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A Triple-band Reflection Type Polarization Converter

Ummer Rashid Dar(*1), Mehran Manzoor Zargar(*2), Neeraj Kumar(*3), Aditya Kumar(*4), Archana Rajput(*5) and Kushmanda Saurav(*6)

*Department of Electrical Engineering, Indian Institute of Technology Jammu, Jammu-181221, J&K, India,
e-mail: umar.rashid.1021@gmail.com[1]; mehzargar@yahoo.com[2]; neerajk3231@gmail.com[3],
adityakumarbgk@gmail.com[4]; rajput.archana07@gmail.com[5]; kushmandasaurav@gmail.com[6]

In this work, a triple-band reflection type polarization converter is proposed that converts a linearly polarized incoming wave into an orthogonal linearly polarized reflected wave in the frequency ranges of 6.3–11.2 GHz and 16.2–17.6 GHz, while a circularly polarized reflected wave is obtained within the frequency range of 12.2–15.6 GHz. The unit cell design of the proposed polarization converter is studied in our previous work reported in [1]. In the present work, the performance of the polarization converter is studied experimentally by carrying out measurements on a fabricated 28 x 28 array of the 45º rotated Split Ring Resonator (SRR) structure (Figures 1(a), 1(b)). The simulated and measured co/cross reflection coefficients and polarization conversion ratio (PCR)/axial ratio (AR) of the polarization converter are shown in Figure 1(c) and Figure 1(d), respectively. The simulated and measured results show a good agreement. The contribution of this work over the earlier reported work [1] is provided in Table 1.

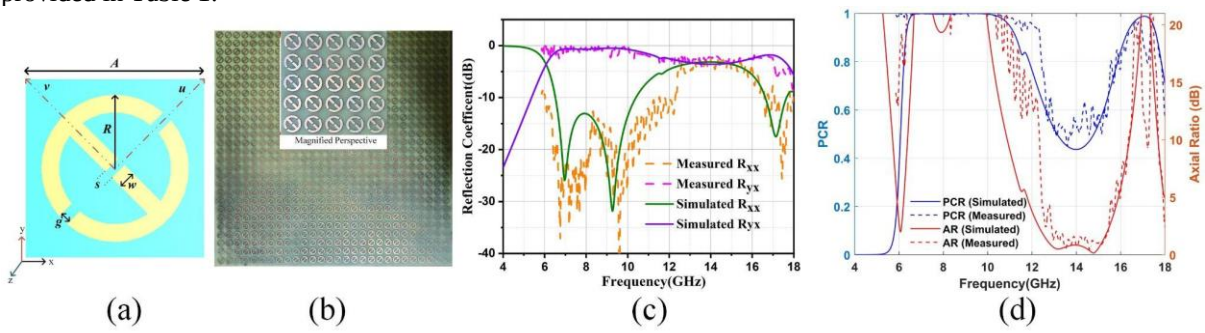

Figure 1: (a) Top view of the unit cell of the proposed polarization converter. Dimensions (in mm): A = 9.3, R = 3.84, H = 2.8, g = 0.58, w = 0.93, s = 0.47. (b) Fabricated prototype. Comparison of simulated and measured: (c) co (R_{xx}) and cross-polarized (R_{yx}) reflection coefficients, (d) polarization conversation ratio (PCR) and axial ratio (AR) of the proposed triple-band reflection type polarization converter.

T**able 1:** Comparison of the performance parameters of present work with respect to [1].

Ref	Frequency	Polarization conversion	FBW%/PCR	Angular Stability	Size
[1]	7.63-12.21 13.85-18.5 19.34-21.2	Linear-Cross Linear-Circular Linear-Cross	46.16 / > 90 28.79 / > 45 9.20 / > 90	15º	$0.26\lambda \times 0.26\lambda \times 0.08\lambda$
This work	6.3-11.2 12.5-15.5 16.2-17.6	Linear-Cross Linear-Circular Linear-Cross	56 />90 24.4 />45 8.2 />90	30º	0.20λ x 0.20λ x 0.06λ

Further, in this work, authors have included the following investigation over [1].

(a) The working principle of the polarizer is analyzed by using the uv-coordinate system .
(b) The polarization extinction ratio to quantify the efficiency and LHCP/RHCP handedness of the circularly polarized wave has been studied.
(c) The magnitude and phase difference of the co and cross reflection coefficients are also investigated for a better understanding of linear to cross and circular polarization conversion.
(d) The surface current distributions are analyzed for showing the physical interpretation of the working mechanism of the polarization converter.

1. M. A. Sofi, K. Saurav, S. K. Koul, and E. L. Tan, "Wideband Multifunctional Polarization Converter: Application to Low Radar Cross-Section Radiating System," *IETE Journal of Research*, October 2023, pp. 1-11, doi: 10.1080/03772063.2023.2258519