

Hi-P Electronics Pte. Ltd. / H375iS

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# **EMC Test Report**

Project Number: 3986695

Report Number: 3986695EMC02 Revision Level: 0

Client: Hi-P Electronics Pte. Ltd.

**Equipment Under Test: iDEN Cellular Phone with Bluetooth** 

Model: H375iS

FCC ID: 2ACUZ375iS

Applicable Standards: FCC Part 15 Subpart C, § 15.247

ANSI C63.10: 2013

Report issued on: 15 July 2016

Test Result: Compliant

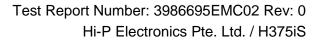
Tested by:	Mica
	Fabian Nica, Senior Technician
Reviewed by:	Anny Fel
	Jeremy Pickens, Senior EMC Engineer

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#### Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. 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.







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# **Summary of Test Results**

Test Description	Test Specification	Test Result
Occupied Bandwidth	15.247(a) (1)	Compliant
Peak Power Output	15.247(a) (1)	Compliant
Conducted Spurious Emissions	15.247(d)	Compliant
Radiated Spurious Emissions	15.247(d), 15.35(b),15.205, 15.209	Compliant
Dwell time	15.247(a) (1)(iii)	Compliant
Number of Hopping Frequencies	15.247(a) (1)(iii)	Compliant
Channel separation	15.247(a)(1)	Compliant
AC Power Line Conducted	FCC Part 15, Subpart B	Compliant
Emission	ANSI C63.4:2014	Compliant

#### Modifications Required for Compliance 1.1

None



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### 2 General Information

### 2.1 Client Information

Name: Hi-P Electronics Pte. Ltd.

Address: 12 ANG MO KIO STREET 64 #03-02, UE BIZHUB CENTRAL (BLK A)

City, State, Zip, Country: SINGAPORE 569088

## 2.2 Test Laboratory

Name: SGS North America, Inc.

Address: 620 Old Peachtree Road NW, Suite 100

City, State, Zip, Country: Suwanee, GA 30024, USA

### 2.3 General Information of EUT

EUT: iDEN Cellular Phone with Bluetooth

Model Number: H375iS

Serial Number: 364KSL01GQ (Radiated Measurements) 364KSL03V7 (Conducted Measurements)

Frequency Range: 902.525 to 927.475 MHz

Number of channels: 500 (10 lots of 50 hopping channels)

Modulation type: 8FSK
Channel spacing: 50 kHz
Antenna: Integral

Rated Voltage: 3.7 VDC Internal Battery

Sample Received Date: 24 June 2016

Dates of testing: 28 June - 10 July 2016

#### **Operating Modes and Conditions**

The EUT was configured in software to allow the user to the control the EUT to run continuously exercising all modes of operation.

During testing, the hopping sequence was stopped in accordance with Section 5.1 of ANSI C63.10-2013 so that the low, mid and high channels could be tested independently.

Modulations used: For fundamental and spurious measurements, the EUT was configured to operate continuously with 8FSK modulation enabled.

As specified in Section 5.10.5 of ANSI C63.10:2013:

- Software was designed to allow the EUT to operate
  - o at 95.139 % duty cycle
  - at the worst-case duty cycle to allow measurements in instances where an average correction factor needs to be determined to calculate the average field strength from the measured peak field strength

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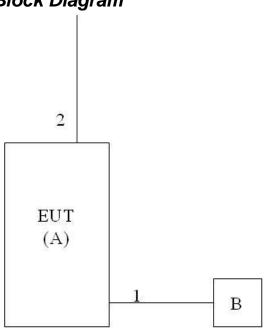


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- The software allowed configuration and operation on all available unlicensed wireless device channels.
- The software allowed configuration and operation using all available modulations and data rates
- The software allowed configuration and operation on all available power out levels
- Since this is a frequency hopping system, the software allowed the hopping sequence to be turned off

#### **EUT Connection Block Diagram** 2.4



# System Configurations

r	Device eference	Manufacturer	Description	Model Number	Serial Number
	А	Hi-P Technology	iDEN Cellular Phone with Bluetooth	H375iS	364KSL01GQ (Radiated) 364KSL03V7 (Conducted)
	В	Phihong	Switching Power Supply	PSB05R-050Q	Not Labeled

### Cable List

Cable reference	Port Name	Start	End	Cable Length (m)	Ferrite installed?	Shielded?
1	USB	EUT	Power Supply	1.2	N	Y
2	Headphone	EUT	Ear Buds	1.2	N	N



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# **Occupied Bandwidth**

#### Test Result 3.1

Test Description	Basic Standards	Test Result
20 dB bandwidth	15.247(a) (1)	Pass

#### Test Method 3.2

The procedures from ANSI C63.10 Clause 6.9.2 were used to determine the 20 dB bandwidth.

