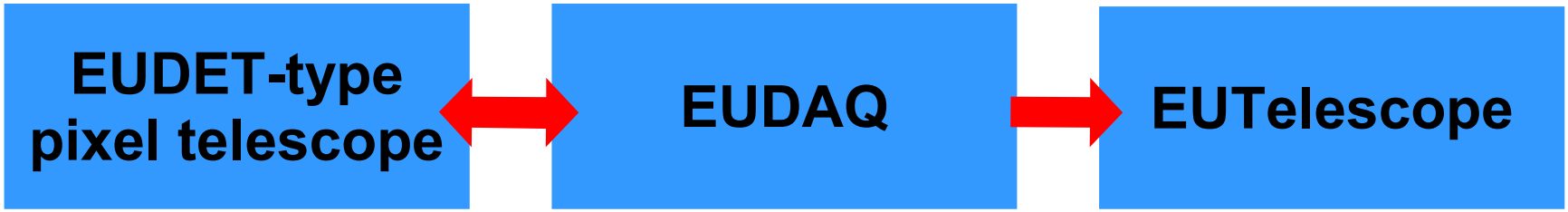
WP 15.2: Improvements of test beam infrastructure for high precision tracking

AIDA-2020 2nd Annual Meeting
4th of April 2017

Dimitra Tsionou
for the DESY telescope crew

Outline and Connections

Three main pillars of the **EUDET-style pixel telescope** infrastructure:



hardware:
sensors,
mechanics,
electronics,
...

DAQ software:
modular framework,
generic,
common,
…

offline beam reconstruction software for data **analysis**

New 7th telescope and development

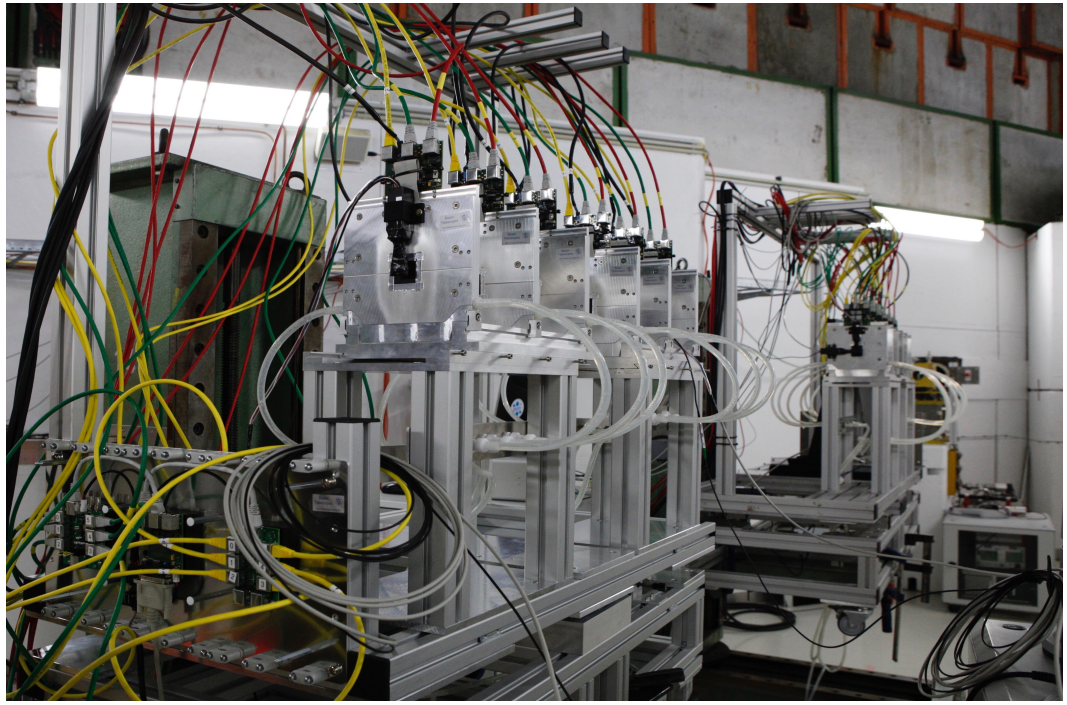
Strong work together with WP5 (Cussans/Wing) and the DESY Calo group

Coordination with Weingarten/Bisanz (Göttingen)

