



Renesas RRQ610x1-008 Wi-Fi module

Antenna characterization

Doc.no: 3-3-TR- 865 008-01

Revision History

Date	Rev.	Author	Description
2025-06-30	A	Pär Berglund	Released after internal review



Table of Contents

1	TABLE OF FIGURES.....	3
2	TABLE OF TABLES	4
3	ACRONYMS, ABBREVIATIONS AND DEFINITIONS.....	5
4	INTRODUCTION	6
5	ANTENNA MEASUREMENTS.....	7
5.1	VOLTAGE STANDING WAVE RATIO.....	7
5.2	2D RADIATION PATTERNS	10
5.2.1	2.4GHZ.....	11
5.2.2	5GHZ.....	12



1 Table of Figures

Figure 5-1 The Wi-Fi module is positioned at right, middle and left position on a reference board with dimension 70 x 50mm	7
Figure 5-2 VSWR Renesas RRQ610x1-008 Wi-Fi module antenna. Module in right position	8
Figure 5-3 VSWR Renesas RRQ610x1-008 Wi-Fi module antenna. Module in middle position	8
Figure 5-4 VSWR Renesas RRQ610x1-008 Wi-Fi module antenna. Module in left position.....	9
Figure 5-5 Satimo SG-23 6 GHz Stargate Antenna Test Chamber	10
Figure 5-6 Measurement plane definitions	10
Figure 5-7 2D radiation patterns for 2.4GHz band; Renesas RRQ610x1-008 Wi-Fi module located at position Middle	11
Figure 5-8 2D radiation patterns for 5GHz band; Renesas RRQ610x1-008 Wi-Fi module located at position Middle	12



Prepared:
Pär Berglund
Approved:
Jonas Strandell

Release:
2025-06-30
Doc.no:
3-3-TR- 865 008-01

Page:
4 of 12
Rev:
A

2 Table of Tables

Table 1. Acronyms	5
-------------------------	---



Prepared:
Pär Berglund
Approved:
Jonas Strandell

Release:
2025-06-30
Doc.no:
3-3-TR- 865 008-01

Page:
5 of 12
Rev:
A

3 Acronyms, Abbreviations and Definitions

Table 1. Acronyms

Acronym	Description
WSI	Wireless System Integration



Prepared:
Pär Berglund
Approved:
Jonas Strandell

Release:
2025-06-30
Doc.no:
3-3-TR- 865 008-01

Page:
6 of 12
Rev:
A

4 Introduction

This paper presents antenna measurements for the Renesas RRQ610x1-008 Wi-Fi module when positioned on a reference test board. The module has an internal PCB integrated dual band antenna supporting the 2.4GHz and 5GHz frequency bands.

5 Antenna measurements

The Wi-Fi antenna performance is characterized in terms of *Voltage Standing Wave Ratio (VSWR)*, *antenna efficiency* and *radiation patterns*.

The antenna performances have been evaluated for the Wi-Fi module when positioned at three locations; left, middle and right on a reference test board with dimensions 70 x 50 mm.

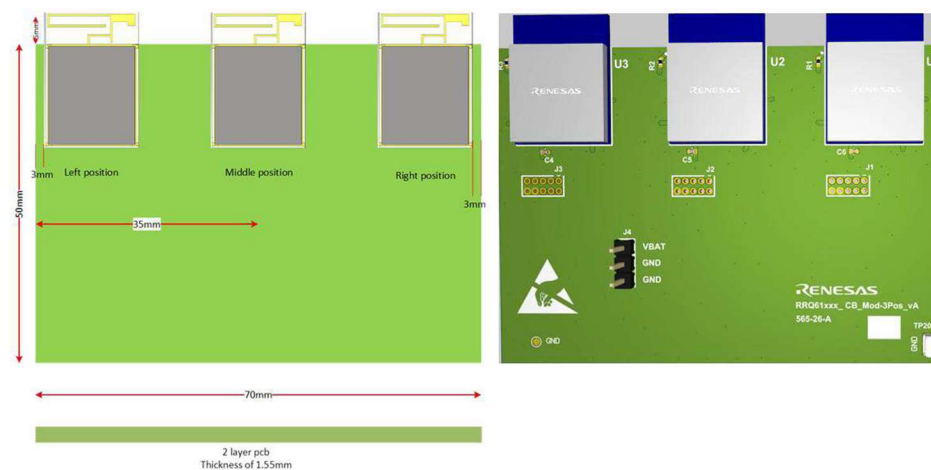


Figure 5-1 The Wi-Fi module is positioned at right, middle and left position on a reference board with dimension 70 x 50mm.

5.1 Voltage Standing Wave Ratio

Voltage Standing Wave Ratio (VSWR) is a measure of how well an antenna is impedance matched to the system impedance. A VSWR of one means a perfect match where all the available power is delivered to the antenna and an infinite VSWR means a short or an open circuit where all the energy is reflected.

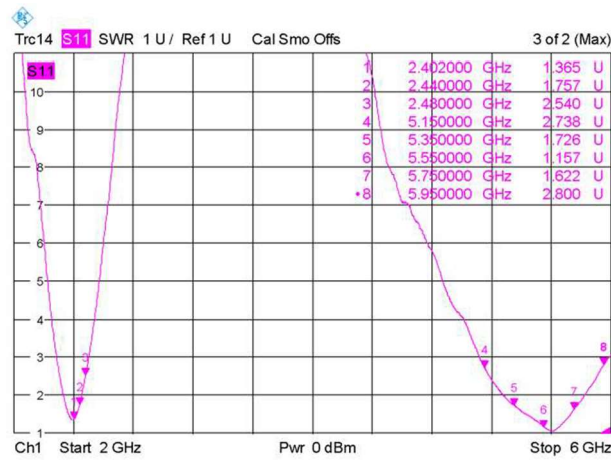


Figure 5-2 VSWR Renesas RRQ610x1-008 Wi-Fi module antenna. Module in right position.



Figure 5-3 VSWR Renesas RRQ610x1-008 Wi-Fi module antenna. Module in middle position.

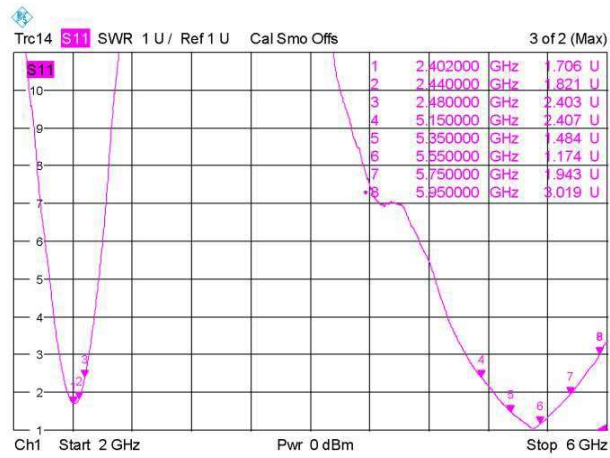


Figure 5-4 VSWR Renesas RRQ610x1-008 Wi-Fi module antenna. Module in left position.

5.2 2D Radiation patterns

The antenna radiation pattern measurements are carried out in a Satimo SG-23 6GHz Stargate Antenna Test Chamber. Radiation patterns are presented for three measurement planes: XY-, XZ- and YZ-planes.



Figure 5-5 Satimo SG-23 6 GHz Stargate Antenna Test Chamber.

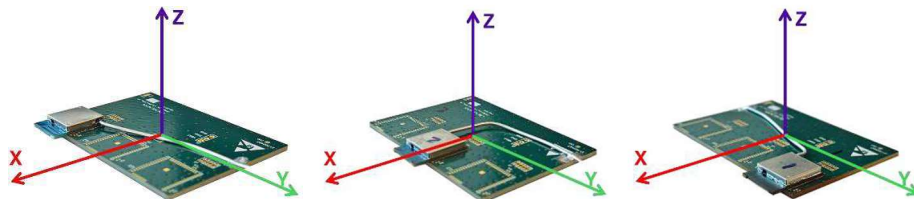


Figure 5-6 Measurement plane definitions.

