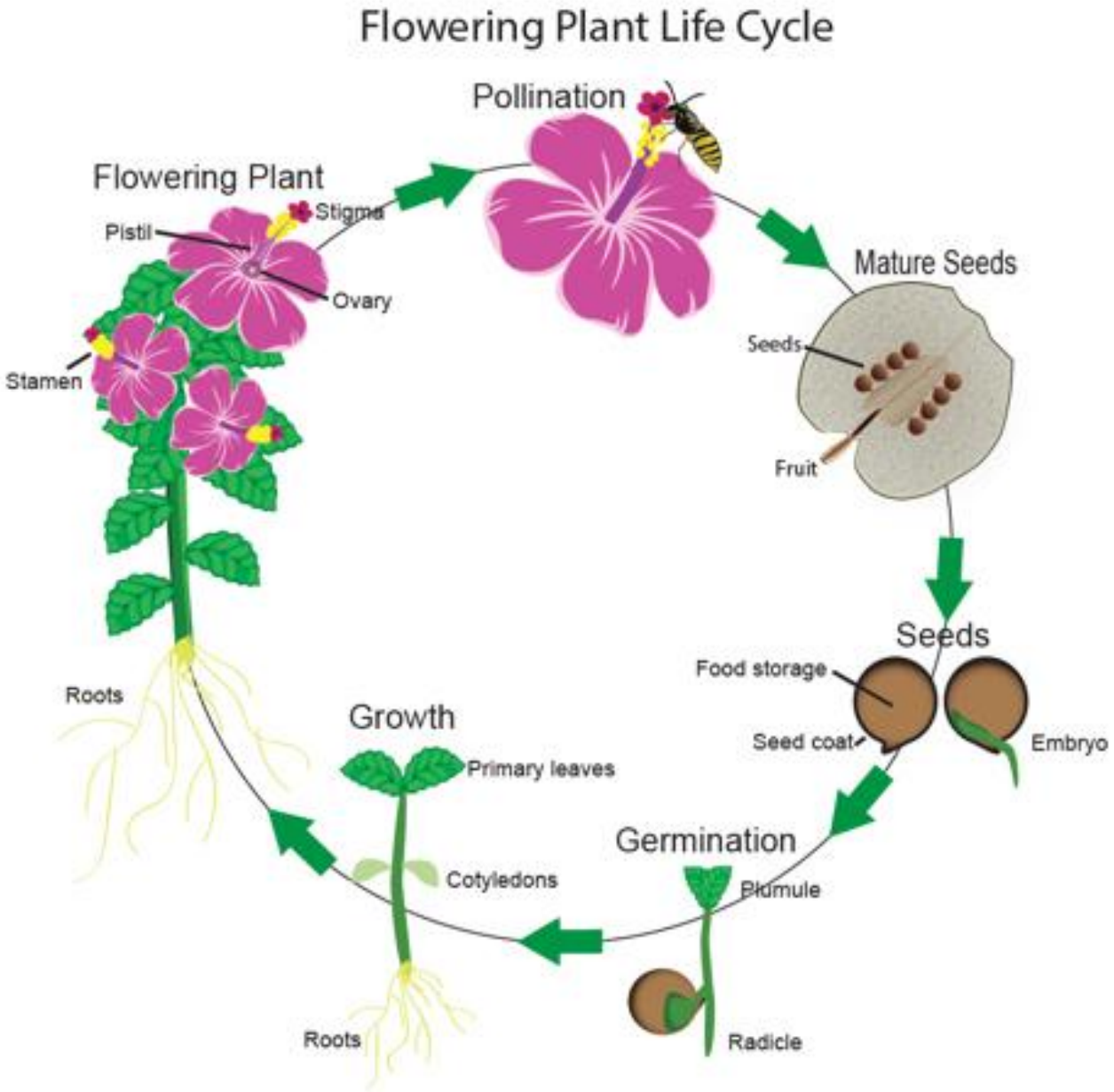

The life cycle of the R2E Timepix3 detector

Daniel Prelipcean

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CERN SY-STI-Beam Machine Interactions
Technische Universität München (TUM)

