Abstracts

Injection Locking of Klystron Oscillators

R.C. Mackey. "Injection Locking of Klystron Oscillators." 1962 Transactions on Microwave Theory and Techniques 10.4 (Jul. 1962 [T-MTT]): 228-235.

If certain criteria are met, a microwave oscillator may be synchronized by the injection of a controlling signal into the oscillator cavity. Synchronization is dependent upon oscillator circuit parameters, the ratio of injected power to oscillator power, and frequency difference between the free-running oscillator and the injection signal. Locking has been observed with injection signals 70 db below the oscillator output and 30-db ratios have been demonstrated to be easily realizable. Injection locking may be considered a form of amplification that permits taking advantage of the fact that microwave oscillators are smaller, lighter, less expensive and more efficient than amplifier devices. The low-frequency theory of Adler is shown to describe accurately the locking phenomena in reflex klystron oscillators and the transient response is extended to determine limitations on the amplification of modulated signals. Experimental verification of the theory is shown for 180° phase modulation of the locking signal at rates up to 100 kc for a VA-201 klystron. Design relations and curves are presented and applications and improvements are discussed.

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