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Analysis Of Innovative Phased Array Antenna For The Space Based Applications As Per The Industrial Standards

K.Phani Srinivas Dr.K.SAI MANOJ Ms.K.Mrudula Mrs K.Maanasa

Head R&D , Amrita Sai Institute of Science and Technology, Paritala, AP, India
CEO, Innogeecks Technologies and Professor in Amrita Sai Institute of Science and Technology, Paritala, AP, India
Assistant Professor, Amrita Sai Institute of Science and Technology, Paritala, AP, India
Research Scholar , Acharya Nagarjuna University Guntur Dist.AP,India

ABSTRACT: Till now, Department of Space has been using radar systems for tracking single objects, either launch vehicles or its related components. Space Industry envisages Human Space Programmes and Manned Space Missions in the coming years. Manned Missions necessitate Multiple Object Tracking Radar (MOTR) antennas to achieve the mission objectives. This multiple object tracking is done using Phased Array antennas. Phased array antenna consists of an array of radiating elements and each element is connected to a phase shifter. The phase shifters control the phase of the radiated signals at each element to form a beam at the desired direction. This research Paper deals with design aspects of phased array antenna and to study its properties. That is why the title of our project has been chosen as Design of Phased Array Antenna and Study of its Characteristics.

Keywords: Phased Array antenna, MOTR and Phase shifters

1. INTRODUCTION:

The aim of this research Paper is to design a Phased Array Antenna and to study its characteristics. The Phased Array Antenna is one of the most important subsystems in Phased Array Radar.

Phased Array Radars find wide applications in the areas of space research and defense, particularly for multi target tracking. So far requirement of Phased Array Radar was not called for in ISRO for PSLV, GSLV missions. For the future missions like Reusable Launch Vehicles (RLV), and Human Space Missions, Space debris tracking, it is felt that requirement of Phased Array Radar is essential.

The advantages of Phased Array Radar are specifically considered for multiple target long range tracking in skin mode, elimination of mechanical errors and instantaneous beam positioning capability.

1.1.1. Existing system:

Existing radar antenna can track only a single object. The tracking is done by parabolic antennas using mechanical beam steering. The antenna beam of a single target-tracker follows the target by obtaining an angle error signal and employing a closed loop servo system to keep the error signal small. These radar antennas work on S and C band frequencies.

1.1.2. Proposed System:

ISRO envisages Human Space Programmes or Manned Space Missions in the coming years. Manned missions necessitate Multiple Object Tracking Radar (MOTR) to achieve the mission objectives. The multiple object tracking is done using Active Phased Array Radar, with long range in skin mode using electronic beam steering technique. This radar antenna functions at L- band frequencies.

Radar with electronic beam steering and simultaneous multiple object tracking is necessary to track the reusable stages in RLV, to know the position of the various separating systems in manned mission during reentry, thermal protection system, capsule separation. Etc.,

Thus proposed Radar would be able to track multi objects simultaneously in skin mode and eliminated the difficulties caused by using mechanical steering.

The following plots represents array factor response of M=8 elements for different beam steering angles : i.e. , 0 and 30deg.

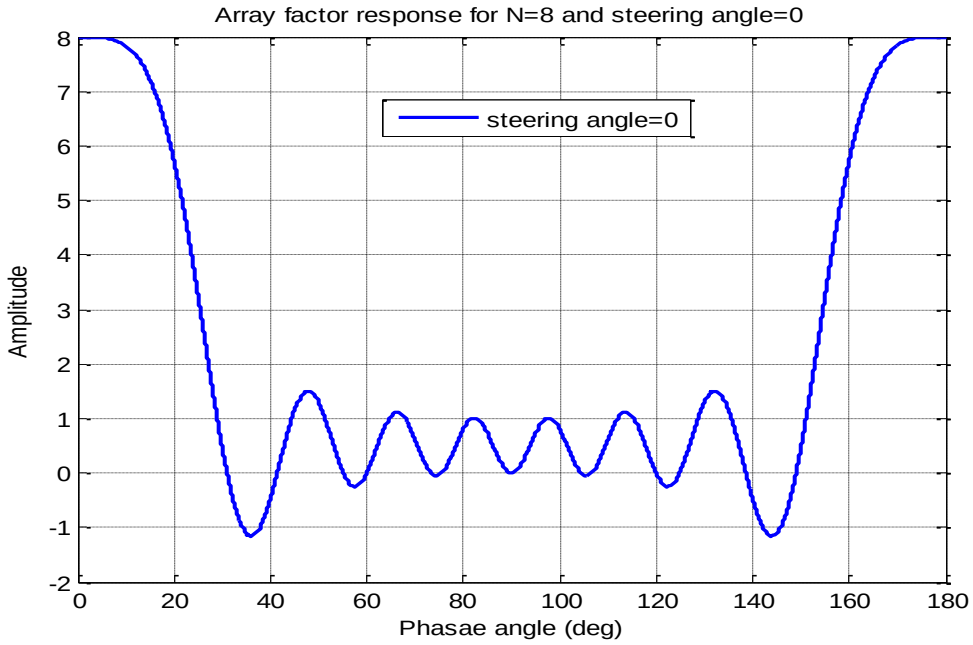


Fig a: phase scanning of N=8,at 0=0deg(plot)

