

Presentation

Improvements of test beam infrastructure for high precision tracking

Dreyling-Eschweiler, Jan (DESY)

14 January 2019



The AIDA-2020 Advanced European Infrastructures for Detectors at Accelerators project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement no. 654168.

This work is part of AIDA-2020 Work Package 15: **Upgrade of beam and irradiation test infrastructure.**

The electronic version of this AIDA-2020 Publication is available via the AIDA-2020 web site <http://aida2020.web.cern.ch> or on the CERN Document Server at the following URL: <http://cds.cern.ch/search?p=AIDA-2020-SLIDE-2019-026>



WP15.2 – Improvements of test beam infrastructure for high precision tracking

Jan Dreyling-Eschweiler (DESY) for the telescope and test beam team

AIDA-2020 WP15 satellite meeting during 7th BTTB Workshop

WP15: Upgrade of beam and irradiation test infrastructure

CERN, 14th January 2019

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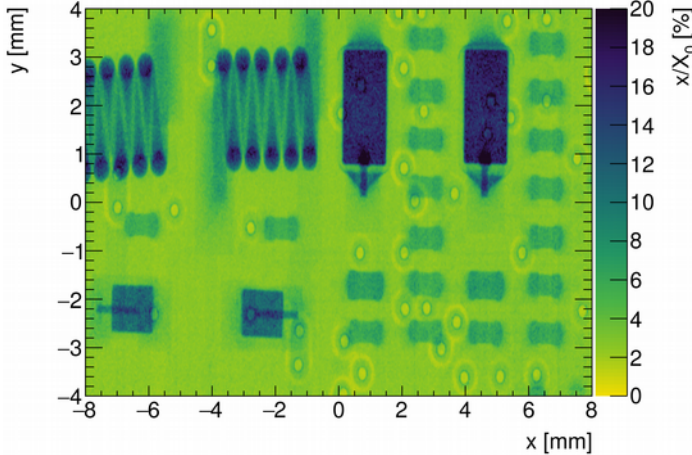
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Scientific/Technical Note

