EE572/EEP572 Microwave Engineering **Winter 2021**

Instructor: Professor Yasuo Kuga, Rm430 EEB, OH: M: 9-10pm
Tel: 543-0478, ykuga@u.washington.edu

Schedule: Lecture: Monday 6-9pm Lab: **No lab in 2021**

TA: Yannan Liu, liuyannan0721@hotmail.com OH: Sat, 1-3pm

Prerequisite: Basic EM course, EE361 or equivalent

This course will be based on my lectures notes and references
Textbooks: (recommended but not required)
(1) *Microwave Engineering*, Addison Wesley, 2012. D. Pozar

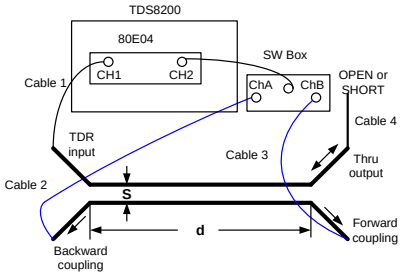
Topics:
1. Transmission lines
2. TDR, time domain analysis and parameter extraction techniques
3. Transmission line matching techniques.
4. Microwave circuit analysis using S-parameters
5. 90^{o} and 180^{o} hybrid analysis and design
6. Microwave filter analysis and design
7. Design of microwave amplifiers
8. Electrical properties of materials and measurement techniques
9. Dispersion and anisotropic media

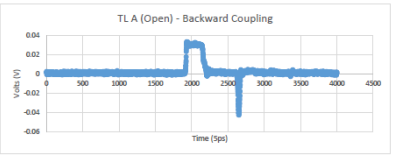
HW/Lab projects:
- HW1: TDR time-domain analysis of complex loads
- HW2: TDR coupled noise on TLs
- HW3: Intro to Ansys Electronics Desktop
- HW4: Microwave 180 degree hybrid design
- HW5: Microwave low pass filter design
- Final Project: Microwave amplifier design

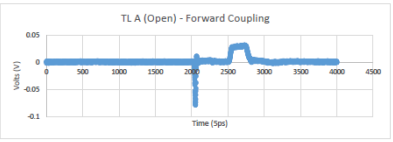
Lab instruments and simulation software: No lab in 2021
Simulation software: Ansys ED (Electronics Desktop)
Time-domain reflectometer (TDR)
Microwave Network analyzer (NWA)

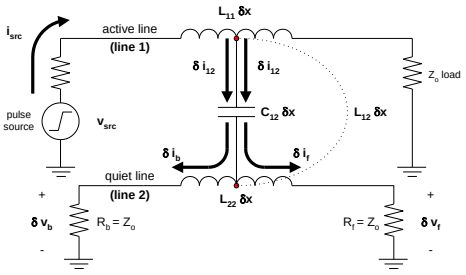
Grading policy: Six HW/projects are assigned. The final grade will be based on the projects/reports. No exam.

TDR Lab (Forward and backward coupled noise on TL)