#### Test Site 3.3

SGS EMC Laboratory, Suwanee, GA

**Environmental Conditions** 

Temperature: 23.0 °C Relative Humidity: 53.8 %

#### **Test Equipment** 3.4

Test Date: 29-Jun-2016 Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
COAXIAL CABLE	1134	GORE	B094785	4-Aug-2016
10DB ATTENUATOR	10DB	UNKNOWN	B095592	5-Aug-2016

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle per manufacturer's recommendation.

#### Test Data 3.5

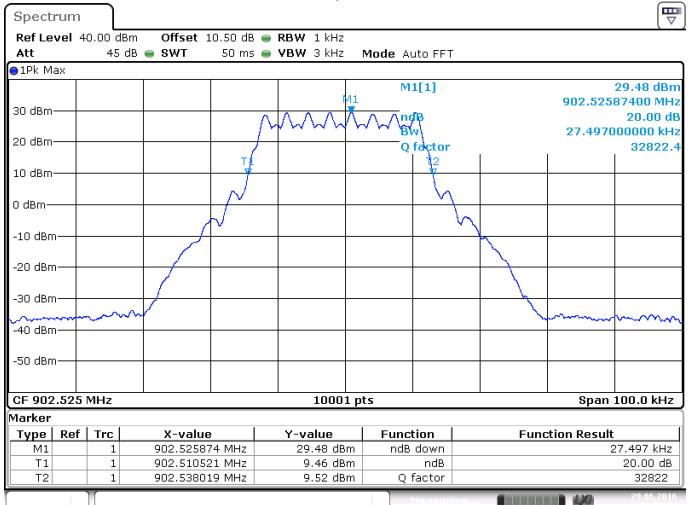
Frequency	20 dB bandwidth <b>kHz</b>
902.525MHz	27.497
915MHz	27.507
927.475MHz	27.487



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#### Sample Plot



Date: 29.JUN.2016 09:03:10



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# **Peak Output Power**

### Test Result

Test Description	Test Specification	Test Result
Peak Output Power	15.247(a)(1)	Compliant

#### Test Method

Measurements were recorded using the test methods defined in ANS C63.10, Clause 7.8.5.

#### Limit

For frequency hopping systems operating in the 902-928 MHz band employing at least 50 hopping channels: 1 watt.

#### Test Site 4.3

SGS EMC Laboratory, Suwanee, GA

**Environmental Conditions** 

Temperature: 23.0 °C Relative Humidity: 53.8 %

#### Test Equipment 4.4

Test Date: 29-Jun-2016 Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
COAXIAL CABLE	1134	GORE	B094785	4-Aug-2016
10DB ATTENUATOR	10DB	UNKNOWN	B095592	5-Aug-2016

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle per manufacturer's recommendation.

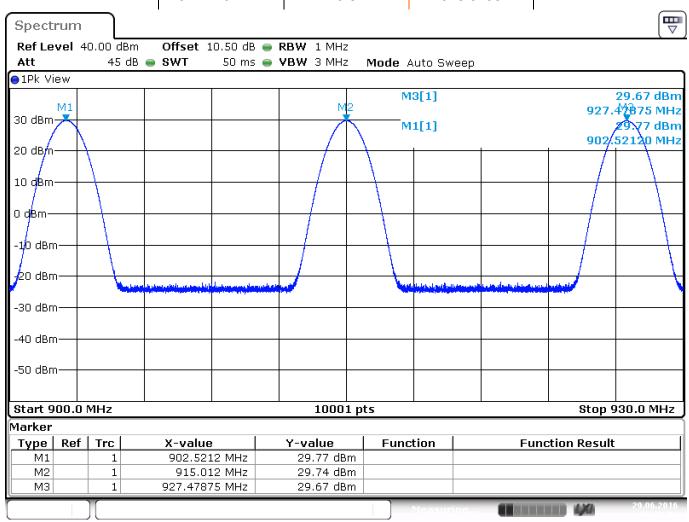


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#### Test Data

Frequency	Peak Output Power (dBm)	Peak Output Power (mW)
902.525 MHz	29.77	948.4185
915 MHz	29.74	941.8896
927.475 MHz	29.67	926.8298



Date: 29.JUN.2016 09:12:54



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# **Conducted Spurious Emissions**

#### Test Result 5.1

Test Description	Test Specification	Test Result
Conducted Spurious Emissions	15.247(d)	Compliant

#### Test Method 5.2

Measurements were recorded using the test methods defined in ANS C63.10, Clause 7.8.8.

The limit is 20 dB below the measured peak power.

