Temasek Defence Systems Institute

Study on Robustness of a Multi-Beam Staring Array Against Jamming

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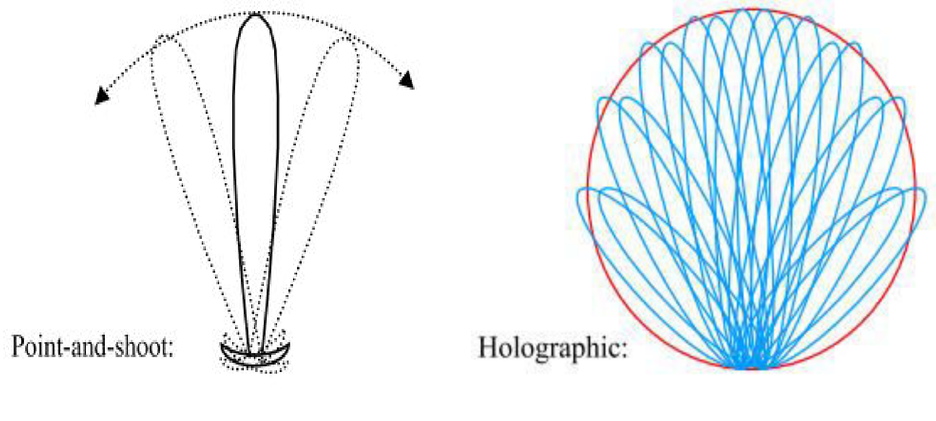
Aveillant Holographic Radar

First "Single-Transmitter Multiple-Receiver" Digital Phased Array Radar



Difference between Single Beam Scanning (Point-and-Shoot) and Multi-Beam Static Holographic Radar

INTRODUCTION

Aveillant Holographic Radar is the first radar that employs a single transmit antenna but static 2D staring phased array on receive for surveillance. This increases dwell time which improves classification and identification. For example, it has demonstrated ability to detect & track mini-UAV as well as differentiate wind turbine clutter from aircraft motion.

OBJECTIVE

(1) To investigate impact on radar detection accuracy in presence of AM jammer

(2) To develop an effective, simple and low cost Electronic Defence (ED) approach against it and investigate its feasibility

RESULTS

Radar was modelled (see Fig 1-2) & simulated using MATLAB algorithm. Results (see Fig 3-4) showed:

(1) Detection accuracy was affected by AM Jammer

(2) Proposed ED approach was able to determine location of jammer to an accuracy of 0.1° (improved from 12.7°) & suppress it effectively

