TEST REPORT

KCTL Inc.
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Suwon-si, Gyeonggi-do, 16677, Korea
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1. Client

- Name : HOIMYUNG ICT Corporation
- Address : 1203, 8th Daeryungtechnotown, 96, Gamasan-ro, Geumcheon-gu, Seoul, Republic of Korea
- Date of Receipt : 2019-06-03

2. Use of Report : -

3. Name of Product and Model : Telemetics mangement Terminal / DTM-02L

4. Manufacturer and Country of Origin : HOIMYUNG ICT Corporation / Korea

5. FCC ID : 2ARPKDTM-02L

6. IC Certification : 24504-DTM02L

6. Date of Test : 2019-07-03 to 2019-08-13

7. Test Standards : FCC Part 2 / RSS-Gen
FCC Part 22 subpart H / RSS-132
FCC Part 24 subpart E / RSS-133

8. Test Results : Refer to the test result in the test report

Affirmation	Tested by	Technical Manager
	Name : Heesu Ahn (Signature)	Name : Jaehyong Lee (Signature)

2019-09-25

KCTL Inc.

Report revision history

Date	Revision	Page No
2019-09-18	Initial report	-
2019-09-25	Updated measurement equipment	15

CONTENTS

1. General information

Client	:	HOIMYUNG ICT Corporation
Address	:	1203, 8th Daeryungtechnotown, 96, Gamasan-ro, Geumcheon-gu, Seoul, Republic of Korea
Manufacturer	:	HOIMYUNG ICT Corporation
Address	:	1203, 8th Daeryungtechnotown, 96, Gamasan-ro, Geumcheon-gu, Seoul, Republic of Korea
Laboratory	:	KCTL Inc.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	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

2. Device information

Equipment under test	:	Telemetics mangement Terminal
Model	:	DTM-02L
Frequency range	:	2 402 ㎒ ~ 2 480 ㎒ (Bluetooth Low Energy)
		699.7 ㎒ ~ 715.3 ㎒ (LTE Band 12)
		824.7 ㎒ ~ 848.3 ㎒ (LTE Band 5)
		1 710.7 ㎒ ~ 1 754.3 ㎒ (LTE Band 4)
		1 850.7 ㎒ ~ 1 909.3 ㎒ (LTE Band 2)
		2 502.5 ㎒ ~ 2 567.5 ㎒ (LTE Band 7)
		826.4 ㎒ ~ 846.6 ㎒ (WCDMA Band V)
		1 852.4 ㎒ ~ 1 907.6 ㎒ (WCDMA Band II)
Modulation technique	:	GFSK (Bluetooth Low Energy)
		QPSK, 16-QAM (LTE, WCDMA)
Number of channels	:	Bluetooth(BLE)_40 ch
Power source	:	DC 12 V, DC 24 V
Antenna specification	:	Chip Antenna (Bluetooth Low Energy, LTE, WCDMA)
Antenna gain	:	3.50 ㏈i (Bluetooth Low Energy)
		1.97 ㏈i (LTE Band 12)
		1.94 ㏈i (LTE Band 5, WCDMA Band V)
		3.03 ㏈i (LTE Band 4)
		2.98 ㏈i (LTE Band 2, WCDMA Band II)
		1.46 ㏈i (LTE Band 7)
Software version	:	Ver1.0.1
Hardware version	:	LTGHTTMS_LTE_R1.0
Operation temperature	:	-30 ℃ ~ 70 ℃

2.1. Frequency/channel operations

This device contains the following capabilities:
Bluetooth(BDR/EDR/BLE), LTE Band 12, LTE Band 5, LTE Band 4, LTE Band 2, LTE Band 7
WCDMA 850, WCDMA 1900

WCDMA 850

Ch.	Frequency (㎒)
4132	826.4
4182	836.4
4233	846.6

Table 2.1.1. RMC

WCDMA 1900

Ch.	Frequency (㎒)
9262	1 852.4
9400	1 880.0
9538	1 907.6

Table 2.1.2. RMC

3. Maximum ERP/EIRP power

WCDMA850

Mode	Tx frequency (㎒)	Emission designator	ERP	
			Max. power (dBm)	Max. power (W)
WCDMA850	826.4 ~ 846.6	4M13F9W	23.10	0.204

