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Report No.: SZEM111200546001  
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# FCC REPORT

<b>Application No:</b>	SZEM1112005460RF
<b>Applicant:</b>	Eureka Technology Partners, LLC
<b>Product Name:</b>	Marco Polo Tag
<b>Operation Frequency:</b>	902.700586MHz -906.600586MHz
<b>FCC ID:</b>	A8QMPT-101
<b>Standards:</b>	FCC CFR Title 47 Part 15 Subpart C Section 15.247: 2010
<b>Date of Receipt:</b>	2011-12-26
<b>Date of Test:</b>	2012-02-23 to 2012-02-28
<b>Date of Issue:</b>	2012-03-01
<b>Test Result :</b>	<b>PASS *</b>

\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Jack Zhang  
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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### 3 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.247 (b)(2)	Pass
20dB Occupied Bandwidth	15.247 (a)(1)(i)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(1) (i)	Pass
Dwell Time	15.247 (a)(1) (i)	Pass
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)&TCB Exclusion List (7 July 2002)	Pass
Radiated Emission	15.205/15.209	Pass

*Remark: Pass: The EUT complies with the essential requirements in the standard.*

*Fail: The EUT does not comply with the essential requirements in the standard.*



## 4 General Information

### 4.1 Client Information

Applicant:	Eureka Technology Partners, LLC
Address of Applicant:	5519 Paseo Gilberto
Manufacturer:	Mecca Holding (HK) Co., LTD
Address of Manufacturer:	Rm406, 4/F, Kinox Centre, 9 Hung To Road Kwun Tong, KLN, HK
Factory:	Mecca Manufacturing Co., Ltd.
Address of Factory:	Kong Yang Industrial Centre, Zhang Mu Tou Town, Dong Guan City, Guang Dong, China

### 4.2 General Description of E.U.T.

Product Name:	Marco Polo Tag
Model No.:	ETP-TAG-01
Operation Frequency:	902.700586MHz -906.600586MHz
Channel Numbers:	53
Channel Separation:	75kHz
Modulation Type:	2FSK
Antenna Type:	Integral
Antenna Gain:	2.0dBi (declared by manufacturer)
AC Adapter:	WAHHING Cat No.: SA1105-050100 Switching Mode Power Supply Input: 100-240V~50/60Hz 200mA Output: 5V 1000mA
EUT Power Supply:	Li-ion 3.7V 700mAh

Operation Frequency each of channel					
Channel	Frequency	Channel	Frequency	Channel	Frequency
0	902.700586 MHz	20	904.200586 MHz	40	905.700586 MHz
1	902.775586 MHz	21	904.275586 MHz	41	905.775586 MHz
2	902.850586 MHz	22	904.350586 MHz	42	905.850586 MHz
3	902.925586 MHz	23	904.425586 MHz	43	905.925586 MHz
4	903.000586 MHz	24	904.500586 MHz	44	906.000586 MHz
5	903.075586 MHz	25	904.575586 MHz	45	906.075586 MHz
6	903.150586 MHz	26	904.650586 MHz	46	906.150586 MHz
7	903.225586 MHz	27	904.725586 MHz	47	906.225586 MHz
8	903.300586 MHz	28	904.800586 MHz	48	906.300586 MHz
9	903.375586 MHz	29	904.875586 MHz	49	906.375586 MHz
10	903.450586 MHz	30	904.950586 MHz	50	906.450586 MHz
11	903.525586 MHz	31	905.025586 MHz	51	906.525586 MHz
12	903.600586 MHz	32	905.100586 MHz	52	906.600586 MHz
13	903.675586 MHz	33	905.175586 MHz		
14	903.750586 MHz	34	905.250586 MHz		
15	903.825586 MHz	35	905.325586 MHz		
16	903.900586 MHz	36	905.400586 MHz		
17	903.975586 MHz	37	905.475586 MHz		
18	904.050586 MHz	38	905.550586 MHz		
19	904.125586 MHz	39	905.625586 MHz		

**Note:**

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	902.700586 MHz
The middle channel	904.725586 MHz
The Highest channel	906.600586 MHz

### 4.3 E.U.T Operation mode

<b>Operating Environment:</b>	
Temperature:	25.0 °C
Humidity:	50 % RH
Atmospheric Pressure:	1012 mbar
<b>Test mode:</b>	
Transmitting mode:	Keep the EUT in transmitting mode with 100% duty cycle.
Hopping mode:	Keep the EUT in Hopping mode.

### 4.4 Description of Support Units

The EUT has been tested as an independent unit.

## 4.5 Test Facility

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

**CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 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.

**VCCI**

The 3m Semi-anechoic chamber, Full-anechoic Chamber and Shielded Room (7.5m x 4.0m x 3.0m) of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2197, G-416, T-1153 and C-2383 respectively.

**FCC – Registration No.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen 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 No.: 556682.

**Industry Canada (IC)**

The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1.

## 4.6 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch E&E Lab

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

## 4.7 Other Information Requested by the Customer

None.

## 4.8 Test Instruments list

RE in Chamber					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEL0017	2012-06-10
2	EMI Test Receiver	Rohde & Schwarz	ESIB26	SEL0023	2012-05-26
3	EMI Test software	AUDIX	E3	SEL0050	N/A
4	Coaxial cable	SGS	N/A	SEL0028	2012-05-29
5	BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEL0015	2012-10-29
6	Double-ridged horn (1-18GHz)	ETS-LINDGREN	3117	SEL0006	2012-10-29
7	Horn Antenna (18-26GHz)	ETS-LINDGREN	3160	SEL0076	2012-10-29
8	Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEL0053	2012-05-26
9	Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEL0168	2012-10-26
11	Band filter	Amindeon	82346	SEL0094	2012-05-26

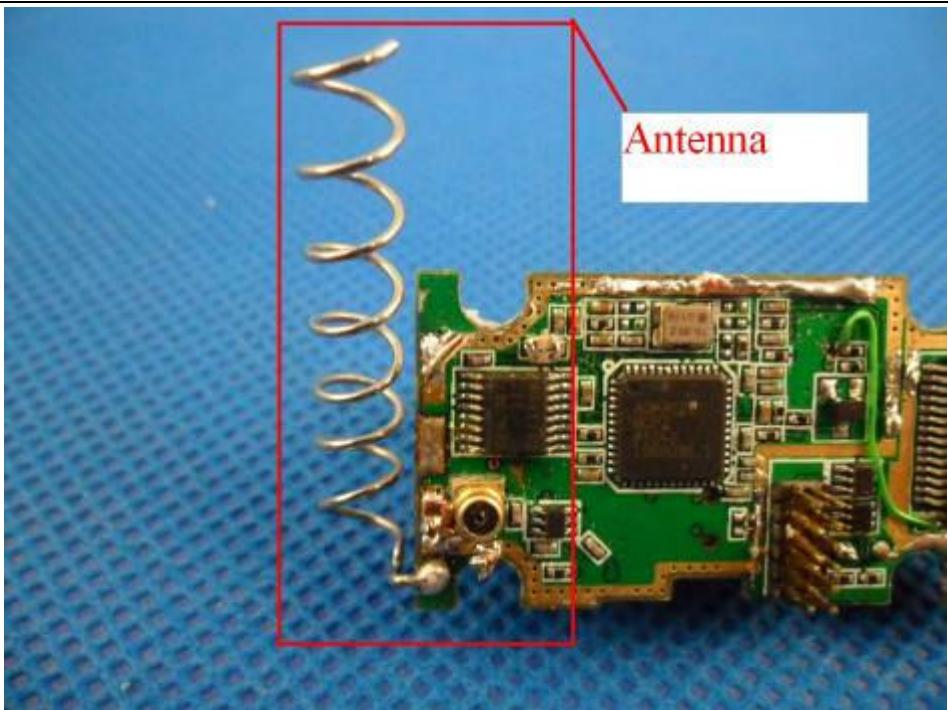
Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	Shielding Room	ZhongYu Electron	GB-88	SEL0042	2012-06-10
2	Two-Line V-Network	ETS-LINDGREN	3816/2	SEL0021	2012-05-26
3	LISN	Rohde & Schwarz	ENV216	SEL0152	2012-10-23
4	EMI Test Receiver	Rohde & Schwarz	ESCI	SEL0022	2012-05-26
5	Coaxial Cable	SGS	N/A	SEL0024	2012-05-29

<b>RF conducted</b>					
<b>Item</b>	<b>Test Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Inventory No.</b>	<b>Cal.Due date (yyyy-mm-dd)</b>
1	Spectrum Analyzer	Rohde & Schwarz	FSP 30	SEL0154	2012-10-23
2	Coaxial cable	SGS	N/A	SEL0028	2012-05-29

<b>General used equipment</b>					
<b>Item</b>	<b>Test Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Inventory No.</b>	<b>Cal.Due date (yyyy-mm-dd)</b>
1	Humidity/ Temperature Indicator	Shanghai	ZJ1-2B	SEL0102 to SEL0103	2012-10-27
2	Humidity/ Temperature Indicator	Shanghai	ZJ1-2B	SEL0101	2012-10-27
3	Barometer	ChangChun	DYM3	SEL0088	2012-05-18

## 5 Test results and Measurement Data

### 5.1 Antenna requirement:

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
<p>15.203 requirement:</p> <p>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, 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.</p>	
<p>15.247(b) (4) requirement:</p> <p>The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p>	
E.U.T Antenna:	
<p>The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.0dBi.</p>	
	

## 5.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207																	
Test Method:	ANSI C63.10: 2009																	
Test Frequency Range:	150KHz to 30MHz																	
Class / Severity:	Class B																	
Limit:	<table border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th></th> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr> <tr> <td>0.5-5</td><td>56</td><td>46</td></tr> <tr> <td>5-30</td><td>60</td><td>50</td></tr> </tbody> </table>			Frequency range (MHz)	Limit (dBuV)			Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)																	
	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.																	
Test Procedure:	<p>The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). They provide a 50ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2009 on conducted measurement.</p>																	
Test Setup:	<p><b>Reference Plane</b></p> <p><b>Remark:</b>  E.U.T: Equipment Under Test  LISN: Line Impedance Stabilization Network  Test table height=0.8m</p>																	
Test Instruments:	Refer to section 4.8 for details																	
Test Mode:	Transmitting mode																	
Test Results:	Pass																	

