

EMC Test Report


Project Number: 3986695**Report Number:** 3986695EMC01**Revision Level:** 0**Client:** Hi-P Electronics Pte. Ltd.**Equipment Under Test:** iDEN Cellular Phone with Bluetooth**Model Number:** H375iS**FCC ID:** 2ACUZ375iS**Applicable Standards:** FCC Part 90, Subpart S**Report issued on:** 14 July 2016**Test Result:** Compliant

Tested by:



Fabian Nica, Senior Technician

Reviewed by:



Jeremy Pickens, Senior EMC Engineer**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.

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1 Summary of Test Results

Basic Standards	Test Result
Transmitter Output Power	Compliant
Modulation Characteristics	Compliant
Radiated Spurious Emissions	Compliant
Frequency Stability	Compliant
Effective Radiated Power (ERP)	Compliant

1.1 *Modifications Required to Compliance*

None

1.2 *Performance Criteria for Immunity*

Criteria A – No loss of performance or data during or after the test

Criteria B – No loss of data, some loss of performance that is self recoverable without operator intervention

Criteria C – No loss of data, some loss of performance that can be recovered with operator intervention

2 General Information

2.1 Client Information

Name: Hi-P Technology 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

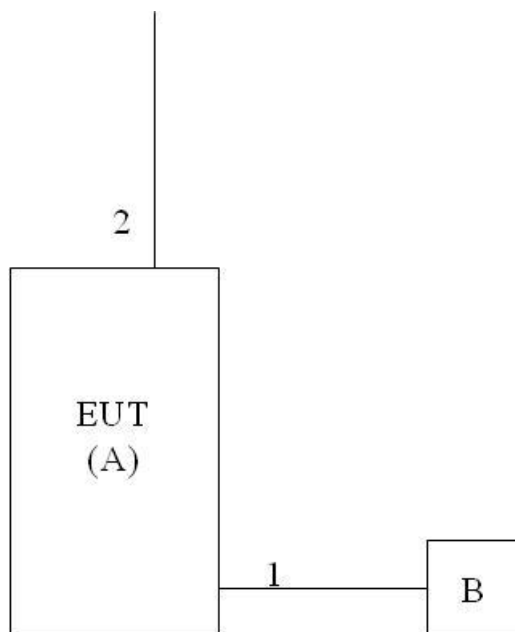
Description: iDEN Cellular Phone with Bluetooth
Model Number: H375iS
Serial Number: 364KSL00NL (Radiated Measurements)
364KSL01GQ (Conducted Measurements)
Rated Voltage: 3.7 VDC (1830mAh Rechargeable Li-Ion Battery)
Test Voltage: 3.7 VDC

Sample Received Date: 24 June 2016
Dates of testing: 28 June - 13 July 2016

2.4 Operating Modes and Conditions

During emissions testing, software was used that allowed the device to be configured to transmit continuously at full power at any of the available channels.

2.5 EUT Connection Block Diagram



2.6 System Configurations

Device reference	Manufacturer	Description	Model Number	Serial Number
A	Hi-P Technology	iDEN Cellular Phone with Bluetooth	H375iS	364KSL01GQ (Radiated) 364KSL00NL (Conducted)
B	Phihong	Switching Power Supply	PSB05R-050Q	Not Labeled

2.7 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

3 Transmitter Output Power

3.1 Test Result

Test Description	Product Specific Reference	Basic Reference	Test Result
Land Mobile Transmitter Power	47 CFR 90.7	47 CFR 2.1046	Compliant
Maximum Output Power Rating	47 CFR 90.635(d)	47 CFR 2.1033(c)(7)	Compliant
Operating output power range		47 CFR 2.1033(c)(6)	Compliant
DC power used by final amplifier device		47 CFR 2.1033(c)(8)	Compliant

3.2 Test Method

The EUT was connected to the spectrum analyzer, which was gated to measure only when the device was transmitting. An RMS detector was used to measure maximum average power.

3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 24.8 °C

Relative Humidity: 44.1 %

Atmospheric Pressure: 98.23 kPa

3.4 Test Equipment

Test Date: 29-Jun-2016

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
DC POWER SUPPLY	382280	EXTECH	EA03	CNR
MULTIFLEX COAXIAL CABLE	141	HUBER&SUHNER	B095589	4-Aug-2016
HANDHELD MULTIMETER	87V	FLUKE	B079676	4-Aug-2016

Note: The calibration period equipment is 1 year.

3.5 Test Data

Characteristics	800 MHz	
Power Setting	Minimum	Maximum
DC Voltage, Volts	3.7	3.7
DC Current, A	0.302	0.512
RF Output Power, mW	0.22	640

Maximum output power rating: 640 milliwatts (28.06 dBm), pulse average power. Output power will vary from 0.22 to 640 milliwatts (pulse average power).

Note 1: Nominal output power rating: 600 milliwatts (27.78 dBm) (Pulse average power).

Note 2: These ratings are compliant with the FCC maximum of 100 watts (50 dBm) for Mobile stations operating under Part 90.

Note 4: The term pulse average power is used to specify the power that would be measured during the intervals of recurrent TDM transmission pulses by an average responding RF power meter. Power expressed in this manner is independent of the TDM duty cycle, and facilitates RF system coverage analysis.

4 Modulation Characteristics

4.1 Test Result

Test Description	Product Specific Reference	Basic §	Test Result
Modulation Characteristics and Necessary Bandwidth	47 CFR §90.210(g), §90.691	47 CFR 2.1033(c)(13) §2.1047(d), §2.1049, §2.202	Compliant

4.2 Test Method

Emission Mask G is applied between 809 and 824 MHz, per the Applicable Emission Masks Table in §90.210.

Emission Mask G is applied also in the range between 806 and 809 MHz. The above referenced table calls for Emission Mask H, but the band plan for this spectrum was established for 12.5 kHz channels (§90.209(b)(5)). Mask H is intended for that application. The subject transmitter's emission is suited to 25 kHz channels (aggregated), and thus the G-Mask is applicable.

For these plots, the Authorized Bandwidth is taken to be 20 kHz (per §90.205(b)(5)) for all the above bands.

