



Physics Analysis Coordinators' Report

Rachel Montgomery (Glasgow) & Salvatore Fazio (Calabria)
Rosi Reed (Lehigh)



ePIC Collaboration Meeting
Glasgow (UK) - July, 2026

Structure of the Physics Working Groups

PHYSICS ANALYSIS COORDINATORS

Salvatore Fazio (Calabria) - Rachel Montgomery (Glasgow)
Rosi Reed (Lehigh) - deputy

- Each PWG convener is for a two-years term
 - Rotations in each PWG are staggered every year
- **Conveners and PAC in blue** are ending their term after **2 years**

INCLUSIVE PHYSICS

Win Lin (Stony Brook)
Stephen Maple (Birmingham)

PWGs typically meet biweekly

Mailing list: eic-projdet-Inclusive-I@lists.bnl.gov

Indico: <https://indico.bnl.gov/category/417/>

SEMI-INCLUSIVE PHYSICS

Anselm Vossen (Duke)
Ralf Seidl (RIKEN)

Mailing list: eic-projdet-semiincl-I@lists.bnl.gov

Indico: <https://indico.bnl.gov/category/418/>

JETS AND HEAVY FLAVOR

Shyam Kumar (Bari)
Rongrong Ma (BNL)

Mailing list: eic-projdet-jethf-I@lists.bnl.gov

Indico: <https://indico.bnl.gov/category/420/>

EXCLUSIVE, DIFFRACTION TAGGING

Stephen Kay (York)
Zhoudunming Tu (BNL)

Mailing list: eic-projdet-excldiff-I@lists.bnl.gov

Indico: <https://indico.bnl.gov/category/419/>

BSM AND PRECISION EW

Zuhal Seyma Demiroglu (Stony Brook)
Juliette Mammei (Manitoba)

Mailing list: eic-projdet-semiincl-I@lists.bnl.gov

Indico: <https://indico.bnl.gov/category/421/>



Other relevant meetings

☐ Physics Analysis Coordination meeting (open to all)

- Typically biweekly on Tuesdays at either 8:30am or 11:00am ET
- Indico page: <https://indico.bnl.gov/event/30471/>
- **Goal:** cross-cutting discussions on analyses progress and priorities

☐ Joint S&C and Physics Working Groups meeting

- Typically, several per year
- Last meeting on July 8th, 2026: <https://indico.bnl.gov/event/33492/>
- **Goal:** an opportunity to coordinate efforts between the two endeavors
 - Discuss: generators, simulation campaigns, status of reconstruction, specific TDR needs and mutual feedback
 - Incredibly important for a successful TDR!
 - Has been essential for coordinating ESR campaigns

☐ **Joint SCCs and PACs meeting:** biweekly on Wednesday at 9:30am

☐ **Physics Forums (open to all):** when results are released to the whole ePIC Collaboration!³

Conveners who completed their term Thank you!



❖ We express our deepest gratitude to:
Stephen, Ralf, Rongrong, Kong and Juliette
for having served as conveners for the two
(very intense!) years!

**Thank
You**

New PWG convener nominees

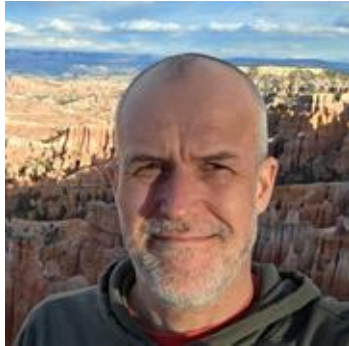
We will propose a **new set of PWG convenors** at the upcoming CC meeting
(*more info at the C.C. meeting*)

INCLUSIVE



Tyler Kutz
Mainz

SIDIS



Oleg Eyser
BNL

EDT



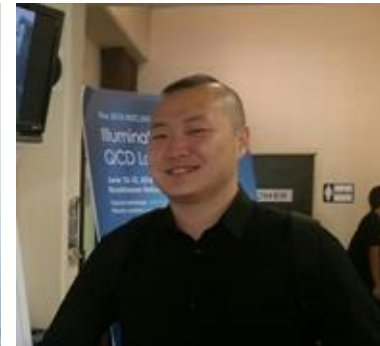
Jan Vanek
U. of New Hampshire

JETS + HF



Austin Baty
U. of Illinois
Chicago

BSM + EW



Jae Nam
BNL

Thank you Rachel!



