UMEÅ UNIVERSITET

RULE FOR RADIATION PROTECTION

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[1] [1]This document has been translated from Swedish into English. If the English version differs from the original, the Swedish version takes precedence.

1. Description

This rule describes how local agencies at Umeå university must work to maintain, evaluate, and improve, the radiation protection at the local agency to comply with Swedish laws and regulations.

The Head of the Department/Director is responsible for ensuring that all staff members working with ionizing radiation has knowledge of, and access to, this document.

Unless otherwise stated, the Head of the Department/Director is responsible for ensuring that the local agency complies with Swedish laws, Swedish Radiation Safety Authority issued regulations, and with the University's rules as stated in this document.

This document has been translated from Swedish into English. If the English version differs from the original, the Swedish version takes precedence.

2. Background

To be granted a permit for work involving ionizing radiation, Umeå University must fulfill certain conditions. One of these conditions is that there must exist a well-documented Radiation Protection Organization at the University, with a clear division of roles and responsibilities. There must exist a radiation protection management system that can guide, evaluate, and improve, the local agencies in their work. This management system is described in this document.

The purpose of this rule is to fulfill the above-mentioned requirements and to work as a source of information for the local agencies at Umeå university where work involving ionizing radiation is conducted.

This rule was initiated by the university's Radiation Protection Expert on February 20, 2020, when the university received an injunction from the Swedish Radiation Safety Authority. This document has been prepared in joint consultation together with the acting Radiation Protection Coordinator. University faculties and union organization were consulted on April 29, 2020 and given 15 workdays to raise questions or objections.

The following Swedish laws laws and regulations are relevant to any agency at Umeå university where work involving ionizing radiation is conducted:

- The Swedish Radiation Protection Act - Strålskyddslagen (2018:396)
- Strålskyddsförordningen (2018:506)
- SSMFS (2018:1) grundläggande bestämmelser för tillståndspliktig verksamhet med joniserande strålning
- SSMFS (2018:2) anmälningspliktiga verksamheter
- SSMFS (2018:3) undantag från strålskyddslagen om friklassningen av material, byggnadsstrukturer och områden
- Förordningen (2007:193) om producentansvar för vissa radioaktiva produkter och herrelösa strålkällor

3. Definitions

The radiation protection website
The radiation protection website is the part of the University's webpage where all information regarding radiation protection is collected and published, except for: (1) university common governing documents which must be published under the Legal Framework tab instead, and (2) local governing documents which should be collected and published at the local agency's website for laboratory work. Links to the university common governing documents regarding radiation protection and to the local agencies websites for laboratory work can be found on the radiation protection website.

Radiation Protection Expert
The Radiation Protection Expert at Umeå University is an advisory support function. Local agencies working with ionizing radiation should seek advice from the Radiation Protection Expert regarding how to protect their staff, the public, animals, and the environment from ionizing radiation.

Radiation Protection Coordinator
The Radiation Protection Coordinator at the Buildings office coordinates the radiation protection work for the university on a general level. The Radiation Safety Coordinator at Umeå University is the university's contact towards the Swedish Radiation Protection Authority.

The Swedish Radiation Safety Authority
The Swedish Radiation Safety Authority (SSM) is both a permit testing and supervisory authority. The authority sets regulations for work involving ionizing radiation, and they review agencies, such as Umeå University, to ensure that they are working responsibly and that they are following the rules and regulations. The authority also reviews applications and grants permits for work involving ionizing radiation.

Agency and local agency
In the permit granted by the Swedish Radiation Safety Authority, Umeå University is counted as one agency. Faculties, Departments or Research Centers are in this document referred to as local agencies, and they are subordinate to, and included, in the agency subjected to the permit.

4. Permit

The purpose of the Swedish Radiation Protection Act is to protect the people and the environment from the harmful effects of radiation. Umeå University is classified by the Swedish Radiation Safety Authority as an agency subject to a permit, which means that the university must apply for, and be granted, a permit to work with ionizing radiation. The university has two permits: one group permit for scientific and educational purposes (SSM2019-1607, CU 08205, valid through 2024-03-12); and one for exposing human subjects to radiation for medical purposes (SSM2016-4122, Am-12069, valid through 2021-09-30).

The group permits cover open and sealed sources, as well as technical equipment that can produce ionizing radiation and that have been registered with the Swedish Radiation Safety Authority. The permits also cover discarded sources and radioactive waste.

