

DESY II Test Beam Facility

Safety Briefing

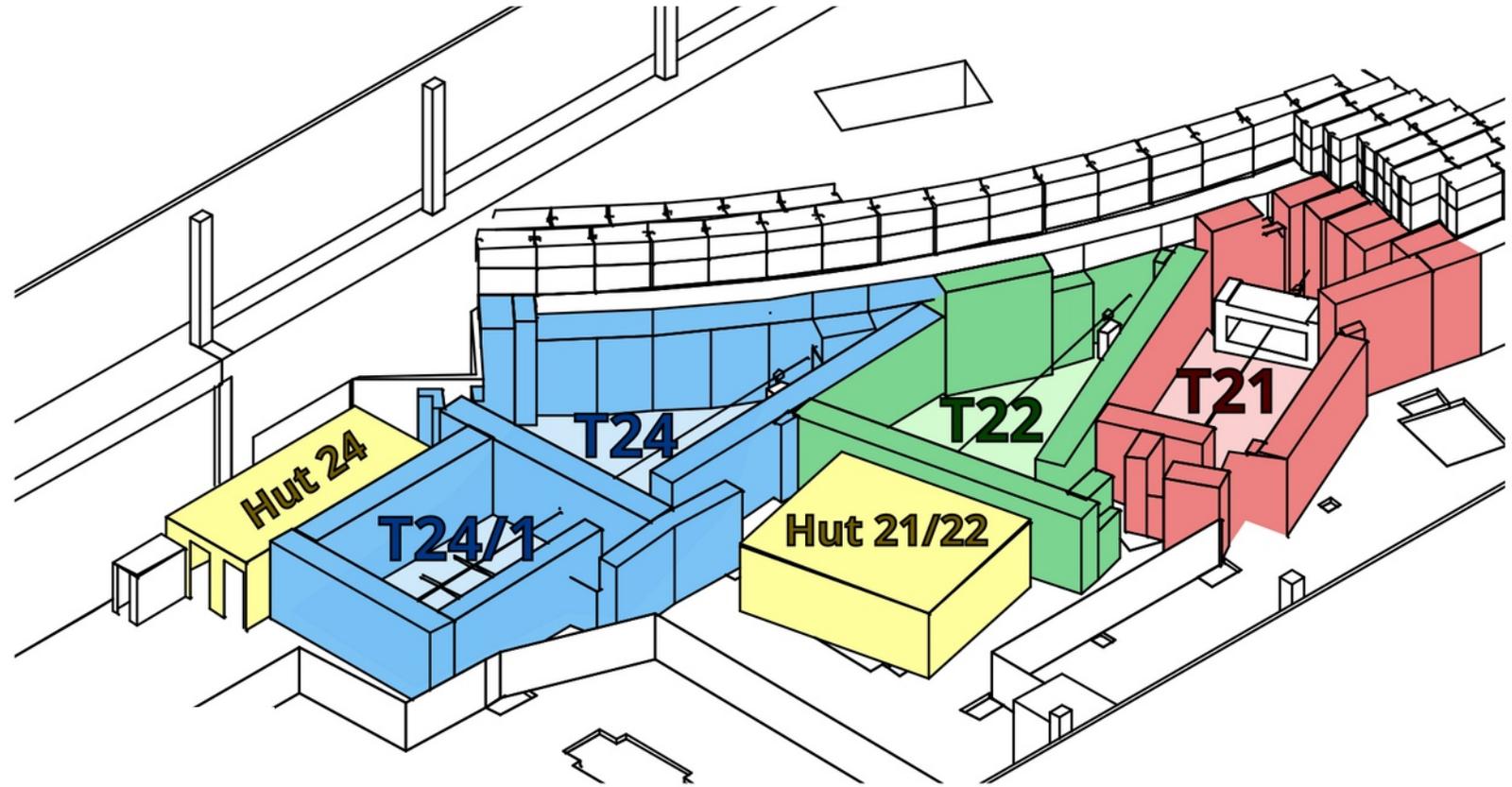
Coordinators:

Ralf Diener

Norbert Meyners

Marcel Stanitzki

Status: Apr 23, 2025



Introduction

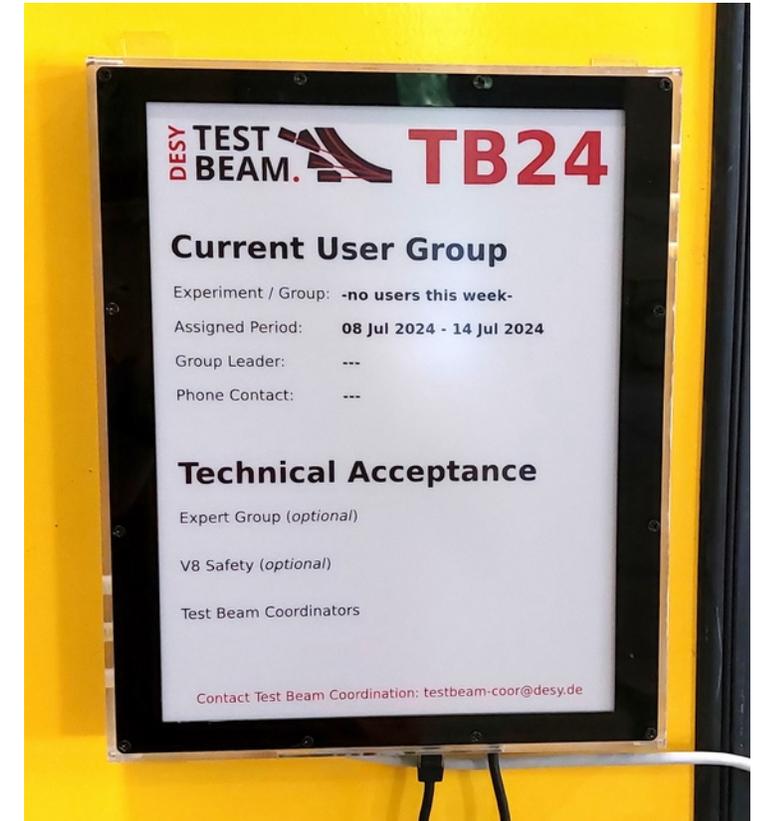
- In this lecture, your attention is not optional



→ 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

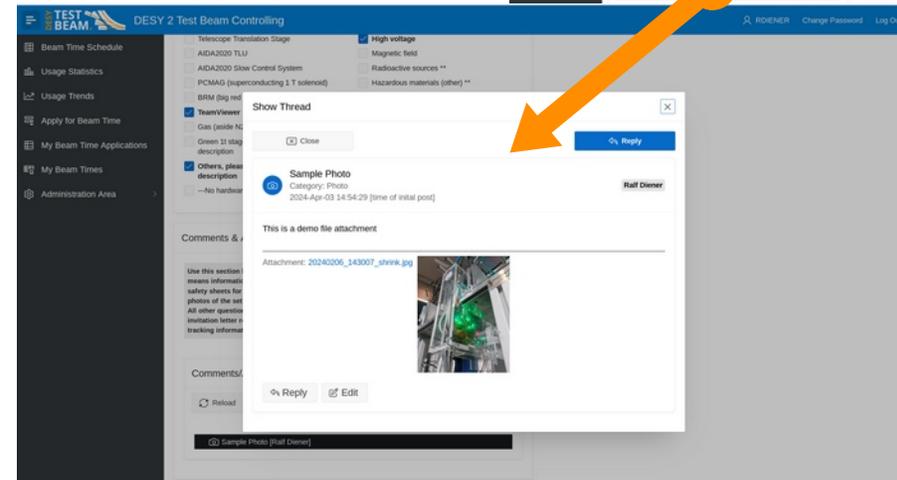
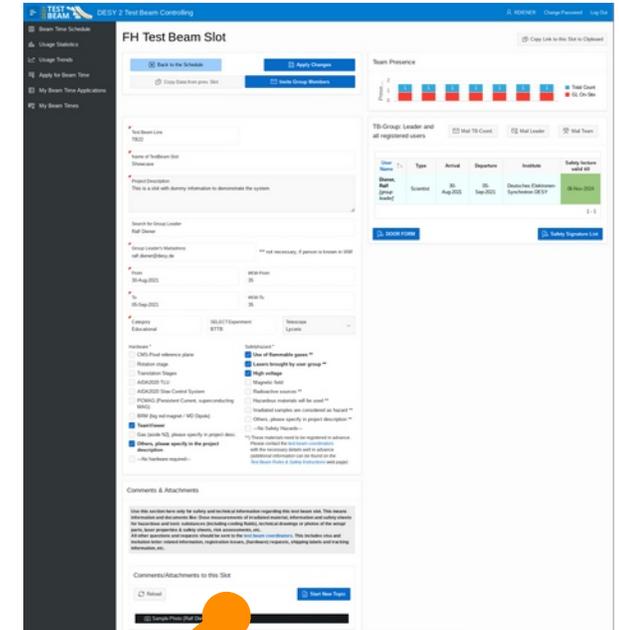


Introduction

- **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!

