

EE 3113

INTRODUCTION INTO RF

CIRCUIT DESIGN

Lecture Notes for A-term 1999

LECTURE 26

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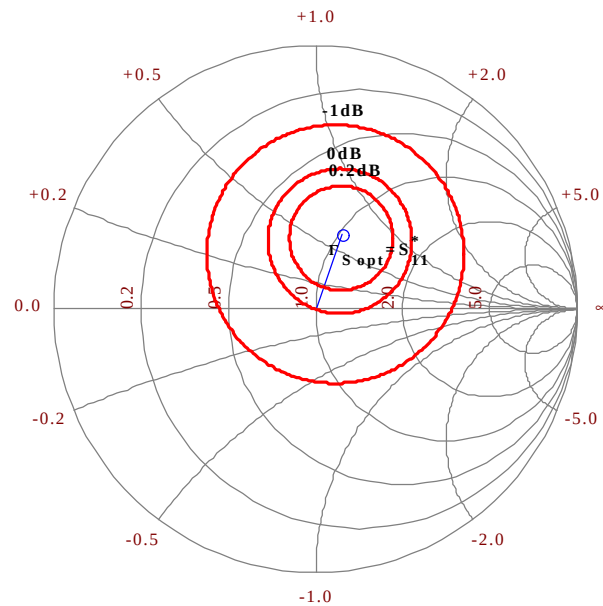
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RF Amplifier Design Project

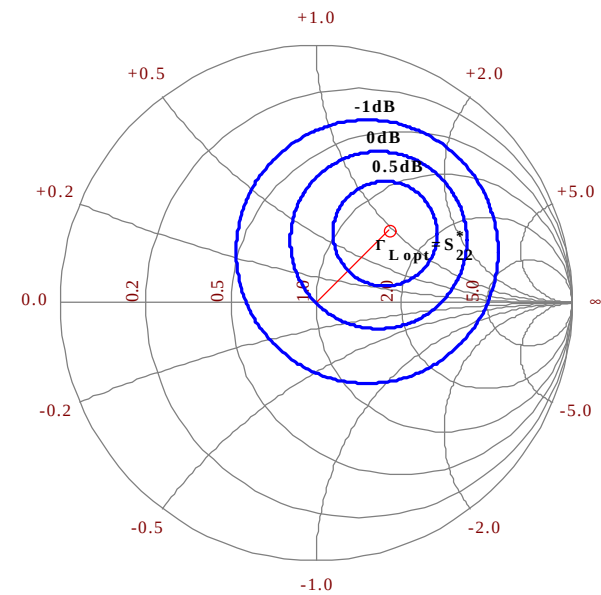
- Amplifier design
 - passive bias network
 - stability analysis of BJT (k-factor)
 - no feed-back ($S_{12}=0$) -> unilateral design
 - class A (low-efficiency) BJT configuration
 - S-parameter description (given bias, frequency)
 - discrete, two-element matching networks