4.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 25.2 °C

Relative Humidity: 46.0 %

Atmospheric Pressure: 98.20 kPa

4.4 Test Equipment

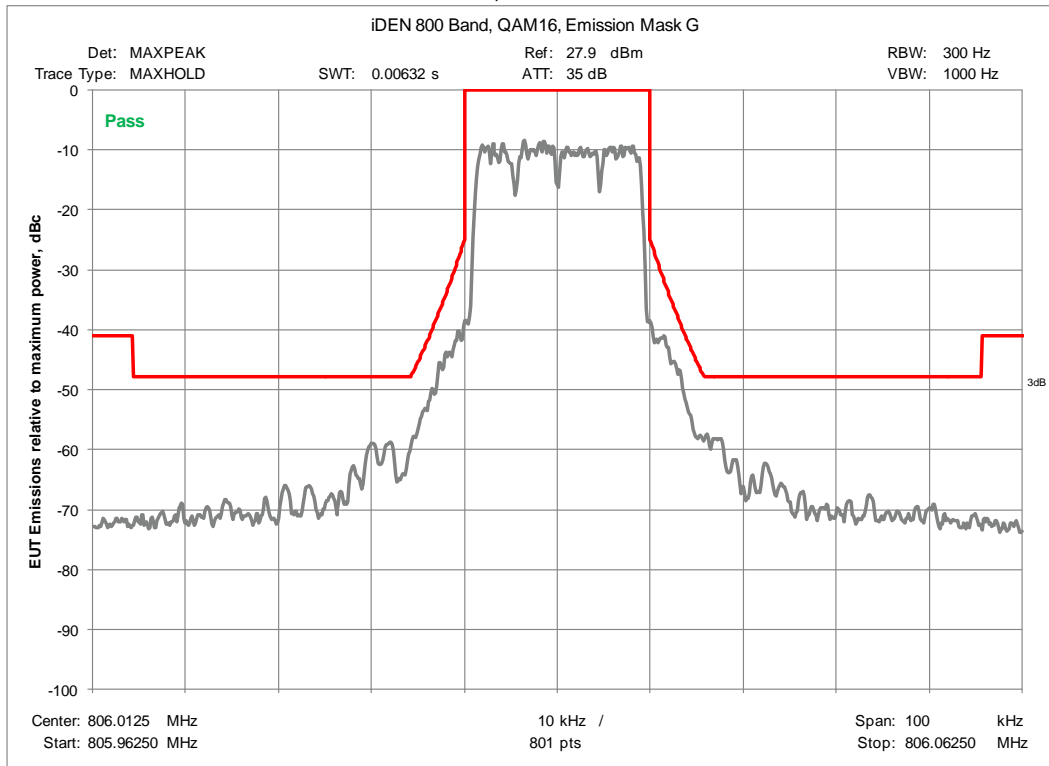
Test Date: 13-Jul-2016

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

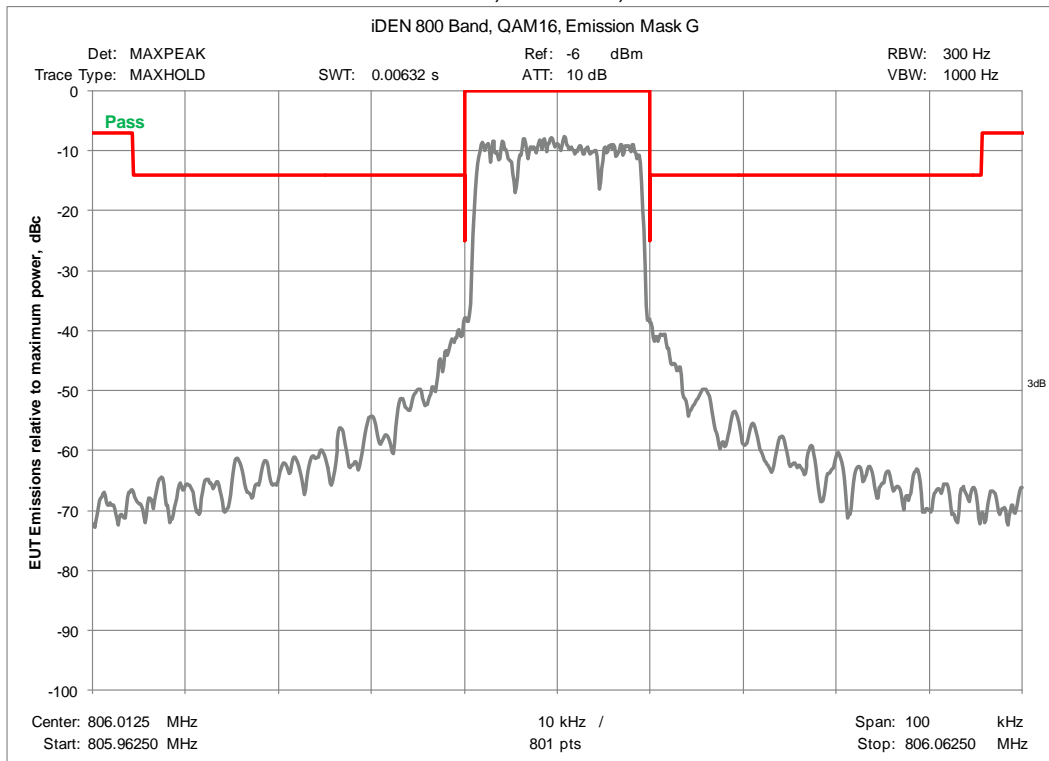
Note: The equipment calibration period is 1 year except for the FSV30 which has a 2-year cal cycle per manufacturer recommendation.

4.5 Test Data (Mask G)

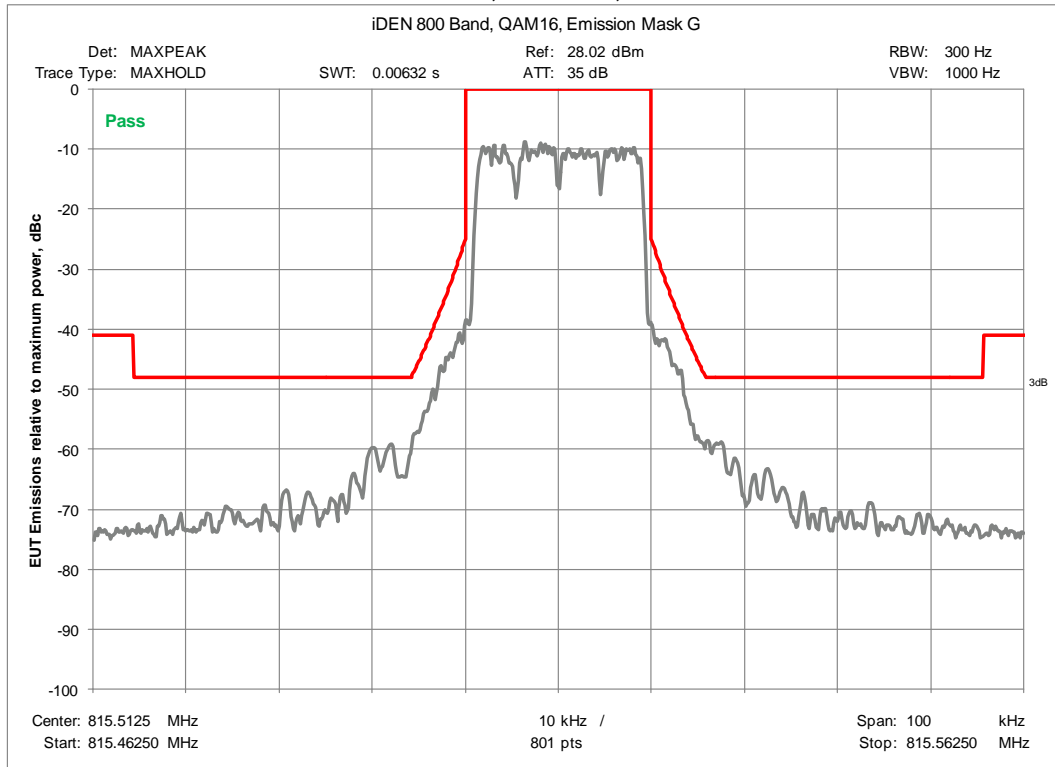
iDEN 806.0125 MHz, QAM 16 Maximum Power



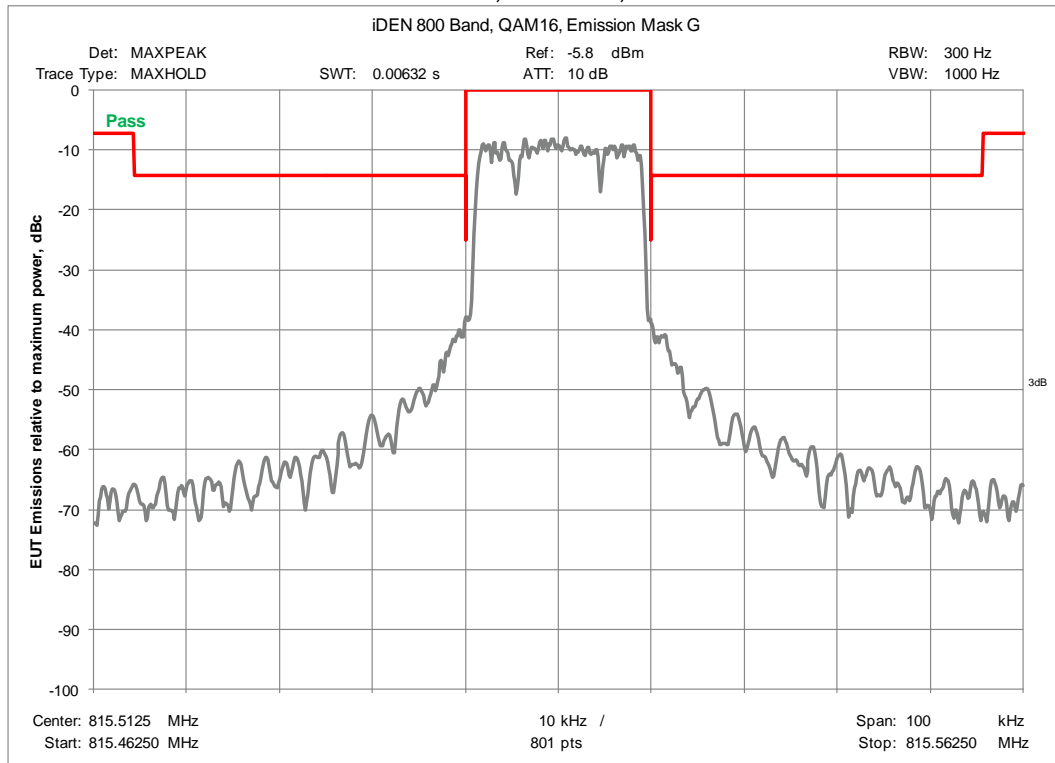
iDEN 806.0125 MHz, QAM 16, Minimum Power



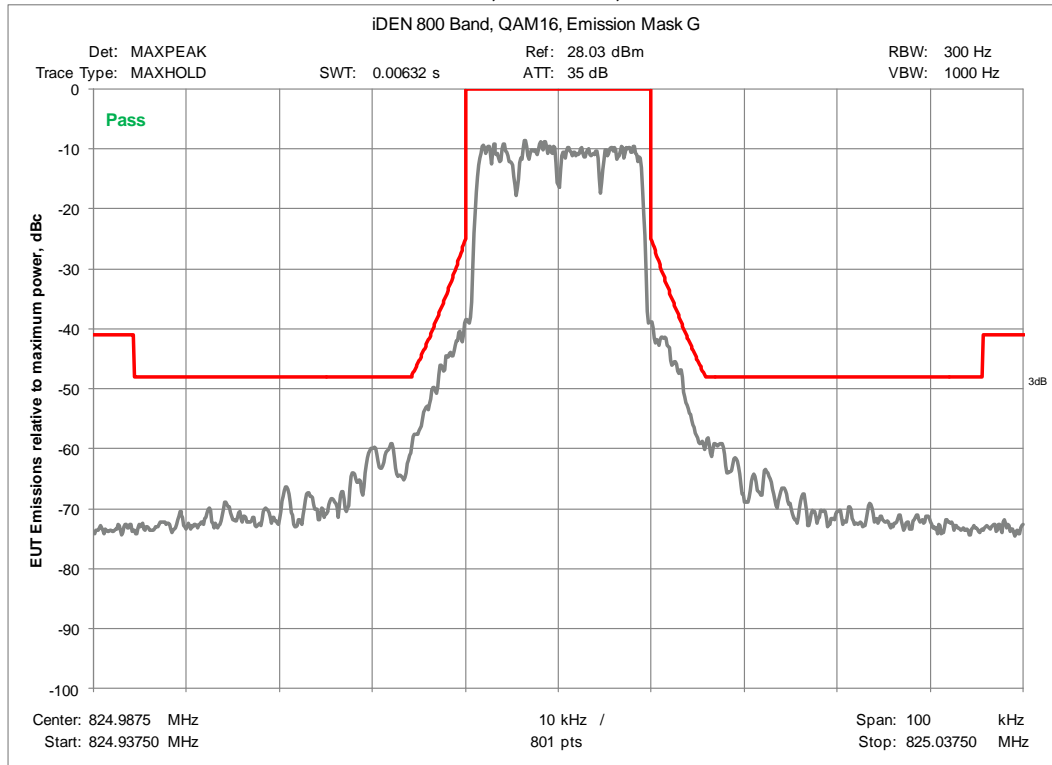
iDEN 815.5125 MHz, QAM 16, Maximum Power



