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SIMULATION A MICROWAVE CLASS E MESFET AMPLIFIER WITH ADAPTIVE ELEMENTS USED IN DATA TRANSMISSION

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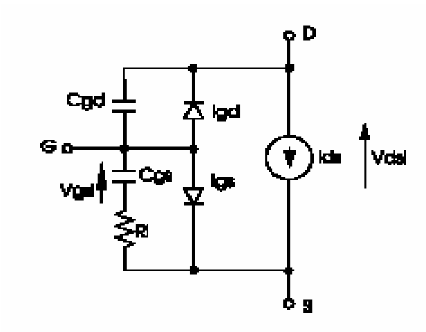
Abstract. *In this paper will be try to present the data transmission system with a E class amplifier used in WLAN device. The problem in this system is power of transmission and the adaptation with antenna. Antenna adaptation is essential in data transmission in microwave domain and this paper tri to present same practical and theoretical result.*
Keywords: *Class E, amplifier, Smith.*

Introduction

The class E amplifier an amplifier circuits used in special in microwave domain prevalent in aviation data transmission system.
The analyses presents in this paper is based by the practical approach in WLAN domain. Simulation presents a theoretical result in WLAN system.

Model of Curtice Ettenberg Cubic MESFET and adaptive elements circuits

The model of Curtice Ettenberg Cubic MESFET



is presented in figure 1:

Figure 1. Curtice Ettenberg model

The model is described with the next equation:

$$I_{ds} = \begin{cases} (A_0 + A_1 V_x + A_2 V_x^2 + A_3 V_x^3)\tanh(Gamma V_{dsl}) \\ 0 \end{cases} \quad (1)$$

where

$$V_x = V_{gsi}(t - T)(1 + \beta(V_{ds0} - V_{dsi}) \quad (2)$$

Simetric diode equation is presented in (3) and (4):

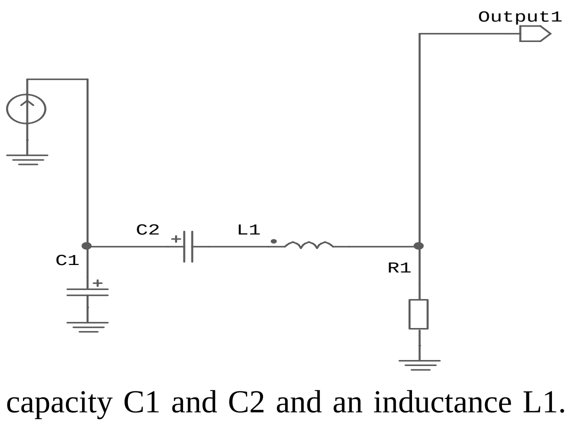
$$I_{gs} = I_S\left(\exp\left(\frac{V_{gs_i}}{NV_t}\right) - 1\right) - I_{B0}\exp\left(\frac{-(V_{gsi} + V_{BD})}{N_R V_t}\right) \quad (3)$$

$$I_{gd} = I_{gdc} - \begin{cases} I_{B0}\exp\left(\frac{-(V_{gdi}+V_{BD})}{N_R V_t}\right) \\ \frac{G_{MAX}}{4}\left(\tanh\left(K_{1D}\left(V_{gsi} - K_{2D}\right)\right) - 1\right)\left(V_{gdi} + V_{BD} - \sqrt{\left(V_{gdi}+V_{BD}\right)^2 + K_{3D}}\right) \end{cases} \quad (4)$$

The important elements of this circuits is a E class network presented in figure 2:

Figure 2. E class networks

The main elements of E class network is



capacity C1 and C2 and an inductance L1. This element allows achieving adaptation of 50 ohms impedance or antenna impedance.