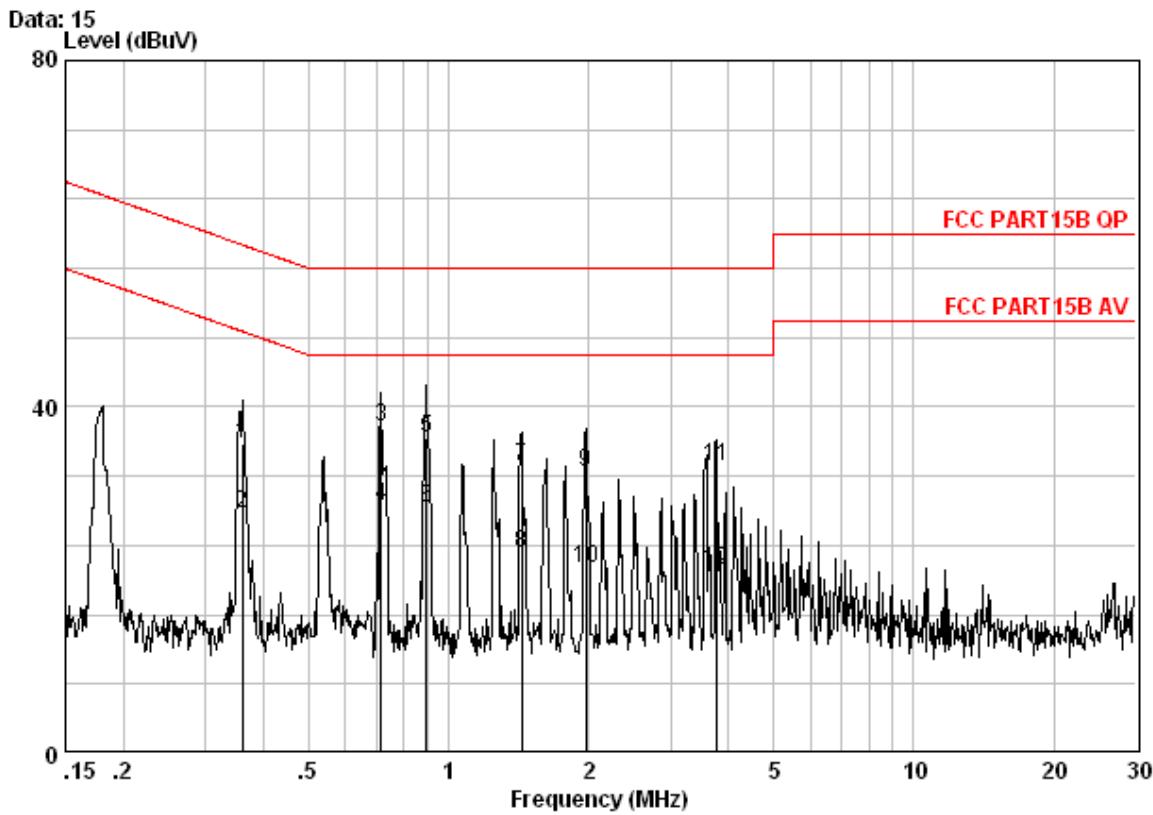
### Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

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Live line:

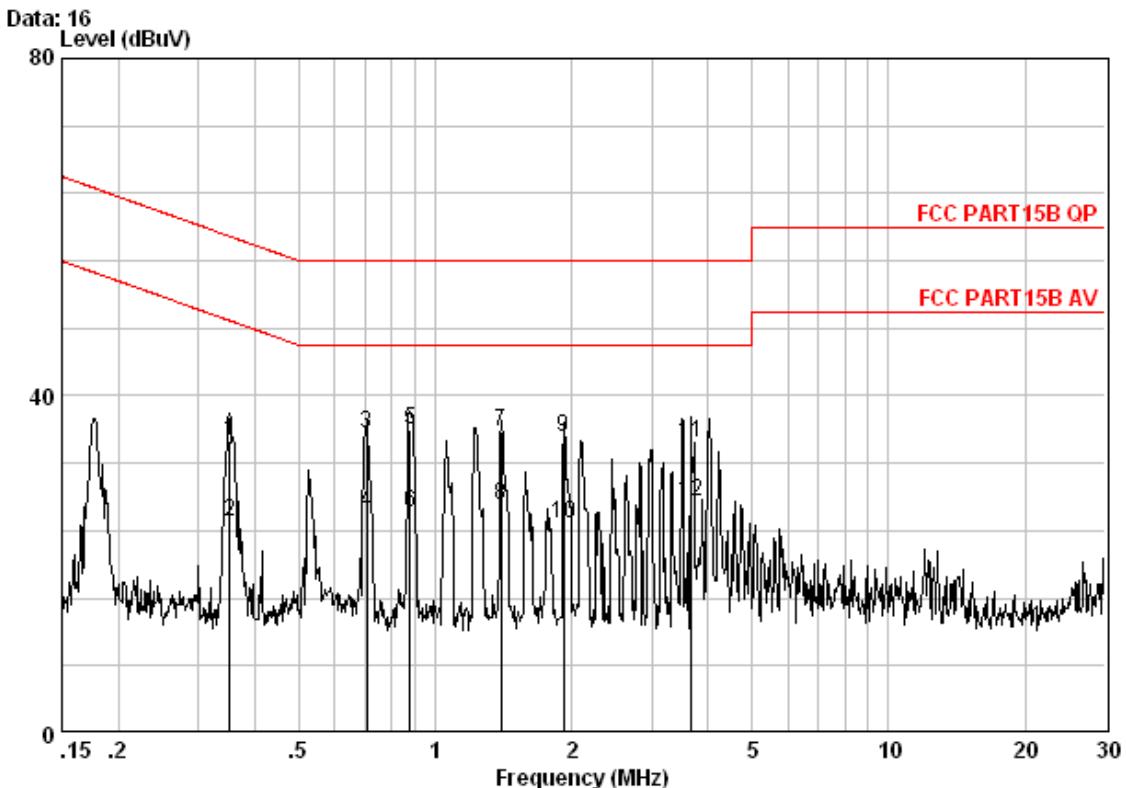


Freq	Cable	LISN	Read	Limit	Over		
	Loss	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB
1	0.35955	0.05	9.60	26.09	35.75	58.74	-22.99 QP
2	0.35955	0.05	9.60	18.09	27.75	48.74	-20.99 Average
3	0.71597	0.06	9.70	27.85	37.61	56.00	-18.39 QP
4	0.71597	0.06	9.70	18.85	28.61	46.00	-17.39 Average
5	0.89441	0.07	9.70	26.63	36.41	56.00	-19.59 QP
6	0.89441	0.07	9.70	18.63	28.41	46.00	-17.59 Average
7	1.433	0.10	9.70	23.24	33.04	56.00	-22.96 QP
8	1.433	0.10	9.70	13.24	23.04	46.00	-22.96 Average
9	1.970	0.12	9.70	22.60	32.41	56.00	-23.59 QP
10	1.970	0.12	9.70	11.60	21.41	46.00	-24.59 Average
11	3.759	0.15	9.77	23.20	33.12	56.00	-22.88 QP
12	3.759	0.15	9.77	11.20	21.12	46.00	-24.88 Average

**Notes:**

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

Neutral line:



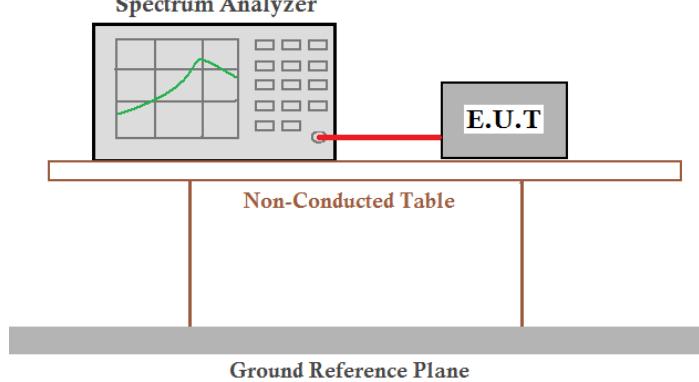
Freq	Cable	LISN	Read	Limit	Over	Remark
	Loss	Factor	Level			
	MHz	dB	dB	dBuV	dBuV	dB
1	0.35201	0.05	9.60	25.07	34.72	58.91 -24.19 QP
2	0.35201	0.05	9.60	15.35	25.00	48.91 -23.91 Average
3	0.70468	0.06	9.70	25.75	35.51	56.00 -20.49 QP
4	0.70468	0.06	9.70	16.38	26.14	46.00 -19.86 Average
5	0.88031	0.07	9.70	26.25	36.02	56.00 -19.98 QP
6	0.88031	0.07	9.70	16.46	26.24	46.00 -19.76 Average
7	1.396	0.10	9.70	25.95	35.75	56.00 -20.25 QP
8	1.396	0.10	9.70	17.34	27.14	46.00 -18.86 Average
9	1.918	0.12	9.70	25.26	35.07	56.00 -20.93 QP
10	1.918	0.12	9.70	15.12	24.94	46.00 -21.06 Average
11	3.661	0.15	9.77	24.49	34.41	56.00 -21.59 QP
12	3.661	0.15	9.77	17.54	27.46	46.00 -18.54 Average

**Notes:**

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.



### 5.3 Conducted Peak Output Power

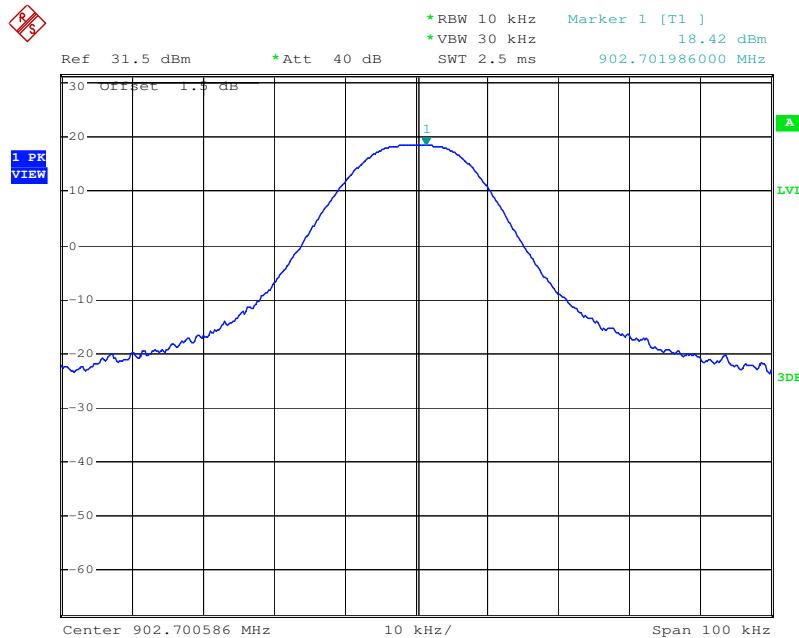
Test Requirement:	FCC Part15 C Section 15.247 (b)(2)
Test Method:	ANSI C63.10:2009 and KDB DA00-705
Limit:	30dBm
Test Setup:	 <p><b>Spectrum Analyzer</b> E.U.T Non-Conducted Table Ground Reference Plane</p> <p><i>Remark:</i> <i>Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.</i></p>
Test Instruments:	Refer to section 4.8 for details
Test State:	Transmitting mode
Test Results:	Pass