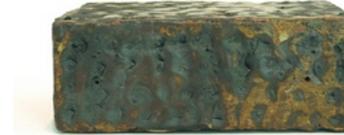
- Do not set up working places in the hall area outside the huts and beam areas

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



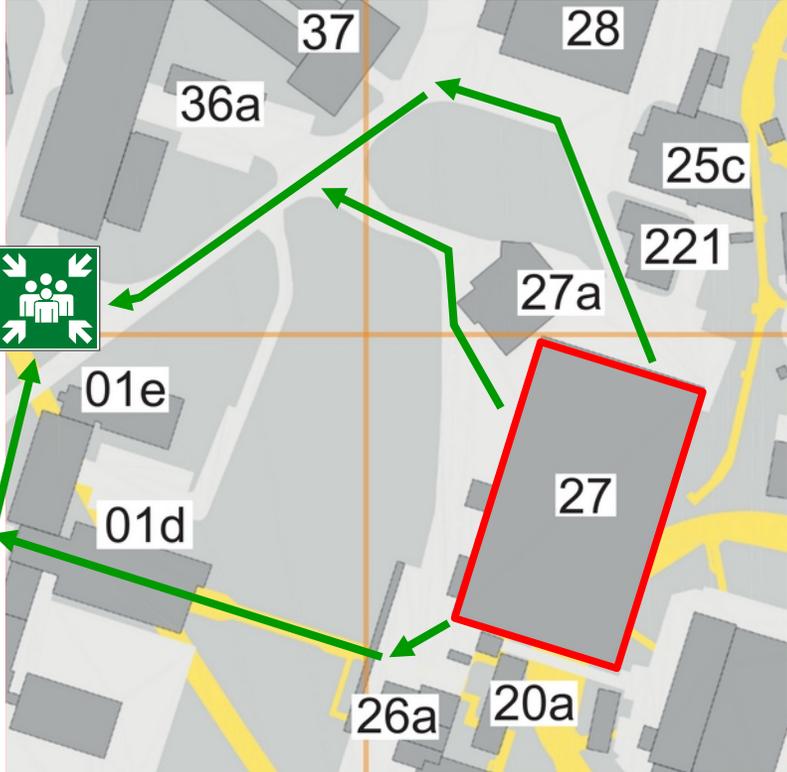
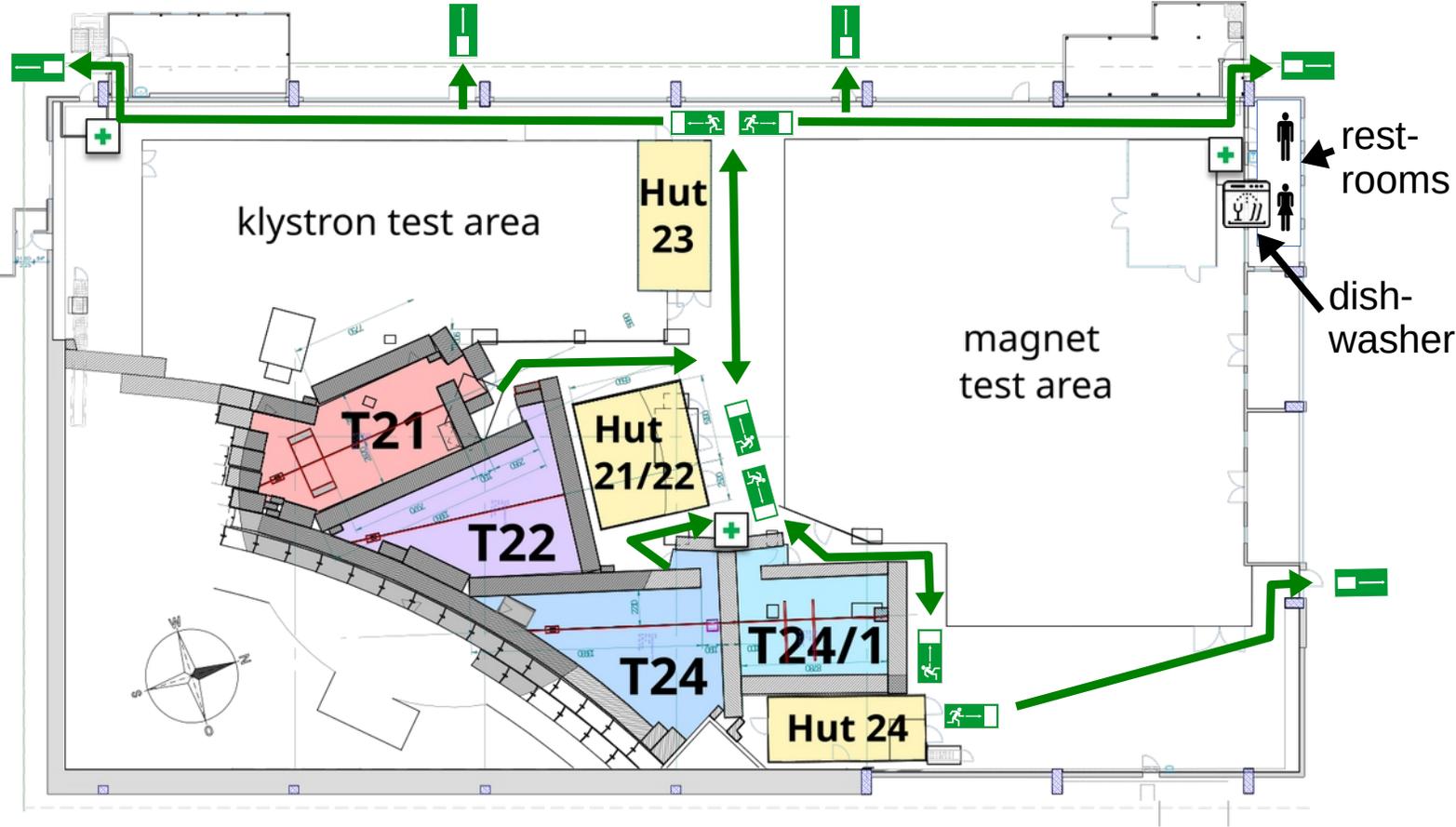
Emergency (Notruf)	2500	
DESY Mobile	66-2500	
External Mobile	+49-40-8998-2500	
Technical Emergency Service	5555	
Accelerator Control Room (BKR)	3500	
Coordinators		
Ralf Diener	(9)3426	
Norbert Meyners	(9)3321	
Marcel Stanitzki	(9)4930	
Telescope Support	telescope-support@desy.de	
Porter's Lodge Notkestrasse	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

