

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



FCC Applicant: GIGA-TMS INC.
9F-2, No.31, Lane 169, Kang-Ning St.,Hsi-Chih, New Taipei
City 22180,Taiwan

Product Name: Time Recorder

Brand Name: PROMAG,GIGATEK,ProxData

Model No.: TR515A

Model Difference: N/A

Report Number: E2/2021/80061

FCC ID WXATR515AR

Issue Date: November 17, 2021

Date of Test: August 17, 2021 ~ September 11, 2021

Date of EUT Received: August 17, 2021

Approved By _____

Jay Lin

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.

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Revision History

Report Number	Revision	Description	Issue Date	Revised By
E2/2021/80061	00	Original	November 17, 2021	Ariel Chang

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1 GENERAL INFORMATION

1.1 Product Description

Product Name	Time Recorder
Brand Name	PROMAG,GIGATEK,ProxData
Model No.	TR515A
Model Difference	N/A
Power Supply	5Vdc to 12Vdc (Typical: 9Vdc)

1.2 RF specification

Radio Technology	NFC
Operating Frequency	125 kHz
Transmit Power	-2.33 dBuV/m at 300m.
Number of Channels	1
Modulation Type	ASK
Antenna Type	COIL Antenna

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 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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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 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. 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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- Remark 1. Emission level in $\text{dBuV/m} = 20 \log(\text{uV/m})$
:
2. Measurement was performed at an antenna to the closed point of EUT distance of 3 meters.
 3. Distance extrapolation factor = $40 \log(\text{required distance}/\text{test distance})$ (dB);
 4. The measurement was undertaken in closer distance at 3m, where extrapolation factor is offset to convert the limit of the measurement.
Ex. $20 \log(30) + 40 \log(30/3) = 69.54 \text{dBuV/m}$
 5. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of §15.205.
 6. 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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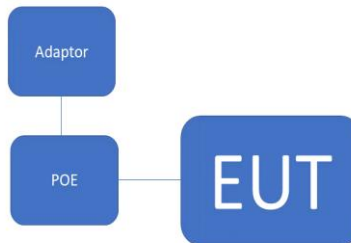
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2.4 Test Configuration

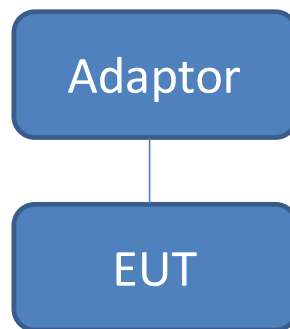
2.4.1 AC Power Line Conducted Emission _ Adaptor



2.4.2 AC Power Line Conducted Emission _ POE



2.4.3 Emission Measurements



2.4.4 Equipment used for test

Equipment	Mfr/Brand	Model/Type No.	Series No.
Adaptor	Kircuit	AD41-0900500DU	N/A
Adaptor for PoE	LEI	MU24-B480050-A1	N/A
PoE	N/A	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.

The data rate as the lowest supported is selected while tests are conducted.

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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 Standard Applicable

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

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 Measurement Equipment Used:

Radiated Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	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	04/28/2021	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

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.

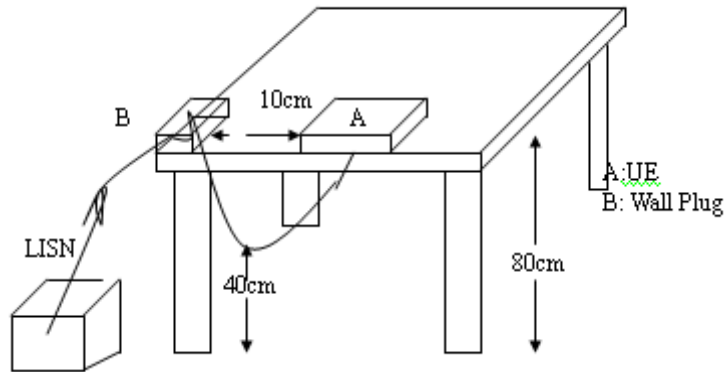
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6.4 Test SET-UP (Block Diagram of Configuration)



