

International comparison of activity measurements
of a solution of ^{109}Cd (March 1986)

Preliminary report

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In this preliminary report, after a list of the participants having submitted their results for the ^{109}Cd intercomparison by August 31, 1986, we present some data which may be of interest for a comparison of the results. A graphical representation of the results with their uncertainties (1σ) is also given.

The participants are requested to check carefully whether their respective results have been correctly interpreted and to inform us on possible changes or complements.

A final report of the intercomparison with a detailed analysis of all the results received and the conclusions to be drawn will be published later.

Table 1

List of participants

AECL	Atomic Energy of Canada Limited, Chalk River, Canada
BCMNM	Central Bureau for Nuclear Measurements, Geel, Belgium
BIPM	Bureau International des Poids et Mesures, Sèvres, France
ETL	Electrotechnical Laboratory, Ibaraki, Japan
IEA	Instytut Energii Atomowej, Swierk, Poland
IER	Institut d'électrochimie et radiochimie de l'EPFL, Lausanne, Switzerland
IFIN	Institutul de Fizica si Inginerie Nucleara, Bucuresti Magurele, Romania
IMM	Institut de Métrologie D.I. Mendéléev, Leningrad, USSR
IPEN	Instituto de Pesquisas Energéticas e Nucleares, São Paulo, Brazil
KSRI	Korea Standards Research Institute, Taejon, Korea
LMRI	Laboratoire de Métrologie des Rayonnements Ionisants, Saclay, France
NAC	National Accelerator Centre, Faure, South Africa
NBS	National Bureau of Standards, Gaithersburg, USA
NIM	National Institute of Metrology, Beijing, Peoples' Republic of China
NPL	National Physical Laboratory, Teddington, UK
OMH	Országos Mérésügyi Hivatal, Budapest, Hungary
PTB	Physikalisch-Technische Bundesanstalt, Braunschweig, Federal Republic of Germany
UVVVR	Institute for research, production and application of radioisotopes, Prague, Czechoslovakia

Table 2 - Summary of the results

Laboratory	Methods used	Pressure (MPa)	Threshold or window (keV)	Approximate dilution factor *	Number of sources measured	Typical count rate (s ⁻¹)	Final result with combined uncertainty, at reference date (1986-03-01) (Bq·mg ⁻¹ ; 1σ)
AECL	4π(PC)ce standardization of ¹⁰⁹ Pd Ge(Li)	0,1	0,1	20,3 and 52,2	6 ¹⁰⁹ Cd 5 ¹⁰⁹ Pd	2 600 2 to 68	6 026 ± 42
			10				
	4π Auger electron X-ray coincidence counting NaI(Tl)	0,1	0,1	"	6	2 600	5 995 ± 41
BCMN	4π-CsI(Tl) sandwich spectrometer	0,3 to 0,5	46	39,3 and 202	4	1 100 to 5 200	5 980 ± 24
			20	39 to 217 (5)	10	800 to 6 000	5 967 ± 20
BLM	4π(PFC)ce	1,1	36,2	34,17	28	1 400 to 10 700	5 976 ± 16
ETL	4π e-X coincidence	0,1	0,2	6,15	22	8 000	6 001 ± 38
				5,65	17	8 000	
IEA	TDCR **			1	11	71 000 to 87 000	6 016 ± 20
				10,99	12	13 000 to 41 000	6 022 ± 18
IER	4π ce(LS)-X coincidence 4π ce(LS) + 4π NaI(Tl)γ			10,99	12	250 to 750 X 5500 to 16000 ce	6 009 ± 20
				36,3 to 198 35,5 to 111,5	5,25 to 375,4 (6)	16 9	130 to 8 000 5,2 to 215

Table 2 (cont'd)

Laboratory	Methods used	Pressure (MPa)	Threshold or window (keV)	Approximate dilution factor *	Number of sources measured	Typical count rate (s ⁻¹)	Final result with combined uncertainty, at reference date (1986-03-01) (Bq·mg ⁻¹ ; 1σ)
IFIN	4π(PC)ce	0,1	1	10,54	6 ***	8 000	6 480 ± 110 } 6 440 ± 70 } 6 400 ± 100 }
	Ge(Li)		80 to 96	10,54	4	0,5 to 2	
IMM	4π(PFC)ce	0,7	36	11,25; 20,32; 29,80	10	700 to 2 000	5 968 ± 12
IPEN	4π(PFC)ce	1,0	30,7	58,02; 66,95; 112,47	16	2 100	6 000 ± 13
KSRI	4π(PFC)ce	1,31	31,0	1; 7,24	12	9 000	5 994 ± 19
IMRI	4π(PFC)ce	1,0	40	301,56	10	300	5 967 ± 5
NAC	4πe-4πe-LS coincidence		57	7,5	10	20 000	6 033 ± 10
	4π(LS)e-X		50 ce 22 X ****	7,5	10	21 000 ce 370 ***	6 026 ± 41
NBS	4π ce(LS) + 4πγNaI(Tl)		ce 25 γ 39	121,96	9 12	1 000 100	5 940 ± 28
			25	¹⁰⁹ Cd 121,96	9	1 000	
	109Pd standardization NaI(Tl)	39	¹⁰⁹ Pd 6,61	3	1 000		
NIM	4π(PFC)ce	0,68	33 to 35	1,36; 11,41; 12,72	30	6 000	6 027 ± 34
	4π(LS)ce		1,64 to 1,9 *****	12,72	11	8 000 to 9 000	6 030 ± 15

