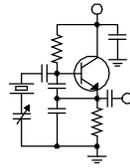


The Local Oscillator



The Newsletter of Crawford Broadcasting Company Corporate Engineering

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New AM Protection and Proof Rules

As far back as I can remember, AM stations have struggled with the effects of nearby conductive objects that receive the incident wave and re-radiate it. Sometimes the problem comes from power line towers, elevated water storage tanks and even grain elevators, and our industry has certainly spent a lot of time and money dealing with those kinds of reradiators. But the bigger, more dynamic problem is that of nearby communications towers.

The problem really exploded in the late 1980s and early 1990s as cellular networks began to build all across the nation. Of necessity and by design, these networks require cells to be placed within just a few miles of adjacent cells, in proximity to population centers and along travel corridors. This often places them in close proximity to AM antenna sites as well.

Many years ago, the FCC recognized the potential for trouble and implemented rules in Part 22 (Public Mobile Services), Part 27 (Wireless Communications Services) and Part 73 (Broadcast) that required advance notice to AM licensees whose patterns may be impacted and, where indicated, detuning of the offending structures. These rules have worked fairly well for a long time, but there were situations that they did not address: those cases where the reradiating structures were licensed pursuant to other than Parts 22, 27 or 73.

One of the biggest offenders, in my experience, is Part 90 (Private Land Mobile). This includes public safety licensees, such as police, fire, meter maid and dog catcher. Just about every community has a tower supporting its public safety radio system(s), and occasionally these end up being right next door to an AM array. And because there is no Part 90 rule requiring notification, study and detuning where indicated, many times the AM licensee is left holding the bag when a Part 90 antenna structure wrecks its directional pattern. That

often means an STA to operate with parameters at variance or a power reduction to maintain monitor point field intensities below the licensed values. Either option is costly for the broadcaster.

Since 2008 or so, a group of broadcasters and consulting engineers has been after the FCC to fix this. This group, the AM Directional Antenna Performance Verification Coalition, is the same bunch that worked closely with the FCC to get moment-method modeling (MoM) accepted as a means of verifying the performance (pattern shape and size) of AM directional antennas, and Crawford Broadcasting Company has been a part of that group from its earliest days.

After the MoM rules were enacted, we continued to work with the good folks at the Media Bureau to see what issues would arise and offer suggestions for policies and further rule refinements to deal with these issues. But in addition to MoM-specific issues, we have also worked to get the FCC to implement a more omnibus and universal set of rules dealing with reradiators and detuning. The FCC listened, and just last month the agency issued a Third Report & Order enacting those rules, which will be placed in Part 1 (Practice and Procedure), thus making them universally applicable across all other rule parts. These rules will go into effect upon publication in the Federal Register, and chances are they will be in force by the time you read this.

The highlights of the new rules, which are primarily contained in §1.30000 to 1.30004, are as follows:

- All parties holding or applying for FCC authorizations that propose to construct or alter an antenna support structure in the vicinity of an AM antenna must do an analysis, make notification and take measures to correct disturbances in the radiation pattern.

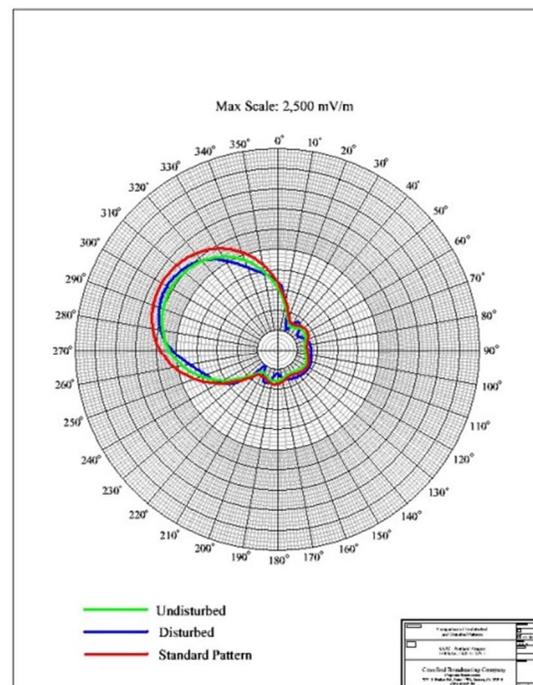
- The screening distances within which the analysis must be made are based on the wavelength of the AM station.
- Antenna structures of less than 60 electrical degrees at the AM frequency for non-directional and 36 electrical degrees for directional antennas are generally exempt from analysis and notification.
- The criteria for "disturbance" is a change of more than 2 dB in any direction for non-directional antennas, for directional antennas, it is an increase in the inverse distance field (IDF) in any direction so that it exceeds the standard pattern IDF.
- Moment-method modeling is to be used as the primary tool to determine the likelihood of pattern disturbance, although for conventionally-licensed AM stations, pre-/post-construction measurements of the monitor points can be used in lieu of a moment-method model analysis.
- Criteria are set for what constitutes a "significant modification" of an existing antenna structure in the vicinity of an AM antenna (alteration of height of more than five electrical degrees at the AM frequency, or the addition or replacement of one or more antennas or transmission lines on a base-insulated or detuned tower).

