8(a), (b)


```
Series and Parallel Resonant Circuits
*Uncomment the appropropriate sections to alter the circuits
*and to view the results.

*series resonant circuit
*V_src    vin   gnd  ac 1.0 sin  ;1v ac source, no dc value
*r_src    vin  tie1  1.0    ;1 ohm resistor to sense current
*c_net   tie1  tie2  2nf    ;2nf network cap
*r_cap   tie1  tie2  10Meg  ;10Meg ohm resistor, models capacitor leakage
*l_net   tie2  tie3  1uH    ;1uh network inductor
*r_ind   tie3   gnd  0.6    ;0.6 ohm, models inductor resistance

*parallel resonant circuit
V_src   vin   gnd  ac 1.0 sin  ;1v ac source, no dc value
r_src   vin  tie1  10k    ;10k ohm resistor to sense voltage
r_cap  tie1   gnd  10Meg  ;10Meg ohm resistor, models capacitor leakage
c_net  tie1   gnd  500pf  ;500pf network cap
l_net  tie1  tie2  2.5uH  ;2.5uh network inductor
r_ind  tie2   gnd  0.6    ;0.6 ohm, models inductor resistance

*T-line parallel resonator
*V_src    vin     gnd            ac 1.0 sin  ;1v ac source, no dc value
*r_src    vin  tl_in             10k         ;10k ohm resistor to sense voltage
*t_line tl_in  gnd  tie1  tie1   z0=50  F=5Meg  NL=.25 ; tline resonanator
*r_dummy tie1  gnd  1G      ;required DC path to ground for spice

.control
 set hcopydevtype=postscript
 set hcopypscolor=0
 set color0=rgb:f/f/e
 set color1=rgb:0/0/0
 ac lin 1000 1m 10Meg

*parallel circuit measurments
plot vm(tie1) vm(vin, tie1) ;V across and relative I through resonator
hardcopy parallel_circuit.ps vm(tie1) vm(vin, tie1)

*series circuit measurments
*plot vm(tie1) vm(vin, tie1)  ;V across and relative I through resonator
*hardcopy series_circuit.ps vm(tie1) vm(vin, tie1)

*T-line circuit measurments
*plot vm(tl_in) vm(vin, tl_in)  ;V across and relative I through resonator
*hardcopy tline_resonator.ps vm(tie1) vm(vin, tie1)

.endc

.end
```

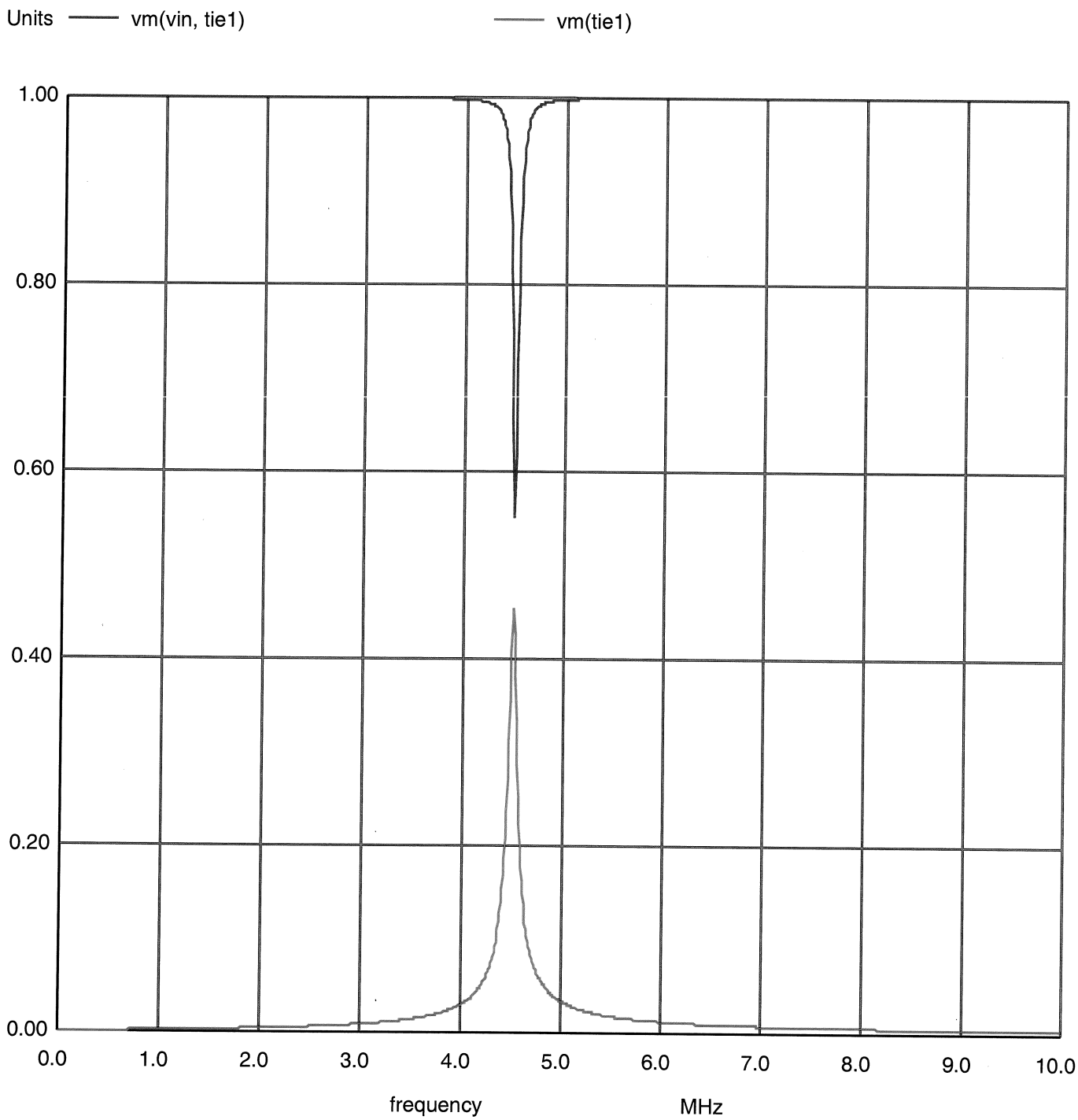
This file is downloadable from:

