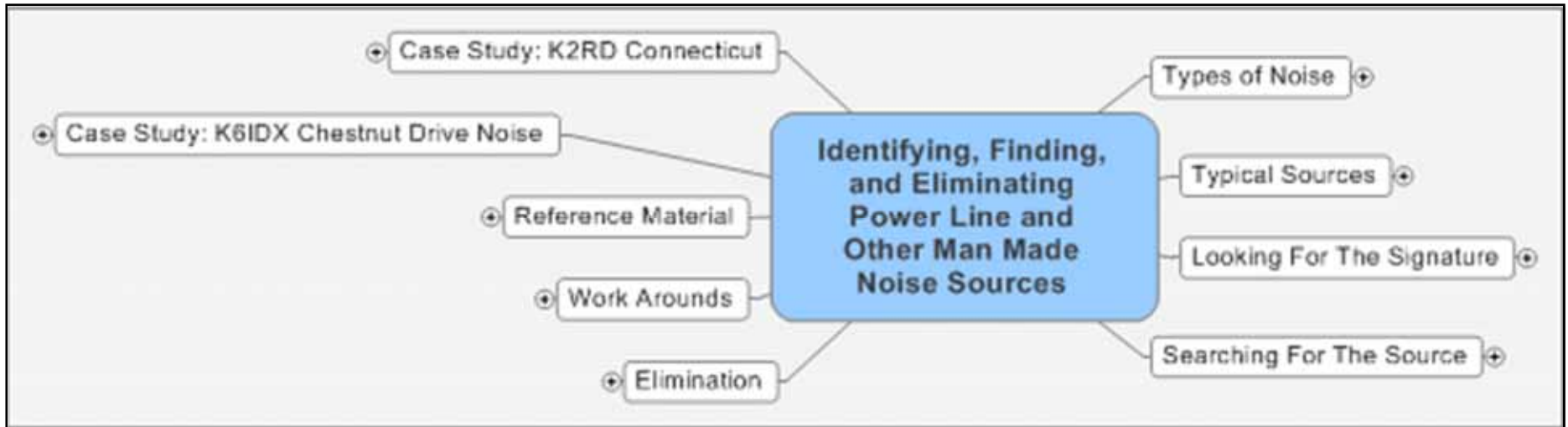


# Identifying, Finding, and Eliminating Power Line and Other Man Made Noise Sources

Ira Stoler – K2RD

NCCC – April 10, 2006

# Outline



# Types of Noise

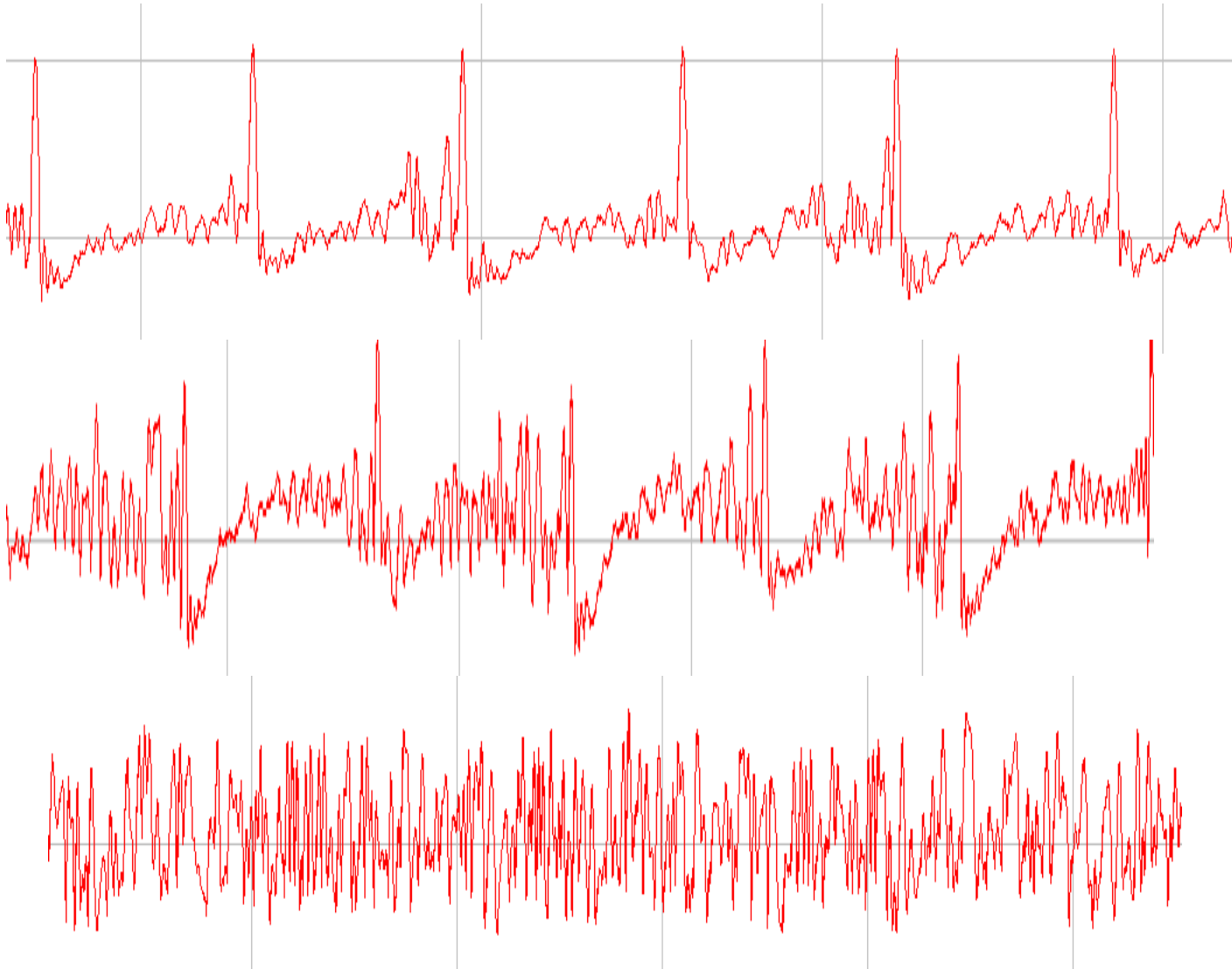
- What Does It Sound Like?
  - Hum, buzz, hiss, pulse.
  - On all the time? Periodic? Sporadic?

