

# Cognitive Sub-Nyquist Collocated MIMO Radar Prototype

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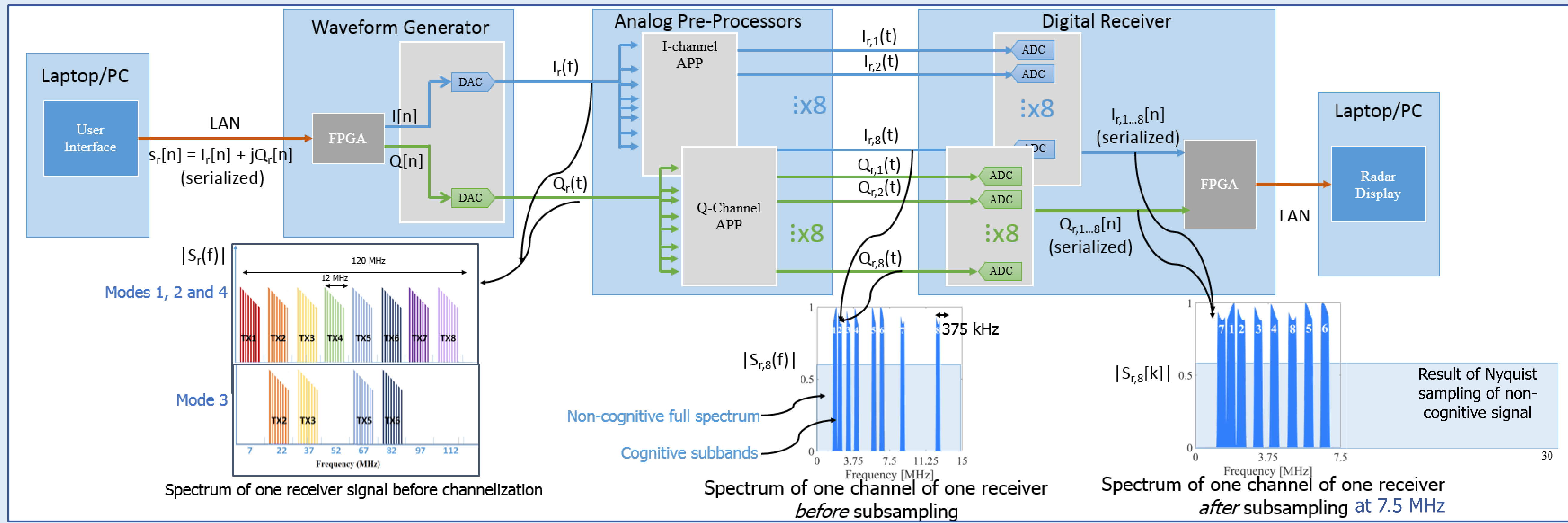
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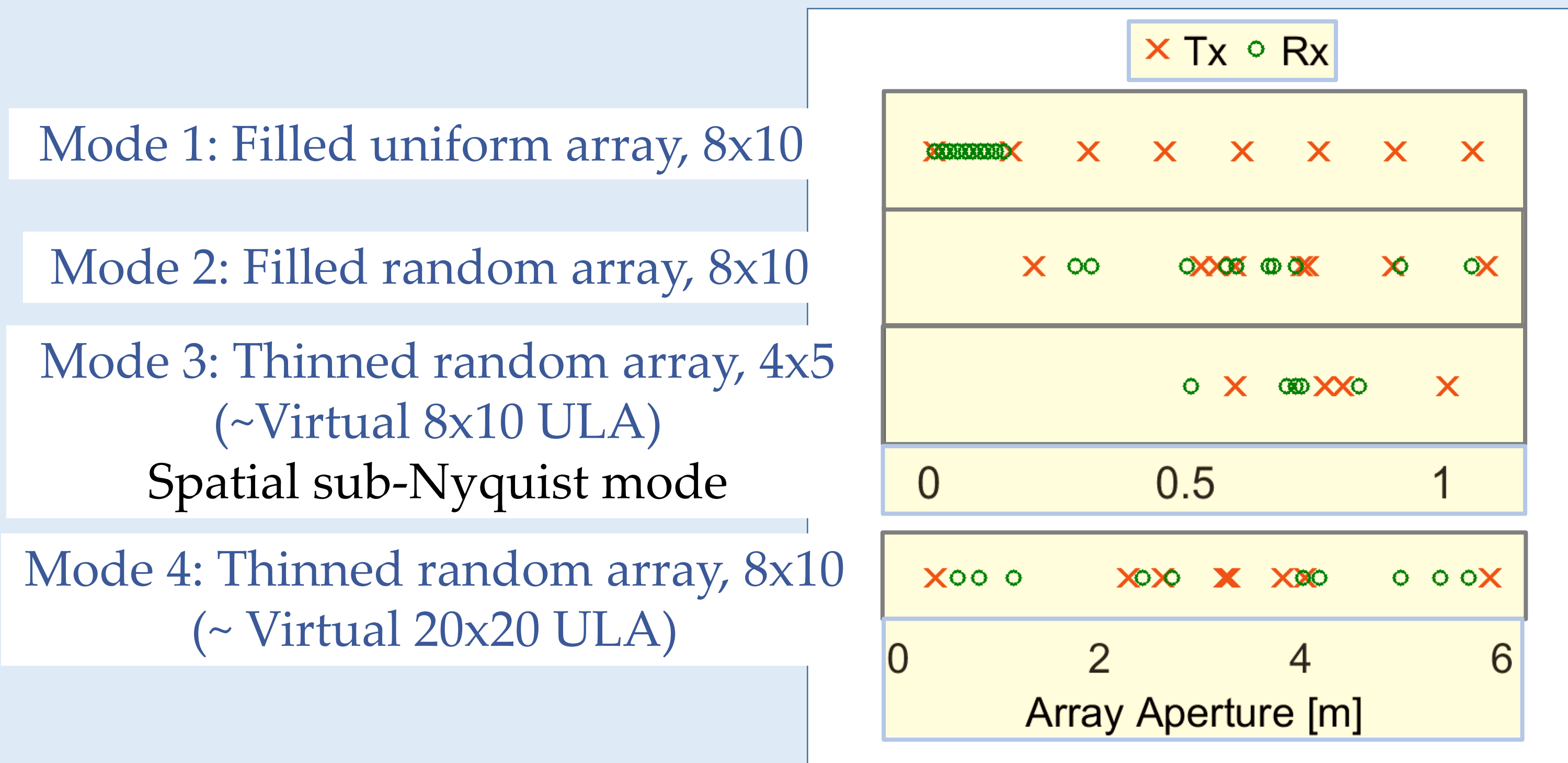
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## Overview of Hardware Architecture

