

Resolving 2 Meter/Cable TV Interference

A winning strategy for keeping the peace, and staying on the air!

by S.M. Yost NM8R

Is your 2m packet station in danger because of interference (TVI) it causes to the local cable TV system? Knowing your options, responsibilities, and how to track down the problem can put you back in the driver's seat. This article walks you through the entire process toward resolving this difficult issue: the technical details, how to deal with your neighbors, and how to work successfully with your cable company.

The story starts the same way, and is echoed on packet BBSs across the country: "HELP! My neighbors are up in arms, and mad as heck. I'm interfering with their cable TV. If I don't find a solution soon, my new packet station will have to go QRT. Can anyone help?"

The plea usually goes unanswered, and when it dies off the BBS, with it goes another amateur's hard-earned privilege to enjoy part of his hobby.

Worse, it's not only packet operators who can suffer. Amateur-caused cable television (CATV) interference can rear its ugly head during 2m FM voice operations as well. So, even if you're not packet-equipped (and shame on you if so!), read on . . .

KI8W BBS>NM8R (B,K,L,R,S)

S WB8HSL

MSG# TO FROM DATE TITLE
7258 WB8HSL NM8R 930907 HELP
W/2m CATV INTERFERENCE
ENTER MESSAGE/ CTRL-Z TO END

OM—Pulled the message about your CATVI problem from the Bulletin Board tonight. I understand your frustration, but hang in there; this problem can be solved! I had the same difficulty here. I fixed it, though, and I'm still on the air, with happy neighbors to boot. It takes three steps to solve this matter, so let's get started. First, you need a little background.

Long ago it was established that every radio service—commercial, government, and amateur—had its own frequency assignment. These assignments were formed into an orderly structure throughout the radio spectrum. A latecomer, however, called cable TV, added a silent partner to the plan. Silent, because cable TV's coaxial media (versus the ether used by the original ten-

ants) ingenuously allowed room for coexistence. Coax allowed two worlds, the off-air services and CATV, to occupy the same spectrum, separated by only a few mils of copper braid. One is free to roam the ether, while the other exists only within the confines of a coaxial cable. When everything works properly, one never knows the other exists.

Shielding—the basis for this coexistence—is the issue in your case. Because CATV runs a shielded, closed system, it is permitted to borrow frequencies already in use by other services. Nothing leaks out to QRM the off-the-air users, and conversely, nothing gets in to interfere with the CATV system. This may be great in theory, but how does it stand up in practice?



Photo A. Your foot survey for CATV leaks is easy and can be low profile. Who would suspect that this amateur operator (N8HGM) is sniffing out a CATV leak in her neighborhood, rather than just grooving to a tune on her Walkman? Conducting your leak survey while driving is also very effective, but don't forget to pay attention to the road!

Where the Rubber Meets the Road

Unfortunately, there are many things which can degrade a CATV system's shield integrity. When this happens, the door is opened for signals from the outside to get in, and for cable signals to get out. You didn't mention it, but I'll bet the interference is *only* on CATV channel 18, and *only* when you are on 2m. (I'll bet your HF gear, the "traditional" television interference source, isn't guilty at all this time.) Further, I'd wager it's not a harmonic or spurious output from your 2m rig. Consider this: Cable TV assignments are spread throughout the VHF and UHF spectra. They not only share the traditional TV band plan, but also many frequencies around it. All told, CATV signals occupy frequencies already in use by aircraft, broadcast TV, public safety services, and VHF amateur radio. Specifically, the video portion of cable channel 18 is centered at 145.25 MHz . . . get the picture?

A cable signal is very weak in relation to the signal you can accidentally inject with your 45 watt, packet-equipped 2m station. Once your signal gets in, it's not even a fair match! Plus, it doesn't take much of a CATV shield breach to let in an ample amount of renegade, 2m energy.

The Open Door

After you've pondered that for a moment, you should be wondering: "If my problem is one of getting into the cable system, why even mention their signal getting out?" The reason is simple: This is where the shared spectrum concept comes to the unexpected relief of amateurs. The shield break that is letting your 2m signal in is spraying wide-band video signals over the nearby area. The FCC takes a dim view of cable TV leakage, and for good reason. They don't want jumbo jets thrown off course by escaping "I Love Lucy" reruns! As a result, the FCC requires that cable companies check their systems for leaks, to prevent this. Also, limits are set on the amount of radiation permitted to escape from a CATV system. Lastly, the FCC requires prompt action to resolve leaks.

