

## Key comparison CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12

### Key comparison CCEM-K12

MEASURAND : AC-DC current transfer difference

CURRENT : 10 mA

FREQUENCY : 10 Hz, 55 Hz, 1 kHz, 10 kHz, 20 kHz, 50 kHz and 100 kHz

$x_i$  : AC-DC difference reported by Laboratory  $i$

$U_{Lab i}$  : expanded uncertainty of  $x_i$  at a 95 % level of confidence

Lab $i$	10 Hz		55 Hz		1 kHz		10 kHz		20 kHz		50 kHz		100 kHz		Measurement dates
	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	
NMIA	-0.1	2.0	-1.1	1.0	-1.2	1.0	-1.2	1.0	-1.2	1.0	-1.3	1.4	-1.7	1.8	Oct 2004 to Feb 2005
NIST	7.0	9.0	-1.0	6.0	-2.0	4.0	0.0	4.0	0.0	4.0	2.0	7.0	5.0	10.0	Mar 2005 to May 2005
NRC	2.5	1.7	-0.9	0.8	-0.9	0.8	-1.8	1.4	-1.8	1.8	-2.1	1.6	-2.6	1.6	May 2005 to Jun 2005
INTI	1.2	6.0	1.0	6.0	1.3	3.0	1.2	3.0	1.1	5.0	0.2	10.0	-1.0	20.0	Jul 2005 to Aug 2005
PTB	4.7	3.0	-0.3	3.0	0.0	2.0	-0.1	2.0	-0.1	2.0	-0.4	2.0	-1.0	2.0	Sep 2005 to Oct 2005
BEV	2.7	2.2	-1.1	2.2	-1.0	2.2	-1.4	2.2	-1.2	2.4	-1.1	2.6	-1.4	3.4	Oct 2005
JV	6.6	12.6	-0.5	6.6	-1.3	6.6	-1.3	6.8	-1.9	8.4	-3.0	10.4	-5.0	12.5	Nov 2005 to Dec 2005
SP	2.8	3.3	-1.0	2.2	-1.2	1.6	-1.4	2.0	-1.1	2.1	-1.2	2.5	-1.6	3.4	Jan 2006 to Feb 2006
NMIA	0.1	2.0	-1.1	1.0	-1.3	1.0	-1.4	1.0	-1.5	1.0	-1.6	1.4	-1.8	1.8	Mar 2006 to May 2006
NMC, A*STAR	2.0	7.0	-2.0	7.0	-2.0	7.0	-2.0	7.0	-2.0	7.0	-1.0	7.0	0.0	12.0	Jun 2006 to Jul 2006
INMETRO	-	-	-14.0	27.0	-14.0	27.0	-12.0	36.0	-	-	-	-	-	-	Aug 2006 to Sep 2006
NPL	4.0	11.0	-2.0	11.0	-1.0	11.0	-1.0	13.0	-2.0	14.0	0.0	15.0	1.0	22.0	Sep 2006 to Jan 2007
VNIIM	5.0	2.6	2.0	2.8	-0.8	2.4	-1.0	2.6	-1.1	2.6	-1.3	2.6	-1.7	2.6	Mar 2007 to Apr 2007
NMIA mean	0.0	2.0	-1.1	1.0	-1.3	1.0	-1.3	1.0	-1.4	1.0	-1.5	1.4	-1.8	1.8	

### Key comparison SIM.EM-K12

The measured AC-DC differences at 10 mA are reported in Table V (p. 9) in the SIM.EM-K12 Final Report.

### Key comparison EURAMET.EM-K12

The measured AC-DC differences at 10 mA are reported in Table 3 (p. 12) in the EURAMET.EM-K12 Final Report.

## Key comparison CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12

### Key comparison CCEM-K12

MEASURAND : AC-DC current transfer difference

CURRENT : 5 A

FREQUENCY : 10 Hz, 55 Hz, 1 kHz, 10 kHz, 20 kHz, 50 kHz and 100 kHz

$x_i$  : AC-DC difference reported by Laboratory  $i$

$U_{Lab i}$  : expanded uncertainty of  $x_i$  at a 95 % level of confidence

Lab $i$	10 Hz		55 Hz		1 kHz		10 kHz		20 kHz		50 kHz		100 kHz		Measurement dates
	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	$x_i$ / ( $\mu$ A/A)	$U_{Lab i}$	
NMIA	-0.6	4.5	0.4	4.1	0.8	4.1	-1.3	4.2	-8.3	4.5	-37.1	8.0	-70.5	12.0	Oct 2004 to Feb 2005
NIST	3.0	19.0	4.0	18.0	3.0	17.0	6.0	17.0	-8.0	21.0	-33.0	27.0	-91.0	33.0	Mar 2005 to May 2005
NRC	-0.1	15.0	-0.2	14.0	-0.6	14.0	-3.1	15.0	-8.2	15.0	-35.6	20.0	-76.6	31.0	May 2005 to Jun 2005
INTI	1.2	8.0	-1.2	7.0	3.4	5.0	-2.1	7.0	-7.7	8.0	-31.1	13.0	-65.2	22.0	Jul 2005 to Aug 2005
PTB	0.0	6.0	0.0	4.0	0.0	4.0	-4.0	5.0	-11.0	7.0	-36.0	9.0	-66.0	11.0	Sep 2005 to Oct 2005
BEV	0.5	2.0	0.0	2.0	0.0	2.0	-3.2	9.0	-9.0	9.0	-32.9	9.6	-59.1	12.6	Oct 2005
JV	5.0	44.6	1.8	13.2	-0.5	10.6	-3.6	11.0	-10.4	18.4	-36.5	25.2	-68.8	38.4	Nov 2005 to Dec 2005
SP	-0.5	4.9	-0.7	4.2	-0.9	3.9	-1.4	4.3	-6.7	5.1	-31.0	10.0	-56.0	15.0	Jan 2006 to Feb 2006
NMIA	-0.8	4.5	0.0	4.1	0.4	4.1	-2.2	4.2	-10.3	4.5	-37.8	8.0	-69.9	12.0	Mar 2006 to May 2006
NMC, A*STAR	-2.0	25.0	-1.0	25.0	-2.0	25.0	-3.0	25.0	-8.8	25.0	-36.7	25.0	-70.1	44.0	Jun 2006 to Jul 2006
INMETRO	-	-	-1.0	91.0	24.0	91.0	118.0	96.0	-	-	-	-	-	-	Aug 2006 to Sep 2006
NPL	-26.0	56.0	8.0	25.0	-2.0	24.0	-9.0	22.0	-10.0	53.0	-56.0	84.0	-80.0	166.0	Sep 2006 to Jan 2007
VNIIM	-2.0	4.0	-2.4	4.0	2.0	3.4	2.8	3.2	-	-	-	-	-	-	Mar 2007 to Apr 2007
NMIA mean	-0.7	4.5	0.2	4.1	0.6	4.1	-1.8	4.2	-9.3	4.5	-37.5	8.0	-70.2	12.0	

### Key comparison SIM.EM-K12

The measured AC-DC differences at 5 A are reported in Table VI (p. 13) in the SIM.EM-K12 Final Report.

### Key comparison EURAMET.EM-K12

The measured AC-DC differences at 5 A are reported in Table 4 (p. 12) in the EURAMET.EM-K12 Final Report.

## Key comparison CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12

### Key comparison CCEM-K12

MEASURAND : AC-DC current transfer difference

CURRENT : 10 mA and 5 A

FREQUENCY : 10 Hz, 55 Hz, 1 kHz, 10 kHz, 20 kHz, 50 kHz and 100 kHz

For each nominal value of the current and of the frequency, the key comparison reference value,  $x_R$ , is computed as the weighted average of the results of those participants who have an independent realisation of primary standards for current AC-DC difference and a low reported uncertainty (see Section 6 of the Final Report).

At 10 mA, the key comparison reference values are based on the measurements carried out by NMIA, NIST, NRC, PTB, BEV, SP, and VNIIM, and at 5 A on those from NMIA, NIST, NRC, INTI, PTB, BEV, JV (except at 10 Hz), SP, NMC A\*STAR, and VNIIM (from 10 Hz to 10 kHz).

The combined standard uncertainty,  $u_R$ , of  $x_R$  is the standard uncertainty of the weighted average (see equation 2 on page 11 of the Final Report).

10 mA	10 Hz	55 Hz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz
$x_R / (\mu A/A)$	2.6	-0.8	-1.0	-1.2	-1.2	-1.3	-1.8
$2u_R / (\mu A/A)$	0.9	0.6	0.5	0.6	0.7	0.8	0.9

5 A	10 Hz	55 Hz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz
$x_R / (\mu A/A)$	-0.1	-0.3	0.5	-0.6	-8.6	-34.5	-65.3
$2u_R / (\mu A/A)$	1.5	1.4	1.3	1.8	2.6	4.0	5.7

For each nominal value of the current and of the frequency, the degree of equivalence of laboratory  $i$  relative to the corresponding key comparison reference value is given by a pair of terms both expressed in  $\mu A/A$ :  $D_i = x_i - x_R$ , and its expanded uncertainty ( $k = 2$ )  $U_i$  obtained from equations 4, 5 and 6 on page 11 of the Final Report.

## Key comparison CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12

### Key comparison SIM.EM-K12

MEASURAND : AC-DC current transfer difference

CURRENT : 10 mA and 5 A

FREQUENCY : 10 Hz, 55 Hz, 1 kHz, 10 kHz, 20 kHz, 50 kHz and 100 kHz

The INTI, NIST and the NRC acted as linking laboratories to the key comparison reference value  $x_R$  of the CCEM-K12 comparison. The linking process is described in chapter 12 of the SIM.EM-K12 Final Report.

For each nominal value of the current and of the frequency, the degree of equivalence of laboratory  $i$  relative to the corresponding key comparison reference value is given by a pair of terms both expressed in  $\mu A/A$ :  $D_i = x_i - x_R$ , and its expanded uncertainty ( $k = 2$ )  $U_i$  obtained from Tables XIV and XV of the Final Report.

### Key comparison EURAMET.EM-K12

MEASURAND : AC-DC current transfer difference

CURRENT : 10 mA and 5 A

FREQUENCY : 10 Hz, 55 Hz, 1 kHz, 10 kHz, 20 kHz, 50 kHz and 100 kHz

The BEV, JV, NPL, PTB and SP acted as linking laboratories to the key comparison reference value  $x_R$  of the CCEM-K12 comparison. The linking process is described in Section 6 (p. 10) of the EURAMET.EM-K12 Final Report.