- **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 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

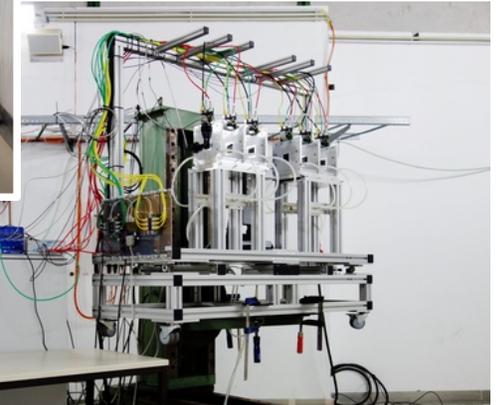
- Remote controlled
 - Stay in contact via phone during remote operation if people are inside the area

- 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)

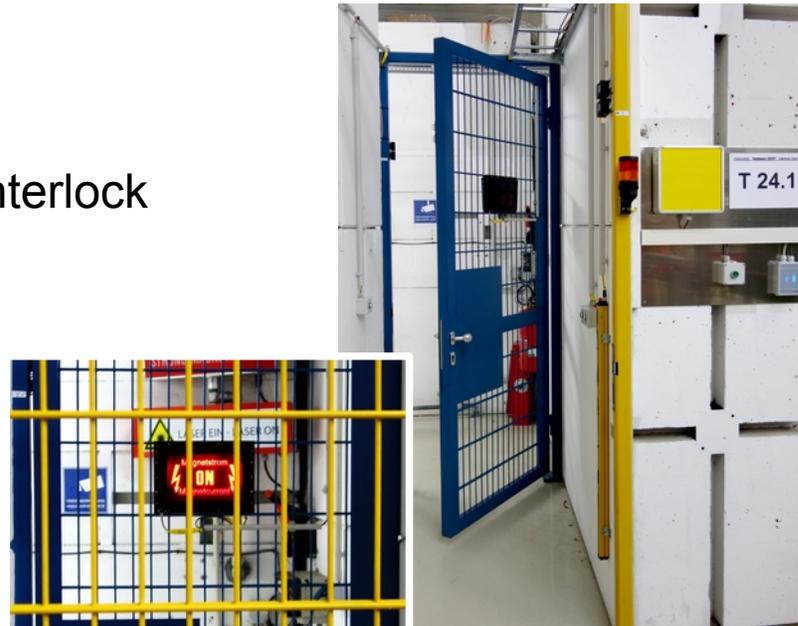


- Usage:
 - Data flow should be over the local network 192.168.<2x>.<x> ranges
 - Copy your data saved from the local raids after your test beam to free the disk space

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: ~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 → 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: $> 60 \text{ V (DC)}$
 $> 25 \text{ V (AC)}$



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

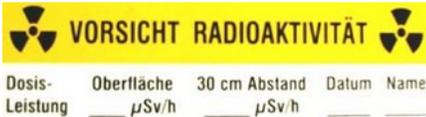
- Always practice **ALARA**:
As Low As Reasonably Achievable
- Key ingredients
 - Proper shielding
 - Minimize exposure time
 - Maximize distance ($1/r^2$ is your friend)
- Dose limits from the German regulations (Strahlenschutzverordnung)
 - Rad Worker:
Maximum annual dose for category B / A:
6 / 20 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)

