Key comparison CCM.FF-K4

MEASURAND : Volume
NOMINAL VALUE : 20 L
THREE TRANSFER STANDARDS

x_i : volume of water the transfer standard is able to deliver after a 60 second period of dripping-off at a reference temperature of 20 °C, measured by laboratory *i*
u_i : standard uncertainty of x_i

Lab *i*	x_i / mL	u_i / mL	x_i / mL	u_i / mL	x_i / mL	u_i / mL	Date of measurement
	Transfer standard TS 710-04		Transfer standard TS 710-05		Transfer standard TS 710-06		
CENAM	19 996.71	0.17	19 997.31	0.17	20 005.60	0.17	December 2003
NIST	19 996.42	0.38	19 996.83	0.25	20 005.04	0.37	January 2004
NRC	19 996.88	0.31	19 997.75	0.31	20 005.98	0.31	March 2004
SP	19 992.87	0.36	19 997.40	0.36	20 005.63	0.36	April 2004
PTB	19 996.80	0.20	19 997.44	0.20	20 005.54	0.20	June 2004
INRIM	19 997.30	0.13	19 998.00	0.15	20 005.96	0.14	August to October 2004
NMIA	19 996.80	0.23	19 997.16	0.22	20 005.59	0.22	October to December 2004
INMETRO	19 996.77	0.15	19 997.33	0.14	20 005.54	0.15	February 2005

Key comparison CCM.FF-K4

MEASURAND : Volume
NOMINAL VALUE : 100 mL
SIX TRANSFER STANDARDS

x_i : volume of water the transfer standard contains at a reference temperature of 20 °C, measured by laboratory *i*
u_i : standard uncertainty of x_i

Lab *i*	x_i / mL	u_i / mL	x_i / mL	u_i / mL	x_i / mL	u_i / mL	Date of measurement
	Transfer standard TS 03.04.03		Transfer standard TS 03.04.04		Transfer standard TS 03.01.13		
CENAM	99.893 5	0.000 77	100.159 4	0.000 87	98.630 0	0.000 86	December 2003
NRC	99.897 8	0.000 80	100.163 6	0.000 75	98.633 6	0.000 95	March 2004
SP	99.895 0	0.001 6	100.161 2	0.001 6	98.631 0	0.001 4	April 2004
INRIM	99.893 0	0.000 83	100.157 8	0.000 84	98.629 5	0.000 84	August to October 2004
NMIA	99.895 5	0.001 1	100.160 9	0.001 1	98.631 6	0.000 98	October to December 2004
INMETRO	99.892 9	0.000 61	100.158 5	0.000 72	98.631 5	0.000 65	February 2005

Lab *i*	x_i / mL	u_i / mL	x_i / mL	u_i / mL	x_i / mL	u_i / mL	Date of measurement
	Transfer standard TS 03.01.14		Transfer standard TS 03.01.15		Transfer standard TS 03.01.17		
CENAM	97.702 4	0.000 85	98.398 8	0.000 81	102.184 0	0.001 1	December 2003
NRC	97.707 7	0.000 85	98.403 6	0.001 0	102.188 7	0.000 95	March 2004
SP	97.705 6	0.001 4	98.401 0	0.001 4	102.186 2	0.001 6	April 2004
INRIM	97.702 2	0.000 85	98.398 6	0.000 84	102.183 1	0.000 84	August to October 2004
NMIA	97.704 6	0.001 0	98.399 9	0.000 99	102.184 6	0.000 98	October to December 2004
INMETRO	97.703 2	0.000 71	98.398 4	0.000 64	102.182 3	0.000 76	February 2005

Key comparison EUROMET.M.FF-K4

MEASURAND : Volume
NOMINAL VALUE : 100 mL

$x_{i\text{-EUR}}$: volume of water measured by laboratory *i* participant in EUROMET.M.FF-K4 (see Table 6 on page 8 of the Final Report)
$u_{i\text{-EUR}}$: standard uncertainty of $x_{i\text{-EUR}}$

Lab *i*	$x_{i\text{-EUR}}$ / mL	$u_{i\text{-EUR}}$ / mL	Date of measurement
IPQ	100.0917	0.0012	March 2003
CMI	100.0878	0.0028	November 2002
LNE	100.0924	0.0007	January 2003
FORCE	100.0918	0.0050	February 2003
PTB	100.0903	0.0006	March 2003
NMi-VSL	100.0926	0.0030	April 2003
UME	100.0936	0.0043	June 2003
CEM	100.0928	0.0009	July 2003
INRIM	100.0922	0.0012	September 2003
OMH	100.0904	0.0008	November 2003
EIM	100.1017	0.0077	December 2003
BEV	100.0927	0.00205	January 2004
SP	100.0920	0.0039	March 2004

Key comparison EURAMET.M.FF-K4.b

MEASURAND : Volume
NOMINAL VALUE : 20 L
TRANSFER STANDARD: TS 710-04FyV

$x_{i\text{-EUR.b}}$: volume of water measured by laboratory *i* participant in EURAMET.M.FF-K4.b
$U_{i\text{-EUR.b}}$: expanded uncertainty (k = 2) of $x_{i\text{-EUR.b}}$

Lab *i*	$x_{i\text{-EUR.b}}$ / mL	$U_{i\text{-EUR.b}}$ / mL	Date of measurement
SP	20 002.44	0.49	May 2007
JV	20 002.87	0.80	July 2007
METAS	20 000.95	1.22	August 2007
IPQ	20 002.47	0.58	August 2007
VSL	20 002.07	0.70	September 2007
SMU	20 001.72	0.40	September 2007
MKEH	20 002.32	0.36	October 2007
INRIM	20 002.14	0.39	November 2007
PTB	20 002.04	0.39	January 2008
DMDM	20 002.05	0.68	February 2008
UME	20 002.23	0.39	February 2008
EIM	20 001.95	0.33	March 2008
BEV	20 002.11	0.48	April 2008
CMI	20 000.95	1.74	April 2008

Key comparison SIM.M.FF-K4

MEASURAND : Volume
NOMINAL VALUE : 20 L
TRANSFER STANDARD : TS 710-05

$x_{i\text{-SIM}}$: volume of water measured by laboratory *i* participant in SIM.M.FF-K4
$u_{i\text{-SIM}}$: standard uncertainty of $x_{i\text{-SIM}}$

Lab *i*	$x_{i\text{-SIM}}$ / mL	$u_{i\text{-SIM}}$ / mL	Date of measurement
	Transfer standard TS 710-05		
CENAM	19 995.03	0.25	January 2007
NIST	19 995.79	0.59	March 2007
BSJ	19 996.62	6.40	April 2007
LACOMET	19 990.39	1.46	June 2007
CENAMEP AIP	19 995.47	0.53	August 2007
INDECOPI	19 994.45	0.89	October 2007
IBMETRO	19 994.18	0.96	February 2008
LATU	19 993.50	0.59	April 2008
INTI	19 995.04	0.12	August 2008
INMETRO	19 995.06	0.23	October 2008

Key comparison SIM.M.FF-K4

MEASURAND : Volume
NOMINAL VALUE : 100 mL
THREE TRANSFER STANDARDS

$x_{i\text{-SIM}}$: volume of water measured by laboratory *i* participant in SIM.M.FF-K4
$u_{i\text{-SIM}}$: standard uncertainty of $x_{i\text{-SIM}}$

Lab *i*	$x_{i\text{-SIM}}$ / mL	$u_{i\text{-SIM}}$ / mL	$x_{i\text{-SIM}}$ / mL	$u_{i\text{-SIM}}$ / mL	$x_{i\text{-SIM}}$ / mL	$u_{i\text{-SIM}}$ / mL	Date of measurement
	Transfer standard TS 03.04.04		Transfer standard TS 03.01.15		Transfer standard TS 03.01.17		
CENAM	99.0802	0.0016	97.9534	0.0016	100.9276	0.0015	January 2007
BSJ	100.1307	0.037	99.0639	0.020			April 2007
LACOMET	99.0818	0.0031	97.9557	0.0031			June 2007
CENAMEP AIP	99.0790	0.0014	97.9500	0.0015			August 2007
INDECOPI	99.0769	0.0035	97.9523	0.0035			October 2007
IBMETRO	99.0833	0.0017			100.9313	0.0017	February 2008
LATU	99.0831	0.0013			100.9339	0.0013	April 2008
INTI	99.0730	0.0030			100.9180	0.0030	August 2008
INMETRO	99.0789	0.00095			100.9280	0.00095	October 2008

During the comparison, one of the pycnometers (serial 03.04.15) suffered an irreversible damage; this occurred after INDECOPI tests. Therefore, pycnometer 03.01.15 was tested by CENAM, BSJ, LACOMET, CENAMEP AIP and INDECOPI. This transfer standard was replaced by pycnometer 03.01.17, which was measured by CENAM, IBMETRO, LATU, INTI and INMETRO.
Degrees of equivalence are computed using results from pycnometer 03.04.04, as it is the only artefact measured by all participants.