#### Test Site 5.3

SGS EMC Laboratory, Suwanee, GA

**Environmental Conditions** 

Temperature: 22.9 °C Relative Humidity: 51.9 %

## **Test Equipment**

Test Date: 29-Jun-2016 Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
COAXIAL CABLE	1134	GORE	B094785	4-Aug-2016
10DB ATTENUATOR	10DB	UNKNOWN	B095592	5-Aug-2016

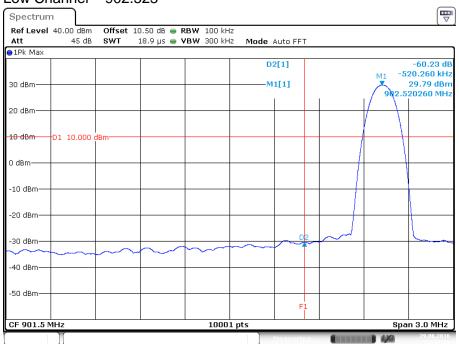
Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle per manufacturer's recommendation.

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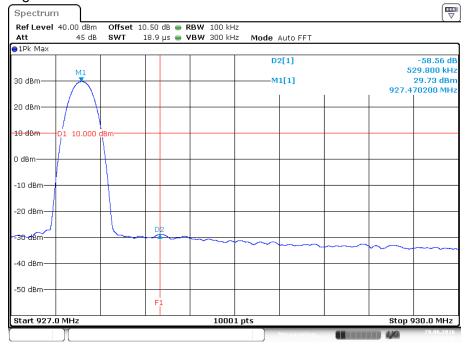
# Test Data (Band-Edge)

#### Low Channel - 902.525



Date: 29.JUN.2016 12:36:00

#### High Channel - 927.475



Date: 29.JUN.2016 12:41:20

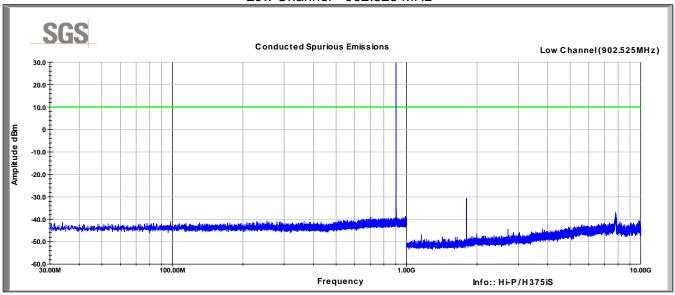


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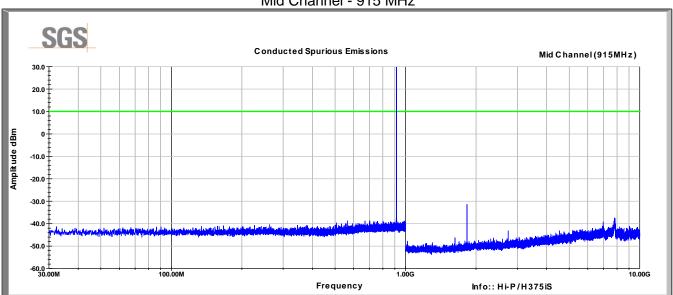
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# Test Data (Spurious Emissions)

Low Channel - 902.525 MHz



Mid Channel - 915 MHz

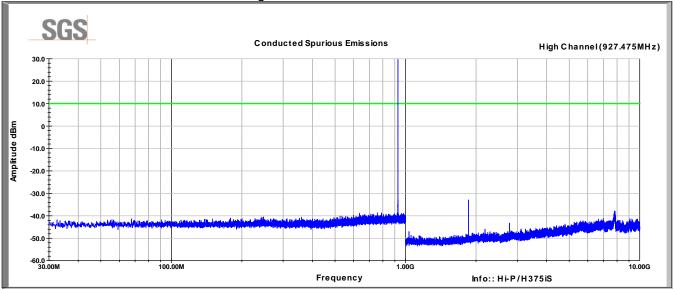




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High Channel - 927.475 MHz





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# Field Strength of Spurious Radiation

#### Test Result 6.1

Test Description	Test Specification	Test Result
Field strength of spurious radiation	15.247(d), 15.35(b),15.205, 15.209	Compliant

#### 6.2 Test Method

Radiated spurious emissions measurements were recorded with the device configured to transmit at the lowest, middle, and highest channels. The frequency range investigated was up through the 10<sup>th</sup> harmonic of the fundamental transmit frequency. The methods defined in ANSI C63.10: 2013 were used.

For measurements below 1GHz, the device was manipulated through three orthogonal axes. Above 1GHz, the alternative method in Clause 6.6.5 was used.