That covers the theory part. The second step of the three-part plan is foot patrol. Basically, what you'll be doing is scouting your

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neighborhood with a portable FM radio, so put on your sneakers!

Recon!

Though it's the cable company's job, you can track down the leak source (they call it an "egress") yourself. But why would you *want* to? Don't get the wrong idea—you won't fix any leak you find. That's up to the CATV company. You'll see in a moment, though, why it's helpful to know the source of the shield breach causing the leak. For now, be satisfied that it may save you some embarrassment if the source is in your own home! Before starting, however, carefully heed the following warning: *Do not trespass on other people's property while performing your self-styled leak survey.* It's not worth a load of No.7 shot, or a tangle with a Doberman, to find the leak! Ham radio needs your picture in the local paper because you hooked up a homesick foreign exchange student with her family or ran a battery of phone patches for weary servicemen through MARS, *not* because of an article about your arrest for trespassing! 'Nuff said?

For our purposes, you can perform a leak survey handily from the sidewalk, or from your car. Don't do it from other people's yards without their permission (and even with their permission, only with great care).

So . . . how do you do it?

Sniffing It Out

CATV systems inject a special modulated RF carrier into their system to act as an "odorant," sort of like the gas company does. If they have a shield break—an egress—this tone-modulated radio frequency carrier, or tracer, intentionally escapes the cable and they sniff it out with equipment carried in their vans. Luckily, you can use a portable FM broadcast band (BCB) radio to do the same! Just like your nose finds a gas leak because of the odorant injected, your portable FM radio can find a cable TV leak.

Here's how to put your amateur version of the sniffer to work. First, determine what frequency the tracer is on in your area. Do this by placing an FM BCB portable radio near your own cable TV coax. (What? No CATV in your home? Then try this test with a cooperative neighbor, or even better, the one who is complaining.) Disconnect the incoming CATV coax from the TV or VCR and, with an FM radio close by, tune until you come across a raucous whoop-whoop-whoop tone. If the carrier injector is turned on, you *can't* miss it. In my area this carrier resides around 107.8 MHz, although in some locales it's placed in the middle of the FM band. Once you know the tracer carrier's frequency, drive or walk your neighborhood, listening for this obnoxious tone. (Hook the coax you pulled for this test back up, first!)

Don't be surprised if you encounter a number of cable TV leaks in your search. Not everything you will hear, however, is a leak the cable company needs to be con-

cerned about. There *is* a permissible amount of radiation, tolerated by the FCC. You'll quickly learn to sort out the weak ones from the strong ones.

Note, too, that the sensitivity of a car's FM BCB radio is greater than the squelch setting of the commercial sniffers the CATV companies use. As a guideline, you're interested in strong leaks within a few block area of your QTH. A strong leak would be one where you hear "S9" more than 50 feet from its source. I find the car radio works best for the general search, and a portable radio for pinpointing the source.

Just remember this clue, Sherlock: Where their signal escapes, your signal enters.

What to Look For

Once your sniffer has helped you zero in on a possible leak, you need to turn to your observation skills. As you drive the system, pay particular attention to pedestal junction block housings (those 12" square by 3'-high metal boxes), and any pole-mounted distribution amplifiers. Also, scan the overhead cables for any that may have been damaged by falling branches. At a residence, the leak source can be damaged or water-corroded cable, especially in the drip loop where it enters a house. Also look for loose connectors or unterminated splitters or cable runs. Devices a subscriber puts on his line, such as cheap (poorly-shielded) coax, lengths of 300 ohm twinlead(!), and game switches, can breach the system's integrity, too. One other possibility to be aware of is the illegal tap. Take the safe path and let the cable employees "discover" these.

Why go through the hassle of hunting down the leak yourself? You don't need to. But it will help, and might even favorably impress the CATV company if you can tell them where you think the egress is located. Possibly you can even guide the CATV tech, saving him time in his search.

Contacting the Cable Company

The last step toward a solution is to make contact. (This should be easy; you're a ham, remember?!) Once you're at this point, simply pick up the telephone and call the cable company.