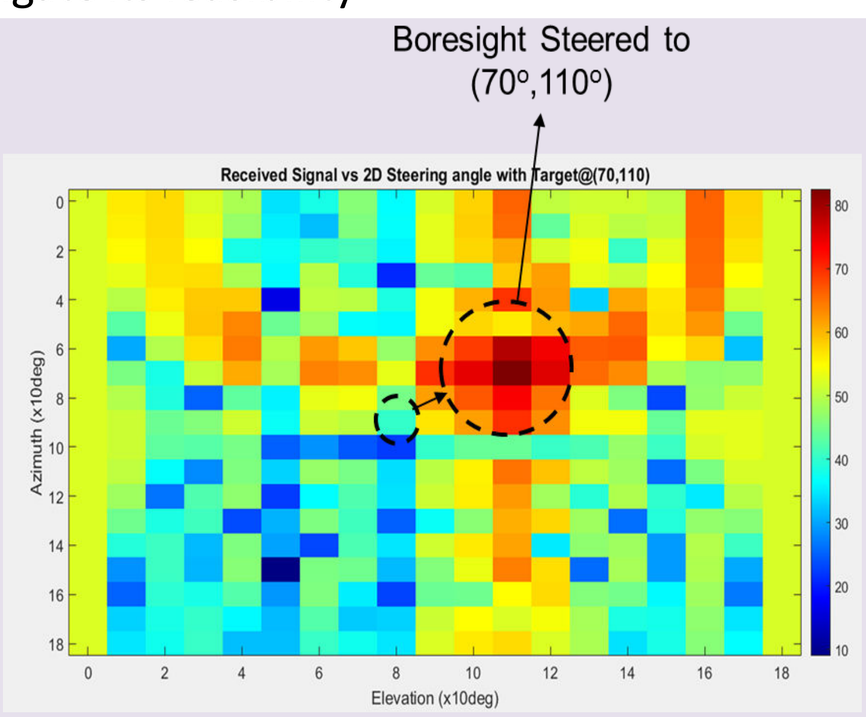


Fig 2: Demonstrated Accurate 2D Steering of MATLAB Model based on desired input

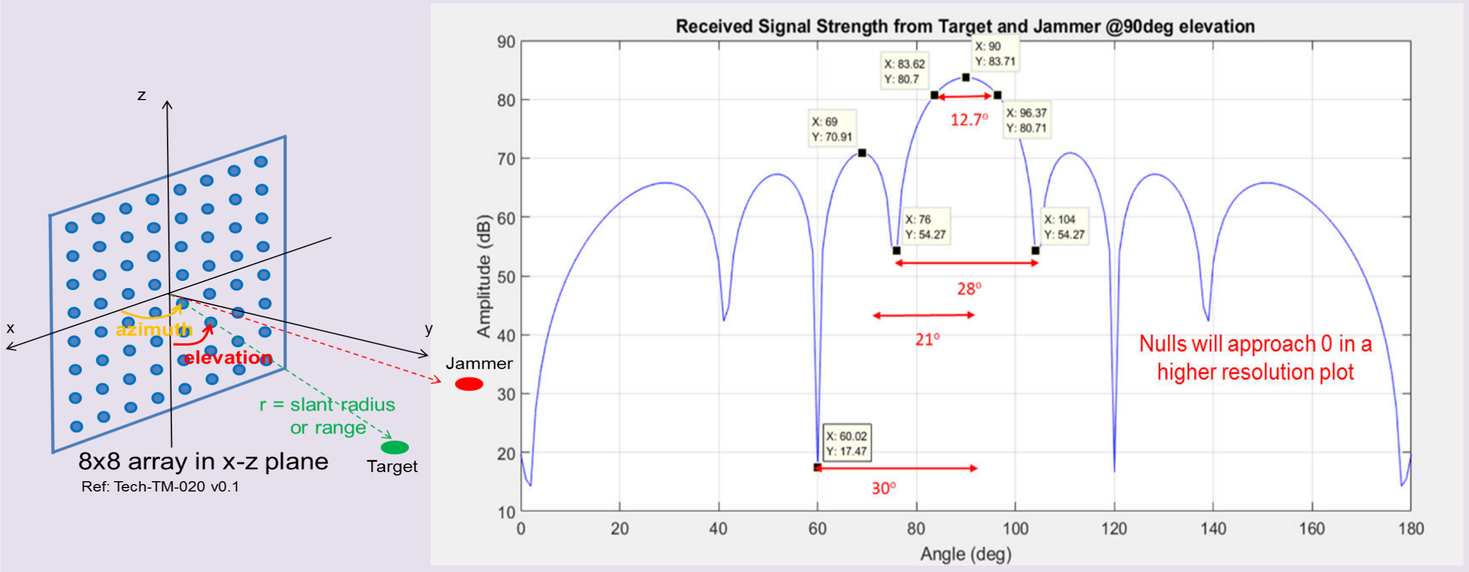


Fig 1: Simulated 8x8 Planar Phased Array in MATLAB (Left) & Achieved Beam Pattern showing a 12.7° ambiguity if used for DF (without phase monopulse) (Right)

MAIN RESEARCH IDEA

By leveraging on its passive, static multi-beam array architecture & Digital Beam Forming (DBF) capability, **phase monopulse Direction Finding (DF) followed by null steering** ED approach was proposed to suppress jammer without compromising affordability for the first time.