- Prototype shows spatial sub-Nyquist sampling of 8x10 ULA with a 4x5 thinned array
- Spectral sub-Nyquist sampling is demonstrated via cognitive transmission

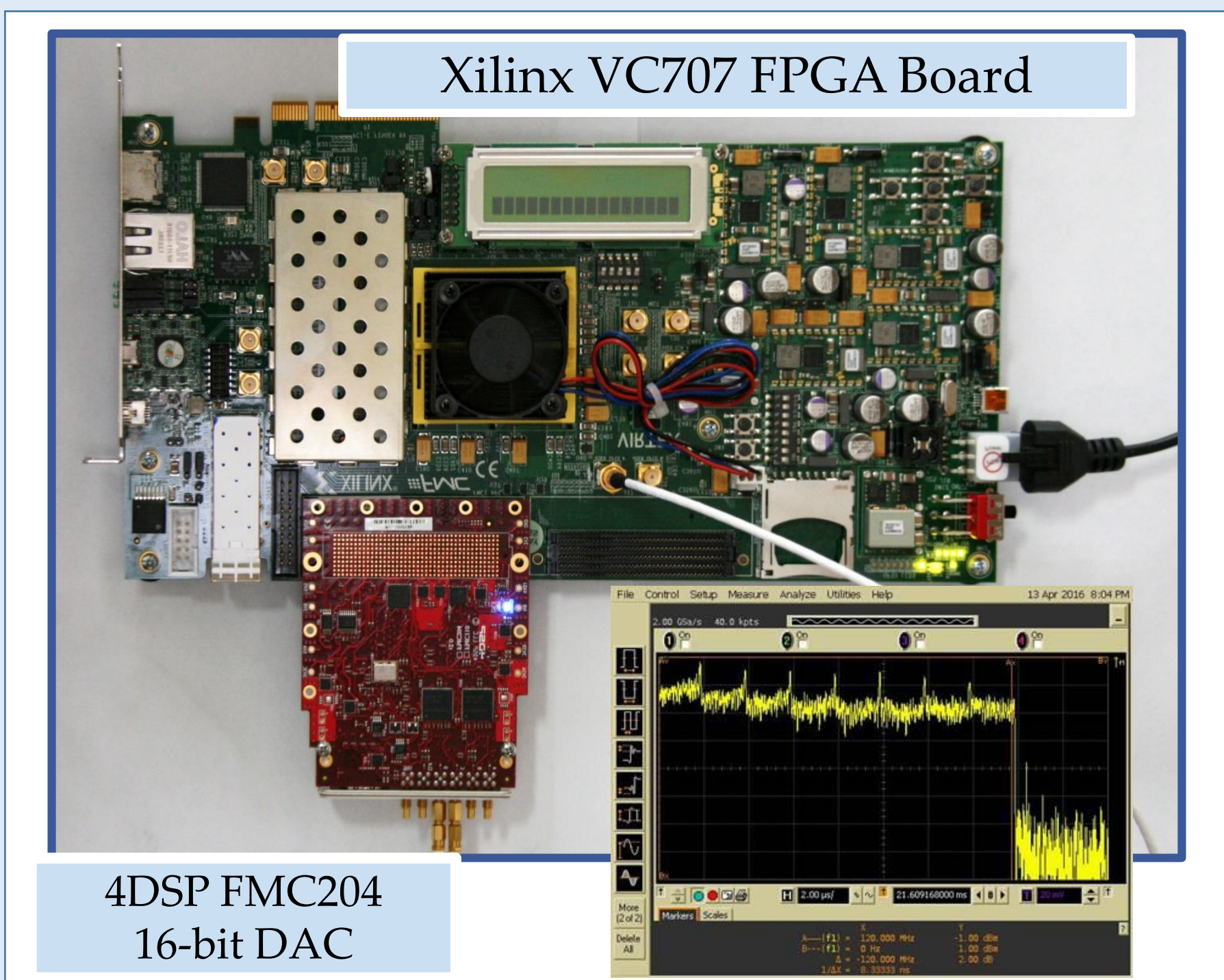


## Array Modes



## Waveform Generator

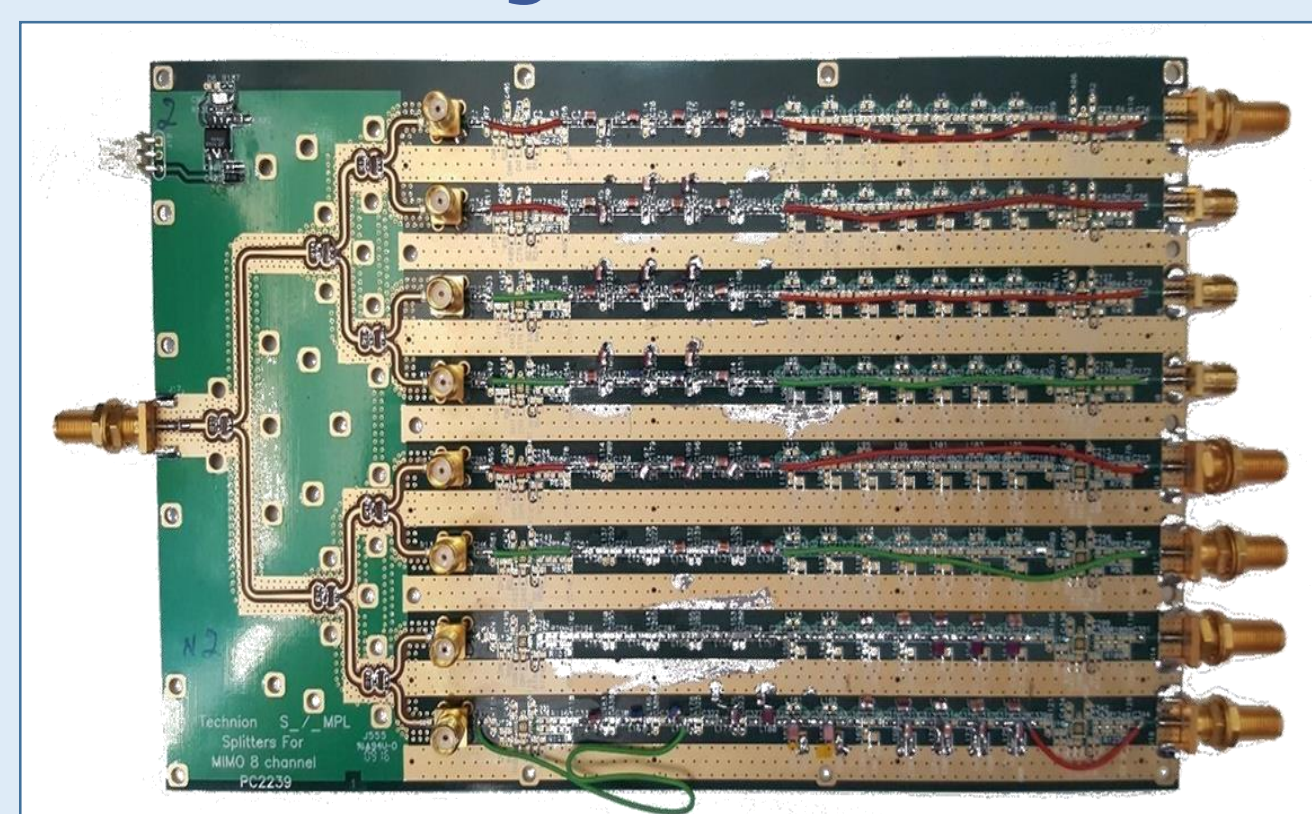
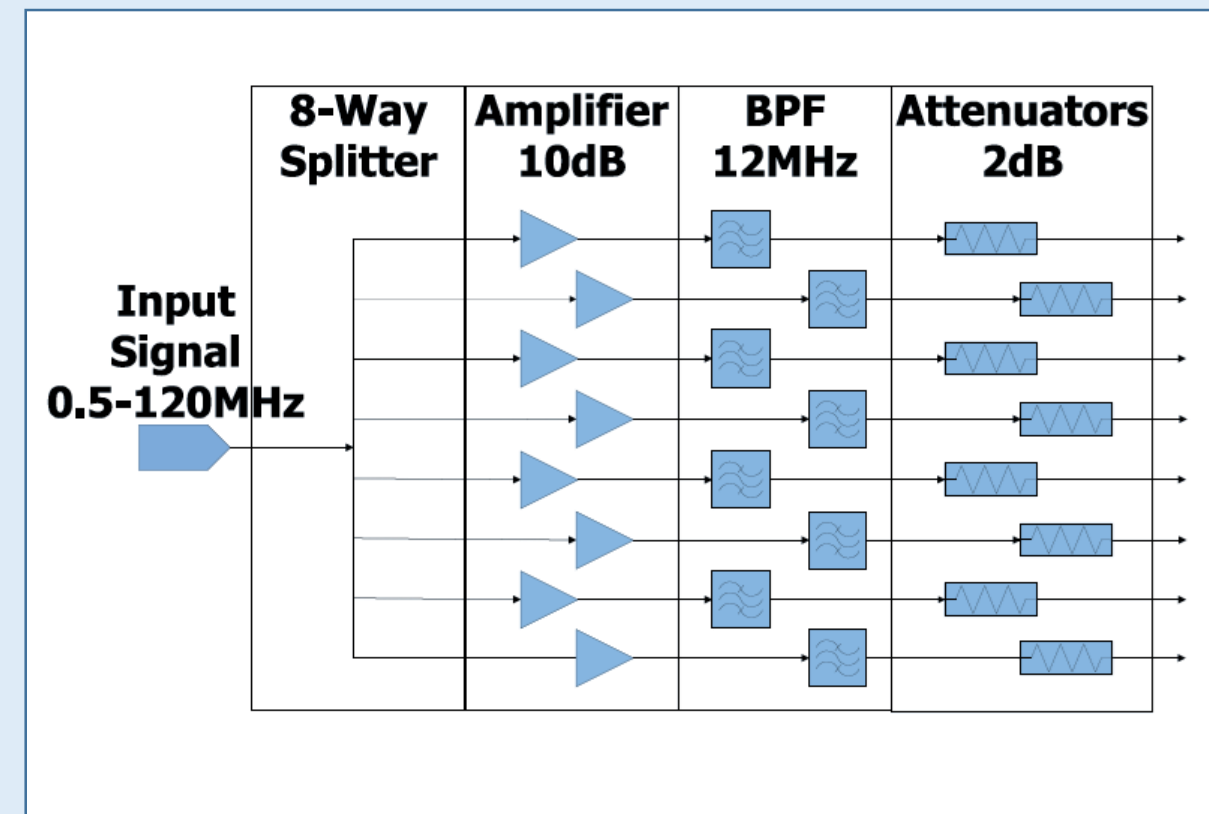
- Total BW, 8 Tx: 120 MHz  
3 MHz Guardband
- Cognitive BW, 1 Tx: 3 MHz (= 8 x 375 kHz)
- Cognitive BW, 4 Tx: 12 MHz (= 4x8x375 kHz)
- Reduction Factor: 10% (12 of 120 MHz)