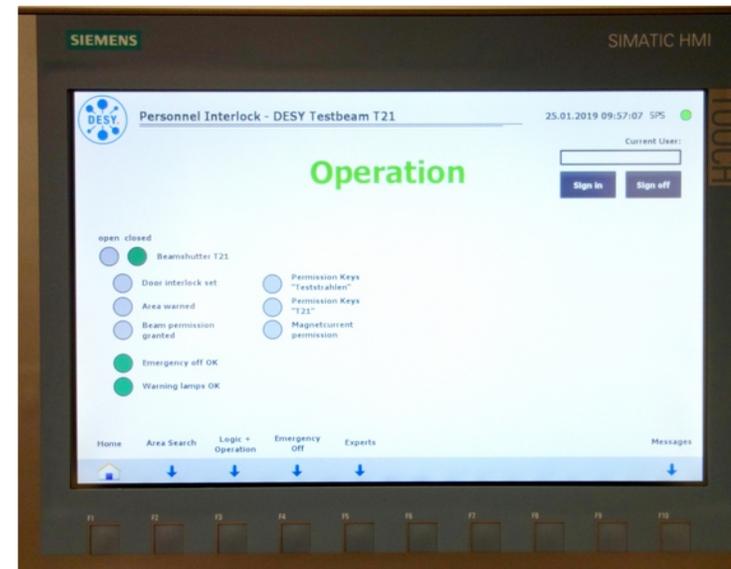
Beam Interlock

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

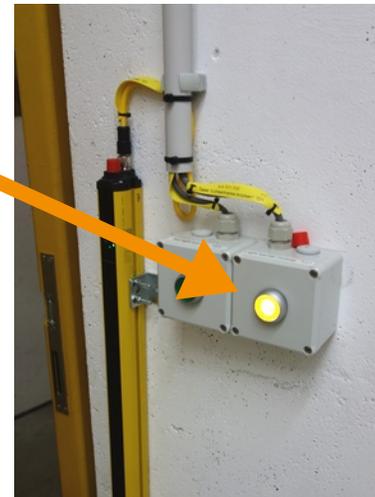
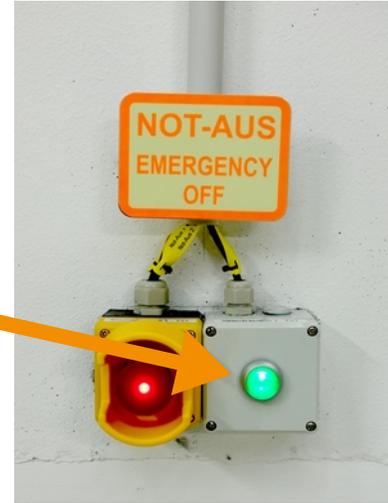
- Do
 - Swipe DACHS card across reader at entrance
 - Go in past the light barrier and press green “Set light barrier” button right after entrance
- Effect
 - Yellow interlock light at entrance and green search buttons inside area will light up
 - Announcement that the interlock search is taking place 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!**



