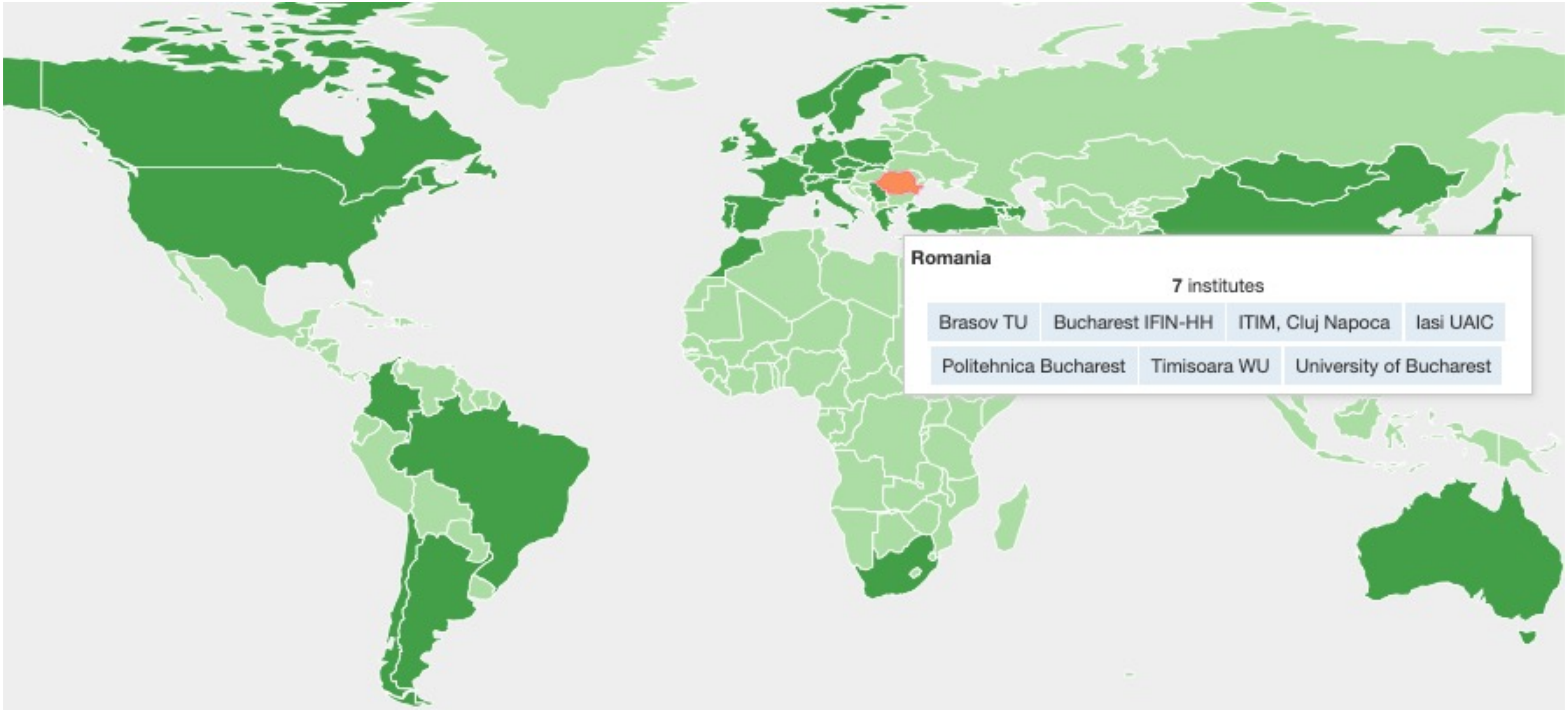
ATLAS++ for ISAB open session

ATLAS cluster composition: 66 members (31 physicists, 32 engineers), 57 active members, 22 authors (A), 3 under qualification (q).



ATLAS++ for ISAB open session

ATLAS cluster composition: 66 members (31 physicists, 32 engineers), 57 active members, 22 authors (A), 3 under qualification (q).

short name	name	active members	physicist	PhD std	master	ugraduate	eng PhD	eng	eng std	tech	admin
Brasov TU	Transilvania University of Brasov	3	0	0	0	0	3	0	0	0	0
Bucharest IFIN-HH	Horia Hulubei National Institute of Physics and Nuclear Engineering	16	11	3	0	0	2	0	0	0	0
ITIM, Cluj Napoca	National Institute for Research and Development of Isotopic and Molecular Technologies	15	1	0	0	0	5	4	0	5	0
Iasi UAIC	Alexandru Ioan Cuza University of Iasi	8	6	0	0	0	0	2	0	0	0
Politehnica Bucharest	National University of Science and Technology POLITEHNICA Bucharest	9	0	0	0	1	5	1	2	0	0
Timisoara WU	West University in Timisoara	1	1	0	0	0	0	0	0	0	0
University of Bucharest	Faculty of Physics, University of Bucharest	5	2	1	2	0	0	0	0	0	0
	total:	57	21	4	2	1	15	7	2	5	0

ATLAS++ for ISAB open session

ATLAS cluster composition: 66 members (31 physicists, 32 engineers), 57 active members, 22 authors (A), 3 under qualification (q).

OTP - Operational Task Planner (waiting for the update for the second half of the year)

ATLAS OTP Reports | Reports | Checks | Final Reports | Website

Year: 2025 | Category: All | Funding Agency: Romania | System: All | Activity: All | Type: Expert and Shifter | Recognition: Duty | Unit: Auto Units

FundingAgencyOverview Report - 2025 - Class 1, Class 2, Class 3, Class 4 and Upgrade Construction

Search:

2025	Effective Operational Task (OT)		Requirements			Allocations				
Year	Class 1&2 [FTEs]	Class 3 [FTEs]	Class 1 [Shifts]	Class 2 [Shifts]	Class 3 [FTEs]	Class 1 [Shifts]	Class 2 [Shifts]	Class 3 [FTEs]	Class 4 [FTEs]	Upgrade [FTEs]
2025	23.75	28.91	55.14	234.78	7.55	0.00	181.55	1.55	1.56	2.67
2024	22.75	24.55	62.95	215.11	6.46	25.20	327.60	2.06	3.16	6.26
Average	**23.57**	**24.32**	**51.51**	**191.63**	**6.41**	**11.20**	**166.19**	**2.67**	**2.85**	**6.60**

ATLAS++ for ISAB open session

ATLAS cluster composition: 66 members (31 physicists, 32 engineers), 57 active members, 22 authors (A), 3 under qualification (q).

OTP - Operational Task Planner (waiting for the update for the second half of the year)

Class	System	Activity	Task	2024	2025
Class 1	DAQ/HLT	Detector Operation	ATLAS Run Control Shifter (ACR)	0.01	
Class 1	General Tasks	Data Preparation	Online DQ ACR shifts	0.05	
Class 2	DAQ/HLT	Detector Operation	DAQ/HLT on-call	0.10	0.02
Class 2	DAQ/HLT	Detector Operation	Deputy System run coordinator	0.15	
Class 2	DAQ/HLT	Detector Operation	System run coordinator	0.40	0.06
Class 2	General Tasks	Computing/Software	Distributed Analysis Shifts 1st level	0.16	0.16
Class 2	General Tasks	Data Preparation	Data Preparation Operations Shifts	0.02	0.01
Class 2	LAr	Detector Operation	LAr On call experts		0.23
Class 2	TILE	Detector Operation	Tile DQ validator	0.04	
Class 2	TILE	Detector Operation	Tile Test-Beam shifter	0.03	
Class 3	DAQ/HLT	Detector Operation	Control & Configuration	0.33	0.07
Class 3	General Tasks	Analysis Support	Generator Software	0.10	
Class 3	General Tasks	Analysis Support	Performance Studies - Egamma	0.02	
Class 3	General Tasks	Analysis Support	Performance Studies - Tracking CP	0.06	0.38
Class 3	General Tasks	Computing/Software	Validation of software release		0.33
Class 3	General Tasks	Data Preparation	Condition data base coordination	0.40	0.15
Class 3	General Tasks	Data Preparation	Non-collision background group	0.05	0.07
Class 3	General Tasks	Data Preparation	Prompt reconstruction operations coordination (PROC)	0.02	
Class 3	ID gen	Computing/Software	Common Tracking Software Support	0.40	0.20
Class 3	LAr	Data Preparation	Development and maintenance of infrastructure	0.02	0.03
Class 3	LAr	Data Preparation	Overall system DP responsible		0.07
Class 3	LAr	Data Preparation	Reconstruction,EDM,Validation		0.02
Class 3	Muon	Detector Operation	Muon DCS Maintenance	0.25	0.10
Class 3	Muon	Detector Operation	Muon Trigger M&O	0.40	0.12
Class 4	General Tasks	Computing/Software	RO Romanian Tier-2 Federation	3,16	1,56
Upgrade Construction	General Tasks	Detector Operation	Phase-II TDAQ	2,88	1,54
Upgrade Construction	TILE	Detector Operation	Phase-II Tiles	3,38	1,14
			Total FTE:	**9,42**	**4,24**

ATLAS++ for ISAB open session

ATLAS cluster composition: 66 members (31 physicists, 32 engineers), 57 active members, 22 authors (A), 3 under qualification (q).

Representing Romania in several committees at CERN:

- Călin Alexa, Scientific Policy Committee Adviser (SPC)
- Gabriel Stoicea, Restricted European Committee for Future Accelerators (RECFA)
- Gabriel Popeneciu, Industrial Liaison Officer (ILO)
- Roxana Zus, Teacher and Student Forum
- Paul Mircea Grăvilă, International Particle Physics Outreach Group (IPPOG)
- Adam Jinaru, European Particle Physics Communication Network (EPPCN)

ATLAS collaboration responsibilities:

- Gabriel Popeneciu: Tile Calorimeter Mechanical coordinator
- Otilia Ducu: Coordination of the Clustering and Tracking in Dense Environments (CTIDE) group
- Julien Maurer: Conditions coordinator - managing tags of the COOL database (until October 2025)
- Adrian Chițan: Non-Collision Background coordinator - managing analyses and monitoring efforts for Beam Induced and Cosmic backgrounds

Event organisation (IFIN-HH and UB):

- ATLAS TDAQ Week, 15-19 Sept. 2025, University of Bucharest

ATLAS++ for ISAB open session

Specific scientific focus of group

a) Physics studies:

- ***Supersymmetry*** (SUSY): Final states: one lepton, two same-sign or three leptons; Grand pMSSM scan (pMSSM-19); RPC-to-RPV;
- ***Beyond the Standard Model (BSM):*** The Type II Seesaw doubly-charged Higgs boson search; BSM pseudoscalar boson; Search for heavy neutral leptons (HNL); Resonant production of vectorlike quarks; Anomaly detection in multilepton final states; Higgs to Za with "a" is an axion-like particle.

b) Performance studies and analysis software: Electron performance measurements, discrimination, and study of misidentified reconstructed objects; Fake and lost tracks in the jet core, co-coordination of the "Clustering and Tracking in Dense Environments" group; PMG Central Page

c) Data preparation: Coordination mandates: conditions and Non-Collision Background (NCB); NCB: simulation, reconstruction, validation, Run3 migration, online monitoring, characterisation and mitigation of the cosmics-ray background; Data quality monitoring infrastructure: maintenance/development of the software; validation of recorded data, Dara Quality shifts

d) Detector operation and TDAQ: Tile calorimeter maintenance and operation, Data Quality Validator; LAr calorimeter operation and offline activities; DCS for NSW Trigger Processor ATCA; Maintenance of the data acquisition global monitoring tools; TDAQ Run Coordinator; DAQ on-call;

e) Software and computing: Physics Validation (PhysVal); Performance studies and analysis software; Contribution to the Distributed Analysis support team; Machine Learning (ML) applications development for physics analysis; Maintenance and operation of the data centres managed by our group members; Local datacentre architecture and operations

f) Upgrade:

- ***Phase-I*** NSW: New Small Wheel (NSW) DCS development and support
- ***Phase-II TDAQ:*** Commissioning of the new Trigger Processor Demonstrator Board at the NSW Vertical Slice Lab; Design of the new Trigger Processor Board with single sector architecture
- ***Phase-II Tile Calorimeter*** - New front-end (FE) electronics development; Drawer mechanics; Mini-drawers services distribution; Tooling System; High voltage active dividers boards. Development and deployment of the procedures for Mini-drawers (MDs) assembly, certification and installation in the ATLAS detector. Demonstrator operation in ATLAS detector. Test Beam Campaign in the H8 beam line facility.

g) DRD1 (Gaseous Detector R&D): Participation to the DRD1-WG5 activities for the definition and design of DAQ systems for gaseous detectors, including new front-end hybrids and new SRS DAQ components and firmware; Participation to the definition and design of versatile front-end ASIC for gaseous particle detectors; Consolidation of the microscopic simulation tool of the Micromegas detector

h) DRD4: Detector trigger system using the FPGA pulse processing algorithms for SiPM sensors

i) DRD Calo (DRD6) and FCC Allegro: Scintillating Tile Hadronic Calorimeter for future colliders with TileCal like geometry. Noble-liquid-based electromagnetic calorimeters for FCC-ee detectors, test beam prototype; Allegro calorimeter design studies, conjointly within the FCC and DRD6 collaborations. EM calorimeter design and performance studies with simulation R&D for the geometry optimization of the Hadron calorimeters with scintillating tiles readout by wavelength shifting fibres and SiPMs readout.

j) DRD7: Work Package 7.5b: From Front-End to Back-End with 100GbE

k) Outreach (extensive information in the dedicated slides of this report)

Specific scientific focus of group

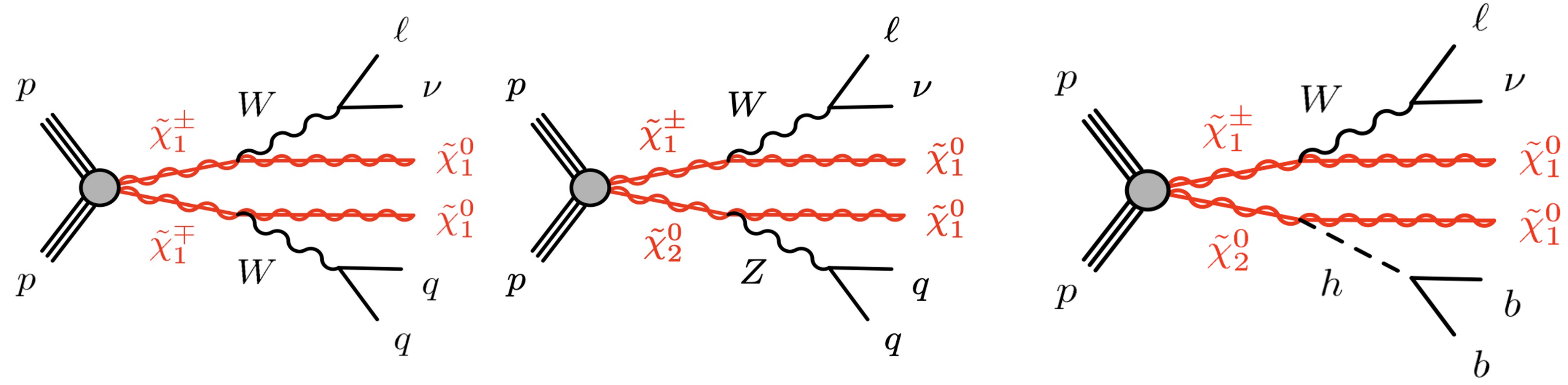
a) Physics studies:

- ***Supersymmetry*** (SUSY):
    - Final states: one lepton, two same-sign or three leptons;
    - Grand pMSSM scan (pMSSM-19);
    - RPC-to-RPV;

- ***Beyond the Standard Model (BSM):***
    - The Type II Seesaw doubly-charged Higgs boson search;
    - BSM pseudoscalar boson; Search for heavy neutral leptons (HNL);
    - Resonant production of vectorlike quarks;
    - Anomaly detection in multilepton final states;
    - Higgs to Za with “a” is an axion-like particle.

SUSY Searches with leptonic final states

- Search for strongly produced SUSY particles with **two same-sign or three leptons**
- Search for electroweakinos in events with **one isolated lepton**, jets and missing transverse momentum in the final state:



- The limits are presently undergoing refinement based on the full Run-2 and partial Run-3 ATLAS dataset, with an integrated luminosity of 139 fb^{-1}

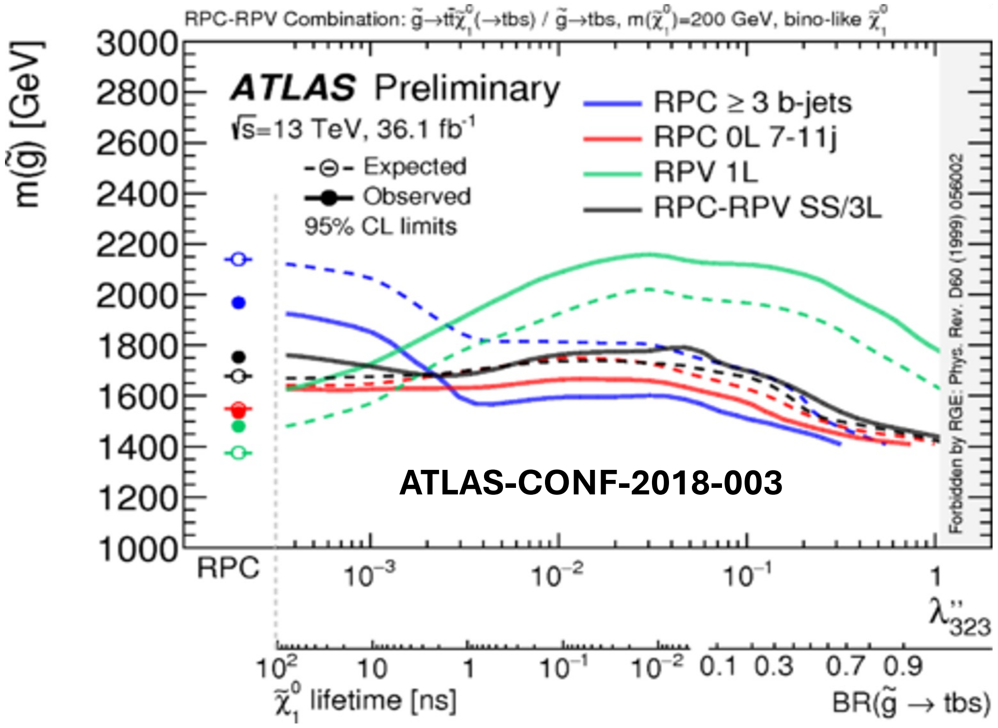
Reinterpreting published SUSY searches

Reinterpretation of searches for supersymmetry models with long-lived particles using the ATLAS experiment at the LHC

A set of ATLAS searches for SUSY, originally designed for both R-parity–conserving and R-parity–violating scenarios, has been reinterpreted in models where the strength of the RPV coupling is varied. Depending on the coupling magnitude, the LSP may either be long-lived—decaying at a measurable distance from the interaction point—or decay promptly. Using these searches, ATLAS establishes 95% confidence-level limits on simplified SUSY models, including:

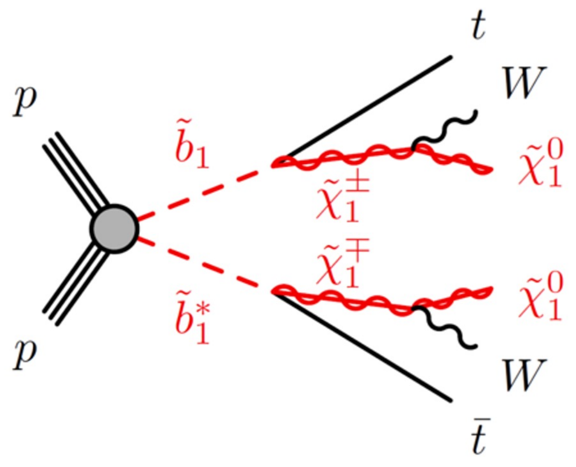
- pair-produced gluinos with decay channels enriched or suppressed in top quarks,
- pair-produced stops,
- pair-produced charginos and neutralinos,
- pair-produced staus.

The existing limits are being rederived using the full Run-2 ATLAS dataset, corresponding to an integrated luminosity of 139 fb^{-1}, with the updated plots currently undergoing internal approval within the ATLAS collaboration.



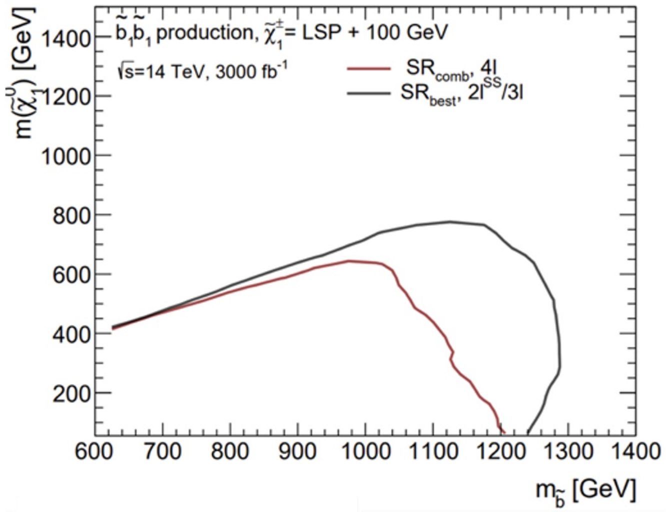
Sbottom multi-leptons search: projection studies (arxiv:2510.13355)

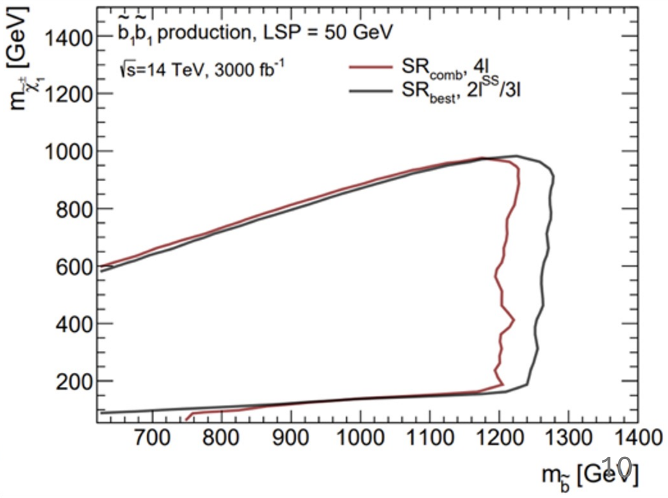
- **HL-LHC and FCC-hh projection studies** for the sbottom pair production with chino1 in the decay chain SUSY simplified model
  - Using the background estimations & the associated uncertainties, as well as the signal regions from:
    - JHEP 07 (2021) 167, arXiv:2103.11684
    - JHEP 06 (2020) 046, arXiv:1909.08457



- **Considered luminosities and center of mass energies:**
  - 139 fb^{-1} (end of LHC Run-2), 300 fb^{-1} (projected for the end of LHC Run-3), and 3000 fb^{-1} (anticipated for the HL-LHC)
  - 13 TeV (LHC Run-2), 13.6 TeV (LHC Run-3) and 14 TeV (anticipated for the HL-LHC)

- Samples generated with MadGraphs + Delphes, and analysed with the SimpleAnalysis framework





Type 2 Seesaw: JHEP publication and LLP studies

JHEP

Published for SISSA by Springer

Received: November 8, 2024
Revised: March 15, 2025
Accepted: March 26, 2025
Published: June 3, 2025

