

# Testbeam at DESY in December?

# Availability in 2019?



## DESY Test Beam Schedule 2019 - Version 8 02/08/2019

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	Week		TB21	TB22	TB24/1	TB24
			DATURA	DURANTA	PCMAG	Telescope in PCMAG
7-Jan-19	2					AZALEA

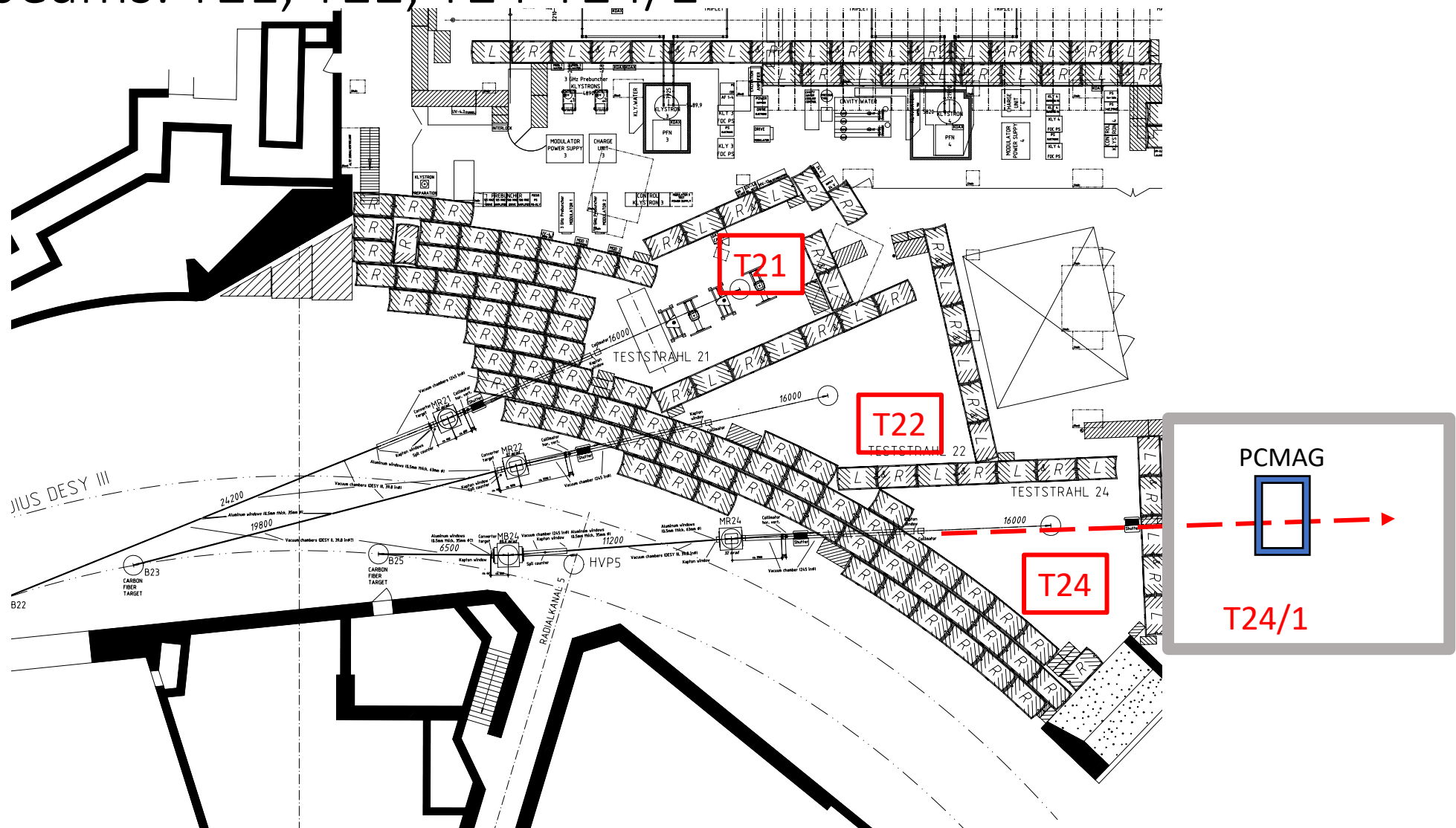
Summer Shutdown									
29-Jul-19	31		SummerStudents	X	SummerStudents	X		CALICE AHCAL	X
5-Aug-19	32		BL4S	X	SummerStudents	X		BL4S	X
12-Aug-19	33		TBMST	X				CBM-TRD	
19-Aug-19	34		TBMST	X	ATLAS-HGTD	X		CBM-TRD	
26-Aug-19	35								
2-Sep-19	36		CMS-Pixel-Phase2		Setup Time				
9-Sep-19	37		CMS-Pixel-Phase2	X	ATLAS-ITk-Strips	X		CEPC-STCF	X
16-Sep-19	38		AFP-TOF	X	Mu3e	X		CEPC-STCF	X
23-Sep-19	39		CLIC PIXEL	X	ATLAS-ITk-Pixel	X	TPEX	TOTEM	X
30-Sep-19	40		X-Ray-Crystal-Rad	X	ATLAS-ITk-Pixel	X	TPEX		
7-Oct-19	41								
14-Oct-19	42		BL4S	X	SHiP-SplitCAL			ATLAS-ITk-TJCMOS	
21-Oct-19	43		BL4S	X	SHiP-SciFi				
28-Oct-19	44		CMS-Pixel-Phase2	X	SHiP-SciFi			SHiP-Emulsion+Ship-SBT	
4-Nov-19	45		CMS-Pixel-Phase2	X	ATLAS-HGTD	X		LHCb-ECAL	X
11-Nov-19	46		FCAL	X	ATLAS-HGTD	X		LHCb-ECAL	X
18-Nov-19	47				Setup Time				
25-Nov-19	48		CMS Outer Tracker	X	ATLAS-ITk-Strips	X		ATLAS-ITk-Pixel	X
2-Dec-19	49		CMS Outer Tracker	X	ATLAS-ITk-Strips	X		ATLAS-ITk-Pixel	X
9-Dec-19	50		ELIOT		CMS-Pixel-Phase2	X		Mu3e	X
16-Dec-19	51	Beam till 20/12 0800	ELIOT		CMS-Pixel-Phase2	X		CLIC PIXEL	X
23-Dec-19	52		Shutdown						
30-Dec-19	1								