One thing we (Crawford) specifically pushed for was a mechanism for dealing with *existing* nearby reradiators. The specific case we had in mind is on Mt. Scott in Portland where the Trimet tower (with several Part 90 public safety licensees on it) is just down the street from the KKPZ site and has been giving KKPZ fits for years. This tower deepens the forward nulls and fills the back nulls, requiring KKPZ to operate with parameters at variance to maintain monitor point field intensities below the licensed limits. Over the years we have been repeatedly stiff-armed by Trimet (which is a three-county government agency) when we have tried to get them to detune the tower.

The new rules provide a one-year window in which licensees such as CBC who have patterns disturbed by existing "exempt" antenna structures can do a moment-method analysis and submit a showing to the FCC. The rule says: "If necessary, the Commission shall direct the tower owner, if the tower owner holds a Commission authorization, to install and maintain any detuning apparatus necessary to restore proper operation of the AM antenna." All I can say is, "Woo-hoo!!!" At long last we can get

KKPZ back to licensed parameters and off the "permanent STA" it has been operating under for many years!

There are also new rules in this batch that deal with mounting antennas on AM towers. For conventionally-proofed stations, things pretty much work as they always have - do a partial proof after installation. But for moment-method proofed stations, the rules say to measure the base impedance of the tower supporting the antennas. If the measurement comes up within +/-2 ohms and +/-4% from the previously modeled values of R and X, you're good to go; otherwise, a new model is needed. Presumably this would apply for other tower modifications as well. When we replaced the insulators and added corona rings on KBRT tower #3, that was the procedure and criteria I applied.



Overlay showing the undisturbed, disturbed and standard KKPZ patterns.

I couldn't be more pleased with these new rules. They plug the loopholes in the AM antenna protection rules and give us some great tools and standards to use to evaluate pattern distortion. Since I have those tools at my disposal, it's not a difficult thing for me to run a quick model and see for myself when I receive the required notification. You can bet I'll be filing a showing on that Trimet tower as soon as the new rules go into effect.

The New York Minutes
By
Brian Cunningham, CBRE
Chief Engineer, CBC – Western New York

Hello to all from Western New York! It is almost incomprehensible that Labor Day is here already. By New York standards, Labor Day marks

the end of summer, and we start preparing for the upcoming winter months, which will come all too soon. Basically, we will have the month of September to get all our outdoor projects completed, as October in Western New York can sometimes be tricky ó you just don't know which way the weather will turn. It would not be unusual to see snow in the latter part of October. It just depends

when Indian summer occurs. Usually by the third week of October we experience three or four days of hot/sticky weather, then the winds shift from the north and the cooler air prevails. The latest edition of "The Farmer's Almanac" predicts a much colder winter with significant snowfall this year for the northeast. I'm not really sure how they come up with this information, but they do boast an 80 to 85 percent accuracy rate. By far, much better than our local meteorologists!

WDCX-FM – Buffalo, WDCX(AM) – Rochester, WDCZ(AM) - Buffalo

Our summertime projects are in full swing here, with Don Boye (Western Antenna) painting the five-tower array at the WDCZ transmitter site, JM Enterprises is making capital improvements to the driveway and walkway to the transmitter building at WDCX-FM, and Freedom Restoration Services are preparing to make necessary repairs to the tower foundations at WDCZ. Along with keeping track of the contractors and performing the day-to-day maintenance for all four stations, throw in yearly inventories and budget requests and it makes for a quite busy month.

We have been fortunate indeed that we have not experienced much in the way of thunder/lightning storms this summer. In all, with the exception of the

early rains in June, we have not had any damaging storms in quite some time. No complaints here.

I recently learned a valuable lesson in

dealing with one of our vendors and obtaining quotes for work that needed to be done. When we purchased WDCZ late last year, we knew that the five 245-foot towers needed to be painted. I obtained quotes from a couple of tower painters, and the best one was selected, and the work was scheduled. Not long after the work started, the contractor came to me and stated that the damage (rust)

on the tower was far worse than he expected, and he would need to spend additional time (labor) and materials (paint) over and above that included in the original quote. Had he done a thorough inspection of all five towers before submitting his quote, all would be well, but that is not what happened. He looked at the towers from ground level, and basing what he saw on the lower levels of the tower, assumed the top sections would be the same. From now on, I will physically be on site when any of our contractors submit proposals for work to insure that all bases are covered and that we receive an estimate that is accurate and complete.

Operations at the WDCX(AM) studios and transmitter site have been running flawlessly, with no major problems to report on. I recently performed the occupied bandwidth measurements on the station and all is well there.

After all of the contractors have finished their work, it will be about time to check the monitor points for both my AMs. WDCZ is an easy one, as we do not change patterns or power levels after dark. WDCX(AM) takes a bit longer with day and nighttime parameters to check and measure. I do not anticipate finding any problems, as this array is relatively stable, and is usually always within the legal operating parameters.



That about wraps up another month here in the great northeast, and until we meet again here in

the pages of *The Local Oscillator*, be well, and happy engineering!

