

Sample 1 Key comparison CCQM-K9

MEASURAND : pH value of phosphate buffer
sample 1: 0.025 mol kg⁻¹ KH₂PO₄ + 0.025 mol kg⁻¹ Na₂HPO₄
 measurements at 15 °C, 25 °C and 37 °C

NOMINAL VALUE: pH = 6.9 at 25 °C

pH_i: result of measurement carried out by laboratory *i*

u_i: combined standard uncertainty (*k* = 1) of pH_i

Lab <i>i</i> ↓	Temperature / °C						Date of measurement
	15		25		37		
	pH _i	u _i	pH _i	u _i	pH _i	u _i	
NRCCRM	6.8950	0.0030	6.8600	0.0020	6.8370	0.0020	99-12
PTB	6.8992	0.0010	6.8643	0.0011	6.8406	0.0011	99-11
DPL	6.8983	0.0008	6.8643	0.0008	6.8407	0.0008	99-10
KRISS	6.8941	0.0010	6.8597	0.0010	6.8360	0.0010	99-11
CENAM	6.8990	0.0030	6.8580	0.0060			99-11
GUM	6.8990	0.0010	6.8645	0.0009	6.8382	0.0009	99-12
VNIIFTRI	6.8980	0.0019	6.8640	0.0018	6.8390	0.0019	99-10
SMU	6.8930	0.0010	6.8590	0.0010	6.8350	0.0010	00-02
NIST	6.8973	0.0005	6.8630	0.0007	6.8406	0.0022	00-01

SMU discovered a calculation error.

The erroneous result is used for computing the degrees of equivalence involving SMU.

The erroneous result is corrected before it is used for evaluating the key comparison reference value.

SMU corrected	6.8970	0.0009	6.8640	0.0009	6.8397	0.0009	00-02
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A subsequent bilateral comparison was carried out between SMU and PTB in December 2000.

The composition of the measured sample was very similar to that of sample 1.

Measurements were carried out at 15 °C, 25 °C and 37 °C.

PTB(s)	6.9004	0.0011	6.8657	0.0011	6.8422	0.0011	00-12
SMU(s)	6.9014	0.0010	6.8668	0.0011	6.8439	0.0013	00-12

'(s)' means 'subsequent bilateral comparison'.

Key comparison CCQM-K9.2

MEASURAND : pH value of phosphate buffer
sample 1: 0.025 mol kg⁻¹ KH₂PO₄ + 0.025 mol kg⁻¹ Na₂HPO₄
measurements at 15 °C, 25 °C and 37 °C

NOMINAL VALUE: pH = 6.9 at 25 °C

pH_i: result of measurement carried out by laboratory *i*

U_{Lab i}: expanded uncertainty (*k* = 2) of pH_{*i*}

Lab <i>i</i> ↓	Temperature / °C						Date of measurement
	15		25		37		
	pH _{<i>i</i>}	U _{Lab <i>i</i>}	pH _{<i>i</i>}	U _{Lab <i>i</i>}	pH _{<i>i</i>}	U _{Lab <i>i</i>}	
CMI	6.9245	0.0036	6.8786	0.0036	6.8564	0.0043	Dec 2006
DFM	6.8980	0.0016	6.8642	0.0016	6.8409	0.0016	Nov 2006
INMETRO	6.8884	0.0062	6.8593	0.0059	6.8345	0.0058	Jan 2007
NMIJ	6.8968	0.0026	6.8619	0.0022	6.8386	0.0024	Dec 2006
PTB	6.8977	0.0020	6.8632	0.0020	6.8403	0.0020	Nov 2006
VNIFTRI	6.9008	0.0022	6.8642	0.0021	6.8393	0.0026	Jan 2007

Key comparison CCQM-K9

MEASURAND : pH value of phosphate buffer
 sample 1: 0.025 mol kg⁻¹ KH₂PO₄ + 0.025 mol kg⁻¹ Na₂HPO₄
 measurements at 5 °C, 10 °C, 20 °C, 30 °C, 40 °C, 45 °C and 50 °C

NOMINAL VALUE: pH = 6.9 at 25 °C

pH_{*i*}: result of measurement carried out by laboratory *i*

*u*_{*i*}: combined standard uncertainty (*k* = 1) of pH_{*i*}

Lab <i>i</i> ↓	Temperature / °C								Date of measurement
	5		10		20		30		
	pH _{<i>i</i>}	<i>u</i> _{<i>i</i>}	pH _{<i>i</i>}	<i>u</i> _{<i>i</i>}	pH _{<i>i</i>}	<i>u</i> _{<i>i</i>}	pH _{<i>i</i>}	<i>u</i> _{<i>i</i>}	
PTB	6.9514	0.0012	6.9229	0.0012	6.8799	0.0011	6.8522	0.0011	99-11
KRISS	6.9466	0.0011	6.9183	0.0010	6.8751	0.0010	6.8478	0.0010	99-11
CENAM	6.9420	0.0080	6.9130	0.0090	6.8840	0.0050	6.8540	0.0060	99-11
GUM	6.9532	0.0010	6.9234	0.0009	6.8792	0.0009	6.8511	0.0009	99-12
VNIIFTRI	6.9500	0.0018	6.9220	0.0019	6.8790	0.0018	6.8520	0.0018	99-10
NIST	6.9490	0.0006	6.9208	0.0007	6.8779	0.0006	6.8520	0.0021	00-01

Lab <i>i</i> ↓	Temperature / °C						Date of measurement
	40		45		50		
	pH _{<i>i</i>}	<i>u</i> _{<i>i</i>}	pH _{<i>i</i>}	<i>u</i> _{<i>i</i>}	pH _{<i>i</i>}	<i>u</i> _{<i>i</i>}	
PTB	6.8373	0.0011	6.8336	0.0011	6.8322	0.0011	99-11
DPL	6.8382	0.0008	6.8346	0.0008			99-10
KRISS	6.8326	0.0010	6.8294	0.0009	6.8272	0.0010	99-11
CENAM	6.8370	0.0040	6.8400	0.0040	6.8380	0.0050	99-11
GUM	6.8344	0.0012	6.8297	0.0012	6.8252	0.0013	99-12
VNIIFTRI	6.8340	0.0019	6.8310	0.0019	6.8280	0.0018	99-10
NIST	6.8382	0.0021	6.8347	0.0022	6.8357	0.0023	00-01

Key comparison APMP.QM-K9

MEASURAND : pH value of phosphate buffer
sample 1: 0.0217 mol kg⁻¹ KH₂PO₄ + 0.0219 mol kg⁻¹ Na₂HPO₄
 measurements at 15 °C, 25 °C and 37 °C

