Hot Tips

Good info for the new ham, and old stuff to refresh your memory

Why get a better antenna and coax

A friend recently asked me for some advice on his radio setup, which consisted of a 2-meter mobile radio connected by 75 feet of RG-8X to a Pockrus J-pole on his roof. He said he felt his radio wasn't giving him the punch he needed, to communicate with his son on simplex two towns away, even at full power, which is 50 watts. He wondered if I knew of a VHF / UHF radio that can crank out, maybe, 100 watts.

I knew where he and his son live, so I simply, and almost flippantly, suggested that he upgrade to a higher-gain antenna, something like the Diamond X300A. I told him, while he was at it, he should probably also upgrade his coax to LMR-400. Naturally, he wanted to know how changing two mere components would help more than a better radio, adding that, as he was increasing the power on his mobile radio, his son gave him increasingly improved reports.

So, we looked up the specs on the two antennas, and started making comparisons. According to published test data, the Pockrus J-pole has 2.6 dBi (or 2.6 dBi - 2.15 dBi/dBd = 0.45 dBd) of gain on 2 meters. According to Diamond's website, the X300A antenna has 6.5 dBi (or 6.5 dBi - 2.15 dBi/dBd = 4.35 dBd) of gain on 2 meters. At the same time, we looked up the loss figures for the coaxial cable. According to the coax chart, the loss on 2 meters per 100 feet of RG-8X is 4.5 dB, and the loss on 2 meters per 100 feet of LMR-400 is 1.5 dB.

Gains and losses measured in dB are nothing more than unit-less multipliers, calculated by

$$\text{number of dB} = 10\log_{10}(\text{output watts}/\text{input watts})$$

Their respective multipliers are therefore

RG-8X : 4.5 dB per 100 feet x 0.75 = 3.375 dB (about 54% loss, or 46% to the antenna)
LMR-400 : 1.5 db per 100 feet x 0.75 = 1.125 dB (about 23% loss, or 77% to the antenna)

The 0.45 dBd gain of the Pockrus J-pole translates to x 1.109
The 4.35 dBd gain of the Diamond X300A translates to x 2.723

So, if he's transmitting with 50 watts on 2 meters, the actual ERP (effective radiated power) is

RG-8X and J-pole = 50 watts x 0.46 x 1.109 = **25.5 watts (roughly half the maximum)**
RG-8X and X300A = 50 watts x 0.46 x 2.723 = **62.63 watts**
LMR-400 and J-pole = 50 watts x 0.77 x 1.109 = **42.7 watts**
LMR-400 and X300A = 50 watts x 0.77 x 2.723 = **104.8 watts (roughly twice the maximum)**

This means that if my friend upgrades his antenna to a Diamond X300A and his coax to LMR-400, his son can receive twice as much signal power, instead of a fraction of the power, his radio can put out. The words "his son can receive" are important here, because my friend won't be magically generating that extra 54.8 watts from nothing. He's simply *focusing more of the power he's sending out, to a narrower audience*, similar to how a parabolic flashlight reflector focuses more of the light in a particular direction. This is the definition of *antenna gain*.

And now you know why I've installed a tall antenna (Diamond X510HDM, in my case) connected by LMR-400 to my indoor radio. Let's see whether my friend does a similar thing.

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