The permit for exposing human subjects to radiation for medical purposes covers the transfer, lease, acquisition, holding, and use of X-ray equipment intended for medical diagnostic imaging. It also covers the Department of Public Health and Clinical Medicine's,
and enheten för arbets- och miljömedicin's (the Unit for Occupational and Workplace Medicine, at the University Hospital of Umeå), work with iDXA and CT scanners.

The Vice-Chancellor of Umeå University is the permitholder, and thereby the utmost responsible for the work involving ionizing radiation at the university. The Vice-Chancellor is responsible for ensuring that departments working with ionizing radiation have access to qualified and properly educated staff and support functions.

5. Swedish Radiation Protection Authority and regulatory inspections

The Swedish Radiation Safety Authority (SSM) is both a permit testing and supervisory authority. The authority sets regulations for work involving ionizing radiation, and they review agencies, such as Umeå University, to ensure that they are working responsibly and that they are following the rules and regulations. The authority also reviews applications and grants permits for work involving ionizing radiation.

The Swedish Radiation Protection Authority is a regulatory authority, and their work is to oversee agencies working with ionizing radiation. Tillsyn sker genom granskning av de dokument som årligen skickas in till myndigheten och genom besök, planerade såväl som oplanerade, i verksamheten. Om Strålsäkerhetsmyndigheten bedömer att verksamheten inte följer rådande lagstiftning kan myndigheten utfärda ett föreläggande, ålägga universitetet att betala vite, eller dra tillbaka tillståndet.

Unless otherwise stated, the Head of the Department/Director is responsible for ensuring that the local agency complies with Swedish laws, Swedish Radiation Safety Authority issued regulations, and with the University's rules as stated in this document.

The Head of the Department/Director is responsible for ensuring that correct information is sent to the Radiation Protection Coordinator, who in turn is responsible for summarizing all the information from the local agencies and, if requested, forward it to the Swedish Radiation Safety Authority.

6. Annual inventory

Once a year, local agencies working with ionizing radiation must fill out the annual inventory form and send it to the Radiation Protection Coordinator, who is responsible for summarizing all the information from the local agencies and, if requested, forward it to the Swedish Radiation Safety Authority.

The Head of the Department/Director is responsible for ensuring that the filled-out form is sent to the Radiation Protection Coordinator before the end of April.

7. Annual report

Before the end of December, an annual radiation protection report must be produced by the Radiation Protection Expert and the Radiation Protection Coordinator. The annual report must contain all discovered problems or flaws in the radiation protection at the University, as well as an action plan to fix them. The annual report is brought forth by the Radiation Protection Coordinator at a meeting with the working environment committee, the budget Director and, if needed, the Heads of Faculty Offices.

8. Organization

The radiation protection organization at Umeå university is described in detail in the university common governing document *Radiation protection organisation at Umeå university*.

9. Basic radiation protection course

All staff members working with ionizing radiation must attend the university's basic radiation protection course. The course must be repeated every fifth year. The course is given once a year. The course is given in Swedish and English. The course covers:

- Ionizing radiation, different types of radiation, and radiation shielding.
- Radioactivity, X-rays, and dose.
- Detecting and measuring ionizing radiation.
- Harmfull effects and accidents
- Swedish laws and regulations
- Training and qualification
- Personal radiation protection
- Categorization of staff members and premises
- Pregnancy and breastfeeding
- Applied radiation protection

The Head of the Department/Director is responsible for ensuring that all staff members working with ionizing radiation at the local agency have participated in the basic radiation protection course, that the staff members repeat the course every fifth year, and that a local register is kept.

10. Internal audit

The Radiation Protection Expert conducts regular internal audits at the local agencies. The Radiation Protection Expert evaluates whether the radiation protection is adequate and offers advice and support. The Radiation Protection Expert is an advisory support function. The Head of the Department/Director is responsible for ensuring that the radiation protection at the local agency complies with Swedish law, Swedish Radiation Safety Authority regulations, and the university's rules.

A notice is given 10 workdays in advance before an internal audit.

11. Purchasing radioactive sources

See the university common governing document *Rule for purchasing radioactive sources*.

