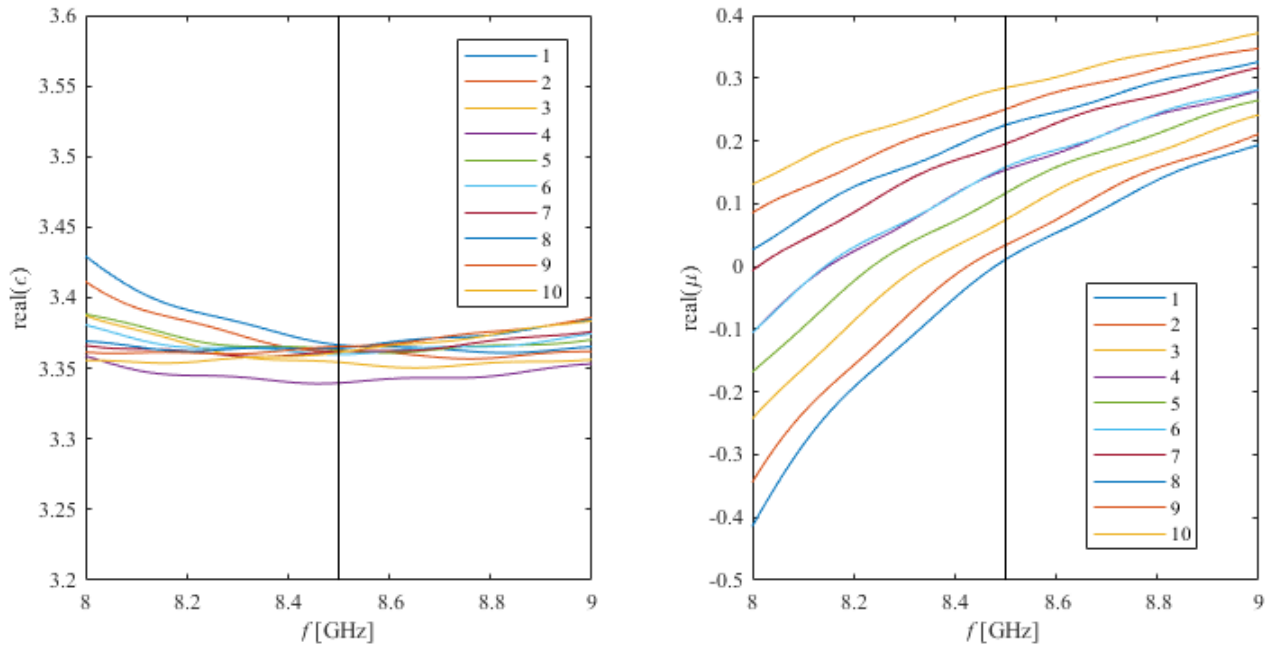
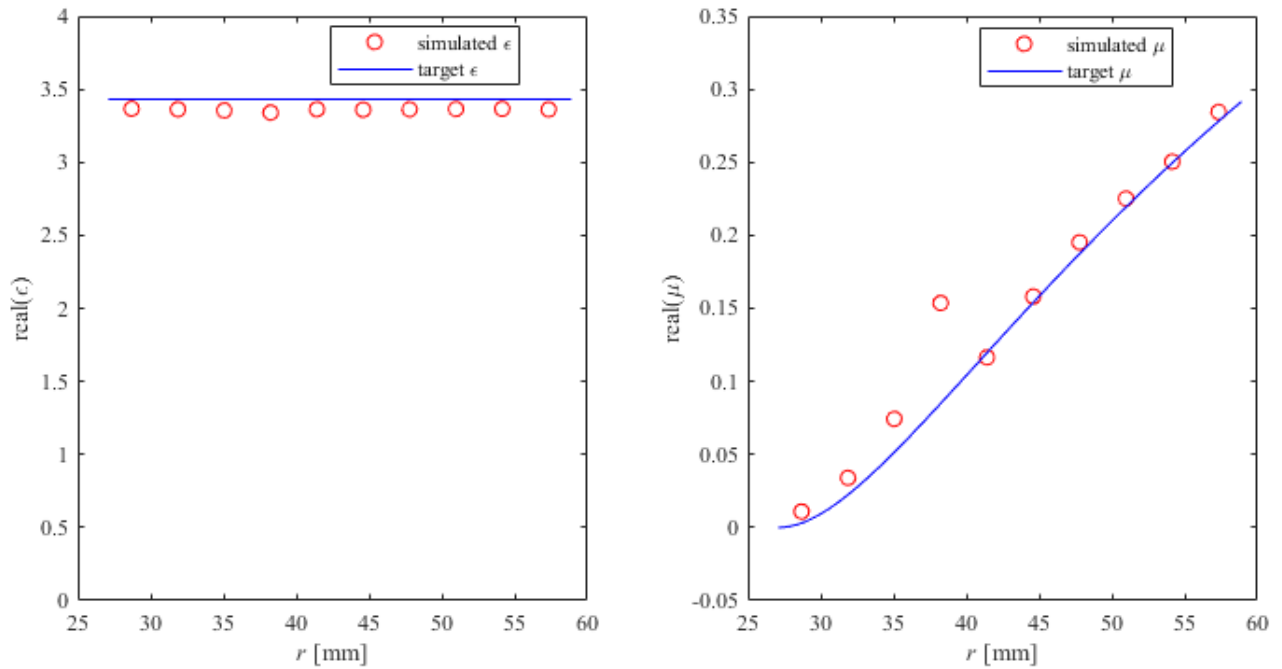