Type-II Seesaw Higgs triplet productions and decays at the LHC

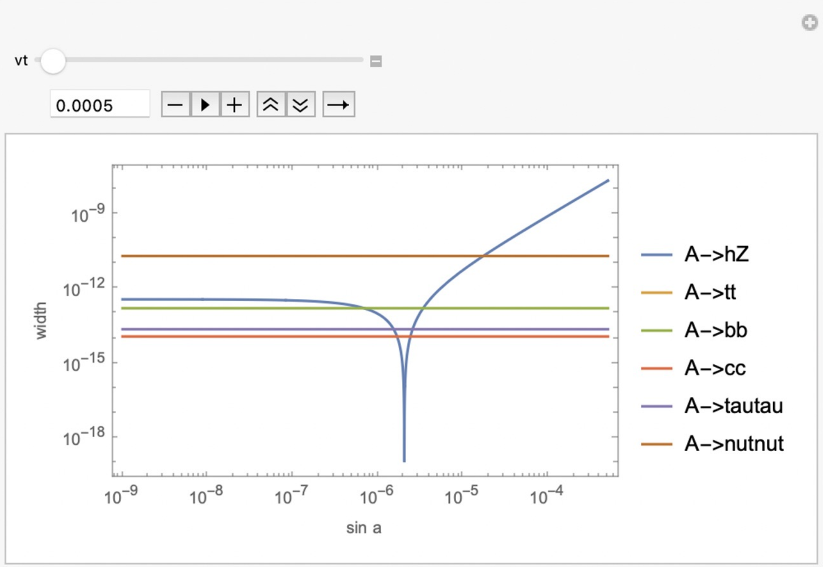
Otilia A. Ducu[a], Ana E. Dumitriu[a], Adam Jinaru[a], Romain Kukla[b], Emmanuel Monnier[c], Gilbert Moultaka[d], Alexandra Tudorache[a] and Hanlin Xu[e]

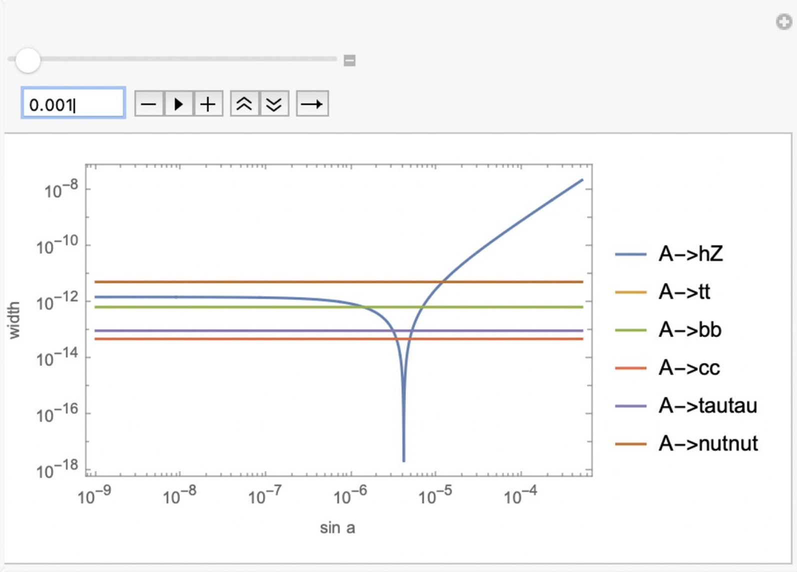
[a] Horia Hulubei National Institute for Physics and Nuclear Engineering, 30 Reactorului, Măgurele - Ilfov, 077125, Bucharest, Romania
[b] Naval Electromagnetism Laboratory, 21 avenue des Martyrs, 38000 Grenoble, France
[c] CPPM, Aix-Marseille Université, CNRS/IN2P3, 163, avenue de Luminy, Marseille, France
[d] Laboratoire Univers & Particules de Montpellier (LUPM), Université de Montpellier, CNRS, Montpellier, France
[e] Department of Modern Physics and State Key Laboratory of Particle Detection and Electronics, University of Science and Technology of China, Hefei, China

E-mail: oducu@cern.ch, ana.elena.dumitriu@cern.ch, adam.jinaru@cern.ch, romain.kukla@grenoble-inp.fr, monnier@in2p3.fr, gilbert.moultaka@umontpellier.fr, atudorac@cern.ch, hanlinxu@mail.ustc.edu.cn

Abstract: The Type-II Seesaw Model provides an attractive scenario to account for Majorana-neutrino masses. Its extended Higgs sector, if sufficiently light, can have a rich and distinctive phenomenology at the LHC while yielding automatically an essentially Standard-Model-Higgs-like state. Several phenomenological studies have been devoted to the scalar sector of this model, as well as experimental searches focusing mostly on the (doubly-)charged states. In this paper we present an exhaustive study of the main production and decay

JHEP06(2025)020



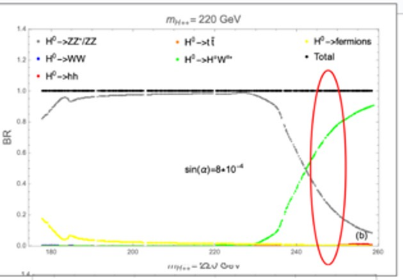


- Reviewer feedback prompted a focused study on the long-lived particle (LLP) behavior of the scalars
- A^0 was identified as the most promising LLP at lower v.e.vs (e.g. $v_t = 5*10^{-4}$ and 10^{-3}) and certain sin α values, due to favorable lifetimes and event rates

- our work on the Type II Seesaw model led to a JHEP publication (JHEP06(2025)020). Some highlights:
  - the sensitivity of heavy scalars branching ratios to the scalar mixing angle, sin α.
  - the scalar leading-order discovery potential in multi-lepton final states at ATLAS-like luminosities, assuming a fixed triplet vacuum expectation value (v.e.v.)

- Widths of around 10^{-13} - 10^{-11} GeV already are promising for a 1mm-1cm travel distance order in the detector with convenient number of events

Type 2 Seesaw: NLO studies

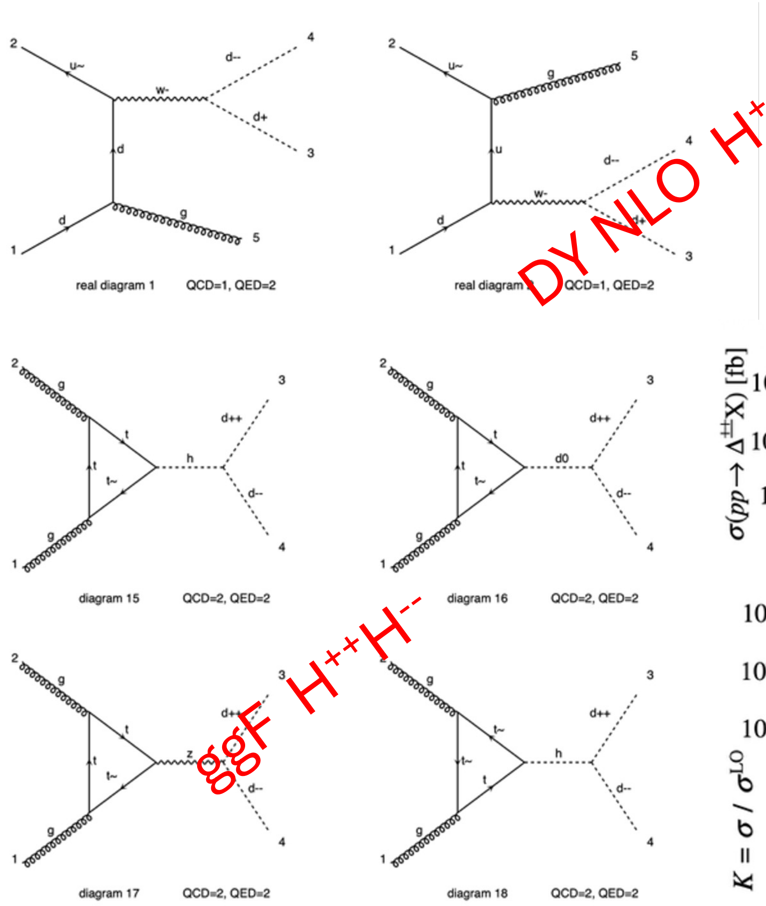


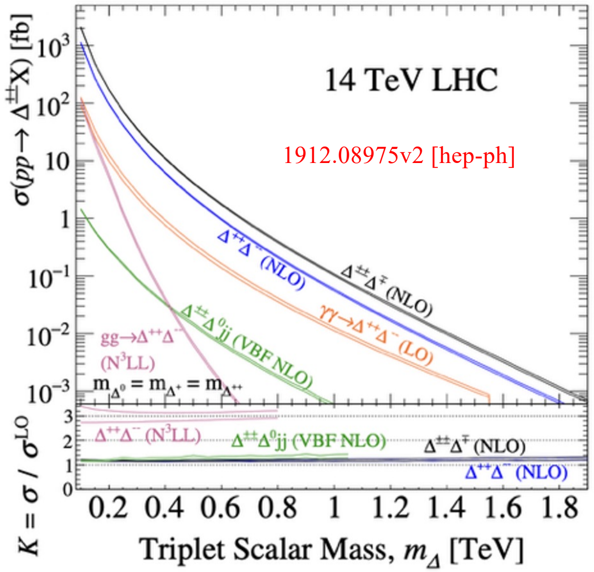
LO Vs NLO codes: (220, 235, 249.098),

DECAY 9000035 2.146840*10-6
0.623 H+W* # 1.337*10-6
0.3717213 23 23 # 7.980262663938447*10-7
0.03222928 5 -5 # 6.919112792424674*10-9
DECAY 9000036 1.722926*10-6

DECAY 9000035 2.143267*10-6 (2.143267*10-6)
0.624 (0.622) H+W* # 1.337*10-6 (1.334*10-6)
0.372341(0.372341) 23 23 # 7.98026*10-7 (7.98026*10-7)
0.003228301 (0.03228301) 5 -5 # 6.9191*10-9 (6.9191*10-9)
Different neutrino flavor decays not there (anyway, very small)
DECAY 9000036 1.725936*10-6 (1.725936*10-6)

- we also began incorporating the NLO corrections via the Fuks et al. framework (arXiv:1912.08975v2 [hep-ph]), aiming to improve the cross-section accuracy and jet pT modeling
- first we validated the LO consistency between the LO and NLO codes, both at cross-section and BRs/widths levels: the results match pretty well



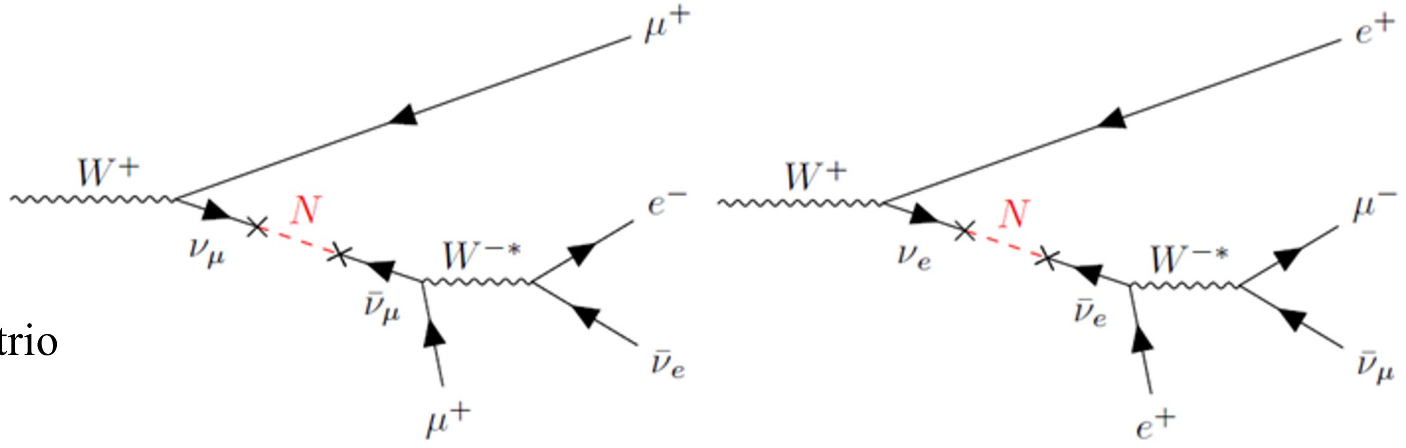


- then we extended the Madgraph pair and associated productions to NLO Drell–Yan, NLO gluon–gluon fusion, and LO photon fusion across triplet masses
- all channels behaved as expected, with one exception (NLO VBF) which however remains subdominant

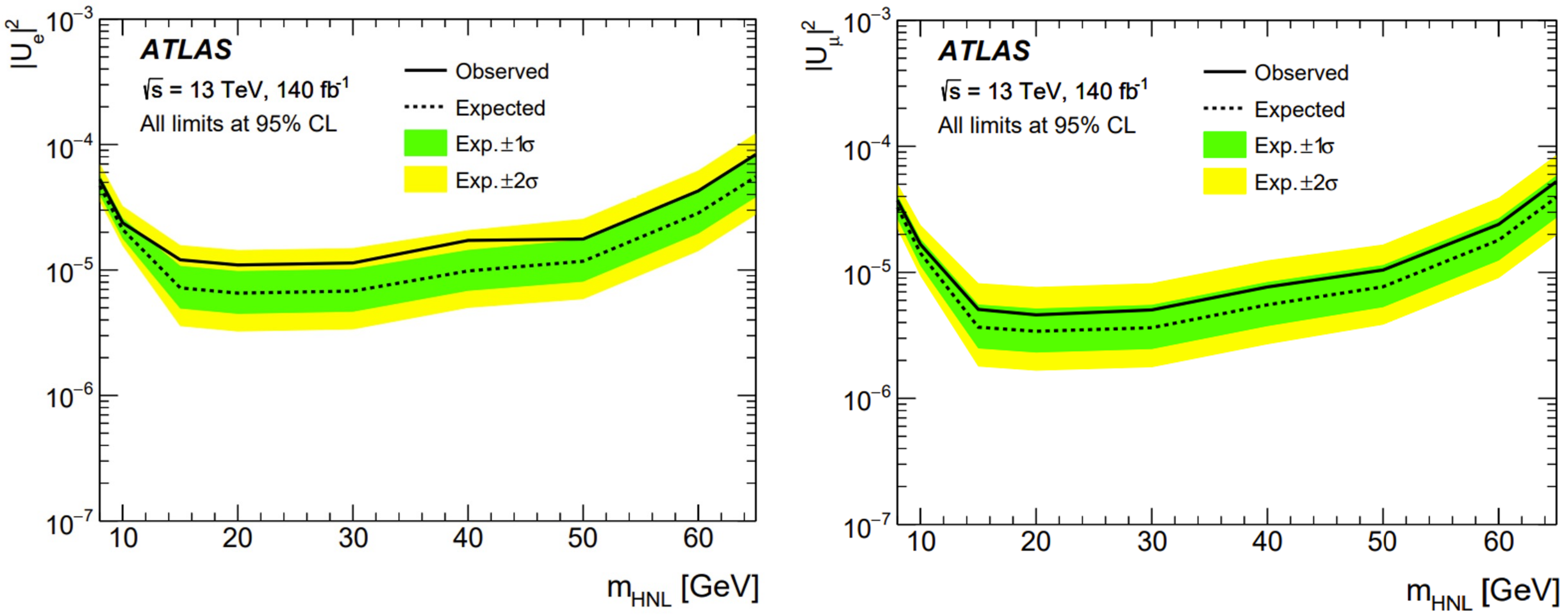
- **An NLO-level ATLAS signal request is underway**

Search for heavy neutral leptons (N, arXiv:2508.20929)

- **Using 139 fb^{-1} of Run-2 data**
- **Final states:**
  - Two same-sign signal muons + one third baseline electron of opposite sign
  - Three signal leptons, with no same-sign trio



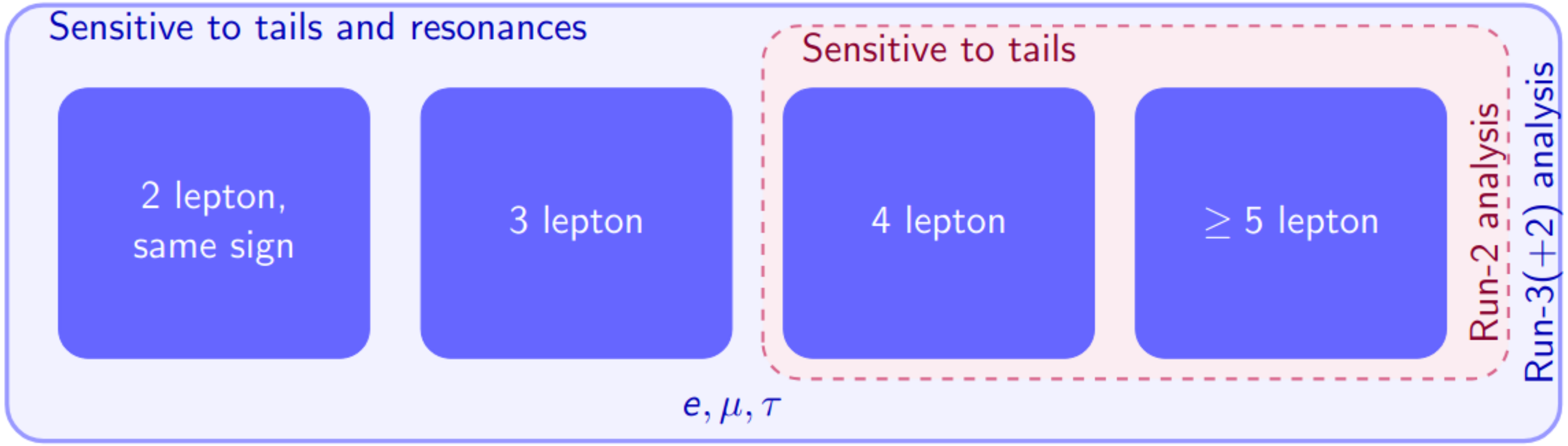
- **Cut-and-count signal regions** defined separately for:
  - Each signal mass point
  - Each N decay mode
- **Main background sources:**
  - Fake/non-prompt leptons



H→Z a→4 l analysis

- customize and validate various **analysis frameworks**
  - HZZAnalRun2Code, HZZCutCode, TopCPToolkit, EasyJet
- develop the **offline** visualization **framework**
- move to **Run-3** data analysis

Multilepton Anomaly Detection Run-3(+2)



- Split regions by charge and flavour

Splitting	Example final states
$Q=0,\ 0Z,\ 0\text{SFOS}$	$e^+e^+\mu^-\mu^-$
$Q=0,\ 0Z,\ 1\text{SFOS}$	$e^+e^-e^-\mu^+,\ \mu^+\mu^-e^-\mu^+$
$Q=0,\ 1Z,\ 2\text{SFOS}$	$e^+e^-\mu^+\mu^-$
$Q=2,\ e>\mu$	$e^+e^-e^+e^+,\ \mu^+\mu^-e^+e^+$

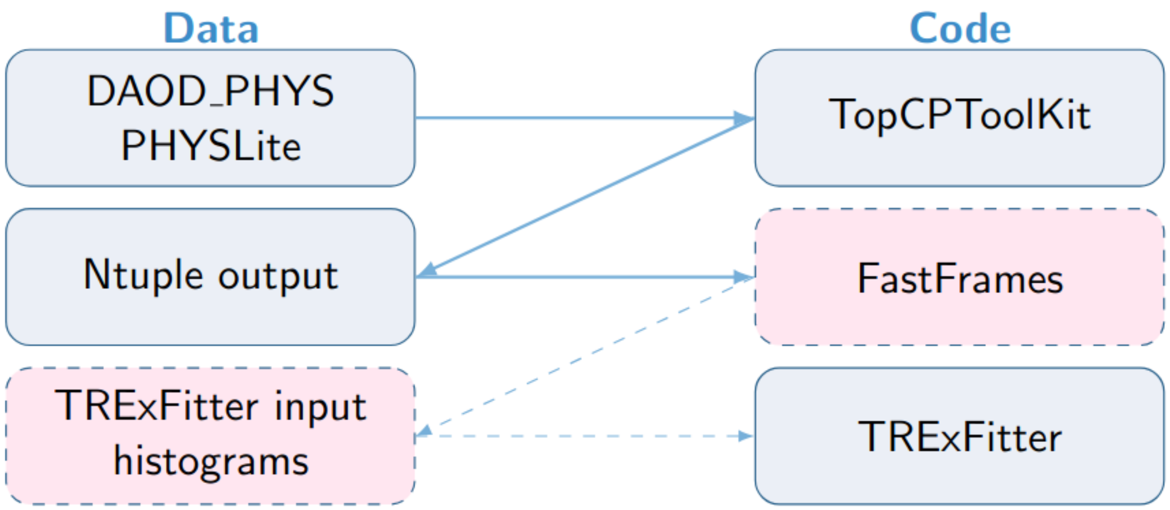
- Model-independent scan: split analysis regions depending on number of reconstructed Z boson, flavour dependent lepton multiplicities and charge correlations, and b-jet multiplicities

- Regions dominated by SM contribution would serve for data-driven background estimation

- Use Anomaly Detection techniques, where statistics permits to learn the background probability

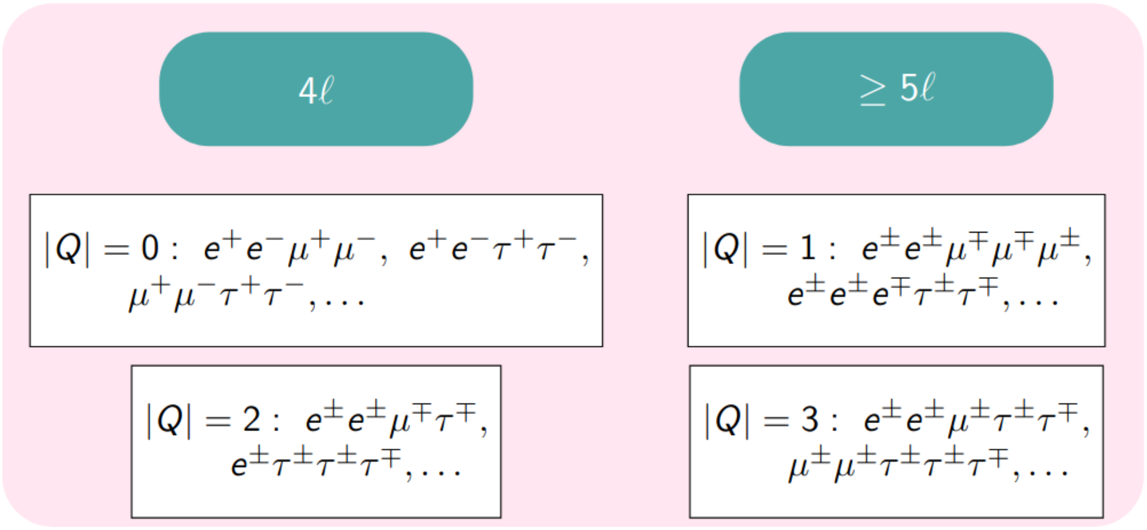
- Cut and count analysis in low statistics regions for 5l

Multilepton Anomaly Detection Run-3(+2)



- Framework developments
- Sample production
- Data-MC comparisons

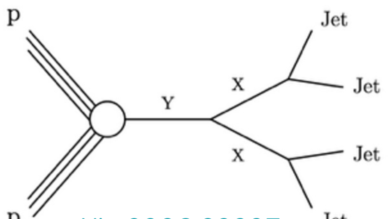
- FastFrames adapted to recent ntuples updates and to maintain consistency for all final states searches



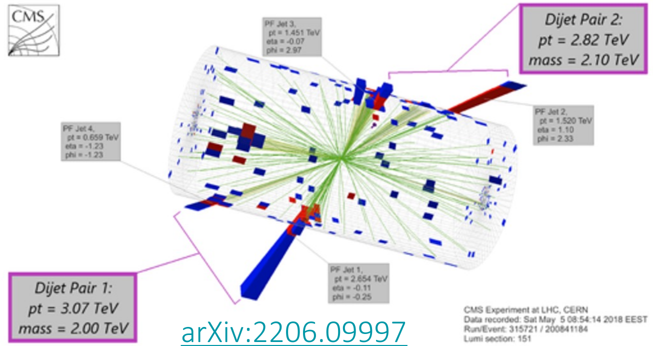
Production of an ultraheavy diquark scalar at the HL-LHC (Phys. Rev. D 111 (2025) 11, 115025)

● The ATLAS and CMS Collaborations have been on the search for heavy dijet resonance, with CMS reporting an excess of events (3.9σ) with 4-jet masses around 8 TeV.

