



TEST REPORT

KCTL Inc. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR18-SRF0127-C Page (1) of (21)				
1. Client ◦ Name : Hoimyung ICT ◦ Address : 1203, Daeryung-technotown-8cha, 96, Gamasanro, Geumcheon-gu, Seoul, Korea, 08501 ◦ Date of Receipt : 2018-02-27 2. Use of Report : - 3. Name of Product and Model : Telematics Management System Terminal / DTM-01 4. Manufacturer and Country of Origin : Hoimyung ICT / Korea 5. FCC ID : 2ARPKDTM-01 6. IC : 24504-DTM01 7. Date of Test : 2018-09-19 to 2018-10-01 8. Test Standards : Part 22 (H) RSS-132 Issue 3 January 2013 RSS GEN Issue 5 April 2018 9. Test Results : Refer to the test result in the test report					
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; text-align: center; vertical-align: middle;">Affirmation</td> <td style="width: 40%; padding: 5px;"> Tested by Name : Seonjun Yun (Signature) </td> <td style="width: 45%; padding: 5px;"> Technical Manager Name : Seungyong Kim (Signature) </td> </tr> </table> 2018-12-28 KCTL Inc. As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.			Affirmation	Tested by Name : Seonjun Yun (Signature)	Technical Manager Name : Seungyong Kim (Signature)
Affirmation	Tested by Name : Seonjun Yun (Signature)	Technical Manager Name : Seungyong Kim (Signature)			

REPORT REVISION HISTORY

Date	Revision	Page No
2018-10-05	Originally issued	-
2018-11-20	Revised	6, 7
2018-12-24	Revised antenna information	6
2018-12-28	Revised antenna gain	6

This report shall not be reproduced except in full, without the written approval of KCTL Inc. This document may be altered or revised by KCTL Inc. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by KCTL Inc. will constitute fraud and shall nullify the document.

This test report is a general report that does not use the KOLAS accreditation mark and is not related to KOLAS accreditation.

KCTL

[Contents]

1. Client information	4
2. Laboratory information	5
3. Description of E.U.T.....	6
3.1 Basic description	6
3.2 General description	6
3.3 Ambient Conditions	7
3.4 Test frequency	7
3.5 Test Voltage	7
4. Summary of test results.....	8
4.1 Standards & results	8
4.2 Measurement Uncertainty	8
5. Test results	9
5.1 Radiated Power(ERP/EIRP)	9
5.2 Radiated Spurious emission	11
5.3 Conducted Output Power	16
5.4 Occupied Bandwidth	17
5.5 Peak to Average Ratio.....	18
5.6 Band Edge / Spurious Emission at Antenna Terminal.....	19
5.7 Frequency Stability.....	20
6. Test equipment used for test.....	21

KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR18-SRF0127-C

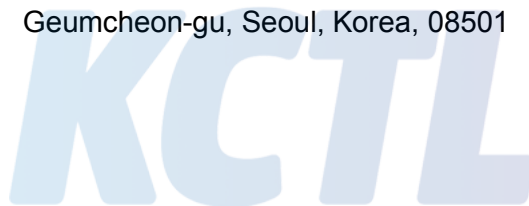
Page (4) of (21)



1. Client information

Applicant: Hoimyung ICT
Address: 1203, Daeryung-technotown-8cha, 96, Gamasanro,
Geumcheon-gu, Seoul, Korea, 08501
Telephone number: +82 2 6958 3500
Facsimile number: +82 2 6958 3530
Contact person: Jongrak Geun / kjr1234@hoimyung.co.kr

Manufacturer: Hoimyung ICT
Address: 1203, Daeryung-technotown-8cha, 96, Gamasanro,
Geumcheon-gu, Seoul, Korea, 08501



KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR18-SRF0127-C

Page (5) of (21)

