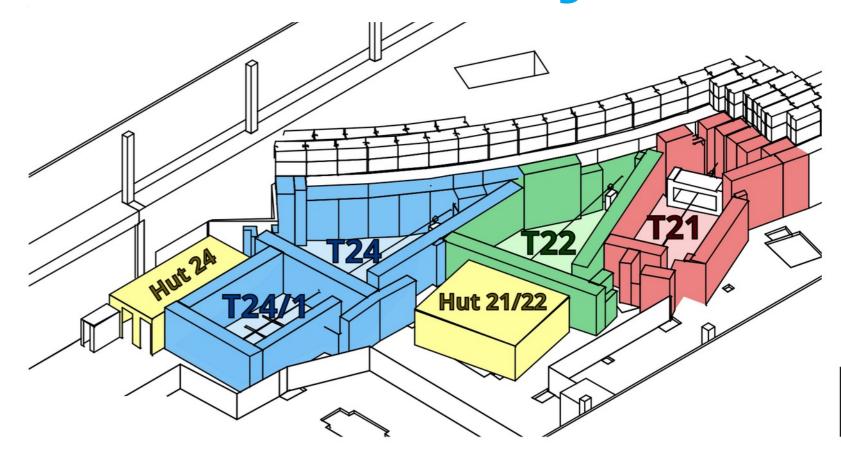
DESY II Test Beam Facility

Safety Briefing

Coordinators:

Sven Ackermann Ralf Diener Marcel Stanitzki

Status: Aug 27, 2025





Introduction



• In this lecture, your attention is not optional







→ No smartphones, laptops etc.

Introduction



- Each user has to attend this safety lecture once every twelve months
- Rules are specific for the DESY II Test Beam Facility
 - → Might differ from other places at DESY
- Each group has to assign one responsible person which has to be present during the test beam!
 - This person is responsible for the actions of the whole group
 - All communication should include this person
 - All responsibilities listed on the e-paper door sheet (including a mobile phone number)
 - Communicate any changes of responsible person ASAP



Introduction



- Before data taking: Safety check by test beam coordinators (special setups: involvement of DESY safety experts)
- All hazardous material has to be announced well before coming to DESY



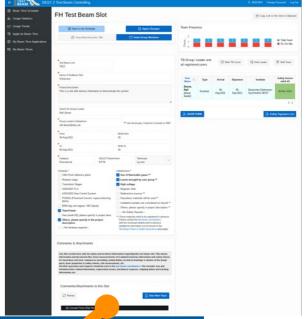


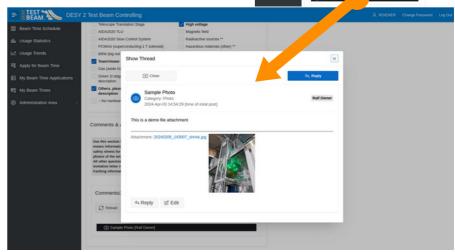


- Everything has to be handled/marked/stored/disposed properly
- Do not just leave things behind after your beam time
- Ask beforehand if unsure
- Safety relevant information like
 - Safety data sheets for chemicals, cooling liquids (any except pure water), etc.
 - Sample declarations and irradiation reports etc.

has to be uploaded to the slot page before use

→ accessible to complete user group and test beam crew





DACHS

BEAM.

DESY Access Control Handling System

- Access and interlock controlled by DACHS system
 - → DACHS card mandatory for DESY test beam
 - Entry in the DESY person information system via your beam time registration



- Card can be obtained in Bld. 6 / Room 110
- Personalized ID: Must not be handed to others
- Three levels of permissions
 - Working permission: Access hall & huts
 - Beam permission: Interlock search
 - Coordinator





| blue | DACHS ready |
|-------------|---------------------------------------|
| green | Access granted |
| green / red | Hold card longer in front of terminal |
| red | Access denied |

General Safety Rules



- Obey all safety signs
 - No people with pacemakers or active medical implants in the hall



 No headphones / earbuds in the areas (acoustic warning)



- No open fires, smoking, eating or drinking
 - Food and drinks (non-alcoholic) only inside huts
- Watch out for crane work
 - Stay clear of hanging loads
 - Wear hard hat when assisting (safety shoes if available)