5.2.1 2.4GHz

5.2.1.1 2.4GHz: Module at position Middle

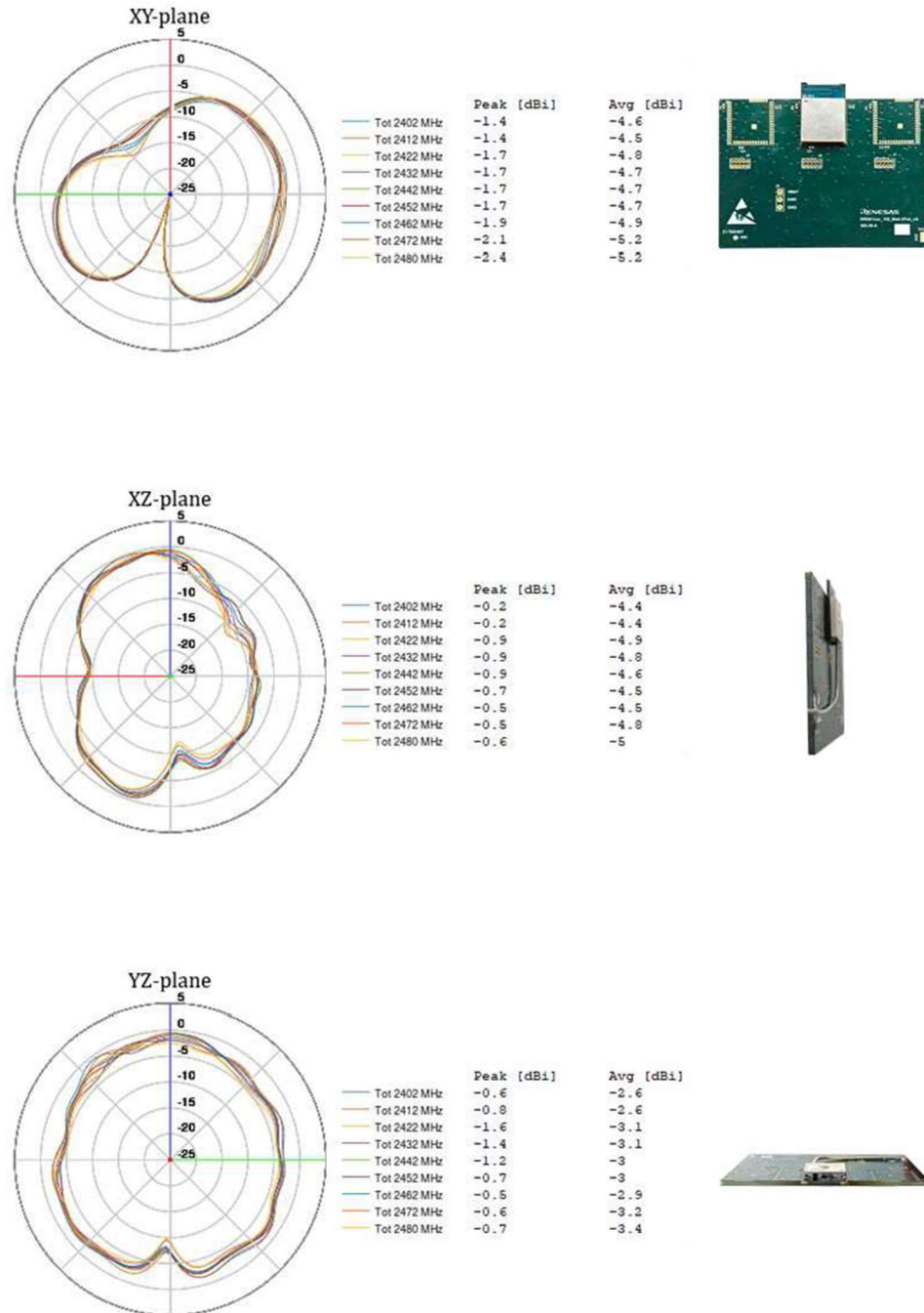


Figure 5-8 2D radiation patterns for 2.4GHz band; Renesas RRQ610x1-008 Wi-Fi module located at position Middle.