#### Test distance:

30 MHz to 1 GHz - The EUT to measurement antenna distance is 3 meters 1 to 18 GHz - The EUT to measurement antenna distance is 3 meters 18 to 40 GHz - The EUT to measurement antenna distance is 1 meter

Formula	Limits <sup>(1)</sup>		Peak Limits
Frequency	Microvolts/m	dBuV/m	dBuV/m
30 - 88 MHz	100	40 (2)	
88 - 216 MHz	150	43.5 <sup>(2)</sup>	
216 - 960 MHz	200	46 (2)	
960 - 1000 MHz	500	54 <sup>(2)</sup>	
1 - 40 GHz	500	54 <sup>(3)</sup>	74

<sup>(1)</sup> These limits are applicable to emissions within the restricted bands of operation defined in FCC §15.205.

- (2) Quasi-peak limit
- (3) Average limit



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#### **Test Site** 6.3

10m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA (Measurements < 1GHz) 3m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA (Measurements > 1GHz)

**Environmental Conditions** 

Temperature: 23.2 °C Relative Humidity: 51.6 %

#### Test Equipment 6.4

Test End Date: 10-Jul-2016 Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	4-Aug-2016
ANTENNA, BILOG	JB6	SUNOL	B079690	21-Oct-2016
DRG HORN (MEDIUM)	3117	ETS-LINDGREN	B079699	26-Apr-2017
PREAMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	16-Feb-2017
RF CABLE	NMS-290-236.2-NMS	FLORIDA RF LABS	B095020	4-Aug-2016
RF CABLE	NFS-290-78.7-NFS	FLORIDA RF LABS	B095019	4-Aug-2016
RF CABLE - 7500MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079713	3-Aug-2016
RF CABLE - 7000MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079716	3-Aug-2016
COAXIAL CABLE	SUCOFLEX 100	HUBER&SUHNER	B108523	27-Oct-2016
RF CABLE	SF106	HUBER&SUHNER	B085892	3-Aug-2016
COAXIAL CABLE	1134	GORE	B094785	4-Aug-2016

Note: The equipment calibration period is 1 year.

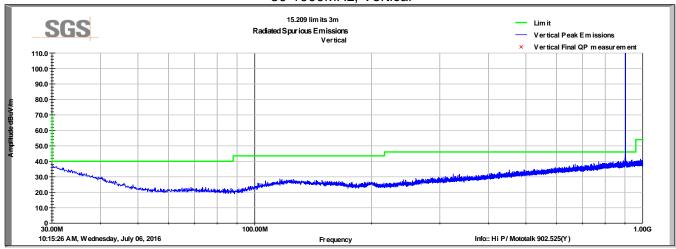


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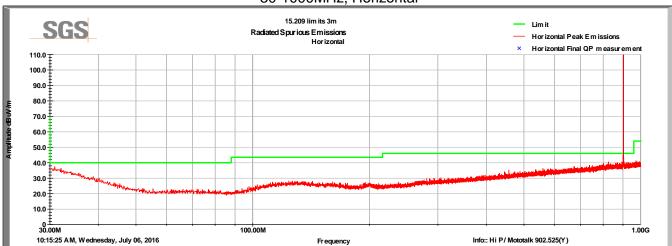
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### Test Data

### MOTOtalk Low Channel, 902.525 MHz 30-1000MHz, Vertical



### MOTOtalk Low Channel, 902.525 MHz 30-1000MHz, Horizontal

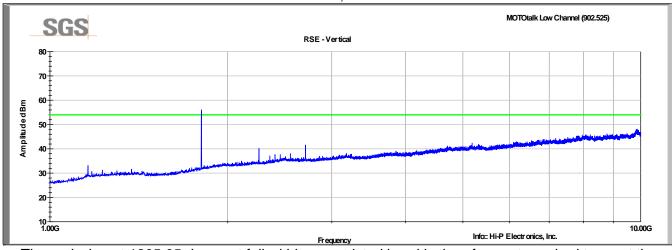




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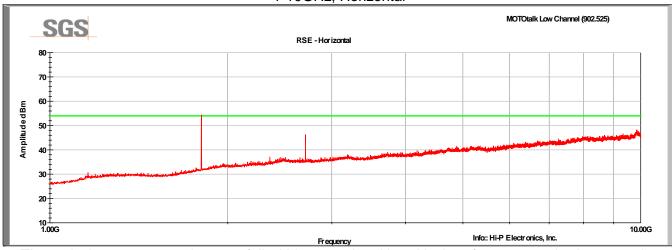
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### MOTOtalk Low Channel, 902.525 MHz 1-10GHz, Vertical



The emission at 1805.05 does not fall within a restricted band is therefore not required to meet the 15.209 limits.

