

TEST REPORT

KOSTEC Co., Ltd. 28(175-20, Annyeong-dong) 406-gil sejaro, Hwaseong-si, Gyeonggi-do, Korea Tel:031-222-4251, Fax:031-222-4252	Report No.: KST-FCR-200007	 KOSTEC Co., Ltd. http://www.kostec.org
1. Applicant • Name : Midland Radio Corporation • Address : 5900 Parretta Drive Kansas City, MO 64120-2134		
2. Test Item • Product Name: FAMILY RADIO TRANSCEIVER • Model Name: T65B • Brand: X-TALKER • FCC ID: MMAT65A		
3. Manufacturer • Name : R12 EMS, PHILIPPINES, INC. • Address : New Blk 1 Lot 4&5, Calamba Premier International Park, Barangay Batino, Calamba City, Laguna, Philippines		
4. Date of Test : 2020. 03. 26. ~ 2020. 03. 27. FCC CFR 47, Part 95 KDB 888861 D01 Part 95 GMRS FRS v01		
5. Test Method Used : ANSI/TIA-603-E-2016 ANSI C63.4-2014		
6. Test Result : Compliance		
7. Note: Class II Permissive Change		
Supplementary Information The device bearing the brand name and FCC ID specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with measurement procedures specified in ANSI/TIA-603-E-2016. We attest to the accuracy of data and all measurements reported herein were performed by KOSTEC Co., Ltd. and were made under Chief Engineer's supervision. We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report is not related to KOLAS accreditation.		
Affirmation	Tested by Name : Choo, Kwang-Yeol (Signature)	Technical Manager Name : Park, Gyeong-Hyeon (Signature)
2020. 03. 30.		
KOSTEC Co., Ltd.		

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1. GENERAL INFORMATION

1.1 Test Facility

Test laboratory and address

KOSTEC Co., Ltd.

28(175-20,Annyeong-dong)406-gil sejaro, Hwaseong-si Gyeonggi-do, Korea

Telephone Number: 82-31-222-4251

Facsimile Number: 82-31-222-4252

Registration information

KOLAS No.: KT232

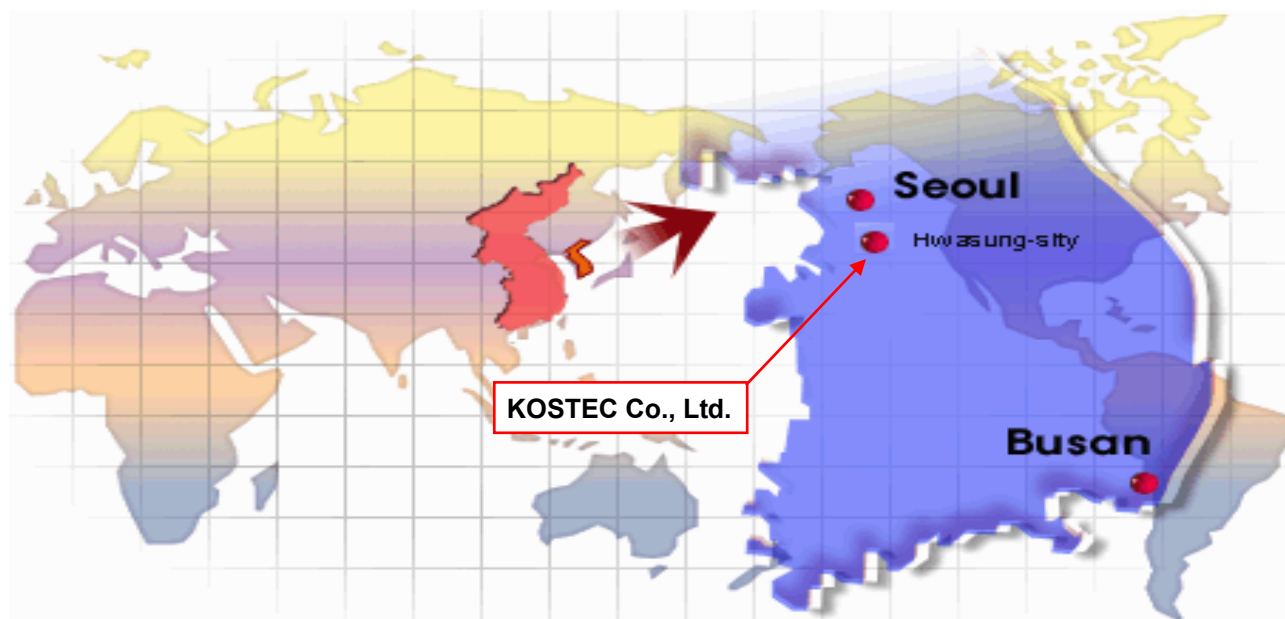
RRA (National Radio Research Agency): KR0041