Key comparison APMP.M.FF-K4

MEASURAND : Volume
NOMINAL VALUE : 20 L
TRANSFER STANDARD : TS 710-04

$x_{i\text{-APMP}}$: volume of water measured by laboratory *i* participant in APMP.M.FF-K4
$U_{i\text{-APMP}}$: expanded uncertainty of $x_{i\text{-APMP}}$ with coverage factor $k_{i\,\text{APMP}}$

Lab *i*	$x_{i\text{-APMP}}$ / mL	$U_{i\text{-APMP}}$ / mL	$k_{i\text{-APMP}}$	Date of measurement
CENAM	19 992.94	0.65	2.09	July 2006
NMIA	19 992.87	0.44	2	Jul - Aug 2006
SCL	19 992.50	0.50	2	Aug - Sep 2006
KRISS	19 992.87	0.44	2	September 2006
NIM	19 992.98	0.65	1.96	October 2006
NMISA	19 991.57	2.30	2.28	Nov 06 - Jan 07
NIMT	19 990.03	0.95	2	Jan - Feb 2007
NMIJ	19 993.10	2.20	2	Feb - Mar 2007
VMI-STAMEQ	19 992.33	0.66	2	June 2007
MUSSD	19 993.39	0.72	2.19	July 2007
NMIA	19 992.85	0.44	2	Jul - Aug 2007

Key comparison APMP.M.FF-K4

MEASURAND : Volume
NOMINAL VALUE : 100 mL

$x_{i\text{-APMP}}$: volume of water measured by laboratory *i* participant in APMP.M.FF-K4
$U_{i\text{-APMP}}$: expanded uncertainty of $x_{i\text{-APMP}}$ with coverage factor $k_{i\text{ APMP}}$

Lab *i*	$x_{i\text{-APMP}}$ / mL	$U_{i\text{-APMP}}$ / mL	$k_{i\text{-APMP}}$	$x_{i\text{-APMP}}$ / mL	$U_{i\text{-APMP}}$ / mL	$k_{i\text{-APMP}}$	Date of measurement
	Transfer standard 03.04.03			Transfer standard 03.01.17			
CENAM	99.4028	0.0027	2.02	100.9309	0.0033	2.02	July 2006
NMIA	99.4040	0.0020	2	100.9332	0.0021	2	Jul - Aug 2006
SCL	99.3992	0.0070	2	100.9283	0.0070	2	Aug - Sep 2006
NIM	99.4029	0.0016	1.96	100.9336	0.0016	1.96	October 2006
NMISA	99.3953	0.0104	2.37	100.9330	0.0045	2.37	Nov 06 - Jan 07
NIMT	99.3894	0.0024	2	100.9177	0.0024	2	Jan - Feb 2007
VMI-STAMEQ	99.4078	0.0034	2	100.9361	0.0034	2	June 2007
MUSSD	99.3360	0.0067	2	100.9227	0.0064	2	July 2007
NMIA	99.4048	0.0020	2	100.9332	0.0021	2	Jul - Aug 2007

Key comparison CCM.FF-K4 **MEASURAND : Volume** **NOMINAL VALUE : 20 L**

For each of the transfer standard, the key comparison reference value, x_R, is computed either as the median or as the weighted mean of the results. Its expanded uncertainty, U_R, is approximately given at a 95 % level of confidence.
SP is excluded from the analysis for the transfer standard TS 710-04. The details are explained in Appendix C of the CCM.FF-K4 Final Report.

Transfer standard TS 710-04		Transfer standard TS 710-05		Transfer standard TS 710-06	
x_R / mL	U_R / mL	x_R / mL	U_R / mL	x_R / mL	U_R / mL
19 996.80	0.22	19 997.37	0.20	20 005.67	0.14
Median		Median		Weighted mean	

For each transfer standard, the degree of equivalence of laboratory i with respect to the key comparison reference value is determined by a pair of terms, both expressed in relative value: $D_{i\,TS} = (x_i - x_R)/x_R$ and its expanded uncertainty $U_{i\,TS}$ at a ~95 % level of confidence.

The degree of equivalence of laboratory i participating in this key comparison for the 20 L measurements is given by a pair of terms, both expressed in relative value: D_i and its expanded uncertainty U_i at a ~95 % level of confidence determined as the arithmetic average of the degrees of equivalence obtained for each individual transfer standard.

The degree of equivalence between two laboratories i and j is given by a pair of terms, both expressed in relative value: $D_{ij} = (D_i - D_j)$ and its expanded uncertainty U_{ij} at a ~95 % level of confidence.

Linking EURAMET.M.FF-K4.b to CCM.FF-K4

The linking process is described in section 7 of the EURAMET.M.FF-K4.b Final Report.
The matrix of equivalence obtained at 20 L in CCM.FF-K4 is thus extended to EURAMET.M.FF-K4.b participants.
Note: The D_{ij} values given in the Annex 2 of the EURAMET.M.FF-K4.b Final Report correspond to $-D_{ij}$ values shown in the Matrix of equivalence.

Linking SIM.M.FF-K4 to CCM.FF-K4

The regional comparison reference value is first determined as the median of the SIM results for transfer standard TS 710-05, as described in section 8 of the SIM.M.FF-K4 Final Report. Then the linking process uses common participation of CENAM, NIST and INMETRO in both key comparisons, as described in section 9 of the same Report.
Pair-wise degrees of equivalence involving CCM.FF-K4 and SIM.M.FF-K4 are given on page 16 of the SIM.M.FF-K4 Final Report.

Linking APMP.M.FF-K4 to CCM.FF-K4

The linking process uses common participation of NMIA and CENAM in both key comparisons, as described in section 7 of the APMP.M.FF-K4 Final Report. Pair-wise degrees of equivalence involving APMP.M.FF-K4 participants are given on page 17 of the APMP.M.FF-K4 Final Report.

Key comparisons CCM.FF-K4, EURAMET.M.FF-K4.b, SIM.M.FF-K4, and APMP.M.FF-K4

Full set of degrees of equivalence relative to the CCM.FF-K4 reference value

Lab *i* ⇩	D_i / 10^{-6}	U_i / 10^{-6}
CENAM	-3	15
NIST	-26	34
NRC	13	30
SP	0	34
PTB	-1	19
INRIM	24	16
NMIA	-5	21
INMETRO	-3	14
SP	9	31
JV	30	44
METAS	-66	64
IPQ	10	35
VSL	-10	40
SMU	-27	27
MKEH	3	26
INRIM	-7	27
PTB	-11	27
DMDM	-11	39
UME	-2	27
EIM	-16	25
BEV	-8	30
CMI	-66	89

Lab *i* ⇩	D_i / 10^{-6}	U_i / 10^{-6}
CENAM	-3	22
NIST	35	59
BSJ	73	631
LACOMET	-235	145
CENAMEP AIP	19	54
INDECOPI	-33	89
IBMETRO	-46	95
LATU	-80	59
INTI	-3	19
INMETRO	-2	20
CENAM	-4	17
NMIA	-5	23
SCL	-24	29
KRISS	-5	26
NIM	1	36
NMISA	-70	116
NIMT	-147	50
NMIJ	6	111
VMI-STAMEQ	-32	36
MUSSD	21	39

Red: participants in CCM.FF-K4
Blue: participants in EURAMET.FF-K4.b
Green: participants in SIM.M.FF-K4
Orange: participants in APMP.M.FF-K4

Key comparisons CCM.FF-K4 and EURAMET.M.FF-K4.b

Pair-wise degrees of equivalence involving CCM.FF-K4 and SIM.M.FF-K4 are given on page 16 of the SIM.M.FF-K4 Final Report.

Pair-wise degrees of equivalence involving APMP.M.FF-K4 participants are given on page 17 of the APMP.M.FF-K4 Final Report.

