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ICRM Life Sciences Working Group

RCUF
Radionuclide Calibrator User Forum

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History of RCUF

- 1st RCUF Meeting
  - Early 2002
- Held approx. once per year
- Fifth meeting : mid 2008
  - Approx 30 participants
  - Successful dialog
- Next meeting : Planned for Mid 2009

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Remit of the RCUF

- The RCUF shall aim to facilitate both the exchange of information about UK radionuclide calibrators, measurement techniques and the efficient use of those systems by the user base. It shall represent members' interest in discussions and correspondence with expert bodies in the filed of radionuclide calibrator measurements.

- WEBSITE : www.npl.co.uk/rcuf

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RCUF Remit (continued)

- Aims to provide “two way” communication
  - Not just a series of presentations from NPL

- My personal experience
  - Allocate around 2 hours for a free discussion session

Recent Outputs of RCUF

- Working group of RCUF appointed to disseminate “best practice”
- NPL Good Practice Guide 93
  - Free download from NPL website

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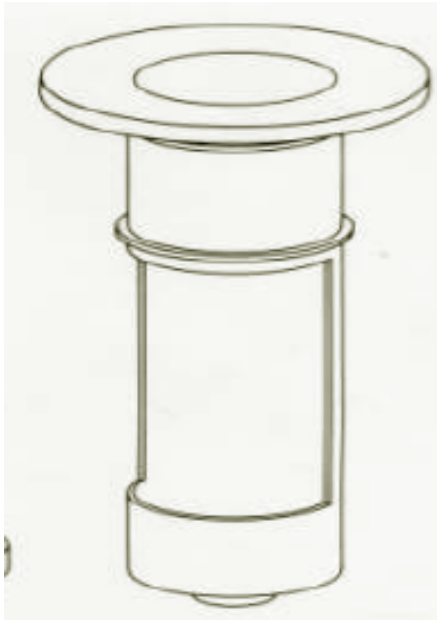
I-131 Capsules

- “I have noticed in the Fidelis that there is a 0.3% difference in the reading of an I-131 Capsule in a P6 vial depending on whether the capsule is pointing towards the opening in the Perspex dipper or is parallel to it”.



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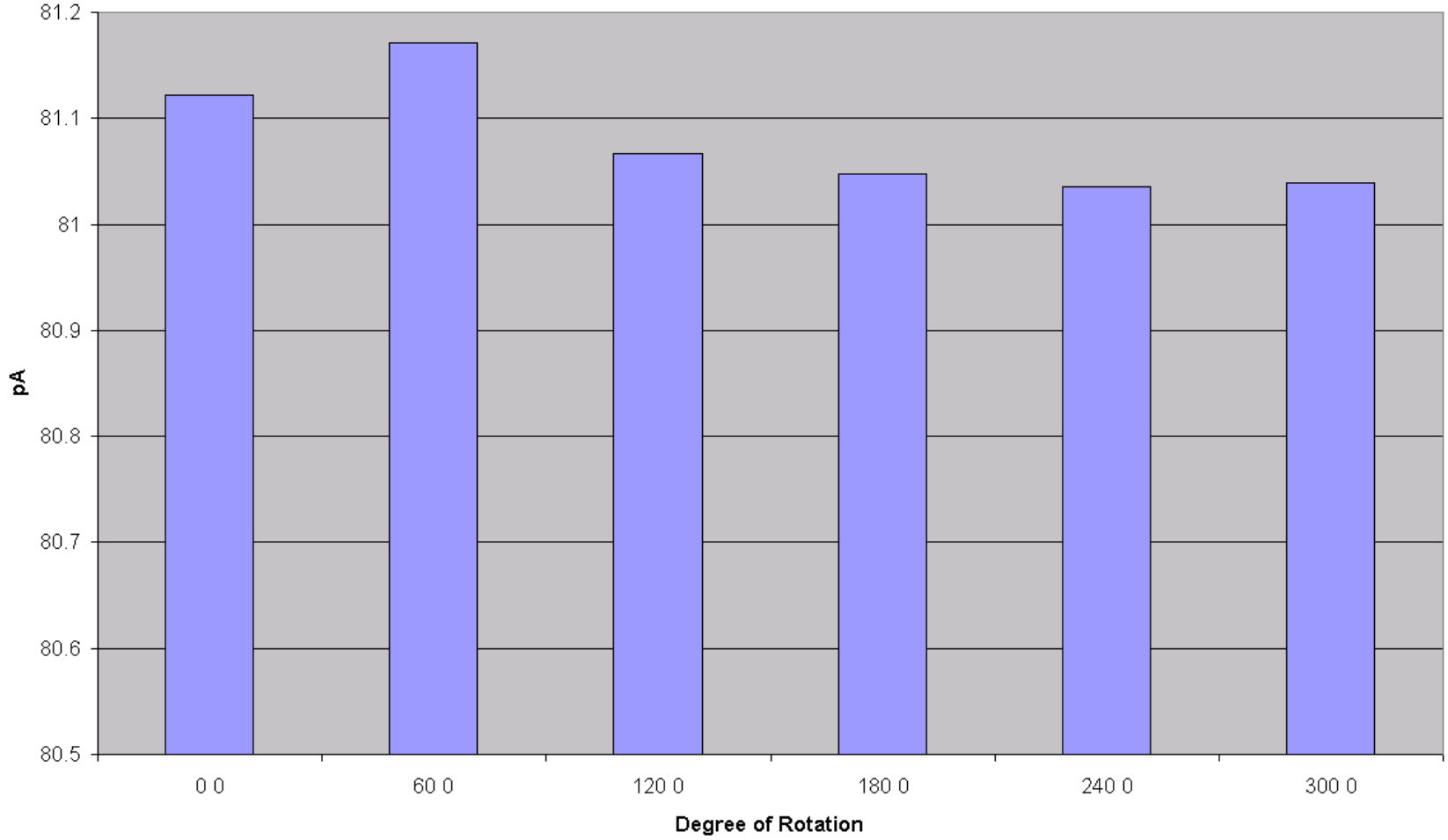
Uncertainty Budget

