NPL Environmental Comparison Exercise 2002

International comparisons – Equivalence and Traceability

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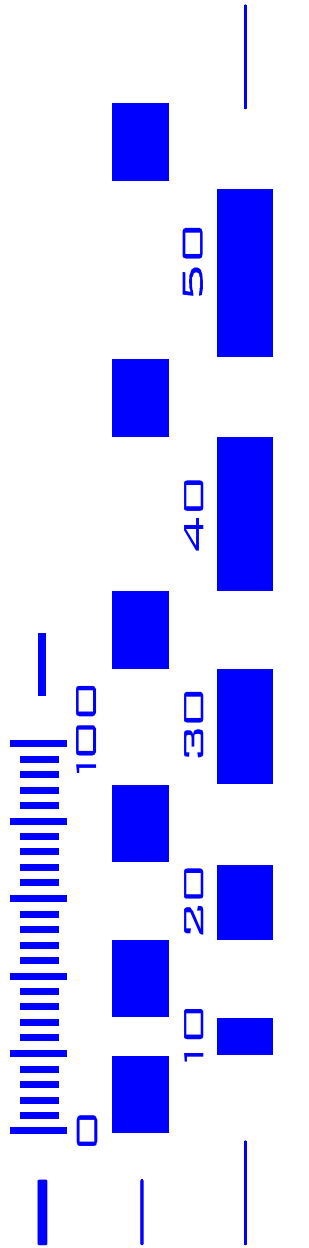


