



Result Report Week 4

USPR(2) : Active Sensing

Topic 1 : Active Sensing Experiment

Input Parameter Data Sets

10 Parameter data sets are made with different combinations of number of chirps and IQ rate. The other parameters are fixed.

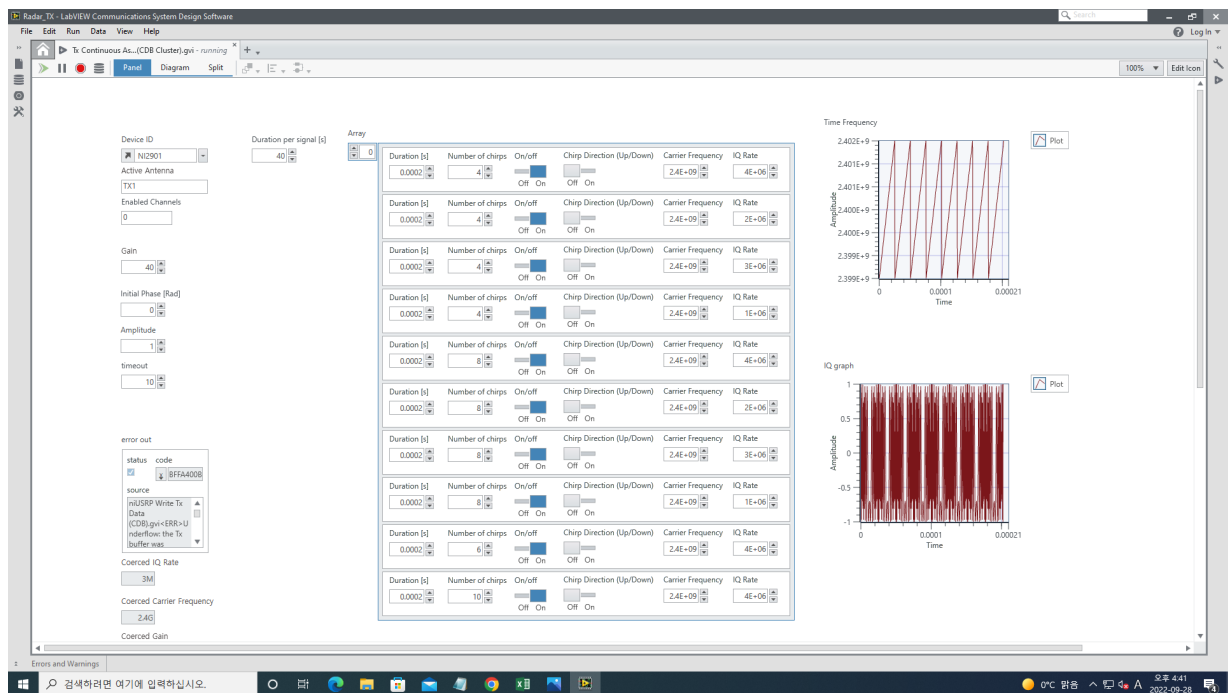


Figure 1: TX panel

Set	Duration	Number of Chirps	On	Chirp Direction	Carrier Frequency	IQ rate
1	200u	4	on	off	2.4G	4M
2	200u	4	on	off	2.4G	2M
3	200u	4	on	off	2.4G	3M
4	200u	4	on	off	2.4G	1M
5	200u	8	on	off	2.4G	4M
6	200u	8	on	off	2.4G	2M
7	200u	8	on	off	2.4G	3M
8	200u	8	on	off	2.4G	1M
9	200u	6	on	off	2.4G	4M
10	200u	10	on	off	2.4G	4M

Table 1: Parameter Sets

Experiment Result

Executing Radar signal generator and Spectrum sensor, we could check the signal reception in the RX panel as below figure which used the parameter set 7. We can see the signal centered on 2.4GHz(Carrier Frequency) and has the bandwidth(IQ rate) of 3MHz.