### MOTOtalk Low Channel, 902.525 MHz 1-10GHz, Horizontal



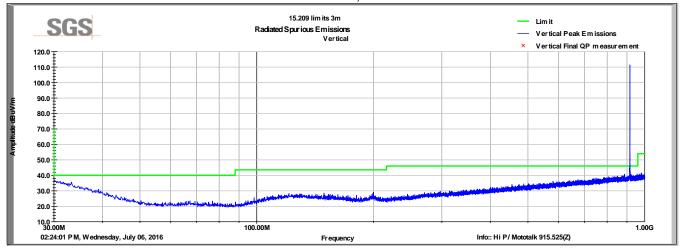
The emission at 1805.05 does not fall within a restricted band is therefore not required to meet the 15.209 limits.



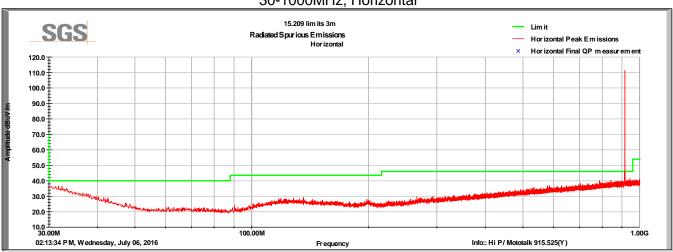
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### MOTOtalk Mid Channel, 915 MHz 30-1000MHz, Vertical



### MOTOtalk Mid Channel, 915 MHz 30-1000MHz, Horizontal

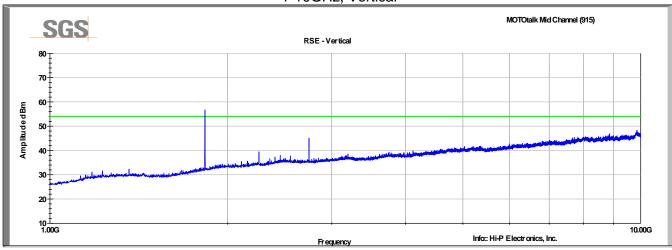




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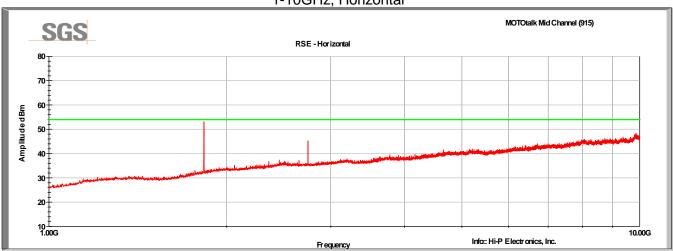
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### MOTOtalk Mid Channel, 915 MHz 1-10GHz, Vertical



The emission at 1830 does not fall within a restricted band is therefore not required to meet the 15.209 limits.

### MOTOtalk Mid Channel, 915 MHz 1-10GHz, Horizontal



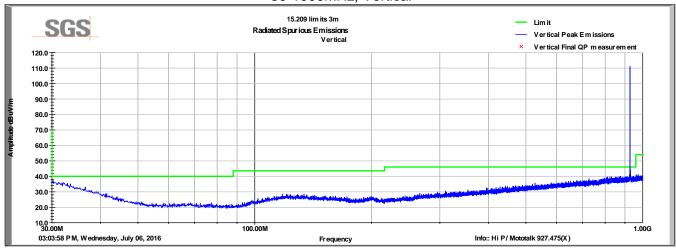
The emission at 1830 does not fall within a restricted band is therefore not required to meet the 15.209 limits.



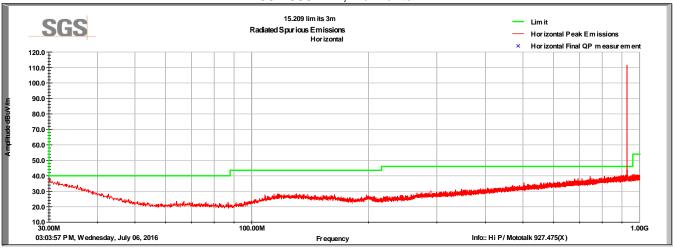
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### MOTOtalk High Channel, 927.475 MHz 30-1000MHz, Vertical