For each nominal value of the current and of the frequency, the degree of equivalence of laboratory  $i$  relative to the corresponding key comparison reference value is given by a pair of terms both expressed in  $\mu A/A$ :  $D_i = x_i - x_R$ , and its expanded uncertainty ( $k = 2$ )  $U_i$  obtained from Tables 5 and 6 (p. 20) of the EURAMET.EM-K12 Final Report.

### Key comparison CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12

MEASURAND : AC-DC current transfer difference

CURRENT : 10 mA

Lab <i>i</i>	10 Hz		Lab <i>i</i>	55 Hz		Lab <i>i</i>	1 kHz		Lab <i>i</i>	10 kHz	
	$D_i$	$U_i$		$D_i$	$U_i$		$D_i$	$U_i$		$D_i$	$U_i$
<i>I</i> (μA/A)			<i>I</i> (μA/A)			<i>I</i> (μA/A)			<i>I</i> (μA/A)		
NMIA	-2.6	1.8	NMIA	-0.3	0.8	NMIA	-0.3	0.9	NMIA	-0.1	0.8
NIST	4.4	9.0	NIST	-0.2	6.0	NIST	-1.0	4.0	NIST	1.2	3.9
NRC	-0.1	1.4	NRC	-0.1	0.6	NRC	0.1	0.6	NRC	-0.6	1.2
INTI	-1.4	6.1	INTI	1.8	6.0	INTI	2.3	3.0	INTI	2.4	3.1
PTB	2.1	2.9	PTB	0.5	2.9	PTB	1.0	1.9	PTB	1.1	1.9
BEV	0.1	2.0	BEV	-0.3	2.1	BEV	0.0	2.1	BEV	-0.2	2.1
JV	4.0	12.6	JV	0.3	6.6	JV	-0.4	6.6	JV	0.0	6.8
SP	0.2	3.2	SP	-0.2	2.1	SP	-0.2	1.5	SP	-0.2	1.9
NMC, A*STAR	-0.6	7.1	NMC, A*STAR	-1.2	7.0	NMC, A*STAR	-1.0	7.0	NMC, A*STAR	-0.8	7.0
INMETRO	-	-	INMETRO	-13.2	27.0	INMETRO	-13.0	27.0	INMETRO	-10.8	36.0
NPL	1.4	11.0	NPL	-1.2	11.0	NPL	0.0	11.0	NPL	0.2	13.0
VNIIM	2.4	2.4	VNIIM	2.8	2.7	VNIIM	0.2	2.3	VNIIM	0.2	2.5
CENAM	-	-	CENAM	0.4	22.0	CENAM	-0.1	22.0	CENAM	0.1	22.1
INMETRO	-0.2	3.9	INMETRO	0.3	3.5	INMETRO	-0.1	3.4	INMETRO	-0.5	3.9
NIS	-5.6	3.8	NIS	-1.1	2.9	NIS	-1.1	5.6	NIS	-3.1	6.7
UTE	-	-	UTE	-4.2	12.1	UTE	-4.1	12.0	UTE	-3.4	14.2
CMI	-0.9	4.2	CMI	-0.3	4.1	CMI	0.7	4.0	CMI	0.6	4.1
PTB	0.0	1.3	PTB	-0.2	0.6	PTB	-0.1	0.4	PTB	0.0	0.4
METAS	0.5	8.4	METAS	0.4	8.3	METAS	0.4	8.3	METAS	0.2	8.3
JV	2.4	4.8	JV	0.8	2.9	JV	0.0	2.9	JV	0.6	2.9
UME	0.3	4.9	UME	-0.1	3.4	UME	0.1	3.4	UME	-0.2	3.4
GUM	1.7	4.9	GUM	0.3	3.9	GUM	0.8	3.9	GUM	-3.7	4.6
IPQ	-10.6	40.0	IPQ	-14.2	18.0	IPQ	-12.0	16.0	IPQ	-1.4	17.0
CEM	1.0	4.4	CEM	-0.1	3.6	CEM	-0.1	3.6	CEM	-0.6	3.6
BIM	0.4	14.1	BIM	-0.3	5.2	BIM	0.0	4.9	BIM	0.2	5.0
MKEH	-	-	MKEH	-4.9	21.0	MKEH	-4.9	18.0	MKEH	-4.9	23.0
NSAI NML	1.4	50.0	NSAI NML	3.8	30.0	NSAI NML	4.0	30.0	NSAI NML	1.6	47.0
VSL	-0.6	18.3	VSL	0.1	18.2	VSL	-0.6	18.1	VSL	6.3	19.5
NPL	-4.6	10.9	NPL	1.8	11.0	NPL	1.0	11.0	NPL	-1.4	12.0
METROSERT	-0.6	28.0	METROSERT	-0.2	13.0	METROSERT	-1.0	12.0	METROSERT	-17.4	33.0
SP	-0.3	3.0	SP	0.2	2.0	SP	0.1	1.4	SP	0.0	1.9
BEV	-0.2	1.8	BEV	-0.1	2.0	BEV	0.3	2.1	BEV	0.1	2.1
NIS	-2.7	7.5	NIS	0.2	7.2	NIS	1.3	7.2	NIS	1.3	7.2
LNE	2.9	5.5	LNE	1.7	3.9	LNE	0.1	2.9	LNE	-0.6	3.3
TRESCAL	-3.6	5.1	TRESCAL	-0.2	5.1	TRESCAL	0.0	5.0	TRESCAL	-0.4	5.0
INRIM	-0.8	3.5	INRIM	0.0	2.5	INRIM	0.0	2.5	INRIM	0.0	2.5
MIRS/SIC	0.4	8.1	MIRS/SIC	-0.2	4.1	MIRS/SIC	0.0	4.0	MIRS/SIC	-0.4	4.1

### Key comparison CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12

MEASURAND : AC-DC current transfer difference

CURRENT : 10 mA

Lab <i>i</i>	20 kHz		Lab <i>i</i>	50 kHz		Lab <i>i</i>	100 kHz	
	$D_i$	$U_i$		$D_i$	$U_i$		$D_i$	$U_i$
	<i>I</i> (μA/A)			<i>I</i> (μA/A)			<i>I</i> (μA/A)	
NMIA	-0.2	0.7	NMIA	-0.1	1.2	NMIA	0.0	1.6
NIST	1.2	3.9	NIST	3.3	7.0	NIST	6.8	10.0
NRC	-0.6	1.7	NRC	-0.8	1.4	NRC	-0.8	1.3
INTI	2.3	5.0	INTI	1.5	10.0	INTI	0.8	20.0
PTB	1.1	1.9	PTB	0.9	1.8	PTB	0.8	1.8
BEV	0.0	2.3	BEV	0.2	2.5	BEV	0.4	3.3
JV	-0.7	8.4	JV	-1.7	10.4	JV	-3.2	12.5
SP	0.1	2.0	SP	0.1	2.4	SP	0.2	3.3
NMC, A*STAR	-0.8	7.0	NMC, A*STAR	0.3	7.0	NMC, A*STAR	1.8	12.0
INMETRO	-	-	INMETRO	-	-	INMETRO	-	-
NPL	-0.8	14.0	NPL	1.3	15.0	NPL	2.8	22.0
VNIIM	0.1	2.5	VNIIM	0.0	2.5	VNIIM	0.1	2.4
CENAM	0.7	22.1	CENAM	2.9	22.1	CENAM	-1.3	24.1
INMETRO	-0.5	4.0	INMETRO	-1.1	4.0	INMETRO	-2.2	4.0
NIS	-	-	NIS	-	-	NIS	-	-
UTE	-	-	UTE	-	-	UTE	-	-
CMI	0.8	4.5	CMI	1.7	5.3	CMI	5.4	5.4
PTB	0.1	0.5	PTB	-0.1	0.8	PTB	0.2	1.4
METAS	-0.2	8.3	METAS	0.6	8.4	METAS	0.4	9.5
JV	0.1	2.9	JV	0.0	2.8	JV	-1.1	4.8
UME	-0.6	3.4	UME	0.6	4.1	UME	0.9	6.2
GUM	3.0	4.5	GUM	-	-	GUM	-	-
IPQ	28.1	18.0	IPQ	-	-	IPQ	-	-
CEM	-1.1	3.8	CEM	-0.1	3.9	CEM	-0.1	4.6
BIM	-1.6	5.0	BIM	-3.4	7.3	BIM	-5.1	13.1
MKEH	-1.0	19.0	MKEH	-	-	MKEH	-	-
NSAI NML	-0.9	103.0	NSAI NML	-5.0	200.0	NSAI NML	-18.1	410.0
VSL	8.9	30.8	VSL	14.3	48.2	VSL	32.2	98.4
NPL	-3.9	14.0	NPL	-9.0	15.0	NPL	-9.1	22.0
METROSERT	-	-	METROSERT	-	-	METROSERT	-	-
SP	-0.5	1.9	SP	0.2	2.2	SP	-0.1	3.1
BEV	-0.2	2.3	BEV	0.3	2.4	BEV	0.0	3.1
NIS	-	-	NIS	-	-	NIS	-	-
LNE	0.0	3.1	LNE	1.3	3.3	LNE	1.3	3.5
TRESCAL	0.1	7.0	TRESCAL	4.0	10.0	TRESCAL	7.9	20.1
INRIM	-0.3	2.9	INRIM	0.1	3.2	INRIM	-0.4	3.7
MIRS/SIC	-0.9	4.1	MIRS/SIC	0.0	4.1	MIRS/SIC	0.9	5.2