News From The South

By

Stephen Poole, CBRE, CBNT, AMD
Chief Engineer, CBC–Alabama
(with assistance from Todd Dixon)

It's hard to believe that a year ago, we were sweltering here in Alabama and Cris was muttering darkly about a certain building inspector out in California. My, how things have changed! The weather here has been unseasonably pleasant. We've had plenty of storms, but the temperatures have moderated. We've been in the 80s, giving our poor air conditioning (especially at the transmitter sites) a much-needed break. Nice!

This is also that time of year when we rush to get things completed. Inventory, final cap-ex expenditures, maintenance of all the usual things. One item that we're working on is 850's new Dragonwave 11 GHz microwave link. As I write this, Jimmy is headed to the site in Tarrant to measure the tower legs and take some pictures for a structural study on tower #2. Having high-speed network access at that site is going to be sweet.

But on the subject of digital in general, it has brought its own new set of problems. With analog, you could have fades and distortion; with digital, it's either there or it ain't. Theoretically. In practice, what digital audio can (and will!) do is give occasional, sometimes-difficult-to-diagnose dropouts.

I've mentioned that here before. Moseley's DSP-6000 series of STLs, for example, boasted that they were usable with a better fade margin than the older analog links. Yes ... and no. Yes, they'd sound perfectly clear to about the same signal point at which the analog would become a little noisy. Drop the signal any further, though, and they'd start chattering and faulting ... far more annoying to the average listener.

This doesn't mean that I want to go back to analog, of course. Digital is here to stay, and we'll

simply have to learn the new ropes for how to deal with it. With these Dragonwave and Trango digital links, you enjoy crystal-clear audio, no audio at all or those annoying dropouts.

We've started using a more proactive approach. As part of our routine maintenance, we regularly check these digital links to watch for trends. All of these links, even the low-cost Nanobridges, can be accessed via a Web browser, and all have a page listing dropouts, signal quality over time and other useful information.

One thing that we've noticed is that these digital links don't like the pea-soup humidity here in Alabama. When the moisture in the air creeps up, so do occasional errors. It's fascinating to me to watch the RSSI numbers on our Dragonwave between the studios and the WDJC site on Red Mountain. When there's a heavy rain, or when the humidity is really high, the RSSI can drop as much as 15dB in a matter of minutes. Once the weather clears, it goes back up just about as quickly.

Does this mean I want to go back to analog? No way! Never happen and even if it tried to happen, I'd fight it.

Some Useful Apps

Another thing that has become an indispensable part of the engineer's toolkit is a smartphone. I have an Android, not only because it's cheaper (heh), but because Google's operating system is more in line with my free and open source philosophy. Regardless of whether you use an iPhone or a Droid, though, there are plenty of apps that are perfect for our jobs. I'll start with one of my favorites: AndroidVNC. It's a freebie from the Google Play store and it works like a champ.



Everything above leads me to say that I recently saw an interesting device that I believe we'll begin to see a lot more of in the coming years. Ubuntu, one of the more popular Linux distributions around, started a crowd-funding campaign to bring one of their projects to life—the Ubuntu Edge. The funding drive was for one month and they had hoped to raise \$32 million to bring the Edge to their crowd-funding supporters. Unfortunately, they only raised about \$12.8 million so all of the support money was refunded.

The Edge is a smart phone with some fantastic specifications (a 720p screen, nearly 326 pixels per inch, 4 GB of RAM and a 128 GB SSD storage). The specs are great, but several smart phones are nearly there already. What sets the Edge apart is that it is running a full-out version of Ubuntu as an operating system. So not only does the phone do everything that a current Android phone does (including apps), but you really have a mobile desktop work environment as well.

While it is incredible that Ubuntu has placed their robust Linux operating system on mobile phone hardware, if that were the end of it, small screens are still difficult to navigate and most people are hard pressed to be as productive on a mobile phone as they are at a full workstation. This is really where the Edge outperforms its current competitors.

It has a docking station accessory that allows you to have your keyboard, monitor and mouse hooked up. When you get to work, simply

plug in the phone and it acts as your CPU. You've got all of your documents, music, pictures, videos, programs, apps all on a single device that you can carry with you. Ubuntu is calling it a "super phone."

The thought of having all of your data available to you at the office, the tower site or at home in one device is extremely useful. Having your data in the same place every time, without having to change over to another device to find it is really powerful. The only phone that currently delivers something close to is the Motorola Atrix. The Atrix uses a "webtop" dock that throws the phone's 720p screen onto a monitor with a keyboard connected as well.

Since their funding efforts ultimately failed, Ubuntu is currently pitching their concept to a number of phone manufacturers and they anticipate that one will use the prototyping work they have done to bring an Ubuntu-powered device to the market in mass. In truth, I think within a couple years, all of the major device players (Apple, Samsung, Nokia, HTC...) will have something similar to the Edge in the marketplace.

For most people, IOS or Android completely meets all of their mobile computing needs, but for some, there is no substitute for a complete operating system to work with in. Radio engineers are certainly included in the "some" category when it comes to needing the most out of their devices, but if I were left to my own devices, I might just pare it down to one ... the Edge.