Checklists for using and maintaining EUDET beam telescopes

Dreyling-Eschweiler, Jan (DESY) *et al*

06 March 2017

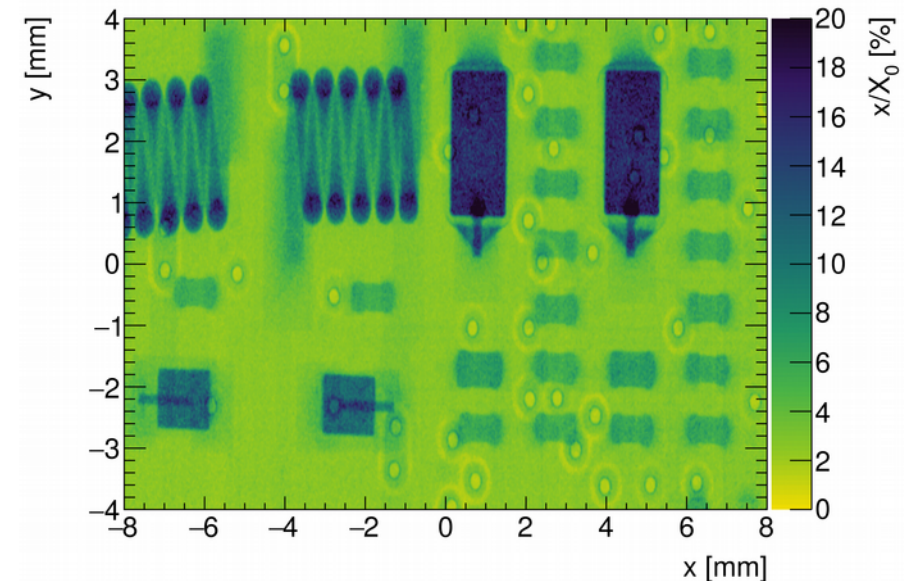
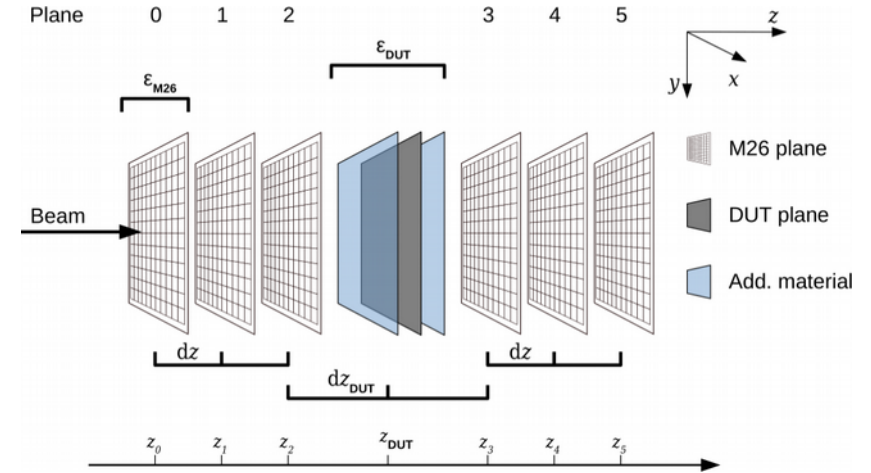
| Test beams* in the world, status September 2017 | | | | | | |
|-------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Laboratory | Number of beam lines | Particles | Energy range | Diagnostics etc. | Availability | Information, contacts & comments |
| CERN / PS (CH) | 2 | e, h, μ (sec.) | 0.5 - 10 GeV/c | Threshold Cherenkov, scintillators, MWPCs, delay wire chambers, scintillators, magnet, movable platform | 9 months per year, continuous except winter shutdown Duty cycle depends on PS / SPS / LHC operation mode and is typical | Contact beam time request and scheduling: Spa-Coord@cern.ch http://spa-schedule.web.cern.ch/ps-schedule/ contact beam lines: the-physics@cern.ch http://ba.web.cern.ch/ba/ |
| CERN / SPS (CH) | 4 | p (prim.) e, h, μ (sec.) e, h (bars) Pb ions (prim.) other ion species (out of fragmented primary Pb ions) | 400 GeV/c 10 - 400 GeV/c 10 - 200 GeV/c 20 - 400 GeV/c proton equivalent (α^+) | Delay wire chambers, Fibre optic scanners, XEMC calorimeters, Threshold & CEDAR, hodoscopes, magnet, movable platform | * PS - 1-3% * SPS 20-40% No PS and SPS test beams in 2019 and 2020 | |
| CERN / CLEAR (CH) | 1 | e ⁻ | 50-250 MeV/c | | 8-9 months per year | Contact: CLEAR-info@cern.ch http://clear.web.cern.ch |
| DAFNE STP Frascati, (IT) | 1 | e ⁺ /e ⁻ both primaries and secondaries | 55-750 MeV/c Rep Rate 50Hz 1-40 ns 1 to 10 ¹⁰ p/pulse | Calorimeter, silicon pixel, remote trolley, gas system, HV, trigger | depending on DAFNE schedule, from 25 to 35 weeks/year Not available in the first half of 2018 | Contact: bd@inf.it , paolo.valera@inf.it info at: http://www.inf.it/accelerator/stp/ http://www.inf.it/accelerator/stp/ |
| DESY (D) | 3 | e ⁺ , e ⁻ (sec.) e ⁻ (prim., planned for 201X) | 1 - 6 GeV/c 4.3 GeV/c | Trigger systems and beam telescopes, magnet (-1T) | 10 months per year, Duty cycle ~ 50% | Contact: TestBeam-Coord@desy.de http://testbeam.desy.de |
| ELPH (Sendai) | 2 | photons (tagged) e ⁺ , e ⁻ (conv.) | 0.7-1.2 GeV/c 0.1-1.0 GeV/c | | 2 months/year | contact: Toshimi Suda (suda@ims.shokug.ac.jp) |

01 Introduction: Beam Telescopes

High precision reference tracker

EUDET-type telescopes in a nutshell

- Mimosa26 based 6-plane telescope
 - Device Under Test (DUT) in between (or behind)
 - Response studies, efficiency, Lorentz angle, etc.
- Pointing resolution ($> 1.8 \mu\text{m}$) or angular resolution ($> 0.03 \text{ mrad}$) @ 1-6 GeV/c
 - Material Budget (X0) imaging
- Whole infrastructure: Trigger and DAQ user interfaces and track reconstruction software
- In the last decade a workhorse for various (HEP) test beams: 7 copies at 5 different test beam facilities



02 WP15.2 Status

Deliverables achieved

This slide is recycled from Bologna

AIDA2020 – WP15.2 – Improvements of test beam infrastructure for high precision tracking

- 7th EUDET-type telescope AZALEA was installed at PS T10, CERN, in September 2016
- Milestone and Delivery achieved, Documentation updated

| | | | | | | |
|-------|--------------------------------------|------|-----|------------|----------|--------|
| MS32 | Pixel telescope hardware assembled | 15 | M18 | 31/10/2016 | Achieved | Report |
| D15.1 | CERN pixel beam telescope for the PS | WP15 | M24 | 27/03/2017 | Achieved | Report |