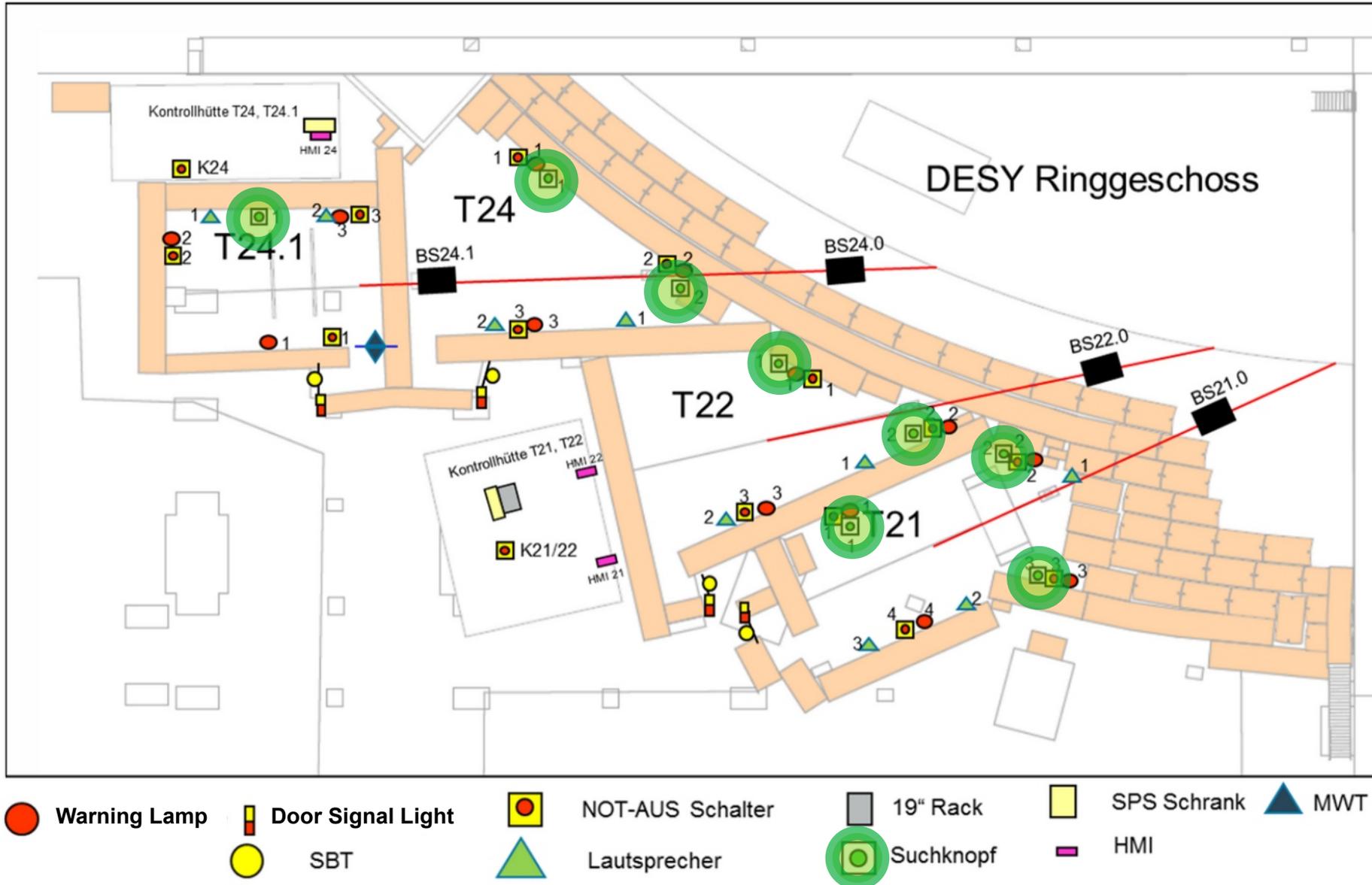
Setting the Area Interlock

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

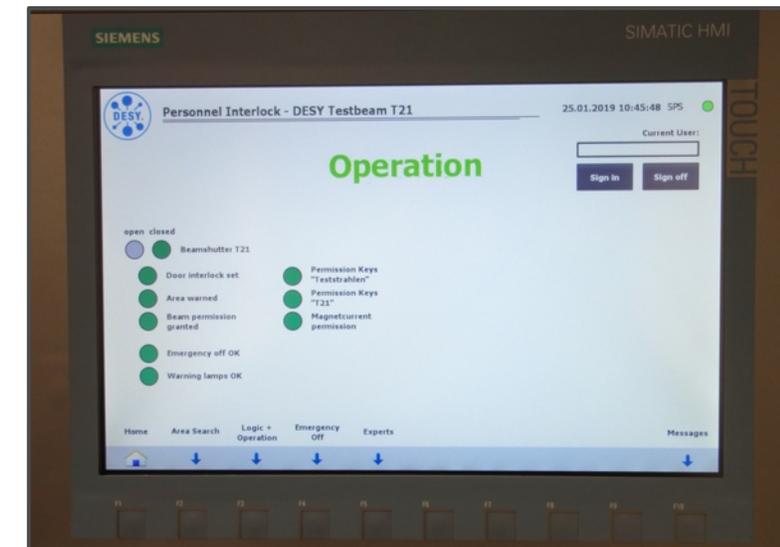
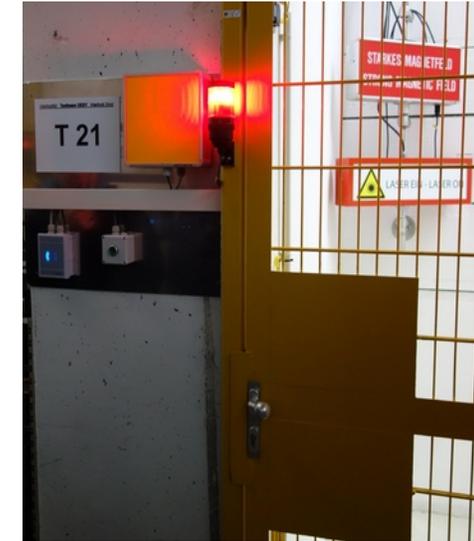


