

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



Applicant: Opticon sensors Europé B.V.
Opaallaan 35, 2132 XV Hoofddorp, The Netherlands
Product Name: Companion scanner
Brand Name: Opticon
Model No.: RS-3000
Model Difference: N/A
Report Number: E2/2021/60087
FCC ID Q2Q-RS3000
Issue Date: Aug.11,2021
Date of Test: Jun.30,2021~Aug.11,2021
Date of EUT Received: Jun.30,2021

Approved By

Vito. Pei

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 §15C.

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

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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Revision History

Report Number	Revision	Description	Issue Date	Revised By
E2/2021/60087	Rev.00	Original.	Aug. 11, 2021	Viola Su

Note:

- 1、Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

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1 GENERAL INFORMATION

1.1 Product Description

Product Name:	Companion scanner
Brand Name:	Opticon
Model No.:	RS-3000
Model Difference:	N/A
Hardware Version:	N/A
Firmware Version:	N/A
EUT Series No.:	000028
Power Supply:	3.7V DC

1.2 RF Specification

Technology:	Wireless Power Transfer
Operating Frequency	110 kHz ~ 300 kHz
FCC Transmit Power	< -0.60 dBuV/m at 3m.
Number of Channels	1
Antenna Type	Loop

Note: Antenna information is provided by the applicant.

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1.3 Test Methodology

FCC Part 15, Subpart C

ANSI C63.10:2013

1.4 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1	TW0027	TW3702
		SAC 3		
		Conduction 1		
		Conducted 1		
		Conducted 2		
		Conducted 3		
		Conducted 4		
		Conducted 5		
		Conducted 6		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction C	TW0028	
		SAC C		
		SAC D		
		SAC G		
		Conducted A		
		Conducted B		
		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 special accessory used while test was conducted.

1.6 Equipment Modifications

There was no modification incorporated into the EUT.

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2 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 placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 9kHz 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 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. 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 radiated emissions, 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*9m*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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2.4 Configuration of Tested System

Fig. 2-1 Conducted Setup&Conduction Setup&Radiated Setup

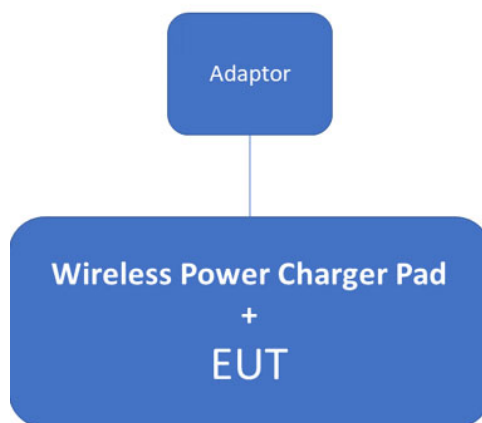


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	ADAPTER	PHIHONG	PSAI10R-050Q	KP0100P00130 10226CPJA5	N/A	N/A
2.	Wireless power charger Pad	MI	WPC01ZM	N/A	N/A	N/A
3.	Test Software	audix	e3	20923 sgs Ver.9	N/A	N/A
4.	Adapter	Sony	AC-0400-TW	3504600	N/A	N/A
5.	WPC	MI	WPC01ZM	WPC01ZM	N/A	N/A
6.	Test Software	audix	e3	Ver. 6.11- 20180419c	N/A	N/A

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	Compliant
§15.209	Radiated Emission Limits, general requirement	Compliant
§15.215 (c)	20 dB OCCUPIED BANDWIDTH	Compliant
§15.203	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

The EUT stay in continuous transmitting mode. The frequency is the default channel to test, where it is the only manipulative channel as this application supports.

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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5 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			
Polarization: Vertical	+/-	2.64 dB	9kHz~30MHz
	+/-	4.93 dB	30MHz - 1000MHz
	+/-	4.81 dB	1GHz - 18GHz
	+/-	4.52 dB	18GHz - 40GHz
Polarization: Horizontal	+/-	2.64 dB	9kHz~30MHz
	+/-	4.45 dB	30MHz - 1000MHz
	+/-	4.81 dB	1GHz - 18GHz
	+/-	4.52 dB	18GHz - 40GHz

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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6 CONDUCTED EMISSIONS TEST

6.1 Limitation

According to section 15.207(a) Conducted Emission Limits as following.

