

# DESY II Test Beam Facility

## Safety Briefing

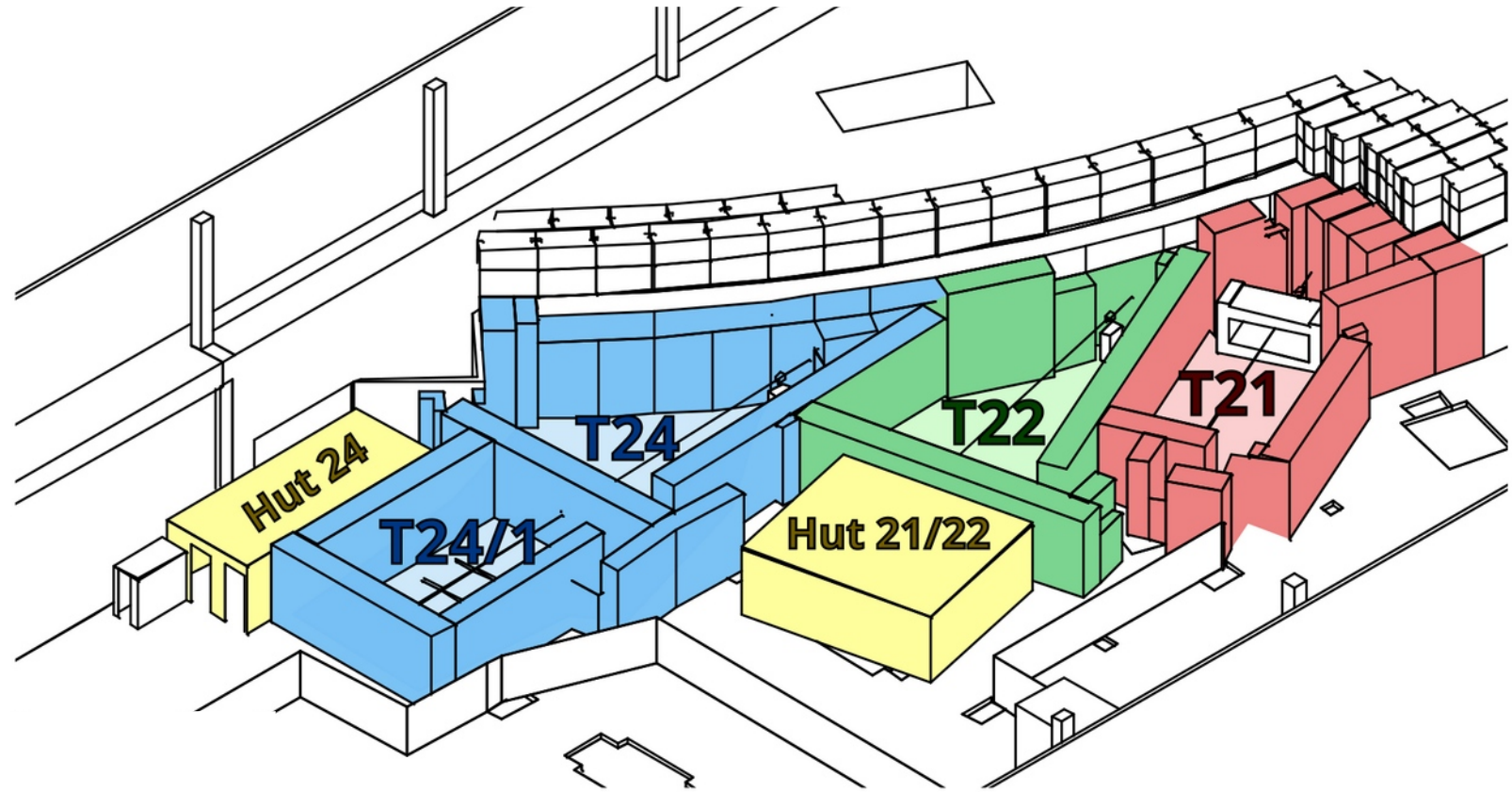
Coordinators:

Ralf Diener

Norbert Meyners

Marcel Stanitzki

Status: Apr 23, 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

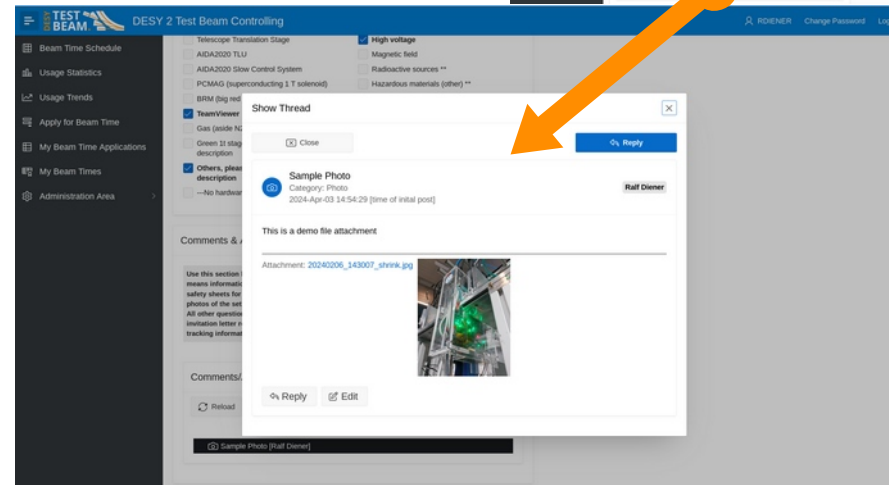
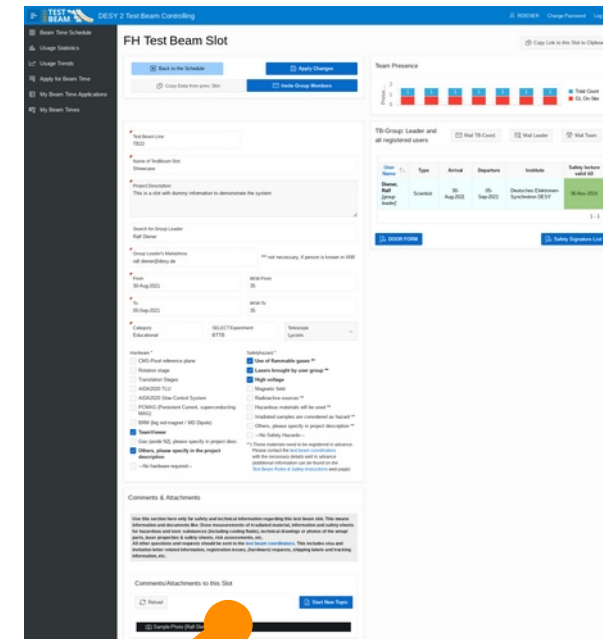


# Introduction

- **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



## 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)

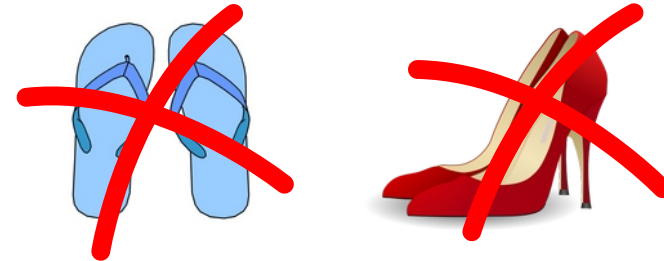


- **Working alone is not permitted**, there always has to be a second person that can call for help

