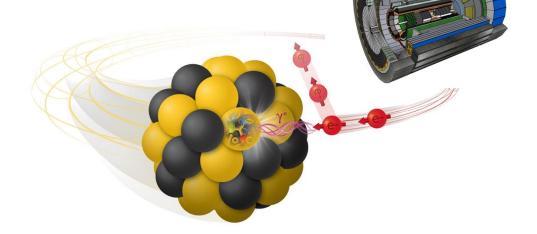
Giornate Nazionali ePIC Italia

Padova June 16-18, 2025





ePIC Italia and the EIC project status and prospects

Domenico Elia, INFN Bari











- VII edition including all nice meetings in the EIC_NET era
 - ✓ marking a lot of effort, a long and fruitful path for early (networking) initiative







- VII edition including all nice meetings in the EIC_NET era
- first time as experiment "sigla" ePIC in CSN3
- first time agenda runs over 3 days:
 - ✓ a new phase both in ePIC Italia and EIC
 - ✓ growing as ePIC Italia community
 - ✓ increasing effort on R&D, prototyping, physics
 - ✓ extending activities in many directions (eg outreach)





- VII edition including all nice meetings in the EIC_NET era
- first time as experiment "sigla" ePIC in CSN3
- first time agenda runs over 3 days:
 - ✓ a new phase both in ePIC Italia and EIC
 - ✓ growing as ePIC Italia community
 - ✓ increasing effort on R&D, prototyping, physics
 - ✓ extending activities in many directions (eg outreach)
 - → need to double the total agenda available time (decided in Bologna)







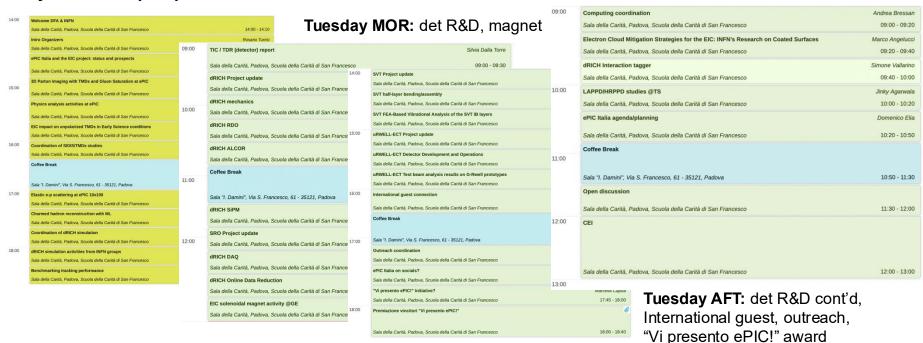


Agenda is very rich

thanks to organizers, programme committee, available speakers!

Today: Intro, Theory, Physics & simulation

Wednesday: det R&D con'd, computing, accelerator, planning & organisational







Outline

- EIC project status and current timeline
- Status of the ePIC Collaboration
- ePIC Italia organization and size
- INFN contribution to ePIC
- Summary





Latest (5th) EIC Resource Review Board

- held on June 5-6, 2025 in Prague:
 - ✓ info online: https://indico.bnl.gov/event/26316/
 - ✓ attendance: DOE/NP, NSF, EIC management, FAs: Canada, Czech, France/CEA & France/IN2P3, Italy/INFN, Japan, Korea, Taiwan, UK/SFC

INFN: D. Bettoni (GE, RRB co-chair → end of mandate, F. Sabatié/CEA takes over on next RRB)

P. Giubellino (CSN3 chair) and DE, observers

- with usual agenda items/sessions:
 - ✓ Welcome, Goals, Project Director report
 - ✓ EIC Project and ePIC sessions
 - ✓ Action Items followup (Computing, Common Funds, Global Strategy etc)
 - ✓ Final comments and decision on next RRB



DOE CD-3B expected in July



J. Yeck, June 5-6 2025 EIC RRB

EIC project highlights

Major Project Milestones

- CD-3A Long Lead Procurement (LLP) of \$90M approved in 2024 and most contracts already awarded.
- Successful DOE CD-3B/Status review in Jan 2025.
- CD-3B LLP of \$66M ready for ESAAB approval.
- Coordination of "EIC Portfolio" led by Erik Johnson.