Results of constant gain analysis

Input gain circles

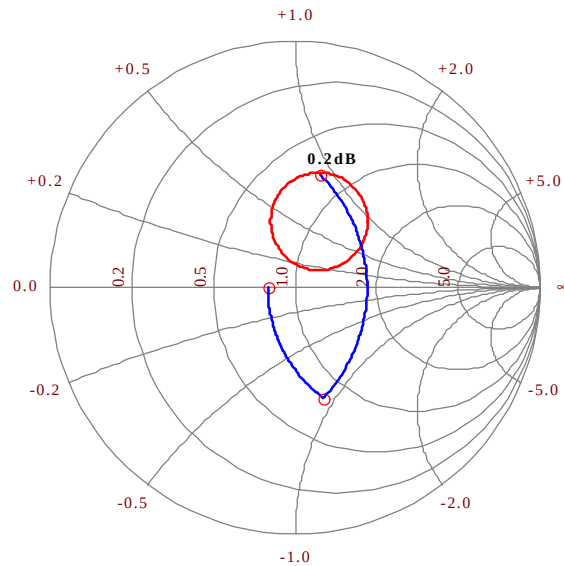


Output gain circles

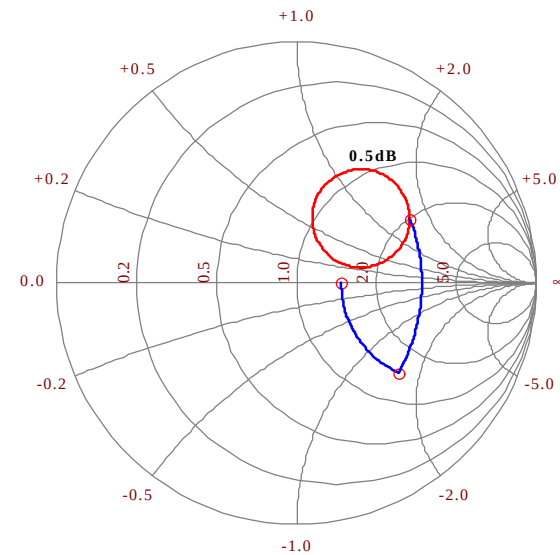


Required Matching Networks

