

TEST REPORT

Report Number: R13571139-E1

- Applicant : Chiaro Technology Ltd 63-66 Hatton Garden London, EC1N 8LE United Kingdom
 - Model : LIMA EV
 - Brand : LIMA BREAST PUMP
 - FCC ID : 2AEHI-EB01
- EUT Description : Battery Operated Breast Pump
- Test Standard(s) : FCC 47 CFR PART 15 SUBPART C ISED RSS-247 ISSUE 2 ISED RSS-GEN ISSUE 5

Date Of Issue: 2021-02-04

Prepared by:

UL LLC 12 Laboratory Dr. Research Triangle Park, NC 27709 U.S.A. TEL: (919) 549-1400



REPORT REVISION HISTORY

Rev.	lssue Date	Revisions	Revised By	
V1	2021-02-04	Initial Issue	Noah Bennett	

Page 2 of 57

TABLE OF CONTENTS

REI	PORT F	REVISION HISTORY	2		
TA	TABLE OF CONTENTS				
1.	ATTE	STATION OF TEST RESULTS	5		
2.	TEST	RESULTS SUMMARY	6		
3.	TEST	METHODOLOGY	7		
4.	FACIL	ITIES AND ACCREDITATION	7		
5.	DECIS	SION RULES AND MEASUREMENT UNCERTAINTY	8		
5 5 5 5	.1. .2. .3. .4.	METROLOGICAL TRACEABILITY DECISION RULES MEASUREMENT UNCERTAINTY SAMPLE CALCULATION	8 8 8 9		
6.	EQUIF	PMENT UNDER TEST	10		
6 6 6 6 6	.1. .2. .3. .4. .5. .6.	EUT DESCRIPTION MAXIMUM OUTPUT POWER DESCRIPTION OF AVAILABLE ANTENNAS SOFTWARE AND FIRMWARE WORST-CASE CONFIGURATION AND MODE DESCRIPTION OF TEST SETUP	10 10 10 10 10 11		
7.	MEAS		12		
8.	TEST	AND MEASUREMENT EQUIPMENT	13		
9.	ANTE	NNA PORT TEST RESULTS	16		
9 9	.1. .2. 9.2.1. 9.2.2.	ON TIME AND DUTY CYCLE 99% BANDWIDTH BLE (1Mbps) BLE (2Mbps)	16 18 18 19		
9	.3. 9.3.1. 9.3.2.	6 dB BANDWIDTH BLE (1Mbps) BLE (2Mbps)	20 20 21		
9	. <i>4.</i> 9.4.1. 9.4.2.	OUTPUT POWER BLE (1Mbps) BLE (2Mbps)	22 22 22		
9	.5. 9.5.1. 9.5.2.	AVERAGE POWER BLE (1Mbps) BLE (2Mbps)	23 23 23		
9	. <i>6.</i> 9.6.1.	POWER SPECTRAL DENSITY BLE (1Mbps)	24 25		

Page 3 of 57

UL LLC 12 Laboratory Dr., RTP, NC 27709; USA

9.6.2.	. BLE (2Mbps)	
9.7.	CONDUCTED SPURIOUS EMISSIONS	
9.7.1.	. BLE (1Mbps)	
9.7.2.	BLE (2Mbps)	
10. RA	DIATED TEST RESULTS	
10.1.	LIMITS AND PROCEDURE	
10.2.	TRANSMITTER ABOVE 1 GHz	
10.2.1	1. BLE (1Mbps)	
10.2.2	2. BLE (2Mbps)	
10.3.	WORST CASE BELOW 30MHZ	
10.4.	WORST CASE BELOW 1 GHZ	
10.5.	WORST CASE 18-26 GHZ	
11. SE	TUP PHOTOS	

Page 4 of 57

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	Chiaro Technology Ltd
EUT DESCRIPTION:	Battery powered Breast Pump
MODEL:	LIMA EV
BRAND:	LIMA BREAST PUMP
SERIAL NUMBER:	EV52
SAMPLE RECEIPT DATE:	2020-12-28
DATE TESTED:	2021-01-14 to 2021-01-29.

APPLICABLE STANDARDS	6
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5	Complies

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. government.

Approved & Released For UL LLC By:

Prepared By:

Fal-

Brian T. Kiewra Project Engineer Consumer Technology Division UL LLC.

hambert

Noah Bennet Engineer Consumer Technology Division UL LLC.

Page 5 of 57

2. TEST RESULTS SUMMARY

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting	ANSI C63.10 Section
Oee Comment		Duty Cycle	purposes only	11.6.
	RSS-GEN 6.7		Reporting	ANSI C63.10 Section
-		9970 OBVV	purposes only	6.9.3.
15.247 (a) (2)	RSS-247 5.2 (a)	6dB BW	Compliant	None.
15.247 (b) (3)	RSS-247 5.4 (d)	Output Power	Compliant	None.
See Comment		Average power	Reporting	Per ANSI C63.10,
			purposes only	Section 11.9.2.3.2.
15.247 (e)	RSS-247 5.2 (b)	PSD	Compliant	None.
15.247 (d)	RSS-247 5.5	Conducted Spurious Emissions	Compliant	None.
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions	Compliant	None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions	Compliant	None.

Page 6 of 57

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02, RSS-GEN Issue 5, and RSS-247 Issue 2.

4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Drive, Research Triangle Park, North Carolina, USA and 2800 Perimeter Park Dr. Suite B, Morrisville, North Carolina, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

12 Laboratory Dr.	2800 Suite Perimeter Park Dr. Suite B				
ISED Site Code: 2180C					
Chamber A RTP	North Chamber				
Chamber C RTP	🛛 South Chamber				

The above test sites and facilities are covered under FCC Test Firm Registration # 703469. Chambers above are covered under Industry Canada company address and respective code .

UL LLC (RTP), CABID: US00067, is accredited by NVLAP, Laboratory Code 200246-0

Page 7 of 57

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	1.22%
RE output power, conducted	1.3 dB (PK)
	0.45 dB (AV)
RF output power, radiated (SAC) < 180 MHz	6.18 dB
RF output power, radiated (SAC) >=180 MHz	3.23 dB
Power Spectral Density, conducted	2.47 dB
Unwanted Emissions, conducted	1.94 dB
All emissions, radiated	6.01 dB
Conducted Emissions (0.150-30MHz) - LISN	3.40 dB
Temperature	0.57°C
Humidity	3.39%
DC Supply voltages	1.70%
Time	3.39%

Uncertainty figures are valid to a confidence level of 95%.

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided: Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB) 36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided: Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss. 36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

Page 9 of 57

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a battery-operated Breast Pump with a BLE radio.

6.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	BLE: 1Mbps	3.77	2.38
2403 - 2480	BLE: 2Mbps	3.75	2.37

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an chip antenna, with a maximum gain of -2.23 dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was lima-puck-fw-v1.0.0-auto-dtm

The test utility software used during testing was CoolTerm v3.0.264.0.

6.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz and above 18GHz were performed with the EUT set to transmit at the channel and data rate with highest output power as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels, at 1Mbps and 2Mbps.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List						
Description Manufacturer Model Serial Number FCC ID						
Laptop	Lenovo	T450s	PC0BHFNX	PD97265NGU		

I/O CABLES

I/O Cable List							
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks	
1	USB-A	2	USB-A	USB	<3m	Connects to laptop for configuration	

TEST SETUP

The EUT is connected to a test laptop during the tests. Test software exercised the radio card.

SETUP DIAGRAMS

Please refer to R13571139-EP1 for setup diagrams

Page 11 of 57

7. MEASUREMENT METHOD

On Time and Duty Cycle: ANSI C63.10-2013 Section 11.6.

<u>6 dB BW:</u> ANSI C63.10 Subclause -11.8.1

Occupied BW (99%): ANSI C63.10-2013 Section 6.9.3

Output Power: ANSI C63.10 Subclause -11.9.1.3 Method PKPM1 Peak-reading power meter Output Power: ANSI C63.10 Subclause -11.9.2.3.2 Method AVGPM-G (Measurement using a gated RF average-reading power meter)

PSD: ANSI C63.10 Subclause -11.10.2 Method PKPSD (peak PSD)

Emissions in non-restricted frequency bands: ANSI C63.10 Subclause -11.11 and 6.10.4

Emissions in restricted frequency bands: ANSI C63.10 Subclause -11.12.1 and 6.10.5

General Radiated Emissions: ANSI C63.10:2013 Sections 6.3 - 6.6

Page 12 of 57

8. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - North Chamber)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	0.009-30MHz	(Loop Ant.)			
AT0059	Active Loop Antenna	EMCO	6502	2020-08-06	2021-08-06
	30-1000 MHz				
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2020-07-27	2021-07-27
	18-40 GHz				
AT0063	Horn Antenna, 18- 26.5GHz	ARA	MWH-1826/B	2020-10-30	2021-10-30
	Gain-Loss Chains				
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2020-07-29	2021-07-29
N-SAC02	Gain-loss string: 25- 1000MHz	Various	Various	2020-07-29	2021-07-29
N-SAC04	Gain-loss string: 18-40GHz	Various	Various	2020-07-31	2021-07-31
	Receiver & Software				
SA0026	Spectrum Analyzer	Agilent	N9030A	2020-07-16	2021-07-16
SOFTEMI	EMI Software	UL	Version 9.5 (2020- 08-18)	NA	NA
	Additional Equipment used				
s/n 200037610	Environmental Meter	Fisher Scientific	06-662-4	2020-01-22	2022-01-22

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equip.		Manufacturer/Bra			
ĪD	Description	nd	Model Number	Last Cal.	Next Cal.
	1-18 GHz				
470067	Double-Ridged Waveguide Horn Antenna, 1 to 18		0447	2020 04 28	2024 04 28
A10067	GHZ	ETS Lindgren	3117	2020-04-28	2021-04-28
	Gain-Loss Chains				
	Gain-loss string:				
S-SAC03	1-18GHz	Various	Various	2020-07-06	2021-07-06
	Receiver & Software				
SA0025	Spectrum Analyzer	Agilent	Νούσοα	2020-03-17	2021-03-17
070020	Analyzoi	Aglion	NJUJUA	2020-03-17	2021-00-17
SOFTEMI	EMI Software	UL	Version	<u>9.5 (2020-08-</u>	<u>18)</u>
	Additional Equipment used				
	Environmental				
s/n 200037635	Meter	Fisher Scientific	06-662-4	2020-01-22	2022-01-22

Test Equipment Used - Radiated Disturbance Emissions (E-field) – Chamber C

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	1-18 GHz				
AT0062	HORN Antenna	ETS-Lindgren	3117	2020-01-30	2021-01-30
	Gain-Loss Chains				
C-SAC02	Gain-loss string: 1-18GHz	Various	Various	2020-03-03	2021-03-03
	Receiver & Software				
SA0018	Spectrum Analyzer	Agilent	PXA (N9030A)	2020-03-18	2021-03-18
SOFTEMI	EMI Software	UL	Version 9.5 (2020- 08-18)	NA	NA
	Additional Equipment used				
HI0085	Temp/Humid/Pressure Meter	EXTECH	SD700	2020-04-20	2021-04-30

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 1				

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
PWM005 (PRE0136341)	RF Power Meter	Keysight Technologies	N1912A	2020-07-14	2021-07-14
PWS005 (s/n MY55090030)	Peak and Avg Power Sensor, 50MHz to 6GHz	Keysight Technologies	E9323A	2020-05-26	2021-05-26
HI0091	Environmental Meter	Fisher Scientific	15-077-963	2020-06-26	2021-06-26
	Conducted Room 2				
SA007 (PRE0126407	Spectrum Analyzer	Keysight Technologies	N9030A	2020-06-10	2021-06-10
HI0090 (PRE0191271)	Environmental Meter	Fisher Scientific	15-077-963	2020-06-26	2021-06-26
SOFTEMI	Antenna Port Software	UL	Version 2020.12.3	NA	NA

Page 15 of 57

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

ANSI C63.10 Zero-Span Spectrum Analyzer Method

ON TIME AND DUTY CYCLE RESULTS

	В		х	Cycle	Correction Factor	Minimum VBW
	(msec)	(msec)	(linear)	(%)	(dB)	(kHz)
2.4GHz Band						
BLE 1 Mbps	0.104	0.625	0.166	16.64%	15.58	9.615
BLE 2 Mbps	0.061	0.624	0.098	9.78%	20.20	16.393

DUTY CYCLE PLOTS



	er - AP2020.12.3,84740	/40882,							
enter Freq 2.44	10000000 G		Trig Delay-1	33.3 μs	#Avg Typ AvalHold:	ALIGN AUTO e: RMS : 1/1	06:21:04 PM TRAC TYP	4Jan 14, 2021 E 1 2 3 4 5 6 E A WWWWW	Frequency
0 dB/div Ref 20	.00 dBm	Gain:Low	#Atten: 30 d	В	5		₀ 104 Mkr3 2.	24.0 μs .663 dB	Auto Tun
	<u>1∆2</u>			3∆2	2				Center Fre 2.440000000 G⊦
20.0								TRIG LVL	Start Fre 2.440000000 GH
0.0 4445 444 44	yelweed during water	havywyanhama	panenter	1kg/kujul	n plpt-pe-siljerra	hhairnanailaga	alifen permer vinant.	ny/withwateryw ⁴ 6	Stop Fre 2.440000000 GH
enter 2.4400000 es BW 8 MHz	00 GHz	#VBW	50 MHz	EUNCT		Sweep 1	S .333 ms (1	pan 0 Hz 1001 pts)	CF Ste 8.000000 M <u>Auto</u> M
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	6 1; 6;	1.33 μs (Δ) 33.3 μs 24.0 μs (Δ)	0.034 dB -8.040 dBm -2.663 dB				PONCIL	E	Freq Offs 01
4 5 6									
4 5 6 7 8 9 0 1									

Page 17 of 57

9.2. 99% **BANDWIDTH**

LIMITS

None; for reporting purposes only.

RESULTS

9.2.1. BLE (1Mbps)

Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low	2402	1.0271
Middle	2440	1.0293
High	2480	1.0295



9.2.2. BLE (2Mbps)

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	2.0567
Middle	2440	2.0585
High	2480	2.0617



9.3. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2) RSS-247 5.2 (a) The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

9.3.1. BLE (1Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.6840	0.5
Middle	2440	0.6780	0.5
High	2480	0.6750	0.5





Page 20 of 57

9.3.2. BLE (2Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	1.1700	0.5
Middle	2440	1.2120	0.5
High	2480	1.1820	0.5





9.4. OUTPUT POWER

<u>LIMITS</u>

FCC §15.247 (b) (3)

RSS-247 5.4 (d)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 11.73 dB (including 10.28 dB pad and 1.45 dB cable) was entered as an offset in the power meter.

RESULTS

9.4.1. BLE (1Mbps)

Tested By:	84740/40882
Date:	2021-01-14

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.77	30	-26.230
Middle	2440	3.69	30	-26.310
High	2480	3.68	30	-26.320

9.4.2. BLE (2Mbps)

Tested By:	84740/40882
Date:	2021-01-14

Channel	Frequency	Peak Power Reading	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Low	2402	3.75	30	-26.250
Middle	2440	3.70	30	-26.300
High	2480	3.71	30	-26.290

9.5. AVERAGE POWER

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a gated average power meter.

The cable assembly insertion loss of 11.73 dB (including 10.28 dB pad and 1.45 dB cable) was entered as an offset in the power meter.

RESULTS

9.5.1. BLE (1Mbps)

Tested By:	84740/40882
Date:	2021-01-14

Channel	Frequency	AV power			
	(MHz)	(dBm)			
Low	2402	3.6			
Middle	2440	3.54			
High	2480	3.52			

9.5.2. BLE (2Mbps)

Tested By:	84740/40882
Date:	2021-01-14

Channel	Frequency	AV power			
	(MHz)	(dBm)			
Low	2402	3.58			
Middle	2440	3.53			
High	2480	3.51			

9.6. POWER SPECTRAL DENSITY

<u>LIMITS</u>

FCC §15.247 (e)

RSS-247 (5.2) (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

Page 24 of 57

9.6.1. BLE (1Mbps)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)		
Low	2402	-14.53	8	-22.53		
Middle	2440	-14.37	8	-22.37		
High	2480	-14.24	8	-22.24		





9.6.2. BLE (2Mbps)

Channel	Frequency	PSD	Limit	Margin
	(MHz)	(dBm/3kHz)	(dBm/3kHz)	(dB)
Low	2402	-16.05	8	-24.05
Middle	2440	-15.94	8	-23.94
High	2480	-15.90	8	-23.90





9.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

RSS-247 5.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is -20 dBc.

RESULTS

9.7.1. BLE (1Mbps)



Page 27 of 57

Keysight Spectrum Analyzer - AP2020.12.3,84740/40882,			Keysight Spectrum Analyzer - AP2020.12.	3,84740/40882,		
Center Freq 2.483500000 GHz	ALIGN AUTO 06:39:25 PM Jan 14, 2021 #Avg Type: RMS TRACE 1 2 3 4 5 6 Avg Hold: 100/100 TYPE M WWWWWW	Frequency	Center Freq 13.0150000	00 GHz	ALIGN AUTO 06:12:36 PM 3an 14, 20 #Avg Type: RMS TRACE 1 2 3 4 Avg Hold: 10/10 TYPE MW000	Frequency
PRO, Wide - Fright Tooldan IFGainLow #Atten: 40 dB	Mkr1 2.480 02 GHz 3.855 dBm	Auto Tune	Ref Offset 12.12 dl	IFGain:Low #Atten: 40 dB	Mkr4 25.570 8 GH -29.325 dB	Auto Tune
		Center Freq 2.483500000 GHz				Center Freq 13.015000000 GHz
-100 -200 -300		Start Freq 2.478500000 GHz	-10.0 -20.0 -30.0			Start Freq 30.000000 MHz
400		Stop Freq 2.488500000 GHz	-40.0 -50.0 -60.0			Stop Freq 26.00000000 GHz
Center 2.433500 GHz #Res BW 100 kHz #VBW 300 kHz International State A	Span 10.00 MHz Sweep 5.000 ms (1001 pts) NCTION FUNCTION WIDTH FUNCTION VALUE	CF Step 1.000000 MHz Auto Man	Start 30 MHz #Res BW 100 kHz MRR MODE TRC SCL	#VBW 300 kHz	Stop 26.00 GH Sweep 957.3 ms (40001 pt NCTION FUNCTION WIDTH FUNCTION WILL	z CF Step 2.597000000 GHz <u>Auto</u> Man
N T 2480 02 CHz 3,855 dBm 2 N T 2 2483 45 CHz 3,8384 dBm 3 N T 2483 50 GHz 40.916 dBm 4 5 5	E	Freq Offset 0 Hz	1 N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 2 6	2.480 0 GHz -4.427 dBm 4.960 0 GHz -37.959 dBm 7.440 0 GHz -40.425 dBm 5.570 8 GHz -29.325 dBm		Freq Offset
7 9 10 11			7 8 9 10 11			
MSG	STATUS		MSG	m	STATUS	
HIGH CHANNE	L BANDEDGE		OUT	-OF-BAND I	HIGH CHANNE	L

Page 28 of 57

9.7.2. BLE (2Mbps)



Page 29 of 57

10. RADIATED TEST RESULTS

10.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9 to 150kHz range. Peak detection is used unless otherwise noted as quasi-peak or average (9-90kHz and 110-490kHz).

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for linear voltage average measurements.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Page 30 of 57

3D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel).

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

KDB 414788 Open Field Site(OFS) and Chamber Correlation Justification

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

Page 31 of 57

10.2. TRANSMITTER ABOVE 1 GHz

10.2.1. BLE (1Mbps)

<u>Antenna 1</u>

BANDEDGE (LOW CHANNEL)

Test Facility: UL Morrisville 2021 Jan 15 18:53:55 Restricted Bandedge Project Number: 13571139 Client: Chiaro Technology Test Location: C-SAC Mode: 1Tx, BLE, 2482MHz Tested by: 84740/11993 115 105 95 85 (dBuU/m) Peak Limit (dBuV/m 75 65 imit (dBuU 55 4 35 2 31 10.5MHz/ 2 415 Frequency (GHz) RBM/VBW Ref/Attn Det/Avg Type Pts #Swps/Mode Labe RBM/VBM 1M(-6dB)/3M Ref/Attn Det/Avg Type 107/10 PEAK/Pwr Avg(RMS) Pts #Sups/Mode Range (6Hz) 1:2.31-2.41 Sueep that a Pb

HORIZONTAL RESULT

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	36.58	Pk	32.1	-18.2	50.48	54	-3.52	74	-23.52	283	132	Н
2	* ** 2.38922	38.78	Pk	32	-18.2	52.58	54	-1.42	74	-21.42	283	132	Н

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band ** - indicates frequency in Taiwan NCC LP0002 Restricted Band Pk - Peak detector





Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	34.71	Pk	32.1	-18.2	48.61	54	-5.39	74	-25.39	270	290	V
2	* ** 2.37855	36.52	Pk	32	-18.4	50.12	54	-3.88	74	-23.88	270	290	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

BANDEDGE (HIGH CHANNEL)



HORIZONTAL RESULT

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.4835	37.42	Pk	32.6	-18	52.02	54	-1.98	74	-21.98	259	211	Н
2	* ** 2.48376	39.08	Pk	32.6	-18	53.68	54	-0.32	74	-20.32	259	211	Н

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band ** - indicates frequency in Taiwan NCC LP0002 Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band Pk - Peak detector

Page 34 of 57



VERTICAL RESULT

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.4835	33.17	Pk	32.6	-18	47.77	54	-6.23	74	-26.23	164	240	V
2	** 2.56278	36.47	Pk	32.4	-17.6	51.27	54	-2.73	74	-22.73	164	240	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

HARMONICS AND SPURIOUS EMISSIONS



LOW CHANNEL RESULTS



Page 36 of 57

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/Fltr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.49602	34.42	PK2	27.8	-17.8	44.42	54	-9.58	74	-29.58	229	147	Н
4	* ** 12.01009	48.53	PK2	38.8	-37.3	50.03	54	-3.97	74	-23.97	213	308	Н
2	* ** 4.09292	51.61	PK2	33.5	-48.1	37.01	54	-16.99	74	-36.99	333	101	Н
5	* ** 1.49831	34.02	PK2	27.8	-17.9	43.92	54	-10.08	74	-30.08	90	239	V
9	* ** 12.00861	49.52	PK2	38.8	-37.3	51.02	54	-2.98	74	-22.98	28	192	V
7	* ** 4.80434	52.39	PK2	34.1	-47.8	38.69	54	-15.31	74	-35.31	4	184	V
3	7.20607	53.54	Pk	35.7	-45.3	43.94	-	-	-	-	0-360	101	Н
6	3.19001	50.34	Pk	32.9	-49.8	33.44	-	-	-	-	0-360	200	V
8	7.20607	54.2	Pk	35.7	-45.3	44.6	-	-	-	-	0-360	101	V

RADIATED EMISSIONS

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band ** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector PK2 - Maximum Peak

