

FCC Part 15C Measurement and Test Report

For

IPW China Limited

5/F, Block B3, Xujingchang Industrial Park, Fuyong, Shenzhen,

Guangdong, China

FCC ID: Y9P-K-BULB-062

FCC Rules:	<u>FCC Part 15.249</u>
Product Description:	<u>K BULB / DELICES PRO</u>
Tested Model:	<u>IPW 003-K</u>
Report No.:	<u>STR13038523I</u>
Tested Date:	<u>2013-04-01 to 2013-04-22</u>
Issued Date:	<u>2013-04-24</u>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by SEM.Test Compliance Service Co., Ltd

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: IPW China Limited
Address of applicant: 5/F, Block B3, Xujingchang Industrial Park, Fuyong,
Shenzhen, Guangdong, China

Manufacturer: IPW China Limited
Address of manufacturer: 5/F, Block B3, Xujingchang Industrial Park, Fuyong,
Shenzhen, Guangdong, China

General Description of EUT	
Product Name:	K BULB / DELICES PRO
Brand Name:	Smart&Green/Airstar
Model No.:	IPW 003-K
Adding Model:	IPW 003-KAS
Rated Voltage:	Battery DC 3.7V Charging Adapter DC 5V
Rated Current:	400mA
Rated Power:	1.2W
<i>Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model IPW 003-K, but the circuit and the electronic construction do not change, declared by the manufacturer.</i>	

Technical Characteristics of EUT	
Frequency Range:	905MHz
Max. Field Strength:	89.61dBuV/m
Modulation:	FSK
Quantity of Channels:	1
Antenna Type:	Integral Antenna
Antenna Gain:	-4.0 dBi
Lowest Internal Frequency of EUT:	26 MHz
Device Category:	Portable Device

1.2 Test Standards

The following report is prepared on behalf of the IPW China Limited in accordance with FCC Part 15, Subpart B, Subpart C, and section 15.107, 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.107, 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which results in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.4 Test Facility

- **FCC – Registration No.: 994117**

SEM.Test Compliance Services Co., Ltd. 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 and the Registration is 994117.

- **Industry Canada (IC) Registration No.: 7673A**

The 3m Semi-anechoic chamber of SEM.Test Compliance Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 7673A.

- **CNAS Registration No.: L4062**

Shenzhen SEM.Test Electronics Service Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 3/F, Jinbao Commerce Building, Xin'an Fanshen Road, Bao'an District, Shenzhen, P.R.C (518101)

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Transmitting	905 MHz
TM2	Charging	/

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
DC Power Cable	1.5	Unshielded	Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.203	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	Compliant
§ 15.209(a)(f)	Radiated Spurious Emissions	Compliant
§15.249(a)	Field Strength of Emissions	Compliant
§15.249(d)	Out of Band Emission	Compliant
§15.215 (c)	Emission Bandwidth	Compliant

3. Antenna Requirements

3.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.2 Test Result

This product has an integral antenna, fulfill the requirement of this section.

4. Radiated Emissions

4.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ± 5.10 dB.

4.2 Standard Applicable

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (milli-volts/meter)	Field strength of fundamental (micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

4.3 Test Equipment List and Details

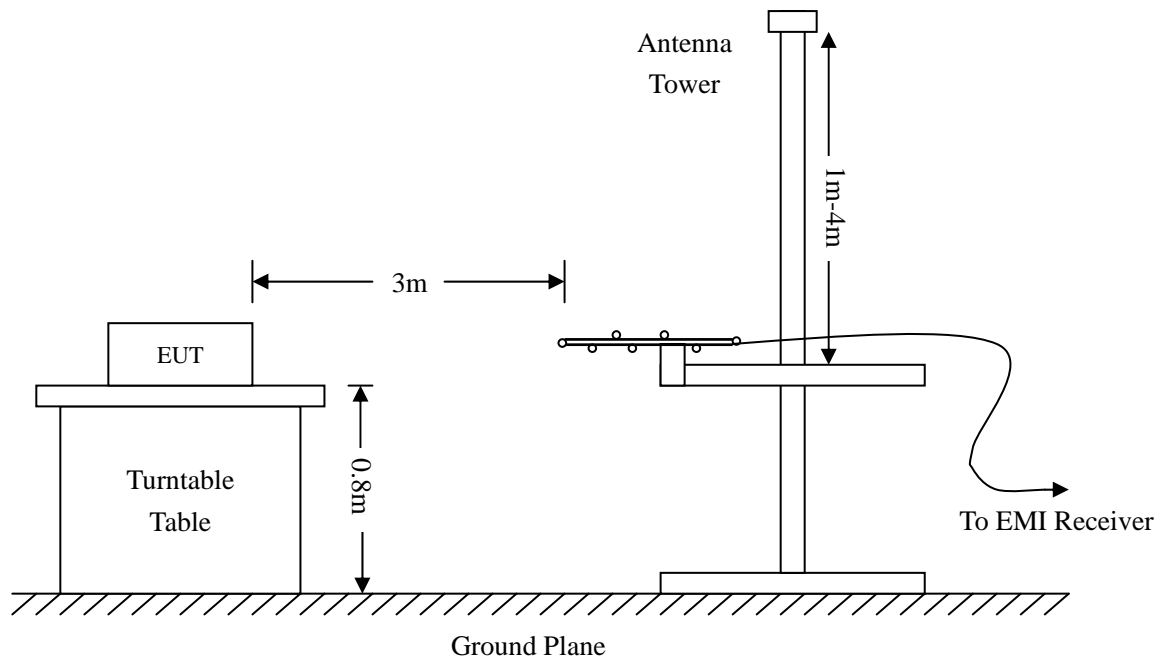
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2013-03-28	2014-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2013-03-28	2014-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2013-03-28	2014-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2013-03-28	2014-03-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2013-02-25	2014-02-24
Horn Antenna	ETS	3117	00086197	2013-02-25	2014-02-24
Loop Antenna	SCHWARZECK	HFRA 5165	9365	2013-02-25	2014-02-24

