

Antenna array for off-body communication at 60 GHz

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OUTLINE

- Introduction
- Off-body antenna
- SIW dividers
- Off-body antenna array
- Results

INTRODUCTION

- Communications: **on-body, off-body**, in-body
- Frequencies: **2.4 GHz, 5.8 GHz, 60 GHz**
- Conventional antenna design requirements:
 - Reflection coefficient $< -10\text{dB}$
 - Gain
 - Bandwidth
- Substrate materials for antennas:
 - Low loss materials
 - Sufficiently large and stable thickness
 - Flexible
 - Waterproof, fire-resistant

OFF-BODY ANTENNA

Selected methodology

- Antenna for off-body communication
- Operating frequency 60 GHz
- SIW slot antenna
- Substrate CuClad217, thickness 0.508 mm, permittivity 2.17

Structure of antenna and far-field results at 60 GHz

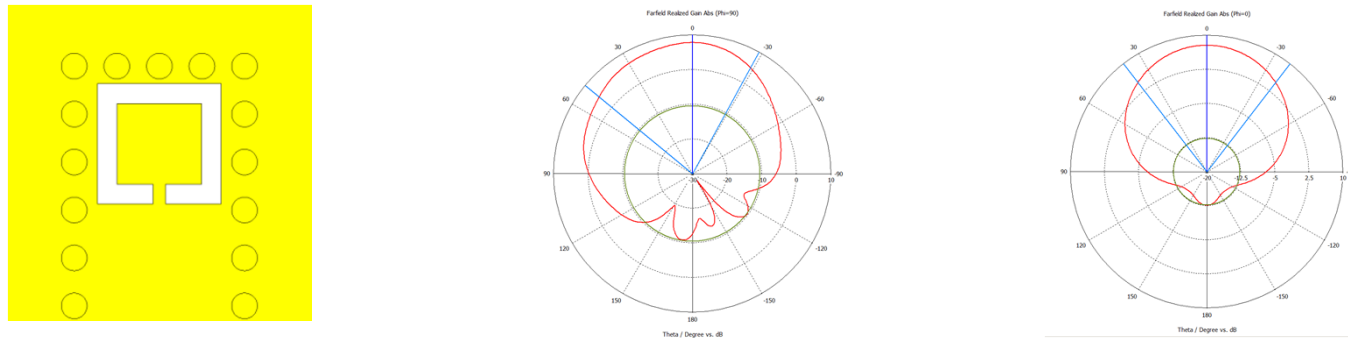


Fig. 1: Structure of antenna (left), E-field pattern (center), H-Field pattern (right).

OFF-BODY ANTENNA

Impedance matching of original antenna

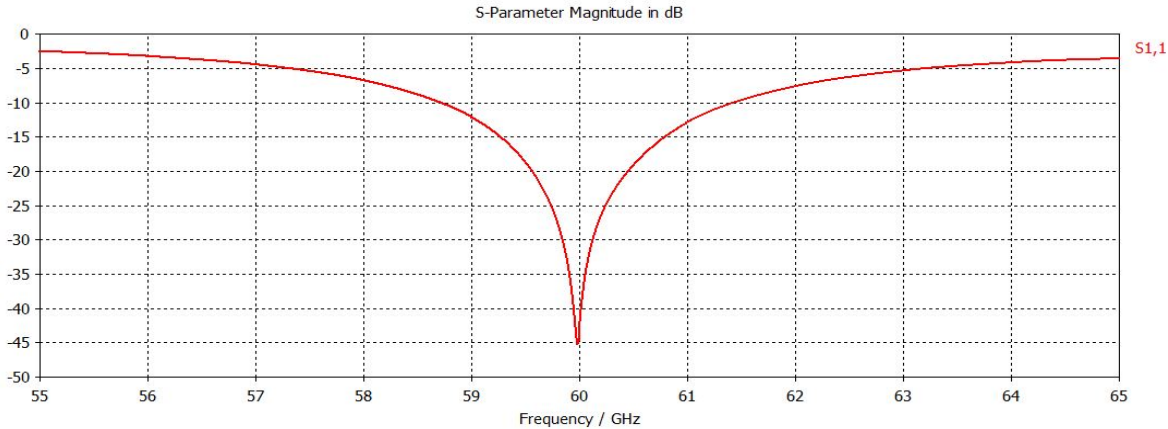


Fig. 2: Simulated frequency response of reflection coefficient of designed antenna.