Mainland Memoirs

By
Bill Agresta
Chief Engineer, KBRT

Greetings from Oak Flat!

As KBRT continues to transmit from its beautiful new 50 kW mainland transmitter site at Oak Flat, I continue to work on the final few pieces of our move.

We are very close to saying our final goodbye to our old KBRT Ranch site on Catalina Island. The tower fences and tuning houses were torn down in late August, and now we are awaiting the arrival of Northstar Broadcast, the tower crew that has been contracted to remove the three transmission towers. After that, it's one more truckload of junk and then goodbye forever. Northstar is finishing up a paint job on a tall tower in the northwest. As soon as they're done, we're next on their schedule.

Though there are a few things and people I miss from that island, overall I'm very glad to be at our new mainland site and am missing the island hardly at all. In fact, the sooner we can get those towers down and finish the final cleanout of that property, the better I will feel. I have plenty to do here at the new site, so going back for the final island project almost seems like a distraction.

I have been working hard to learn more about computer networking. Thank God I have several friends who are some of the best networking guys around and who have been nice enough to spend time with me on this. Now that computer networking seems to be the future of AM broadcast, I have decided this is something I need to not only be able to do well but something I should enjoy.

In very little time I have finished several long overdue computer projects at the KBRT studios/offices, including a good, facility-wide Wi-Fi. I have also installed Wi-Fi with a VOIP client at our transmitter site, allowing us to use our cell phones way up where there is no cell phone coverage. Back at the studio I have installed new gigabit switches and networked video security in and around our offices and studios. Soon our new Internet supplier will

install some real bandwidth, which will allow us to add a few more things to our network and automate things that will continue to make the operation at KBRT more reliable and efficient.

There is always plenty of work to be done up at the new transmitter site. The place is large and always needs attention. It's not so much the equipment it has done quite well it but I have yet to find a way to automate weed and erosion control. Of

course, there are always the little things like the auxiliary transmitter's exporter that has decided to give us intermittent GPS locks no matter what antenna we attach to it. That unit is now on its way back to Nautel for repair and will hopefully come home fixed very soon.

We continue to work on the security at the new site, something we plan to stay very aggressive on. It is nice to report that things have settled down up there quite a bit compared to how things were when we first bought that site.

There are lots of critters up there. I recently got some photos of several tarantulas I met as they were crossing the road, and my raccoon friends still come around once in a while as do the bobcats. The owls and hawks seem to love perching on our guy wires and are always keeping a close eye on me as I work, as are our security cameras.

Our good neighbor Larry has done a very nice job on cleaning up his place as well as mowing down some of the brush around our tower fences and guy anchors. In fact, he seems to work a bit too hard up there and has hurt his back once again, so he has been out of commission and I have missed him being up there. Please keep him in your prayers and continue to pray for all of us here at KBRT, we appreciate your support!

Until next month, the Lord bless you and keep you; the Lord make his face shine upon you and be gracious to you; the Lord turn his face toward you and give you peace.



The Chicago Chronicles

By

**Art Reis, CPBE, CBNT, AMD
Chief Engineer, CBC–Chicago**

Tower Climber Shortage?

The job malaise in this country can be attributed to a number of factors, but it mainly boils down to two: government policies, and a skills shortage or gap. Much though I would just love to start a rant on the first factor (and you all know I would!), I am not going there. Rather, as the title above suggests, I am going to give at least some of you a hint of the labor shortage we are facing in the world of broadcasting, other than that of engineers. It seems that, in the last few years, tower climbers have come into increasingly short supply.

As you all should at least grudgingly acknowledge, as I do and I live here, Chicago is, shall we say, the capital of the Midwest. Agriculture is a huge driving force in this area, and every school child knows it. But in addition to growing crops, farmers have now turned their lands into gigantic-sized power plants, with the addition of huge wind turbines to harness that power. And they are making a ton of money doing it. The rent income is phenomenal, the impact on the actual farmer business is minimal, their least productive acreage can be set aside for not only wind-chargers but cell towers, radio towers, or whatever. Our Kirkland site is a perfect example. And in the case of wind-chargers, government money is involved, and not just for them, but for the tower services companies as well. That is where the fun begins.

Now, understand that this trend tends to be more or less regional. Where the wind tends to be plentiful, the potential for such profit is as well, but that is not everywhere. In those areas where it is, however, the competition is not for customers anymore; it is for tower company services. And the customers are having to wait longer and longer for service, and pay higher prices as well, just to get the tower services they need. Broadcasters in those cases are getting closer to the back of the line.

In one particularly glaring case, my best friend Len told me recently of a tower company, long in business, with a name which many of you would

recognize, who used to advertise in Broadcasting, Broadcast Engineering, and Radio World, has now stopped servicing radio and TV stations, period. Len had used them forever.

Incredulous at the loss, he asked the manager why. The answer was revealing: "It doesn't make any business sense for us to work with you guys anymore. Look, the money is real good, most of it is straight from the government, they pay us to go out and put up a whole bunch of these towers in a particular location, we build them, we get paid, and these are

just the ones they're experimenting with!"