4.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.205 15.249(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.



Frequency :9kHz-30MHz

RBW=10KHz,

VBW =30KHz

Sweep time= Auto

Detector function = QP

Frequency :30MHz-1GHz

RBW=120KHz,

VBW=300KHz

Sweep time= Auto

Detector function = QP

Frequency :Above 1GHz

RBW=1MHz,

VBW=3MHz(Peak), 10Hz(AV)

Sweep time= Auto

Detector function = peak, AV

4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB μ V means the emission is 6dB μ V below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15C Limit}$$

4.6 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

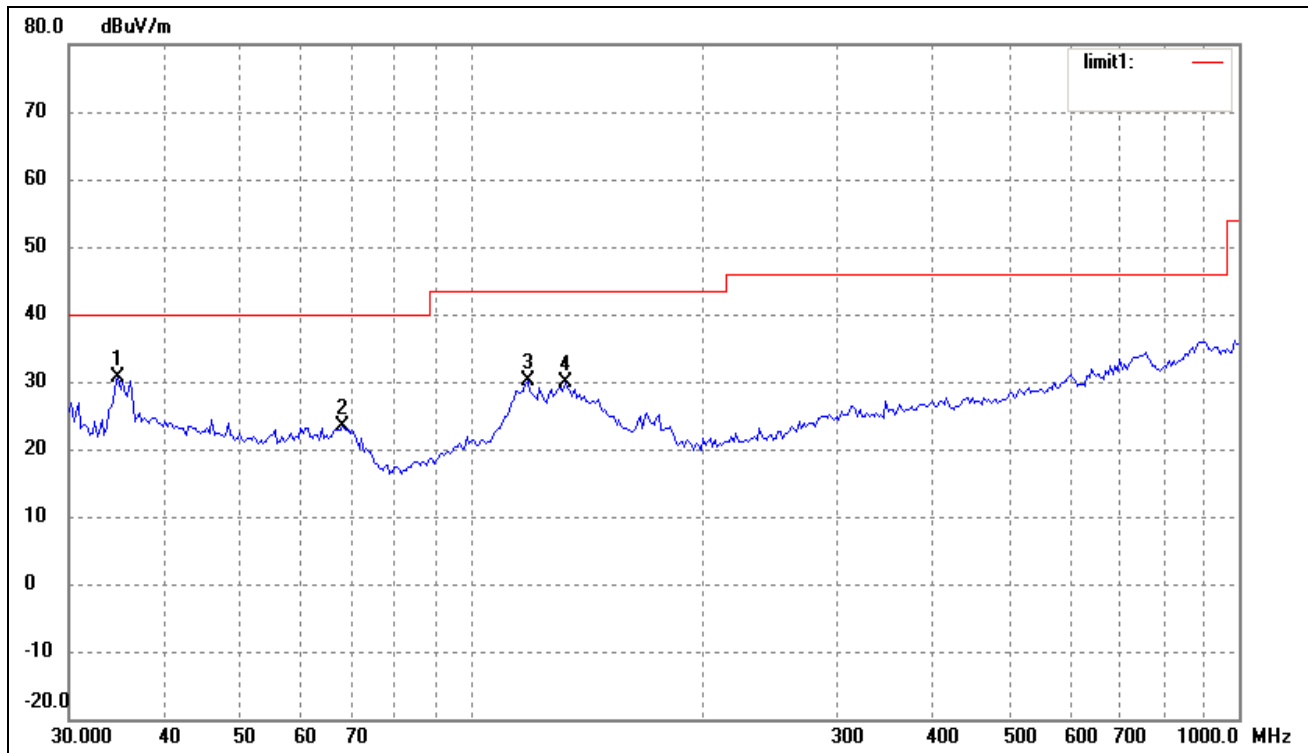
4.7 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.249 standards, and had the worst margin of:

-7.89 dB at 47.3255 MHz in the Vertical polarization, Charging Mode 9 kHz to 1 GHz, 3Meters

