

**NIGERIAN NUCLEAR REGULATORY AUTHORITY**



**DRAFT**

**NIGERIAN TRANSPORT SECURITY OF RADIOACTIVE MATERIAL  
REGULATIONS, 2022**

**NUCLEAR SAFETY AND RADIATION PROTECTION ACT (No. 19, 1995)**

**NIGERIAN TRANSPORT SECURITY OF RADIOACTIVE MATERIAL REGULATIONS,  
2022**

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S. I. No. of 2022

NUCLEAR SAFETY AND RADIATION PROTECTION ACT No.19 of 1995

## Nigerian Transport Security of Radioactive Material Regulations, 2022

Commencement:

In exercise of the powers conferred on it by section 47 of the Nuclear Safety and Radiation Protection Act No.19 of 1995 and of all other powers enabling it in that behalf, THE NIGERIAN NUCLEAR REGULATORY AUTHORITY, with the approval of the President, hereby makes the following Regulations:

### PART I - GENERAL PROVISIONS

#### 1. Objectives

The objectives of these Regulations are:

- i. To achieve and maintain high level security of radioactive material by preventing unauthorized access, damage, loss, theft, sabotage and/or unauthorized transfer of radioactive material, sabotage and other malicious acts during transport.
- ii. To establish requirements for the security of radioactive material during transport.

#### 2. Scope

- i. These Regulations shall apply to the transport of all radioactive material that pose significant risk to individuals, society and the environment, including the radioactive material referred to in Schedule I and to any other potentially harmful radioactive material so determined by the Authority.
- ii. These Regulations do not apply to:
  - a. nuclear material as defined in Schedule 1 of the Nigerian Physical Protection of Nuclear Material and Nuclear Material and Nuclear Facilities Regulations, 2021 except for radioactive sources incorporating plutonium-239;
  - b. radioactive material within military or defense programmes.

#### 3. Application

- i. These Regulations shall apply in addition to the Nigerian Radiation Protection Regulations, Nigerian Safety and Security of Radioactive Material in Use and Storage Regulations, Nigerian transportation of Radioactive Material Regulations, and any other existing Laws and Regulations in force at the commencement of these Regulations.
- ii. A licensee shall comply with any additional requirements imposed by the Authority by any order or terms and conditions of a license, in addition to

those established in these regulations, as deemed appropriate or necessary for the security of radioactive material.

#### 4. Relation to other Regulations and Resolution of Conflicting Provisions

- i. Where a licensee identifies an apparent or actual conflict between the provisions of these Regulations and other laws or regulations, they shall notify the Authority in order to resolve the conflict.
- ii. Nothing in these regulations shall be construed as restricting any actions that may otherwise be necessary for security of radioactive material.

#### \*\*Requirements for International Transportation of Radioactive Materials\*\*

- i. For transboundary shipment, the provision of Nigerian Regulations on Security of Radioactive Materials will be applicable
- ii. For shipments going outside the country, the licensee shall abide by the transiting state transboundary regulations.

**Commented [h1]:** The scope of these regulation does not cover international transportation of radioactive materials

## PART II - RESPONSIBILTIES OF THE AUTHORITY AND LICENSEE

### 5. Responsibilities of the Authority

The Authority shall:

- i. maintain records of licensees that transport radioactive material, with clear indication of the types of radioactive material and records for transport of the radioactive material; These records shall be properly secured against unauthorised access, alterations and backup copies shall be made and kept in a secured place.
- ii. implement an inspection programme to determine whether licensees are in compliance with these Regulations;
- iii. carry out security inspections of facilities, vehicles and vessels where radioactive material are present or to be transported. These inspections may be announced or unannounced inspections at appropriate intervals taking into account past performance and the risks presented by the radioactive material;
- iv. verify that the licensee submits a detailed transport security plan, as required;
- v. establish and maintain a database of licensed transporters of radioactive material belonging to Category 1, 2 and 3 as described in Schedule 1;
- vi. have in place strategies including rapid response for gaining or regaining control over theft of radioactive material during transport, provide for measures to reduce likelihood of malicious acts, mitigate or minimize the radiological consequences of accidents or malicious acts involving radioactive material during transport and provide for continuous improvement of the strategies;
- vii. put in place a mechanism to ensure that licensees have a financial guarantee for accidents during transport in case of contamination.
- viii. in coordination with security and intelligence Agencies develop national threat assessment for radioactive material during transport.

- ix. ensure the confidentiality of any information that it receives in confidence from another State and provide such information to third parties only with the consent of the State concerned; and
- x. ensure the consideration of cyber security in the objective of protection against theft of radioactive material and sabotage resulting in possible radiological release.

## **6. Responsibilities of the Licensee**

The Licensee shall:

- i. Bear the responsibility for establishing and implementing the measures that are required for ensuring security of radioactive material for which they are licenced and for compliance with all applicable requirements of these Regulations.
- ii. Appoint and specifically identify to the Authority persons to carry out actions and tasks related to the security of radioactive material however the licencees shall retain primary responsibility for those action and tasks;
- iii. Emplace and implement programs and procedures for the security of radioactive material and for administration of radiation safety
- iv. Ensure that there is a procedure for communicating to the Authority on the status of radioactive material and reporting within prescribed interval nuclear security events that may affect the security of radioactive material during transport;
- v. Ensure that transport of radioactive material is documented, authorized and received in accordance with regulatory requirements;
- vi. Notify the Authority of intention to introduce any modification to transport activities affecting the safety and security of a radioactive material for which they are authorized, and shall not carry out any such modification unless specifically authorized by the Authority;
- vii. Through the appropriate security agency, carryout background checks on all key personnel who use or have access to radioactive material to determine their trustworthiness prior to authorizing them for such access;
- viii. Grant Inspectors appointed by the Authority unrestricted access to premises, facilities and activities in order to obtain necessary information with regard to safety, security and verify compliance with these Regulations
- ix. Provide appropriate security information and records to the Inspectors;
- x. Prepare and submit to the Authority a detailed site transport security plan as outlined in Regulation 13 and Schedule II. Categories 1 – 3
- xi. Take into account threat information from the Authority while designing the security system for the transport.

## **7. License Applications**

- i. No person or organisation shall transport radioactive material without an appropriate authorization from the Authority.
- ii. All proposals from applicants to transport radioactive material shall specify the following in a written application to the Authority:
  - a. The applicant's name, email, physical address and telephone number;

- b. The description of the radioactive source or radioactive source containing equipment, including its quantity and unique identifiers, radionuclide and aggregate activity;
  - c. The name and address of the supplier/manufacturer;
  - d. The country of origin of the radioactive material or radioactive material containing equipment;
  - e. The name, address and telephone number of the receiver
  - f. Such other details as the Authority may consider necessary.
- iii. An applicant shall pay the requisite Authorization fee prescribed by the Authority.
  - iv. The Licensee shall comply with all the terms and conditions specified in the licence.
  - v. The prospective carrier shall submit an application requesting for an authorization from the Authority to transport radioactive material
  - vi. The Authority shall, within ten (10) days after receipt of an application for an authorization, confirm in writing to the applicant, that the application is complete in all aspects; and where the application is not complete, shall request the applicant to re-submit the application.
  - vii. An authorization to transport radioactive material shall be granted for specific duration.

### **PART III - OVERALL REQUIREMENTS FOR RADIOACTIVE MATERIAL**

#### **8. Categorization of Radioactive Material**

The Licensee shall categorize radioactive material according to the requirements of table I of Schedule I of these Regulations;

#### **9. Integrated Management System**

The Licensee shall establish integrated management system programmes that provide:

- a. Adequate assurance that the specific applicable requirements relating to security are satisfied;
- b. Assurance that the components of the security system are of good quality and sufficient for their tasks; and
- c. Quality control mechanisms and procedures for reviewing and assessing the overall effectiveness of security measures.

#### **10. Training Requirements**

- i. The Licensee shall ensure that all personnel with responsibilities for security during transport are appropriately trained. They shall be periodically retrained as may be appropriate.
- ii. The Licensee shall submit for approval by the Authority a radiological security training program for workers including its contents and resource person(s)/organization.

- iii. The Licensee shall routinely evaluate and update the training program as necessary.
- iv. The Licensee shall maintain records of training during the period of employment of the individual and 3 years after the period of employment.

#### **11. Safety and Security Interface**

- i. The Licensee shall ensure that during normal and emergency situations, transport safety measures do not compromise security measures and vice versa.
- ii. The Licensee shall ensure that during a response to a nuclear security event, security measures do not adversely affect the safety of the personnel and the public.
- iii. In the event that there is a conflict between safety and security, the licensee shall submit a plan for a compensatory measure to the Authority prior to undertaking a transport.

