

DocID	Rev.	Validità
INFN-CSN3-QA-EPIC-100.OO	1.0	Final

Data 7/06/2024

Letter of Intent  
Richiesta di passaggio a sigla di esperimento ePIC  
da parte della sigla di networking EIC\_NET

## EIC\_NET to ePIC: Introduction

P. Antonioli (INFN Bologna)

Meeting with CSN3 INFN Referees  
10/6/2024

## Table of Contents

This meeting is not about the status of R&D

- [Introduction](#)
    - [Essential timeline of the EIC project](#)
    - [Miscellanea useful references](#)

we'll know to CSN3 referees
  - [Status of the EIC project](#)
  - [Status of the ePIC experiment](#)
  - [The INFN contribution to the ePIC Collaboration](#)
    - [Roles in the Collaboration](#)
    - [Key physics interests](#)
    - [Direct contributions to ePIC detectors: dRICH, GEM- \$\mu\$ RWELL, SVT](#)
    - [Streaming readout](#)
    - [Computing](#)
    - [Involvement of the Italian theoretical community](#)
    - [Beyond ePIC: the EIC User Group](#)
    - [The INFN In-Kind Contribution \(IKC\)](#)
      - [dRICH \(BA BO CS CT FE GE LNS RM1 RM-TV SA TO TS\)](#)
      - [GEM- \$\mu\$ RWELL \(CT GE RM-TV\)](#)
      - [SVT \(BA PD PV TS\)](#)

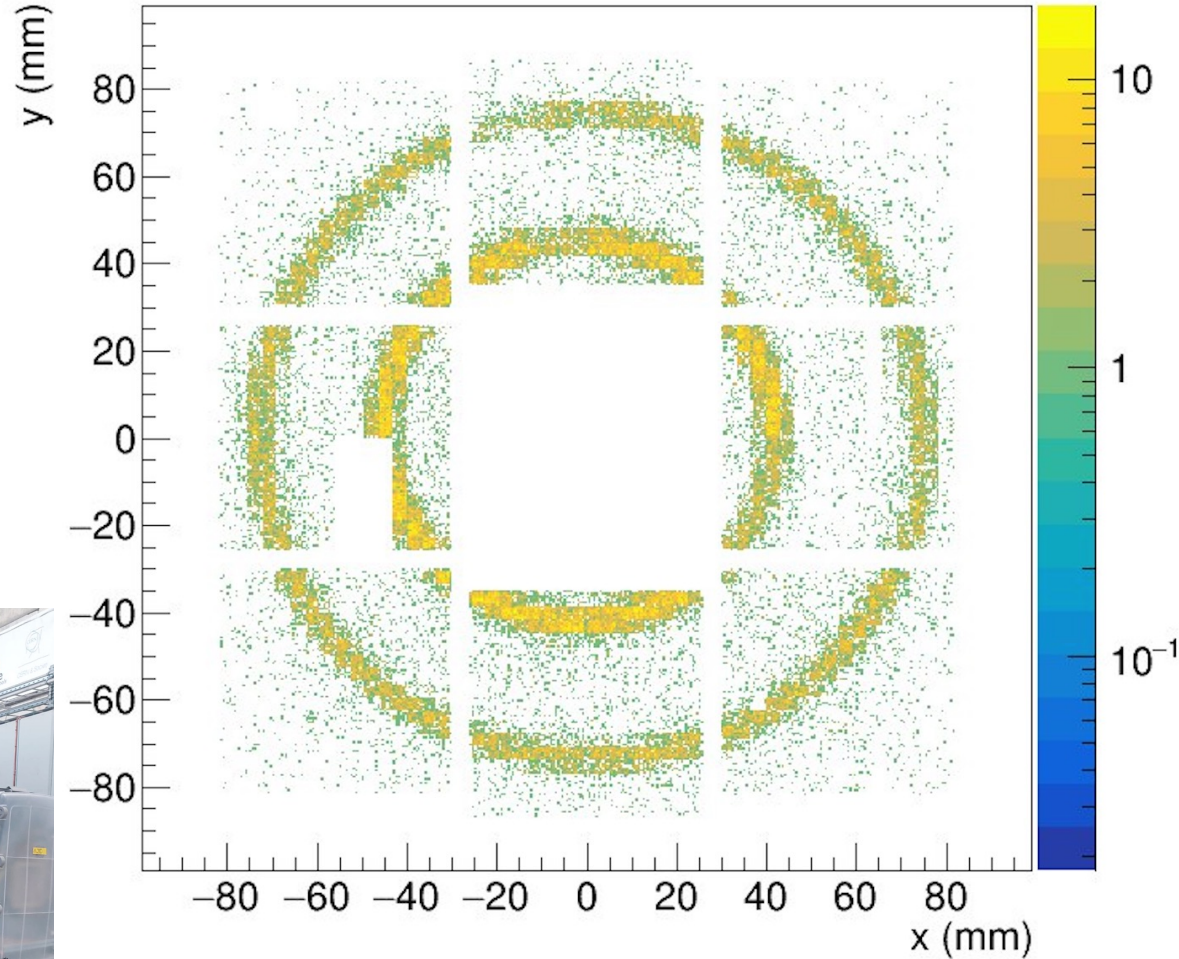
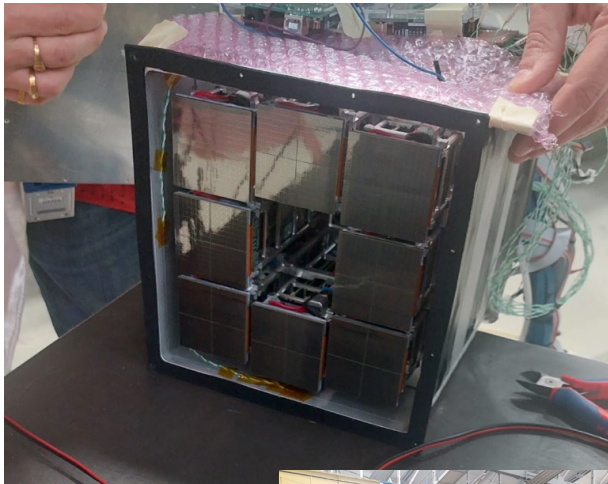
this talk, key news from May 2024 RRB

this talk ( quickly)

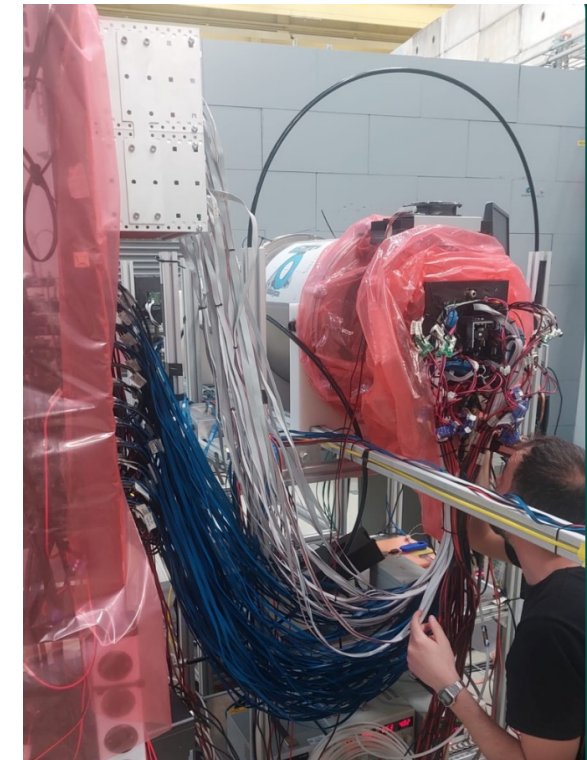
see Marco, Domenico, Annalisa talks
  - [INFN ePIC groups: composition and FTE](#)
  - [Financial plan](#)
  - [Key synergies with other INFN projects: ALICE and JLab](#)
  - [International Cooperation Agreement with DOE and Project Planning Document](#)
- this talk, as requested from referees + CSN3 chair

# Not about the status of R&D but...

May – June 2024 dRICH test beam  
> 2000 channels instrumented



aerogel  $n=1.02$   
gas  $C_2F_6$   
negative beam 1.1 GeV



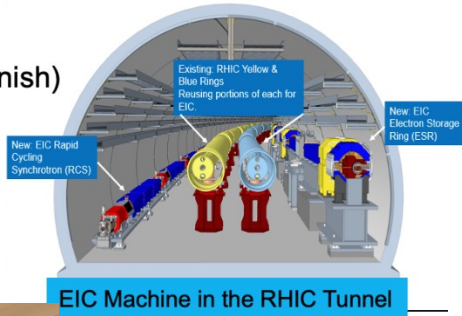
# Status of the EIC project



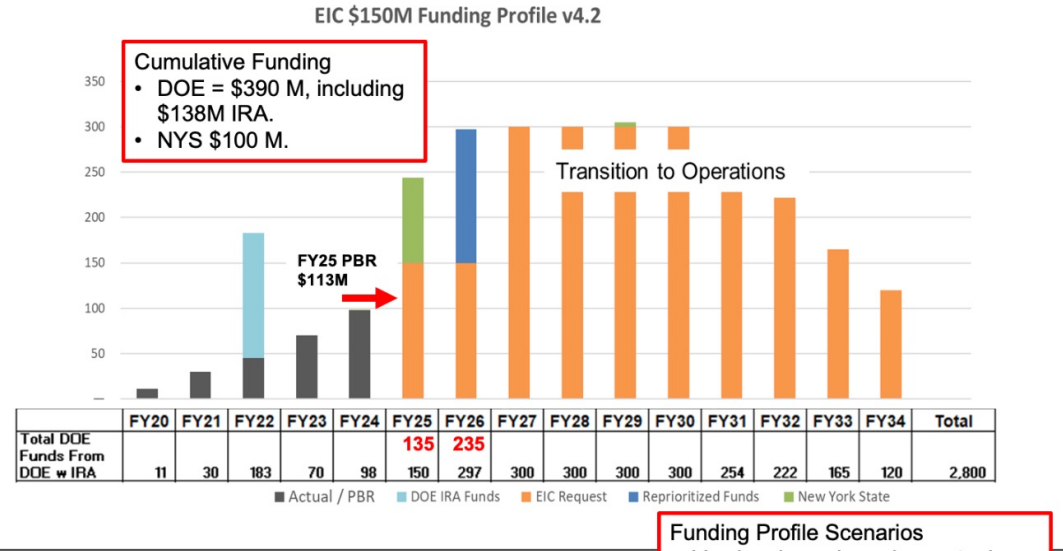
Jim Yeck at [May RRB](#)

