RF TEST REPORT

Test item	:	DIGITAL CAR AVN SYSTEM
Model No.	:	ATC41F2AN
Order No.	:	DTNC1505-02549
Date of receipt	:	2015-05-22
Test duration	:	2015-07-20 ~ 2015-07-24
Date of issue	:	2015-07-27
Use of report	:	FCC Original Grant

Applicant : HYUNDAI MOBIS CO., LTD.
203 Teheran-ro, Gangnam-gu, Seoul, Korea, 135-977

Test laboratory : DT&C Co., Ltd.
42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935

Test specification	:	FCC Part 27
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:

Engineer
Jaejin Lee

Reviewed by:

Technical Manager
Geunki Son

Test Report Version

Test Report No.	Date	Description
DRTFCC1507-0175	Jul. 27, 2015	Initial issue

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1. GENERAL INFORMATION

Applicant Name: HYUNDAI MOBIS CO., LTD.

Address: 203 Teheran-ro, Gangnam-gu, Seoul, Korea, 135-977

FCC ID	**:**	TQ8-ATC41F2AN
FCC Classification	**:**	PCS Licensed Transmitter (PCB)
EUT Type	**:**	DIGITAL CAR AVN SYSTEM
Model Name	**:**	ATC41F2AN
Add Model Name	**:**	N/A
Supplying power	**:**	DC 14.4V
Antenna Type	**:**	External Antenna

Mode	Tx Frequency (MHz)	Emission Designator	Modulation	ERP & EIRP	
				Max power(dBm)	Max power(W)
LTE Band 13	779.5 ~ 784.5	4M49G7D	QPSK	23.58	0.228
LTE Band 13	779.5 ~ 784.5	4M49W7D	16QAM	22.41	0.174
LTE Band 13	782	8M94G7D	QPSK	23.37	0.217
LTE Band 13	782	8M92W7D	16QAM	22.52	0.179
LTE Band 4	1710.7 ~ 1754.3	1M09G7D	QPSK	24.65	0.292
LTE Band 4	1710.7 ~ 1754.3	1M09W7D	16QAM	23.72	0.236
LTE Band 4	1711.5 ~ 1753.5	2M68G7D	QPSK	24.60	0.288
LTE Band 4	1711.5 ~ 1753.5	2M69W7D	16QAM	23.41	0.219
LTE Band 4	1712.5 ~ 1752.5	4M48G7D	QPSK	24.19	0.262
LTE Band 4	1712.5 ~ 1752.5	4M48W7D	16QAM	23.53	0.225
LTE Band 4	1715 ~ 1750	8M95G7D	QPSK	24.98	0.315
LTE Band 4	1715 ~ 1750	8M92W7D	16QAM	24.01	0.252
LTE Band 4	1717.5 ~ 1747.5	13M4G7D	QPSK	24.99	0.316
LTE Band 4	1717.5 ~ 1747.5	13M4W7D	16QAM	23.91	0.246
LTE Band 4	1720 ~ 1745	17M9G7D	QPSK	24.84	0.305
LTE Band 4	1720 ~ 1745	17M9W7D	16QAM	23.45	0.221

2. INTRODUCTION

2.1 EUT DESCRIPTION

The Equipment Under Test(EUT) supports CDMA / LTE with Bluetooth, WLAN.

2.2 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

2.3 TEST FACILITY

The 3M test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935. The site is constructed in conformance with the requirements.

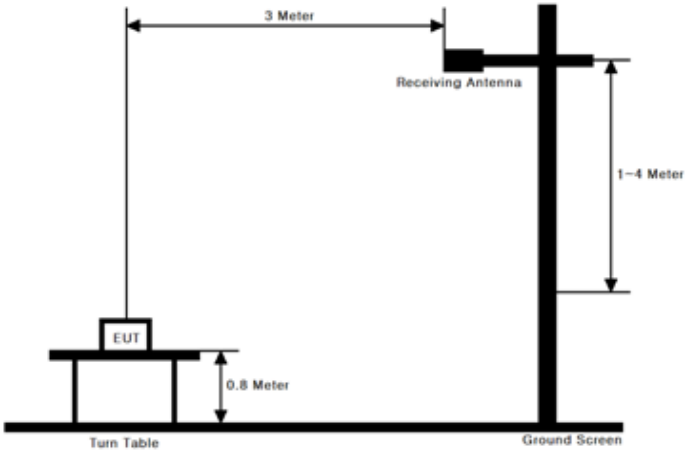
- Semi anechoic chamber registration Number: 165783 (FCC)

3. DESCRIPTION OF TESTS

3.1 ERP & EIRP

(Effective Radiated Power & Equivalent Isotropic Radiated Power)

Test Set-up



Test Procedure

- **ANSI / TIA-603-C-2004 - Section 2.2.17**
- **KDB971168 v02r02 - Section 5.2.1**

These measurements were performed at 3 &10 m test site. The equipment under test is placed on a non-conductive table 0.8 - meters above a turntable which is flush with the ground plane and 3 meters from the receive antenna.

Test setting

1. Set span to at least 1.5 times the OBW.
2. Set RBW = 1 - 5 % of the OBW, not to exceed 1 MHz.
3. Set VBW ≥ 3 x RBW.
4. Set number of points in sweep ≥ 2 x Span / RBW.
5. Sweep time = Auto couple.
6. Detector = RMS (power averaging).
7. If the EUT can be configured to transmit continuously (i.e., burst duty cycle ≥ 98 %), then set the trigger to free run.
8. If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle < 98 %), 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.
   Ensure that the sweep time is less than or equal to the transmission burst duration.
9. Trace average at least 100 traces in power averaging (i.e., RMS) mode.
10. Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with the band limits set equal to the OBW band edges. If the instrument does not have a band 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.