# Typical Sources

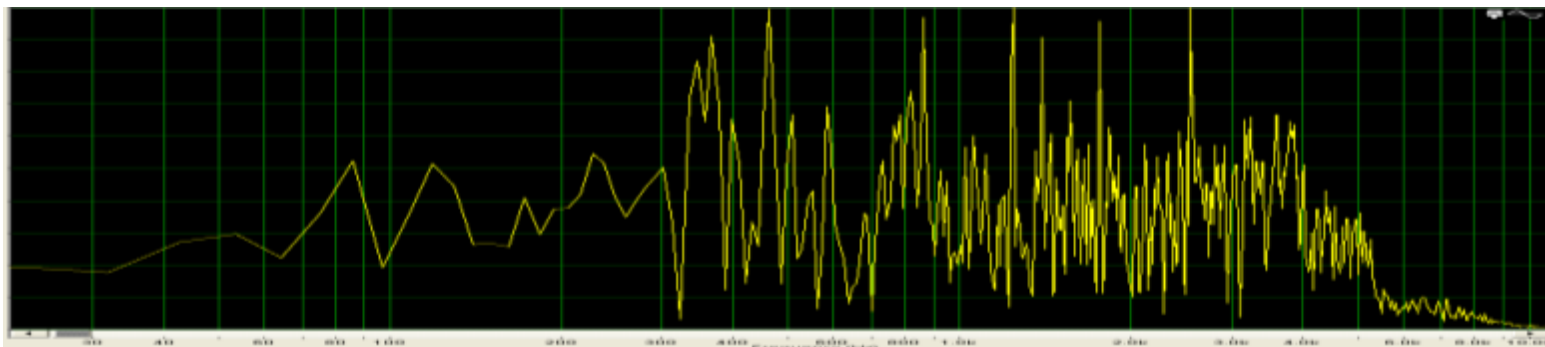
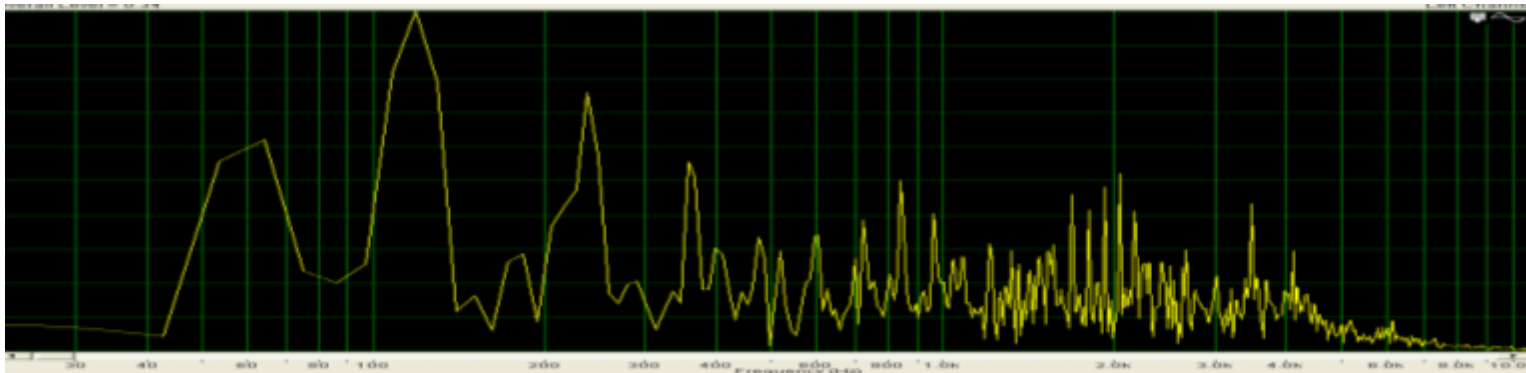
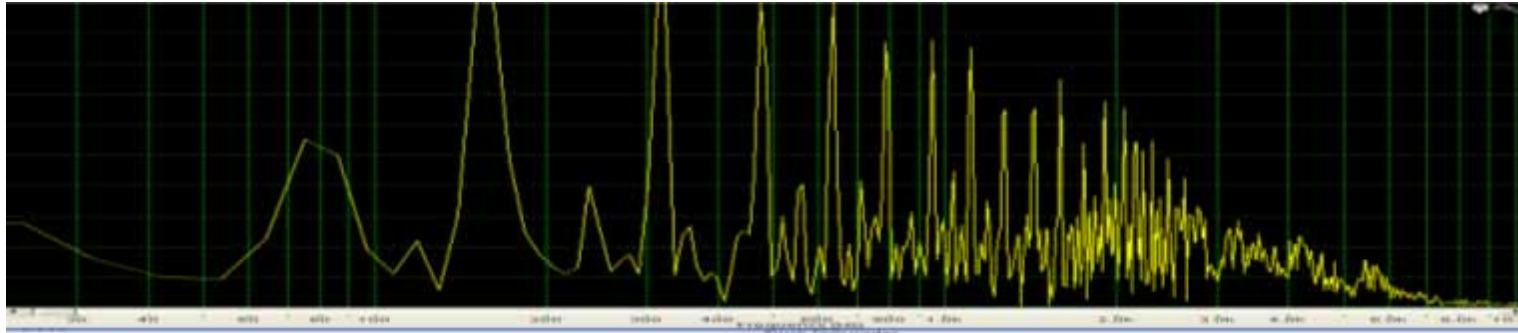
- Mains
  - Anything in or near a power line can be a suspect.
  - Some examples:
- Appliances
  - Motors, timers, contactors.
    - [K2RD-10m-motor.wav](#)
    - [K2RD-160m-wide.wav](#)
  - Digital Devices
    - [K2RD-40m-broadband.wav](#)

