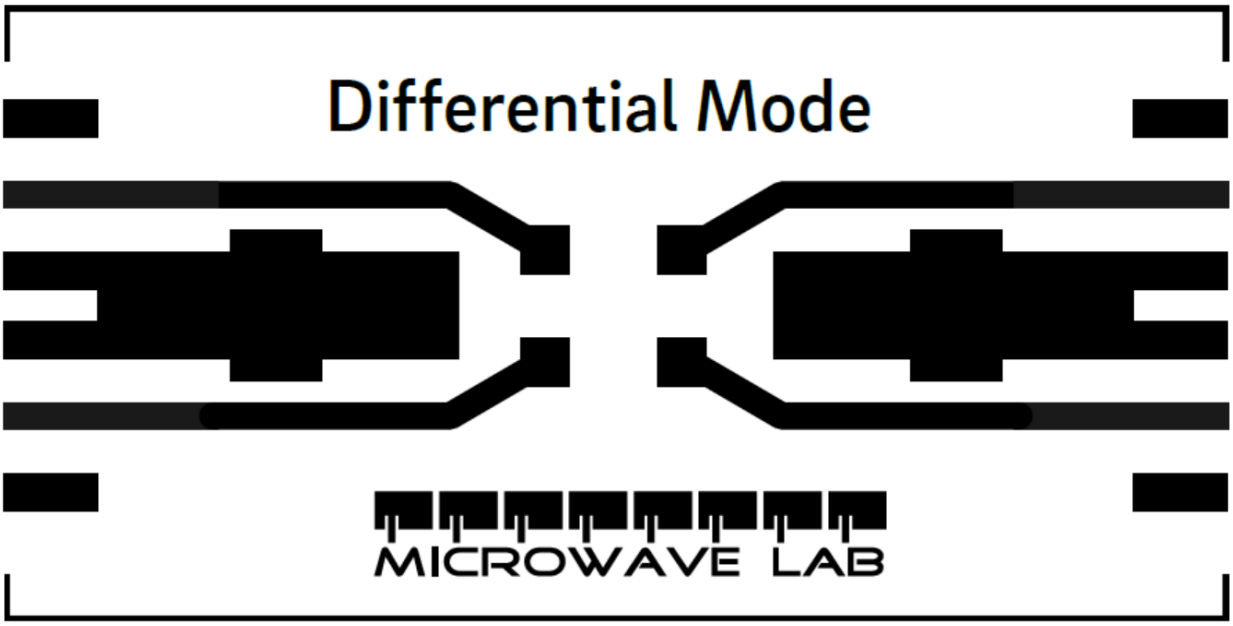
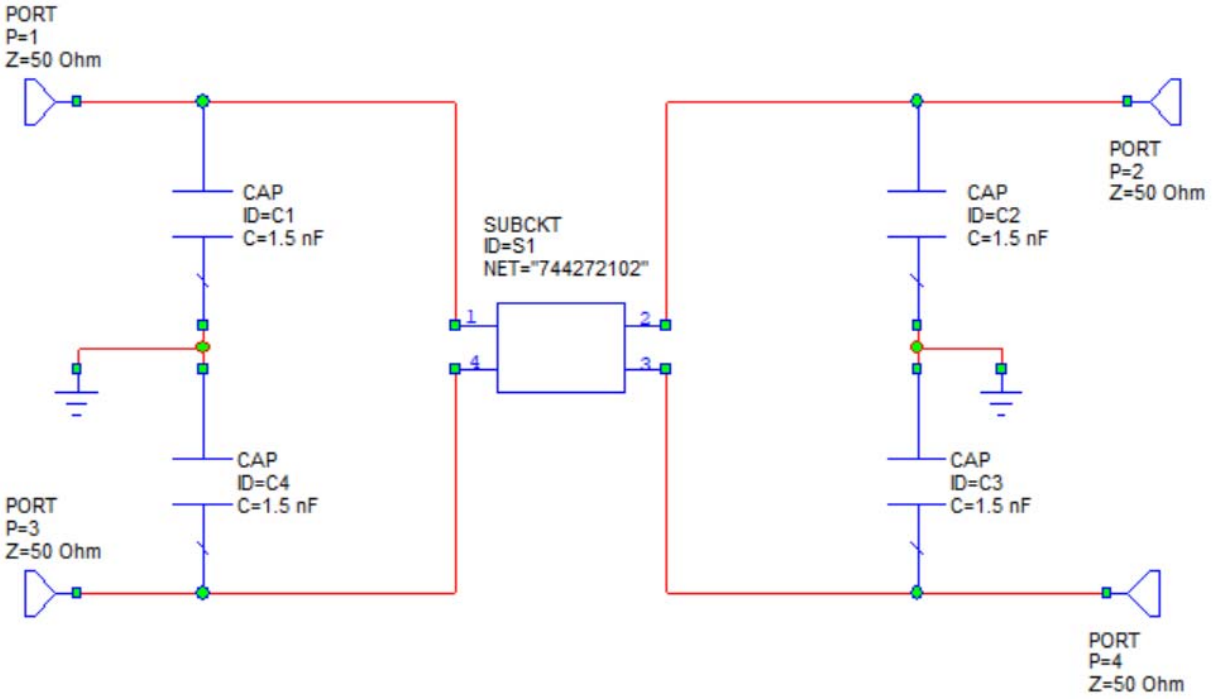

