Radiation Protection Program

pursuant to the provisions of §24 of Act No. 263/2016 Coll., Atomic Act

for Handling of Source of Ionizing Radiation

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Approved by: doc. RNDr, Eva Bártová, Ph.D., director

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IČ: 68081707, DIČ: CZ68081707
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In Brno on May 5, 2017

29.5.2017 Ing. Petr Bufka
STÁTNÍ ÚŘAD PRO JADERNOU BEZPEČNOST
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Description of authorized activity

The subject is manipulation with source of ionizing radiation - the use of open radionuclide sources, which are simple sources of ionizing radiation in the 1st category workplaces (in carrying out research tasks in the framework of scientific research grants).

Authorized activity location

Open radionuclide sources will be used in laboratories of the Institute of the Biophysics of the Czech Academy of Sciences, v.v.i. (hereinafter referred to as IBP), in Brno, Královopolská 135, 612 65 Brno.

Specification of sources of ionizing radiation within the scope of authorized activity

Used open radionuclide sources: ^{3}H, ^{14}C, ^{32}P, ^{33}P, ^{35}S, ^{125}I.
Determination of the highest activity processed at standard workplaces is given in Table 1 according to Annex No. 9 of Decree No. 422/2016 Coll., On Radiation Protection and Security of Radionuclide Source.

More detailed specification:
^{3}H organically bound (labelled thymidine and uridine, labelled S-adenosylmethionine, labelled cytokinin and auxin derivatives, labelled sugars and amino acids, labelled arachidonic acid and its metabolites, labelled unsaturated fatty acids)

^{14}C organically bound (labelled thymidine and uridine, labelled S-adenosylmethionine, labelled cytokinin and auxin derivatives, labelled sugars and amino acids)

^{32}P organically bound (alpha and gamma-labelled deoxynucleoside triphosphates and nucleoside triphosphates, bound forms in DNA)

^{33}P organically bound (alpha and gamma-labelled deoxynucleoside triphosphates and nucleoside triphosphates, bound forms in DNA)

^{35}S organically bound (alpha and gamma-labelled deoxynucleoside triphosphates and nucleoside triphosphates, bound forms in DNA, labelled methionine and cysteine)

^{125}I organically bound (labelled cytokines, peptides, amino acids, hormones) to detect binding of labelled ligands to soluble and immobilized receptors under in vitro conditions.

Table No. 1:

Determination of the highest activity processed at standard workplaces (The table shows the maximum actual/calculated simultaneously processed activity (upper limit for category I))

Workplace / facility coefficient	Radionuclide					
	^{3}H wet processing	^{14}C wet processing	^{32}P wet processing	^{33}P wet processing	^{35}S wet processing	^{125}I volatile substance
Radiochemical fume hood / 1	370 MBq 73170 GBq	370MBq 5170 GBq	370MBq 1034GBq	370 MBq 2143GBq	370 MBq 4286GBq	37 MBq 71 MBq
Chemical fume hood, protective shield /0.1	370MBq 7317GBq	370MBq 517 GBq	370MBq 103.4 GBq	370MBq 214.3 GBq	370MBq 429 GBq	3.7 MBq 7.1 MBq
Free area, Working table /0.01	370MBq 731 GBq	370MBq 51.7 GBq	370MBq 10.34 GBq	370MBq 21.43 GBq	370MBq 43 GBq	0.37 MBq 0.71 MBq
Conversion factor (Sv/Bq)	$4.1 .10^{-11}$	$5.8 .10^{-10}$	$2.9.10^{-9}$	$1.4.10^{-9}$	$7.0.10^{-10}$	$1.4.10^{-8}$

Description of the organizational structure of the person performing the authorized activity, rights and obligations

It is the responsibility of the management to secure quality and safety in performing radiation activities. This is achieved by establishing responsibilities and rules for staff, financial and technical provision of said activities, by providing systematic supervision of compliance with radiation protection requirements, by optimization of activities carried out with sources of ionizing radiation, by continuous training of IBP staff and by introduction of standard working procedures.

Detailed organizational structure is described in the IBP Organizational Rules.

The competencies and responsibilities of individuals specified below should ensure, to the fullest extent possible, that activities with the open radionuclide sources are performed properly and that corrective mechanisms are provided in the event of an unauthorized manipulation with open radionuclide sources.