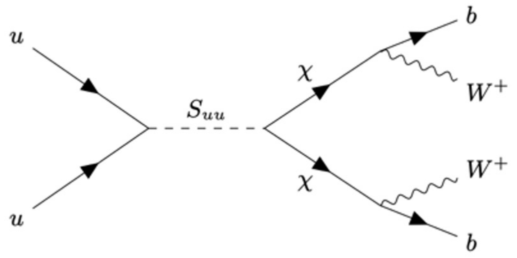
● By delivering far more data and sharper measurements, the High Luminosity LHC greatly increases our chances of discovering new physics beyond the Standard Model, especially for ultraheavy particles testing the collider kinematic limitations.

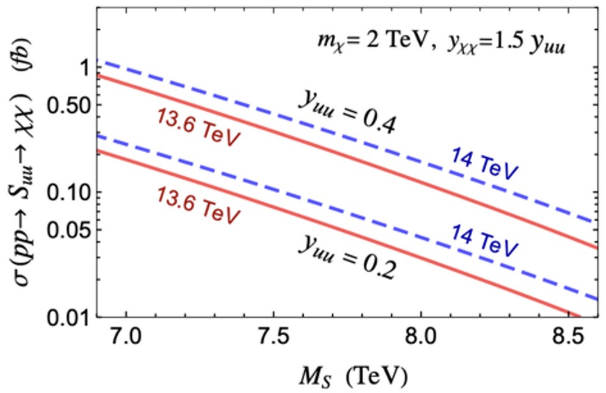


arXiv:2206.09997



arXiv:2206.09997

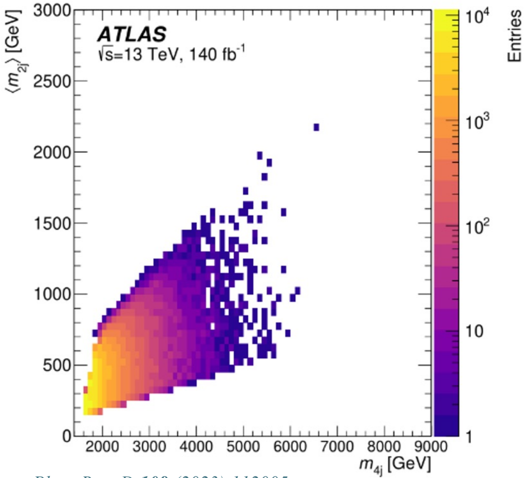




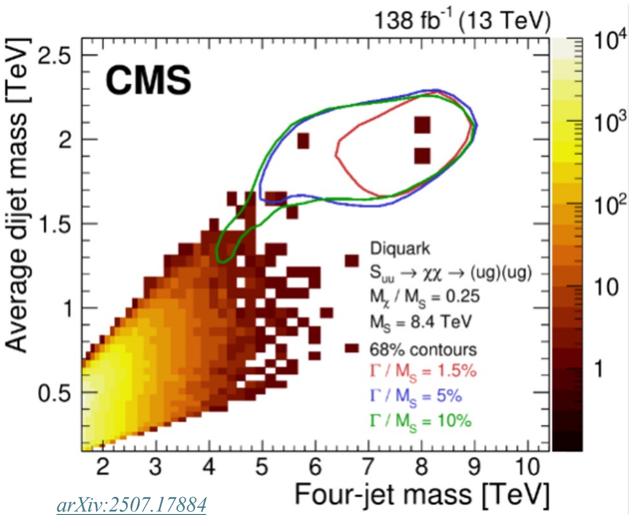
● We analyse the potential for discovering or ruling out an ultraheavy diquark in fully-hadronic final states (6-14 jets) processes at the High Luminosity LHC experiments.

● The theoretical BSM framework (arXiv:1810.09429) includes two new particles: a diquark scalar S_{uu} with (6, 1, +4/3) and vectorlike quarks χ with (3, 1, +2/3).

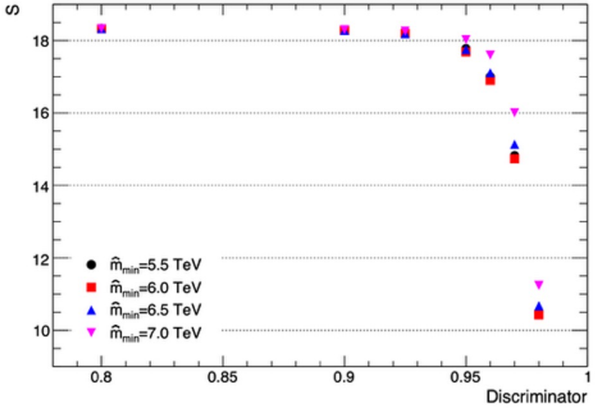
● Signal-from-background selection is done using a Random Forest classification algorithm to build a multidimensional discriminator variable.

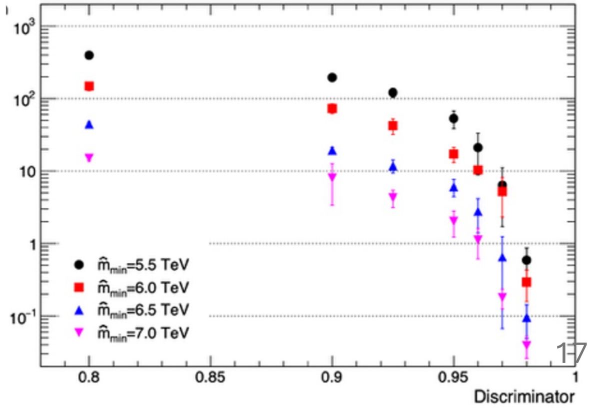


Phys. Rev. D 108 (2023) 112005



arXiv:2507.17884

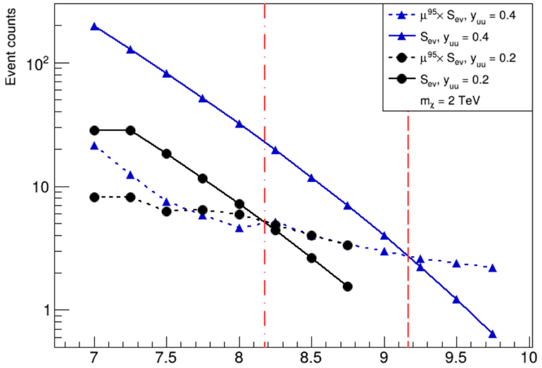




Production of an ultraheavy diquark scalar at the HL-LHC

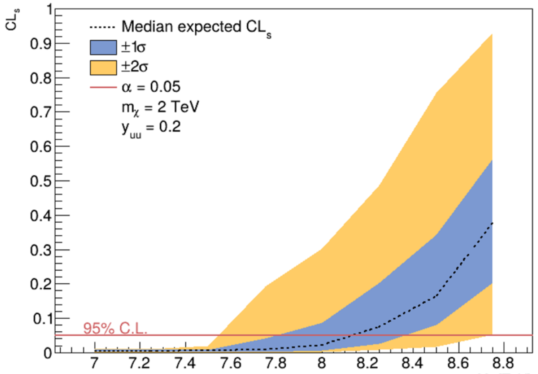
(Sent for publication at Phys. Rev. D, arXiv:2511.02474)

- We have performed an exclusion region scan, using the CL_s criterion and the 95% C.L. upper limit on the signal strength multiplier μ.



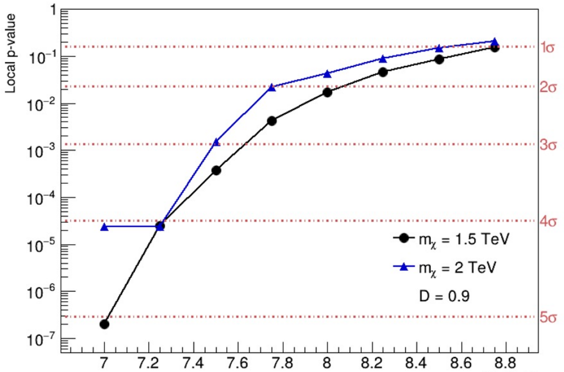
arXiv:2511.02474

- The results indicate a high sensitivity to the Yukawa coupling y_{uu} (a ~1 TeV shift), with the dependency on the mass of the vectorlike quark m_χ (a ~0.2 TeV shift) and the ML discriminator (a ~0.1 TeV shift) being considerably smaller.



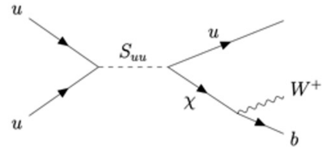
arXiv:2511.02474

- The mass reaches of the model fluctuate from around 8.2 to 9.3 TeV depending on the parameters, with both methods used being in good agreement, well within $\pm1\sigma$ of each other.

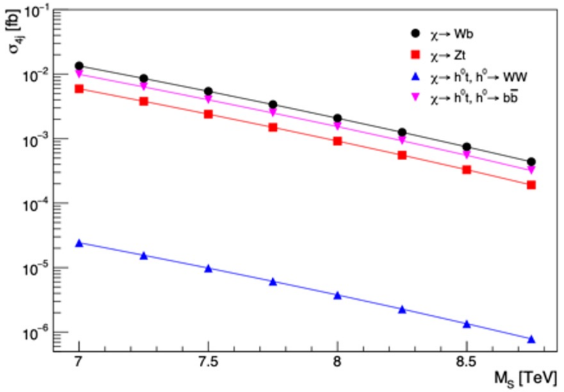


arXiv:2511.02474

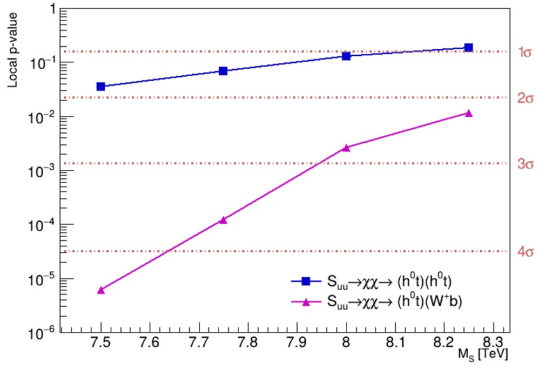
- Further studies delve into other decay modes of the diquark scalar, such as $S_{uu} \to u\chi$, while also enabling diverse decay modes of the VLQ.

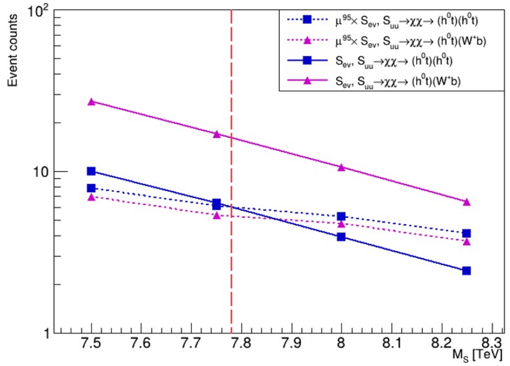


	$D=0.90$	$D=0.925$	$D=0.95$	$D=0.96$	$D=0.97$
	$S_{uu}\to u\chi\to u(Wb)$				
S_{ev}	6.04	5.91	5.40	4.86	4.00
B_{ev}	3.15±0.26	1.89±0.42	0.72±0.19	0.44±0.23	0.17±0.06
	$S_{uu}\to u\chi\to u(h^0t),\ h^0\to b\bar{b}$				
S_{ev}	4.53	4.45	4.12	3.75	3.13
B_{ev}	3.43±0.54	1.84±0.44	0.56±0.19	0.31±0.10	0.18±0.09
	$S_{uu}\to u\chi\to u(Zt)$				
S_{ev}	2.67	2.60	2.37	2.14	1.79
B_{ev}	3.23±0.58	1.72±0.42	0.68±0.23	0.35±0.10	0.21±0.09



- One problem with our new decay channels: large number of final-state jets (8-14 jets), requiring increased computational and memory resources for performing analysis.
- Solution: improved feature engineering. Inspired by classical statistical methods, we are introducing χ^2-test, as well as additional jet variables.





Specific scientific focus of group

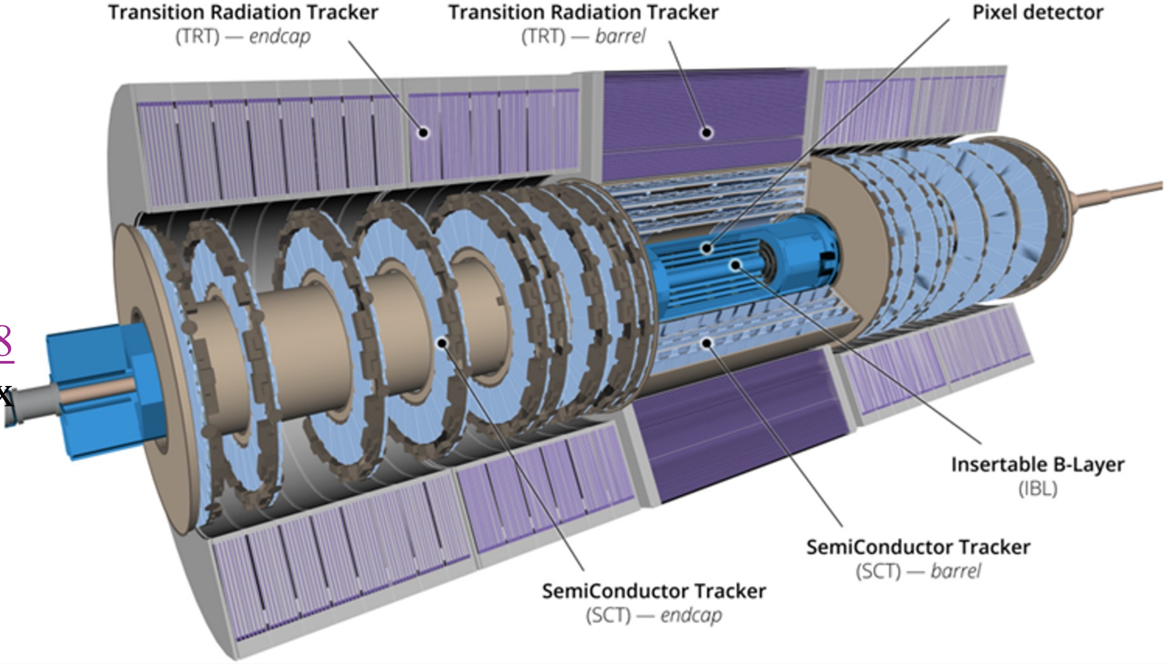
b) Performance studies and analysis software:

- Electron performance measurements, discrimination, and study of misidentified reconstructed objects;
- Fake and lost tracks in the jet core, co-coordination of the “Clustering and Tracking in Dense Environments” group;
- PMG Central Page

Clustering and Tracking in Dense Environments (CTIDE)

- **Ensured coordination** of this Tracking sub-group in the Oct. 2023 - Sept. 2025 period
  - Main activities during 2025: coordinate / perform / validate the Run-3 (2022 →) 2024 CTIDE recommendations for the ATLAS collab.

- **Provided results** for the ongoing ATL-COM-PHYS-2024-008 general Tracking paper that documents the tracking and vertex reconstruction for the ATLAs Inner Detector



- **Work started to document the CTIDE group methods and results in a dedicated CTIDE paper:**
  - First ATLAS paper dedicated exclusively to CTIDE methods and results since 2015 (early Run-2)
  - Extends the ongoing ATL-COM-PHYS-2024-008 paper, focusing on dense environments and using Run-3 data
    - Plan to use 2022 data-set, 2023 data-set and sometimes also the 2024 data-set
  - Will be used as a reference by all ATLAS analysis using the CTIDE group recommendations
  - Useful to all **PhD students** working on CTIDE performance studies

Specific scientific focus of group

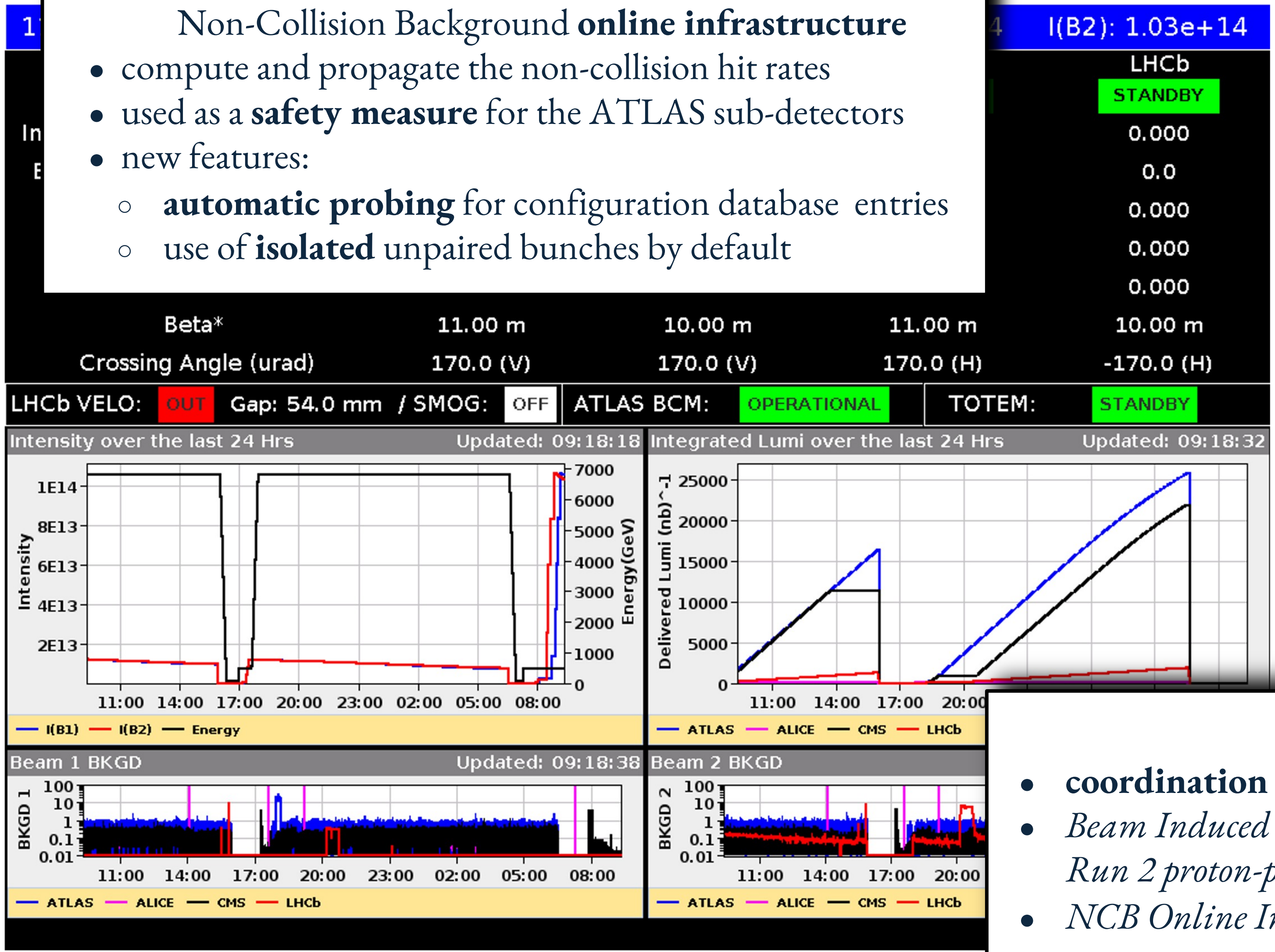
c) Data preparation:

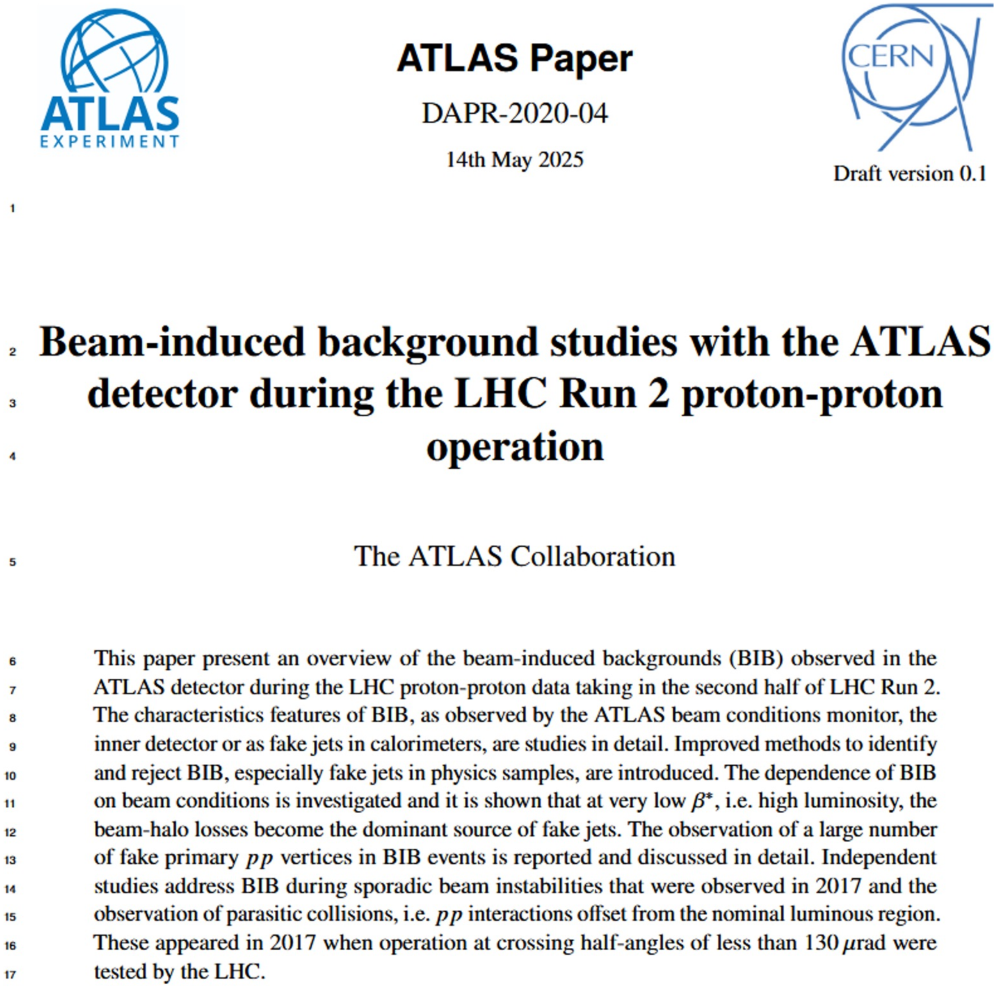
- Coordination mandates: conditions and Non-Collision Background (NCB);
- NCB: simulation, reconstruction, validation, Run3 migration, online monitoring, characterisation and mitigation of the cosmics-ray background;
- Data quality monitoring infrastructure: maintenance/development of the software; validation of recorded data,
- Data Quality shifts

Non-Collision Background

Non-Collision Background **online infrastructure**

- compute and propagate the non-collision hit rates
- used as a **safety measure** for the ATLAS sub-detectors
- new features:
  - **automatic probing** for configuration database entries
  - use of **isolated** unpaired bunches by default





ATLAS Paper

DAPR-2020-04

14th May 2025

Draft version 0.1

Beam-induced background studies with the ATLAS detector during the LHC Run 2 proton-proton operation

The ATLAS Collaboration

This paper present an overview of the beam-induced backgrounds (BIB) observed in the ATLAS detector during the LHC proton-proton data taking in the second half of LHC Run 2. The characteristics features of BIB, as observed by the ATLAS beam conditions monitor, the inner detector or as fake jets in calorimeters, are studies in detail. Improved methods to identify and reject BIB, especially fake jets in physics samples, are introduced. The dependence of BIB on beam conditions is investigated and it is shown that at very low β^*, i.e. high luminosity, the beam-halo losses become the dominant source of fake jets. The observation of a large number of fake primary pp vertices in BIB events is reported and discussed in detail. Independent studies address BIB during sporadic beam instabilities that were observed in 2017 and the observation of parasitic collisions, i.e. pp interactions offset from the nominal luminous region. These appeared in 2017 when operation at crossing half-angles of less than 130 μrad were tested by the LHC.

