The Local Oscillator

The Newsletter of Crawford Broadcasting Company Corporate Engineering

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MDCL Savings

Since we started employing Modulation Dependent Carrier Level (MDCL) operation on our high-power AM stations several months ago, we have been seeing some very tangible savings, both in power consumed and cost.

It wasn't until early February that we got our first look at the savings realized from MDCL operation from the XL60 at WXJC in Birmingham. Astoundingly, we saw almost a 40% savings for the month of January over the same period last year. That is almost double the savings that we have seen on our two NX50 MDCL stations, and I really don't see how MDCL alone can account for it. I initially suspected that weather has played a part, but the data I have been able to obtain shows that the average daily highs and lows for January 2011 and 2012 were within three or four degrees of one another. We're going to have to watch this one over a longer period of time to determine what the real savings are.

The other two 50 kW stations are enjoying a consistent 21% reduction in power usage, and I believe that is a reasonable number that we can continue to expect in the cooler weather months. I look for increased savings in the cooling season, probably another 2-3%.

We have implemented MDCL on one of our 5 kW AM stations, WYDE(AM) in Birmingham. For the month of January (compared to January of 2011) we saw a 5% savings. This is a little less than I thought we would see, but I believe it is reasonable. At the lower power levels, the fixed loads (HVAC, rack equipment, security lighting, etc.) represent a larger part of the overall usage.

This was well illustrated at the KLVZ day site in Denver for the months that station was dark last fall. The power consumption, even with the transmitter off and the thermostat set to 50 degrees, dropped only about 25%. Tower lights, security lighting and all that clearly represent the lion's share of the electric load there, and although WYDE (AM) operates with twice the transmitter power, the situation is similar.

I have filed a request with the FCC to implement MDCL on KLZ in Denver and am awaiting grant. With a simple firmware upgrade in the AM-IBOC exciter, we can experiment with MDCL on that station as well. It may not be worthwhile in the final analysis, but it's certainly worth a look at least.

KBRT Project

We continue to make good progress on the permit process for the new KBRT transmitter site in Orange County, California. In the last month we completed the first round of plan checks and were provided with a number of pages of corrections and clarifications that we need to address. At this writing, we are well along with these and have even filed the completed package of grading plan corrections. We should, by the first week in March, have filed the corrections/amendments to all the other plan sets, including towers, foundations and prefabricated building.

The whole process is being somewhat complicated by a change in the applicable building code that will take place in April. Because the new code will go into effect before we turn any dirt, we are being held to the standards of that new code, and we did not know that going in. This primarily affects the prefabricated equipment building.

Interestingly, one thing I had to do was purchase a copy of the ANSI/TIA-222-G tower standard, which is incorporated by reference into the 2010 California Building Code. The county plan checker did not have a copy of the standard so I had to obtain one and loan it to him. Evidently the Orange County planning department doesn't see a lot of

applications for tower construction, which is no surprise.

On a separate track, we are working with Southern California Edison to finalize the plans and permits for the underground utility feed to the site. We will, of course, need temporary power for the construction phase, and then we will need power to the building, towers, etc. as early in the project as possible (for one thing, we will have to light the towers as soon as they are up).

Overall, the project is moving forward nicely, and we look to moving dirt starting in mid-April.

LTSpice IV

Stephen Poole is a self-admitted circuit geek. He loves to design and play with circuits, and one of the tools he has long used for this activity is the free application LTSpice.

Recently, Stephen turned me onto LTSpice IV as a means of analyzing RF networks. He had been playing with a model of one of the WXJC(AM) ATU networks and suggested that I take a look.

I have a number of tools that I use to analyze and model RF networks, including Westberg Consultingôs excellent WCAP Pro. I have been using WCAP in one form or another since the early 1990s, and the current GUI version is a real gem. Every moment-method application that I file with the FCC includes a number of WCAP circuit models, which account for the base-region reactances that influence the self-impedance of the tower as measured at the ATU output. These reactances also influence the phase and current at each ATU output in the directional mode, which we must account for when utilizing base sampling.

It occurred to me that LTSpice IV just might perform some of the same functions as WCAP but without the hefty up-front cost and annual license fee, so I began experimenting with it. First, I opened a WCAP circuit model that I used in the calibration of one tower in the WRDT directional array. Then I created an identical model in LTSpice IV and ran it. I then compared the two model outputs to see how close they were.

What I found was very encouraging. The current and phase shift through the base-region reactance ñnetworkò was virtually identical between the two models. But the one thing LTSpice does not provide is nodal impedance information, and that is something that we must have when calibrating a moment-method model.

As I was about to give up on LTSpice IV as an ñalso ran,ò the thought occurred to me that the impedance at any one point in a circuit is simply the voltage to current ratio. If I could create a ñnodeò in the LTSpice model at a point where we need impedance data, I should be able to calculate the impedance.

Creating a ñnodeò for which voltage data is provided in the model output took a little investigating ï it is not directly provided for in the program. The workaround was to create an ñoutputò at this point. When I did that, I got the voltage data that I needed (the current data was already provided through an inductor at that point in the circuit).

Both models were run with a 100-amp source (chosen to provide the resolution we need in the output) on 560 kHz with a phase of zero.

Note that in the WCAP model below, the output current (through the resistance at node 3) is 103.02 amps with a phase of -0.664. Now compare to the output of the LTSpice model at I(R2) (the current in the resistive component of the load impedance): 103.024 amps with a phase of -0.663614. Round that to the same number of significant figures in the WCAP model and you have 103.02 amps at -0.664 degrees. We can call that an exact match.

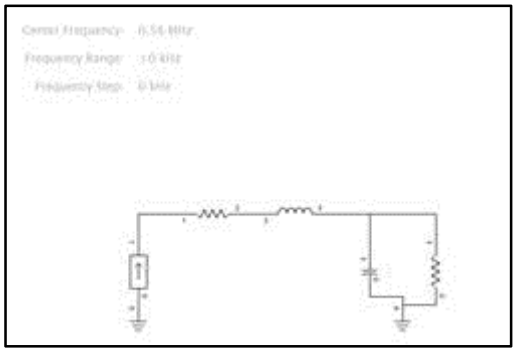

Figure 1 - WCAP Pro Circuit Model

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	1-2	1.00000000	100.00 ∠	0.000° V	100.00 ∠	0.000° A
L	2-3	2.20000000	774.09 ∠	90.000° V	100.00 ∠	0.000° A
C	3-0	0.00005000	18440.69 ∠	68.421° V	3.24 ∠	158.421° A
R	3-0	63.90000000	18440.69 ∠	68.421° V	103.02 ∠	-0.664° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1-2	1.00000000	68.82 + j 179.223	67.82 + j 179.223
L	2-3	2.20000000	67.82 + j 179.223	67.82 + j 171.482
C	3-0	0.00005000	0.00 - j 5684.105	0.00 + j 0.000
R	3-0	63.90000000	63.90 + j 167.200	0.00 + j 0.000