DEFINITIONS

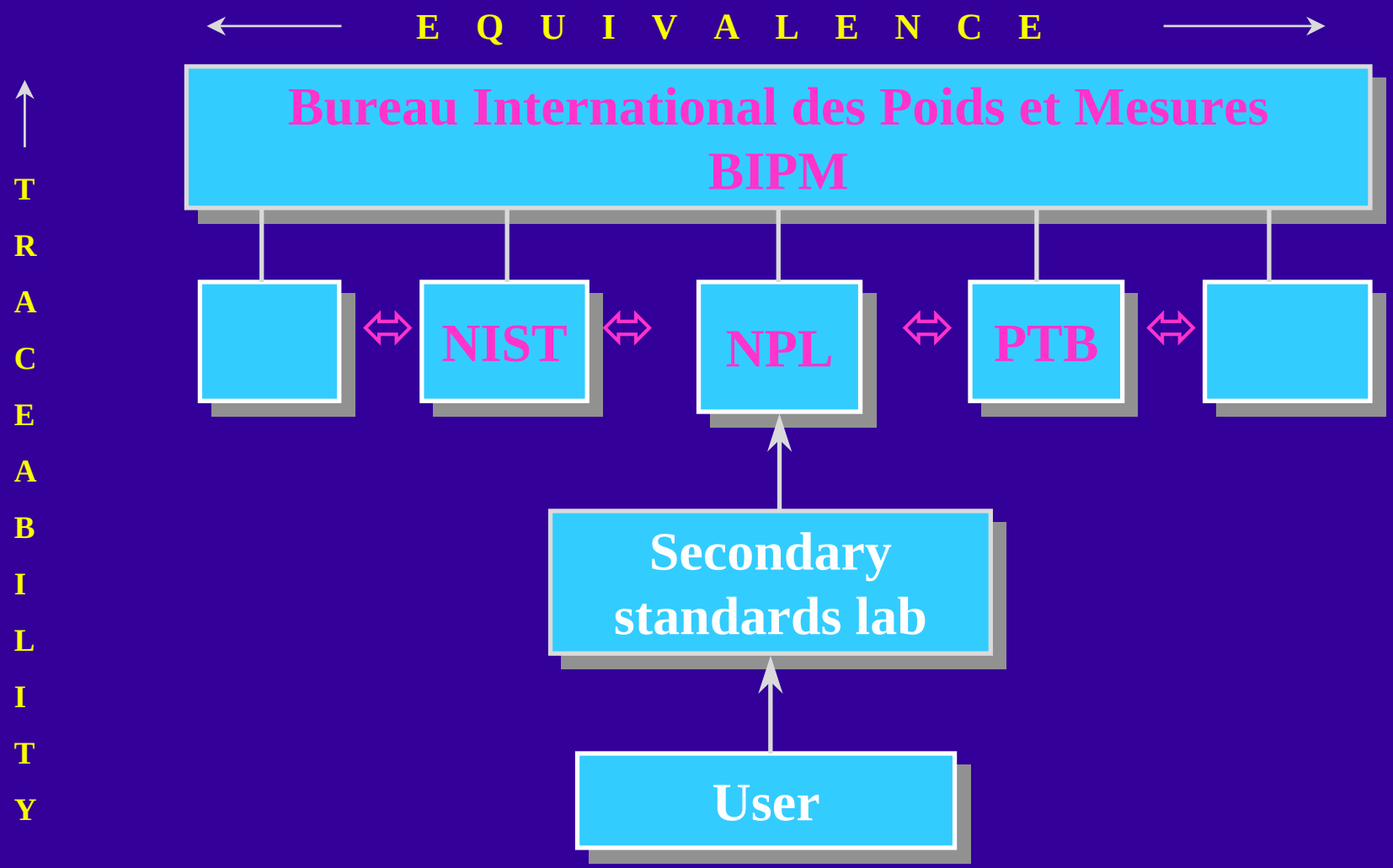
- **TRACEABILITY**

  The property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons.

- **EQUIVALENCE**

  The condition of being equivalent, i.e. equal for practical purposes, in significance or worth. Note: equivalence does not imply identity.

INTERNATIONAL MEASUREMENT SYSTEM



Mutual Recognition Arrangement (MRA)

- **Appendix B**

  Tables of Equivalence to SI and between NMIs

  Defines differences and uncertainties from international comparisons

- **Appendix C (CMCs)**

  Defines Calibration and Measurement Capabilities of individual NMIs

MRA: ***NMIs recognise standards and calibration certificates of other NMIs for those radionuclides in the CMC tables***

Radionuclides with Supporting Comparisons

^{3}H ^{18}F ^{22}Na ^{24}Na ^{32}P ^{46}Sc ^{47}Sc ^{51}Cr ^{54}Mn

^{56}Co ^{56}Mn ^{57}Co ^{58}Co ^{59}Fe ^{60}Co ^{65}Zn ^{67}Ga ^{75}Se

^{85}Sr ^{88}Y ^{89}Sr ^{90}Sr ^{95}Nb ^{95}Zr ^{99}Mo $^{99}Tc^{m}$ ^{103}Ru

^{106}Ru ^{109}Cd $^{110}Ag^{m}$ ^{111}In ^{113}Sn ^{123}I ^{124}Sb ^{125}I ^{131}I