MEASURAND : Volume

NOMINAL VALUE : 20 L

Matrix of equivalence

Lab *j* ⇨

Lab *i* ⇩

			CENAM		NIST		NRC		SP		PTB		INRIM		NMIA		INMETRO		SP	
	D_i / 10^{-6}	U_i / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}
CENAM	-3	15			23	38	-16	34	-3	38	-2	25	-27	23	2	26	0	21	-12	34
NIST	-26	34	-23	38			-39	45	-26	48	-25	39	-50	38	-21	40	-23	37	-35	46
NRC	13	30	16	34	39	45			13	45	14	36	-11	34	18	37	16	33	4	43
SP	0	34	3	38	26	48	-13	45			1	39	-24	38	5	40	3	37	-9	46
PTB	-1	19	2	25	25	39	-14	36	-1	39			-25	25	4	29	2	24	-10	36
INRIM	24	16	27	23	50	38	11	34	24	38	25	25			29	26	27	21	15	35
NMIA	-5	21	-2	26	21	40	-18	37	-5	40	-4	29	-29	26			-2	25	-14	37
INMETRO	-3	14	0	21	23	37	-16	33	-3	37	-2	24	-27	21	2	25			-12	34
SP	9	31	12	34	35	46	-4	43	9	46	10	36	-15	35	14	37	12	34		
JV	30	44	33	47	56	56	17	53	30	55	31	48	6	47	35	49	33	46	21	46
METAS	-66	64	-63	66	-40	72	-79	70	-66	72	-65	67	-90	66	-61	67	-63	65	-75	65
IPQ	10	35	13	38	36	48	-3	46	10	48	11	40	-14	38	15	41	13	37	1	37
VSL	-10	40	-7	53	16	61	-23	59	-10	61	-9	54	-34	53	-5	55	-7	52	-19	42
SMU	-27	27	-24	31	-1	43	-40	40	-27	43	-26	33	-51	31	-22	35	-24	31	-36	30
MKEH	3	26	6	30	29	43	-10	40	3	42	4	32	-21	30	8	34	6	30	-6	29
INRIM	-7	27	-4	31	19	43	-20	40	-7	43	-6	33	-31	31	-2	34	-4	31	-15	30
PTB	-11	27	-8	31	15	43	-24	40	-11	43	-10	33	-35	31	-6	34	-8	30	-20	30
DMDM	-11	39	-8	42	15	51	-24	49	-11	51	-10	43	-35	42	-6	44	-8	41	-20	41
UME	-2	27	1	31	24	43	-15	40	-2	43	-1	33	-26	31	3	34	1	30	-11	30
EIM	-16	25	-13	29	10	42	-29	39	-16	42	-15	32	-40	29	-11	33	-13	29	-25	28
BEV	-8	30	-5	34	18	45	-21	43	-8	45	-7	36	-32	34	-3	37	-5	34	-17	33
CMI	-66	89	23	90	-40	95	-79	94	-66	95	-65	91	-90	90	-61	92	-63	90	-75	90

MEASURAND : Volume
NOMINAL VALUE : 20 L

Matrix of equivalence (Continued)

Lab *j* ⇨

Lab *i* ⇩

	D_i / 10^{-6}	U_i / 10^{-6}	JV D_{ij} / 10^{-6}	JV U_{ij} / 10^{-6}	METAS D_{ij} / 10^{-6}	METAS U_{ij} / 10^{-6}	IPQ D_{ij} / 10^{-6}	IPQ U_{ij} / 10^{-6}	VSL D_{ij} / 10^{-6}	VSL U_{ij} / 10^{-6}	SMU D_{ij} / 10^{-6}	SMU U_{ij} / 10^{-6}	MKEH D_{ij} / 10^{-6}	MKEH U_{ij} / 10^{-6}	INRIM D_{ij} / 10^{-6}	INRIM U_{ij} / 10^{-6}	PTB D_{ij} / 10^{-6}	PTB U_{ij} / 10^{-6}	DMDM D_{ij} / 10^{-6}	DMDM U_{ij} / 10^{-6}
CENAM	**-3**	15	**-33**	47	**63**	66	**-13**	38	**7**	53	**24**	31	**-6**	30	**4**	31	**8**	31	**8**	42
NIST	**-26**	34	**-56**	56	**40**	72	**-36**	48	**-16**	61	**1**	43	**-29**	43	**-19**	43	**-15**	43	**-15**	51
NRC	**13**	30	**-17**	53	**79**	70	**3**	46	**23**	59	**40**	40	**10**	40	**20**	40	**24**	40	**24**	49
SP	**0**	34	**-30**	55	**66**	72	**-10**	48	**10**	61	**27**	43	**-3**	42	**7**	43	**11**	43	**11**	51
PTB	**-1**	19	**-31**	48	**65**	67	**-11**	40	**9**	54	**26**	33	**-4**	32	**6**	33	**10**	33	**10**	43
INRIM	**24**	16	**-6**	47	**90**	66	**14**	38	**34**	53	**51**	31	**21**	30	**31**	31	**35**	31	**35**	42
NMIA	**-5**	21	**-35**	49	**61**	67	**-15**	41	**5**	55	**22**	35	**-8**	34	**2**	34	**6**	34	**6**	44
INMETRO	**-3**	14	**-33**	46	**63**	65	**-13**	37	**7**	52	**24**	31	**-6**	30	**4**	31	**8**	30	**8**	41
SP	**9**	31	**-21**	46	**75**	65	**-1**	37	**19**	42	**36**	30	**6**	29	**15**	30	**20**	30	**20**	41
JV	**30**	44			**96**	72	**20**	49	**40**	52	**57**	44	**27**	43	**37**	44	**41**	44	**41**	52
METAS	**-66**	64	**-96**	72			**-76**	67	**-56**	70	**-39**	63	**-68**	63	**-59**	63	**-55**	63	**-55**	69
IPQ	**10**	35	**-20**	49	**76**	67			**20**	45	**37**	34	**8**	33	**17**	34	**22**	34	**21**	44
VSL	**-10**	40	**-40**	52	**56**	70	**-20**	45			**17**	39	**-13**	38	**-3**	39	**1**	39	**1**	48
SMU	**-27**	27	**-57**	44	**39**	63	**-37**	34	**-17**	39			**-30**	25	**-21**	26	**-16**	26	**-16**	38
MKEH	**3**	26	**-27**	43	**68**	63	**-8**	33	**13**	38	**30**	25			**9**	25	**14**	25	**14**	37
INRIM	**-7**	27	**-37**	44	**59**	63	**-17**	34	**3**	39	**21**	26	**-9**	25			**5**	26	**4**	38
PTB	**-11**	27	**-41**	44	**55**	63	**-22**	34	**-1**	39	**16**	26	**-14**	25	**-5**	26			**0**	38
DMDM	**-11**	39	**-41**	52	**55**	69	**-21**	44	**-1**	48	**16**	38	**-14**	37	**-4**	38	**0**	38		
UME	**-2**	27	**-32**	44	**64**	63	**-12**	34	**8**	39	**25**	26	**-5**	25	**5**	26	**9**	26	**9**	38
EIM	**-16**	25	**-46**	42	**50**	63	**-26**	32	**-6**	49	**11**	24	**-18**	23	**-9**	24	**-5**	24	**-5**	37
BEV	**-8**	30	**-38**	46	**58**	65	**-18**	37	**2**	52	**19**	30	**-10**	29	**-1**	30	**3**	30	**3**	41
CMI	**-66**	89	**-96**	95	**0**	106	**-76**	91	**-56**	98	**-39**	89	**-68**	88	**-59**	89	**-55**	89	**-55**	93

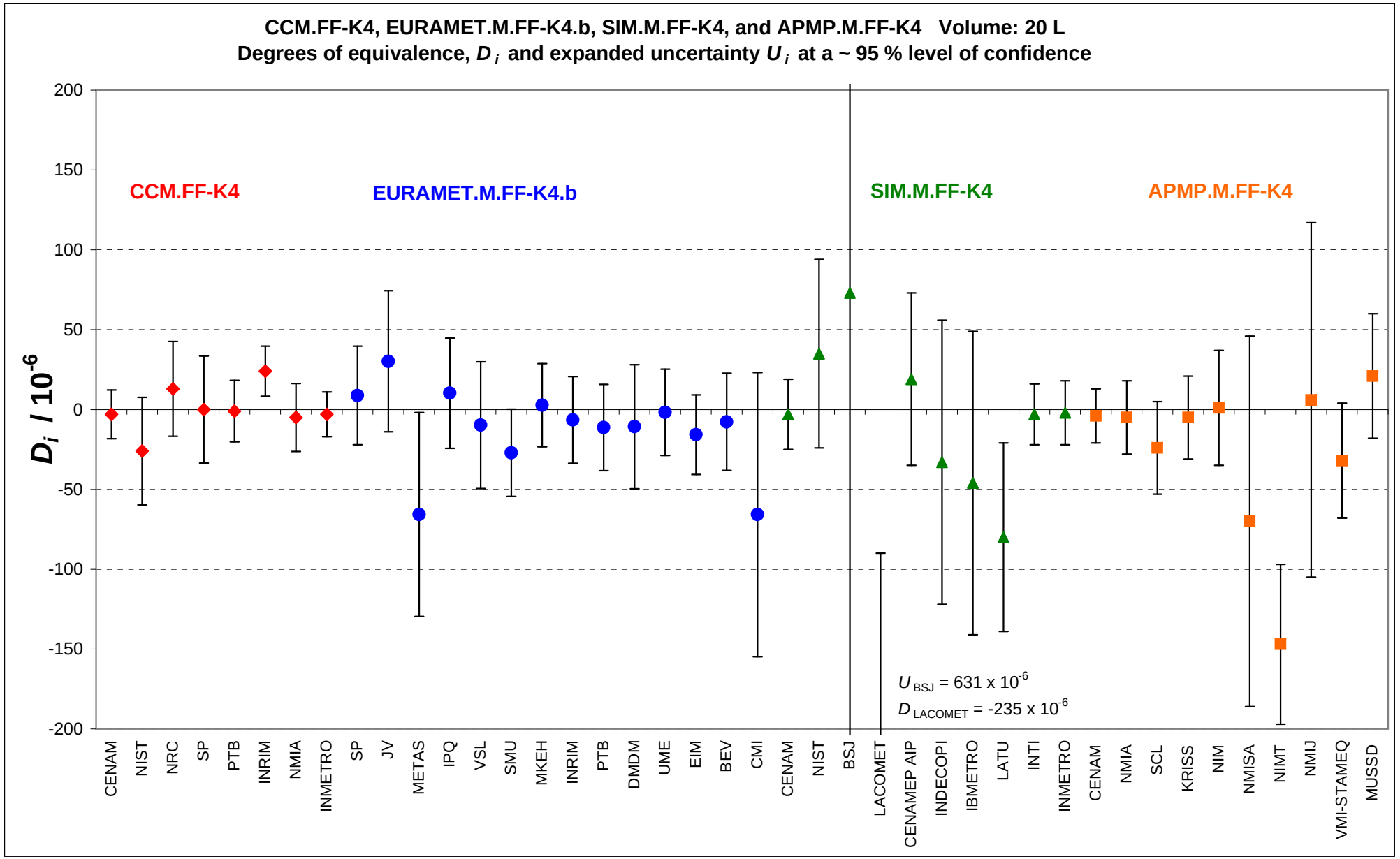
MEASURAND : Volume
NOMINAL VALUE : 20 L

Matrix of equivalence (Continued)