12. Disposal of radioactive waste

See the university common governing document *Code of rules and procedures for disposal of radioactive waste.*

13. Incidents and accidents

An incident or accident of significance from a radiation protection point of view must be reported to both the Radiation Protection Coordinator and the Radiation Protection Expert as soon as possible. Afterwards, the Head of the Department must, together with all staff members involved in the incident/accident, must fill out the Incident Report Form and send it to the Radiation Protection Coordinator

14. Categorization of staff members

Staff members working with ionizing radiation must be categorized into category A or B depending on the dose level they are at risk of being exposed to.

A staff member belongs in **Category A** if they could be exposed to the following dose levels during one year:

- An effective dose exceeding 6 millisievert,
- An equivalent dose to the lens of the eye exceeding 15 millisievert,
- An equivalent dose to extremities exceeding 150 millisievert,
- An equivalent dose to the skin (the average taken over 1 square centimeter) exceeding 150 millisievert.

A staff member belongs in **Category B** if they could be exposed to the following dose levels during one year:

- An effective dose exceeding 1 millisievert but not 6 millisievert,
- An equivalent dose to extremities exceeding 50 millisievert, but not 150 millisievert,
- Ab equivalent dose to the skin (the average taken over 1 square centimeter) exceeding 50 millisievert, but not 150 millisievert (no matter the size of the exposed area).

Some staff members at Umeå university are categorized in category B, but most staff members are exposed to so small amounts of ionizing radiation that no categorization is necessary. A staff member belonging to category B has the right to wear a personal dosimeter, but it is not required of them. Staff members should contact the Radiation Protection Expert for questions or consultations regarding categorization or a personal dosimeter. The Head of the Department/Director is responsible for ensuring that sample measurements are conducted every 2 years, or when there has been a change in work procedure, for staff members belonging to category B.

The Head of the Department/Director is responsible for ensuring that all staff members have been categorized and that it has been documented properly. The Radiation Protection Expert can be contacted for consultation.

The Head of the Department/Director is responsible for ensuring that alla staff members have been informed about which category they belong to, and that the act of informing staff members is properly documented.

15. Categorization of premises

Premises where work involving ionizing radiation is conducted must be categorized as either a Protected or a Controlled area.

Rooms or areas where staff members could be exposed to dose levels exceeding 6 millisievert during one year, or where significant radioactive contamination could occur and spread to other rooms or areas, is categorized as a **Controlled Area.**

A **Protected Area** is a room or area where staff members can be exposed to the following dose levels during one year:

- An effective dose exceeding 1 millisievert,
- An equivalent dose to the lens of the eye exceeding 15 millisievert,
- An equivalent dose to extremities exceeding 50 millisievert,
- An equivalent dose to the skin (the average taken over 1 square centimeter) exceeding 50 millisievert, no matter the size of the exposed area.

Most premises at Umeå university where work involving ionizing radiation is conducted are categorized as Protected Areas, but there are also those that are categorized as Controlled Areas. The Head of the Department/Director is responsible for ensuring that there are written instructions regulating how a Protected Area can be used. The Head of the Department/Director is responsible for ensuring that there are written instructions regulating how a Controlled Area can be used, and that only authorized staff members have access to it.

The Head of the Department/Director is responsible for ensuring that premises where work involving ionizing radiation is conducted, are categorized.

16. Pregnant and nursing women

Staff working with ionizing radiation is obligated to report pregnancy or nursing. The employer is obligated to inform the staff of this. When pregnant, an employee has the right to demand that the employer offer new work duties that don't involve ionizing radiation. When an employee reports that they are nursing, the employer must plan the work duties so that no intake or contamination of radioactive substances that would lead to the child being exposed to ionizing radiation can occur.

17. Open Radioactive Sources

17.1. Types of Open Radioactive Sources

Open Radioactive Sources are radioactive substances (solutions, gases, aerosols, solids) that are not permanently sealed within a shielding material. The following types of Open Radioactive Sources are used at Umeå university:

Alpha: U-238

Low-energetic Beta: H-3, C-14 och S-35

High-energetic Beta: P-32

Gamma: I-125

17.2. Working with Open Radioactive Sources

The Head of the Department/Director is responsible for ensuring that work with open sources is planned in such a way that staff members are exposed to the lowest dose reasonably possible. This includes, but is not limited to, the following:

1. Work involving open sources can only be carried out at designated and delimited workspaces with adequate signage (See section 17.3. Design of workspaces and signage).
2. Protective gloves must be used. A lab coat or other protective clothing, such as a visor or hair protection, must be used if there is a risk of splash or spillage.
3. The work bench must be protected with plastic lined absorbent paper. The absorbent paper must be replaced after each lab session. Contaminated absorbent paper must be treated as radioactive waste.
4. A protective radiation shield must be used for work involving opens sources that emit high-energetic beta radiation.
5. A fume cupboard must be used if there is a high risk for splash or spillage, or if there is a risk of radioactive gas/aerosol leakage.
6. Eating, drinking, snuffing, or storing food, is strictly prohibited at a workspace where open radioactive sources are stored or used.
7. The workbench must be wiped clean after each lab session and, if the used source is a high-energetic beta or gamma emitter, a contamination control must be performed.
8. Staff members must wash their hands after each lab session before leaving the workspace.

Staff members are obliged to follow the instructions/code of rules and procedures at the local agency.

17.3. Design of workspaces and signage

Workspaces intended for work with open radioactive sources must be delineated with warning tape for radioactive materials. Containers marked for radioactive waste must be placed near the workspace, see the university common governing document *Code of rules and procedures for disposal of radioactive waste*. Specific containers for hazardous materials, marked 'leftover radioactive materials', must be placed near the workspace, see the university common document *Code of rules and procedures for disposal of radioactive waste*.

The following signs must be placed in the direct vicinity of the workplace in such a fashion that no one can enter the workplace without receiving the following information:

- Categorization of the workplace (Controlled/Protected area)
- Warning for ionizing radiation
- Type of radioactive source (Open, sealed, alpha/beta/gamma)

The following signs must be placed inside the workplace in such a fashion that staff members working there can easily find the following information:

- Contact information for the Radiation Protection Expert

The following information must be easily accessible in the workplace:

- Procedures for each task
- Procedures for accidents/incidents
- Procedures for contamination measurements

The Head of the Department/Director is responsible for ensuring that the workplace is adequate for work involving open radioactive sources, and that signs are placed adequately and contain correct information. Contact the Radiation Protection Expert for consultation.

17.4. Access

Only qualified staff members with relevant education and knowledge about local procedures are allowed access to workplaces where work involving open radioactive sources is conducted. Relevant education refers to the basic radiation protection course given once a year by the university. Staff members that have received an equivalent education at another institution can contact the Radiation Protection Expert for validation.

The Head of the Department/Director is responsible for ensuring the above and ensuring that local registers are kept of staff members with the relevant education and with access to workplaces where work involving open radioactive sources is conducted.

17.5. Contamination control

An instrument for contamination control must be accessible for staff members at a workplace where work involving open radioactive sources is conducted. The instrument must be calibrated

annually, either by the manufacturer/supplier or with the aid of the university Radiation Protection Expert. The instrument must be calibrated/serviced if it is suspected of displaying inaccurate values. When working with high-energetic beta or gamma emitting open radioactive sources, a contamination control must be performed after each lab session. When working with low-energetic beta emitting open radioactive sources, swipe samples must be taken at least once every 6 months and always in case of spillage.

The Head of the Department/Director is responsible for ensuring the above, and for ensuring that there exist local procedures for calibration and contamination controls.

17.6. Spillage

Spillage must be thoroughly cleaned as soon as possible. Wipe with absorbing material but be careful not to spread the activity out over a larger area. After the clean up a contamination control must be performed. Spillage on skin must be cleaned off immediately, as low-energetic beta emitters can yield very high local radiation doses.

Accidents must always be reported as described in *13. Incidents and accidents.*

The Head of the Department/Director is responsible for ensuring the above, and for ensuring that the local agency has written procedures regarding spillage.

17.7. Storing and marking open radioactive sources

Open radioactive sources must be kept in locked storage and be marked with the warning symbol for ionizing radiation. The container must be marked with the name of the radionuclide, the activity, and activity date. The storage must be marked with a warning sign, “Storage of radioactive material”, and the storage for radioactive waste must be marked with a warning sign “Storage of radioactive waste”.

Order signs through the Radiation Protection Coordinator.

The Head of the Department/Director is responsible for ensuring the above.