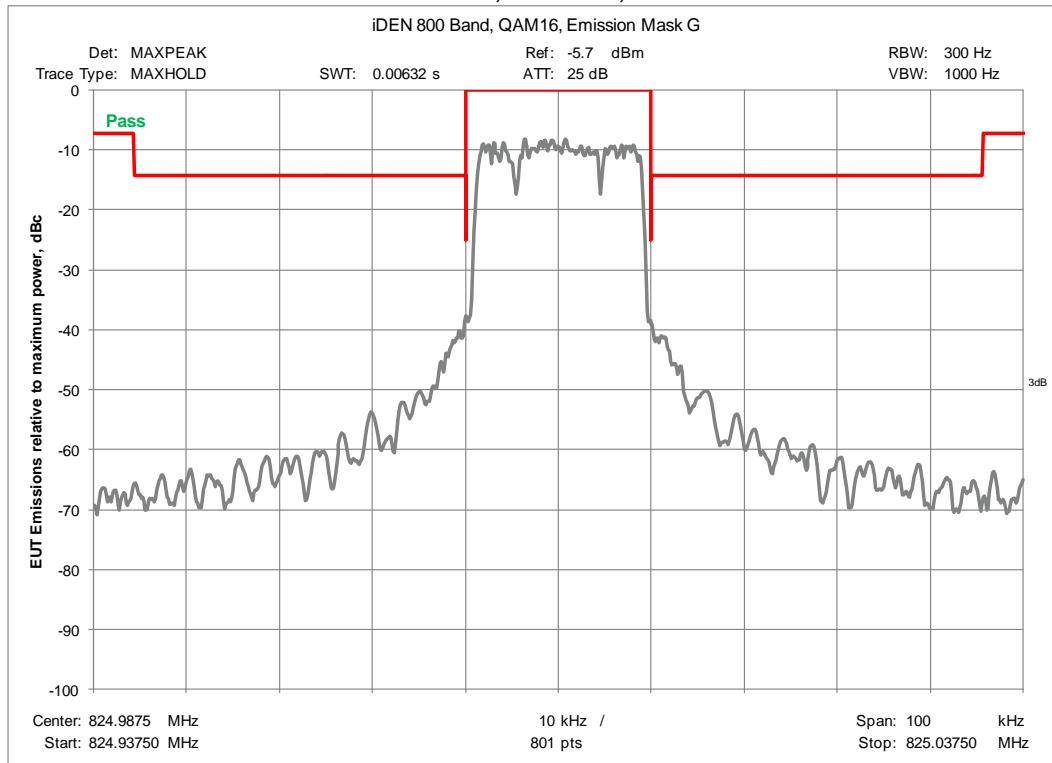
iDEN 815.5125 MHz, QAM 16, Minimum Power



