FCC Test Report

FCC ID	:	**MXF-WLTCS106**
Equipment	:	**B42/B43 TD-LTE/WiMAX Outdoor CPE**
Model No.	:	**WLTCS-106**
Brand Name	:	**Gemtek**
Applicant	:	**Gemtek Technology Co., Ltd.**
Address	:	**No. 15-1 Zhonghua Road, Hsinchu Industrial Park, Hukou, Hsinchu, Taiwan, 30352.**
Standard	:	**47 CFR FCC Part 90 Subpart Z**
Received Date	:	**Jul. 06, 2016**
Tested Date	:	**Sep. 13 ~ Sep. 14, 2016**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by: **Approved by:**

Along Chen / Assistant Manager **Gary Chang / Manager**

Testing Laboratory 2732

Table of Contents

Release Record

Report No.	Version	Description	Issued Date
FW3D1801-03	Rev. 01	Initial issue	Sep. 30, 2016

Summary of Test Results

FCC Rules	Test Items	Measured	Result
2.1046 / 90.1321	Equivalent Isotropically Radiated Power	Maximum EIRP: 6.823 W	Pass
2.1046 / 90.1321	Peak EIRP Power Density	Meet the requirement of limit	Pass
2.1053 / 90.1323	Radiated Emissions	Meet the requirement of limit	Pass
2.1051 / 90.1323	Conducted Emissions	Meet the requirement of limit	Pass
90.210	Emission Mask	Meet the requirement of limit	Pass
2.1049 / 90.1323	26dBc Bandwidth	Meet the requirement of limit	Pass
2.1055 / 90.213	Frequency Stability	Meet the requirement of limit	Pass

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

Operating Frequency	Channel Bandwidth: 20MHz: 3660 MHz ~ 3690 MHz
Modulation Type	QPSK, 16QAM (Uplink)
Duplex Mode	TDD
UE Category	Cat. 4
Release	9
H/W Version	Main board: WLTCS-100_V02 Daughter board: WLTFSR-115GN_B42_B43_V00A
S/W Version	01.01.02.015

1.1.2 Maximum EIRP & Emission Designator

Channel Bandwidth	Modulation	Maximum EIRP (W)	Emission Designator
20MHz	QPSK	6.823	17M9G7D
20MHz	16QAM	6.745	17M9W7D

1.1.3 Antenna Details

Ant. No.	Type	Gain (dBi)	Connector
1	Outdoor patch ant.	15	MHF

1.1.4 EUT Operational Condition

Power Supply Type	56Vdc from POE		
Operational Voltage	☒ Vnom (120 V)	☒ Vmax (138 V)	☒ Vmin (102 V)
Operational Climatic	☒ Tnom (20°C)	☒ Tmax (55°C)	☒ Tmin (-30°C)

1.1.5 Accessories

Accessories		
No.	**Equipment**	**Description**
1	POE	Brand Name: GOSPELL Model Name: G0720-560-027 Power Rating: I/P: 100-240Vac, 50/60Hz, 0.75A Max. O/P: 56Vdc, 0.27A
2	AC Power cord 1	AC 0.72m non-shielded cable w/o core
3	AC Power cord 2	AC 0.5m non-shielded cable w/o core

1.1.6 Operating Channel List

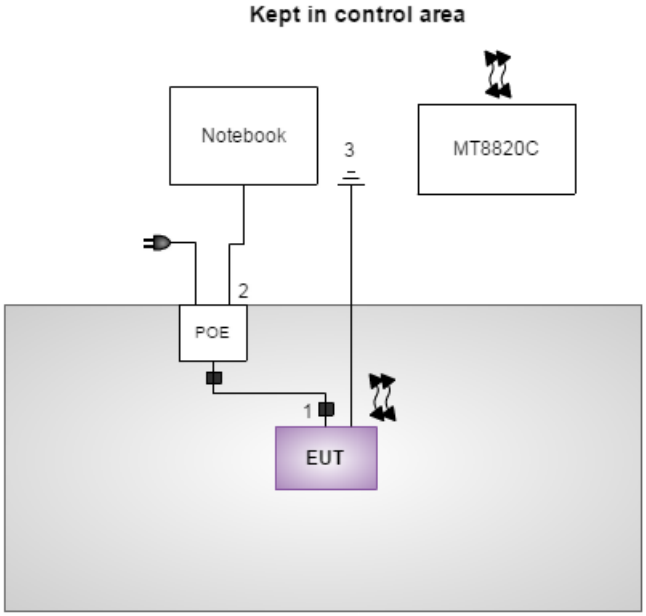
Channel Bandwidth (MHz)	Channel	Frequency (MHz)
20	44190	3660
20	44340	3675
20	44490	3690

1.2 Local Support Equipment List

Support Equipment List						
No.	**Equipment**	**Brand**	**Model**	**S/N**	**FCC ID**	**Signal cable / Length (m)**
1	Notebook	DELL	Latitude E6430	G3GB4X1	DoC	RJ45, 10m non-shielded

1.3 Test Setup Chart

Test Setup Diagram



1. RJ45, 1.5m non-shielded with 2 cores
2. RJ45, 10m non-shielded
3. Ground cable, 2m

1.4 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Dec. 13, 2015	Dec. 12, 2016
Receiver	R&S	ESR3	101658	Nov. 04, 2015	Nov. 03, 2016
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Aug. 04, 2016	Aug. 03, 2017
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 16, 2015	Dec. 15, 2016
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016
Preamplifier	EMC	EMC02325	980225	Aug. 05, 2016	Aug. 04, 2017
Preamplifier	Agilent	83017A	MY39501308	Oct. 02, 2015	Oct. 01, 2016
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 10, 2015	Dec. 09, 2016
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 10, 2015	Dec. 09, 2016
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 10, 2015	Dec. 09, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101063	Feb. 17, 2016	Feb. 16, 2017
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Nov. 27, 2015	Nov. 26, 2016
Power Meter	Anritsu	ML2495A	1241002	Sep. 21, 2015	Sep. 20, 2016
Power Sensor	Anritsu	MA2411B	1207366	Sep. 21, 2015	Sep. 20, 2016
Radio Communication Analyzer	Anritsu	MT8820C	6201240341	Mar. 28, 2016	Mar. 27, 2017
AC POWER SOURCE	APC	AFC-500W	F312060012	Oct. 26, 2015	Oct. 25, 2016
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards.

47 CFR FCC Part 90 Subpart Z
KDB 965270 D01 PwrMeas Part 90 Z Equipment v01
ANSI C63.4-2014
ANSI/TIA-603-D 2010
KDB 971168 D01 Power Meas License Digital Systems v02r02
KDB 412172 D01 Determining ERP and EIRP v01r01

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty	
Parameters	**Uncertainty**
Bandwidth	±34.134 Hz
Conducted power	±0.808 dB
Frequency error	±34.134 Hz
Conducted emission	±2.670 dB
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.63 dB
Temperature	±0.6 °C

2 Test Configuration

2.1 Testing Condition and Location Information

Test Item	Test Site	Ambient Condition	Tested By
RF conducted	TH01-WS	22°C / 61%	Alex Huang
Radiated Emissions	03CH01-WS	21°C / 64%	Felix Sung

- FCC site registration No.: 181692
- IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Test item	Channel Bandwidth	Modulation	Test channel (MHz)
Equivalent Isotropically Radiated Power Peak EIRP Power Density	20 MHz	QPSK / 16QAM	3660 / 3675 / 3690
Radiated Emission ≤ 1GHz	20 MHz	16QAM	3660
Radiated Emission > 1GHz	20 MHz	16QAM	3660 / 3675 / 3690
Conducted Emissions Emission Mask 26dBc Bandwidth	20 MHz	QPSK / 16QAM	3660 / 3675 / 3690
Frequency Stability	---	Un-modulation	3675

Note:
1. The device supports TX antenna diversity function (Ant. 0 & Ant. 1). After pretest, **Ant. 1** has the worst emission value, therefore the following test results came out from this.

3 Test Results

3.1 Equivalent Isotropically Radiated Power and Peak EIRP Power Density

3.1.1 Limit of Equivalent Isotropically Radiated Power and Peak EIRP Power Density

Base and fixed stations are limited to 25 watts/25 MHz equivalent isotropically radiated power (EIRP), the peak EIRP power density shall not exceed 1 Watt in any one-mega hertz slice of spectrum.

Mobile and portable stations are limited to 1 watt/25 MHz EIRP. The peak EIRP density shall not exceed 40 milli watts in any one-megahertz slice of spectrum.

3.1.2 Test Procedures

For EIRP

1. A broadband Average RF power meter is used for output power measurement. The video bandwidth of power meter is greater than occupied bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power
2. Determine the EIRP by adding the effective antenna gain to the adjusted power level.

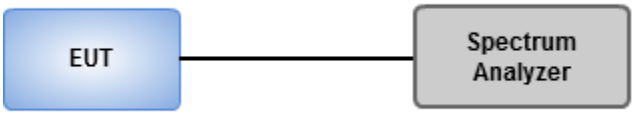
For Peak EIRP Power Density

1. Connect the transmitter to the spectrum analyzer via coaxial cable (i.e., conducted measurement) while ensuring proper impedance matching.
2. Tune the analyzer to the nominal center frequency of the emission bandwidth.
3 Set the span to twice the nominal EBW (span = 2 x EBW).
4 Set the resolution bandwidth (RBW) to 1 MHz.
5 Set the video bandwidth (VBW) to 3 MHz
6 Select the average power (RMS) display detector.
7 Set the number of measurement points to ≥ 1001.
8 Use auto-coupled sweep time.
9 Perform the measurement over an interval of time when the transmission is continuous and at its maximum power level.
10 Utilize trace averaging over 100 traces in the power averaging.
11 Find the maximum trace amplitude (peak search) and record.
12 Adjust the recorded level by applying appropriate correction factors for the measurement set-up.
13 Determine the EIRP by adding the effective antenna gain to the adjusted power level.

3.1.3 Test Setup

Conducted Power

Power Density



3.1.4 Test Result of EIRP

Channel Bandwidth: 20MHz- QPSK

Channel	Channel Frequency (MHz)	Conducted Output Power (dBm)	Max. Ant. Gain (dBi)	EIRP (dBm)	EIRP (W)	LIMIT (W)
44190	3660	23.34	15	38.34	6.823	20
44340	3675	23.31	15	38.31	6.776	20
44490	3690	23.31	15	38.31	6.776	20

Channel Bandwidth: 20MHz- 16QAM

Channel	Channel Frequency (MHz)	Conducted Output Power (dBm)	Max. Ant. Gain (dBi)	EIRP (dBm)	EIRP (W)	LIMIT (W)
44190	3660	23.29	15	38.29	6.745	20
44340	3675	23.24	15	38.24	6.668	20
44490	3690	23.26	15	38.26	6.699	20

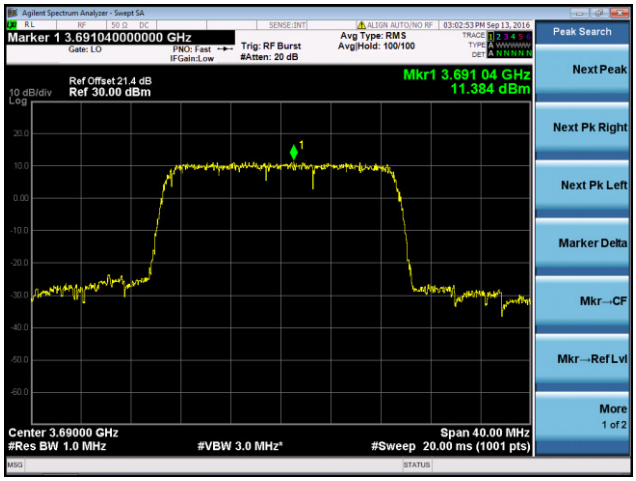
3.1.5 Test Result of Peak EIRP Density

Channel Bandwidth: 20MHz- QPSK

Channel	Channel Frequency (MHz)	Conducted Power Density (dBm/MHz)	Max. Ant. Gain (dBi)	EIRP Peak Density (dBm/MHz)	EIRP Peak Density (W/MHz)	LIMIT (W/MHz)
44190	3660	11.068	15	26.068	0.404	1
44340	3675	11.044	15	26.044	0.402	1
44490	3690	11.487	15	26.487	0.445	1

Channel Bandwidth: 20MHz- 16QAM

Channel	Channel Frequency (MHz)	Conducted Power Density (dBm/MHz)	Max. Ant. Gain (dBi)	EIRP Peak Density (dBm/MHz)	EIRP Peak Density (W/MHz)	LIMIT (W/MHz)
44190	3660	11.207	15	26.207	0.418	1
44340	3675	11.273	15	26.273	0.424	1
44490	3690	11.384	15	26.384	0.435	1

Worst Plots			
Mode	**CB: 20MHz , QPSK**	**Mode**	**CB: 20MHz, 16QAM**
			

3.2 Radiated Emissions

3.2.1 Limit of Radiated Emissions

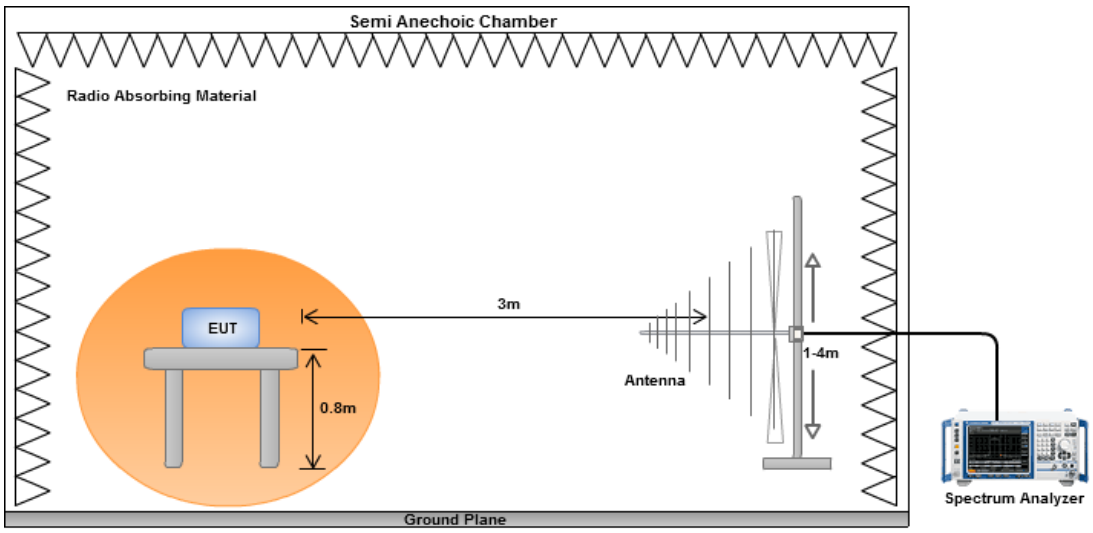
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB equal to -13dBm.

3.2.2 Test Procedures

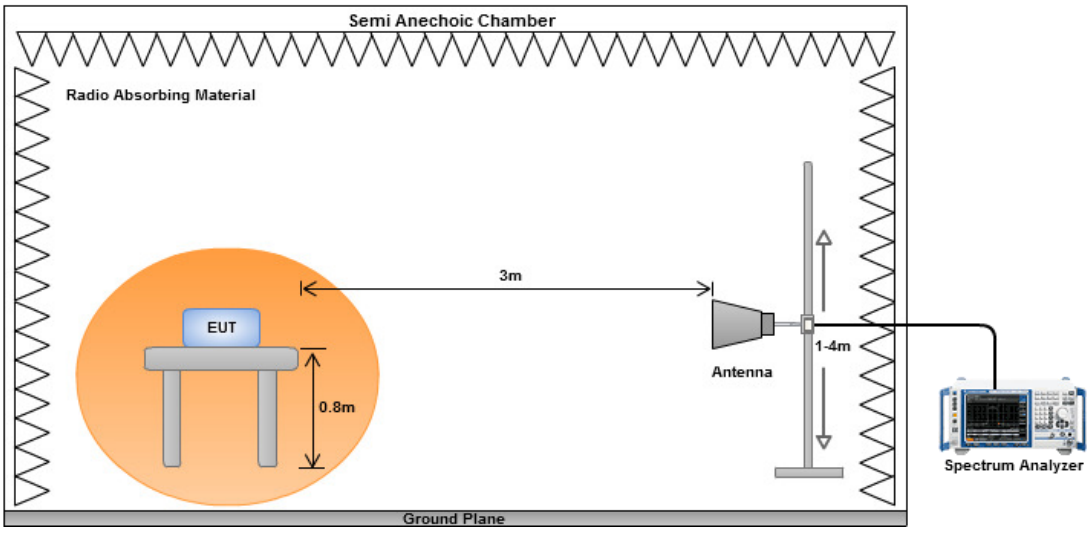
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at a height of 0.8 m test table above the ground plane.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.
4. After finding the max radiated emission, substitution method will be used for getting effective radiated power. EUT will be removed and substitution antenna will be placed at same position. Signal generator will output CW signal to substitution antenna through a RF cable. Rotate turntable and move antenna to find maximum radiated emission. Adjust output power of signal generator to let the maximum radiated emission is same as step 3. Record the output power level.
5. E.I.R.P = output power of step 4 + gain of substitution antenna – cable loss of RF cable.

3.2.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



3.2.4 Test Result of Radiated Emissions below 1GHz

Mode	CB:20MHz, Channel: 44190						
Frequency (MHz)	Antenna Polarity	E.I.R.P (dBm)	Limit (dBm)	Margin (dB)	S.A Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)
264.43	H	-61.89	-13.00	-48.89	-83.07	-66.26	4.37
335.29	H	-62.12	-13.00	-49.12	-85.86	-66.47	4.35
375.32	H	-50.94	-13.00	-37.94	-75.77	-55.26	4.32
475.55	H	-52.97	-13.00	-39.97	-80.10	-57.10	4.13
624.67	H	-60.77	-13.00	-47.77	-88.53	-64.52	3.75
672.86	H	-58.75	-13.00	-45.75	-86.89	-62.51	3.76
224.81	V	-52.19	-13.00	-39.19	-77.22	-56.65	4.46
269.49	V	-52.44	-13.00	-39.44	-77.71	-56.80	4.36
325.57	V	-56.57	-13.00	-43.57	-82.00	-60.90	4.33
474.66	V	-45.87	-13.00	-32.87	-73.21	-49.99	4.12
500.52	V	-55.13	-13.00	-42.13	-82.15	-59.42	4.29
715.19	V	-57.03	-13.00	-44.03	-88.72	-60.55	3.52

3.2.5 Test Result of Radiated Emissions above 1GHz

Mode	CB:20MHz, Channel: 44190						
Frequency (MHz)	**Antenna Polarity**	**E.I.R.P (dBm)**	**Limit (dBm)**	**Margin (dB)**	**S.A Reading (dBm)**	**S.G Power Value (dBm)**	**Correction Factor (dB)**
7320.00	H	-42.68	-13.00	-29.68	-62.26	-46.40	3.72
10980.00	H	-39.19	-13.00	-26.19	-60.93	-40.23	1.04
14640.00	H	-36.13	-13.00	-23.13	-60.30	-36.60	0.47
7320.00	V	-43.68	-13.00	-30.68	-62.29	-47.40	3.72
10980.00	V	-40.96	-13.00	-27.96	-60.44	-42.00	1.04
14640.00	V	-35.49	-13.00	-22.49	-60.67	-35.96	0.47
Mode	CB:20MHz, Channel: 44340						
Frequency (MHz)	**Antenna Polarity**	**E.I.R.P (dBm)**	**Limit (dBm)**	**Margin (dB)**	**S.A Reading (dBm)**	**S.G Power Value (dBm)**	**Correction Factor (dB)**
7350.00	H	-44.11	-13.00	-31.11	-61.26	-47.76	3.65
11025.00	H	-40.57	-13.00	-27.57	-60.15	-41.61	1.04
14700.00	H	-35.74	-13.00	-22.74	-59.84	-36.25	0.51
7350.00	V	-43.82	-13.00	-30.82	-60.49	-47.47	3.65
11025.00	V	-42.50	-13.00	-29.50	-59.59	-43.54	1.04
14700.00	V	-36.99	-13.00	-23.99	-58.77	-37.50	0.51
Mode	CB:20MHz, Channel: 44490						
Frequency (MHz)	**Antenna Polarity**	**E.I.R.P (dBm)**	**Limit (dBm)**	**Margin (dB)**	**S.A Reading (dBm)**	**S.G Power Value (dBm)**	**Correction Factor (dB)**
7380.00	H	-42.57	-13.00	-29.57	-61.15	-46.18	3.61
11070.00	H	-39.52	-13.00	-26.52	-60.94	-40.57	1.05
14760.00	H	-36.19	-13.00	-23.19	-59.48	-36.72	0.53
7380.00	V	-42.98	-13.00	-29.98	-61.05	-46.59	3.61
11070.00	V	-41.25	-13.00	-28.25	-60.89	-42.30	1.05
14760.00	V	-35.29	-13.00	-22.29	-60.07	-35.82	0.53

3.3 Conducted Emissions

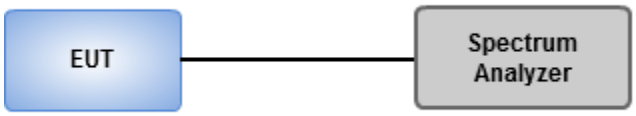
3.3.1 Limit of Conducted Emissions

The power of any emission outside of the authorized operating frequencyranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB equal to -13dBm.

3.3.2 Test Procedures

1. Lowest, middle and highest operating channels are tested for this item.
2. Scan frequency range is from 30MHz~40GHz.
3. Set RBW = 1MHz, VBW = 3MHz, detector = RMS, sweep time = auto.
4. Record the max trace value and capture the test plot of each sub frequency band.

3.3.3 Test Setup



3.3.4 Test Result of Conducted Emissions

Low Ch.	QPSK, CB: 20MHz	Low Ch.	16QAM, CB: 20MHz
			
Mid. Ch.	**QPSK, CB: 20MHz**	**Mid. Ch.**	**16QAM, CB: 20MHz**
			
High Ch.	**QPSK, CB: 20MHz**	**High Ch.**	**16QAM, CB: 20MHz**
			

3.4 Emission Mask

3.4.1 Limit of Emission Mask

The power of any emission must be attenuated below the unmodulated carrier power (P) as follows.

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

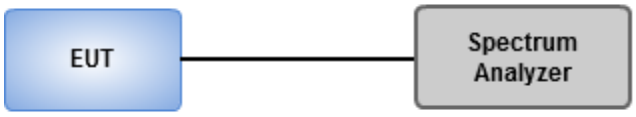
(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

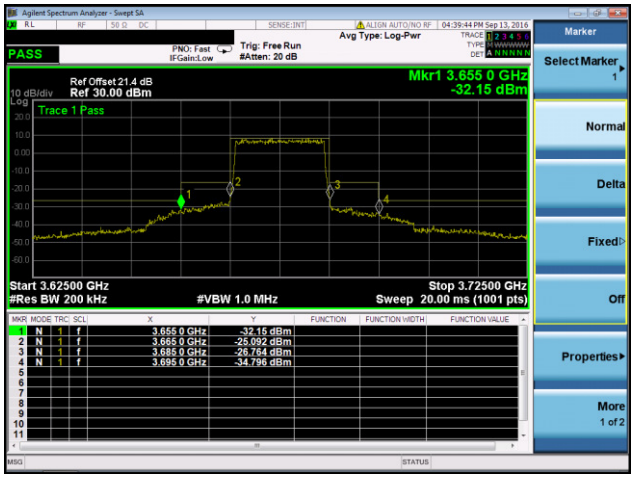
3.4.2 Test Procedures

1. Set RBW=1% of 26dBc bandwidth, VBW=3 X RBW, detector=RMS, Sweep time = Auto.
2. Set EUT to transmit modulation signal to spectrum analyzer and confirm that the signal complies the limit or not.
3. Record the max trace value and capture the test plot.

3.4.3 Test Setup



3.4.4 Test Result of Emission Mask

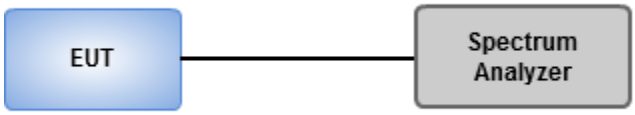
Low Ch.	QPSK, CB: 20MHz	Low Ch.	16QAM, CB: 20MHz
			
Mid. Ch.	**QPSK, CB: 20MHz**	**Mid. Ch.**	**16QAM, CB: 20MHz**
			
High Ch.	**QPSK, CB: 20MHz**	**High Ch.**	**16QAM, CB: 20MHz**
			

3.5 26dBc Bandwidth

3.5.1 Test Procedures

1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth=300kHz.
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Using 26dBc and occupied bandwidth measurement function of spectrum analyzer to measure 26dBc and occupied bandwidth.

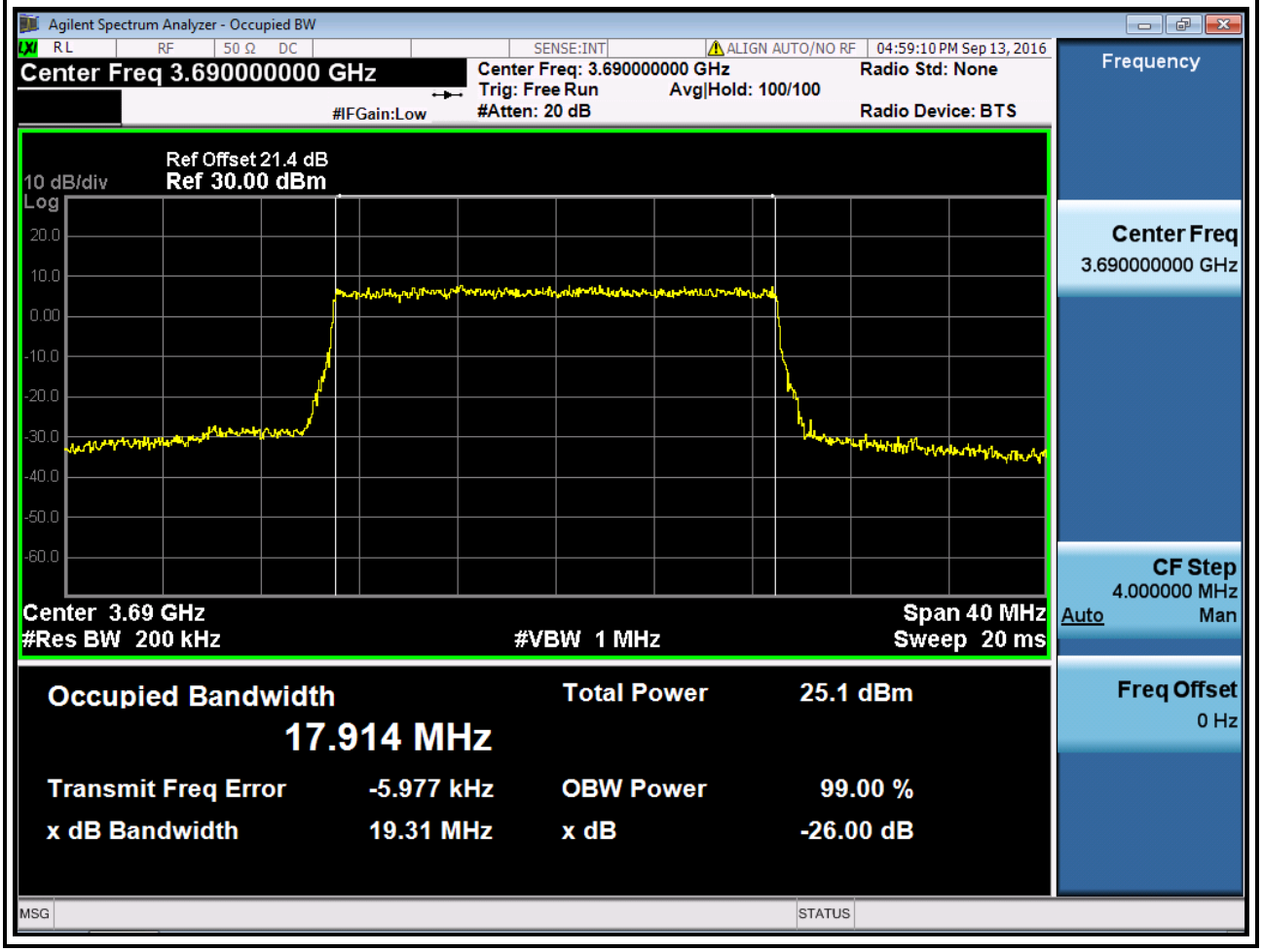
3.5.2 Test Setup



3.5.3 Test Result of 26dBc Bandwidth

Mode	Modulation	Channel	Frequency (MHz)	26dBc Bandwidth (MHz)	Occupied Bandwidth (MHz)
BW 20MHz	QPSK	44190	3660	19.23	17.915
BW 20MHz	QPSK	44340	3675	19.12	17.887
BW 20MHz	QPSK	44490	3690	19.17	17.886
BW 20MHz	16QAM	44190	3660	19.09	17.898
BW 20MHz	16QAM	44340	3675	19.10	17.884
BW 20MHz	16QAM	44490	3690	19.31	17.914

Worst plot



3.6 Frequency Stability

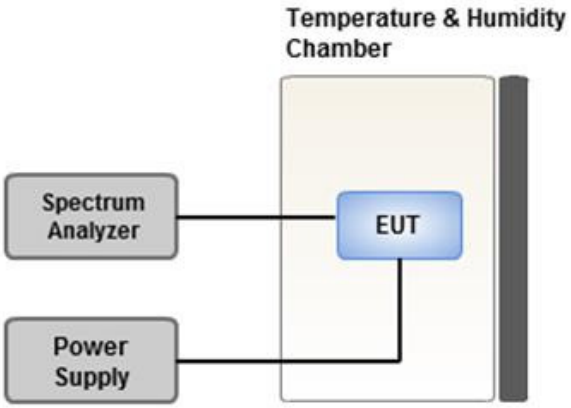
3.6.1 Limit of Frequency Stability

The frequency stability shall be less +/- 2.5ppm.

3.6.2 Test Procedures

1. EUT was placed at temperature chamber and connected to an external power supply.
2. Temperature and voltage condition shall be tested to confirm frequency stability.
3. Temperature range is from -30~55°C and voltage range is from lowest to highest working voltage.
4. Tem Link up EUT and simulator. Confirm frequency drift value of simulator and record it.

3.6.3 Test Setup



3.6.4 Test Result of Frequency Stability

Frequency: 3675 MHz	Frequency Drift (ppm)	
Temperature (°C)	**Frequency Error (ppm)**	**Limit (ppm)**
T20°CVmax	-0.008	2.5
T20°CVmin	-0.004	2.5
T55°CVnom	-0.003	2.5
T50°CVnom	-0.006	2.5
T40°CVnom	-0.008	2.5
T30°CVnom	-0.011	2.5
T20°CVnom	-0.004	2.5
T10°CVnom	-0.005	2.5
T0°CVnom	-0.007	2.5
T-10°CVnom	-0.008	2.5
T-20°CVnom	-0.005	2.5
T-30°CVnom	-0.006	2.5
Vnom [Vac]: 120	Vmax [Vac]: 138	Vmin [Vac]: 102
Tnom [°C]: 20	Tmax [°C]: 55	Tmin [°C]: -30

4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan Hsiang. Location map can be found on our website http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C..

If you have any suggestion, please feel free to contact us as below information

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

==END==