

Key comparison CCQM-K55.a

MEASURAND : Mass fraction of Estradiol in the CCQM-K55.a samples

x_i : result of measurement carried out by laboratory i

u_i : combined standard uncertainty of x_i

Lab i	x_i / (mg/g)	u_i / (mg/g)
BAM	990	2
BIPM	974.8	+0.81, -1.13
CENAM	990.1	1.8
GL	989.1	0.36
INMETRO	982.96	0.47
LGC	990.3	1.9
NIM	988	2.5
NIST	983.8	+0.15, -1.45
NMIA	980.3	3.8
NMIJ	983.6	1.0
NMISA	981.8	2.9
NRC	984.9	1.6

Key comparison CCQM-K55.a

MEASURAND : Mass fraction of Related Structure Impurities in the CCQM-K55.a samples

x_i : result of measurement carried out by laboratory i

u_i : combined standard uncertainty of x_i

Lab i	x_i / (mg/g)	u_i / (mg/g)
BAM	9.1	2.0
BIPM	17.7	1.04
CENAM	8.67	1.8
GL	8.24	0.12
INMETRO	6.74	0.2
LGC	8.1	1.8
NIM	11.88	2.4
NIST	9.6	+1.0, -0.3
NMIA	9.1	0.41
NMIJ	8.93	0.65
NMISA	11.62	0.21

Key comparison CCQM-K55.a

MEASURAND : Mass fraction of Water in the CCQM-K55.a samples

x_i : result of measurement carried out by laboratory i

u_i : combined standard uncertainty of x_i

Lab i	x_i / (mg/g)	u_i / (mg/g)
BAM	0.79	0.03
BIPM	7.48	0.44
CENAM	0.57	0.007
GL	1.42	0.12
INMETRO	10.3	0.42
LGC	1.3	0.81
NIM	1.2	0.2
NIST	6.7	+1.2, -0.3
NMIA	10.7	1.8
NMIJ	7.07	0.53
NMISA	6.75	0.48

Key comparison CCQM-K55.a

MEASURAND : Mass fraction of Volatile Organic Content in the CCQM-K55.a samples

x_i : result of measurement carried out by laboratory i

u_i : combined standard uncertainty of x_i

Lab i	x_i / (mg/g)	u_i / (mg/g)
BAM	0	0
BIPM	0	+0.29, 0
GL	0	0
LGC	0.2	0.1
NIST	0.09	0.02
NMIA	0	+1.2, 0
NMIJ	0.055	0.007

Key comparison CCQM-K55.a

MEASURAND : Mass fraction of Non-Volatile Content in the CCQM-K55.a samples

x_i : result of measurement carried out by laboratory i

u_i : combined standard uncertainty of x_i

Lab i	x_i / (mg/g)	u_i / (mg/g)
BIPM	0	+0.29, 0
GL	0.04	0.008
LGC	0.03	0.008
NIST	0.42	0.06
NMIA	0	+1.2, 0
NMIJ	0	+0.46, 0

Key comparison CCQM-K55.a

MEASURAND : Mass fraction of Estradiol in the CCQM-K55.a samples

The key comparison reference value for the mass fraction of estradiol, x_R , was calculated by subtraction from the limit value of 1000 mg/g of the summation of the individual estimates for each contributing class of impurities present in CCQM-K55.a samples, as explained in page 21 of the Final Report. Its standard uncertainty, u_R , is computed by combination in quadrature of the uncertainties associated with each contributing impurity estimate and also uncertainties in the inter-unit homogeneity of water and related structure impurity content.

$$x_R = 984.3 \text{ mg/g}, u_R = 0.41 \text{ mg/g}$$

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 mg/g:

$$D_i = (x_i - x_R) \text{ and its expanded uncertainty } (k = 2), U_i = 2(u_R^2 + u_i^2)^{1/2}$$

No pair-wise degrees of equivalence have been computed for this key comparison.

