Severe RFI: Neighbors, ARRL, FCC, and Me

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October, 2019
Question: What might bring the demise of ham radio as we know it?

NO-CODE LICENSING?

THE INTERNET?

CELL PHONES?

FT8?

……..???
Radio Frequency Interference

Even if it doesn’t affect YOU, it affects everyone you want to work
Working thru a severe RFI case

Each step will be illustrated with my experience

- Identify the source
- Keep a detailed log
- Talk to your neighbor
- Contact ARRL early; work on solutions
- Escalation: FCC
- Legal stuff
- Resolution
- References
1. Identify the RFI source

• Signal characteristics (fingerprints)
  • Frequency, strength, time of day, modulation characteristics, sound, SDR panfall display captures

• Direction finding
  • Pinpoint the right house

• In my case: Coincidence with contractor activity
  • “Hey, did you just install some new lights?”
Feb, 2018: Sudden RFI onset!

- All-band buzzing, S9 + 10 dB on 40 meters
- Whipped out my direction finding gear, and it obviously was next door
Make a direction finding antenna

- Simple resonant loop, use with a portable radio
- Directions on my RFI pages at [WB9JPS.COM](http://WB9JPS.COM)
Or a wideband loop, nice with SDR

- Non-resonant, needs about 40 dB of gain
- Works great with an SDR or spectrum analyzer

Article by KQ6RS in QST May 2019

- W6LPV amplifier
- Battery and bias inserter
An electrician worked for a week...

- Installed 23 of these fixtures next door
- I bought one from him ($40) to characterize
Root cause: NO filtering

- Zero filter components on AC line side of the converter module. This is very common!
- Pads for an X capacitor… but no component
The other problem: Proximity
2. Maintain a detailed log

• Write down everything, right from the start
  • ARRL, FCC, lawyers, etc. will really appreciate details
• Be **quantitative** when collecting observations
• What to record:
  • Time and date stamp everything
  • Signal characteristics: Freq, dBm, sound, etc.
  • Direction finding results
  • Content of every contact with neighbor, ARRL, FCC, etc. especially verbal conversations
  • Letters sent/received
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<td>TS-590 Ant.</td>
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3. Talk to your neighbor

• No threats! Calm diplomacy will always help
• FCC really wants us to fix problems this way
• This is another good reason to remain friendly with all your neighbors
• My previous neighbor was real nice, let me fix things on the spot. You never know til you try.
• *Don’t* put anything in writing until you get advice from ARRL
We talked several times. No luck.

• I clearly explained the problem, in simple terms
• I explained the likely solution (filtering) since these are permanent fixtures
• Told him about FCC regulations on RFI:

  The *operator* of the interference source is responsible for fixing it.

  **FCC is the sole authority in all such cases.**

• He had no interest in taking any action
4. Contact the ARRL RFI team

- Phone ARRL HQ and ask for Paul, W1VLF
- (I worked with Mike, W1MG, now retired)
- Explain your situation
- They will offer advice on next steps, what to do, and what *not* to do
- They can test items for FCC compliance
- They can write letters to your neighbor
- They can initiate FCC action

AN INCREDIBLY VALUABLE SERVICE
Make a donation thru the *Spectral Defense Fund*
March: Sent fixture to ARRL

- Mike at ARRL tested the fixture for FCC Part 15 conducted emissions compliance
- It was just barely compliant. Also had a marking violation (Part 15 notice absent).
  - He notified FCC of the marking issue
- Since it was basically in compliance, the manufacturer would be unlikely to absorb responsibility for the RFI… but it pays to ask
  - They did supply some filters, but not effective
Mike determined that this fixture has really bad **normal-mode** conducted emissions.

I tested several commercial EMI/RFI filters as well as common-mode chokes.

Measured actual radiated noise to my station.

Commercial EMI/RFI filter was the best.

