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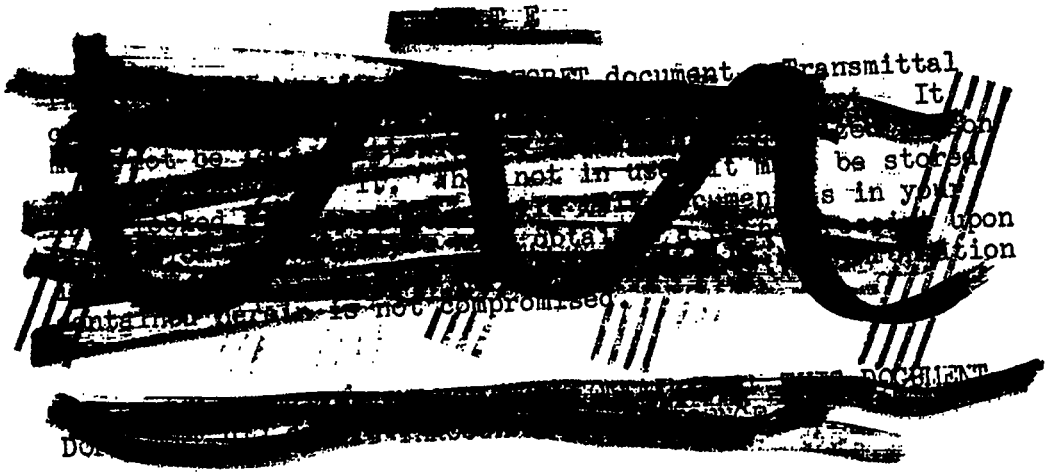

Physics - Fission

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September 16, 1943. LA MS- 8

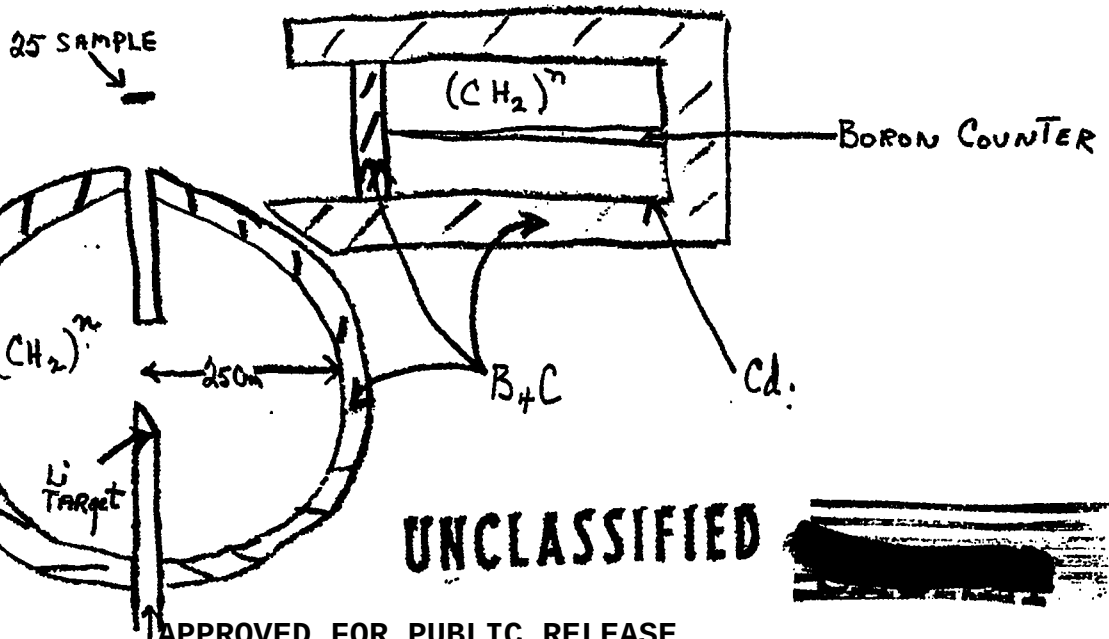
This document contains 3 pages

ABSOLUTE MEASUREMENT OF γ_{25} WITH LONG COUNTER

Summary of Meeting of R. Feynman, J. McKibben and T. Snyder.
Report by T. Snyder.

It has been suggested that the value of γ_{25} be determined using the "long boron counter" of W. This counter seems to have an efficiency for counting fast neutrons which is independent of their energy. The method of determining γ is as follows: slow neutrons fall on a sample of 25. The number of fission neutrons produced is measured with the long counter which has been calibrated for absolute efficiency against a c.p. counter. The number of fissions is determined by replacing the 25 sample by a fission chamber containing a thin sample of the same shape and position as the thick one. The counter should be made of aluminum. The number of fission neutrons per unit beam is related to the number of fissions per ditto by a suitable beam monitor.

The details of the arrangement are roughly as follows:



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To simplify shielding problems, primary Li neutrons of 100 kv are used. The target is surrounded with a 25 cm sphere of paraffin for slowing down the neutrons and for shielding. This sphere is covered by a cm of B_4C for additional shielding against the slower neutrons. A collimated beam of neutrons emerge from a 4 x 4 cm hole in the paraffin and fall on a 1 gr sample of 6 to 1 separated 25. This sample is in the form of a foil thin enough to avoid self absopption. The long boron counter is placed at right angles to the neutron beam and as close as the large amounts of shielding and the collimation requirements of the counter allow. This is roughly 30 cm from the 25 sample. In this arrangement, an adequate counting rate (>1 per sec) was estimated assuming a primary source strength of 10^9 neutrons/sec.

The problem of background will be the most serious in performing this measurement.

a) The cosmic ray background is $\sim 1/6$ count/sec.

b) Rough estimates show that the shielding of the source given in the figure make the background due to neutrons from the paraffin sphere a small factor.

c) If the counter were not shielded by additional boron, it is estimated that neutrons from the hole in the sphere, back scattered from the walls of the laboratory, would give a counting rate of ~ 2/sec.

d) The effect of scattering the collimated beam directly into the counter may be minimized by making the hole in the paraffin sufficiently shallow that the emerging neutrons are rather slow and by covering the face of the counter with a thin slab of B_4C.

e) The entire counter must be surrounded by cadmium to eliminate the effect of thermals.

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The following program is suggested in connection with this experiment:

1. Carefully check the linearity of the sensitivity versus energy curve of the long neutron counter. This is important, since the whole idea of the experiment is to use a counter with a linear response. If this is OK,

2. Make an absolute calibration of the counter efficiency for neutron detection.

3. Make a set up similar to that planned and find if the background can be made sufficiently small.

It was felt that this experiment would not be easy to perform in Building X because of the geometry requirements of the long counter which make the shielding problem a more difficult one. However such a decision could only be made by an experiment to measure the background obtained. The arrangement at X would be to cover the back of the graphite column with B_4C (large quantities required) except for a small hole from which would emerge the thermal neutron beam.

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