FCC Designation No.: KR0041

IC Designation No.: KR0041

VCCI Membership No.: 2005

1.2 Location



1.3 Revision History of test report

Rev.	Revisions	Effect page	Reviewed	Date
-	Initial issue	All	Gyeong Hyeon, Park	2020. 03. 30.

2. EQUIPMENT DESCRIPTION

The product specification described herein was declared by manufacturer. And refer to user's manual for the details.

Equipment Name	FRS
Model No	T65B
Usage	FRS held-near-face push-to-talk (PTT) portable device
Intended Operating Environment	General population/Uncontrolled exposure
Serial Number	1
Primary User Functions of EUT	2-Way Wireless Voice Communication
Rated output power	0.63 W
Max. E.R.P	0.29 W
Operating Frequency Range	462.550 0 MHz - 462.725 0 MHz, 467.562 5 MHz - 467.712 5 MHz
Channel Number	36 EA
Channel Spacing	12.5 kHz
Modulation	FM
Occupied Bandwidth (99%)	9.99 kHz
Emission Designation	11K0F3E
Power Source	Ni-MH battery pack / 3.6 VDC nominal / 700 mAh
Antenna Description	Helical antenna, 0.50 dBi
FCC ID	MMAT65A
Remark	This report is prepared for FCC class II permissive change. This report is issued as a supplementary report to original report no. KES-RF-15T0065. The modification is concerned with following: 1) Q1A of TX power FET change to RFM04U6P 2) Q4, Q11 and Q14 of TX RF transistor change to KTC3770U-C. 3) IC3 of audio Amp. Change to 8002. Changed part is not the worst case of original test report, thus only RF output power and Transmitter Radiated Unwanted Emissions had been tested.

3. SYSTEM CONFIGURATION FOR TEST

3.1 Characteristics of equipment

FRS

3.2 Used peripherals list

Description	Model No.	Serial No.	Manufacture	Remark
Switching Power Supply	S005CAV0500100	None	Midland Radio Corporation	-
Rechargeable Battery	PB-X6	None	Midland Radio Corporation	-
Ear/Mic	None	None	Midland Radio Corporation	-
Desktop Charger	18CVP15	None	Midland Radio Corporation	-

3.3 Product Modification

N/A

3.4 Operating Mode

Constantly transmitting with a carrier at maximum power.