# Looking For The Signature

# The Signatures



# The Signatures



# Why?

- So that you find the actual offending source in the field.



# Quantifying The Sound

You can tell a lot from the  
signature!

# Tools

- Receiver(s)
- Antennas
- Audio Spectrum Analyzer
  - A Big and \$\$ Box
  - PC S/W and Sound card

# Receiver

- Listen on AM
- Turn AGC off if possible otherwise lower RF gain so noise doesn't move S-meter.
- Use maximum attenuation

# Scope

- Frequency Info
  - Helps determine source
- Time scale - noise waveform
  - May further refine suspected source

Signature

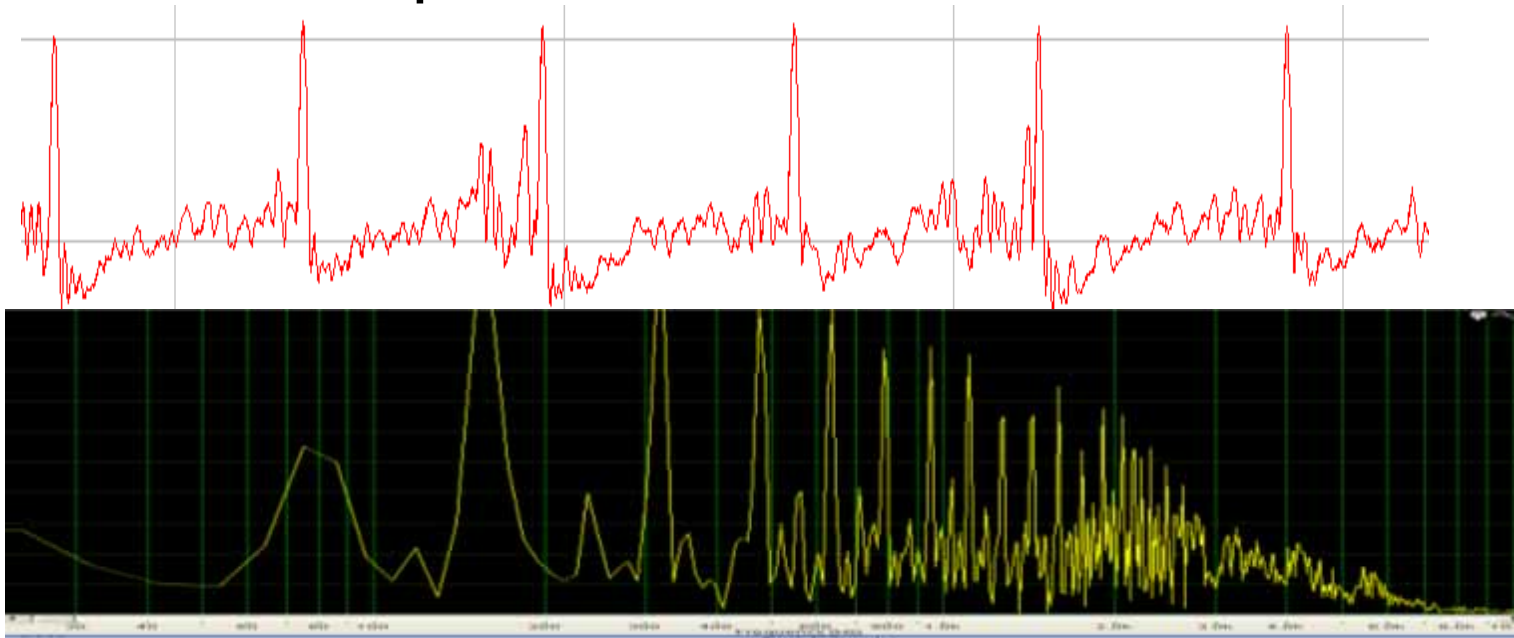