On behalf of Radiation to Electronics (R2E)
r2e.web.cern.ch

at the EURIZON detector school
indico.cern.ch/event/1224299

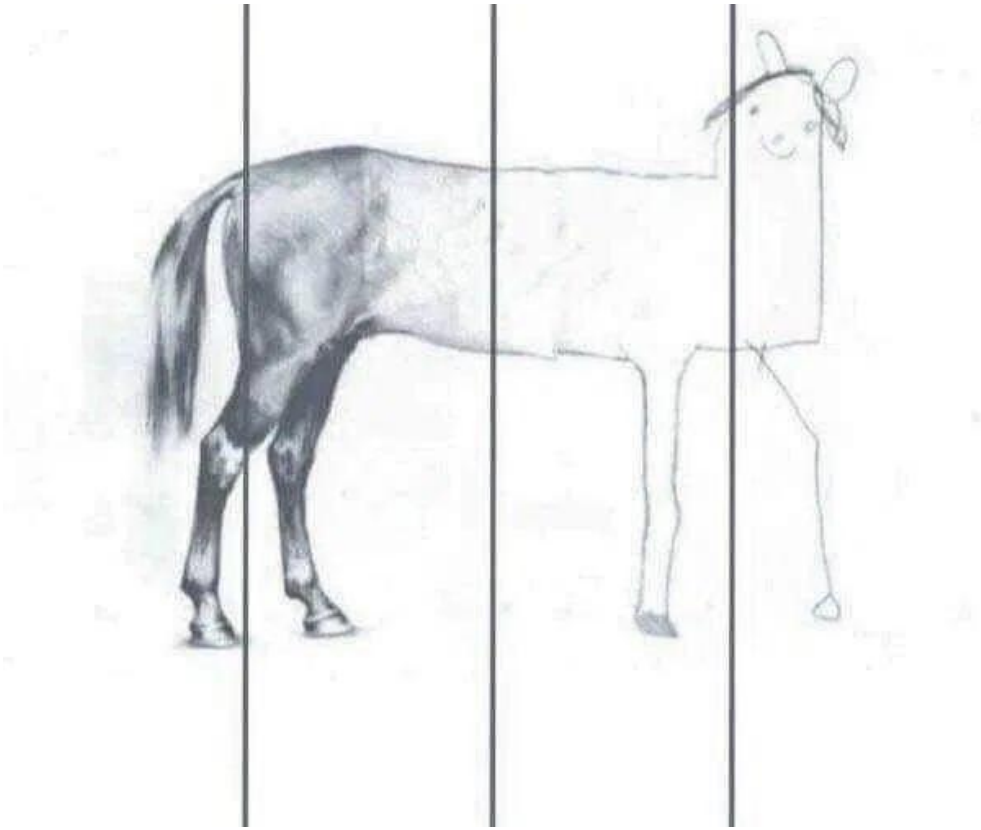
2023.07.27

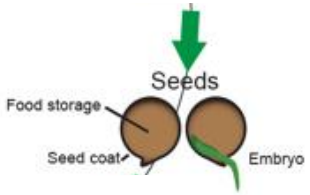
Thank you!

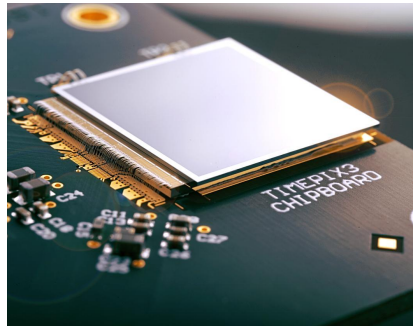
@John Doe for lorem ipsum

Structure of a presentation

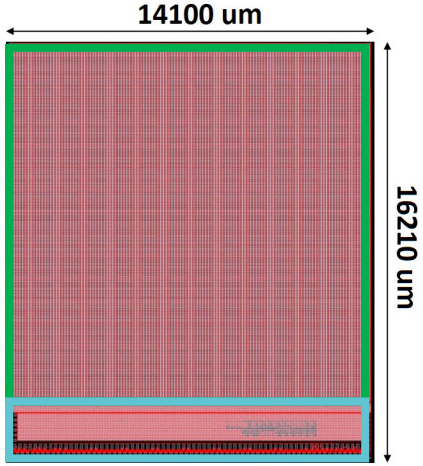
Introduction Methods Results Acknowledgements







