Standardisations at NPL

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Introduction

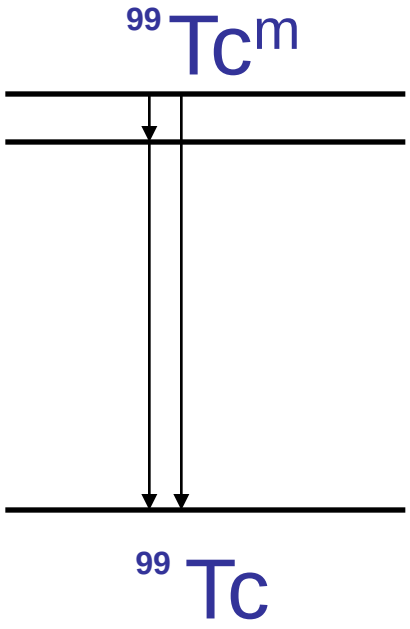
- Tc-99m
- Tl-201
- Cu-64

(on-going)

The nuclear decay

2 keV conv electrons

140 keV γ-rays



6.0079 hours

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Elution of the generator

- Activity concentration vs. salt concentration
- No Mo-99 impurities (or Nb-92m)

- 9 μg/g NaCl in water
- Mo-99 (0.0010) %; u = (0.0005) %

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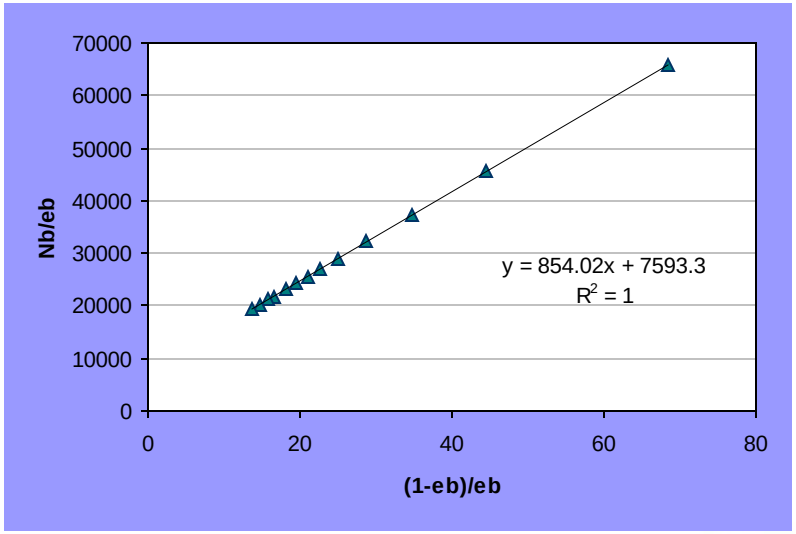
Standardisation

- $4\pi\beta$(LS)-γ using DCC
- $4\pi\beta$(PC)-γ with HV variation

Efficiencies:

