

EbNaut LF Reception using Sound Card Line-In

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Reception using a computer sound card line-in connection is limited to half the sampling rate. Older, simpler sound cards may be limited to 48 kbps. Thus, to receive signals in the 137 kHz region down conversion is necessary. Sampling rates are generally set by crystal oscillators and thus drift with time and temperature. The most recent Spectrum Lab software allows correction of such drift through a 1pps GPS signal applied to one side of the stereo line-in. The down converter local oscillator of course must also be referenced to GPS to realize the full potential of EbNaut decoding.

The receive setup at K3SIW is as follows: the output of either a 10' loop or a backyard eprobe (it is generally more sensitive than the rooftop eprobe) is cabled to an LF amplifier whose output is connected to the RF port of an LF mixer. The 0 dBm output of a GPS-locked HP *selective level meter* (SLM) tuned to 120 kHz is passed through an HP step attenuator set to 0 dB and on to an LF amplifier to produce an LO level of about 10 dBm which is applied to the mixer. The reason for the LF amplifier ahead of the RF input is that the mixer conversion gain is quite low, probably because it expects an LO drive level much greater than 10 dBm. By adding extra receive gain hopefully degradation of the *signal-to-noise ratio* (SNR) is kept to a minimum. The mixer IF output at around 17.5 kHz is cabled to a pair of boxes that also include GPS 1pps and NMEA signaling. The former goes to the line-in L channel while the latter goes to the R channel.

The following images show important settings for the Spectrum Lab software and a decoding example for an HP signal generator carrier:

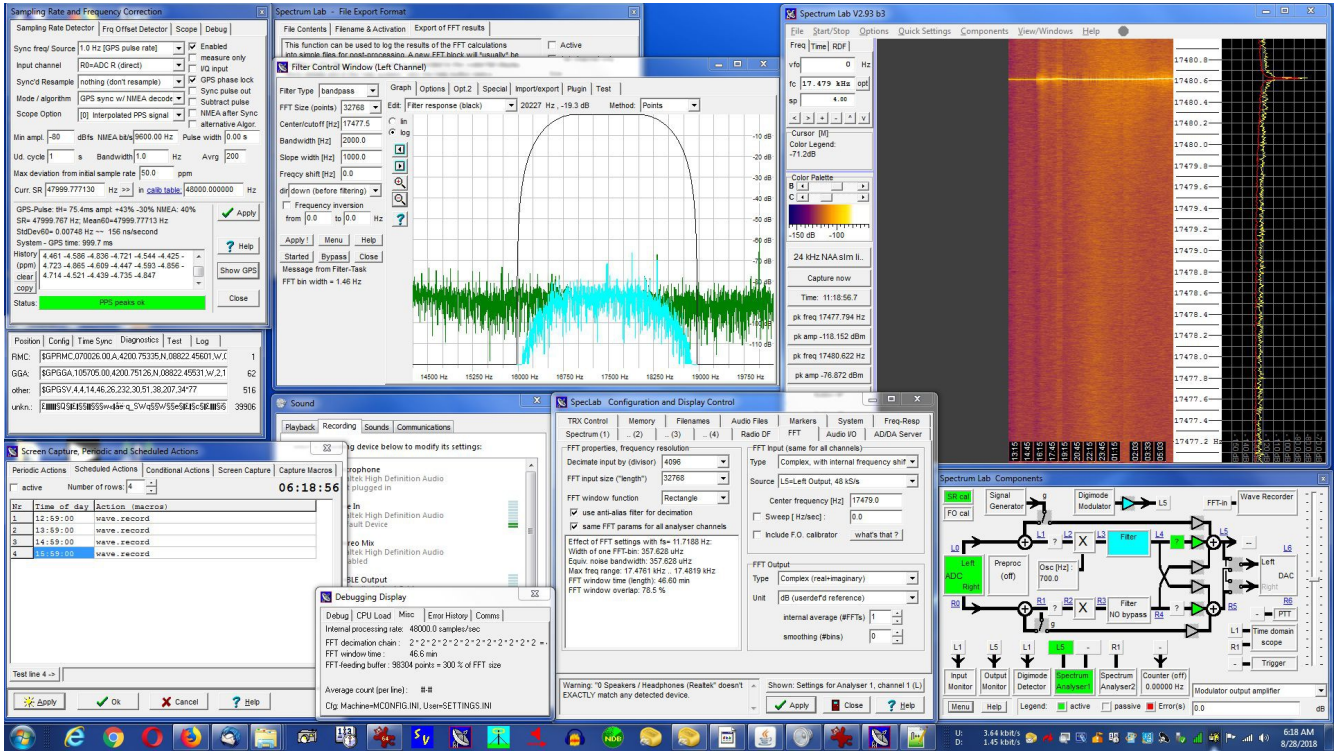


Figure 1 Full screen capture while receiving EbNaut transmissions via Line-In (carrier signal is from an HP signal generator).

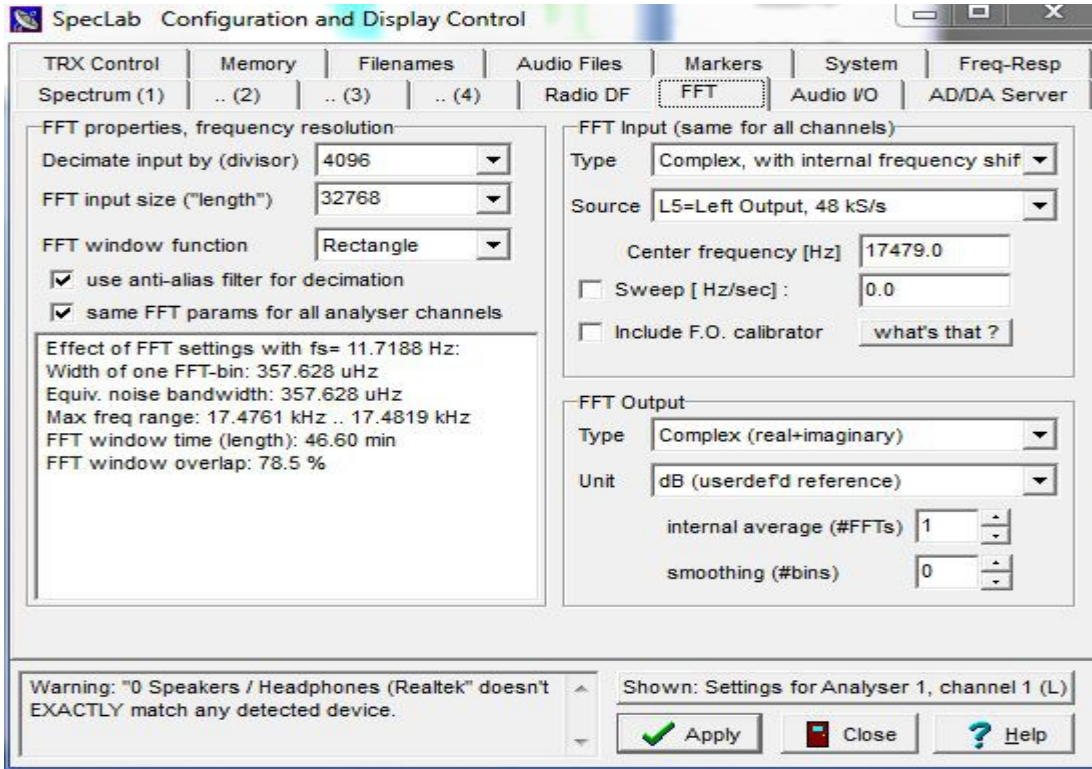


Figure 2 Spectrum Lab FFT window.