### **PART IV - SECURITY REQUIREMENTS FOR RADIOACTIVE MATERIAL**

#### **12. General Security Requirements**

##### **i. Security Management**

- a. Security management includes measures for access control, trustworthiness verification, information protection, preparation of a security plan, training and qualification of personnel, accounting, inventory, and response to and reporting of nuclear security events.
- b. The licensee shall establish a security management system, commensurate with the size and nature of the authorized activity, which ensures that:
  - 1. Policies and procedures are established that identify security as being of the highest priority;
  - 2. Problems affecting security are promptly identified and corrected in a manner commensurate with their importance;
  - 3. The responsibilities of each individual for security are clearly identified and each individual is suitably trained and qualified;
  - 4. Clear lines of authority for decisions on security are defined;
  - 5. Organizational arrangements and lines of communications are established that result in an appropriate flow of information on security at and between the various levels in the entire organization; and
  - 6. Strong security culture is instilled, practiced, and promoted.

##### **ii. Security Culture**

The licensee shall develop management structures, allocate sufficient resources, and put in place appropriate management systems for motivating personnel to

adopt strict and prudent approach to, and seeking continuous improvement in nuclear security, which ensures:

- a. Organizational arrangements and lines of communications that result in an appropriate flow of information on transport security at and between the various levels within the organization are established;
- b. Sensitive information related to the transport security of radioactive material are identified and protected;
- c. individual and collective commitments to transport security at all levels of the organization are promoted;
- d. common understanding of the key aspects of security culture within the organization;
- e. organizational supports for individuals and teams with account taken of the interactions between individuals, technology and the organization;
- f. participation of workers, their representatives and other relevant persons in the development and implementation of policies, rules and procedures dealing with transport security are encouraged;
- g. accountability of the organization and of individuals at all levels for transport security;
- h. open communication with regard to transport security within the organization and with relevant parties, as appropriate;
- i. questioning and learning attitude and discourages complacency with regard to transport security; and
- j. that the organization continually seeks to develop and strengthen its security culture.

### iii. Emergency and Contingency Response

- a. The licensee shall establish and document contingency plan to respond to unauthorized removal of radioactive material or sabotage or attempts thereof during transport;
- b. The plan shall, as appropriate, give consideration of the following aspects:
  1. Infrastructure for coordination and operational interfaces for emergency and contingency response between the licensee and the **Nigeria Police Force** and/or State Emergency Management Agencies (SEMA).
  2. Organization and staffing;
  3. procedures for responding to security events during transport especially unauthorised removal or sabotage, or its attempt.
  4. Establish and document the organizational relationship and interfaces between all major responding organizations.
- c. The contingency plan shall be made available to the relevant organizations.
- d. The contingency plan shall be tested every 12 months within the organization and every two years with relevant stakeholders

### iv. Information Security

- a. The licensee shall on a need-to-know basis, control and limit distribution of information and documents on transport security that can be used to identify specific locations, specific security measures or weaknesses in the licensee's system of management of radioactive material or otherwise compromise the licensee's security system
- b. The information and documents shall include but not limited to information and documents pertaining to the following topics:
  - 1. specific locations of radioactive material;
  - 2. the transport security plan;
  - 3. temporary or permanent weaknesses in the security system;
  - 4. proposed date and time of radioactive material shipment or transfer;
  - 5. emergency response plans and systems; and
  - 6. personnel information.

**v. Cyber Security**

- a. The Licensee shall ensure that:
  - 1. cyber security policy which specifies the overall cyber security goals of the licensee is established;
  - 2. cyber security plan is an integral part of the Transport Security Plan;
  - 3. cyber security Plan is regularly reviewed and updated;
  - 4. cyber security procedures are developed;
  - 5. the various levels of management within the organization maintain appropriate level of cyber security within their areas of responsibility;
  - 6. cyber security awareness is fully integrated into the overall security culture;
  - 7. graded approach is applied in the protection of computer and network based systems;
  - 8. computer systems that can impact security of transport and related activities are adequately protected and
  - 9. staff are sufficiently trained and briefed on cyber security issues relevant to their roles.
- b. For radioactive sources in Basic and Enhanced Security Levels that use computer and network based systems, Licensee shall appoint a Cyber Security Officer (CSO) with the authority to fulfill the duties and responsibilities listed in regulation (v)(c)
- c. Duties and responsibilities of the CSO shall include:
  - 1. Advising the licensee on cyber security matters;
  - 2. Coordinating and controlling the development of cyber security activities such as implementing the provisions of regulation (11) (ii), of these Regulations;
  - 3. Coordinating with responsible security officers to plan security measures and response to cyber security incidents;
  - 4. Conducting periodic cyber security risk assessments;
  - 5. Conducting periodic inspections, audits and reviews of the cyber security and provide status reports to management; and

**6. Investigating cyber security incidents and develop post-incident procedures and preventive actions.**

**vi. Reporting of Nuclear Security Events**

- a. The licensee shall immediately inform the Authority and local and state emergency authorities in the case of the following nuclear security events:
1. Detection of an unauthorised removal or sabotage, or its attempt (promptly);
  2. Confirmed absence or accounting discrepancy in the amount of radioactive material (promptly);
  3. If storage containers or packages of radioactive material have been tampered with (within 24 hours);
  4. Any malfunctioning of the transport security system; (within 24 hours);
  5. Any breach of the security of sensitive information. (within 24 hours).
- b. The licensee shall investigate the nuclear security event and its causes, circumstances and consequences, take appropriate compensatory actions to remedy the circumstances and to prevent a recurrence of similar situations and shall submit a report to the Authority about the results of the examination and the corrective actions within thirty (30) days, or as required. Failure to take corrective or preventive actions within a reasonable time in accordance with these Regulations shall be grounds for enforcement in accordance with Section 45 of the Act.

**vii. Compensatory Security Measures for Mobile and Portable Sources**

The licensee shall include in their transport security plan a description of the security measures for mobile and portable sources.

**viii. Transport of Radioactive Material**

The licensee shall not transport a radioactive material to another party unless:

- a. the recipient possesses a valid license for the radioactive material; and
- b. the recipient provides the licensee with all relevant technical information to determine the appropriate transport security level for the radioactive material.
- c. In their applications, the current licensee and the proposed transferee provide to the Authority a description of the transaction, change of personnel, change of location, equipment, procedures, surveillance records, decommissioning processes and related records of transfer and transferee's commitment to abide by the current licensee's commitments.

**ix. Graded Approach for Protection against Unauthorized Removal and Sabotage during transport**

The Licensee shall:

- a. categorize radioactive material in accordance with Schedule 1 of this Regulation;

- b. establish required level of protection taking into account the current evaluation of the threat, the relative attractiveness of a radioactive material, the nature of the source and potential consequences associated with its unauthorized removal or sabotage during transport.
- c. implement measures for protection against unauthorized removal and sabotage during transport as required in these Regulations.

**x. Measures to Locate and Recover Missing or Stolen Radioactive Material during Transport**

a. The Licensee shall:

- 1. ensure that the system for the security of radioactive material is designed to detect in a timely manner any radioactive material that are missing or stolen during transport;
- 2. immediately notify the Authority, Nigerian Police Force and other relevant Security Agencies of missing or stolen radioactive material during transport;
- 3. take all appropriate measures to locate, as soon as possible, any declared missing or stolen radioactive material during transport or collaborate with security agencies for search and recovery of the missing or stolen radioactive material;

b. The Licensee shall include in its contingency plan measures to implement the above requirements and shall test and evaluate it at least once in two years depending on the categorization of the radioactive sources as indicated in Schedule 1 of these Regulations.

**xi. Quality Assurance**

Licensees shall establish quality assurance programmes that provide:

- a. Adequate assurance that all the requirements in these Regulations are satisfied;
- b. Assurance that the components of the transport security systems are of good quality and sufficient for their tasks; and
- c. Quality control mechanisms and procedures for reviewing and assessing the overall effectiveness of security measures.

**13. Security Requirements for Radioactive Material in Transport**

**i. Determination of Security Levels**

- a. the carrier shall identify the security level of protection for the radioactive material being transported and the corresponding measures and requirements as outlined in schedule III.
- b. the carrier shall determine the radioactive material categorization and transport configuration as outlined in schedules I and III.
- c. Packages containing activity values less than the threshold value shall be assigned to the basic transport security level.
- d. Packages containing activity levels equal to or greater than the threshold value shall be assigned to the enhanced transport security level.
- e. Conveyance with the total activity exceeding the threshold value shall be assigned to the enhanced transport security level.

## ii. Prudent Management Practices

The carrier is responsible for:

- a. ensuring all employees who are involved with the transport hold verifiable documentation, including;
  1. driver licenses and operating documents where applicable; and
  2. any necessary work permits.
- b. maintaining records associated with the custody and movement of the radioactive material
- c. providing persons transferring and receiving these radioactive materials with photographic identification cards and developing procedures to positively verify and document identification of individuals from other organizations (i.e., carriers);
- d. establishing the trustworthiness of employees who are involved in the transport;
- e. tracking packages by count
- f. employing key control procedures or both the vehicle locks and the cargo compartment locks;
- g. Providing the driver with effective communication capabilities;
- h. providing the driver with appropriate operational instructions and training:
  - i. that explain their roles and responsibilities;
  - j. that details the expected security practices and precautions to ensure their safety and security as well as that of the cargo;
  - k. their actions during the transport and during interim stops;
  - l. restricting access to only those persons that have a need to access the radioactive material
- m. not using public transport for the transport of radioactive material;
- n. ensuring that the vehicle is properly maintained, inspected and covered with the appropriate levels of insurance;
- o. not leaving packages or conveyances unattended for any time longer than necessary
- p. the driver must keep the vehicle and the cargo area locked at all times to prevent unauthorized removal
- q. use a closed vehicle for the conveyance of the radioactive material or an open vehicle with a closed cargo area.
- r. transportation of radioactive material by land shall be between 6.00 am and 6.00 pm.

