Key comparison CCQM-K4

MEASURAND: **Amount-of-substance fraction of ethanol in air**
NOMINAL VALUE: **120 µmol/mol**

x_i: **result of measurement carried out by laboratory *i***
u_i: **combined standard uncertainty of x_i**
$x_{i\,grav}$: **gravimetric value of the ethanol amount-of-substance fraction in the cylinder received by laboratory *i***
$u_{i\,grav}$: **combined standard uncertainty of $x_{i\,grav}$**

Lab *i*	x_i / (µmol/mol)	u_i / (µmol/mol)	$x_{i\,grav}$ / (µmol/mol)	$u_{i\,grav}$ / (µmol/mol)	Date of measurement
BNM-LNE	121.40	1.35	120.59	0.05	Aug 99
NPL	120.50	0.50	120.49	0.05	Oct 99
VNIIM	124.70	0.35	120.67	0.05	Jun 99
NIST	121.50	0.60	120.48	0.05	Mar 99
NMi-VSL	120.80	0.60	120.84	0.05	May 99
NRCCRM	112.0	1.0	120.68	0.05	Jul 99
NMIJ	121.04	0.23	120.76	0.05	Apr 99
OMH	119.30	0.22	120.39	0.05	May 99

Key comparison EUROMET.QM-K4

MEASURAND: **Amount-of-substance fraction of ethanol in air**
NOMINAL VALUE: **120 µmol/mol**

$x_{i\text{-EUR}}$: **result of measurement carried out by laboratory *i***
$u_{i\text{-EUR}}$: **combined standard uncertainty of $x_{i\text{-EUR}}$**
$x_{i\,\text{grav-EUR}}$: **gravimetric value of the ethanol amount-of-substance fraction in the cylinder received by laboratory *i***
$u_{i\,\text{grav-EUR}}$: **combined standard uncertainty of $x_{i\,\text{grav-EUR}}$**

Lab *i*	$x_{i\text{-EUR}}$ / (µmol/mol)	$u_{i\text{-EUR}}$ / (µmol/mol)	$x_{i\,\text{grav-EUR}}$ / (µmol/mol)	$u_{i\,\text{grav-EUR}}$ / (µmol/mol)	Date of measurement
BNM-LNE	119.10	0.60	120.04	0.05	Dec 00
NPL	119.08	0.25	118.99	0.05	Nov 00
VNIIM	118.60	0.60	118.52	0.05	Dec 00
CSIR-NML	119.20	0.78	118.99	0.05	Dec 00
IPQ	119.65	0.55	119.62	0.05	Nov 00
SMU	118.88	0.30	118.68	0.05	Apr 01

CSIR-NML originally submitted an expanded uncertainty (k = 2) of 3.2 µmol/mol. However, an error in the calculation of this uncertainty was identified some time after the report had been submitted. Subsequently, CSIR-NML submitted an amended report containing a corrected value of 1.56 µmol/mol. This change in the value of the uncertainty was approved in the 8th CCQM meeting held on 18 and 19 April 2002.

Key comparison APMP.QM-K4

MEASURAND: **Amount-of-substance fraction of ethanol in air**
NOMINAL VALUE: **120 µmol/mol**

$x_{i\text{-APMP}}$: **result of measurement carried out by laboratory *i***
$u_{i\text{-APMP}}$: **combined standard uncertainty of $x_{i\text{-APMP}}$**
$x_{i\text{ grav-APMP}}$: **gravimetric value of the ethanol amount-of-substance fraction in the cylinder received by laboratory *i***
$u_{i\text{ grav-APMP}}$: **combined standard uncertainty of $x_{i\text{ grav-APMP}}$**

Lab *i*	$x_{i\text{-APMP}}$ / (µmol/mol)	$u_{i\text{-APMP}}$ / (µmol/mol)	$x_{i\text{ grav-APMP}}$ / (µmol/mol)	$u_{i\text{ grav-APMP}}$ / (µmol/mol)	Date of measurement
CMS/ITRI	121.27	1.76	121.15	0.184	Nov, Dec 00
KRISS	120.27	0.37	121.57	0.185	Jul, Aug, Nov 00
NMIJ	119.31	0.16	119.45	0.182	Jun 00
CSIR-NML	122.31	0.36	121.72	0.185	Dec 00

CSIR-NML originally submitted an expanded uncertainty (k = 2) of 4.1 µmol/mol. However, an error in the calculation of this uncertainty was identified some time after the report had been submitted. Subsequently, CSIR-NML submitted an amended report containing a corrected value of 0.72 µmol/mol. This change in the value of the uncertainty was approved in the CCQM Gas analysis working group meeting held in October 2003.

