ZIMÁNYI SCHOOL 2023

A. Gáspár: Calculate the Entropy XIV

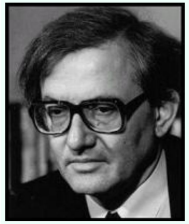
23rd ZIMÁNYI SCHOOL

WINTER WORKSHOP

ON HEAVY ION PHYSICS

December 4-8, 2023

Budapest, Hungary



József Zimányi (1931 - 2006)

The ALICE Fast Interaction Trigger performance and upgrade

Sahil Upadhyaya

on behalf of the ALICE *collaboration*

THE HENRYK NIEWODNICZAŃSKI
INSTITUTE OF NUCLEAR PHYSICS
POLISH ACADEMY OF SCIENCES

ALICE

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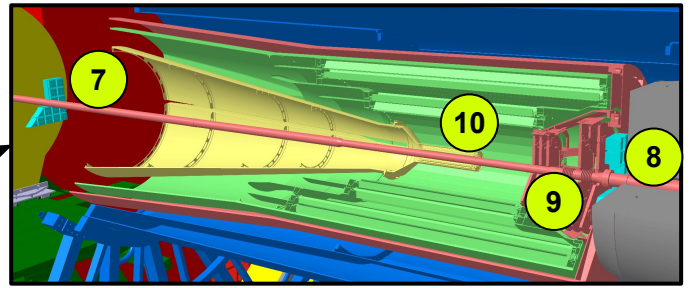
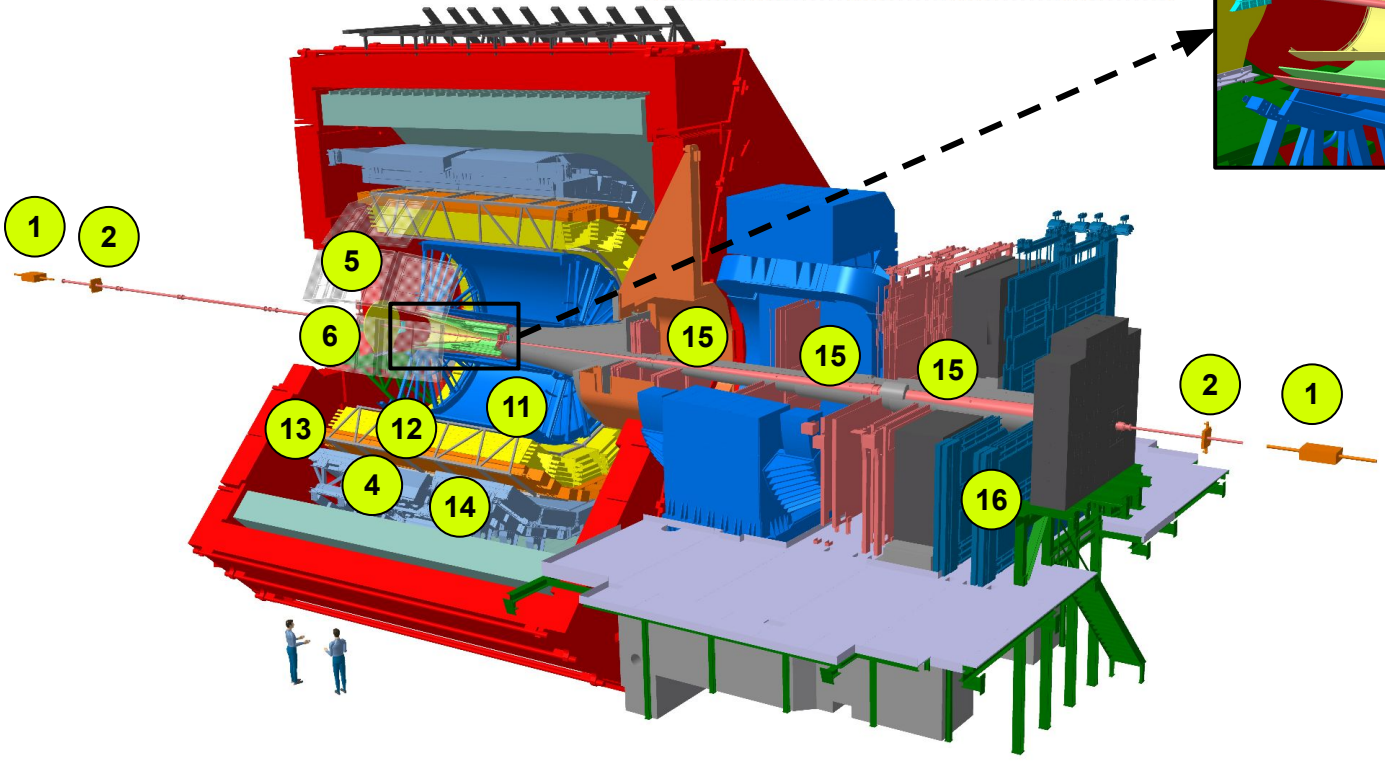
ALICE Upgrade