256x256 pixel matrix



Active periphery

@Medipix collaboration [1] for the Timepix detector family [2, 3]

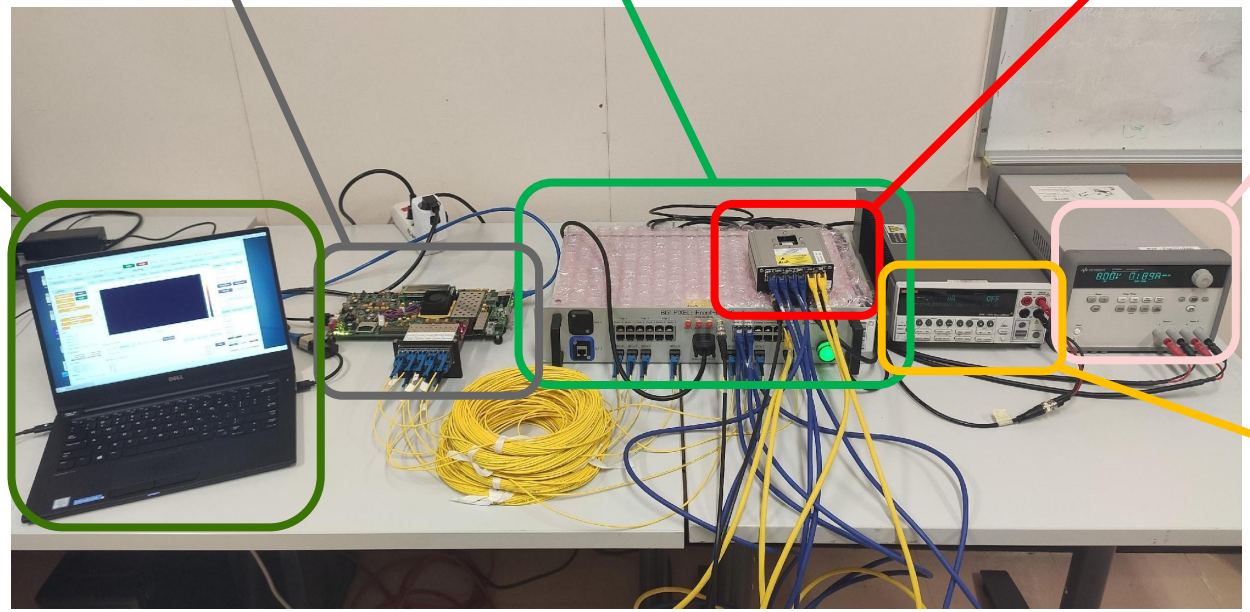
@Beam Instrumentation for the radiation hard Timepix setup [4]

Back-end electronics

Front-end electronics

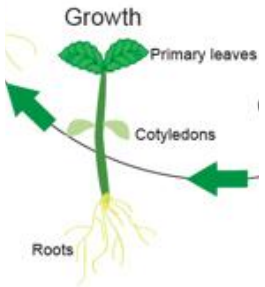
Timepix3 module

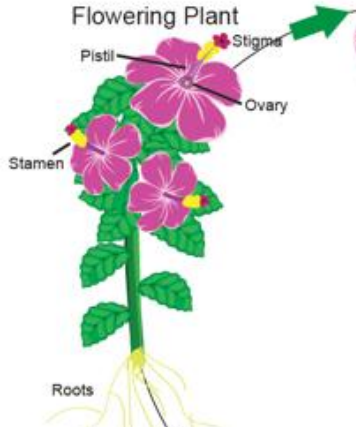
Laptop with control software running



Timepix3 + frontend crate power supply (2 x 8V)

