LID2509 Vivaldi Antenna

Rev. 0.1 — 17 March 2023

User manual
PUBLIC

Document information

Information	Content
Keywords	UWB, antenna, radar
Abstract	This document presents the simulation results of the LID2509 Vivaldi antenna.

Revision history

Rev	Date	Description
v.1	17.03.2023	Initial version

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1 Introduction

The LID2509 is a linearly polarized Vivaldi antenna covering the frequency range from 3.5 GHz to 9 GHz. Therefore, it is suited to operate on most UWB channels. With a gain around 6 dBi the LID2509 is a directional antenna and was designed for UWB Radar measurements, but can also be used for UWB Ranging or any other radio technology operating in its bandwidth. The antenna features landing pads for an edge mounted SMA connector for the transition to a microstrip line. The parameters of the antenna were chosen in a way to provide a compromise between antenna size, gain and bandwidth.

The data in this user manual is derived from EM simulations only. Nevertheless, reference measurements were performed with manufactured antennas and the results match well with simulation data. Measurements showed that real antennas can have slightly reduced gain and return loss compared to simulations.

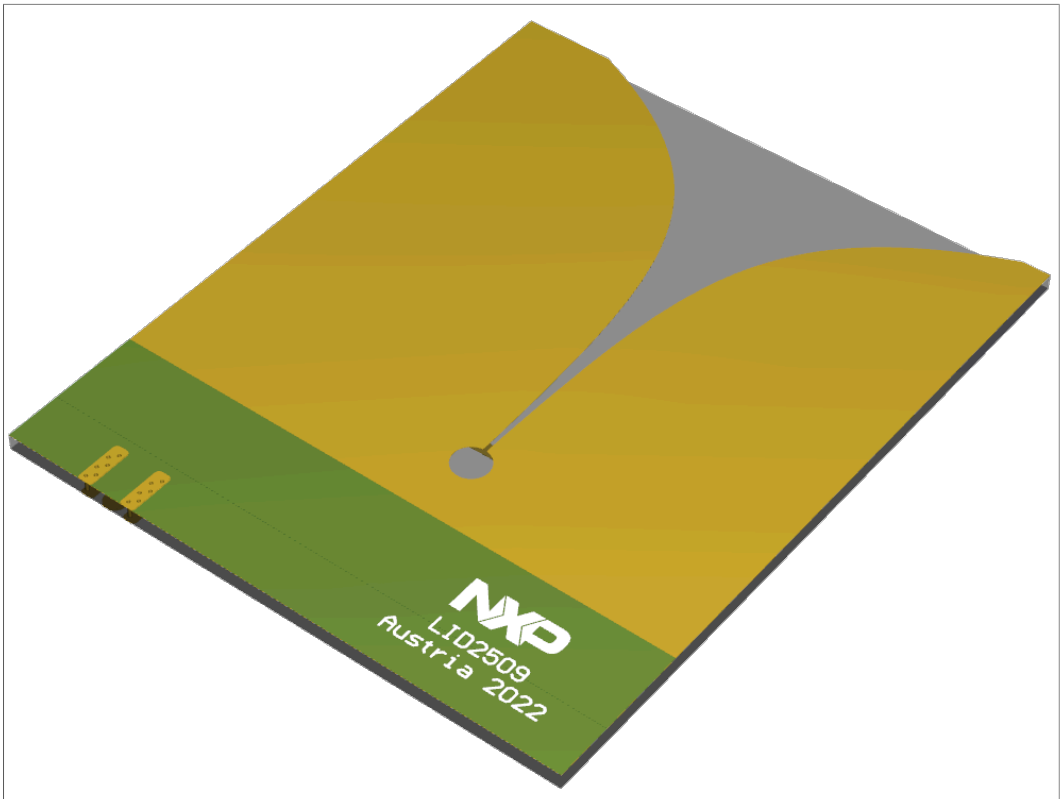

Figure 1. LID2509 perspective view

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2 PCB Layout and Stackup

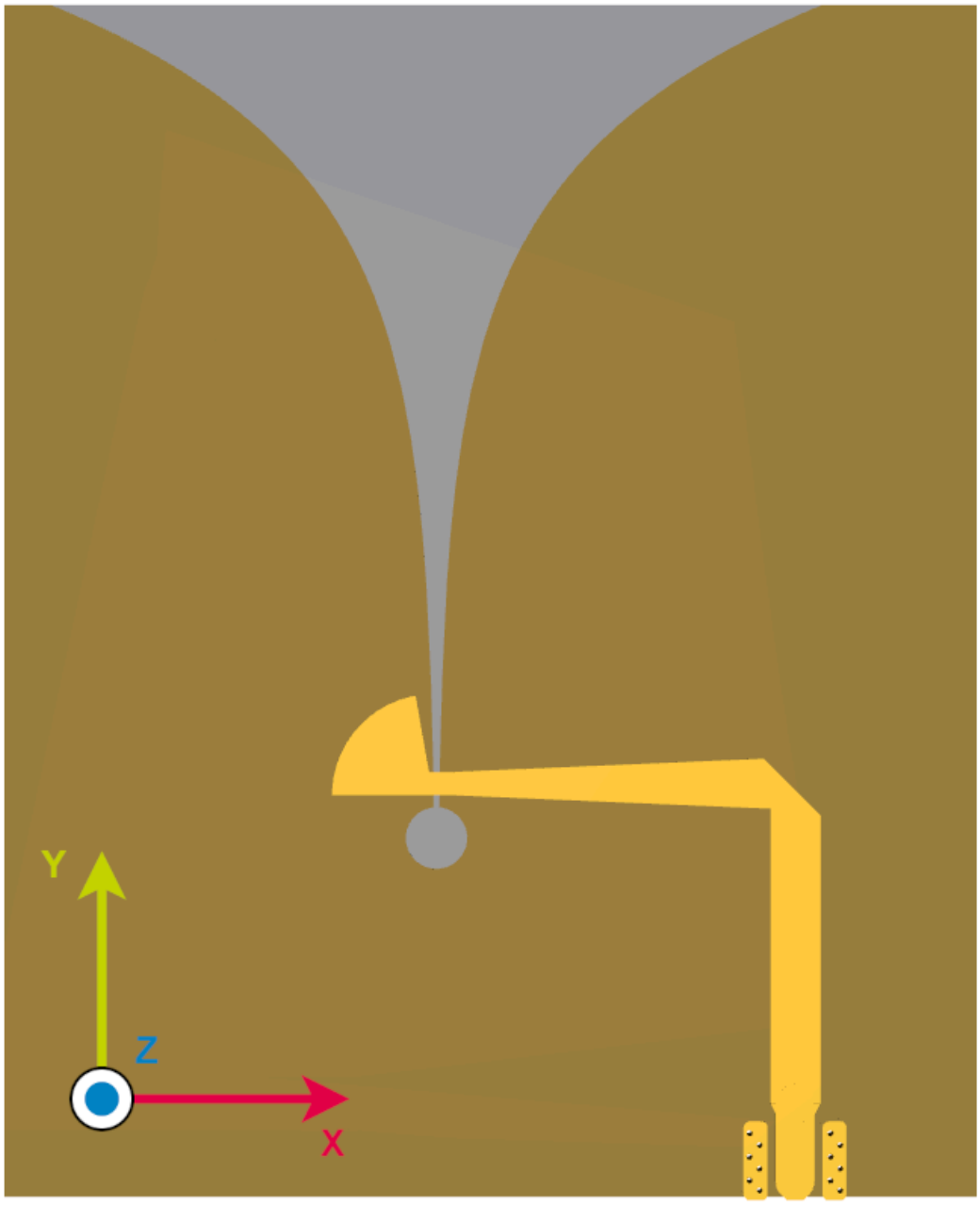

Figure 2. PCB top view.

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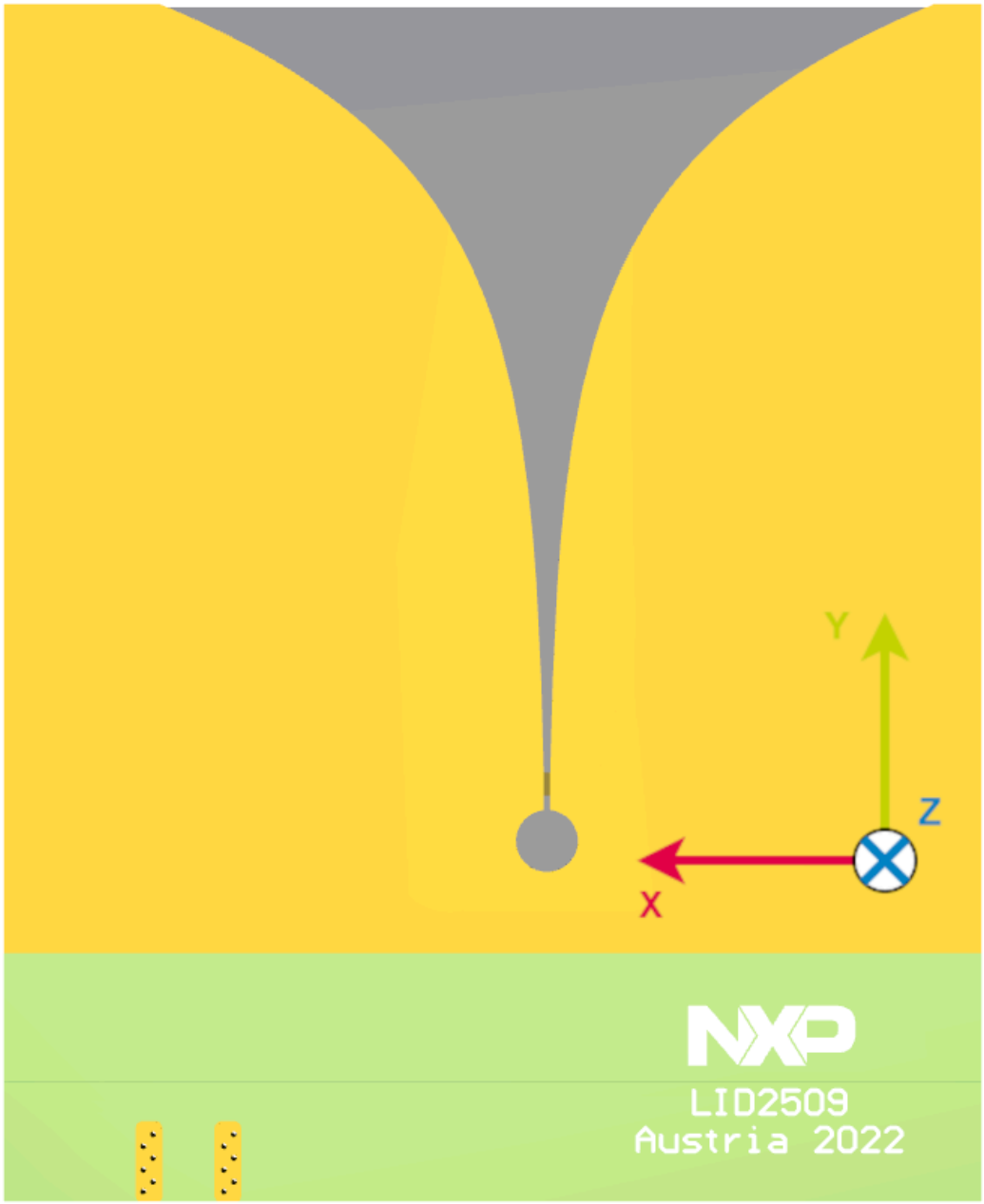