### MOTOtalk High Channel, 927.475 MHz 30-1000MHz, Horizontal

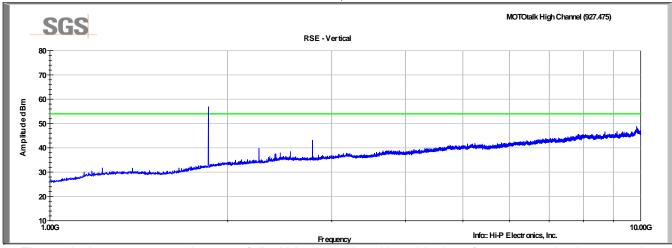




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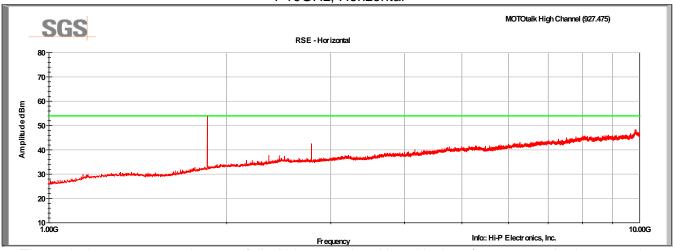
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### MOTOtalk High Channel, 927.475 MHz 1-10GHz, Vertical



The emission at 1854.95 does not fall within a restricted band is therefore not required to meet the 15.209 limits.

### MOTOtalk High Channel, 927.475 MHz 1-10GHz, Horizontal



The emission at 1854.95 does not fall within a restricted band is therefore not required to meet the 15.209 limits.



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# **Pseudo-Random Hop Sequence**

#### Test Result 7.1

Test Description	Test Specification	Test Result	
Pseudo-Random Hop Sequence	15.247(d)	Compliant <sup>(1)</sup>	

Note (1): The theory of operation states that the device is MOTOtalk and operates using a pseudorandom hopping technique.

#### 7.2 Test Method

Compliance is demonstrated by Manufacturer's declaration or is stated in the Theory of Operation.

#### Requirement

The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset, while the long-term distribution appears evenly distributed.



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# **Channel Separation**

#### Test Result 8.1

Test Description	Test Specification	Test Result
Number of Hopping Channels	15.247(a)(1)	Compliant

#### Test Method 8.2

Measurements were recorded using the test methods defined in ANSI C63.10, Clause 7.8.2.

#### Requirement

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. Alternatively, frequency hopping systems operating in the band 2400-2483.5 MHz 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 that the systems operate with an output power no greater than 0.125 W.

#### 8.3 Test Site

SGS EMC Laboratory, Suwanee, GA

**Environmental Conditions** 

Temperature: 23.1 °C Relative Humidity: 53.5 %

# Test Equipment

Test Date: 29-Jun-2016 Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
COAXIAL CABLE	1134	GORE	B094785	4-Aug-2016
10DB ATTENUATOR	10DB	UNKNOWN	B095592	5-Aug-2016

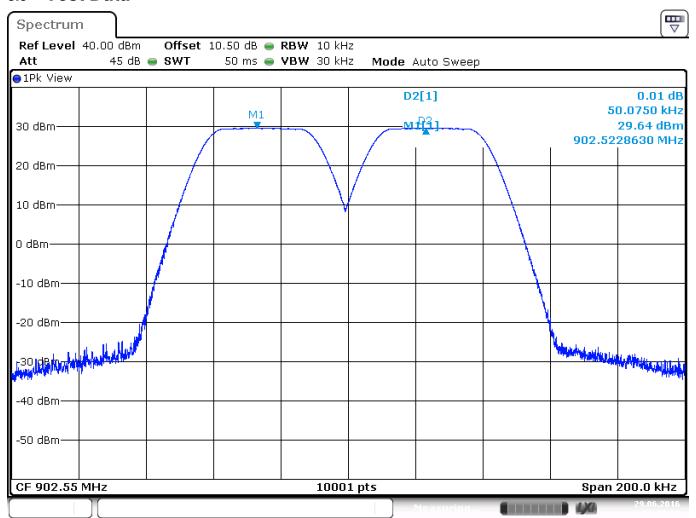
Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle per manufacturer's recommendation.



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#### Test Data 8.5



Date: 29.JUN.2016 09:43:15



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# Number of Hopping Channels

#### Test Result 9.1

Test Description	Test Specification	Test Result
Number of Hopping Channels	15.247(a)(1)(i)	Compliant

#### Test Method

Measurements were recorded using the methods defined in ANSI C63.10, Clause 7.8.3.

#### Requirement

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies

#### Test Site 9.3

SGS EMC Laboratory, Suwanee, GA

**Environmental Conditions** 

Temperature: 23.1 °C Relative Humidity: 53.5 %

#### Test Equipment 9.4

Test Date: 29-Jun-2016 Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
COAXIAL CABLE	1134	GORE	B094785	4-Aug-2016
10DB ATTENUATOR	10DB	UNKNOWN	B095592	5-Aug-2016

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle per manufacturer's recommendation.