## iii. Basic Security Level

- a. In addition to the prudent management practices, the carrier shall apply the following requirements;

1. The carrier shall provide crew members, with written procedures/instructions on security measures required by these Regulations.
  2. Confidentiality and Protection of Information
  3. The carrier shall protect and secure sensitive information and sensitive information assets relating to transport operations, including detailed information on the schedule and route, the security measures in place, the capabilities of the Nigeria Police Force and of measures for detection, assessment and delay;
  4. Sensitive information shall be stored, transferred securely and shared on a “need to know” basis;
  5. The carrier shall ensure the security of electronic systems, particularly computer systems
- b. Key Control
- The carrier shall establish appropriate and effective procedures to ensure the security of keys to conveyances and security locks, their distribution between the licensees.
- c. Transport Security Plan
1. Prior to each shipment, approval from the Authority shall be obtained by the carrier for the Transport Security Plan (TSP).
  2. The TSP, shall describe and document the security measures, arrangements, procedures, personnel and equipment that will be used to provide security during transport, including:
    - i. Specific allocation of security responsibilities of organizations and persons engaged in the transport of radioactive material, who have been provided with appropriate authority to carry out their responsibilities;
    - ii. Provisions for keeping records of radioactive material packages transported;
    - iii. Provisions for review of current operations and for vulnerability assessments, including for intermodal transfer, in-transit storage, handling and distribution, as appropriate;
    - iv. Clear statements of security measures to be implemented that address: training, policies, verification of new employees and employment, operating practices, equipment and resources to be used to reduce security related risks;
    - v. Effective procedures and equipment for timely reporting and management of security related threats, breaches of security or security related incidents;
    - vi. procedures for evaluating and testing security plans and procedures for periodic review and update of these plans;
    - vii. measures to protect sensitive information;

- viii. measures to ensure that the distribution of sensitive transport information is limited, to maintain security of the information, that do not preclude the provision of transport documents and shipper's declaration as required by the applicable dangerous goods regulations;
    - ix. measures to monitor the location of the shipment; and
    - x. where appropriate, details concerning any agreements on the point of transfer of responsibility for security including for international shipments.
  - 3. as a part of its TSP, the Licensee shall prepare a contingency plan to counter malicious acts effectively and to provide for appropriate response;
  - 4. the Licensee shall conduct exercises to assess and validate the TSP
  - 5. this TSP shall be reviewed periodically by the licensee
    - a. this TSP shall be properly protected as sensitive information by the Licensee.
- d. Continuity of Security Measures
  - 1. If the conveyance makes an expected or unexpected stop, the security measures shall be maintained.
  - 2. The licensee shall undertake contingency measures for unexpected stops and be responsible for coordinating security with the Nigeria Police Force during unexpected stops.
  - 3. When radioactive material is stored in transit, such as areas within temporary storage terminals, temporary storage sites, vehicle depots, berthing areas and marshalling yards used for the temporary storage during carriage of radioactive material shall be properly secured, well-lit and, where possible and appropriate, not accessible to the general public. Security measures shall be applied to the material consistent with the measures applied during use and storage to the extent possible.
- e. Checks, Notification, and verification upon Receipt
  - 1. The shipper shall ensure that the receiver has procedures in place to verify package contents, which shall include;
    - i. Checking the integrity of the packages, locks and seals to verify that the security of the consignment has not been compromised and accept the shipment immediately upon arrival;
    - ii. notifying the licensee immediately if radioactive material is discovered to be missing or when a package has not been delivered by the expected time;
  - 2. The receiver shall notify the shipper and the Authority of the arrival of the shipment within two (2) hours of the receipt.
  - 3. The receiver shall notify the shipper and the Authority of non-arrival within two hours after the scheduled time of arrival at the destination.

4. The shipper shall have procedures in place to respond to notification from the receiver;
5. Through the course of the inquiry, if it is determined that the package or its contents have been lost, stolen or diverted, the shipper shall take action to locate and recover the package or its contents and notify the Authority immediately.

Communication **to be discussed with stakeholders for the most effective method**

**Commented [CN2]:** Subject to further discussion

f. Route selection

1. When selecting the route (primary and alternate), the Licensee shall pay special attention to routes which avoid areas of natural disaster, civil disorder, repair/maintenance works, high population areas or known threat;
2. The Licensee shall verify the availability and security-related trait of the selected route prior to the transport.

g. Transport schedule

1. The transport time, namely the duration spent by the vehicle on the way, and the mode of transport shall be determined as follows:
  - i. Time restriction as stated in section 13(ii)(r)
  - ii. Other considerations include;
    - a. minimize the total time during which the radioactive material remains in transport;
    - b. minimize the number and duration of radioactive material transfers,
    - c. minimize the number of transports and re-loading;
    - d. ensure some elements of unpredictability in the schedule of transport; and
    - e. If the transport takes more than one day, a guarded and monitored night-time stop meeting the security requirements shall be arranged in advance.
2. for any stop taking more than one (1) hour, arrangements shall be made with the Nigeria Police Force along the route to ensure a secure compound is available for temporary/emergency storage.

h. Advance Notification and Coordination

1. Prior to shipping the radioactive material, the licensee shall verify with the Authority that the receiver is authorized to possess the radioactive material.
2. The licensee shall give the receiver, the Authority and the Nigeria Police Force advance notification of the planned shipment, mode of transport, the estimated time of arrival of the shipment and the exact point of handover if this is to be done at some intermediate point before the ultimate destination;
3. this advance notice shall be supplied in a secure manner and in two (2) days before commencing the transport to enable the receiver to make adequate security arrangements for receiving the shipment.

i. Conveyance Verifications

Prior to commencing transport, the Licensee shall perform its own security verifications of the package and conveyance, to verify that security measures associated with the conveyance are effective. Verification shall include a visual inspection of the package and conveyance to ensure that nothing has been tampered with and that nothing has been affixed to the package or conveyance that might affect the security of the consignment.

j. Communication Capabilities

The licensee shall ensure that its drivers or otherwise dedicated personnel have at least two forms of functional means of communication during transport of radioactive material

k. Detection Measures

1. The outside of every package, conveyance and freight container, shall incorporate seals and Tamper Indicating Devices (TIDs) not readily breakable and which, while intact, will be evidence that the package has not been opened;
2. The Licensee shall establish procedures for the use of seals and TID.

l. Delay measures

1. Unless there are overriding safety or operational considerations, packages containing radioactive material shall be carried in closed, locked or sheeted conveyances, compartments or freight containers. However, carriage of packages weighing more than two thousand (2000) kg that is locked and secured to the conveyance are appropriate for transport in open vehicles. Whenever it is necessary to use open conveyances, the load shall be covered or hidden from view unless precluded by safety requirements;
2. The package shall be attached by secured tie-downs and the cargo doors of the conveyance remain locked whenever the package is loaded on the conveyance;
3. Unless agreed otherwise by the Authority, the licensee shall ensure that locks and seals are applied to conveyances, compartments or freight containers.
4. Escort Requirements: **The Licensee shall request the Nigeria Police Force to escort the shipment.**

**iv. Enhanced Security Levels**

In addition to the requirements established in the prudent management practices and basic security level, the following requirements shall apply to the enhanced security level;

- a. In determining the mode(s) of transport and routing to be used in the transport of radioactive material, the licensee shall identify and evaluate the

characteristics of the proposed shipment that could affect the ability to protect the shipment against the potential threats involved.