iDEN 824.9875 MHz, QAM 16, Maximum Power

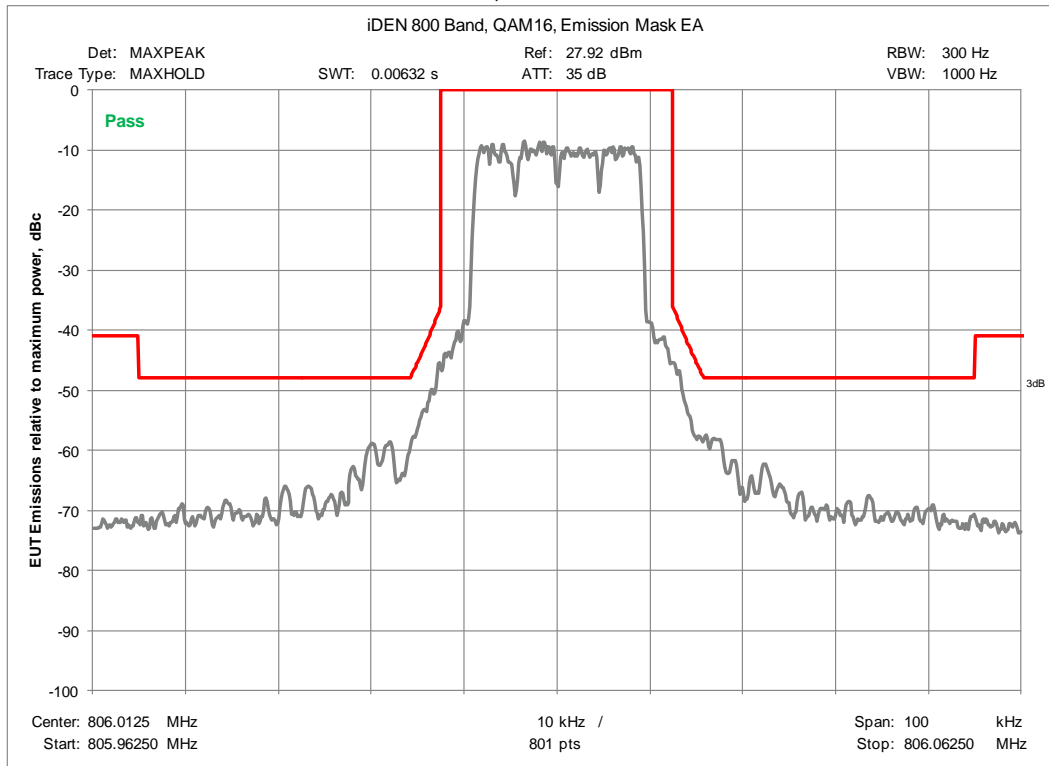


iDEN 824.9875 MHz, QAM 16, Minimum Power

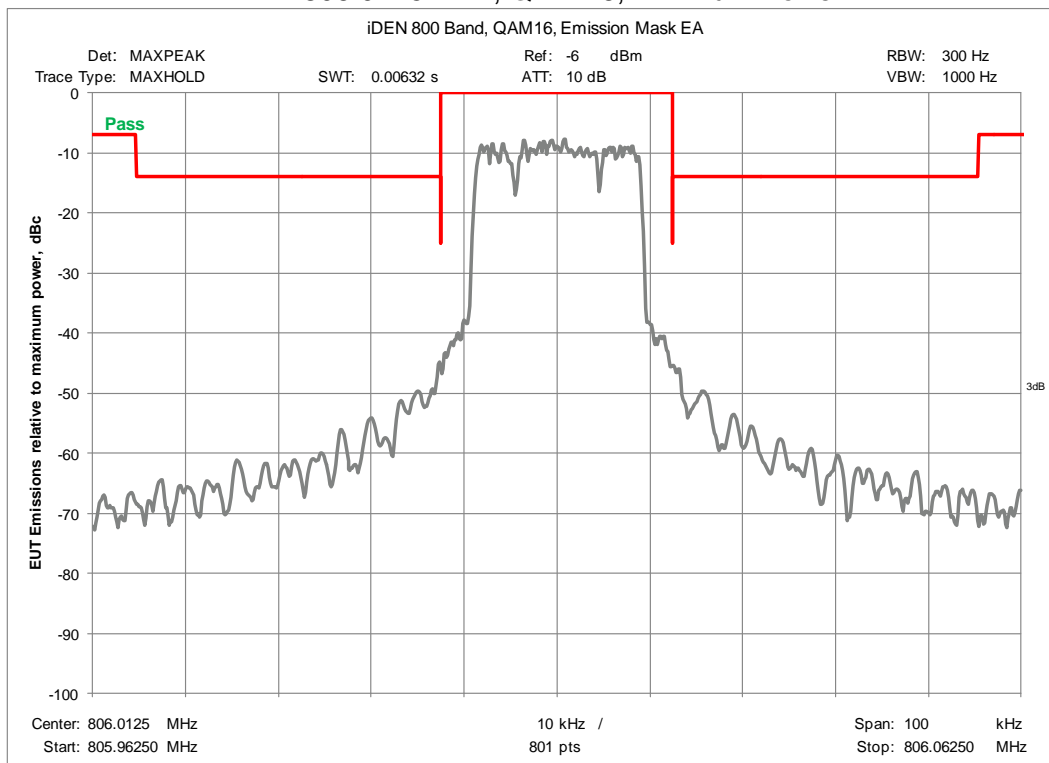


4.6 Test Data (Mask EA)

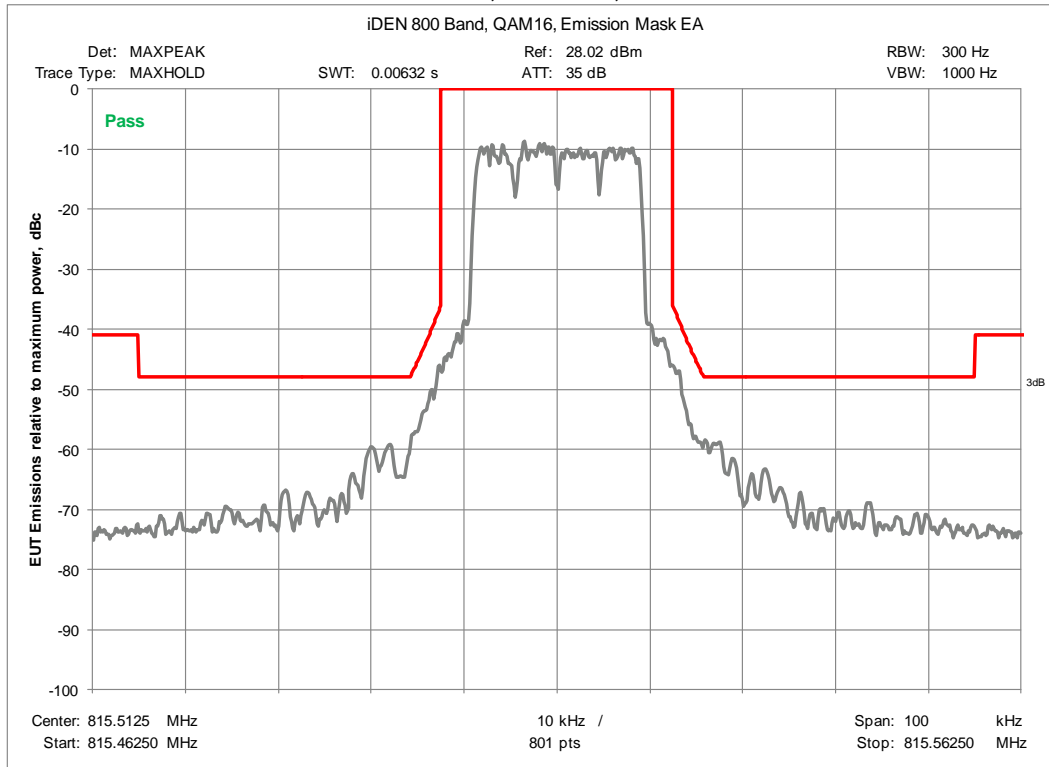
iDEN 806.0125 MHz, QAM 16 Maximum Power



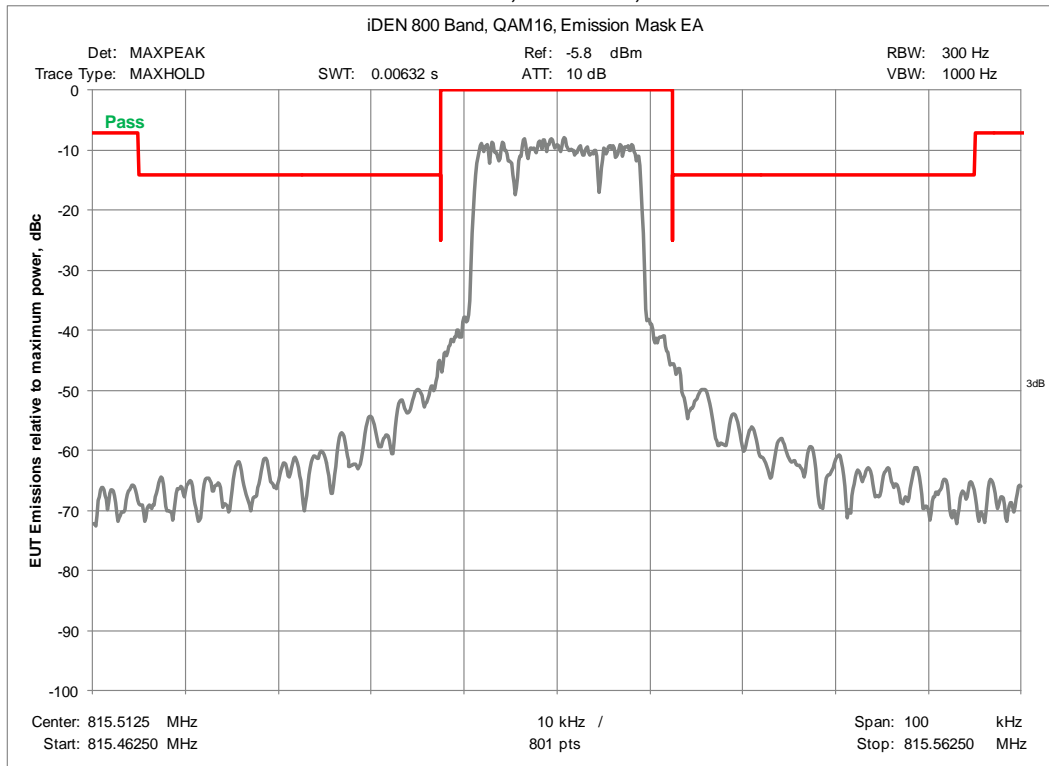
iDEN 806.0125 MHz, QAM 16, Minimum Power



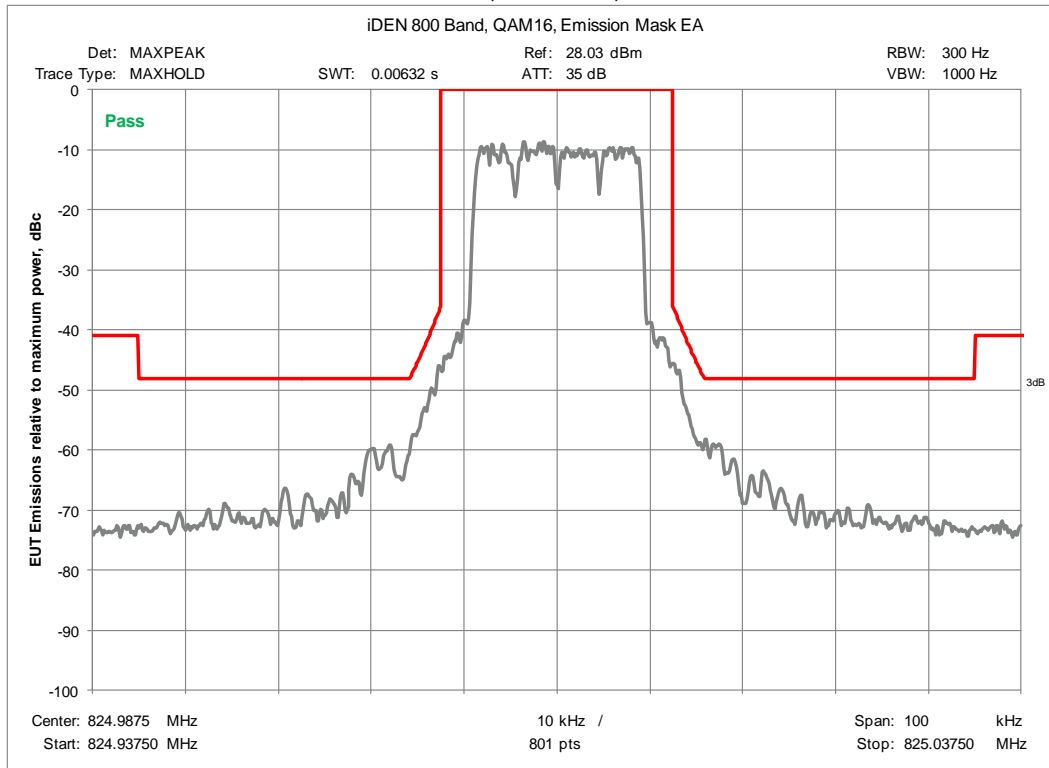
iDEN 815.5125 MHz, QAM 16, Maximum Power



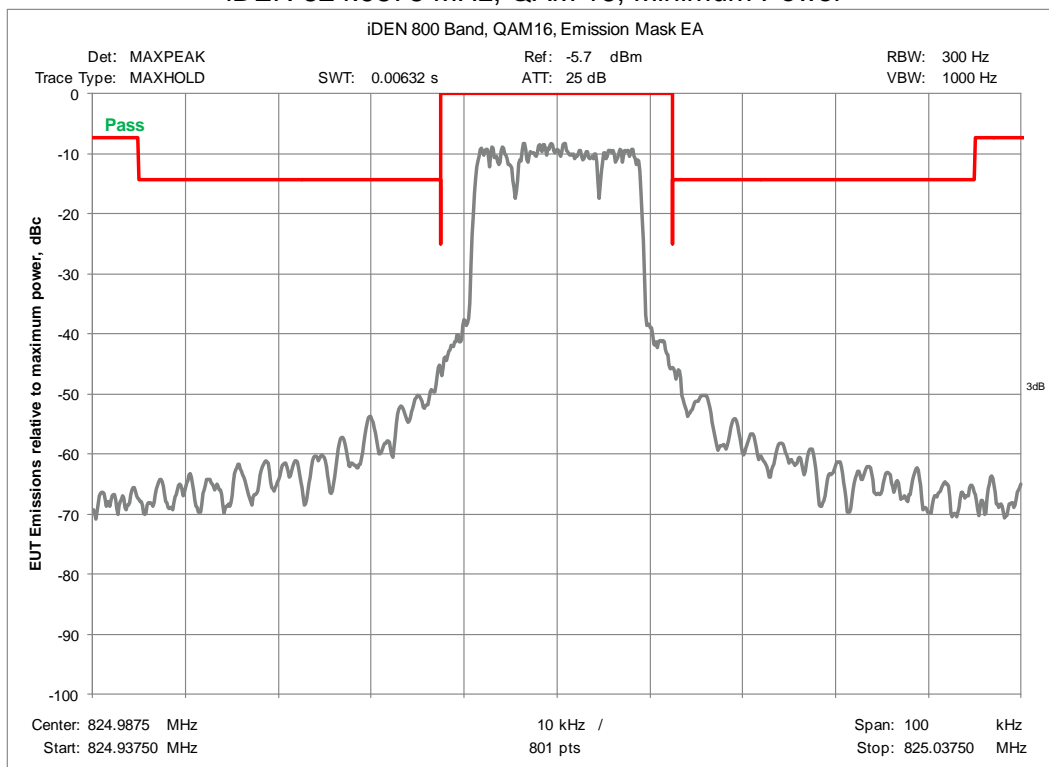
iDEN 815.5125 MHz, QAM 16, Minimum Power



iDEN 824.9875 MHz, QAM 16, Maximum Power



iDEN 824.9875 MHz, QAM 16, Minimum Power



5 Radiated Spurious Emissions

5.1 Test Result

Test Description	Product Specific Standard	Basic Standard	Test Result
Radiated Spurious Emissions	47 CFR 2.1053 47 CFR Part 90	ANSI / TIA 603-D:2009	Compliant

5.2 Test Method

The spectrum was investigated from 30 MHz to at least the 10th harmonic of the fundamental. The substitution method of ANSI / TIA 603-D: 2009 was used to make the measurements.