Key comparison APMP.QM-K4.1

MEASURAND: **Amount-of-substance fraction of ethanol in nitrogen**
NOMINAL VALUE: **120 µmol/mol**

$x_{i\text{-APMP1}}$: **result of measurement carried out by laboratory *i***
$u_{i\text{-APMP1}}$: **combined standard uncertainty of $x_{i\text{-APMP1}}$**
$x_{i\ \text{grav-APMP1}}$: **gravimetric value of the ethanol amount-of-substance fraction in the cylinder received by laboratory *i***
$u_{i\ \text{grav-APMP1}}$: **combined standard uncertainty of $x_{i\ \text{grav-APMP1}}$**

Lab *i*	$x_{i\text{-APMP1}}$ / (µmol/mol)	$u_{i\text{-APMP1}}$ / (µmol/mol)	$x_{i\ \text{grav-APMP1}}$ / (µmol/mol)	$u_{i\ \text{grav-APMP1}}$ / (µmol/mol)	Date of measurement
CERI	110.20	0.187	110.21	0.08	Nov 05
KRISS	105.37	0.223	105.32	0.08	Apr 06
NIM	116.4	1.164	113.18	0.08	Jan, Feb 06

Key comparison EURAMET.QM-K4.1

MEASURAND: **Amount-of-substance fraction of ethanol in nitrogen**
NOMINAL VALUE: **120 µmol/mol**

$x_{i\text{-EUR1}}$: **result of measurement carried out by laboratory** i
$u_{i\text{-EUR1}}$: **combined standard uncertainty of** $x_{i\text{-EUR1}}$
$x_{i\text{ grav-EUR1}}$: **gravimetric value of the ethanol amount-of-substance fraction in the cylinder received by laboratory** i
$u_{i\text{ grav-EUR1}}$: **combined standard uncertainty of** $x_{i\text{ grav-EUR1}}$

Lab i	$x_{i\text{-EUR1}}$ / (µmol/mol)	$u_{i\text{-EUR1}}$ / (µmol/mol)	$x_{i\text{ grav-EUR1}}$ / (µmol/mol)	$u_{i\text{ grav-EUR1}}$ / (µmol/mol)	Date of measurement
CEM	122.0	1.9	120.66	0.32	Nov 09
INMETRO	121.4	0.8	120.25	0.32	Sep 09
NMISA	120.79	0.49	120.45	0.32	Dec 09
NPL	120.6	0.2	120.79	0.32	Sep 09
VNIIM	119.04	0.25	120.36	0.32	Nov 09
VSL	120.65	0.42	120.66	0.32	Aug 09

Key comparison CCQM-K4

MEASURAND: Amount-of-substance fraction of ethanol in air **NOMINAL VALUE: 120 µmol/mol**

Key comparison reference value: there is no single key comparison reference value for CCQM-K4 the value $x_{i\,grav}$ is taken as the reference value for laboratory *i* participant in CCQM-K4.

The degree of equivalence of laboratory *i* participant in CCQM-K4 with respect to the reference value is given by a pair of terms: $D_i = (x_i - x_{i\,grav})$ and U_i, its expanded uncertainty ($k = 2$), both expressed in µmol/mol, $U_i = 2(u_i^2 + u_{i\,grav}^2)^{1/2}$.

The degree of equivalence between two laboratories *i* and *j* participant in CCQM-K4 is given by a pair of terms: $D_{ij} = D_i - D_j$ and U_{ij}, its expanded uncertainty ($k = 2$), both expressed in µmol/mol, $U_{ij} = (U_i^2 + U_j^2)^{1/2}$.

Key comparison EUROMET.QM-K4

MEASURAND: Amount-of-substance fraction of ethanol in air **NOMINAL VALUE: 120 µmol/mol**

The gravimetric value $x_{i\,grav\text{-}EUR}$ is taken as reference value for laboratory *i* participant in EUROMET.QM-K4.