# Mains Sourced

- Usually 120hz and its harmonics



# Appliances

- Likely have varying base frequency
- Often sporadic
  - Example: K6IDX restaurant spray painter - resonant power cord



# Digital Devices

- Usually broadband noise with some varying components
- Birdies





# Searching For The Source

# Use Your Station's Directional Antennas

# Hand-held Receivers

- Examples
  - FT-817
  - VX1R
- Try a small beam on 2m and 432
- Specialty loop rx

# Mobile Rigs

- multi-band antennas useful

# Frequencies

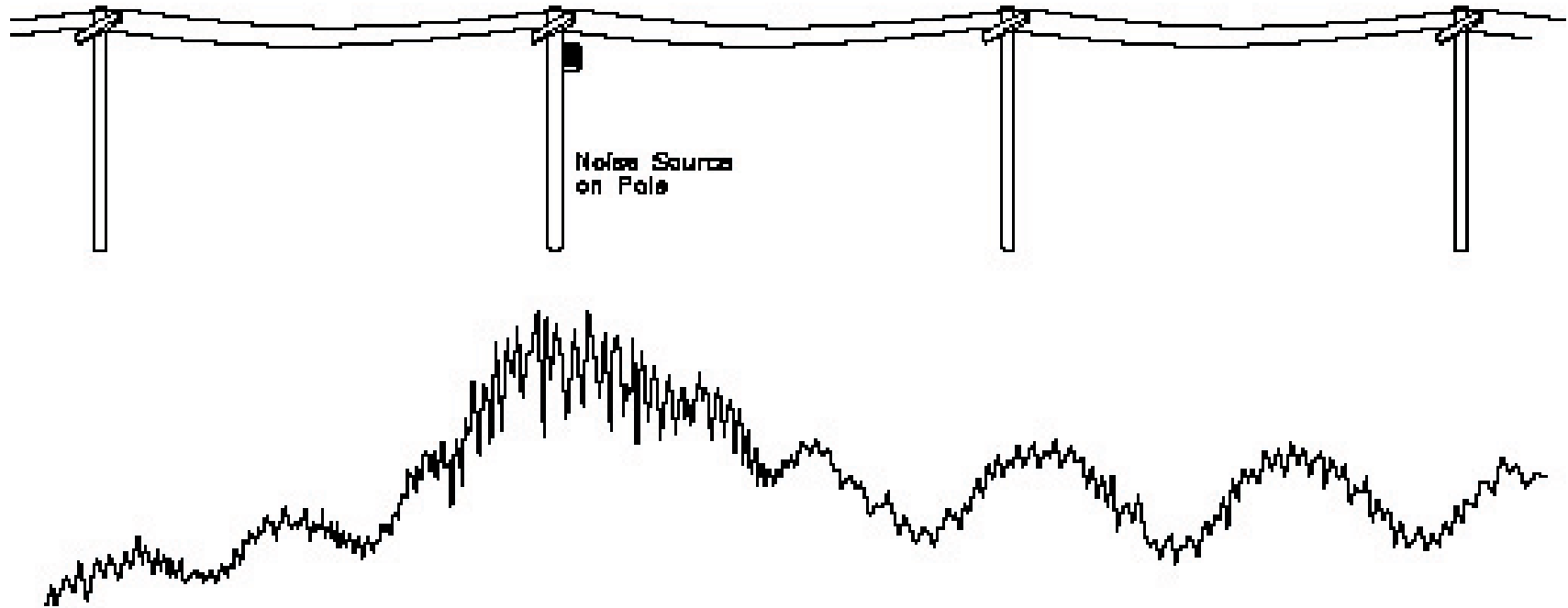
# Archiving-based noise sources will likely be rich in harmonics