- ❖ Rachel stepping down as PAC
 - Due to happy family news!

Rachel joined the PAC team in early Summer 2025.

- In just over one year, Rachel has been truly transformational for our activities
 - ✓ Ch.4 pre-TDR landed in Dec. 2025
 - ✓ 1st Physics Read. Workshop organized in London
 - ✓ ESR landed in July 2026

Best wishes Rachel, waiting till you are back soon!

New PAC nominee



At the upcoming session, on behalf of the SP office, we will petition **CC Council** to nominate Charlotte as a new PAC together with Sal and Rosi (Deputy)

After a good search for a new PAC, we are excited to propose **Charlotte Van Hulse**, Vrije Universiteit Brussel

Charlotte comes with outstanding qualifications:

- Ph.D. at the University of Ghent, in 2010 on exclusive measurements at HERMES
- Junior professor in Alcal, Spain
- Now: Professor at the Vrije Universiteit Brussel in Belgium
- Extensive experience in SIDIS and UPC
- Leadership experience:
 - Physics coordinator at HERMES
 - convenor at LHCb, ECCE and ePIC (former SIDIS PWG conv.)
- Current physics activities:
 - SIDIS studies at ePIC
 - UPC and inclusive quarkonium studies at LHCb, and CMS

Technical Design Report



preTDR ⇒ 19 December 2025 -> preTDR v3.1

- An ePIC Coll. physics paper, spin-off from Ch.4, will be part of a NIM Special Issue
- **Executive Summary**
- **CHAPTER 1 – Introduction**
 - About the EIC project and the accelerator complex (high level approach)
- **CHAPTER 2 – Requirements**
 - Requirements resulting as an evolution of the YR ones
- **CHAPTER 3 – Experimental Systems**
 - Past “chapter 8”
 - Presenting the detector subsystems matching the requirements (mainly individual performance)
- **CHAPTER 4 – Detector Performance for the EIC physics program**
 - Past “chapter 2”
 - Presenting the holistic detector performance by the performance for key physics measurements
- **CHAPTER 5 – Detector-Accelerator interfaces**
 - INTEGRATION INTO THE FACILITY

preTDR - Structure of Ch.4

4	Detector Performance for the EIC physics program	455
4.1	ePIC and the Science Case of the EIC	455
4.1.1	Connecting the Physics Processes to the NAS Science Pillars	455
4.2	Global Performance Considerations	457
4.2.1	Electron Identification	457
4.2.2	Photon Detection	459
4.2.2.1	Clustering	460
4.2.2.2	Photon Identification	461
4.2.2.3	Photon Energy Measurements	462
4.2.2.4	Photon Position Measurements	462
4.2.2.5	π^0/γ discrimination	463
4.2.2.6	Additional capabilities with Barrel Imaging EMCal	464
4.2.3	Hadron Identification	464
4.2.4	Jet Reconstruction and Performance	465
4.2.5	Muon Identification	466
4.3	Incorporation of Beam Backgrounds in the Studies	468
4.4	Physics Processes and Detector Performance	469
4.4.1	Inclusive Processes	470
4.4.1.1	Reconstruction of Inclusive Events	470
4.4.1.2	Key Inclusive Physics Measurements using Full Detector Simulation	473
4.4.1.3	Influence of beam Background on Inclusive measurements	476
4.4.2	Semi Inclusive Processes	478
4.4.2.1	Methods and Reconstruction of SIDIS kinematics	478
4.4.2.2	Key Semi-Inclusive Physics Measurements using Full Detector Simulation	479
4.4.2.3	Influence of beam Background on SIDIS measurements	483
4.4.3	Exclusive and Diffractive Processes	485
4.4.3.1	Methods and Reconstruction of Exclusive and Diffractive kinematics	485
4.4.3.2	Key Exclusive and Diffractive Physics Measurements using Full Detector Simulation	487
	DVCS Studies.	487
	π^0 Background to DVCS.	488
	Upsilon (Υ) production.	489
	Gluon Saturation.	492
	$e^3\text{He}$ Double Tagging.	493
	Timelike Compton Scattering (TCS).	494
	Sullivan Process.	498
4.4.4	Hard Probes	501
4.4.4.1	Heavy Flavor	501
4.4.4.2	Displaced vertex resolution and tracking	501
4.4.4.3	Key Heavy Flavor Physics Measurements using Full Detector Simulation	504
4.4.4.4	Influence of beam on Background on Heavy Flavor measurements	504
4.4.4.5	Jets as a Hard Probe	506
4.4.4.6	Key Jet Physics Measurements using Full Detector Simulation	507
4.4.4.7	Influence of beam on Background on Jet measurements	507

