RFI MEASUREMENTS, SANTA FE COLLEGE CAMPUS
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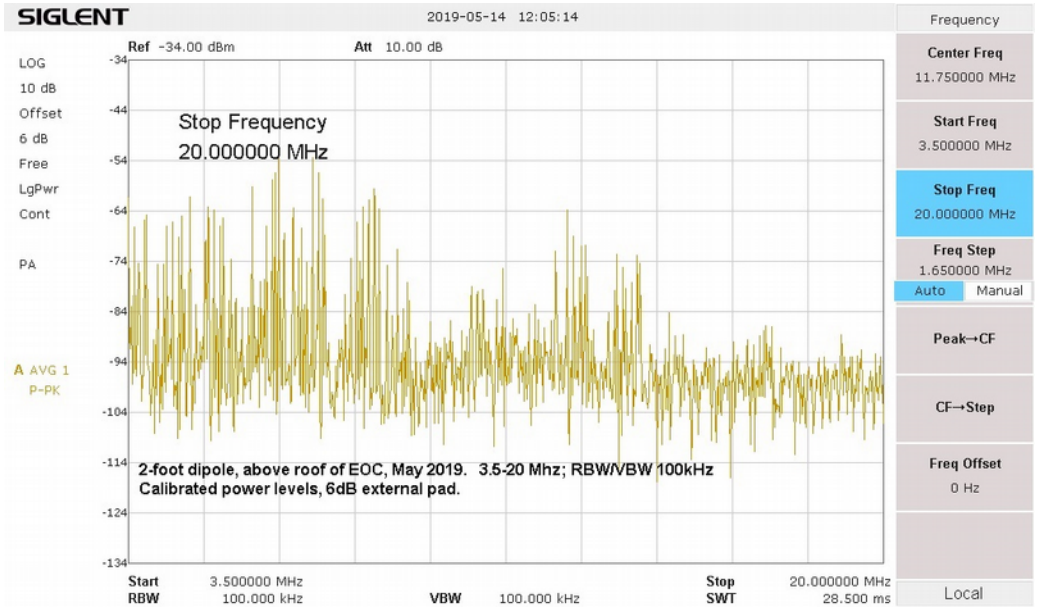
Measurements of HF background noise were carried out at multiple locations to assess the likely success or failure of HF radio systems antennas at each location. These measurements were carried out in accordance with a locally developed protocol[1], and therefore can be compared to successful as well as difficult locations previously identified. Frequency range tested included the entire HF frequencies typically used for emergency communications over longer distances, from 3.5 to 20 MHz.