- Higher frequencies are weaker (usually).
  - K6IDX 15M Power Pole Ground Shield

# Search for noise on progressively higher frequencies as you get closer

- HF noise can often be heard for miles
- 6m noise within a mile
- 2m noise a few hundred feet
- 432 noise under 100 ft

# It's Easy To Be Fooled





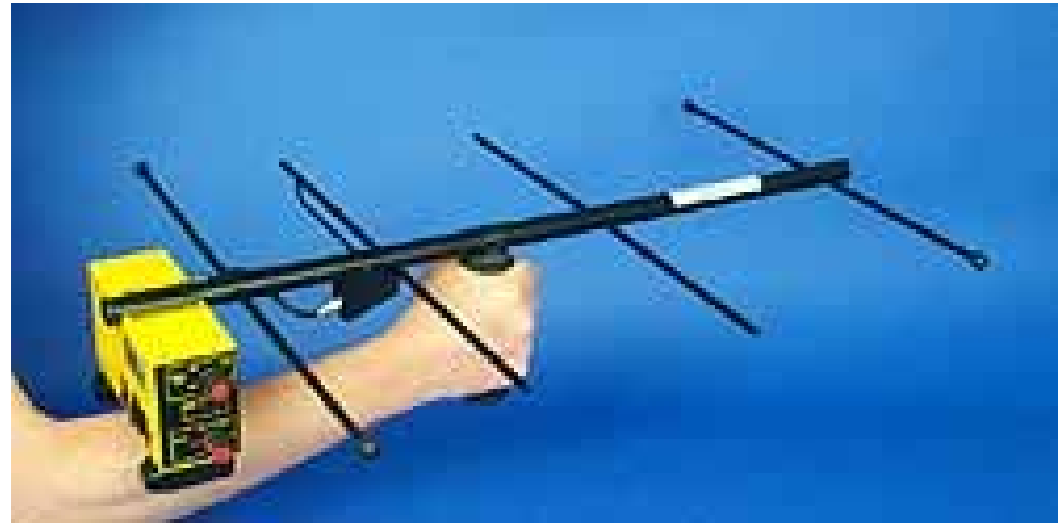
# Listen for the arc - ultrasonic dish receiver

- Source must be open
- Won't hear concealed sources like inside an insulator or lightning arrestor.
- Power company usually has one

# K2RD Toolset

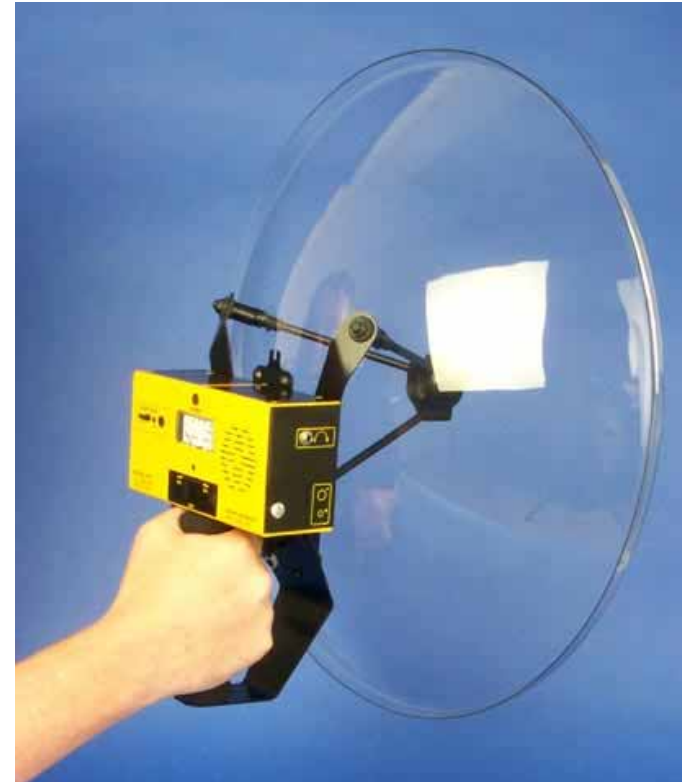
- 160m-70cm mobile station
- 144/432 5 el yagi with FT817
- WB6BYU 80m loop
- Ultrasound Dish (coming soon)
- Laptop PC w/Soundcard
- Audio Spectrum Analyzer Software