Figure 2 - WCAP Model Output

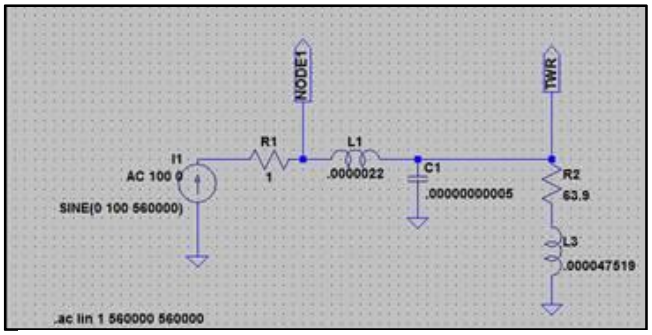

Figure 3 - LTSpice Circuit Model

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--- AC Analysis ---

frequency:    560000          Hz
V(node1):     mag:    19162.7 phase:    69.2713°          voltage
V(n001):      mag:    19198.3 phase:    68.9922°          voltage
V(twr):       mag:    18440.7 phase:    68.4203°          voltage
V(n002):      mag:    17225.5 phase:     89.336°          voltage
I(C1):        mag:    3.24426 phase:     158.42°          device_current
I(L3):        mag:    103.024 phase:  -0.663614°          device_current
I(L1):        mag:        100 phase: -4.98203e-013°       device_current
I(I1):        mag:        100 phase:          0°          device_current
I(R2):        mag:    103.024 phase:  -0.663614°          device_current
I(R1):        mag:        100 phase:        180°          device_current
```

Figure 4 - LTSpice Model Output

As for the impedance at the input of the network, WCAP shows it to be 67.87 +j179.223 (output of the resistor between node 1 and 2). In LTSpice, I put ñNode 1ò at that same point in the circuit, and the model output shows 19162.7 volts at 69.2713 degrees at that point. The current at that point shows to be 100 amps at a phase of -4.98 x 10^{-13} degrees (weôll call that zero degrees for all intents and purposes). Divide the voltage by the current and you get 191.627 ohms at 69.2713 degrees. Convert that to rectangular and you get 67.83 +j179.222 ohms. Thatôs within a tenth of an ohm.

Just to be sure, I ran some other models in LTSpice and compared with the WCAP output and got very similar results.

My conclusion is that LTSpice IV, while not really intended to be a passive RF network modeling tool, still does a credible job. While I will continue to use WCAP Pro as my primary RF network modeling tool, Iôm going to keep LTSpice in my bag of tricks. LTSpice IV is available at:

www.linear.com/designtools/software/#LTspice.

Stephen will have more to say about LTSpice and SPICE simulation/modeling in his column below.

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

Hello to all from Western New York! In last monthôs report, I wrote about one of our manufacturerôs extremely poor customer service. On numerous occasions I had contacted technical support about a problem only to be told that a technician would call me back. After waiting several hours each time at the transmitter site with no return call, I would have to leave to take care of other issuesé I canôt spend all day at the transmitter site! Email support wasnôt much better than phone support, and eventually I just chalked it up that they didnôt care.

After reading the report, Cris forwarded it on to a personal friend who works with the company to raise awareness that they had a serious problem. It wasnôt long at all before I received a reply with apologizes abounding about the service they rendered (or didnôt render, in this case). Checking back into their call logs substantiated the claims I had made, and they were not aware of any problems associated with their customer support department. After a lengthy conversation with

person(s) in upper management in this company, I feel that progress was made, and they will employ greater efforts to insure that customer support is given the attention it needs.

As far as the problem with the equipment I originally called about, they agreed to replace the device outright with a brand new unit. I haven't received the new one yet – there was a new version of software that they wanted to install and ensure was working properly before I received it. Hopefully the problems experienced with the original unit have been resolved in the software upgrade.

It is ironic to note that after last month's issue of *The Local Oscillator* hit the virtual presses, I had two manufacturers call me to see if it was *their* company I was talking about! Hmmm, makes you wonder just what kind of shape they are in? I assured both callers that everything was just fine with their respective services, and they can be certain that if there was a problem, I would surely let them know about it!

WDCX-FM Buffalo, WDCX (AM)/WLGZ-FM – Rochester

At WDCX-FM in Buffalo, we recently had a couple of NexGen workstations begin to fail. We have been fortunate indeed that these computers have lasted as long as they have. To date, we have only replaced one of the production workstations, and these computers have been in constant service since 2004! I really like the Dell T-3500 computers we are replacing the older NexGen computers with. I am hoping that they will give us as good service as the original Dell 360's gave us. In order for these machines to run flawlessly, I would highly recommend installing 4 GB of memory, or more, if you can. Windows 7 doesn't seem to be as much as a memory hog as XP was, but it's the ancillary programs running that still need a high dose of memory to run smoothly.

At WDCX (AM) in Rochester, on my visit there on Wednesday, February 22nd I noted a problem with the HD Radio signal cutting in and out. Upon arriving at the transmitter site, I found that indeed the digital carrier was on for a short period of time, then would cut off momentarily, then back on.

I checked a number of things, one being the mag/ phase delay reading along with 1.96 vdc present at TP8 on the modulator driver board. By varying the mag/phase delay reading, I noted there was hardly any change in the frequency of the digital drops, and the voltage (audio gain) on the test point was dead on along with the duty cycle which was set at 50%.

I did not have our LG LPT-3000 spectrum analyzer with me to look at the spectrum to try and determine what is going on here. I will have to address that upon next visit. I suspect that possibly a change has occurred in the antenna network, i.e. impedance cusp, but don't want to jump to any conclusions until I take a look at the spectrum. I remember in the initial setup of the NE-IBOC exciter, it took Jeff Welton and me forever to get the digital signal locked and stable.

There is not a lot of room on this 4-tower array for error, and you may recall that I had to install a line stretcher network between the transmitter output and input to the day phasor to even get the cusp on the Smith chart to the proper alignment. I am hoping that the problem is found at the transmitter end and not at the antenna. If any of you have any thoughts on this, please let me know.

