Key comparison CCQM-K12

MEASURAND: **Mass fraction of creatinine in human serum**
Material I (physiological range)

x_i : **result of measurement carried out by laboratory *i***
u_i : **combined standard uncertainty of x_i**

Lab *i*	x_i / (µg/g)	u_i / (µg/g)
IRMM	8.360	0.1060
KRISS	8.186	0.0796
LGC	8.193	0.0080
NIST	8.277	0.0319
PTB	8.211	0.0289

Key comparison CCQM-K12

MEASURAND: **Mass fraction of creatinine in human serum**
Material I (physiological range)

The key comparison reference value calculated as the mean of the participant results, excluding IRMM is: x_R = 8.217 µg/g.
The expanded uncertainty of the key comparison reference value at a 95 % level of confidence is: U_R = 0.066 µg/g.

The degree of equivalence of each laboratory with respect to the reference value is given by a pair of terms: $D_i = (x_i - x_R)$ and U_i, its expanded uncertainty corresponding to a 95% level of confidence, both expressed in µg/g.

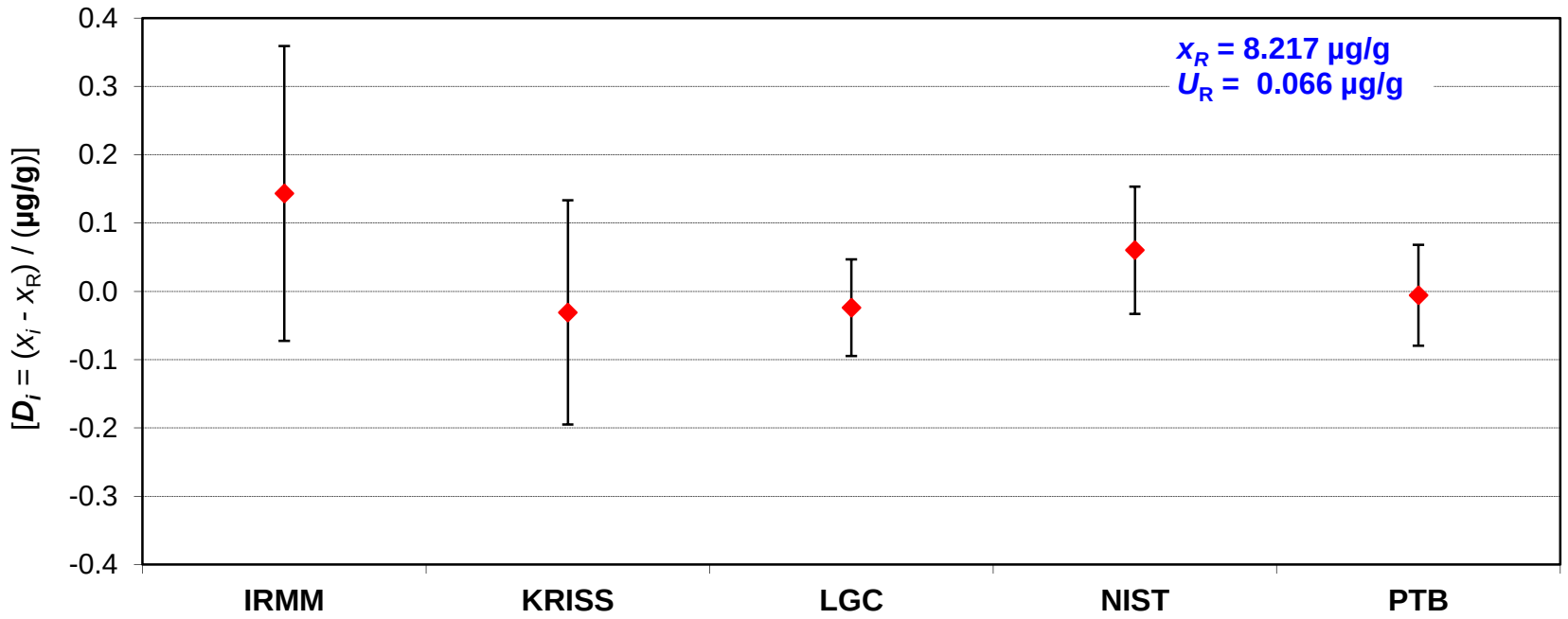
The degree of equivalence between two laboratories is given by a pair of terms: $D_{ij} = D_i - D_j = (x_i - x_R) - (x_j - x_R) = x_i - x_j$ and U_{ij}, its expanded uncertainty corresponding to a 95% level of confidence, both expressed in µg/g.

Lab *j* ⇨

Lab *i* ⇩	D_i / (µg/g)	U_i / (µg/g)	IRMM		KRISS		LGC		NIST		PTB	
			D_{ij} / (µg/g)	U_{ij} / (µg/g)	D_{ij} / (µg/g)	U_{ij} / (µg/g)	D_{ij} / (µg/g)	U_{ij} / (µg/g)	D_{ij} / (µg/g)	U_{ij} / (µg/g)	D_{ij} / (µg/g)	U_{ij} / (µg/g)
IRMM	**0.143**	0.216			**0.174**	0.263	**0.167**	0.213	**0.083**	0.221	**0.149**	0.219
KRISS	**-0.031**	0.164	**-0.174**	0.263			**-0.007**	0.160	**-0.091**	0.171	**-0.025**	0.168
LGC	**-0.024**	0.071	**-0.167**	0.213	**0.007**	0.160			**-0.084**	0.091	**-0.018**	0.060
NIST	**0.060**	0.093	**-0.083**	0.221	**0.091**	0.171	**0.084**	0.091			**0.066**	0.094
PTB	**-0.006**	0.074	**-0.149**	0.219	**0.025**	0.168	**0.018**	0.060	**-0.066**	0.094		

