

Page: 1 of 36

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT





Applicant: Laipac Technology Inc

> 25 Valleywood Drive Unit11, Markham, Ontario, Canada.

L3R 5L9

Manufacturer: Laipac Technology Inc

> 25 Valleywood Drive Unit11, Markham, Ontario, Canada,

L3R 5L9

Product Name: Look SPOT 2

Look SPOT **Brand Name:**

Model No.: Look SPOT 2

Model Difference: N/A

Report Number: E2/2021/80083

FCC ID **TET-LOOKSPOT2**

IC: 11280A-LOOKSPOT2

Issue Date: Dec.03,2021

Date of Test: Aug.30,2021~Sep.27,2021

Date of EUT Received: Jun.15,2021

Approved By ALMO HSi

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT comply with FCC rule part §15.225, ISED RSS-210.

The results of this report relate only to the sample identified in this report.

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Page: 2 of 36

Revision History							
Report Number Revision Description Issue Date Revised By Remark							
E2/2021/80083	Rev.00	Original.	Dec.03,2021	Viola Su	-		

Note:

- 1. The remark "*" indicates modification of the report upon requests from certification body.
- 2 · Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

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Page: 3 of 36

Table of Contents

1	GENERAL INFORMATION	. 4
2	SYSTEM TEST CONFIGURATION	. 6
3	SUMMARY OF TEST RESULTS	8
4	DESCRIPTION OF TEST MODES	. 9
5	MEASUREMENT UNCERTAINTY	10
6	CONDUCTED EMISSIONS TEST	.11
7	RADIATED EMISSION TEST	15
8	FREQUENCY STABILITY	29
9	EMISSION BANDWIDTH MEASUREMENT	33
10	ANTENNA REQUIREMENT	36

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SCST Taiwan Lift

No.134 We King Part Med Taiwa Lift

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Page: 4 of 36

GENERAL INFORMATION

1.1 **Product Description**

Product Name:	LooK SPOT 2
Brand Name:	LooK SPOT
Model No.:	LooK SPOT 2
Model Difference:	N/A
Hardware Version:	V2.0
Firmware Version:	V1.0
EUT Series No.:	PJ216050001
Power Supply:	12V DC

1.2 RF specification

Radio Technology:	NFC
Operating Frequency	13.56MHz
Transmit Power	< 4.71dBuV/m at 30m.
Number of Channels	1
Modulation Type	ASK
Antenna Type	Loop Antenna

Note: Antenna information is provided by the applicant.

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Page: 5 of 36

1.3 **Test Methodology**

FCC Part 15, Subpart C §15.225

RSS-210 issue 10 Annex B B.6 Dec. 2019

RSS-Gen, Issue 5 (Amendment 2, February 2021)

ANSI C63.10:2013.

Test Facility 1.4

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
		SAC 1		
		SAC 3		
		Conduction 1		
	No.134, Wu Kung Road, New Taipei	Conducted 1		
	Industrial Park, Wuku District, New	Conducted 2	TW0027	TW3702
	Taipei City, Taiwan.	Conducted 3		
		Conducted 4		
		Conducted 5		
CCC Taissan Ltd		Conducted 6		
SGS Taiwan Ltd.		Conduction C	-	
Central RF Lab.		SAC C		
(TAF code 3702)		SAC D		
		SAC G		
	No O Kaii dat Dal Quiahan Diatriat	Conducted A		
	No.2, Keji 1st Rd., Guishan District,	Conducted B	TW0028	
	Taoyuan City, Taiwan 333	Conducted C	1	
		Conducted D		
		Conducted E	1	
		Conducted F		
		Conducted G		

Note: Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.

1.5 **Special Accessories**

There is no other accessory attached. This is the worst case condition.

1.6 **Equipment Modifications**

There was no modification incorporated into the EUT.

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Page: 6 of 36

SYSTEM TEST CONFIGURATION

2.1 **EUT Configuration**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 **EUT Exercise**

The Transmitter was operated in the normal operating mode. The Tx frequency was fixed which was for the purpose of the measurements.

2.3 **Test Procedure**

2.3.1 **Conducted Emissions**

The EUT is a placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 **Radiated Emissions**

The EUT is a placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max, emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz 2.3.3

Radiated emission below 30MHz is measured in a 9m*6m*6m semi-anechoic chamber. the measurements correspond to those obtained at an open-field test site. There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

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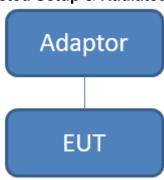
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Page: 7 of 36

Test Configuration

Conducted Setup & Radiated Setup



2.5 Control Unit(s)

Item	Equipment	MRF/BRAND	Model/Type No.	Version
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N/A
Test Software	audix	e3	210322 sgs Ver.9	N/A
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N/A
Adapter	CUI INC	SDM36-12-U	2038000662	N/A
LXPanel	N/A	N/A	N/A	v0.10.0

