

UCF-CARSE data set - I: Correlated noise + tone

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Fig.1 shows the test setup for the correlated noise + tone data collection. The synthesizer was configured to output a sine wave at a frequency of 33.6 MHz and a power level of -15 dBm. Gaussian noise, with a bandwidth of 60 MHz and an RMS voltage of 5 mV, was generated using an arbitrary waveform generator. The combined synthesizer and noise output were routed to the 4-channel voltage recording system. We collected data using the 49.152 MHz sampling frequency mode of the 4-channel system [see 1]. The data collection lasted for one hour. A list of files containing the raw data is provided below¹.

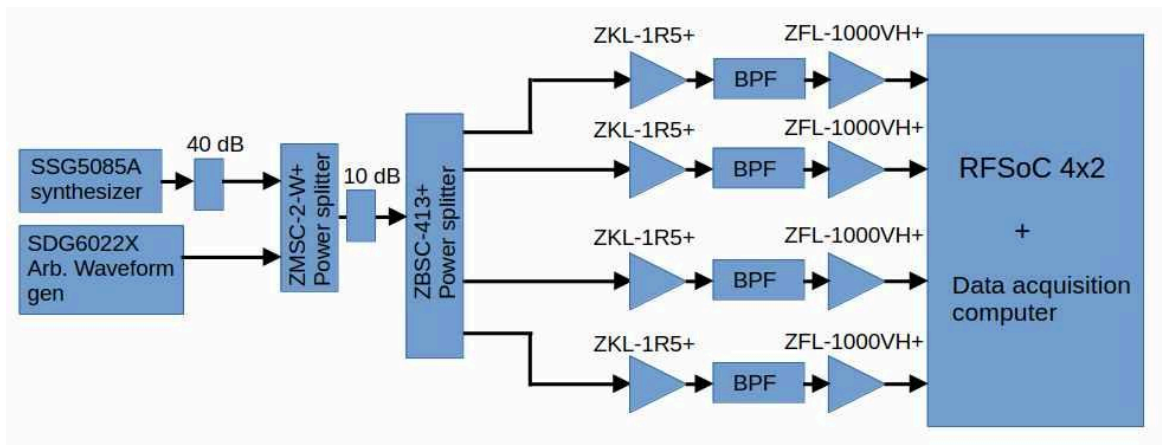


Figure 1 shows the test setup for the correlated noise + tone data collection.

```
-rw-rw-r-- 1 anish      anish    120G Aug 16 14:58 20240816_185307_0000.dat
-rw-rw-r-- 1 anish      anish    120G Aug 16 15:03 20240816_185307_0001.dat
-rw-rw-r-- 1 anish      anish    120G Aug 16 15:09 20240816_185307_0002.dat
-rw-rw-r-- 1 anish      anish    120G Aug 16 15:14 20240816_185307_0003.dat
-rw-rw-r-- 1 anish      anish    120G Aug 16 15:20 20240816_185307_0004.dat
-rw-rw-r-- 1 anish      anish    120G Aug 16 15:25 20240816_185307_0005.dat
-rw-rw-r-- 1 anish      anish    120G Aug 16 15:30 20240816_185307_0006.dat
-rw-rw-r-- 1 anish      anish    120G Aug 16 15:36 20240816_185307_0007.dat
-rw-rw-r-- 1 anish      anish    120G Aug 16 15:41 20240816_185307_0008.dat
-rw-rw-r-- 1 anish      anish    120G Aug 16 15:46 20240816_185307_0009.dat
-rw-rw-r-- 1 anish      anish    120G Aug 16 15:52 20240816_185307_0010.dat
-rw-rw-r-- 1 anish      anish    17G Aug 16 15:53 20240816_185307_0011.dat
```