#### Measurement Data

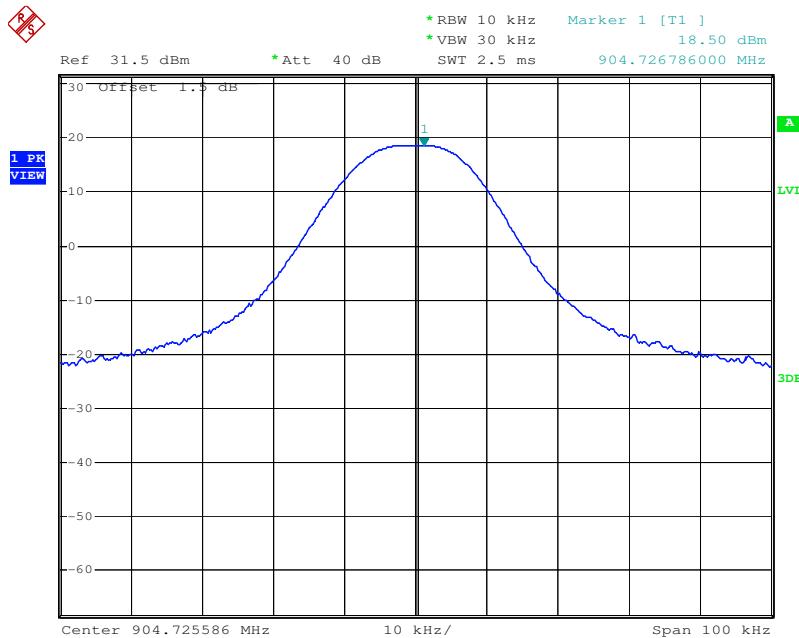
2FSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	18.42	30.00	Pass
Middle	18.50	30.00	Pass
Highest	18.51	30.00	Pass

**Test plot as follows:**

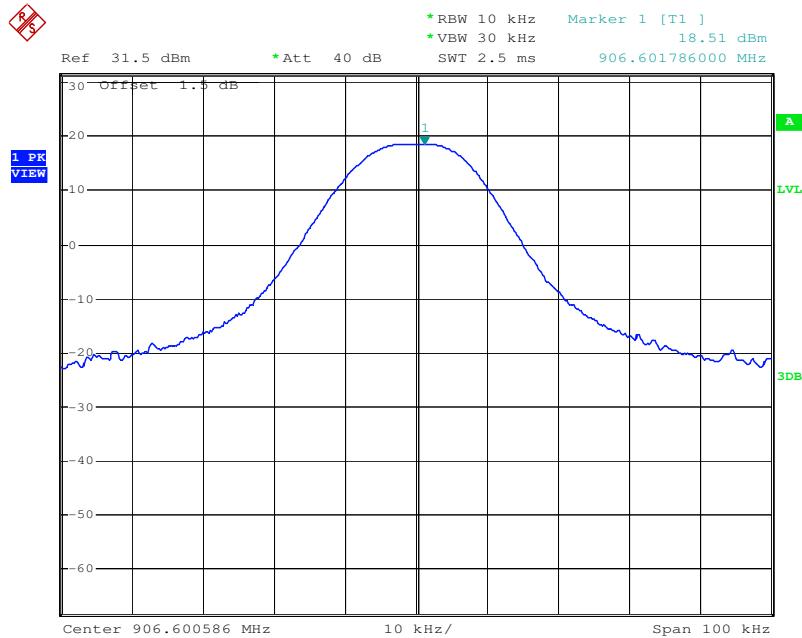
Test mode:	2FSK	Test channel:	Lowest
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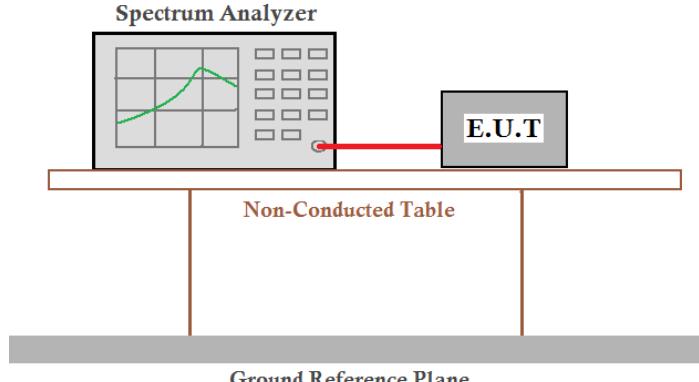
Test mode:	2FSK	Test channel:	Middle
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Test mode:	2FSK	Test channel:	Highest
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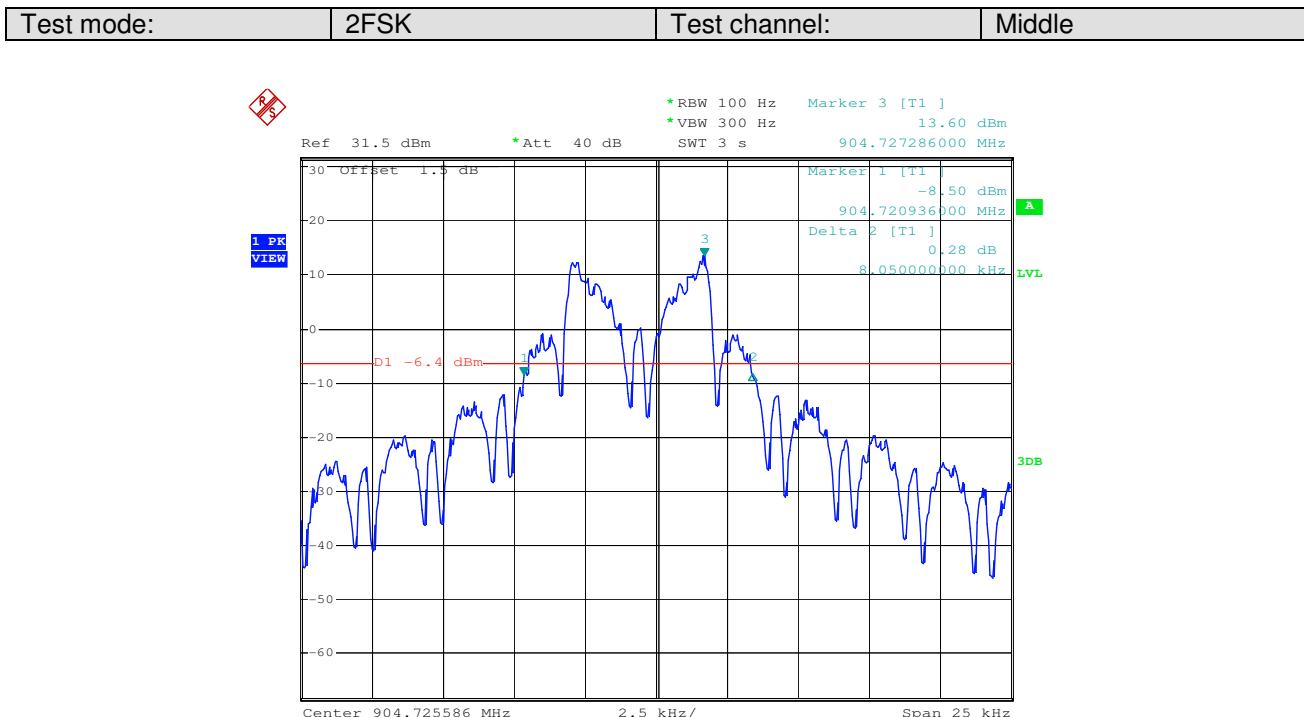
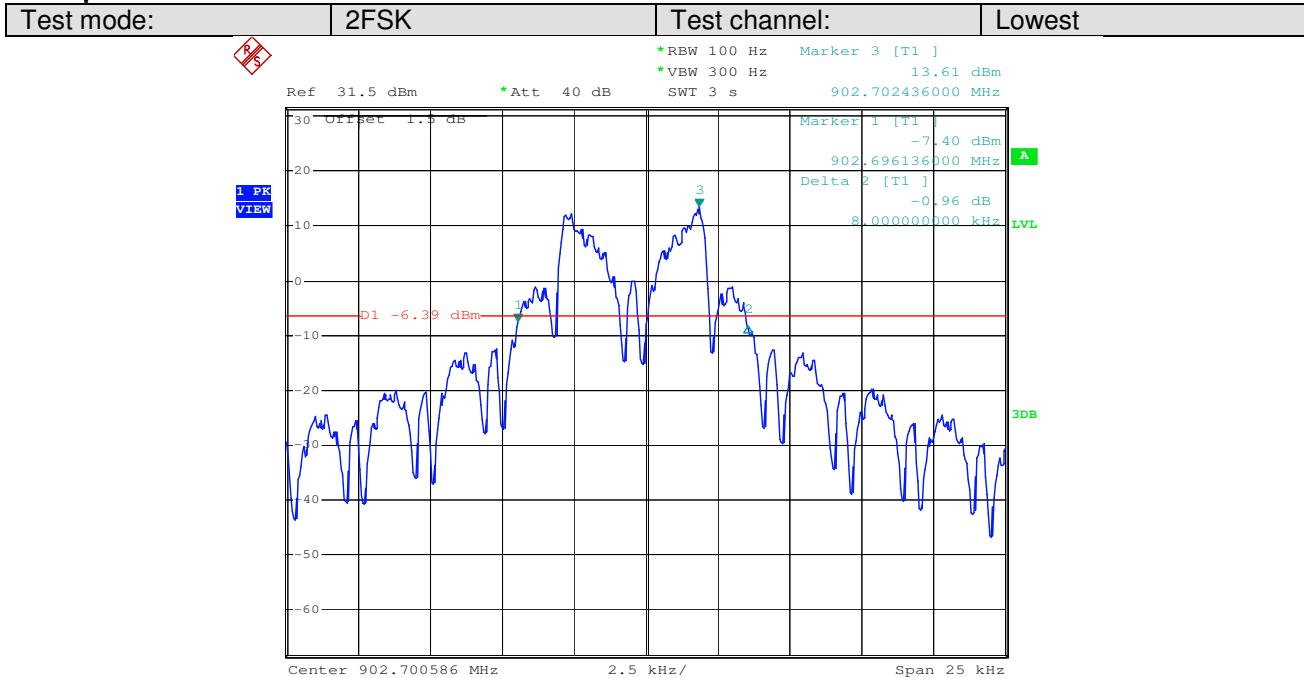