## Analog Pre-Processor (APP)

APP filters the receiver data into eight channels

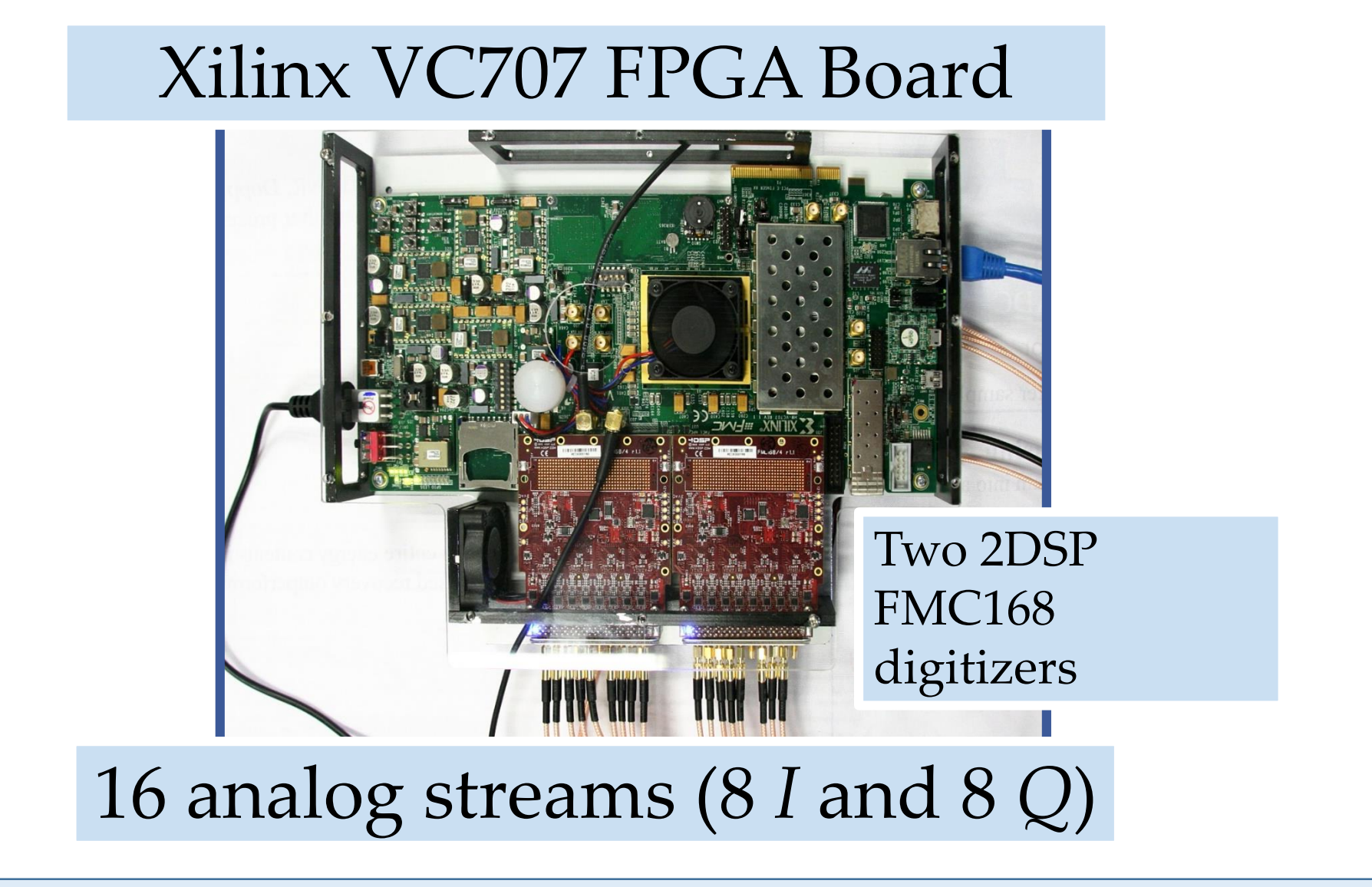
Dual back-to-back APPs in a single chassis



BPFs have ~30 dB stopband attenuation to mitigate subsampling noise

## Digital Receiver

- Two 16-bit eight-channel digitizers for I and Q streams
- Sub-Nyquist sampling rate: 7.5 MHz/channel
- Signal BW with guardbands: 30 MHz/channel



## User Interface and Radar Display

Array Configuration  
Received Signal Before Sub-sampling  
Transmitted Signal  
Signal Information  
PPI Radar Display  
User Input Interface

## Measurement Results