- Working alone is not permitted, there always has to be a second person that can call for help
 - Underage persons (below 18 yrs.) have to be always under supervision
- Wear proper footwear
 (e.g. no flip-flops or very high heeled shoes)



- User hut occupancy limit (5 or 7, see signs)
 - → don't put additional chairs inside!
 - Do not set up working places in the hall area outside the huts and beam areas

Ladders, Bricks and Lead



- Ladders: working in heights is dangerous
 - Do not take broken ones
 - Use properly:
 - correct angle
 - solid ground
 - both feet on the ladder



- Remove large ladders from area when finished
- You are not allowed to climb on the walls or huts
- When any beam line is ON, do not climb higher than the shielding wall with any body part
- Always use a ladder, step-stool, elephant foot
 Never use tables, (swivel) chairs, infrastructure

- Lead/Iron bricks and collimators
 - Are heavy → danger of hurting feet etc.





- Lead is poisonous:
 - Avoid hand-mouth contact
 - → always wear gloves
 - Don't work on or scrape of the lead

General Tidiness



 Keep all ways in the areas tidy and escape routes clear at all times including the setup phase

- Use trash bins or for large amounts containers outside
- Remove returnable bottles yourself
- Remove smelly trash from the control huts
- Before you leave (the incoming group will appreciate it):
 - Put all your cups & dishes into the dishwasher
 - Clean up area and hut
- Leave the clean blue and red chairs in the huts, use only the grey, old ones in the areas





Phone Numbers and Emergency Call



- In case of an emergency: Call 2500
 - Never call external emergency number
 - Answer the usual questions:
 Who? Where? What? How many?
 Most importantly: Wait! for questions
- DESY SAVE will come and help as fast as possible
- Remember your first aid training and help
- First aid supplies (band-aids)
 - Next to hut H22
 - South-west corner of the hall
 - In front of the restrooms





| Emergency (Notruf) | 2500 | |
|--------------------------------|---------------------------|--|
| DESY Mobile | 66-2500 | |
| External Mobile | +49-40-8998-2500 | |
| Technical Emergency Service | 5555 | |
| Accelerator Control Room (BKR) | 3500 | |
| Coordinators | | |
| Sven Ackermann | (9)6239 | |
| Ralf Diener | (9)3426 | |
| Marcel Stanitzki | (9)4930 | |
| | | |
| Telescope Support | telescope-support@desy.de | |
| Porter's Lodge Notkestrasse | 3333 | |

Technical Emergency Service (☎ 5555): If you hear anomalous noise or notice other strange things (water floods...)

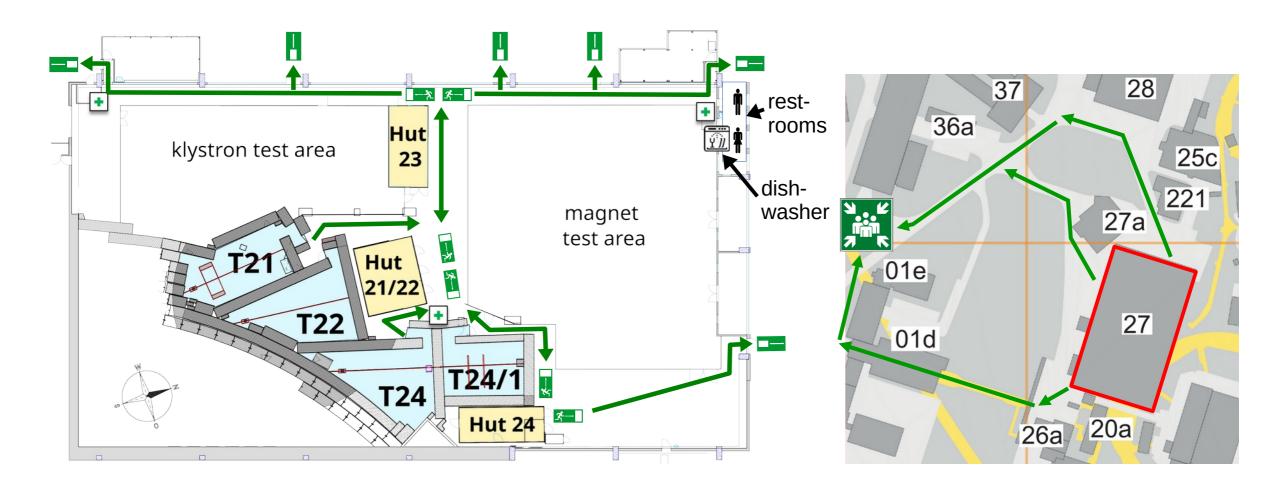
→ (take into account to leave the hall)

