

Megavolt Flash X-Ray Equipment

THE EQUIPMENT consists of a Marx generator of unusually low inductance in combination with tubes of the lowest obtainable impedance.

The generator is built up from 0.01- μ f capacitors of resonant frequency > 4 Mc/sec. These are constructed from 0.15- μ f sections which are series connected in such a way that the output terminals are lengths of strip transmission line. The interconnections between the 0.01- μ f capacitors are such that the spark gaps and the output leads form a further line whose impedance is comparable with the appropriate multiple of the impedance of the individual units.

The generator contains 10 stages to give 1 megavolt; two generators can be connected in series to give 2 Mv. The latter arrangement has a resonant frequency of > 2 Mc/sec.

Presented in summary form on October 18, 1960, at the Fifth International Congress on High-Speed Photography in Washington, D.C., by E. W. Walker, Atomic Weapons Research Establishment, Aldermaston, Berkshire, England.

The tubes have been of two types. The first is based on a Russian design, but with some modifications. This type of tube has proved difficult to manufacture satisfactorily, but good examples are reliable from one flash to the next, and have a reasonable life. The second type uses a heated cathode, run at the same temperature used in the Fexitron tube. The cathode is very much more rugged, and the insulation is appropriate to the higher working potential. These tubes give a larger x-ray dose than the cold cathode tube, and are quite reproducible from flash to flash; at the moment, however, tube life is very short. A number of modifications to the electrode system are under consideration.

The mechanism of operation of the present tubes is not fully understood; there is, however, considerable evidence that secondary mechanisms are important.

The equipment gives flashes of effective duration of 0.2 μ sec and of sufficient intensity (about 60 mR at 1 meter) to enable a large range of explosive systems to be studied. Examples were shown of shock waves in metals, and of the distortion of metal plates by explosives charges.