ANNOUNCED

No longer available

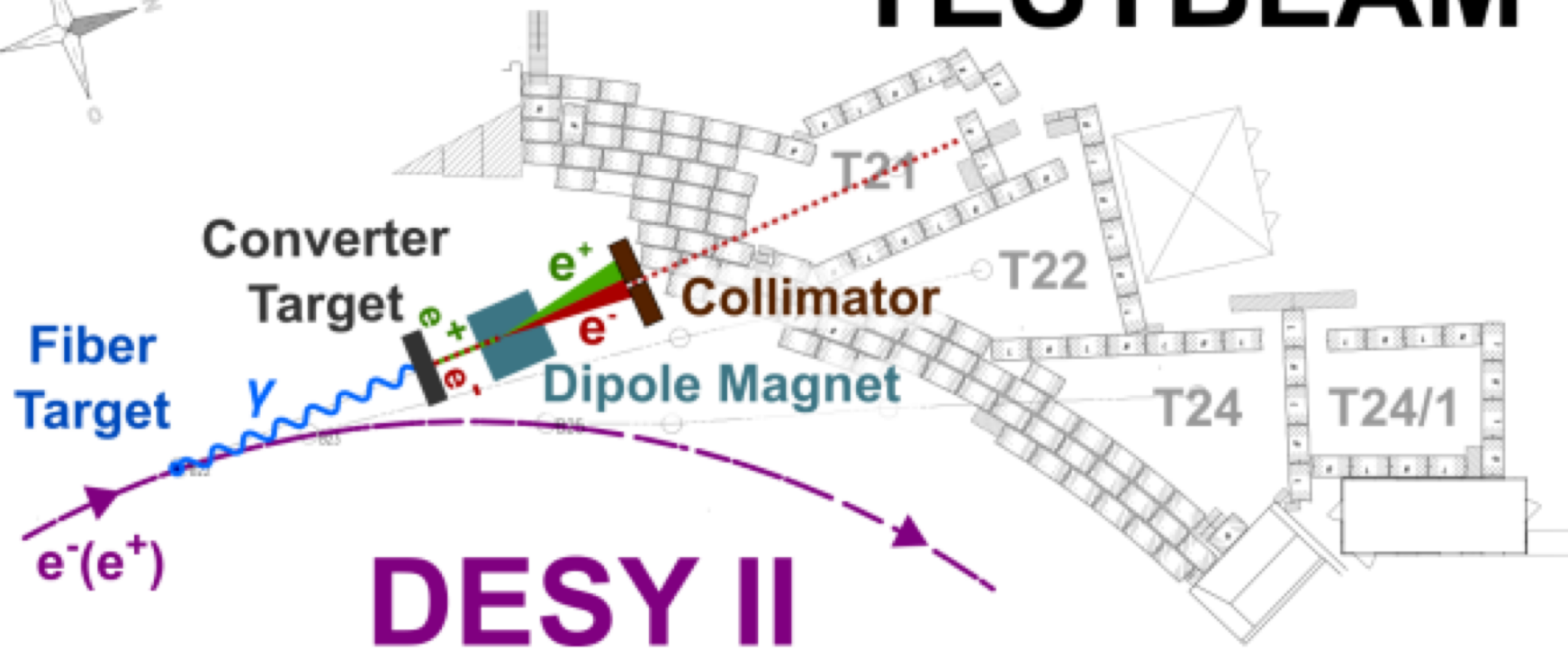
Parasitical user !

