

**OFFICE OF ENGINEERING AND TECHNOLOGY ANNOUNCES
TECHNOLOGICAL ADVISORY COUNCIL (TAC) NOISE FLOOR TECHNICAL
INQUIRY
ET Docket No. 16-191**

July 27, 2016

Respectfully submitted from:

Christopher E. Hudak
166 Cherry Valley Rd
McDonald, PA. 15057

Amateur Radio Operator WA3PBL
WA3PBL@arrl.net

Responses to questionnaire:

1. Is there a noise problem?

YES, most definitely.

a. If so, what are the expected major sources of noise that are of concern?

- Switching power supplies
- Power line insulator leakage
- Plasma televisions
- Grow lighting used for “indoor gardening”
- CATV equipment
- AC Motor Variable Frequency Drives (VFD's)
- Traffic Signaling systems
- Electronic ballasts
- Indoor “Grow lighting” used by indoor gardening enthusiasts
- Solar charging systems

b. What services are being most impacted by a rising spectrum noise floor?

- AM broadcast service
- Amateur radio service
- Shortwave spectrum

c. If incidental radiators are a concern, what sorts of government, industry, and civil society efforts might be appropriate to ameliorate the noise they produce?

Increase regulations to encompass these devices either under Part 18 or create another more specific category.

2. Where does the problem exist?

a. 100kHz through 25MHz (Worst cases measured)

i. What frequency bands are of the most interest?

- AM broadcast (500KHz-1.75MHz)
- Amateur Radio 160 meters through 6 meters (1.8MHz-50MHz)

b. Spatially

i. Indoors vs. outdoors?

In the case of amateur receiver, use of external resonant antenna will enable the receiver to hear noise sources quite a distance away.

In the case of a broadcast receiver being operated in a mobile environment, Noise sources may be audible for several hundred yards from the source.

In the case of AM or FM broadcast receiver being operated indoors using internal antenna...Receiver may be completely wiped out due to overload from the interfering source.

ii. Cities vs. rural settings?

Cities- Urbanization has radically impacted AM broadcast and Amateur reception.

Rural- Power lines, Consumer electronics, CATV installations still impact the reception experience.

iii. How close in proximity to incidental radiators or other noise sources?

Depending on desired listening spectrum, interference may be an influence one half 1/2 mile away if using a gain antenna.

iv. How can natural propagation effects be accounted for in a noise study?

Close range interference influence is difficult to mitigate.

Signal to noise ratios still come into play. For example; when propagation is down the desired received signal is obviously closer to the quiescent noise floor so ANY interfering noise can be a problem.

- c. Temporally**
 - i. Night versus day?**

Signal to noise ratio is the determining factor day or night.

- ii. Seasonally?**

Again, Signal to noise impacts the receiver. My findings in AM broadcast work reveal ground conductivity changes radically from Winter to Summer and may impact the received broadcast signal by 50% during extreme hot Summer weather. The desired signal is now closer to noise floor therefore the noise is more pronounced during demodulation.

- 3. Is there quantitative evidence of the overall increase in the total integrated noise floor across various segments of the radio frequency spectrum?**
 - a. At what levels does the noise floor cause harmful interference to particular radio services?**

Many years ago, AM broadcast stations were capable of being received quite well within their 0.5mv contour. NO LONGER POSSIBLE!!

Over the past 25 years, as the noise floor continues to rise...AM broadcast now struggles in 10 millivolt areas where there's significant interference.

- b. What RF environment data from the past 20 years is available, showing the contribution of the major sources of noise?**
- c. Please provide references to scholarly articles or other sources of spectrum noise measurements.**

4. How should a noise study be performed?

- a. What should be the focus of the noise study?**
 - 100khz to 25 mhz.
 - Impact on particular service- How bad is it really!
- b. How should it be funded?**
- c. What methods should be used?**
Tighter Part 15 and Part 18 compliance

d. How should noise be measured?

- Direct radiated noise from device as designed
- Coupling and impact on surrounding environment and other receiving devices near field once installed.

i. What is the optimal instrumentation that should be used?

- Spectrum analyzer
- Directional antenna
- General coverage receiver

ii. What measurement parameters should be used for that instrumentation?

- Quiescent noise floor
- Desired receive signal to be measured within a given bandwidth.
- Signal to noise of desired to offending signal
- Is the noise able to be demodulated or as in the case of digital – causing bit errors.

iii. At what spatial and temporal scales should noise be measured?

iv. Should the monitoring instrumentation be capable of determining the directions of the noise sources? If so, how would those data be used?

v. Is there an optimal height above ground for measurements?

I always consider the receiving environment.

e. What measurement accuracy is needed?

i. What are the statistical requirements for sufficient data? Would these requirements vary based on spectral, spatial and temporal factors?

ii. Can measurements from un-calibrated, or minimally calibrated, devices be combined?

Yes, absolutely.

iii. Is it possible to “crowd source” a noise study?

Yes, I believe so.

f. Would receiver noise measurements commonly logged by certain users (e.g. radio astronomers, cellular, and broadcast auxiliary licensees) be available and useful for noise floor studies?

Yes

g. How much data must be collected to reach a conclusion?

This is dependent on the particular noise source and service being impacted. As few as 10 points at a given location can be sufficient to determine whether a noise problem exists or not.

h. How can noise be distinguished from signals?
Must be demodulated

i. Can noise be characterized and its source identified?

Yes

ii. Is there a threshold level, below which measurements should be ignored?

All dependent on desired receive level at the given location. During recent experiments, I found mobile receive noise floor of -80 db easily obtainable (Without interference, of course!)