

## A Magnetostatic Oscillator for the Generation of 1 to 3 cm Waves

Continuous waves have been produced by tubes, of the split anode type,<sup>1, 2</sup> of very small dimensions. A simple grating spectrometer consisting of two parabolic brass mirrors, about one meter in diameter, and an echelette grating was used to measure the wave-length. The grating consisted of 18 elements of sheet aluminum each 7.4 cm wide and 70 cm long. The angle between the plane of the grating and the elements may be changed from zero to the largest angle at which the grating may be used without reducing the effective width of the beam of radiation. In use, the elements were automatically adjusted to give maximum energy at any position of the grating. The receiver was completely shielded except for an opening at the focus of the receiving mirror.

The reading on the grating circle is plotted against the galvanometer deflection in Fig. 1. Six orders are shown and also the direct image. The tube used for this curve had an anode diameter of 0.070 cm and operated with 910 volts on the anode and in a magnetic field of 9700 gauss. The wave-length as measured by the spectrometer is given in Table I.

TABLE I.

Order:	1	2	3	4	5	6
$\lambda$ (cm):	1.233	1.229	1.224	1.227	1.230	1.232

A small hump appears on the long wave-length side of the peaks. As the magnetic field is decreased this hump disappears and then reappears on the opposite side. At a field of 7500 gauss the peaks become double. The tube must be operating at two slightly different frequencies, the weaker characteristic of the geometry of the tube and the other characteristic of the fields applied. Although both frequencies vary with the field, the former does not vary as rapidly as the latter. When in proper adjustment

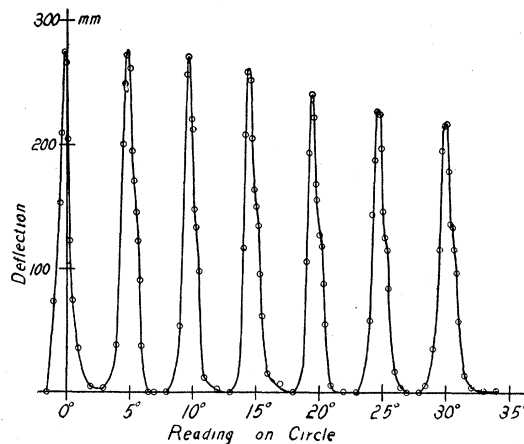


FIG. 1. Six orders at  $\lambda 1.23$  cm as given by the echelette grating.

the two merge into one and the oscillations are much stronger.

With a tube of somewhat smaller dimensions waves of 1.05 cm length were obtained. The oscillations were very stable in all cases except when the adjustments were such as to give peaks that were decidedly double.

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<sup>1</sup> H. Yagi, Proc. I. R. E. 16, 715 (1928).

<sup>2</sup> K. Okabe, Proc. I. R. E. 18, 1748 (1930).