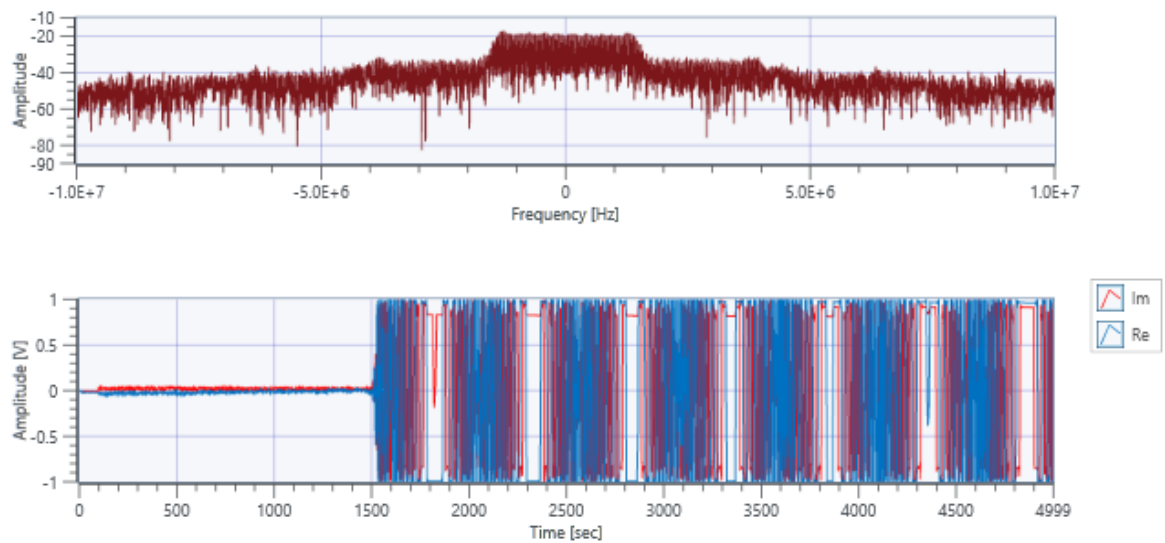


Figure 2: RX panel

The IQ data is recorded in RX computer. Each csv file has 250us signal data with two columns, Imaginary and Real.