First, some tips to make your effort more successful:

Plan what you will say *before* calling. Your goal is to get one point across, clearly: You're the one who is causing the interference (*that* will get their attention), and you want to resolve the matter quickly, to their benefit as well as yours. Speak and act professionally—it will make a more favorable impression. Ask to speak with the System Manager, his assistant, or a member of the Engineering Department. (You may prefer to visit the cable company's office and deliver your message personally. If you're the charming, amiable type, the doors will open quickly.) After you've clearly stated your reason for contacting them, run down the following list of points to discuss: Explain

the problem and how you know the things you do. (Expect them to be curious how you know about the technical aspects of their system.) Use the word egress. (They prefer it to leak; it sounds less threatening.) Did you find anything in your own search for the egress? If so, tell them now.

Have they encountered this problem be-

fore? How did they resolve it?

Keep in mind it's not always a fault of their system that causes the leak—oops, egress. It can be devices the subscriber puts on the line. They should be as interested in these, however, as defects in their own system. Either can allow CATV signals to escape, or permit outside signal entry. It's all

in how you present it.

Don't pepper your speech with ham "Q" signals. Even though we talk this way, CATV people won't find it intelligible, or amusing.

Inquire if the cable company noted any leaks in your area at their last FCC-mandated leak survey. (They refer to this survey as

CATV Notes

CATV Frequency Assignments

Knowing what frequency is used (and shared) by a particular CATV channel can be useful in troubleshooting CATV problems. Table 1 can help you determine CATV channel frequencies from the cable company's decoder, whether your local system uses letter or number designators. Only cable TV channels 2 through 13 correspond directly with the off-air channel frequencies. From that point, CATV channels bound across the spectrum, borrowing slices of RF real estate along the way. Although it's not shown on this chart, in some systems frequencies as low as 5 MHz are used! (Source: *Scientific Atlanta*.)

FCC Rules Governing CATV Service

Part 76 of the FCC rules is on the mind of every CATV system operator. This section governs how he operates his CATV system, and spells out the technical standards he must follow. The *FCC Bulletin* reproduced here in part (FOB Bulletin No. 17), is a checklist CATV operators can use to ensure compliance. Rules 76.601 and 76.611 are of particular interest (and help) to amateurs. Rules 76.613 and 76.614 apply in the special case of cable TV frequencies shared with aeronautical services. Keep in mind that some leakage is tolerated; you might hear leaks during your tone-sniffing survey that are entirely legal. How much radiation is tolerated? FCC rules state that, at 2m frequencies, a leaking CATV signal's strength cannot exceed 20 microvolts per meter at a distance of 10 feet. You'll probably have no way of knowing the actual field strength of any leaks you encounter. Note them all, anyway, following the guidelines given in the main article, for the benefit of the service technician. He'll be able to sort out the strong ones.

Reverse Psychology

In some areas, amateur repeaters at the low end of the 2m band have long suffered QRM from leaking CATV signals. The concepts described in this article work for tracking down these leaks and resolving them. Think of it this way: If leaking CATV signals are ruining 2m repeater operation, surely some ham in the area is getting into *their* system, too . . . Use a little reverse psychology to solve this one!

What to do if the Tracer is Off

Occasionally, lightning or equipment failure will knock a cable company's FM band tracer system out of service. If so, you'll have to resort to conducting your search with different equipment. Your 2m mobile rig and 2m HT, or a scanner, will fill the bill. (Be aware of your state's laws regarding scanners in automobiles, if you employ one for the search.) Although these methods won't be as inconspicuous as a Walkman or the FM receiver in your car, they will work. Instead of a tone, you'll be searching for the actual audio portion of a cable TV channel. Here's how: Refer to Table 1 for the audio sideband frequency of a CATV channel within the tuning range of your 2m rigs or scanner. I suggest channels A through E, as these lower frequencies carry farther once they've escaped the cable. After programming your rig, drive or walk the area listening for the audio portion of the TV channel you've targeted. Zero in on it in the same manner as described in the main article for the FM receiver. Use a scanner or your mobile 2m rig with an external antenna for the general search, and an HT for pinpointing leaks on foot.

What to do if the FM Tracer is Gone!