- 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



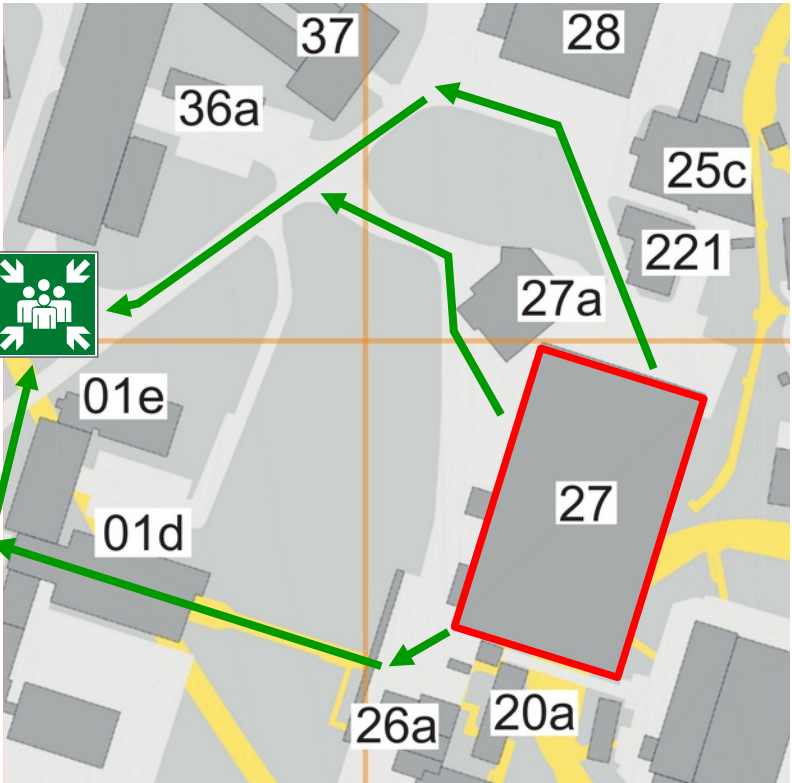
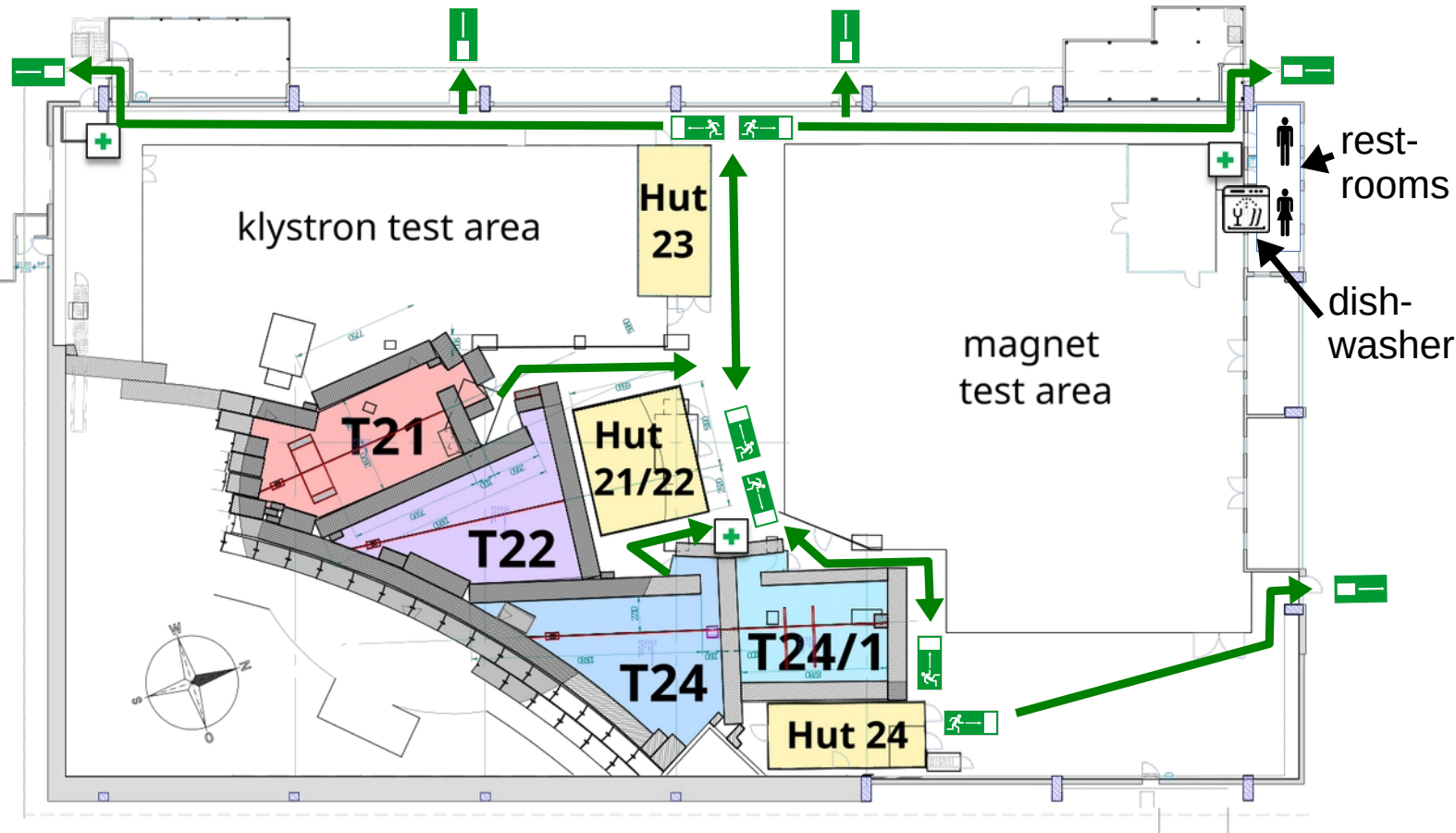
Emergency (Notruf)	2500	
DESY Mobile	66-2500	
External Mobile	+49-40-8998-2500	
Technical Emergency Service	5555	
Accelerator Control Room (BKR)	3500	
Coordinators		
Ralf Diener	(9)3426	
Norbert Meyners	(9)3321	
Marcel Stanitzki	(9)4930	
Telescope Support	<a href="mailto:telescope-support@desy.de">telescope-support@desy.de</a>	
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

- **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 CO<sub>2</sub> fire extinguisher
- Inform test beam coordinators and Technical Emergency Service (☎ 5555)





# 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, ...)



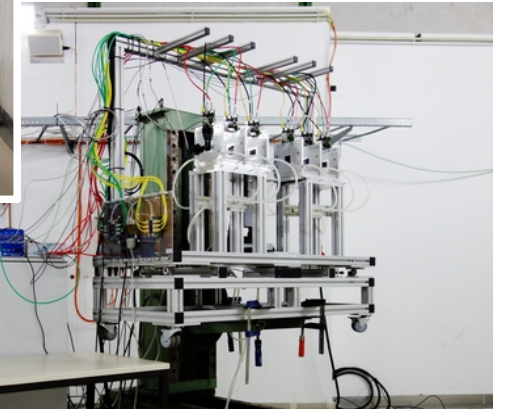
# Translation Stages

- 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](mailto: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  $\mu\text{m}$  silicon sensors
  - Watch out the travel range of the PI- $\mu\text{m}$ -stages
  - Telescope low voltage provided by uninterruptible power supply (8 V Mimosa26, 15 V PMTs)

