

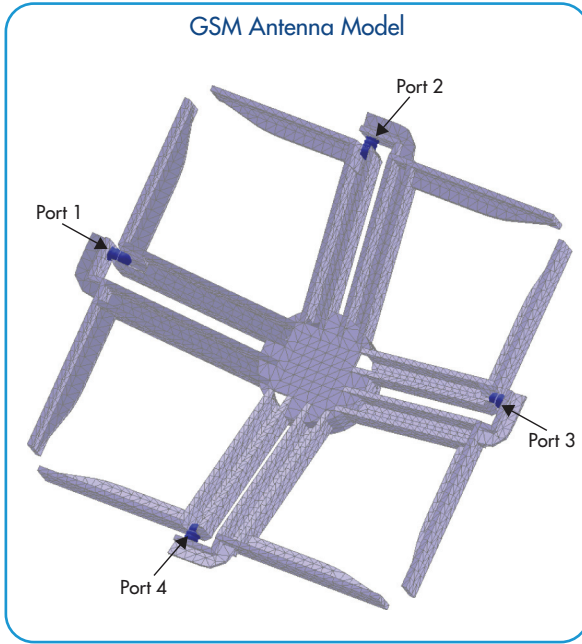


# DUAL POLARIZED DIPOLE ARRAY ANTENNA

## Introduction

Many applications require dual-polarized operating antennas including wireless communication, broadband stations and cell towers. Dual polarized antennas excite two orthogonal modes, which generate the vertically and the horizontally polarized electric field. This application demonstrates simulation of GSM dual polarized antenna at 1.9 GHz.

## Simulation Model Description



Simulation model of GSM dual polarized antenna contains 10,316 triangles. All parts of the antenna are symmetrical.

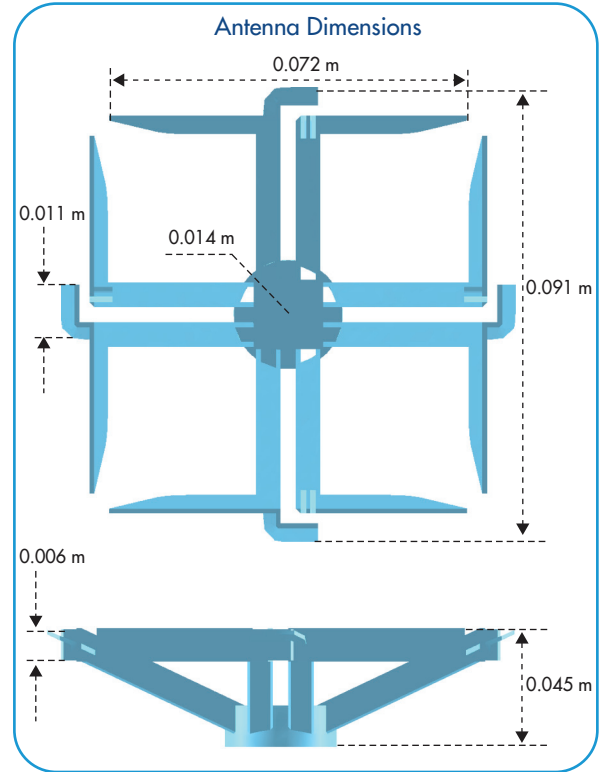
Antenna is represented as 4-port network as shown below:

$$\begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix} = \begin{bmatrix} S_{11} & S_{12} & S_{13} & S_{14} \\ S_{21} & S_{22} & S_{23} & S_{24} \\ S_{31} & S_{32} & S_{33} & S_{34} \\ S_{41} & S_{42} & S_{43} & S_{44} \end{bmatrix} \cdot \begin{bmatrix} a_1 \\ a_2 \\ a_3 \\ a_4 \end{bmatrix}$$

However according to symmetries of geometry following simplifications can be considered:

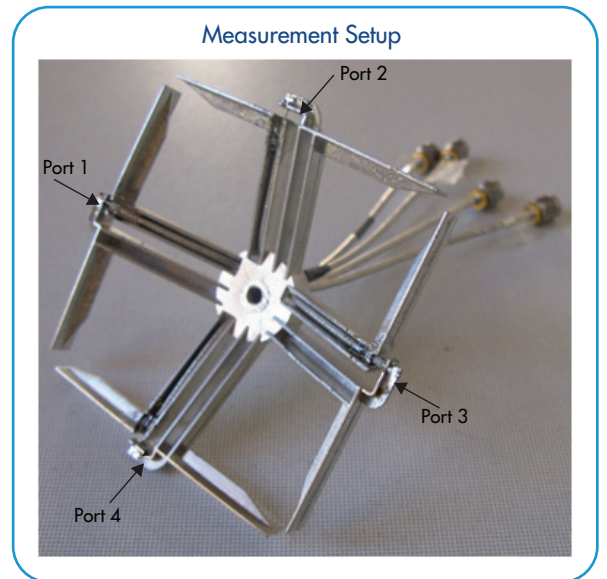
$$\begin{aligned} S_{se} &= S_{11} = S_{22} = S_{33} = S_{44} \\ S_{mc} &= S_{12} = S_{23} = S_{34} = S_{41} \\ S_{ac} &= S_{13} = S_{42} \end{aligned}$$

Where *se*, *mc* and *ac* are correspondingly "self", "mutual coupling" and "adjacent coupling".