The degree of equivalence of laboratory *i* participant in EUROMET.QM-K4 with respect to the reference value is given by a pair of terms: $D_{i\text{-}EUR} = (x_{i\text{-}EUR} - x_{i\,grav\text{-}EUR})$ and $U_{i\text{-}EUR}$, its expanded uncertainty ($k = 2$), both expressed in µmol/mol, $U_{i\text{-}EUR} = 2(u_{i\text{-}EUR}^2 + u_{i\,grav\text{-}EUR}^2)^{1/2}$.

Key comparison APMP.QM-K4

MEASURAND: Amount-of-substance fraction of ethanol in air **NOMINAL VALUE: 120 µmol/mol**

The gravimetric value $x_{i\,grav\text{-}APMP}$ is taken as reference value for laboratory *i* participant in APMP.QM-K4.

The degree of equivalence of laboratory *i* participant in APMP.QM-K4 with respect to the reference value is given by a pair of terms: $D_{i\text{-}APMP} = (x_{i\text{-}APMP} - x_{i\,grav\text{-}APMP})$ and $U_{i\text{-}APMP}$, its expanded uncertainty ($k = 2$), both expressed in µmol/mol, $U_{i\text{-}APMP} = 2(u_{i\text{-}APMP}^2 + u_{i\,grav\text{-}APMP}^2)^{1/2}$.

Key comparison APMP.QM-K4.1

MEASURAND: **Amount-of-substance fraction of ethanol in nitrogen** **NOMINAL VALUE: 120 µmol/mol**

The gravimetric value $x_{i\ \text{grav-APMP1}}$ is taken as reference value for laboratory *i* participant in APMP.QM-K4.1

The degree of equivalence of laboratory *i* participant in APMP.QM-K4.1 with respect to the reference value is given by a pair of terms: $D_{i\text{-APMP1}} = (x_{i\text{-APMP1}} - x_{i\ \text{grav-APMP1}})$ and $U_{i\text{-APMP1}}$, its expanded uncertainty ($k = 2$), both expressed in µmol/mol, $U_{i\text{-APMP1}} = 2(u_{i\text{-APMP1}}^2 + u_{i\ \text{grav-APMP1}}^2)^{1/2}$.

Key comparison EURAMET.QM-K4.1

MEASURAND: **Amount-of-substance fraction of ethanol in nitrogen** **NOMINAL VALUE: 120 µmol/mol**

The gravimetric value $x_{i\ \text{grav-EUR1}}$ is taken as reference value for laboratory *i* participant in EURAMET.QM-K4.1

The degree of equivalence of laboratory *i* participant in EURAMET.QM-K4.1 with respect to the reference value is given by a pair of terms: $D_{i\text{-EUR1}} = (x_{i\text{-EUR1}} - x_{i\ \text{grav-EUR1}})$ and $U_{i\text{-EUR1}}$, its expanded uncertainty ($k = 2$), both expressed in µmol/mol. $U_{i\text{-EUR1}}$ is computed according to equation 8 of the EURAMET.QM-K4.1 Final Report.

Linking EUROMET.QM-K4 to CCQM-K4

The range of gravimetric values of the standards used in both comparisons is very small, so both comparisons are referred to the same nominal amount-of-substance fraction of 120 µmol/mol.

The link between EUROMET.QM-K4 and CCQM-K4 is given by the gravimetric values delivered by NPL for both comparisons.

The laboratories common to both comparisons are the BNM-LNE, the NPL and the VNIIM. The result of VNIIM deviated significantly from the reference value in CCQM-K4. The degrees of equivalence of BNM-LNE and NPL obtained in both comparisons are given in the following table:

	CCQM-K4		EUROMET.QM-K4	
	D_i / (µmol/mol)	U_i	$D_{i\text{-EUR}}$ / (µmol/mol)	$U_{i\text{-EUR}}$
BNM-LNE	**0.81**	2.70	**-0.94**	1.20
NPL	**0.01**	1.00	**0.09**	0.51

Since the results from both BNM-LNE and NPL are comparable with the gravimetric values within their claimed uncertainty in both comparisons, they provide validation that the gravimetric values act as valid reference values.
It follows that:

The degrees of equivalence with respect to the reference values obtained in EUROMET.QM-K4 are transferred to CCQM-K4 without correction: $D_i = D_{i\text{-EUR}}$ and $U_i = U_{i\text{-EUR}}$.