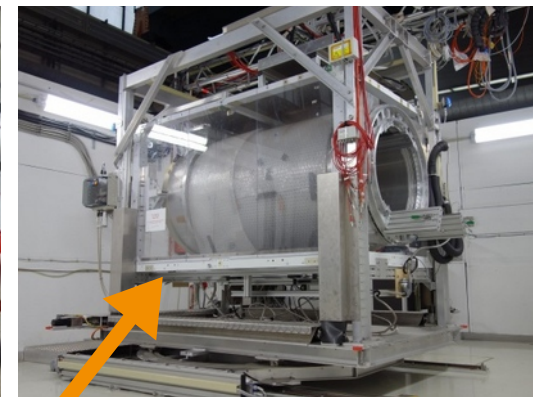
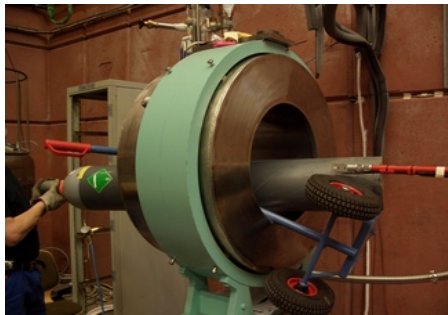


- Usage:
  - Data flow should be over the local network 192.168.<2x>.<x> ranges
  - Copy your data saved from the local raids after your test beam to free the disk space

# Test Magnets

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



- BRM Dipole in T21: no access
- 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 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
    - 1M**: as long as **no** optical instruments used!
  - $\rightarrow$  Operation restricted by key switch, warning sign at entrance



- Portable cross laser
  - Class 2: with intact protection reflexes no risk to eyes  $\rightarrow$  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 properly 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

- 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 ( $1/r^2$  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 due

- For reference: signposted areas at DESY
  - **Supervised Area**  
Effective dose  $< 1$  mSv/a  
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**



## 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

## 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)

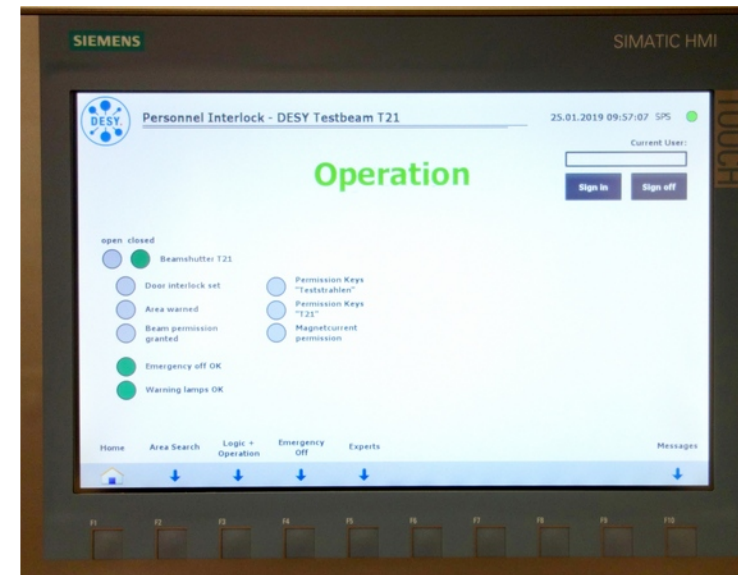




# Beam Interlock

## Introduction

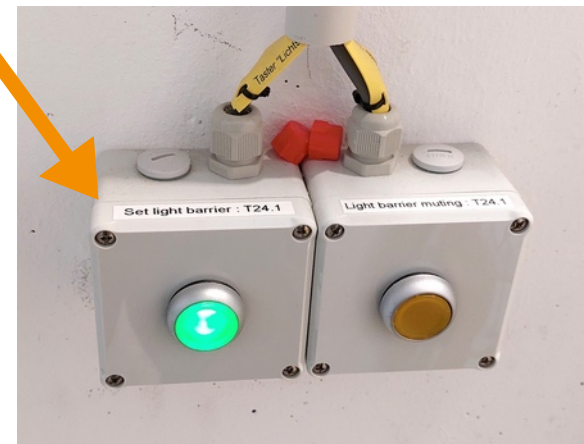
- Keys always stay in the cabinet (only needed for maintenance)
- Operation of interlock system:
  - User panel in hut and buttons in area
- Area search by **single person only (no exceptions)**



# Setting the Area Interlock

## Starting the Procedure

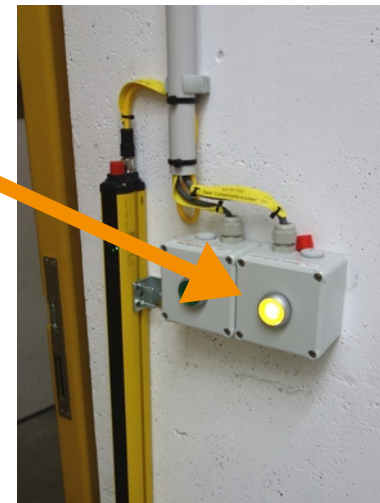
- Do
  - Swipe DACHS card across reader at entrance
  - Go in past the light barrier and press green “Set light barrier” button right after entrance
- Effect
  - Yellow interlock light at entrance and green search buttons inside area will light up
  - Announcement that the interlock search is taking 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
  - **Don't enter an area when yellow door light is on!**