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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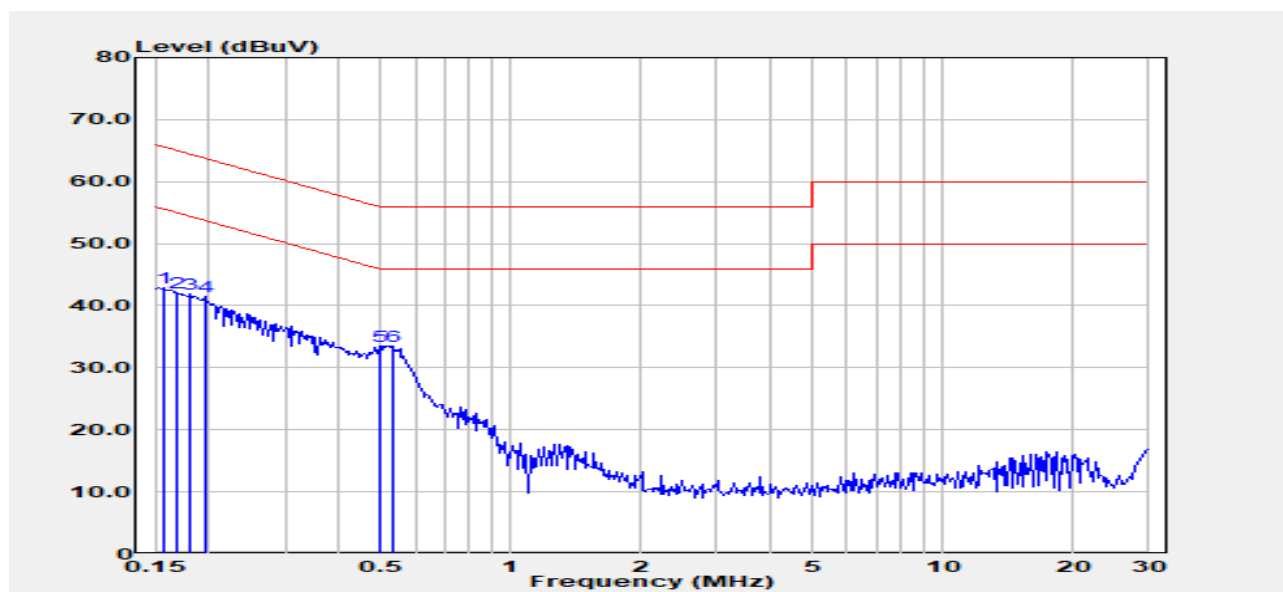
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number :E2/2021/80061 Test Site :Conduction C
 Test Mode :RFID 125 KHz Test Date :2021-09-09
 Power :120V/60Hz Temp./Humi. :23.5/61
 Probe :L1 Engineer :Ashton Chiu
 Note: : Adapter:AD41-0900500DU



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV	Limit dBuV	Margin dB
0.156	Peak	32.56	10.30	42.86	65.65	-22.79
0.169	Peak	31.89	10.30	42.19	65.03	-22.84
0.182	Peak	31.52	10.30	41.82	64.42	-22.59
0.195	Peak	31.12	10.30	41.42	63.80	-22.38
0.497	Peak	23.26	10.31	33.57	56.05	-22.48
0.535	Peak	23.13	10.32	33.45	56.00	-22.55

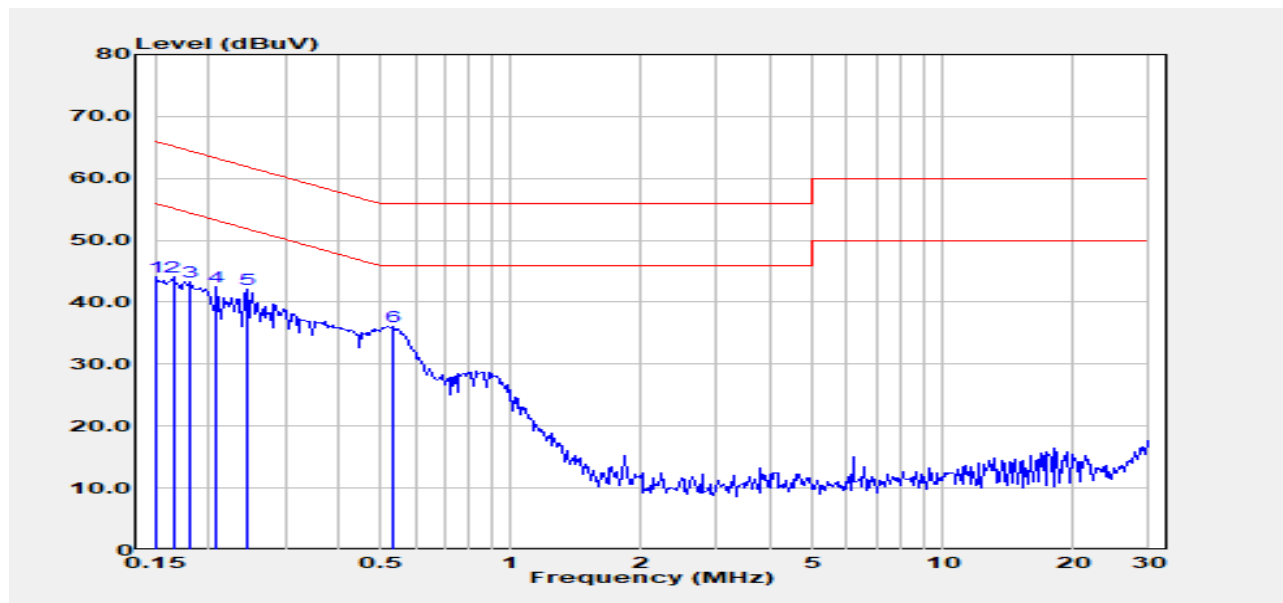
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Report Number :E2/2021/80061 Test Site :Conduction C
 Test Mode :RFID 125 KHz Test Date :2021-09-09
 Power :120V/60Hz Temp./Humi. :23.5/61
 Probe :N Engineer :Ashton Chiu
 Note: : Adapter:AD41-0900500DU



