

TURN STILE ANTENNA

The Antenna is similar to stub antenna with ground plane but with a feed point moved to approximately the center of the stub.

A basic turn stile consists of two horizontal short dipoles placed normal to each other as shown in fig. The individual field patterns are 'figure of eight' fitted by 90° . The total field pattern is given by

$$E = \sin \theta \cos \omega t + \cos \theta \sin \omega t$$

$$E = \sin(\theta + \omega t)$$

$$\omega t = -\theta$$

$$|E| = \sqrt{\cos^2 \omega t + \sin^2 \omega t} = 1$$

$$E = \frac{\cos(90^\circ \cos \theta)}{\sin \theta} \cos \omega t + \frac{\cos(90^\circ \sin \theta)}{\cos \theta} \sin \omega t$$

$$I_1 = \frac{V}{70 + j70}$$

$$I_2 = \frac{V}{70 - j70}$$

Where

V = Impressed emf

I_1 = current at terminals of dipole 1

I_2 = current at terminals of dipole 2

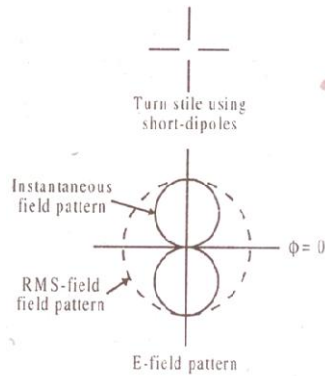
Thus

$$I_1 = \frac{V}{99} \angle -45^\circ$$

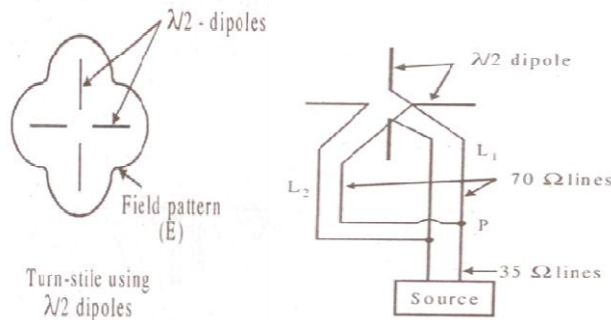
$$I_2 = \frac{V}{99} \angle +45^\circ$$

$$Z = \frac{1}{Y} = \frac{1}{\left[\frac{1}{(70 + j70)} \right] + \left[\frac{1}{(70 - j70)} \right]} = 70 + j0 (\Omega)$$

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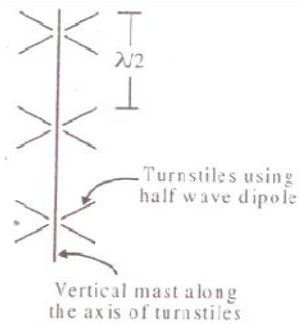


Turn stile array with individual field pattern



Turn stile array with resultant field pattern

The turn stile is most suited for TV transmission for frequency from 50 MHz. Directivity can be increased by stacking super turn stiles one above the other as assshown in figure.



Stack of turn stile array