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Request for  $\bar{\nu}$  Measurements

A Discussion of the Requests in EANDC 55"U"

by

H Condé, Research Institute of National Defence, Stockholm 80

and

N Starfelt, AB Atomenergi, Studsvik, Nyköping

Introduction

EANDC 55"U" contains 38 requests for  $\bar{\nu}$  measurements. In nine of these requests the required accuracy is 1 % or better. These high accuracy requests present the most difficult problems in the present attempt to evaluate the situation. Westcott et al (1) have made a very careful evaluation of the 2200 m/s constants for four fissile nuclides. They also include  $\bar{\nu}$  for spontaneous fission of  $\text{Cf}^{252}$ . The accuracies in their recommended  $\bar{\nu}$ -values are 0.4 %, 0.3 %, 0.5 %, 0.8 % and 0.4 % for  $\text{U}^{233}$ ,  $\text{U}^{235}$ ,  $\text{Pu}^{239}$ ,  $\text{Pu}^{241}$  and  $\text{Cf}^{252}$ , respectively. Absolute measurements of  $\bar{\nu}$  of  $\text{Cf}^{252}$  have given values which differ by up to 2 % (1).

In our discussion of the requests for  $\bar{\nu}$  measurements we have, in some cases, given alternative recommendations based on one of the following assumptions

- A.  $\bar{\nu}$  given by Westcott et al.
- B. No  $\bar{\nu}$  is known with better accuracy than 1 %.

Measurements at a certain energy on different isotopes of the same element have always given  $\bar{\nu}$  results which differ by less than 5 %. Requests for measurements with accuracy worse than 10 % for the less common isotopes can probably be fulfilled by the use of the experimental results for another isotope of the same element. A request which is considered to be fulfilled in this meaning is denoted by C.

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No.	Isotope	Energy range	Accuracy	Comment
582	U <sup>233</sup>	Thermal region	1/2%	A: fulfilled (1) B: more work required
583	U <sup>233</sup>	10 eV - 1 keV	3%, at worst 5% in n	fulfilled (2)(3)(4)
584	U <sup>233</sup>	10 eV to 1 keV	3% in n	fulfilled (2)(3)(4)
585, 86	U <sup>233</sup>	1 - 30 keV	2% in n	fulfilled (2)(3)(4)
587	U <sup>233</sup>	1 keV to 10 MeV	1%	more work required
588	U <sup>233</sup>	30 keV to 10MeV	0.5% in n	more work required
589	U <sup>233</sup>	40 keV to 5 MeV	1%	more work required
590	U <sup>233</sup>	2 - 7 MeV	2% in n	more work required above 4 MeV
591	U <sup>233</sup>	7 - 14 MeV		cannot be discussed because no accuracy stated
611	U <sup>234</sup>	Threshold to 10 MeV	15%	C: fulfilled experiments planned by Condé et al
612	U <sup>234</sup>	100 keV	10%	C: fulfilled experiments planned by Condé et al
613	U <sup>234</sup>	500keV - 14 MeV		cannot be discussed because no accuracy stated
657	U <sup>235</sup>	Thermal region	1/2%	A: fulfilled (1) B: more work required
680	U <sup>236</sup>	Threshold to 10 MeV	20%	C: fulfilled experiments planned by Condé et al
681	U <sup>236</sup>	500keV - 14 MeV		cannot be discussed because no accuracy stated
690	U <sup>237</sup>	500keV - 14 MeV		cannot be discussed because no accuracy stated
719	U <sup>238</sup>	Threshold - 5 MeV	0.5%	more work required (3)(5)
720	U <sup>238</sup>	500keV - 14 MeV		cannot be discussed because no accuracy stated

No.	Isotope	Energy range	Accuracy	Comment
721	U <sup>238</sup>	7 to 15 MeV	2%	measurements only at 7.5 and 14 MeV (5) but interpolation probably fulfils requirement
725	U <sup>239</sup>	500keV -14 MeV		cannot be discussed because no accuracy stated
731	Pu <sup>238</sup>	100keV- 10 MeV	5% or at worst 10%	C: fulfilled, but one point should be measured
732	Pu <sup>238</sup>	500keV- 14 MeV		cannot be discussed because no accuracy stated
780	Pu <sup>239</sup>	Thermal region	1/2%	A: fulfilled (1) B: more work required
781	Pu <sup>239</sup>	40 keV - 4 MeV	1/2%	more work required (2)(3)
782	Pu <sup>239</sup>	5 - 14 MeV		cannot be discussed because no accuracy stated
783	Pu <sup>239</sup>	5MeV to 15MeV	10%	fulfilled by interpolation (3)
784	Pu <sup>239</sup>	5MeV to 15MeV	2%	more work required experiments planned by Condé et al
822	Pu <sup>240</sup>	Threshold - 5 MeV	2%	more work required, difficult because of spontaneous fission
823	Pu <sup>240</sup>	Thermal - 14 MeV	3%	more work required, difficult because of spontaneous fission
824	Pu <sup>240</sup>	1 keV to 1 MeV	10%	fulfilled, C and (6)
825, 26	Pu <sup>240</sup>	100 keV to 15 MeV	5%	more work required (6)
856, 57	Pu <sup>241</sup>	1 keV to 14 MeV	5%	fulfilled (7)
858	Pu <sup>241</sup>	40 keV- 4 MeV	5%	fulfilled (7)
872	Pu <sup>242</sup>	500keV - 14MeV		cannot be discussed because no accuracy stated
875	Cf	Spontaneous fission	1/4%	much more work required.

### Conclusions

Accepting assumption B above 15 requests are still left without appropriate actions. Out of these 588 for  $U^{233}$ , 719 for  $U^{238}$ , 781 for  $Pu^{239}$ , 822 and 823 for  $Pu^{240}$  and 875 for  $Cf^{252}$  would require a large experimental effort. The need of these measurements and the possibility of initiating experiments should be thoroughly studied. These requests should be transmitted through IAEA to Australia and USSR.

### References

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