3.5 Test Setup of EUT



3.6 Table for Carrier Frequencies

Channel	Freq. [MHz]	Description	Channel	Freq. [MHz]	Description
1	462.562 5	462 MHz Interstitial	19	462.650 0	462 MHz New
2	462.587 5	462 MHz Interstitial	20	462.675 0	462 MHz New
3	462.612 5	462 MHz Interstitial	21	462.700 0	462 MHz New
4	462.637 5	462 MHz Interstitial	22	462.725 0	462 MHz New
5	462.662 5	462 MHz Interstitial	23	462.562 5	462 MHz Interstitial
6	462.687 5	462 MHz Interstitial	24	462.612 5	462 MHz Interstitial
7	462.712 5	462 MHz Interstitial	25	462.662 5	462 MHz Interstitial
8	467.562 5	467 MHz Interstitial	26	462.712 5	462 MHz Interstitial
9	467.587 5	467 MHz Interstitial	27	462.550 0	462 MHz New
10	467.612 5	467 MHz Interstitial	28	462.600 0	462 MHz New
11	467.637 5	467 MHz Interstitial	29	462.650 0	462 MHz New
12	467.662 5	467 MHz Interstitial	30	462.700 0	462 MHz New
13	467.687 5	467 MHz Interstitial	31	462.587 5	462 MHz Interstitial
14	467.712 5	467 MHz Interstitial	32	462.637 5	462 MHz Interstitial
15	462.550 0	462 MHz New	33	462.687 5	462 MHz Interstitial
16	462.575 0	462 MHz New	34	467.562 5	467 MHz Interstitial
17	462.600 0	462 MHz New	35	467.612 5	467 MHz Interstitial
18	462.625 0	462 MHz New	36	467.662 5	467 MHz Interstitial

According to ANSI C63.26 section 5.1.2.1:

Measurements of transmitters shall be performed and, if required, reported for each frequency band in which the EUT can be operated with the device transmitting at the number of frequencies in each band specified in Table 2.

Frequency range over which EUT operates	Number of frequencies	Location in frequency range of operation
1 MHz or less	1	Middle
1 MHz to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

Description	Frequency Bands [MHz]	Test Channel	Test Frequency [MHz]
462 MHz	462.550 0~462.725 0	CH4	462.637 5
467 MHz	467.562 5~467.712 5	CH11	467.637 5