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
0.152	Peak	33.74	10.31	44.05	65.91	-21.86
0.165	Peak	33.82	10.31	44.12	65.21	-21.09
0.182	Peak	32.94	10.30	43.25	64.42	-21.17
0.208	Peak	32.21	10.30	42.51	63.27	-20.76
0.244	Peak	31.88	10.31	42.18	61.95	-19.77
0.535	Peak	25.76	10.33	36.09	56.00	-19.91

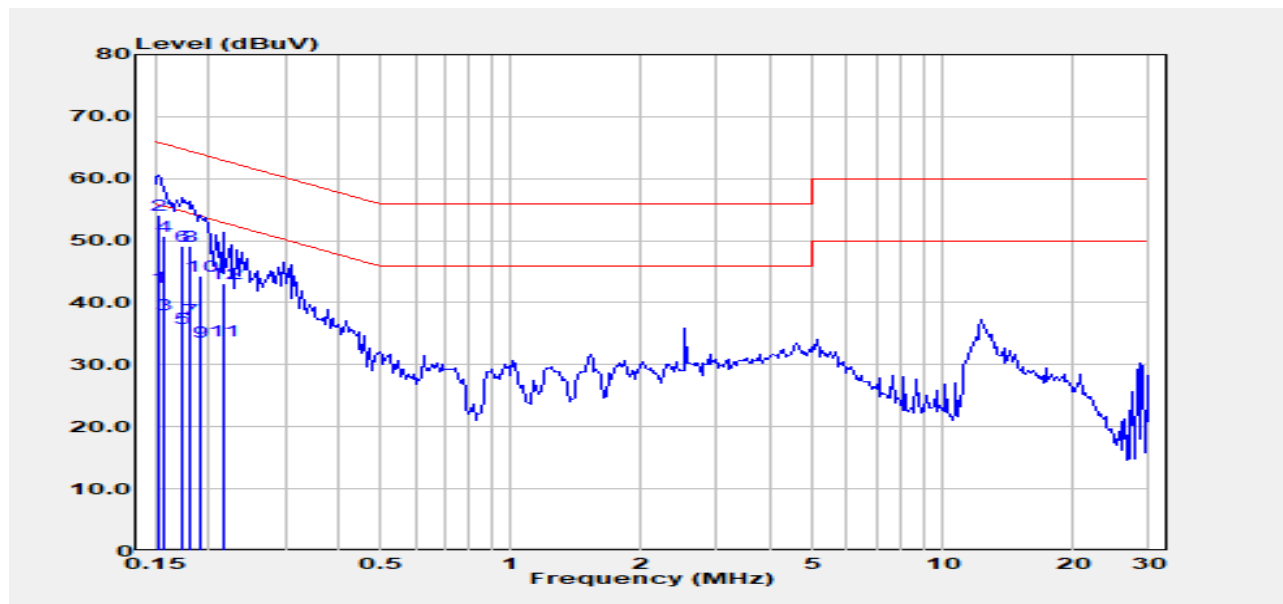
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Report Number	:E2/2021/80061	Test Site	:Conduction C
Test Mode	:RFID 125 KHz	Test Date	:2021-09-09
Power	:120V/60Hz	Temp./Humi.	:23.5/61
Probe	:L1	Engineer	:Ashton Chiu
Note:	: POE		



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
0.153	Average	32.30	10.30	42.60	55.82	-13.22
0.153	QP	43.90	10.30	54.20	65.82	-11.62
0.158	Average	27.70	10.30	38.00	55.56	-17.56
0.158	QP	40.40	10.30	50.70	65.56	-14.86
0.174	Average	25.60	10.30	35.90	54.77	-18.87
0.174	QP	38.90	10.30	49.20	64.77	-15.57
0.180	Average	26.90	10.30	37.20	54.50	-17.30
0.180	QP	38.90	10.30	49.20	64.50	-15.30
0.191	Average	23.30	10.30	33.60	53.98	-20.38
0.191	QP	34.10	10.30	44.40	63.98	-19.58
0.215	Average	23.60	10.30	33.90	53.01	-19.11
0.215	QP	32.80	10.30	43.10	63.01	-19.91

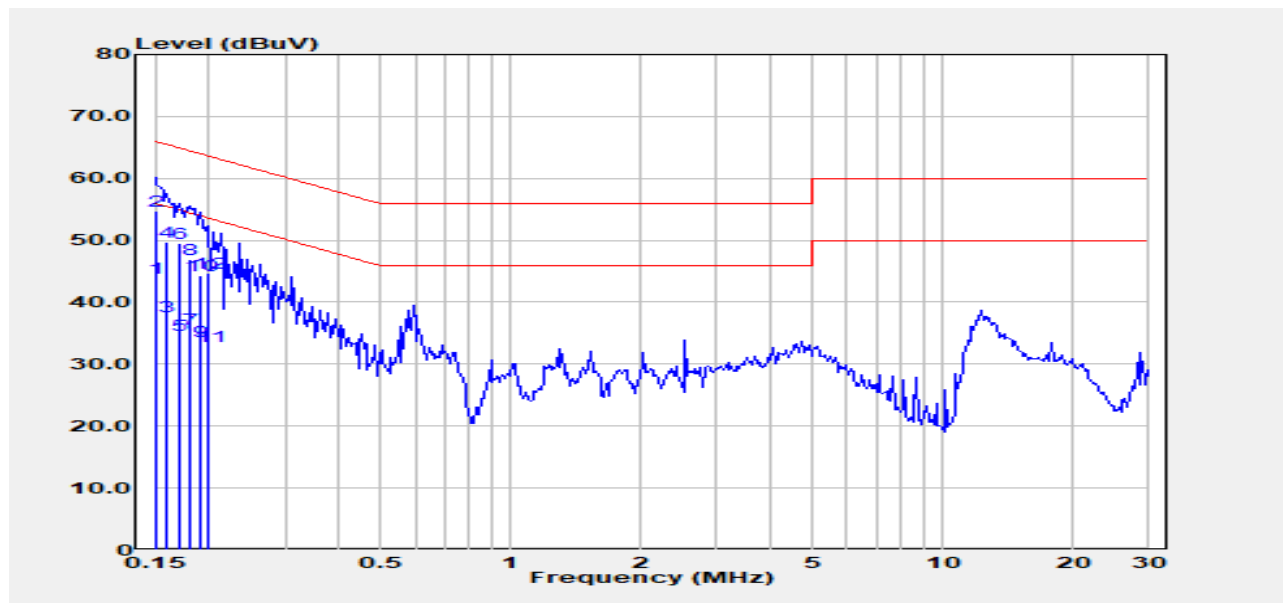
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Report Number	:E2/2021/80061	Test Site	:Conduction C
Test Mode	:RFID 125 KHz	Test Date	:2021-09-09
Power	:120V/60Hz	Temp./Humi.	:23.5/61
Probe	:N	Engineer	:Ashton Chiu
Note:	: POE		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV	Limit dBµV	Margin dB
0.150	Average	33.60	10.31	43.91	56.00	-12.09
0.150	QP	44.40	10.31	54.71	66.00	-11.29
0.160	Average	27.30	10.31	37.61	55.47	-17.86
0.160	QP	39.40	10.31	49.71	65.47	-15.76
0.170	Average	24.40	10.31	34.71	54.94	-20.24
0.170	QP	39.30	10.31	49.61	64.94	-15.34
0.182	Average	25.30	10.30	35.60	54.42	-18.81
0.182	QP	36.60	10.30	46.90	64.42	-17.51
0.191	Average	23.30	10.30	33.60	53.98	-20.37
0.191	QP	34.00	10.30	44.30	63.98	-19.67
0.200	Average	22.60	10.30	32.90	53.62	-20.72
0.200	QP	34.40	10.30	44.70	63.62	-18.92

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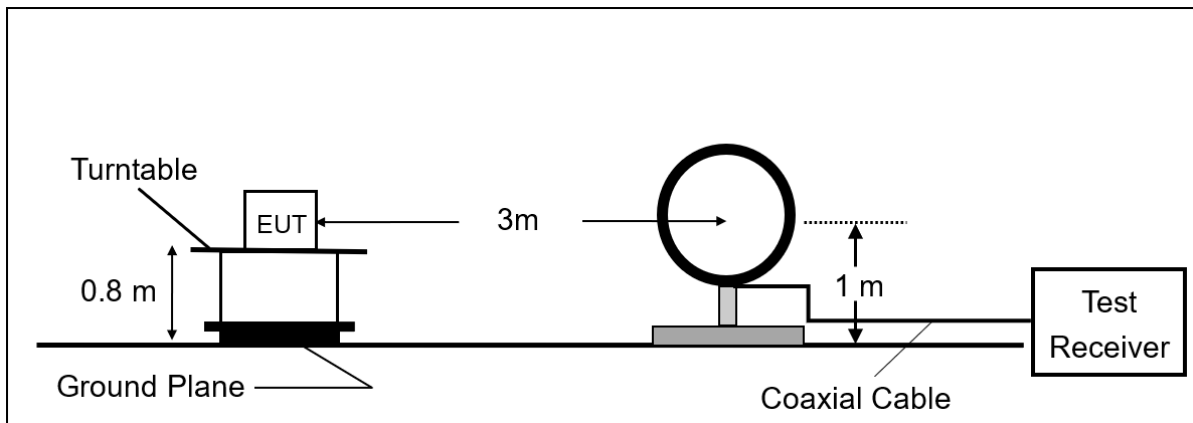
7 RADIATED EMISSION TEST

7.1 Measurement Procedure

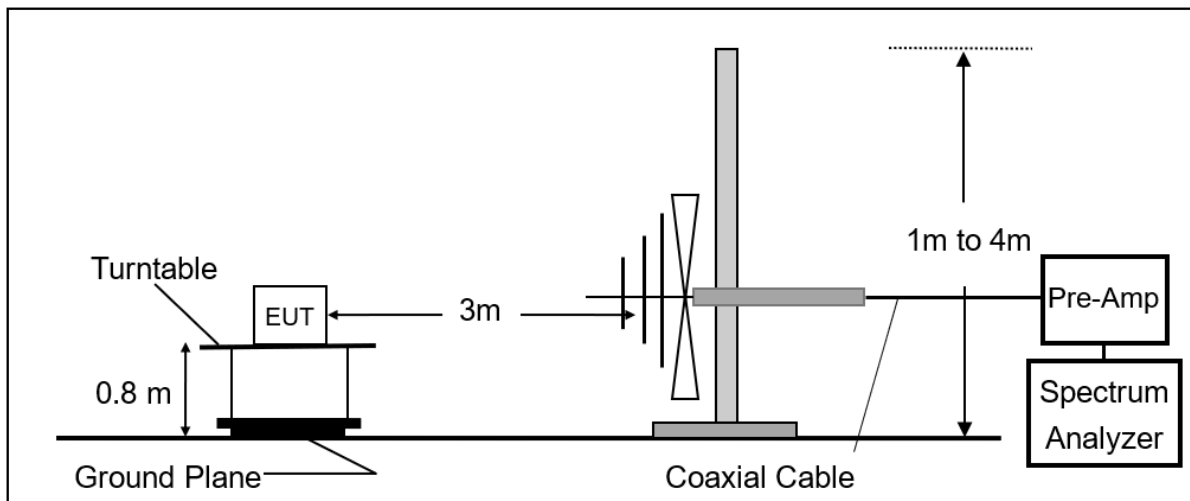
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

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	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	TESEQ	CBL 6112D	35243	10/07/2020	10/06/2021
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

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

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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	

7.5 Limit

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 (μV/m)
2. Distance extrapolation factor = 40 log (required distance/ test distance) (dB)
3. 20*log(30uV/m) + 40dB = 69.54 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.
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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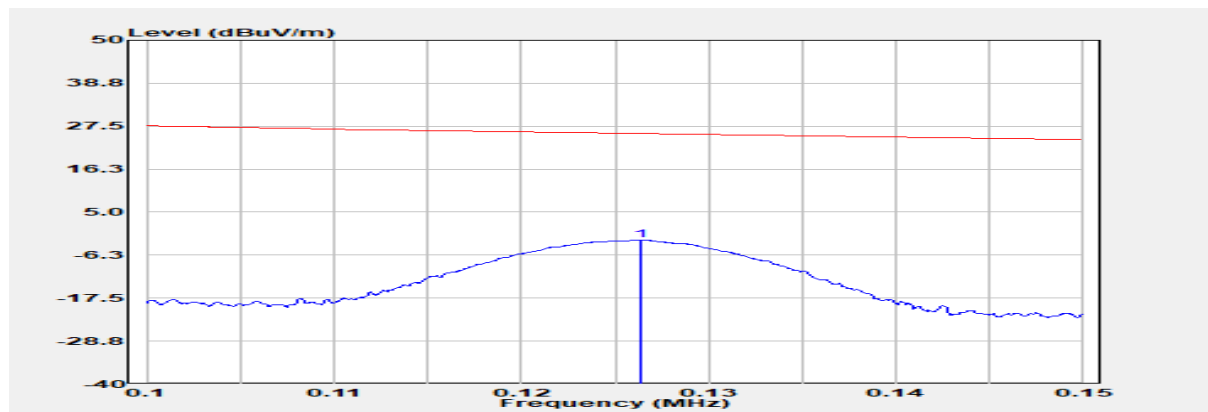
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7.6 Main

Report Number	:E2/2021/80061	Test Site	:SAC C
Operation Mode	:RFID	Test Date	:2021-09-09
Test Frequency	:125 KHz	Temp./Humi.	:23.5/52
Test Mode	:Main	Antenna Pol.	:Vertical
EUT Pol	:H 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
0.126	Peak	66.68	-69.01	-2.33	25.57	-27.91

