

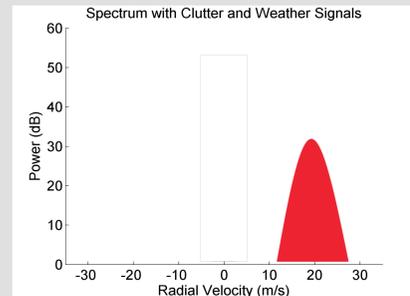
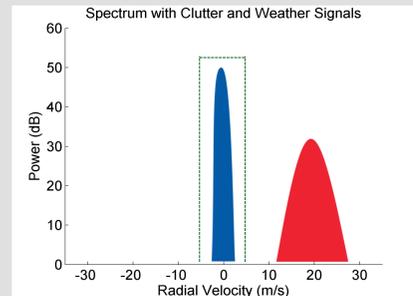
PAR to the Rescue: Improving Clutter Mitigation with Adaptive Beamforming

Christopher Curtis

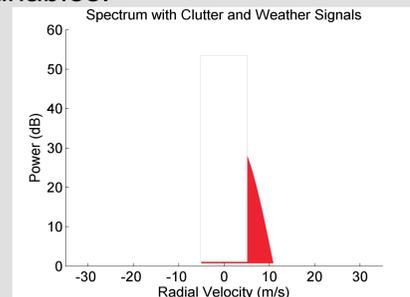
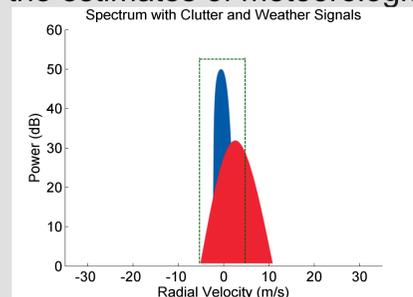
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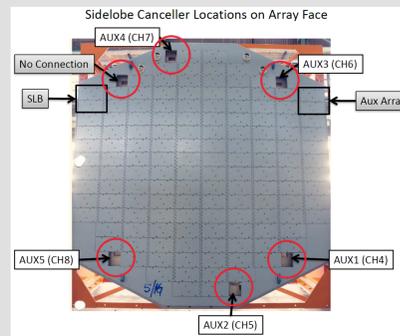
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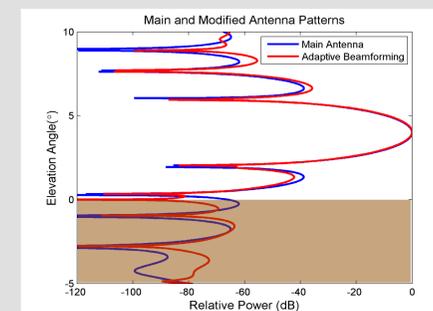
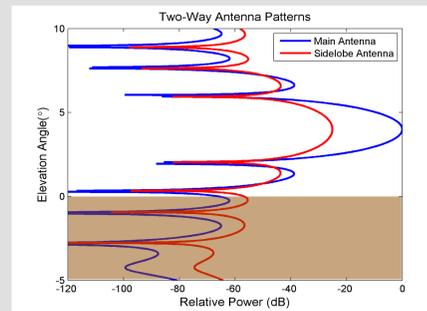
NWRT as a Proof-of-Concept

Is there another way to discriminate between clutter and weather signals?



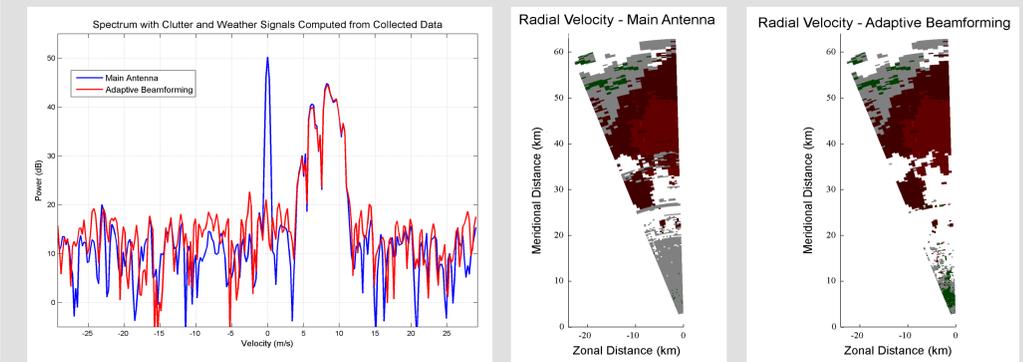
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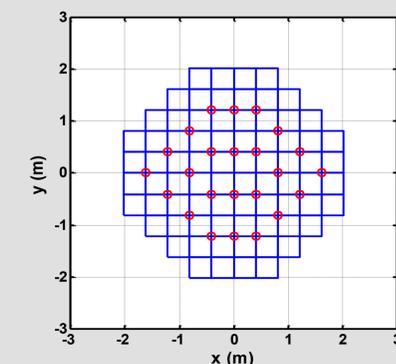
NWRT Multi-Channel Results

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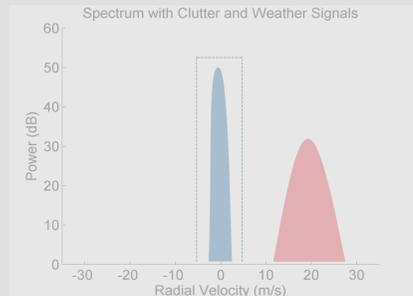
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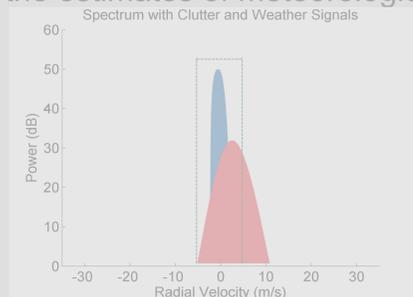
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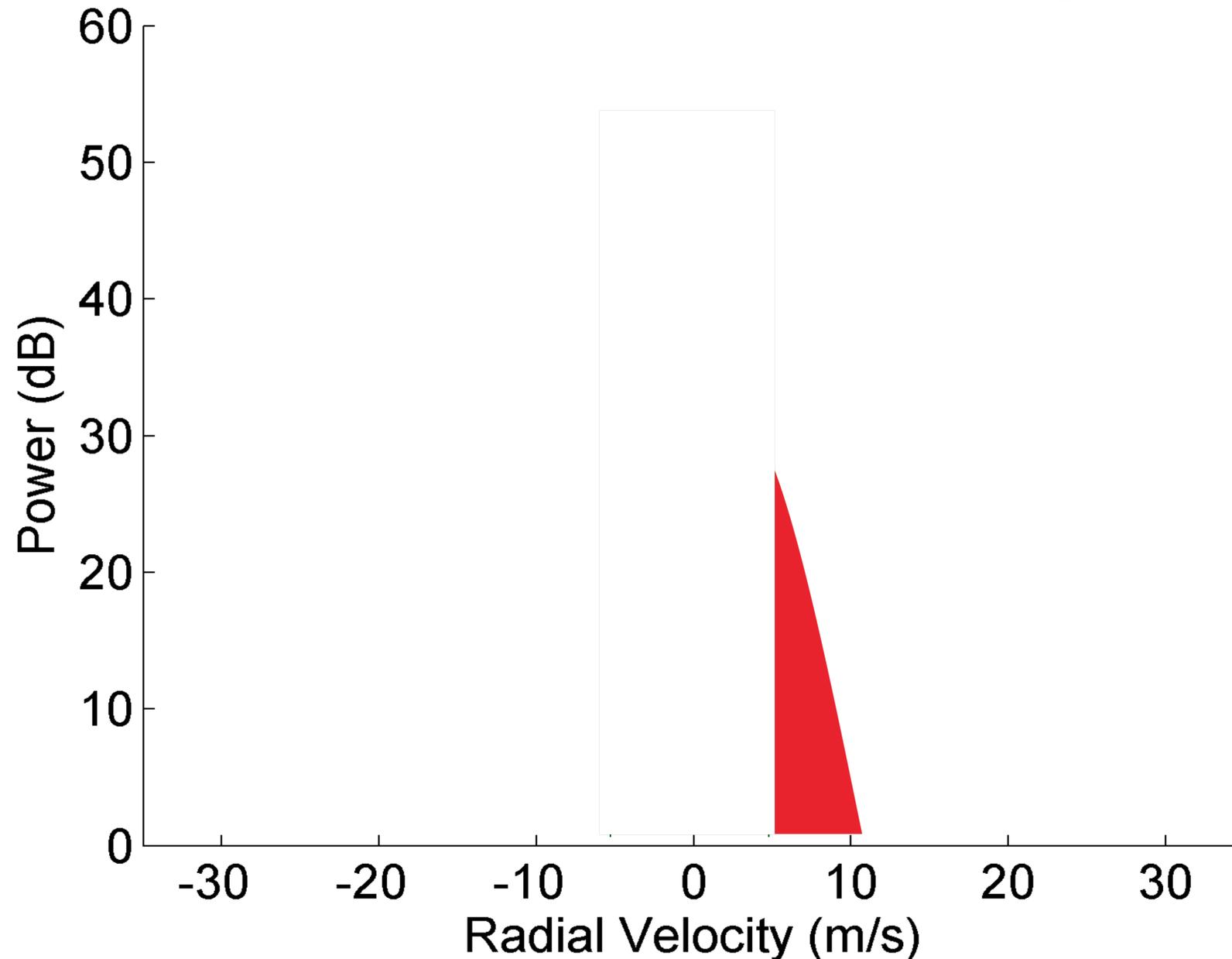


