Test Report of FCC Part 15 C for FCC Certificate

On Behalf of

SBW (Hangzhou) MGF Co., LTD

Product description:	**TRANSMITTER**
Model No.:	**T2011-11**
Supplementary Model:	**N/A**
FCC ID:	**A2N-T2011-11**

Prepared for:	**SBW (Hangzhou) MGF Co., LTD** # 218 Hongxing Road, Qiaonan, Xiaoshan Development Zone, Hangzhou, Zhejiang, CN, 311251
Prepared by:	**Bontek Compliance Laboratory Ltd** 1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China Tel: 86-755-86337020 Fax: 86-755-86337028
Report No.:	BCT11KR-1866E
Issue Date:	December 16, 2011
Test Date:	November 21~December 16, 2011

Test by:	**Reviewed By:**
Kendy Wang	Tony Wu

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	**SBW (Hangzhou) MGF Co., LTD**
Address of applicant:	# 218 Hongxing Road, Qiaonan, Xiaoshan Development Zone, Hangzhou, Zhejiang, CN, 311251
Manufacturer:	**SBW (Hangzhou) MGF Co., LTD**
Address of manufacturer:	# 218 Hongxing Road, Qiaonan, Xiaoshan Development Zone, Hangzhou, Zhejiang, CN, 311251

General Description of E.U.T

Items	Description
EUT Description:	TRANSMITTER
Trade Name:	N/A
Model No.:	T2011-11
Supplementary Model:	N/A
Rated Voltage	DC 3V
Frequency range	433.92MHz
Number of channels	1
Channel Separation	None
Product Class:	Low Power Communication Device Transmitter

** The test data gathered are from the production sample provided by the manufacturer.*

1.2 Test Standards

The following Declaration of Conformity report of EUT is prepared in accordance with

FCC Rules and Regulations Part 15 Subpart C Section 15.231

The objective of the manufacturer is to demonstrate compliance with the described above standards.

1.3 Test Summary

For the EUT described above. The standards used were FCC Part 15 Subpart C Section 15.231 for Emissions

Tests Carried Out Under FCC Part 15 Subpart C

Standard	Test Items	Status	Application
Part 15 Subpart C Section 15.231	Disturbance Voltage at The Mains Terminals	x	N/A, without AC power supply
	Radiation Emission	√	
	20dB Bandwidth	√	
	Duty Cycle	√	
	Transmission time	√	
	Antennal requirement	√	

√ Indicates that the test is applicable
× Indicates that the test is not applicable

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

The maximum emission levels emanating from the device are compared to the Part 15 Subpart C Section 15.231 limits for radiation emissions and the measurement results contained in this test report show that EUT is to be technically compliant with FCC requirements.

All measurement required was performed at Bontek Compliance Testing Laboratory Ltd at 1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China

1.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC – Registration No.: 338263

Bontek Compliance Testing Laboratory Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 338263, March, 2008.

IC Registration No.: 7631A

The 3m alternate test site of Bontek Compliance Testing Laboratory Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 7631A on August 2009.

The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

CNAS - Registration No.: L3923

Bontek Compliance Testing Laboratory Ltd. to ISO/IEC 17025:25 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing. The acceptance letter from the CNAS is maintained in our files: Registration:L3923,February,2009.

TUV - Registration No.: UA 50203122-0001

Bontek Compliance Testing Laboratory Ltd. An assessment of the laboratory was conducted according to the"Procedures and Conditions for EMC Test Laboratories"with reference to EN ISO/IEC 17025 by a TUV Rheinland auditor. Audit Report NO. 17010783-002

1.6 Test Equipment List and Details

Test equipments list of BONTEK COMPLIANCE TESTING LABORATORY LTD.

