

Update on Cu radioactivity assay

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(on behalf of the LNGS group)

12 November 2025

Samples



Sample 1: copper (100 x 102 x 10) mm
mass: 952.36 g
live time: 2 027 688 s
detector: GeMPI4

Sample 2: copper (80 x 82 x 12) mm
mass: 715.17 g
live time: 815 646 s
detector: GeMPI4

Measurements

Radioactive chain	Radionuclide	Sample 1 (Metalminotti)		Sample 2 (Luvata)		CUORE frames (NOSV Aurubis) [1]	
		Activity (mBq/kg)	Concentration (g/g)	Activity (mBq/kg)	Concentration (g/g)	Activity (mBq/kg)	Concentration (g/g)
Th-232	Ra-228	<0.58	$<1.4 \times 10^{-10}$	<0.79	$<2.0 \times 10^{-10}$	<0.002	—
	Th-228	(0.7 ± 0.2)	$(1.8 \pm 0.4) \times 10^{-10}$	<0.26	$<6.5 \times 10^{-11}$	<0.002	—
U-238	Ra-226	(0.7 ± 0.1)	$(7 \pm 1) \times 10^{-11}$	(0.5 ± 0.2)	$(4 \pm 2) \times 10^{-11}$	<0.065	—
	Th-234	<15	$<1.2 \times 10^{-9}$	<22	$<1.8 \times 10^{-9}$	—	—
	Pa-234m	<9.9	$<8.0 \times 10^{-10}$	NA	NA	—	—
U-235	U-235	<0.35	$<6.2 \times 10^{-10}$	<0.99	$<1.7 \times 10^{-9}$	<0.065	—
—	K-40	(7 ± 2)	$(2.3 \pm 0.6) \times 10^{-7}$	(7 ± 3)	$(2.1 \pm 0.9) \times 10^{-7}$	—	—
—	Cs-137	<0.20	—	<0.29	—	—	—
—	Co-60	<0.34 (@ 09AUG2025)	—	<0.32 (@ 06OCT2025)	—	<0.035	—

upper limits with $k=1.645$ (90% CL)

uncertainties are given with $k=1$ (approx. 68% CL)

Reasonably good for the external shield,
definitely not for the internal components

References

[1] C. Alduino et al., "The projected background for the CUORE experiment", Eur. Phys. J. C (2017)

Special thanks to Matthias Laubenstein

ICP-MS ongoing on Sample 1
to understand where the
contamination is from
(surface/bulk)

Measurements

If we were to choose today, we should go with Luvata (only UL for Th-228, where we have (0.7 ± 0.2) mBq/kg for Metalminotti), but it is important to understand if the contamination is coming from surface or bulk...

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