Lab *j* ⇨

Lab *i* ⇩

	D_i / 10^{-6}	U_i / 10^{-6}	UME D_{ij} / 10^{-6}	UME U_{ij} / 10^{-6}	EIM D_{ij} / 10^{-6}	EIM U_{ij} / 10^{-6}	BEV D_{ij} / 10^{-6}	BEV U_{ij} / 10^{-6}	CMI D_{ij} / 10^{-6}	CMI U_{ij} / 10^{-6}
CENAM	**-3**	15	**-1**	31	**13**	29	**5**	34	**-23**	90
NIST	**-26**	34	**-24**	43	**-10**	42	**-18**	45	**40**	95
NRC	**13**	30	**15**	40	**29**	39	**21**	43	**79**	94
SP	**0**	34	**2**	43	**16**	42	**8**	45	**66**	95
PTB	**-1**	19	**1**	33	**15**	32	**7**	36	**65**	91
INRIM	**24**	16	**26**	31	**40**	29	**32**	34	**90**	90
NMIA	**-5**	21	**-3**	34	**11**	33	**3**	37	**61**	92
INMETRO	**-3**	14	**-1**	30	**13**	29	**5**	34	**63**	90
SP	**9**	31	**11**	30	**25**	28	**17**	33	**75**	90
JV	**30**	44	**32**	44	**46**	42	**38**	46	**96**	95
METAS	**-66**	64	**-64**	63	**-50**	63	**-58**	65	**0**	106
IPQ	**10**	35	**12**	34	**26**	32	**18**	37	**76**	91
VSL	**-10**	40	**-8**	39	**6**	49	**-2**	52	**56**	98
SMU	**-27**	27	**-25**	26	**-11**	24	**-19**	30	**39**	89
MKEH	**3**	26	**5**	25	**18**	23	**10**	29	**68**	88
INRIM	**-7**	27	**-5**	26	**9**	24	**1**	30	**59**	89
PTB	**-11**	27	**-9**	26	**5**	24	**-3**	30	**55**	89
DMDM	**-11**	39	**-9**	38	**5**	37	**-3**	41	**55**	93
UME	**-2**	27			**14**	24	**6**	30	**64**	89
EIM	**-16**	25	**-14**	24			**-8**	28	**50**	88
BEV	**-8**	30	**-6**	30	**8**	28			**58**	90
CMI	**-66**	89	**-64**	89	**-50**	88	**-58**	90		


CCM.FF-K4, EURAMET.M.FF-K4.b, SIM.M.FF-K4, and APMP.M.FF-K4 Volume: 20 L
Degrees of equivalence, D_i and expanded uncertainty U_i at a ~ 95 % level of confidence
D_i / 10^{-6}
200
150
100
50
0
-50
-100
-150
-200
CCM.FF-K4
EURAMET.M.FF-K4.b
SIM.M.FF-K4
APMP.M.FF-K4
U_{BSJ} = 631 x 10^{-6}
$D_{LACOMET}$ = -235 x 10^{-6}
CENAM
NIST
NRC
SP
PTB
INRIM
NMIA
INMETRO
SP
JV
METAS
IPQ
VSL
SMU
MKEH
INRIM
PTB
DMDM
UME
EIM
BEV
CMI
CENAM
NIST
BSJ
LACOMET
CENAMEP AIP
INDECOPI
IBMETRO
LATU
INTI
INMETRO
CENAM
NMIA
SCL
KRISS
NIM
NMISA
NIMT
NMIJ
VMI-STAMEQ
MUSSD

Key comparison CCM.FF-K4 **MEASURAND : Volume** **NOMINAL VALUE : 100 mL** **SIX TRANSFER STANDARDS**

For each of the transfer standard, the key comparison reference value, x_R, is computed as the median of the results. Its expanded uncertainty, U_R, is approximately given at a 95 % level of confidence.
The details are explained in Appendix C of the CCM.FF-K4 Final Report.

Transfer standard TS 03.04.03		Transfer standard TS 03.04.04		Transfer standard TS 03.01.13	
x_R / mL	U_R / mL	x_R / mL	U_R / mL	x_R / mL	U_R / mL
99.894 2	0.001 2	100.159 9	0.001 3	98.631 1	0.001 0

Transfer standard TS 03.01.14		Transfer standard TS 03.01.15		Transfer standard TS 03.01.17	
x_R / mL	U_R / mL	x_R / mL	U_R / mL	x_R / mL	U_R / mL
97.703 9	0.001 1	98.399 5	0.001 0	102.184 3	0.001 2

For each transfer standard, the degree of equivalence of laboratory i with respect to the key comparison reference value is given by a pair of terms, both expressed in relative value:
$D_i = (x_i - x_R)/x_R$ and its expanded uncertainty U_i at a ~95 % level of confidence.

For each transfer standard, the degree of equivalence between two laboratories i and j is given by a pair of terms, both expressed in relative value: $D_{ij} = (D_i - D_j)$ and its expanded uncertainty U_{ij} at a ~95 % level of confidence.

Key comparison EUROMET.M.FF-K4 **MEASURAND : Volume** **NOMINAL VALUE : 100 mL**

The EUROMET reference value, $x_{R\text{-}EUR}$, and its expanded uncertainty ($k = 2$), $U_{R\text{-}EUR}$, are obtained from the weighted average of the EUROMET participants' results that are published here.
$x_{R\text{-}EUR} = 100.0914$ mL and $U_{R\text{-}EUR} = 0.0006$ mL.

The degree of equivalence of laboratory i participant in EUROMET.M.FF-K4 with respect to the EUROMET reference value is given by a pair of terms, both expressed in mL:
$D_{i\text{-}EUR} = (x_{i\text{-}EUR} - x_{R\text{-}EUR})$ and its expanded uncertainty ($k = 2$), $U_{i\text{-}EUR}$, computed as $U_{i\text{-}EUR} = 2[u_{i\text{-}EUR}^2 - (U_{R\text{-}EUR}/2)^2]^{1/2}$.

The degree of equivalence between two laboratories i and j is given by a pair of terms, both expressed in mL:
$D_{ij} = (D_{i\text{-}EUR} - D_{j\text{-}EUR})$ and its expanded uncertainty ($k = 2$), U_{ij}, expressed as $U_{ij} = 2(u_{i\text{-}EUR}^2 + u_{j\text{-}EUR}^2)^{1/2}$.

Linking EUROMET.M.FF-K4 to CCM.FF-K4

The EUROMET.M.FF-K4 results are linked to those obtained at 100 mL in CCM.FF-K4 with transfer standard TS 03.04.03.
The technical protocols and transfer standards of both comparisons are very similar, and INRIM and SP participated in both exercises with comparable performance. The degrees of equivalence relative to the EUROMET reference value are thus transferred to the key comparison reference value determined in CCM.FF-K4 with slight changes. The resulting values of D_i, U_i, D_{ij}, and U_{ij} are listed in Annexes 3, 4, and 5 of the EUROMET.M.FF-K4 Final Report.
The matrix of equivalence obtained at 100 mL in CCM.FF-K4 with the Transfer standard TS 03.04.03 is thus extended to EUROMET.M.FF-K4 participants (after conversion to relative values).

Linking SIM.M.FF-K4 to CCM.FF-K4

The regional comparison reference value is first determined as the median of the SIM results for transfer standard TS 03.04.04, as described in section 8 of the SIM.M.FF-K4 Final Report. Then the linking process uses common participation of CENAM and INMETRO in both key comparisons, as described in section 9 of the same Report.
Pair-wise degrees of equivalence involving CCM.FF-K4 and SIM.M.FF-K4 are given on page 18 of the SIM.M.FF-K4 Final Report.

Linking APMP.M.FF-K4 to CCM.FF-K4

The APMP.M.FF-K4 results are linked to those obtained at 100 mL in CCM.FF-K4 with transfer standard TS 03.04.03, and TS 03.01.17. The linking process uses common participation of NMIA and CENAM in both key comparisons, as described in section 7 of the APMP.M.FF-K4 Final Report. Pair-wise degrees of equivalence involving APMP.M.FF-K4 participants are given on page 18 and 19 of the APMP.M.FF-K4 Final Report.

