

15 Apr 2023—Howdy!

**ADDXA**

**Albuquerque DX  
Association**

**Good DX !**

**Good Luck in the Contest!**

**<https://adxa.groups.io/>**



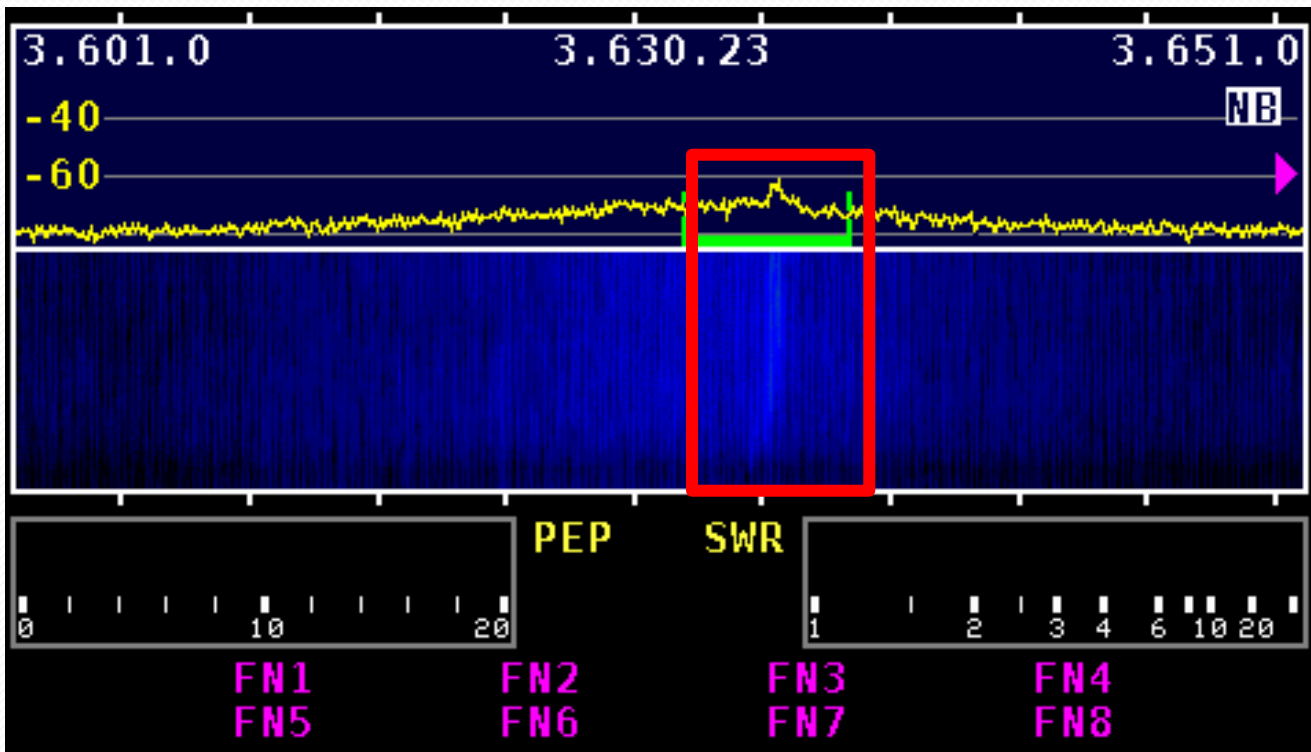
"Reducing RF interference in an  
Urban Environment"  
for HDARC

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K8TE@ARRL.net

# RFI and Its Remediation

- What's the Problem?
- Identification of Source and Type
- Antenna Solutions
- Radio Solutions
- RFI Searches
- Bonding and Grounding for RFI
- Available Help

# What's This Noise?



80m "Birdie" Flying on By

# Define Remediation Plan

1. The act or process of remedying something that is undesirable or deficient: **remediation** of the pollution from the factories.
2. The act or process of providing remedial education: **remediation** of poor writing skills in college students.  
re·me'di·ate' v.