NOMINAL VALUE: pH = 6.86 at 25 °C

pH_i: result of measurement carried out by laboratory *i*

u_i: combined standard uncertainty (*k* = 1) of pH_i

Lab <i>i</i> ↓	Temperature / °C					
	15		25		37	
	pH _{<i>i</i>}	u _{<i>i</i>}	pH _{<i>i</i>}	u _{<i>i</i>}	pH _{<i>i</i>}	u _{<i>i</i>}
NMIJ	6.9169	0.0012	6.8825	0.0012	6.8594	0.0013
NIMT	6.9116	0.00445	6.8801	0.00325	6.8575	0.0044
GL	6.919	0.0055	6.883	0.0057	6.859	0.0056
MSL	-	-	6.9114	0.0015	-	-
NIM	6.9181	0.00175	6.8835	0.00175	6.8582	0.00175
KIM-LIPI	-	-	6.8650	0.0066	-	-
NML-SIRIM	6.9218	0.0014	6.8797	0.0014	6.8541	0.00155
SMU	6.9171	0.00185	6.8845	0.00115	6.8604	0.00125
ITDI	6.88	0.025	6.82	0.0265	6.78	0.02685
VMI-STAMEQ	-	-	6.880	0.042	-	-

Key comparison CCQM-K9

MEASURAND : pH value of phosphate buffer
 sample 1: 0.025 mol kg⁻¹ KH₂PO₄ + 0.025 mol kg⁻¹ Na₂HPO₄
 NOMINAL VALUE: pH = 6.9 at 25 °C

The key comparison reference value, pH_R, is obtained as the variance-weighted mean of the results from the participants.
 The standard deviation of the weighted mean is taken as the standard uncertainty, u_R, of pH_R.

Temperature / °C	15	25	37
pH _R	6.8975	6.8633	6.8394
u _R	0.0005	0.0006	0.0006

Temperature / °C	5	10	20	30
pH _R	6.9497	6.9213	6.8781	6.8512
u _R	0.0009	0.0008	0.0007	0.0007
Temperature / °C	40	45	50	
pH _R	6.8360	6.8325	6.8290	
u _R	0.0009	0.0011	0.0015	

The degree of equivalence of each laboratory with respect to the reference value is given by a pair of terms:

$D_i = (pH_i - pH_R)$ and U_i , its expanded uncertainty ($k = 2$), $U_i = 2(u_i^2 + u_R^2)^{1/2}$. Note: this gives a conservative estimate of U_i .

The degree of equivalence between two laboratories is given by a pair of terms:

$D_{ij} = D_i - D_j = pH_i - pH_j$ and U_{ij} , its expanded uncertainty ($k = 2$), $U_{ij} = 2(u_i^2 + u_j^2)^{1/2}$.

Within its uncertainty, the performance of PTB is assumed to be similar in the original full comparison and in the subsequent bilateral comparison between SMU and PTB. Following this bilateral comparison:

- the new degree of equivalence of SMU with respect to the key comparison reference value is

$D_{SMU(s)} = pH_{SMU(s)} - pH_{PTB(s)} + D_{PTB}$ and $U_{SMU(s)} = 2(u_{SMU(s)}^2 + u_{PTB(s)}^2 + u_R^2)^{1/2}$;

- the new degree of equivalence between SMU and any other laboratory j is

$D_{SMU(s)j} = D_{SMU(s)} - D_j$ and $U_{SMU(s)j} = 2(u_{SMU(s)}^2 + u_{PTB(s)}^2 + u_j^2)^{1/2}$.

Linking CCQM-K9.2 results to CCQM-K9 results

The linkage process is detailed in Section 13 of the CCQM-K9.2 Final Report and is based on the performance of the common participants, PTB and VNIIFTRI, in both key comparisons. It leads to the computation of the degrees of equivalence of participants in CCQM-K9.2 only, relative to the CCQM-K9 key comparison reference values, and allows to extend the graphs of equivalence obtained in CCQM-K9 at temperatures 15 °C, 25 °C and 37 °C.

No pair-wise degrees of equivalence involving participants in CCQM-K9.2 only is computed.

Linking APMP.QM-K9 results to CCQM-K9 results

The linkage process is detailed in Section 8 of the APMP.QM-K9 Final Report and is ensured by the performance of SMU, NIM and NMIJ, which participated in APMP.QM-K9 and also in one of the key comparisons CCQM-K9, CCQM-K9 (subsequent) or CCQM-K9.2. It leads to the computation of the degrees of equivalence of participants in APMP.QM-K9 only, relative to the CCQM-K9 key comparison reference values, and allows to extend the graphs of equivalence obtained in CCQM-K9 at temperatures 15 °C, 25 °C and 37 °C.

No pair-wise degrees of equivalence involving participants in APMP.QM-K9 only is computed.

Key comparisons CCQM-K9, CCQM-K9.2, and APMP.QM-K9

MEASURAND : pH value of phosphate buffer, sample 1: 0.025 mol kg⁻¹ KH₂PO₄ + 0.025 mol kg⁻¹ Na₂HPO₄

NOMINAL VALUE: pH = 6.9 at 25 °C

Temperature: 15 °C

Lab *j* →

Lab <i>i</i> ↓	<i>D_i</i> <i>U_i</i>		NRCCRM		PTB		DPL		KRISS		CENAM		GUM		VNIIFTRI		SMU		NIST		SMU(s)		
	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	
NRCCRM	-0.0025	0.0061																					
PTB	0.0017	0.0022	0.0042	0.0063			0.0009	0.0026	0.0051	0.0028	0.0002	0.0063	0.0002	0.0028	0.0012	0.0043	0.0062	0.0028	0.0019	0.0023	-0.0010	0.0036	
DPL	0.0008	0.0019	0.0033	0.0062	-0.0009	0.0026			0.0042	0.0026	-0.0007	0.0062	-0.0007	0.0026	0.0003	0.0041	0.0053	0.0026	0.0010	0.0019	-0.0019	0.0034	
KRISS	-0.0034	0.0022	-0.0009	0.0063	-0.0051	0.0028	-0.0042	0.0026			-0.0049	0.0063	-0.0049	0.0028	-0.0039	0.0043	0.0011	0.0028	-0.0032	0.0023	-0.0061	0.0036	
CENAM	0.0015	0.0061	0.0040	0.0085	-0.0002	0.0063	0.0007	0.0062	0.0049	0.0063			0.0000	0.0063	0.0010	0.0071	0.0060	0.0063	0.0017	0.0061	-0.0012	0.0067	
GUM	0.0015	0.0022	0.0040	0.0063	-0.0002	0.0028	0.0007	0.0026	0.0049	0.0028	0.0000	0.0063			0.0010	0.0043	0.0060	0.0028	0.0017	0.0023	-0.0012	0.0036	
VNIIFTRI	0.0005	0.0039	0.0030	0.0071	-0.0012	0.0043	-0.0003	0.0041	0.0039	0.0043	-0.0010	0.0071	-0.0010	0.0043			0.0050	0.0043	0.0007	0.0039	-0.0022	0.0048	
SMU	-0.0045	0.0022	-0.0020	0.0063	-0.0062	0.0028	-0.0053	0.0026	-0.0011	0.0028	-0.0060	0.0063	-0.0060	0.0028	-0.0050	0.0043			-0.0043	0.0023			
NIST	-0.0002	0.0014	0.0023	0.0061	-0.0019	0.0023	-0.0010	0.0019	0.0032	0.0023	-0.0017	0.0061	-0.0017	0.0023	-0.0007	0.0039	0.0043	0.0023			-0.0029	0.0032	
SMU(s)	0.0027	0.0031	0.0052	0.0067	0.0010	0.0036	0.0019	0.0034	0.0061	0.0036	0.0012	0.0067	0.0012	0.0036	0.0022	0.0048			0.0029	0.0032			

