Audix Technology Corp.
No. 491, Zhongfu Rd., Linkou Dist.,
New Taipei City244, Taiwan

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FCC 15.249 & RSS-210
902-928 MHz Report

for

AAEON Technology Inc.

5F, No. 135, Lane 235, Pao Chiao Rd., Hsin-Tien Dist, New Taipei City, 231, Taiwan, R.O.C.

Product Name	:	**IOTAS Connect 3**
Model Name	:	**(1)ITS-GW01-A10-C001** **(2)ITS-GW01-A10-C002**
Brand	:	**IOTAS**
FCC ID	:	**OHB-A010001**
IC	:	**23644-A010001**

Prepared by:	:	**AUDIX Technology Corporation,** **EMC Department**

Testing Laboratory
1724

The test report is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.

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TEST REPORT

Applicant	:	AAEON Technology Inc.
Manufacturer	:	AAEON Technology Inc.
EUT Description		
(1) Product	:	IOTAS Connect 3
(2) Model	:	(1)ITS-GW01-A10-C001 (2)ITS-GW01-A10-C002
(3) Brand	:	IOTAS
(4) Power Rating	:	DC 5V, 3A

Applicable Standards:

Title 47 CFR FCC Part 15 Subpart C
RSS-Gen (Issue 5), April 2018
RSS-210 (Issue 10), December 2019
ANSI C63.10:2013

Audix Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.
Audix Technology Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Report: 2021. 04. 09

Reviewed by: Annie Yu (Annie Yu/Administrator)

Approved by: Johnny Hsueh (Johnny Hsueh/Section Manager)

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1. REVISION RECORD OF TEST REPORT

Edition No	Issued Data	Revision Summary	Report Number
0	2021. 04. 09	Original Report	EM-F210207

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2. SUMMARY OF TEST RESULTS

Rule		Description	Results
FCC	IC		
15.207	RSS-Gen §8.8	Conducted Emission	**PASS**
15.205/ 15.209/ 15.249(a)	RSS-Gen §8.9 RSS-210 Annex B §B.10	Radiated Band Edge and Radiated Spurious Emission Fundamental Frequency	**PASS**
15.215	---	Emission Bandwidth	**PASS**
15.203	RSS-Gen §8.3	Antenna Requirement	**PASS**

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3. GENERAL INFORMATION

3.1. Description of Application

<table>
<tr><td>Applicant</td><td>AAEON Technology Inc.
5F, No. 135, Lane 235, Pao Chiao Rd., Hsin-Tien Dist, New Taipei City, 231, Taiwan, R.O.C.</td></tr>
<tr><td>Manufacturer</td><td>AAEON Technology Inc.
5F, No. 135, Lane 235, Pao Chiao Rd., Hsin-Tien Dist, New Taipei City, 231, Taiwan, R.O.C.</td></tr>
<tr><td>Product</td><td>IOTAS Connect 3</td></tr>
<tr><td>Brand</td><td>IOTAS</td></tr>
<tr><td>Model</td><td>(1)ITS-GW01-A10-C001 (2)ITS-GW01-A10-C002
The difference between models is as following, and the difference has no influence on RF function. The model ITS-GW01-A10-C002 was tested in this report.
<table>
<tr><td>Model / Difference</td><td>ITS-GW01-A10-C001</td><td>ITS-GW01-A10-C002</td></tr>
<tr><td>LTE Module</td><td>Without</td><td>With</td></tr>
</table></td></tr>
</table>

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3.2. Description of EUT

Test Model	ITS-GW01-A10-C002
Serial Number	N/A
Power Rating	DC 5V, 3A
RF Features	WLAN:802.11 a/b/g/n/ac Bluetooth: BT and BLE ZigBee Z-Wave
Transmit Type	WLAN: 1T1R Bluetooth: 1T1R ZigBee: 1T1R Z-Wave: 1T1R
Test Sample	Sample No. / Test Item / Firmware 02 / AC Conduction, RSE, Conducted / N/A
Sample Status	Mass production
Date of Receipt	2021. 03. 09
Date of Test	2021. 03. 24 ~ 29
Interface Ports of EUT	• One LAN Port • One USB Port • One DC Input Port
Accessories Supplied	• AC Adapter

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3.3. Antenna Information

WLAN/ZigBee/BT Antenna				
Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain(dBi)
RFA-DB1-AP609-70-100	Aristotle	PIFA	2400-2500	2.39
			5150-5875	4.06

Z-Wave Antenna				
Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain(dBi)
RFA-ZW-AP856-100-R2	Aristotle	PIFA	868-928	0.3

3.4. EUT Specifications Assessed in Current Report

Mode	Operating Frequency Range	Channel Number	Modulation	Data Rate
Z-Wave	908.4 to 916MHz	3	2-Key FSK/GFSK	Up to 100kbps

Channel List	
Z-Wave	
Channel	Frequency (MHz)
1	908.4
2	908.42
3	916

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3.5. Description of Key Components

Item	Supplier	Model / Type	Character
CPU (Socket: BGA1170)	Intel	N2807	1.58GHz
Storage (SSD)	Kingston	EMMC16G-TB28	eMMC flash 16GB
Memory (RAM)	NANYA	NT5CC256M16EP-EK	4GB DDR3
WLAN/BT Combo Card	AMPAK	AP6255	---
Antenna	Aristotle	RFA-DB1-AP609-70-100	Wi-Fi/BT/ZigBee/antenna
Z-Wave Chip	Silicon Labs	ZGM130S	---
Antenna	Aristotle	RFA-ZW-AP856-100-R2	Z-Wave antenna
ZigBee Chip	Silicon Labs	EFR32MG1B232	---
Antenna	Aristotle	RFA-DB1-AP609-70-100	Wi-Fi/BT/ZigBee/antenna
LTE Module (Option)	Quectel	EC25-AFX	FCC ID: XMR201909EC25AFX IC: 10224A-2019EC25AFX
Antenna	Aristotle	RFA-LTE-T42-U-M62-1	LTE antenna
AC Adapter (Wall-mount, 2C)	SUNNY COMPUTER TECHNOLOGY CO., LTD	SYS1639-1505-W2 (P/N: G401163915009)	I/P: 100-240Vac, 50-60Hz, 1.0A O/P: 5Vdc, 3A 15W MAX
	DC Cable: Unshielded, Detachable, 1.4m		

Remark: For more detailed features description, please refer to the manufacturer's specifications or the user manual.

