RADIO TEST REPORT For SHENZHEN SAMHOO SCI&TECH CO., LTD Digital Two Way Radio Test Model: SPM6015

Prepared for	:	SHENZHEN SAMHOO SCI&TECH CO.,LTD
Address	:	Room 401, Building 2th, Huaqiangyun Industrial Park, Meixiu
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Web	:	www.LCS-cert.com
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Date of receipt of test sample	:	April 25, 2016
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	April 25, 2016 ~ June 08, 2016

:

June 08, 2016

Date of Report

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SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. FCC ID: 2ABUBSPM6015 Report No.: LCS1606130857E

	RADIO TEST REPORT	
	FCC Part 90	
Report Reference No	: LCS1606130857E	
Date of Issue	: June 08, 2016	
Testing Laboratory Name	: Shenzhen LCS Compliance Testing Laboratory Ltd.	
Address	: 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China	
Testing Location/ Procedure	 Full application of Harmonised standards Partial application of Harmonised standards Other standard testing method 	
Applicant's Name	: SHENZHEN SAMHOO SCI&TECH CO.,LTD	
Address	: Room 401, Building 2th, Huaqiangyun Industrial Park, Meixiu Road, Meilin, Futian District, Shenzhen, China	
Test Specification		
Standard	: FCC Part 90/FCC Part 2/FCC Part 15B	
Test Report Form No	: LCSEMC-1.0	
TRF Originator	: Shenzhen LCS Compliance Testing Laboratory Ltd.	
Master TRF	: Dated 2011-03	
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Test Item Description	: Digital Two Way Radio	
Trade Mark	: Samhoo	
Test Model	: SPM6015	
Ratings	: DC 13.6V by External DC power supply	
Result	: Positive	

Compiled by:

Aking Jin

Aking Jin/ File administrators

Supervised by:

an

Glin Lu/ Technique principal

Approved by:

Gavin Liang/ Manager

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 SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD.
 FCC ID: 2ABUBSPM6015

Report No.: LCS1606130857E

RADIO -- TEST REPORT

Test Report No. : LCS1606130857E

June 08, 2016 Date of issue

Test Model	: SPM6015
EUT	: Digital Two Way Radio
Applicant	: SHENZHEN SAMHOO SCI&TECH CO.,LTD
Address	Room 401, Building 2th, Huaqiangyun Industrial Park, Meixiu Road, Meilin, Futian District, Shenzhen, China
Telephone	:/
Fax	: /
Manufacturer	: SHENZHEN SAMHOO SCI&TECH CO.,LTD
Address	Room 401, Building 2th, Huaqiangyun Industrial Park, Meixiu Road, Meilin, Futian District, Shenzhen, China
Telephone	
Fax	: /
-	: SHENZHEN SAMHOO SCI&TECH CO.,LTD
Address	: Room 401, Building 2th, Huaqiangyun Industrial Park, Meixiu
	Road, Meilin, Futian District, Shenzhen, China
Telephone	:/
Fax	: /

Test Result Positive

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. FCC ID: 2ABUBSPM6015 Report No.: LCS1606130857E

Revision History

Revision	Issue Date	Revisions	Revised By
00	2016-06-08	Initial Issue	Gavin Liang

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1. GENERAL INFORMATION

1.1. Product Description for Equipment Under Test (EUT)

EUT	: Digital Two Way Radio
Test Model	: SPM6015
Power Supply	: DC 13.6V by External DC power supply
Hardware Version	: SPM6000V2.0
Software Version	: V1.02.01.007
Frequency Range	: 136MHz-174MHz
Channel Separation	: Analog Voice 12.5KHz
	Digital Voice/Data 12.5KHz
	Digital Data 12.5KHz
Modulation Type	: FM for Analog Voice
	4FSK for Digital Voice/Digital Data
	4FSK for Digital Data
Emission Designator	: 11K0F3E for FM Modulation at 12.5KHz Channel Separation
	7K60FXD for Digital Data only at 12.5KHz Channel Separation
	7K60FXW for Digital Data & Digital Voice at 12.5KHz Channel Separation
Antenna Description	: External, 3.65dBi (Max)
Rated Power	: 50Wattes/5Watts
GPS Receiver	:
Receive Frequency	: 1575.42MHz
Channel Number	:1

Note: The product has the same digital working characters when operating in both two digitized voice/data mode. So only one set of test results for digital modulation modes are provided in this test report.

1.2. Objective

The tests were performed according to following standards:

FCC Rules Part 90: 2015: PRIVATE LAND MOBILE RADIO SERVICES.

47 CFR FCC Part 15 Subpart B: 2015 - Unintentional Radiators

FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS

<u>TIA/EIA 603 D: June 2014:</u> Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

1.3. Related Submittal(s)/Grant(s)

No Related Submittals.

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1.4. Description of Test Facility

CNAS Registration Number. is L4595.
FCC Registration Number. is 899208.
Industry Canada Registration Number. is 9642A-1.
VCCI Registration Number. is C-4260 and R-3804.
ESMD Registration Number. is ARCB0108.
UL Registration Number. is 100571-492.
TUV SUD Registration Number. is SCN1081.
TUV RH Registration Number. is UA 50296516-001

1.5. Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate

1.6. External I/O

I/O Port Description	Quantity	Cable
Micro SD Card Slot	1	N/A
Handheld Microphone	1	N/A
Interface	1	IN/A
Accessories Interface	1	N/A
RF Antenna Base	1	N/A
Power Interface	1	N/A
Positioning Module Antenna	1	N/A
Interface	1	IN/A

1.7. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Items	Measurement Uncertainty	Notes
Frequency stability	30 Hz	(1)
Transmitter power conducted	0.62 dB	(1)
Transmitter power Radiated	2.67 dB	(1)
Conducted spurious emission 9KHz-40 GHz	1.88 dB	(1)
Conducted Emission 9KHz-30MHz	1.63 dB	(1)
Radiated Emission 30~1000MHz	4.65 dB	(1)
Radiated Emission 1~18GHz	3.89 dB	(1)
Radiated Emission 18-40GHz	3.90 dB	(1)
Occupied Bandwidth		(1)
Emission Mask		(1)
Modulation Characteristic		(1)
Transmitter Frequency Behavior		(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

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1.8. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

1.9. Description Of Test Modes

The EUT has been tested under typical operating condition and The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