- b. The mode(s) and route(s) of the transport shall be identified and the conditions under which an alternative route(s) would be used shall be determined in choosing the route and mode, consideration shall be given to:
  1. the security situation along the entire routes; for example, avoiding areas where there are known threats or areas where security cannot be ensured;
  2. the Nigeria Police Force capabilities and the time they need to reach any point along the route;
  3. the practicality of the route.
- c. The Licensee shall confirm the ability and readiness of the receiver to accept delivery and handover at the expected time;
- d. the transport time, namely the duration spent by the vehicle on the road and the mode of transport shall be determined as follows:
  1. any stop taking more than one (1) hour shall be avoided.
  2. arrangements shall be made with the Nigeria Police Force along the route to ensure a secure compound is available for temporary storage;
- e. if road movements cannot be completed without extended stops, or if there is a requirement to place radioactive material in temporary storage while in route, then **the material shall be protected during such stops or storage in a manner that is consistent with storage measures that shall be employed at a facility which is licensed to store radioactive material of the same category and to the extent practicable,** the conveyance shall:
  1. Be parked in closed, locked, secure buildings, with the use of camera monitoring;
  2. Be parked in an enclosed fenced secure area under surveillance by armed guards equipped with instructions and means for contacting the Nigeria Police Force and the vehicle drivers
- f. temporary storage arrangements shall be approved in advance by the Authority as part of the TSP.
- g. The Licensee shall conduct and maintain records of pre-shipment security verification
- h. The licensee shall take corrective actions upon identifying deficient elements. Without the corrective actions or appropriate compensatory measures, the shipment shall not be undertaken;
- i. The Licensee shall ensure that the cargo, freight container, cargo compartment, or conveyance is under continuous and effective surveillance by the Nigeria Police Force throughout the entire period of transport until delivered to the receiver;

- j. in addition to visual observation, the Licensee shall equip the vehicle with an access control system that requires two-person activity, biometric verification or multiple verification to control the authorized access to the cargo areas;
- k. the Licensee shall incorporate electronic seals on the cargo compartment
- l. the Licensee shall apply electronic intrusion detection system or engineered alarm to conveyances.
- m. the Licensee shall use a real-time tracking system to monitor the movement of the conveyance.
- n. The Licensee shall:
  - 1. apply locks to packages where appropriate;
  - 2. apply additional delay measures on the compartment, freight container and the conveyance doors including anti-theft systems;
  - 3. install a remote vehicle immobilization system on the vehicle;
  - 4. tie down the package to the vehicle bed using strong chains, nuts, bolts, ratcheting and related devices;
  - 5. ensure that the load compartment is isolated from the driver/passenger area.
- o. During transport, the licensee shall provide redundant capability for crew members to communicate with contact points specified in the TSP.
- p. the Licensee shall ensure that all security-related information is transmitted encrypted;
- q. the licensee shall install a duress alarm on the vehicle;
- r. The Licensee shall use a Transport Control Centre (TCC) for the purpose of keeping track of the current location and security status of the shipment, alerting the Nigeria Police Force in case of an attack and maintaining continuous secure two way voice communication with the shipment and the Nigeria Police Force;
- s. the TCC shall be protected in a manner approved by the Authority and shall be staffed by qualified personnel whose trustworthiness has been predetermined.
- t. the Licensee shall ensure that the conveyance crew are instructed to report to the transport control center every 15 minutes, at each overnight stopping place, at the place(s) of handover of the shipment, and upon arrival at the final destination

**v. Additional Security Measures**

**a. Additional Security Measures for protection against Sabotage and Elevated Threats**

- 1. If the current or potential threat warrants additional security measures to protect against sabotage, the Authority may require the Licensee to implement or apply additional security measures such as:
  - i. postponing the shipment;

- ii. rerouting the shipment to avoid high threat areas;
  - iii. enhancing the robustness of the package or the conveyance;
  - iv. detailed route surveillance to observe the current environment and/or;
  - v. the provision of additional security capacities.
2. The licensee shall plan for response to an elevated threat level in close cooperation with the Authority and the Nigeria Police Force.
3. The licensee shall establish, to the extent practicable, pre-arranged procedures with the Nigeria Police Force regarding intelligence information and use of secure communications as well as the reactions to an increased threat

**b. Security Measures for Transport by Air and Sea**

1. The Licensee shall carry out transport by air in accordance with the applicable security provisions in Annexes 17 and 18 of the Convention on International Civil Aviation and the International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air; (this should be discussed during the stakeholders meeting)
2. The Licensee shall carry out transport by Sea in accordance with the applicable security provisions of the International Ship and Port Facility Security Code and of the International Maritime Dangerous Goods Code as required by the International Convention for the Safety of Life at Sea (SOLAS 74 amended). (this should be discussed during the stakeholders meeting. Refer this part to the relevant stakeholders for observations and comments)

**c. Prohibited Modes of Transport**

Transport of radioactive material by post mail, or using public transport means by road are prohibited.

## **PART V - OFFENCES, PENALTIES, AND APPEAL**

### **14. Offences and Penalties**

- i. A person who contravenes any of the provisions of these Regulations commits an offence and is liable on conviction to the penalties stipulated under the Act and any other extant Laws.

- ii. Notwithstanding the provisions of paragraph (i) above, the Authority may impose penalties such as administrative fine, suspension, revocation of authorization, sealing of facility or any combination of these.

#### **15. Appeal**

Any person or body corporate may appeal to the Board of the Authority against any decision made by the Authority pursuant to these Regulations.

#### **16. Citation**

These Regulations may be cited as the Nigerian Transport Security of Radioactive Material Regulations, 2021.

17. In these Regulations, unless the context otherwise requires;

“**A<sub>1</sub>/A<sub>2</sub>**” means the activity value of radioactive material, other than special form radioactive material that is derived in IAEA *Regulations for the Safe Transport of Radioactive Material*;

“**the Act**” means the Nuclear Safety and Radiation Protection Act 19 of 1995 including any amendment thereto;

“**the Authority**” means the Nigerian Nuclear Regulatory Authority established under Section 1 of the Act;

“**authorization**” means permission granted in a document by the Authority to a legal person who has submitted an application to carry out a practice or any other action described in the Act or regulations **thereunder**. The Authorization can take the form of a registration or a licence;

“**carrier**” means any person, organization or government undertaking the carriage of radioactive material by any means of transport. The term includes both carriers for hire or reward and carriers on own account;

“**consignment**” means any package or packages, or load of radioactive material, presented by a shipper for transport;

“**contingency plan**” means a predefined set of actions for response to unauthorized acts indicative of attempted unauthorized removal or sabotage, including threats thereof, designed to effectively counter such acts;

“**conveyance**” means for transport (a) by road or rail: any vehicle used for carriage of radioactive material cargo; (b) by water: any seagoing vessel or inland waterway craft, or any hold, compartment, or defined deck area of a seagoing vessel or inland waterway

craft used for carriage of radioactive material cargo; and (c) by air: any aircraft used for carriage of radioactive material cargo;

**“delay”** means the element of a physical protection system designed to increase the time required for an adversary to gain unauthorized access to or to remove or sabotage radioactive material, generally through barriers or other physical means;

**“detection”** means a process in a physical protection system that begins with sensing a potentially malicious or other unauthorized act and that is completed with the assessment of the cause of the alarm;

**“export”** means the physical transfer, originating from an exporting state, into an importing state or to a recipient in an importing state, of radioactive material covered by these Regulations;

**“guard”** means a person who is entrusted with responsibility for patrolling, monitoring, assessing, escorting individuals or transports, controlling access and or providing initial response;

**“import”** means the physical transfer into an importing state or to a recipient in an importing state, originating from an exporting state, of radioactive material covered by these Regulations;

**“importing state”** means the state of final destination for a physical transfer of radioactive material from an exporting state or an exporting facility;

**“ionizing radiation”** means energy in the form of particles or electromagnetic waves of a wavelength of 100 nanometers or less or a frequency of  $3 \times 10^{15}$  hertz or more capable of producing ions directly or indirectly;

**“legal person”** means any organisation, corporation, partnerships, firm, association, trust, estate, public or private institution, group, political or administrative entity or other persons designated in accordance with national legislation, who or which has responsibility and authority for actions taken under these Regulations;

**“licensee”** means the holder of a current licence granted by the Authority for a practice or for radioactive material, who has recognized rights and duties for the practice or radioactive material, particularly in relation to radiation protection, safety and security;

**“malicious act”** means a criminal or intentional unauthorized act involving or directed at radioactive material;

**“management”** means the administrative and operational activities that are involved in practices entailing radioactive material;

**“NPF”** means Nigeria Police Force

**“nuclear material”** means Plutonium except that with isotopic concentration exceeding 80% in plutonium-238; uranium-233; uranium enriched in the isotope 235 or 233; uranium containing the mixture of isotope 235 or 233; uranium containing the mixture of isotopes as occurring in nature other than in the form of ore or ore-residue; any material containing one or more of the foregoing;

**“nuclear security”** means the prevention of, detection of, and response to, criminal or intentional unauthorized acts involving or directed at radioactive material, associated facilities, or associated activities;

**“nuclear security event”** means an event that has potential or actual implications for nuclear security that must be addressed;

**“package”** means the complete product of the packing operation, consisting of the packaging and its contents prepared for transport;

**“practice”** means work involving the production, processing, handling, use, holding, storage, transport or disposal of radioactive material;

**“radioactive material”** means any material containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values specified in table III of this Regulations;

**“radioactive source”** means radioactive material that is permanently sealed in a capsule or closely bonded, in a solid form and which is not exempt from regulatory control. It also means any radioactive material released if the radioactive source is leaking or broken, but does not mean material encapsulated for disposal, or nuclear material within the nuclear fuel cycles of research and power reactors;

**“radioactive waste”** means material, whatever its physical form, remaining from practices or interventions and for which no further use is foreseen:

- (a) that contains or is contaminated with radioactive substances and has an activity or activity concentration higher than the level for exemption or clearance from regulatory requirements, and
- (b) exposure to which is not excluded from these Regulations;

**“radionuclide”** means a nucleus (of an atom) that possesses properties of spontaneous disintegration (radioactivity). Nucleus is distinguished by their mass and atomic number;