Page 37 of 57



MID CHANNEL RESULTS



Page 38 of 57

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/Fltr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.48462	34.22	PK2	27.8	-17.6	44.42	54	-9.58	74	-29.58	4	214	Н
2	* ** 4.58121	50.58	PK2	34.1	-47.8	36.88	54	-17.12	74	-37.12	254	101	Н
3	* ** 7.31928	56.1	PK2	35.7	-44.6	47.2	54	-6.8	74	-26.8	340	101	Н
4	* ** 1.09931	41.89	PK2	27.3	-21	48.19	54	-5.81	74	-25.81	92	261	V
5	* ** 3.98243	53.64	PK2	33.4	-48.2	38.84	54	-15.16	74	-35.16	103	204	V
6	* ** 7.31921	58.25	PK2	35.7	-44.6	49.35	54	-4.65	74	-24.65	214	117	V

RADIATED EMISSIONS

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band ** - indicates frequency in Taiwan NCC LP0002 Restricted Band PK2 - Maximum Peak

Page 39 of 57



HIGH CHANNEL RESULTS



Page 40 of 57

	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/Fltr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.48551	34.1	PK2	27.8	-17.8	44.1	54	-9.9	74	-29.9	346	392	Н
5	* ** 11.11084	48.82	PK2	37.8	-38.7	47.92	54	-6.08	74	-26.08	351	193	Н
6	* ** 12.48942	49.07	PK2	39.1	-37.9	50.27	54	-3.73	74	-23.73	140	304	Н
2	* ** 4.64431	55	PK2	34.1	-46.9	42.2	54	-11.8	74	-31.8	103	393	Н
3	* ** 4.95974	54.66	PK2	34	-47.4	41.26	54	-12.74	74	-32.74	130	101	Н
4	* ** 7.44014	56.6	PK2	35.7	-45.3	47	54	-7	74	-27	158	101	Н
7	* ** 1.52819	34.09	PK2	28	-18.2	43.89	54	-10.11	74	-30.11	232	129	V
15	* ** 11.06058	49.68	PK2	37.8	-38.9	48.58	54	-5.42	74	-25.42	190	320	V
16	* ** 12.39884	49.69	PK2	39	-37.4	51.29	54	-2.71	74	-22.71	193	190	V
9	* ** 3.78483	51.14	PK2	33.5	-48.2	36.44	54	-17.56	74	-37.56	33	197	V
10	* ** 3.88959	52.69	PK2	33.5	-49.3	36.89	54	-17.11	74	-37.11	347	197	V
11	* ** 3.99671	59.29	PK2	33.4	-48.6	44.09	54	-9.91	74	-29.91	97	206	V
12	* ** 4.96055	52.93	PK2	34	-47.5	39.43	54	-14.57	74	-34.57	190	202	V
13	* ** 4.99204	57.07	PK2	34	-47.3	43.77	54	-10.23	74	-30.23	248	214	V
14	* ** 7.43929	56.71	PK2	35.7	-45.3	47.11	54	-6.89	74	-26.89	355	192	V
8	3.19751	51.13	Pk	32.9	-49.9	34.13	-	-	-	-	0-360	200	V

RADIATED EMISSIONS

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band ** - indicates frequency in Taiwan NCC LP0002 Restricted Band PK2 - Maximum Peak

Pk - Peak detector

Page 41 of 57

10.2.2. BLE (2Mbps)

<u>Antenna 1</u>

BANDEDGE (LOW CHANNEL)



HORIZONTAL RESULT

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	33.68	Pk	32.1	-18.2	47.58	54	-6.42	74	-26.42	30	276	Н
2	* ** 2.38822	37.02	Pk	32	-18.3	50.72	54	-3.28	74	-23.28	30	276	Н

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band ** - indicates frequency in Taiwan NCC LP0002 Restricted Band Pk - Peak detector



v	FRT	Ίςδι	RES	ШΤ
v		ICAL	RES	

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.39	36.21	Pk	32.1	-24	44.31	54	-9.69	74	-29.69	111	367	V
2	* ** 2.35528	37.83	Pk	32.2	-23.8	46.23	54	-7.77	74	-27.77	111	367	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

BANDEDGE (HIGH CHANNEL)



HORIZONTAL RESULT

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.4835	36.92	Pk	32.6	-18	51.52	54	-2.48	74	-22.48	256	152	Н
2	* ** 2.48787	38.05	Pk	32.6	-18	52.65	54	-1.35	74	-21.35	256	152	Н

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band ** - indicates frequency in Taiwan NCC LP0002 Restricted Band

A - Indicates frequency in Talwan NCC LPU
Pk - Peak detector



VERTICAL RESULT

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 2.4835	33.53	Pk	32.6	-18	48.13	54	-5.87	74	-25.87	181	264	V
2	** 2.54622	36.52	Pk	32.5	-17.7	51.32	54	-2.68	74	-22.68	181	264	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