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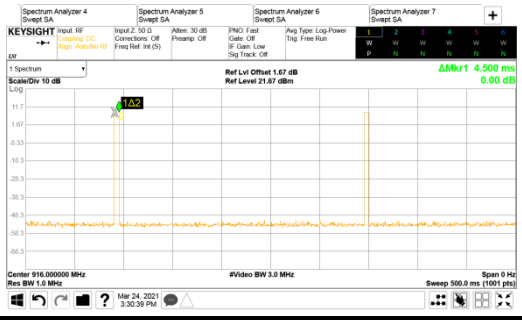
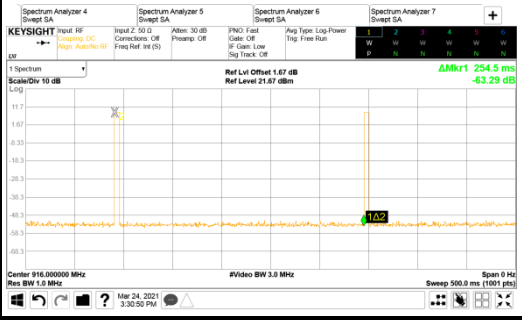
3.6. Test Configuration

Mode	TX_{on} (ms)	1/ TX_{on} (kHz)	Duty Cycle (x)	Duty Cycle Factor [10log(1/x)] (dB)
Z-Wave	4.500	0.22	0.018	N/A

Mode	Duty Cycle (x)	
Z-Wave	TX_{on} 	TX_{on+off} 

AC Conduction	
Test Case	Normal operation

Item		Mode	Test Frequency (MHz)
Radiated Test Case	Radiated Spurious Emission (30MHz-1GHz) Note1	Z-Wave	908.4/916
	Radiated Spurious Emission (Above 1GHz) Note1	Z-Wave	908.4/916
	Fundamental Frequency	Z-Wave	908.4/908.42/916
	Occupied Bandwidth 99% Power	Z-Wave	908.4/916

Note : ■Mobile Device

□Portable Device, and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow: □ Lie □ Side□ Stand

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3.7. Tested Supporting System List

3.7.1. Support Peripheral Unit

No.	Product	Brand	Model No.	Serial No.	Approval
1.	Notebook Computer	hp	TPN-Q189	5CD8175992	Contains FCC ID: PD93168NG Contains IC: 1000M-3168NG

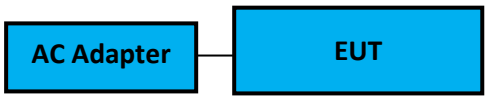
3.7.2. Cable Lists

No.	**Cable Description Of The Above Support Units**
1.	LAN Cable: Unshielded, Detachable, 1.0m Adapter: hp, M/N PPP-012C-S DC Cord：Shielded, Undetachable, 1.8m, Bonded a ferrite core AC Power Cord：Unshielded, Detachable, 1.0m

3.8. Setup Configuration

3.8.1. EUT Configuration for Power Line & Radiated Emission

3.8.2. EUT Configuration for RF Conducted Test Items



3.9. Operating Condition of EUT

Test program “putty” is used for enabling EUT Z-Wave function under continues transmitting and choosing data rate/ channel.

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3.10.Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 491, Zhongfu Rd., Linkou Dist., New Taipei City 244, Taiwan Tel: +886-2-26092133 Fax: +886-2-26099303 Website : www.audixtech.com Contact e-mail: attemc_report@audixtech.com
Accreditations	The laboratory is accredited by following organizations under ISO/IEC 17025:2017 (1) NVLAP(USA) NVLAP Lab Code 200077-0 (2) TAF(Taiwan) No. 1724 (3) FCC OET Designation No. TW1724
Test Facilities	FCC OET Designation Number under APEC MRA by NCC is : TW1724 ISED CAB Identifier Number under APEC TEL MRA by NCC is TW1724 (1) No.8 Shielded Room (2) No.1 3m Semi Anechoic Chamber (3) Fully Anechoic Chamber

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3.11.Measurement Uncertainty

Test Items/Facilities		Frequency Range	Uncertainty
Conduction Test		150kHz~30MHz	±3.50dB
Radiation Test	No.1 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±3.9dB
		200MHz-1000MHz, 3m, Horizontal	±4.3dB
		30MHz-200MHz, 3m, Vertical	±4.5dB
		200MHz-1000MHz, 3m, Vertical	±4.1dB
		1GHz-6GHz, 3m	±5.1dB
		6GHz-18GHz, 3m	±5.5dB
	No.3 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.7dB
		200MHz-1000MHz, 3m, Horizontal	±4.5dB
		30MHz-200MHz, 3m, Vertical	±4.3dB
		200MHz-1000MHz, 3m, Vertical	±4.1dB
	No.4 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.1dB
		200MHz-1000MHz, 3m, Horizontal	±4.4dB
		30MHz-200MHz, 3m, Vertical	±4.2dB
		200MHz-1000MHz, 3m, Vertical	±5.0dB
		1GHz-6GHz, 3m	±4.4dB
		6GHz-18GHz, 3m	±4.1dB
	No.5 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.0dB
		200MHz-1000MHz, 3m, Horizontal	±4.0dB
		30MHz-200MHz, 3m, Vertical	±4.2dB
		200MHz-1000MHz, 3m, Vertical	±4.4dB
		1GHz-6GHz, 3m	±4.3dB
		6GHz-18GHz, 3m	±4.6dB
	Fully Anechoic Chamber	30MHz~1000MHz	±4.7dB
		1GHz~18GHz	±5.3dB

Remark：Uncertainty = $ku_c(y)$

Test Item	Uncertainty
Occupied Bandwidth 99% Power	± 1kHz

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4. MEASUREMENT EQUIPMENT LIST

4.1. Conducted Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Test Receiver	R&S	ESR3	101774	2021. 02. 02	1 Year
2.	A.M.N.	R&S	ENV432	101567	2020. 04. 20	1 Year
3.	L.I.S.N.	Kyoritsu	KNW-407	8-855-9	2020. 12. 10	1 Year
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2021. 01. 04	1 Year
5.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.8 S/R	2020. 04. 17	1 Year
6.	Coaxial Cable	Yeida	RG/58AU	CE-08	2020. 09. 19	1 Year
7.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

4.2. Radiated Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Keysight	N9010B-544	MY55460198	2020. 04. 29	1 Year
2.	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2021. 01. 14	1 Year
3.	Test Receiver	R&S	ESCS30	100039	2020. 06. 05	1 Year
4.	Amplifier	HP	8447D	2944A07178	2020. 04. 29	1 Year
5.	Microwave Amplifier	Keysight	83051A	MY53010042	2020. 08. 05	1 Year
6.	Microwave Amplifier	Agilent	8449B	3008A02678	2021. 02. 27	1 Year
7.	Loop Antenna	R&S	HFH2-Z2	891847/27	2019. 12. 26	2 Years
8.	Bilog Antenna	TESEQ	CBL6112D	33821	2021. 01. 15	1 Year
9.	Horn Antenna	ETS-Lindgren	3117	00135902	2021. 03. 19	1 Year
10.	2.4GHz Notch Filter	K&L Microwave	7NSL10-2441.5/E130.5-O/O	1	2020 .07. 24	1 Year
11.	3GHz Notch Filter	Microwave	H3G018G1	484796	2020. 08. 20	1 Year
12.	Coaxial Cable	MIYAZAKI	5D2W	CLAMP-01	2020.09.19	1 Year
13.	Coaxial Cable	MIYAZAKI	5D2W	RE-11	2021. 01. 29	1 Year
14.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 104	RE-29	2020. 09. 19	1 Year
15.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.1 3m A/C	2020. 04. 17	1 Year
16.	Digital Thermo-Hygro Meter	EVERY DAY	E-512	RF-02	2020. 04. 17	1 Year
17.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.
18.	Test Software	Audix	e3	V6.110601	N.C.R.	N.C.R.