## EIC Project Planning Snapshot

- CD-1 Alternative Selection and Cost Range= \$1.7-2.8B
- Current TPC Point Estimate = \$2.78B
- Plan for Critical Decision Approval Milestones (*Funding Dependent*)
  - Mar 2025 CD-3B, Long-Lead Procurement (Plan)
  - End 2025 CD-2/3, Performance Baseline/Construction Start (Target)
    - The goal is CD-2/3 before RHIC concludes in 2025
    - CD-3A,B,C,...enables procurement, not construction
  - 2026 CD-3 Start of Construction
  - 2033 CD-4 Start of Operations (Early Finish)
  - 2035 CD-4 Start of Operations



EIC Machine in the RHIC Tunnel



Funding Profile Scenarios

- Version 4 was based on actuals through FY23 (PBR) and forecasts.
- RHIC ops funding starts to be repurposed to EIC in FY2026.

Electron-Ion Collider  
EIC RRB Meeting May 6-7, 2024

J. Yeck

12

Date	What and commentary
2030, October	Detector to be ready on the floor
2031	Accelerator starts, machine studies only
Late 2032/2033 <sup>1</sup>	CD-4A (early CD-4) first stable beams physics run
2033-2034	EIC not working at full luminosity. E-ions runs likely to be exploited first. A rich physics program will be already explored thanks to the unique characteristics of the machine
2034	CD-4 ("project completion") accelerator at design parameters

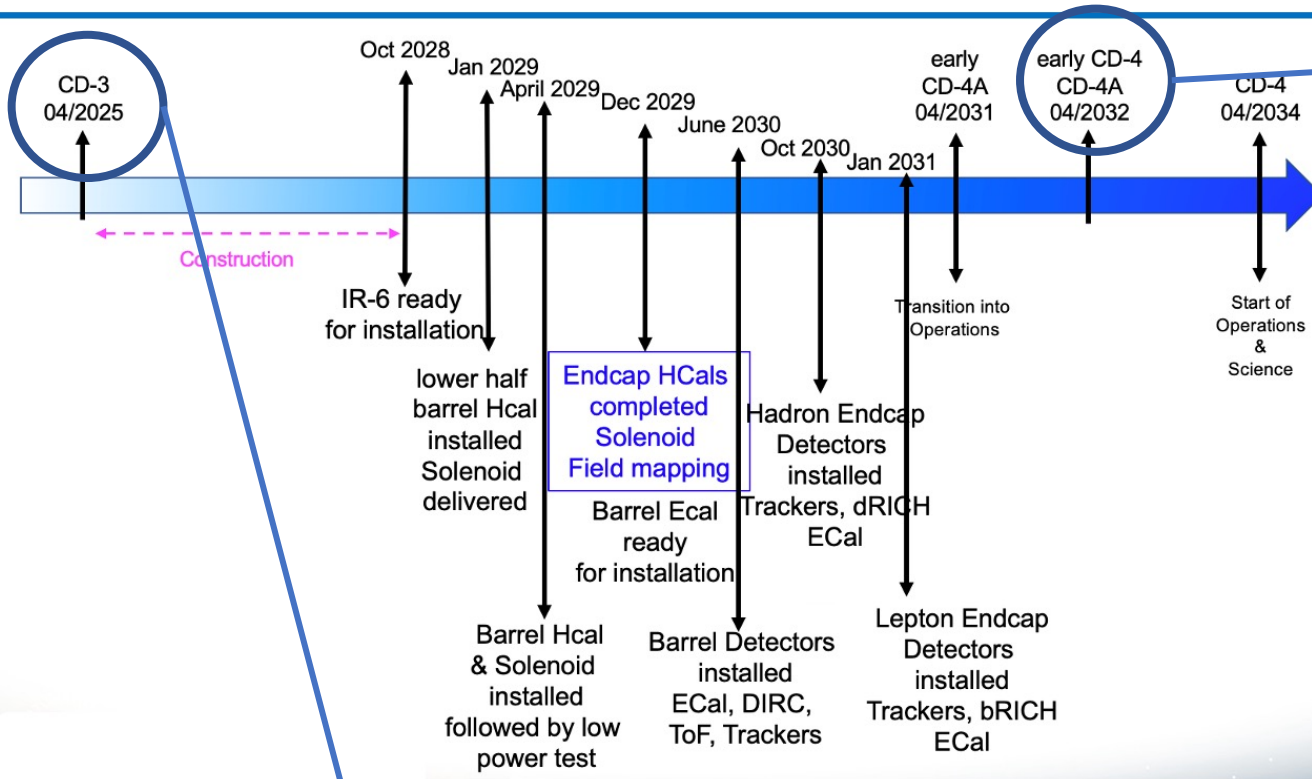
Mc

# Status of the EIC project (2)



This was shown at December 2023 RRB, not yet formally changed

## ePIC barrel detector installation schedule



but now we know this will be 1/2033

- Silicon vertex: **June 2030**
- Gaseous tracker: **June 2030**
- dRICH: **October 2030**

but now we know this will be 1/2026

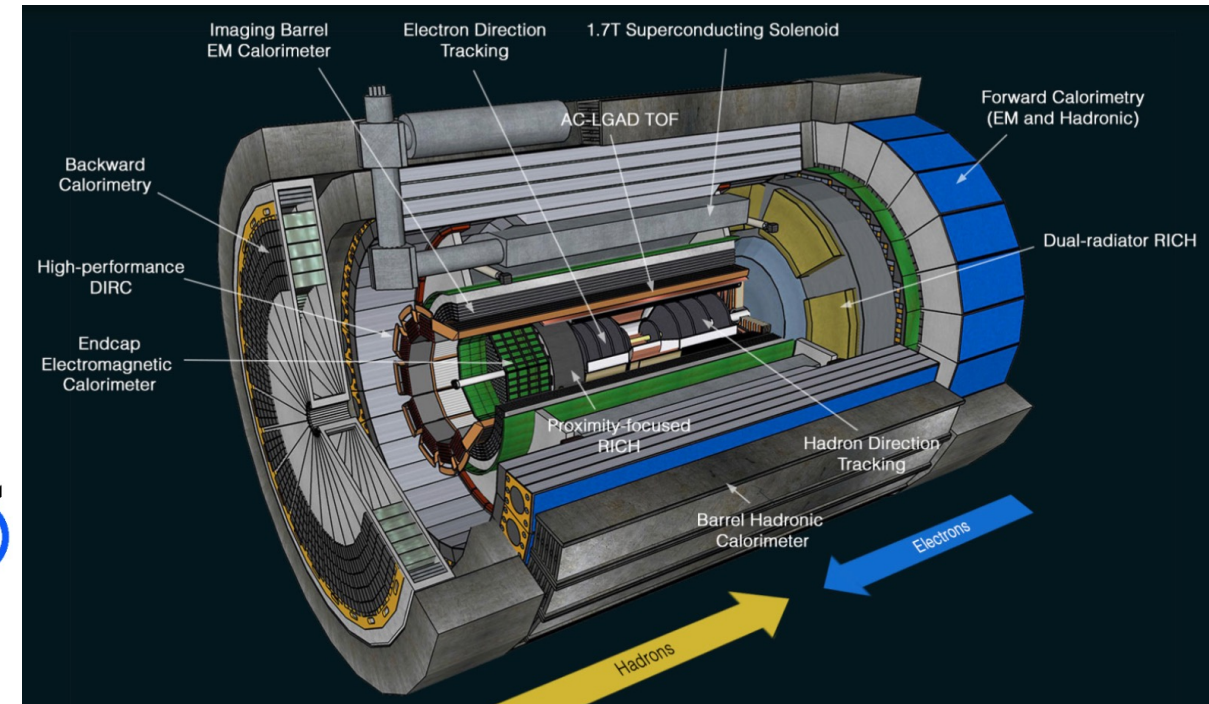
ePIC Italy proposes a financial plan according to this official schedule but aware a 6-months delay on the detector installation schedule is likely to be formally consolidated by end of 2024