Figure 3. PCB bottom view.

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Board Stack Report

Stack Up		Layer Stack			
Layer	Board Layer Stack	Name	Material	Thickness	Constant
1		Top Paste			
2		Top Overlay			
3		Top Solder	Solder Resist	0,010mm	3,5
4		Top Layer	Copper	0,035mm	
5		Dielectric 1	NPG-170	1,710mm	4,2
6		Bottom Layer	Copper	0,035mm	
7		Bottom Solder	Solder Resist	0,010mm	3,5
8		Bottom Overlay			
9		Bottom Paste			
	Height : 1,800mm				

Figure 4. PCB example stackup. Any dielectric with similar RF properties may be used.

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3 Specifications

3.1 Overview

Table 1. Antenna Parameter Overview

Frequency	3.5 GHz to 9.0 GHz
Connector Type	SMA Jack
VSWR	< 1.5
Return Loss	> 13 dB
Polarization	linear, horizontal
Gain	4 dBi to 7 dBi
Radiation Efficiency	73% to 88%
Size	77.25 mm x 63 mm x 1.8 mm
PCB Laminate	NPG-170 or equivalent

3.2 Return Loss and VSWR

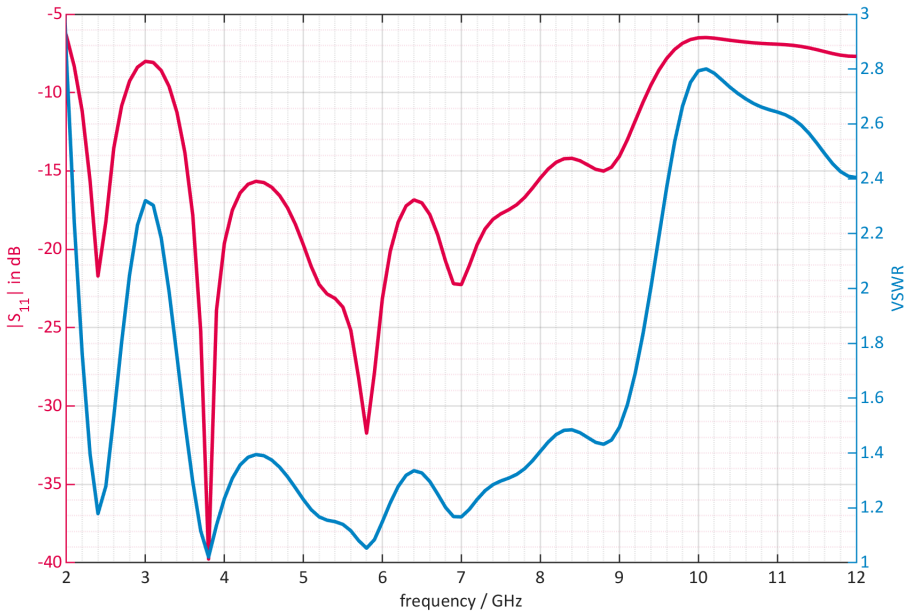

Figure 5. Return Loss and VSWR

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3.3 Gain

3.3.1 Peak Gain

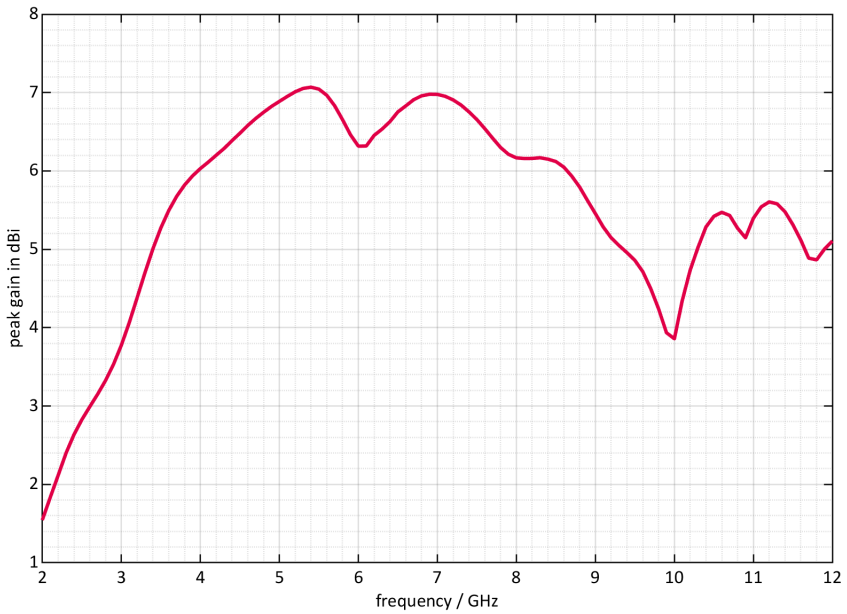

Figure 6. Peak gain over frequency.

