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بالرسالة صفحات لم ترد بالأصل

DESIGN AND REALIZATION OF A K-BAND HEMT MIXER

THESIS

SUBMITTED IN PARTIAL FULFILLMENT FOR THE MASTER OF SCIENCE DEGREE IN ELECTRICAL ENGINEERING

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ABSTRACT

In this thesis the design and realization of a K-band HEMT mixer is presented. The mixer design used a single gate HEMT that features reasonable conversion gain of about 5-6 dB and good isolation between input and output ports.

The design involved first the experimental characterization and modeling of the equivalent circuit of the chosen HEMT.

The analysis of the mixer circuit followed the "harmonic-balance technique" implemented on the nonlinear simulator of HP's "Microwave Design System" package (MDS).

The matching circuits were designed using coupled microstrip lines for the input circuit at RF = 20 GHz and Lo = 18 GHz, and low pass filter prototype microstrip lines for the output circuit at IF = 2 GHz.

The designed mixer was finally tested and experimental results were compared with theoretical ones.

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LIST OF ABBREVIATIONS

HEMT ..... High Electron Mobility Transistor.

FET ..... Field Effect Transistor.

LO ..... Local Oscillator.

RF ..... Radio Frequency.

IF ..... Intermediate Frequency.

C_{gs} ..... Gate-source capacitance.

R_{ds} ..... Drain-source resistance.

C_{gd} ..... Gate-drain capacitance.

G_m ..... Transcanductance.

I_d ..... Drain current.

I_{ds} ..... Drain-source current.

V_g, V_d ..... Gate, and drain voltages.

L_g, L_d, L_s ..... Gate, drain and source inductances

R_g, R_d, R_s ..... Gate, drain and source resistances

R_i ..... Intrinsic resistance.

C_{DS} ..... Drain-source capacitance.

g_d ..... Drain transconductance.

V_{gs} ..... Gate-source voltage.

V_{ds} ..... Drain-source voltage.

I_j ..... Junction current.

V_p ..... Pinch-off voltage.

V_t ..... Turn-on voltage.