## 5.4 20dB Occupy Bandwidth

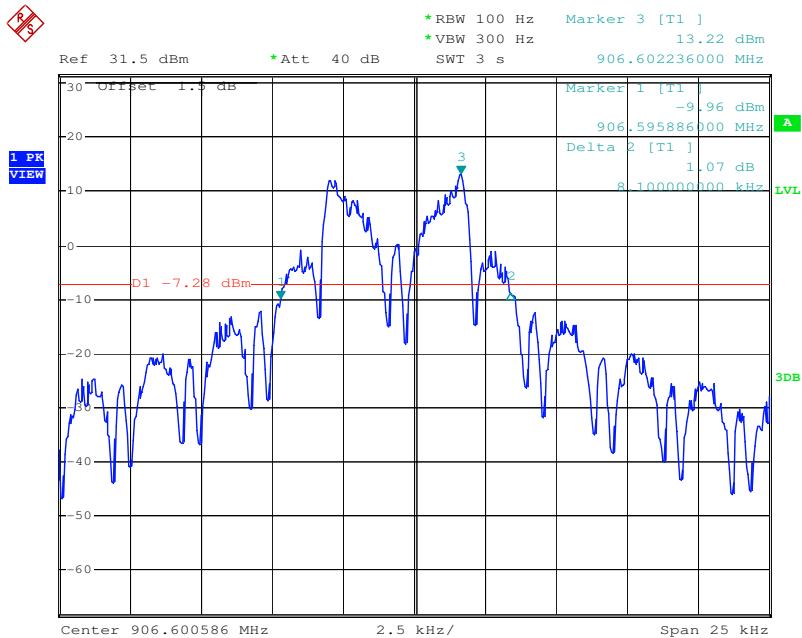
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(i)
Test Method:	ANSI C63.10:2009 and KDB DA00-705
Limit:	NA
Test Setup:	 <p>The diagram illustrates the test setup for measuring 20dB Occupy Bandwidth. A Spectrum Analyzer is connected to the E.U.T (Equipment Under Test) via a coaxial cable. The E.U.T is placed on a Non-Conducted Table. The entire setup is positioned above a Ground Reference Plane.</p>
Test Instruments:	Refer to section 4.8 for details
Test State:	Transmitting mode
Test Results:	Pass

### Measurement Data

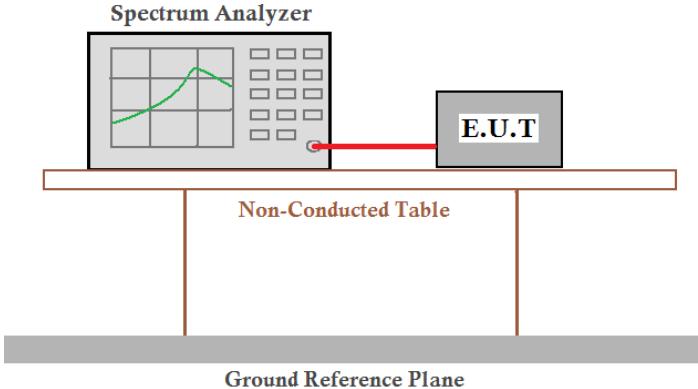
2FSK mode			
Test channel	20dB Occupy Bandwidth (kHz)	Limit (kHz)	Result
Lowest	8.00	$\leq 500$	Pass
Middle	8.05	$\leq 500$	Pass
Highest	8.10	$\leq 500$	Pass

**Test plot as follows:**


Test mode:	2FSK	Test channel:	Highest
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## 5.5 Carrier Frequencies Separation

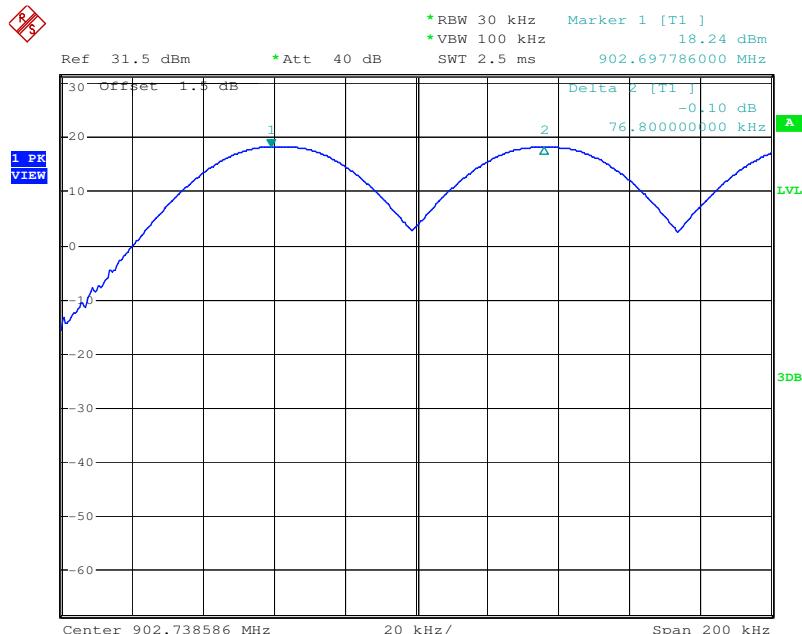
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2009 and KDB DA00-705
Limit:	0.025MHz or 20dB bandwidth (whichever is greater)
Test Setup:	
Test Instruments:	Refer to section 4.8 for details
Test State:	Hopping mode
Test Results:	Pass

### Measurement Data

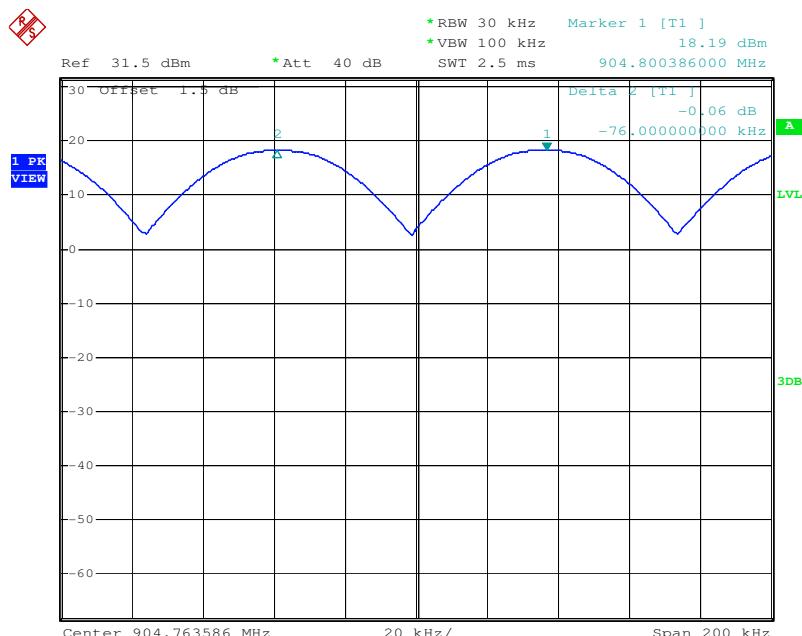
2FSK mode			
Test channel	Carrier Frequencies Separation (KHz)	Limit (kHz)	Result
Lowest	76.8	≥25	Pass
Middle	76.0	≥25	Pass
Highest	76.0	≥25	Pass

**Test plot as follows:**

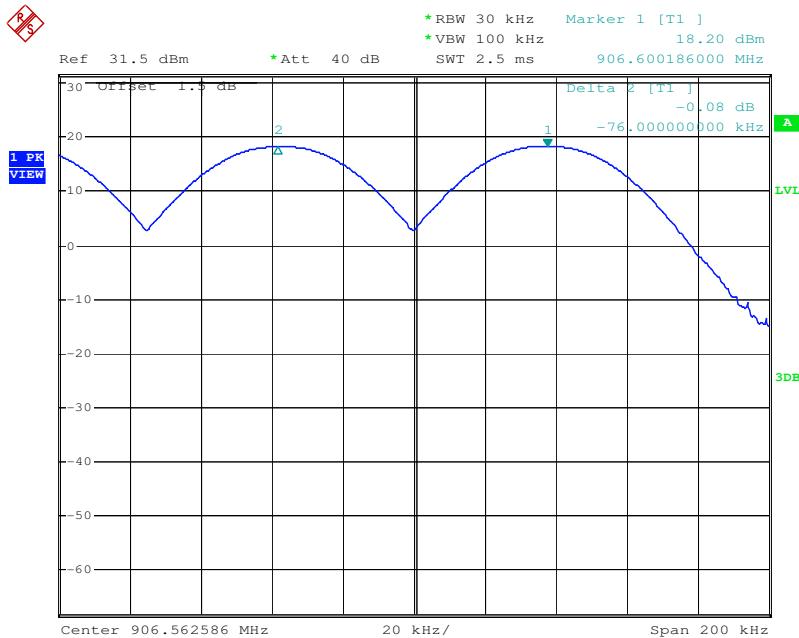
Test mode:	2FSK	Test channel:	Lowest
------------	------	---------------	--------



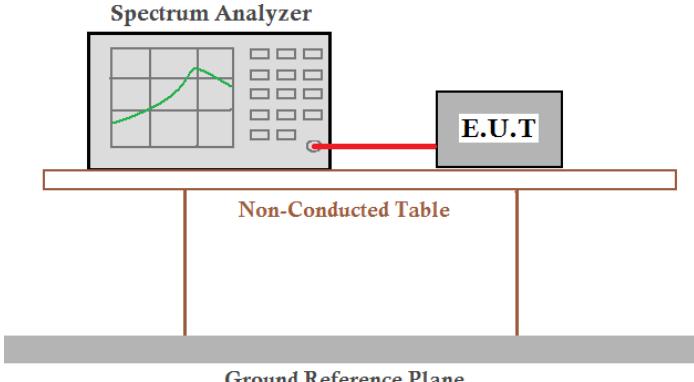
Test mode:	2FSK	Test channel:	Middle
------------	------	---------------	--------



Test mode:	2FSK	Test channel:	Highest
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## 5.6 Hopping Channel Number

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(i)	
Test Method:	ANSI C63.10:2009 and KDB DA00-705	
Limit:	50 channels	
Test Setup:	 <p>The diagram illustrates the test setup for measuring the hopping channel number. A Spectrum Analyzer is connected to the E.U.T (Equipment Under Test) via a red cable. The E.U.T is placed on a Non-Conducted Table. The entire setup is positioned above a Ground Reference Plane.</p>	
Test Instruments:	Refer to section 4.8 for details	
Test State:	Hopping mode	
Test Results:	Pass	

