INDSWG-53
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INFORMATION ON STANDARD NEUTRON SOURCES AND STANDARDS ACTIVITIES received by IAEA up to 19 October 1964.

Introduction

Relatively few answers have been received to the letter and questionnaire we sent out requesting information on standards activities and standard neutron sources. This is a summary of the answers, full details of which are on file. Because of the low number of answers, which we feel makes the implementation very incomplete, we have taken no action other than to draw up this summary.

I. Standard Neutron Sources

1. Euratom, Bureau Central de Mesures Nucléaires, Dr. J. Spaepen
   1.1 Ra-α-Be source, absolutely calibrated by supplier $6.46 \cdot 10^6$ n/s ± 5 %. Gold foil calibration proceeding, results with 3 % accuracy expected before the end of 1964. Same source, relatively to Canadian NRC Ra-α-Be N-2601 (quoted as $3.21 \cdot 10^6$ n/s ± 1.5 %) with result $6.25 \cdot 10^6$ n/s ± 1.5 %.

2. Germany, Karlsruhe, from Dr. K. Beckurts
   2.1 Ra-α-Be source, c/o Dr. W. Eyrich, Karlsruhe. Absolutely, gold foils, $7.60 \pm 0.12 \cdot 10^6$ n/s
   2.2 Am-α-Be source, c/o Dr. D. Nachtigall, Jülich. Relatively to a Ra-α-Be source of Physikalisch-Technische Bundesanstalt Braunschweig (quoted as $(1.99 \pm 0.04) \cdot 10^6$ n/s) with results 2.10 and $2.07 \cdot 10^7$ n/s, both ± 4 % Same Am-α-Be source relative calibration ("calibrated long counter") $2.11 \cdot 10^7$ n/s ± 5 %

2.3 Ra-α-Be source BR 5482, c/o Dr. W. Schneider, Jülich
Absolutely $2.95 \cdot 10^5$ n/s $\pm$ 2.5 %

2.4 Ra-α-Be source BR 6985, c/o Dr. W. Schneider, Jülich
Absolutely $7.60 \cdot 10^6$ n/s $\pm$ 2.5 %
Same source absolutely at PTB Braunschweig
$7.80_7 \cdot 10^6$ n/s $\pm$ 3 %

2.5 Ra-α-Be source PTR 10230, BR 2063,
c/o Dr. J. Bortfeldt, Physikalisch-Technische
Bundesanstalt, Braunschweig.
Absolutely $1.94_9 \cdot 10^6$ n/s $\pm$ 2 %

2.6 Source in 2.5 compared to
Canadian NRC Ra-α-Be source N-2001,
quoted as $(3.22 \pm 0.05) \cdot 10^6$ n/s
Four methods, weighted mean $Q_{PTB}/Q_{NRC} = 0.6036 \pm 0.3$ %

2.7 Source in 2.5 compared to Ra-α-Be source 128967,
UM II of Union Miniere du Haut-Katanga, Bruxelles,
quoted as $4.72_9 \cdot 10^6$ n/s
Four methods, weighted mean $Q_{PTB}/Q_{UM\ II} = 0.4130 \pm 0.3$ %

2.8 Source in 2.5 compared to Ra-α-Be source
of AB Atomenergi, Stockholm,
quoted as $2.65 \cdot 10^6 \pm 2$ % (October 1954) and
$2.68_7 \cdot 10^6 \pm 2$ % (January 1959)
Four methods, weighted mean $Q_{PTB}/Q_{ABA} = 0.7245 \pm 0.3$ %

3. Spain, from Dr. G. Velardo

3.1 Ra-α-Be source, calibrated absolutely with gold foils, result $6.91 \pm 0.20 \cdot 10^6$ n/s

3.2 Ra-α-Be c/o Prof. Sanchez del Rio relatively to 3.1 with manganese foils, result $(6.8 \pm 0.5) \cdot 10^5$ n/s

4. USA, Los Alamos, from Dr. Taschek

4.1 Ra-α-Be source c/o Dr. Elisabeth R. Graves Absolutely, neutron absorption rate in boric acid solution $5.92 \cdot 10^6$ n/s $\pm$ 5 %

