

# **Radiation safety instructions of the University of Hamburg for the research vessels SONNE, MERIAN, METEOR**

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## 1.

In accordance with § 45 of the Radiation Protection Ordinance (StrlSchV) from 29.11.2018, radiation protection commissioners are obliged to issue radiation safety instructions listing the radiation protection measures to be observed within the company.

Radiation safety instructions help protect humans and the environment against possible hazard when working with ionising radiation.

Operating plants that generate ionising radiation and handling radioactive materials can present the danger of external exposure with a possible risk to the life and health of the deployed employees or third parties if this is carried out incorrectly. Therefore, all necessary technical and organisational measures have to be carried out and observed at all times so that

- unnecessary exposure is avoided,
- unavoidable exposure is kept as low as possible and the exposure
- limits are not exceeded.

Further information can also be found in the authorisations named in Section 2. These authorisations list the open radioactive materials that are approved for use as well as their maximum total activity. Tips and instructions on using the electron capture detector (ECD) can also be found in the authorisation. Special instructions on handling and disposing of radioactive materials can also be found in the authorisations.

## 2. Legislative basis and authorisations, scope

These radiation safety instructions are based

- § 45 of the Ordinance on Protection against Damage and Injuries caused by Ionising Radiation (Radiation Protection Ordinance – StrlSchV) and
- the following approval notices:

Vessel	File ref.	Date of issue	Valid until
Sonne	<a href="#">HH-RA 44/21</a>	10.12.2021	11.12.2026
Merian	<a href="#">HH-RA 45/21</a>	10.12.2021	11.12.2026
Meteor	<a href="#">HH-RA 46/21</a>	10.12.2021	11.12.2026

The competent approval and supervisory body is the

**Department of Justice and Consumer  
Protection, Office for Occupational Health and  
Safety:** [Radiation protection](#)  
**Postal address:** PO Box 30 28 22, 20310 Hamburg  
**Street address:** Billstrasse 80 20539 Hamburg.  
**Your contact:** Heiko Bittner  
**Tel.:** 040 – 4 28 37 - 3142

These radiation safety instructions apply for

**Institute of Geology of the University  
of Hamburg**  
[German Research Fleet Coordination Centre](#)  
**Bundesstraße 55**  
**Room 908a 20146**  
**Hamburg**

and relate specifically to the three research vessels **FS Meteor, FS Maria S. Merian and FS Sonne.**

The material scope relates to handling radioactive materials. Employees that perform this work or work of this kind in accordance with StrISchG must observe these radiation safety instructions to the word.

### 3. Organisation

The organisation is based on three key functions: radiation protection commissioner, radiation safety authorized representative and radiation safety officer.

The **radiation protection commissioner** within the meaning of § 69 StrISchG is the approval holder represented by the Chancellor of the University of Hamburg.

The **radiation safety authorized representative** is

**Mr. Florian Steinke**  
**University of Hamburg**  
**Occupational Safety and Environmental Protection Administrative Department**  
**Mittelweg 177**  
**20148 Hamburg**

- a. The radiation safety authorized representative takes over part of the duties and responsibilities of the radiation protection commissioner within the scope of dealing with all research vessels of the UHH. They are required to implement the directives of the Chancellor and the supervisory body. They shall appoint the necessary number of radiation safety officers for the research vessels on behalf of the radiation protection commissioner (limited to the time of the voyage).
- b. The radiation safety authorized representative has the authority to examine all documents relating to radiation protection and to inspect all equipment and rooms to the extent that this is deemed necessary for the performance of their duties.
- c. The Chancellor, the radiation safety officers of the research vessels and the Administrative Department for Occupational Safety and Environmental Protection ("Stabsstelle AU") of the University, shall support the radiation safety authorized representative in performing their duties.

**Radiation safety officers** within the meaning of § 70 StrlSchG are appointed for each research expedition by the radiation safety authorized representative.

