EDIT 2020

Safety Briefing

General & Specific

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Hall West:
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Status: 2/17/20

For more detailed information,
see general DESY safety instructions

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

DESY.

Content

- General safety
- Specific
  - Test beam facility
  - Basics radiation protection
  - Hall West specific

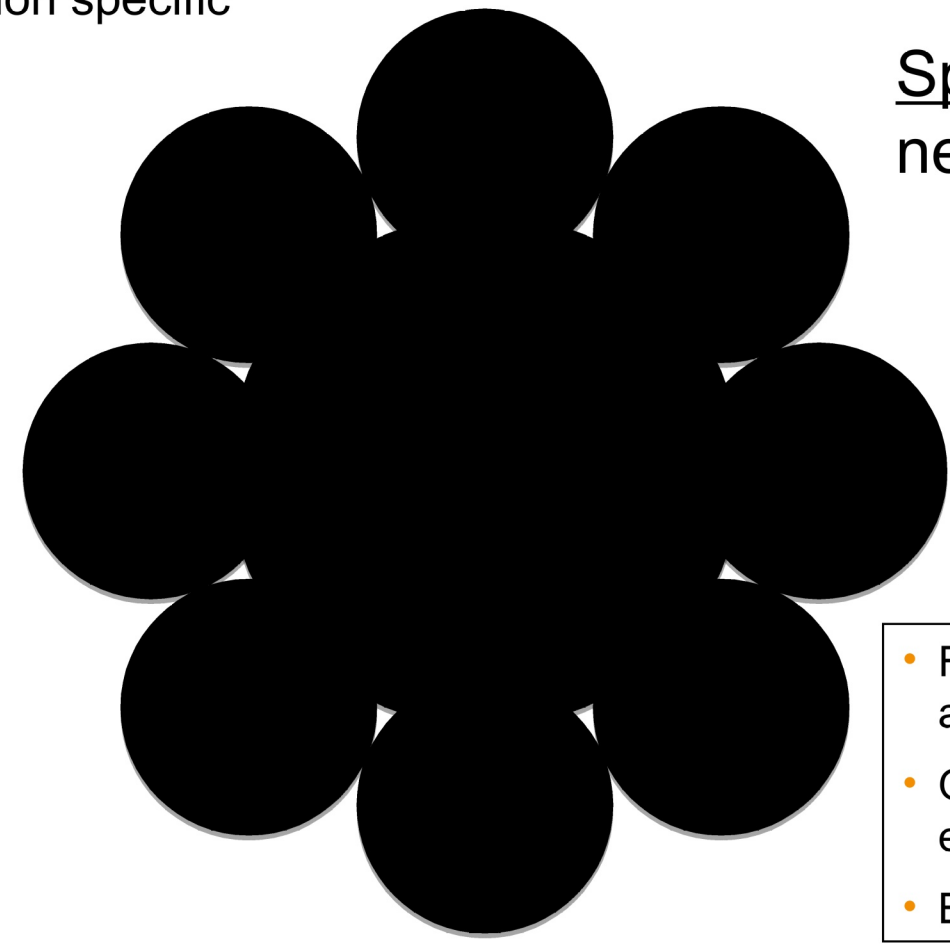
Safety Concept

Collection of Ingredients

- General safety + topic specific + location specific

Groups:

- D3:
  - Radiation Protection
- D4:
  - IT Security and Data Protection
- D5:
  - General Safety
  - Environmental Protection
- SAVE
  - Emergency Response
  - Safety Technology



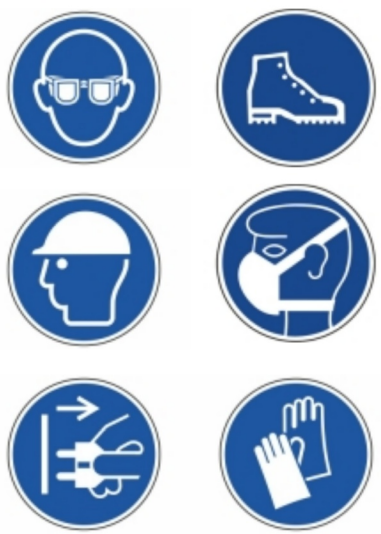
Specific trainings as necessary complement:

- For specific hazards in working areas
- On various topics and working equipment
- By the responsible person on-site

Barriers and Safety Signs

They are there for Your Safety

- Respect barriers and fences: they are there for a reason. Do not squeeze through!
- Familiarize yourself with the different safety signs



Order signs

Prohibition signs

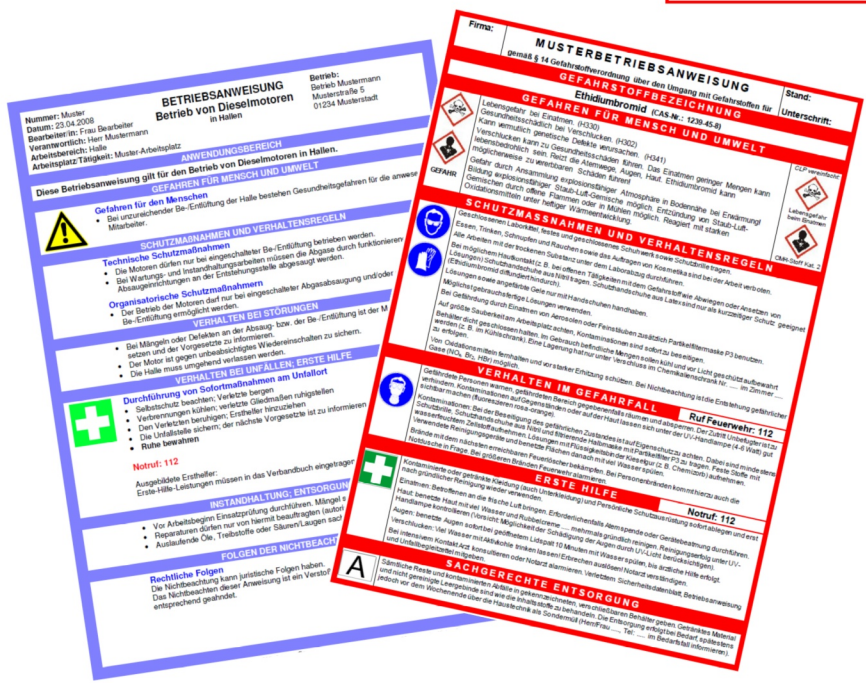
Warning signs

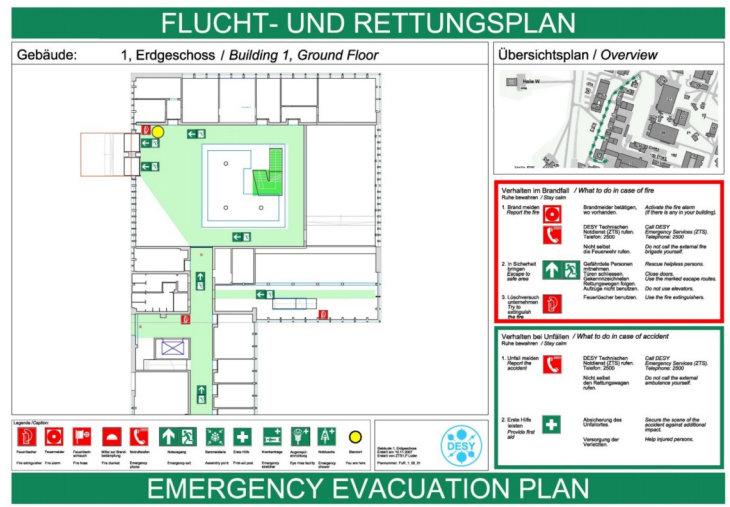
Rescue signs

Information Sources

Use It, Read It, For Your Safety

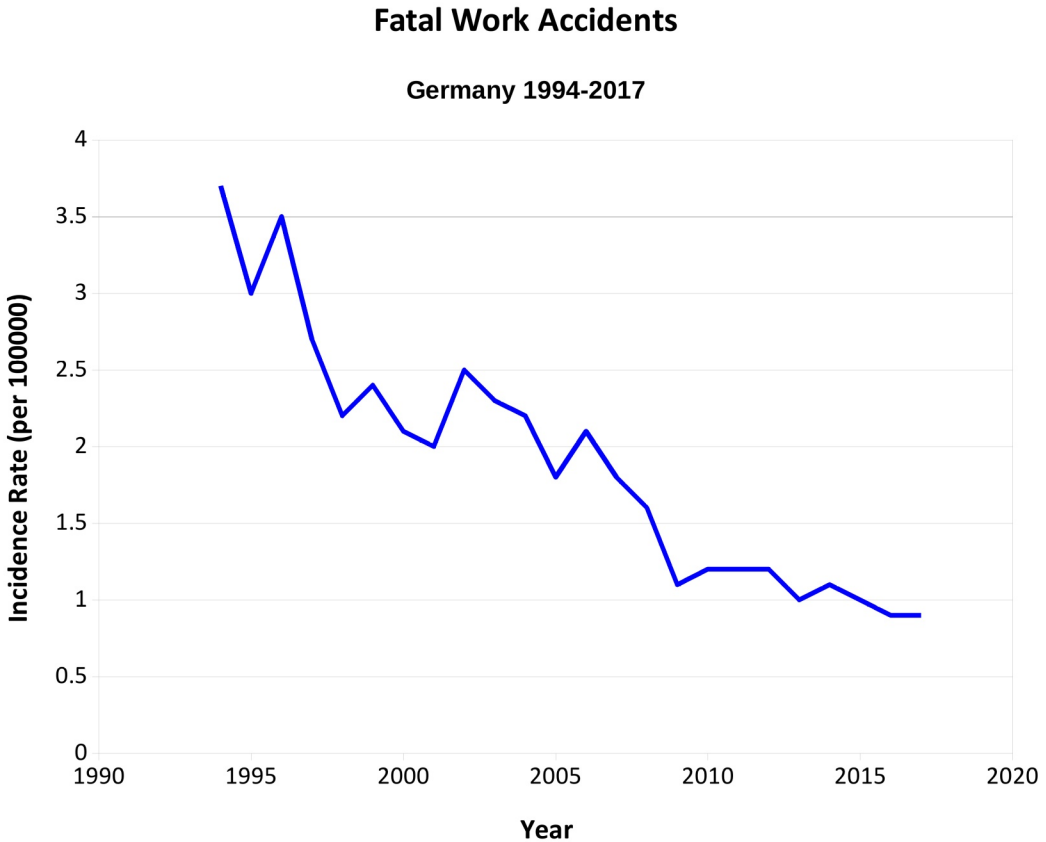
- Safety information
- Emergency/evacuation plans
- Material safety data sheet
- Working instructions
  operating instructions
- Manuals