WCDMA1900

Mode	Tx frequency (㎒)	Emission designator	EIRP	
			Max. power (dBm)	Max. power (W)
WCDMA1900	1 852.4 ~ 1 907.6	4M15F9W	23.63	0.231

4. Summary of tests

FCC Part Section(s)	RSS Section(s)	Parameter	Test results
2.1046 22.913(a)(5) 24.232(c)	RSS-Gen(6.12) RSS-132(5.4)	Conducted Output Power	N/T(note1)
2.1049	RSS-Gen(6.7) RSS-133(2.3)	Occupied Bandwidth & 26 dB Bandwidth	N/T(note1)
2.1051 22.917(a) 24.238(a)	RSS-132(5.5) RSS-133(6.5)	Band Edge Emissions at Antenna Terminal	N/T(note1)
		Spurious Emissions at Antenna Terminal	N/T(note1)
24.232(d)	RSS-132(5.4) RSS-133(6.4)	Peak to Average Power Ratio	N/T(note1)
2.1055 22.355 24.235	RSS-132(5.3) RSS-133(6.3)	Frequency stability	N/T(note1)
22.913(a)(5) 24.232(c)	RSS-132(5.4) RSS-133(6.4)	Effective Radiated Power & Equivalent Isotropic Radiated Power	Pass
2.1053 22.917(a) 24.238(a)	RSS-132(5.5) RSS-133(6.5)	Radiated Spurious Emissions	Pass

Notes: (N/T: Not Tested, N/A: Not Applicable)

1. This test item was not performed by the request of manufacturer. Please refer to original test report no. HR/2019/1001601(FCC), HR/2019/1001603(IC) issued on Feb. 28, 2019 by SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch.
2. All modes of operation were investigated and the worst case emissions are reported with the EUT positioning, modulations and paging service configurations in the test data.
3. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.26-2015
   - ANSI/TIA-603-E-2016
   - KDB 971168 D01 v03r01

5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014.

All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

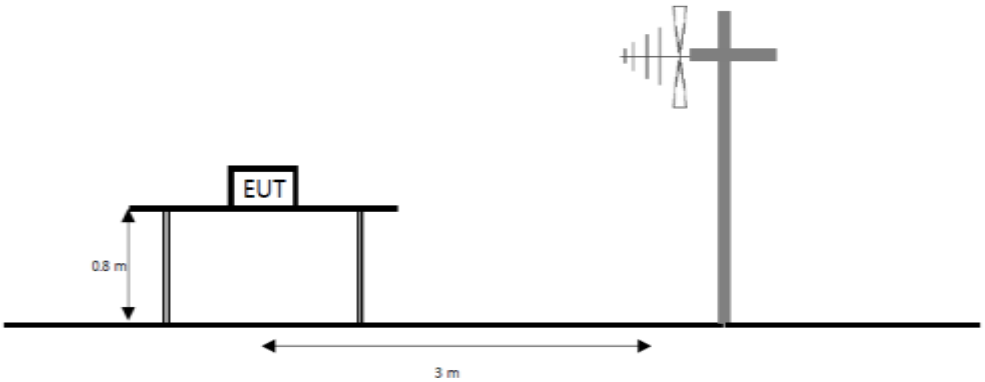
Parameter	Expanded uncertainty(±)	
Radiated spurious emissions	9 kHz ~ 30 MHz	2.28 dB
	30 MHz ~ 1 GHz	3.68 dB
	Above 1 GHz	5.72 dB

