



FLIR-E1330

Antenna Characterization

Doc.no: 3-3-TR-587 996-05

Revision History

Date	Rev.	Author	Description
2023-04-25	A	Pär Berglund	Released after internal review



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3 Acronyms, Abbreviations and Definitions

Table 1. Acronyms

Acronym	Description
WSI	Wireless System Integration

4 Introduction

This paper presents antenna measurements for the *FLIR-E1330* thermal camera. The *FLIR-E1330* camera is equipped with an internal dual band Wi-Fi antenna supporting the 2,4GHz and 5GHz frequency bands.



Figure 4-1 FLIR-E1330 thermal camera

5 Antenna measurements

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

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.

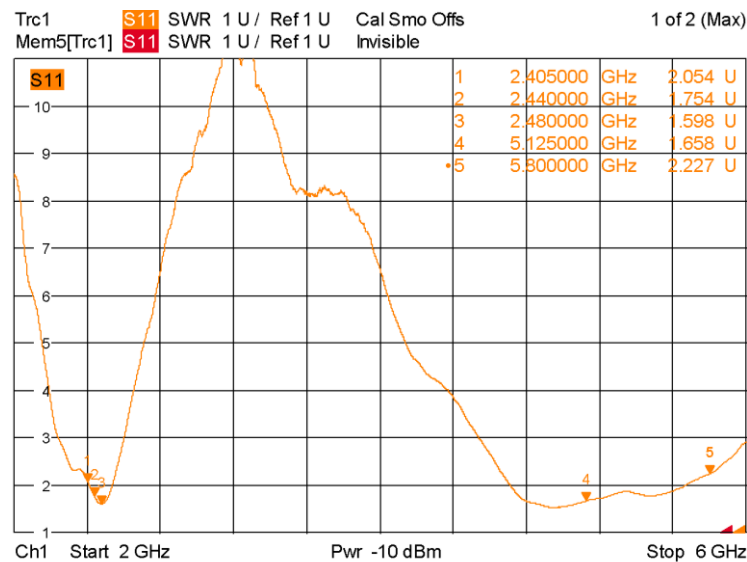


Figure 5-1 VSWR for the FLIR-E1330 Wi-Fi antenna

5.2 Antenna efficiency

The antenna efficiency measurements are carried out in a Satimo SG-23 6 GHz Stargate Antenna Test Chamber. The antenna efficiency, ϵ_T , is the ratio of the power delivered at the 50 Ω antenna interface, P_t , relative to the power radiated from the antenna, $P_{radiated}$.

$$\epsilon_T = \frac{P_{radiated}}{P_t}$$

The antenna system efficiency can be expressed in dB or %, where 100% corresponds to 0dB.

Table 2 Antenna efficiency for FLIR-E1330

Frequency	Antenna efficiency		
	[MHz]	[%]	[dB]
2400	45	-3,5	
2420	47	-3,3	
2440	47	-3,3	
2460	47	-3,3	
2480	49	-3,1	
5100	76	-1,2	
5150	71	-1,5	
5200	71	-1,5	
5250	71	-1,5	
5300	71	-1,5	
5350	65	-1,9	
5400	72	-1,4	
5450	69	-1,6	
5500	65	-1,9	
5550	60	-2,2	
5600	58	-2,4	
5650	59	-2,3	
5700	60	-2,2	
5750	58	-2,4	
5800	52	-2,8	

5.3 Radiation patterns

The antenna radiation pattern measurements are carried out in a Satimo SG-23 6 GHz Stargate Antenna Test Chamber. Radiation patterns are presented for three measurement planes: XY-, XZ- and YZ-planes as well as a 3D pattern visualising the radiation pattern around the DUT.