DFM	-0.0001	0.0024
NMIJ	-0.0013	0.0032
INMETRO	-0.0097	0.0065
CMI	0.0264	0.0040

NIMT	-0.0061	0.0094
GL	0.0013	0.0114
MSL	-	-
KIM-LIPI	-	-
NML-SIRIM	0.0041	0.0042
ITDI	-0.0377	0.0502
VMI-STAMEQ	-	-

Key comparisons CCQM-K9, CCQM-K9.2, and APMP.QM-K9

MEASURAND : pH value of phosphate buffer, sample 1: $0.025 \text{ mol kg}^{-1} \text{ KH}_2\text{PO}_4 + 0.025 \text{ mol kg}^{-1} \text{ Na}_2\text{HPO}_4$

NOMINAL VALUE: pH = 6.9 at 25 °C

Temperature: 25 °C

Lab *j* \implies

Lab <i>i</i> ↓	<i>D_i</i> <i>U_i</i>		NRCCRM		PTB		DPL		KRISS		CENAM		GUM		VNIIFTRI		SMU		NIST		SMU(s)	
	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
NRCCRM	-0.0033	0.0042			-0.0043	0.0046	-0.0043	0.0043	0.0003	0.0045	0.0020	0.0126	-0.0045	0.0044	-0.0040	0.0054	0.0010	0.0045	-0.0030	0.0042	-0.0054	0.0051
PTB	0.0010	0.0025	0.0043	0.0046			0.0000	0.0027	0.0046	0.0030	0.0063	0.0122	-0.0002	0.0028	0.0003	0.0042	0.0053	0.0030	0.0013	0.0026	-0.0011	0.0039
DPL	0.0010	0.0020	0.0043	0.0043	0.0000	0.0027			0.0046	0.0026	0.0063	0.0121	-0.0002	0.0024	0.0003	0.0039	0.0053	0.0026	0.0013	0.0021	-0.0011	0.0036
KRISS	-0.0036	0.0023	-0.0003	0.0045	-0.0046	0.0030	-0.0046	0.0026			0.0017	0.0122	-0.0048	0.0027	-0.0043	0.0041	0.0007	0.0028	-0.0033	0.0024	-0.0057	0.0038
CENAM	-0.0053	0.0121	-0.0020	0.0126	-0.0063	0.0122	-0.0063	0.0121	-0.0017	0.0122			-0.0065	0.0121	-0.0060	0.0125	-0.0010	0.0122	-0.0050	0.0121	-0.0074	0.0124
GUM	0.0012	0.0021	0.0045	0.0044	0.0002	0.0028	0.0002	0.0024	0.0048	0.0027	0.0065	0.0121			0.0005	0.0040	0.0055	0.0027	0.0015	0.0022	-0.0009	0.0037
VNIIFTRI	0.0007	0.0038	0.0040	0.0054	-0.0003	0.0042	-0.0003	0.0039	0.0043	0.0041	0.0060	0.0125	-0.0005	0.0040			0.0050	0.0041	0.0010	0.0038	-0.0014	0.0048
SMU	-0.0043	0.0023	-0.0010	0.0045	-0.0053	0.0030	-0.0053	0.0026	-0.0007	0.0028	0.0010	0.0122	-0.0055	0.0027	-0.0050	0.0041			-0.0040	0.0024		
NIST	-0.0003	0.0017	0.0030	0.0042	-0.0013	0.0026	-0.0013	0.0021	0.0033	0.0024	0.0050	0.0121	-0.0015	0.0022	-0.0010	0.0038	0.0040	0.0024			-0.0024	0.0035

SMU(s)	0.0021	0.0033	0.0054	0.0051	0.0011	0.0039	0.0011	0.0036	0.0057	0.0038	0.0074	0.0124	0.0009	0.0037	0.0014	0.0048			0.0024	0.0035		
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DFM	0.0014	0.0024
NMIJ	-0.0009	0.0029
INMETRO	-0.0035	0.0062
CMI	0.0158	0.0040

NIMT	-0.0041	0.0070
GL	-0.0012	0.0118
MSL	0.0272	0.0040
KIM-LIPI	-0.0192	0.0134
NML-SIRIM	-0.0045	0.0040
ITDI	-0.0642	0.0530
VMI-STAMEQ	-0.0042	0.0840

Key comparisons CCQM-K9, CCQM-K9.2, and APMP.QM-K9

MEASURAND : pH value of phosphate buffer, sample 1: 0.025 mol kg⁻¹ KH₂PO₄ + 0.025 mol kg⁻¹ Na₂HPO₄

