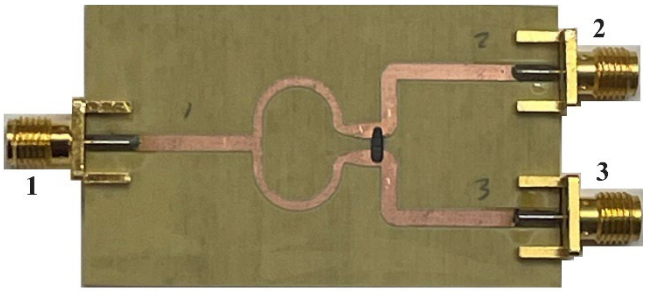
EE 481/581 Microwave Engineering (Fall 2025)
Laboratory 6 Multiport Device Analysis- Part 1

Background

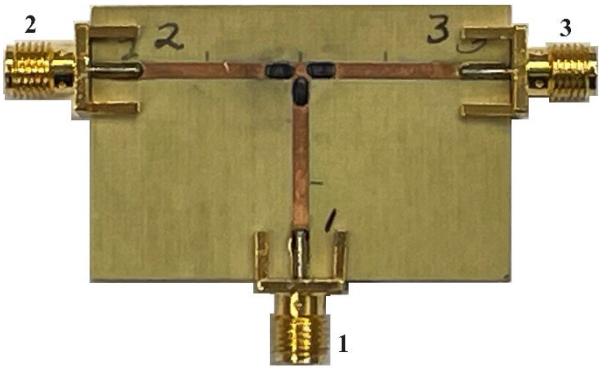
You will be taking on the role of CSI - SDSM&T Microwave Engineers! For this case, it is critical that we identify the devices shown below in preparation for the arrival of essential test equipment. To avoid destroying evidence, all tests **must** be conducted in a **nondestructive** fashion. Any damage to the device will incur ***severe*** penalties.

Preliminary

To assist your investigation, you will initially have access to the devices, digital multimeter, ruler, tape measure, caliper, and whatever personal equipment you or your team might possess, e.g., Rogers Corporation Microwave Impedance Calculator (MWI). An informant has passed on the information that the devices were made on Rogers Corporation RO4003C laminate.



Device 1



Device 2

Questions to answer/consider for each device **in turn**:

- What is it? Give your theory. What evidence/references do you have to support your theory?
- What are the key characteristics and/or parameters of the materials and parts?
- What is the expected impedance of each port? What evidence do you have to support your theory?
- What are the critical dimensions? Measure and record them.
- Does the device have an expected center frequency f_c and/or bandwidth (f_{low} to f_{high}) of operation? If so, what is f_c and/or f_{low} & f_{high}? What evidence do you have to support your theory?
- What is the expected characteristic impedance of each microstrip trace used on each device? What evidence do you have to support your theory? [Hint: screenshots from MWI.]
- Give a predicted [S]-matrix for the device at f_c or a representative frequency. Is the device lossless?
- When given access to a vector network analyzer (VNA) and associated calibration equipment and accessories, what tests (include frequency range) would you conduct to confirm your hypotheses/theories?

Be sure to fully detail, document, and summarize your measurements/tests and analysis in your logbook(s) with clarity to a degree that will hold up in court.