No.	Equipment	Manufacturer	Model No.	S/N	Calibration Date	Calibration Due Date
1	EMI Test Receiver	R&S	ESCI	100687	2011-4-07	2012-4-06
2	EMI Test Receiver	R&S	ESPI	100097	2011-4-07	2012-4-06
3	Amplifier	HP	8447D	1937A02492	2011-4-07	2012-4-06
4	Single Power Conductor Module	FCC	FCC-LISN-5-50-1-01-CISPR25	7101	2011-4-07	2012-4-06
5	Single Power Conductor Module	FCC	FCC-LISN-5-50-1-01-CISPR25	7102	2011-4-07	2012-4-06
6	Power Clamp	SCHWARZBECK	MDS-21	3812	2011-4-07	2012-4-06
7	Positioning Controller	C&C	CC-C-1F	MF7802113	N/A	N/A
8	`Electrostatic Discharge Simulator	TESEQ	NSG437	125	2011-4-07	2012-4-06
9	Fast Transient Burst Generator	SCHAFFNER	MODULA6150	34572	2011-4-07	2012-4-06
10	Fast Transient Noise Simulator	Noiseken	FNS-105AX	31485	2011-4-07	2012-4-06
11	Color TV Pattern Genenator	PHILIPS	PM5418	TM209947	N/A	N/A
12	Power Frequency Magnetic Field Generator	EVERFINE	EMS61000-8K	608002	2011-4-07	2012-4-06
14	Capacitive Coupling Clamp	TESEQ	CDN8014	25096	2011-4-07	2012-4-06
15	High Field Biconical Antenna	ELECTRO-METRICS	EM-6913	166	2010-4-14	2012-4-13
16	Log Periodic Antenna	ELECTRO-METRICS	EM-6950	811	2010-4-14	2012-4-13
17	Remote Active Vertical Antenna	ELECTRO-METRICS	EM-6892	304	2010-4-14	2012-4-13
18	TRILOG Broadband Test-Antenna	SCHWARZBECK	VULB9163	9163-324	2010-4-14	2012-4-13
19	Horn Antenna	SCHWARZBECK	BBHA9120A	B08000991-0001	2010-4-14	2012-4-13
20	Teo Line Single Phase Module	SCHWARZBECK	NSLK8128	D-69250	2011-4-07	2012-4-06
21	10dB attenuator	SCHWARZBECK	MTAIMP-136	R65.90.0001#06	2011-4-07	2012-4-06
22	Electric bridge	Zentech	100 LCR METER	803024	N/A	N/A

23	RF Current Probe	FCC	F-33-4	80	2011-4-07	2012-4-06
24	Triple-Loop Antenna	EVERFINE	LLA-2	607004	2011-4-07	2012-4-06
25	CDN	FRANKONIA	M2+M3	A3027019	2011-4-07	2012-4-06
26	6dB Attenuator	FRANKONIA	75-A-FFN-06	1001698	2011-4-07	2012-4-06
27	EMV-Mess-Systeme GMBH	FRANKONIA	FLL-75	1020A1109	2011-4-07	2012-4-06
28	EM Injection Clamp	FCC	F-203I-13mm	91536	2011-4-07	2012-4-06
29	9KHz-2.4GHz Signal generator	MARCONI INSTRUMENTS	2024	112260/042	2011-4-07	2012-4-06
30	Broadband Preamplifier	SCHWARZBECK	BBV 9718	9718-182	2011-4-07	2012-4-06
31	Harmonics& Flicker Analyser	Voltech	PM6000	AFC-150	2011-4-07	2012-4-06
32	Spectrum Analyzer	R&S	FSP30	1093.4495.30	2011-4-07	2012-4-06
33	Temperature & Humidity Chamber	TOPSTAT	TOS-831A	3438A05208	2011-4-07	2012-4-06

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The system was configured for testing in a typical fashion (as transmittingly used by a typical user).

2.2 EUT Exercise Software

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The software offered by manufacture, can let the EUT being transmitting operation.

2.3 Equipment Modifications

The EUT tested was not modified by Bontek.