# Status of the ePIC experiment

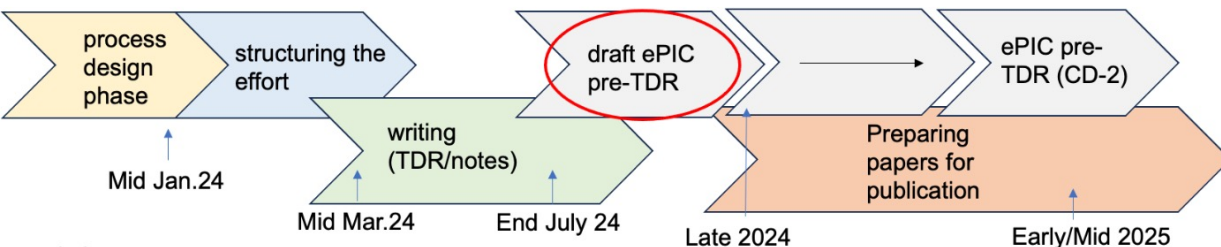


- see Lol for key roles covered by INFN associated personnel in the Collaboration
- ePIC will contribute to EIC pre-TDR for CD-2 in 2024, with "repeated cycle" in 2025 (for final TDR)
- UK, France and Italy expected to formalize IKC by end of 2024

## TDR Strategy and Publications



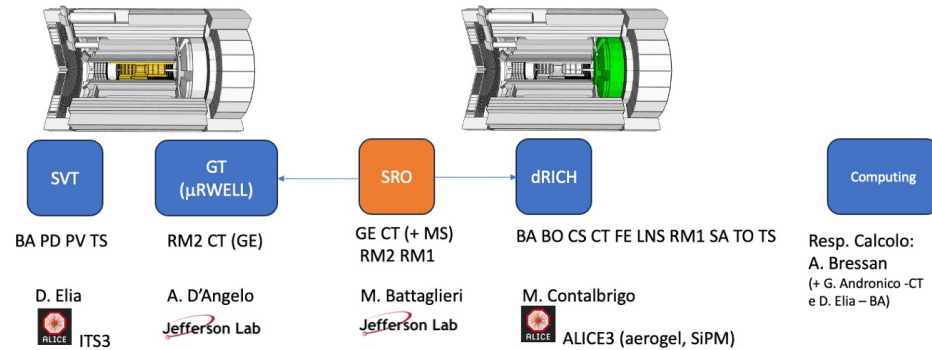
- In 2024 the ePIC collaboration will produce:
  - The ePIC contributions to the EIC TDR
    - The EIC TDR is the top priority
      - Chapters on *Physics Goals and Requirements and Experimental Systems*
      - Not just the document, but the simulations and detector R&D that form the basis
      - Requires close cooperation between the collaboration and the project!
- An ePIC Detector Design paper:
  - Derived and expanded from the *Experimental Systems* TDR chapter
- An ePIC Physics Performance paper:
  - Derived and expanded from the *Physics Goals and Requirements* TDR chapter
- Both to be published in a scientific journal (such as NIMA, JINST, or PRC)
- These publications will serve as a focus in developing the ePIC Membership and Publication policies.



## ePIC organization and INFN contribution



- dRICH team leaders (all INFN + Duke + Niser) indicated **Marco Contalbrigo** as DSSL (I acted as facilitator/some how convener in the process) ( TO GE TS FE BO BA RM1 RM2 CT LNS CS SA are members of dRICH DSSC )
- EIC Silicon Consortium morphed in Silicon Vertex Tracker DSC → **Ernst Sichtermann** as DSSL (LBNL) (PD BA TS PV are members of SVT DSSC)
- Gaseous Trackers (MPGD) → **Kondo Gnavno** (JLab) is DSSL (RM2 + GE/CT)



- Responsabile nazionale role is changing: less “coalescence” work, more “pure INFN coordination” work
- Detector sub-system oriented presentations towards our referees last 31<sup>st</sup> August

19/09/23 CSN3

P. Antonioli - EIC\_NET status

9

slide shown at 2023 September CSN3. Nothing changed but....

- D. Elia now formally responsible in ePIC of the coordination of the three SVT inner layers
- A. D'Angelo now formally responsible in ePIC of the coordination of GEM-muRWELL disks (backward and forward)

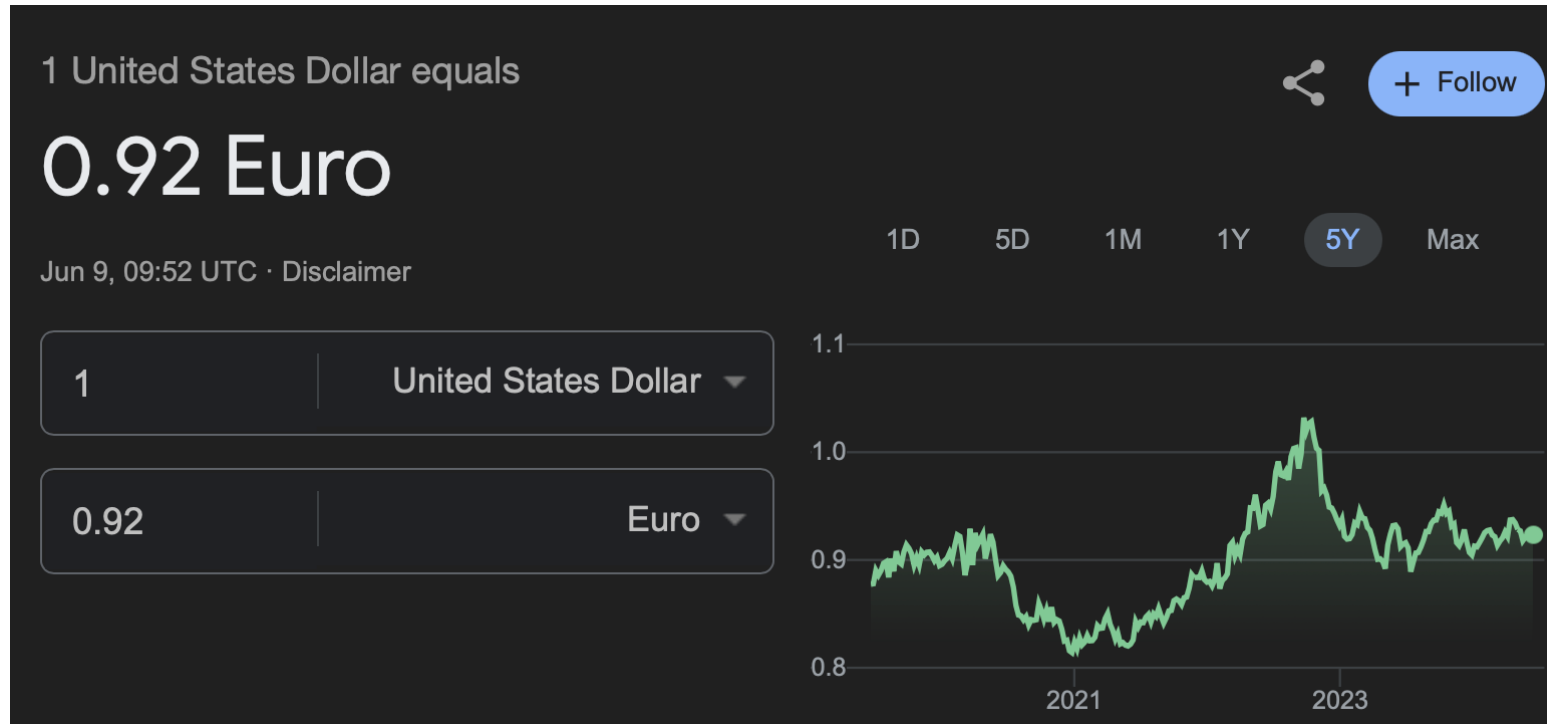
Don't forget SRO, contribution to physis, computing, role of EICUG group... → see report

## Summary table submitted for EoI (November 2020)

- Not a Bible but a key reference
- Numbers re-stated by INFN management in in-camera meeting with DOE December 2023

TABLE 1 – Labor and investment for R&D and construction in period 2021-2029.

Years	Labor, scientists	Labor, technical personnel	In-kind investment R&D	In-kind investment constructions	Travelling	Manpower	Investment, TOTAL
	(FTE)	(FTE)	(USD)	(USD)	(USD)	(USD)	(USD)
2021	10		minimal		minimal	0.4 M	0.4 M
2022-2023	10		1 M		0.3 M	1.6 M	2.9 M
2024	20						
2025-2029	50	10		7-8 M	0.7 M	12 M	19.7 - 20.7 M
<b>Investment 2021-2029, TOTAL</b>			<b>1 M</b>	<b>7-8 M</b>	<b>1 M</b>	<b>14 M</b>	<b>23-24 M</b>



we assume in all the following **1 \$ = 0.9 €**



# The big summary of the financial plan



EIC_NET	INFN R&D				Total R&D	Tot YTD		INFN in-kind (kEU)				DoE funds (kEU)			TOT YTD
Year	tracking	dRICH	uRWELL	SRO			Year	SVT	dRICH	uRWELL	TOT	eRD	PED	Construction	
2019	0	19	0	5,5	24,5	24,5	2019					58,9	0	0	58,9
2020	0	33,5	0	6,5	40	64,5	2020					53,4	0	0	112,3
2021	0	72	0	6	78	142,5	2021					58,8	0	0	171,1
2022	0	149,5	0	0	149,5	292	2022					244	0	0	415,1
2023	0	198,5	0	6	204,5	496,5	2023					360	45,5	0	820,6
2024	15	349	5	15	384	880,5	2024					373,5	87	0	1281,1
ePIC								INFN In-Kind (kEU)							
							Year	SVT	dRICH	uRWELL	TOT				
2025	60	200	20		280		2025	0	450	30	480				
2026	40	100	30		170		2026	180	1300	40	1520				
2027					100		2027	180	1400	200	1780				
2028							2028	270	1450	100	1820				
2029							2029	220	800	80	1100				
2030							2030	50	400	50	500				
								900	5800	500	7200				
								<b>Total IKC (EU)</b>		7200					
								<b>Eol Target (total)</b>		7200					