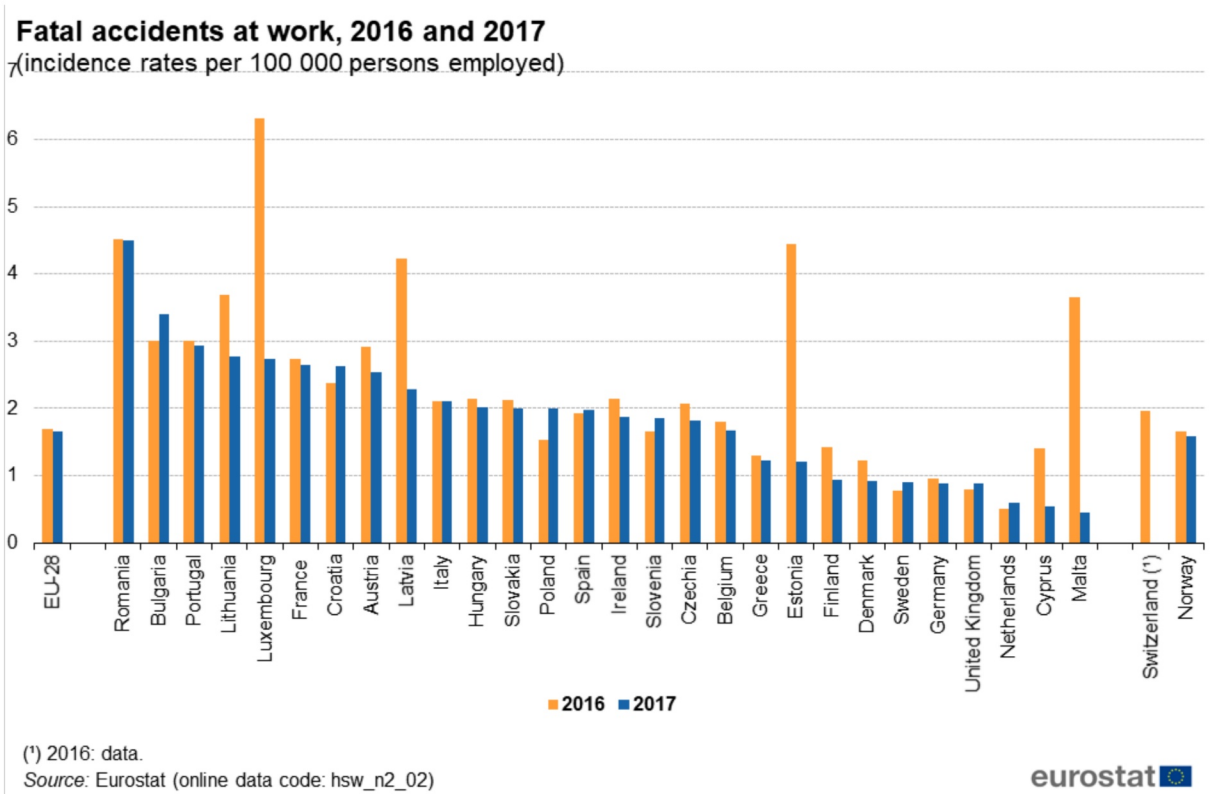




Impact of Safety

Does all this safety stuff make a difference

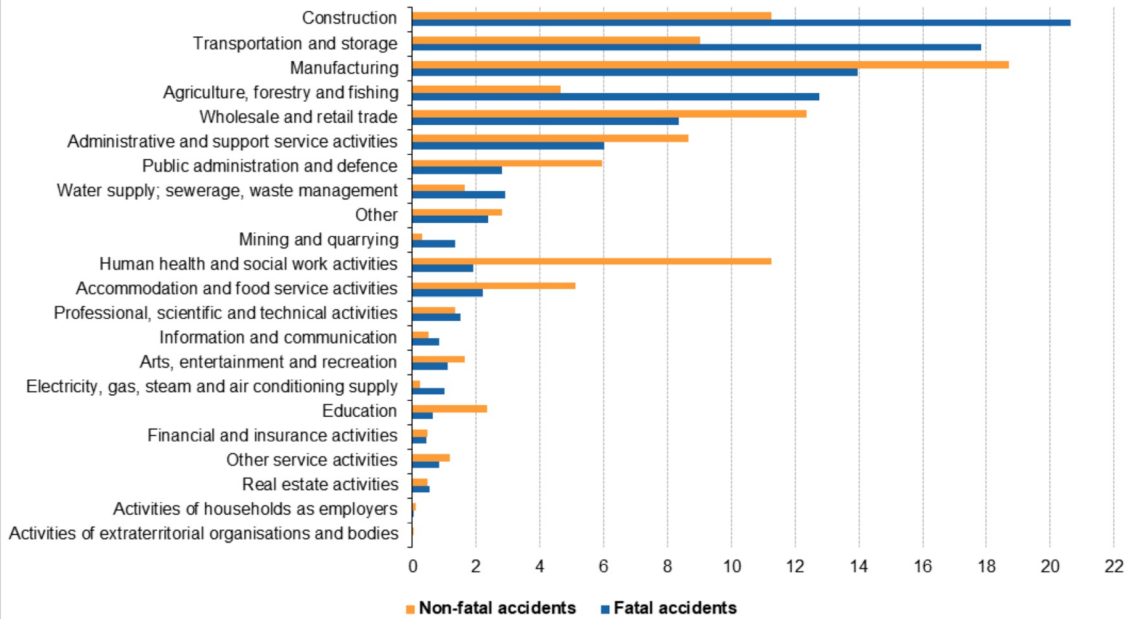




Safety

Where do accidents happen?

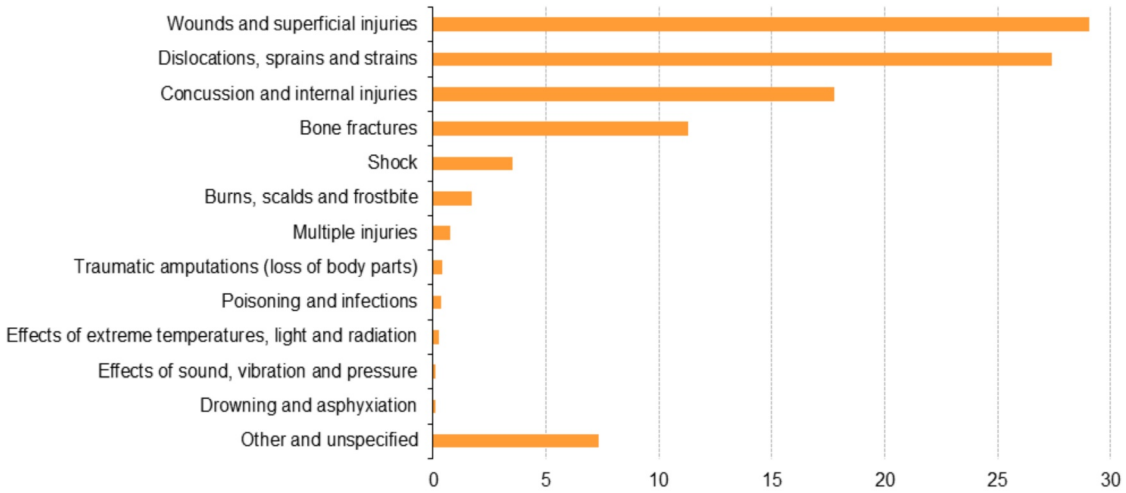
Fatal and non-fatal accidents at work by NACE section, EU-28, 2017
(% of fatal and non-fatal accidents)



Note: non-fatal (serious) accidents reported in the framework of ESAW are accidents that imply at least four full calendar days of absence from work. Ranked on the values for fatal accidents.
Source: Eurostat (online data codes: hsw_n2_01 and hsw_n2_02)

eurostat

Fatal and non-fatal accidents at work by type of injury, EU-28, 2017
(% of accidents)

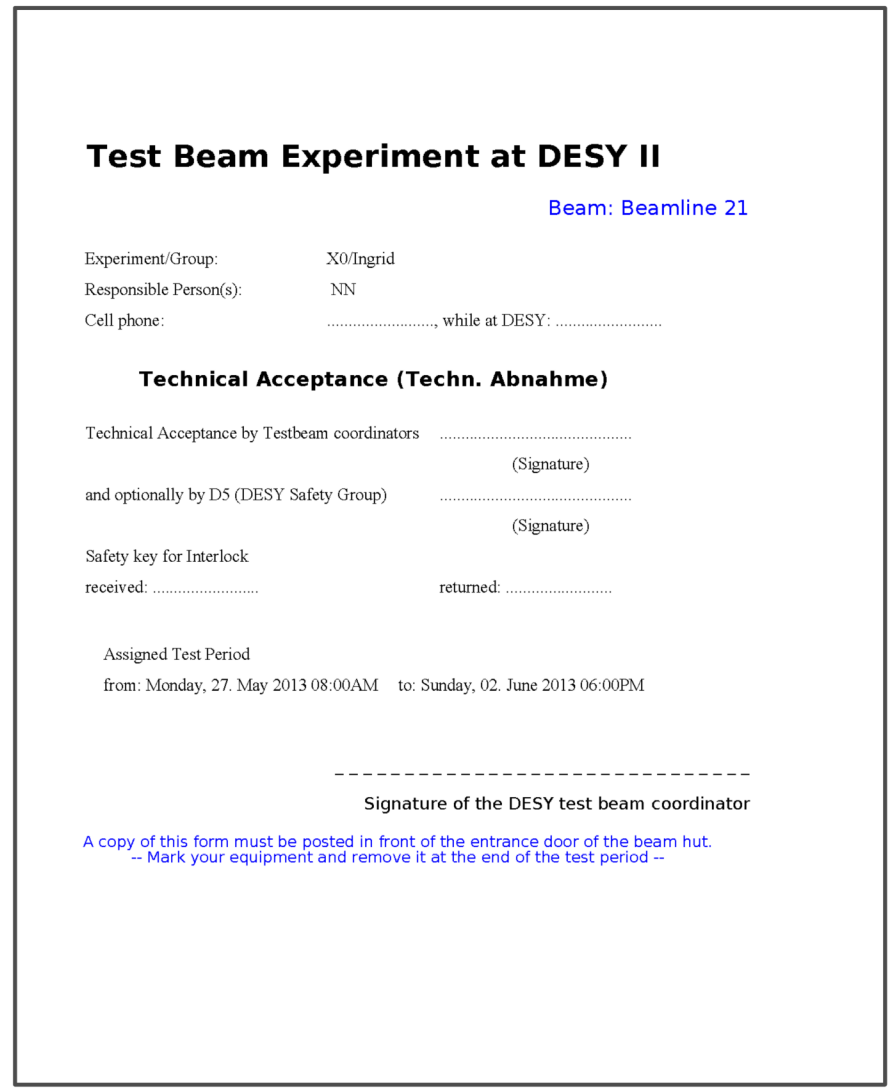


Note: non-fatal (serious) accidents reported in the framework of ESAW are accidents that imply at least four full calendar days of absence from work.
Source: Eurostat (online data code: hsw_n2_07)

eurostat

Test Beam - 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!**
  - 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

- 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

- Spring 2020 installation of new windows
  - Walkways / corridors close to the wall may get temporary blocked / fenced for safety
  - Respect the barriers and choose a different way!

