



General safety briefing

**Institut für Experimentalphysik
Universität Hamburg**

30.11.2017



Content

Part I

- **General safety (M. Wieland)**
- **Handling of hazardous substances:
“Chemicals“ (M. Wieland)**

Part II

- **Radiation safety (M. Tluczykont)**
- **Laser safety (A. Azima)**



Part I: General safety

- **Organisation/sources of information**
- **Fire safety/emergency cases**
- **General safety rules/work equipment**
- **Special risks (Laboratories)**



Presidential directive for employment protection: Organisation of employment protection at the University of Hamburg

Professors/Group leader sind für ihren jeweiligen Bereich der Forschung und Lehre unmittelbar zuständig und tragen damit gegenüber ihren Mitarbeiterinnen oder Mitarbeitern und Studierenden die **Verantwortung für den Arbeits- und Gesundheitsschutz** und sind verpflichtet, ihre Forschung und Lehre unter Beachtung des Umweltschutzes zu organisieren.

Leader of units of organisation tragen die **Verantwortung für Arbeits- und Umweltschutz** in ihrer jeweiligen Einrichtung.

Supervisors tragen für ihren Weisungsbereich die **Verantwortung hinsichtlich des Arbeits- und Gesundheitsschutzes** für Mitarbeiterinnen und Mitarbeiter sowie Studierende und sind verpflichtet, Umweltschutzbelange zu beachten.

→ annual **general and working place related**
safety briefing

- sensitization to work safely & maintain everybody's health
- Fulfill legal requirements
(German Social Accident Insurance Institution (UK Nord))



Advice, control and support

Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNGArbeitssicherheit
und Umweltschutz

Stabsstelle Arbeitssicherheit und Umweltschutz (AU)

- Informs responsible persons in each area about their duties
- Supports and advises selectively and regularly

Training programs: First Aid, Fire safety, ...

Works doctor

- Advice, preventive medical checkup
→ provided by arbeitsmedizinischer
Dienst Hamburg

Physics Department:
Officer for working safety
Bernd Poppendieker (Bahrenfeld)

Institute:

Safety delegates (per working group at least one person)

Special delegates (authority to issue directives):

- Laser safety delegate, radiation protection delegate,



More involved persons

Evacuation assistants

- Help to evacuate a building in case of a fire alarm
- Two persons per corridor/floor
- Training organised by AU

First Aider

- 10 % of staff
- First Aid course (1 day) valid for 2 years

Fire safety team

- First at fighting a fire
- Support in fire protection work
- Education: fire fighting training (valid unlimited)

→ Appendix to safety code



Where to search?

Information on job safety



Information on job safety

- **Website of the division for job safety and environmental protection (AU):**

<https://www.uni-hamburg.de/uhh/organisation/stabsstellen/arbeitssicherheit-und-umweltschutz.html>

- **Job safety management system (AGUM) used by the university:**

<http://uni-hamburg.agu-hochschulen.de/index.php?id=1095>

- **Website of the institute (safety instructions, job safety code, ...):**

http://www.physnet.uni-hamburg.de/fachbereich-physik/institute/iexp/service/sicherheit_e.html

→ Risk assessments

- mandatory for every (dangerous) work, every work place
- provided by responsible, annual check, needs to be available in written form

→ Operation instructions/Code of practice

- Rules to follow when using work equipment
- Informs about potential special dangers
- **Blue:** Machines, **Orange:** Chemicals



Safety at a glance:

Special rules & a bit of attention

Work and work place arranged so that accidents are avoided!



Most accidents happen due to „human failures“

→ disrespect of safety rules



Every person contributes by her/his action!



Inform colleagues as soon as safety rules are not followed!



Universität Hamburg

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General safety briefing 2017
Institut für Experimentalphysik



Fire safety

Emergency cases

Fire safety

- No smoking and open fire allowed in any building
- Corridors/Stairways are escape ways in case of an emergency



KEEP CLEAR of cartons & packaging/tables, chairs, etc.

NEVER block fire protection doors!

NEVER block safety equipment (fire extinguisher etc.)

→ evacuation assistants/building responsables

- Electrical devices for preparation of hot water (also private ones!):

Water boilers, coffee machines etc

To be used only in appropriate rooms (kitchens)

Usage of fire resistant support mandatory!

VdE testing (electrical safety) necessary!

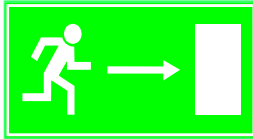


If needed talk to your local safety delegate

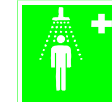
In an emergency case:

Do you know the...

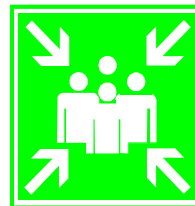
Emergency exits



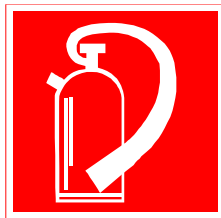
**Locations of first aid
accessoires**



**Common
meeting points**



**Locations of fire
extinguishers**

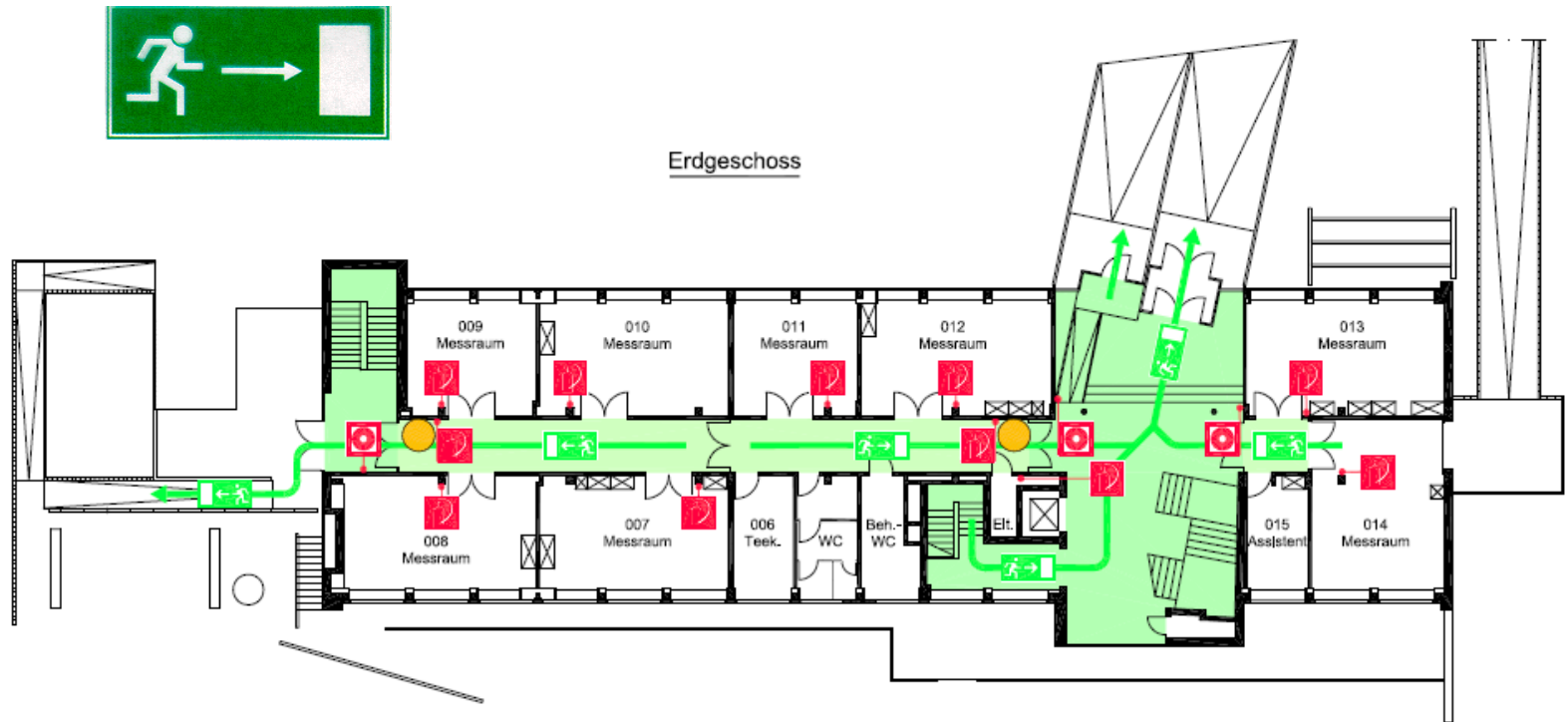


Emergency number



First-Aiders

Escape way and emergency exit maps



You have to be able to orient yourself even under strong smoke development!



Common meeting points

In case of an alarm you **immediately** have to go to the meeting points!

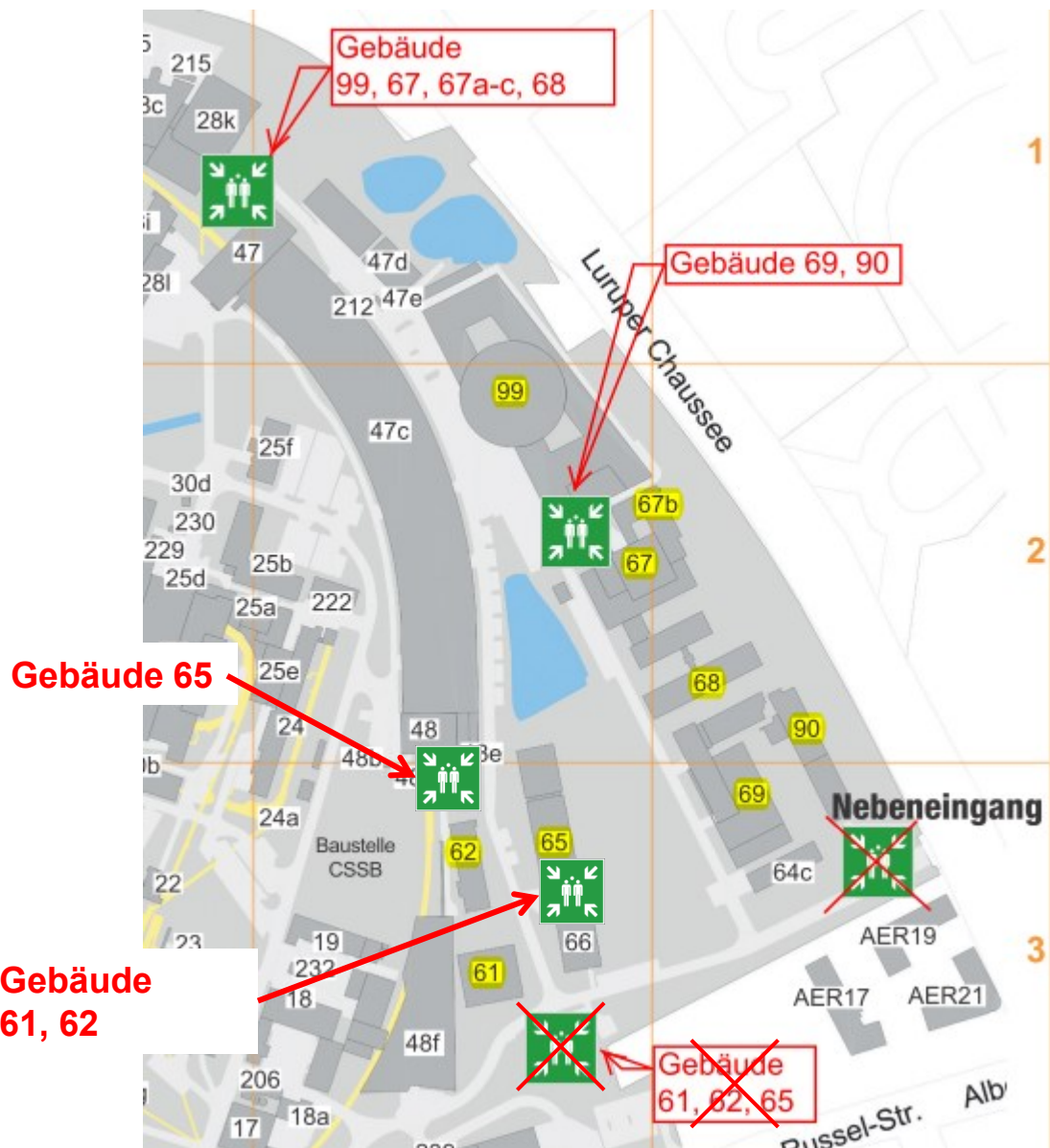
This also applies in case of a power failure



Evacuation assistants report building cleared



Check if all colleagues are there and inform rescue people if necessary



In an emergency case/rescue plan:



SAVE DESY

Phone 2500 from outside: 040-8998-2500

Inform SAVE according to the following scheme:

Where	did the accident/emergency happen? Accurate description of place/building/floor/room
What	happened exactly? Describe shortly the situation.
How many	people are injured/involved?
What	kind of injuries?
Wait	for possible questions

→ Do NOT call external fire men/ambulance/police!



In case of a fire

- Press fire alarm buttons or call **2500**
- Stay calm, close windows and doors
- If possible, switch of machines/experiments
- In case of an alarm leave the dangerous area **immediately** and help injured or disabled persons
- **Only** try to extinguish a fire if this is possible without bringing yourself into danger!
- Do **NOT** enter any area under smoke!
- **NEVER** use the elevator!!! Move to the **meeting points**!