20% - 4%

both methods



Standardisation

$4\pi\beta$(LS)-γ using DCC

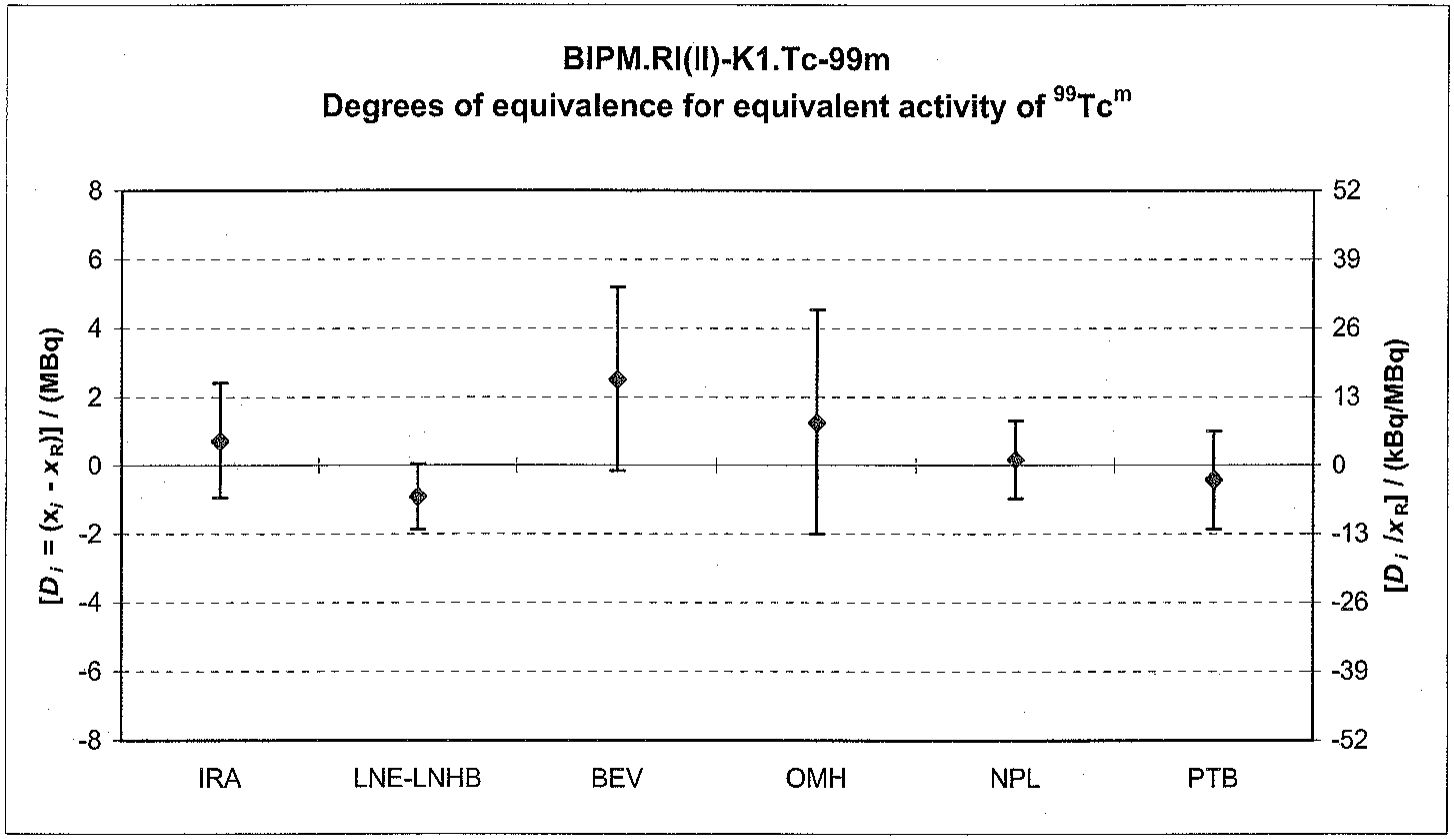
7630 kBq/g ± 0.54%

$4\pi\beta$(PC)-γ with HV variation

7600 kBq/g ± 0.42%

SIR Tc-99m

Figure Graph of degrees of equivalence with the KCRV for $^{99}Tc^{m}$
(as it appears in Appendix B of the MRA)



N.B. The right-hand axis gives approximate relative values only

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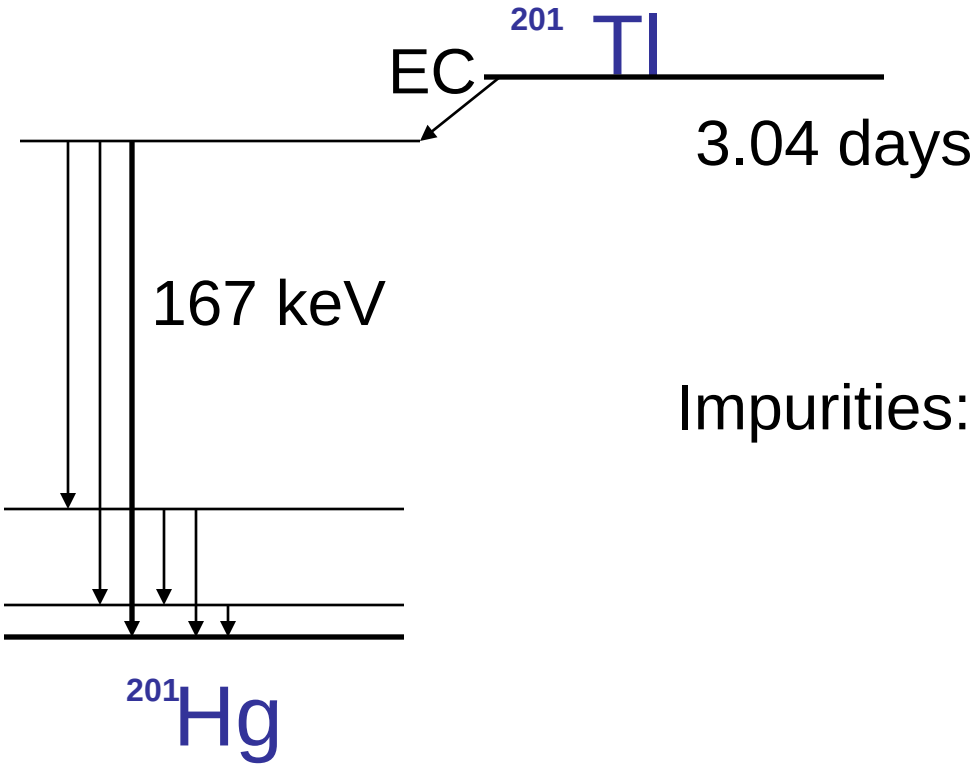
The nuclear decay



Impurities: Tl-200 (1.088d)
Tl-202 (12.23d)

Ion chamber calibration factor

^{200}Tl	52.1 pA/MBq	± 10%	52.4 ± 1.7%
^{201}Tl	6.9537 pA/MBq	± 0.5%	
^{202}Tl	17.2 pA/MBq	± 10%	21.7 ± 2.3%