Assignment-II Solutions

1. The plot of the real part of the ten extracted material properties i.e. permittivity ϵ_r and permeability μ_r versus frequency:



2. The plot of the real part of ϵ and μ versus radius, r , in the cloak at the operating frequency:



3. The following is the table of the ten target values and extracted values for the real and imaginary parts of permittivity and the permeability of the extracted material properties. (The target values for the imaginary parts would be zero, since a lossless device would be ideal.)

For permittivity ϵ :

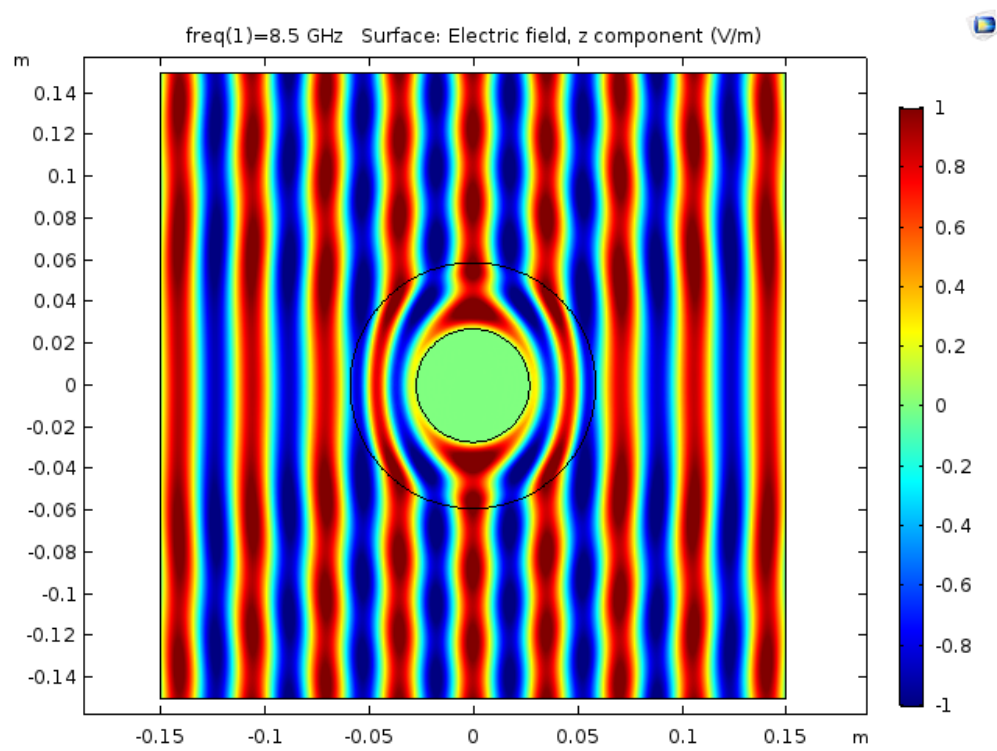
Radius (m)	Target Values		Extracted Values	
	ϵ_r	ϵ_i	ϵ_r	ϵ_i
0.028692	3.430649	0	3.366581	0.001002
0.031875	3.430649	0	3.361992	-0.000650
0.035058	3.430649	0	3.354332	0.002222
0.038241	3.430649	0	3.339634	0.001049
0.041424	3.430649	0	3.363023	0.003388
0.044607	3.430649	0	3.359829	0.002192
0.047790	3.430649	0	3.362014	0.002372
0.050973	3.430649	0	3.364302	0.002091
0.054156	3.430649	0	3.365396	0.003101
0.057339	3.430649	0	3.361247	0.001419

