Abstracts

The YIG-Tuned Gunn Oscillator, its Potentials and Problems

M. Omori. "The YIG-Tuned Gunn Oscillator, its Potentials and Problems." 1969 G-MTT International Microwave Symposium Digest of Technical Papers 69.1 (1969 [MWSYM]): 176-181.

The YIG-tuned Gunn oscillator has the capability of achieving broadband tuning with low residual FM noise, as good as or better than that of a reflex Klystron. Our approach to YIG-tuning a Gunn diode is shown in Fig. 1. The uniform precession mode of the YIG sphere acts as a magnetically tunable transmission type resonator. The diode and output loops are orthogonally located so that the coupling is null in the absence of the YIG sphere or magnetic field. The capability of achieving smooth, broadband tuning with medium power output with this approach is illustrated in Fig. 2. The diode was fabricated from Varian-grown, n-type, epitaxial GaAs. The carrier concentration in the solution-grown active layer was 2.5 x 10/sup 15/ cm/sup -3/. The thickness of the epitaxial layer was about 9 m. The Gunn diode was mounted in a 0.76 mm o.d. x 0.3 mm high ceramic package. The YIG sphere had an outside diameter of 1 mm, saturation magnetization of 1780 G, and a line-width of 0.5 Oe. The capability of achieving low noise oscillation, which is comparable to that of a Varian Gunn effect oscillator mounted in a waveguide cavity, is illustrated in Fig. 3. The data was taken from a diode which was oscillating at a frequency of 10.25 GHz with 40 mW of output power. Note that for modulation frequencies greater than 1 KHz from the carrier, the FM noise is as good as or better than that of an ordinary reflex Klystron. This rather good FM noise performance was achieved through circuit optimization and through improvements in the Gunn diode fabrication. The YIG-tuned Gunn oscillator was built for use with a small electromagnet having a gap of 2.8 mm. The entire oscillator, including magnet, weighs 445g and is pictured in Fig. 4.

❑ Return to main document.