Ultra Low Profile, Unbalanced Fed Inverted F antenna on Finite Conducting Plane
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1 Introduction
The authors have proposed an ultra low profile, unbalanced fed inverted L antenna located very close on a rectangular conducting plane [1]. A simple and typical modification of inverted L antenna is an inverted F antenna [2]. In this paper, the ultra low profile, unbalanced fed inverted F antenna is proposed and its characteristics are compared with those of the base fed inverted F antenna and the ultra low profile inverted L antenna. In the numerical analysis, the electromagnetic simulator “WIPL-D” is used [3].

2 Analytical Structure
Figure 1 shows the structure of the proposed ULPIF antenna located on a rectangular conducting plane (p_xp x p_xm by p_y p_x by p_y m) and its size is fixed as p_xp = p_xm = 15mm, p_y p = 50mm and p_y m = 10mm. The coaxial radiator is mounted on the conducting plane. The radius of the outer conductor is 0.8 mm and that of the inner conductor is 0.16 mm. The inner conductor of the coaxial cable is extended from the end of outer conductor. Therefore, this antenna is excited at the end of outer conductor. The height of horizontal element is h. The design frequency is 2.45 GHz. The wavelength \( \lambda \) at 2.45 GHz is 122.45 mm.

3 Results and discussion
The calculation condition of the ULPIF antenna are antenna height h=6, 8, and 10mm, the length of shorted element \( L_s = 6.8 \) mm while the parameters of horizontal element L and L1 are optimized to match the input impedance to 50 ??? at the frequency of 2.45 GHz.
Figure 2 shows the comparison of the return loss characteristics between ULPIF, ULPIL and the base fed IF antenna.

Figure 3 shows the comparison of directive gain in the z direction between the ULPIF antenna, ULPIL antenna and the base fed IF antenna. The directive gain of ULPIF antenna becomes larger than that of ULPIL antenna. This may be due to that the horizontal length of the ULPIF antenna (L+Ls) is a little bit longer than that of ULPIL antenna.

4 Conclusion
The unbalanced fed, ULPIF antenna on a rectangular conducting plane has been proposed. The return loss and the directive gain of this antenna have been compared with those of the base fed inverted F antenna and the ULPIL antenna. The directive gain of proposed antenna is higher than that of base fed inverted F antenna. When the size of the conducting plane is 0.245 \( \lambda \) by 0.49 \( \lambda \) and antenna height is \( \lambda / 30 \), the return loss bandwidth less than -10 dB becomes 3.67 % and the directive gain is 4.15 dBi. This ULPIF antenna may be promising as the base station antenna or mobile terminal antenna of the wireless communication system.

References