EUT operation mode no.	Description of operation mode	Additional information
Op 1	FM+BW12.5KHz+TX	The equipment is set with FM modulation and 12.5KHz bandwidth at maximum rated power for transmitter, powered by DC 13.60V
Op 2	FM+BW12.5KHz+TX	The equipment is set with FM modulation and 12.5KHz bandwidth at minimum rated power for transmitter, powered by DC 13.60V
Op 3	4FSK+BW12.5KHz+TX	The equipment is set with 4FSK modulation and 12.5KHz bandwidth at maximum rated power for transmitter, powered by DC 13.60V
Op 4	4FSK+BW12.5KHz+TX	The equipment is set with 4FSK modulation and 12.5KHz bandwidth at minimum rated power for transmitter, powered by DC 13.60V
Op 5	FM+BW12.5KHz+RX (Standby)	The equipment is set with FM modulation and 12.5KHz bandwidth at Receiver/Standby mode, powered by DC 13.60V
Op 6	4FSK+BW12.5KHz+RX (Standby)	The equipment is set with 4FSK modulation and 12.5KHz bandwidth at Receiver/Standby mode, powered by DC 13.60V

Test frequency list

Modulation Type	Channel Sequestion	Test Channel	Test Frequency (MHz)		
Modulation Type	Channel Separation	Test Channel	TX	RX	
		Ch1	150.825	150.825	
Analog/FM	12.5KHz	Ch2	158.55	158.55	
		Ch3	173.3875	173.3875	
		Ch7	150.825	150.825	
Digital/4FSK	12.5KHz	Ch8	158.55	158.55	
6		Ch9	173.3875	173.3875	

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2. SYSTEM TEST CONFIGURATION

2.1. Justification

The system was configured for testing in engineering mode.

2.2. EUT Exercise Software

N/A.

2.3. Special Accessories

N/A.

2.4. Block Diagram/Schematics

Please refer to the related document.

2.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

2.6. Configuration of Test Setup

Please refer to the test setup photo.

SUMMARY OF TEST RESULT 3.

Test specification clause	Test case	Verdict
FCC Part 15.107	AC Conducted Emission	N/A
FCC Part 90.205	Maximum Transmitter Power	PASS
FCC Part 90.207	Modulation Characteristic	PASS
FCC Part 90.209	Occupied Bandwidth	PASS
FCC Part 90.210	Emission Mask	PASS
FCC Part 90.213	Frequency Stability	PASS
FCC Part 90.214	Transmitter Frequency Behavior	PASS
FCC Part 90.210	Transmitter Radiated Spurious Emission	PASS
FCC Part 90.210	Spurious Emission On Antenna Port	PASS

Remark:

1. The measurement uncertainty is not included in the test result.

2. The sample was powered by DC 13.60V from battery, not need test AC conducted emission per 15.107

4. TEST CONDITIONS AND RESULTS

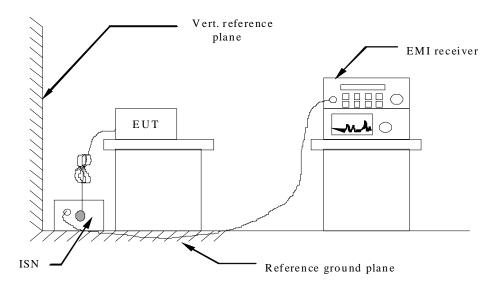
4.1. Conducted Emissions Test

TEST APPLICABLE

The EUT was tested according to ANSI C63.4 - 2014. The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm / 50 u Henry as specified by section 5.1 of ANSI C63.4 - 2014. Cables and peripherals were moved to find the maximum emission levels for each frequency.

TEST CONFIGURATION

For AC Power



TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4-2014.
- 2 Support equipment, if needed, was placed as per ANSI C63.4-2014.
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2014.
- 4 If a EUT received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 If a EUT received DC 13.60V power through an Impedance Stabilization Network (ISN) which supplied power source and was grounded to the ground plane.
- 6 All support equipments received AC power from a second LISN, if any.
- 7 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 8 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 9 During the above scans, the emissions were maximized by cable manipulation.

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Conducted Power Line Emission Limit

For intentional device, according to § 15.207(a) and RSS-Gen Section 7.2.4 for DC Power Conducted Emission Limits is as following:

Frequency (MHz)	Maximum RF Line Voltage (dBµV)							
	CLA	SS A	CLA	SS B				
(MITZ)	Q.P.	Ave.	Q.P.	Ave.				
0.15 - 0.50	79	66	66-56*	56-46*				
0.50 - 5.00	73	60	56	46				
5.00 - 30.0	73	60	60	50				

* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

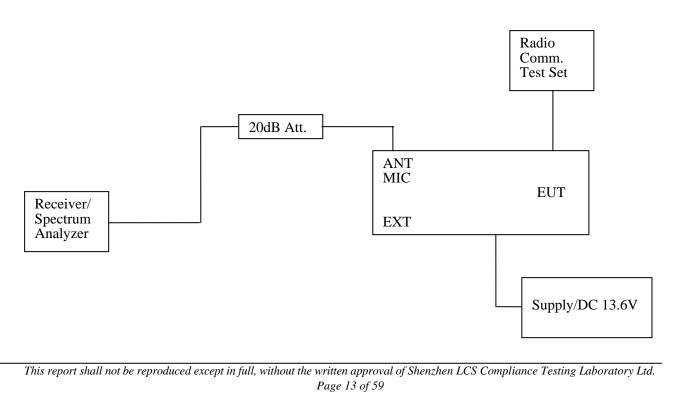
Not applicable (The sample was powered by DC 13.60V from battery)

4.2. Occupied Bandwidth and Emission Mask Test

TEST APPLICABLE

- (a). Occupied Bandwidth: The EUT was connected to the audio signal generator and the spectrum analyzer via the main RF connector, and through an appropriate attenuator. The EUT was controlled to transmit its maximum power. Then the bandwidth of 99% power can be measured by the spectrum analyzer.
- (b). Emission Mask B: For transmitters that are equipped with an audio low-pass filter pursuant to §90.211(a), the power of any emission must be 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.
- (c). Emission Mask D, 12.5 kHz channel bandwidth equipment: For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:
 - On any frequency from the centre of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.
 - (2) On any frequency removed from the centre of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(f_d 2.88 kHz) dB.
 - (3) On any frequency removed from the centre of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

TEST CONFIGURATION



TEST PROCEDURE

- 1 The EUT was placed on a turn table which is 0.8m above ground plane.
- 2 The EUT was modulated by 2.5 KHz Sine wave audio signal; the level of the audio signal employed is 16 dB greater than that necessary to produce 50% of rated system deviation. Rated system deviation is 2.5 kHz (12.5 kHz channel spacing).
- 3 Set EUT as normal operation.
- 4 Set SPA Centre Frequency = fundamental frequency, RBW=300Hz, VBW= 3 KHz, span =50 KHz.
- 5 Set SPA Max hold. Mark peak, Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth.
- 6 Set SPA Centre Frequency=fundamental frequency, set =300Hz, VBW=1 KHz, span=50 KHz for 12.5 KHz channel spacing.