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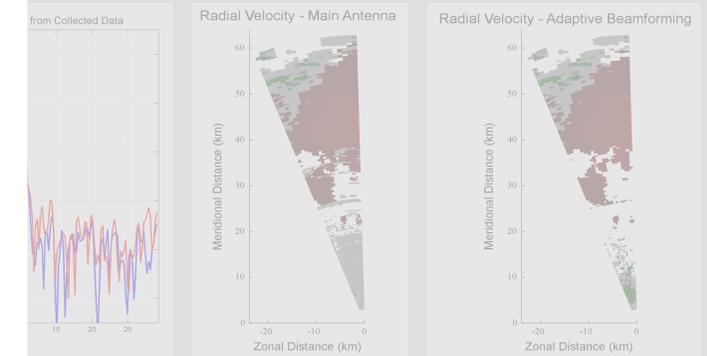
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Spectrum with Clutter and Weather Signals



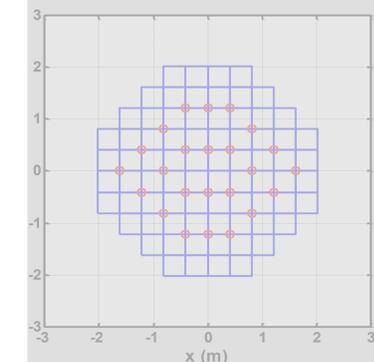
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Phased Array Active Arrays

Advances in active array technology, such as the Advanced Technology Active Array (ATAA), provide more channels and a different array geometry, which offers new opportunities.