EUDET-style telescope

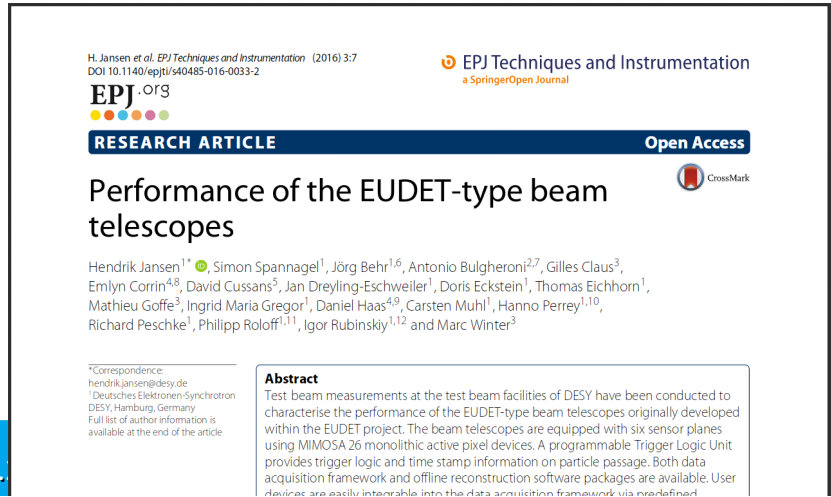
Tracking the beam with

- 6 sensor planes (Mimosa26)
  - active area: 10.6 mm x 21.1 mm
  - 18.4 mum squared pixel
- up to 4 PMTs as trigger
- EUDET TLU
- COTS based DAQ-hardware
- plus infrastructure



"Performance of the EUDET-type beam telescopes" - Jansen et. al. (2016)

- ~2μm tracking resolution using 6 planes of MIMOSA26 sensors (1x2cm^2, 18.4μm pitch)
- **Oct. 2016:** Reference paper published in EPJ



H. Jansen *et al. EPJ Techniques and Instrumentation* (2016) 3:7
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a SpringerOpen Journal

EPJ.org

RESEARCH ARTICLE Open Access

Performance of the EUDET-type beam telescopes

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Abstract
Test beam measurements at the test beam facilities of DESY have been conducted to characterise the performance of the EUDET-type beam telescopes originally developed within the EUDET project. The beam telescopes are equipped with six sensor planes using MIMOSA 26 monolithic active pixel devices. A programmable Trigger Logic Unit provides trigger logic and time stamp information on particle passage. Both data acquisition framework and offline reconstruction software packages are available. User

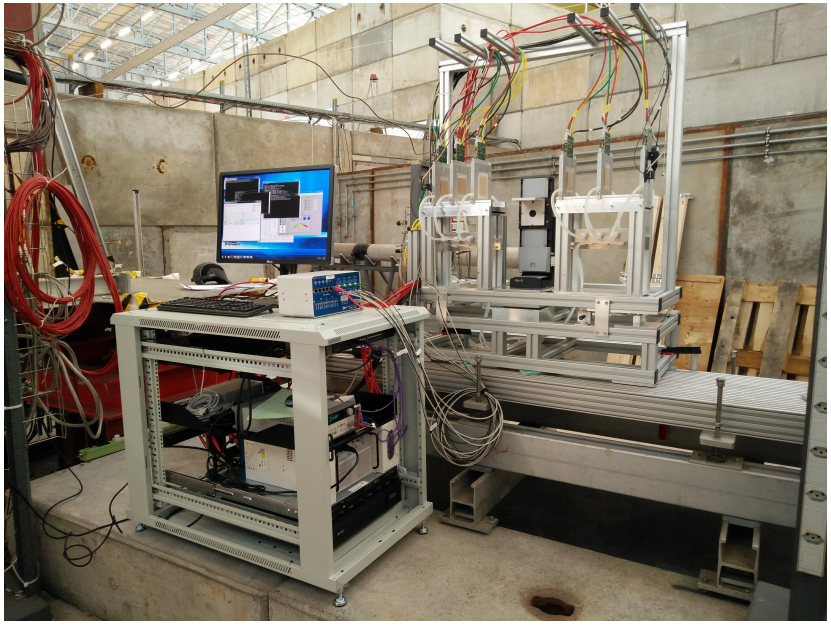
EUDET-type telescopes family

No.	Name	Location	Funded by	Year
1	(EUDET-) **A**IDA Telescope	CERN SPS	EUDET/AIDA FP6/7	
2	ANEMONE	Bonn	U Bonn	2011
3	**A**CONITE	CERN SPS	ATLAS	2012
4	**D**ATURA	DESY	DESY	2012
5	CALADIUM	Fermilab	Carleton U	2013
6	**D**URANTA	DESY	DESY	2015
7	**A**ZALEA	CERN PS	AIDA2020	2016