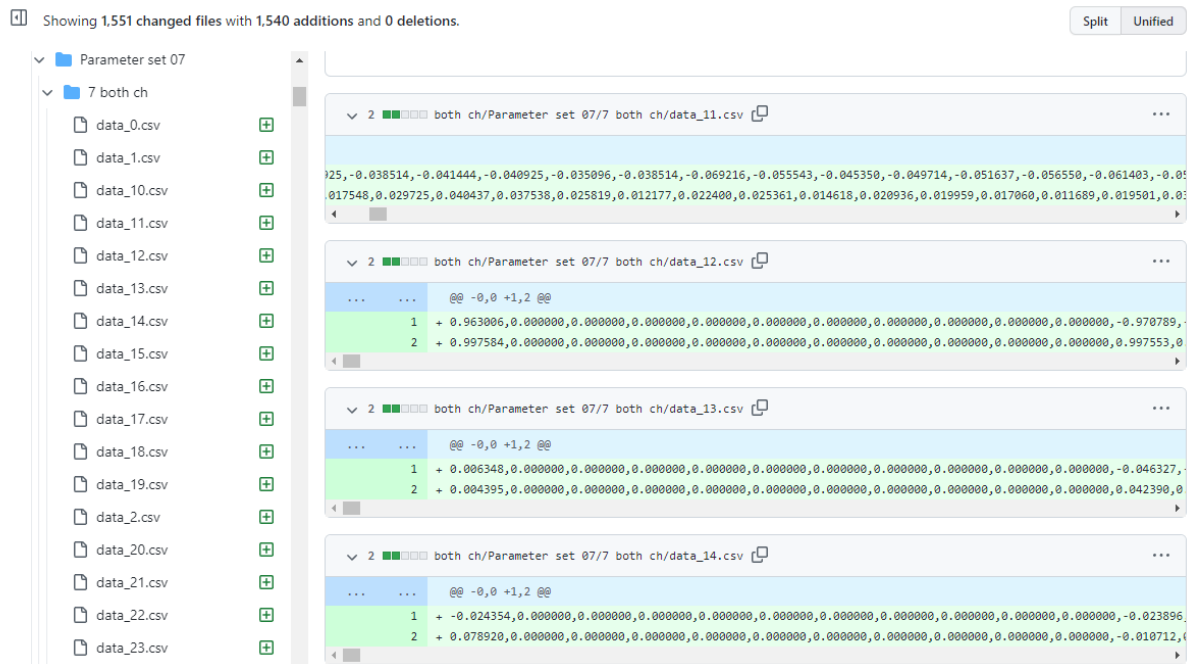


Figure 3: IQ data

Spectrograms

Using Python visualization code on IQ data of csv files, we generated spectrograms. The chirp signals appear in the middle of the spectrograms. As there was noise and interference, the chirp signals were received intermittently. The chirp signals seem more clear as the number of chirps decreases or IQ rate increases.

