



# Result Report Week 4

## USPR(2) : Active Sensing

### Homework Notice

- The CSV files of IQ data sets and generated spectrogram images were uploaded to github website. You can check those guys through to the URL link below.
  - [Github link of generated CSV dataset of IQ datas and Spectrogram images in Week04 Experiments](#)
- You can also check the additional description of the submitted dataset folder uploaded to the github
  - [Description of submitted github folder of dataset](#)

## 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.

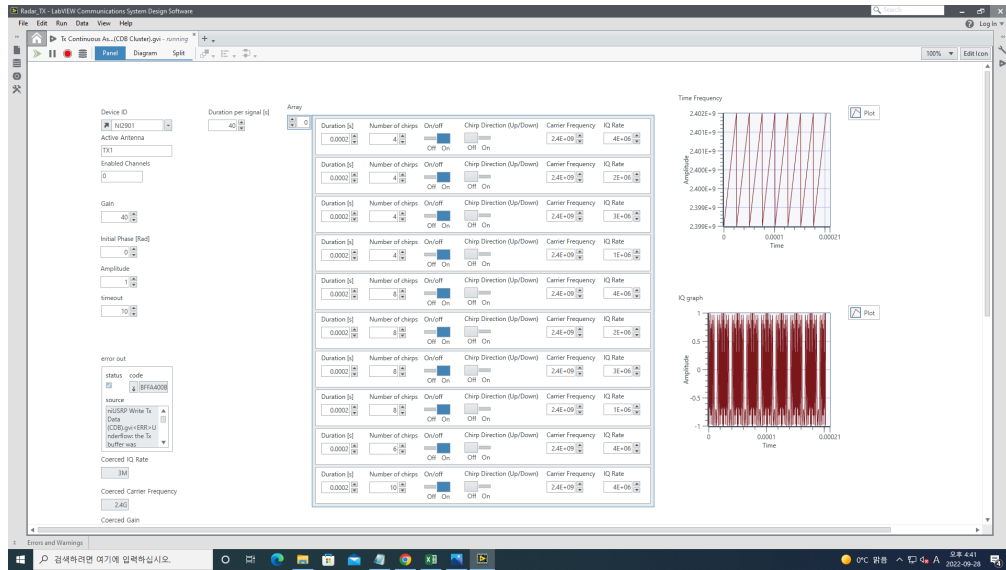


Figure 1: TX panel

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.

