**Key comparison CCQM-K78.a**

**MEASURAND : Mass fraction of phenylalanine in the CCQM-K78.a sample**

$x_i$ :  result of measurement carried out by laboratory $i$

$u_i$ :  combined standard uncertainty of $x_i$

| Lab $i$ | $x_i$ / (µg/g) | $u_i$ / (µg/g) |
|---|---|---|
| | | |
| BIPM | 486.3 | 7.2 |
| EXHM/GCSL-EIM | 492.2 | 4.6 |
| GL | 489 | 11 |
| HSA | 483.6 | 5.8 |
| KRISS | 486.0 | 4.2 |
| LGC | 488.3 | 1.4 |
| LNE | 486.6 | 4.1 |
| NIM | 488.53 | 2.5 |
| NIMT | 494.7 | 3.2 |
| NIST | 492.2 | 5.4 |
| NMIJ | 487.9 | 1.9 |
| NMISA | 488 | 7.2 |
| NRC | 489.1 | 1.8 |
| PTB | 487.8 | 2.5 |
| UME | 482.59 | 3.6 |
| VNIIM | 495 | 6.0 |

**Key comparison CCQM-K78.a**

**MEASURAND : Mass fraction of isoleucine in the CCQM-K78.a sample**

$x_i$ :   result of measurement carried out by laboratory $i$

$u_i$ :   combined standard uncertainty of $x_i$

| Lab $i$ | $x_i$ / (µg/g) | $u_i$ / (µg/g) |
|---|---|---|
| | | |
| BIPM | 212.8 | 3.6 |
| EXHM/GCSL-EIM | 213.6 | 2.6 |
| GL | 215.6 | 3.2 |
| HSA | 214.7 | 2.2 |
| KRISS | 215.6 | 1.2 |
| LGC | 214.9 | 0.86 |
| LNE | 214.8 | 1.7 |
| NIM | 215.72 | 1.8 |
| NIMT | 217.9 | 4.0 |
| NIST | 220.3 | 4.6 |
| NMIJ | 214.6 | 0.9 |
| NMISA | 208.0 | 5.3 |
| NRC | 215.3 | 0.6 |
| PTB | 215.20 | 1.10 |
| UME | 218.98 | 3.50 |
| VNIIM | 193.3 | 3.1 |

**Key comparison CCQM-K78.a**

**MEASURAND : Mass fraction of leucine in the CCQM-K78.a sample**

$x_i$ :          result of measurement carried out by laboratory $i$

$u_i$ :          combined standard uncertainty of $x_i$

| Lab $i$ | $x_i$ / (µg/g) | $u_i$ / (µg/g) |
|---|---|---|
| | | |
| BIPM | 199.4 | 3.6 |
| EXHM/GCSL-EIM | 200.6 | 3.2 |
| GL | 199.5 | 3.1 |
| HSA | 198.1 | 2.1 |
| KRISS | 199.5 | 2.1 |
| LGC | 199.2 | 1.4 |
| LNE | 203.0 | 1.5 |
| NIM | 199.9 | 1.56 |
| NIMT | 190.8 | 3.91 |
| NIST | 206.0 | 4.6 |
| NMIJ | 199.8 | 0.9 |
| NMISA | 187.5 | 4 |
| NRC | 199.6 | 0.62 |
| PTB | 199.7 | 1.1 |
| UME | 200.6 | 1.62 |
| VNIIM | 186.7 | 3.4 |

**Key comparison CCQM-K78.a**

**MEASURAND : Mass fraction of proline in the CCQM-K78.a sample**

$x_i$ :  result of measurement carried out by laboratory $i$

$u_i$ :  combined standard uncertainty of $x_i$

| Lab $i$ | $x_i$ / (µg/g) | $u_i$ / (µg/g) |
|---|---|---|
| | | |
| BIPM | 47.4 | 0.83 |
| EXHM/GCSL-EIM | 49.87 | 0.79 |
| GL | 46.6 | 1.2 |
| HSA | 46.7 | 0.44 |
| KRISS | 47.4 | 0.4 |
| LGC | 46.8 | 0.4 |
| LNE | 46.7 | 0.5 |
| NIM | 47.0 | 0.2 |
| NIMT | 50.4 | 0.9 |
| NIST | 47.8 | 0.4 |
| NMIJ | 46.7 | 0.5 |
| NMISA | 47.2 | 1.4 |
| NRC | 46.6 | 0.1 |
| PTB | 47.1 | 0.26 |
| UME | 47.2 | 0.8 |
| VNIIM | 46.0 | 0.6 |

