

Tips 'N' Tricks

Care and Feeding of the AM Transmitter Site

(Grounding, Security, Maintenance, etc.)



Agenda

Overview

- ✓ Grounding
 - Protecting equipment and engineers
 - How much is too much?
- ✓ Security
 - Keeping the copper
 - Adding visibility
- ✓ Maintenance
 - Sometimes it is easier to stop the fire from starting
 - Spending a little to save a lot
 - Outside the building



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Your questions please?

(if you don't see the control panel, click on the orange arrow icon to expand it)

Please enter your questions in the text box of the webinar control panel (remember to press send)

The screenshot shows a software interface for a webinar. At the top, there is a menu bar with 'File', 'View', and 'Help'. Below the menu, there are several icons: a blue square, a hand with a green arrow, and an orange arrow pointing right. The orange arrow icon is circled in orange. Below these icons, the 'Audio' section is expanded, showing 'Audio Mode' with two radio buttons: 'Use Telephone' and 'Use Mic & Speakers'. Below the audio mode, there is a 'MUTED' status indicator and a volume level bar. Below the audio section, there is a 'Questions' section with a text input field containing the placeholder text '[Enter a question for staff]' and a 'Send' button. The text input field is circled in red. At the bottom of the interface, there is a promotional banner for 'GoToWebinar' with the text 'Start Holding your Own Web Events with GoToWebinar' and 'Webinar ID: 977-124-241'.



Remember: The completion of a Nautel webinar qualifies for ½ SBE re-certification credit, identified under Category I of the Re-certification Schedule for SBE Certifications.

Grounding

- Single Point
- Bonded connections
- Surge Protector
- Use ferrite
- Look for ground loops



Single Point

Bulkhead ground for coax cables

- Best done where cables enter building
- Connected to station reference ground
- Keep ground leads as short as possible



Bonding

- All connections should be soldered, brazed or CAD welded.
- Compression connections are not ideal, they can loosen over time, or become less effective as materials oxidize.



Bonding

Make certain your ground is
REALLY a ground!



Surge Protector

AC Power line protectors are a must – and they **MUST** be connected to your station reference ground.

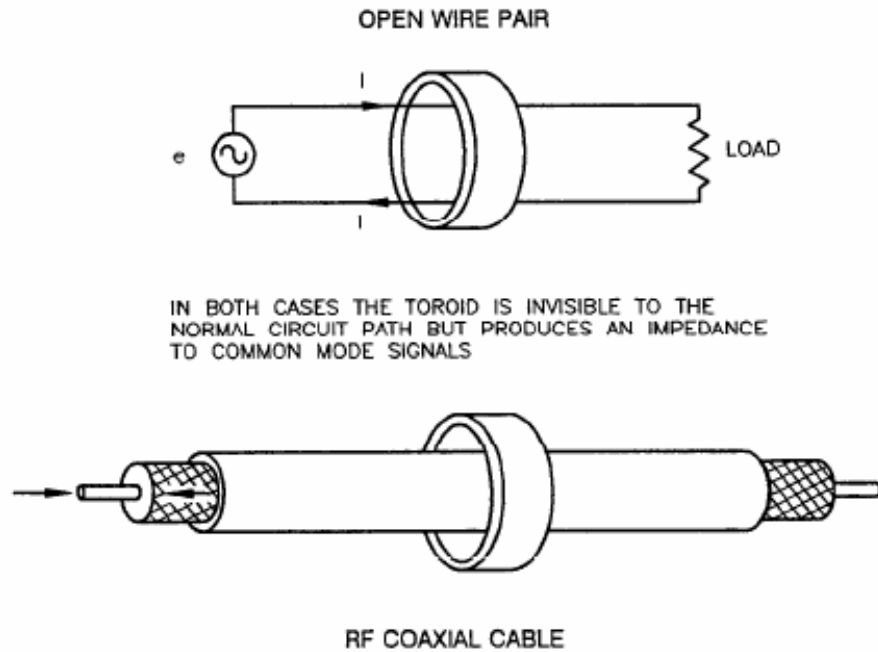


Ferrites

- ON the coax near the transmitter
- ON the coax near the input to the antenna tuning unit (ATU)
- ON audio cables near their termination point only twisted pair, shielded cables should be used
- ON the AC to the transmitter all AC phases and AC ground go through the same ferrite
- ON the remote control cables only twisted pair, shielded cables should be used
- ON AC cables to any external equipment



Ferrites



Ferrites are good for reducing common mode signals

- Lightning surges
- Induced RF (especially at co-located AM and FM sites)
- Power line and power supply noise