Instrument Settings

Frequency	RBW, MHz	VBW, MHz
Up to 1 GHz	0.1	1
Above 1 GHz	1	3

For Emission Mask G, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- on any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

For a power of P in W, the emissions must be attenuated by $43 + 10 \log (P)$, in dB. This equates to -43 dBW or -13 dBm.

The EUT was rotated through 3 orthogonal axes. The highest axis was reported.

5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.5 °C
Relative Humidity: 50.9 %
Atmospheric Pressure: 98.10 kPa

5.4 Test Equipment

Test End Date: 10-Jul-2016

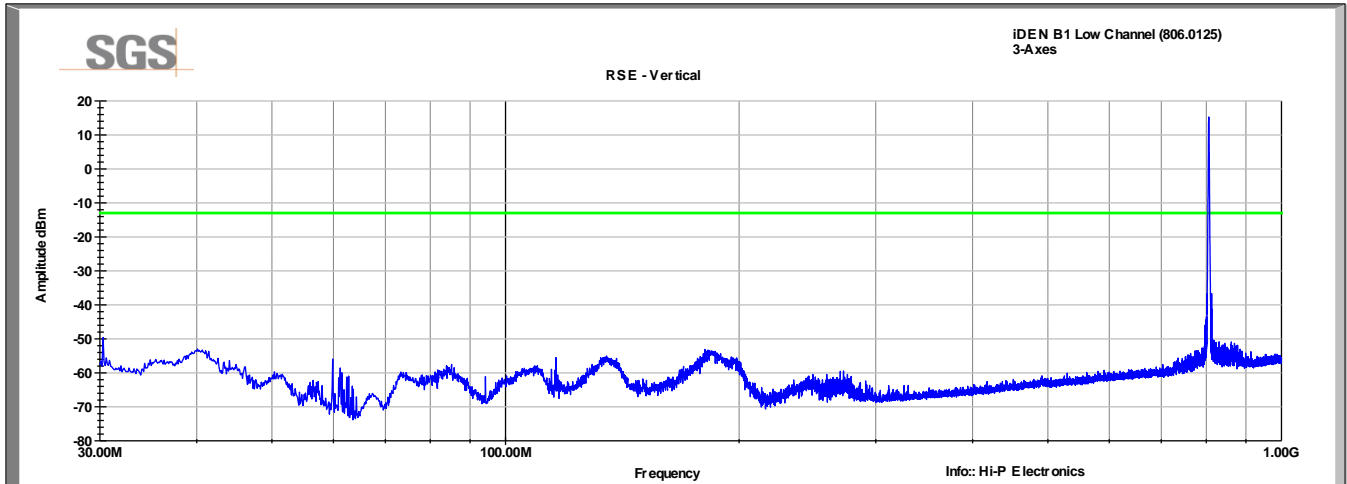
Tester: JOP

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 calibration period equipment is 1 year.

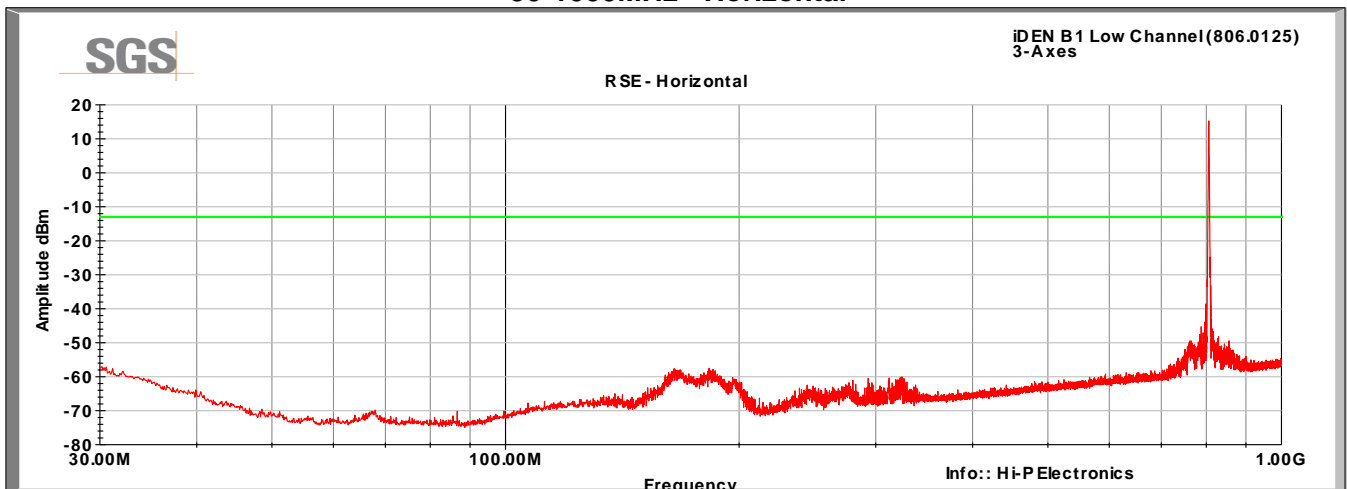
5.5 Test Data

806.0125 MHz 30-1000MHz - Vertical



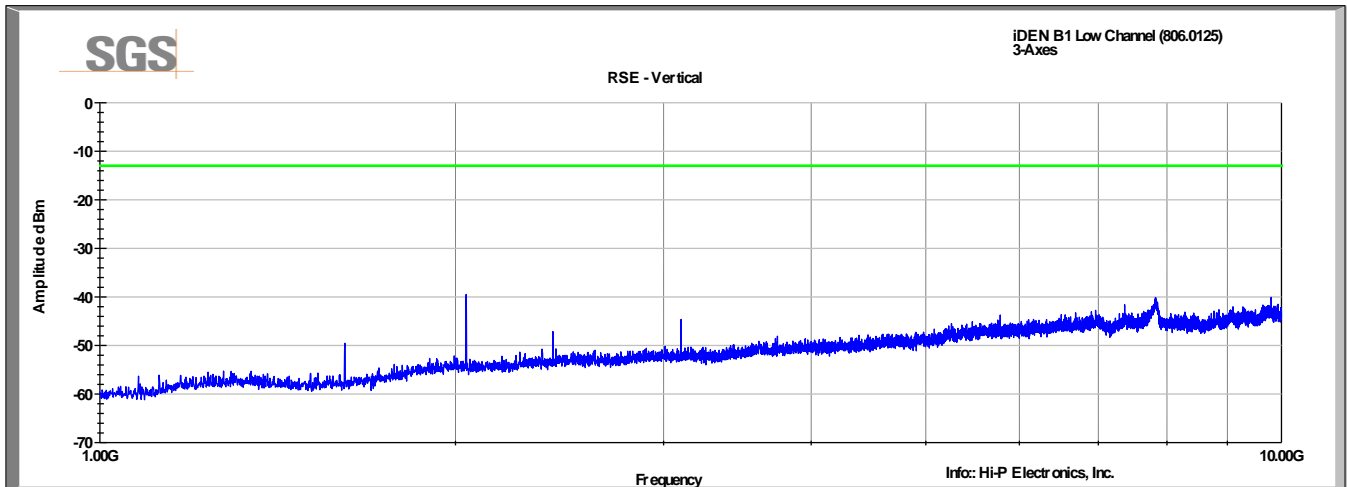
There were no emissions within 20 dB of the limit.

806.0125 MHz 30-1000MHz - Horizontal

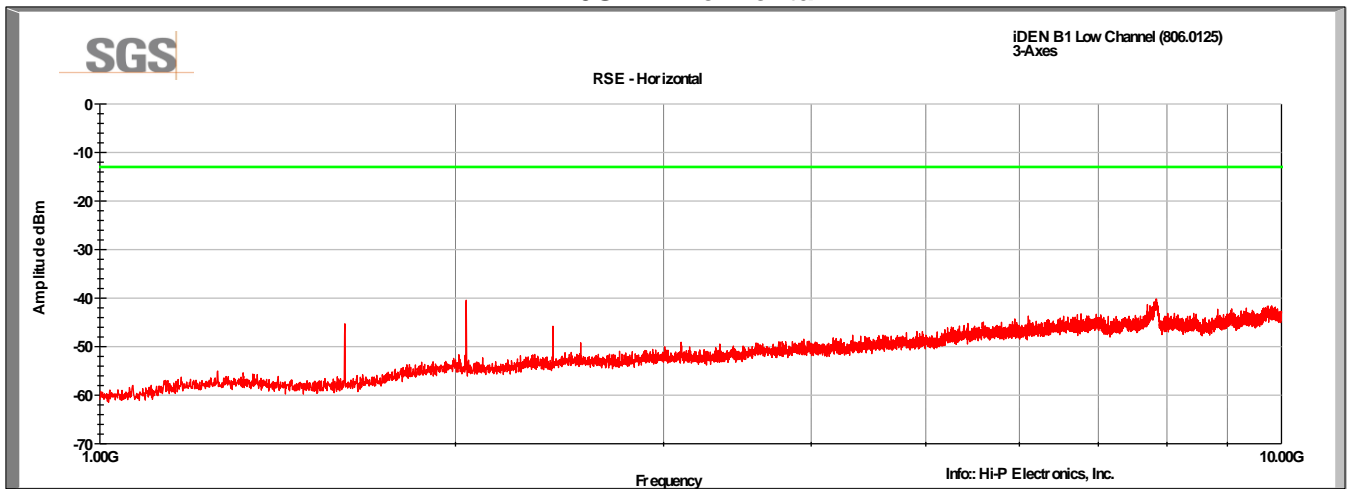


There were no emissions within 20 dB of the limit.