Experiments for making broadband

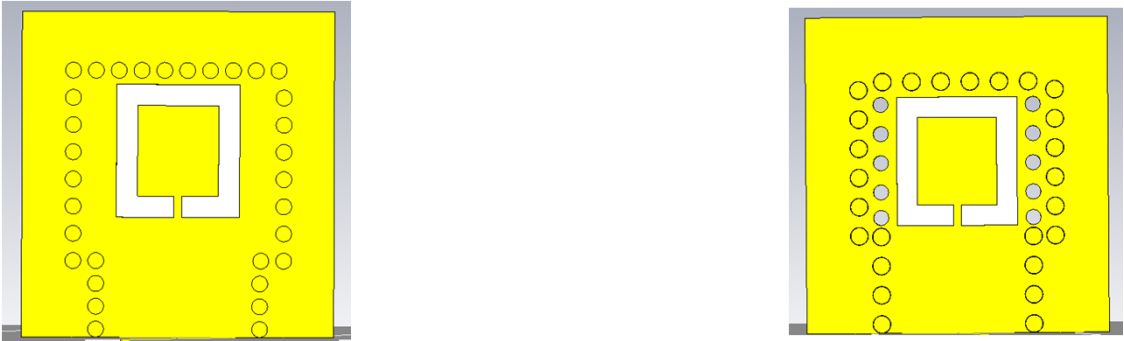


Fig. 3: Structure with different widths of SIW (left), structure with air vias (right).

SIW DIVIDERS

Types of SIW dividers

Square corners

- + **Simpler modeling**
- **More metallic vias**
- **Worse reflection coefficient**

Rounded corners

- + **Less metallic vias**
- + **Better reflection coefficient**
- **Modeling and manufacturing of rounded corners**