5. USA, National Bureau of Standards, from Dr. H.W. Koch

5.1 Ra-α-Be source NBS-1 c/o V. Spiegel, Jr.

Absolutely by

(a) $Mn\ SO_4$ in D_2O bath

(b) $Mn\ SO_4$ in H_2O bath

(c) Indium foils in H_2O bath

Results

(a) $1.25_2 \cdot 10^6 \pm 1.1$ %

(b) $1.25_6 \cdot 10^6 \pm 2$ %

(c) $1.27_2 \cdot 10^6 \pm 3$ %

Weighted average $1.25_7 \cdot 10^6$ n/s $\pm$ 1 %

5.2 Ra-α-Be source NBS-II c/o V. Spiegel, Jr.

Relatively to 5.1 (NBS-I);

ratio $0.939_3 \pm 0.001_7$ which gives * $1.18_1 \cdot 10^6$ n/s $\pm$ 1.1 %

5.3 Oxford (Rd Th - D_2O) compared to NBS-II by Richmond, Harwell

Result 0.996 k for NBS-II,

$6.18 \cdot 10^4 \pm 1.6$ % quoted for comparison source.

5.4 Basel (B 2) Ra-α-Be compared as 5.3.

Result 0.973 k for NBS-II,

$1.515 \cdot 10^6 \pm 2.8$ % quoted for comparison source.

5.5 Harwell Ra-α-Be compared as 5.3

Result 1.060 k for NBS-II,

$9.66 \cdot 10^6 \pm 4.5$ % quoted for comparison source.

* this number is used in other comparisons (we write $1.18_1 \cdot 10^6$ n/s = k below)

5.6 Stockholm Ra-α-Be compared as 5.3
Result 1.002 k for NBS-II,
$2.65 \cdot 10^6 \pm 2$ % quoted for comparison source.
Stockholm Ra-α-Be compared to NBS-II by K.E. Larsson at Atomenergi, Sweden.
Result 0.986 k $\pm$ 3 % for NBS-II,
$2.65 \cdot 10^6 \pm 2$ % quoted for comparison source.

5.7 Canadian NRC N-200-1 Ra-α-Be source compared to NBS-II by K.W. Geiger.
Result 0.995 k $\pm$ 1 % for NBS-II,
$3.208 \pm 0.05 \cdot 10^6$ quoted for comparison source.

5.8 UK National Physics Laboratory
Ra-γ- Be NPL 2C compared to NBS-II.
Result 0.988 k $\pm$ 2 % for NBS-II,
$1.664 \cdot 10^5 \pm 2$ % quoted for comparison source.

6. India, Trombay, from Dr. G. Venkataraman.

6.1 Ra-α-Be, T.I.N. 250, absolutely by gold foils
$(3.16 \pm 0.09) \cdot 10^6$ n/s

6.2 Ra-α-Be AEE/Trombay, absolutely
Mn SO_4 in H_2O, $(3.91_6 \pm 0.13) \cdot 10^6$ n/s
Same source by comparison to Canadian
NRC N-200-1 $(3.99_2 \pm 0.09) \cdot 10^6$ n/s

6.3 Canadian NRC-200-1 Ra-α-Be absolutely
calibrated at Trombay $(3.20_8 \pm 0.08) \cdot 10^6$ n/s

7. Japan, from Dr. Momota

7.1 Ra-α-Be source, c/o O. Yura
Absolutely $(1.47_2 \pm 0.04_4) \cdot 10^7$ n/s
Same source compared to Canadian NRC N-2001,
quoted as $(3.244 \pm 0.05) \cdot 10^6$ n/s.
Result $(1.46_0 \pm 0.02_4) \cdot 10^7$ n/s

II. Standards Activities

Information on standards activities has so far (19 October) been received only from Dr. Koch, National Bureau of Standards, USA. He gives a quarter-page to half-page statement on the standards activities in each of the following areas:

1. Neutron Physics
2. Radioactivity
3. Gamma Ray Sources
4. X-ray and Gamma Ray Instruments
5. Uranium Isotopic Mass Standards
6. Boron Isotopic Mass Standards
7. Photonuclear Data Compilation.

Vienna, 20 October 1964