Degrees of equivalence for Mass fraction of Estradiol

Lab i



	D_i / (mg/g)	U_i / (mg/g)
BAM	5.7	4.1
BIPM	-9.5	+2.0, -2.5
CENAM	5.8	3.7
GL	4.8	1.1
INMETRO	-1.3	1.3
LGC	6.0	3.9
NIM	3.7	5.1
NIST	-0.5	+1.0, -3.0
NMIA	-4.0	7.6
NMIJ	-0.7	2.2
NMISA	-2.5	5.9
NRC	0.6	3.3

MEASURAND : Mass fraction of individual impurity classes in the CCQM-K55.a samples

Key comparison reference values (x_R) and associated standard uncertainty (u_R) were assigned for the mass fraction of each orthogonal impurity class - related substances, water, volatile organics and non-volatiles - quantified by the participants in CCQM-K55.a who used a mass balance approach to assign the estradiol content. They are consensus values derived from the individual data supplied by each participant. The assignment method varied by impurity class and each is separately described on pages 17 to page 20 of the Final Report.

For Total Related Structure Impurities: $x_R = 8.65$ mg/g, $u_R = 0.16$ mg/g

For Water: $x_R = 6.75$ mg/g, $u_R = 0.21$ mg/g

For Volatile Organics $x_R = 0.10$ mg/g, $u_R = 0.06$ mg/g

For Non-Volatiles $x_R = 0.20$ mg/g, $u_R = 0.12$ mg/g

The degree of equivalence of laboratory i with respect to each key comparison reference value for impurities is given by a pair of terms, both expressed in mg/g:

$$D_i = (x_i - x_R) \text{ and its expanded uncertainty } (k = 2), U_i = 2(u_R^2 + u_i^2)^{1/2}$$

No pair-wise degrees of equivalence have been computed for this key comparison.

Degrees of equivalence for Related Structure Impurities

Lab i ↓

	D_i / (mg/g)	U_i / (mg/g)
BAM	0.45	4.01
BIPM	9.05	2.10
CENAM	0.02	3.61
GL	-0.41	0.40
INMETRO	-1.91	0.51
LGC	-0.55	3.61
NIM	3.23	4.81
NIST	0.95	+2.03, -0.68
NMIA	0.45	0.88
NMIJ	0.28	1.34
NMISA	2.97	0.53

Degrees of equivalence for Water

Lab i ↓

	D_i / (mg/g)	U_i / (mg/g)
BAM	-5.96	0.42
BIPM	0.73	0.98
CENAM	-6.18	0.42
GL	-5.33	0.48
INMETRO	3.55	0.94
LGC	-5.45	1.67
NIM	-5.55	0.58
NIST	-0.05	+2.44, -0.73
NMIA	3.95	3.62
NMIJ	0.32	1.14
NMISA	0.00	1.05

MEASURAND : Mass fraction of individual impurity classes in the CCQM-K55.a samples