Frequency range MHz	Limits (dBuV)	
	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

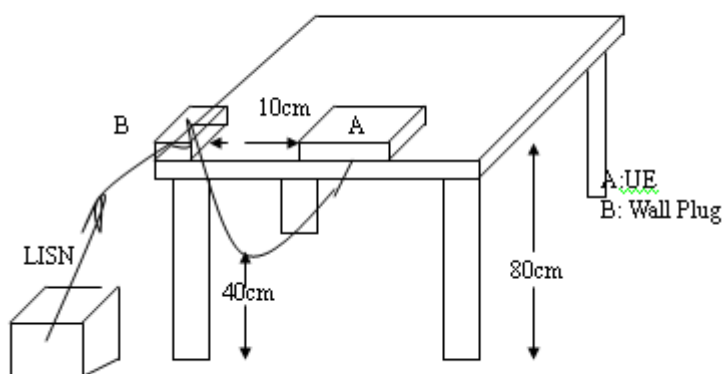
Note

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.

6.2 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.

6.3 Test SET-UP (Block Diagram of Configuration)



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6.4 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.

6.5 Measurement Equipment Used:

Radiated Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Software	audix	e3	Ver. 6.11-20180419c	N.C.R	N.C.R
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	973	03/25/2021	03/24/2022
EMI Test Receiver	R&S	ESCI	101342	04/27/2021	04/26/2022
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	Sony	AC-0400-TW	3504600	N.C.R	N.C.R

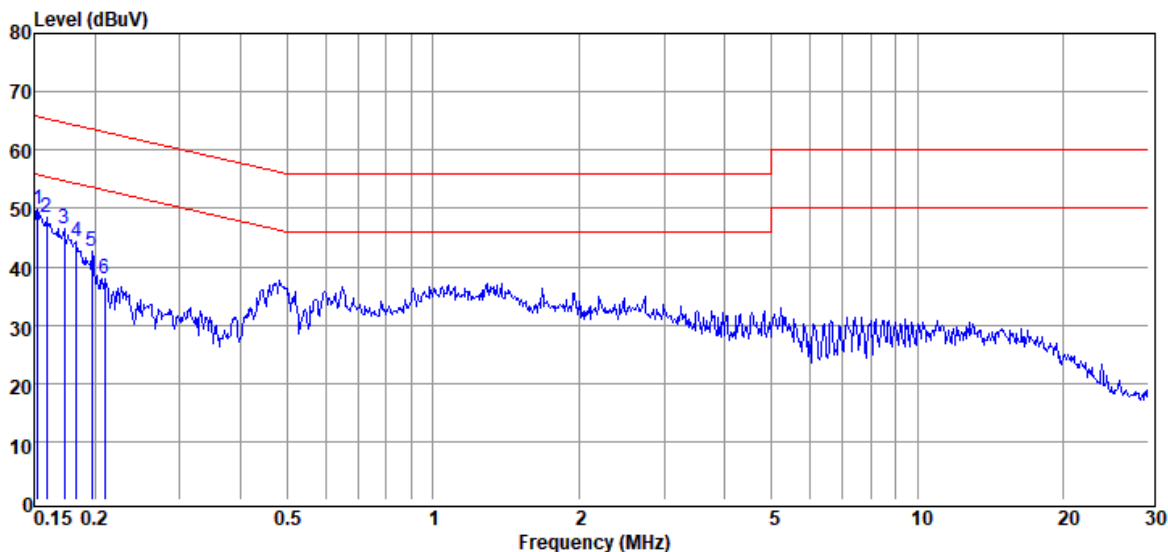
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6.6 Measurement Result:

Report Number	:E2-2021-60087	Test Site	:Conduction C
Test Mode	:WPC	Test Date	:2021-07-13
Power	:120V/60Hz	Temp./Humi.	:22.6/60
Probe	:L1	Engineer	:Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V	Limit dB μ V	Margin dB
0.15	Peak	39.40	10.30	49.70	65.87	-16.17
0.16	Peak	38.08	10.30	48.38	65.52	-17.14
0.17	Peak	36.34	10.30	46.64	64.81	-18.17
0.18	Peak	33.94	10.30	44.24	64.33	-20.09
0.20	Peak	32.27	10.30	42.57	63.71	-21.14
0.21	Peak	27.75	10.30	38.05	63.23	-25.18

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Report Number :E2-2021-60087

Test Site :Conduction C

Test Mode :WPC

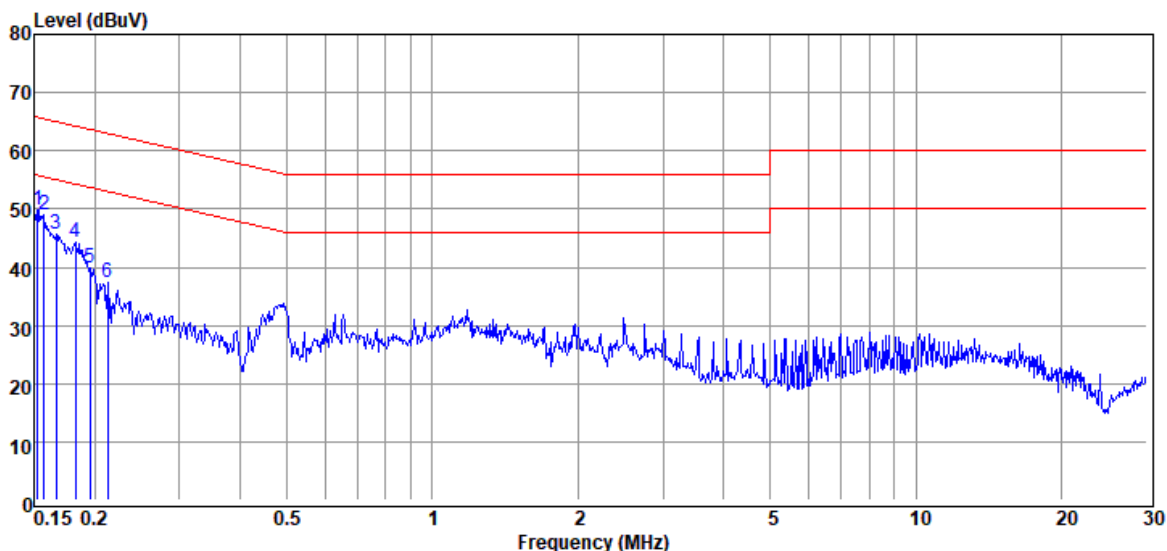
Test Date :2021-07-13

Power :120V/60Hz

Temp./Humi. :22.6/60

Probe :N

Engineer :Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV	Limit dBμV	Margin dB
0.15	Peak	39.53	10.31	49.84	65.87	-16.03
0.16	Peak	38.64	10.31	48.95	65.60	-16.65
0.17	Peak	35.40	10.31	45.71	65.12	-19.41
0.18	Peak	33.86	10.30	44.16	64.37	-20.21
0.20	Peak	29.60	10.30	39.90	63.80	-23.90
0.21	Peak	27.19	10.30	37.49	63.10	-25.61

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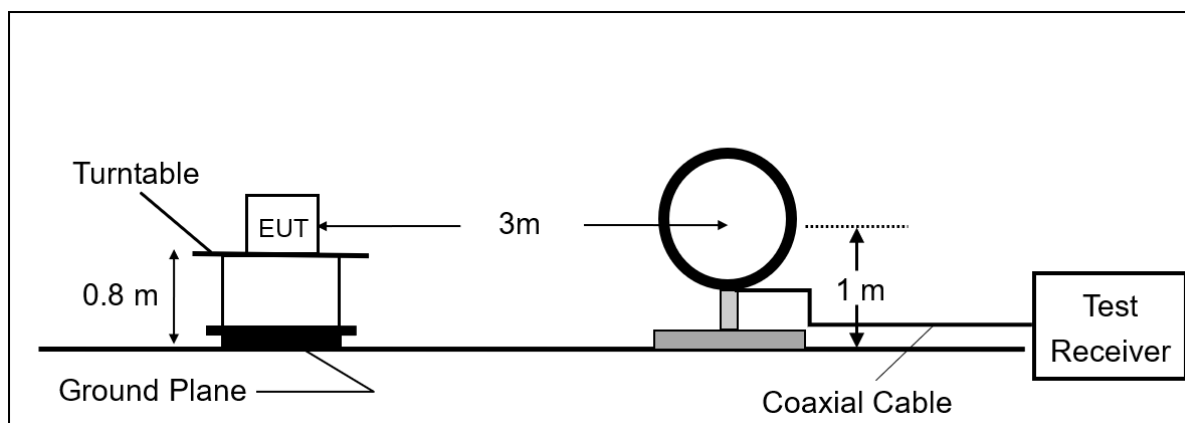
7 RADIATED EMISSION TEST

7.1 Measurement Procedure

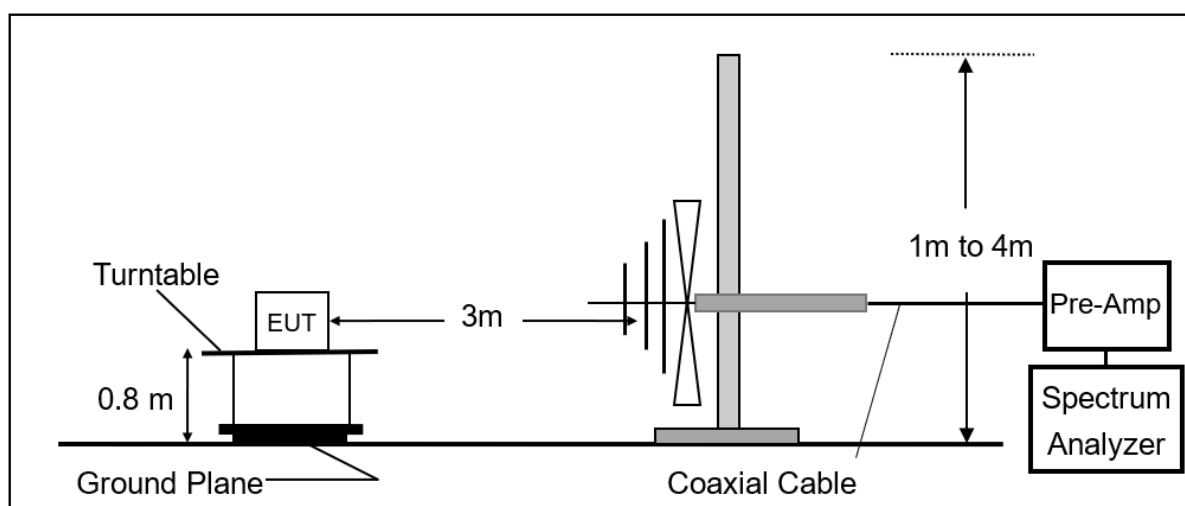
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

7.2 Test SET-UP:

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



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



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7.3 Measurement Equipment Used:

Radiated Emission Test Site: SAC C					
EQUIPMENT TYPE	MFR/BRAND	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	TESEQ	CBL 6112D	35240	09/08/2020	09/07/2021
Loop Antenna	ETS.LINDGREN	6502	143303	05/07/2021	05/06/2022
EMI Test Receiver	R&S	ESU 40	100363	04/28/2021	04/27/2022
Pre-Amplifier	EMC Instruments	EMC330	980096	11/19/2020	11/18/2021
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	11/19/2020	11/18/2021
Test Software	audix	e3	20923 sgs Ver.9	N.C.R	N.C.R
Adapter	Sony	AC-0400-TW	3504600	N.C.R	N.C.R
WPC	MI	WPC01ZM	WPC01ZM	N.C.R	N.C.R
USB Cable	MI	SJX10ZM	USB to Type-c	N.C.R	N.C.R

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7.4 FCC Applicable Standard

The field strength of any emissions appearing outside of operation frequency 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:

1. Emission level in dBμV/m = $20 \log (\mu\text{V/m})$
2. Distance extrapolation factor = $40 \log (\text{required distance} / \text{test distance})$ (dB)
3. $20 * \log(30 \mu\text{V/m}) + 40 \text{dB} = 69.54 \text{ dBuV/m}$
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.
8. Actual FS(dBμV/m) = Spectrum. Reading level(dBμV) + Factor(dB)
Factor(dB) = Antenna Factor(dB) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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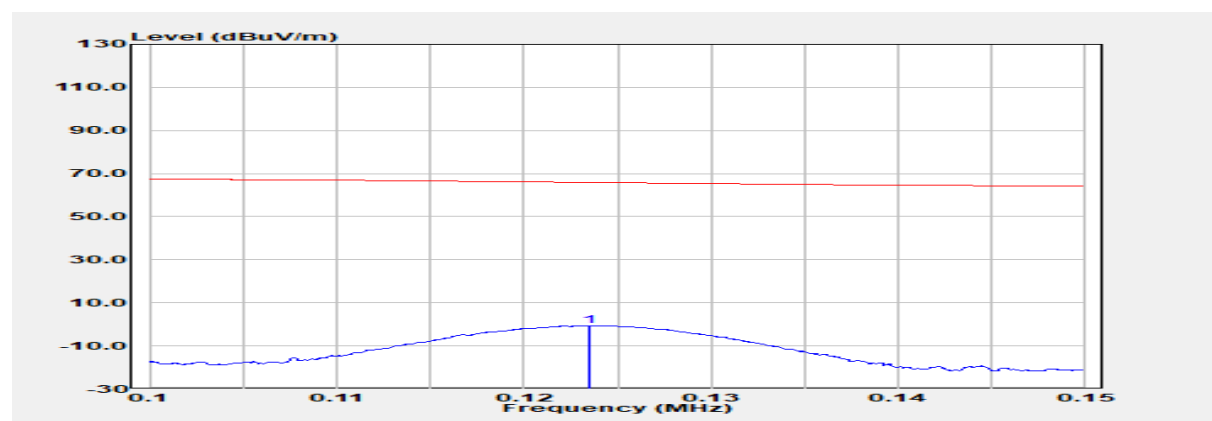
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7.5 FCC Test Result

7.5.1 Field Strength of Fundamental Emission

Report Number	:E2/2021/60087	Test Site	:SAC C
Operation Mode	:WPC	Test Date	:2021-07-21
Test Frequency	:125 KHz	Temp./Humi.	:23.2/57
Test Mode	:Main	Antenna Pol.	:Vertical
EUT Pol	:E2 Plane	Engineer	:Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual d μ V/m	Limit d μ V/m	Margin dB
0.124	Peak	68.43	-69.03	-0.60	65.77	-66.37

Actual level = Reading level + Factor

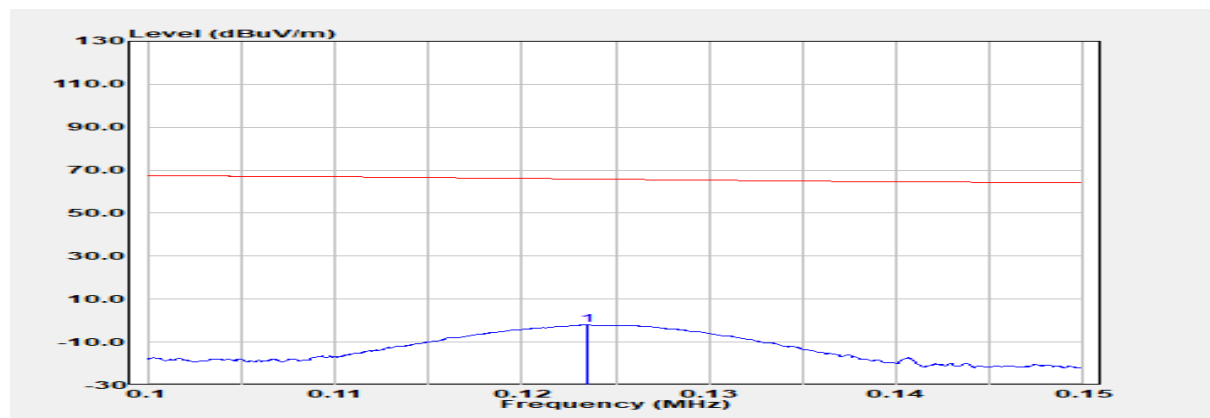
Factor = Antenna factor + cable loss – distance factor(3m to 30m and 3m to 300m)

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Report Number	:E2/2021/60087	Test Site	:SAC C
Operation Mode	:WPC	Test Date	:2021-07-21
Test Frequency	:125 KHz	Temp./Humi.	:23.2/57
Test Mode	:Main	Antenna Pol.	:Horizontal
EUT Pol	:E2 Plane	Engineer	:Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBUV	Factor dB	Actual dBUV/m	Limit dBUV/m	Margin dB
0.123	Peak	66.94	-69.03	-2.09	65.78	-67.86

Actual level = Reading level + Factor

Factor = Antenna factor + cable loss – distance factor(3m to 30m and 3m to 300m)

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7.5.2 Below 30 MHz test result

Report Number :E2/2021/60087

Test Site :SAC C

Operation Mode :WPC

Test Date :2021-07-21

Test Frequency :125 KHz

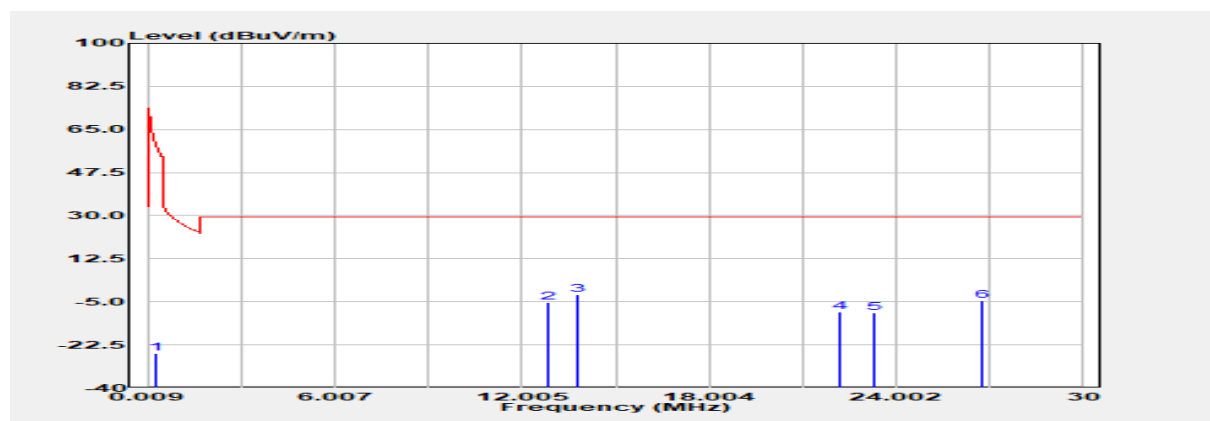
Temp./Humi. :23.2/57

Test Mode :TX

Antenna Pol. :Vertical

EUT Pol :E2 Plane

Engineer :Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit dBuV/m	Margin dB
0.250	Peak	42.77	-68.67	-25.89	59.65	-85.54
12.842	Peak	22.76	-28.06	-5.30	29.54	-34.84
13.755	Peak	25.89	-28.13	-2.25	29.54	-31.79
22.214	Peak	20.03	-29.03	-9.00	29.54	-38.54
23.319	Peak	19.82	-29.25	-9.43	29.54	-38.97
26.780	Peak	25.48	-29.88	-4.39	29.54	-33.93

Actual level = Reading level + Factor

Factor = Antenna factor + cable loss – distance factor(3m to 30m and 3m to 300m)

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Report Number :E2/2021/60087

Test Site :SAC C

Operation Mode :WPC

Test Date :2021-07-21

Test Frequency :125 KHz

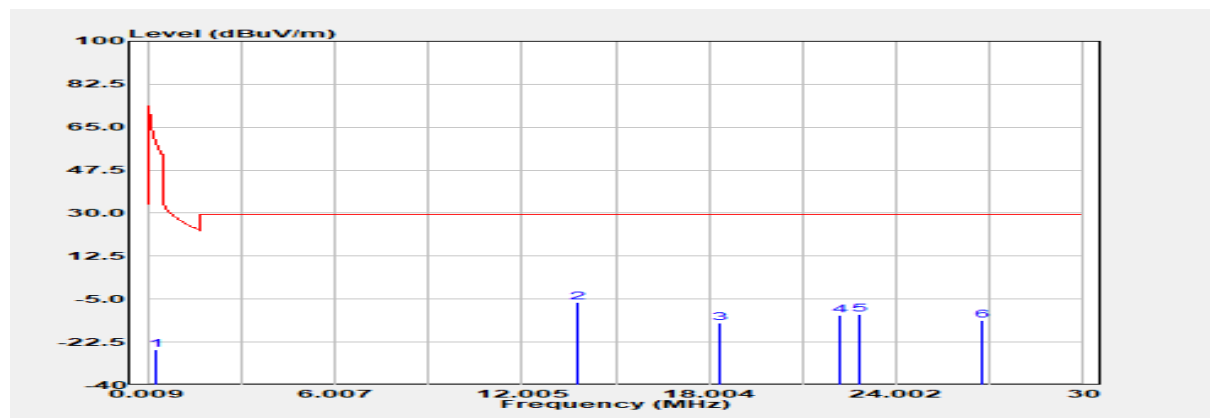
Temp./Humi. :23.2/57

Test Mode :TX

Antenna Pol. :Horizontal

EUT Pol :E2 Plane

Engineer :Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBUV	Factor dB	Actual FS dBUV/m	Limit dBUV/m	Margin dB
0.250	Peak	42.90	-68.67	-25.77	59.65	-85.42
13.803	Peak	21.71	-28.13	-6.42	29.54	-35.96
18.369	Peak	13.57	-28.45	-14.88	29.54	-44.42
22.166	Peak	17.59	-29.02	-11.42	29.54	-40.96
22.839	Peak	17.84	-29.16	-11.32	29.54	-40.86
26.732	Peak	16.27	-29.87	-13.60	29.54	-43.14

Actual level = Reading level + Factor

Factor = Antenna factor + cable loss – distance factor(3m to 30m and 3m to 300m)

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7.5.3 FCC Above 30MHz test result

Report Number :E2/2021/60087

Test Site :SAC C

Operation Mode :WPC

Test Date :2021-07-21

Test Frequency :125 KHz

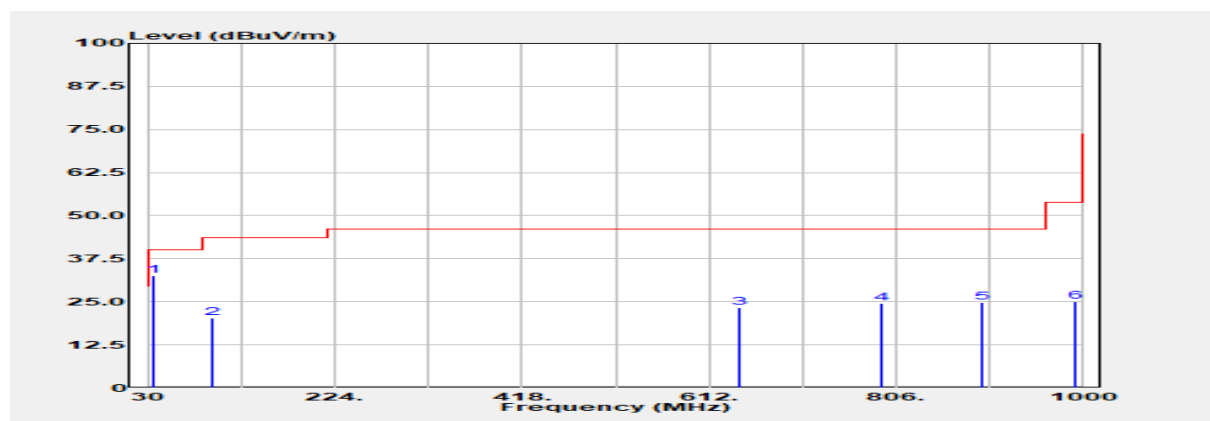
Temp./Humi. :23.2/57

Test Mode :TX

Antenna Pol. :VERTICAL

EUT Pol :E2 Plane

Engineer :Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
36.218	Peak	42.61	-10.03	32.57	40.00	-7.43
96.843	Peak	40.60	-20.32	20.28	43.50	-23.22
642.468	Peak	31.68	-8.43	23.25	46.00	-22.75
791.699	Peak	31.60	-7.03	24.57	46.00	-21.43
895.849	Peak	30.39	-5.49	24.90	46.00	-21.10
992.228	Peak	29.96	-4.82	25.14	54.00	-28.86