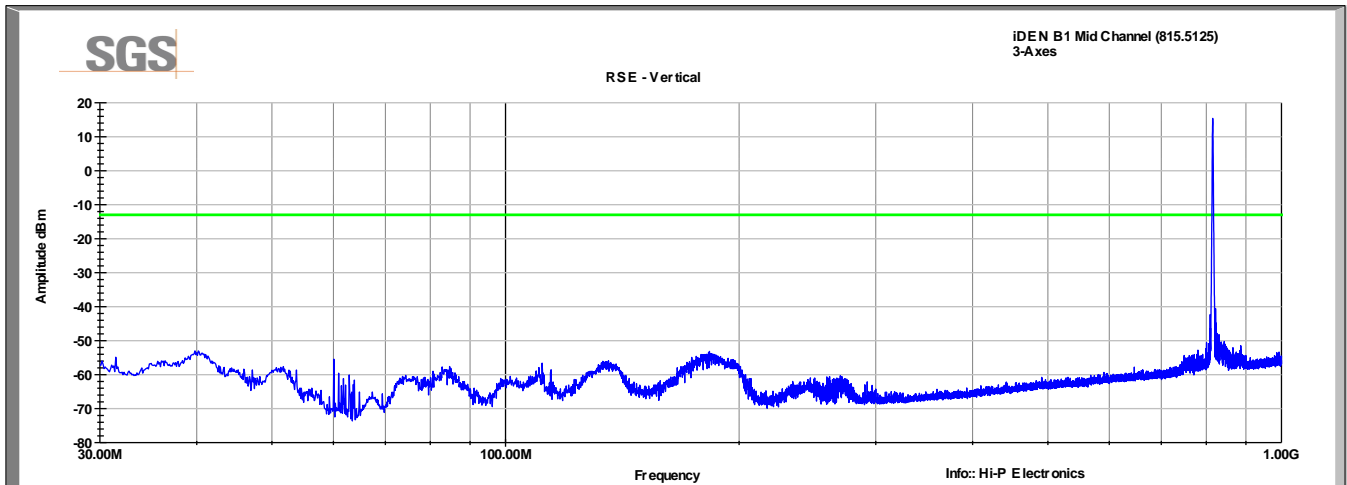
806.0125 MHz 1-10GHz - Vertical



806.0125 MHz 1-10GHz - Horizontal

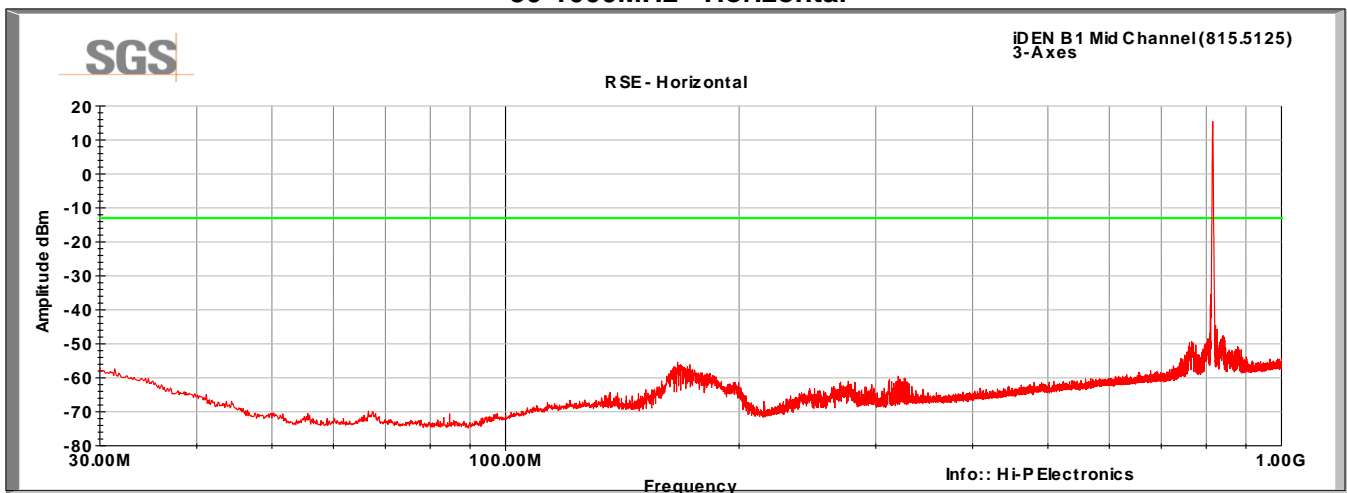


815.5125 MHz 30-1000MHz - Vertical



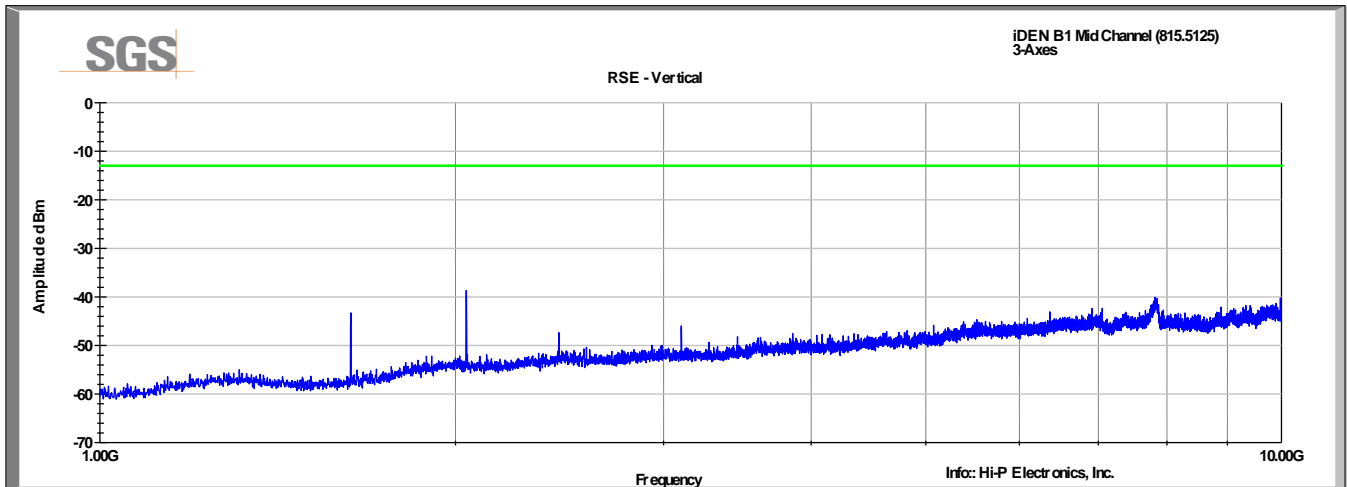
There were no emissions within 20 dB of the limit.

815.5125 MHz 30-1000MHz - Horizontal



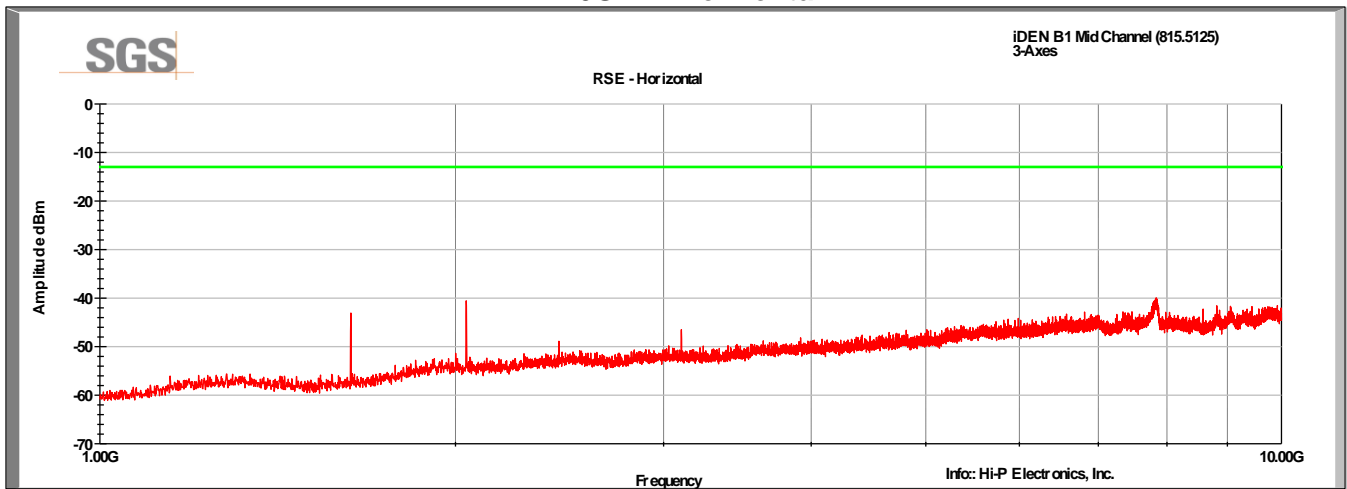
There were no emissions within 20 dB of the limit.