Figure F-4 Use of Toroids to Impede Common Mode Signals

Ground Loops

Clean up excess wiring

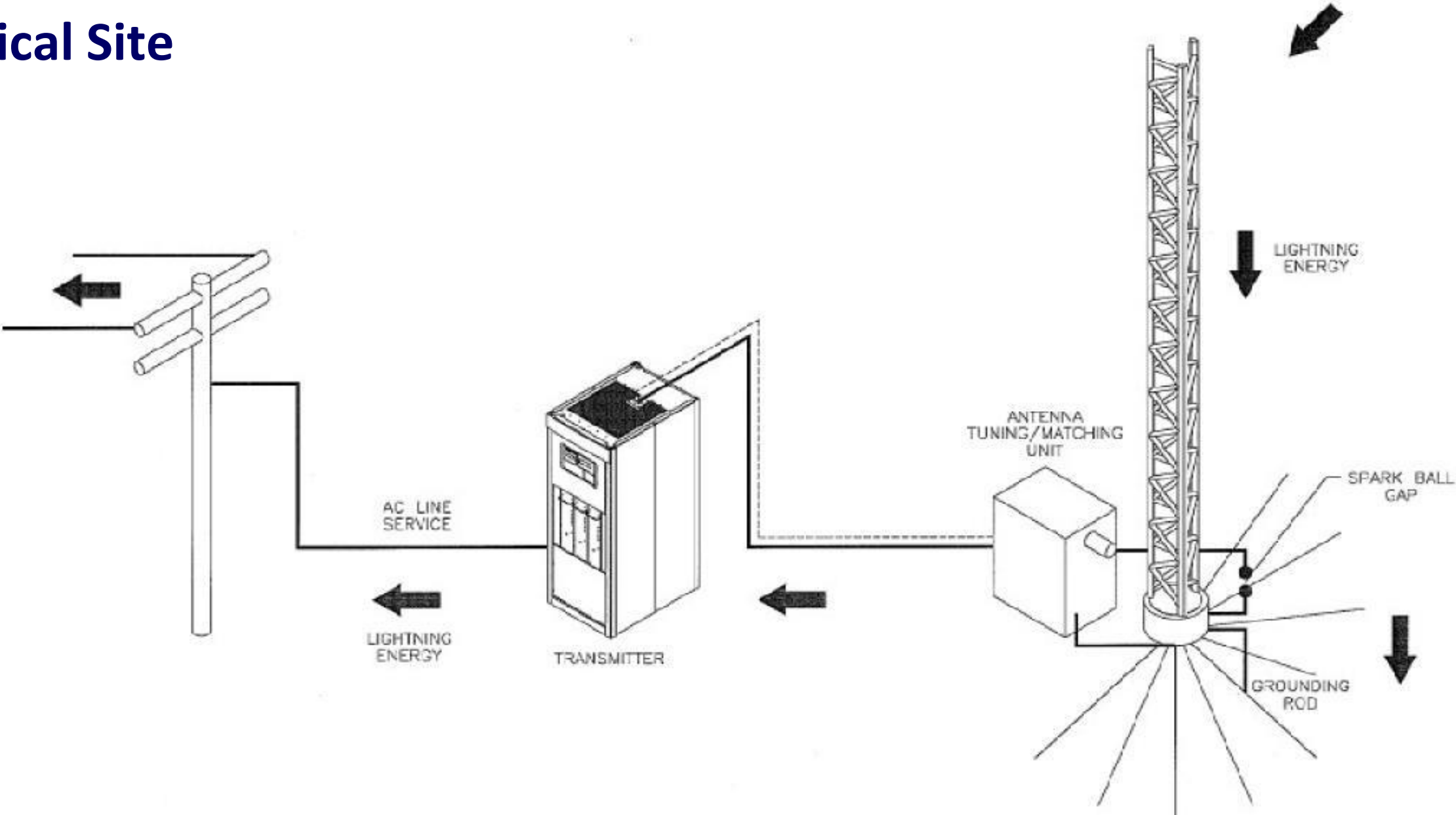
- previous installs
- broken connections that were replaced