6. Test results

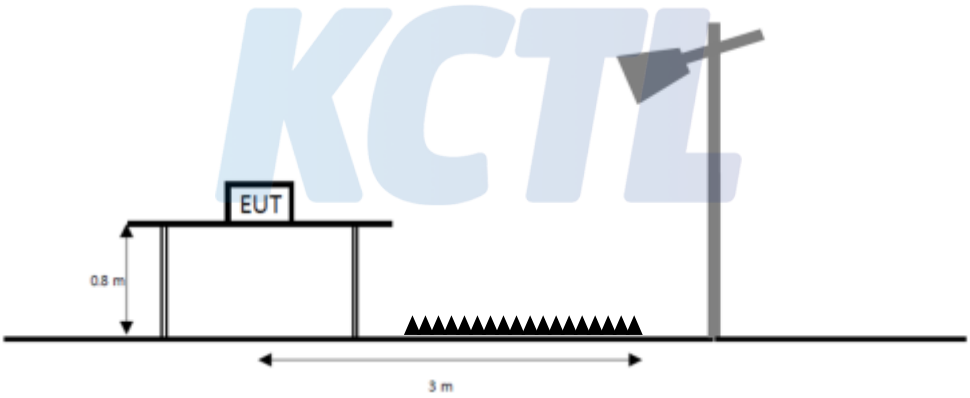
6.1. Radiated Power (ERP/EIRP)

Test setup

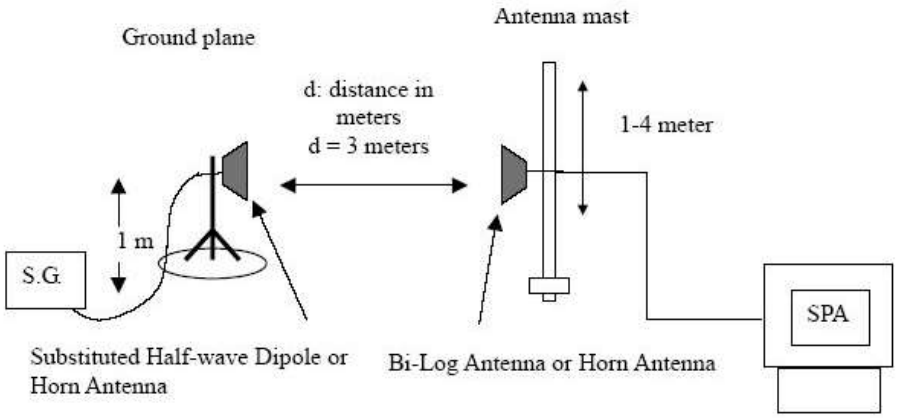
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to the tenth harmonic of the highest fundamental frequency or to 40 ㎓ emissions, whichever is lower.



The diagram below shows the test setup for substituted method.



Limit

According to §22.913(a)(5), the ERP of transmitters in the cellular radiotelephone service must not exceed the limits in this section. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to §24.232(c), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

Test procedure

971168 D01 v03r01 - Section 5.2.2
ANSI 63.26-2015 – Section 5.2.4.4.1
ANSI/TIA-603-E-2016 - Section 2.2.17

Test settings

1) RBW = 1 % to 5 % of the OBW.
2) VBW ≥ 3 × RBW.
3) SPAN = 2 × to 3 × the OBW.
4) Number of measurement points in sweep ≥ 2 × span / RBW.
5) Sweep time :
   1) Auto couple, or
   2) ≥ [10 × (number of points in sweep) × (transmission period)] for single sweep (automation-compatible) measurement. Transmission period is the on and off time of the transmitter.
6) Detector = RMS
7) If the EUT can be configured to transmit continuously, then set the trigger to free run.
8) If the EUT cannot be configured to transmit continuously, then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Verify that the sweep time is less than or equal to the transmission burst duration. Time gating can also be used under similar constraints (i.e., configured such that measurement data is collected only during active full -power transmissions).
9) Trace mode = trace averaging (RMS) over 100 sweeps.
10) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
11) Allow trace to fully stabilize.

