

## Microwave Varactor Tuned Transistor Oscillator Design

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*K.M. Johnson. "Microwave Varactor Tuned Transistor Oscillator Design." 1966 Transactions on Microwave Theory and Techniques 14.11 (Nov. 1966 [T-MTT]): 564-572.*

An analysis is made of the common base microwave transistor oscillator circuit which uses a varactor in series with the collector to tune over octave bandwidths. Equations are derived giving the required feedback capacitances and resonating elements required for octave tuning. Normally, the collector-emitter capacitance  $C_{ce}$  is made approximately equal to the transistor collector capacitance  $C_c$ . The emitter-base capacitance  $C_{eb}$  is important only at very high frequencies. It is shown that a high-Q varactor must be used and that only a limited amount of collector-base capacitance  $C_{cb}$  may be added if the circuit is to be resonated over an octave. The output power for such a circuit is normally about 1/5 the maximum power available from the transistor. Experimental oscillators were made from 0.5 to 1 GHz and 1 to 2 GHz which substantially verified the analysis. Using the TIXS13 transistor, an output power of 200 mW was obtained from 430 to 860 MHz tuning from -2 to -115 volts. In the 1 to 2 GHz range a TIXS13 transistor oscillator was tuned from 1.09-1.96 GHz with about 40 mW power tuning from -2 to -115 volts. By use of a lower case capacitance varactor, the 1 to 2 GHz oscillator could be made to tune over the full octave.

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