http://www.ece.orst.edu/~traylor/ece391/new_hw/quarter_half_behavior/solutions/resonator.sp

To run: invoke ngspice, within ngspice
> source resonator.sp

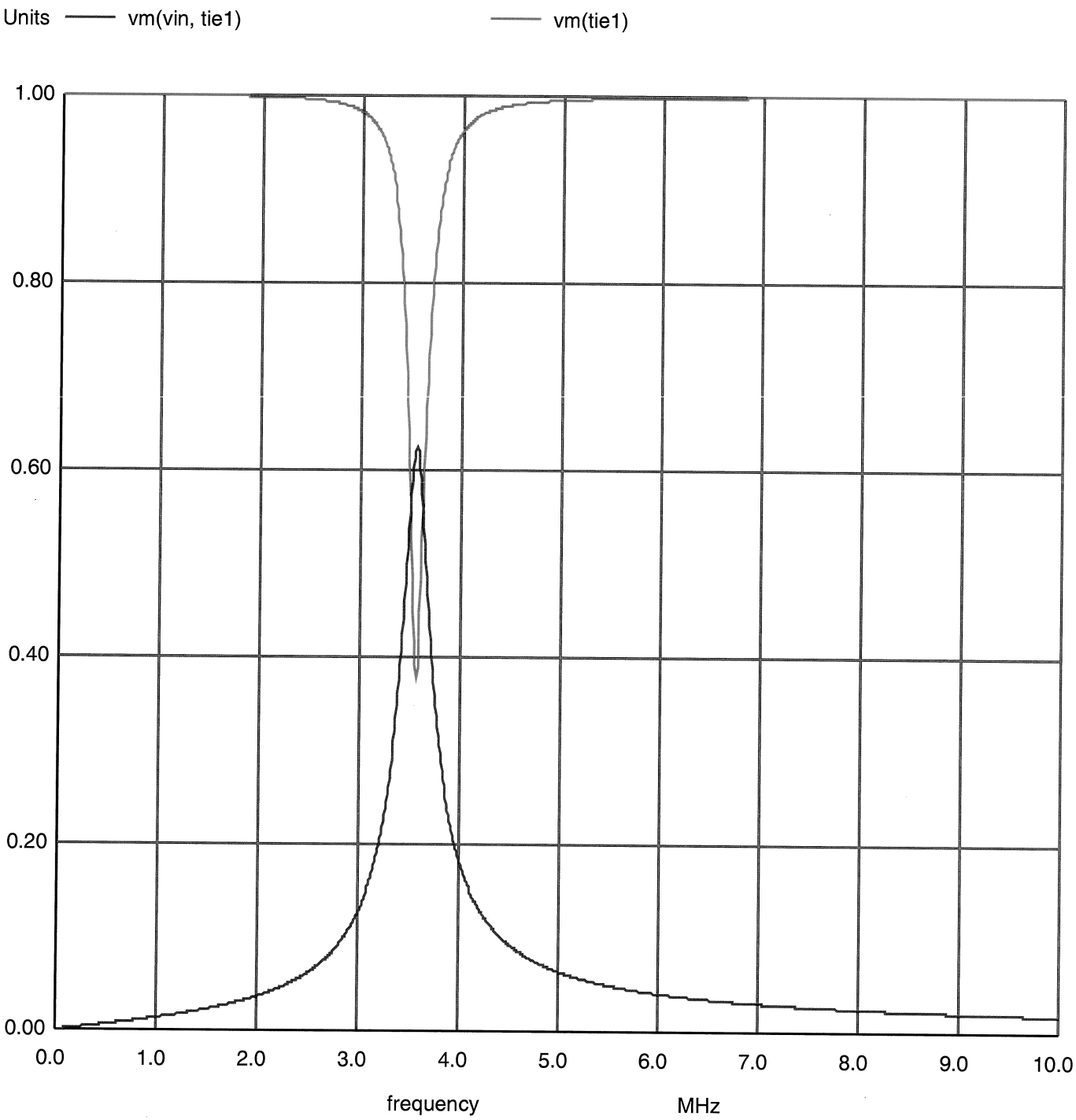
8 (a)

