



# Pseudo True Time Delay for Wideband Phased Array (20140016, Dr. Ramesh Harjani)

Technology No. 20140016

**IP Status:** Issued US Patent; **Application #:** 14/219,202

## Multi Beam Spatiospectral Scheme for Wideband Phased Array

A low power, wide bandwidth phased array for wideband signal steering applications minimizes squinting and eliminates wideband signal blockers. The technology makes use of Charge Reuse Analog Fourier Transform (CRAFT) and features a switched capacitor based radio frequency (RF) front-end that delivers wider bandwidth, higher speed, a smaller footprint, scalability and an improved dynamic range. This technology shows promise in military S- and X-Band tactical radar and UAV radar applications, as well as other applications for wideband signal processing for phased arrays.

## Wideband True Time Delay

In radar applications, true-time delay (TDD) is critical for wideband systems since there is an invariance of time delay with phase and frequency. Current wideband radar systems using TDD schemes face challenges such as high performance analog to digital converter requirements and use of RF delay lines. In addition, digital beam formers for radar use are burdened by high power consumption and large footprints. In this technology, an analog Fast Fourier Transform is used as a channelizer combined with phased arrays to eliminate TDD RF delay line requirements as well as the large area and power requirements of digital channelization. Specifically, the CRAFT circuit design applied to beam forming provides a smaller footprint and significantly reduced power requirements.

### **BENEFITS AND FEATURES OF PSEUDO TRUE TIME DELAY FOR WIDEBAND PHASED ARRAY:**

- Lower power consumption, scalable, reduced footprint
- Squint reduction in radar applications.
- High dynamic range; cancels wideband jammers
- Potential applications in wideband signal processing for phased arrays, military tactical radar, millimeter wave spectrum for small antennae development and drone applications
- Rapid ultra-wide spectrum sampling in analog
- Efficiently uses available spectrum where wideband signal blockers are employed

**Other Technologies based on CRAFT:**  
[Radio Frequency Front End Channelizer](#)

**Phase of Development** Prototype developed

**Researchers**

Ramesh Harjani, PhD

*Professor, Department of Electrical and Computer Engineering*

[External Link](#) (ece.umn.edu)

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