KCTL

2. Laboratory information

Address

KCTL Inc.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea

Telephone Number: +82 31 285 0894

Facsimile Number: +82 505 299 8311

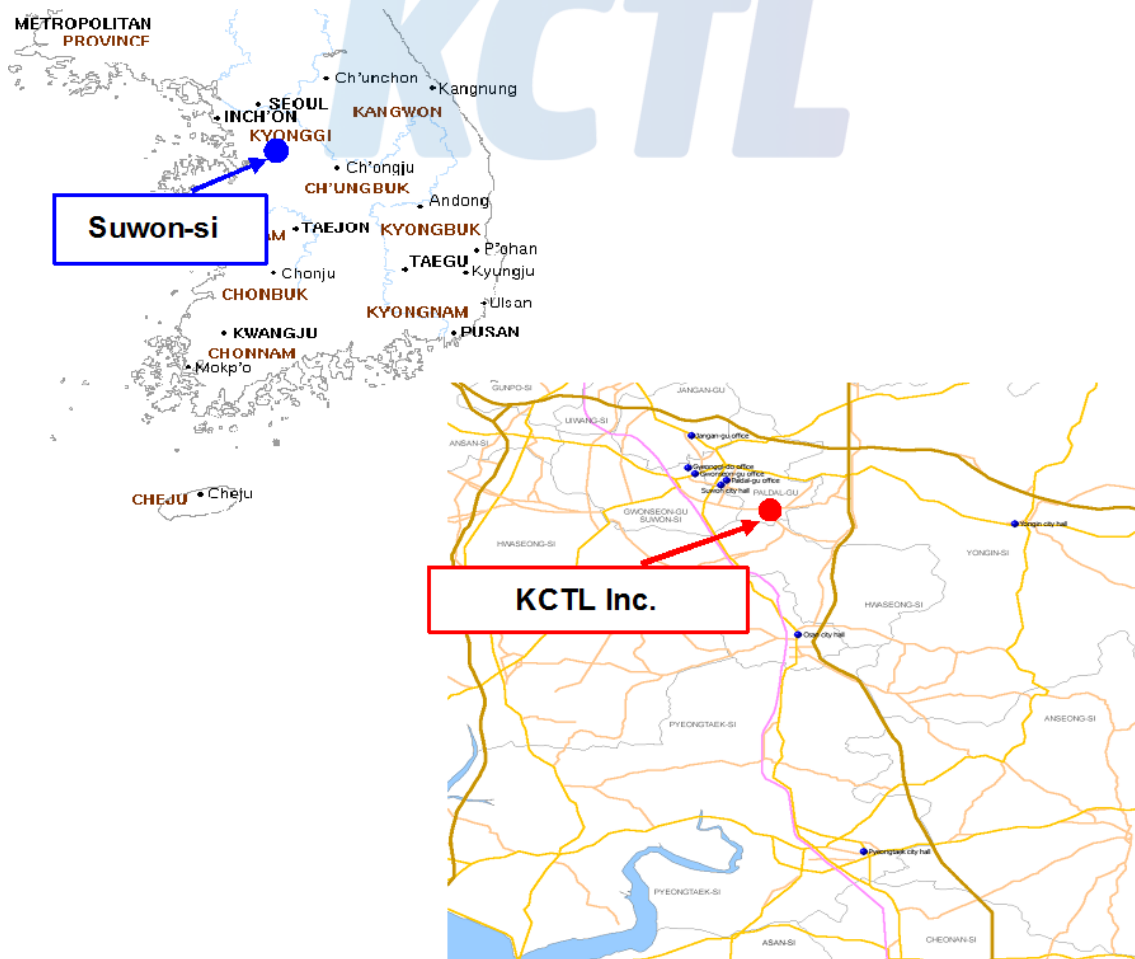
FCC Site Designation No: KR0040, FCC Site Registration No: 687132

VCCI Registration No. : R-3327, G-198, C-3706, T-1849

Industry Canada Registration No. : 8035A

KOLAS NO.: KT231

SITE MAP



This test report shall not be reproduced, except in full, without the written approval

KCTL-TIR001-003/2

3. Description of E.U.T.

3.1 Basic description

Applicant	Hoimyung ICT
Address of Applicant	1203, Daeryung-technotown-8cha, 96, Gamasanro, Geumcheon-gu, Seoul, Korea, 08501
Manufacturer	Hoimyung ICT
Address of Manufacturer	1203, Daeryung-technotown-8cha, 96, Gamasanro, Geumcheon-gu, Seoul, Korea, 08501
Type of equipment	Telematics Management System Terminal
Basic Model	DTM-01
Serial number	N/A