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4.3. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Spectrum Analyzer	Keysight	N9020B-544	MY57120357	2021. 01. 06	1 Year
2.	Digital Thermo-Hygro Meter	Shenzhen Datronn Electronics	KT-905	RF	2020. 04. 17	1 Year

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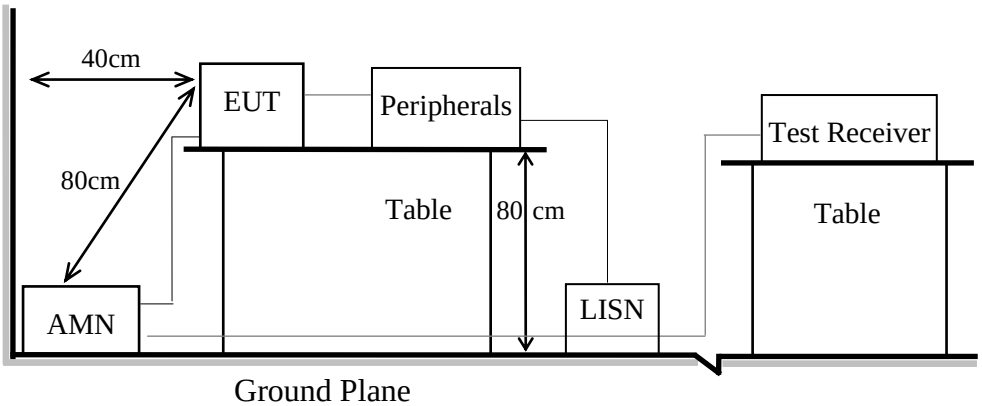
5. CONDUCTED EMISSION MEASUREMET

5.1. Block Diagram of Test Setup

5.1.1. Block Diagram of EUT

Indicated as section 3.8

5.1.2. Shielded Room Setup Diagram



5.2. Conducted Emission Limit

Frequency	Conducted Limit	
	Quasi-Peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 dBμV	56 ~ 46 dBμV
500kHz ~ 5MHz	56 dBμV	46 dBμV
5MHz ~ 30MHz	60 dBμV	50 dBμV

Remark 1.: If the average limit is met when using a Quasi-Peak detector, the measurement using the average detector is not required.
2.: The lower limit applies to the band edges.

5.3. Test Procedure

5.3.1. To set up the EUT as indicated in ANSI C 63.10. The EUT was placed on the table which has 80 cm height to the ground and 40 cm distance to the conducting wall.

5.3.2. Power supplier of the EUT was connected to the AC mains through an Artificial Mains Network (A.M.N.).

5.3.3. The AC power supplies to all peripheral devices must be provided through line impedance stabilization network (L.I.S.N.)

5.3.4. To Check frequency range from 150 kHz to 30 MHz and record the emission which does not have 20 dB below limit.

5.4. Test Results

Please refer to Appendix A.

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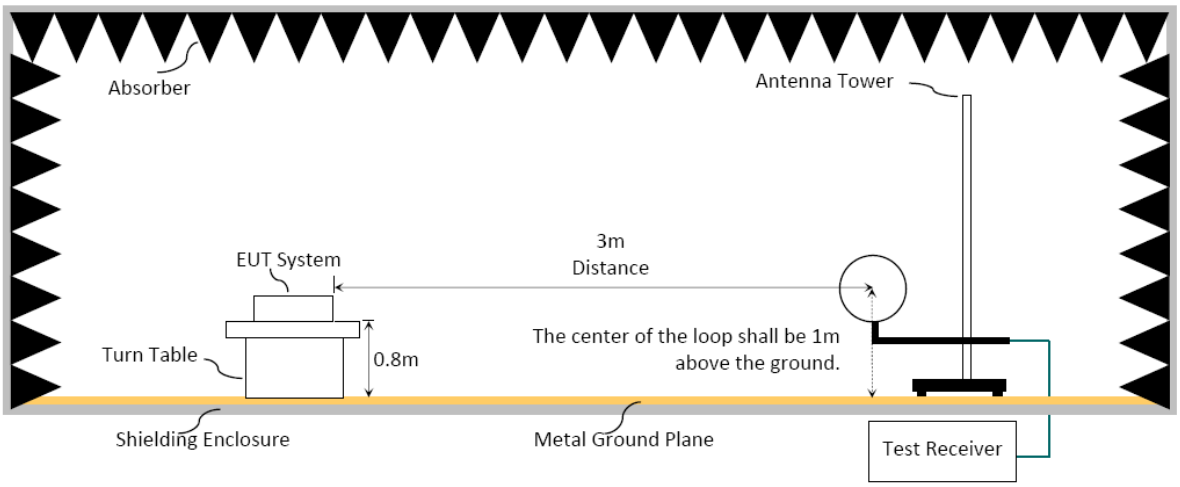
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