# Setting the Area Interlock

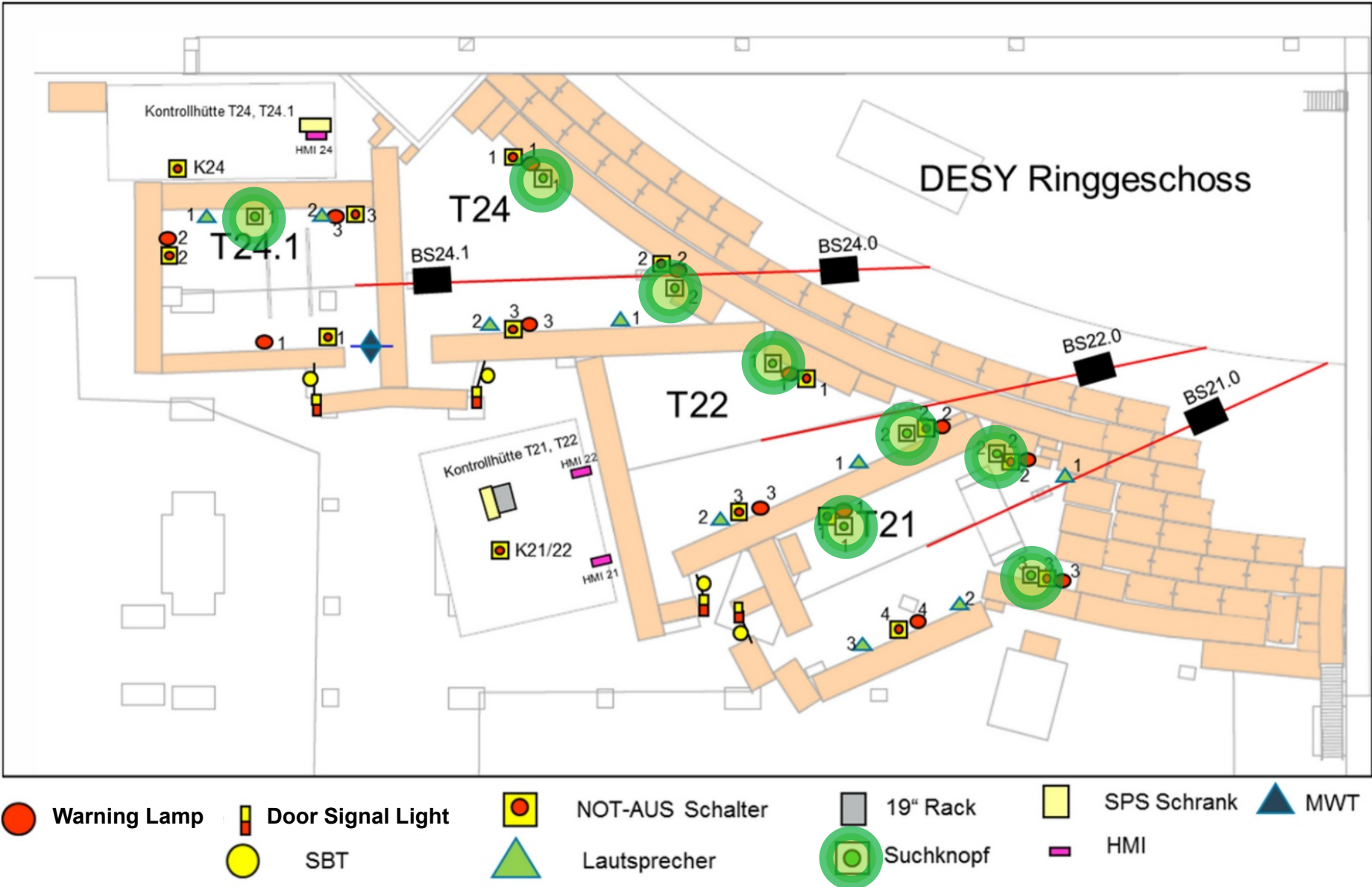
## Search and Leaving the Area

- 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

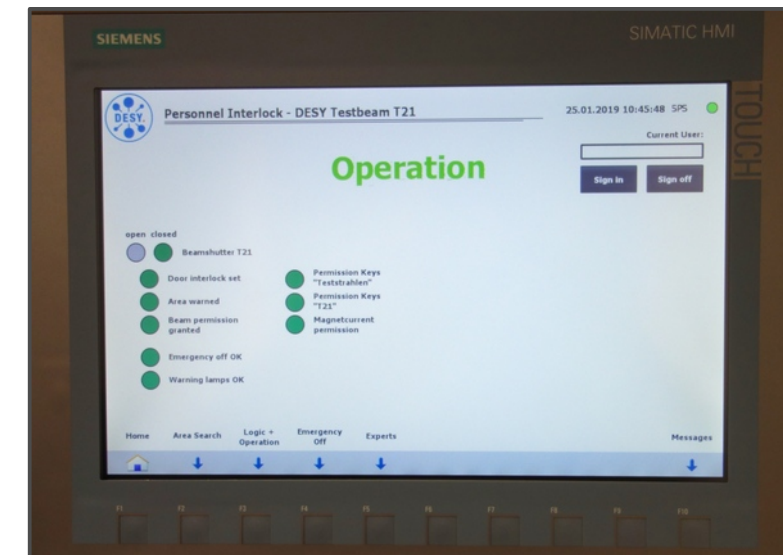
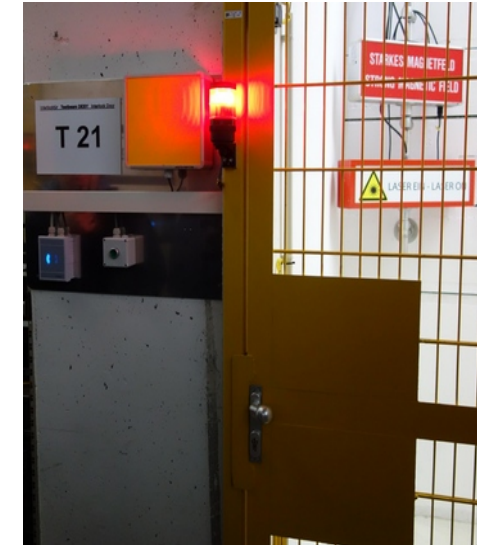


