

THE PHASE EXCITATION EFFECT ON RADIATION PATTERN & VSWR OF A TWO ELEMENT MICROSTRIP ANTENNA ARRAY MOUNTING ON A CYLINDER

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ABSTRACT

A practical study of the phase excitation effect on radiation pattern and VSWR of a two-element Microstrip antenna array mounting on a cylinder is presented. Generally, for space vehicles like satellite and missiles, onboard antenna systems require nearly Omni-directional coverage so that even if it rotates transmission should be continuous. Mostly, space vehicles can be considered as cylinders. It is not possible to get nearly Omni-directional coverage with single antenna. This is understood very well because it is due to shadow effect of a cylinder on the other side. So, minimum two antenna elements are required to connect in array configuration to get nearly Omni-directional coverage depending on diameter of the cylinder, frequency of operation and type of antenna.

KEY-WORDS

Microstrip Antenna Array, On-board Antenna, Phase effect.

1 INTRODUCTION

The effect of phase of excitation between two antenna elements of array mounted on cylinder is studied. These two antenna elements are mounted on opposite side of cylinder so that each antenna can cover nearly one hemisphere. Antennas are designed and fabricated to work at S Band and cylinder diameter is around 200mm. These two antennas are mounted on opposite side of cylinder and excited in-phase & out of phase. We found that out of phase excitation gives better beam-width and VSWR bandwidth.

2 DISCUSSIONS AND RESULTS

Microstrip antenna is designed and fabricated to work in S Band. These antennas have been fabricated with curvature so that these can be assembled such a way that antennas are in flush with the cylinder. The antenna photograph and mounting view on cylinder are shown in "Fig.1," This minimizes the drag of a space vehicle. These antennas are connected using two-way power divider and co-axial cables to form an array. By changing the length of these cables, phase of excitation between two elements of an array is controlled. These antenna elements are excited in-phase and out of phase and studied the effect of radiation pattern and VSWR bandwidth. We considered $VSWR \leq 2$. The 3dB-beam width measured with single antenna mounted on a cylinder is 36.11% as shown in "Fig.2," The beam width of an array with out of phase excitation is 55.55% as shown in "Fig.3," and with in-phase excitation is 16.7% as shown in "Fig.4,"

The VSWR bandwidth achieved for single antenna is 3.3% as shown in "Fig.5," with out of phase excitation is 8.4% as shown in "Fig.6," and with in-phase excitation of an array is 3.7% as shown in "Fig.7,"

3 CONCLUSION

S Band on-board Microstrip antenna is designed fabricated and mounted two elements on opposite side of a cylinder and radiation pattern & VSWR is measured with in-phase and out of phase excitation between two elements of an array. From the above discussions, it can be concluded that out of phase excitation gives better Radiation pattern and VSWR performance.

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Fig. 1. Conformal Microstrip Antenna and mounting view.

