



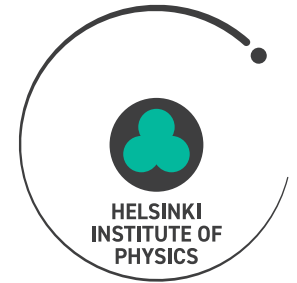
Centre of Excellence
in Quark Matter



ALICE



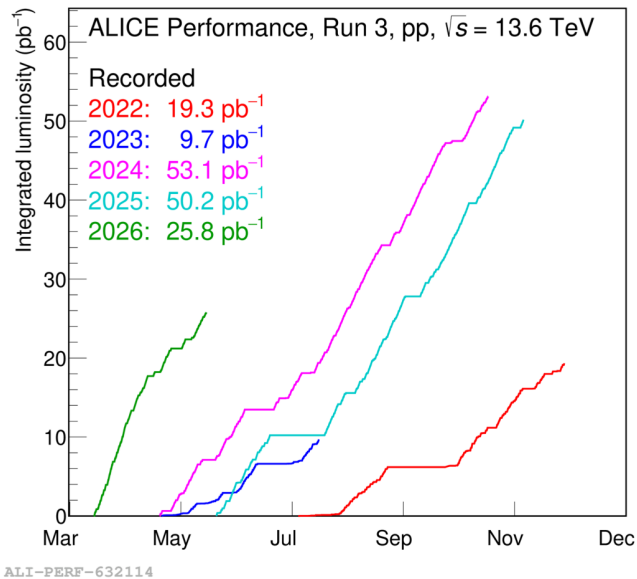
UNIVERSITY OF JYVÄSKYLÄ



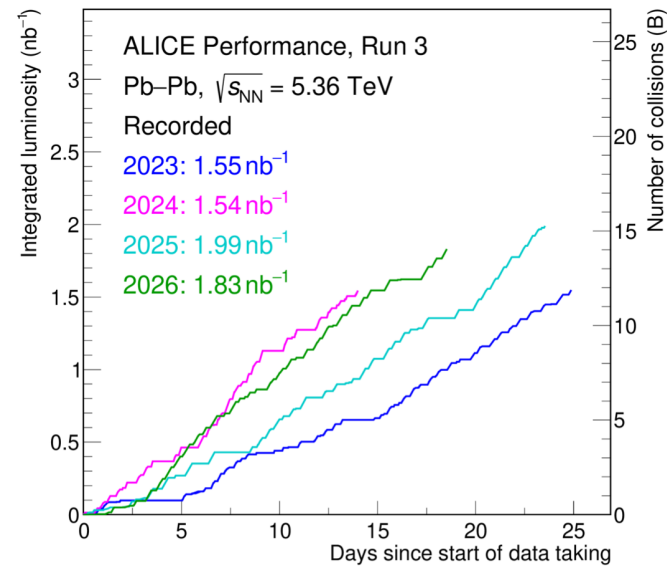
ALICE Project

Sami Räsänen
HIP SAB meeting
August 25th, 2026

Run 3 data taking completed – ALICE statistics



158 pb⁻¹ of pp collisions, software triggered, zero-bias pp data collected in 2026 of about 25 pb⁻¹, 1.5 trillion reconstructed collisions available as thinned, first-pass A02Ds



Collected 1.8 nb⁻¹ of Pb-Pb at up to 23 kHz, total is 6.9 nb⁻¹, reaching the Run 3 goal, 53 billion zero-bias Pb-Pb collisions recorded

pp: continuous readout, ~110 offline triggers, large MB sample + selected ~0.1% of data

Heavy-ion: continuous readout, keep every event

- pp target (min 100 pb⁻¹ @ Run3) exceeded, Pb-Pb (slightly) behind total 13 nb⁻¹ Run3+4 (since no p-Pb yet)

Run 3: our contributions to ALICE common tasks

	Central shifts		Service work	
Year	Quota (shifts)	Done (%)	Quota (FTE)	Done (%)
2022	44	106	1	107
2023	51	103	1.5	94
2024	63	109	1.5	135
2025	56	99	1.5	140
2026	26	98	Ongoing	

FoCal tasks
counted 2024-

Weighted averages 2022-2026:

- Central shifts **104%** (largest contributions in ALICE ~150%)
- Service work **120%** (largest contributions ~200%)

We did our share without significant “overbooking”

Finnish Team in ALICE:

3 Seniors:

- Wladek Trzaska (emeritus), DongJo Kim, Sami Räsänen (team leader)

2 postdocs (+1 starting October):

- Yury Melikyan (technical coordinator of ALICE timing detector FT0, expert in photosensors)
- Neelkamal Mallick (flow and two-particle correlations, Bayesian analysis)
- Leonardo Barreto (starting 1st October, target: heavy-flavour jets)

4 PhD students – 2 new:

- Andreas Molander (FIT detector performance and software)
- Hira Sharif ("spin-off", using ALICE detector elements in hadron therapy applications)
- Finn Smits (front end electronics for forward calorimeter (FoCal), jets) – started September 2025
- Uzair Aslam (flow) – started January 2026

Project engineer:

- Joni Tantt (packing technologies for ALICE3 Outer Tracker, 50% – 50% with VTT Ltd)

Master Student:

- Nana Kelokaski (FoCal, forward π^0 - π^0 correlations)

Two PhD defences since previous SAB:



Maxim Virta

24.10.2025

“Investigating the QCD matter properties with measurements from various collision systems”

→ Continue ALICE, NBI, Denmark



Laura Huhta

5.12.2025

“Probing QCD via dijet invariant mass in pp and p–Pb collisions and performance of forward jets with ALICE FoCal”

→ Finnish National Bureau of Investigation (KRP)

Data analysis:

ALICE papers:

- ALICE [arXiv:2604.07961 \[nucl-ex\]](#), response given to EPJC referees
“Dijet invariant mass of charged-particle jets in pp and p-Pb collisions at $\sqrt{s_{NN}}=5.02$ TeV”

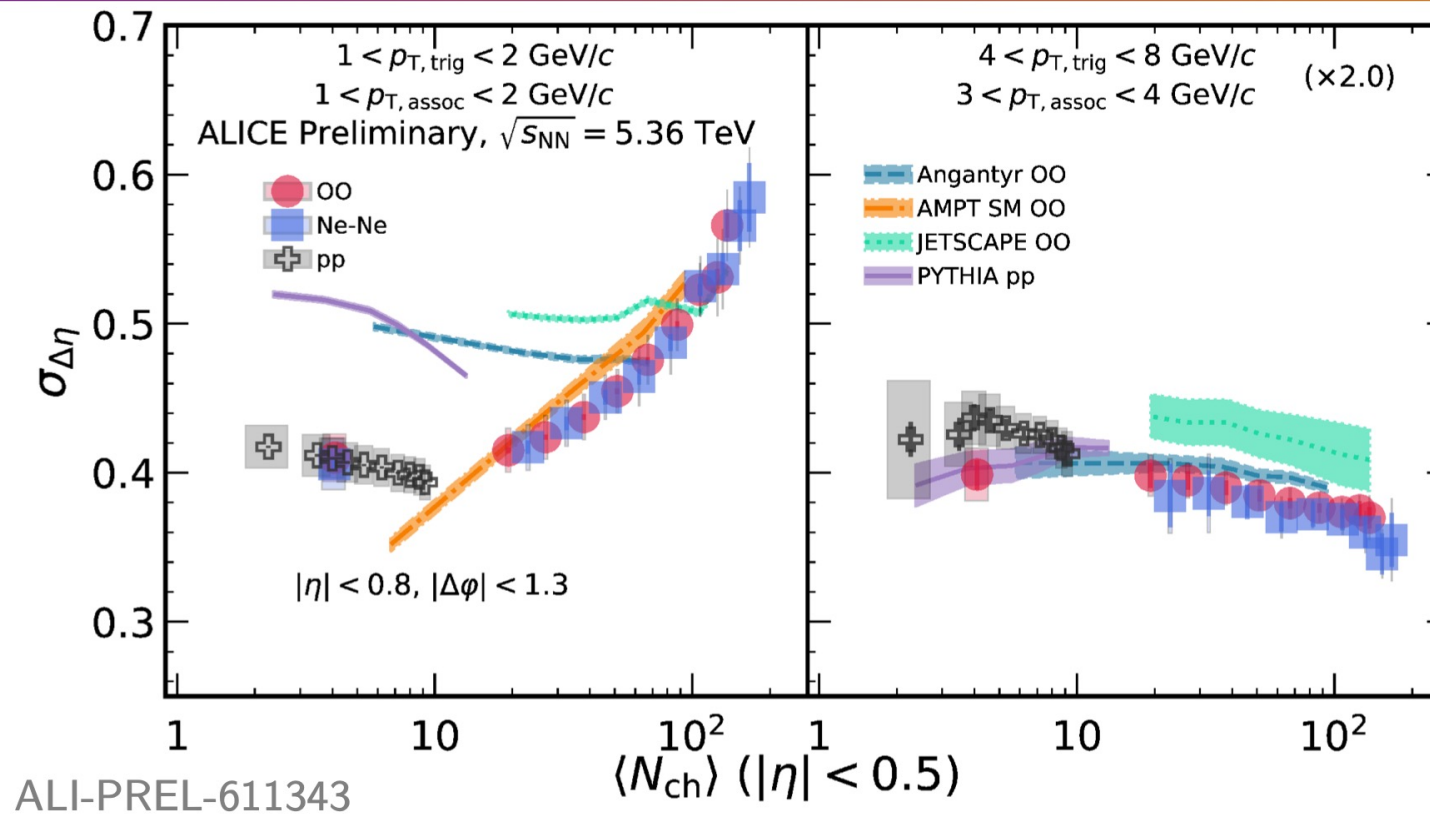
Phenomenology papers:

- A.M.K. Radhakrishnan, S. Prasad, N. Mallick, and R. Sahoo, Phys.Rev.D 113 (2026) 054032
“Topological production of charmonia with event-shape engineering in pp collisions at $\sqrt{s}=13$ TeV using pythia8”
- A.M.K. Radhakrishnan, S. Prasad, N. Mallick, R. Sahoo, and G. G. Barnaföldi, Phys.Lett.B 870 (2025) 139941
“Probing the sensitivity of anisotropic flow coefficients to the initial nuclear structure in pO and OO collisions at the LHC”
- H. Hassan, N. Mallick, D.J. Kim, Phys.Rev.D 114 (2026) 034004
“Machine Learning-Based b-Jet Tagging in pp Collisions at $\sqrt{s}=13$ TeV”
- A. M. K. Radhakrishnan, S. Prasad, N. Mallick, R. Sahoo, and G. G. Barnaföldi, [arXiv:2607.26758](#)
“Constraining α -cluster compactness in ^{16}O and ^{20}Ne at TeV energies using azimuthal anisotropy”

Presentations – main result in the next slide:

- Joonsuk Bae and **Neelkamal Mallick**, [talk](#) at Hard Probes 2026
“Jet-like dihadron correlations in pO, OO, and Ne–Ne collisions with ALICE”

Model comparison



- **PYTHIA Angantyr:** no system size dependence, high- p_T approaches data [ALICE, JHEP 03 \(2025\) 194](#)
- **AMPT:** reasonable agreement at low- p_T , over-predicts at high- p_T (not shown)

Long Shutdown LS3 activities and upgrades:

- **Fast Interaction Trigger (FIT) – refurbishment during LS3**
- **Forward calorimeter (FoCal) – installation during LS3**
- **ALICE3 Outer Tracker (OT) – TDR expected December 2026**