Inform the test beam coordinators about any safety relevant incident

Escape Routes & Assembly Point



Building 27



Behavior in Case of Fire



Page 11

Large fires

- Leave hall as fast as possible via escape routes
- Make sure your colleagues are leaving with you
- Consider to press fire alarm when leaving
 - → confirms alarm from smoke detectors
- Call: 2500
- Go to the dedicated assembly point:
 - Wait for fire brigade
 - Answer questions and report missing people











Small fires

- May be attacked using fire extinguisher
- Only if you think it is safe for you!
- Press first emergency-off
- Keep a distance of 1 m minimum from electrical and HV systems



- For HV systems: Must use CO₂ fire extinguisher
- Inform test beam coordinators and Technical Emergency Service (2555)

Emergency Off and Lights



- Emergency-off buttons in huts and areas
 - Kill both: beam and electrical power
- Electrical circuits
 - ① Areas TB21 + TB22 + hut H21/22
 - ② Areas TB24 + TB24/1 + hut H24
 - → take power only from inside specific area or hut, respectively
- Areas/huts equipped with mobile emergency lights
 - In case of a larger power cut:
 emergency power should be available after 60 s
- Keep emergency-off and lights always accessible: no material, tables, boxes, cables etc. in front

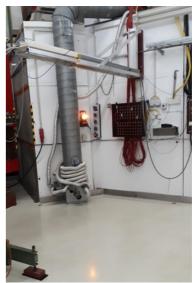












Unattended Data Taking





- Possible solution to take the best out of the beam time even with small team
- Running automatically without people in the hall
- In principle allowed...

- Requirements for running in "auto pilot" mode:
 - Call the BKR (3500) and tell them from when to when you will have the control room unattended and give them a contact phone number
 - Prepare a note with the same information and put it next to the interlock/shutter control
 - On return inform the BKR that the room is attended again

 Unattended data taking is not allowed when hazardous material is in use (i.e. flammable gas or radioactive material, ...)

Translation Stages



- In all areas
- Be careful: danger of squeezing
- The big green stages can carry up to 1 t

- Remote controlled
 - Stay in contact via phone during remote operation if people are inside the area
- Make sure that the stages do not hit persons or equipment and don't rip of cables



Beam Telescopes



 Two areas equipped with EUDET-type telescopes one with Alpide based telescope

- Contact & Support telescope-support@desy.de
- Safety & Rules
 - The telescopes are flexible but sensitive
 - Upper frame can be rotated (not fixed!)
 - Behind the thin foil are 50 µm silicon sensors
 - Watch out the travel range of the PI-µm-stages
 - Telescope low voltage provided by uninterruptible power supply (8 V Mimosa26, 15 V PMTs)





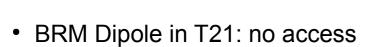
- Data flow should be over the local network 192.168.<2x>.<x> ranges
- Copy your data saved from the local raids after your test beam to free the disk space

Test Magnets

BEAM.

