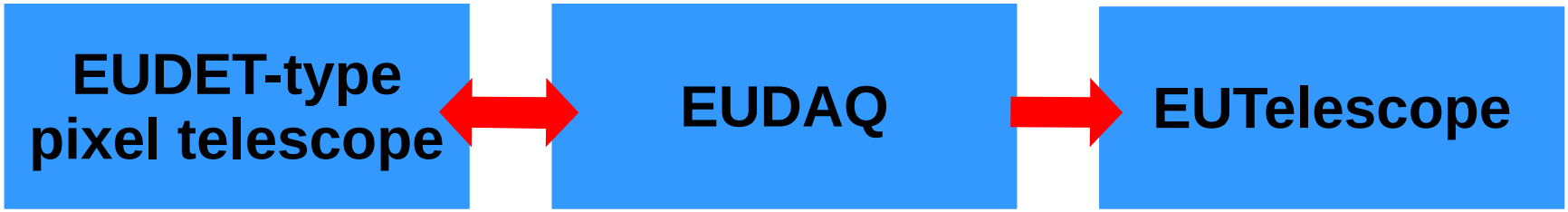
WP 15.2: Improvements of test beam infrastructure for high precision tracking

WP15 meeting at BTTB5
26th of January 2017
Jan Dreyling-Eschweiler

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

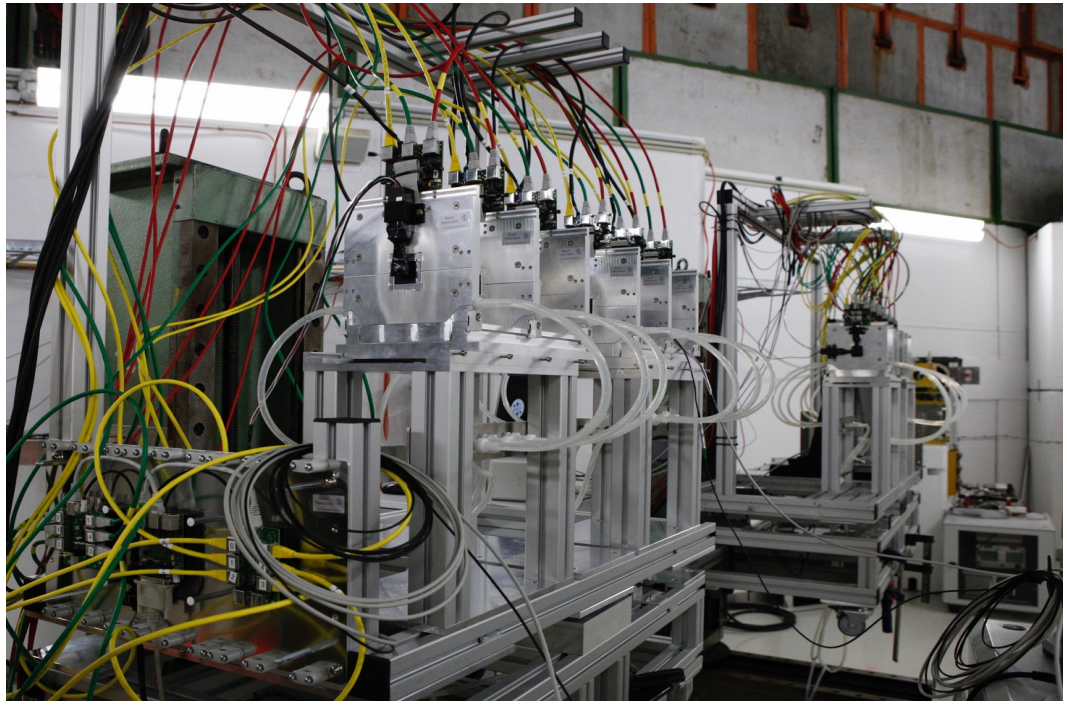
Strong work together with WP5 (Cussans/Wing) and the DESY Calo group

Coordination with Weingarten/Bisanz (Göttingen)

EUDET-style telescope

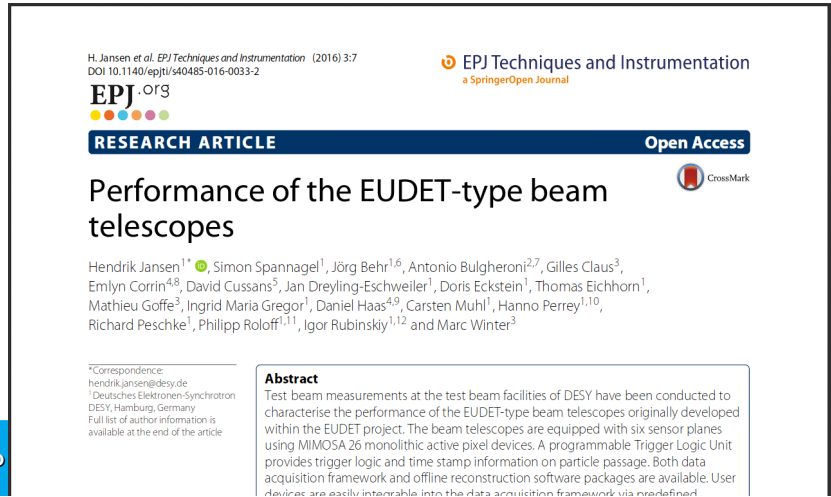
Tracking the beam with

- 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.