NOMINAL VALUE: pH = 6.9 at 25 °C

Temperature: 37 °C

Lab *j* →

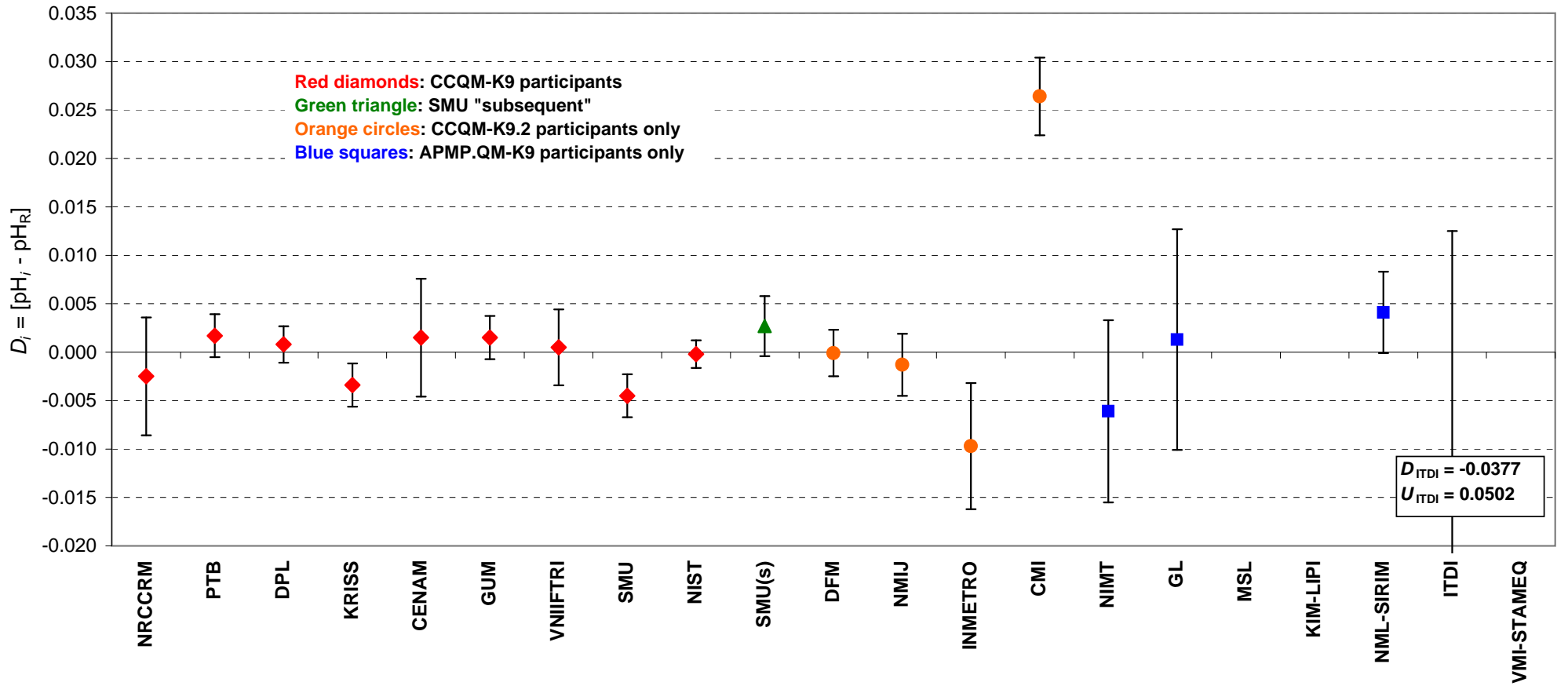
Lab <i>i</i> ↓	<i>D_i</i>	<i>U_i</i>	NRCCRM		PTB		DPL		KRISS		GUM		VNIIFTRI		SMU		NIST		SMU(s)	
			<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
NRCCRM	-0.0024	0.0042			-0.0036	0.0046	-0.0037	0.0043	0.0010	0.0045	-0.0012	0.0044	-0.0020	0.0055	0.0020	0.0045	-0.0036	0.0059	-0.0053	0.0052
PTB	0.0012	0.0025	0.0036	0.0046			-0.0001	0.0027	0.0046	0.0030	0.0024	0.0028	0.0016	0.0044	0.0056	0.0030	0.0000	0.0048	-0.0017	0.0040
DPL	0.0013	0.0020	0.0037	0.0043	0.0001	0.0027			0.0047	0.0026	0.0025	0.0024	0.0017	0.0041	0.0057	0.0026	0.0001	0.0046	-0.0016	0.0038
KRISS	-0.0034	0.0024	-0.0010	0.0045	-0.0046	0.0030	-0.0047	0.0026			-0.0022	0.0027	-0.0030	0.0043	0.0010	0.0028	-0.0046	0.0047	-0.0063	0.0039
GUM	-0.0012	0.0022	0.0012	0.0044	-0.0024	0.0028	-0.0025	0.0024	0.0022	0.0027			-0.0008	0.0042	0.0032	0.0027	-0.0024	0.0047	-0.0041	0.0038
VNIIFTRI	-0.0004	0.0040	0.0020	0.0055	-0.0016	0.0044	-0.0017	0.0041	0.0030	0.0043	0.0008	0.0042			0.0040	0.0043	-0.0016	0.0057	-0.0033	0.0051
SMU	-0.0044	0.0024	-0.0020	0.0045	-0.0056	0.0030	-0.0057	0.0026	-0.0010	0.0028	-0.0032	0.0027	-0.0040	0.0043			-0.0056	0.0047		
NIST	0.0012	0.0045	0.0036	0.0059	0.0000	0.0048	-0.0001	0.0046	0.0046	0.0047	0.0024	0.0047	0.0016	0.0057	0.0056	0.0047			-0.0017	0.0055

SMU(s)	0.0029	0.0036	0.0053	0.0052	0.0017	0.0040	0.0016	0.0038	0.0063	0.0039	0.0041	0.0038	0.0033	0.0051			0.0017	0.0055		
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DFM	0.0015	0.0026
NMIJ	-0.0008	0.0032
INMETRO	-0.0049	0.0062
CMI	0.0170	0.0048

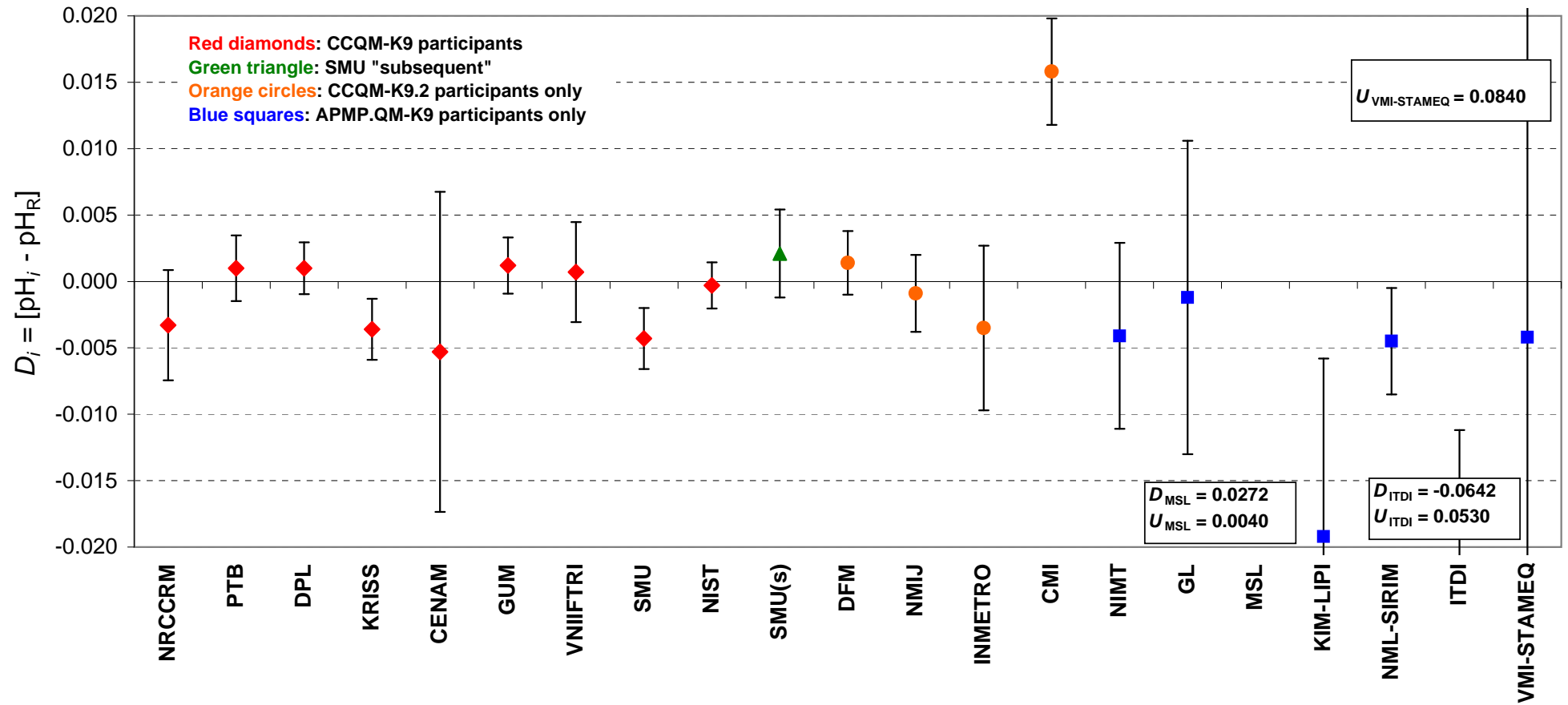
NIMT	-0.0019	0.0092
GL	-0.0004	0.0116
MSL	-	-
KIM-LIPI	-	-
NML-SIRIM	-0.0053	0.0042
ITDI	-0.0794	0.0538
VMI-STAMEQ	-	-