Degrees of equivalence for Volatile Organics

Lab *i* ↓

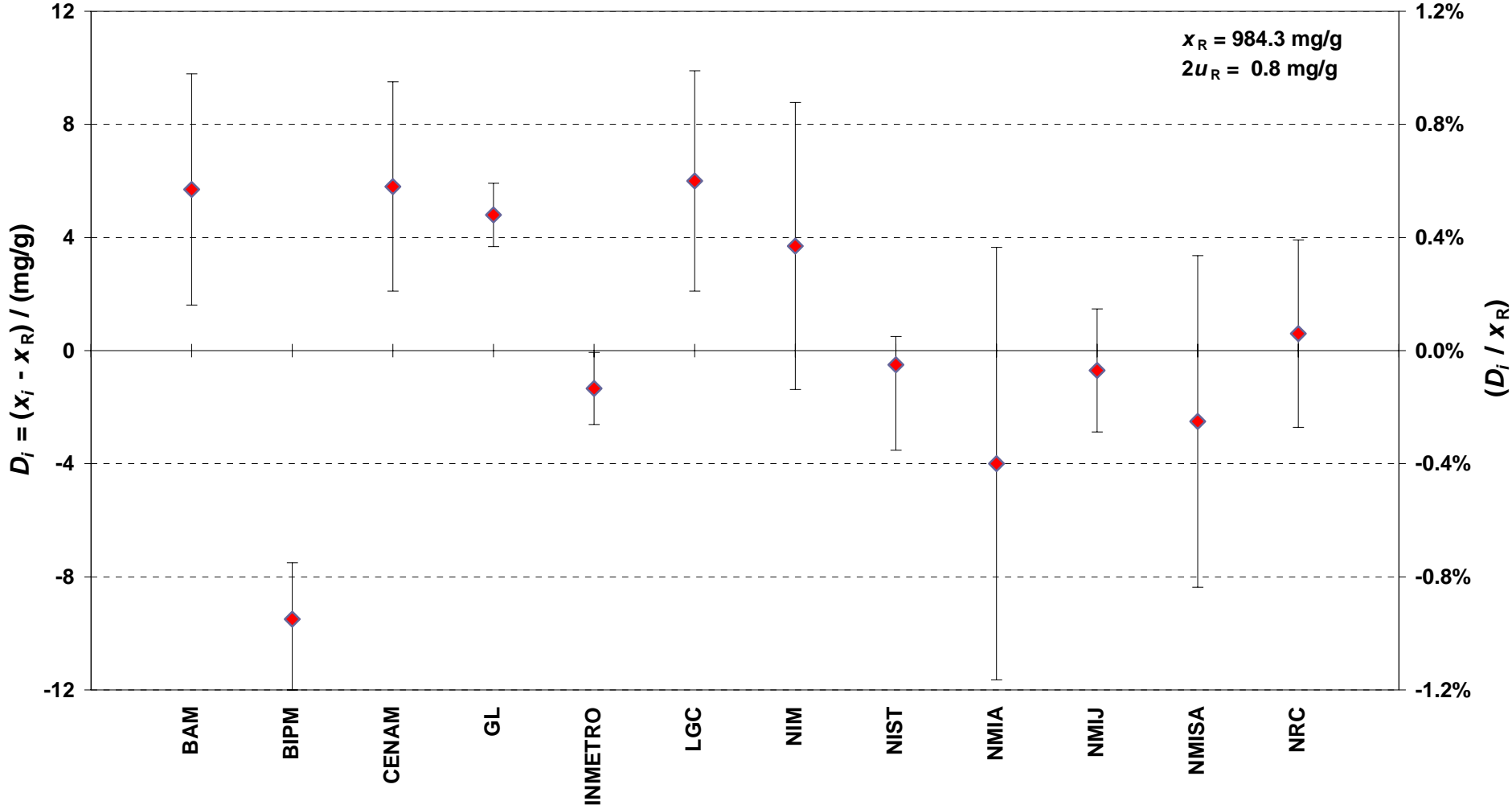
	D_i / (mg/g)	U_i / (mg/g)
BAM	-0.10	0.12
BIPM	-0.10	+0.59, -0.12
GL	-0.10	0.12
LGC	0.10	0.23
NIST	-0.01	0.13
NMIA	-0.10	+2.40, -0.12
NMIJ	-0.05	0.12