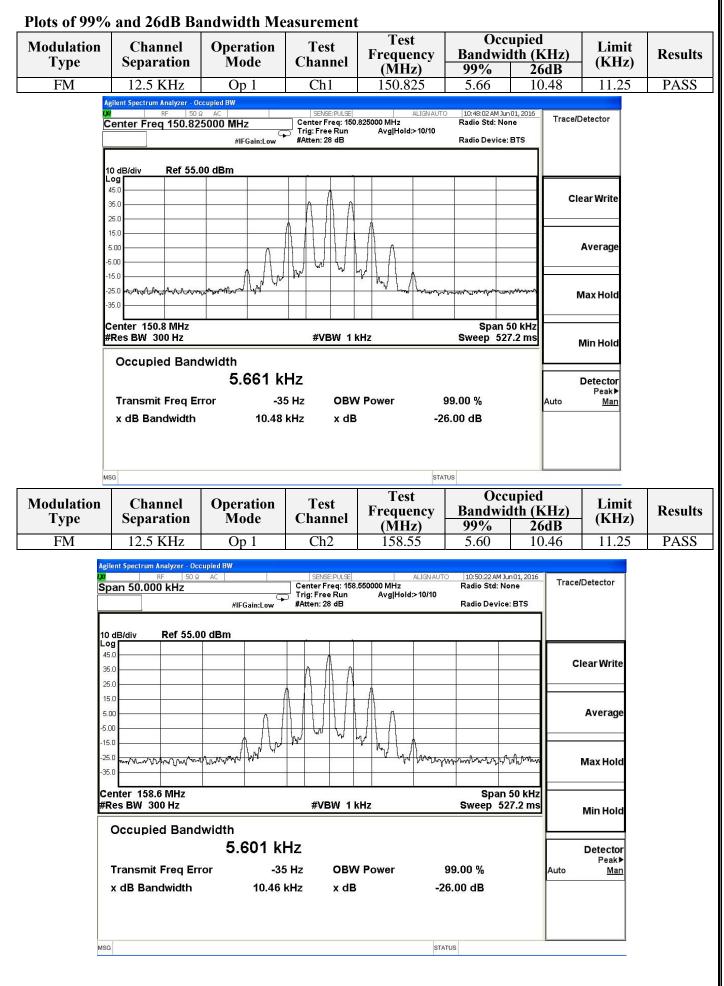
TEST RESULTS

Remark: We tested Op 1 to Op 4, recorded worst case at Op 1 and Op 3.

4.2.1 Occupied Bandwidth

Modulation	Channel Separation	Operation Mode	Test Channel	Test Frequency (MHz)	Occupied Bandwidth (KHz)			
Туре	Separation	widue	Channel	(141112)	99%	26dB		
		Op 1	Ch1	150.825	5.66	10.48		
Analog/FM	12.5KHz		Ch2	158.55	5.60	10.46		
C			Ch3	173.3875	5.69	10.48		
		Op 3	Ch7	150.825	7.57	10.09		
Digital/4FSK	12.5KHz		Ch8	158.55	7.40	9.94		
Ū.		-	Ch9	173.3875	7.66	9.58		
	Limit			11.25KHz for 12.5KHz Channel Separation				
	Test Results		PASS					

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<u>SHENZHEN LCS</u>	<u>COMPLIANCE TH</u>	ESTING LABORA	TORY LTD.	FCC ID: 2AI	BUBSPM6015	Report	No.: LCS1606	<u>130857E</u>
Modulation Type FM	Channel Separation 12.5 KHz	Operation Mode	Test Channel	Test Frequency (MHz)		upied dth (KHz) 26dB	Limit (KHz) 11.25	Results
		Op 1	Ch3	173.3875	5.69	10.48	11.25	PASS
LXI	ilent Spectrum Analyzer - Oco RF 50 Ω Dan 50.000 kHz		SENSE:PULSE Center Freq: 173 Trig: Free Run #Atten: 28 dB	ALIGN AU .387500 MHz Avg Hold:>10/10	TO 10:55:14 AM Ju Radio Std: No Radio Device	one Traci	e/Detector	
Lc 45	0 dB/div Ref 55.0 Pg	0 dBm					Clear Write	
24 18 5. -5.	5.0 5.0 5.0 00 5.0 5.0						Average	
-25	5.0 mm	from the for		har have	a urran all a grand and a grand a gran	᠆ᢦᡆᡟᠬᢧᢞᠯᠶ᠇	Max Hold	
	enter 173.4 MHz Res BW 300 Hz Occupied Band	width	#VBW 1	٢Hz	Span Sweep 52	50 kHz 7.2 ms	Min Hold	
	Transmit Freq Err	5.689 k	Hz OBV	/ Power	99.00 % 26.00 dB	Auto	Detector Peak► <u>Man</u>	
Modulation Type	G Channel Separation	Operation Mode	Test Channel	Test Frequency (MHz)		upied ith (KHz) 26dB	Limit (KHz)	Results
4FSK	12.5 KHz	Op 3	Ch7	150.825	7.57	10.09	11.25	PASS
	ilent Spectrum Analyzer . Occ	AC 5000 MHz #IFGain:Low	SENSE:PULSE Center Freq: 150 Trig: Free Run #Atten: 28 dB		TO 11:03:26 AM Ju Radio Std: No Radio Device	one Traci	e/Detector	
48 38	5.0 5.0		and the second s	iq		(Clear Write	
	5.0 00 00	ANNO CONTRACTOR					Average	
-25	5.0 	town, topus and		- L	1	KIMM MANA	Max Hold	
	enter 150.8 MHz Res BW 300 Hz		#VBW 1	(Hz	Span Sweep 52	50 kHz 7.2 ms	Min Hold	
	Occupied Band Transmit Freq Err x dB Bandwidth	7.574 k	Hz OBV	/ Power -;	99.00 % 26.00 dB	Auto	Detector Peak▶ <u>Man</u>	

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<u>SHENZHEN LCS</u>	COMPLIANCE TH	ESTING LABORA	TORY LTD.	FCC ID: 2AB	BUBSPM6015 H	Report No.: LCS1606	<u>130857E</u>
Modulation Type 4FSK	Channel Separation 12.5 KHz	Operation Mode	Test Channel Ch8	Test Frequency (MHz) 158.55			Results PASS
			Clið	138.33	7.40 9.	.94 11.23	PASS
LXI		AC	SENSE:PULSE	ALIGNAU	TO 11:01:04 AM Jun 01, 2016 Radio Std: None	Trace/Detector	
	enter Freq 158.550	JUUU IVIHZ #IFGain:Low	Trig: Free Run #Atten: 28 dB	Avg Hold:>10/10	Radio Device: BTS		
Г							
La	dB/div Ref 55.0	0 dBm	All Mark Mall				
	5.0	Clear Write					
	5.0						
	.00	hay A		n. Mu		Average	
-5.1		JV					
-25		www.math.math.			ית לתויאלו איז	Max Hold	
-36							
	enter 158.6 MHz Res BW 300 Hz		#VBW 1	kHz	Span 50 kHz Sweep 527.2 ms	MinHold	
	Occupied Band	width			- 11	Min Hold	
	Decapion Daila	7.398 k	Hz			Detector	
	Transmit Freq Err	ror -170	Hz OBV	V Power	99.00 %	Peak▶ Auto <u>Man</u>	
	x dB Bandwidth	9.938	kHz xdB	-2	26.00 dB		
	- 1						
MSC	3			100	ATUS		
Modulation Type	Channel Separation	Operation Mode	Test Channel	Test Frequency (MHz)	Occupied Bandwidth (H 99% 26		Results
4FSK	12.5 KHz	Op 3	Ch9	173.3875	7.66 9.	.58 11.25	PASS
Agi	i <mark>lent Spectrum Analyzer - Occ</mark> RF 50 Ω	AC	SENSE:PULSE	ALIGNAU	TO 11:01:51 AM Jun 01, 2016		
Ce	enter Freq 173.387	7500 MHz	Center Freq: 173 Trig: Free Run	.387500 MHz Avg Hold:>10/10	Radio Std: None	Trace/Detector	
F		#IFGain:Low	#Atten: 28 dB		Radio Device: BTS		
	dB/div Ref 55.0	0 dBm					
45	5.0		"burger of the second s			Clear Write	
1000	5.0		man h	An-			
	5.0	N				Average	
-5.1		N.		Nu Nu		Average	
-15							
-35	. and M P. to ano 11 . A	(Var. a) Lower		Manahal	who we wanted and a second	Max Hold	
	5.U						
	enter 173.4 MHz				Span 50 kHz		
#F	enter 173.4 MHz Res BW 300 Hz		#VBW 1	kHz	Span 50 kHz Sweep 527.2 ms	Min Hold	
#F	enter 173.4 MHz			kHz			
<u>#</u> F	enter 173.4 MHz Res BW 300 Hz Occupied Band	7.664 k	Hz		Sweep 527.2 ms	Detector Peak▶	
<u>#F</u>	enter 173.4 MHz Res BW 300 Hz	7.664 k	Hz) Hz ови	√ Power		Detector	
<u>#F</u>	enter 173.4 MHz Res BW 300 Hz Occupied Band Transmit Freq Err	7.664 k	Hz) Hz ови	√ Power	Sweep 527.2 ms	Detector Peak▶	
<u>#F</u>	enter 173.4 MHz Res BW 300 Hz Occupied Band Transmit Freq Err	7.664 k	Hz) Hz ови	√ Power	Sweep 527.2 ms	Detector Peak▶	
<u>#F</u>	enter 173.4 MHz Res BW 300 Hz Occupied Band Transmit Freq Err x dB Bandwidth	7.664 k	Hz) Hz ови	√ Power -2	Sweep 527.2 ms	Detector Peak▶	

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4.2.2 Emission Mask

Modulation Type	Channel Separation	Operation Mode	Test Channel	Test Frequency (MHz)	Applicable Mask	RBW (Hz)
		Op 1	Ch1	150.825	D	300
Analog/FM	12.5 KHz		Ch2	158.55	D	300
			Ch3	173.3875	D	300
	12.5 KHz	Op 3	Ch7	150.825	D	300
Digital/4FSK			Ch8	158.55	D	300
			Ch9	173.3875	D	300
	Test Results			PASS		

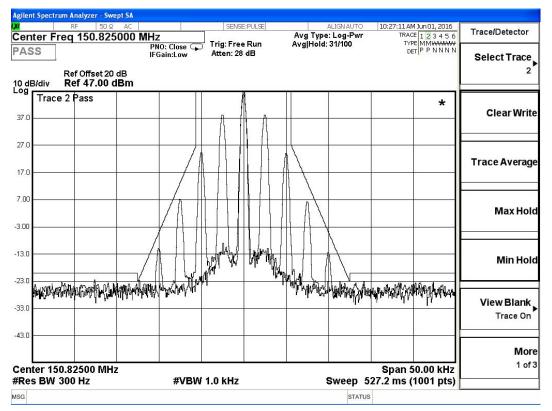
Plots of Emission Mask Measurement

Referred as the attached plot hereinafter

Note: The Black curve represents unmodulated signal.

The Blue curve represents modulated signal.

Modulation Type	Channel Separation	Operation Mode	Test Channel	Test Frequency (MHz)	Applicable Mask	RBW (Hz)	Audio Freq. (KHz)	Results
FM	12.5KHz	Op 1	Ch1	150.825	D	300	2.5	PASS



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Test Audio Modulation Operation **RBW** Channel Test Applicable Freq. Results Frequency Mode Mask Type Separation Channel (Hz) (MHz) (KHz) FM 12.5KHz Ch2 D 300 Op 1 158.55 2.5 PASS alyzer 22 AM Jun 01, 2016 TRACE 1 2 3 4 5 6 TYPE MMWMMW DET P P N N N N |10:25Trace/Detector Avg Type: Log-Pwr Avg|Hold: 23/100 Center Freq 158.550000 MHz Trig: Free Run PNO: Close 😱 IFGain:Low PASS Atten: 28 dB Select Trace 2 Ref Offset 20 dB Ref 47.00 dBm 10 dB/div Trace 2 Pass * **Clear Write** 37. 27.0 Trace Average 17.0 7.00 Max Hold -3.00 the fully -13.0 Min Hold V Marin Marin Warker Mar franciscoper a Alfred Marine and -23.0 van-hangeloopen-enougharonetherheiten View Blank -33.0 Trace On -43.0 More 1 of 3 Center 158.55000 MHz Span 50.00 kHz #VBW 1.0 kHz Sweep 527.2 ms (1001 pts) #Res BW 300 Hz MSG STATUS Test Audio **Modulation** Operation Test Applicable RBW Channel Frequency Freq. Results Separation Mode Channel Mask Туре (Hz) (MHz) (KHz) FM 300 PASS 12.5KHz Op 1 Ch3 173.3875 D Agilent Spectrum Analyzer - Swept SA 10:22:33 AM Jun 01, 2016 ALIGN AUTO SENSE: PULS Trace/Detector Avg Type: Log-Pwr Avg|Hold: 30/100 TRACE 1 2 3 4 5 6 TYPE MMWWWW DET P P N N N N Center Freq 173.387500 MHz Trig: Free Run PNO: Close G PASS Atten: 28 dB Select Trace Ref Offset 20 dB Ref 47.00 dBm 10 dB/div Log Trace 2 Pass * **Clear Write** 37.0 27.0 Trace Average 17.0 7.00 Max Hold -3.00 17/TH 咃 -13.0 Min Hold Andrew Maria program of the second Linder and a flag and a start and a start and a start -23.0 View Blank -33.0 Trace On -43.0 More 1 of 3 Center 173.38750 MHz Span 50.00 kHz #Res BW 300 Hz #VBW 1.0 kHz Sweep 527.2 ms (1001 pts) MSG STATUS

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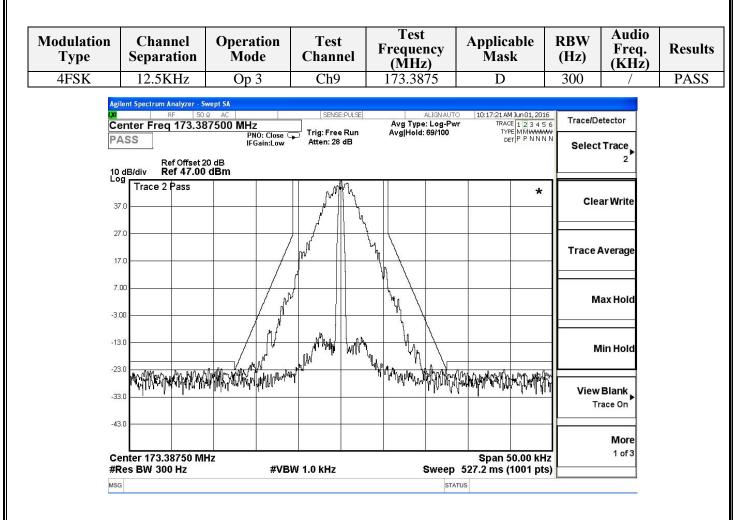
FCC ID: 2ABUBSPM6015 Report No.: LCS1606130857E

Audio Test Modulation **RBW** Channel Operation Test Applicable Freq. Results Frequency Mask Туре Separation Mode Channel (Hz) (MHz) (KHz) 4FSK 12.5KHz Ch7 D 300 Op 3 150.825 PASS gilent Spectrum Analyzer - Swept SA 10:14:45 AM Jun 01, 2016 TRACE 1 2 3 4 5 6 TYPE MMWAMW DET P P N N N N Trace/Detector Avg Type: Log-Pwr Avg|Hold: 65/100 Trig: Free Run PNO: Close 🆵 IFGain:Low PASS Atten: 28 dB Select Trace 2 Ref Offset 20 dB Ref 47.00 dBm 10 dB/div Trace 2 Pass * **Clear Write** 37. 27.0 Trace Average 17.0 7.00 ſk Max Hold ŋ -3.00 Lingthe lines -13.0 MI Min Hold Water and the second ήh -23.0 ĸĸĸĹĬĸĸĸĸŶĸĿĸĸŶĸŢĊĸŧŊĿĸŶĬĬĬŗĸŢĊĬŔĊŀſĬŢĊĬŢĬŗŊŊIJĿĸĿĸĸ View Blank -33.0 Trace On -43.0 More 1 of 3 Center 150.82500 MHz Span 50.00 kHz #VBW 1.0 kHz Sweep 527.2 ms (1001 pts) #Res BW 300 Hz MSG STATUS Test Audio **Modulation** Operation Applicable RBW Channel Test Frequency Freq. Results Separation Mode Mask Type Channel (Hz) (MHz) (KHz) 4FSK 300 PASS 12.5KHz Op 3 Ch8 158.55 D Agilent Spectrum Analyzer - Swept SA ALIGN AUTO 10:16:11 AM Jun 01, 2016 SENSE:PUL Trace/Detector Avg Type: Log-Pwr Avg|Hold: 62/100 TRACE 1 2 3 4 5 6 TYPE MMWWWW DET P P N N N N Center Freq 158.550000 MHz Trig: Free Run PNO: Close G PASS Atten: 28 dB Select Trace Ref Offset 20 dB Ref 47.00 dBm 10 dB/div Log Trace 2 Pass * **Clear Write** 37. 27.0 Trace Average 17.0 7.00 N Max Hold łA -3.00 I JM MAN -13.0 WN Min Hold Land Anton Manual Manual Control Contr -23.0 (HUASHER OPPLATES THAT WITH THE WITH View Blank -33.0 Trace On -43.0 More 1 of 3 Center 158.55000 MHz Span 50.00 kHz #Res BW 300 Hz #VBW 1.0 kHz Sweep 527.2 ms (1001 pts) MSG STATUS

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Report No.: LCS1606130857E



4.3. Transmitter Radiated Spurious Emission

TEST APPLICABLE

According to the TIA/EIA 603 test method, and according to Section 90.210, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with 12.5 KHz channel bandwidth:

- 1 On any frequency removed from the centre of the authorized bandwidth f_o to 5.625 KHz removed from $f_o:$ Zero dB
- 2 On any frequency removed from the centre of the authorized bandwidth by a displacement frequency (f_d in KHz) f_o of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB
- 3 On any frequency removed from the centre of the authorized bandwidth by a displacement frequency (f_d in KHz) f_o of more than 12.5 KHz: At least 50+10 log (P) dB or 70 dB, which ever is lesser attenuation.

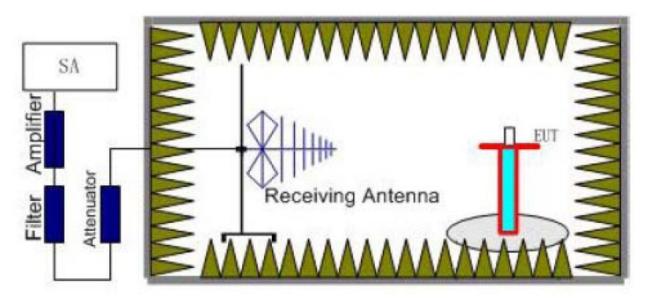
For transmitters designed to transmit with 25 KHz channel separation and equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as following:

- 1 On any frequency removed from the assigned frequency by more than 50 percent, but no 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 no 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+10Log (P) dB.

TEST CONFIGURATION

SA		Signal Generator
ter Amplifier Attenuator	Antenna Antenna Receiving Antenna	
Atte		

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TEST PROCEDURE

- 1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in six channels were measured with peak detector.
- 2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
- 3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz for above 1GHz and RBW=100 KHz, VBW=300 KHz for 30MHz to 1GHz, and the maximum value of the receiver should be recorded as (P_r).
- 4. The EUT shall be replaced by a substitution antenna. In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
- 5. An amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test. The measurement results are obtained as described below:

Power (EIRP) = P_{Mea} - P_{Ag} - P_{cl} - G_a

Amplifier for substituation test;

The measurement results are amending as described below:

Power (EIRP) = P_{Mea} - P_{cl} - G_a

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- 6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
- 7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

LIMIT

Modulation Type: FM

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 12: For 12.5 kHz bandwidth: On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least: High: $50 + 10 \log (Pwatts) = 50 + 10 \log (50.0) = 66.99 \text{ dB}$ Low: $50 + 10 \log (Pwatts) = 50 + 10 \log (5.0) = 56.99 \text{ dB}$ Note: In general, the worst case attenuation requirement shown above was applied. Calculation: Limit (dBm) =EL-50-10log10 (TP) Notes: EL is the emission level of the Output Power expressed in dBm, In this application, the EL is 46.99 dBm for Rated High power level and 37.02 dBm for Rated Lower power level; High: Limit (dBm) =46.99-50-10log10 (50.0) = -20 dBm Low: Limit (dBm) =37.02-50-10log10 (5.0) = -20 dBm

Modulation Type: 4FSK

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 12 (12.5 kHz Bandwidth only):

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:

High: $50 + 10 \log (Pwatts) = 50 + 10 \log (50.0) = 66.99 \text{ dB}$

Low: $50 + 10 \log (Pwatts) = 50 + 10 \log (5.0) = 56.99 \text{ dB}$

Note: In general, the worst case attenuation requirement shown above was applied.

Calculation: Limit (dBm) =EL-50-10log10 (TP)

Notes: EL is the emission level of the Output Power expressed in dBm,

In this application, the EL is 46.99 dBm for Rated High power level and 37.0w dBm for Rated Lower power level;

High: Limit (dBm) =46.99-50-10log10 (50.0) = -20 dBm

Low: Limit (dBm) =37.00-50-10log10 (5.0) = -20 dBm

Note:

1. In general, the worse case attenuation requirement shown above was applied.

2. The measurement frequency range from 9 KHz to 5 GHz.

3. *** means that the emission level is too low to be measured or at least 20 dB down than the limit.

4. Radiated spurious tested ERP for below 1GHz and EIRP for above 1GHz.

TEST RESULTS

Remark:

1. We tested Op 1 to Op 4, recorded worst case at Op 1 and Op 3.

	Modulation Type: FM								
	Operation N	Aode: Op 1		(Channel Separa	ation:12.5K	Hz		
	Test Chan	nel: Ch1]	Fest Frequency	:150.825M	Hz		
Frequency	P _{Mea}	Path	Antenna	Correction	Peak	Limit	Polarization		
(MHz)	(dBm)	Loss	Gain	(dB)	EIRP(dBm)	(dBm)	roiarization		
301.650	-51.53	0.87	6.42	2.15	-48.13	-20.00	Н		
452.475	-46.28	1.02	7.35	2.15	-42.10	-20.00	Н		
745.125	-57.95	1.10	8.26	2.15	-52.94	-20.00	Н		
•••	•••	•••	•••	•••	•••	•••	Н		
301.650	-50.83	0.87	6.42	2.15	-47.43	-20.00	V		
452.475	-46.80	1.02	7.35	2.15	-42.62	-20.00	V		
745.125	-57.76	1.10	8.26	2.15	-52.75	-20.00	V		
•••	•••	•••	•••	•••	•••	•••	V		

	Modulation Type: FM								
(Operation N	Aode: Op 1		(Channel Separation:12.5KHz				
	Test Chan	nel: Ch2		r	Test Frequency	y: 158.55MI	Hz		
Frequency	P _{Mea}	Path	Antenna	Correction	Peak	Limit	Polarization		
(MHz)	(dBm)	Loss	Gain	(dB)	EIRP(dBm)	(dBm)	Polarization		
317.100	-52.83	0.92	6.80	2.15	-49.10	-20.00	Н		
475.650	-44.66	1.06	7.89	2.15	-39.98	-20.00	Н		
792.750	-61.00	1.12	8.12	2.15	-56.15	-20.00	Н		
•••	•••	•••	•••	•••		•••	Н		
317.100	-53.12	0.92	6.80	2.15	-49.39	-20.00	V		
475.650	-45.62	1.06	7.89	2.15	-40.94	-20.00	V		
792.750	-60.74	1.12	8.12	2.15	-55.89	-20.00	V		
	•••	•••	•••	•••	•••	•••	V		

	Modulation Type: FM								
	Operation N	Mode: Op 1		(Channel Separation:12.5KHz				
	Test Char	nnel: Ch3		Т	est Frequency:	: 173.3875M	Hz		
Frequency (MHz)	P _{Mea} (dBm)	Path Loss	Antenna Gain	CorrectionPeakLimit(dB)EIRP(dBm)(dBm)					
346.7750	-54.43	0.95	6.80	2.15	-50.73	-20.00	Н		
520.1625	-43.95	1.10	7.91	2.15	-39.29	-20.00	Н		
866.9375	-59.16	1.21	8.25	2.15	-54.27	-20.00	Н		
•••	•••	•••	•••	•••		•••	Н		
346.7750	-53.02	0.95	6.80	2.15	-49.32	-20.00	V		
520.1625	-41.78	1.10	7.91	2.15	-37.12	-20.00	V		
866.9375	-59.75	1.21	8.25	2.15	-54.86	-20.00	V		
•••	•••	•••	•••	•••	•••	•••	V		

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	Modulation Type: 4FSK									
	Operation N	Aode: Op 3		Channel Separation:12.5KHz						
	Test Chan	nel: Ch7		1	Fest Frequency	:150.825M	Hz			
Frequency	P _{Mea}	Path	Antenna	Correction	Peak	Limit	Polarization			
(MHz)	(dBm)	Loss	Gain	(dB)	EIRP(dBm)	(dBm)	1 Ulai ization			
301.650	-50.47	0.87	6.42	2.15	-47.07	-20.00	Н			
452.475	-46.37	1.02	7.35	2.15	-42.19	-20.00	Н			
745.125	-61.12	1.10	8.26	2.15	-56.11	-20.00	Н			
•••	•••	•••	•••	•••	•••	•••	Н			
301.650	-51.79	0.87	6.42	2.15	-48.39	-20.00	V			
452.475	-44.91	1.02	7.35	2.15	-40.73	-20.00	V			
745.125	-60.97	1.10	8.26	2.15	-55.96	-20.00	V			
	•••	•••	•••	•••		•••	V			

Op	peration M		Modulation Type: 4FSK									
1	Jet ation in	Iode: Op 3		Channel Separation:12.5KHz								
ſ	Test Chanı	nel: Ch8]	Fest Frequency	y: 158.55MI	Iz					
Frequency	P _{Mea}	Path	Antenna	Correction	Peak	Limit	Polarization					
(MHz)	(dBm)	Loss	Gain	(dB)	EIRP(dBm)	(dBm)						
317.100	-52.45	0.92	6.80	2.15	-48.72	-20.00	Н					
475.650	-44.32	1.06	7.89	2.15	-39.64	-20.00	Н					
792.750	-59.56	1.12	8.12	2.15	-54.71	-20.00	Н					
•••	•••	•••	•••	•••	•••	•••	Н					
317.100	-53.47	0.92	6.80	2.15	-49.74	-20.00	V					
475.650	-45.72	1.06	7.89	2.15	-41.04	-20.00	V					
792.750	-60.33	1.12	8.12	2.15	-55.48	-20.00	V					
•••	•••	•••	•••	•••	•••	•••	V					

Modulation Type: 4FSK									
	Operation M	Aode: Op 3		(Channel Separation:12.5KHz				
	Test Chan	inel: Ch9		Т	est Frequency:	: 173.3875M	ſHz		
Frequency	P _{Mea}	Path	Antenna	Correction	Peak	Limit	Polarization		
(MHz)	(dBm)	Loss	Gain	(dB)	EIRP(dBm)	(dBm)	Polarization		
346.7750	-53.49	0.95	6.80	2.15	-49.79	-20.00	Н		
520.1625	-43.44	1.10	7.91	2.15	-38.78	-20.00	Н		
866.9375	-58.38	1.21	8.25	2.15	-53.49	-20.00	Н		
•••	•••	•••	•••	•••	•••	•••	Н		
346.7750	-54.19	0.95	6.80	2.15	-50.49	-20.00	V		
520.1625	-44.50	1.10	7.91	2.15	-39.84	-20.00	V		
866.9375	-64.04	1.21	8.25	2.15	-59.15	-20.00	V		
•••	•••	•••	•••	•••	•••	•••	V		

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FCC ID: 2ABUBSPM6015

4.4. Spurious Emission on Antenna Port

TEST APPLICABLE

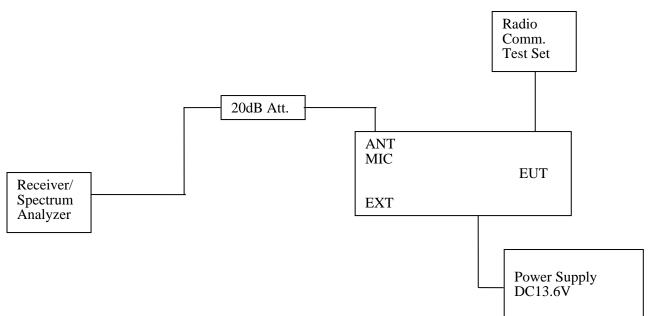
The same as Section 4.3

TEST PROCEDURE

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to show any out of band emission up to 10th. Harmonic for the lower and the highest frequency range. Set RBW=1KHz/VBW=3KHz in the frequency band 9KHz to 150KHz, RBW=10KHz/VBW=30 KHz in the frequency band 150KHz to 30 MHz, RBW=100 kHz/VBW=300 kHz in the frequency band 30MHz to 1GHz, and RBW=1MHz/VBW=3MHz from the 1GHz to 10th Harmonic.

The audio input was set to 0 to get the unmodulated carrier, the resulting picture is print out for each channel separation.

TEST CONFIGURATION



LIMIT

Modulation Type: FM

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 12:

For 12.5 kHz bandwidth:

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:

High: $50 + 10 \log (Pwatts) = 50 + 10 \log (50.0) = 66.99 \text{ dB}$

Low: $50 + 10 \log (Pwatts) = 50 + 10 \log (5.0) = 56.99 \text{ dB}$

Note: In general, the worst case attenuation requirement shown above was applied.

Calculation: Limit (dBm) =EL-50-10log10 (TP)

Notes: EL is the emission level of the Output Power expressed in dBm,

In this application, the EL is 46.99 dBm for Rated High power level and 37.02 dBm for Rated Lower power level;

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Modulation Type: 4FSK

FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 12 (12.5 kHz Bandwidth only):

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:

High: $50 + 10 \log (Pwatts) = 50 + 10 \log (50.0) = 66.99 \text{ dB}$

Low: $50 + 10 \log (Pwatts) = 50 + 10 \log (5.0) = 56.99 \text{ dB}$

Note: In general, the worst case attenuation requirement shown above was applied.

