

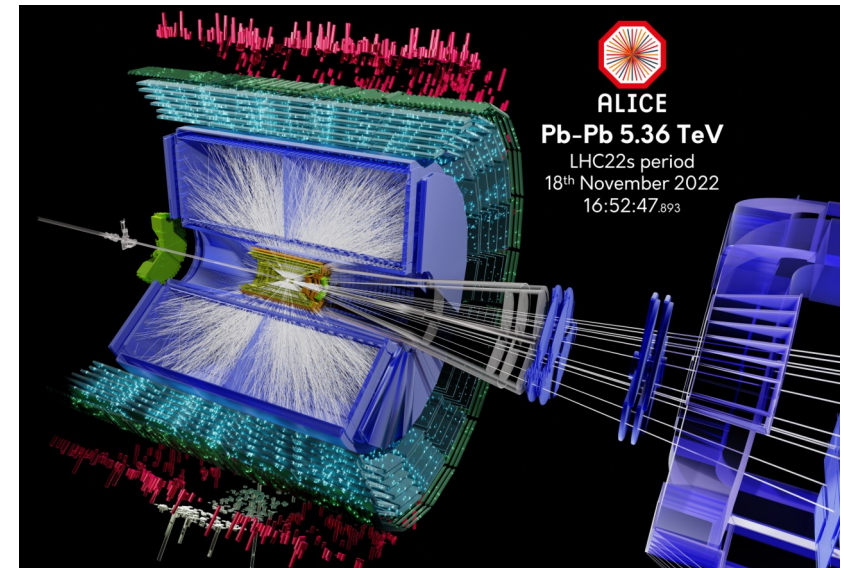
MINISTERUL EDUCAȚIEI ȘI CERCETĂRII
AUTORITATEA NAȚIONALĂ PENTRU CERCETARE

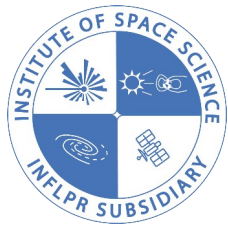


ISS contributions to ALICE physics, computing and hardware (ISSconALICE)

A. Dobrin (Team/Project Leader)

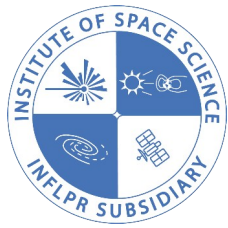
- Accomplishments from last meeting
- Physics highlights
- Summary





ALICE

Accomplishments from last meeting



Papers / presentations



- Papers

- *“Limits on chiral magnetic effect from event shape engineering and participant-spectator correlation techniques in Pb-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV”*, in Collaboration Round 2
 - Paper members: *A. Danu, A. Dobrin et al. (6 authors)*

- Presentations

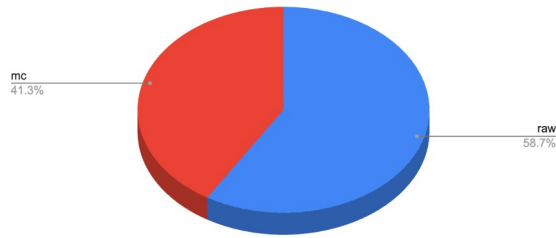
- 2nd Latin American Workshop on Electromagnetic Effects in QCD, Santiago, Chile
 - *“Searches for effects of the electromagnetic fields with ALICE”*, A. Dobrin – invited talk
- 6th Workshop on Nonperturbative Aspects of QCD, Valparaiso, Chile
 - *“Searches for effects of the electromagnetic fields with ALICE”*, A. Dobrin – invited talk
- Quark Matter 2025, Frankfurt, Germany
 - *“Investigating small collision system properties using balance functions”*, A. Manea – poster
- Various presentations in ALICE meetings

PDP, GRID, ALICE roles

- **Physics and Data Processing (PDP)**

- **Institutional responsibility** for central processing of RAW data reconstruction and Monte Carlo (MC) simulations → Data Preparation Group (DPG) coordinator

number of productions vs. prod type



- **Productions (383 completed)**

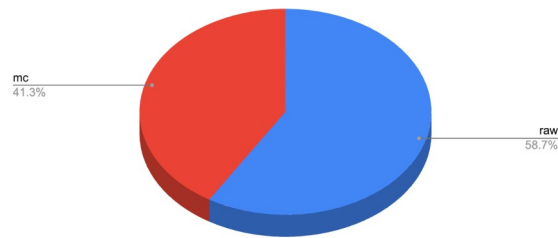
- 60% RAW data
- 40% MC

PDP, GRID, ALICE roles

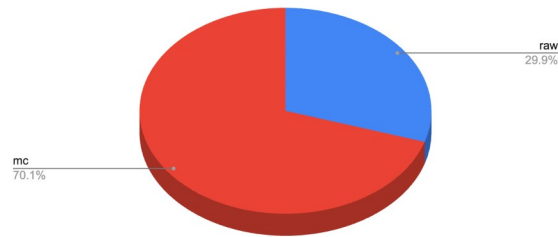
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number of productions vs. prod type



cpu (years)



- **Productions (383 completed)**

- 60% RAW data
- 40% MC

- **CPU time (50500 years)**

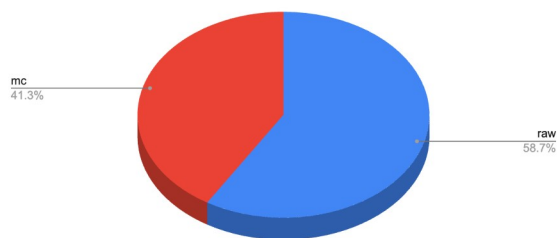
- 30% RAW data
- 70% MC

PDP, GRID, ALICE roles

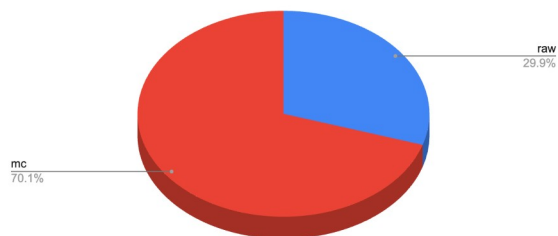
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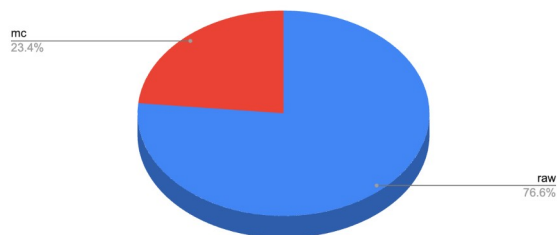
number of productions vs. prod type



cpu (years)



disk (PiB)