Connects processes with the NAS pillars (provides a table)

Presents global performance and tools:

- Electron identification
- Photon measurement
- Hadron identification
- Jets reconstruction
- Muon identification

Discuss the detector performance in measuring physics processes:

- Inclusive
- Semi-inclusive
- Exclusive and diffractive
- Hard probes (heavy flavor and jets)



For each process the influence of **beam background** is being investigated

We continue polishing the document under the guidance of the **Editorial Board** and the **Project**



The ESR Charge and the Opportunity

- The EIC will ramp up gradually — luminosity, beam energies, species and polarization arrive in stages during the early years of running
- In June 2025 BNL & JLab Associate Lab Directors charged ePIC to summarize the science achievable with early data, before full machine capability
 - The initial deadline of May 1 -> **July**
- This report answers that charge using the **full Geant4 detector ePIC simulation** and **official ePIC event reconstruction**
- **Goal of this exercise:**
 - Highlight *meaningful* and *impactful* science within early years of running without undermining the importance of achieving full EIC capabilities

Jefferson Lab

Brookhaven
National Laboratory

June 13, 2025

Subject: ePIC Collaboration: Early Science Document

John Lajoie and Silvia Dalla Torre
Spokespeople, ePIC Collaboration

Dear John, Silvia and the ePIC Collaboration,

As the EIC construction plan becomes more mature, it is apparent that there will be a period of about five years when there will be collisions at the ePIC and early data could be recorded. The EIC Project team has released their expectations for the beam parameters (polarization, luminosity, energy and nuclear species) and their ramp-up during that early operating phase. We are writing to you – the ePIC collaboration - to develop a short document summarizing the science that would be possible from those early data.

Based on the early commissioning beam parameters released by the EIC project [1,2], the ePIC collaboration should summarize for the broader nuclear physics community, the funding agencies, and for the Labs, what exciting scientific results would be possible from this period. The results in the document should be based on the most recent understanding of the ePIC detector including the acceptances, efficiencies of each detector subsystem, and off-line reconstruction capabilities the collaboration has developed so far. We believe this document will also serve to help in the preparation of the ePIC TDR currently under preparation by the collaboration with the EIC Project, as input to CD2/3 milestone for the EIC. Beyond the physics of interest, we think that this ePIC early physics document would also be useful to demonstrate the collaboration's engagement and getting prepared for physics at the EIC and capture the status of ePIC collaboration's activities at this stage. We are happy to support this activity through in-person or hybrid workshops or topical meetings should they be needed.

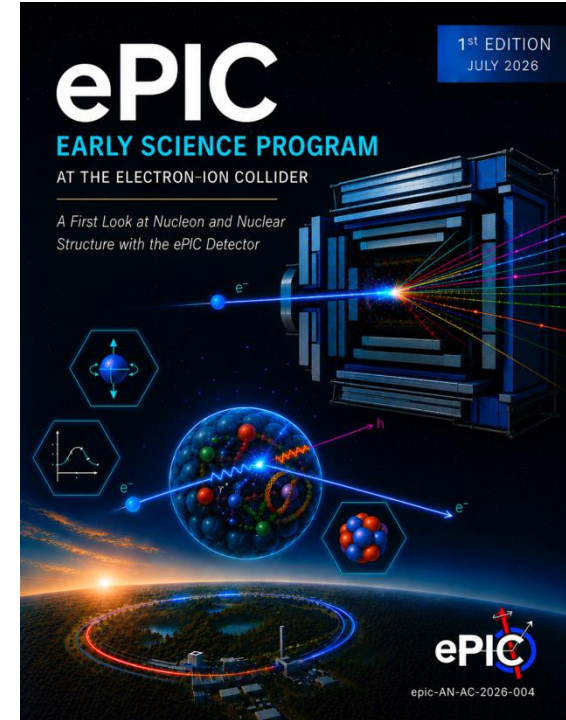
We recognize that this is an additional exercise for the ePIC community. At the same time, many previous such exercises (like the Yellow Report) were focused on full EIC machine capability. This report should focus on the science that could be produced before the ramp up to the full EIC machine capability.