2.4 Basic Test Setup Block Diagram

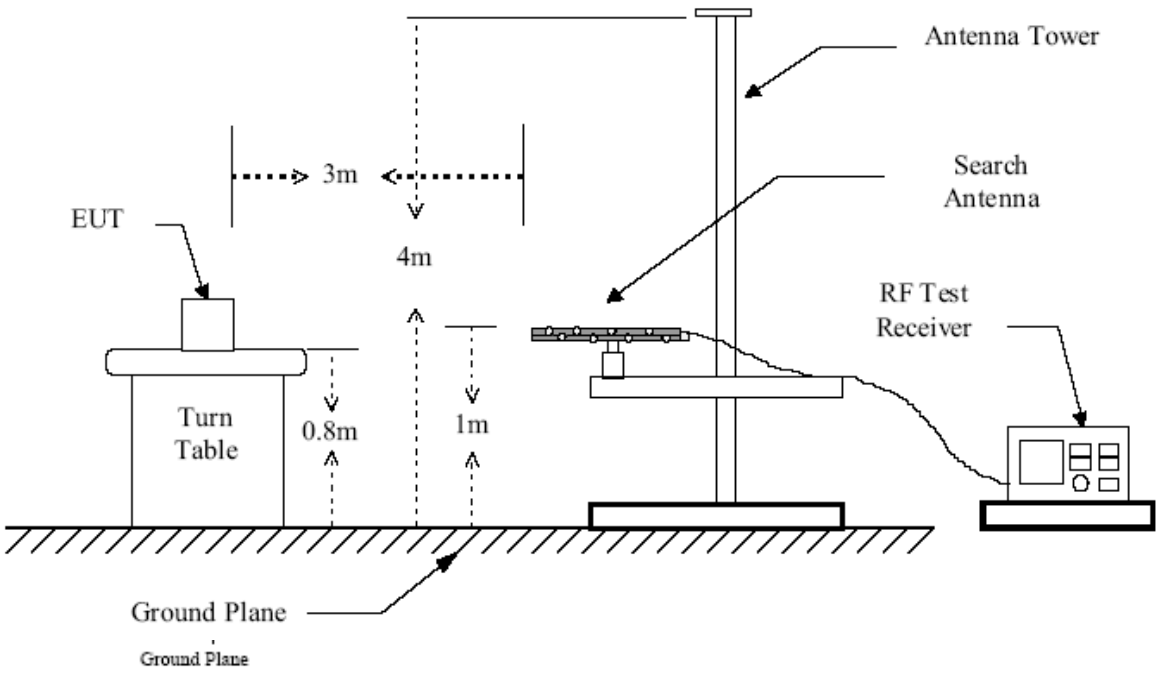


Figure 1 : Frequencies measured below 1 GHz configuration

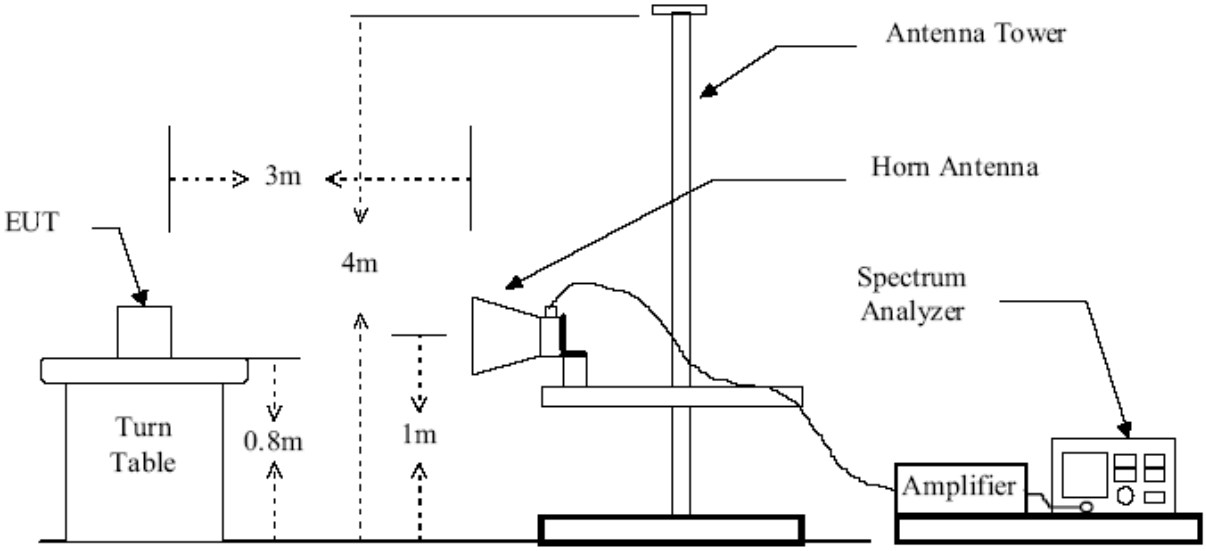


Figure 2 : Frequencies measured above 1 GHz configuration

3 – DISTURBANCE VOLTAGE AT THE MAINS TERMINALS

3.1 Measurement Uncertainty

All test results complied with Section 15.207 requirements. Measurement Uncertainty is 2.4 dB.

3.2 Applicable Standard

Section 15.207: For a Low-power Radio-frequency Device is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency Range (MHz)	Limits (dBuV)	
	Quasi-Peak	Average
0.150～0.500	66～56	56～46
0.500～5.000	56	46
5.000～30.00	60	50

3.3 Test Description

The EUT is excused from investigation of Disturbance Voltage at The Mains Terminals, for it is powered by a DC 3V bettary. According to the Section 15.207(d),measurement to demonstrate compliance with the limits of Disturbance Voltage at The Mains Terminals are not required to the devices which only employed bettary power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

4- RADIATED DISTURBANCES

4.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ±4.0 dB.

4.2 Limit of Radiated Disturbances

According to 15.231(b), the field strength of emissions from Intentional Radiators operated under this section shall not exceed the following:

Fundamental Frequency	Field Strength of Fundamental		Field Strength of Spurious	
(MHz)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)
40.66 - 40.70	67.04	2,250	47.04	225
70 - 130	61.94	1,250	41.94	125
130 - 174	* 61.94 - 71.48	* 1,250 -3,750	* 41.94 - 51.48	* 125 - 375
174 - 260	71.48	3,750	51.48	375
260 - 470	* 71.48 - 81.94	* 3,750 - 12,500	* 51.48 - 61.94	* 375 - 1,250
above 470	81.94	12,500	61.94	1,250

** linear interpolations
Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F) - 6136.3636; for band 260-470 MHz, uV/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

4.3 EUT Setup

The radiated emission tests were performed in the in the 3-meter anechoic chamber, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC Part 15 Subpart B limits.

The EUT was placed on the center of the test table. In the frequency range below 1 GHz, Ultra-Broadband Antenna horn-antenna is used. In the frequency range above 1 GHz horn-antenna is used. Test setup refer to Section 2.4 Basic Test Setup Block Diagram of this report.

Maximum emission emitted from EUT was determined by manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation and the levels in the final result of the test were recorded with the EUT running in the operating mode that maximum emission was emitted.

4.4 Test Receiver Setup

According to FCC Part 15 rule, the frequency was investigated from 30 to 4000 MHz.During the radiated emission test, the test receiver was set with the following configurations:

Test Receiver Setting for frequency range below 1000MHz:

Detector……..Peak & Quasi-Peak
IF Band Width……100KHz
Frequency Range……30MHz to 1000MHz
Turntable Rotated……0 to 360 degrees

Test Receiver Setting for frequency range above 1000MHz:

Detector……..Peak
IF Band Width……1MHz
Frequency Range……1000MHz to 4000MHz
Turntable Rotated……0 to 360 degrees

Antenna Position:

Height……1m to 4m
Polarity……...Horizontal and Vertical

4.5 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

1). Configure the EUT according to ANSI C63.4:2003.

2). The EUT was placed on the top of the turntable 0.8 meter above ground.

3). The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.

4). Power on the EUT and all the supporting units.

5). The turntable was rotated by 360 degrees to determine the position of the highest radiation.

