

Beam Selection

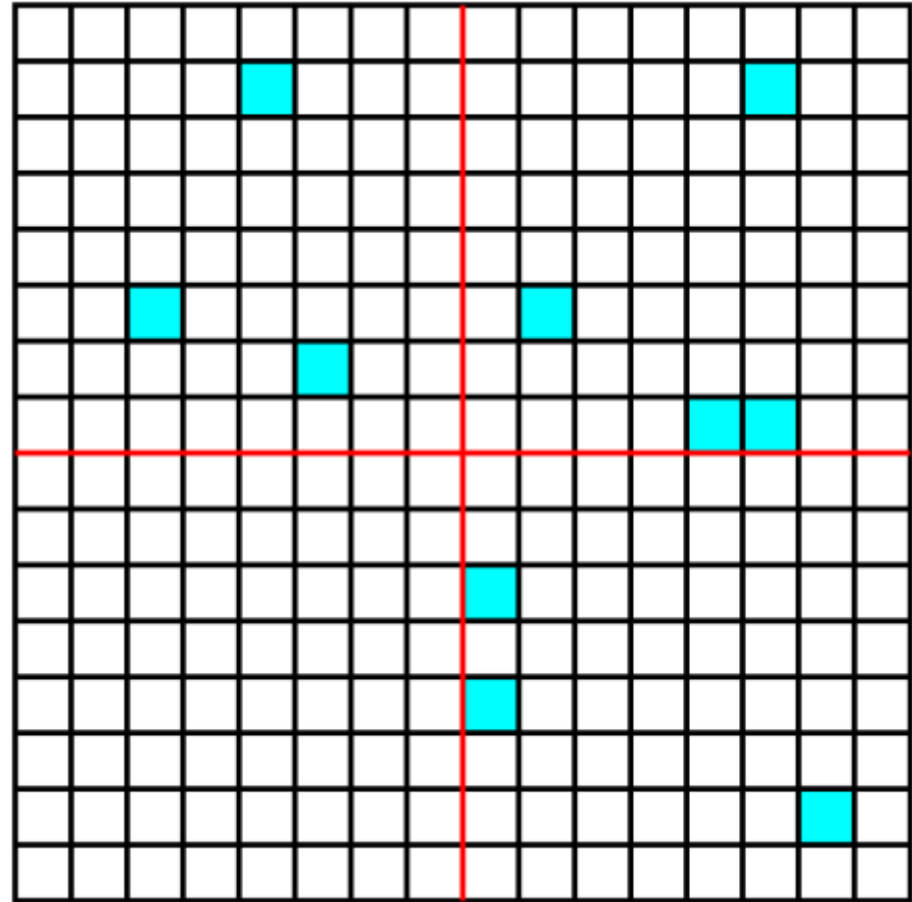
Paul Thomas

Outline

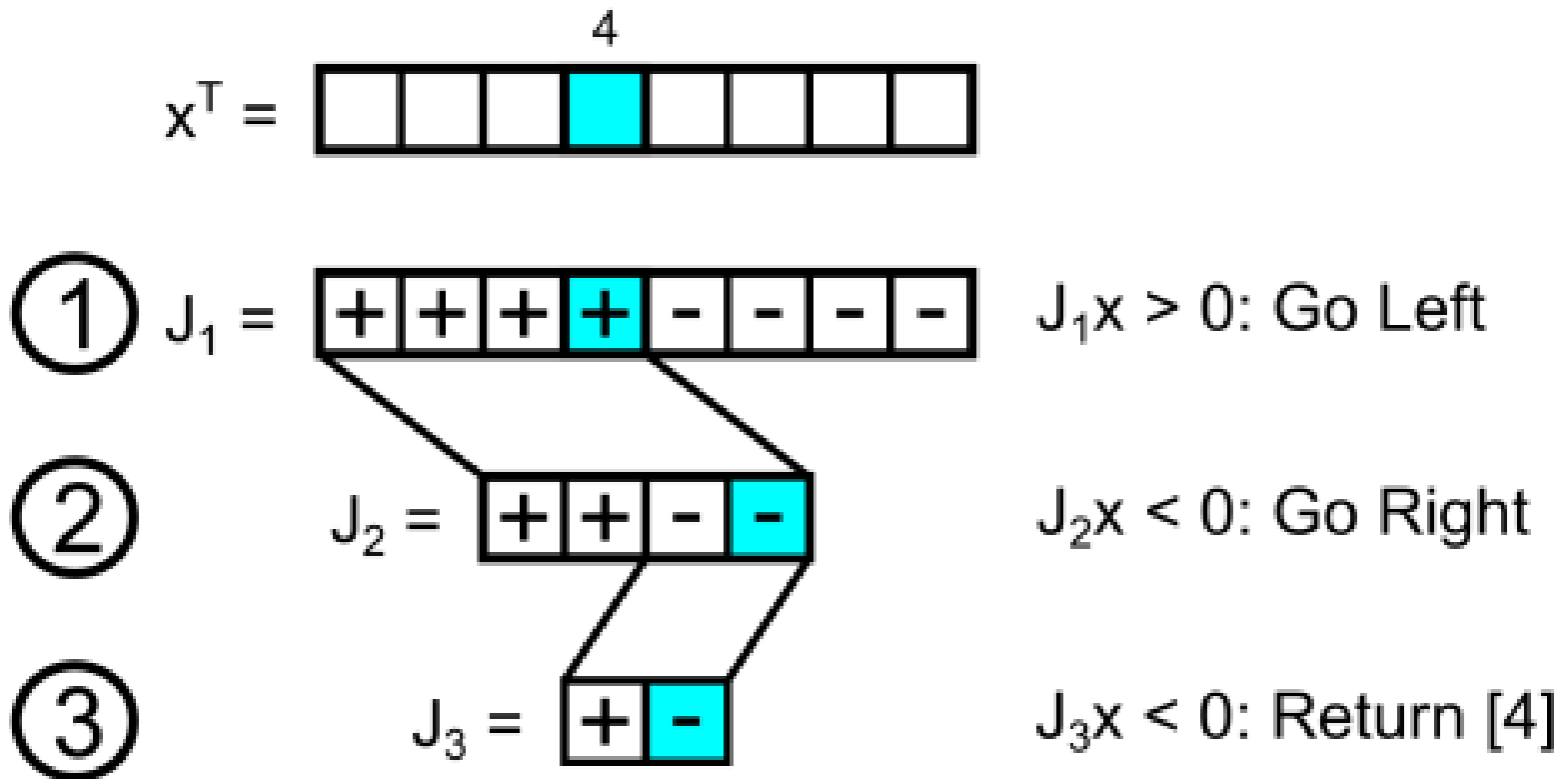
- The Beam Selection Problem
- Beam Selection Algorithms
 - Compressive Binary Search (CBS)
 - Compressive Threshold Search (CTS)
 - Compressive Quad Search (CQS)
- CQS Matlab Simulations
- Next Steps

The Beam Selection Problem

- Example: 16-by-16 array with 10 “users”
- How do we find the users (blue squares) efficiently?
- Compressive Sensing
- Sectorization