One item I have been struggling with is the repair of our Tascam DM3200 digital console in the WDCX(AM) production room in Rochester. Last year the display went out on this console, and between Tascam, Crouse-Kimzey and me, we can't seem to get a resolve on getting this repaired. When we purchased this console, it came in a giant cardboard crate, one that was too large to keep and store, we simply had no room for it, so it was discarded. After the failure, I contacted Crouse-Kimzey, our representative for Tascam, to see if they could get us a shipping container to send the console back for repair. They stated that, at that time, Tascam did not have any shipping containers to send us, that we would have to take it somewhere to be boxed up and shipped. I contacted The UPS Store, gave them all the information, and they came back with a price of $535.00 to crate up the console and ship it. That was way too much, considering the initial cost of the console, this shipping charge plus the repair charge along with return shipping would be better than 50 % of the replacement cost! To get the console back up and running, I have ordered a replacement display from Crouse-Kimzey and will make the repair myself. I am hoping that nothing else is bad; to keep the expenses down, I do not want to "shotgun" the repair. I'll let you know next month how this went.

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!

The Motown Update
By
Joseph M. Huk, Jr.,
P.E., CPBE, CBNT
Chief Engineer, CBC–Detroit

New Dual Stacked Monitor Mount

The WMUZ-FM control room is used by many members of our broadcast team. Each user requires or prefers different configurations of the computer equipment and video monitors in that room. Larry Foltran, our IT director, wanted to retire the computer we use primarily for call screening from internet use. We know from experience that given time, if this computer would be continuously used for surfing the net, it would eventually get contaminated. Call screening is a vital function for many of our talk shows, and having down time due to a computer virus is completely unacceptable.

The internet computer which we use exclusively for surfing in that control room was available only if you switched one of the NexGen monitors to it. Our operations manager and chief board operator, Vito Faletti, liked the current layout for use during the afternoon Bob Dutko show. Both our morning and late afternoon shows hosts require simultaneous viewing of NexGen and internet. Therefore, the object was to allow the internet computer to be viewed without switching to it and to maintain the current configuration allowing switching of monitors.

To allow us to add the needed functionality, we provided the third monitor from the left in the block diagram on the next page, a continuously un-switched video signal. This was accomplished by inserting a VGA video distribution amplifier (DA) into the system. The one output of the DA is fed to the internet-only monitor (new feature) while the other is feeding the keyboard video mouse (KVM) switch.

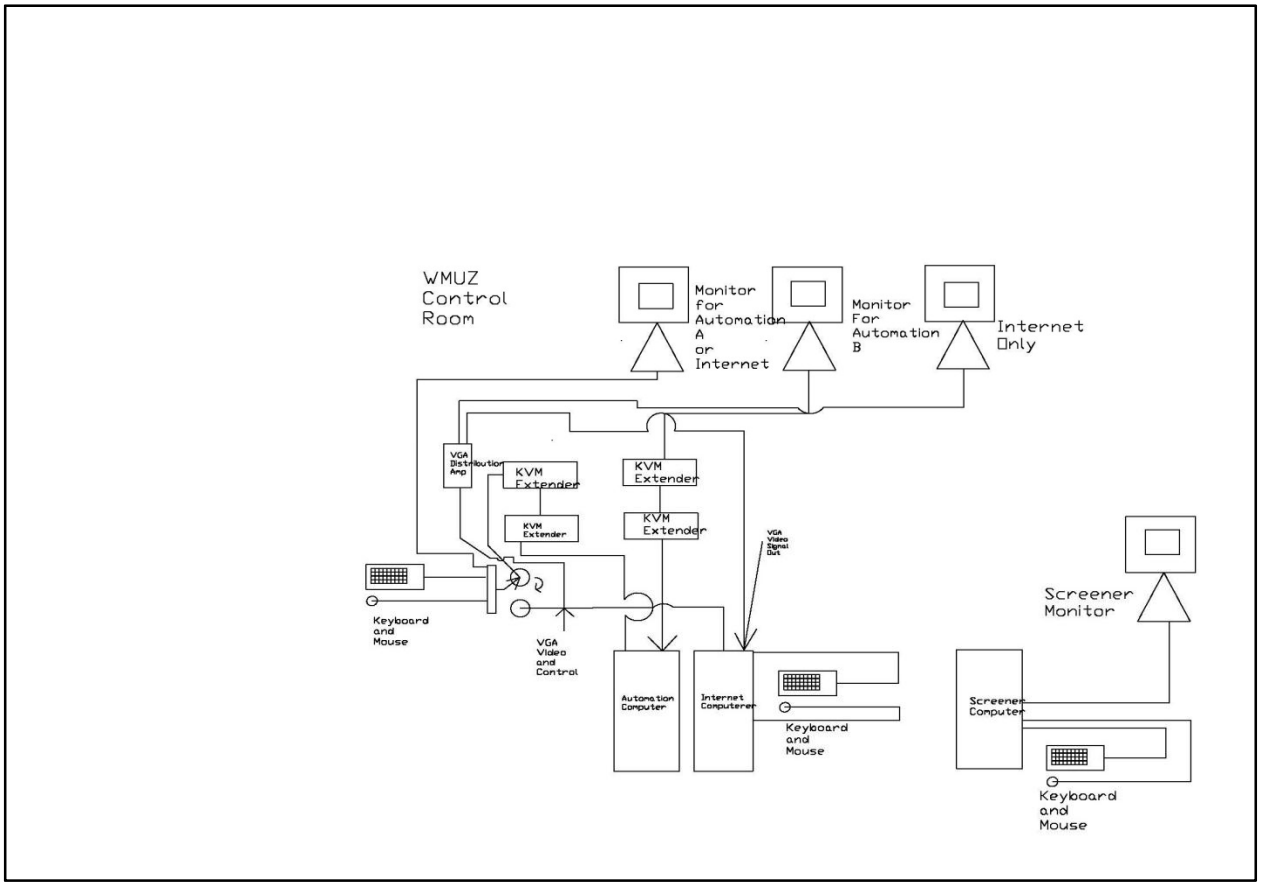
When the KVM is switched to view the internet computer, the monitor on the left views that video. In the other position, it allows the user to view ½ of the NexGen on-air workstationôs desktop. This maintains the current configuration. An extra keyboard and mouse was added to the internet computer to allow it full control in any switched mode.

Initially, I purchased an off-brand VGA DA. What I found was the video on the output of the DA was very noisy and was blurry. I exchanged the unit for an IOGEAR high-resolution DA and used high-quality VGA cables. The result was a magnificent improvement in video quality.

The call screen computer was then retired from general internet use and is now used exclusively for call screening tasks. The mount we installed was purchased from Ergo in Demand. It allows you to stack two monitors and unitizes a series or articulating arms. This allows both vertical and horizontal positioning to suit any userôs preference.

My advice to anyone embarking on this kind of a project is continued to ask questions to your operations staff up front. This project, like so many, effect many folks with divergent objectives or needs. To get everyone to accept change requires compromise and good planning.

Until next time, be safe, and if all goes well, we will be reporting to you from the pages of *The Local Oscillator* next month. Best regards.



WMUZ-FM Control Room KVM Block Diagram

News From The South

By
Stephen Poole, CBRE, CBNT, AMD
Chief Engineer, CBC–Alabama

Iôm going to take a detour this month and introduce you to one of my favorite toys, the LTSpice simulator. Itôs free for the download from Linear Technologyôs Website (www.linear.com), and Iôve been using it for a few years now. Itôs an experimenterôs dream.

SPICE was originally developed to simulate integrated circuits. Even by the early 70s, ICs had become complex enough that it simply

wasnôt possible to ñbreadboardò them for normal testing. Besides, the transistors were much smaller and the reactances were completely different. Thus, SPICE ï Simulation Program with Integrated Circuit Emphasis ï was born.

The original version was written in Fortran and required that you manually enter a ñnetlistò for every component in the design. This was plain-text listing that said,

ñthe base of transistor Q1 connects to R1,ò and so on. Behavior was modeled with formulas: ñas you increase the current on the base, the collector will follow this curve.ò It was very tedious work and the output was just as exciting: it was a lengthy table of calculations showing voltages, currents and phases at each junction point (called a ñnodeò) in the list.

We have excellent computer models for building antenna systems now, and SPICE has come a long way as well. There are professional versions, such as PSPICE, but most of these are quite expensive. The fact that LTSpice is free makes it especially attractive to a stingy rascal like yours truly.

Now, you can easily figure out why Linear would do this. They want to sell chips, after all. They figure that if they can show you how easy it is to design a circuit around one of their integrated circuits, who knows? You might just order a few thousand and keep them in business. But the fact that itôs free for the download, with no strings attached, has made it *immensely* popular with a broad spectrum of users ï from college professors to design engineers to hobbyists like me. Thereôs even a Yahoo! group online for LTSpice users, with tons of simulation files ready to be downloaded.

The Caveat: Garbage In, Garbage Out

Those of us whoôve modeled an AM antenna system know all about this one. When we did the night pattern for WXJC, Cris warned us emphatically to take our time with the initial tower measurements. We had to ensure that we had all of the right parameters to accurately predict what the pattern would look like. We needed an accurate *model* of each tower to make this work.

Not surprisingly, the same rule applies to SPICE simulations, and the biggest caveat is this: the results will only be as good as your component models. A truly good model for a MOSFET, for example, will list the transconductance, the gate charge capacitance, the various limits for current and power dissipation and many other parameters.

