

EPFL 12.11.2018 – Waste, transport, accident management

- 1) When will you be allowed to dispose of a solid waste of I-125 with an activity of 10 MBq (ref date 11.11.2018) as conventional waste, considering that you own a license for the handling of radioactive material ?

Half-life = 59.4 days
 LL= 100 Bq/g
 Decay time to reach 10 kg x LL:
197 days

- 2) Can the following sources be considered as Exempt material?
- a. Plutonium 236
 1,3 kBq
 Total mass of material to be transported is 100 g
 - b. Americium 241
 400 MBq

Radionuclide	Activity (Bq)	Activity limit for an exempt consignment(Bq)	Activity concentration limit for exempt material (Bq/g)	Activity concentration (Bq/g)	Exempt?
P-236	$1,3 \cdot 10^3$	$1 \cdot 10^4$	10	$\frac{1,3 \cdot 10^3}{100} = 13$	Yes
Am-241	$400 \cdot 10^6$	$1 \cdot 10^4$	1	No information	No

- 3) Can the following solid sources be transported as excepted packages?
- a. Cesium 137
 1,3 MBq
 Special form
 - b. Americium 241
 400 MBq

Step 1: Can the following sources be considered as Exempt material?

Radionuclide	Activity (Bq)	Activity limit for an exempt consignment(Bq)	Activity concentration limit for exempt material (Bq/g)	Activity concentration (Bq/g)	Exempt?
Cs-137	$1,3 \cdot 10^6$	$1 \cdot 10^4$	10	No information	No
Am-241	$400 \cdot 10^6$	$1 \cdot 10^4$	1	No information	No

Step 2: Can the following sources be transported as excepted packages?

- a. Cs-137 in special form, so the A1 should be used.

Radionuclide	Activity (Bq)	A1 (TBq)	Activity limit for excepted packages	Excepted packages?
Cs-137	$1,3 \cdot 10^6$	2	$10^{-3} A_1 = 2 \cdot 10^9 \text{ Bq}$	Yes

No information on the form for Am-241, so the A2 should be used.

Radionuclide	Activity (Bq)	A2 (TBq)	Activity limit for excepted packages	Excepted packages?
Am-241	$400 \cdot 10^6$	$1 \cdot 10^{-3}$	$10^{-3} A_2 = 1 \cdot 10^6 \text{ Bq}$	No

4) What type of package is required to transport the following source?

No information on the form for Am-241, so the A2 should be used.

$$A_2(\text{Am-241}) = 1 \cdot 10^{-3} \text{ TBq} = 1 \text{ GBq}$$

$$400 \text{ MBq} < 1 \text{ GBq}$$

Type A

5) Which label should be placed on a package with a dose rate on the surface of 0.67 mSv/h and a dose rate at 1 m of 1.4 $\mu\text{Sv/h}$?

- a. Step 1 : Transport index

$$1.4 \mu\text{Sv/h} = 0.0014 \text{ mSv/h}$$

$$0.0014 \cdot 100 = 0.14$$

$$0.14 \text{ rounded up to the first decimal} \rightarrow \text{TI} = 0.2$$

- b. Step 2 : Categories

$$0 < \text{TI} = 0.2 < 1$$

$$0,5 \text{ mSv/h} < 0.67 \text{ mSv/h} \leq 2 \text{ mSv/h}$$

→ III - Yellow