CCQM-K9, CCQM-K9.2, and APMP.QM-K9
pH of phosphate buffer, sample 1, temperature: 15 °C
 Degrees of equivalence: D_i and expanded uncertainty U_i ($k = 2$)



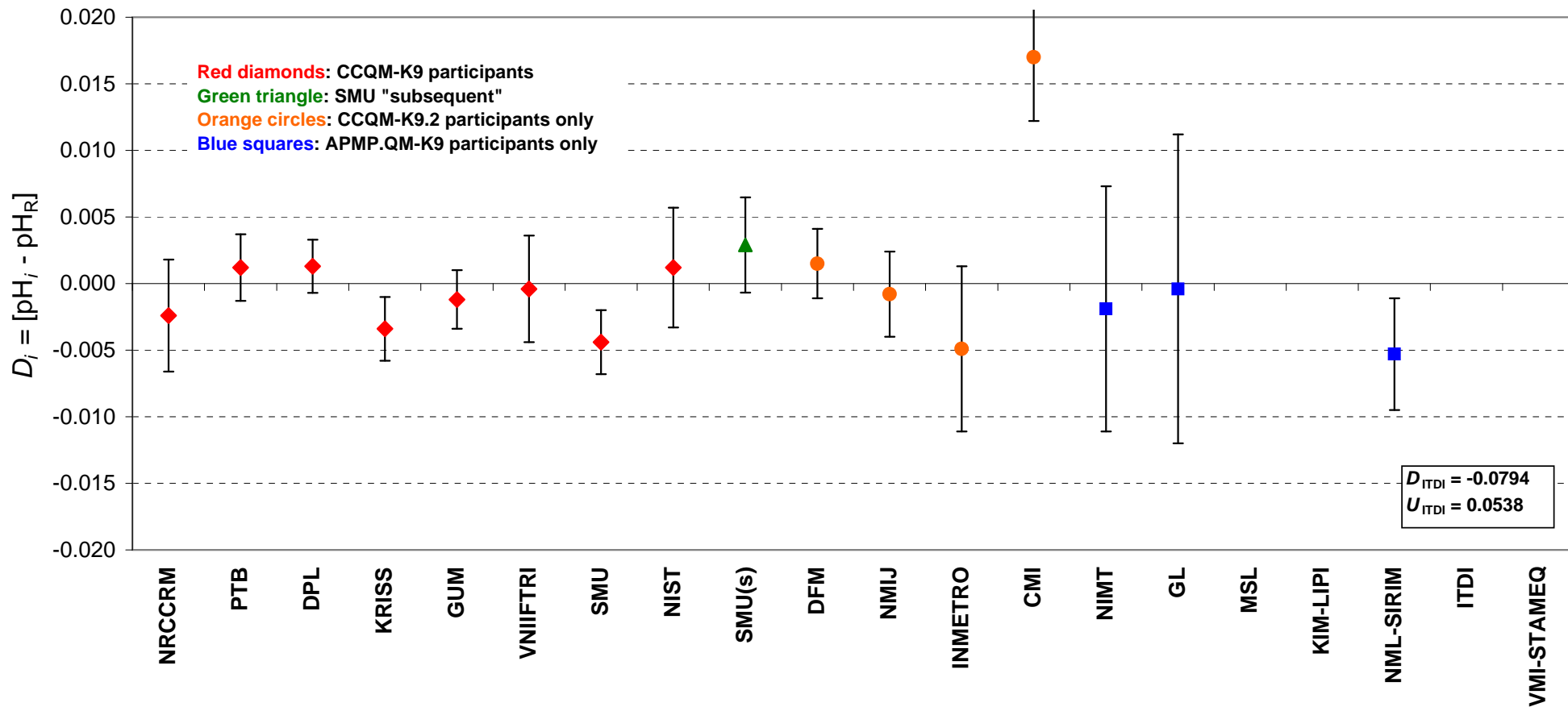
Sample 1: 0.025 mol kg⁻¹ KH₂PO₄ + 0.025 mol kg⁻¹ Na₂HPO₄

CCQM-K9 and CCQM-K9.2, and APMP.QM-K9
pH of phosphate buffer, sample 1, temperature: 25 °C
 Degrees of equivalence: D_i and expanded uncertainty U_i ($k = 2$)



Sample 1: 0.025 mol kg⁻¹ KH₂PO₄ + 0.025 mol kg⁻¹ Na₂HPO₄

CCQM-K9, CCQM-K9.2, and APMP.QM-K9
pH of phosphate buffer, sample 1, temperature: 37 °C
 Degrees of equivalence: D_i and expanded uncertainty U_i ($k = 2$)



Sample 1: 0.025 mol kg⁻¹ KH₂PO₄ + 0.025 mol kg⁻¹ Na₂HPO₄

Key comparison CCQM-K9

MEASURAND : pH value of phosphate buffer, sample 1: 0.025 mol kg⁻¹ KH₂PO₄ + 0.025 mol kg⁻¹ Na₂HPO₄

NOMINAL VALUE: pH = 6.9 at 25 °C

Temperature: 5 °C

Lab *i* ↓

	<i>D_i</i>	<i>U_i</i>
PTB	0.0017	0.0030
KRISS	-0.0031	0.0029
CENAM	-0.0077	0.0161
GUM	0.0035	0.0027
VNIIFTRI	0.0003	0.0041
NIST	-0.0007	0.0022

Lab *j* →

PTB		KRISS		CENAM		GUM		VNIIFTRI		NIST	
<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
		0.0048	0.0033	0.0094	0.0162	-0.0018	0.0031	0.0014	0.0043	0.0024	0.0027
-0.0048	0.0033			0.0046	0.0162	-0.0066	0.0030	-0.0034	0.0042	-0.0024	0.0025
-0.0094	0.0162	-0.0046	0.0162			-0.0112	0.0161	-0.0080	0.0164	-0.0070	0.0160
0.0018	0.0031	0.0066	0.0030	0.0112	0.0161			0.0032	0.0041	0.0042	0.0024
-0.0014	0.0043	0.0034	0.0042	0.0080	0.0164	-0.0032	0.0041			0.0010	0.0038
-0.0024	0.0027	0.0024	0.0025	0.0070	0.0160	-0.0042	0.0024	-0.0010	0.0038		