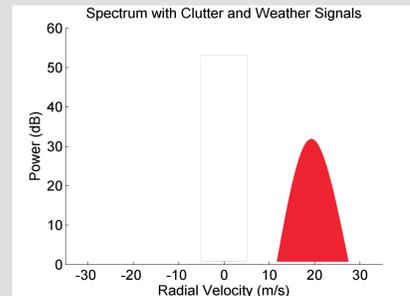
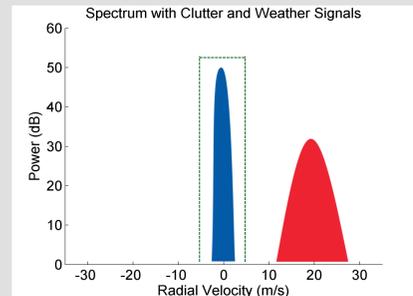
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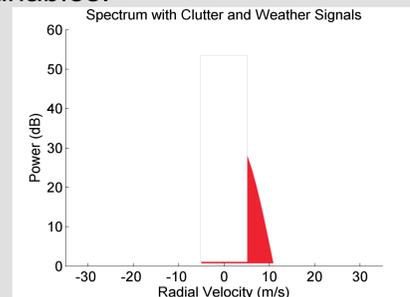
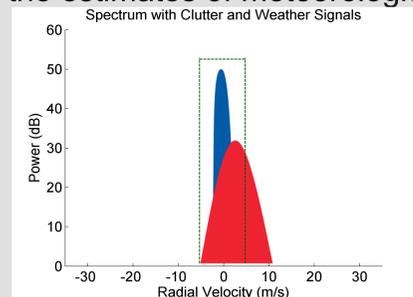
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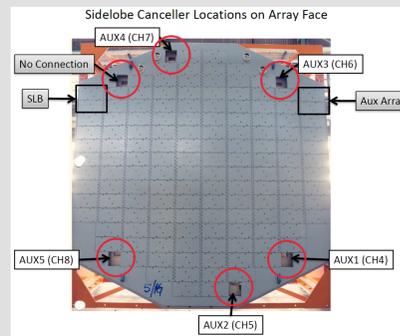
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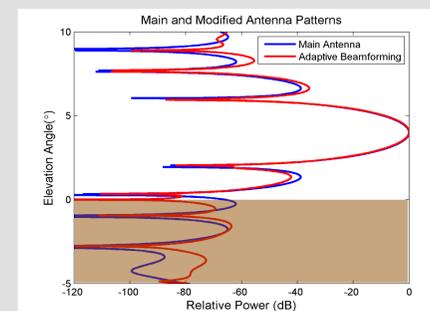
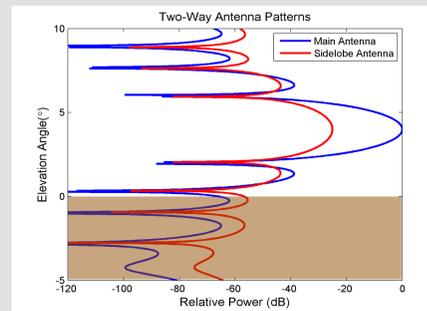
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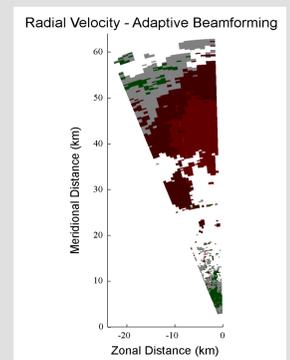
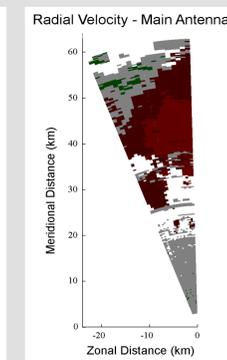
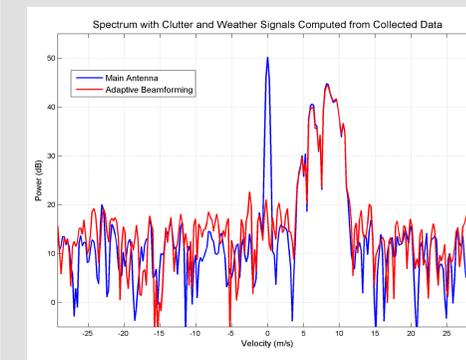
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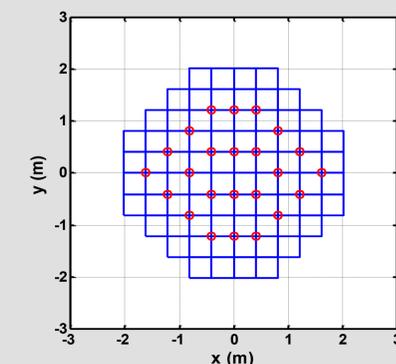
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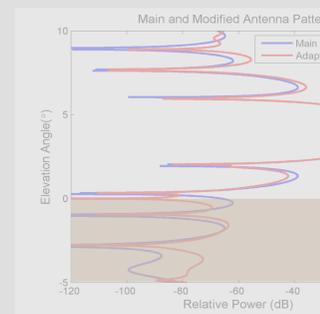
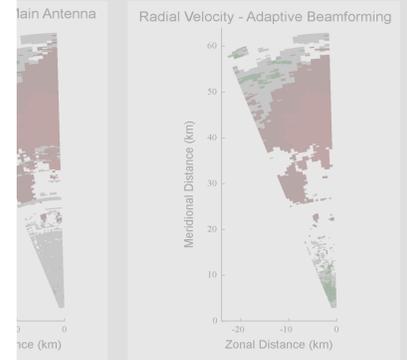
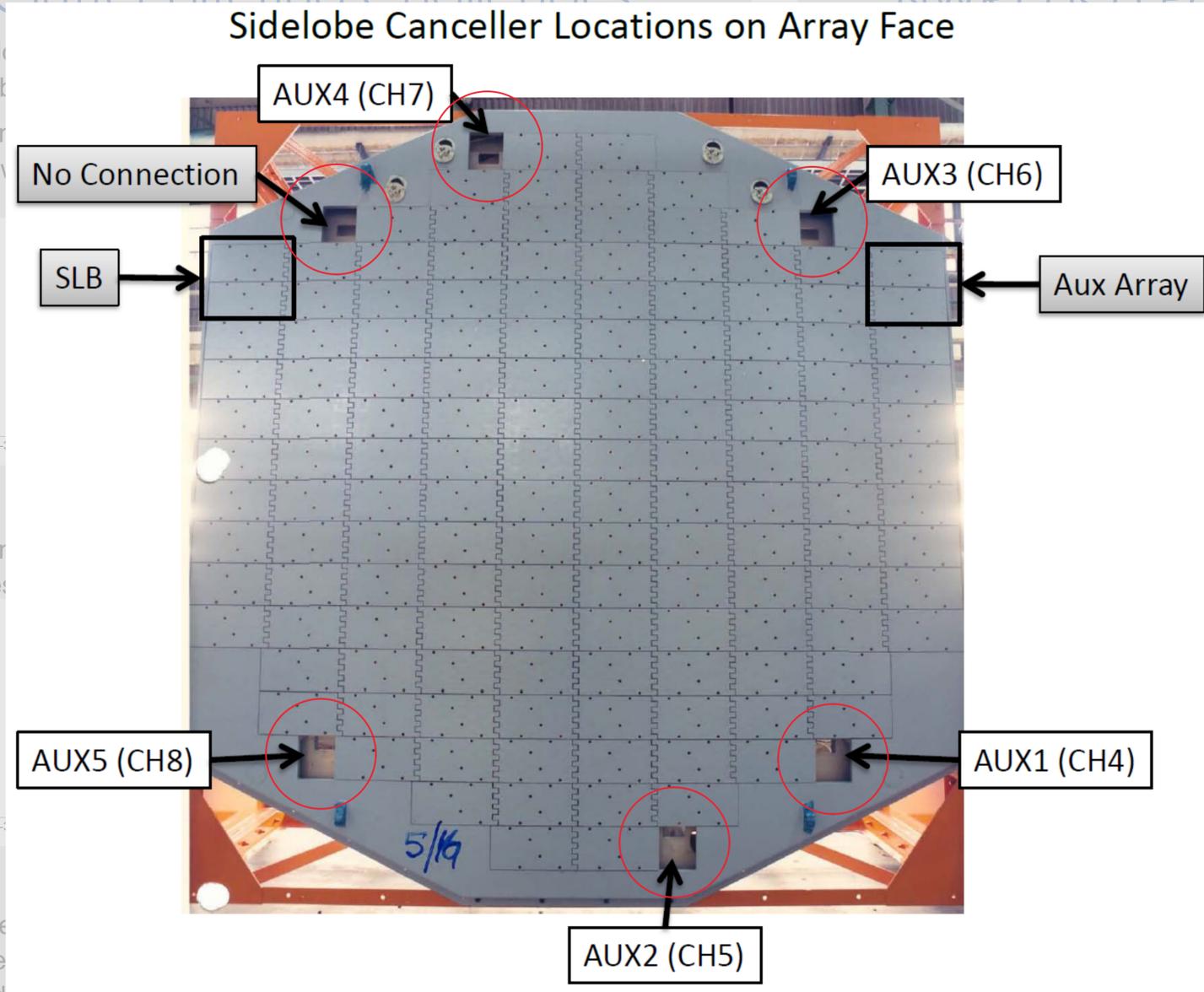
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NWPT as a Proof-of-Concept