Skizze Interlockkomponenten in den Teststrahlgebieten (A. Liedtke)

Setting the Area Interlock

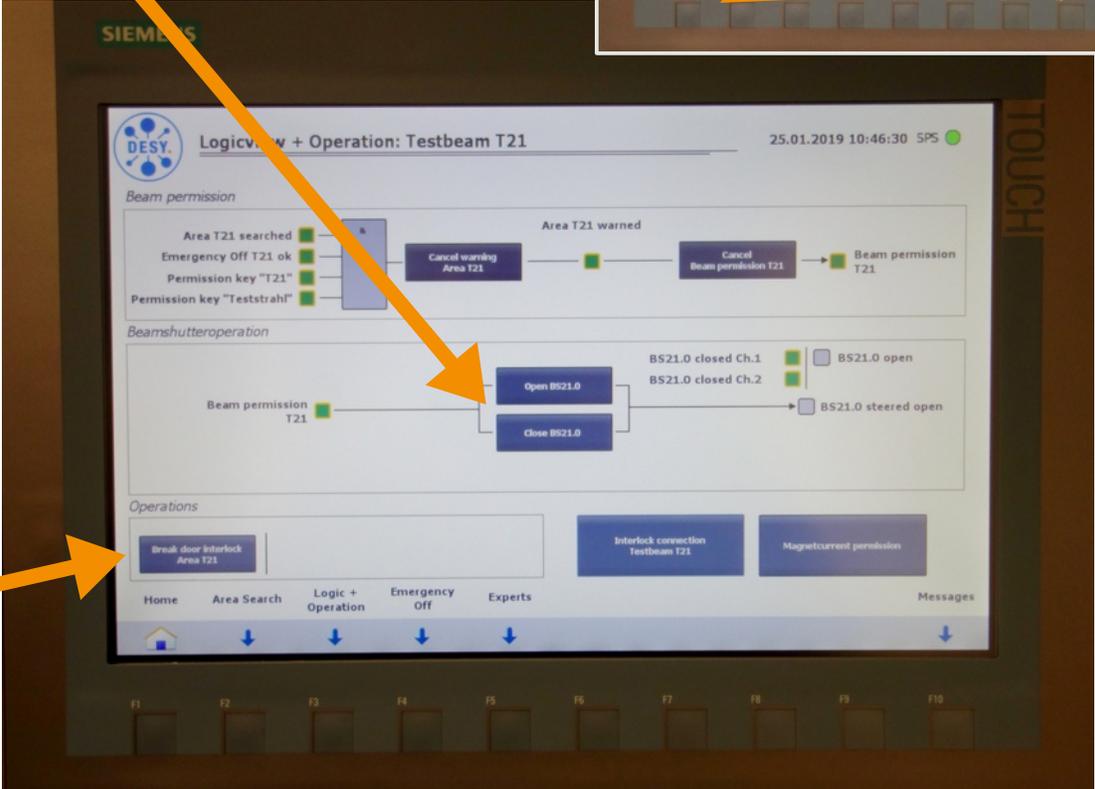
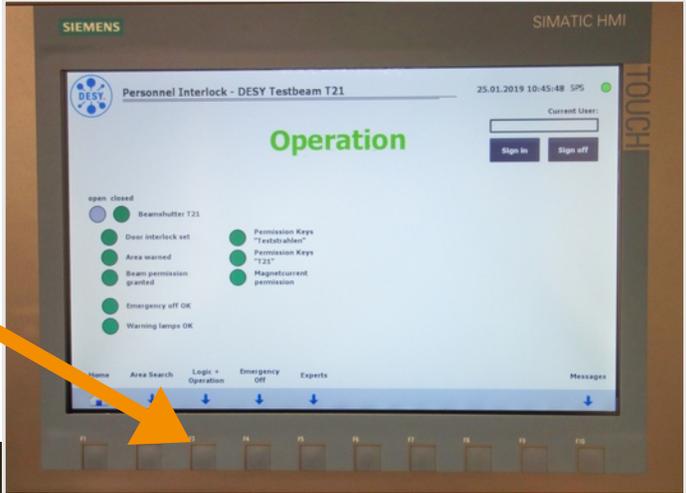
Finishing