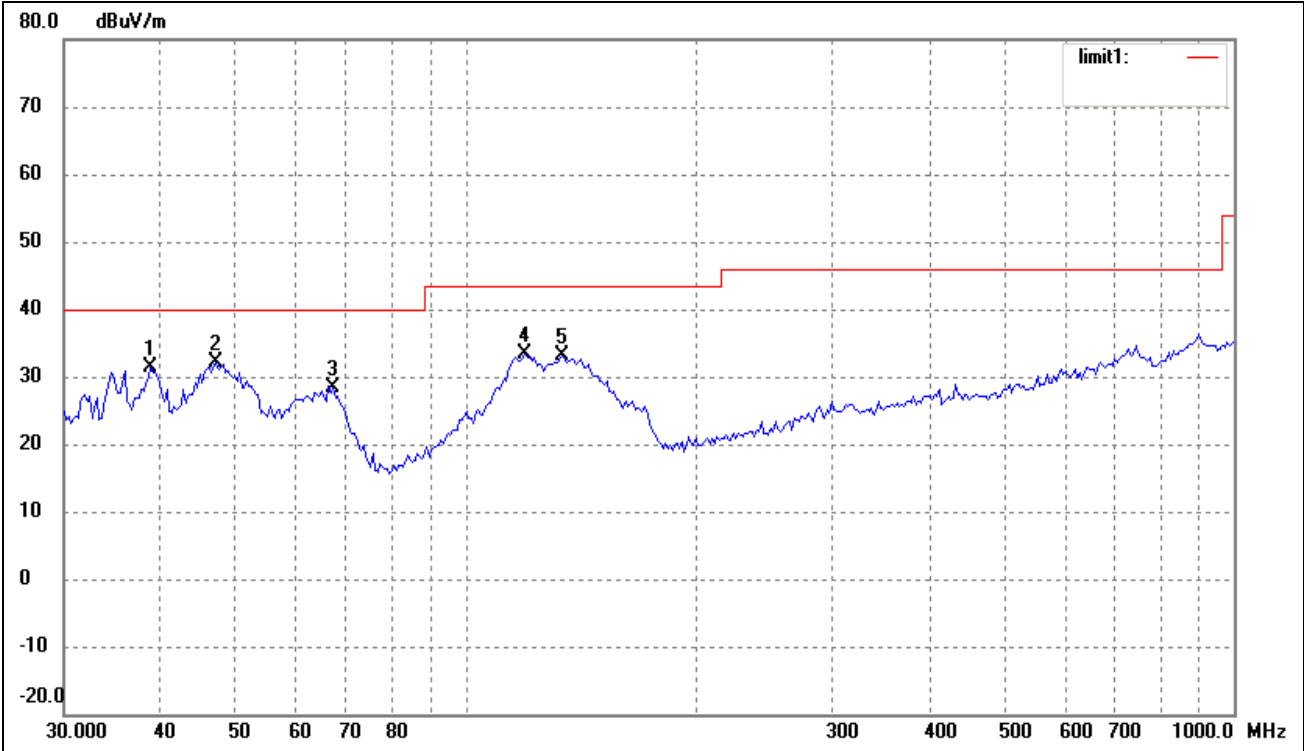
-4.39 dB at 904.9948 MHz in the Horizontal polarization, Transmitting Mode 9 kHz to 10 GHz, 3Meters

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Plot of Radiated Emissions Test Data (30MHz to 1GHz)*EUT:* *K BULB / DELICES PRO**Tested Model:* *IPW 003-K**Operating Condition:* *Charging**Comment:**Test Specification:* *Horizontal*

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	34.7602	21.67	8.84	30.51	40.00	-9.49	247	100	peak
2	68.1514	20.32	3.11	23.43	40.00	-16.57	330	100	peak
3	118.6014	25.18	5.00	30.18	43.50	-13.32	270	100	peak
4	132.6850	25.94	3.93	29.87	43.50	-13.63	116	100	peak

Test Specification: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	38.8879	21.83	9.50	31.33	40.00	-8.67	272	100	peak
2	47.3255	24.67	7.44	32.11	40.00	-7.89	360	100	peak
3	67.2022	24.94	3.42	28.36	40.00	-11.64	360	100	peak
4	119.4361	28.40	4.92	33.32	43.50	-10.18	157	100	peak
5	133.6188	29.19	3.86	33.05	43.50	-10.45	227	100	peak

Plot of Radiated Emissions Test Data (30MHz to 1GHz)