**“regulatory control”** means any form of control applied to radioactive material, associated facilities or associated activities by the Authority for reasons related to radiation protection or the safety or security of radioactive material;

**“response”** means the actions undertaken following detection to prevent an adversary from succeeding or to mitigate potentially severe consequences;

**“sabotage”** means any deliberate act directed against radioactive material in transport that could directly or indirectly endanger the health and safety of personnel, the public, or the environment by exposure to radiation or release of radioactive substances;

**“safety”** means measures intended to minimize the likelihood of accidents with radioactive material and, should such an accident occur, to mitigate its consequences;

**“nuclear security culture”** means the assembly of characteristics, attitudes and behaviours of individuals, organizations and institutions which serves as a means to support, enhance and sustain nuclear security;

**“security management”** means the establishment and implementation of policies, plans, and procedures and the deployment of the necessary resources, for the security of radioactive material and associated facilities;

**“Shipper”** means any person, organization or government that prepares or offers a consignment of radioactive material for transport (i.e. the consignor);

**“insider threat”** means a person or group of persons with motivation, intention and capability to commit a malicious act;

**“transport”** means international or domestic carriage of radioactive material by any means of transport, beginning with the departure from a facility of the shipper and ending with the arrival at a facility of the receiver;

**“trustworthiness determination”** means assessment of an individual's integrity, honesty and reliability in pre-employment checks and checks during employment that are intended to identify the motivation or behaviour of persons who could become insiders;

**“unauthorized removal”** means the theft or other unlawful taking of radioactive material;

## **SCHEDULE I**

### **A and D values tables for Radioactive Materials**

This Schedule describes the system of categorization to be used in categorizing radioactive material subject to these Regulations as Category 1, 2, or 3. All other radioactive material shall be protected as assets but are not otherwise subject to these Regulations.

In recognition of the fact that human health is of paramount importance, the categorization system is based primarily on the potential for radioactive material to cause deterministic health effects. The D-value is the radionuclide-specific activity of radioactive material which, if not under control, could cause severe deterministic effects for a range of scenarios that include both external exposure from unshielded radioactive material and inadvertent internal exposure following dispersal by fire or explosion of the radioactive material.

Radioactive material is assigned to a category based on the activity of the radioactive material (A) divided by the danger value (D-value or D) for the particular radionuclide. If this activity ratio is greater than or equal to 1000, the radioactive material is assigned to Category 1. If the ratio is less than 1000 but greater than or equal to 10, the radioactive material is assigned to Category 2. If the ratio is less than 10 but greater than or equal to 1, the radioactive material is assigned to Category 3. This assignment is shown in Table 1. Categorization thresholds of A/D ratios for commonly used radionuclides are shown in Table 2.

**TABLE 1: CATEGORIZATION BASED ON A/D RATIO**

Category	A/D Ratio
1	$A/D \geq 1000$
2	$1000 > A/D \geq 10$
3	$10 > A/D \geq 1$

The table provides a categorization by activity levels for radionuclides that are commonly used. These are based on D-values, which define dangerous radioactive material i.e.: radioactive material that could, if not under control, give rise to exposure sufficient to cause severe deterministic effects. A more complete listing of radionuclides and associated activity levels corresponding to each category, and a full explanation of the derivation of the D-values, may be found in eighth schedule of Nigeria Basic Ionizing Radiation Regulations, which also provides the underlying methodology that could be applied to radionuclides not listed. Typical source uses are noted above for illustrative purposes only.

**Table 2: ACTIVITIES CORRESPONDING TO THRESHOLDS OF CATEGORIES**

Radionuclide	Activity limit for Category 1 (TBq)	Activity limit for Category 2 (TBq)	Activity limit for Category 3 (TBq)
<sup>241</sup> Am	60	0.6	0.06
<sup>241</sup> Am/Be	60	0.6	0.06
<sup>198</sup> Au	200	2	0.2
<sup>109</sup> Cd	2 000	200	20
<sup>252</sup> Cf	20	0.2	0.02
<sup>244</sup> Cm	50	0.5	0.05
<sup>57</sup> Co	700	7	0.7
<sup>60</sup> Co	30	0.3	0.03
<sup>137</sup> Cs	100	1	0.1
<sup>55</sup> Fe	800 000	8 000	800
<sup>68</sup> Ge	700	7	0.7
<sup>153</sup> Gd	1 000	10	1
<sup>192</sup> Ir	80	0.8	0.08
<sup>63</sup> Ni	60 000	600	60
<sup>103</sup> Pd	90 000	900	90
<sup>147</sup> Pm	40 000	400	40
<sup>210</sup> Po	60	0.6	0.06
<sup>238</sup> Pu	60	0.6	0.06
<sup>239</sup> Pu-/Be	60	0.6	0.06
<sup>226</sup> Ra	40	0.4	0.04
<sup>106</sup> Ru	300	3	0.3
<sup>75</sup> Se	200	2	0.2
<sup>90</sup> Sr	1 000	10	1
<sup>204</sup> Tl	20 000	200	20
<sup>170</sup> Tm	20 000	200	20
<sup>169</sup> Yb	300	3	0.3

#### Aggregation of radioactive material

When radioactive material is in close proximity of each other, such as in a single room or other enclosure), the license shall aggregate the activity of the radioactive material and assign a category to the group. In situations of this type, the summed activity of the radionuclide should be divided by the appropriate D value and the calculated ratio A/D compared with the ratios A/D given in Table 1, thus allowing the set of different radionuclides to be categorized on the basis of activity.

If radioactive material of various radionuclides is aggregated, then the sum of the ratios A/D should be used in determining the category, in accordance with the formula:

Aggregate A/D =

$$\sum_n \frac{\sum_i A_{i,n}}{D_n}$$

where:

$A_{i,n}$  = activity of each individual radioactive material  $i$  of radionuclide  $n$ .

$D_n$  = D value for radionuclide  $n$ .

## SCHEDULE II

### TEMPLATE OF A TRANSPORT SECURITY PLAN

1. SCOPE
2. OBJECTIVES
3. DESCRIPTION OF THE SHIPMENT AND MATERIAL TO BE TRANSPORTED
  - 3.1 Description of radioactive material
  - 3.2 Mode(s) of transport
4. ADMINISTRATIVE REQUIREMENTS
  - 4.1. Policies and procedures
  - 4.2. Vulnerability and threat assessment
  - 4.3. Testing and evaluating the transport security plan
  - 4.4. Transport security verification
  - 4.5. Notification of relevant agencies
  - 4.6. Review and update of the transport security plan
5. PERSONNEL QUALIFICATIONS
  - 5.1. Trustworthiness
  - 5.2. Training
6. RESPONSIBILITIES
  - 6.1. Organizational structure
  - 6.2. Allocation and transfer of responsibilities
7. INFORMATION MANAGEMENT
  - 7.1. Information security
  - 7.2. Records retention
8. TRANSPORT SECURITY MEASURES
  - 8.1. Routes
  - 8.2. Transport security system
    - 8.2.1. Conveyance
    - 8.2.2. Operations command and control
    - 8.2.3. Physical protection measures
    - 8.2.4. Communications and positional tracking for normal operations
    - 8.2.5 Maintenance and testing of systems and equipment
9. EMERGENCY RESPONSE
  - 9.1. Emergency and contingency response
  - 9.2 Communications during incidents
  - 9.3 Reporting of threats and incidents

**SCHEDULE III**  
**TRANSPORT SECURITY LEVELS FOR RADIOACTIVE MATERIALS**

There are three possible basis for specifying which shipments should be subject to enhanced transport security measures:

- i. Per package approach: enhanced security provisions would be applied when the activity of any package in a consignment exceeds the threshold value;
- ii. Per consignment approach: enhanced security provisions would be applied when the activity in a consignment exceeds the threshold value; and
- iii. Per conveyance approach: enhanced security provisions would be applied when the total activity on a conveyance exceeds the threshold.

Note: Refer to definitions section for package consignment and conveyance.

Once radioactive material has been categorized as above or below the applicable threshold, it shall be assigned to a transport security level as illustrated in the below Figure:

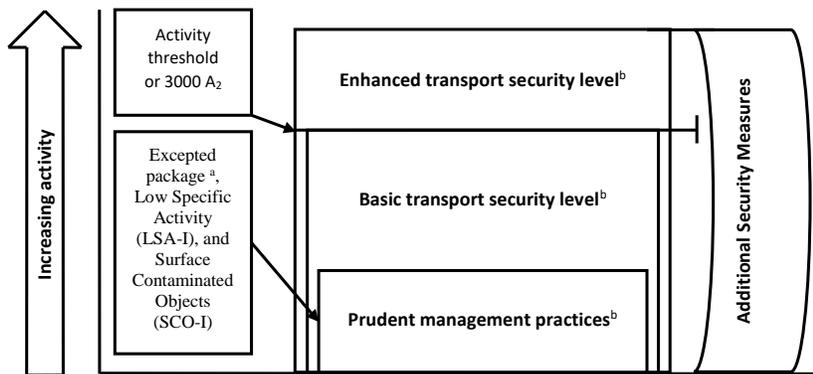


FIG. 1. Transport security levels.