Operation only by trained users (extra training)

- 1 T is a strong field
 - → forces very high (lifts e.g. gas bottle easily)
 - → Secured by door interlock



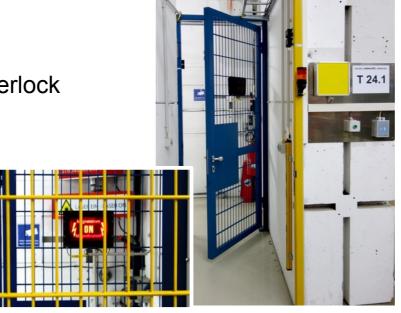
- PCMAG in T24/1:
 - Access possible by bridging interlock
 - For small adjustments only
 - Do not open blue door when magnet current sign on Careful: takes up to 12 h to cool down after emergency-off







- PCMAG lifting stage
 - Watch all cables carefully
 - Do not climb on stage
 - Do not manipulate mechanical setup (includes mounting rails and all screws)



Laser Safety



- Laser alignment system in all beam lines
 - Height: \sim 1.70 m \rightarrow \sim eye level for 1.80 m person
 - Class 1M laser system:
 - 1M: accessible laser radiation not hazardous in sensibly foreseeable conditions
 - 1**M**: as long as **no** optical instruments used!
 - → Operation restricted by key switch, warning sign at entrance



- Portable cross laser
 - Class 2: with intact protection reflexes no risk to eyes → less than 20% have this reflex

Rules

- Announce use before switching on
- Never look directly into any laser: turn away / close eyes if accidentally doing so
- Never use optical instruments or reflecting tools
- Use laser only during alignment, switch off immediately after



User setups:

All laser of class 3R, 3B or 4 operated at DESY have to be announced » 4 weeks in advance, including a description / sketch + risk assessment

Electrical Safety and Cabling



Rule #1: NO work on HV or electrical systems when the power is switched on!

- Only proper equipment is allowed
 - Annual checks for equipment required
- Home made devices have to be proper too
 - E.g. obey the voltage limits of your cable and connectors etc.
- No Daisy-chaining of power strips
- Be extra careful when using remote-controlled power supplies
- High voltage: > 60 V (DC)
 - > 25 V (AC)



that is not shielded → Use a warning sign!

- Keep every path always free and easily passable
 - Use cable bridges



- In the rare cases, cable bridges don't work:
 put cables at least 2 m high
- Attach cables to stage platforms e.g with Velcro tape and screw terminals, etc.

Gas Safety



- Announce well in advance
- Pre-mixed gases can be supplied
- Measures adjusted to specific gas (mixture)
 - Flammable gases possible: mobile gas safety system
- Always use exhaust and ventilation system
- No mechanical work on system under pressure: depressurize before breaking lines
- Always protect gas cylinders from falling
 - → store cylinders in the cabinets or in the stand outside (north gate)





Cryogenic Gases and Dry Ice

BEAM.

- The use of liquid gases (nitrogen, helium) or dry ice needs to be announced beforehand
- Danger of cryogenics burns
 - Use the appropriate personal protection equipment:
 - Cryogenic gloves and safety goggles must be worn (available from the coordinators)
 - Wear closed shoes, long trousers, long sleeves
- Additionally asphyxiation hazard: proper ventilation / oxygen sensor may be required
- Refer to CERN Cryogenics Course









Radiation Safety

General Rules

- Always practice ALARA:
 As Low As Reasonably Achievable
- Key ingredients
 - Proper shielding
 - Minimize exposure time
 - Maximize distance (1/r² is your friend)
- Dose limits from the German regulations (Strahlenschutzverordung)
 - Rad Worker:
 Maximum annual dose for category B / A:
 6 / 20 mSv/a (Lifetime dose of 400 mSv)
 - Everyone else
 Less than 1 mSv/a allowed due to occupation

- For reference: signposted areas at DESY
 - Supervised Area
 Effective dose < 1 mSv/a</p>
 but activation possible
 - Controlled area
 Effective dose > 1 mSv/a
 - Training & Dosimeter required
 - No eating, drinking, smoking
 - No access under 18 and during pregnancy
 - Prohibited area
 Effective dose > 3 mSv/h
 - Entry strictly forbidden
 - Additional sign when Activation Possible









Radiation Safety

BEAM.

