A Survey on Microstrip Antenna With Parasitic Ring For CNSS Application

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Abstract :- A compact single-feed circularly-polarized(CP) wide beam microstrip antenna is proposed for CNSS application. The antenna is designed with a double-layer structure, comprising a circular patch with two rectangular stubs along the diameter direction and a parasitic ring right above it. The resonance frequency and the CP characteristics are mainly controlled by the circular patch and the rectangular stubs, respectively. The vertical HPBW (half power beam width) could be widened by the parasitic ring.
Keywords: - Microstrip antenna, Parasitic ring, Antenna gain.

INTRODUCTION-

In the last decades, satellite positioning and navigation have become more and more important, both for military as well as civil use. GPS (Global Positioning System) in USA, Galileo in European Unionand Glonass in Russia have been developed greatly. In China, CNSS (Compass Navigation Satellite System) or "BeiDou" in its Chinese name, began to provide navigation and positioning services in late 2001. The downlink band (S band) of the CNSS system is 2491.754.08 MHz. In order to receive the satellite signal quickly, the terminal antenna generally should be designed to have wider vertical HPBW and higher gain for low elevation angle. That has especially important meaning for CNSS which has fewer satellites compared with others at present. According to the official performance specifications of CNSS antennas, the gain for 5 elevation angle should be no less than 3 Db and its out-of-roundness for the horizontal radiation pattern must be less than 3 dB.

Quadrifilar helix antenna has good circular polarization characteristics. Its heart-shaped radiation pattern, which leads to wide vertical HPBW and high gain for low elevation angle, could meet the demand of satellite communication. However, the profile of quadrifilar helix antenna is too high to be coplanar and integrated with communication systems. Microstrip antenna has many advantages such as low profile, light weight, easy fabrication and conformability to mounting hosts. Meanwhile it could be easy to generate good circular polarization characteristics and because of this it has been highly appreciated. Generally, the vertical HPBWof microstrip antenna is about70–110 . On the premise of circular polarization characteristics, how to broaden the vertical HPBW and improve the gain for low elevationangle are very challenging research topics at present.

There are some traditional ways to broaden the vertical HPBWof circularly polarized microstrip antennas, such as using the materials with high permittivity, decreasing the ground size and so on. In a singlefeedcircularly-polarized microstrip antenna is placed in a semi-closed dielectric wall, which could effectively broaden the vertical HPBW and meanwhile maintain good low-profile characteristics. But its lateral dimension is large. In a wide-beam circularly-polarized microstrip- dielectric antenna is designed through adjusting the substrate size and the vertical radiation beamwidth could be widened. Nevertheless, this structure has very strict requirements for the ground size,which may be rather hard to be applied in real environment. Besides, the half power vertical beam width of slot antenna could be widened with a cavity , but it will bring in mass waviness in the radiation pattern and the out-of-roundness for the horizontal radiation pattern may become bigger.

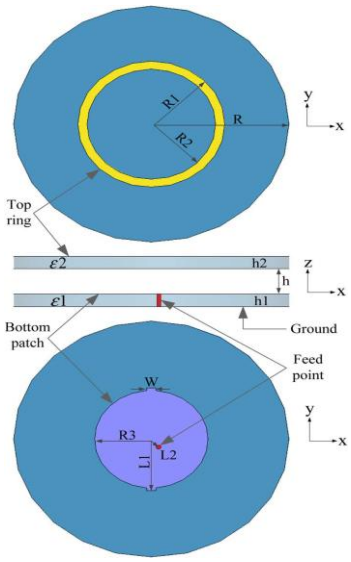

Fig.1 Geometry of the wide-beam circularly-polarized microstrip antenna

In this communication, a novel single-feedwide-beam circularly-polarized microstrip antenna for CNSS application is proposed. The proposed antenna is designed with a double-layer structure, which has a main radiation patch and a parasitic ring. Through simulated and measured results, it is demonstrated that this structure could effectively widen the vertical HPBW and improve the gain of low elevation angle for circularly-polarized microstrip antennas. Moreover, it could maintain good omnidirectional characteristics for horizontal radiation pattern. This structure is simple, easy to manufacture and has a good low profile. This project aims to receive the satellite signal quickly.