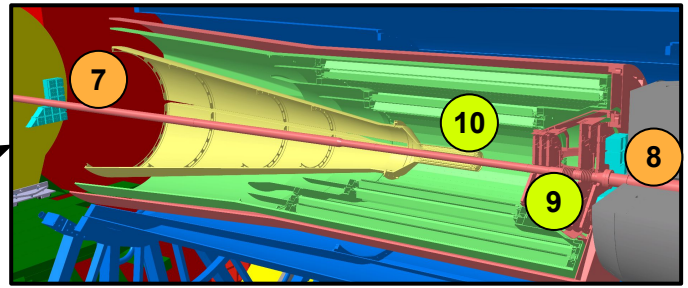


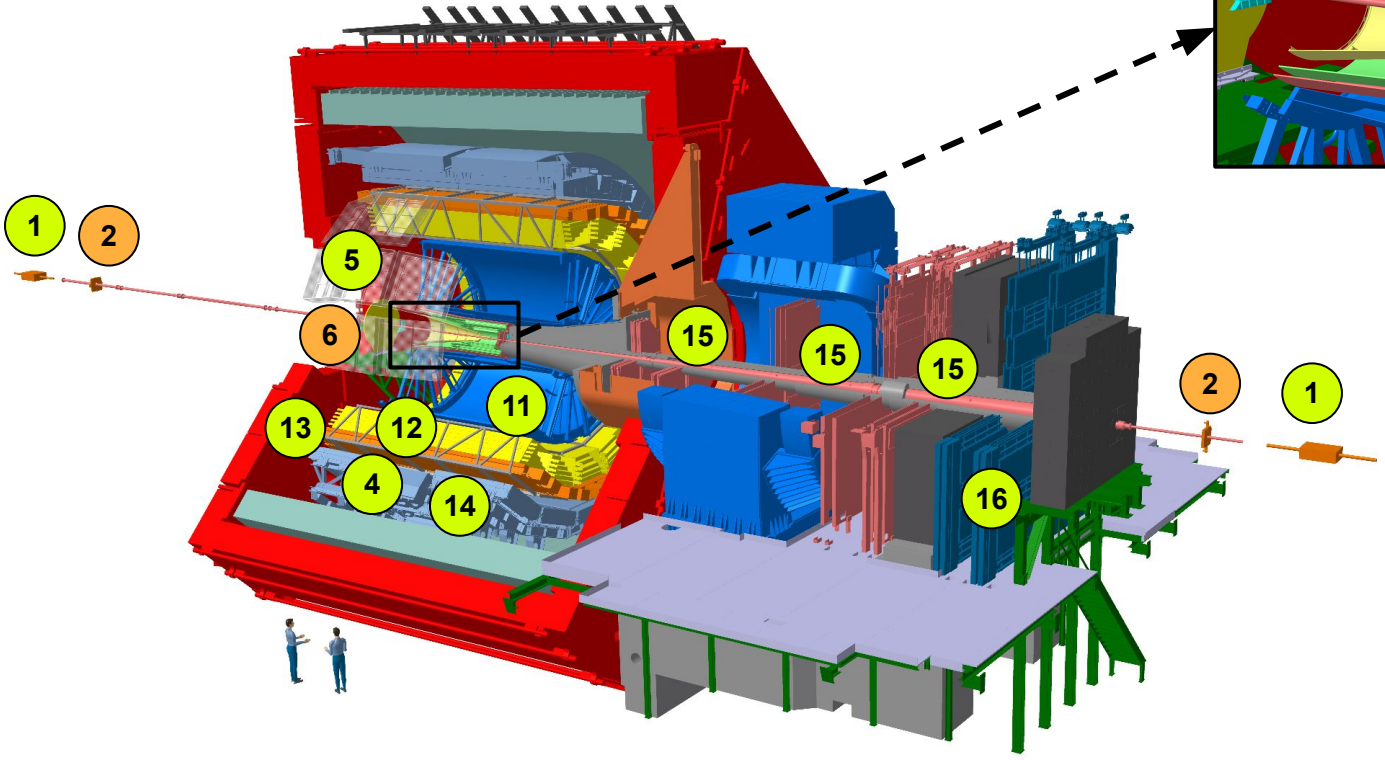


ALICE Run 3 setup

1. **ZDC** – Zero Degree Calorimeter
2. **FDD** – Forward Diffractive Detector
3. **EMCal** – Electromagnetic Calorimeter
4. **DCal** – Di-jet Calorimeter
5. **HMPID** – High Momentum Particle Identification Detector
6. **FV0** – FVzero
7. **FT0-A** – FTzero A-side
8. **FT0-C** – FTzero C-side
9. **MFT** – Muon Forward Tracker
10. **ITS** – Inner Tracking System
11. **TPC** – Time Projection Chamber
12. **TRD** – Transition Radiation Detector
13. **TOF** – Time-of-Flight Detector