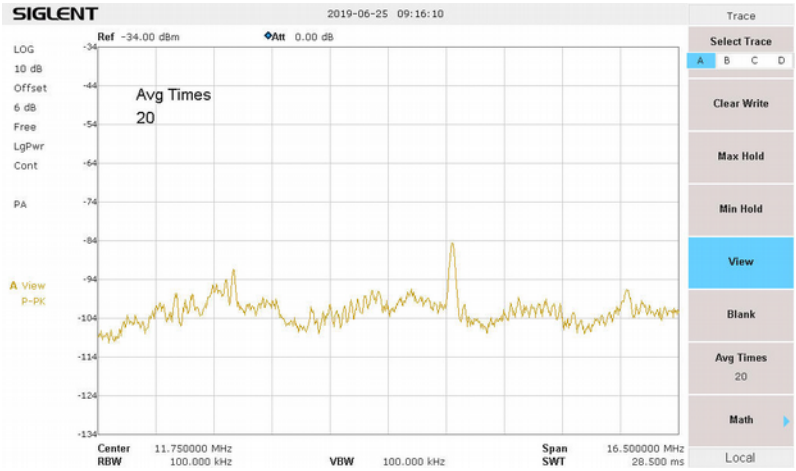
RESULTS

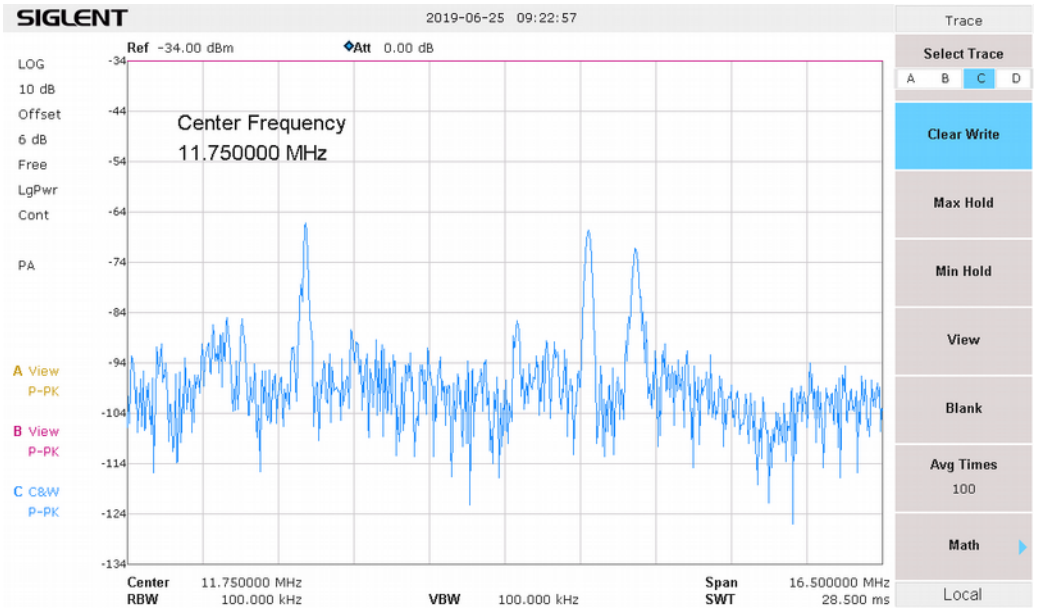
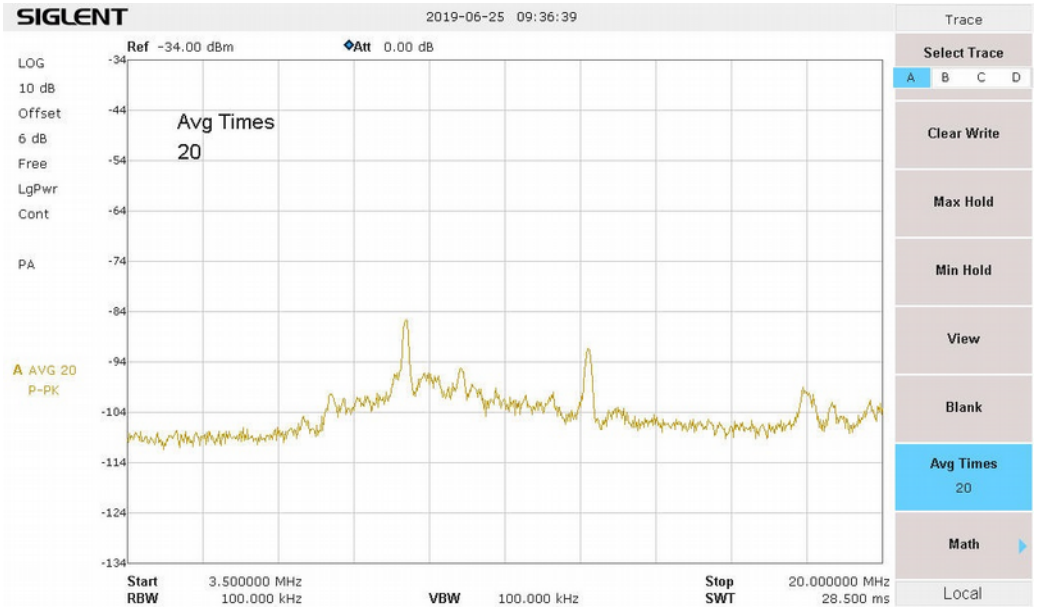
Location	Measurements	Likelihood of good equipment function (interior) or low antenna noise (exterior)
Baseline Spectrum Analyzer	Excellent sensitivity down to -104 dBm	
K4EAC station, interior	Typically -94 dBm	Excellent
K4EAC station, exterior	Typically -94 dBm	Excellent
D building, interior	-100 dBm with one stronger signal	Excellent
D building, exterior	-90 dBm with three stronger signals, not expected to interfere with our operations	Very Good
Campus Police, interior	-100 dBm with three signals stronger to -84 dBm	Excellent
Campus Police, exterior	-104 dBm with three stronger signals, one as strong as -81 dBm not expected to be an issue	Excellent
Comparison, Alachua County EOC roof	-50 to -60 dBm interfering signals (30+ dB worse than measurements at Santa Fe)	Significant Problems