Director of the Institute of the Biophysics of the CAS, v.v.i.

is responsible for the provision of radiation protection, creates conditions which allow the permit holder to meet the obligations according to Act No. 263/2016 Coll.; Atomic Act, appoints a supervisor.

Supervisor

the Supervisor holds a valid license of special professional competence pursuant to Decree No. 409/2016 Coll., for systematic supervision when working with open radionuclide sources in the 1st category workplaces.
The Supervisor:

- ensures communication and contact between the IBP and the State Office for Nuclear Safety (hereinafter referred to as SONS)
- ensures the processing of documentation in the field of radiation protection of the workplace
- organizes and provides training of radiation workers on the risks and principles of safe work with sources of ionizing radiation and regular verification of their knowledge
- monitors, evaluates and records the measurement of all variables and parameters important for radiation protection
- is responsible for the registration of radioactive waste; measures it before its release into the environment
- is authorized to terminate the work with sources of ionizing radiation in case of radiation protection rules violation
- proposes corrective measures after termination of work with sources of ionizing radiation
- informs the head of the laboratory and the IBP Director about the termination of work and corrective measures
- has the right to propose sanctions against workers violating the radiation protection rules
- is responsible for monitoring the workplace
- resolves disagreements relating to radiation protection
- monitors compliance with the radiation protection rules
- submits proposals for a change in the organization of working with sources of ionizing radiation

Heads of laboratories

- are responsible for the implementation and enforcement of radiation protection rules at their departments
- ensure compliance with the radiation protection rules at their departments according to generally valid regulations and internal documentation in cooperation with the supervisor and the person directly responsible for providing radiation protection
- cooperate with the supervisor in the training of subordinate staff

Radiation workers

- are obliged to familiarize themselves with the internal regulations of the workplace with open radionuclide sources
- observe the rules of radiation protection
- participate in annual training, undergo regular verification once a year of knowledge of radiation protection
- inform the supervisor of all facts and changes relevant to radiation protection

Other workers

This group of employees includes IBP employees who do not directly work with open radionuclide sources, but, because of their duties, can operate in the 1st class laboratories (e.g. porter, warehouseman). These workers are familiar with the risk of ionizing radiation and with operating instructions for working in the 1st category laboratories as well as with other related internal regulations.

Documentation and records management

Preparation of documentation related to radiation protection is provided by the supervisor. Changes to the documentation are implemented with every change in the facts, conditions and circumstances of carrying out the activities documented in the Radiation Protection Program (hereinafter referred to as RPO). For subsequent documents, changes are made in line with RPO changes. Changes to the documentation are communicated to the SONS and to all radiation workers, including other staff affected by the changed procedures.

The results of activities related to the use of the source of ionizing radiation are documented through records.

The person responsible for managing the documentation and records is the supervisor.

List of documentation and records (documents are archived for 10 years):

- Authorization by the SONS
- Radiation Protection Program
- Monitoring program
- Appointment of supervisor, their consent to the appointment
- Decision to grant an authorization of special professional competence
- Cover letters of open radionuclide sources
- Records of the acceptance testing of the open radionuclide sources
- Workplace monitoring records
- Radioactive waste storage records
- Records of radioactive waste monitoring before its release
- Records of the transfer of radioactive waste to an authorized person
- Records of instructing the workers on the risks and principles of safe work with sources of ionizing radiation
- Records on radiation protection training and records on radiation worker test pursuant to §50 para. 5 and 6 of V422 on RP and Radionuclide Source Security
- Records of instructing other employees
- Records of movement/transfer of radionuclide sources
- Records of consumed activity
- Records of disagreements and measures taken
- Documents for verification of specified gauges

- Records on the stability of work gauges not specified
- Service book of devices

Description of the method of information transmission to the SONS

In accordance with the provisions of § 69 para.1 a) a report on "Evaluation of the method of ensuring radiation protection" is submitted to SONS once a year, no later than on April 30 of the following calendar year. The content thereof is pursuant to § 54 of Decree No. 422/2016 Coll., on Radiation Protection and Security of Radionuclide Source. The report shall be signed by the Director of the IBP. Information about the important radiation protection changes shall be sent to the SONS immediately after their implementation, in case of changes which could affect the level of radiation protection, these shall be submitted before their implementation.