# The big summary of the financial plan



EIC_NET	INFN R&D				Total R&D Tot YTD			INFN in-kind (kEU)				DoE funds (kEU)			TOT YTD		
Year	tracking	dRICH	uRWELL	SRO			Year	SVT	dRICH	uRWELL	TOT	eRD	PED	Construction			
2019	0	19	0	5,5	24,5	24,5	2019					58,9	0	0	58,9		
2020	0	33,5	0	6,5	40	64,5	2020					53,4	0	0	112,3		
2021	0	72	0	6	78	142,5	2021					58,8	0	0	171,1		
2022	0	149,5	0	0	149,5	292	2022					244	0	0	415,1		
2023	0	198,5	0	6	204,5	496,5	2023					360	45,5	0	820,6		
2024	15	349	5	15	384	880,5	2024					373,5	87	0	1281,1		
ePIC							INFN In-Kind (kEU)										
							Year	SVT	dRICH	uRWELL	TOT						
2025	60	200	20		280		2025	0	450	30	480						
2026	40	100	30		170		2026	180	1300	40	1520						
2027					100		2027	180	1400	200	1780						
2028							2028	270	1450	100	1820						
2029							2029	220	800	80	1100						
2030							2030	50	400	50	500						
								900	5800	500	7200						
								<b>Total IKC (EU)</b>			7200						
								<b>Eol Target (total)</b>			7200						

- R&D funded so far by CSN3 is 0.9 M€ close to expectations in Eol
- Note synergies: CSN3 paid "zero" for SVT R&D thanks to synergy with ITS3

# The big summary of the financial plan



EIC_NET	INFN R&D				Total R&D Tot YTD			INFN in-kind (kEU)				DoE funds (kEU)			TOT YTD	
Year	tracking	dRICH	uRWELL	SRO			Year	SVT	dRICH	uRWELL	TOT	eRD	PED	Construction		
2019	0	19	0	5,5	24,5	24,5	2019					58,9	0	0	58,9	
2020	0	33,5	0	6,5	40	64,5	2020					53,4	0	0	112,3	
2021	0	72	0	6	78	142,5	2021					58,8	0	0	171,1	
2022	0	149,5	0	0	149,5	292	2022					244	0	0	415,1	
2023	0	198,5	0	6	204,5	496,5	2023					360	45,5	0	820,6	
2024	15	349	5	15	384	880,5	2024					373,5	87	0	1281,1	
<b>ePIC</b>								<b>INFN In-Kind (kEU)</b>								
							Year	SVT	dRICH	uRWELL	TOT					
2025	60	200	20		280		2025	0	450	30	480					
2026	40	100	30		170		2026	180	1300	40	1520					
2027					100		2027	180	1400	200	1780					
2028							2028	270	1450	100	1820					
2029							2029	220	800	80	1100					
2030							2030	50	400	50	500					
								900	5800	500	7200					
								<b>Total IKC (EU)</b>		7200						
								<b>Eol Target (total)</b>		7200						

- EIC is a win-win operation for INFN: attracted external funds for R&D larger than investment done
- We expect support to continue during end of R&D ("PED") and construction → used mainly to secure contracts

# The big summary of the financial plan



EIC_NET	INFN R&D				Total R&D Tot YTD			INFN in-kind (kEU)				DoE funds (kEU)			TOT YTD
Year	tracking	dRICH	uRWELL	SRO			Year	SVT	dRICH	uRWELL	TOT	eRD	PED	Construction	
2019	0	19	0	5,5	24,5	24,5	2019					58,9	0	0	58,9
2020	0	33,5	0	6,5	40	64,5	2020					53,4	0	0	112,3
2021	0	72	0	6	78	142,5	2021					58,8	0	0	171,1
2022	0	149,5	0	0	149,5	292	2022					244	0	0	415,1
2023	0	198,5	0	6	204,5	496,5	2023					360	45,5	0	820,6
2024	15	349	5	15	384	880,5	2024					373,5	87	0	1281,1
ePIC							INFN In-Kind (kEU)								
							Year	SVT	dRICH	uRWELL	TOT				
2025	60	200	20		280		2025	0	450	30	480				
2026	40	100	30		170		2026	180	1300	40	1520				
2027					100		2027	180	1400	200	1780				
2028							2028	270	1450	100	1820				
2029							2029	220	800	80	1100				
2030							2030	50	400	50	500				
								900	5800	500	7200				
								<b>Total IKC (EU)</b>			7200				
								<b>Eol Target (total)</b>			7200				

- a certain amount of R&D resources will be needed during next 2-3 years (details in next presentations)
- note the synergistic aspects towards Jlab and ALICE3
- **ECFA DRD** might be an option to fund part of this effort: BA BO FE RM-TV TS are part of DRD

# The big summary of the financial plan



EIC_NET	INFN R&D				Total R&D Tot YTD			INFN in-kind (kEU)				DoE funds (kEU)			TOT YTD
Year	tracking	dRICH	uRWELL	SRO			Year	SVT	dRICH	uRWELL	TOT	eRD	PED	Construction	
2019	0	19	0	5,5	24,5	24,5	2019					58,9	0	0	58,9
2020	0	33,5	0	6,5	40	64,5	2020					53,4	0	0	112,3
2021	0	72	0	6	78	142,5	2021					58,8	0	0	171,1
2022	0	149,5	0	0	149,5	292	2022					244	0	0	415,1
2023	0	198,5	0	6	204,5	496,5	2023					360	45,5	0	820,6
2024	15	349	5	15	384	880,5	2024					373,5	87	0	1281,1
<b>ePIC</b>								<b>INFN In-Kind (kEU)</b>							
							Year	SVT	dRICH	uRWELL	TOT				
2025	60	200	20		280		2025	0	450	30	480				
2026	40	100	30		170		2026	180	1300	40	1520				
2027					100		2027	180	1400	200	1780				
2028							2028	270	1450	100	1820				
2029							2029	220	800	80	1100				
2030							2030	50	400	50	500				
								900	5800	500	7200				
								<b>Total IKC (EU)</b>		7200					
								<b>Eol Target (total)</b>		7200					

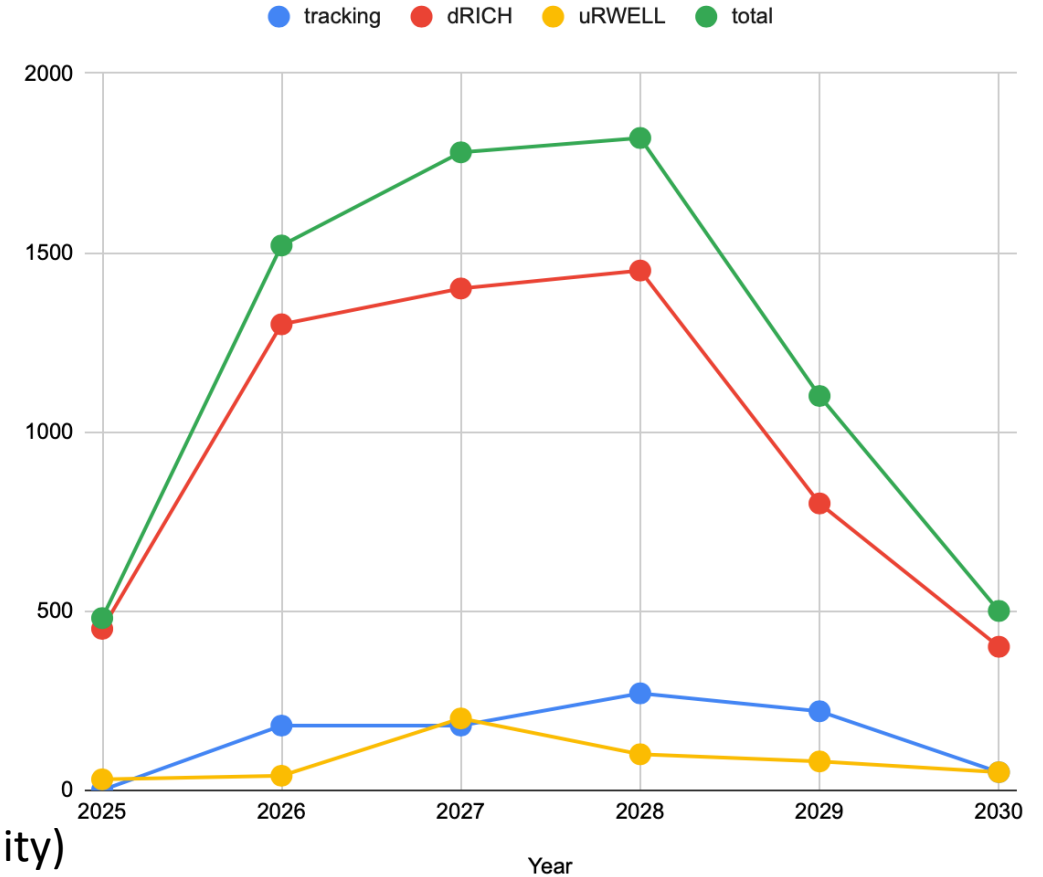
- financial plan assumes big procurements (SiPM, aerogel, SVT IBM sensors) can be modulated over 2-3 years
- for several items VAT will be paid, for others not (direct shipping to US, or temporary import)

