

# Kings Bay Isotope Lab User Guide

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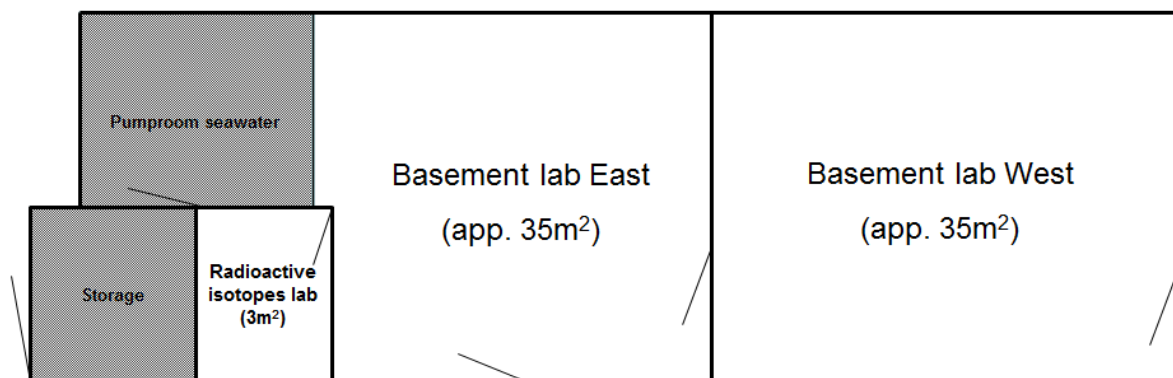
Corrections: Marine Ilg, 08.06.2020

## USE OF RADIOISOTOPES AT KBML

Kings Bay Marine Lab offers an Isotope Lab for researchers working with radioactive materials. All activities involving the use of radioactive isotopes are overseen by the Kings Bay Radiation Coordinator who has been certified by the Norwegian Radiation and Nuclear Safety Authority (Direktoratet for Strålevern og Atomsikkerhet, **DSA**). The Radiation Coordinator is ultimately responsible for all lab users and materials, ensuring that all usage complies with the *Act on Radiation Protection and Use of Radiation (2000)*. The use of radioactive materials must be approved by Kings Bay to assure that the planned usage is within the limits set by the Norwegian authorities for this type of lab.

## FACILITY

The isotope lab is located on the first floor of the Marine Lab. The isotope lab contains a small refrigerator and a fume hood. Outside the door to the Isotope lab is a Scintillation counter. The isotope lab is locked, except when it is in use. The key to isotope lab will be handed out to the scientists, after the isotope lab user agreement has been signed.



\*insert pictures\*

## ACTIVITY AND DOSE RATE LIMITATIONS

The Norwegian Radiation and Nuclear Safety Authority demands that all workplaces handling radioactive materials follow the “As Low As Reasonably Achievable” (ALARA) principle. This means that users of the isotope lab should aim to reduce their exposure as much as possible within practical limits (social, economic, etc.).

The Isotope Lab is classified as a type C lab, meaning that there are limits to the activity and concentration of open radioactive sources allowed in the lab. Table 1 indicates the limits for different radioactive isotopes. These limits refer to the amount of radioactive material which will be IN USE in the lab. It does not include stored materials. If there are multiple users of the lab, the total activity or concentration of all the sources used by each user must be below the given limits.

Radioactive materials above the given limits can be stored in the Isotope lab, but must be under lock. All materials being stored must be adequately sealed and shielded according to their activity. A label containing the following information should be affixed to the stored material: Name of user, project ID number, contents, radioactive isotope, activity, concentration, dates of use.