We suggest that the collaboration prepares this report by May 1, 2026.

ESR Roadmap

- ✓ **May 29** – **v2.0** draft handed over to the referees
- ✓ **June 10** - feedback received from the referees
- ✓ **June 16** – **v2.1** circulated to Collaboration
- ✓ **June 23** – Feedback received (230+ comments) from ePIC Collaborators, compiled on a list [[Link](#)]
- ✓ **July 1** – **v3.0** handed to SPs and CC Chairs for final comments
- ✓ **July 10** – **v3.2** handed over to the ALDs for comments and feedback
-  **We are working with the pub. committee and CC on a polished ePIC author list**

Link to the latest version of the ESR:
<https://zenodo.org/records/21120166>



ESR - v3.2



ESR Take Aways

See [Rachel's talk](#) for all the details and results highlights!

Even before full design parameters, ePIC will deliver world-leading insights, and lay the foundation for the complete EIC science mission

Main takeaways:

- Impact studies supported by theory, we demonstrate Early ePIC running takes the first decisive steps on all three NAS pillars — not a commissioning exercise, but globally competitive QCD science
- Early running also establishes the validated reconstruction, calibration and analysis methods for the full EIC program

An ePIC teamwork!

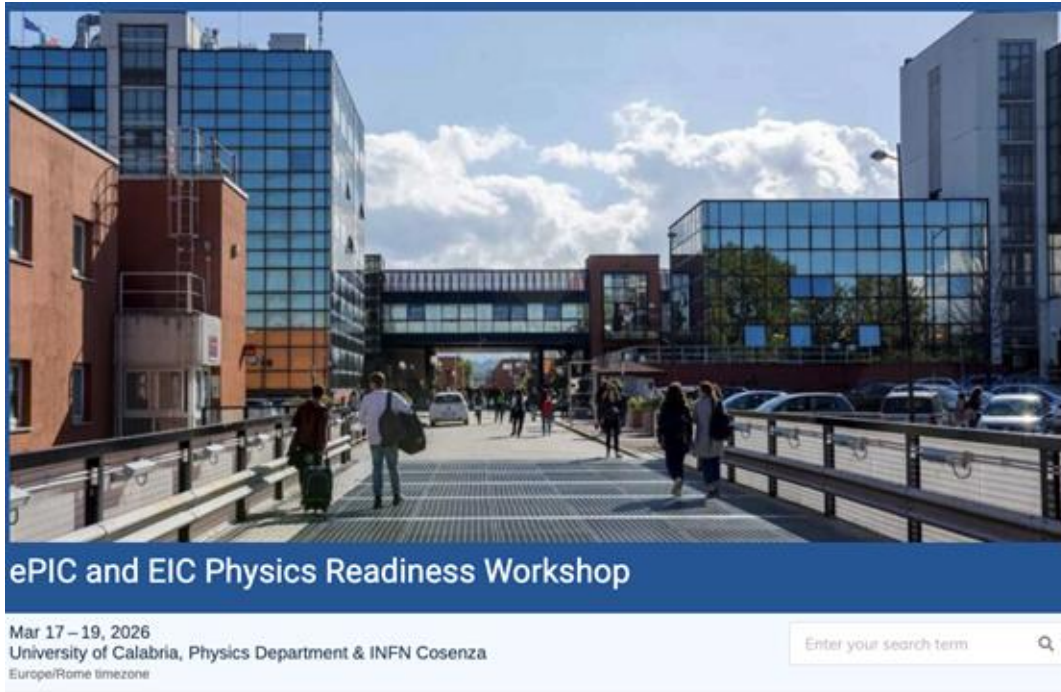
- Tireless efforts of all parts of the collaboration, round-the clock work by ePIC PWGs, three international workshops, production based millions of core-hours of computing, simulation based on design and digitization by DSCs



Delivered early

- SFs & proton & nuclear PDFs
- F_2^n , neutron SFs
- α_s at world-class precision
- Meson structure
- proton and neutron spin structure and nuclear FFs
- Initiate Sivers/Collins/transv.
- Nuclear gluon imaging
- Charm & jet R_{eA} in nuclei

Organized in March: 2nd Physics Readiness Workshop



- March 17-19 - U. of Calabria & INFN Cosenza
 - Indico: <https://indico.bnl.gov/event/30283/>
- Focus on the finalization of studies and text for the **TDR** and **early science** documents
- Next is being planned, jointly with S&C, for the first week of December.

