RADIONUCLIDES AND DECAY DATA FOR EXPERIMENTAL IMPROVEMENT

1. Standards for detector calibration.

Nuclide	Comments	Methods
^{67}Ga	The evaluation is based on the value of the absolute emission probability of conversion electrons from the gamma transition of 93.3 keV $P(ec_{1,0})$=0.325(4). It is obtained from the two discrepant measurement results of 0.3206(23) and 0.329(4). Further measurements of this key value are required.	4π(LS)e, X-γ coincidences
^{111}In	More accurate measurements of gamma-ray energies are recommended.	Ge detectors, curved-crystal spectrometers
^{129}I	The 2nd unique forbidden β^--transition to the $1/2^+$ ground state of ^{129}Xe was not observed. The experimental limit on this β^- branch intensity was obtained in 1954. Its refinement is required as the evaluation of the Pγ (39.58 keV) depends on this value.	β-γ anti-coincidences Precise measurement of ICC (α_K)
^{153}Sm	Significant uncertainties exist in the detail and accuracy of the proposed decay scheme. Therefore, γ-ray measurements are recommended to help resolve these issues, particularly with respect to the lower-energy transitions (< 100 keV).	Ge, Si(Li) detectors, β-γ coincidences
^{155}Eu	Weak overlapping of the two most accurate measurement results of the key value for the evaluation of ^{155}Eu decay data [Pγ (86.548 keV) = 0.305(3) and 0.311(4)] does not allow to obtain a good accuracy for the absolute X- and gamma-ray emission probabilities. Further measurements are merited to aid in making Pγ (86.548 keV) more precise.	Ge, Si(Li) detectors, β-γ coincidences
^{170}Tm	Discrepancy of the half-life measurement results obtained before 1970 does not allow to give a reliable recommended value for the ^{170}Tm half-life and requires new additional measurement of this half-life.	High isotopic purification, ionisation camera

Nuclide	Comments	Methods
^{228}Th decay chain	^{224}Ra decay: P_γ(240.986 keV) of 0.0412 (4) was derived from the relatively large number of direct γ-ray measurements. However, α-particle measurements and their adoption in decay scheme calculations gave P_γ(240.986 keV) of 0.0390 (3). While the γ-ray measurements were assumed to be more reliable in the evaluation, further α-particle and γ-ray studies are required to resolve this significant discrepancy between the two spectroscopic techniques.	α-γ coincidences α-spectrometry γ-spectrometry
^{234m}Pa	Recommended P_γ(1001 keV) of 0.00832 (10) was based on a series of extensive measurements in 1980/90s. However, three of these studies gave significantly higher values (by ~10%, at approximately 0.0091) than the other six measurements. Further studies are merited to aid in the resolution of this discrepancy.	β-γ coincidences
^{241}Am	There are some gamma-transitions scarcely studied and expected but not certainly observed: 27,03; 54,1; 95,0 keV. This leads to the not very good intensity balance for some levels. Further measurements of gamma-ray and conversion electron emission probabilities are required for these gamma transitions.	Ge, Si(Li) detectors α-e coincidences

2. Actinide decay data

Nuclide	Data type [a]	Accuracy achieved (%)	Comments
^{233}Th	P(β), P(γ)	~10	More precise P(β), P(γ) measurements are required
^{231}Pa	P(α), P(γ)	2-5	More precise P(α), P(γ) measurements are required
^{233}Pa	P(β)	~10	More precise P(β) measurements are required
^{235}U	P(α) P(γ)	5-12 1	More precise P(α), P(γ) (<120 keV) measurements are required
^{236}U	P(α) P(γ)	5-15 10	More precise P(α), P(γ) measurements are required
^{237}U	P(γ)	2-3	More precise P(γ) measurements for the main transitions are required

Nuclide	Data type [a]	Accuracy achieved (%)	Comments
^{236}Np	$T_{1/2}$ P(β)	10 -	P(β) and more precise $T_{1/2}$ measurements are required
^{237}Np	P(α) P(γ)	20 1-2	More precise P(α), P(γ), P(LX), P(e) measurements are required
^{238}Np	P(γ)	5	More precise P(γ) measurements are required
^{236}Pu	P(α) P(γ)	1-3 30	More precise P(α), P(γ) measurements are required
^{242m}Am	P(LX)	-	P(LX) measurements are required
^{243}Am	P(LX)	-	P(LX) measurements are required
^{243}Cm	P(LX)	-	P(LX) measurements are required
^{245}Cm	P(LX) P(γ)	- 10	P(LX) and more precise P(γ) measurements are required
^{246}Cm	$T_{1/2}$ P(LX) P(γ)	2 - ~10	P(LX) and more precise $T_{1/2}$, P(γ) measurements are required
^{248}Cm	P(LX) P(γ)	- ~5	P(LX) and more precise P(γ) measurements are required

[a] P(α), P(β), P(γ), P(LX) – alpha-particle, beta-particle, gamma-ray, X-ray emission probability, respectively; $T_{1/2}$ – total half-life.

3. Radionuclides important for activation measurements of reactor neutron fluencies.

The precise (<~1%) P(γ) measurements are required for the following radionuclides: **^{59}Fe, ^{72}Ga, ^{94}Nb, ^{111m}Cd, ^{115m}In, ^{116m1,m2}In, ^{165}Dy, ^{199m}Hg, ^{204m}Pb.**

4. Nuclei far from stability line, important for nuclear physics and astrophysics.

Complex nuclear equipment is required for obtaining these nuclei and measurements of their decay data: accelerator, on-line electromagnetic mass-separator and different spectrometric apparatus. The following nuclei are of great interest for nuclear physics and astrophysics: **^{80}Y, ^{81}Y, $^{80-83}$Zr, $^{82-86}$Nb, $^{84-87}$Mo.**

5. Nuclear isomers important for applications.

The additional experimental investigations of decay schemes, particularly, high energetic levels (~ 2MeV) are required for **^{178m1,2}Hf, ^{180m}Hf, ^{180m}Ta,** ^{177m}Lu.