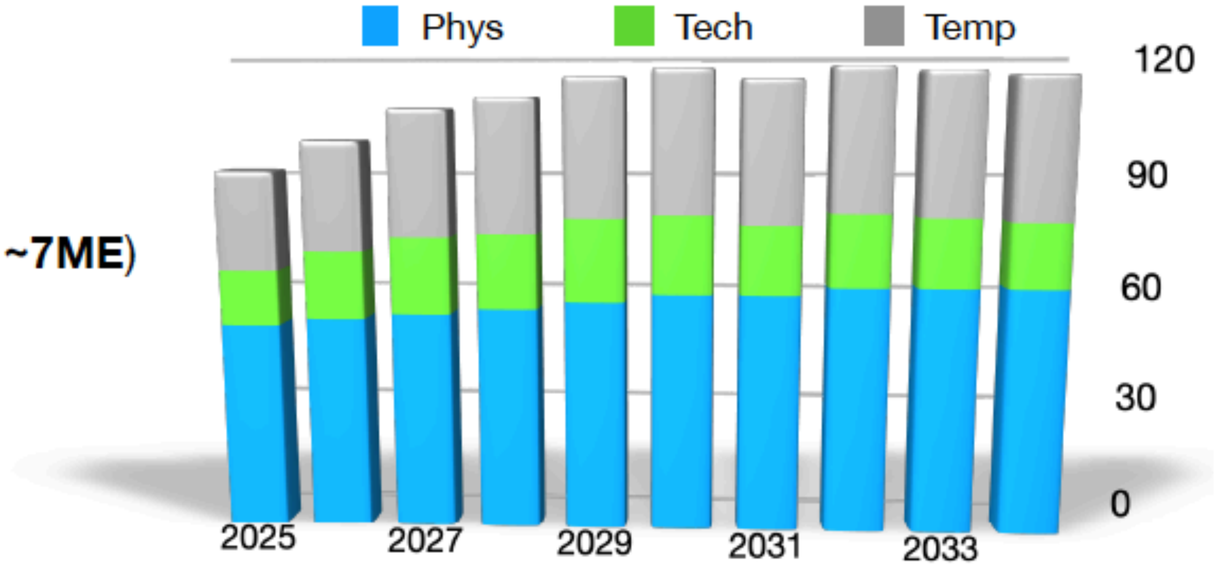


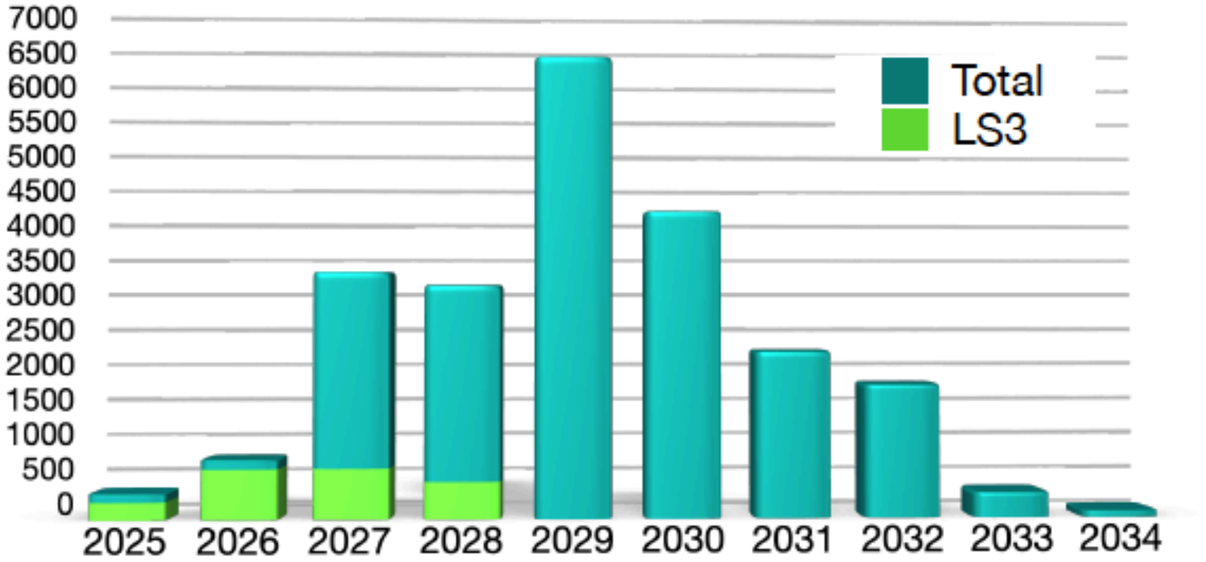


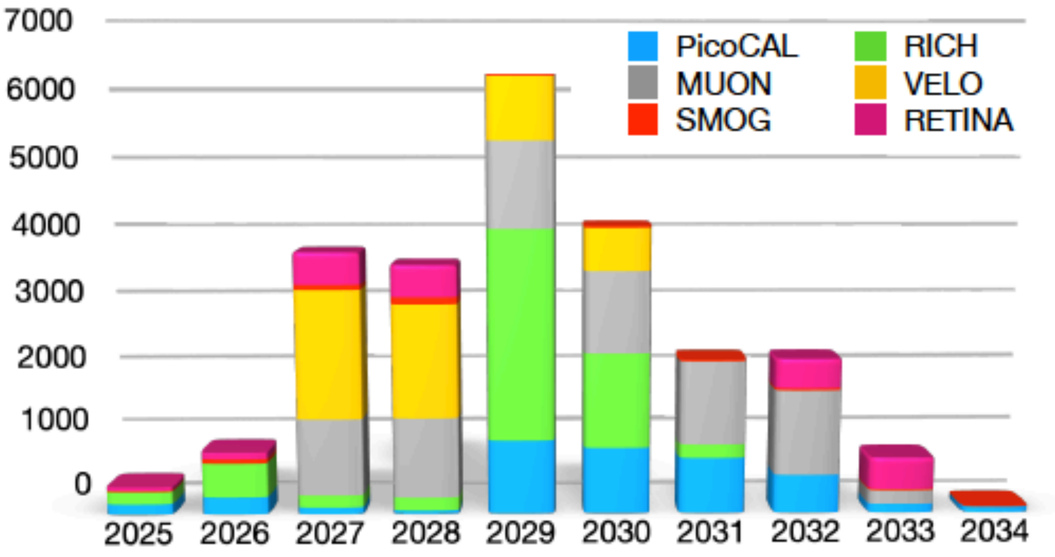
The required human power has been calibrated against Upgrade I
Challenging but plausible for a collaboration the size of LHCb (growing !)