LTSpice includes models for all of Linearôs components (of course), and has good models for many common transistors, diodes and other devices. For most passive devices, the ñstandardò generic (or ñidealò) models will work fine for tinkering, demonstration and ñwhat if.ò Iôve used LTSpice to simulate the real-life voltages and currents in an ATU, for example, and it worked like a charm.

The problem will come when you decide to branch out and start plugging other component models into your simulations. For example, LTSpice doesnôt come with tube models. I downloaded and manually inserted some into my simulations and the results were mixed. At normal voltages and operating currents, they were decent, but at low voltages, the models were way off the mark. I never did get the cathode self-bias resistors to agree with the published charts, either.

Your mileage will vary and keep that in mind. But for most everyday tinkering and design work, especially the type that weôre likely to do, LTSpice is a gem.

Now: LTSpice in Action

LTSpice (also called ñSwitcher CADò in older Linear documents) is a graphical interface around a very good SPICE engine. You draw your circuit with the mouse, dropping components into the schematic and wiring them up very quickly. Once youôve completed your circuit, you can do any number of different analyses. I most often use the ñTransientò analysis, to look at waveforms, and the ñAC Analysis,ò which lets me see the bandwidth at any point in my circuit. The latter is ideal for designing active filters.

What makes LTSpice really neat is that, once youôve run your simulation, you can open a virtual oscilloscope and simply click on the schematic to see the waveform (voltage or current) at that ñnode.ò A really slick feature is that you can view a Fast Fourier Transform to get a good look at harmonics or other unwanted products.

In the example below, Iôve modeled the ñmagò input of the NAP177A IBOC interface board in our Nautel transmitter. Iôve used a Linear LT1920 IC as a substitute for the AD620 that Nautel puts in there, because itôs a similar chip. (Actually, Linear claims that theirs is better; no surprise there!) In the image below, you see the schematic at the bottom; at the upper left, Iôm looking at the output waveform, and to the right, an FFT of the same output. Iôm injecting 5V of RF at 850KHz to test the common mode rejection, which is extremely good.

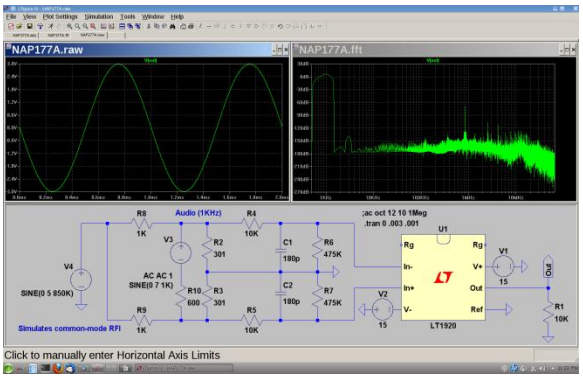


Figure 1 - LTSpice in action, simulating the Nautel NAP177A IBOC interface

BUT... and this is where LTSpice is really interestingé it allows you to ponder, ñwhat ifò and simulate all sorts of failure modes. You know your theory: good common mode rejection requires that the ñ+ò and ñ-ò inputs see the same voltage. If thereôs any difference, then by definition itôs no longer ñcommon modeò and it can make it through the IC. This next figure shows the FFT plot with one of the 180pF capacitors (C1 in my schematic) loose. I simulated a bad solder joint by lowering the capacitance to 10pF. Look at the difference!

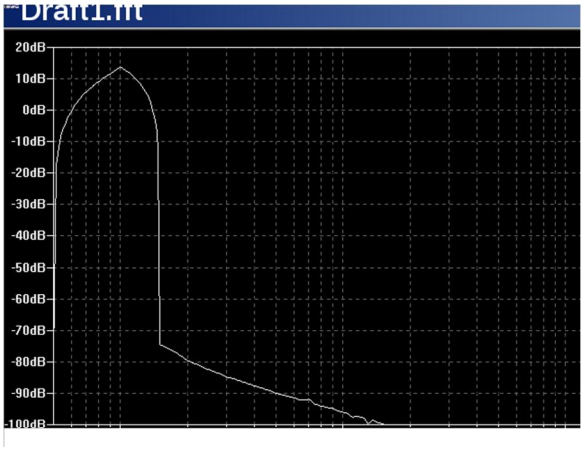


Figure 2- FFT of circuit with good common-mode rejection

In real life, especially if you have more than the 5V of RF that Iôve simulated with, you might not be able to make your NRSC mask. If this junk makes it through the modulator, you could be putting out all sorts of spurious products. All because of a single loose cap!

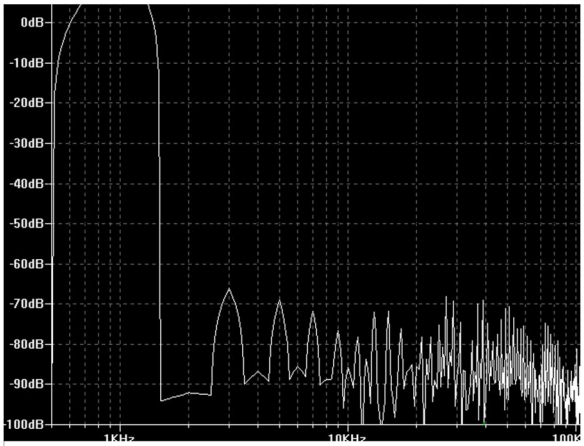


Figure 3 - FFT with a single 180pF capacitor loose in the circuit

Using LTSpice as a Teaching Tool

LTSpice is also ideal for instructing your assistants on real-life electronics. You can create simple circuits and show them precisely what will happen for various inputs, failure modes, and so on. You can virtually ñdestroyò stuff *without* all of the smoke and debris. Itôs a beautiful thing.

In this example, Iôll craft a scenario: itôs 1:00 AM youôve taken a bite of lightning and the switch-mode power supply (SMPS) in a critical piece of equipment has failed. The surge came in on the power line and took out the ñhigh sideò (i.e., the AC line or ñoff lineò side) of the supply board. The primary transformer connections are completely burned off. You donôt have a replacement and youôre off air...

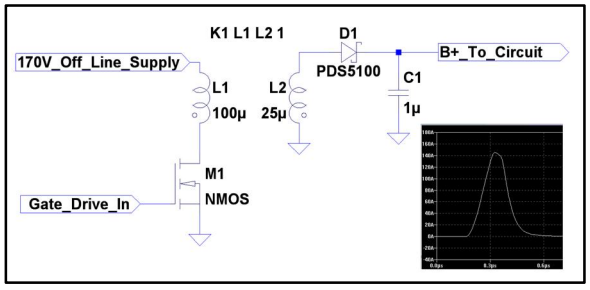


Figure 4 - Flyback power supply circuit

Thereôs a catch. This is a flyback-type supply. Theyôre called ñflybackò transformers for a reason: itôs a two-step process. The transistor (M1 in Figure 4, a MOSFET) pulls current through the transformer, building up a big, fat magnetic field. The voltage on the secondary is negative and the output diode (D1 in Figure 4) stays turned off. When the transistor switches off, that big magnetic field collapses (it ñflies backò), dumping a voltage through

that secondary and into your circuit.

Itôs *absolutely* essential that the transformer primary and secondary be phased properly, and with LTSpice, you can demonstrate this to your assistants without damaging anything. In typical usage, the primary and secondary are actually out of phase ï the ñdotsò on the schematic would be reversed. In figure 4, weôre wired incorrectly (the dots are both at the bottom).

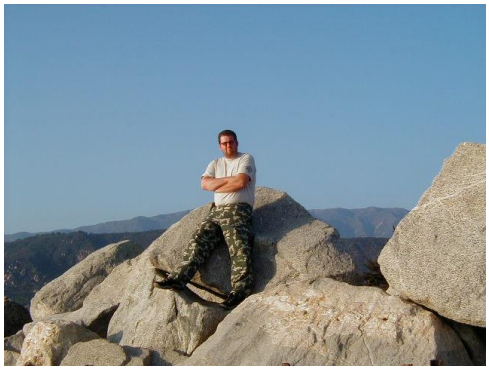
With the transformer wired correctly, we get a worst-case current of less than 3 amps through the MOSFET. But look at the current through the transistor with the phases reversed! Yes, this is a very short pulse, but hereôs the final rule about SPICE simulations: you donôt want to see *anything* that looks funky. Regardless of pulse length, the very fact that SPICE is estimating that 160 amps might get pulled through that transistor should be warning enough that something is wrong!

Until next time, have fun, and pray for America!

Catalina Tales

By
Bill Agresta
Chief Engineer, KBRT

Greetings from Santa Catalina Island! As I sit here listing to a phone conference hosted by National Federation of Independent Businesses, I am wondering where all this bureaucratic attack on small business will end, especially here in California. As we continue to navigate the issues here on the island, I am realizing more and more the deterioration of the ñbig pictureò for California and for our entire country. From insurance costs to EPA fees that now attack those who are simply trying to produce and/or market a product, many huge walls seem to be going up around us all. This has had me on my knees pleading with God for direction as many close friends have been forced to close their businesses, some that have been around for generations.



That being said, however, I praise God that He has covered Crawford Broadcasting Company so well. The progress we continue to make both on and off the island regarding our transmitter plant move has been nothing short of miraculous!

The power issues here on the island seem to have stabilized for now. As things so often go here, however, there always seems to be a new issue on the horizon, so we must always stay prepared to face a new challenge.

