DESY II Test Beam Facility

Safety Briefing BL4S Edition

Coordinators:
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Status: 10/19/19

For more detailed information, see general DESY safety instructions
Introduction

- Each user has to attend this safety lecture once per year
- The 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 should be present during the test beam!
  - This person is responsible for the actions of the whole group
  - All communication should include this person
  - If more than one group in an area: assign one coordinator
  - All responsibilities have to be filled in the door sheet (including a mobile phone number) which has to be placed at the entry of the hut
  - Communicate any changes of responsible person ASAP
- **Before** data taking: Safety check by the test beam coordinators (in case of special setups: involvement of DESY safety group)
General Safety Rules

• Obey the safety signs!
• Follow the instructions
  • No people with pacemakers or other medical implants in the hall
  • Do not touch or enter areas signed as electrical area
  • Do not wander into other areas of the hall
  • **No** open fires, smoking, eating or drinking in hall
    • Food and drinks (*non-alcoholic*) only inside huts
  • Working alone only for data taking (*in the hut*) and during normal working hours (*i.e. 8-17h, Mo-Fr*)
    • Outside these times or inside areas: ≥ 2 people
    • **Underage persons** (below 18 yrs.) have to be always under supervision

• **NEW**
  Test beam hall access controlled by DACHS system

• Watch out for crane work
  • Stay clear of hanging loads, wear protective clothes (hard hat, safety shoes) when assisting
DACHS

DESY Access Control Handling System

• DACHS card mandatory for the DESY test beam
  • Entry in the DESY person information system by Indico registration for your beam period

• Card can be obtained in Bld. 6 / Room 110
  • Personalized ID: Must not be handed to others

• Three levels of permissions
  • Access hall & huts
  • Interlock permission
  • Coordinator

<table>
<thead>
<tr>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>blue</td>
<td>DACHS ready</td>
</tr>
<tr>
<td>green</td>
<td>Access granted</td>
</tr>
<tr>
<td>green</td>
<td>Hold card longer in front of terminal</td>
</tr>
<tr>
<td>red</td>
<td>Access denied</td>
</tr>
</tbody>
</table>
Unattended Data Taking

• Some 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

• 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…

• Unattended data taking is not allowed
  when hazardous material is in use
  (i.e. flammable gas or radioactive material, …)
# Phone Numbers and Emergency Call

<table>
<thead>
<tr>
<th>Emergency (Notruf)</th>
<th>2500</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESY Mobile</td>
<td>66-2500</td>
</tr>
<tr>
<td>External Mobile</td>
<td>+49-40-8998-2500</td>
</tr>
</tbody>
</table>

| Technical Emergency Service | 5555 |
| Accelerator Control Room (BKR) | 3500 |

**Coordinators**

- Ralf Diener | (9)3426 |
- Norbert Meyners | (9)3321 |
- Marcel Stanitzki | (9)4930 |

Telescope Support | https://tblogs.desy.de |
Porter’s Lodge Notkestrasse | 3333 |

- In case of an **emergency**: Call 2500
- **Never** call external emergency number
- DESY SAVE will help as fast as possible
- Remember your first aid training and help!
- First aid supplies in white lockers: close hut 22 and in south west corner of hall
- Inform the test beam coordinators about any safety relevant incident that occurred

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*If you hear anomalous noise or notice other strange things (water floods...) → Technical Emergency Service (☎️ 5555) (take into account to leave the hall)*
Escape Routes and Assembly Point

Building 27
Behavior in Case of Fire

- **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 → loud alarm from smoke detectors and sirens
  - 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 (☎ 5555)
Emergency Off

• Emergency-off buttons in huts and areas
  • Keep them always accessible
    *(no boxes, tables etc. placed in front)*

• **NEW**
  Emergency-off kills both the beam and electrical power

• Electrical circuits:
  T21 + T22 together and T24 + T24/1 together
  →
  Take power only from inside specific area or hut, respectively

• **NEW**
  Areas/hut equipped with mobile emergency lights
  *(keep them accessible, no material, tables etc. in front)*
Hall Lights

Both light switches are labeled: “Hallen-Licht”

Switches lights on “south side”

Switches lights on “north side”

T21

Hut 21/22

T22

T24

T24/1

Hut 24
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 connectors:
    - NO HV on standard Lemo 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)
  → Use a warning sign!
- NEW
  No more HV warning lamp at area entrance

- 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.
- NEW
  Huts: use only power strips with included residual-current device
General Tidiness

- Keep the areas tidy and escape routes *(basically all ways in any area)* clear **at all times**
  - This includes setup phase, too!
- No trash or boxes in areas where people walk
- Use larger trash bins in hall or containers outside of the hall for your garbage
  - Small trash bins can be emptied into large bins
  - Remove smelly trash from the control huts
- Cleaning staff does not come regularly
- Clean up before leaving the area: The incoming group will appreciate it
- Leave the blue, nice & clean chairs in the huts and only use the grey, old ones in the areas
Translation Stages / Ladders / Bricks