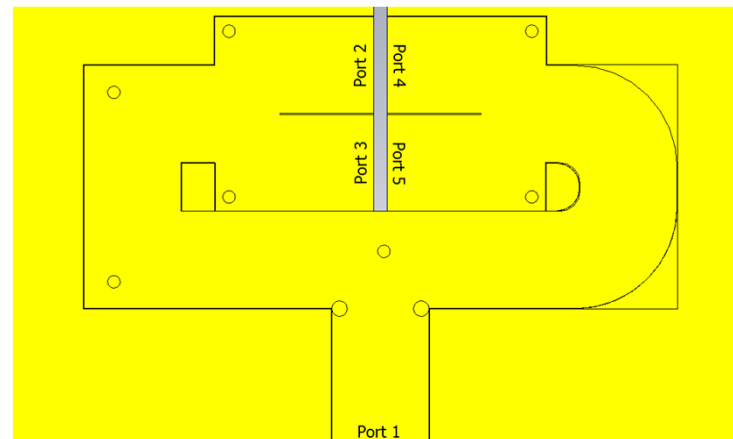


Fig. 4: Model of SIW divider

OFF-BODY ANTENNA ARRAY

Impedance matching of antenna array with rounded walls

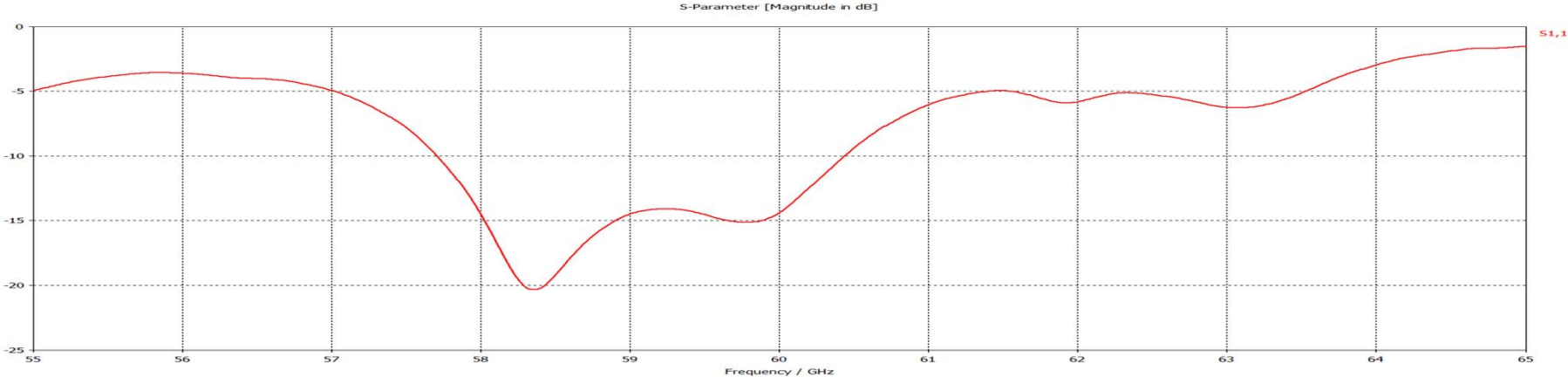


Fig. 6: Simulated frequency response of reflection coefficient of SIW antenna array.

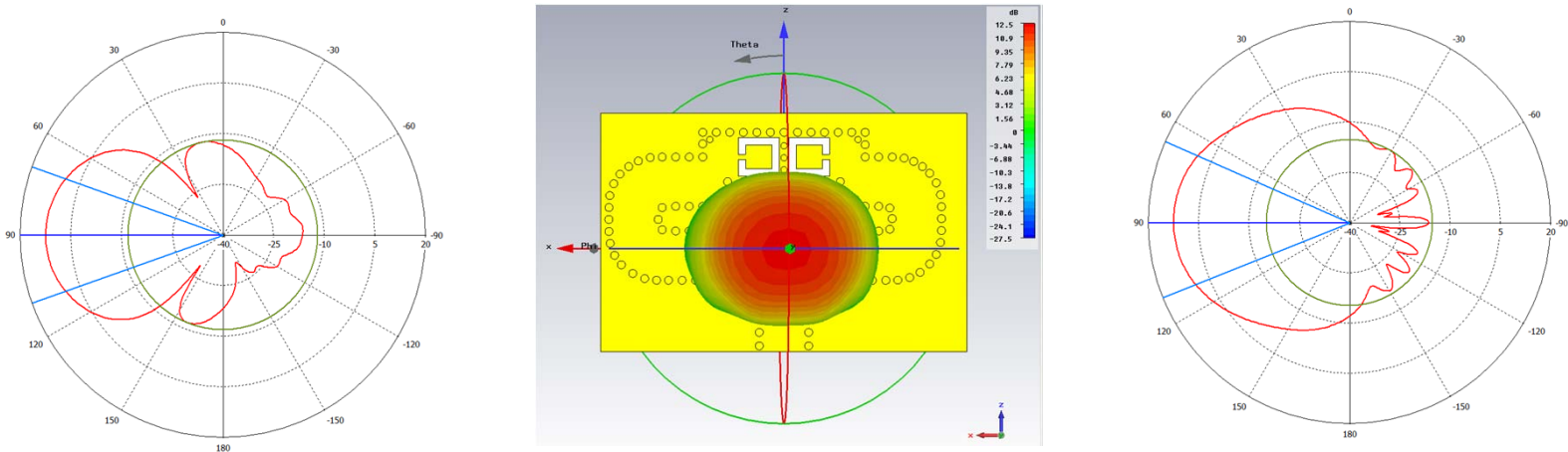


Fig. 7: E-field pattern (left), 3D pattern (center), H-field pattern (right).