The data were processed using the executable of `corr_cpu_complex_v2.c`, referred to as “corr.” The following commands processed the data. The FFT length used was 4096, and the number of FFTs averaged was also 4096, corresponding to averaging the cross-products over approximately 341 milliseconds.

```
./corr -c 4096 -a 4096 -i /mnt/carsedat/20240816_185307_0000.dat -o procdat/20240816_185307_0000
./corr -c 4096 -a 4096 -i /mnt/carsedat/20240816_185307_0001.dat -o procdat/20240816_185307_0001
./corr -c 4096 -a 4096 -i /mnt/carsedat/20240816_185307_0002.dat -o procdat/20240816_185307_0002
```

¹ We will delete the raw data files 20240816_185307_0001.dat to 20240816_185307_0011.dat when we need more disk space. But the processed data will be available in the data archive.

```
./corr -c 4096 -a 4096 -i /mnt/carsedat/20240816_185307_0003.dat -o procdat/20240816_185307_0003
./corr -c 4096 -a 4096 -i /mnt/carsedat/20240816_185307_0004.dat -o procdat/20240816_185307_0004
./corr -c 4096 -a 4096 -i /mnt/carsedat/20240816_185307_0005.dat -o procdat/20240816_185307_0005
./corr -c 4096 -a 4096 -i /mnt/carsedat/20240816_185307_0006.dat -o procdat/20240816_185307_0006
./corr -c 4096 -a 4096 -i /mnt/carsedat/20240816_185307_0007.dat -o procdat/20240816_185307_0007
./corr -c 4096 -a 4096 -i /mnt/carsedat/20240816_185307_0008.dat -o procdat/20240816_185307_0008
./corr -c 4096 -a 4096 -i /mnt/carsedat/20240816_185307_0009.dat -o procdat/20240816_185307_0009
./corr -c 4096 -a 4096 -i /mnt/carsedat/20240816_185307_0010.dat -o procdat/20240816_185307_0010
./corr -c 4096 -a 4096 -i /mnt/carsedat/20240816_185307_0011.dat -o procdat/20240816_185307_0011
```

Below is the list of processed files. The *.LCCSPC file contains the cross spectra, and the *.LACSPC files have the self spectra.

```
-rw-rw-r-- 1 anish anish 178M Aug 26 17:00 20240816_185307_0000.LCCSPC
-rw-rw-r-- 1 anish anish 60M Aug 26 17:00 20240816_185307_0000.LACSPC
-rw-rw-r-- 1 anish anish 178M Aug 26 21:46 20240816_185307_0001.LCCSPC
-rw-rw-r-- 1 anish anish 60M Aug 26 21:46 20240816_185307_0001.LACSPC
-rw-rw-r-- 1 anish anish 178M Aug 26 22:18 20240816_185307_0002.LCCSPC
-rw-rw-r-- 1 anish anish 60M Aug 26 22:18 20240816_185307_0002.LACSPC
-rw-rw-r-- 1 anish anish 178M Aug 26 22:50 20240816_185307_0003.LCCSPC
-rw-rw-r-- 1 anish anish 60M Aug 26 22:50 20240816_185307_0003.LACSPC
-rw-rw-r-- 1 anish anish 178M Aug 26 23:22 20240816_185307_0004.LCCSPC
-rw-rw-r-- 1 anish anish 60M Aug 26 23:22 20240816_185307_0004.LACSPC
-rw-rw-r-- 1 anish anish 178M Aug 26 23:54 20240816_185307_0005.LCCSPC
-rw-rw-r-- 1 anish anish 60M Aug 26 23:54 20240816_185307_0005.LACSPC
-rw-rw-r-- 1 anish anish 178M Aug 27 00:26 20240816_185307_0006.LCCSPC
-rw-rw-r-- 1 anish anish 60M Aug 27 00:26 20240816_185307_0006.LACSPC
-rw-rw-r-- 1 anish anish 178M Aug 27 00:58 20240816_185307_0007.LCCSPC
-rw-rw-r-- 1 anish anish 60M Aug 27 00:58 20240816_185307_0007.LACSPC
-rw-rw-r-- 1 anish anish 178M Aug 27 01:30 20240816_185307_0008.LCCSPC
-rw-rw-r-- 1 anish anish 60M Aug 27 01:30 20240816_185307_0008.LACSPC
-rw-rw-r-- 1 anish anish 178M Aug 27 02:02 20240816_185307_0009.LCCSPC
-rw-rw-r-- 1 anish anish 60M Aug 27 02:02 20240816_185307_0009.LACSPC
-rw-rw-r-- 1 anish anish 178M Aug 27 02:34 20240816_185307_0010.LCCSPC
-rw-rw-r-- 1 anish anish 60M Aug 27 02:34 20240816_185307_0010.LACSPC
-rw-rw-r-- 1 anish anish 25M Aug 27 02:39 20240816_185307_0011.LCCSPC
-rw-rw-r-- 1 anish anish 8.2M Aug 27 02:39 20240816_185307_0011.LACSPC
```