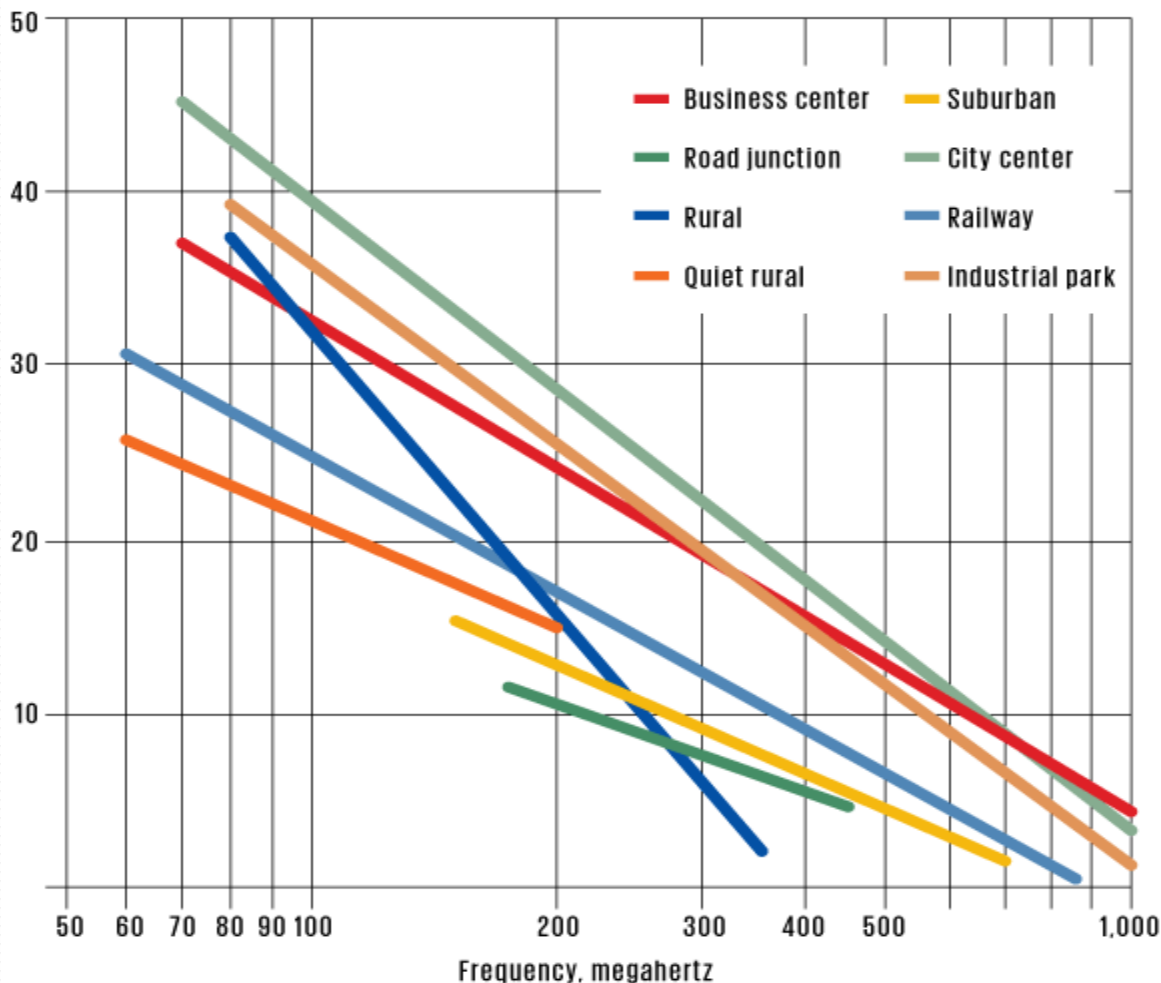
# What's the Problem? IEEE

“Radio-frequency noise pollution is everywhere.”

NOTE: NOTHING about HF spectrum!

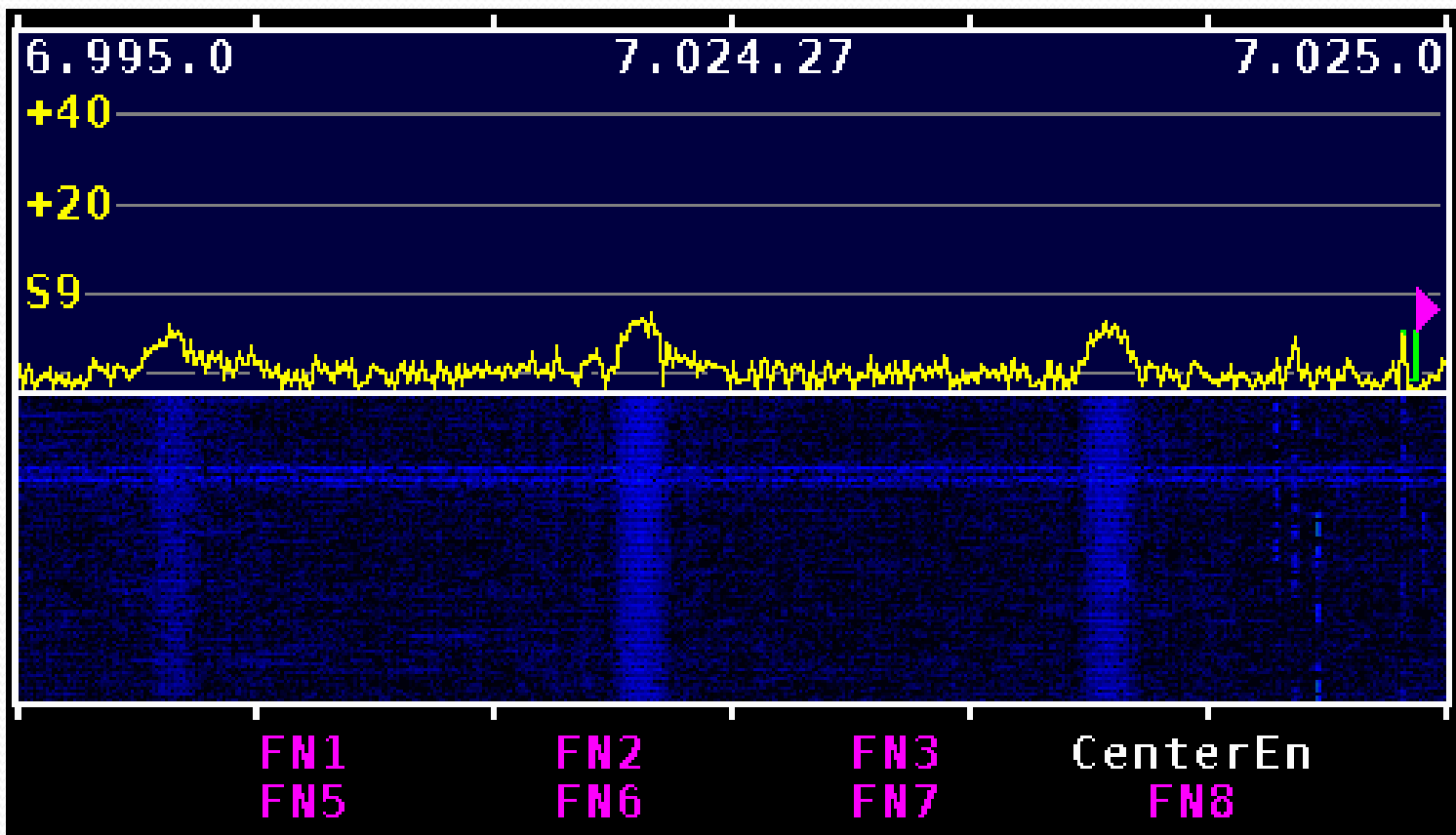
“Our lack...data... is unacceptable.”