Convenership

- **coordination** of the NCB team
- *Beam Induced Background studies with the ATLAS detector during the LHC Run 2 proton-proton operation* paper under **final editing**
- *NCB Online Infrastructure* supporting **public note** for the above paper

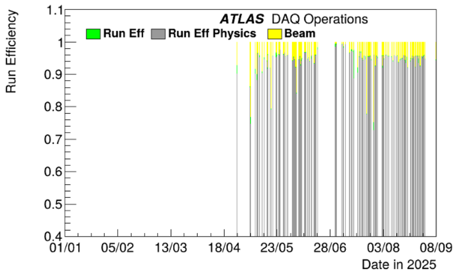
Specific scientific focus of group

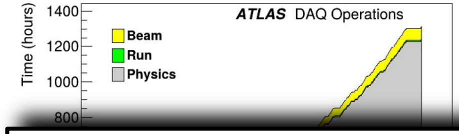
d) Detector operation and TDAQ:

- Tile calorimeter maintenance and operation,
- Data Quality Validator;
- LAr calorimeter operation and offline activities;
- DCS for NSW Trigger Processor ATCA;
- Maintenance of the data acquisition global monitoring tools;
- TDAQ Run Coordinator;
- DAQ on-call;

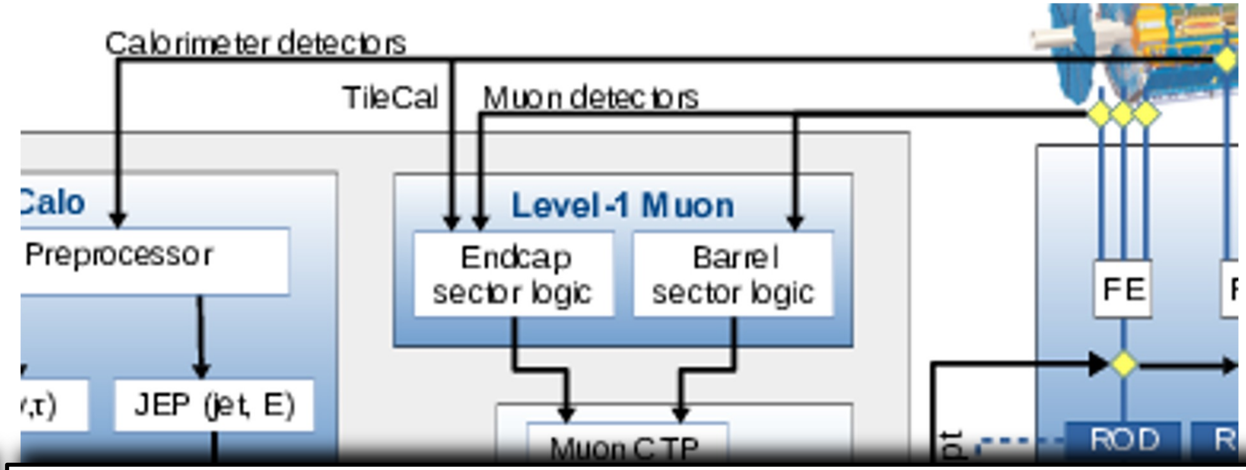
ATLAS TDAQ @ Bucharest – 15-19 september 2025

Trigger & Data Acquisition (TDAQ)






```
Info in <TCanvas::Print>: png file 0206_0906.png has been created
Info in <TCanvas::Print>: png file 0206_0906_rfp.png has been created
PROCESSING WEEK 09/06/2025 to 16/06/2025
Info in <TCanvas::Print>: png file 0906_1606.png has been created
Info in <TCanvas::Print>: png file 0906_1606_rfp.png has been created
PROCESSING WEEK 16/06/2025 to 23/06/2025
Info in <TCanvas::Print>: png file 1606_2306.png has been created
Info in <TCanvas::Print>: png file 1606_2306_rfp.png has been created
PROCESSING WEEK 23/06/2025 to 30/06/2025
PROCESSING WEEK 30/06/2025 to 07/07/2025
Info in <TCanvas::Print>: png file 3006_0707.png has been created
Info in <TCanvas::Print>: png file 3006_0707_rfp.png has been created
PROCESSING WEEK 07/07/2025 to 14/07/2025
Info in <TCanvas::Print>: png file 0707_1407.png has been created
Info in <TCanvas::Print>: png file 0707_1407_rfp.png has been created
PROCESSING WEEK 14/07/2025 to 21/07/2025
Info in <TCanvas::Print>: png file 1407_2107.png has been created
Info in <TCanvas::Print>: png file 1407_2107_rfp.png has been created
PROCESSING WEEK 21/07/2025 to 28/07/2025
```

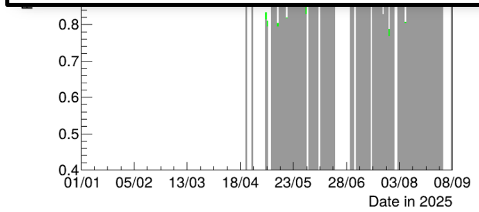


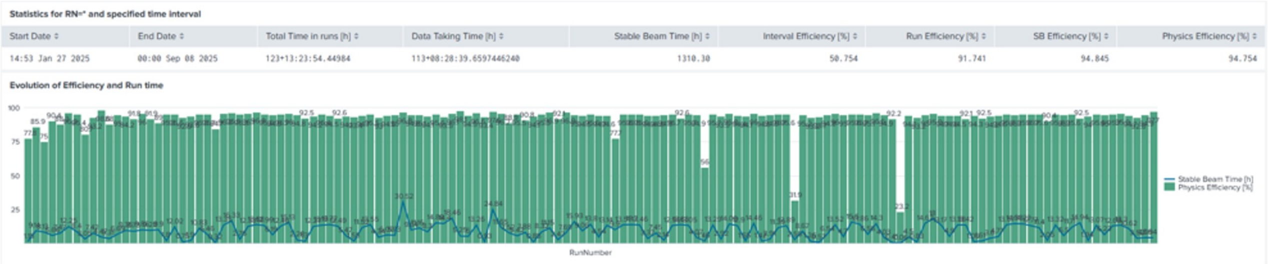
tools for measuring the **data acquisition efficiency**

- takes info from the **COOL** database (new **pbeast**-based development)
- formatted output: **HTML** & **SPLUNK**
- **multi-threading** processing

DAQ on-call role

- 1st responder for any **real-time issues** related to the Data Acquisition:
  - Data Flow
  - High Level Trigger processing farm
  - Read-Out machines
  - Online infrastructure
  - run-time troubleshooting
- follow-up for **long term solutions**





Specific scientific focus of group

e) Software and computing:

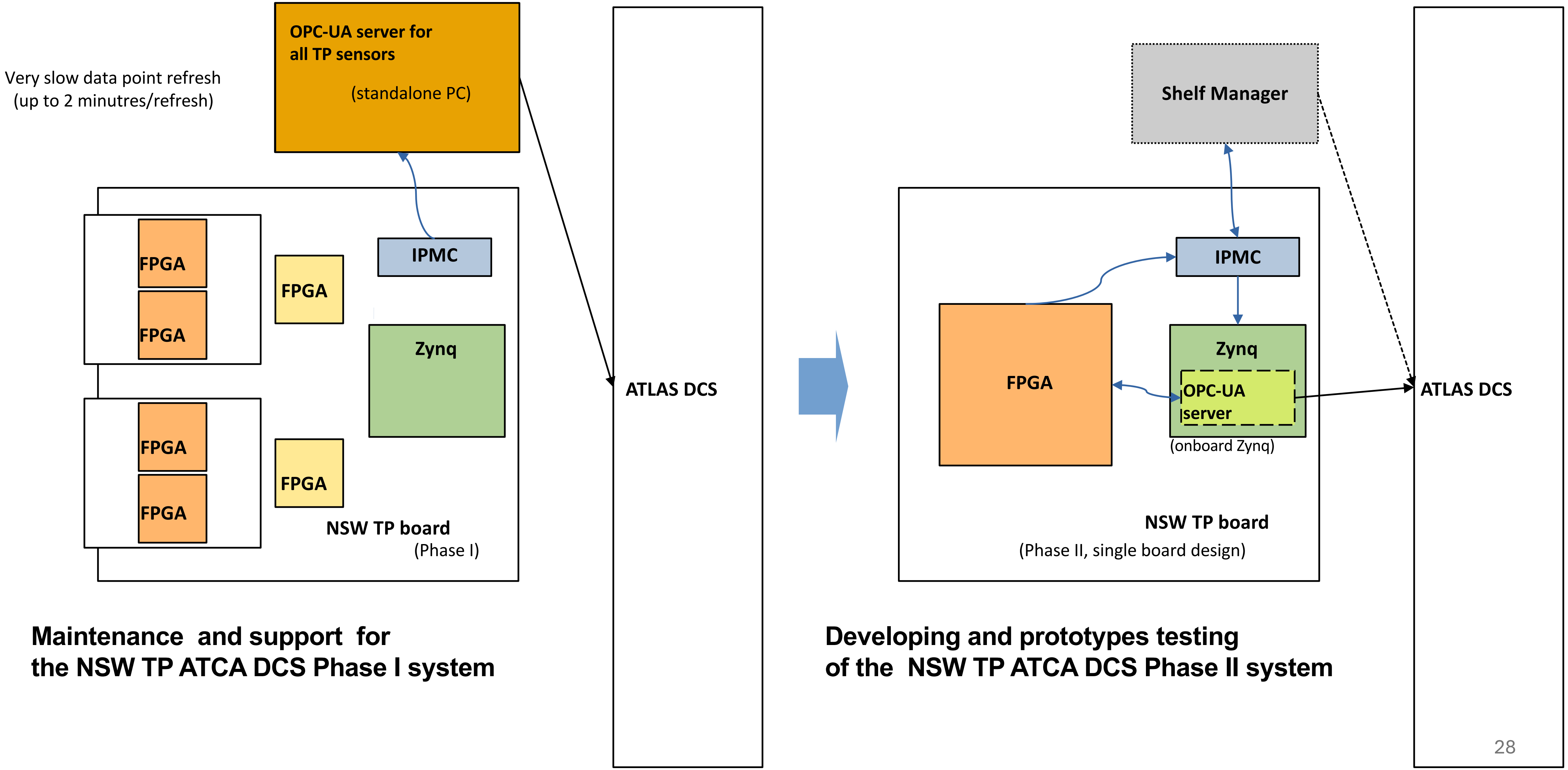
- Physics Validation (PhysVal);
- Performance studies and analysis software;
- Contribution to the Distributed Analysis support team;
- Machine Learning (ML) applications development for physics analysis;
- Maintenance and operation of the data centres managed by our group members;
- Local datacentre architecture and operations

Specific scientific focus of group

f) Upgrade:

- ***Phase-I*** NSW:
  - New Small Wheel (NSW) DCS development and support
- ***Phase-II TDAQ:***
  - Commissioning of the new Trigger Processor Demonstrator Board at the NSW Vertical Slice Lab;
  - Design of the new Trigger Processor Board with single sector architecture
- ***Phase-II Tile Calorimeter:***
  - New front-end (FE) electronics development;
  - Drawer mechanics;
  - Mini-drawers services distribution;
  - Tooling System;
  - High voltage active dividers boards.
  - Development and deployment of the procedures for Mini-drawers (MDs) assembly, certification and installation in the ATLAS detector.
  - Demonstrator operation in ATLAS detector.
  - Test Beam Campaign in the H8 beam line facility.

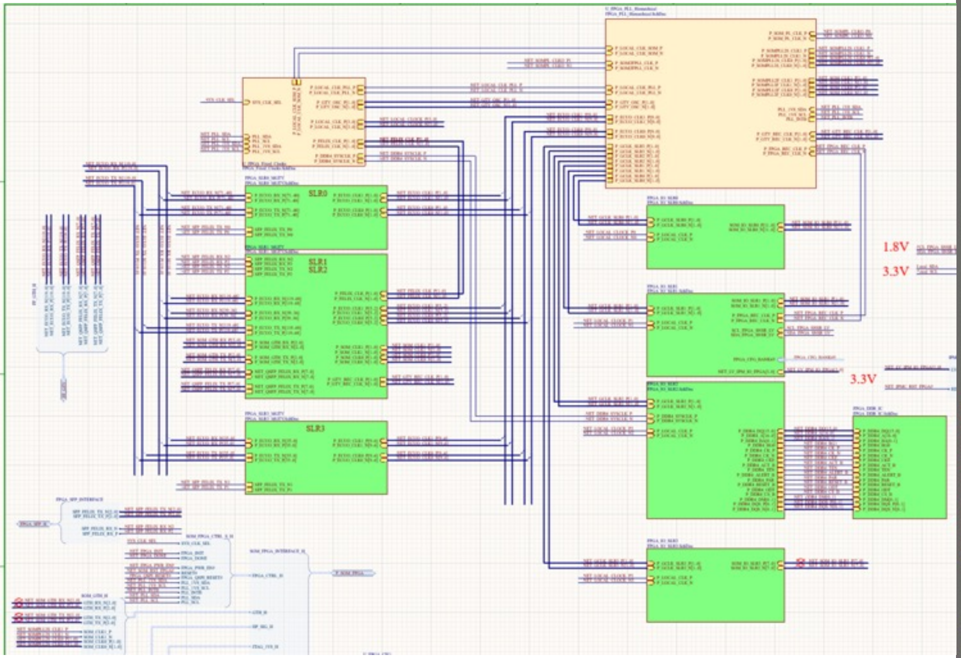
NSW TP ATCA DCS Phase I to Phase II changes

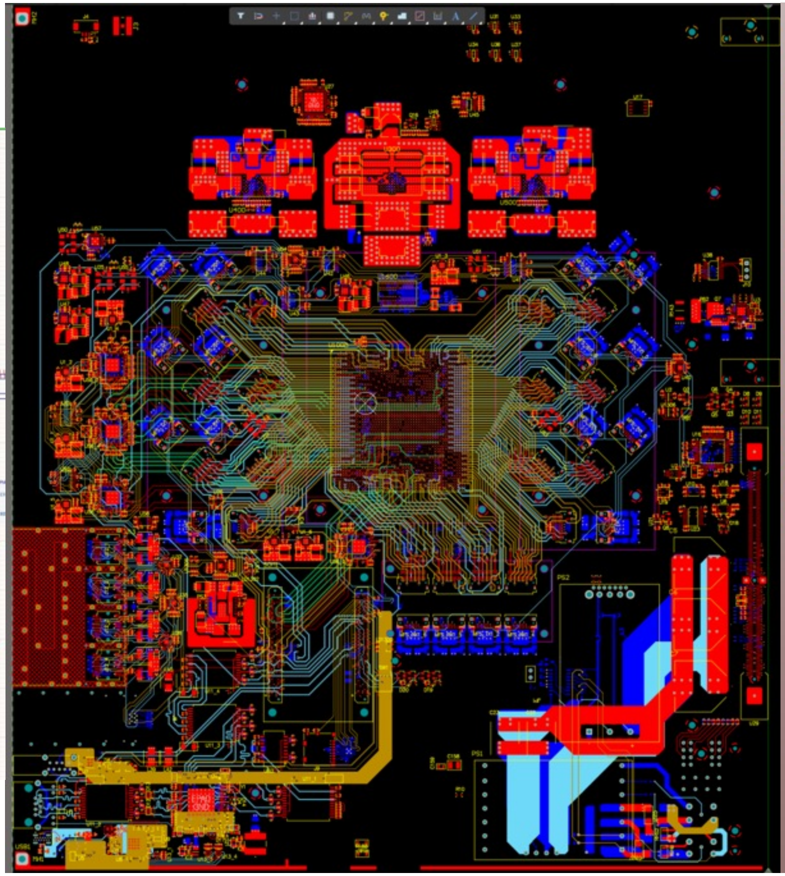


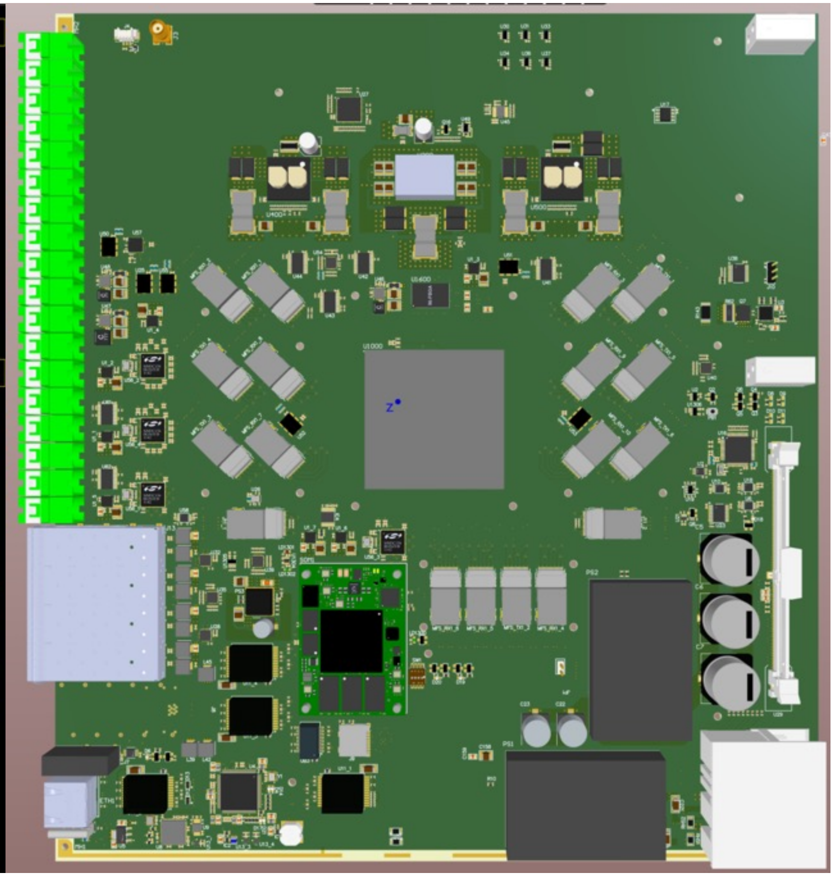
Maintenance and support for the NSW TP ATCA DCS Phase I system

Developing and prototypes testing of the NSW TP ATCA DCS Phase II system

Design of the Phase-II NSW Trigger Processor Board



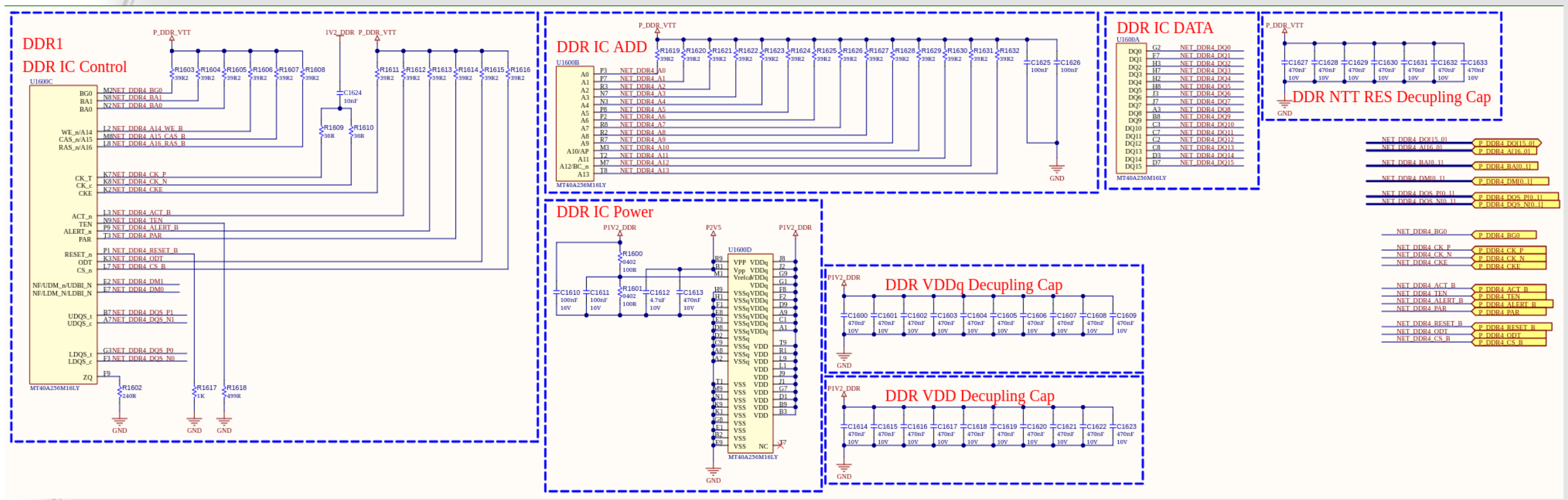


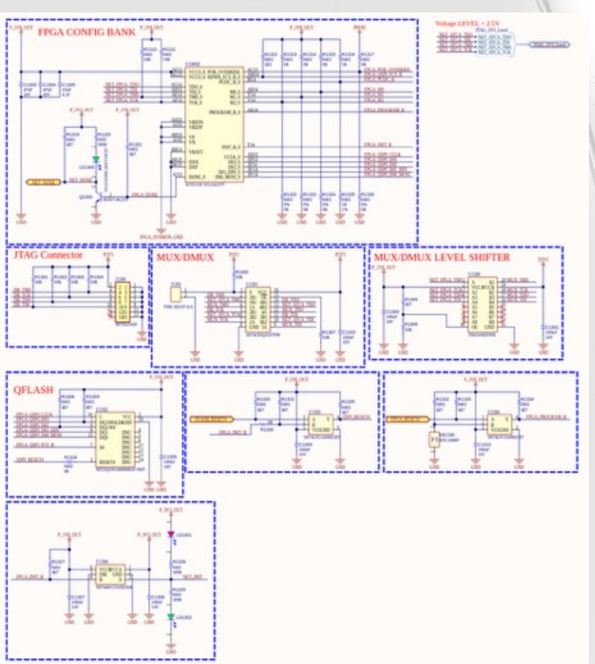


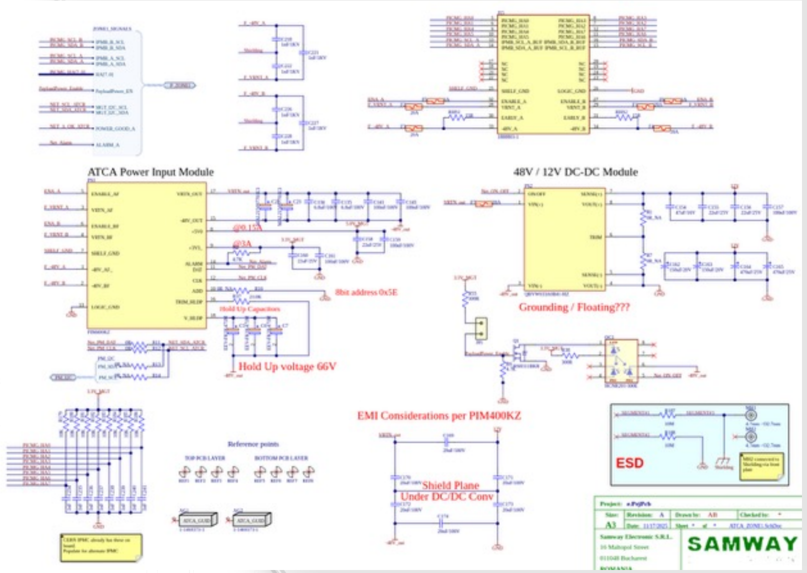
SCH and PCB design for redesigned ATCA Carrier board (effort led by SAMWAY)