The last part of February has been focused on cleanup, a never-ending job at this site, especially with all the wind we have gotten recently. The good news is that the Conservancy did follow through with their brokered effort to collect the debris in our junk pile, a big deal for us since there is no trash collection at this site.

This has opened the door to more cleaning as they promise to return when needed, and the timing on this is very good as we get rid of unneeded ñstuffò in preparation for the move. It is always fun to pull old boxes from storage and see parts from things that were here long before my time or, even KBRTôs time for that matter. I am sure we will have a nice little treasure chest full of goodies for those who come here to help us with our move.

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

The Government that Can't Shoot Straight, and the Pointy-Heads who Love It

My buddy Len Watson got me going a little while back on the subject of the governmentôs campaign to make the entire nation broadband accessible. Heôs really hot about this, and since anger, like misery, loves company, it didnôt take him long to bring me to a boil about it as well.

The statists who run the current administration (or do you prefer, ñregime?ò ï I use both terms advisedly) have, in their oh-so-infinite wisdom, decided to give everyone who wants it, and that means *everybody*, access to any kind of electronic media, visual or aural, at any time they want it, on any device they prefer, from wherever they are, usually while theyôre moving. This is the electronic version of that old ñbread and circusesò promise which dates back to the Roman Empire (and you know what happened to them). In short, our rulers are legislating against the laws of both physics and math, and now, it seems. they have an ñesteemedò member of academia to back them up.

Writing in the *New York Times* (where else?) last year, Prof. Richard Thaler of the University of Chicago, in an article entitled, ñThe Buried Treasure in Your TV Dial,ò pontificates that the TV spectrum is used very inefficiently and should simply be turned over to the kind of ñon-demand, personalò broadband service audio/video service which millions could use all at once. Iôd like to dissect his article a little, if you donôt mind, by directing my comments straight at him. You are more than welcome to follow the article at the following URL:
http:/nytimes.rcom/2010/02/28/business/economy/28view.html.

Now, if I may respond: Rick, you have a problem here. You write in your article a whole list of problems which could be solved, all at once, if weôd just let the regime take away the television spectrum, which has already been reduced, and give it to the broadband crowd. The thing is, there are some fundamental flaws in your plan, Rick, and here are just a few of them, in thumbnail form, because thatôs all that space will permit here:

First of all, Broadcasting, *if only in concept*, is far more spectrum efficient than is broadbanding over the public airwaves. How? Simple. Take the amount of spectrum, measured in Hertz, which is taken up by an individual video or audio RF channel, and divide by the number of folks receiving it. For example, letôs start with a TV station located in New York City. Itôs a fact that an ñover the airò TV channel, be it analog or digital, has a bandwidth of all of six MHz, which is the case. We further posit that each Nielsen rating point equals about 113,000 *viewers*, not sets, watching any channel in New York. So, a program which draws a really marginal Nielsen rating of, letôs say, a 0.5 has about 56,500 viewers for that program.

Now, letôs divide the number of viewers of that channel into the total number of *Hertz* of bandwidth taken up by that channel, six million, and the amount of spectrum used, per viewer, of that low rated show, is all of 106 Hz. Thatôs not a pie in the sky analogy equation. Itôs spectrum vs. user count, which is a legitimate measure of spectrum occupancy. By broadcasting that low-rated show on that station in that town, the per-viewer spectrum use translates to that much.

Now, pretend that that TV signal is digital, and is divided into, letôs say, 3 program channels on that one TV station. Now the bandwidth can be, for purposes of this discussion, divided by 3, or 2 MHz. That *lowers* the per-viewer bandwidth down to about 35 Hertz.

And, these numbers go lower when the number of viewers to a given program go up. Imagine the same station broadcasting the Super Bowl with, say, a 35 rating, and the full 6 MHz bandwidth being used. Bandwidth use per viewer, on that broadcast channel, is approximately 0.66 Hz. Now *that's* spectrum efficiency in terms of users per unit of bandwidth!

As I said, this example is for New York, where there is no spare spectrum available for doing

anything anymore. Any of the other top 25 markets could be considered to be in the same boat, give or take some. Beyond the top 25 markets, spectrum demand isn't nearly as great, so fewer viewers translating into lowered spectrum efficiency per viewer is nowhere near as big a deal. Still, the number of Hertz per viewer is a lot lower than is the case with "on demand" broadband, which is exactly what you're advocating, Rick. Keep reading.

Another way in which the spectrum is used efficiently is in (surprise!) the geosynchronous satellite service. Where else can you get so many services occupying the same frequencies, all in use from several different places at the same time, simply by turning a receive antenna to a different bird?

Contrast those two examples with your scheme, Rick, which is "programming on demand" via broadband, from anywhere, to users of "smart" devices, in real time. Each person would have his or her own video viewer to watch whatever each person would want. Well, that means that, in this case, the amount of bandwidth in a given area for use by just *one person*, even with all of the companding and other spectrum conserving tricks in place, is about 768 kHz of use, *per user!*

I don't know the geographic details of any of the other markets, but here in Chicago on, say, the Kennedy Freeway near downtown where it cross over the Metra (commuter railroad) North and Northwest lines tracks, between 4:30 and 6:30 PM, with the number of people looking to view the news from the local TV station, or MeTV, or whatever, via broadband, the amount of demand for bandwidth would be staggering. It cannot be accommodated. And Chicago, like all the other major markets, has many, many places just like that, in and around the city. The need for spectrum would be from DC to white light just to accommodate all of that demand, which is, of course, impossible.

Remember, there are others users of the radio spectrum who have needs as well, such as police, fire, and other public and communications services. Under your scheme, they'd have to be shut out from using any RF spectrum at all. And, in case you didn't notice, Rick, there is a portion of the vacated UHF TV spectrum which has been set aside for such public service and emergency communications users already. You're going to take that spectrum away from them? (I'm told that such a move may already be underway.)