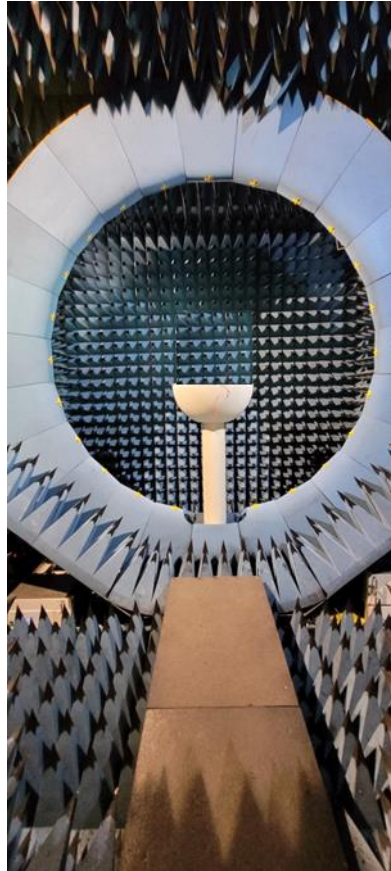


Figure 5-2 Satimo SG-23 6 GHz Stargate Antenna Test Chamber



Figure 5-3 Measurement plane definition

5.3.1 2,4GHz band

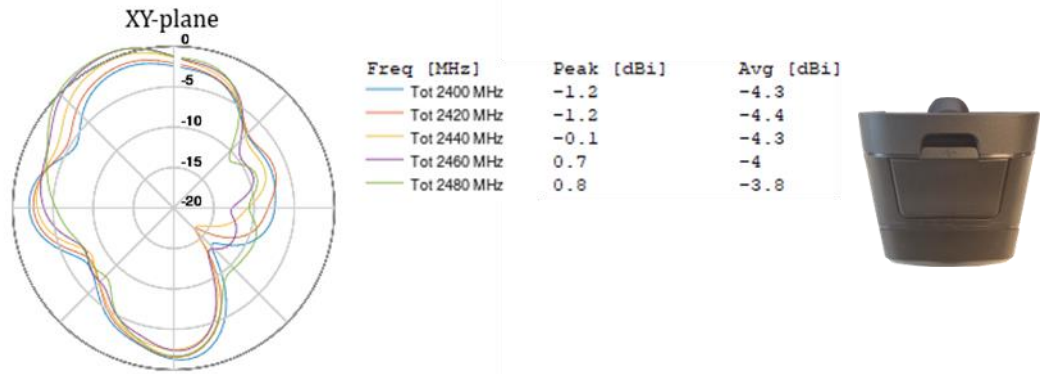


Figure 5-4 XY-plane for the FLIR-E1330 Wi-Fi antenna, 2,4GHz band. Total antenna gain (vertical + horizontal polarization)

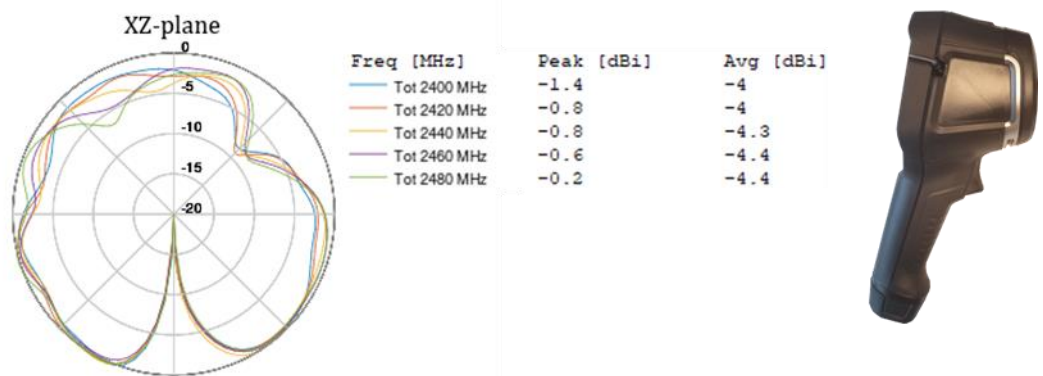


Figure 5-5 XZ-plane for the FLIR-E1330 Wi-Fi antenna, 2,4GHz band. Total antenna gain (vertical + horizontal polarization)

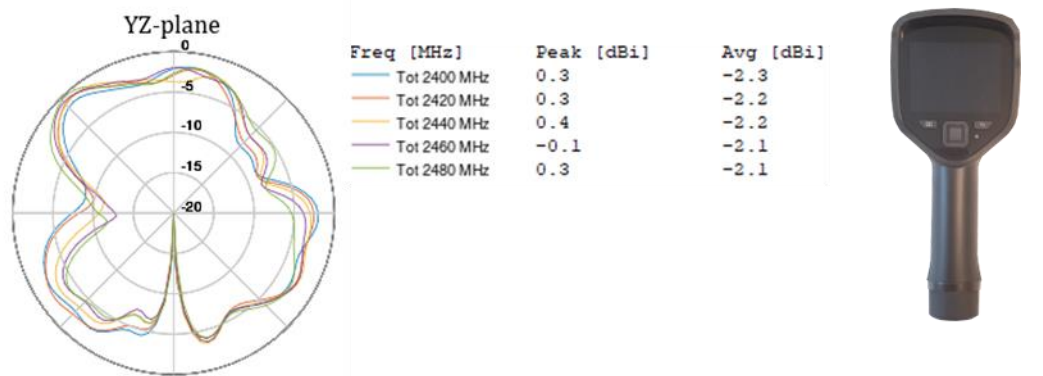


Figure 5-6 ZY-plane for the FLIR-E1330 Wi-Fi antenna, 2,4GHz band. Total antenna gain (vertical + horizontal polarization)