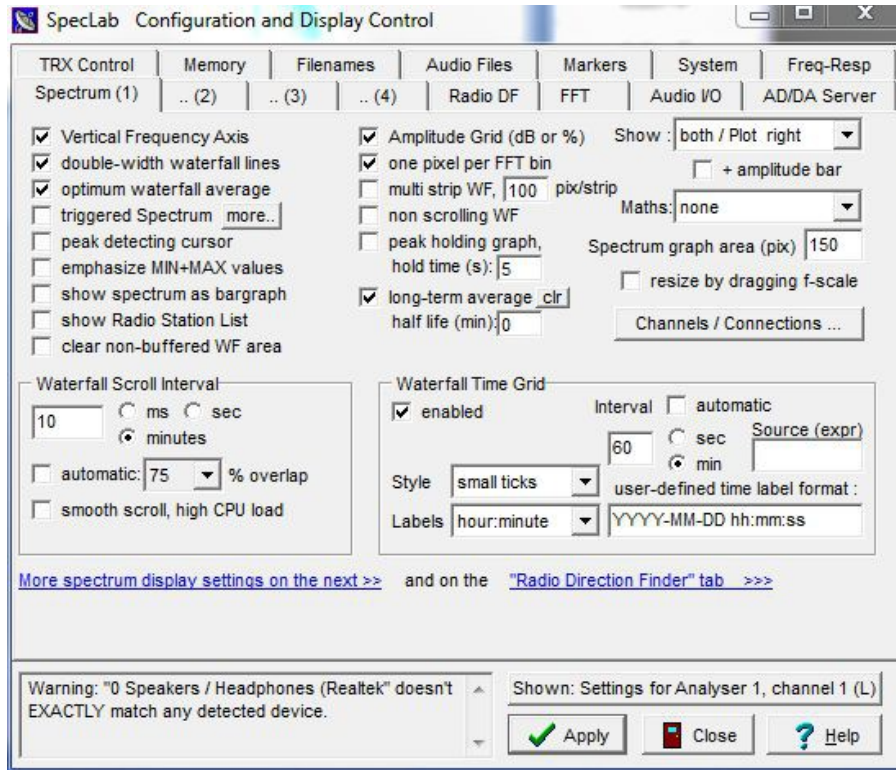


Figure 3 Spectrum Lab spectrum(1) window.

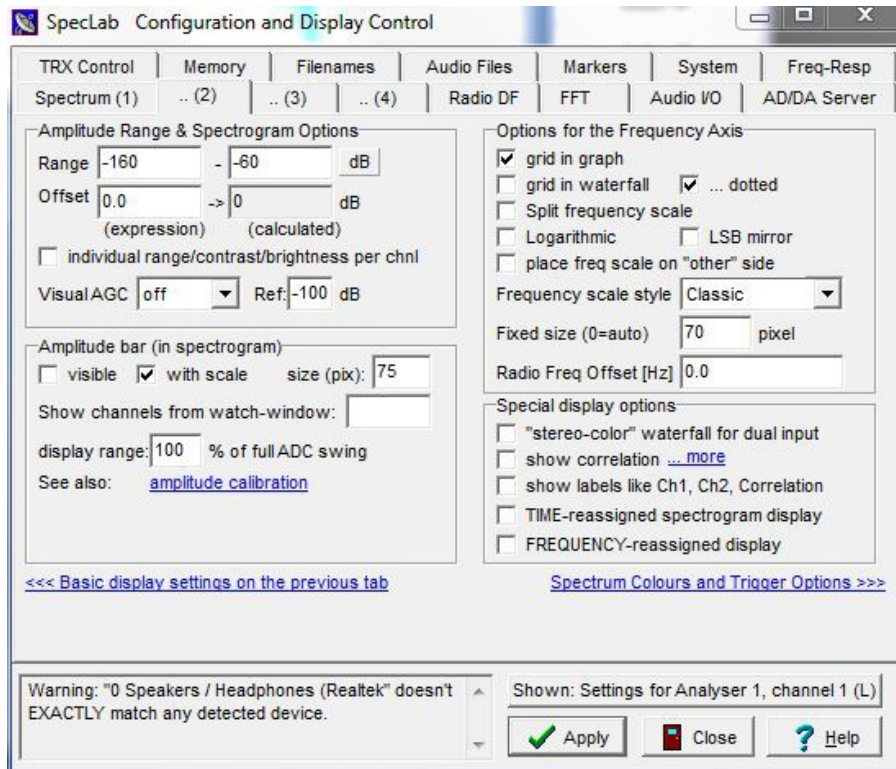


Figure 4 Spectrum Lab spectrum(2) window.