Table 2
Uncertainties

	^{131}I capsules	^{125}I seeds	^{137}Cs sources
Type B			
System reproducibility	±0.1%	±0.1%	±0.1%
Background	negligible	negligible	negligible
Positioning	±0.03%	±0.2%	±0.1%
Container variation	±0.04%	n.a.	n.a.
Activity/air kerma assay	±0.33%	±0.88%	±0.72%
Solution density	±0.13%	n.a.	n.a.
Gelatin interference	±0.15%	n.a.	n.a.
Saturation effects	±0.01%	negligible	±0.005%
Overall non-random for NPL reference chamber	±0.4%	±0.9%	±0.8%
Type A uncertainty	±0.3%	±0.4%	±0.4%
Overall uncertainty for NPL reference chamber	±0.5%	±1.0%	±0.9%
Between chamber variation	±0.3%	±1.8%	±0.2%
Overall uncertainty for production chambers	±0.6%	±2.1%	±0.9%

Note: Type A and B uncertainties are at the 1σ level and are combined in accordance with the ISO standard [14].

P6 Vial Rotating Vial



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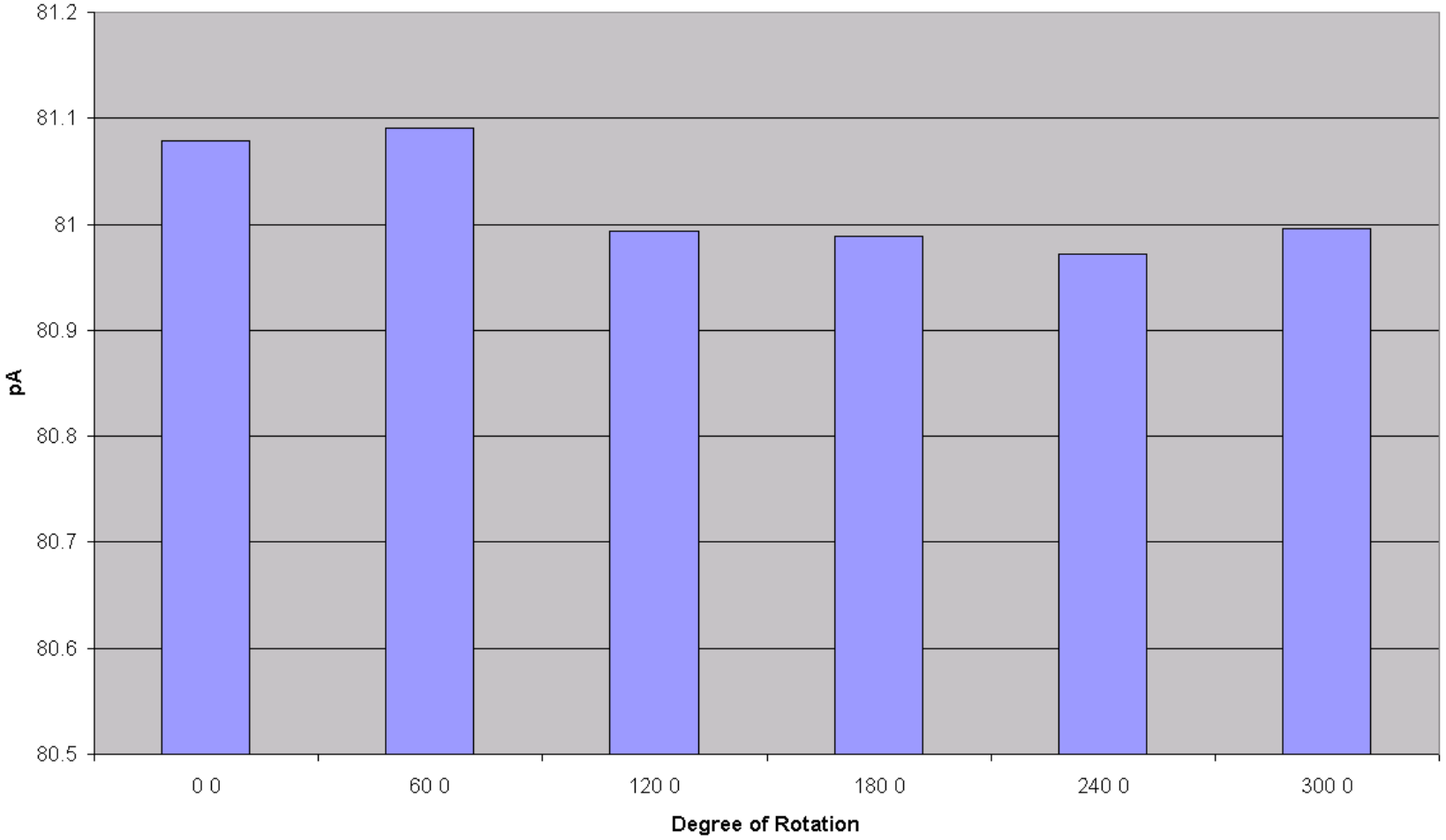
P6 Vial Rotating Holder



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P-32 Measurements

- P32_NPL25june08.ppt

- P32_mmt_JDK.ppt

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Syringes

- NPL Report CIRM 56 (September 2002)
  - D.K. Tyler and M.J. Woods
  - Calibration factors for the NPL secondary standard radionuclide calibrator for various syringes
    - Some questionable data
  - Report has been withdrawn for time being: Awaiting return of Dagmara Tyler from long term sick leave

- RCUF working group appointment
  - Develop a short “protocol” for cross-calibration for various geometries, containers etc … including syringes