Details on proposed italian participation in the document

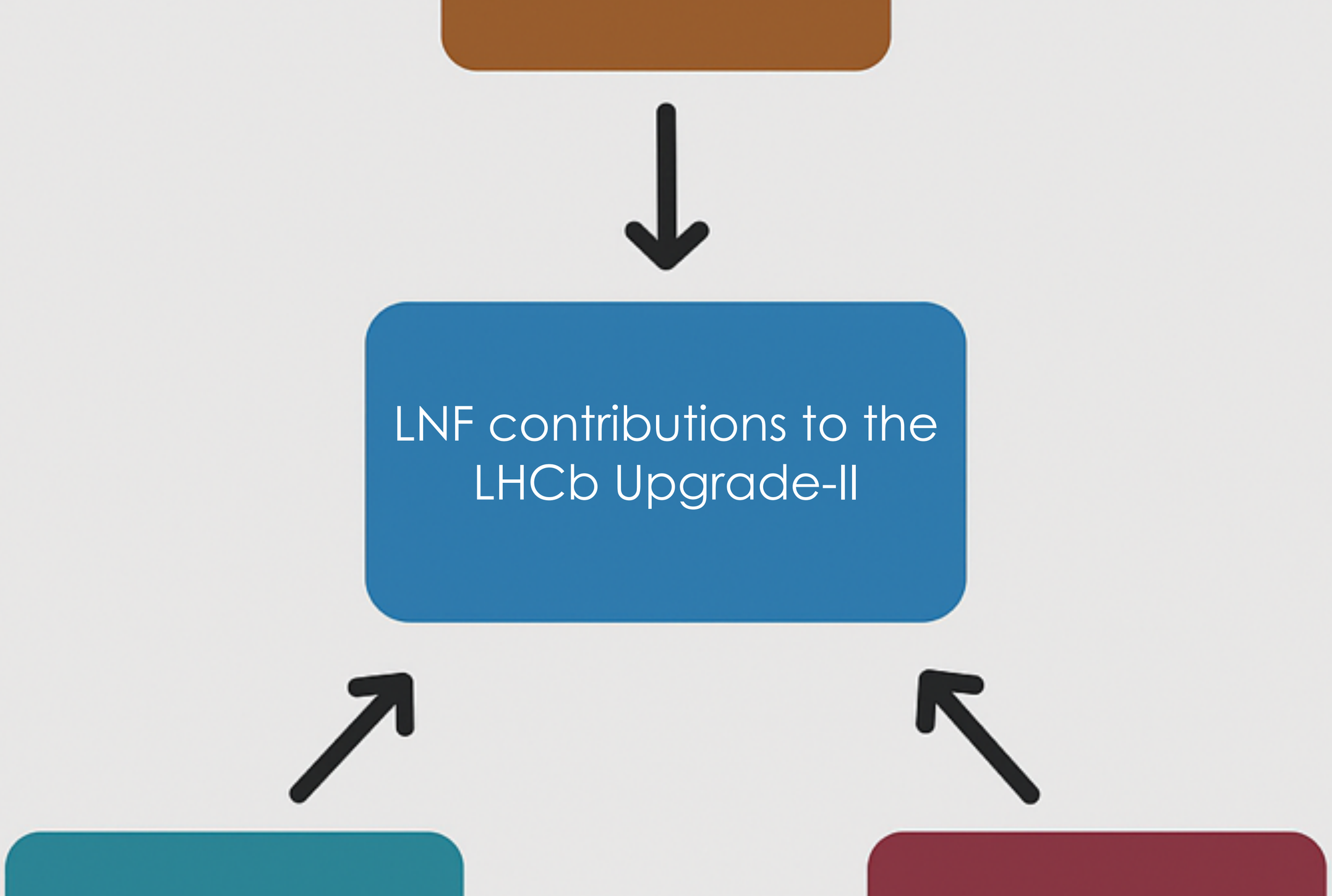
- Descrizione dettagliata di attivita', persone, costi
  - Divisi per sezione INFN e per progetto
- Con profilo temporale per tutta la durata (10y)
- Totale 'core': **22 ME** (+0.4 ME per SMOG)
  - Non include Common Funds (expected 25% of total: **~7ME**) ne' eventuali contratti ad-hoc
  - Frazione 17.8 % del 'Middle Scenario' (cambio 1.05)
- Sottoinsieme **LS3 Enhancement: 2.1 ME** (TDRs gia' approvati, partenza urgente)





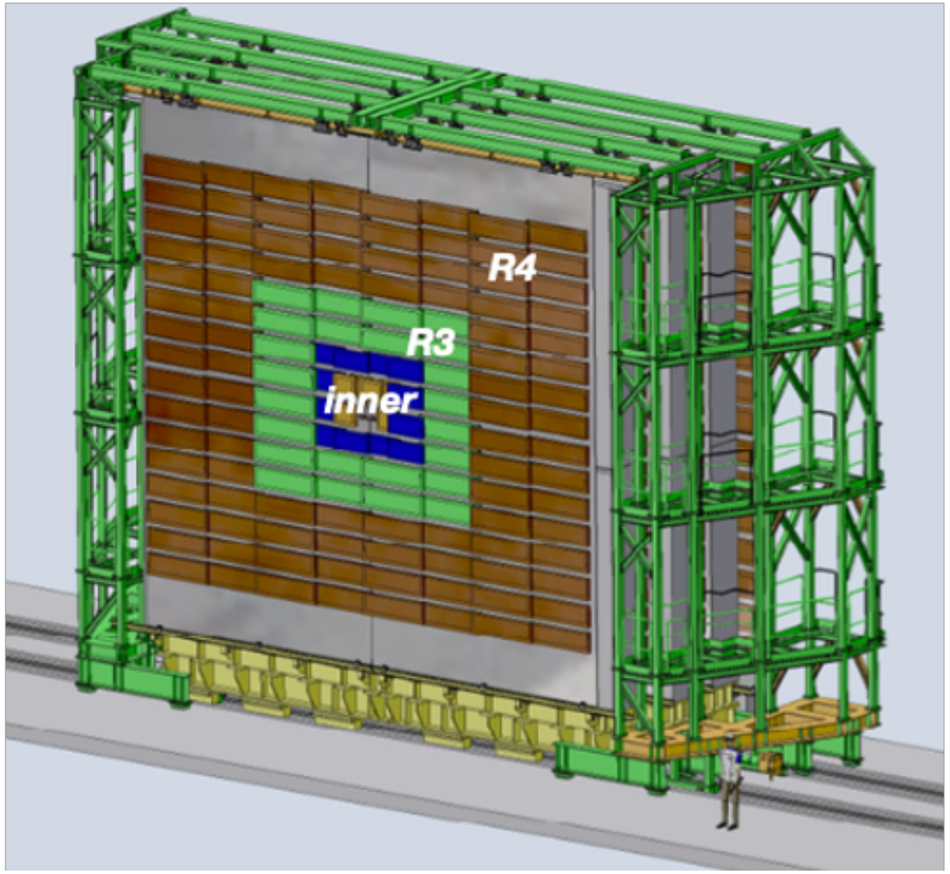


G.Punzi's slide at CSN1


LNF contributions to the
LHCb Upgrade-II

Muon

The main technical challenge lies in the substantial increase in readout rates, especially in the detector's inner region, leading to very high occupancy and rate-induced dead time