# The INFN IKC

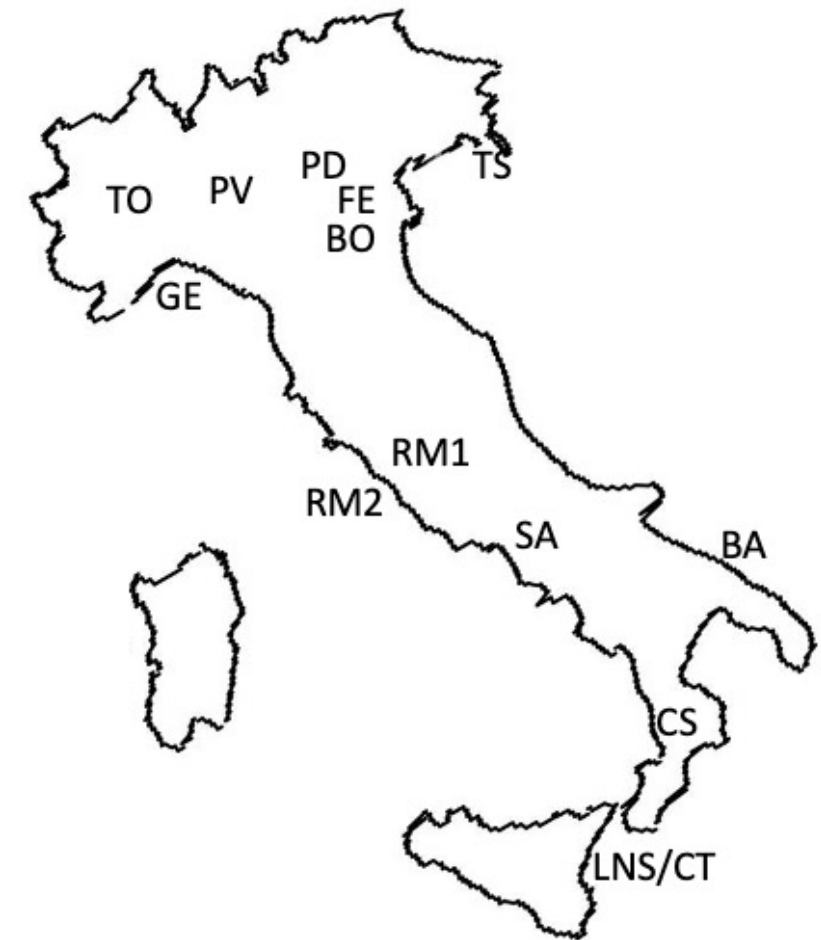
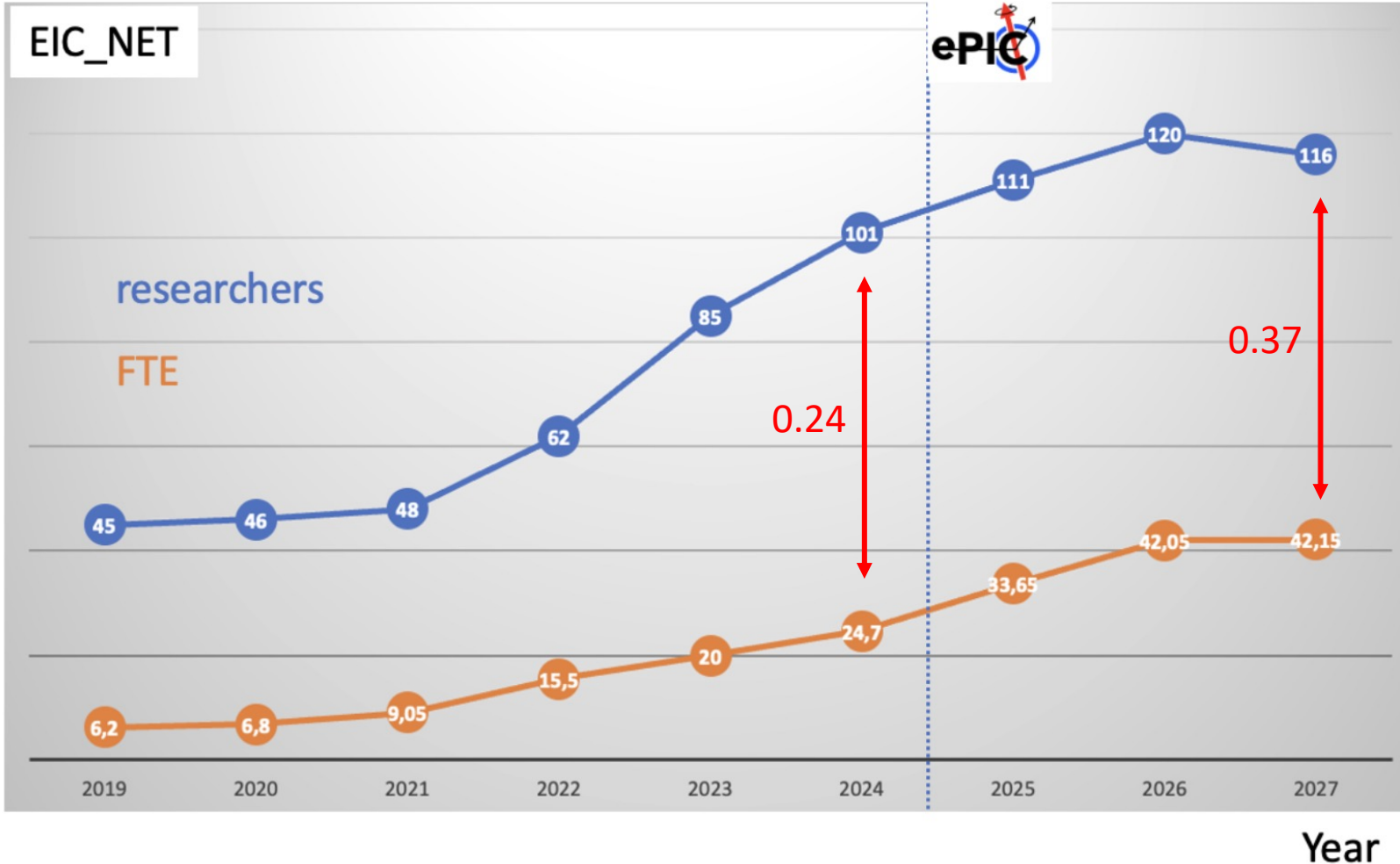
INFN In-Kind (kEU)				
Year	SVT	dRICH	uRWELL	TOT
2025	0	450	30	480
2026	180	1300	40	1520
2027	180	1400	200	1780
2028	270	1450	100	1820
2029	220	800	80	1100
2030	50	400	50	500
	900	5800	500	7200
	<b>Total IKC (EU)</b>		7200	

- effort to avoid peak as much as possible (SVT vs dRICH)
- details on what is behind in next presentations
- 2025 big item is ALCOR ER
- ICRADA gives only the full envelope: 8 M\$ (this gives us some flexibility)
- IKC items to be then detailed in PPD

INFN in-kind (kEU)



