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STUDY OF FUNCTIONAL ELEMENTS OF CONTROL SYSTEMS

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This paper presents the results of investigations conducted at the Department for Functional Elements of Control Systems of the Institute of Technical Mechanics of the National Academy of Sciences of Ukraine and the State Space Agency of Ukraine over the past five years. The investigations into microwave probe measurements resulted in a two-probe implementation of microwave interferometry for displacement measurement. The possibility of using as few as two probes was demonstrated by analyzing the roots of the equation that relates the magnitude of the unknown complex reflection coefficient to the currents of the semiconductor detectors connected to the probes. To improve the measurement accuracy, methods were developed to do this by accounting for the reflection coefficient of the horn antenna, by changing the operating wavelength according to the measured reflection coefficient, and by compensating the interprobe distance error.

The results of development and study of microwave meters of ionospheric plasma parameters are presented. Experimental and computer models of microwave meters of plasma parameters were developed and studied. An experimental and theoretical basis was prepared for the development of meters based on biconical cavities to assess the electron density in a rarefied low-temperature plasma. A novel circuit for a pulse discharge source was designed. The performance characteristics of a magnetron system were studied in the regime of generation of a directed gas and metal ion flow. To provide ion beam focusing, a self-contained anode-layer ion source was upgraded.

The paper presents the results of development and study of prototype ion-plasma, ion-beam, and combined process devices for auxiliary and main surface strengthening operations and combined strengthening treatment in a single vacuum cycle.

Keywords: *complex reflection coefficient, displacement, electrical probe, microwave interferometry, waveguide section, low-density plasma, plasma processing devices, biconical cavity.*

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