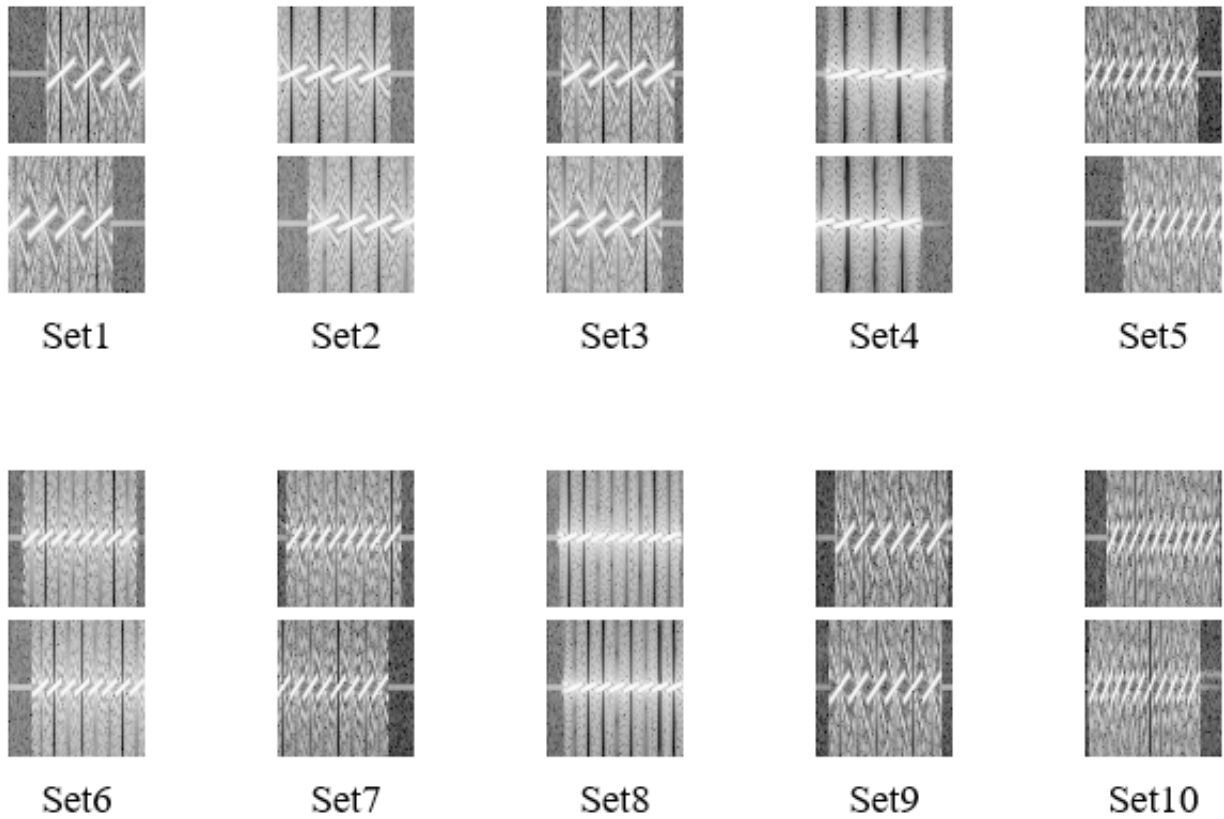


Figure 4: Spectrograms, 10 sets

Discussion

Parameter sets 1, 9, 5, 10 differ in the number of chirps and the other parameters are fixed. Each of them has 4, 6, 8, 19 chirps. As the number of chirps increases, there are more chirps in one spectrogram and the slope of the chirp increases.

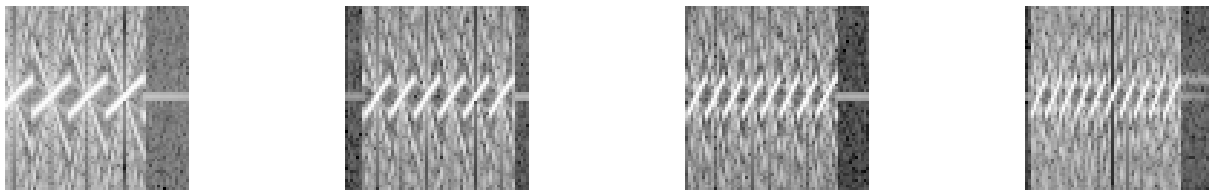


Figure 5: Set 1, 9, 5, 10 : Number of Chirps 4, 6, 8, 10

Parameter sets 4, 2, 3, 1 / 8, 6, 7, 5 differ in IQ rate and the other parameters are fixed. Each of them has IQ rate of 1M, 2M, 3M, 4M. As IQ rate increases, the bandwidth increases and the slope of the chirp increases.

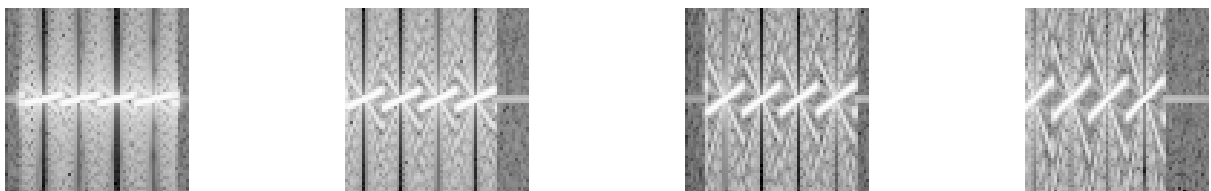


Figure 6: Set 4, 2, 3, 1 : IQ rate 1M, 2M, 3M, 4M

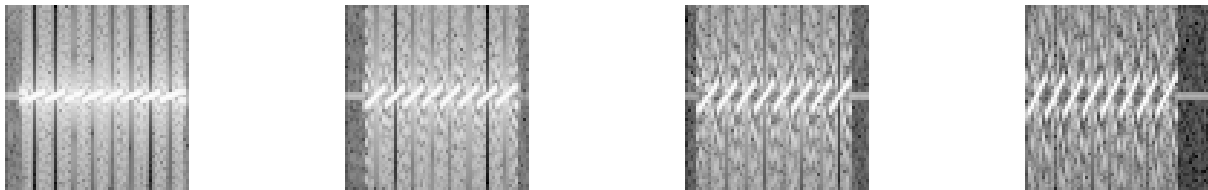


Figure 7: Set 8, 6, 7, 5 : IQ rate 1M, 2M, 3M, 4M