Linking APMP.QM-K4 to CCQM-K4

The range of gravimetric values of the standards used in both comparisons is very small, so both comparisons are referred to the same nominal amount-of-substance fraction of 120 µmol/mol.

The link between APMP.QM-K4 and CCQM-K4 is given by the gravimetric values delivered by NMIJ for APMP.QM-K4 and by NPL for CCQM-K4.

The laboratory common to both comparisons is NMIJ. The degrees of equivalence of NMIJ in both comparisons are given in the following table:

	CCQM-K4		APMP.QM-K4	
	D_i / (µmol/mol)	U_i	$D_{i\text{-APMP}}$ / (µmol/mol)	$U_{i\text{-APMP}}$
NMIJ	**0.28**	0.47	**-0.14**	0.48

Since the results from NMIJ are comparable with the gravimetric values within their claimed uncertainty in both comparisons, they provide validation that the gravimetric values act as valid reference values
It follows that:

The degrees of equivalence with respect to the reference values obtained in APMP.QM-K4 are transferred to CCQM-K4 without correction: $D_i = D_{i\text{-APMP}}$ and $U_i = U_{i\text{-APMP}}$.

Linking APMP.QM-K4.1 to CCQM-K4

Discussion on the link is given on page 3 of the APMP.QM-K4.1 Final Report. CERI, which participated in CCQM-K4 in the name of NMIJ, acts as the linking laboratory between key comparisons APMP.QM-K4.1 and CCQM.K4.

The degrees of equivalence with respect to the reference values obtained in APMP.QM-K4.1 are transferred to CCQM-K4 without correction: $D_i = D_{i\text{-APMP1}}$ and $U_i = U_{i\text{-APMP1}}$.

The degree of equivalence between two laboratories *i* and *j*, one and the other participant in any one of the four comparisons CCQM-K4, EUROMET.QM-K4, APMP.QM-K4, and APMP.QM-K4.1 is given by a pair of terms: $D_{ij} = D_i - D_j$ and U_{ij}, its expanded uncertainty ($k = 2$), both expressed in µmol/mol, $U_{ij} = (U_i^2 + U_j^2)^{1/2}$.

Linking EURAMET.QM-K4.1 to CCQM-K4

The range of gravimetric values of the standards used in both comparisons is very small, so both comparisons are referred to the same nominal amount-of-substance fraction of 120 µmol/mol.

The link between EURAMET.QM-K4.1 and CCQM-K4 is given by the gravimetric values delivered by VSL for EURAMET.QM-K4.1 and NPL for CCQM-K4.

The laboratories common to both comparisons are NPL and VSL. Their degrees of equivalence in both comparisons are given in the following table:

	CCQM-K4		EURAMET.QM-K4.1	
	D_i / (µmol/mol)	U_i	$D_{i\text{-EUR}}$ / (µmol/mol)	$U_{i\text{-EUR}}$
NPL	**0.01**	1.00	**-0.19**	0.75
VSL	**-0.04**	1.20	**-0.01**	1.06

Since the results from both NPL and VSL are comparable with the gravimetric values within their claimed uncertainties in both comparisons, they provide validation that the gravimetric values act as valid reference values.
It follows that:

The degrees of equivalence with respect to the reference values obtained in EURAMET.QM-K4.1 are transferred to CCQM-K4 without correction: $D_i = D_{i\text{-EUR1}}$ and $U_i = U_{i\text{-EUR1}}$.

These statements make it possible to extend the CCQM-K4 matrix of equivalence to the full matrix of equivalence involving all participants in CCQM-K4, EUROMET.QM-K4, APMP.QM-K4, APMP.QM-K4.1, and EURAMET.QM-K4.1.

In the following the pair-wise degrees of equivalence are explicitely computed between CCQM-K4 and EUROMET.QM-K4, and inside APMP.QM-K4 and APMP.QM-K4.1. No pair-wise degrees of equivalence involving EURAMET.QM-K4.1 participants have been computed.