Notes:

1. On a test site, the EUT shall be placed at 80 cm height on a turn table, and in the position close To normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to Correspond to the fundamental frequency of the transmitter.
3. The turntable is rotated through 360°, and the receiving antenna scans in order to determine the Level of the maximized emission.
4. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
5. The maximum signal level detected by the measuring receiver shall be noted.
6. The EUT was replaced by half-wave dipole (1 ㎓ below) or horn antenna (1 ㎓ above) connected to a signal generator.
   The power is calculated by the following formula;
   Pd(㏈m) = Pg(㏈m) – Cable loss (㏈) + Antenna gain (㏈)
   Note. Pd is the dipole equivalent power and Pg is the generator output power into the substitution antenna.
7. The test antenna shall be raised and lowered through the specified range of height to ensure that The maximum signal is received.
8. The input signal to the substitution antenna shall be adjusted to the level that produces a level Detected by the measuring corrected for the change of input attenuator setting of the measuring Receiver.
9. The input level to the substitution antenna shall be recorded as power level in ㏈m, corrected for Any change of input attenuator setting of the measuring receiver.
10. The measurement shall be repeated with the test antenna and the substitution antenna Orientated for horizontal polarization.

Test results

Test mode: WCDMA850

Mode	Channel	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP	
		[㎒]	[V/H]	[dBi]	[dB]	[dB ㎷]	[dB ㎷]	[W]
RMC	4132	826.40	H	-0.60	3.70	25.16	20.86	0.122
	4182	836.40	H	-0.50	3.71	27.31	23.10	0.204
	4233	846.60	H	-0.50	3.73	26.90	22.67	0.185

Test mode: WCDMA1900

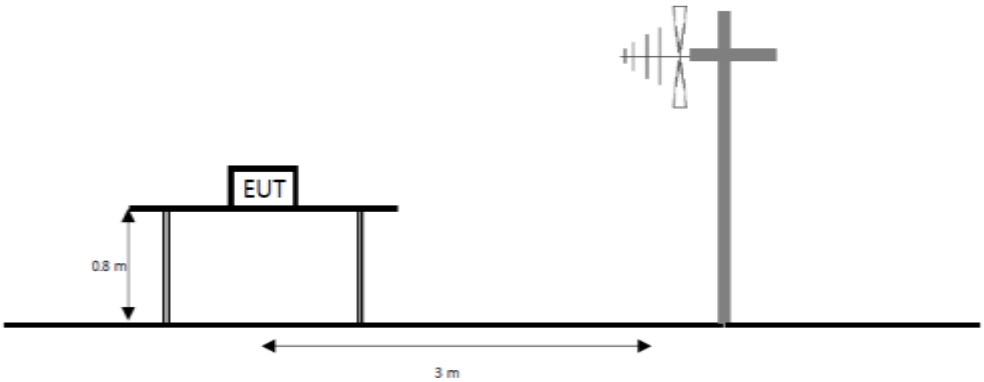
Mode	Channel	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	EIRP	
		[㎒]	[V/H]	[dBi]	[dB]	[dB ㎷]	[dB ㎷]	[W]
RMC	9262	1 852.4	H	4.60	5.74	24.24	23.10	0.204
	9400	1 880.0	H	4.90	5.78	24.31	23.43	0.220
	9538	1 907.6	H	4.90	5.80	24.53	23.63	0.231

Note.
1. E.R.P & E.I.R.P(dBm) = Substitute Level(dB) + Antenna gain(dBi) - C.L(Cable loss) (dB)