- a. Two radiation safety officers are to be appointed for the duration of each research expedition. The radiation safety officers are members of the respective scientific working groups. All radiation safety officers are appointed in writing by the radiation safety authorized representative, who determines the scope of their duties.
  - Requirements for the appointment:
    - Valid proof of specialist knowledge in radiation safety for handling open and closed radioactive materials and working with enclosed radioactive materials that are firmly installed (ECD), not older than 5 years (§ 47 StrSchV).  
Certificate of competence in accordance with § 47 (1) StrSchV. If no
    - certificate of competence is available from the relevant authority (administrative body), this can be applied for by the radiation safety authorised representative at the time of the appointment. The management hereby has to submit the radiation safety authorised representative to be appointed in writing:
      - Evidence of suitable training for the relevant field of application
      - Evidence of practical experience and
      - Proof of the successful participation in recognised courses (current specialist knowledge, not older than 5 years)

The certificate of competence in accordance with § 47 (2) StrSchV shall contain the following details:

- personal details

- a list of activities with details of the periods of employment in the relevant field of application and
  - the name of the institution in which the work was performed.
- b. Radiation safety officers are responsible for compliance with the Radiation Protection Ordinance, the associated regulations and the directives and conditions issued by the supervisory bodies and brought to the attention of the radiation safety officers, as well as with these service instructions, within their designated area of responsibility.

They are granted authority to issue instructions to all crew members in matters of radiation protection, irrespective of their administrative status. They can order measures, make decisions, issue instructions, regulate access to radiation protection areas and revoke the work permit of persons who intentionally or through gross negligence violate the regulations or demonstrate that they do not have the necessary fundamental knowledge.

- c. The radiation protection officers shall immediately inform the radiation safety authorized representative about all relevant processes in their area and support the radiation safety authorized representative in fulfilling their duties.
- d. In the event of a fire, the radiation safety officer must inform the firefighters about radioactive substances at the scene of the fire in accordance with the fire safety regulations of the research vessel.
- e. The radiation safety officers must immediately inform the radiation safety authorized representative about defects that affect radiation safety and about incidents, damage and accidents that can lead to radiation damage.
- f. The radiation safety officers are responsible for the radiation safety documentation and records, which must be kept in accordance with StrISchV.
- g. The radiation safety officer shall certify the contamination-free status of the isotope container at the end of the research expedition and confirm the return of the radioactive materials taken on board and if necessary the disposal of all radioactive waste (handover certificate). This confirmation must be sent unprompted to the competent supervisory body by way of the radiation safety authorized representative.
- h. The radiation safety officers shall forward the required notifications and approval applications in accordance with StrISchV to the radiation safety authorized representative.
- i. Further information can be found in the approval notices.

## 4. Radiation protection areas and access regulations

Access points to the radiation protection areas must be marked with radiation symbols. The marking must contain at least the clearly visible words “Caution radiation”, “Radioactive.” In addition, the words “Controlled area” or “Restricted area – no access” may also be necessary.

Access regulations to the surveillance areas and control areas are determined by the competent radiation safety officers. The necessary prerequisites for this are that the provisions on

- Medical monitoring
- Physical personal dosage control and legal access
- restrictions are complied with
- The competent radiation safety officer shall be notified of employees and students as well as trainees who are assigned to an activity during which they will be exposed to radiation in good time before these take up their duties. They shall also inform them immediately upon completion of their activities. The radiation safety officers shall arrange for the necessary personal protective measures to be taken (e.g. preventive medical screenings).

Once the radiation safety officers have confirmed that the isotope container is free from radiation at the end of a research expedition and have handed over the rooms/isotope container ([see also Section 3 g](#)), these can be used without restrictions by the crew or external companies for any necessary work. The standards stored in the isotope container in accordance with the authorisations must be secured against unauthorised access (for example with a padlock). Both members of the crew and external companies are to be informed of this.

## 5. Instruction

Persons who carry out their work within the scope of activities that require approval or who have been granted access must be instructed before they are granted access for the first time [in accordance with § 63 StrlSchV]. These radiation safety instructions and any further instructions must be included in the instruction.

Such instruction must be carried out verbally. The instruction must take place in a manner and language that is understandable for the instructed person(s). The competent authorities can allow the instruction to take the form of e-learning offers or audio-visual media if the success of this is monitored and the opportunity is given for questions and queries. This must be repeated annually, or at shorter intervals at the request of the competent authorities. Records must be kept of the content and time of the instruction and these must be signed by the instructed person(s).