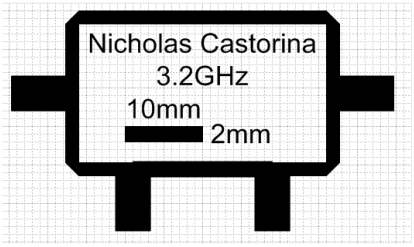


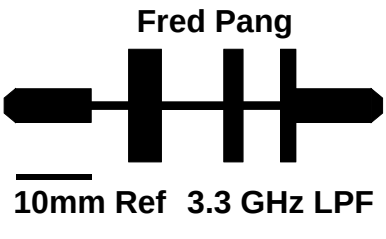




$$V_b = \int_0^d \left(\frac{K_C + K_L}{2v_o} \right) \frac{dV_{src}}{dt} dx$$

Examples of microwave circuits

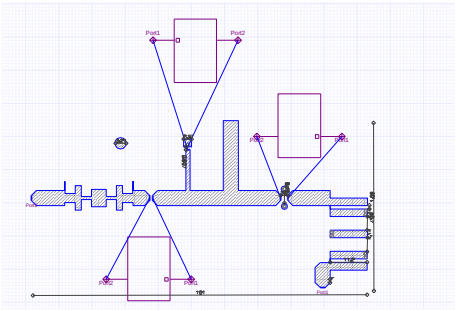


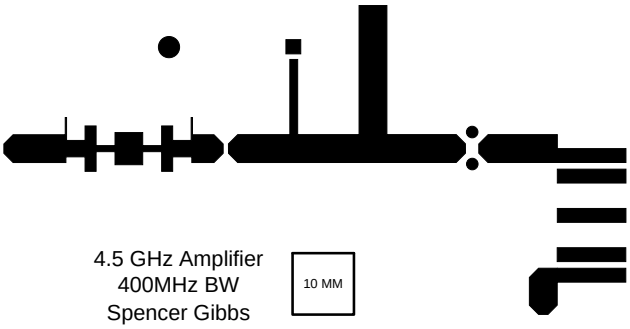


180 degree hybrid

Low-Pass Filter: fc=3.3 GHz

Example of microwave amplifier using Ansys ED





2020 Final Project: 2.4 GHz Balanced Amplifier Design

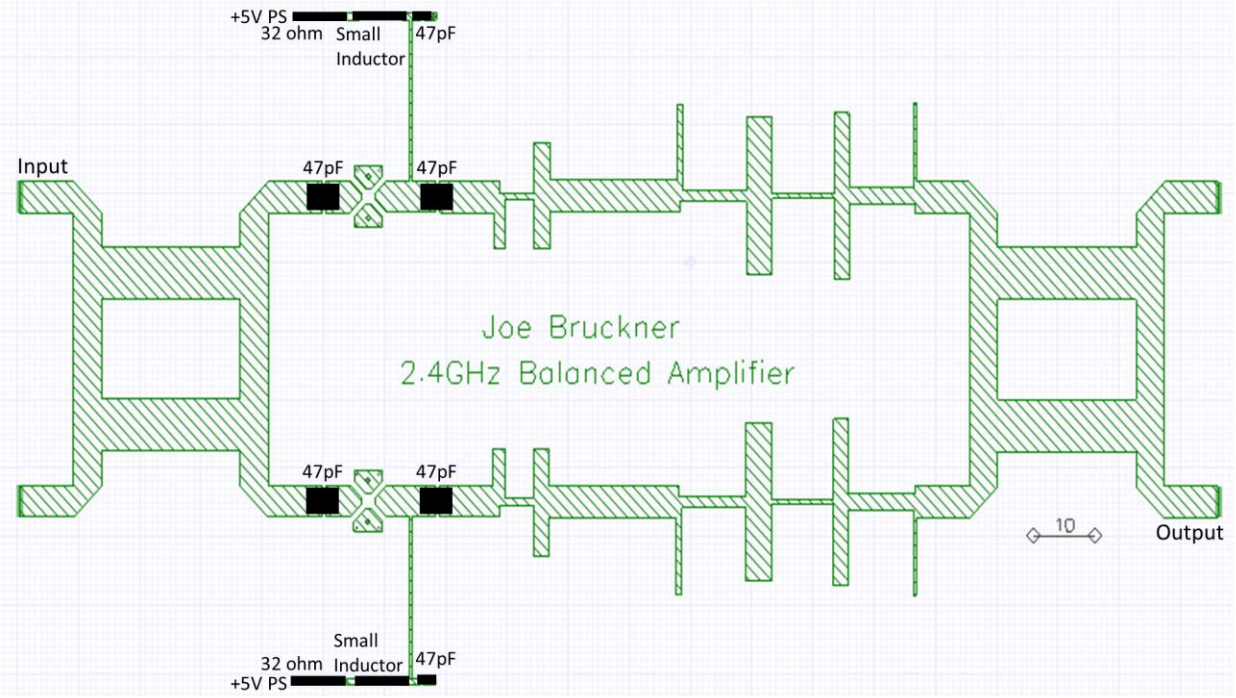


Figure1: 2.4 GHz Balanced Amplifier EM Layout with Elements

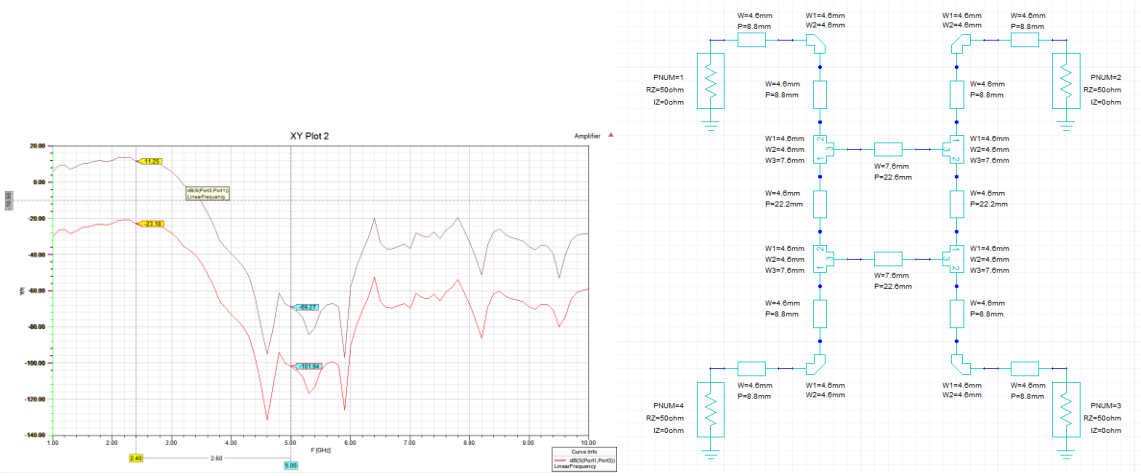


Figure: 2.4 GHz Balanced Amplifier Circuit Simulation

Figure: 2.4 GHz 90 Deg Hybrid Circuit Design