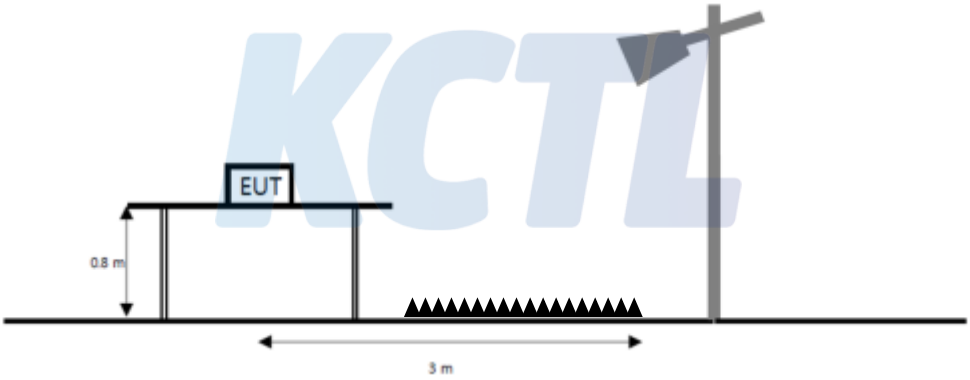
6.2. Radiated Spurious Emissions

Test setup

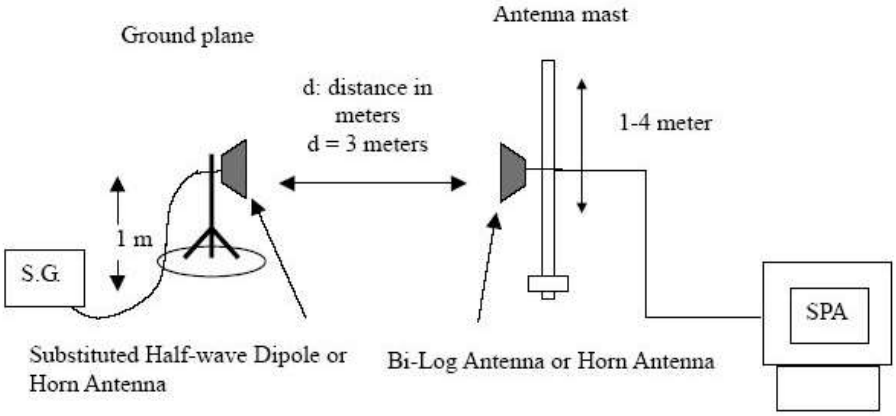
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to the tenth harmonic of the highest fundamental frequency or to 40 ㎓ emissions, whichever is lower.



The diagram below shows the test setup for substituted method.



Limit

According to §22.917(a), §24.238(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) ㏈.

Test procedure

971168 D01 v03r01 - Section 5.8
ANSI 63.26-2015 – Section 5.5
ANSI/TIA-603-E-2016 - Section 2.2.12

Test settings

1) RBW = 1 ㎑ for below 1 ㎓ and 1 ㎒ for above 1 ㎓.
2) VBW ≥ 3 × RBW.
3) Detector = RMS
4) Trace mode = Max hold
5) Sweep time = Auto couple
6) Number of sweep points ≥ 2 × span / RBW
7) Allow trace to fully stabilize.

Notes:

1. On a test site, the EUT shall be placed at 80 cm height on a turn table, and in the position close To normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to Correspond to the fundamental frequency of the transmitter.
3. The turntable is rotated through 360°, and the receiving antenna scans in order to determine the Level of the maximized emission.
4. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
5. The maximum signal level detected by the measuring receiver shall be noted.
6. The EUT was replaced by half-wave dipole (1 ㎓ below) or horn antenna (1 ㎓ above) connected to a signal generator.
7. The test antenna shall be raised and lowered through the specified range of height to ensure that The maximum signal is received.
8. The input signal to the substitution antenna shall be adjusted to the level that produces a level Detected by the measuring corrected for the change of input attenuator setting of the measuring Receiver.
9. The input level to the substitution antenna shall be recorded as power level in ㏈m, corrected for Any change of input attenuator setting of the measuring receiver.
10. The measurement shall be repeated with the test antenna and the substitution antenna Orientated for horizontal polarization.