Scientific/Technical Note

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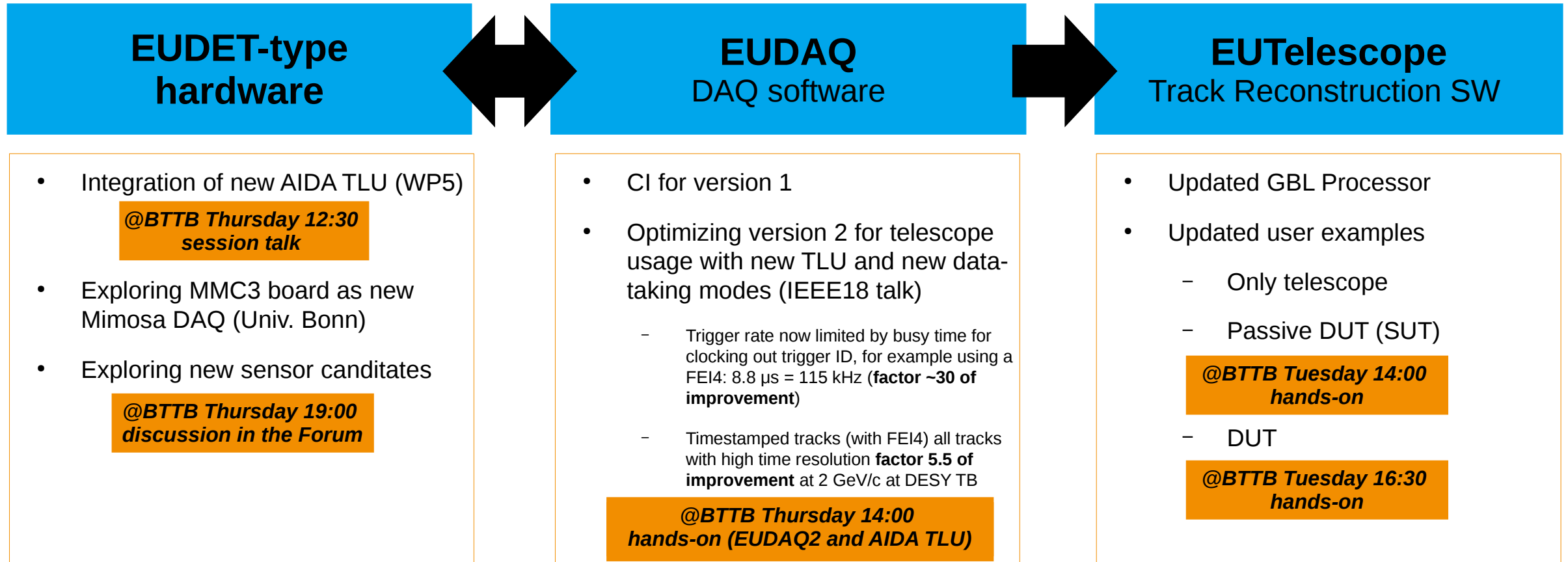
Starting point of documentation

- telescopes.desy.de

03 Results of improving the infrastructure

@BTTB Tuesday 11:50
Overview and status talk

Main purpose here: Higher time resolution



@BTTB: And many more user talks, see <https://indico.cern.ch/event/731649/timetable/#all.detailed>

04 Request for “Test Beam Database”?

Copying the success story of the irradiation facility database

This slide is recycled from Bologna

Considerations:

- Technical part as for the irrads
- Manpower for coordination/reviewing contents
- Starting point: Table from Christoph Rembser (CERN)
- Add-ons: particle rate (peak and avg.), available tools, ...

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05 Summary & Outlook

Summary

- EUDET, AIDA, AIDA2020 were and are booster for success story of common beam telescopes
- WP15.2 supported 7th telescope and maintenance
- DESY reviewed the last decade and asked the community for future needs
 - Better time resolution: Ongoing integrations and documentations
 - **The AIDA2020 extension will be helpful!**
 - Test beam database
- **Link:** telescopes.desy.de

Outlook

- BTTB sessions
- Continuing support & continuous integration
- 4 reference publications in pipeline: Hardware upgrade, EUDAQ1, EUDAQ2, EUTelescope
- Long LHC shutdown 2019/2020
 - Moving one telescope from CERN to DESY
 - Three telescopes at DESY