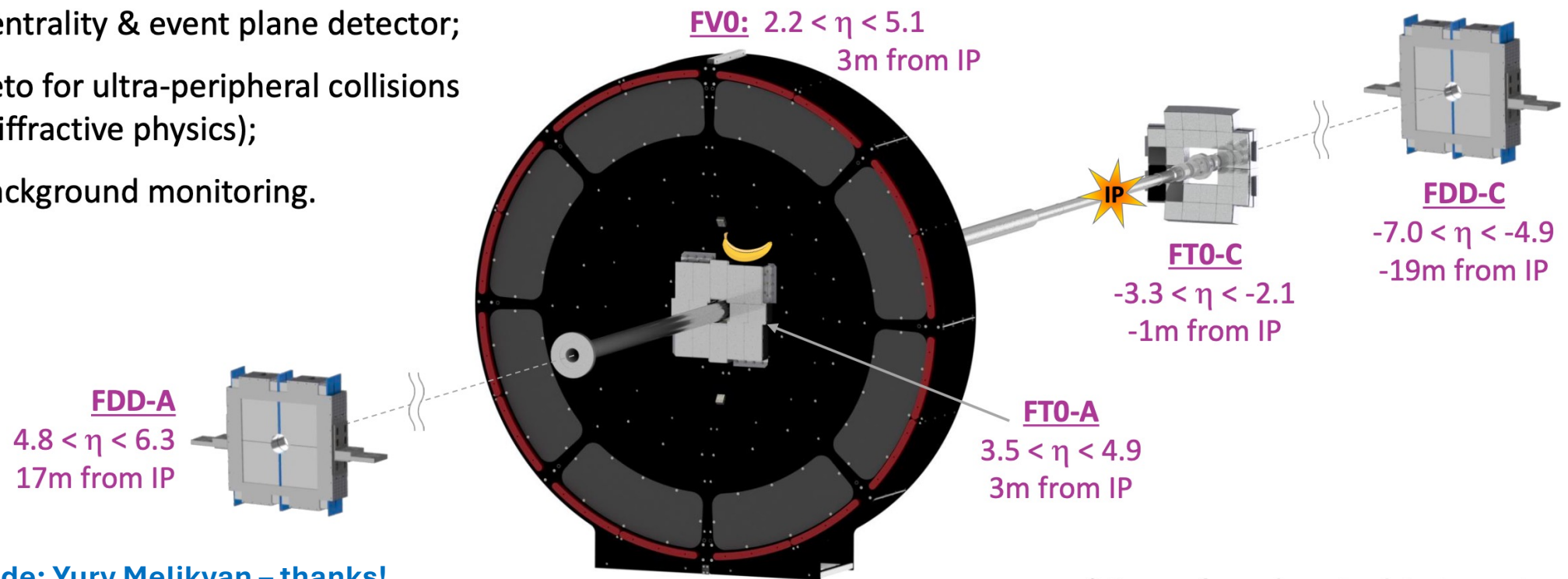
FIT layout & purpose

10

- On-line trigger;
- Precise time-zero detector;
- ALICE luminometer & feedback to LHC;
- Centrality & event plane detector;
- Veto for ultra-peripheral collisions (diffractive physics);
- Background monitoring.

Three different sub-detectors – FT0, FV0 & FDD

arranged in five separate arrays on both sides of the Interaction Point (IP)



Slide: Yury Melikyan – thanks!

* Banana for scale, not a detector part

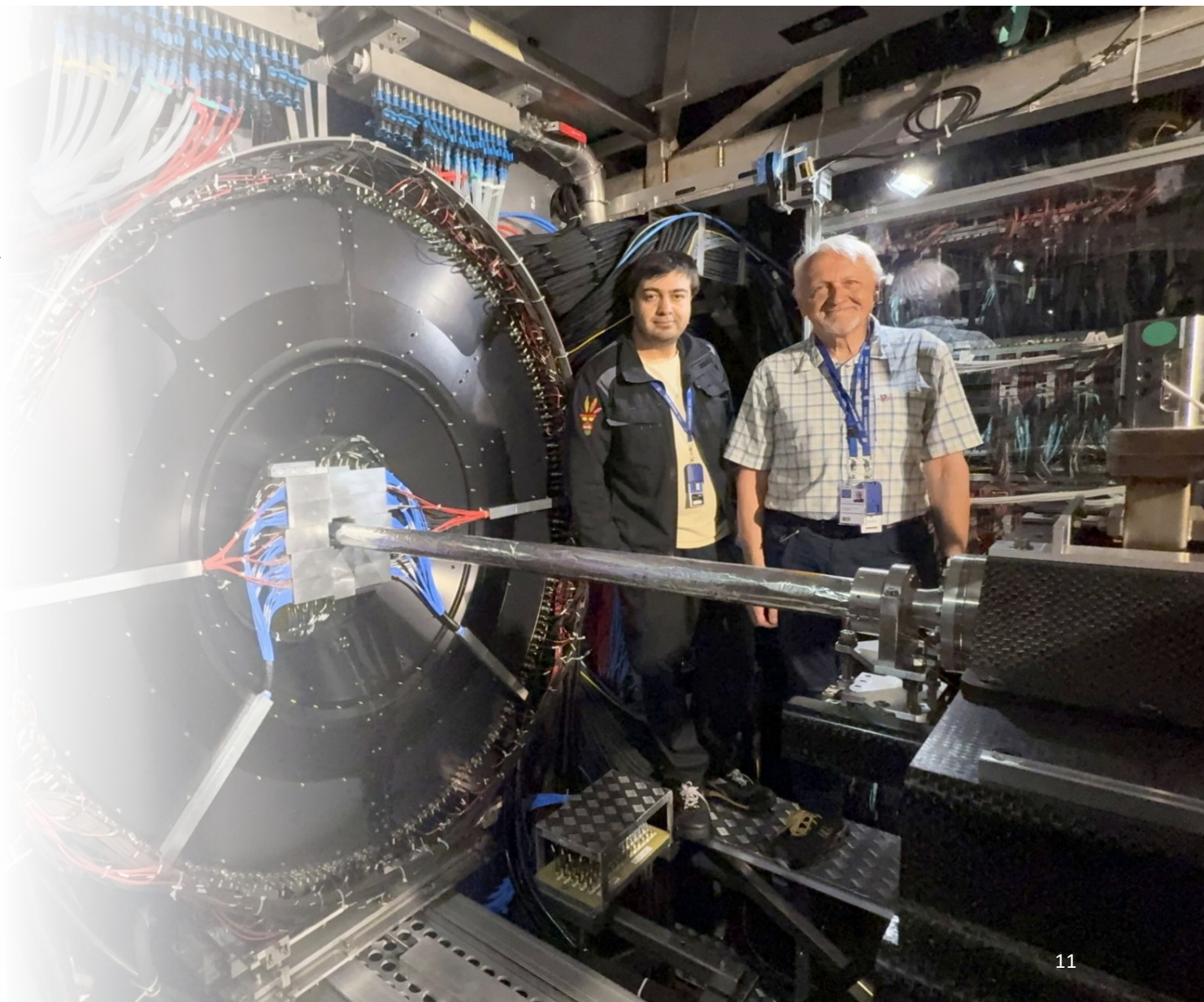
Our activities at FIT:

- Disassemble timing detector (FT0) to last screw
- Qualify new sensors
- Reassemble with new components and updated electronics

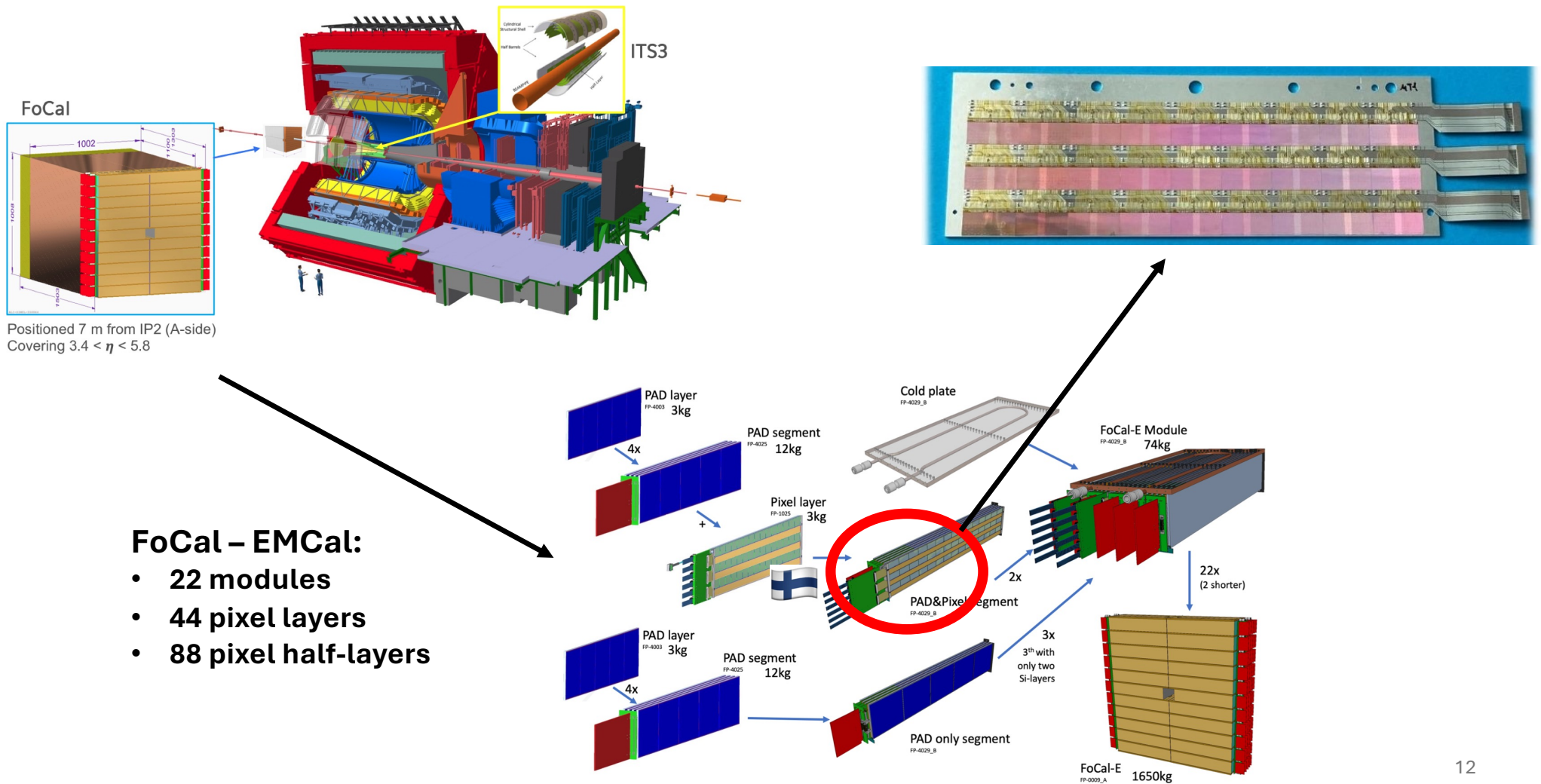
Yury Melikyan (left) FT0 technical coordinator, leads the FT0 LS3 activities at Point 2