Decibels above thermal noise background



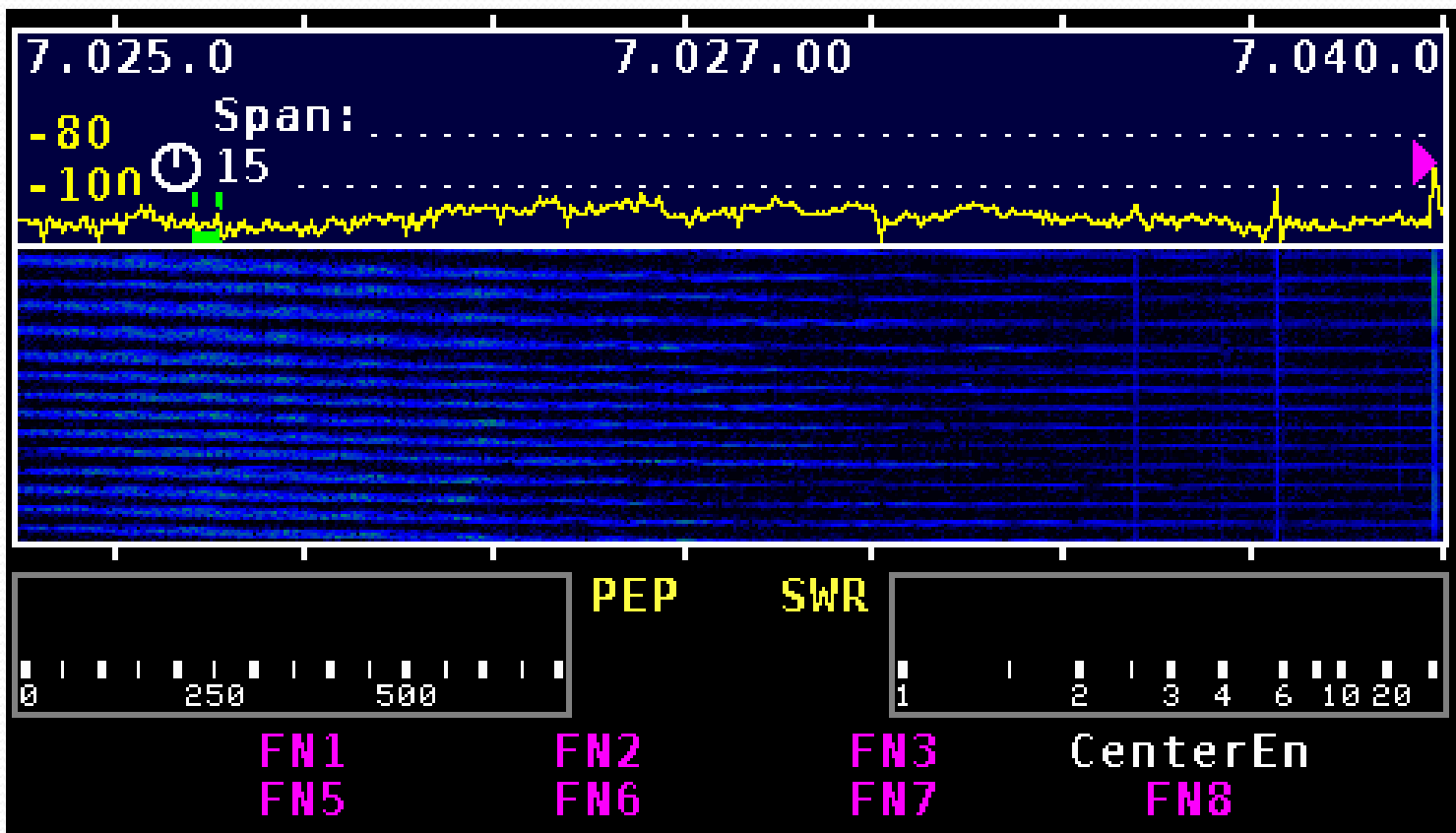
Source: Mass Consultants Limited (2003)

