

# DESY II Test Beam Facility



## Safety Briefing BL4S Edition

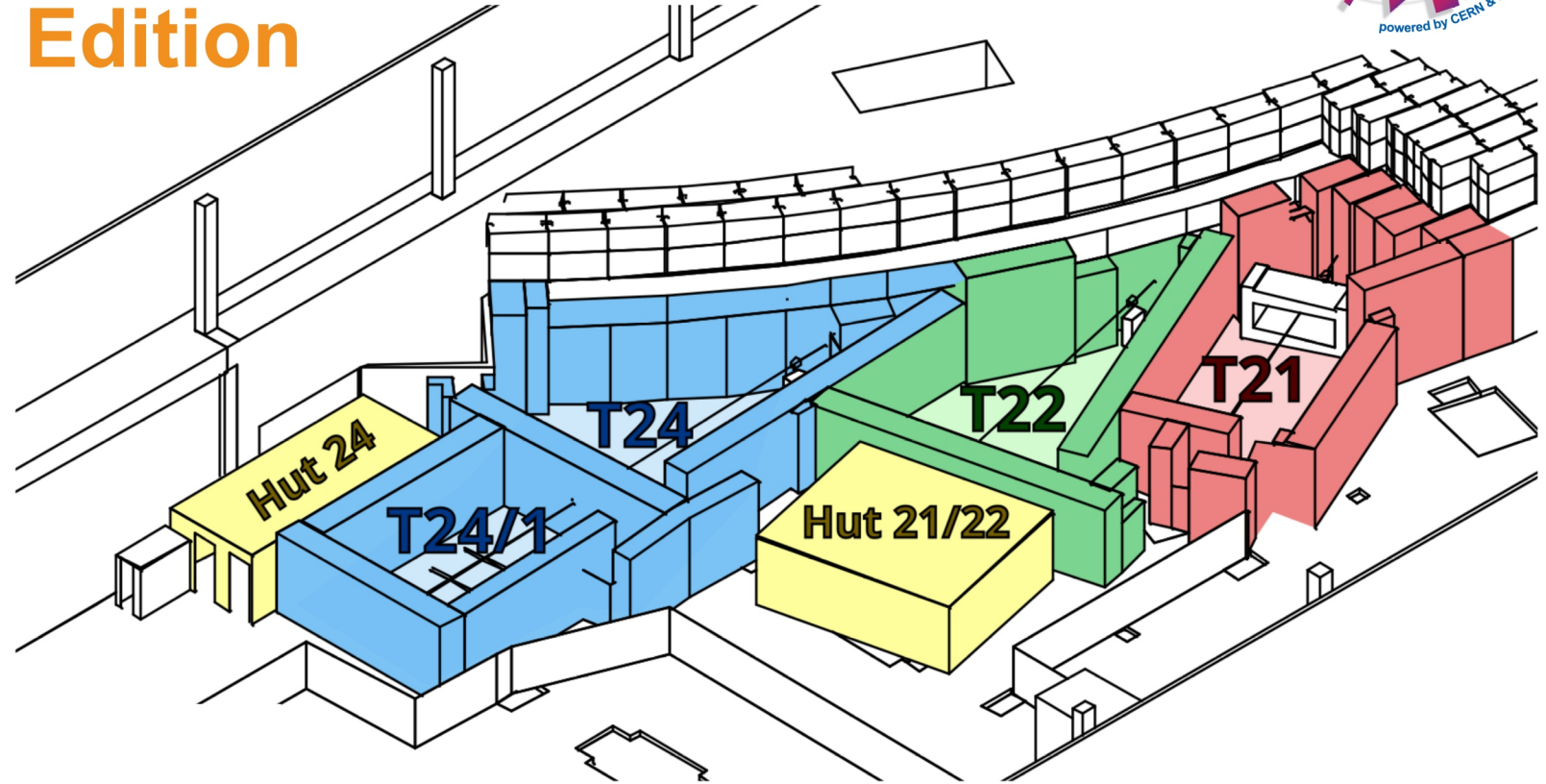
Coordinators:

Ralf Diener

Norbert Meyners

Marcel Stanitzki

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)*

## Test Beam Experiment at DESY II

Beam: Beamline 21

Experiment/Group: X0/Ingrid  
Responsible Person(s): NN  
Cell phone: ....., while at DESY: .....

### Technical Acceptance (Techn. Abnahme)

Technical Acceptance by Testbeam coordinators .....  
(Signature)  
and optionally by D5 (DESY Safety Group) .....  
(Signature)

Safety key for Interlock  
received: ..... returned: .....

Assigned Test Period  
from: Monday, 27. May 2013 08:00AM to: Sunday, 02. June 2013 06:00PM

-----  
Signature of the DESY test beam coordinator

A copy of this form must be posted in front of the entrance door of the beam hut.  
-- Mark your equipment and remove it at the end of the test period --

# 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:  $\geq 2$  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

## 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



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<b>blue</b>	DACHS ready
<b>green</b>	Access granted
<b>green / red</b>	<i>Hold card longer in front of terminal</i>
<b>red</b>	Access denied

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# 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...