Table 2 (cont'd)

Laboratory	Methods used	Pressure	Threshold or window	Approximate dilution factor	Number of sources measured	Typical count rate	Final result with combined uncertainty, at reference date (1986-03-01) (Bq·mg ⁻¹ ; 1σ)
		(MPa)	(keV)	*		(s ⁻¹)	
NPL	large 4π(PFC)ce	0,5	37	180,43; 463,32	14	700	5 983 ± 19
OMH	4π(PFC)ce	1,1	37	4,94; 60,03	21	12 500 and 1 030	5 978 ± 16
PTB	4π(PFC)ce	1,1	30	4,73	7	10 500	5 983 ± 20
UVVVR	4π(PFC)ce	0,5	33 to 166	27,68; 29,93	11 x 2	5 500	6 098 ± 13
	X _K emission rate 4πNaI(TL)		5,9 to 58			5 600	6 055 ± 67
	γ-ray 4πNaI(TL)		58 to 160			200	6 000 ± 67

* The figures in parentheses indicate the number of dilutions used.

** TDCR: Triple to double coincidence ratio (cf. K. Pochwalski, R. Broda, T. Radoszewski and P. Zelazny, Standardization of low-level beta-emitter solutions by using the liquid-scintillation triple to double coincidence ratio method, International Symposium on methods of low-level counting and spectrometry, Berlin 1981, IAEA-SM-252/62).

*** 600 μg/cm² metallized foil on both sides to stop the Auger electrons.

**** Discrimination window set on the 22 keV peak.

***** Threshold values given in V.

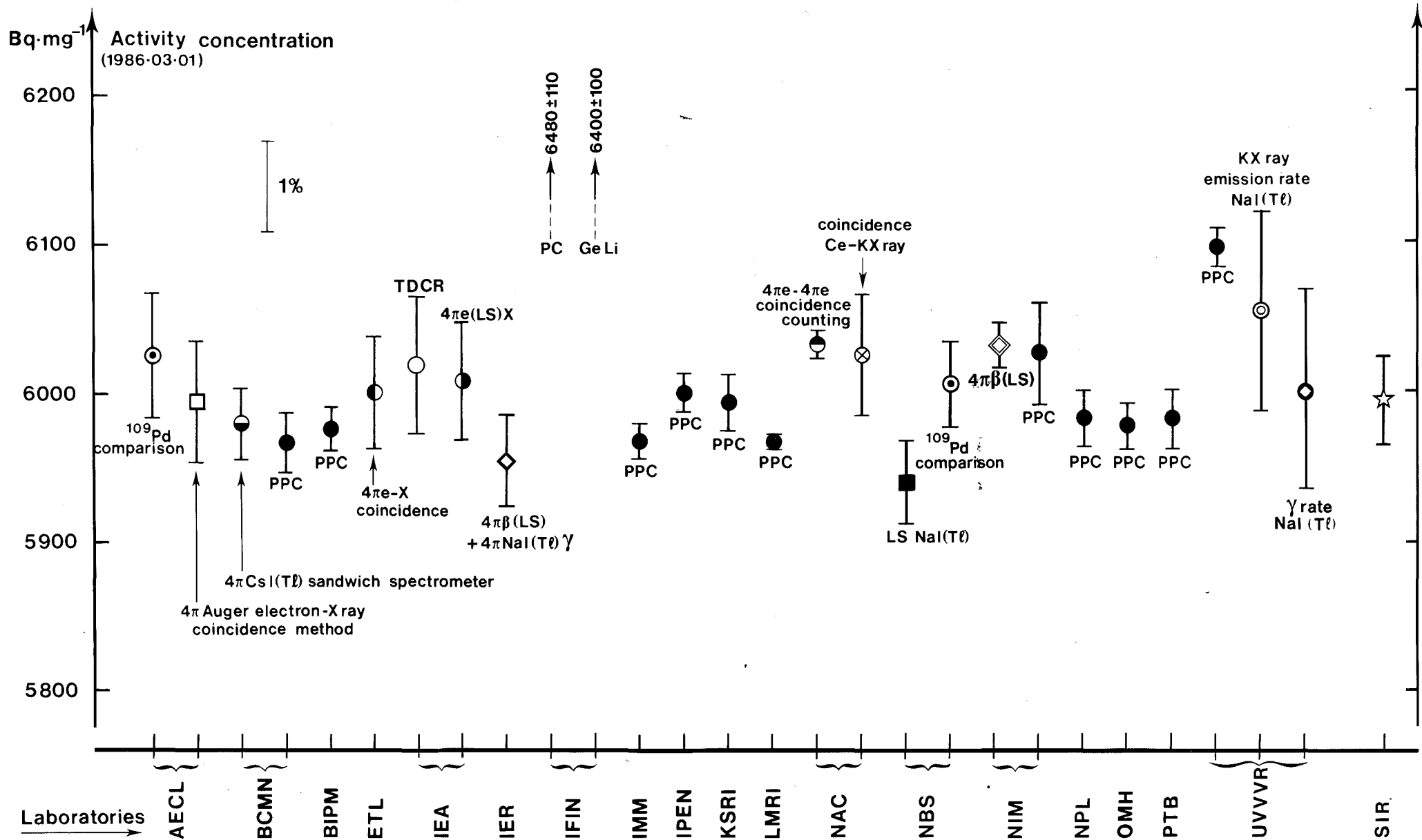


Fig. 1 - Graphical representation of the results of the ^{109}Cd intercomparison