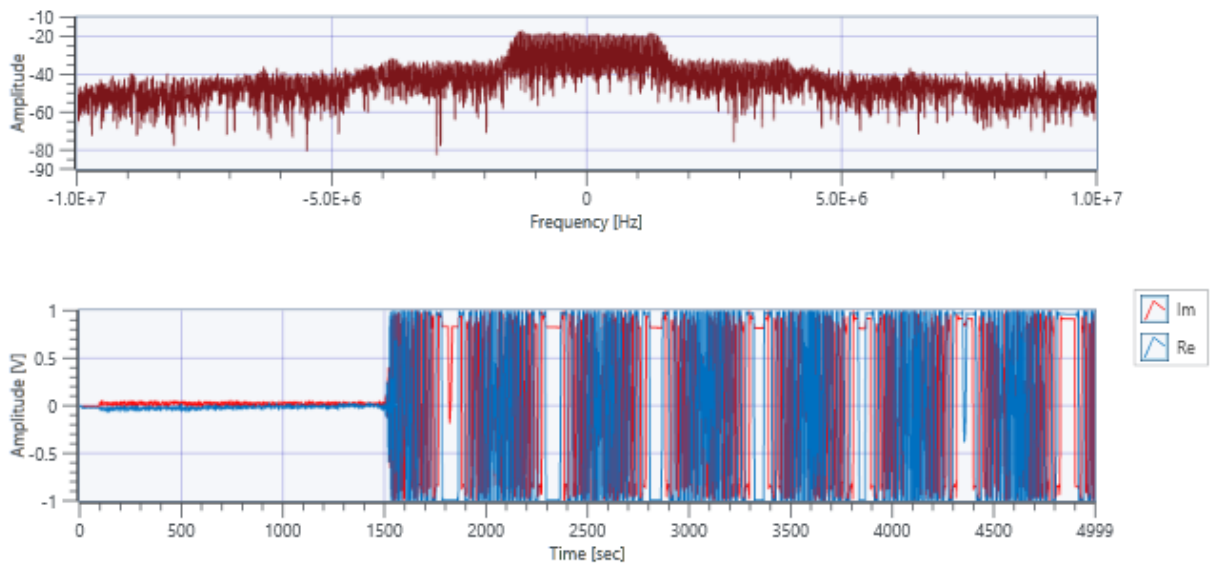


Figure 2: RX panel

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

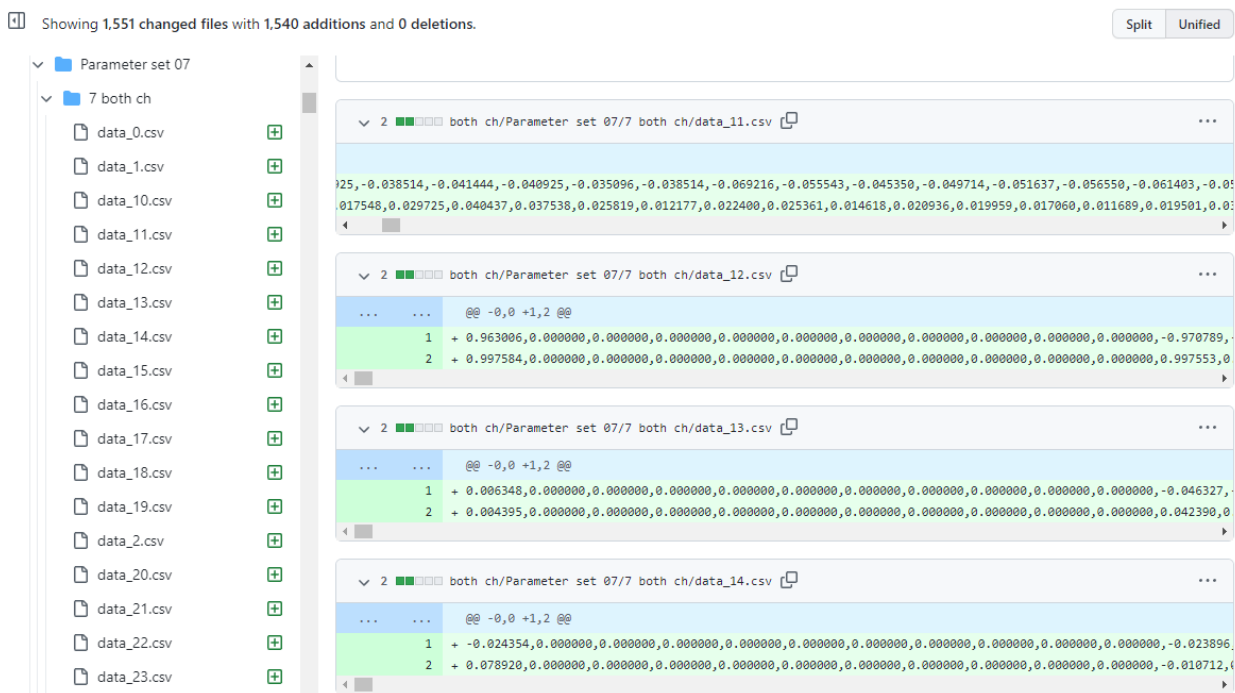


Figure 3: IQ data

## 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.

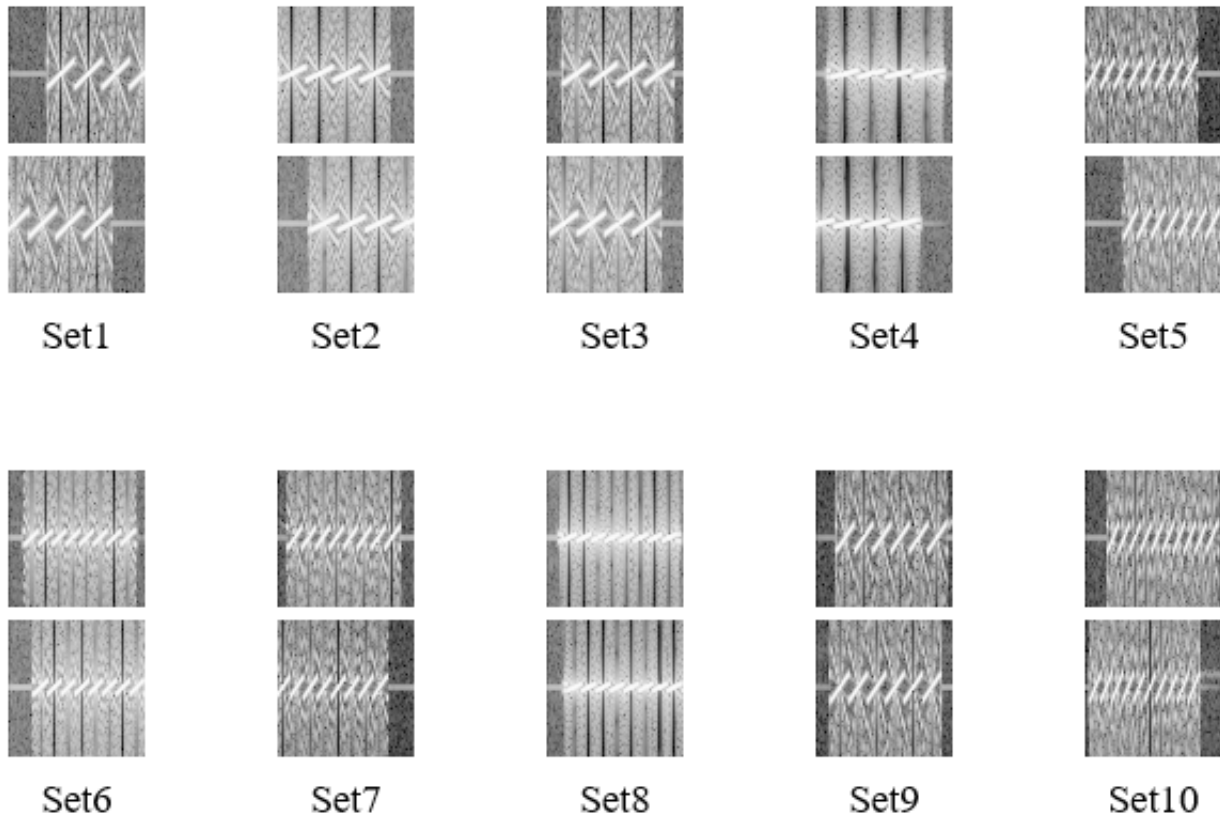


Figure 4: Spectrograms, 10 sets