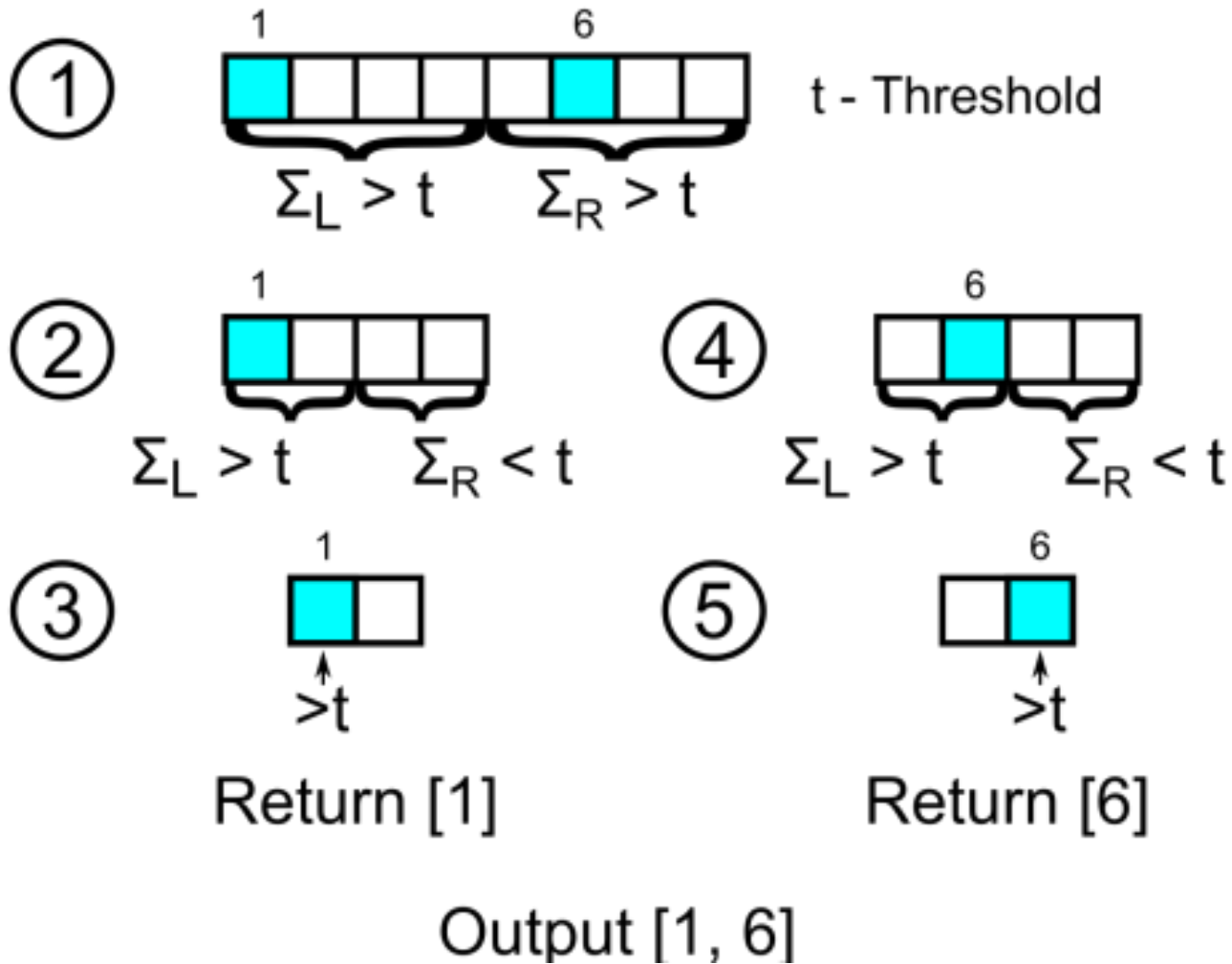


Compressive Binary Search (CBS)

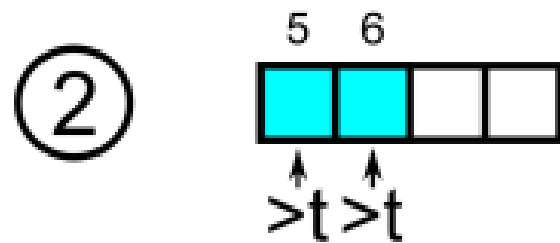
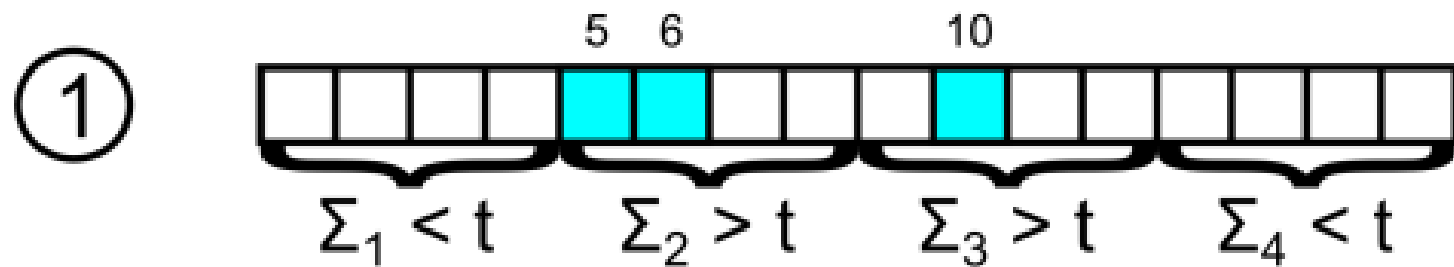


Problem: CBS can only find one, non-zero entry

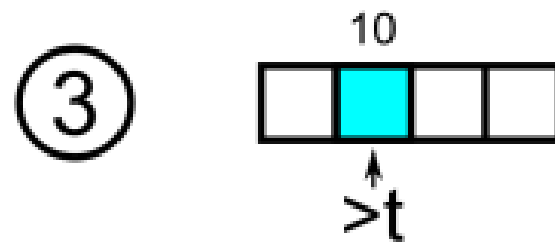
Compressive Threshold Search (CTS)



Compressive Quad Search (CQS)



