

EM Wave Project Guidelines (2019)

The aim of this project is for each group of you to design, construct and measure an RF/microwave component (working at frequencies from 10MHz to 20GHz). To complete the project, each group should follow the following steps under teacher and TA's guidance.

1. Design of your RF/microwave component

Choose one of the following typical RF/microwave components as your project goal:

- (a) Dividers
- (b) Couplers (ring hybrid coupler, quadrature hybrid coupler, Lange coupler...)
- (c) Filters (low pass, high pass, bandpass, Butterworth, Chebyshev...)
- (d) Amplifiers
- (e) Bias-Tees
- (f) Resonators
- (g) Antenna
- (h) Others with notable applications

Study the circuitry and the working principle of the component you choose from the textbook (Wentworth) and other literatures. Design your component on the circuit level with proper element parameters. **No two groups can share the same design so submit your idea first to claim it.**

Check point: To propose the circuit design and the functions of your component before 10/9

2. Construct of your RF/microwave component

As the second step you will start to design your component on the PCB level. Follow the TA's guidance to generate the pattern with a CAD program and transfer it on to a PCB. Prepare suitable circuit elements for your need and solder them onto your patterned PCB. You will also need to attach standard SMA connectors for RF/microwave signal input and output.

Check point: To finish the component before 11/13

3. S-parameter measurement

Learn the basic operation of network analyzers under the guidance of the TA, and measure the S-parameters of your RF/microwave component with the TA's help. Remember that you will need to modify your component to get satisfactory measurement results. **The network analyzer is very very expensive \$\$\$\$! Never operate it without the TA's guidance.**

Check point: To hand in your S-parameters data before 12/11

4. Modeling and data analysis

Do calculations of RF/microwave propagations according to your circuit design. Compare it to your measurement data and discuss any deviation from the calculation results.

Poster presentation and demo on 12/27

Final project report: To complete a report in journal-paper format including abstract, introduction, method, result, and conclusions. The guidelines for preparing the report will be given after mid term. Submission deadline: 1/10

Progress reports and e-campus working area

At each check point, each group should hand in the progress report, which should be uploaded to the ilearning working area. **The progress reports and the final report should be handed in by your group leader**, which would be pre-assigned. Please follow the instruction and announcement posted by the teacher. Do not e-mail directly to teacher's e-mail address since it may be detected as a spam and blocked.

The document is preferred in PDF format. The final report should be written in a formal technical paper. Please follow the guidelines given by teacher.

Teacher will also provide useful documents in the ilearning working area, including lecture viewgraphs and instructions for writing papers. Please visit the working area frequently to find what you need.