Description of ways to resolve mismatches

All workers are obliged to report any detected deviations/mismatches to the supervisor who decides on a subsequent procedure, i.e. whether it is necessary to record the detected mismatch and to take steps to remove it and not repeat it.

If the findings relate to the result of the operational inspection of a measuring device, the measuring device is considered as non-conforming and until the defect is remedied, it is identified as non-conforming and not used.

Records of mismatches and measures taken are kept by the supervisor. Documents are archived for 10 years.

Description of the system of informing and training a radiation worker in the field of radiation protection

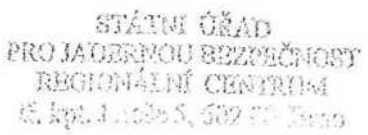
Prior to the start of work with open radionuclide sources (hereinafter referred to as ORS), all radiation workers are informed about the risks of the work and familiarized with the operating procedures for safe handling of the ORS, including procedures in the event of deviations from normal operation. The information is provided and recorded by the supervisor.

Furthermore, all radiation workers take part in radiation safety training provided by the supervisor regularly, once a year. Radiation workers are required to undergo verification of their knowledge at the end of the training. Records of attendance at the training and verification of knowledge are kept by the supervisor.

Description of the scope of monitoring, measurement, evaluation, verification and recording of variables and facts important from the point of view of radiation protection

All facts and variables relevant to radiation protection and related to radiation activity, resources or workers are recorded and stored. A list thereof is provided in the section Documentation and Records Management. Variables and facts related to workplace and radioactive waste monitoring are listed in the monitoring program.

Description of metrological securing of the gauges



Gauges intended to measure surface contamination are checked every two years by an authorized Metrological Institute. Once a month, the gauges are checked for stability by means of a control source. If the gauge response is not documented, the gauge shall be handed over for repair and the supervisor shall designate a replacement gauge to monitor the workplace.

Documents of verification of the established gauges shall be kept by the supervisor.

Description of source acceptance testing

Following a delivery to the ORS, the acceptance testing is carried out by an authorized laboratory worker to the extent which includes a visual inspection of the integrity and consistency of the source of ionizing radiation and the verification of the data specified in the ORS accompanying cover letter (identification number of the ORS cover letter and ORS identification number). The ORS acceptance testing will be recorded in the ORS documentation (delivery note) and its receipt will be recorded in the laboratory records.

Principles of radioactive waste handling

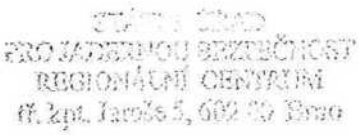
With the authorized method of handling a source of ionizing radiation - the use of ORS, mainly radioactive wastes contaminated by radionuclides with short half-life (^{32}P, ^{33}P, ^{35}S, ^{125}I) will be generated, this waste will be stored in the workplace in a defined space until the activity drops below the release level; they will then be disposed of as ordinary municipal waste.
Radioactive waste with short half-life radionuclides is solid, combustible and non-combustible, collected in PE-sealed bags that are properly labelled and inserted into a plexiglass box in annex C (Laboratory 317). Before the plexiglass box is fully filled, an authorized worker transports the radioactive waste into a separate radioactive waste repository, which is located in a separate building. Liquid radioactive water-soluble waste is collected in PE containers, water-insoluble waste is collected in glass containers.
In the case of long half-life radionuclides (^{3}H or ^{14}C), which are not used so often, the generated radioactive waste is stored in a radioactive waste repository and after about 5 years, when a larger volume thereof is collected, it is sent to the authorized person for disposal. The radioactive waste repository is secured against unauthorized access.

Prior to releasing radioactive waste into the environment or its transmission to the authorized person, the radioactive waste is measured and the result is recorded. The supervisor is responsible. Radioactive waste monitoring is described in the Monitoring Program document.

Use of personal protective equipment and means

All surfaces, areas, devices and equipment used for work with ORS are properly marked and labelled. The working surfaces for ORS handling are protected by PE foil and filter paper.

When working with ORS, the radiation workers are obliged to use the work jacket and protective gloves. When working with ^{32}P, they are obliged to use a protective plexiglass shield.



The supervisor or a representative authorized by the supervisor randomly checks the labelling of surfaces, areas and equipment for ORS handling and the integrity of the work equipment. The results are recorded and stored with the supervisor.