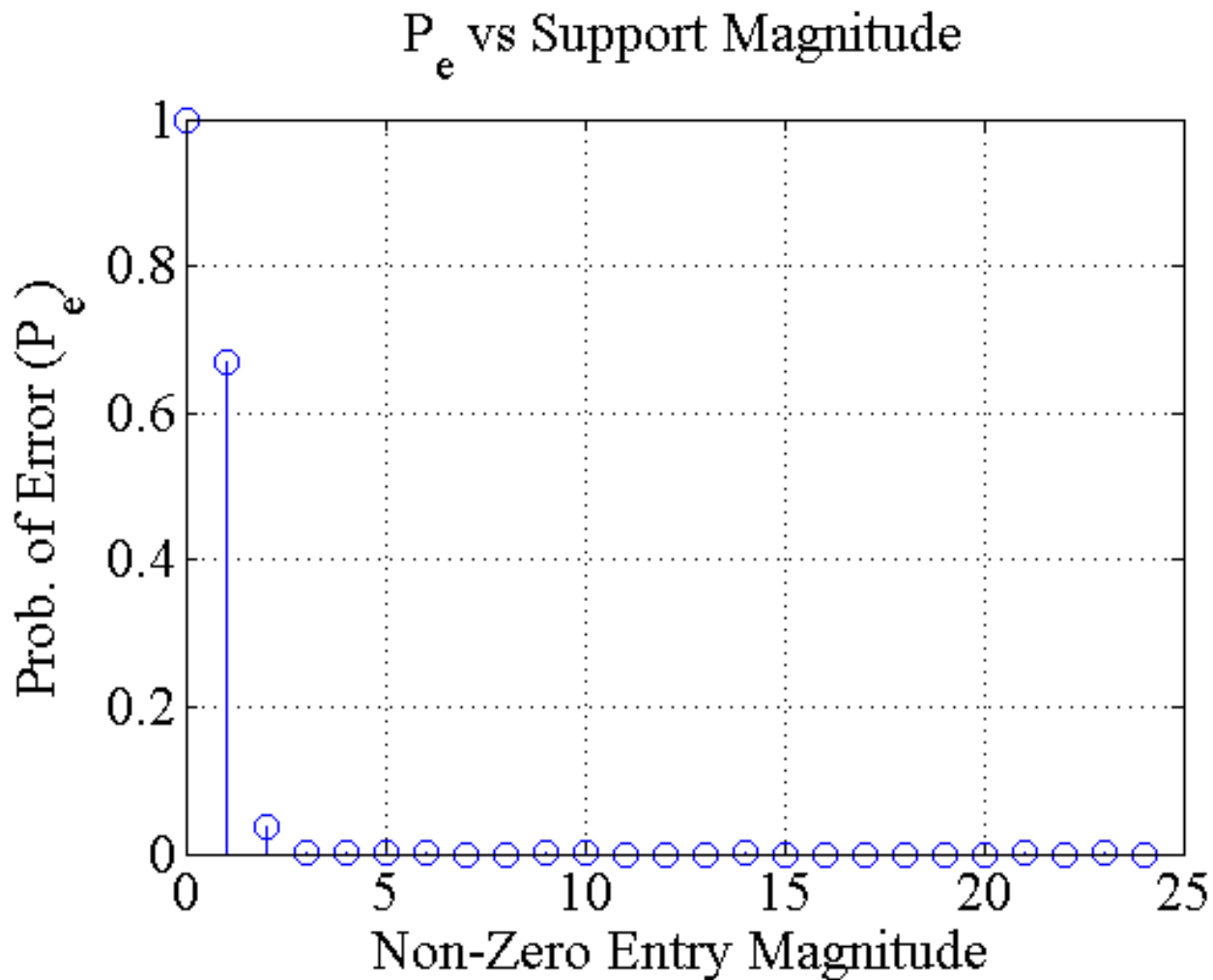
Return [5, 6]



Return [10]

Output [5, 6, 10]