Temperature: 10 °C

Lab *i* ↓

	<i>D_i</i>	<i>U_i</i>
PTB	0.0016	0.0029
KRISS	-0.0030	0.0026
CENAM	-0.0083	0.0181
GUM	0.0021	0.0024
VNIIFTRI	0.0007	0.0041
NIST	-0.0005	0.0021

Lab *j* →

PTB		KRISS		CENAM		GUM		VNIIFTRI		NIST	
<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
		0.0046	0.0031	0.0099	0.0182	-0.0005	0.0030	0.0009	0.0045	0.0021	0.0028
-0.0046	0.0031			0.0053	0.0181	-0.0051	0.0027	-0.0037	0.0043	-0.0025	0.0024
-0.0099	0.0182	-0.0053	0.0181			-0.0104	0.0181	-0.0090	0.0184	-0.0078	0.0181
0.0005	0.0030	0.0051	0.0027	0.0104	0.0181			0.0014	0.0042	0.0026	0.0023
-0.0009	0.0045	0.0037	0.0043	0.0090	0.0184	-0.0014	0.0042			0.0012	0.0040
-0.0021	0.0028	0.0025	0.0024	0.0078	0.0181	-0.0026	0.0023	-0.0012	0.0040		

Temperature: 20 °C

Lab *i* ↓

	<i>D_i</i>	<i>U_i</i>
PTB	0.0018	0.0026
KRISS	-0.0030	0.0024
CENAM	0.0059	0.0101
GUM	0.0011	0.0023
VNIIFTRI	0.0009	0.0039
NIST	-0.0002	0.0018

Lab *j* →

PTB		KRISS		CENAM		GUM		VNIIFTRI		NIST	
<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
		0.0048	0.0030	-0.0041	0.0102	0.0007	0.0028	0.0009	0.0042	0.0020	0.0025
-0.0048	0.0030			-0.0089	0.0102	-0.0041	0.0027	-0.0039	0.0041	-0.0028	0.0023
0.0041	0.0102	0.0089	0.0102			0.0048	0.0102	0.0050	0.0106	0.0061	0.0101
-0.0007	0.0028	0.0041	0.0027	-0.0048	0.0102			0.0002	0.0040	0.0013	0.0021
-0.0009	0.0042	0.0039	0.0041	-0.0050	0.0106	-0.0002	0.0040			0.0011	0.0038
-0.0020	0.0025	0.0028	0.0023	-0.0061	0.0101	-0.0013	0.0021	-0.0011	0.0038		

Temperature: 30 °C

Lab *i* ↓

	<i>D_i</i>	<i>U_i</i>
PTB	0.0010	0.0026
KRISS	-0.0034	0.0024
CENAM	0.0028	0.0121
GUM	-0.0001	0.0023
VNIIFTRI	0.0008	0.0039
NIST	0.0008	0.0045

Lab *j* →

PTB		KRISS		CENAM		GUM		VNIIFTRI		NIST	
<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
		0.0044	0.0030	-0.0018	0.0122	0.0011	0.0028	0.0002	0.0042	0.0002	0.0048
-0.0044	0.0030			-0.0062	0.0122	-0.0033	0.0027	-0.0042	0.0041	-0.0042	0.0047
0.0018	0.0122	0.0062	0.0122			0.0029	0.0121	0.0020	0.0125	0.0020	0.0127
-0.0011	0.0028	0.0033	0.0027	-0.0029	0.0121			-0.0009	0.0040	-0.0009	0.0046
-0.0002	0.0042	0.0042	0.0041	-0.0020	0.0125	0.0009	0.0040			0.0000	0.0056
-0.0002	0.0048	0.0042	0.0047	-0.0020	0.0127	0.0009	0.0046	0.0000	0.0056		

Key comparison CCQM-K9

MEASURAND : pH value of phosphate buffer, sample 1: 0.025 mol kg⁻¹ KH₂PO₄ + 0.025 mol kg⁻¹ Na₂HPO₄

NOMINAL VALUE: pH = 6.9 at 25 °C

Temperature: 40 °C

Lab i ↓ Lab j →

Lab i	Lab j		PTB		DPL		KRISS		CENAM		GUM		VNIIFTRI		NIST	
	<i>D_i</i>	<i>U_i</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
PTB	0.0013	0.0029														
DPL	0.0022	0.0025			-0.0009	0.0027	0.0047	0.0030	0.0003	0.0083	0.0029	0.0033	0.0033	0.0044	-0.0009	0.0047
KRISS	-0.0034	0.0027			0.0009	0.0027	0.0056	0.0026	0.0012	0.0082	0.0038	0.0029	0.0042	0.0041	0.0000	0.0045
CENAM	0.0010	0.0082			-0.0047	0.0030	-0.0056	0.0026	-0.0044	0.0082	-0.0018	0.0031	-0.0014	0.0043	-0.0056	0.0047
GUM	-0.0016	0.0030			-0.0003	0.0083	-0.0012	0.0082	0.0044	0.0082	0.0026	0.0084	0.0030	0.0089	-0.0012	0.0090
VNIIFTRI	-0.0020	0.0042			-0.0029	0.0033	-0.0038	0.0029	0.0018	0.0031	-0.0026	0.0084	0.0004	0.0045	-0.0038	0.0048
NIST	0.0022	0.0046			-0.0033	0.0044	-0.0042	0.0041	0.0014	0.0043	-0.0030	0.0089	-0.0004	0.0045	-0.0042	0.0057
					0.0009	0.0047	0.0000	0.0045	0.0056	0.0047	0.0012	0.0090	0.0038	0.0048	0.0042	0.0057