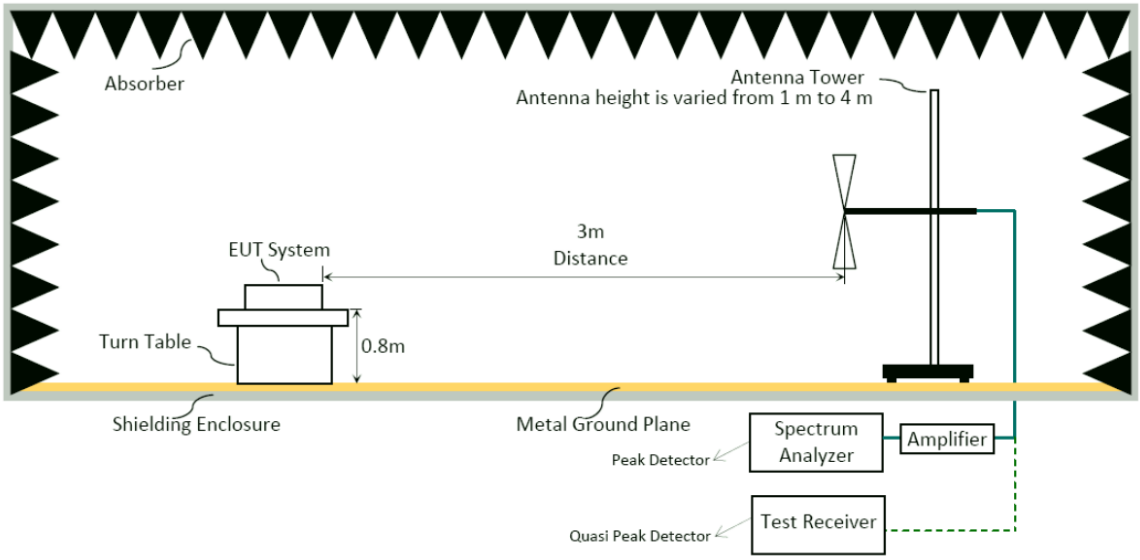
6.1.1. Block Diagram of EUT

Indicated as section 3.8

6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000 MHz



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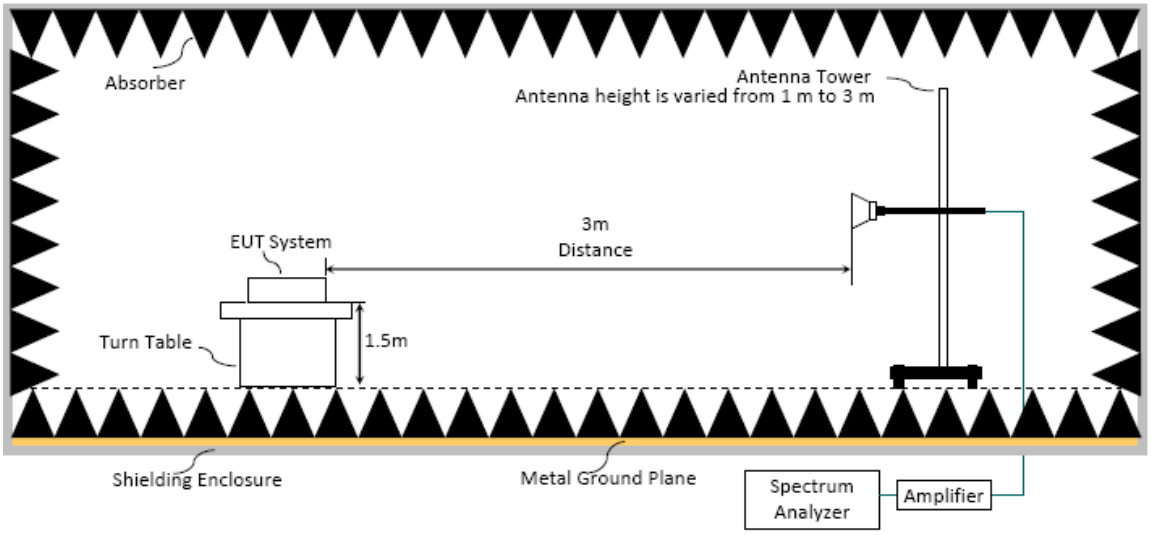
6.1.4. Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

6.2.1. General Limit

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in FCC Section 15.205/RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance (m)	Limits	
		dBμV/m	μV/m
0.009 - 0.490	300	67.6-20 log f(kHz)	2400/f kHz
0.490 - 1.705	30	87.6-20 log f(kHz)	24000/f kHz
1.705 - 30	30	29.5	30
30 - 88	3	40.0	100
88- 216	3	43.5	150
216- 960	3	46.0	200
Above 960	3	54.0	500
Above 1000	3	74.0 dBμV/m (Peak) 54.0 dBμV/m (Average)	

Remark：(1) dBμV/m = 20 log (μV/m)
(2) The tighter limit applies to the edge between two frequency bands.
(3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
(4) Fundamental and emission fall within operation band are exempted from this section.
(5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

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6.2.2. Limite for Fundamental & Harmonics Frequency

Fundamental Frequency	Field strength of fundamental		Field strength of harmonics	
	mV/m	dBμV/m	mV/m	dBμV/m
902-928MHz	50	94 (Quasi-Peak)	500	74 (Peak)
				54 (Average)
2400-2483.5MHz	50	114 (Peak)	500	74 (Peak)
		94 (Average)		54 (Average)
5725-5875MHz	50	114 (Peak)	500	74 (Peak)
		94 (Average)		54 (Average)
24.0-24.25GHz	250	128 (Peak)	2500	88 (Peak)
		108 (Average)		68 (Average)

Remark: mV/m=1000μV/m; dBμV/m = 20 log (μV/m)

6.3. Test Procedure

Frequency Range 9kHz~30MHz:
The EUT setup on the turn table which has 80cm height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level.
In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

(1) RBW = 9kHz with peak and average detector.
(2) Detector: average and peak (9kHz-490kHz)
Q.P. (490kHz-30MHz)

Frequency Range 30MHz ~ 25GHz:
The EUT setup on the turn table which has 80 cm (for 30-1000 MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

Frequency below 1 GHz:
Spectrum Analyzer is used for pre-testing with following setting:
(1)RBW = 120KHz
(2)VBW ≥ 3 x RBW.
(3)Detector = Peak.
(4)Sweep time = auto.
(5)Trace mode = max hold.
(6)Allow sweeps to continue until the trace stabilizes.
(7)When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required, otherwise using Q.P. for final measurement.

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Frequency above 1GHz to 10th harmonic (up to 25 GHz):
Peak Detector:
(1)RBW = 1MHz
(2)VBW ≥ 3 x RBW.
(3)Detector = Peak.
(4)Sweep time = auto.
(5)Trace mode = max hold.
(6)Allow sweeps to continue until the trace stabilizes.
(7)When peak-detected value is lower than limit that the measurement using the average detector is not required, otherwise using average detector for final measurement.

Average Detector:
■**Option 1:**
(1)RBW = 1MHz
(2)VBW ≥ 1/ T.

Modulation Type	T (ms)	1/ T (kHz)	VBW Setting (kHz)
Z-Wave	4.500	0.22	220Hz

N/A: 1/ T is not implemented when duty cycle presented in section 3.7 is ≥98%.
(3)Detector = Peak.
(4)Sweep time = auto.
(5)Trace mode = max hold.
(6)Allow sweeps to continue until the trace stabilizes.
□**Option 2:**
Average Emission Level= Peak Emission Level+ D.C.C.F.

6.4. Measurement Result Explanation

■Peak Emission Level=Antenna Factor + Cable Loss + Meter Reading Meter Reading= Spectrum Analyzer Reading - Preamp factor
■Average Emission Level l=Antenna Factor + Cable Loss + Meter Reading Meter Reading= Spectrum Analyzer Reading - Preamp factor
□Average Emission Level= Peak Emission Level+ DCCF
Duty Cycle Correction Factor (DCCF)= 20log (TX_{on}/TX_{on+off}) presented in section 3.6
□ERP= Peak Emission Level-95.2dB-2.14dB

6.5. Test Results

Please refer to Appendix A.

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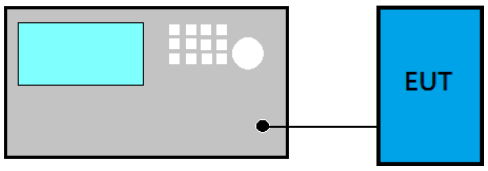
7. EMISSION BANDWIDTH MEASUREMENT

7.1. Block Diagram of Test Setup



7.2. Test Procedure

(1) Set RBW close to 1-5 % of OBW.
(2) Set VBW≥RBW.
(3) Detector = Peak.
(4) Trace mode = max hold.
(5) Sweep = auto couple.
(6) Allow the trace to stabilize.
(7) Setting channel bandwidth function x dB to -20 dB to record the final bandwidth.

7.3. Test Results

Please refer to Appendix A

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8. DEVIATION TO TEST SPECIFICATIONS

【NONE】

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APPDNDIX A

TEST DATA AND PLOTS

(Model: (1)ITS-GW01-A10-C001 (2)ITS-GW01-A10-C002)

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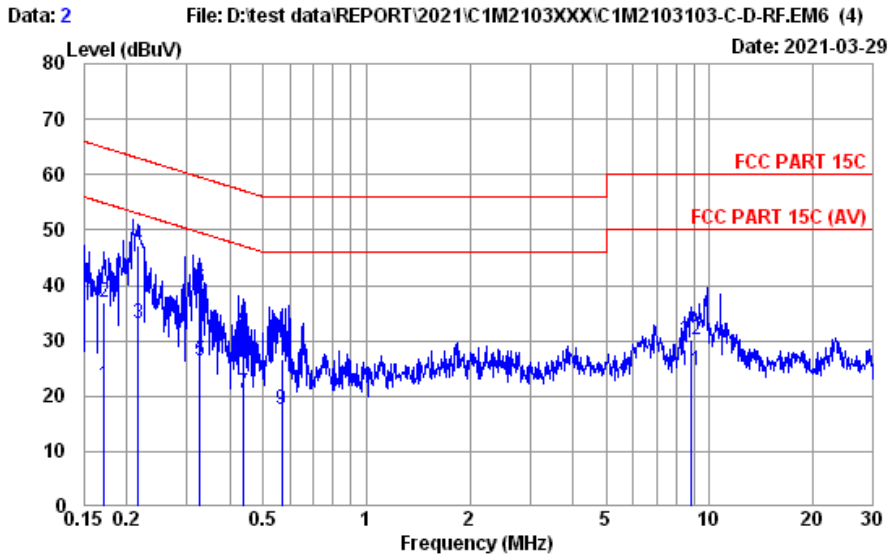
A.1 CONDUCTED EMISSION

Test Date	2021/03/29	Temp./Hum.	24°C/74%
Test Voltage	AC 120V 60Hz (Via AC Adapter)	Tested By	Chucky Chiu




```
Site No.        : No.8 Shielded Room            Data No.     : 2
Instrument 1    : Receiver ESR3(774)
Instrument 2    : ENV432 (567)(A)|CE-08|ESH3-Z2 (354)
Limit           : FCC PART 15C                  Phase        : NEUTRAL
Environment     : 24°C / 74%                    Engineer     : Chucky Chiu
EUT Model       : ITS-GW01-A10-C002             Test Rating  : 120Vac/60Hz
Test Mode       : Operating
```

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
1	0.172	10.20	0.03	9.85	1.81	21.89	54.86	32.97	Average
2	0.172	10.20	0.03	9.85	16.84	36.92	64.86	27.94	QP
3	0.216	10.20	0.03	9.85	13.11	33.19	52.96	19.77	Average
4	0.216	10.20	0.03	9.85	27.20	47.28	62.96	15.68	QP
5	0.327	10.20	0.03	9.85	6.28	26.36	49.53	23.17	Average
6	0.327	10.20	0.03	9.85	19.56	39.64	59.53	19.89	QP
7	0.440	10.20	0.03	9.85	0.43	20.51	47.07	26.56	Average
8	0.440	10.20	0.03	9.85	11.70	31.78	57.07	25.29	QP
9	0.567	10.20	0.03	9.85	-2.48	17.60	46.00	28.40	Average
10	0.567	10.20	0.03	9.85	6.68	26.76	56.00	29.24	QP
11	8.822	10.46	0.13	9.88	4.15	24.62	50.00	25.38	Average
12	8.822	10.46	0.13	9.88	9.84	30.31	60.00	29.69	QP

```
Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
         2. If the average limit is met when using a quasi-peak detector,
            the EUT shall be deemed to meet both limits and measurement
            with average detector is unnecessary.
```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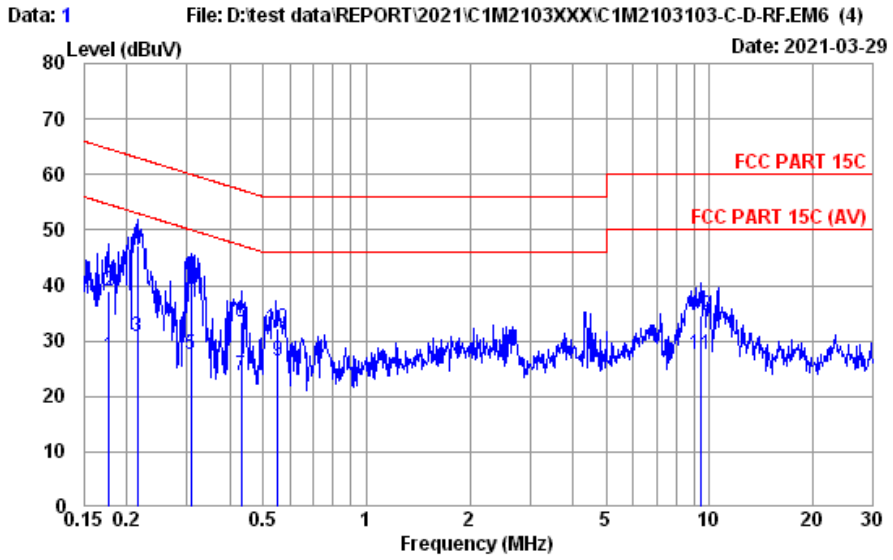
Test Date	2021/03/29	Temp./Hum.	24°C/74%
Test Voltage	AC 120V 60Hz (Via AC Adapter)	Tested By	Chucky Chiu



Site No. : No.8 Shielded Room
Instrument 1 : Receiver ESR3(774)
Instrument 2 : EMV432 (567)(A)|CE-08|ESH3-Z2 (354)
Limit : FCC PART 15C
Environment : 24°C / 74%
EUT Model : ITS-GW01-A10-C002
Test Mode : Operating

Data No. : 1
Phase : LINE
Engineer : Chucky Chiu
Test Rating : 120Vac/60Hz

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.178	10.20	0.03	9.85	7.19	27.27	54.59	27.32	Average
2	0.178	10.20	0.03	9.85	18.78	38.86	64.59	25.73	QP
3	0.215	10.20	0.03	9.85	10.73	30.81	53.01	22.20	Average
4	0.215	10.20	0.03	9.85	27.23	47.31	63.01	15.70	QP
5	0.308	10.20	0.03	9.85	7.35	27.43	50.02	22.59	Average
6	0.308	10.20	0.03	9.85	21.44	41.52	60.02	18.50	QP
7	0.431	10.20	0.03	9.85	3.70	23.78	47.24	23.46	Average
8	0.431	10.20	0.03	9.85	13.19	33.27	57.24	23.97	QP
9	0.552	10.20	0.03	9.85	6.36	26.44	46.00	19.56	Average
10	0.552	10.20	0.03	9.85	12.11	32.19	56.00	23.81	QP
11	9.451	10.38	0.14	9.88	7.12	27.52	50.00	22.48	Average
12	9.451	10.38	0.14	9.88	14.29	34.69	60.00	25.31	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
2. If the average limit is met when using a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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A.2 RADIATED EMISSION

Test Date	2021/03/29	Temp./Hum.	21 ~ 25℃/69 ~ 70%
Test Voltage	AC 120V 60Hz (Via AC Adapter)	Tested By	Sean Wang

A.2.1 Emissions Applied to General Requirement

A.2.1.1 Frequency 9kHz~30MHz

The emissions (9kHz~30MHz) not reported for there is no emission be found.