I could go on and on about this (don't tempt me), but you get the picture. Broadcasting is the most effective, efficient use of the spectrum it occupies, with the trade-off being that there can be no "on-demand" use by just anybody. Anything like that kills dead any efficient use of the spectrum. Video on demand is what DVRs and iPods, and wired or fibered media are for, not over-the-air RF. But the powers that be in Washington these days are lapping this up. This is a great way, they figure, to demagogue the issue of "spectrum for the people," and they apparently don't care who's in the way of their goal.

Yes, I know what you're saying right about now, the ones threatened are the folks who run over-the-air TV, and yes, they'd survive on cable, but it can't stop there because once this gets going, the public demand will be such that all other users of the RF spectrum will have to fight like pit bulls or risk losing the frequencies that they need to perform their public services. And yes, I'm talking to you Amateur Radio operators especially. What the FCC, at the urging of the White House, is trying to do is to legislate against the laws of physics and of sheer mathematics, pure and simple. If they win, many are going to suffer. This country is going to suffer.

Those brilliant Washington minds are using similar logic to that which says, "If one ship can cross the ocean in five days, then five ships can cross the ocean in one day." Makes about as much sense, too. And, Rick, in case you feel you're dissed by all this, remember: Respect is *earned* in this man's world. On this issue, at the very least, you fall short.

One more point before I stop this rant: Remember the spectrum auctions and how much money they allegedly took in? That was for all of those VHF and UHF channels which went to the highest bidder. Now ï remember that, during the conversions to digital TV, the converters, and the savings coupons that everyone was supposed to get to help pay for those digital converters for everyone's outmoded analog TV sets (which coupons I avoided like the plague)? Did you know that the cost of the coupon program was actually substantially greater than was the income from the spectrum auction? Yup. Google it, or use Yahoo! Search, and find out.

Don't forget: Your tax money and in many cases, votes, bought and paid for the mighty brains that dreamed all this up. Just thought you should know. End of rant. Have a nice day.

Updating the RBDS PTY list

RBDS (RDS to some, though that term actually applies to the European version of the "program associated data on the radio" service) has been around for quite a while now, and in much of that time, there has been very little change in that part of RBDS known as PTY codes. Well, I have a

thought about that. I feel that a new PTY code is needed. So, Iôm off on a little crusade.

For the uninitiated, PTY codes are the designations which are used to bring up the *format* information on any radio equipped for RBDS. There are at present 31 of these codes available in the either system, and between RDS and RBDS, there are a lot of differences between which codes mean what formats. In Europe, all the RDS codes are assigned (source: Wikipedia). In North America, five codes are still unassigned. I believe that one of those should be assigned to a genre which has been around for maybe 20 years, but has yet to receive its own designation: Urban.

Thatôs right: Urban, the format of hip-hop and rap. Now, Iôll admit up front that Iôm not into that genre much, but shouldnôt it have its own designator? Right now, those urban stations which bother to put a PTY on their RBDS use ñR&B.ò Sorry, folks, itôs not the same thing. R&B means something entirely different to me. It ranges from the real blues and B.B. King, to Motown, Earth, Wind and Fire, and even the Ohio Players, groups which I both grew up with and enjoyed during my young adult life and which I still like to hear. My interest in adding an ñUrbanò designation to the PTY list is actually as much a defense of the old-school music as it is to give the hip-hop genre its own designation. As it is right now, for PTY purposes, the R&B designation is too broad, and as far as Iôm concerned, needs to be split off. Donôt tell me about ñSoft R&B.ò Iôm still trying to figure out what that means.

Why would the chief engineer of an Urban station (WPWX here in Chicago) be doing something like this, which is clearly part of programmingôs territory? Because this part of the business is still technology-driven. Iôm the one, not programming, who installs and maintains the equipment upon which these codes are produced, and the PDs just donôt know how they would deal with this sort of thing. Nor should they have to. Thatôs part of my job, really, and it should be yours as a CE to identify a need that a programmer would want but not know how to get, or even that he or she can get. The PD at WPWX, Jay Alan, is backing me 100% on this project, and heôs getting support from other Urban PDs as well. Besides, as far as I know, no one else has yet come up with this idea, so why shouldnôt I try it?

Iôm going to be at NAB this year. Itôs been over 20 years since Iôve gone, a lot of my friends are pushing me to go, and frankly, itôs about time. An NAB RBDS committee working session is being held on Saturday afternoon, way early, but what the hey? Ben Barber at Inovonics has been kind enough to get me pointed in the right direction with the committee on this issue, so Iôm laying the groundwork, going in to present my pitch, and see how it floats.

Even if the Committee puts the Urban PTY code into the RBDS standard right now, it will be a while before a lot of car radios will be able to show listeners that the station theyôre hearing is indeed ñUrbanò via either RBDS or HD PAD. Thatôs because the table of codes is embedded in the radios themselves; they just take the two digit code coming from the station, do a look-up, and then display the full format. Radios coming out after the change would have the new designator. Older ones donôt.

Be that as it may, the addition of the óUrbanô format to RBDS should be happening, it really should have happened a long time ago, and maybe now is the time. Iôll let you know how it turns out.

The Portland Report

By
John White, CBRE
Chief Engineer, CBC–Portland

In years past I worked with emergency disaster communications planning from a perspective of Amateur Radio. In the aftermath of the Mount St. Helens eruption, Amateur Radio operators provided more than 20,000 operator hours conducting emergency communications. That didn't include the preparation for the potential massive flooding of Longview, Washington (just north of Portland) if the Spirit Lake Debris Dam had failed.