Key comparisons CCM.FF-K4 and SIM.FF-K4

MEASURAND : Volume
NOMINAL VALUE : 100 mL
TRANSFER STANDARD : TS 03.04.04

Lab *j* ⇨

Lab *i* ⇩

	D_i / 10^{-6}	U_i / 10^{-6}
CENAM	-5	15
NRC	37	20
SP	13	27
INRIM	-21	21
NMIA	10	19
INMETRO	-14	17
CENAM	-3	22
BSJ	10601	721
LACOMET	13	64
CENAMEP AIP	-15	32
INDECOPI	-36	72
IBMETRO	28	38
LATU	26	30
INTI	-75	63
INMETRO	-16	22

CENAM		NRC		SP		INRIM		NMIA		INMETRO	
D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}
		-42	23	-18	35	16	24	-15	29	9	22
42	23			24	35	58	23	27	27	51	21
18	35	-24	35			34	35	3	38	27	34
-16	24	-58	23	-34	35			-31	28	-7	22
15	29	-27	27	-3	38	31	28			24	27
-9	22	-51	21	-27	34	7	22	-24	27		

Pair-wise degrees of equivalence involving CCM.FF-K4 and SIM.M.FF-K4 are given on page 18 of the SIM.M.FF-K4 Final Report.

Black: participants in CCM.FF-K4
Green: participants in SIM.M.FF-K4

Key comparison CCM.FF-K4

MEASURAND : Volume
NOMINAL VALUE : 100 mL
TRANSFER STANDARD : TS 03.01.13

Lab *j* ⇨

Lab *i* ⇩	D_i / 10^{-6}	U_i / 10^{-6}	CENAM D_{ij} / 10^{-6}	CENAM U_{ij} / 10^{-6}	NRC D_{ij} / 10^{-6}	NRC U_{ij} / 10^{-6}	SP D_{ij} / 10^{-6}	SP U_{ij} / 10^{-6}	INRIM D_{ij} / 10^{-6}	INRIM U_{ij} / 10^{-6}	NMIA D_{ij} / 10^{-6}	NMIA U_{ij} / 10^{-6}	INMETRO D_{ij} / 10^{-6}	INMETRO U_{ij} / 10^{-6}
CENAM	**-11**	17			**-36**	25	**-10**	32	**5**	24	**-16**	26	**-15**	22
NRC	**25**	21	**36**	25			**26**	33	**41**	26	**20**	28	**21**	23
SP	**-1**	24	**10**	32	**-26**	33			**15**	32	**-6**	33	**-5**	30
INRIM	**-16**	18	**-5**	24	**-41**	26	**-15**	32			**-21**	26	**-20**	21
NMIA	**5**	18	**16**	26	**-20**	28	**6**	33	**21**	26			**1**	24
INMETRO	**4**	13	**15**	22	**-21**	23	**5**	30	**20**	21	**-1**	24		

Key comparison CCM.FF-K4

MEASURAND : Volume
NOMINAL VALUE : 100 mL
TRANSFER STANDARD : TS 03.01.14

Lab *j* ⇨

Lab *i* ⇩	D_i / 10^{-6}	U_i / 10^{-6}	CENAM D_{ij} / 10^{-6}	CENAM U_{ij} / 10^{-6}	NRC D_{ij} / 10^{-6}	NRC U_{ij} / 10^{-6}	SP D_{ij} / 10^{-6}	SP U_{ij} / 10^{-6}	INRIM D_{ij} / 10^{-6}	INRIM U_{ij} / 10^{-6}	NMIA D_{ij} / 10^{-6}	NMIA U_{ij} / 10^{-6}	INMETRO D_{ij} / 10^{-6}	INMETRO U_{ij} / 10^{-6}
CENAM	**-15**	20			**-54**	24	**-33**	34	**2**	24	**-22**	28	**-8**	23
NRC	**39**	21	**54**	24			**21**	34	**56**	24	**32**	27	**46**	23
SP	**18**	27	**33**	34	**-21**	34			**35**	34	**11**	36	**24**	32
INRIM	**-17**	20	**-2**	24	**-56**	24	**-35**	34			**-24**	27	**-10**	23
NMIA	**7**	16	**22**	28	**-32**	27	**-11**	36	**24**	27			**14**	26
INMETRO	**-7**	14	**8**	23	**-46**	23	**-24**	32	**10**	23	**-14**	26		

Key comparison CCM.FF-K4

MEASURAND : Volume **NOMINAL VALUE : 100 mL**

TRANSFER STANDARD : TS 03.01.15

Lab *i* ⇩	D_i / 10^{-6}	U_i / 10^{-6}	Lab *j* ⇨ CENAM D_{ij} / 10^{-6}	CENAM U_{ij} / 10^{-6}	NRC D_{ij} / 10^{-6}	NRC U_{ij} / 10^{-6}	SP D_{ij} / 10^{-6}	SP U_{ij} / 10^{-6}	INRIM D_{ij} / 10^{-6}	INRIM U_{ij} / 10^{-6}	NMIA D_{ij} / 10^{-6}	NMIA U_{ij} / 10^{-6}	INMETRO D_{ij} / 10^{-6}	INMETRO U_{ij} / 10^{-6}
CENAM	-7	16			-49	26	-22	31	2	24	-11	26	4	21
NRC	42	23	49	26			27	35	51	27	38	29	53	24
SP	15	27	22	31	-27	35			24	33	11	34	26	31
INRIM	-9	17	-2	24	-51	27	-24	33			-13	26	2	21
NMIA	4	16	11	26	-38	29	-11	34	13	26			15	24
INMETRO	-11	15	-4	21	-53	24	-26	31	-2	21	-15	24		

Key comparisons CCM.FF-K4 and APMP.M.FF-K4

MEASURAND : Volume **NOMINAL VALUE : 100 mL**

TRANSFER STANDARD : TS 03.01.17

Lab *i* ⇩	D_i / 10^{-6}	U_i / 10^{-6}	Lab *j* ⇨ CENAM D_{ij} / 10^{-6}	CENAM U_{ij} / 10^{-6}	NRC D_{ij} / 10^{-6}	NRC U_{ij} / 10^{-6}	SP D_{ij} / 10^{-6}	SP U_{ij} / 10^{-6}	INRIM D_{ij} / 10^{-6}	INRIM U_{ij} / 10^{-6}	NMIA D_{ij} / 10^{-6}	NMIA U_{ij} / 10^{-6}	INMETRO D_{ij} / 10^{-6}	INMETRO U_{ij} / 10^{-6}
CENAM	-3	17			-46	28	-22	37	9	27	-6	28	17	26
NRC	43	22	46	28			24	36	55	25	40	27	63	24
SP	19	30	22	37	-24	36			31	35	16	36	39	34
INRIM	-12	18	-9	27	-55	25	-31	35			-15	25	8	22
NMIA	3	15	6	28	-40	27	-16	36	15	25			23	24
INMETRO	-20	19	-17	26	-63	24	-39	34	-8	22	-23	24		
CENAM	-7	20												
NMIA	7	20												
SCL	-41	72												
NIM	12	23												
NMISA	6	48												
NIMT	-147	29												
VMI-STAMEQ	37	38												
MUSSD	-97	66												

Pair-wise degrees of equivalence involving APMP.M.FF-K4 participants are given on page 19 of the APMP.M.FF-K4 Final Report.

Black: participants in CCM.FF-K4
Orange: participants in APMP.M.FF-K4

Key comparisons CCM.FF-K4 and EUROMET.M.FF-K-4, APMP.M.FF-K-4

MEASURAND : Volume
NOMINAL VALUE : 100 mL
CCM.FF-K4 TRANSFER STANDARD : TS 03.04.03

Matrix of equivalence

Lab *j* ⇨

Lab *i* ⇩

	D_i / 10^{-6}	U_i / 10^{-6}	CENAM D_{ij} / 10^{-6}	CENAM U_{ij} / 10^{-6}	NRC D_{ij} / 10^{-6}	NRC U_{ij} / 10^{-6}	SP D_{ij} / 10^{-6}	SP U_{ij} / 10^{-6}	INRIM D_{ij} / 10^{-6}	INRIM U_{ij} / 10^{-6}	NMIA D_{ij} / 10^{-6}	NMIA U_{ij} / 10^{-6}	INMETRO D_{ij} / 10^{-6}	INMETRO U_{ij} / 10^{-6}	IPQ D_{ij} / 10^{-6}	IPQ U_{ij} / 10^{-6}
CENAM	-7	16			-43	22	-15	35	5	22	-20	26	6	20	-10	21
NRC	36	20	43	22			28	36	48	23	23	27	49	20	33	21
SP	8	26	15	35	-28	36			20	36	-5	38	21	34	5	23
INRIM	-12	18	-5	22	-48	23	-20	36			-25	27	1	20	-15	20
NMIA	13	20	20	26	-23	27	5	38	25	27			26	24	10	14
INMETRO	-13	16	-6	20	-49	20	-21	34	-1	20	-26	24			-16	23
IPQ	3	9	10	21	-33	21	-5	23	15	20	-10	14	16	23		
CMI	-37	51	-29	55	-72	55	-44	55	-24	54	-49	53	-23	56	-39	61
LNE	9	17	17	25	-26	25	2	27	22	25	-3	20	23	27	7	28
FORCE	3	98	11	99	-32	99	-4	100	16	99	-9	98	17	100	1	103
PTB	-11	19	-4	26	-47	26	-19	28	1	26	-24	21	2	28	-14	27
NMi-VSL	12	56	19	59	-24	59	4	60	24	59	-1	57	25	60	9	65
UME	22	83	29	85	-14	85	14	86	34	85	9	84	35	86	19	89
CEM	14	14	21	24	-22	23	6	25	26	23	1	18	27	25	11	29
INRIM	8	9	15	21	-28	21	0	23	20	20	-5	14	21	23	5	34
OMH	-10	15	-3	24	-46	24	-18	26	2	23	-23	19	3	26	-13	29
EIM	103	152	110	153	67	153	95	153	115	153	90	152	116	153	100	155
BEV	13	35	20	39	-23	39	5	40	25	39	0	36	26	40	10	48
SP	6	75	13	77	-30	77	-2	78	18	77	-7	76	19	78	3	82
CENAM	-8	20														
NMIA	7	20														
SCL	-43	72														
NIM	-6	23														
NMISA	-82	106														
NIMT	-142	29														
VMI-STAMEQ	44	38														
MUSSD	-678	69														

