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# **ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT**





Applicant: SHARP Corporation Mobile Communication BU

2-13-1 lida Hachihonmatsu, Higashi-hiroshima city, Hiroshima,

739-0192, Japan

Manufacturer: Sharp Corporation

1 Takumi-cho, Sakai-ku, Sakai City, Osaka 590-8522, Japan

**Product Name: Smart Phone** 

**Brand Name:** SHARP

**Report Number:** TERF2404001038ER

FCC ID APYHRO00332

Date of EUT Received: April 18, 2024

Date of Test: April 18, 2024~May 10, 2024

Issue Date: May 22, 2024

Approved By

Blue Yang

### 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.

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

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Revision History							
Report Number	Revision	Description	Issue Date	Revised By	Remark		
TERF2404001038ER	00	Original.	May 22, 2024	Karen Huang			

### Note:

1 · The remark "\*" indicates modification of the report upon requests from certification body.

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### 1 GENERAL INFORMATION

### 1.1 Product Description

Product Name:	Smart Phone
Brand Name:	SHARP
Hardware Version:	DVT
Firmware Version:	N/A
Power Supply:	3.89Vdc from Rechargeable Battery
Test Software (Name/Version)	Windows 7 ADB Command

### 1.2 RF specification

Radio Technology:	NFC
Operating Frequency	13.56MHz
Transmit Power	< 84dBuV/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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### **Test Methodology**

FCC Part 15, Subpart C §15.225 ANSI C63.10:2013.

### **Test Facility**

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
		SAC 1		
		SAC 2		
		SAC 3		
	No 124 Wu Kung Dood New Toingi	Conduction 1		
	No.134, Wu Kung Road, New Taipei	Conducted 1	T\\/0027	
	Industrial Park, Wuku District, New Taipei City, Taiwan.	Conducted 2	TW0027	TW3702
		Conducted 3		
		Conducted 4		
		Conducted 5		
SGS Taiwan Ltd.		Conducted 6		
Central RF Lab.		Conduction C	TW0028	
(TAF code 3702)		SAC C		
		SAC D		
		SAC G		
	No.2, Keji 1st Rd., Guishan District,	Conducted A		
	Taoyuan City, Taiwan 333	Conducted B		
	ladydaii Oity, Taiwaii 333	Conducted C		
		Conducted D		
		Conducted E		
		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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### 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.

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

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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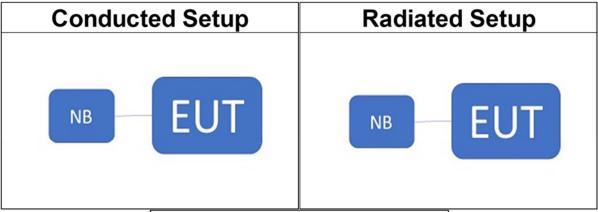
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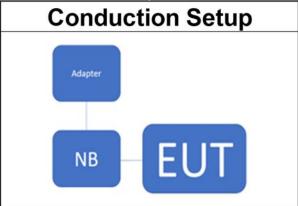
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# 2.4 Test Configuration





### 2.5 Control Unit(s)

Conducted Emission Test Site: Conducted 1						
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Notebook	Lenovo	T440P	PB-02Y6RK 14/07	N/A	N/A	
H-Loop Near Field Antenna	EMCI	LF-R 400	02-1637	N/A	N/A	
	Radiated Emission Test Site: SAC 2					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Notebook	Lenovo	T470	PF-0TGY30 17/07	N/A	N/A	
	AC Powe	r-Line Conducted Em	nission Test Site: Con	duction 1		
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Notebook	Lenovo	T470	PF-0TGY30 17/07	N/A	N/A	
Adapter	Lenovo	ADLX90NCC3A	N/A	N/A	N/A	

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# 3 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 (a)	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
§15.205	RSS-Gen § 8.10	Restricted Bands	Compliant

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### **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			

The field strength of radiated emission was measured as the EUT positioned in different orthogonal planes (E1/E2/H) based on actual usage of the EUT to pre-scan the emissions for determining the worst case scenario.