I mention this because of some changes I have noticed in the last few months, but first I need to add some context. Being a blue state, Oregon has no shortage of top-down solutions. A few examples include a transit system in which government is pushing very expensive rail solutions. Rail capital costs typically run 50 to 100 times the capital and operation cost of bus transit, which actually provides 98% of the local transit rides. So as Trimet, the local transit authority, is on the brink of bankruptcy, new rail lines are being constructed without any source of funding.

On other fronts, the governor, as a former ER doctor, is implementing state control of medical services and doctors' offices. Similarly, our governor is moving K-12 and higher education from the Oregon Department of Education and its elected Superintendent of Public Instruction to the governor's office.

Given that environment, the disaster preparation changes I have perceived are all the more remarkable.

One example was a news item in just the last week. Oregon doesn't get the usual kinds of disasters that challenge other parts of the country. We do, however, have a potential for a very large (Richter Magnitude 10) earthquake. A fair bit of geologic research has been done which found, among other things, that the last quake was on January 26, 1700 at about 21:00 hours. Until recently the research indicated a quake frequency on average of every 300 to 500 years. The latest research has honed that down to 300 years on average.

For many years, the general recommendation has been that everyone should have an emergency kit and resources for 72 hours. The expectation generally was that people need to be self sufficient for three days while emergency responders deploy to a disaster. However, I see that changing here in the northwest.

Unlike past news, the latest research showing quake frequency at 300 years actually made the news in a newscast through a press release. (Yes, I know that is a criticism of the broadcast and legacy news coverage.) The surprise was that the news coverage included references for the need for self-sufficiency for longer than the traditional three days. And that I think is wise.

A 9-plus rupture of several hundred miles of the Cascadia Subduction zone creates damage potential for Vancouver and Victoria (BC in Canada), Seattle, and Portland. That would result in transportation damage that will cut fuel and food delivery for not just three days but weeks.

It's evident that the recent Japanese earthquake lessons are being learned here in the Northwest by police and fire responders. In that thin line between panic (crying wolf) and preparation, the perspective of self-sufficiency is making its way to the public, a view that is being championed by the actual boots on the ground which recognize the demands of a major quake will quickly overrun government resources– a move from top-down solutions to bottom-up salvation.

All that just highlights the need for communications – Amateur Radio and Broadcast. What will it take to get our station back on the air? Planning has often been described as decisions that can be made prior to a disaster. It's good to see that planning focusing on the people as the major resource during any disaster. Not all the wisdom resides somewhere in the bureaucratic catacombs of a government building.

I sometimes find myself looking for a well-known solution to a problem only to find it no longer

exists. I had that experience with a recent security problem at the station. I want to close the gate at the station, which will require an intercom at the gate for valid visitors. That, I thought, should be simple.

I thought that in a delusional moment, later to find out the definition of ñintercomò must have changed. A trip to the big box home stores produced blank stares and required a description of what an intercom isé not at all a good start. The search went downhill from there. Webcams were offered as the latest solution. Hmmm, donôt think so. With the emphasis on the latest product fad, something seems to be lost.

The latest revelation that Motorola land mobile base stations and vehicle radios are no longer serviceable sets a fine point to the changes. Motorola no longer provides service manuals, schematics or replacement parts for those products. That does seem extreme.

Rocky Mountain Ramblings
The Denver Report
by
Amanda Alexander, CBRE
Chief Engineer, CBC - Denver

Security

I donôt have much to update on this time around. Thankfully, things finally have slowed down.

You may recall from last month that we had a near break-in at our 670 KLTT transmitter site. After a few weeks of waiting, the security company received the parts they would need to get our towers monitored. They came out on February 14 and began the work. This included an updated system. We got a new keypad, and they got all the towers hooked up. One of the wireless sensors for the tower base areas was bad, so they had to come out later in the month to finish up the work. It puts my mind at ease knowing the towers are monitored. I know someone can easily start breaking apart the fence elsewhere, but chances are, theyôd just cut the lock and go in through the gate thinking it is outside and there is no way weôd monitor it with the security system.

Server Installation

We also received our final two servers to replace the office file server and streaming firewall machines. The original servers were both 2RU and the new servers are only 1RU. It is still amazing to me to think that we have created more room in our racks when we went from seven racks at Wheeler Block to only four here at Pavillion Towers.

I had an interesting time learning the various things I needed to get these servers installed. For our office file server we installed the FreeNAS operating system, and for the stream firewall, ClearOS. Getting things set up for the stream firewall was simple. Install ClearOS and click a few boxes and weôre off to the races. The office file server, on the other hand, was a beast. With the help of Stephen Poole, I was able to get it installed and begin the long process of transferring the files over from the old server. This server is for our office people to backup important documents. It is also a way for people to share documents without having to email back and forth. Some people have taken full advantage of the server while others have not. But because of the few who do backup their computers to it, it made for a long transfer. After trying it on a weekday and realizing how long it would take, I decided to do it on a weekend. And it took an entire day to get it done.

Once this was done, the ñfunò began. I had to go into the server and create all the usernames and passwords for everyone. Of course the old server had some accounts for people who had not been around in some time that I forgot to delete, so this caused issues with the creations of new usernames. Because of how I transferred the info over, it associated an ID with that username. When I created the new username it created its own ID, and since the two IDs didnôt match, things didnôt work. Stephen came to the rescue and showed me how to fix the issue. I was finally able to start going to computers and giving them access. I had two logins that would not work.