Keep ground connections to a minimum

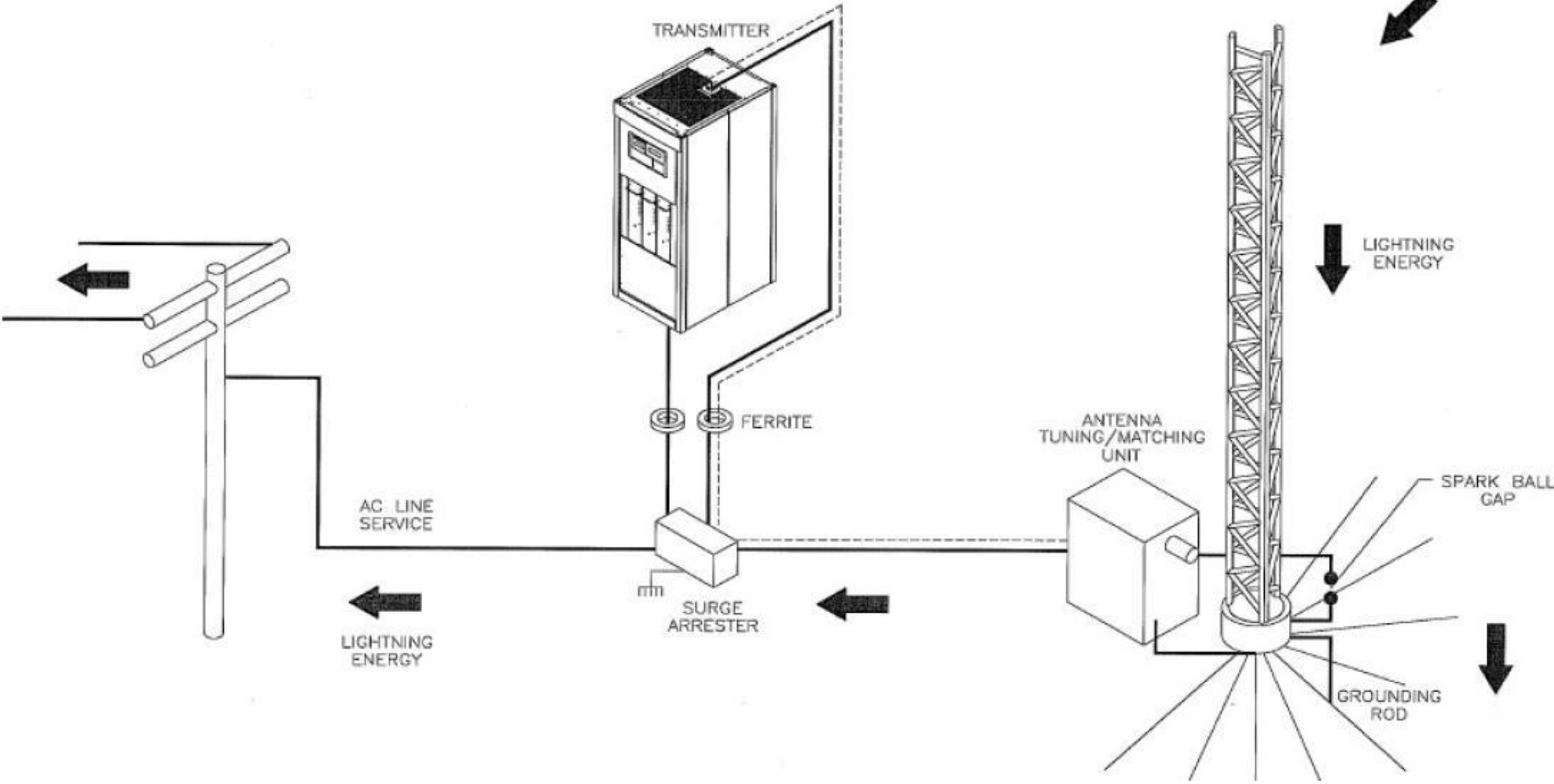
- one per piece of equipment



Typical Site



Installation of Surge Protector



Periodic Safety Checks

