Logitech
Antenna Under Test (AUT)
Report

Model Name: MR0107

Equipment Type: Mouse

Manufacturer: Logitech Technology (Suzhou) Co., Ltd.

Test Location: No. 3 Songshan Road, Suzhou New District, Jiangsu, China

Tested by: Tod Ji

Report Date: 2023.03.31

Report Release History

Report version	Description	Date Issued
MR0107 AUT Report 001	Original release	2023/03/31

Table of Contents

1. EUT Antenna Information

1) Antenna Material：PCB on board
2) Antenna Type：Dipole
3) Antenna Dimension: 24 x 9 mm
4) Operating Frequency：2.4GHz-2.5GHz
5) Input Impedance：50Ω
6) Standing-Wave Ratio：2:1

2. Measured Values and Calculation of Antenna Gains

Measure peak horizontal/vertical EIRP on each x-y, y-z, x-z plane. The highest measured values will be used to calculate the antenna peak gain.

Antenna Peak Gain (dBi) = Max EIRP(dBm) - Conducted Power (dBm)

Frequency	X-Y Plane (ø=156 deg@max EIRP)		X-Z Plane (ø=-15 deg@max EIRP)		Y-Z Plane (ø=72 deg@max EIRP)		Max Peak EIRP (dBm)	Conducted Power (dBm)	Antenna Peak Gain (dBi)
	Hori. Peak EIRP (dBm	Ver. Peak EIRP (dBm)	Hori. Peak EIRP (dBm	Ver. Peak EIRP (dBm)	Hori. Peak EIRP (dBm	Ver. Peak EIRP (dBm)			
2405	6.58	-9.71	3.43	6.35	0.80	3.84	6.58	2.96	3.62
2444	6.74	-8.81	3.37	6.74	1.46	4.32	6.74	3.20	3.54
2474	6.75	-9.10	4.23	7.09	1.76	5.10	7.09	3.16	**3.93**

Test Date: 2023.03.31

3. Conducted Power Measurement

3.1 Test Setup
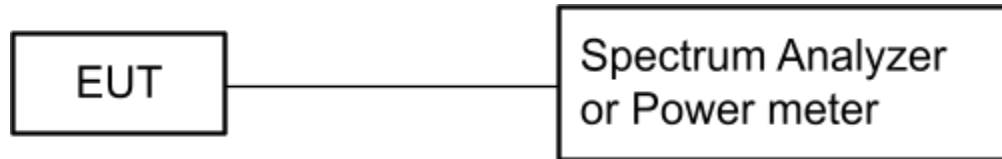
3.2 Test Instruments

Description	Model No.	Serial No.	Last Calibration
Spectrum Analyzer Keysight	N9020A	N/A	2022.11.15

Note: The calibration interval of the above test instruments is 12 months

3.3 Test Procedure

A spectrum analyzer was used to perform output power measurement, setting the detector to normal and configuring EUT continuously transmitting power.