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

# Phone Numbers and Emergency Call

<b>Emergency (Notruf)</b>	<b>2500</b>	
<b>DESY Mobile</b>	<b>66-2500</b>	
<b>External Mobile</b>	<b>+49-40-8998-2500</b>	
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="https://tblogs.desy.de">https://tblogs.desy.de</a>	
Porter's Lodge Notkestrasse		
	3333	

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

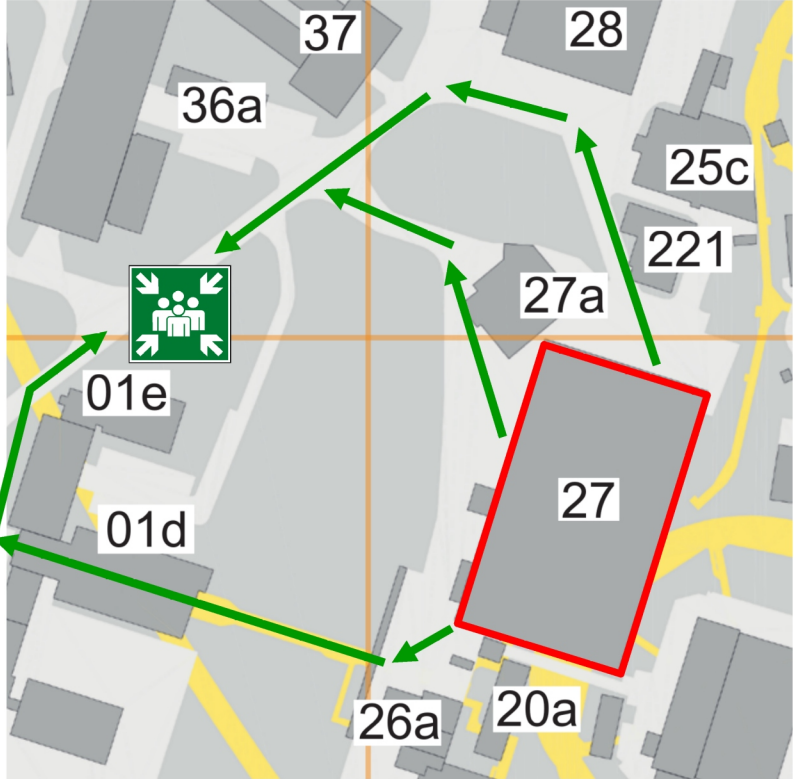
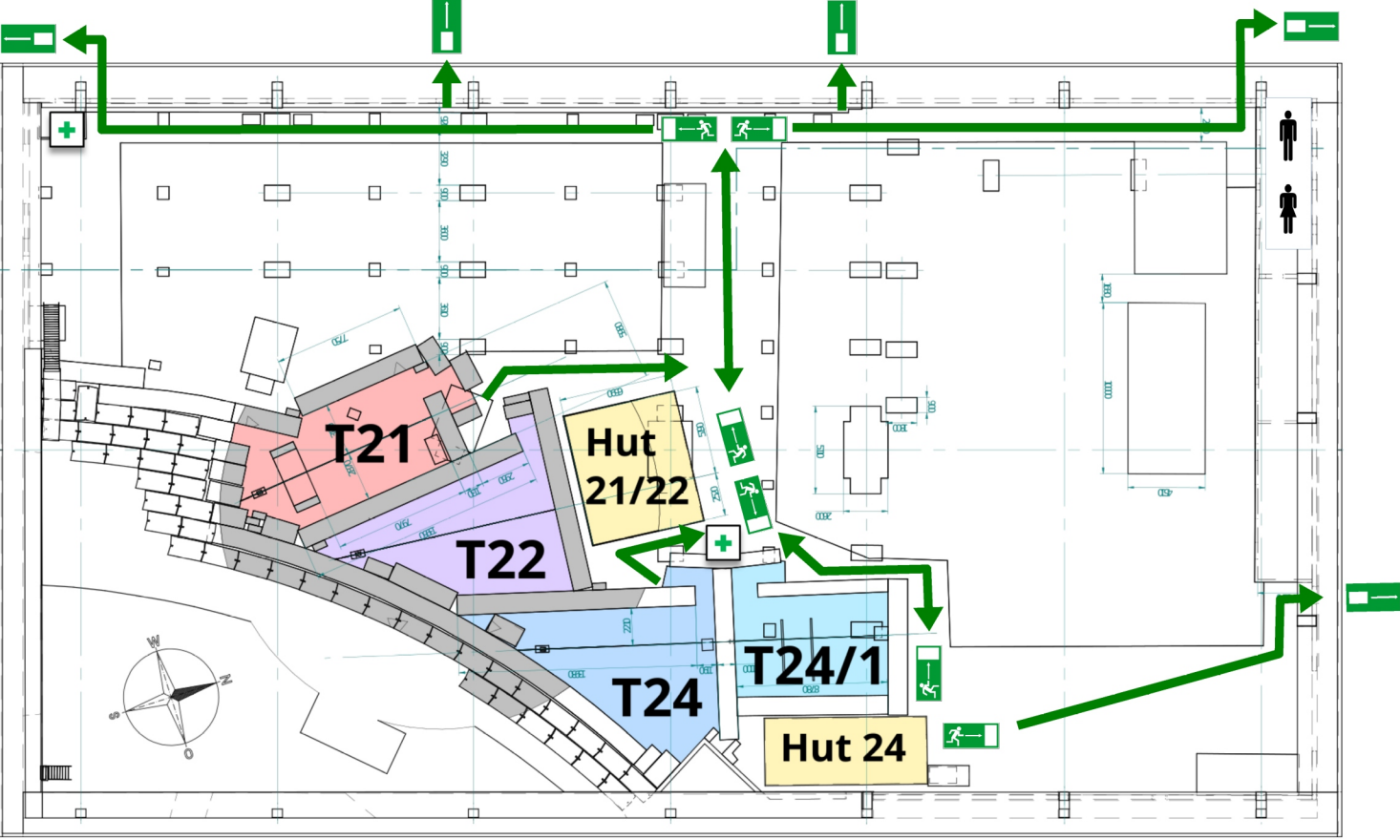
- In case of an **emergency: Call 2500**
  - **Never** call external emergency number
  - Answer the usual questions: Who? Where? What? How many? Most importantly: **Wait!** for questions
  - DESY SAVE will help as fast as possible
  - Remember your first aid training and help!
  - First aid supplies 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