# What's the Problem? K8TE



10 Year-Old Plasma TV RFI

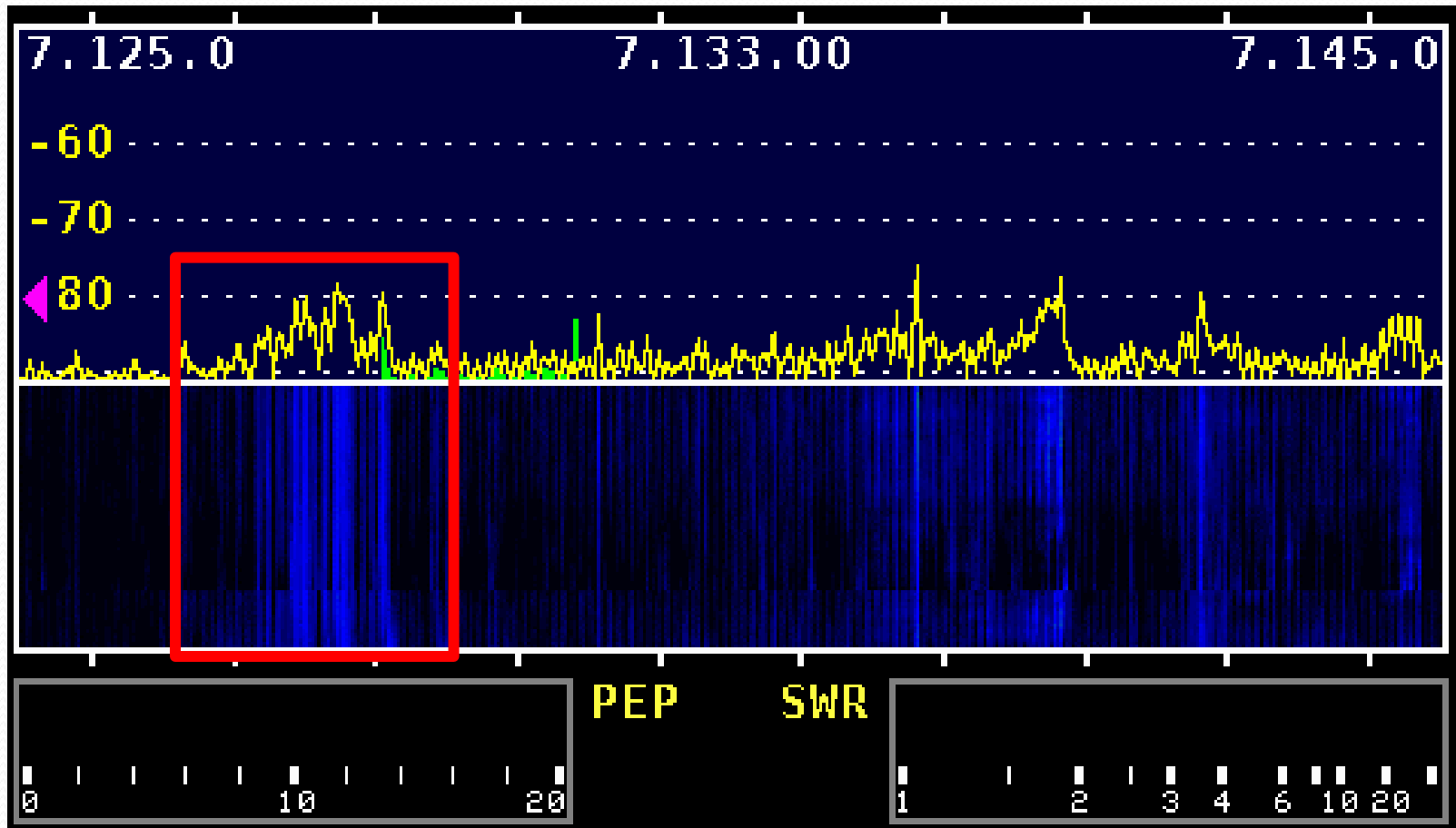
# What's the Problem? K8TE



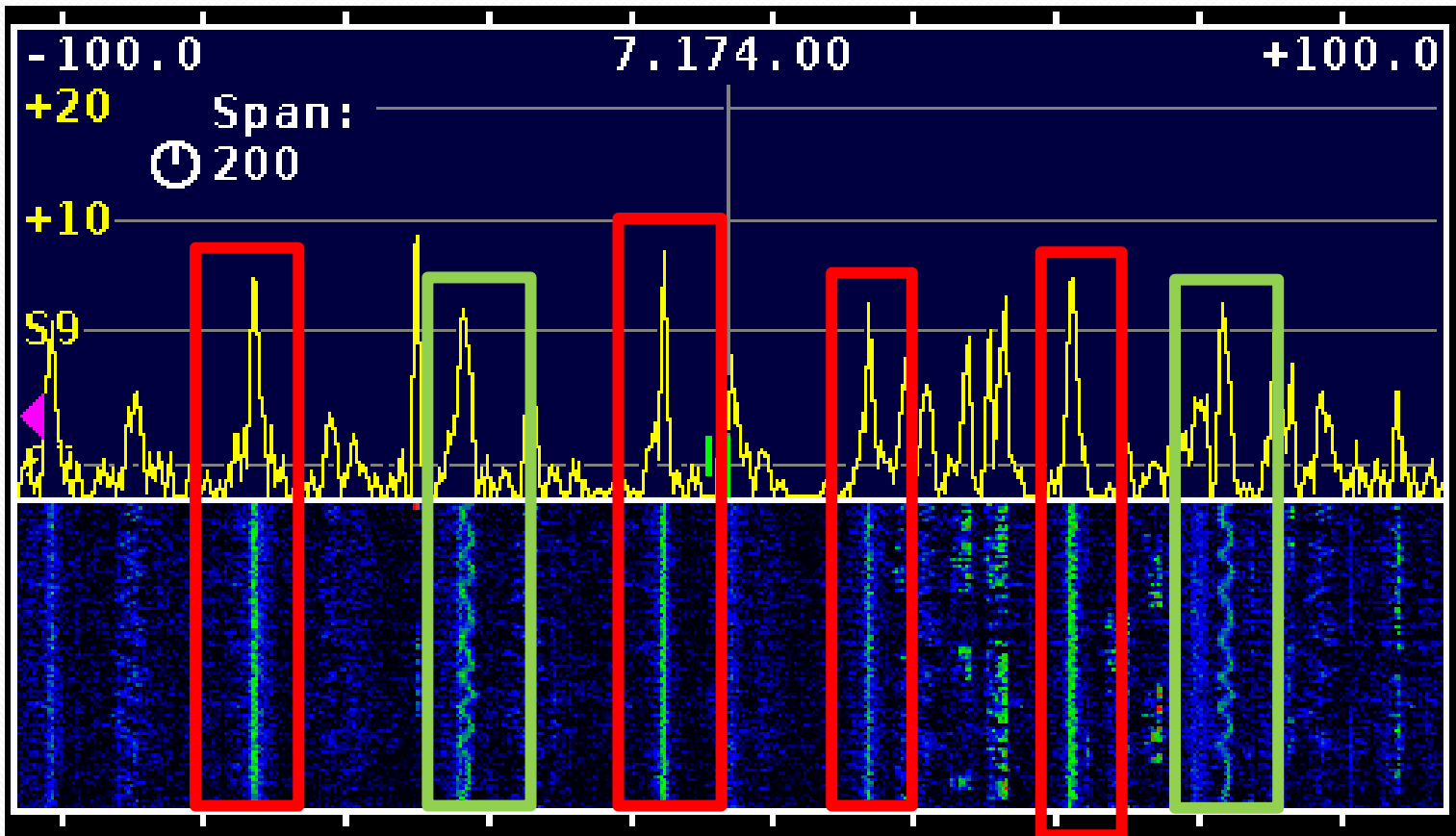
Chinese OTH RADAR



# What's the Problem? K8TE



# What's the Problem? K8TE/RV



Picacho Peak State Park

# Identifying Source and Type

- Pulse Repetition Rate (120 Hz?) of the “Buzz”
- Drifting On By—SMPS/Inverters
- <http://www.arrl.org/sounds-of-rfi> KA1GYB
- Oscilloscope or Pan Adapter Extremely Helpful
- Hand-Held AM Receiver (Kenwood TH-F6A)  
AM/FM Broadcast/HF/VHF
- Tecsun PL660 AM/FM/SW/LW/VHF Air
- MFJ MFJ-856 VHF AM RX with Yagi Antenna

# Identifying Source and Type

- Start at Home
- Identify Problem Frequencies
- Put Your Radio on Battery Power
- Turn Off the Main Breaker  
Some Noise Disappears?
- Turn On One Breaker At-A-Time
- Start Unplugging “Stuff”
- Remove/Replace the “Stuff”

# Identifying Source and Type

- Replace SMPS Items Wherever Possible
- Use Wi-Fi, Rather Than Ethernet