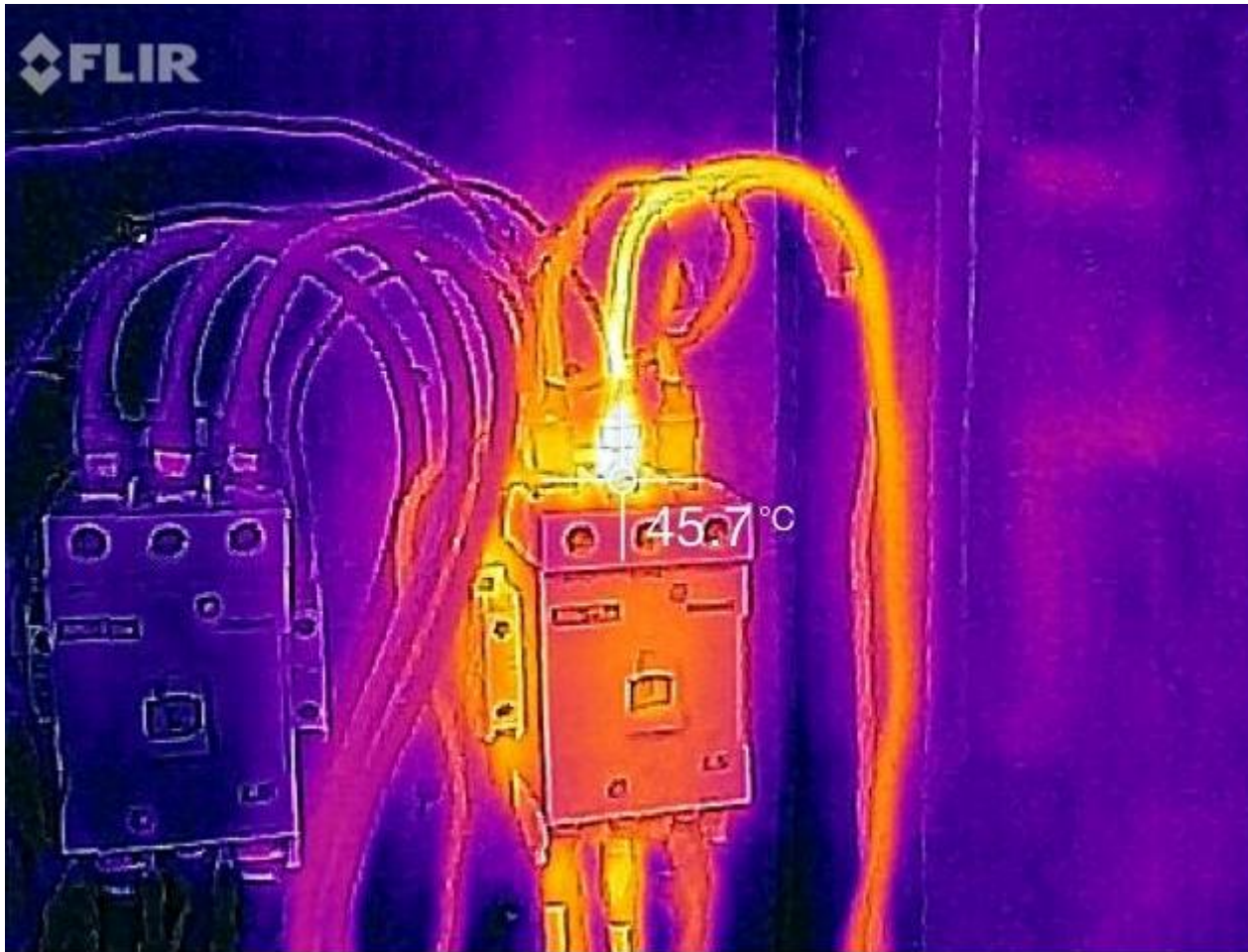


Photo credit: Guy West, Far East Broadcasting Company



Good Engineering Practices

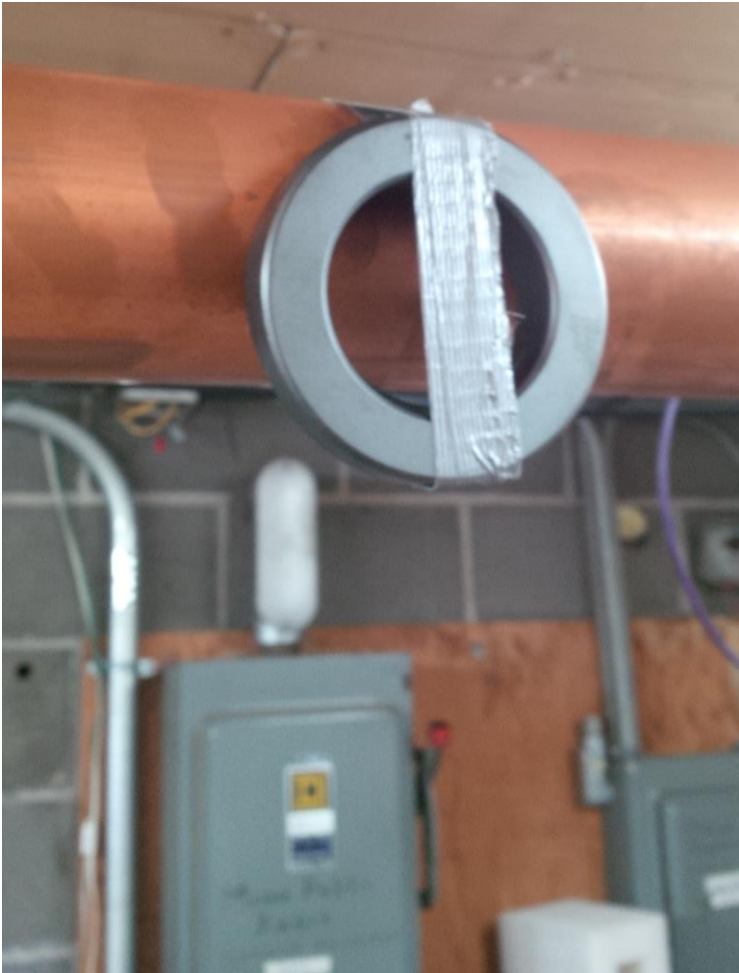
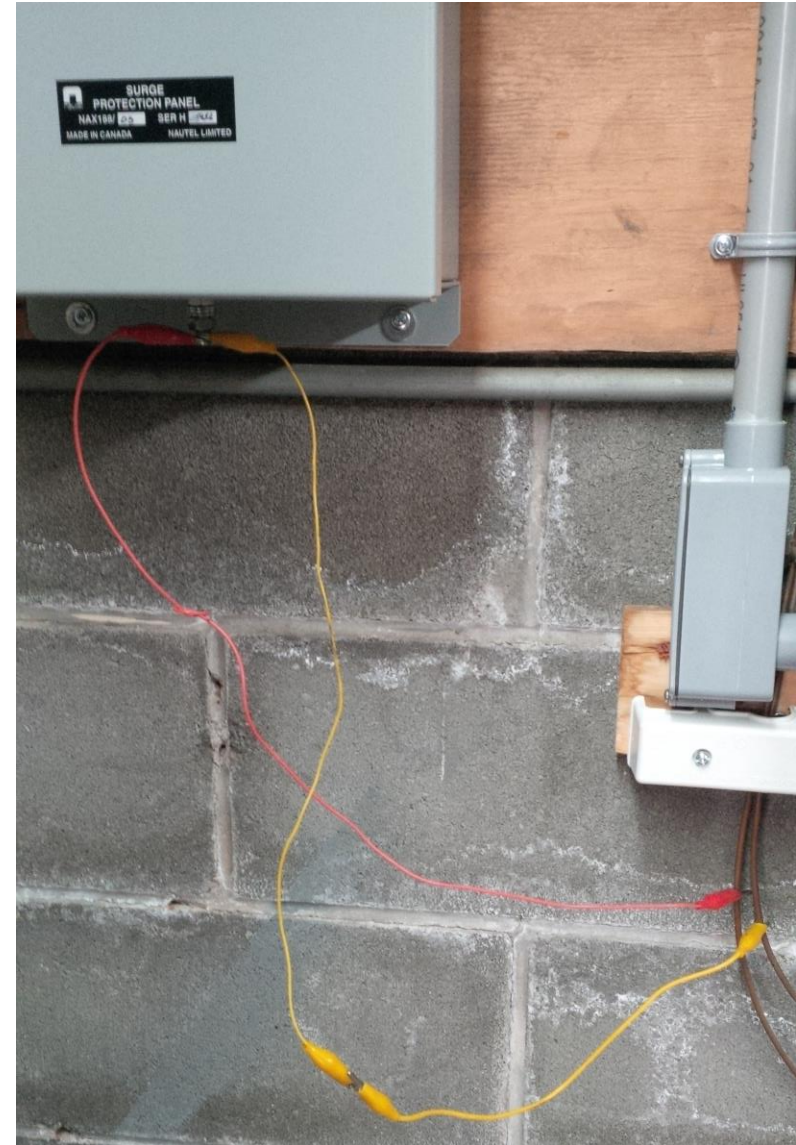


