There have been numerous discussions concerning the RF characteristics of Straux namely antenna input impedance and supposition concerning interference issues . Measurements were made on a typical dual dongle Stratux build to evaluate these concerns.

Stratux Build used for this evaluation:
EdiMax Wi-Fi Dongle
Dual NooElec 820T2 dongles (originally specified 820T2 dongles)
Raspberry PI - Vilros Kit
5V DC Fan
2V USB Wall Wart Power Supply
SMA - MCX pigtails to interface to the antenna port on the SDR dongle

Input Impedance:
The first objective was to determine the antenna input impedance of the RTL-SDR dongles. Documentation is hard to find, but what is available places the input impedance anywhere between 50 ohms and 2000 ohms. An HP Network analyzer was used to measure the input impedance of the dongles. The input impedance was measured at 978 MHz and 1090 MHz. The measurements were taken at “turn on” and were monitored through 30 minutes of operation. The input impedance did not vary appreciably during the test period.

Input Impedance Dongle 1 (Named stratux:978):
978 MHz = 36.9 -j10.9 ohms
1090 MHz = 27.7+24.6 ohms

Input impedance Dongle 2 (Named stratux:1090)
978 MHz = 32.2 -j13.5 ohms
1090 MHz = 24.6+j25.3 ohms

The approximately 25 ohm - to 30 ohm input impedance of the dongles may explain why there has been success of using a single 50 ohm antenna to feed both dongles through an SMA “T” and short lengths of coax. Also, now that the actual input impedance is know custom antennas can be fabricated to better match with the dongles.

RF Noise:

The second objective was to see how much noise is generated by Stratux as there have been numerous comments concerning potential EMI. The author has noticed an intermittent weak "birdie" at 135.325 MHz and the intent was to determine the source of the "birdie." A sniffing loop was constructed and connected to an HP Spectrum analyzer to sniff for and measure potential radiated noise. The sniffing loop was scanned over all sides of the Stratux while monitoring the Spectrum Analyzer for a response. An original scan up to 3000 MHz was made and with the exception of a response at 2400 MHz- 2500 Mhz from the Wi-Fi dongle no appreciable noise was detected. Subsequent detailed scans were limited to 1100 MHz for the remainder of the evaluation. The worst case responses are detailed below.

Image 1 (Stratux Off):

Baseline measurement of noise in the lab. The predominant noise spikes at 97 Mhz, 760, MHz, 870 MHz, and 890 MHz were consistent. Other noise spikes appeared intermittently. Any noise above this level were sourced by Stratux.

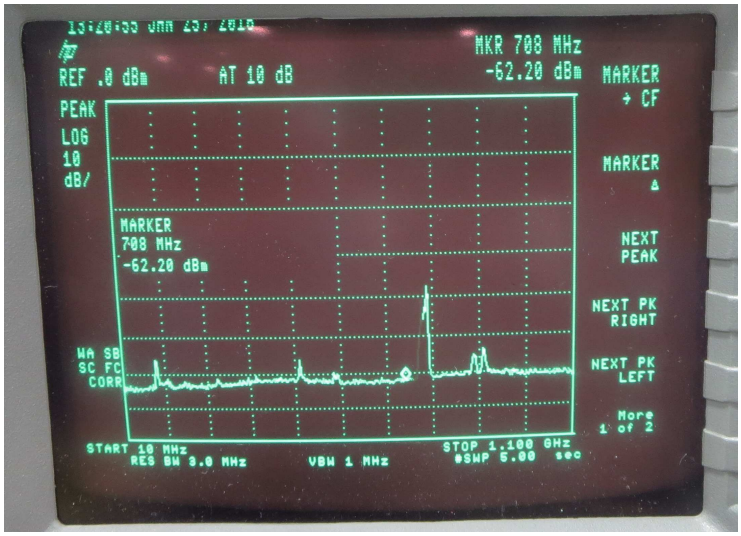


Image 2 (Stratux On):
Sweep of Statux with loop probe over the Raspberry Pi. There were no additional noise spikes or shift in the noise floor with the loop probe positioned over or in the vicinity of the Raspberry PI.