3.3.2 Gain Polar Plots

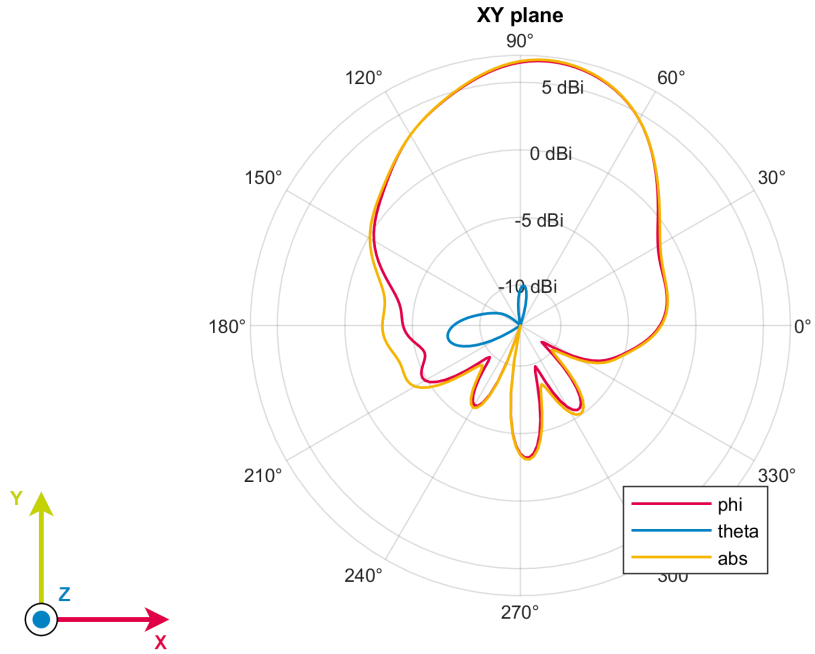

Figure 7. Gain plot of XY plane for 6.5 GHz.

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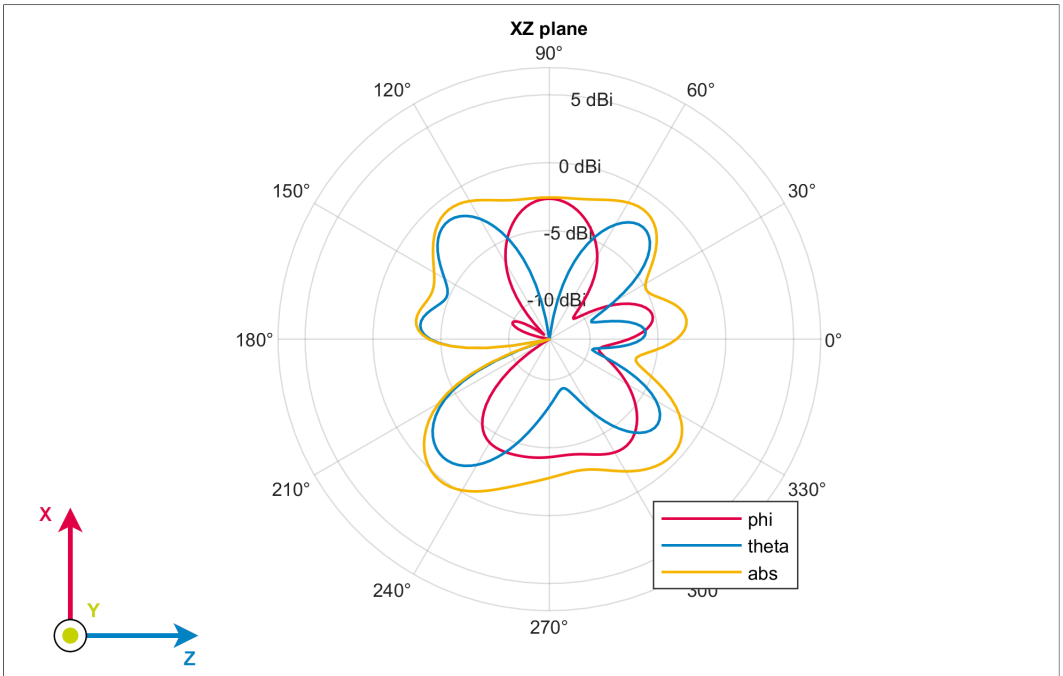

Figure 8. Gain plot of XZ plane for 6.5 GHz.