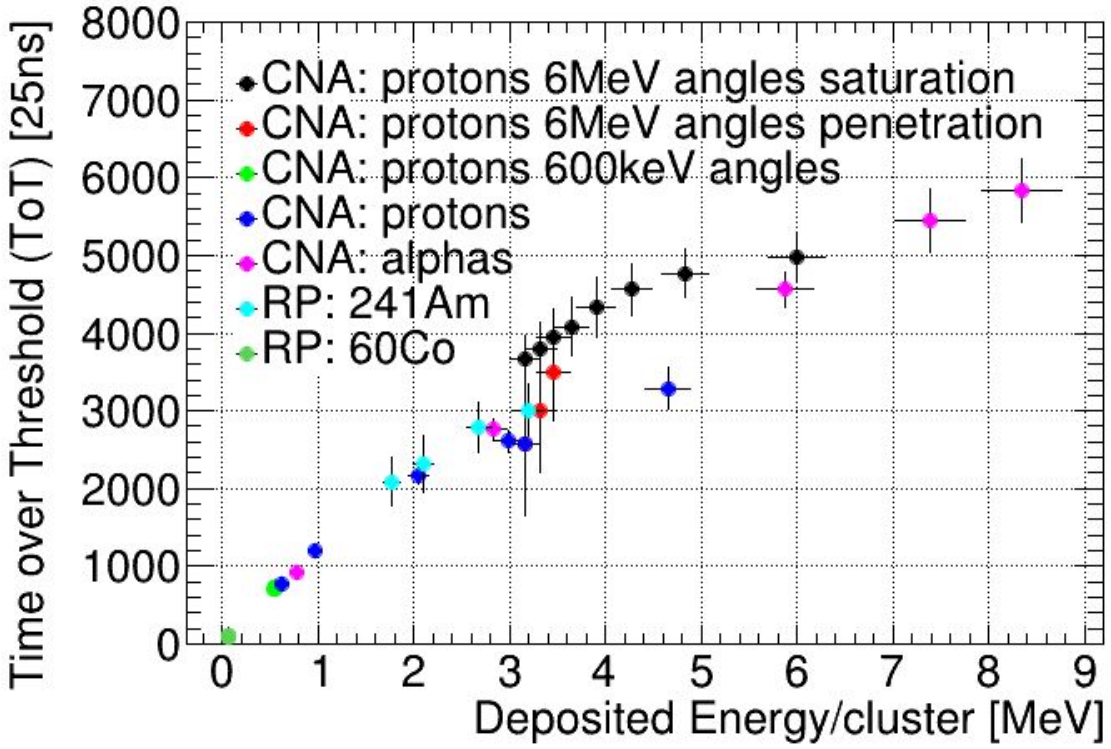
Timepix3 detector bias power supply (+50V)





