

Current and Recent Examples of Interference for Public Safety

1. In January of this year, the Washington Department of Natural Resources (DNR) worked with the only local (Seattle-area) FCC Enforcement Officer, to identify a source and resolve an interference issue. The issue was an almost constant co-channel signal on the output of a DNR area repeater in the Port Townsend area. Mr. Larry Zanella, FCC Field Enforcement Agent, was helpful in identifying the issue as coming from a new NEXEDGE ® installation in Cowlitz County. It was most helpful that Larry took an even-handed approach; rather than moving directly to enforcement, he allowed both parties to work together to resolve the interference, thus preserving positive relationships between public safety agencies.
2. Yorktown, VA – An interference was placing noise on a main radio channel, wiping out communications. The source was identified as a Pine Row, VA cell tower. Two FCC enforcement representatives were deployed on the weekend, and it was resolved.
3. Florida – Other issue that we have had is surplus radio product being sold on Ebay and other websites that can easily be reprogrammed with a control channel; thereby temporarily knocking out our system until it locks the channel out. The email example (below) illustrates an issue currently happening:

Sunday April 19, 2015 - Broward County Public Service Trunked Radio System (TRS) has been experiencing some major interference issues since last week (mainly the western portion of the County from north to south). It has been identified that 8CAL90 is also impacted, as well as areas in Miami-Dade. Palm Beach has advised that they are currently not affected. This interference is also affecting the SLERS users in Miami and Broward. The portable units are the most affected.

April 20, 2015 -Since Thursday, April 16, 2015 afternoon agencies on 800 MHz spectrum in the southeast have been experiencing interference.

Radio Systems Impacted by Interference:

Miami-Dade County
City of Miami
City of Hialeah
City of Aventura
Broward County
State of Florida (SLERS portable radios in the area)

Areas impacted by Interference:

South of 595
North of Flagler

While continuing to send teams to try to determine the source of the interference, yesterday we discovered a substantial increase in the noise floor on our RX band radiating in the downtown area. While in a helicopter we were looking at a -70 dbm signal.

Based on the field units, it was determined that a 45 story building downtown (Biscayne Blvd NE 28 St) had a very high signal. The new building had 5 Bi-Directional Amplifiers (BDA) that were activated on Thursday 4-16. The senior project manager at the site agreed to turn off the equipment. This took place shortly before midnight.

The FCC field office is arrive on scene today (4/20/2015) and will assist us if there is still interference occurring.

4/20/2015 afternoon - Unfortunately, the FCC hasn't sent anyone to assist us. I opened the case with the FCC Crisis Center yesterday and they were scheduled to come today. I spoke to the field agent to find out their estimated time of arrival and he indicated that he thought the interference was resolved when we found the BDAs last night. Therefore, no one came today. He stated that he would assist us and come tomorrow, if needed. We are still experiencing some interference, but at a much smaller level. Listed is a summary of some of the issues going on from Thursday (4-16-15) afternoon through today: Over the weekend we experienced intermitted issues with Radio communications affecting mostly areas north of Flagler and South of 595. After careful review we have determined that the root cause is not product (Harris 800Mhz) related, rather is being caused by interference with some of the 800Mhz frequencies. This interference is also affecting other systems in the area regardless of Manufacturer (Motorola & Harris) or technology (P25, EDACS, Smartnet, SmartZone, Conventional etc.). A few of the radio systems impacted by the issues were: Miami-Dade County, Broward County, State of Florida (SLERS), City of Aventura, City of Miami, City of Hialeah. We have identified and shut-down the main source of the interference (5 BDAs at a 45 story high rise) on 4/19/15 at approximately 11:30pm and continue working with partner agencies to identify remaining sources registering as interference. A few incident still are reported from field units. We are asking agencies to specify any issues still occurring. We continue to have units in the field trying to track down any remaining interference.

4/21/15 – The FCC field responders reviewed the 2 buildings we found BDAs installed causing the issues (one in the City of Miami on 4/19 and one in the City of Hallandale on 4/20). We arranged meetings for the FCC with staff and the BDA installer. The FCC is following up on the issue.

