Comment on FCC Docket 15-99
By
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Subject: Amendment of Pts. 1,2,15,25,27,74,78,80,87,90,97, and 101 of the Commission's rules regarding Final Acts of the WRC 07

1. Introduction

I am a retired former electrical engineer with Martin Marietta at the NASA Michoud Assembly facility. My responsibilities in that job mostly concerned the control systems used in the facility to produce the Space Shuttle External Tank. I know the general engineering principles upon which the control and monitoring of the power grid must be based. I am familiar with the RF noise produced by industrial equipment and the methods necessary to protect control systems from interference, but cannot comment directly on the power company sensitivity to interference since I never had the need-to-know that industry.

I have held an amateur radio license since 1956 (Now W5THT extra class), a first-phone, second telegraph, General Radiotelephone with Ship Radar endorsement, USAF Heavy Ground Radar AFSC, and am part of the ARRL-sponsored WD2XSH 600 meter experiment (WD2XSH/6).

In paragraph 171 of FCC 15-50 the FCC asks
"We likewise invite information on the technical characteristics of amateur stations that are likely to be deployed or have operated under experimental licenses in these two bands."
And
We also seek comment on service rules for amateur stations in both these bands that will allow the amateur stations to coexist with Power Line Carrier (PLC) systems, which operate in these bands.

It is in response to this invitation that I submit these comments for the proposed 630 meter band based on my experience.

According to the city map, I am a mile south of an east-west street which contains tall cement poles with wide-spaced power lines. These wires feed the Navy Seabee base. I have no need-to-know the voltages or control signals on these wires. In the thousands of hours I have transmitted as WD2XSH/6 I have had no interference reports.

2.
Radio amateurs are not usually professional radio engineers. That does not prevent them from the inquisitiveness that leads to experimentation. I was lucky enough to learn of the ARRL-sponsored WD2XSH group and become their unit six a decade after I had changed careers to software engineering. The "new thing" to the average ham is meeting the requirement of power output limits which are specified in EIRP/ERP.

E-field probes can be purchased for under $150, or built by the experimenter for about $30. Simple math from documents we have used in the WD2XSH experiments allows field strength to be converted into ERP. When measurement of field strength is not practical such as in a crowded city or equipment is not available, the experimenter can use his measured impedance combined with antenna-efficiency graphs. I have successfully used this method in the ARRL-sponsored WD2XSH experimental license.

There are two basic types of antennas, the "E"probe and the "H" loop, both of which have been successfully used in the 600 meter experiment. My own transmit experience is with the "E"probe in the form of an inverted "L" antenna of wire suspended from trees on a city lot.
I have receiving experience with the same antenna and also a shielded loop antenna with about a four-foot radius.

2a Amateur Receiving:
When a lightning arrester on the tall transmission lines listed above failed a few years ago, the ham bands, AM broadcast, and experimental bands were blanketed with noise until it was repaired. As an experimenter using free software such as ARGO mostly for CW, I have seen traces of many strange signals in the 630 meter passband. Digital software such as WSPR ignores these extraneous signals, as does the other free "Joe Taylor" digital software unless the receiver is overloaded.

Reading over the years and from my own control system experience, I do not believe that believe that a properly functioning wire line control system hardened for protection from the hackers we hear about on TV news will cause a problem to a ham operator -- Unless the antenna is actually coupled into the lines such as the farm-legend power-stealing-by-induction schemes. I am not qualified to determine the amount of induction from the power system based on distance.

2b Amateur Transmitting :
My experience with antennas on my city lot (120 foot square) with houses, shed, garages, and radials limited to on my own property has led to several improving versions of compromise antennas.