Simulation of E class amplifier structure with adaptive compensation

The purpose of this paper is to highlight the importance of adaptive control for MESFET device.
Experimental circuits is presented in figure 3:

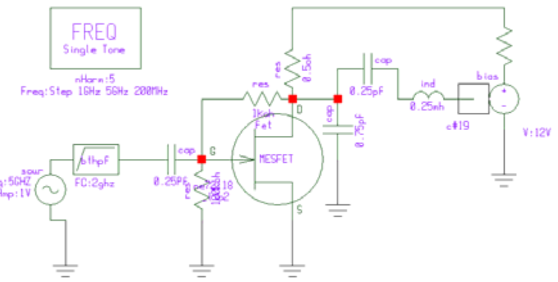


Figure 3. E class basics circuits

With this circuits in presented forms the results of simulation is:

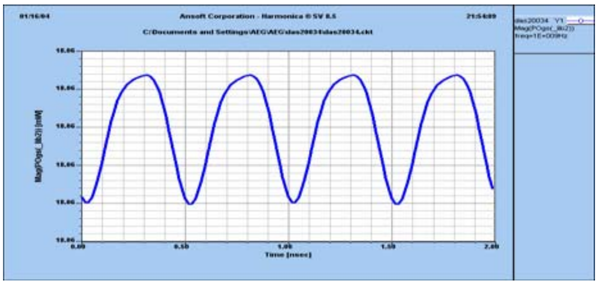


Figure 4. Results of basics simulation

If impedance load is diminuate the power of circuit is normally changed. But in proposal circuits the active current control permits loading compensation.

In figure 5 is presented the compensation of loading with the passive circuits:

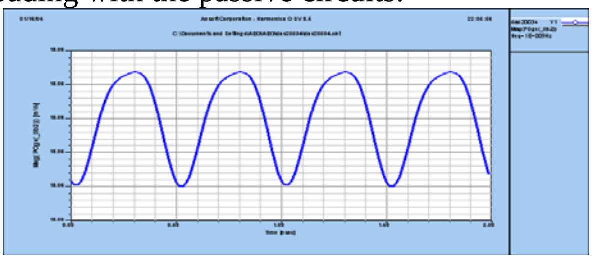


Figure 5. Loading compensation

The schematics with an active circuits is presented in figure 6:

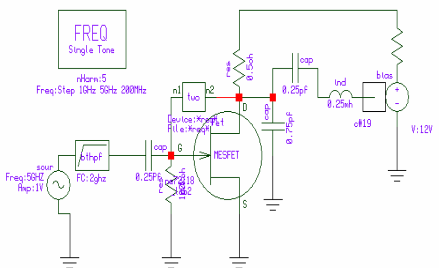


Figure 6. the circuits with active compensation

The compensatory block is an active circuits which permits the automate control of impedance problem.

The active block makes by transistors system or a microcontroler circuits, which is possible to memories, the accurate level of impedance loading.

In figure 7 and 8 is presented the real simulation with an active compensation circuits and two variants for impedance 50 and 75 ohms:

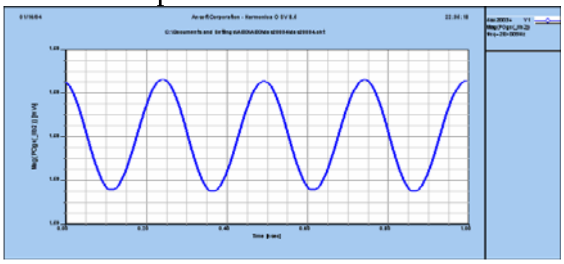


Figure 7. Load impedance 50 ohm

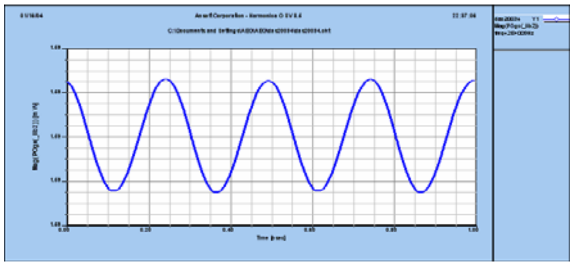


Figure 8. Load impedance 75 ohm

The results of this simulation are to same. The value of impedance not affected the output power in circuits.

Conclusion

In this paper the principal scope is to evaluate the impact of automation system in radiotransmision and the using of microcontroler device in this application.

References

[1] Al. Stefan (2000) *Microwave assisted simulation circuits*, Cluj Napoca

[2] Paulo Rodrigues (1998) *Computer Aided analyses of non-linear microwave circuits*, Artech House

[3] Sthephen Mass (1998) *Nonlinear Microwave Circuits*, Artech House

[4] *Serenade SV 6* – Using guide

[5] *Microwave Journal*, 2001 - 2003 Collection