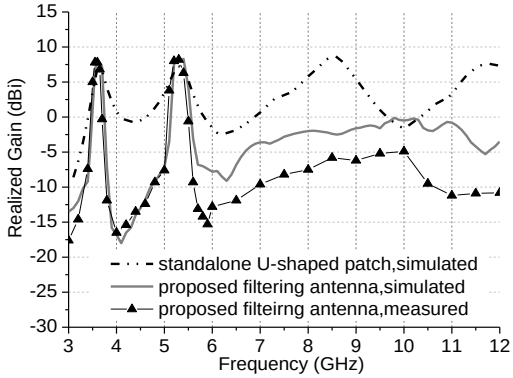

Fig. 8. The simulated and measured gain of the proposed dual-band filtering antenna.

TABLE II
COMPARISON WITH OTHER DUALBAND PATCH ANTENNAS

Types of antennas	Harmonics suppression	Polarization at two bands	Gain (dBi) (f_L/f_H)	XPD (dB) (f_L/f_H)
Ref. [13]	No	different	-1.8/1.1	-10/-22
Ref. [14]	No	consistent	-4.0/3.8	NA
This work	Yes	consistent	-7.5/8.0	-40/-30

radiation, is mainly attributed to the influence of measurement devices and the cables behind the antenna.

Fig. 8 shows the simulated and measured realized gains of the proposed dual-band filtering antenna from 3 to 12 GHz. For comparison, the simulated gain of a standalone U-slot patch antenna is also included. The proposed antenna achieves the gains of 6.5 and 7 dBi at low- and high-band, respectively. At the harmonics of 8.5 and 11.7 GHz, the traditional U-slot patch antenna has a gain of 7.5 dBi. However for the proposed filtering antenna, the gain drops sharply to below -7.5 dBi as the frequency offsets by 5.6% from the two central frequencies. At the two harmonic bands, the simulated and measured gains are significantly reduced to below -2 and -5 dBi, respectively. This demonstrates that the proposed antenna has excellent frequency selectivity and out-of-band harmonic suppression over a wideband.

Table II compares the proposed dual-band filtering antenna with the other two reported dual-band filtering antennas in [13] and [14]. The comparison focuses on the harmonic suppression, polarization, gain and XPD at the two bands. This comparison shows that this work exhibits an improved gain and XPD at the two operation bands. The works in [13] and [14] lack the investigation of harmonic suppression and the gains are relatively lower than a traditional patch antenna. In addition, the design in [13] exhibits different polarizations at the two bands, and thus the technical contribution may be insufficient.

IV. Conclusion

In this communication, a novel dual-band filtering antenna has been proposed by integrating a dual-mode resonator in the U-slot patch antenna design. The U-slot antenna as well as the resonator have been investigated. The proposed antenna exhibits an improved 2nd-order filtering response with two reflection zeros in both bands, which results in enhanced bandwidth and frequency selectivity. The bandwidth can be tuned by adjusting the coupling strength between the SLR and the patch. In addition, the harmonic suppression over a broadband has been studied. Simulated and measured results agree very well, showing an excellent frequency response in terms of impedance matching, bandwidth, frequency selectivity, out-of-band rejection, radiation and gain.

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