**Key comparison CCQM-K78.a**

**MEASURAND : Mass Fraction of 4 Amino Acids in the CCQM-K78.a sample**

For each amino acid component the key comparison reference value $x_R$ was obtained from the DerSimonian-Laird variance-weighted mean (DSL-mean) of the participants results excluding outliers. The computation of $x_R$ and its associated uncertainty $u_R$ is explained in the page 17 of the Final report.

For phenylalanine: $x_R$ = 488.5 µg/g, $u_R$ = 0.49 µg/g

For isoleucine: $x_R$ = 215.1 µg/g, $u_R$ = 0.15 µg/g

For leucine: $x_R$ = 199.9 µg/g, $u_R$ = 0.26 µg/g

For proline: $x_R$ = 46.9 µg/g, $u_R$ = 0.13 µg/g

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

$D_i = (x_i - x_R)$ 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.

**Key comparison CCQM-K78.a**

**MEASURAND : Mass Fraction of 4 Amino Acids in the CCQM-K78.a sample**

| Lab $i$ | phenylalanine | | isoleucine | | leucine | | proline | |
|---|---|---|---|---|---|---|---|---|
| | $D_i$ / (µg/g) | $U_i$ / (µg/g) | $D_i$ / (µg/g) | $U_i$ / (µg/g) | $D_i$ / (µg/g) | $U_i$ / (µg/g) | $D_i$ / (µg/g) | $U_i$ / (µg/g) |
| BIPM | -2.19 | 14.52 | -2.39 | 7.25 | -0.53 | 7.20 | 0.49 | 1.68 |
| EXHM/GCSL-EIM | 3.70 | 9.25 | -1.53 | 5.21 | 0.70 | 6.42 | 2.97 | 1.60 |
| GL | 0.50 | 22.02 | 0.47 | 6.41 | -0.40 | 6.22 | -0.30 | 2.41 |
| HSA | -4.90 | 11.72 | -0.43 | 4.41 | -1.80 | 4.27 | -0.18 | 0.92 |
| KRISS | -2.50 | 8.46 | 0.47 | 2.42 | -0.40 | 4.23 | 0.50 | 0.91 |
| LGC | -0.20 | 2.96 | -0.23 | 1.74 | -0.70 | 2.85 | -0.13 | 0.88 |
| LNE | -1.90 | 8.26 | -0.33 | 3.41 | 3.10 | 3.04 | -0.20 | 1.03 |
| NIM | 0.03 | 5.01 | 0.59 | 3.69 | -0.03 | 3.16 | 0.14 | 0.55 |
| NIMT | 6.20 | 6.53 | 2.77 | 7.93 | -9.10 | 7.84 | 3.50 | 1.84 |
| NIST | 3.70 | 10.84 | 5.17 | 9.20 | 6.10 | 9.21 | 0.90 | 0.86 |
| NMIJ | -0.60 | 3.92 | -0.53 | 1.82 | -0.10 | 1.87 | -0.20 | 1.03 |
| NMISA | -0.50 | 14.43 | -7.13 | 10.60 | -12.40 | 8.02 | 0.30 | 2.81 |
| NRC | 0.60 | 3.73 | 0.17 | 1.14 | -0.30 | 1.35 | -0.30 | 0.32 |
| PTB | -0.70 | 5.09 | 0.07 | 2.22 | -0.20 | 2.26 | 0.18 | 0.58 |
| UME | -5.91 | 7.27 | 3.85 | 7.01 | 0.74 | 3.28 | 0.34 | 1.64 |
| VNIIM | 6.50 | 12.04 | -21.83 | 6.21 | -13.20 | 6.82 | -0.90 | 1.23 |