- **Productions (383 completed)**

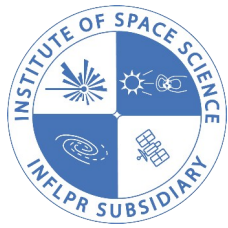
- 60% RAW data
- 40% MC

- **CPU time (50500 years)**

- 30% RAW data
- 70% MC

- **Disk usage (~20 PiB)**

- 75% RAW data
- 25% MC



PDP, GRID, ALICE roles



- **Physics and Data Processing (PDP)**

- **Institutional responsibility** for central processing of RAW data reconstruction and Monte Carlo (MC) simulations → Data Preparation Group (DPG) coordinator
- Development and support of GRID python client alien.py → **default tool to access ALICE GRID**

- alien.py (xjalienfs module)

- Bug fixes and features + library developments
 - 6 releases / 73 commits
- Tight communication with XRootD developers

The screenshot shows the GitHub repository page for 'xjalienfs'. The repository is owned by 'JAIIE' and is currently on the 'master' branch. The page displays a list of files and their commit history. The most recent commit is 'alien.py update version info' by Adrian Sevencio, made 1 week ago. The repository has 1,184 commits, 6 branches, and 69 tags. It was created on August 09, 2019.

Name	Last commit	Last update
.github/workflows	workflows/codeql-analysis.y...	2 years ago
alienpy	alien.py update version info	1 week ago
examples	simplify examples	6 months ago
git-hooks	update hooks	2 years ago
tests	002_env_tokens.test :: improv...	3 months ago
.deepsources.toml	rease cyclomatic complexity le...	2 years ago
.flake8	get_ca_path:: check validity o...	1 year ago

PDP, GRID, ALICE roles

- **Physics and Data Processing (PDP)**

- **Institutional responsibility** for central processing of RAW data reconstruction and Monte Carlo (MC) simulations → Data Preparation Group (DPG) coordinator
- Development and support of GRID python client alien.py → **default tool to access ALICE GRID**
- Development and support of XRootD software for ALICE GRID

- alien.py (xjalienfs module)

- Bug fixes and features + library developments
 - 6 releases / 73 commits
- Tight communication with XRootD developers

- Repackage of ALICE dependencies for XRootD

- Various ALICE Grid sites migrated to XRootD v5
 - Support for sites upgrading to v5

The screenshot displays the GitHub repository page for 'xjalienfs'. At the top, there is a search bar and a notification banner about AI coding assistants. The repository name 'xjalienfs' is prominently displayed with a star count of 1. Below the name, the current branch 'master' is selected. A commit history table is visible, showing the most recent commit: 'alien.py update version info' by Adrian Sevencio, authorized 1 week ago, with commit hash 6d93f37b. The table lists several files and their last commit dates:

Name	Last commit	Last update
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Project information on the right side includes: 1,184 Commits, 6 Branches, 69 Tags, a README file, and a BSD 3-Clause license. The repository was created on August 09, 2019.

PDP, GRID, ALICE roles

- **Physics and Data Processing (PDP)**
 - **Institutional responsibility** for central processing of RAW data reconstruction and Monte Carlo (MC) simulations → Data Preparation Group (DPG) coordinator
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 - Support of ALICE Open Data → develop tools for new data format, documentation, upload data to CERN portal

About ALICE

ALICE is the acronym for A Large Ion Collider Experiment, the experiment at the Large Hadron Collider devoted to the physics of matter at infinitely small scale exploiting heavy-ion collisions. Its scientific programme aims at answering a series of fundamental questions such as:

- What is the phase of matter under extreme conditions of temperature, 200'000 times larger than the temperature at the center of the Sun?
- What generates the mass mass of ordinary matter such that the protons and neutrons weight 100 times more than the c
- What is the dynamics of the strong interaction that binds quarks inside ordinary matter? You can find more information and physics on the [ALICE website](#)

About ALICE Data

The following are provided through this portal:

- Primary and derived datasets
 - The available [primary ALICE datasets](#) contain a limited sample of specially selected interaction events recorded 1 collisions collected in 2010. The data format is the ESD (event summary data) format generated by the ALICE raw software. These datasets are not corrected for detector inefficiency nor statistically representative and therefore c full fledged scientific studies. They rather serve to demonstrate the use of the ALICE analysis tools.
 - A set of [simplified datasets](#) derived from the primary ones for use in the provided masterclass analyses. These d the information needed by the masterclasses and are not useful for a different purpose.
- Tools

cernopendata / opendata.cern.ch

Code Issues 136 Pull requests 24 Actions Projects Wiki Security Insights

Notifications Fork 163 Star 729

feat(records): add ALICE LHC15o #3760 New issue

Draft psaiz wants to merge 1 commit into master from alice_LHC15o

Conversation 0 Commits 1 Checks 32 Files changed 1 +71 -0

psaiz commented on Sep 22

No description provided.

