# Hardware Implementation of Channel Estimation for OFDM Receiver with ESPAR Antenna

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pilot

## **ESPAR-OFDM** System



#### **Electronically steerable passive array radiator** (ESPAR) antenna, is an adaptive beamforming multi-antenna system.

- Low Power (Only one RF Front–End)
- Low Cost (Using inexpensive varactor circuit)
- Almost the same performance with MIMO

**Channel Estimation for ESPAR OFDM** 

**FFT Window** 

 $\mathbf{H}_{ea}$ 

The transmission in the ESPAR-OFDM cannot be modeled as a diagonal matrix anymore, in FFT Windo result, the channel estimation cannot utilize the conventional interpolation method.





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## **CS** complexity Reduction

#### **Multi-column CS**

All the impulse response positions are the same for each antenna element. Thus, a new sensing matrix with smaller size can be proposed.



 $\Psi_N = \mathbf{G}_p^c \mathbf{F}_L diag(\mathbf{P}) + \mathbf{F}_L diag(\mathbf{P}) + \mathbf{G}_n^c \mathbf{F}_L diag(\mathbf{P})$ 

### **Pilot Selection**



Pilot selection technique at the receiver side to reduce the sensing matrix size even more. A selection with genetic algorithm is proposed to maintain a good mutual coherence property.

## **Power Reduction of Sensing Matrix**

Because the sensing matrix is based on the Discrete Fourier Transform matrix, a power reduction method can be applied to reduce the