The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer.

A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminal of the substitute antenna is measured.

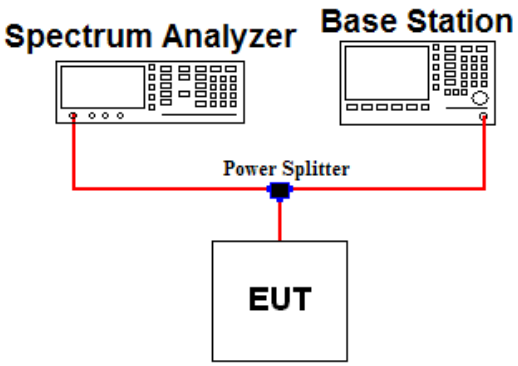
The ERP / EIRP is calculated using the following formula:

ERP / EIRP = The conducted power at the substitute antenna`s terminal [dBm] + Substitute Antenna gain [dBd for ERP , dBi for EIRP]

For readings above 1 GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn antenna and an isotropic antenna are taken into consideration.

3.2 PEAK TO AVERAGE RATIO

Test set-up



Test Procedure

- **KDB971168 v02r02 - Section 5.7.1**

A peak to average ratio measurement is performed at the conducted port of the EUT.
The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The present of time the signal spends at or above the level defines the probability for that particular power level.

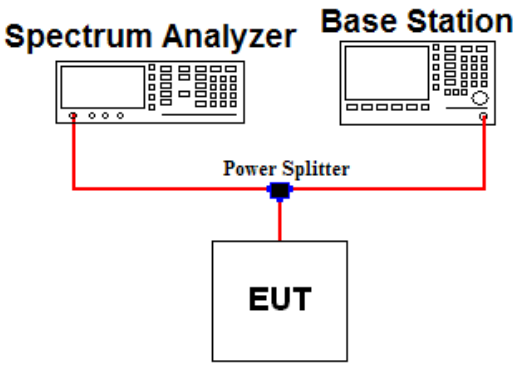
Test setting

The spectrum Analyzer`s CCDF measurement function is enabled.

1. Set resolution/measurement bandwidth ≥ Signal`s occupied bandwidth.
2. Set the number of counts to a value that stabilizes the measured CCDF curve
3. Set the measurement interval as follows:
   1) For continuous transmissions, set to 1 ms.
   2) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
4. Record the maximum PAPR level associated with a probability of 0.1 %

3.3 OCCUPIED BANDWIDTH.

Test set-up



Test Procedure

- **KDB971168 v02r02 - Section 4.2**

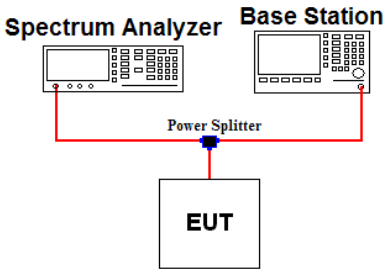
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power of a given emission. And worst case data are reported in the plot.

Test setting

1. The signal analyzer`s automatic bandwidth measurement capability was used to perform the 99 % occupied bandwidth and the 26 dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 - 5 % of the expected OBW & VBW ≥ 3 X RBW
3. Detector = Peak
4. Trance mode = Max hold
5. Sweep = Auto couple
6. The trace was allowed to stabilize
7. If necessary, step 2 - 6 were repeated after changing the RBW such that it would be within 1 - 5 % of the 99 % occupied bandwidth observed in step 6.

3.4 BAND EDGE EMISSIONS (Conducted)

Test set-up



Test Procedure

- **KDB971168 v02r02 - Section 6.0**

All out of band emissions are measured by means of a calibrated spectrum analyzer. The EUT was setup to maximum output power at its lowest and highest channel with all bandwidths, modulations and RB configurations.

The power of any spurious emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB or requirements on note 2 in case of band 7 and 41.

Test setting

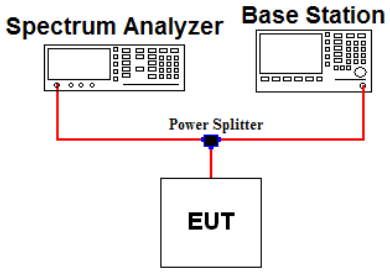
1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW ≥ 1 % of the emission bandwidth or 2 % of the emission bandwidth (refer to note 2)
4. VBW ≥ 3 X RBW
5. Detector = RMS & Trace mode = Max hold
6. Sweep time = Auto couple or 1 s for band edge
7. Number of sweep point ≥ 2 X span / RBW
8. The trace was allowed to stabilize

Note 1: In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of **at least one percent** of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

Note 2: For part 27.53(m) (4) the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 MHz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 MHz and X MHz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X MHz from the channel edge, where X is the greater of 6 MHz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. For mobile digital stations, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of **at least two percent** may be employed, except when the 1 MHz band is 2495 - 2496 MHz, in which case a resolution bandwidth of **at least one percent** may be employed.

3.5 SPURIOUS AND HARMONIC EMISSIONS (Conducted)

Test set-up



Test Procedure

- **KDB971168 v02r02 - Section 6.0**

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The EUT was setup to maximum output power at its low, middle, high channel with all bandwidths, modulations and RB configurations. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

The power of any spurious emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB or 55 + 10 log(P) in case of band 7 and 41.

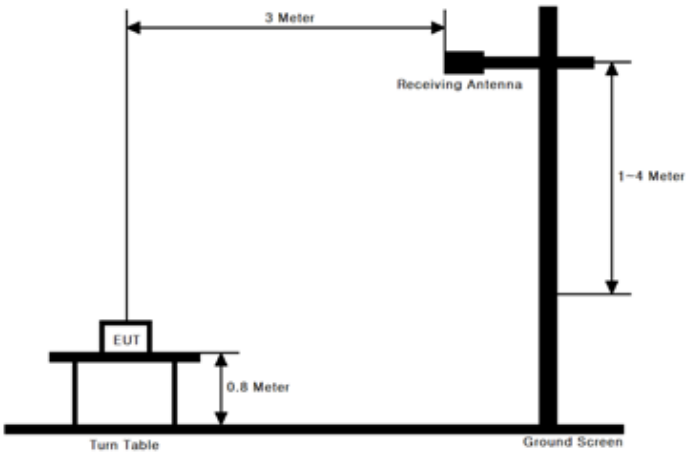
Test setting

1. RBW = 100 KHz or 1 MHz & VBW ≥ 3 X RBW (Refer to Note 1)
2. Detector = RMS & Trace mode = Max hold
3. Sweep time = Auto couple
4. Number of sweep point ≥ 2 X span / RBW
5. The trace was allowed to stabilize

Note 1: Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for Part 22 and 1 MHz or greater for Part 24, 27.

3.6 UNDESIRABLE EMISSIONS (Radiated)

Test Set-up



Test Procedure

- **ANSI / TIA-603-C-2004 - Section 2.2.12**
- **KDB971168 v02r02 - Section 5.8**

These measurements were performed at 3 & 10m test site. The equipment under test is placed on a non-conductive table 0.8 - meters above a turntable which is flush with the ground plane and 3 meters from the receive antenna.

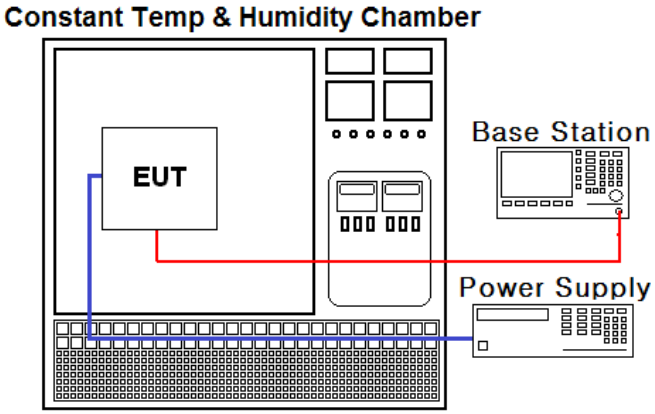
Test setting

1. RBW = 100 kHz for below 1 GHz and 1 MHz for above 1 GHz & VBW ≥ 3 x RBW
2. Detector = Peak & Trace mode = Max hold
3. Sweep time = Auto couple
4. Number of sweep point ≥ 2 x Span / RBW
5. The trace was allowed to stabilize

The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer.
For radiated power measurements below 1 GHz, a half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading.
For radiated power measurements above 1 GHz, a Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading. The difference between the gain of the horn and an isotropic antenna are taken into consideration.
This measurement was performed with the EUT oriented in 3 orthogonal axis.

3.7 FREQUENCY STABILITY

Test Set-up



Test Procedure

- **ANSI / TIA-603-C-2004**
- **KDB971168 v02r02 - Section 9.0**

The frequency stability of the transmitter is measured by:

a.) **Temperature:**
The temperature is varied from - 30 °C to + 50 °C using an environmental chamber.

b.) **Primary Supply Voltage:**
The primary supply voltage is varied from 85 % to 115 % of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Specification:

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block for Part 24. The frequency stability of the transmitter shall be maintained within ± 0.000 25 % (± 2.5 ppm) of the center frequency for Part 22.

Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature.
   (25 °C to provide a reference)

2. The equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.

3. Frequency measurements are made at 10 °C intervals ranging from - 30 °C to + 50 °C.
   A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

4. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal. Date (yy/mm/dd)	S/N
MXA Signal Analyzer	Agilent Technologies	N9020A	15/01/19	16/01/19	MY46471096
RadioCommunication Analyzer	Anritsu	MT8820C	15/01/09	16/01/09	6201274516
Dynamic Measurement DC Source	Agilent Technologies	66332A	15/01/22	16/01/22	GB37470200
Digital Multimeter	FLUKE	17B	15/04/27	16/04/27	26030065WS
Thermohygrometer	BODYCOM	BJ5478	15/02/26	16/02/26	1209
2W 3dB Attenuator	SMAJK	SMAJK-2-3	14/10/21	15/10/21	3
Vector Signal Generator	Rohde Schwarz	SMBV100A	15/01/06	16/01/06	255571
Signal Generator	Rohde Schwarz	SMF100A	15/06/29	16/06/29	102341
Loop Antenna	Schwarzbeck	FMZB1513	14/04/29	16/04/29	1513-128
TRILOG Broadband Test-Antenna	SCHWARZBECK	VULB 9160	14/04/04	16/04/04	3357
Dipole Antenna	Schwarzbeck	VHA9103	13/10/24	15/10/24	2116
Dipole Antenna	Schwarzbeck	VHA9103	14/04/01	16/04/01	2117
Dipole Antenna	Schwarzbeck	UHA9105	13/10/24	15/10/24	2261
Dipole Antenna	Schwarzbeck	UHA9105	14/04/01	16/04/01	2262
HORN ANT	ETS	3115	15/02/09	17/02/09	00021097
HORN ANT	ETS	3117	14/05/12	16/05/12	140394
Low Noise Pre Amplifier	TSJ	MLA-010K01-B01-27	15/04/09	16/04/09	1844538
Amplifier	EMPOWER	BBS3Q7ELU	14/09/12	15/09/12	1020
Amplifier	RF Bay Inc	MPA-40-40	15/05/08	16/05/08	21151801
Amplifier (30dB)	Agilent	8449B	14/11/06	15/11/06	3008A02108
High-pass filter	Wainwright	WHKX12-935-1000-15000-40SS	14/09/11	15/09/11	7
High-pass filter	Wainwright	WHKX12-2580-3000-18000-80SS	14/09/11	15/09/11	3

5. SUMMARY OF TEST RESULTS

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Status Note 1
2.1046	Conducted Output Power	N/A	Conducted	C
2.1049	Occupied Bandwidth	N/A		NA Note 2
24.232(d)	Peak to Average Ratio	< 13 dB		NA Note 2
2.1051 27.53(c.2) 27.53(h)	Undesirable Emissions at band edge and for all out-of-band emissions	< 43 + 10 $\log_{10}$(P) dB		NA Note 2
27.53(c.4)	Undesirable Emissions in 763 ~ 775MHz & 793 ~ 805MHz	< 65 + 10 $\log_{10}$(P) dB		NA Note 2
2.1055 27.54	Frequency Stability	Fundamental emissions must stay within authorized frequency block		NA Note 2
27.50(b.10)	Effective Radiated Power	< 3 W ERP	Radiated	C
27.50(d.4)	Equivalent Isotropic Radiated Power	< 1 W EIRP		C
2.1051 27.53(c.2) 27.53(h)	Undesirable Emissions at band edge and for all out-of-band emissions	< 43 + 10 $\log_{10}$(P) dB		C
27.53(f)	Undesirable Emissions in 1559 ~ 1610MHz	< -70 dBW/MHz (- 40 dBm/MHz)		C
27.53(c.4)	Undesirable Emissions in 763 ~ 775MHz & 793 ~ 805MHz	< 65 + 10 $\log_{10}$(P) dB		C

Note1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

Note 2: These test items were not performed because this device uses the granted module.
(FCCID: YZP-VL1000)
Please refer to the test report of the granted module.
The module test report number: DRTFCC1408-1021(1)

The sample was tested according to the following specification:
ANSI/TIA/EIA-603-C-2004 and KDB 971168 D01 v02r02

6. SAMPLE CALCULATION

A. Emission Designator

LTE Band 13(QPSK)

Emission Designator = **8M94G7D**

LTE Band 13(16QAM)

Emission Designator = **8M92W7D**

LTE Band 4(QPSK)

Emission Designator = **17M88G7D**

LTE Band 4(16QAM)

Emission Designator = **17M87W7D**

Note: Emission designators of the granted module were used.

B. EIRP Sample Calculation

Channel Bandwidth (MHz)	Test Frequency (MHz)	Test Mode	RB Size/ Offset	Spectrum Reading Value(dBm)	EUT Axis	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain (dBi)	EIRP (dBm)	EIRP (W)
20	1720	QPSK	1/50	-18.21	Y	V	15.97	8.87	24.84	0.305

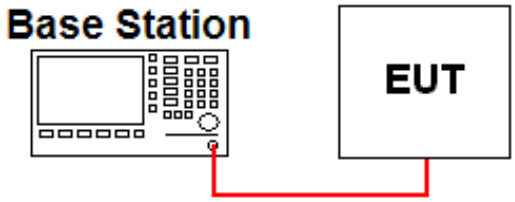
EIRP = @ Ant Terminal LEVEL(dBm) + Ant. Gain

1) The EUT mounted on a non-conductive turntable is 0.8 meter above test site ground level.
2) During the test, the turn table is rotated until the maximum signal is found.
3) Record the field strength meter's level.
4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
6) The signal generator output level with Ant. Gain is the rating of effective isotropic radiated power (EIRP).

7. TEST DATA

7.1 CONDUCTED OUTPUT POWER

A base station simulator was used to establish communication with the EUT. The base station simulator parameters were set to produce the maximum power from the EUT. This device was tested under all configurations and the highest power is reported. Conducted Output Powers of EUT are reported below.



▪ **Band 13**

Conducted Power [dBm]									
RB Alloc			1 RB			MID RB			FULL RB
B.W(MHz)	Freq.(MHz)	Modulation	LOW	MID	HIGH	LOW	MID	HIGH	
10	782	QPSK	23.00	22.97	22.74	21.73	21.91	21.85	21.58
		16QAM	22.40	22.22	22.18	20.78	20.97	20.92	20.63
5	779.5	QPSK	23.06	22.98	23.04	22.02	21.92	21.93	21.88
		16QAM	22.29	22.27	22.18	21.11	20.99	21.06	20.96
	784.5	QPSK	23.00	23.19	23.02	21.91	21.76	21.75	21.77
		16QAM	22.43	22.33	22.01	20.99	20.98	20.90	20.98

Note 1: The conducted output power was measured using the Anritsu MT8820C

Note 2: The number of Mid RB are used 25, 12 for 10, 5MHz B.W

▪ **Band 4**

Conducted Power [dBm]									
RB Alloc			1 RB			MID RB			FULL RB
B.W(MHz)	Freq.(MHz)	Modulation	LOW	MID	HIGH	LOW	MID	HIGH	
20	1720	QPSK	23.63	23.86	23.82	22.21	22.22	22.25	22.30
		16QAM	22.62	22.91	22.94	21.26	21.27	21.41	21.34
	1732.5	QPSK	23.69	23.78	23.65	22.31	22.54	22.31	22.45
		16QAM	22.91	23.13	22.68	21.43	21.45	21.53	21.63
	1745	QPSK	23.79	24.10	23.87	22.48	22.59	22.56	22.61
		16QAM	23.23	23.29	23.02	21.59	21.56	21.66	21.62
15	1717.5	QPSK	23.65	23.83	23.62	22.16	22.37	22.41	22.15
		16QAM	22.54	22.82	22.78	21.26	21.40	21.30	21.18
	1732.5	QPSK	23.69	23.78	23.81	22.54	22.51	22.42	22.48
		16QAM	22.85	22.99	23.01	21.72	21.70	21.55	21.55
	1747.5	QPSK	23.84	24.04	23.85	22.71	22.71	22.59	22.58
		16QAM	23.01	23.27	23.04	21.69	21.79	21.87	21.68
10	1715	QPSK	23.30	23.77	23.64	22.09	22.37	22.58	22.16
		16QAM	22.51	22.82	22.91	21.24	21.39	21.49	21.15
	1732.5	QPSK	23.96	23.76	23.88	22.69	22.64	22.55	22.37
		16QAM	22.94	22.89	22.95	21.66	21.78	21.52	21.58
	1750	QPSK	23.95	23.97	23.95	22.75	22.77	22.62	22.59
		16QAM	23.08	23.09	22.98	21.79	21.88	21.73	21.67
5	1712.5	QPSK	23.43	23.27	23.66	22.33	22.28	22.24	22.15
		16QAM	22.69	22.50	22.74	21.27	21.37	21.32	21.23
	1732.5	QPSK	23.76	23.74	23.92	22.72	22.65	22.65	22.62
		16QAM	22.90	22.86	22.89	21.86	21.87	21.82	21.75
	1752.5	QPSK	24.25	23.98	24.21	22.84	22.81	22.80	22.73
		16QAM	23.06	23.04	23.06	21.91	21.94	21.87	21.81
3	1711.5	QPSK	23.47	23.41	23.29	22.27	22.13	22.17	22.12
		16QAM	22.72	22.56	22.43	21.28	21.25	21.32	21.36
	1732.5	QPSK	23.91	23.82	23.79	22.81	22.75	22.76	22.70
		16QAM	23.03	22.89	22.94	21.85	21.90	21.79	21.84
	1753.5	QPSK	23.96	23.84	24.22	22.85	22.79	22.82	22.76
		16QAM	23.10	22.99	23.02	21.89	21.95	21.84	21.88
1.4	1710.7	QPSK	23.36	23.37	23.41	23.30	23.33	23.32	22.32
		16QAM	22.52	22.52	22.51	22.45	22.49	22.48	21.51
	1732.5	QPSK	23.82	23.74	23.74	23.73	23.70	23.67	22.71
		16QAM	23.11	22.80	22.85	22.82	22.70	22.77	21.89
	1754.3	QPSK	23.92	23.93	23.95	23.80	23.91	23.89	22.90
		16QAM	22.94	23.01	23.23	22.86	22.88	22.87	22.01

Note 1: The conducted output power was measured using the Anritsu MT8820C

Note 2: The number of Mid RB are used 50, 36, 25, 12, 8, 3 for 20, 15, 10, 5, 3, 1.4 MHz B.W

7.2 OCCUPIED BANDWIDTH

- Not Applicable

7.3 PEAKTOAVERAGERATIO

- Not Applicable

7.4 BAND EDGE EMISSIONS (Conducted)

- Not Applicable

7.5 SPURIOUS AND HARMONICS EMISSIONS (Conducted)

- Not Applicable

7.6 EFFECTIVE RADIATED POWER (LTE Band 13)

Channel Bandwidth (MHz)	Test Frequency (MHz)	Test Mode	RB Size/ Offset	EUT Axis	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain (dBd)	ERP (dBm)	ERP (W)
10	782	QPSK	1/0	Y	V	22.03	1.34	23.37	0.217
		16QAM	1/0	Y	V	21.18	1.34	22.52	0.179
5	779.5	QPSK	1/0	Y	V	21.23	1.34	22.57	0.181
		16QAM	1/0	Y	V	20.34	1.34	21.68	0.147
	784.5	QPSK	1/12	Y	V	22.24	1.34	23.58	0.228
		16QAM	1/0	Y	V	21.07	1.34	22.41	0.174

Note: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

7.7 EQUIVALENT ISOTROPIC RADIATED POWER (LTE Band 4)

Channel Bandwidth (MHz)	Test Frequency (MHz)	Test Mode	RB Size/ Offset	EUT Axis	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain (dBi)	EIRP (dBm)	EIRP (W)
20	1720	QPSK	1/50	Y	V	15.97	8.87	24.84	0.305
		16QAM	1/50	Y	V	14.58	8.87	23.45	0.221
	1732.5	QPSK	1/50	Y	V	15.27	8.88	24.15	0.260
		16QAM	1/50	Y	V	14.51	8.88	23.39	0.218
	1745	QPSK	1/50	Y	V	13.74	8.90	22.64	0.184
		16QAM	1/50	Y	V	12.98	8.90	21.88	0.154
15	1717.5	QPSK	1/36	Y	V	16.12	8.87	24.99	0.316
		16QAM	1/36	Y	V	15.04	8.87	23.91	0.246
	1732.5	QPSK	1/74	Y	V	14.25	8.88	23.13	0.206
		16QAM	1/74	Y	V	12.98	8.88	21.86	0.153
	1747.5	QPSK	1/36	Y	V	13.87	8.90	22.77	0.189
		16QAM	1/36	Y	V	11.93	8.90	20.83	0.121
10	1715	QPSK	1/25	Y	V	15.61	8.87	24.48	0.281
		16QAM	1/49	Y	V	14.43	8.87	23.30	0.214
	1732.5	QPSK	1/0	Y	V	16.10	8.88	24.98	0.315
		16QAM	1/0	Y	V	15.13	8.88	24.01	0.252
	1750	QPSK	1/25	Y	V	14.97	8.90	23.87	0.244
		16QAM	1/25	Y	V	13.76	8.90	22.66	0.185
5	1712.5	QPSK	1/24	Y	V	15.33	8.86	24.19	0.262
		16QAM	1/24	Y	V	14.09	8.86	22.95	0.197
	1732.5	QPSK	1/24	Y	V	15.31	8.88	24.19	0.262
		16QAM	1/0	Y	V	14.65	8.88	23.53	0.225
	1752.5	QPSK	1/0	Y	V	15.01	8.90	23.91	0.246
		16QAM	1/0	Y	V	13.90	8.90	22.80	0.191
3	1711.5	QPSK	1/0	Y	V	15.29	8.86	24.15	0.260
		16QAM	1/0	Y	V	14.49	8.86	23.35	0.216
	1732.5	QPSK	1/0	Y	V	15.72	8.88	24.60	0.288
		16QAM	1/0	Y	V	14.53	8.88	23.41	0.219
	1753.5	QPSK	1/14	Y	V	15.21	8.90	24.11	0.258
		16QAM	1/0	Y	V	14.27	8.90	23.17	0.207
1.4	1710.7	QPSK	1/5	Y	V	15.48	8.86	24.34	0.272
		16QAM	1/0	Y	V	14.36	8.86	23.22	0.210
	1732.5	QPSK	1/0	Y	V	15.77	8.88	24.65	0.292
		16QAM	1/0	Y	V	14.84	8.88	23.72	0.236
	1754.3	QPSK	1/5	Y	V	15.32	8.90	24.22	0.264
		16QAM	1/5	Y	V	14.45	8.90	23.35	0.216

Note: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above

7.8 UNDESIRABLE EMISSIONS (RADIATED)

7.8.1 UNDESIRABLE EMISSIONS (LTE Band 13)

B.W (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	EUT Axis	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain(dBd)	Result		Limit (dBc)
									(dBm)	(dBc)	
10	782	1/0	QPSK	1555.26	X	H	-54.29	6.53	-47.76	71.13	36.37
				3110.60	Y	V	-48.04	7.63	-40.41	63.78	
		1/0	16QAM	1555.24	X	H	-54.81	6.53	-48.28	70.80	35.52
				3110.62	Y	V	-48.91	7.63	-41.28	63.80	
5	779.5	1/0	QPSK	1554.71	X	H	-56.82	6.53	-50.29	72.86	35.57
				3109.42	Y	V	-51.76	7.62	-44.14	66.71	
		1/0	16QAM	1554.66	X	H	-57.26	6.53	-50.73	72.41	34.68
				3109.42	Y	V	-52.50	7.62	-44.88	66.56	
	784.5	1/12	QPSK	3137.69	Y	H	-55.03	7.65	-47.38	70.96	36.58
				-	-	-	-	-	-	-	
		1/0	16QAM	3129.52	Y	V	-54.75	7.64	-47.11	69.52	35.41
				-	-	-	-	-	-	-	

Note 1: Limit Calculation = 43 + $10\log_{10}$(P[Watts])

Note 2: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

Note 3: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

7.8.2 UNDESIRABLE EMISSIONS IN 763 ~ 775 MHz & 793 ~ 805 MHz (LTE Band 13)

B.W (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	EUT Axis	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain(dBd)	Result		Limit (dBc)
									(dBm)	(dBc)	
10	782	50/0	QPSK	774.85	Y	V	-40.48	1.34	-39.14	62.51	58.37
				793.10	Y	V	-38.84	1.35	-37.49	60.86	
5	779.5	25/0	QPSK	774.94	Y	V	-39.18	1.34	-37.84	60.41	57.57
				-	-	-	-	-	-	-	
	784.5	25/0	QPSK	793.16	Y	V	-43.21	1.35	-41.86	65.44	58.58
				-	-	-	-	-	-	-	

Note 1: This device was tested under all modulations, RB size and RB offsets and the worst case data are reported in the table above.

Note 2: For part 27.53(c)(4) measurement, the FCC limit is 65 + $10\log_{10}(P_{[Watts]})$ in a 6.25 kHz bandwidth. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth, the result was adjusted by $10\log_{10}$ (10 kHz / 6.25 kHz) = 2.04 dB.

Note 3: No other spurious and harmonic emissions were reported greater than listed emissions above table.

7.8.3 UNDESIRABLE EMISSIONS IN 1559 ~ 1610 MHz (LTE Band 13)

B.W (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	EUT (Axis)	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain(dBi)	Result (dBm)	Margin (dB)	Limit (dBm/MHz)
10	782	1/24	QPSK	1563.97	X	H	-68.04	8.69	-59.35	19.35	-40.00
		-	-	-	-	-	-	-	-	-	
5	779.5	1/24	QPSK	1563.36	X	H	-65.98	8.69	-57.29	17.29	
		-	-	-	-	-	-	-	-	-	
	784.5	1/12	QPSK	1568.96	X	H	-66.53	8.70	-57.83	17.83	
		-	-	-	-	-	-	-	-	-	

Note 1: This device was tested under all modulations, RB size and RB offsets and the worst case data are reported in the table above.
Note 2: No other spurious and harmonic emissions were reported greater than listed emissions above table.

7.8.4 UNDESIRABLE EMISSIONS (LTE Band 4)

B.W (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	EUT Axis	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain(dBi)	Result		Limit (dBc)
									(dBm)	(dBc)	
20	1720	1/50	QPSK	3440.02	Z	H	-51.26	10.06	-41.20	66.04	37.84
				5160.18	Y	V	-49.47	10.75	-38.72	63.56	
				8600.58	Z	H	-45.46	11.35	-34.11	58.95	
		1/50	16QAM	5440.29	Z	H	-49.28	10.87	-38.41	61.86	36.45
				5160.20	Y	V	-49.72	10.75	-38.97	62.42	
				8600.56	Z	H	-45.78	11.35	-34.43	57.88	
	1732.5	1/50	QPSK	3465.24	Z	H	-46.53	10.08	-36.45	60.60	37.15
				5197.70	Y	V	-47.80	10.77	-37.03	61.18	
				8662.98	Z	H	-45.35	11.35	-34.00	58.15	
		1/50	16QAM	3465.25	Z	H	-46.79	10.08	-36.71	60.10	36.39
				5197.70	Y	V	-48.12	10.77	-37.35	60.74	
				8663.05	Z	H	-45.39	11.35	-34.04	57.43	
	1745	1/50	QPSK	3490.22	Z	H	-43.97	10.10	-33.87	56.51	35.64
				5235.30	Y	V	-48.12	10.78	-37.34	59.98	
				8725.26	Z	H	-48.32	11.35	-36.97	59.61	
		1/50	16QAM	3490.25	Z	H	-43.93	10.10	-33.83	55.71	34.88
				5235.30	Y	V	-49.78	10.78	-39.00	60.88	
				8725.47	Z	H	-47.91	11.35	-36.56	58.44	
15	1717.5	1/36	QPSK	3434.67	Z	H	-48.03	10.05	-37.98	62.97	37.99
				5151.71	Y	V	-50.82	10.75	-40.07	65.06	
				8586.57	Z	H	-46.36	11.35	-35.01	60.00	
		1/36	16QAM	3434.63	Z	H	-48.07	10.05	-38.02	61.93	36.91
				5151.69	Y	V	-50.60	10.75	-39.85	63.76	
				8586.57	Z	H	-46.06	11.35	-34.71	58.62	
	1732.5	1/74	QPSK	3478.40	Z	H	-49.19	10.09	-39.10	62.23	36.13
				5217.40	Y	V	-49.98	10.78	-39.20	62.33	
				8695.89	Z	H	-46.36	11.35	-35.01	58.14	
		1/74	16QAM	3478.23	Z	H	-49.06	10.09	-38.97	60.83	34.86
				5217.40	Y	V	-50.31	10.78	-39.53	61.39	
				8696.60	Z	H	-45.81	11.35	-34.46	56.32	
	1747.5	1/36	QPSK	3494.69	Z	H	-42.55	10.11	-32.44	55.21	35.77
				5241.98	Y	V	-46.05	10.79	-35.26	58.03	
				8736.80	Z	H	-46.81	11.35	-35.46	58.23	
		1/36	16QAM	3493.57	Z	H	-42.79	10.10	-32.69	53.52	33.83
				5241.99	Y	V	-46.26	10.79	-35.47	56.30	
				8636.54	Z	H	-47.62	11.35	-36.27	57.10	

B.W (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	EUT Axis	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain(dBi)	Result		Limit (dBc)
									(dBm)	(dBc)	
10	1715	1/25	QPSK	3430.30	Z	H	-47.87	10.05	-37.82	62.30	37.48
				5145.35	Y	V	-50.51	10.74	-39.77	64.25	
				8575.70	Z	H	-46.65	11.35	-35.30	59.78	
		1/49	16QAM	3438.70	Z	H	-50.47	10.06	-40.41	63.71	36.30
				5158.20	Y	V	-51.41	10.75	-40.66	63.96	
				8597.12	Z	H	-46.76	11.35	-35.41	58.71	
	1732.5	1/0	QPSK	3456.15	Z	H	-45.58	10.07	-35.51	60.49	37.98
				5184.50	Y	V	-49.29	10.76	-38.53	63.51	
				8640.34	Z	H	-45.48	11.35	-34.13	59.11	
		1/0	16QAM	3456.20	Z	H	-46.20	10.07	-36.13	60.14	37.01
				5184.30	Y	V	-49.12	10.76	-38.36	62.37	
				8640.47	Z	H	-46.10	11.35	-34.75	58.76	
	1750	1/25	QPSK	3500.15	Z	H	-43.85	10.11	-33.74	57.61	36.87
				5250.18	Y	V	-45.81	10.79	-35.02	58.89	
				8750.40	Z	H	-48.51	11.36	-37.15	61.02	
		1/25	16QAM	3500.05	Z	H	-43.30	10.11	-33.19	55.85	35.66
				5240.24	Y	V	-46.82	10.79	-36.03	58.69	
				8750.38	Z	H	-48.87	11.36	-37.51	60.17	
5	1712.5	1/36	QPSK	3430.00	Z	H	-48.92	10.05	-38.87	63.06	37.19
				5144.93	Y	V	-50.19	10.74	-39.45	63.64	
				8573.58	Z	H	-46.99	11.35	-35.64	59.83	
		1/0	16QAM	3430.20	Z	H	-49.42	10.05	-39.37	62.32	35.95
				5143.96	Y	V	-50.31	10.74	-39.57	62.52	
				8573.13	Z	H	-46.64	11.35	-35.29	58.24	
	1732.5	1/24	QPSK	3469.20	Z	H	-46.90	10.08	-36.82	61.01	37.19
				5204.18	Y	V	-47.53	10.77	-36.76	60.95	
				8673.45	Z	H	-45.18	11.35	-33.83	58.02	
		1/12	16QAM	3460.60	Z	H	-45.45	10.08	-35.37	58.90	36.53
				5191.95	Y	V	-48.11	10.76	-37.35	60.88	
				8651.60	Z	H	-45.40	11.35	-34.05	57.58	
	1752.5	1/0	QPSK	3500.70	Z	H	-43.25	10.11	-33.14	57.05	36.91
				5251.09	Y	V	-45.95	10.79	-35.16	59.07	
				8751.88	Z	H	-47.79	11.36	-36.43	60.34	
		1/0	16QAM	3500.70	Z	H	-43.77	10.11	-33.66	56.46	35.80
				5251.85	Y	V	-46.21	10.79	-35.42	58.22	
				8751.91	Z	H	-48.45	11.36	-37.09	59.89	

B.W (MHz)	Test Freq. (MHz)	RB Size/ Offset	Test Mode	Freq.(MHz)	EUT Axis	Ant Pol (H/V)	Level(dBm) @ Ant Terminal	TX Ant Gain(dBi)	Result		Limit (dBc)
									(dBm)	(dBc)	
3	1711.5	1/0	QPSK	3420.54	Z	H	-51.84	10.04	-41.80	65.95	37.15
				5130.59	Y	V	-50.28	10.74	-39.54	63.69	
				8551.14	Z	H	-46.85	11.35	-35.50	59.65	
		1/0	16QAM	3420.47	Z	H	-52.33	10.04	-42.29	65.64	36.35
				5130.46	Y	V	-49.81	10.74	-39.07	62.42	
				8551.33	Z	H	-46.86	11.35	-35.51	58.86	
	1732.5	1/0	QPSK	3462.65	Z	H	-46.28	10.08	-36.20	60.80	37.60
				5193.65	Y	V	-46.42	10.77	-35.65	60.25	
				8656.24	Z	H	-45.54	11.35	-34.19	58.79	
		1/0	16QAM	3462.55	Z	H	-46.14	10.08	-36.06	59.47	36.41
				5193.85	Y	V	-46.76	10.77	-35.99	59.40	
				8656.30	Z	H	-45.46	11.35	-34.11	57.52	
	1753.5	1/14	QPSK	3509.50	Z	H	-47.76	10.10	-37.66	61.77	37.11
				5264.41	Y	V	-47.45	10.80	-36.65	60.76	
				8774.20	Z	H	-51.57	11.36	-40.21	64.32	
		1/0	16QAM	3504.30	Z	H	-45.66	10.11	-35.55	58.72	36.17
				5256.65	Y	V	-49.90	10.79	-39.11	62.28	
				8761.87	Z	H	-50.56	11.36	-39.20	62.37	
1.4	1710.7	1/5	QPSK	3422.40	Z	H	-51.78	10.04	-41.74	66.08	37.34
				5133.70	Y	V	-50.73	10.74	-39.99	64.33	
				8556.19	Z	H	-45.35	11.35	-34.00	58.34	
		1/0	16QAM	3420.40	Z	H	-51.44	10.04	-41.40	64.62	36.22
				5139.90	Y	V	-50.71	10.74	-39.97	63.19	
				8551.19	Z	H	-45.60	11.35	-34.25	57.47	
	1732.5	1/0	QPSK	3464.00	Z	H	-46.74	10.08	-36.66	61.31	37.65
				5196.18	Y	V	-46.28	10.77	-35.51	60.16	
				8660.42	Z	H	-46.43	11.35	-35.08	59.73	
		1/0	16QAM	3464.00	Z	H	-46.71	10.08	-36.63	60.35	36.72
				5196.19	Y	V	-46.45	10.77	-35.68	59.40	
				8660.42	Z	H	-46.48	11.35	-35.13	58.85	
	1754.3	1/5	QPSK	3509.60	Z	H	-47.90	10.10	-37.80	62.02	37.22
				5264.50	Y	V	-47.95	10.80	-37.15	61.37	
				8773.26	Z	H	-49.64	11.36	-38.28	62.50	
		1/5	16QAM	3509.50	Z	H	-48.26	10.10	-38.16	61.51	36.35
				5264.17	Y	V	-47.32	10.80	-36.52	59.87	
				8773.45	Z	H	-50.22	11.36	-38.86	62.21	

Note 1: Limit Calculation = 43 + $10\log_{10}$ (P[Watts])

Note 2: This device was tested under all bandwidths, modulations and RB configurations and the worst case data are reported in the table above.

Note 3: The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.