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Arrays
Technology
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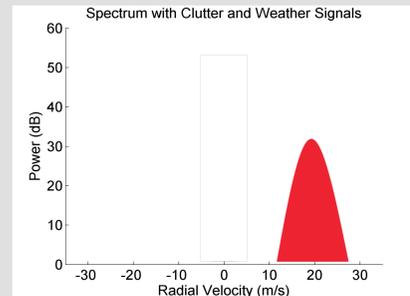
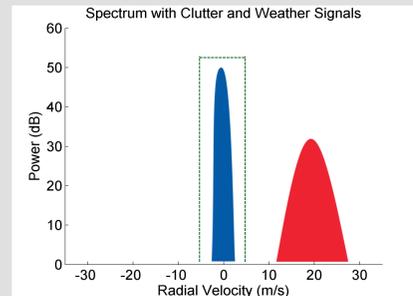
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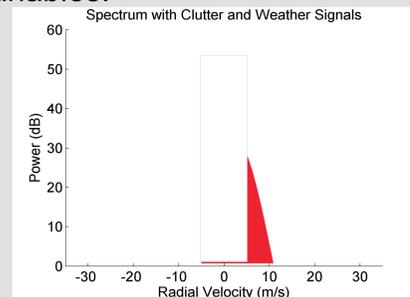
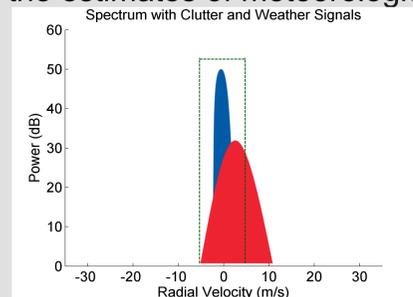
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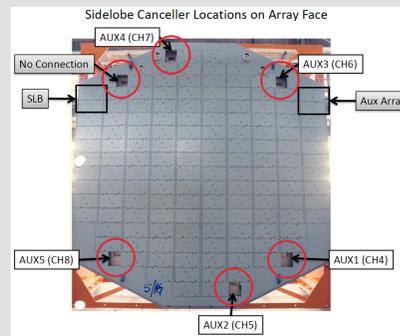
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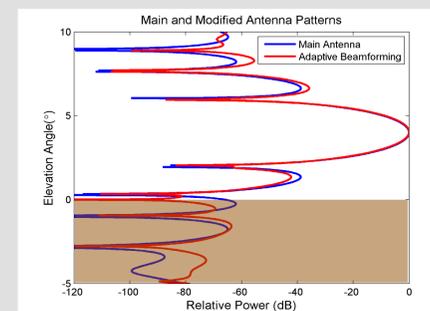
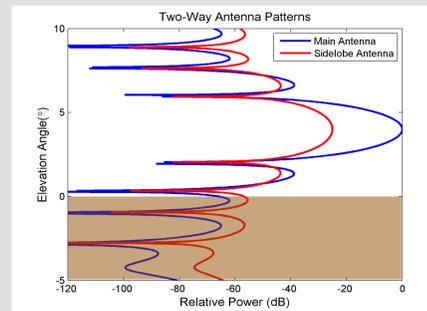
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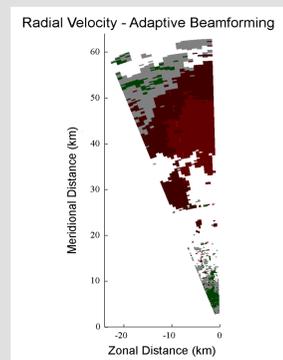
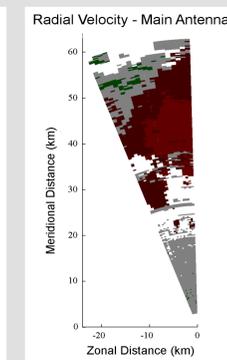
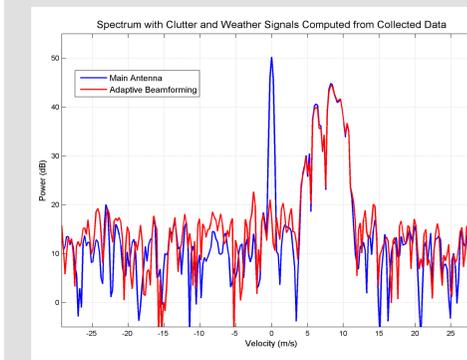
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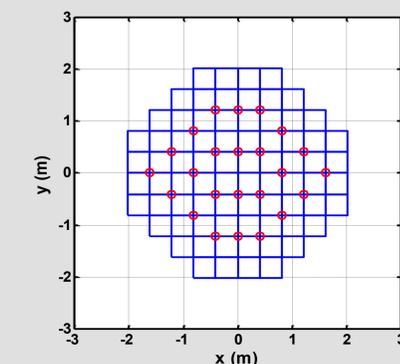
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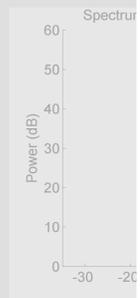
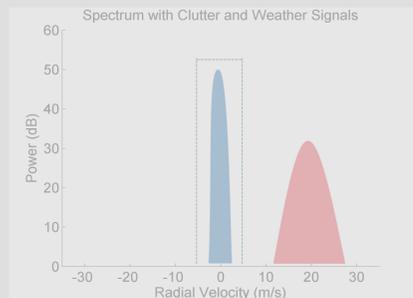
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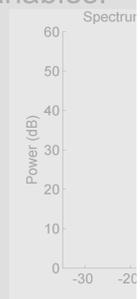
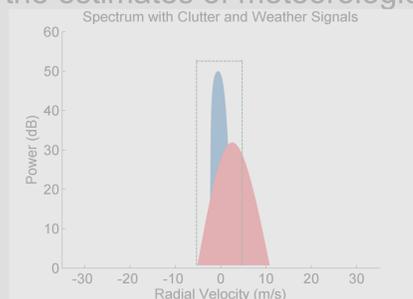
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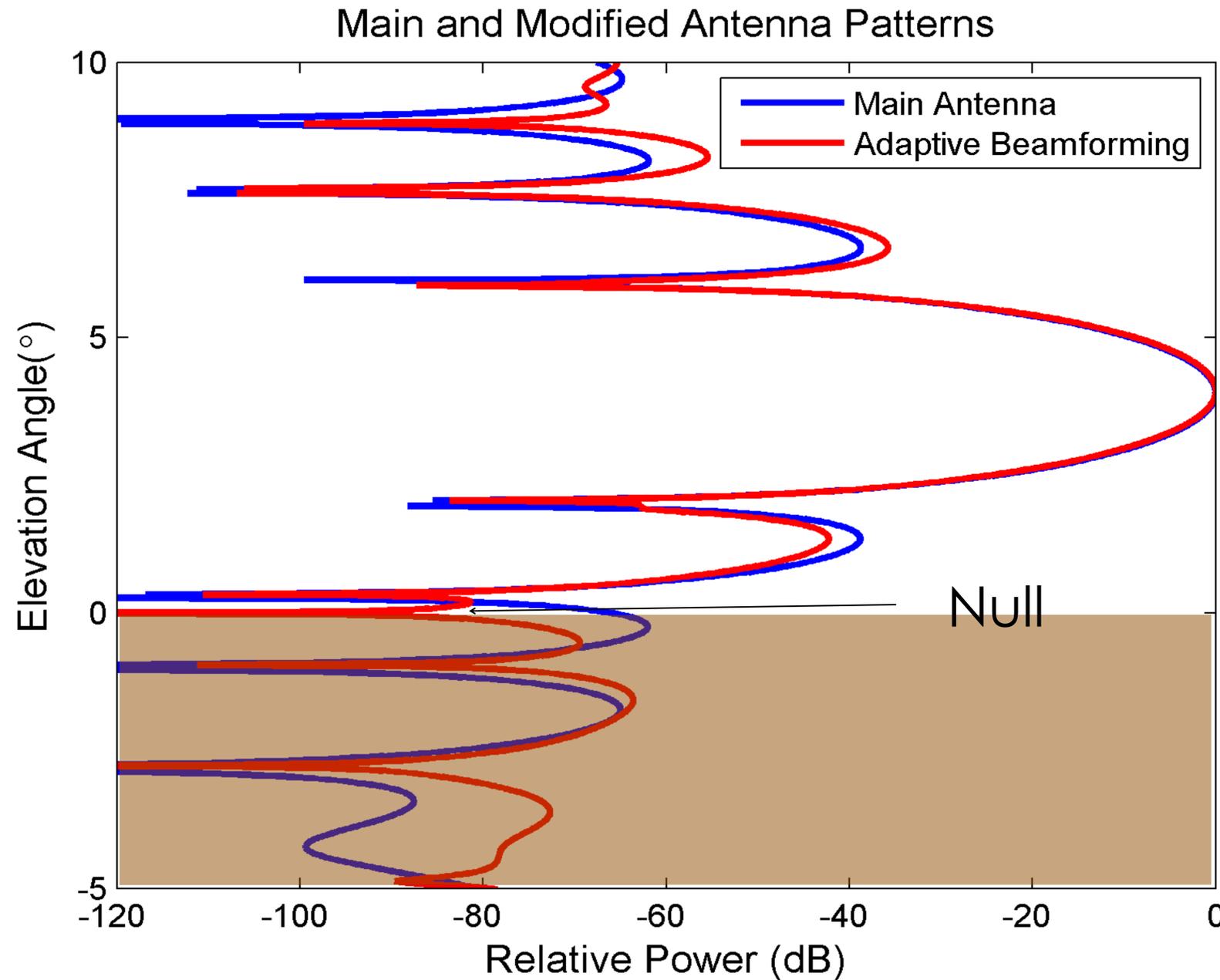
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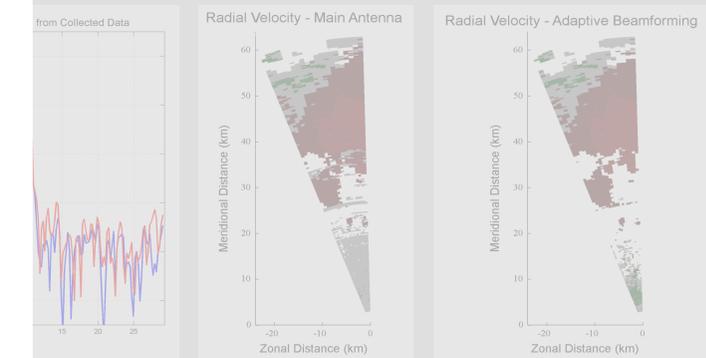