HARMONICS AND SPURIOUS EMISSIONS



LOW CHANNEL RESULTS



Page 46 of 57

Markers	Frequency	Meter	Det	AT0062	Amp/Cbl/Fltr	Corrected	Avg Limit	Margin	Peak Limit	РК	Azimuth	Height	Polarity
	(GHz)	Reading		(dB/m)	(dB)	Reading	(dBuV/m)	(dB)	(dBuV/m)	Margin	(Degs)	(cm)	
		(dBuV)				(dBuV/m)				(dB)			
1	* ** 1.49281	34.58	PK2	27.8	-18	44.38	54	-9.62	74	-29.62	137	218	Н
4	* ** 11.08399	48.33	PK2	37.7	-38.3	47.73	54	-6.27	74	-26.27	196	185	Н
2	* ** 4.98072	58.09	PK2	34	-47.1	44.99	54	-9.01	74	-29.01	87	249	Н
5	* ** 1.59975	34.3	PK2	28.2	-18.9	43.6	54	-10.4	74	-30.4	289	221	V
7	* ** 3.98654	59.42	PK2	33.4	-48.5	44.32	54	-9.68	74	-29.68	116	221	V
8	* ** 4.98012	60.86	PK2	34	-47.1	47.76	54	-6.24	74	-26.24	82	101	V
6	3.18584	53.66	Pk	32.9	-49.8	36.76	-	-	-	-	0-360	101	V
9	7.2044	56.37	Pk	35.7	-45.3	46.77	-	-	-	-	0-360	199	V

RADIATED EMISSIONS

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band ** - indicates frequency in Taiwan NCC LP0002 Restricted Band PK2 - Maximum Peak Pk - Peak detector

Page 47 of 57



MID CHANNEL RESULTS

HORIZONTAL



Page 48 of 57

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/Fltr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.35602	33.79	PK2	28.8	-19.5	43.09	54	-10.91	74	-30.91	210	245	Н
3	* ** 3.81201	54.55	PK2	33.6	-48.5	39.65	54	-14.35	74	-34.35	171	399	Н
5	* ** 7.31855	57.08	PK2	35.7	-44.6	48.18	54	-5.82	74	-25.82	347	102	Н
6	* ** 1.53076	34.21	PK2	28	-18.1	44.11	54	-9.89	74	-29.89	254	380	V
8	* ** 4.98883	56.23	PK2	34	-47.2	43.03	54	-10.97	74	-30.97	65	212	V
9	* ** 7.32001	57.75	PK2	35.7	-44.5	48.95	54	-5.05	74	-25.05	39	223	V
10	* ** 9.39061	52.41	PK2	36.4	-42.5	46.31	54	-7.69	74	-27.69	209	360	V
2	3.19501	49.51	Pk	32.9	-49.8	32.61	-	-	-	-	0-360	101	Н
4	5.72182	47.63	Pk	34.6	-46.9	35.33	-	-	-	-	0-360	101	Н
7	3.19918	51.02	Pk	32.9	-49.9	34.02	-	-	-	-	0-360	199	V

RADIATED EMISSIONS

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band ** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK2 - Maximum Peak

Pk - Peak detector

Page 49 of 57



HIGH CHANNEL RESULTS



Page 50 of 57

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0062 (dB/m)	Amp/Cbl/Fltr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 1.51952	34.18	PK2	27.9	-18.1	43.98	54	-10.02	74	-30.02	58	368	Н
4	* ** 11.09099	48.88	PK2	37.7	-38.3	48.28	54	-5.72	74	-25.72	1	101	Н
3	* ** 7.44014	56.3	PK2	35.7	-45.3	46.7	54	-7.3	74	-27.3	161	101	Н
5	* ** 1.0987	42.36	PK2	27.3	-21	48.66	54	-5.34	74	-25.34	111	354	V
7	* ** 3.99573	57.68	PK2	33.4	-48.6	42.48	54	-11.52	74	-31.52	283	372	V
8	* ** 4.58007	54.86	PK2	34.1	-47.8	41.16	54	-12.84	74	-32.84	113	381	V
9	* ** 4.9866	58.08	PK2	34	-47.4	44.68	54	-9.32	74	-29.32	38	224	V
10	* ** 7.43848	58.06	PK2	35.7	-45.3	48.46	54	-5.54	74	-25.54	203	101	V
2	5.33763	47.83	Pk	34.6	-47	35.43	-	-	-	-	0-360	101	Н
6	3.18584	52.39	Pk	32.9	-49.8	35.49	-	-	-	-	0-360	200	V

RADIATED EMISSIONS

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band ** - indicates frequency in Taiwan NCC LP0002 Restricted Band

PK2 - Maximum Peak

Pk - Peak detector

Page 51 of 57

10.3. WORST CASE BELOW 30MHZ

Note: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40*Log (test distance / specification distance).



SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)

Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	QP/Avg Limit (dBuV/m)	Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Face
1	.02363	43.56	Pk	13.6	.1	-80	-22.74	40.14	60.14	-62.88	0-360	0
7	.02483	44.03	Pk	13.5	.1	-80	-22.37	39.7	59.7	-62.07	0-360	0
4	.0286	44.28	Pk	13.4	.1	-80	-22.22	38.48	58.48	-60.7	0-360	0
8	.17108	45.03	Pk	10.8	.1	-80	-24.07	22.94	42.94	-47.01	0-360	90
2	.25438	42.84	Pk	10.7	.1	-80	-26.36	19.49	39.49	-45.85	0-360	90
5	.27614	40.64	Pk	10.7	.1	-80	-28.56	18.78	38.78	-47.34	0-360	90
3	.75139	33.24	Pk	10.8	.2	-40	4.24	30.09	-	-25.85	0-360	Flat
9	1.21094	28.11	Pk	11	.2	-40	69	25.94	-	-26.63	0-360	Flat
6	1.56297	26.63	Pk	11.1	.2	-40	-2.07	23.73	-	-25.8	0-360	Flat

Pk - Peak detector

Page 52 of 57

10.4. WORST CASE BELOW 1 GHZ

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



44 Test Facility: UL Morrisville 2021 Jan 19 10:11:04 Radiated Emissions - 3 Meters Project Number: 13571139 Client: Chiano Tech Test Location: N-SAC Mode: 1Tx, BLE, WC=X Tested by: 22797/11993 34 24 14 (dBuA/m) -6 QPk Limit @BuA/m -16 1-4 4 Ŵ -26 JAN sh/ laak -36 -46 1000 30 100 Frequency (MHz) Pts #Sxps/Mode Label Ronge (MHz) 4000 MXXH Vartical 4:208-1000 Range (MHz) 2:30-200 RBW/UBN Ref/Attn Det/Avg Type Sweep 128k(-6d8)/IM 97/10 PEAK/LogPw-Uideo Auto RBM/VBM Ref/Attn Det/Avg Type Sweep 128k/-5dB3/1M 97/18 PERK/LogPar-Uides Auto Pts #Sups/Node Lobel 8088 MAXH Vertica VERTICAL

Page 53 of 57

Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 119.4431	39.05	Pk	19.9	-30.2	28.75	43.52	-14.77	0-360	200	Н
2	* ** 170.7964	30.27	Pk	17.9	-29.7	18.47	43.52	-25.05	0-360	100	Н
4	* ** 119.5282	40.91	Pk	19.9	-30.2	30.61	43.52	-12.91	0-360	100	V
5	* ** 169.9462	33.27	Pk	18	-29.7	21.57	43.52	-21.95	0-360	100	V
3	* ** 269.8091	34.39	Pk	19.3	-28.9	24.79	46.02	-21.23	0-360	100	Н
6	* ** 278.3102	41.03	Pk	19.4	-28.8	31.63	46.02	-14.39	0-360	98	V
7	47.7696	47.04	Pk	14.8	-31.1	30.74	-	-	0-360	400	Н
11	47.8121	61.04	Pk	14.8	-31.1	44.74	-	-	0-360	100	V
12	59.6727	58.18	Pk	13.5	-31	40.68	-	-	0-360	100	V
8	59.7152	45.04	Pk	13.5	-31	27.54	-	-	0-360	300	Н
13	83.6489	48.78	Pk	13.3	-30.7	31.38	-	-	0-360	100	V
9	83.7339	42.68	Pk	13.3	-30.6	25.38	-	-	0-360	400	Н
10	107.5401	48.58	Pk	18.2	-30.4	36.38	-	-	0-360	300	Н
14	107.5401	45.34	Pk	18.2	-30.4	33.14	-	-	0-360	100	V

Pk - Peak detector

Page 54 of 57

10.5. WORST CASE 18-26 GHZ

SPURIOUS EMISSIONS 18-26 GHz (WORST-CASE CONFIGURATION)



HORIZONTAL



Page 55 of 57

18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AT0063 AF (dB/m)	Amp/CBL (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* ** 19.25335	48.59	Pk	33.5	-40.6	41.49	54	-12.51	74	-32.51	0-360	250	Н
2	* ** 20.67906	49.41	Pk	34	-40.9	42.51	54	-11.49	74	-31.49	0-360	250	Н
3	* ** 22.78671	49.24	Pk	35.5	-40.9	43.84	54	-10.16	74	-30.16	0-360	250	Н
4	* ** 19.83421	49.09	Pk	33.6	-40.6	42.09	54	-11.91	74	-31.91	0-360	200	V
5	* ** 22.17656	48.49	Pk	36.7	-41.1	44.09	54	-9.91	74	-29.91	0-360	200	V
6	* ** 23.74301	47.67	Pk	34.8	-40.7	41.77	54	-12.23	74	-32.23	0-360	150	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band ** - indicates frequency in Taiwan NCC LP0002 Restricted Band

Pk - Peak detector

Page 56 of 57

11. SETUP PHOTOS

Please refer to R13571139-EP1 for setup photos.

END OF TEST REPORT

Page 57 of 57