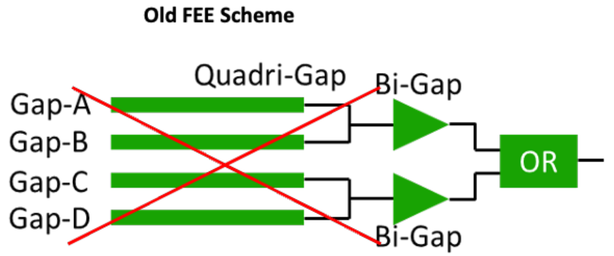
High rate effects are mitigated by:

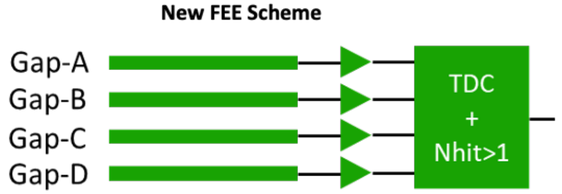
- increasing the granularity of the inner regions:
+ in R1-R2, use GRWELL (ex μRWELL) chambers
+ in R3, new higher granularity MWPCs

- in R4 (80% of detector area) keep current MWPCs: expected to provide adequate performance at Run 5

- additional iron-concrete shielding before M2

- use of a "majority logic" instead of the OR of the 4 gas gaps



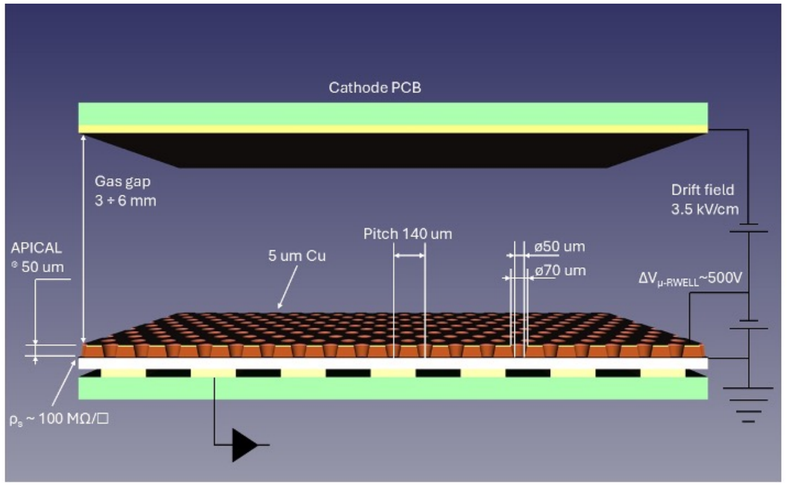


Replace of the detector readout to enable a new logic for combining signals from the four gas gaps. By requiring the presence of signals in at least two gas gaps (majority logic), a significant reduction in background can be achieved without noticeable inefficiency for muons. In addition new readout boards and dedicated control system boards are required (Bari, RM2)

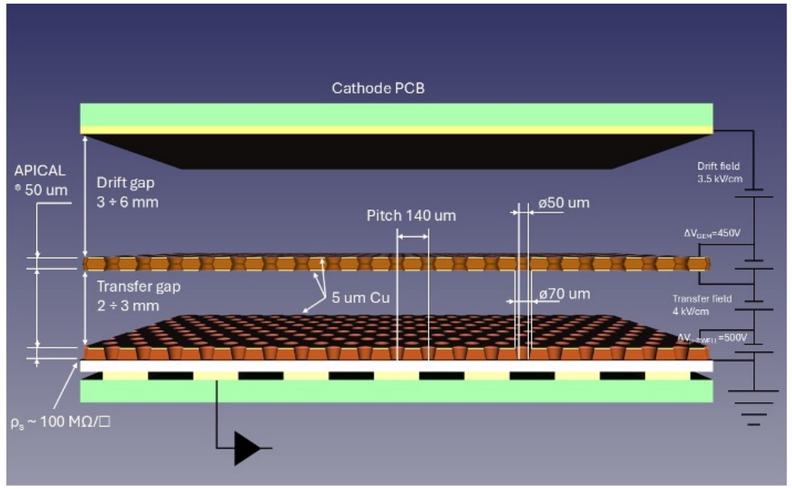
micro-RWELL for the Phase-II upgrade of LHCb Muon system

G. Bencivenni
E. De Lucia
M. Giovannetti
G. Morello
M. Poli Lener

From μ-RWELL to Hybrid G-RWELL



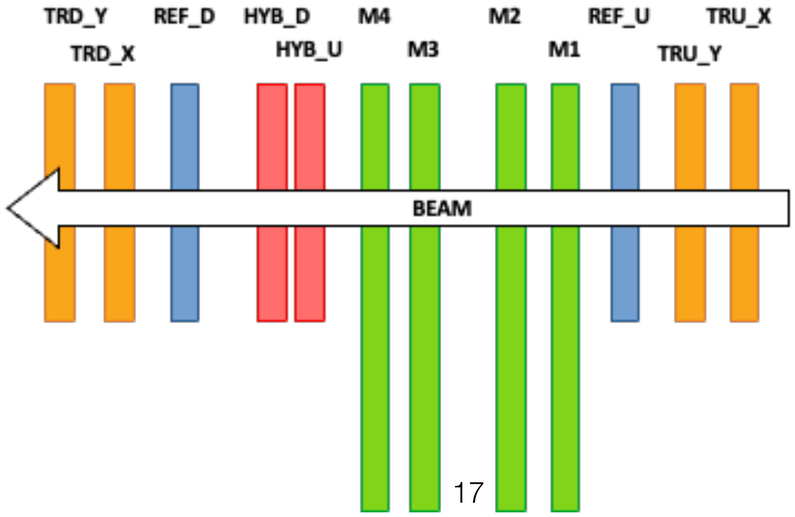
Classic μ-RWELL layout
Prototype tested: M2R1 - LHCb 250x300 mm^2



Hybrid layout → G-RWELL: double amplification stage
Prototype tested: 100x100 mm^2

Efficiency(25ns) ≥ 0.9 per single gap allows to have high efficiency per station (using chambers with 4 gaps and requiring at least 2 fired gaps fired per chamber station)