Key comparison CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12

MEASURAND : AC-DC current transfer difference  
CURRENT : 5 A

Lab <i>i</i>	10 Hz		Lab <i>i</i>	55 Hz		Lab <i>i</i>	1 kHz		Lab <i>i</i>	10 kHz	
	$D_i$	$U_i$		$D_i$	$U_i$		$D_i$	$U_i$		$D_i$	$U_i$
<i>I</i> (μA/A)			<i>I</i> (μA/A)			<i>I</i> (μA/A)			<i>I</i> (μA/A)		
NMIA	-0.6	4.2	NMIA	0.5	3.9	NMIA	0.1	3.9	NMIA	-1.2	3.8
NIST	3.1	18.9	NIST	4.3	17.9	NIST	2.5	16.9	NIST	6.6	16.9
NRC	0.0	14.9	NRC	0.1	13.9	NRC	-1.1	13.9	NRC	-2.5	14.9
INTI	1.3	7.9	INTI	-0.9	6.9	INTI	2.9	4.8	INTI	-1.5	6.8
PTB	0.1	5.8	PTB	0.3	3.8	PTB	-0.5	3.8	PTB	-3.4	4.7
BEV	0.6	1.3	BEV	0.3	1.5	BEV	-0.5	1.5	BEV	-2.6	8.8
JV	5.1	44.6	JV	2.1	13.3	JV	-1.0	10.7	JV	-3.0	11.2
SP	-0.4	4.7	SP	-0.4	4.0	SP	-1.4	3.7	SP	-0.8	3.9
NMC, A*STAR	-1.9	25.0	NMC, A*STAR	-0.7	25.0	NMC, A*STAR	-2.5	25.0	NMC, A*STAR	-2.4	24.9
INMETRO	-	-	INMETRO	-0.7	91.0	INMETRO	23.5	91.0	INMETRO	118.6	96.0
NPL	-25.9	56.0	NPL	8.3	25.0	NPL	-2.5	24.0	NPL	-8.4	22.1
VNIIM	-1.9	3.7	VNIIM	-2.1	3.8	VNIIM	1.5	3.1	VNIIM	3.4	2.6
CENAM	-	-	CENAM	-1.2	42.7	CENAM	-4.2	36.6	CENAM	17.8	41.0
INMETRO	2.8	14.1	INMETRO	0.3	12.0	INMETRO	-4.0	8.9	INMETRO	1.0	11.4
NIS	-	-	NIS	0.4	18.6	NIS	15.8	18.5	NIS	288.8	22.0
UTE	-	-	UTE	1.8	25.3	UTE	-2.2	24.9	UTE	14.8	31.3
CMI	1.0	25.1	CMI	0.0	17.1	CMI	-2.0	17.1	CMI	-2.9	17.2
PTB	0.0	5.7	PTB	0.0	4.7	PTB	0.0	4.7	PTB	-0.9	5.3
METAS	0.5	12.5	METAS	0.0	10.0	METAS	2.0	9.3	METAS	1.1	10.8
JV	0.0	10.9	JV	0.0	6.8	JV	0.0	6.8	JV	1.1	6.4
UME	-2.0	12.1	UME	0.0	8.2	UME	0.0	8.2	UME	-1.9	8.5
GUM	-3.5	12.5	GUM	-2.4	12.4	GUM	-4.5	12.6	GUM	-11.2	12.9
IPQ	-5.0	61.0	IPQ	-3.0	31.0	IPQ	-26.0	32.0	IPQ	-199.9	35.1
CEM	0.9	17.1	CEM	-2.0	10.0	CEM	-0.5	10.0	CEM	-0.3	11.4
BIM	0.0	36.0	BIM	-2.0	26.1	BIM	6.0	26.1	BIM	7.1	24.2
MKEH	-	-	MKEH	-5.5	28.0	MKEH	-9.1	23.1	MKEH	-11.4	24.2
NSAI NML	0.0	185.0	NSAI NML	4.0	73.0	NSAI NML	3.0	73.0	NSAI NML	2.1	120.0
VSL	-1.7	23.8	VSL	0.6	23.8	VSL	1.0	23.8	VSL	-1.2	28.3
NPL	-27.0	55.0	NPL	1.0	21.9	NPL	-6.0	20.9	NPL	-5.9	18.8
METROSERT	5.0	36.0	METROSERT	-9.0	19.1	METROSERT	-9.0	19.1	METROSERT	-2.9	55.1
SP	0.3	4.5	SP	0.0	3.9	SP	0.3	3.4	SP	0.7	3.1
BEV	0.0	1.0	BEV	0.0	1.1	BEV	0.0	1.2	BEV	-1.9	8.5
NIS	-	-	NIS	1.1	28.4	NIS	5.4	28.2	NIS	21.8	28.3
LNE	-12.0	19.1	LNE	1.0	18.1	LNE	-4.0	14.1	LNE	1.1	15.3
TRESCAL	-3.0	18.1	TRESCAL	0.0	18.1	TRESCAL	0.0	18.1	TRESCAL	5.1	22.2
INRIM	2.7	6.7	INRIM	-0.9	5.8	INRIM	-0.6	4.6	INRIM	0.7	6.5
MIRS/SIC	-3.0	14.1	MIRS/SIC	0.0	13.1	MIRS/SIC	1.0	13.1	MIRS/SIC	-0.9	13.3

Key comparison CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12

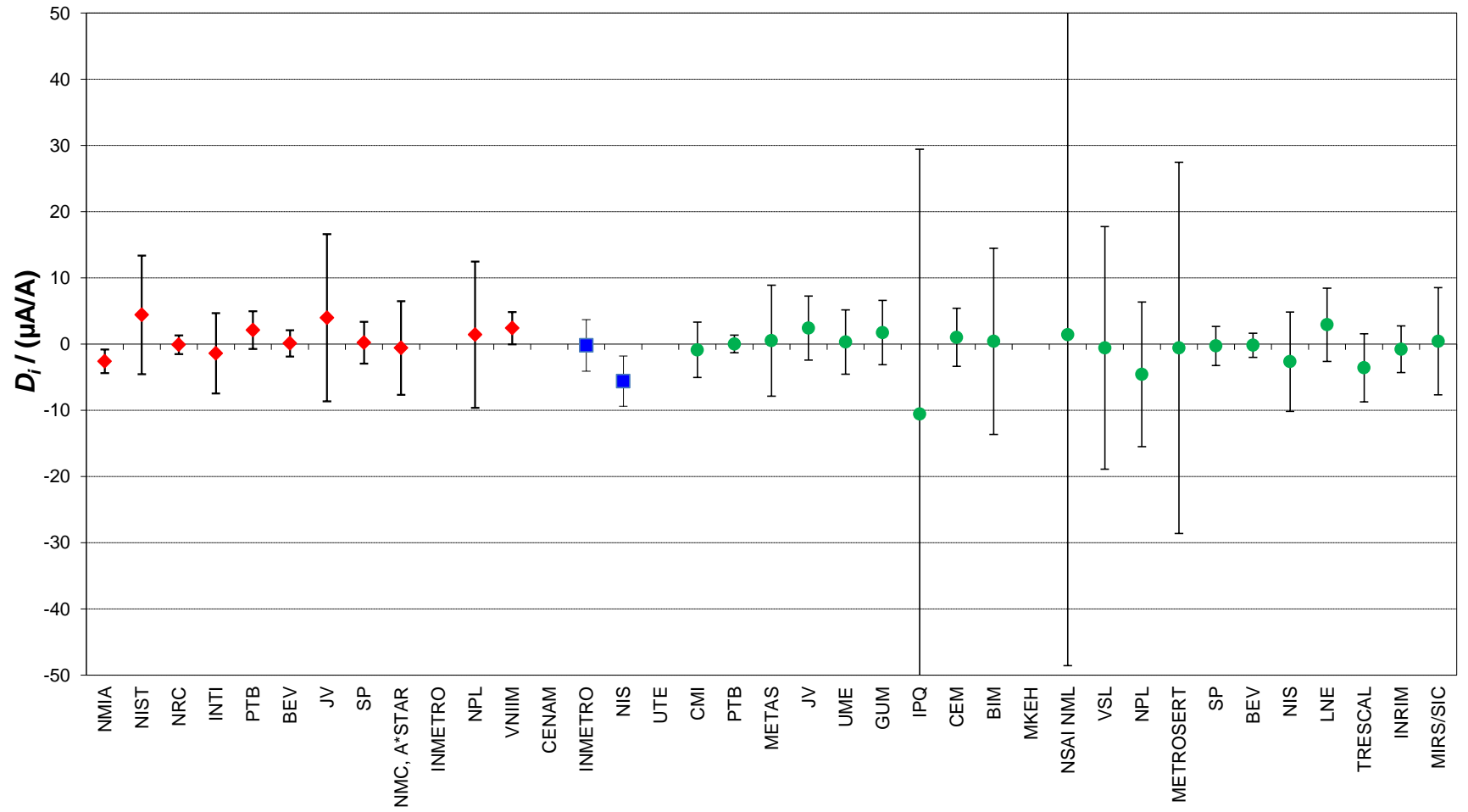
MEASURAND : AC-DC current transfer difference

CURRENT : 5 A

Lab <i>i</i>	20 kHz		Lab <i>i</i>	50 kHz		Lab <i>i</i>	100 kHz	
	$D_i$	$U_i$		$D_i$	$U_i$		$D_i$	$U_i$
	<i>I</i> (μA/A)			<i>I</i> (μA/A)			<i>I</i> (μA/A)	
NMIA	-0.7	3.7	NMIA	-3.0	6.9	NMIA	-4.9	10.6
NIST	0.6	20.8	NIST	1.5	26.7	NIST	-25.7	32.5
NRC	0.4	14.8	NRC	-1.1	19.6	NRC	-11.3	30.5
INTI	0.9	7.6	INTI	3.4	12.4	INTI	0.1	21.3
PTB	-2.4	6.5	PTB	-1.5	8.1	PTB	-0.7	9.4
BEV	-0.4	8.6	BEV	1.6	8.7	BEV	6.2	11.3
JV	-1.8	18.6	JV	-2.0	25.5	JV	-3.5	38.8
SP	1.9	4.4	SP	3.5	9.2	SP	9.3	13.9
NMC, A*STAR	-0.2	24.9	NMC, A*STAR	-2.2	24.7	NMC, A*STAR	-4.9	43.6
INMETRO	-	-	INMETRO	-	-	INMETRO	-	-
NPL	-1.4	53.1	NPL	-21.5	84.1	NPL	-14.7	166.1
VNIIM	-	-	VNIIM	-	-	VNIIM	-	-
CENAM	-	-	CENAM	-	-	CENAM	-	-
INMETRO	0.9	13.9	INMETRO	-0.1	18.9	INMETRO	9.7	29.9
NIS	-	-	NIS	-	-	NIS	-	-
UTE	-	-	UTE	-	-	UTE	-	-
CMI	-4.1	19.3	CMI	-8.7	22.5	CMI	-22.0	43.5
PTB	-1.1	6.2	PTB	-2.7	9.9	PTB	-2.0	15.6
METAS	0.0	12.7	METAS	-3.6	21.7	METAS	-3.7	32.1
JV	1.9	6.2	JV	2.3	6.4	JV	3.0	8.7
UME	-2.1	9.6	UME	-5.7	12.9	UME	-17.0	22.0
GUM	-	-	GUM	-	-	GUM	-	-
IPQ	-220.1	31.2	IPQ	-	-	IPQ	-	-
CEM	1.4	13.4	CEM	0.2	18.6	CEM	-2.0	24.9
BIM	7.9	24.2	BIM	6.3	28.4	BIM	-17.0	40.6
MKEH	-	-	MKEH	-	-	MKEH	-	-
NSAI NML	2.9	230.0	NSAI NML	-	-	NSAI NML	-	-
VSL	-4.3	50.6	VSL	-	-	VSL	-	-
NPL	-8.1	27.8	NPL	-20.7	41.7	NPL	4.0	93.8
METROSERT	-	-	METROSERT	-	-	METROSERT	-	-
SP	0.6	3.8	SP	-0.7	8.8	SP	-3.0	13.4
BEV	-2.1	8.4	BEV	0.3	8.8	BEV	-1.0	11.1
NIS	-	-	NIS	-	-	NIS	-	-
LNE	14.9	15.3	LNE	19.3	16.7	LNE	25.0	18.3
TRESCAL	8.9	27.2	TRESCAL	13.3	45.2	TRESCAL	18.0	70.3
INRIM	0.6	7.8	INRIM	0.7	11.3	INRIM	-0.7	17.4
MIRS/SIC	-2.1	13.4	MIRS/SIC	-8.7	16.7	MIRS/SIC	-11.0	26.9