For permeability μ :

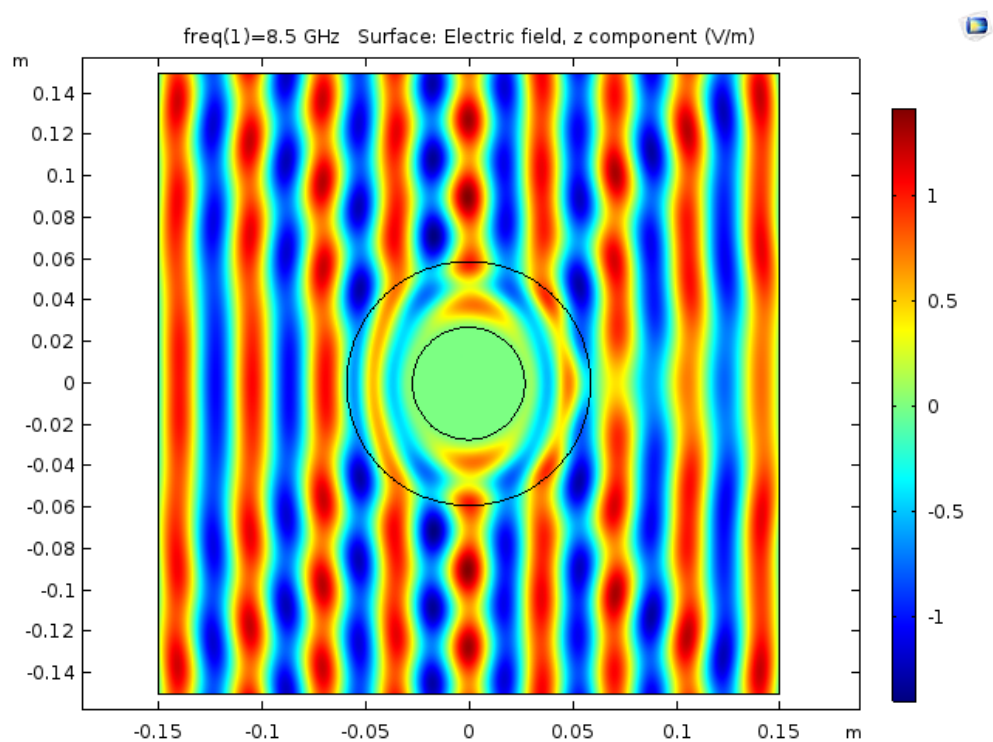
Radius (m)	Target Values		Extracted Values	
	μ_r	μ_i	μ_r	μ_i
0.028692	0.003077	0	0.010946	0.008745
0.031875	0.022439	0	0.033994	0.012017
0.035058	0.051524	0	0.074291	0.005267
0.038241	0.084875	0	0.153647	0.008511
0.041424	0.119570	0	0.116489	0.002092
0.044607	0.154034	0	0.158112	0.005060
0.047790	0.187434	0	0.195213	0.005501
0.050973	0.219350	0	0.225124	0.004802
0.054156	0.249596	0	0.250368	0.002477
0.057339	0.278125	0	0.284431	0.006149