psaiz marked this pull request as draft 2 months ago

feat(records): add ALICE_LHC15o

psaiz force-pushed the alice_LHC15o branch from c663df2 to f5b6d15 2 months ago

Reviewers: No reviews

Assignees: No one assigned

Labels: None yet

Projects: None yet

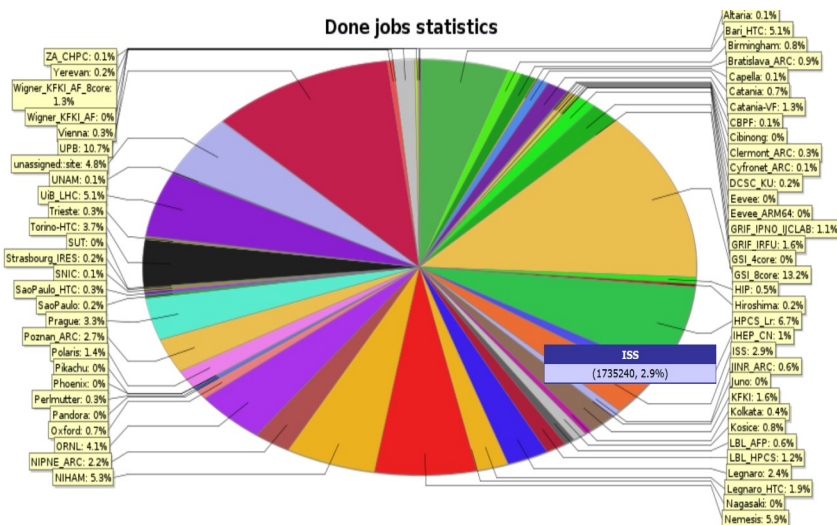
PDP, GRID, ALICE roles

- Physics and Data Processing (PDP)**

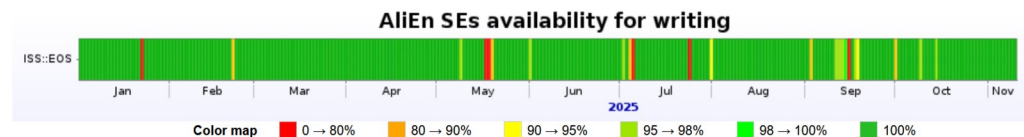
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- GRID**

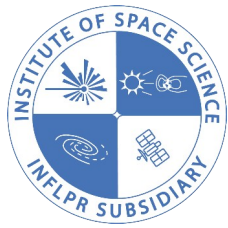
- High computing contribution/cost ratio
- ~1.73M DONE jobs, >98% availability, ~60 PB data transfer
 - 18.1% of CPU time and 13.8% DONE jobs from Romanian contribution



Disk storage elements														
ISS		AllEn SE		Catalogue statistics (1024-base units)				Storage-provided information (1024-base units)						
SE Name	AllEn name	Tier	Size	Used	Free	Usage	No. of files	Type	Size	Used	Free	Usage	Version	EOS Version
1. ISS - EOS	ALICE::ISS::EOS	2	6.028 PB	5.526 PB	514.3 TB	91.67%	83,447,760	EOS	5.92 PB	5.474 PB	456.4 TB	92.47%	Xrootd 5.8.4	5.3.2
Total			6.028 PB	5.526 PB	514.3 TB	91.67%	83,447,760		5.92 PB	5.474 PB	456.4 TB	92.47%		



Statistics						
Link name	Data		Individual results of writing tests			Overall
	Starts	Ends	Successful	Failed	Success ratio	
ISS::EOS	01 Jan 2025 15:21	10 Nov 2025 15:42	7438	105	98.61%	98.65%



PDP, GRID, ALICE roles



- **Physics and Data Processing (PDP)**

- **Institutional responsibility** for central processing of RAW data reconstruction and Monte Carlo (MC) simulations → Data Preparation Group (DPG) coordinator
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- **GRID**

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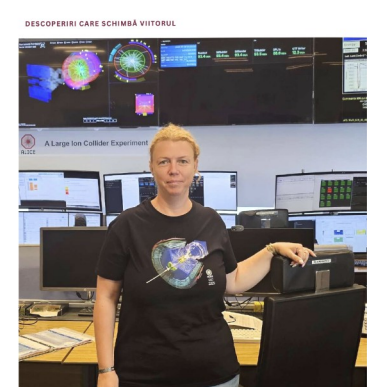
- **ALICE roles**

- Member of Editorial Board
- Coordinator of DPG; coordinator of the ALICE Open Data group
- Members in 2 Internal Paper Review Committees
- Institutional review of 2 ALICE papers

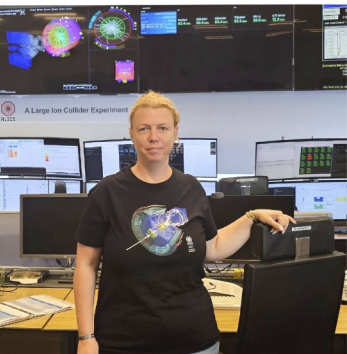
Outreach, Education, Collaboration

- **Outreach**

- “ALICE MasterClass” – DUROCERN, Magurele
- “Different School: Know more, be better!”, middle/high school students – ISS, Magurele
- European Researchers’ Night – Bucharest & Magurele
- AstroFest – Bucharest
- O-O/Ne-Ne collisions – ALICE ACR, CERN



DESCOPERIRI CARE SCHIMBĂ VIITORUL



ACCELERATORUL LHC
În jurul de 27 de km al accelerativului LHC (Large Hadron Collider) de la CERN s-au realizat pentru prima dată coliziuni de ioni de oxigen, oferind posibilitatea unei game largi de servicii, de la studiul materiei condensate până la cel al coliziunii percutante Big Bang, ce a dat naștere Universului nostru.

EXPERIMENTUL ALICE
Cercetătorii români, alături de ceilalți din controlul experimentului ALICE, au contribuit în acest moment important, oferind contribuția semnificativă a României pentru cercetarea și dezvoltarea.



DESCOPERIRI CARE SCHIMBĂ VIITORUL



România la granițele Universului: Coliziuni de oxigen la CERN

Experimental ALICE recrează mici Big Bang-uri, la care iau parte cercetătorii români

În perioada 29 iunie-9 iulie 2025, la Large Hadron Collider (LHC) de la CERN are loc o nouă etapă experimentală, consistând în primele coliziuni proton-Oxigen (p-O) și Oxigen-Oxigen (O-O), urmate de o zi de coliziuni Neon-Neon (Ne-Ne). Aceste coliziuni au recreat condițiile extreme ale materiei de la câteva microsecunde după Big Bang. În special plasma de quarci și gluoni (QGP) - o stare a materiei în care quarci și gluoni, particulele fundamentale, există liber, neconstrânse de forța tare. Pentru domeniul fizicii ionilor grei, acest eveniment a reprezentat un moment de referință. Pentru România, a fost o confirmare a contribuției sale la unul dintre cele mai impresionante experimente științifice ale epocii noastre.