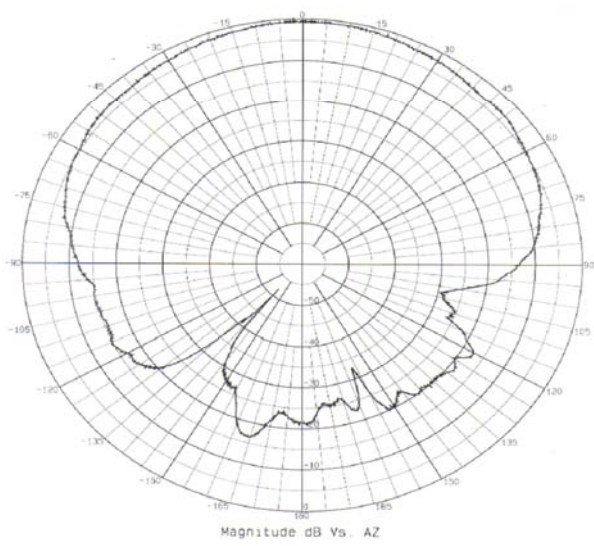


Fig. 2. Radiation Pattern of single antenna mounting on a cylinder

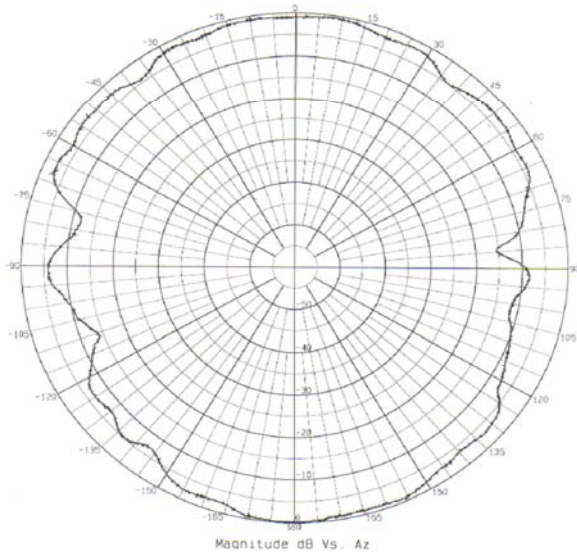


Fig. 3. Radiation Pattern of two element array with out of phase cables

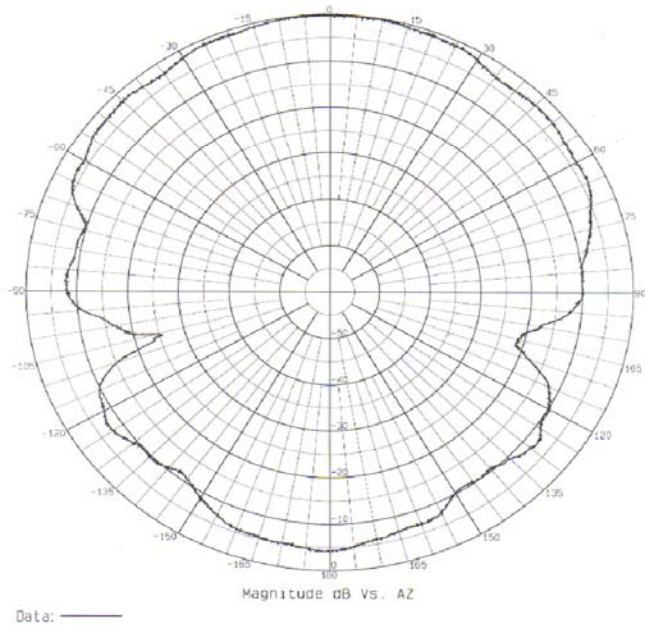


Fig. 4. Radiation Pattern of Two element array
With in phase cables

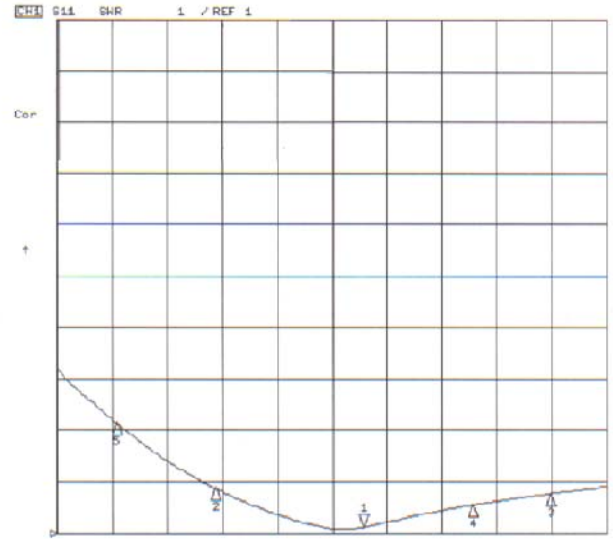


Fig. 5. VSWR of single antenna

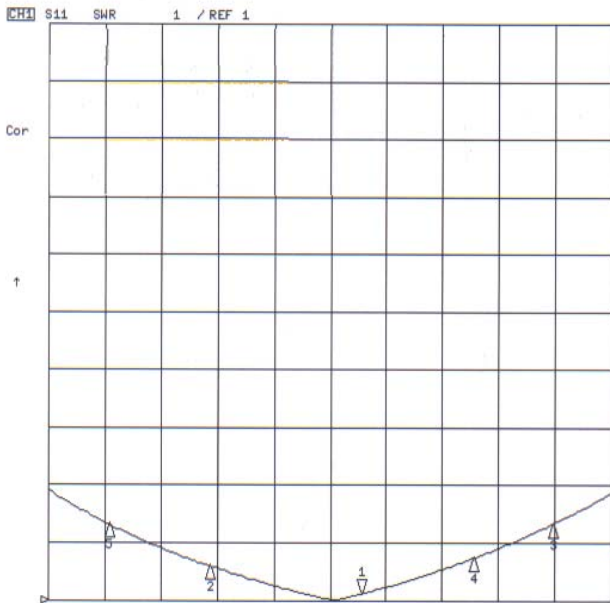


Fig. 6. VSWR of Array with out of phase cables

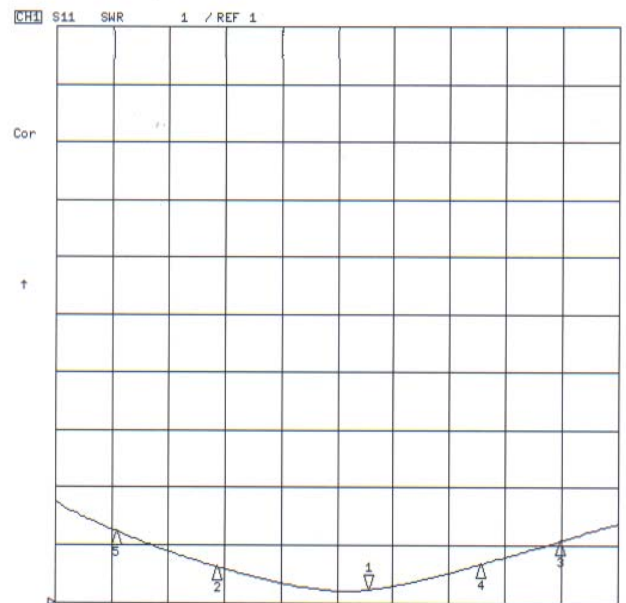


Fig. 7. VSWR of Array with in phase cables