(Ideally, filter components added to the PC board would have superior performance, but impractical or impossible to retrofit.)
The final candidate filters

11 turns Romex
2.4 inch type 31

Delta 03DKAW5
3 A, single-section
$8 in quantity
Packaged filter vs. Romex choke
June: I wrote a letter to my neighbor

- Mike at ARRL edited it
- Mike also supplied a letter similar to what the FCC sends. Both went to my neighbor.
- General content:
  - His lights are generating noise
  - It’s his responsibility to fix it per FCC
  - I volunteered to pay for the work

Formal but non-threatening
Then he went haywire

- **You are irradiating my children**
  He likes keeping the lights on to prevent me from operating (jamming, anyone?)
- **Will not spend any money on this**
  But I said I would pay for it...
July: ARRL sent him a formal letter

• Clearly states the legal situation
• Copy to FCC
• As a bonus, my neighbor got the HOA spun up. This is another ongoing, parallel battle for me. (Funny that it was all ok for 16 years.)
5. Escalation: Work with the FCC

• ARRL has various agreements with the FCC

• You do not have to initiate an FCC action yourself in this case. ARRL will do it for you.

• Remember that this is not your preferred way of solving RFI problems and it will not make your neighbor happier.
September: The FCC steps in

- Letter from Laura Smith, Special Counsel in Enforcement at the FCC, to my neighbor
- She talked to the neighbor on the phone, and also called me
  - “He is digging in, refuses to do anything”
- Neighbor: I am contacting my lawyer
- So I got in touch with ARRL Volunteer Counsel
- Andy Faber, AE6Y, was most helpful
FCC’s Laura Smith

Nice person, very knowledgeable
October: The clouds started to part

- After another call from Laura, my neighbor started to cool off
- I suspect that his lawyer said it was foolish to battle the FCC
- He came by and we had a nice chat
- Agreed to fix the lights as soon as the FCC made their official determination
• Only the FCC can make a legal determination of harmful interference

• The San Francisco Field Office investigates RFI complaints

**November**: Arranged for testing, but the guy never showed up
December: We can fix this

- Neighbor got assurance from the CA state Surgeon General Office that ham radio RF is basically harmless
- For other reasons, they decided to move!
- AND, he agreed that they would fix the problem, knowing it could otherwise encumber the sale
Electrician came to install filters that I bought

**Big problem:** They interact with the dimmers, causing a hideous flicker

I had tested this exact setup but it didn’t happen in my lab

Tried another brand of dimmer, same problem

**Oh, crap. The filters won’t work…**

**Out of time…**
So I quickly wound 23 chokes

- Good thing I had cores in stock, and had previously characterized the design
- These went in on the final day he owned the house!
100 ft of Romex and sore fingers
How well did the chokes work?

- Electrician turned things on and off while I recorded noise levels: It’s BETTER!
- But also found yet another bad actor I had not previously identified: Under-counter lights
  - Even worse than the main lights!
  - Impossible to mitigate
- Detailed data entered into spreadsheet over the following weeks
Final results

Still obnoxious on 40; detectable on all bands

![Bar graph showing dB increase over noise floor with and without filters across different bands.](image)
Panfall, lights OFF

During evening CWT
Panfall, lights ON

During evening CWT
Then they moved out

- Blessed silence at last
- But it only lasted until the new folks moved in
New neighbors...

• Already contacted them. Fixed an RFI problem in their surround-sound system.
• The guy grew up next to a ham, understands what it’s about
• Told him I would teach his kids electronics, radio, machining, woodworking, engine repair…
• Willing to work with me. This is the key!
...Installed solar panels in May

- SolarEdge with Panel Optimizers
- Well-known as an RFI generator
- Here we go again… Vendor working on it.
Lessons learned

- Process mostly went by the book
- Relations with neighbors are very important
- ARRL is your most valuable resource
- FCC can be a final, big hammer
- Practical matters can override your preferred solution
- It takes a long time
References

- ARRL RFI Book
- ARRL RFI web pages [http://www.arrl.org/rfi](http://www.arrl.org/rfi)
- K9YC publications on RFI, noise, and chokes [http://k9yc.com/publish.htm](http://k9yc.com/publish.htm)
- NK7Z RFI pages [https://www.nk7z.net/](https://www.nk7z.net/)