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### 5 MEASUREMENT UNCERTAINTY

Test Items	Und	ertainty	•
AC Power Line Conducted Emission	+/-	1.54	dB
Frequency Stability	+/-	1.48	Hz
Emission Bandwidth	+/-	1.38	Hz
Temperature	+/-	0.6	°C
Humidity	+/-	3	%
DC / AC Power Source	+/-	1	%

Radiated Spurious Emission Measurement Uncertainty					
	+/-	1.89	dB	9kHz~30MHz	
Delevinetien: Vertical	+/-	4.15	dB	30MHz - 1000MHz	
Polarization: Vertical	+/-	3.43	dB	1GHz - 18GHz	
	+/-	3.86	dB	18GHz - 40GHz	
	+/-	1.89	dB	9kHz~30MHz	
Polarization: Horizontal	+/-	4.02	dB	30MHz - 1000MHz	
Polarization. Horizontal	+/-	3.43	dB	1GHz - 18GHz	
	+/-	3.86	dB	18GHz - 40GHz	
	+/-	2	dB	33GHz-50GHz	
Dadiete d Ossaniesse	+/-	1.59	dB	50GHz-60GHz	
Radiated Spurious Emission	+/-	1.7	dB	60GHz-90GHz	
	+/-	1.64	dB	90GHz-140GHz	
	+/-	3.83	dB	140GHz-220GHz	

### Note:

- 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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# **MEASUREMENT EQUIPMENT USED**

#### 6.1 **Emission from AC power line**

	•					
AC Power-Line Conducted Emission Test Site: Conduction 1						
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Test Software	Audix	e3	Ver. 9.210616	N.C.R	N.C.R	
LISN	SCHWARZBECK	NSLK 8127	1040	09/06/2023	09/05/2024	
Coaxial Cables	EMC Instruments Corp.	EMCCFD300-BM- BM-3000	161207	06/22/2023	06/21/2024	
Pulse Limiter	SCHWARZBECK	VTSD 9561F-N	793	06/22/2023	06/21/2024	
EMI Test Receiver	R&S	ESCI 7	100759	08/21/2023	08/20/2024	

#### 6.2 **Conducted Measurement**

	Conducted Emission Test Site: Conducted 1							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY59071571	06/07/2023	06/06/2024			
Temperature Chamber	TERCHY	MHG-120LE	1110435	05/24/2023	05/23/2024			
DC Power Supply	Gwinstek	SPS-3610	GEV856757	10/23/2023	10/22/2024			
DC Block	Mini-Circuits	BLK-18-S+	2	12/12/2023	12/11/2024			

#### **Radiated Measurement** 6.3

Radiated Emission Test Site: SAC 2							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.		
Loop Antenna	COM-POWER	AL-130R	10160104	12/04/2023	12/03/2024		
Bi-log Antenna	SCHWARZBECK	VULB9168	9168-1278	03/04/2024	03/03/2025		
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY60242392	12/22/2023	12/21/2024		
Test Software	Audix	e3	Ver. 9.210616	N.C.R	N.C.R		
EMI Test Receiver	R&S	ESCI 7	100759	08/21/2023	08/20/2024		
Site Cal	SGS	SAC 2	N/A	08/31/2023	08/30/2024		
Coaxial Cables	EMCI	EMC104-SM-SM- 1000+EMC105-SM- SM-1000+EMC105- SM-SM- 1500+EMC104-SM- SM-600+EMC105- SM-SM-2000	RX Cable 9K-18G (220236+201211+22 0906+220237+2209 09)	08/31/2023	08/30/2024		

**NOTE:** N.C.R refers to Not Calibrated Required.

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### 7 CONDUCTED EMISSIONS TEST

### 7.1 Standard Applicable

Frequency within 150 kHz to 30MHz shall not exceed the limit table as below.

Frequency range		mits 3uV)
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

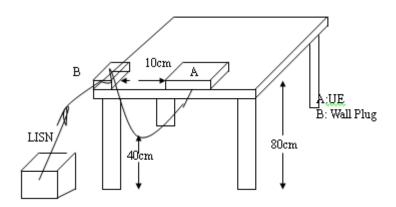
### Note

- 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.

### 7.2 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.

# 7.3 Test SET-UP (Block Diagram of Configuration)



### 7.4 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.

### 7.5 Measurement Result

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

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

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# AC POWER LINE CONDUCTED EMISSION TEST DATA

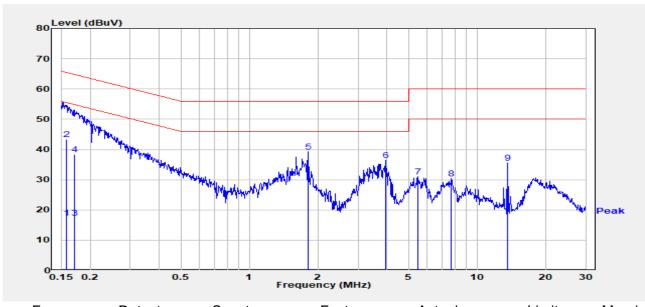
Report Number :TERF2404001038ER Test Site :Conduction 1