Table 1: Type C labs can have open sources in active use no greater than **ten times** the given limits below

Isotope	Amount (Bq)	Concentration (Bq/g)
H-3	$10^9$	$10^6$
C-14	$10^7$	$10^4$
P-32	$10^5$	$10^3$
P-33	$10^8$	$10^5$
S-35	$10^8$	$10^5$
Cr-51	$10^7$	$10^3$
Tc-99m	$10^7$	$10^2$
I-125	$10^6$	$10^3$
I-131	$10^6$	$10^2$
U-233	$10^4$	$10^1$

**\*\*IMPORTANT\*\***

If you are using H-3 bound to thymidine (tritiated thymidine  $^3\text{H-TdR}$ ), the limits given in table 1 are **NOT to be multiplied by 10.**

## **PRIOR TO ARRIVAL**

### **Documentation of adequate training**

Anyone working with radioactive isotopes at the Marine Lab must provide some documentation indicating that he/she has had adequate training to safely handle radioactive materials. This can either be from a governmental body or from a research institution/University. The legal responsibility of all users and materials lies with the Kings Bay Radiation Coordinator, and thus he/she has the right to demand further documentation or inquire more deeply into the experience and certification of the user. If the potential user does not produce enough evidence of competence, the Kings Bay Radiation Coordinator can deny usage of the lab and isotopes.

### **Project information form**

The project information form (see below) will need to be completed before the arrival of the lab user. This form must be sent to the marine lab coordinator and radiation coordinator for approval of the planned work.

## **HEALTH AND SAFETY PRECAUTIONS**

### **Risk Assessment**

Prior to beginning work in the Isotope lab, all users must conduct a risk assessment which is a part of the project information form. This includes the identification of risks, measures taken to reduce exposure and a plan in case of spills or incidents. This risk assessment is to be completed before the arrival of the lab user. Upon arrival, the lab user will be given an orientation by the Radiation Coordinator.

### **Personal Protective Equipment**

Appropriate personal protective equipment (PPE) must always be worn when handling radioactive isotopes. Kings Bay can provide an emergency kit in case of spills. For daily work, the user must provide his own PPE, which entails – where applicable - gloves, eye protection, shoe covers, dust masks and coveralls. It is the responsibility of the user to ensure that this protective equipment is used properly.

### **Accident Contingency**

In case of a spill or accident, the isotope lab is equipped with a contingency kit containing the following materials:

- dust mask
- coveralls
- shoe covers
- rubber gloves
- cloths
- tweezers
- scissors
- bags for waste
- tape
- plastic sheet
- cleaning agent

In case of an incident, the radiation coordinator and marine lab coordinator should be informed as soon as possible (after preliminary evacuation and removal of contaminated clothing, etc.). Detailed protocols for incident handling will be explicitly described in the risk assessment conducted by the lab user (with help from radiation coordinator).

## Contamination Risks

The isotope lab is located in the Marine Lab and joins directly to an open wet lab space. Contamination of the wet lab is obviously highly undesirable. All personal protective equipment that is contaminated with radioactive material must be removed and placed into a plastic bag (or appropriate container) **before** leaving the isotope lab space. Only closed sources (i.e. scintillation vials) are to be taken out of the isotope lab for analysis on the scintillation counter. In case it is not possible to contain everything within the isotope lab and when the lab is left, the yellow line should not be crossed.

## PRIOR TO DEPARTURE

### Wipe Test

After the lab user has completed all lab activities using radioactive isotopes, they are responsible for completing a wipe test to ensure that there has been no contamination of the lab areas. The wipe test must be confirmed by the radiation coordinator **before** the user leaves Ny-Ålesund. If the wipe test shows signs of contamination, the lab user must clean (and re-clean) the lab as necessary until the wipe test is approved by the radiation coordinator.

### Waste Management

Kings Bay is responsible for the shipping of radioactive waste from Ny-Ålesund. All radioactive waste must be registered with the radiation coordinator and the marine lab coordinator (often the same person). A waste submission form will be given to the lab user upon arrival. The lab user shall pack the waste in the yellow container inside a black plastic bag. In case more containers are necessary, please ask the marine lab coordinator. This form must be completed and returned to the aforementioned staff **prior** to the departure of the lab user. Waste shipping and disposal is paid by the kilo at a rate set by Kings Bay. This rate is based on the costs incurred in the shipping and disposal process. For a detailed description of how this fee is calculated please speak with the marine lab coordinator. The lab user will be invoiced for radioactive waste disposal along with lab usage and chemical orders upon departure from Ny-Ålesund.

Waste is to be packed and labelled appropriately with the following information:

Name of user

RiS ID (project ID)

Radiative isotope

Activity in Bq

Classification in one of the following categories:

1. Empty packaging (which formerly contained radioactive material)<sup>1</sup>
2. Natural thorium/materials prepared from natural uranium

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<sup>1</sup> Measurement of radiation from the **inside** of empty containers or packaging cannot exceed 100x the limits declared in table 2.