In case of a fire

If you are not able to leave the building:

- **Go to a room with windows**
- **Move close to the floor if smoky areas have to be crossed**
- **Keep doors closed**
- **Try to give signals from the window that people get aware of you**



NIST

**National Institute of Standards
and Technology
Technology Administration
U.S. Department of Commerce**



In case of an accident

- Rescue injured persons from the hazard area and place them in recovery position (if unconscious)

- Take care of life-threatening injuries

- **Call** Where?
2500 How many injured?
 Kind of injury *

* Try to decide if ambulance is needed

Mandatory if:

1. Person unconscious
2. Life-threatening injuries
3. Electrical accident

- Continue supply of injured person

- Briefing for SAVE if possible

- Minor injuries: First Aid Kits
Verbandsbuchauszug
(Proof for accident at work)

Spare parts for First Aid Kits: Mr. Illing/Weppner 2207/2106

First-aider course
26.06.2018/English



Accidents:

- Accident at or on the way to or at work: If a physician has to be consulted, visit at a so called „**Durchgangsarzt**“ (approved by health insurance) or a hospital is mandatory.

Dr. M. Frieling
Ärztin für Unfallchirurgie
Rugenbarg 20

Dr. H.V. Grüber
Arzt für Unfallchirurgie
Giesestr. 7

AK Altona
Tel. 040-88 22-0
Augenverletzungen
Augenklinik (AKA)

- Names and addresses of other „**Durchgangsärzte**“:

Appendix 2 of the job safety code

or at **<http://lviweb.dguv.de>**

- Report any accident - in particular if medical assistance is needed - to your supervisor/boss (report needed for insurance (UK Nord)) and your administration.



General safety rules

Work equipment

General safety rules

How to behave on the Campus Bahrenfeld



- The speed limit is 30 km/h (no matter which vehicle you are using)

- Parking is only allowed at dedicated places – never block emergency exits or emergency access roads!

Feuerwehruzufahrt



- Adapt yourself to the weather conditions!



General safety rules

Respect restrictions (**blockades**) even if this leads to detours!
⇒ This also applies for pedestrians!



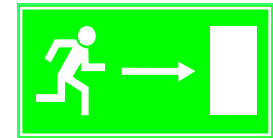
General safety rules

Respect safety signs:

**Mandatory Signs:
Personal
Protective
Equipment (PPE)**



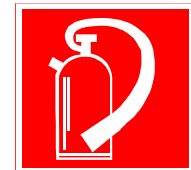
**Exit or
evacuation signs**



Prohibition Signs



Fire safety signs



Warning Signs





General safety rules



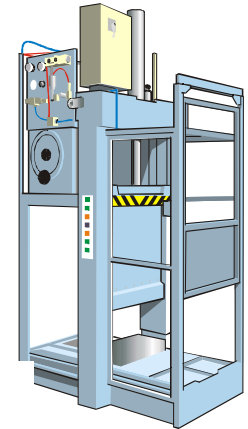
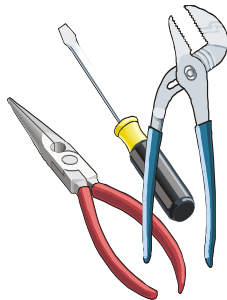
**Warning:
dangerous
Voltage**

- **Respect danger and warning signs as well as access restrictions!**
- **Crosscheck with responsible person if work has to be carried out in areas with **access restrictions**!**
- **Never carry out dangerous experimental or technical work alone!**



Work equipment

Work equipment: tools, devices, machines or machinery



- Follow **manuals & warning notices**,
also **operation instructions**
- Keep an eye on regular checks required, e.g. for ladders,
forklifts



Rules for safe operation:

- Every user has to be instructed **BEFORE** using any device/machine
- Visual inspection **BEFORE** usage!
- **NEVER** operate devices with open housings,
do **NOT** bypass, shortcut or even remove safety mechanisms
- Use your PPE (to be supplied by employer):

safety boots,
gloves,
safety glasses,
ear protection



⇒ Intended usage of work equipment!



Special risks (laboratories)

Electrical devices/High voltages

Pressurized gas containers

Liquefied gases

Electrical devices

- Do NOT use damaged devices! Clearly label them and arrange for repair
 - movable electrical devices **regularly** have to inspected by trained personnel, inspecting periods may vary (i.e. offices every 2nd year)
- Use extensions/multiplugs safe:
 - Avoid risk of stumbling by use of cable ducts
- Multiplugs MUST not be used as extensions:
 - No stacking of multiplugs!
- Acquisition: TÜV/VdE-Label
 - No cheap stuff!!!!





Electrical devices/high voltages

- **NEVER** change any permanent electrical installation!
- Energized parts at voltages above 25V (AC) or 60V (DC) have to be shielded; warning signs have to be placed
- Devices for voltages **above 1kV** need to be labeled with „High Voltage“
- Always use appropriate cabling and connectors fulfilling the application demands; assembling has to be carried out by qualified&trained personnel!



In case of doubt: Ask a professional!

Handling of pressurized gas containers

- ...is allowed only **AFTER** being instructed:
 - Main risks: tilting over/displacement of air
- Storage only in an appropriate **gas bottle storage**
Supply (secured) in the lab is allowed
- **NEVER** move without protection cap/do **NOT** use valve as handle
 - Usage of gas bottle cart
- Secure bottles against tilting over **BEFORE** usage
- **Labeling** of laboratories needed (fire brigade!)
- Color code according to type of gases: Only use pressure reducers suited for the used gas!



⇒ **Follow risks assessments/operation instructions!**

Liquefied gases

Using liquefied gases (liquid nitrogen/helium) the following risks occur:

- Freezes (cold burns) by direct contact
- Suffocation due to evaporation of huge amounts of liquefied gases in rooms
⇒ Never transport liquefied gases **AND** persons simultaneously in an elevator!



- Possibility of oxygen enrichment

⇒ Handling of liquefied gases is allowed for instructed persons only.

⇒ Persons allowed to order (liquefied) gases from the DESY-Gaselager need a special instruction



⇒ **Follow risks assessments/operation instructions!**

Safety briefings/DESY

General radiation safety briefing, main auditorium, building 5

- 1. Termin: **Do, 23.11.2017** um 09:30 im DESY Hörsaal
- 2. Termin: **Do, 30.11.2017** um 09:30 im DESY Hörsaal → **auf Englisch!**
- 3. Termin: **Di, 05.12.2017** um 09:30 im DESY Hörsaal
- 4. Termin: **Fr, 08.12.2017** um 11:00 im **XFEL Meetingraum!** → **auf Englisch!**
- 5. Termin: **Mo, 11.12.2017** um 09:30 im DESY Hörsaal
- 6. Termin: **Mi, 13.12.2017** um 09:30 im DESY Hörsaal



Zu den genannten Terminen werden jeweils folgende Unterweisungen erteilt:

- Allgemeine Strahlenschutzunterweisung (N. Tesch, D3)
- Spezielle Strahlenschutz- und Sicherheitsunterweisungen für die Beschleunigeranlagen LINAC, DESY, PETRA, FLASH, XFEL (M. Bieler, MBB); für den 4. Termin bei der XFEL GmbH wird es nur den speziellen Teil für die Beschleunigeranlage XFEL geben!

General safety instructions, main auditorium, building 5

24.01.2018 09.00 and 13.00 Uhr
14.02.2018 09.00 and 13.00 Uhr
15.02.2018 09.00 and 13.00 Uhr
20.02.2018 09.00 and 13.00 Uhr in Englisch



Questions? Comments?

Safety delegates of working groups& supervisors

Special safety delegates for particular duties :

Officer for working safety (Herr Poppendieker)

Radiation safety delegate (Herr Tluczykont)

Laser safety delegate (Herr Azima)

Hazardous substances delegate (Herr Schnepf)

Fire protection (Bernd Poppendieker)

Organisation of job safety (M. Wieland)

Or: Sicherheit_IEXP@desy.de

Safety briefing 2017

Part II

Hazardous substances



Institut für Experimentalphysik

Hazardous substances?

- Even Work with small amounts of common chemicals could be dangerous
- Careful handling of hazardous substances is important for your safety and for the safety of your colleagues

You are responsible for safety at your working place!



Important:

Personal training at site by experienced user!

Or by Bernd Poppendieker

Bernd.Poppendieker@desy.de

Outline: Handling

- Important basic rules
- General behavior in lab
- Personal protective equipment (PPE)
- Storage and labeling of chemicals
- Sources of information about used chemicals:
 - hazard pictograms, hazard & precautionary statements, material safety data sheet
 - CLAKS database software

Important Basic Rules

- **substitution rule**: Always look if it would be possible to substitute dangerous by un-dangerous
- Only use **little necessary amounts**, small bottles not more than “daily use”
- bigger bottles in **safety cabinet**, and refill to small bottles (storage space available in build. 61, room 112)

Behavior in (chemical) labs

- Work carefully
- Dangerous work: never alone
- Protect yourself and your colleagues
- Everybody is responsible for tidiness and cleanliness in lab
- Do NOT drink or eat
 - Do NOT smoke
 - NO Alcohol



Clothes and PPE

- Lab coats
- Long pants
- Proper closed shoes
- Protection goggles
- Protection gloves
(according to requirements of
substance handled,
i.e. solvent proof!)



Use of the fume hood

- Use and refill of hazardous substances is generally only allowed under the fume hood
- Correct operation of the fume hood needs to be checked before every use
- Front window should always be closed, for work only open as much as needed



Storage of chemicals

- Only suitable and allowed container
- Confusion must be impossible
- No chemicals in fridges used for food!



Labeling of containers

- Chemical Name
- Concentration
- Hazard pictograms
- H.- und P.-Statements
- Group/responsible person
- Date
- CLAKS barcode



Hazard Pictograms

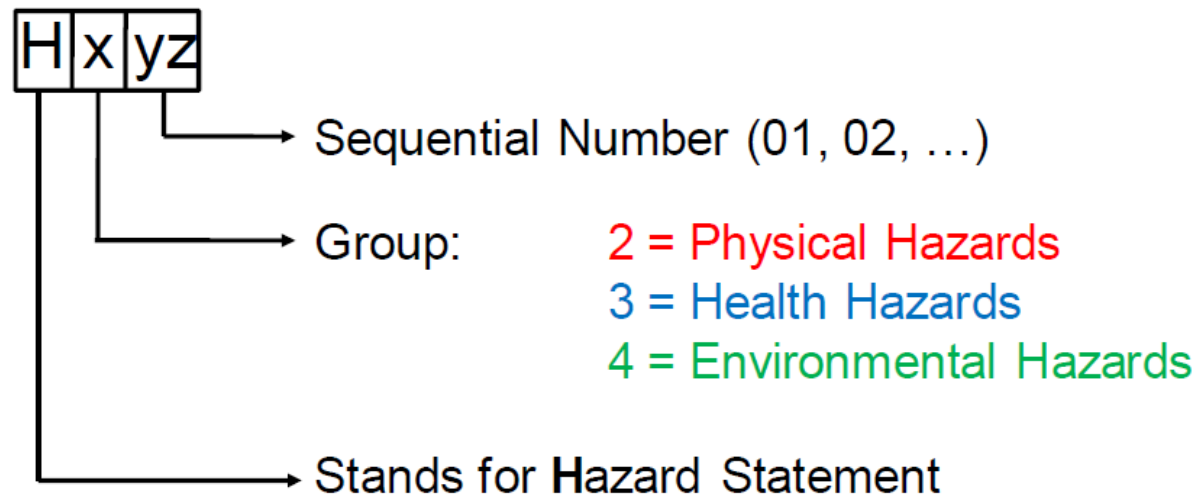
Global harmonized System GHS

Alt	Neu (GHS)
 Ätzend	
 Brandfördernd	
 Explosionsgefährlich	
 Umweltgefährlich	
 Leichtentzündlich	
 Hochentzündlich	

 Giftig	
 Sehr giftig	
 Gesundheitsschädlich	Keine direkte Entsprechung
 Reizend	
Keine direkte Entsprechung	
Keine Entsprechung	
Keine Entsprechung	

H- und P-Statements

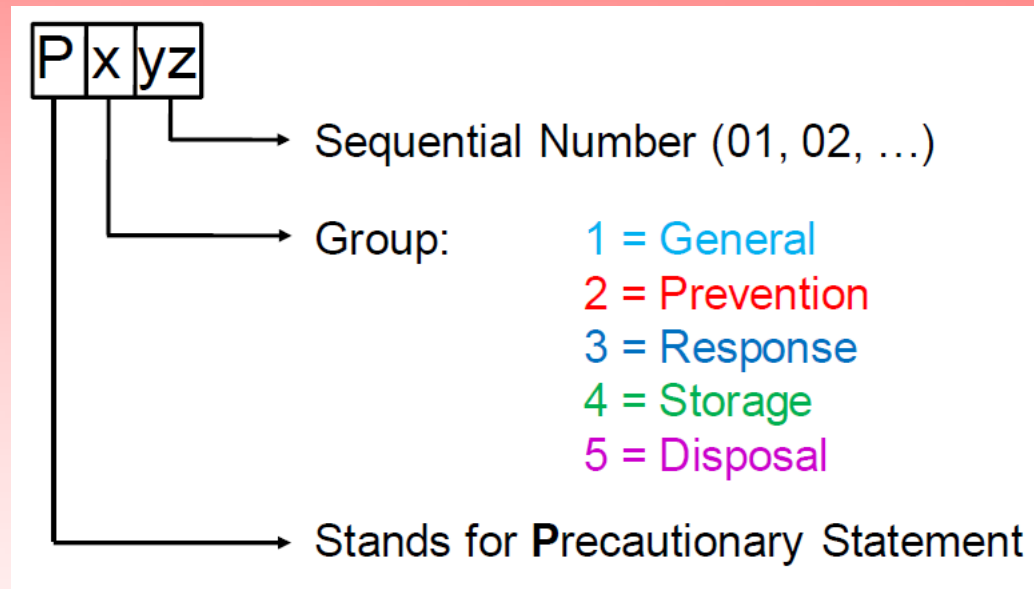
Hazard-Statements



→ **Safety data sheet**

H- und P-Statements

Precautionary Statements



→ **Safety data sheet**

Material safety data sheet

Sicherheitsdatenblatt

gemäß Verordnung (EG) Nr. 1907/2006 (REACH), geändert mit 2015/830/EU



Ethanol 96%, Ph.Eur., reinst

Artikelnummer: **P075**

2.2 Kennzeichnungselemente

Kennzeichnung gemäß Verordnung (EG) Nr. 1272/2008 (CLP)

Signalwort

Gefahr

Piktogramme



Gefahrenhinweise

H225

Flüssigkeit und Dampf leicht entzündbar

H319

Verursacht schwere Augenreizung

Sicherheitshinweise

Sicherheitshinweise - Prävention

P210

Von Hitze, heißen Oberflächen, Funken, offenen Flammen sowie anderen Zündquellenarten fernhalten. Nicht rauchen.