- Don't Operate on Those Frequencies—Really?  
Sources Always Appear in the Worst Places
- Use Shielded Ethernet Cables  
CAT 6 or &



# Switching Mode Power Supplies

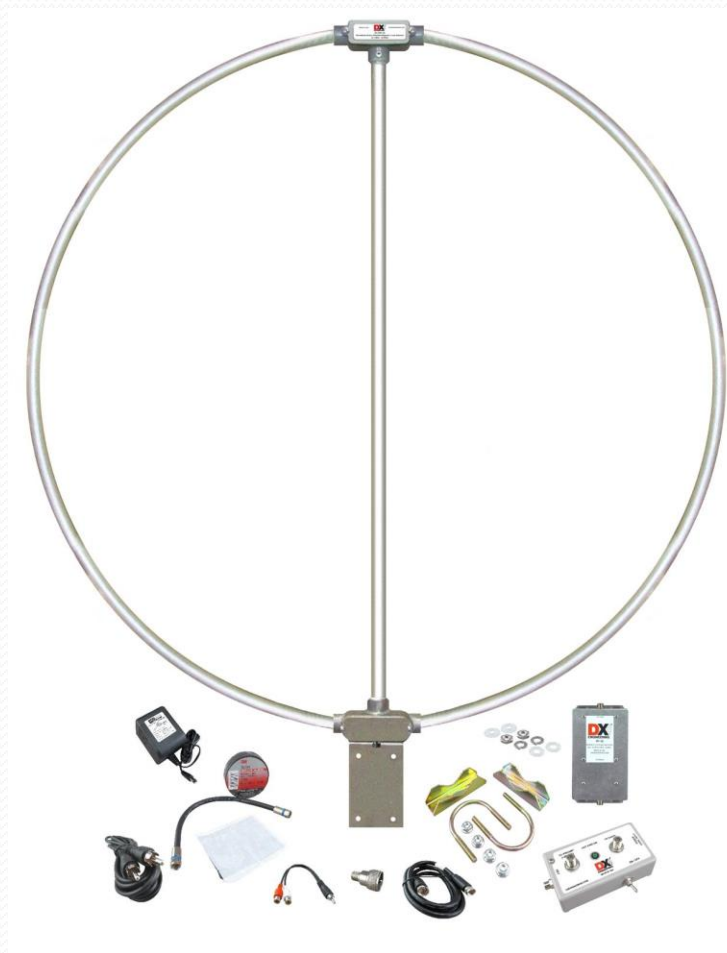
- 10-100 kHz Intervals
- Strong 60 or 120 Hz Components (“Buzz”)  
Listen in AM Mode
- No “Data” Sound
- Often Drift Up or Down in Frequency
- Sensitive to Line Voltage/Current Draw
- Use a Loop and Portable Receiver to Locate
- Take Lots of Notes with Time/Day/Sound/Pix

# Antenna Solutions

- Your TX/RX Antenna May be the Problem  
RF Current Chokes for BOTH TX/RX!  
Ferrites Are Your Friends!  
Try Moving Your Antenna  
Make it Higher and More Directional
- Separate RX Antennas  
K9AY/Pixel Loop/Waller Flag/Beverage
- Off-Site Antennas (and Radios)

# Antenna Solutions— Pixel Loop

- DX Engineering  
RF-PRO-1B
- Formerly Pixel Loop
- Deep Nulls at 90/180°
- Broadband Preamp  
Disable During TX!
- KKOB-AM 50 KW  
Use a Bandpass Filter