# 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

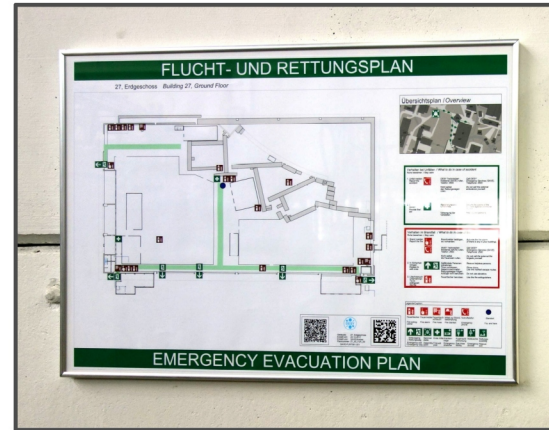
- Consider to press fire alarm when leaving → loud alarm from smoke detectors and sirens

- 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 CO<sub>2</sub> fire extinguisher

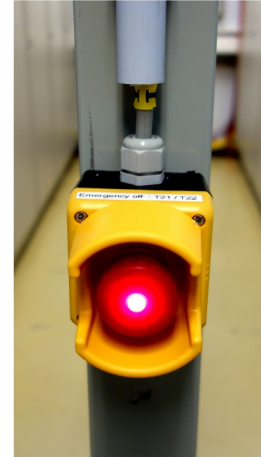
- Inform test beam coordinators and Technical Emergency Service (☎ 5555)





# 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)*

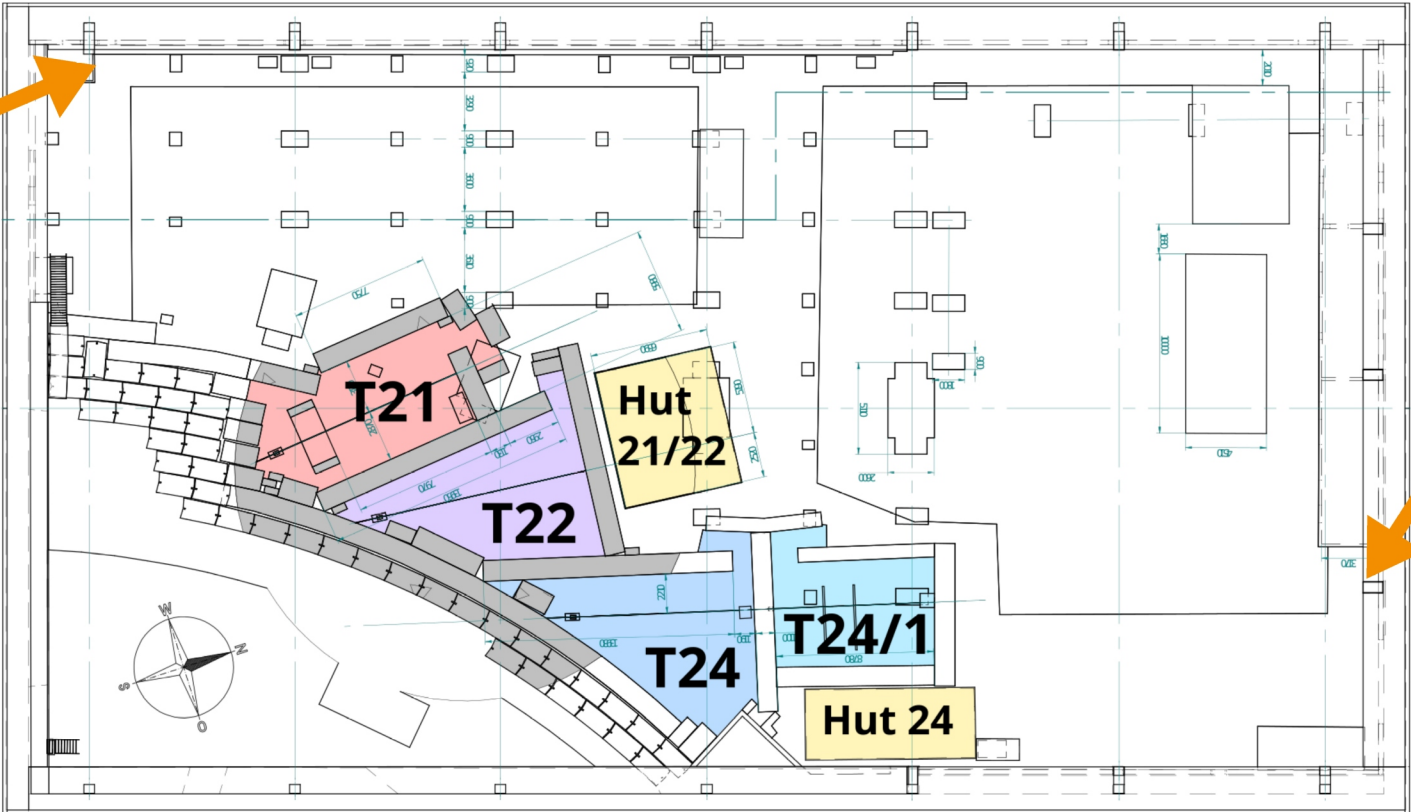


# Hall Lights

Both light switches are labeled: "Hallen-Licht"

Switches lights on "south side"

Switches lights on "north side"