Actual level = Reading level + Factor

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

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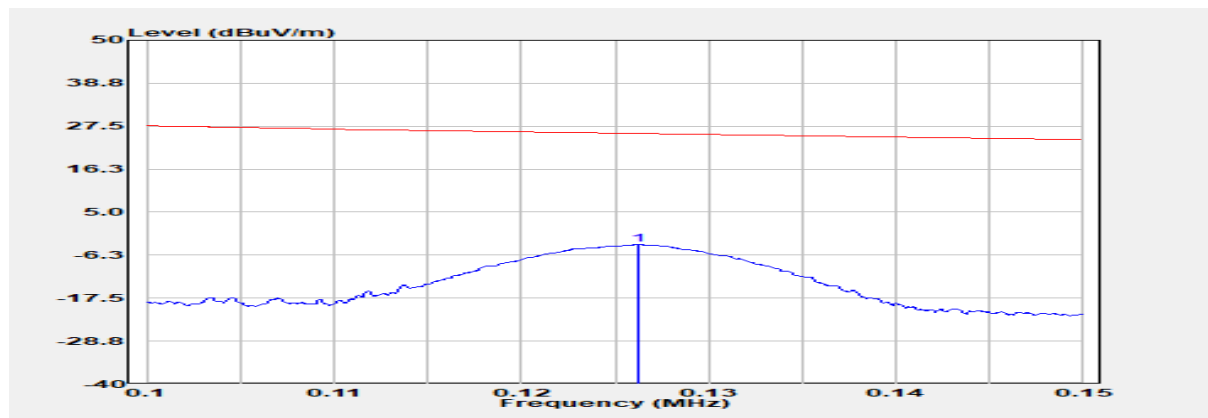
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Report Number	:E2/2021/80061	Test Site	:SAC C
Operation Mode	:RFID	Test Date	:2021-09-09
Test Frequency	:125 KHz	Temp./Humi.	:23.5/52
Test Mode	:Main	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual dBuV/m	Limit dBuV/m	Margin dB
0.126	Peak	65.48	-69.01	-3.53	25.58	-29.11

Actual level = Reading level + Factor

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

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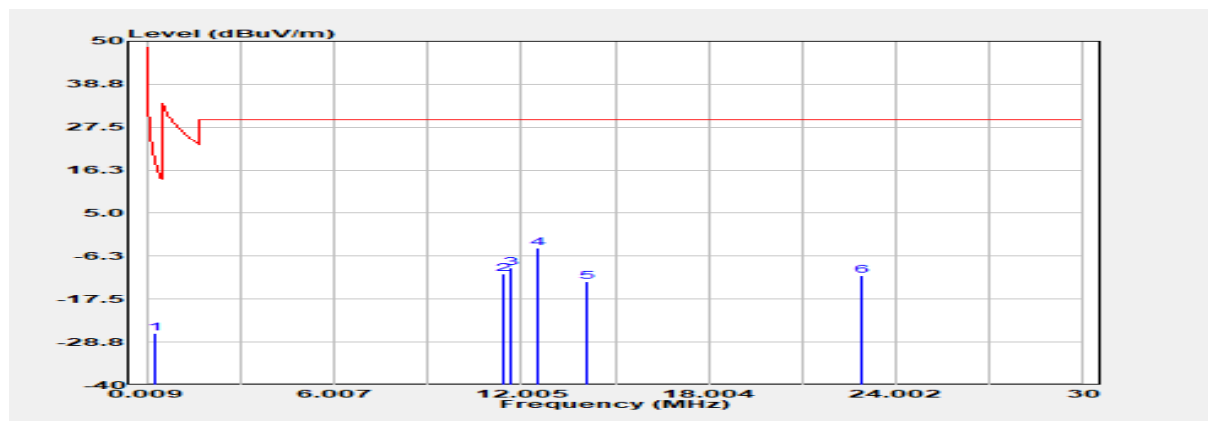
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7.7 Tx

Report Number :E2/2021/80061
 Operation Mode :NFC
 Test Frequency :125 KHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC C
 Test Date :2021-09-09
 Temp./Humi. :23.5/52
 Antenna Pol. :Vertical
 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
0.250	Peak	42.20	-68.67	-26.46	19.65	-46.11
11.400	Peak	17.13	-27.92	-10.79	29.54	-40.33
11.640	Peak	18.65	-27.95	-9.30	29.54	-38.84
12.553	Peak	23.83	-28.03	-4.20	29.54	-33.74
14.139	Peak	15.25	-28.16	-12.91	29.54	-42.45
22.887	Peak	17.75	-29.17	-11.42	29.54	-40.96