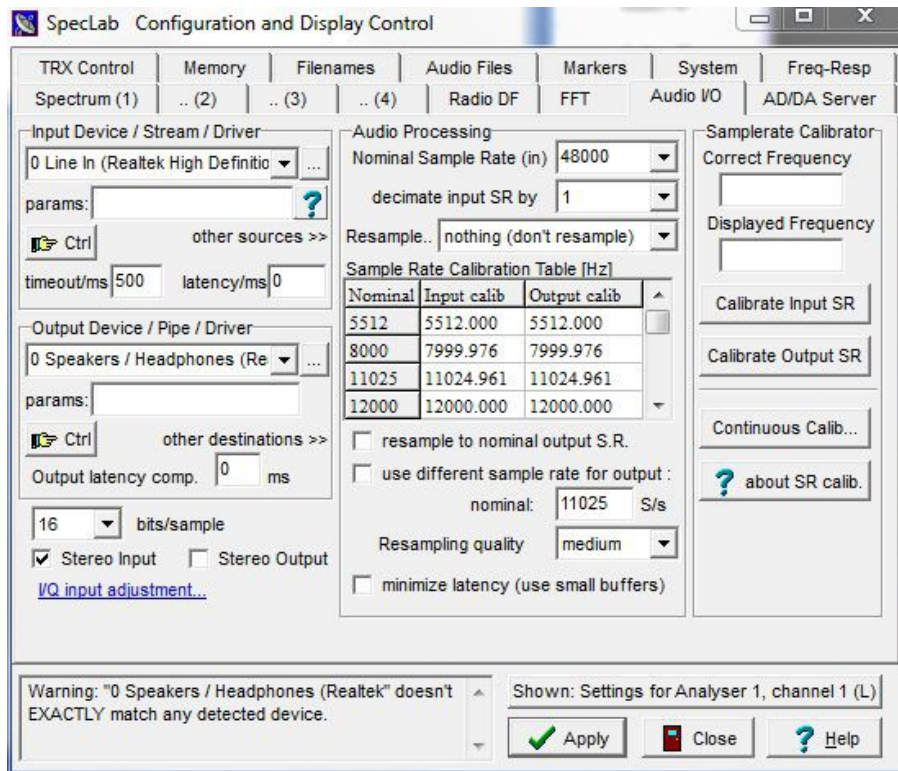


Figure 5 Spectrum Lab Audio I/O window.

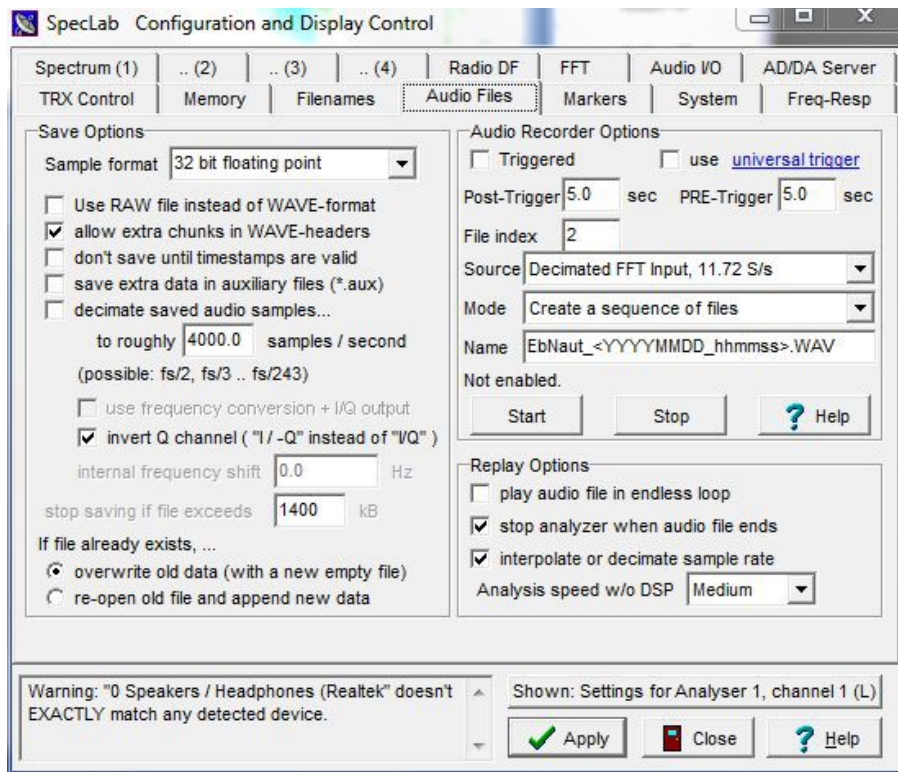


Figure 6 Spectrum Lab Audio Files window.