# 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**

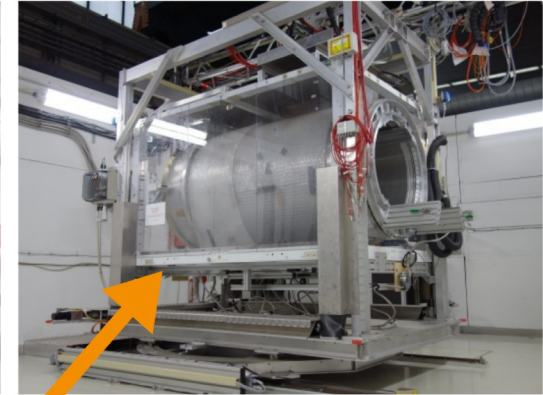
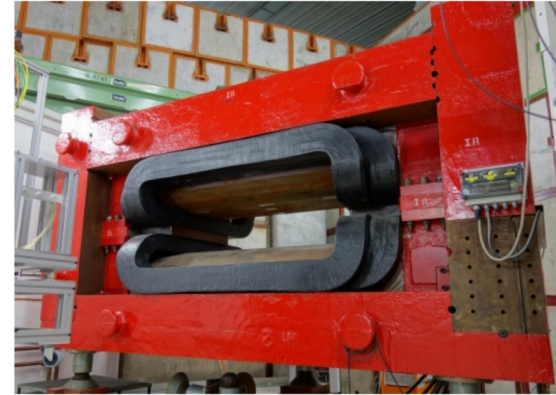
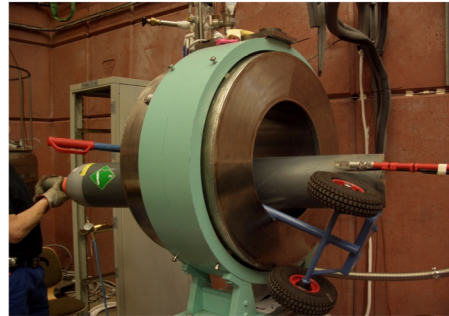
- The bricks are heavy
- Lead is poisonous
  - Avoid hand-mouth contact → wear gloves
  - Applies also to lead collimators in areas
  - Don't scrape the lead collimators



# Test Magnets

## Operation only by trained users (extra training)

- **1 T is a strong field**  
→ 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  
*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 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!

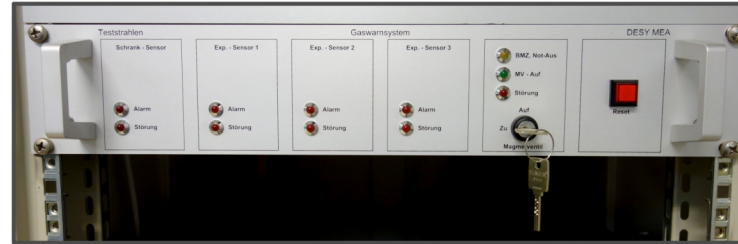
- **Rules**
  - Limit access (number of people)
  - Never look directly into the laser: turn away / close eyes if accidentally doing so
  - Only use one laser direction at a time
  - Never use optical instruments or reflecting tools
  - Use laser only during alignment, switch off immediately after



- **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**:  
**A**s **L**ow **A**s **R**easonably **A**chievable
- 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  $> 5 \mu\text{S/h}$  in 30 cm distance
  - Needs to be clearly marked and properly stored

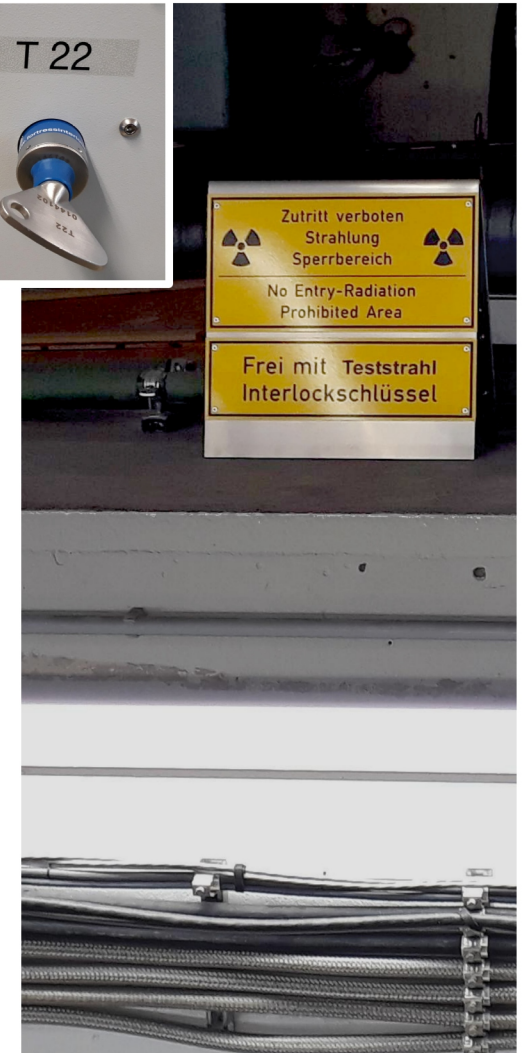


- Additional training required (see [here](#))  
→ Contact us well in advance

# 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

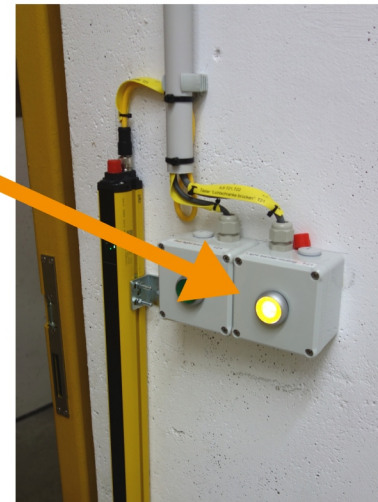
- Do
  - Swipe DACHS card across reader at entrance
  - Go in past the light barrier and press green “Set light barrier” button right after entrance
- Effect
  - Yellow interlock light at entrance and green search buttons inside area will light up
  - Announcement that the interlock search is taking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