Test results (Above 1 000 ㎒)

Test mode : WCDMA850
Frequency(㎒) : 826.4
Channel : 4132

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
RMC	1 652.54	V	5.74	5.36	-60.38	-60.00	-13.00	47.00
	2 479.08	V	6.27	6.64	-56.93	-57.30	-13.00	44.30
	3 305.63	H	7.61	7.67	-57.84	-57.90	-13.00	44.90

Test mode : WCDMA850
Frequency(㎒) : 836.4
Channel : 4182

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
RMC	1 672.04	V	5.73	5.40	-59.23	-58.90	-13.00	45.90
	2 509.08	V	6.31	6.64	-57.87	-58.20	-13.00	45.20
	3 345.13	V	7.69	7.72	-58.87	-58.90	-13.00	45.90

Test mode : WCDMA850
Frequency(㎒) : 846.6
Channel : 4233

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
RMC	1 692.54	V	5.72	5.44	-59.88	-59.60	-13.00	46.60
	2 539.59	V	6.36	6.73	-59.03	-59.40	-13.00	46.40
	3 385.63	V	7.77	7.77	-60.00	-60.00	-13.00	47.00

Note.
1. Limit Calculation(dBm)= 43 + 10log($P_{[Watts]}$) [dBc]

Test mode : WCDMA1900
Frequency(㎒) : 1 852.4
Channel : 9262

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
RMC	3 704.00	V	8.20	8.15	-61.65	-61.60	-13.00	48.60
	5 557.00	V	10.42	10.05	-62.07	-61.70	-13.00	48.70
	7 409.00	V	11.75	11.63	-57.22	-57.10	-13.00	44.10

Test mode : WCDMA1900
Frequency(㎒) : 1 880
Channel : 9400

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
RMC	3 760.00	V	8.26	8.24	-60.52	-60.50	-13.00	47.50
	5 640.50	V	10.46	10.18	-60.28	-60.00	-13.00	47.00
	7 520.00	V	12.02	11.83	-56.29	-56.10	-13.00	43.10

Test mode : WCDMA1900
Frequency(㎒) : 1 907.6
Channel : 9538

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
RMC	3 815.00	V	8.32	8.21	-60.71	-60.60	-13.00	47.60
	5 722.00	V	10.49	10.44	-59.85	-59.80	-13.00	46.80
	7 631.00	V	12.13	11.92	-55.71	-55.50	-13.00	42.50

Note.
1. Limit Calculation(㏈m)= 43 + 10log($P_{[Watts]}$) [㏈c]

7. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal Generator	R&S	SMB100A	176206	19.01.25	20.01.25
High pass Filter	Wainwright Instruments GmbH	WHKX3.0/18G-12SS	44	19.01.25	20.01.25
High pass Filter	Wainwright Instruments GmbH	WHKX1.0/1.5S-10SS	14	19.01.25	20.01.25
Attenuator	Weinschel ENGINEERING	10	AJ1239	19.05.14	20.05.14
Attenuator	API Inmet	40AH2W-10	12	19.05.15	20.05.15
Spectrum Analyzer	AGILENT	N9040B	MY57010132	19.07.31	20.07.31
Amplifier	SONOMA INSTRUMENT	317	321041	19.01.04	20.01.04
Amplifier	L-3 Narda-MITEQ	AMF-7D-01001800-22-10P	2031196	19.02.21	20.02.21
Amplifier	L-3 Narda-MITEQ	JS44-18004000-33-8P	2000997	19.08.01	20.08.01
Bilog Antenna	Teseq GmbH	CBL 6143A	35039	20.05.21	21.05.21
Biconical VHF-UHF Broadband Antenna	SCHWARZBECK	VUBA9117	275	19.04.13	20.04.13
Horn Antenna	ETS.lindgren	3117	161225	19.05.22	20.05.22
Horn Antenna	ETS.lindgren	3117-PA	00161083	18.09.19	19.09.19
Horn Antenna	ETS.lindgren	3116	00086635	19.05.09	20.05.09
Horn Antenna	ETS.lindgren	3116	00086632	19.05.09	20.05.09
Antenna Mast	MATURO	EAS 1.5	042/8941211	N/A	N/A
Antenna Mast	MATURO	EAS 1.5	043/8941211	N/A	N/A
Turn Table	MATURO	TT 0.8 PF	041/8941211	N/A	N/A
Cable Assembly	Radiall	R286303620	1649.241	N/A	N/A
Cable Assembly	Radiall	TESTPRO 3	-	N/A	N/A

End of test report