17.8. Documentation

The Head of the Department/Director is responsible for ensuring that the following documentation is kept and stored at the local agency:

- Register of all staff members at the local agency who works with ionizing radiation
- Register of, and a written procedure for, which staff members are allowed access to workplaces where work involving ionizing radiation is conducted.
- Register of staff members who have attended the university Basic Radiation Protection course within the last five years.
- Written procedures for all work tasks involving ionizing radiation.
- A local waste disposal plan and written procedures regarding disposal of radioactive waste (including transportation and storage).
- Written procedure for contamination
- Written procedure for the calibration of instruments for detecting ionizing radiation.

- Written procedures that ensure that all staff members working with ionizing radiation receive the relevant education (the university's Basic Radiation Protection course), that they repeat it every fifth year, and that they have been introduced to the local radiation protection procedures at the local agency.
- Written procedures regarding pregnancy and nursing for staff members working with ionizing radiation.
- Written procedures regarding incidents, spillage, etc.
- Written procedures regarding the purchase, reception, transport, and disposal of radioactive materials.
- A decommissioning plan for the local agency. The plan must include final disposal of radioactive materials and waste, which materials and premises that might come under consideration for exempt status, as well as which requirements in the Swedish Radiation Safety Authority regulation SSMFS 2018:3 that might apply to the local agency.

18. Sealed radioactive sources

18.1. Types of sealed radioactive sources

Sealed radioactive sources are radioactive sources that cannot contaminate staff members or workplaces. Sealed radioactive sources also includes technical equipment containing x-ray tubes or radioactive sources.

The following are examples of sealed sources used at Umeå university:

- Cabinet x-ray systems
- Liquid scintillators
- EC-detectors
- Radiation shielded radioactive substances

18.2. Work with sealed radioactive sources

The Head of the Department/Director is responsible for ensuring that work with sealed radioactive sources is planned in such a way that staff members are exposed to the lowest dose reasonably possible. This includes, but is not limited to:

- Staff members must have adequate knowledge of how to safely use the sealed radioactive source/equipment.

- Available protective clothing must always be used

Staff members are obliged to follow the instructions/code of rules and procedures at the local agency.

18.3. Design of workplaces and signage

The workplace containing the sealed radioactive sources must be clearly marked with signs, and there must be a system in place that clearly indicates whenever an exposure is in progress. The sealed radioactive source must be marked with a warning sign for ionizing radiation and be stored in such a way that no unauthorized members of staff or the public can get access to it. If relevant, the sealed radioactive source must be marked with the name of the radionuclide, activity, activity date. The storage place for the sealed radioactive source must be marked with a warning sign for ionizing radiation.

18.4. Access

Only qualified staff members with relevant education and knowledge about local procedures are allowed access to workplaces where work involving sealed radioactive sources is conducted. Other staff members are allowed access when the equipment is turned off, provided no radiation is emitted when the equipment is turned off. Relevant education refers to the basic radiation protection course given once a year by the university. Staff members that have received an equivalent education at another institution can contact the Radiation Protection Expert for validation.

The Head of the Department/Director is responsible for ensuring the above and ensuring that local registers are kept of staff members with the relevant education and with access to workplaces where work involving sealed radioactive sources is conducted.

18.5. Documentation

The Head of the Department/Director is responsible for ensuring that there are written local procedures at the local agency regarding calibration control of instruments for measuring ionizing radiation.

The Head of the Department/Director is responsible for ensuring that a Swedish manual for the sealed radioactive source is available at the workplace.

The Head of the Department/Director is responsible for ensuring that the following documentation is kept and stored at the local agency:

- Register of all staff members at the local agency who works with ionizing radiation
- Register of, and a written procedure for, which staff members are allowed access to workplaces where work involving ionizing radiation is conducted.
- Register of staff members who have attended the university Basic Radiation Protection course within the last five years.
- Written procedures for all work tasks involving ionizing radiation.
- Written procedures that ensure that all staff members working with ionizing radiation receive the relevant education (the university's Basic Radiation Protection course), that they repeat it every fifth year, and that they have been introduced to the local radiation protection procedures at the local agency.
- Written procedures regarding pregnancy and nursing for staff members working with ionizing radiation.
- Written procedures regarding incidents and accidents
- Service plan for sealed radioactive sources
- A decommissioning plan for the local agency. The plan must include final disposal of radioactive materials and waste, which materials and premises that might come under consideration for exempt status, as well as which requirements in the Swedish Radiation Safety Authority regulation SSMFS 2018:3 that might apply to the local agency.