- ☐ Next tentatively Dec. 2026 – 1st week
- ☐ Organized jointly with S&C

Overview

Timetable

FEE payment

Virtual/Remote Connection

WiFi for In-Person Participants

The scope of this workshop includes preparation and readiness of EIC focused physics analyses and related activities for the upcoming ePIC preTDR and Early Science documents. We will also have the opportunity to discuss contributed topics outside of this scope. Everyone interested is welcome to attend!

We are very grateful to the Physics Department of the University of Calabria and to the Diffraction Association for supporting this event financially.

The FEE is waived for students and postdocs.

Our path to results release and papers

- Principle Analysers (PAs) present analysis in PWG meetings and write **Analysis Note (AN)**
 - For *Performance Results* - AN can be brief and should include descriptions of e.g.:
 - Production campaign; how analysis was performed; cuts, how plots were made
 - Link to code for reproducing plots and metadata for collaboration
 - PWG Convenors **approve** the AN
 - PACs **review** and confirm approval of the AN, and assign an official AN tag
 - **AN and plots uploaded to Zenedo and circulated to the Collaboration**
 - PAs give presentation at a **Physics Forum** open to the whole ePIC Collaboration for discussion and feedback -> **release results to the public**
- **Performance Results are released for Collaboration use (talks, papers, documents ... etc)**
- Released Performance Results can be shared with phenomenologists for impact studies
- Plots of **performance results** have a tag (simulation campaign) and **can evolve over time**
 - New versions will not require the full approval chain, just the conveners approval



Physics Forums and Analysis Notes

Events

Events		
☒	Create subcategory	☒ Create event
		4
	Title	Start date
☐	ePIC Physics Forum	Jul 7, 2026, 11:00 AM
☐	ePIC Physics Forum	Jun 2, 2026, 8:30 AM
☐	ePIC Physics Forum	Feb 24, 2026, 11:00 AM
☐	ePIC Physics Forum	Dec 16, 2025, 11:00 AM

4 Physics Forums

8 Analysis Notes

A great way to:

- document work
- highlight work by the ECRs

Notes publicly available on our website: https://www.epic-eic.org/documents/analysis_notes.html



Analysis Notes

[epic-AN-AC-2025-001](#), M. Kesler, A. I. Sheikh, R. Ma, Z. Tu, T. Ullrich, Z. Xu, "Precision Extraction of Momentum Transfer in Diffractive Coherent Exclusive Vector Meson Production"

[epic-AN-AC-2025-002](#), J. Kim, "Study of Exclusive π^0 Production Measurement at ePIC of the Future Electron-Ion Collider"

[epic-AN-AC-2025-003](#), G. Matousek, C. Pecar, A. Vossen, "Dihadron A_UT for Early Science at the EIC"

[epic-AN-AC-2025-004](#), S. Maple, "Reduced cross sections from electron-proton collisions during EIC early science"

[epic-AN-AC-2025-005](#), W. Lin, "Projection study of A_1^n and g_1^n Measurement at ePIC in the Early Running of EIC"

[epic-AN-AC-2026-001](#), S. Kumar, A. Mastroserio, D. Elia, " D^0 meson Reconstruction and Expected Statistical Precision on Nuclear Modification Factor $\{R_{\{eAu\}}\}$ "

[epic-AN-AC-2026-002](#), G.M. Huber, S.J.D. Kay, and L. Preet, "Light Meson Form Factors from Deep Exclusive Meson Production in early EIC science configurations with the ePIC Detector"

[epic-AN-AC-2026-003](#), R. Siedl, "ePIC sensitivity studies for single hadron transverse single spin asymmetry measurements for the EIC early science running"

[epic-AN-AC-2026-004](#), J. Vanek, A. Jentsch, "Tagged Deep Inelastic Scattering in e-Deuteron collisions at 10x130 GeV"

NIM-A Special Issue

- NIM A Special Issue form filed with Elsevier – open till Fall 2026
 - Physics analysis currently planning to publish or contribute to:
 - ePIC Overview Paper (includes science)
 - Physics Performance of the ePIC Detector -> *spin off from Ch.4 of TDR*
 - The Science of the Early Running at ePIC -> *spin off from ESR*
 - Physics with inclusive measurements in the ePIC early running
 - Physics with semi-inclusive measurements in the ePIC early running
 - Physics with exclusive and diffractive measurements in the ePIC early running
 - Physics with jets and heavy flavor measurements in the ePIC early running
 - Opportunities for electroweak and BSM physics with the ePIC experiment at the EIC
- 7+1 physics analysis papers (overall 30+ publications)**