# Radio Solutions

- Noise Blanker Use
- Noise Reduction
- Noise Cancellers
- Bandwidth—CW!!
- Others' Radios/Locations

# Radio Solutions—Others' SDR's

- <http://www.websdr.org/>

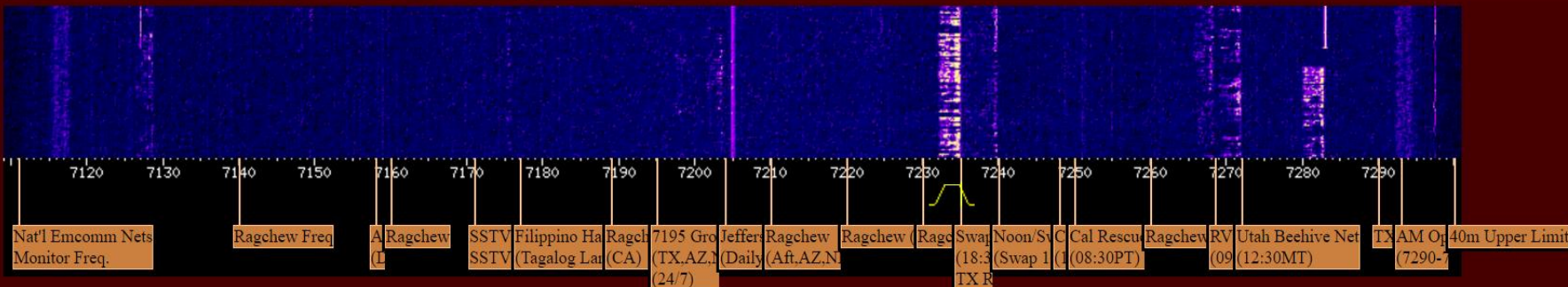
Kind, Generous Hams!

W7RNA Sedona AZ

- Tunable on All the HF Bands!
- Audio Recording Capability
- Signal Strength Plot
- Is It Local or “DX”?

# W7RNA Sedona AZ

View:  all bands  others slow  one band  blind Allow keyboard:  Waterfall:  Java  HTML5 Sound:  Ja



Bands:  40m  60/49m  75m

Frequency: 7235 kHz

-1 -1 -0.1 +0.1 +1 +1

You may also tune by clicking/dragging/scrollwheel on the frequency scale. (On "AM," Steps are 5, 1, and 0.1kHz)

Memories: WWV 60m-1 60m-2 60m-3 60m-4 60m-5

recall erase store (new)

\$1 \$3 \$5 \$7 \$9 +2.0dB +4.0dB +6.0dB

-75.1 dB; peak= -71.3 dB;

mute  squelch  autonotch

Volume:

Audio recording: start

Signal strength plot: none

Waterfall view:

Zoom Out Zoom In

Max Out Max In

Or use scroll wheel and dragging on waterfall.

Speed: Slow

Size: Medium

View: Waterfall

Hide labels

Mode/Bandwidth:

1.89 kHz @ -6dB; 2.35 kHz @ -60dB. + -

CW/Wide LSB/Wide USB/Wide AM/Wide

CW/Narrow LSB/DX USB/DX AM/Narrow

(You can also adjust bandwidth by dragging the yellow passband edges on the frequency scale.)

Bandpass Freq Shift: down up

# W7RNA Sedona AZ

**Bands:**  40m  60/49m  75m

**Frequency:** 7235| kHz

-1 | -.1 | -.01 | +.01 | +.1 | +1

You may also tune by clicking/dragging/scrollwheel on the frequency scale. (On "AM," Steps are 5, 1, and .01kHz)

**Memories:** WWV | 60m-1 | 60m-2 | 60m-3 | 60m-4 | 60m-5

recall | erase | store (new)

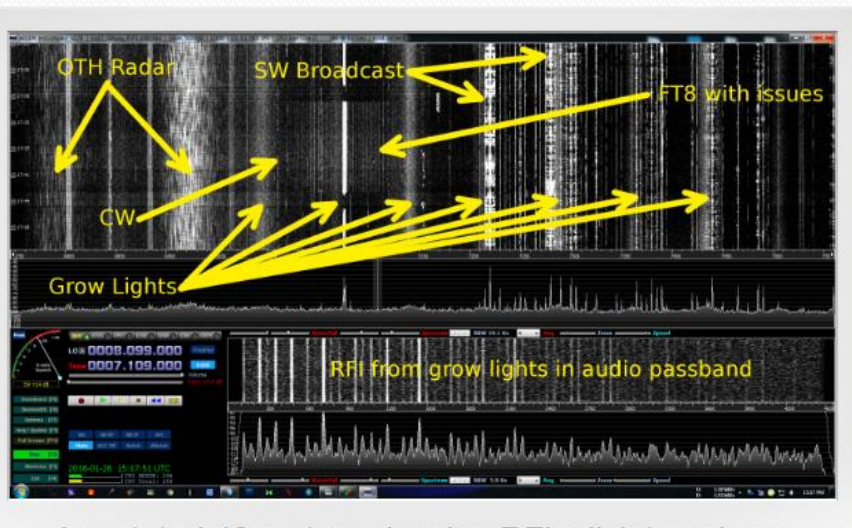
# Radio Solution Noise Blankers

- Good and Bad—Distortion on Stronger Signals
- Try it, You May Like It
- RTFM
  - Multiple Settings
  - (K3 About  $21 \times 21 + 2 = 433$  Settings!)
  - Different Effects on Different Noise
  - Make Note Settings for Specific Frequencies and Types of Noise
- Sometimes No Help at All!