The following warnings must be given for women of a child-bearing age in accordance with the StrISchV and the internal organisation:

1. A pregnancy must be communicated as early as possible in view of the radiation risk to the unborn child.
2. In case of contamination, an infant can intake radioactive materials during breastfeeding.

The instruction can be part of any other necessary instructions, in particular in accordance with occupational health and safety, emission control, hazardous goods or substances regulations. Other persons who are allowed to access radiation protection areas by reason of an official authorisation must be instructed of the possible hazards and their avoidance pursuant to § 63 (4) before being granted access.

Crew members of the vessels must be informed about work with radioactive materials and instructed in emergency measures.

Such instruction must also be documented.

A record must be kept of “otherwise employed persons” who enter and leave such areas, including their instruction about the necessary knowledge of the possible radiation risk and the protective measures to be employed (§ 13 (1) No. 4 StrISchG). The records must be kept for inspection by the authorities and presented to these on request.

#### **Contents of the instruction (§ 63 (2))**

- Relevant contents of the authorisations and the radiation safety instructions.
- Use of working methods, arrangement for wearing protective clothing and for using protective equipment to prevent contamination of persons involved,  
Handover and acceptance of the isotope container from the scientific radiation safety officer, including documentation.
- Wipe tests at the end of the research trip, checks to ensure that all isotopes have been taken off board, etc.



## 6. Determining the body dose

### 1) External exposure

The body doses are to be determined on persons who find themselves in a radiation protection area. Exceptions are explained in § 64 StrlSchV. The body dose is to be determined by measuring the personal dose with an official dosimeter provided by a competent measuring point under federal state law.

Official dosimeters are personalised. During work, the dosimeter must be worn at all times on that part of the body's surface that is relevant for the exposure (normally: top of the torso).

Further information can be found at [External Radiation Exposure – Guideline Part 1 \(PDF, 160 KB\)](#).

### 2) Internal exposure

Incorporation monitoring determines whether radioactive materials have been taken in by employees working in a radiation protection area. The common monitoring procedures to determine the body dose for internal radiation exposure are the in-vivo method, in-vitro method and room air determination. The Incorporation Monitoring Coordination Centre of the Federal Office for Radiation Protection (BfS) has been responsible for the "Incorporation monitoring" scope of duties since 1996. Further information can be found on the website of the [BfS](#). Incorporation monitoring is regulated here: [Internal Radiation Exposure – Guideline Part 2 \(PDF, 297 KB\)](#).

The body doses must be determined in the event of a significant incident in accordance with [Chapter 9](#). Both internal and external exposure may play a role in this case.

## 7. Medical monitoring

Occupationally exposed person in Category A may only take up work in the controlled area if they have been examined by an authorised doctor within the past 12 months before the start of their work and the radiation protection commissioner is presented with a certificate issued by this doctor, according to which there are no health concerns that speak against the activity. The medical examination must be repeated annually.

*Occupationally exposed person in Category A: Persons who are exposed to an occupational exposure from work that can lead to an effective dose of more than 6 millisievert, an organ dose equivalent higher than 15 millisievert for the lens of the eye or 150 millisievert for the hands, lower arms, feet or ankles, or a local skin dose of more than 150 millisievert in one calendar year.*

Occupationally exposed person in Category B are only subject to an obligatory examination if this has been stipulated in the authorisation.

*Occupationally exposed person in Category B: Persons who are not classified in Category A and who are exposed to an occupational exposure from work that can lead to an effective dose of more than 1 millisievert, an organ dose equivalent higher than 50 millisievert for the hands, lower arms, feet or ankles, or a local skin dose of more than 50 millisievert in one calendar year.*

## 8. Work behaviour - general rules

**The conditions named in Section C4 (handling) of the aforementioned authorisations must be taken into particular consideration.**

The basis rules of radiation protection always apply when working with radioactive materials:

- Keep your distance,
- Limit the amount of time you spend in the direct vicinity of the radiation source, use the shields provided.