    - Does this already exist elsewhere ???

^{99m}Tc Comparison Exercise

- See slides from 4th RCUF

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Future Comparison Exercises

- Y-90 comparison proposed by majority of participants at the 5th RCUF meeting at NPL in 2008

- Proposal is for exercise to start in early 2009
  - NO FUNDING agreed : must be self sustaining
  - Include manufacturers, source suppliers etc …
  - Need to determine logistics and funding

- NIST have recently held a similar exercise

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RCUF ongoing work

- Issues with P-32 measurements
  - Sue Hooper, Velindre Hospital, Wales
    - Issues with Syringe Calibration Factors
    - “Strange results”
  - Invited to NPL to investigate

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P-32 : Certificate from Supplier

Certificate of radioactive source No. DP1-1-022/30/08/0004

Preparation	**Sodium orto-phosphate $Na_2H^{32}PO_4$ for injection**
Form	solution
Code	MP-9
Batch No.	15/08
Activity on calibration date	**185 MBq** ± 10 % on day 30.07.2008 (12:00 CET)
Activity on dispatch date	273 MBq on day 22.07.2008
Radioactive concentration	92,500 MBq/cm^3
Specific activity	> 11,100 MBq/mg P
Registration No.	R-3264
Radiochemical purity	>99,0%
Radionuclidic purtity	>99,5%
Volume	2,00 cm^3
Quantity	**1**
Expiration date	13.08.2008

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Quality Control Report
Ref date : 30/7/2008