I started 600 meters with a 160 meter inverted-L antenna supported by trees and over other small trees and a base load coil (big plastic flower pot wound with wire), and progressed to a capacitive loading 90-foot long eleven-wire flattop 10 feet wide on one end and five feet wide on the fed end. Directly bolted under the copper-pipe spreader was the inductive top loading coil which consisted of a 16 inch diameter single layer of fiberglass cloth epoxied and wound with copper tape.
A 45 foot long radiator of eighteen wires twisted together ran from the top of the tuning box to the bottom of the coil. The most evolved tuning box contained the local and remote ammeter and a ferrite matching transformer. The addition of the 630 meter frequency range required adding a remote roller coil in the box.
My prior (1971) experience as a broadcast engineer helped me know where to measure "R" and "X" and make changes to get the best (pitifully poor) efficiency. I had access to a local lab to check the accuracy of my RF ammeters and Jasik (first edition LF antennas chapter) to calculate the radiation resistance of an ideal antenna with my height. The average ham does not have this experience. I needed the easily available advice of other experimenters to apply the necessary factors to change ERP to transmitter power.

2c Conclusion based on above:
I believe for the "average ham" without the field-strength measuring ability an OPTIONAL (not required if field strength is used) service rule to determine the correct or maximum transmitter power should provide or reference two graphs of perfect lossless antenna height, one with no top load and one with full top load for the 5 watt ERP level. With the factors already calculated into the graphs, the ham can read the lossless radiation resistance from the graph, and measure his own total resistance, and then calculate the transmitter power level he cannot exceed to drive the maximum allowed antenna current through his radiation resistance. Since nothing physical is perfect, there should be no danger of exceeding the ERP/EIRP limit.
Creating the two graphs for heights up to 200 feet should require an engineer less than an hour with modern software. Copyright questions are beyond my pay grade.

3. Personal Opinions:
American Part-5 experimenters have successfully used 20 watts and more ERP without causing interference. If we are headed into another Maunder Minimum, the ERP/EIRP limit should be reevaluated each few years as well as the width of the band. AM broadcast radio has proven that signals in this frequency range can make it into and out of an emergency affected area when other methods fail.

The American amateur radio experimenter knows not to “trust the salesman”. His satisfaction comes from making a contact with something he has created wholly or partly himself.
With modern DSP, only a few will be able to design and build receivers able to cope with the characteristics of 630 meters.
The more likely transmitter experimentation will run every where from my own proof of concept “junk box and donation tube transmitter” to esoteric class “D” and “E” FET stations.

Concerning allowed emissions:
One Christmas, Hellschriber ran Santa Claus across the experimenter receiver ARGO screens along with the QRSS and CW signals.
Without the ability to transmit certain digital test modes, the WD2XSH group had to receive-only the digital tests of other experimental stations.
With the freedom to experiment, who knows what will be found? Narrow digital voice may be developed.
I have insufficient data to determine if geology really affects propagation, but there appears to be a definite difference in signals going north and those coming south.
CW operating fills an emotional need for many operators, and the ability to operate CW on the frequencies that ancestors used should not be eliminated.
Channels should not be specified, they would prevent stations in different geographic areas from communicating in roughly the same frequency by slightly offsetting transmit frequencies.

I really believe that the only emission type prohibited should be those with bandwidths beyond the band edges, such as full-carrier AM and high-power pulses.

Concerning another service rule:
The existing experienced Part-5 experimental operators can help the first batch of hams arriving on the band learn to prevent interference and achieve satisfactory operation. The fine-tuned-over-years experimental stations can hear the weak first attempts of new ham stations and the unfamiliar ham can hear the higher-power experimental station and learn to copy through noise or optimize his digital reception.
Making this feedback of signal quality instantly available to the new ham will eliminate harmful interference to other services. My own experience indicates that six months would be the reasonable time for the design and construction of a 630 meter station. An additional year will allow two “seasons” of “Elmering” intercommunication as new hams appear.

For this reason, there needs to be limited-duration permission available to existing part-5 amateur experimenters to contact American amateur

stations and American amateurs to contact the noncommercial part-5 experimental stations.

Respectfully submitted,
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