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

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

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

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	https://tblogs.desy.de
Porter's Lodge Notkestrasse	3333

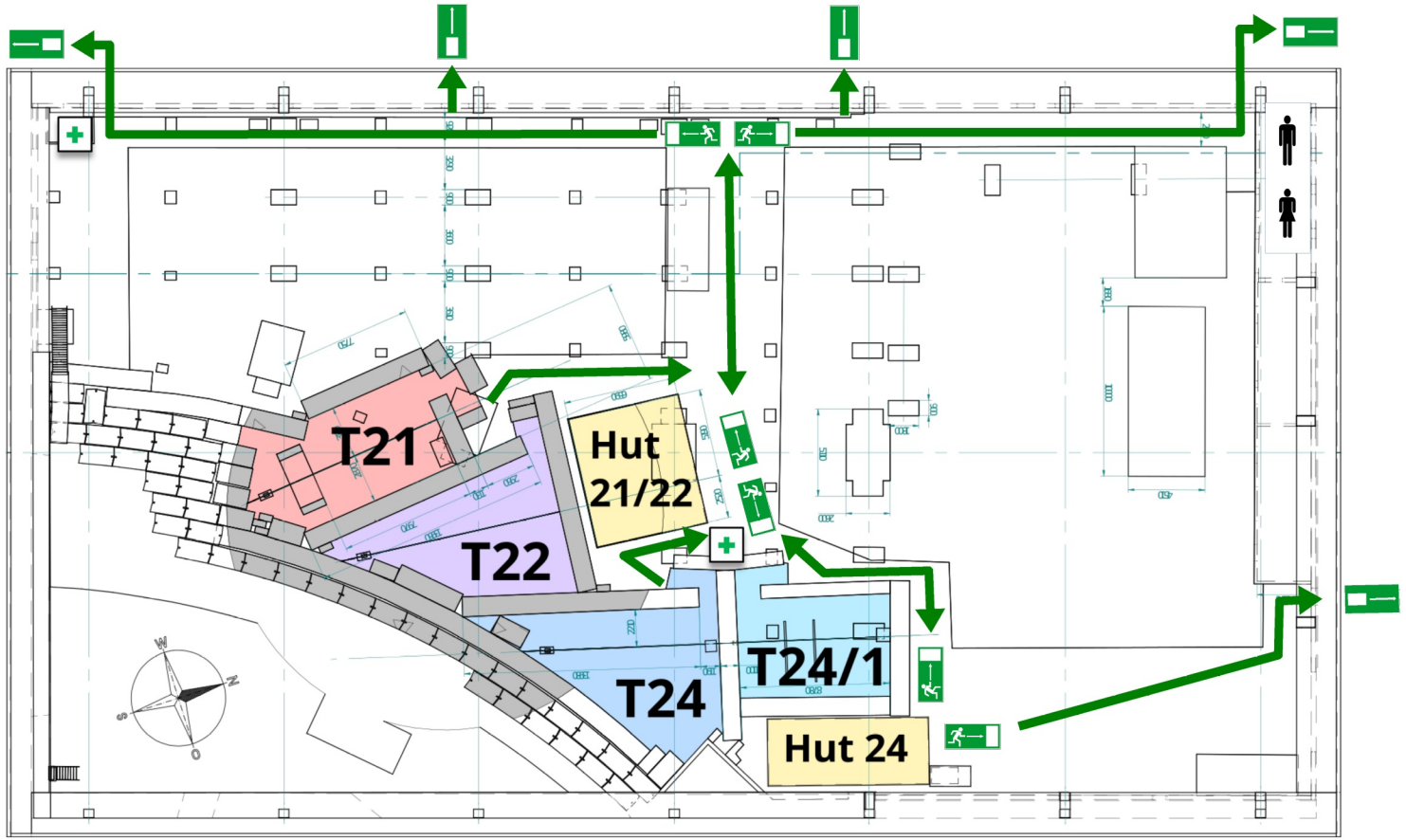
- If you hear anomalous noise or notice other strange things (water floods...) → Technical Emergency Service (☎ 5555) *(take into account to leave the hall)*

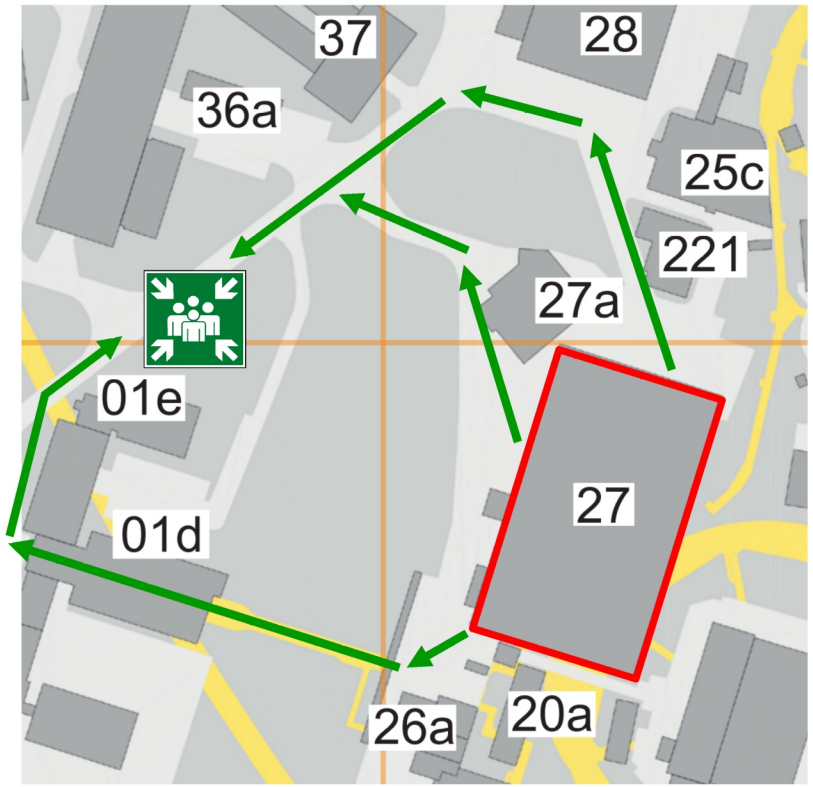
- In case of an **emergency: Call 2500**
  - **Never** call external emergency number
  - Answer the usual questions:
    Who? Where? What? How many?
    Most importantly: **Wait!** for questions
  - DESY SAVE will help as fast as possible
  - Remember your first aid training and help!
  - First aid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

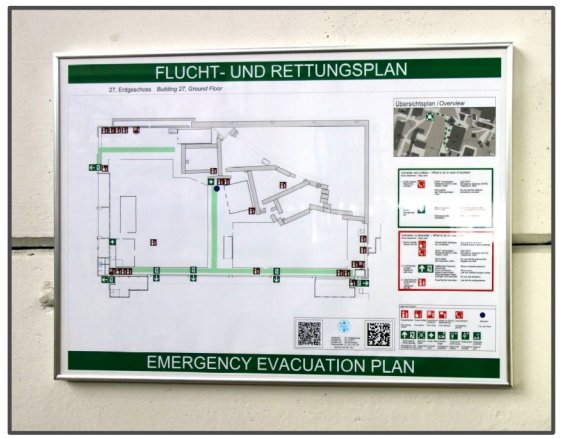
Building 27

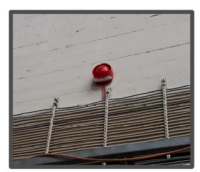




Behavior in Case of Fire

- **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_2 fire extinguisher
  - Inform test beam coordinators and Technical Emergency Service (☎ 5555)

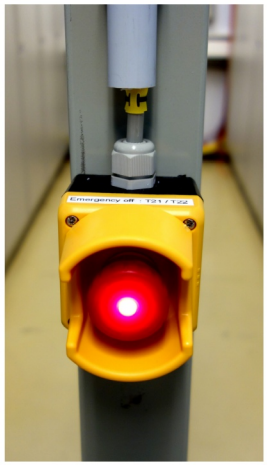
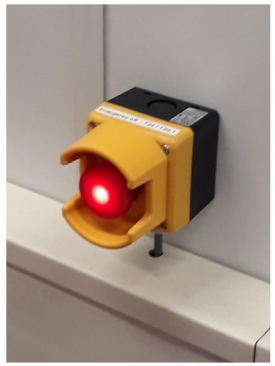
Emergency Off

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

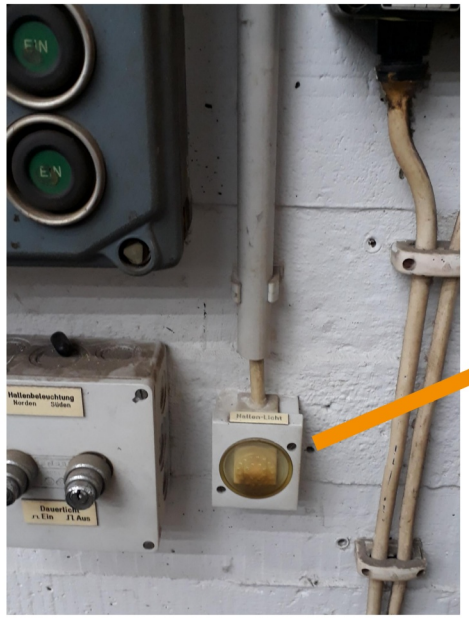
- Emergency-off kills both the beam and electrical power

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

- Areas/hut equipped with mobile emergency lights
  (keep them accessible, no material, tables etc. in front)