3.4 Test Result of RF conducted Power

Frequency	Conducted Power (dBm)
2405	2.96
2444	3.20
2474	3.16

Test Date: 2023.03.31

4. 2D Radiation Pattern Measurement

4.1 Test Location

No. 3 Songshan Road, Suzhou New District, Jiangsu, China
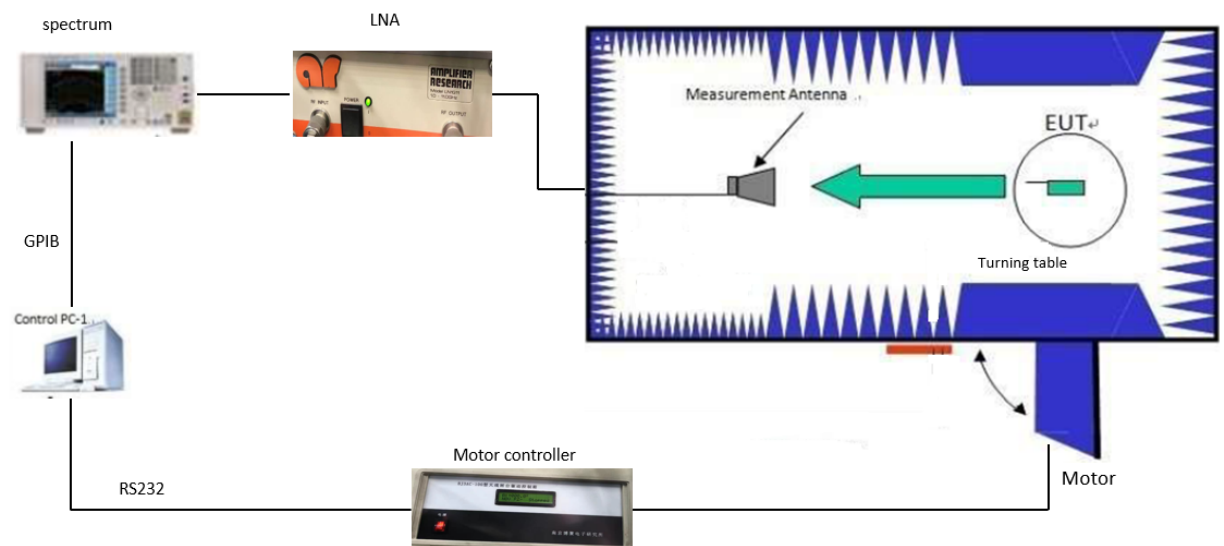
4.2 Description of the anechoic chamber

Length: 5.0m
Width: 2.8m
Height: 2.8m
Turn table Height: 1.4m
Measurement antenna height: 1.4m

4.3 Test Instruments

Description	Model No.	Serial No.	Last Calibration
Spectrum Analyzer Keysight	N9010A	MY49061163	2022.7.14
Horn Antenna ETS	BBHA 9120 D(1201)	D69250	2022.12.21
RF signal cable	SUCOFLEX104	SN293270/4	N/A
Software	FAC-Radio Measurement System	Version 1.1.0.7	N/A
Turntable controller	BJ3AC-100	N/A	N/A
LNA	LN1G11	321282	2022.12.23

Note: The calibration interval of the above test instruments is 12 months

4.4 Test Procedure

i. Connect the EUT to Spectrum Analyzer and record the power setting of EUT and the measured conducted power.
ii. Fasten the EUT in the center of the turntable, record the coordinates and take pictures.
iii. Configuring EUT continuously transmitting power(100% duty cycle).
iv. Make sure the transmit signal is stable and at the maximum RF power level.
v. Setup the channel power function by spectrum analyzer.
vi. Read the channel power level on the spectrum analyzer and record in the following positions.
   1. The turntable is then stepped between 0 to 360 degrees along the horizontal plane in 3-degree increments.
   2. Data is recorded using the spectrum analyzer at each position.
vii. Rotate the EUT with 90 degrees and repeat step f.1 and step f.2 until all 3 planes(X-Y,X-Z,Y-Z) were measured.

Report No: EVT-700-006368

viii. According to substitution techniques, a substitution horn antenna is substituted for EUT at the same position and the signal generator exports the CW signal to the substitution antenna via a TX cable. Rotated the turntable and moved the receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a value of spectrum reading equal to "Raw Value" gotten from step vii. Record the power level of S.G.

$$EIRP = P_{SigGen} + G_T - L_C$$

where:

P_{SigGen} = power setting of the signal generator that produces the same received power reading as the DUT, in dBm;

G_T = gain of the substitute antenna, in dBd (ERP) or dBi (EIRP);

L_C = signal loss in the cable connecting the signal generator to the substitute antenna, in dB

ix. Antenna Peak Gain (dBi) = Max EIRP(dBm) - Conducted Power (dBm)

4.5 Test Setup photos

short term confidential.