OFF-BODY ANTENNA ARRAY

Field distribution

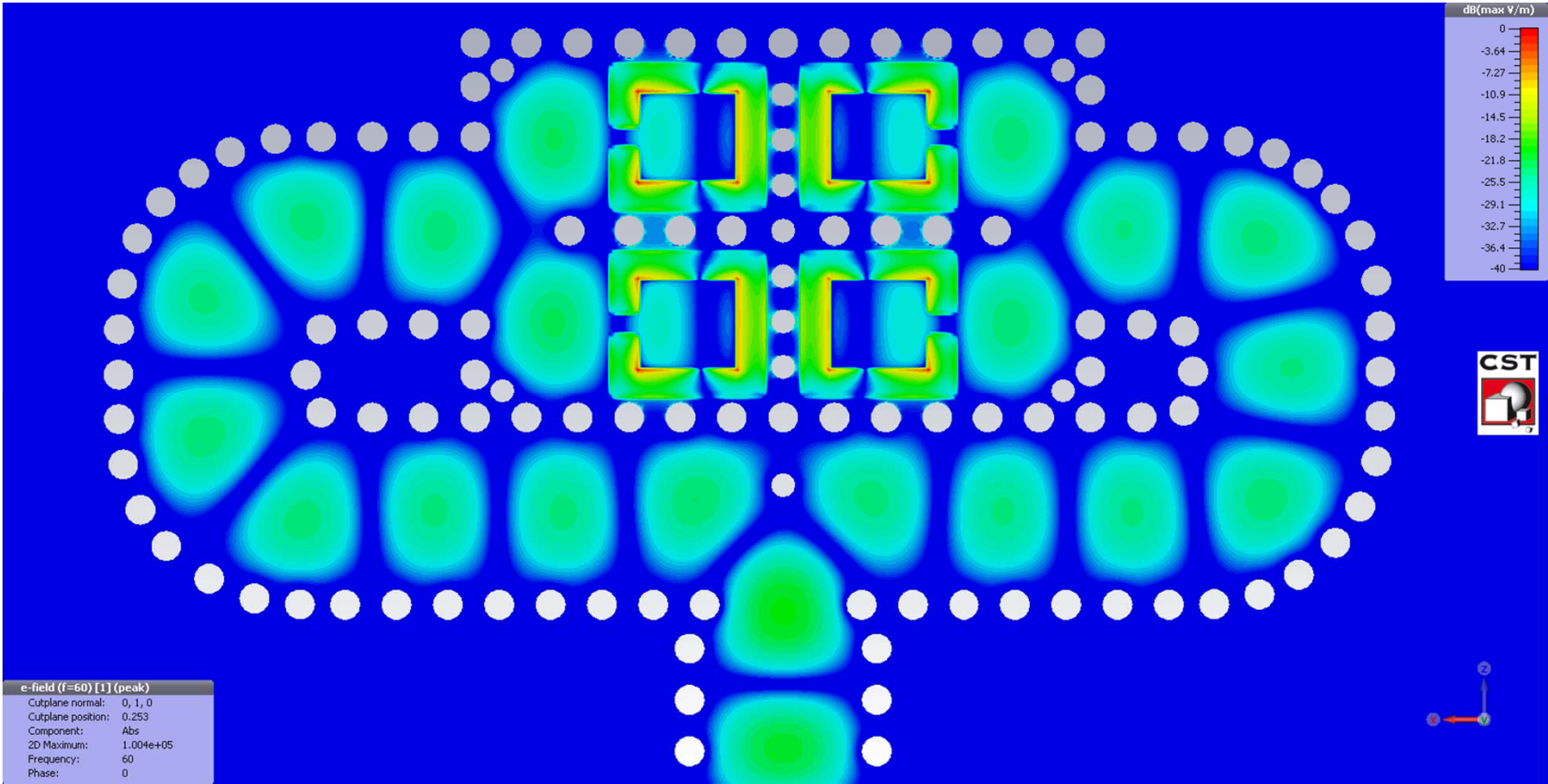


Fig. 8: Field distribution at 60 GHz.

SUMMARY

Parameters of the antenna array computed by CST

- Reflection coefficient < - 10 dB:
57.7 to 60.4 GHz
- Frequency band: 2.7 GHz
- Gain at 60 GHz: 12.3 dB
- Angular width (3dB): 39.9 dB, 45.6 dB
- Side lobe level: -24.3 dB, -27.7 dB
- Perpendicular radiation

Thank you for your attention!



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