Calculation: Limit (dBm) =EL-50-10log10 (TP)

Notes: EL is the emission level of the Output Power expressed in dBm,

In this application, the EL is 46.99 dBm for Rated High power level and 37.02 dBm for Rated Lower power level;

High: Limit (dBm) =46.99-50-10log10 (50.0) = -20 dBm

Low: Limit (dBm) =37.00-50-10log10 (5.0) = -20 dBm

Note:

1. In general, the worse case attenuation requirement shown above was applied.

2. The measurement frequency range from 9 KHz to 6GHz.

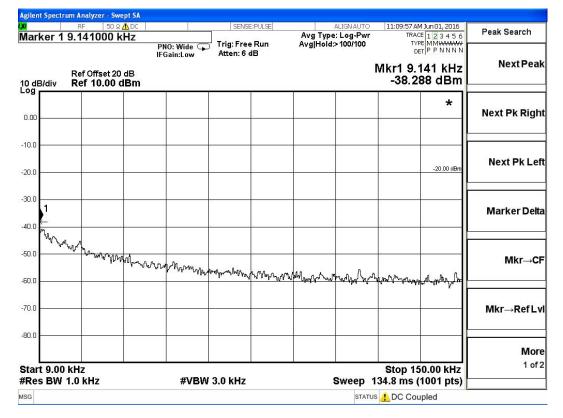
TEST RESULTS

Operation	Test	Test Frequency	Maximum Spurious Emissi	Conducted ons Below 1GHz	Maximum Conducted Spurio Emissions Above 1GHz			
Mode	Channel	(MHz)	Frequency (MHz)	Data (dBm)	Frequency (MHz)	Data (dBm)		
	Ch1	150.825	301.60	-27.51	1996.00	-32.35		
Op 1	Ch2	158.55	317.12	-29.29	1981.00	-30.87		
_	Ch3	173.3875	347.19	-28.81	1988.00	-31.71		
	Ch7	150.825	301.60	-28.59	1947.00	-31.35		
Op 3	Ch8	158.55	317.12	-28.41	1957.00	-31.84		
	Ch9	173.3875	347.19	-29.33	1946.00	-31.63		
	Limit		-200	IBm for 12.5KHz	Channel Separation			
	Test Result	S		PAS	PASS			

Plots of Spurious Emission on Antenna Port Measurement

SHENZHEN LCS COMPLIANCE TESTING LABORATORY LTD. FCC ID: 2ABUBSPM6015 Report No.: LCS1606130857E

Operation	- r · · · · ·	Test	Maximum Condu Emissions Bel	1	Maximum Co Emissions	Limit	
Mode	Channel	Frequency (MHz)	Frequency	Data	Frequency	Data	(dBm)
		(IVIIIZ)	(MHz)	(dBm)	(MHz)	(dBm)	
Op 1	Ch1	150.825	301.60	-27.51	1996.00	-32.35	-20.00



R	F 50 Ω AC		SENSE:PULSE	ALIGN AUTO	11:18:37 AM Jun 01, 2016	
arker 1 299	9.250000 kH	PNO: Fast 😱 IFGain:Low	Trig: Free Run Atten: 6 dB	Avg Type: Log-Pwr Avg Hold: 46/100	TRACE 1 2 3 4 5 6 TYPE MMWWWWW DET P P N N N N	Peak Search
dB/div Re	f Offset 20 dB ef 10.00 dBm	IFG2IN:LUW	Attent of the		Mkr1 299 kHz -34.126 dBm	Next Peal
00					*	Next Pk Righ
0.0						
0.0					-20.00 dBm	Next Pk Le
1.0 1						Marker Del
						Mkr→C
0.0	^h yblal a lidharaan ayaadhar	maniland my land flunded	การสีโรงในเสียง (โรงการสารสาร	hinddiwyddiwanahywlwydaedd	สุรไปขันงกังสารสู-เลกะสุกปรัชญาสไรส์กูลสีกูรไม่จ 	Mkr→RefL
0.0						Мо
art 150 kHz Res BW 10 k	2.	#VBW	30 kHz	Sweep 2	Stop 30.00 MHz 85.3 ms (1001 pts)	1 of

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	t Spectrum	Analyzer - Sw										
	level in		AC		SENSE	E:PULSE		ALIGN AUTO		4 Jun 01, 2016 E 1 2 3 4 5 6		Display
UISP		e -20.00	P IF	NO: Fast 😱 Gain:Low	Trig: Free Atten: 28		Avg Hold:	>100/100	kr1 301.			Annotation►
10 dE Log		Ref 47.00						2-960-928	-27.5	07 dBm	-	
37.0										*		Title►
37.0												- 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2
27.0			1		,				·			Graticule
17.0											<u>On</u>	Off
7.00	-											Display Line
-3.00											<u>On</u>	Off
-13.0												
										-20.00 dBm		
-23.0	๛๚๛	une malinde		gliorestricetories	Manana	the mark to be the second	المعالية ومعالية ومراد المراجع	konoriely webs	han algentifted at	un almunter and		System Display▶
												Settings
-43.0			-									
L Stari	t 30.0 N	IHz							Stop 1.0	0000 GHz		
#Res	5 BW 10	00 kHz		#VBW	300 kHz		;	Sweep 9	92.73 ms (1001 pts)		
MSG								STATU	S		28	

	-					1000000000			ım Analyzer - S	
Peak Search	I Jun 01, 2016 E 1 2 3 4 5 6	TRAC	LIGNAUTO		E:PULSE	1	Hz		RF 50	ø Aarker 1
Next Peak	96 GHz 52 dBm	₀. 1.9%		Avg Hol		Trig: Free Atten: 10	NO: Fast 🕞 Gain:Low	ı⊧ 0.dB	Ref Offset 2 Ref 30.00	0 dB/div
Next Pk Right										20.0
Next Pk Lef										0.00
Marker Delta	-20.00 dBm					3				20.0
Mkr→Cl	ndermanterier	ล.)า ¹ โป ^ล ์มางานาการ	producernada	annadanna.	white the states of the states	aful and a second	up water and a second	underson processing to	Lowniger, white the	30.0 • \}****\}
Mkr→RefLv										50.0
More 1 of 2	000 GHz	Stop 2.0	Sween 4			3.0 MHz	#\/D\\			60.0 Start 1.000
	1001 pts)		SWEEP I			5.0 MIAZ	#VDVV			SG

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