3.7 Used Test Equipment List

No.	Instrument	Model	S/N	Manufacturer	Next Cal Date	Cal interval	used
1	T & H Chamber	PL-3J	15003623	ESPEC	2020.11.07	1 year	☐
2	T & H Chamber	SH-662	93000067	ESPEC CORP	2020.09.04	1 year	☒
3	Spectrum Analyzer	8563EC	3046A00527	Agilent Technology	2021.01.21	1 year	☐
4	Spectrum Analyzer	FSV30	104029	Rohde & Schwarz	2020.09.24	1 year	☐
5	Spectrum Analyzer	FSV30	20-353063	Rohde& Schwarz	2021.01.21	1 year	☐
6	Signal Analyzer	N9010A	MY56070441	Agilent Technologies	2020.05.29	1 year	☒
7	EMI Test Receiver	ESCI7	100823	Rohde & Schwarz	2021.01.21	1 year	☒
8	EMI Test Receiver	ESI	837514/004	Rohde & Schwarz	2020.09.03	1 year	☒
9	Vector Signal Analyzer	89441A	3416A02620	Agilent Technology	2021.01.22	1 year	☐
10	Network Analyzer	8753ES	US39172348	AGILENT	2020.09.04	1 year	☐
11	EPM Series Power meter	E4418B	GB39512547	Agilent Technology	2021.01.22	1 year	☐
12	RF Power Sensor	E9300A	MY41496631	Agilent Technology	2021.01.22	1 year	☐
13	Microwave Frequency Counter	5352B	2908A00480	Agilent Technology	2021.01.22	1 year	☐
14	Audio Analyzer	8903B	3514A16919	Agilent Technology	2021.01.20	1 year	☐
15	Audio Telephone Analyzer	DD-5601CID	520010281	CREDIX	2020.01.23	1 year	☐
16	Modulation Analyzer	8901A	3041A05716	H.P	2021.01.22	1 year	☐
17	Digital storage Oscilloscope	TDS3052	B015962	Tektronix	2020.09.03	1 year	☐
18	ESG-D Series Signal Generator	E4436B	US39260458	Agilent Technology	2021.01.20	1 year	☐
19	Vector Signal Generator	SMBV100A	257557	Rohde & Schwarz	2021.01.20	1 year	☐
20	GNSS Signal Generator	TC-2800A	2800A000494	TESCOM CO., LTD.	2021.01.22	1 year	☐
21	Signal Generator	SMB100A	179628	Rohde & Schwarz	2020.05.14	1 year	☒
22	SLIDAC	None	0207-4	Myoung sung Ele.	2021.01.20	1 year	☐
23	DC Power supply	DRP-5030	9028029	Digital Electronic Co.,Ltd	2021.01.20	1 year	☐
24	DC Power supply	E3610A	KR24104505	Agilent Technology	2021.01.20	1 year	☐
25	DC Power supply	UP-3005T	68	Unicon Co.,Ltd	2021.01.20	1 year	☐
26	DC Power Supply	SM 3004-D	114701000117	DELTAELEKTRONIKA	2021.01.20	1 year	☐
27	DC Power supply	6632B	MY43004005	Agilent Technology	2021.01.20	1 year	☐
28	DC Power Supply	6632B	MY43004137	Agilent Technology	2021.01.20	1 year	☒
29	Termination	1433-3	LM718	WEINSCHEL	2020.07.11	1 year	☐
30	Termination	1432-3	QR946	AEROFLEX/WEINSCHEL	2020.07.11	1 year	☐
31	Attenuator	24-30-34	BX5630	Aeroflex / Weinschel	2020.12.17	1 year	☐
32	Attenuator	8498A	3318A09485	HP	2021.01.22	1 year	☐
33	Step Attenuator	8494B	3308A32809	HP	2021.01.21	1 year	☐
34	RF Step Attenuator	RSP	100091	Rohde & Schwarz	2021.01.21	1 year	☐
35	Attenuator	18B50W-20F	64671	INMET	2021.01.22	1 year	☐
36	Attenuator	10 dB	1	Rohde & Schwarz	2020.05.14	1 year	☐
37	Attenuator	10 dB	2	Rohde & Schwarz	2020.05.14	1 year	☐
38	Attenuator	10 dB	3	Rohde & Schwarz	2020.05.14	1 year	☐
39	Attenuator	10 dB	4	Rohde & Schwarz	2020.05.14	1 year	☐
40	Attenuator	54A-10	74564	WEINSCHEL	2020.09.05	1 year	☐
41	Attenuator	56-10	66920	WEINSCHEL	2020.05.14	1 year	☐
42	Attenuator	48-20-11	BV2658	Aeroflex/Weinschel	2020.07.11	1 year	☐
43	Attenuator	48-30-33-LIM	BL5350	Weinschel Corp.	2020.07.11	1 year	☒
44	Power divider	11636B	51212	HP	2021.01.23	1 year	☐
45	3Way Power divider	KPDSU3W	00070365	KMW	2020.09.03	1 year	☐
46	4Way Power divider	70052651	173834	KRYTAR	2021.01.23	1 year	☐
47	3Way Power divider	1580	SQ361	WEINSCHEL	2020.05.14	1 year	☐
48	OSP	OSP120	101577	Rohde & Schwarz	2020.05.14	1 year	☐
49	White noise audio filter	ST31EQ	101902	SoundTech	2020.09.04	1 year	☐

No.	Instrument	Model	S/N	Manufacturer	Next Cal Date	Cal interval	used
50	Dual directional coupler	778D	17693	HEWLETT PACKARD	2021.01.21	1 year	☐
51	Dual directional coupler	772D	2839A00924	HEWLETT PACKARD	2021.01.21	1 year	☐
52	Band rejection filter	3TNF-0006	26	DOVER Tech	2021.01.22	1 year	☐
53	Band rejection filter	3TNF-0007	311	DOVER Tech	2021.01.22	1 year	☐
54	Band rejection filter	WTR-BRF2442-84NN	09020001	WAVE TECH Co.,LTD	2021.01.22	1 year	☐
55	Band rejection filter	WRCJV12-5695-5725-5825-5855-50SS	1	Wainwright Instruments GmbH	2020.05.14	1 year	☐
56	Band rejection filter	WRCJV12-5120-5150-5350-5380-40SS	4	Wainwright Instruments GmbH	2020.05.14	1 year	☐
57	Band rejection filter	WRCGV10-2360-2400-2500-2540-50SS	2	Wainwright Instruments GmbH	2020.05.14	1 year	☐
58	Band rejection filter	CTF-155M-S1	001	RF One Electronics	2020.09.02	1 year	☐
59	Band rejection filter	CTF-435M-S1	001	RF One Electronics	2020.09.02	1 year	☒
60	Highpass Filter	WHJS1100-10EF	1	WAINWRIGHT	2021.01.22	1 year	☒
61	Highpass Filter	WHJS3000-10EF	1	WAINWRIGHT	2021.01.22	1 year	☐
62	Highpass Filter	WHNX6-5530-7000-26500-40CC	2	Wainwright Instruments GmbH	2020.05.14	1 year	☐
63	Highpass Filter	WHNX6-2370-3000-26500-40CC	4	Wainwright Instruments GmbH	2020.05.14	1 year	☐
64	WideBand Radio Communication Tester	CMW500	102276	Rohde & Schwarz	2021.01.21	1 year	☐
65	Bluetooth Tester	TC-3000B	3000B6A0166	TESCOM CO., LTD.	2021.01.22	1 year	☐
66	Loop Antenna	6502	9203-0493	EMCO	2021.05.27	2 year	☐
67	BiconiLog Antenna	3142B	1745	EMCO	2020.05.10	2 year	☒
68	Biconical Antenna	VUBA9117	9117-342	Schwarz beck	2022.03.24	2 year	☒
69	Trilog-Broadband Antenna	VULB 9168	9168-606	SCHWARZBECK	2020.09.14	2 year	☐
70	Horn Antenna	3115	2996	EMCO	2022.02.14	2 year	☒
71	Horn Antenna	3115	9605-4834	EMCO	2022.03.06	2 year	☒
72	Horn Antenna	BBHA9170	743	SCHWARZBECK	2021.01.22	2 year	☐
73	PREAMPLIFIER(3)	8449B	3008A00149	Agilent	2020.09.02	1 year	☐
74	AMPLIFIER(10)	TK-PA6S	120009	TESTEK	2021.01.21	1 year	☒
75	AMPLIFIER	TK-PA18	150003	TESTEK	2021.01.21	1 year	☒
76	AMPLIFIER	TK-PA1840H	160010-L	TESTEK	2021.01.28	1 year	☐
77	AMPLIFIER	8447D	2944A07881	H.P	2021.01.21	1 year	☐

4. SUMMARY TEST RESULTS

Description of Test	FCC Rule	Reference Clause	Used	Test Result
RF Output Power	Part 95.567	Clause 5.1	☒	Compliance
Transmitter Radiated Unwanted Emissions	Part 95.579	Clause 5.2	☒	Compliance
Compliance/pass : The EUT complies with the essential requirements in the standard. Not Compliance : The EUT does not comply with the essential requirements in the standard. N/A : The test was not applicable in the standard.				
Procedure Reference : FCC CFR 47, Part 95 KDB 888861 D01 Part 95 GMRS FRS v01 ANSI/TIA-603-E-2016 ANSI C 63.4-2014				

5. MEASUREMENT RESULTS

5.1 RF Output Power

5.1.1 Standard Applicable [FCC Part 95.567]

FCC Part 95.567

Each FRS transmitter type must be designed such that the effective radiated power (ERP) on channels 8 through 14 does not exceed 0.5 Watts and the ERP on channels 1 through 7 and 15 through 22 does not exceed 2.0 Watts.