Figs 2, 3, and 4 show example plots from the data visualization programs examineCC.py and graysCCandAuto.py.

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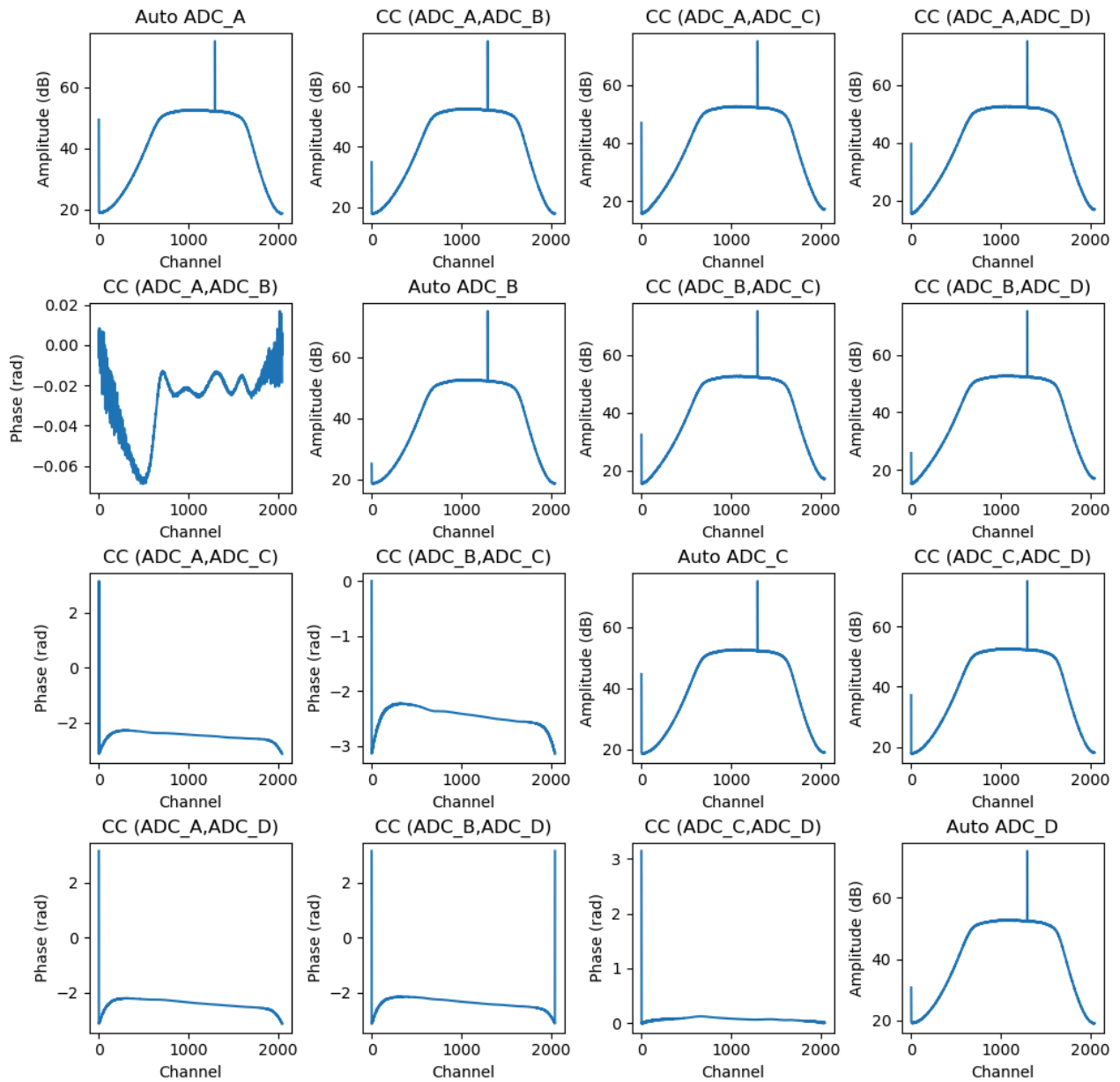