# K3RFI with 300 mhz Rx



**The Radar Engineers Model M330 is a professional grade Mini RFI Locator**

# K3RFI with Ultrasound Dish Rx



<http://www.rfiservices.com/>

**Radar Engineers Model 250  
Parabolic Pinpointer**

# What He Was Looking At



# April 2006 QST



## A Home-made Ultrasonic Power Line Arc Detector

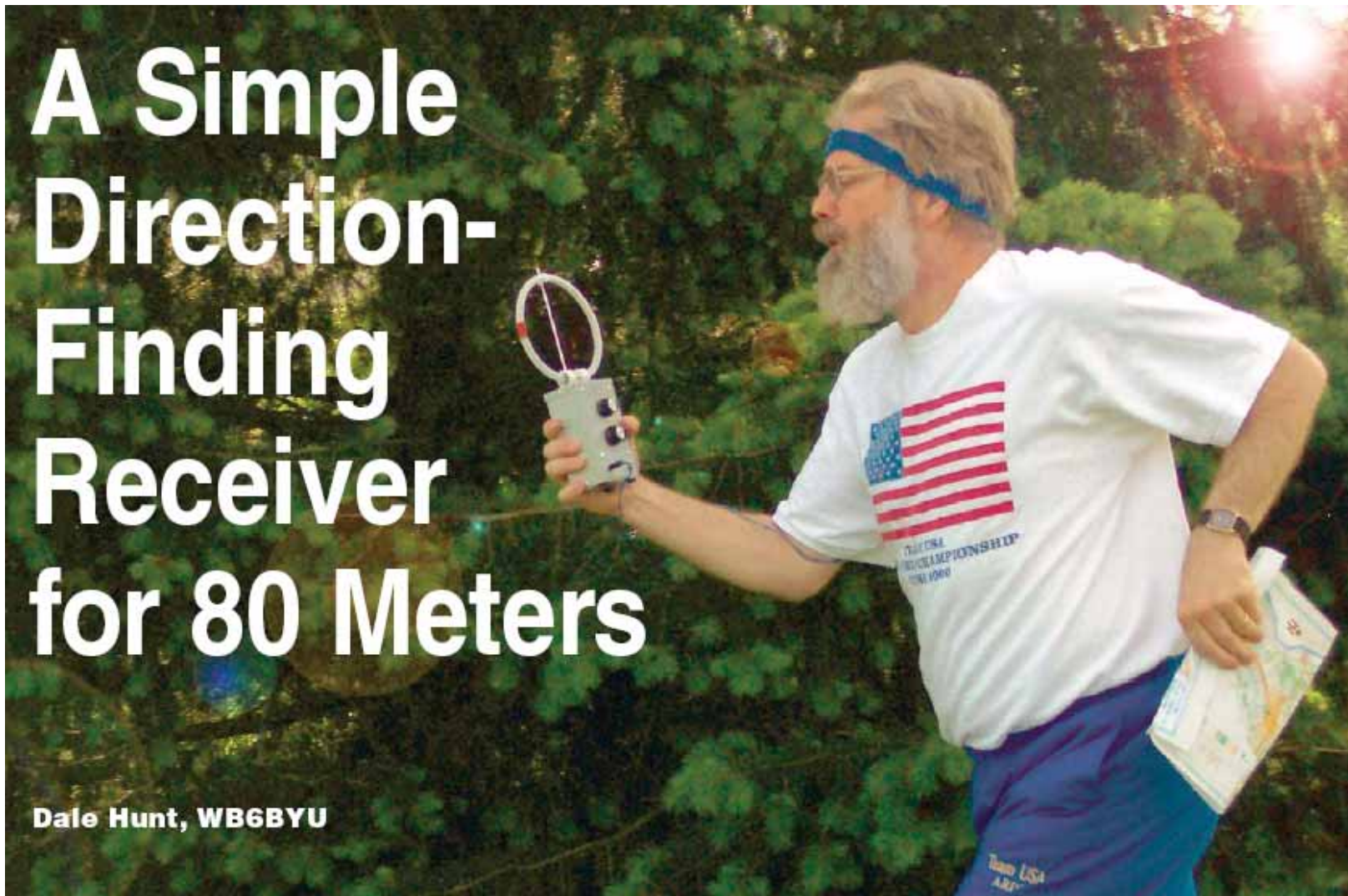
*The device described in this article can help you track down power line noise sources to help utility crews more quickly resolve problems.*

**James T. Hanson, W1TRC**

# Sept 2005 QST

## A Simple Direction- Finding Receiver for 80 Meters

Dale Hunt, WB6BYU



# Bang The Pole Slowly ... and Carefully

- Shake the guy wires if there are any.