3.2 General description

Frequency Range	2 412 MHz ~ 2 462 MHz (802.11b/g/n_HT20) 826.4 MHz ~ 846.6 MHz (WCDMA Band 5)
Type of Modulation	DSSS (802.11b), OFDM (802.11g/n_HT20), QPSK (WCDMA Band 5)
The number of channels	11 ch (802.11b/g/n_HT20)
Type of Antenna	Dipole Antenna (802.11b/g/n_HT20, WCDMA Band 5)
Antenna Gain	2.882 dBi (802.11b/g/n_HT20) 1.519 dBi (WCDMA Band 5)
Conducted Output Power ²⁾	26.60 dBm (WCDMA Band 5)
Power supply	DC 12 V, DC 24 V
Product SW/HW version	V1.01 / V1.01
Radio SW/HW version	V1.01 / V1.01
Test SW Version	MT8820C 23.03 #004
RF power setting in TEST SW	Referred the measuring instrument from manufacturer

Note₁) : The above EUT information was declared by the manufacturer.

Note₂) : Test was performed by modular transmitter (Model Name: LISA-U200, FCC ID: XPYLISAU200, IC: 8595A-LISAU200N, Test Report No.6-0082-11-1-2b issued on 27, November, 2011 by CETECOM GmbH.

3.3 Ambient Conditions

	Temperature [°C]	Relative humidity [%]
Requirement for tests	15 to 35	20 to 75
Ambient Conditions	21	51

3.4 Test frequency

- WCDMA Band 5 –

Frequency (MHz)	Mode	Channel
826.4 ~ 832.4	WCDMA	4132
836.4 ~ 836.6		4183
846.4 ~ 846.6		4233

3.5 Test Voltage

Mode	Voltage
Nominal Voltage	DC 12 V, DC 24 V

4. Summary of test results

4.1 Standards & results

FCC Rule Reference	IC Rule Reference	Parameter	Report Section	Test Result
22.913(a)(2)	RSS-132 Issue 3 (5.4) RSS-133 Issue 6 (6.4)	Effective Radiated Power	5.1	C
2.1053 22.917(a)	RSS-132 Issue 3 (5.5) RSS-133 Issue 6 (6.5)	Radiated Spurious Emission	5.2	C
2.1046	RSS-Gen Issue 5 (6.12)	Conducted Output Power	5.3	NT (Note ₂)
2.1049	RSS-Gen Issue 5 (6.7)	Occupied Bandwidth	5.4	NT (Note ₂)
24.232(d)	RSS-132 Issue 3 (5.4) RSS-132 Issue 6 (6.4)	Peak to Average Ratio	5.5	NT (Note ₂)
2.1051 22.917(a)	RSS-132 Issue 3 (5.5) RSS-133 Issue 6 (6.5)	Band Edge Spurious Emission at Antenna Terminal	5.6	NT (Note ₂)
2.1055 22.917(a)	RSS-Gen Issue 5 (6.11) RSS-132 Issue 3 (5.3) RSS-133 Issue 6 (6.3)	Frequency Stability	5.7	NT (Note ₂)
Note ₁ : C = Complies, NC = Not Complies, NT = Not Tested, NA = Not Applicable Note ₂ : Test was performed by modular transmitter (Model Name: LISA-U200, FCC ID: XPYLISAU200, IC: 8595A-LISAU200N, Test Report No.6-0082-11-1-2b issued on 27, November, 2011 by CETECOM GmbH.				

- The general test methods used to test on this device are ANSI/TIA-603-E-2016 and KDB 971168 D01 v03.

4.2 Measurement Uncertainty

Measurement Item	Expanded Uncertainty $U = kU_c (k = 2)$	
Voltage	0.30 %	
Temperature	1.12 °C	
Radiated Spurious emissions	30 MHz ~ 1 000 MHz	3.84 dB
	1 000 MHz ~ 12.75 GHz	3.90 dB

5. Test results

5.1 Radiated Power(ERP/EIRP)

5.1.1 Regulation

FCC §22.913(a)(2)

5.1.2 Measurement Procedure

The method of measurement used to test this device are ANSI/TIA-603-E-2016 and KDB 971168 D01 v03 Section 5.1.2.

This procedure can be used to measure the peak power in either a CW-like or noise-like Narrowband RF signal.