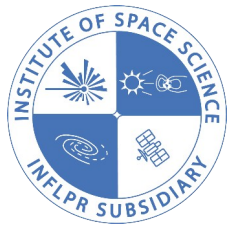
O campanie istorică pentru fizica ionilor grei

Între 29 iunie și 1 iulie, timp de două zile, coliziunile p-O au reprezentat o provocare tehnică majoră datorită diferențelor în raportul de sarcină-masă dintre protoni și ioni de oxigen, necesitând ajustări precise ale frecvenței și impulsului fasciculelor pentru a asigura coliziuni exacte în centrul experimentelor ALICE, ATLAS, CMS și LHCb.

Între 2 și 4 iulie, coliziunile O-O, o premisă pentru datele experimentale, vor permite studierea plasmei de quarci și gluoni în sisteme mai compacte decât cele create prin coliziuni Pb-Pb. Spre finalul campaniei, o zi de informații despre nucleul intermediar și compoziția lor în coliziuni relativiste.



Generated content



Outreach, Education, Collaboration



- **Outreach**

- “ALICE MasterClass” – DUROCERN, Magurele
- “Different School: Know more, be better!”, middle/high school students – ISS, Magurele
- European Researchers’ Night – Bucharest & Magurele
- AstroFest – Bucharest
- O-O/Ne-Ne collisions – ALICE ACR, CERN

- **Collaboration**

- Shifts: 48 (done) / 46.75 (due)

RO - Bucharest ISS Institute of Space Science

Members Statistics

Show 10 entries

Email Selected Select All

Search:

Member	Category	Start date	End date	Booked	Done
Profile Diana Catalina BRANDIBUR	Master Student	2023-05-08	2024-09-30	6	6
Profile Andrea DANU	M&O Physicist	2013-06-20		6	6
Profile Alexandru Florin DOBRIN	M&O Physicist	2019-02-01		6	6
Profile Maria LINC	Bachelor Student	2023-07-01	2024-09-30		
Profile Alexandru MANEA	PhD Student	2024-01-01	2026-09-30	6	6
Profile Catalin-Lucian RISTEA	M&O Physicist	2013-09-11		12	12
Profile Adrian SEVCENCO	M&O Physicist	2012-09-01		6	6
Profile Ionel STAN	M&O Physicist	2013-12-04		6	6

Details Data taking 2025

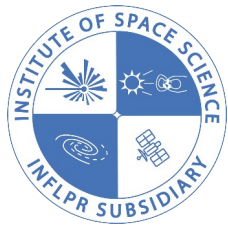
Total M&O 5
Due credits 46.75
Carryover 0

regular

Booked/Due 103% 48 of 46.75

Done/Booked 100% 48 of 48

A



Outreach, Education, Collaboration



• Outreach

- “ALICE MasterClass” – DUROCERN, Magurele
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• Collaboration

- Shifts: 48 (done) / 46.75 (due)
- Service work: 2.325 FTE (assigned) / 1.25 FTE (due)

RO - Bucharest ISS 2025 of Space Science

Member ↑	M&O	Category	Start date	End date	Institute	Assigned FTE
Adrian Sevcenco	M&O	Physicist	2012-09-01	2099-12-31	RO - Bucharest ISS	1
Alexandru Florin Dobrin	M&O	Physicist	2019-02-01	2099-12-31	RO - Bucharest ISS	0.025
Alexandru Manea		PhD Student	2024-01-01	2026-09-30	RO - Bucharest ISS	0.25
Andrea Danu	M&O	Physicist	2013-06-20		RO - Bucharest ISS	0
Catalin-Lucian Ristea	M&O	Physicist	2013-09-11	2099-12-31	RO - Bucharest ISS	0.8
Diana Catalina Brandibur		Master Student	2023-05-08	2024-09-30	RO - Bucharest ISS	0.25
Ionel Stan	M&O	Physicist	2013-12-04		RO - Bucharest ISS	0
Maria Linc		Bachelor Student	2023-07-01	2024-09-30	RO - Bucharest ISS	0

Accounting

- Total M&O-A: 5
- Due FTE: 1.25
- Assigned FTE: 2.325
- Final FTE: 2.325
- Provisional FTE: 0

186%
2.325/1.25

Category	Start date	End date	Booked	Done
BRANDIBUR	2023-05-08	2024-09-30	6	6
M&O Physicist	2013-06-20		6	6
in DOBRIN M&O Physicist	2019-02-01		6	6
Bachelor Student	2023-07-01	2024-09-30		
NEA PhD Student	2024-01-01	2026-09-30	6	6
RISTEA M&O Physicist	2013-09-11		12	12
CO M&O Physicist	2012-09-01		6	6
M&O Physicist	2013-12-04		6	6

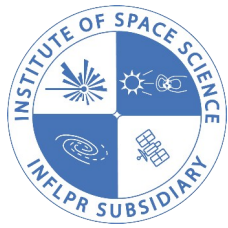
Details Data taking 2025

Total M&O: 5
 Due credits: 46.75
 Carryover: 0

regular

Booked/Due
 103%
 48 of 46.75

Done/Booked
 100%
 48 of 48



Outreach, Education, Collaboration



- **Outreach**

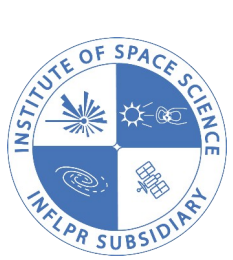
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- **Collaboration**

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- Service work: 2.325 FTE (assigned) / 1.25 FTE (due)

- **Education**

- 2 projects: 1 master and 1 PhD students
- Participation at different schools
 - International school of nuclear physics – Erice, Italy
 - 1st PhyStat School of Statistics – Nooitgedacht, Netherlands