# 3 testbeams: T21, T22, T24-T24/1

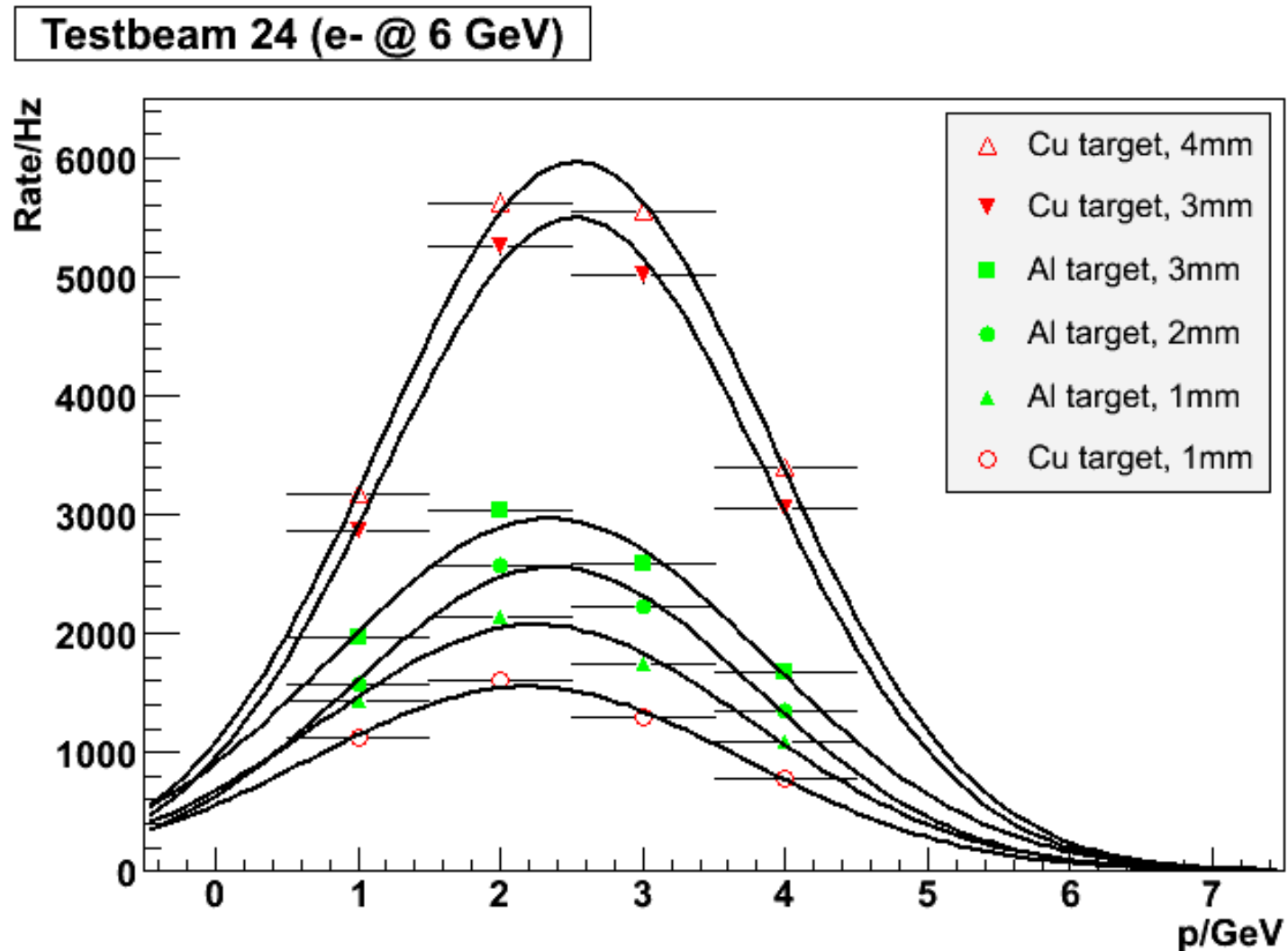




# TESTBEAM



Beam energies/intensities -- but depend on main user!



# Main user is Mu3e -- some questions/answers

- Material in beam?
  - 4% X0 in total (Thick ATLASPix3 layers, Mimosa, scintillators)
- Will you be using DESY Mimosa telescope? YES
- What beam energy?
  - 3-4 GeV (mainly 3 GeV as it provides highest possible rate)
  - Note that beam in T24 will be further reduced somewhat by secondary collimator in between T24 and T24/1 areas
- Running around the clock?
  - Stable during the night; During day: expect longer phases without beam for hands-on interventions
- How many people in counting room (limited space)?
  - Hut may be rather crowded with 4+ people; have ~10 people total. But some people during day in “blue hut”.

