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Designing Nanotechnology Matching Devices

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The work describes the features of simulation of the ultrahigh-frequency electromagnetic interaction, which forms an internal solenoid status of monolithic integrated circuits. As an example, is the study of matching devices, which are made in the form of the band-pass lines. The proposed method of modeling, to determine the dependence of the finite frequency and temporal characteristics of the cascading schemes amplifiers. Thus, the proposed method of modeling physical processes appear not only domestic but also external display spatially distributed nano-and micro-strip technology structures.

Keywords: High-frequency electronics, Electromagnetic interference, Simulation in nanoelectronics, CAD.

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1. POLICY OF THE PROCEEDINGS

Synergetics of natural phenomena in nanoelectronics received little attention. Some work, while remaining within the classical concepts of methods of analysis and synthesis of electrical circuits, are without deep theoretical studies. So even work utilitarian nature [1], to some extent, have a declarative. The purpose of this study is an illustration of the new system analysis methods based on the concepts of dependent sources of electricity. A mathematical model that justifies this approach is very complex and is aimed at building computer-aided design of nan electronic monolithic integrated circuits [2, 3]. The main advantages of novation illustrated on the example electromagnetic effects on reproduction of characteristics of the amplifier in a wide frequency band (WBAF) [4]. Primarily this concerns quadripoles, that coordinated input and output amplifier. Research performed in the package Micro-Cap, but with the same success it can be carried out in environments OrCad, MultiSim, або Altium Designer

2. CIRCUITRY DISPLAY OF ELECTROMAGNETIC INTERFERENCE

Analysis amplifier, Fig. 1, taking into account the flow vectors induction electromagnetic field distributed in space bandpass lines, that coordinate both input and output WBAF, can be done on the basis of input phantom source of electrical energy Fig. 2.

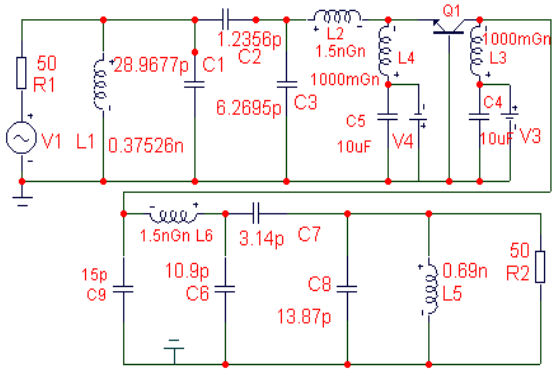

Fig. 1 – Scheme transistor cascade of WBAF

Simulated flow of the electric induction surface Thumb lines to other parts WBAF possible input dependent current source, whose value depends on the voltage at the poles components WBAF. Phantom scheme, both macro model has two inputs is selected from the set of all arcs voltage components, that have the greatest value and one output current. The latter was connected to the communicator from the trees, which had the smallest current amongst all possible poles currents of components.

To equalize the frequency response and agreement of the cascade, Fig. 1, Fig. 2, the load *R*4 and *R*3 internal resistance of the generator at the input and the output of the cascade plugged matching trans-?orming circle [4].

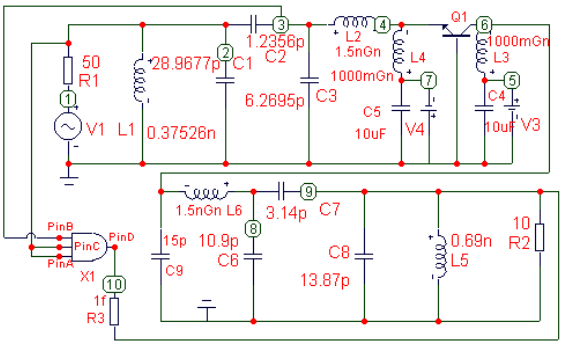

Fig. 2 – Scheme WBAF with reflexion of an electromagnetic interference of macro model dependent current source

To perform a comparative analysis between schemes with phantom and real components must have: circuit board constructions that includes all component WBAF; information about the "dangerous" currents and voltages at the first iterative step are determined from the original scheme, [4], Fig. 1, based on the majority of verification; matrix electrodynamics parameters communicator, whose elements are determined by methods of electrodynamics; scheme of substitution electromagnetic interference that is intro-

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duced as a macro model when used with input data, which are determined in the process of solving problem of electrodynamics [2, 3]. Results matching frequency AC analysis transforming circles shown in Fig. 3.