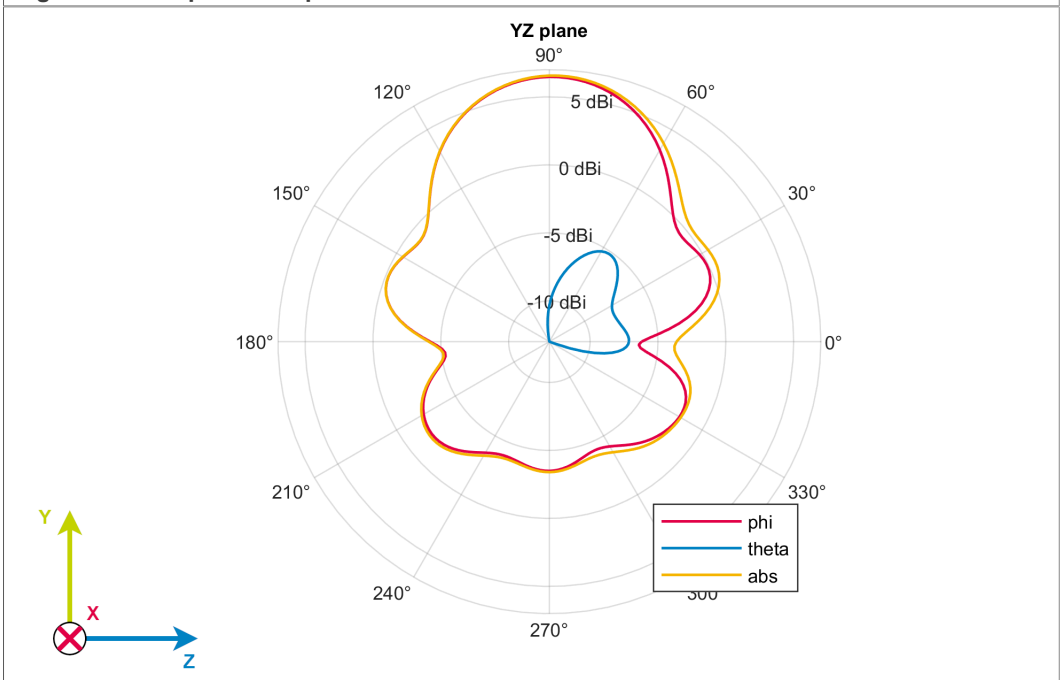

Figure 9. Gain plot of YZ plane for 6.5 GHz.

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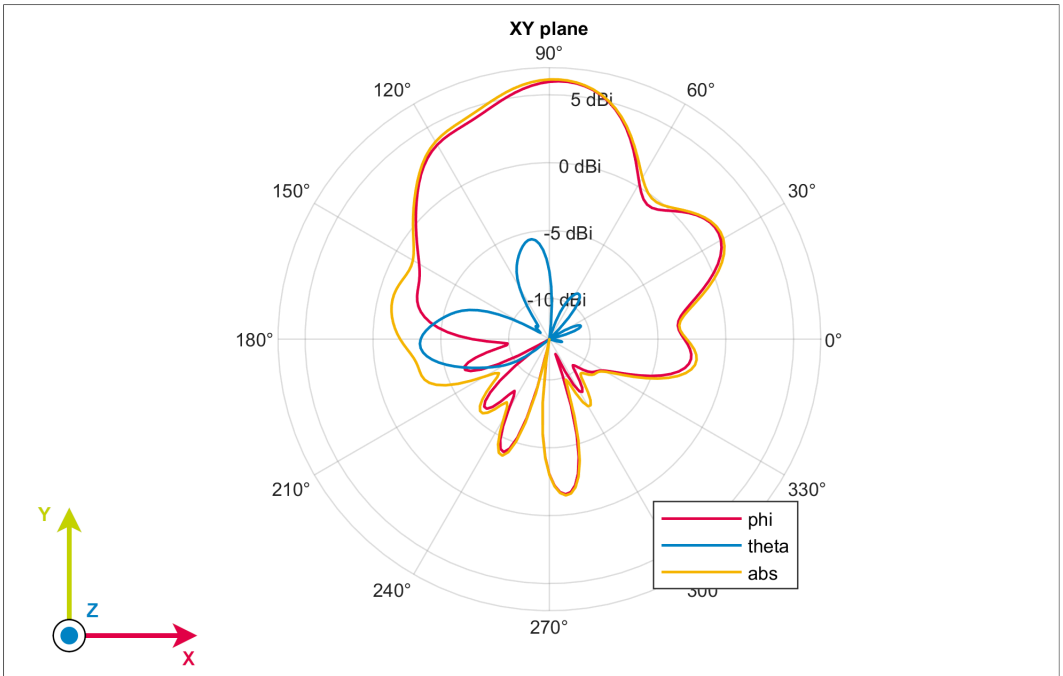

Figure 10. Gain plot of XY plane for 8 GHz.