Photo credits: Rod Thannum, Northwestern Media



Maintenance

- Air Filters / Air Conditioning Systems
- Hardware – power supplies
- Air Handling – belts and blowers
- Ground System - integrity
- Housekeeping – clean up!



Air Filters

Air Filters should be changed on a schedule, based on site conditions.

Metal mesh filters can be washed – make sure they are dry before reinstalling!



Hardware

- Compression connections (as AC entry points and circuit breakers) can loosen over time, as wires compress.
- Filter connections and grounds should also be checked (fan/blower vibration and heating/cooling cycles can also cause these to loosen)



Groundskeeping

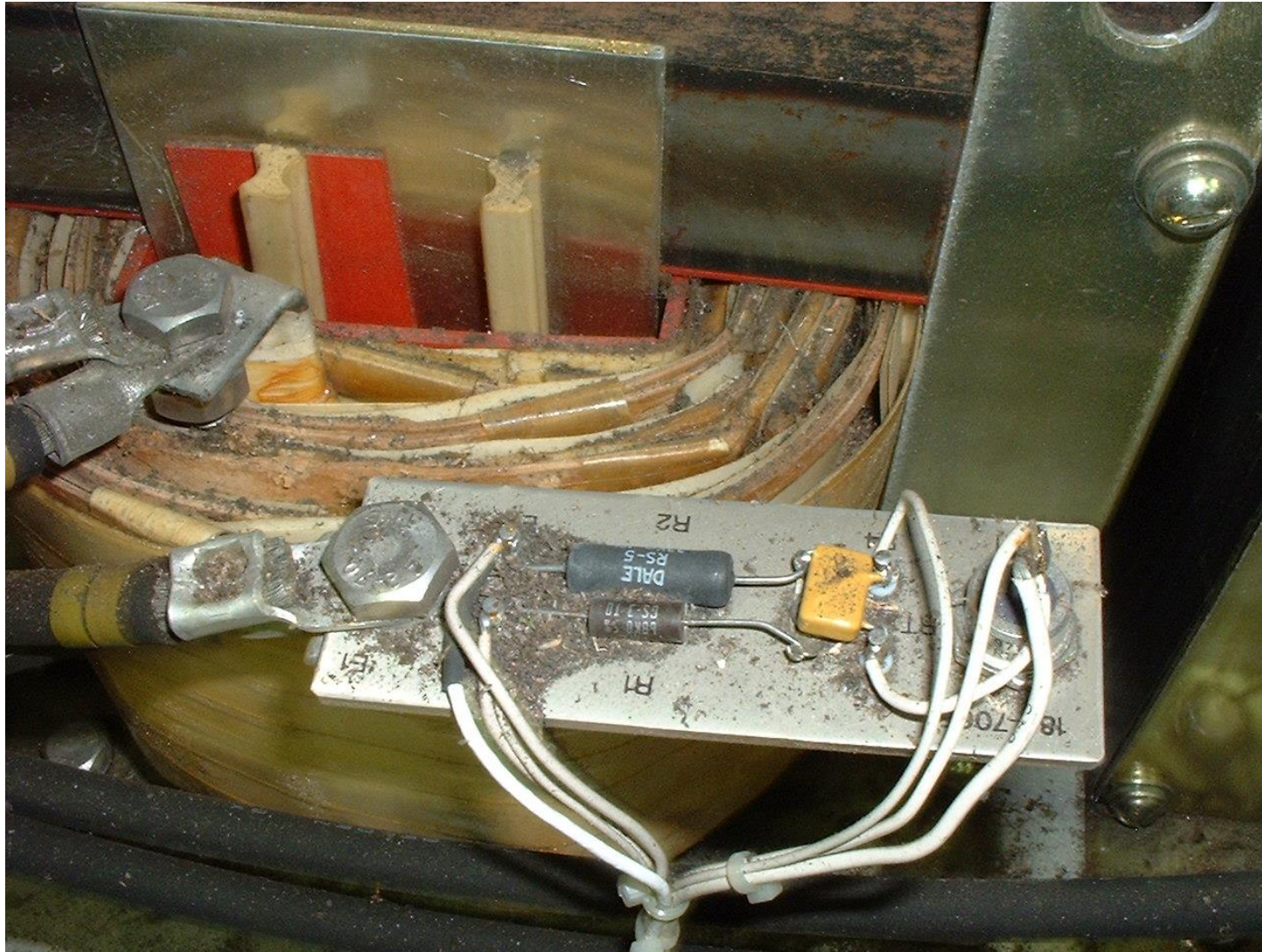
Make sure ground is grounded!