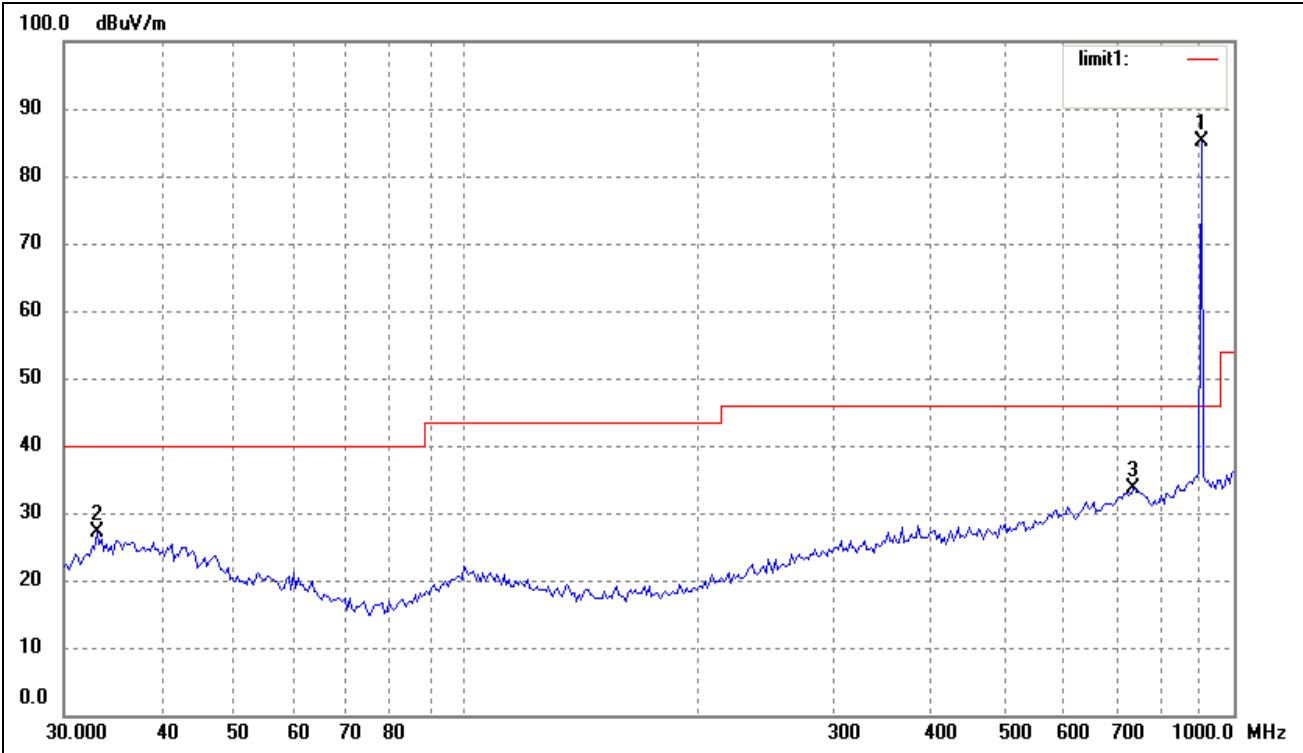
EUT: K BULB / DELICES PRO

Tested Model: IPW 003-K

Operating Condition: Transmitting 905MHz

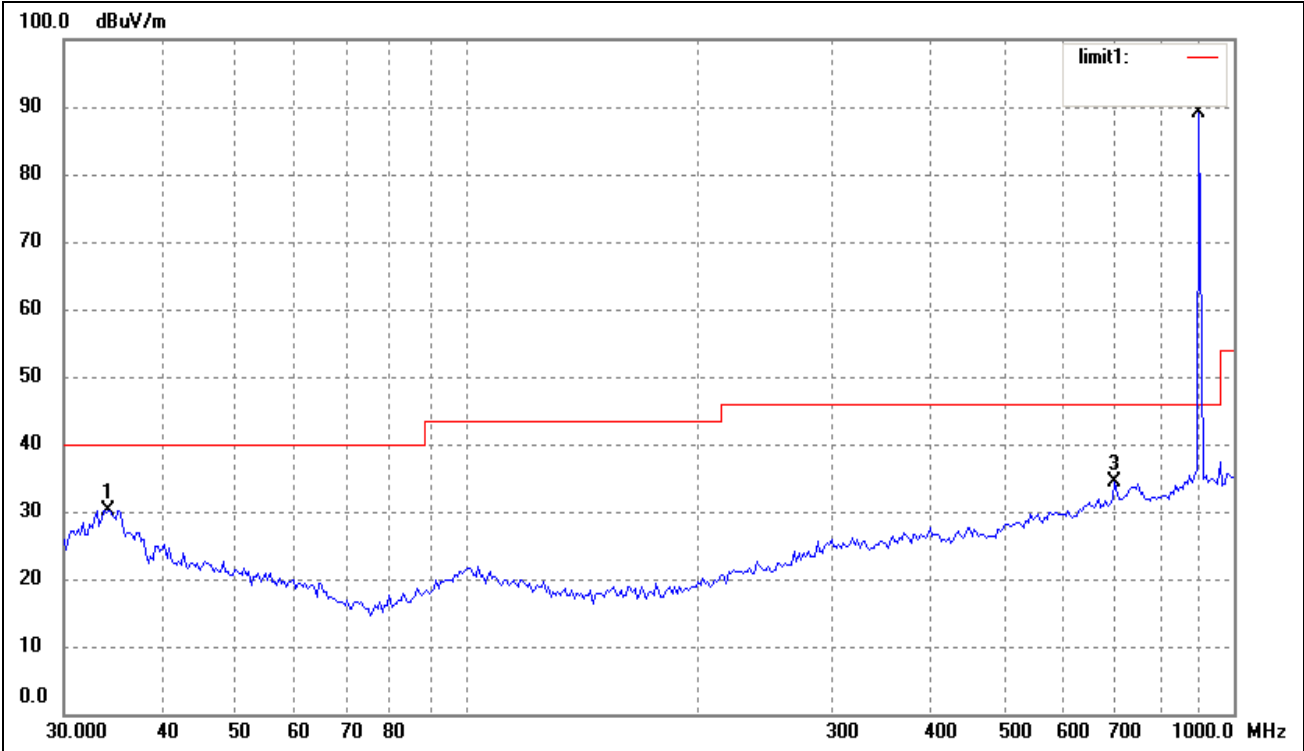
Comment: Battery DC 3.7V

Test Specification: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	904.9948	65.91	19.15	85.06	94.00	-8.94	92	100	Fundamental
2	33.0949	18.54	8.56	27.10	40.00	-12.90	360	100	QP
3	739.6603	15.60	18.07	33.67	46.00	-12.33	92	100	QP

Test Specification: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	34.2760	21.48	8.76	30.24	40.00	-9.76	254	100	QP
2	904.9948	70.23	19.38	89.61	94.00	-4.39	270	100	Fundamental
3	699.3046	18.72	15.73	34.45	46.00	-11.55	360	100	QP

Spurious Emissions for 1GHz~10GHz

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
1810	57.82	-12.57	45.25	74.00	-28.75	H	PK
1810	51.51	-12.57	38.94	54.00	-15.06	H	AV
2710	51.53	-8.21	43.32	74.00	-30.68	H	PK
2710	43.88	-8.21	35.67	54.00	-18.33	H	AV
1810	62.94	-12.57	50.37	74.00	-23.63	V	PK
1810	54.79	-12.57	42.22	54.00	-11.78	V	AV
2710	59.56	-8.21	51.35	74.00	-22.65	V	PK
2710	51.71	-8.21	43.50	54.00	-10.50	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 4th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The measurements greater than 20dB below the limit from 9 kHz to 30MHz.

5. Out of Band Emissions

5.1 Standard Applicable

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2013-03-28	2014-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2013-03-28	2014-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2013-03-28	2014-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2013-03-28	2014-03-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2013-02-25	2014-02-24
Horn Antenna	ETS	3117	00086197	2013-02-25	2014-02-24

5.3 Test Procedure

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 902 MHz to 928 MHz, than mark the higher-level emission for comparing with the FCC rules.

Frequency: 900MHz-930MHz

RBW=100KHz, VBW ≥ RBW

Sweep time= Auto

Detector function = QP

5.4 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

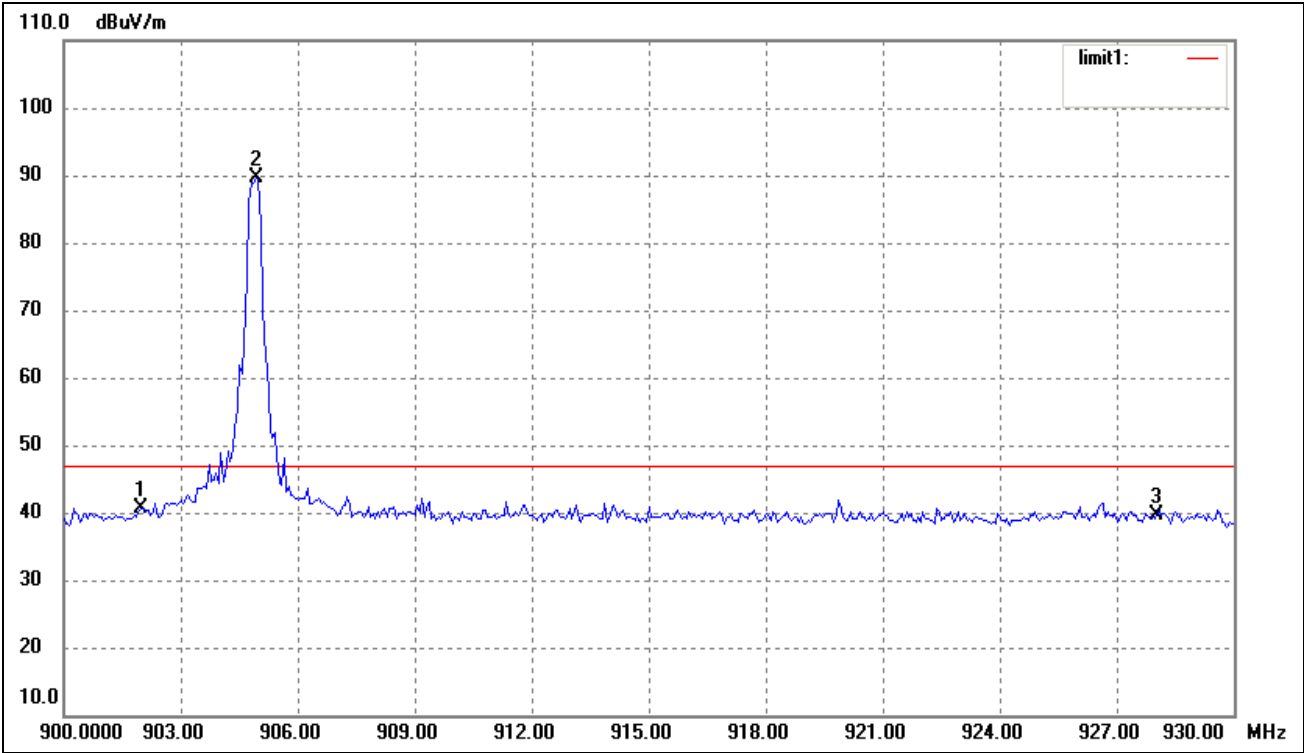
5.5 Summary of Test Results/Plots

Test mode	Frequency	Limit	Result
	MHz	dBuV / dBc	
Lowest	902	<46 dBuV	Pass
Highest	928	<46 dBuV	Pass

The edge emissions are below the FCC 15.209 Limits or complies with the 15.249 requirements.

Please refer to the test plots as below.

Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	902.0000	21.34	19.31	40.65	46.00	-5.35	137	100	QP
2	904.9748	70.40	19.21	89.61	94.00	-4.39	270	100	QP
3	928.0000	21.31	18.43	39.74	46.00	-6.26	270	100	QP

6. Emission Bandwidth

6.1 Standard Applicable

According to 15.215 (c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2013-03-28	2014-03-27
Attenuator	ATTEN	ATS100-4-20	/	2013-03-28	2014-03-27

6.3 Test Procedure

According to the ANSI 63.4-2003, the emission bandwidth test method as follows.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Set span = 1MHz, centered on a transmitting channel

RBW \geq 1% 20dB Bandwidth, VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down and 99% bandwidth of the emission.

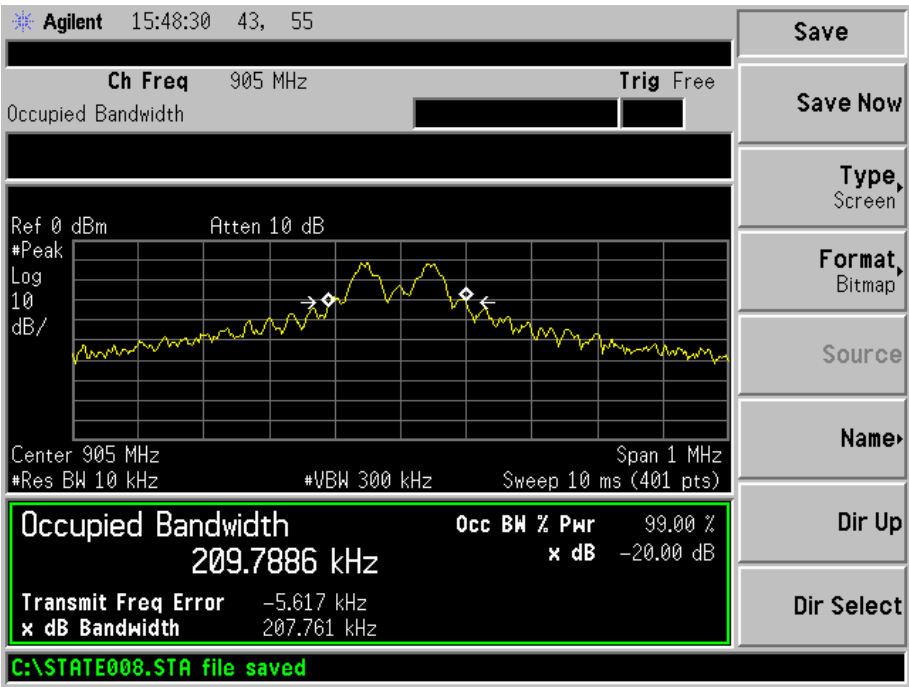
6.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.5 Summary of Test Results/Plots

Channel	Frequency MHz	20dB Bandwidth kHz	99% Bandwidth kHz
1	905	207.761	209.7886

Please refer to the following test plots



7. Conducted Emissions

7.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is ± 2.88 dB.

7.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2013-03-28	2014-03-27
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2013-03-28	2014-03-27
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2013-03-28	2014-03-27