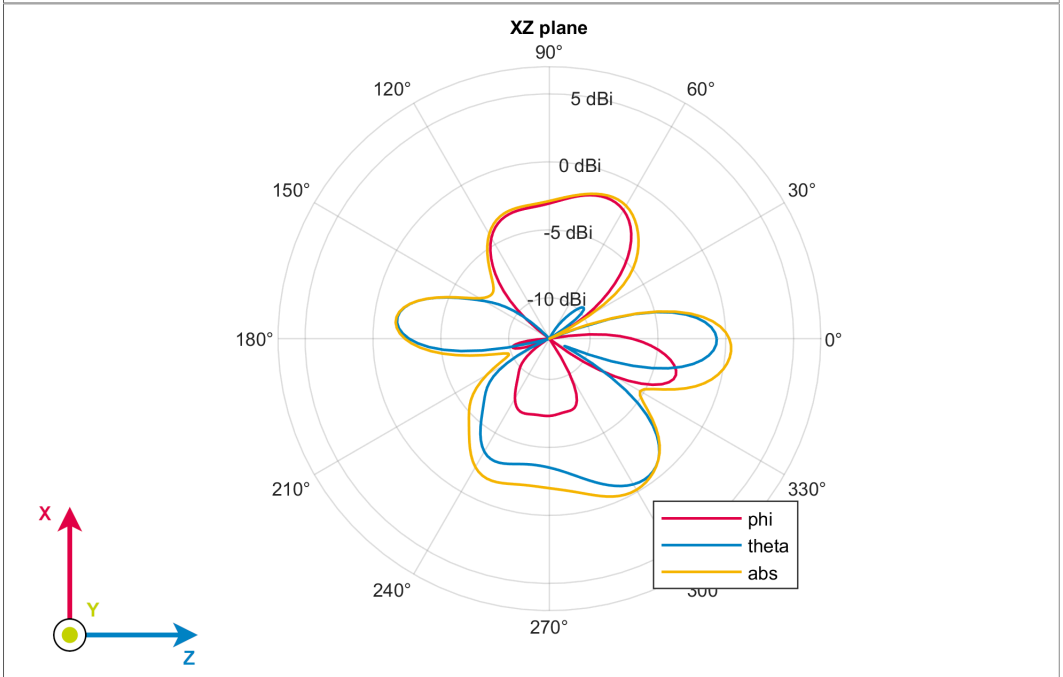

Figure 11. Gain plot of XZ plane for 8 GHz.

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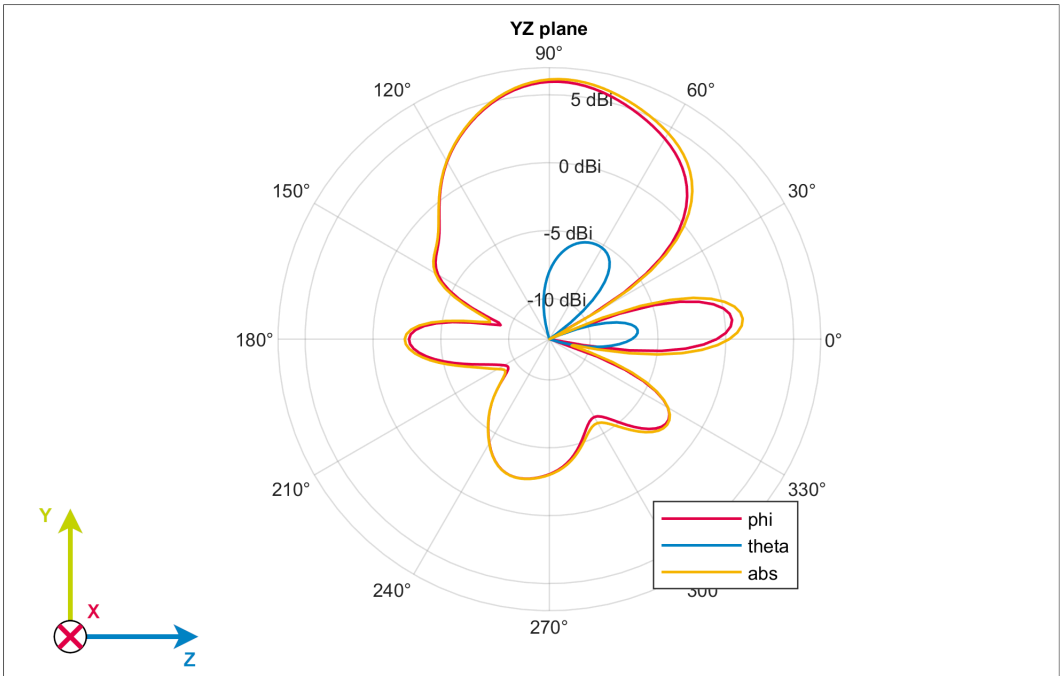

Figure 12. Gain plot of YZ plane for 8 GHz.