- 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



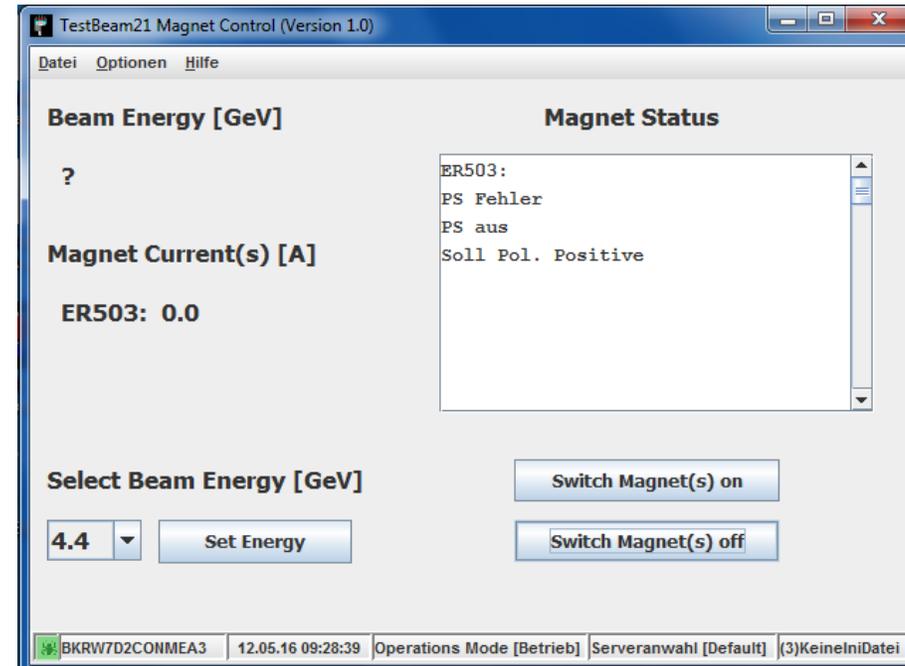
→ **Leave area immediately**
(avoid crossing beam path)

- 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

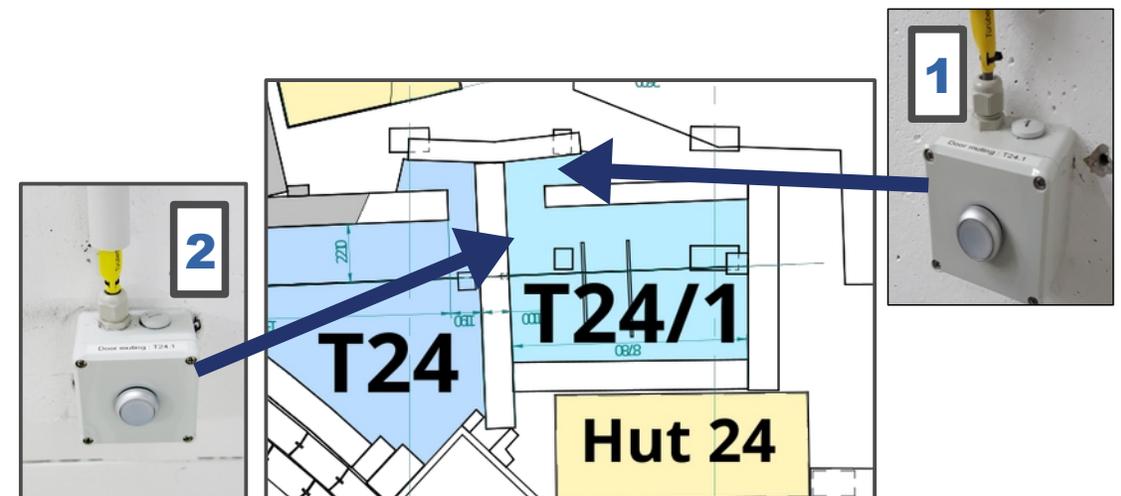
- Checking status of magnet power supplies
 - All 5 green LEDS need to be on to power up
 - Big red light indicates, if magnet is powered



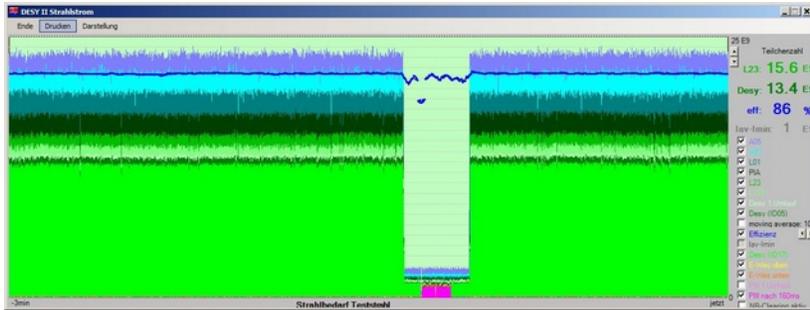
PCMAG Magnet Interlock in T24/1

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.
 - 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** synchrotron: 6.3 GeV, typically $6\text{-}15 \times 10^9 e^- / \text{bunch}$
- 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/
- In doubt: ask us!