Temperature: 45 °C

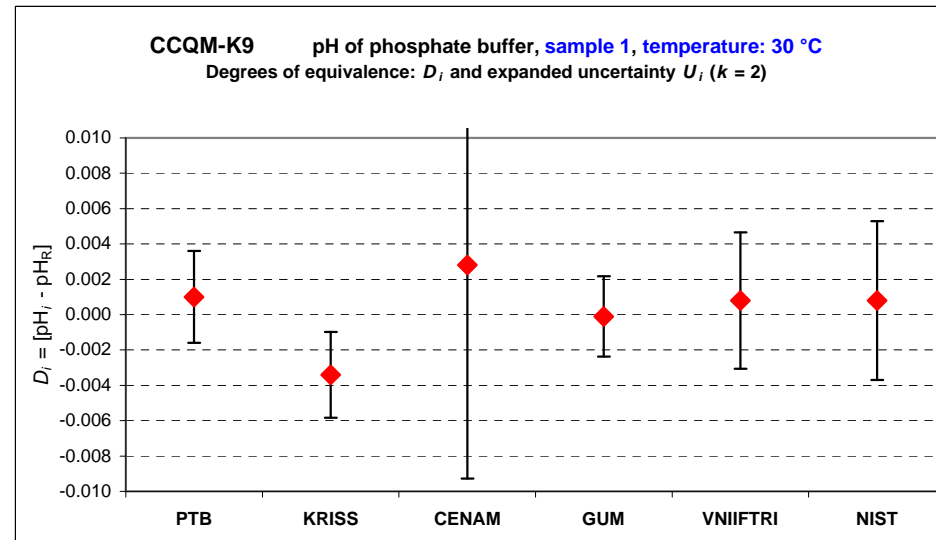
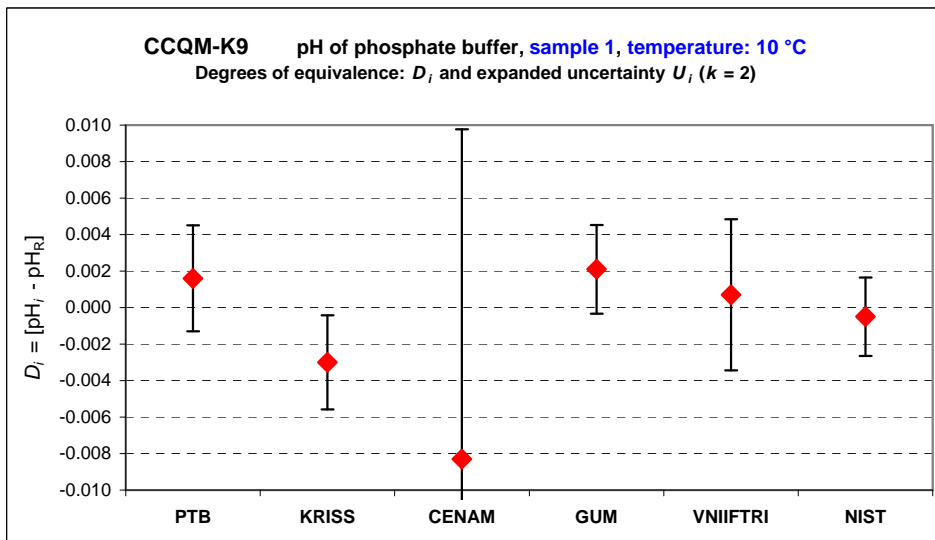
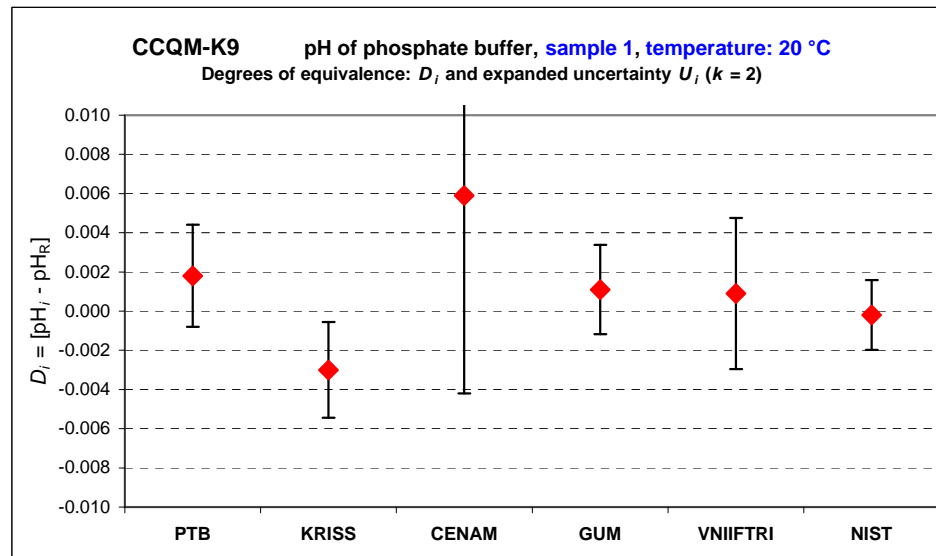
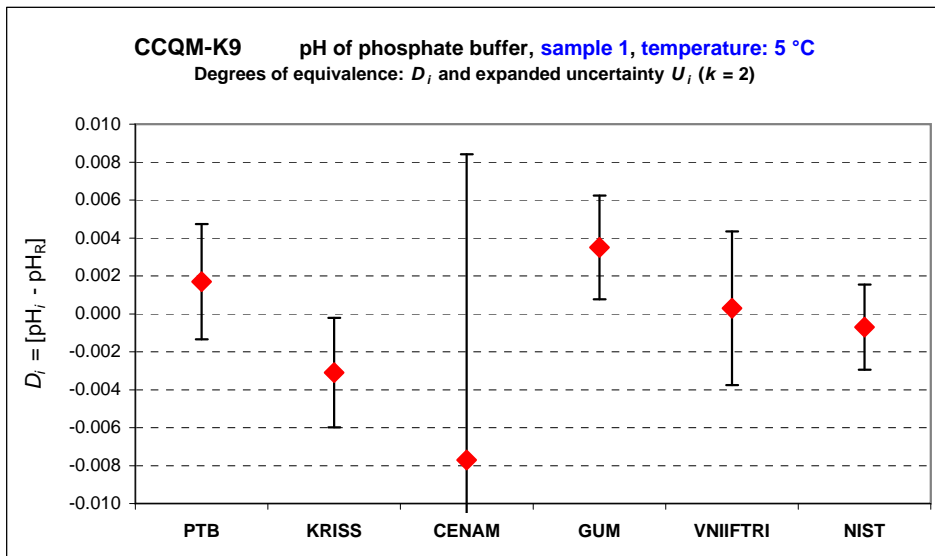
Lab i ↓ Lab j →

Lab i	Lab j		PTB		DPL		KRISS		CENAM		GUM		VNIIFTRI		NIST	
	<i>D_i</i>	<i>U_i</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
PTB	0.0011	0.0031														
DPL	0.0021	0.0027			-0.0010	0.0027	0.0042	0.0028	-0.0064	0.0083	0.0039	0.0033	0.0026	0.0044	-0.0011	0.0050
KRISS	-0.0031	0.0028			0.0010	0.0027	0.0052	0.0024	-0.0054	0.0082	0.0049	0.0029	0.0036	0.0041	-0.0001	0.0048
CENAM	0.0075	0.0083			-0.0042	0.0028	-0.0052	0.0024	-0.0106	0.0082	-0.0003	0.0030	-0.0016	0.0042	-0.0053	0.0048
GUM	-0.0028	0.0033			0.0064	0.0083	0.0054	0.0082	0.0106	0.0082	0.0103	0.0084	0.0090	0.0089	0.0053	0.0092
VNIIFTRI	-0.0015	0.0044			-0.0039	0.0033	-0.0049	0.0029	0.0003	0.0030	-0.0103	0.0084	-0.0013	0.0045	-0.0050	0.0051
NIST	0.0022	0.0050			-0.0026	0.0044	-0.0036	0.0041	0.0016	0.0042	-0.0090	0.0089	0.0013	0.0045	-0.0037	0.0059
					0.0011	0.0050	0.0001	0.0048	0.0053	0.0048	-0.0053	0.0092	0.0050	0.0051	0.0037	0.0059