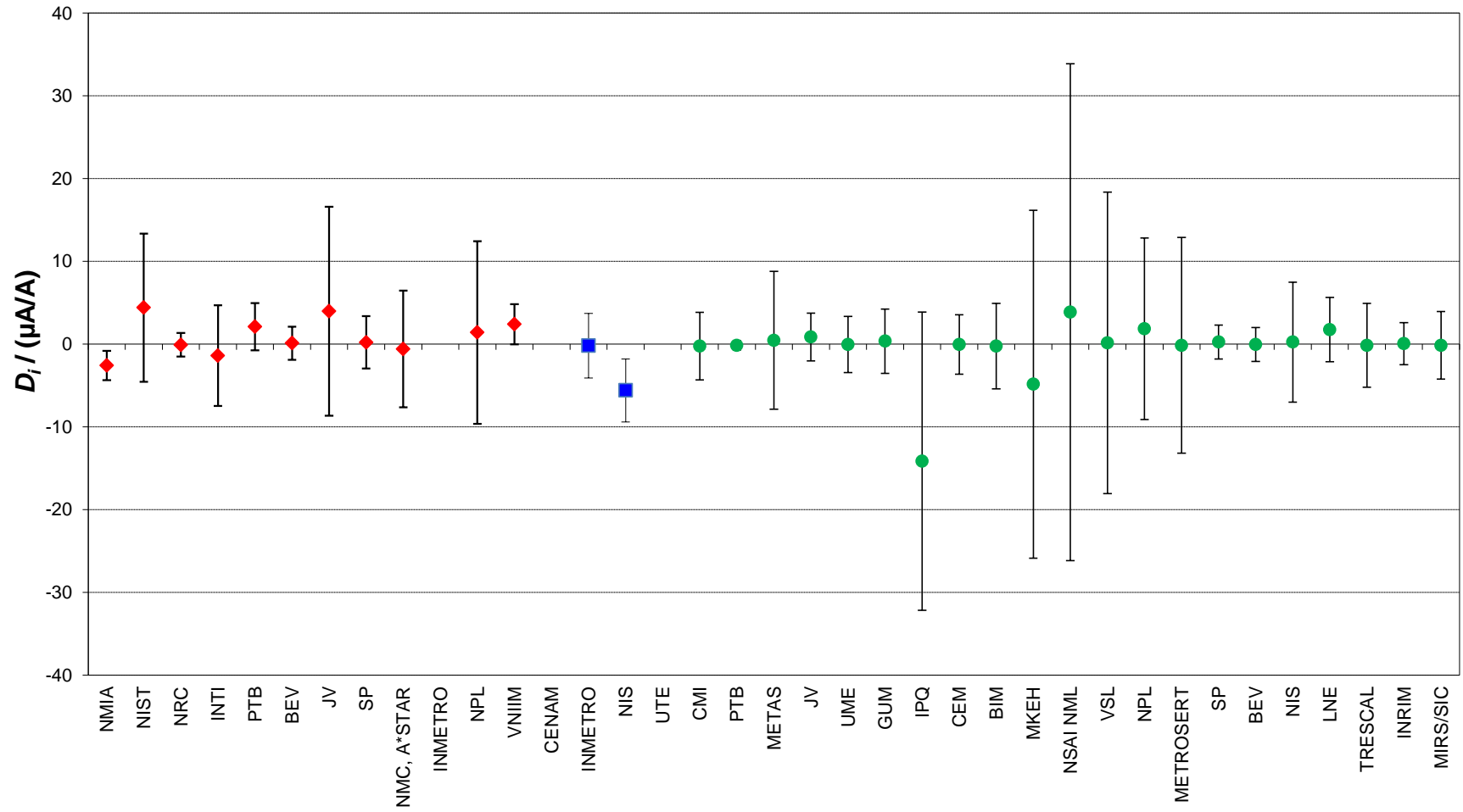


**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 10 mA, 10 Hz**  
 Degrees of equivalence [  $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$  ]



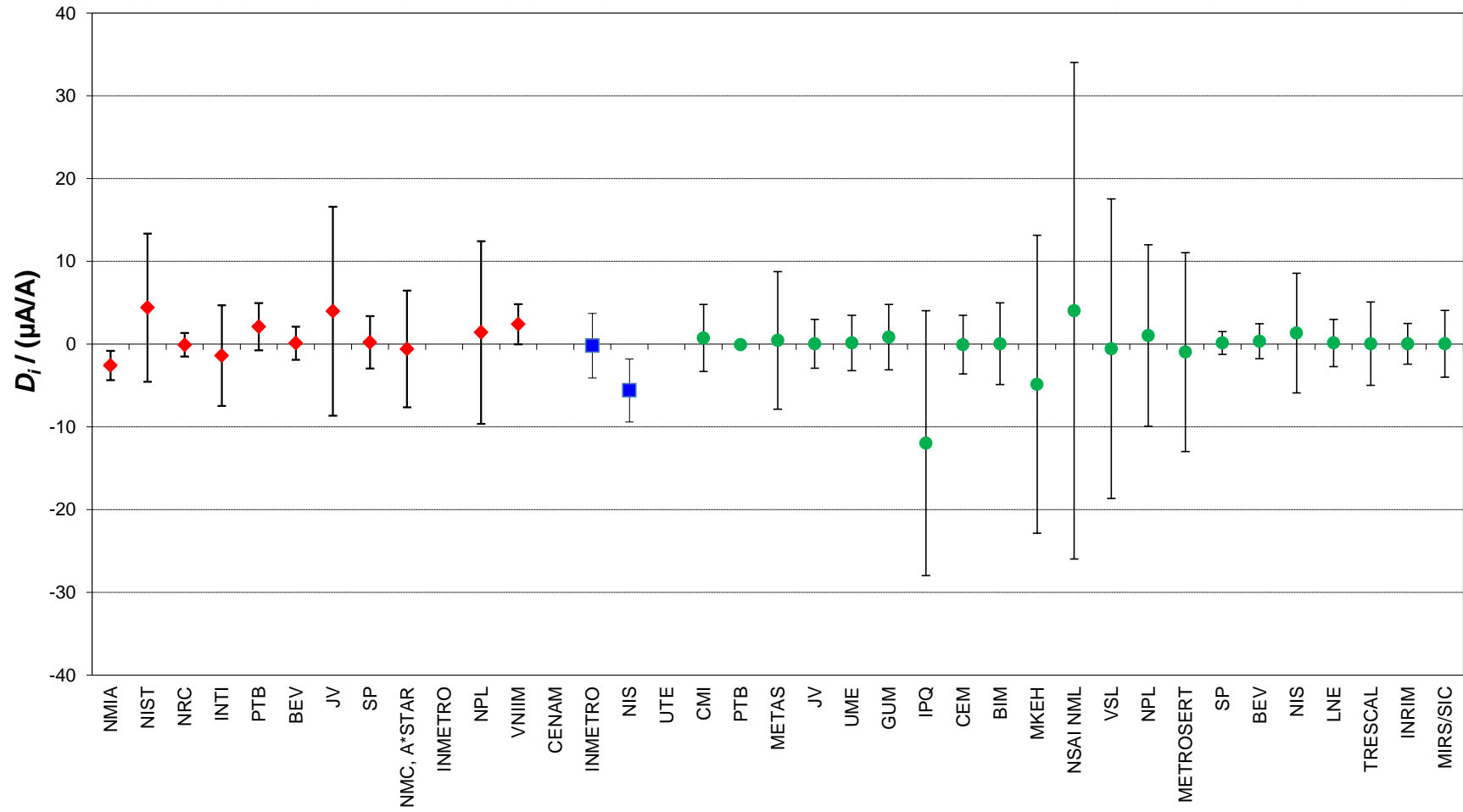
**Red:** participant in CCEM-K12  
**Blue:** participant in SIM.EM-K12  
**Green:** participant in EURAMET.EM-K12

**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 10 mA, 55 Hz**  
 Degrees of equivalence [ $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$ ]



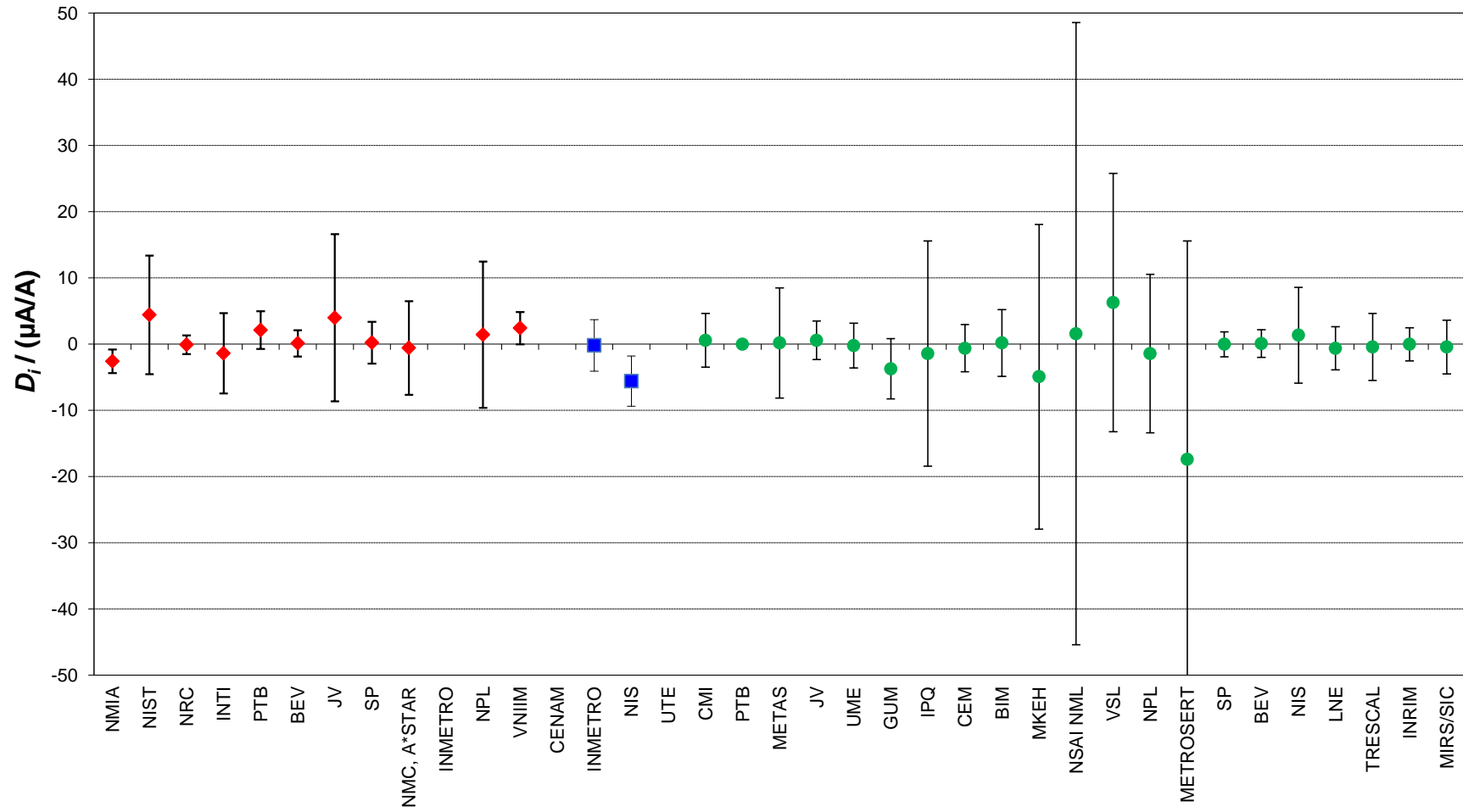
Red: participant in CCEM-K12  
Blue: participant in SIM.EM-K12  
Green: participant in EURAMET.EM-K12