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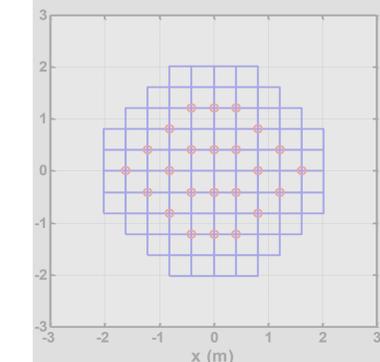
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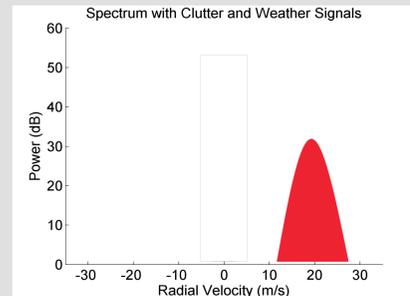
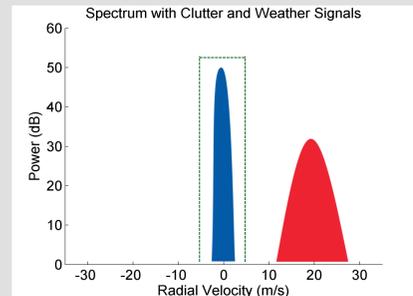
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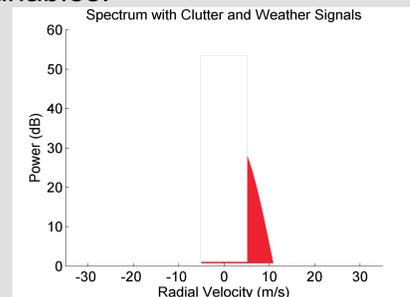
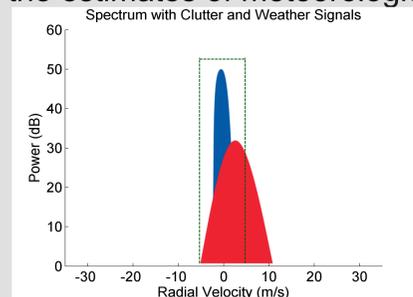
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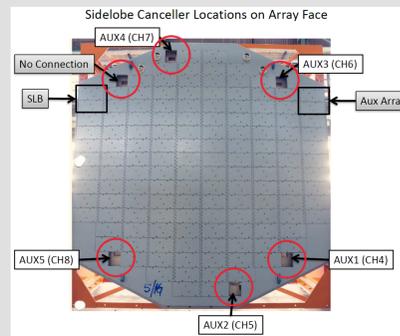
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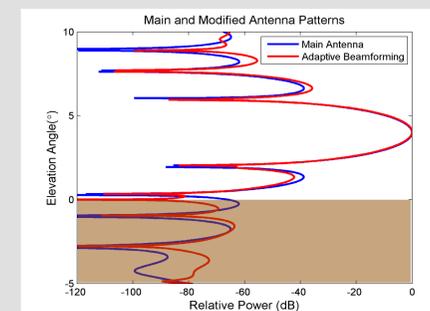
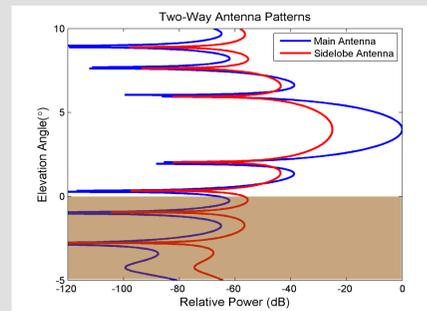
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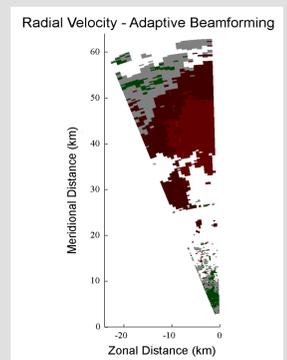
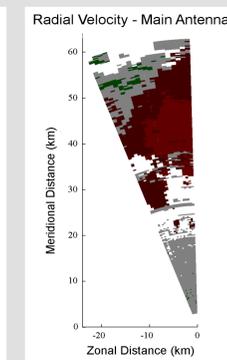
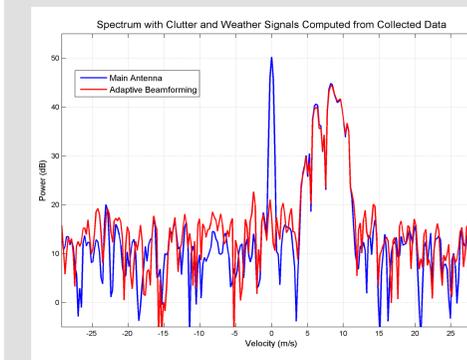
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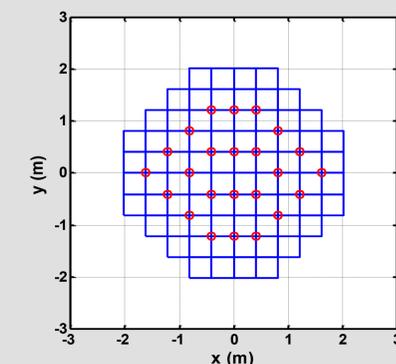
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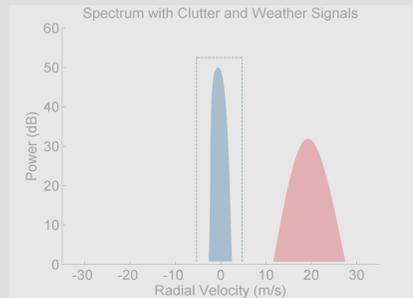
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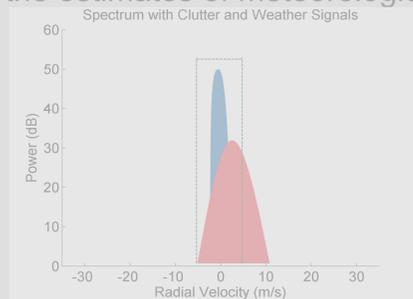
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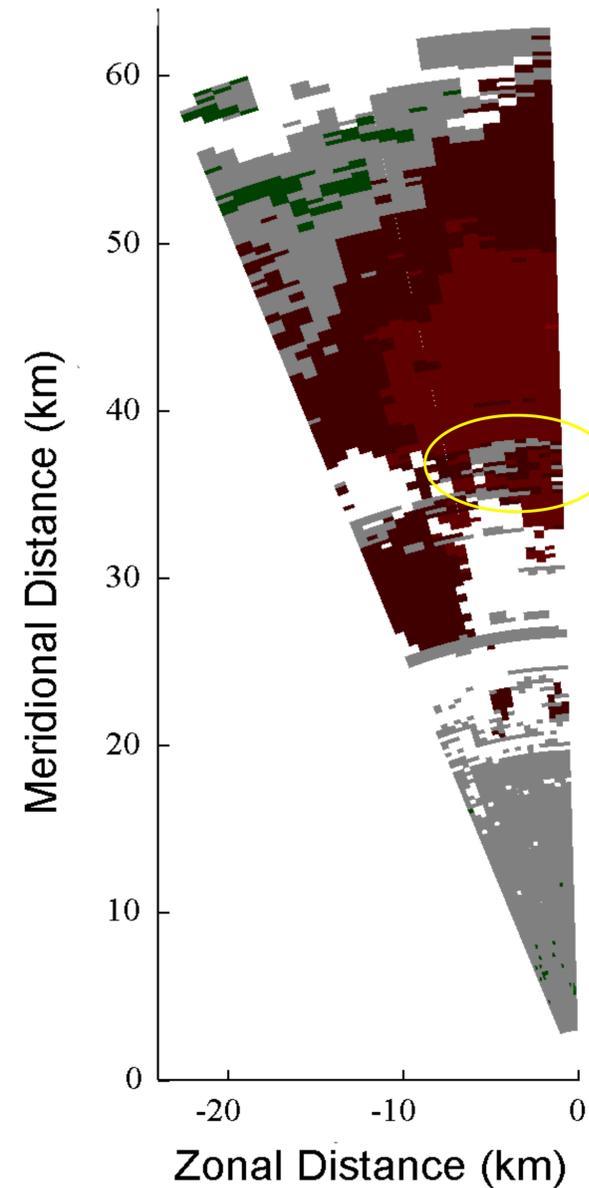