TEST	SPECIFICATION	METHOD	RESULT
Characteristics: Appearance of the solution	clear and colourless	visual inspection	Complies
Radionuclide identification	Beta-ray spectrum E_{max}=1.71 MeV	beta – spectrometry	Complies
pH	6.0 – 7.0	colorimetric	6.2
Radionuclidic purity:	≥ 99.5%	gamma-spectrometry	> 99.5 %
Radiochemical purity	≥ 97%	Paper chromatography	99.6 %
Chemical purity	Ba, Ni,Pb ≤ 5 µg/ml B, Zn, Al ≤ 10µg/ml Si, Mg, Ca ≤ 20µg/ml	ICP-OES spectrometry	Ba=0.4,Ni<0.2,Pb<0.2, B=1.7, Zn<0.1,Al<0.1, Si=5.5,Mg<0.5,Ca<0.2
Radioactive concentration	37 - 370 MBq/ml	Ionization chamber	185.0 MBq/ml
Specific activity	≥11.1 MBq/mg P	Ionization chamber / ICP-OES spectrometry	208 MBq/mg P
Sterility	Sterile	Direct inoculation	*)
Bacterial endotoxins	< 0.125 EU/ml	Gel - clot method	< 0.125 EU/ml

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Initial NPL Result
Ref Date : 30/7/2008

Measured on NPL Ionisation Chamber

- 113 MBq/cm^3 +/- 0.8%
- Result confirmed by 4π proportional counting

- CF : Manufacturers result
  - Apparent Bias : 18%
  - 92.5 MBq/cm^3 (???) +/- 10%

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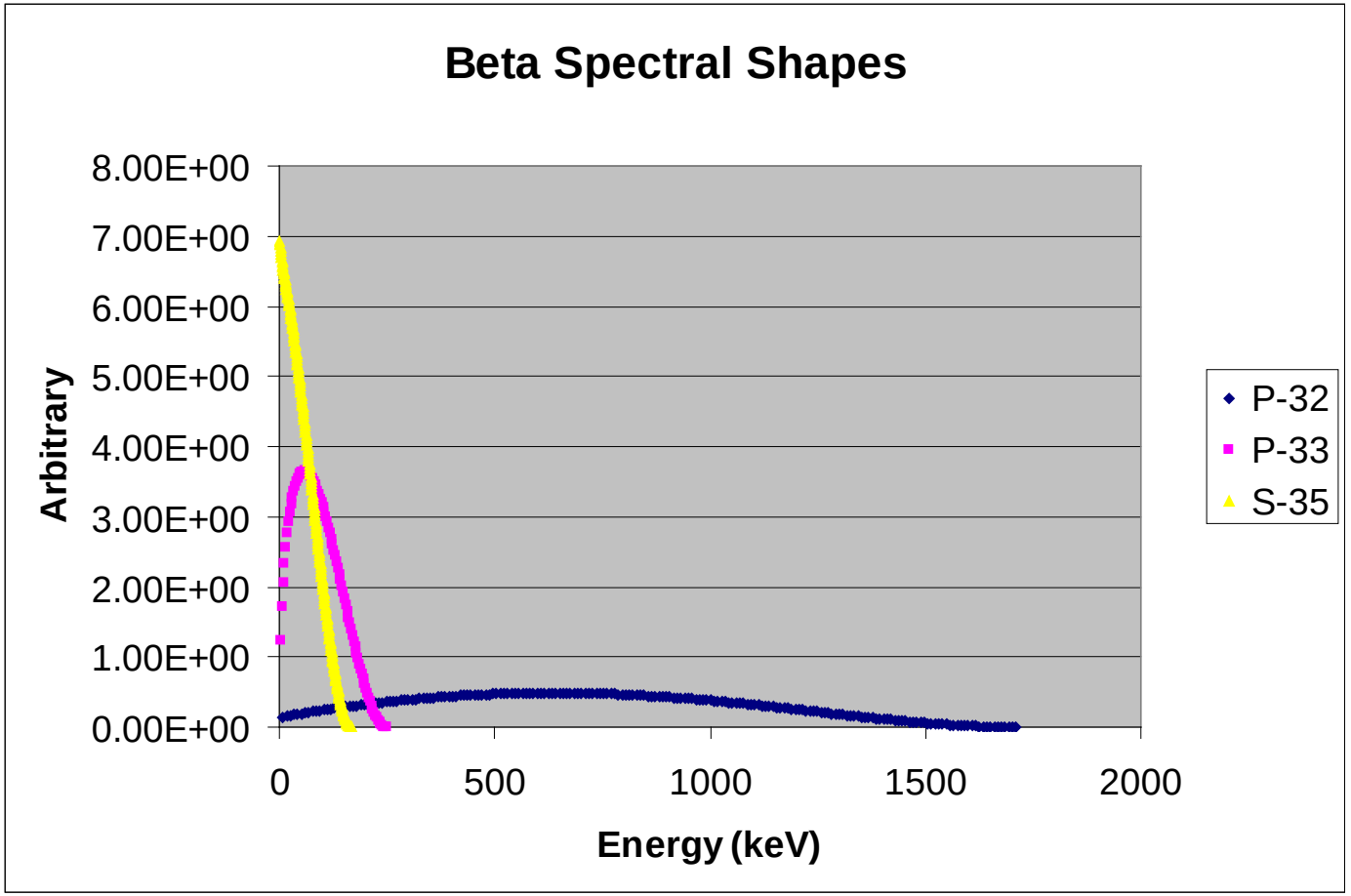
Beta Spectral Shapes