P233

Behälter dicht verschlossen halten.

Sicherheitshinweise - Reaktion

P305+P351+P338

BEI KONTAKT MIT DEN AUGEN: einige Minuten lang behutsam mit Wasser ausspülen. Eventuell vorhandene Kontaktlinsen nach Möglichkeit entfernen. Weiter spülen.

Kennzeichnung von Verpackungen bei einem Inhalt von nicht mehr als 125 ml

Signalwort: **Gefahr**

Gefahrensymbol(e)



P210

Von Hitze, heißen Oberflächen, Funken, offenen Flammen sowie anderen Zündquellenarten fernhalten. Nicht rauchen.

P233

Behälter dicht verschlossen halten.

P305+P351+P338

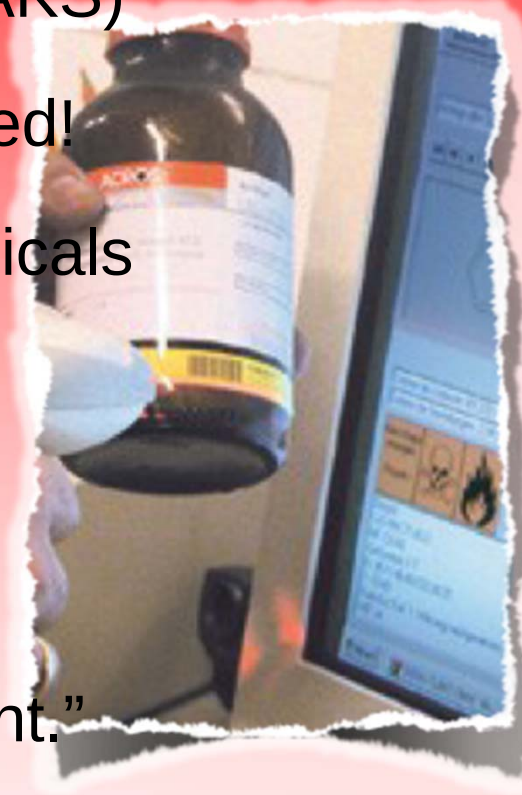
BEI KONTAKT MIT DEN AUGEN: einige Minuten lang behutsam mit Wasser ausspülen. Eventuell vorhandene Kontaktlinsen nach Möglichkeit entfernen. Weiter spülen.

2.3 Sonstige Gefahren

Es liegen keine zusätzlichen Angaben vor.

CLAKS-database software

- Chemikalien Lager und Kataster System (CLAKS)
- Provides register/database for substances used!
- Accounts for everybody who works with chemicals
- Includes material safety data sheets and additional information
- Easy labeling of containers
- Each group needs to have a “CLAKS represent.”
- Procurement of chemicals possible



Information: <http://www.chemie.uni-hamburg.de/claks/>

Conclusion: Handling

It doesn't matter which hazardous substances you use:

- leaches, acids, solvents
- compressed gases
- liquid nitrogen
-

It's always important to be informed about the chemicals you are working with!!!

Disposal

Disposal is allowed only using specific containers

- Container unexpired and clean from outside
- Correct labeling according specific guidelines
- Mandatory: hazard pictograms/UN-Code/origin of waste
Must not be changed



Transport to disposal station:

- Carefully seal containers
- use buckets for carrying smaller containers, bowls for larger ones
- Wear suited protective equipment according to requirements of substance handled, i.e. solvent proof!
- Take special care of glass ware (risk of damage&cutting damage)

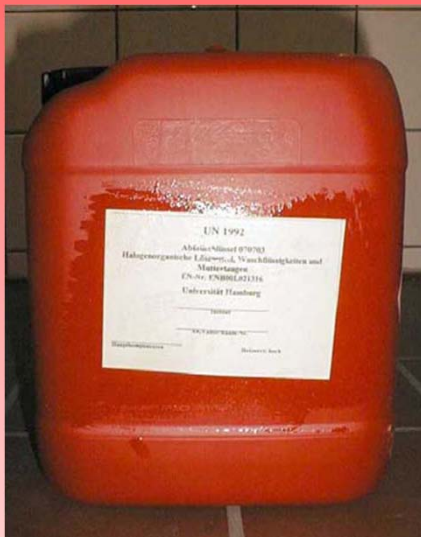
Disposal

- For the Campus Bahrenfeld:
 - storage of dangerous materials container next to building 65
- Disposal is organized by Mr. Poppendieker, contacting him is mandatory!
 - Supply of all material needed
 - bernd.poppendieker@desy.de,
0151-25052761 or 8998-2186

Thank you for your attention!

Questions?

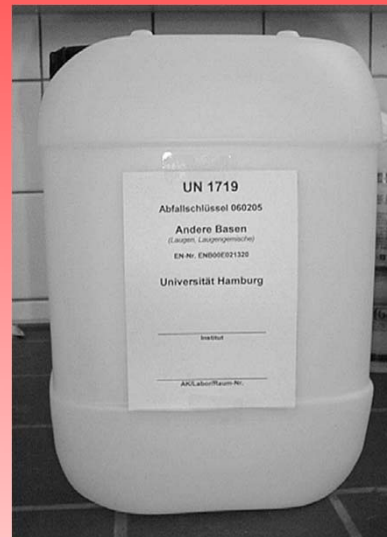
Allowed containers



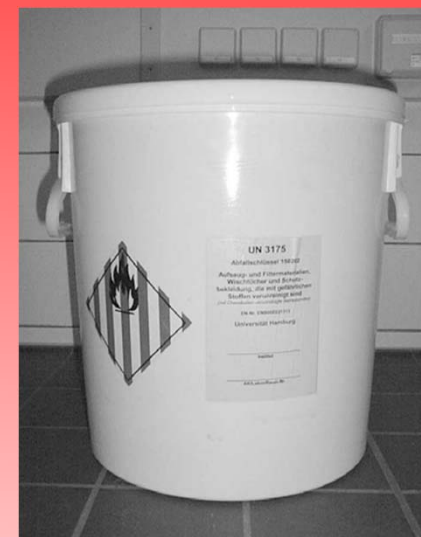
Organic solvents,
halogenated



Organic solvents,
halogen-free



- Acids and acids mixtures
- Leaches and leach mixtures
- machine oils
- disinfections solutions



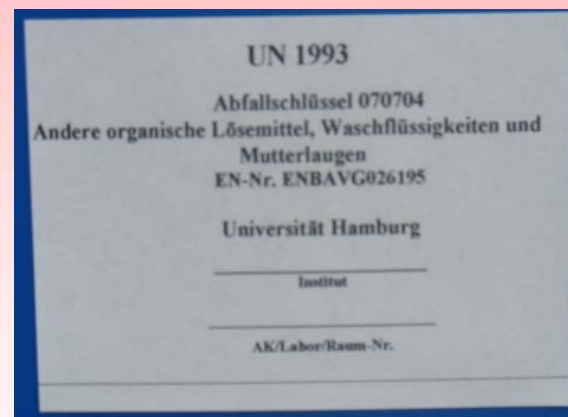
- Contaminated tissues, filters, gloves & clothes
- Broken glass
- Other solid contaminated waste

Pick up and disposal in the storage container

Labelling of disposal containers

Waste label: „Abfalletikett“

- Must contain UN-code , the waste code (Abfallschlüsselnummer), a detailed description of the content and the origin (name, working group)
- Here the same rules as for the labels for the chemicals apply!
- The disposal labels must not be changed or overwritten! Name of responsible person needs to be placed before filling the container.



Transport- and handling regulations

Transport to disposal station:

- Carefully seal containers
- use buckets for carrying smaller containers, bowls for larger ones
- Wear suited protective equipment according to requirements of substance handled, i.e. solvent proof!
- Take special care of glass ware (risk of damage&cutting damage)

Labeling

- Appropriate hazard label has to be used, i.e.
- Disposal label has to contain:
 - UN-code
 - Origin of waste
 - Must not be changed

Transport- and handling regulations

Hazard label and pictograms: examples

UN 1719
Abfallschlüssel 060205
Andere Basen
(Laugen, Laugengemische)
EN-Nr. ENBAVG024041
Universität Hamburg

Institut

AK/Labor/Raum-Nr.



flammable



corrosive

Available from Mr. Poppendieker/Mr. Schnepf

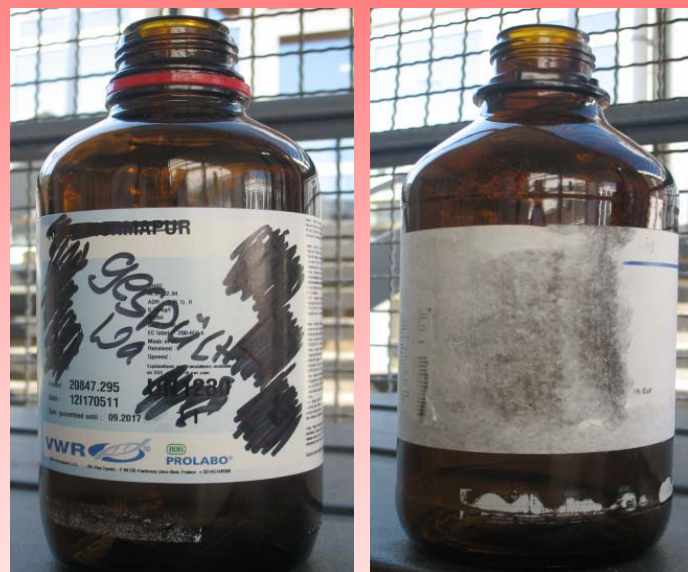
Transport- and handling regulations

Do NOTS:



Disposal of emptied containers/bottles

- Containers have to be fully emptied&rinsed
 - No remaining chemicals
 - No smelling
 - Labels removed/destroyed
- Glas bottles should be disposed in regular bottle banks
- Follow transport and handling regulations



Safetybox/Disposal of cannulas



- dedicated box for used cannulas, different sizes available
- used cannulas are disposed as „chemically contaminated equipment“
- use of safetybox is mandatory!
- carefully seal box after completely filled
- in case of toxic contamination extra labelling required!!!
- disposal of the plastic caps is carried out separately



Laser safety instruction

for the institute of experimental physics – location Bahrenfeld

Armin Azima, AG Prof. Drescher

University of Hamburg
2017



Signature liste

Acknowledgment of participation at the laser safety instruction of the Hamburg university institute of experimental physics

Hereby i confirm the participation at a general as well as a workplace specific laser safety instruction. I'm aware of the risks in handling with laser systems of the laser classes 2-4. Inside the laser laboratories of the University of Hamburg, i will comply with the rules of the Laser safety guide lines of the accident prevention regulation according to German's directive **TROS-Laser***

surname	name	group	bldg.	pulsed /cw	laser class	laser bldg.	signature
Anwar	Mamuna	Drescher	62		4		
Atala	Marcos	MPSD/ Miller	99	p	4	67a	



for newcomers

Acknowledgment of participation at a laser safety instruction

Hereby i confirm the participation at a general as well as a workplace specific laser safety instruction. I'm aware of the risks in handling with laser systems of the laser classes 2-4. Inside the laser laboratories of the University of Hamburg, i will comply with the rules of the Laser safety guide lines of the accident prevention regulation according to German's directive **TROS-Laser***.