Pair-wise degrees of equivalence involving APMP.M.FF-K4 participants are given on page 18 of the APMP.M.FF-K4 Final Report.

Black: participants in CCM.FF-K4
Blue: participants in EUROMET.FF-K4
Orange: participants in APMP.M.FF-K4

Key comparisons CCM.FF-K4 and EUROMET.M.FF-K4, APMP.M.FF-K-4

MEASURAND : Volume
NOMINAL VALUE : 100 mL
CCM.FF-K4 TRANSFER STANDARD : TS 03.04.03

Matrix of equivalence (Continued)

Lab *j* ⇨

Lab *i* ⇩	D_i / 10^{-6}	U_i / 10^{-6}	CMI		LNE		FORCE		PTB		NMi-VSL		UME		CEM	
			D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}	D_{ij} / 10^{-6}	U_{ij} / 10^{-6}
CENAM	-7	16	29	55	-17	25	-11	99	4	26	-19	59	-29	85	-21	24
NRC	36	20	72	55	26	25	32	99	47	26	24	59	14	85	22	23
SP	8	26	44	55	-2	27	4	100	19	28	-4	60	-14	86	-6	25
INRIM	-12	18	24	54	-22	25	-16	99	-1	26	-24	59	-34	85	-26	23
NMIA	13	20	49	53	3	20	9	98	24	21	1	57	-9	84	-1	18
INMETRO	-13	16	23	56	-23	27	-17	100	-2	28	-25	60	-35	86	-27	25
IPQ	3	9	39	61	-7	28	-1	103	14	27	-9	65	-19	89	-11	29
CMI	-37	51			-46	58	-40	115	-25	57	-48	82	-58	103	-50	59
LNE	9	17	46	58			6	101	21	18	-2	62	-12	87	-4	22
FORCE	3	98	40	115	-6	101			15	101	-8	117	-18	132	-10	101
PTB	-11	19	25	57	-21	18	-15	101			-23	61	-33	87	-25	21
NMi-VSL	12	56	48	82	2	62	8	117	23	61			-10	105	-2	62
UME	22	83	58	103	12	87	18	132	33	87	10	105			8	88
CEM	14	14	50	59	4	22	10	101	25	21	2	62	-8	88		
INRIM	8	9	44	61	-2	28	4	103	19	27	-4	65	-14	89	-6	29
OMH	-10	15	26	58	-20	21	-14	101	1	20	-22	62	-32	87	-24	23
EIM	103	152	139	163	93	154	99	183	114	154	91	165	81	176	89	155
BEV	13	35	49	69	3	43	9	108	24	43	1	73	-9	95	-1	44
SP	6	75	42	96	-4	79	2	127	17	79	-6	98	-16	116	-8	80
CENAM	-8	20														
NMIA	7	20														
SCL	-43	72														
NIM	-6	23														
NMISA	-82	106														
NIMT	-142	29														
VMI-STAMEQ	44	38														
MUSSD	-678	69														

Pair-wise degrees of equivalence involving APMP.M.FF-K4 participants are given on page 18 of the APMP.M.FF-K4 Final Report.

Black: participants in CCM.FF-K4
Blue: participants in EUROMET.FF-K4
Orange: participants in APMP.M.FF-K4

Key comparisons CCM.FF-K4 and EUROMET.M.FF-K4, APMP.M.FF-K-4

MEASURAND : Volume
NOMINAL VALUE : 100 mL
CCM.FF-K4 TRANSFER STANDARD : TS 03.04.03

Matrix of equivalence (Continued)