A.2.1.2 Frequency Below 1 GHz

Mode	Z-Wave	Frequency	TX 908.4MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
36.790	15.27	1.40	28.13	35.78	24.32	40.00	15.68	Peak
178.410	9.20	3.32	27.74	42.09	26.87	43.50	16.63	Peak
500.450	17.28	6.93	29.21	40.70	35.70	46.00	10.30	Peak
700.270	18.84	7.62	29.33	41.48	38.61	46.00	7.39	Peak
900.090	20.39	8.72	28.86	40.03	40.28	46.00	5.72	Peak
993.210	21.26	9.13	28.59	34.89	36.69	54.00	17.31	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
37.760	14.73	1.43	28.13	47.03	35.06	40.00	4.94	Peak
150.280	10.56	3.06	27.83	45.75	31.54	43.50	11.96	Peak
500.450	17.28	6.93	29.21	43.07	38.07	46.00	7.93	Peak
700.270	18.84	7.62	29.33	39.09	36.22	46.00	9.78	Peak
950.530	20.89	8.94	28.71	35.88	37.00	46.00	9.00	Peak
977.690	21.13	9.06	28.64	35.23	36.78	54.00	17.22	Peak

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Mode	Z-Wave	Frequency	TX 916MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
33.880	22.99	1.26	28.13	28.82	24.94	40.00	15.06	Peak
151.250	16.98	2.87	27.83	36.68	28.70	43.50	14.80	Peak
384.050	21.87	5.36	28.31	34.45	33.37	46.00	12.63	Peak
500.450	23.75	6.44	29.21	34.61	35.59	46.00	10.41	Peak
900.090	26.84	8.44	28.86	33.94	40.36	46.00	5.64	Peak
972.840	27.64	8.83	28.66	28.43	36.24	54.00	17.76	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
37.760	20.93	1.34	28.13	41.15	35.29	40.00	4.71	Peak
146.400	17.32	2.82	27.85	38.02	30.31	43.50	13.19	Peak
384.050	21.87	5.36	28.31	30.62	29.54	46.00	16.46	Peak
500.450	23.75	6.44	29.21	37.43	38.41	46.00	7.59	Peak
700.270	25.56	7.27	29.33	33.34	36.84	46.00	9.16	Peak
995.150	27.89	8.95	28.59	28.36	36.61	54.00	17.39	Peak

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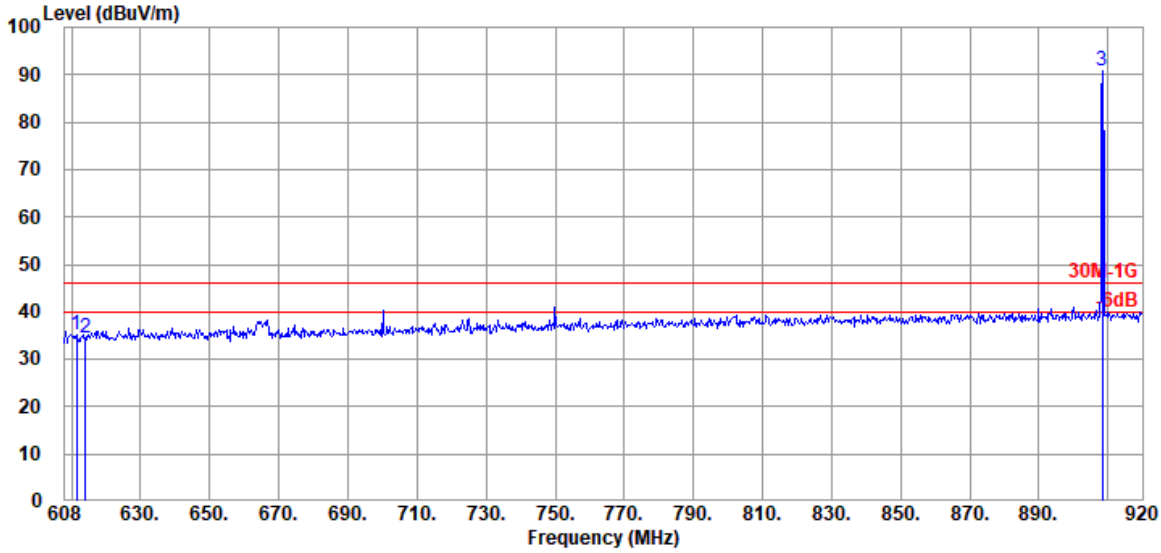
A.2.1.3 Frequency Above 1 GHz to 10th harmonics

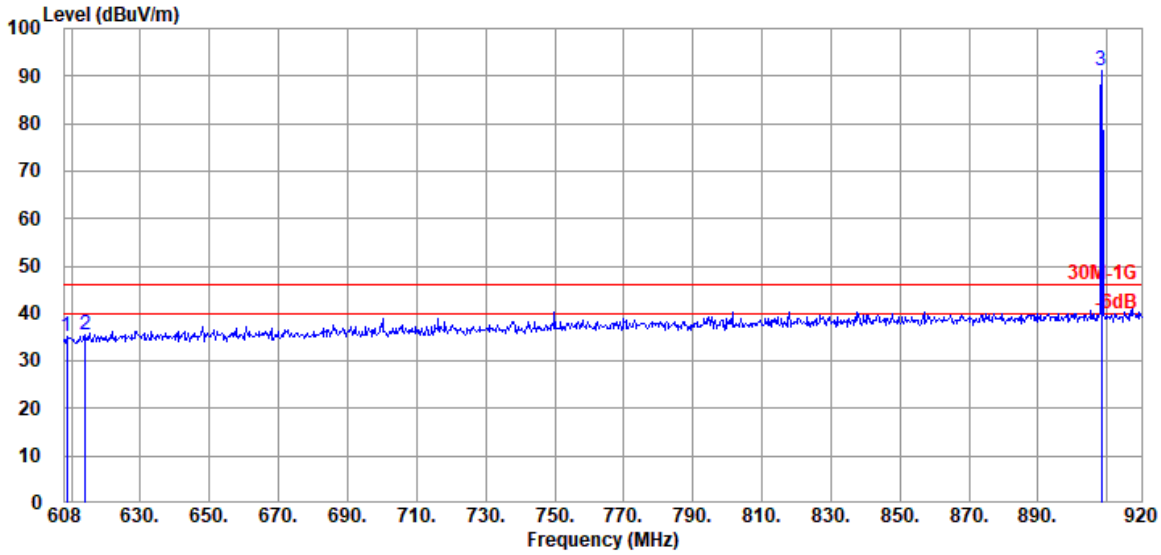
Band Edge:

Mode	Z-Wave	Frequency	TX 908.4MHz



Antenna at Horizontal Polarization

	Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
	611.432	18.48	7.09	29.39	39.05	35.23	46.00	10.77	Peak
	613.928	18.49	7.11	29.39	38.34	34.55	46.00	11.45	Peak
@	908.456	20.48	8.76	28.84	90.52	90.92	---	---	Peak



Antenna at Vertical Polarization

	Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
	608.624	18.46	7.08	29.39	38.96	35.11	46.00	10.89	Peak
	613.928	18.49	7.11	29.39	39.17	35.38	46.00	10.62	Peak
@	908.456	20.48	8.76	28.84	90.76	91.16	---	---	Peak

Remark: The "@" means fundamental frequency, it is ignored in this section.