**Stages**
- Be careful! Danger of squeezing
- The big green stages can carry up to 1 t

- Stay in contact via phone during remote operation if people are inside the area
- Make sure that the stages do not touch other equipment when they move remotely *(Stages with adjustable end switches are available)*
- Make sure that you don’t rip your cables

**Ladders:** working on ladders is dangerous
- Do **not** take broken ones
- Use properly: correct angle, solid ground, both feet on the ladder
  - Best if a second person is holding it
- You are not allowed to climb on the walls or huts!
- **Always** use a ladder, step-stool, elephant foot
- **Never** use tables, (swivel) chairs, infrastructure

**Lead/Iron bricks**
- The bricks are heavy
- Lead is poisonous
  - Avoid hand-mouth contact → wear gloves
  - Applies also to lead collimators in areas
  - Don’t scrape the lead collimators
Test Magnets

Operation only by trained users (extra training)

- **1 T is a strong field**
  
  \[ \rightarrow \text{forces very high (lifts e.g. gas bottle easily)} \]

- Magnets connected to door interlock

- BRM Dipole in T21: no access

- PCMAG in T24/1:
  
  - Access allowed by bridging blue door
    
    \[ \text{Careful: takes up to 12 h to cool down after emergency-off by broken interlock} \]
  
  - For small adjustments only!
  
  - Check carefully for magnetic tools, jewelry...

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

- Always keep control area at back of hut accessible (no laptops, food, bags etc.)
Laser Safety

• Laser alignment system in all beam lines
  • Height: ~1.70 m → ~ eye level for 1.80 m person
  • Class 1M laser system:
    1M: accessible laser radiation not hazardous in sensibly foreseeable conditions
    1M: 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 → not all people have this reflex!

• Rules
  • Limit access (number of people)
  • Never look directly into the laser: turn away / close eyes if accidentally doing so
  • Only use one laser direction at a time
  • Never use optical instruments or reflecting tools
  • Use laser only during alignment, switch off immediately after

• NEW
  All laser of class 3R, 3B or 4 brought to DESY have to be announced > 4 weeks in advance, including a description / sketch + risk assessment

• See also: DESY laser regulations
Gas Safety

- Announce use well in advance
- Pre-mixed gases can be supplied
- Adjust measures to specific gas (mixture)
- Flammable gases possible
  - **NEW**
    - No more warning lamp at entrance
    - Movable gas safety system
- Use exhaust and ventilation system
- **No** manipulation of the gas safety system
- **No** mechanical work on a running gas system: depressurize before breaking lines
- **Always** attach gas cylinders
  - Store gas cylinders outside or in cabinets
Radiation Safety

General Rules

• Always practice ALARA: As Low As Reasonably Achievable

• Key ingredients
  • Proper shielding
  • Minimize exposure time
  • Maximize distance ($1/r^2$ is your friend)

• Dose limits from the German regulations (Strahlenschutzverordnung)
  • 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

• Signposted areas
  • **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
Radiation Safety

DESY II Test Beam Facility

- A dosimeter not required when beam is off
- **Interlock** (see following slides) needs to be set before beam shutter can be opened
  - Area becomes *Prohibited Area / Sperrbereich* when beam is present

- **Yellow doors** and interlock system
  - The yellow doors and the rest of the interlock system are part of the radiation safety
  - Any manipulation of or attempt to work around radiation protection leads to consequences up to immediate cancellation of your current and future test beam(s)
  - If you leave the area, the doors should always be closed

- **Additional radioactive material** (sources or irradiated samples)
  - Dosimeter will be mandatory if dose is > 5 μS/h in 30 cm distance
  - Needs to be clearly marked and properly stored

- Additional training required (see here)
  - Contact us well in advance
Beam Interlock

New System

• Keys
  • Safety keys for test beam general + single areas
  • NO keys needed for search anymore
    • Do not remove them from cabinet!

• User panels in the hut
  • Touch screen + buttons on the bottom

• Area search by single person only!
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
  • **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
NEW Locations of Search / Emergency-Off Buttons
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
    - **NEW** Door locked when 30 s warning finished
  - Door emergency-open: Use key in red box
Shutter Operation and Breaking Interlock

- 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

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

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 📞 3500) to immediately shut off machine and inform test beam coordinators
Beam Operations

- Operation via Software
  - MEA PC in corner of hut
  - Powering on 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
DESY II Test Beam

- DESY II synchrotron: 6.3 GeV, typically $6\times10^9 \text{ e}^-/\text{bunch}$
- Injector for PETRA III:
  Depending on operating mode, top-up every few minutes

- Machine mornings:
  no beam every second Wednesday from 07:00 till \textit{noonish}
- Operating costs (estimate): 500 €/hour $\rightarrow$ 84000 €/week
- Make good use of your beam time and save power (=cost)
  - Close shutter when beam not used
  - Switch off beam magnets for longer breaks
Closing Remarks I

• These rules are for your safety!

• 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://desy2.desy.de/
  (logbook, status, calendar, maintenance schedule)

• 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

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- Include the following acknowledgment sentence in 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)."