Remove unused cables



Housekeeping



Antenna System Maintenance



Spark Gap At ATU Input

Ball gaps

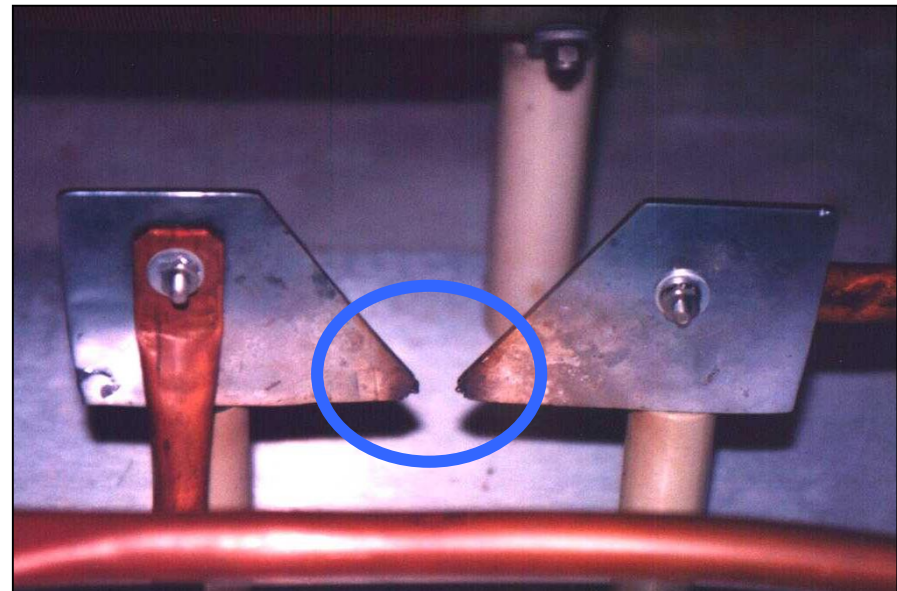
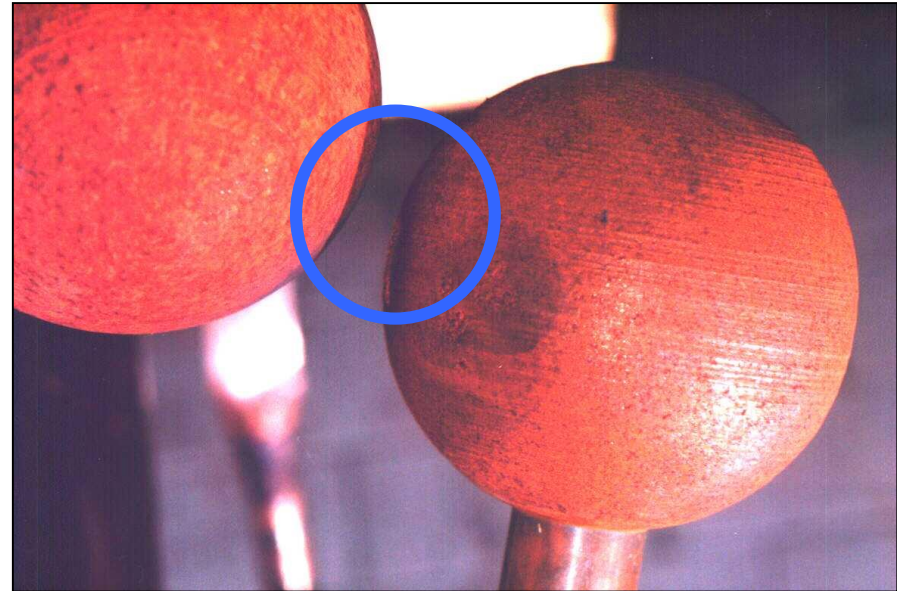
- 1/2" and larger, can be calculated