[Emphasis, mine]. "Then they often pay us to take that first bunch of towers down and put up bigger, more efficient ones. We don't have enough time or manpower, with that work load, to deal with broadcast anymore. The pay is greater here, and there is almost no waiting to get paid, and the work is real steady. What would you do?"

Make no mistake – tower climbing is a skill. I know, because I did it on the side years ago, when I was younger and had less sense (and less body) than I do now. I actually painted a tower. But everyone knows that not everyone can do it. There can be no fear of heights in that line of work. Then again, there are those who would argue that the lack of that very fear of heights is also an indicator of a lack of common sense as well. Funny, but nobody argues with that premise, either.

Because of all those factors, however, tower climbers, while not a dying breed, are not around in abundance enough to satisfy the burgeoning market for their services. And the Law of Supply and Demand is starting to kick in, big time. The wait for attention in our case has been anywhere from two weeks to two months. And these dudes we've been using are so busy that they don't do the work, then not bill us for six months or more. Did I mention something about common sense? Isn't prompt billing a service, too? They are not alone. Our previous tower climbers had issues in the billing area as well. It cost them our gig.

As the result of all this, I've decided that the



best strategy is to treat tower companies in the same way I treat HVAC contractors: keep a stable of them in my hip pocket, and bring in whichever one can get to the job fastest, and forget the cost. Well, almost. Most of them are not all that far apart in that area anyway. Recently, I've approached Southern Broadcast Services. They've just expanded into the Chicago area to take some advantage of some of that wind-charger business that's going on up here. But they say they'll keep their hand in the broadcast business as well. And, they come highly recommended by both Stephen Poole, and Cris, so what's not to like? There will be other vendors as well.

I've just learned also that a couple of the really large broadcasting companies have simply created or bought their own tower companies, whose job it is to service only *their* towers and antennas. Nice work if you can get it. For the smaller fish, it makes no sense to do that. However, either way you handle it, one strategy or the other for keeping reliable tower climbing services is good self-defense for a key part of your station's vendor sector, and I can't recommend too highly that you readers do likewise.

The ISDN Conundrum

This part is for those of you who are new enough in the business of broadcast engineering to have not had much experience with ISDN. Those who have such experience can skip this section. I'm preaching to the choir newbies there.

There are those who say that ISDN's days are numbered, that the telco gang wants to move us all to the Internet for remote audio. While it is true that the ability to get new ISDN service may be problematic beginning sometime this fall (*that means right now*), the ones which are out get used every day of the week, for all sorts of broadcasting, and the folks from telco say that they'll continue to support the service into the distant future. I hope so.

But ISDN can still be a hassle to keep happy. With a lot of help, we just solved a big problem that was driving us buggy.

We'd had ISDN service at all of our transmitter sites, as well as the studios, for years. Then we dropped ISDN at our Burnham site because telco simply couldn't maintain the reliability of the lines for more than a few days at a time. We had a similar problem in Beecher. But after that we drew the line. We have three very active ISDN circuits at the studios, and we still have a circuit each at Lansing and Kirkland, and that Kirkland circuit is very important to us. So when it decided to quit some time

back, we first thought that our equipment was acting up.

We use an Adtran/ Comrex package out there, so we brought the previous Beecher setup out to see if that was the problem. It still didn't work. Still not sure whether the issue was equipment or line, we talked to Cris. He and Amanda carefully set up an identical ISDN setup to ours, and sent it out. Same issue. It had to be a line issue.

Next stop, our Kirkland service provider, Frontier Communications. The tech came out to the site, checked the line from there to DeKalb (our closest real CO), and found the circuit good. We still had problems. So, Frontier sent along someone more knowledgeable fellow, Jeff Gerald, to check things out. Jeff quickly realized that someone further up the food chain needed to be brought in. Enter Clive Campbell, digital specialist. He brought in one more fellow to help him; behind them was a whole team that I never saw. Their job was to try and provision this line remotely. It took several hours, across two or three days, of changing this and tweaking that ó experimenting, if you will ó until someone óut thereö asked me who the long distance carrier for the Kirkland ISDN line was. It was Frontier itself. Okay, let's see what happens, said the someone óut there,ö if we ócasual dialö the number back in Hammond.

Casual dialing means dialing a 010100 code, which includes a unique ócarrier numberö plus 010 followed by the number you want to dial. The cost for casual dialing is astronomical, something on the order of *35-40 cents/minute*, but in this case, *voila!* It got the job done. Then we had the Hammond side ócasual dialö the Kirkland site, using the AT&T code. The system worked again, and both times with clear audio going both ways. Same story happened later with the Rockford studio site. We'd found the secret.

I called Cris and gave him the story. Result: Corporate is changing the long distance carrier for all of our ISDN circuits over to CenturyLink (formerly Qwest Communications ó anything but AT&T, you know). Everything seems to be peachy now, and we have one less problem to sweat about.

