

Annex 03

of 2007-07-03 to the accreditation certificate of the calibration laboratory **DKD-K-36901**

Registration number:

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at

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Measured quantities:

activity,
specific activity,
photon flux,
particle flux

Head: Daniel James Van Dalsem, Ph.D.
Deputy: Timothy Catterson, M.S.

Accredited since: 2003-08-28

Permanent Laboratory

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability ¹⁾	Remarks
Activity	185 Bq to 3,7 GBq	1. Photon emitting nuclides, $E > 50$ keV Be-7, Na-22, K-40, Ti-44, Sc-46, Cr-51, Mn-54, Co-56, Co-57, Co-58, Fe-59, Co-60, Zn-65, Cu-67, Ga-67, Ge-68/Ga-68, Se-75, Rb-83, Rb-84, Kr-85, Sr-85, Y-88, Zr-88, Nb-92m, Nb-95, Zr-95, Mo-99, Rh-101, Rh-102, Ru-106, Cd-109, Ag-110m, Ag-111, In-111, Sn-113, Te-121, Te-121m, Te-123m, Sb-122, Sb-124, Sb-125, Sb-127, Te-127m, I-131, Xe-131m, Te-132, Ba-133, Xe-133, Cs-134, Cs-137, Ce-139, Ba-140/La-140, Ce-141, Ce-144, Nd-147, Eu-152, Gd-153, Sm-153, Eu-154, Eu-155, Tb-160, Yb-169, Er-169, Hf-181, Ta-182, Re-186, Ir-192, Au-195, Hg-197, Au-198, Tl-201, Tl-202, Hg-203, Pb-203, Bi-207, Ra-226, Th-228, Am-241	2,5 %	The measurement uncertainty depends on the instrumentation used for the calibration, on the specific radionuclide and on the activity of the source to be calibrated.
	1,85 kBq to 3,7 MBq	2. Photon emitting nuclides, $10 \text{ keV} < E \leq 50 \text{ keV}$ Pb-210	3 %	
	370 Bq to 37 MBq	3. Photon emitting nuclides, $E \leq 10 \text{ keV}$ Fe-55	3 %	
	37 Bq to 37 MBq	4. Beta emitting nuclides, $E_{\text{max}} > 150 \text{ keV}$ C-14, P-32, Si-32, P-33, S-35, Cl-36, Co-60, Sr-89, Sr-90, Tc-99, Ru-106, Cs-137, Pm-147, Tl-204	2,5 %	
	37 Bq to 37 MBq	5. Beta emitting nuclides, $E_{\text{max}} \leq 150 \text{ keV}$ H-3, Ni-63	3 %	
	18,5 Bq to 3,7 MBq	6. Alpha emitting nuclides Po-210, Th-228, Th-230, Th-232, U-234, U-235, Np-237, Pu-238, Pu-239, Pu-240, Am-241, Cm-242, Am-243, Cm-243, Cm-244	2,5 %	
	3,7 Bq to 18,5 Bq	7. Alpha emitting nuclides Contained U-238 activity only based on mass and specific activity	5 %	
	18,5 Bq to 37 kBq	7. Alpha emitting nuclides Contained U-238 activity only based on mass and specific activity	3 %	

¹⁾ The best measurement capabilities are stated according to DKD-3 (EA-4/02). These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability ¹⁾	Remarks
Specific Activity	37 Bq/g to 370 MBq/g	1. Photon emitting nuclides, $E > 50$ keV see p. 1	2,5 %	see p. 1
	3,7 kBq/g to 3,7 GBq/g	2. Photon emitting nuclides, $10 \text{ keV} < E \leq 50 \text{ keV}$ see p. 1	3 %	
	37 Bq/g to 3,7 MBq/g	3. Photon emitting nuclides, $E \leq 10$ keV see p. 1	3 %	
	37 Bq/g to 3,7 MBq/g	4. Beta emitting nuclides, $E_{\text{max}} > 150$ keV see p. 1	2,5 %	
	37 Bq/g to 3,7 MBq/g	5. Beta emitting nuclides, $E_{\text{max}} \leq 150$ keV see p. 1	3 %	
	37 Bq/g to 3,7 MBq/g	6. Alpha emitting nuclides see p. 1	2,5 %	
Photon flux	20 s^{-1} to $3 \cdot 10^5 \text{ s}^{-1}$	1. Photon emitting nuclides, $E > 50$ keV see p. 1	2,5 %	
	20 s^{-1} to $4 \cdot 10^5 \text{ s}^{-1}$	2. Photon emitting nuclides, $10 \text{ keV} < E \leq 50 \text{ keV}$ see p. 1	3 %	
Particle flux	20 s^{-1} to $4 \cdot 10^3 \text{ s}^{-1}$	4. Beta emitting nuclides, $E_{\text{max}} > 150$ keV see p. 1	3 %	
	5 s^{-1} to 20 s^{-1}	6. Alpha emitting nuclides see p. 1	3 %	
	20 s^{-1} to $3 \cdot 10^4 \text{ s}^{-1}$	6. Alpha emitting nuclides see p. 1	2,5 %	
	5 s^{-1} to 20 s^{-1}	8. Alpha emitting nuclides U-238	5 %	
	20 s^{-1} to $4 \cdot 10^3 \text{ s}^{-1}$	8. Alpha emitting nuclides U-238	3 %	

¹⁾ The best measurement capabilities are stated according to DKD-3 (EA-4/02). These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.