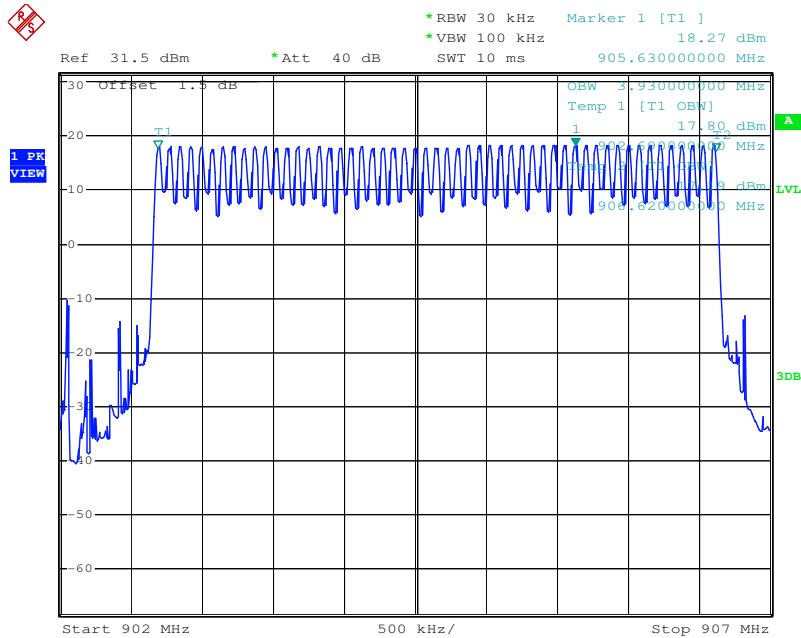
### Measurement Data

Mode	Hopping channel numbers	Limit
2FSK	53	≥50



## Test plot as follows

Test mode:	2FSK	
------------	------	--



## 5.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)(i)
Test Method:	ANSI C63.10:2009 and KDB DA00-705
Limit:	0.4 Second
Test Setup:	
Test Instruments:	Refer to section 4.8 for details
Test State:	Hopping mode
Test Results:	Pass

### Measurement Data

Mode	Channel	Dwell time (millisecond)	Limit (millisecond)
2FSK	Lowest	205.5	400
	Middle	207.2	400
	Highest	205.9	400

### Test Result:

The lowest channel (902.700586MHz), middle channel (904.725586MHz), highest channel (906.600586MHz) as below,

$$\text{Dwell time} = \text{on}/(\text{on+off}) * 20 \text{ s}$$

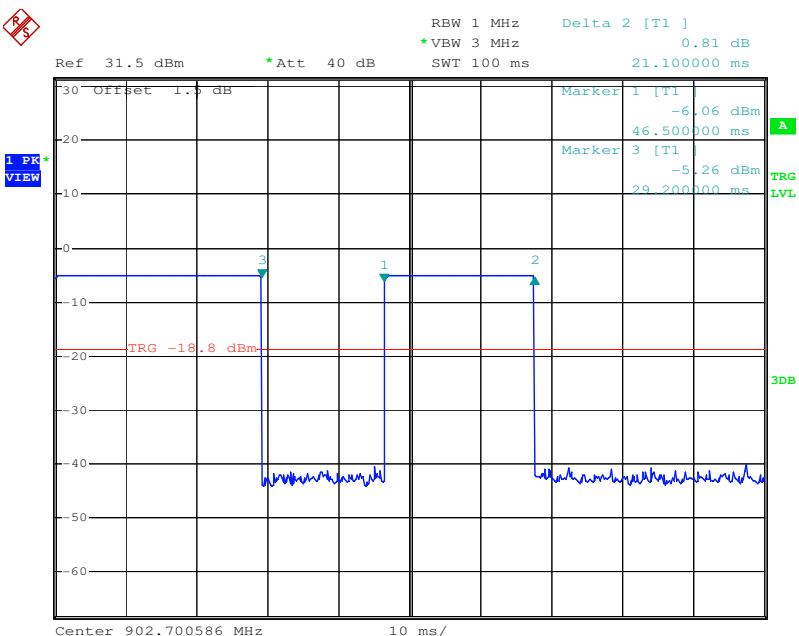
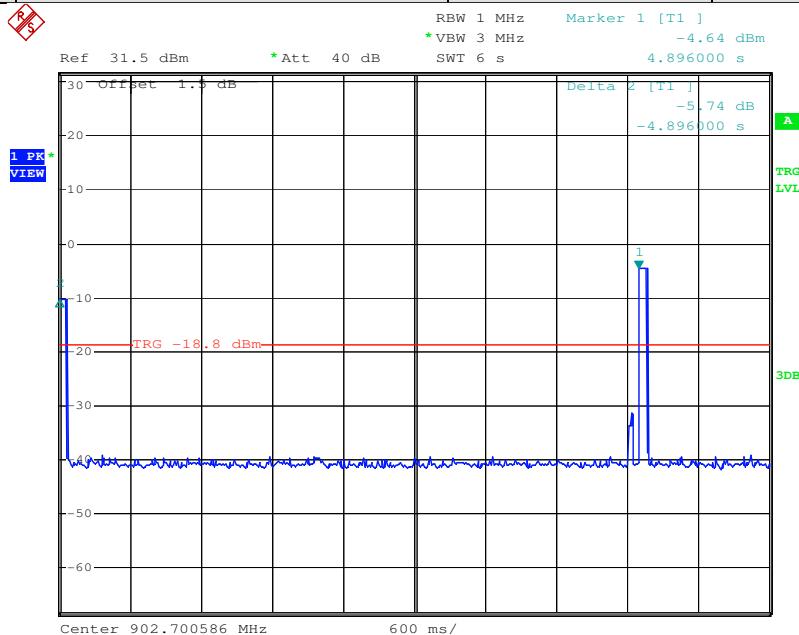
$$\text{Lowest dwell time} = 50.3 \text{ ms}/4.896 \text{ s} * 20 \text{ s} = 205.5 \text{ ms}$$

$$\text{Middle dwell time} = 50.5 \text{ ms}/4.874 \text{ s} * 20 \text{ s} = 207.2 \text{ ms}$$

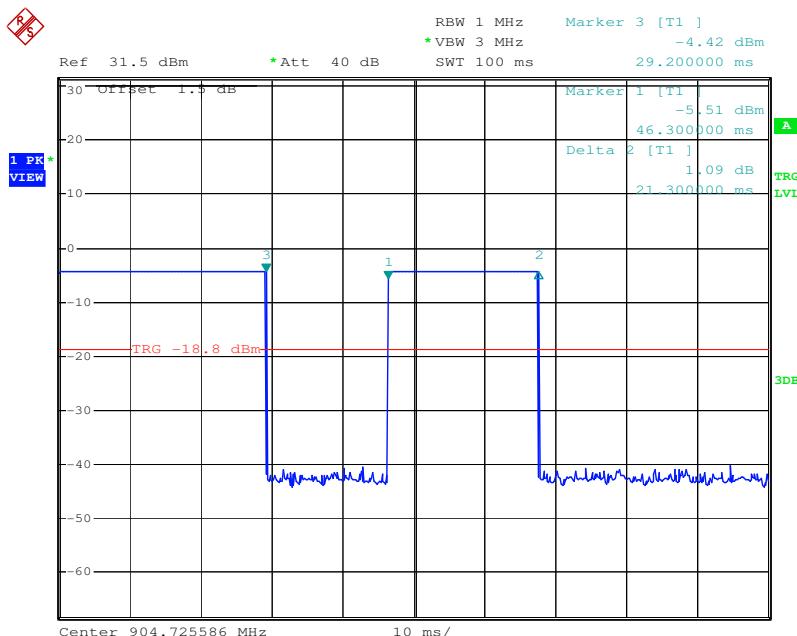
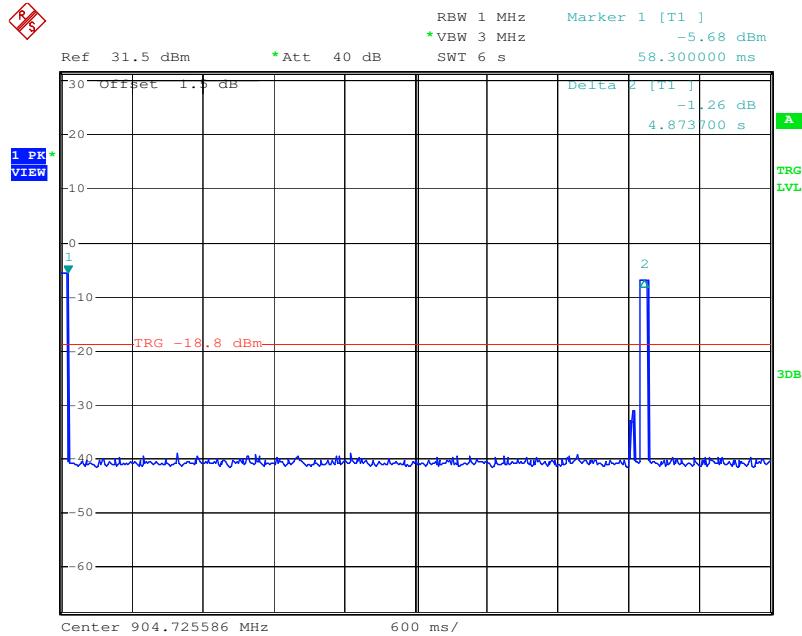
$$\text{Highest dwell time} = 50.4 \text{ ms}/4.896 \text{ s} * 20 \text{ s} = 205.9 \text{ ms}$$

