

The Radio Hotel Field Day -- A Curious, Ham Radio Confluence

by Rick Hiller W5RH

If you have never been to a Ham Radio Field Day, please, make time to come out to the BVARC, TDXS, KARS, ECHO Field Day on June 22nd and 23rd. A lot happens on Field Day. In fact, things are happening now as far as planning for radios, antennas, operators, food, computer logging and many other things. For a large Field Day operation like ours, it takes a lot of gear, coordination and people – neophytes to experts – all are welcome and encouraged to come out and participate in any aspect. One important personal area for you to take advantage of is to learn something new. Lots of opportunity in the learning department. Just extend your introduction and questions to those that know and you will learn.

When I started writing The Radio Hotel 5 years ago I had one goal in mind: “*The purpose of The Radio Hotel is to give you a practical kick start into exploring the workings of antenna systems*” That “practical kick start” is what most Hams need at the beginning of their trek. I know I did. In Ham Radio there are a lot of working parts and putting it all together at times is difficult. That is what Elmers are for. Helping and guiding you through the technical jungle. Even a simple 2 Meter FM or HF station at the house has radios and power supplies and coax and antennas. Plus, all the things that go along with that – finding the perfect room for your shack, getting your spouse’s permission, drilling holes in walls, multiple visits to Home Depot, climbing on your roof, throwing ropes up into trees, etc. All of this for just one single Ham Radio station.

Now, visualize, if you will.....a Ham Radio station with ten (yes,10) HF transceivers connected to multiple dipole, mono-bander and tri-band Yagi antennas with all of the radios and antennas operating at the same time and, get this, all of this gear within 350 feet of each other. These transmitters and receivers are on 5 different bands that are harmonically related – 80,40,20,15,10 Meters. From your license study about harmonics and RFI, etc. you know that there will bound to be RF interference between the different stations due to these harmonic relations and the closeness of the 100 watt stations and antennas to each other. 100 watts is not high power, but with 10 transceivers operating simultaneously, it is certainly enough total RF to cause a few interference issues.

So, what do you do about this interference issue? Luckily, we have experts within the multiple clubs participating that can apply their RF knowledge to alleviate (unfortunately, at times only minimize) these interference issues. A few things can be done:

***Each K3 transceiver** is on a specific band, and it will have a matching Band Pass filter connected to its’ RF/Antenna connector. This filter passes signals, both transmit and receive, within the band but attenuates signals outside the band and, therefore, on harmonically related bands. K3’s analog Roofing (1st i.f.) Filters and DSP Audio filters help dramatically with interfering signals on the same band but different modes.

***Antennas** – antennas are physically separated as much as possible. Signal strength loss thru air is quite high, so this helps a lot. Gain antennas – the two 40 meter Yagi-Udas are separated by 200 feet as are the 3 element tri-banders. Plus, lucky us, in Texas we have no states to work south of us so our gain antennas can point NW thru NE and hit most of the folks we want to work. The “gain producing end” of the Yagi-Udas will not have to point into each other.

***Coaxial cable** has loss and will attenuate the desired signal slightly in the 200 feet runs. We use very good coax so radiation from the feedlines is negligible, providing maximum station isolation.

Putting all of these solutions together makes for a marvelous interference free Field Day so fun can be had by all. Come see how it is done and get on the air with us. Enjoy your hobby. 73...Rick W5RH

Field Day Antennas and Rigs – An Interactive Dilemma

by Rick Hiller W5RH

The June 13th meeting will have a short, but indepth, presentation on this subject

Visualize, if you will.....a Ham Radio station with 10 HF transceivers connected to multiple dipole, mono-bander and tri-band Yagi antennas with all of the radios and antennas operating at the same time within 350 feet of each other. Now, further imagine how much RF this puts into the air. And as RF goes, it goes everywhere, even where you don't want it to go. This describes the situation at our BVARC/TDXS/KARS/ECHO Field Day.

So, with W5VOM's purposeful and beneficial placement of the towers and antennas (**see the picture**) and with the use of an appropriate band pass filter on each of the 100 watt K3(S) transceivers and tri-bander triplexers, we can all work in concert toward a common Field Day goal with minimal inter-station interference. A semi-detailed view of how and why this interstation interference prevention scheme is implemented follows below.



Field Day Antenna Set-up Plan 2019 (aerial view)

The Simple Field Day Case: Take the 40 meter band for instance, (probably our worst case band). We run Phone and CW on 2 separate 100 watt K3's each driving a 2 element, rotatable, Yagi-Uda "gain" antenna.

Receiver Damage: Now, consider that a 100 Watt output from a K3 is 50dBm (dB in reference to a milliwatt). This is a very, very strong signal for any receiver, so we need to reduce the possibility of such a strong signal getting to the other K3 receiver where it will cause major damage. [FYI -- Damage to a K3 input will happen at a +17 dBm(75 mW) level.] Therefore: We need to have any signal received at a K3 input be less than +17 dBm.

Path Loss: The 50 dBm transmitted signal has a ways to travel before getting to the other K3 and most of the path has loss. From the K3 the RF goes thru the Band Pass filter (.3 dB insertion loss), then 200 feet of transmission line (.5 dB loss), the Yagi antenna (gain forward, but to the side maybe 0 dB) and then the 200 feet of air between the 2 Yagis (about 35 dB path loss – calculated), it is then received by the other Yagi (again, 0 dB from the side), thru another 200 feet of coax (.5 dB) to a band pass filter (insertion loss .3 dB) then into the receiving K3. It is close to +13dBm at that point and just under the damage signal level. Good.

A More Important Signal Level: Now, 40 Meter same band signals for SSB and CW are separated by a frequency delta of about 150 KHz and both receivers have substantial analog, first IF "roofing" filters in place. Plus, the internal steep skirt DSP based audio filters add to that filter attenuation path loss. The spec for the K3 is the "2 kHz Blocking Level" -- meaning, how strong can a close-in signal be before causing receiver blocking (or other distortion). Blocking occurs when the K3 just begins to overload from a signal outside the desired passband (i.e. 400 Hz CW filter). The K3 2KHz Blocking signal level is + 5dBm, still way above the -12 dBm S9 + 60. Thank goodness for that.

Other signal distortions can occur from the Phase Noise and Harmonic production of the transmitter, etc. but with the efficient design of the K3 (both receive and transmit), all of these distortions can be handled more readily these days versus a receiver of 20 years ago. To know more, visit <http://www.sherweng.com/table.html> for the Receiver Rating Chart and the PDF "Terms Explained -- Sherwood Table of Receiver Performance" and read the book "Managing Interstation Interference" by George Cutsogeorge W2VJN