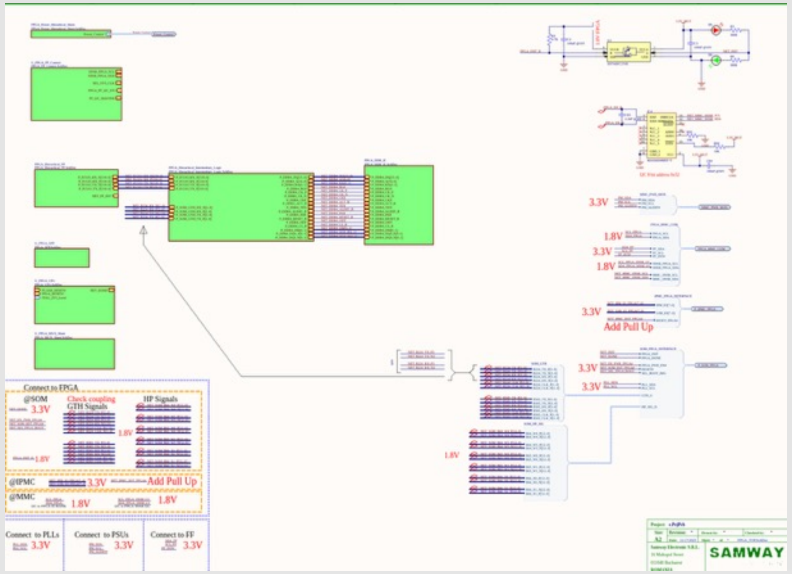
- 4x2to1MUX_SN74CB3Q325.SchDoc
- ATCA_Carrier_TOP.SchDoc
- ATCA_TP2_I2C_BlockDiagram.SchDoc
- ATCA_ZONE1.SchDoc
- DC_DC_LMZ31704.SchDoc
- FPGA_CFG.SchDoc
- FPGA_DDR_IC.SchDoc
- FPGA_EXPANDER1_Sheet.SchDoc
- FPGA_FF_Control.SchDoc
- FPGA_FF_NEW.SchDoc
- FPGA_FF_PAG1.SchDoc
- FPGA_FF_PAG2.SchDoc
- FPGA_FF_PAG3.SchDoc
- FPGA_Fixed_Clocks.SchDoc
- FPGA_GND.SchDoc
- FPGA_Hierachical_FF.SchDoc
- FPGA_Hierachical_Intermediary_Logic.SchDoc
- FPGA_IO_SLR0.SchDoc
- FPGA_IO_SLR1.SchDoc
- FPGA_IO_SLR2.SchDoc
- FPGA_IO_SLR3.SchDoc
- FPGA_MUX_Sheet.SchDoc
- FPGA_PLL_Hierarchical.SchDoc
- FPGA_Power.SchDoc
- FPGA_Power_Hierarhical_Sheet.SchDoc
- FPGA_Power_MGTY_LLC_LUC_LN_LS_RLC_RUC_RN_RS.SchDoc
- FPGA_Power_Monitor_and_Sequencer.SchDoc
- FPGA_SFP.SchDoc
- FPGA_SLR0_MGTY.SchDoc
- FPGA_SLR1_MGTY.SchDoc
- FPGA_SLR2_MGTY.SchDoc
- FPGA_SLR3_MGTY.SchDoc
- FPGA_TOP.SchDoc
- FSUSB42_DPDT_MUX.SchDoc
- FT2232HQ.SchDoc
- GB-ETH_Switch_KSZ9897.SchDoc
- GbE_Transformer_HX5008NL.SchDoc
- IPMC.SchDoc
- KSZ9897_Control.SchDoc
- KSZ9897_Interfaces.SchDoc
- KSZ9897_Power.SchDoc
- LDO_2A.SchDoc
- Main_Power_LDO_Additional
- Main_Power_P0V9_P1V2.Sch
- Main_Power_P0V85.SchDoc
- Main_Power_P1V8_P3V3.Sch
- ManagementPower.SchDoc
- MMC.SchDoc
- SOM.SchDoc
- SOM_GND.SchDoc
- SOM_GTH.SchDoc
- SOM_HD_BANKS.SchDoc
- SOM_HP_BANKS.SchDoc
- SOM_NC.SchDoc
- SOM_PWR.SchDoc
- TPS2459.SchDoc

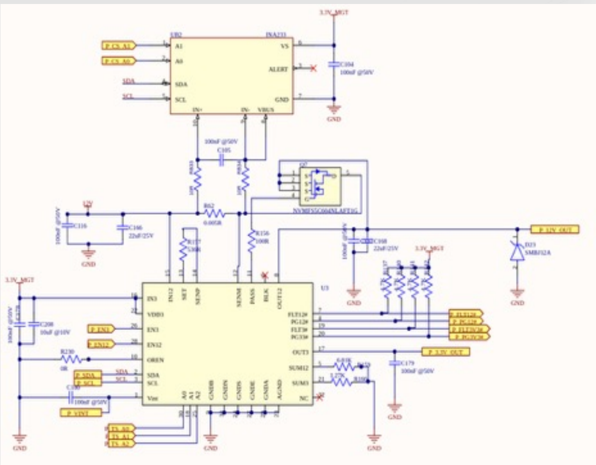
SCH and PCB design for redesigned ATCA Carrier board (effort led by SAMWAY)



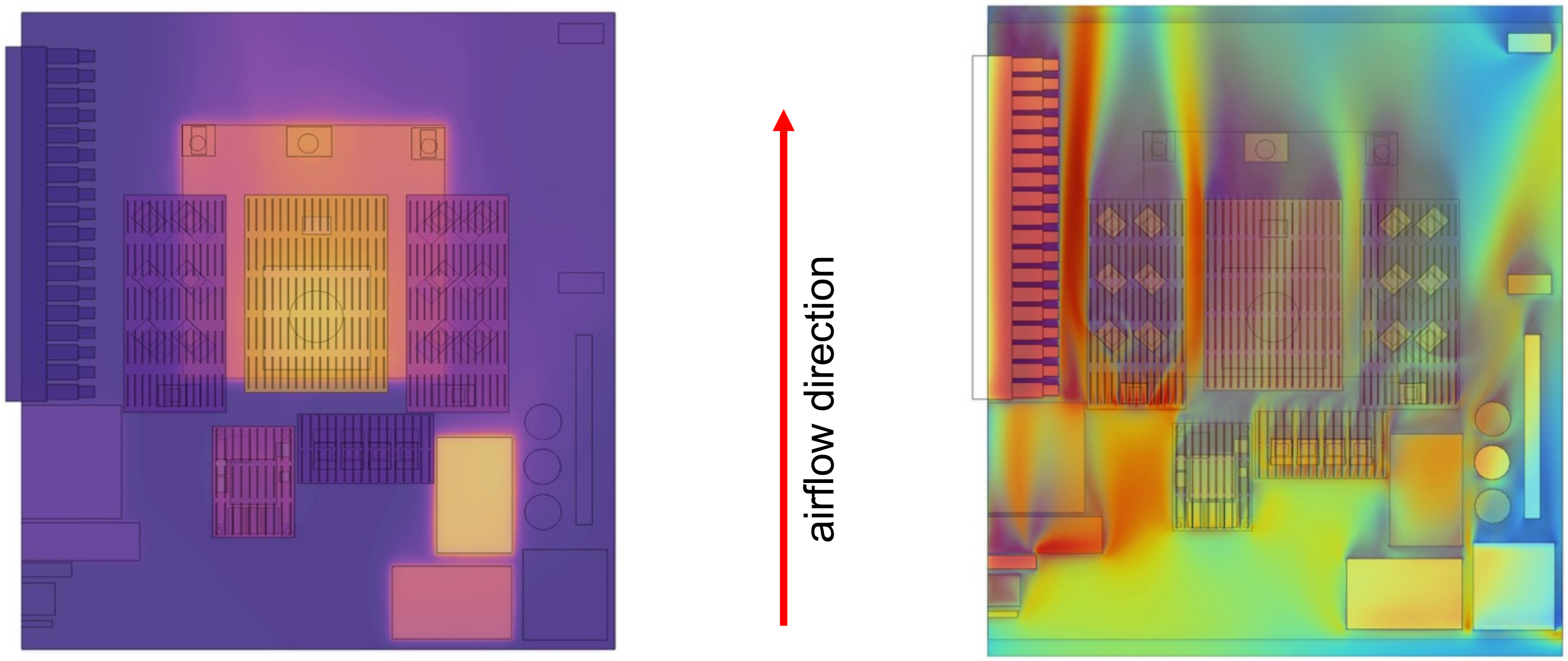








NSW TP ATCA Phase II design thermal testing



components’ temperatures
(yellow to magenta = hot to cold)

airflow over/around components
(blue to red = slow to fast)

Extensive thermal studies were conducted to optimize the NSW TP ATCA Phase II board layout and ensure compliance with the components’ thermal requirements.

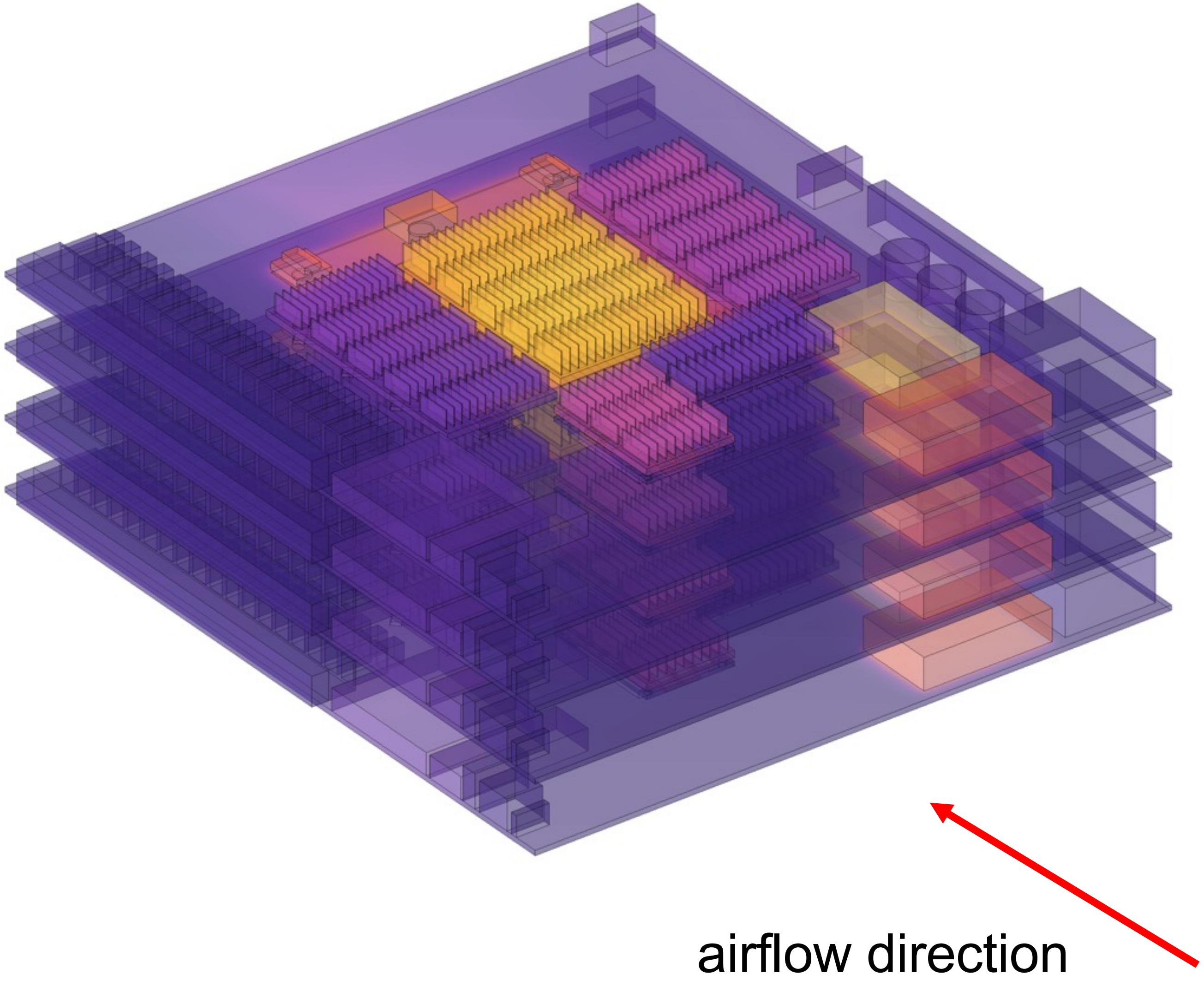
The analysis covered board geometry, airflow and temperature conditions, as well as the power dissipation and operating temperatures of the main components.

Both realistic and worst-case scenarios were evaluated, and the results were iteratively refined based on continuous feedback from the electronics team and PCB designers.

NSW TP ATCA Phase II design thermal testing (2)

- For more realistic results:
  - Created a stack of 4 boards
  - Top board has **unrealistically cold air** because the **top** of its volume does not have any nearby heat sources
  - Bottom board has **unrealistically poor cooling** because there is **no air flowing on its underside**, thus not being cooled realistically
  - Only **the middle boards** have relatively **realistic thermal conditions**

- This approach is slow because the simulated system is large, but this is necessary to get results closer to reality

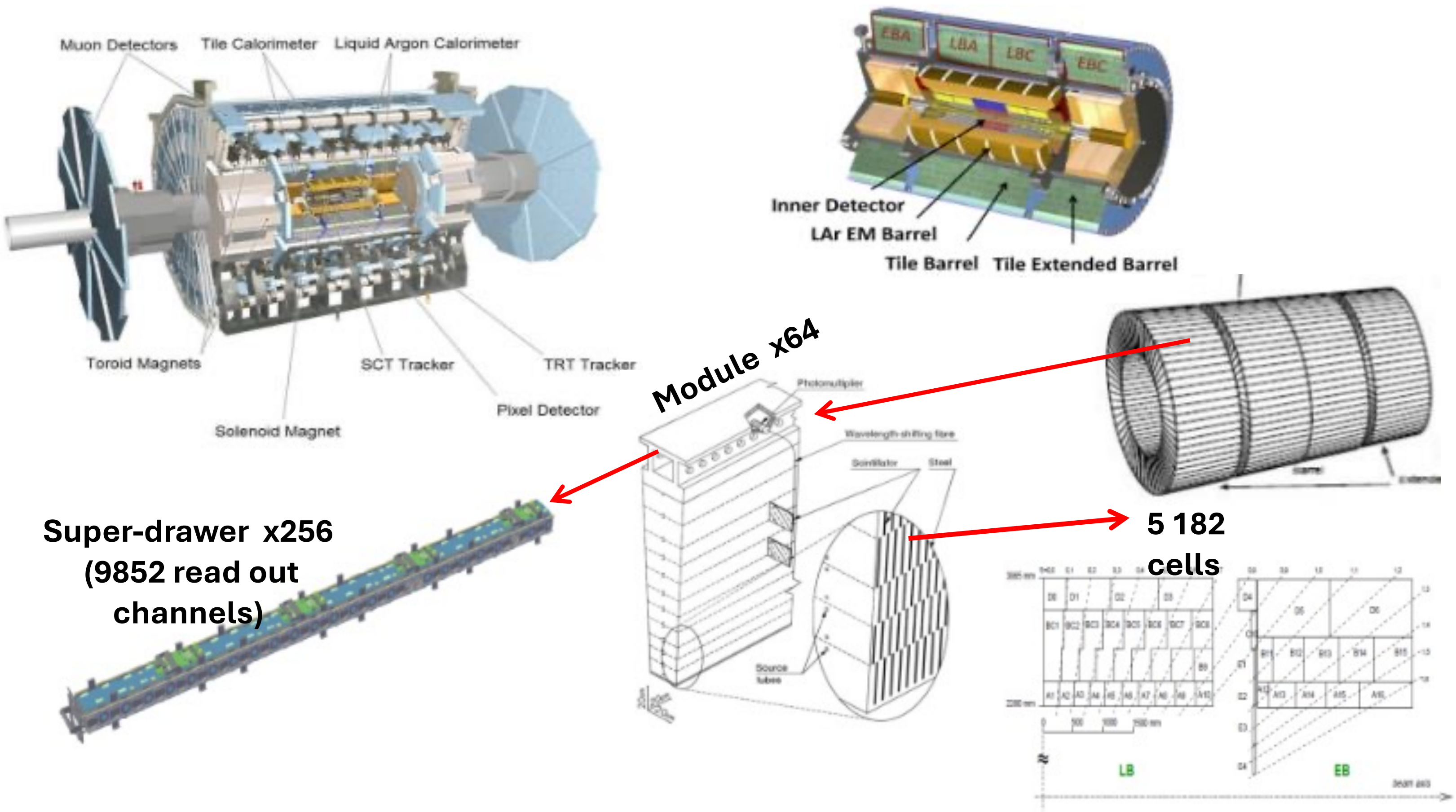


ITIM

Tile Calorimeter Phase II Upgrade

TileCal Phase II Upgrade: complete replacement of the readout electronics and services

New FE electronics: 256 mechanical Super-drawers housing the electronic boards and PMT blocks



Work packages under ITIM's responsibility: https://twiki.cern.ch/twiki/bin/viewauth/Atlas/TileCalUpgradePhaseIIWBS

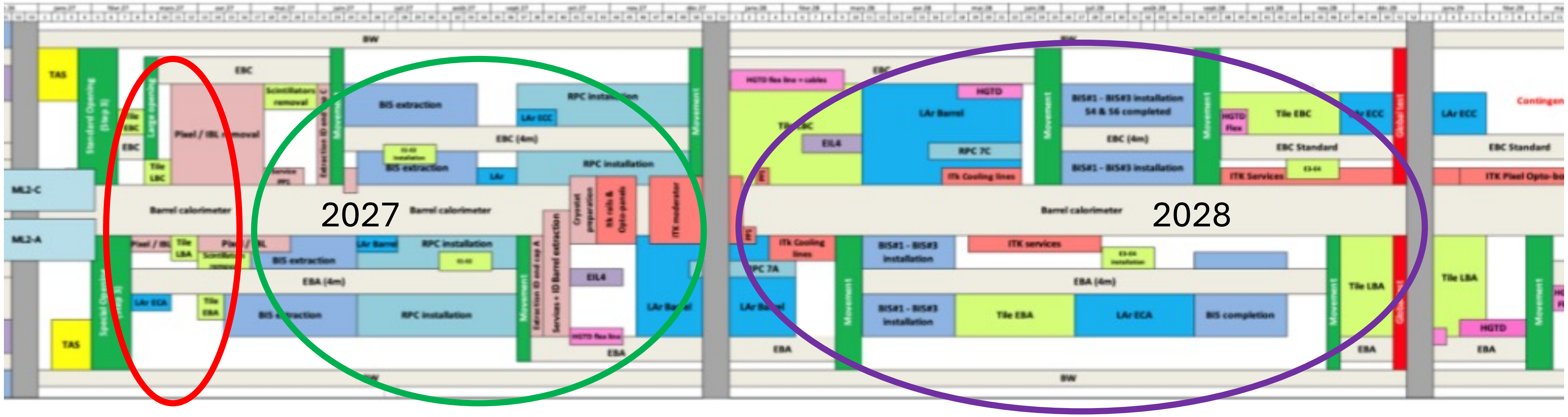
- ❑ **WBS 4.1 Drawer Mechanics**
  - Mini-drawers (MDs) mechanics
  - MDs Services distribution
  - MDs Handling tools
- ❑ **WBS 4.2 On-detector electronics**
  - PMTs High Voltage Active Dividers (HVAD)
- ❑ **WBS 4.7 Drawer Assembly and QA**
  - QA test benches for SDs certification
  - MDs Assembly line
- ❑ **WBS 4.8 Installation and Commissioning**
  - 4.8.2 Installation tools

➢ ***Demonstrator operation in ATLAS detector –*** laser and pedestal data analysis

ITIM

Tile Calorimeter Phase II Upgrade

➢ **Planning and leading the process for Mini-drawers assembly and Super-drawers installation in ATLAS detector**



Decommissioning 8 weeks Mini/Micro-drawers assembly 9 months Super-drawers installation 12 months Commissioning

starts in February 2027

- The assembly, testing, and installation of the new Front-End electronics will be carried out in accordance with the procedures released by ITIM:
    - Rework and testing of PMT blocks;
    - Assembly of Mini/Micro-drawers;
    - Installation and Certification of the Super-drawers inside the Tile Calorimeter modules.

➢ **Resource planning**: contribution to an internal MoU-style document for sharing of the resources

Status: approved by Tile Institutes (https://edms.cern.ch/document/3287610/1).

Tile Calorimeter Phase II Upgrade

ITIM

- **Mini/Micro-drawers assembly**

1. ***Recovery of the PMT blocks from legacy drawers***: all 9,852 PMT blocks will be extracted from the legacy drawers and stored in wooden boxes

2. ***Rework and testing of the PMT blocks -*** consists in:

(i) opening the PMT block, removing HV divider and 3in1 card and reassembling it with the new HV active divider and FENICS card;

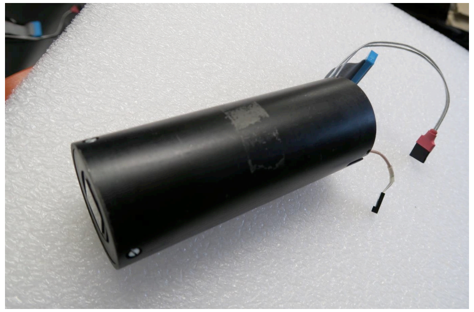
(ii) testing of the PMT blocks

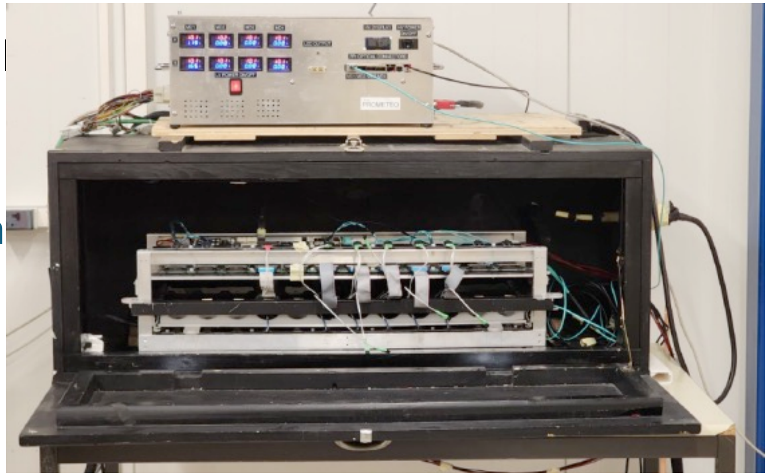
✓ ***Rework procedure***: validated during Expert weeks, first version released (PMT blocks Rework.pdf)

- to provide the assembly of 90 PMT blocks/day - 4 sets of handling devices were produced

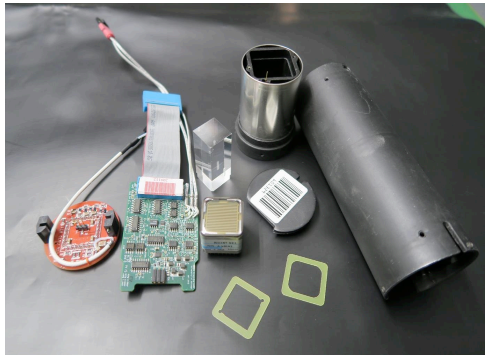
✓ ***Testing procedure***: validated, will be released after F
2025)

Manpower: to ensure the assembly of 90 PMT blocks/da
are necessary 3 teams (2persons/team)