CCQM-K78.a : Mass fraction of Phenalanine

Degrees of equivalence, $D_i$ and expanded uncertainty $U_i$ ($k = 2$) in µg/g

$x_R$ = 488.5 µg/g
$u_R$ = 0.49 µg/g
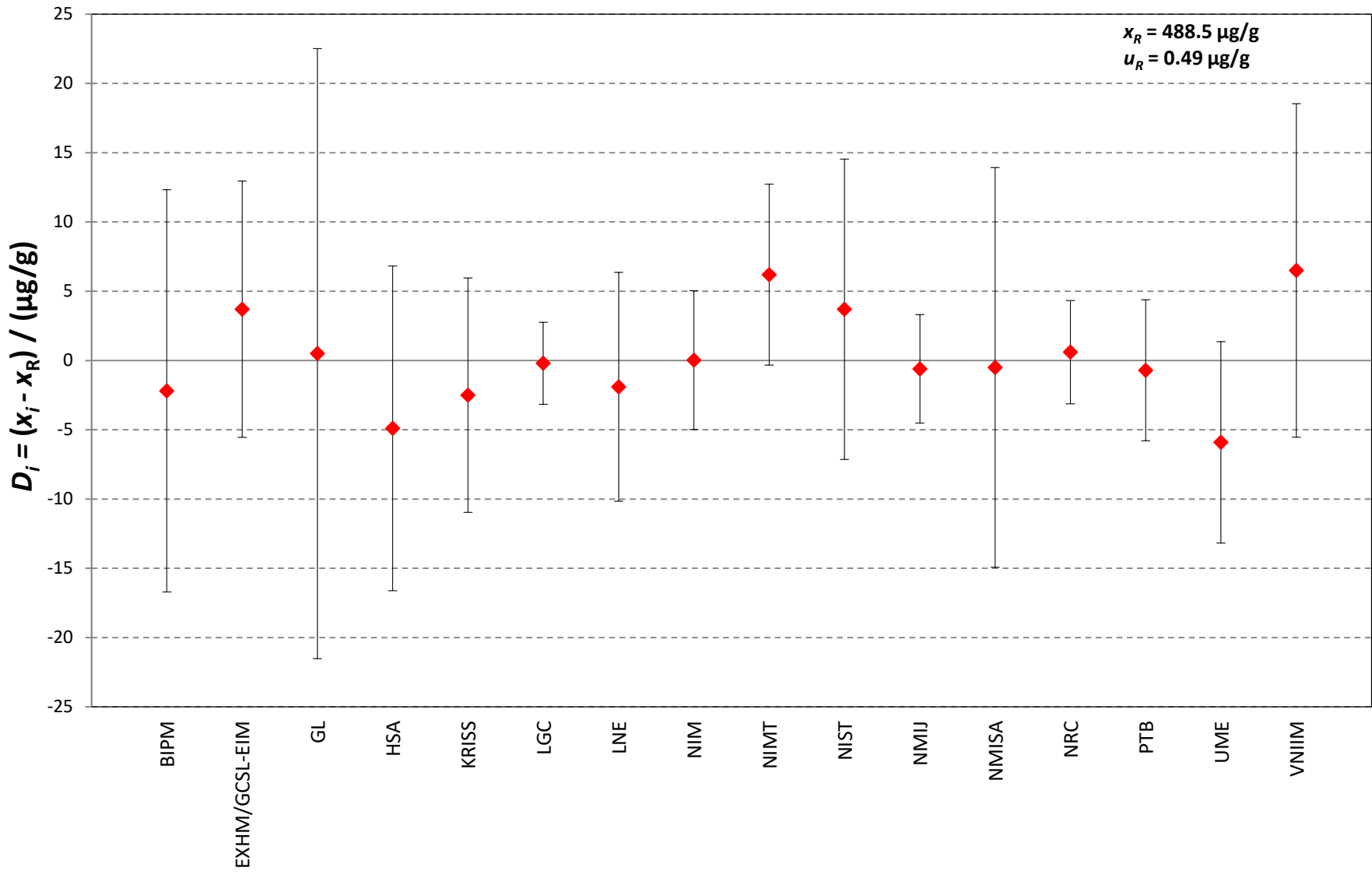