Radioactive Material - Shipping and Handling

- Radioactive material and irradiated samples
 - Contact us well in advance
 - RSO/D3 will determine, if a dosimeter is needed
- Needs to be clearly marked and properly stored (thief-proof)
 - Label: details, date, name, group



- Radiation safes in every hut
- Lockable Freezer (-24 °C) in hut 22
- Remove from the safe/freezer (and ship) at the end of your beam time

- Shipping irradiated samples and material to and from DESY
 - Needs to be announced well before (4-6 weeks)
 - All radioactive material coming to DESY has to be reported to the radiation safety group (D3)
 - Shipping will be done in consultation with D3
 - Shipping is your responsibility
 - Transporting samples might be tricky
 - For details see this step-by-step description

Radiation Safety

BEAM.

DESY II Test Beam Facility

- A dosimeter not required when beam is off
- No activation of material in the areas



- Interlock (see following slides) needs to be set before beam shutter can be opened
 - When interlock is set, area becomes a Prohibited Area / Sperrbereich



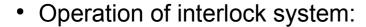
- Yellow doors and the rest of the interlock system are part of the radiation safety
 - Any manipulation or work around radiation protection leads to consequences, up to the cancellation of your current and future test beam(s)
 - If you leave the area, yellow doors should be closed, but **never** be locked/blocked (escape routes)

Beam Interlock

BEAM.

Introduction

 Keys always stay in the cabinet (only needed for maintenance)



User panel in hut and buttons in area

 Area search by single person only (no exceptions)







Setting the Area Interlock

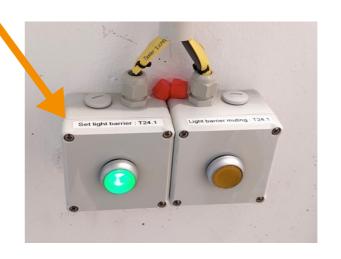
Starting the Procedure

- Do
 - Swipe DACHS card across reader at entrance
 - Go in past the light barrier and press green "Set light barrier" button right after entrance
- Effect
 - Yellow interlock light at entrance and green search buttons inside area will light up
 - Announcement that the interlock search is taking place will run in German and English
- Beware
 - Passing light barrier will break search procedure
 - Second swiping of DACHS card breaks search
 - You do not have to close the door (yet)
 - Don't enter an area when yellow door light is on!











Setting the Area Interlock

Search and Leaving the Area

- Do
 - Search area, confirm at every green search button
- Effect
 - Button turns off, presence confirmed
 - "Light barrier muting" button will light up
- Do
 - Press yellow "Light barrier muting" button (can be done only once) and exit area
- Effect (for ~ 6 seconds)
 - Yellow door light goes off
 - Light barrier switched off to pass it









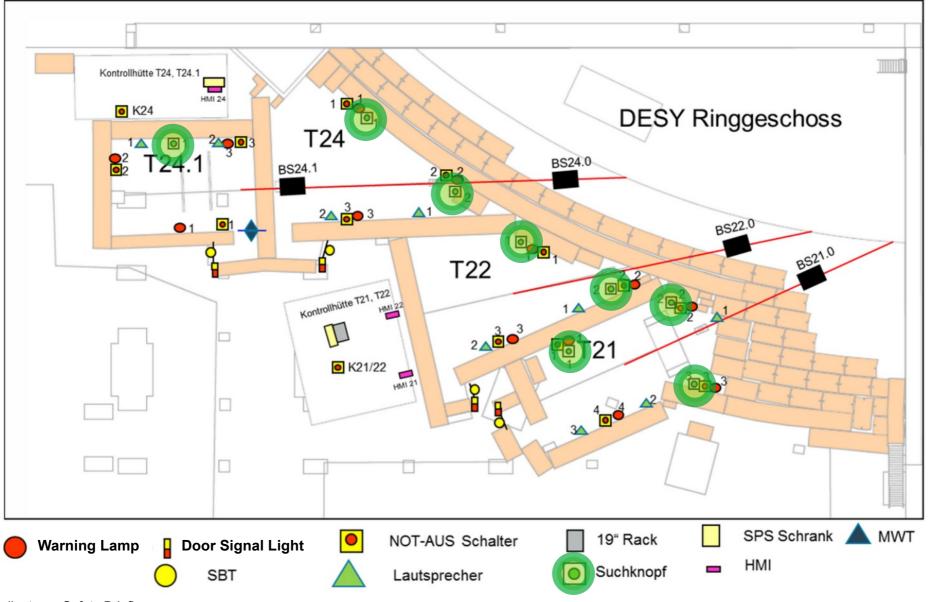


Locations of Search / Emergency-Off Buttons



Skizze Interlockkomponenten in den

Teststrahlgebieten (A. Liedtke)