14. **PHOS** – Photon Spectrometer
15. **MCH** – Muon Tracking Chambers
16. **MID** – Muon Identifier

ALICE Upgrade





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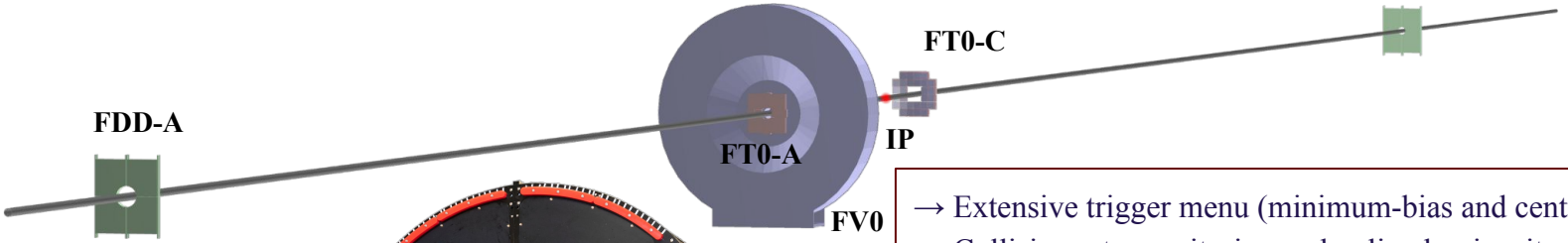
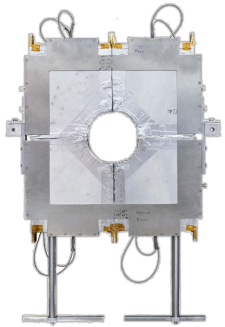
ALICE Fast Interaction Trigger (FIT)

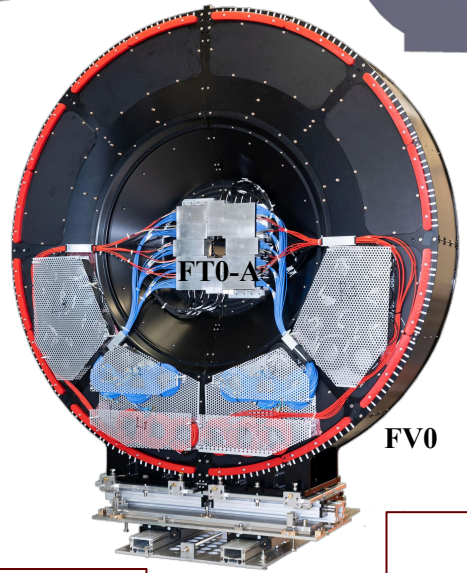
Detector	η_{min}	η_{max}
FDD-A	4.8	6.3
FT0-A	3.5	4.9
FV0	2.2	5.0
FT0-C	-3.3	-2.1
FDD-C	-7.0	-4.9



→ Extensive trigger menu (minimum-bias and centrality-based triggers)
→ Collision rate monitoring and online luminosity feedback to the LHC
→ LHC beam induced background monitoring