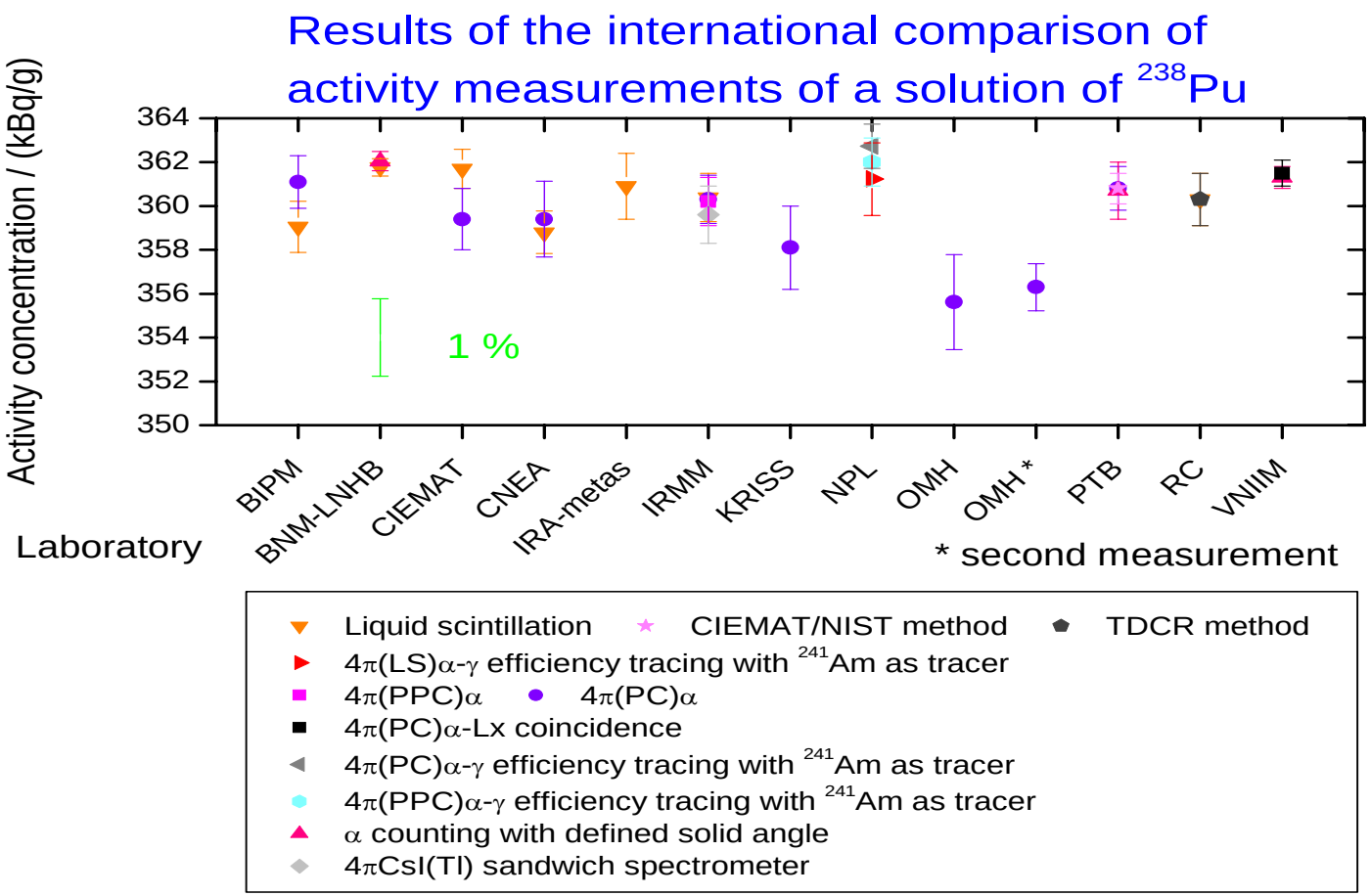
^{133}Ba ^{133}Xe ^{134}Cs ^{137}Cs ^{139}Ce ^{140}Ba ^{141}Ce ^{144}Ce