6). The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.

7). For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.

8). Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode. Then all data was recorded in the peak detection mode. Quasi-peak readings performed only when an emission was found to be marginal (within -10 dBμV of specification limits), and are distinguished with a "**QP**" in the data plots.

4.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude Indicated reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Transd.

Transd.= Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. –Limit

4.7 Radiated Emissions Test Result

Temperature (℃) : 22~23	EUT: TRANSMITTER
Humidity (%RH): 50~54	M/N: T2011-11
Barometric Pressure (mbar): 950~1000	Operation Condition: Transmitting

Note: In this testing, the EUT was respectively tested in three different orientations. That is:

(1) EUT was lie vertically, and then its Antenna oriented upward
(2) EUT was lie vertically, and then its Antenna oriented downward
(3) EUT was lie flatwise, and then its Antenna oriented to the receiving antenna

The worst test data see following pages

When the EUT was lie flatwise, and its Antenna oriented to the receiving antenna, the worst test data was got as following table.

433.99 MHz Tx in operation							
Maximum Frequency (MHz)	Emission Position and Level					Limit	Margin
	Polarity	m	Deg°	Transd	dBµV/m	dBµV/m	dBµV/m
47.46	V	1.85	156.0	20.8	22.32	40.00	17.68
59.10	V	1.40	90.0	21.5	21.45	40.00	18.55
107.60	V	1.60	105.0	23.2	22.33	40.00	17.67
433.90	V	1.65	65.0	23.1	58.43	80.14	21.71
867.98	V	1.95	155.0	23.5	32.54	60.14	27.60
1301.97	V	1.30	85.0	24.1	31.65	60.14	28.49
1735.96	V	1.55	73.0	23.4	30.94	60.14	29.20
2169.95	V	1.75	88.0	23.1	30.43	60.14	29.71
2603.94	V	---	---	---	---	60.14	---
3037.93	V	---	---	---	---	60.14	---
3471.92	V	---	---	---	---	60.14	---
3905.91	V	---	---	---	---	60.14	---
4339.90	V	---	---	---	---	60.14	---
Maximum Frequency (MHz)	Emission Position and Level					Limit	Margin
	Polarity	m	Deg°	Transd	dBµV/m	dBµV/m	dBµV/m
47.46	H	1.35	165.0	20.8	24.36	40.00	15.64
59.10	H	1.55	175.0	21.5	21.32	40.00	18.68
97.90	H	1.65	85.0	23.2	20.41	40.00	19.59
433.90	H	1.15	45.0	23.1	55.76	80.14	24.38
867.98	H	1.45	135.0	23.5	33.43	60.14	26.71
1301.97	H	1.75	90.0	24.1	31.08	60.14	29.00
1735.96	H	1.85	30.0	24.1	30.21	60.14	29.63
2169.95	H	1.35	97.0	23.4	28.01	60.14	32.13
2603.94	H	---	---	---	---	60.14	---
3037.93	H	---	---	---	---	60.14	---
3471.92	H	---	---	---	---	60.14	---
3905.91	H	---	---	---	---	60.14	---
4339.90	H	---	---	---	---	60.14	---

Remark:

--- Means that The emission level of the rest measuring harmonic up to 5GHz are so low below applicable limit in operation mode, so the result were not recorded.

5- 20dB BANDWIDTH

5.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ±4.0 dB.

5.2 Limit of 20dB Bandwidth

In accordance with Part15.231(c), the fundamental frequency bandwidth was kept within 0.25% of the center frequency for devices operating>70MHz and <900MHz.

Fundamental Frequency (MHz)	Limit of 20dB Bandwidth (kHz)
433.902	433902x0.0025=1084.755

5.3 EUT Setup

The radiated emission tests were performed in the in the 3-meter anechoic chamber, using the setup accordance with the ANSI C63.4-2003.

The EUT was placed on the center of the nonmetal table which is 0.8 meter above a grounded turntable. The turntable can rotate 360 degrees to determine the azimuth of the maximum emission level.

