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A Four-Gun Oscilloscope for Use in Nuclear Research

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UNIVERSITY OF CALIFORNIA

Radiation Laboratory
Berkeley, California

Contract No. W-7405-eng-48

**A FOUR-GUN OSCILLOSCOPE FOR USE
IN NUCLEAR RESEARCH**

Horace G. Jackson

February 6, 1958

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A unit has been built around a four-gun cathode-ray tube which is quickly mounted, as a top deck, to a Tektronix Type 517 oscilloscope, as shown in Fig. 1.

The cathode-ray tube is a Dumont type K1479 P11M, which is a flat-face tube of 5-inch diameter with linear post accelerator and electrostatic deflection and focus, having four independently deflected and focused beams. The tube has electrical characteristics very similar to the 5XP11M, that is

Maximum postaccelerator voltage		25,500 volts dc
Maximum focusing voltage		1,550 volts dc
Deflection sensitivities:	horizontal	260-318 volts dc per inch
	vertical	84-104 volts dc per inch
(With postaccelerator 24,000 volts, accelerator 4,000 volts)		
Useful scan:	horizontal	4.25 inches
	vertical	1.40 inches

Only the heater-voltage transformer is an integral part of the top deck; all other voltages are obtained from the 517 oscilloscope. A simple banana-plug strip at the rear end of the 517 oscilloscope allows for quick connection of all voltages to the four-gun oscilloscope. The 24-kv post-accelerator voltage is connected at the front end by an Alden "IMI" Hi-Voltage Disconnect.

The four vertical inputs are shown at the rear with their associated vertical and horizontal centering controls. The intensity and focusing controls are shown at the top left of the front panel. The astigmatism and scale illumination controls are on the right side of the cathode-ray screen. A common horizontal sweep is used. Again this is obtained from the 517 oscilloscope, and connection is made by a 300-Ω transmission line and low-loss connector. A simple counting-rate circuit allows for a small increment

of voltage to be applied to the vertical deflection plates of the four-gun cathode-ray tube after each externally triggered horizontal sweep of the beams. Thus only one set of vertical signals is displayed on each horizontal trace, and each trace is separated by a small space. This allows for easy recognition of signals after they have been recorded with a moving-film oscilloscope camera.

This unit has been most useful to physicists in that the timing and amplitude distribution of nuclear events can be readily obtained. A four-fold coincidence can be detected with a resolution time of less than 1 millimicrosecond. When the number of events to be studied is not too many, the use of the four-gun oscilloscope and moving-film camera is to be recommended over an expensive coincidence and pulse-height analyzer system.

This work is a development of an idea first suggested by Dick Mack and Clyde Wiegand of this laboratory.

This work was done under the auspices of the U. S. Atomic Energy Commission.

LEGEND

Fig. 1. Four-gun oscilloscope, showing top deck elevated for easy servicing.

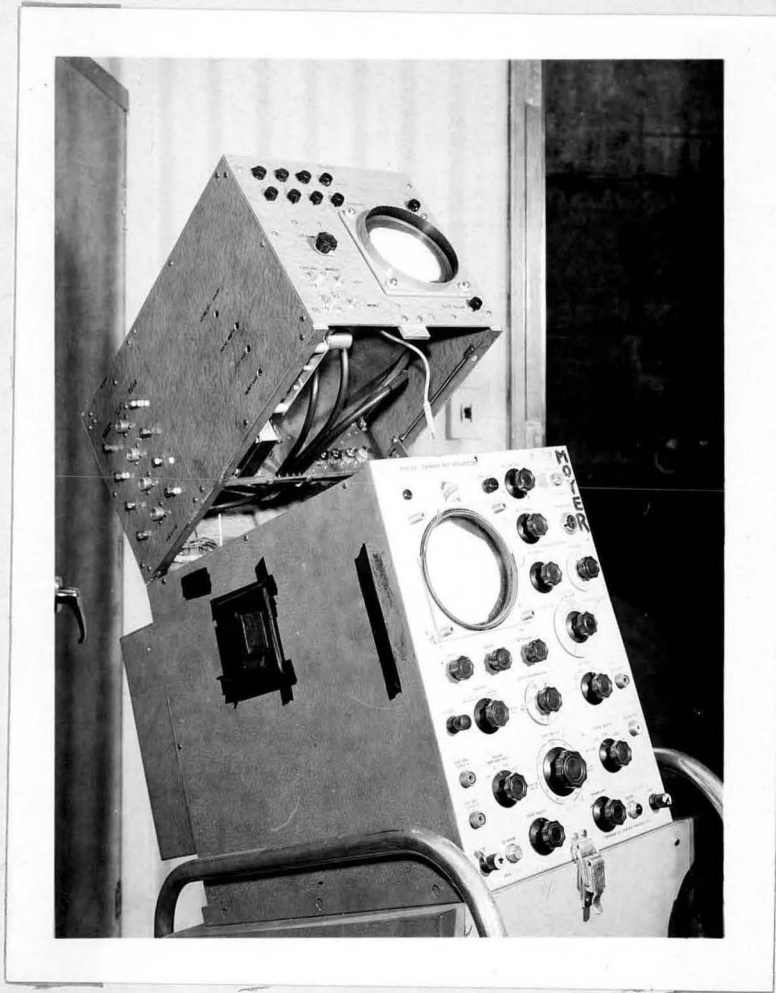


Fig. 1