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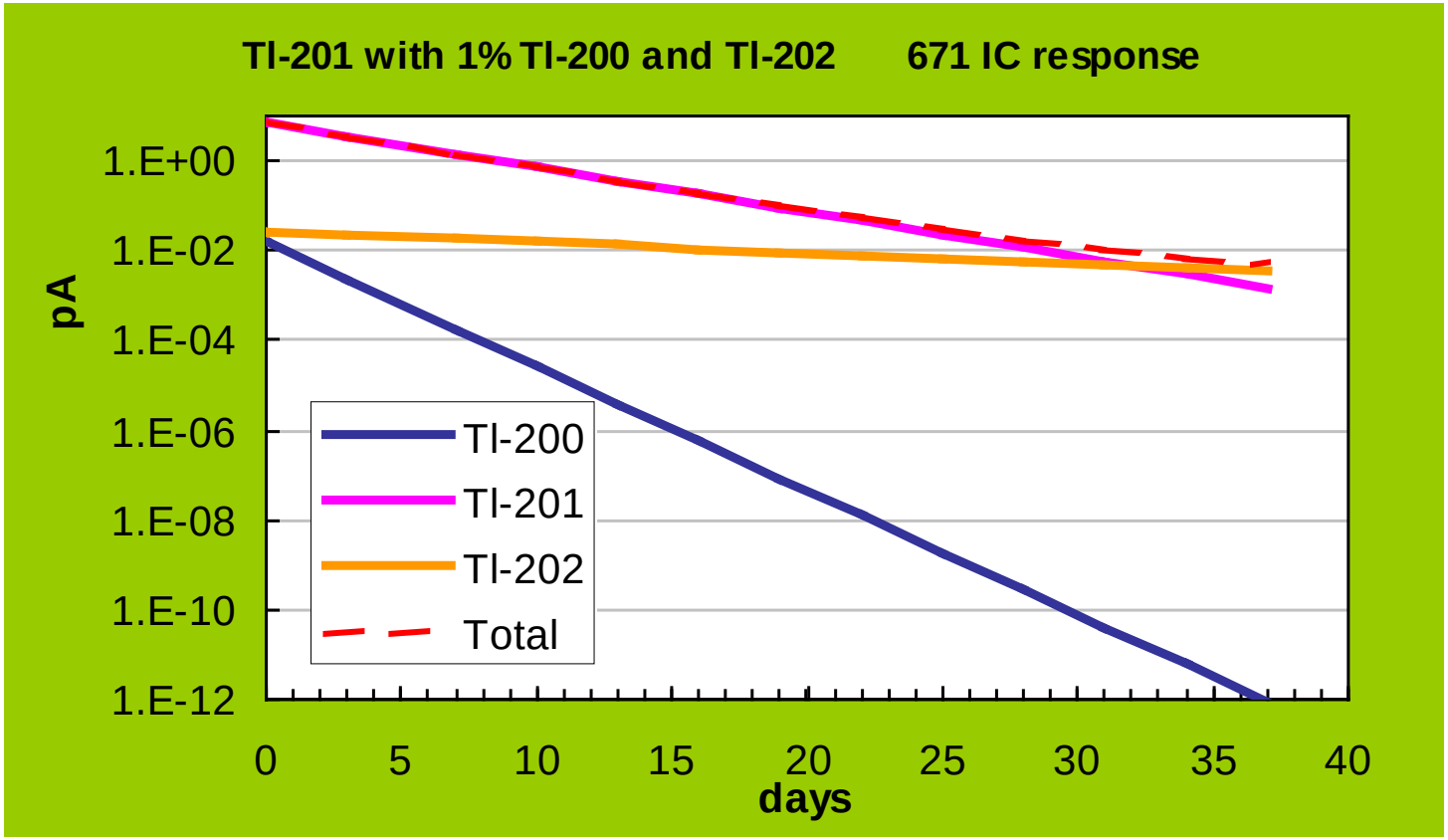
Ion chamber calibration factor



Impurities

Determined by gamma-ray spectrometry:

^{200}Tl 0.133 %; u = 0.003 %

^{202}Tl 0.206 %; u = 0.003 % @ ref date

Source preparation

Solvent : water carrier : 700 μg/g NaCl 1.001 g/cm^3

Strong solution

10.8 MBq/g → BIPM ampoule
VYNS sources
IC ampoules

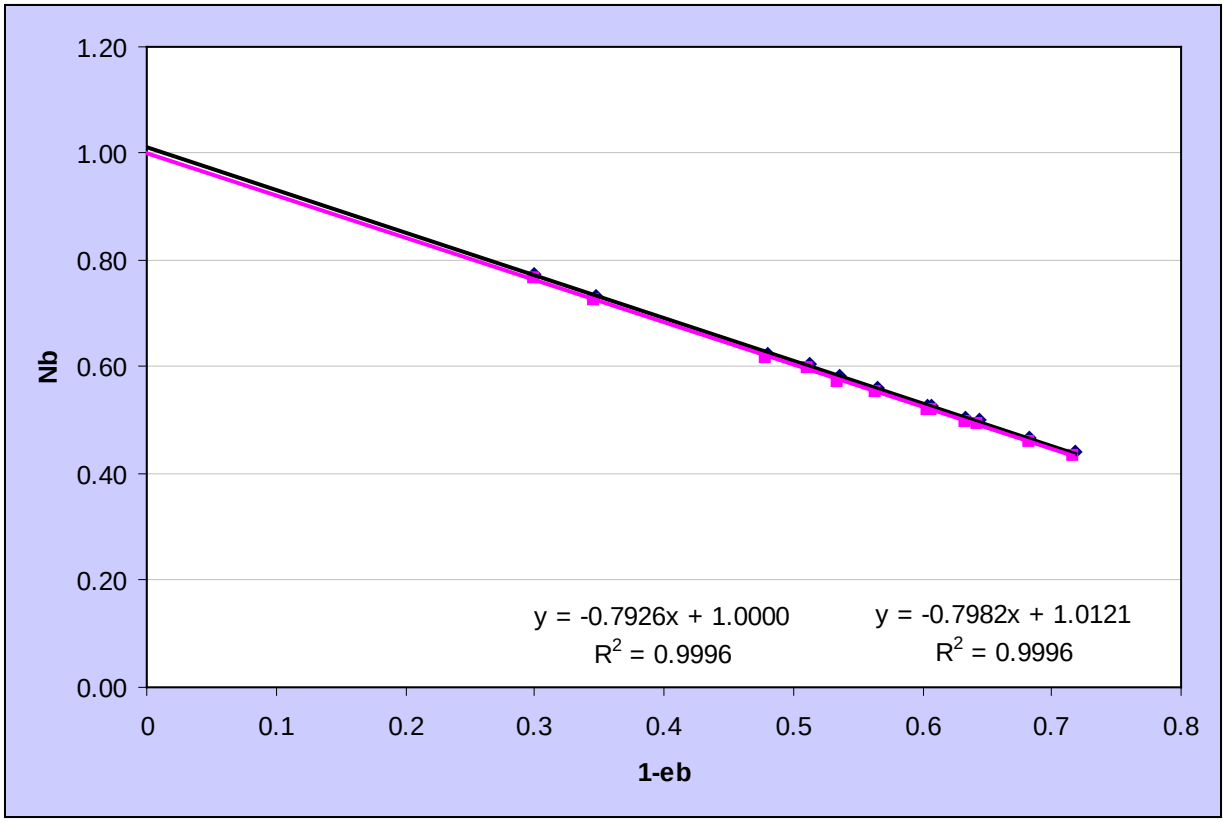
Weaker solution

1.12 MBq/g → VYNS sources
IC ampoules

Coincidence counting

				WEAK foil			Half lives	3.0421	1.088	12.23	d	
		Reference date	07/11/2006 12:00						Impurities ratio			
		Activity concentration	1000.00	kBq/g					0.0013146	0.0020595	@ ref. date	
		Measurement time	300	s							bkg subtracted	
Source	**mass**	**Start**	**Finish**	**t1 (days)**	**t2 (days)**	**εβ**	**N(Tl-201)**	**N(Tl-200)**	**N(Tl-202)**	**N(Tl-201)**	**$N(Tl\text{-}201)_{corr}$**
s06210	26.411	13/11/2006 17:18	13/11/2006 17:23	6.22	6.22	0.7161	1374358	142	8212	1512872	1503732
	26.411	13/11/2006 17:23	13/11/2006 17:28	6.22	6.23	0.7161	1373253	141	8211	1507178	1498067
	26.411	13/11/2006 17:28	13/11/2006 17:33	6.23	6.23	0.7161	1372149	141	8209	1508712	1499586
	26.411	13/11/2006 17:33	13/11/2006 17:38	6.23	6.24	0.7161	1371046	141	8208	1503316	1494218
	26.411	13/11/2006 17:38	13/11/2006 17:43	6.24	6.24	0.7161	1369944	140	8206	1503901	1494794
S06206	23.193	14/11/2006 10:01	14/11/2006 10:06	6.92	6.92	0.6761	972227	75	6545	1063303	1056111
	23.193	14/11/2006 10:06	14/11/2006 10:11	6.92	6.92	0.6761	971445	75	6544	1060689	1053511
	23.193	14/11/2006 10:11	14/11/2006 10:16	6.92	6.93	0.6761	970664	75	6543	1060898	1053714
	23.193	14/11/2006 10:16	14/11/2006 10:21	6.93	6.93	0.6761	969883	75	6541	1060898	1053710
	23.193	14/11/2006 10:21	14/11/2006 10:26	6.93	6.94	0.6761	969104	75	6540	1058229	1051055
s06210	26.411	14/11/2006 10:51	14/11/2006 10:58	6.95	6.96	0.5954	1289576	98	8734	1346167	1337009
	26.411	14/11/2006 10:58	14/11/2006 11:04	6.96	6.96	0.5954	1288199	98	8732	1345990	1336827
	26.411	14/11/2006 11:05	14/11/2006 11:11	6.96	6.97	0.5954	1286824	98	8730	1344649	1335488