CCQM-K12 Creatinine in Human Serum (Material I)

Degrees of equivalence D_i and expanded uncertainty at a 95% level of confidence U_i



CCQM-K12 and EURAMET.QM-K12

Key comparison CCQM-K12

MEASURAND: **Mass fraction of creatinine in human serum**
Material II (elevated range)

x_i **:** **result of measurement carried out by laboratory** ***i***
u_i **:** **combined standard uncertainty of** x_i

Lab *i*	x_i / (µg/g)	u_i / (µg/g)
IRMM	18.720	0.2396
KRISS	18.539	0.1627
LGC	18.614	0.0316
NIST	18.708	0.0722
PTB	18.718	0.0650

Key comparison EURAMET.QM-K12

MEASURAND: **Mass fraction of creatinine in human serum**

$x_{i\text{-EUR}}$ **:** **result of measurement carried out by laboratory** ***i*** **participant in EURAMET.QM-K12**
$u_{i\text{-EUR}}$ **:** **combined standard uncertainty of** $x_{i\text{-EUR}}$

Material A - high level

Lab *i*	$x_{i\text{-EUR}}$ / (µg/g)	$u_{i\text{-EUR}}$ / (µg/g)
LGC	53.50	0.27
LNE	54.04	0.22
HSA	54.24	0.29
EXHM/GCSL-EIM	54.509	0.697
PTB	55.06	0.41

Material B - low level

Lab *i*	$x_{i\text{-EUR}}$ / (µg/g)	$u_{i\text{-EUR}}$ / (µg/g)
LGC	37.71	0.12
LNE	37.70	0.22
HSA	37.94	0.22
EXHM/GCSL-EIM	38.438	0.4534
PTB	38.28	0.29

Key comparison CCQM-K12

MEASURAND: **Mass fraction of creatinine in human serum**
Material II (elevated range)

The key comparison reference value calculated as the mean of the participant results, excluding IRMM is: x_R = 18.645 µg/g.
The expanded uncertainty of the key comparison reference value at a 95 % level of confidence is: U_R = 0.135 µg/g.

The degree of equivalence of each laboratory with respect to the reference value is given by a pair of terms:
$D_i = (x_i - x_R)$ and U_i, its expanded uncertainty corresponding to a 95% level of confidence, both expressed in µg/g.
D_i and U_i are also given in relative terms.

The degree of equivalence between two laboratories is given by a pair of terms:
$D_{ij} = D_i - D_j = (x_i - x_R) - (x_j - x_R) = x_i - x_j$ and U_{ij}, its expanded uncertainty corresponding to a 95% level of confidence, both expressed in µg/g.

Linking EURAMET.QM-K12 to key comparison CCQM-K12

The linkage is obtained through the common participation of PTB and LGC in both key comparisons and is explained on page 14 of the EURAMET.QM-K12 Final Report. The set of results obtained for Material II in CCQM-K12 was used to linked the results obtained for both material A and B in EURAMET.QM-K12, as this was closer in mass fraction nominal value. It leads to the computation of the degrees of equivalence of participants in EURAMET.QM-K12 relative to the CCQM-K12 reference value, and the D_i and U_i values are given in relative terms.

No pair-wise degrees of equivalence involving participants in EURAMET.QM-K12 only have been computed.

Degrees of equivalence D_i and U_i expressed in relative terms

Lab *i* ⇩	D_i/x_R / %	U_i/x_R / %
IRMM	0.40	2.61
KRISS	-0.57	1.78
LGC	-0.16	0.67
NIST	0.34	1.10
PTB	0.39	0.86
LGC	-1.42	1.38
LNE	-0.42	1.25
HSA	-0.06	1.43
EXHM/GCSL-EIM	0.44	2.74
PTB	1.46	1.78
LGC	-0.80	1.01
LNE	-0.82	1.40
HSA	-0.19	1.38
EXHM/GCSL-EIM	1.12	2.51
PTB	0.70	1.72

Black indicates participants in CCQM-K12

Blue indicates participants in EURAMET.QM-K12 (Material A)

Green indicates participants in EURAMET.QM-K12 (Material B)

Key comparison CCQM-K12

MEASURAND: **Mass fraction of creatinine in human serum**
Material II (elevated range)

Matrix of equivalence in absolute terms

Lab *j* ⇨

Lab *i* ⇩

	D_i / (µg/g)	U_i / (µg/g)	IRMM		KRISS		LGC		NIST		PTB	
			D_{ij} / (µg/g)	U_{ij} / (µg/g)	D_{ij} / (µg/g)	U_{ij} / (µg/g)	D_{ij} / (µg/g)	U_{ij} / (µg/g)	D_{ij} / (µg/g)	U_{ij} / (µg/g)	D_{ij} / (µg/g)	U_{ij} / (µg/g)
IRMM	**0.075**	0.487			**0.181**	0.574	**0.106**	0.484	**0.012**	0.501	**0.002**	0.496
KRISS	**-0.106**	0.331	**-0.181**	0.574			**-0.075**	0.326	**-0.169**	0.353	**-0.179**	0.345
LGC	**-0.031**	0.125	**-0.106**	0.484	**0.075**	0.326			**-0.094**	0.203	**-0.104**	0.145
NIST	**0.063**	0.205	**-0.012**	0.501	**0.169**	0.353	**0.094**	0.203			**-0.010**	0.214
PTB	**0.073**	0.161	**-0.002**	0.496	**0.179**	0.345	**0.104**	0.145	**0.010**	0.214		

CCQM-K12 and EURAMET.QM-K12 Creatinine in Human Serum (Material II)

Degrees of equivalence D_i and expanded uncertainty at a 95% level of confidence U_i expressed in relative terms