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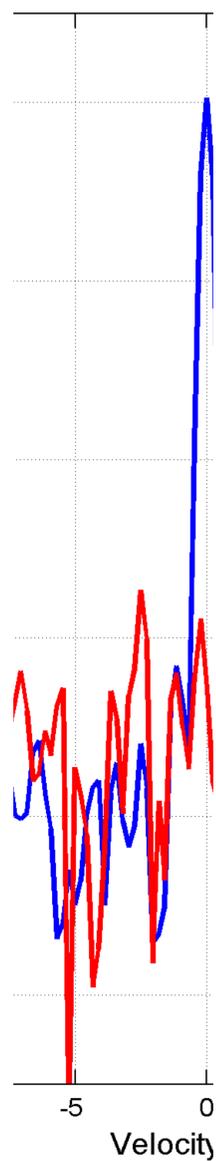


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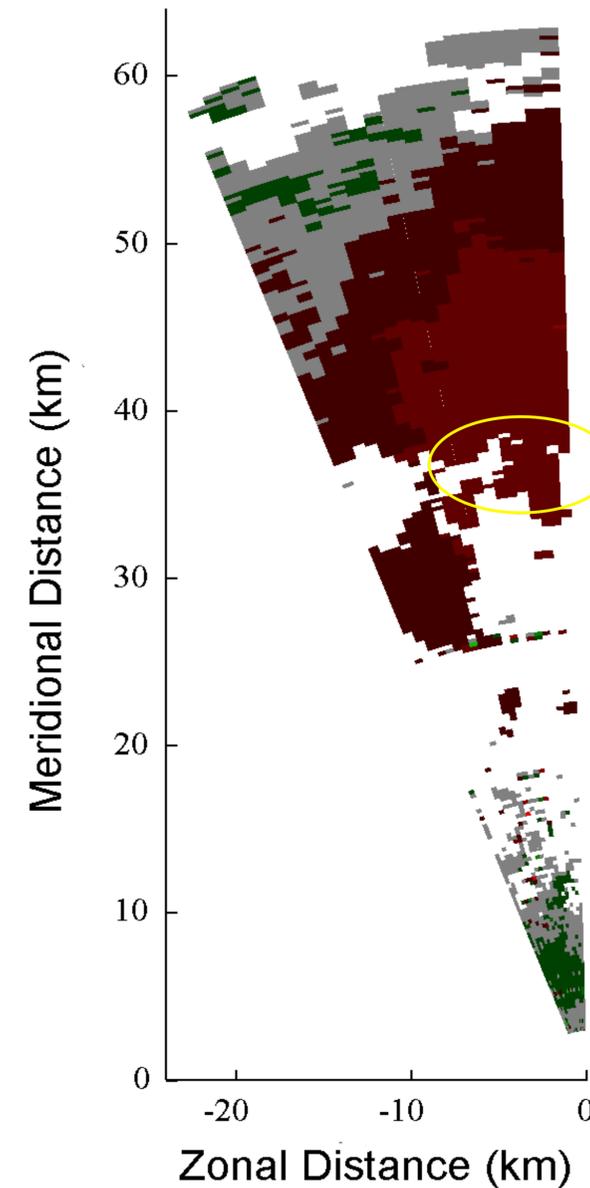
Radial Velocity - Main Antenna