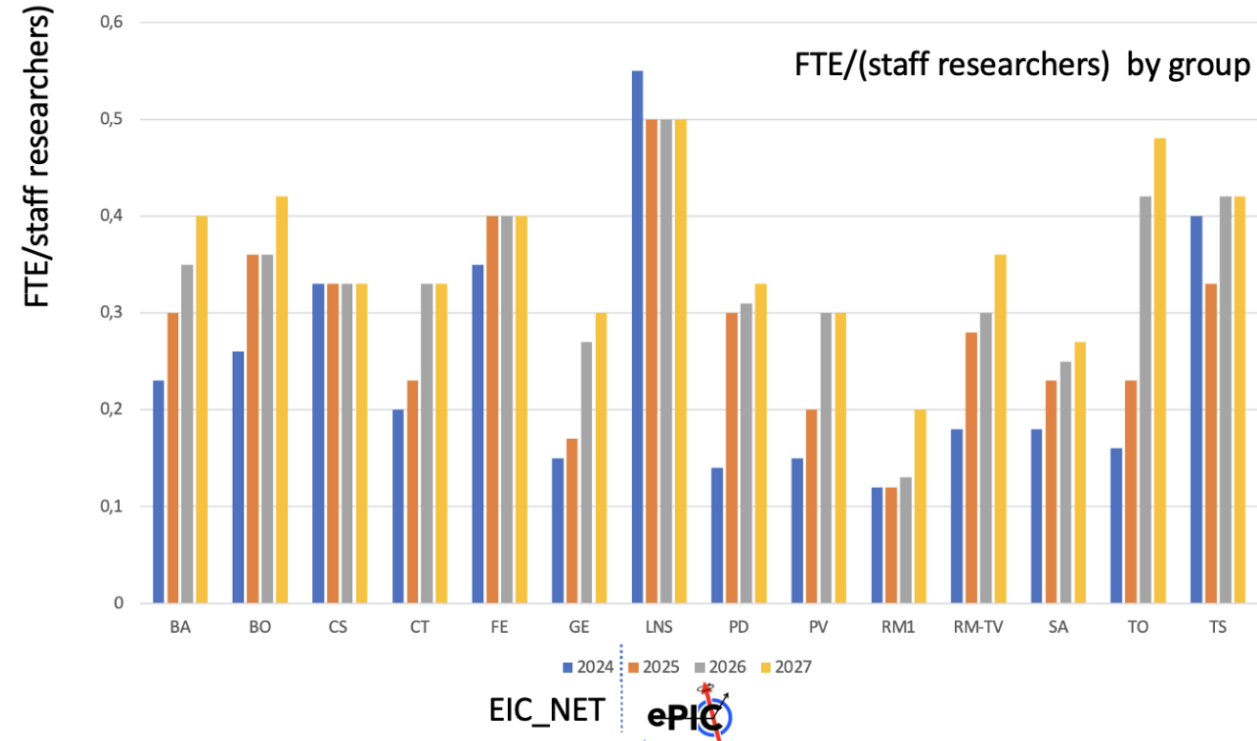
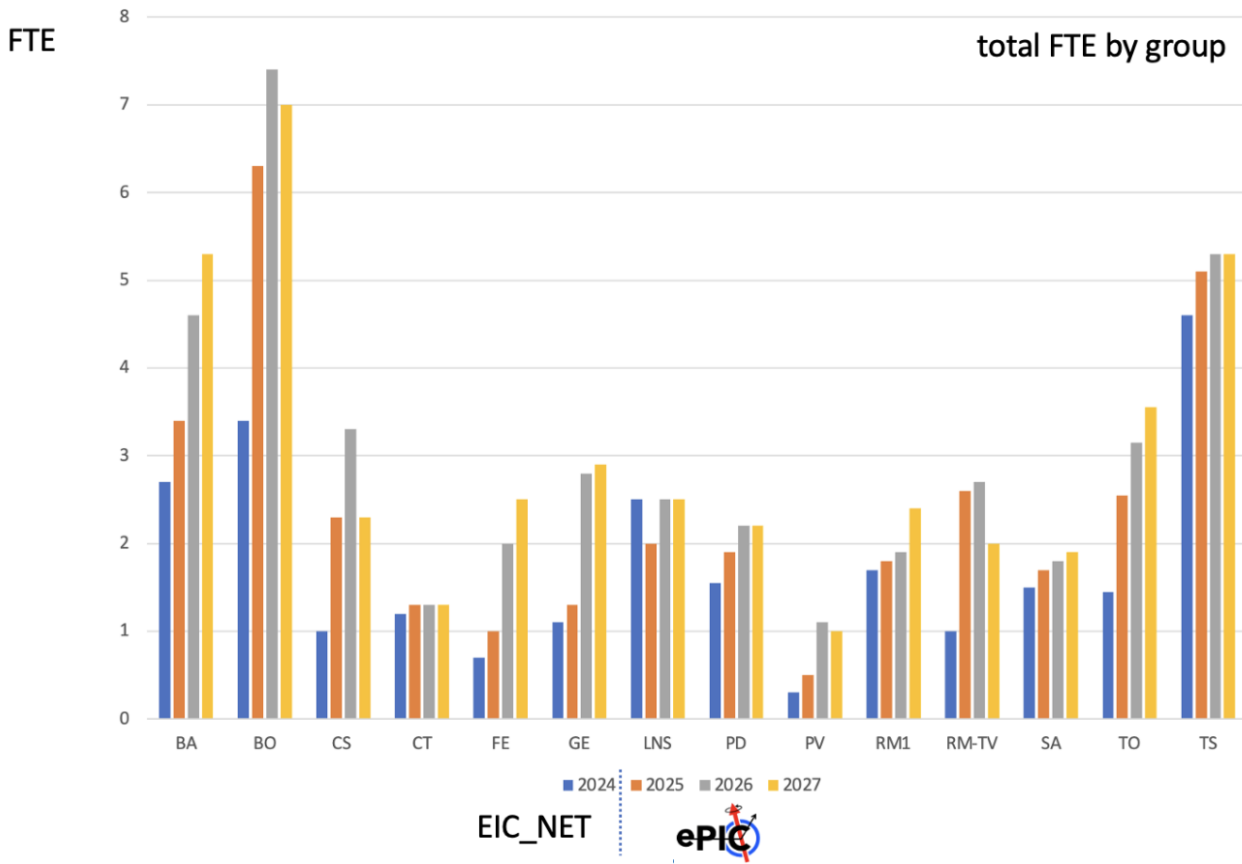
# Organization and FTE



- 14 INFN units: the largest "cluster" within CSN3
- steady growth consistently with the project, capacity to attract also from other CSN
- **solid(\*)** 3-year projections

(\*) no senior associations, only contracts assigned or under recruitment

# FTE by group

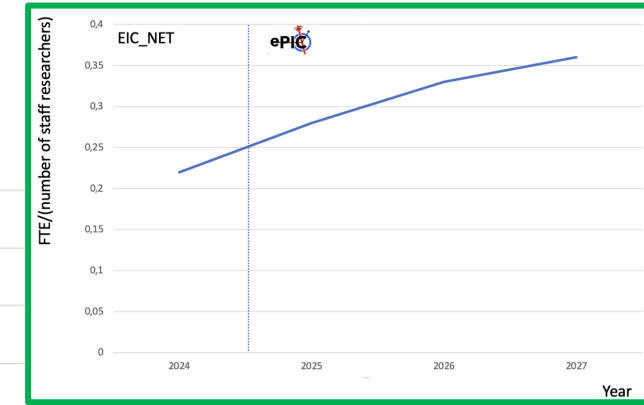
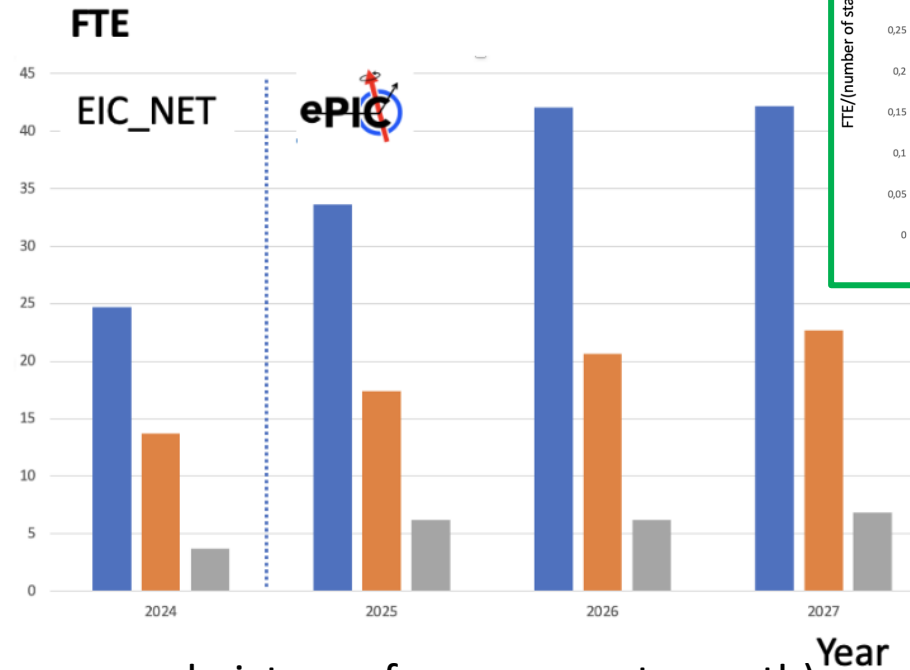
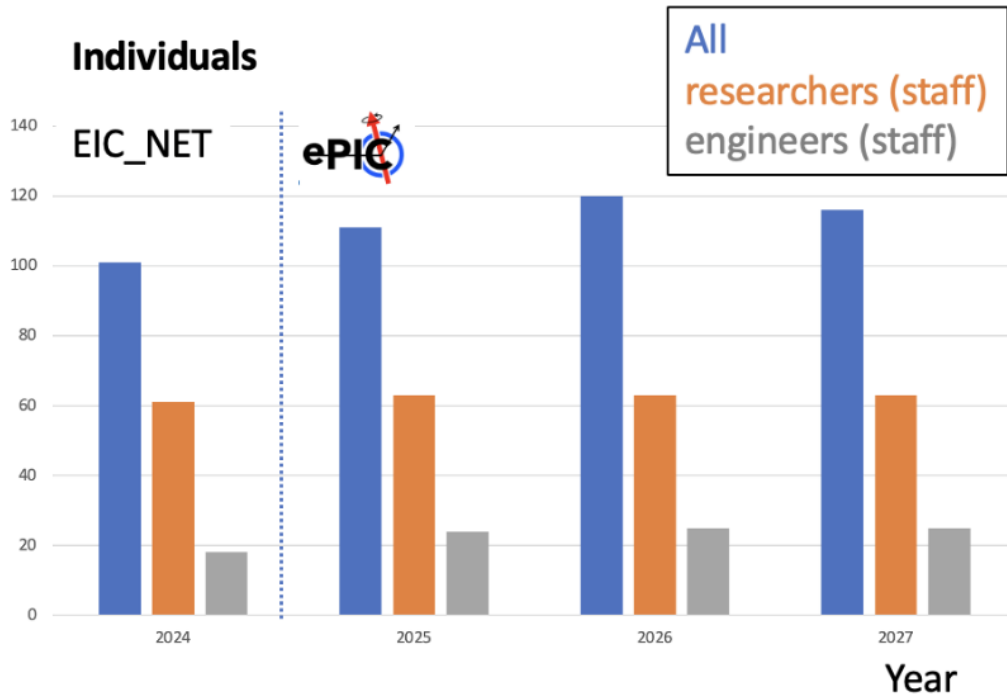


- all groups are growing
- 1.0 FTE thrshold passed by all but one in 2025
- high engagement by RN and RL

- note on small Jlab groups and missions for shifts
- what next? End of LHC Run3, and other stuff