**815.5125 MHz
1-10GHz - Vertical**



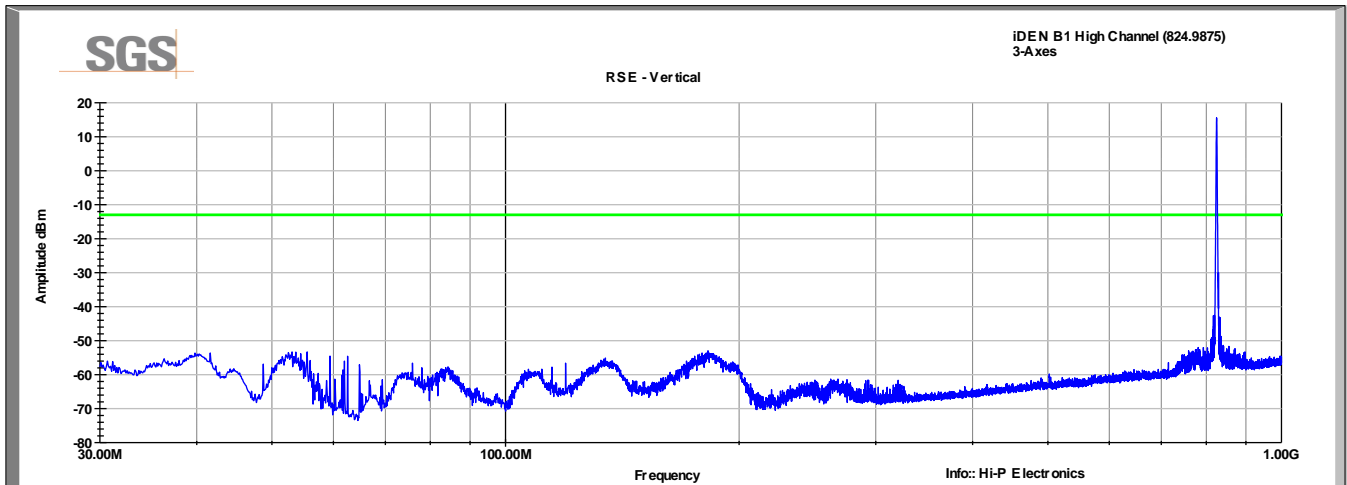
There were no emissions within 20 dB of the limit.

**815.5125 MHz
1-10GHz - Horizontal**



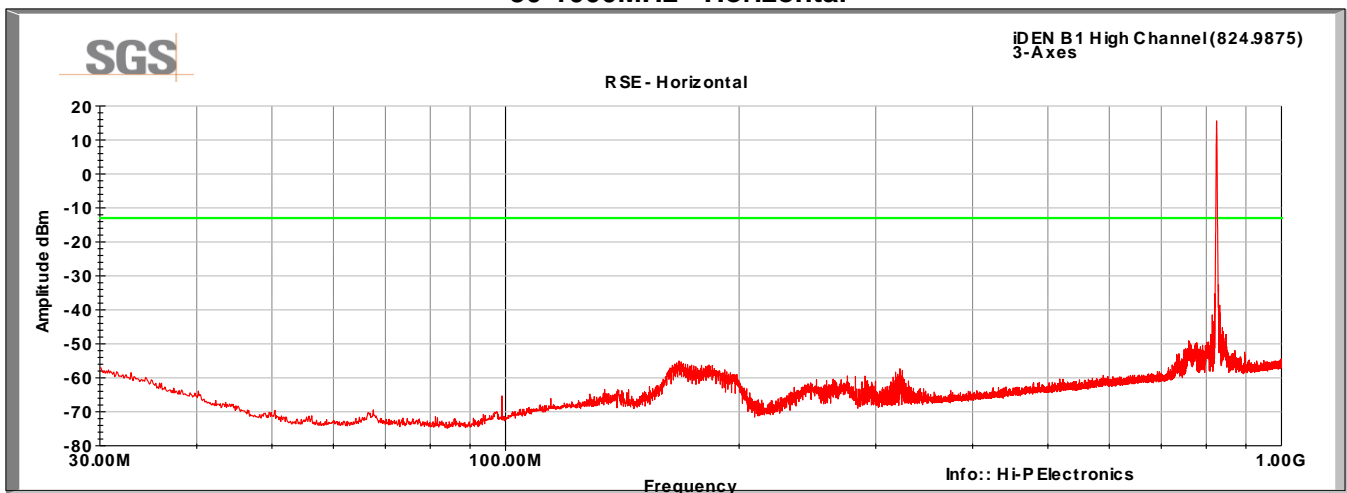
There were no emissions within 20 dB of the limit.

824.9875 MHz
30-1000MHz - Vertical



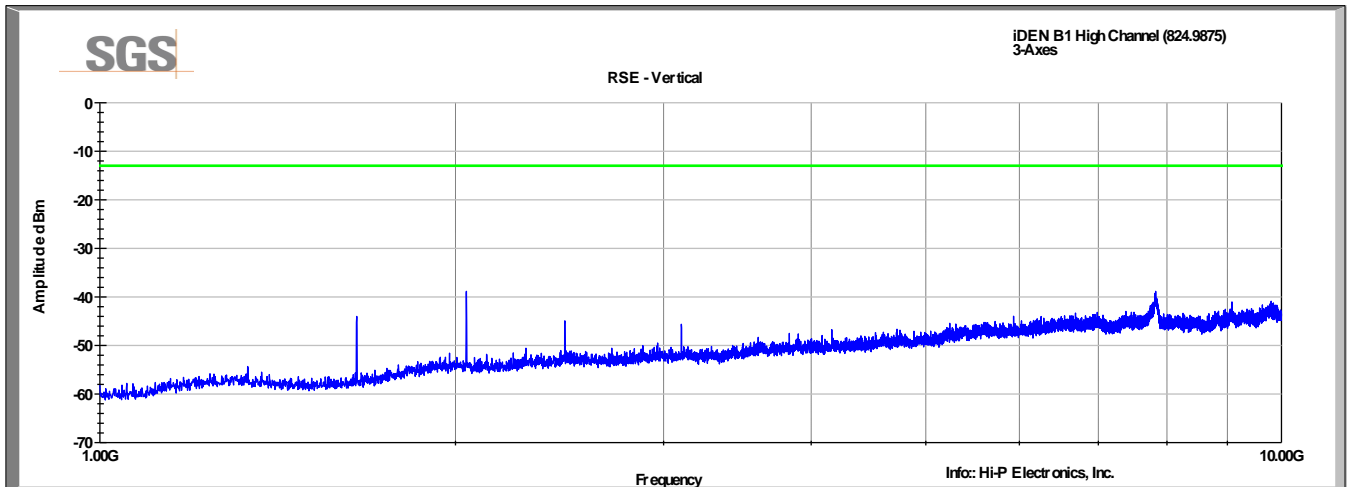
There were no emissions within 20 dB of the limit.

824.9875 MHz
30-1000MHz - Horizontal



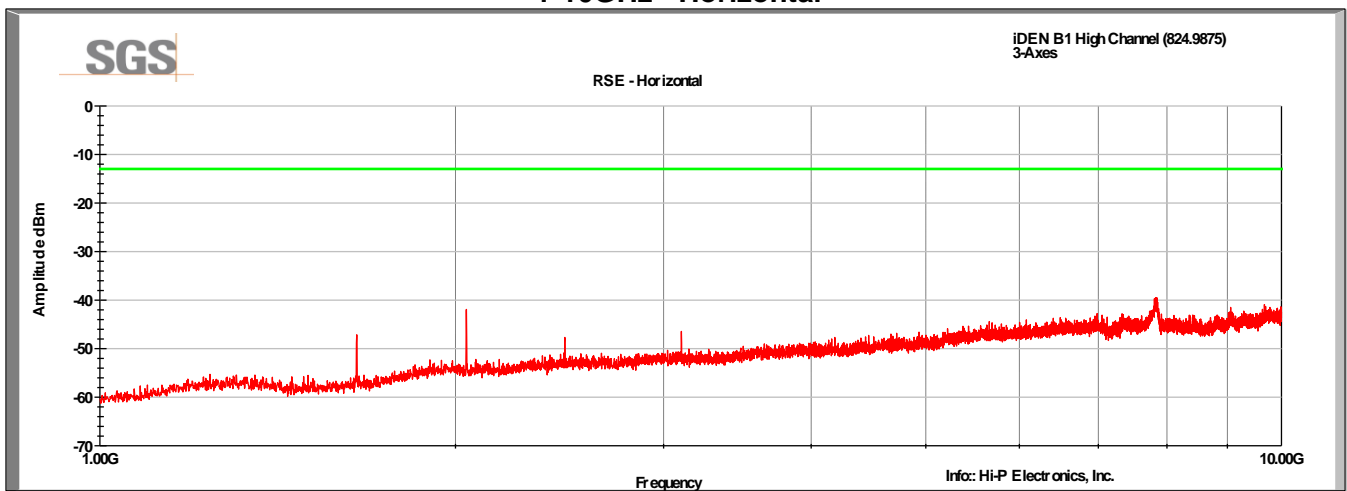
There were no emissions within 20 dB of the limit.

**824.9875 MHz
1-10GHz - Vertical**



There were no emissions within 20 dB of the limit.

**824.9875 MHz
1-10GHz - Horizontal**



There were no emissions within 20 dB of the limit.

6 Frequency Stability

6.1 Test Result

Test Description	Product Specific Standard	Basic Standard	Test Result
Modulation Characteristics	47 CFR 2.947(c) and 47 CFR 2.1055	47 CFR 2.1055(a)(1), §2.1055(d)(2), §24.135	Compliant

6.2 Test Method

The center frequency was determined by using the average of the two 20dB points.

Frequency Error vs. temperature

A Power Supply was controlled to provide a continuous 3.7 VDC to the unit tested. The sensor leads from the power supply were attached to the input of the DC/RF test fixture in which the radio was placed. A Temperature Chamber was used to control a temperature range of –30 degree Celsius to +60 degree Celsius.

At each set point, a soak time of 20 minutes was used to ensure thermal penetration of the unit tested before each measurement of frequency error was taken. A soak time of 45 minutes was used at –30 degree Celsius to ensure thermal penetration of the unit tested because of the variance from the starting temperature of +25 degree Celsius. Soak cycles of 20 minutes each thereafter were used because of the fact that the set points were incremented at 10 degree (Celsius) steps.