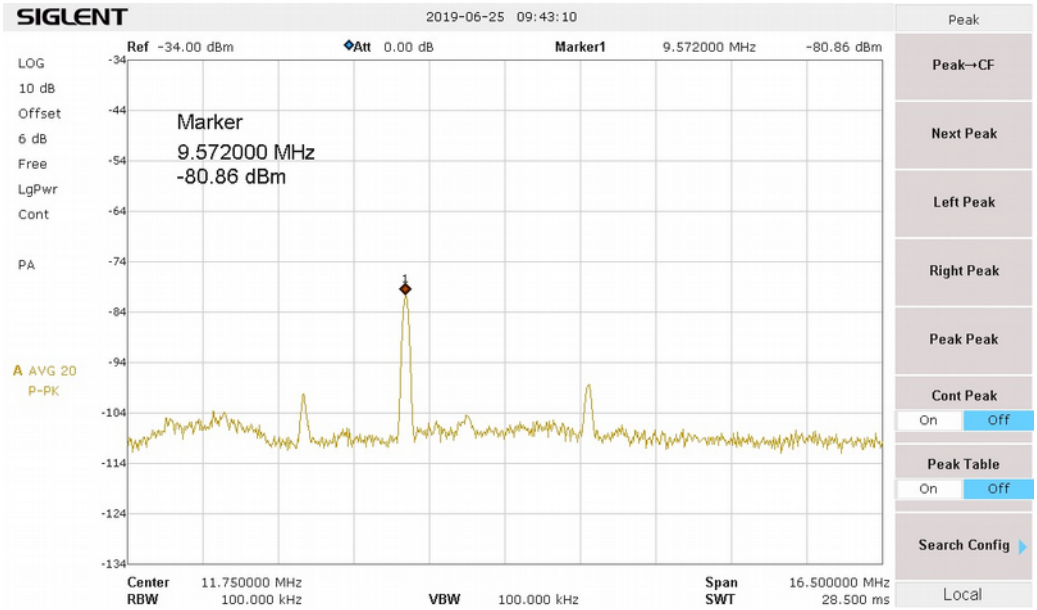
1 See: https://qsl.net/nf4rc/2019/AmbientNoiseMeasurementProtocol.pdf

DETAILED DATA:

LOCATION	DATA CAPTURE
Spectrum Analyzer baseline	6 dB fixed external physical attenuator Preamplifier ON Internal attenuation: MANUAL, 0 dB Bandwidth: 100 kHz 3.5-20.0 MHz (1.65 MHz per major division) Measured internal noise floor approximately -104 dBm
Example of Severe Interference	This example plot, showing interference signals measured on the 2-foot test antenna as strong as -54 dBm, was taken at the roof line of the Alachua CountyEOC – where there have been quite severe noise issues. The interference should have been down 30dB more more quieter. This gives you a baseline of what a difficult situation looks like. The bandwidth is 100 kHz. 
Inside K4EAC current station location, gym building	2-foot dipole background measurements were typically at -94 dBm with one signal slightly higher (100 kHz bandwidth). <u>Comparison to residential house baseline measurement</u>

	With a 15dB correction, these measurements can be corrected for the 3kHz bandwidth used on baseline measurements at my house: https://qsl.net/nf4ac/2019/GibbyEFieldBaseline042232019/GLGHouseE-Field2ftwand10AM04232019.jpg) Those measurements were in the 80 meter band and showed signals as high as -109 dBm; correcting for the bandwidth difference, they would be 15dB higher or -94dBm @ 100kHz bandwidth – *about the same as the measurements at the K4EAC station inside location.* Outside measurements at 6 foot elevation at the K4EAC station location were very similar. This suggests that suitable HF antennas at this location should experience no excessive radio frequency interference.
D-Building Inside	 One strong signal to approximately -84 dBm @ approx 13.5 MHz, otherwise the background noise is in the range of -100 dBm. These are favorable measurements for an HF Antenna
D-Building roof	Due to technical problems (short coax) we were not able to make full measurements from the roof of the D-Building but did capture a snapshot of received signals at the roof. This demonstrates background noise on the order of -90 to -94 dBm (as much as 10dB worse than inside the room below) , with three notable peaks stronger than -75 dBm. This can be compared to the very significant interference found at roof level at the Alachua County EOC in the graph on page 5 of this document: https://qsl.net/nf4ac/2019/May18Investigations.pdf **where the interference is frequently in the -54dBm to -64dBm range** [30 db worse than the roof measurement at Santa Fe] (same 100 kHz bandwidth). This suggests that an HF antenna at this location, while experiencing impedance matching coupling into the massive horizontal metallic structures, may experience normal levels of RFI. A vertical antenna may function better, or a horizontal antenna >20 feet off the roof should be reasonably successful.

	
Campus Police building conference room inside measurements.	X20 Averages were able to be captured inside the campus police building, and demonstrate very low interference of -108 dB for the lower ham bands, with a couple of peak signals in the -94 to -86 dBm range. These levels of RFI are quite manageable and radio equipment should function well in that environment. 
Campus Police Building, SW Corner, by the A/C	X 20 averages were able to be captured at head height outside the fenced area of the AC equipment and demonstrate quite workable background noises levels quieter than -104 dBm except for 3 peaks, the worst of which is at 9.57 MHz

units	and -81 dBm. That frequency is not an important one for our communications.  That location has large trees and tall buildings nearby. Any of those could easily be used to place a non-intrusive wire dipole antenna of roughly 130 feet length, in either horizontal, sloping, or inverted V shape, avoiding any risk of interaction with students, with balanced or coaxial feedline depending on design, and likely with success. Due to the expected absorption by the buidings themselves it would be best to get the antenna up to the height of their rooflines, or position it so that it traverses good areas of free space.