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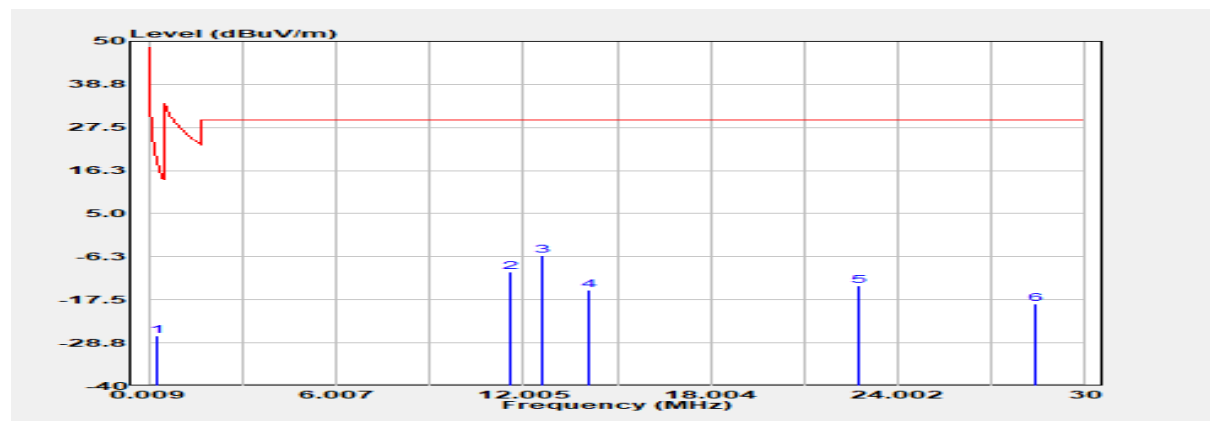
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Report Number :E2/2021/80061
 Operation Mode :NFC
 Test Frequency :125 KHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC C
 Test Date :2021-09-09
 Temp./Humi. :23.5/52
 Antenna Pol. :Horizontal
 Engineer :Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
0.250	Peak	41.85	-68.67	-26.82	19.65	-46.46
11.592	Peak	17.65	-27.94	-10.29	29.54	-39.83
12.601	Peak	21.98	-28.03	-6.05	29.54	-35.59
14.091	Peak	13.12	-28.16	-15.04	29.54	-44.58
22.743	Peak	15.28	-29.14	-13.86	29.54	-43.40
28.414	Peak	11.67	-30.14	-18.47	29.54	-48.01

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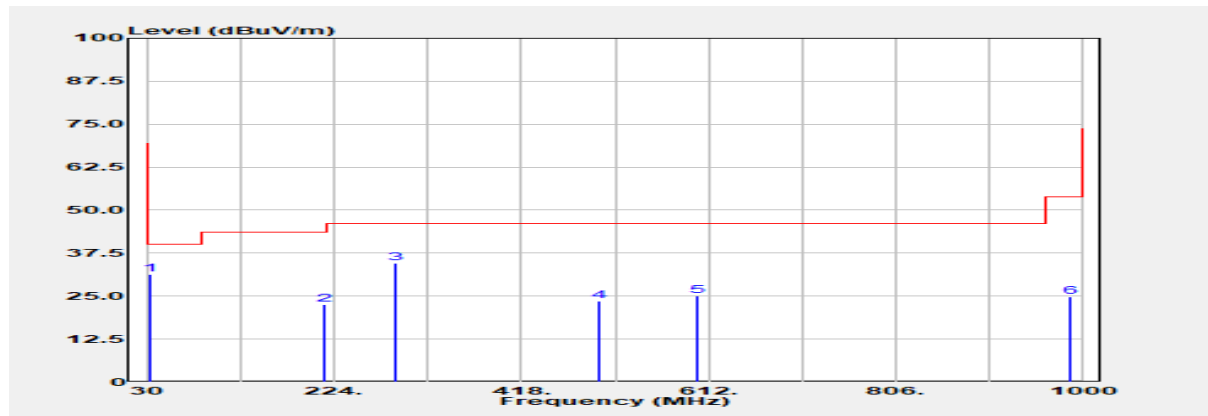
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Report Number :E2/2021/80061
 Operation Mode :NFC
 Test Frequency :125 KHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC C
 Test Date :2021-09-09
 Temp./Humi. :23.5/52
 Antenna Pol. :VERTICAL
 Engineer :Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
33.109	Peak	39.65	-8.39	31.26	40.00	-8.74
214.984	Peak	42.18	-19.74	22.45	43.50	-21.05
288.045	QP	50.13	-15.54	34.59	46.00	-11.41
499.455	Peak	34.23	-10.63	23.60	46.00	-22.40
600.497	Peak	34.60	-9.44	25.15	46.00	-20.85
986.010	Peak	30.00	-5.14	24.86	54.00	-29.14