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Test Site :SAC C

Operation Mode :WPC

Test Date :2021-07-21

Test Frequency :125 KHz

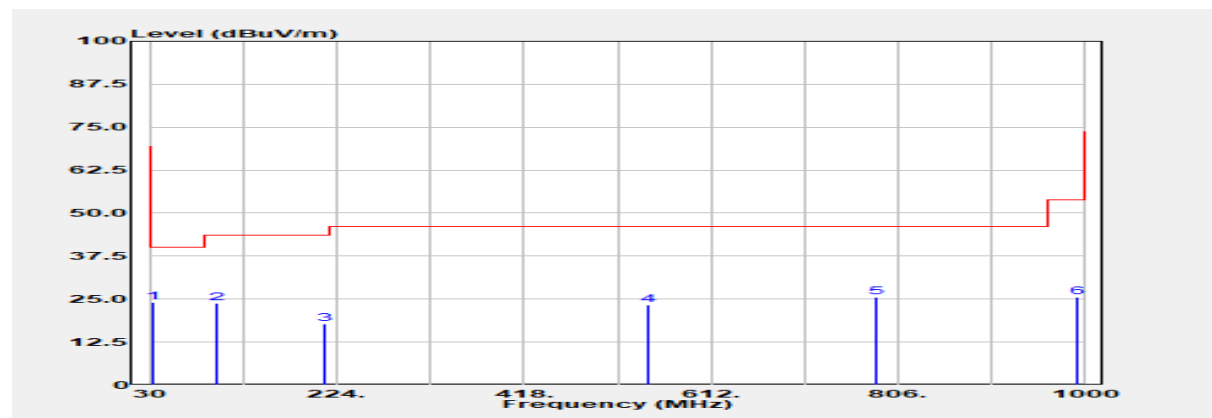
Temp./Humi. :23.2/57

Test Mode :TX

Antenna Pol. :HORIZONTAL

EUT Pol :E2 Plane

Engineer :Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBUV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
34.663	Peak	32.94	-8.86	24.08	40.00	-15.92
99.952	Peak	43.68	-19.87	23.81	43.50	-19.69
210.321	Peak	37.03	-19.36	17.67	43.50	-25.83
546.090	Peak	32.40	-9.14	23.26	46.00	-22.74
783.926	Peak	32.57	-6.93	25.64	46.00	-20.36
992.228	Peak	30.27	-4.82	25.45	54.00	-28.55

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8 20 dB OCCUPIED BANDWIDTH MEASUREMENT

8.1 Standard Applicable:

§2.1049 & §15.215 (c)

8.2 Limit:

None

8.3 Test Set-up

Refer to section 6.2 in this report

8.4 Measurement Procedure

20dB bandwidth

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak mode.
2. 20dB Bandwidth the resolution bandwidth of 200 Hz and the video bandwidth of 1 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.

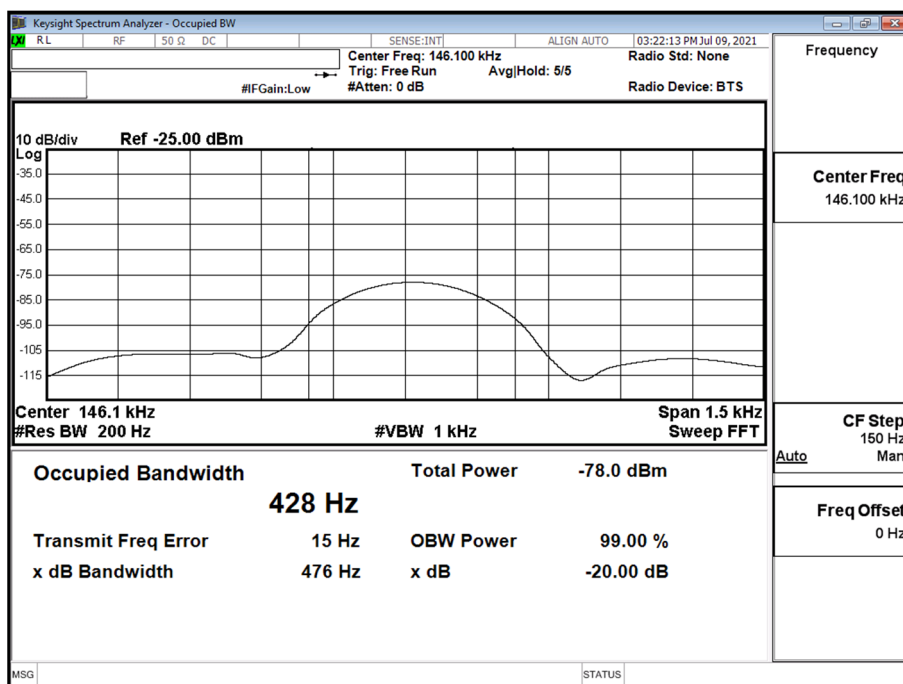
8.5 Measurement Equipment Used:

Refer to section 8.3 in this report

8.6 Measurement Result

-20dB Bandwidth

20dB Bandwidth
476 Hz



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9 ANTENNA REQUIREMENT

9.1 Standard Applicable:

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

9.2 Antenna Connected Construction:

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

~ End of Report ~

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