Setting the Area Interlock

Finishing

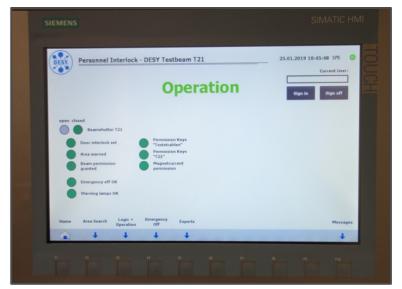
- Do
 - Close door
 - Press "Set button main door"
 - Swipe DACHS card across reader (same card as at start!)
- Effect
 - Door secured, red door light switches on
 - Announcement in area for about 30 s that beam is going to be switched on (German + English)
 - After this:
 - Area ready to switch on beam
 - Door locked when 30 s warning finished
 - Door emergency-open: Use key in red box











Shutter Operation and Breaking Interlock

TEST BEAM.

Operation

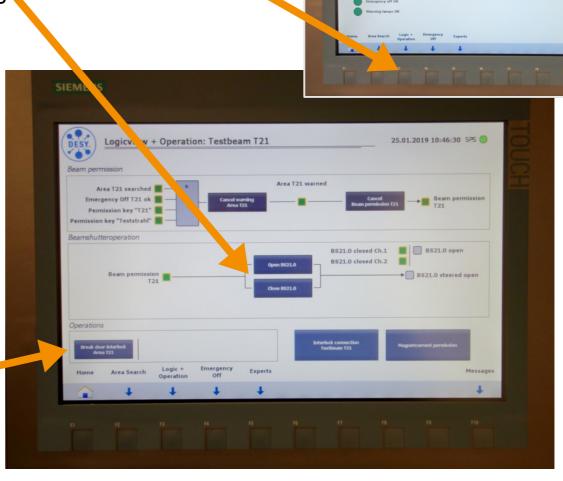
• Display in hut: Go via button on bottom to "Logic + Operation"

Shutter operation (BS = Beam Shutter)

Open / close via respective touch screen buttons



- Interlock breaking
 - Press on touch screen
 "Break door interlock Area TXY"



Radiation Warnings inside Areas

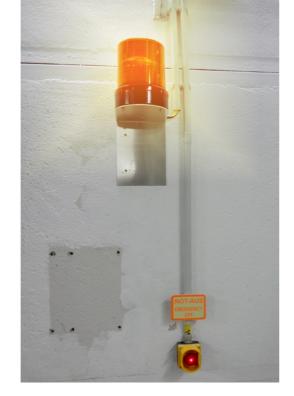
BEAM.

Danger to Life: Immediate Action Required

- Interlock set, ready for beam
 - Orange warning lamps will flash
 - Voice announcing in German and English that beam is to be turned on

 \rightarrow

If inside area: ~ 30 sec to save your life!



Press Emergency-off
and / or
Leave area though door / light barrier

- Area open, not interlocked
 - Loud warning signal
 - Radiation alarm sign switches on



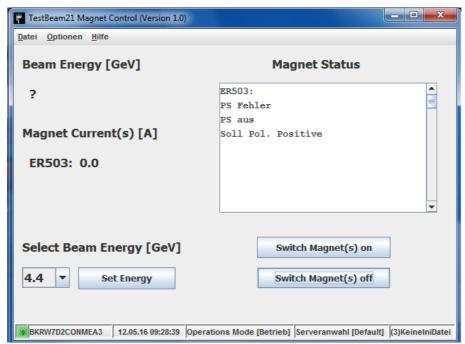
- → Leave area immediately (avoid crossing beam path)
- Keep others from entering
- Call control room (BKR \$\simeq\$ 3500)
 to immediately shut off machine
 and inform test beam coordinators

Beam Operations

BEAM.