Hamburg, the

signature

Seen by laser safety officer Bahrenfeld site

Armin Azima

Surname: _____ Dept./group: _____

Name: _____ Building: _____

E-Mail: _____

Dealing with[†]: cw-laser ☐ pulsed laser ☐
laser class: _____

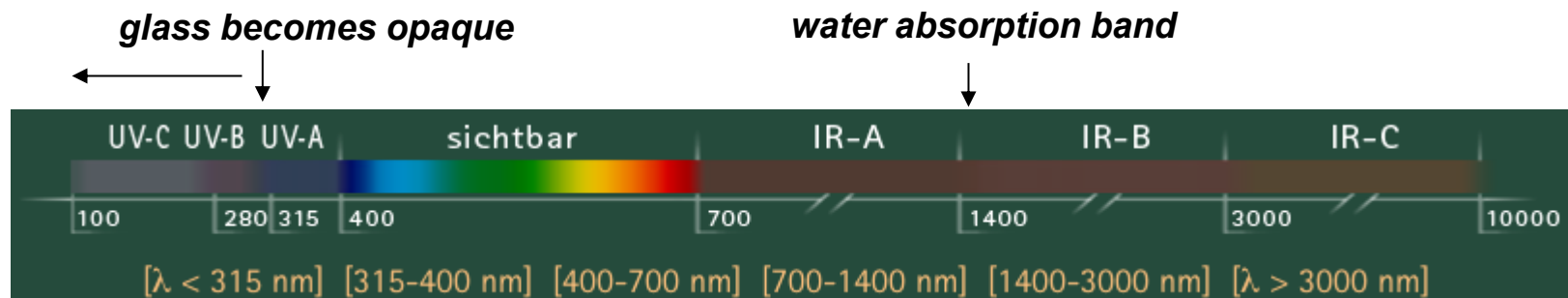
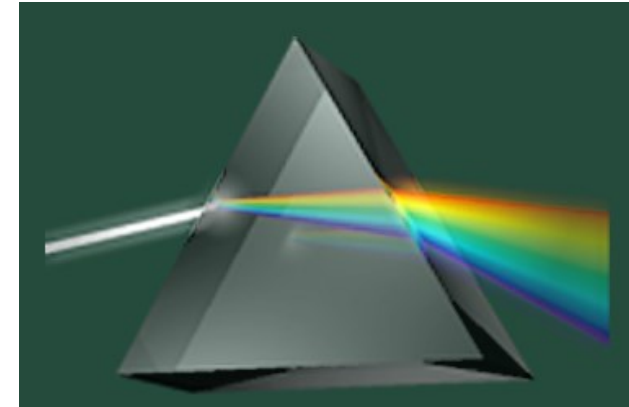
*Technical Rules for Occupational Safety and Health Regulation to artificial optical radiation [†]unless known



1. Laser radiation - basics
2. Danger from laser radiation for eye and skin
3. Classification of lasers
4. Behavior in case of accident
5. Independent calculation of laser goggles
6. Laser safety training for employees of the Institute



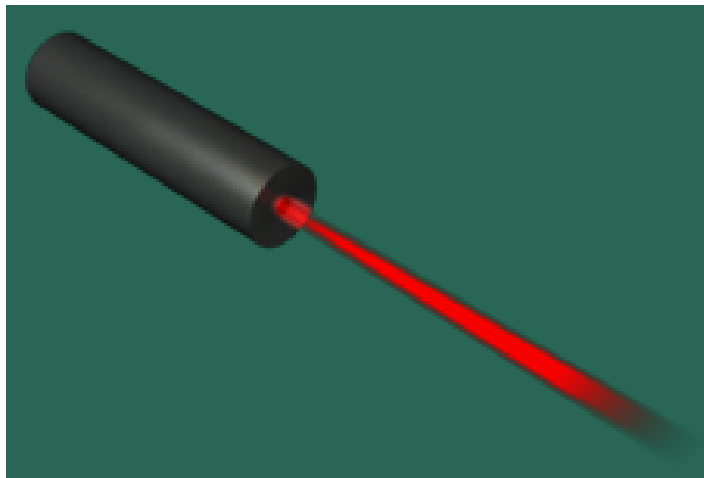
- Light spreads as an electro-magnetic wave through space
- Natural light sources always consist of multiple wavelengths.
- A part of the EM spectrum can be observed by the human eye as different colors.



Spectral range from UV to far-infrared



- Laser radiation is artificial light, which does not exist in nature.
- Laser radiation always spreads as a **collimated** beam !



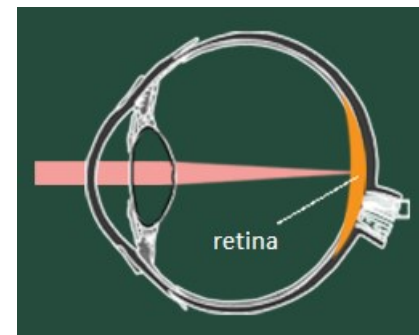
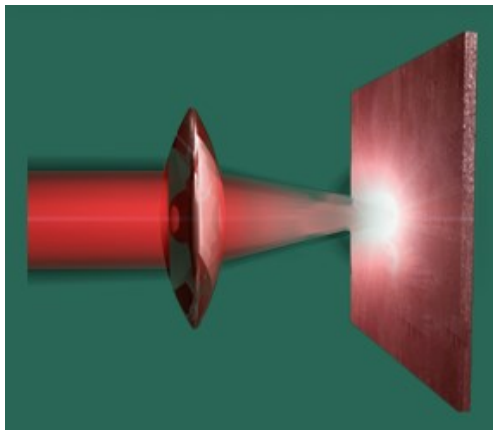
collimated beam



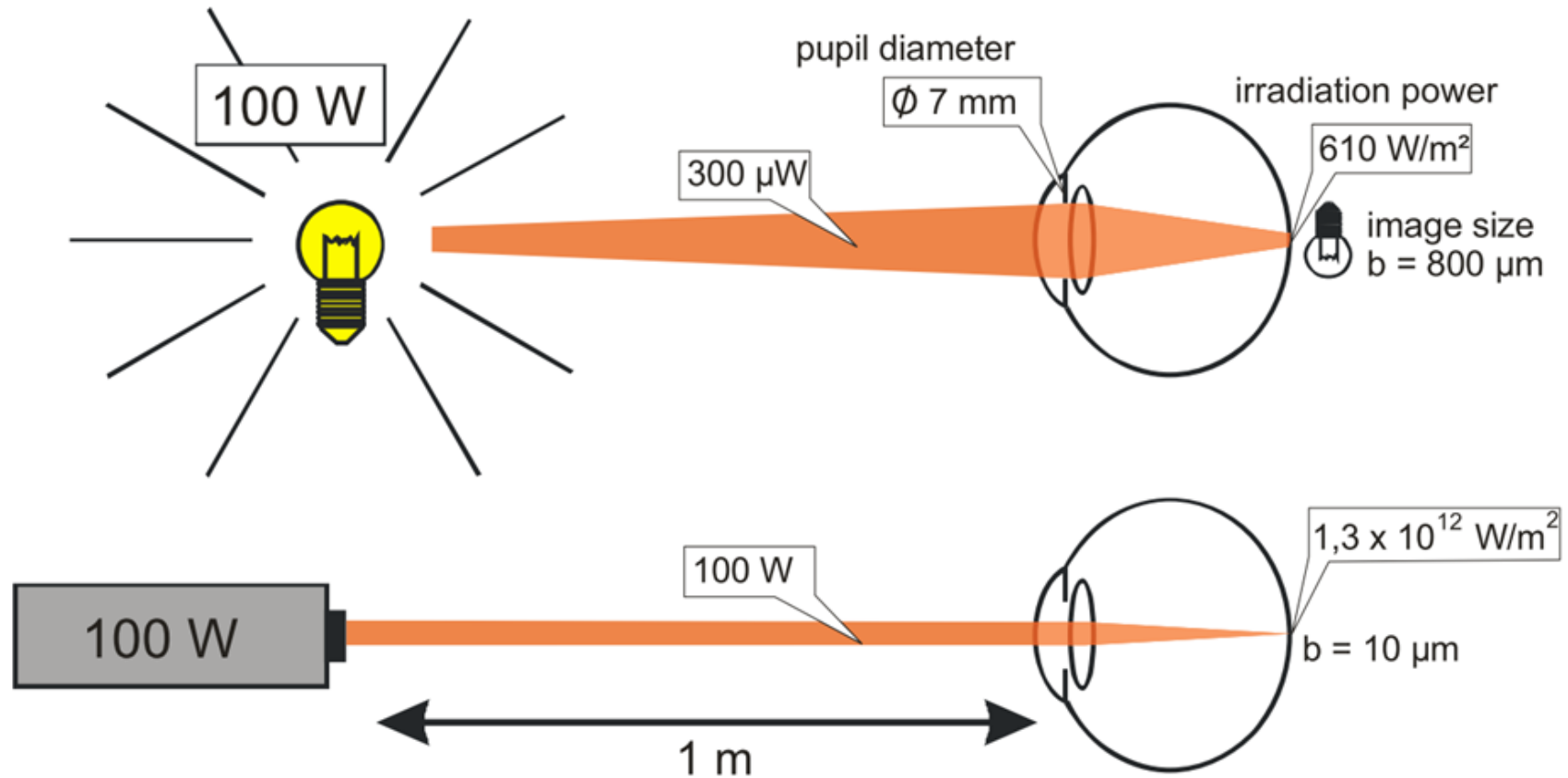
4π -emitter,
uncollimated



- collimated radiation is hazardous for the human eye, because it can be much stronger focused by a lens than any natural light source. In particular this is dangerous in the case of the eye pupil, which focusses any collimated beam directly into the visual nerve of the retina.

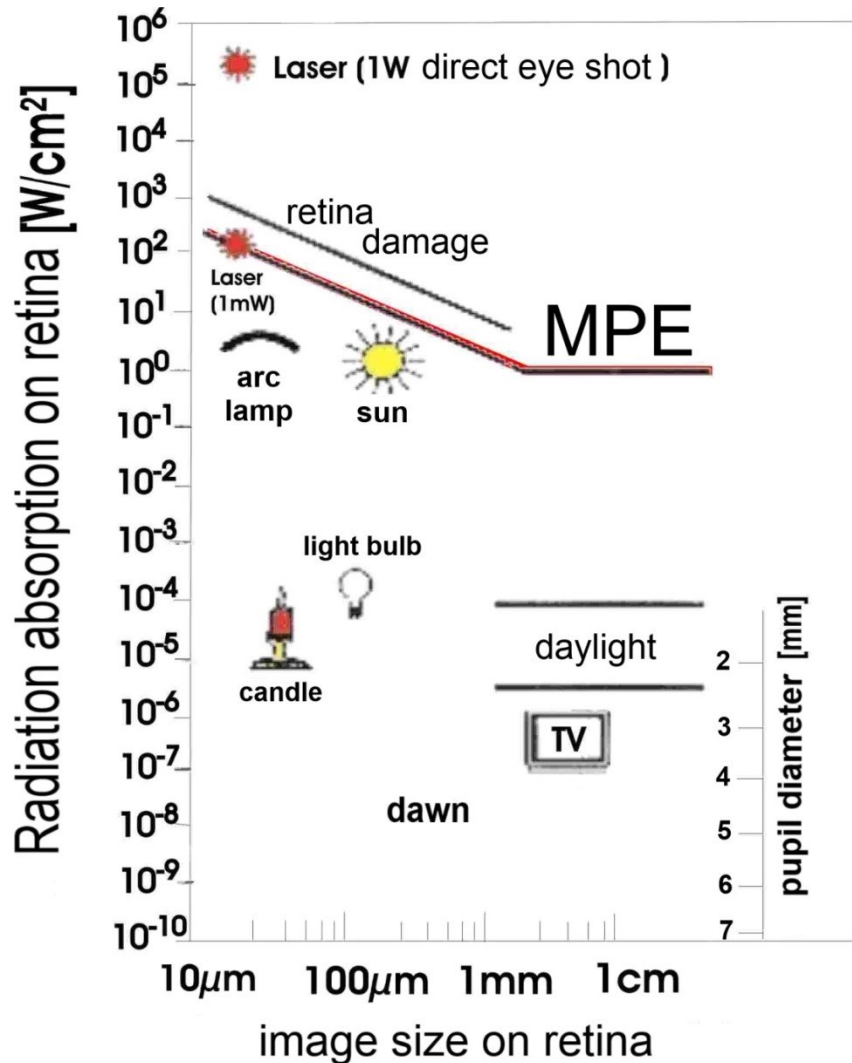


Comparison light bulb – laser beam



ratio of irradiation powers:

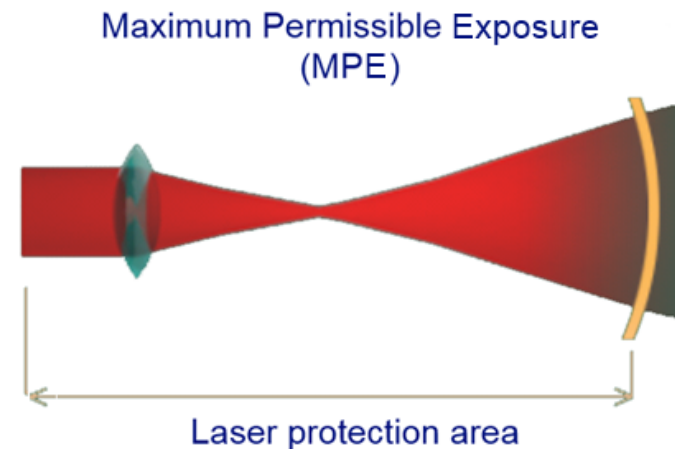
$$\frac{I(\text{Laser, } 100 \text{ W})}{I(\text{light bulb, } 100 \text{ W})} = 2,1 \times 10^9$$



Damage of tissue appears after exceeding a certain irradiation power level [W/cm^2].

⇒ Threshold definition for tissue damage: **MPE** (German [MZB](#)) (**M**aximum **P**ermissible **E**xposure)

In combination with the thresholds for accessible radiation (German [GZS](#)), laser classes and laser protection areas are defined in DIN-EN 60825.