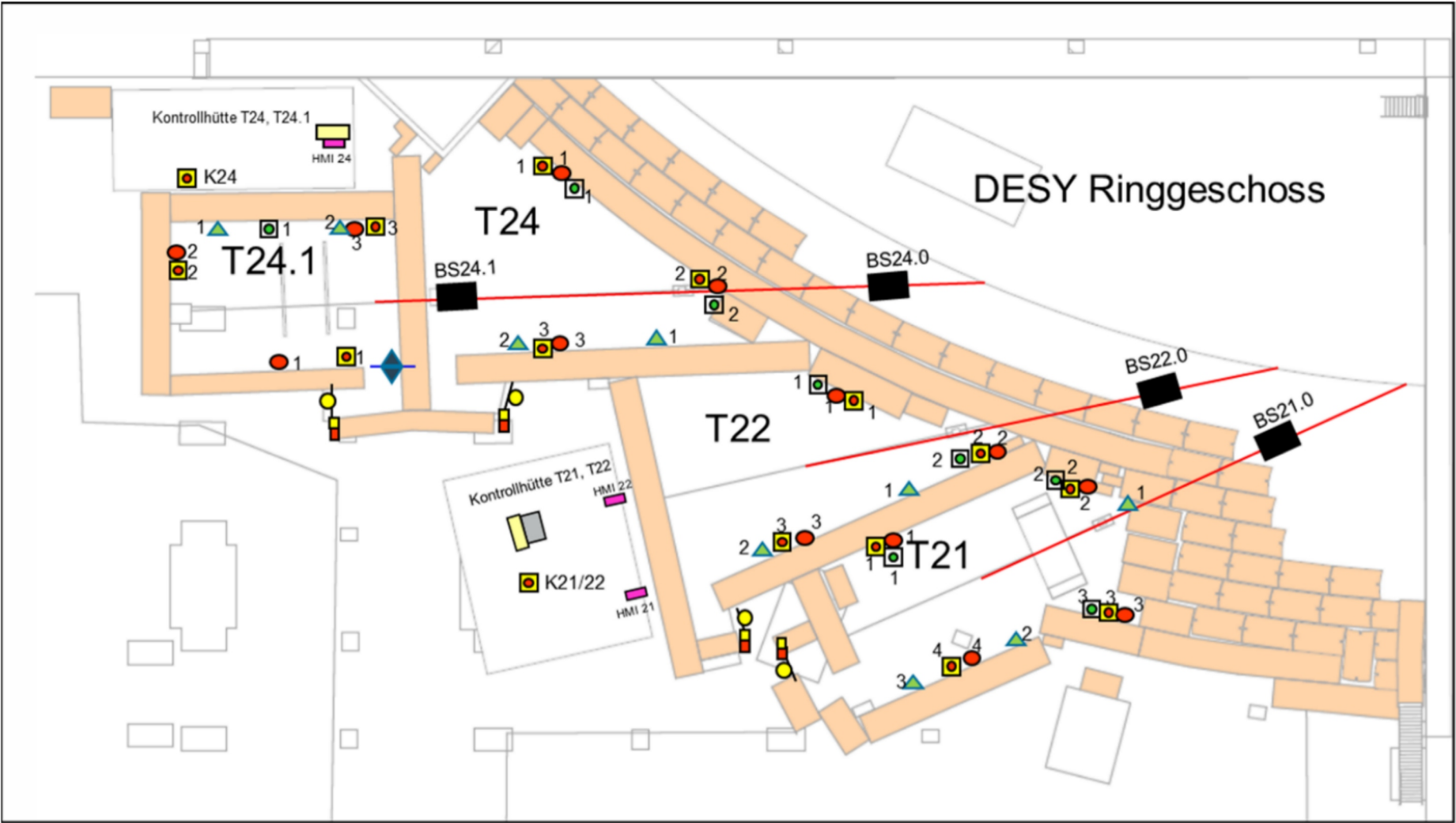
# Setting the Area Interlock

## 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



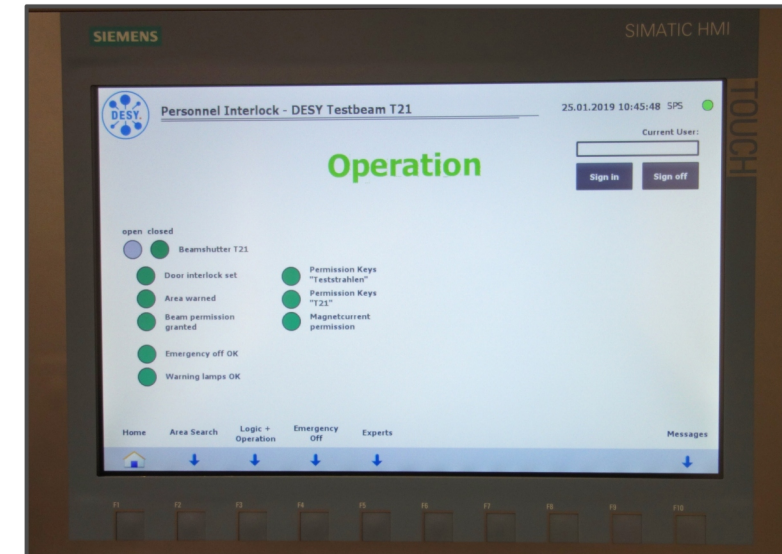
-  **Warning Lamp**
-  **Door Signal Light**
-  **Emergency-Off Button**
-  **19" Rack**
-  **SPS Schrank**
-  **MWT**
-  **SBT**
-  **Speaker**
-  **Search Button**
-  **HMI**

Skizze Interlockkomponenten in den Teststrahlgebieten (A. Liedtke)