Lab *j* ⇨

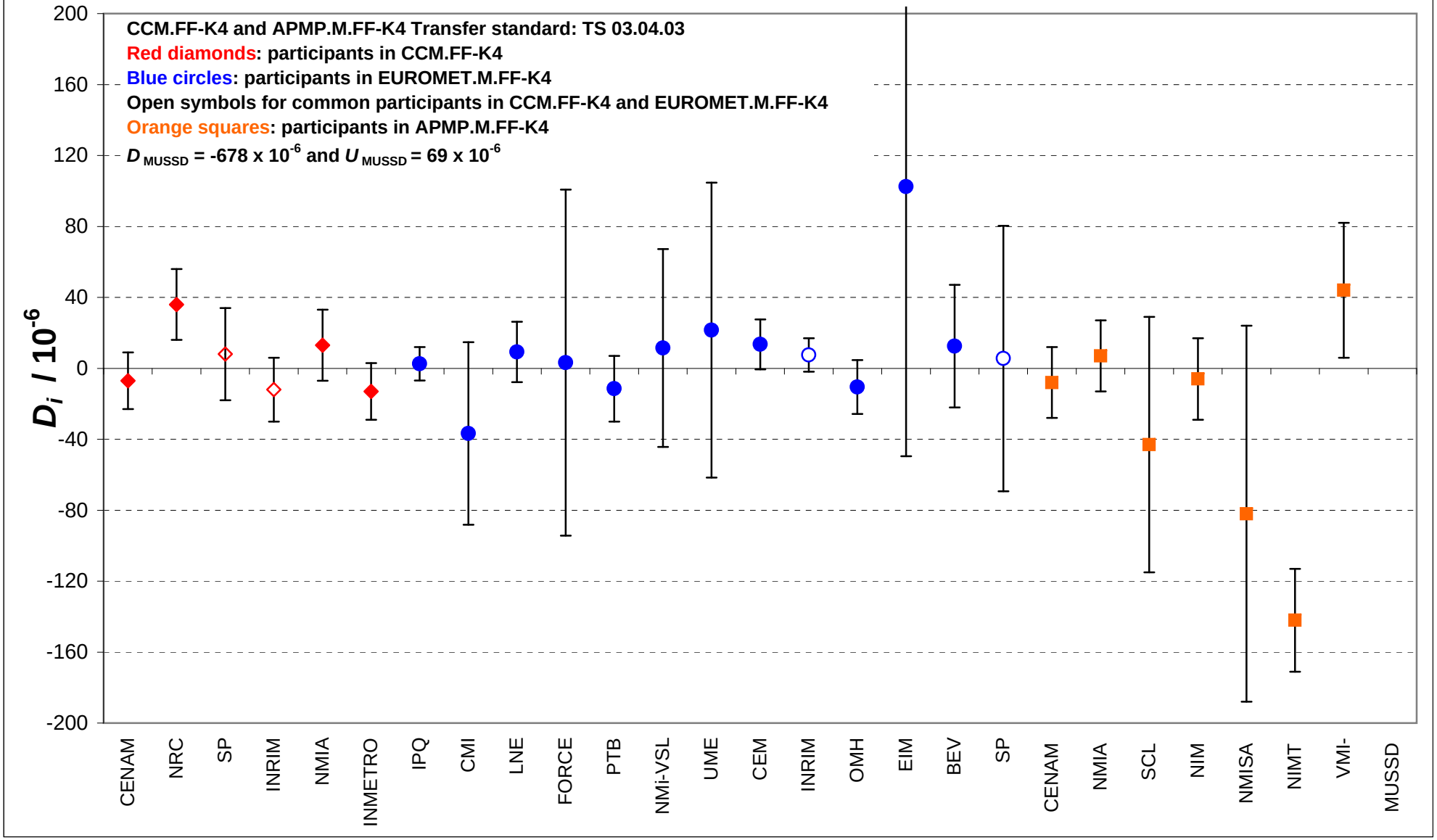
Lab *i* ⇩

	D_i / 10^{-6}	U_i / 10^{-6}	INRIM D_{ij} / 10^{-6}	INRIM U_{ij} / 10^{-6}	OMH D_{ij} / 10^{-6}	OMH U_{ij} / 10^{-6}	EIM D_{ij} / 10^{-6}	EIM U_{ij} / 10^{-6}	BEV D_{ij} / 10^{-6}	BEV U_{ij} / 10^{-6}	SP D_{ij} / 10^{-6}	SP U_{ij} / 10^{-6}
CENAM	-7	16	-15	21	3	24	-110	153	-20	39	-13	77
NRC	36	20	28	21	46	24	-67	153	23	39	30	77
SP	8	26	0	23	18	26	-95	153	-5	40	2	78
INRIM	-12	18	-20	20	-2	23	-115	153	-25	39	-18	77
NMIA	13	20	5	14	23	19	-90	152	0	36	7	76
INMETRO	-13	16	-21	23	-3	26	-116	153	-26	40	-19	78
IPQ	3	9	-5	34	13	29	-100	155	-10	48	-3	82
CMI	-37	51	-44	61	-26	58	-139	163	-49	69	-42	96
LNE	9	17	2	28	20	21	-93	154	-3	43	4	79
FORCE	3	98	-4	103	14	101	-99	183	-9	108	-2	127
PTB	-11	19	-19	27	-1	20	-114	154	-24	43	-17	79
NMi-VSL	12	56	4	65	22	62	-91	165	-1	73	6	98
UME	22	83	14	89	32	87	-81	176	9	95	16	116
CEM	14	14	6	29	24	23	-89	155	1	44	8	80
INRIM	8	9			18	29	-95	155	-5	48	2	82
OMH	-10	15	-18	29			-113	154	-23	44	-16	80
EIM	103	152	95	155	113	154			90	159	97	172
BEV	13	35	5	48	23	44	-90	159			7	88
SP	6	75	-2	82	16	80	-97	172	-7	88		
CENAM	-8	20										
NMIA	7	20										
SCL	-43	72										
NIM	-6	23										
NMISA	-82	106										
NIMT	-142	29										
VMI-STAMEQ	44	38										
MUSSD	-678	69										

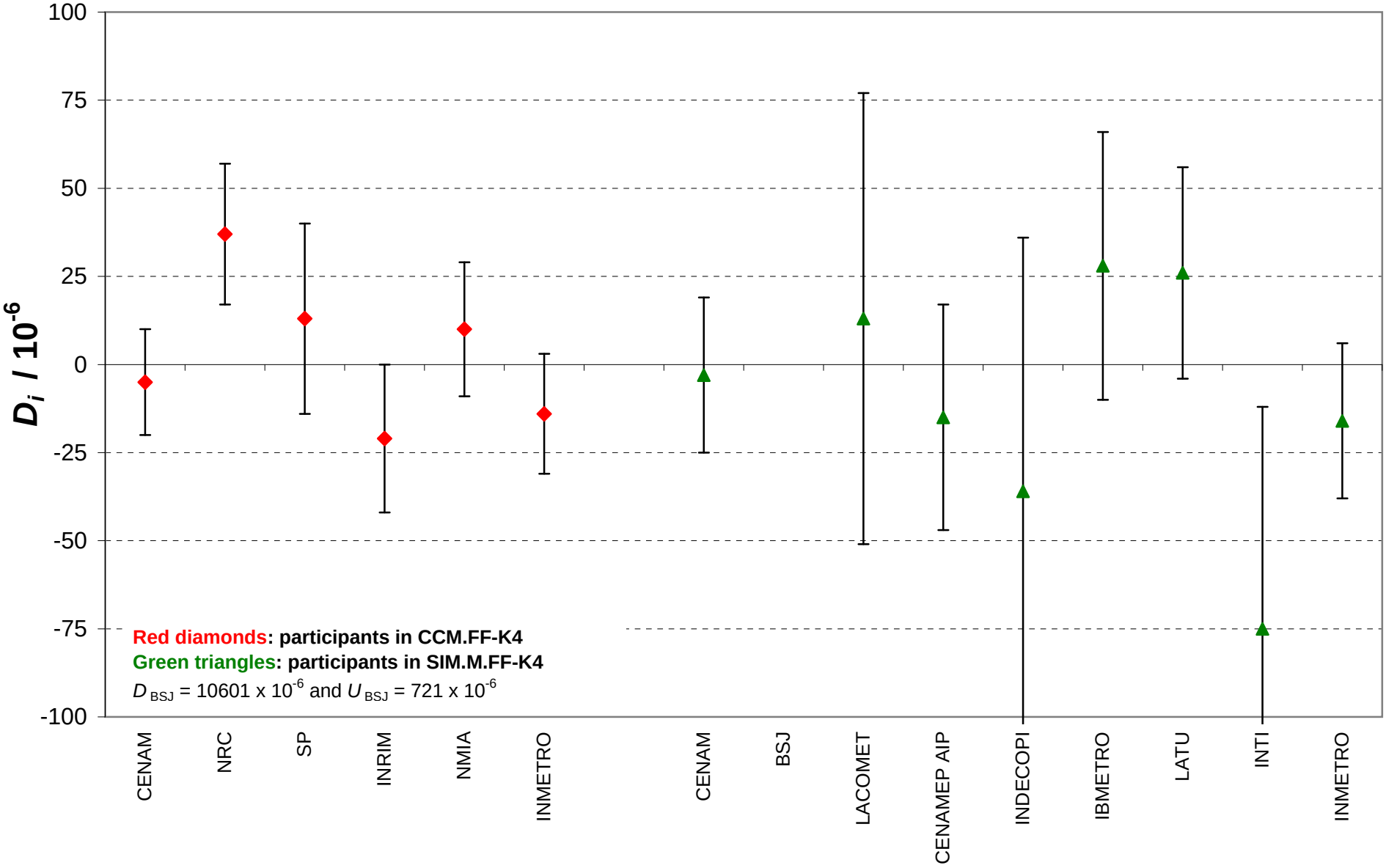
Pair-wise degrees of equivalence involving APMP.M.FF-K4 participants are given on page 18 of the APMP.M.FF-K4 Final Report.

Black: participants in CCM.FF-K4
Blue: participants in EUROMET.FF-K4
Orange: participants in APMP.M.FF-K4

CCM.FF-K4, EUROMET.M.FF-K4, and APMP.M.FF-K4 Volume: 100 mL
Degrees of equivalence, D_i and expanded uncertainty U_i at a ~ 95 % level of confidence

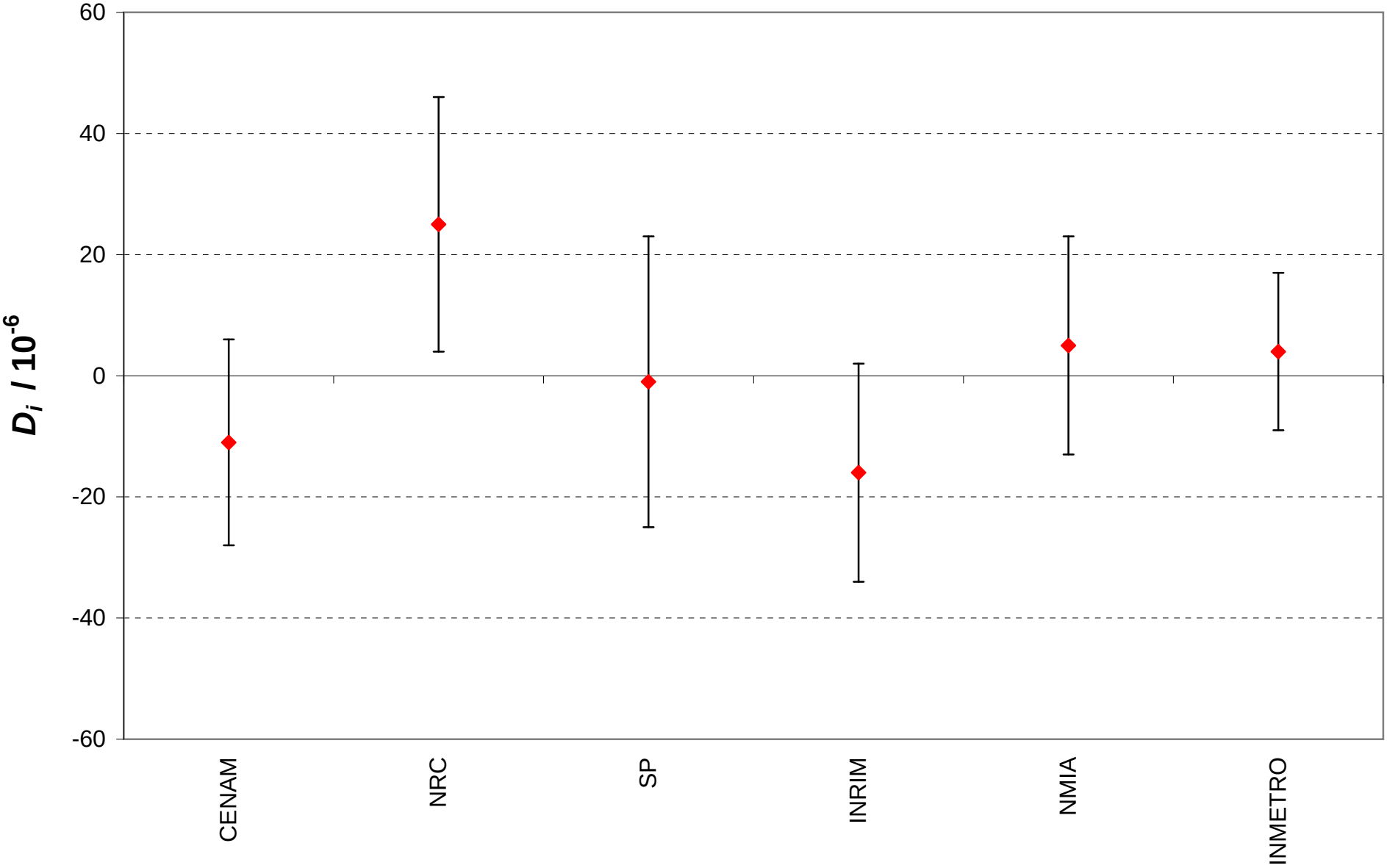


CCM.FF-K4 and SIM.M.FF-K4 Volume: 100 mL, Transfer standard: TS 03.04.04
Degrees of equivalence, D_i and expanded uncertainty U_i at a ~95 % level of confidence