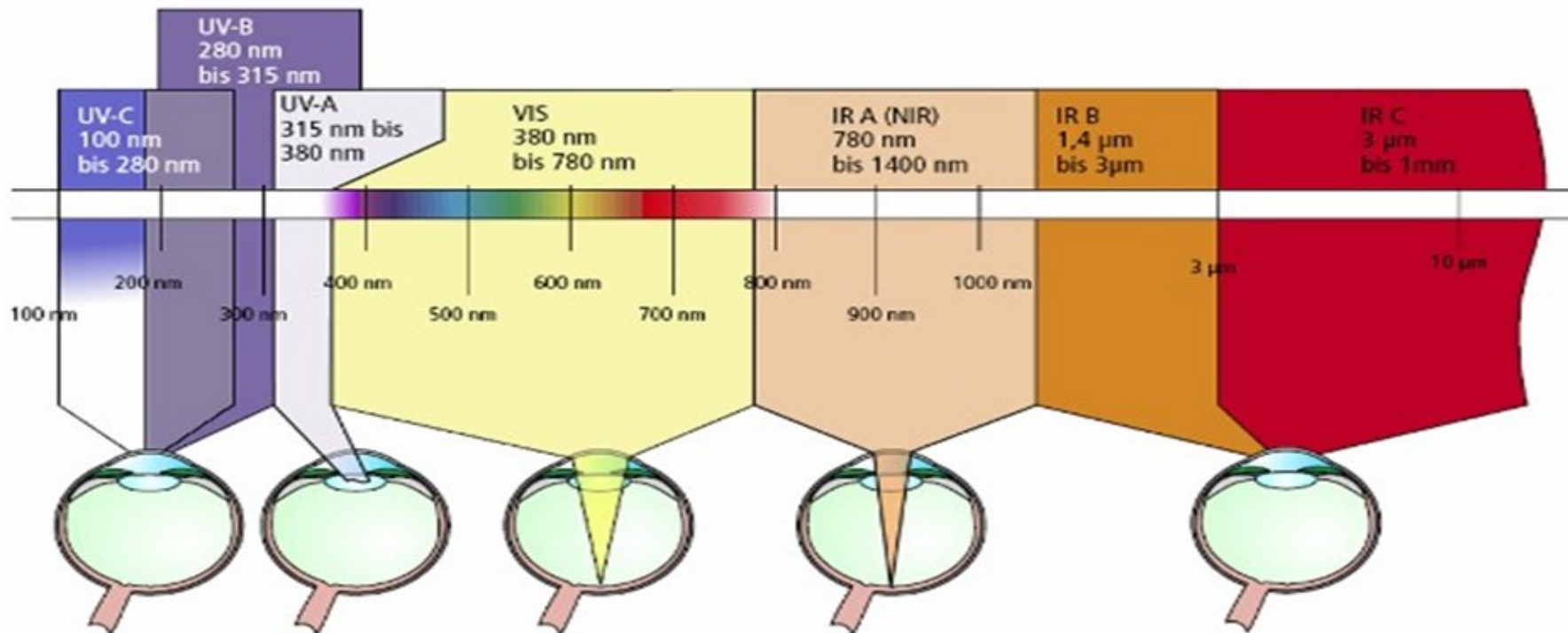


Injury of eye in different spectral ranges



$300 \mu\text{W}/\text{cm}^2$ - sun

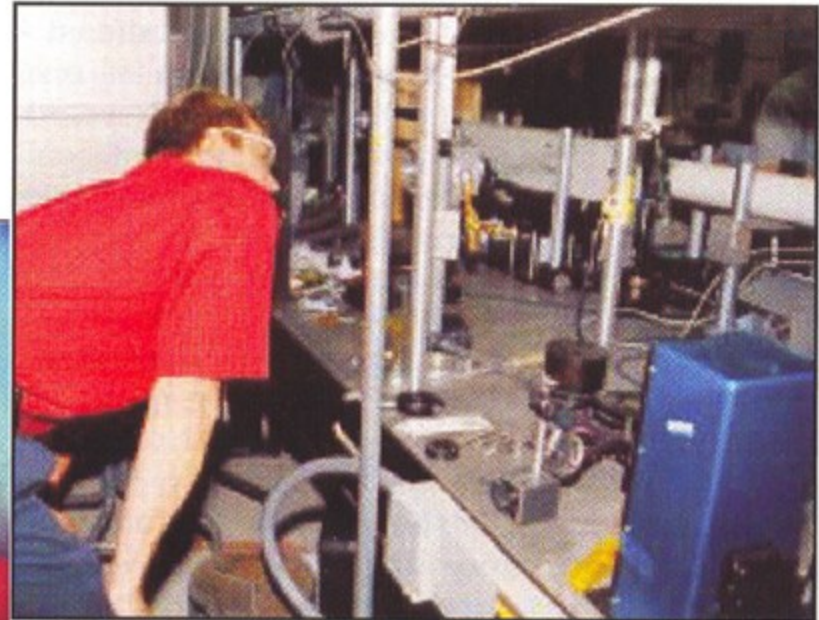
Photokeratitis = inflammation of cornea



Eye penetration depth of spectral ranges



▪ Laser accident by observation of a process chamber



- Q-Switch Nd:YAG Laser
- $\lambda = 1064 \text{ nm}$

- Damage size of retina , ca. $0,4 \times 0,25 \text{ mm}^2$

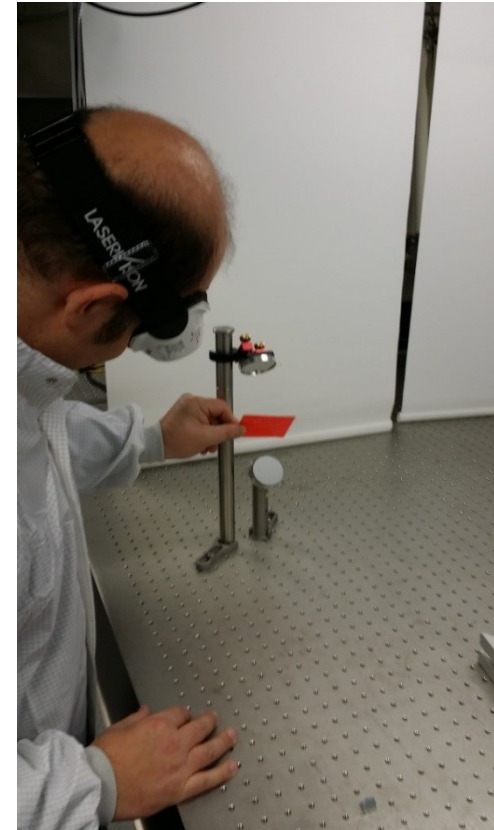
Photonics Spectra, 03/2005



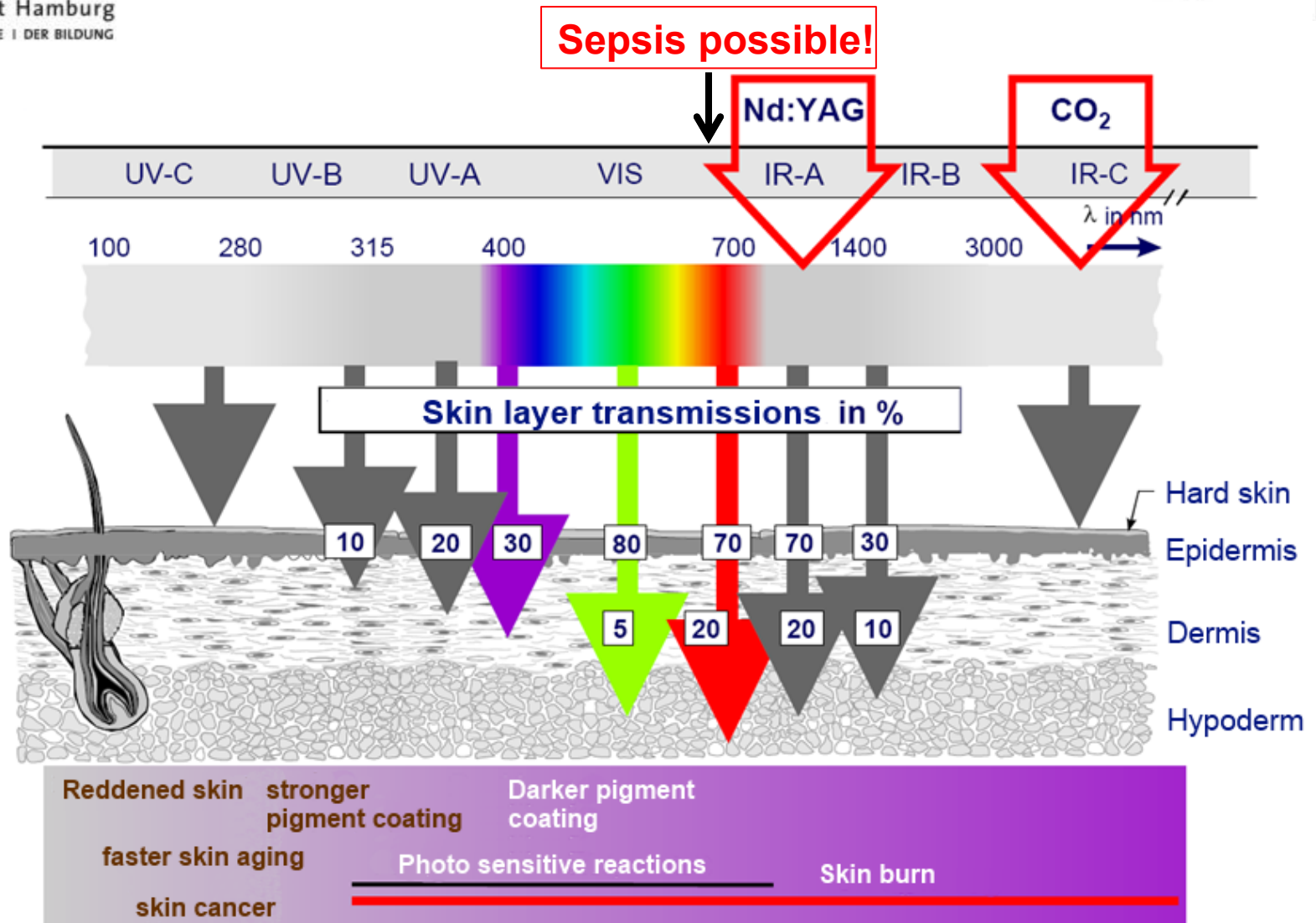
wrong

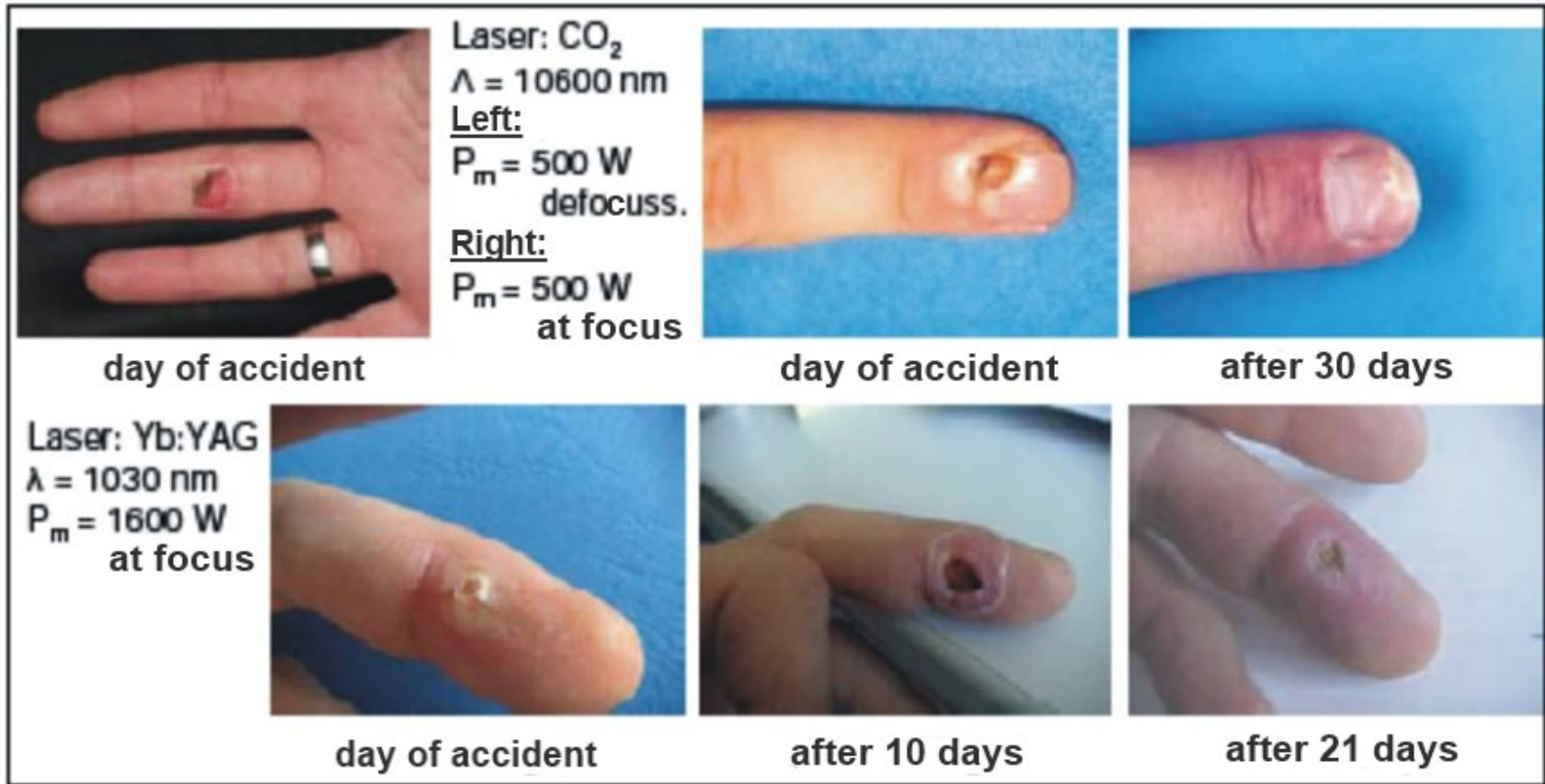


right



Real example of a **laser accident** (without injury) at the institute !