Steel balls


- require frequent maintenance

Horn gaps

- difficult to calculate
- some require major rework after a strike



Setting Ball Gaps

| | A | B | C | D | E | F |
|----|--|----------------|---------------|---------------------------------------|---|---------------|
| 1 | Calculation Of Maximum Voltage Generated By The Transmitter At The antenna Base | | | | | |
| 2 | Load Resistance | <u>133.00</u> | Ohms | |  | |
| 3 | Load Reactance (+/- j) | <u>17.00</u> | J Factor | | | |
| 4 | Maximum operating power in kilowatts | <u>100.00</u> | kilowatt | Polar To Rectangular Converter | | |
| 5 | VSWR limit (1.5:1 for Nautel transmitters) | <u>1.50</u> | Factor | Z Converter | Magnitude | Angle |
| 6 | Maximum modulation (peak in percent) | <u>140</u> | Percent | Polar | <u>50.0000</u> | <u>5.0000</u> |
| 7 | Maximum transmitter output voltage at antenna | 18.7181 | kVp | Rectangular | 49.8097 | 4.3578 |
| 8 | | | | | Resistance | +/- j |
| 9 | Calculation Of Ball Gap Breakdown Voltage At The antenna Base | | | | | |
| 10 | Gap in inches | <u>0.332</u> | Inch | | Rectangular To Polar Converter | |
| 11 | Gap in centimeters | <u>0.842</u> | cm | | | |
| 12 | Ball diameter in inches | <u>3.000</u> | Inch | Z Converter | Resistance | +/- j |
| 13 | Altitude in thousands of feet | <u>4.000</u> | Thousand Feet | Rectangular | <u>49.8079</u> | <u>4.3578</u> |
| 14 | Breakdown voltage with Uniform Field | 25.9844 | kVp | Polar | 49.9982 | 5.0002 |
| 15 | Calculated Field Enhance factor | 1.000 | Factor | | Magnitude | Angle |
| 16 | Breakdown voltage with Field Enhance | 25.9974 | kVp | | | |
| 17 | Breakdown voltage with frequency correction | 20.7979 | kVp at 1 MHz | | | |
| 18 | Breakdown voltage with altitude correction | 18.0248 | kVp | | | |
| 19 | | | | | | |