Input matching network



Output matching network

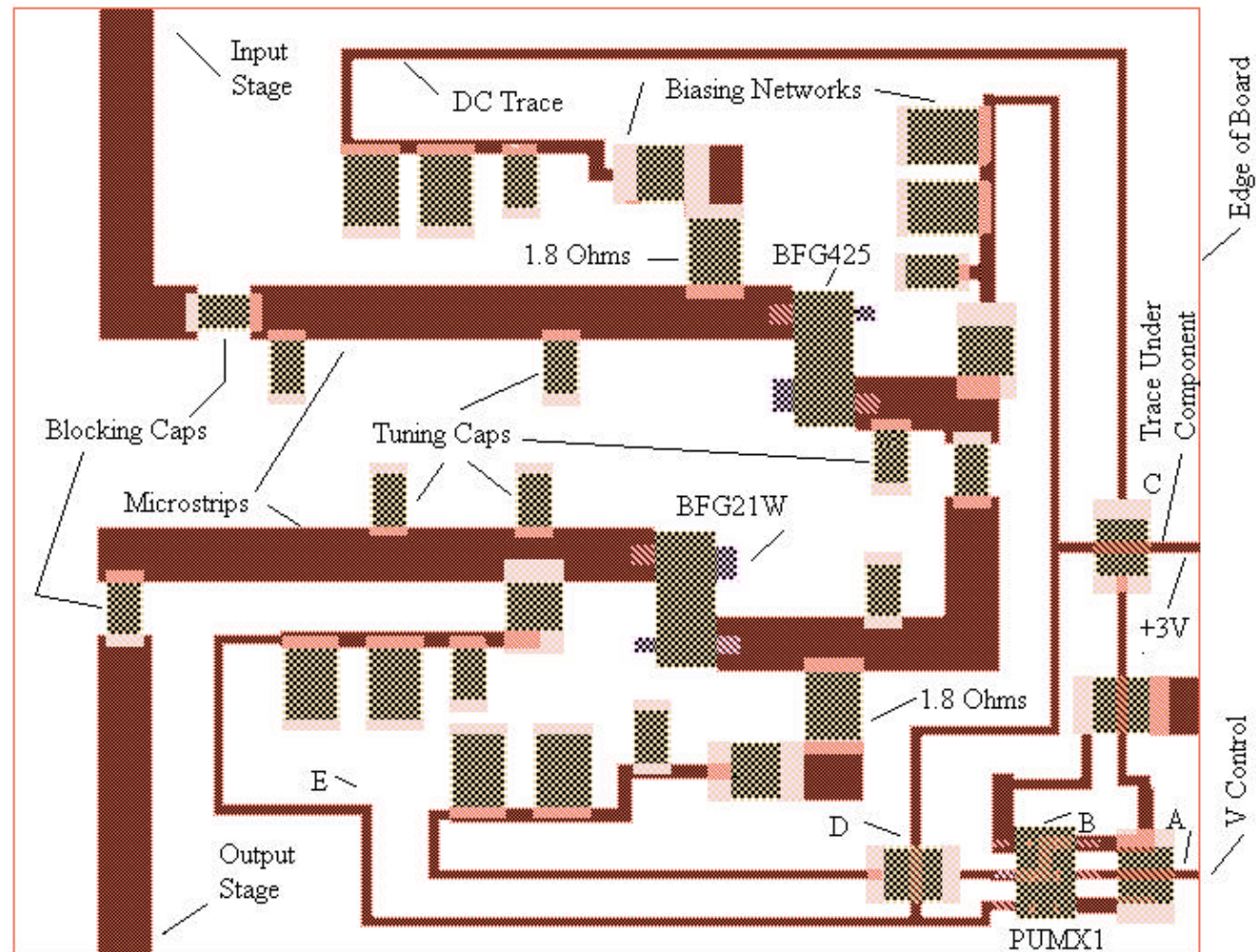


L, C elements

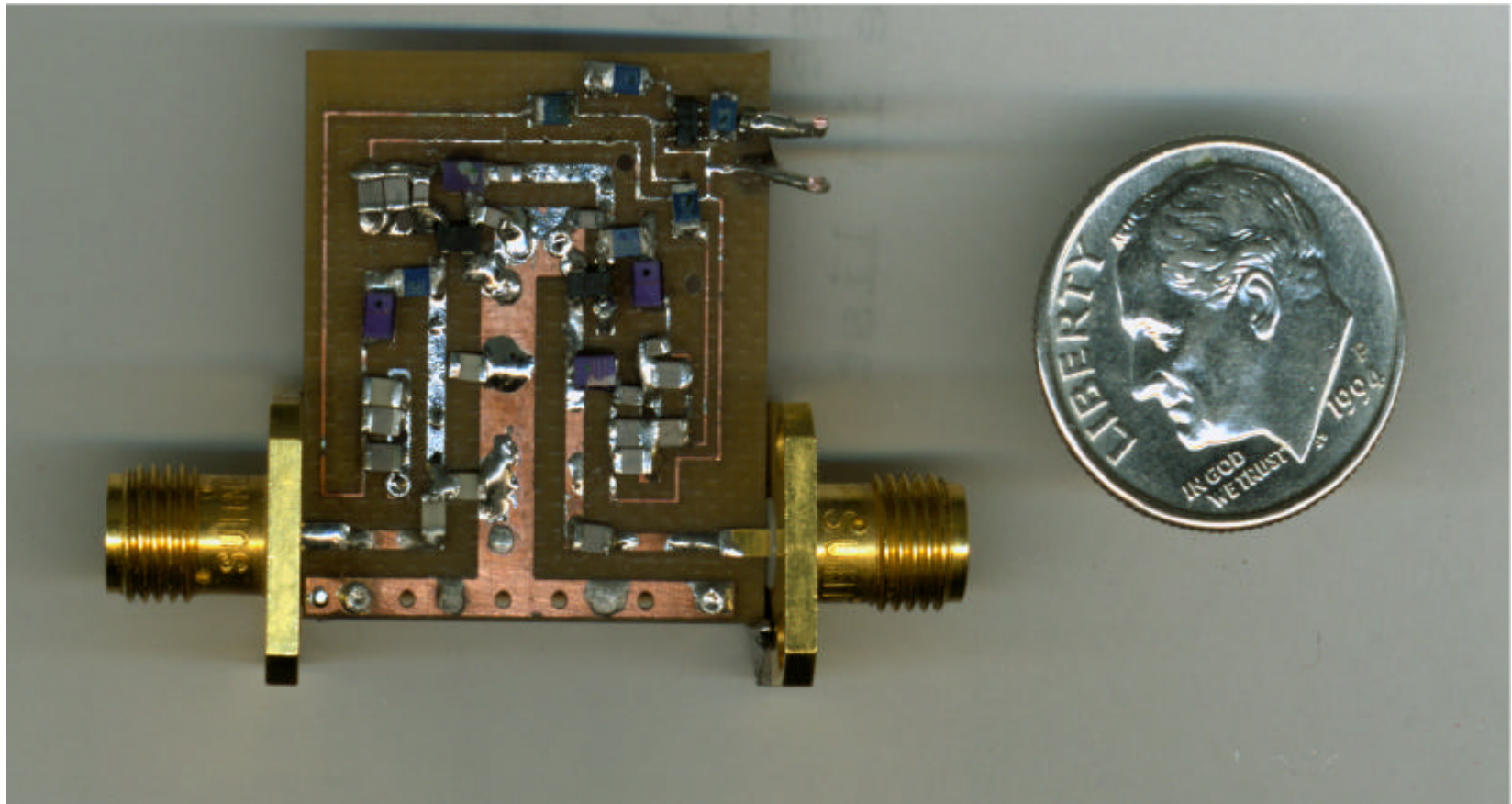
What to do next?