Intense R&D and test beam activities

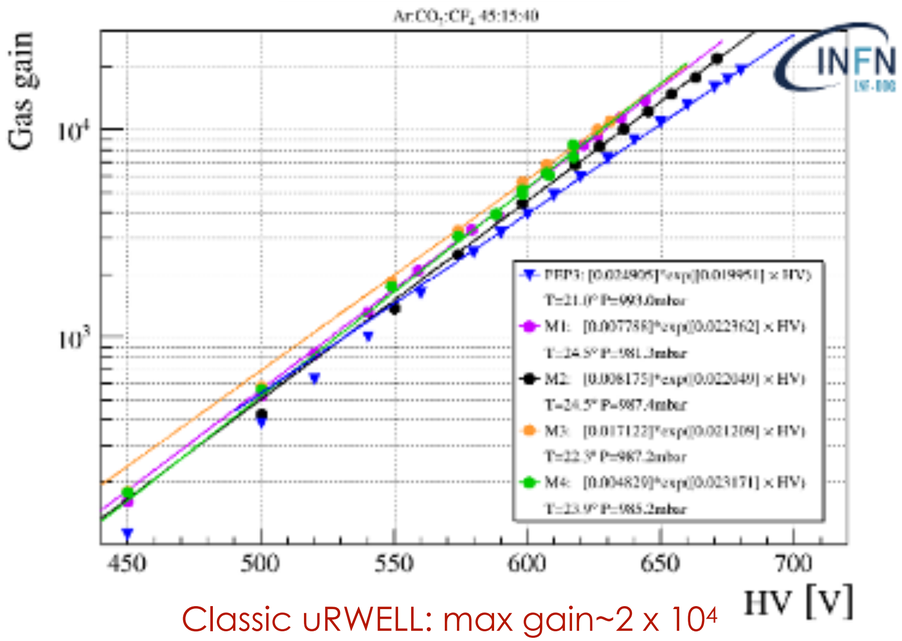


FEE: **16 FATIC3** FEE boards

Trackers: 10×10cm^2 - 1.2mm strip R/O (Capacitive Sharing)
Reference: 10×10cm^2 - 9×9mm^2 pad R/O
HYBRID: 10×10cm^2 - 9×9mm^2 pad R/O
M2R1: 30×25cm^2, instrumented 15×13cm^2 - 9×9mm^2 pad R/O
Gas MIXTURE: Ar/CO_2/CF_4 = 45/15/40

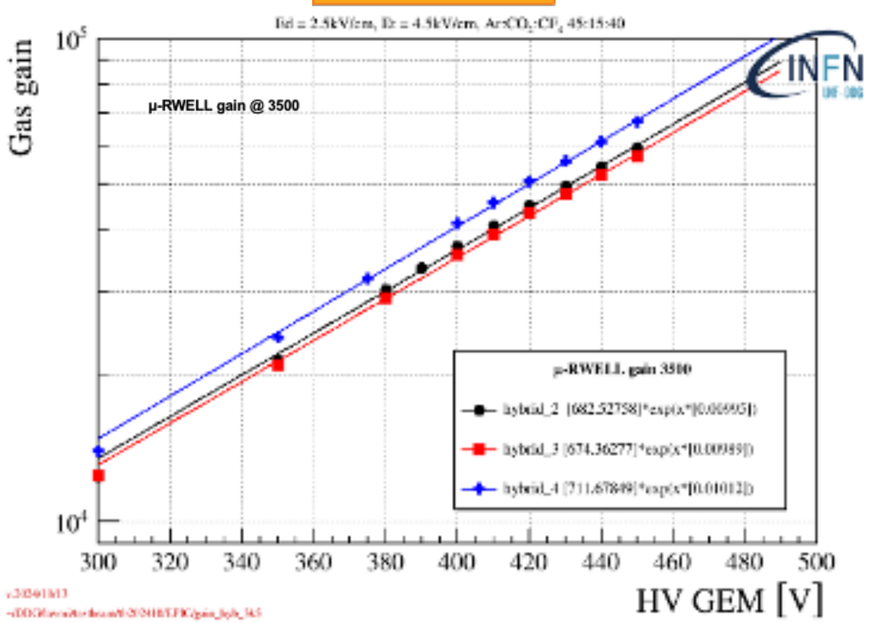
TB area: PS-T10 w/ 5 GeV muons

M1-M4 (M2R1-LHCb) - uRWELL

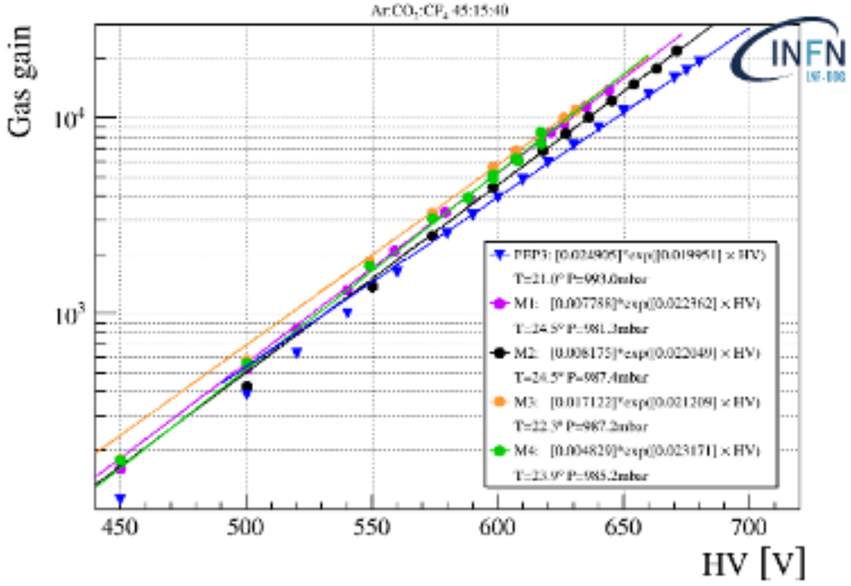


Classic uRWELL: max gain~2 x 10^4

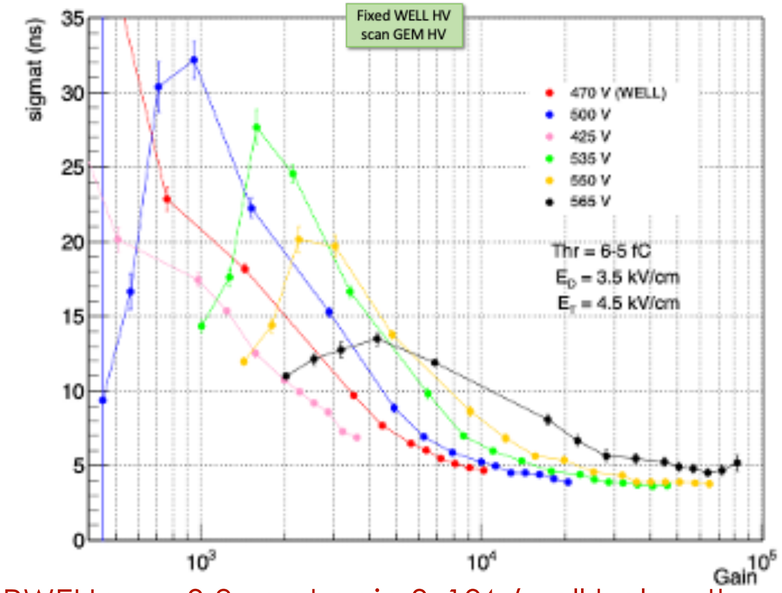
HYBRID



G-RWELL: max gain >> 10^4 (up to 10^5)



Classic uRWELL: σ_t ~ 5 ns at max gain 2x10^4



G-RWELL: σ_t ~ 3.8 ns at gain 3x10^4 (well below the max gain)

The implementation of a pre-amplification GEM stage to a classic μ-RWELL enables very stable operation at gas gains significantly greater than 10^4

The time performance of a G-RWELL is improved to as low as 3.8 ns

Next plans:

hybridization of the M2R1 and M2R2 and TB at CERN-PS with FATIC3 + TB at high rate (up to 1 MHz/cm2) at PSI with FATIC4 fee (dead-time 100 ns)