3.3.3 3D Gain

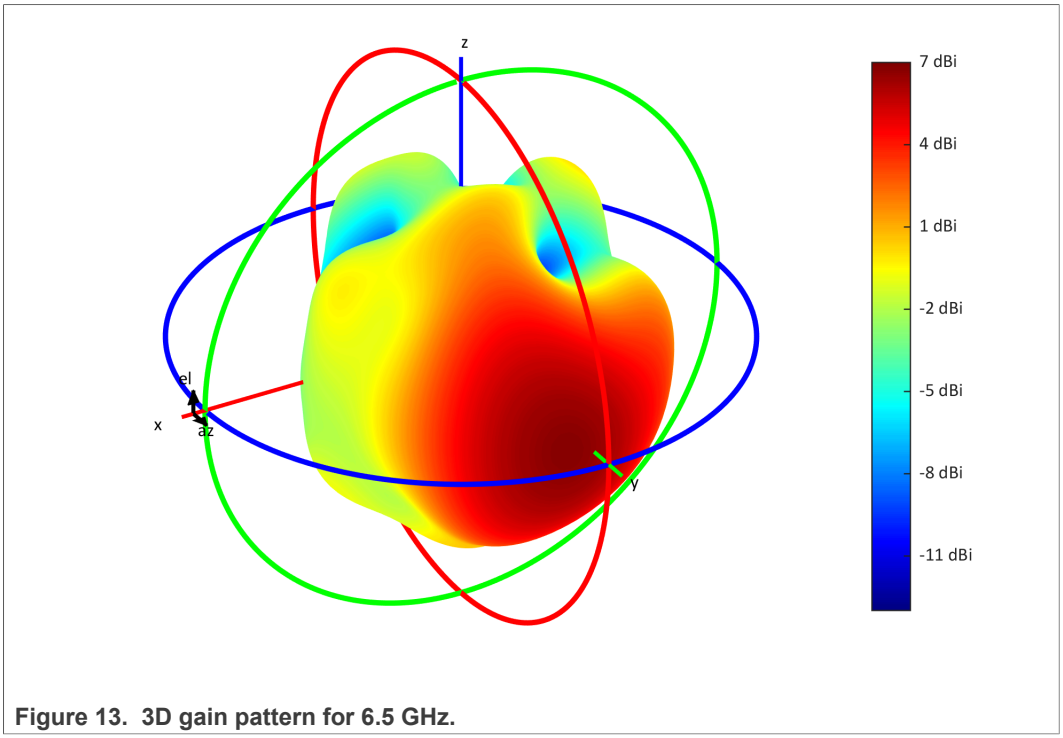

Figure 13. 3D gain pattern for 6.5 GHz.

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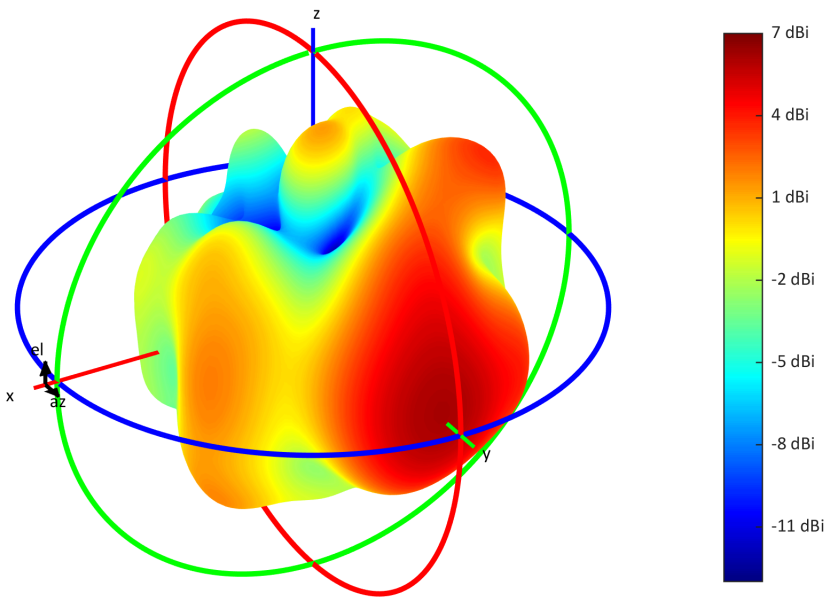

Figure 14. 3D gain pattern for 8 GHz.

3.3.4 Gain Contour Plots

The spherical coordinate system used for the contour plots in this section is as in ISO 80000-2:2019. The polar angle theta starting with 0° from the Z-axis towards the XY plane and the azimuthal angle phi starting with 0° from the X-axis towards the Y-axis.

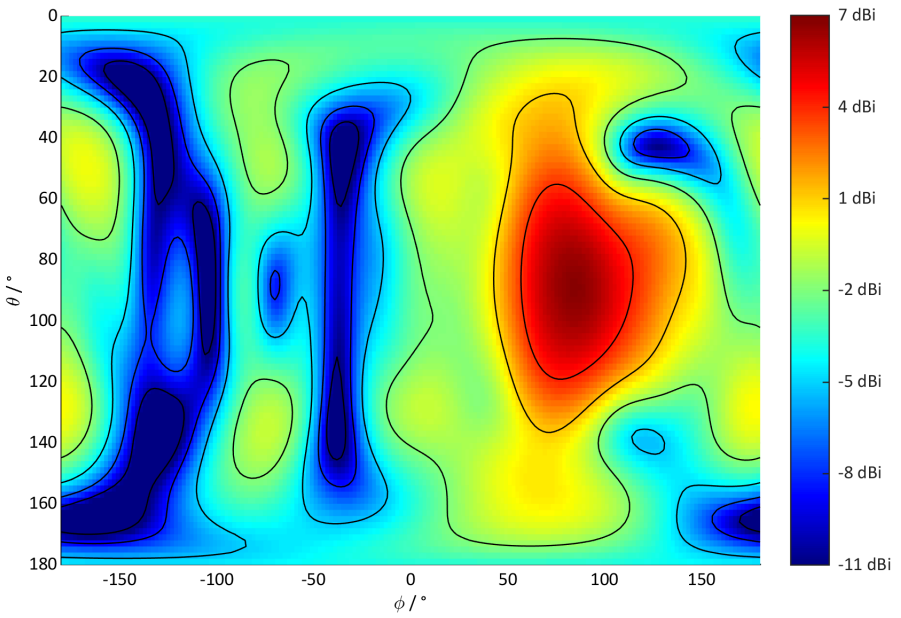

Figure 15. Contour plot of gain at 6.5 GHz.