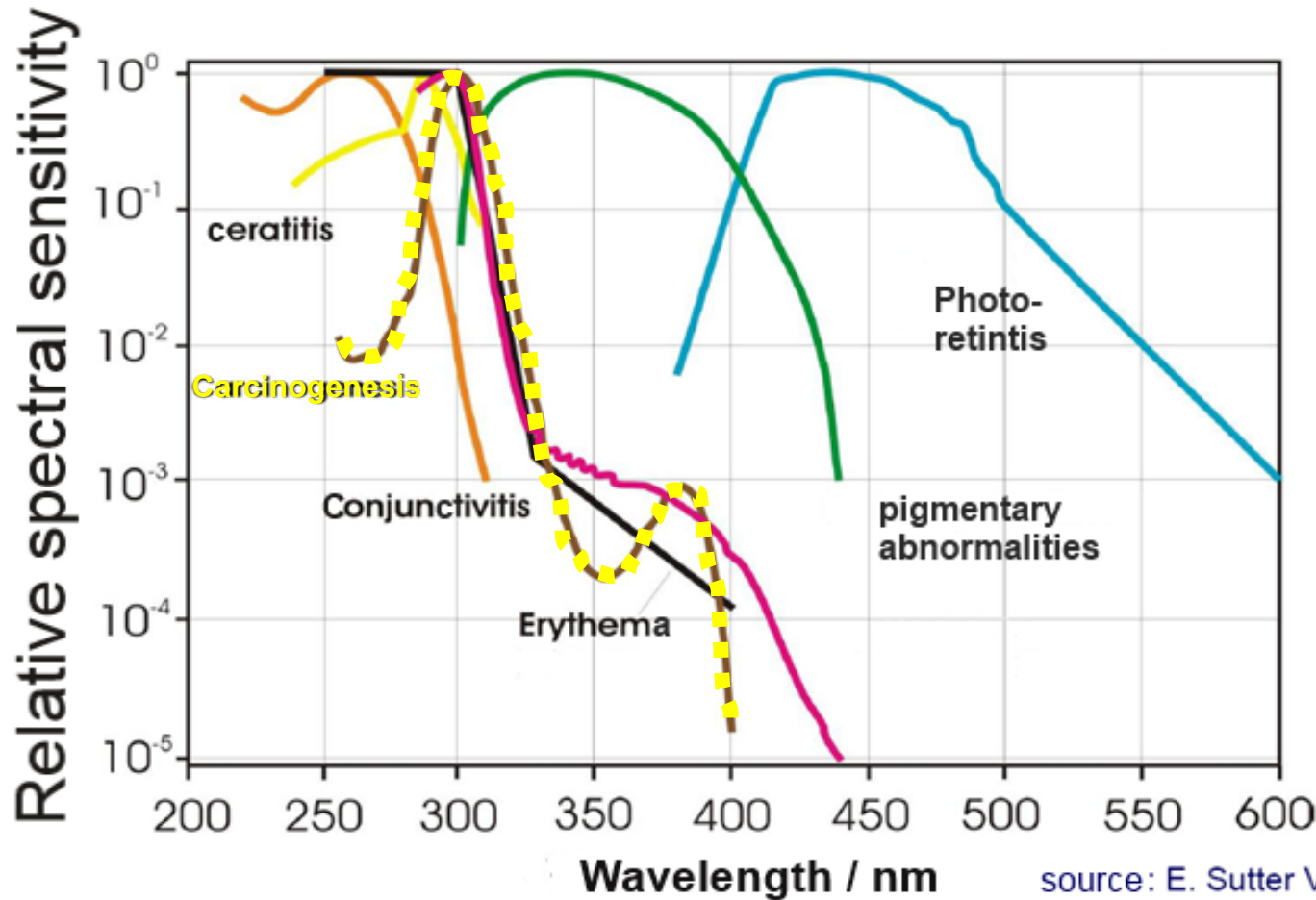




source : BAUA-Forschungsbericht F2117; Meier, Püster, Beier, Wenzel

Be careful during „laser welding“ !!

Biological skin reactions in the UV range



Wear gloves
for wavelengths
smaller than
400nm !

source: E. Sutter VDE Schriftenreihe Bd. 104



- If there exists the suspicion, that an eye damage has occurred, quickly head for an ophthalmic doctor, f.ex.:

UKE Eppendorf
Klinik für Augenheilkunde
Martinistraße 52
20246 Hamburg
Tel.: +49(0) 40 7410 - 52350

Notfallpraxis Altona
Stresemannstraße 54
22769 Hamburg 22763
Hamburg

- in case of a heavy accident CALL 2500 and inform them that an eye specialist is required and wait for rescue service

Tel.: 2500

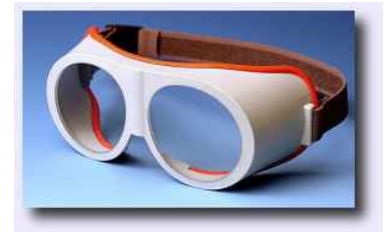
- Due to scarring a local retina damage can spread further. A doctor is able to stop the scarring and inhibit further nerve damage!
- Strong IR radiation can deeply penetrate the skin and may lead to an inner injury, which can lead to a sepsis !



- Laser safety areas are marked !
- Access of laser safety areas only for instructed personnel !
- Intense laser radiation should always be covered.
- Pre-alignment works should be done using class 1 or 2 lasers.
- Adolescents older than 16 may have laser access only under the continuous supervision of an expert.



- **Always wear laser goggles !**



... and better not touch the beam ...





1. For any work with radiation of $<400\text{nm}$ wavelength, ...
2. ... or for any works with the laser welding facility

→ wear protection gloves

Certified gloves are available from Laservision
and JUTEC

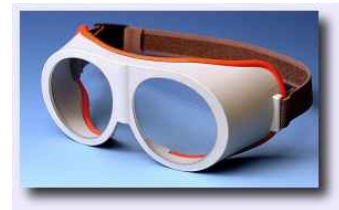
*DIN standards for laser protection gloves
meanwhile are available
(DIN SPEC 91250:2014-11 (D))*





Since 2003 the following **laser classification** is active

- class 1 **harmless** for the human eye
 - class 1M **harmless** because of large divergence.
Becomes harmful, if observed with **optical instruments**
 - class 2 **actually harmless** for the human eye for **exposure times < 0,25s**
only defined for **visible light**, with working eye lid closing reflex,
 $P < 1\text{mW} \Leftrightarrow E_{\text{Puls}} < 3\text{nJ}$
 - class 2M because of divergence **actually harmless** as class 2.
Becomes harmful, if observed with **optical instruments**
-
- Klasse 3R **direct beam harmful**, but not for the skin,
» (may exceed up to **5 times** the thresholds of class 2 in visible range
and of class 1 in the non-visible range)
 - Klasse 3B **direct beam harmful** for skin and eye, reflexes not
 - Klasse 4 **direct beam very harmful for eye and skin**,
diffuse reflexes in the near field as well, incineration endanger





Laser class 1

acc. to DIN EN 60825-1:2001-11

Laser radiation

Don't watch into the beam

Laser class 2

acc. to DIN EN 60825-1:2001-11

Laser radiation

Don't watch with optical instruments

Laser class 1M

acc. to DIN EN 60825-1:2001-11

Laserstrahlung

Don't watch into the beam neither
directly nor with optical instruments

Laser Klasse 2M

acc. to DIN EN 60825-1:2001-11

No laser safety precautions are necessary !



Laser radiation

avoid direct irradiation

Laser class 3R

acc. to DIN EN 60825-1:2001-11

Laser radiation

don't expose yourself to the beam

Laser class 3B

acc. to DIN EN 60825-1:2001-11

Laser radiation

avoid irradiation of eye or skin by direct
beam or reflexes

Laser class 4

acc. to DIN EN 60825-1:2001-11

Laser protection measures are required !



- Since June 2015 new laser systems **do not** have to be declared at the accident insurance fund (german: Unfallkasse Nord). Instead declaration must be done at the *university department of safety at work* directly !
- The laser class must be known and a **risk assessment** must be created.
- please always keep me informed me, if you install a new laser system in bldg. 61 or 62

Geb. 62, 3. Stock, armin.azima@desy.de

Calculation of laser classes and filter levels



- use LaserSAFE PC pro, for each PC on the DESY campus available free of charge !

LaserSafe PC Professional Ver 4.10

File Edit Options Calculation Window Help

Options

Small (Point) Source - Repetitively Pulsed

Laser Beam Wavelength	512 nm
Exposure to Beam Time Frame	0.25 s
Laser Output Pulse Energy	200 nJ
Axis 1 Laser Beam Diameter	2 mm
Axis 2 Laser Beam Diameter	5 mm
Axis 1 Beam Divergence	0.1 mr
Axis 2 Beam Divergence	0.1 mr
Laser to Target Distance	1 m
Pulse Repetition Frequency	10 Hz
Pulse Width	10 ns

Wavelength

Accessible Emission = 1.37 x MPE.
These conditions are above the MPE.

Small (Point) Source Details Window

Single Pulse MPE	5 mJ/m ²	Accessible Emission	5.2 mJ/m ²
Pulse Train MPE	3.8 mJ/m ²	MPE Limit Aperture	7 mm
Average MPE	2.12 J/m ²	ExNOHD Aperture	50 mm
MPE Excess	1.37	Skin AE	14.3 mJ/m ²
Class 2 AEL Excess	1.32	Skin MPE Excess	.0000713
Test Class	3R	N.O.H.D.	45.9 m
Class Time Base	0.25 s	Extended NOHD	551 m
Av. Beam Irradiance	52	Spot Major Axis	5.1 mm
Pk. Beam Irradiance	520 kW/m ²	Spot Minor Axis	2.1 mm
Av. Power Output	2 μW	Exposure Train	3 Pulses

Safety Eyewear and Filters

Nominal O.D.	0.1	0.4
L Number	DL1	RL2
LB Number for Glass	DLB1	RLB2
LB Number for Plastic	DLB1	RLB2
EN208 RB Number	RB1	
Av. Actual Irradiance	238 mW/m ²	
Peak Actual Irradiance	2.38 MW/m ²	
Actual Radiant	23.8 mJ/m ²	

Small (Point) Source Detailed Information Window

Correction Factors	Pulse Train Calculation Values
C ₁	
C ₂	
C ₃	17.4
C ₄	
C ₅	0.76
C ₆	1
C ₇	
Time Breakpoints	
T ₁	
T ₂	10 s

Pulse Summing not Employed

Pulse Train Duration	250 ms
Effective Pulse Train	3

Laser Product Classifications

Class Overview

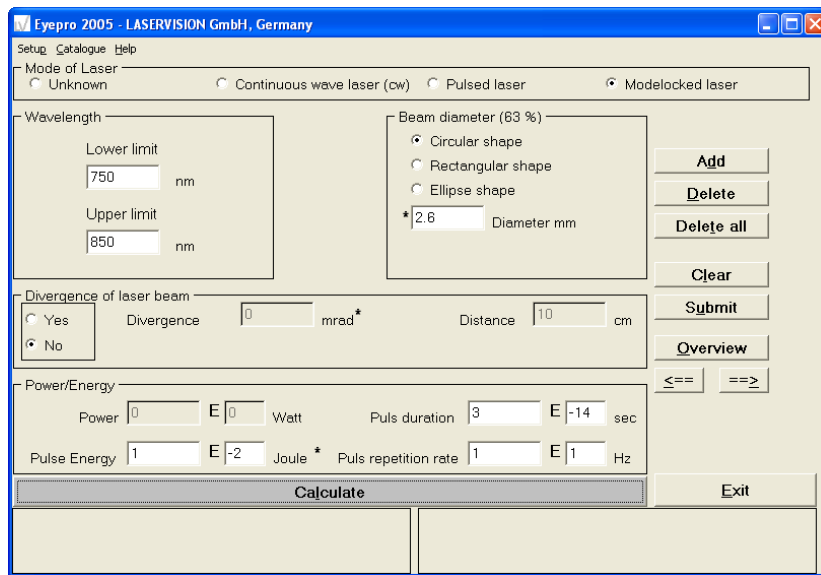
Class 1	Intrinsically safe by either low emission levels or good engineering design.
Class 1M	Lasers emitting from 302.5nm to 4000nm that are safe but could be hazardous if optical aids are employed within the beam path.
Class 2	Low power CW or pulsed devices emitting in the visible spectrum. Not intrinsically safe but protection is afforded by the blink reflex. Output power must be limited to 1mW for CW or 1mW peak power for pulsed systems.
Class 2M	As Class 2 but may be hazardous if optical aids are used within the beam.
Class 3R	Devices emitting from 302.5 to 4000nm which are potentially hazardous. CW or pulsed visible devices can have an output of up to 5mW.
Class 3B	Medium power CW or pulsed devices up to 500mW output. Direct intra-beam viewing of the beam is HAZARDOUS.
Class 4	High power devices, mostly above 0.5 Watt output power. EXTREMELY HAZARDOUS! Use with great caution.