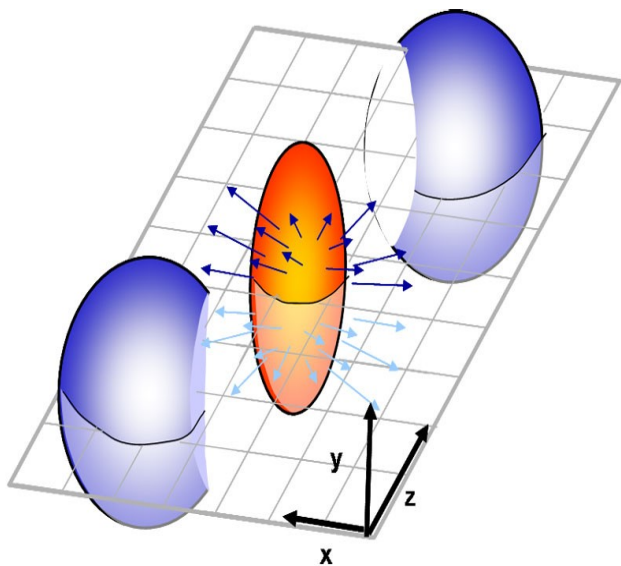


Physics highlights

Anisotropic flow

$$E \frac{d^3 N}{d^3 p} = \frac{1}{2\pi} \frac{d^2 N}{p_T dp_T dy} \left(1 + \sum_{n=1}^{\infty} 2 v_n \cos(n(\varphi - \Psi_n)) \right)$$

$$v_n = \langle \cos(n(\varphi - \Psi_n)) \rangle$$



- **Anisotropic flow:** initial spatial anisotropy → final momentum anisotropy via collective interactions
 - v_n quantify the event anisotropy
- Characterize key QGP properties

Flow vector → q-distributions

$$Q_{n,x} = \sum_i \cos(n\varphi_i) \quad \rightarrow \quad Q_n = \{Q_{n,x}, iQ_{n,y}\}$$

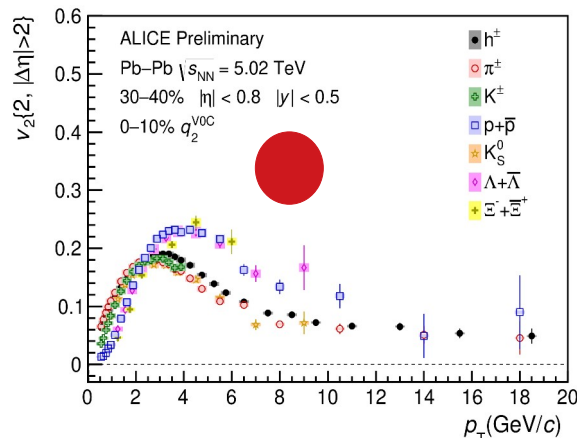
$$Q_{n,y} = \sum_i \sin(n\varphi_i) \quad \rightarrow \quad q_n = |Q_n|/\sqrt{M}$$



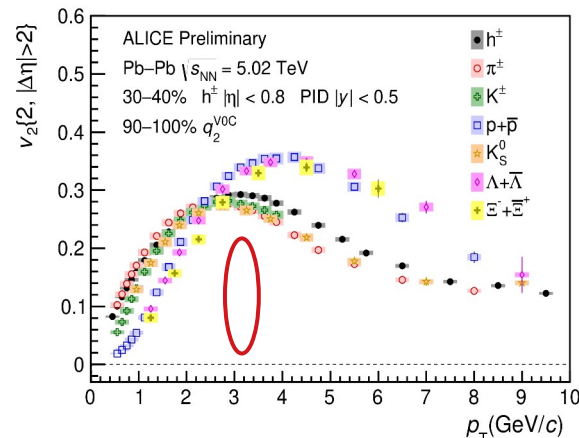
Large- q_2 :
10% high



Small- q_2 :
10% low



ALI-PREL-327051



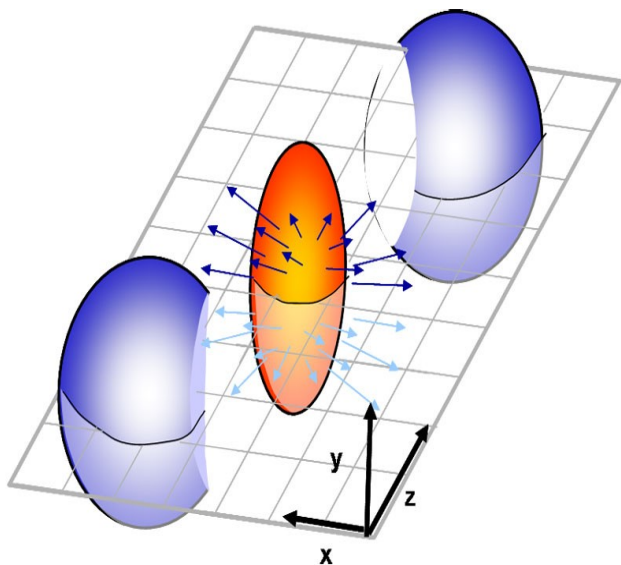
ALI-PREL-327055

- More differential measurements using event shape engineering (ESE)
- Rerun analysis on the latest reconstruction passes

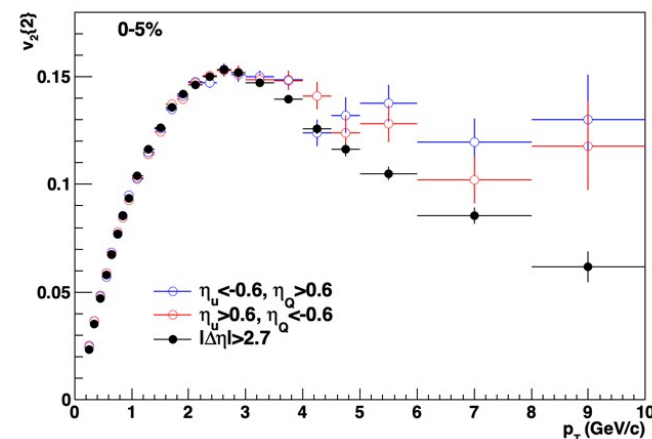
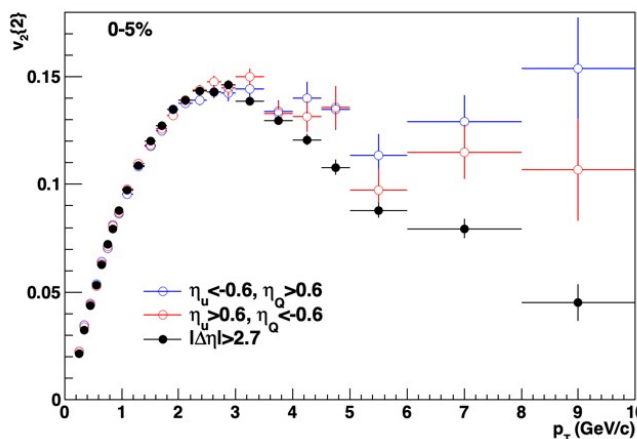
Anisotropic flow