PMT blocks test bench

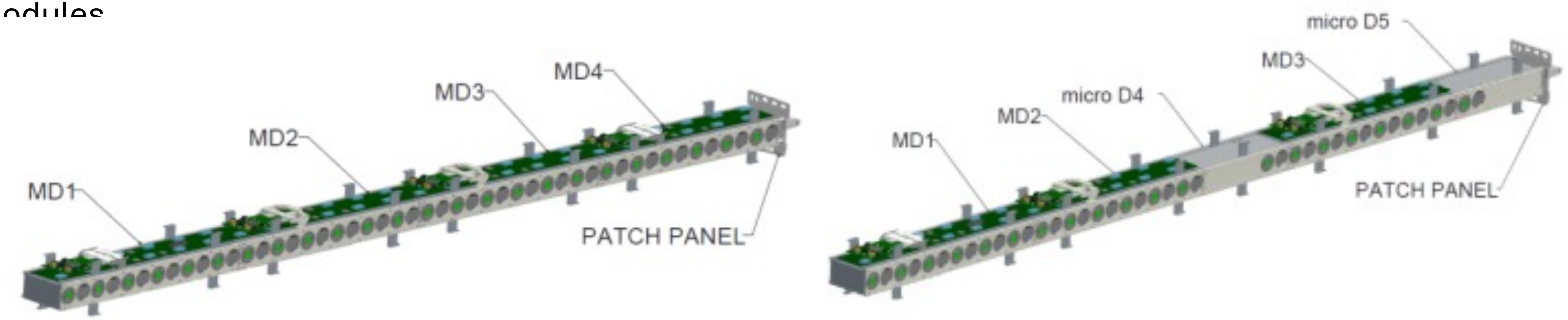


PMT block

ITIM

Tile Calorimeter Phase II Upgrade

3. *Mini/Micro-drawers assembly* - 256 SDs with a different architecture. will be installed in the LB and EBs TileCal modules



Quantity: 896 MDs + 256 mDs

Timeline: need to be assembled 2 SDs/day (256 SDs→128 working days ~26weeks)

Duration: min. 6 months (complies with current LS3 MS v9.7)

Manpower: 2 teams (2persons/team)

✓ ***Documentation***:

- MDs/mDs Assembly procedure (*MDs&mDs Assembly.pdf*)
- Tile mapping (http://zenis.dnp.fmph.uniba.sk/tile.html)
- PMT blocks arrangement in the SDs according TileCal partitions
- MDs layout scheme of the metallic stand-offs (2 pcs./MD)

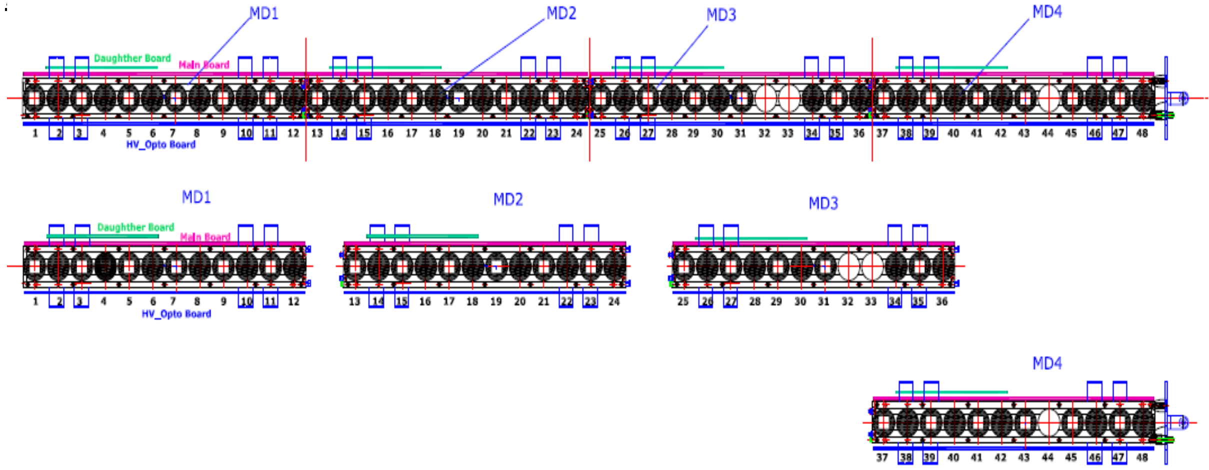
Tile Calorimeter Phase II Upgrade

ITIM

Super-drawers for the Long barrel modules

SD consists of: 4 MDs, 45 PMT blocks, 4 sets of electronic boards

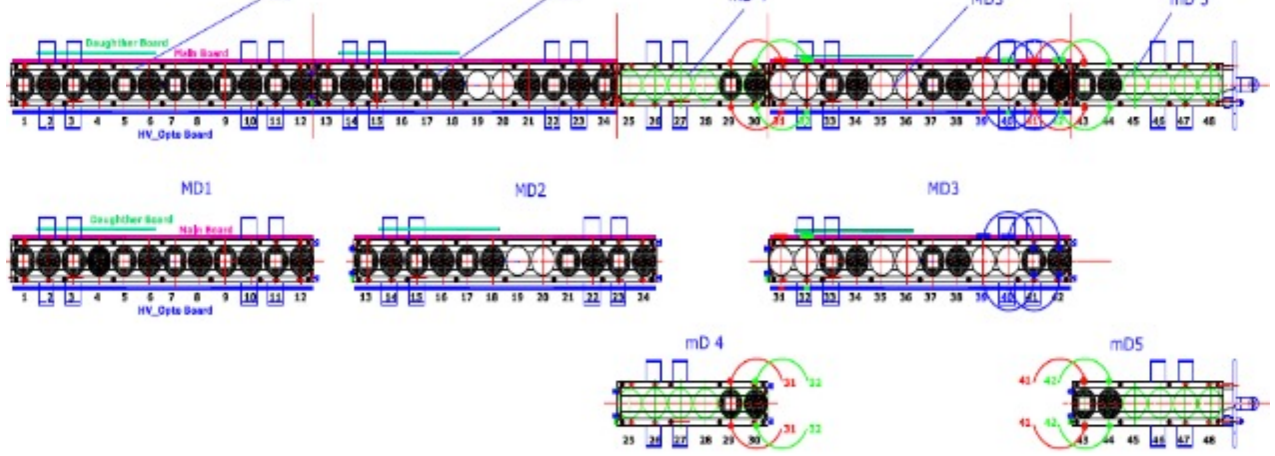
Location scheme of the PMT blocks



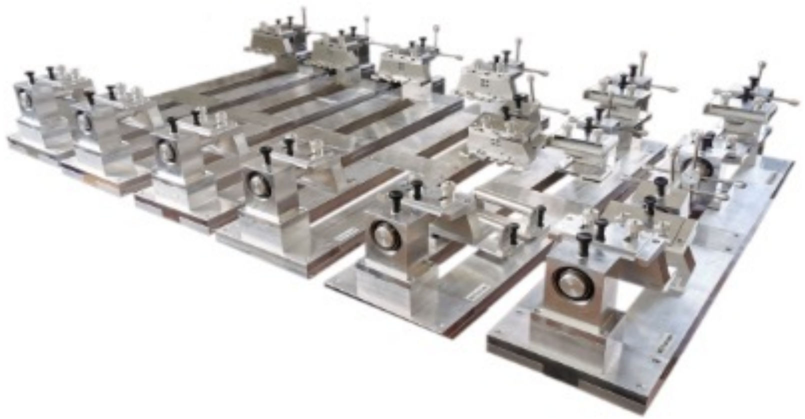
Super-drawers for the Extended barrels modules

- SD consists of: 3 MDs + 2 mDs, 32 PMT blocks, 3 sets of electronic boards

Location scheme of the PMT blocks



- ***Infrastructure provided***:
  - ***Assembly line*** – 6 rotating tables + Handle tools + ”crystal cubes” for PMT blocks alignment inside the MD body
  - Work benches
  - MDs Handling tools – Baskets (8B+2SB+2EB) + Handle tools
  - Labeling devices and bookkeeping system for Data base



ITIM

Tile Calorimeter Phase II Upgrade

SDs testing and certification before their installation in TileCal modules

▪ ***Infrastructure:*** SDs Test benches (2 units) consisting of the Long black box (LB) & accessories + the Prometeo system to verify the correct functionality of the new electronic + the Leakage Tester for checking the tightness of the water cooling circuit

✓ ***Documentation:***

- Procedure for SDs installation into LBB
- Procedure for SDs testing with Prometeo system

Timeline: need to be tested & certified 2 SDs/day

Manpower: 2 teams (2persons/team)

ITIM

Tile Calorimeter Phase II Upgrade

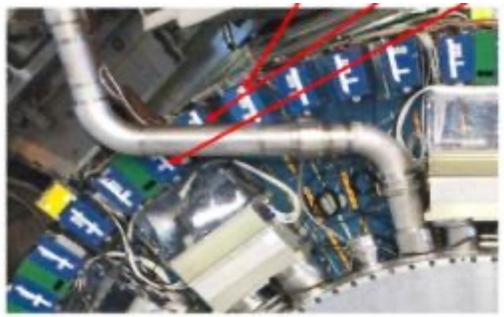
4. Super-drawers installation - 256 SDs will be installed in the partitions of the Tile Calorimeter

✓ ***SDs installation procedures***

According the structure and their position in the TileCal modules, the SDs shall be installed following dedicated procedures:

- Installation of the SDs into the Long barrel (LB) modules – standard installation
- Installation of the SDs into the Extended barrels (EBs) modules – standard installation
- Installation of the SDs in EBA 21, 22, 23 and EBC 21, 22, 23 - *backside installation*
- Installation of the SDs in LBA 15 and LBC 18 – *backside special installation*

EBA 21 EBA 22 EBA 23



EBC 21 EBC 22 EBC 23

LBA 15

LBC 18

- ***Installation equipments***: ITIM produced 4 sets of Installation tools to ensure:
  - Insertion/extraction of the MDs/mDs as parts of a SD;
  - Final certification of the SDs already installed and SDs services during future maintenance.

Tile Calorimeter Phase II Upgrade

ITIM

✓ ***Documentation:***

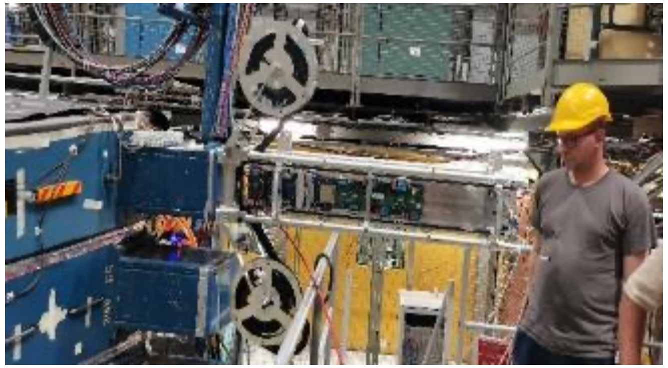
- Procedures for SDs installation: validated, first version released (SDs Installation.pdf)
- Procedure for testing the tightness of the SD cooling circuit - released (SD leakage test.pdf).

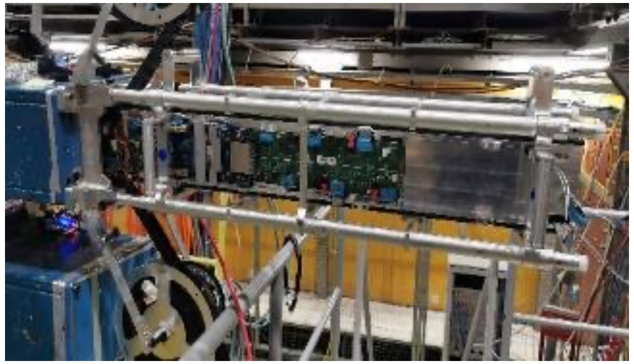
▪ ***Installation planning:***

- Quantity: 4 partitions x 64 SDs = 256 SDs
- Duration: 8 weeks/partition (according LS3 MS v9.7)
- Timeline: 2 SDs/day installed and tested for certification
- **Manpower**: 4 teams -3 teams (2p/team) on the scaffoldings + 1 team (2 p) for logistics

➢ ***Installation Expert Week*** (Test Beam area, June 2025)

- Were validated the installation procedures, using the dedicated an Installation Tools set already produced
- Was very good training for the personnel who will be involved in LS3





ITIM

Tile Calorimeter Phase II Upgrade

Demonstrator operation in ATLAS detector

The Demonstrator represents a fully functional Phase-II read-out prototype, designed to operate with the upgraded digital trigger architecture while maintaining full compatibility with the legacy system. **The upgrade module** serves as the second prototype for the continuous evolution of readout electronics, located in the test-beam area, H8 beam line facility.

Calibration and monitoring runs are taken regularly whereas the registered data is analyzed for accurate cell energy reconstruction (pedestal stability, cesium calibration, laser calibration) using the upgrade modules. **Dedicated packages** were **designed** to analyze the reconstructed data for monitoring the stability and uniformity of the detector's response over time:

- pedestal uniformity evaluation
- low and high frequency noise computation
- timing analysis for the readout electronics using charge injection
- laser pulse reconstruction
- timing analysis for laser calibration runs

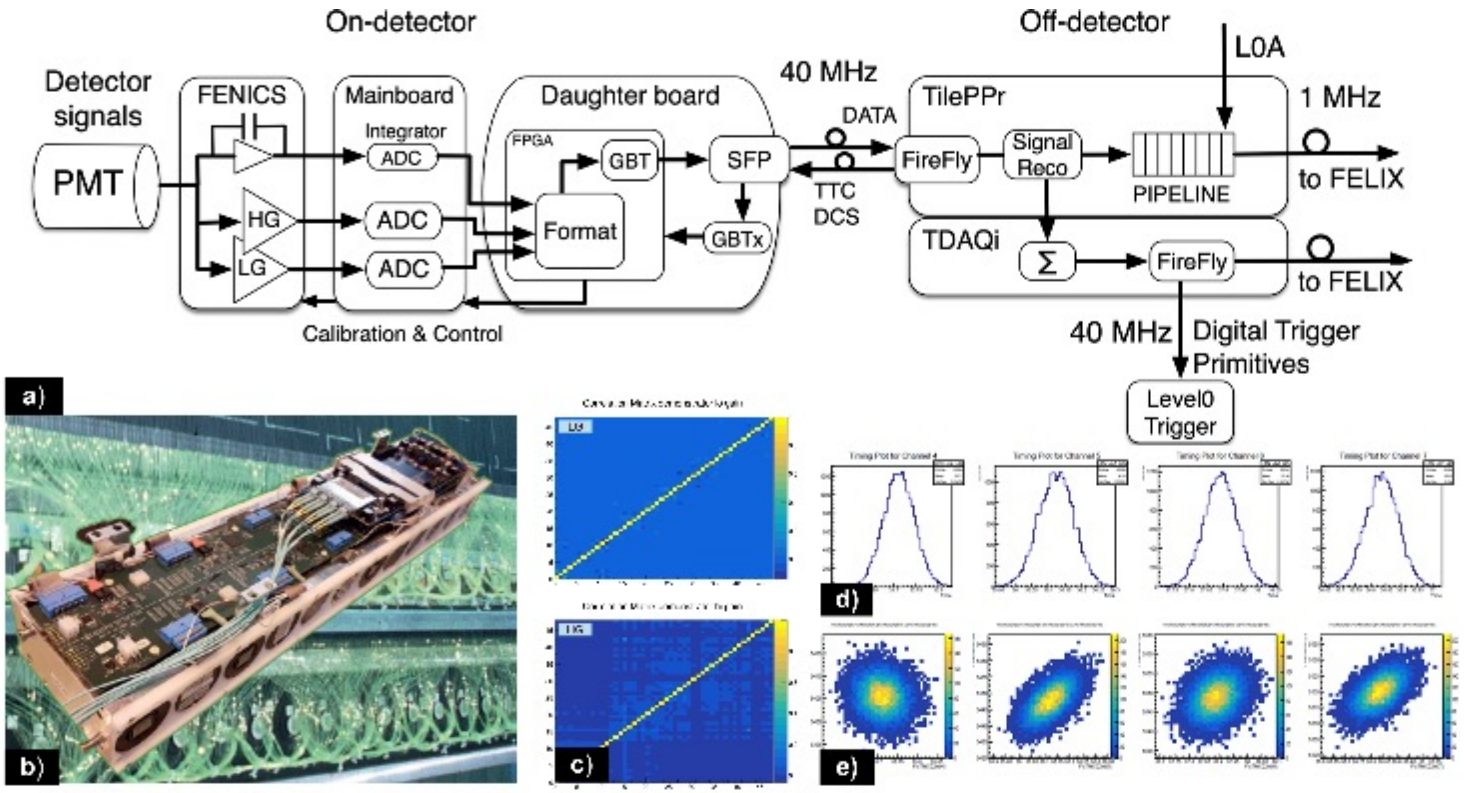


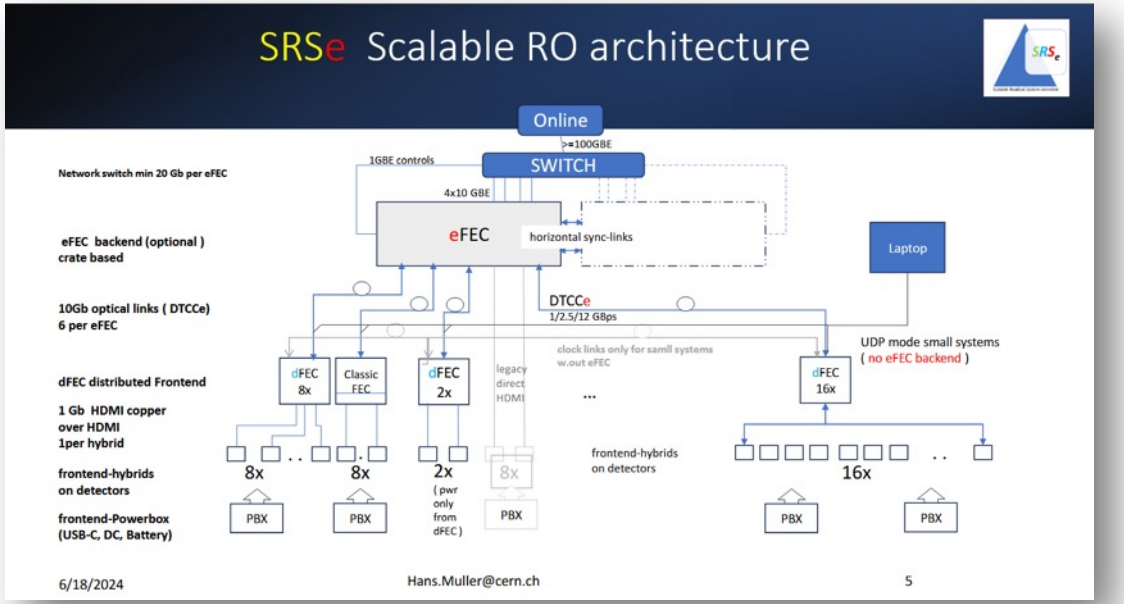
Figure: Result delivered by the proposed packages using the upgrade read-out chain: a) block diagram of the TileCal detector readout electronics, b) mini-drawer concept for the acquisition and calibration system, c) noise correlation matrices of pedestal values for the upgrade module, analyzed separately for the high-gain and low-gain channels , d) Timing versus amplitude diagrams for a selection of channels, e) Timing distributions

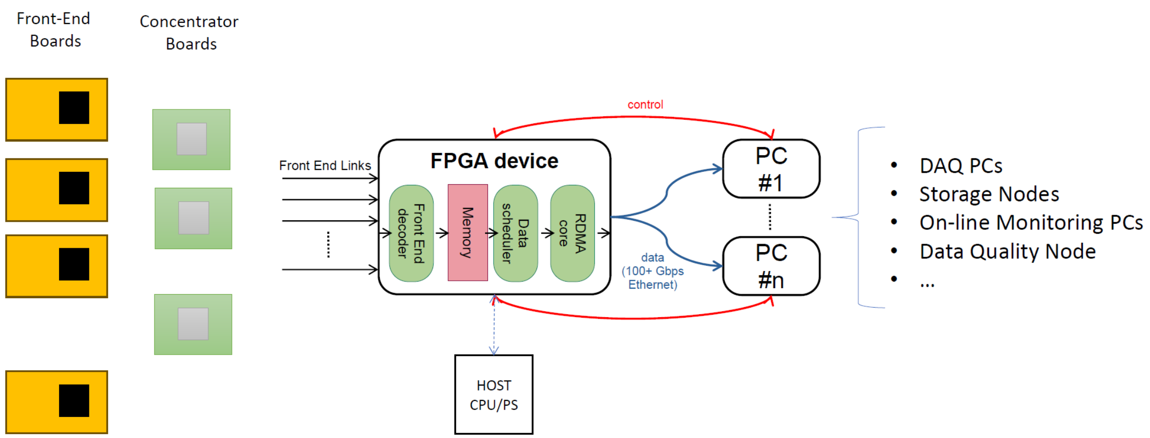
Specific scientific focus of group

g) DRD1 (Gaseous Detector R&D):

- Participation to the DRD1-WG5 activities for the definition and design of DAQ systems for gaseous detectors, including new front-end hybrids and new SRS DAQ components and firmware;
- Participation to the definition and design of versatile front-end ASIC for gaseous particle detectors;
- Consolidation of the microscopic simulation tool of the Micromegas detector

DRD1





Working Group 5 - Electronics

- Support of the DRD1-WG5 activities for the definition and design of new eSRS board
  - Collaboration with CERN and UP Valencia
- Study the implementation of the RDMA on FPGA IP on the eSRS platform

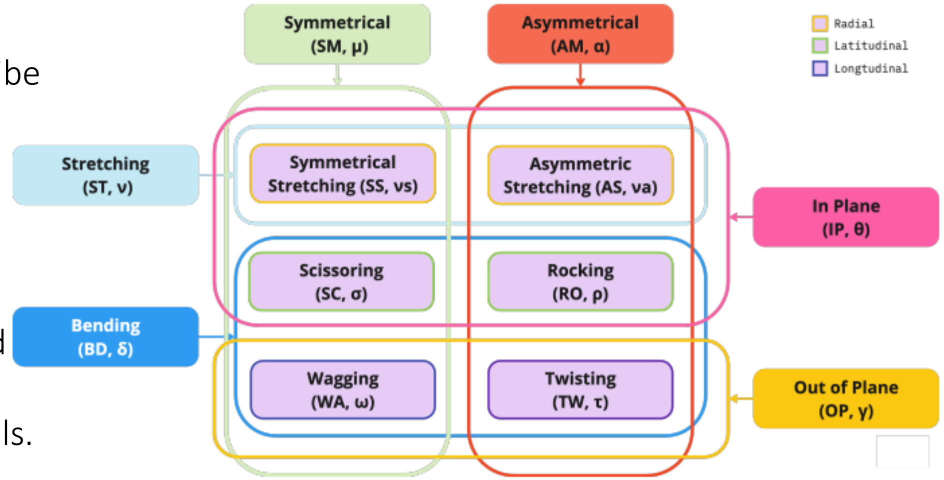
WG5 & Work Package 1 (Trackers, Hodoscopes, Large area muon systems)

- On-going definition of a versatile front-end ASIC architecture for gaseous particle detectors
- Future development of Front-End ASIC blocks for DRD1 withing the OTELLO Call

An Interoperable Syntax for Gas Scattering Reaction Definition (arXiv:2504.09780)

- a unified, human-readable, and machine-processable novel syntax designed to comprehensively describe reactions, molecules and excitation states
- we resolve inconsistencies in existing data representations and facilitate seamless integration with computational tools.
- molecular species, excitation states and reaction mechanisms have received a well-defined structured syntax that ensures compatibility with a wide range of scientific applications.
- based on Parsing Expression Grammar syntax, our open-source project enables automated parsing and interpretation of the proposed notation.
- our standardized framework is establishing increased interoperability accuracy for gas scattering models.