Do we want to use this opportunity as 1<sup>st</sup> trial test of 8 quads?

## Some info on T24/1 facilities:

- **PCMAG:** 1 Tesla (superconducting) solenoid; no (iron) yoke, so rather large stray fields closely around!
  - My opinion: if at DESY, **we must use it ALSO**
    - Because of much lower diffusion, and study of ExB effects
- There is T2K gas bottle supply (however) in T24 area + monitoring by computer
- There is (NIKHEF manufactured) CO2 cooling installation (!), but should probably not use it now
- The complete PCMAG setup is movable in horizontal, vertical and angle in hor. plane
- A non-magnetic support frame is available to install one of the Mimosa telescopes inside the PCMAG
- The PCMAG coil/wall thickness is  $\sim 20\% X_0$



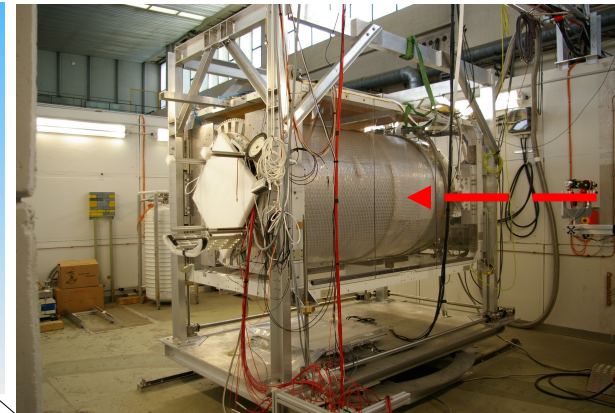
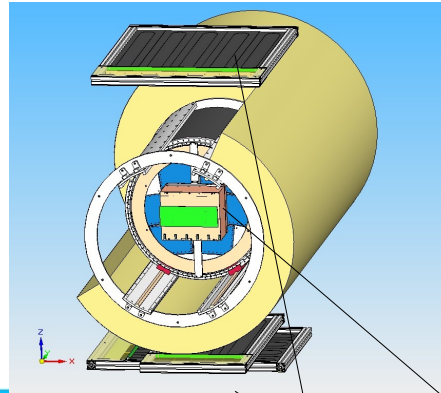
# Some pictures



