A Compact Spherical Dual-Polarized Antenna Array for 5G Wireless Communication

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Abstract

Two novel dual-polarized antenna array units and a new method to fabricate compact spherical antenna array for 5G wireless channel characterization are proposed in this paper. The traditional planar metallic reflectors are replaced by polyhedral reflectors in our antenna arrays, through which the distance between each antenna units is controlled to half of the wavelength. The relative bandwidth of the proposed antenna array units are 62.1% and 63.3%. The mutual coupling of two ports is below -20 dBi. And the maximum gain of two types of antenna array units is from 4.58 dBi to 6.52 dBi.

Background

1) Multipath propagation channel characteristics measuring for 5G.
2) Traditional spherical measuring antenna array: expensive and not compact.

Simulated Results

Simulated S11 and S12/S21 of the proposed antenna.

Simulated radiation patterns of the antenna unit with a pentagonal reflector beneath. (a) 2.6 GHz. (b) 3.5 GHz. (c) 4.5 GHz.

Simulated radiation patterns of the antenna unit with a hexagonal reflector beneath. (a) 2.6 GHz. (b) 3.5 GHz. (c) 4.5 GHz.

Configuration

Configuration of the crossed-dipole antenna and the reflector structure.

A prototype of the proposed antenna array.

The transformation from a plane reflector to a polygon reflector.

Conclusions

This paper proposed two antenna array units. Two different types of units share a same crossed-dipole antenna part itched on Rogers RO4350 substrate. The metallic kernel is made of stainless steel. Each crossed-dipole antenna is fed by two coaxial cables, and all feeding coaxial cables go through the holes on metallic plates soldered together.

This paper proposed two antenna array units. Two different types of units share a same crossed-dipole antenna part itched on Rogers RO4350 substrates, but have different stainless steel reflector structures. The distance between each antenna units is controlled to about half the wavelength, which can guarantee the channel measuring system’s compactness and the space coverage of the measurement.

1) Both of the proposed unit covers part of the frequency band of China Mobile’s 5G wireless communication networks (2515 MHz - 2675 MHz), and the whole frequency band of China Telecom and China Unicom’s (3400 MHz - 3600 MHz).
2) The S12 of the antenna unit with a hexagonal reflector beneath is below -20 dB. And for the one with a pentagonal reflector, the S12 parameters is below -25 dB among the whole frequency range.
3) The polarization isolation for both antenna units is above 20 dB. The maximum gain of the antenna unit with a hexagonal reflector beneath is from 5.91 dBi to 6.52 dBi. And the maximum gain of the antenna unit with a pentagonal reflector beneath is from 4.58 dBi to 6.22 dBi.

References