^{152}Eu ^{153}Gd ^{153}Sm ^{154}Eu ^{155}Eu $^{166}Ho^{m}$ ^{169}Yb ^{177}Lu

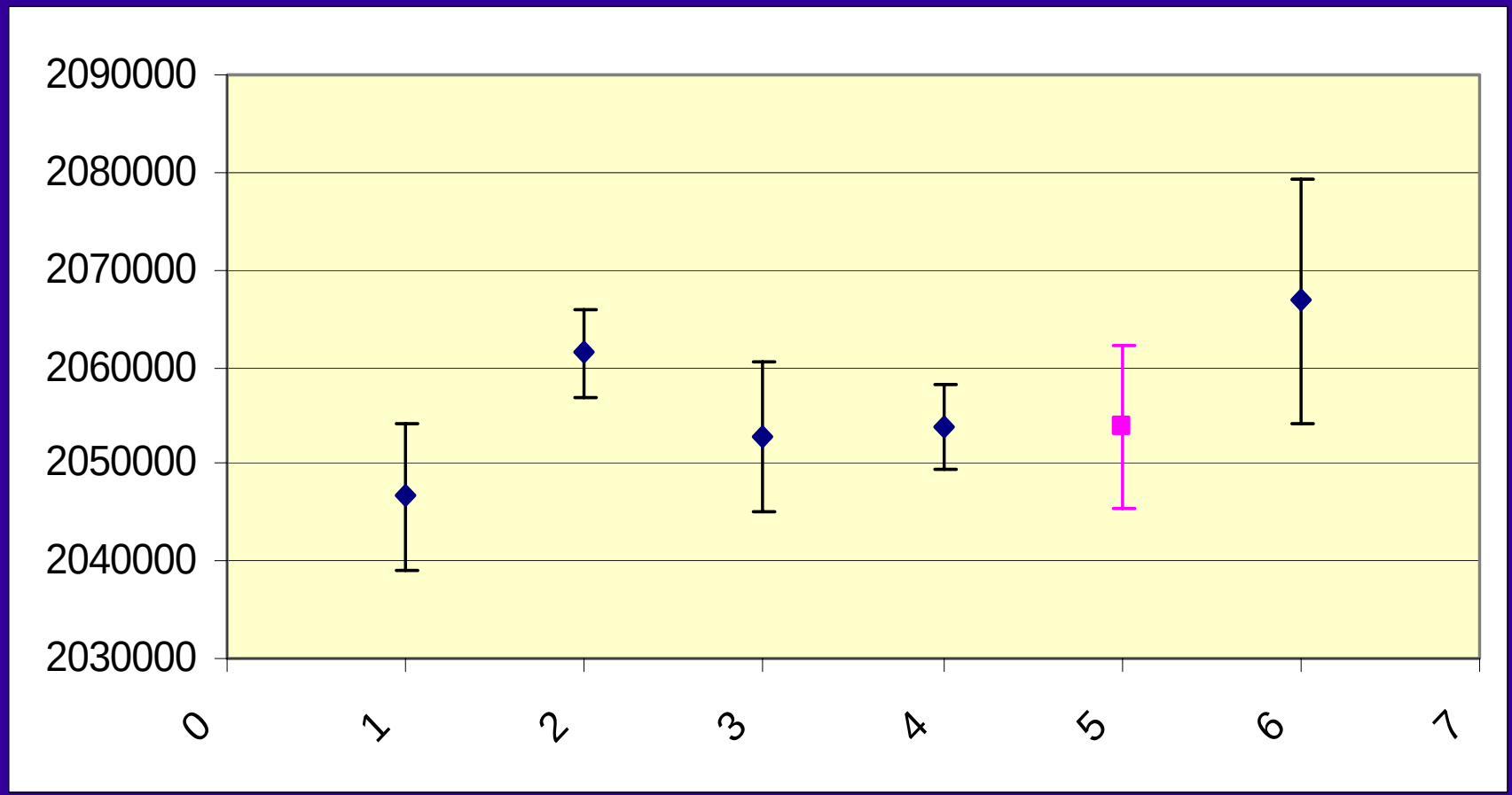
^{182}Ta ^{192}Ir ^{195}Au ^{201}Tl ^{203}Hg ^{203}Pb ^{204}Tl ^{207}Bi