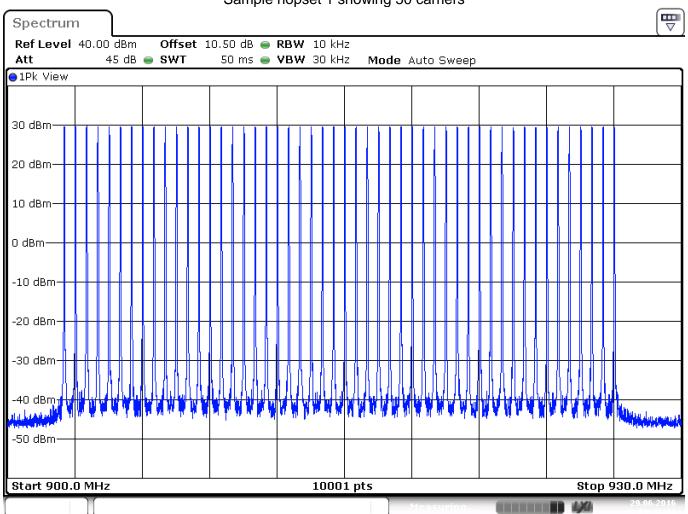


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#### Test Data 9.5

Theory of operation states that the radio splits the 500 carriers up into 10 hopsets of 50 carriers each Sample hopset 1 showing 50 carriers



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### 10 Dwell Time

#### 10.1 Test Result

Test Description	Test Specification	Test Result
Dwell Time	15.247(a)(1)(i)	Compliant

#### 10.2 Test Method

Measurements were recorded using the methods defined in ANSI C63.10, Clause 7.8.4.

#### Requirement

f the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

For this device employing 50 hopping channels, the occupancy period is 20 seconds

#### 10.3 Test Site

SGS EMC Laboratory, Suwanee, GA

**Environmental Conditions** 

Temperature: 23.1 °C Relative Humidity: 53.5 %

## 10.4 Test Equipment

Test Date: 29-Jun-2016 Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
COAXIAL CABLE	1134	GORE	B094785	4-Aug-2016
10DB ATTENUATOR	10DB	UNKNOWN	B095592	5-Aug-2016

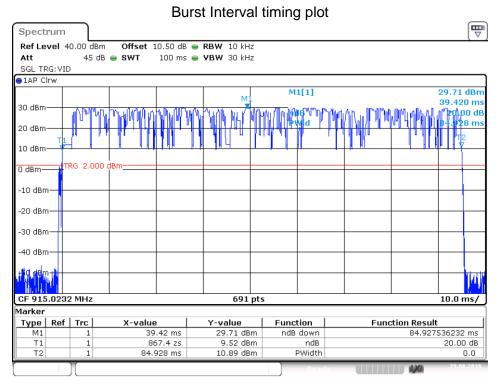
Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle per manufacturer's recommendation.



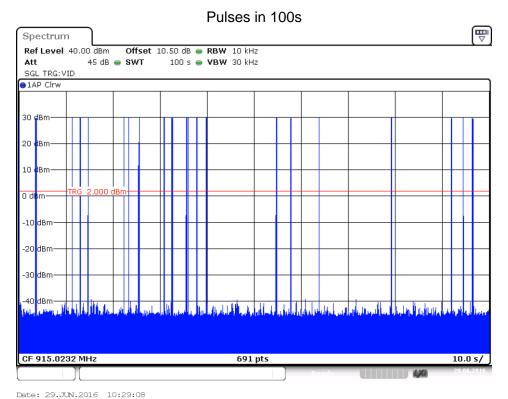
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### 10.5 Test Data



Date: 29.JUN.2016 10:19:28



20 pulses over 100s = 4 average per 20s 0.085s \* (20/5) pulses = 0.34s



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### 11 AC Power Line Conducted Emissions

### 11.1 Test Result

Test Description	Basic Standards	Test Result	
Conducted Emissions, Class B	FCC Part 15, Subpart B ANSI C63.4:2014	Compliant	

#### 11.2 Test Method

With the receivers resolution bandwidth was set to 9 kHz exploratory scans were performed over the measuring frequency range (0.15MHz to 30MHz) using a max hold mode incorporating a Peak detector and Average detector and using the TILE! software. The final test data was measured using a Quasi-Peak detector and Average detector and compared against the limits indicated in the table below.

