

Method to improve the quality of the local access point based on mixed polarization of MIMO antenna

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Abstract. *The given work is devoted to increase of carrying capacity of Wi-Fi channel with MIMO by use the mixed polarization antenna system and orthogonal data coding. We investigate how this depends on the array geometry and the electric field polarization. Moreover, we validate our theoretical predictions with measurements above a nearly perfectly flat surface*

Keywords: *Wi-Fi, MIMO, mixed polarization, orthogonal data coding.*

I. INTRODUCTION

Interest in using the properties of polarization of radio waves under interference has increased at the present time. The polarization can be constant, permanently existing in a certain orientation, or it can rotate with each wave cycle.

Polarization sometimes plays an important role in wireless communication systems. The orientation of the linear antenna, dipole, and vibrator corresponds to the polarization of radio waves received or transmitted by this antenna.

Thus, a vertical antenna receives and emits vertically polarized waves, and a horizontal antenna receives or emits horizontally polarized waves. The best short-range communication is achieved when the transmitting and receiving antennas (source and receiver) have the same polarization. The least effective short-range communication usually occurs when two antennas are located at a right angle (for example, one horizontal and one vertical). At large distances, the atmosphere can cause fluctuations in the polarization of radio waves, so the difference between horizontal and vertical becomes less significant.

Thus, an ideal vertical antenna receives and radiates vertically polarized waves, and a horizontal antenna receives or radiates horizontally polarized waves. Of course, the best short-range communication is achieved when the transmitting and receiving antennas (source and receiver) have the same polarization. Naturally, the least effective short-range communication usually occurs when two antennas are at right angles. At large distances, the atmosphere can cause fluctuations in the polarization of radio waves, so the difference between horizontal and vertical becomes less significant. Under the conditions of short-range communication, the influence of interference leads to the fact that the received wave becomes arbitrarily different from the polarization transmitted. In this connection, the reception and processing of orthogonal field components becomes relevant. It seems relevant further development of communication systems based on the signal of double polarization.

II. PROBLEM SOLUTION AND RESULTS

The diversity of transmitted polarizations is proposed as an alternative to spatial diversity in order to limit the aperture of

antenna arrays at both ends of the radio link. It is proposed to consider the use of different combinations of polarization states of signals on the emission and reception. It is expected to receive a combination of polarization, when the fluctuations of the main polarization signal channel will be minimal.

The spatial orientation of the electric field component is called polarization of the EM wave. The type of the polarization is defined by the mark that electrical field component 'draws' while the wave propagates.

For the Linear polarization direction of E is constant and does not change with time. The type of the linear polarization can be vertical, horizontal, or slant ($\pm 45^\circ$). Vertical polarization is Transverse electric (TE) polarization or parallel polarization. Horizontal polarization is Transverse magnetic (TM) polarization or perpendicular polarization. For the Elliptical polarization the direction of E changes according to ratio of E_z/E_y , if x is the direction of propagation.

For Circular polarization the amplitude of E is time-independent. The rotation of the polarization (either elliptical or circular) can be right-handed circular polarization (RHCP) (=counter clockwise) or left-handed circular polarization (LHCP) (=clockwise).

Actual transmitted signal characterized by the parameters of the polarization ellipse - the angle of ellipticity and orientation angle of semi-major axis of the ellipse. Then, omitting the factors - angular frequency, attenuation and range, the vector of the electric field near a transmitting antenna can be represented in the form of the polarization vector of the emitted signal

III. CONCLUSIONS

Research results indicate the different propagation conditions at different polarizations at the two radiation patterns. Various orthogonal polarizations create different conditions improvement and development of troposphere communication systems. The research results indicate the need to manage the state of orthogonal polarizations, depending on the range and propagation conditions.

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