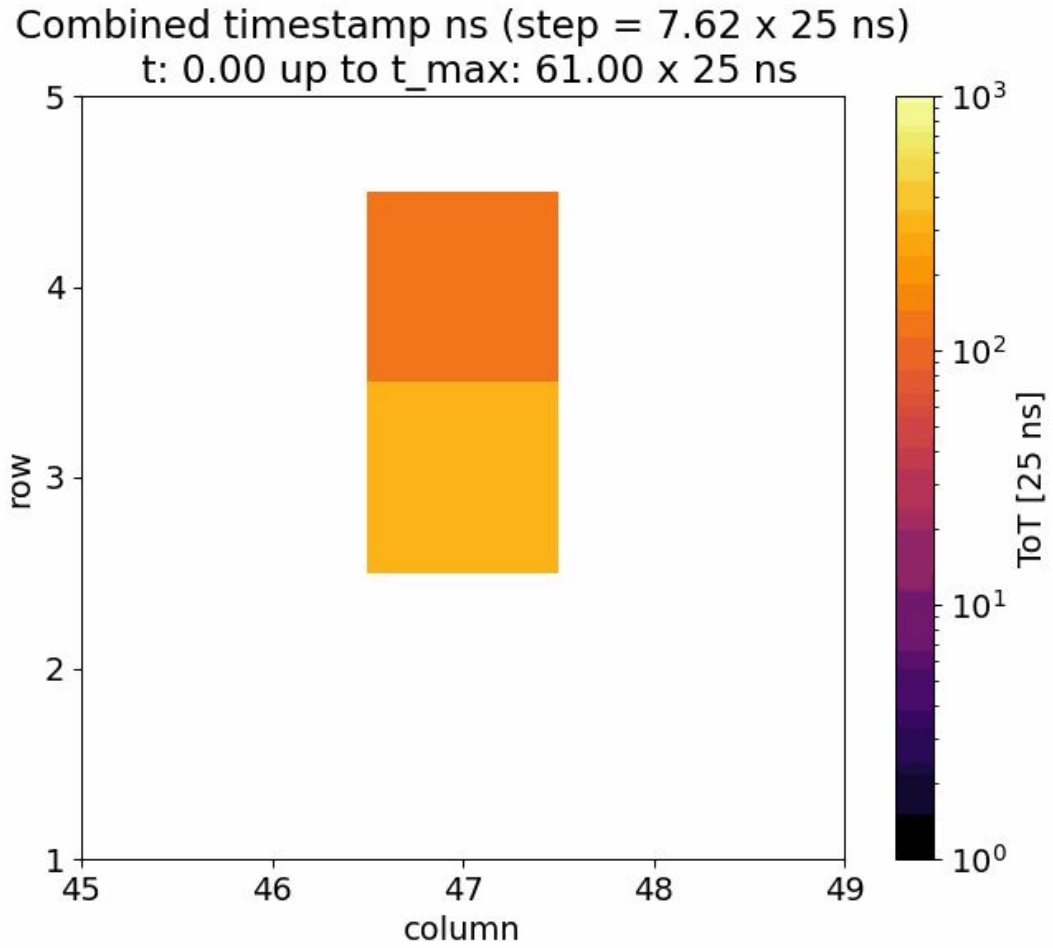
@RADNEXT: radnext.web.cern.ch/ for beam time