## Measurement Setup

Measurements were performed in EMCoS laboratory.

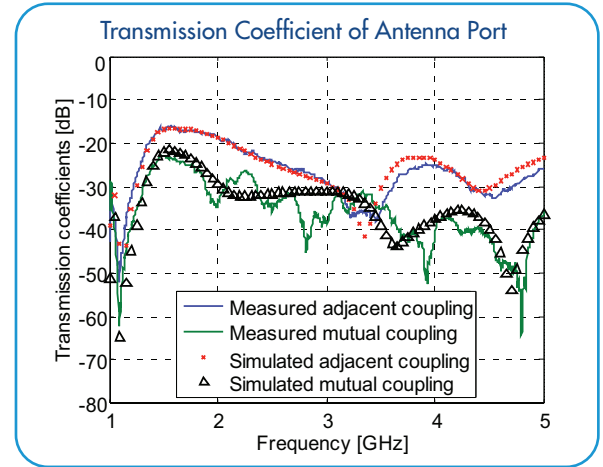
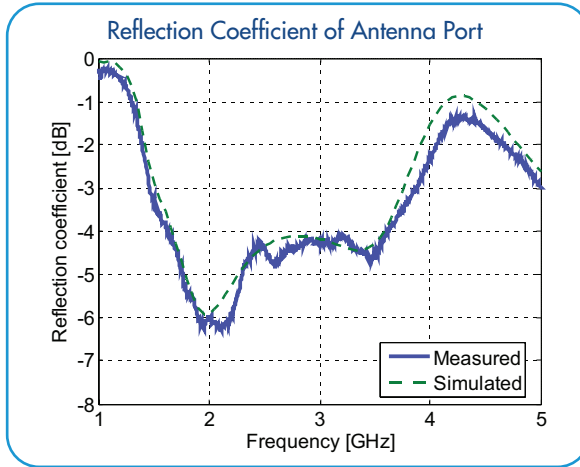




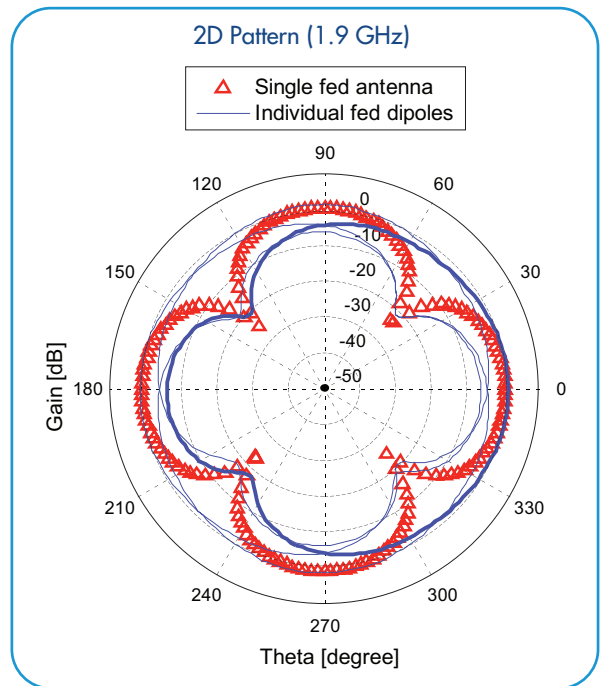
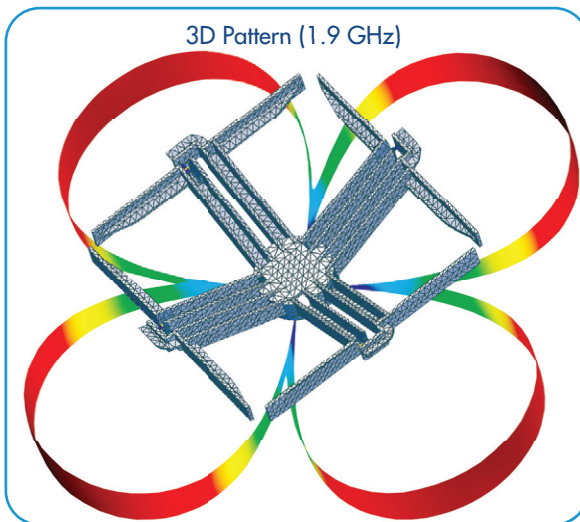
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## Results

Measured and simulated reflection coefficients and coupling levels between antenna ports are shown below:



For proper antenna functionality dipoles are fed simultaneously from single source. Simulated radiation patterns of antenna in individual and single feeding models are presented below:



## Conclusions

According to performed investigation the main conclusions are:

- GSM dual polarized antenna simulations can be effectively done in EMC Studio and EMCoS Antenna VLab environment
- In case of single feeding antenna array is dual polarized
- Simulated characteristics of GSM dual polarized antenna are in good agreement with measurements results