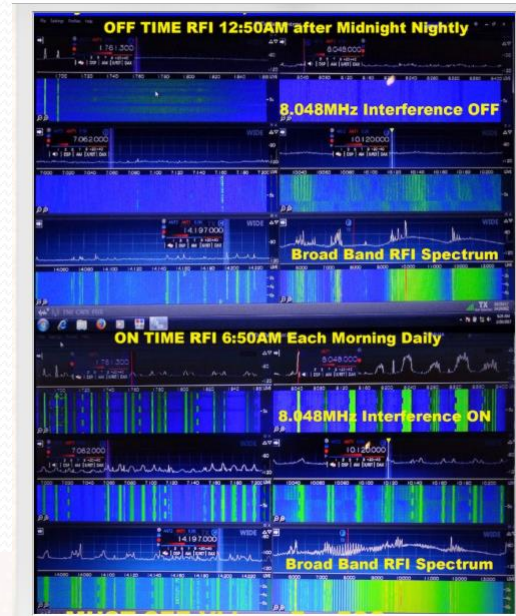
# Radio Solutions Noise Reduction

- SDR/DSP
- Best at RF/IF Ranges
- Algorithm-Driven  
Some “Smarter” Than Others
- RTFM!

# <https://www.nk7z.net/rfi-snapshots/>



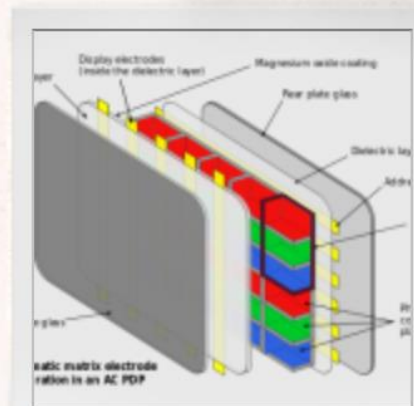
Annotated 40 meters showing



250 plant operation on 40.



Grow light RFI



Plasma Display RFI



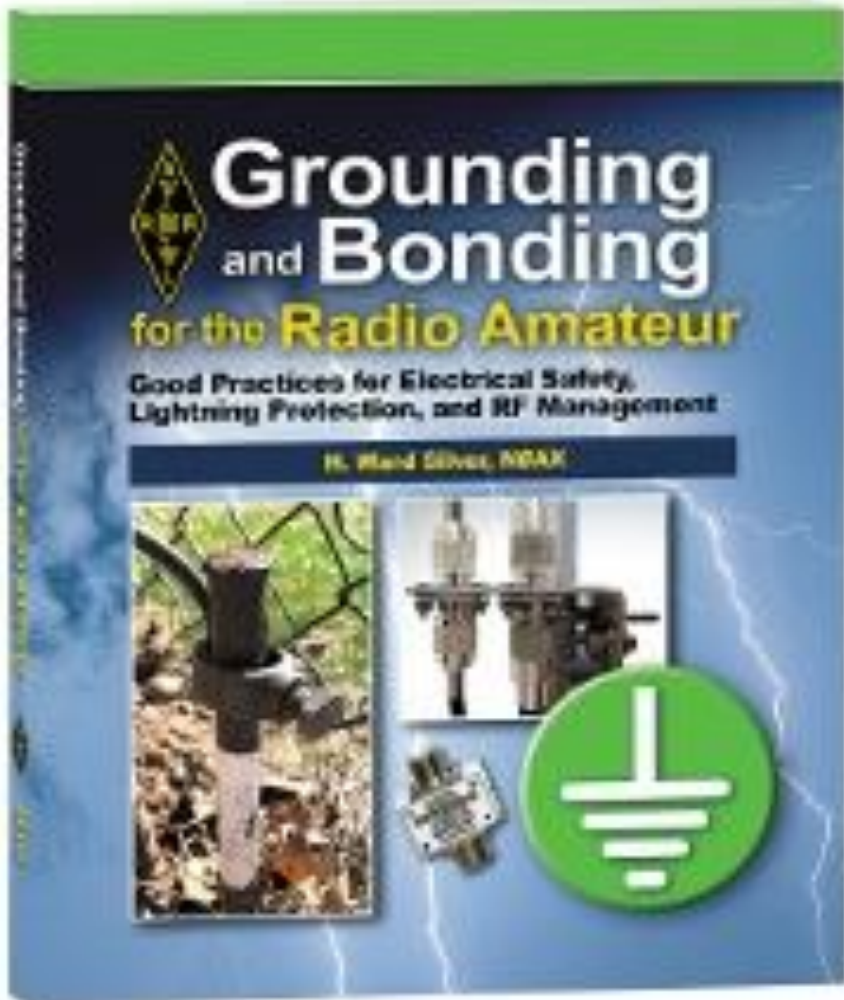
Non Plasma TV

# Bonding & Grounding

- Two Separate but Properly Combined Concepts
- RTFB *Bonding and Grounding* by N0AX
- Especially Useful for RFI during Transmit
- Combined with RF Chokes—Very Effective!
- Oh, Safer for You and Your Radios!
- Spring Time—disconnect your antennas!
- Another Entire Presentation!



# Grounding and Bonding for Us



- Ward Silver, N0AX
- Engineer
- Long Time ARRL Editor
- Fun, Amiable Guy!
- Jim Brown, K9YC
- Buy the Book



# RFI Searches

- Look for Low Quality Components  
PL-259's, SO-239's, Coax, etc.
- Bad Connections—W3LPL Tighten Annually
- Ineffective Bonding and Grounding
- Inadvertent Dissimilar Junctions
- Apply Protective Tape to Connections Properly  
Start at Lowest Point (from Down to Up)  
Wrap Counterclockwise to Avoid Loosening
- Consider Timing for Solar/Who is at Home/Work

# RFI Searches—Common Mode

- Remove Coax—No Noise?
- Insert Center Only—More Noise?
- Properly Connect—More Noise
- If Yes, You Have Common Mode Current Issues!



