

Figure 1. Geometry of the triple U-shaped slot antenna

- (a) Top view of the proposed U-shaped slot antenna
- (b) Side view of the proposed U-shaped slot antenna

Based on the proposed design described earlier, this study designs, fabricates, and measures a multiple U-shaped slot microstrip patch antenna in the Hiper-LAN band. The return loss of the antenna is measured using an HP8510 network analyzer, with the far-field patterns and gain measured inside an available compact range at the RFIC Center of Kwangwoon University. Figure 2 shows the measured return loss versus frequency for the proposed antenna; Figure 3 illustrates the VSWR versus frequency at the starting point of 4.5GHz and stop point of 6.5GHz with an interval of 200MHz. The impedance bandwidth (2:1 VSWR) of the proposed antenna reaches approximately 730MHz (5.05-5.61GHz, 5.92-6.09GHz). Likewise, the bandwidth of the proposed antenna satisfies the conditions of  $VSWR < 1.5$  in the operating band (Hiper-LAN band).



Figure 2. Measured return loss vs. frequency for the proposed antenna.

The radiation characteristics of the proposed antenna are also studied. Figure 10 shows the measured radiation

patterns of the proposed antenna at 5.1, 5.3, 5.5, 5.7, and 5.9GHz. Good broadband radiation patterns are obtained. Slight asymmetry in the radiation patterns is also observed, which is largely due to the fringe and coupling effects of the four U-shaped slots.

Figure 11 shows the measured antenna gain versus frequency for the proposed antenna for five frequencies across the 5GHz band. Gain is measured at 3.45-9.28dBi. The antenna gain has a peak value of 9.28dBi, with gain variation at 5.4dBi.

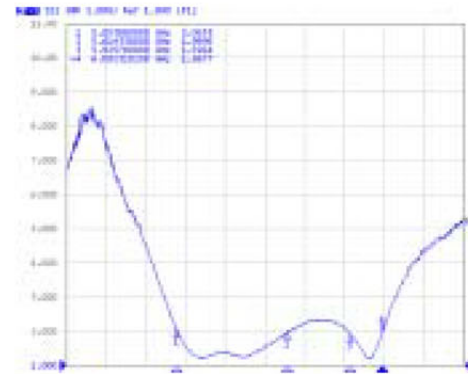
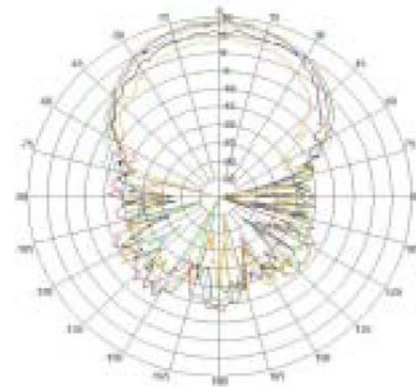
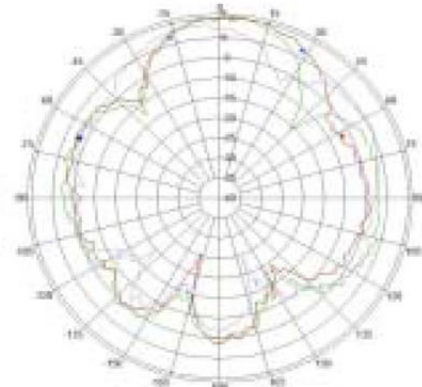


Figure 3. Measured VSWR vs. frequency for the proposed antenna.



(a) Azimuth.



(b) Elevation.

Figure 4. Radiation pattern. (a) Azimuth; (b) Elevation.

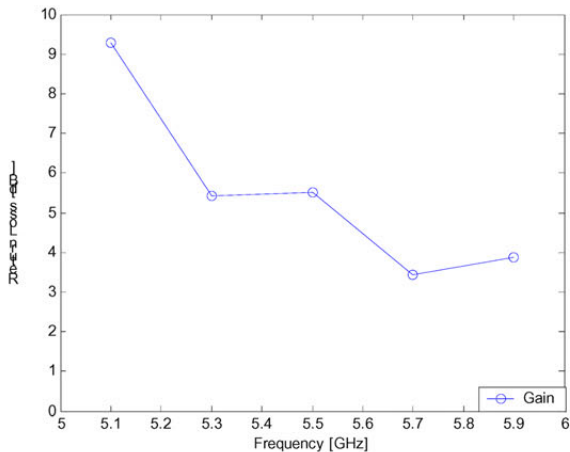


Figure 5. Measured antenna gain for the operating frequencies.

### 3. Conclusion

A multiple U-shaped slot microstrip antenna is proposed, described, and experimentally investigated for the Hiper-LAN band. By varying the U-slot width, the position of U-slot sections, the thickness of the foam, and the position of the feeding point, optimizing parameters are obtained to determine the good characteristic in the operating band. The obtained impedance bandwidth (2:1 VSWR) covers 730MHz (5.05~5.61GHz, 5.92~6.09GHz). Across the 5GHz band, the proposed antenna also shows broadband radiation pattern. Gain is measured at 3.88-9.28dBi. Therefore, the antenna is suitable for practical applications requiring broadband antennas in the Hiper-LAN band.

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