Detailed Information

Above MPE



- additionally one can use the free software “**Eyepro**” from **LASERVISION** to select the right filter types for laser goggles.



Eyepro 2005 - LASERVISION GmbH, Germany

Setup Catalogue Help

Mode of Laser
☐ Unknown ☐ Continuous wave laser (cw) ☐ Pulsed laser ☒ Modelocked laser

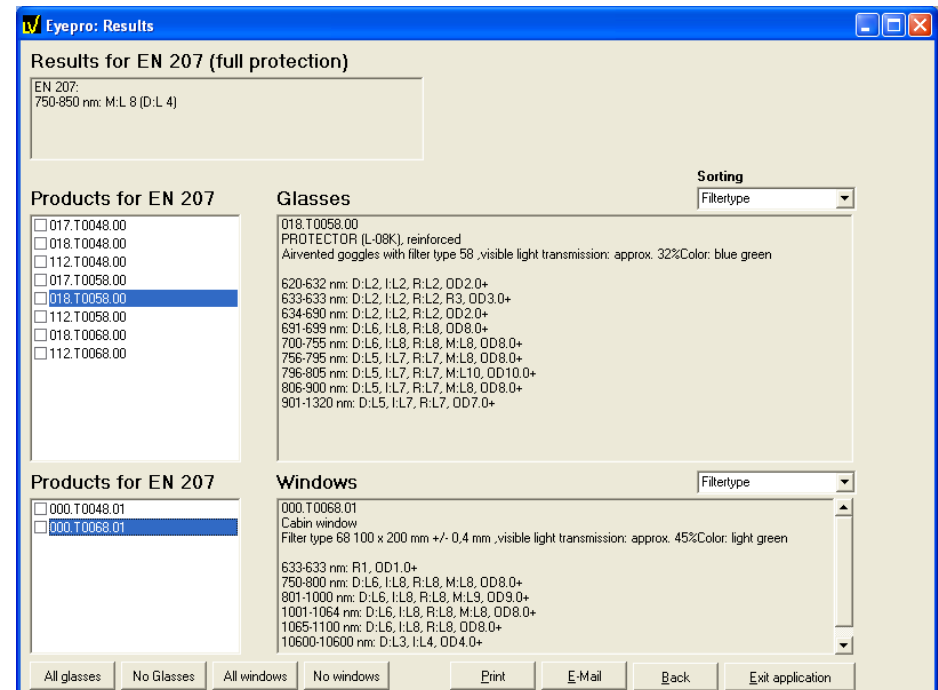
Wavelength
Lower limit: 750 nm
Upper limit: 850 nm

Beam diameter (83 %)
☒ Circular shape
☐ Rectangular shape
☐ Ellipse shape
* 2.8 Diameter mm

Divergence of laser beam
☐ Yes Divergence: 0 mrad * Distance: 10 cm
☒ No

Power/Energy
Power: 0 Watt Puls duration: 3 E -14 sec
Pulse Energy: 1 Joule * Puls repetition rate: 1 E 1 Hz

Buttons: Add, Delete, Delete all, Clear, Submit, Overview, <==, ==>, Calculate, Exit



Eyepro: Results

Results for EN 207 (full protection)

EN 207:
750-850 nm: M:L 8 (D:L 4)

Sorting: Filtertype

Products for EN 207

- ☐ 017.T0048.00
- ☐ 018.T0048.00
- ☐ 112.T0048.00
- ☐ 017.T0058.00
- ☒ 018.T0058.00
- ☐ 112.T0058.00
- ☐ 018.T0068.00
- ☐ 112.T0068.00

Glasses

018.T0058.00
PROTECTOR (L-08K), reinforced
Airtented goggles with filter type 58 ,visible light transmission: approx. 32%Color: blue green

620-632 nm: D:L2, I:L2, R:L2, OD2.0+
633-633 nm: D:L2, I:L2, R:L2, R3, OD3.0+
634-690 nm: D:L2, I:L2, R:L2, OD2.0+
691-699 nm: D:L6, I:L8, R:L8, OD8.0+
700-755 nm: D:L6, I:L8, R:L8, M:L8, OD8.0+
756-795 nm: D:L5, I:L7, R:L7, M:L8, OD8.0+
796-805 nm: D:L5, I:L7, R:L7, M:L10, OD10.0+
806-900 nm: D:L5, I:L7, R:L7, M:L8, OD8.0+
901-1320 nm: D:L5, I:L7, R:L7, OD7.0+

Products for EN 207

- ☐ 000.T0048.01
- ☒ 000.T0068.01

Windows

000.T0068.01
Cabin window
Filter type 68 100 x 200 mm +/- 0.4 mm ,visible light transmission: approx. 45%Color: light green

633-633 nm: R1, OD1.0+
750-800 nm: D:L6, I:L8, R:L8, M:L8, OD8.0+
801-1000 nm: D:L6, I:L8, R:L8, M:L9, OD9.0+
1001-1064 nm: D:L6, I:L8, R:L8, M:L8, OD8.0+
1065-1100 nm: D:L6, I:L8, R:L8, OD8.0+
10600-10600 nm: D:L3, I:L4, OD4.0+

Buttons: All glasses, No Glasses, All windows, No windows, Print, E-Mail, Back, Exit application



- magic thresholds, which define the need of laser protections ($>400\text{nm}$):

- cw-beam:

$>1\text{mW}$ emitted power



- pulsed radiation:

$>3\text{nJ}$

$>200\text{nJ}$

(mode coupled)

(flash lamp induced)





There exists a computer supported laser safety instruction
in **bldg. 62, 3rd floor, seminar room 312**

1. Move through the **tutorial**.
2. Sign the **notification**.
3. Let a form of notification be **cross signed**
by me.

(Empty forms will be available !)

(Please contact me in advance)

armin.azima@desy.de



- A laser safety instruction for all on the DESY campus, who work with laser systems of class 3R, 3B or 4 is available as PPT file!
- This and further information you find at DESY homepage → ... → D5 safety
http://d5.desy.de/e61251/e64402/index_eng.html
- The directive **TROS-Laser** is now binding for all institutes on the DESY campus !



- Status Nov. 2017

- since the beginning of 2017, the following university-wide regulation has come into force:

All research group leaders who operate laser safety-relevant systems are automatically nominated as laser safety officers in their area.

In addition, the groups can appoint technical representatives to support the respective laser safety officer in his task.

Acknowledgment of participation at the safety instruction of the Hamburg university in the semester 2016/2017

Hereby i confirm the participation at a safety instruction. I'm aware of the responsibilities of the laboratories of the University of Hamburg and the regulation according to German law of the accident prevention

surname

laser
bldg.

signature

Anwar

Atala

Marcos

SD/
Miller

p

4

67a

**Reminder:
Please sign the list now !**

Thank you for your attention!



Instructions for Radiation Protection

Strahlenschutzunterweisung nach
§38 StrlSchV (Strahlenschutzverordnung)
Und
§36 RöV (Röntgenschutzverordnung)

19.11.2015



Radiation protection

- Protection from damage by ionizing radiation
 - Protection of human beings and environment
 - Radioactive materials
 - Ionizing radiation from activities with purpose
“Zielgerichtete Nutzung”
(Not: natural radiation)
- Lawtext
 - “Strahlenschutzverordnung” (StrlSchV)
 - “Röntgenschutzverordnung” (RöV)
 - Availability: my office, Internet

Guidelines

- “Strahlenschutzverordnung” (President, UHH)
 - “Sicherheitsordnung” incl. Section “H. Strahlenschutz”
 - “Betriebsanweisungen” / Code of practice
 - “Strahlenschutzanweisung” / Code of practice for radiation passport
 - “Merkblätter” / Handout-Memos
Emergency plan (Alarmierungsplan), etc.
-
- AGUM System:
safety (including radiation safety) relevant information stored centrally on University web site.
- uni-hamburg.agu-hochschulen.de



	Code of Practice	Date: 23 June 2015
Scope:	Valid for:	Signature:
Handling radioactive materials	All persons in the rooms of the Institute of Experimental Physics	

DESIGNATION

Radioactive preparations

General code of practice for handling and storing radioactive preparations

RISK TO PERSONNEL AND THE ENVIRONMENT



- The effects of large doses (> 1 Sv) of ionizing radiation on human beings can include acute deterministic radiation damage (burns, organ damage, radiation disease, death). Small doses of radiation can cause stochastic radiation damage (carcinomas, leukemia, genetic damage).

SAFETY MEASURES AND CODE OF CONDUCT



- Radioactive materials are to be handled exclusively for work-related purposes.
- The basic radiation safety rules apply: justification of their use (minimization of activity), minimization of the exposure time, maximization of the distance to the source, optimization of the shielding.
- The following regulations apply: German Radiation Protection Ordinance (Strahlenschutzverordnung, StrlSchV; see Foyer Building 67 or Internet), the radiation protection regulations issued by the president of the University, and section "H" of the Safety Regulations (Strahlenschutzanweisung) of the Institute of Experimental Physics.
- All persons exposed to radiation must be briefed by the radiation safety officer. Attendance of yearly radiation safety briefings is mandatory.
- Transport of radioactive materials on the DESY campus is allowed exclusively with the agreement of the radiation safety officer.
- Transport of radioactive materials outside the DESY campus is subject to the German Road Transport Regulations (Straßenverkehrsordnung, StVO) and may only be arranged by the radiation safety officer.
- Radioactive materials must be stored in well-shielded, lockable cabinets (safes). In addition to the safes in the main storage room for radioactive materials, safes are also available in the laboratories in order to minimize exposure during transportation.
- Radioactive substances are issued exclusively by the radiation safety officer for work purposes. The recipient must sign them out, and the radiation safety officer must confirm their receipt with signature and date.
- The procurement of radioactive materials can only be arranged via the radiation safety officer.
- In controlled areas (radiation dose in excess of 6 mSv but less than 20 mSv per year), official personal dosimetric monitoring must be carried out. Even if the radiation dose per year expected is lower, official personal dosimetric monitoring can be requested.
- Enclosed radioactive substances above a certain level of activity must undergo an official yearly inspection (StrlSchV). When this inspection is to be carried out, the sources must be handed over to the radiation safety officer.
- Radiation protection equipment (shielding, transport containers) must not be modified.
- Unborn children deserve special protection. Corresponding safety measures can only be implemented if the radiation safety officer has been informed about the pregnancy.

WHAT TO DO IN THE EVENT OF ACCIDENTS: EMERGENCY NUMBER EXT. 2500



- In the event of malfunctions or accidents (e.g., a high level of radiation exposure, contamination of persons or rooms, damage or loss of radioactive chemical preparations and fire), inform the radiation safety officer, staff, and the supervisor.
- In the event of incipient fires: fight the fire if this is possible without putting yourself at risk. Every fire must be reported to the Technical Emergency Service, (ext. 6565).



- In the event of more serious incidents: dial emergency number ext. 2500.
- Evacuate persons from the hazardous area without putting yourself at risk.
- Treat minor injuries using the first aid kit (enter the details in the logbook).
- Inform the radiation safety officer and first aid officers.
- List of emergency doctors: <http://www.dguv.de/dguv/Lv/Web/Adressen/>

CONSEQUENCES OF NON-COMPLIANCE

- Health consequences: injuries and sickness
- Disciplinary consequences: written warning

	Code of Practice	Date: 23 June 2015
Scope:	Valid for:	Signature:
Working with X-ray equipment and stray radiation emitters	Employees in the buildings of the Institute of Experimental Physics	

DESIGNATION

Equipment for the generation of ionizing radiation and stray radiation emitters

General code of practice for the use of X-ray equipment and stray radiation emitters

RISKS TO PERSONNEL AND THE ENVIRONMENT



- The effects of large doses (> 1 Sv) of ionizing radiation on human beings can include acute deterministic radiation damage (burns, organ damage, radiation disease, death). Small doses of radiation can cause stochastic radiation damage (carcinomas, leukemia, genetic damage).
- Equipment uses high voltage. Please refer to the Code of Practice: Electricity.



SAFETY MEASURES AND CODE OF CONDUCT



- Operating instructions for the X-ray equipment must be observed.
- The following regulations apply: German X-ray Ordinance (Röntgenverordnung, RÖV, see notice in Building 67 or Internet), the radiation protection regulations issued by the president of the University, and section "H" of the safety regulations (Strahlenschutzanweisung) of the Institute of Experimental Physics.
- Persons working with ionizing radiation must be briefed by the radiation safety officer. Participation in the annual briefing is obligatory.
- Technical briefings must be provided by the group leader or the leading experimentalist. These are also required for operating the system.
- Safety devices must be visually inspected before switching on the equipment and must not be removed or bypassed.
- Structural modifications of any kind to the X-ray tubes are not permitted.
- Positional changes during the experiment and swapping devices between experiments are only permitted with the agreement of the radiation safety officer.
- The operating time of a system should be limited (switch on only when necessary).
- The operating time is to be documented in a logbook (Betriebsbuch).
- In controlled areas (radiation dose in excess of 6 mSv but less than 20 mSv per year), official personal dosimetric monitoring must be carried out. Even if the radiation dose per year expected is lower, official personal dosimetric monitoring can be requested.
- Radiation protection equipment (shielding, transport containers) must not be modified.
- Unborn children deserve special protection. Corresponding safety measures can only be implemented if the radiation safety officer has been informed about the pregnancy.