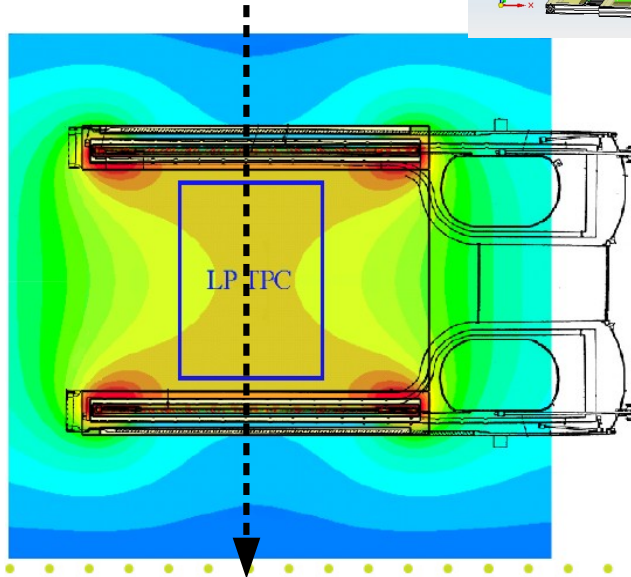
## The Present



- *PCMAG*:  
superconducting  
magnet, up to 1.25 T
- $e^-$  test beam  
@DESY  
( $1\text{ GeV}/c < p < 6\text{ GeV}/c$ )



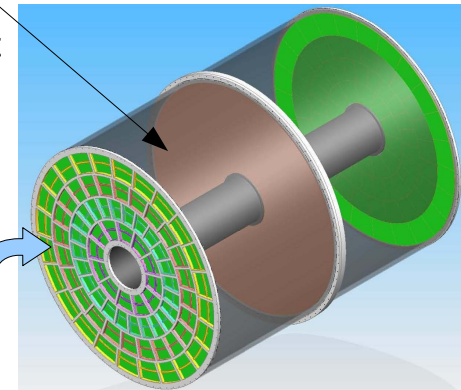
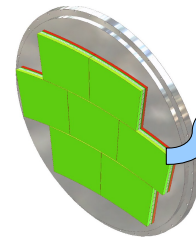
beam



Cosmic Trigger  
Setup

LP as half part  
of a TPC

$U_{\text{sc}} / \text{m}^2$   
1.50  
1.27  
0.984  
0.703  
0.422  
0  
exported from  
CST EM-Studio