^{222}Rn ^{226}Ra ^{228}Th ^{237}Np ^{238}Pu ^{241}Am ^{243}Am

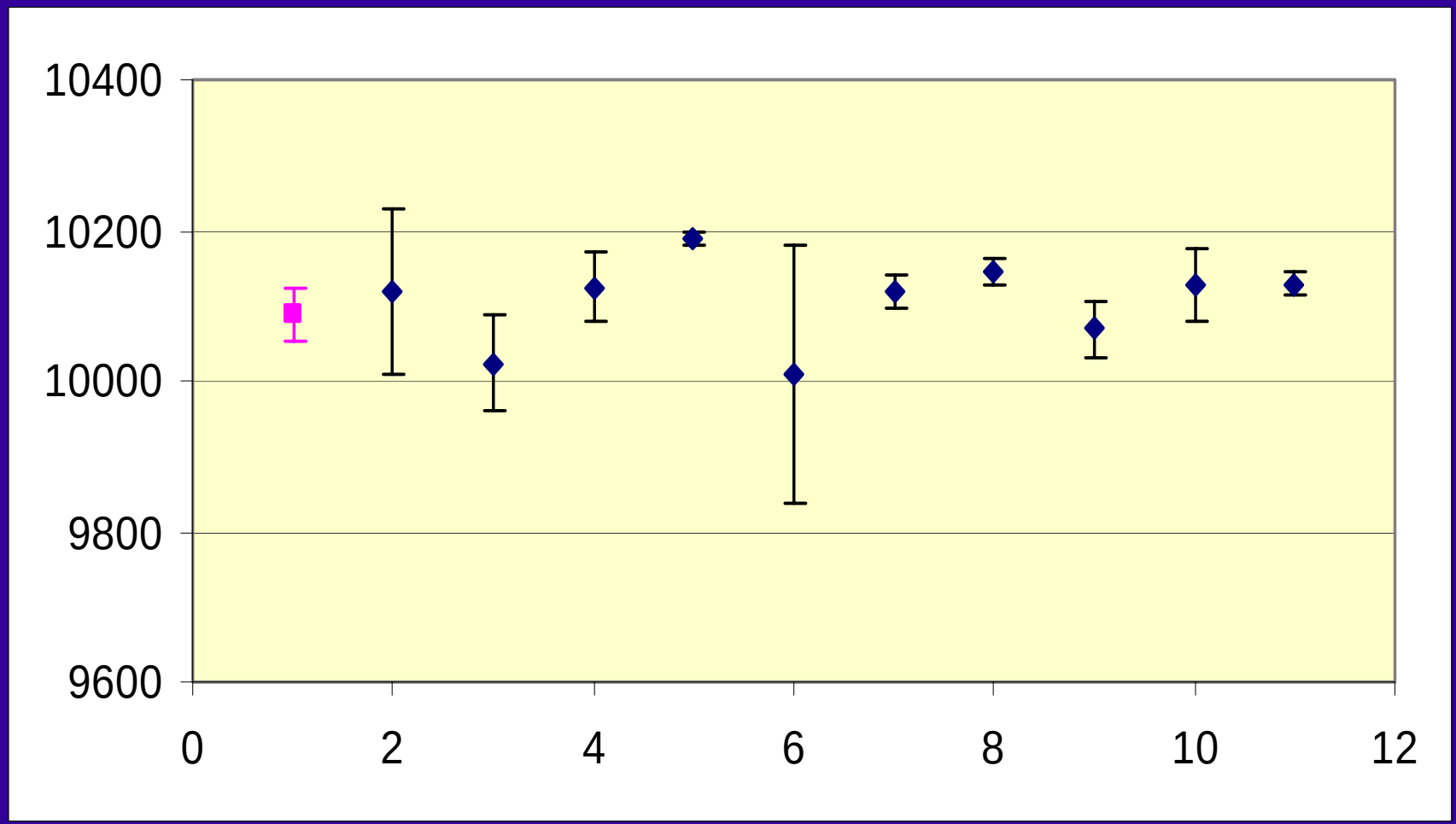
Pu-238


Results of the international comparison of activity measurements of a solution of 238Pu
Activity concentration / (kBq/g)
364
362
360
358
356
354
352
350
1 %
BIPM
BNM-LNHB
CIEMAT
CNEA
IRA-metas
IRMM
KRISS
NPL
OMH
OMH*
PTB
RC
VNIIM
Laboratory
* second measurement
Liquid scintillation
CIEMAT/NIST method
TDCR method
4π(LS)α-γ efficiency tracing with 241Am as tracer
4π(PPC)α
4π(PC)α
4π(PC)α-Lx coincidence
4π(PC)α-γ efficiency tracing with 241Am as tracer
4π(PPC)α-γ efficiency tracing with 241Am as tracer
α counting with defined solid angle
4πCsI(Tl) sandwich spectrometer