LITERATURE SURVEY

Assembled dual-band broadband quadrifilar helix antennas with compact power divider networks has been proposed for CNSS application. Its heart-shaped radiation pattern, which leads to wide vertical HPBW and high gain for low elevation angle, could meet the demand of satellite communication. However, the profile of quadrifilar helix antenna is too high to be coplanar and integrated with communication system. [1]

Dual-band circularly-polarized square microstrip antenna is developed. In this proposed antenna the described the advantages of microstrip antenna such as low profile, light weight, easy fabrication and conformability to mounting hosts. Meanwhile it could be easy to generate good circular polarization characteristics and because of this it has been highly appreciated. [2]

A Rectangular Dielectric fortification for wide-beamwidth patch arrays for cnss application. a single feed circularly-polarized microstrip antenna is placed in a semi-closed dielectric wall, which could effectively broaden the vertical HPBW and meanwhile maintain good low-profile characteristics. But its lateral dimension is large [3]

A novel wide beam circular polarization antenna-microstrip- dielectric antenna, for cnss application is proposed a wide-beam circularly-polarized microstrip-dielectric antenna is designed through adjusting the substrate size and the vertical radiation beamwidth could be widened. Nevertheless ,this structure has very strict requirements for the ground size, which may be rather hard to be applied in real environment.[4]

Dual-band circularly polarized pentagonal slot antenna *IEEE Antennas Wireless Propag has been* presented for cnss application. In this proposed antenna the described the advantages of microstrip antenna such as low profile, light weight, easy fabrication and conformability to mounting hosts. Meanwhile it could be easy to generate good circular polarization characteristics and because of this it has been highly appreciated [5]

"Low-profile cavity-backed crossed-slot antenna with a single-probe feed designed for 2.34 GHz satellite radio applications. In this paper, the half-power vertical beam width of slot antenna could be widened with a cavity [11], but it will bring in mass waviness in the radiation pattern and the out-of-roundness for the horizontal radiation pattern may become bigger. [6]

FEEDING TECHNIQUE-

A feed is used to excite to radiate by direct or indirect contact. The feed of microstrip antenna can have many configurations. In this we have discussed some of the feeding techniques.

Table1. Different Feed Techniques

Characteristics	Microstrip Line Feed	Co axial Cable Feed	Aperture Coupled Feed	Proximity Coupled Feed
Spurious Feed Radiation	More	More	Less	Minimum
Reliability	Better	Poor	Good	Good
Fabrication	Easy	Soldering and Drilling	Alignment Required	Alignment Required
Impedence Matching	Easy	Easy	Easy	Easy

BASIC ANTENNA PARAMETER-

Radiation Pattern

A radiation pattern of antenna defines the variation of the power radiated by an antenna as a function of the direction away from the antenna.

Directivity

It is a measure of how directional an antenna's radiation pattern is. The directivity of an antenna increases as its Beamwidth is made smaller.

Antenna Efficiency

An efficiency of antenna is a measure of how much power is radiated by the antenna relative to the antenna input power.

Antenna Gain

Gain of antenna describes how much power is transmitted in the direction of peak radiation to that of an isotropic source.

Effective Aperture

Effective aperture is a measure of the power captured by an antenna from a plane wave.

ADVANTAGES AND DISADVANTAGES-

Microstrip antenna has several advantages over conventional microwave antenna. The various advantages and disadvantages are given in table:

Sr. No.	Advantages	Disadvantages
1	Low Weight	Low Efficiency
2	Low Profile	Low Gain
3	Thin Profile	Large Ohmic Loss
4	Linear and Circular Polarization	Low power handling capacity

CONCLUSION-

A survey on microstrip antenna for CNSS application is presented in this paper. A practical method has been discussed for controlling the vertical HPBW of circularly polarized microstrip antennas. This method is based on a parasitic ring right above the microstrip antenna.Different feeding techniques and basic parameter of antenna have been studied in this paper.

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