<sup>a</sup> Prudent management practices are applicable to:

- (a) Radioactive material, excepted package-empty packaging–UN 2908;
- (b) Articles manufactured from natural uranium, depleted uranium or thorium – UN 2909;
- (c) Excepted packages with an activity level not exceeding the level permitted for the radionuclide when it is not in special form – UN 2910 and UN 2911;
- (d) LSA-I (low specific activity materials) – UN 2912;
- (e) SCO-I (surface contaminated objects) – UN 2913; and
- (f) Uranium hexafluoride, radioactive material, excepted package, less than 0.1 kg per package, non-fissile or fissile excepted – UN 3507.

**TABLE 3: BASIC RADIONUCLIDE VALUES**

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Actinium (89)				
Ac-225 (a)	8 x 10 <sup>-1</sup>	6 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
Ac-227 (a)	9 x 10 <sup>-1</sup>	9 x 10 <sup>-5</sup>	1 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>
Ac-228	6 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Silver (47)				
Ag-105	2 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Ag-108m (a)	7 x 10 <sup>-1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>6</sup> (b)
Ag-110m (a)	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Ag-111	2 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Aluminum (13)				
Al-26	1 x 10 <sup>-1</sup>	1 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Americium (95)				
Am-241	1 x 10 <sup>1</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>
Am-242m (a)	1 x 10 <sup>1</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup> (b)	1 x 10 <sup>4</sup> (b)
Am-243 (a)	5 x 10 <sup>0</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup> (b)	1 x 10 <sup>3</sup> (b)
Argon (18)				
Ar-37	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>6</sup>	1 x 10 <sup>8</sup>
Ar-39	4 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>7</sup>	1 x 10 <sup>4</sup>
Ar-41	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>9</sup>
Arsenic (33)				
As-72	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
As-73	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
As-74	1 x 10 <sup>0</sup>	9 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
As-76	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
As-77	2 x 10 <sup>1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Astatine (85)				

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
At-211 (a)	2 x 10 <sup>1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Gold (79)				
Au-193	7 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Au-194	1 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Au-195	1 x 10 <sup>1</sup>	6 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Au-198	1 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Au-199	1 x 10 <sup>1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Barium (56)				
Ba-131 (a)	2 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Ba-133	3 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Ba-133m	2 x 10 <sup>1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Ba-140 (a)	5 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>5</sup> (b)
Beryllium (4)				
Be-7	2 x 10 <sup>1</sup>	2 x 10 <sup>1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Be-10	4 x 10 <sup>1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>6</sup>
Bismuth (83)				
Bi-205	7 x 10 <sup>-1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Bi-206	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Bi-207	7 x 10 <sup>-1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Bi-210	1 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Bi-210m (a)	6 x 10 <sup>-1</sup>	2 x 10 <sup>-2</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Bi-212 (a)	7 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>5</sup> (b)
Berkelium (97)				
Bk-247	8 x 10 <sup>0</sup>	8 x 10 <sup>-4</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>
Bk-249 (a)	4 x 10 <sup>1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Bromine (35)				

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Br-76	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Br-77	3 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Br-82	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Carbon (6)				
C-11	1 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
C-14	4 x 10 <sup>1</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Calcium-20				
Ca-41	Unlimited	Unlimited	1 x 10 <sup>5</sup>	1 x 10 <sup>7</sup>
Ca-45	4 x 10 <sup>-1</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Ca-47 (a)	3 x 10 <sup>0</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Cadmium (48)				
Cd-109	3 x 10 <sup>1</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>6</sup>
Cd-113	4 x 10 <sup>1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Cd-115 (a)	3 x 10 <sup>0</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Cd-115m	5 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Cerium (58)				
Ce-139	7 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Ce-141	2 x 10 <sup>1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Ce-143	9 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Ce-144 (a)	2 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup> (b)	1 x 10 <sup>5</sup> (b)
Californium (98)				
Cf-248	4 x 10 <sup>1</sup>	6 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
Cf-249	3 x 10 <sup>0</sup>	8 x 10 <sup>-4</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>
Cf-250	2 x 10 <sup>1</sup>	2 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
Cf-251	7 x 10 <sup>0</sup>	7 x 10 <sup>-4</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>
Cf-252	5 x 10 <sup>-2</sup>	3 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>

<b>Radionuclide (Atomic number)</b>	<b>A<sub>1</sub> (TBq)</b>	<b>A<sub>2</sub> (TBq)</b>	<b>Activity concentration for exempt material (Bq/g)</b>	<b>Activity limit for an exempt consignment (Bq)</b>
Cf-253 (a)	4 x 10 <sup>1</sup>	4 x 10 <sup>-2</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Cf-254	1 x 10 <sup>-3</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>
Chlorine (17)				
Cl-36	1 x 10 <sup>1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>6</sup>
Cl-38	2 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Curium (96)				
Cm-240	4 x 10 <sup>1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Cm-241	2 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Cm-242	4 x 10 <sup>1</sup>	1 x 10 <sup>-2</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Cm-243	9 x 10 <sup>0</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>
Cm-244	2 x 10 <sup>1</sup>	2 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
Cm-245	9 x 10 <sup>0</sup>	9 x 10 <sup>-4</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>
Cm-246	9 x 10 <sup>0</sup>	9 x 10 <sup>-4</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>
Cm-247 (a)	3 x 10 <sup>0</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>
Cm-248	2 x 10 <sup>-2</sup>	3 x 10 <sup>-4</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>
Cobalt (27)				
Co-55	5 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Co-56	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Co-57	1 x 10 <sup>1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Co-58	1 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Co-58m	4 x 10 <sup>1</sup>	4 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Co-60	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Chromium (24)				
Cr-51	3 x 10 <sup>1</sup>	3 x 10 <sup>1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Caesium (55)				
Cs-129	4 x 10 <sup>0</sup>	4 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Cs-131	3 x 10 <sup>1</sup>	3 x 10 <sup>1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Cs-132	1 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Cs-134	7 x 10 <sup>-1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
Cs-134m	4 x 10 <sup>1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>5</sup>
Cs-135	4 x 10 <sup>1</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Cs-136	5 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Cs-137 (a)	2 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>4</sup> (b)
Copper (29)				
Cu-64	6 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Cu-67	1 x 10 <sup>1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Dysprosium (66)				
Dy-159	2 x 10 <sup>1</sup>	2 x 10 <sup>1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Dy-165	9 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Dy-166	9 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Erbium (68)				
Er-169	4 x 10 <sup>1</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Er-171	8 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Europium (63)				
Eu-147	2 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Eu-148	5 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Eu-149	2 x 10 <sup>1</sup>	2 x 10 <sup>1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Eu-150 (short-lived)	2 x 10 <sup>0</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Eu-150 (long-lived)	7 x 10 <sup>-1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Eu-152	1 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Eu-152m	8 x 10 <sup>-1</sup>	8 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Eu-154	9 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Eu-155	2 x 10 <sup>1</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Eu-156	7 x 10 <sup>-1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Fluorine (9)				
F-18	1 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Iron (26)				
Fe-52	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Fe-55	4 x 10 <sup>1</sup>	4 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>6</sup>
Fe-59	9 x 10 <sup>-1</sup>	9 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Fe-60 (a)	4 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Gallium (31)				
Ga-67	7 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Ga-68	5 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Ga-72	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Gadolinium (64)				
Gd-146 (a)	5 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Gd-148	2 x 10 <sup>1</sup>	2 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
Gd-153	1 x 10 <sup>1</sup>	9 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Gd-159	2 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Germanium (32)				
Ge-68 (a)	5 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Ge-71	4 x 10 <sup>1</sup>	4 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>8</sup>
Ge-77	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Hafnium (72)				
Hf-172 (a)	6 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Hf-175	3 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Hf-181	2 x 10 <sup>0</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Hf-182	Unlimited	Unlimited	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Mercury (80)				
Hg-194 (a)	1 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Hg-195m (a)	3 x 10 <sup>0</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Hg-197	2 x 10 <sup>1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Hg-197m	1 x 10 <sup>1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Hg-203	5 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Holmium (67)				
Ho-166	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>5</sup>
Ho-166m	6 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Iodine (53)				
I-123	6 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
I-124	1 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
I-125	2 x 10 <sup>1</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
I-126	2 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
I-129	Unlimited	Unlimited	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
I-131	3 x 10 <sup>0</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
I-132	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
I-133	7 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
I-134	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
I-135 (a)	6 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Indium (49)				
In-111	3 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
In-113m	4 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
In-114m (a)	1 x 10 <sup>1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
In-115m	7 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Iridium (77)				
Ir-189 (a)	1 x 10 <sup>1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Ir-190	7 x 10 <sup>-1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Ir-192	1 x 10 <sup>0</sup> (c)	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
Ir-194	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Potassium (19)				
K-40	9 x 10 <sup>-1</sup>	9 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
K-42	2 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
K-43	7 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Krypton (36)				
Kr-79	4 x 10 <sup>0</sup>	4 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>5</sup>
Kr-81	4 x 10 <sup>1</sup>	4 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Kr-85	1 x 10 <sup>1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>	1 x 10 <sup>4</sup>
Kr-85m	8 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>10</sup>
Kr-87	2 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>9</sup>
Lanthanum (57)				
La-137	3 x 10 <sup>-1</sup>	6 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
La-140	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Lutetium (71)				
Lu-172	6 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Lu-173	8 x 10 <sup>0</sup>	8 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Lu-174	9 x 10 <sup>0</sup>	9 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Lu-174m	2 x 10 <sup>1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Lu-177	3 x 10 <sup>1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Magnesium (12)				
Mg-28 (a)	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Manganese (25)				
Mn-52	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Mn-53	Unlimited	Unlimited	1 x 10 <sup>4</sup>	1 x 10 <sup>9</sup>
Mn-54	3 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Mn-56	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Molybdenum(42)				
Mo-93	4 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>8</sup>
Mo-99 (a)	1 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Nitrogen (7)				
N-13	9 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>9</sup>
Sodium (11)				
Na-22	5 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Na-24	2 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Niobium (41)				
Nb-93m	4 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Nb-94	7 x 10 <sup>-1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Nb-95	1 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Nb-97	9 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Neodymium (60)				
Nd-147	6 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Nd-149	6 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Nickel (28)				
Ni-59	Unlimited	Unlimited	1 x 10 <sup>4</sup>	1 x 10 <sup>8</sup>
Ni-63	4 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>5</sup>	1 x 10 <sup>8</sup>
Ni-65	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Neptunium (93)				