**Test plot as follows**

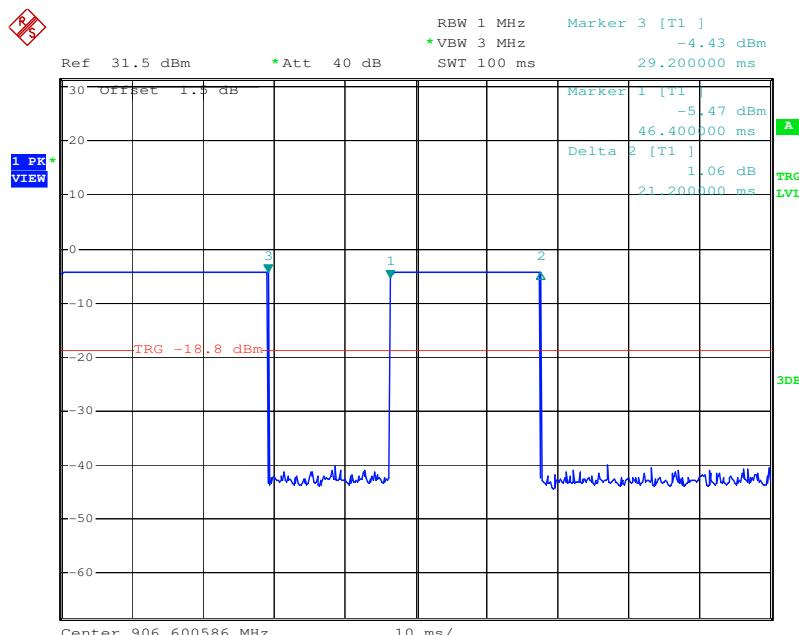
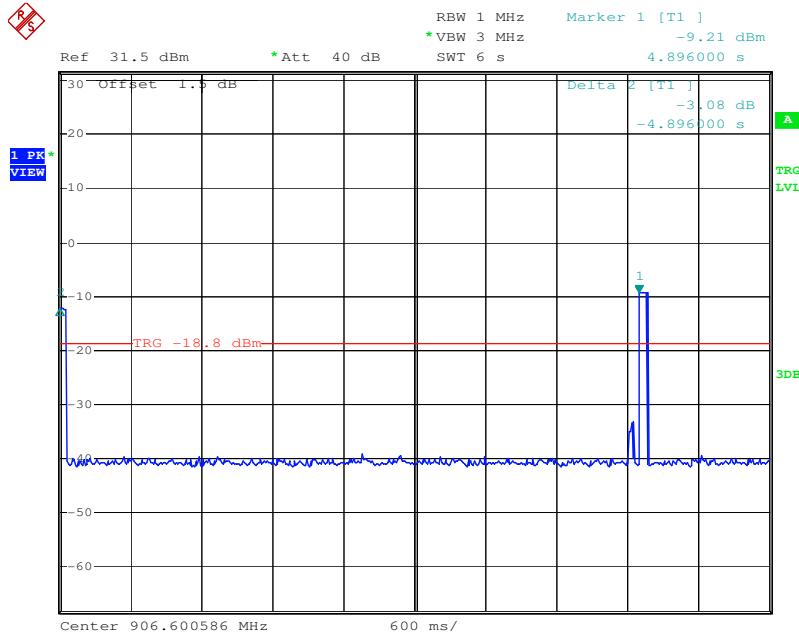
Test mode:	2FSK	Channel	Lowest
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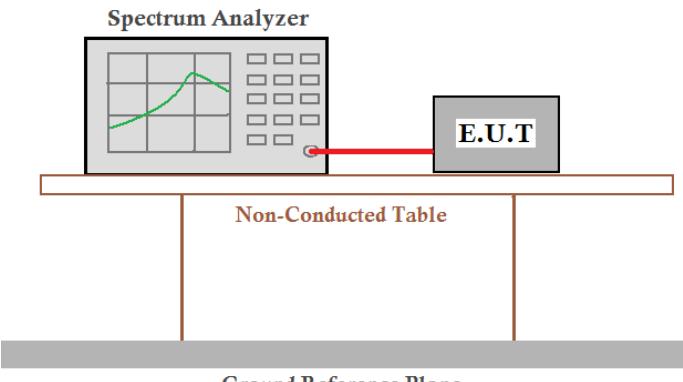
Test mode:	2FSK	Channel	Middle
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Test mode:	2FSK	Channel	Highest
------------	------	---------	---------

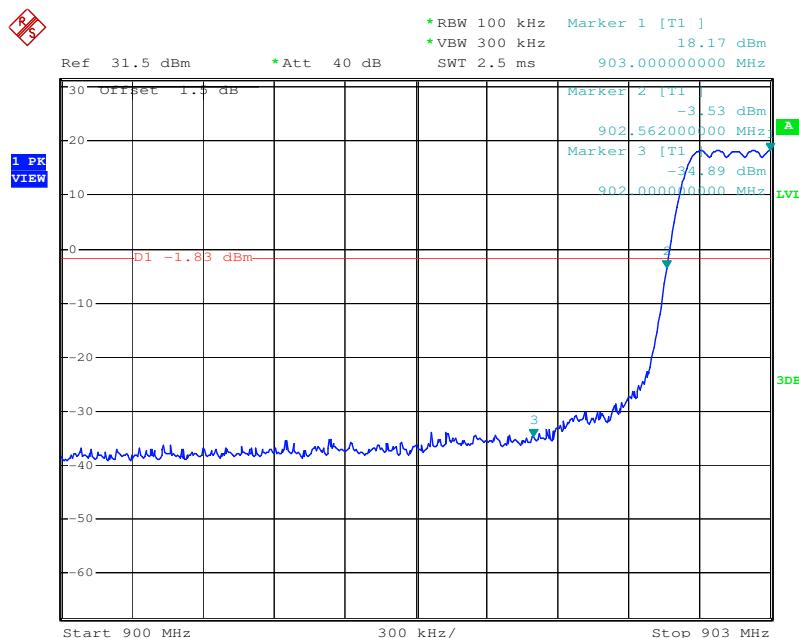
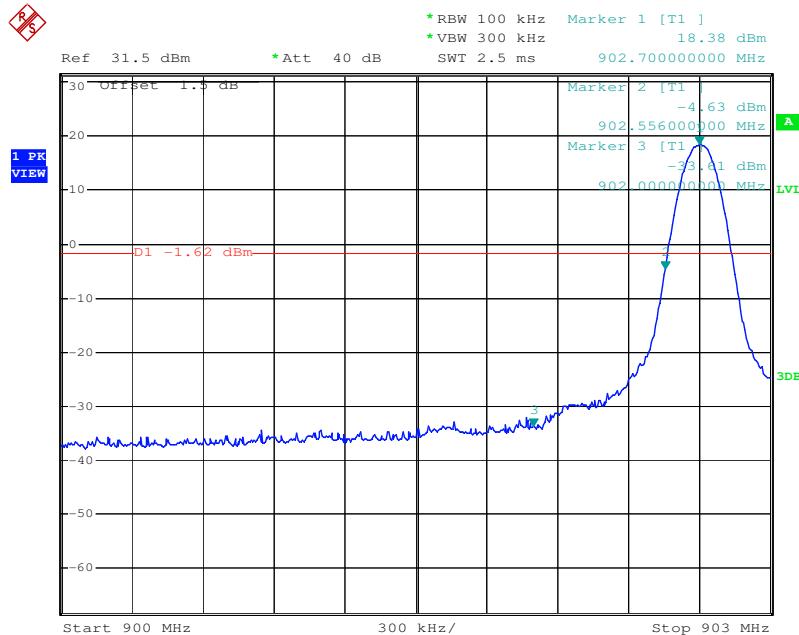


## 5.8 Band Edge

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2009 and KDB DA00-705
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Setup:	 <p><b>Spectrum Analyzer</b> E.U.T Non-Conducted Table Ground Reference Plane</p> <p><i>Remark: Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.</i></p>
Test Instruments:	Refer to section 4.8 for details
Test State:	Transmitting mode
Test Results:	Pass

**Test plot as follows:**

Test mode:	2FSK	Test channel:	Lowest
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Test mode: 2FSK