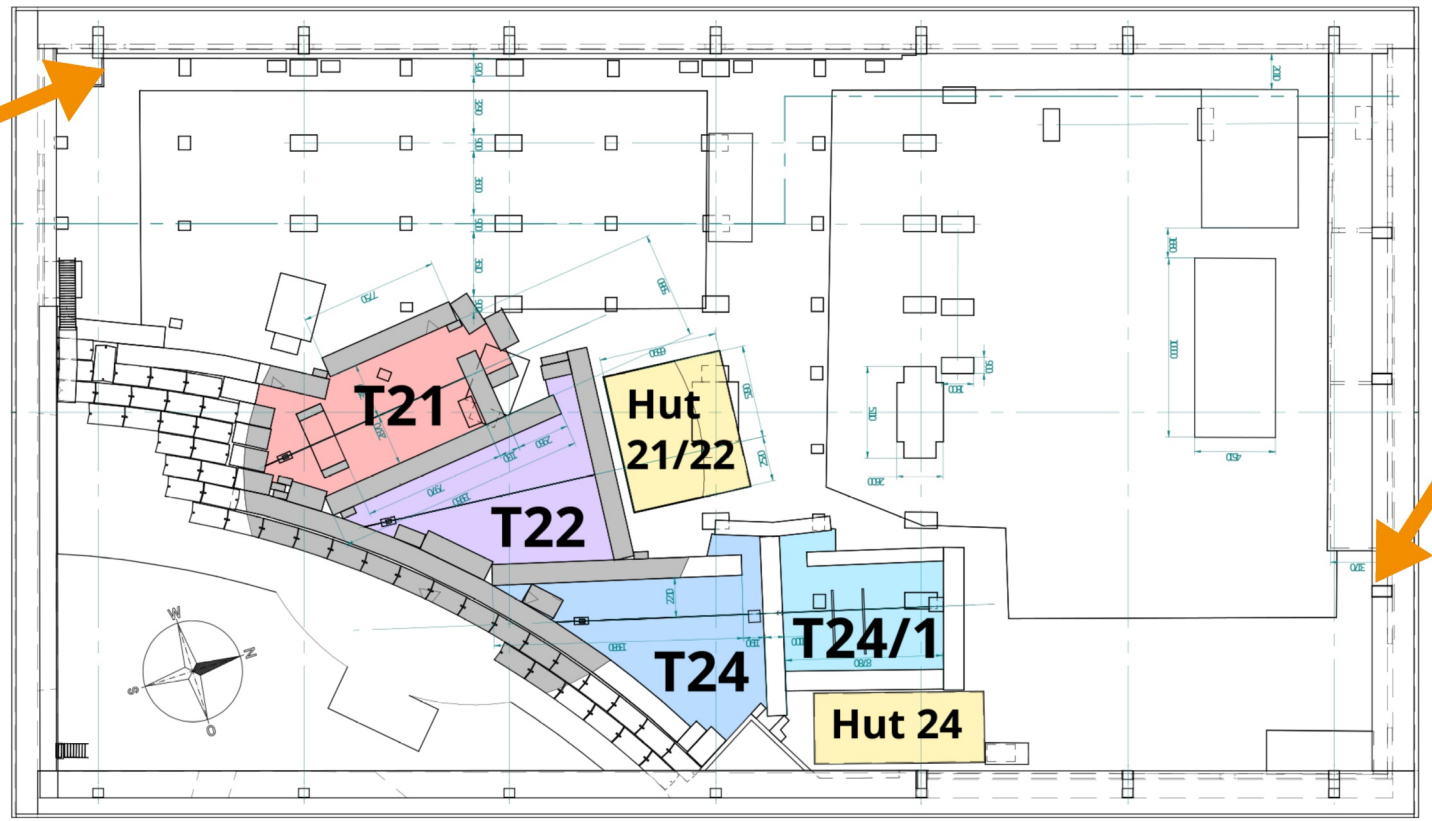

Hall Lights



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!

- 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.

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 comes 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

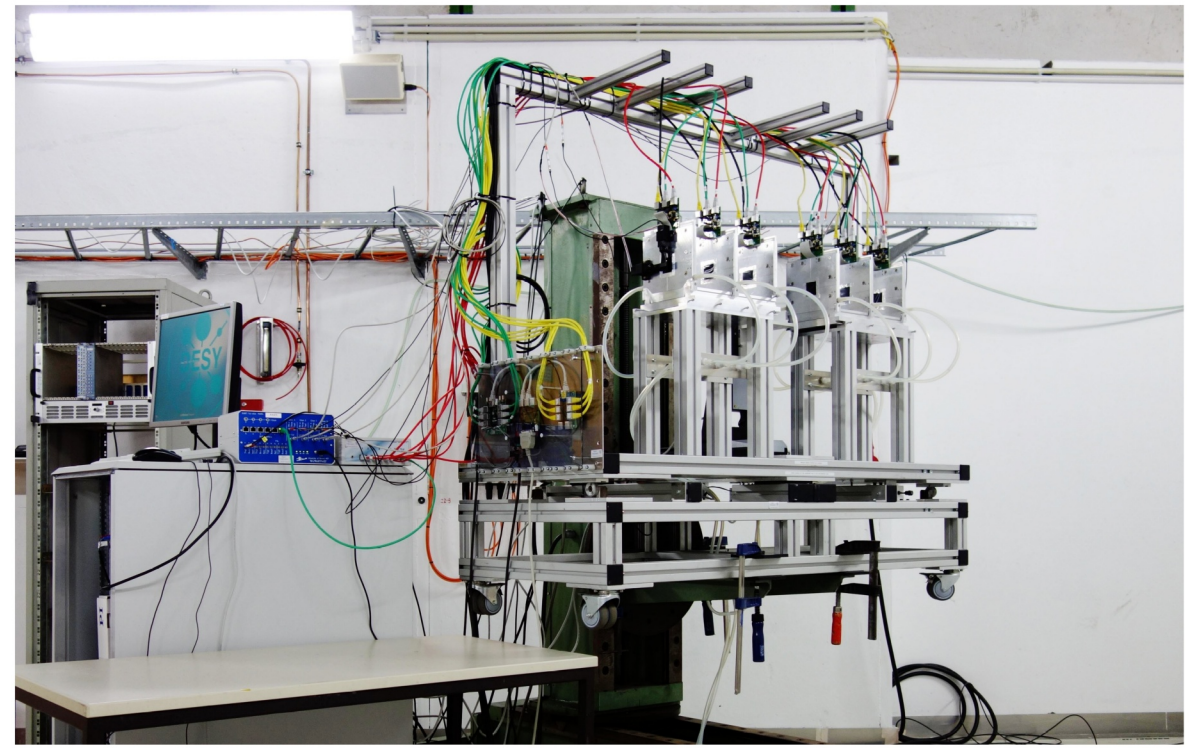
  - Stay in contact via phone during remote operation if people are inside the area
  - Make sure that the stages do not touch other equipment when they move remotely *(Stages with adjustable end switches are available)*
  - Make sure that you don't rip your cables

- **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 of the collimators

Beam Telescopes

- Several areas equipped with EUDET-type telescopes
  - User manual: https://telescopes.desy.de
  - Usage needs to be requested in advance
- Contact & Support
  - Use the e-log: https://tblogs.desy.de
    → *(automatic)* mail to telescope-support@desy.de
- Safety & Rules
  - The telescopes are flexible but sensitive devices
    - The upper frame can be rotated *(not fixed!)*
    - Behind the black Kapton foil are 50 µm Silicon
  - Watch out the travel range of the PI-um-stages
  - The telescope power is provided by an uninterruptible power supply, but only low voltage devices (8 V Mimosa26, 15 V PMTs)

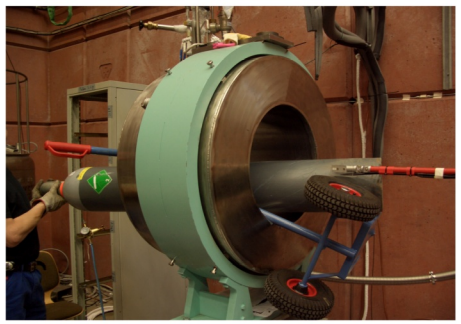


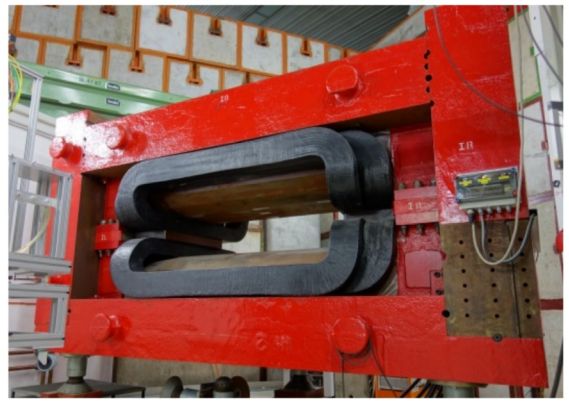
- Usage remarks
  - Data flow should be over the local network: 192.168.<2x>.<x>
  - Take your data saved on the local raids after your test beam

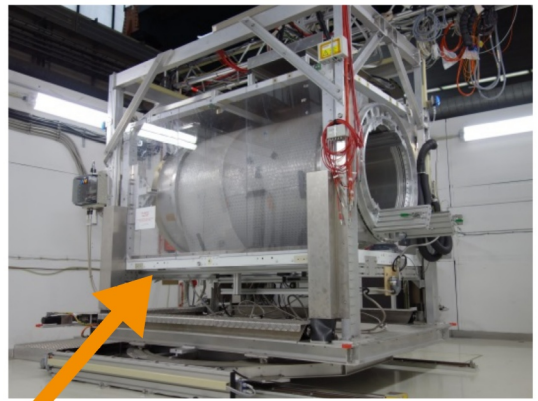
Test Magnets

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 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
    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 → not everyone has this reflex!

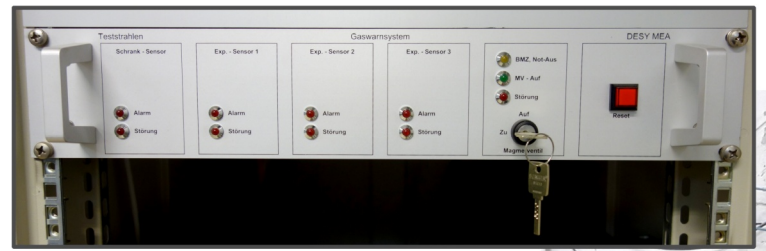
- **Rules**
  - Limit access (number of people)
  - Never look directly into the laser:
    turn away / close eyes if accidentally doing so
  - Only use one laser direction at a time
  - Never use optical instruments or reflecting tools
  - Use laser only during alignment,
    switch off immediately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

- User setups:
  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
  - Put a warning sign on / close to your setup
  - 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



Cryogenic Gases

- **General**:
  - The use of liquid gases as Nitrogen, Helium or dry ice needs to be announced beforehand
  - Special safety precautions will be required
- Use the appropriate personal protection equipment
  - Cryo gloves and safety goggles must be worn
  - Available on request from the coordinators
  - Also: closed sturdy shoes, long trousers and long sleeves
- Danger of cryogenics burns
- Additionally asphyxiation hazards
  - Proper ventilation may be required
- Refer to CERN Cryogenics Course

Hazardous Materials - Shipping and Handling

- **Have to be announced** well before coming to DESY
- Have to be handled/marked/stored properly
- Ask beforehand if unsure

- **Shipping** irradiated samples 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

- **Handling** irradiated samples
  - RSO/D3 will determine, if a dosimeter is needed
  - Need to be labeled accordingly
  - Needs to be stored properly (thief-proof)
    →
    Lockable Freezer (-24 ºC) available for storage:
    - Label: name, group, date, details
    - Need to be removed from the freezer (and shipped) at the end of beam time

Radiation Safety

General Rules

- Always practice **ALARA**:
  As **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 (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
- 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