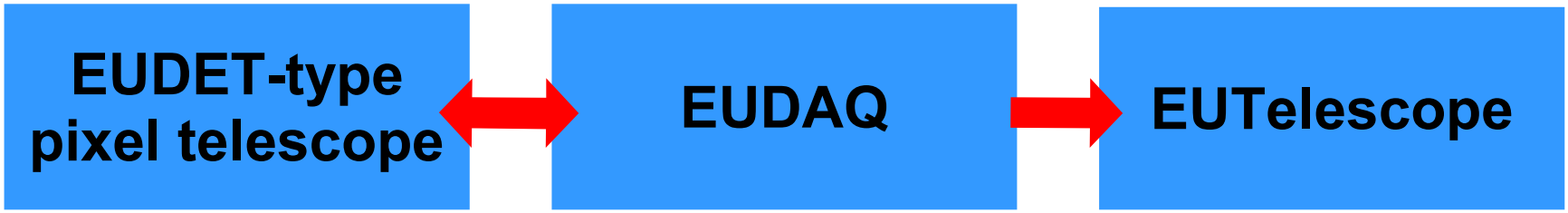
Users can go to different test beam facilities and use the **same** beam tracking infrastructure

7th EUDET-type telescope for CERN PS

- **AZALEA** = **A**ida2020 **Z**ero-suppressed Acquisition **L**ocated at the **E**ast **A**rea
- **From Nov. 2015:**
  Starting purchasing with Henric Willkens
- **Jan.-June 2016:**
  Mech. and el. Production and setup at DESY
- **July 2016:**
  Commissioning at DESY TB22
- **Sept. 2016:**
  Installation at CERN PS T10
- **Results: MS32 and D15.1**
  - Hardware/timing in MS32 (ach. 31/10/16)
    "Pixel Telescope Hardware assembled"
  - Results in D15.1 (achieved 27/03/07)
    "CERN pixel beam telescope for the PS"



Development: Towards higher rates



Re-integration of Mimosa DAQ
(Micro Computer FPGA plus self made carrier board)
~ June 2017
ongoing

AIDA TLU (see WP5)
~ Sept. 2017
finalizing

Release of EUDAQ2 (multiple data stream)
March 2017
finished

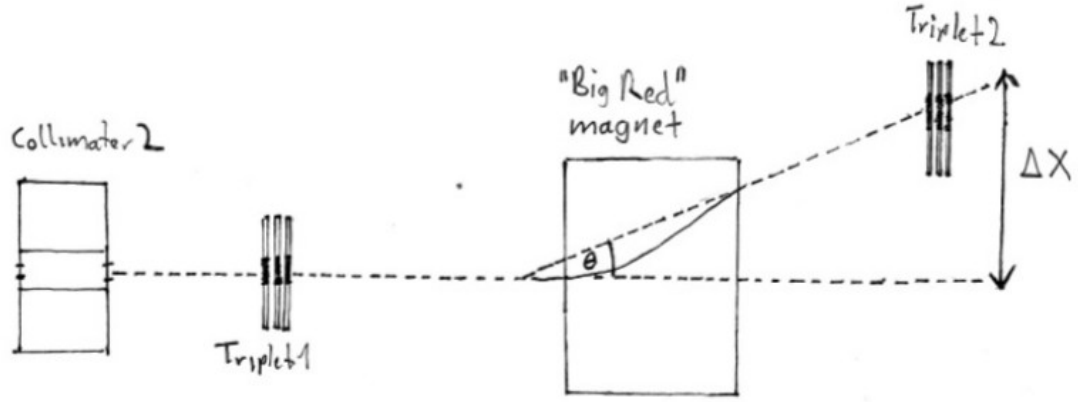
Keep the connection and define Event Building
March 2017
finished

Quite promising to finish this development and offer to the community this year – finally.

Ao important B

Documentation, Education and Knowledge transfer

- **Telescope Portal, operation manual and hardware:** telescopes.desy.de
- **Ongoing individual support for telescope users**
- **EUDAQ 1 documentation:** https://github.com/eudaq/eudaq
- **EUDAQ 2 documentation:** ongoing, see Master branch
- **EUTelescope documentation and** stable release in preparation
- **Summer students 2016:**
  - EUDAQ and Slow Control
  - Energy measurements



- 5th Beam Telescopes and Test Beams (**BTTB**) in Barcelona **http://indico.desy.de/event/bttb5**

Team and Contact

- **DESY telescope crew**
  Paul Schütze (CMS PhD), Jan-Hendrik Arlinger (ATLAS PhD), Uli Koetz (Senior), Yi Liu (ATLAS Postdoc), Claire David (ATLAS Postdoc), Uwe Kraemer (PhD FLC), Hendrik Jansen (CMS Postdoc), Jan Dreyling-Eschweiler (ATLAS Postdoc)
- **DESY workshop team**
  Torsten Kuelper, Adam Zuber, Carsten Muhl, Volkert Sturm, Christian Camien, Karsten Gadow
- **ATLAS telescope / "CERN" support**
  Andre Rummler (ATLAS)
- **Telescope coordinators**
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