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INCREASING EFFICIENCY WITH USING “NEGATIVE RESISTANCE” INTO THE RESONANT AMPLIFIER

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Justification of relevance. The problems of the electric power industry, caused by the depletion of the natural resources of the planet, and the need to replace them, initiate the development of new physical and technical solutions with the practical use of known natural phenomena.

Purpose of the work. The purpose of this work is to propose to introduce an additional source of a harmonic signal (voltage or current) into the circuit of a resonant amplifier of electric power, to obtain calculated analytical dependencies for numerical estimates of the characteristics of ongoing electromagnetic processes, which make it possible to give a fundamental justification for the real performance of the proposed circuit as a whole, taking into account the interaction of all its functional components. This work, ultimately, involves the use of resonant phenomena in circuits with active-reactive elements and their theoretical analysis using the mathematical apparatus of the theory of electrical circuits.

It is proposed to implement the resonant amplifier circuit in the form of four active-reactive closed circuits inductively coupled to each other. Moreover, in a practical embodiment, inductive couplings can be carried out using HF ferrites. The first circuit is the input circuit with the harmonic power source to be amplified. The second circuit generates amplified reactive power in the "voltage resonance" mode. The third circuit with an additional harmonic voltage source outputs reactive power from the second circuit in the "current resonance" mode. The fourth circuit, inductively coupled to the third circuit, contains the output load of the entire resonant amplifier. This is a resistor that simulates the release of active power.

Originality. Physically, the introduction of an additional source in the third circuit is equivalent to the creation of a "negative active resistance", which makes it possible to create conditions for excitation of current resonance with the minimum possible distortion and, ultimately, to reduce the reverse effect on the amplifying processes in the second circuit (reactive power amplifier). The analysis and numerical evaluation of the characteristics of the proposed scheme of the resonant amplifier of active electric power showed its fundamental viability.

Practical value. As an example, calculations of currents and voltages in the circuit of an experimental model were made, which made it possible to formulate recommendations for the selection of elements of a real active electric power amplifier with high efficiency for low-resistance output loads.