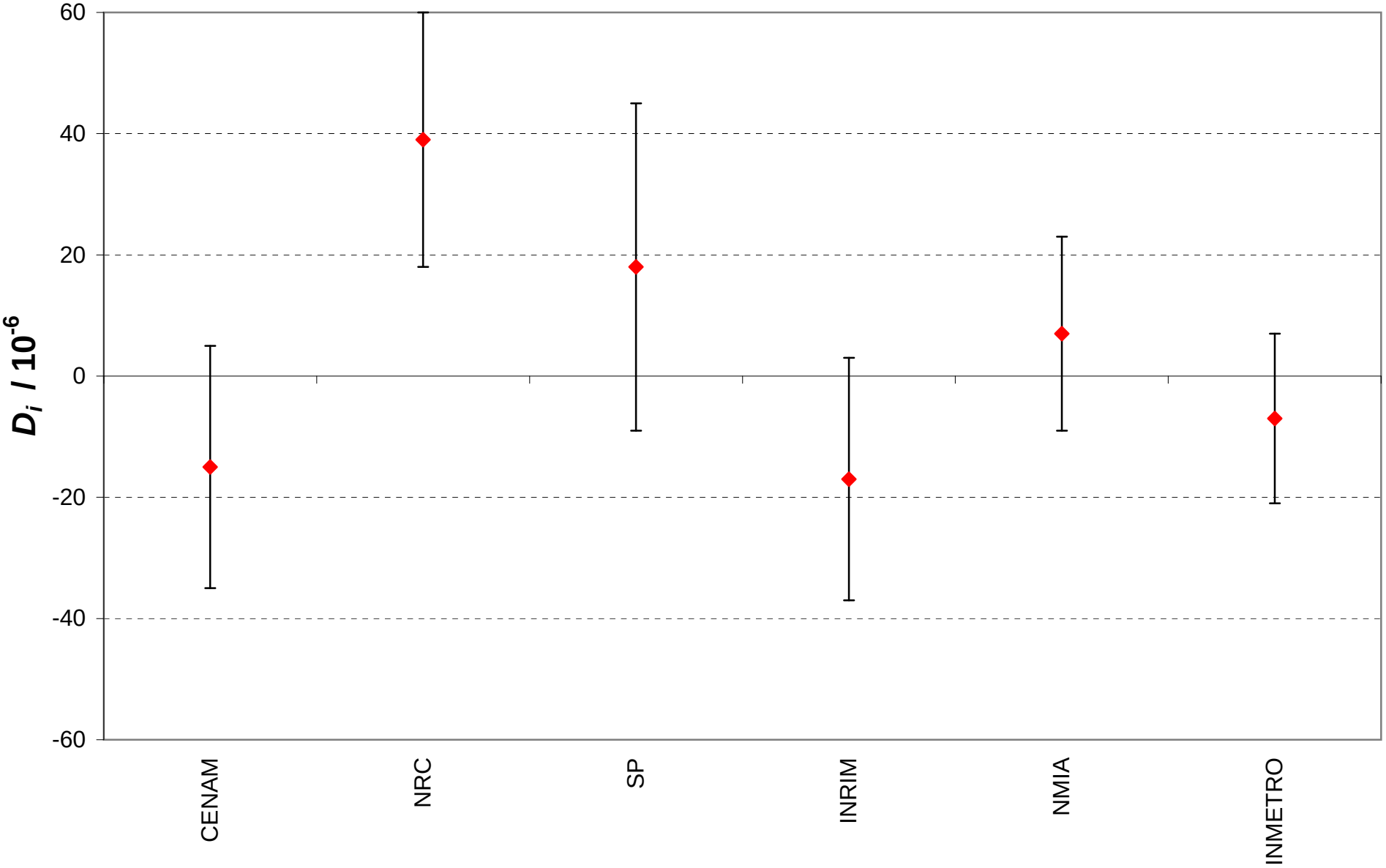
CCM.FF-K4 Volume: 100 mL, Transfer standard: TS 03.01.13

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



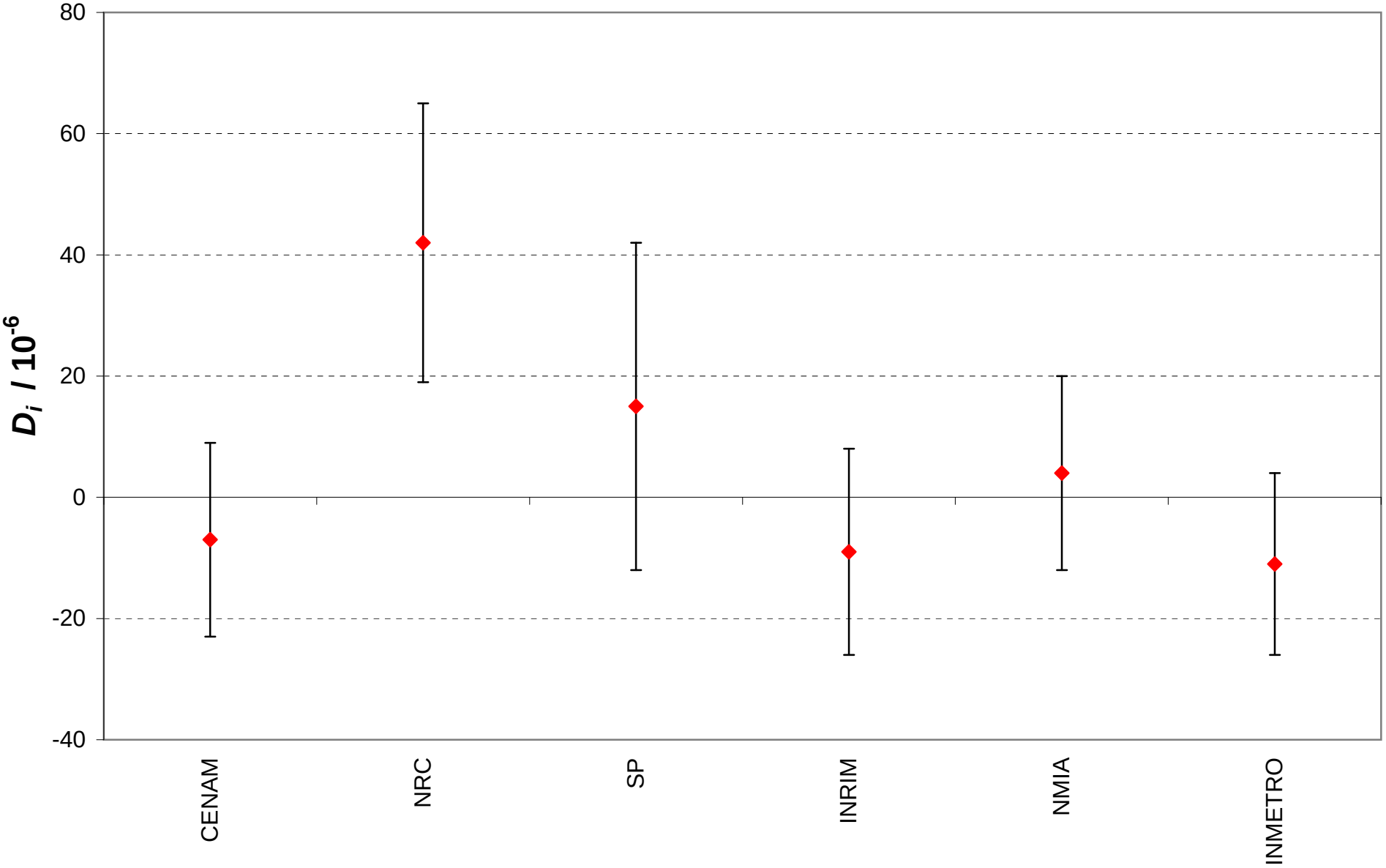
CCM.FF-K4 Volume: 100 mL, Transfer standard: TS 03.01.14

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



CCM.FF-K4 Volume: 100 mL, Transfer standard: TS 03.01.15

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



CCM.FF-K4 and APMP.M.FF-K4 Volume: 100 mL, TS 03.01.17

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