Sept. 30, 2010



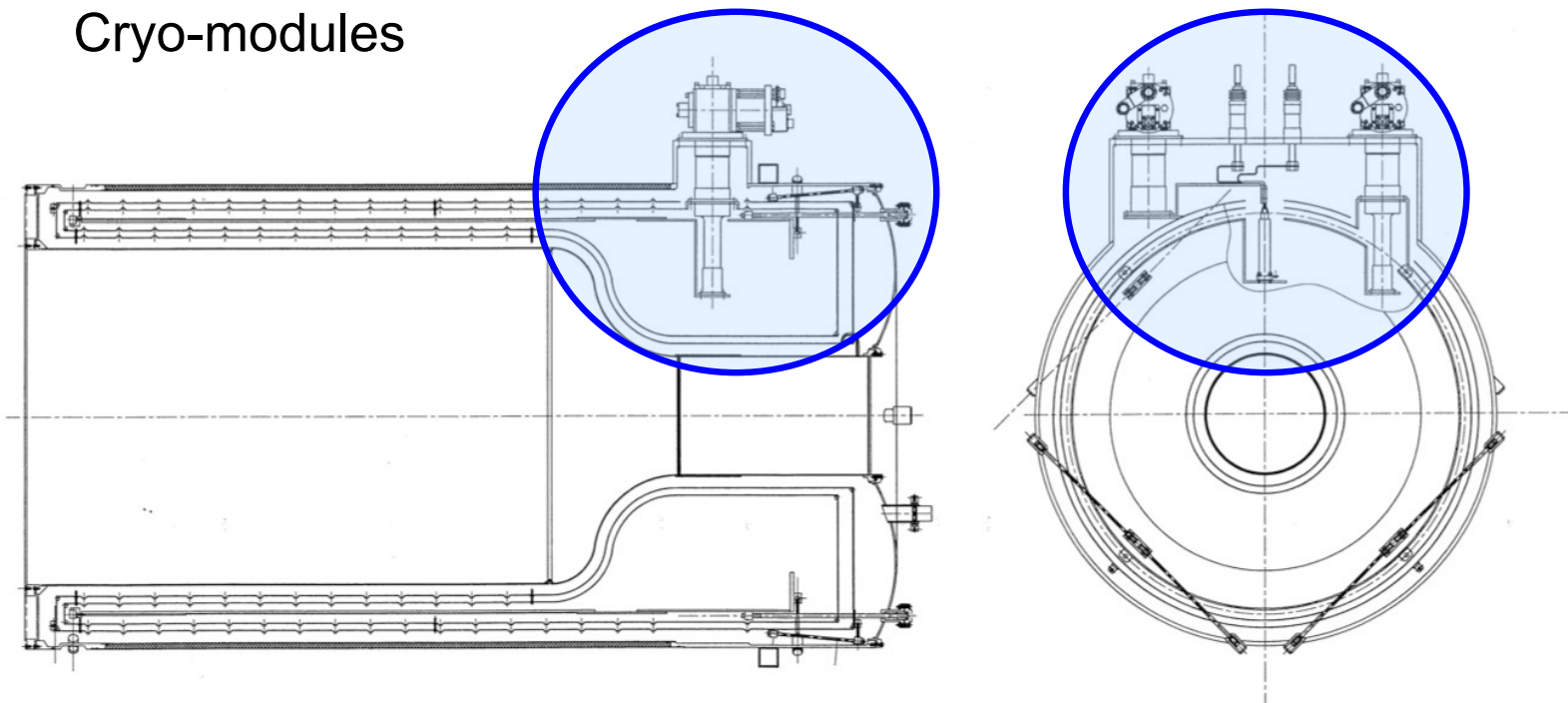
Klaus Dehmelt



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EUDET Annual  
Meeting 2010

## Cryo-modules

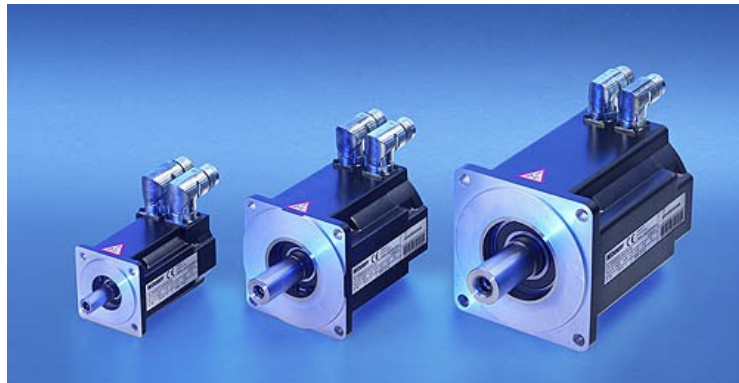


Modification planned for 2011 → ~6 months  
duration, after “finishing” beam tests





## Actuation and Control





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Nuclear Inst. and Methods in Physics Research, A

journal homepage: [www.elsevier.com/locate/nima](http://www.elsevier.com/locate/nima)The DESY II test beam facility<sup>☆</sup>R. Diener, J. Dreyling-Eschweiler<sup>\*</sup>, H. Ehrlichmann, I.M. Gregor, U. Kötz, U. Krämer,  
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## ARTICLE INFO

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## ABSTRACT

DESY Hamburg operates a test beam facility with three independent beam lines at the DESY II synchrotron. It is world-wide one of very few facilities providing test beams in the GeV range. To this end, it offers electron/positron beams with user-selectable momenta from 1–6 GeV/c. The available infrastructure for the users is unique, including a high field solenoidal magnet and permanently installed high-precision pixel beam telescopes. This publication gives a detailed description of the facility, the available infrastructure, and the simulated and measured performance.

## 1. Introduction

DESY (Deutsches Elektronen-Synchrotron)<sup>1</sup> operates a test beam facility at its campus at Hamburg-Bahrenfeld (Fig. 1). The facility offers three independent beam lines with electron or positron particles with selectable momenta from 1–6 GeV/c and is located in building 27 (“Halle 2”), one of the experimental halls at DESY. The beam lines are attached to the DESY II synchrotron, which typically runs electron beams with an oscillating energy from 0.45–6.3 GeV. This Test Beam Facility is one of the few worldwide that offers users access to multi-GeV beams. It has essential infrastructure for the development and testing of nuclear and particle physics detectors and generic detector R&D.

After the start-up of the original DESY electron synchrotron in 1964 the developments and studies of new detector components were done by using the primary beam when not used for the recognized experiments. The place behind the pair spectrometer in beam line 24 was a popular location which also provided an energy measurement of the electrons. With the installation of DESY II this possibility ceased to exist and the current facility started serving the test beam needs of the community.