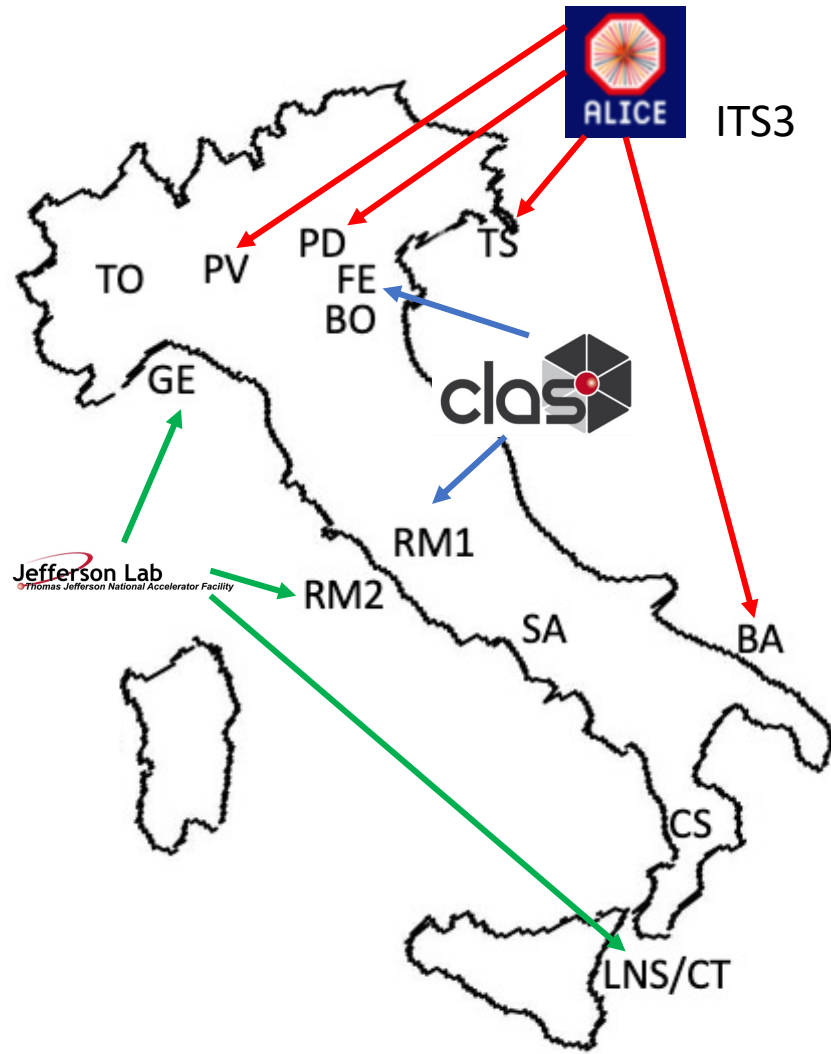
# A look to "personale strutturato"



- staff is the same but **its engagement grows up** (in a general picture of engagement growth)
- tecnologo percentages are somehow a different animal (especially during PNR...) )
- key staff listed in Lol as requested by referees

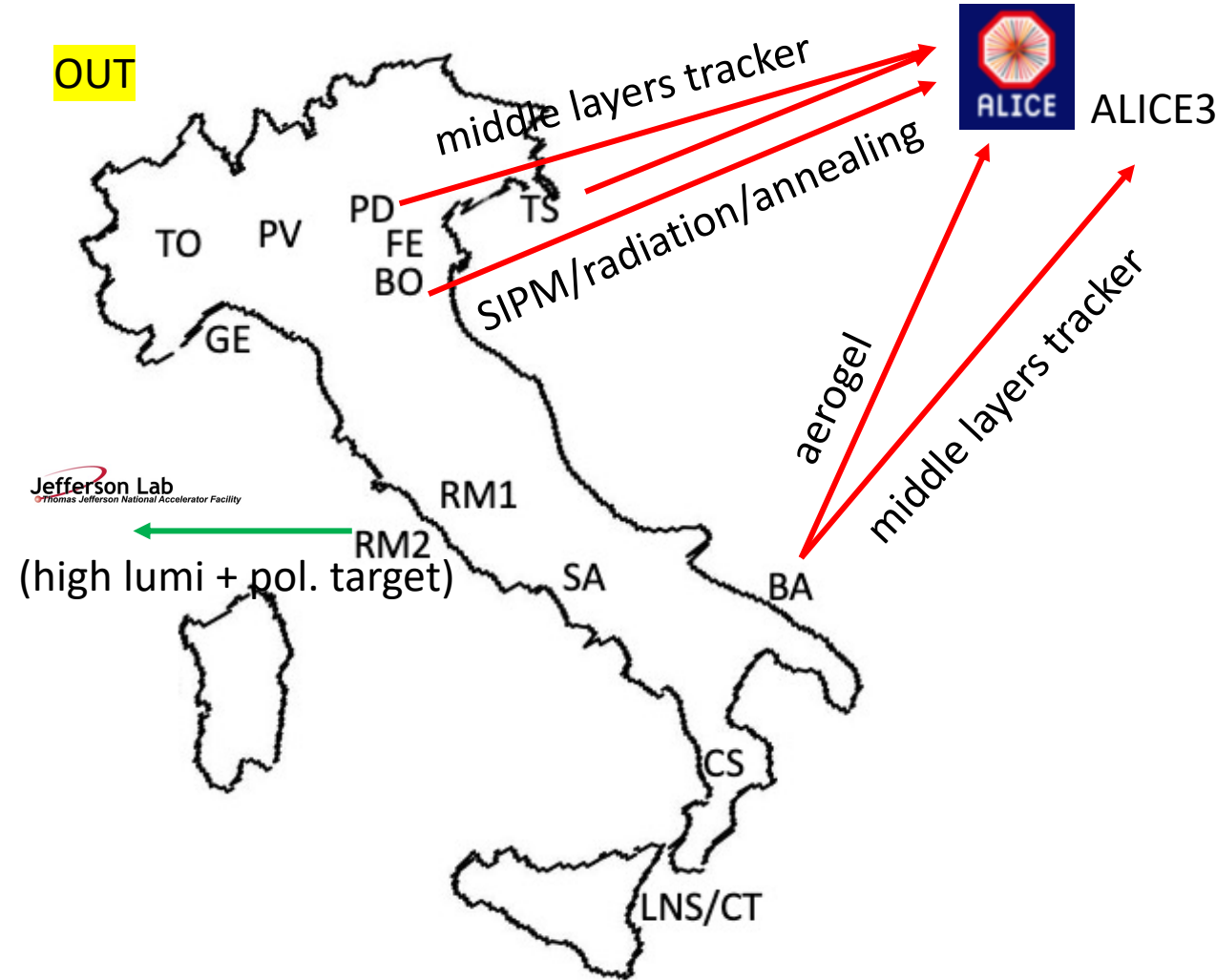
# Synergies

IN



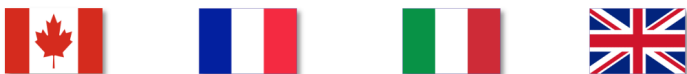
(plus expertise coming from ATLAS, BELLE, CMS  
COMPASS/AMBER, CMS, DARKSIDE, JUNO, NA62, STAR)

OUT

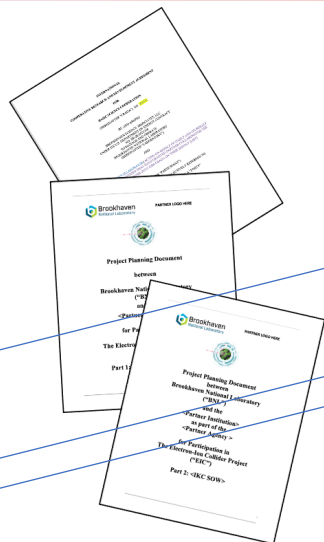


(plus ALCOR (TO) to be used in DUNE + IBIS\_NEXT)

## First Phase of EIC IKC identified areas



IKC Area	Activity ID and Name
Accelerator	6.06.02.02 IR Spin Rotator Magnets
Accelerator	6.08.04.03 1773 MHz 5-Cell Elliptical Cavity Cryomodule
Accelerator	6.08.04.05 394 MHz Crab Cryomodule
Accelerator	6.08.04.02 591 MHz 5-Cell Cryomodule
Detector	6.10.04.02 dRHIC Dual ring Cherenkov Detector
Detector	6.10.07 Detector Magnets Procurement
Detector	6.10.07 Detector Magnets Labor
Detector	6.10.03.01 Silicon Trackers (UK)
Detector	6.10.03.01 Silicon Trackers (INFN)
Detector	6.10.03.02 Micro Pattern Gaseous Detector (MPGD) Trackers
Detector	6.10.11.04 Low-Q2 Detectors
Detector	6.10.05.01 Backward Electromagnetic Calorimetry



The process of formalize the IKC is started.

INTERNATIONAL  
 COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENT  
 FOR  
 BASIC SCIENCE COOPERATION  
 (HEREINAFTER "ICRADA") NO. 2024SXXX  
 BY AND AMONG  
 JEFFERSON SCIENCE ASSOCIATES, LLC  
 UNDER ITS U.S. DEPARTMENT OF ENERGY CONTRACT  
 TO MANAGE AND OPERATE  
 THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY (JLAB)  
 (HEREINAFTER "LABORATORY")  
 AND  
 ISTITUTO NAZIONALE FISICA NUCLEARE (INFN)  
 (HEREINAFTER "PARTICIPANT")  
 LABORATORY AND PARTICIPANT COLLECTIVELY REFERRED TO  
 AS THE "PARTIES" AND SEPERATELY AS A "PARTY"

## ANNEX A

This collaborative project between JLab and INFN involves the design, procurement, fabrication and testing of key components of various sub-systems for the EIC detector, including the forward-region dual Ring Imaging Cherenkov (dRICH) particle identification detector, the inner three layers of the Silicon Vertex Tracking (SVT) detector, and the forward-region GEM-muRwell tracking detector disks.