Coincidence counting



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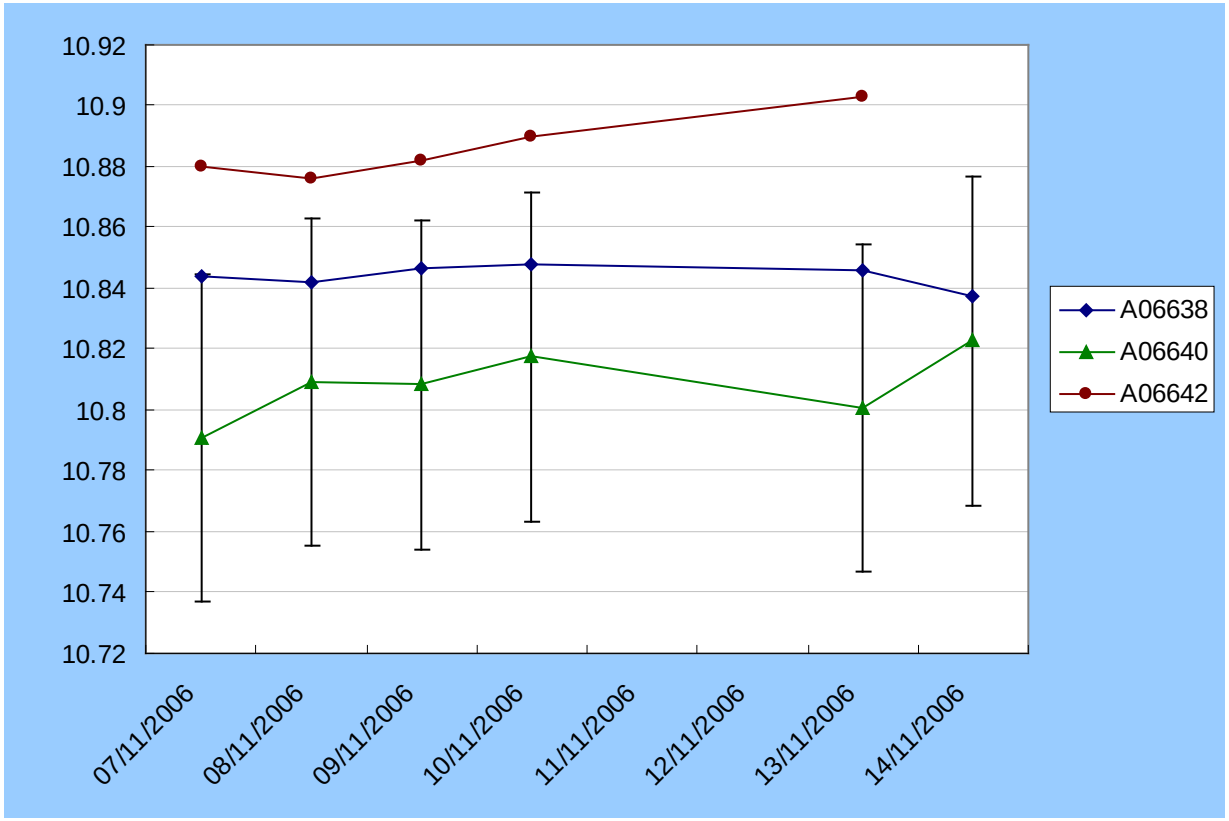
Coincidence counting