Key comparisons CCQM-K4, EUROMET.QM-K4, APMP.QM-K4, APMP.QM-K4.1, and EURAMET.QM-K4.1

Degrees of equivalence relative to the key comparison reference values

Lab *i* ⇩

	D_i / (µmol/mol)	U_i
BNM-LNE	**0.81**	2.70
NPL	**0.01**	1.00
VNIIM	**4.03**	0.71
NIST	**1.02**	1.20
NMi-VSL	**-0.04**	1.20
NRCCRM	**-8.68**	2.00
NMIJ	**0.28**	0.47
OMH	**-1.09**	0.45
BNM-LNE	**-0.94**	1.20
NPL	**0.09**	0.51
VNIIM	**0.08**	1.20
CSIR-NML	**0.22**	1.56
IPQ	**0.03**	1.09
SMU	**0.20**	0.61
CMS/ITRI	**0.12**	3.54
KRISS	**-1.30**	0.82
NMIJ	**-0.14**	0.48
CSIR-NML	**0.59**	0.81
CERI	**-0.01**	0.41
KRISS	**0.05**	0.47
NIM	**3.22**	2.33
CEM	**1.34**	3.85
INMETRO	**1.15**	1.72
NMISA	**0.34**	1.17
NPL	**-0.19**	0.75
VNIIM	**-1.32**	0.81
VSL	**-0.01**	1.06

Participant in CCQM-K4 (1999)
Participant in EUROMET.QM-K4 (2000 - 2001)
Participant in APMP.QM-K4 (2000)
Participant in APMP.QM-K4.1 (2005 - 2006)
Participant in EURAMET.QM-K4.1 (2009)

Key comparisons CCQM-K4, EUROMET.QM-K4, APMP.QM-K4, and APMP.QM-K4.1: pair-wise degrees of equivalence

MEASURAND: Amount-of-substance fraction of ethanol in air
NOMINAL VALUE: 120 µmol/mol

Lab *j* ⟹

Lab *i* ⇩

	BNM-LNE		NPL		VNIIM		NIST		NMi-VSL		NRCCRM		NMIJ		OMH	
	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}
BNM-LNE			**0.80**	2.88	**-3.22**	2.79	**-0.21**	2.96	**0.85**	2.96	**9.49**	3.36	**0.53**	2.74	**1.90**	2.74
NPL	**-0.80**	2.88			**-4.02**	1.23	**-1.01**	1.57	**0.05**	1.57	**8.69**	2.24	**-0.27**	1.11	**1.10**	1.10
VNIIM	**3.22**	2.79	**4.02**	1.23			**3.01**	1.40	**4.07**	1.40	**12.71**	2.12	**3.75**	0.85	**5.12**	0.84
NIST	**0.21**	2.96	**1.01**	1.57	**-3.01**	1.40			**1.06**	1.70	**9.70**	2.34	**0.74**	1.29	**2.11**	1.29
NMi-VSL	**-0.85**	2.96	**-0.05**	1.57	**-4.07**	1.40	**-1.06**	1.70			**8.64**	2.34	**-0.32**	1.29	**1.05**	1.29
NRCCRM	**-9.49**	3.36	**-8.69**	2.24	**-12.71**	2.12	**-9.70**	2.34	**-8.64**	2.34			**-8.96**	2.06	**-7.59**	2.05
NMIJ	**-0.53**	2.74	**0.27**	1.11	**-3.75**	0.85	**-0.74**	1.29	**0.32**	1.29	**8.96**	2.06			**1.37**	0.65
OMH	**-1.90**	2.74	**-1.10**	1.10	**-5.12**	0.84	**-2.11**	1.29	**-1.05**	1.29	**7.59**	2.05	**-1.37**	0.65		