Skizze Interlockkomponenten in den Teststrahlgebieten (A. Liedtke)

# 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



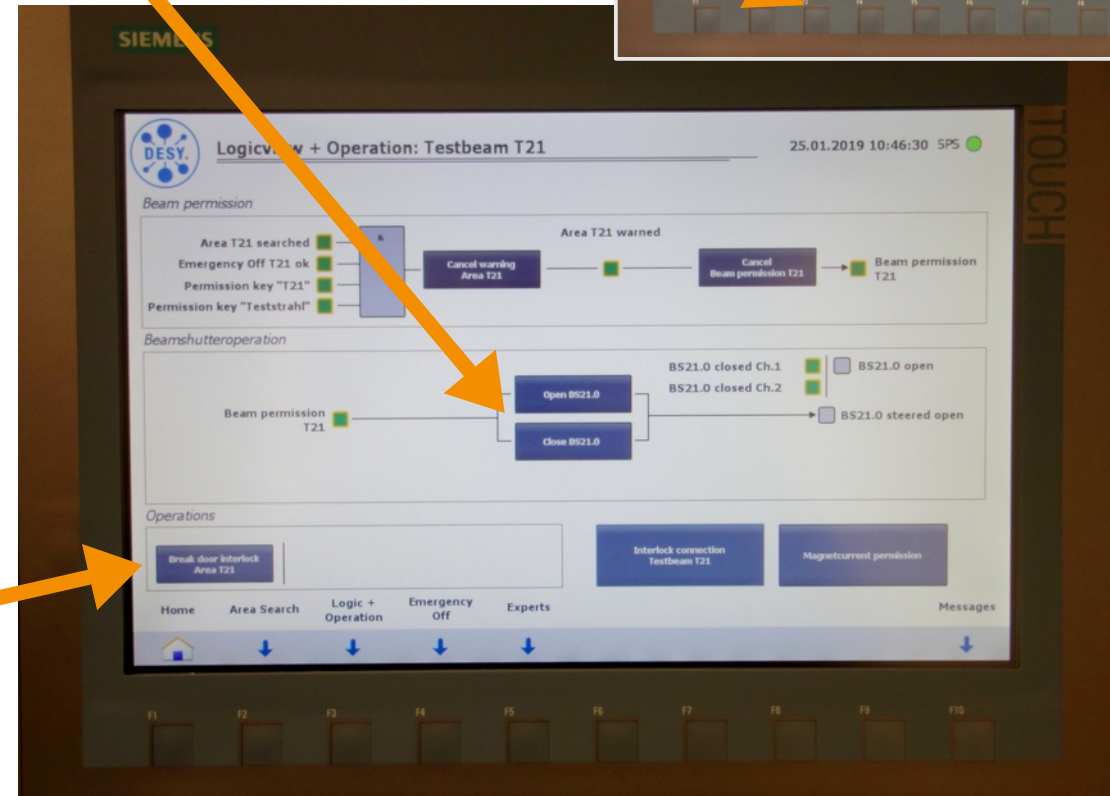
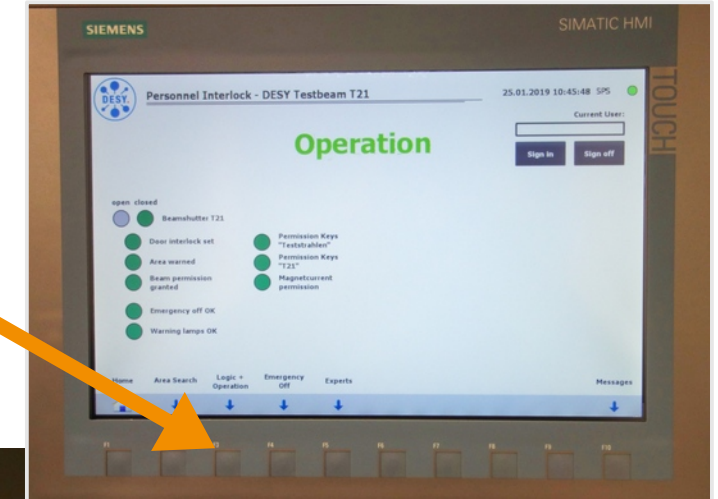