5.1.2 Test Environment conditions

- Ambient temperature : (21 ~ 22) °C
- Relative Humidity : (48 ~ 52) % R.H.

5.1.3 Measurement Procedure

The EUT was setup according to ANSI/TIA-603-E-2016 for compliance to FCC 47CFR part 95 requirements.

As a below test procedure (①~⑩), The result value of measurement is performed to condition of the below; The EUT will operate in continuous transmission mode during the time necessary to perform the measured of the frequency. Substitution method was performed to determine the actual P_{erp} (or P_{eirp}) emission levels of the EUT.

The following test procedure as below;

The test is performed in a fully pyramidal chamber to determine the accurate frequencies, after maximum emissions level will be checked on a test chamber and measuring distance is 3 m from EUT to test antenna.

- ① The EUT was set on with continuous transmission mode and placed on a 1.5 meter high non-conductive table on the chamber.
- ② The test antenna is used on Bi-Log antenna at above 30 MHz, and used on Horn antenna at 1 GHz and then the measurements are repeated with the test antenna for vertical and horizontal polarization. The output of the test antenna will be connected to a measuring receiver, and it is set to tuned over the required standard measuring frequency range.
- ③ At each frequency at which a relevant spurious component is detected, the test antenna will be raised and lowered through the specified range of heights until an maximum signal level is detected on the measuring receiver.
- ④ The EUT is position x, y, z axis on rotating through 360 degrees in the horizontal plane, until the Max. signal level is detected by the measuring receiver.
- ⑤ The receiver is scanned from requested measuring frequency band and then the maximum meter reading is recorded. The radiated emissions were measured with requested standard specification (detector and resolution bandwidth etc.)
- ⑥ The EUT was then removed and replaced with substitution antenna .The center of the antenna was approximately at the same location as the center of the EUT, and calibrated for the frequency of the spurious component detected.
- ⑦ Signal generator output port connected with substitution antenna input port. If necessary, may use shield cable between signal generator and substitution antenna
- ⑧ The frequency of the calibrated signal generator is set to frequency of the spurious component detected, and the input attenuator setting of the measuring receiver was adjust in order to increase the sensitivity of the measuring receiver, if necessary
- ⑨ The test antenna was raised and lowered through the specified range of heights to ensure that maximum signal is received.
- ⑩ The input signal to the substitution antenna was be adjusted until an equal or a known related level to that detected from the transmitter is obtained on the measuring receiver.

- ⑪ The input signal to the substitution antenna was be recorded as a power level and corrected for any change of input attenuator setting of the measuring receiver
 - ⑫ The measure of P_{erp} (or P_{eirp}) the spurious components is the larger of the two power levels recorded for each spurious component at the input to the substitution antenna, corrected for the gain of the substitution antenna, if necessary.
 - ⑬ It is correction to signal generator's offset value. In this case of P_{erp} (or P_{eirp}) shall calculated as follow as formula ;
- P_{erp} (or P_{eirp}) = Signal generator level (dBm) – Cable loss(dB)

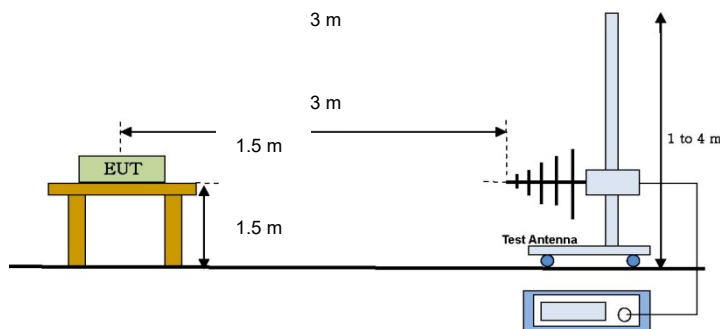
5.1.4 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the UCISPR measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

