Amateur Extra Class License Manual
Notes For 2016-2020

E9CXX: Radiation Pattern of two ¼ Wave Vertical Antennas

Question	Wavelength Apart	Feed Phase	Radiation Patters
E9C01	1/2	180 Out	A figure-8 oriented along the axis of the array
E9C02	1/4	90 Out	A cardioid
E9C03	1/2	In Phase	A Figure-8 broadside to the axis of the array

E9FXX: Transmission Line Impedance

Question	Length	Far End	Impedance
E9F10	1/8	Shorted	Inductive Reactance
E9F11	1/8	Open	Capacitive Reactance
E9F12	1/4	Open	Very Low (not open)
E9F13	1/4	Shorted	Very High (not shorted)
E9F14	1/2	Shorted	Very Low
E9F15	1/2	Open	Very High

Effective Radiated Power

The Generals Class Exam Manual Uses The Term "anti log" and the Extra Class Manual Uses The Term "log $^{-1}$".

From Generals Class Exam Manual:

$$\text{Power in dB} = 10 \times \log_{10}(\text{Power Ratio}) = 10 \times \log_{10}(\text{Power Measured} \div \text{Power Reference})$$

$$\text{Power Ratio} = \text{Anti log}(\text{Power in dB} \div 10)$$

From Mathematics:

$$\text{Log}_{10}^{-1}(Y) = \text{Antilog}_{10}(Y) = 10^{Y}$$

Therefore:

$$\text{Power Ratio} = 10^{(\text{Power in dB} \div 10)}$$

From Extra Class Exam Manual:

System Gain = (Sum of Gains and Losses Of Everything From The Transmitter Output To The Antenna In dB)

Effective Radiated Power (In Watts) = Transmitter Power (In Watts) x System Gain

What The Extra Class Exam Manual Implies But Does Not Say Is That System Gain Is Expressed In "Power In dB" And Must be Converted To A "Power Ratio" For Proper Usage.

$$\text{Effective Radiated Power (In Watts)} = \text{Transmitter Power (In Watts)} \times 10^{(\text{System Gain} \div 10)}$$

E9H01 What is the effective radiated power relative to a dipole of a repeater station with 150 watts transmitter power output, 2-dB feed line loss, 2.2-dB duplexer loss and 7-dBd antenna gain?

1977 watts
78.7 watts
420 watts
286 watts ← ← ← ←

System Gain = 2 dB Loss + 2.2 dB Loss + 7 dB Gain = (-) 2 dB+ (-) 2.2 dB + (+) 7 dB = 2.8 dB

System Power Ratio = $10^{(\text{System Gain} \div 10)} = 10^{(2.8 \div 10)}$ = 1.905460718

Effective Radiated Power = 150 Watts x 1.905460718 = 285.8191077 Watts

E9H02 What is the effective radiated power relative to a dipole of a repeater station with 200 watts transmitter power output, 4-dB feed line loss, 3.2-dB duplexer loss, 0.8-dB circulator loss and 10-dBd antenna gain?

317 watts ← ← ← ←
2000 watts
126 watts
300 watts

System Gain = 4 dB Loss + 3.2 dB Loss + 0.8 dB Loss + 10 dB Gain = (-) 4 dB+ (-) 3.2 dB + (-) 0.8 dB + (+) 10 dB = 2 dB

System Power Ratio = $10^{(\text{System Gain} \div 10)} = 10^{(2 \div 10)}$ = 1.584893192

Effective Radiated Power = 200 Watts x 1.584893192 = 316.9786385 Watts

E9H03 What is the effective isotropic radiated power of a repeater station with 200 watts transmitter power output, 2-dB feed line loss, 2.8-dB duplexer loss, 1.2-dB circulator loss and 7-dBi antenna gain?

159 watts
252 watts ← ← ← ←
632 watts
63.2 watts

System Gain = 2 dB Loss + 2.8 dB Loss + 1.2 dB Loss + 7 dB Gain = (-) 2 dB+ (-) 2.8 dB + (-) 1.2 dB + (+) 7 dB = 1 dB

System Power Ratio = $10^{(\text{System Gain} \div 10)} = 10^{(1 \div 10)}$ = 1.258925412

Effective Radiated Power = 200 Watts x 1. 258925412 = 251.7850824 Watts

Quick Guesses:

E9H01. 2.8 dB is nearly 3 dB which doubles the power. 286 watts is closest to nearly double 150 watts.

E9H02. 300 watts would require 1.76 dB. 317 watts would require 2.00 dB. Remember this answer.

E9H03. 1 dB is a gain and it is less than 3 db which doubles. 252 watts is just a small gain and less than double.