# Shutter Operation and Breaking Interlock

- 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

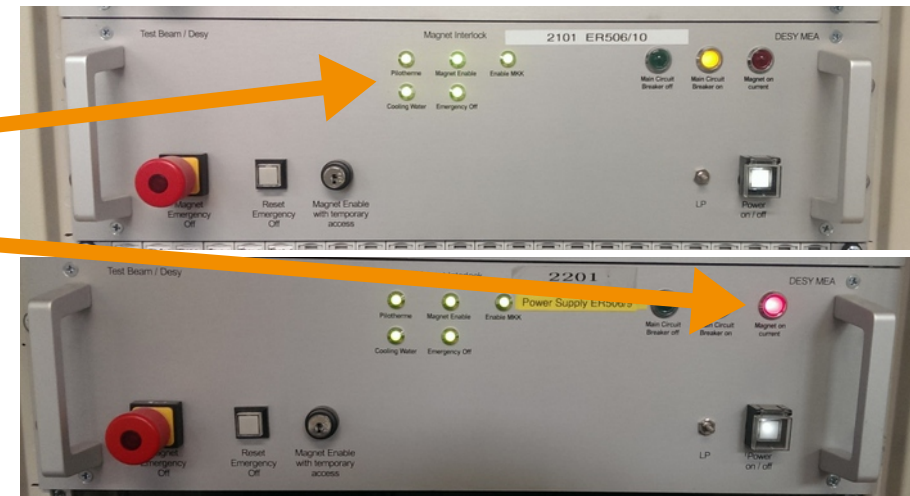
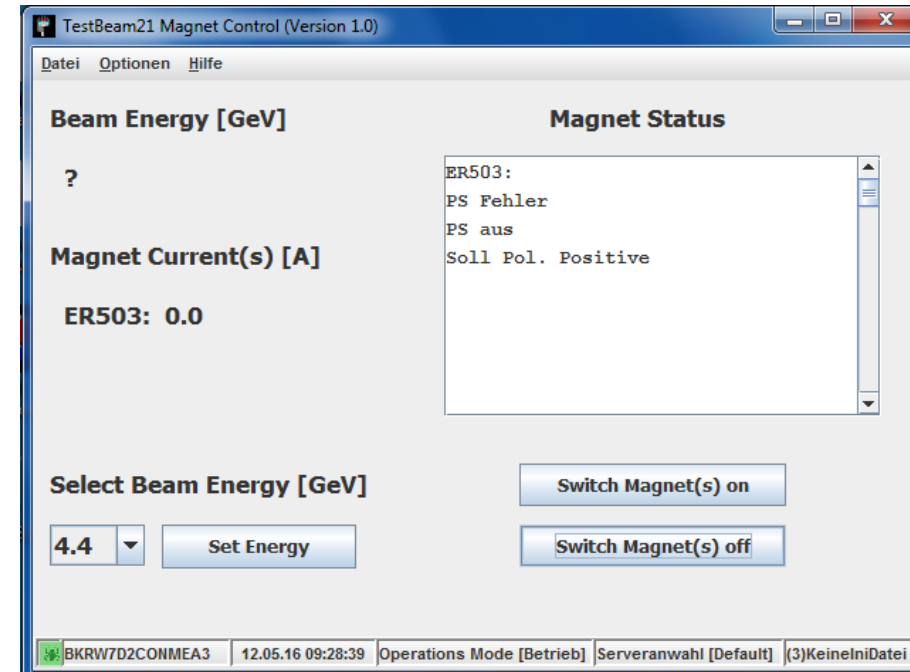


→ **Leave area immediately**  
***(avoid crossing beam path)***

- 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 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