Classification of the vibrational modes

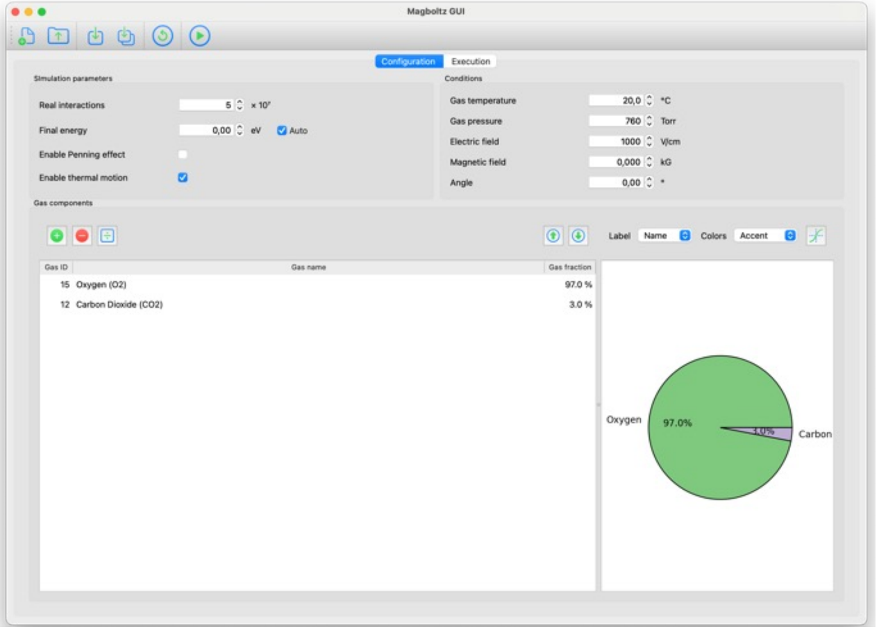


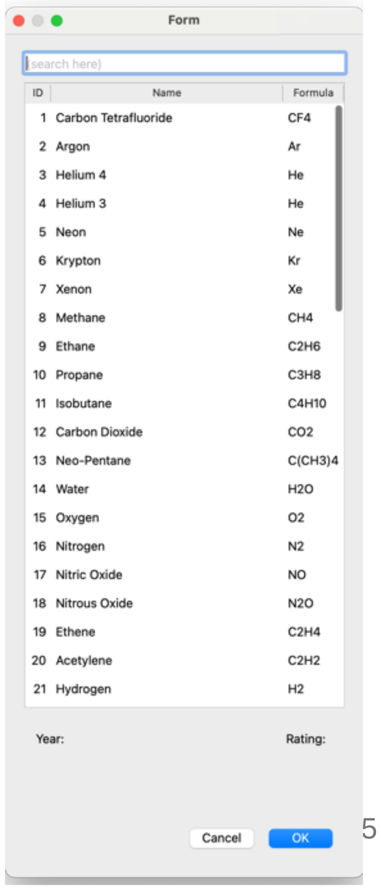
A GUI for Magboltz: an open-source tool for easing gas transport simulations

- we developed a user-friendly graphical user interface (GUI) developed in Python for Magboltz, offering an intuitive tool for defining gas mixtures, configuring the simulation parameters,
and visualizing the simulation results.

- this GUI enhances accessibility for researchers and students working with gas detectors, such as Micromegas.

- this tool is intended to support both educational and research applications in the field of detector development.



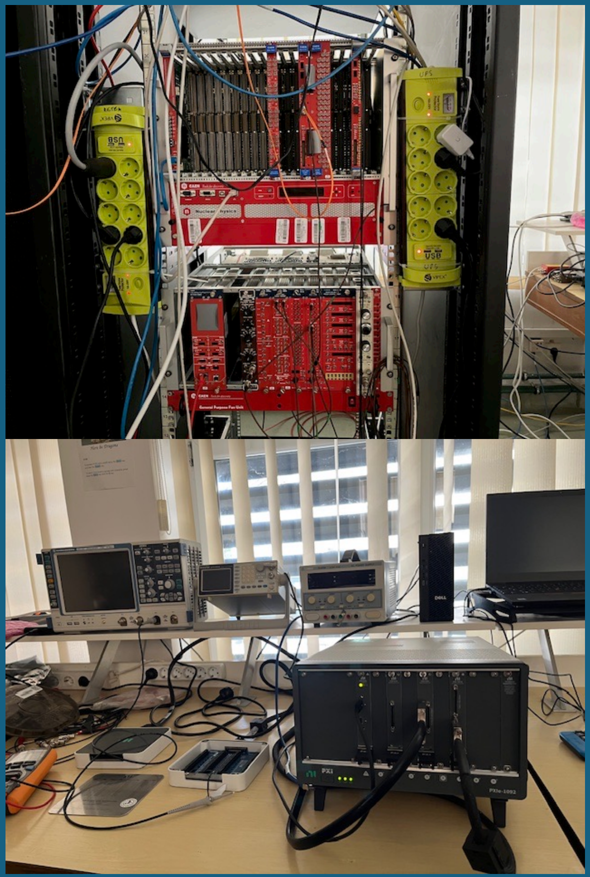


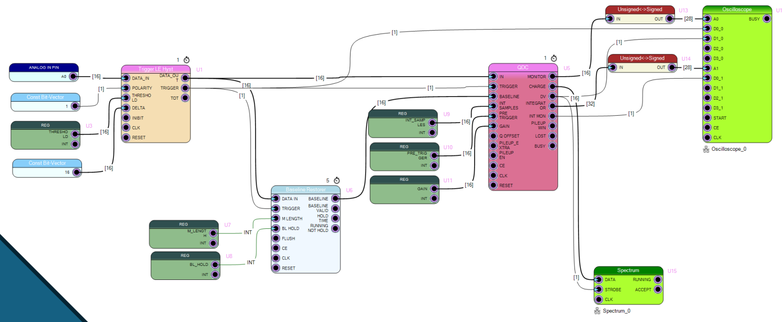
Specific scientific focus of group

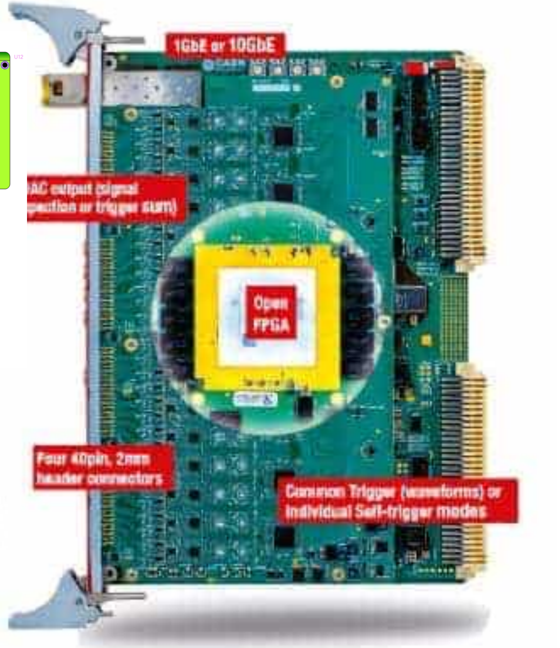
h) DRD4:

- Detector trigger system using the FPGA pulse processing algorithms for SiPM sensors

DRD4







- Development of a custom detector trigger and pulse-processing system based on FPGA technology, e.g. Visual Programming Language for Open FPGA, optimized for operation with SiPM sensor arrays.
- The proposed system will implement real-time digital algorithms for signal processing tasks such as pulse discrimination, precise timing extraction, and coincidence triggering within a multi-channel architecture.

Specific scientific focus of group

i) DRD Calo (DRD6) and FCC Allegro:

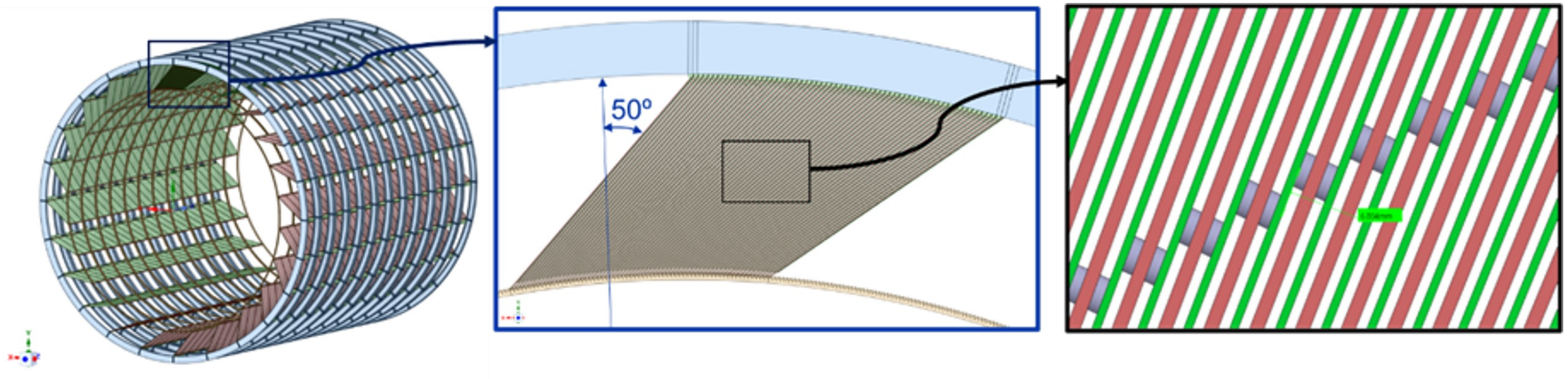
- Scintillating Tile Hadronic Calorimeter for future colliders with TileCal like geometry.
- Noble-liquid-based electromagnetic calorimeters for FCC-ee detectors, test beam prototype;
- Allegro calorimeter design studies, conjointly within the FCC and DRD6 collaborations.
- EM calorimeter design and performance studies with simulation R&D for the geometry optimization of the Hadron calorimeters with scintillating tiles readout by wavelength shifting fibres and SiPMs readout.

DRD Calo – WP2 [UPB, ITIM, IFIN] [allegro.web.cern.ch]

- Great interest in design of Allegro's EM calorimeter
- Experience with ATLAS LAr calorimeter operation, e/ɣ reconstruction and calibration, usage in measurements...
- Cooperation with established IN2P3 partners

First steps undergone:

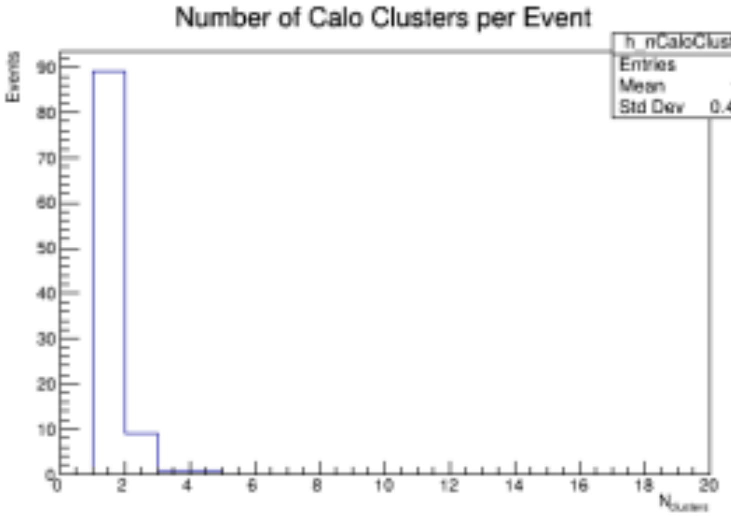
- Formal participation to DRD and FCC collaborations, meetings
- Familiarization with FCC simulation software stack
- Assessment of detector layout variations through impact on electron energy resolution (following pages)
- Initiated contacts with local industrial partners regarding feasibility of producing prototype absorbers

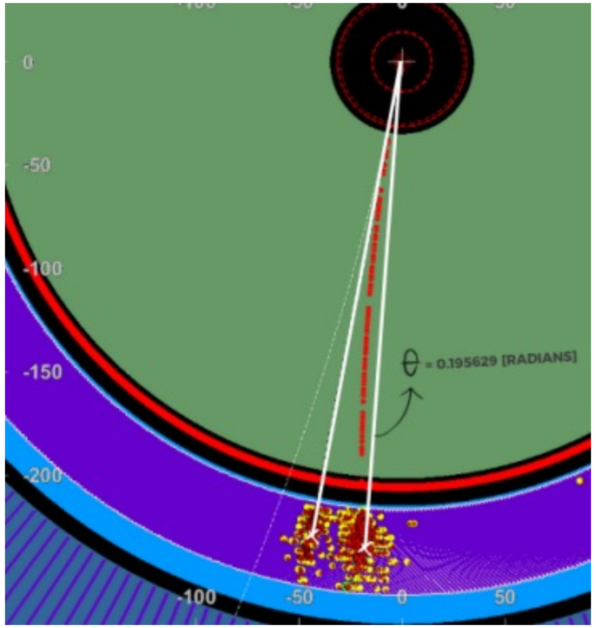


ALLEGRO electromagnetic calorimeter simulations

Study of how the deposited energy is shared among event clusters

- study of the distribution of clusters and multiple events
- study events with two clusters => if energies differ highly, is that detector noise?
- study of the angle between the formation positions of the two clusters => should the energies be summed up to reconstruct the energy of the original particle?

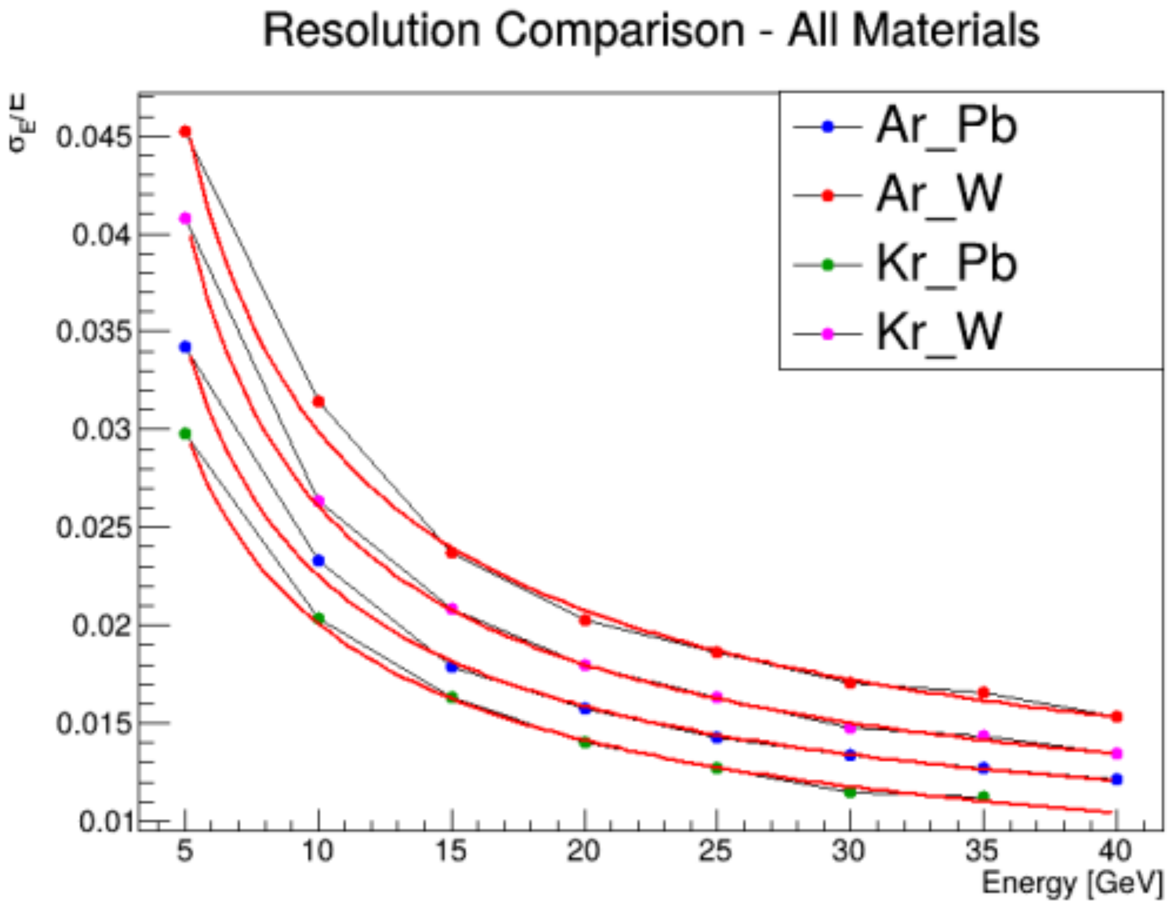




ALLEGRO electromagnetic calorimeter simulations

- Study of the impact that the choice of different materials for the absorber layers and the active medium has on the detector resolution.

- Studied material combinations: Ar+Pb, Ar+W, Kr+Pb, Kr+W) => Kr+Pb combination would be preferable.

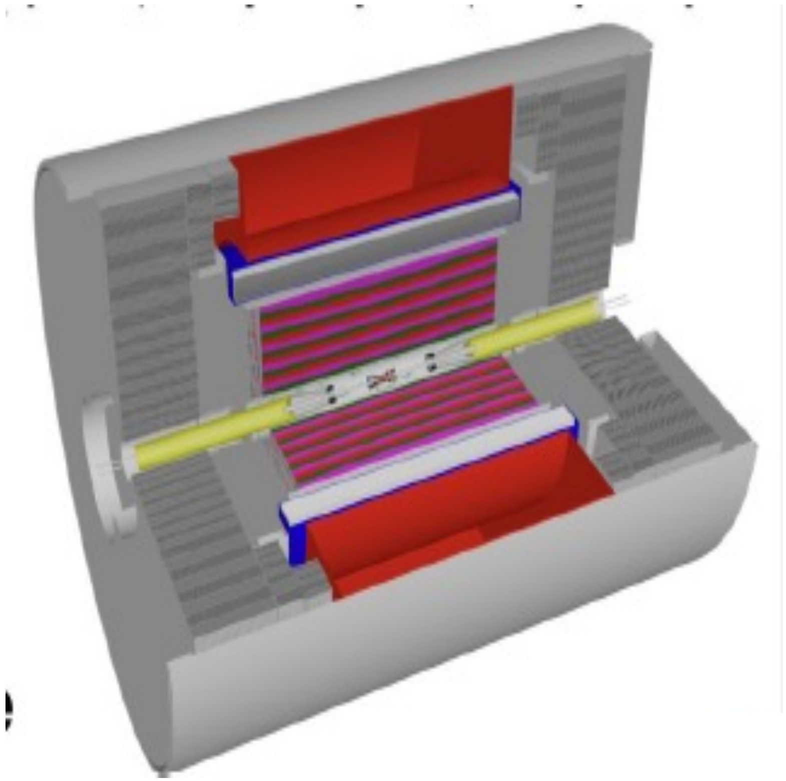


DRD Calo - Development of the HCAL test beam module prototype

ITIM

➢ **Hadronic calorimeter (HCAL) concept** based on the Tile Calorimeter of ATLAS

Currently integrated in the **ALLEGRO** detector concept - general purpose detector for FCC-ee

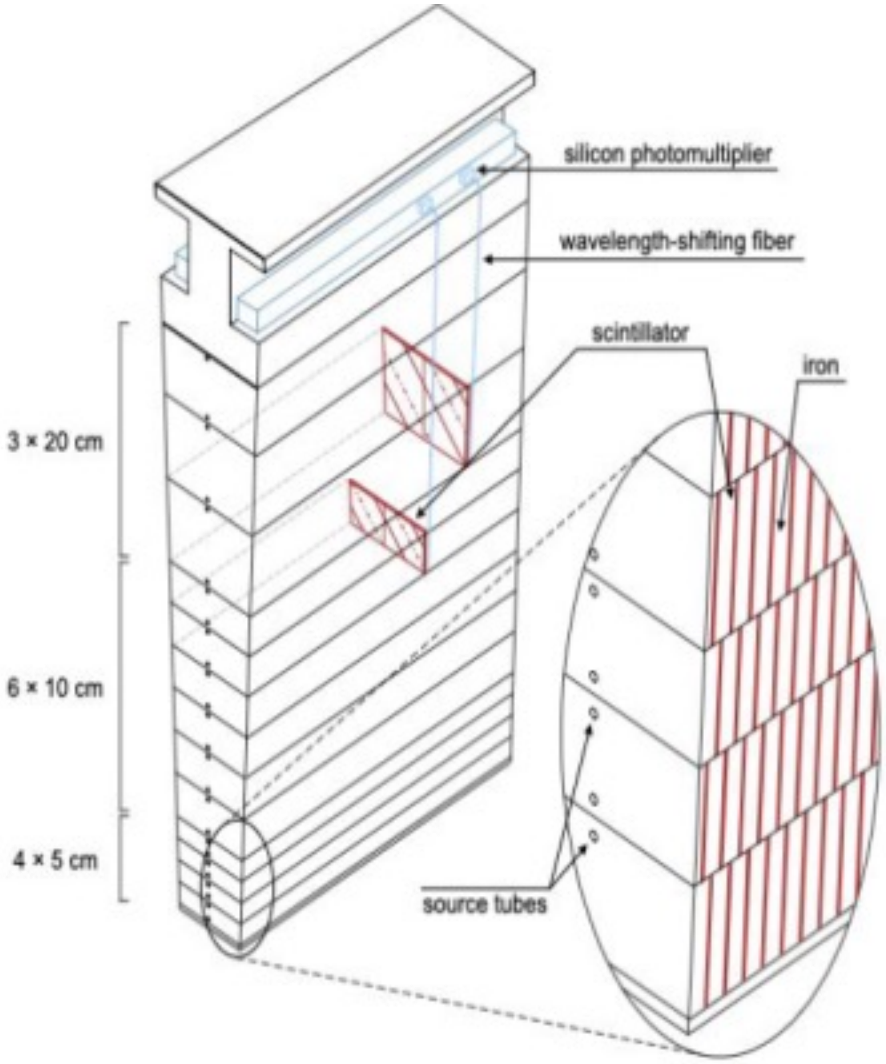


DRD Calo - Development of the HCAL test beam module prototype

ITIM

- **HCAL design**

- Based on alternating steel and scintillator layers
  - 5/4 mm steel absorbers, 3 mm scintillator
- Light collection by wavelength-shifting(WLS) fibres
- SiPM readout enebles high granularity in depth and θ
  - 13 radial layers (4x5cm, 6x10cm, 3x20cm)
  - Δθ=0.006-0.022 (single tile -3/4 tiles readout)
- 128 modules in Φ
  - 2 tiles/layer → ΔǾ=0.0125rad



Well tested design, very good performance

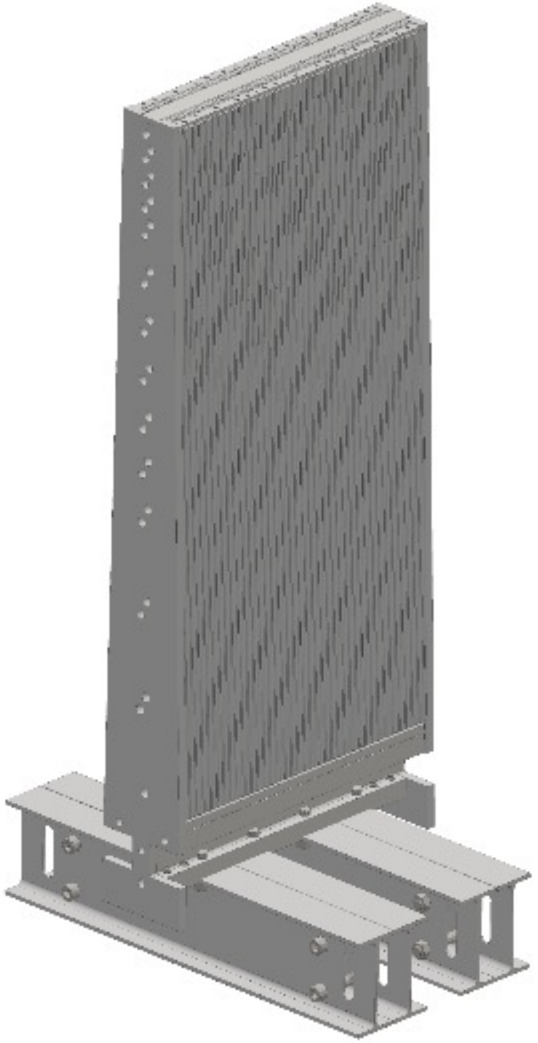
- Photodetectors and electronics out of detector allow maintenance and replacement
- In situ calibration with ^{127}Cs sources