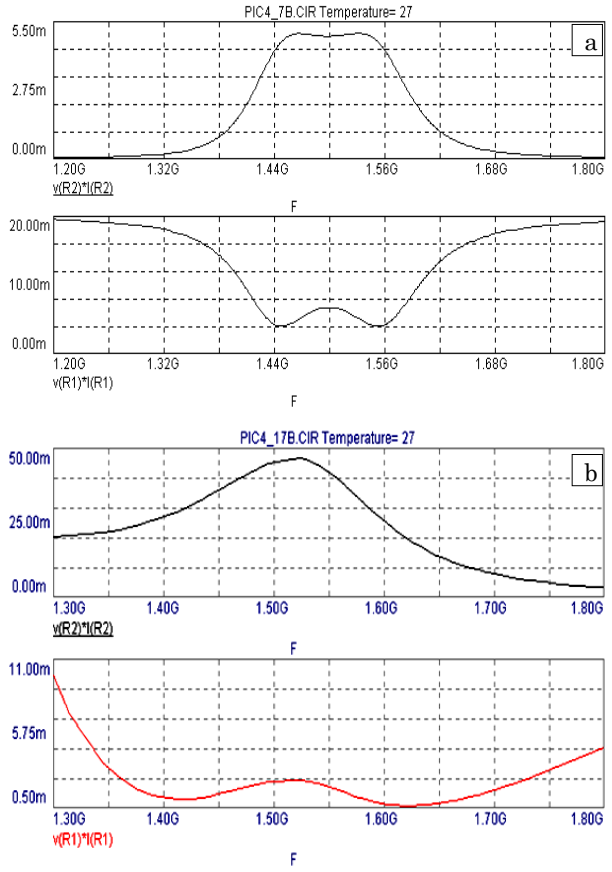

Fig. 3 – Frequency Response the matching 4- poles: a – input, b – output

Comparing the results, Fig. 4, of the analysis of the frequency characteristics of the output power (upper curves) and power transfer ratio (lower curves), calculated in accordance with the classical model (curves - *k*) and – caused by electrodynamic model (curves - *e*), the following conclusions:

Output power from right below the bands of transparency in the real constructions is much greater than in a idealized, ie selective properties of the input and output matching transforming circle largely offset by not reflected electromagnetic interference design of form with the input voltage spectrum of oscillation. The reason this result that "phantom" routes of transmission of energy, reduce the role of the power amplifier, as a significant share of the energy is flagged for circle load outside of the active component, ie, by the transistor. In real circuit design of spectrum output voltage less amenable to correction, that he largely coincides in communicator. At frequencies greater than 1.52 GHz to 1.58 GHz frequencies is a sharp rise in output power of the WBAF. This testifies a lack of stability of the amplifier in this range. In other words, by not reflected inverse electromagnetic interference, appears the effect of regenerative amplification (gain of power due to positive feedback). The reason for this are the elect-?omagnetic interactions of conductive wires (communicator) that connect the individual components in the design WBAF. On the form rather than in substance, a phenomenon vaguely reminiscent of internal reaction "effect" feedback diode.

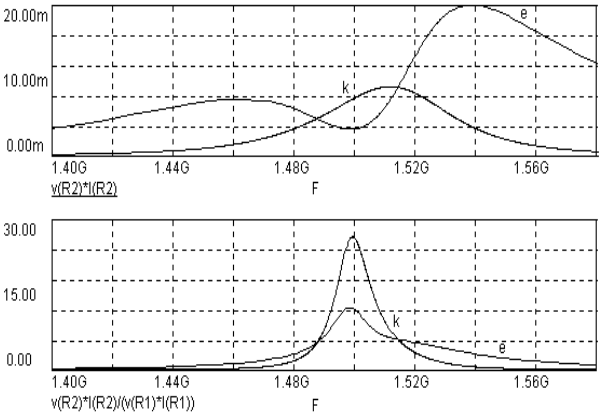

Fig. 4 – Comparison of the frequency characteristics of classical – (*k*) and electrodynamics based – (*e*) models

3. CONCLUSIONS

The results calculating the impact on matching characteristics of stages Broadband amplifier with the use of various physical models, one of which takes into account the actual design features, and the other – there is no such tool. Proposed innovations allow you to perform structural optimization minimizing, both internal and external electromagnetic interference, thus solving the problem of internal and external electromagnetic compatibility monolithic integrated circuits, including nanotechnology.

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