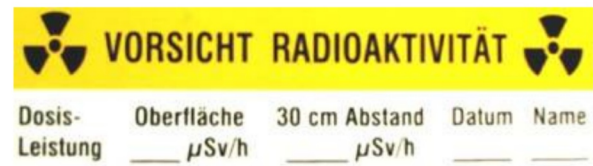
Radiation Safety

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 the 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)

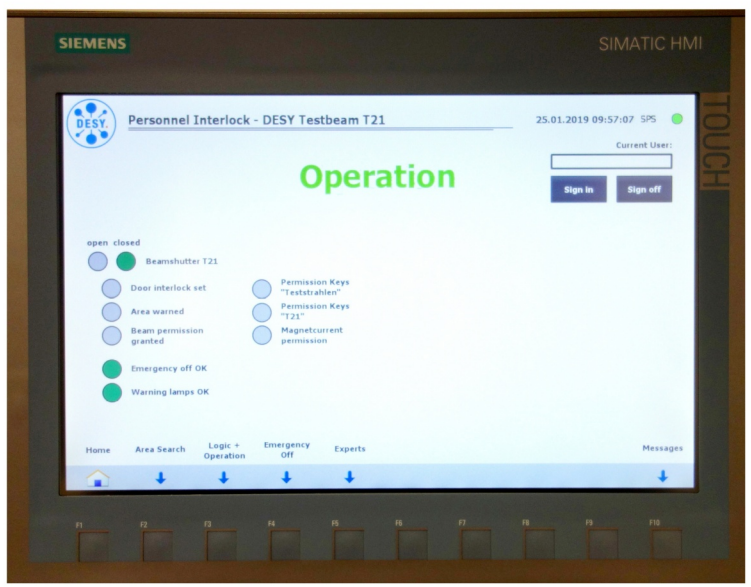
→ Contact us well in advance

Beam Interlock

New System

- Keys
  - Safety keys for test beam general + single areas **only** for safety during repairs/maintenance
  - 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

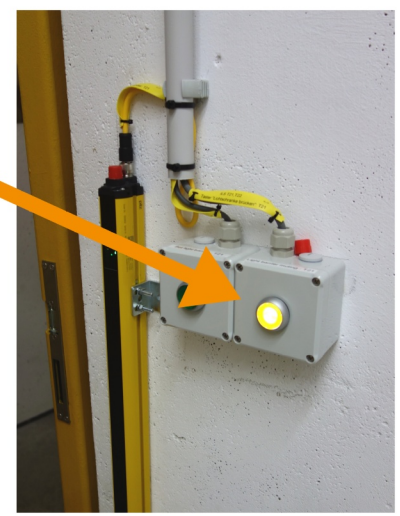
- Do
  - Swipe DACHS card across reader at entrance
  - Go in past the light barrier and press green “Set light barrier” button right after entrance
- Effect
  - Yellow interlock light at entrance and green search buttons inside area will light up
  - Announcement that the interlock search is taking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

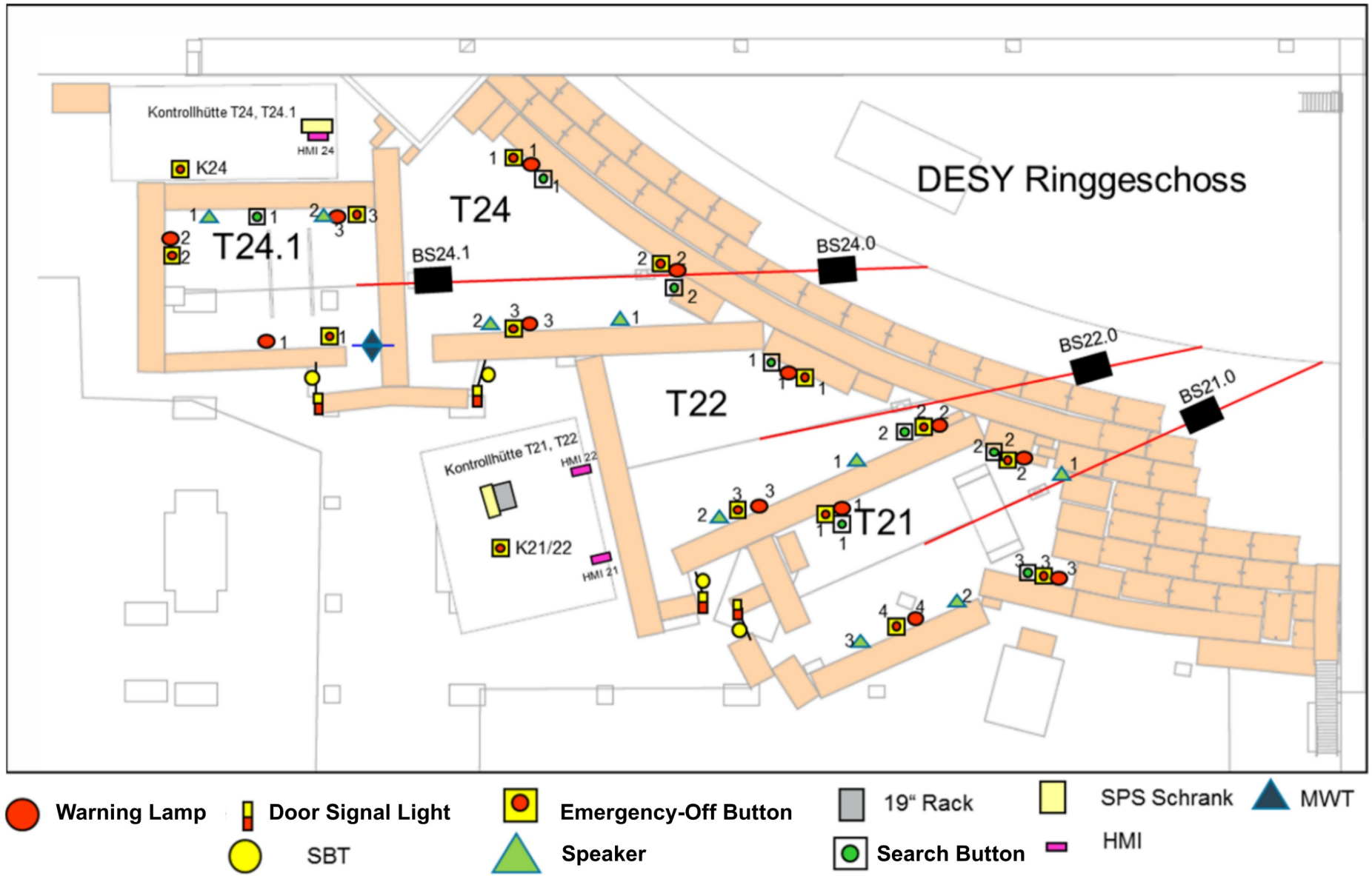
Search and Leaving the Area

- 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

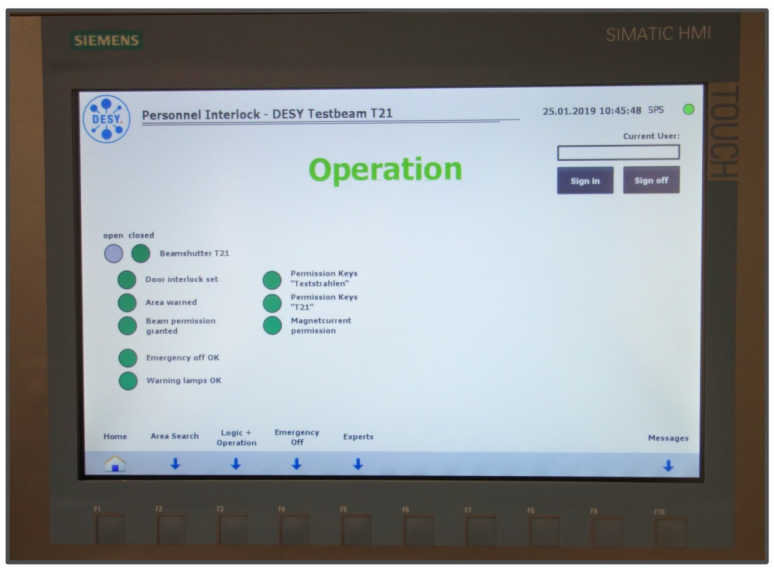


Skizze Interlockkomponenten in den Teststrahlgebieten (A. Liedtke)