Optimization of the on-board HV distribution/gas distribution/fee-integration

DLC sputtering training

Contacts for detector engineering

Already groundbreaking results achieved

MWPC for LHCb U2

MWPC is a well-established, robust, and time-tested technology

The LHCb chambers have been operating perfectly since LHC Run 1

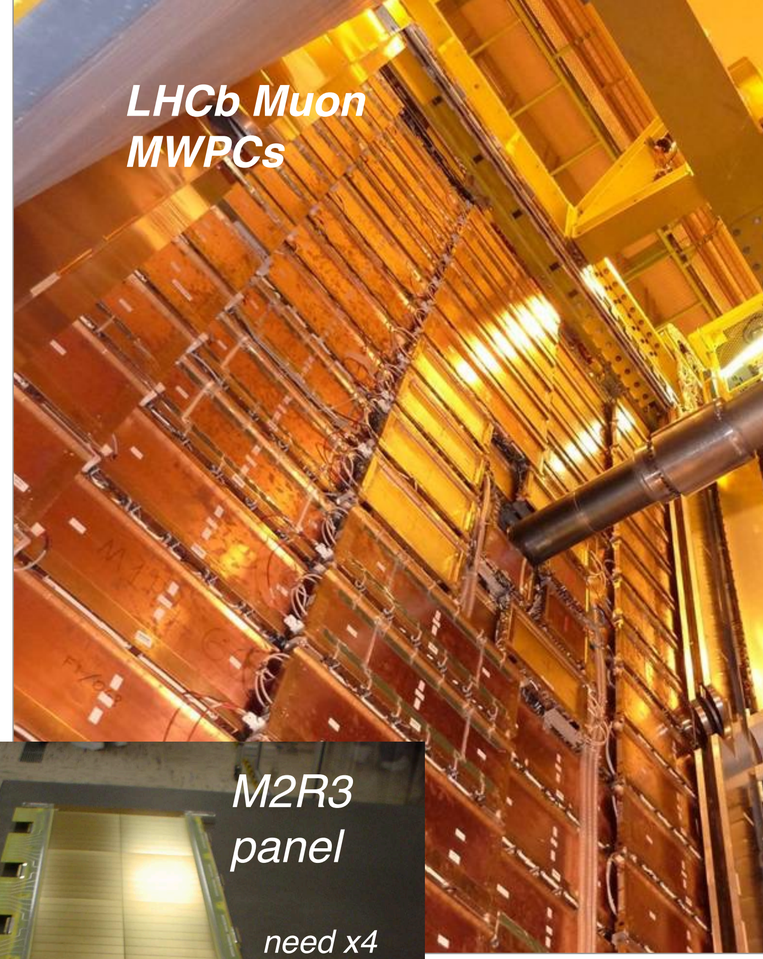
Drawback: complex construction process, which requires heavy manual work and full attention to many crucial mechanical details

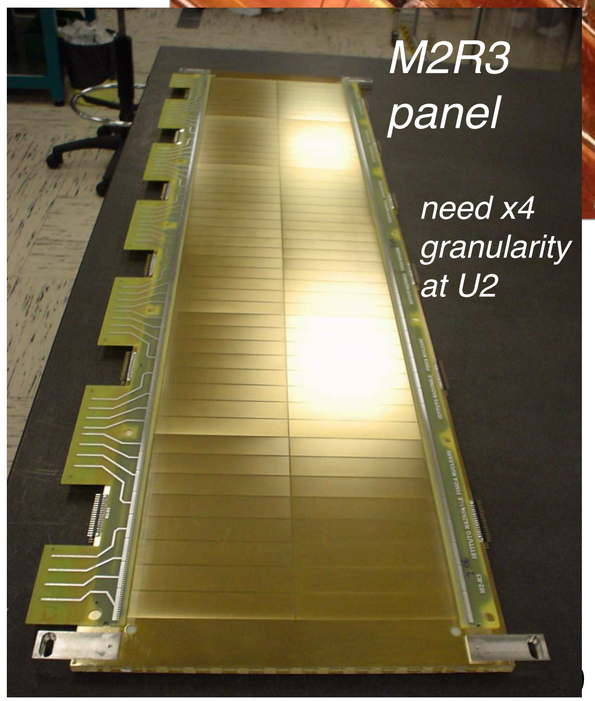
We have full control of the construction process at LNF, along with all the necessary tools from previous production runs (~400 chambers)

For U2, we need to build up to 200 new MWPCs (with 4 gaps) with higher granularity than the present ones

The Frascati team will maintain a leadership role in the MWPC project, regardless of the final decision on the production sites, which will be defined in the U2 Muon TDR (expected by the end of next year)

In the meantime, we are interested in opening new production sites outside Italy. We have organised a technology transfer session in Frascati in September 2025 with a team from Tbilisi State University (2 chambers will be built)





P. Albicocco
G. Bencivenni
P. Ciambrone
G. Morello,
M. Palutan
A. Paoloni

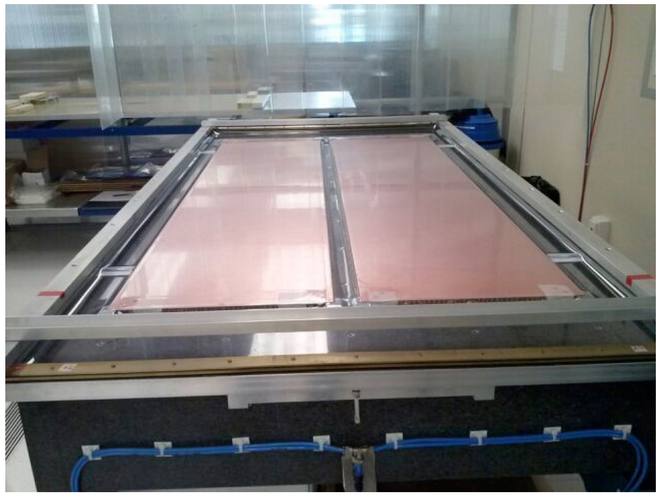
M. Gatta
E. Paoletti
G. Papalino
R. Tesauro

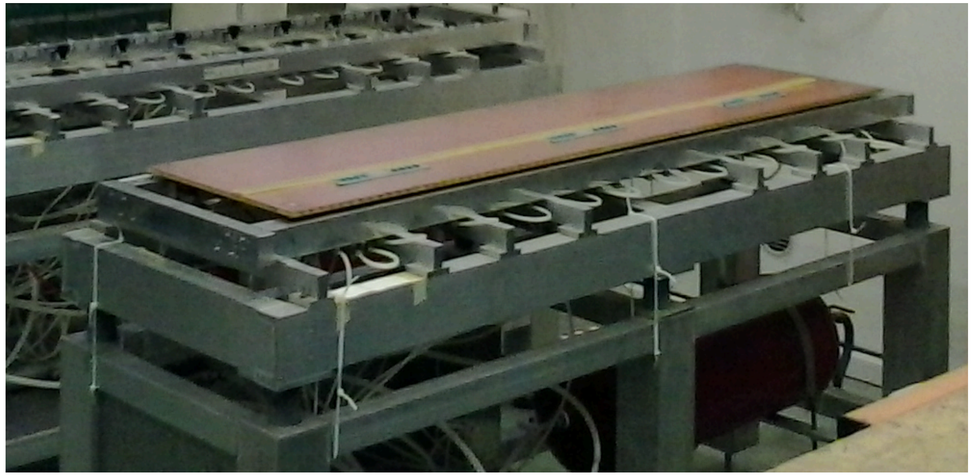
Chamber construction at LNF

We're restarting the production tools in building 28 and 29 for the September test