**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 10 mA, 1 kHz**  
 Degrees of equivalence [  $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$  ]



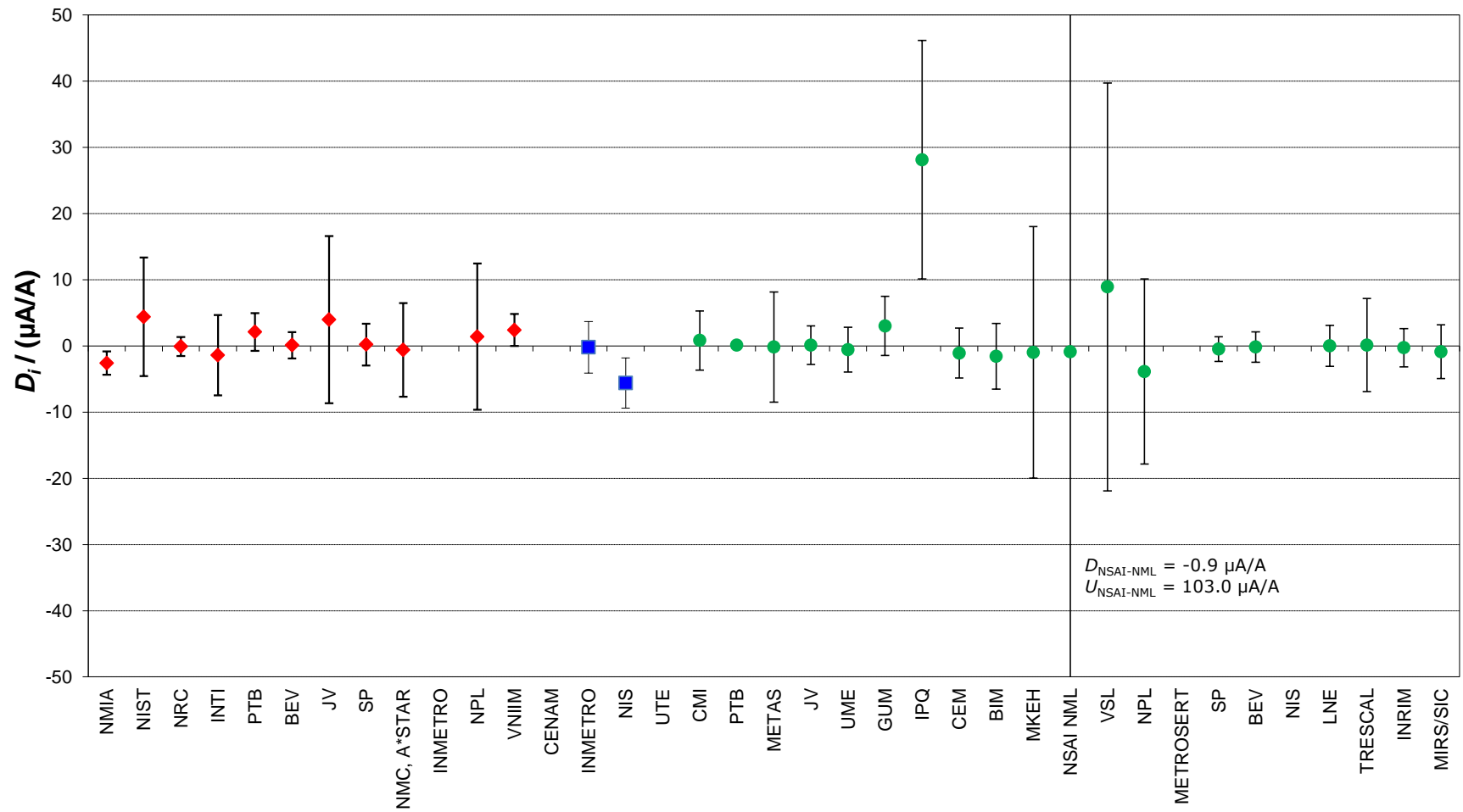
Red: participant in CCEM-K12  
Blue: participant in SIM.EM-K12  
Green: participant in EURAMET.EM-K12

**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 10 mA, 10 kHz**  
**Degrees of equivalence [  $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$  ]**



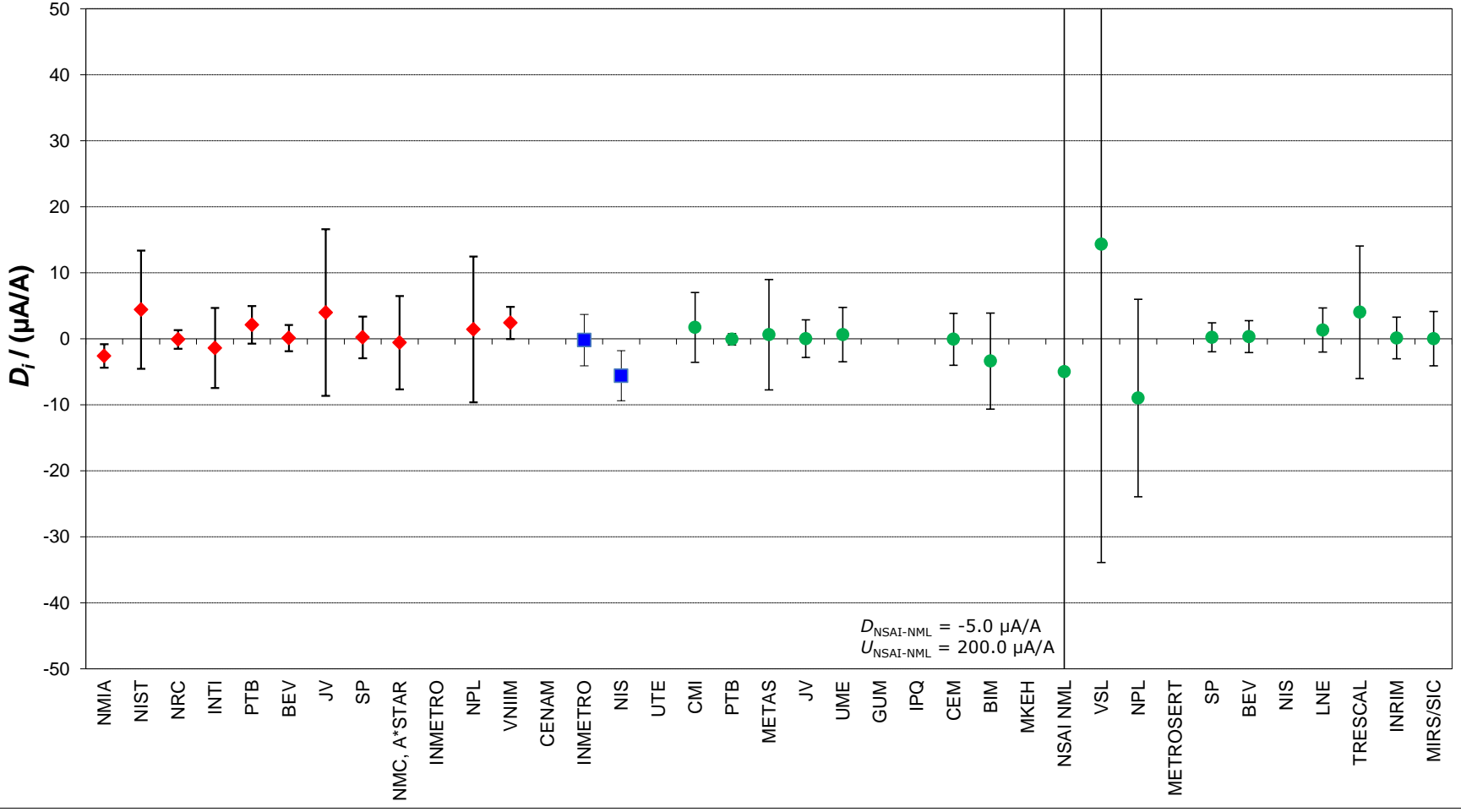
**Red:** participant in CCEM-K12  
**Blue:** participant in SIM.EM-K12  
**Green:** participant in EURAMET.EM-K12

**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 10 mA, 20 kHz**  
**Degrees of equivalence [  $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$  ]**