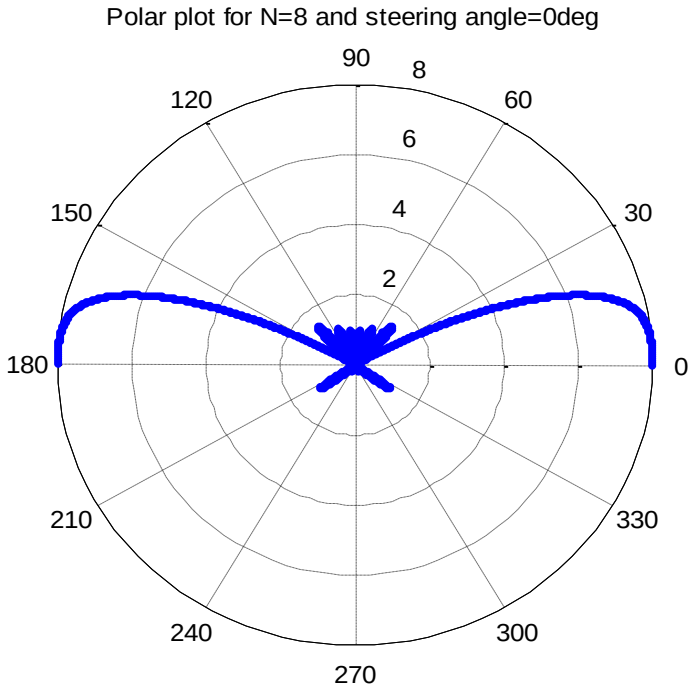
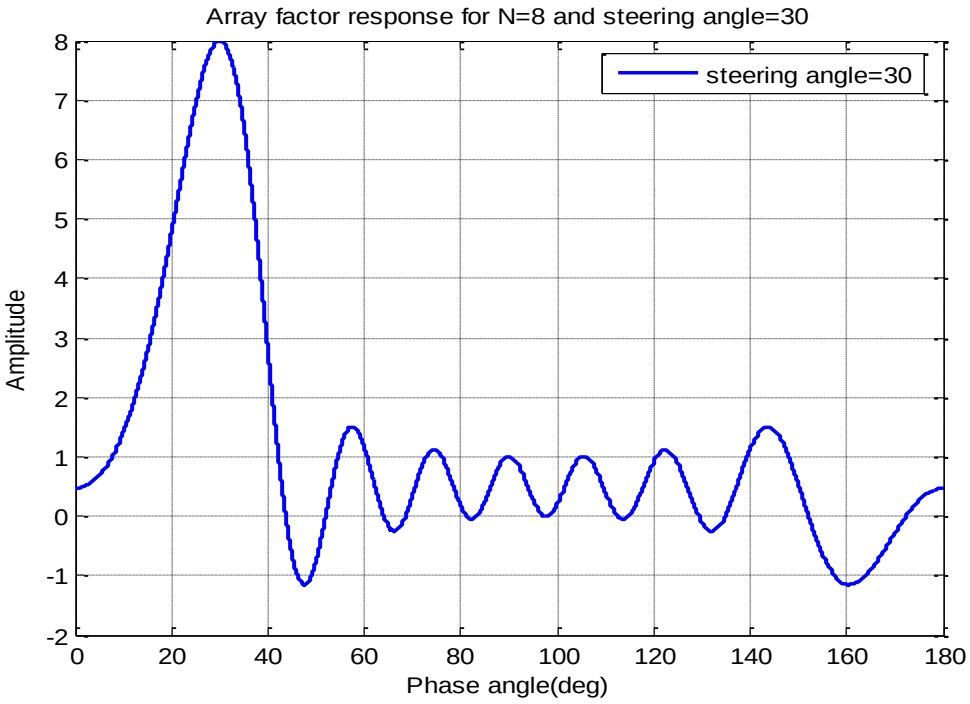
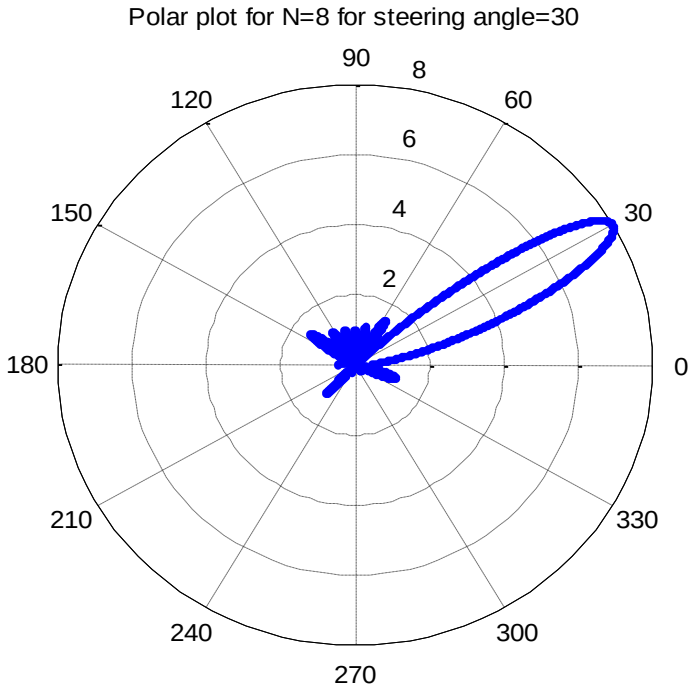


