



# X-BAND COAXIAL MONOPOLE ANTENNA WITH AN ADDITIONAL SCREEN

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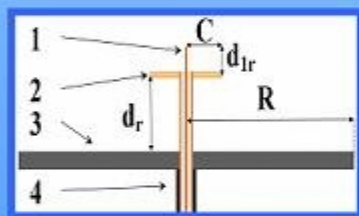
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## Abstract

The novel coaxial monopole antenna design with an additional metal screen is presented. The radiation characteristics of this antenna are investigated depending on a distance between the basic/ground and additional screens, as well as on dimensions of the last. Calculated and experimental radiation patterns are compared in the operative frequency range and their differences revealed are discussed. Monopole antenna of this kind can be considered as a challenge candidate for various practical applications both a single radiator and array component.

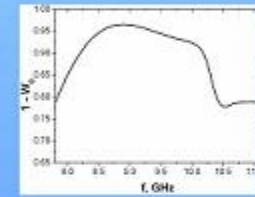
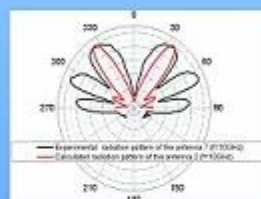
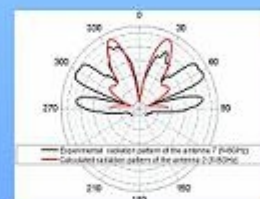
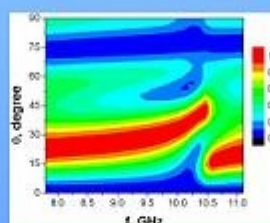
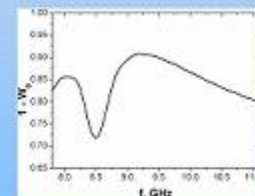
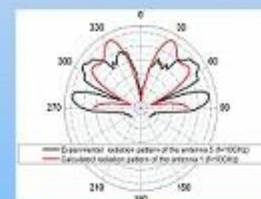
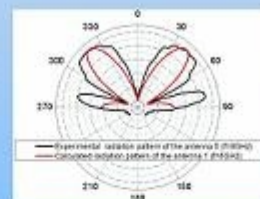
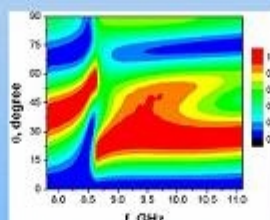
## Introduction

Monopole antennas have found wide applications in WLAN systems [1], subsurface communication, geophysical exploration, biomedical telemetry, for mobile terrestrial and aerospace communication systems etc. As an advantage of the given class of antennas is the ability to form different conical radiation patterns by means of architecture changing of the separate elements of antenna, for example, the geometrical shape [2, 3] and size [4] of the monopole. It makes new demands to the permanent improvement of their characteristics and stimulates a permanent search of new antenna designs. The main objective of this research is a features clarification in the radiation pattern formation with respect to a coaxial monopole antenna with an additional metal screen and investigations of its basic characteristics.



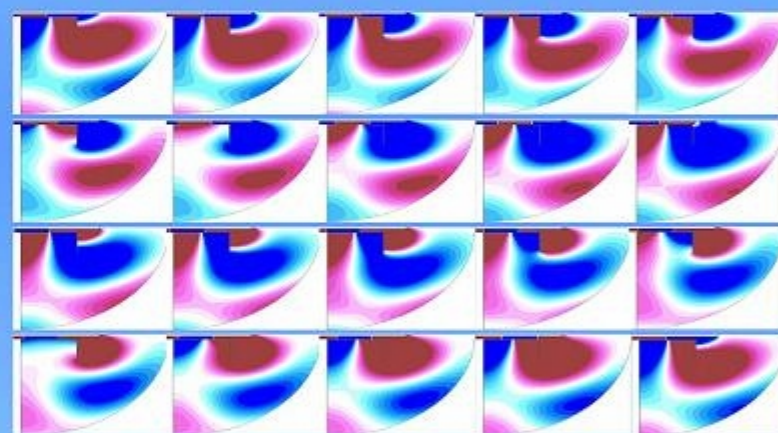
Side view of the monopole antenna: 1-monopole; 2-additional metal screen; 3-basic screen/ground plane; 4-coaxial cable.