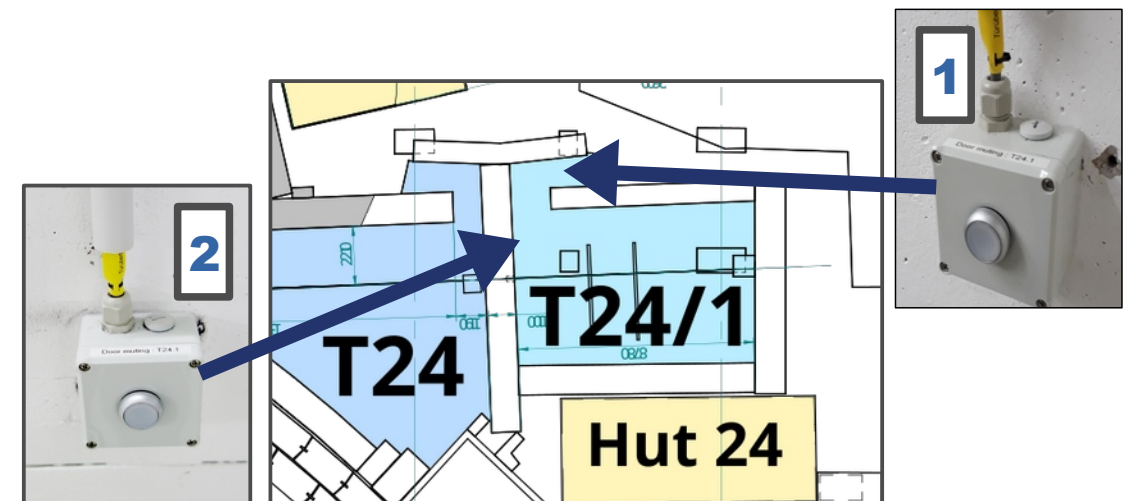
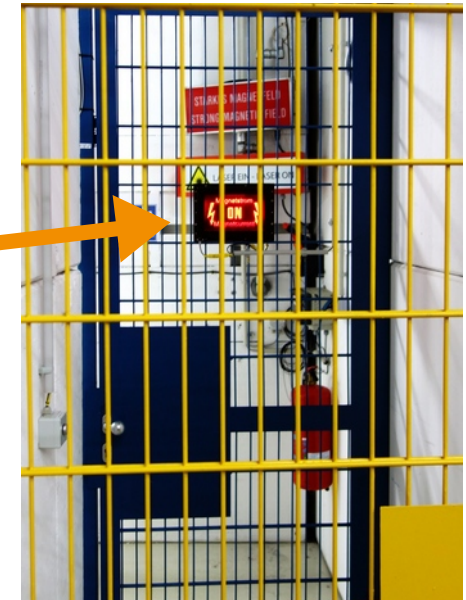




# PCMAG Magnet Interlock in T24/1

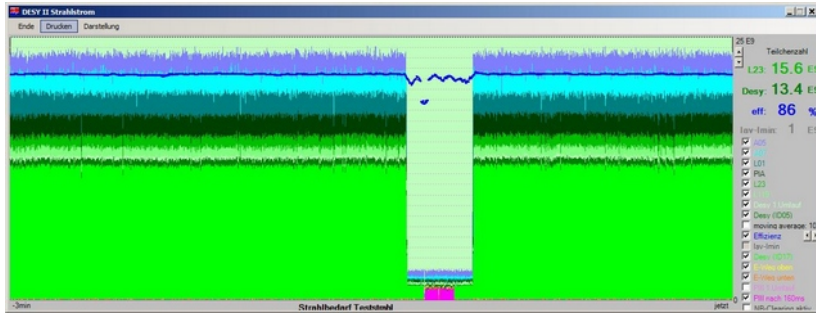
## Setting and Bridging

- 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.
  - 1<sup>st</sup> person keeps pressed “door mute” button “1” at area entry
  - 2<sup>nd</sup> person enters and keeps pressed door mute button “2”
  - 1<sup>st</sup> 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!**





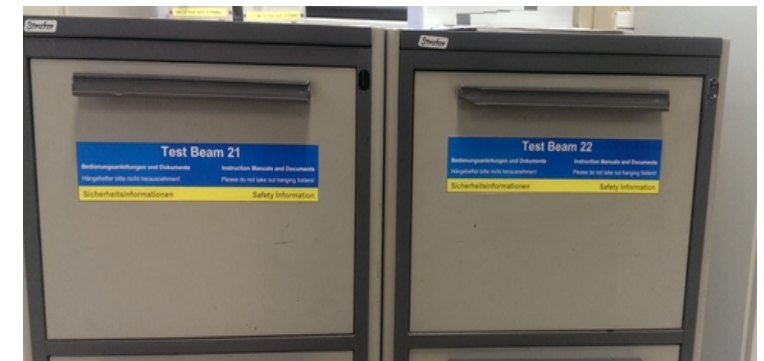
- **DESY II** synchrotron: 6.3 GeV, typically  $6\text{-}15 \times 10^9 \text{ e}^- / \text{bunch}$
- Injector for PETRA III:  
Depending on mode, top-up every few minutes



- **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 HF 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/](https://min.desy.de/beschleuniger/desy_ii/)
- In doubt: ask us!

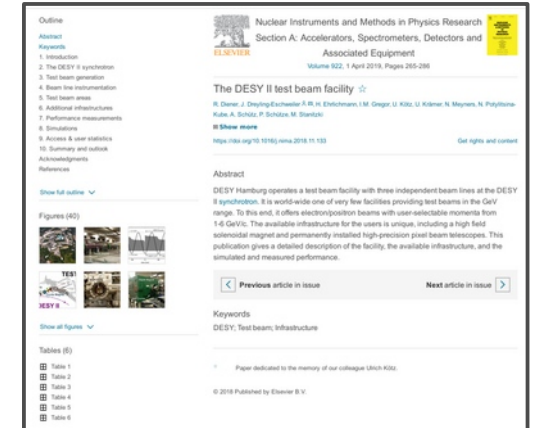


# Closing Remarks II

- 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.