## 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.

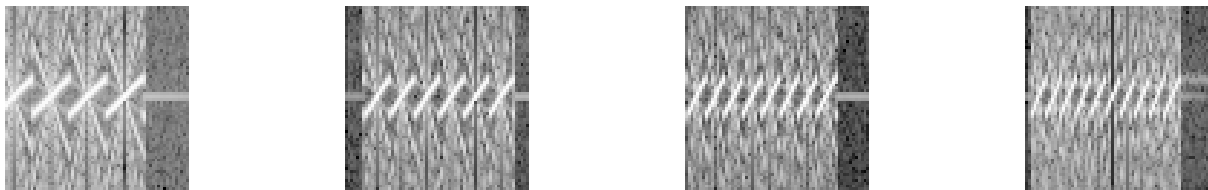


Figure 5: Set 1, 9, 5, 10 : Number of Chirps 4, 6, 8, 10

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.

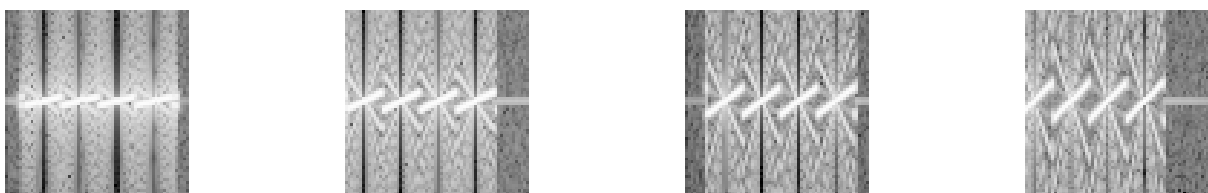


Figure 6: Set 4, 2, 3, 1 : IQ rate 1M, 2M, 3M, 4M

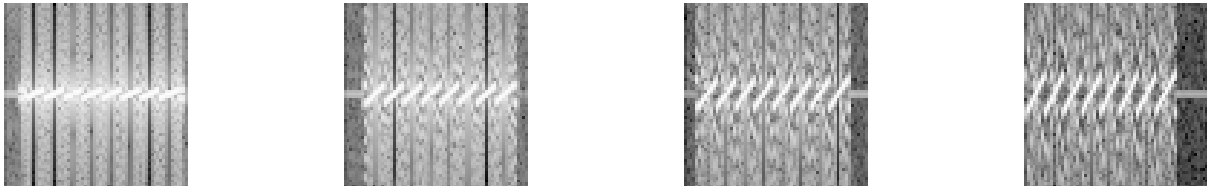


Figure 7: Set 8, 6, 7, 5 : IQ rate 1M, 2M, 3M, 4M