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Np-235	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Np-236 (short-lived)	2 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Np-236 (long-lived)	9 x 10 <sup>0</sup>	2 x 10 <sup>-2</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Np-237	2 x 10 <sup>-1</sup>	2 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup> (b)	1 x 10 <sup>3</sup> (b)
Np-239	7 x 10 <sup>-0</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Osmium (76)				
Os-185	1 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Os-191	1 x 10 <sup>1</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Os-191m	4 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Os-193	2 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Os-194 (a)	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Phosphorus (15)				
P-32	5 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>5</sup>
P-33	4 x 10 <sup>-1</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>5</sup>	1 x 10 <sup>8</sup>
Protactinium (91)				
Pa-230 (a)	2 x 10 <sup>0</sup>	7 x 10 <sup>-2</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Pa-231	4 x 10 <sup>0</sup>	4 x 10 <sup>-4</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>
Pa-233	5 x 10 <sup>0</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Lead (82)				
Pb-201	1 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Pb-202	4 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Pb-203	4 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Pb-205	Unlimited	Unlimited	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Pb-210 (a)	1 x 10 <sup>0</sup>	5 x 10 <sup>-2</sup>	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>4</sup> (b)
Pb-212 (a)	7 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>5</sup> (b)
Palladium (46)				

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Pd-103 (a)	4 x 10 <sup>1</sup>	4 x 10 <sup>1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>8</sup>
Pd-107	Unlimited	Unlimited	1 x 10 <sup>5</sup>	1 x 10 <sup>8</sup>
Pd-109	2 x 10 <sup>0</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Promethium (61)				
Pm-143	3 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Pm-144	7 x 10 <sup>-1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Pm-145	3 x 10 <sup>1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Pm-147	4 x 10 <sup>1</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Pm-148m (a)	8 x 10 <sup>-1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Pm-149	2 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Pm-151	2 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Polonium (84)				
Po-210	4 x 10 <sup>1</sup>	2 x 10 <sup>-2</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
Praseodymium (59)				
Pr-142	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Pr-143	3 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>6</sup>
Platinum (78)				
Pt-188 (a)	1 x 10 <sup>0</sup>	8 x 10 <sup>1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Pt-191	4 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Pt-193	4 x 10 <sup>1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Pt-193m	4 x 10 <sup>1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Pt-195m	1 x 10 <sup>1</sup>	5 x 10 <sup>1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Pt-197	2 x 10 <sup>1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Pt-197m	1 x 10 <sup>1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Plutonium (94)				
Pu-236	3 x 10 <sup>1</sup>	3 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Pu-237	2 x 10 <sup>1</sup>	2 x 10 <sup>1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Pu-238	1 x 10 <sup>1</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>
Pu-239	1 x 10 <sup>1</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>
Pu-240	1 x 10 <sup>1</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>
Pu-241 (a)	4 x 10 <sup>1</sup>	6 x 10 <sup>-2</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Pu-242	1 x 10 <sup>1</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>
Pu-244 (a)	4 x 10 <sup>1</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>
Radium (88)				
Ra-223 (a)	4 x 10 <sup>-1</sup>	7 x 10 <sup>-3</sup>	1 x 10 <sup>2</sup> (b)	1 x 10 <sup>5</sup> (b)
Ra-224(a)	4 x 10 <sup>-1</sup>	2 x 10 <sup>-2</sup>	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>5</sup> (b)
Ra-225 (a)	2 x 10 <sup>-1</sup>	4 x 10 <sup>-3</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Ra-226 (a)	2 x 10 <sup>-1</sup>	3 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>4</sup> (b)
Ra-228 (a)	6 x 10 <sup>-1</sup>	2 x 10 <sup>-2</sup>	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>5</sup> (b)
Rubidium (37)				
Rb-81	2 x 10 <sup>0</sup>	8 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Rb-83 (a)	2 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Rb-84	1 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Rb-86	5 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Rb-87	Unlimited	Unlimited	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Rb(nat)	Unlimited	Unlimited	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Rhenium (75)				
Re-184	1 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Re-184m	3 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Re-186	2 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Re-187	Unlimited	Unlimited	1 x 10 <sup>6</sup>	1 x 10 <sup>9</sup>
Re-188	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>

<b>Radionuclide (Atomic number)</b>	<b>A<sub>1</sub> (TBq)</b>	<b>A<sub>2</sub> (TBq)</b>	<b>Activity concentration for exempt material (Bq/g)</b>	<b>Activity limit for an exempt consignment (Bq)</b>
Re-189 (a)	3 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Re(natural)	Unlimited	Unlimited	1 x 10 <sup>6</sup>	1 x 10 <sup>9</sup>
<b>Rhodium (45)</b>				
Rh-99	2 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Rh-101	4 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Rh-102	5 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Rh-102m	2 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Rh-103m	4 x 10 <sup>1</sup>	4 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>8</sup>
Rh-105	1 x 10 <sup>-1</sup>	8 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
<b>Radon (86)</b>				
Rn-222 (a)	3 x 10 <sup>-1</sup>	4 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>8</sup> (b)
<b>Ruthenium (44)</b>				
Ru-97	5 x 10 <sup>0</sup>	5 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Ru-103 (a)	2 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Ru-105	1 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Ru-106 (a)	2 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup> (b)	1 x 10 <sup>5</sup> (b)
<b>Sulphur (16)</b>				
S-35	4 x 10 <sup>1</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>5</sup>	1 x 10 <sup>8</sup>
<b>Antimony (51)</b>				
Sb-122	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>4</sup>
Sb-124	6 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Sb-125	2 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Sb-126	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>6</sup>	1 x 10 <sup>5</sup>
<b>Scandium (21)</b>				
Sc-44	5 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Sc-46	5 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Sc-47	1 x 10 <sup>1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Sc-48	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Selenium (34)				
Se-75	3 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Se-79	4 x 10 <sup>1</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Silicon (14)				
Si-31	6 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Si-32	4 x 10 <sup>1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Samarium (62)				
Sm-145	1 x 10 <sup>1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Sm-147	Unlimited	Unlimited	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
Sm-151	4 x 10 <sup>1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>8</sup>
Sm-153	9 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Tin (50)				
Sn-113 (a)	4 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Sn-117m	7 x 10 <sup>0</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Sn-119m	4 x 10 <sup>1</sup>	3 x 10 <sup>1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Sn-121m (a)	4 x 10 <sup>1</sup>	9 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Sn-123	8 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Sn-125	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Sn-126 (a)	6 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Strontium (38)				
Sr-82 (a)	2 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Sr-85	2 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Sr-85m	5 x 10 <sup>0</sup>	5 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Sr-87m	3 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>