Reviews, Boards, and Advisory Committees in 2025

- Advisory Board meets quarterly.
- Resource Review Board meets 2x each year.
- Advisory Committees meet (PAC, MAC, DAC, ICAC).
- IR SC Magnet Steering Group meets monthly.
- Electron Injector Design & Cost Review in April.
- "Red Team Review" in May 2025 Focus on project delivery strategy via sub-projects.
- DOE "Focused Review" on August 5-7, 2025.

Infrastructure

\$100M New York State Grant for EIC buildings.

Focused DOE IPR in 6 months

- 90% Detailed Design submission received in April 2025.
- A/F Contract Modification for crab cavities CM awarded

Accelerator

- New Technical Director in Jan '24, Sergei Nagaitsev.
- Reuse of Advanced Photon Source magnets processed at BNL and JLab.
- Optimized design and scope to mitigate risk.
- Electron injector design changed to remove Rapid Cycling Synchrotron (RCS) from RHIC tunnel.
- International EIC Accelerator Collaboration established and working groups established.

Detector

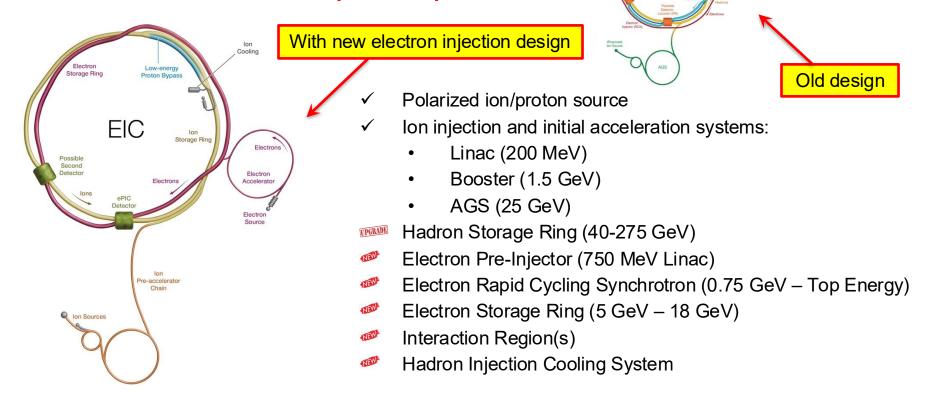
From R&D to final design/construction

- R&D complete
- ePIC Detector technical baseline defined and Preliminary Design Report in preparation.
- Assessment of Baseline Readiness planned for Nov 2025.
- Plans developing for the EIC Science Program.

RHIC to EIC Transition

- DOE ONP Review of RHIC Operations in the EIC era planned for September 2025
- RHIC Operations planned to conclude end of 2025.
- Removal & Repurposing planned for January 2026.

EIC accelerator concept and parameters



Istituto Nazionale di Fisica Nucleare





EIC Project Delivery Requirements: subprojects

Requirements:

- EIC is a single, integrated line-item project.
- Subprojects have well-defined deliverables, interfaces, and KPPs.
- Subprojects enable start of the EIC science program.
- Subproject plans are consistent with DOE annual funding guidance.

EIC Line-Item Project Scope:

Accelerator Storage Rings

Electron Injector

Interaction Region (IR) Integration – SC Magnets, RF Crab Cavities

Detector (ePIC)

Start Science Program

Energy and Luminosity Ramp-up (CD-4)

Project delivery strategy based on subprojects

The strategy enables the start of the EIC science program during collider commissioning and for the concurrent completion of the full capability required to meet the DOE Mission Need.







EIC Reference Schedule

- project on track, navigating through financial constraints
 - CD-2 (60% design maturity, pre-TDR): ~Q4 2026
 - CD-3 (full TDR → start construction): ~Q1 2028
 - Early CD-4 (first beams → early physics): ~Q2 2034

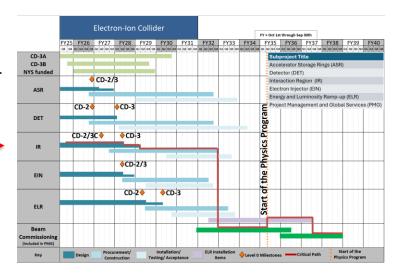
6-months delay wrt last November RRB

based on:

- delivery of subprojects
- revised annual funding assumption

Updated status:

- CD-1 cost range ~ \$1.7B to \$2.8B, with assumed peak annual funding at \$325M/year in FY2026
- CD-2/3 for the Accelerator Rings and CD-2 for the Detector planned ~ end of FY2026

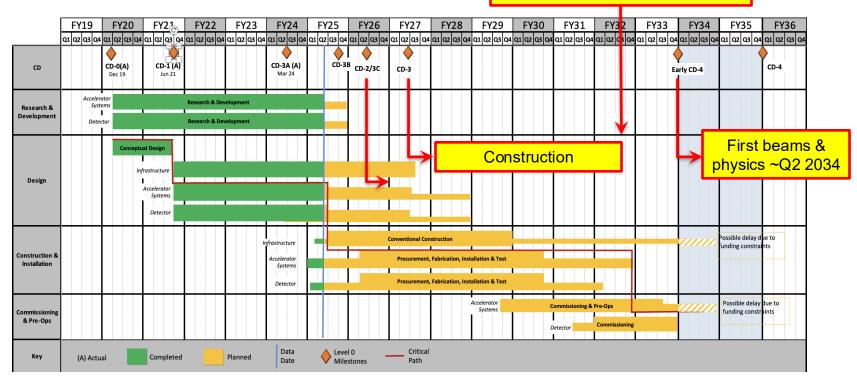






EIC Reference Schedule

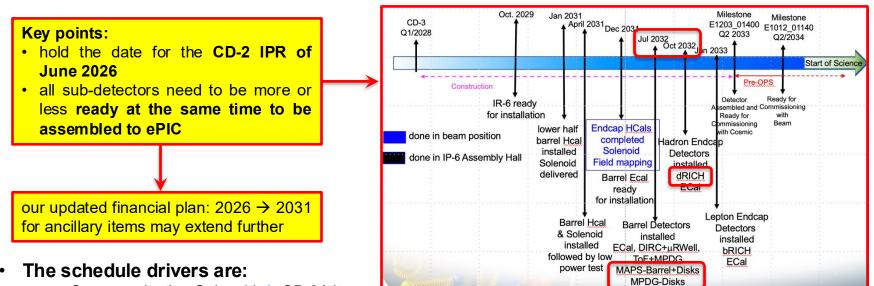
Detectors on the floor by 2032





EIC Reference Schedule

E. C. Aschenauer, June 5-6 2025 EIC RRB

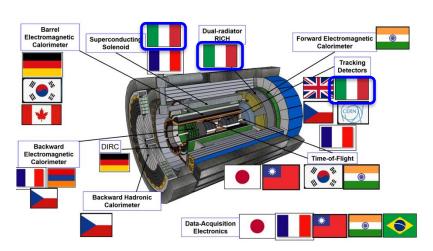


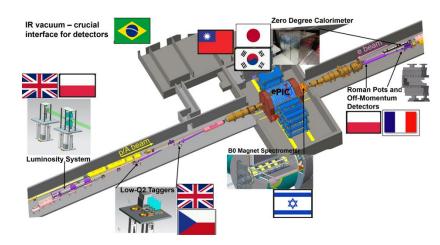
- Superconducting Solenoid → CD-3A item
- Silicon Sensors (MAPS, AC-LGAD & ASTROPIX)
- ASIC long time frames only one ASIC designed from scratch all others are modifications to existing ASICS
- Items with long production times, single vendor and complex assembly → CD-3A & CD-3B
- International agreements driving in-kind and MAPS design (agreement with CERN)



IKC for subdetector project

- target for the EIC detectors is ~30% of the total scope: ~100M\$
 - ✓ Italy and France IKCs for the Detector Solenoid magnet, procurement and design respectively.
 - ✓ UK, Italy, France, Korea, Canada, and Japan identified scope for IKCs in several detector areas
 - ✓ other IKCs are being discussed with India, Israel, Taiwan and potentially others could follow