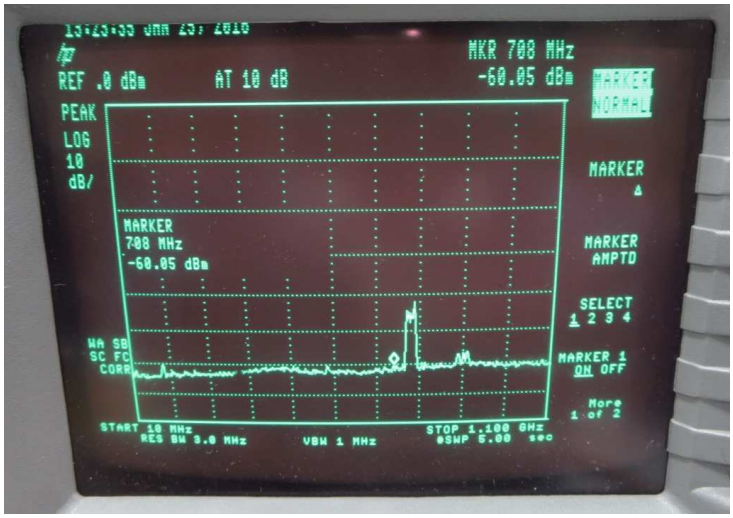


Image 3 (Stratux On):
Sweep of Stratux with the loop over the RY835AI module. Notice the noise centered around 100 MHz. The top of the Stratux case was removed placing the RY835 away from the Stratux. This showed noise is associated with the RY835. When power is removed from the noise at 100 MHz drops into the noise floor. While the top was removed the loop was scanned around the SDR Dongles. These was no appreciable noise detected in the vicinity of the dongles.

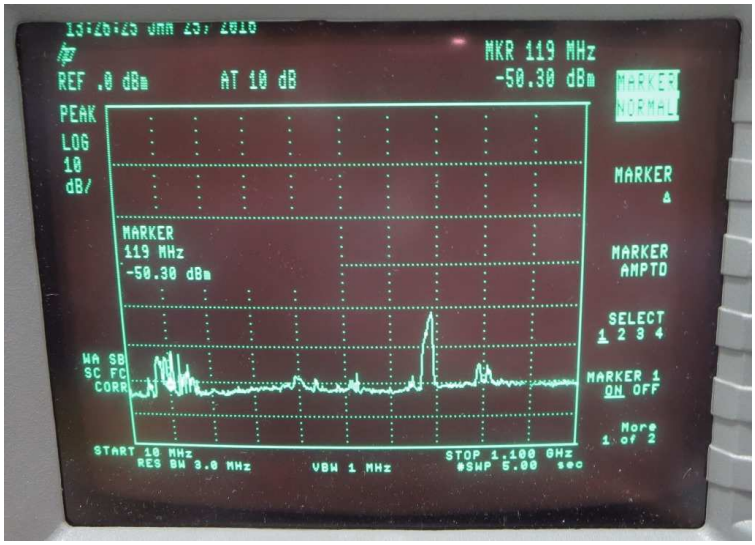
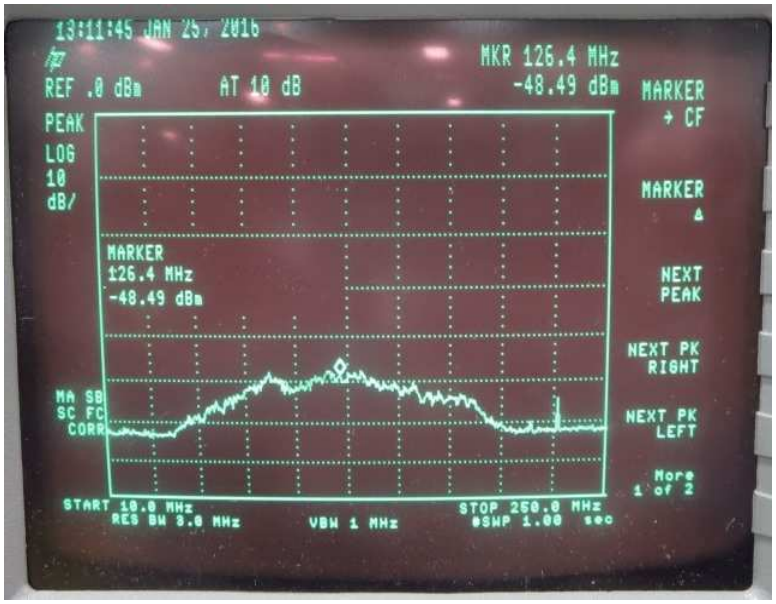


Image 4 (Stratux On):
Expanded view of image 3. The bandwidth of the noise is 162 MHz with a peak at 136 MHz measuring -47.4 dBm. This is the source of the “birdie” that was detected at 135.325 MHz.



Conclusion:

The measurements taken in the area of the Raspberry Pi coincide with the FCC type acceptance report located on the FCC website. There does not appear to be an EMI issue with Startux when built with the Vilros R-Pi, NooElec 820T2 dongles, and the Edimax Wi-Fi. However, there appears to be a radiation issue when the RY835 is added to the build. More testing will need to be performed to determine if it is the RY835 itself or the GPIO wiring between the R-Pi and the RY835 causing the RF noise. It also is not know if any other GPS / AHRS solutions or add on peripherals to the GPIO will generate RF noise like seen with the RY835.