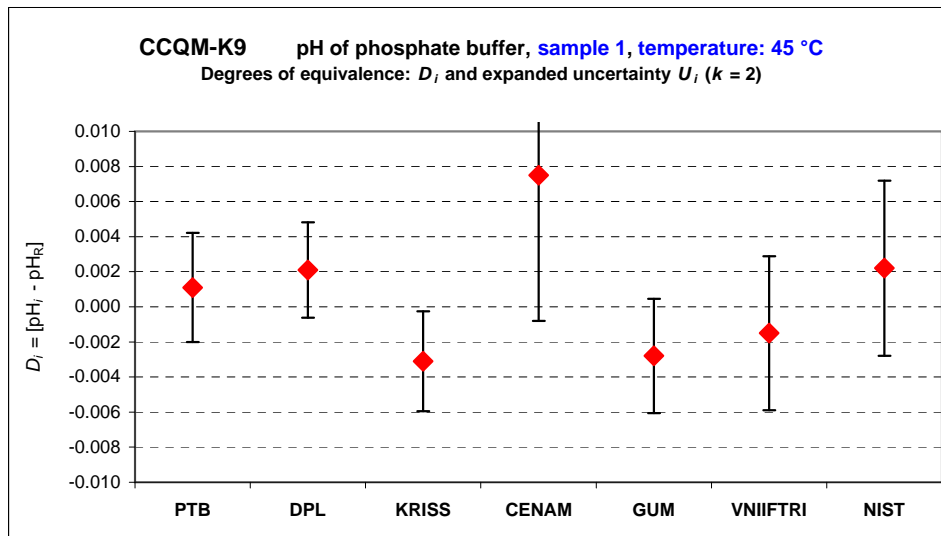
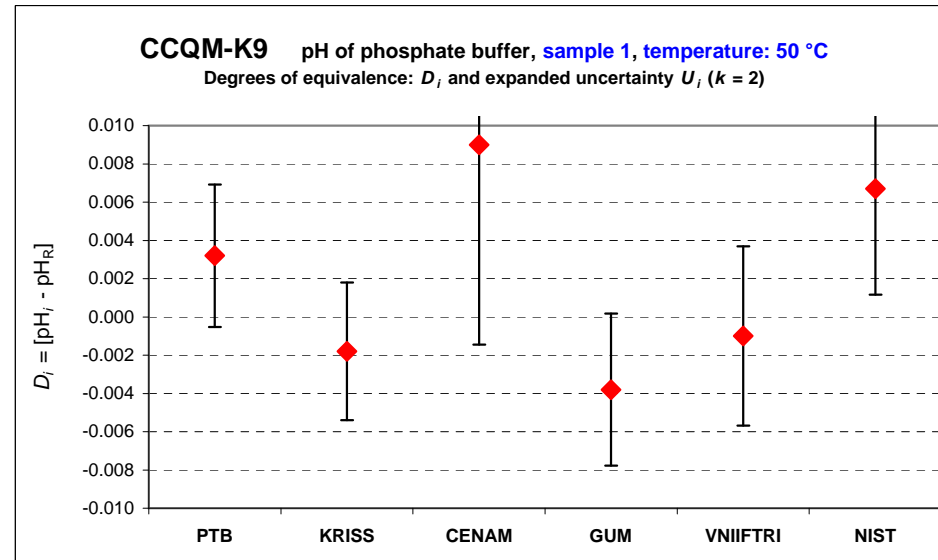
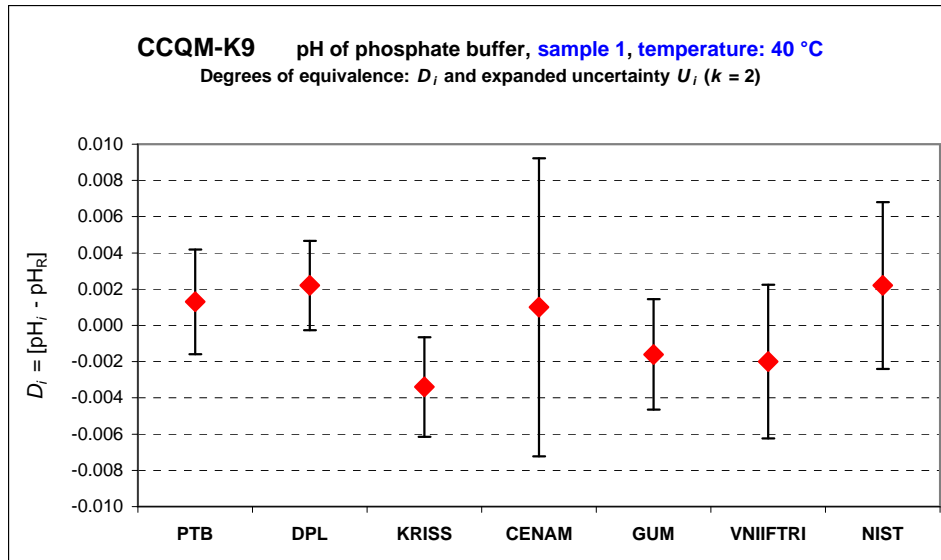
Temperature: 50 °C

Lab i ↓ Lab j →

Lab i	Lab j		PTB		KRISS		CENAM		GUM		VNIIFTRI		NIST	
	<i>D_i</i>	<i>U_i</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>	<i>D_{ij}</i>	<i>U_{ij}</i>
PTB	0.0032	0.0037												
KRISS	-0.0018	0.0036			0.0050	0.0030	-0.0058	0.0102	0.0070	0.0034	0.0042	0.0042	-0.0035	0.0052
CENAM	0.0090	0.0104			-0.0050	0.0030	-0.0108	0.0102	0.0020	0.0033	-0.0008	0.0041	-0.0085	0.0051
GUM	-0.0038	0.0040			0.0058	0.0102	0.0108	0.0102	0.0128	0.0103	0.0100	0.0106	0.0023	0.0110
VNIIFTRI	-0.0010	0.0047			-0.0070	0.0034	-0.0020	0.0033	-0.0128	0.0103	-0.0028	0.0044	-0.0105	0.0053
NIST	0.0067	0.0055			-0.0042	0.0042	0.0008	0.0041	-0.0100	0.0106	0.0028	0.0044	-0.0077	0.0059
					0.0035	0.0052	0.0085	0.0051	-0.0023	0.0110	0.0105	0.0053	0.0077	0.0059



Sample 1: $0.025 \text{ mol kg}^{-1} \text{ KH}_2\text{PO}_4 + 0.025 \text{ mol kg}^{-1} \text{ Na}_2\text{HPO}_4$



Sample 1: 0.025 mol kg⁻¹ KH₂PO₄ + 0.025 mol kg⁻¹ Na₂HPO₄