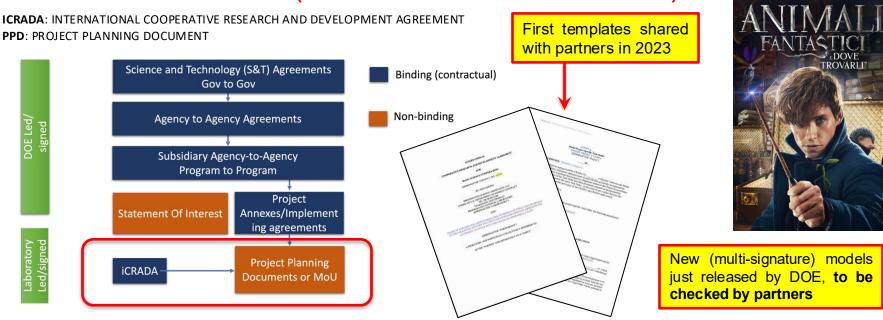








iCRADAs and PPDs (... and where to find them)



DOE level agreements do not contain details on EIC IKC scope. For this reason, it is suggested to pursue an iCRADA (laboratory-level) **binding agreement** for all the IKC items for which the development of Project Planning Documents (PPDs) are necessary.



Istituto Nazionale di Fisica Nucleare SEZIONE DI BARI

iCRADAs and PPDs

ICRADA: INTERNATIONAL COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENT

PPD: PROJECT PLANNING DOCUMENT

Drafted Annex A – iCRADAs → aim to have them **signed by end 2025**

Country/Agency	Scope	Status
Canada – TRIUMF	JLab Crab 394 MHz CMs for Full Capability	Drafted
Canada – TRIUMF	BNL Crab 394 MHz CMs for Full Capability (New Model)	Approval Pending
France – IN2P3	591 MHz 5-Cell CMs for EIN	Drafted
Czech Republic – ČVUT	Electron Source Laser for EIN	Drafting in progress
Italy-INFN	Detector (dRICH, Si/ITS3, GEM-muRwell)	Drafted
UK-STFC	Si-LAS, Low-Q2, Lumi	Drafted
France-CEA	MicroMegas, SALSA	Drafted
France-IN2P3	EEEmCAL, RPs, ASICs	Drafted
Italy-INFN	Solenoid	Drafted
France-CEA	Solenoid	Drafted
Korea-MSIT	Barrel EMCal, GEM-muRwell, TOF/ZDC collab.	Drafted
Japan-MEXT	Barrel TOF, streaming DAQ, ZDC	Drafted
Canada-CFI	Barrel EMCal readout, software	Drafted

- Likely IKC
 - UK detector (UKRI/STFC)
 - Italy/INFN detector
 - Italy/INFN magnet
 - CEA/IN2P3 detector
 - Japan detector
 - Korea detector
- Possible IKC
 - Canada detector
 - Taiwan detector
 - Israel Auxiliary detectors
 - India detector
 - NSF

we would surpass this \$100M goal.

Elke and Rolf will contact partners to start work on PPDs



J. Lajoie, June 5-6 2025 EIC RRB

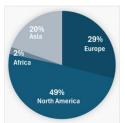
A new (growing) collaboration in HEP/NP

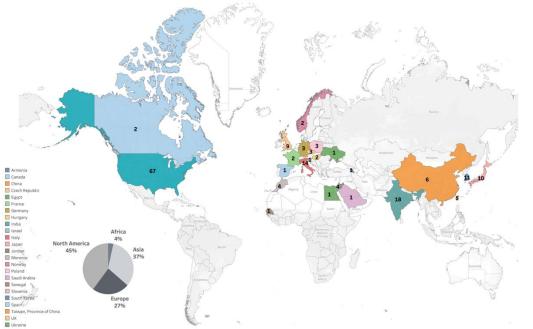
Institutions:

Collaborators:









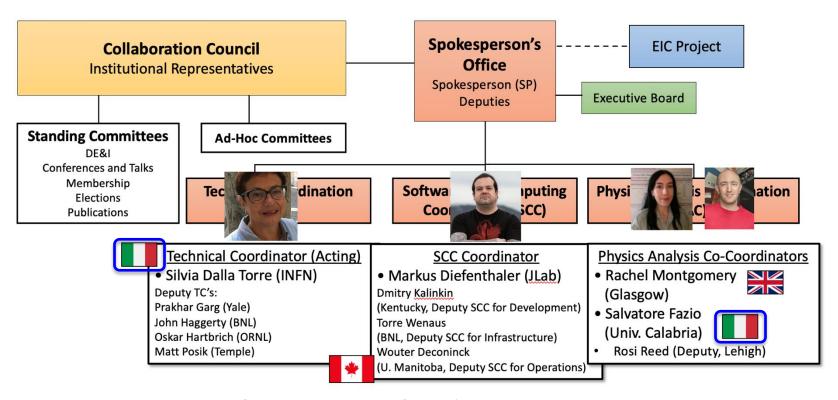


INFN



Status of the ePIC Collaboration

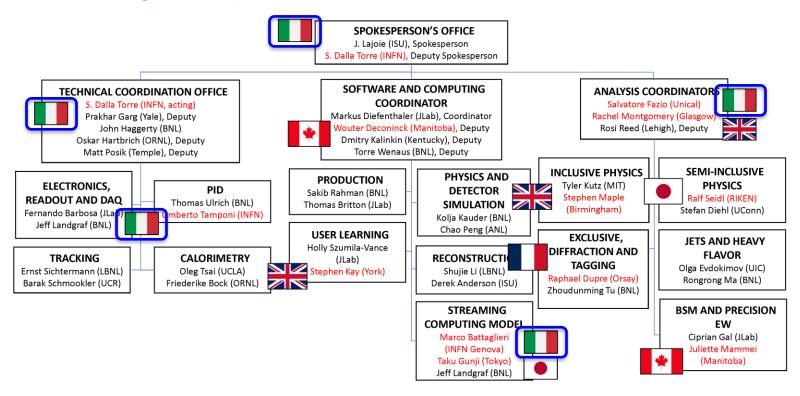
The Collaboration structure





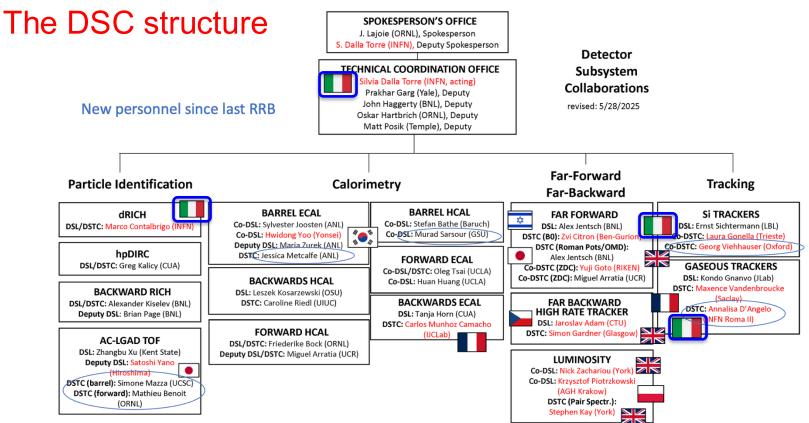
Istituto Nazionale di Fisica Nucleare SEZIONE DI BARI

The Working Group structure







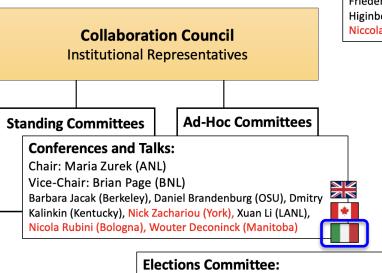








The ePIC Committees



Chair: Helen Caines (Yale)

Vice-Chair: Ken Barish (UCR)

Past-Chair: John Arrington (LBNL)

Maria Stefaniak (OSU), Domenico Elia (INFN)

Membership Committee:

Chair: Peter Steinberg (BNL) Vice-Chair: Pietro Antonioli (INFN-Bologna)

Friederike Bock (ORNL), Helen Caines (Yale), Doug Higinbotham (JLab), Bedhanga Moharty (NISER), Silvia

Niccolai (IJCLAB), Marzia Rosati (ISU)



DE&I Committee:

Chair: Megan Connors (GSU)

Vice-Chair: Christine Nattrass (UTK)

Francesco Bossù (CEA-Saclay), Wouter Deconinck (University of Manitoba), Narbe Kalantarians (Virginia Union University), Iris Ponce Pinto (Yale University),

