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Chapter X The Marginal Oscillator

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CHAPTER X

THE MARGINAL OSCILLATOR

1. *Choice between different detection methods*

Several types of oscillating detectors for NMR have been published in literature. Oscillators using tubes *(Pound* 1947, *Gabillard,* 1953, *Buss & Bogart*, 1960), or transistors *(Donnaly & Sanders,* 1960, *Robinson*, 1965) have been described. Negative conductance oscillators have also been tried, for example the transitron circuit of *Knoebel & Hahn* (1951). The various published methods have been tried here. In addition, a negative conductance oscillator utilizing a tunnel diode has been constructed and tried. The marginal oscillator using an electron tube was selected for use here. The best performance of the tube marginal oscillator and tunnel diode oscillator was compared at 25 Mc/sec, 47 Mc/sec and 104 Mc/sec.

2. *The tunnel diode oscillator*

The tunnel diode oscillator working best is shown in Fig. X:A. The oscillation amplitude was about 75 mV. The primary output of signal amplitude amounted to about 8 μV at 25 Mc/sec and 5 μV at 47 Mc/sec. Considerable amplification was therefore necessary before the signal could be displayed on an oscilloscope. The primary output from a tube marginal oscillator utilizing the same coil and sample in the same position in the 6 kG field was 3 mV and in the 11 kG field 4 mV, which means about 300 times

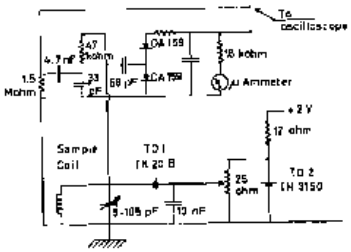

Fig. X:A Tunnel diode oscillator using JK20B as oscillator diode. Bias is obtained from the 25 ohm potentiometer. Tunnel diode 1N3150 is working as a voltage stabilizing diode. On top of the figure the filtering and detection circuitry.

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