GROUPING CRITERIA FOR RADIONUCLIDES TO SUPPORT CMCS

Cautionary note

These tables, known as generic groupings tables, are intended as a resource for NMIs wishing to submit CMCs for review, and for CMC reviewers. While they are presented as guidance for the radionuclide metrology community regarding relevant key and other comparisons, the uncertainty values contained herein are subject to change by the CCRI as technology advances and as higher-level capabilities become attainable within the community. Therefore, the data can neither be taken as definitive nor determinate.

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The CCRI(II) requested that the KCWG(II) and the UCWG(II) produce a table of radionuclides that are grouped generically and for which each has an expected measurement uncertainty. Their work is presented in this paper.

The table contains all the radionuclides that are currently given in the CMC tables of the CIPM MRA Appendix C for activity measurement.

An appropriate measurement method has been allocated to each radionuclide depending on its radiation-type and decay scheme. The relative difficulty of measuring a specific nuclide by the indicated method is denoted by a colour-coded system: "red" for the most difficult, "yellow" for the moderately difficult, and "green" for the least difficult method. It should be noted that a radionuclide measured by a "red" method may be easier to measure by another indicated as "green".

Within each coloured cell is the estimated best relative (%) uncertainty value (k = 2) that can be expected for the measurement of that radionuclide, using the specified measurement method.

In general, participation in a key comparison using a measurement method that is coloured red for a given radionuclide supports the CMCs of all radionuclides in the same measurement group whether the radionuclides are indicated by a red, yellow or green colour.

Participation in a key comparison using a measurement method that is coloured yellow for a given radionuclide generally supports the CMCs of all radionuclides in the same measurement group when the radionuclides are indicated by a yellow or green colour.

Participation in a key comparison using a measurement method that is coloured green for a given radionuclide generally supports the CMCs of all radionuclides in the same measurement group, when they are also indicated by a green colour.

The final column in the table indicates the most recent key comparisons and, in red, those proposed by the KCWG(II) to be undertaken by the CCRI(II) over the next ten years.

Regarding CMC claims in particular, it should be noted that:

- **A comparison result from a radionuclide measured using a specific primary method generally cannot support claims for that radionuclide measured by other primary methods. Consequently, laboratories are encouraged to use every appropriate method to measure the radionuclide while participating in a comparison.**
- **Secondary methods of measurement, and the expected associated uncertainties for radionuclides measured by them, are not listed in the table. Normally, only supplementary comparisons would be made for these methods, so no grouping of nuclides is feasible. When such a method is used in the context of a comparison, the results for that comparison can support the CMCs of only that nuclide as measured by that method.**
- **Users of the generic groupings table should be aware that using a particular method with a particular radionuclide allows claims only for radionuclides in the same column that are marked with the *same or an "easier"* colour.**
- **If a laboratory submits a result with a lower uncertainty than indicated in the table, they may be asked to provide justification.**

Acronyms used to identify different measurement methods

Each acronym has six components, geometry-detector (1)-radiation (1)-detector (2)-radiation (2)-mode. When a component is not specified, ?? is used and when it is not applicable 00 is used.

Geometry	**acronym**	**Detector**	**acronym**
4π	4P	proportional counter	PC
defined solid angle	SA	press. prop counter	PP
2π	2P	liquid scintillation counting	LS
undefined solid angle	UA	NaI(Tl)	NA
		Ge(HP)	GH
		Ge(Li)	GL
		Si(Li)	SL
		CsI(Tl)	CS
		ionization chamber	IC
		grid ionization chamber	GC
		bolometer	BO
		calorimeter	CA
		PIPS detector	PS
Radiation	**acronym**	**Mode**	**acronym**
positron	PO	efficiency tracing	ET
beta particle	BP	internal gas counting	IG
Auger electron	AE	CIEMAT/NIST	CN
conversion electron	CE	sum counting	SC
mixed electrons	ME	coincidence	CO
bremsstrahlung	BS	anti-coincidence	AC
gamma rays	GR	coincidence counting with efficiency tracing	CT
X - rays	XR	anti-coincidence counting with efficiency tracing	AT
photons (x + γ)	PH	triple-to-double coincidence ratio counting	TD
photons + electrons	PE	selective sampling	SS
alpha - particle	AP	high efficiency	HE
mixture of various radiation	MX	digital coincidence counting	DC

Examples **method**	**acronym**
4π(PC)β–γ-coincidence counting	4P-PC-BP-NA-GR-CO
4π(PPC)β–γ-coincidence counting eff. trac.	4P-PP-MX-NA-GR-CT
defined solid angle α-particle counting with a PIPS detector	SA-PS-AP-00-00-00
4π(PPC)AX-γ(GeHP)-anticoincidence counting	4P-PP-MX-GH-GR-AC
4π CsI-β,AX,γ counting	4P-CS-MX-00-00-HE
calibrated IC	4P-IC-GR-00-00-00
internal gas counting	4P-PC-BP-00-00-IG

Please note that the data in the tables have been produced by the CCRI and are presently available only to National Metrology Institutes (NMI) working in radionuclide metrology. Access to the data is restricted but may be obtained either through your RMO TC Chair for Ionizing Radiation, through the NMI to whom you are traceable for activity measurements, or through the CCRI Executive Secretary.