Well, almost. That's the lesson here: If you're having trouble getting ISDN calls to work outside your immediate area, and line maintenance and equipment checks can't resolve it, then it's time to change long distance carriers but, and get this, not at the receiving end, but at the origination point. Heck, do it at both ends.

We learned the hard way, again, that not all ISDN carriers are the same, or even close to it. There are some, such as AT&T and CenturyLink, which

can be provisioned to handle broadcast quality audio over ISDN; many others are not. They just do data. With them, audio in equals garbage out, or worse, nothing at all in both directions. Or digital garbage out at one end, with silence at the other.

ISDN still beats the Internet for quality audio backhaul hands down, but for us it has spawned enough paranoia, that we now make it a point to check every transmitter site ISDN line either daily or every other day by dialing into them from

our studio site units. If we don't get a connection or a lit clock light within half a minute, telco hears from us. But, unless telco changes our designated long distance carriers or configuration, and that could happen, I don't see much chance of a problem now.

Bottom line: unless you maintain a close watch on your ISDN service, at some point you can expect that something bad will happen; just be prepared for the hassles which follow.

Until next month...

The Portland Report

By

John White, CBRE
Chief Engineer, CBC-Portland

Last month I discussed shorter reradiating towers that are approximately 90 degrees in height. I would like to quickly recap the important points.

1. The purpose of evaluating reradiation and detuning towers is to protect the pattern of AM radio stations and not just the monitor points.
2. For a shorter tower, ground current is significant and a high quality ground increases the reradiated signal.
3. Structures which have a large cross section at the top (candelabras or water tanks, for example) will have a higher apparent electrical height than the physical height would suggest.
4. A tower may be effectively taller than the physical tower height itself. Several 20-foot collinear antennas mounted at the top of the tower effectively increase the apparent height of the tower.



The aerial photograph, Figure 1, shows the reradiation measurement problem at Mt. Scott. Four

communications towers and a water tower are grouped closely together. Fortunately, tower 1 and the water tower afford a location to the south to allow a conventional adjustment with a field intensity meter (FIM) that is relatively free of interference from other towers. At locations south of these two structures, a FIM will sample the signal from the closer tower more than from other towers.

The photograph is a bit deceptive. The north road in the photograph is inaccessible, located at the bottom of a 70-foot cliff (a hot air balloon doesn't seem a reasonable measurement solution). As a result, a similar measurement location to the north for tower 3 and 4 is not available.

As I mentioned last month, Jack Sellmeyer, a well known P.E. in Texas, dropped me a note about some of his experiences. Jack gave me some detail on a detuning job dealing with a tall tower and complex detuning network he had worked on.

Tall towers, those 160 degrees and taller, can't be detuned as easily as shorter towers. Here in the Portland metro area, we have an example of just that kind of problem. Historically, the KOIN-TV transmitter was collocated with the original KOIN AM (970) transmitter in the Portland West Hills. Currently, a new 2,000-foot TV/FM tower at the same site is detuned.

Very tall towers have significant high-angle reradiation. In this case, a component of the

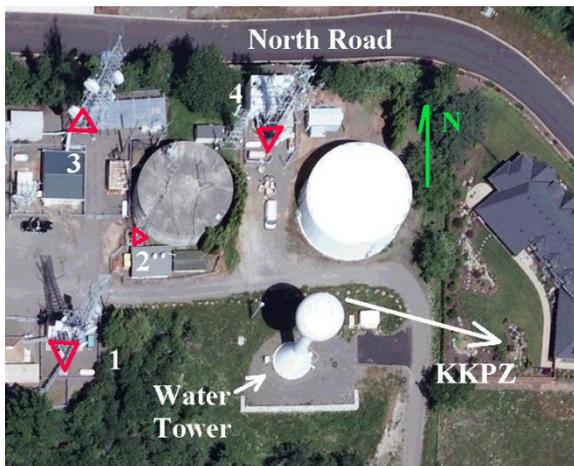
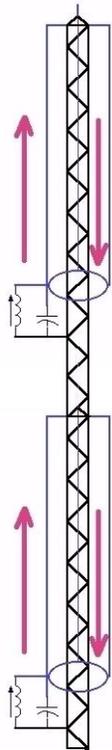


Figure 1 - Aerial photo of Mt. Scott

reradiation is nearly vertical. Close-in listeners occasionally notice some phase cancellation of the 970 carrier as the groundwave and skywave drift in and out of phase, which suggests a possible detuning adjustment error or reduced effectiveness of the detuning.



The typical solution for taller towers is the use of two or more detuning networks stacked vertically as shown in Figure 2. Each network is adjusted to null the reradiation from that portion of the tower. Jack suggests that the longest skirt should be to approximately 130 to 140 electrical degrees where high suppression is needed. When this is done, the upper skirt lengths should be on the order of 50 to 70 electrical degrees.

Jack had a number of other excellent suggestions which I will cover next month. For the moment, BEEP DE BEEP BEEP, News Sounder, we interrupt this column for breaking news!

At press time, the FCC has released its Third Report & Order for AM Radio Service Directional Antenna Performance Verification. (MM Docket No. 93-177) As the title suggests, the report and order deals with policies and rules governing protection of AM radio station patterns.