Differential Mode
MICROWAVE LAB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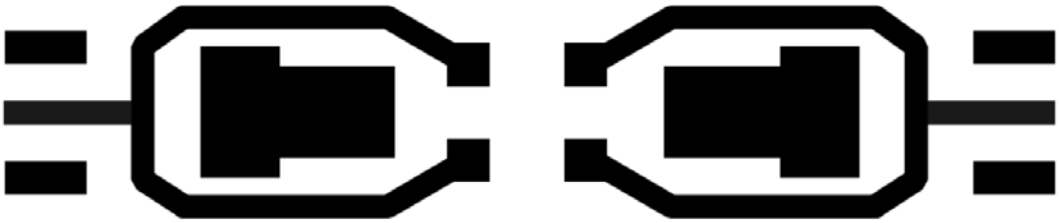
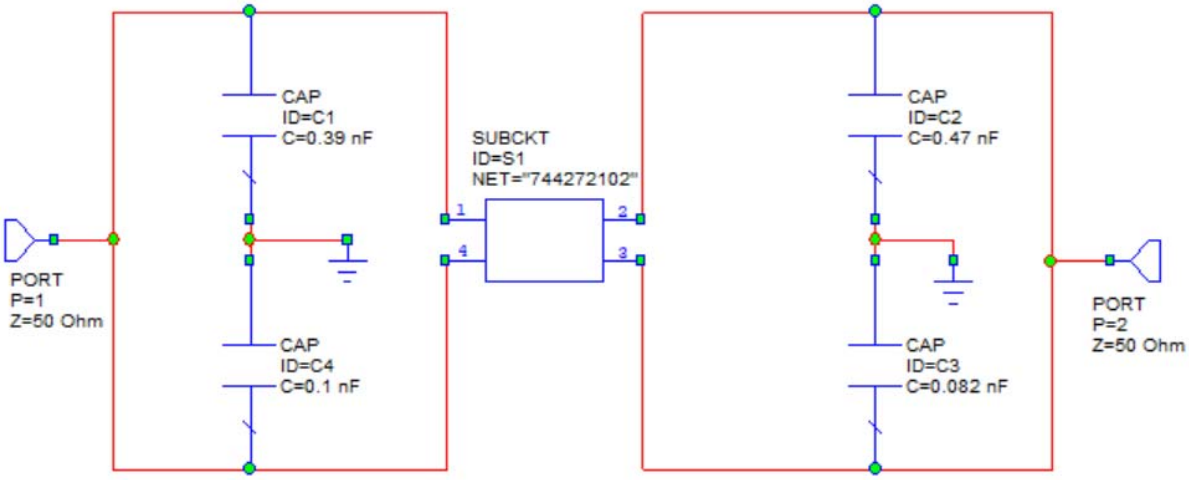
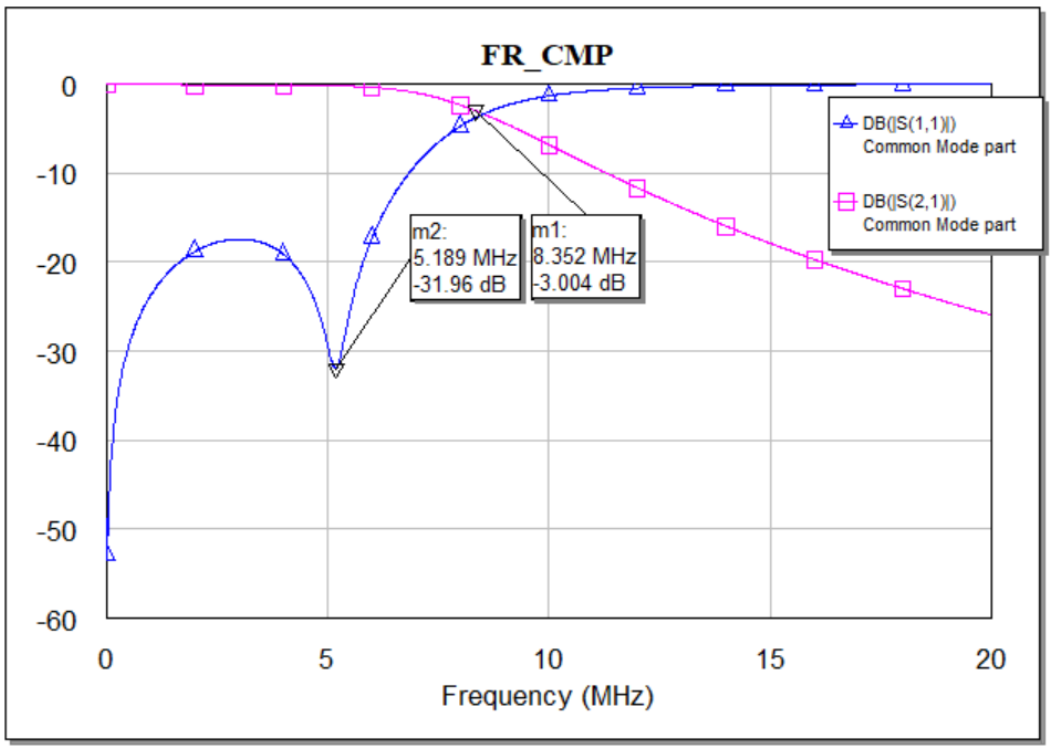
Z=50 Ohm
CAP
ID=C1
C=1.5 nF
SUBCKT
ID=S1
NET="744272102"
1
2
4
3
PORT
P=2
Z=50 Ohm
CAP
ID=C2
C=1.5 nF
CAP
ID=C4
C=1.5 nF
PORT
P=3
Z=50 Ohm
CAP
ID=C3
C=1.5 nF
PORT
P=4
Z=50 Ohm