DRD Calo - Development of the HCAL test beam module prototype

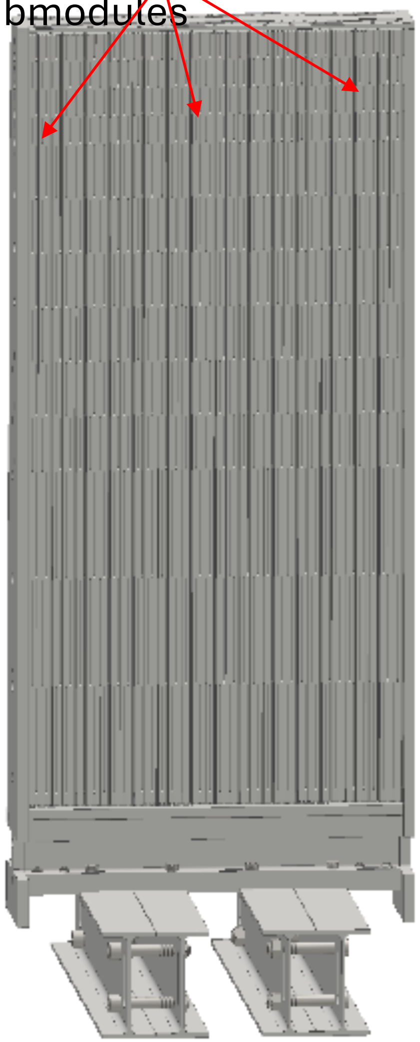
ITIM

Design of the test beam HCAL module

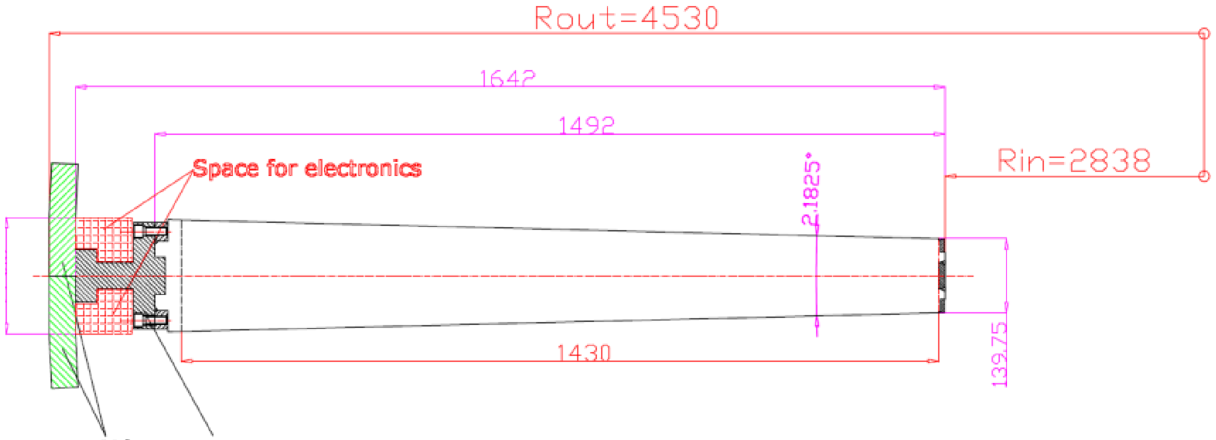
Module (39 periods)



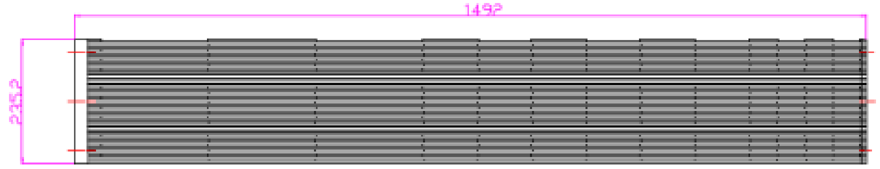
3 Submodules



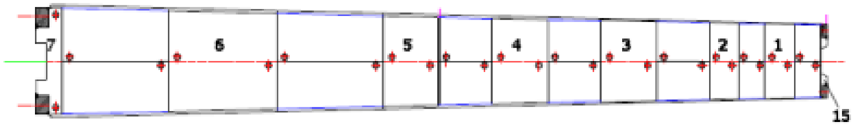
Module cross section geometry



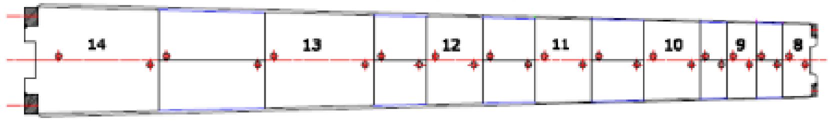
Submodule (13 periods)



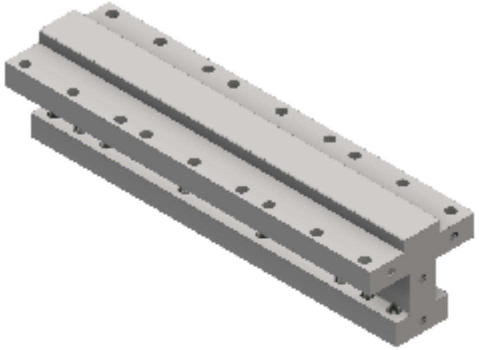
HALF PERIOD (TOP)



HALF PERIOD (START)



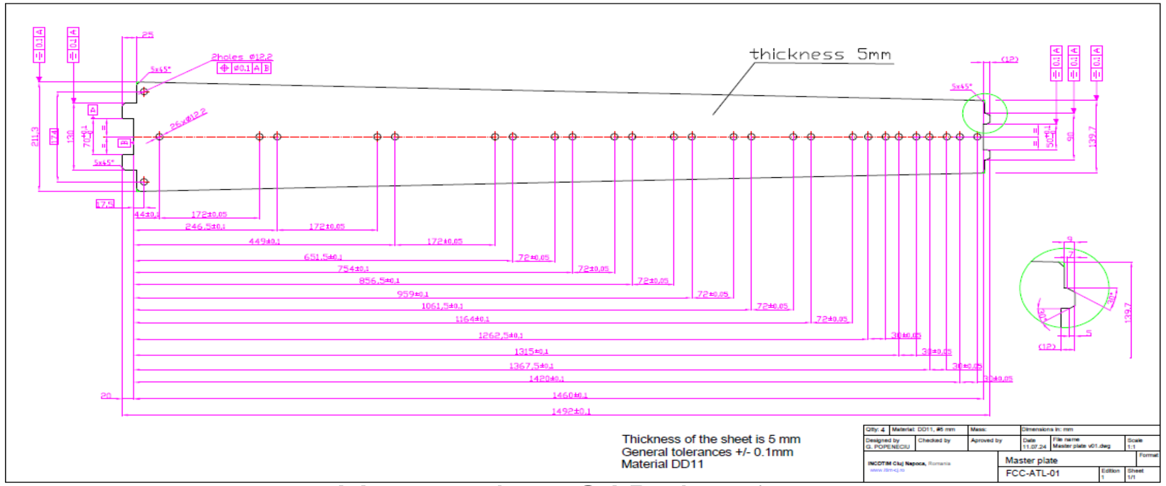
Girder



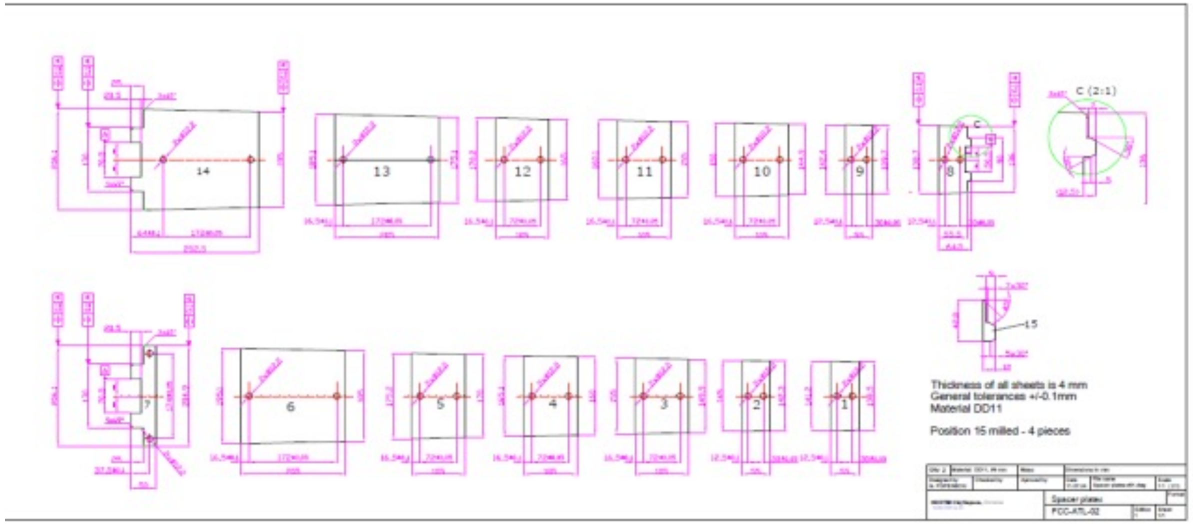
DRD Calo - Development of the HCAL test beam module prototype

ITIM

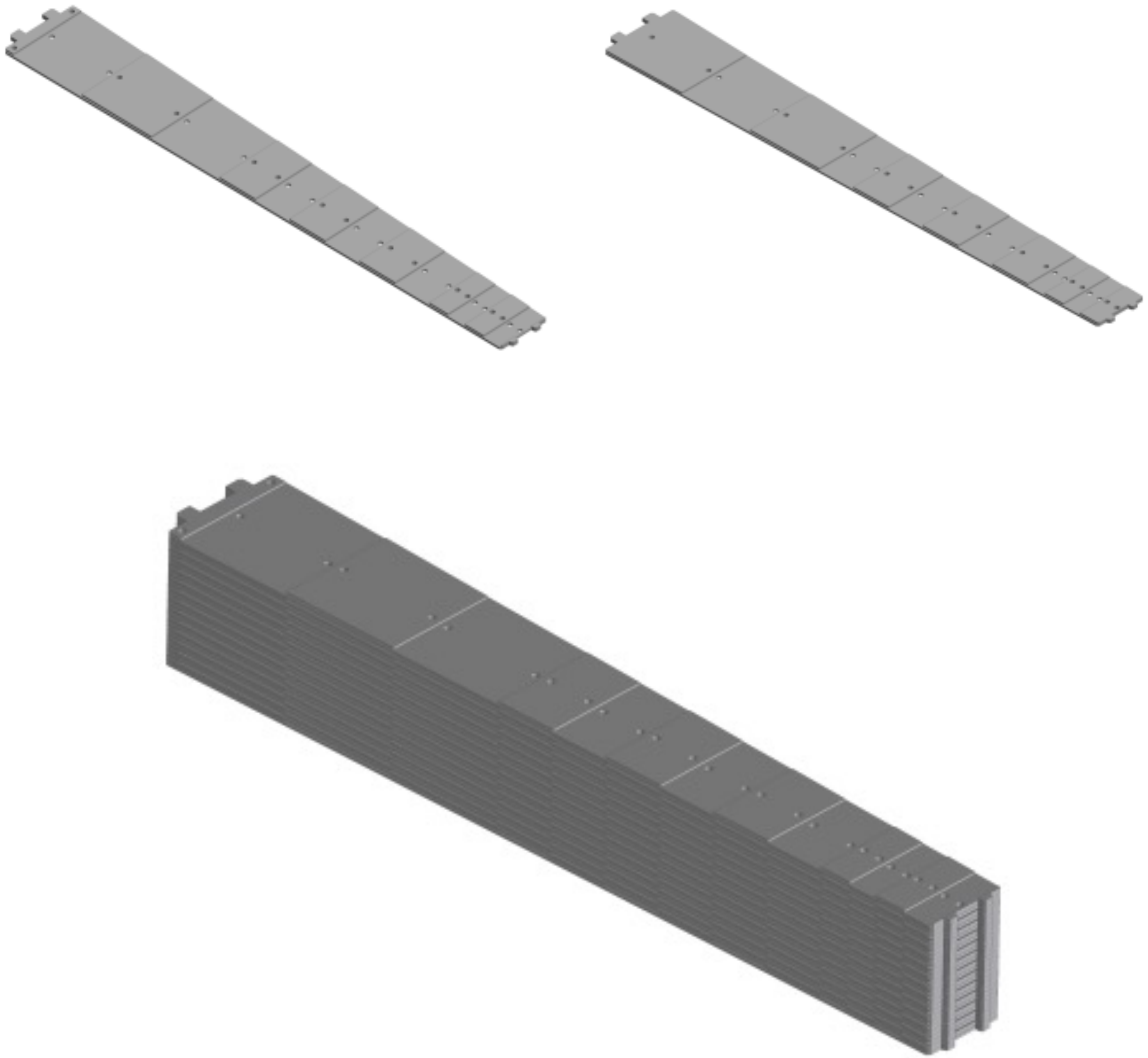
Design of the test beam HCAL mini-module



Master plate CAD drawing



Spacer plates CAD drawing



DRD Calo - Development of the HCAL test beam module prototype

ITIM

Fabrication of the first HCAL mechanical mini-module in ITIM's Workshop

- Aim to build 3 - 5 mini-modules – 74 cm wide, 1.2 tone each, to allow (6-10)x0.025 in Φ
- Production of a mini-module includes:
  - fabrication of the absorber structure (including the structure and FE electronics support) – **done!**
  - instrumentation with leftover legacy scintillators and/or with new scintillator material + optical fibres + FE electronics based on SiPMs

Master and spacers plates for a module period (4 layers)

Submodule – 13 periods glued and welded

ITIM

DRD Calo - Development of the HCAL test beam module prototype

Fabrication of the first HCAL mechanical mini-module in ITIM's Workshop

Submodule fabrication: stacking , welding and painting

DRD Calo - Development of the HCAL test beam module prototype

ITIM

Fabrication of the first HCAL mechanical mini-module in ITIM's Workshop

Mini-module assembly

Specific scientific focus of group

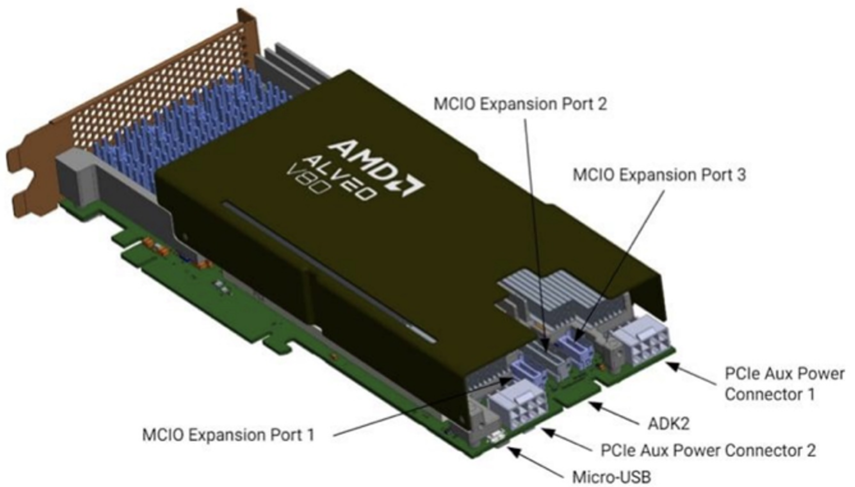
j) DRD7:

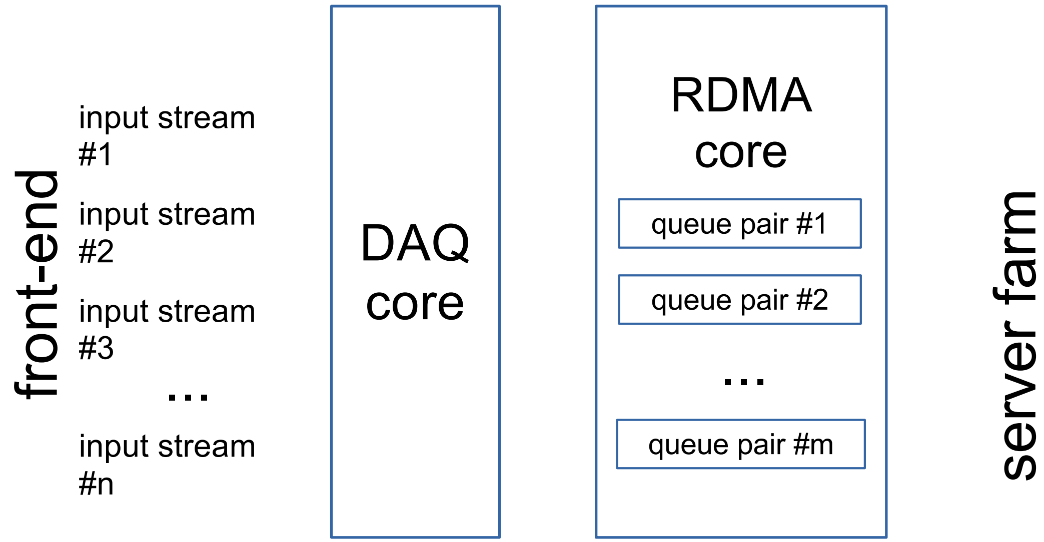
- Work Package 7.5b: From Front-End to Back-End with 100GbE

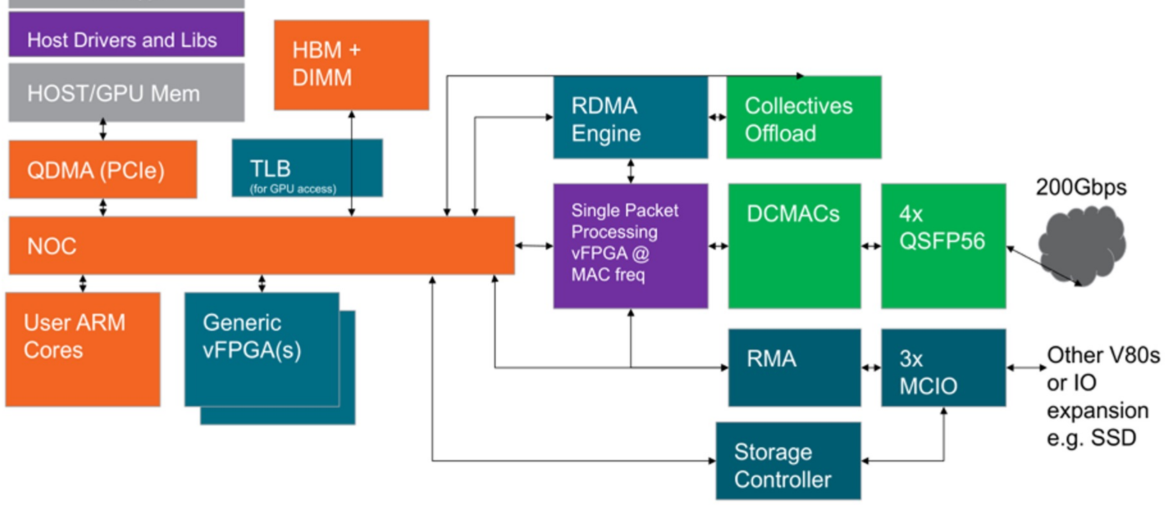
DRD7

IFIN-HH & UPB joined DRD7

- In 2025 IFIN-HH & UPB joined DRD7
- Joined Work Package 7.5b: FPGA-based RDMA communication system
- Activities:
- DAQ core
- Switching old RDMA implementation to:
  - Coyote on Alveo Ultrascale+ boards (U280, U250, U50 etc.)
  - SLASH platform on Alveo Versal boards (V80 etc.)







Specific scientific focus of group

k) Education and outreach

ATLAS++ for ISAB open session

Education

- To address these challenges and to strengthen the national capacity for participation in global HEP projects, a joint effort was made by four universities -
  - *University of Bucharest,*
  - *"Alexandru Ioan Cuza" University of Iași,*
  - *West University of Timișoara, and*
  - *Babeș-Bolyai University of Cluj-Napoca*,

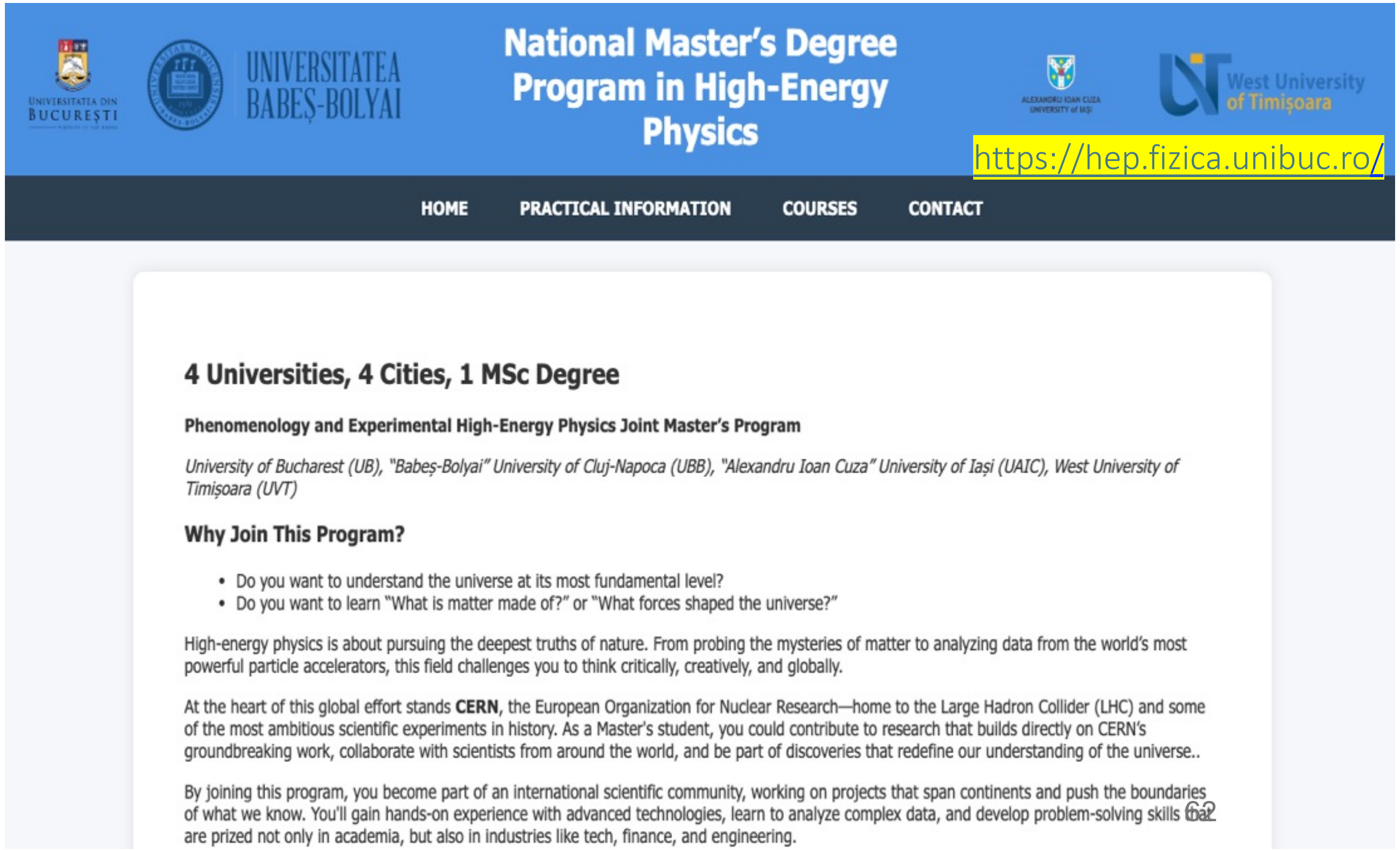
  to establish a National Master's Program in High Energy Physics (NMP-HEP) in Romania.

- This initiative was further supported by two national research and development institutes, IFIN-HH from Măgurele and ITIM from Cluj-Napoca, whose expertise, infrastructure and resources provided an essential foundation for the program's academic and research components.

- Members of our ATLAS cluster have teaching responsibilities.

- The first generation of students was enrolled in October 2025.

- Bachelor and master students jointly coordinated for research practice by ATLAS members.



OUTREACH - Events (selection):

- Open gates events at the Faculties of Physics of UB, UVT and UAIC
- Presentations at different conferences and events, workshops for pupils held by the members of the project
- ,,International Masterclasses ATLAS’’ at all Faculties of Physics in the country
- European Researchers Night – 26 September 2025