Date	Test Campaign	Particles
2021-02	Institut Laue–Langevin	neutrons (cold, 6.67 meV)
2021-07	CALLAB - radioactive sources (RP)	alphas @ 4.7 MeV gammas @1.17 and 1.13 MeV
2022-02	CALLAB - AmBe	neutrons (up to 11 MeV)
2022-05	Centro Nacional de Aceleradores (CNA)	protons from 0.6 to 6 MeV alphas from 1 to 8.4 MeV
2022-11	CERN - North Area	Pb ions (350 GeV)

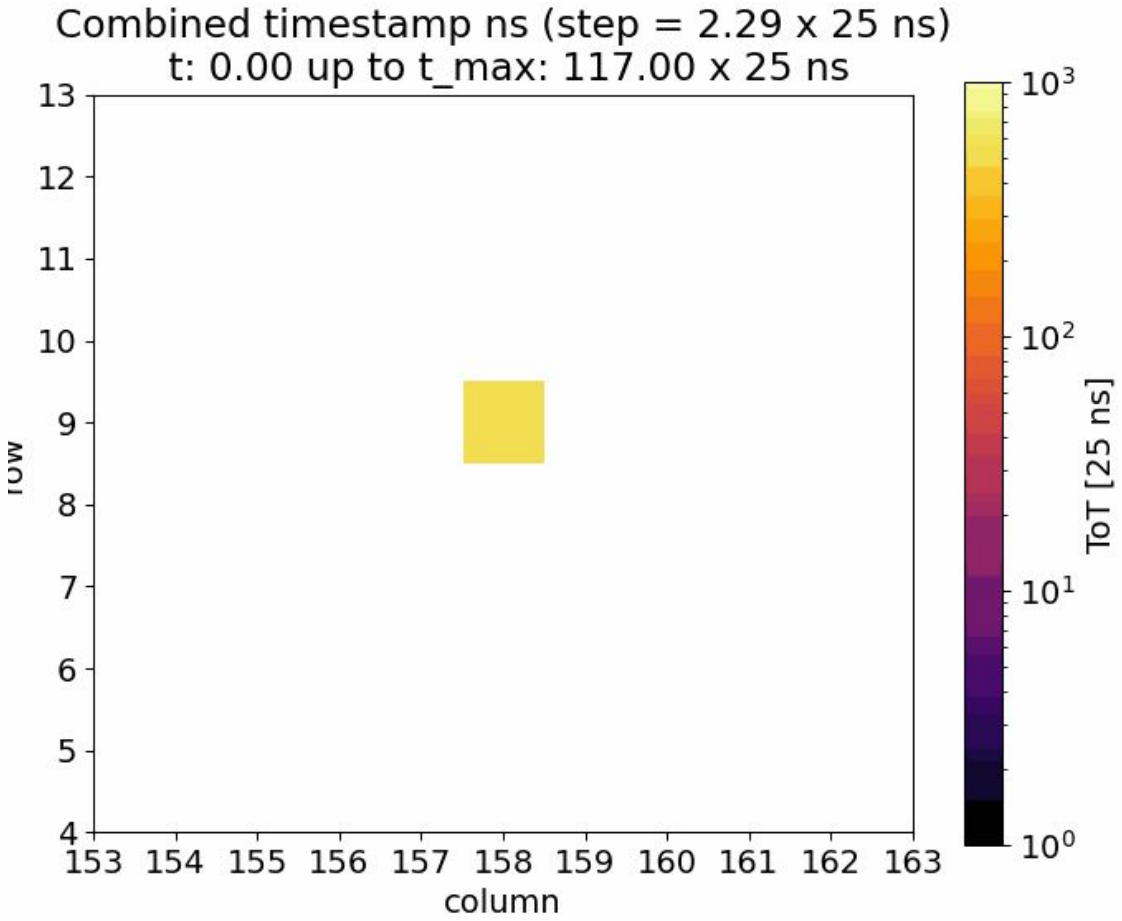


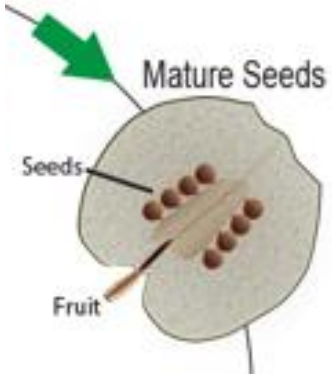
@myself for following programming and data analysis workshops and courses