5.2.1.2 5GHz: Module at position Middle

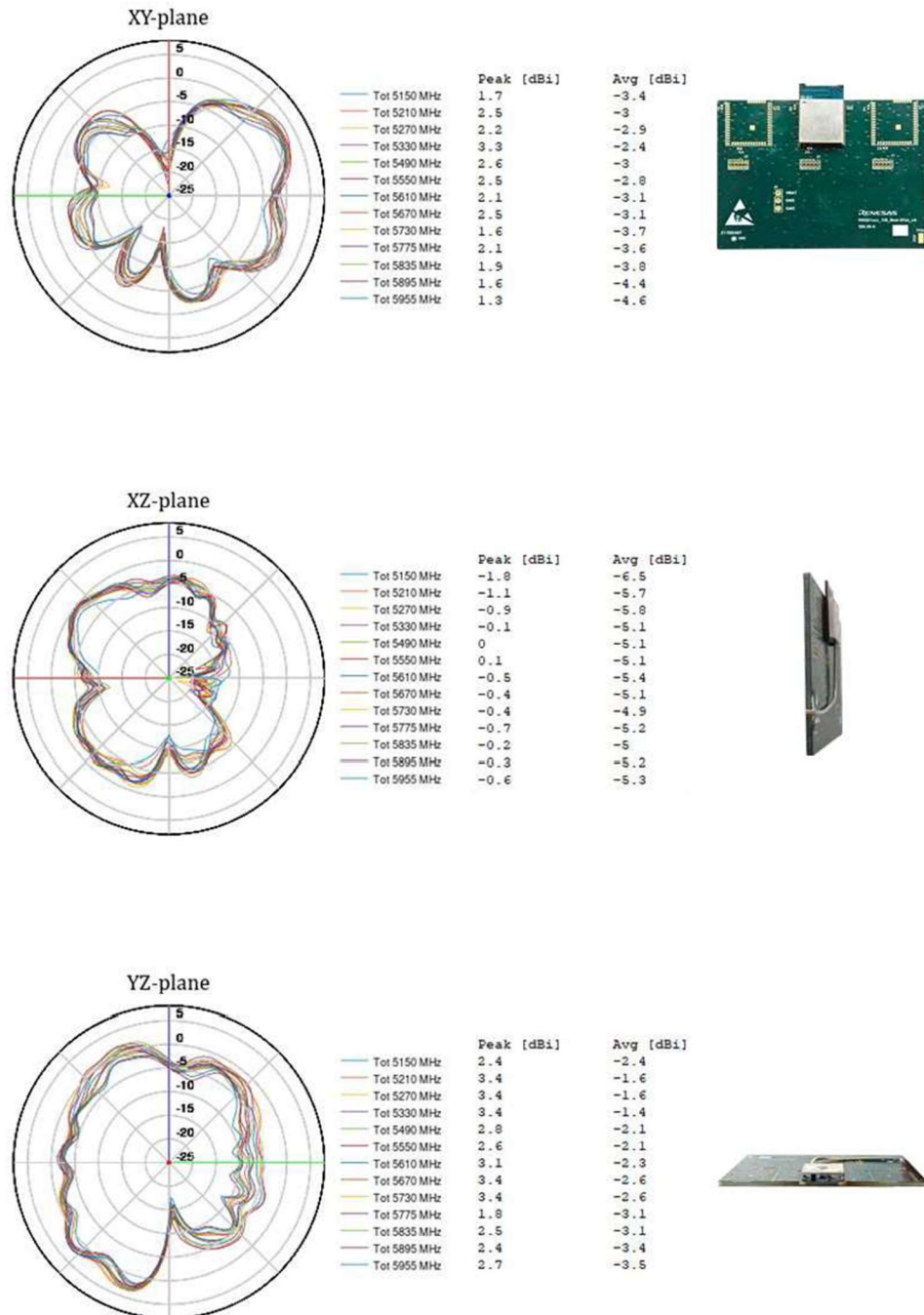


Figure 5-11 2D radiation patterns for 5GHz band; Renesas RRQ610x1-008 Wi-Fi module located at position Middle.