**Figure 2 -
Stacked Skirt**

Included in this docket is the issue of protection provided to AM stations by interference by Part 90 and other towers. In particular, the Commission acknowledged that the "absence of explicit rules across all services" has led to confusion as to what should be done to protect the AM station. KKPZ has firsthand experience, having suffered a decade or more of STAs resulting from that confusion.

A bit of background is in order. In the 1940s, the broadcast industry experienced several cases of pattern distortion caused by reradiation from nearby towers. At that time, the Commission and broadcasters developed a series of rules and good

engineering practices to resolve the problems.

In 1968, reradiation again became a problem. B&W Truck Service constructed a tower which was causing pattern disturbance interference to AM station KCRC, Enid, Oklahoma. KCRC was unable to comply with the rules because of that tower, which was beyond the station's control. The land mobile licensee claimed that the rules and good engineering practice didn't apply to him.

After an extended record of non-cooperation by the land mobile operator, the full Commission intervened and ordered B&W to remove or detune the tower. That action produced a clear precedent and standard of good engineering practice.

Then in the early 1980s, a new cellular service was proposed. With the large number of cell towers involved, the Commission recognized the potential of frequent interference with AM stations. In a proactive effort to resolve that potential conflict, the Commission included a set of procedures in the rules for the cellular, and later the PCS, services. Other services remained covered by earlier precedent and standards of good engineering practice.

Fast forward to the late 90s when KKPZ began an upgrade of the station's ground system. As an outgrowth of that project, we conducted preliminary field measurements and discovered extensive asymmetrical distortion of the KKPZ pattern.

To make a long story short, we discovered detuning of one communications tower was disabled and found damaged detuning apparatus on another tower. More disturbing were several towers that suddenly appeared or were modified.

As the project progressed, the task became working with those tower owners to resolve the problem. As a general observation, I received good cooperation from most tower owners and I have to give particular credit to American Towers and Joe Kuran, who is the Technical Systems Manager for the Washington County Communications Bureau.

One agency, however, concluded that the absence of explicit AM protection rules within the land mobile service rules allowed that agency to ignore precedent, the "newcomer rule" and good engineering practice. The new report and order resolves the KKPZ open complaint and the confusion as to what should be done to protect AM stations.

Personally, I look forward to the day that KKPZ will no longer need perpetual STAs.

**Rocky Mountain Ramblings
The Denver Report**

by
**Amanda Hopp, CBRE
Chief Engineer, CBC - Denver**

NX50 Update

Nautel recently released firmware version 4.0 for the NX50 transmitter. We were waiting a little while before updating our unit just to make sure the bugs were worked out. After a full two months, we were running into some issues and needed to do the update, so I contact Nautel.

There were several ways offered to do the update. I decided that rather than overwriting the firmware on the existing compact flash card, it would be better to buy a new card to do this. The option Nautel suggested was to burn the new image (.ISO) file with the new software onto the existing card. I don't know about you, but I like the idea of having something to go back to if need be, so I opted to leave the original card as is.

So I went and bought a new compact flash card and a USB card reader so I could burn the image to the new card. It took about an hour to download the file and burn it. The next day I went to the transmitter site, instructions in hand, and began the process.

Of course it didn't work. The new software came up but was super slow to load. Among other issues, the presets were offset by one (i.e. the 10 kW preset was the 50 kW day power, the 2 kW preset was the 1.5 kW night power, etc.), which would greatly hurt us once night time came.

After talking to Nautel, I found that I missed a step in the installation process - the important one of "flashing the transmitter." While the upgrade instructions are fairly well written, they do jump around some (e.g. "If skip to step 41"). It would've helped had the critical steps been in a different color or highlighted somehow. Anyway, I went back and did the step I missed, and still got the same thing - very slow boot-up and stuff just didn't work right. When we tried a restart (both soft and power-cycle), the AUI (local touch screen interface) wouldn't come up at all. This whole process was not a fast one. After several hours of trying various things with Nautel's help, we gave up and put the old

software back on.

The next day I headed out first thing in the morning. I had re-downloaded and re-burned the image thinking that maybe, just maybe, something was corrupt in the original download. I carefully followed every step in the instructions but got the same results: It would take over five minutes to boot up each time, and the local AUI was MIA. Yes, the transmitter worked fine, produced RF and all that, but we still need an AUI at the site.

I spent the entire day at the site working with Nautel, trying many different things with no luck. They informed me that version 4.1 would be released within the next day or two, so we got the transmitter working well enough for the weekend, and the following Monday I received the image file from Nautel for version 4.1.

Thankfully they have a local customer support guy in Denver who was able to drop off two of the flash cards for me to try. While the initial install seemed to go by fast, before the AUI could come up we got an error message. Neither Nautel-supplied card worked. We put 4.0 back in and left for the day. In the rush to try and help us, the image wasn't properly tested and something was missing.

The kind software engineer who had been working with me all this time worked tirelessly the whole day, making sure the new image (take 30) he was about to give me worked. I burned it to both cards and went out to the site the next day. Victory! Well, almost. The settings with the new version aren't exactly the same as with the older version (2.8.6). The boot-up process was still five minutes.