# Antenna Solutions—Palomar Eng



# RFI Searches

- Add Receiver Attenuation (Avoid False Signals)  
Avoid Self-Induced False Problems
- Be Aware of Test Equipment Limitations  
SDR Overload/Desensing
- Be Methodical, Persistent, Patient
- Use Bandpass Filters for High Power RF Sources
- Test with Attenuation In/Out  
Watch for Non-Linear Changes
- View Both Wide/Narrow & Fast/Slow Bandpass/AGC

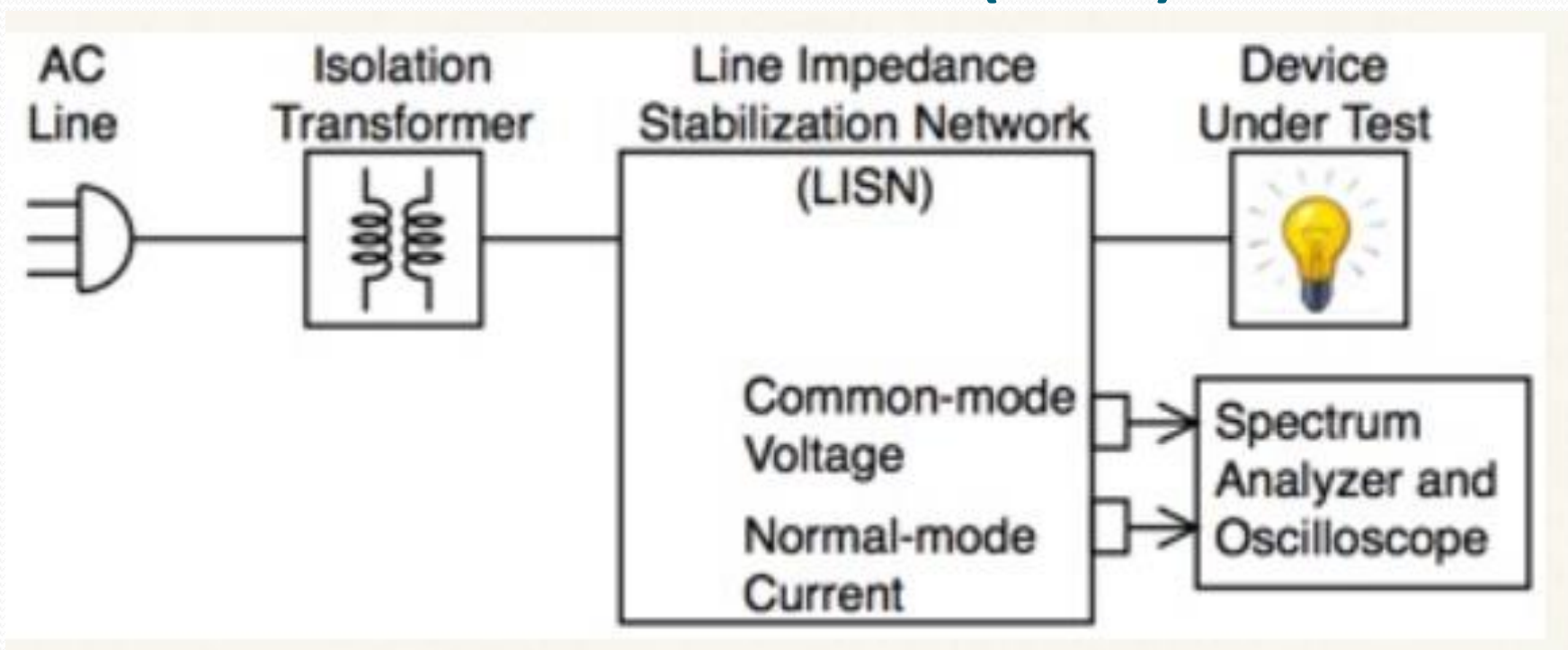
# Available Help

- <https://apps.dtic.mil/dtic/tr/fulltext/u2/a468464.pdf> Naval RFI Handbook.pdf
- <http://nk7z.net/i-have-rfi-now-what-locating-it/>
- <http://k9yc.com/KillingReceiveNoise.pdf>
- <http://www.arrl.org/radio-frequency-interference-rfi>
- <https://www.sigidwiki.com/wiki/Category:Active>
- <https://qrm.guru/>
- <http://alloutput.com/amateur-radio/ethernet-rfi-noise-reduction/>
- <https://web.archive.org/web/20130718061802/http://servv89pnoaj.sn.sourcedns.com:80/~gbpprorg/mil/non/>
- ARRL Lab Ed Hare, W1RFI@ARRL.org

# Summary

- What's the Problem?
- Identification of Source and Type
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- Available Help
- RFI Searches
- Bonding and Grounding for RFI
- Questions?

# Drowning in Radio-Frequency Interference (RFI)





# Drowning in Radio-Frequency Interference (RFI)

## **RECOMMENDED FOR AMATEUR RADIO STATION USE**

Probably undetectable at most ham stations.

[Feit 75W eq. dimmable LED PAR30 flood lamp, medium base](#)

[Feit 100W eq. dimmable LED bulb, medium base](#)

[GE 65W eq. dimmable BR30 flood lamp, medium base](#)

[http://wb9jps.com/Gary\\_Johnson/RFI.html](http://wb9jps.com/Gary_Johnson/RFI.html)