Antenna №	$d_r$ , mm	$C$ , mm	$R$ , mm
1	1.9	10	∞
2	3.0	10	∞
3	7.5	10	230
4	1.5	10	230
5	1.9	10	230
6	22.5	10	230
7	3.0	10	230
8	7.5	15	230
9	1.5	15	230
10	1.9	15	230
11	22.5	15	230
12	3.0	15	230

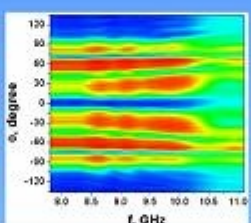
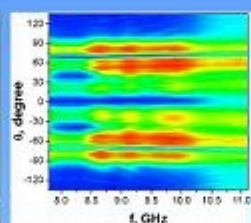
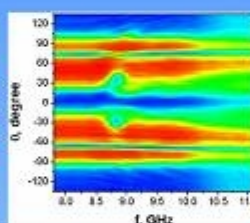
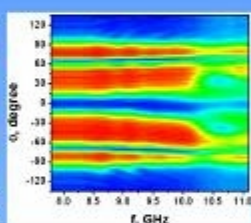
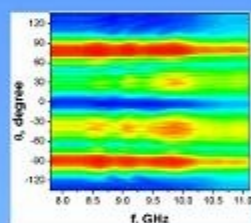


Calculated antenna efficiency: antenna №1 (upper Figure), antenna №2 (bottom Figure)

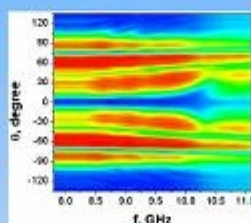
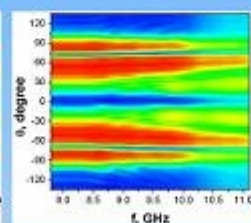
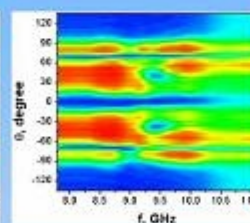
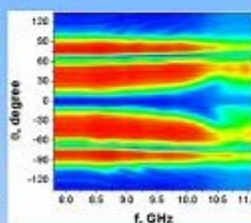
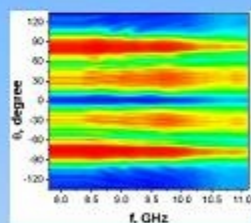
2D plot of calculated radiation patterns with normalized signal amplitudes at the every fixed frequency. a) upper picture - for the antenna №1; b) bottom picture - for the antenna №2



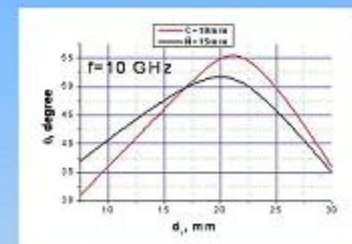
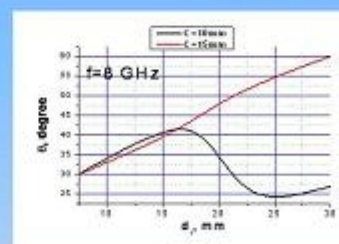
Calculated near field distributions ( $H_q$ -component) highlighted in the successive time points of the antenna №1 with an additional metal screen at the frequency  $f=7.9$  GHz



2D plots of experimental radiation patterns of antennas №3 - №7



2D plots of experimental radiation patterns of antennas №8 - №12



The elevation angle versus the parameter  $d$ ,

## Conclusions

The novel coaxial monopole antenna design with an additional element as the second metal screen is presented. It was found that the different conical radiation patterns can be formed by variations of both the distance between these screens and additional screen dimensions. We note that the multi-beam radiation patterns in experiment are formed as a result of interference between the waves of the basic antenna radiation and repeated waves scattered from boundaries of the basic screen. A possibility of antenna operation in the dual-band mode has been shown. The monopole antenna design suggested can be used as a basic one in manufacturing the compact and effective antenna arrays.

## Acknowledgements

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