Construction steps

1. *Panel assembly (PCB+honeycomb) in the clean room*





2. *HV bars glued on the panels in the adjacent lab*

3. *Chamber wiring, HV test*

4. *Lateral bars are glued, and the 4 gaps are finally assembled*

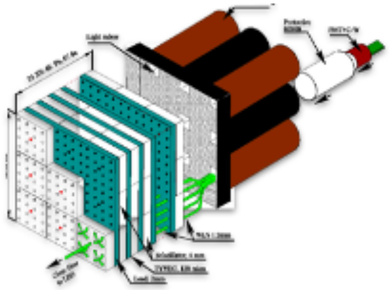
PicoCal (LHCb ECAL) … LHCb enhancement, to be completed in the LHC LS3

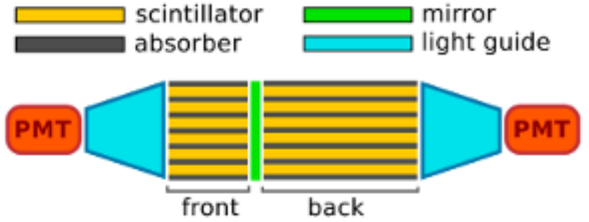
Current ECAL: Shashlyk modules 12×12 cm^2
- Plastic scintillators and WLS fibers
- Radiation-hard to 40 kGy

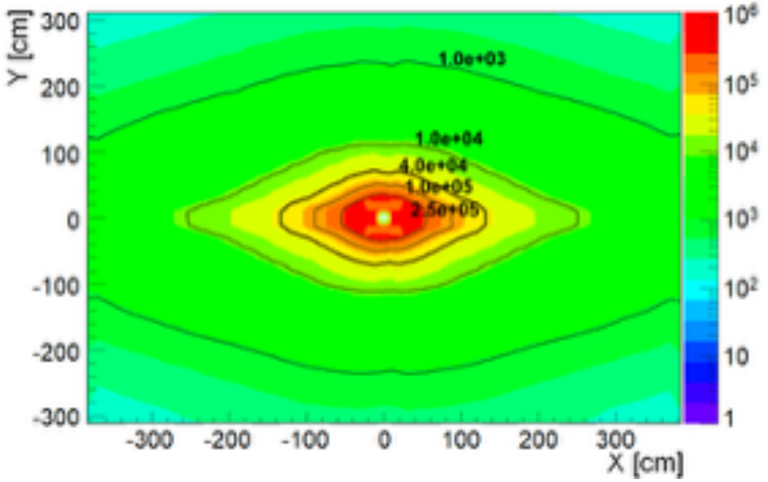
Upgrade II requirements:

- Instantaneous luminosity to **1.5×10^{34} cm^{-2} s^{-1}**
- Sustain radiation up to **1 MGy** and **6×10^{15} n/cm^2**
- Mitigate pile-up: Time resolution **O(20) ps**

Initial directions for ex-NA62 groups:
LNF: Plastic fibers for SpaCal
NA: Shashlyk reconditioning





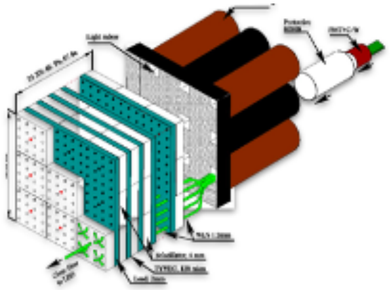


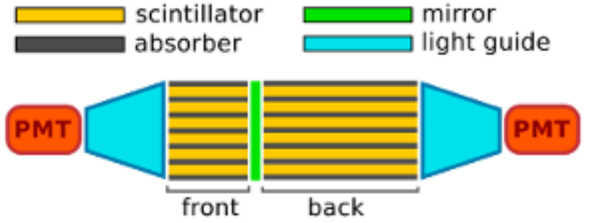
Inner region: SpaCal technology
- Innermost region:
  Tungsten absorber + crystal fibers
- Plastic fibers for Run 4
- Replaced with crystal in LS4
- Intermediate layers:
  Lead absorber + plastic fibers
- Develop radiation-tolerant plastic fibers

Outer region: Recondition shashlyk modules

PicoCal (LHCb ECAL) … LHCb enhancement, to be completed in the LHC LS3

Current ECAL: Shashlyk modules 12×12 cm²
- Plastic scintillators and WLS fibers
- Radiation-hard to 40 kGy





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- Instantaneous luminosity to **1.5×10^{34} cm^{-2} s^{-1}**
- Sustain radiation up to **1 MGy** and **6×10^{15} *n*/cm²**
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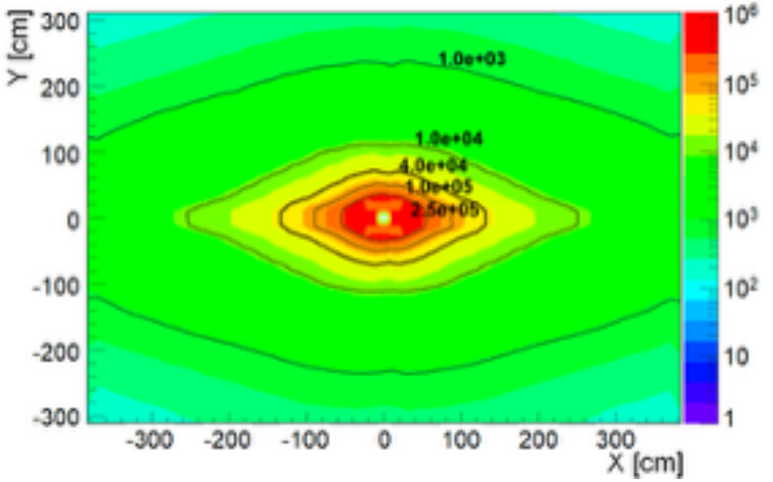
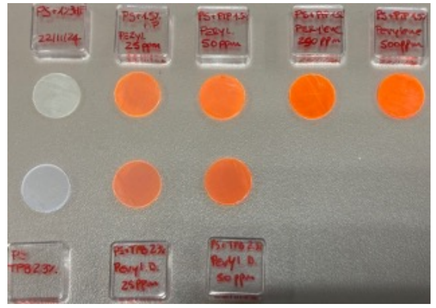
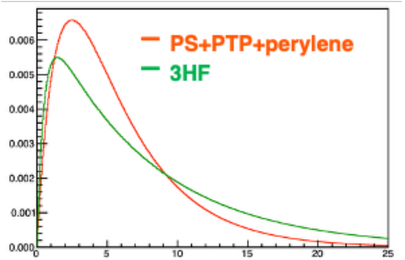