Am-241


2090000
2080000
2070000
2060000
2050000
2040000
2030000
0
1
2
3
4
5
6
7

Cs-134



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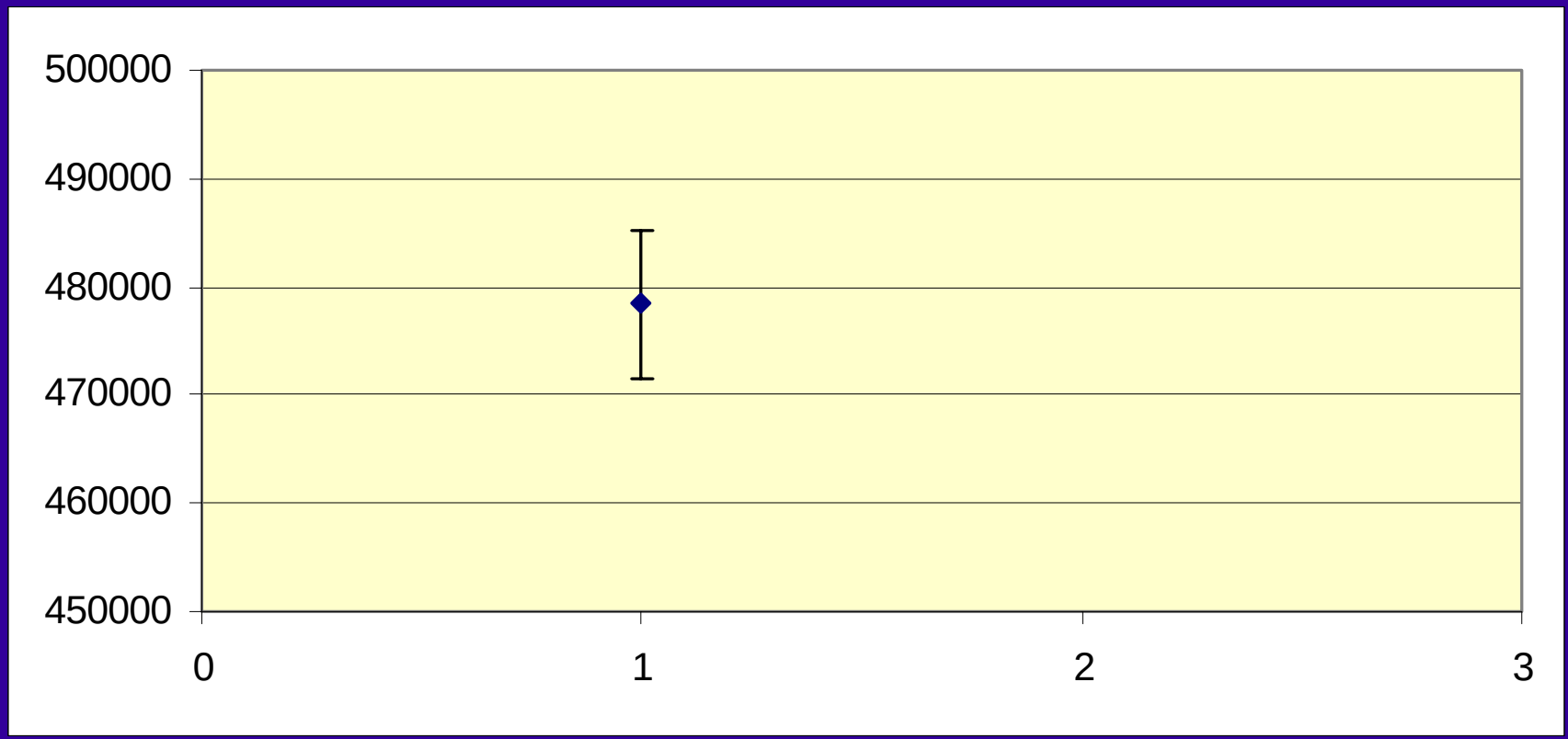