THE measurement instrument must have a RBW that is greater than or equal to the OBW Of the signal to be measured and a VBW $\geq 3 \times$ RBW

- a) Set the RBW $\geq$ OBW.
- b) Set VBW $\geq 3 \times$ RBW.
- c) Set span $\geq 2 \times$ RBW.
- d) Sweep time $\geq 20 \times$ (number of point in sweep) $\times$ (transmission symbol period).
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker dunction to determine the peak amplitude level.

Remark:

- Actual setting: RBW = 1 MHz, VBW = 3 MHz

5.1.3 Test Result

- Complied

WCDMA Band 5 (DC 12 V)

Frequency (MHz)	Ant. Pol. (H/V)	E.R.P.		Substitute Level (dB m)	ANT Gain (dB i)	Cable Loss (dB)	Limit (W)
		(dB m)	(W)				
826.40	V	19.13	0.082	23.40	-0.50	3.77	7.00
836.60	V	19.10	0.081	23.39	-0.50	3.79	7.00
846.60	V	19.01	0.080	23.42	-0.60	3.81	7.00

Note : The E.R.P or E.I.R.P = Substitute Level (dBm) + Ant. Gain (dBd or dBi) – Cable Loss (dB)

WCDMA Band 5 (DC 24 V)

Frequency (MHz)	Ant. Pol. (H/V)	E.R.P.		Substitute Level (dB m)	ANT Gain (dB i)	Cable Loss (dB)	Limit (W)
		(dB m)	(W)				
826.40	V	19.10	0.081	23.37	-0.50	3.77	7.00
836.60	V	19.13	0.082	23.42	-0.50	3.79	7.00
846.60	V	18.95	0.079	23.36	-0.60	3.81	7.00

Note : The E.R.P or E.I.R.P = Substitute Level (dBm) + Ant. Gain (dBd or dBi) – Cable Loss (dB)

KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR18-SRF0127-C

Page (11) of (21)



5.2 Radiated Spurious emission

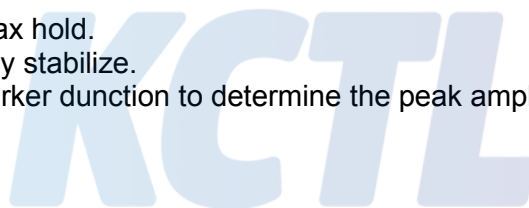
5.2.1 Regulation

FCC §2.1053, §22.917(a)

5.2.2 Measurement Procedure

The method of measurement used to test this device are ANSI/TIA-603-E-2016 and KDB 971168 D01 v03 Section 5.8. and 6.1.

- a) Set the RBW
 - 100 kHz below 1 GHz
 - 1 MHz above 1 GHz
- b) Set VBW
 - 300 kHz below 1 GHz
 - 3 MHz above 1 GHz
- c) Detector = peak.
- d) Trace mode = max hold.
- e) Allow trace to fully stabilize.
- f) Use the peak marker dunction to determine the peak amplitude level.



KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR18-SRF0127-C

Page (12) of (21)



5.2.3 Test Result

- Complied

WCDMA Band 5_(DC 12 V)

Operating Frequency : 826.40 MHz

Channel : 4132

Measured Output Power : 19.13 dBm = 0.082 W

Limit = 43+10log(P) dB = 32.13 dBc

Frequency (MHz)	Ant. Pol. (H/V)	E.R.P.	Substitute Level	ANT Gain	Cable Loss	dB c	Margin (dB)
		(dB m)	(dB m)	(dB d)	(dB)		
183.26	H	-48.30	-47.43	0.80	1.67	67.43	35.30
767.20	V	-46.20	-42.68	0.10	3.62	65.33	33.20
1 655.33	V	-52.00	-54.95	8.40	5.45	71.13	39.00
4 576.72	H	-46.40	-48.13	11.30	9.57	65.53	33.40

Note : The E.R.P = Substitute Level (dBm) + Ant. Gain (dBd) - Cable Loss (dB)

Operating Frequency : 836.60 MHz

Channel : 4183

Measured Output Power : 19.10 dBm = 0.081 W

Limit = 43+10log(P) dB = 32.10 dBc

Frequency (MHz)	Ant. Pol. (H/V)	E.R.P.	Substitute Level	ANT Gain	Cable Loss	dB c	Margin (dB)
		(dB m)	(dB m)	(dB d)	(dB)		
183.26	H	-48.40	-47.53	0.80	1.67	67.50	35.40
614.91	H	-44.90	-40.96	-0.70	3.24	64.00	31.90
745.86	V	-41.00	-37.22	-0.20	3.58	60.10	28.00
1 672.13	V	-54.30	-57.35	8.50	5.45	73.40	41.30