parallel resonant ckt.



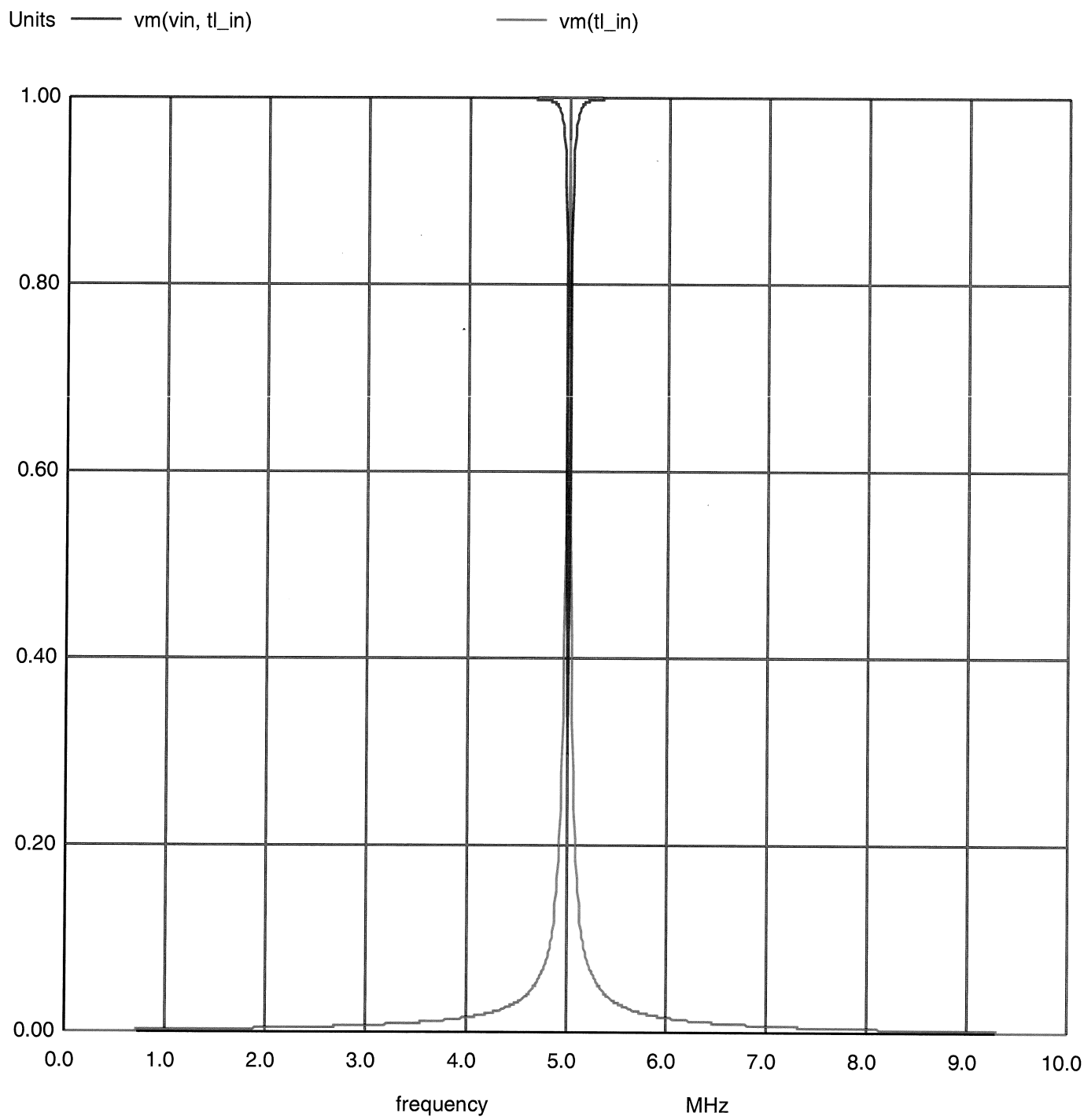
8(a)

series resonant ckt.



8(b)

t-line resonator (looks like parallel resonator)
8(d)



parallel resonant ckt w 1.6 Ω resistor in series with the inductor