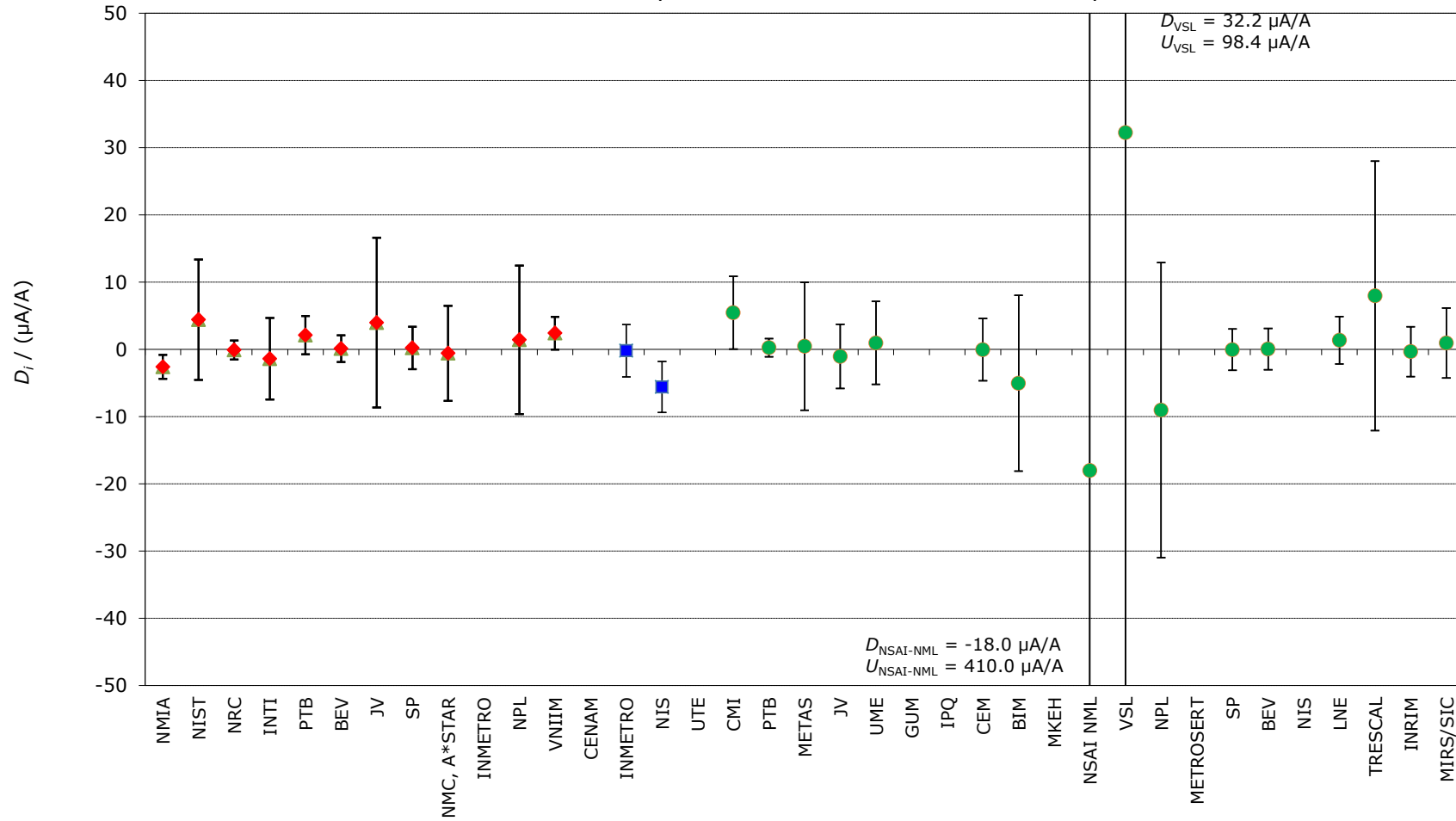
**Red:** participant in CCEM-K12  
**Blue:** participant in SIM.EM-K12  
**Green:** participant in EURAMET.EM-K12

**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 10 mA, 50 kHz**  
**Degrees of equivalence [  $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$  ]**



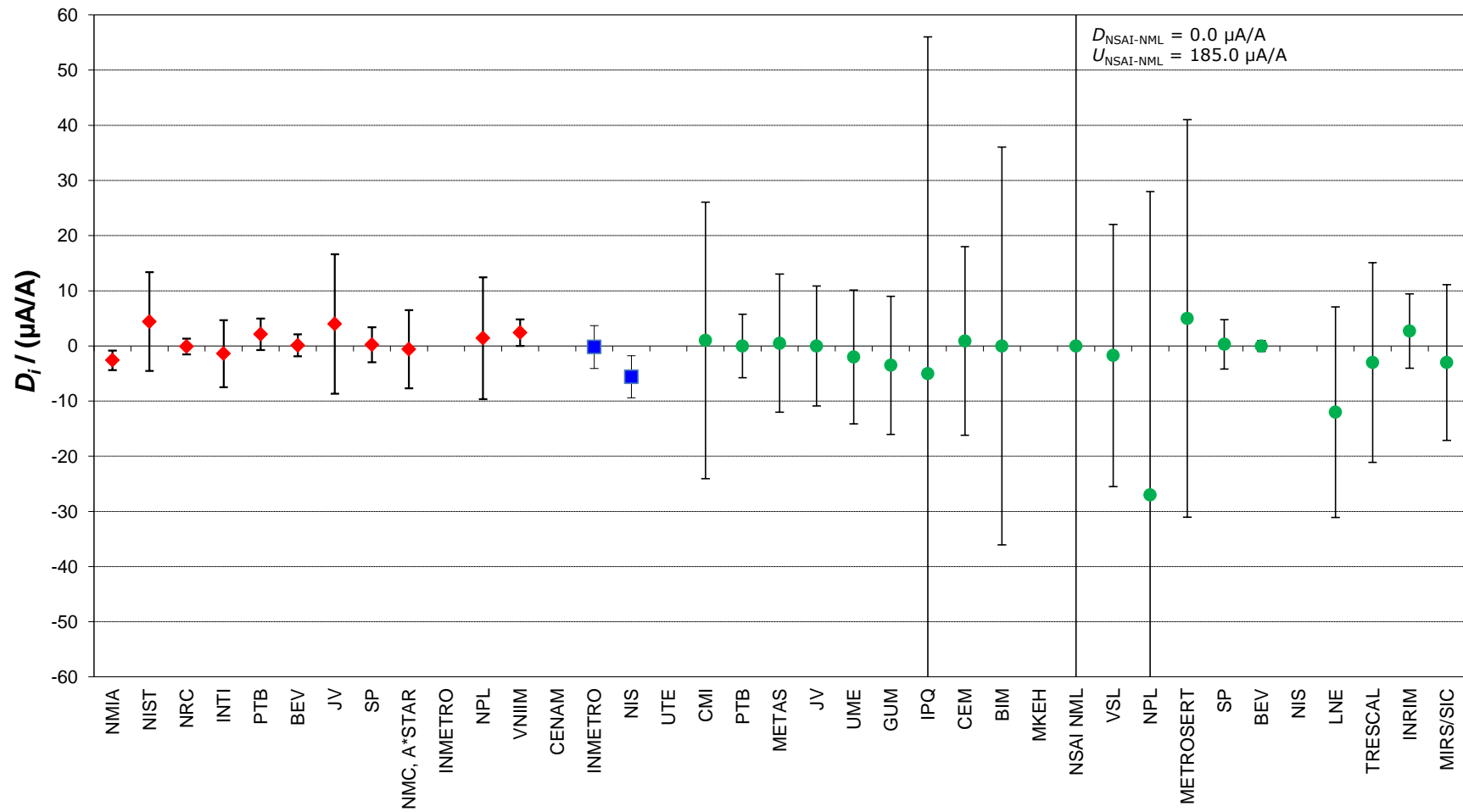
**Red:** participant in CCEM-K12  
**Blue:** participant in SIM.EM-K12  
**Green:** participant in EURAMET.EM-K12

**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 10 mA, 100 kHz**  
**Degrees of equivalence [  $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$  ]**



**Red:** participant in CCEM-K12  
**Blue:** participant in SIM.EM-K12  
**Green:** participant in EURAMET.EM-K12

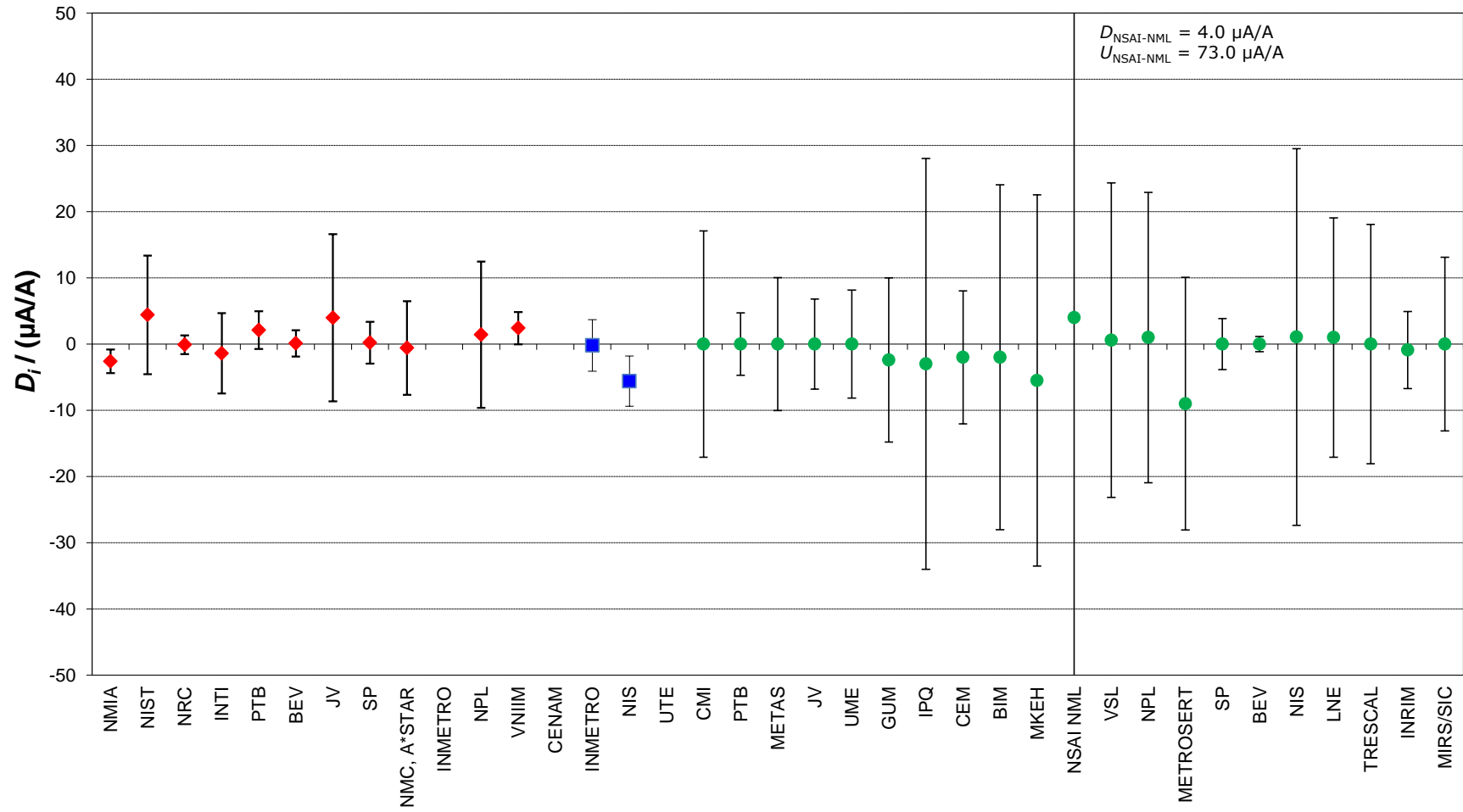
**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 5 A, 10 Hz**  
 Degrees of equivalence [  $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$  ]