Test channel: Highest

Ref 31.5 dBm Att 40 dB SWT 2.5 ms 906.572400000 MHz

Marker 1 [T1] 18.42 dBm

Marker 2 [T1] -6.53 dBm

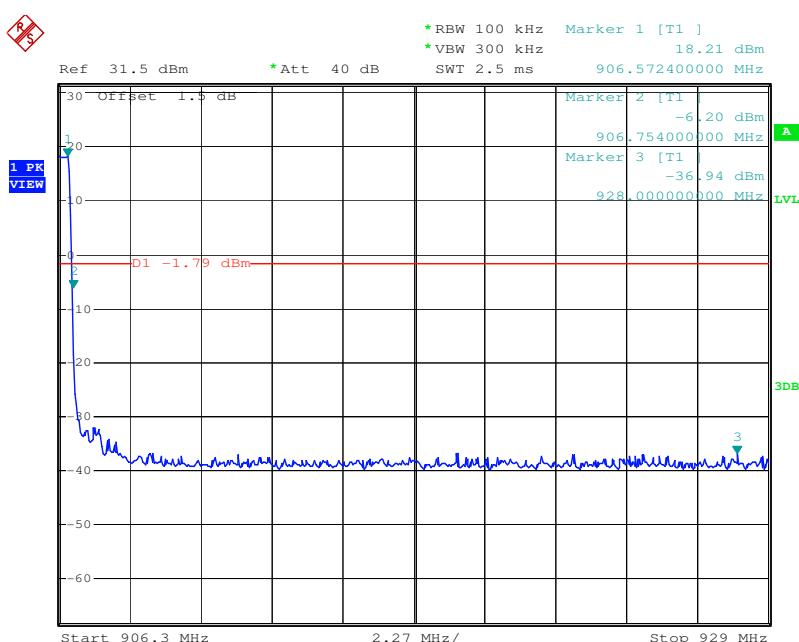
Marker 3 [T1] -39.68 dBm

Start 906.3 MHz 2.27 MHz/ Stop 929 MHz

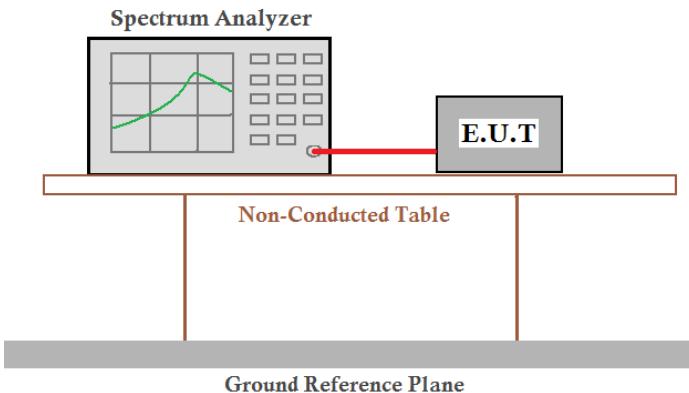
1 PK VIEW

D1 -1.58 dBm

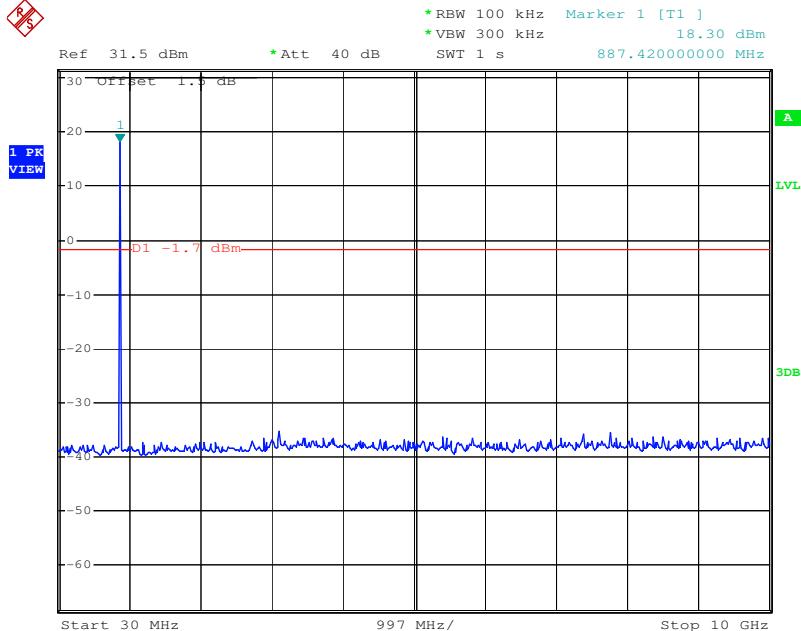
A LVL 3DB



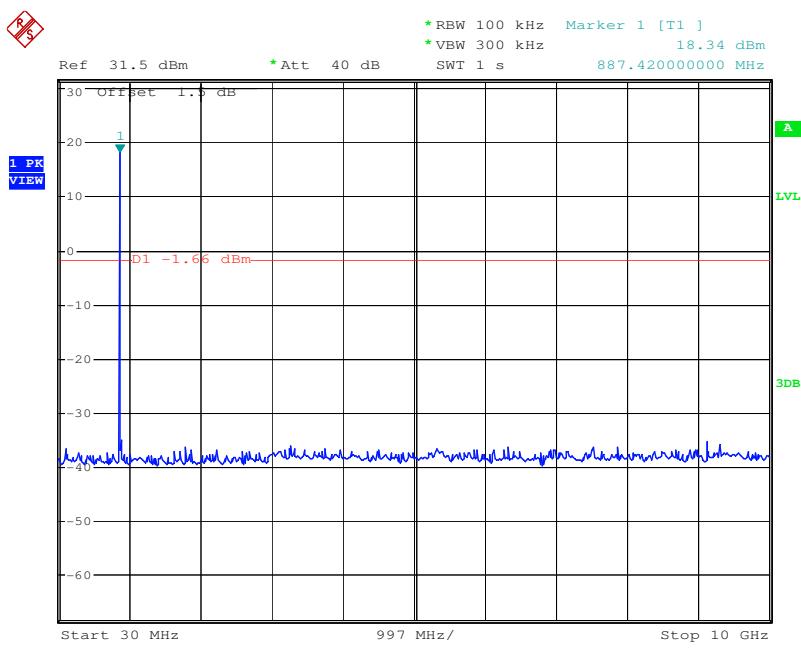
## 5.9 RF Antenna Conducted spurious emissions

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2009 and KDB DA00-705
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Setup:	 <p><b>Spectrum Analyzer</b> E.U.T Non-Conducted Table Ground Reference Plane</p> <p><i>Remark:</i> <i>Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.</i></p>
Test Instruments:	Refer to section 4.8 for details
Test Results:	Pass

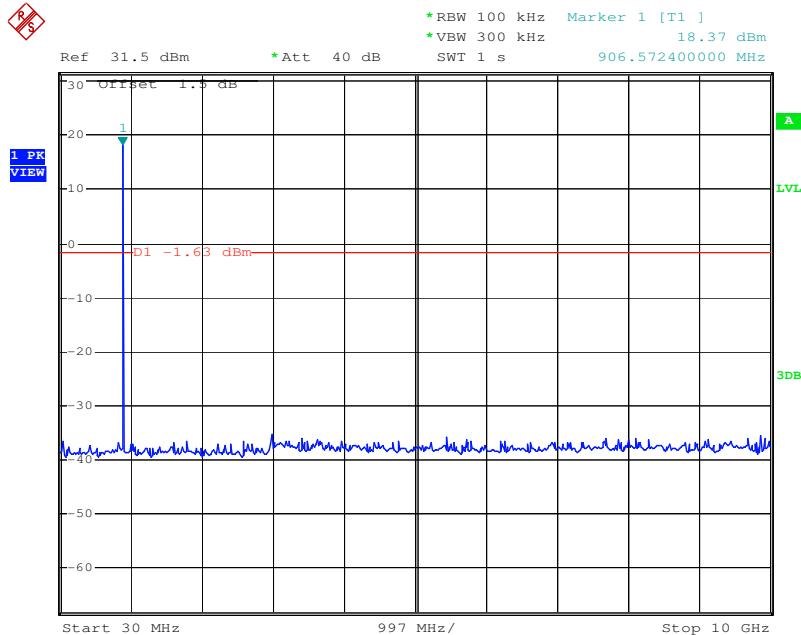
Test mode:	2FSK	Test channel:	Lowest
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Test mode:	2FSK	Test channel:	Middle
------------	------	---------------	--------



Test mode:	2FSK	Test channel:	Highest
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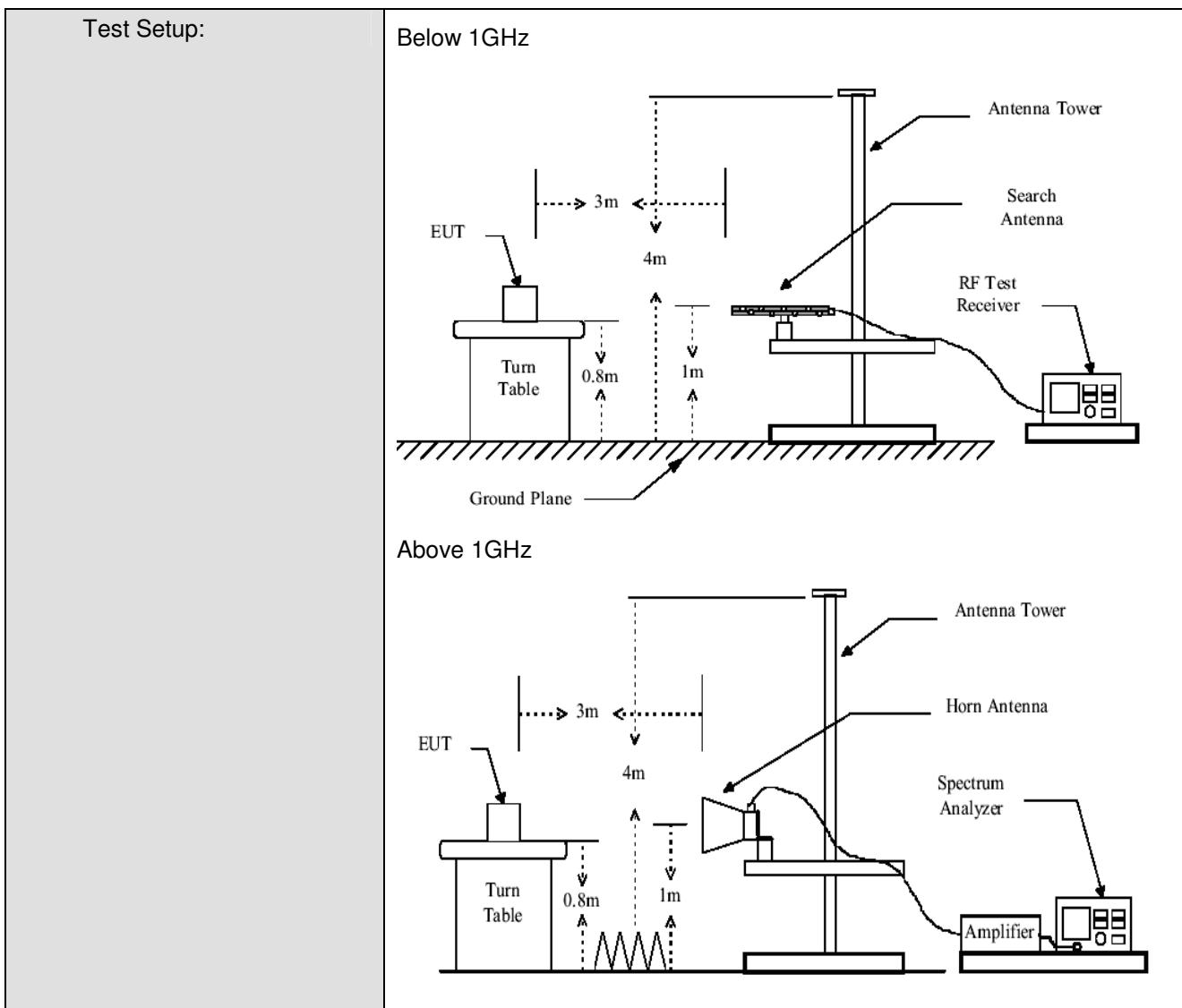


## 5.10 Pseudorandom Frequency Hopping Sequence

Test Requirement:	FCC Part15 C Section 15.247 (a)(1) requirement:
<p><i>The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.</i></p>	
<p><b>EUT Pseudorandom Frequency Hopping Sequence</b></p> <p><i>Tag Specific: The 53 channel hopping sequence of FCNs (Frequency Channel Numbers) for transmission for a given Tag shall be computed as follows:</i></p> <p><i>First, 53 pseudo-random numbers are computed using the Tag ID as a seed initializer. The numbers are generated using a 16 bit CRC algorithm. First, the 24 bit TagID taken as a GF(2) polynomial is divided by the GF(2) polynomial <math>P16(X) = X^{16} + X^{12} + X^5 + 1</math> (i.e., the 16 bit CRC for the 24 bit TagID is computed). The 16 bit result is <math>T(0)</math>, taken as an unsigned number from 0 to 65535. CRC16 is then run for 2 cycles with 0 for input. This 16 bit result is <math>T(1)</math>. This process is repeated to generate numbers <math>T(2)</math> through <math>T(52)</math>.</i></p> <p><i>Second, the 53 numbers <math>T(0)</math> through <math>T(52)</math> are sorted from smallest to biggest and the FCN channel sequence corresponds to each channel's location in the sorted list. For example, if the <math>T(0)</math> were sorted into the 34th position, then FCN0 shall be the 34th hop in the sequence of 53 channels. These numbers may be pre-computed and stored by Tags and Locators.</i></p>	

## 5.11 Radiated Emission

Test Requirement:	FCC Part15 C Section 15.209 and 15.205						
Test Method:	ANSI C63.10: 2009 and PUBLIC NOTICE DA 00-705						
Test Frequency Range:	30MHz to 10GHz						
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)						
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark		
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak Value		
	Above 1GHz	Peak	1MHz	3MHz	Peak Value		
Limit:	Peak	1MHz	10Hz	Average Value			
	Frequency	Limit (dBuV/m @3m)		Remark			
	30MHz-88MHz	40.0		Quasi-peak Value			
	88MHz-216MHz	43.5		Quasi-peak Value			
	216MHz-960MHz	46.0		Quasi-peak Value			
	960MHz-1GHz	54.0		Quasi-peak Value			
	Above 1GHz	54.0		Average Value			
Test Procedure:			74.0	Peak Value			
	<ol style="list-style-type: none"> <li>a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li> <li>d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.</li> <li>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li> <li>g. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.</li> </ol>						
	Refer to section 4.8 for details						
	Transmitting mode						
	Pass						

