

# Minor Actinide Samples for the n\_TOF-Ph2 (neutron capture) measurements

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The two golden rules to be followed at the n\_TOF Experimental Area:

1. ISO-2919 containers
2. Mass limits for actinides inside ISO-2919 containers (source: Thomas Otto, 2007)

Element	A	t 1/2 (a)	LA (Bq) (Bq)	E_inh_eff (Sv/Bq)	A (1mSv) (Bq)	lambda (s-1)	N (Atoms)	M (mg)
Pa	231	3.27E+04		1.15E-12	8.70E+08	6.72E-13	1.29E+21	496.6
U	232	72		6.39E-13	1.56E+09	3.05E-10	5.13E+18	2.0
U	233	160000	700	2.95E-13	3.39E+09	1.37E-13	2.47E+22	9554.1
U	235	7.04E+08		2.56E-13	3.91E+09	3.12E-17	1.25E+26	48858295.4
U	238	4.47E+09		2.38E-13	4.20E+09	4.91E-18	8.55E+26	337944418.5
Am	241	432.2	200	3.44E-12	2.91E+08	5.08E-11	5.72E+18	2.3
Am	243	7380	200	3.36E-12	2.98E+08	2.98E-12	1.00E+20	40.4
Pu	239	2.41E+04		4.10E-12	2.44E+08	9.11E-13	2.68E+20	106.2
Pu	240	6.54E+03		4.10E-12	2.44E+08	3.36E-12	7.26E+19	28.9
Pu	242	3.76E+05		3.93E-12	2.54E+08	5.84E-14	4.36E+21	1750.4
Cm	245	8.50E+03		3.44E-12	2.91E+08	2.58E-12	1.12E+20	45.8

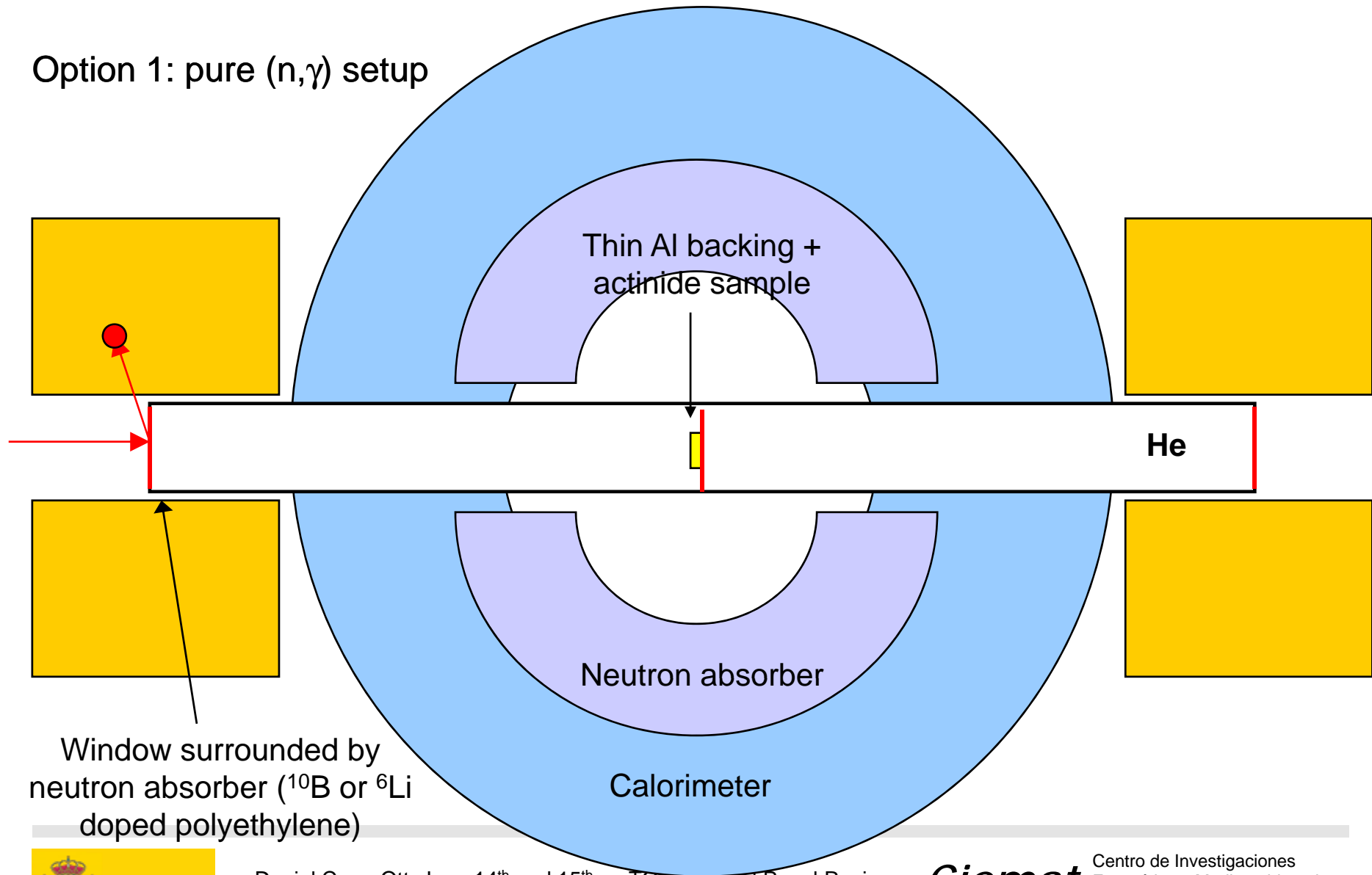
Measurements done in 2004:  $^{237}\text{Np}$ ,  $^{240}\text{Pu}$  and  $^{243}\text{Am}$  samples inside Titanium ISO-2919 certified cannings.