0.6 MeV proton



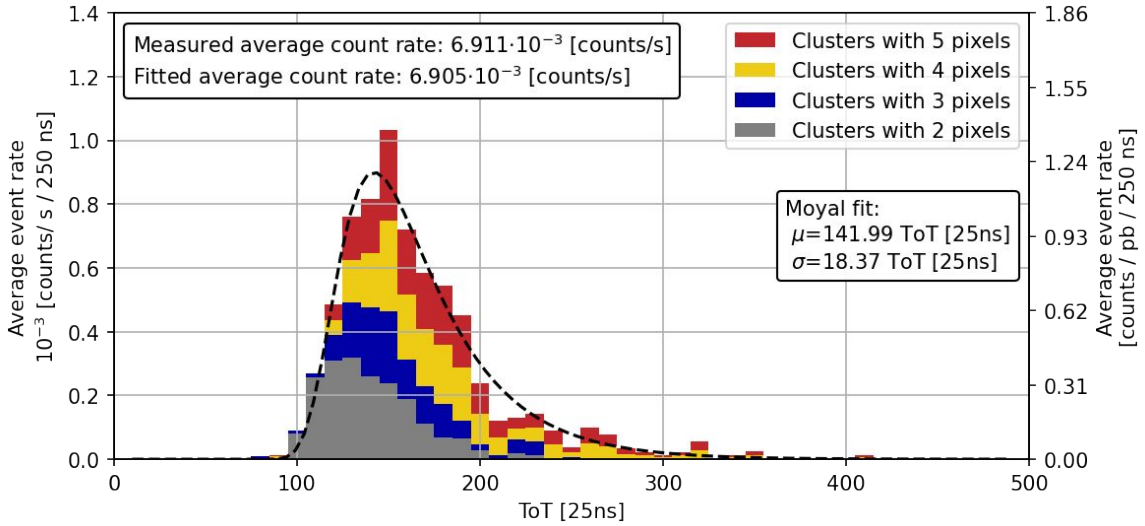
8.405 MeV alpha



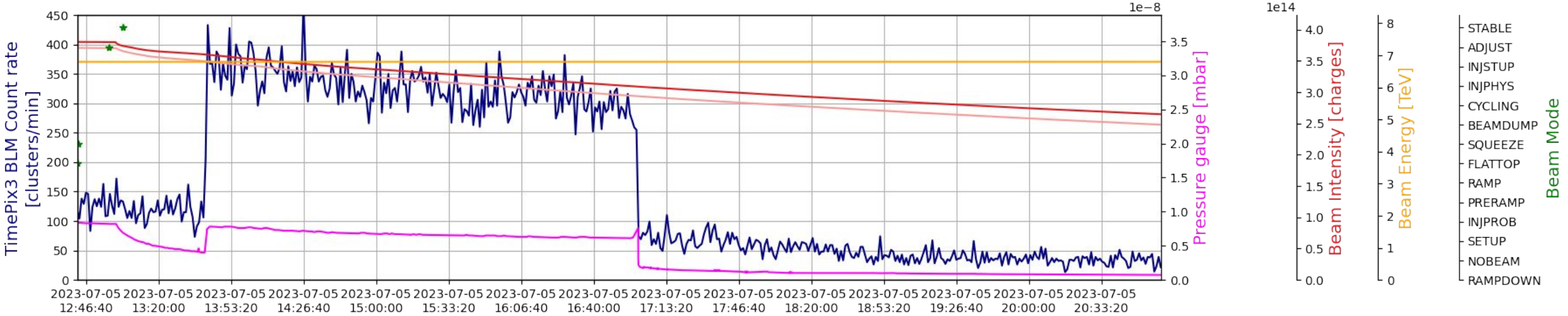


@CERN Accelerator Complex users for radiation monitoring requests

Measured muon rate for the proposed CODEXb experiment in transverse momentum region at LHCb [5]

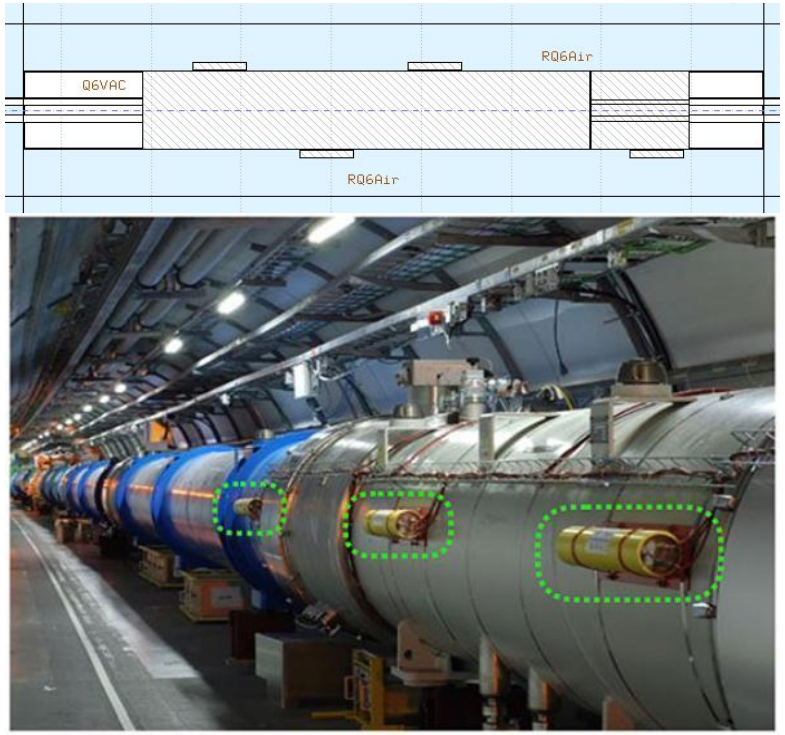


Monitoring the Beam Gas Curtain (BGC) instrument at Interaction Region 4 (IR4) of the LHC [6]