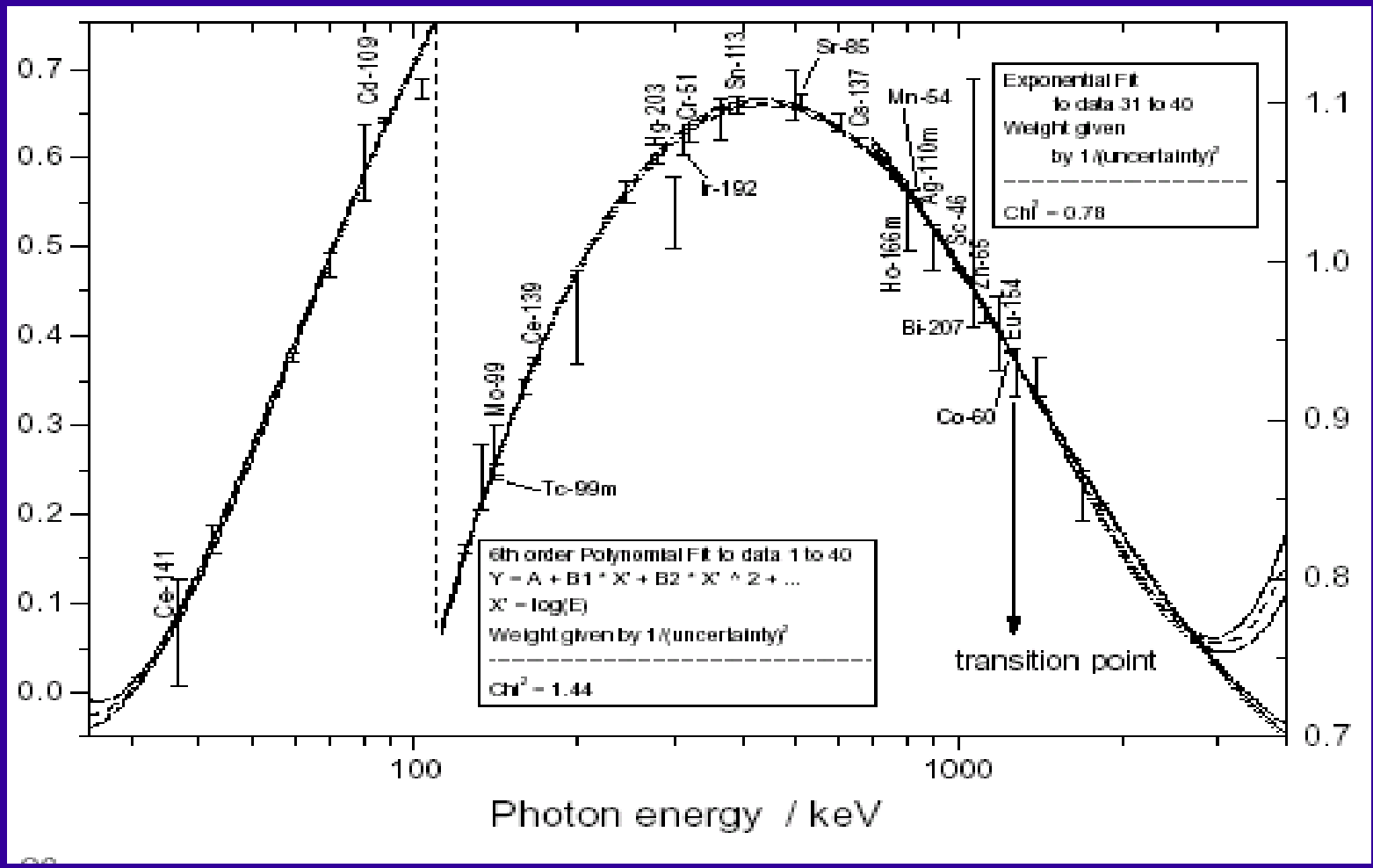
Eu-155



BIPM SIR Ionization Chamber Efficiency Curve



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