Depending on how progressive, or financially flush, your local cable company is, they may have upgraded their leak tracing system beyond the FM band leak tracer. The new generation of leak tracer uses specialized equipment which searches for actual video radiation on chan-

nels A, B, or C. These are aeronautical frequencies, slightly above the FM band. Why the switch from a perfectly good system that was also easy for *us* to track? One incentive for the cable operator is that the new system frees FM band frequencies for commercial use. Cable systems sell an entertainment product, but no one would pay to hear a repetitive whooping tone! (Unless, of course, the customer happens to be a ham—the type who parks his receiver on WWV for hours on end . . .). If your cable system *has* made the switch, use the tracking methods described in "What to do if the Tracer is Off."

Portable TVs as Leak Detectors

It's tempting, but leave the portable TV at home; it won't work well as a CATV leak sniffer. The video component of a leaking signal weakens too quickly with distance. Beyond five feet or so of an egress, a consumer-grade TV will not detect a leak source. Also, note that only CATV channels 2 through 13 correspond directly with the frequencies of off-air TV, so it's difficult to tune the entire range of cable channels.

Neighbor PR

A little premeditated public relations effort with your neighbors goes a long way. Really now, why be hard-headed about it? Try a gentler approach. I always start with: "I'm *sorry* that I'm affecting your TV/radio/telephone . . ." It can be positively disarming, and that can work in your favor. Ditto with the cable company.

What to do when the Problem is Wrapped Up

When an RFI case of any type is finally wrapped up, I make a call to tie the ribbons on it with my neighbor. I do this to get his agreement that it is resolved, or (put the words in his mouth if necessary) "99% better, and acceptable."

Also, call the cable company and leave a message for your contact person to say thanks. Our CATV system manager went so far as to tell me to encourage other amateurs to contact him if they encountered similar problems. You can open the door for your brother and sister amateurs with this follow-up call.

Lastly, write down what you did and learned. Others can benefit from this knowledge! Share it with your local club, repeater group or packet organization.

High-Pass Filters . . . One Thing *Not* To Do

A local amateur, N8LDQ, also experienced serious CATVI shortly after my situation was resolved. Interestingly, he found that a high-pass filter, a typical TVI *solution*, was *causing* the cable system shield breach at a neighbor's home. It was a poorly-shielded L/C unit which let 2m energy in and cable energy out. Although it would have been a fine approach to an HF-related source of TVI in an off-air TVX case, in the cable system it was a Pandora's box (or gateway).

The Cable Company Field Tech and You

Try to meet the cable company technician who performs the investigation and repair work. There are two reasons to do this. First, if you impress him as a technically competent and helpful individual, you'll enhance the image of our hobby. This will help your case, and those who follow you. Secondly, you might *learn something!* (Then pass it on at your next ham club meeting!) Keep in mind the poor tech's lot: He enters the home of strangers, deals with their smoke and pets, must figure out and fix the problem, all while playing referee between the subscriber, his company and possibly even you! If you can ally the CATV company tech, your job of resolving the matter will be more effective, and quicker to succeed.

the Cumulative Leakage Index). It's not a good point to open the conversation on, but can be worked in during the visit.

Be prepared, also, for the possibility that your neighbors have not yet registered a complaint with the cable company, and you made it there first.

Once again: The basis of your position is that you are entering and QR'ing the cable system because it has some type of shield integrity problem. Likewise, their signal is get-

ting out. You are licensed to transmit over the air on 2m; they are not! The problem is theirs, whether it's a subscriber's poorly-shielded jumper, or their own damaged cables. You've even helped them locate it! Both economics (lost revenue due to mad subscribers) and the FCC inspire them to return their system to a shielded, leak-free condition. Remind them of this, ever so politely. Always end with a polite "thank you," noting you are willing to assist.

Now, reread the last paragraph, pump yourself up, and go! In the unlikely event your contact attempts are rebuffed, a letter to the system manager is the next recourse. Keep copies for reference. You might need them later on. That's it, the third and final step!

In the Meantime

At all times you should be making an effort toward good public relations. If you favorably impress your neighbors with your efforts, and maybe even self-impose some quiet hours until the problem is cleared up, they'll have a better impression of you and of our hobby. (Also, in the future they might overlook the fact that your kW on 40m makes their phone chirp a bit. You can reap the benefits of this PR effort down the road, too!) You should tell your neighbors you are working with the cable company to resolve the problem. Explain as much as they want to know. Keep relations good, and try to enlist their help in your troubleshooting efforts. Besides being the right thing to do, allying yourself with your neighbors is the most prudent path to follow. You may even need their assistance at some point to pressure the

CATV company to resolve the matter.