4. Cochise County Arizona a couple months ago. A yet-to-be-identified owner of a new system (still working on this) began mixing with a local amateur radio repeater on the Mule Mountain repeater site caused interference with Sierra Vista/Fry Fire channel. There were common PL tones involved. In this case 162.2. We have resolved the problem by removing the RXPL tone of the “passed through” signal amateur repeater. The amateurs were using the common PL tone for send and receive. The Fire Frequency was using the same PL to open their repeater. This has stopped the interference but we are still working on identifying the third station. Appears to be digital signal as opposed to VOICE on the other two channels. It only occurred when the unknown station, the amateur repeater, and the Fire channel were active at the same time. Audio from the Amateur repeater was bleeding through onto the Fire channel.

We have good cooperation with the local amateur group and they were quick to respond.

5. Tennessee Emergency Management Agency (TEMA) was having digital interference on a convention 800 MHz repeater at the State EOC. The interference was tracked down to a Mall about ½ mile from the SEOC. The FCC Atlanta office was contacted, and they sent a field agent. We had to wait about two weeks for the agent to schedule the trip. He went with us to the mall and it was a Nextel in building amplification system that was fiber connected throughout the mall. We finally found the closet with the amplifier, and determined it was the problem. The FCC agent called Nextel and told them to send out a

technician to fix it. He stayed there until their contractor came out, replaced the unit, and made sure the interference was resolved.

Once we establish a relationship with the FCC field agents, they call and we help identify towers for them or help find the interference if we have time. TEMA has an understanding with local ham radio operators to track down interference using Agency provided tracking equipment. If we can find the problem and resolve it, the FCC is not involved. If we find the problem and cannot get cooperation from the one causing the interference, we will call the FCC and then they get involved.

The biggest problem is getting the field agent to come up. They are trying to cover so much area with so many types of problems (not just RF), they have to schedule it weeks out.

6. For the most part, Public Safety in Southern California is self-policing as a necessity. Interference identified as emanating from consumer sources when we Direct Find (DF) them are usually resolved directly with the offender who are usually cooperative once told it is affecting public safety systems. We only recently had to get the local FCC office involved when we identified an oscillating TV Antenna preamp. The residence refused to cooperate and ordered our techs off the property. Upon contacting the local FCC office, a letter was sent to the resident and we received full cooperation. We have a hotline number with the local office. They started action once we notified them of the issue. We try to be sensitive to the FCC staffing (or lack of), so we try to resolve issues ourselves before involving the FCC. I don't recall the exact timeframe for resolution but it was very quick.

A larger and more important issue is south of the border interference which has been difficult to resolve.

7. As Maryland FiRST has been deployed throughout the State, we have experienced numerous incidents of interference that required FCC assistance. One case successfully resolved, involved a scanning device at a Wal-Mart operating on 700 MHz, which adversely affected a simulcast cell. The FCC was very helpful in resolving this problem. Like others, we've also had some baby monitors that affected communications, as well as unhappy mothers when the FCC made them disable their devices.

We're continually experiencing intermittent interference in both Baltimore and Ocean City that can be so severe as to take a site completely off of the air. In Ocean City, we've augmented FCC support with a private sector engineering resource and the cause of the interference remains unresolved. This one is really stumping everyone, and is a very serious problem as we can lose the entire ASR for up to 30 minutes. This has been occurring on an intermittent basis for over a year. The problems in Baltimore do not occur as often as they do in Ocean City, nor are they as severe, but they do degrade system capacity for brief periods of time. We suspect that the interference may be coming from ships in the harbor, but as an intermittent source of interference. It's really hard to isolate.

Maryland believes that it is important to keep FCC field service persons in the field and readily available to address interference problems.

8. Last year, were solved at least 3 Bi-Directional Amplifier (BDA) System interference cases, and a Verizon cell site interference case. In previous years, we have resolved a number cases of interference from Sprint, ALL Tel, and BDA's.

Additional Issues Identified by Public Safety

A common problem with trunked systems are control stations with high Effective Radiated Power (ERP) that are close to a public safety site causing its receivers to experience intermodulation due to the extremely high signal power. Control stations should only use sufficient ERP for reliable communications and not produce extreme received power at the site.

High power cell sites create Near/Far interference scenarios, as we learned from Nextel, and are currently experiencing from cellular systems. High power from cell type systems allow them to increase coverage while PS systems are limited to field strength contours at the edge of their jurisdictions. This creates the Near/Far scenarios where a PS user at the edge of their jurisdiction has to contend with high power interference.

Two additional issues that, especially over recent years, are playing a significant role in reducing the number of calls to local FCC offices for enforcement action.