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Page: 8 of 36

SUMMARY OF TEST RESULTS

FCC Rules	ISED Rules	Description Of Test	Result
§15.207 RSS-Gen § 8.8		AC Power Line Conducted Emission	Compliant
§15.225 (a)-(d)	RSS210 Annex B B.6	Radiated Emission	Compliant
§15.209 RSS-Gen § 8.9		Radiated Emission Limits, general requirement	Compliant
§15.225 (e)	RSS210 Annex B B.6 (b)	Frequency Stability	Compliant
§2.1049 §15.215 (c) RSS-Gen § 6.7		Emission Bandwidth	Compliant
§15.203	N/A	Antenna Requirement	Compliant

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Page: 9 of 36

DESCRIPTION OF TEST MODES

The Worst Test Modes and Channel Details

- 1. The EUT stay in continuous transmission mode.
- 2. The frequency 13.56 MHz is the default channel to test, where it is the only manipulative channel as this application supports.
- 3. Only one configuration is supported/applicable as follows.

RADIATED EMISSION TEST							
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION				
NFC	1	1	ASK				
FREQUENCY STABILITY							
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION				
NFC	1	1	ASK				
	20dB BANDWIDTH						
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION				
NFC	1 1 ASK		ASK				

The field strength of radiation emission was measured as EUT three orthogonal planes, E1 / E2 / H, are positioned to pre-scan the emission generating the highest one. The worst position is tested and recorded.

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Page: 10 of 36

MEASUREMENT UNCERTAINTY

Test Items	Uncertainty			
AC Power Line Conducted Emission	+/-	2.34	dB	
Frequency Stability	+/-	1.53	Hz	
Emission Bandwidth	+/-	1.53	Hz	
Temperature	+/-	0.4	°C	
Humidity	+/-	3.5	%	
DC / AC Power Source	+/-	1	%	

Radiated Spurious Emission Measurement Uncertainty					
	+/-	2.64	dB	9kHz~30MHz	
Polarization: Vertical	+/-	4.93	dB	30MHz - 1000MHz	
Polarization, vertical	+/-	4.81	dB	1GHz - 18GHz	
	+/-	4.52	dB	18GHz - 40GHz	
	+/-	2.64	dB	9kHz~30MHz	
Polarization: Horizontal	+/-	4.45	dB	30MHz - 1000MHz	
Foianzation. Honzontal	+/-	4.81	dB	1GHz - 18GHz	
	+/-	4.52	dB	18GHz - 40GHz	

- 1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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Page: 11 of 36

CONDUCTED EMISSIONS TEST

6.1 Standard Applicable

According to §15.207 and frequency within 150 kHz to 30MHz shall not exceed the limit table as helow

as below.					
_	Limits				
Frequency range	(dBuV)				
MHz	Quasi-peak	Average			
0.15 to 0.50	66 to 56	56 to 46			
0.50 to 5	56	46			
5 to 30	60	50			

Note

6.2 Measurement Equipment Used:

AC Power-Line Conducted Emission Test Site: Conduction C								
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
Test Software	audix	e3	210322 sgs Ver.9	N.C.R	N.C.R			
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	974	04/19/2021	04/18/2022			
EMI Test Receiver	R&S	ESCI	101342	04/28/2021	04/27/2022			
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB-250- 01	03/27/2021	03/26/2022			
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2021	03/26/2022			
Adapter	CUI INC	SDM36-12-U	2038000662	N.C.R	N.C.R			

Note: N.C.R refers to Not Calibrated Required

6.3 EUT Setup

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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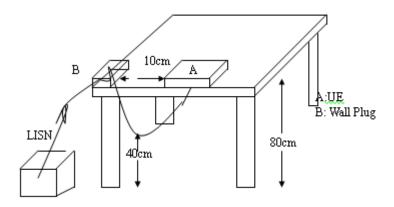
^{1.} The lower limit shall apply at the transition frequencies

^{2.} The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.



Page: 12 of 36

6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.

6.6 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit.

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Page: 13 of 36

AC POWER LINE CONDUCTED EMISSION TEST DATA

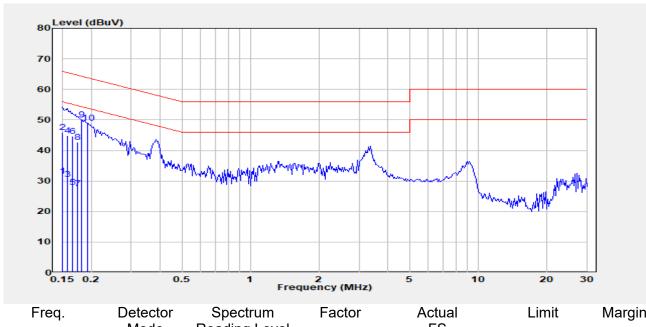
Report Number :E2/2021/80083 Test Site :Conduction C

Test Mode :NFC Test Date :2021-09-02

Power :120V/60Hz Temp./Humi. :23.5/60

Probe :L1 Engineer :Jack Tseng

Note: : Adpater:SDM36-12-U



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dΒμV	dΒμV	dB
0.150	Average	21.40	10.30	31.70	56.00	-24.30
0.150	QP	35.70	10.30	46.00	66.00	-20.00
0.156	Average	20.30	10.30	30.60	55.65	-25.05
0.156	QP	34.50	10.30	44.80	65.65	-20.85
0.165	Average	17.60	10.30	27.90	55.21	-27.31
0.165	QP	34.30	10.30	44.60	65.21	-20.61
0.174	Average	17.20	10.30	27.50	54.77	-27.27
0.174	QP	32.50	10.30	42.80	64.77	-21.97
0.182	Peak	39.80	10.30	50.10	64.42	-14.31
0.193	Peak	38.62	10.30	48.92	63.89	-14.96

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际升另有說明**U和它的表面具有,同时近保而程序图90大。本程古术是个公司青圃市刊,不可而好模型。
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Page: 14 of 36

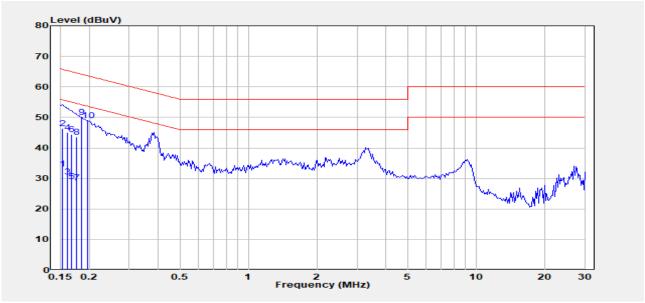
Report Number **Test Site** :Conduction C :E2/2021/80083

Test Mode :NFC **Test Date** :2021-09-02

:120V/60Hz Power Temp./Humi. :23.5/60

Probe :N Engineer :Jack Tseng

Note: : Adpater:SDM36-12-U



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dΒμV	dΒμV	dB
0.153	Average	22.80	10.31	33.11	55.82	-22.71
0.153	QP	36.00	10.31	46.31	65.82	-19.51
0.160	Average	20.30	10.31	30.61	55.47	-24.86
0.160	QP	34.89	10.31	45.20	65.47	-20.27
0.167	Average	18.70	10.31	29.01	55.12	-26.11
0.167	QP	34.10	10.31	44.41	65.12	-20.71
0.176	Average	18.30	10.30	28.60	54.68	-26.08
0.176	QP	33.25	10.30	43.55	64.68	-21.13
0.185	Peak	39.77	10.30	50.07	64.24	-14.17
0.198	Peak	38.70	10.30	49.00	63.71	-14.72

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Taiwan Ltd



Page: 15 of 36

RADIATED EMISSION TEST

7.1 **Measurement Equipment Used**

	Radiated Emission Test Site: SAC D									
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.					
Broadband Antenna	SCHWAZBECK	VULB 9168	9168-617	11/11/2020	11/10/2021					
Loop Antenna	ETS.LINDGREN	6502	143303	05/07/2021	05/06/2022					
3m Site NSA	SGS	966 chamber D	N/A	07/12/2021	07/11/2022					
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R					
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120200	03/22/2021	03/21/2022					
Pre-Amplifier	EMC Instruments	EMC9135	980234	11/19/2020	11/18/2021					
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	11/19/2020	11/18/2021					
Adapter	CUI INC	SDM36-12-U	2038000662	N.C.R	N.C.R					

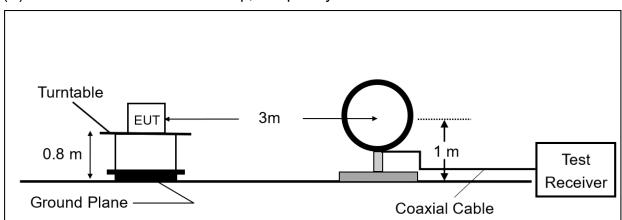
Note: N.C.R refers to Not Calibrated Required



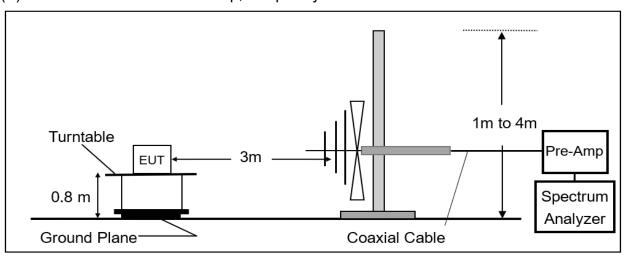
Page: 16 of 36

7.2 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.



7.3 **Measurement Procedure**

- 1. Configure the EUT according to ANSI C63.10.
- 2. The EUT was placed on a turn table which is 0.8m above ground plane and been measured in the frequency range between 0.009MHz to 30MHz and 30MHz to 1GHz.
- 3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission.
- 5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7. Repeat above procedures until all default test channel measured were complete.

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Page: 17 of 36

7.4 **Field Strength Calculation**

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

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Page: 18 of 36

7.5 Field Strength of Fundamental Emission

7.5.1 Applicable standard

Rules and specifiactions	CFR 47 Part 15 section 15.225(a)-(a		
Frequency of Emission (MHz)	Field Strength (µV/m)at 30m	Field Strength (dBµV/m)at 30m	
1.705~13.110	30	29.5	
13.110~13.410	106	40.5	
13.410~13.553	334	50.5	
13.553~13.567	15848	84	
13.567~13.710	334	50.5	
13.710~14.010	106	40.5	
14.010~30.00	30	29.5	

Radiated Mask per ISED RSS 210 Annex B B6

- (a) 15.848 millivolts/m (84 dBµV/m) at 30 m, within the band 13.553-13.567 MHz.
- (b) 334 microvolts/m (50.5 dBµV/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz.
- (c) 106 microvolts/m (40.5 dBµV/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz.
- (d) RSS-Gen general field strength limits for frequencies outside the band 13.110-14.010 MHz

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Page: 19 of 36

7.5.2 **Distance Extrapolation Factor**

30m to 3m

Distance extrapolation = 40 * log (30/3) = 40 dB

30m to 10m

Distance extrapolation = 40 * log (30/10) = 19.08 dB

10m to 3m

Distance extrapolation = $40 \cdot \log (10/3) = 20.92 \, dB$

Note:

- 1. Distance extrapolation factor = 40 log (required distance/ test distance) (dB)
- 2. The lower limit shall apply at the transition frequencies.
- 3. KDB 414788 D01 OATS and 3m semi-anechoic chamber Justification: 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. OATS and 3m SAC chamber testing had been performed and 3m SAC measured test result is the worst case test result.

Actual FS(dB μ V/m) = Spectrum. Reading level(dB μ V) + Factor(dB)

Below 30 MHz of Factor(dB) = Antenna Factor(dBµV/m) + Cable Loss(dB) – Distance Factor (dB)

Above 30 MHz of Factor(dB) = Antenna Factor(dBµV/m) + Cable Loss(dB) - Pre Amp Gain (dB)

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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Page: 20 of 36

7.5.3 Field Strength of Fundamental Emission Measurement Result

7.6 **Radiated Spurious Emission Measurement**

7.6.1 Standard Applicable

The field strength of any emissions appearing outside of the 13.110-14.010 MHz shall not exceed the general radiated emission limits in section 15.209 as below.

Frequency (MHz)	Field strength (μV/m)	Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

- Emission level in $dB\mu V/m=20 \log (\mu V/m)$ 1.
- Distance extrapolation factor = 40 log (required distance/ test distance) (dB) 2.
- 3. $20*\log(30uV/m) = 29.54 dBuV/m$
- 4. The lower limit shall apply at the transition frequencies.
- The measurement was undertaken in closer distance at 3m, where extrapolation 5. factor is offset to convert the limit of the measurement.
- 6. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of §15.205 and RSS-Gen §8.10.
- 7. The general radiated emission limits in §15.209 and RSS-Gen §8.9 apply for the spurious emission generate from UE, except for the fundamental emission where the respective section specifies otherwise.

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Page: 21 of 36

7.6.2 **Radiated Spurious Emission Measurement Result**

7.6.3 Main

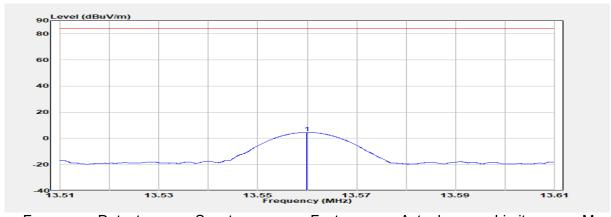
Test Site Report Number :SAC D :E2/2021/80083

Test Date :2021-09-01 **Operation Mode** :NFC

Temp./Humi. **Test Frequency** :13.56 MHz :23.3/58

Antenna Pol. Test Mode :Main :Vertical

Engineer **EUT Pol** :E2 Plane :Jack Tseng



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
13.560	Peak	33.08	-28.55	4.53	84.00	-79.47

Actual level = Reading level + Factor

Factor = Antenna factor + cable loss – Pre_Amplifier Gain — distance factor

Test distance= 3m

For Actual level and limit:

Field strength (dBuV/m) at 300m, within the band 9 kHz - 490 kHz.

Field strength (dBuV/m) at 30m, within the band 490 kHz - 30 MHz.

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Page: 22 of 36

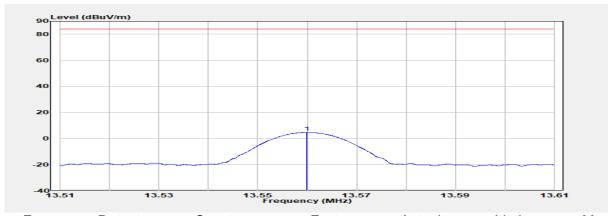
Test Site Report Number :E2/2021/80083 :SAC D

Test Date Operation Mode :NFC :2021-09-01

Temp./Humi. **Test Frequency** :23.3/58 :13.56 MHz

Antenna Pol. Test Mode :Main :Horizontal

Engineer **EUT Pol** :E2 Plane :Jack Tseng



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
13.560	Peak	33.26	-28.55	4.71	84.00	-79.29

Actual level = Reading level + Factor

Factor = Antenna factor + cable loss – Pre Amplifier Gain — distance factor

Test distance= 3m

For Actual level and limit:

Field strength (dBuV/m) at 300m, within the band 9 kHz - 490 kHz.

Field strength (dBuV/m) at 30m, within the band 490 kHz - 30 MHz.

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Page: 23 of 36

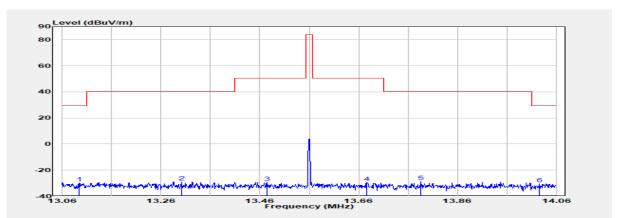
7.6.4 Mask

Test Site Report Number :E2/2021/80083 :SAC D

Test Date Operation Mode :NFC :2021-09-01

Temp./Humi. **Test Frequency** :13.56 MHz :23.3/58 Antenna Pol. Test Mode :Mask :Vertical

Engineer **EUT Pol** :E2 Plane :Jack Tseng



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
13.094	Peak	-1.20	-28.51	-29.71	29.54	-59.25
13.301	Peak	-0.45	-28.53	-28.98	40.50	-69.48
13.474	Peak	-0.78	-28.54	-29.33	50.47	-79.80
13.677	Peak	-1.00	-28.56	-29.56	50.47	-80.03
13.786	Peak	-0.03	-28.57	-28.60	40.50	-69.10
14.027	Peak	-1.83	-28.59	-30.42	29.54	-59.96

Actual level = Reading level + Factor

Factor = Antenna factor + cable loss – Pre Amplifier Gain — distance factor

Test distance= 3m

For Actual level and limit:

Field strength (dBuV/m) at 300m, within the band 9 kHz - 490 kHz.

Field strength (dBuV/m) at 30m, within the band 490 kHz - 30 MHz.

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Page: 24 of 36

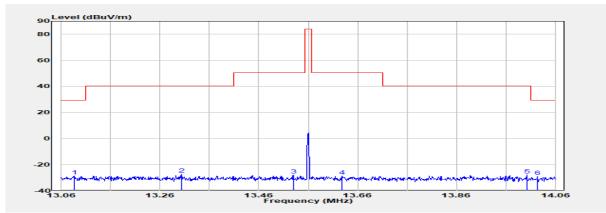
Test Site Report Number :E2/2021/80083 :SAC D

Test Date Operation Mode :NFC :2021-09-01

Temp./Humi. **Test Frequency** :23.3/58 :13.56 MHz

Antenna Pol. Test Mode :Mask :Horizontal

Engineer **EUT Pol** :E2 Plane :Jack Tseng



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
13.087	Peak	-0.13	-28.51	-28.64	29.54	-58.18
13.304	Peak	1.22	-28.53	-27.31	40.50	-67.81
13.530	Peak	0.49	-28.55	-28.06	50.47	-78.53
13.629	Peak	-0.22	-28.56	-28.77	50.47	-79.24
14.003	Peak	0.61	-28.59	-27.98	40.50	-68.48
14.025	Peak	-0.64	-28.59	-29.23	29.54	-58.77

Actual level = Reading level + Factor

Factor = Antenna factor + cable loss – Pre Amplifier Gain — distance factor

Test distance= 3m

For Actual level and limit:

Field strength (dBuV/m) at 300m, within the band 9 kHz - 490 kHz.

Field strength (dBuV/m) at 30m, within the band 490 kHz - 30 MHz.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Page: 25 of 36

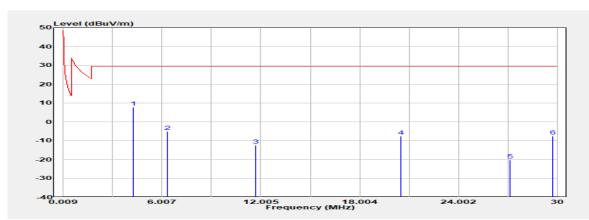
7.6.5 TX

Test Site Report Number :E2/2021/80083 :SAC D

Test Date Operation Mode :NFC :2021-09-01

Temp./Humi. **Test Frequency** :13.56 MHz :23.3/58 Antenna Pol. Test Mode :TX :Vertical

Engineer **EUT Pol** :E2 Plane :Jack Tseng



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4.238	Peak	36.98	-29.20	7.78	29.54	-21.76
6.307	Peak	23.78	-28.86	-5.08	29.54	-34.62
11.705	Peak	15.88	-28.38	-12.50	29.54	-42.04
20.493	Peak	21.58	-29.11	-7.53	29.54	-37.07
27.120	Peak	10.11	-30.43	-20.32	29.54	-49.86
29.730	Peak	23.20	-30.86	-7.65	29.54	-37.19

Actual level = Reading level + Factor

Factor = Antenna factor + cable loss – Pre Amplifier Gain — distance factor

Test distance= 3m

For Actual level and limit:

Field strength (dBuV/m) at 300m, within the band 9 kHz - 490 kHz.

Field strength (dBuV/m) at 30m, within the band 490 kHz - 30 MHz.

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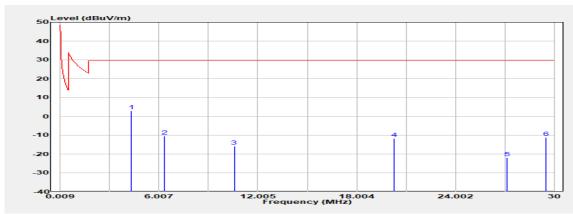
EUT Pol

Report No.: E2/2021/80083

:Jack Tseng

Page: 26 of 36

Test Site Report Number :E2/2021/80083 :SAC D **Test Date Operation Mode** :NFC :2021-09-01 Temp./Humi. **Test Frequency** :23.3/58 :13.56 MHz Antenna Pol. Test Mode :TX :Horizontal Engineer



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
4.298	Peak	32.09	-29.20	2.89	29.54	-26.65
6.307	Peak	18.41	-28.86	-10.45	29.54	-39.99
10.566	Peak	12.44	-28.26	-15.83	29.54	-45.37
20.283	Peak	17.39	-29.07	-11.67	29.54	-41.21
27.120	Peak	8.57	-30.43	-21.86	29.54	-51.40
29.520	Peak	19.62	-30.82	-11.20	29.54	-40.74

Actual level = Reading level + Factor

:E2 Plane

Factor = Antenna factor + cable loss – Pre Amplifier Gain — distance factor

Test distance= 3m

For Actual level and limit:

Field strength (dBuV/m) at 300m, within the band 9 kHz - 490 kHz.

Field strength (dBuV/m) at 30m, within the band 490 kHz - 30 MHz.

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Page: 27 of 36

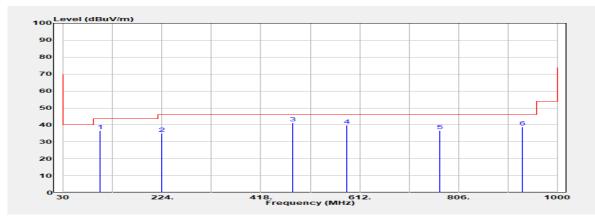
Test Site Report Number :E2/2021/80083 :SAC D

Test Date Operation Mode :NFC :2021-09-01

Temp./Humi. **Test Frequency** :13.56 MHz :23.3/58

Antenna Pol. Test Mode :TX :Vertical

Engineer **EUT Pol** :Jack Tseng :E2 Plane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level			@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
101.780	Peak	59.39	-22.78	36.61	43.50	-6.89
224.000	Peak	56.53	-21.65	34.89	46.00	-11.11
480.080	Peak	55.22	-14.15	41.08	46.00	-4.92
586.780	Peak	52.79	-12.99	39.80	46.00	-6.20
770.110	Peak	46.56	-9.89	36.67	46.00	-9.33
932.100	Peak	47.41	-8.61	38.80	46.00	-7.20

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Page: 28 of 36

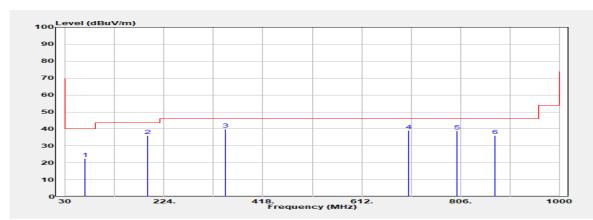
Test Site Report Number :E2/2021/80083 :SAC D

Test Date Operation Mode :NFC :2021-09-01

Temp./Humi. **Test Frequency** :13.56 MHz :23.3/58

Antenna Pol. Test Mode :TX :Horizontal

Engineer **EUT Pol** :E2 Plane :Jack Tseng



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level			@3m	
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
68.800	Peak	42.11	-19.63	22.48	40.00	-17.52
191.990	Peak	57.13	-21.07	36.06	43.50	-7.44
344.280	Peak	57.22	-17.48	39.74	46.00	-6.26
704.150	Peak	50.90	-11.85	39.05	46.00	-6.95
800.180	Peak	48.71	-9.87	38.84	46.00	-7.16
874.870	Peak	46.05	-9.95	36.10	46.00	-9.90

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Page: 29 of 36

8 FREQUENCY STABILITY

8.1 Applicable Standard

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Carrier frequency stability shall be maintained to ±0.01% (±100 ppm). For licence-exempt radio apparatus, the frequency stability shall be measured at temperatures of -20°C (-4°F), +20°C (+68°F) and +50°C (+122°F).

8.2 Measurement Procedure

- 1. The EUT was placed on a turn table which is 0.8m above ground plane.
- 2. Set EUT as normal operation
- 3. Set SPA Center Frequency = fundamental frequency, RBW, VBW= 10kHz, Span =100kHz.
- 4. Set SPA Max hold. Mark peak.

8.3 Measurement Equipment Used

	Conducted Emission Test Site: Conducted B							
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	07/13/2021	07/12/2022			
Attenuator	Marvelous	MVE2213-10	RF05	11/19/2020	11/18/2021			
DC Block	PASTERNACK	PE8210	RF157	11/19/2020	11/18/2021			
Coaxial Cables	Woken	00100A1F1A185C	RF54	11/19/2020	11/18/2021			
Loop Antenna	ETS.LINDGREN	6502	00143303	05/07/2021	05/06/2022			
Temperature Chamber	TERCHY	MHK-120LK	1020582	07/01/2021	06/30/2022			
Test Software	EMI Tool	Alpha	Ver.1	N.C.R	N.C.R			
Adapter	CUI INC	SDM36-12-U	2038000662	N.C.R	N.C.R			

Note: N.C.R refers to Not Calibrated Required

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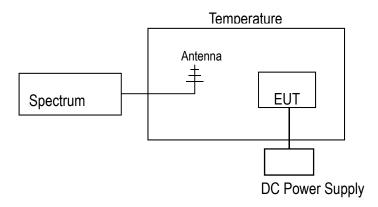
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Page: 30 of 36

8.4 Test SET-UP (Block Diagram of Configuration)



8.5 **Measurement Results**

Startup

A. Temperature Variation

Power Supply	Environment	Frequency		
Vdc	Temperature (°C)	(MHz)	Delta (KHz)	Limit (KHz)
12	-20	13.5598	0.20000	+/- 1.356
12	-10	13.5599	0.10000	+/- 1.356
12	0	13.5596	0.40000	+/- 1.356
12	10	13.5599	0.10000	+/- 1.356
12	20	13.56	0.00000	+/- 1.356
12	30	13.5598	0.20000	+/- 1.356
12	40	13.5596	0.40000	+/- 1.356
12	50	13.5597	0.30000	+/- 1.356

B. Supply Voltage Variation

Power Supply	Environment	Frequency		Limit (KHz)	
Vdc	Temperature (°C)	(MHz)	Delta (KHz)		
13.8	20	13.56	0.00000	+/- 1.356	
12	20	13.56	0.00000	+/- 1.356	
10.2	20	13.5599	0.10000	+/- 1.356	

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Page: 31 of 36

2 minutes

A. Temperature Variation

Power Supply	Environment	Frequency		
Vdc	Temperature (°C)	(MHz)	Delta (KHz)	Limit (KHz)
12	-20	13.5597	0.30000	+/- 1.356
12	-10	13.5597	0.30000	+/- 1.356
12	0	13.5596	0.40000	+/- 1.356
12	10	13.5596	0.40000	+/- 1.356
12	20	13.5599	0.10000	+/- 1.356
12	30	13.56	0.00000	+/- 1.356
12	40	13.5597	0.30000	+/- 1.356
12	50	13.5598	0.20000	+/- 1.356

B. Supply Voltage Variation

Power Supply	Environment	Frequency			
Vdc	Temperature (°C)	(MHz)	Delta (KHz)	Limit (KHz)	
13.8	20	13.5599	0.10000	+/- 1.356	
12	20	13.5599	0.10000	+/- 1.356	
10.2	20	13.56	0.00000	+/- 1.356	

5 minutes

A. Temperature Variation

Power Supply	Environment	Frequency		
Vdc	Temperature (°C)	(MHz)	Delta (KHz)	Limit (KHz)
12	-20	13.56	0.00000	+/- 1.356
12	-10	13.56	0.00000	+/- 1.356
12	0	13.5598	0.20000	+/- 1.356
12	10	13.56	0.00000	+/- 1.356
12	20	13.5596	0.40000	+/- 1.356
12	30	13.5597	0.30000	+/- 1.356
12	40	13.5598	0.20000	+/- 1.356
12	50	13.5596	0.40000	+/- 1.356

B. Supply Voltage Variation

Power Supply	Environment	Frequency		
Vdc	Temperature (°C)	(MHz)	Delta (KHz)	Limit (KHz)
13.8	20	13.56	0.00000	+/- 1.356
12	20	13.5596	0.40000	+/- 1.356
10.2	20	13.5596	0.40000	+/- 1.356

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Page: 32 of 36

10 minutes

A. Temperature Variation

7. Temperature Variation						
Power Supply	Environment	Frequency				
Vdc	Temperature (°C)	(MHz)	Delta (KHz)	Limit (KHz)		
12	-20	13.5597	0.30000	+/- 1.356		
12	-10	13.5598	0.20000	+/- 1.356		
12	0	13.5599	0.10000	+/- 1.356		
12	10	13.5599	0.10000	+/- 1.356		
12	20	13.5598	0.20000	+/- 1.356		
12	30	13.5596	0.40000	+/- 1.356		
12	40	13.56	0.00000	+/- 1.356		
12	50	13.5596	0.40000	+/- 1.356		

B. Supply Voltage Variation

117				
Power Supply	Environment	Frequency		
Vdc	Temperature (°C)	(MHz)	Delta (KHz)	Limit (KHz)
13.8	20	13.5599	0.10000	+/- 1.356
12	20	13.5598	0.20000	+/- 1.356
10.2	20	13.5599	0.10000	+/- 1.356

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Page: 33 of 36

9 EMISSION BANDWIDTH MEASUREMENT

9.1 Applicable Standard:

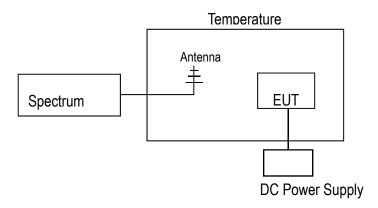
The 20 dB and 99% bandwidth shall be specified in operating frequency band.

9.1 Measurement Equipment Used

Conducted Emission Test Site: Conducted B							
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.		
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	07/13/2021	07/12/2022		
Attenuator	Marvelous	MVE2213-10	RF05	11/19/2020	11/18/2021		
DC Block	PASTERNACK	PE8210	RF157	11/19/2020	11/18/2021		
Coaxial Cables	Woken	00100A1F1A185C	RF54	11/19/2020	11/18/2021		
Loop Antenna	ETS.LINDGREN	6502	00143303	05/07/2021	05/06/2022		
Temperature Chamber	TERCHY	MHK-120LK	1020582	07/01/2021	06/30/2022		
Test Software	EMI Tool	Alpha	Ver.1	N.C.R	N.C.R		
Adapter	CUI INC	SDM36-12-U	2038000662	N.C.R	N.C.R		

Note: N.C.R refers to Not Calibrated Required

9.2 Test Set-up



9.3 Measurement Procedure

- 1. Placed the EUT on the testing table.
- Set the EUT under transmission condition continuously at specific channel frequency.
- 3. The resolution bandwidth of 1 kHz and the video bandwidth of 3 kHz were used.
- 4. Measured the spectrum width with power higher than 20dB below carrier.

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Page: 34 of 36

9.4 **Measurement Result**

FCC

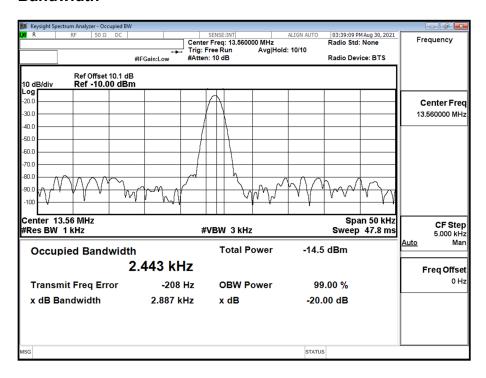
20dB BW (kHz)		
2.887		

Opration range	Frequency (MHz)	Limit (MHz)
Low	13.55855	>13.11
High	13.56105	<14.01

IC

99% BW (kHz)			
2.443			

Bandwidth



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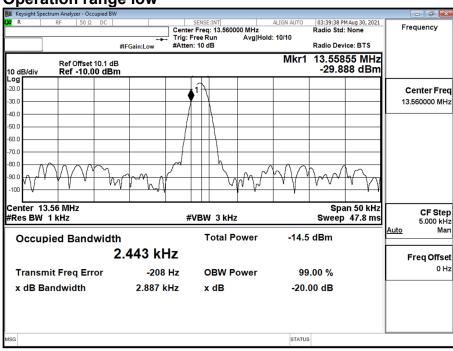
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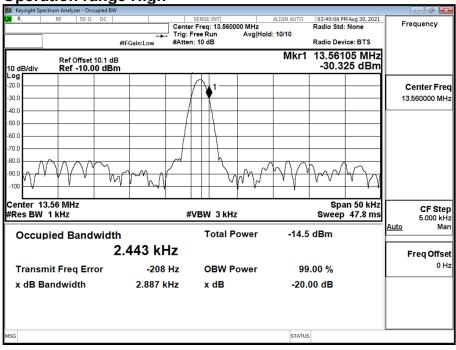


Page: 35 of 36

Operation range low







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Page: 36 of 36

10 ANTENNA REQUIREMENT

10.1 Standard Applicable:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Antenna Connected Construction:

The antenna is designed as permanently attached and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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