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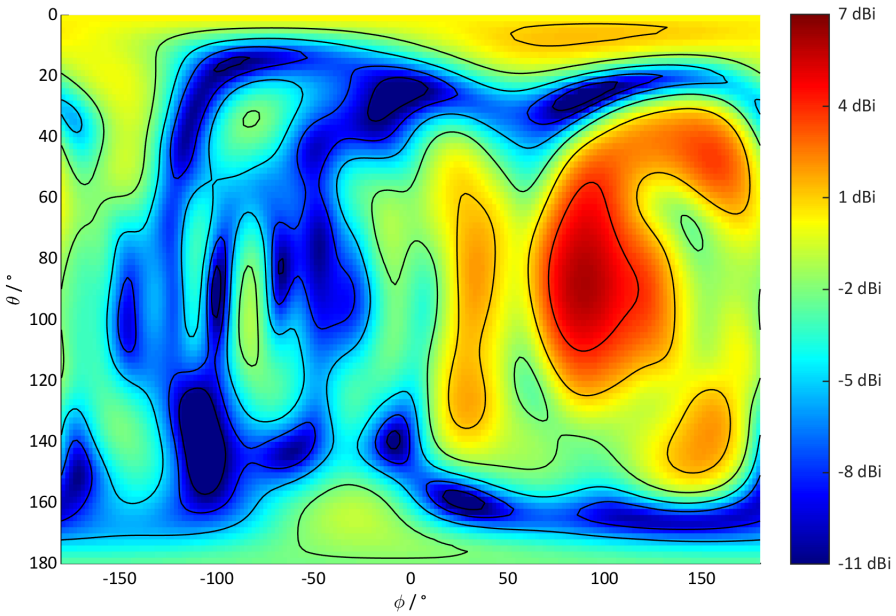

Figure 16. Contour plot of gain at 8 GHz.

3.4 Front to Back Ratio

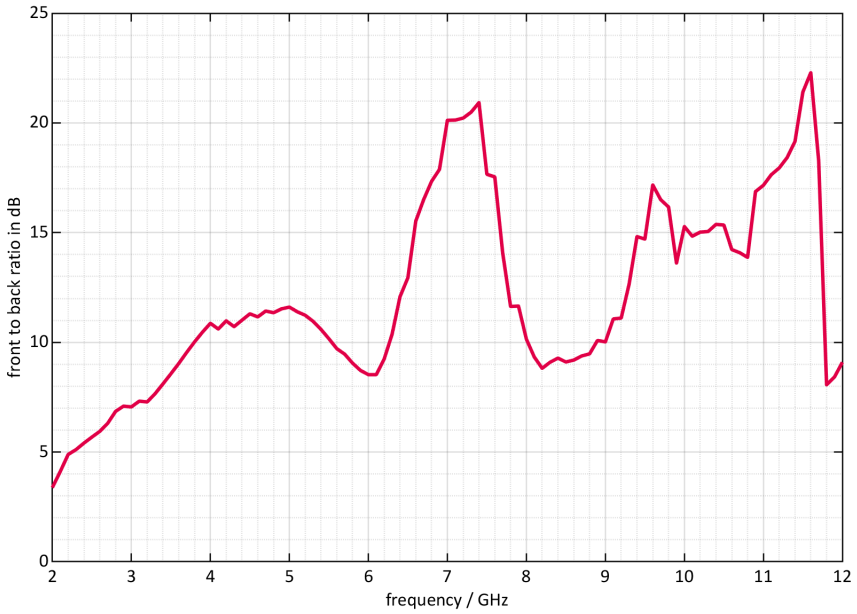

Figure 17. Front to back ratio.

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3.5 Radiation Efficiency

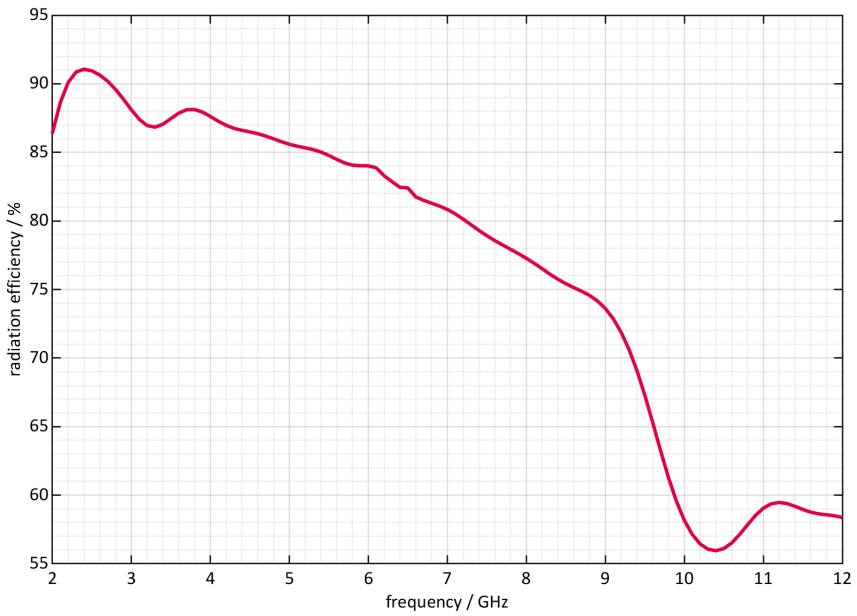

Figure 18. Radiation efficiency over frequency.

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