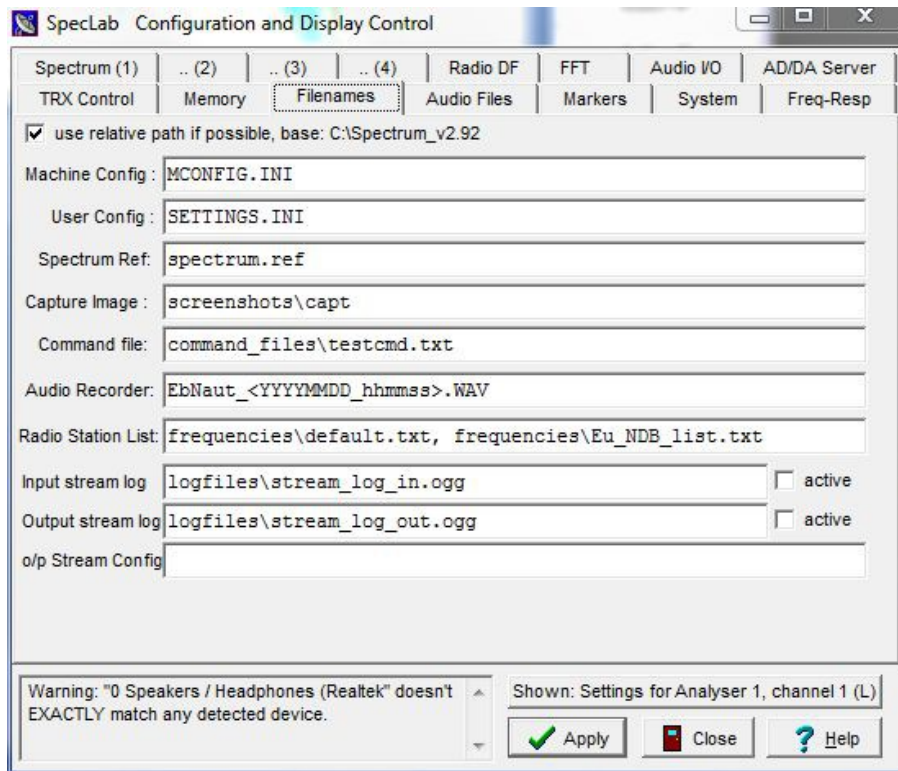


Figure 7 Spectrum Lab FileNames window.

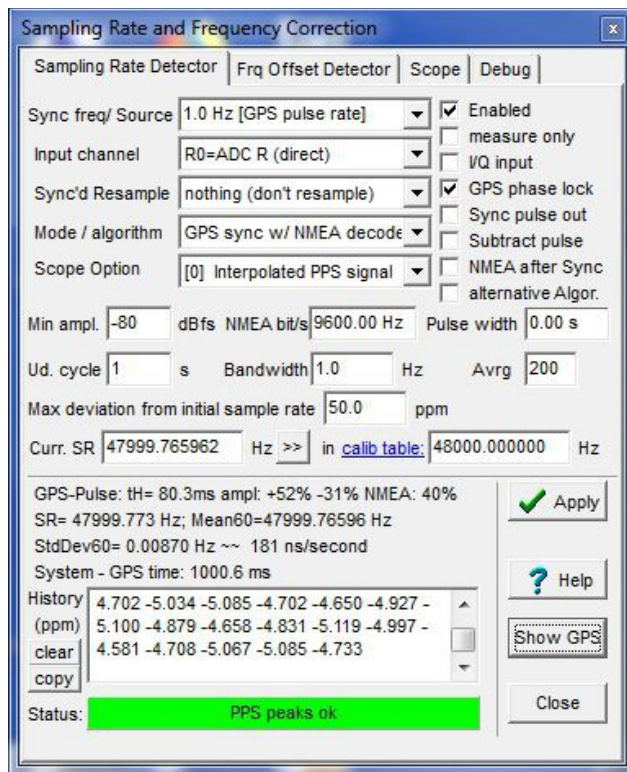


Figure 8 Sampling Rate and Frequency Correction window.