Monte Carlo validation [Tuesday 16:10-1650]

EDT NIM Paper Updates - Latest Status		Zhoudunming Yu
466, Gilbert Scott Building		09:00 - 09:10
Muon Identification in the ePIC Detector Using the XGBoo...		
<i>Maciej Blaut</i>		
Exclusive Production of Electron and Muon Pairs in Elect...		
<i>Mr Kacper Koped</i>		
Exclusive Production of Tau Lepton Pairs in Electron-Pro...		
<i>Karol Olsz</i>		
DVCS Analysis - Latest Progress		Oliver Jevons
Lecture Theatre 466, Gilbert Scott Building		09:55 - 10:10
eD TDIS - Latest Progress	Jan Vanek	Echelon 2 Participat...
		<i>Dr Markus Diefert...</i>
Coffee Break		Coffee Break
Diffractive DIS - Latest Progress		1A The Square, Gibe...
<i>Arjun Kumar</i>		10:30 - 11:00
eA Phi - Latest Progress		Maci Kesler
Lecture Theatre 466, Gilbert Scott Building		11:00 - 11:15
DVMP J/psi - Latest Progress	Mr Olajya Olokinboyo	
Lecture Theatre 466, Gilbert Scott Building		11:15 - 11:30
Kaon SF - Latest Progress		Baptiste Fraisse
Lecture Theatre 466, Gilbert Scott Building		11:30 - 11:45
e3He Double Tagging - Latest Updates		Wen Lin
Lecture Theatre 466, Gilbert Scott Building		11:45 - 12:00
DVPi0P - Latest Progress		Li Xu
Lecture Theatre 466, Gilbert Scott Building		12:00 - 12:15
Upsilon Analysis - Latest Progress	Dr Georgios Kintiras	
Lecture Theatre 466, Gilbert Scott Building		12:15 - 12:30

Collaborator Contributions



Priorities moving forward

Top most near term priority for the remainder of 2026

- Successfully land our 6+ **NIM-A papers**

Mid-term priorities

- Refine studies on **machine background effects** on physics
- Support base-lining of detector design with dedicated physics performance studies
- What's next? **Brainstorm the next steps** with physics studies at the next Physics Readiness Workshop (tentatively 1^o week of December)
- Jointly with S&C:
 - Explore the development of AI in ePIC reconstruction and analysis. Where are the **real** opportunities?
 - Validation of MC generators
 - Developing and backmarking analysis frameworks
 - Further develop **analysis tools** and Event **reconstruction** [see next slide]

2026 Reconstruction Priorities

- Holistic reconstruction

- There has been a tremendous progress with our reconstruction software, which has enabled many physics performance studies over the past year!
- Nevertheless, further development of a more realistic holistic treatment of information from different components is crucial
- Moving forward we prioritize:
 - Development of our **electron finder** into a more complex tool, capable of identifying all electron candidates and assigning to them a probability, via combining informations from calorimeters, trackers and PID systems
 - Complete the development of a **particle flow** algorithm
 - Development of a **true PID reconstruction**, using the information from all PID subsystems (we are currently using look-up tables)
 - Development of a **muon finder**, using tracker and veto from HCAL
 - **Joint effort** of PWGs and **Tracking CC WG** to demonstrate that the tracking system in ePIC is adequate for all the various physics studies

Summary

- **Physics Forums are now well established:** several Analysis Notes released ([link](#))
- **Much activity towards the TDR and the ESR**
 - ✓ **preTDR version 3.1**
 - TDR chapter 4 will seed a science paper on NIM special issue
 - ✓ **ESR version 3.2:** delivered to the ALDs of BNL and JLAB for comments and feedback
 - a spin-off will be published in NIM A
- 👷 **NIM A papers by the PWGs**

- **HOW do I join a PWG?**
 - **step 1:** email the conveners of your favorite PWG and subscribe the mailing list!
 - **step 2:** join the biweekly meetings
 - **step 3:** actively engage in studies and efforts – **make an impact!**
- PWG convenors are aware of specific open tasks in their group if you are looking for a way to get involved