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



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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

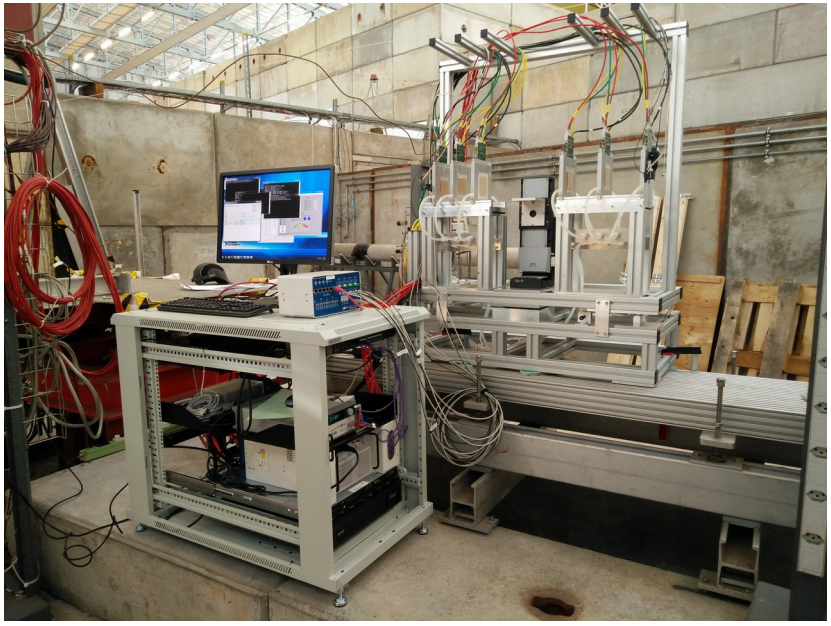
EUDET-type telescopes family

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

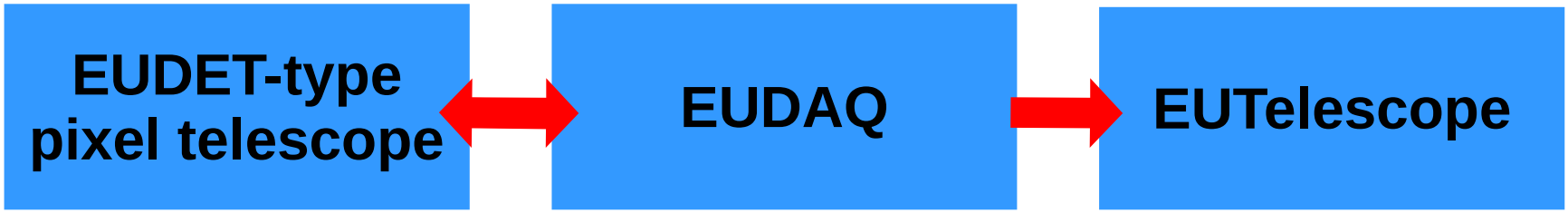
Users can go to different test beam facilities and use the **same** beam tracking infrastructure

7th EUDET-type telescope for CERN PS

- **AZALEA** = **A**ida2020 **Z**ero-suppresed **A**cquisiton **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
- Hardware and timing in MS32
  “Pixel Telescope Hardware assembled”
- Till April 2017: Results and Documentation in D15.1 “CERN pixel beam telescope for the PS”



Development: Towards higher rates



Re-integration of Mimosa DAQ
~ March 2017

Release of EUDAQ2 (multiple data stream)
~ March 2017

AIDA TLU (WP5)
~ Sept. 2017

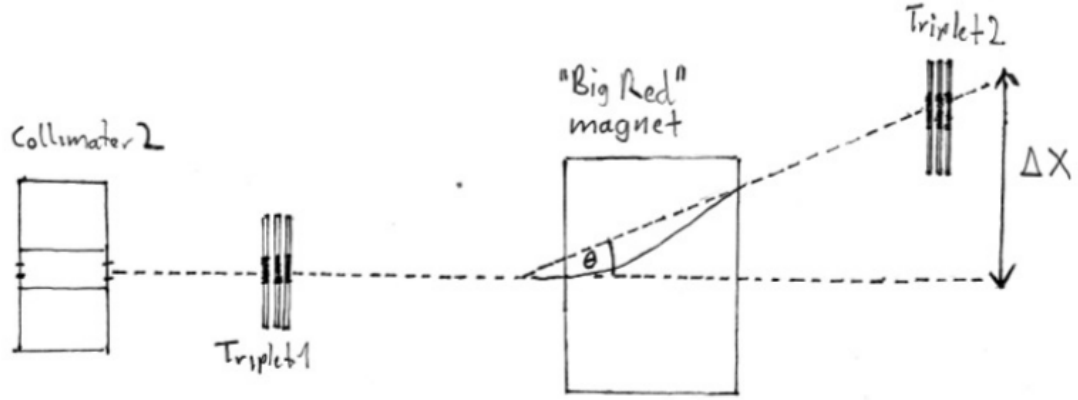
Keep the connection and define Event Building
~ March 2017

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
- **EUDAQ 1 documentation:** https://github.com/eudaq/eudaq
- **EUDAQ 2 documentation:** in preparation
- **EUTelescope documentation and** stable release in preparation
- **Summerstudents 2016:**
  - EUDAQ und Slow Control
  - Energy measurements



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

Team and Contact

- **DESY telescope crew**
  Paul Schütze (CMS PhD), Jan-Hendrik Arlinger (ATLAS PhD), Uli Koetz (Senior), Yuri Soloviev (BELLE Permanent), Yi Liu (ATLAS Postdoc), 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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