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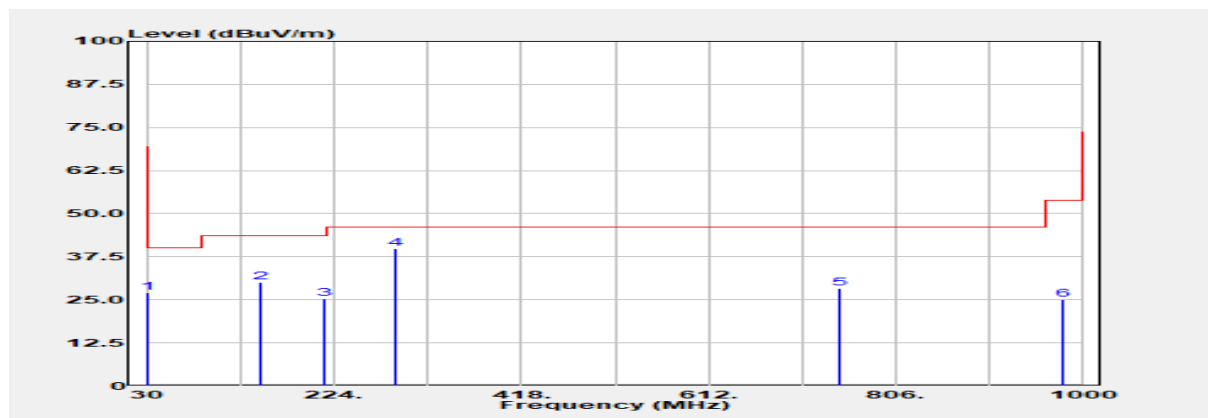
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Report Number :E2/2021/80061
 Operation Mode :NFC
 Test Frequency :125 KHz
 Test Mode :Tx
 EUT Pol :H Plane

Test Site :SAC C
 Test Date :2021-09-09
 Temp./Humi. :23.5/52
 Antenna Pol. :HORIZONTAL
 Engineer :Ashton Chiu



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
30.000	Peak	33.41	-6.45	26.96	40.00	-13.04
148.141	Peak	48.00	-17.89	30.11	43.50	-13.39
214.984	Peak	44.94	-19.74	25.21	43.50	-18.29
288.045	QP	55.31	-15.54	39.77	46.00	-6.23
746.619	Peak	36.09	-7.79	28.30	46.00	-17.70
979.792	Peak	29.77	-4.79	24.98	54.00	-29.02

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8 20 dB OCCUPIED BANDWIDTH MEASUREMENT

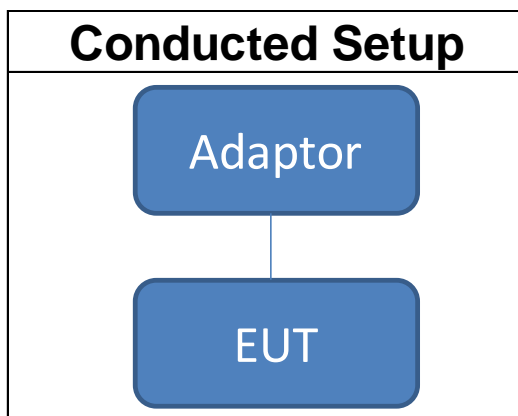
8.1 Standard Applicable:

§2.1049 & §15.215 (c)

8.2 Limit:

None

8.3 Test Set-up



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:

Conducted Emission Test Site: Conducted B					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	07/13/2021	07/12/2022
DC Block	PASTERNAK	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
Test Software	EMI Tool	Alpha	Ver.1	N.C.R	N.C.R

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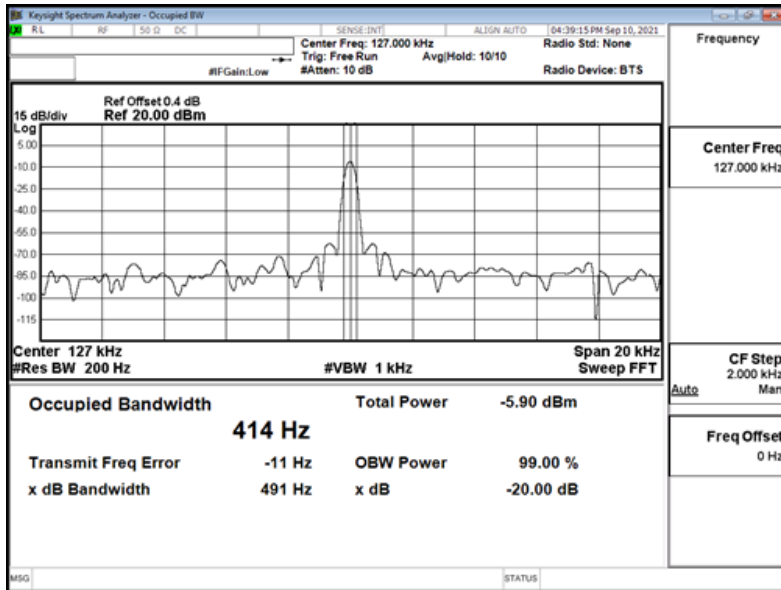
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8.6 Measurement Result
-20dB Bandwidth



20dB Bandwidth	Limit
491 Hz	No requirement

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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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