If, after all this (and only as a last measure), no positive results are attained, write your FCC Field Office. Addresses are in the ARRL's *FCC Rule Book*. This is a last resort, though. My philosophy is that if you present yourself in a friendly, positive, and reasonable manner, you'll receive excellent response from your cable company. More often than not they will be ready to resolve the problem and will welcome your assistance. Case in point: My local cable company took less than 24 hours to solve my CATVI problem once I brought it to their attention.

I also recommend you obtain a back issue of *QST*, October 1990. On page 42, two Cable TV employees, who also happen to be hams, offer some insight in the "Hints and Kinks" column. Your library can probably obtain a copy of that page through interlibrary loan, depending on their copyright agreement. Another reference well worth obtaining for your shack library is the *Interference Handbook* by William Nelson WA6FQG. It treats a wide range of interference subjects, including that of CATVI, in depth.

It's late, and time for me to sign off. I'll leave you with these final thoughts: You want this resolved, and you don't want your neighbors ticked at you. They probably blame you, even though it's likely that the problem is the cable system's shortcoming, or even their own fault! Keep their viewpoint in mind though: Everything was fine until "that ham down the street" went on the air. So do things right, be helpful; but remember—you are licensed to use the airwaves. Persist! 73

CATV CH	CONVTR CH	STANDARD VIDEO	AUDIO
2	2	55.25	59.75
3	3	61.25	65.75
4	4	67.25	71.75
5	5	77.25	81.75
6	6	83.25	87.75
A2	1	109.25	113.75
A1	37	115.25	119.75
A	14	121.25	125.75
B	15	127.25	131.75
C	16	133.25	137.75
D	17	139.25	143.75
E	18	145.25	149.75
F	19	151.25	155.75
G	20	157.25	161.75
H	21	163.25	167.75
I	22	169.25	173.75
7	7	175.25	179.75
8	8	181.25	185.75
9	9	187.25	191.75
10	10	193.25	197.75
11	11	199.25	203.75
12	12	205.25	209.75
13	13	211.25	215.75
J	23	217.25	221.75
K	24	223.25	227.75
L	25	229.25	233.75
M	26	235.25	239.75
N	27	241.25	245.75
O	28	247.25	251.75
P	29	253.25	257.75
Q	30	259.25	263.75
R	31	265.25	269.75
S	32	271.25	275.75
T	33	277.25	281.75
U	34	283.25	287.75
V	35	289.25	293.75
W	36	295.25	299.75
AA	38	301.25	305.75
BB	39	307.25	311.75
CC	40	313.25	317.75
DD	41	319.25	323.75
EE	42	325.25	329.75
FF	43	331.25	335.75
GG	44	337.25	341.75
HH	45	343.25	347.75
II	46	349.25	353.75
JJ	47	355.25	359.75
KK	48	361.25	365.75
LL	49	367.25	371.75
MM	50	373.25	377.75
NN	51	379.25	383.75
OO	52	385.25	389.75
PP	53	391.25	395.75
QQ	54	397.25	401.75

Table 1. Scientific-Atlanta frequency channel plan.

Part 76—Cable Television

Rule/Reference	Suggested Procedure
Leakage Tests	
Rule: 76.601	Conduct leakage tests once a year to show compliance with leakage standards in Rules Section 76.605. Maintain complete test data from annual tests for 5 years. Note: Performing regular monitoring and leakage repairs in accordance with Section 76.614 will ensure that your system complies with leakage standards.
Cable Television Basic Signal Leakage Performance	
Rule: 76.611	Conduct a test once a year to establish conformance with the Cumulative Leakage Index.
Interference from a Cable Television System	
Rule: 76.613	Stop operation immediately and correct any condition that threatens radio navigation or other safety-of-life services. Before reactivation, submit an interference report to the Field Operations Bureau of the Federal Communications Commission. Await response from Engineer in Charge before resuming operation.
Regular Monitoring	
Rule: 76.614	Provide for a program of regular monitoring for signal leakage by checking the entire plant every 3 months when using aeronautical frequencies. Maintain a log of leakage sources, probable causes, and corrective action taken for 2 years.

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