

# Microwave sensors of the fast process's in thermal power engines (TPE).

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Sensors are applicative for diagnostics of the most dynamic processes in combustion chambers and other TPE nodes during the takeoff and flight. The main test subjects are space- and aero-engines.

Controlled parameters are fluctuations' spectrums of electron density and flame temperature, as well as engine vibrations. Tests' importance is conditioned by information capability of parameters and proved by the nonlinear thermodynamics states.

Complete constructional compatibility of the sensors with the engine is an indispensable condition as well as nonperturbative character of control.

Principle of operation is an intrachamber space microwave probing.

Sensor is presented as a miniaturized transceiver of the nearfield radiolocation. Three-parameters sensors are quite similar both the principle of operation and the construction, but also by their disturbance's sensitivity. The last means that each of them reacts on "neighbors'" parameters as well as on other aggressive factors, caused by combustion process.

The main result of the work is the measuring transformation processes analysis. It tuned out that the most complicated step was nontrivial for radiolocation and different for all three sensors a transformation of initial parameters into complex admittance of small-sized nondirectional antenna. Sensitivities and amplitude-frequency characteristics of the sensors by main and neighbors' parameters were found. Probing frequency choice was suggested as the main mean of disturbances' responses decay. Probing frequency for the electron density sensor is near Langmuir frequency, which is (2...5) GHz; for the temperature sensor is ~10GHz, for vibration sensor it is (28...37) GHz.

Constructively sensors are presented as antenna-oscillator modules based on coaxial lengths and circular waveguides with ring-slit antenna or open end correspondingly.