Very successful measurements even with NON-optimised cannings

Measurements planned for 2007 ->:  $^{231}\text{Pa}$ ,  $^{233,235}\text{U}$ ,  $^{240,242}\text{Pu}$ ,  $^{243}\text{Am}$  samples inside ISO-2919 “long” containers (10 to 50 times less background, NIMA in preparation)

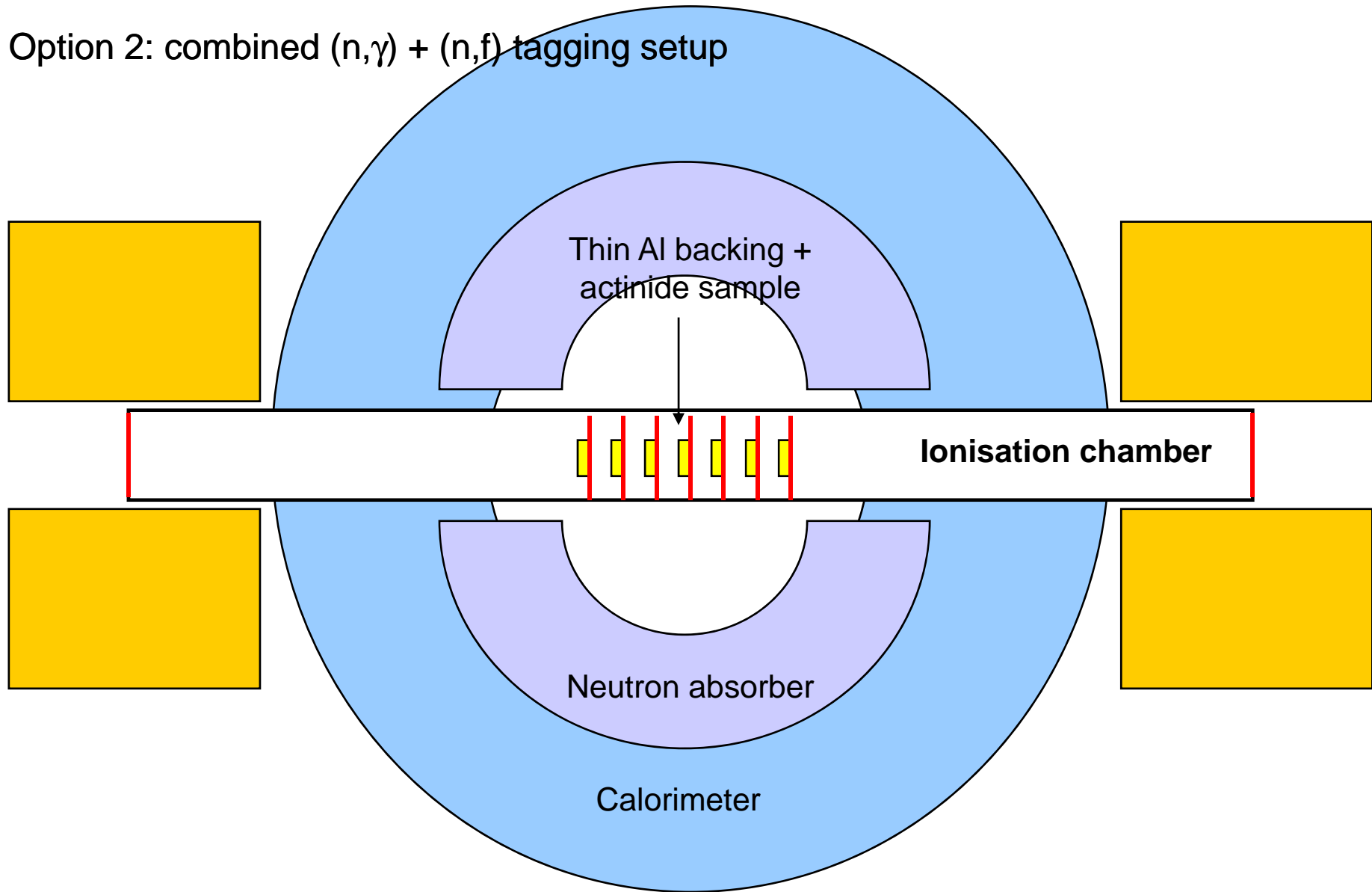
Option 1: pure (n, $\gamma$ ) setup



Window surrounded by neutron absorber ( $^{10}\text{B}$  or  $^6\text{Li}$  doped polyethylene)