The following are also

- Instruction of all persons handling radioactive materials. Obligation to label radioactive materials, also below the exemption limit.
- Monitoring of the number and functionality of appropriate radiation measuring devices.
- Radioactive waste hand-over and disposal, at the end of each voyage. It is prohibited to retain radioactive materials and waste.
- Radioactive materials must be included in the ship's loading documents, including ECDs. The ship's management and the control center must be informed by the radiation safety officer.

Use the means of protection provided for the corresponding activities. These must be in perfect working order.

All employees must be organised and perform their work in such a way that this does not endanger other persons.

Missing radiation protection, control or measuring equipment must be reported to the radiation safety officer immediately.

The radiation safety officer must estimate the possible exposure when preparing and performing new work projects. The working methods and protective measures must be selected so as to keep the exposure as low as reasonably possible.

All scientists who handle radioactive materials have the duty to,

- observe the StrlSchV;
- inform the competent radiation safety officers of the nature and scope of their current and planned work with radioactive materials or ionizing radiation and to obtain their consent for such measures;
- provide the competent radiation safety officers with all necessary information and to follow their instructions;
- inform the competent radiation safety officers of any contamination as well as any dose exceedances, incidents, damage and accidents;
- support the radiation safety officers in their work with advice and information and by any other means.

Radiation safety measurements must be taken to ensure that the limit values of the Radiation Protection Ordinance are complied with, if necessary by implementing shielding measures. The rooms (isotope container) in which radioactive materials are handled may only be cleaned by specially trained personnel or under expert supervision. Shielding or spacing devices and/or filling systems must be used when handling radioactive materials.

Work with volatile open radioactive materials may only be carried out under an exhaust hood. Should radioactive substances be suspected of being taken in, the person concerned must be immediately taken to an authorized doctor. The **supervisory body** must be informed **without delay**. [Intake measurements](#) must be carried out at an [official measuring point](#).

Contamination measuring equipment and contamination measurements must comply with the recommendations of the Radiation Protection Commission "Requirements for contamination control when leaving the controlled area."

Contamination checks must be carried out every working day in rooms and workplaces, in which open radioactive materials are handled. Persons leaving the controlled area, in which open radioactive material is handled, shall be subjected to contamination measurements. Checks must also be made immediately if contamination is suspected. The results must be documented.

Objects used in control and surveillance areas must not be returned to other areas or for repair until an inspection has shown that the limit values specified in Annex III Table 1 Column 4 StrlSchV have not been exceeded. Objects which cannot be decontaminated must be treated as radioactive waste.

If contamination of objects is detected which exceeds the limit values, immediate measures must be taken to avoid any exposure of persons working in this area to external radiation, contamination or intake (such as blocking off and marking the affected rooms or areas, safeguarding work clothing, shoes, etc.). The supervisory body must be immediately informed if major contamination occurs.

## 9. How to react to unusual courses of events or operating states or significant incidents

An incident is a deviation from an intended operating procedure or operational status during which accidental exposure occurs or could occur. Accidental exposure takes place if the actual exposure exceeds the expected value for normal exposure by more than the usual margin of fluctuations, even if the limit values are not reached. This possibility could arise, for example, in the event of a technical fault or a disturbance in the operating procedure.

If an incident occurs, every employee is obliged to inform the radiation safety officer immediately in person or by phone.

The radiation safety officer checks whether the criteria for a significant incident have been fulfilled in accordance with Annex 15 StrlSchV. They register the causes and effects, take measures to rectify and limit the effects and define regulations to prevent the occurrence of similar incidents.

The radiation safety authorized representative must be immediately informed if the following events occur:

- Discovery, loss, theft, fire, water damage, violent impact as far as radioactive materials are concerned;
- Release of radioactive materials with waste water or exhaust air, if limit values might be exceeded;
- Accidents or incidents, irrespective of any immediate measures; possible or actual intake of radioactive materials;
- Contamination of persons or objects outside of radiation safety areas, operational surveillance areas;
- Personal dose values greater than 1mSv per month;
- ECD defects that could impair radiation safety.
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- The radiation protection authorized representative shall immediately inform the radiation protection commissioner.

Hamburg, 11.04.2022

[Signature]

[Signature]

Chancellor Dr. Martin Hecht

Florian Steinke

(Radiation protection commissioner by order of  
the President of the University of Hamburg)

(Radiation safety authorized representative)