Noise Power Ratio & Sensitivity Tests on FunCube Dongle Pro+

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The following tests were performed on an FCDP+, running under HDSDR v2.7 on Win7 Pro, 64-bit. HDSDR was selected, as its spectrum scope is scalable.

1. ***Noise Power Ratio (NPR):*** Test setup: Wandel & Goltermann RS-50 white noise generator, fitted with filters as per Table 1. The RS-50 was connected to the FCDP+ input via a 75/50Ω matching transformer. The noise loading was increased until NPR (the difference in dB between the top and bottom of the notch) reached a peak value, then read off the RS-50's attenuator scale.
   - Reference: http://www.ab4oj.com/test/docs/npr_test.pdf

   The noise loading in a given bandpass width is equivalent to the stated number of contiguous SSB channels; thus, the NPR test simulates a band packed with very strong signals.

Table 1: FCDP+ NPR

Bandstop kHz	Bandpass kHz	Equiv. J3E channels	Noise loading P_{TOT} dBm	NPR dB	Per-channel loading
1940	60-2048	480	-39	40	S9+7dB
3886	60-4100	960	-28	39	S9+7dB
5340	60-5600	1260	-25	43	S9+17dB
7600	316-8160	1800	-24	42	S9+17dB

Figure 1: FCDP+ NPR notch spectrum at 5340 kHz.

By comparison, the Perseus has 75 dB NPR at higher noise loading levels, i.e. higher signal strength per equivalent channel. The conclusion is that the FCD Pro+ is no great shakes as an HF receiver – but then, HF is not its primary mission.

- Reference: http://www.ab4oj.com/sdr/perseus/perseus_notes.pdf pp. 12-15

2. *Noise Power Ratio (NPR) re-test with SDR#:* Test setup as per 1. Above. This test was run under SDR# ver. 1.0.0.1000, with LNA off/on, Mixer Gain on and IF gain = 0 dB.

Table 2: FCDP+ NPR with LNA off & on

Bandstop kHz	Bandpass kHz	Equiv. J3E channels	LNA off			LNA on		
			Noise loading P_{TOT} dBm	NPR dB	Per-channel loading	Noise loading P_{TOT} dBm	NPR dB	Per-channel loading
1940	60-2048	480	-11	41	S9+35dB	-39	40	S9+7 dB
3886	60-4100	960	-16	37	S9+19dB	-28	39	S9+7 dB
5340	60-5600	1260	-4	42	S9+38dB	-25	43	S9+17 dB
7600	316-8160	1800	-8	41	S9+33dB	-24	42	S9+17 dB

3. ***Sensitivity***: Test setup: HP/Agilent 8935 E6380A, connected to FCDP+ via a 30 dB fixed attenuator. LNA on. FCDP+ running under HDSDR v2.7 on Win7 Pro, 64-bit.

   The input power required to display a spike 3 dB above the noise floor on the spectrum scope was recorded at various frequencies.

Table 2: FCDP+ Sensitivity (+3dBr spike)

Test freq. MHz	Input power dBm
260	-102
410	-122
1015	-148
1701	-146
1901	-145
2000	-137

It is interesting to note that the FCDP+ is relatively "hot" in the 1-2 GHz range, and falls off significantly in the VHF/UHF range.

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