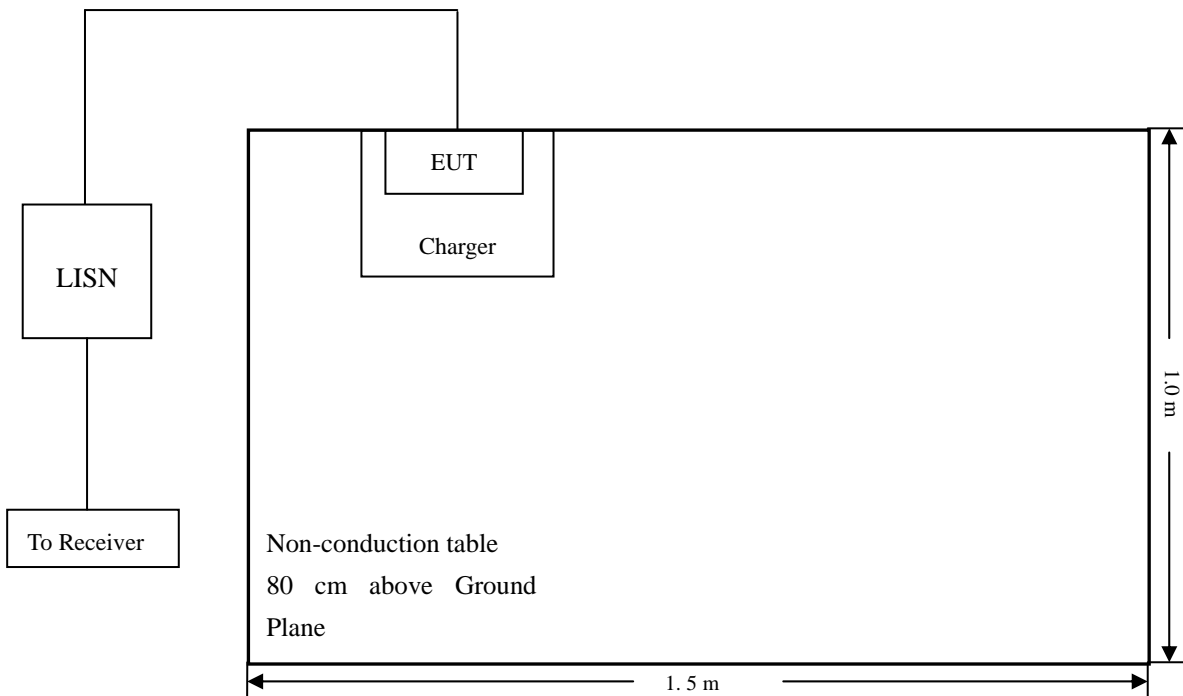
7.3 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

7.4 Basic Test Setup Block Diagram



7.5 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

7.6 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency 150 kHz
Stop Frequency..... 30 MHz
Sweep Speed Auto
IF Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth 9 kHz
Quasi-Peak Adapter Mode Normal

7.7 Summary of Test Results/Plots

According to the data in section 3.8, the EUT complied with the FCC Part 15.207 Conducted margin for a Class B device, with the *worst* margin reading of:

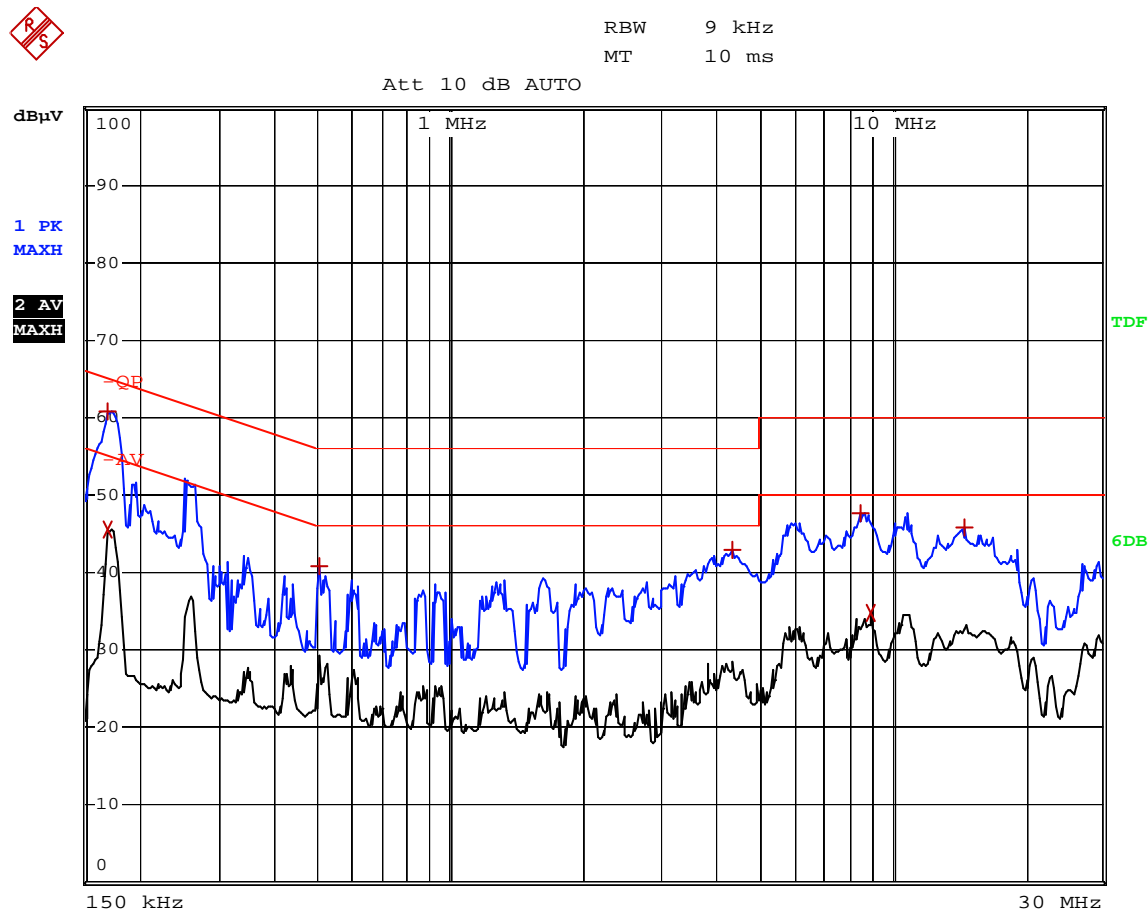
-4.31 dB at 0.170 MHz in the Neutral, Peak detector, 0.15-30MHz