4. The following are the plots for the invisibility cloaks:

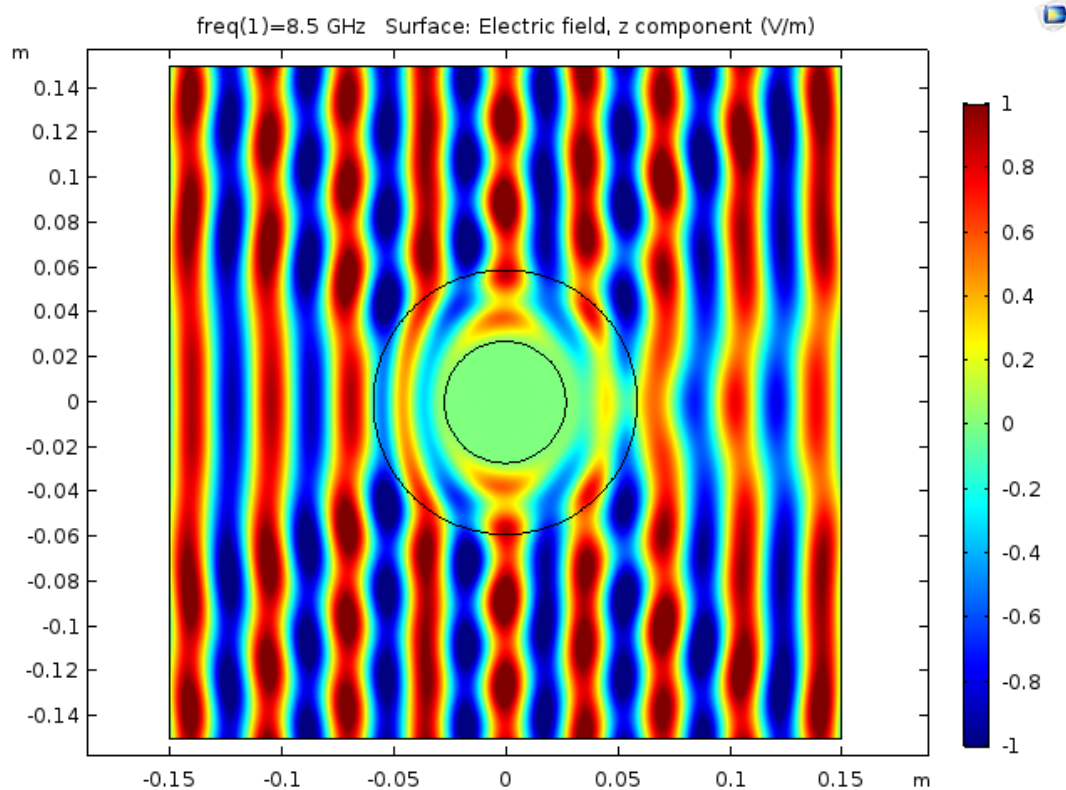
(a) Ideal Cloak



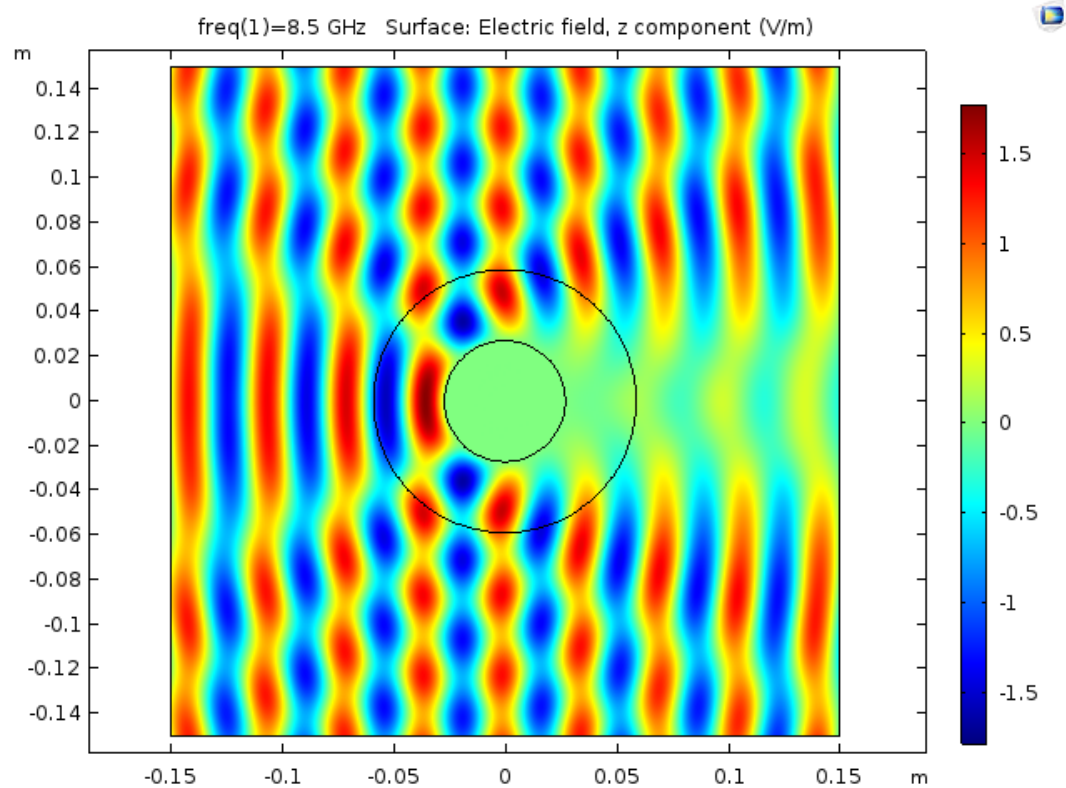