- Operation via Software
 - MEA PC in corner of hut
 - Powering on the beam dipole and selecting desired energy

- Checking status of magnet power supplies
 - All 5 green LEDS need to be on to power up
 - Big red light indicates, if magnet is powered





PCMAG Magnet Interlock in T24/1

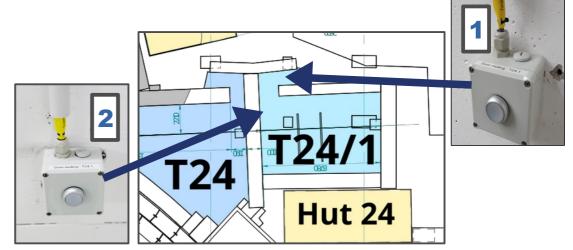
Setting and Bridging

- PCMAG interlock set by closing blue door during normal beam interlock procedure
- Temporary access for small adjustments only!
 - Release beam interlock door in touch panel
 - → Magnet current warning sign active
 - Bridging (2 person procedure):
 - Check carefully for magnetic tools, watches, jewelry etc.
 - 1st person keeps pressed "door mute" button "1" at area entry
 - 2nd person enters and keeps pressed door mute button "2"
 - 1st person releases button "1" and enters area
 - Close blue door and release button "2"
 - Exiting likewise in reverse order
 - Here only exception for beam interlock:
 - 2 persons allowed during area search
 - → Extra careful!





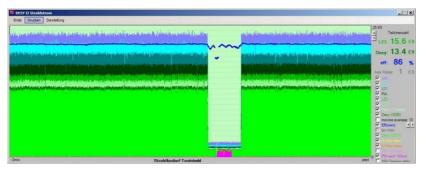


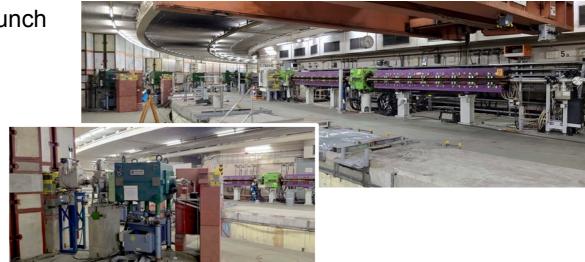


DESY II Test Beam



- **DESY II** synchrotron: 6.3 GeV, typically 6-15 x 10⁹ e⁻ / bunch
 - Injector for PETRA III:
 Depending on mode, top-up every few minutes





Wednesdays

- Machine studies possible 7-15h → beam might not be stable
- Every second Wednesday: no beam from 07:00 till noonish possible
- Operating costs: ~ 500 € /hour (84000 € /week) → Use your beam time well and save power (cost)
 - Close shutter when beam not used (saves RF power)
 - Switch off beam magnets for longer breaks (automatic switch-off when shutter closed > 60 min)

Closing Remarks I



Most important: think before doing

- For more information see our web page: http://testbeam.desy.de
- Refer also to safety information and reference provided in cabinets

 Web page of our favorite synchrotron: https://min.desy.de/beschleuniger/desy_ii/

• In doubt: ask us!





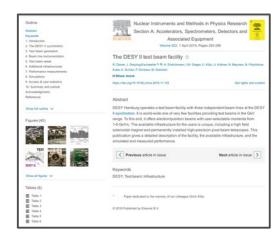
Closing Remarks II



• More information about the working and parameters of the DESY II test beam and the installed infrastructure can be found in the recent **reference publication**:

"The DESY II test beam facility" (https://doi.org/10.1016/j.nima.2018.11.133)

NIMA, Volume 922, 1 April 2019, Pages 265-286



 The following note is expected to appear in the acknowledgment of all publications, presentations and posters based on data taken at the DESY II test beam:

"The measurements leading to these results have been performed at the Test Beam Facility at DESY Hamburg (Germany), a member of the Helmholtz Association (HGF)."

• In accordance with the *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities*, signed by all German research organizations, the Helmholtz Association among them, the Deutsches Elektronen-Synchrotron supports the **open access** movement.

Therefore, we encourage our users to publish their scientific results, that are based in total or in part on data taken at the DESY II Test Beam Facility, in open access journals.