Initial directions for ex-NA62 groups:
LNF: Plastic fibers for SpaCal
NA: Shashlyk reconditioning

Activity @ LNF
Perylene-based orange plastic fibers for PicoCal





Advantage: Radiation hardness
Advantage: Faster light emission

Objectives of R&D project:
In collaboration with CERN and Milano Bicocca Materials Science, **manufacture, characterize, and test samples** of perlyene orange scintillator
Irradiate samples at IRRAD
Construct and test SpaCal prototype:
- **750 m** of perylene-based fiber **currently in production** at Kuraray, to be delivered in July
- Ready to assemble fibers into SpaCal module for **upcoming test beam**

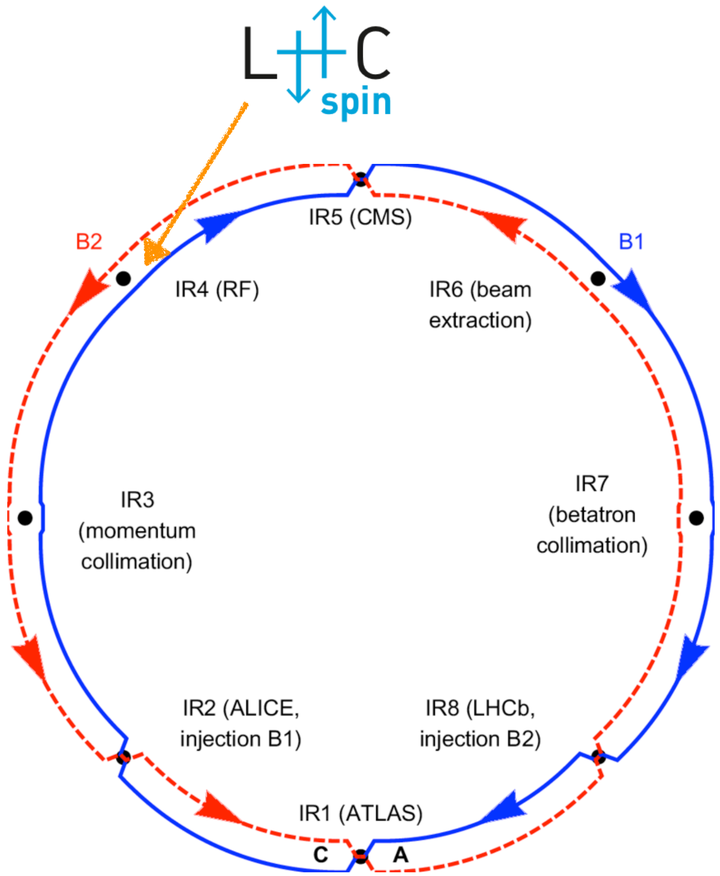
LHCspin

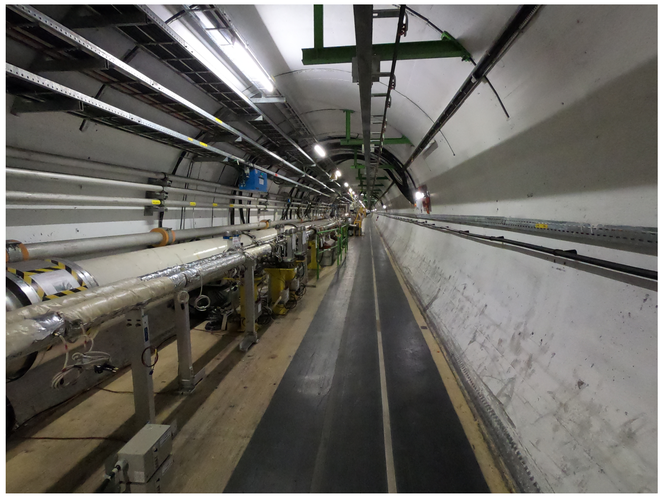
PDN Project Leader: Frascati, Ferrara, Torino … and many other institutions

We have the opportunity to explore a wide range of new physics scenarios at the LHC by enabling polarized collisions in previously unexplored kinematic regions and by employing novel probes that have not been used so far

The LHC beams cannot be polarized. The only possibility to have polarized collisions is through a polarized fixed-target.

SMOG2 demonstrates the feasibility of employing a gas target with a storage cell along LHC in LHCb





The project implies the R&D for a new generation target system (+unique measurements) at the LHC-IR4, and then to be part of LHCb for the Upgrade-II

The cost is extremely reduced by the existence of a polarized target system to be done compliant with LHC+LHCb

E. De Lucia, P. Di Nezza, M. Rotondo, M.Santimaria arXiv:2504:16034

Servizi laboratorio: CIF secondo semestre 2025 - si stimano richieste simili nei prossimi anni

SEM - Progettazione

RICHIESTE II SEMES. 2025			ASSEGNATE		PRIORITY		Note: Priority -> 1= High 2= Medium 3= Low
LHCb (P.Di Nezza)	1,5	12%	1,5	12%	1	1	Progettazione meccanica di cui 1 settimana di missione al CERN per passaggio consegne da Saputi (disegn. di LHCb1)

DDEAS - Sviluppo e costruzione riv.

			richiesta					proposta		
Esperimento	Richiedente	Descrizione	m.u	Prior.	Tecnici	%	Reparto	m.u.	Prior.	Commenti
lhcb	Di Nezza	Incollaggi n.4 GEM per M2R1 e n.4 GEM per M2R2 + n.4 Catodi M2R2	1,0	high	Tesauro	20%	D.D.Unit	0,5	1	U2 LHCb - TB Oct/Nov 2025
			1,0	high	Paoletti	20%	D.D.Unit	0,5	1	
		test wiring MWPC per TT to Georgia	1,5	high	Tesauro	30%	D.D.Unit	1,5	1	fU2 LHCb
			1,5	high	Paoletti	30%	D.D.Unit	1,5	1	
		missione CERN per sputtering DLC (training + produzione)	0,5	high	Russo	10%	D.D.Unit	0,5	1	nov. 2025
			0,5	high	Tesauro	10%	D.D.Unit	0,5	1	nov. 2025

SEA II Semestre 2025

Esperimento	Progettazione Elettronica	CAD	Automazione	Staff	TOTALE	PRIORITA' CIF
LHCb	0.0	2.5	1.0	1.0	3.0	Alta+Media

SPCM

PREVISIONE

Priorità	**PROGETTAZIONE**	**M.U.**	mesi =	6	personale =	1	**M.U. disponibili*= 5,0**
2	LHCB	0,25	stampa 3D n.16 HV box				

