

Microwave Components and Circuits
ECPC25
Assignment



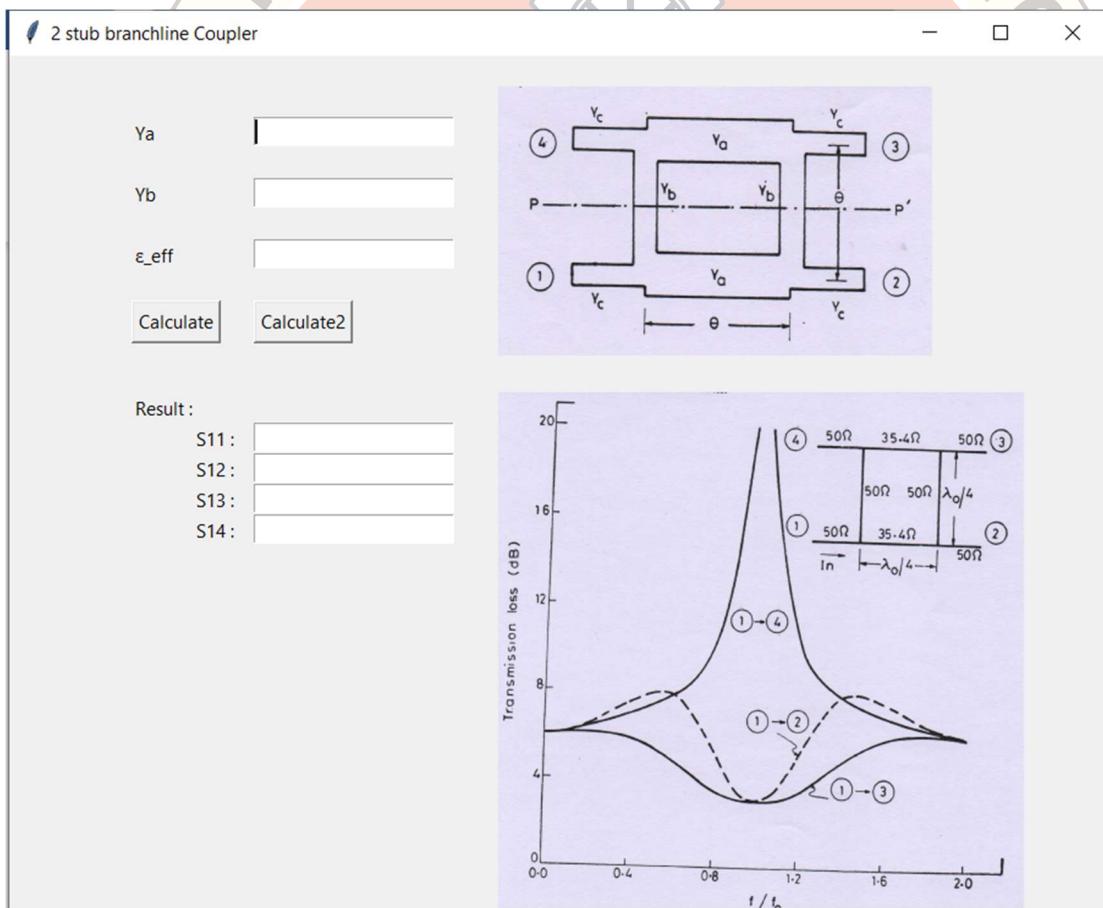
ECE – B

Submitted on: 23/05/21

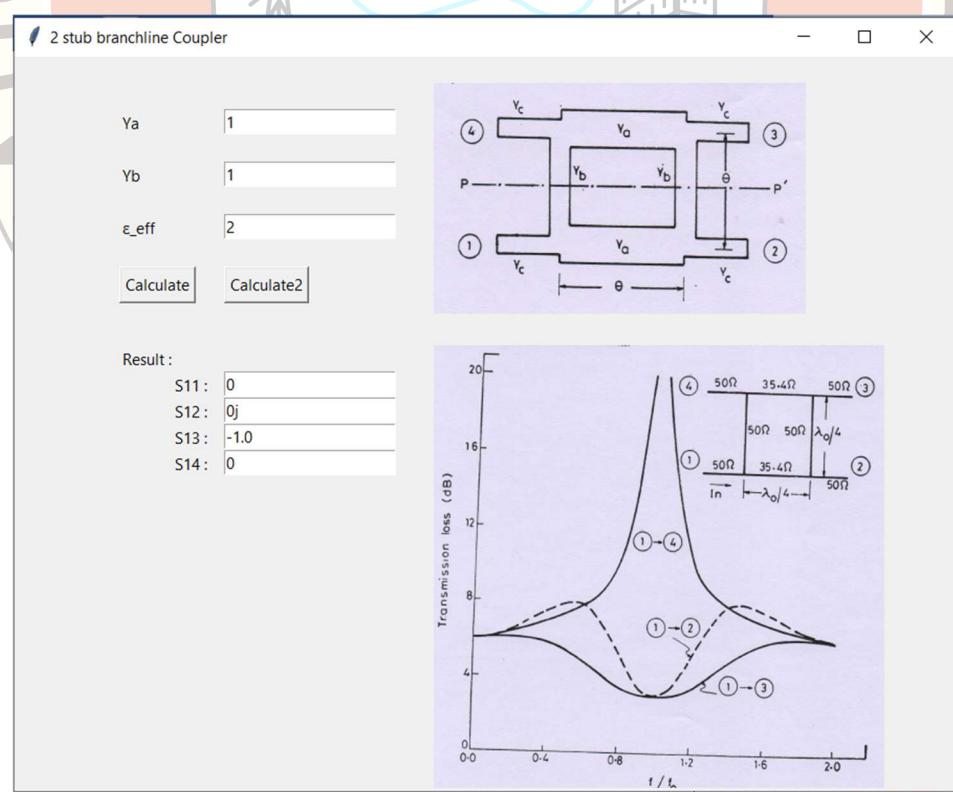
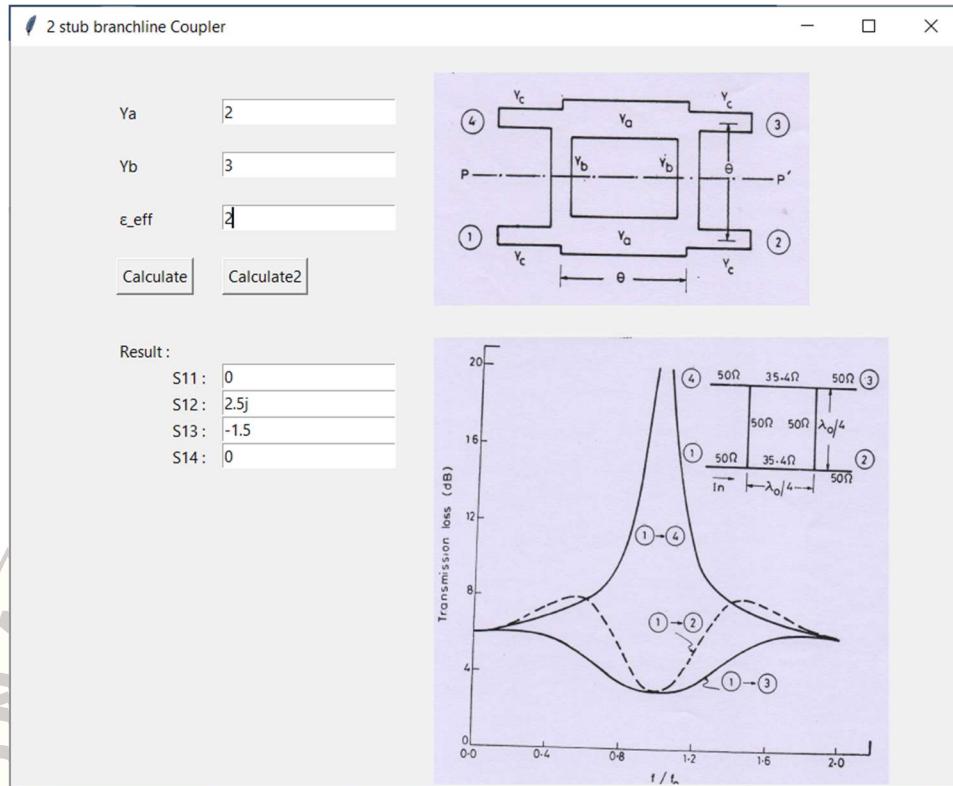
Submitted to: Dr.S.Raghvan

Two Stub Branch line Coupler

The branchline the simplest type of quadrature coupler, since the circuitry is entirely planar. Each transmission line is a quarter wavelength. However, 3/4, 5/4 or 7/4 wavelengths (etc.) could also be used on each arm if the circuit layout requires it, the penalty is paid in decreasing bandwidth. A signal entering the top left port (port 1 in the figure) is split into two quadrature signals on the right (ports 2 and 3), with the remaining port 4 fully isolated from the input port at the center frequency. Remember that the lower output port (port 3) has the most negative transmission phase since it has the farthest path to travel.