NRSC

Must be done every 14 months for
U.S. AM stations

Can be a useful troubleshooting tool

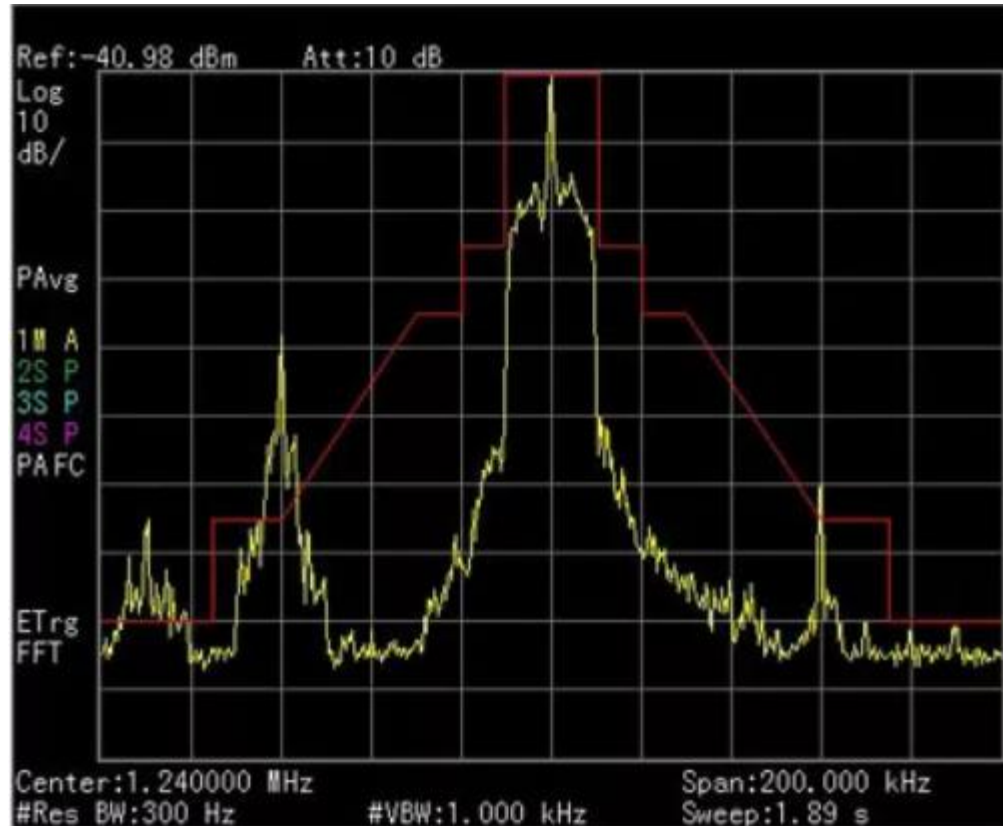


Photo credit: Jeremy Ruck, PE

Monitor Points and Proofs

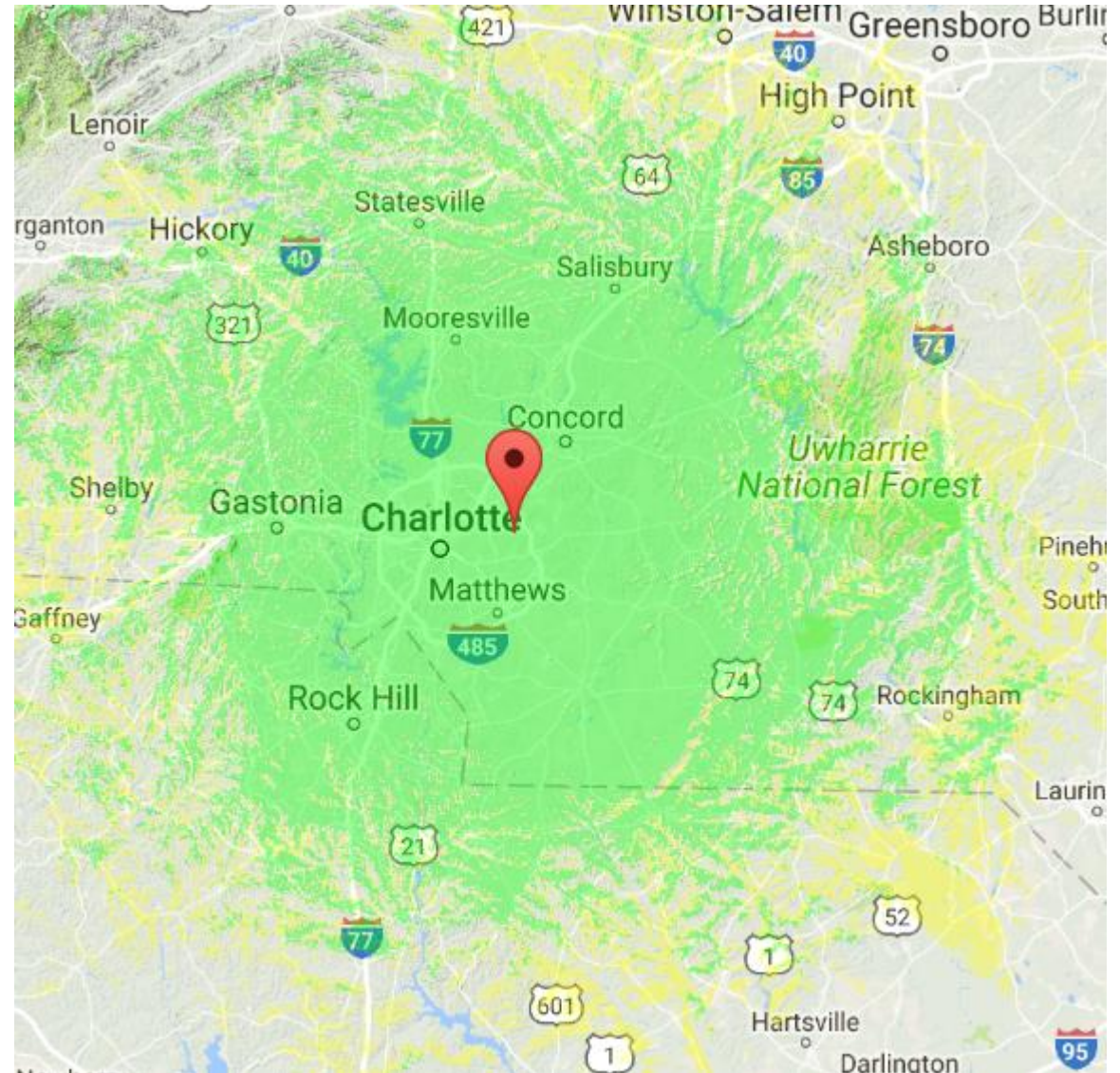


Photo credit: Hatfield & Dawson, www.hatdaw.com

Online Information

- **Nautel Waves Newsletter**
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