Degrees of equivalence for Non-Volatiles

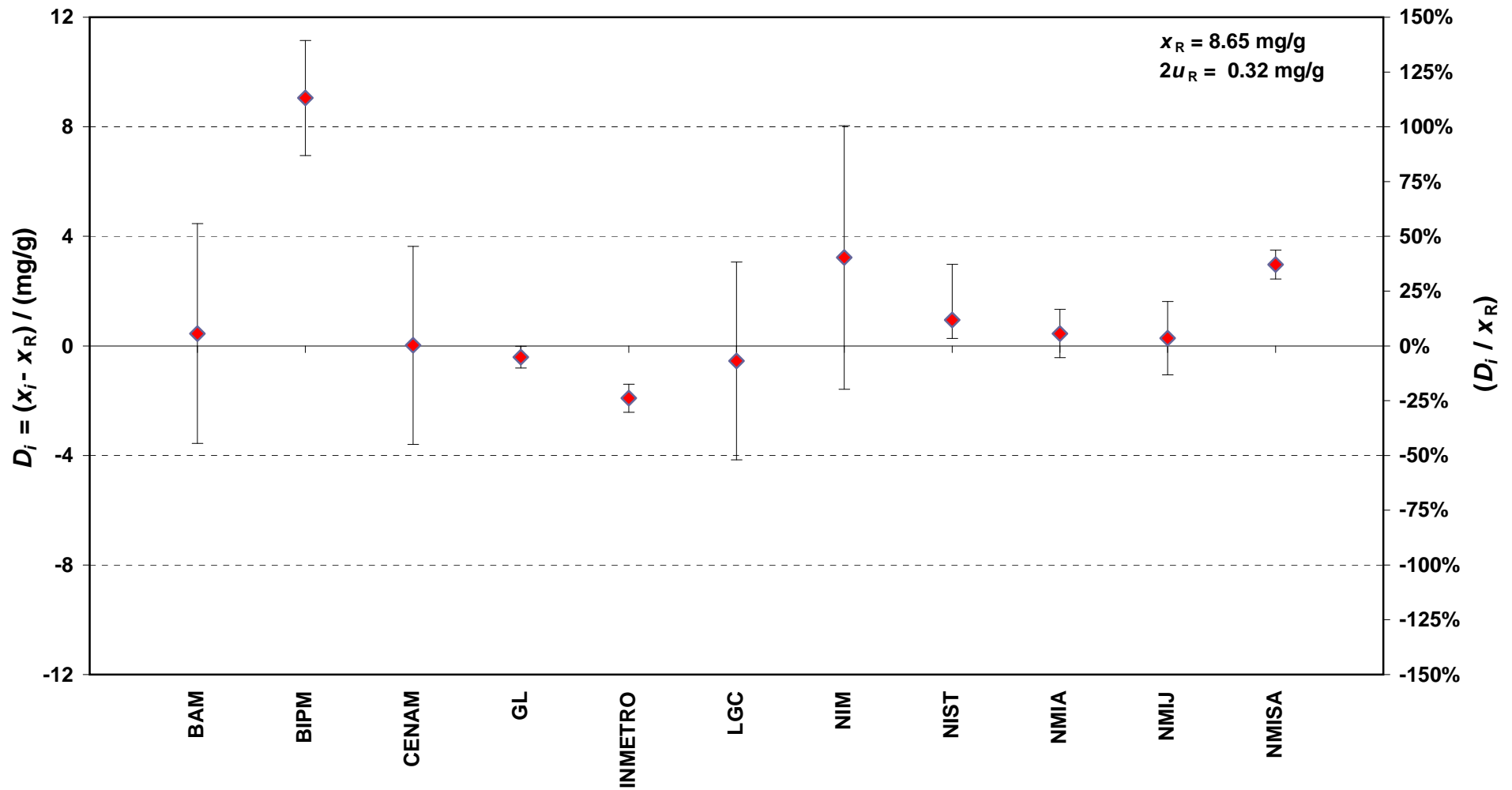
Lab *i* ↓

	D_i / (mg/g)	U_i / (mg/g)
BIPM	-0.20	+0.63, -0.24
GL	-0.16	0.24
LGC	-0.17	0.24
NIST	0.22	0.27
NMIA	-0.20	+2.41, -0.24
NMIJ	-0.20	+0.95, -0.24