Try Giving some values:



Hybrid Coupler

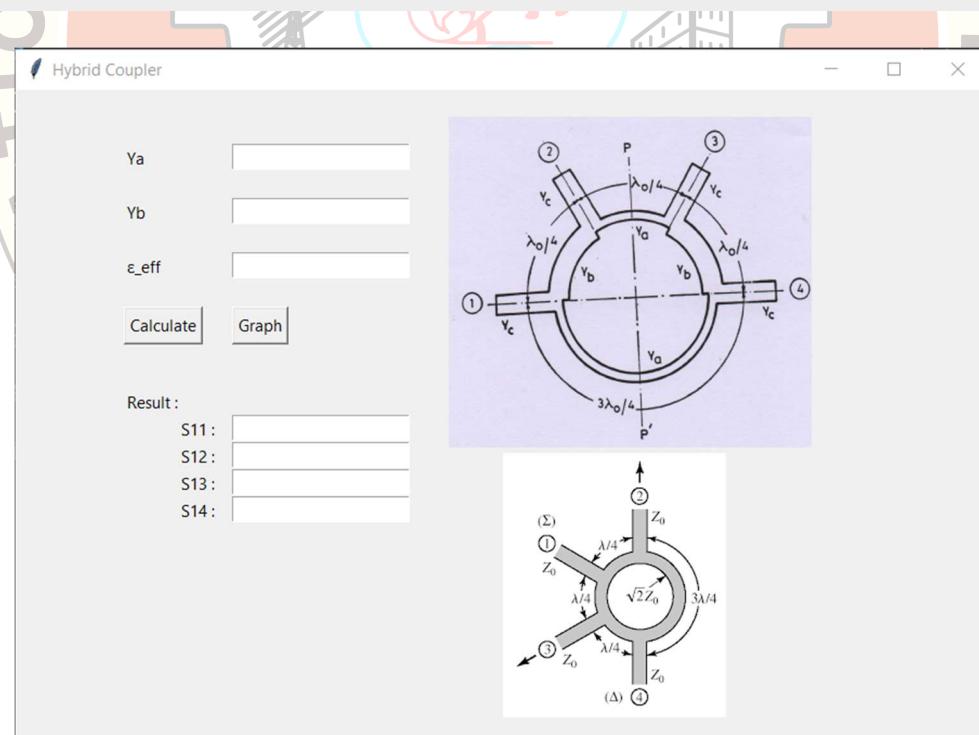
A 3 dB, 90° hybrid coupler is a four-port device that is used either to equally split an input signal with a resultant 90° phase shift between output ports or to combine two signals while maintaining high isolation between the ports.

3 dB, 90° degree hybrids are also known as **quadrature** hybrids because a signal applied to any input, will result in two equal amplitude signals that are quadrant (90° apart). It also makes no difference which port is the input because the relationship at the outputs remains the same as these devices are electrically and mechanically symmetrical. This configuration ensures a high degree of isolation between the two output ports and the two input ports without unwanted interaction between them.

3dB, 180° Hybrid Ring Couplers

180° hybrid ring couplers (also called “rat race” couplers) are four-port devices used to either equally split an input signal or to sum two combined signals. An additional benefit of the hybrid ring is to alternately provide equally-split but 180 degree phase-shifted output signals.

The center conductor ring is 1½ wavelengths in circumference (or six ¼ wavelengths) and each port is separated by 90°. This configuration creates a lossless device with low VSWR, excellent phase & amplitude balance, high output isolation and match output impedances. The low loss, airline construction also makes the device a perfect choice for combining high power mixed signals.



Hybrid Coupler

γ_a	<input type="text" value="1"/>
γ_b	<input type="text" value="1"/>
ϵ_{eff}	<input type="text" value="1"/>
<input type="button" value="Calculate"/>	<input type="button" value="Calculate2"/>

Result :

S11 :	-0.3333333333333333
S12 :	-0.666666666666666j
S13 :	0
S14 :	0.666666666666666j

Hybrid Coupler

γ_a	<input type="text" value="3"/>
γ_b	<input type="text" value="2"/>
ϵ_{eff}	<input type="text" value="1"/>
<input type="button" value="Calculate"/>	<input type="button" value="Calculate2"/>

Result :

S11 :	-0.8571428571428571
S12 :	-0.2857142857142857j
S13 :	0
S14 :	0.4285714285714285j

Thank You Sir, For the wonderful sessions during classes and this wonderful opportunity of making use of software for ECE Core work.

Doing this assignment, I learnt a lot.

References Used:

Stripline-like Transmission Lines for Microwave Integrated Circuits – Bharathi Bhat

<https://www.microwaves101.com/encyclopedia/branchline-couplers>

<https://www.microwaves101.com/encyclopedia/hybrid-couplers>