Yury: [plenary talk](#) at RICH-2025

“Long-term performance of non-ALD MCP-PMTs in the high-radiation environment of ALICE”



Forward calorimeter FoCal, LHC Run 4, 2030 - 2033



FoCal work at Helsinki:

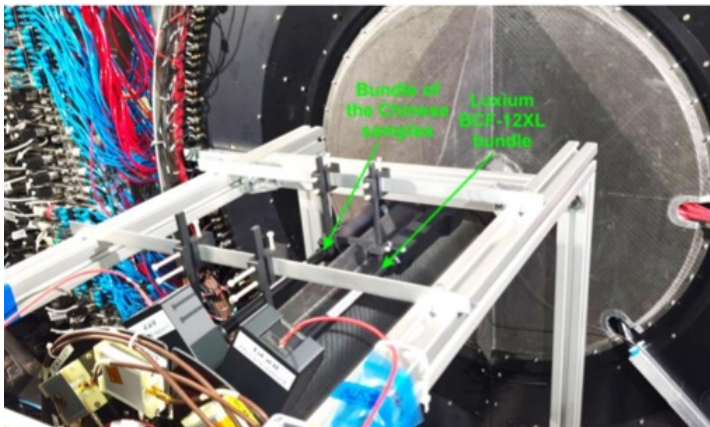
- Materials from LTU Kharkiv arrived early August this year, **over a year late**
- Currently practice gluing in Helsinki, progresses well
- Wuhan people will visit in late September – early October
 - polish mass production procedures, Ukraine experts participate online
- Pixel layers should be produced by end of 2027 and shipped to Krakow
 - considering holidays, effectively ~55 weeks to produce 44 layers
 - **very tight schedule**, share lab with CMS project
 - I have warned FoCal collaboration that can be challenging to achieve production and testing, reliable estimate with experience
- CMS-ALICE FIRI funding ends in December 2026
 - search salary for technician (Antti) and postdoc (Hussam) for 2027, needed in both CMS and ALICE productions

FoCal work at CERN:

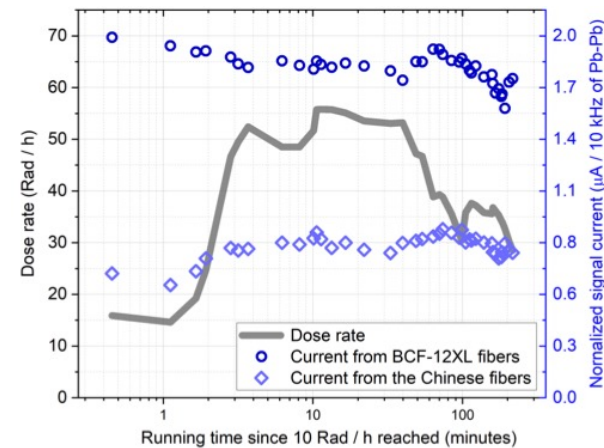
Radiation hardness of scintillating fibers for FoCal-H confirmed

- Literature: fibers degrade under ~ 400 Rad/h dose rate
- **How about FoCal conditions, where 55 Rad/h at Pb-Pb (and bit more in p-Pb)?**
- Test during the 2025 Pb-Pb run in ALICE cavern
- Using FIT infrastructures for the readout