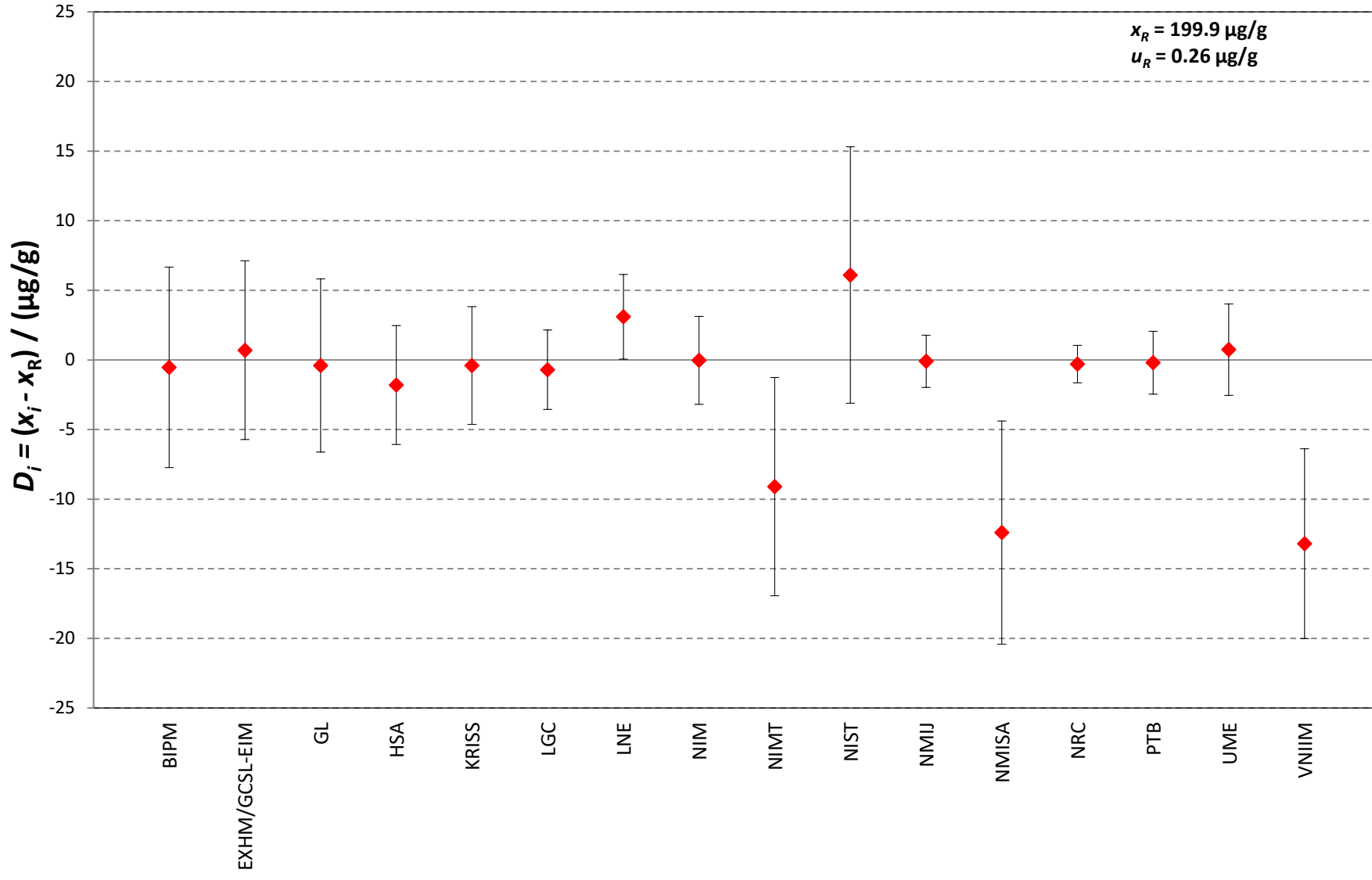# CCQM-K78.a : Mass fraction of Isoleucine
## Degrees of equivalence, $D_i$ and expanded uncertainty $U_i$ ($k$ = 2) in µg/g