Operation Mode :NFC Test Date :2024-05-10

Power :120V/60Hz Temp./Humi. :23.0°C/50%

Probe :L Engineer :Eason Wang

Note: :



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS		
MHz	PK/QP/AV	dΒμV	dB	dΒμV	dΒμV	dB
0.157	Average	7.11	10.13	17.24	55.60	-38.36
0.157	QP	33.14	10.13	43.27	65.60	-22.33
0.170	Average	7.31	10.13	17.44	54.94	-37.50
0.170	QP	28.15	10.13	38.28	64.94	-26.66
1.810	Peak	29.11	10.19	39.30	56.00	-16.70
3.964	Peak	26.03	10.29	36.32	56.00	-19.68
5.476	Peak	20.60	10.35	30.95	60.00	-29.05
7.728	Peak	20.07	10.37	30.44	60.00	-29.56
13.560	Peak	25.10	10.45	35.55	60.00	-24.45

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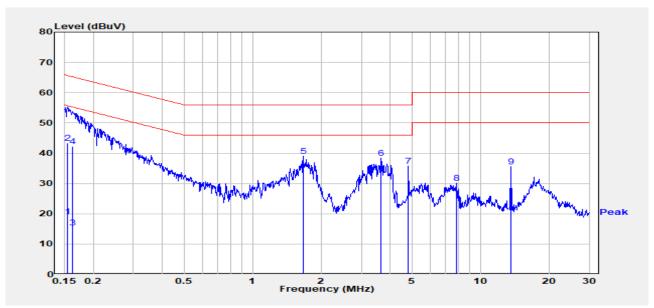
Report Number :TERF2404001038ER Test Site :Conduction 1

Operation Mode :NFC Test Date :2024-05-10

Power :120V/60Hz Temp./Humi. :23.0°C/50%

Probe :N Engineer :Eason Wang

Note: :



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV	dΒμV	dB
0.154	Average	9.03	10.12	19.15	55.78	-36.63
0.154	QP	33.29	10.12	43.41	65.78	-22.37
0.162	Average	5.32	10.12	15.44	55.34	-39.90
0.162	QP	32.11	10.12	42.23	65.34	-23.11
1.662	Peak	28.73	10.19	38.92	56.00	-17.08
3.661	Peak	28.08	10.29	38.37	56.00	-17.63
4.822	Peak	25.41	10.35	35.75	56.00	-20.25
7.852	Peak	19.76	10.38	30.14	60.00	-29.86
13.560	Peak	25.16	10.48	35.64	60.00	-24.36

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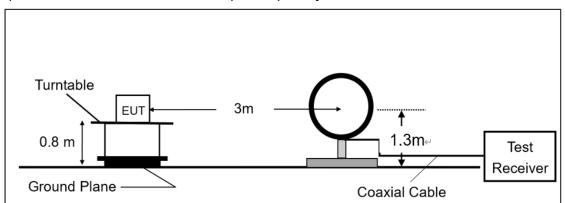


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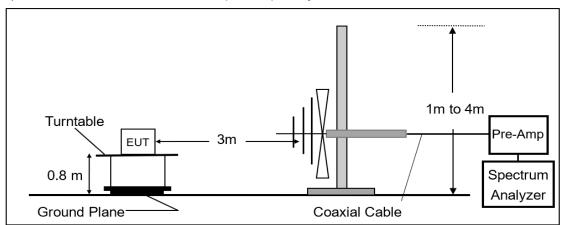
# **RADIATED EMISSION TEST**

#### 8.1 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.



#### 8.2 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
- 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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## **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	

#### **Field Strength of Fundamental Emission** 8.4

#### 8.4.1 Applicable standard

Rules and specifications	CFR 47 Part 15 sec	ction 15.225(a)-(d)
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

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# **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 $\mu$ V/m) = Spectrum. Reading level(dB $\mu$ 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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# 8.4.3 Field Strength of Fundamental Emission Measurement Result

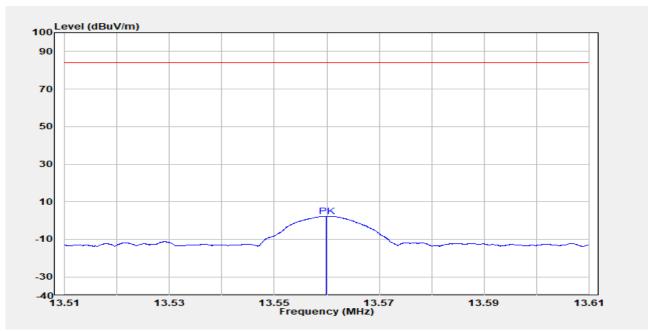
Report Number :TERF2404001038ER Test Site :SAC 2

Operation Mode :NFC Test Date :2024-05-06

Test Frequency :13.56 MHz Temp./Humi. :23.7°C/65%

Test Mode :Main Antenna Pol. :Vertical

EUT Pol :E1 Plane Engineer :Eason Wang



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
13.560	Peak	27.12	-24.87	2.24	84.00	-81.76

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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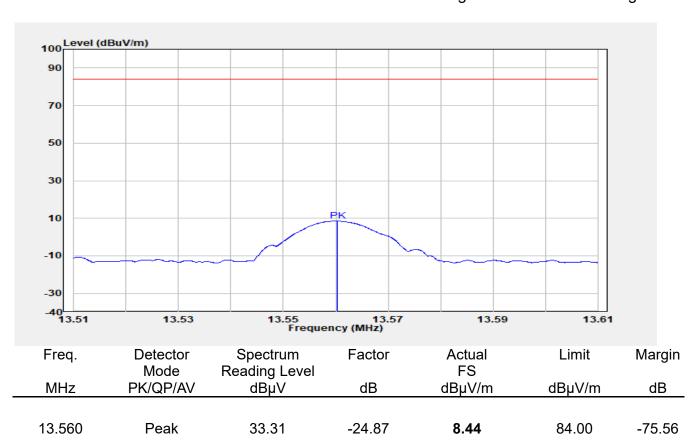
Report Number :TERF2404001038ER Test Site :SAC 2

Operation Mode :NFC Test Date :2024-05-06

Test Frequency :13.56 MHz Temp./Humi. :23.7°C/65%

Test Mode :Main Antenna Pol. :Horizontal

EUT Pol :E1 Plane Engineer :Eason Wang



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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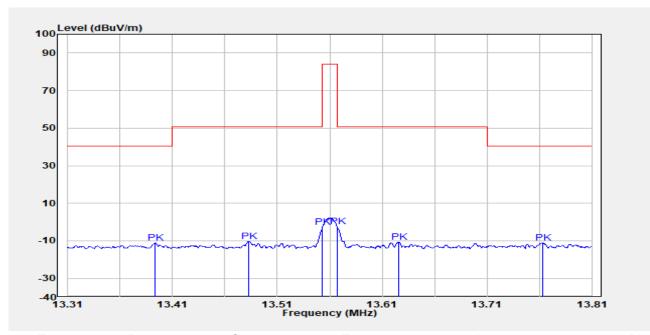
Report Number :TERF2404001038ER Test Site :SAC 2

Operation Mode :NFC Test Date :2024-05-06

Test Frequency :13.56 MHz Temp./Humi. :23.7°C/65%

Test Mode :Mask Antenna Pol. :Vertical

EUT Pol :E1 Plane Engineer :Eason Wang



Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
Peak	13.54	-24.84	-11.31	40.50	-51.81
Peak	14.45	-24.86	-10.41	50.50	-60.91
Peak	21.89	-24.87	-2.98	50.50	-53.48
Peak	22.59	-24.87	-2.28	50.50	-52.78
Peak	14.12	-24.89	-10.76	50.50	-61.26
Peak	13.69	-24.91	-11.22	40.50	-51.72
	Mode PK/QP/AV Peak Peak Peak Peak Peak	Mode PK/QP/AV Reading Level dBμV  Peak 13.54 Peak 14.45 Peak 21.89 Peak 22.59 Peak 14.12	Mode PK/QP/AV         Reading Level dBμV         dB           Peak         13.54         -24.84           Peak         14.45         -24.86           Peak         21.89         -24.87           Peak         22.59         -24.87           Peak         14.12         -24.89	Mode PK/QP/AV         Reading Level dBμV         FS dBμV/m           Peak         13.54         -24.84         -11.31           Peak         14.45         -24.86         -10.41           Peak         21.89         -24.87         -2.98           Peak         22.59         -24.87         -2.28           Peak         14.12         -24.89         -10.76	Mode PK/QP/AV         Reading Level dBμV         FS dBμV/m         dBμV/m         dBμV/m           Peak         13.54         -24.84         -11.31         40.50           Peak         14.45         -24.86         -10.41         50.50           Peak         21.89         -24.87         -2.98         50.50           Peak         22.59         -24.87         -2.28         50.50           Peak         14.12         -24.89         -10.76         50.50

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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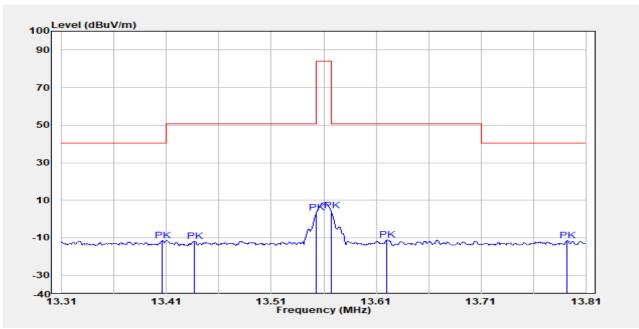
**Test Site** Report Number :TERF2404001038ER :SAC 2

**Operation Mode Test Date** :2024-05-06 :NFC

**Test Frequency** :13.56 MHz Temp./Humi. :23.7°C/65%

Test Mode :Mask Antenna Pol. :Horizontal

**EUT Pol** :E1 Plane Engineer :Eason Wang



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
13.406	Peak	13.22	-24.85	-11.62	40.50	-52.12
13.437	Peak	13.12	-24.85	-11.74	50.50	-62.24
13.553	Peak	28.14	-24.87	3.27	50.50	-47.23
13.567	Peak	29.14	-24.87	4.27	50.50	-46.23
13.621	Peak	13.59	-24.88	-11.30	50.50	-61.80
13.793	Peak	13.38	-24.92	-11.54	40.50	-52.04

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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### 8.5 Radiated Spurious Emission Measurement

### 8.5.1 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 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:

- 1. Emission level in  $dB\mu V/m=20 \log (\mu V/m)$
- 2. Distance extrapolation factor = 40 log (required distance/ test distance) (dB)
- 3. 20\*log(30uV/m) = 29.54 dBuV/m
- 4. The lower limit shall apply at the transition frequencies.
- 5. The measurement was undertaken in closer distance at 3m, where extrapolation 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.
- 7. The general radiated emission limits in §15.209 apply for the spurious emission generate from UE, except for the fundamental emission where the respective section specifies otherwise.

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### 8.5.2 Radiated Spurious Emission Measurement Result

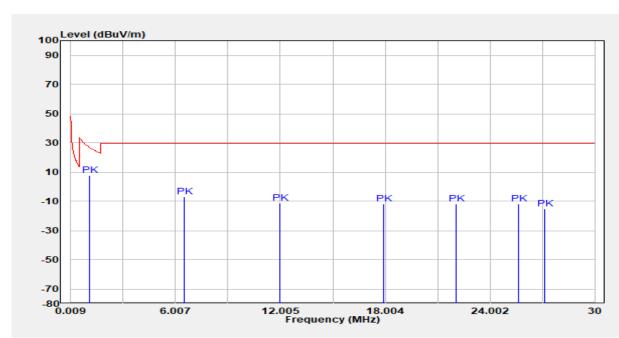
Report Number :TERF2404001038ER Test Site :SAC 2

Operation Mode :NFC Test Date :2024-05-06

Test Frequency :13.56 MHz Temp./Humi. :23.7°C/65%

Test Mode :Tx Antenna Pol. :Vertical

EUT Pol :E1 Plane Engineer :Eason Wang



Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
PK/QP/AV	dBµV	dB	dBµV/m	dBμV/m	dB
Peak	34.25	-26.33	7.92	26.87	-18.95
Peak	17.68	-24.62	-6.95	29.54	-36.49
Peak	13.06	-24.29	-11.23	29.54	-40.77
Peak	12.61	-24.20	-11.59	29.54	-41.13
Peak	13.86	-25.76	-11.90	29.54	-41.44
Peak	14.14	-25.67	-11.53	29.54	-41.07
Peak	10.48	-25.79	-15.31	29.54	-44.85
	Mode PK/QP/AV  Peak Peak Peak Peak Peak Peak Peak Pea	Mode PK/QP/AV Reading Level dBµV  Peak 34.25 Peak 17.68 Peak 13.06 Peak 12.61 Peak 13.86 Peak 14.14	Mode PK/QP/AV         Reading Level dBμV         dB           Peak         34.25         -26.33           Peak         17.68         -24.62           Peak         13.06         -24.29           Peak         12.61         -24.20           Peak         13.86         -25.76           Peak         14.14         -25.67	Mode PK/QP/AV         Reading Level dBμV         FS dBμV/m           Peak         34.25         -26.33         7.92           Peak         17.68         -24.62         -6.95           Peak         13.06         -24.29         -11.23           Peak         12.61         -24.20         -11.59           Peak         13.86         -25.76         -11.90           Peak         14.14         -25.67         -11.53	Mode PK/QP/AVReading Level dBμVFS dBμV/mdBμV/mPeak34.25-26.337.9226.87Peak17.68-24.62-6.9529.54Peak13.06-24.29-11.2329.54Peak12.61-24.20-11.5929.54Peak13.86-25.76-11.9029.54Peak14.14-25.67-11.5329.54

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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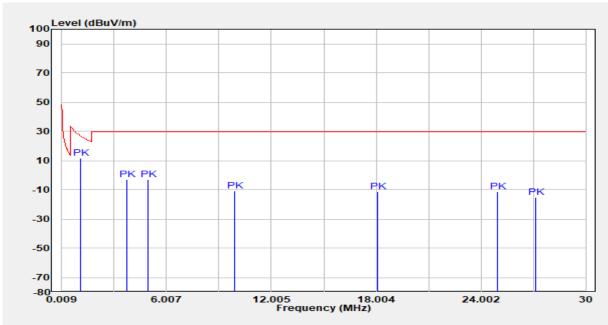
Report Number :TERF2404001038ER Test Site :SAC 2

Operation Mode :NFC Test Date :2024-05-06

Test Frequency :13.56 MHz Temp./Humi. :23.7°C/65%

Test Mode :Tx Antenna Pol. :Horizontal

EUT Pol :E1 Plane Engineer :Eason Wang



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
1.089	Peak	37.80	-26.33	11.47	26.87	-15.40
3.728	Peak	22.57	-25.52	-2.95	29.54	-32.49
4.958	Peak	22.23	-25.30	-3.06	29.54	-32.60
9.876	Peak	13.98	-24.59	-10.61	29.54	-40.15
18.094	Peak	13.04	-24.20	-11.16	29.54	-40.70
24.962	Peak	13.93	-25.32	-11.39	29.54	-40.93
27.120	Peak	10.50	-25.79	-15.29	29.54	-44.83

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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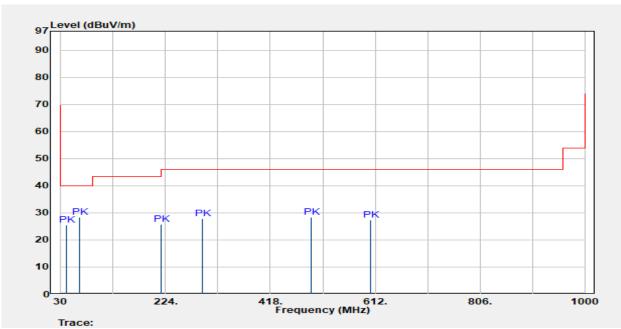
Report Number :TERF2404001038ER Test Site :SAC 2

Operation Mode :NFC Test Date :2024-05-06

Test Frequency :13.56 MHz Temp./Humi. :23.7°C/65%

Test Mode :Tx Antenna Pol. :Vertical

EUT Pol :E1 Plane Engineer :Eason Wang



mace.						
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
40.670	Peak	38.75	-13.14	25.61	40.00	-14.39
63.950	Peak	42.56	-14.29	28.26	40.00	-11.74
216.240	Peak	41.40	-15.57	25.83	46.00	-20.17
291.900	Peak	40.18	-12.22	27.96	46.00	-18.04
492.690	Peak	35.63	-7.33	28.30	46.00	-17.70
604.240	Peak	31.91	-4.51	27.40	46.00	-18.60

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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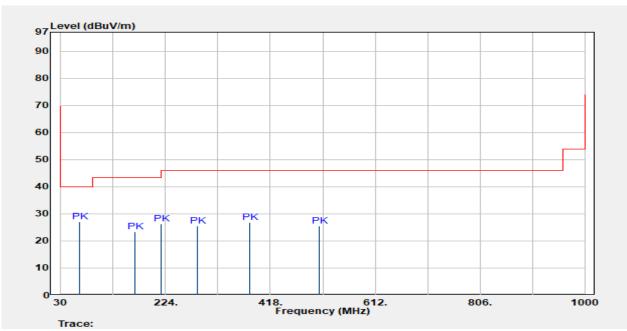
**Test Site** Report Number :TERF2404001038ER :SAC 2

**Operation Mode Test Date** :2024-05-06 :NFC

**Test Frequency** :13.56 MHz Temp./Humi. :23.7°C/65%

Test Mode :Tx Antenna Pol. :Horizontal

**EUT Pol** :E1 Plane Engineer :Eason Wang



mucc.						
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit	Margin
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
63.950	Peak	41.29	-14.29	27.00	40.00	-13.00
167.740	Peak	36.71	-13.21	23.49	43.50	-20.01
216.240	Peak	41.79	-15.57	26.22	46.00	-19.78
283.170	Peak	37.73	-12.32	25.41	46.00	-20.59
380.170	Peak	36.71	-9.99	26.72	46.00	-19.28
509.180	Peak	32.28	-6.80	25.48	46.00	-20.52
	Freq.  MHz  63.950 167.740 216.240 283.170 380.170	Freq. Detector	Freq.         Detector Mode PK/QP/AV         Spectrum Reading Level dBμV           63.950         Peak         41.29           167.740         Peak         36.71           216.240         Peak         41.79           283.170         Peak         37.73           380.170         Peak         36.71	Freq.         Detector Mode PK/QP/AV         Spectrum Reading Level dBμV         Factor dBμV           63.950         Peak         41.29         -14.29           167.740         Peak         36.71         -13.21           216.240         Peak         41.79         -15.57           283.170         Peak         37.73         -12.32           380.170         Peak         36.71         -9.99	Freq.Detector Mode PK/QP/AVSpectrum Reading Level dBμVFactor dBActual FS dBμV/m63.950Peak41.29-14.2927.00167.740Peak36.71-13.2123.49216.240Peak41.79-15.5726.22283.170Peak37.73-12.3225.41380.170Peak36.71-9.9926.72	Freq.         Detector Mode PK/QP/AV         Spectrum Reading Level ABμV         Factor ABμV         Actual FS ABμV/m         Limit FS ABμV/m           63.950         Peak Peak Peak Peak Abull Abu

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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### 9 FREQUENCY STABILITY

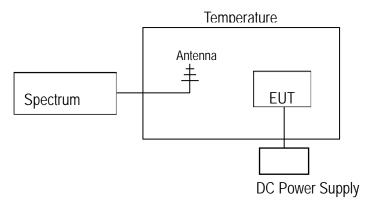
### 9.1 Applicable Standard

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.

### 9.2 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.

# 9.3 Test SET-UP (Block Diagram of Configuration)



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#### 9.4 **Measurement Results**

### Startup

### A. Temperature Variation

Power Supply	Environment	Frequency		
Vdc	Temperature	(MHz)	Delta (kHz)	Limit (kHz)
Vuc	(℃)	(171112)		
3.89	-20	13.5599949	-0.00510	+/- 1.356
3.89	-10	13.5599827	-0.01730	+/- 1.356
3.89	0	13.5599812	-0.01880	+/- 1.356
3.89	10	13.5599985	-0.00150	+/- 1.356
3.89	20	13.55999	-0.01000	+/- 1.356
3.89	30	13.559991	-0.00900	+/- 1.356
3.89	40	13.5599932	-0.00680	+/- 1.356
3.89	50	13.5599874	-0.01260	+/- 1.356

### B. Supply Voltage Variation

Power Supply	Environment	Frequency		
Vdo	Temperature	(NALL <del>-</del> )	Delta (kHz)	Limit (kHz)
Vdc	(℃)	(MHz)		
4.47	20	13.5599808	-0.01920	+/- 1.356
3.89	20	13.55999	-0.01000	+/- 1.356
3.31	20	13.5599963	-0.00370	+/- 1.356

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### 2 minutes

# A. Temperature Variation

71. Tomporatoro Variation				
Power Supply	Environment	Frequency		
Vdc	Temperature	(MHz)	Delta (kHz)	Limit (kHz)
Vuc	(℃)	(IVITZ)		
3.89	-20	13.5599969	-0.00310	+/- 1.356
3.89	-10	13.5599883	-0.01170	+/- 1.356
3.89	0	13.5599838	-0.01620	+/- 1.356
3.89	10	13.5599819	-0.01810	+/- 1.356
3.89	20	13.5599887	-0.01130	+/- 1.356
3.89	30	13.5599907	-0.00930	+/- 1.356
3.89	40	13.5599955	-0.00450	+/- 1.356
3.89	50	13.5599949	-0.00510	+/- 1.356

### B. Supply Voltage Variation

- 111 3 - 1 3 - 1 1 1				
Power Supply	Environment	Frequency		
Vdc	Temperature	(NALI=)	Delta (kHz)	Limit (kHz)
Vac	(℃)	(MHz)		
4.47	20	13.5599803	-0.01970	+/- 1.356
3.89	20	13.5599887	-0.01130	+/- 1.356
3.31	20	13.5599859	-0.01410	+/- 1.356

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### 5 minutes

# A. Temperature Variation

Power Supply	Environment	Frequency		
Vdc	Temperature (°C)	(MHz)	Delta (kHz)	Limit (kHz)
3.89	-20	13.559998	-0.00200	+/- 1.356
3.89	-10	13.5599837	-0.01630	+/- 1.356
3.89	0	13.5599927	-0.00730	+/- 1.356
3.89	10	13.559992	-0.00800	+/- 1.356
3.89	20	13.5599922	-0.00780	+/- 1.356
3.89	30	13.5599846	-0.01540	+/- 1.356
3.89	40	13.5599822	-0.01780	+/- 1.356
3.89	50	13.5599843	-0.01570	+/- 1.356

# B. Supply Voltage Variation

Power Supply	Environment	Frequency		
Vdc	Temperature	(NALI=)	Delta (kHz)	Limit (kHz)
Vuc	(℃)	(MHz)		
4.47	20	13.559998	-0.00200	+/- 1.356
3.89	20	13.5599922	-0.00780	+/- 1.356
3.31	20	13.5599891	-0.01090	+/- 1.356

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### 10 minutes

### A. Temperature Variation

7t. Temperature Variation					
Power Supply	Environment	Frequency			
Vdc	Temperature	(MHz)	Delta (kHz)	Limit (kHz)	
Vuc	(℃)	(1011 12)			
3.89	-20	13.5599919	-0.00810	+/- 1.356	
3.89	-10	13.5599989	-0.00110	+/- 1.356	
3.89	0	13.5599888	-0.01120	+/- 1.356	
3.89	10	13.5599812	-0.01880	+/- 1.356	
3.89	20	13.5599944	-0.00560	+/- 1.356	
3.89	30	13.5599893	-0.01070	+/- 1.356	
3.89	40	13.5599872	-0.01280	+/- 1.356	
3.89	50	13.5599815	-0.01850	+/- 1.356	

### B. Supply Voltage Variation

Power Supply	Environment	Frequency		
Vdc	Temperature	(\\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Delta (kHz)	Limit (kHz)
Vac	(℃)	(MHz)		
4.47	20	13.5599897	-0.01030	+/- 1.356
3.89	20	13.5599944	-0.00560	+/- 1.356
3.31	20	13.5599867	-0.01330	+/- 1.356

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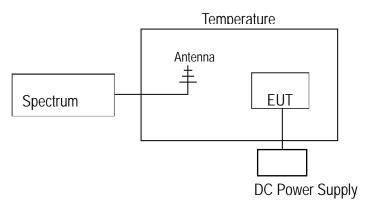
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### 10 EMISSION BANDWIDTH MEASUREMENT

### **Applicable Standard:**

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

#### 10.2 **Test Set-up**



#### 10.3 **Measurement Procedure**

- 1. Placed the EUT on the testing table.
- Set the EUT under transmission condition continuously at specific channel frequency.
- 3. Set SPA Center Frequency = fundamental frequency, RBW=1% to 5% OBW, VBW=3 x RBW, Span = large enough to capture all products of the modulation process.
- 4. Measured the spectrum width with power higher than 20dB below carrier.

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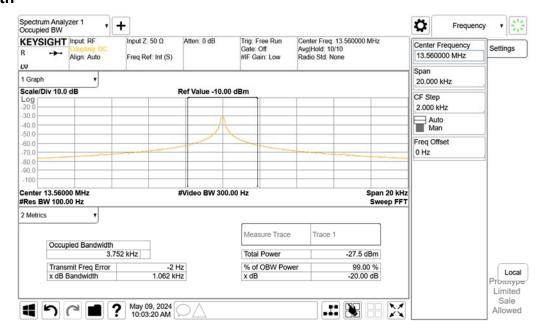
### 10.4 Measurement Result

### **FCC**

20dB BW (kHz)
1.062

Opration range	Frequency (MHz)	Limit (MHz)
Low	13.55812	>13.11
High	13.56186	<14.01

### **Bandwidth**



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# Operation range low



**Operation range High** 



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### 11 ANTENNA REQUIREMENT

### 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 complies with this requirement and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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