Maya Shimomura (Nara Women's University), Allison Zec

(University of New Hampshire)

Publications Committee:

Chair: Rene Bellwied (U. Houston)

Vice - Chair: Annalisa Mastroserio (INFN Bari) Lokesh Kumar (Panjab U.), Michela Chiosso (Torino),

Prithwish Tribedy (BNL), Markus Diefenthaler (JLab), Sevil

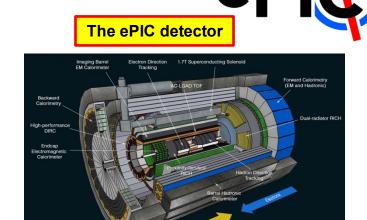
Salur (Rutgers),

ex-officio w. Conferences and Talks Committee:

Daniel Brandenburg (OSU)

Most recent news:

- spokesperson election in February 2025:
 - ✓ **John Lajoie** elected to a second (final) term
 - ✓ Silvia Dalla Torre continues as Deputy-SP
- formation of the ePIC Policies well advanced:
 - Membership (Aug 2024), Conference and Talks (Nov 2024), Code of Conduct (Dec 2024), Results Release (May 2025), Publication (advanced draft)



Istituto Nazionale di Fisica Nuclear

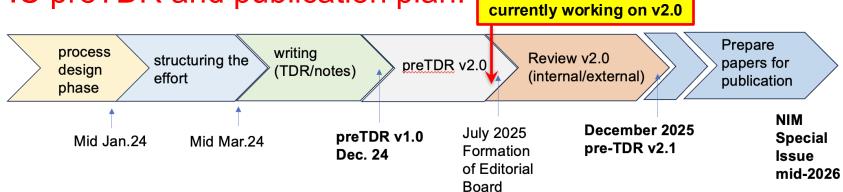
- ePIC CERN recognized experiment since March 2025
 - ✓ RE47 in grey book (https://greybook.cern.ch/experiment/recognized), inividual ePIC group registration ongoing
- elections underway for next ePIC Collaboration Council vice-chair
- incoming elections also for ePIC Committees chair-lines (just over for EICUG SC)
- summer EICUG/ePIC Collaboration meeting @JLab on July 14-18

INFN



Status of the ePIC Collaboration

ePIC preTDR and publication plan:



- preTDR version 1.0 ready in Dec 2024
- intent to publish a super-set of the material prepared for the preTDR
 - √ longer articles on subsystems, physics performance, etc.
 - ✓ important for collaborators to have a published product for all their hard work
- plan to open a NIM Special Issue at the end of 2025, open for ∼6 months

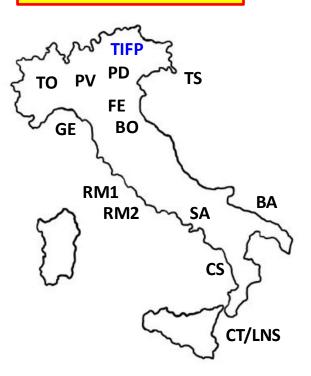
ePIC Italia organization and size

INFN groups and coordination team:

- 15 INFN units: largest cluster within CSN3
 - ✓ 14 units till 2025, TIFPA officially joining from 2026
- CEI (Comitato ePIC Italia):
 - ✓ RN, 15 RLs and 1 Theory representative: M. Radici (PV)
- Coordination team:
 - ✓ dRICH: M. Contalbrigo (FE)
 - ✓ **SVT**: R. Turrisi (PD)
 - ✓ **uRWELL-ECT**: A. D'Angelo (Roma TV)
 - ✓ Physics: S. Fazio (CS) + SIDIS subgroup: S. Costanza (PV)
 - ✓ **Computing**: A. Bressan (TS) + deputy: F. Noferini (BO)
 - ✓ Streaming RO: M. Battaglieri (GE)
 - ✓ Outreach: M. Ruspa (TO)



ePIC Italia INFN units in 2026



INFN



ePIC Italia organization and size

Mailing lists and useful links:

- general coordination lists:
 - ✓ epic-italia@lists.infn.it
 - ✓ epic-italia-staff@lists.infn.it
 - ✓ epic-italia-cei@lists.infn.it
 - ✓ <u>epic-italia-rl@lists.infn.it</u>
- specific activity coordination lists:
 - ✓ epic-italia-drich@lists.inf.it
 - ✓ epic-italia-svt@lists.infn.it
 - ✓ epic-italia-mrwect@lists.infn.it
 - ✓ epic-italia-physics@lists.infn.it
 - ✓ <u>epic-italia-physics-sidis@lists.infn.it</u>
 - ✓ epic-italia-outreach@lists.infn.it

- ePIC Italia indico: https://agenda.infn.it/category/1147/
- ePIC Italia web pages: https://eic-it.infn.it/



- ePIC Collaboration indico:
 - https://indico.bnl.gov/category/402/
- EIC and ePIC web site: https://www.bnl.gov/eic/goals.php
- EICUG: https://eicug.org

Welcome to subscribe if interested, eg startgin from here:

- ✓ ePIC-Italia: https://lists.infn.it/sympa/subscribe/epic-italia?previous_action=info
- ✓ ePIC/EIC/EICUG lists: https://lists.bnl.gov/mailman/listinfo (list names about to be updated ...)





PIC

ePIC Italia organization and size

FTE evolution vs 2024 Lol prospects:

FTE: EIC_NET to ePIC (from Lol 2024)

preliminary 2026 vs final numbers 2025:

Anagrafica						
	2025	2026				
Ricercatori	93,0	112,0				
Tecnologi	27,0	30,0				
Sinergie	6,0	9,0				
Ricercatori staff	61,0	65,0				
Tecnologi staff	25,0	24,0				
FTE Ricercatori	26,6	42,2				
FTE Tecnologi	8,9	6,2				
FTE Sinergie	3,3	4,5				
FTE Ricercatori staff	15,5	18,2				
FTE Tecnologi staff	4,9	5,3				
Tot Persone	126,0	151,0				
Tot FTE	38,8	52,8				
FTE/Persona	0,31	0,35				



Year

Quite large increase in FTE: 35% (expected ~20%)

- increasing FTE of collaborators (avg FTE 0.31 → 0.35)
- including new interested colleagues/groups (new FTEs)
- doing quite well with DOE-funded contracts (new FTEs)
- prepare for further increase (PhDs, outreach activity etc)

INFN contribution to ePIC

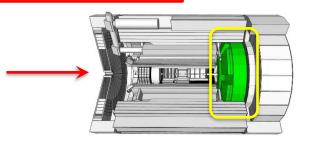
Istituto Nazionale di Fisica Nucleare SEZIONE DI BARI

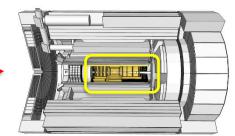
In-kind contribution from INFN:

- dRICH: 5.8 M€ (hadron forward PID)
 - ✓ BA BO CS CT LNS FE GE RM1 RM2 SA TO TS.
 - ✓ DSC Leader (and Italian coordinator): M. Contalbrigo (FE)
- **SVT**: 900 k€ (Inner Barrel of the silicon vertex tracker)
 - ✓ BA PD PV TIFP TS
 - ✓ DSC Technical coordinator: L. Gonella (TS)
 - ✓ SVT IB coordinator: **D. Elia** (BA)
 - ✓ Italian coordinator: R. Turrisi (PD)
- uRWELL-ECT: 500 k€ (forward end-cap disks)
 - ✓ CT GE RM2
 - ✓ DSC Technical coordinator (and Italian coordinator): **A. D'Angelo** (Roma TV)

Total of 21 INFN people in various coordination roles both in ePIC Italia and in the ePIC Collaboration

- same numbers since INFN Eol 2020
- officially re-stated by INFN management









Updated multi-year financial plan (includes 2031):

what is new: 2026-2030 profile updated including 2031 (missioni, R&D, IKC)

