Novel S shaped Dielectric Resonator Antenna for Wireless Communication

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A novel S shaped dielectric resonator antenna for wireless communication is proposed. The proposed configuration is achieved by making two symmetrical U shape notches on conventional rectangular dielectric resonator antenna (RDRA). It lowers down the quality factor and thus, improves bandwidth significantly. The optimum dimension of these notches excites the fundamental TE_{111} like mode of the conventional RDRA. The fundamental mode has a broadside pattern which radiates in the direction normal to the ground plane.

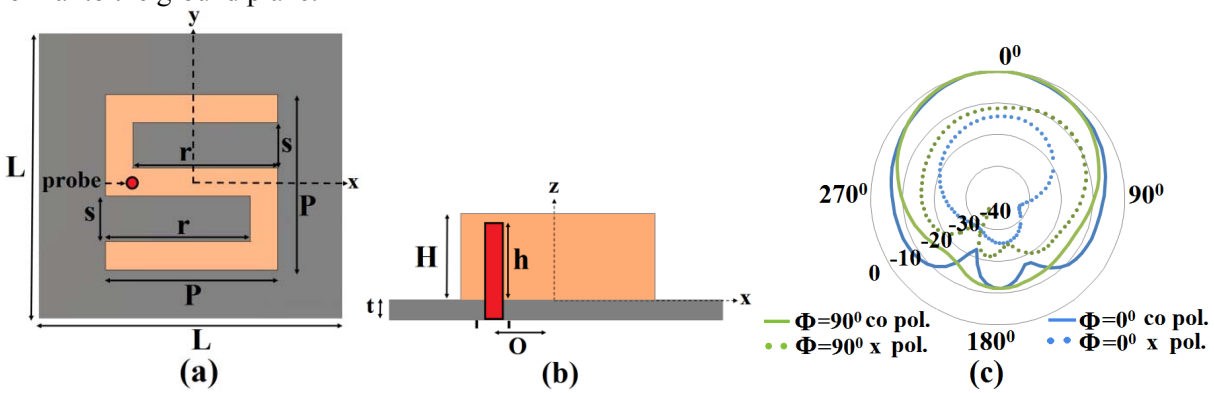

Fig.1 Top view (L=10 cm, P=3.1 cm, r=2.65 cm, s=0.8 cm), cross sectional view (H=1.5 cm, h=1 cm, O=-1.3 cm, t=0.2 cm) of the proposed S shaped dielctric resonator antenna and radiation pattern at 3.2 GHz.

The dielectric waveguide model is used for calculating the dimensions of the RDRA. The dielectric material selected is Rogers 6010 having a dielctric constant of 10.2 and dissipation factor of 0.0023. The calculated dimensions for resonant frequency of 2.4 GHz and excitaion of TE_{111} mode are 3.1 cm × 3.1 cm × 1.55 cm. The base of the RDRA is chosen to be a square for design simplicity. A coaxial probe of height 1 cm located at -0.95 cm from the center along x-axis is used for excitation of RDRA. The antenna is placed at the center of square ground plane of dimensions 10 cm × 10 cm.

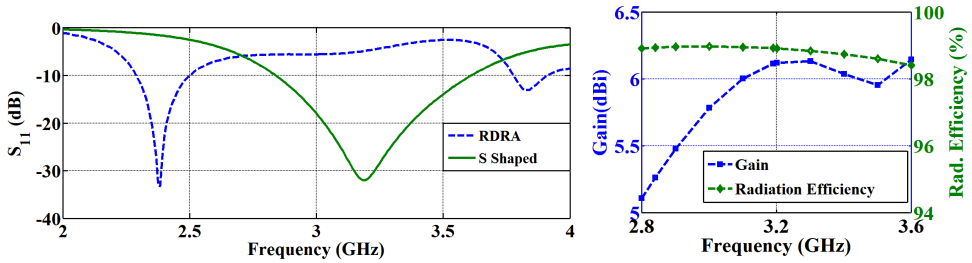

Fig.2 The S_{11} response, gain and radiation efficiency response for proposed S shaped dielectric resonator antenna.

The proposed antenna offers wide impedance bandwidth. An improvement from 10% to 25% is achieved with the consistent radiation pattern. A shift in the resonant frequency is observed from 2.4 GHz to 3.2 GHz due to the lowering down of effective dielectric constant because both are inversely related. The maximum gain of 6.2 dBi is obtained at resonant frequency while the radiation efficiency is more than 98% due to the absence of conductor losses.