ICRADA to be signed by end of 2024  
 PPD to follow in 2025

# Summary

- right time to move to "experiment sigla" with multi-year commitment by INFN (ICRADA by end of the year)
- 6 years of R&D are paying off in terms of responsibilities and roles in the ePIC experiment
- large (14 units, O(50) FTE) CSN3 initiative for the decade to come
- INFN well positioned in major hadron physics experiment in the '30s

## What is ePIC

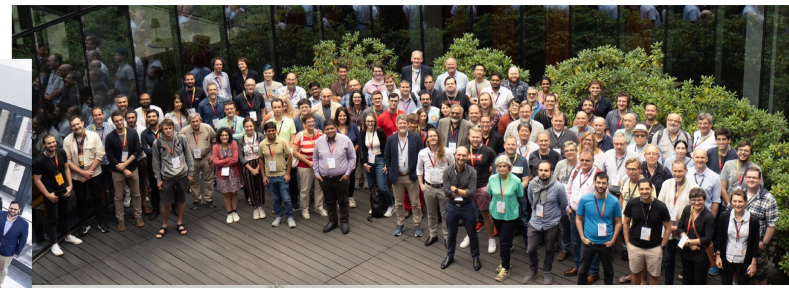
JLab, Jan. 2023



ePIC is a community of scientists dedicated to realizing the EIC science mission.

The ePIC Collaboration is as unique as the ePIC detector.

Warsaw, July 2023



ANL,  
Jan. 2024



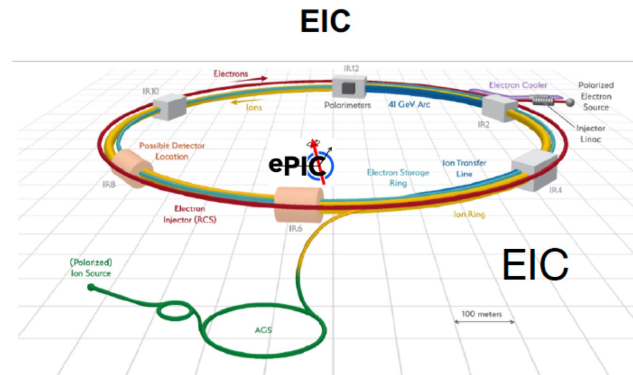
D. Elia (BA) elected new RN for EIC\_NET (ePIC) since 1/XI/2024



## Recommendations for Nuclear Physics Infrastructures



- Collaboration with non-European infrastructures should be fostered in all areas of nuclear research to seize unique scientific opportunities and synergies that complement scientific programmes based in Europe. In particular, European participation in the construction of ePIC at the future international flagship facility EIC is recommended.



## Recommendations for Hadron Physics



### • Future flagship facilities and experiments

We recommend the expedited realisation of the antiproton experiment PANDA, and the support of European groups to contribute to the electron-ion experiment ePIC. By virtue of their different beam species and energy regimes, PANDA and ePIC will explore complementary physics aspects. In a ten-year perspective, these two next-generation experiments must be made ready to launch.

- PANDA: The physics program, including the prospect of unravelling exotic matter, remains unique and compelling. PANDA will strengthen the European position on the global scene and act as a unifying force for the community. Therefore, we recommend support for its construction and for the development of instrumentation, software and analysis tools.
- ePIC: Here, European researchers will be able to explore unknown features of quarks and gluons inside nucleons and nuclei. We recommend supporting the participation of European groups in ePIC and reinforcing scientific and technological activities which synergize with European projects.

# INFN units for construction effort



On-going discussions with INFN directors of relevant units for spaces, resources, access to facilities. Level of support already clarified in the large majority of INFN units

INFN units	What
BA	aerogel qualification
BO	RDO production, photosensors, PDU coordination and PDU assembly center
FE	detector box coordination and detector box coordination
SA-CS	SiPM testing before PDU assembly
TO	ASIC effort + FEB production
TS	gas radiator monitor design (+ SiPM qualification backup)
BA	inner layers assembly center
TS	FPC (peripheral circuitry for inner layers)
PD	inner layers mechanics (+ backup assembly)
PV	glueing test centre + shipping detector boxes
RM-TV	GEM-uRWELL disks production + FEB production

(and see text for additional key contributions from CT, GE, RM1 on dRICH)

# Detailed FTE projection



Sezione	2024								2025								2026								2027							
	#	FTE	FTE/#	Ric.	FTE	FTE/Ric	Tec.	FTE	#	FTE	FTE/#	Ric.	FTE	FTE/Ric	Tec.	FTE	#	FTE	FTE/#	Ric.	FTE	FTE/Ric	Tec.	FTE	#	FTE	FTE/#	Ric.	FTE	FTE/Ric	Tec.	FTE
BA	12	2.70	0.23	9	2.05	0.23	1	0.05	14	3.40	0.24	9	2.70	0.30	3	0.30	15	4.60	0.31	8	2.80	0.35	3	0.50	15	5.30	0.35	8	3.20	0.40	3	0.60
BO	12	3.40	0.28	5	1.30	0.26	3	1.10	14	6.20	0.44	5	1.80	0.36	3	1.10	15	7.40	0.49	5	1.80	0.36	3	1.10	13	7.00	0.54	5	2.10	0.42	3	1.20
CS	3	1.00	0.33	3	1.00	0.33	0	0.00	5	2.30	0.46	3	1.00	0.33	0	0.00	6	3.30	0.55	3	1.00	0.33	0	0.00	5	2.30	0.46	3	1.00	0.33	0	0.00
CT	7	1.20	0.17	4	0.80	0.20	2	0.20	7	1.30	0.19	4	0.90	0.23	2	0.20	6	1.30	0.22	3	0.90	0.30	2	0.20	6	1.30	0.22	3	0.90	0.30	2	0.20
FE	2	0.70	0.35	2	0.70	0.35	0	0.00	3	1.00	0.33	2	0.80	0.40	1	0.20	5	2.00	0.40	3	1.20	0.40	1	0.30	6	2.50	0.42	3	1.20	0.40	1	0.30
GE	8	1.10	0.14	4	0.60	0.15	0	0.00	6	1.30	0.22	3	0.50	0.17	0	0.00	7	2.80	0.40	3	0.80	0.27	0	0.00	7	2.90	0.41	3	0.90	0.30	0	0.00
LNS	5	2.50	0.50	2	1.10	0.55	2	0.60	5	2.00	0.40	3	1.50	0.50	1	0.50	6	2.50	0.42	3	1.50	0.50	2	1.00	6	2.50	0.42	3	1.50	0.50	2	1.00
PD	7	1.55	0.22	4	0.55	0.14	0	0.00	6	1.90	0.32	3	0.90	0.30	1	0.10	7	2.20	0.31	4	1.25	0.31	2	0.20	7	2.20	0.31	4	1.30	0.33	2	0.20
PV	2	0.30	0.15	2	0.30	0.15	0	0.00	3	0.50	0.17	2	0.40	0.20	0	0.00	4	1.10	0.28	2	0.60	0.30	0	0.00	3	1.00	0.33	2	0.60	0.30	0	0.00
RM1	12	1.70	0.14	6	0.70	0.12	5	0.80	12	1.80	0.15	6	0.70	0.12	5	0.90	11	1.90	0.17	6	0.80	0.13	5	0.90	11	2.40	0.22	6	1.20	0.20	5	1.20
RM2	6	1.00	0.17	5	0.90	0.18	1	0.10	7	2.60	0.37	5	1.40	0.28	2	1.20	7	2.70	0.39	5	1.50	0.30	1	0.20	6	2.00	0.33	5	1.80	0.36	1	0.20
SA	7	1.50	0.21	5	0.90	0.18	0	0.00	7	1.70	0.24	6	1.40	0.23	1	0.30	7	1.80	0.26	6	1.50	0.25	1	0.30	7	1.90	0.27	6	1.60	0.27	1	0.30
TO	8	1.45	0.18	5	0.80	0.16	3	0.65	10	2.55	0.26	6	1.40	0.23	3	0.65	11	3.15	0.29	6	2.50	0.42	3	0.65	11	3.55	0.32	6	2.90	0.48	3	0.65
TS	10	4.60	0.46	5	2.00	0.40	1	0.20	12	5.10	0.43	6	2.00	0.33	2	0.70	13	5.30	0.41	6	2.50	0.42	2	0.80	13	5.30	0.41	6	2.50	0.42	2	1.00
<b>Totali</b>	<b>101</b>	<b>24.70</b>	<b>0.24</b>	<b>61</b>	<b>13.70</b>	<b>0.22</b>	<b>18</b>	<b>3.70</b>	<b>111</b>	<b>33.65</b>	<b>0.30</b>	<b>63</b>	<b>17.40</b>	<b>0.28</b>	<b>24</b>	<b>6.15</b>	<b>120</b>	<b>42.05</b>	<b>0.35</b>	<b>63</b>	<b>20.65</b>	<b>0.33</b>	<b>25</b>	<b>6.15</b>	<b>116</b>	<b>42.15</b>	<b>0.36</b>	<b>63</b>	<b>22.70</b>	<b>0.36</b>	<b>25</b>	<b>6.85</b>

# = numero persone (non strutturati + strutturati)  
 ric = numero fisici strutturati  
 tec = numero tecnologi

Non vanno considerati come strutturati personale associato insegnante in scuole superiori  
 Il personale tecnico (non tecnologo) non entra nel conto degli FTE  
 Inviare eventuali note riguardo situazione evoluzione gruppo a [pietro.antonioli@bo.infn.it](mailto:pietro.antonioli@bo.infn.it)