Frequency Error vs. voltage

A Power Supply was controlled to provide a voltage range of 85% to 115% of the nominal voltage of the unit tested. The sensor leads from the power supply were attached to the input of the battery eliminator of the unit tested.

After having taken a frequency error measurement at the maximum voltage, the Power Supply's output was reduced to the minimum voltage.

6.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.2 °C
Relative Humidity: 48.5 %
Atmospheric Pressure: 97.9 kPa

6.4 Test Equipment

Test Date: 13-Jul-2016

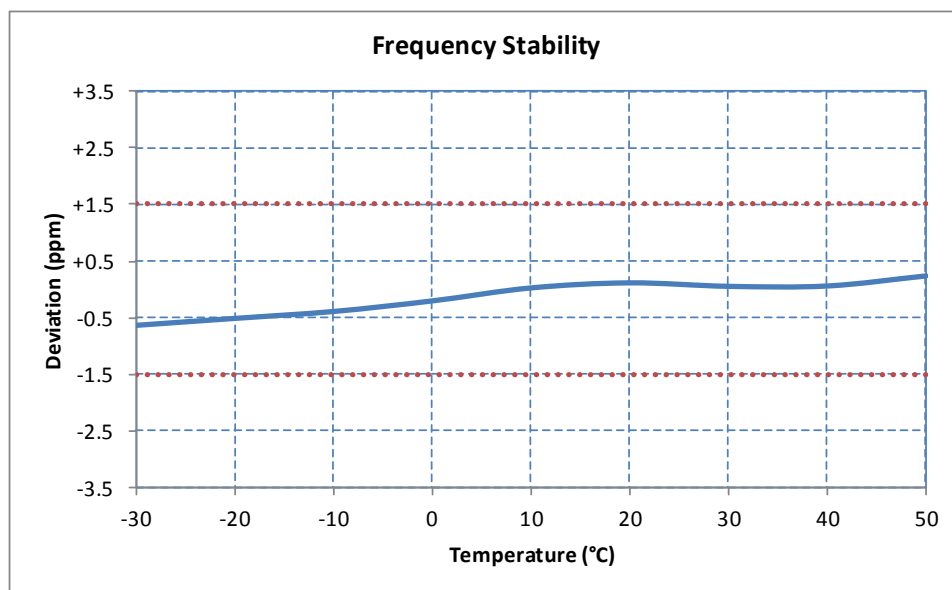
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
DC POWER SUPPLY	382280	EXTECH	EA03	CNR
ENVIRONMENTAL TEST CHAMBER	T2RC	TENNEY ENVIRONMENTAL	B094877	CNR
HANDHELD MULTIMETER	87V	FLUKE	B079676	4-Aug-2016

Note: The calibration period equipment is 1 year.

6.5 Test Data

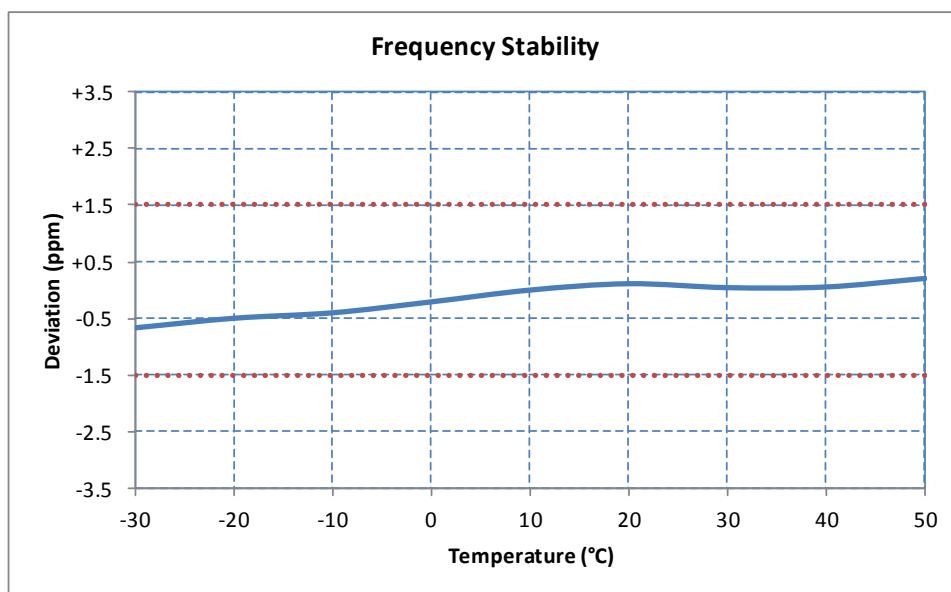
806.0125 MHz

Voltage %	Power V _{DC}	Temp °C	Frequency MHz	Freq Dev Hz	Freq Dev ppm
100%	3.70	+20 (Ref)	806.0126000	+100	+0.12
100%	3.70	-30	806.0119876	-512	-0.64
100%	3.70	-20	806.0120876	-412	-0.51
100%	3.70	-10	806.0121876	-312	-0.39
100%	3.70	0	806.0123401	-160	-0.20
100%	3.70	+10	806.0125275	+27	+0.03
100%	3.70	+20	806.0126000	+100	+0.12
100%	3.70	+30	806.0125500	+50	+0.06
100%	3.70	+40	806.0125550	+55	+0.07
100%	3.70	+50	806.0127000	+200	+0.25
115%	4.26	+20	806.0126001	+100	+0.12
85%	3.15	+20	806.0126001	+100	+0.12



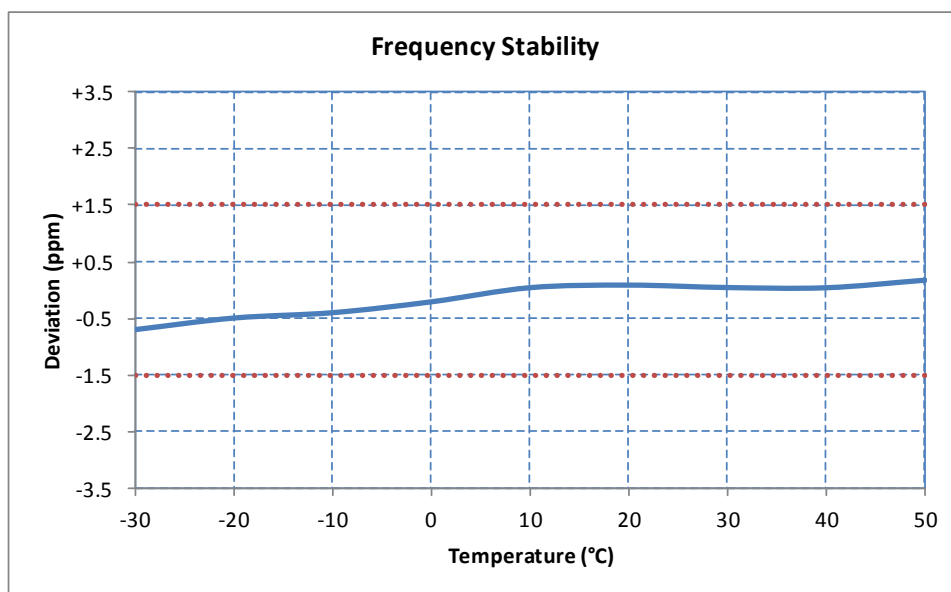
815.5125 MHz

Voltage %	Power V_{DC}	Temp °C	Frequency MHz	Freq Dev Hz	Freq Dev ppm
100%	3.70	+20 (Ref)	815.5125975	+97	+0.12
100%	3.70	-30	815.5119526	-547	-0.67
100%	3.70	-20	815.5120926	-407	-0.50
100%	3.70	-10	815.5121726	-327	-0.40
100%	3.70	0	815.5123326	-167	-0.21
100%	3.70	+10	815.5125050	+5	+0.01
100%	3.70	+20	815.5125975	+97	+0.12
100%	3.70	+30	815.5125400	+40	+0.05
100%	3.70	+40	815.5125500	+50	+0.06
100%	3.70	+50	815.5126750	+175	+0.21
115%	4.26	+20	815.5126000	+100	+0.12
85%	3.15	+20	815.5125925	+92	+0.11



824.9875 MHz

Voltage %	Power V_{DC}	Temp °C	Frequency MHz	Freq Dev Hz	Freq Dev ppm
100%	3.70	+20 (Ref)	824.9875741	+74	+0.09
100%	3.70	-30	824.9869101	-590	-0.72
100%	3.70	-20	824.9870826	-417	-0.51
100%	3.70	-10	824.9871626	-337	-0.41
100%	3.70	0	824.9873251	-175	-0.21
100%	3.70	+10	824.9875360	+36	+0.04
100%	3.70	+20	824.9875741	+74	+0.09
100%	3.70	+30	824.9875375	+38	+0.05
100%	3.70	+40	824.9875350	+35	+0.04
100%	3.70	+50	824.9876475	+148	+0.18
115%	4.26	+20	824.9875700	+70	+0.08
85%	3.15	+20	824.9875825	+83	+0.10



7 Effective Radiated Power (ERP)

7.1 Test Result

Test Description	Product Specific Standard	Basic Standard	Test Result
ERP	47 CFR 2.1046	47 CFR 2.1046	Compliant

7.2 Test Method

ERP was calculated by adding the maximum antenna gain to the measured conducted output power.

7.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 25.2 °C

Relative Humidity: 46.0 %

Atmospheric Pressure: 98.20 kPa

7.4 Test Equipment

Test Date: 13-Jul-2016

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

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

7.5 Test Data

Frequency MHz	Conducted Power (dBm)	Antenna Gain (dBi)	ERP (dBm)	ERP (W)
802.0125	27.9	0.24	28.14	0.652
815.5125	28.02	0.24	28.26	0.670
824.9875	28.03	0.24	28.27	0.671

8 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	14 July 2016