$x_R$ = 215.1 µg/g
$u_R$ = 0.15 µg/g
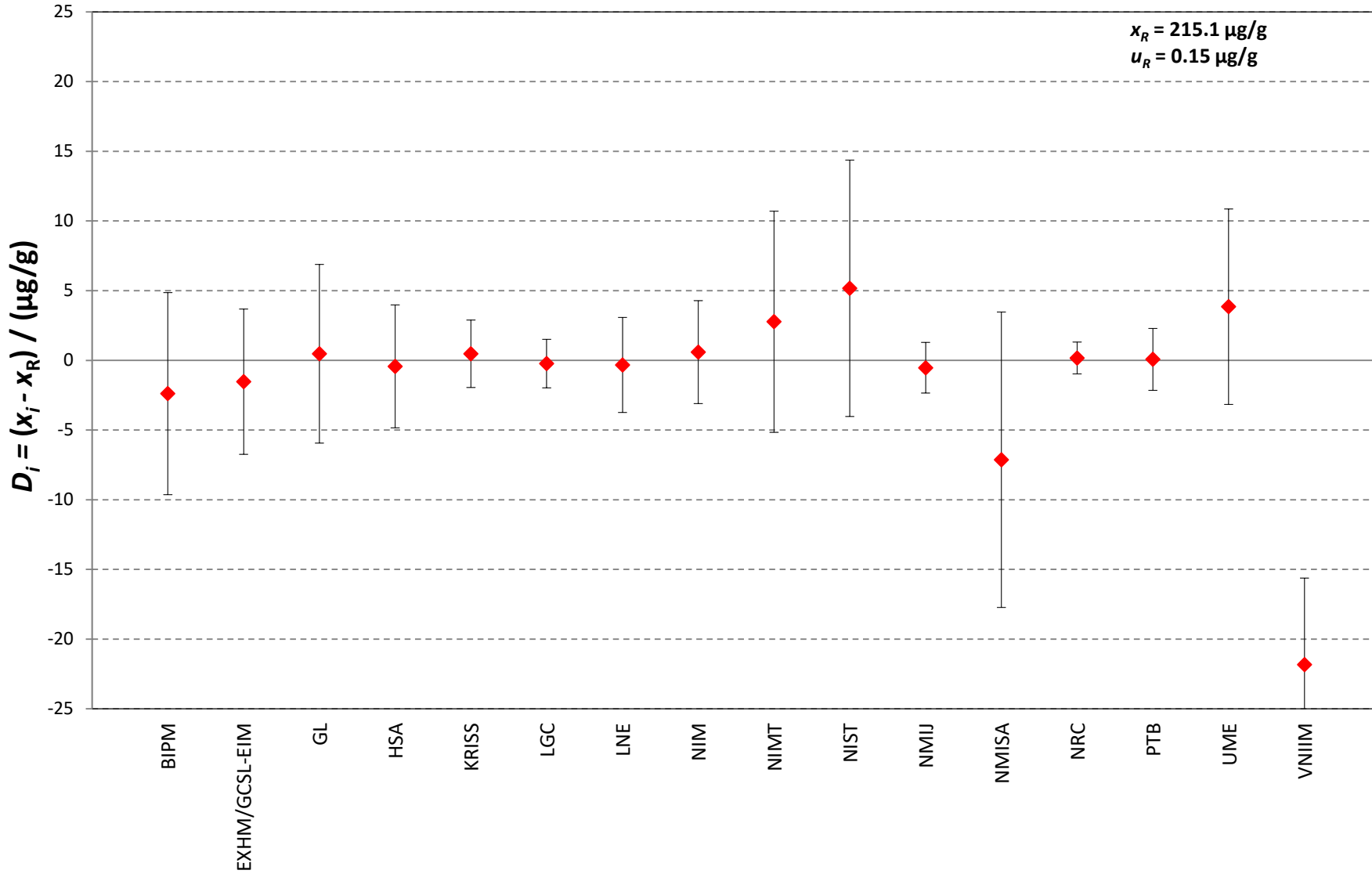
CCQM-K78.a : Mass fraction of Leucine

Degrees of equivalence, $D_i$ and expanded uncertainty $U_i$ ($k$ = 2) in μg/g

$x_R$ = 199.9 μg/g
$u_R$ = 0.26 μg/g

**CCQM-K78.a : Mass fraction of Proline**

Degrees of equivalence, $D_i$ and expanded uncertainty $U_i$ ($k$ = 2) in µg/g

$x_R$ = 46.9 µg/g
$u_R$ = 0.13 µg/g

$D_i = (x_i - x_R) / (µg/g)$