After a long while, I decided to delete those accounts and recreate them, and that worked. I have no idea what happened, but recreating the user accounts fixed it.

It is a good feeling knowing all of our servers are a year old or less. Our next project, I hope, will be to replace some of our NexGen workstations as they are getting older and are beginning to cause us problems. I will take my time, though, as I need a break from computers for a while!

That about covers it for this issue. Maybe things will happen in March to give me more to write about next time. So until thené thatôs all folks!!!

Digital Diary
by
Larry Foltran
Corporate Website & Information Technology Coordinator

Shazam

The success of a business is generally related to drawing more attention to your product or service than your competitor can. In todayôs advertising rich world, leaving a lasting impression is critical. But if you can lead the consumer to complete the transaction nearly instantaneously and do so in large numbers, you are guaranteed to be successful. Mobile technology has nearly eliminated the ñIôll check on that laterò approach when an ad successfully touches a consumer. Prospective customers can quickly reach out, reacting to a call to action from almost anywhere.

Not too long ago, companies began to look towards utilizing QR codes in print materials to lead the target audience to a specific web site, micro-site or web page. Although Iôve seen some attempts at using QR codes in television ads or even web ads, they have been extremely limited. Aside from simply displaying a web URL, linking to the web via a television has been unsuccessful. Possibly until nowé

A UK-based company called Shazam ï named after the 1940ôs era comic book character ï is attempting to bridge the gap between television spots and the web. You may have noticed their small blue, black and white ñSò logo appearing during a number of television ads, specifically during the recent Grammy awards.

Some mobile app users may already be familiar with Shazamôs offering on the music side. For quite some time, users of their mobile app have been able to identify a specific prerecorded song by analyzing the pieceôs acoustic fingerprint. The advertising aspect of it comes into play by providing the related iTunes link along with the songôs title and artist information, allowing the user to quickly purchase the song.

Referred to as the ñsecond screenò experience, Shazam has now utilized similar technology to direct consumers to additional brand information as they watch a television ad. The user holds up their mobile device when the logo appears on the screen and then activates the sound recognition app. They are then instantly linked to the related web-based content. But are consumers downloading the app? Based on the companyôs information, Shazam claims to reach over 165 million users currently with the number growing.

Similar to QR codes, the Shazam TV appôs foundation rests on the concept of permission marketing which means only those truly interested in the product or service will be seeking the additional information provided by the web-based content. Shazam also claims that one specific ad campaign drove 20% more traffic to the associated microsite than general traffic to the brandôs main web site. But in my opinion, two questions remain. Did the associated web content ultimately lead to additional sales, and how many of those who linked to the content previously unaware of the advertiserôs

offerings?

In my opinion, there are two hurdles Shazam will need to overcome to ensure theirs isnôt the latest mobile app to disappear from the radar. First, the general model for the TV app is miles apart from their song app in the sense of consumer usefulness. An app that helps you figure out what ñthatò song is serves as a definite benefit to the user. The marketing aspect follows, allowing for quick and easy purchase of that song. In terms of the television ad, the user expects the content they will be redirected to will containé wellé more advertising. The success falls upon whether the person is either prepared or driven by the ad enough to complete the transaction or if the brand provides some sort of free incentive.

Secondly, does the consumer have enough time during a 30-second television spot to determine an interest in the product or service, launch the app on their mobile device and scan the audio to successfully link to the web content? Keep in mind that the app first needs to analyze the acoustic fingerprint to determine where to send the user, so add in some additional time for that. Some may argue that any number of consumers that actively pursue additional marketing information for a product is a plus, but whatôs the return on investment?

I know I havenôt been very kind regarding QR codes in the past, specifically relating to the general populationôs lack of familiarity with what to do with them and the developerôs lack of effort to change that. In my opinion, that is one feather in the cap that Shazam possesses. Although there are several music recognition apps available, users have been familiar with Shazam and their blue logo for quite some time. Even if simply a cure for curiosity, users will scan television adsé at least initially.

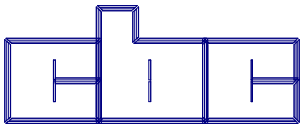
There are definitely a number of pros and cons for advertising and media related to this new technology. Whether this type of advertising content proves successful will fall on the quality of the advertising spot itself. If not already compelled by the message or branding, I donôt believe consumers will feel compelled to link through unless provided with some sort of additional incentive in the form of a contest or free downloadable content. Donôt believe that consumers are generally driven by free content? Think back on the last trade convention you attended and how many companies offered free pens as an incentive just to stop by and chat.

Shazam claims that new ad campaigns are coming onboard, so you should have an opportunity to run across one of these enhanced ads at some point. Iôm certainly eager to see how well this technology catches on and if weôll be ñshazamingò television spots for some time to come. Based on its audio component, I also wonder how or if this technology can be applied to radio spots without the visual cue afforded by television. Regardless, I believe we will continue to work towards bridging the gap between the different types of media in a way that users will embrace and consider second nature.

é until next month!

KBRT • Avalon - Los Angeles, CA
740 kHz, 10 kW-D, DA
KCBC • Manteca - San Francisco, CA
770 kHz, 50 kW-D/1 kW-N, DA-1
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
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



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