Figure 2 shows the self spectra (diagonal plots) and amplitudes of cross spectra (‘upper triangle’ plots). The ‘lower triangle’ plots are the corresponding phases of the cross spectra.

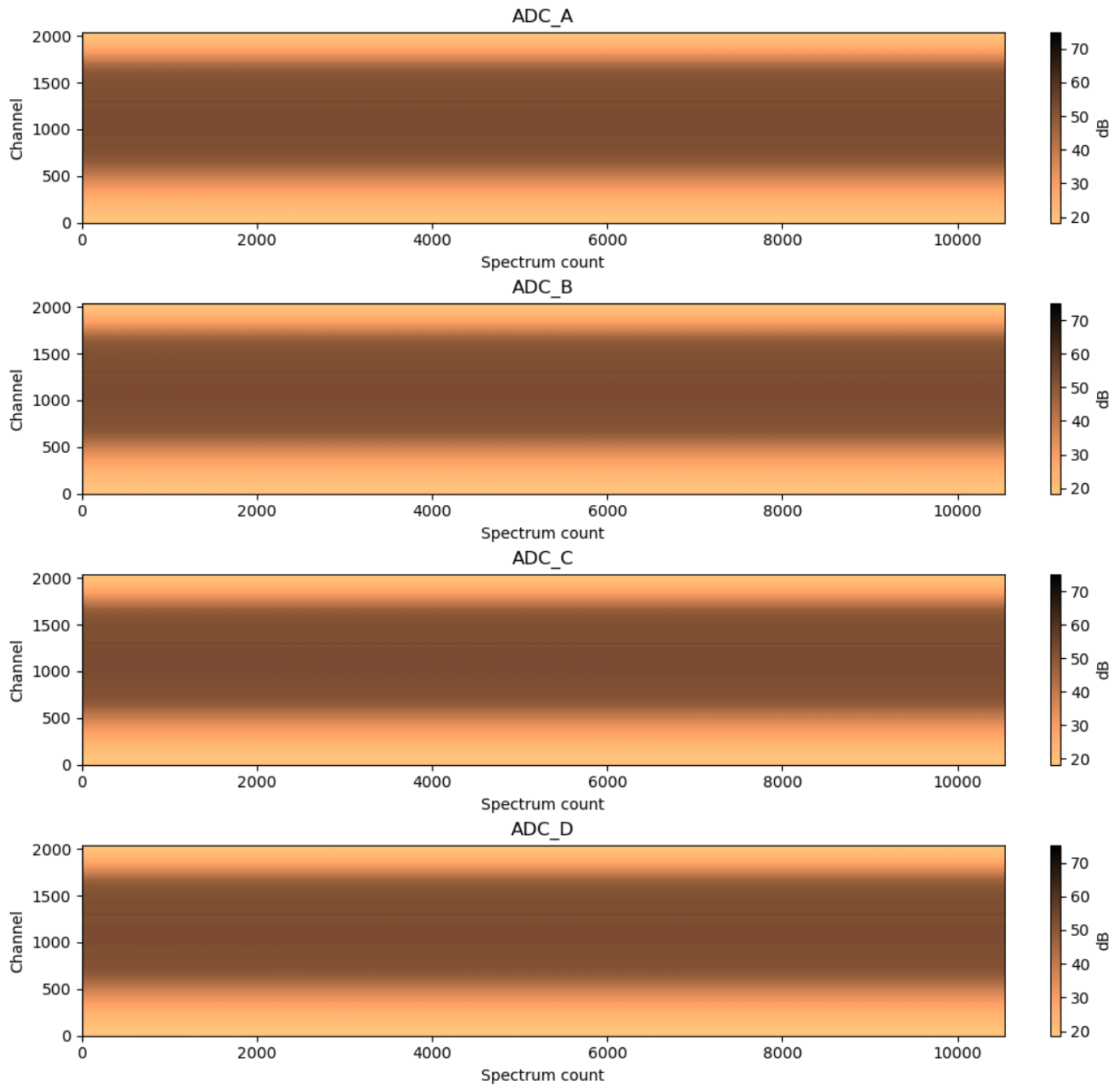


Figure 3 shows the self spectra from the four ADCs vs time obtained for the one-hour data.

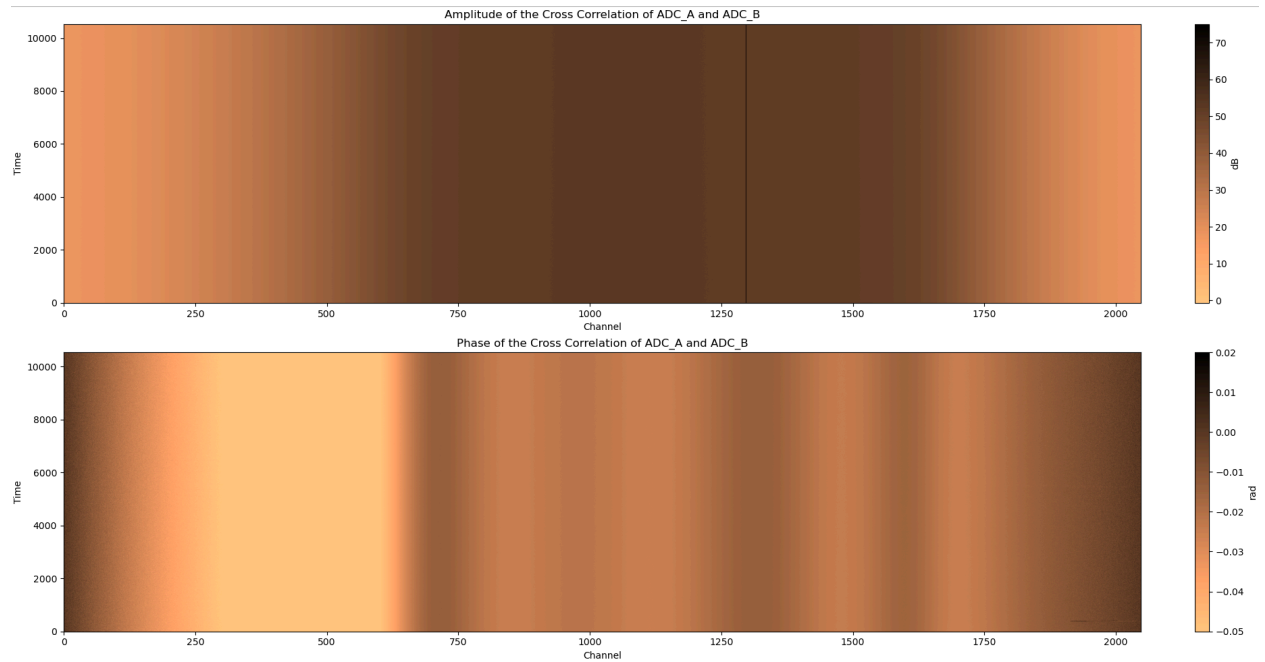


Figure 4 shows the amplitude (top) and phase (bottom) of the ADC_A-AC_B cross spectra obtained for the one-hour data.

References

- [1] D. Anish Roshi, E. Armas, C. Wescott, W. Dellinger, N. Patel, "A four-channel voltage recording system for Radio Frequency Interference mitigation research", CARSE report, October 2024, <https://carseuprm.org/resources/publication-rscs/>