The Medical Research Center

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BROOKHAVEN NATIONAL LABORATORY

MEMORANDUM

DATE: March 30, 1973

REPOSITORY Records Holding Area 494

COLLECTION Cronkite's Files

BOX No. 1

FOLDER COHN-Whole Body Studies

TO: S. H. Cohn

FROM: R. G. Fairchild

SUBJECT: DOSE FROM ^{14}N REACTION

Minimum usable thermal neutron flux density = 4.54×10^4 n/cm^2-sec,* for 5 min (300 sec) → 1.36×10^7 n/cm^2 absorbed dose from $^{14}N(n,p)^{14}C$ reaction** = $D = 1.602 \times 10^{-8} \times EFN\sigma\Phi = 0.681 \times 10^{-9}\ F\ \Phi$ rads where F = fraction by weight of N in tissue.

If F = 0.04

$D = .027 \times 10^{-9} = 2.7 \times 10^{-11} \times 1.36 \times 10^7$

$= 3.67 \times 10^{-4}$ rads

∴ Dose from $^{14}N(n,p)^{14}C$ reaction $\cong 4 \times 10^{-4}$ rads during WBNAA

* Cohn et al, 1970

** Fairchild et al, 1966

RGF:mas

P.S. The fast neutron dose to the patient is .025 rad/exposure site.

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From ICRU #13 1969

2. Energy Spectra

a. Neutron Sources

Radioactive Neutron Sources. The neutron spectra from radioactive neutron sources were treated in considerable detail in NCRP (1960) and ICRU (1964). A review paper on this subject has also been written by Hanson (1960).

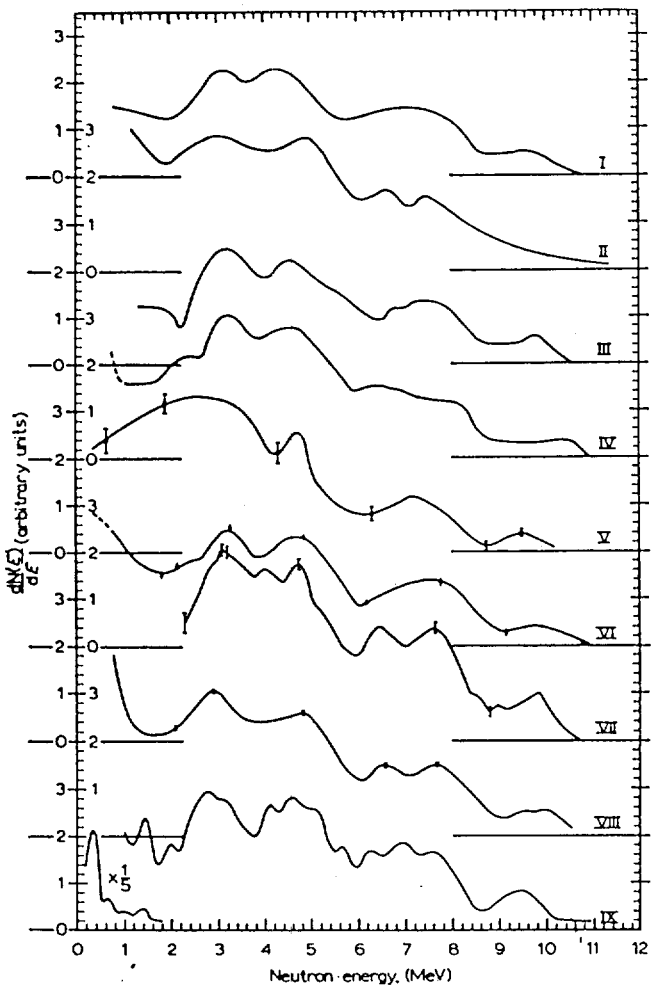

Fig. III.3. Energy distribution of Pu-Be neutrons, according to different authors.

Curve	Author	Grams of Pu in Pu-Be	Method
I	Stewart (1955)	13	emulsions
II	Huber et al. (1962)	80	time of flight
III	Broek and Anderson (1960)	13	stilbene crystal
IV	Akagi and Lehmann (1963)	80	emulsions
V	Tochilin (1963)	2	emulsions
VI	Anderson and Bond (1963)	80	emulsions
VII	Rubbino et al. (1966)	16	proton-recoil spectrometer (silicon detector)
VIII	Gredel and Säbel (1967)	45	stilbene crystal with pulse-shape discrimination
IX	Goryachev et al. (1967)	?	stilbene crystal with pulse-shape discrimination

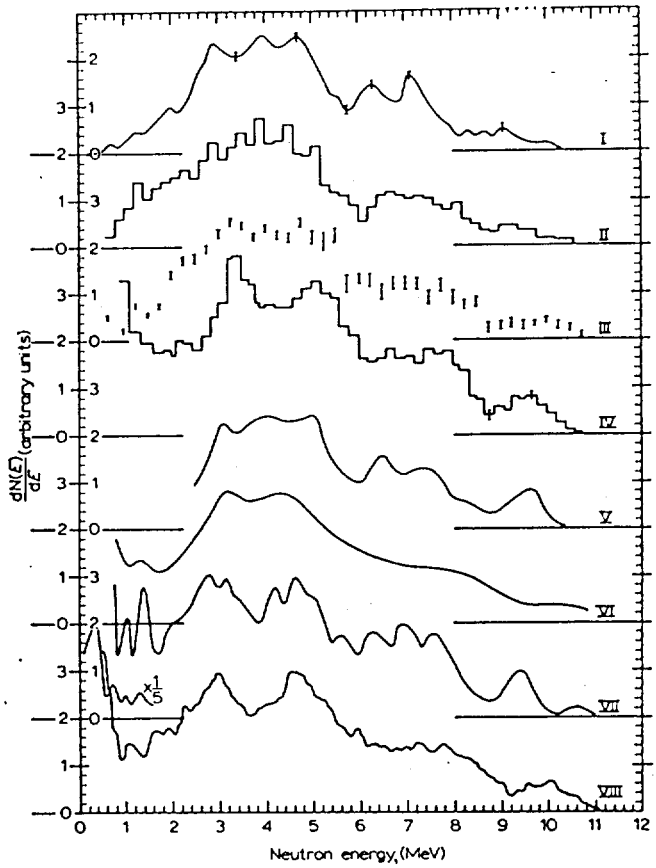

Fig. III.4. Energy distribution of Po-Be neutrons according to different authors.

Curve	Author	Method
I	Medveczky (1961)	emulsions
II	Notarrigo et al. (1962)	emulsions
III	Brunfelter et al. (1963)	stilbene crystal with pulse-shape discrimination
IV	Haag and Fuchs (1963)	stilbene crystal with pulse-shape discrimination
V	Potenza et al. (1963)	proton-recoil spectrometer (silicon detector)
VI	Verbinski et al. (1967)	proton - recoil spectrometer with liquid scintillator and pulse-shape discrimination
VII	Goryachev et al. (1967)	stilbene crystal with pulse-shape discrimination
VIII	Bakov et al. (1967)	n-γ coincidences with pulse-shape discrimination

Since the publication of ICRU (1964) several measurements of neutron spectra from Be(α,n) sources have been made. The new experiments on Po-Be sources (Brunfelter et al., 1963; Notarrigo et al., 1962; Sadeh et al., 1964; Haag and Fuchs, 1963; Venkatapathi and Jnanananda, 1964) are in reasonable agreement with the older results of Whitmore and Baker (1950) and Medveczky (1961) and also with spectra calculated by Notarrigo et al. (1962). New measurements of the

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