(b) Reduced Cloak



(c) Metamaterial Cloak

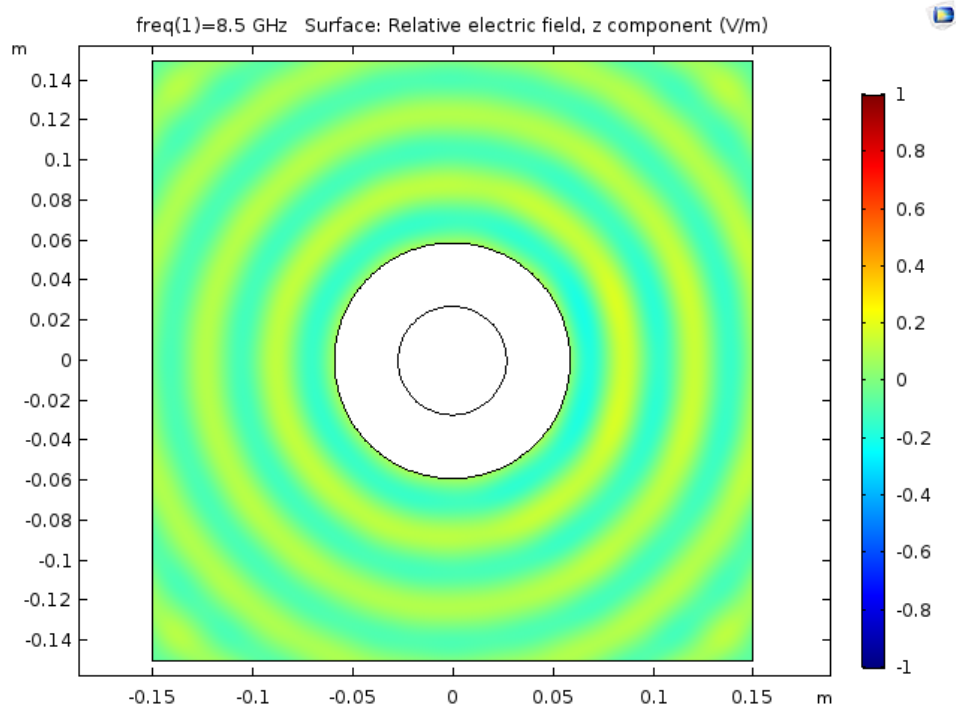


(d) No Cloak

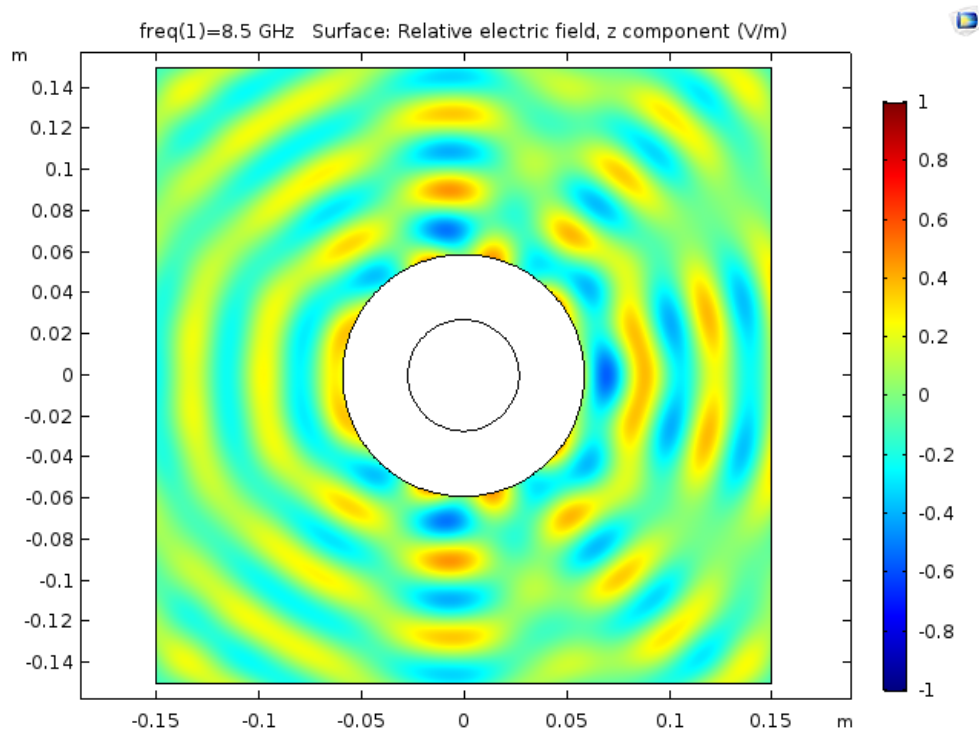


5. The following are the