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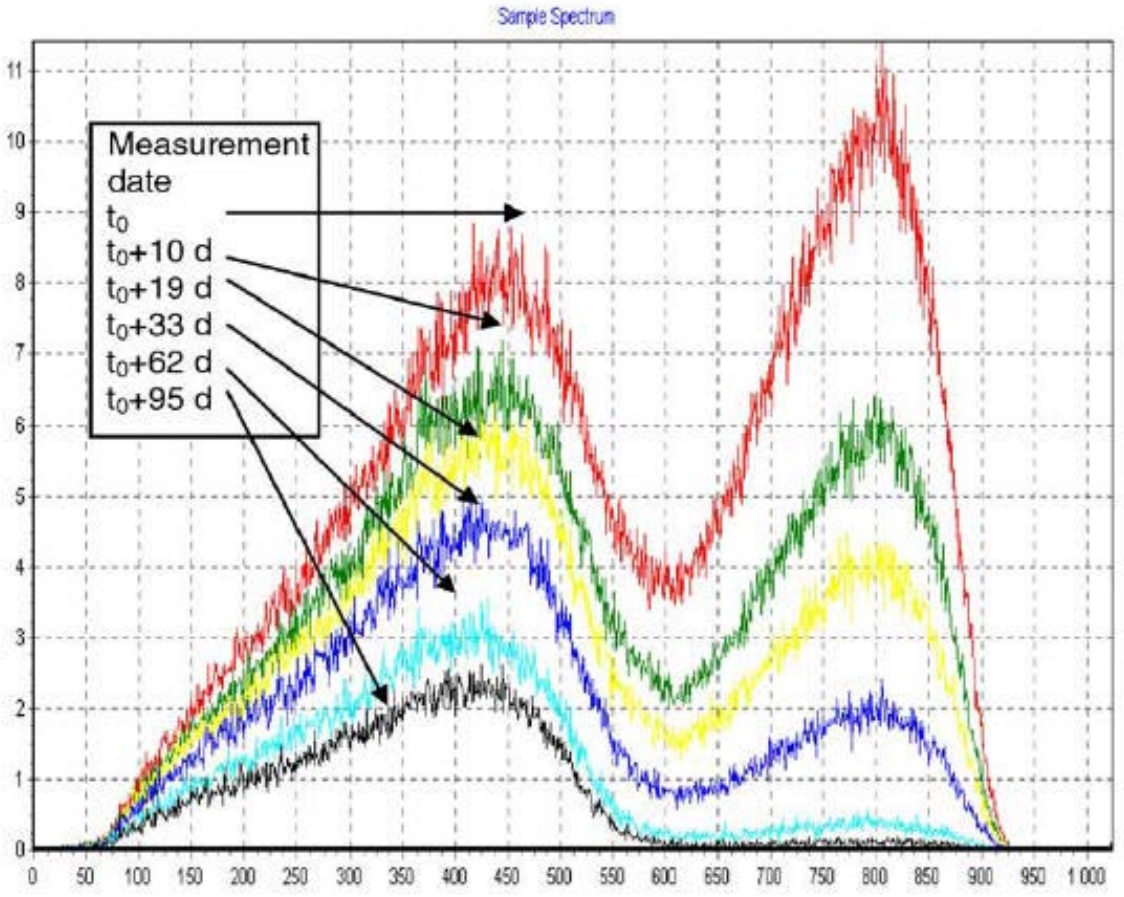
Liquid Scintillation Spectra
Jaubert and Cassette
ARI, 60, 2004, 601-606



$$N(t) = N_{P32}e^{-\lambda_{P32}t} + N_{P33}e^{-\lambda_{P33}t} + N_{S35}e^{-\lambda_{S35}t}$$

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Measurements Ongoing

- Arzu Arinc (NPL) is continuing measurements
  - Initial estimates
  - P-33/P-32 : approx 3%
  - S-35/P-32 : 0.04%

  - No final uncertainties on these ratios yet
  - Continue to measure for another month or so

Conclusions

- RCUF is a growing entity
  - Good feedback from participants
- Will continue to run into foreseeable future
- Question
  - Would other NMIs like to attend/participate ?

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