Technion Israel Institute of Technology

S_X_MPL Signal Acquisition Modeling and Processing Lab

NATIONAL INSTRUMENTS

ICASSP 2014 IEEE INTERNATIONAL CONFERENCE ON ACOUSTICS, SPEECH, AND SIGNAL PROCESSING

Sub-Nyquist Radar Sensing

Hardware and Supporting System

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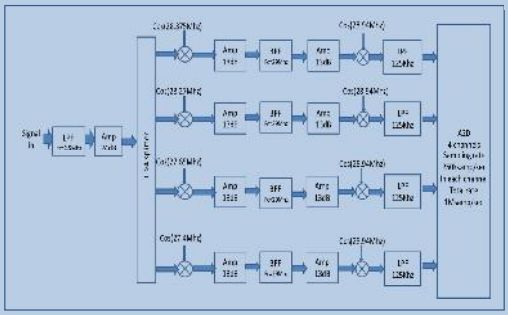
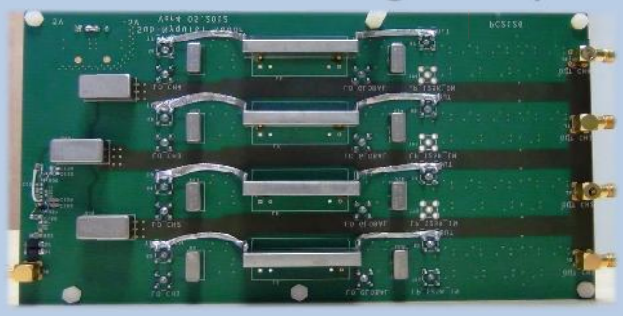
Pulse Analog Xampler

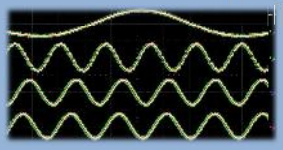




- Input signal BW< 150MHz
- Crystal filter BW 70KHz
- Modular and flexible design
- Dynamic range 65dB

Supporting Hardware – NI System

3 NI Flex Rio 7965R FPGA and NI 5781 Baseband transceiver create 5 local oscillators waveforms with constant starting phase



NI 6672 timing and synchronization module distribute clock and trigger signals

NI 6123 4 channels simultaneous A/D @ 250Ksamp/sec per channel

System Challenges:

- Start all devices at the same time with skew less then 1nsec
- Good synchronization- Low clock jitter and small clock drifts between devices
- Connectivity- AWR RF simulation environment to LabView

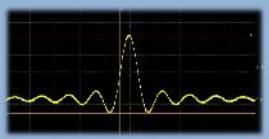
NI 4130 Power supply to Pulse Xampler

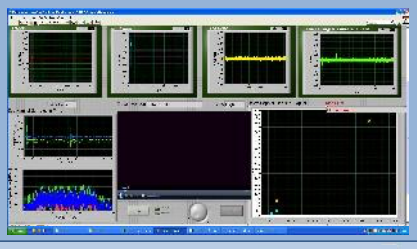
NI 8133 I7 controller
Run AWR , LabView and MATLAB script

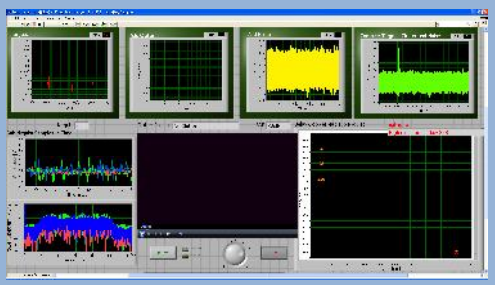
NI 5451 Arbitrary Waveform Generator

NI 5690 RF amplifier

LabView based GUI Software

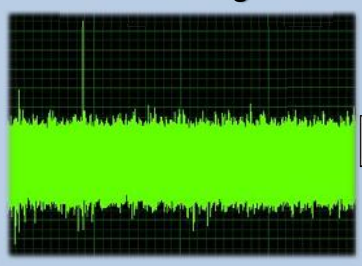






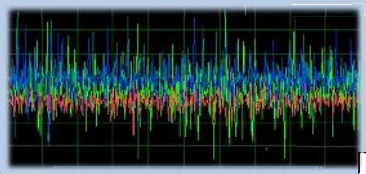
Measurements Results

RF signal – 10 MHZ width
Average SNR=0dB include 2 clutter targets

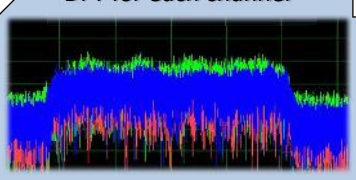


Xampling

4 channels sampled at 250 kHz each



DFT for each channel



Estimation Algorithm

Delay-Doppler Map