Frequency Range	Class A Limits (dBuV)	Class B Limits (dBuV)
0.15 to 0.5 MHz	Avg 66 QP 79	Avg 56 to 46 QP 66 to 56
0.5 to 5 MHz	Avg 60 QP 73	Avg 46 Pk 56
5 to 30 MHz	Avg 60 QP 73	Avg 50 Pk 60

### 11.3 Test Site

SGS EMC Laboratory, Suwanee, GA

**Environmental Conditions** 

Temperature: 23.4°C Relative Humidity: 51.6%

# 11.4 Test Equipment

Test Fnd Date: 1-Jul-2016

Test End Date.	163661. 301			
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	9-Jul-2016
COAXIAL CABLE	CBL-25FT-NMNM	MINI-CIRCUIT	B094941	4-Aug-2016
TWO-LINE V-NETWORK	NNB 51	TESEQ	B087573	12-Nov-2016

Tester: JOP

Note: The equipment calibration period is 1 year.

#### Software:

"Conducted Emissions" TILE! profile dated Mar 2016

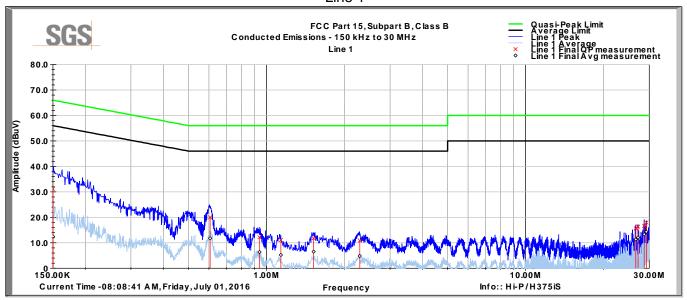


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### 11.5 Test Data

### Conducted Emissions Plot 150-30MHz Line 1



#### Conducted Emissions Data 150-30MHz Line 1

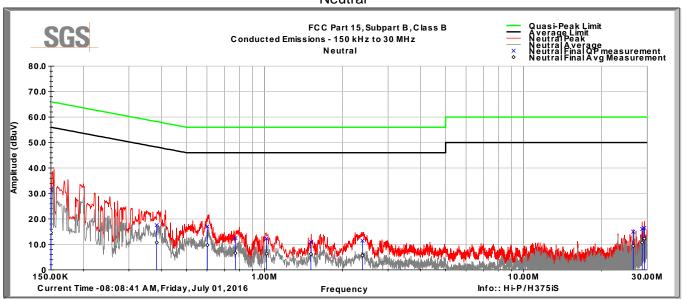
Frequency	QP Value	QP Limit	QP Margin	Avg Value	Avg Limit	Avg Margin
MHz	dBuV	dBuV	dB	dBuV	dBuV	dB
0.150	31.2	66.0	-34.8	12.5	56.0	-43.5
0.606	20.0	56.0	-36.0	11.8	46.0	-34.2
0.940	12.2	56.0	-43.8	6.3	46.0	-39.7
1.137	11.1	56.0	-44.9	5.2	46.0	-40.8
1.522	11.8	56.0	-44.2	6.5	46.0	-39.5
2.293	10.8	56.0	-45.2	4.8	46.0	-41.2
26.610	15.7	60.0	-44.3	11.3	50.0	-38.7
27.160	16.4	60.0	-43.6	12.1	50.0	-37.9
28.685	16.6	60.0	-43.4	13.3	50.0	-36.7
29.235	18.0	60.0	-42.0	14.3	50.0	-35.7



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### Conducted Emissions Plot 150-30MHz Neutral



### Conducted Emissions Data 150-30MHz Neutral

Frequency	QP Value	QP Limit	QP Margin	Avg Value	Avg Limit	Avg Margin
MHz	dBuV	dBuV	dB	dBuV	dBuV	dB
0.150	31.5	66.0	-34.5	14.7	56.0	-41.3
0.384	17.6	58.2	-40.7	10.7	48.2	-37.5
0.602	17.0	56.0	-39.0	9.7	46.0	-36.3
0.773	12.4	56.0	-43.6	6.5	46.0	-39.5
1.020	12.2	56.0	-43.8	6.3	46.0	-39.7
1.511	10.9	56.0	-45.1	6.3	46.0	-39.7
2.389	11.5	56.0	-44.5	5.7	46.0	-40.3
26.489	15.0	60.0	-45.0	9.4	50.0	-40.6
28.689	16.0	60.0	-44.0	10.7	50.0	-39.3
29.235	16.5	60.0	-43.5	12.3	50.0	-37.7



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# **12 Revision History**

Revision Level	Description of changes	Revision Date
0	Initial release	15 July 2016
1	<ul><li>Corrected units in power measurement table on page 10.</li><li>Corrected dwell time limit reference on page 28</li></ul>	22 July 2016