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DEMONSTRATION VARIANT OF BOTHE'S EXPERIMENT

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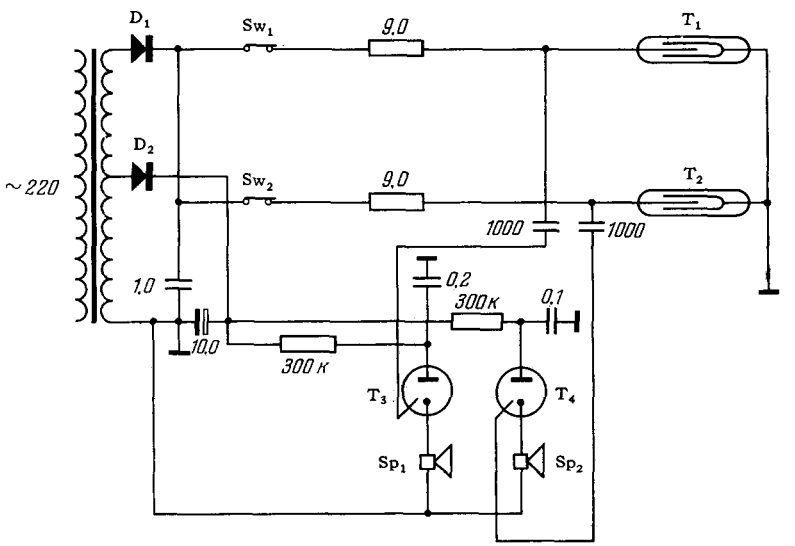
Usp. Fiz. Nauk 92, 350–351 (June, 1967)

IN the teaching of physics, there is an acute need for demonstration experiments explaining the main laws of atomic physics. The number of such experiments is highly limited, so that further efforts should be made to develop new demonstration experiments.

The foregoing is fully applicable to experiments demonstrating the quantum nature of light. The quantum nature of light is manifest most clearly and most directly in Bothe's classical experiment. We propose below a simple and logically irrefutable demonstration variant of Bothe's experiments, which can be easily and simply realized. Inasmuch as the students are already familiar with the unified nature of the electromagnetic spectrum, it is possible to replace the x-rays in Bothe's experiment by gamma radiation (either from secondary cosmic rays or from an artificial gamma emitter).

We arrange in one line the tubes of two gamma Geiger counters (for example, STS-1) fed from different current sources (so as to leave no doubts about autonomy of the two counters). A diagram of the instrument is shown in the figure. The autonomy of both counters must be demonstrated by connecting each of them separately. If the gamma radiation from a source located nearby or somewhere in the atmosphere (in the case of secondary cosmic rays) were to propagate in the form of waves, then the wave front should reach both counters simultaneously, that is, both counters should operate in synchronism. In fact, however, the counters always operate without coordi-



nation (one or the other), as can be readily heard or seen.

The proposed variant of Bothe's experiment demonstrates simply and convincingly that radiation produced upon interaction with matter becomes manifest in the form of a flux of particles (photons).