**Red:** participant in CCEM-K12  
**Blue:** participant in SIM.EM-K12  
**Green:** participant in EURAMET.EM-K12

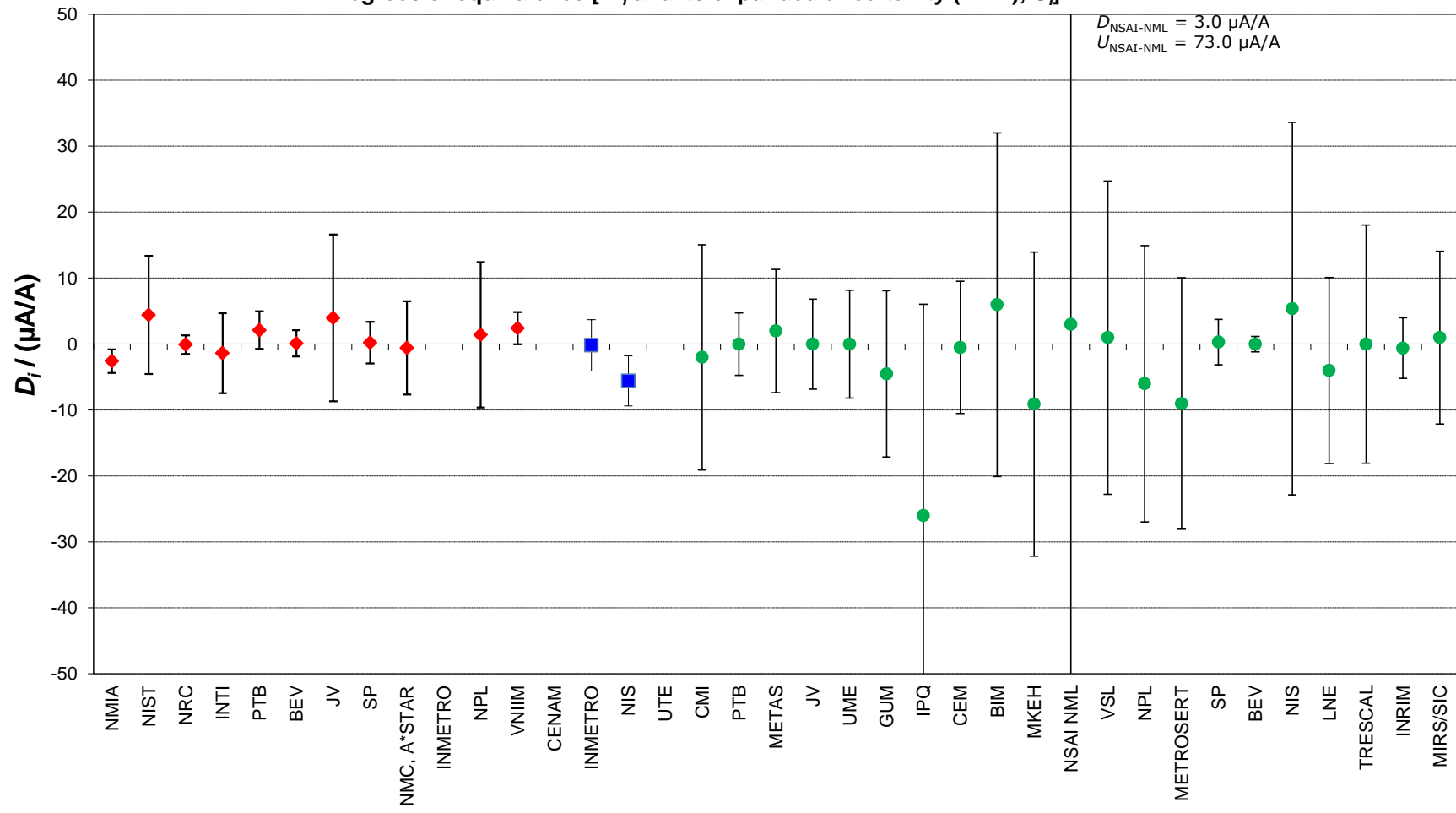


**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 5 A, 55 Hz**  
**Degrees of equivalence [  $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$  ]**



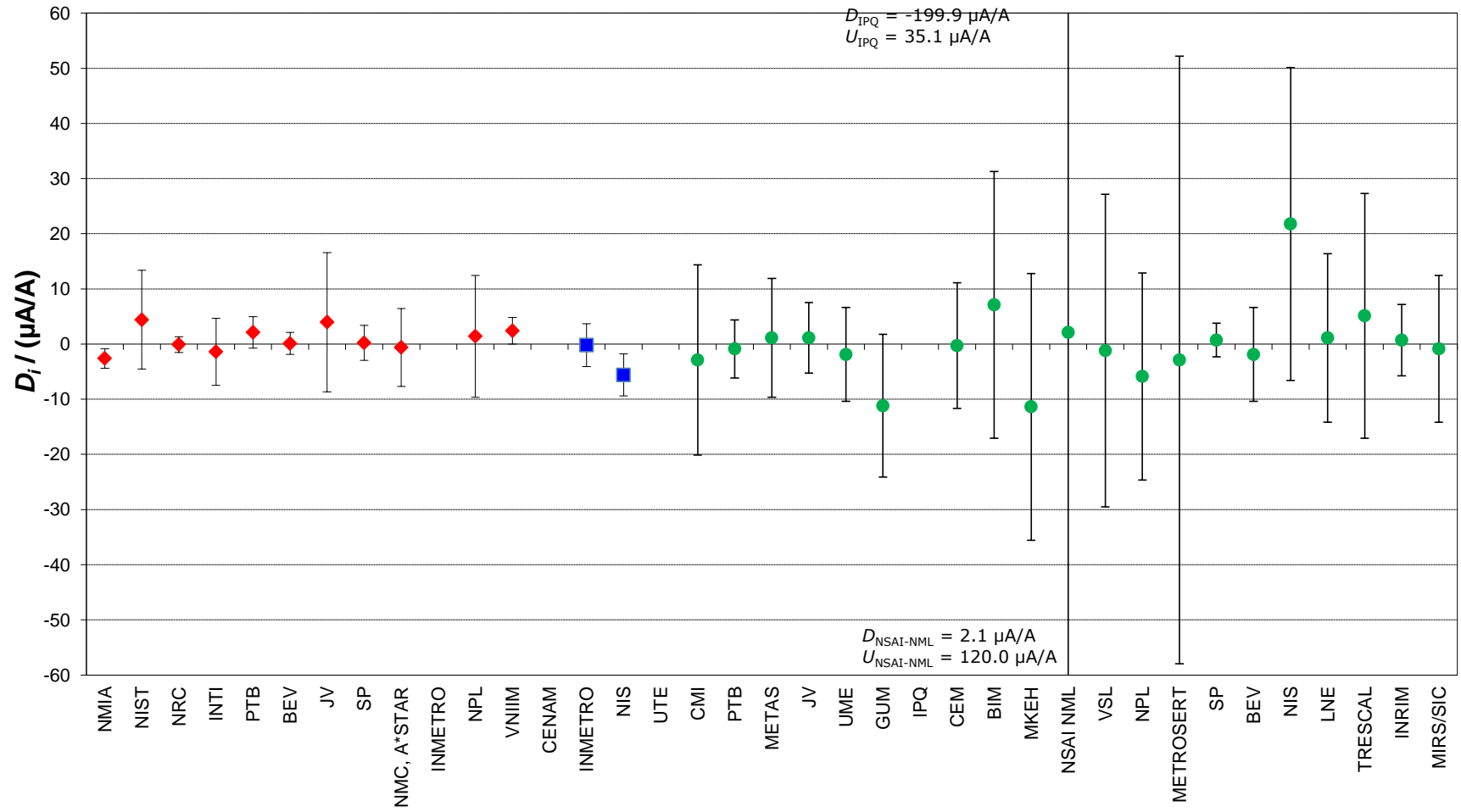
**Red:** participant in CCEM-K12  
**Blue:** participant in SIM.EM-K12  
**Green:** participant in EURAMET.EM-K12

**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 5 A, 1 kHz**  
**Degrees of equivalence [  $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$  ]**