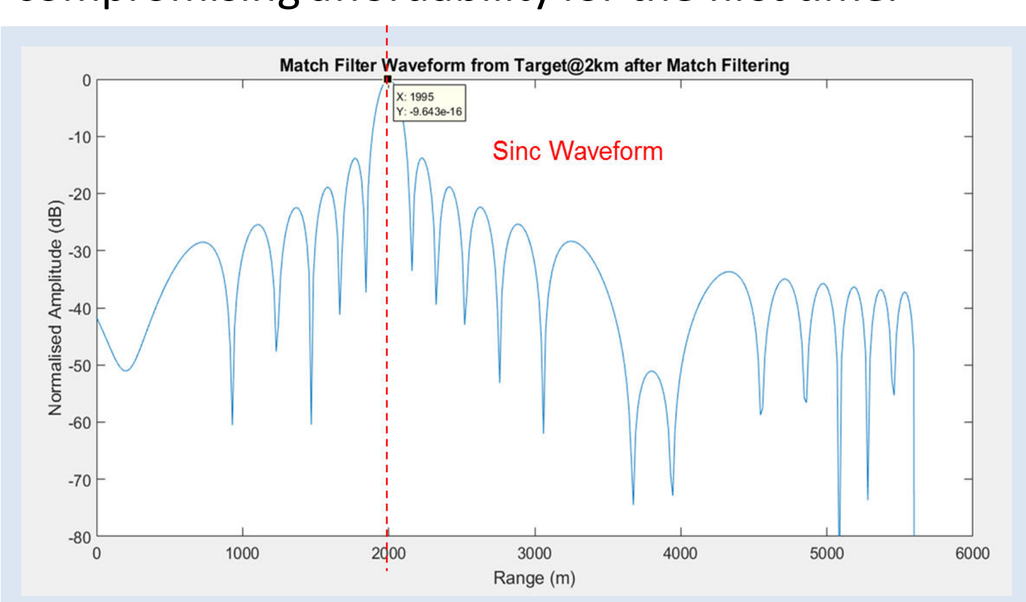


Fig 3: Radar Match Filter Output without ambiguity (target at 2km)

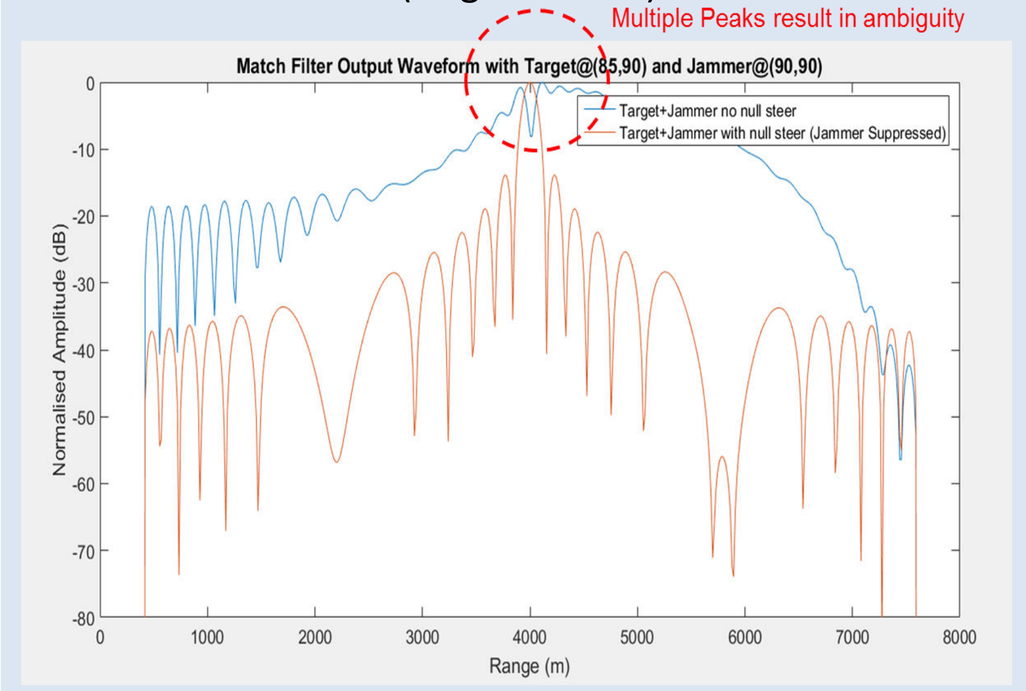


Fig 4: Ambiguity seen in presence of jammer & recovery after suppressing jammer (target at 4km)

BENEFITS

Simple & low cost technique that can be expeditiously implemented with phase change and software modification to existing radars.

POTENTIAL APPLICATIONS

(1) Retrospective Processing

(2) Clutter suppression around small targets

Reference

Oswald GKA. Holographic Surveillance Radar

www.aveillant.com

NUS National University of Singapore