Setting the Area Interlock

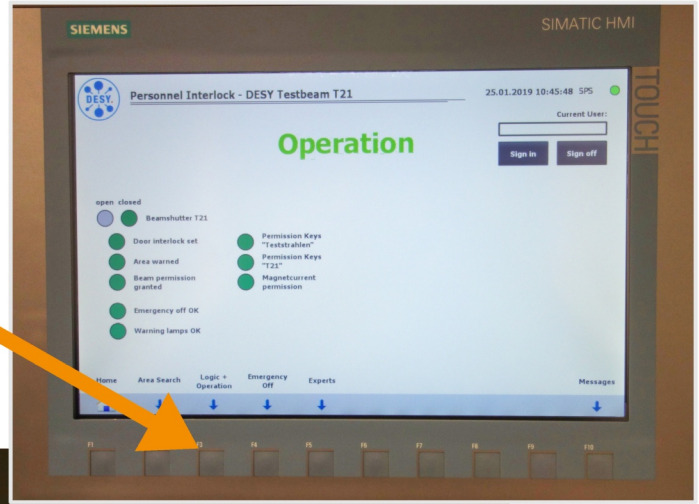
Finishing

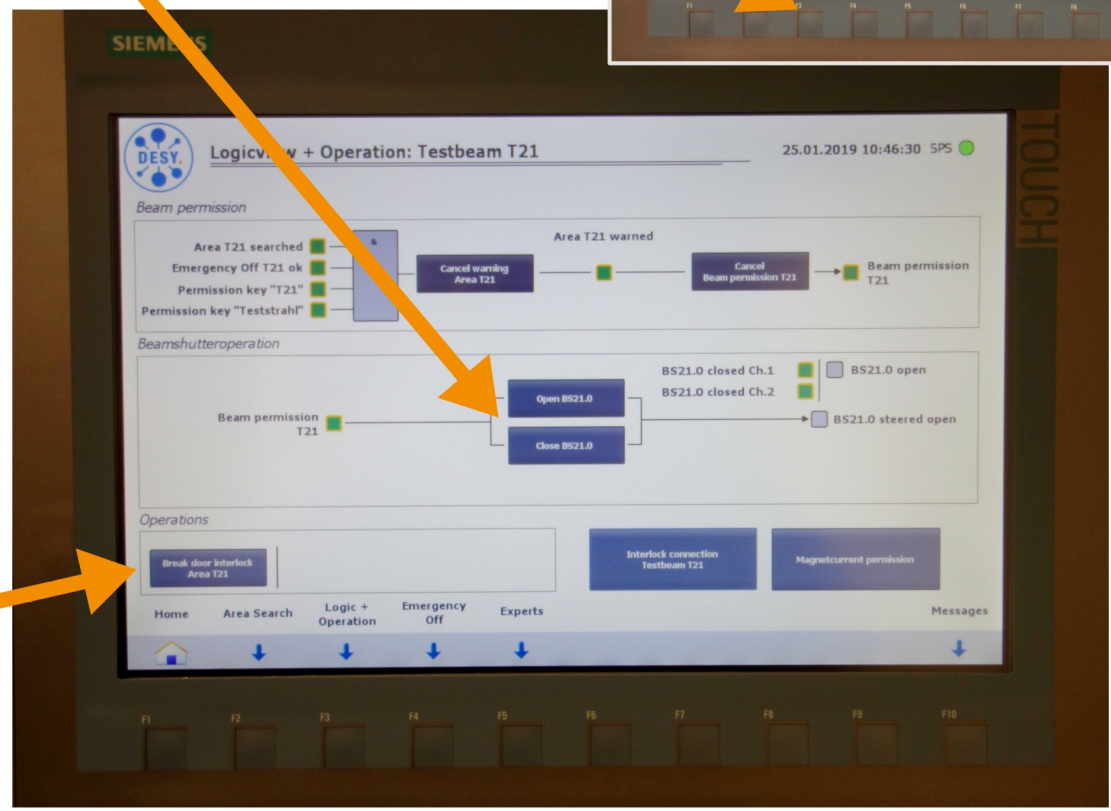
- Do
  - Close door
  - Press “Set button main door”
  - Swipe DACHS card across reader *(same card as at start!)*
- Effect
  - Door secured, red door light switches on
  - Announcement in area for about 30 s that beam is going to be switched on (German + English)
  - After this:
    - Area ready to 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 T*XY*”

Radiation Warnings inside Areas

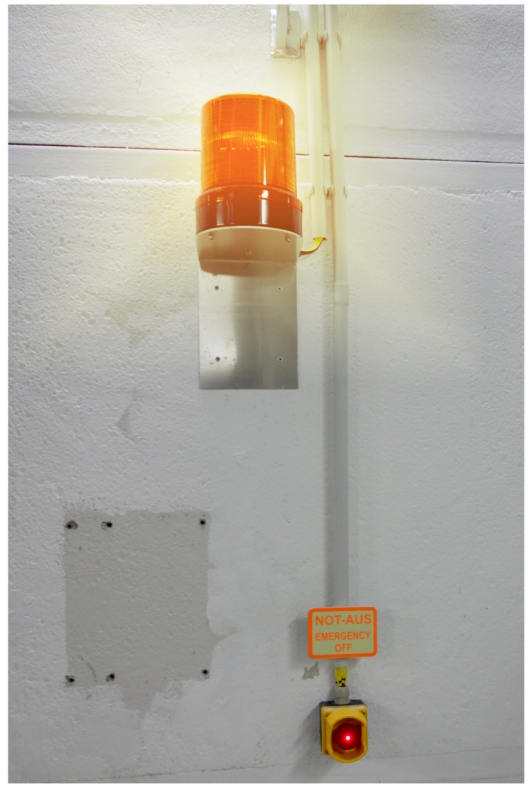
Danger to Life: Immediate Action Required

- **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

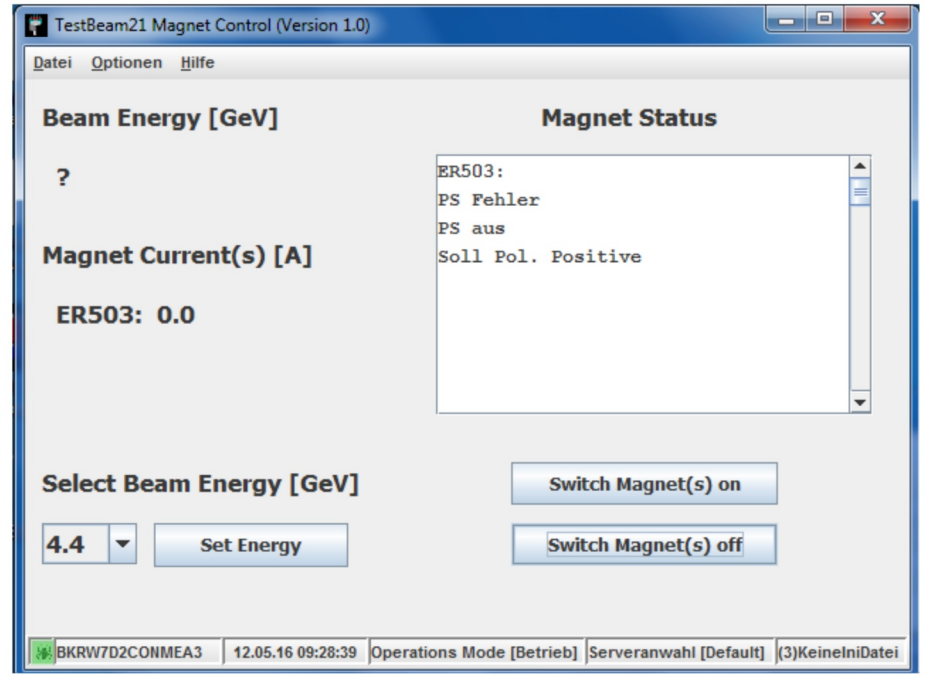


- **Area open, not interlocked**
  - Loud warning signal
  - Radiation alarm sign switches on

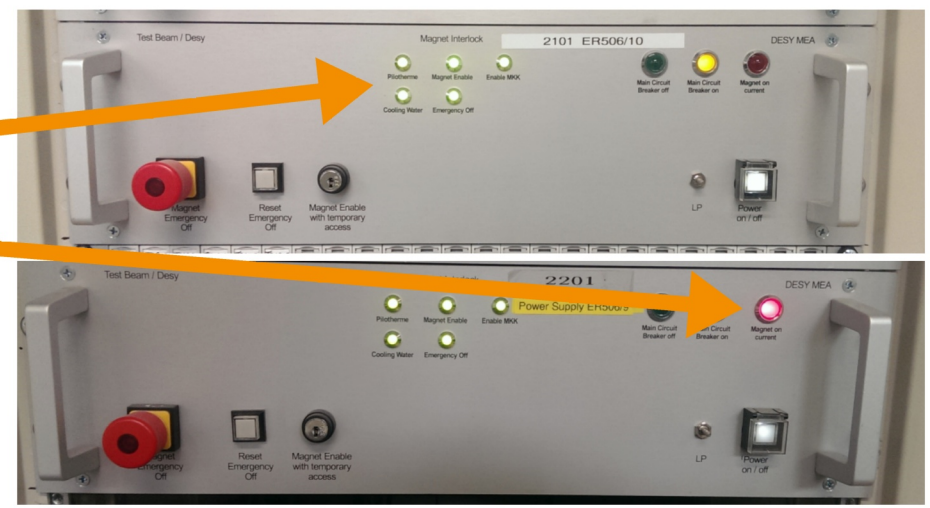
  → **Leave area immediately** ***(avoid crossing beam path)***
  - Keep others from entering
  - Call control room (BKR ☎ 3500) to immediately shut off machine and inform test beam coordinators

Beam Operations

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



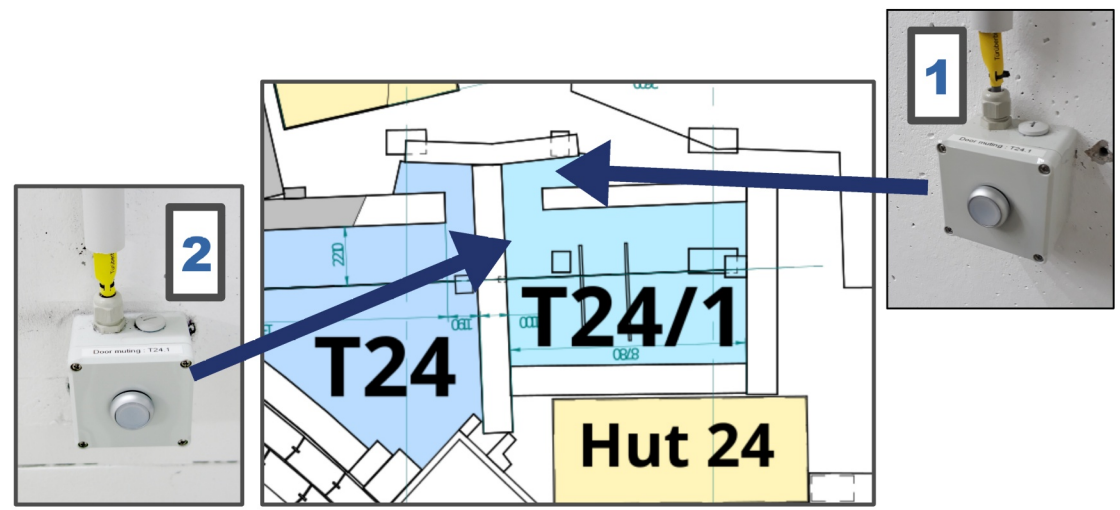
- Checking status of magnet power supplies
  - All 5 green LEDS need to be on to power up
  - Big red light indicates, if magnet is powered



PCMAG Magnet Interlock in T24/1

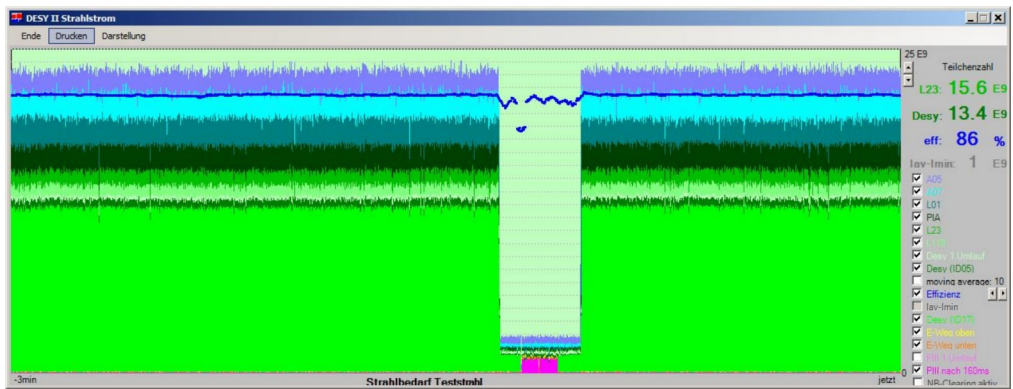
Setting and Bridging

- PCMAG interlock set by closing blue door when leaving area during normal beam interlock procedure
- Temporary access **for small adjustments**
  - Release beam interlock door in touch panel
  - Magnet current warning lights up
  - Bridging *(2 person procedure)*:
    - 1st person presses and keeps pressed “door mute” button ”1” at area entry
    - 2nd person enters though blue door and presses 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** exception for beam interlock:
    2 persons allowed during area search