4.6 2D Pattern Test Plot

Test antenna_（XY plane）

Horizontal	**Vertical**

Horizontal

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Radiation pattern #1:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH05-XY_0_CORR

Average power = **0.30 dBm**
Front average power = **2.25 dBm** (From 0 deg to 180 deg)

Min power = **-11.75 dBm** @ -33.00 deg
Max power = **6.58 dBm** @ 177.00 deg

Radiation pattern #2:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH44-XY_0_CORR

Average power = **0.51 dBm**
Front average power = **1.79 dBm** (From 0 deg to 180 deg)

Min power = **-7.98 dBm** @ -33.00 deg
Max power = **6.74 dBm** @ -180.00 deg

Delta max power = **0.16 dBm**
Delta average power = **0.21 dBm**
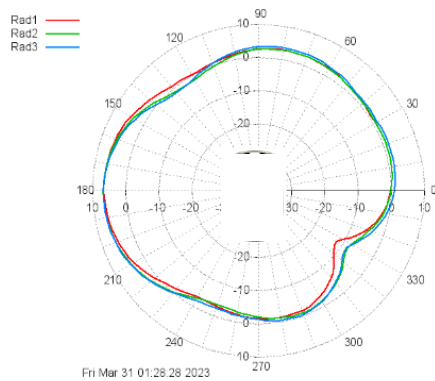Delta front average power = **-0.46 dBm**

Radiation pattern #3:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH74-XY_0_CORR

Average power = **0.89 dBm**
Front average power = **2.15 dBm** (From 0 deg to 180 deg)

Min power = **-8.23 dBm** @ -36.00 deg
Max power = **6.75 dBm** @ 180.00 deg

Delta max power = **0.18 dBm**
Delta average power = **0.59 dBm**
Delta front average power = **-0.11 dBm**

Vertical

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Radiation pattern #1:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH05-XY-V_0_CORR

Average power = **-14.35 dBm**
Front average power = **-14.23 dBm** (From 0 deg to 180 deg)

Min power = **-27.42 dBm** @ -72.00 deg
Max power = **-9.71 dBm** @ -150.00 deg

Radiation pattern #2:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH44-XY-V_0_CORR

Average power = **-13.79 dBm**
Front average power = **-13.27 dBm** (From 0 deg to 180 deg)

Min power = **-26.78 dBm** @ -75.00 deg
Max power = **-8.81 dBm** @ -147.00 deg

Delta max power = **0.90 dBm**
Delta average power = **0.56 dBm**
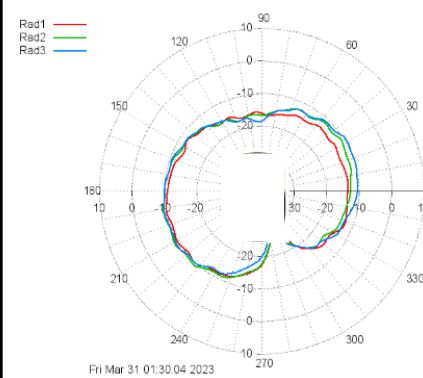Delta front average power = **0.95 dBm**

Radiation pattern #3:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH74-XY-V_0_CORR

Average power = **-13.70 dBm**
Front average power = **-12.98 dBm** (From 0 deg to 180 deg)

Min power = **-27.50 dBm** @ -78.00 deg
Max power = **-9.10 dBm** @ -147.00 deg

Delta max power = **0.61 dBm**
Delta average power = **0.65 dBm**
Delta front average power = **1.25 dBm**

Report No: EVT-700-006368

Horizontal

Rad1
Rad2
Rad3

Fri Mar 31 01:34:39 2023

Rad #1: Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH05-XZ_0_CORR
Rad #2: Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH44-XZ_0_CORR
Rad #3: Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH74-XZ_0_CORR