<b>Radionuclide (Atomic number)</b>	<b>A<sub>1</sub> (TBq)</b>	<b>A<sub>2</sub> (TBq)</b>	<b>Activity concentration for exempt material (Bq/g)</b>	<b>Activity limit for an exempt consignment (Bq)</b>
Sr-89	6 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Sr-90 (a)	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup> (b)	1 x 10 <sup>4</sup> (b)
Sr-91 (a)	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Sr-92 (a)	1 x 10 <sup>0</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Tritium (1)				
T (H-3)	4 x 10 <sup>1</sup>	4 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>	1 x 10 <sup>9</sup>
Tantalum (73)				
Ta-178 (long-lived)	1 x 10 <sup>0</sup>	8 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Ta-179	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Ta-182	9 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
Terbium (65)				
Tb-157	4 x 10 <sup>1</sup>	4x10 <sup>1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Tb-158	1x10 <sup>0</sup>	1x10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Tb-160	1 x 10 <sup>0</sup>	6x10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Technetium (43)				
Tc-95m (a)	2 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Tc-96	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Tc-96m (a)	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Tc-97	Unlimited	Unlimited	1 x 10 <sup>3</sup>	1 x 10 <sup>8</sup>
Tc-97m	4 x 10 <sup>1</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Tc-98	8 x 10 <sup>-1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Tc-99	4 x 10 <sup>1</sup>	9 x 10 <sup>-1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Tc-99m	1 x 10 <sup>1</sup>	4 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Tellurium (52)				
Te-121	2 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Te-121m	5 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Te-123m	8 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Te-125m	2 x 10 <sup>1</sup>	9 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Te-127	2 x 10 <sup>1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Te-127m (a)	2 x 10 <sup>1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Te-129	7 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Te-129m (a)	8 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Te-131m (a)	7 x 10 <sup>-1</sup>	5 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Te-132 (a)	5 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Thorium (90)				
Th-227	1 x 10 <sup>1</sup>	5 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
Th-228 (a)	5 x 10 <sup>-1</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup> (b)	1 x 10 <sup>4</sup> (b)
Th-229	5 x 10 <sup>0</sup>	5 x 10 <sup>-4</sup>	1 x 10 <sup>0</sup> (b)	1 x 10 <sup>3</sup> (b)
Th-230	1 x 10 <sup>1</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>4</sup>
Th-231	4 x 10 <sup>1</sup>	2 x 10 <sup>-2</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Th-232	Unlimited	Unlimited	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
Th-234 (a)	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup> (b)	1 x 10 <sup>5</sup> (b)
Th (natural)	Unlimited	Unlimited	1 x 10 <sup>0</sup> (b)	1 x 10 <sup>3</sup> (b)
Titanium (22)				
Ti-44 (a)	5 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
Thallium (81)				
Tl-200	9 x 10 <sup>-1</sup>	9 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Tl-201	1 x 10 <sup>1</sup>	4 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Tl-202	2 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Tl-204	1 x 10 <sup>1</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>4</sup>
Thulium (69)				
Tm-167	7 x 10 <sup>0</sup>	8 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Tm-170	3 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Tm-171	4 x 10 <sup>1</sup>	4 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>8</sup>
Uranium (92)				
U-230 (fast lung absorption)(a)(d)	4 x 10 <sup>1</sup>	1 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>5</sup> (b)
U-230 (medium lung absorption) (a)(e)	4 x 10 <sup>1</sup>	4 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
U-230 (slow lung absorption)(a)(f)	3 x 10 <sup>1</sup>	3 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
U-232 (fast lung absorption)(d)	4 x 10 <sup>1</sup>	1 x 10 <sup>-2</sup>	1 x 10 <sup>0</sup> (b)	1 x 10 <sup>3</sup> (b)
U-232 (medium lung absorption)(e)	4 x 10 <sup>1</sup>	7 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
U-232 (slow lung absorption)(f)	1 x 10 <sup>1</sup>	1 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
U-233 (fast lung absorption)(d)	4 x 10 <sup>1</sup>	9 x 10 <sup>-2</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
U-233 (medium lung absorption)(e)	4 x 10 <sup>1</sup>	2 x 10 <sup>-2</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
U-233 (slow lung absorption)(f)	4 x 10 <sup>1</sup>	6 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
U-234 (fast lung absorption)(d)	4 x 10 <sup>1</sup>	9 x 10 <sup>-2</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
U-234 (medium lung absorption)(e)	4 x 10 <sup>1</sup>	2 x 10 <sup>-2</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
U-234 (slow lung absorption)(f)	4 x 10 <sup>1</sup>	6 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
U-235 (all lung absorption types) (a),(d),(e),(f)	Unlimited	Unlimited	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>4</sup> (b)
U-236 (fast lung absorption)(d)	Unlimited	Unlimited	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
U-236 (medium lung absorption)(e)	4 x 10 <sup>1</sup>	2 x 10 <sup>-2</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
U-236 (slow lung absorption)(f)	4 x 10 <sup>1</sup>	6 x 10 <sup>-3</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>
U-238 (all lung absorption types) (d),(e),(f)	Unlimited	Unlimited	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>4</sup> (b)
U (nat)	Unlimited	Unlimited	1 x 10 <sup>0</sup> (b)	1 x 10 <sup>3</sup> (b)
U (enriched to 20% or less)(g)	Unlimited	Unlimited	1 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>
U (dep)	Unlimited	Unlimited	1 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>
Vanadium (23)				
V-48	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>5</sup>
V-49	4 x 10 <sup>1</sup>	4 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
Tungsten (74)				
W-178 (a)	9 x 10 <sup>0</sup>	5 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
W-181	3 x 10 <sup>1</sup>	3 x 10 <sup>1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
W-185	4 x 10 <sup>1</sup>	8 x 10 <sup>-1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>7</sup>
W-187	2 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
W-188 (a)	4 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Xenon				
Xe-122 (a)	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>9</sup>
Xe-123	2 x 10 <sup>0</sup>	7 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>9</sup>
Xe-127	4 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>5</sup>
Xe-131m	4 x 10 <sup>1</sup>	4 x 10 <sup>1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>4</sup>
Xe-133	2 x 10 <sup>1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
Xe-135	3 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>10</sup>
Yttrium (39)				
Y-87 (a)	1 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>

Radionuclide (Atomic number)	A <sub>1</sub> (TBq)	A <sub>2</sub> (TBq)	Activity concentration for exempt material (Bq/g)	Activity limit for an exempt consignment (Bq)
Y-88	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Y-90	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>5</sup>
Y-91	6 x 10 <sup>-1</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>6</sup>
Y-91m	2 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Y-92	2 x 10 <sup>-1</sup>	2 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Y-93	3 x 10 <sup>-1</sup>	3 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>5</sup>
Ytterbium (79)				
Yb-169	4 x 10 <sup>0</sup>	1 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>7</sup>
Yb-175	3 x 10 <sup>-1</sup>	9 x 10 <sup>-1</sup>	1 x 10 <sup>3</sup>	1 x 10 <sup>7</sup>
Zinc (30)				
Zn-65	2 x 10 <sup>0</sup>	2 x 10 <sup>0</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Zn-69	3 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>4</sup>	1 x 10 <sup>6</sup>
Zn-69m (a)	3 x 10 <sup>0</sup>	6 x 10 <sup>-1</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Zirconium (40)				
Zr-88	3 x 10 <sup>0</sup>	3 x 10 <sup>0</sup>	1 x 10 <sup>2</sup>	1 x 10 <sup>6</sup>
Zr-93	Unlimited	Unlimited	1 x 10 <sup>3</sup> (b)	1 x 10 <sup>7</sup> (b)
Zr-95 (a)	2 x 10 <sup>0</sup>	8 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup>	1 x 10 <sup>6</sup>
Zr-97 (a)	4 x 10 <sup>-1</sup>	4 x 10 <sup>-1</sup>	1 x 10 <sup>1</sup> (b)	1 x 10 <sup>5</sup> (b)

(a) A<sub>1</sub> and/or A<sub>2</sub> values include contributions from daughter nuclides with half-lives less than 10 days

(b) Parent nuclides and their progeny included in secular equilibrium are listed in the following:

Sr-90	Y-90
Zr-93	Nb-93m
Zr-97	Nb-97
Ru-106	Rh-106
Cs-137	Ba-137m
Ce-134	La-134

Ce-144	Pr-144
Ba-140	La-140
Bi-212	Tl-208 (0.36), Po-212 (0.64)
Pb-210	Bi-210, Po-210
Pb-212	Bi-212, Tl-208 (0.36), Po-212 (0.64)
Rn-220	Po-216
Rn-222	Po-218, Pb-214, Bi-214, Po-212
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208, (0.36), Po-212 (0.64)
Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228	Ac-228
Th-226	Ra-222, Rn-218, Po-214
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209
Th-natural	Ra-228, Ac-228, Th-228, Ra-224. Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212(0.64)
Th-234	Pa-234m
U-230	Th-226, Ra-222, Rn-218, Po-214
U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
U-235	Th-231
U-238	Th-234, Pa-234m
U-natural	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214,
Po-214	Pb-210, Bi-210, Po-210
U-240	Np-240m
Np-237	Pa-233
Am-242m	Am-242
Am-243	Np-239

- (c) the quantity may be determined from a measurement of the rate of decay or a measurement of the radiation level at a prescribed distance from the source;
- (d) these values apply only to compounds or uranium that take the chemical form of UF<sub>6</sub>, UO<sub>2</sub>F<sub>2</sub> and UO<sub>2</sub>(NO<sub>3</sub>)<sub>2</sub> in both normal and accident conditions of transport;
- (e) these values apply only to compounds of uranium that take the chemical form of UO<sub>3</sub>, UF<sub>4</sub>, UCl<sub>4</sub> and hexavalent compounds in both normal and accident conditions of transport;