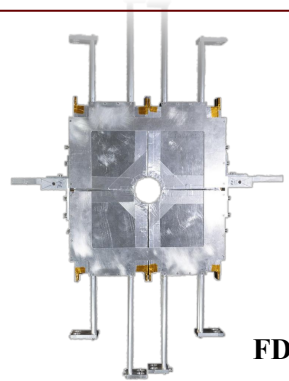


FDD-A



FV0

FT0-C



FDD-C

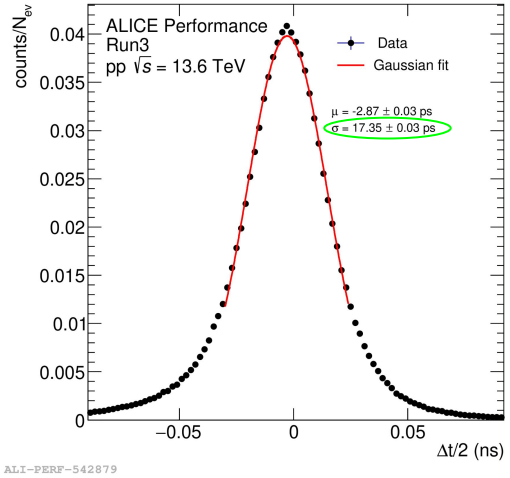
FV0
– **48 plastic scintillator** cells
– **Large acceptance** – 144 cm diameter
– **Event centrality determination**

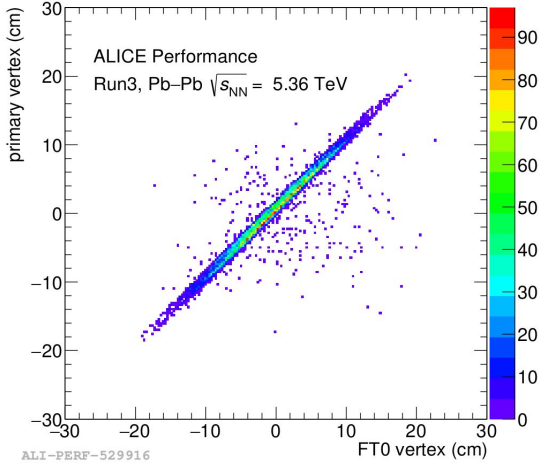
FT0
– **Cherenkov** arrays (total **208** pixels)
– Minimum-bias and centrality **trigger generation**
– **Collision time** and **vertex position** calculations.
– **Excellent time resolution**.

FDD
– **F**orward **D**iffractive **D**etector
– **Plastic scintillator** arrays (total **16** pixels)
– **Diffractive** and **ultra-peripheral** events tagging

