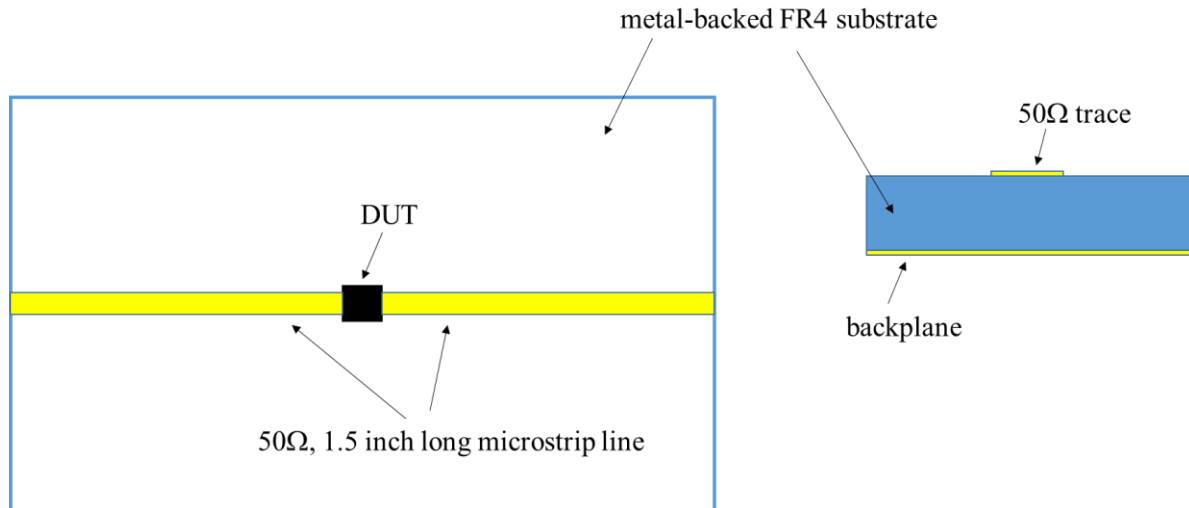


TRL design problem

You will measure a device-under-test (DUT) in later experiments in the lab. The DUT is a two-port device, implemented on an FR-4 substrate, extended to the edges by two 50Ω traces. Top and cross-sectional view of the device you would measure in the lab are shown in the following figure.



It is known that TRL calibration provides a magnificently accurate 2-port measurement over the SOLT calibration. However, TRL standards are, as same as SOLT standards, only valid in a certain range of frequency. In this problem, you are asked to design a TRL standard set to enable TRL calibration for measuring the aforementioned device.

The frequency range of interest is from **1 to 6 GHz**. Your final TRL set should look like one depicted below. Board dimensions should be reasonable, i.e. within 4"x4". Put all 03 standards on the same board, ensure separating them far enough so that coupling effects between them would be negligible and you can easily work with them when connecting/disconnecting cables. Center them accordingly so that the E-shop could cut the board properly. For more information about PCB fabrication capability of E-shop, go [here](#).

Important: In order for E-shop to be able to cut your board, you have to draw a *board outline* in your design file to define a boundary for your board. Any rectangular line (no-filled) shape in your favorite layout tool would suffice this purpose.

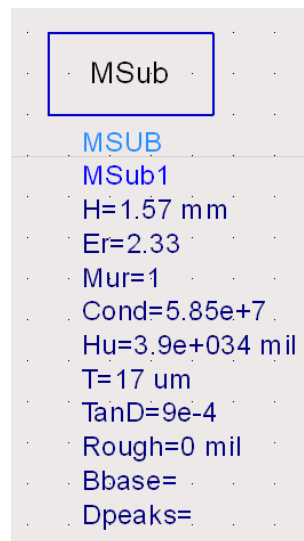


You should work with your lab partner in this problem and your team are to submit one design only. However, you are individually required to submit a design procedure report. Your report should include your reasoning and calculation for your design.

Use Keysight ADS for your design and file export. Simulate each of your TRL standards; you will collect measurement data of them later for comparison. Simulation results, schematic snapshots etc. are also a part of your individual report.

For students who are not familiar with ADS, there will be tutorials on the website. Check for updates regularly.

Your design will be made on FR4 substrate, 62 mil thickness, 1/2 oz copper. PCB material can be entered as following



Due date: Design file (in gerber, .gbr format) and report will have to be submitted on Compass by midnight **Thursday, Mar 15, 2018**. You do **not** need to submit your ADS workspace. Name your design file properly so that it can be distinguished from others.

You will received your design back from your lab TA before the lab. You will mount SMA connectors on your design in the lab before using it.