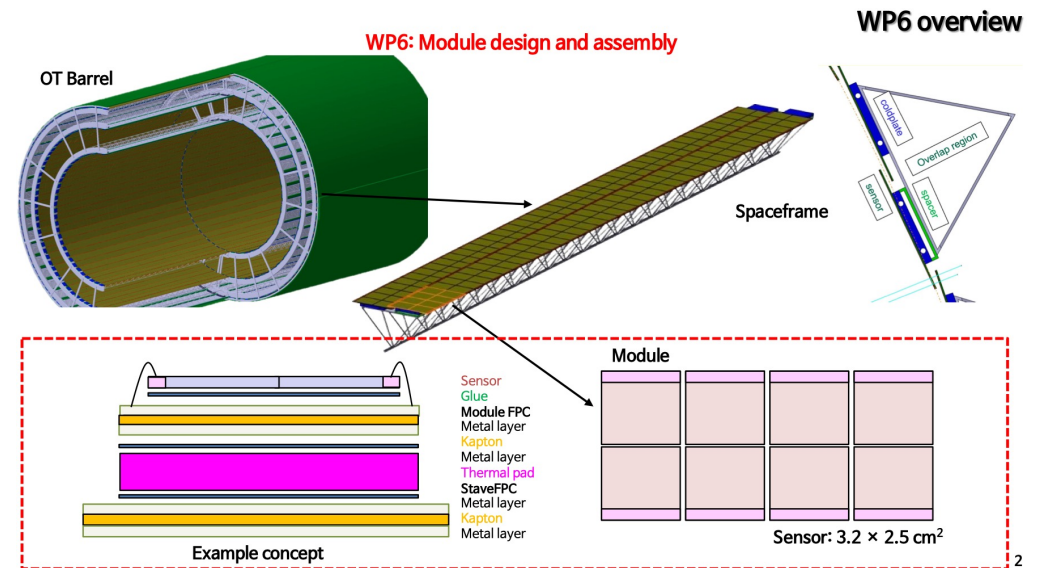
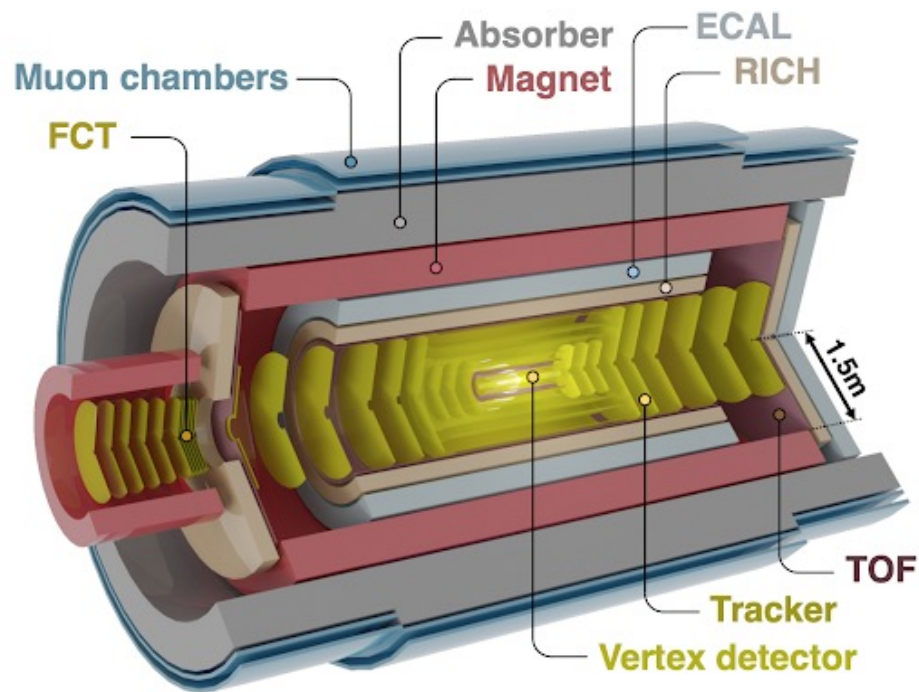
Test stations ↓



Fiber transparency stable, light-yield does not degrade!

