Antenna Restrictions? Lose the Mic!

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As we know, far too many hams are affected by antenna restrictions: CC&Rs, zoning problems, rental properties, etc. Possible solutions vary with the specifics of the situation, some being more "solvable" than others.

What about hams who find themselves in the "less solvable" category but still want to operate HF? Unfortunately, there's a pattern that I've seen repeated all too frequently. The ham (we'll call him Sam) puts up a "stealth" antenna of some sort, buys a transceiver, and goes on SSB because it's the only mode he feels comfortable with. Besides, his buddy Fred, you know, the one who lives on a farm with a 100-foot tower, has so much fun yakking with his friends all over the world on 20 meters.

When conditions are right, Sam has a blast. Unfortunately, however, that doesn't occur very often, especially with sunspots being as rare as they are. In fact, Sam is getting increasingly frustrated. Why can't anybody hear him? When he does work someone, he has trouble getting his name and call across with a 3x3 report, let alone carry on a conversation. Sam now finds himself going on the air less and less. Before long, he'll probably sell the radio and go back on 2-meter FM, or even give up hamming entirely. I've seen it happen many, many times.

Does Sam's predicament sound like yours? There may be things you can do about it, even if you cannot improve your antenna situation. Here's one of the simplest: lose the mic, or put it away for use only on the local net. Switch to CW, or if that's not your thing, learn to use PSK or RTTY.

Don't get me wrong. I'm not anti-SSB. I've been on it since 1958, when I built a Central Electronics 20A phasing exciter. It's just that the laws of physics are what they are, and SSB is so inefficient compared with CW and digital modes that for those unable to have a good antenna, the latter will be far more effective.

How much more effective? Let's begin by looking at bandwidth. A CW transmission, at 25 words per minute, has a baud rate (bits per second) of 20. Typical keying and HF fading characteristics combine to produce an effective noise bandwidth at the receiver of up to 100 Hz. PSK31 has a baud rate of 31, by definition, and the typical effective noise bandwidth is also approximately 100 Hz. RTTY, with a baud rate of 45 and 170 Hz shift, has a typical effective noise bandwidth of around 250 Hz. The effective noise bandwidth of an SSB signal can be up to 3 kHz, but we'll use 2.4 kHz for our analysis. All of these figures are approximations, but they are close enough for our purposes.

CW, PSK31 and RTTY are all "key down" modes. When the transmitter is keyed, average power equals peak power. Not so for SSB. Without speech processing, average power is typically a small fraction of peak power (PEP), depending on voice characteristics. For our analysis, however, let's assume that the processing and ALC are turned up pretty far, so that average power is 50% of peak.

Now, we can put these figures together to determine relative effectiveness, as measured by the signal-to-noise ratio (SNR). As compared with SSB, the noise bandwidths of CW and PSK31 are about 24 times narrower, so the noise level is approximately 14 dB lower. Factoring in SSB's 50% average power results in the SNR for CW and PSK31 being approximately 17 dB greater than that of SSB. A similar analysis for RTTY produces an SNR advantage over SSB of approximately 13 dB.

What do these SNR figures mean for you? If you are running 100 watts (PEP) to a dipole, switching from SSB to CW or PSK31 would be equivalent to adding a 1 kW amplifier and a 3-element beam (at the same height as your dipole). If you then switch from CW to RTTY, that would be equivalent to turning that 1 kW amplifier down to 400 watts, but that's still 20 times more effective, in SNR terms, than 100 watts to a dipole.

Looking at it another way, let's say that you are running 100 watts to a "stealth" antenna on CW or PSK31. Switching to SSB would be equivalent, in SNR terms, to reducing your power output to just 2 watts. No wonder Sam has so much difficulty being heard!

For ham radio to be fun, you have to have a signal good enough for the receiving operator to understand you easily. That usually requires a reasonable antenna -- for example, a dipole, in the clear, at least half a wavelength above ground. The performance of many "stealth" antennas is often several "S" units below that. If you've already done all you can to improve your antenna, why not put the 13-17 dB advantage of CW and digital modes over SSB to work for you?