Maximum emission emitted from EUT was determined by manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation and the levels in the final result of the test were recorded with the EUT running in the operating mode that maximum emission was emitted.

5.4 Test Procedure

1) Turn on the transmitter, and set it to transmit the pulse train continuously.

2) Set Test Receiver into spectrum analyzer mode, Tune the spectrum analyzer to the transmitter carrier frequency, and set the spectrum analyzer resolution bandwidth(RBW) to 100kHz and video bandwidth(VBW) to 100kHz, then select Peak function to scan the channel frequency.

3) The 20dB bandwidth was measured and recorded.

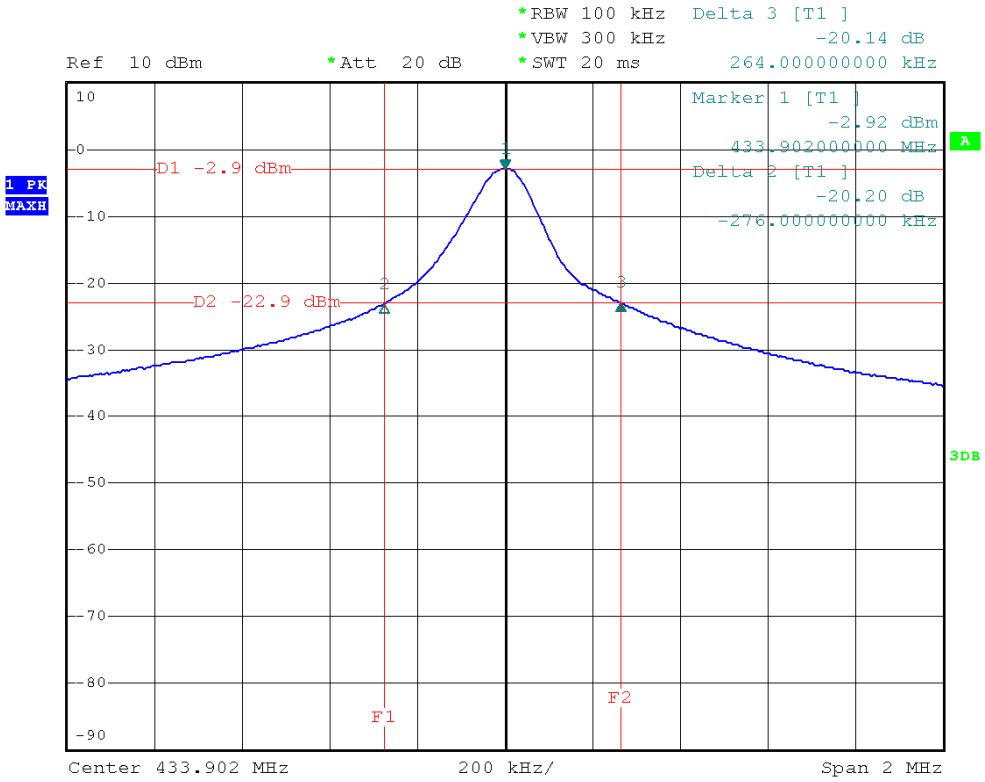
Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

5.5 Emissions within Band Edges Test Result

Temperature (℃) : 22~23	EUT: TRANSMITTER
Humidity (%RH): 50~54	M/N: T2011-11
Barometric Pressure (mbar): 950~1000	Operation Condition: Transmitting

Test plots see following pages

Fundamental Frequency (MHz)	20dB Bandwidth (kHz)	Maximum Limit (kHz)	Pass/Fail
433.902	540	1084.525	Pass



6- Duty Cycle

6.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ±4.0 dB.

6.2 EUT Setup

The radiated emission tests were performed in the in the 3-meter anechoic chamber, using the setup accordance with the ANSI C63.4-2003.

The EUT was placed on the center of the nonmetal table which is 0.8 meter above a grounded turntable. The turntable can rotate 360 degrees to determine the azimuth of the maximum emission level.

6.3 Test Procedure

1) The EUT was placed on a turntable which is 0.8m above ground plane.