Weather Signal

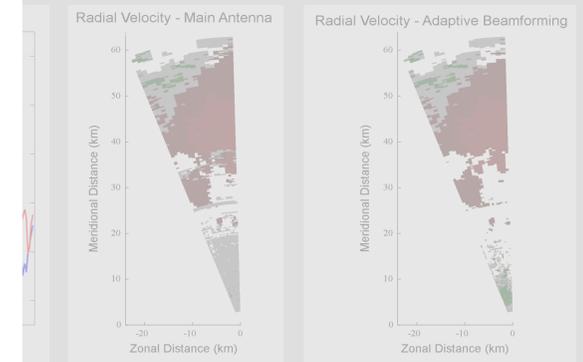


Radial Velocity - Adaptive Beamforming



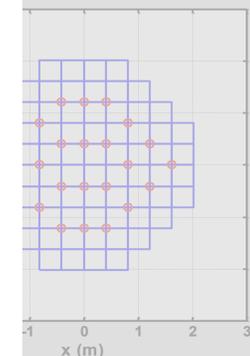
Channel Results

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Active Arrays

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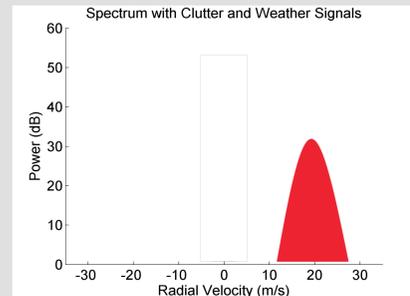
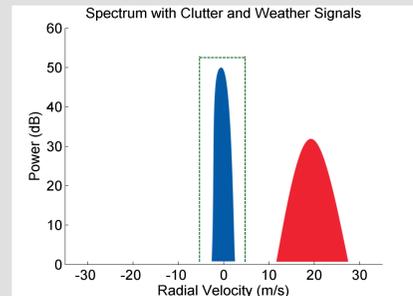
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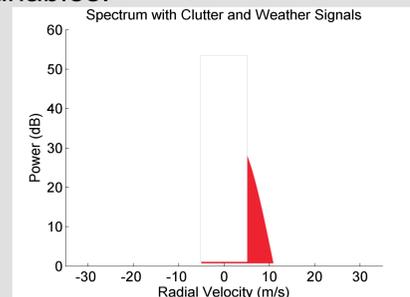
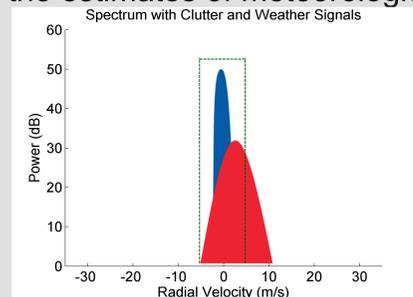
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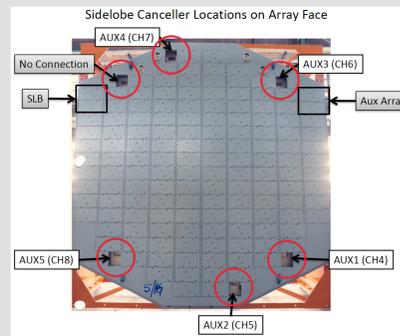
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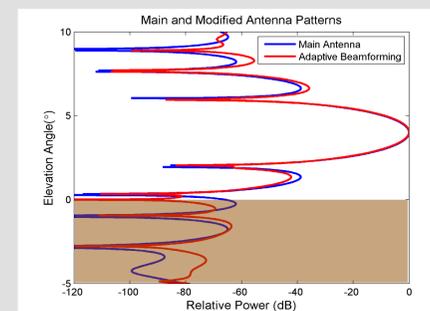
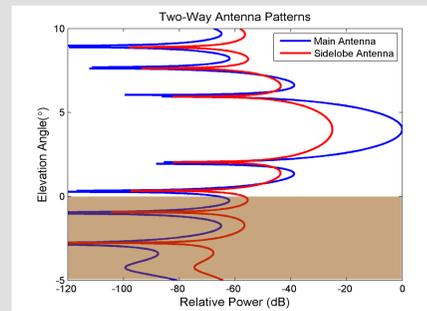
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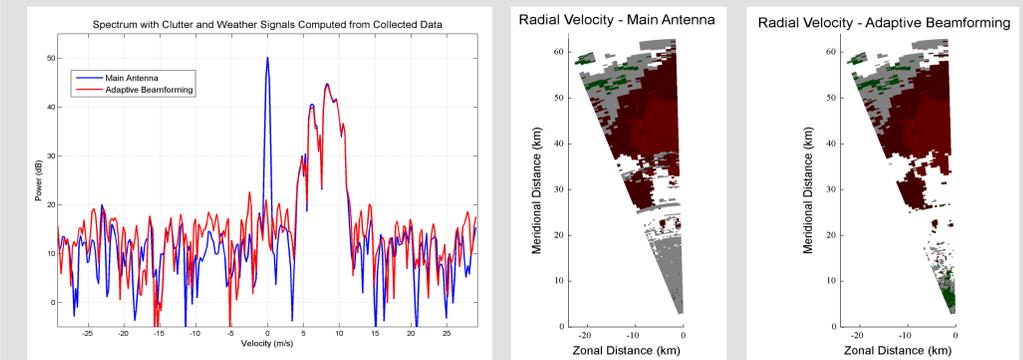
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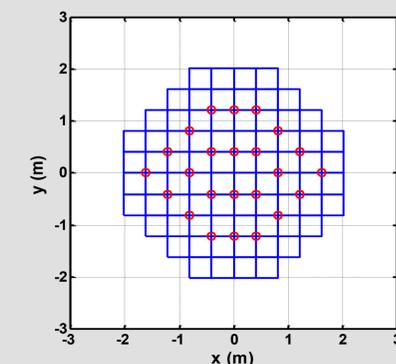
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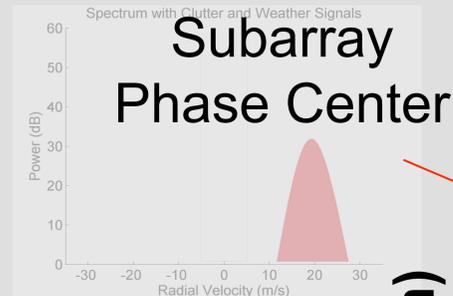
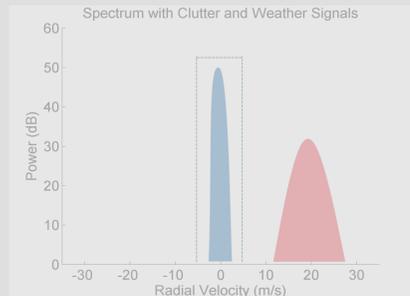
PAR to the Rescue: Improving Clutter Mitigation with Adaptive Beamforming

Christopher Curtis

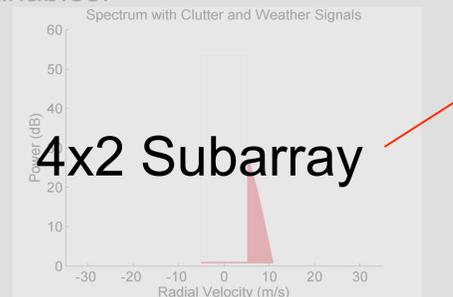
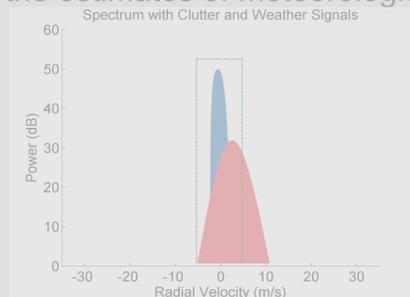
Clutter Filtering Challenges

Conventional ground clutter filters discriminate between clutter and weather based on radial velocity.

- When clutter and weather have sufficiently different velocities, they work very well.



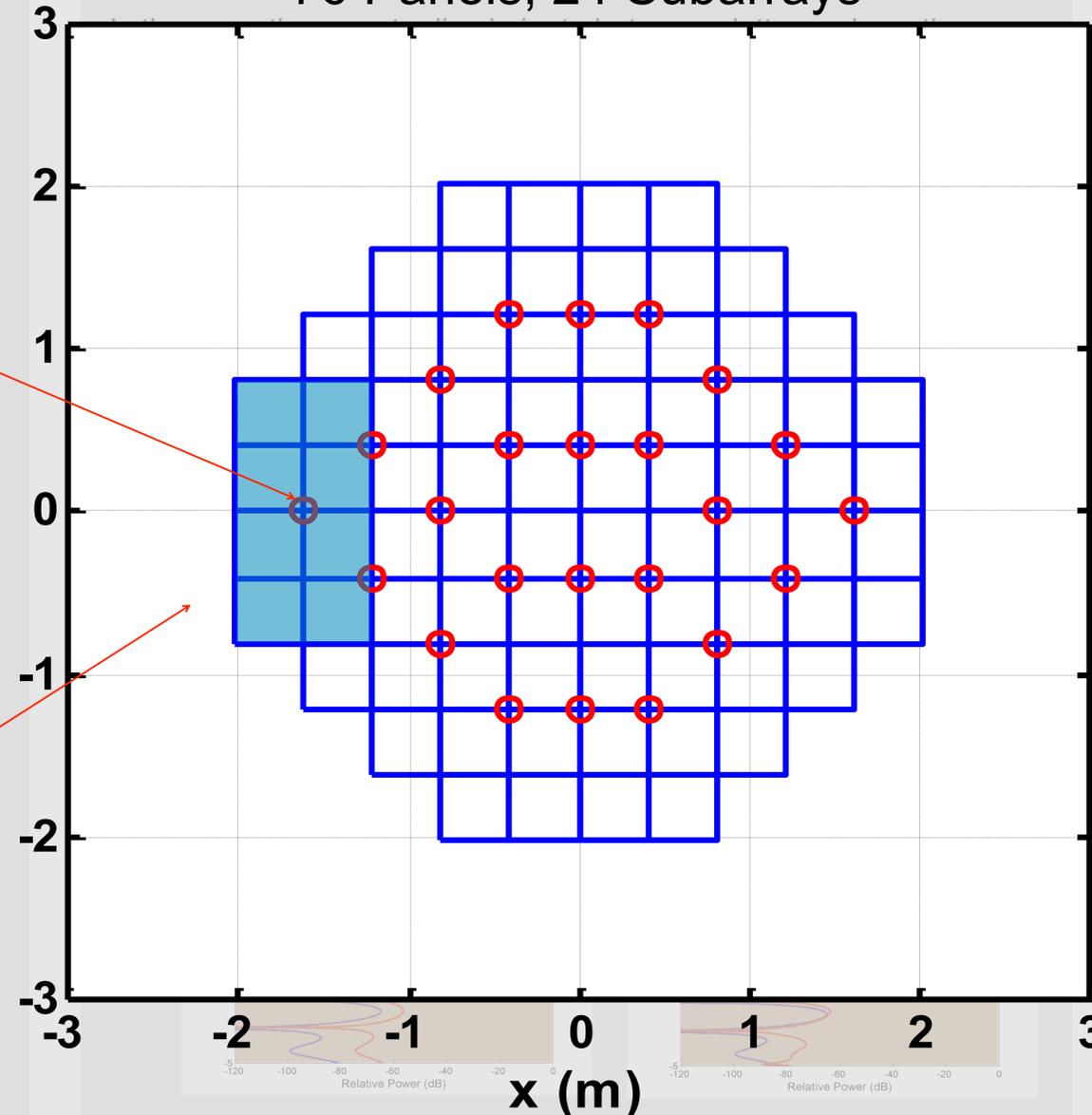
- When the weather velocity is near zero, clutter filtering can affect the estimates of meteorological variables.



