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Research Article

Performance Characteristics of a Vee Antenna for Short Haul Communication

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Abstract

The Vee antenna is a directional antenna with a slightly higher gain as compared to dipole antenna.Here the performance of a Vee antenna is analysed operating at a frequency of 235 Mhz.The length and the angle beteen the two arms is determined accordingly and the results shows a return loss of -17.4 dB at resonant frequency.The VSWR is constant over a broad range of frequencies.The radiation pattern shows its directional properties as well as a considerable gain in the backlobe like an omni directional antenna. The Gain at its best is 20 dBuV. The antenna can be effectively used for short range communication.

Keywords: *Vee Antenna, Return Loss, VSWR, Radiation pattern, Gain.*

1. Introduction

An antenna consists of an arrangement of metallic conductors (elements), electrically connected (often through a transmission line) to the receiver or transmitter. An oscillating current of electrons forced through the antenna by a transmitter will create an oscillating magnetic field around the antenna elements, while the charge of the electrons also creates an oscillating electric field along the elementsn(Harrison, 1943). These time-varying fields, when created in the proper proportions, radiate away from the antenna into space as a moving transverse electromagnetic field wave. Conversely, during reception, the oscillating electric and magnetic fields of an incoming radio wave exert force on the electrons in the antenna elements, causing them to move back and forth, creating oscillating currents in the antenna (Schrank. H *et al*,1988). Antennas are required by any radio receiver or transmitter to couple its electrical connection to the electromagnetic field. Radio waves are electromagnetic waves which carry signals through the air (or through space) at the speed of light with almost no transmission loss. Radio transmitters and receivers are used to convey signals (information) in systems including broadcast (audio) radio, television, mobile telephones, wi-fi (WLAN) data networks, trunk lines and point-to-point communications links (telephone, data networks), satellite links, many remote controlled devices such as garage door openers, and wireless remote sensors, among many others(Tsukiji, T. *et al*,2002;Constantine A. Balanis *et al*,2005). Radio waves are also used directly for measurements in technologies including RADAR, GPS, and radio astronomy. In each and every case, the transmitters and receivers involved require antennas.

2. VEE Antenna

A Vee ANTENNA is a bidirectional antenna used widely in military and commercial communications. It consists of two conductors arranged to form a V. Each conductor is fed with currents of opposite polarity. The V is formed at such an angle that the main lobes reinforce along the line bisecting the V and make a very effective directional antenna (Constantine A. Balani, 2005; Qiu Jing-hui, 2008). Connecting the two-wire feed line to the apex of the Vee and exciting the two sides of the V 180 degrees out of phase cause the lobes to add along the line of the bisector and to cancel in other directions. The lobes are designated 1, 2, 3, and 4 on leg AA', and 5, 6, 7, and 8 on leg BB'. When the proper angle between AA' and BB'

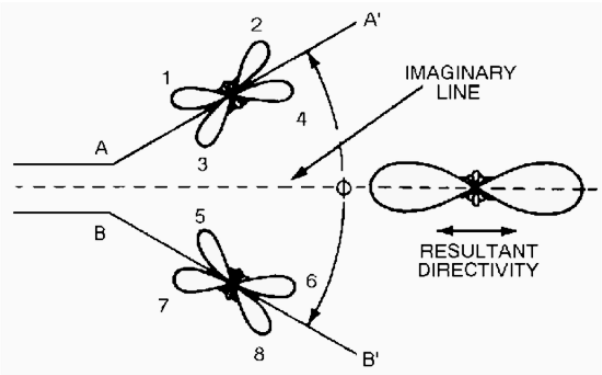

Fig 1: Formation of directional radiation pattern from a resonant V antenna.

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is chosen, lobes 1 and 4 have the same direction and combine with lobes 7 and 6, respectively. This combination of two major lobes (Wen-Shan Chen *et al*,2009; Nielsen E, 1970) from each leg results in the formation of two stronger lobes, which lie along an imaginary line bisecting the enclosed angle. Lobes 2, 3, 5, and 8 tend to cancel each other, as do the smaller lobes, which are approximately at right angles to the wire legs of the Vee. The resultant waveform pattern is shown at the right of the Vee antenna in figure 1.

Performances of the Proposed Antenna

The performance of a Vee Antenna operating at 235 MHz is analysed. It has a length of 120 cm with both arms fully extended. The Vee antenna is polarized in the direction of its elements. The gain of this antenna is 20 dBuV at its best (front lobe) as can be seen from the fig 2.