Note : The E.R.P = Substitute Level (dBm) + Ant. Gain (dBd) - Cable Loss (dB)

Operating Frequency : 846.60 MHz
 Channel : 4233
 Measured Output Power : 19.01 dB_m = 0.080 W
 Limit = 43+10log(P) dB = 32.01 dBc

Frequency (MHz)	Ant. Pol. (H/V)	E.R.P.	Substitute Level	ANT Gain	Cable Loss	dB c	Margin (dB)
		(dB m)	(dB m)	(dB d)	(dB)		
183.26	H	-47.40	-46.53	0.80	1.67	66.41	34.40
590.66	H	-43.30	-39.42	-0.70	3.18	62.31	30.30
722.58	H	-44.60	-40.79	-0.30	3.51	63.61	31.60
1 691.34	V	-49.50	-52.65	8.60	5.45	68.51	36.50

Note : The E.R.P = Substitute Level (dBm) + Ant. Gain (dBd) - Cable Loss (dB)



KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR18-SRF0127-C

Page (14) of (21)

**WCDMA Band 5_(DC 24 V)**

Operating Frequency : 826.40 MHz

Channel : 4132

Measured Output Power : 19.10 dB_m = 0.081 W

Limit = 43+10log(P) dB = 32.10 dB_c

Frequency (MHz)	Ant. Pol. (H/V)	E.R.P.	Substitute Level	ANT Gain	Cable Loss	dB c	Margin (dB)
		(dB m)	(dB m)	(dB d)	(dB)		
183.26	H	-48.60	-47.73	0.80	1.67	67.70	35.60
627.52	V	-41.60	-37.34	-1.00	3.26	60.70	28.60
763.32	V	-39.20	-35.39	-0.20	3.61	58.30	26.20
1 650.53	V	-53.00	-56.13	8.40	5.27	72.10	40.00

Note : The E.R.P = Substitute Level (dBm) + Ant. Gain (dBd) - Cable Loss (dB)

Operating Frequency : 836.60 MHz

Channel : 4183

Measured Output Power : 19.13 dB_m = 0.082 W

Limit = 43+10log(P) dB = 32.13 dB_c

Frequency (MHz)	Ant. Pol. (H/V)	E.R.P.	Substitute Level	ANT Gain	Cable Loss	dB c	Margin (dB)
		(dB m)	(dB m)	(dB d)	(dB)		
183.26	H	-48.20	-47.33	0.80	1.67	67.33	35.20
610.06	V	-41.10	-37.16	-0.70	3.24	60.23	28.10
1 669.73	V	-53.10	-56.15	8.50	5.45	72.23	40.10

Note : The E.R.P = Substitute Level (dBm) + Ant. Gain (dBd) - Cable Loss (dB)

Operating Frequency : 846.60 MHz
 Channel : 4233
 Measured Output Power : 18.95 dBm = 0.079 W
 Limit = 43+10log(P) dB = 31.95 dBc

Frequency (MHz)	Ant. Pol. (H/V)	E.R.P.	Substitute Level	ANT Gain	Cable Loss	dB c	Margin (dB)
		(dB m)	(dB m)	(dB d)	(dB)		
183.26	H	-47.80	-46.93	0.80	1.67	66.75	34.80
595.51	V	-46.10	-41.99	-0.90	3.21	65.05	33.10
725.49	V	-45.70	-41.56	-0.60	3.54	64.65	32.70
1 691.34	V	-49.20	-52.35	8.60	5.45	68.15	36.20
2 536.31	V	-51.50	-54.51	9.70	6.69	70.45	38.50
4 564.71	V	-48.70	-50.33	11.20	9.57	67.65	35.70

Note : The E.R.P = Substitute Level (dBm) + Ant. Gain (dBd) - Cable Loss (dB)



5.3 Conducted Output Power

5.3.1 Regulation

FCC §2.1046

5.3.2 Measurement Procedure

A radio link was established between EUT and Radio Communications Tester. The output power of the EUT was set to maximum value by using the maximum power setting on the Radio Communications Tester.
The worst case being reported.