## Option 2: combined (n, $\gamma$ ) + (n,f) tagging setup



## Calendar of events and actions:

**End of 2004.** 1<sup>st</sup> negotiation with the Russian Federal Center of Nuclear Physics (RFCNP - Sarov). First quotation for the samples. Postponed until n\_TOF restart.

**2005 – 2006.** Optimisation of the sample container by MC simulations: CIEMAT and ITN.

**End of 2006.** Meeting in Madrid: CIEMAT, CEA and Russian delegation lead by the Prof. Leonid Ponomarev (Scientific leader of MUCATEX). Preparation of a MoU for the preparation of MA samples for n\_TOF-Ph2

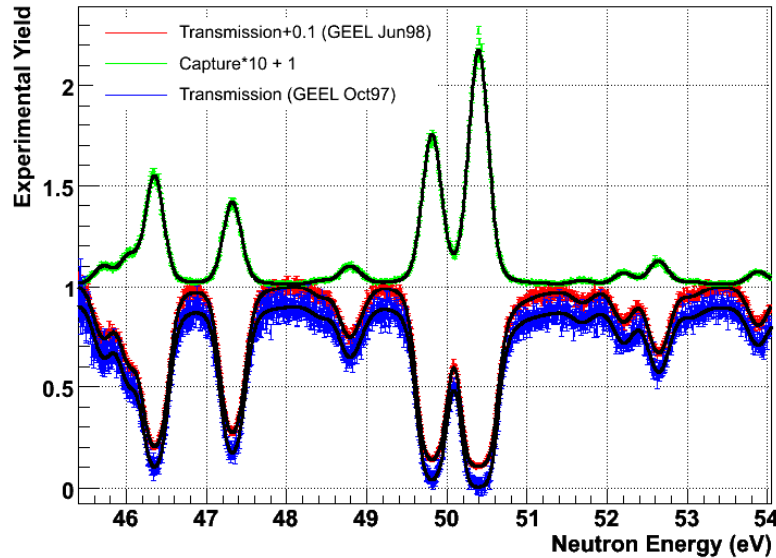
**Feb 2007** – Draft agreement between CIEMAT, CEA and the RFCNP.

**May 2007** – Meeting in Moscow between head of CIEMAT's Nuclear Fission division and RFCNP head of laboratory. Agreement finalised and waiting now for the new offer.

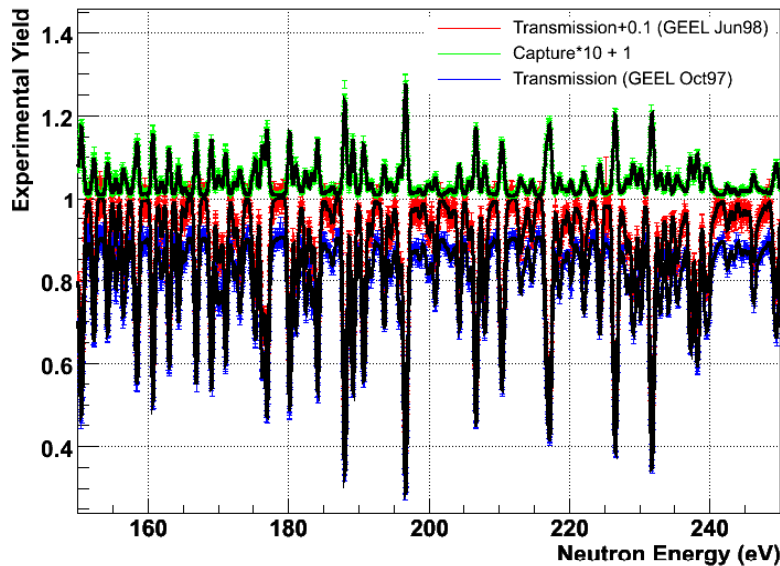
**Ready** for submitting a new proposal to INTC (+ 3 submitted already).

**Ready and anxious** for the beam.

<sup>237</sup>Np Capture (nTOF) + Transmission (GEEL) Yield



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In Europe, those samples can ONLY be measured at n\_TOF: facility + detectors + CERN infrastructure + EXTREMELY well characterised (years of work).