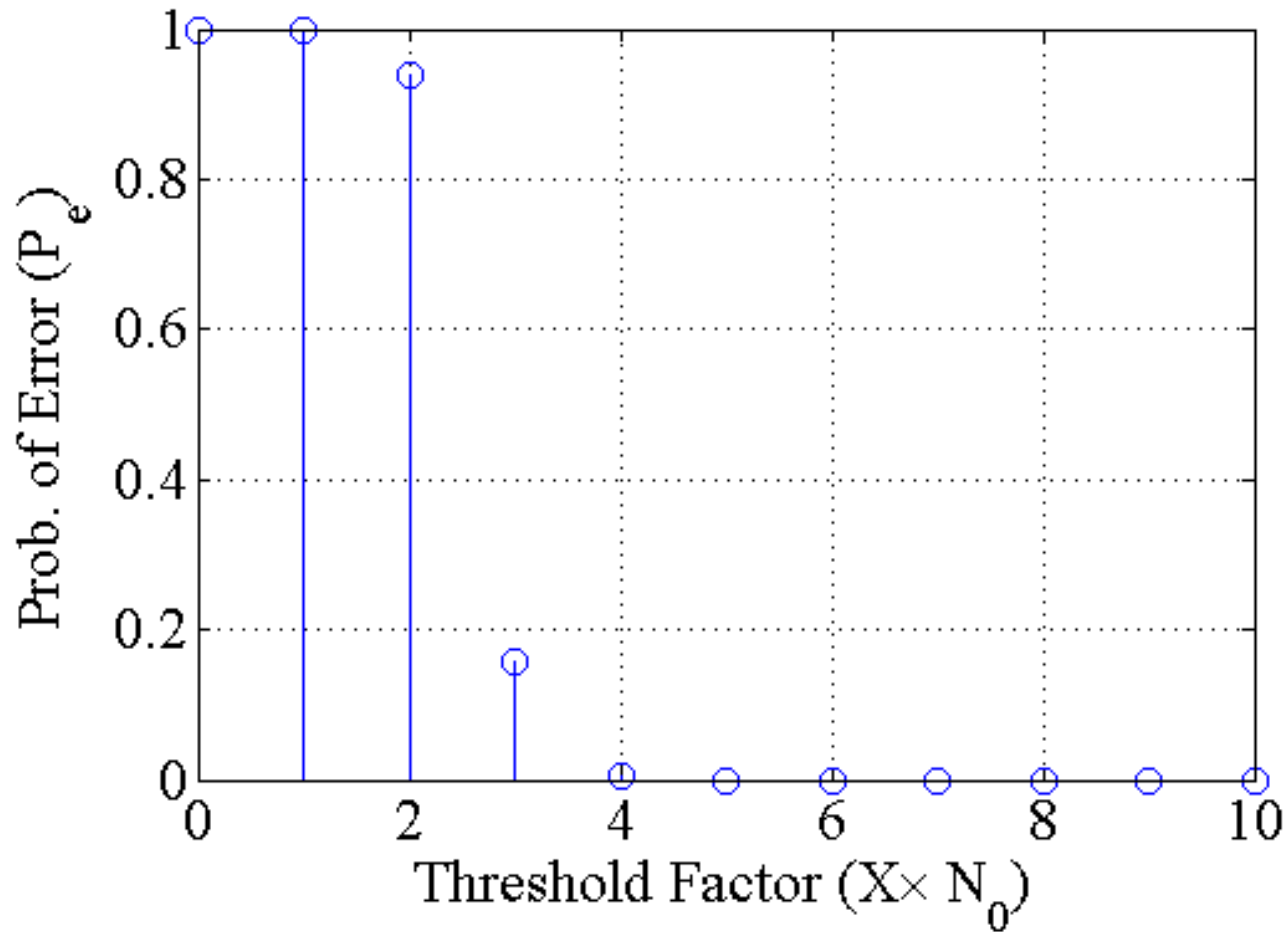
CQS Support Magnitude



- SNR = 30 dB
- 10,000 trials per magnitude
- $n = 256$
- Nominal value from CBS: 11.5