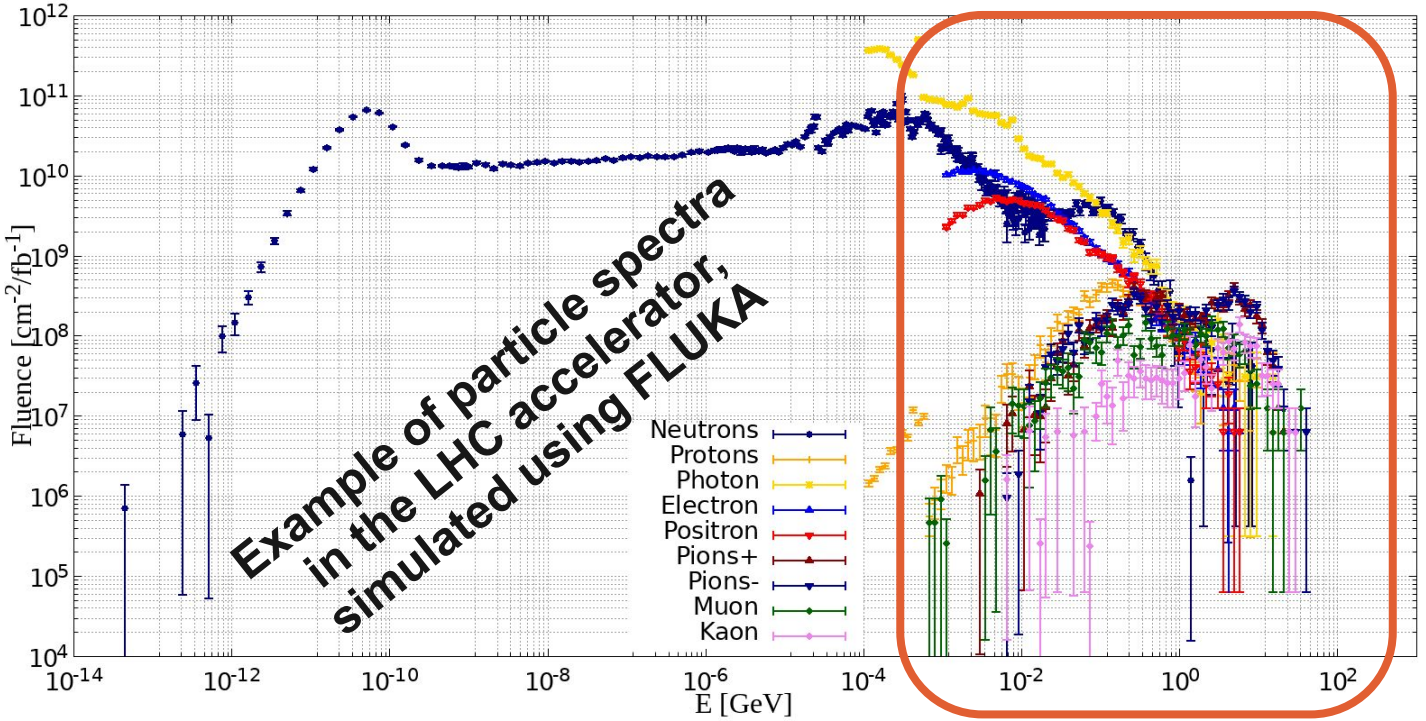
What added value can the Timepix bring?

Beam Loss Monitor (BLM) [7]-
Total Ionizing Dose (TID)
Radiation detectors (mostly Ionization Chambers), that detect particle showers caused by the beam losses.



Timepix R2E BLM
Dose rate
Particle count rate
Energy discrimination
Directionality
Particle identification (?)

Focus on high energy particles responsible for radiation damage!



dprelipcean.github.io/
personal-website/

References

1. Medipix Collaboration. URL : https://medipix.web.cern.ch/home (visited on 02/09/2023).
2. X. Llopart et al. “Timepix, a 65k programmable pixel readout chip for arrival time, energy and/or photon counting measurements”. In: Nucl. Instrum. Meth. A 581 (2007). Ed. by Josef Hrubec et al. [Erratum: Nucl.Instrum.Meth.A 585, 106–108 (2008)], pp. 485–494. DOI : 10.1016/j.nima. 2007.08.079.
3. T. Poikela et al. “Timepix3: a 65K channel hybrid pixel readout chip with simultaneous ToA/ToT and sparse readout”. In: Journal of Instrumentation 9.05 (May 2014), pp. C05013–C05013. DOI : 10.1088/1748-0221/9/05/c05013. URL : https://doi.org/10.1088/1748-0221/9/05/ c05013.
4. J. Storey, Introduction to the LHC Beam Gas Ionisation (BGI) profile monitors
5. D. Prelipcean, Radiation monitoring in the D1 area, CODEXb week, https://indico.cern.ch/event/1239064/contributions/5439527/
6. D. Prelipcean, Prediction of Ionizing Radiation, BGC collaboration meeting, https://indico.cern.ch/event/1281084
7. K. Wittenburg, Beam loss monitors, https://cds.cern.ch/record/1213279/files/p249.pdf

Thank you for your attention!

Questions?

daniel.prelipcean@cern.ch

CERN SY STI R2E MCWG