Since its inception and start of operation simultaneously to the start of DESY II in 1987, the usage of the DESY II Test Beam Facility has continuously increased. At the same time, there were continuous investments into this facility and more infrastructure added, including a high-field solenoid and two high-precision pixel beam telescopes. All of these are available to all users of the facility.

The EU has supported both access and enhancements to the DESY II Test Beam Facility within the FP6-EUDET [1], the FP7-AIDA [2] and the Horizon 2020-AIDA2020 [3] grants. The transnational access offers

travel support for users from outside Germany thus enabling further groups to use the facility.

This paper is organized as follows: first an overview of the DESY II synchrotron is given (Section 2), then the test beam generation (Section 3), the beam line instrumentation (Section 4), and the individual beam areas (Section 5) are explained. All additional test beam infrastructure, like magnets and beam telescopes, is then described in detail (Section 6). The performance of the DESY II Test Beam Facility is presented by the results of different measurements (Section 7) and is compared to simulations of the test beam (Section 8). It is concluded with a report on the user community (Section 9) and a summary and an outlook on future improvements (Section 10).

## 2. The DESY II synchrotron

More than thirty years ago, on the 22nd of March 1985, the first electron beam in DESY II was circulated [4,5]. After the final connection of all transport lines and magnet circuits, from spring 1987 on, DESY II has delivered electron or positron beams with high stability and reliability up to 7 GeV beam energy to DORIS, PETRA, HERA and the DESY II Test Beam Facility.

DESY II is installed in the DESY tunnel. It is 292.8 m long and has an average radius of 46.6 m (Fig. 2). The tunnel houses the DESY II synchrotron and the DESY III proton synchrotron, which served as an 8 GeV proton injector for HERA and was decommissioned in 2007. As DESY III has been re-using most infrastructure from the original DESY synchrotron including the dipole magnets, DESY II was designed from scratch.

<sup>☆</sup> Paper dedicated to the memory of our colleague Ulrich Kötz

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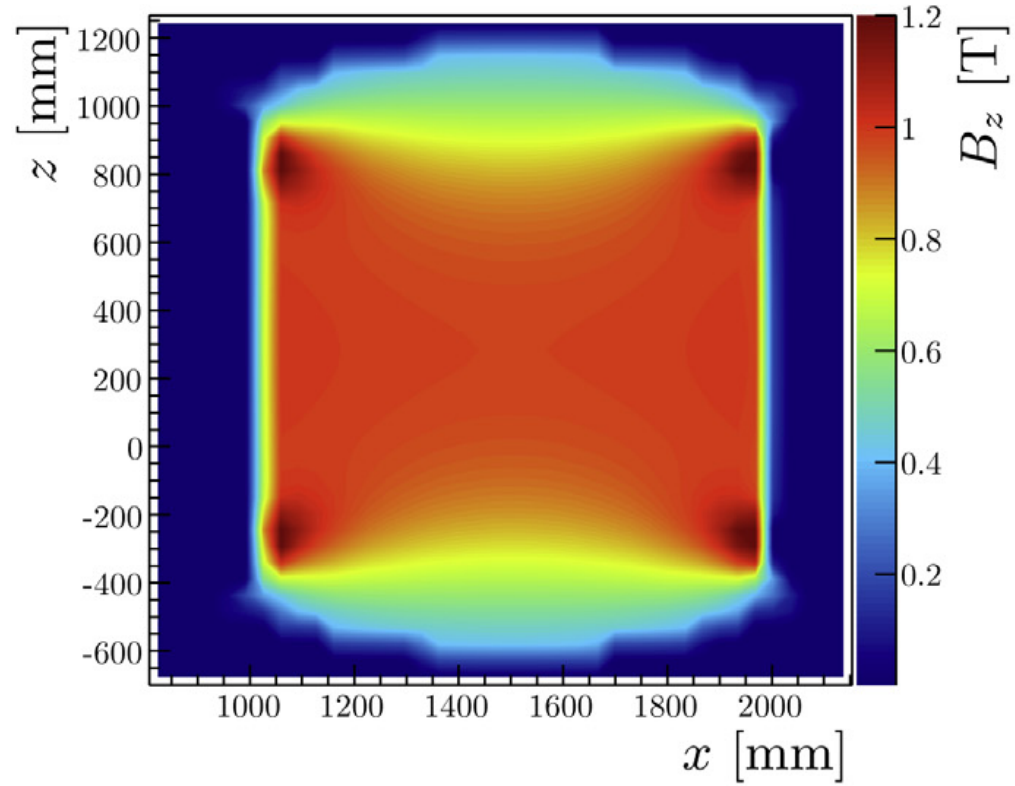
<sup>1</sup> <http://www.desy.de>.