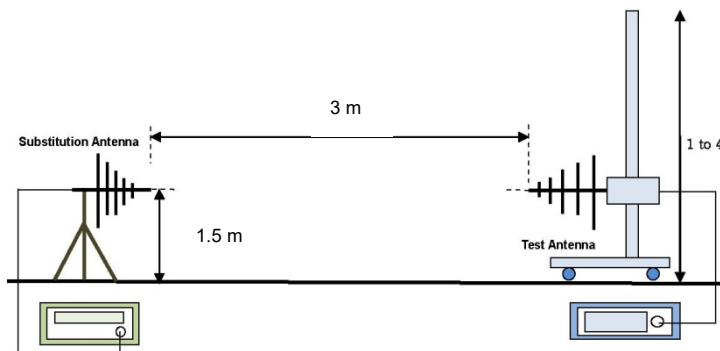
Radiated Emission measurement: Below 1 GHz: 3.62 dB (CL: Approx 95 %, $k=2$)

Above 1 GHz: 4.06 dB (CL: Approx 95 %, $k=2$)

5.1.5 Test Setup



[Radiatedmeasurement setup_Below than 1 GHz]



[Effective Radiated Power measurement setup]

※ Above the test antenna is used on Horn antenna at above 1 GHz.

5.1.6 Measurement Result

Channel Description	CH	Frequency [MHz]	Effective Radiated Power		Limit [W]	Test Results
			[dBm]	[W]		
462 MHz Interstitial	4	462.637 5	24.63	0.290	2	Compliance
467 MHz Interstitial	11	467.637 5	23.70	0.234	0.5	Compliance

5.2 Transmitter Radiated Unwanted Emissions

5.2.1 Standard Applicable [FCC Part 95.579]

According to FCC section 95.579, the unwanted emission should be attenuated below Transmitter output power(P) by at least $43+10 \log(P)$ dB.

5.2.2 Test Environment conditions

- Ambient temperature : (21 ~ 22) °C
- Relative Humidity : (48 ~ 52) % R.H.

5.2.3 Measurement Procedure

Refer 5.1.3

5.2.4 Test Setup

Refer 5.1.4

5.2.5 Measurement Result

The following frequencies were selected based on the output power results.

Channel Description	CH	Freq. [MHz]	ERP power	
			[dBm]	[W]
462 MHz Interstitial	4	462.637 5	24.63	0.290

Emission Frequency [MHz]	Ant Pol	Level below Carrier [dBc]	Margin [dB]	Limit [dBc]	Test Results
925.275 0	H	47.43	9.81	37.62	Compliance
1 387.912 5	V	50.63	13.01	37.62	Compliance
1 850.550 0	V	50.38	12.76	37.62	Compliance
2 313.187 5	V	50.12	12.50	37.62	Compliance
2 775.825 0	H	60.04	22.42	37.62	Compliance
3 238.462 5	V	58.94	21.32	37.62	Compliance

Note: The formula for limit is below;
 $43+10 \log (P)$ where, P = EUT's output power in W
 Therefore $43+10\log(0.290) = 37.62$

Channel Description	CH	Freq. [MHz]	ERP power	
			[dBm]	[W]
467 MHz Interstitial	11	467.637 5	23.70	0.234

Emission Frequency [MHz]	Ant Pol	Level below Carrier [dBc]	Margin [dB]	Limit [dBc]	Test Results
935.275 0	H	51.48	14.79	36.69	Compliance
1 402.912 5	H	67.81	31.12	36.69	Compliance
1 870.550 0	H	60.55	23.86	36.69	Compliance
2 338.187 5	V	61.10	24.41	36.69	Compliance
2 805.825 0	V	63.46	26.77	36.69	Compliance
3 273.462 5	H	67.08	30.39	36.69	Compliance

Note: The formula for limit is below;
 $43 + 10 \log (P)$ where, P = EUT's output power in W
 Therefore $43 + 10 \log (0.234) = 36.69$