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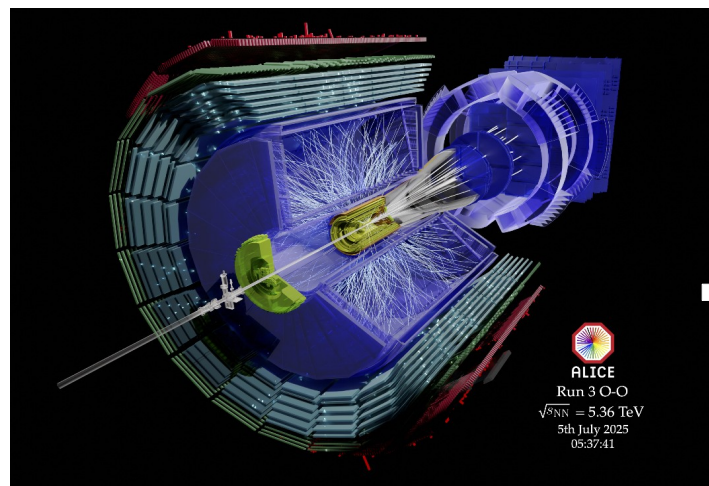
$$v_n = \langle \cos(n(\varphi - \Psi_n)) \rangle$$



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 - v_n quantify the event anisotropy
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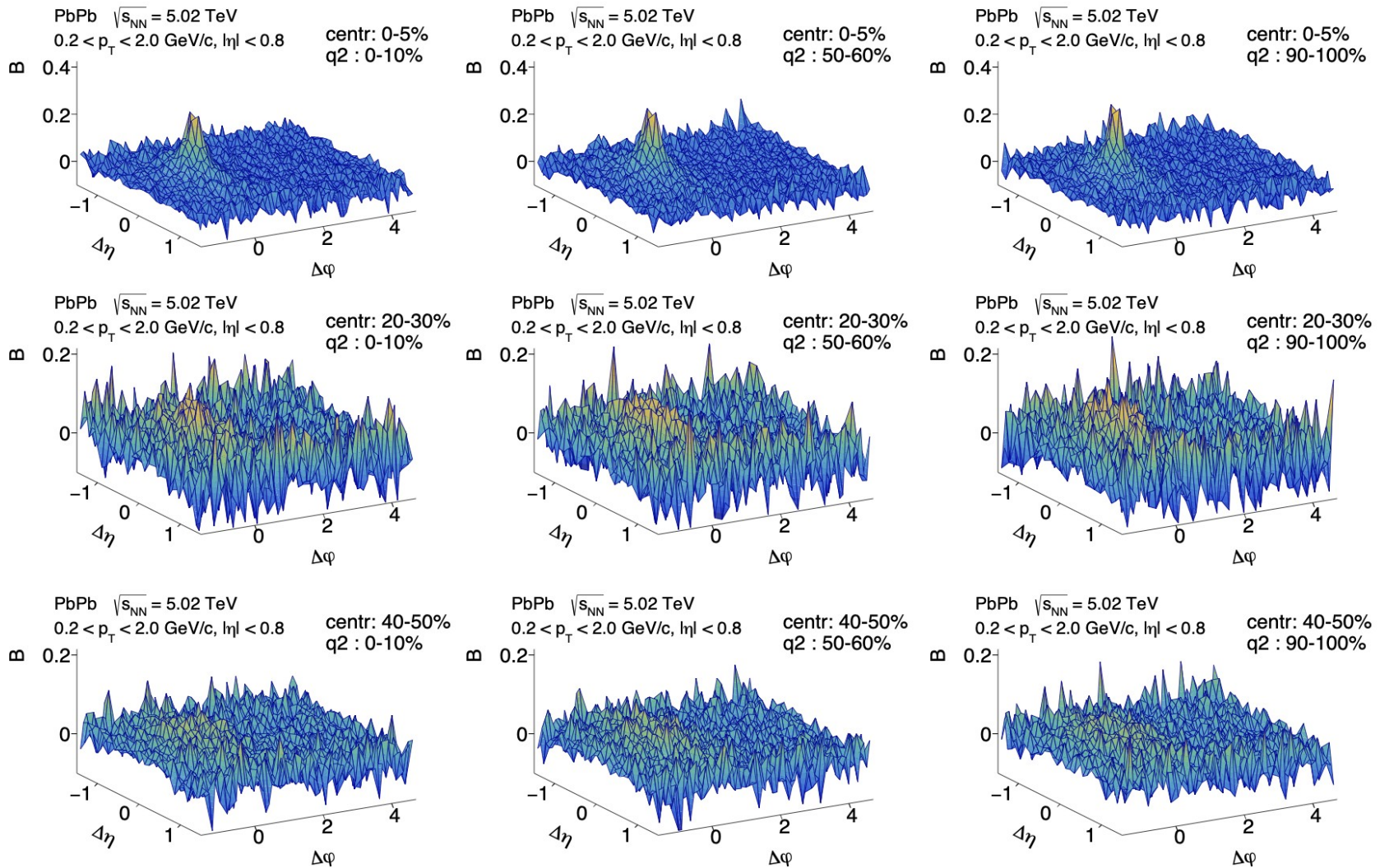
First look at v_2 vs p_T from the O-O and Ne-Ne collisions at $\sqrt{s_{NN}} = 5.36$ TeV



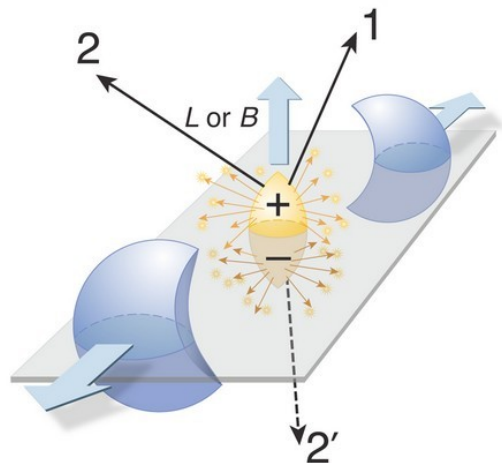
ALICE
Run 3 O-O
 $\sqrt{s_{NN}} = 5.36$ TeV
5th July 2025
05:37:41