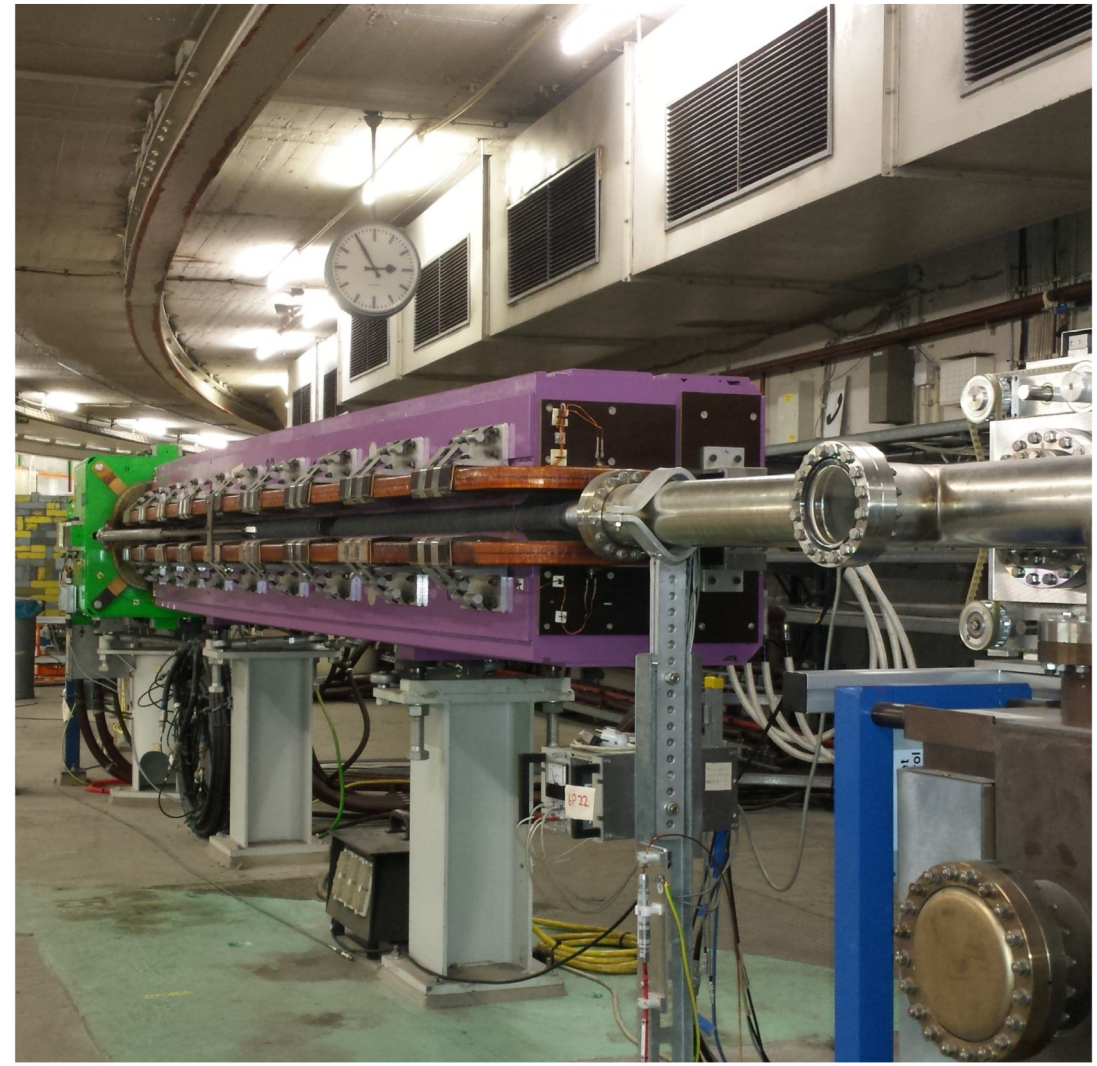


DESY II Test Beam

- DESY II synchrotron: 6.3 GeV, typically 6-15 x 10^9 e^- / 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



Hall West / Building 50

Going Underground

- Building 50 = Hall West
  - Former HERA experimental hall
  - Helmholtz Detector Lab down 7 floors underground
  - In addition: exhibition parts of HERA experiments

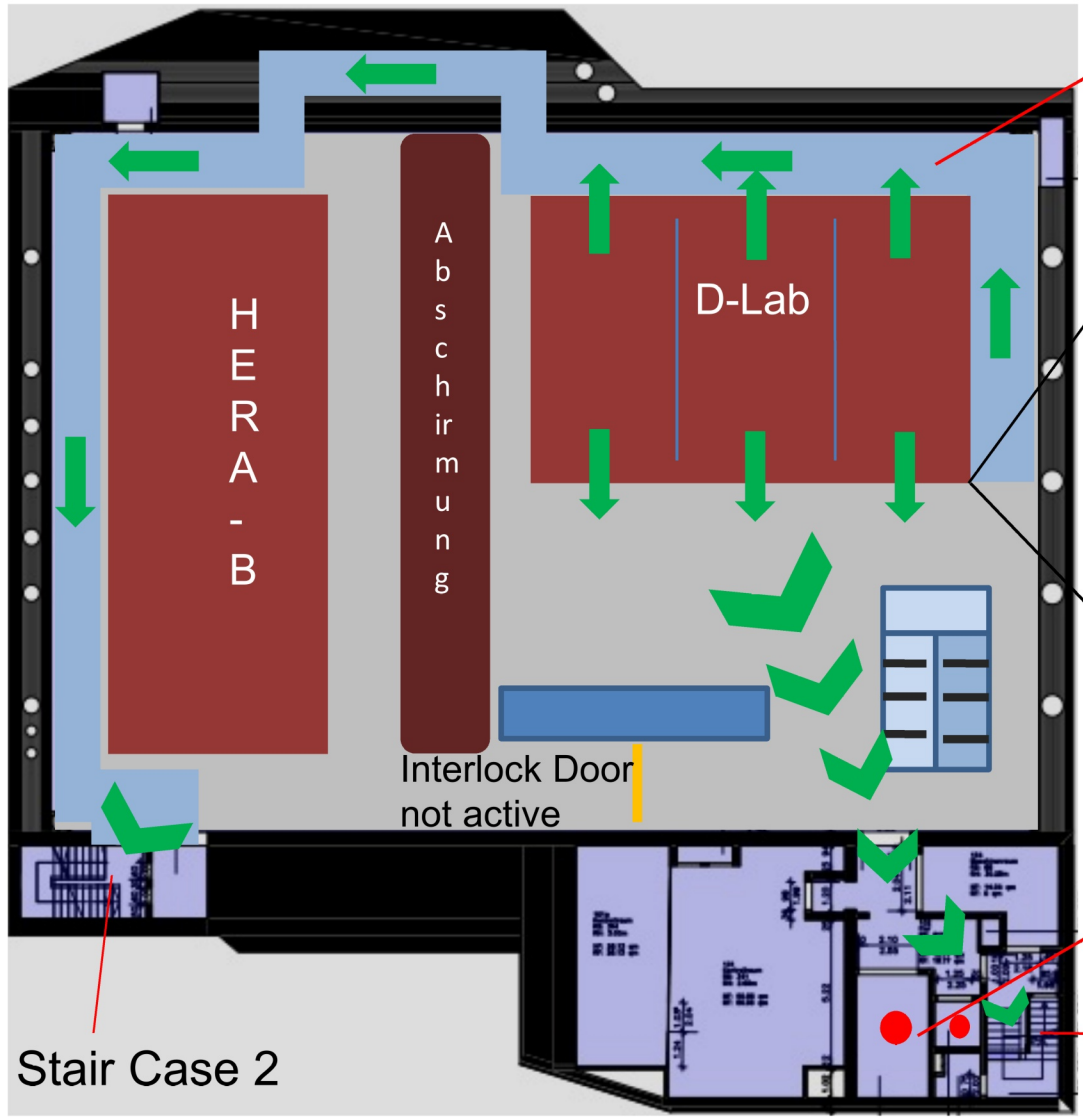
- Due to underground location mining laws apply
  - **Everyone** has to check in and **out again**(!) when going there
  - DACHS card and access rights mandatory
  - Card reader on both sides of the blue door in front of the elevators

- No access to the tunnels! Protected by interlock doors

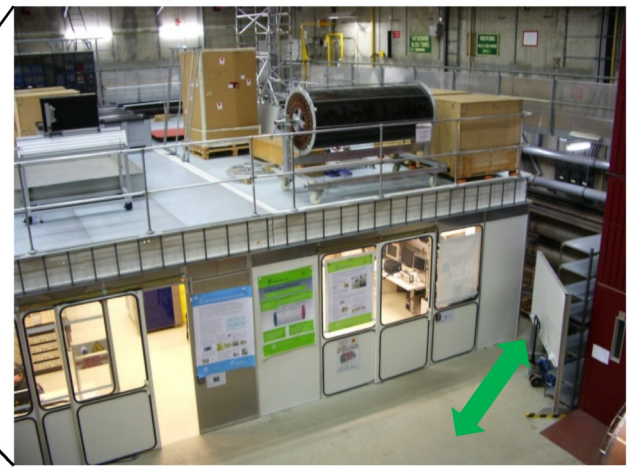
Hall West / Building 50

Escape Routes - Ground floor

- Don't use elevators in case of fire
- Lab rooms have exits on both sides
- Exit route 2 via stair case 2 can be accessed from under former HERA B detector
  - Narrow
  - Careful for pipes etc.



Exit route 2 direction stair case 2



Elevator

Don't use in case of fire!

