

# MY TOWER CAN HEAR

A companion article to My Transmission Line Can Hear

AN ARTICLE

BY

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In a land far away lives a tower that is not to very tall, and not to very old. This tower belongs to a public safety group that is associated with an ancient group that operates the tower as a rental facility. On the tower among other things is a relatively low power FM station that is not running any digital carriers, the Public Safety Trunking System, some little data services, and the odd Two-Way-Radio conventional narrow band channel.

Nothing on the tower is as ancient as the owners of the site. Nothing on the tower is in any danger of departing the toothpick in high wind. Everything on the tower seems like a fairy tale of cotton candy and corn dogs, and then the complaints started.

The Public Safety System started to vent their displeasure with complaints of de-sense on their receivers with poor receive range coverage, high noise levels, intermittent interrupted communication on the in-bound side, and totally random time constraints. Yippie, this is just what the tower owners wanted to hear. Being resourceful folks and with the help of the WWW, they contacted me and asked for some guidance for diagnosing this totally random issue.

Information started pouring in from the contractors that work on the electronic systems at the site. Of primary importance was the data that was being gathered by the maintenance groups for the FM and the Public Safety Trunking System. This Trunking System is an advanced system in the 450mc band and incorporates some very high tech equipment. Perhaps the most interesting is the tower Top Receiver System that is manufactured in Europe and is used by many top dollar-money no object organizations as it has both top and ground amplification, switchable filtration, bypass capabilities and multiple attenuation points and settings. This is truly a working wizard of Tower Top Amplifiers. A companion feature to this wizard box is an internal ability to link total control of the system and Spectral Analysis over the internet. WOW.

The only hamper to the diagnostics is the remote location of the site and the difficulty of being able to get the various contractors and tower crews out to the site to perform the next steps toward the diagnosis of the source of the noise.



After many attempts to gather information and point a bony finger, we focused our thoughts on the Tower Top Amplifier system. We pretty quickly removed this idea from the suspect list and the next step to the diagnosis was the realization that the receive and transmit antennas of the Trunking System were pretty well worn and possibly suffering from lightning and borderline poor V.S.W.R. so they were changed out.

The concern for internal arcing of the bonding loops inside these colinear type exploding cigar antennas was only partially founded. The change out of the antennas was partially positive but the noise persisted.

Further testing with a local Line Sweeping person revealed that some of the jumpers associated with the receive system on the tower top were intermittent. After the jumpers were changed out, the noise remained intermittent and annoying since everyone kept leering at the FM as the culprit.

While periodically operating at half power to placate the problem, the FM transmitter was carefully examined along with the antenna and with the Spectrum Analyzer both directly and over the air with a sampling antenna, nothing was found out of parameters for the flame throwing 15kW ERP. The relatively new solid state R.F. generator was indeed in very good condition and operating properly.

Time passes, the complaints grow in occurrence and in severity. Neither time of day, temperature, or weather seemed to play a factor. Everything that has been tested and replaced only seems to placate the noise briefly and then it comes back with a vengeance. After over a year of chasing these issues with most of the delay due to waiting for the various contractors to do their thing, a conference call was held.

I had recommended that a tower crew go up the tower and visually inspect everything and all of the inhabitants that were above and below the four bay full wave spaced FM antenna for at least 150 feet. I recommended that every fastener on the tower be loosened and then tightened to the specified torque value and when loosened sprayed with cold galv paint and tightened, then sprayed again. With the unavailability of a tower crew, this next procedure was pending and the noise has become so frequent, and so debilitating that things were getting a bit testy between the parties.

Almost as a joke but still being dead serious with my desire for a crew to perform the re-torquing of the fasteners and spraying at least a case of cold galv spray, I asked if one of the people on site has a big hammer. Everyone laughed and wanted to know why. I said I want you to take a big hammer out to the tower base and fram the tower five or ten times and watch the spectrum analyzer in a format that I had specified. With the spectrum Analyzer running at high speed within the filter range of the tower top combline filter, focusing on the receive frequency spread of the Trunking receivers, 300kHz resolution band width and 1mc video band width, one of the attendees said yes, I have a five pound maul.

Then the fun began:

The play by play description was way too funny while I was watching the Spectrum Analyzer and listening to the goings on via cell phone on video chat. The play by play continued.

He is grabbing his hammer, he's walking out the door, he's headed for the tower base, he's raising the hammer and fram, fram, no reaction on the Spectrum Analyzer, fram, fram, fram, tension was thick in the air, another enormous FRAM, it was so loud, that I could hear it on the cell phone from inside the building and presto, the Spectrum Analyzer jumped up like an instant grow Chia pet. Ok once is good, twice would be better. They cleared the peak hold on the Analyzer and once again there was a world shattering **FRAM** and the display on the Analyzer grew to -40dB of jagged noise in one pass. Without provocation the attending tower owner blurted out, MY TOWER CAN HEAR and we scared the daylights out of it.

#### CONCLUSION:

The tower crew was dispatched to the site with great haste and in total, there were numerous leg bolts that were not properly tightened and were showing signs of arcing and corrosion, all in the aperture of the FM antenna. The moral of the story is be sure that your inspections of the tower includes testing of the fasteners. They should be loosened AND tightened, and don't tell dirty jokes around your metal.