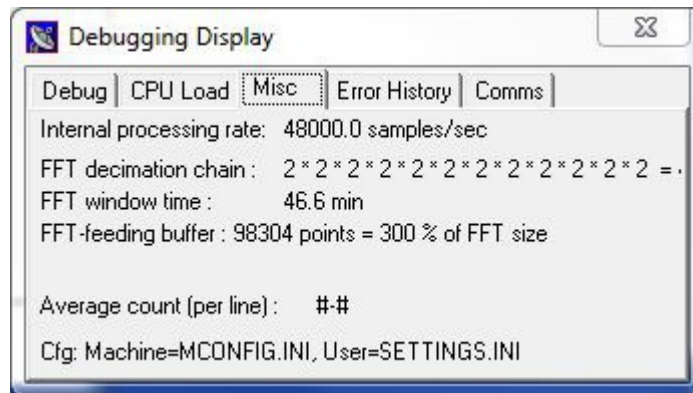


Figure 9 Debugging Display window.

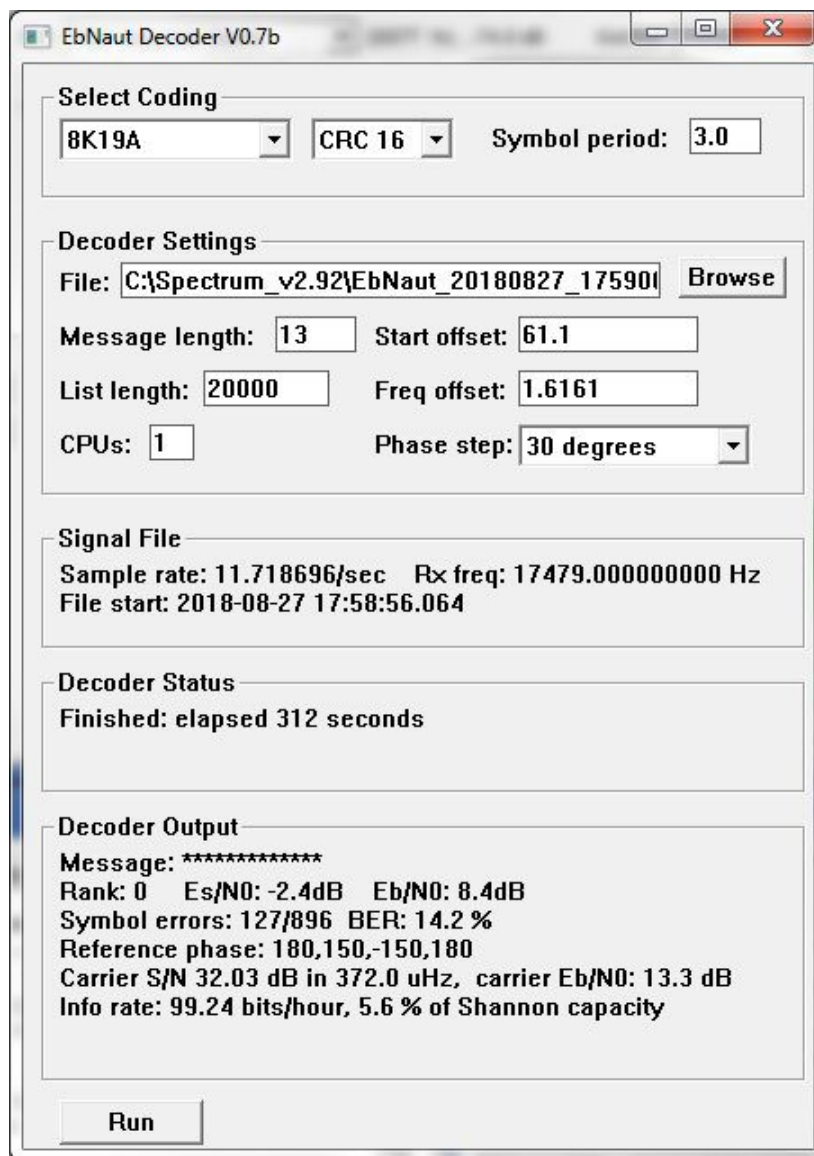


Figure 10 EbNaut Decoder V07.b software decoding the HP signal generator carrier.