Results

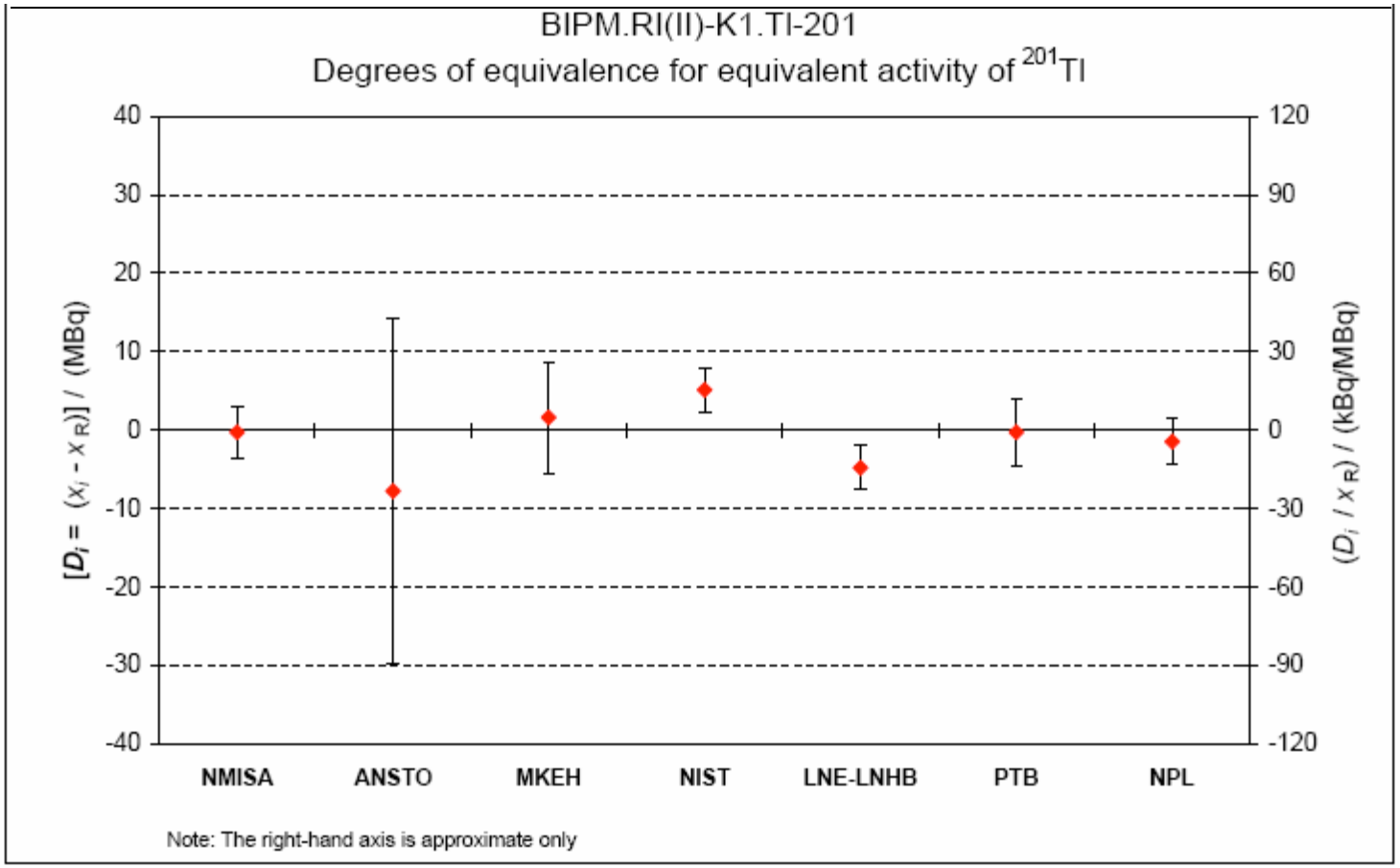
10.799 MBq/g ±0.5% strong solution

10.776 MBq/g ±0.5% weak solution with dil. factor

IC Calibration



SIR Tl-201


BIPM.RI(II)-K1.Tl-201
Degrees of equivalence for equivalent activity of 201Tl
[Di = (xi - xR)] / (MBq)
(Di / xR) / (kBq/MBq)
40
30
20
10
0
-10
-20
-30
-40
120
90
60
30
0
-30
-60
-90
-120
NMISA
ANSTO
MKEH
NIST
LNE-LNHB
PTB
NPL
Note: The right-hand axis is approximate only

Ongoing medical nuclides