5.3.3 Test Result

Result: NT : Not Tested due to client request.

Please refer modular transmitter test report No. 6-0082-11-1-2b.

KCTL

5.4 Occupied Bandwidth

5.4.1 Regulation

FCC §2.1049

5.4.2 Measurement Procedure

The method of measurement used to test this device is ANSI/TIA-603-E-2016 and KDB 971168 D01 v03.

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW $\geq$ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

5.4.3 Test Result

Result: NT : Not Tested due to client request.

Please refer modular transmitter test report No. 6-0082-11-1-2b.

5.5 Peak to Average Ratio

5.5.1 Regulation

FCC §27.50(d)(5)

5.5.2 Measurement Procedure

The method of measurement used to test this device is ANSI/TIA-603-E-2016 and KDB 971168 D01 v03.

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

5.5.3 Test Result

Result: NT : Not Tested due to client request.

Please refer modular transmitter test report No. 6-0082-11-1-2b.

5.6 Band Edge / Spurious Emission at Antenna Terminal

5.6.1 Regulation

FCC §2.1051, §27.53(c)(2), §27.53(h)

The power of emissions shall be attenuated (in dB) below the transmitter output power P (dBW) by at least $43 + 10 \log_{10} p$ (watts).

5.6.2 Measurement Procedure

The method of measurement used to test this device is ANSI/TIA-603-E-2016 and KDB 971168 D01 v03.

- Band Edge Emission -

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1% of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

26 dB below the transmitter power.

- Conducted Spurious Emission –

1. Start frequency was set to 30 MHz and stop frequency was set to at least $10 \times$ the fundamental frequency
2. RBW ≥ 100 kHz (Frequency less than 1 GHz)
RBW ≥ 1 MHz (Frequency greater than 1 GHz)
3. Detector = RMS
4. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

5.6.3 Test Result

Result: NT : Not Tested due to client request.

Please refer modular transmitter test report No. 6-0082-11-1-2b.

5.7 Frequency Stability

5.7.1 Regulation

FCC §2.1055, §27.5(b), §27.5(h), §27.54

5.7.2 Measurement Procedure

The method of measurement used to test this device is ANSI/TIA-603-E-2016 and KDB 971168 D01 v03.

The EUT was placed inside the Environment Chamber.

Temperature is varied from -30°C to $+50^{\circ}\text{C}$ (10°C increments).

The primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment. For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

1. The carrier frequency of the transmitter is measured at room temperature.
2. The EUT was left inside chamber to stabilize to set temperature for minimum of thirty minutes.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to $+50^{\circ}\text{C}$.

5.7.3 Test Result

Result: NT : Not Tested due to client request.

Please refer modular transmitter test report No. 6-0082-11-1-2b.

6. Test equipment used for test

	Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
■	Vector Signal Generator	R&S	SMBV100A	257566	19.01.05
■	Signal Generator	R&S	SMR40	100007	19.05.15
■	Wideband Radio Communication Tester	R & S	CMW500	141780	19.01.31
■	Bilog Antenna	Teseq GmbH	CBL 6143A	35039	19.05.19
■	Horn Antenna	ETS.lindgren	3117	161225	19.05.18
■	Highpass Filter	Wainwright Instruments GmbH	WHKX1.0/1.5S-10SS	14	19.01.31
■	Spectrum Analyzer	AGILENT	N9040B	MY57010132	18.11.23
■	Attenuator	Weinschel ENGINEERING	10	AJ1239	19.05.14
■	Amplifier	L-3 Narda-MITEQ	AFS5-0010180 0-25-S-5	2054571	18.11.20
■	Amplifier	SONOMA INSTRUMENT	317	321041	19.01.05
■	RF Selector	TOYO Corporation	NS5800	1003-010	N/A
■	Band Selector	TOYO Corporation	NS5800	1003-135	N/A
■	Band Selector	TOYO Corporation	NS5800	1003-320	N/A
■	Antenna Mast	MATURO	EAS 1.5	042/8941211	N/A
■	Antenna Mast	MATURO	EAS 1.5	043/8941211	N/A
■	Turn Table	MATURO	TT 0.8 PF	041/8941211	N/A