

## CLASS-E MICROWAVE OSCILLATOR

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**The class-E oscillator with the directed coupler in the feedback is studied. The similar design allows to retune the oscillator with preservation of high efficiency due to a constancy of a directed coupler coupling coefficient in band of readjustable frequencies and absence of the additional selective resonator in the feedback. Influence of spurious elements of the transistor on generation conditions in class-E is considered. The experimental breadboard of a class-E oscillator with output power 500 mW and efficiency 65% on frequency 800 MHz is investigated.**

Modern development of wireless communication systems makes demands to increase efficiency of power consumption and information characteristics of used devices and blocks. The creation of highly effective small-sized microwave sources is one of the problems.

New class of switch amplifiers — class-E, which allows to obtain high efficiency in microwave range is considered in [1, 2]. If such amplifier to uptake into a self-oscillation mode by means of a positive feedback it is possible to realize the oscillator with high efficiency.

Class-E differs from other similar highly effective classes ( $F, F^{-1}$ ) in microwave range simplicity of realization and wider range of working frequencies at remain of high efficiency value. We obtain it due to connection of output transistor capacity in the low-Q output matching network. The working frequencies range of the amplifier reaches 20% from the central frequency [3, 4]. One more advantage of class-E use in the oscillator is the filtration of upper modes in the output matching network that allows to avoid excitation on harmonics, not using of additional filtering (resonant) elements in the feedback (FB), that not reducing a possible frequency range of oscillator readjustment.

Hence, it is possible to assume, if we use non-resonant FB for wide-band class-E amplifier, we could realize the oscillator with high efficiency value and possibility of smooth frequency readjustment in a wide frequency interval.

The using of the directed coupler (DC) in the FB for networks with electromagnetic connection allow to realize the frequency-constant transfer factor module of FB, that it was spoken above, provides a wide readjustment range of the oscillator, and also to avoid galvanic connection of input and output matching networks as opposed with use of DC on the stubs, offered in [5].

The aim of this work is development, modeling and an experimental research of characteristics of the class-E microwave oscillator with use of microstrip lines (MSL) and DC in the feedback, executed with use of connected MSL (CMSL).

**Structure of a class-E oscillator.** The block diagram of an offered class-E oscillator is represented in Fig. 1.

The input network is intended for realization of the complex matching of an input transistor impedance on the first mode  $Z_g$  with wave resistance of a feedback  $Z_{FB}$  and represents a combination of a line section with a stub closed on the ground through capacity (in the experimental sample for the frequency readjustment the variable capacitor is used).

For class-E realization, as is known from [1–5], the impedance on a crystal of the transistor on the fundamental frequency and upper modes should be realized in the form: