COLLAGE INVESTMENTS LLC

Mobile phone

Main Model: L1 FLYER
Serial Model: N/A

July 09, 2014

Report No.: 14050021-FCC-R2

(This report supersedes NONE)

Modifications made to the product : None

This Test Report is Issued Under the Authority of:

Kevin Tian	Alex Liu	
Kevin Tian **Compliance Engineer**	**Alex Liu** **Technical Manager**	

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Test result presented in this test report is applicable to the representative sample only.

RF Test Report

To: FCC Part 15.247: 2013, ANSI C63.4: 2009

SIEMIC, INC.
Accessing global markets

Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management through out a project. Our extensive experience with China, Asia Pacific, North America, European, and international compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC , RF/Wireless , Telecom
Canada	EMC, RF/Wireless , Telecom
Taiwan	EMC, RF, Telecom , Safety
Hong Kong	RF/Wireless ,Telecom
Australia	EMC, RF, Telecom , Safety
Korea	EMI, EMS, RF , Telecom, Safety
Japan	EMI, RF/Wireless, Telecom
Singapore	EMC , RF , Telecom
Europe	EMC, RF, Telecom , Safety

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1 EXECUTIVE SUMMARY & EUT INFORMATION

The purpose of this test programme was to demonstrate compliance of the COLLAGE INVESTMENTS LLC, Mobile phone and model: L1 FLYER against the current Stipulated Standards. The Mobile phone has demonstrated compliance with the FCC 15.247: 2013, ANSI C63.4: 2009.

EUT Information

EUT Description	**Mobile phone**
Main Model	**L1 FLYER**
Serial Model	**N/A**
Antenna Gain	**GSM850: -1.87 dBi** **PCS1900: -0.75 dBi** **UMTS-FDD Band V: -0.62 dBi** **UMTS-FDD Band II: -0.62 dBi** **Bluetooth/ WIFI: -0.7 dBi**
Input Power	**Adapter:** **Model: BSN-DB05B** **Input: AC 100-240V 50/60Hz 150mA** **Output: DC 5V 500mA** **RECHARGEABLE BATTERY BH-P4B:** **3.7V 1300mAh 4.81Wh**
Classification Per Stipulated Test Standard	**FCC 15.247: 2013, ANSI C63.4: 2009**

2 TECHNICAL DETAILS

Purpose	**Compliance testing of Mobile phone with stipulated standard**
Applicant / Client	**COLLAGE INVESTMENTS LLC 11437 NW 34 STREET, DORAL, FLORIDA 33178 U.S.A.**
Manufacturer	**NINGBO BIRD CO., LTD No.999 Dacheng East Road,Fenghua City,Zhejiang**
Laboratory performing the tests	**SIEMIC (Nanjing-China) Laboratories NO.2-1,Longcang Dadao, Yuhua Economic Development Zone, Nanjing, China Tel:+86(25)86730128/86730129 Fax:+86(25)86730127 Email: China@siemic.com.cn**
Test report reference number	**14050021-FCC-R2**
Date EUT received	**May 19, 2014**
Standard applied	**FCC 15.247: 2013, ANSI C63.4: 2009**
Dates of test (from – to)	**May 26 to July 09, 2014**
No of Units	**#1**
Equipment Category	**DSS**
Trade Name	**LIKUID**
RF Operating Frequency (ies)	**GSM850 TX : 824.2 ~ 848.8 MHz; RX : 869.2 ~ 893.8 MHz PCS1900 TX : 1850.2 ~ 1909.8 MHz; RX : 1930.2 ~ 1989.8 MHz UMTS-FDD Band Ⅱ TX :1852.4 ~ 1907.6 MHz; RX : 1932.4 ~ 1987.6 MHz 802.11b/g/n: 2412-2462 MHz Bluetooth : 2402-2480 MHz**
Number of Channels	**299CH (PCS1900) and 124CH (GSM850) UMTS-FDD Band Ⅱ: 277CH Bluetooth: 79CH 802.11b/g/n: 11CH**
Modulation	**GSM / GPRS: GMSK UMTS-FDD: QPSK 802.11b/g/n: DSSS/OFDM Bluetooth: GFSK**
Port	**Earphone Port, USB Port**
GPRS Multi-slot class	**8/10/12**
FCC ID :	**GAO-FLYER**

3 MODIFICATION

N/A

4 TEST SUMMARY

The product was tested in accordance with the following specifications.
All testing has been performed according to below product classification:

Spread Spectrum System/Device

Test Results Summary

Test Standard	Description	Product Class	Pass / Fail
§15.247(i), §2.1093	RF Exposure	See Above	Pass
§15.203	Antenna Requirement	See Above	Pass
§15.207(a)	AC Line Conducted Emissions	See Above	Pass
§15.205, §15.209, §15.247(d)	Radiated Emissions	See Above	Pass
§15.247(a)(1)	20 dB Bandwidth	See Above	Pass
§15.247(a)(1)	Channel Separation	See Above	Pass
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	See Above	Pass
§15.247(a)(1)(iii)	Quantity of Hopping Channel	See Above	Pass
§15.247(b)(1)	Peak Output Power	See Above	Pass
§15.247(d)	Band Edge	See Above	Pass

5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

5.1 §15.247 (i) and §2.1093 – RF Exposure

Test Result: Pass

The EUT is a portable device, thus requires SAR evaluation;
please refer to SIEMIC RF Exposure Report: 140500021-FCC-H2

5.2 §15.203 – Antenna Requirement

Standard Requirement:

According to § 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 user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.
c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has 2 antennas: . a monopole antenna for Bluetooth, the gain is -0.7dBi;
a monopole antenna for WIFI, the gain is -0.7 dBi
.a PIFA antenna for GSM, the gain are -1.87 dBi for GSM, -0.75 dBi for PCS
.a PIFA antenna for WCDMA the gain is -0.62 dBi for Band V
.a PIFA antenna for WCDMA the gain is -0.62 dBi for Band Ⅱ
which in accordance to section 15.203, please refer to the internal photos.

Test Result: Pass

5.3 §15.207 (a) – AC Line Conducted Emissions

Standard Requirement:

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

Procedures:

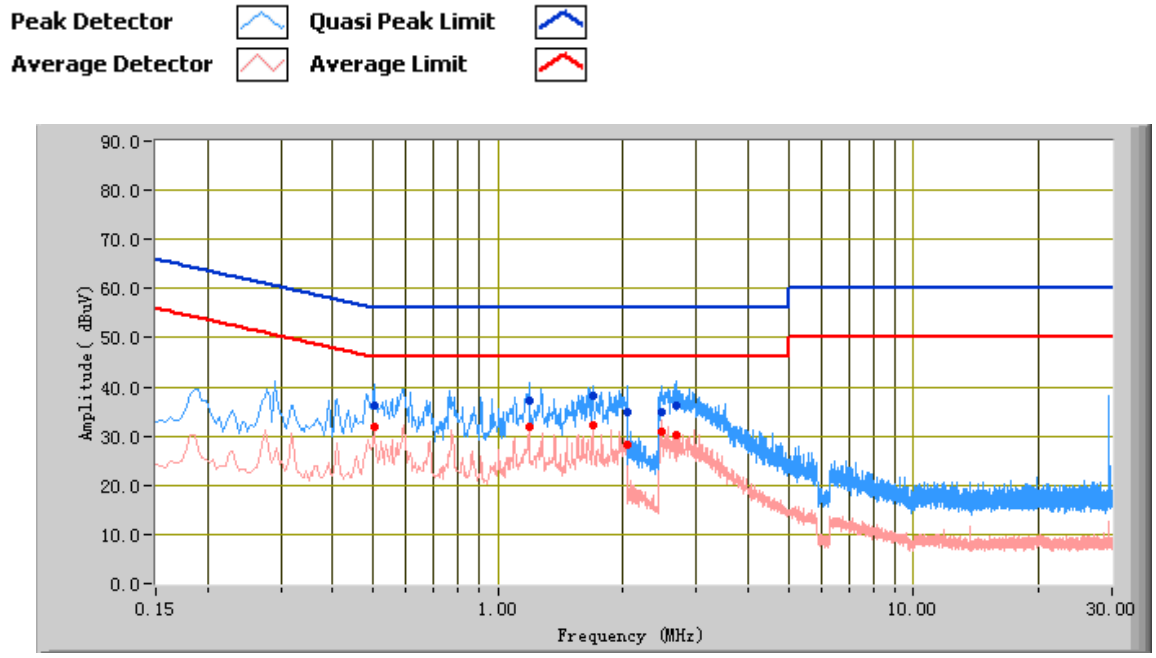
1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is ±3.5dB.
4. Environmental Conditions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

5. Test date : May 29, 2014
   Tested By : Kevin Tian

Test Result: Pass

Test Mode:	Charging & GFSK Transmitting (Worse Case)

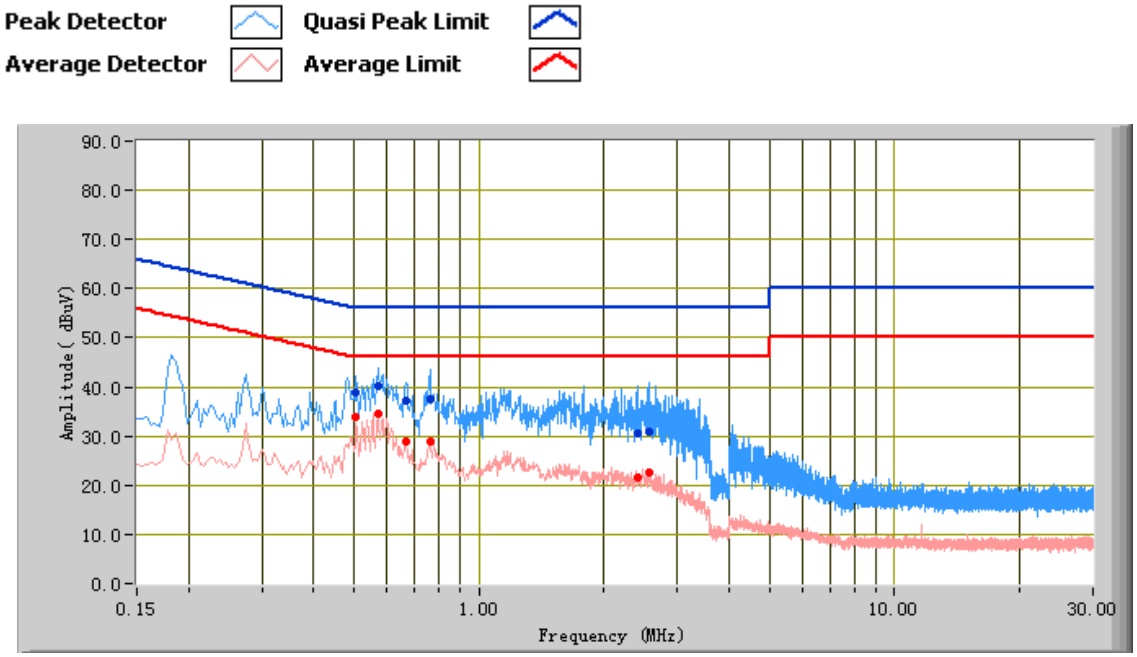


Test Data

Phase Line Plot at 120V AC, 60Hz

Frequency (MHz)	Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Factors (dB)
2.69	36.24	56.00	-19.76	30.31	46.00	-15.69	10.88
1.19	37.17	56.00	-18.83	32.04	46.00	-13.96	10.72
0.50	36.25	56.00	-19.75	31.98	46.00	-14.02	11.09
1.69	38.12	56.00	-17.88	32.34	46.00	-13.66	10.82
2.47	34.96	56.00	-21.04	30.79	46.00	-15.21	10.88
2.04	34.97	56.00	-21.03	28.26	46.00	-17.74	10.88

Test Mode:	Charging & GFSK Transmitting (Worse Case)



Test Data

Phase Neutral Plot at 120V AC, 60Hz

Frequency (MHz)	Peak (dBµV/m)	Limit (dBµV/m))	Margin (dB)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Factors (dB)
0.57	40.12	56.00	-15.88	34.65	46.00	-11.35	11.01
0.76	37.45	56.00	-18.55	28.97	46.00	-17.03	10.87
0.51	38.81	56.00	-17.19	33.72	46.00	-12.28	11.05
0.67	37.22	56.00	-18.78	28.79	46.00	-17.21	10.94
2.57	30.89	56.00	-25.11	22.66	46.00	-23.34	10.93
2.41	30.54	56.00	-25.46	21.60	46.00	-24.40	10.92

5.4 §15.209, §15.205 & §15.247(d) - Spurious Emissions

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 1GHz (3m & 10m) & 1GHz above (3m) is +5.6/-4.5dB.
4. Environmental Conditions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

5. Test date : June 06, 2014
   Tested By : Kevin Tian

Standard Requirement:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Procedures:

1. The EUT was switched on and allowed to warm up to its normal operating condition.

2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:

   a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.

   b. The EUT was then rotated to the direction that gave the maximum emission.

   c. Finally, the antenna height was adjusted to the height that gave the maximum emission.

3. A Quasi-peak measurement was then made for that frequency point for below 1GHz test, PK and AV for above 1GHz emission test.

   a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.

   b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.

   c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth for Average detection (AV) as below at frequency above 1GHz.

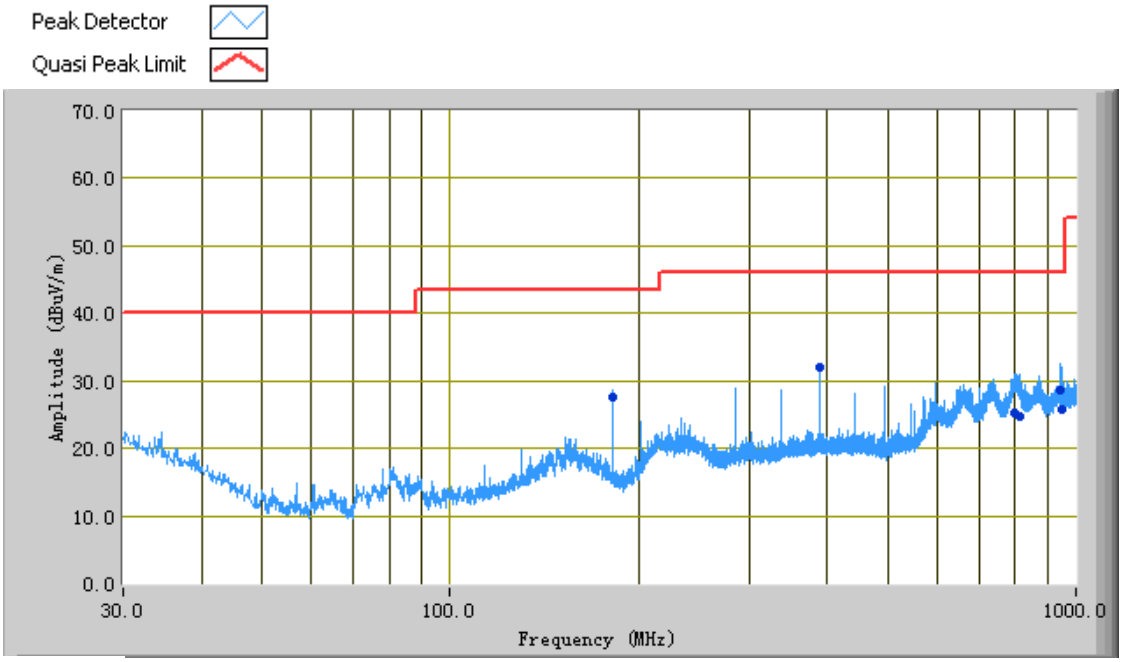
   ☐1 kHz (Duty cycle < 98%) ■ 10 Hz (Duty cycle > 98%)

4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

Test Result: Pass

Test Mode:	**Charging & GFSK Transmitting (Worse Case)**

Below 1GHz



Test Data

Horizontal& Vertical Polarity Plot @3m

Frequency (MHz)	Quasi Peak (dBµV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBµV/m)	Margin (dB)
941.43	28.57	333.00	V	311.00	-18.10	46.00	-17.43
389.99	31.90	239.00	H	242.00	-28.28	46.00	-14.10
949.96	25.83	121.00	V	288.00	-18.13	46.00	-20.17
182.00	27.62	356.00	H	189.00	-31.74	43.50	-15.88
811.23	24.61	2.00	V	300.00	-17.51	46.00	-21.39
799.59	25.32	291.00	V	326.00	-17.48	46.00	-20.68

Test Mode:	GFSK Transmitting(Worse Case)

Above 1 GHz

Note: Other Bluetooth modes were verified; only the result of worst case DH5 mode was presented.

Low Channel (2402 MHz)

Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Direction (degree)	Height (cm)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4804	59.15	AV	152	126	V	33.83	3.3	55	41.28	54	-12.72
4804	60.38	AV	206	159	H	33.83	3.3	55	42.51	54	-11.49
4804	69.15	PK	142	180	V	33.83	3.3	55	51.28	74	-22.72
4804	68.24	PK	253	168	H	33.83	3.3	55	50.37	74	-23.63
5575.5	56.94	AV	173	152	V	34.29	3.8	55	40.03	54	-13.97
5575.5	55.68	AV	202	197	H	34.29	3.8	55	38.77	54	-15.23
5575.5	68.42	PK	137	165	V	34.29	3.8	55	51.51	74	-22.49
5575.5	70.59	PK	243	188	H	34.29	3.8	55	53.68	74	-20.32

Middle Channel (2441 MHz)

Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Direction (degree)	Height (cm)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4880	59.02	AV	121	130	V	33.86	3.3	55	41.18	54	-12.82
4880	59.84	AV	201	222	H	33.86	3.3	55	42	54	-12
4880	75.89	PK	191	130	V	33.86	3.3	55	58.05	74	-15.95
4880	72.49	PK	210	251	H	33.86	3.3	55	54.65	74	-19.35
5564.5	62.05	AV	138	141	V	34.32	3.8	55	45.17	54	-8.83
5564.5	62.15	AV	279	196	H	34.32	3.8	55	45.27	54	-8.73
5564.5	70.83	PK	183	141	V	34.32	3.8	55	53.95	74	-20.05
5564.5	73.16	PK	47	169	H	34.32	3.8	55	56.28	74	-17.72

High Channel (2480 MHz)

Frequency (MHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Direction (degree)	Height (cm)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
4960	58.16	AV	142	101	V	33.9	3.3	55	40.36	54	-13.64
4960	56.38	AV	287	203	H	33.9	3.3	55	38.58	54	-15.42
4960	69.29	PK	142	199	V	33.9	3.3	55	51.49	74	-22.51
4960	72.19	PK	287	203	H	33.9	3.3	55	54.39	74	-19.61
5592.5	57.16	AV	135	118	V	34.35	3.8	55	40.31	54	-13.69
5592.5	55.28	AV	49	199	H	34.35	3.8	55	38.43	54	-15.57
5592.5	68.73	PK	135	150	V	34.35	3.8	55	51.88	74	-22.12
5592.5	69.49	PK	59	143	H	34.35	3.8	55	52.64	74	-21.36

5.5 §15.247(a) (1)-Channel Separation

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Environmental Conditions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

3. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
4. Test date : May 26, 2014
   Tested By : Kevin Tian

Standard Requirement:

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Procedures:

1. Place the EUT on the table and set it in hopping function transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel.
4. Set the spectrum analyzer as Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span, Video (or Average) Bandwidth (VBW) ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
5. Max hold, mark 2 peaks of hopping channel and record the 2 peaks frequency.

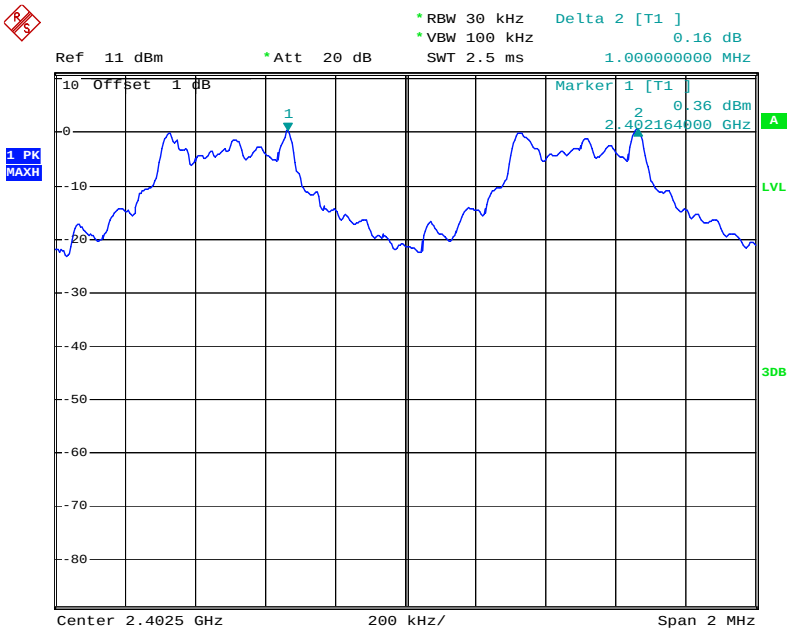
Test Result: Pass

Test Mode:	GFSK Transmitting

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1.000	0.900	Pass
Adjacency Channel	2403			
Mid Channel	2440	1.004	0.900	Pass
Adjacency Channel	2441			
High Channel	2480	1.000	0.900	Pass
Adjacency Channel	2479			

Please refer to the following plots.

Low Channel



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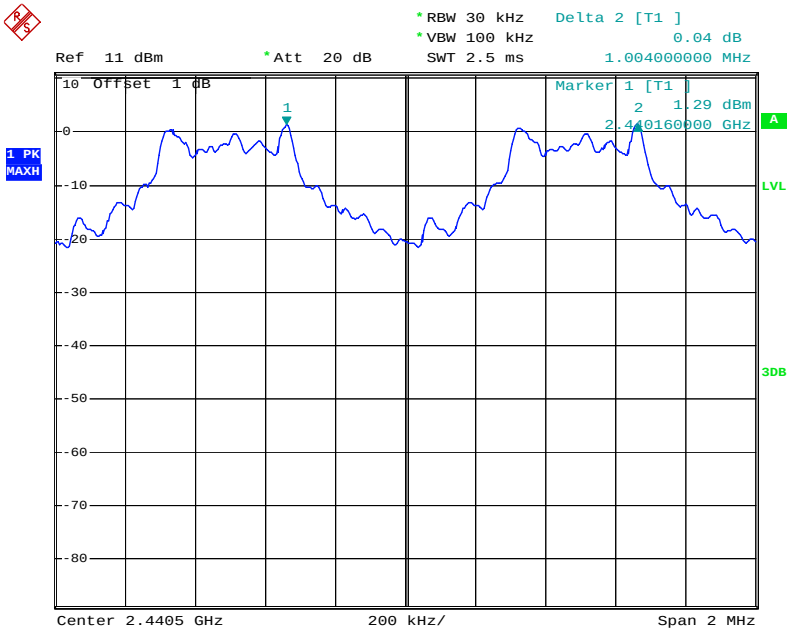
Middle Channel



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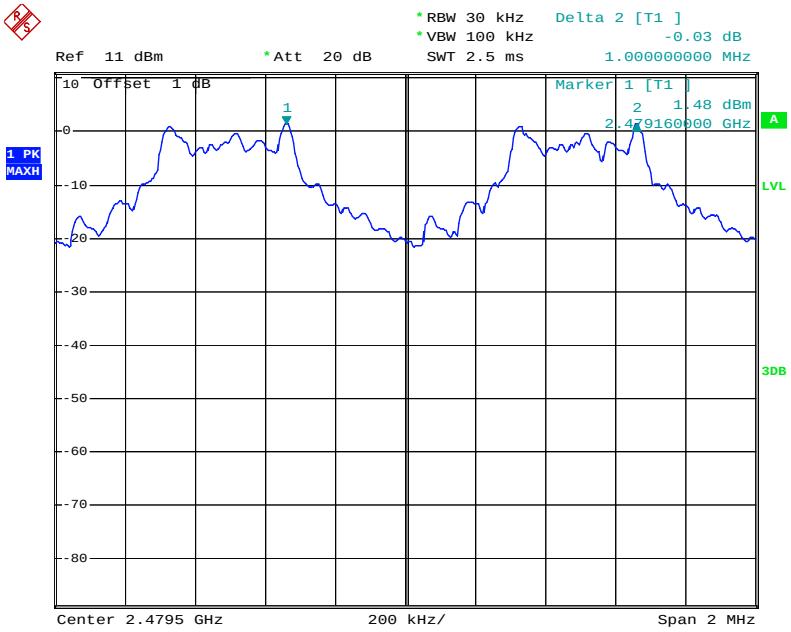
High Channel



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§15.247(a) (1) – 20dB Bandwidth

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Environmental Conditions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

3. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
4. Test date : May 26, 2014
   Tested By : Kevin Tian

Standard Requirement:

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Procedures:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel, RBW ≥ 1% of the 20 dB bandwidth, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
4. Set the measured low, middle and high frequency and test 20dB bandwidth with spectrum analyzer.

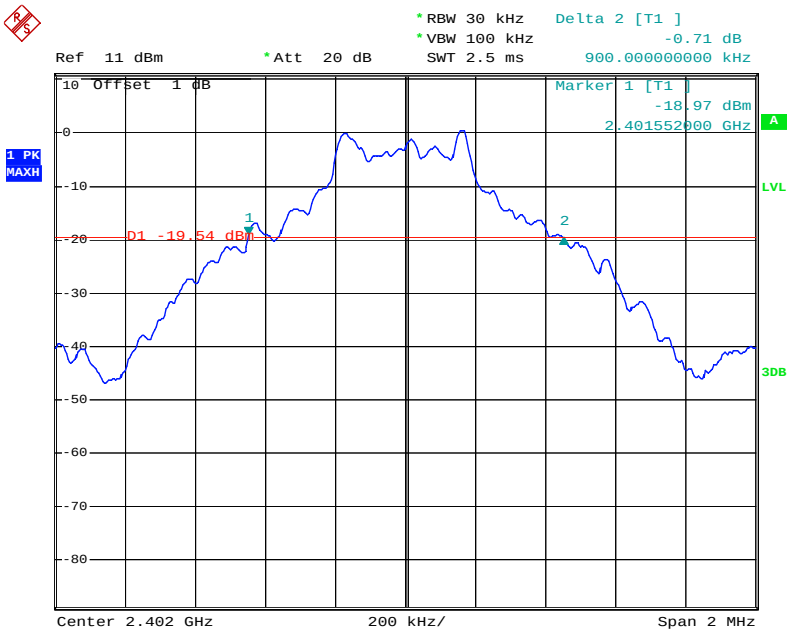
Test Result: Pass

Test Mode:	GFSK Transmitting

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2402	0.900
Middle	2441	0.900
High	2480	0.900

Please refer to the following plots.

Low Channel



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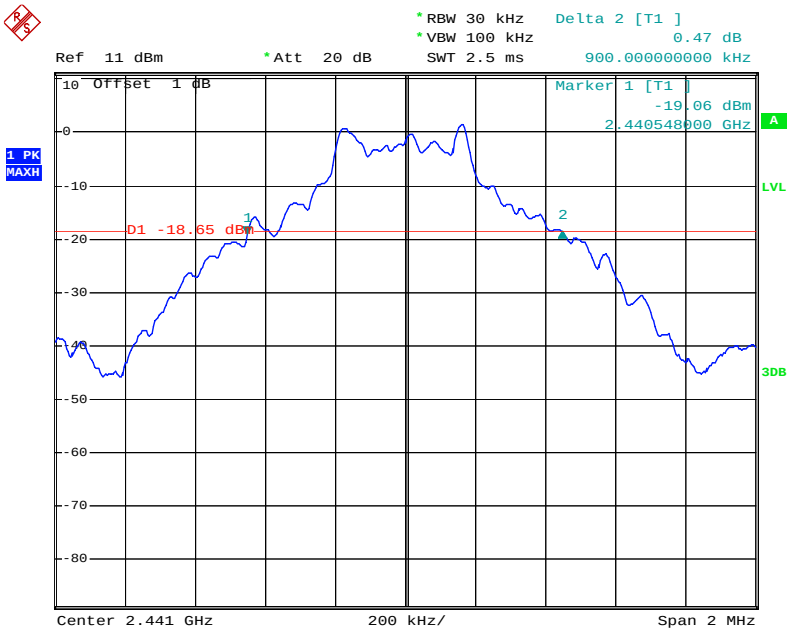
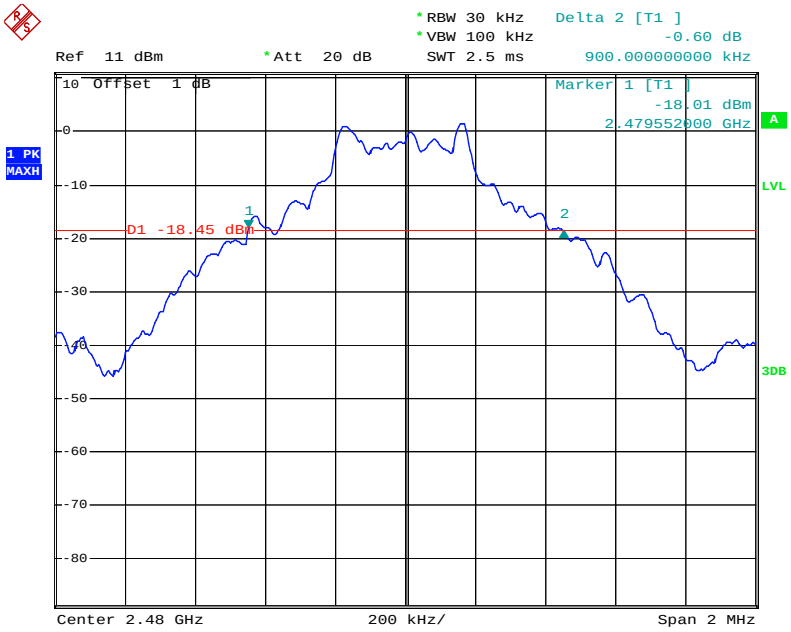
Middle Channel



Date: 26.MAY.2014 15:20:41

High Channel



Date: 26.MAY.2014 15:24:11

5.6 §15.247(a) (1) (iii)-Number of Hopping Channels

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
3. Environmental Conditions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

4. Test date : May 26, 2014
   Tested By : Kevin Tian

Standard Requirement:

According to §15.247(a)(1)(iii), Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Procedures:

1. Place the EUT on the table and set it in hopping function transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as Start=2400MHz, Stop = 2483.5MHz, Span = the frequency band of operation, RBW ≥1% of the span, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
4. Count the quantity of peaks to get the number of hopping channels.

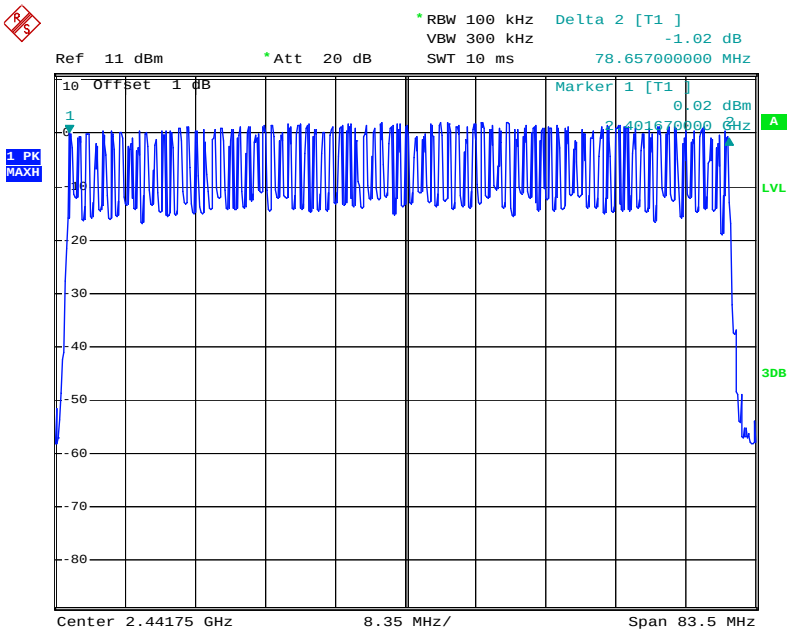
Test Result: Pass

Test Mode:	Hopping Mode With GFSK Modulation

Frequency Range (MHz)	Number of Hopping Channels	Limit
2400-2483.5	79	≥15

Please refer to following tables and plots

Number of Hopping Channels



Date: 26.MAY.2014 15:55:42

5.7 §15.247(a) (1) (iii) -Time of Occupancy (Dwell Time)

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
3. Environmental Conditions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

4. Test date : May 26, 2014
   Tested By : Kevin Tian

Standard Requirement:

According to §15.247(a)(1)(iii), The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Procedures:

1. Place the EUT on the table and set it in transmitting mode and switch on frequency hopping function.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as Span = zero span, centered on a hopping channel,
   RBW=1MHz, VBW ≥ RBW, Sweep = as necessary to capture the entire dwell time per hopping channel, Detector function = peak, Trace = max hold.
4. Calculate the time of occupancy in a period with time occupancy of a burst and quantity of bursts.

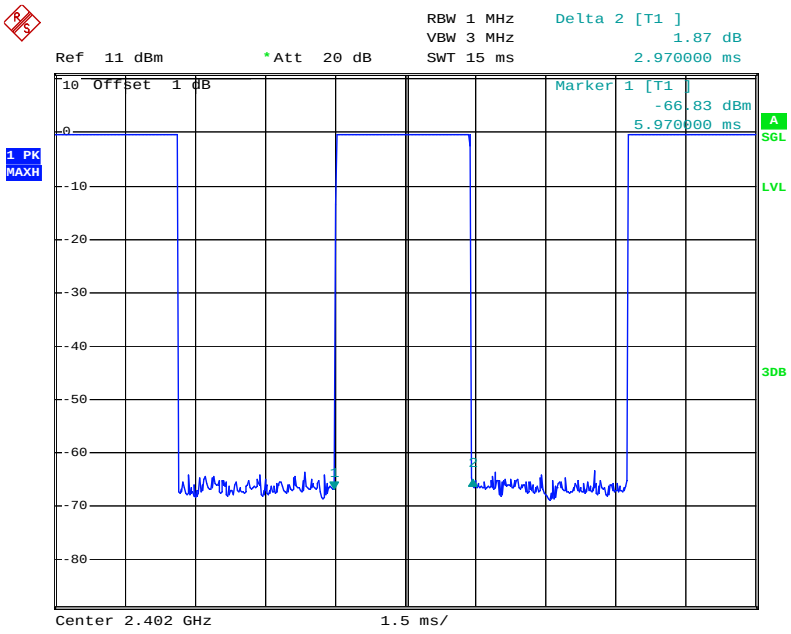
Test Result: Pass

Test Mode:	Hopping Mode With GFSK Modulation

Mode	Channel	Pulse Width (ms)	Dwell Time (s)	Limit (s)	Result
DH 5	Low	2.970	0.31680	0.4	Pass
	Middle	2.940	0.31360	0.4	Pass
	High	2.970	0.31680	0.4	Pass
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second				

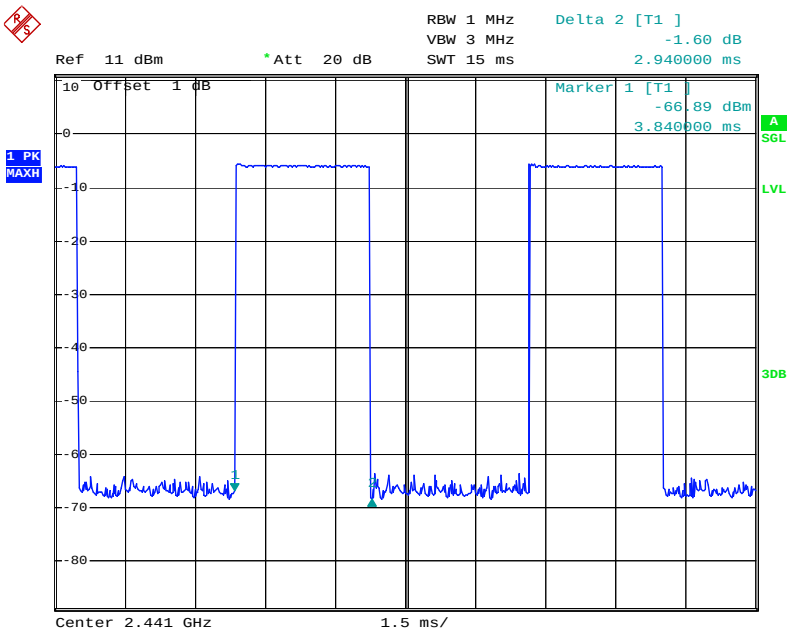
Please refer to the following plots.

Low Channel for DH5



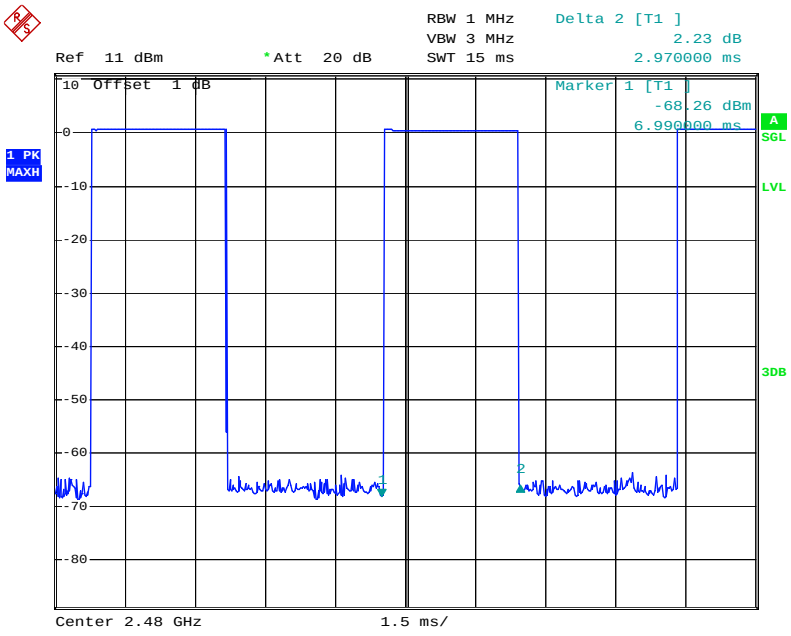
Date: 26.MAY.2014 16:17:31

Middle Channel for DH5



Date: 26.MAY.2014 16:20:39

High Channel for DH5



Date: 26.MAY.2014 16:24:38

5.8 §15.247(b) (1) - Peak Output Power

1. Conducted Measurement
   EUT was set for low, mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ±1.5dB.
3. Environmental Conditions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

4. Test date : May 26, 2014
   Tested By : Kevin Tian

Standard Requirement:

According to §15.247(b)(2), For frequency hopping systems in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5MHz band: 0.125watts.

Procedures:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel, RBW > the 20 dB bandwidth of the emission being measured, VBW ≥ RBW, Sweep=auto, Detector function=peak, Trace = max hold.
4. Then set the EUT to transmit at low, middle and high channel and measure the conducted output power separately.

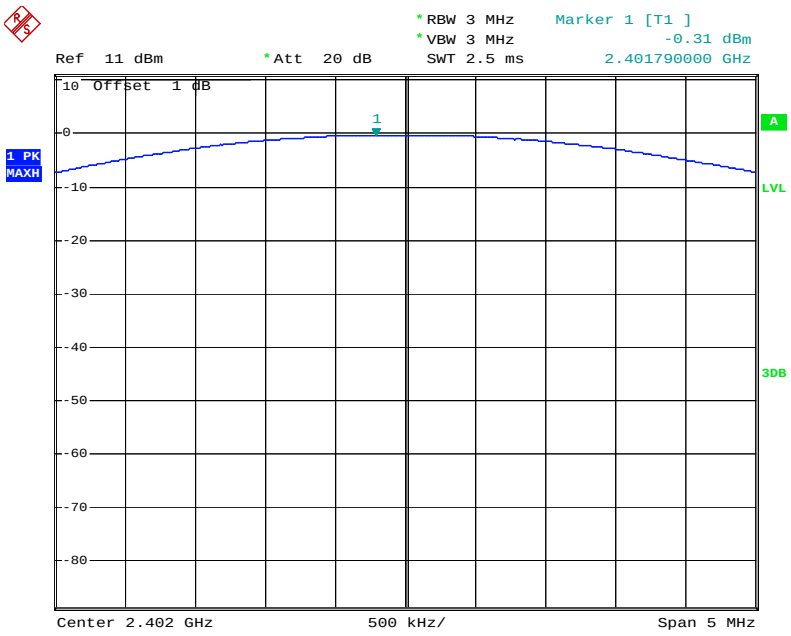
Test Result: Pass

Test Mode:	GFSK Transmitting

Channel	Channel frequency (MHz)	Peak output power (dBm)	Power output (mW)	Limit (W)
Low channel	2402	-0.31	0.93	1
Middle channel	2441	1.57	**1.44**	1
High channel	2480	0.85	1.22	1

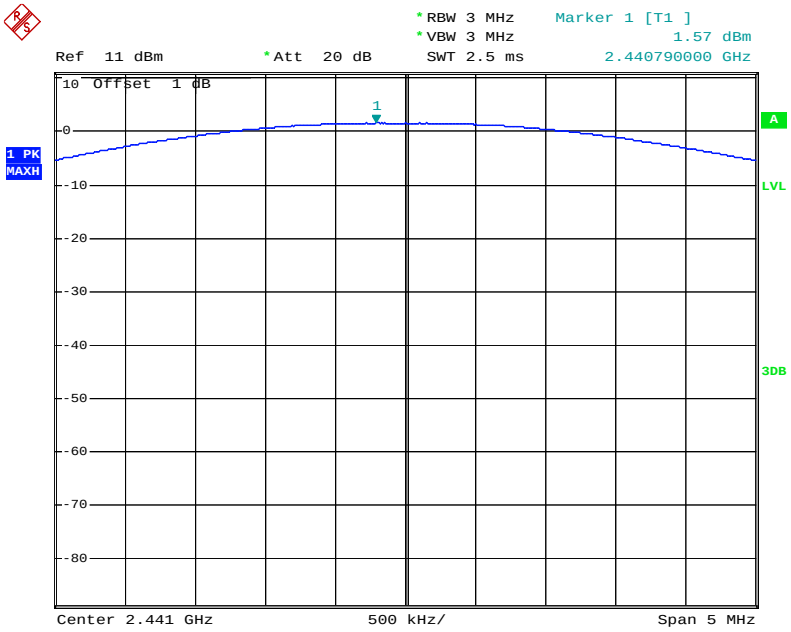
Please refer to the following plots.
Note: The data above was tested in conducted mode.

Low Channel



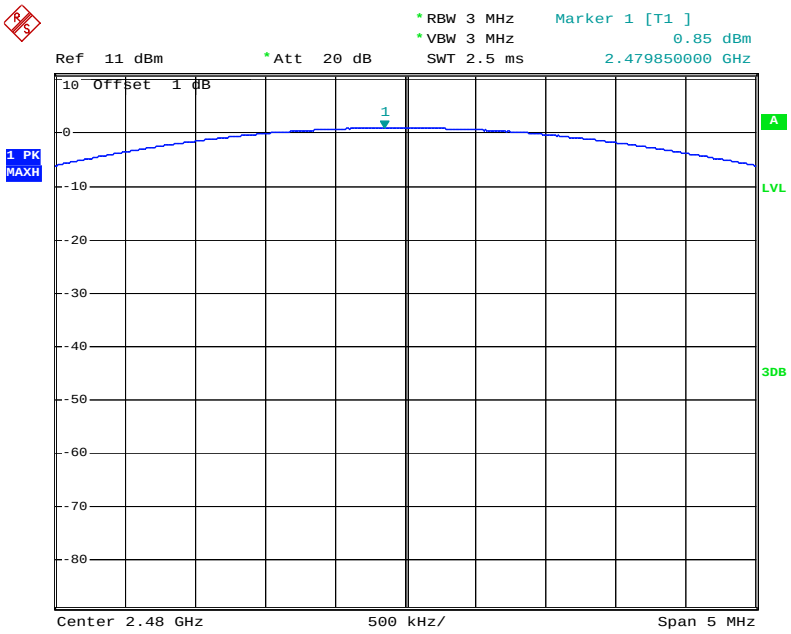
Date: 26.MAY.2014 16:36:32

Middle Channel



Date: 26.MAY.2014 16:35:50

High Channel



Date: 26.MAY.2014 16:32:59

5.9 §15.247(d) - Band Edge

Standard Requirement:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Procedures: (Radiated Method Only)

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below:

   a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.

   b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.

   c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth for Average detection (AV) as below at frequency above 1GHz.

   ■ 1 kHz (Duty cycle < 98%) ☐ 10 Hz (Duty cycle > 98%)
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Note:

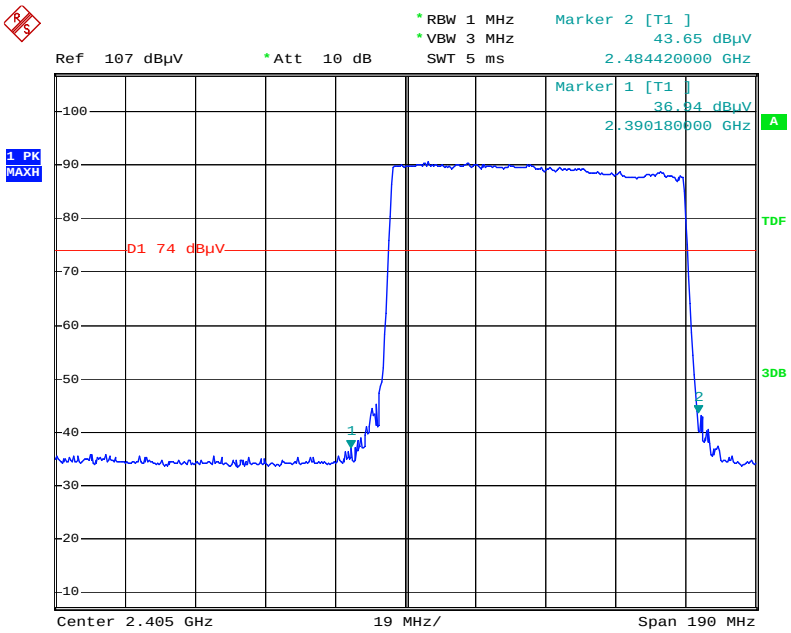
For Hopping device, should test hopping mode and CW Tx mode separately. For hopping mode, find out the worst points outside the frequency band firstly, then set the worst points as the center frequency, use above average 3 (c) spectrum analyzer set, find out the final worst average value separately.

Test Result: Pass

Test Mode:	GFSK Hopping &Transmitting

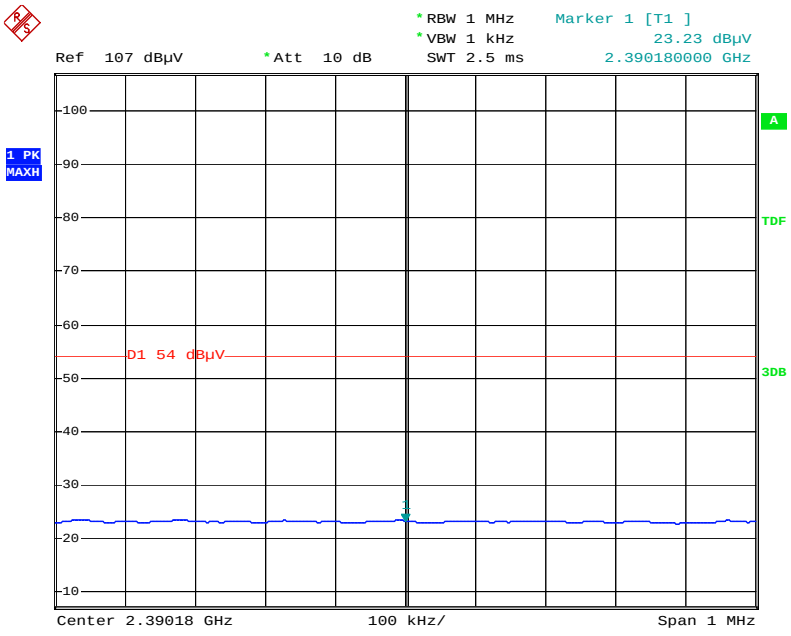
Please refer to the following plots.

GFSK-hopping-PK



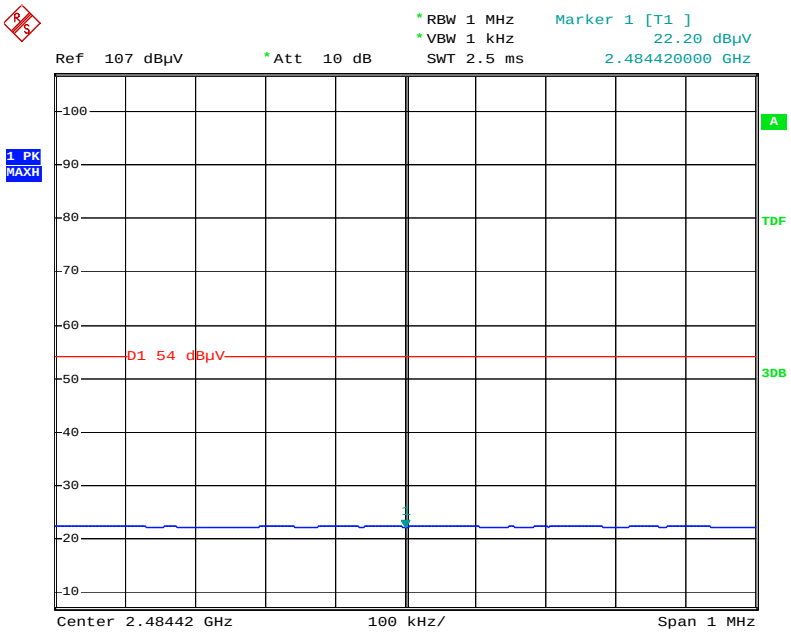
Date: 9.JUL.2014 23:27:15

GFSK-hopping-Av-Left



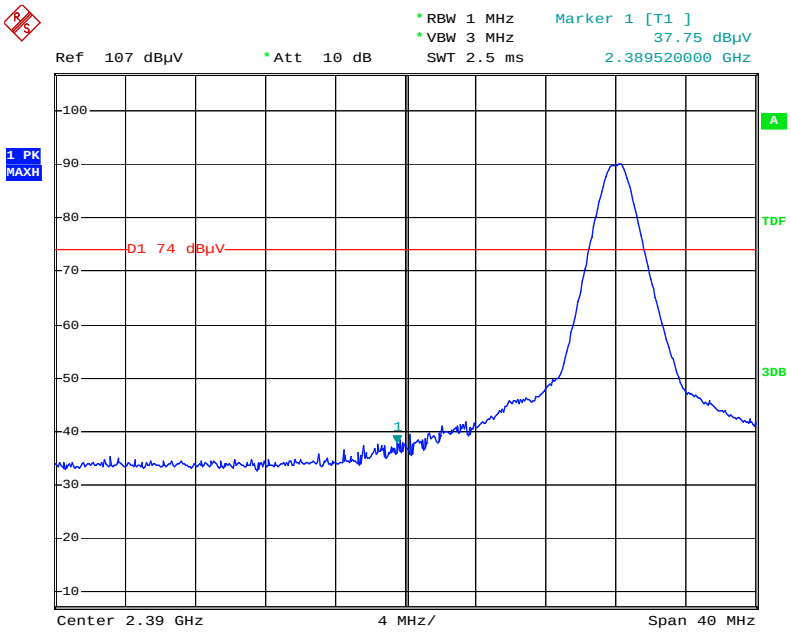
Date: 9.JUL.2014 23:31:37

GFSK-hopping-Av-Right



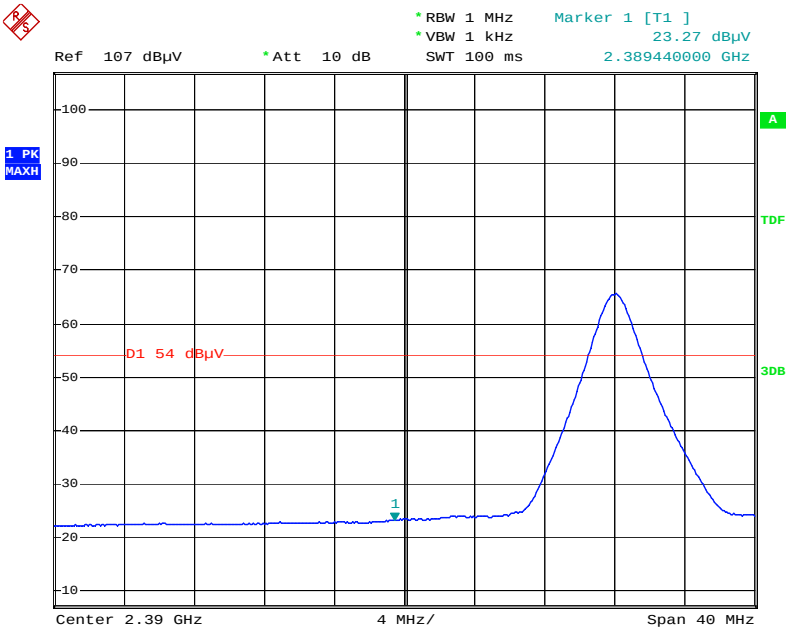
Date: 9.JUL.2014 23:42:02

GFSK Left Side PK



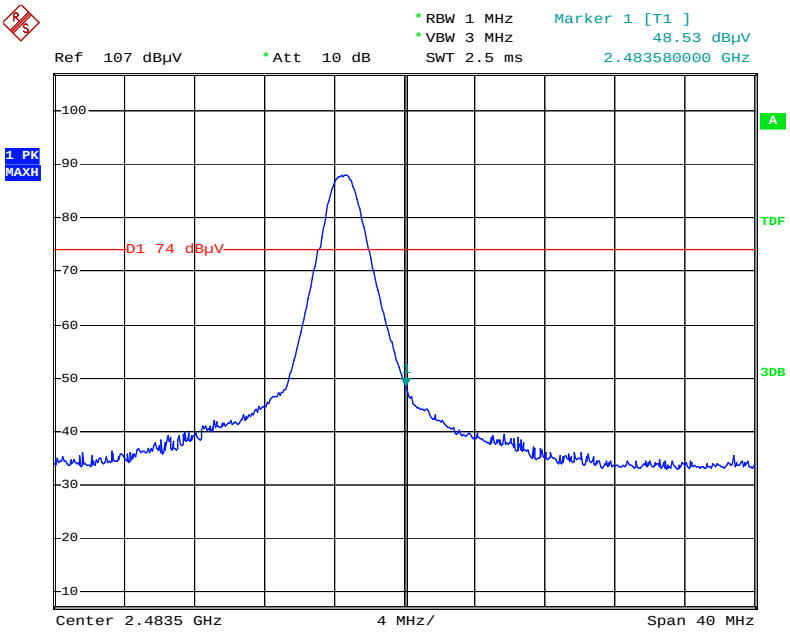
Date: 9.JUL.2014 23:45:15

GFSK Left Side Av



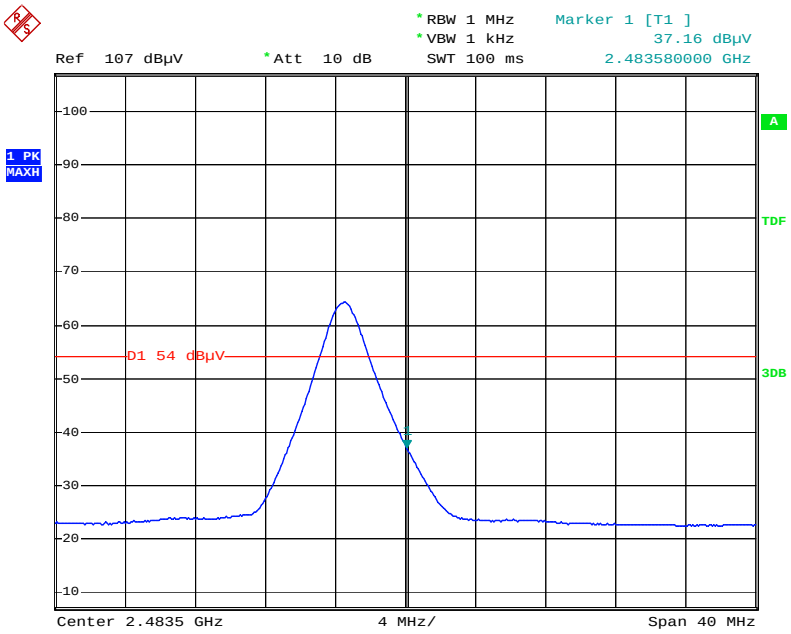
Date: 9.JUL.2014 23:49:40

GFSK Right Side PK



Date: 9.JUL.2014 23:54:31

GFSK Right Side Ave



Date: 9.JUL.2014 23:56:45

Annex A. TEST INSTRUMENT

Annex A.i. TEST INSTRUMENTATION

Instrument	Model	Serial #	Calibration Date	Calibration Due Date
AC Line Conducted Emissions				
R&S EMI Test Receiver	ESPI3	101216	09/27/2013	09/26/2014
V-LISN	ESH3-Z5	838979/005	09/27/2013	09/26/2014
Com-Power Transient Limiter	LIT-153	531021	09/27/2013	09/26/2014
SIEMIC Labview Conducted Emissions software	V1.0	N/A	N/A	N/A
Radiated Emissions				
Hp Spectrum Analyzer	8563E	3821A09023	09/27/2013	09/26/2014
R&S EMI Receiver	ESPI3	101216	09/27/2013	09/26/2014
Antenna (30MHz~6GHz)	JB6	A121411	04/15/2014	04/14/2015
EMCO Horn Antenna (1 ~18GHz)	3115	N/A	10/09/2013	10/08/2014
Horn Antenna (18~40GHz)	AH-840	101013	04/22/2014	04/21/2015
Microwave Pre-Amp (18~40GHz)	PA-840	181250	05/29/2014	05/28/2015
Hp Agilent Pre-Amplifier	8447F	1937A01160	10/27/2013	10/26/2014
MITEQ Pre-Amplifier (0.1 ~ 18GHz)	AMF-7D-00101800-30-10P	1451709	10/27/2013	10/26/2014
Chamber	3m	N/A	04/13/2014	04/12/2015
SIEMIC Labview Radiated Emissions software	V1.0	N/A	N/A	N/A

Annex B. EUT AND TEST SETUP PHOTOGRAPHS

Annex B.i. Photograph : EUT External Photo

All Packages – Front View

EUT - Front View

EUT - Rear View

EUT – Top View

EUT – Bottom View

EUT – Left View

EUT – Right View

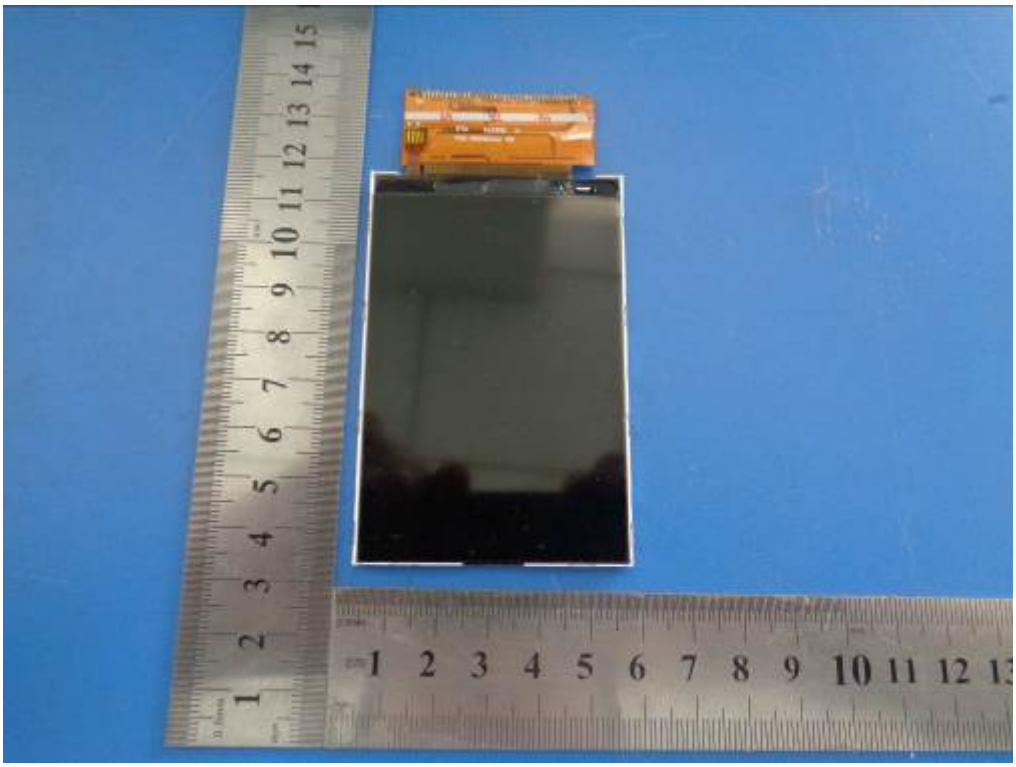
Annex B.ii. Photograph 2: EUT Internal Photo

EUT – Uncover Front View 1

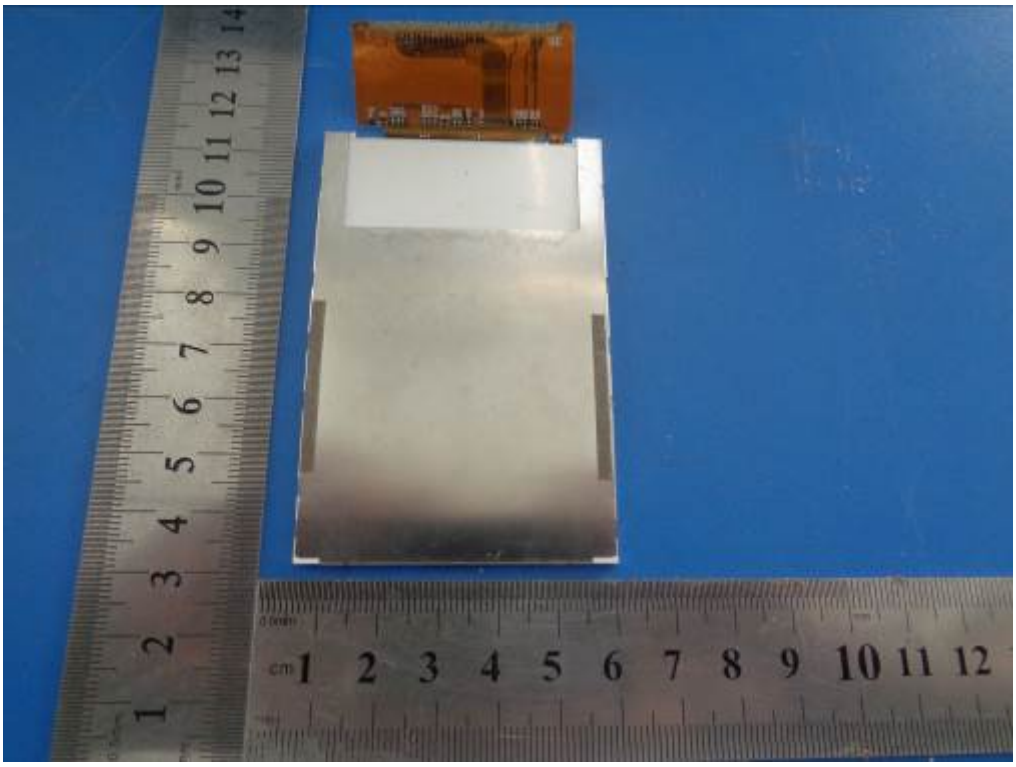
EUT – Uncover Front View 2

EUT – Battery Front View

EUT – Battery Rear View

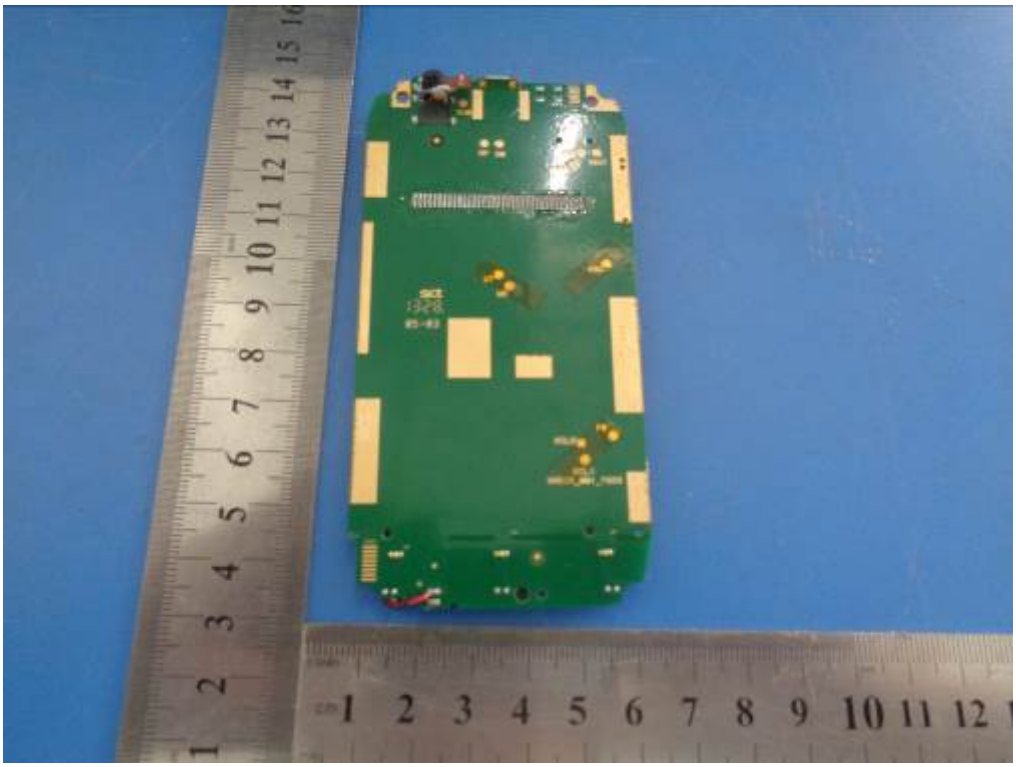


LCD - Front View

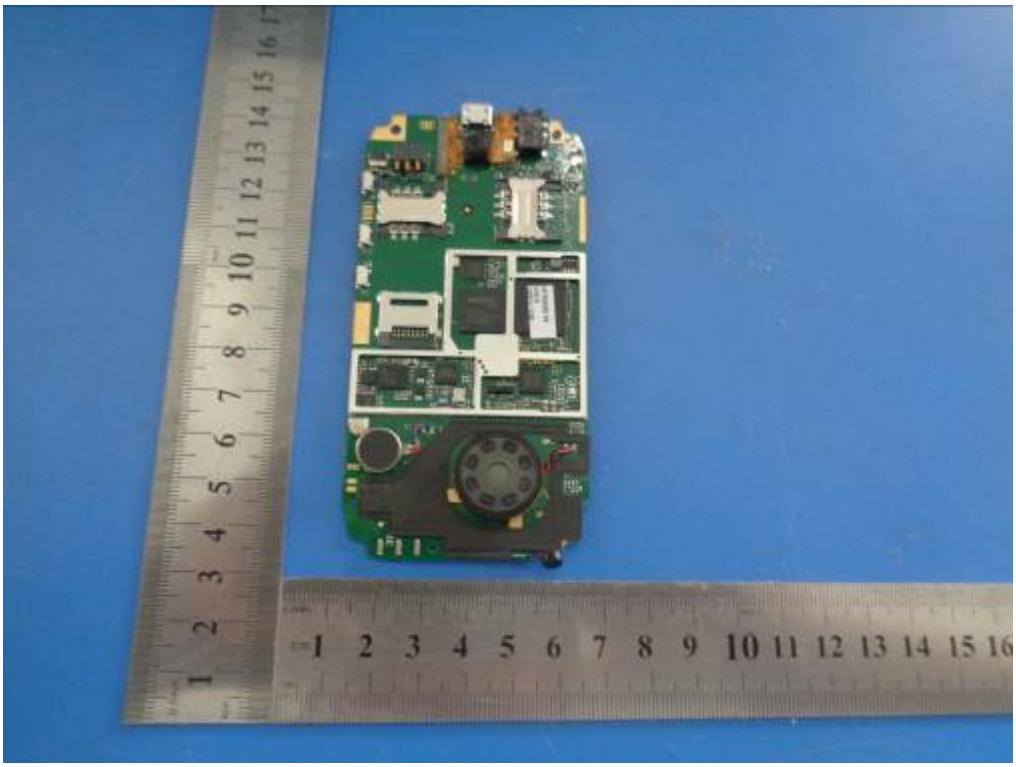


LCD - Rear View

EUT – PCB Front View



EUT – PCB Rear View

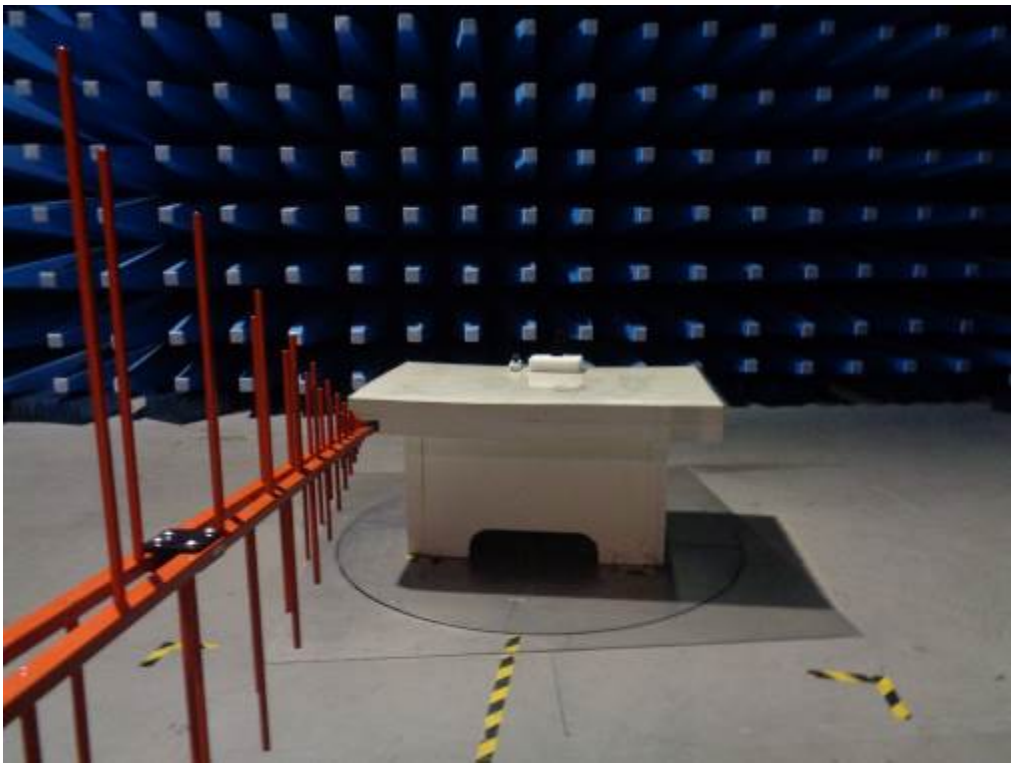


EUT – PCB Shielding Off Front View

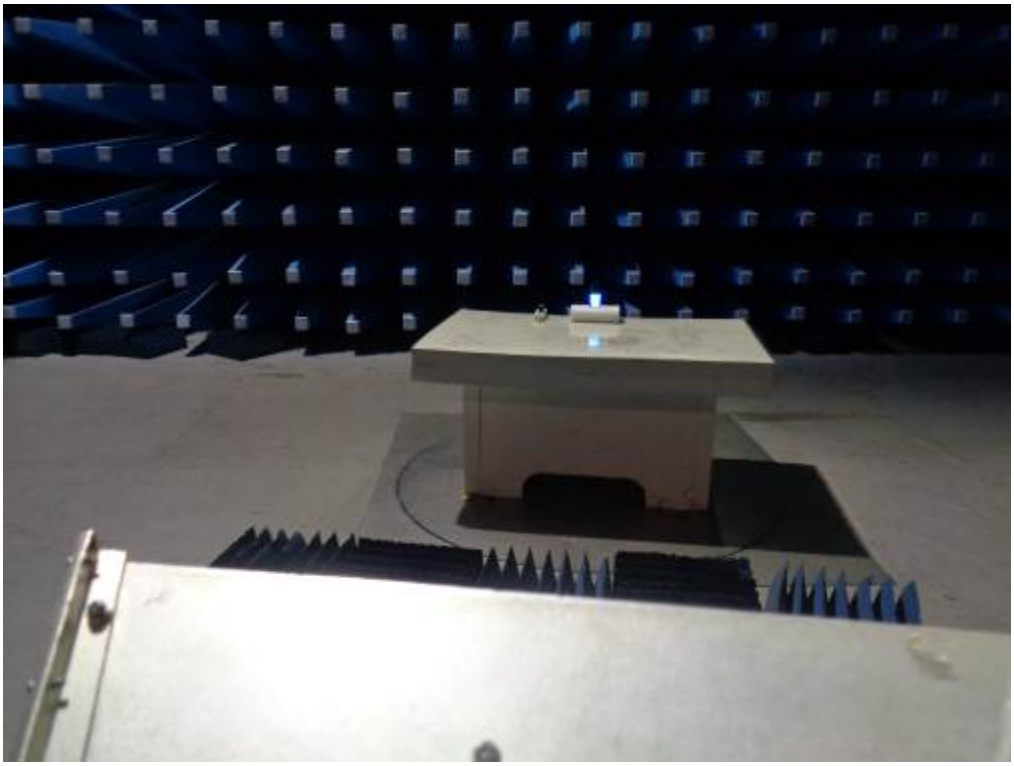
Annex B.iii. Photograph 3: Test Setup Photo

Conducted Emissions Test Setup – Front View

Conducted Emissions Test Setup – Side View



Radiated Spurious Emissions Test Setup Below 1GHz - Front View



Radiated Spurious Emissions Test Setup Above 1GHz –Front View

Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

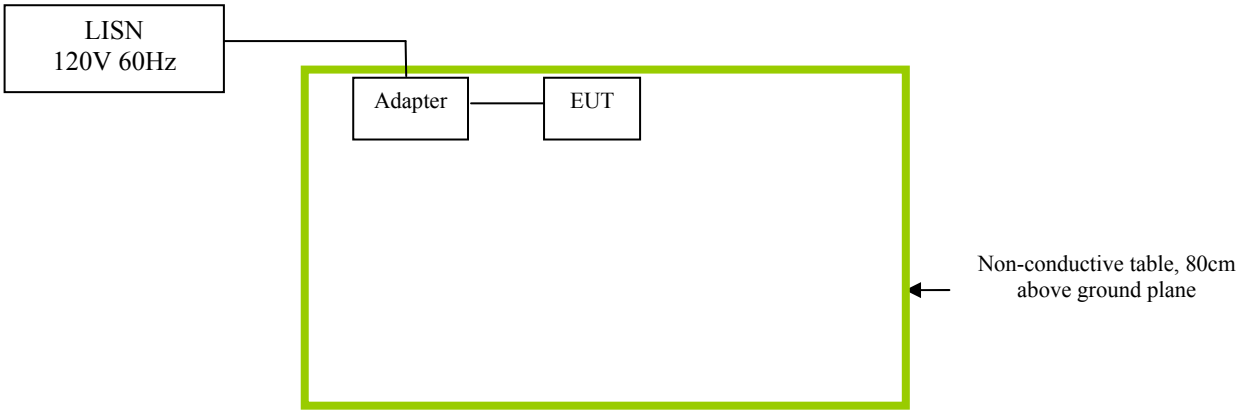
EUT TEST CONDITIONS

Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

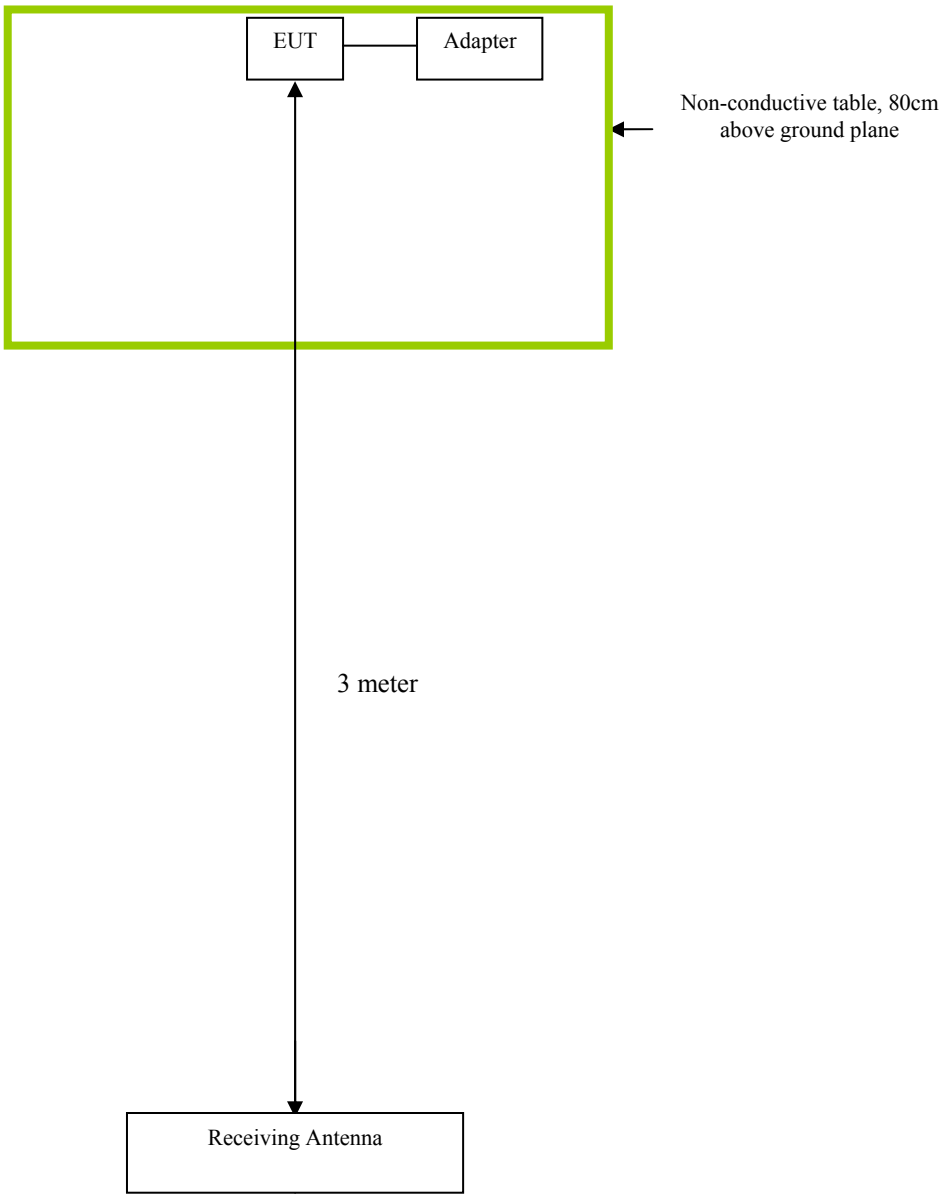
The following is a description of supporting equipment and details of cables used with the EUT.

Manufacturer	Equipment Description (Including Brand Name)	Model	Calibration Date	Calibration Due Date
N/A	N/A	N/A	N/A	N/A

Block Configuration Diagram for AC Line Conducted Emissions



Block Configuration Diagram for Radiated Emissions



Annex C.ii. EUT OPERATING CONDITIONS

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
Emissions Testing	The EUT was continuously transmitting to stimulate the worst case.

Annex D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PART LIST

Please see attachment

Annex E. DECLARATION OF SIMILARITY

N/A