The first issue is the FCC often lacks the capability for a timely response. Additionally, the FCC is increasingly only able to respond to significant interference cases such as intentional interference. As a result, more and more local/state agencies are chasing down those cases themselves, as well as enlisting the support of local volunteers like Amateur Radio operators. As such, it is important to present to the FCC Chairman and Commissioners cases of those types that would have, in the past, been pushed to the local FCC Field Offices for enforcement action. A good source of information on the volunteer side is the American Radio Relay League (ARRL).

Second is the now almost universal use of Continuous Tone Coded Squelch System (CTCSS) on the receive side of public safety subscriber units. CTCSS is masking a lot of major interference that would have been reported in the past. For example, driving around with a receiver in carrier squelch on any band, the interference it is bad in all of them, but particularly 150-174MHz. Noise sources include any equipment with a central processing unit (CPU), but especially Automatic Teller Machines (ATMs) and Point of Service (POS) terminals. If they knew about it, the inability of Law Enforcement to use their Motorola HT portable radios reliably in a number of local bank branches would be a major concern.

Currently broadband systems are allowed 3000 micovolts/sq. meter, which calculates to around-13 dBm within one km of a site. This creates dead zones around those sites unless colocated. However, broadband systems require many more sites (roughly 3:1) so non-co-located sites produce dead zones around those sites.

We are currently several months into identifying the interference source to a multicounty trunked 700/800MHz system. Very difficult to identify interfering sources in such a wide bandwidth that the receivers look at. You have to capture the spectrum and time sync to reports to identify potential interferers. Since it's trunked the channels affected are constantly varying. One of the issues is the bandwidth of the pre-selectors. Since the manufacturer doesn't know the specific frequencies the pre-selectors cover the entire 700 and 800MHz band. This provides great flexibility but is worst case for interference possibilities.

It is left to the user community, cell providers and professional consulting organizations to determine what is going on. The FCC is only involved when some rule is being violated. Current reductions in FCC staffing isn't going to help.

There are time to respond criteria but that is for the cellular to respond to Public Safety (PS) or Business/Industrial/Land Transportation (B/ILT) spectrum holders.

We even have our own terminology for these Near/Far scenarios. We call it Swiss Cheese, as it creates holes in the coverage area.

Older Interference Examples

9. A Fish and Chips restaurant in Mesa, AZ installed a frequency jamming device many years ago to stop its employees from using mobile devices while at work. This device was purchased from China off of the internet but ended up impacting trunking operations for Mesa Police Department and Fire Department.
10. Florida-Some of the interference issues we have had in the past in Florida result in BDA devices going into self-oscillation in a band that periodically knocks out a control channel of a trunking system. This is a time consuming issue, and even though there is a mandate to report your personal and business BDA's to a database, this does not correct the ones that are installed by the cell vendors that are not reported "grandfathered in". We utilized at first the interference website for cellphone carriers, because we thought at the time it was directly from their towers, but because me and the system manager of the trunk system in Alachua County were experienced in locating interference, we located 4 BDA's over a period of two and half years. One TV transmitter that had a spurious emission.
11. Regional VA System: 24 channel system with \$55 million invested in this regional York, Williamsburg, James City County, Gloucester, the College of William and Mary- 14 simulcast sites 800 MHz- coast guard camp Perry, Langley Air Force base-maintenance contract \$2.5million. Interference in control channel- direct hit wiped out 5000 users –sporadic interference, intermittent- sounds like came from Military facilities.

Joe Hussey from the field office came in 1.5 hours on Sunday night- 3 hours of tracking found noise from the York River. Fire boat picked them up and they rode around the York River. At 3AM they found a barge with a tug boat on it –they wouldn't let them onto the tugboat so they called the coast guard who got them boarded. There was a Chinese made cellphone BDA amplifier on the bottom deck of the boat- they removed the problem. That amplifier was interfering with way more than public safety equipment. The boat it was on was delivering to gas refineries and up and down the river.
12. San Francisco Field Office has performed in Oakland to help with the AT&T interference to the City's 800 MHz system. The FCC's work was even discussed on TV news stories. The field office responded the same day. However, it has not been fixed in two years, but that's a long involved story involving 800 MHz interference. I wouldn't blame the field office for that.
13. New Bedford, MA had four instances in the last 15 years of interference that the Boston field office had to send out an engineer with direction finding equipment. They successfully

located three of the offending transmitter, the third ceased operation before it could be found:

- a. In April of 2000, nearly every T-Band police and fire department in Southeastern Massachusetts had an issue with buzzing noise that was intermittent and running up and down the entire T-band segment. The FCC Boston office sent out an engineer with DF equipment and triangulated the interference to a bad transmitter on the runway at the New Bedford Airport. The transmitter was operating in the 410 MHz band, but was radiating all over the place. The FAA replaced the defective transmitter and the problem went away.
 - b. In August of 2004 a digital paging transmitter went off frequency and was transmitting data bursts on one of our 470 MHz fire department channels. The FCC and a field engineer located it with his DF equipment within one day as originating at our local hospital. It was a private entity renting space at the hospital and it was an unlicensed transmitter. The engineer pulled the plug on the transmitter and contacted the company and the interference was stopped.
 - c. In April of 2009 we were receiving audio interference on a 72 MHz radio fire box frequency, this interference was also causing problems with two other fire department contiguous to us using the same 72 MHz band for their fire boxes. The signal set off RF alarms and totally swamped the receivers in all three departments. After several days of the complaint being passed around, the public safety representative called Laura and spoke to her personally informing her that interference was there now and she initiated the response out of Boston. So, from her involvement to someone showing up here was within a couple of hours when the FCC field engineer was dispatched with DF equipment. After 4 hours he located the cause as coming from a store front church that had set up an illegal broadcast station so their members, that couldn't attend the service, could tune in on the low end of their FM radios to hear the service. That transmitter was shut down and I believe the FCC issued a violation notice to them as well. During this incident Laura Smith called to discuss this issue and how things were going.
14. One incident many years ago involved some portable radios that were stolen and were causing much interference to the local Sheriff. I called the 888 CALLFCC, pressed 2 for a public safety emergency and the person on the other end of the phone showed little interest. Basically I was told it would be sometime next week before they could look into it. Fortunately we were able to catch the criminals later that night without assistance from the FCC. By far the majority of our dealing with the FCC has been positive.
15. A few years back (1998), we had an incident in downtown Philadelphia where a local university security/police department was seeing a constant carrier on one of its simplex VHF channels. In most cases the local university field radios were able to override the interference and capture the base station receiver, but when receiving weaker signals from in-building portables, the interfering signal captured the base receiver and over-rode the desired signal. We filed a complaint with the FCC field office in Oxford Valley, PA. They responded quickly, used their direction finding equipment and traced the problem to a local church. The church's base station had malfunctioned, causing a constant transmit condition. Within a day after the complaint was filed, the FCC field team had identified and resolved the issue. We would hope that a centralized enforcement organization could match or improve this kind of response and service that the university experienced.

16. A couple of years ago, a public safety agency here in the Monterey Bay area was having a problem over many months with a carrier that would occasionally capture or beat with portables and weak mobiles. They were unable to find the source and requested the assistance of the FCC field office. The FCC DF vehicle and staff responded and was able to confirm that it was a low level and very stable (probably fixed) transmitter, and probably not a rogue portable as feared. Based on this information (and other sources) it was finally traced to a radio at a backup EOC location that would transmit at low power of its own accord. It's likely that the troubleshooting would have taken longer and compromised more public safety traffic had the field office not been involved.
17. A local police department purchased a wide spectrum multiple frequency disruptor around 2009. This was sold to their SWAT team to allow them to disrupt wireless signals at a targeted location to stop suspects from using wireless devices for communications or to disable wireless triggered explosives. This worked very well, except it wiped their own portable radios for the SWAT unit, and even those around the area on Patrol. It was subsequently determined the company was selling these to local LE illegally. They sent it back, but the company was out selling quite a few these with a very wide interpretation of allowable use by military/federal users and translating that to SWAT teams with liaison members from the military and FBI. So they caused their own interference, but these were not that hard to obtain.
18. In 1998, while working for the Ventura County Fire Department, we had a consistent interference occurring on one of our primary Fireground channels. We could not identify the specific source, but knew only that the language of the communications taking place was in Spanish. We contacted the FCC asking for assistance in identifying the source of this, and within about a week, they were able to identify the source as a repeater for a gas company, located in Tijuana, BC, Mexico. The field officer of the FCC office we worked with had a regular working relationship with his counterparts in the federal office in Mexico. We discussed various solutions, and the FCC hosted a cross border meeting with the Mexican federal government and the gas company to discuss our proposal to help mitigate this interference. I am not sure what value or support will be left to Public Safety by reducing or eliminating this direct hands-on type of support and regional knowledge, as easily as Hal Grigsby and his office did for us and numerous others.