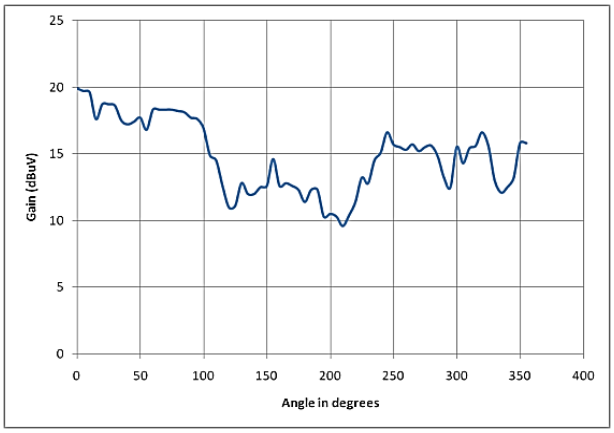

Fig 2.Gain vs angle plot of Vee Antenna

The return loss is around -17.4 dB at resonance frequency of about 235 MHz at a bandwidth of 33 MHz for short haul communication. The VSWR is constant for a wide range of frequencies.

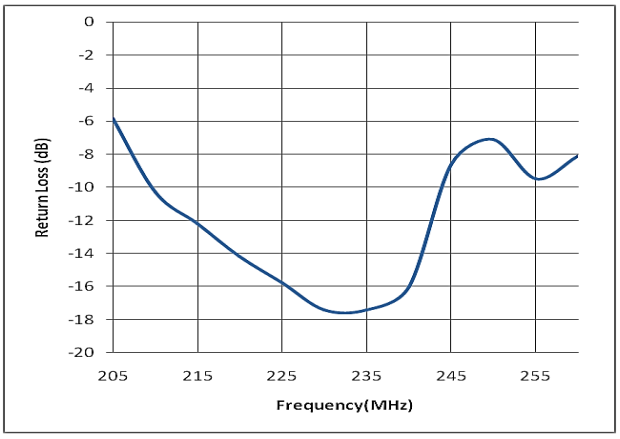

Fig 3: Return loss vs Frequency plot of the proposed Vee antenna

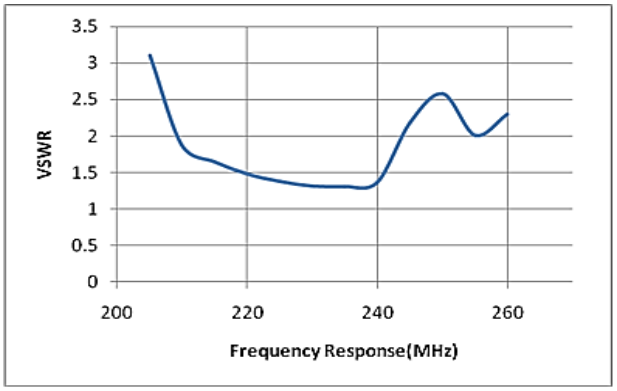

Fig 4: VSWR Vs Frquency Response

From the radiation pattern obtained by rotating the antenna from 0 to 360 degrees by a standard antenna setup, we can see that the vee antenna has a fair gain in all the lobes and high gain in the front lobe.

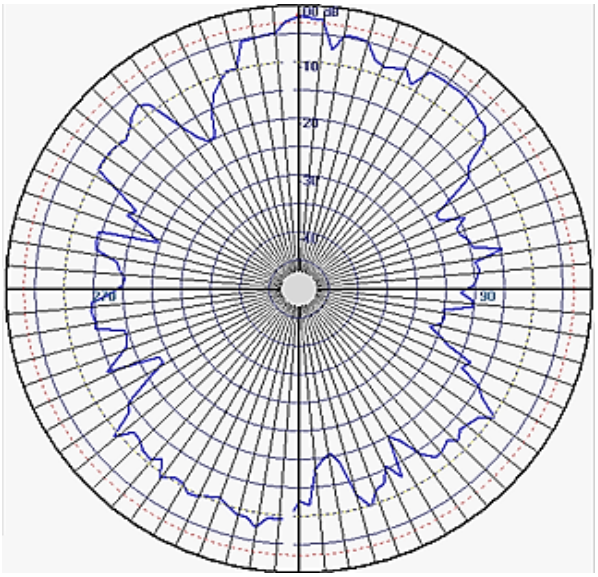

Fig 5: Vee Antenna azimuth radiation pattern

Conclusions

This Vee antenna has an effectively high gain and also considerable return loss at its resonance frequency.The bandwidth obtained is around 33 MHz. It can used for short range communication and also in military for low frequency applications.

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