



The

# Broadcasters' Desktop Resource

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... edited by Barry Mishkind – the Eclectic Engineer

## Transmitter Site Operations

### LTE Build-out Creates Issues for FM

*[August 2016] This article originally appeared in 2013 when the cell companies began pressing broadcasters hard over what they termed as “interference.” With cell companies still trying to hold FM stations to as little as -138 dBc when they set up LTE sites next door, this seems like a good time to bring the topic back.*

The build-out of the various 700 MHz LTE cellular networks around the country has reached a point where problems are being reported.

Specifically, some of the LTE cellular companies – apparently with the help of the FCC – are accusing some FM operators of improper operation. This, although the stations seem to be operating well within the Rules and spectral limits.

The problem manifests as a desensing of the receive antennas the LTE sites are using by the 7<sup>th</sup> and 8<sup>th</sup> harmonics of some stations.

#### WHOSE PROBLEM IS IT?

What should you do if a cellular company calls you and says you are at fault?

The simple answer is that at this time there is no need to panic. But you do need to have knowledge and be prepared should you hear from the cell folks.

FM Operators have long relied on the two-pronged reasoning of compliance with the FCC Rules, and the FCC Policy of the “last in” operator is responsible for resolving any problems, primarily using and supplying filters.

However, in recent weeks, confrontations with cellular companies have become more common.

#### PROPER ATTENUATION

It is useful to remember that FM transmission and harmonics are limited by Section 73.317 to -43 -(10 Log 10 (TPO)) or -80 dB down from the carrier level.

Most properly installed modern transmitters do not have a problem exceeding -80 dB, and even approach -90 dB down.

On the other hand, to increase spacing between cell sites, some LTE antennae are reportedly designed to work with spread spectrum signals as low as -138 dBc, operating well down in the grass of spectrum analyzers. In one case as little as two-millionths of a Watt was enough to cause the cell receiver to misfire.

Because of the way the AT&T sites are engineered, they regularly are demanding suppression to -100 dB, or more, from FM stations in their vicinity, especially within 500 feet or so.

Pressure on stations from AT&T and Verizon include aggressive actions like reporting a station as “interfering” and getting [an FCC Field Agent to issue an NOV to the FM station!](#)

#### “LAST IN” POLICY

The FCC Policy of the last occupant in on a site being responsible for any interference mitigation is long standing.

In the past, the FCC had made it very clear that the resolving of new instances of interference fell to the last entity showing up at a site. There are multiple case law examples and precedent starting with the 1947 Midnight Sun Broadcasting case. There also are subsequent affirming cases out there (Sudbrink, B&W Trucking, etc.).

A good affirmation of where case precedent has been applied to cellular companies can be found in the 1994 cellular proceeding Report & Order that added/modified FCC Rule Section 22.371 (cell tower impact on AM stations). This can be found at 9 FCC Rcd 6513, 6558 (1994).

## THE ATTACK

The 4G band seems to be their focus. Often it starts with a letter, as one engineer reported: "AT&T said (paraphrasing) that they were licensed to this band and anything in it was illegal if it didn't originate from their device."

Then they play the spectrum analyzer game.

Unfortunately, not all cell techs know how to run their spectrum analyzers. Often they do not use a filter for the FM station – just an amplified antenna tuned to the 700 MHz band instead of calibrated dipoles tuned to the fundamental and individual harmonic bands.

Engineers have observed cell companies spectrum analyzer pictures showing obvious front end overload. Worse, they rarely provide engineering credentials or the methodology used.

## GOING ON THE OFFENSE

It is important to meet the cell companies head on by explaining you are familiar with 73.317.

Start with good documentation. A bandwidth plot and harmonic spectra plots for your system are well worth having on hand.

Now, before you strap on your body armor, consider how solving these kinds of issues

requires diplomacy on both sides as well as time, technical expertise, and money.

As one consultant says, "Use of a heavy hand and/or calling in the FCC does little to enhance good will. 'Fixing the problem' really comes down to figuring out who is responsible, and more importantly, who pays to resolve the problem. It is our experience that most broadcast radio stations are very cooperative, but resolving issues like this will cost someone money – in terms of station time, engineering (and legal) time, and materials costs."

Then too, there are wild cards: Most reports seem to point to FM transmitter cabinet radiation as the prime source of the harmonics. And, since Congress has codified cell phones for emergency (911) information communication, the cell companies do have some leverage.

## FINDING THE RIGHT SOLUTION

Indeed, as we look at the anecdotal reports, incidental transmitter cabinet radiation may well be a bigger part of this problem than emissions radiated directly from the antenna.



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For that reason, several consultants have suggested filters and, in some cases, Faraday shielding of the transmitting systems will be required to fully satisfy the cell companies' desires. That solution can be difficult to install at an established site.

Still, stations should be prepared to meet the cell companies directly, telling them they expect the cell companies to pay for any mitigation and compensate you for your measurements – unless your site is actually “leaky.”

Having a figure at hand for the construction of a Faraday shield may prove helpful. Reports from engineers that stood their ground say that in the end, the cell companies installed filters to fix the problem.

## INDUSTRY AWARENESS

Can this happen to you?

As more in the industry are becoming aware of this situation, some just say that the FCC will eventually resolve it.

In the meantime, however, you may find the cell companies' tactics raising your legal costs and tying up the technical department. But, do not give in unnecessarily.

Here is [some research you may wish to download](#), courtesy of Gary Cavell of Cavell, Mertz, and Associates. Cavell kindly spent some time to calculate and identify for us the most likely FM frequencies and the cellular bands that could potentially cause or receive interference.

Briefly stated, Cavell's conclusions show 8th harmonic interference to tower-site 700 MHz LTE installations are likely to occur from

collocated transmitters operating on the following FM Broadcast frequencies in the non-commercial portions of the FM band:

88.1 MHz	88.3 MHz	88.5 MHz
88.7 MHz	88.9 MHz	89.1 MHz
89.3 MHz	89.5 MHz	

Also, 7th harmonic problems are possible from collocated "commercial band" FM broadcast transmitters on the following frequencies:

99.7 MHz	99.9 MHz	100.1 MHz
100.3 MHz	100.5 MHz	100.7 MHz
100.9 MHz	101.1 MHz	101.3 MHz
101.5 MHz	101.7 MHz	101.9 MHz
102.1 MHz		

This can be a good starting place to determine whether an LTE site moving in near to you might create a situation.

Of course, there are any number of factors, from cabinet leakage to poorly set filters, to take into account. But using this spreadsheet as a start will let you know what information you need to get from the cell company as your research develops.

As the facts become clearer and clearer, it is likely that pressure on individual stations will recede a bit.

Nevertheless, do not ignore this, even if you are not currently affected by a nearby LTE install. The cellular industry is highly organized, with strong lobbyists who are talking to a Commission filled with appointees who believe broadband is more important than over-the-air broadcast.

Broadcasters need to speak up now with a loud, unified voice to get the FCC's attention. - **BDR**

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