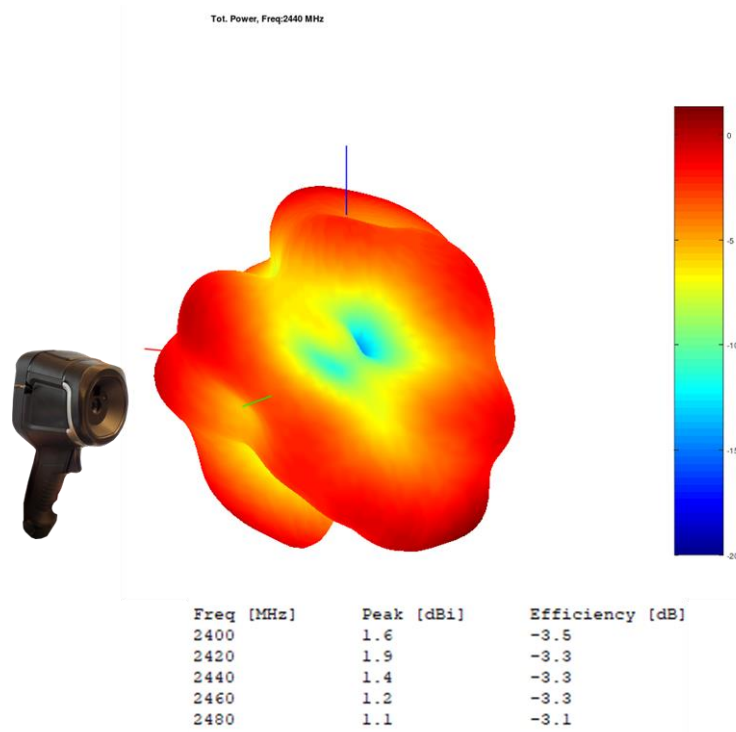


Figure 5-7 Radiation pattern 3-D. Maximum antenna peak gain is found to be in a cut that is not covered by the three planes XY, XZ and YZ.

5.3.2 5GHz band

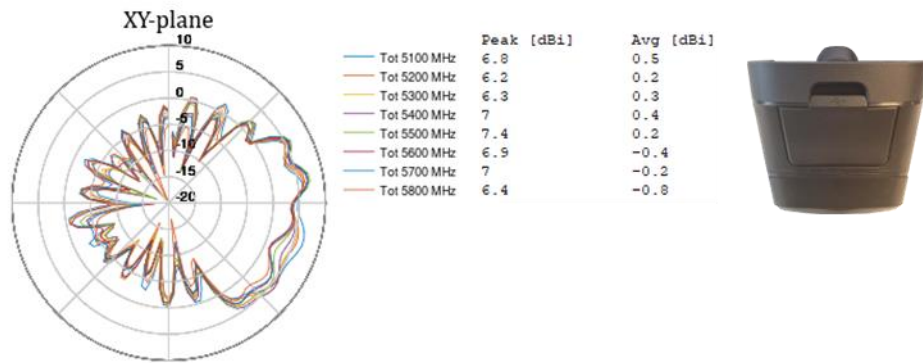


Figure 5-8 XY-plane for the FLIR-E1330 Wi-Fi antenna, 5GHz band. Total antenna gain (vertical + horizontal polarization)

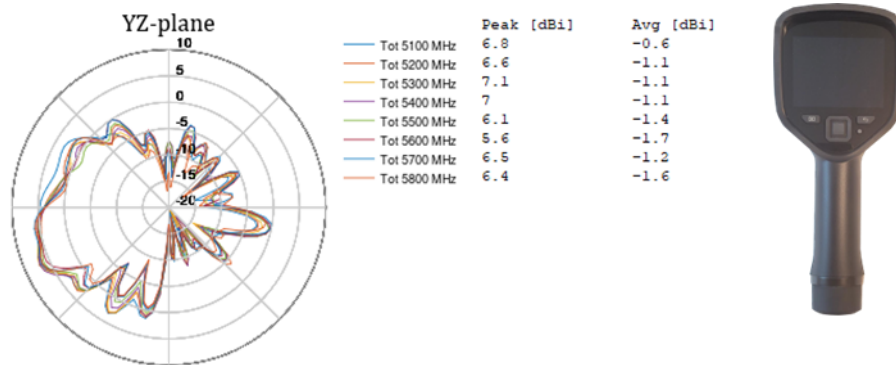


Figure 5-9 YZ-plane for the FLIR-E1330 Wi-Fi antenna, 5GHz band. Total antenna gain (vertical + horizontal polarization)