Balance Function

$$B^{\alpha\bar{\beta}}(\Delta\eta, \Delta\varphi) = \bar{\rho}_1^{\bar{\beta}} \left[R_2^{\alpha\bar{\beta}}(\Delta\eta, \Delta\varphi) - R_2^{\bar{\alpha}\bar{\beta}}(\Delta\eta, \Delta\varphi) \right] \quad R_2^{\alpha\beta}(\Delta\eta, \Delta\varphi) = \frac{\rho_2^{\alpha\beta}(\Delta\eta, \Delta\varphi)}{\rho_1^\alpha \otimes \rho_1^\beta(\Delta\eta, \Delta\varphi)} - 1$$



Chiral Magnetic Effect (CME)



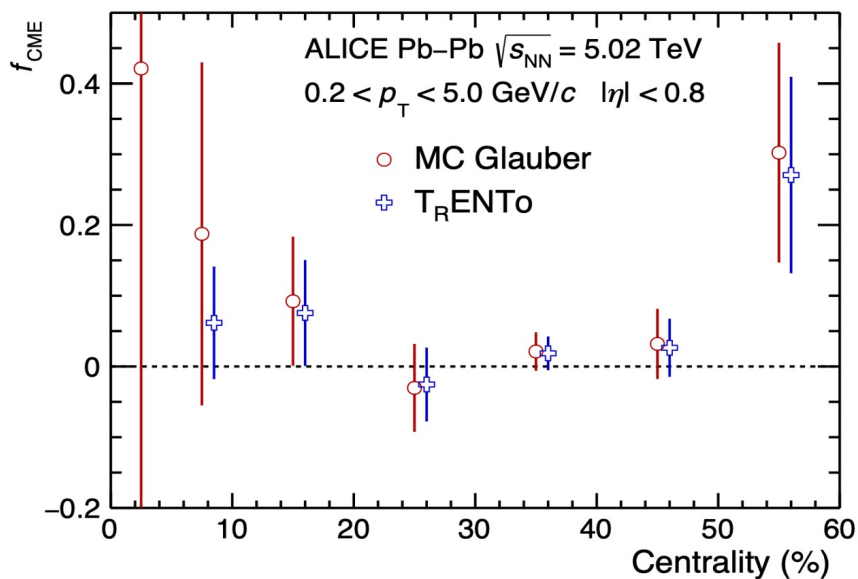
- Investigate parity violation (P) in the strong interaction (**fundamental property**)
 - Allowed by theory but never observed (**strong-CP problem**)
- Heavy-ion collisions: strong magnetic field ($B \sim 10^{19}$ Gauss)
- Theory: domains with P and CP symmetries locally broken
- Interaction of quarks with these domains and $B \rightarrow$ charge separation along B (CME)

3-particle correlator

$$\gamma_{ab} = \langle \cos(\varphi_a + \varphi_b - 2\Psi_2) \rangle \approx -\langle a_{1,a} a_{1,b} \rangle + B_{\text{in-plane}} - B_{\text{out-plane}}$$

D. Kharzeev, PLB 633, 260 (2006)
 D. Kharzeev et al., NPA 803 227 (2008)
 S. Voloshin, PRC 70, 057901 (2004)

$$f_{\text{CME}} * p_{1,MC} + (1 - f_{\text{CME}}) * 1 = p_{1,data}$$



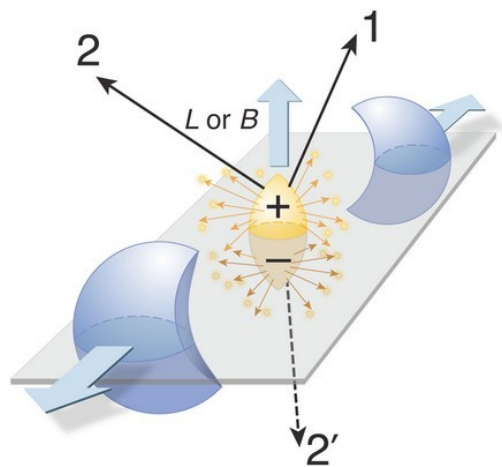
- CME fraction in 0-5% is currently statistically limited
- Combining the points from 5-60% gives

$$f_{\text{CME}} (\text{Glauber}) = 0.028 \pm 0.021 \rightarrow 7\% \text{ at } 95\% \text{ C.L.}$$

$$f_{\text{CME}} (\text{T}_{\text{R}}\text{ENTo}) = 0.025 \pm 0.018 \rightarrow 6\% \text{ at } 95\% \text{ C.L.}$$

- Draft in Collaboration Round 2

Chiral Magnetic Effect (CME)