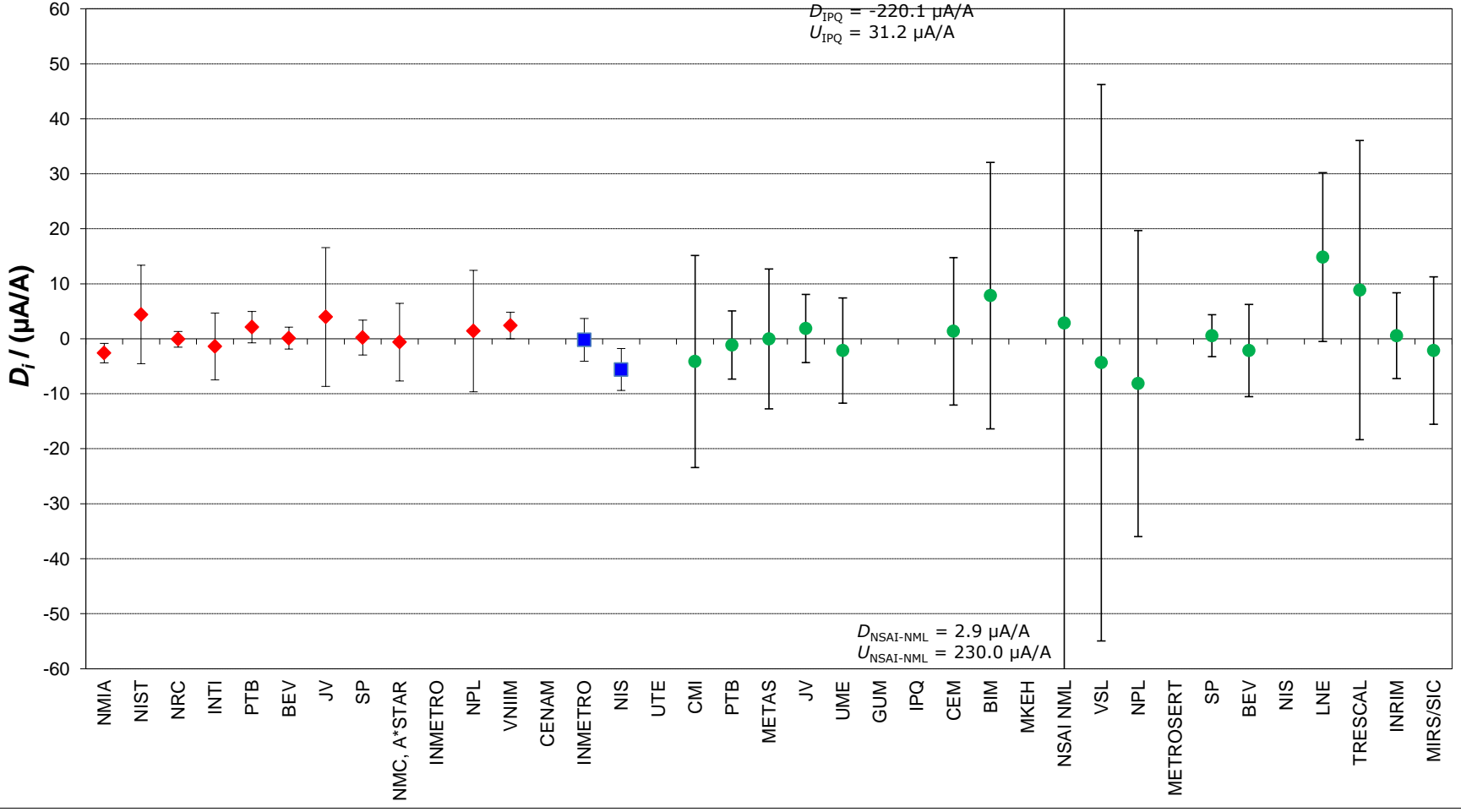
**Red:** participant in CCEM-K12  
**Blue:** participant in SIM.EM-K12  
**Green:** participant in EURAMET.EM-K12

**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 5 A, 10 kHz**  
**Degrees of equivalence [  $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$  ]**



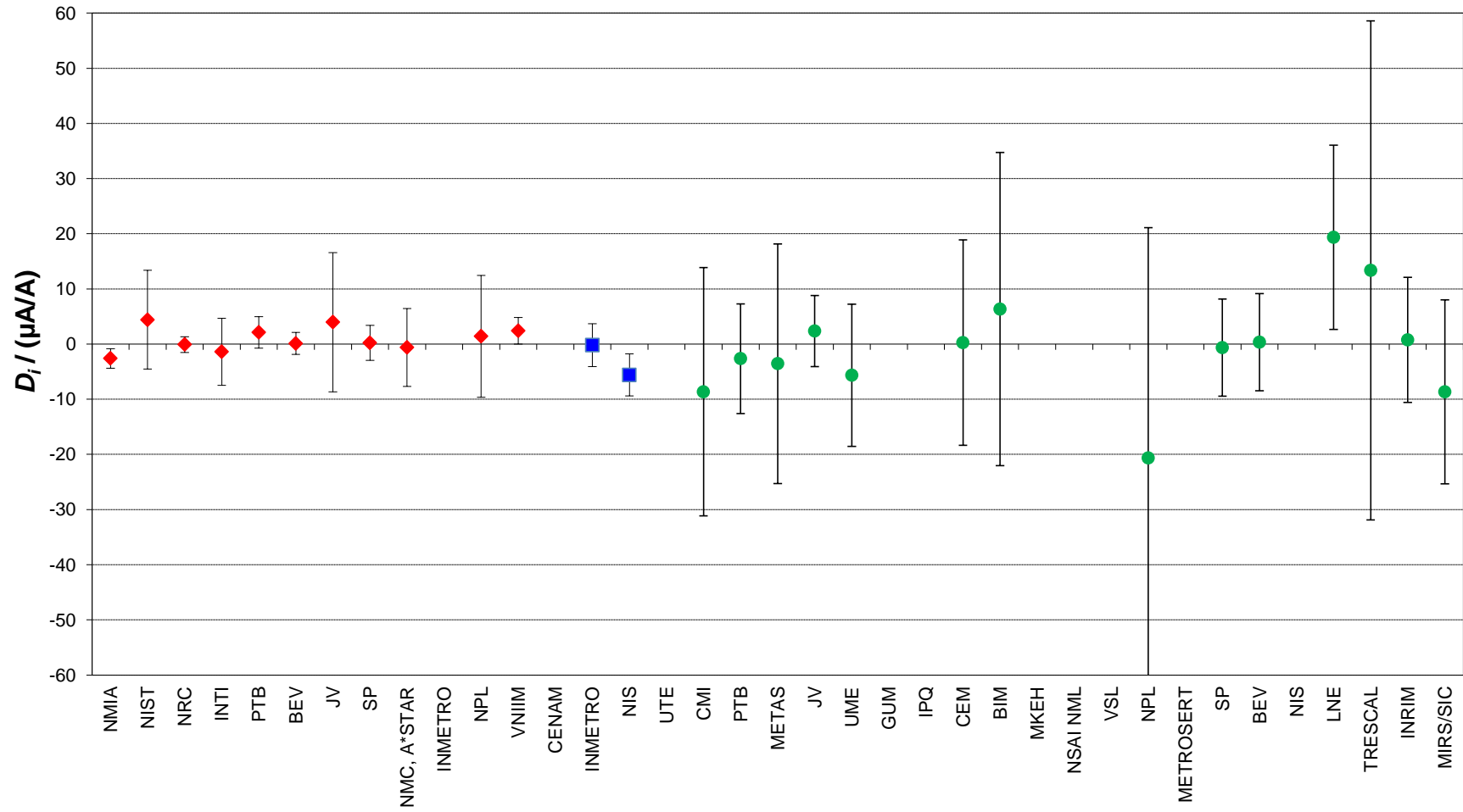
**Red:** participant in CCEM-K12  
**Blue:** participant in SIM.EM-K12  
**Green:** participant in EURAMET.EM-K12

**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 5 A, 20 kHz**  
**Degrees of equivalence [  $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$  ]**



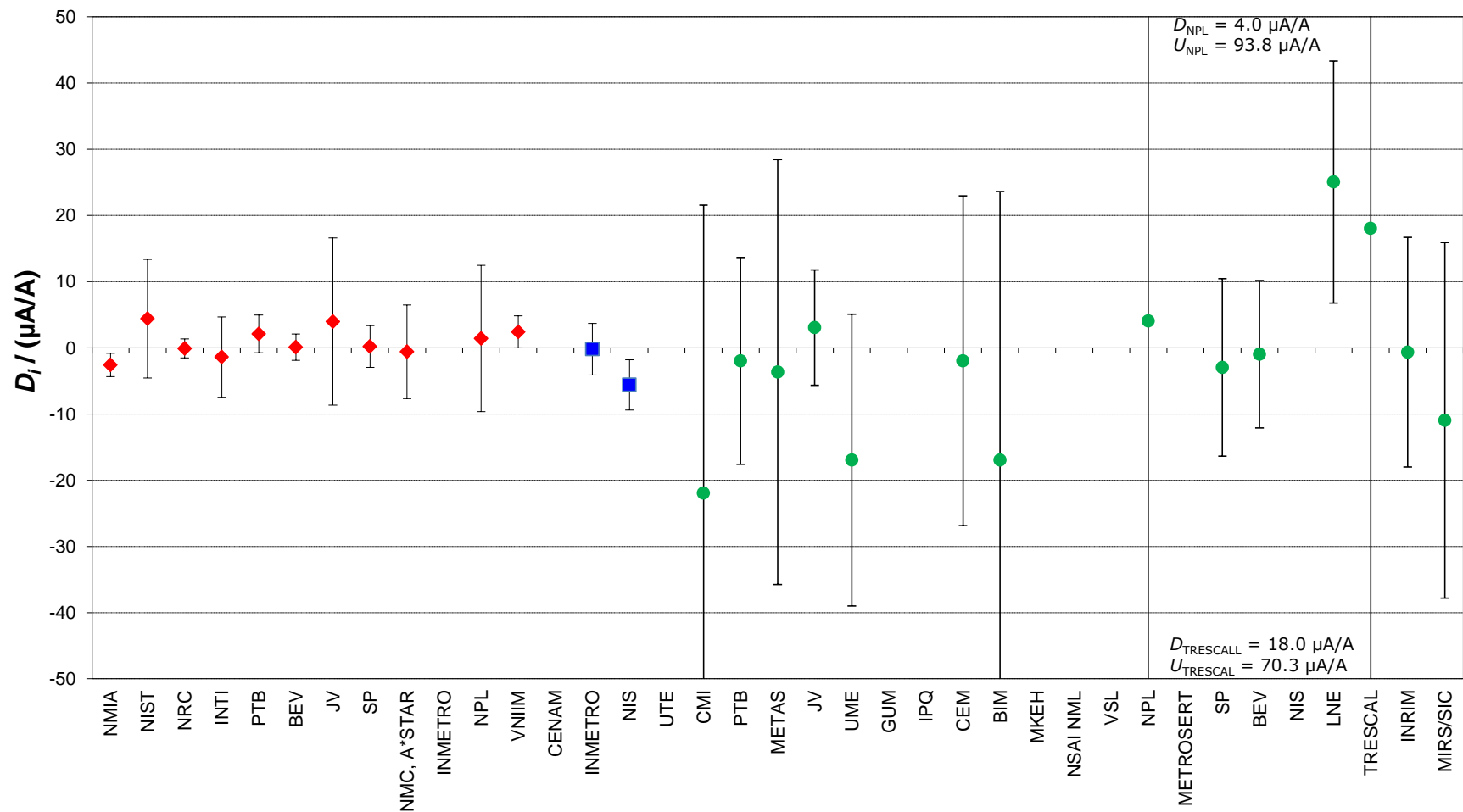
**Red:** participant in CCEM-K12  
**Blue:** participant in SIM.EM-K12  
**Green:** participant in EURAMET.EM-K12

**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 5 A, 50 kHz**  
 Degrees of equivalence [  $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$  ]



Red: participant in CCEM-K12  
Blue: participant in SIM.EM-K12  
Green: participant in EURAMET.EM-K12

**CCEM-K12, SIM.EM-K12 and EURAMET.EM-K12 AC-DC current transfer: 5 A, 100 kHz**  
 Degrees of equivalence [  $D_i$  and its expanded uncertainty ( $k = 2$ ),  $U_i$  ]



Red: participant in CCEM-K12  
Blue: participant in SIM.EM-K12  
Green: participant in EURAMET.EM-K12