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On the Efficiency of the γ-Ray Counter.

By Hideki Yukawa and Shoichi Sakata.

Abstract.

The efficiency, i. e. the probability of the electric discharge per one quantum, of the γ-ray counter with thick wall was computed by making various simplifying assumptions for several energies between 0·2 and 5 MEV in the case of Al and between 1 and 10 MEV in the case of Pb. The efficiency of the thin-walled counter was also discussed.

1. Introduction

In order to infer the absolute intensity of the γ-ray from the measurement by means of a counter, it is always necessary to have a reliable knowledge of the efficiency of the counter. Whereas it can not easily be determined experimentally, the theoretical evaluation of it is possible at least in principle, since, under favourable conditions, it is approximately equal to the probability that, when a γ-ray quantum falls on the counter, a secondary electron or a pair of a positron and a negatron is produced in the wall and is emitted into the inner space.

We can not expect, however, to obtain a result, which is valid at once for wide range, because the above probability depends on the material, the shape and the thickness of the wall as well as the energy of the γ-ray quantum in a complicated manner. Further, the effect of multiple scattering of the secondary electron in the wall prevents us from the rigorous calculation for the thick counter. Hence, approximate numerical computations were performed for several energies in the cases of Al and Pb on various simplifying assumptions[1].

On the contrary, an approximate expression of the efficiency can be deduced at once from elementary considerations for the counter

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[1] A semi-empirical formula of the efficiency of the brass counter was obtained by v. Droste: *Z. Phys.*, 100 (1936), 529.