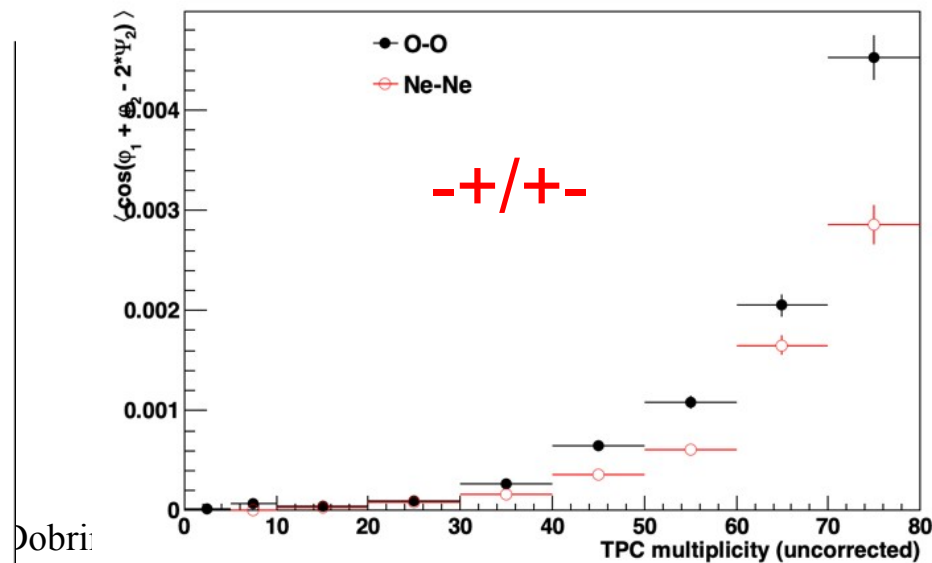
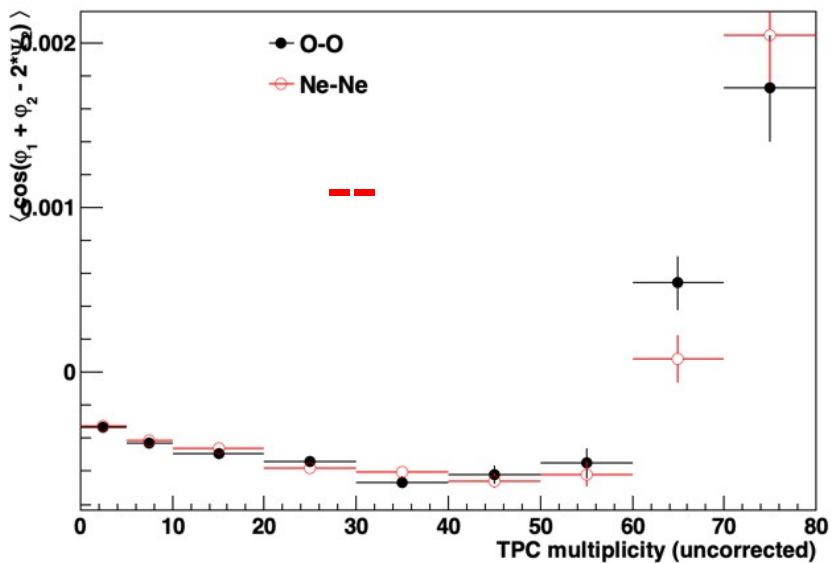
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D. Kharzeev, PLB 633, 260 (2006)
 D. Kharzeev et al., NPA 803 227 (2008)
 S. Voloshin, PRC 70, 057901 (2004)

First look for CME in O-O and Ne-Ne collisions at $\sqrt{s_{NN}} = 5.36$ TeV

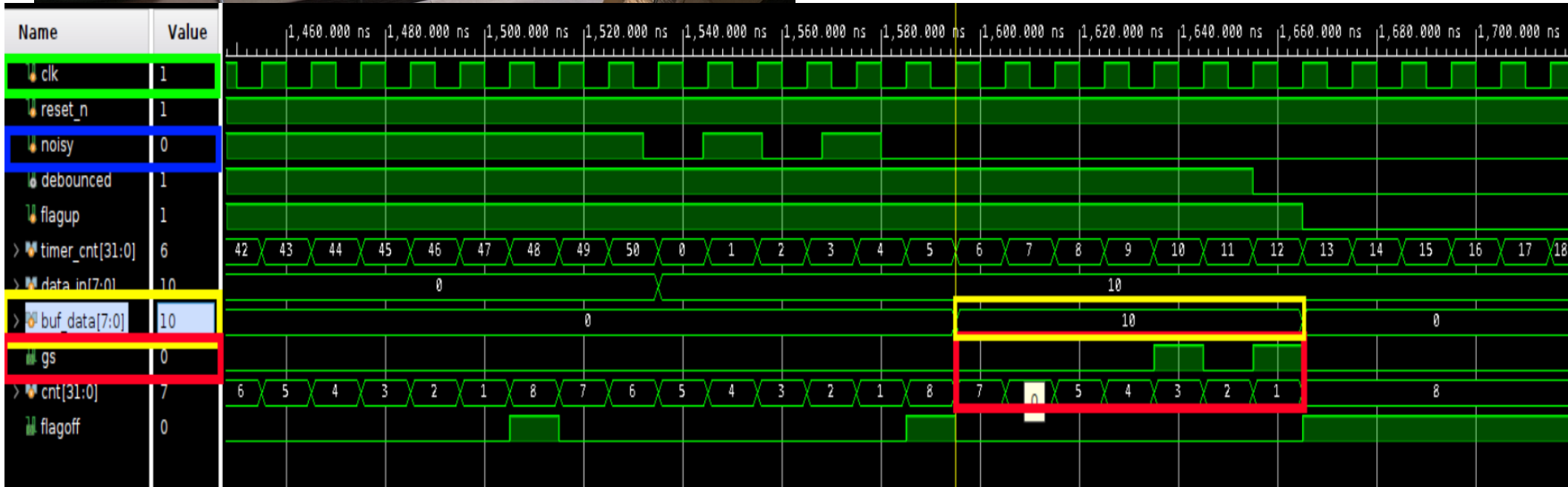


Dobri

FoCal activities



- Acquired several FPGA boards
 - Test benches for the RU framework at ISS and INFLPR
- Developed and tested several modules
 - Bouncing / debouncing
 - Data serialization / deserialization



Project Team

- Group members

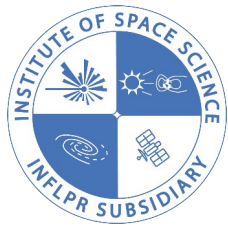
- ISS

- BRANDIBUR Catalina Diana (until 15.10.2025)
 - CHERCIU Madalin
 - DANU Andrea
 - DOBRIN Alexandru Florin
 - LINC Maria
 - MANEA Alexandru
 - NEDELICU Liliana
 - RISTEA Catalin Lucian
 - SEVCENCO Adrian
 - STAN Ionel

- INFLPR

- DINCA Ana
 - MIHAILESCU Cristian Nicolae
 - MIHALCEA Alexandru
 - SIMION Sandel
 - VESTEA Darius Adrian
 - ZAMFIR Mihai Robert





Summary



- Rich physics output → help constraining the properties of the QGP
 - 1 ALICE paper in Collaboration Round 2
 - New analyses started from light-ion and Pb-Pb collisions (e.g., Balance Function)
 - ALICE presentations+poster at 3 conferences/workshops
 - Several presentations at various ALICE meetings
- ALICE data reconstruction and Monte Carlo simulations up-to-date
 - Fulfill the Institutional Responsibility
 - Coordinator of the DPG
- GRID python client default tool when accessing ALICE GRID
 - Independent module in the ALICE software framework
- Coordination of the ALICE Open Data activities
- Support ALICE GRID via ISS-ALICE Tier-2 site
- Develop several FPGA modules for FoCal RU