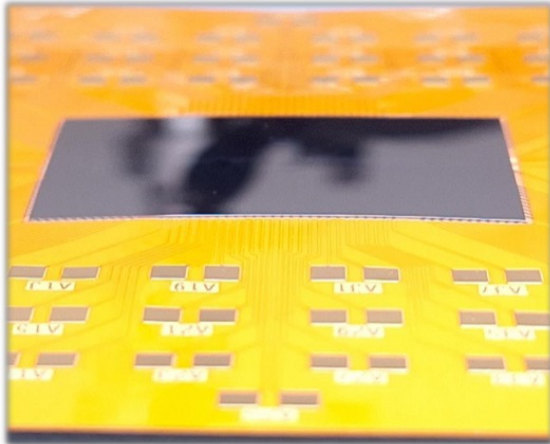


ALICE3 Outer Tracker (OT) – LHC Run 5

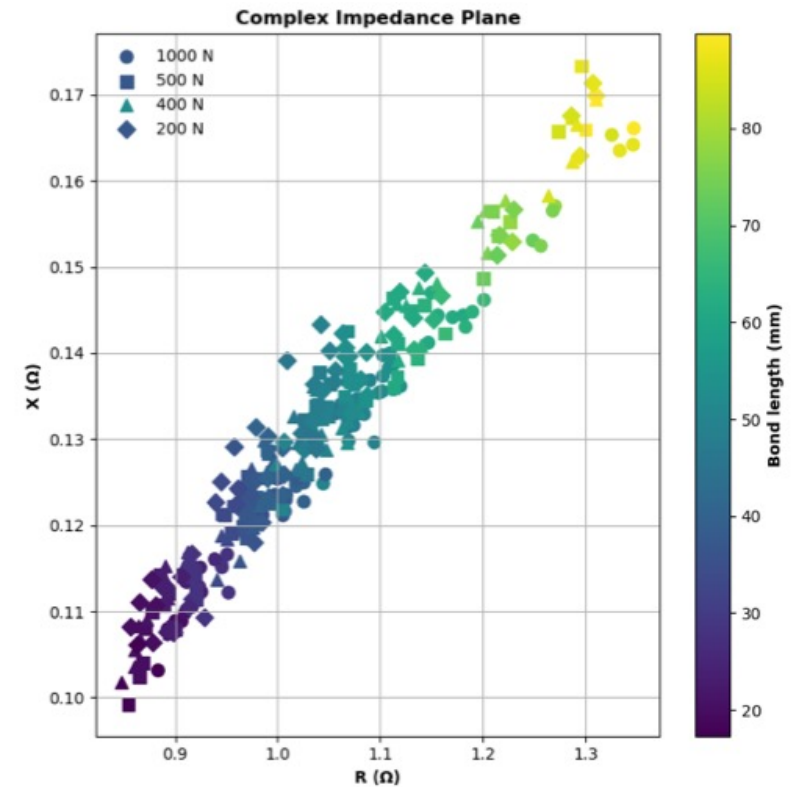


Finland and Korea: industrialization of OT module production
 - we study flip-chip technology, Koreans wire bonding

Studies on flip-chip bonding at VTT Ltd:



- Vary bonding force and temperature
- Measure complex impedance (VTT + JYU)
- Accelerated aging with thermal cycles (JYU)
- Presently Korean chips, versions from PacTech coming
- Conference paper accepted to the [11th IEEE ESTC](#), 2026



→ Contribute to OT Technical Design Report (TDR), release December 2026 **(+6 months added)**

Note related to 2025 update: today no active ALTAI chips available for flip-chip

Outreach visibility:

Yle Tiedetrippi –[podcast](#) 29.6.2026
Kausi 13, Jakso 4: “Nykyajan alkemia”
(Modern time alchemy)

- ALICE made gold from lead
- Thanks to Kenneth Österberg!

[Helsingin Sanomat](#) 8.8.2026

“Universumin alkupuuroa syntyi uusista aineksista, suomalaiset mukana tekemässä”

(Scientists Recreate the Universe's Primordial Soup with New Ingredients, Finns Among the Researchers)

- OO collisions at the LHC
- Thanks to Risto Paatelainen!



Hiukkasfysiikka | Universumin alkupuuroa syntyi uusista aineksista, suomalaiset mukana tekemässä

Kaiken alussa aineen perushiukkaset liikkuvat hetken irrallaan, mutta nyt ne ovat tiukasti kiinni toisissaan.

Summary:

- LS3 started: FIT refurbishment and FoCal building
- Active both in ALICE analysis and phenomenology studies
- ALICE3 OT TDR approaching