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Radiation pattern #1:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH05-XZ_0_CORR

Average power = **-1.72 dBm**
Front average power = **-1.01 dBm** (From 0 deg to 180 deg)

Min power = **-13.02 dBm** @ -3.00 deg
Max power = **3.43 dBm** @ -87.00 deg

Radiation pattern #2:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH44-XZ_0_CORR

Average power = **-1.61 dBm**
Front average power = **-0.94 dBm** (From 0 deg to 180 deg)

Min power = **-11.50 dBm** @ -6.00 deg
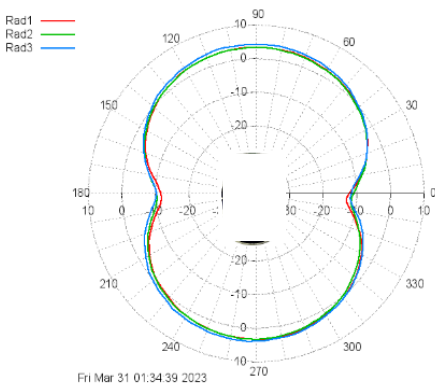Max power = **3.37 dBm** @ -93.00 deg

Delta max power = **-0.05 dBm**
Delta average power = **0.11 dBm**
Delta front average power = **0.08 dBm**

Radiation pattern #3:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH74-XZ_0_CORR

Average power = **-0.99 dBm**
Front average power = **-0.43 dBm** (From 0 deg to 180 deg)

Min power = **-11.81 dBm** @ -3.00 deg
Max power = **4.23 dBm** @ 87.00 deg

Delta max power = **0.80 dBm**
Delta average power = **0.73 dBm**
Delta front average power = **0.58 dBm**

Vertical

Rad1
Rad2
Rad3

Fri Mar 31 01:35:46 2023

Rad #1: Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH05-XZ-V_0_CORR
Rad #2: Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH44-XZ-V_0_CORR
Rad #3: Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH74-XZ-V_0_CORR

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Radiation pattern #1:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH05-XZ-V_0_CORR

Average power = **0.05 dBm**
Front average power = **0.34 dBm** (From 0 deg to 180 deg)

Min power = **-10.22 dBm** @ -117.00 deg
Max power = **6.53 dBm** @ 3.00 deg

Radiation pattern #2:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH44-XZ-V_0_CORR

Average power = **0.50 dBm**
Front average power = **0.57 dBm** (From 0 deg to 180 deg)

Min power = **-7.57 dBm** @ -123.00 deg
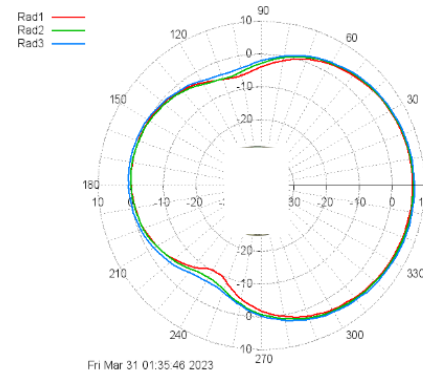Max power = **6.74 dBm** @ -6.00 deg

Delta max power = **0.20 dBm**
Delta average power = **0.46 dBm**
Delta front average power = **0.23 dBm**

Radiation pattern #3:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH74-XZ-V_0_CORR

Average power = **1.15 dBm**
Front average power = **1.19 dBm** (From 0 deg to 180 deg)

Min power = **-6.39 dBm** @ -117.00 deg
Max power = **7.09 dBm** @ -15.00 deg

Delta max power = **0.56 dBm**
Delta average power = **1.10 dBm**
Delta front average power = **0.85 dBm**

Report No: EVT-700-006368

Test antenna_（YZ plane）

Horizontal

Rad1
Rad2
Rad3

Fri Mar 31 01:37:00 2023

Rad #1: Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH05-YZ_0_CORR
Rad #2: Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH44-YZ_0_CORR
Rad #3: Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH74-YZ_0_CORR

