Antenna Theory and Design

Homework 11

20)

a) given radiating power

$P_{rad} = 5kW$

$R_{A1} = 28.175\Omega$

$R_{A2} = 58.26\Omega$

$R_{A3} = 37.25\Omega$

$R_a = 73\Omega$

$\eta = 20$ mile

$$P_{rad} = \frac{1}{2}\sum_{q=1}^{3} |I_q|^2 R_{Aq}$$

$$= \frac{1}{2}\left[(I_1^2 R_{A1}) + (I_2^2 R_{A2}) + (I_3^2 R_{A3})\right]$$

$I_1 = 7.62 \angle 0^\circ$

$I_2 = 7.5 \angle -162^\circ$

$I_3 = 7.7 \angle 36^\circ$

Substituting we get

$S_{max} = 7.201\ \mu w/m^2$

b) radiating power $P_{rad} = 5kw$

$$R_{A1} = 72\Omega$$

$$R_{A2} = 67\Omega$$

$$R_{A3} = 72\Omega$$

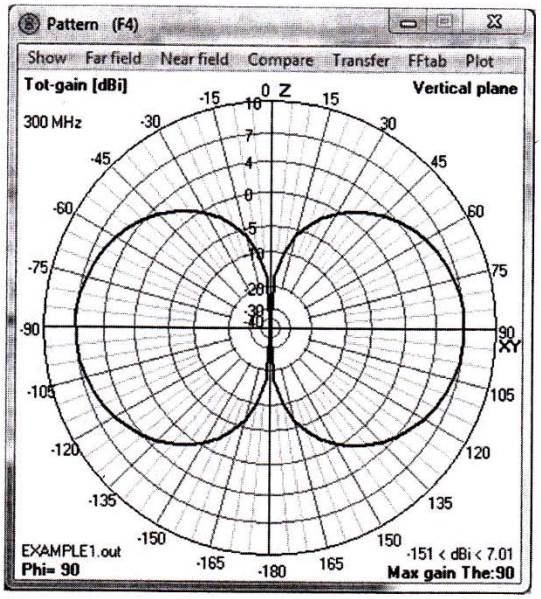
$$R_a = 73\Omega$$

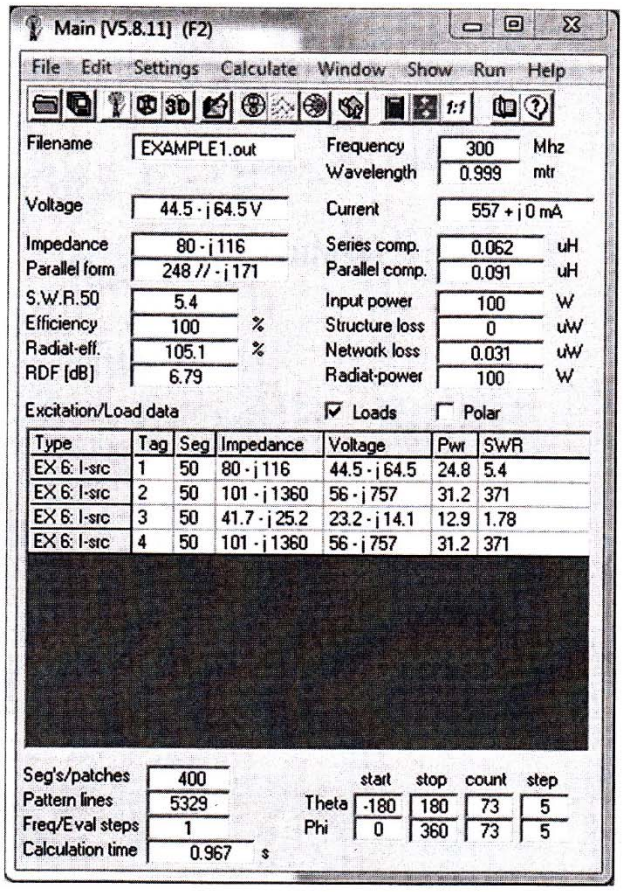
$$P_{rad} = \frac{1}{2}\sum_{q=1}^{3} |I_q|^2 R_{Aq}$$

$$= \frac{1}{2}\left[I_1^2 R_{A1} + I_2^2 R_{A2} + I_3^2 R_{A3}\right]$$

$$I_1 = I_2 = I_3 = 5.25A$$

So $S_{max} = 5.248\ \mu w/m^2$


Pattern (F4)
Show Far field Near field Compare Transfer FFtab Plot
Tot-gain [dBi]
Vertical plane
300 MHz
0 Z
15
30
45
60
75
90
XY
105
120
135
150
165
-180
-165
-150
-135
-120
-105
-90
-75
-60
-45
-30
-15
10
7
4
0
-5
-10
-20
-30
-40
EXAMPLE1.out
Phi= 90
-151 < dBi < 7.01
Max gain The:90


Main [V5.8.11] (F2)
File Edit Settings Calculate Window Show Run Help
Filename EXAMPLE1.out
Frequency 300 Mhz
Wavelength 0.999 mtr
Voltage 44.5 - j 64.5 V
Current 557 + j 0 mA
Impedance 80 - j 116
Parallel form 248 // - j 171
Series comp. 0.062 uH
Parallel comp. 0.091 uH
S.W.R.50 5.4
Efficiency 100 %
Radiat-eff. 105.1 %
RDF [dB] 6.79
Input power 100 W
Structure loss 0 uW
Network loss 0.031 uW
Radiat-power 100 W
Excitation/Load data
Loads
Polar
Type Tag Seg Impedance Voltage Pwr SWR
EX 6: I-src 1 50 80 - j 116 44.5 - j 64.5 24.8 5.4
EX 6: I-src 2 50 101 - j 1360 56 - j 757 31.2 371
EX 6: I-src 3 50 41.7 - j 25.2 23.2 - j 14.1 12.9 1.78
EX 6: I-src 4 50 101 - j 1360 56 - j 757 31.2 371
Seg's/patches 400
Pattern lines 5329
Freq/Eval steps 1
Calculation time 0.967 s
start stop count step
Theta -180 180 73 5
Phi 0 360 73 5

21)