FIT Performance

FT0 time resolution in pp 13.6 TeV

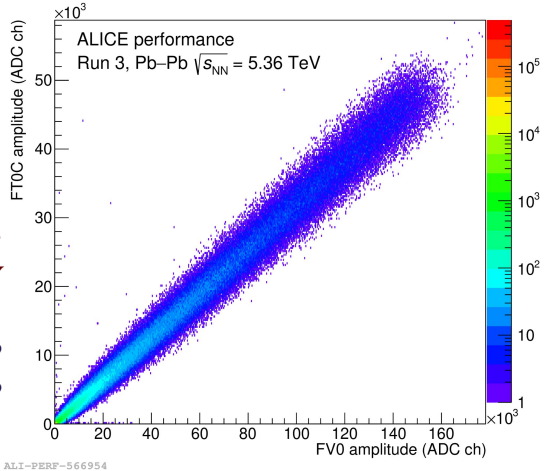


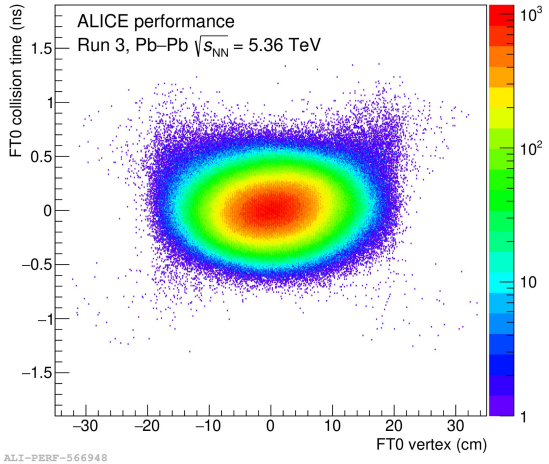


Primary vertex vs. FT0 vertex in Pb-Pb 5.36 TeV

FV0 charge vs FT0C charge in Pb-Pb collisions at 5.36 TeV

FV0 - 4 ADC channels/MIP
FT0 - 14 ADC channels/MIP

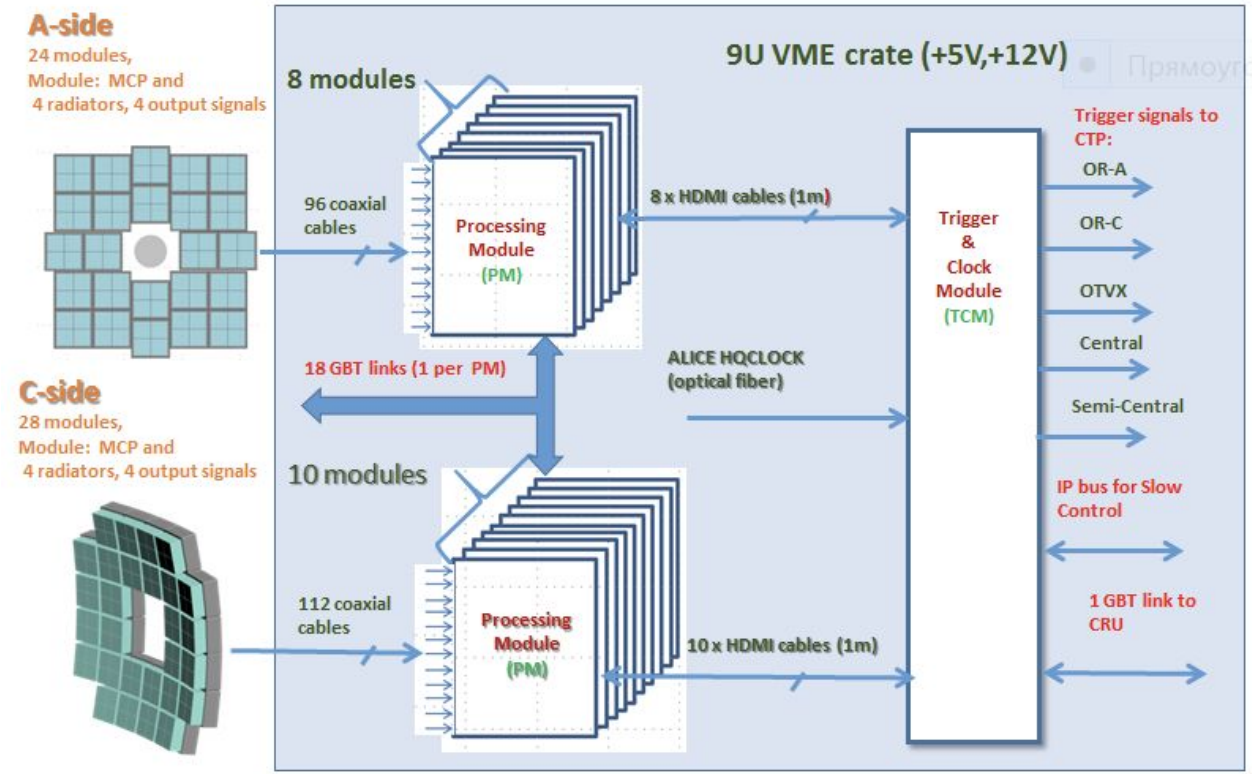




FT0 collision time Vs FT0 vertex in Pb-Pb 5.36 TeV

FIT Upgrade

Current FIT FEE (based on FT0)



Upgrade plans for Run 4

– Replacement of analog with digital electronics based on FPGA and RFSoC
– Increase ADC dynamic range for charge measurements.
– Online tagging of pileup events

Thank You !
Köszönöm !

References

[1] M. Slupecki, NIMA 1039 (2022) 167021
[2] W. H. Trzaska, NIMA 958 (2020) 162116
[3] M. Slupecki, PoS (ICHEP2020) 779
[4] S. Bysiak, PoS (LHCP2020) 251
[5] D. Finogeev et al, 2020 JINST 15 C09005

Acknowledgement

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YouTube **FIT Videos**

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