- Additional design improvements
 - multi-stage (dual) configuration
 - microstripline realization
 - triple and higher order matching network
 - electric circuit transistor model with feed-back (bilateral design approach)

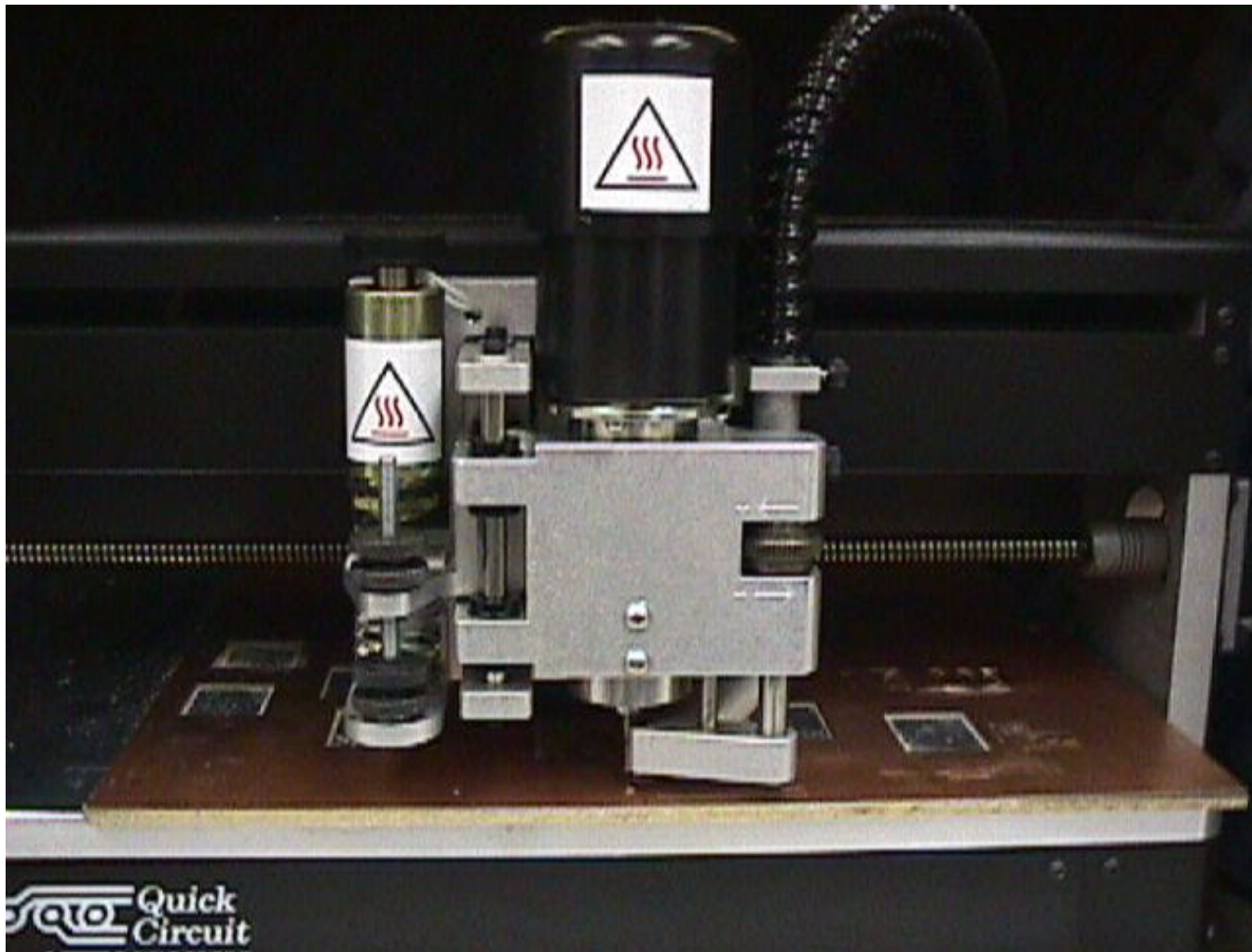
Most recent MQP project



Actual realization



Circuit board cutter



EE 3113 COURSE GOALS

- MATCHING NETWORK STRATEGY
 - input matching
 - conjugate complex output matching
- TRANSISTOR & DIODE CHARACTERIZATION
 - S-parameter description (supplied by manufacturer)
 - small signal, RF circuit model (BJT, GaAs FET, PIN, Schottky diode)
 - DC biasing
- NETWORK DESCRIPTION
 - two-port model (S-parameter, Z, Y, hybrid, etc.)

- SIGNAL FLOW CHART MODELING
- S-PARAMETER THEORY
 - definitions (based on matched port terminations)
 - measurements with network analyzer
- SMITH CHART
 - reflection coefficient/impedance representation
 - impedance transformation as a function of either length or frequency
- TRANSMISSION LINE FUNDAMENTALS
 - distributed circuit theory
 - loaded and source transmission line