Fig:b:polar plot of N=8 at 0=0deg

Fig c) phase scanning of N=8 element array for ø0=30 deg





CONCLUSION

MOTR is the need of the hour for Department of Space to be used in the forthcoming Manned Space Missions.

Phased array antenna forms the main part of the MOTR system. Important characteristics have been studied and presented

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Authors' information

K.PHANI SRINIVAS working as an Associate Professor and Head of Research and Development and he had Five years of Industrial Experience as a team Leader in the research areas of Embedded Systems and Tele-Communications and also He is Having 12 years of Experience in Academics, Research and Administrative reports. He received several research awards like Best Engineer Award, Best Teacher Award and Best Research Paper Award.

The Focus of His research work is Design of Patch antennas which are Suitable for Defense and Space Based Applications. He received appreciation award in various National and International Conferences. He received Best Coordinator Certificates from IUCEE, IIT ROORKEE, IIT Bhubaneswar, NCAT, ELAT and INTEL. He attended WIPRO training Program. He completed one Joint research Program with IIT Kharagpur.He Organized various student level Competitions, workshops, Faculty Development Programs, Guest lectures, Orientation Programs, and Subject Based Seminars with scientists and Academicians. He is doing research work under the valuable Directions of Eminent Scientists. He had done technical Discussions with experts at Space Station, Antenna Research Lab, and Radar station. He Published research articles in Various Scopus International Journals.

Dr. SAI MANOJ KUDARAVALLI, is a Founder and CEO in Innogeecks^{TM} Technologies, Vijayawada and also Worked as Professor Amrita Sai Institute of Science and Technology since 2014, and he played

vital key role in Fidelity Investments as a Senior Business Analyst for 4.4 years in Business Analytics & Research and worked as Project Engineer in Wipro Technologies for 1.5 years, He got more than 10 years of experiences in financial services, IT services and education domain.

He was completed Bachelor of Technology in Mechanical Engineering from Amritha University, Coimatore.He is completed Master of Technology in Information Technology from IIIT- Bangalore. He holds Doctor of Philosophy (Ph.D) in Cloud computing arena from Kanpur University, India.

He was certified in Microsoft Certified Technology Specialist (MCTS) from Microsoft Corporation, and Certified Ethical Hacker v9 (CEH), and "Paul Harris Fellow" recognition by Rotary International. He is Published more than 10 research papers in various reputed International and national research journals/conferences/ Magazines. He attended 4 national level workshops and participated 3 international workshops; He is also a charted Engineer (Computer Science) from IEI. He is active member of IEEE, ACM, IEI, SHRM, NEN – Bangalore Chapter, HR Sangham – Chennai, CCICI (Cloud Computing), Rotary International Services.

Ms. K.Mrudula working with an Assistant Professor in CSE Dept from Amrita Sai Institute of Science and Technology. She was completed M.Tech from IIIT-Hyderabad .She got more than 6 years of experience in Teaching. She published more than 5 research papers in various International and national research journals. She attended 2 FDP, and 1 workshop.

Mrs.K.Maanasa worked as HR manager in Jaya lakshmi Powercorp Ltd for a Period of 6 years after completing her M.B.A from RVR&JC college of Engineering. She is currently Pursuing her doctorate (Ph.d) in Development of Framework for Tourism Promotion in AP and ICT Integration from Nagarjuna University.