# Setting the Area Interlock

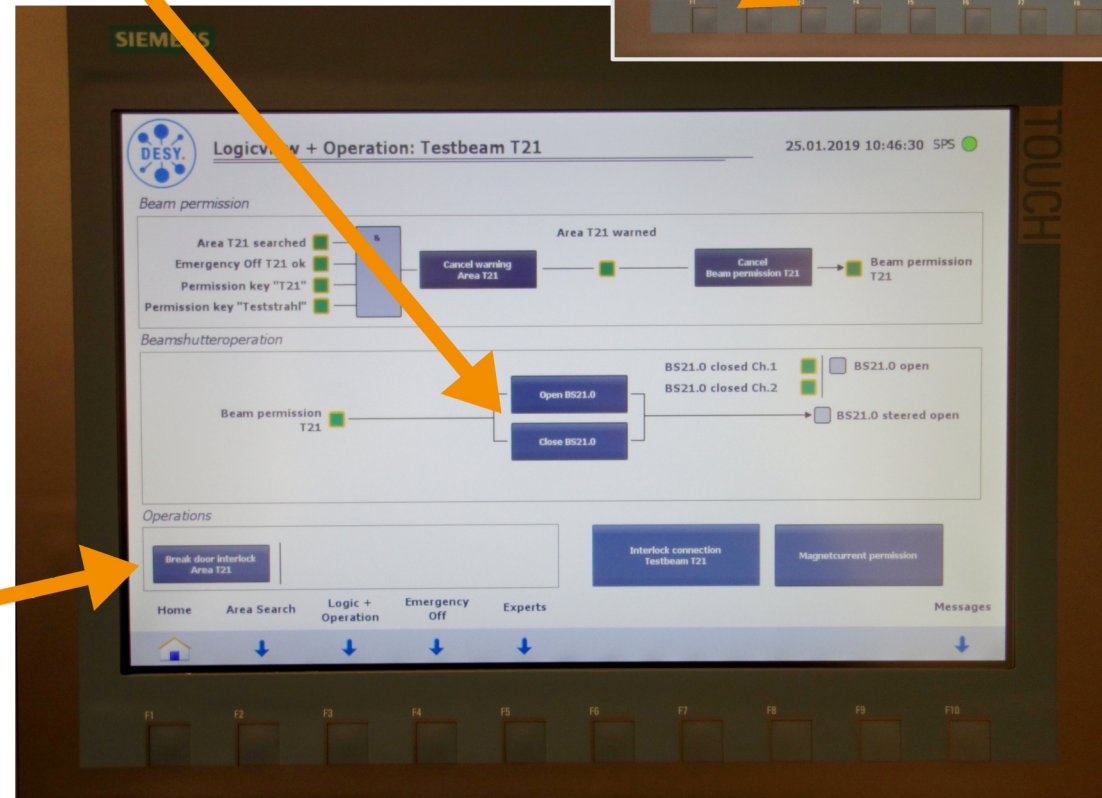
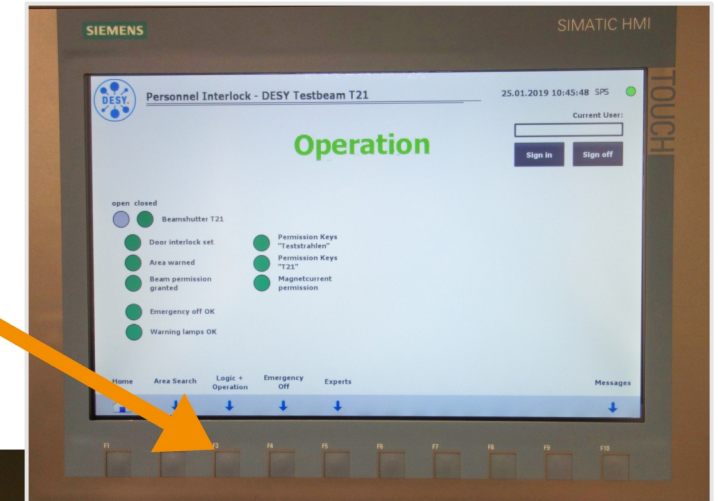
## Finishing

- 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
    - **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

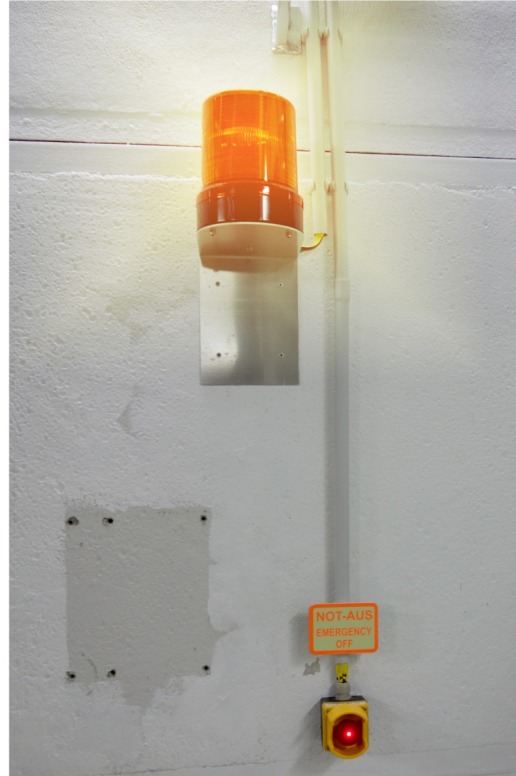
- Interlock set, ready for beam
- Orange warning lamps will flash
- Voice announcing in German and English that beam is to be turned on

→

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

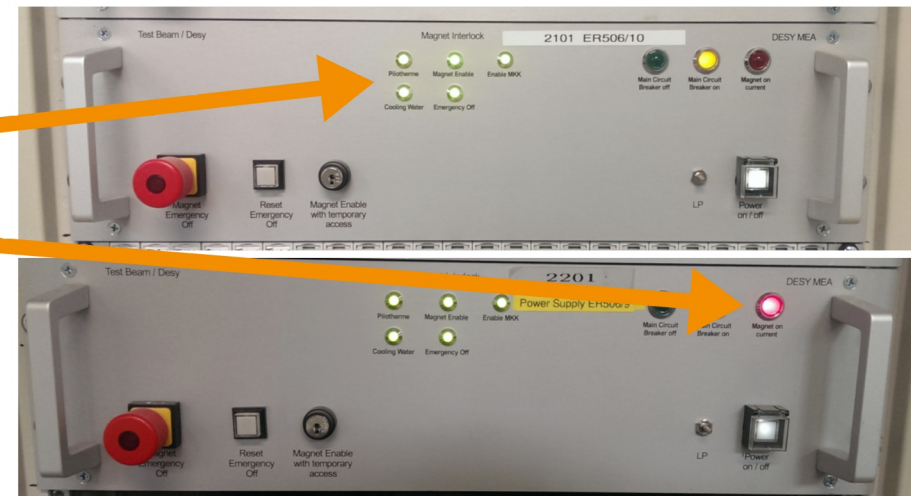
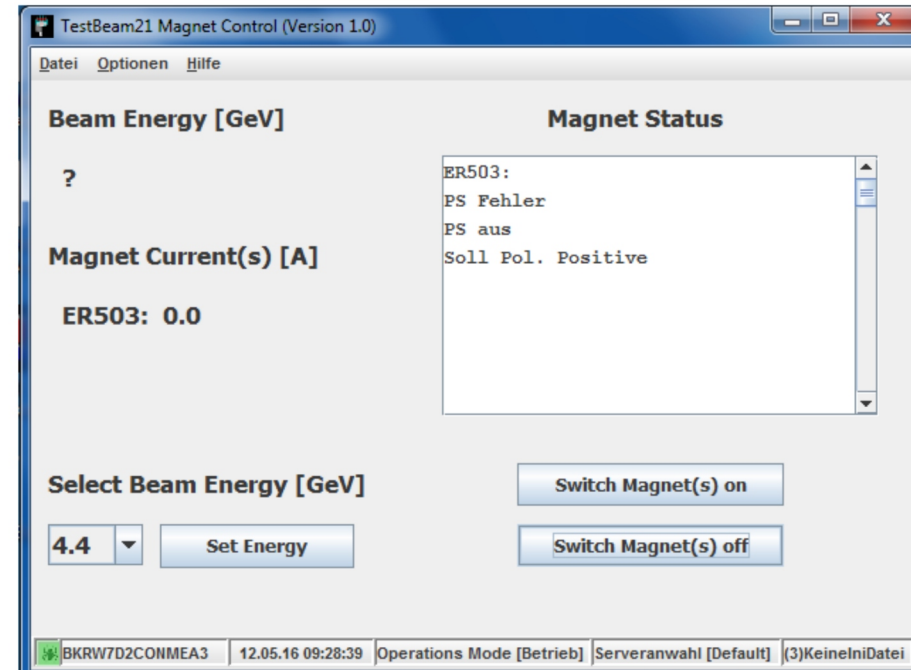


→ **Leave area immediately**  
**(avoid crossing beam path)**

- Keep others from entering
- Call control room (BKR ☎ 3500) to immediately shut off machine and inform test beam coordinators