BNM-LNE			**-0.95**	1.57	**-4.97**	1.40	**-1.96**	1.70	**-0.90**	1.70	**7.74**	2.34	**-1.22**	1.29	**0.15**	1.29
NPL	**-0.72**	2.75			**-3.94**	0.87	**-0.93**	1.31	**0.13**	1.31	**8.77**	2.07	**-0.19**	0.69	**1.18**	0.68
VNIIM	**-0.73**	2.96	**0.07**	1.56			**-0.94**	1.70	**0.12**	1.70	**8.76**	2.34	**-0.20**	1.29	**1.17**	1.29
CSIR-NML	**-0.59**	3.11	**0.21**	1.85	**-3.81**	1.71	**-0.80**	1.97	**0.26**	1.97	**8.90**	2.54	**-0.06**	1.63	**1.31**	1.62
IPQ	**-0.78**	2.92	**0.02**	1.49	**-4.00**	1.31	**-0.99**	1.63	**0.07**	1.63	**8.71**	2.29	**-0.25**	1.20	**1.12**	1.19
SMU	**-0.61**	2.77	**0.19**	1.17	**-3.83**	0.93	**-0.82**	1.35	**0.24**	1.35	**8.88**	2.09	**-0.08**	0.77	**1.29**	0.76

	CMS/ITRI		KRISS		NMIJ		CSIR-NML	
	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}
CMS/ITRI			**1.42**	3.63	**0.26**	3.57	**-0.47**	3.63
KRISS	**-1.42**	3.63			**-1.17**	0.95	**-1.89**	1.15
NMIJ	**-0.26**	3.57	**1.17**	0.95			**-0.73**	0.94
CSIR-NML	**0.47**	3.63	**1.89**	1.15	**0.73**	0.94		

No pair-wide degrees of equivalence involving participants in EURAMET.QM-K4.1 have been computed.

Key comparisons CCQM-K4, EUROMET.QM-K4, APMP.QM-K4, and APMP.QM-K4.1: pair-wise degrees of equivalence

MEASURAND:
NOMINAL VALUE:

Lab *j* ⟹

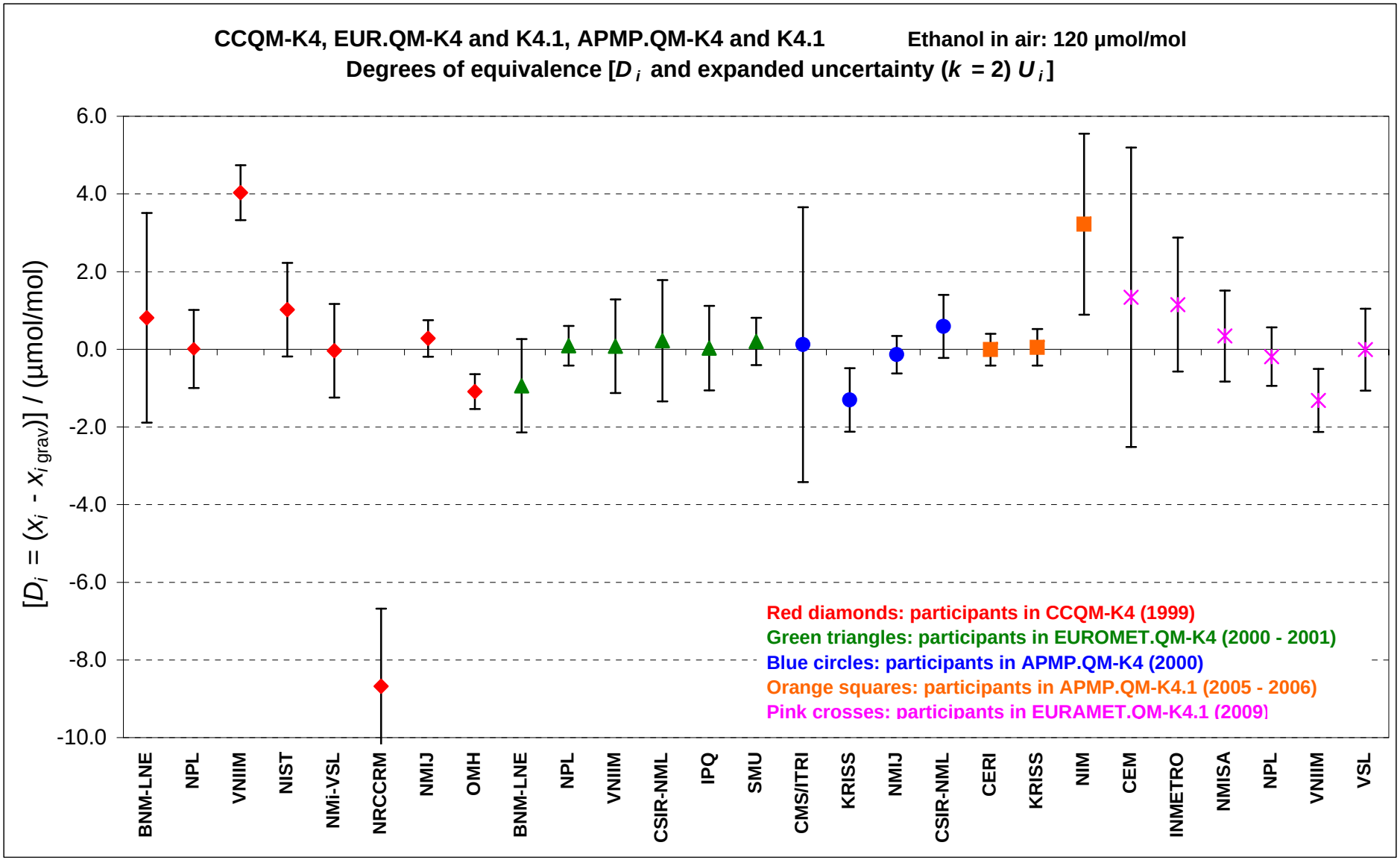
Lab *i* ⇩

	BNM-LNE		NPL		VNIIM		CSIR-NML		IPQ		SMU	
	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}
BNM-LNE			**0.72**	2.75	**0.73**	2.96	**0.59**	3.11	**0.78**	2.92	**0.61**	2.77
NPL	**0.95**	1.57			**-0.07**	1.56	**-0.21**	1.85	**-0.02**	1.49	**-0.19**	1.17
VNIIM	**4.97**	1.40	**3.94**	0.87			**3.81**	1.71	**4.00**	1.31	**3.83**	0.93
NIST	**1.96**	1.70	**0.93**	1.31	**0.94**	1.70	**0.80**	1.97	**0.99**	1.63	**0.82**	1.35
NMi-VSL	**0.90**	1.70	**-0.13**	1.31	**-0.12**	1.70	**-0.26**	1.97	**-0.07**	1.63	**-0.24**	1.35
NRCCRM	**-7.74**	2.34	**-8.77**	2.07	**-8.76**	2.34	**-8.90**	2.54	**-8.71**	2.29	**-8.88**	2.09
NMIJ	**1.22**	1.29	**0.19**	0.69	**0.20**	1.29	**0.06**	1.63	**0.25**	1.20	**0.08**	0.77
OMH	**-0.15**	1.29	**-1.18**	0.68	**-1.17**	1.29	**-1.31**	1.62	**-1.12**	1.19	**-1.29**	0.76

BNM-LNE			**-1.03**	1.31	**-1.02**	1.70	**-1.16**	1.97	**-0.97**	1.63	**-1.14**	1.35
NPL	**1.03**	1.31			**0.01**	1.31	**-0.13**	1.64	**0.06**	1.20	**-0.11**	0.79
VNIIM	**1.02**	1.70	**-0.01**	1.31			**-0.14**	1.97	**0.05**	1.63	**-0.12**	1.35
CSIR-NML	**1.16**	1.97	**0.13**	1.64	**0.14**	1.97			**0.19**	1.91	**0.02**	1.68
IPQ	**0.97**	1.63	**-0.06**	1.20	**-0.05**	1.63	**-0.19**	1.91			**-0.17**	1.26
SMU	**1.14**	1.35	**0.11**	0.79	**0.12**	1.35	**-0.02**	1.68	**0.17**	1.26		

	CERI		KRISS		NIM	
	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}	D_{ij} / (µmol/mol)	U_{ij}
CERI			**-0.06**	0.62	**-3.23**	2.37
KRISS	**0.06**	0.62			**-3.17**	2.38
NIM	**3.23**	2.37	**3.17**	2.38		

No pair-wide degrees of equivalence involving participants in EURAMET.QM-K4.1 have been computed.



Note: CERI participated in CCQM-K4 and APMP.QM-K4 in the name of NMIJ