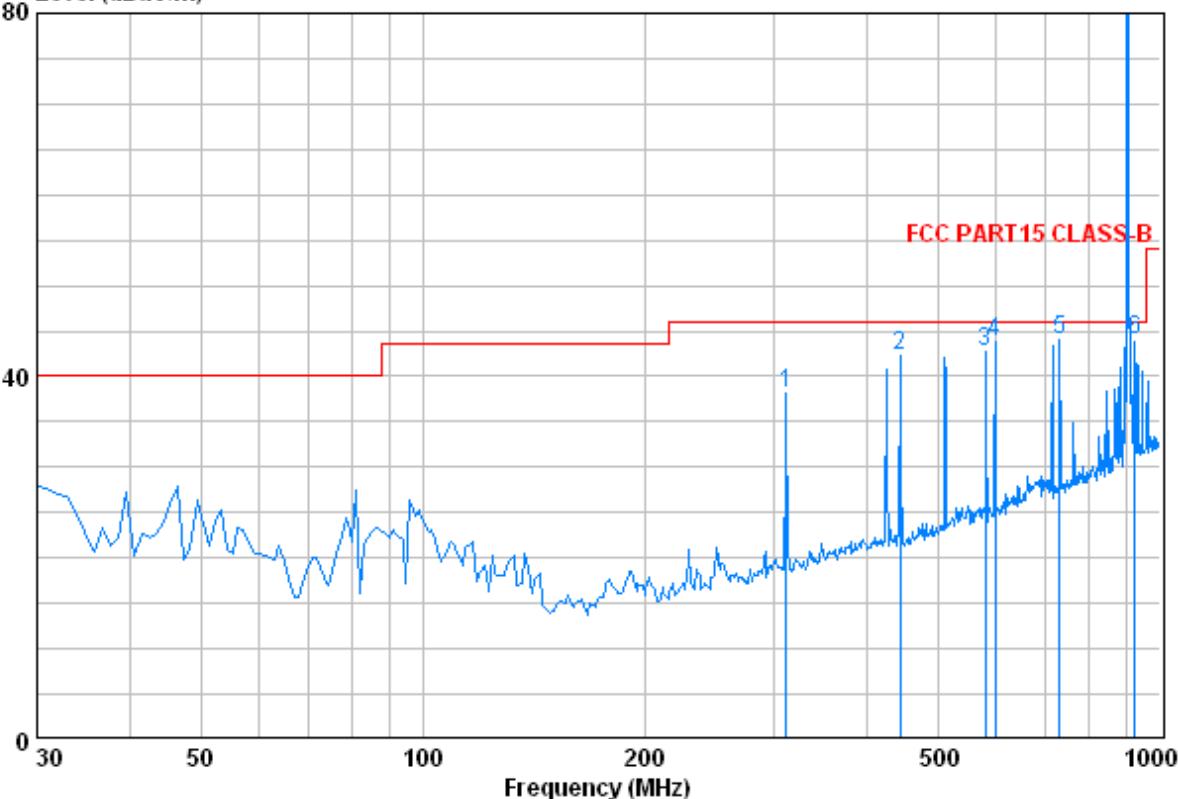


**5.11.1 Radiated emission below 1GHz**

Vertical

Data: 35

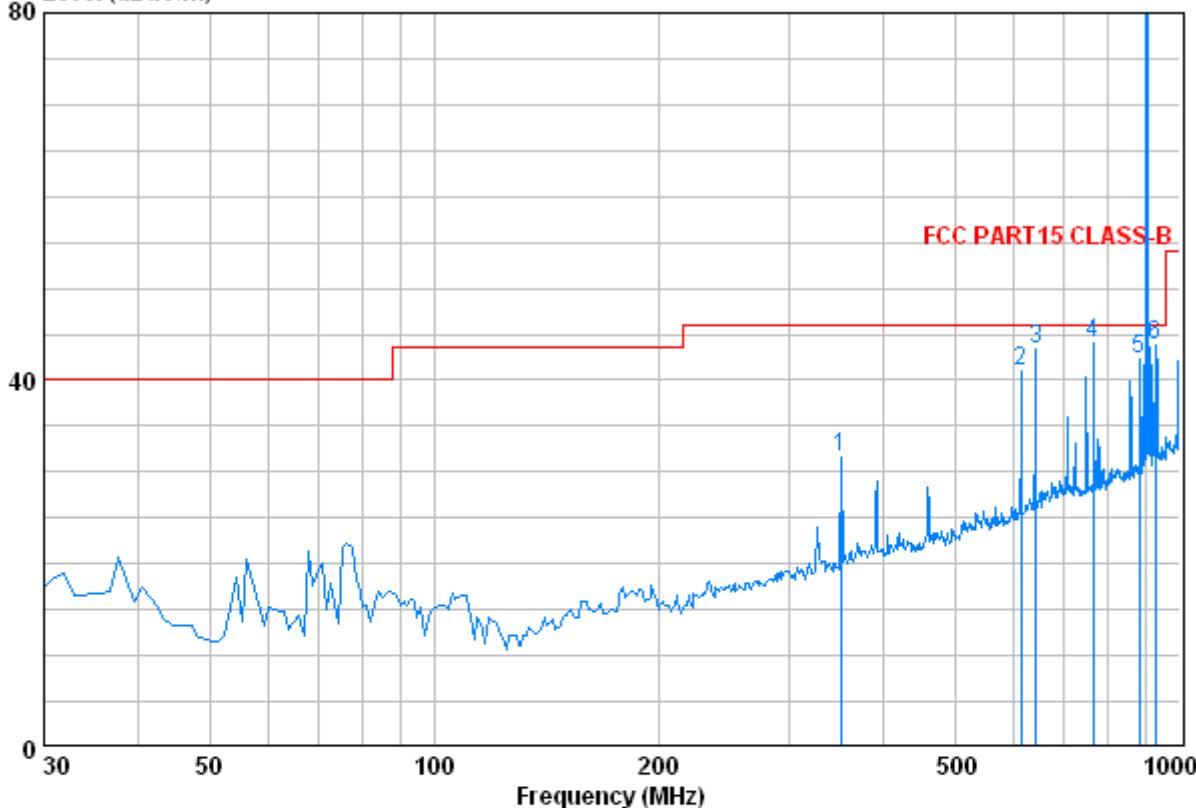
Level (dBuV/m)



Freq	Cable Antenna Preamp			Read	Limit	Over
	Loss	Factor	Factor	Level		

	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	311.300	1.94	14.33	26.48	48.32	38.10	46.00	-7.90
2	444.190	2.39	16.78	27.40	50.46	42.23	46.00	-3.77
3	579.990	2.68	19.22	27.57	48.34	42.67	46.00	-3.33
4	598.420	2.70	19.74	27.55	48.93	43.82	46.00	-2.18
5	731.310	3.00	21.62	27.37	46.71	43.96	46.00	-2.04
6	924.340	3.63	23.30	26.64	43.72	44.01	46.00	-1.99

Horizontal

 Data: 36  
 Level (dBuV/m)


Freq	Cable		Antenna	Preamp	Read	Limit	Line	Over
	Loss	Factor	Factor	Factor	Level			
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	351.070	2.06	15.43	26.81	40.87	31.55	46.00	-14.45
2	612.970	2.73	20.12	27.53	45.73	41.05	46.00	-4.95
3	641.100	2.79	20.56	27.49	47.61	43.47	46.00	-2.53
4	766.230	3.11	21.90	27.33	46.26	43.93	46.00	-2.07
5	883.600	3.54	23.06	26.85	42.53	42.28	46.00	-3.72
6	928.220	3.63	23.30	26.64	43.50	43.78	46.00	-2.22

**Note:**

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

### 5.11.2 Transmitter emission above 1GHz

Test mode:		2FSK		Test channel:		Lowest		Remark:		Peak
Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization		
2683.000	3.14	32.96	40.07	50.77	46.80	74.00	-27.20	Vertical		
4402.000	4.43	34.92	41.33	49.97	47.99	74.00	-26.01	Vertical		
5680.000	5.02	35.18	41.20	50.43	49.43	74.00	-24.57	Vertical		
6274.000	5.20	36.02	40.68	50.69	51.23	74.00	-22.77	Vertical		
7534.000	6.17	36.00	39.59	49.97	52.55	74.00	-21.45	Vertical		
8650.000	6.17	36.32	38.62	47.97	51.84	74.00	-22.16	Vertical		
2683.000	3.14	32.96	40.07	49.73	45.76	74.00	-28.24	Horizontal		
4402.000	4.43	34.92	41.33	50.18	48.20	74.00	-25.80	Horizontal		
5914.000	5.10	35.56	40.99	50.92	50.59	74.00	-23.41	Horizontal		
6526.000	5.27	36.28	40.46	51.00	52.09	74.00	-21.91	Horizontal		
7579.000	6.21	36.00	39.56	49.53	52.18	74.00	-21.82	Horizontal		
9091.000	6.13	36.70	38.24	47.64	52.23	74.00	-21.77	Horizontal		

Test mode:		2FSK		Test channel:		Middle		Remark:		Peak
Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization		
2422.000	3.00	32.58	39.88	54.26	49.96	74.00	-24.04	Vertical		
2710.000	3.16	33.00	40.09	53.87	49.94	74.00	-24.06	Vertical		
4546.000	4.53	35.12	41.44	49.22	47.43	74.00	-26.57	Vertical		
6310.000	5.21	36.06	40.66	52.66	53.27	74.00	-20.73	Vertical		
7858.000	6.21	36.00	39.31	48.61	51.51	74.00	-22.49	Vertical		
8722.000	6.17	36.37	38.57	47.62	51.59	74.00	-22.41	Vertical		
2683.000	3.14	32.96	40.07	51.50	47.53	74.00	-26.47	Horizontal		
3970.000	4.14	33.78	41.01	49.56	46.47	74.00	-27.53	Horizontal		
4510.000	4.50	35.20	41.42	49.69	47.97	74.00	-26.03	Horizontal		
6319.000	5.21	36.08	40.64	53.21	53.86	74.00	-20.14	Horizontal		
7291.000	5.87	35.92	39.80	50.21	52.20	74.00	-21.80	Horizontal		
8263.000	6.19	36.10	38.96	48.55	51.88	74.00	-22.12	Horizontal		

Test mode:		2FSK		Test channel:		Highest		Remark:		Peak
Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization		
2404.000	2.99	32.54	39.86	53.58	49.25	74.00	-24.75	Vertical		
2710.000	3.16	33.00	40.09	51.88	47.95	74.00	-26.05	Vertical		
3430.000	3.69	33.23	40.62	51.15	47.45	74.00	-26.55	Vertical		
5158.000	4.83	34.57	41.65	53.64	51.39	74.00	-22.61	Vertical		
6319.000	5.21	36.08	40.64	50.92	51.57	74.00	-22.43	Vertical		
7282.000	5.87	35.92	39.80	49.76	51.75	74.00	-22.25	Vertical		
2710.000	3.16	33.00	40.09	51.02	47.09	74.00	-26.91	Horizontal		
4150.000	4.27	34.22	41.15	49.94	47.28	74.00	-26.72	Horizontal		
5815.000	5.06	35.40	41.09	50.66	50.03	74.00	-23.97	Horizontal		
6319.000	5.21	36.08	40.64	51.72	52.37	74.00	-21.63	Horizontal		
7579.000	6.21	36.00	39.56	49.38	52.03	74.00	-21.97	Horizontal		
8263.000	6.19	36.10	38.96	48.41	51.74	74.00	-22.26	Horizontal		

Remark: 1. The disturbance above 10GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

2. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.