10 International Responsibilities

Cognome	Nome	LHCb	Altro	Totale	Job	Qualifica	Note	
Albicocco	Pietro	60	10	70	tecn	Tecn	10% IGNITE	
Bencivenni	Giovanni	70		70	staff	I Ric		
Campana	Pierluigi	50		50	Pens	Dir Ric		
Chulikov	Vladimir	100		100	dott	Ass Ric		
Ciambrone	Paolo	60	20	80	tecn	Dir Tecn	20% IGNITE	
De Lucia	Erika	70		70	staff	I Ric		
De Simone	Patrizia	95	5	100	staff	I Ric	5% PRIN_2022N4W8WR	
Di Nezza	Pasquale	90	10	100	staff	I Ric	10% PRIN_2022JS5NYY	
Felici	Giulietto	30		30	Pens	Dir Tecn		
Giovannetti	Matteo	100		100	pdoc	Ass Ric		
Lanfranchi	Gaia	100		100	staff	I Ric		
Martellotti	Silvia	20		20	staff	Ric		
Minucci	Elisa	100		100	pdoc	Ass Ric		
Morello	Gianfranco	70		70	staff	Ric		
Moulson	Mattew	20		20	staff	I Ric		
Palutan	Matteo	100		100	staff	Dir. Ric		
Paoloni	Alessandro	30		30	staff	I Ric		
Pepe Altarell	Monica	100		100	Pens	PA		
Poli Lener	Marco	70		70	tecn	Tecn		
Rotondo	Marcello	80	10	90	staff	I Ric	10% PRIN_2022N4W8WR	
Santimaria	Marco	100	0	100	staff	Ric		
Sciascia	Barbara	95	5	100	staff	I RIc	5% PRIN_2022N4W8WR	
Spadaro	Tommaso	20		20	staff	I RIc		
				16,9				
			FTE/pers	73,5				

Electronic Coordinator for U2
Simulation Project Convener + Muon@U2 TB data analysis coordinator

SMOG Project Leader

Long-Lived Particles LPCC-CERN convener

Institute Board Chair

Muon@U2 detector coordinator

Deputy Muon system
Project Leader Muon + Membership Committee Chair

Capitolo	Descrizione	Parziali (K-EUR)	Parziali SJ (K-EUR)	Totale/Cap (K-EUR)
consumo	SMOG2, consumo gas e manutenzione Gas Fill System (GFS) presa dati 2026	4.00	0.00	101.5
consumo	RD_FLAVOUR: MUON@U2 (DRD1-WP1): Produzione del Proto0 4 gas-gaps	50.00	0.00	101.5
consumo	RD_FLAVOUR: MUON@U2 (DRD1-WP1): Studi sui PCB (U2-R&D - DRD1)	10.00	0.00	101.5
consumo	RD_FLAVOUR: PICOCAL@U2: n. 2 produzione custom fibre scintillanti	12.00	0.00	101.5
consumo	Metabolismo Consumo	25.50	0.00	101.5
interno	1 MU per lavori YETS 2025-26 su SMOG2	4.00	0.00	242.5
interno	3 MU per lavori YETS 2025-26 su Muon System e turni piquet MUON	11.00	0.00	242.5
interno	MUON@U2: turni presso la DLC machine al CERN, training di tecnici per operarare la DLC: 12 settimane, 1kE/settimana	12.00	0.00	242.5
interno	MUON@U2: Contatti per Trasferimento Tecnologico con ditta ELTOS per costruzione rivelatori	3.00	0.00	242.5
interno	MUON@U2: Test beam alta rate al PSI: 14 gg (si richiede contributo per soli tecnici) + trasporto 2 autistix3gg x2 (a/r)	8.50	0.00	242.5
interno	RD_FLAVOUR, PICOCAL@U2: 1 settimana 1 tecnico per test beam al cern	1.00	0.00	242.5
interno	Responsabilita'	61.00	0.00	242.5
interno	Metabolismo MI	17.00	0.00	242.5
interno	Metabolismo ME per meeting di collaborazione e turni di presa dati per 16.90 FTE	125.00	0.00	242.5
spservizi	MOF-B MUON	86.00	0.00	86
Totale	/	0	0	430

Total request for 2026:
430 kE
of which 95.6 kE are for the upgrade

Cognome	Nome	LHCb	Altro	Totale	Job	Qualifica	Note
Albicocco	Pietro	60	10	70	tecn	Tecn	10% IGNITE
Bencivenni	Giovanni	70		70	staff	I Ric	
Campana	Pierluigi	50		50	Pens	Dir Ric	
Chulikov	Vladimir	100		100	dott	Ass Ric	
Ciambrone	Paolo	60	20	80	tecn	Dir Tecn	20% IGNITE
De Lucia	Erika	70		70	staff	I Ric	
De Simone	Patrizia	95	5	100	staff	I Ric	5% PRIN_2022N4W8WR
Di Nezza	Pasquale	90	10	100	staff	I Ric	10% PRIN_2022JS5NYY
Felici	Giulietto	30		30	Pens	Dir Tecn	
Giovannetti	Matteo	100		100	pdoc	Ass Ric	
Lanfranchi	Gaia	100		100	staff	I Ric	
Martellotti	Silvia						
Minucci	Elisa						
Morello	Gianf						
Moulson	Matte						
Palutan	Matte						
Paoloni	Aless						
Pepe Altarell	Moni						
Poli Lener	Marc						
Rotondo	Marc						
Santimaria	Marc						
Sciascia	Barba						
Spadaro	Tomn						

10 International Responsibilities

Electronic Coordinator for U2
Simulation Project Convener + Muon@U2 TB data analysis coordinator

SMOG Project Leader

Long-Lived Particles LPCC-CERN convener

The LNF LHCb group is large and active, playing a key role in both the daily operations and the scientific output of the experiment. Our contributions to Upgrade-II are essential for developing the next-generation detector that will push physics to the highest frontiers throughout the LHC lifetime.

All Upgrade II activities at LNF rely on the support of the laboratory, its infrastructure, services, and dedicated staff … whom we warmly thank!

Capitolo	Descrizione			
consumo	SMOG2, cons			
consumo	RD_FLAVOUR			
consumo	RD_FLAVOUR			
consumo	RD_FLAVOUR			
consumo	Metabolismo			
interno	1 MU per lavo			
interno	3 MU per lavori YETS 2025-26 su Muon System e turni piquet MUON	11.00	0.00	242.5
interno	MUON@U2: turni presso la DLC machine al CERN, training di tecnici per operarare la DLC: 12 settimane, 1kE/settimana	12.00	0.00	242.5
interno	MUON@U2: Contatti per Trasferimento Tecnologico con ditta ELTOS per costruzione rivelatori	3.00	0.00	242.5
interno	MUON@U2: Test beam alta rate al PSI: 14 gg (si richiede contributo per soli tecnici) + trasporto 2 autistix3gg x2 (a/r)	8.50	0.00	242.5
interno	RD_FLAVOUR, PICOCAL@U2: 1 settimana 1 tecnico per test beam al cern	1.00	0.00	242.5
interno	Responsabilita'	61.00	0.00	242.5
interno	Metabolismo MI	17.00	0.00	242.5
interno	Metabolismo ME per meeting di collaborazione e turni di presa dati per 16.90 FTE	125.00	0.00	242.5
spservizi	MOF-B MUON	86.00	0.00	86
Totale	/	0	0	430

6:

of which 95.6 kE are for the upgrade

Backup

Upgrade II schedule

Run 3			LS3			Run 4				LS4		Run 5					
2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
TDR phase			Construction phase							Installation		Exploitation