Measurement results for single-layered reflectarray antenna with Split Rectangular Loop Elements

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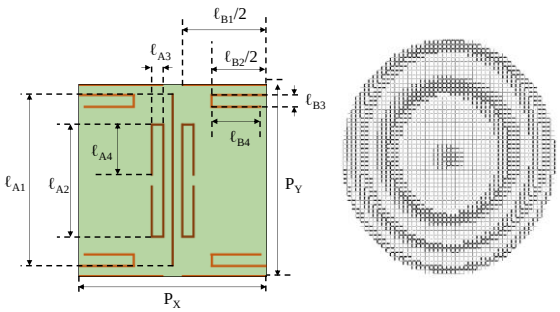
1. Introduction

Reflectarray antennas that change the beam direction depending on the polarization have been investigated [1]. In a previous study, split rectangular loop elements [2] were proposed as an element shape that satisfies the requirements, even at the resonant element spacing, where the grating lobe does not propagate in the dielectric [3]. In this report, we present the measurement results for a reflectarray designed using this element shape.

2. Reflectarray design

The previously proposed split rectangular loop element is shown in Fig. 1(a). This element shape enables 360° reflection phase-region coverage and independent phase control for each polarization [2]. The mirror surface designed based on this element shape is shown in Fig. 1(b). The aperture of the mirror surface is approximately $19.9\lambda_0$, where λ_0 is the wavelength corresponding to the design frequency. The beams of each polarization are designed to be a beamwidth (3.04°) apart from each other.

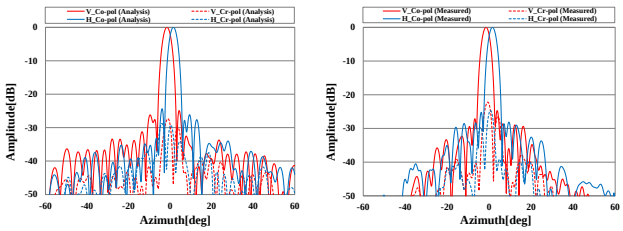


(a) Element shape (b) Mirror surface

Fig. 1 Reflectarray design

3. Measurement results

A prototype of the designed mirror surface was fabricated, analyzed, and measured. The following graphs show the radiation patterns in the Azimuth direction at f_0. Fig. 2(a) shows the analytical values, and Fig. 2(b) shows the measured values. For the measured values, the nearby patterns generally agreed with the analytical values. The graphs also show that the sidelobe and Cr-pol are sufficiently suppressed. Furthermore, the beam direction is consistent with the design values in the analysis and measurements, and the beam swings in different directions for each polarization.



(a) Analysis (b) Measured

Fig. 2 Radiation pattern of V-pol and H-pol

4. Conclusion

A reflectarray antenna was designed, fabricated, and measured using the proposed element shape. Based on the measurement results, it is possible to change the desired beam direction depending on the polarization, and the effectiveness of the proposed element shape is demonstrated.

Acknowledgments

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References

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