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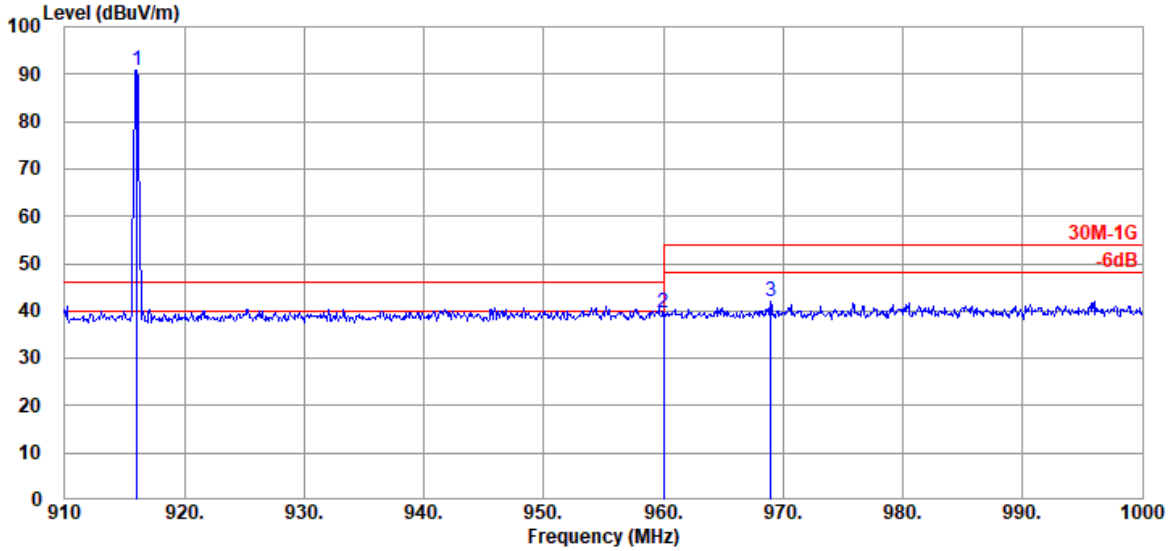
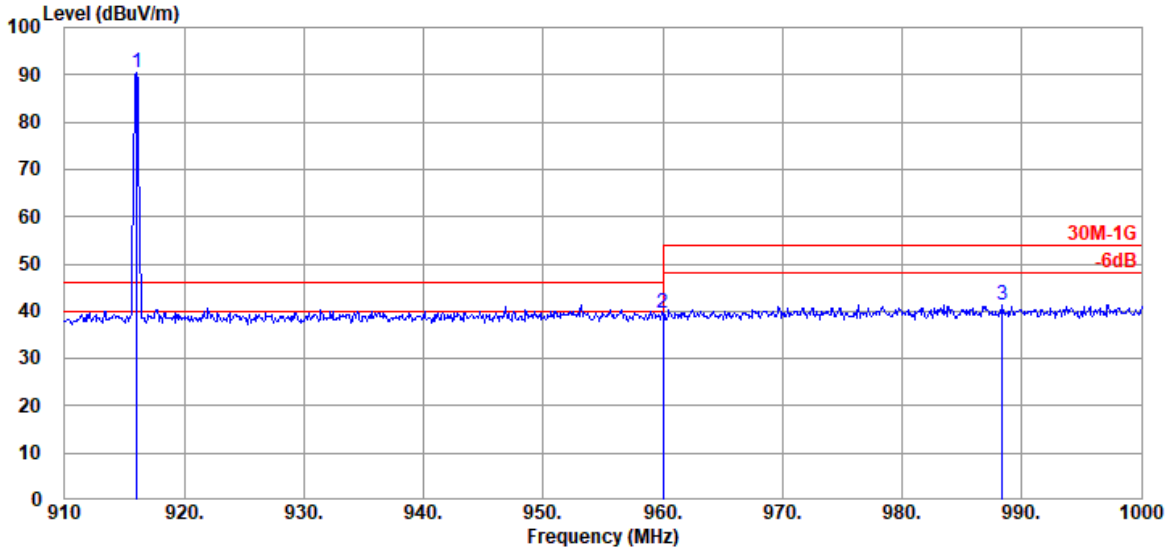
Mode	Z-Wave	Frequency	TX 916MHz



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 916.030	20.55	8.79	28.81	90.14	90.67	---	---	Peak
960.040	20.95	8.98	28.69	38.22	39.46	54.00	14.54	Peak
968.950	21.04	9.02	28.66	40.53	41.93	54.00	12.07	Peak



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 916.030	20.55	8.79	28.81	89.75	90.28	---	---	Peak
960.040	20.95	8.98	28.69	38.19	39.43	54.00	14.57	Peak
988.390	21.23	9.11	28.61	39.56	41.29	54.00	12.71	Peak

Remark: The "@" means fundamental frequency, it is ignored in this section.

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A.2.1.4 Frequency Above 1 GHz

Mode	Z-Wave	Frequency	TX 908.4MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
1816.000	31.10	7.47	34.57	39.09	43.09	54.00	10.91	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
1816.000	31.10	7.47	34.57	38.03	42.03	54.00	11.97	Peak

Mode	Z-Wave	Frequency	TX 916MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
1832.000	31.10	7.50	34.56	39.61	43.65	54.00	10.35	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
1832.000	31.10	7.50	34.56	39.43	43.47	54.00	10.53	Peak

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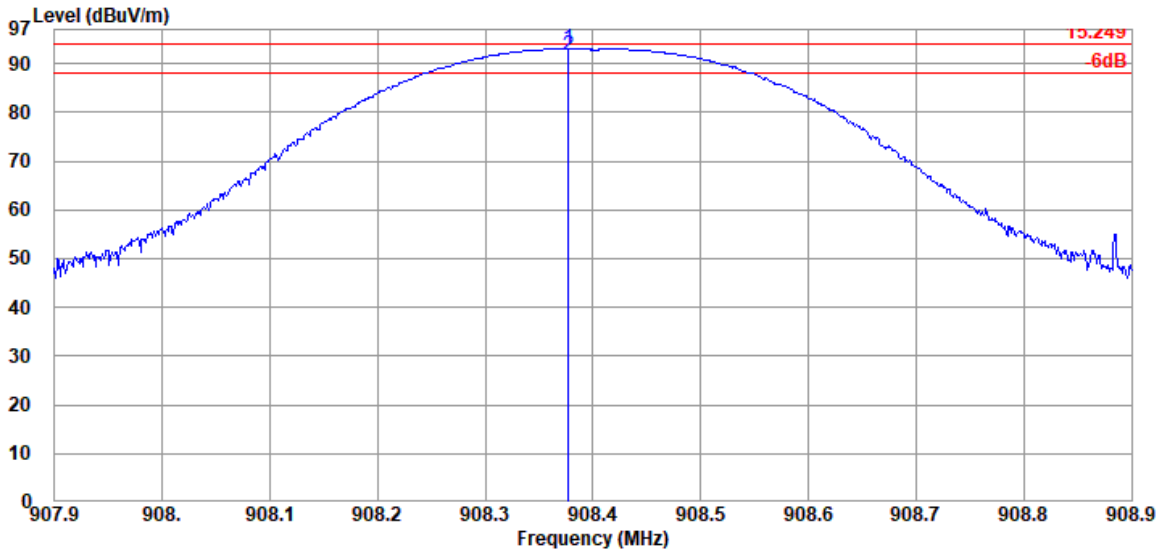
A.2.2 Fundamental Frequency

Mode	Z-Wave	Frequency	TX 908.4MHz



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
908.377	26.95	8.49	0.00	56.11	91.55	94.00	2.45	QP

Remark: Vertical is the strongest polarization and peak value has complied with average limit, so horizontal won't be listed in test report.