WHAT TO DO IN THE EVENT OF MALFUNCTIONS



- In the event of malfunction of the experiment, stop the experiment and activate emergency stop.
- Inform other members of staff and the supervisor.
- If the X-ray equipment malfunctions, inform the radiation safety officer.
- In the event of incipient fires: fight the fire if this is possible without putting yourself at risk. Every fire must be reported to the Technical Emergency Service, (ext. 6565).
- In the event of more serious incidents: dial emergency number ext. 2500.

WHAT TO DO IN THE EVENT OF ACCIDENTS: EMERGENCY NUMBER EXT. 2500



- Evacuate persons from the hazardous area without putting yourself at risk.
- Contact the Technical Emergency Service: emergency number ext. 2500.
- Treat minor injuries using the first aid kit and enter the details in the logbook (Verbandsbuch).
- Inform trained first aid officers and the radiation safety officer.
- List of emergency doctors: <http://www.dguv.de/dguv/Lv/Web/Adressen/>

MAINTENANCE

- Before using a machine, always check its function and safety mechanisms!
- Maintenance and repair must be only be carried out by trained specialist staff!
- The equipment must undergo a technical inspection at 5-year intervals.

CONSEQUENCES OF NON-COMPLIANCE

- Health consequences: injuries and sickness
- Disciplinary consequences: written warning

Organisation of radiation protection

- **Der Strahlenschutzverantwortliche:**
Officially responsible person.
UHH: president of the University
Arbeitssicherheit: Sandra Nickelsen & Esther Bossmann
- **Der Strahlenschutzbevollmächtigte:**
Fullfills the duties of the responsible person
InstExpPh: Prof. Dr. Dieter Horns
- **Der Strahlenschutzbeauftragte (StrlSchB):**
 - Radiation safety officer/expert: **talk to me !**
 - Makes sure StrlSchV and RöV are followed
 - Interface to “Amt für Arbeitsschutz” / Work safety agency
 - Expert: Specific radiation safety knowledge

**Enabler
(not preventer !)**

Organisation of radiation protection

- **Strahlenschutzbeauftragte at InstExpPh:**

Name	Type	Bahrenfeld	Vorlesungs- vorbereitung	Mediziner- praktikum	Dosimetrie / Strahlenpässe (Fremde Anlagen)
Rüdiger Eggerstorf	StrlSchV		✓		
Michael Matysek	StrlSchV	✓			
Marek Wieland	RöV	✓			
Ole Windmüller	StrlSchV RöV			✓	
Martin Tluczykont	StrlSchV RöV	✓	✓	✓	✓

+ INF (M. Langer, A. Koeppen)
+ ILP (U. Pape, F. Holweg)
+ DESY (M. Salmani, +D3)

Radiation at the Institute for Experimental Physics

Storage



Radioactive materials:

- stored in safes at different locations
- can be used in experiments

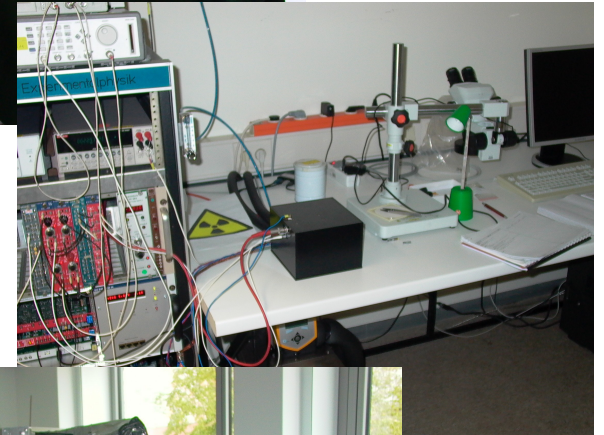
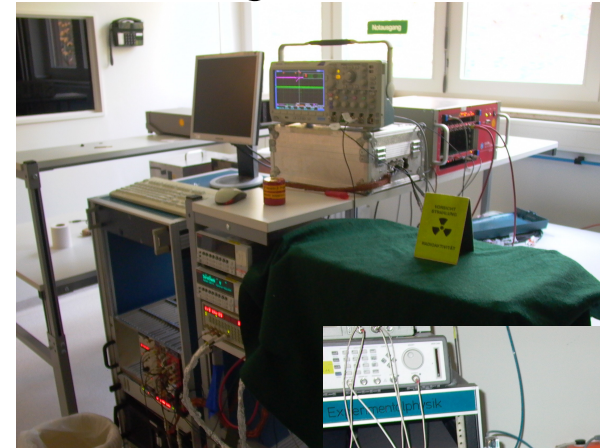


Kobalt 60							
27Co060/01	245	kBq	04.02.74	1.1	kBq	19.11.14	21.10.14 A
27Co060/02	295	kBq	06.03.74	1.4	kBq	19.11.14	21.10.14 A
27Co060/04	70	kBq	09.02.73	0.3	kBq	19.11.14	21.10.14 A
27Co060/05	3700	kBq	27.12.83	63.6	kBq	19.11.14	09.10.14 F
27Co060/06	389	kBq	01.04.79	3.6	kBq	19.11.14	09.10.14 F
27Co060/10	91800	kBq	25.12.98	11339.5	kBq	19.11.14	21.10.14 A
27Co060/11	87000	kBq	25.12.98	10746.5	kBq	19.11.14	21.10.14 A
27Co060/12	3700	kBq	27.05.50	0.8	kBq	19.11.14	21.10.14 A
27Co060/16	185	kBq	01.07.75	1.0	kBq	19.11.14	11.11.14 M
27Co060/17	185	kBq	01.07.75	1.0	kBq	19.11.14	11.11.14 M
27Co060/18	185	kBq	01.07.75	1.0	kBq	19.11.14	11.11.14 M
27Co060/19	118	kBq	26.04.68	0.3	kBq	19.11.14	21.10.14 A
842000				22160.2	kBq		
Strontium 90							
38Sr090/03	37000	kBq	27.11.92	21743	kBq	19.11.14	09.10.14 F
38Sr090/06	37000	kBq	19.07.96	23745	kBq	19.11.14	09.10.14 F
38Sr090/07	1850	kBq	01.07.59	485	kBq	19.11.14	24.10.14 N
38Sr090/08	9250	kBq	01.07.59	2423	kBq	19.11.14	21.10.14 A
38Sr090/09	185	kBq	01.07.75	71	kBq	19.11.14	11.11.14 M
38Sr090/10	185	kBq	01.07.75	71	kBq	19.11.14	11.11.14 M
38Sr090/11	185	kBq	01.07.75	71	kBq	19.11.14	11.11.14 M
38Sr090/12	37000	kBq	20.07.11	34133	kBq	19.11.14	13.03.14 G
38Sr090/13	100000	kBq	20.07.11	92250	kBq	19.11.14	13.03.14 G
DESY-5r90 15	7400	kBq	01.01.14	7244	kBq	19.11.14	22.10.14 G
220000				182236	kBq		
			Aktivität bei Kauf		Aktivität heute	geprüft	Ort
Ruthenium 106							
44Ru106/01	4000	kBq	27.09.94	0.00	kBq	19.11.14	21.10.14 A
8000				0.00	kBq		
Cadmium 109							
48Cd109/01	474	kBq	01.09.90	0.001	kBq	19.11.14	21.10.14 A
48Cd109/02	4720	kBq	01.10.92	0.027	kBq	19.11.14	21.10.14 A
8000				0.03	kBq		
Cäsium 137							
55Cs137/01	740	kBq	01.07.90	423	kBq	19.11.14	21.10.14 A
55Cs137/02	371	kBq	20.07.73	144	kBq	19.11.14	21.10.14 A
55Cs137/03	333	kBq	01.07.79	148	kBq	19.11.14	21.10.14 A
55Cs137/04	7400	kBq	15.03.82	3493	kBq	19.11.14	21.10.14 A
55Cs137/09	410	kBq	01.12.82	197	kBq	19.11.14	21.10.14 A
55Cs137/10	453	kBq	01.12.82	217	kBq	19.11.14	24.10.14 N
55Cs137/16	422	kBq	01.04.79	186	kBq	19.11.14	09.10.14 F
55Cs137/18	3700	kBq	01.07.60	1061	kBq	19.11.14	09.10.14 F
55Cs137/19	370	kBq	01.07.60	106	kBq	19.11.14	09.10.14 F
55Cs137/23	55	kBq	01.07.70	20	kBq	19.11.14	21.10.14 A
55Cs137/24	333	kBq	01.07.78	144	kBq	19.11.14	21.10.14 A
55Cs137/25	333						

- stored in safes at different locations
- can be used in experiments

Radiation at the Institute for Experimental Physics

Usage in experiments



Radioactive materials:

- stored in safes at different locations
- can be used in experiments

Radiation at the Institute for Experimental Physics

X-rays



Labelling requirements

“Kennzeichnungspflicht”

Experiments with ionizing radiation
must be labelled with standard symbols

Labelling requirements



Labelling requirements



Storage rooms for radioactive material:
Additional labelling for fireworkers

Labelling requirements

In case...

- ... you are not sure of the risk of exposure
- ... labelling is unclear

→ **ask the StrlSchB = radiation protection representative**

Facilities / devices (X-rays or stray radiation)

- Necessitate a permission (in most cases)
- Are checked by a service company in a 5-year rhythm
- Modifications of existing facilities – mandatory procedure:
 - Contact StrlSchB
 - StrlSchB organizes **inspection** by independent engineers
 - StrlSchB contacts work safety agency for modification of **permission**

Purchasing / Acquisition and transport of radioactive materials

- **Contact StrISchB**
- Handling of radioactive materials: permission for specific nuclides
- Further regulations exist for:
 - Transport
 - Disposal
- **Always contact the StrISchB !**

Basic principles of radiation protection

ALARA principle:

“As low as reasonably achievable”

“Die 4 A's”

Aufenthaltsdauer	Exposure time	minimize
Abstand	Distance	maximize
Abschirmung	Shielding	optimize
Aktivität	Activity	minimize

Dose and Radiation protection areas

- **Unit: Sievert [Sv] = J/kg**
 - Dose [mSv]
 - Dosisleistung (dose rate) [μ Sv/h]
 - Takes into account energy deposit and biological effective harmfulness of radiation types
- **“Überwachungsbereich” (monitoring area)**
 - 1 – 6 mSv per year
- **“Kontrollbereich” (control area)**
 - 6 – 20 mSv per year
- **“Sperrbereich” (prohibited area)**
 - > 3 mSv/h

Limits on exposure to radiation

“Dosisgrenzwerte”

- “Beruflich strahlenexponierte Personen”
persons with radiation exposure **at work**

Only exposures at work are relevant for StrlSchV / RöV !

- Category A: 6 mSv – 20 mSv per year
regularly inside “Kontrollbereich” / radiation controlled area
- Category B: < 6 mSv per year
occasionally inside “Kontrollbereich” / radiation controlled area

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- **Private radiation exposure:**

- Medical diagnostics ~ 2 mSv per year
 - Tooth: <0.01 mSv
 - Thorax X-ray: ~0.08 mSv / exposure
 - CT: 2-25 mSv / exposure
- Natural sources ~ 2 mSv per year
- Cigarettes – Pb210, Po210: 11 cigarettes per day
= 6 mSv organ dose per year

Limits on exposure to radiation

“Dosisgrenzwerte”

- **Special limits:**
 - Persons under 18 years: $< 1\text{mSv} / \text{year}$
 - Women: Organ dose at uterus $< 2\text{mSv} / \text{year}$
 - Pregnant women: exposition of child $< 1\text{mSv}/\text{year}$
- Limits for pregnancy are valid starting with StrlSchB *knowing* about it

Dosimetrie & Strahlenpässe

- **Official dosimetry:**

- for persons who work inside “Kontrollbereich”
- If you work with radioactive material and need a dosimeter, contact me !
- Ordering a dosimeter takes about 4 weeks !

- **Radiation passports (Strahlenpässe):**

- “Arbeit in fremden Anlagen” = work in foreign facilities
- For persons exposed to radiation at work outside UHH (BESSY, Rossendorf, DESY, ...)
- **Mandatory:** need to be updated before going to the “Fremde Anlage”



Radiation passports

- **Procedure for registration (~2 weeks):**
 - Fill in required information + signatures
 - StrlSchB sends passport to “Amt für Arbeitsschutz” for registration
 - Sent back to me
- **Procedure for passport maintenance**
 - **Passports stay in Office 16**, Building 68
 - **Mandatory regular update** by me
 - If needed for beamtime: **handed out against signature** by me
(Also access to my office: M. Matysek, W. Weppner, D. Horns)
 - Handout along with **OSL-Dosimeter against signature**
 - Note: exceptions exist, where Albedo Dosimeters need to be ordered (~2 weeks !)
 - When back from beamtime, **return passport and dosimeter immediately**
- **Strahlenschutzanweisung zu Genehmigung HH-RA 31/06**

Thanks