Common Mode



MICROWAVE LAB





EMI Filter

We have designed an Electromagnetic Interference filter

Passive Components

1. 744272102 CM choke of 2mH
2. Multilayer ceramic capacitor (100pF, 390pF, 470pF, 82pF)

Theory

An EMI filter is placed in between supply (or signal generator) and Load (or LISN). As well as we connect the filter, current will flow through the circuit and induce two different conducted emission. One is called Common mode emission and another is called Differential mode emission. Common mode emissions occur along two lines of a closed-loop simultaneously, and the current flow is in the same direction and in phase. On the other hand differential mode emissions occur along two lines of a closed-loop however, the current flow is in opposite directions and with 180 phase shift. A high frequency noise will also induced. According to the EMI filter purpose this high frequency noise will be regulated by some capacitors. Among these capacitors some will regulate the differential mode noise induced by supply and choke leakage inductance. Some will regulate common mode noise whose high frequency part will be send to ground.

By fixing the values of these capacitors we can determine the actual frequency response both for Ideal and real components and also can compare them.

Frequency Response

I have focused on mainly the return loss and the transmission loss while measuring the frequency response. As return loss, I have plotted S11 and as transmission loss, I have plotted S21. In the above structure I have got common mode frequency response where the transmission response showing a nice low pass where the cutoff frequency is 8.352MHz.