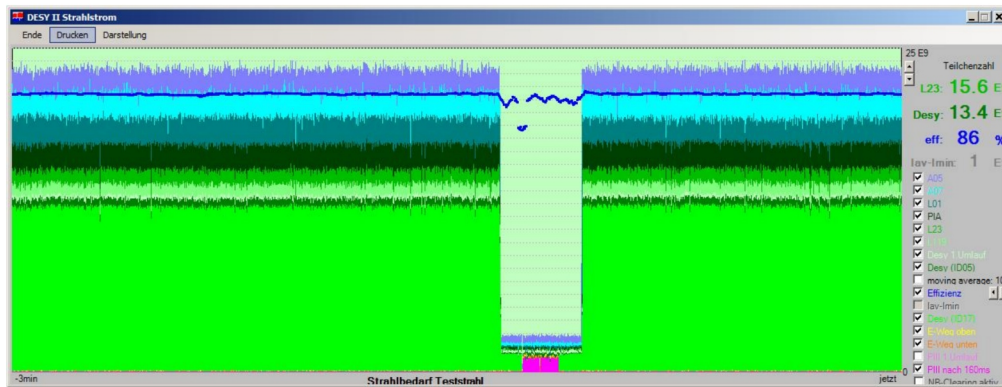
# Beam Operations

- 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

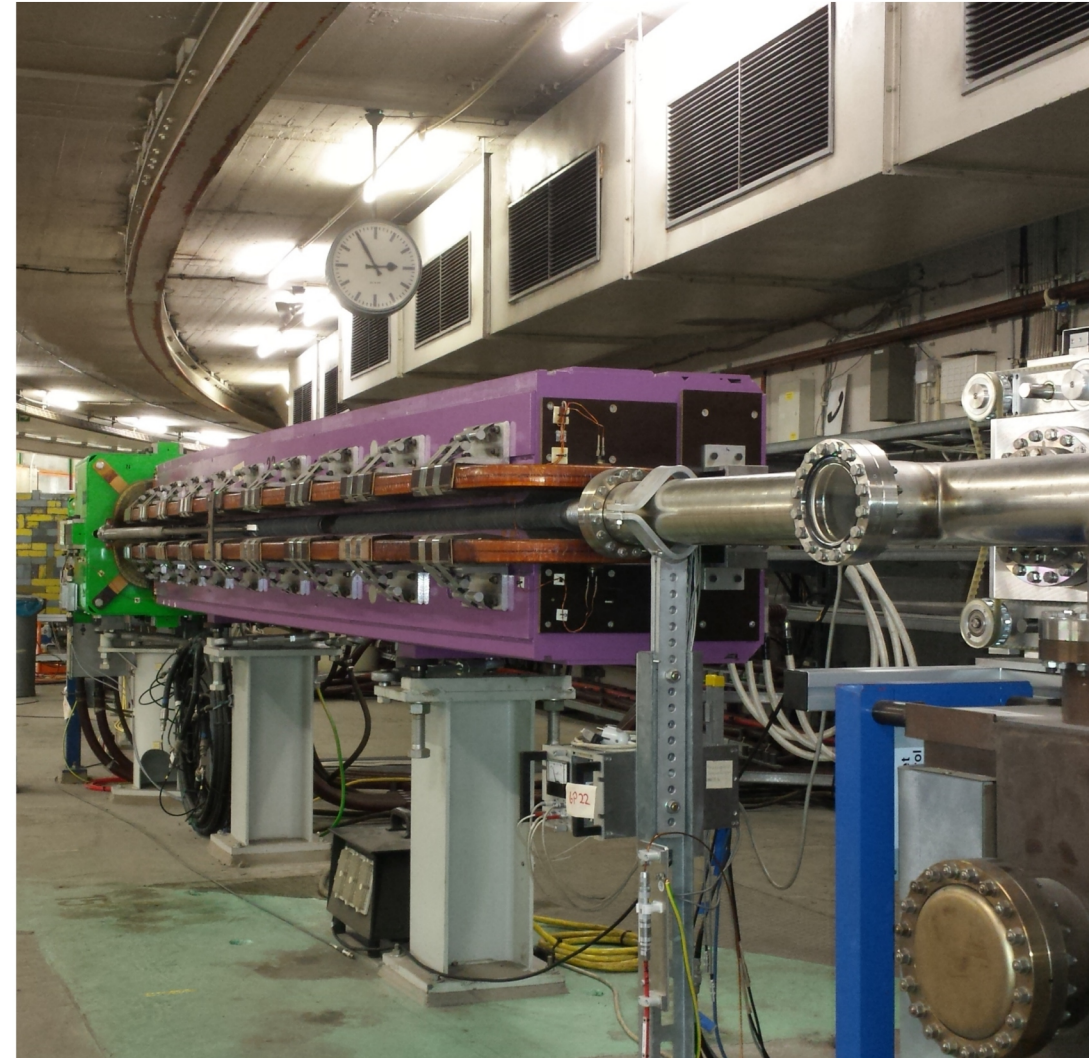


# DESY II Test Beam

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

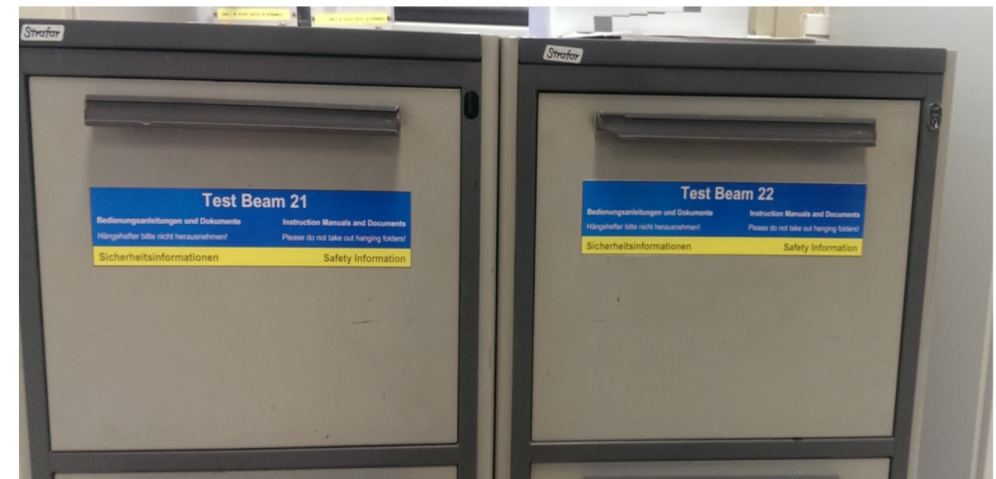


- Machine mornings:  
no beam every second Wednesday from 07:00 till *noonish*
- Operating costs (estimate): 500 € /hour → 84000 € /week
- Make good use of your beam time and save power (=cost)
  - Close shutter when beam not used
  - Switch off beam magnets for longer breaks



# 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:

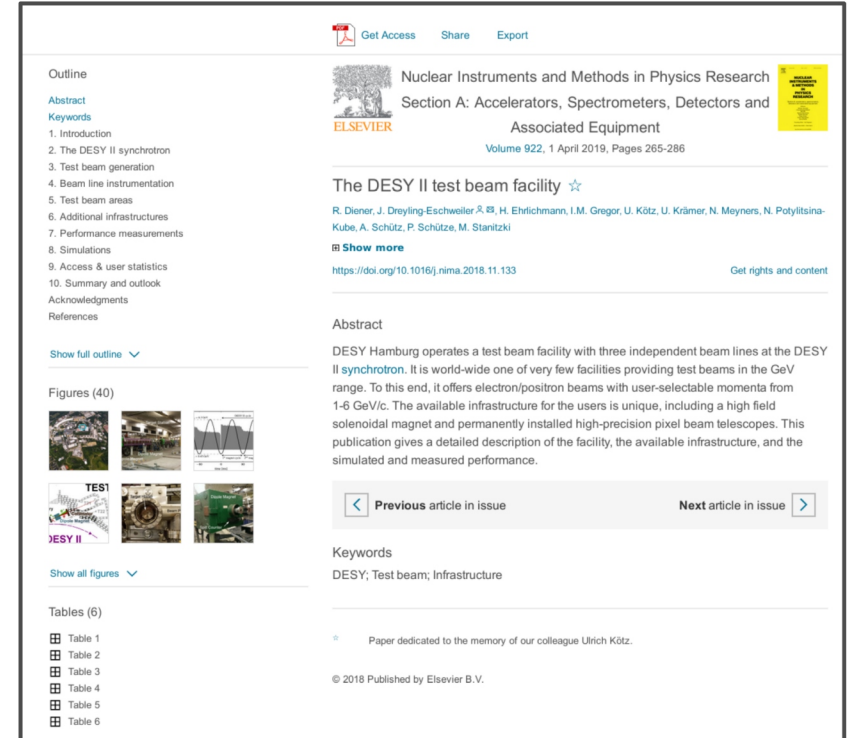
*"The DESY II test beam facility"*

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

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

- 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)".*



The screenshot shows the Elsevier article page for "The DESY II test beam facility". The page includes the journal title "Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment", volume information "Volume 922, 1 April 2019, Pages 265-286", and the article title "The DESY II test beam facility". The authors listed are R. Diener, J. Dreyling-Eschweiler, H. Ehrlichmann, I.M. Gregor, U. Kötz, U. Krämer, N. Meyners, N. Polyitsina-Kube, A. Schütz, P. Schütze, M. Stanitzki. The abstract states: "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." The page also features a table of contents, a list of figures (40), and a list of tables (6).