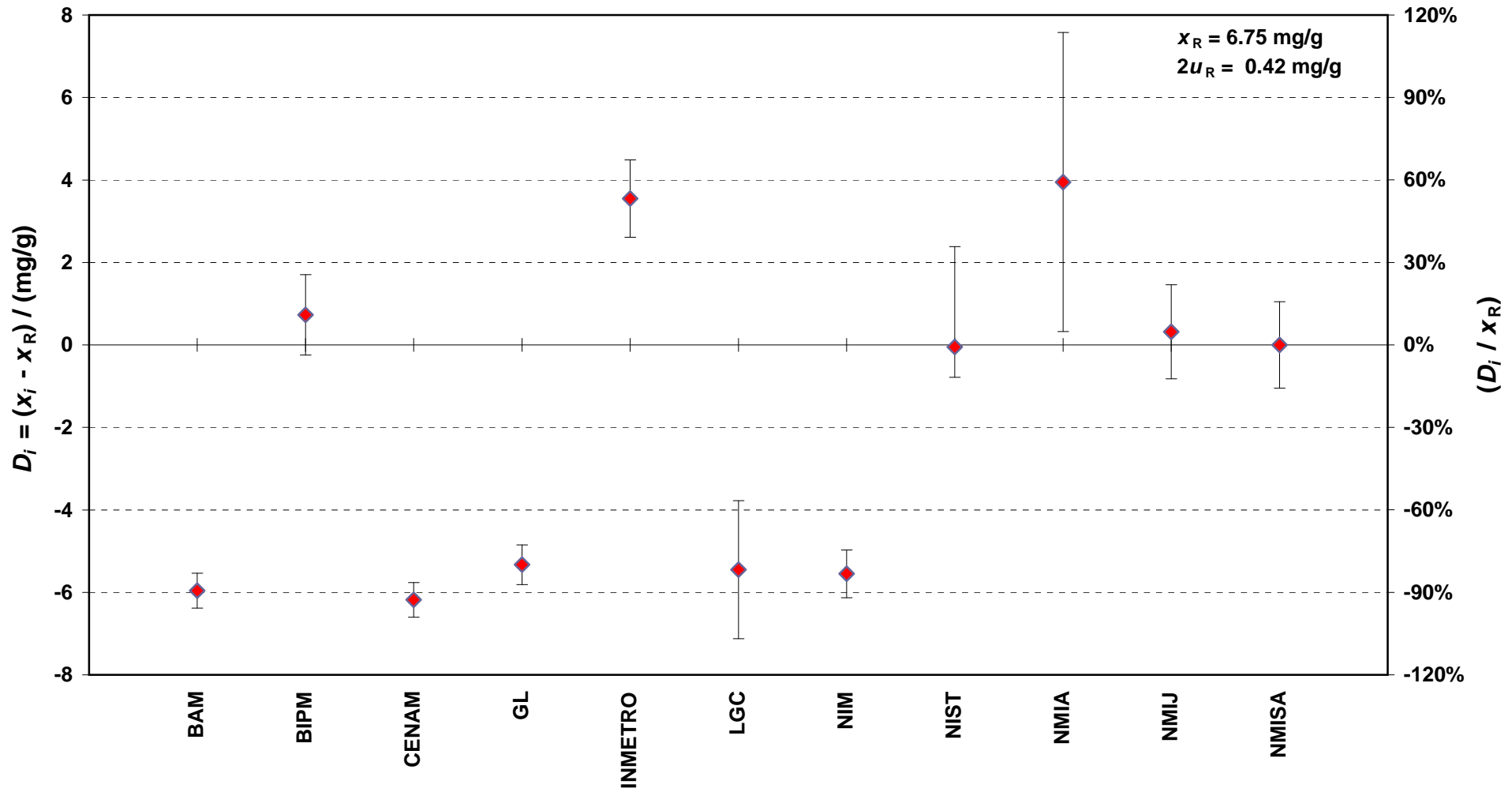
CCQM-K55.a : Mass fraction of Estradiol
Degrees of equivalence, D_i and expanded uncertainty U_i ($k = 2$)