CQS Threshold

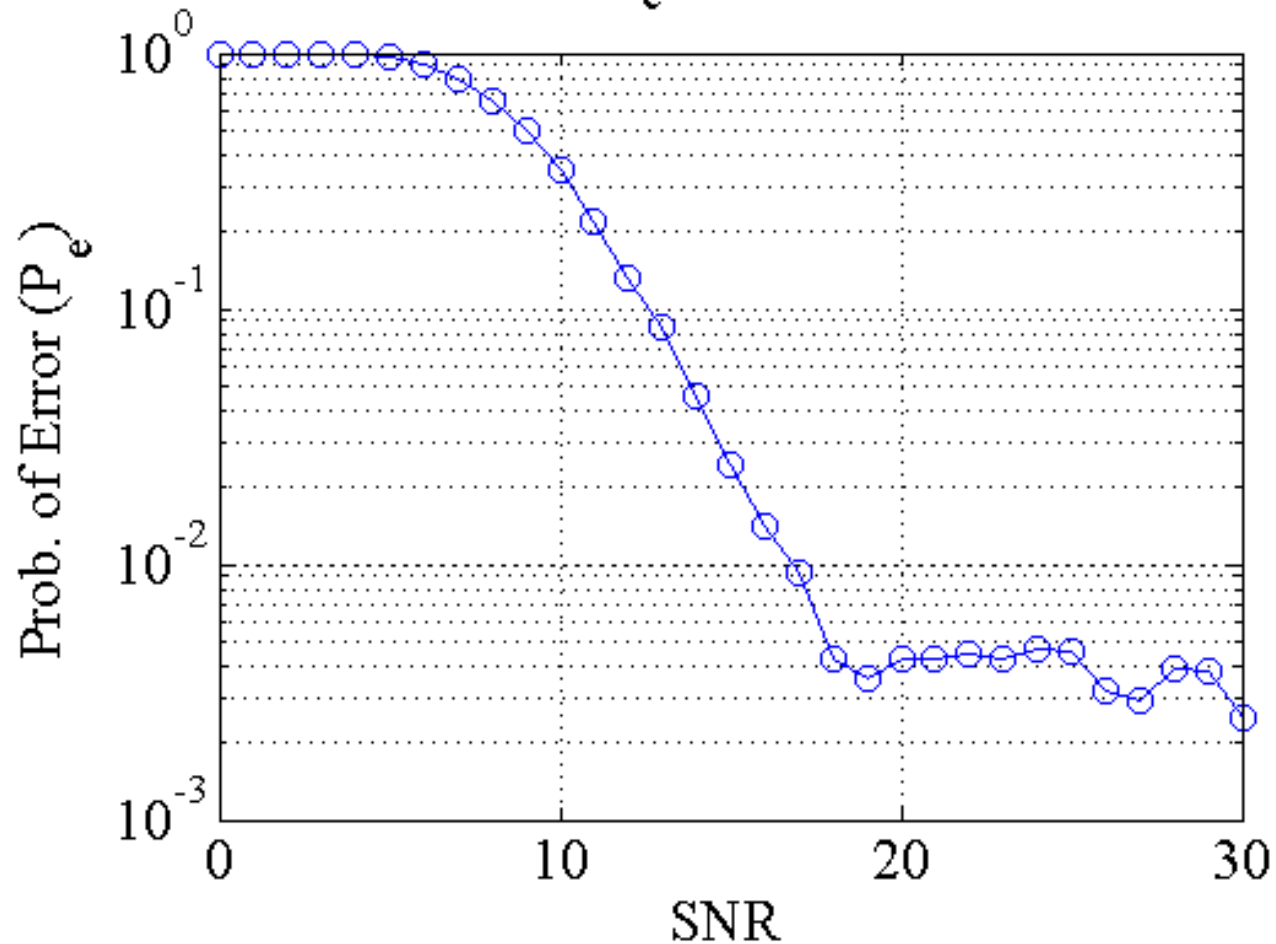
P_e vs Threshold



- SNR = 30 dB
- Support Size = 10
- 10,000 trials per magnitude

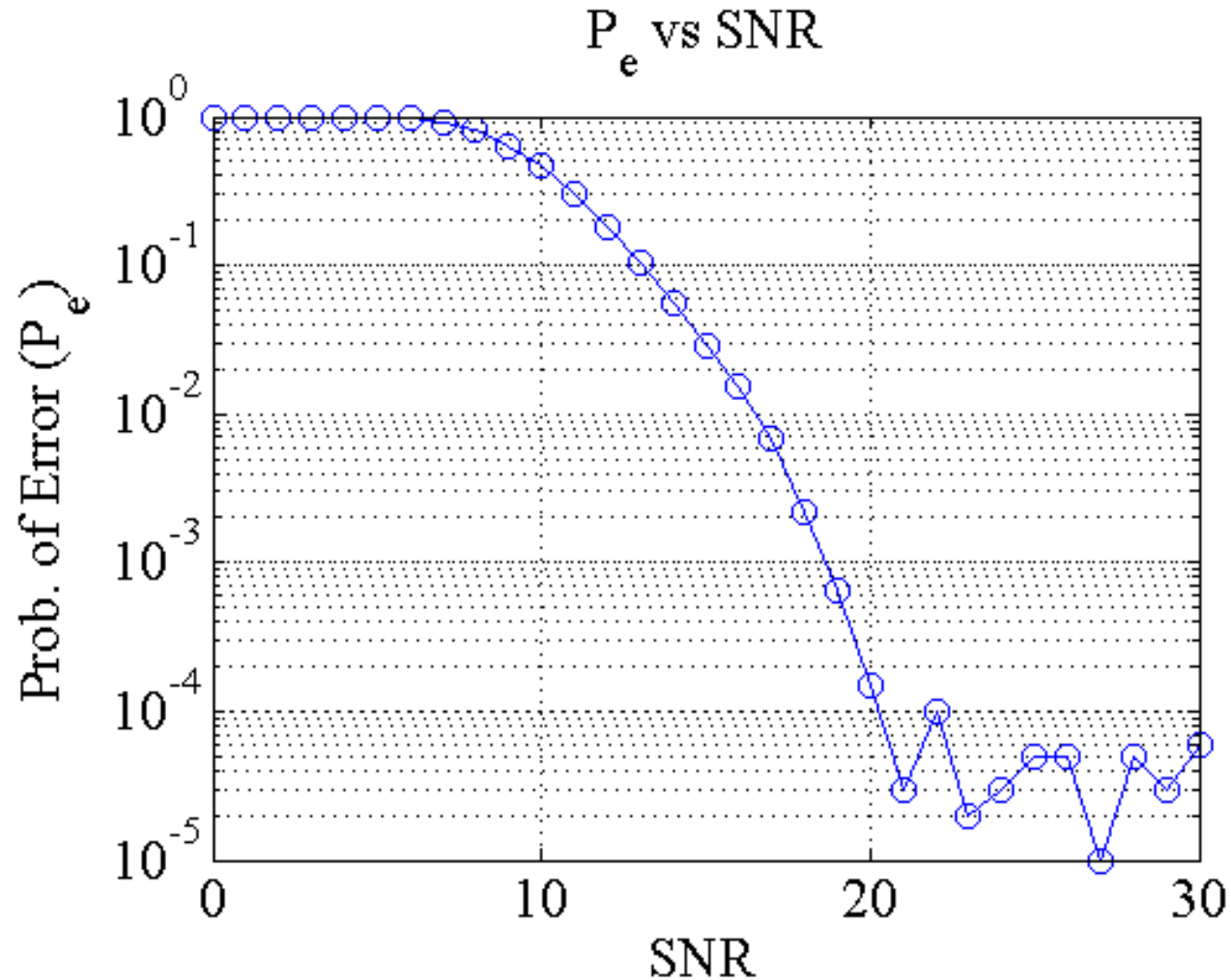
CQS P_e vs SNR

P_e vs SNR



- 10,000 trials per magnitude
- Support Size = 10
- Threshold: $4N_0$

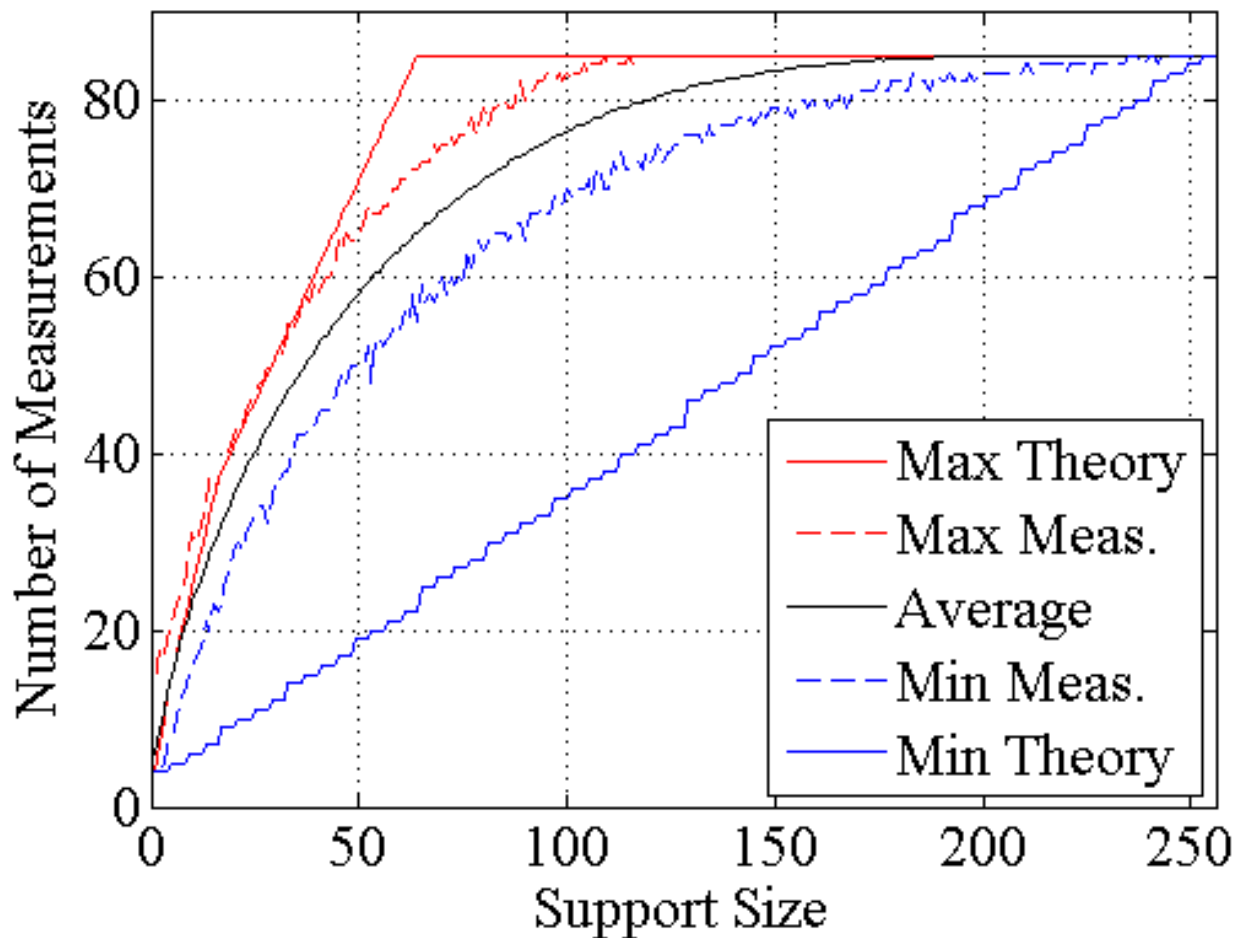