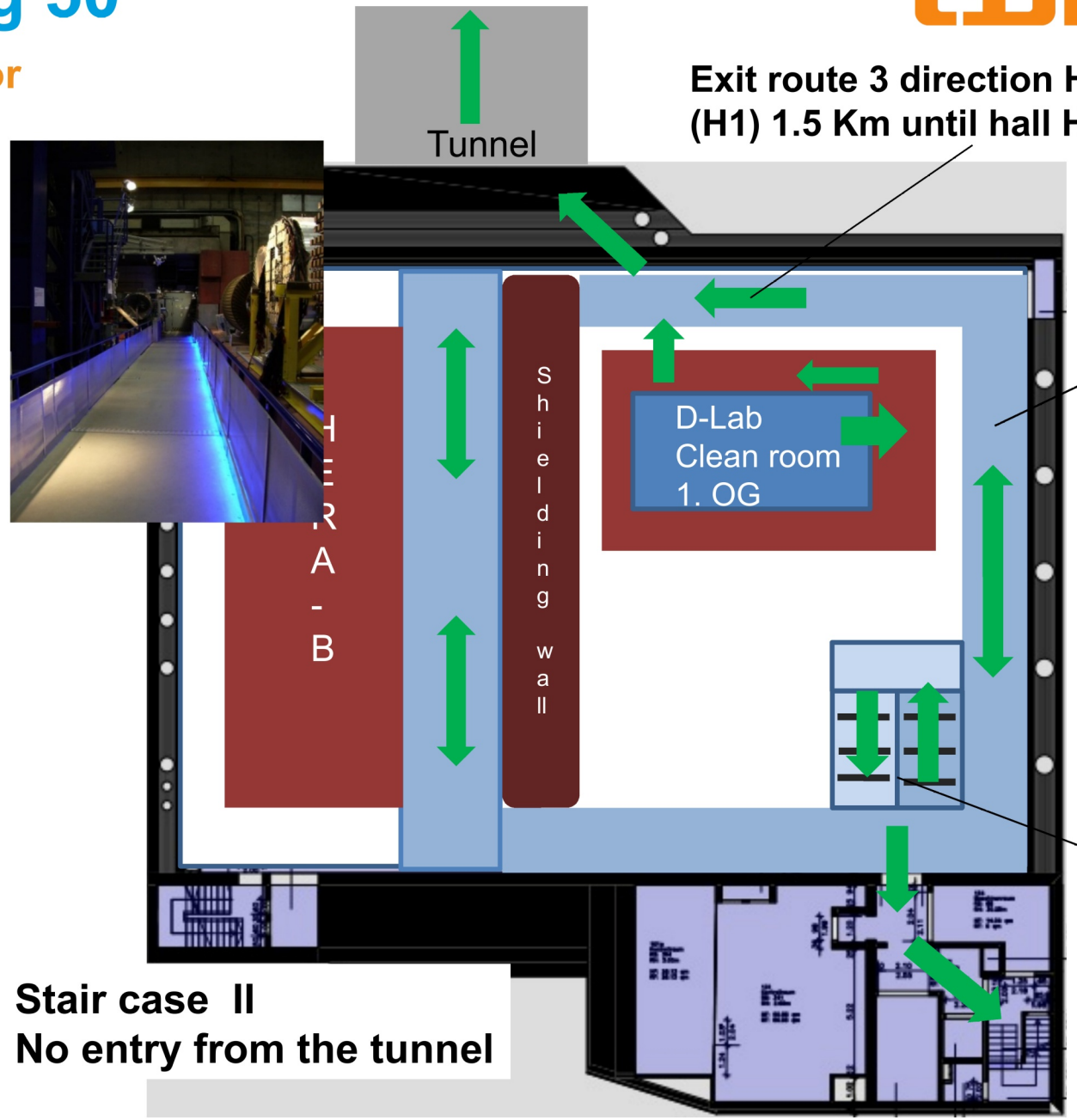
Main Stair Case 1

Hall West / Building 50

Escape Routes - Exhibition floor

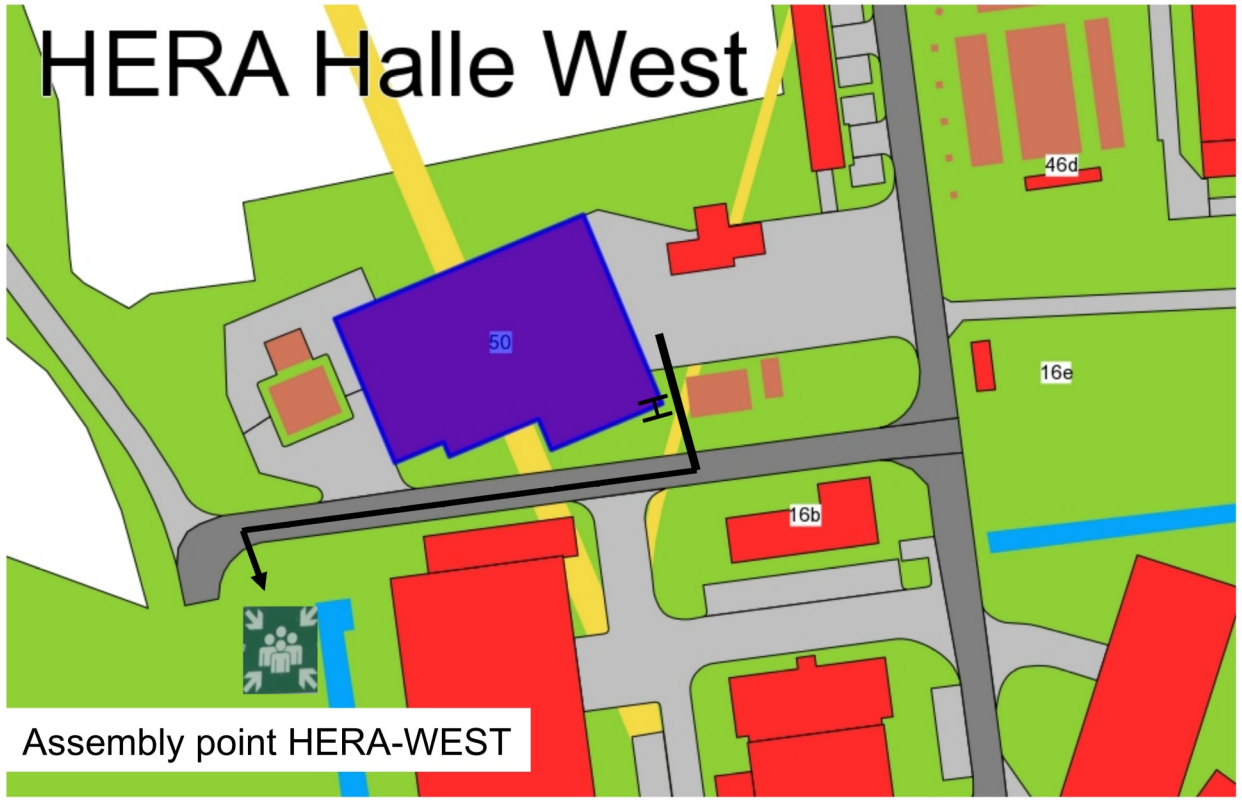
- Don't use elevators in case of fire

- Follow tunnel until Hall North



Hall West / Building 50

Escape Routes - Assembly Point



Hall West / Building 50

Alarm System

- **Alarms in Hall West**
  - Gas pre-alarm
  - Fire alarm
  - Evacuation alarm

  → can be tried at entrance

- If you hear one:
  - Don't try to find out which one is ringing or why: leave the hall immediately!
  - Remember to log your DACHS card at exit

- **Lab equipment**
  - No emergency buttons: Residual Current Devices in power distribution
  - Emergency lights available in labs
  - Radioactive sources: handled only by supervisors
  - There are also: laser setups (up to class 4, two phase CO2 cooling devices, gas distributions, dangerous/flammable liquids

    → Don't explore on your own other areas cabinets etc., in doubt: ask your tutors

- As in every lab: no eating or drinking at the work place

Blue lamp: Low Oxygen Warning

Closing Remarks I

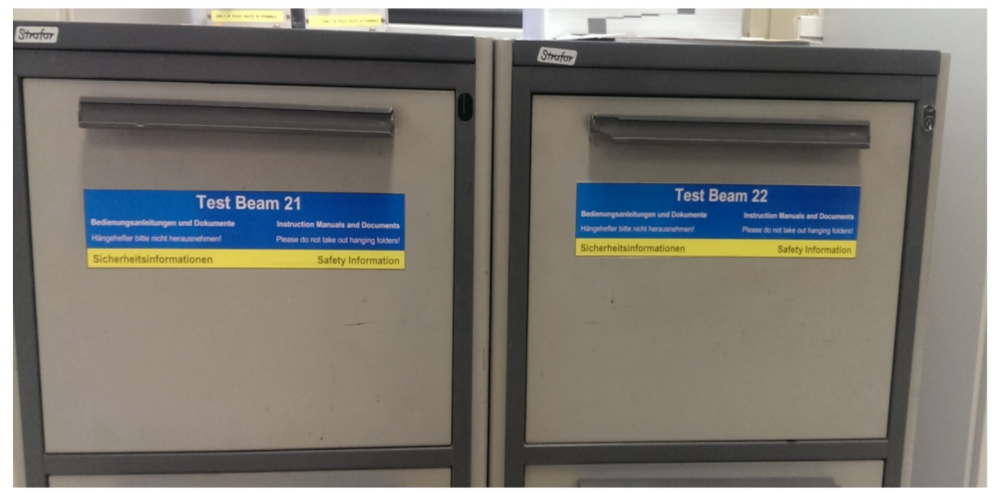
- These rules are for your safety!
  Use your brain before you start to do

- For more information see web pages:
  Test Beam: http://testbeam.desy.de
  Radiation protection: https://d3.desy.de/
  General Safety: https://d5.desy.de/

- Refer also to safety information and
  reference provided in cabinets and drawers

- Web page of our favorite synchrotron:
  https://desy2.desy.de/
  (logbook, status, calendar, maintenance schedule)

- In doubt: ask us!



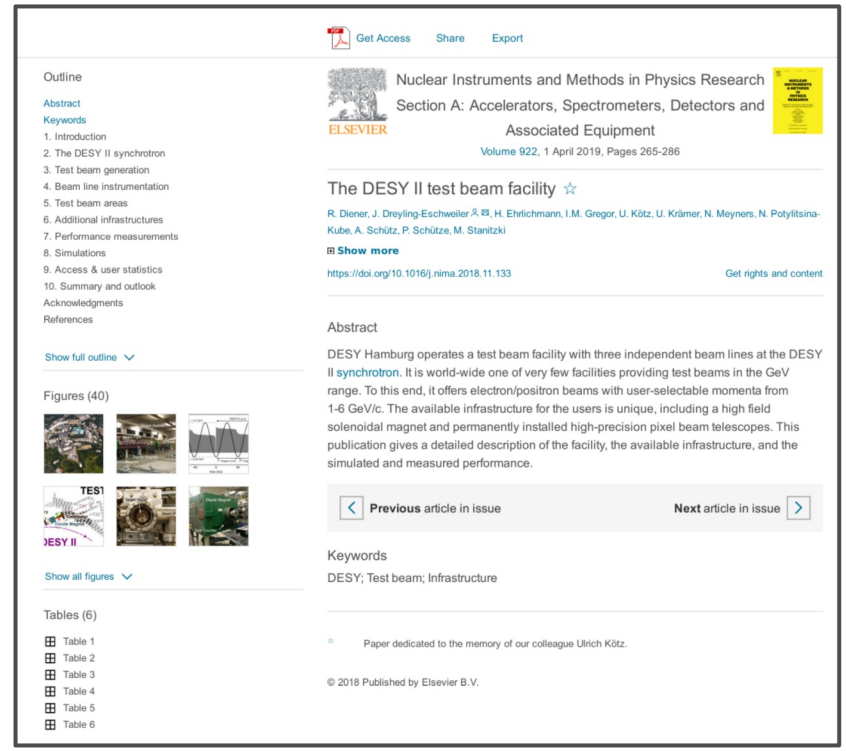
Closing Remarks II

- 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)".