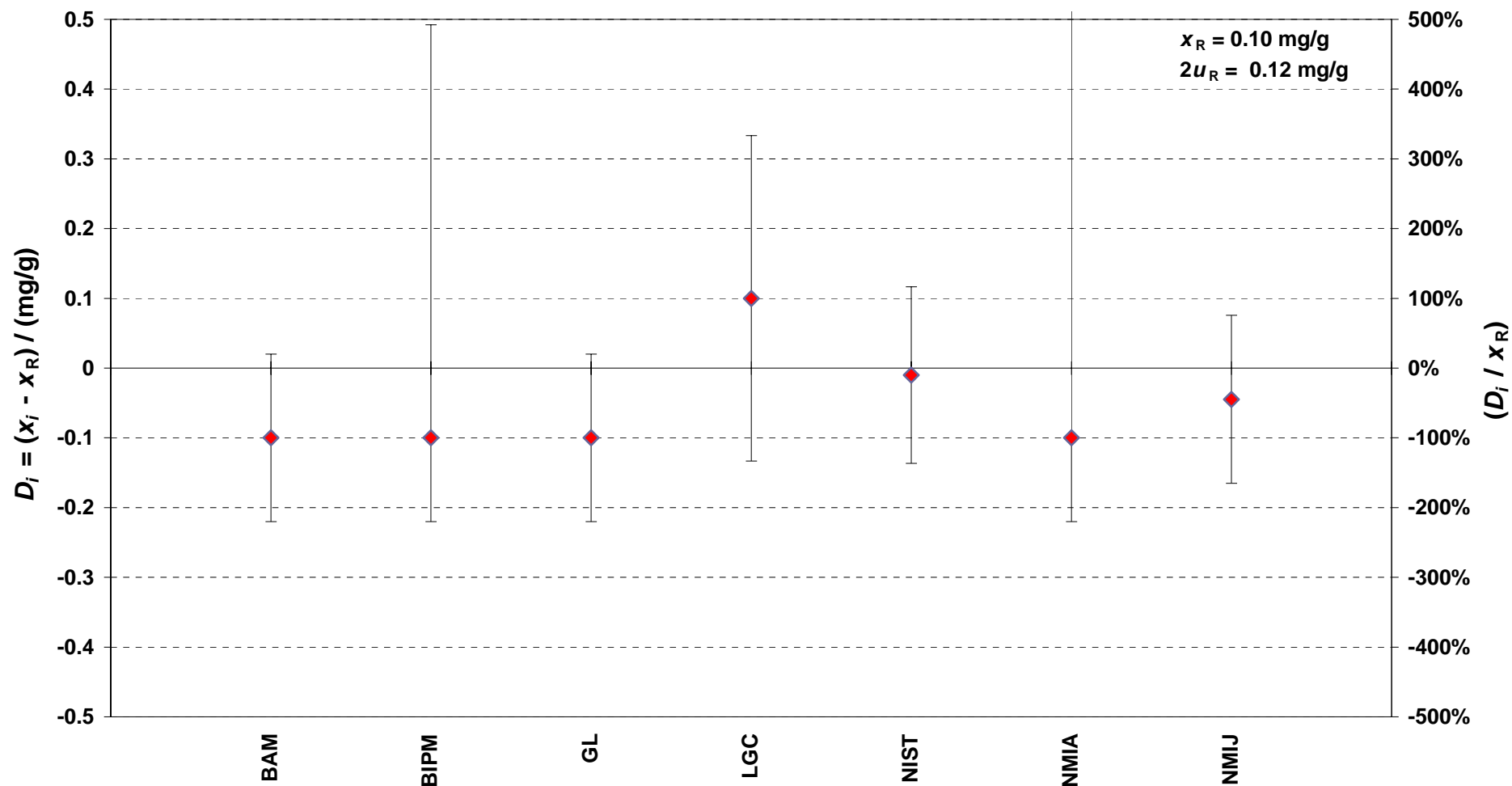
CCQM-K55.a : Mass fraction of Related Structure Impurities
Degrees of equivalence, D_i and expanded uncertainty U_i ($k = 2$)



CCQM-K55.a : Mass fraction of Water
Degrees of equivalence, D_i and expanded uncertainty U_i ($k = 2$)



CCQM-K55.a : Mass fraction of Volatile Organics
Degrees of equivalence, D_i , and expanded uncertainty U_i ($k = 2$)



CCQM-K55.a : Mass fraction of Non-Volatiles
Degrees of equivalence, D_i and expanded uncertainty U_i ($k = 2$)