<https://doi.org/10.1016/j.nima.2018.11.133>

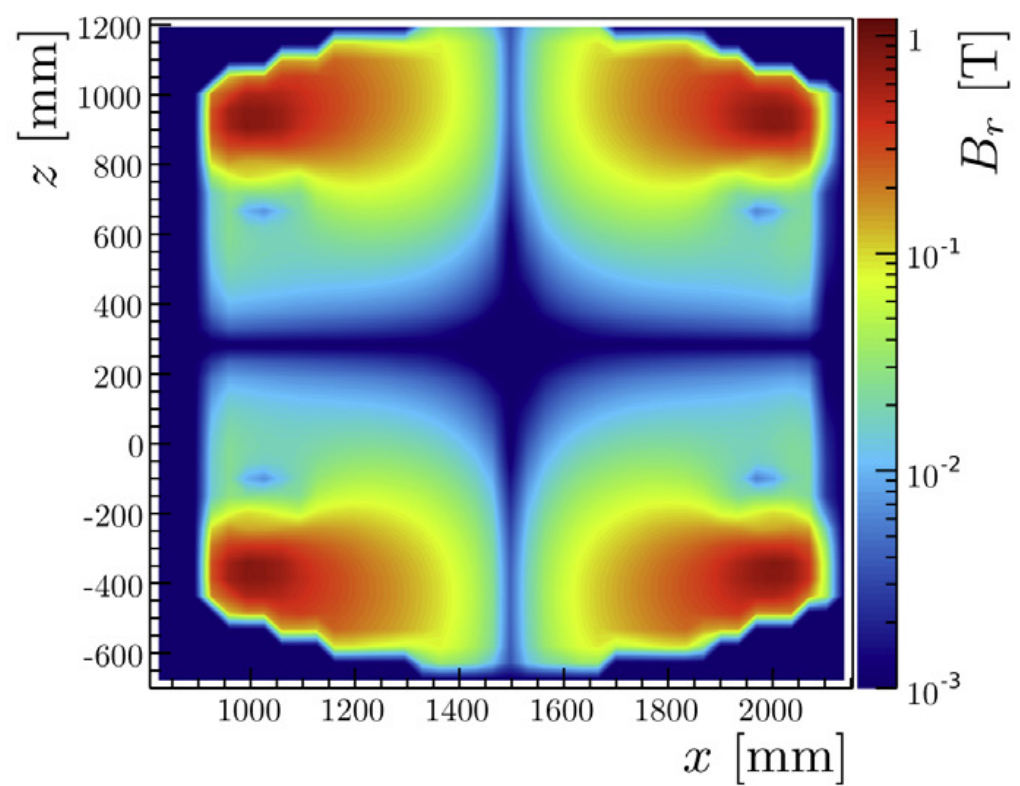
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(a)  $z$ -component of  $B$



(b)  $r$ -component of  $B$

## So, do we want to use this? (my personal opinion)

- Would need agreement to borrow Bonn Mimosa telescope/equipm.
- Go there only if full 8-Quad Spider readout is available and working
- Will we have problems with acceptance of our equipment?
  - Private gas bottles -> could use standard DESY T2K gas bottle system
  - Use of glycol cooling inside setup?
  - Setup needs to be A-MAGNETIC:
    - No close by PC (hard disk), need SSD disk, no fans
    - Power supplies HV(?), LV at ~5 m distance
    - Fred is looking into a-magnetic moving devices
    - Need to check access rules when PCMAG is ON
- Can the beam rate be <1 kHz in T24/1 when Mu3e is running at highest intensity?
- Do WE have enough people to install/check/run during the week 9-15 December (Nikhef Annual meeting is 16-17 Dec.!!)
- Next opportunity would be at DESY from 17 February 2020 onwards; need to submit beam time request SOON.