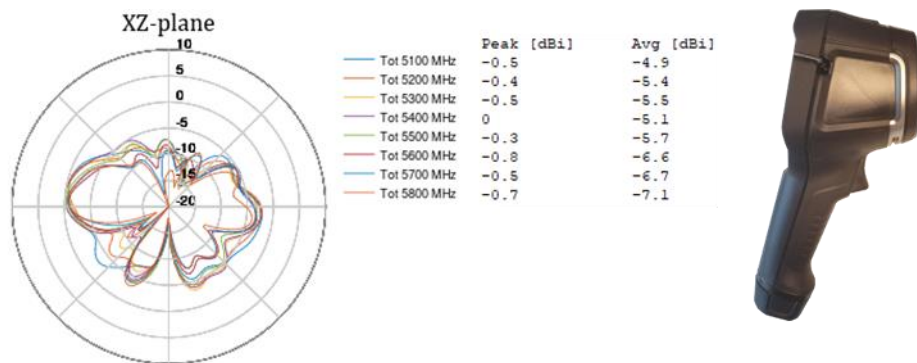


Figure 5-10 XZ-plane for the FLIR-E1330 Wi-Fi antenna, 5GHz band. Total antenna gain (vertical + horizontal polarization)

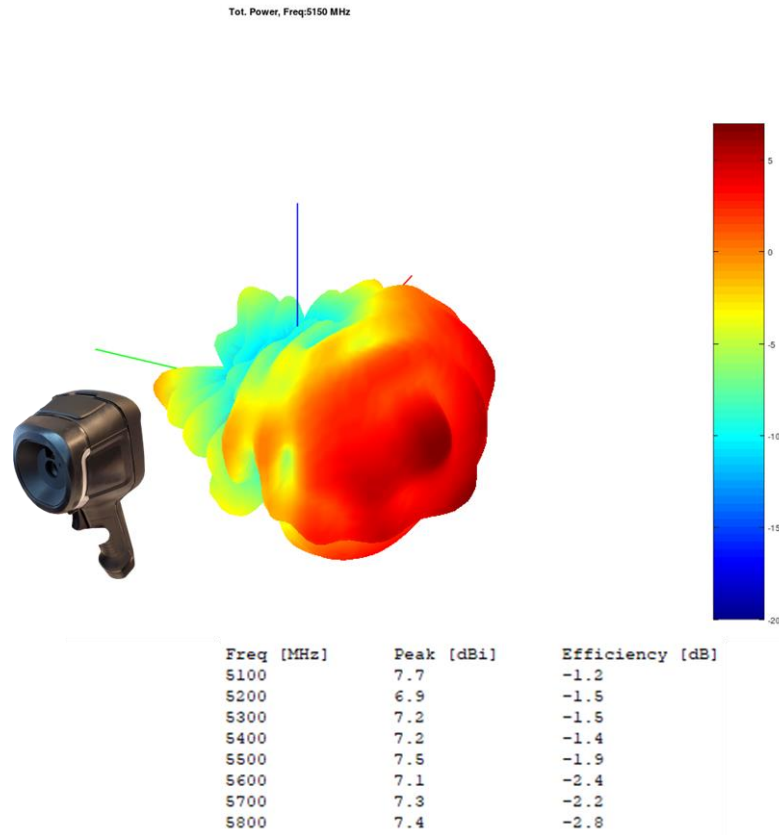


Figure 5-11 Radiation pattern 3-D. Maximum antenna peak gain is found to be in a cut that is not covered by the three planes XY, XZ and YZ.

5.4 Antenna peak gain

The antenna peak gain in each measurement plane for 2,4GHz and 5GHz is summarized in Table 3 and Table 4.

Table 3 Antenna peak gain for 2.4GHz frequency band.

	XY-plane	XZ-plane	YZ-plane	3-D
Frequency band	Peak gain [dBi]	Peak gain [dBi]	Peak gain [dBi]	Peak gain [dBi]
2.4GHz	0.8	-0.2	0.4	1.9

Table 4 Antenna peak gain for 5GHz frequency band.

	XY-plane	XZ-plane	YZ-plane	3-D
Frequency band	Peak gain [dBi]	Peak gain [dBi]	Peak gain [dBi]	Peak gain [dBi]
5GHz	7.4	0.0	7.1	7.7



6 Summary

The antenna performance for the *FLIR-E1330* thermal camera has been characterized. Results for antenna VSWR, antenna efficiency and radiation patterns are presented.

Maximum antenna peak gain the frequency bands 2.4 and 5GHz is measured to be:

2.4GHz: 1.9dBi

5GHz: 7.7dBi