CQS P_e vs SNR



- 100,000 trials per magnitude
- Support Size = 10
- Threshold: $5N_0$

CQS # of Meas. vs Support Size

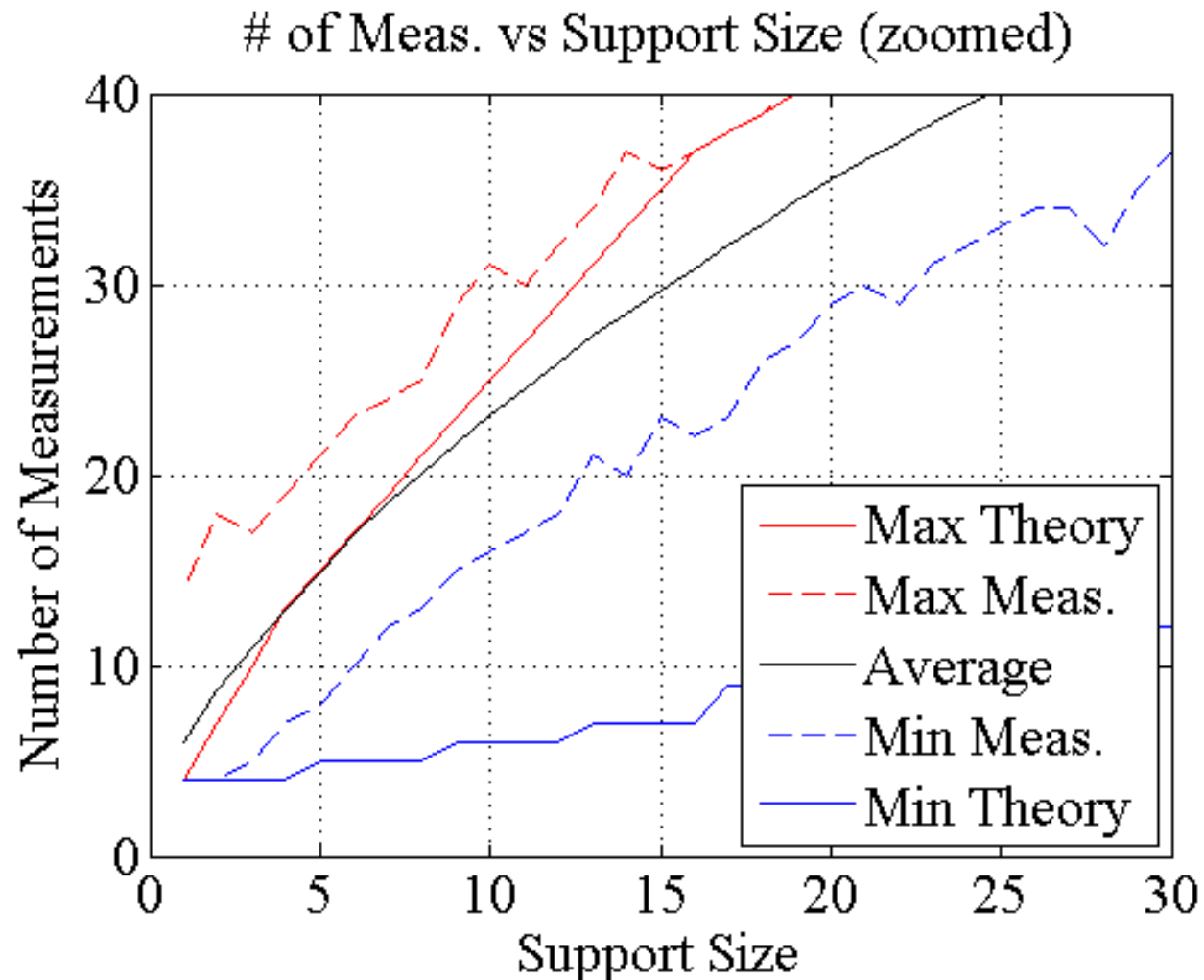
of Meas. vs Support Size



- 1000 trials per size
- SNR = 30 dB

- Threshold: $5N_0$

CQS # of Meas. vs Support Size (zoomed)



Future Work

- Investigate Compressive Distilled Sensing
 - Haupt, J.D.; Baraniuk, R.G.; Castro, R.M.; Nowak, R.D., "Compressive distilled sensing: Sparse recovery using adaptivity in compressive measurements," 2009
- Optimize CQS algorithm
- Begin work on other aspects of beam selection (hardware level)