Capitulo 13 : Horn Antenas

13.12) D_H= 12.12 dB

ρ_2=10 λ a_1=5.55 λ

13.14) show

13.15) a) p_e= 31.862cm and p_h= 31.825 cm , so yes it can be realized physically

b) for f= 10.3GHz, ρ_1=11.77λ, ρ_2= 12.38 λ, ρ_e=12.02 λ, ρ_h = 12.82 λ
a_1 = 6.67 l, b_1 = 4.927 λ , a=0.785 λ , b= 0.3488 λ

u = 1.7135, v =-0.9675, w =1.015 C(u)= .32, c(v)= -0.771, c(w) = .78
S(u)= .5359, S(v)= -.4063, S(w) = 0.44 Using eq13.52: D_p= 187.56 (22dB)

Using eq13.54e: A= 13.2, G_h= 98.7 B= 4.93, G_e = 81.55 D_p= 196, (22.93dB)

13.16) D_p = 15.26 dB (A= 7.2, B= 5.91, G_h= 71, G_e=58.7)

Capt 15 Reflector Antennas

15.7) R_{ff}= 1.33km @2Ghz and Rff= 2.67km @4GHz

15.10) a) cross-pol = $\sin\phi\cos\phi$ Minimum: $\phi = 0$ is zero; $\phi = 90^o$ it's zero; $\phi = 180^o$ is zero

b) cross-pol = $\sin\phi\cos\phi = \frac{1}{2}\sin(2\phi)$ Maximum: $\phi = 45^o$ is 0.5; $\phi = 135^o$ is 0.5

c)

$$E = (\hat{a}_x + \hat{a}_y \sin\phi\cos\phi) f(r,\theta,\phi) = \frac{(\hat{a}_x + \hat{a}_y \sin\phi\cos\phi)}{\sqrt{1+\sin^2\phi\cos^2\phi}} f(r,\theta,\phi) = \hat{a}_w f(r,\theta,\phi)$$

$$PLF = \left|\hat{a}_y \cdot \hat{a}^*_w\right|^2 = \left.\frac{1}{\sqrt{1+\sin^2\phi\cos^2\phi}}\right|_{\phi=45^o} = 1/1.25 = 0.8 = -1dB$$

d) $$PLF = \left|\hat{a}_x \cdot \hat{a}^*_w\right|^2 = \left.\frac{\sin^2\phi\cos^2\phi}{\sqrt{1+\sin^2\phi\cos^2\phi}}\right|_{\phi=45^o} = \frac{0.25}{1.25} = -7dB$$

e) PLF = 1= 0 dB if the receiving antenna has polarization of $\frac{(\hat{a}_x + \hat{a}_y \sin\phi\cos\phi)}{\sqrt{1+\sin^2\phi\cos^2\phi}}$ also.

15.12) a) D= 29.94 dB, and B) D= 28.3 dB (total aperture efficiency is .68)

15.19) $\theta_o = \tan^{-1}\left[\frac{\frac{1}{2}\frac{f}{d}}{\left(\frac{f}{d}\right)^2 - \frac{1}{16}}\right] = 50^o$ $\varepsilon_{ap} = 0.71$ D=58dB **b)** P_t = 557 μW

15.20) a) D = 42.67 dB **b)** P_t = 53μW **c)** P_t = 50.88μW

15.23) a) using fig. 15.27, f/d = 0.5, a_1=1.34 , b_1= 0.94 λ, with rho 1 and rho 2 any value