						E	IC_NET					
	Missioni	R&D		Tot. R&D		Ir	In-kind INFN		Tot. IKC	Tot. non-miss	Totale	
		SVT	dRICH	uRW-ECT	SRO		SVT	dRICH	uRW-ECT			
2019	46,0	0,0	19,0	0,0	5,5	24,5	0,0	0,0	0,0	0,0	24,5	70,
2020	15,5	0,0	33,5	0,0	6,5	40,0	0,0	0,0	0,0	0,0	40,0	55,
2021	46,0	0,0	72,0	0,0	6,0	78,0	0,0	0,0	0,0	0,0	78,0	124,0
2022	90,5	0,0	149,5	0,0	0,0	149,5	0,0	0,0	0,0	0,0	149,5	240,0
2023	119,0	0,0	198,5	0,0	6,0	204,5	0,0	0,0	0,0	0,0	204,5	323,
2024	169,0	15,0	349,0	5,0	15,0	384,0	0,0	0,0	0,0	0,0	384,0	553,
						880,5						1366,
							ePIC					
2025	224,5	49,0	205,0	19,5	3,5	277,0	0,0	220,0	15,0	235,0	512,0	736,
2026	370,0	60,0	200,0	30,0	20,0	310,0	40,0	680,0	40,0	760,0	1070,0	1440,
2027	400,0	30,0	100,0	20,0	5,0	155,0	175,0	970,0	100,0	1245,0	1400,0	1800,
2028	440,0	0,0	0,0	0,0	0,0	0,0	270,0	1050,0	100,0	1420,0	1420,0	1860,
2029	480,0	0,0	0,0	0,0	0,0	0,0	245,0	1050,0	100,0	1395,0	1395,0	1875,
2030	530,0	0,0	0,0	0,0	0,0	0,0	120,0	1050,0	75,0	1245,0	1245,0	1775,
2031	650,0	0,0	0,0	0,0	0,0	0,0	50.0	780.0	70.0	900.0	900,0	1550,
					·		900,0	5800,0	500,0	7200,0		

Total IKC: 7.2 M€

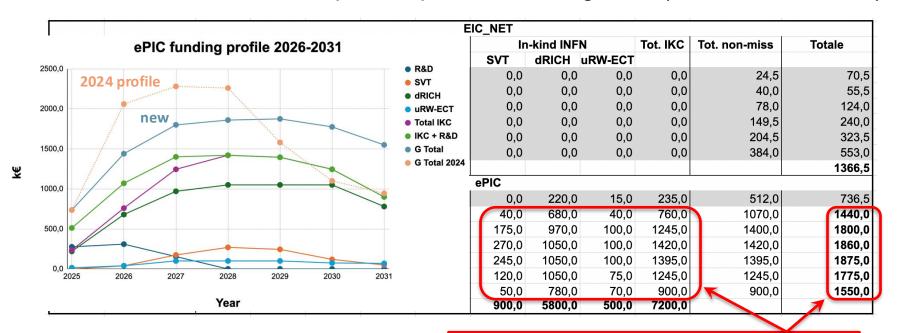




INFN contribution to ePIC

Updated multi-year financial plan (includes 2031):

what is new: 2026-2030 profile updated including 2031 (missioni, R&D, IKC)







Miscellanea

- EICO charter draft presented to the RRB
 - ✓ to be checked by FAs and approved at the next RRB in November.
 - ✓ shared in the past months with INFN C3SN (computing steering committee)
 - ✓ more in Andrea's talk on Wednesday
- Discussion on Common Funds continues
 - ✓ dedicated WG (P Giubellino for INFN) still tuning contribution size and evolution.
 - ✓ to start ~2028-2030, compensation with in-kind for INFN to be discussed.
- Possibility to access DOE funding for PED FY26
 - more in the planning discussion on Wednesday
- Recent and incoming elections
 - ✓ EICUG SC: ballots open till June 10, Marta running as SC vice-chair
 - ✓ ePIC Committees: incoming, Susanna running as DE&I Committee vice-chair







(Instead of a) Summary

- ... five good reasons to be in ePIC:
- 1. Unique timeline and prospects
 - ✓ EIC is the only novel HEP collider in the next 10-20 years
- 2. Broad physic scope and key science questions
 - ✓ EIC will allow high-precision ultimate QCD exploration
- 3. Mix of established and novel detector technologies
 - ✓ unique environment for enabling future technologies
 - ✓ virtuos scenario for R&D synergies, eg with LHC upgrades "2b"
- 4. Growth opportunity for young scientists
 - ✓ get involved in a large HEP/NP project since the early phases
- 5. ePIC Italia enthusiastic and inclusive community!