3. Limited quantity of radioactive material (see table 2 for values)
4. Instrumentation

Table 2: Limits for waste produced at the isotope lab for different substances

State		activity limit
Solid	Special form	10-3 A1
	other form	10-3 A2
Liquid	all	10-4 A2
Gas	tritium	2 10-2 A2
	special form	10-3 A1
	other form	10-3 A2

## APPENDICES

### APPENDIX I

#### Summary of Regulations

- 1) Radioisotope use will be approved by the Radiation coordinator in accordance with the Isotope Lab User Guide and Project Information Form
- 2) Work areas will be prominently marked with appropriate signs in accordance with the *Act on Radiation Protection and Use of Radiation (2000)*.
- 3) Radioisotopes will only be used within the designated Isotope lab spaces
- 4) Counter-top protection is to be used at all times. Spill materials are to be kept in a readily accessible location.
- 5) No smoking, food/drink consumption or storage in any lab area
- 6) In the event of a radioactive material spill, the area will immediately become off-limits to anyone other than trained Kings Bay personnel.
  - a. The radiation coordinator will decontaminate the area
  - b. Spills will be reported to the radiation coordinator who will inform the DSA
  - c. The area will be tested and re-cleaned as necessary
- 7) Wipe test readings of more than 200 require further decontamination and a new wipe test. The radiation coordinator is responsible for ensuring that wipe tests meet this standard.

APPENDIX II

**Kings Bay Isotope Lab Application Form**

for work involving open radioactive sources

Project information		RiS ID:
Lab users: (first and last names)	Dates of use:	Documentation of competency provided?
_____	_____ to _____ from (dd/mm/yy) to (dd/mm/yy)	<input type="checkbox"/>
_____	_____ to _____ from (dd/mm/yy) to (dd/mm/yy)	<input type="checkbox"/>
_____	_____ to _____ from (dd/mm/yy) to (dd/mm/yy)	<input type="checkbox"/>
Short description of proposed work:		

Dose estimation							
Planned work	Source Activity (Bq)	Isotope	Working Distance	Dose Rate	Duration	Annual Frequency	Annual cumulative dose
Protocol 1							
Protocol 2							
Protocol 3							
Protocol 4							
Protocol 5							
<b>Total estimated annual dose for this work:</b>							

<b>Demonstration of compliance with Lab C regulations</b> (Maximum Activity of open sources in active use at any given time)			
Isotope	Max Activity (Bq)	Usage limit (see user guide)	Max activity < Usage limit?
			YES / NO
			YES / NO
			YES / NO

<b>Risk Assessment</b>		
Measures to minimize external exposure		
Personal protective equipment to be used		Supplied by Kings Bay?  YES / NO
Foreseeable accidents		
Contingency arrangements		



APPENDIX III

Delivery of Radioactive Waste to Kings Bay

Name of user:

Institute:

RIS-number:

Name of isotope:

Mass in grams:

Bq/gram:

Total activity in Bq:

State: Solid / Liquid / Gas

Can be frozen? (Yes/No) (Cross over the incorrect answer)

Can be heated? (Yes/No) (Cross over the incorrect answer)

Evaporation temperature (If known):\_\_\_\_\_

Type of waste:

- Natural thorium/materials prepared from natural uranium  Empty containers  
 Limited quantity of radioactive material (see user guide)  Instrumentation

I confirm that the information I have filled in on this form is correct

Date:\_\_\_\_\_

Signature:\_\_\_\_\_

For Kings Bay:

Senja Avfall kan ta imot dersom stoffet er på denne listen og verdiene er mindre en i denne listen	
Isotop	Becquerel/Gram (Bq/g)
CA-45	10K Bq/g
H-3	1M Bq/g
C-14	10K Bq/g
I-125	1K Bq/g
S-35	100K Bq/g

Dersom stoffet ikke er på listen eller verdien er større en listen, må avfallet til Kjeller.

Signer med dato og initialer

- Innleveringen er fakturert  Avfallet er pakket   
Pakken er deklartert  Pakken er avsendt