2) Set EUT operating in continuous transmitting mode

3) Set Test Receiver into spectrum analyzer mode, Tune the spectrum analyzer to the transmitter carrier frequency, and set the spectrum analyzer resolution bandwidth(RBW) to 1000kHz and video bandwidth(VBW) to 1000kHz, Span was set to 0Hz.

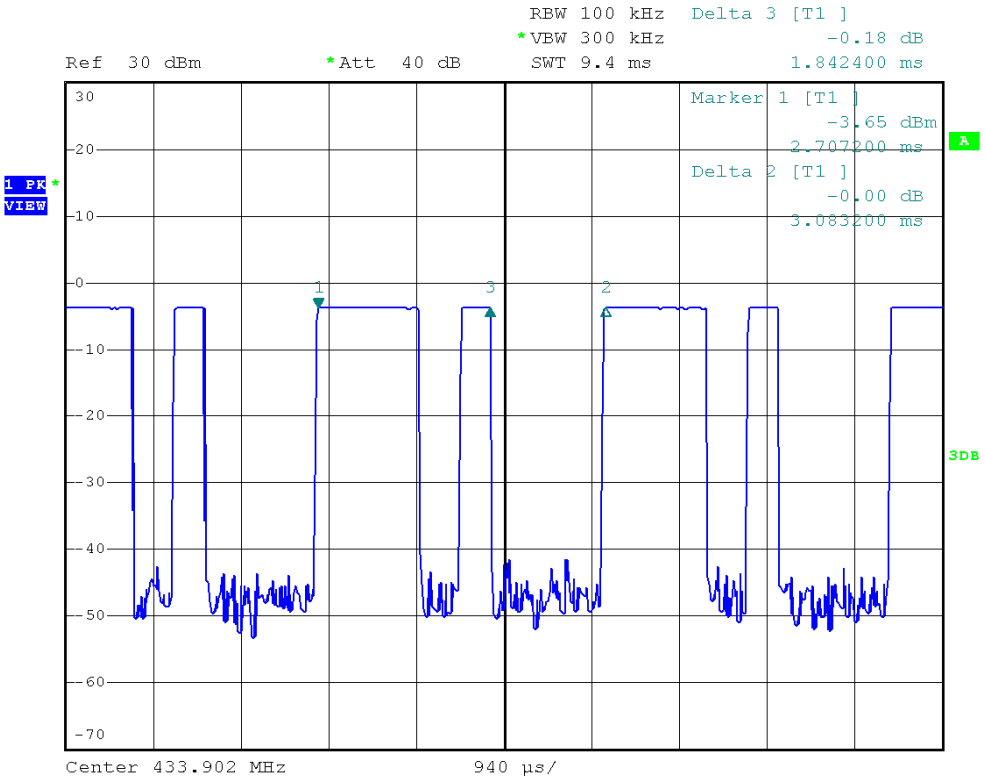
4) The Duty Cycle was measured and recorded.

6.4 Measurement Result

Temperature (℃) : 22~23	EUT: TRANSMITTER
Humidity (%RH): 50~54	M/N: T2011-11
Barometric Pressure (mbar): 950~1000	Operation Condition: Transmitting

Test plots see following pages

The Duty Cycle= 3.0832/3.8424= 80.24%


RBW 100 kHz
*VBW 300 kHz
SWT 9.4 ms
Delta 3 [T1]
-0.18 dB
1.842400 ms
Ref 30 dBm
*Att 40 dB
Marker 1 [T1]
-3.65 dBm
2.707200 ms
Delta 2 [T1]
-0.00 dB
3.083200 ms
1 PK
VIEW
A
3DB
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 433.902 MHz
940 µs/

2

7- Transmission Time

7.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ±4.0 dB.

7.2 EUT Setup

The radiated emission tests were performed in the in the 3-meter anechoic chamber, using the setup accordance with the ANSI C63.4-2003.

The EUT was placed on the center of the nonmetal table which is 0.8 meter above a grounded turntable. The turntable can rotate 360 degrees to determine the azimuth of the maximum emission level.

7.3 Test Procedure

3) The EUT was placed on a turntable which is 0.8m above ground plane.

4) Set EUT operating in continuous transmitting mode

3) Set Test Receiver into spectrum analyzer mode, Tune the spectrum analyzer to the transmitter carrier frequency, and set the spectrum analyzer resolution bandwidth(RBW) to 1000kHz and video bandwidth(VBW) to 1000kHz, Span was set to 0Hz.

5) The Transmission time was measured and recorded.

7.4 Limit of Transmission time

In accordance with Part15.231(a)(2), A transmitter activated automatically shall cease transmission within 5 seconds after activation

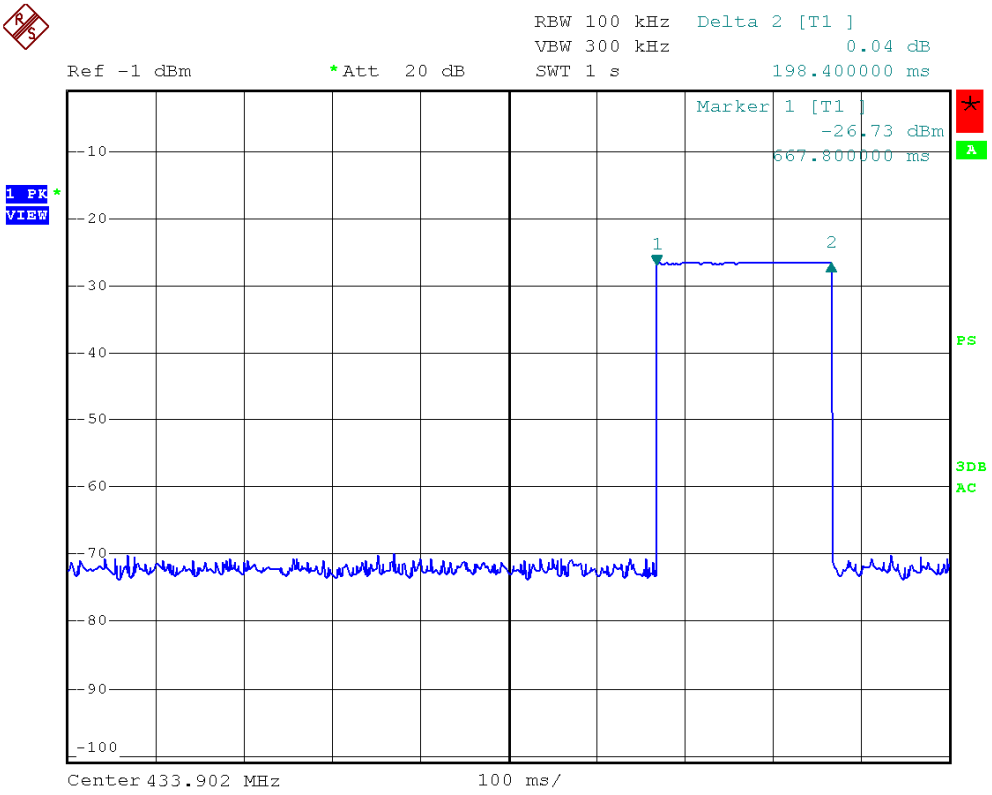
Fundamental Frequency (MHz)	Limit of Transmission (S)
433.902	5

7.5 Transmission Time Test Result

Temperature (℃) : 22~23	EUT: TRANSMITTER
Humidity (%RH): 50~54	M/N: T2011-11
Barometric Pressure (mbar): 950~1000	Operation Condition: Transmitting

Test plots see following pages

Fundamental Frequency (MHz)	Transmission time (S)	Maximum Limit (S)	Pass/Fail
433.902	0.1984	5	Pass



8- ANTENNA REQUIREMENT

8.1 Standard Applicable

Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

8.2 Antenna Connected Construction

The antenna connector is designed with permanent attachment and no consideration of replacement.