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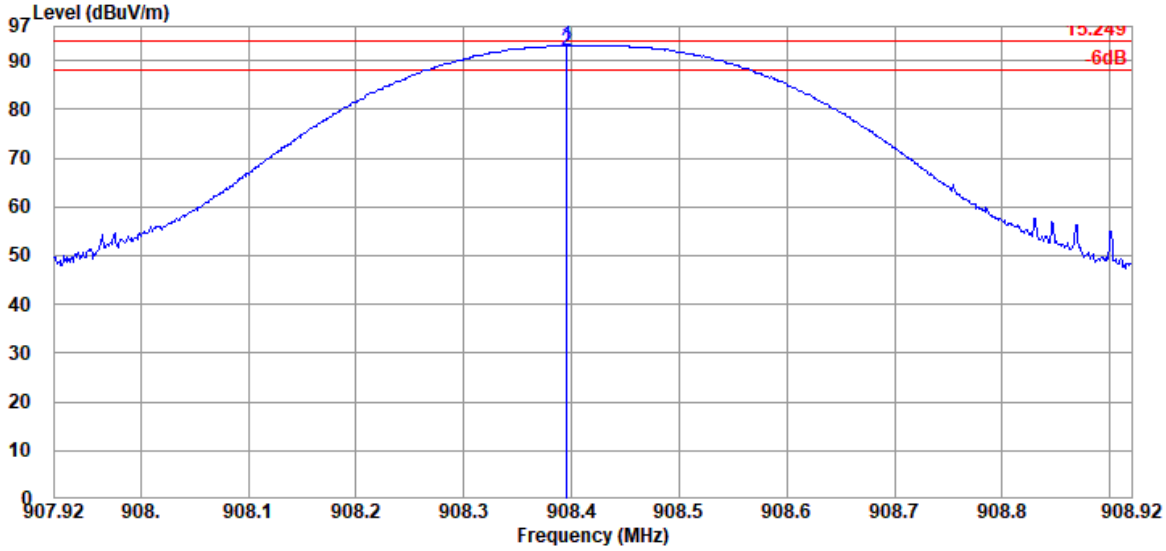
Mode	Z-Wave	Frequency	TX 908.42MHz



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
908.396	26.95	8.49	0.00	56.45	91.89	94.00	2.11	QP

Remark: Vertical is the strongest polarization and peak value has complied with average limit, so horizontal won't be listed in test report.

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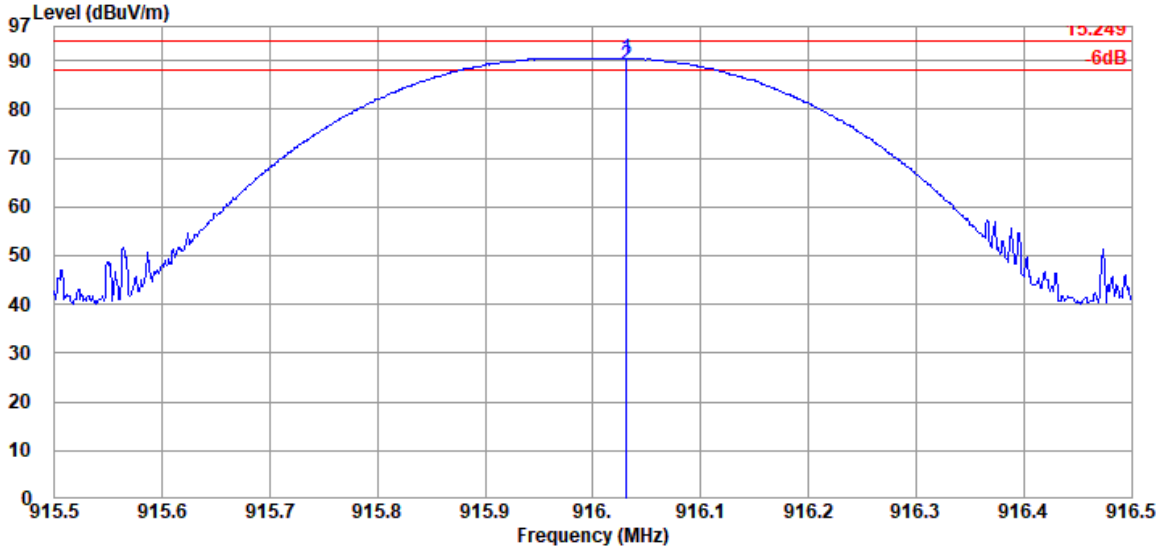
Mode	Z-Wave	Frequency	TX 916MHz



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
916.031	27.02	8.53	0.00	53.46	89.01	94.00	4.99	QP

Remark: Vertical is the strongest polarization and peak value has complied with average limit, so horizontal won't be listed in test report.

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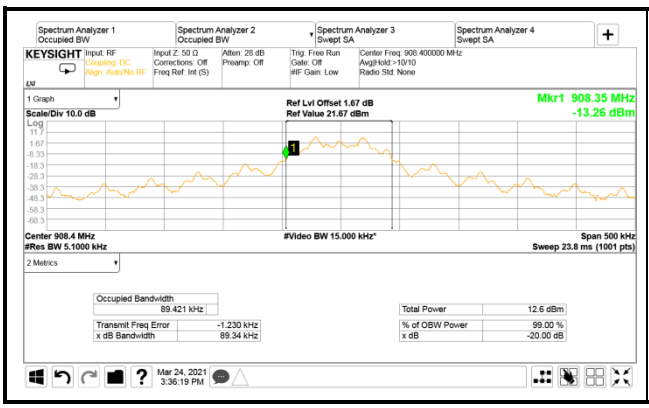
A.3 EMISSION BANDWIDTH MEASUREMENT

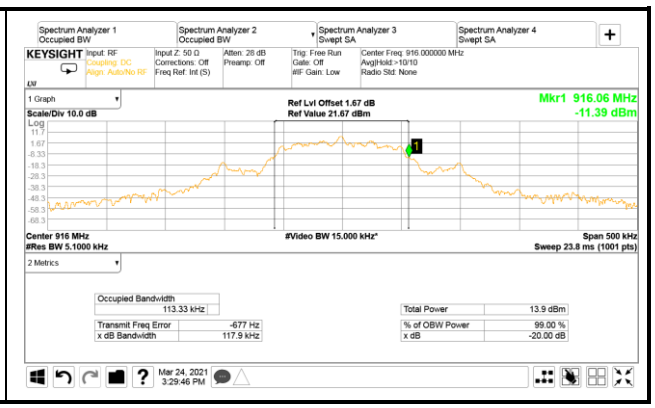
Test Date	2021/03/24	Temp./Hum.	20℃/63%
Test Voltage	AC 120V 60Hz (Via AC Adapter)	Tested By	Sean Wang

A.3.1 Emission Bandwidth

Mode	Centre Frequency (MHz)	20dB Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
Z-Wave	908.4	0.08934	0.089421
	916	0.11790	0.11333

A.3.2 Measurement Plots





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APPDNDIX B

TEST PHOTOGRAPHS

(Model: (1)ITS-GW01-A10-C001 (2)ITS-GW01-A10-C002)

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