scattered plots for the invisibility cloaks:

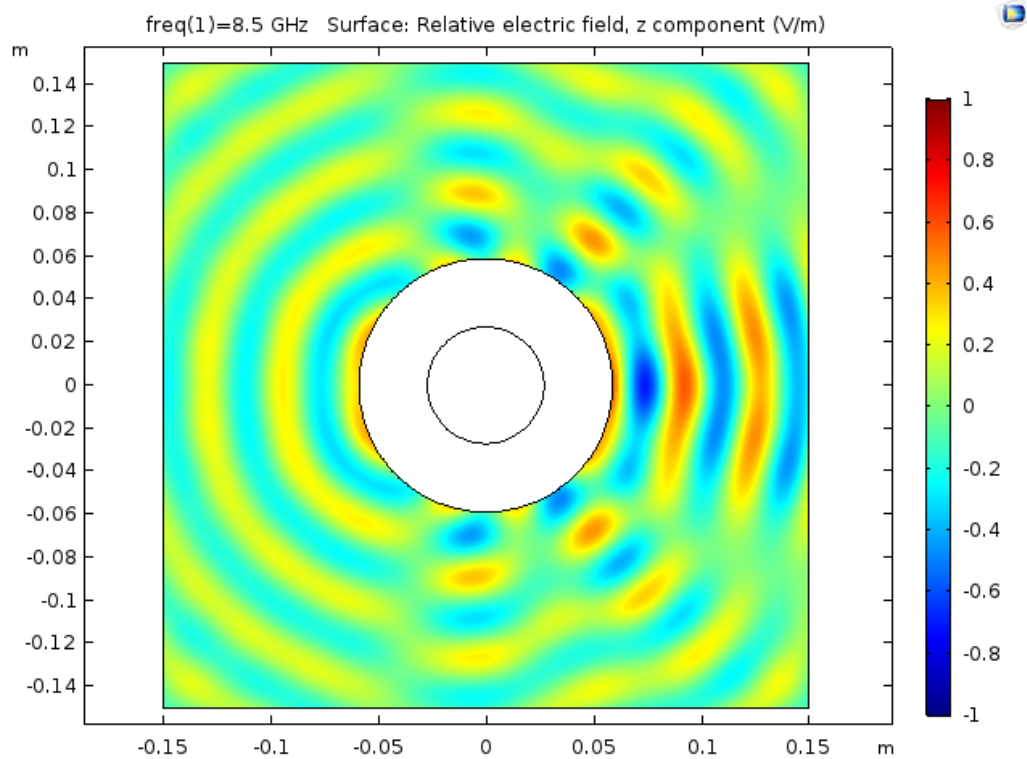
(a) Ideal Cloak



(b) Reduced Cloak



(c) Metamaterial Cloak



(d) No Cloak