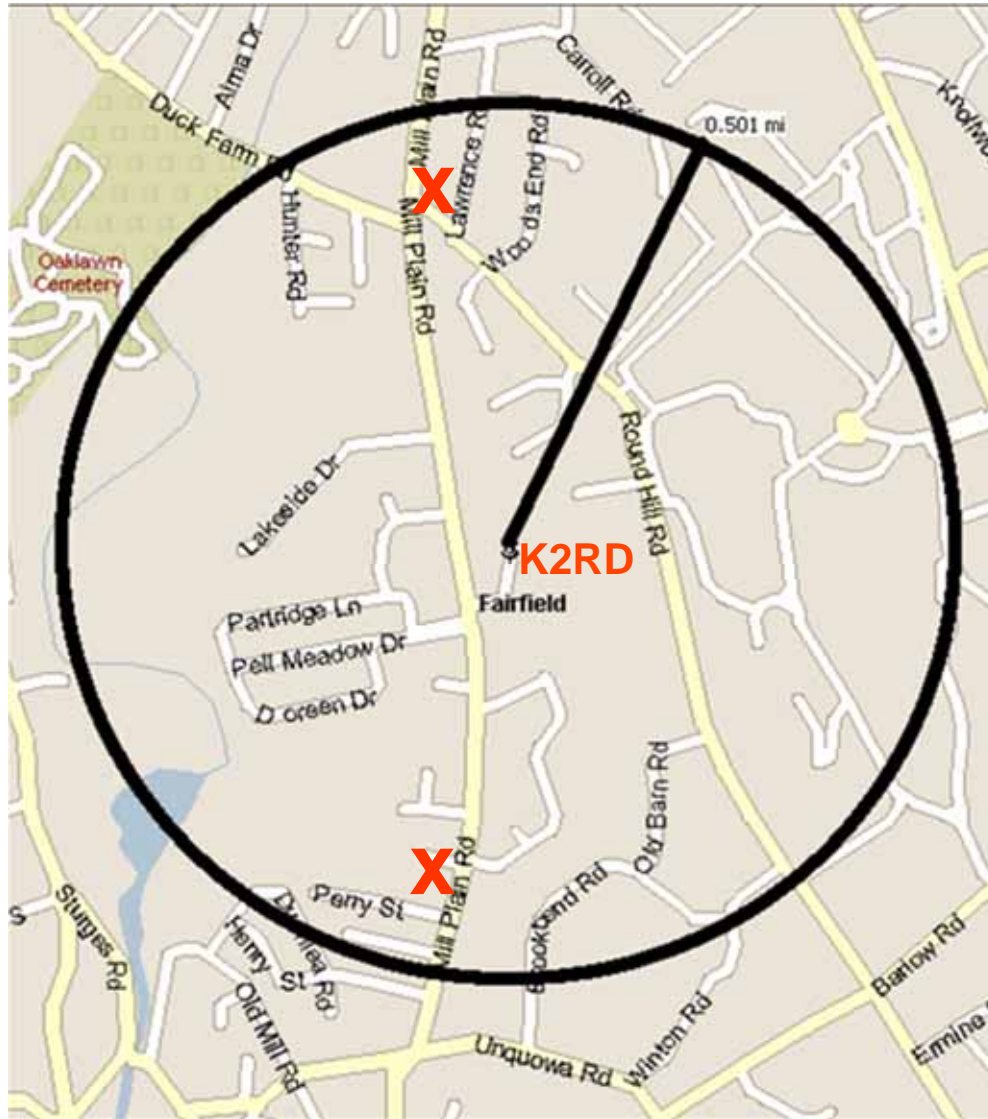


# Check your own house first.

- Listen at the breaker panel with handheld rx
  - Turn off breakers one at a time

**BEWARE: You may have  
MULTIPLE sources**

# K2RD Connecticut Mystery



# Elimination

- Turn stuff off while listening
- Get Power Company help
  - Best done if you have narrowed source location
  - Be persistent
- Neighbors
  - FUD and Diplomacy

# Work Arounds

# Noise Blankers

# Noise Cancellers

- MFJ 1026
  - Requires Noise Optimized Antenna



Use your beam - it may be more directional on local noise than rx/tx signals - use its nulls





# Case Study: K6IDX Chestnut Drive Noise

- All HF Bands
- Seemed to be coming from JA direction
- Present continuously for long periods
- Localized by mobile search and hand-held 432mhz confirmation to top of pole half a mile away
- Rusty rings power company
  - They respond really quickly
  - But.. can't fix problem that day
- Must be present when power company work crew is working
- Took several trips by power company crew to fix because we weren't there with them