We opened a port to allow Nautel's software folks into the transmitter, and with their help we found some network configuration errors that needed to be corrected. Once we got those taken care of, boot-up went from five minutes to a minute seven seconds, which is what Nautel said to expect, give or take ten seconds. Finally, VICTORY!

The transmitter has been running just about flawlessly for several days now. I have found an



Engine error that keeps occurring that I will have to call Nautel on. Hopefully that will be an easy fix, just a setting missed somewhere. The occasional error message notwithstanding, the transmitter is working fine.

With the new software comes several changes. If anyone uses NexGen, you will understand what I mean when I say the changes are significant. How often have we updated NexGen to have the menus and settings changed and basically have to relearn a whole new system? While not so much anymore, I remember in years past it was like a whole new program. With version 4.1, this is no different. Nautel changed the menus around, and the appearance and operation of the AUI is different. There are even some new features. So far I like it all. It has taken some getting used to, especially with navigating, but all good improvements.

Inventory

It's that time of year again, inventory. I got my list several weeks ago after asking for it. I wanted to get a head start on things as we have a ton of stuff in Denver (we maintain equipment, parts and test gear stock for the whole company here). I must say it is always a pain. Things come and go and we have yet to come up with a way to keep track of it all. Things are inevitably forgotten in the mix somehow.

As I say every year, this upcoming year, I am going to try to do my best to keep track of everything. It would definitely make this process a million times easier.

Budget

I am also working on Denver's budget requests for 2014. Last year was fairly quiet for us. This year it seems we are in need of some high-priced items. The one big thing we need this upcoming year is a new roof at the KLZ transmitter site. In late winter/early spring, I went to the site to deal with an issue and upon going on the roof, found the roof membrane was stretched and a tear had formed. While nothing had come of this yet, it was just a matter of time before we had water in the building. I called a repairman and he came out and patched the hole. We knew redoing the roof would cost several thousand dollars, so we put off any further repair. So far, I have gotten two quotes and they seem reasonable, especially since they are within \$5 of each other. I am waiting for a third quote to come in. Then I need to figure out a few other things for this process so we are ready to get this done before any further damages take place.

That about sums it up for this month. So until next time! That's all folks!!!

The Local Oscillator
September 2013

KBRT • Avalon - Los Angeles, CA
740 kHz, 50 kW-D/0.2 kW-N, DA-1

KCBC • Manteca - San Francisco, CA
770 kHz, 50 kW-D/4.3 kW-N, DA-2

KJSL • St. Louis, MO
630 kHz, 5 kW-U, DA-2

KKPZ • Portland, OR
1330 kHz, 5 kW-U, DA-1

KLZ • Denver, CO
560 kHz, 5 kW-U, DA-1

KLDC • Brighton - Denver, CO
1220 kHz, 660 W-D/11 W-N, ND

KLTT • Commerce City - Denver, CO
670 kHz, 50 kW-D/1.4 kW-N, DA-2

KLVZ • Denver, CO
810 kHz, 2.2 kW-D/430 W-N, DA-2

KSTL • St. Louis, MO
690 kHz, 1 kW-D/18 W-N, ND

WDCX • Rochester, NY
990 kHz, 5 kW-D/2.5 kW-N, DA-2

WDCX • Buffalo, NY
99.5 MHz, 110 kW/195m AAT

WDCZ • Buffalo, NY
950 kHz, 5 kW-U, DA-1

WDJC-FM • Birmingham, AL
93.7 MHz, 100 kW/307m AAT

WEXL • Royal Oak - Detroit, MI
1340 kHz, 1 kW-U, DA-D

WLGZ-FM • Webster - Rochester, NY
102.7 MHz, 6 kW/100m AAT

WRDT • Monroe - Detroit, MI
560 kHz, 500 W-D/14 W-N, DA-D

WMUZ • Detroit, MI
103.5 MHz, 50 kW/150m AAT

WPWX • Hammond - Chicago, IL
92.3 MHz, 50 kW/150m AAT

WSRB • Lansing - Chicago, IL
106.3 MHz, 4.1 kW/120m AAT

WYRB • Genoa - Rockford, IL
106.3 MHz, 3.8 kW/126m AAT

WYCA • Crete - Chicago, IL
102.3 MHz, 1.05 kW/150m AAT

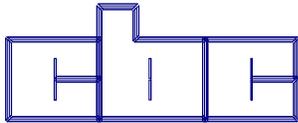
WYDE • Birmingham, AL
1260 kHz, 5 kW-D/41W-N, ND

WYDE-FM • Cullman - Birmingham, AL
101.1 MHz, 100 kW/410m AAT

WXJC • Birmingham, AL
850 kHz, 50 kW-D/1 kW-N, DA-2

WXJC-FM • Cordova-Birmingham, AL
92.5 MHz, 2.2 kW/167m AAT

CRAWFORD
BROADCASTING
COMPANY



Corporate Engineering
2821 S. Parker Road • Suite 1205
Aurora, CO 80014

email address: crisa@crawfordbroadcasting.com