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Radiation pattern #1:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH05-YZ_0_CORR

Average power = **-7.59 dBm**
Front average power = **-7.50 dBm** (From 0 deg to 180 deg)

Min power = **-26.65 dBm** @ -6.00 deg
Max power = **0.80 dBm** @ -108.00 deg

Radiation pattern #2:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH44-YZ_0_CORR

Average power = **-7.25 dBm**
Front average power = **-7.16 dBm** (From 0 deg to 180 deg)

Min power = **-26.01 dBm** @ -6.00 deg
Max power = **1.46 dBm** @ -108.00 deg

Delta max power = **0.65 dBm**
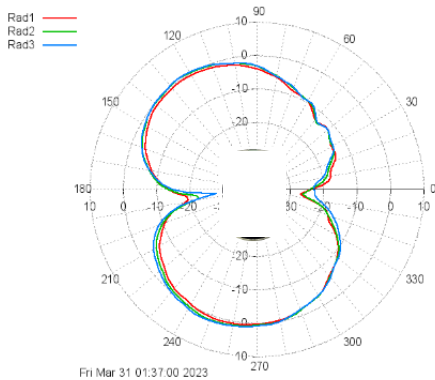Delta average power = **0.34 dBm**
Delta front average power = **0.34 dBm**

Radiation pattern #3:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH74-YZ_0_CORR

Average power = **-7.03 dBm**
Front average power = **-7.17 dBm** (From 0 deg to 180 deg)

Min power = **-27.90 dBm** @ -174.00 deg
Max power = **1.76 dBm** @ -111.00 deg

Delta max power = **0.95 dBm**
Delta average power = **0.56 dBm**
Delta front average power = **0.33 dBm**

Vertical

Rad1
Rad2
Rad3

Fri Mar 31 01:37:56 2023

Rad #1: Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH05-YZ-V_0_CORR
Rad #2: Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH44-YZ-V_0_CORR
Rad #3: Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH74-YZ-V_0_CORR

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Radiation pattern #1:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH05-YZ-V_0_CORR

Average power = **1.70 dBm**
Front average power = **1.96 dBm** (From 0 deg to 180 deg)

Min power = **-1.78 dBm** @ -171.00 deg
Max power = **3.84 dBm** @ 63.00 deg

Radiation pattern #2:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH44-YZ-V_0_CORR

Average power = **1.89 dBm**
Front average power = **2.06 dBm** (From 0 deg to 180 deg)

Min power = **-2.28 dBm** @ -174.00 deg
Max power = **4.32 dBm** @ 63.00 deg

Delta max power = **0.48 dBm**
Delta average power = **0.19 dBm**
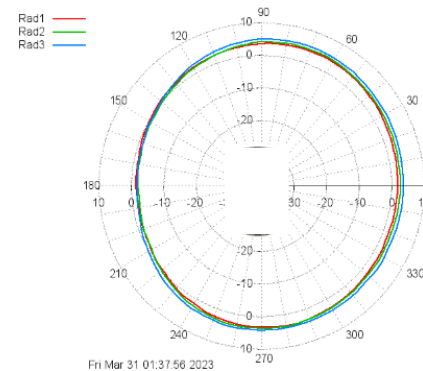Delta front average power = **0.10 dBm**

Radiation pattern #3:

Palau22-SGL_RadPatt_PA1_#AUT-FW04_default-CH74-YZ-V_0_CORR

Average power = **2.67 dBm**
Front average power = **2.78 dBm** (From 0 deg to 180 deg)

Min power = **-1.95 dBm** @ -180.00 deg
Max power = **5.10 dBm** @ 72.00 deg

Delta max power = **1.25 dBm**
Delta average power = **0.97 dBm**
Delta front average power = **0.82 dBm**

Report No: EVT-700-006368