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

NI 4130 Power supply to Pulse Xampler

LabView based GUI Software

NI 8133 I7 controller Run AWR, LabView and MATLAB script

NI 5451 Arbitrary Waveform Generator

NI 5690 RF amplifier

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

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

4 channels sampled at 250 kHz each

DFT for each channel

Xampling

Estimation Algorithm

Targets, detected

Delay-Doppler Map

Clutter filtered

Measurement Results

Delay-Doppler Map