# Another K6IDX Problem on 15M

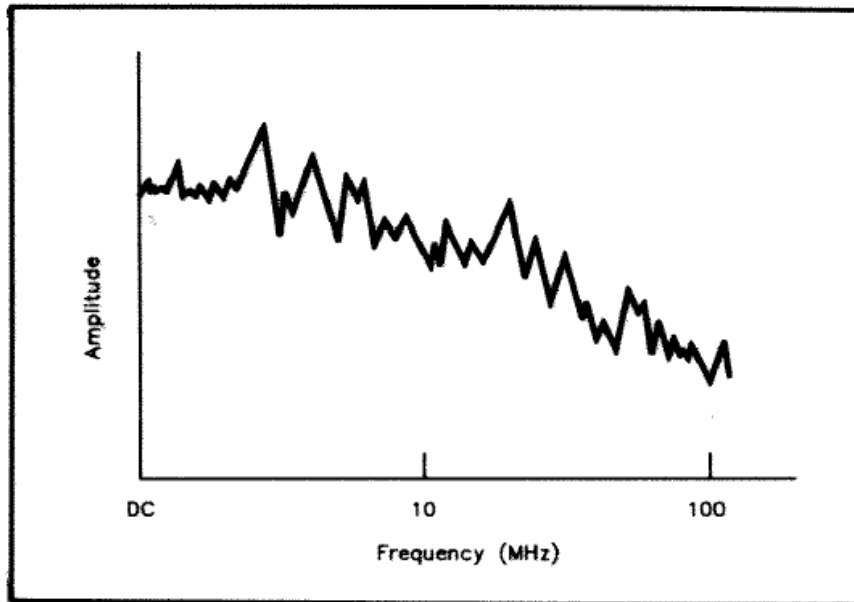


Fig 1—Spark-generated interference generally decreases in strength with rising frequency. The text describes how this characteristic can help you localize an interference source.

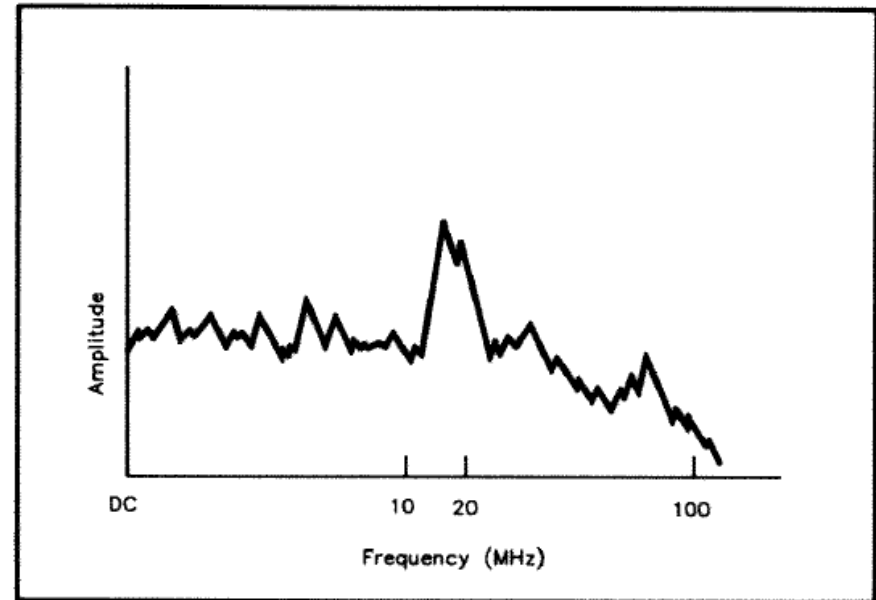


Fig 2—Spark-generated interference may not generally decrease in strength with rising frequency when power lines associated with the noise source resonate and peak the noise at one or more frequencies.

[Basic Steps Toward Tracing and Eliminating Power-Line Interference](#)

QST November 1991, pp. 43-46

# Case Study: K2RD Connecticut

Dumb and lazy at power  
company

# Confounding sources

Very expensive (for K2RD) to  
resolve

# K3RFI - \$\$\$

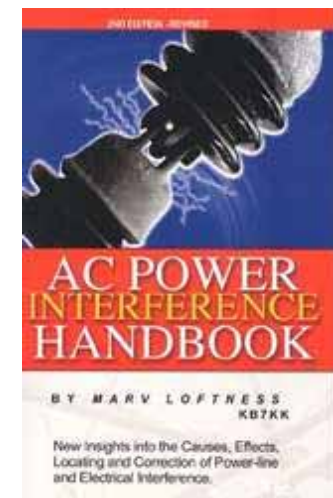
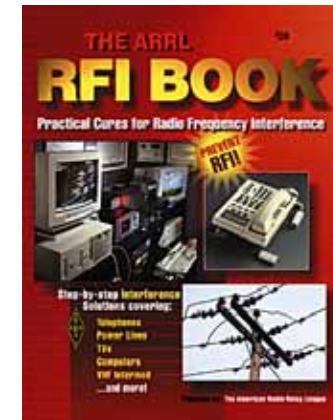
- Worth it except...
  - Suddenly couldn't work everything I could hear (80/160)

Did finally mobilize power  
company (and train them!!!)



# Reference Material

- **The ARRL RFI Book**
  - W1RFI, etc
- **AC Power Interference Handbook**  
-- by Marv Loftness, KB7KK
- Contesting.Com RFI Reflector
- ARRL Web site
  - POWER-LINE NOISE MITIGATION HANDBOOK FOR NAVAL AND OTHER RECEIVING SITES – PDF on ARRL web site
- Google
- [www.rfiservices.com](http://www.rfiservices.com)



# Thank You

- Good Hunting!