- Clutter filtering is also difficult when collecting a small number of pulses (e.g., detection scans, beam multiplexing), techniques that could be useful on a phased array

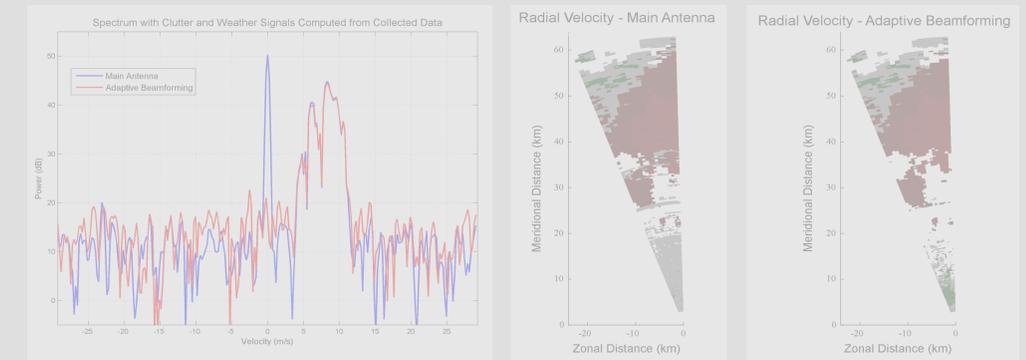
NWRT as a Proof-of-Concept

76 Panels, 24 Subarrays



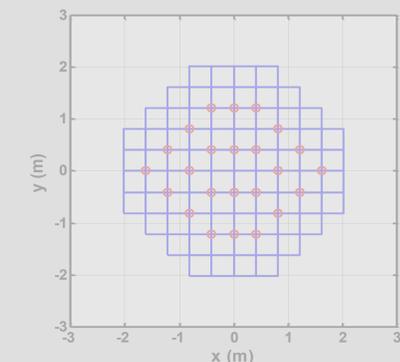
NWRT Multi-Channel Results

By properly combining the channels, ground clutter can be removed using spatial filtering.



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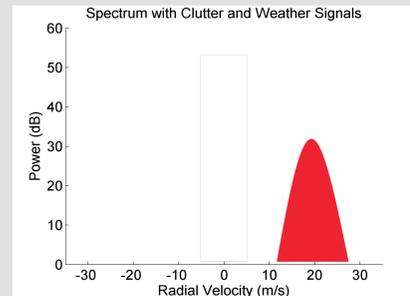
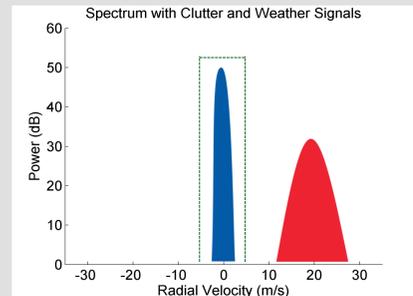
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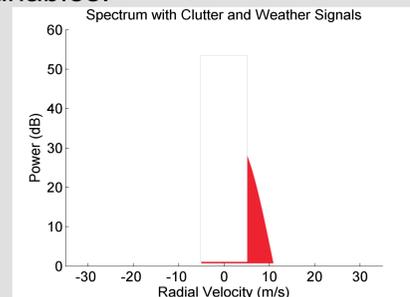
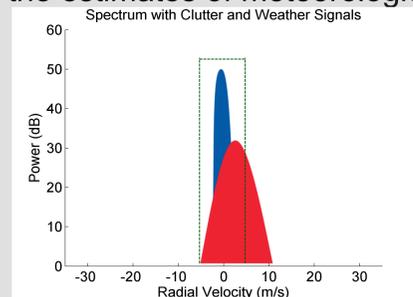
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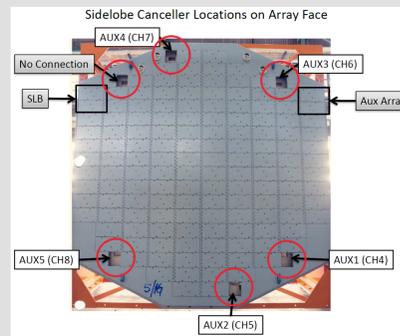
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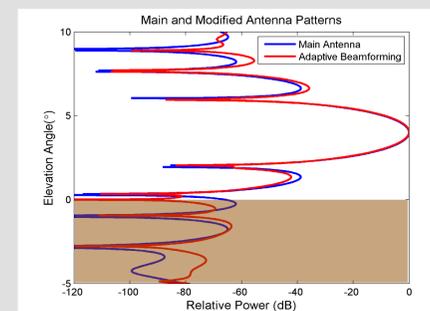
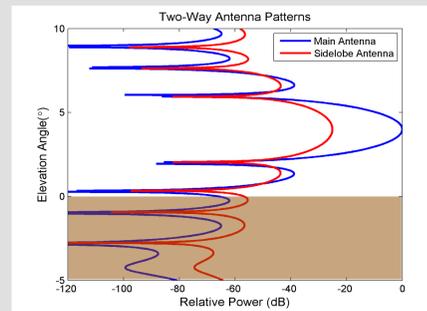
NWRT as a Proof-of-Concept

Is there another way to discriminate between clutter and weather signals?



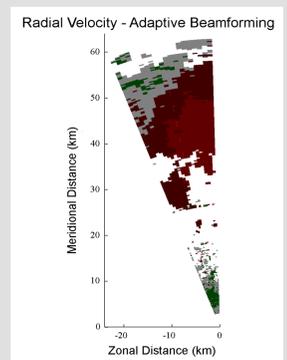
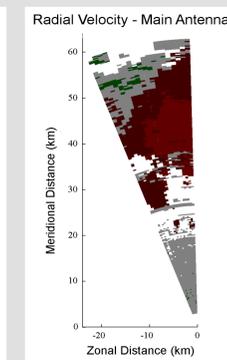
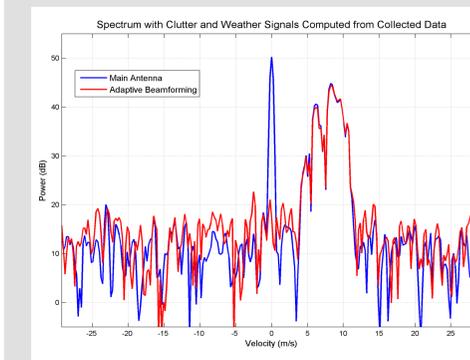
Combining multiple channels from antennas at different positions allows spatial filtering.

- Spatial filtering is a method of adaptive beamforming that discriminates based on position in space.
- Antenna pattern can be changed to reduce sensitivity in certain directions (nulling).



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