7.8 Conducted Emissions Test Data

Plot of Disturbance Voltage Test Data

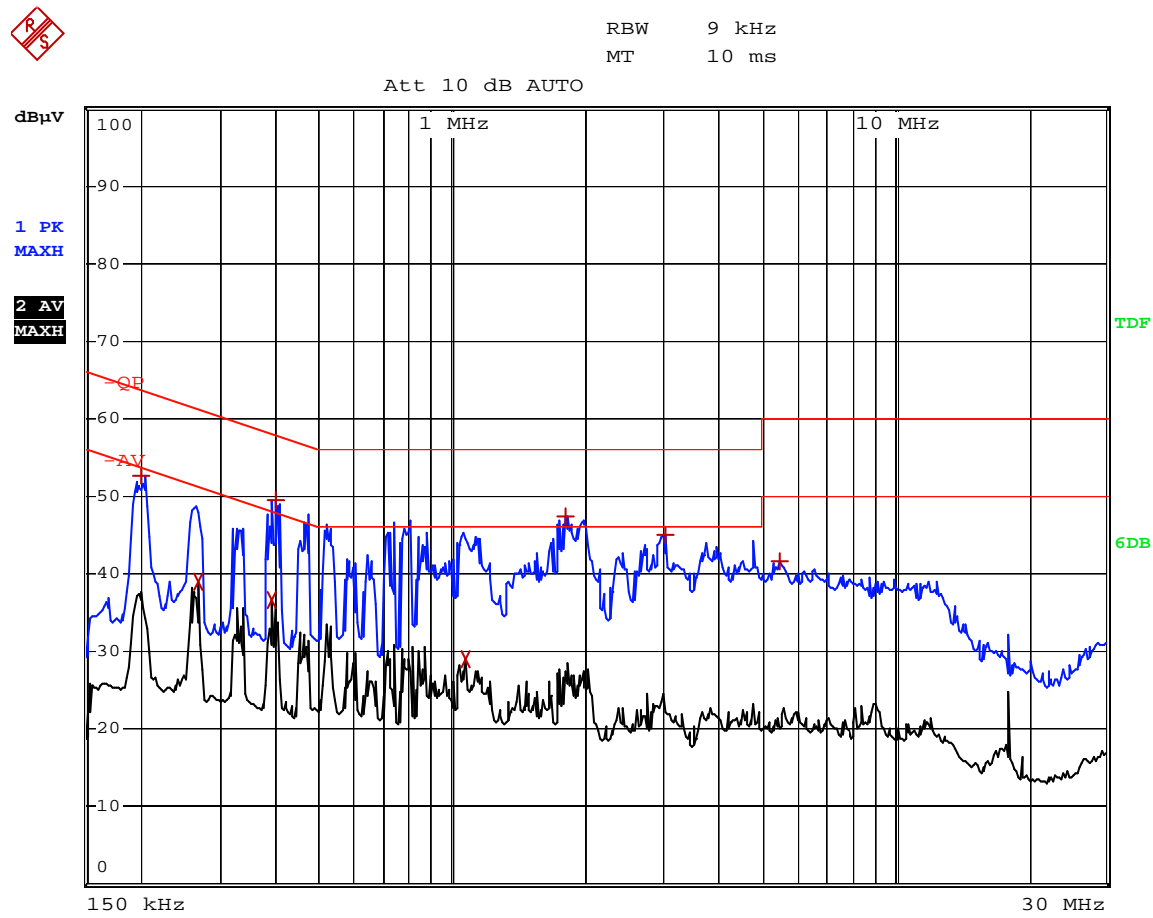
EUT: K BULB / DELICES PRO
Tested Model: IPW 003-K
Operating Condition: Charging
Comment: AC 120V, Adapter DC5V

Test Specification: Neutral



EDIT PEAK LIST (Prescan Results)			
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1 Max Peak	170 kHz	60.64	-4.31
2 Average	170 kHz	45.55	-9.40
1 Max Peak	506 kHz	40.72	-15.27
1 Max Peak	4.342 MHz	42.82	-13.18
1 Max Peak	8.506 MHz	47.65	-12.34
2 Average	8.922 MHz	34.70	-15.30
1 Max Peak	14.55 MHz	45.90	-14.09

Test Specification: Line



EDIT PEAK LIST (Prescan Results)			
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Max Peak	202 kHz	52.50	-11.02
2 Average	266 kHz	38.93	-12.30
2 Average	390 kHz	36.67	-11.38
1 Max Peak	398 kHz	49.47	-8.41
2 Average	1.074 MHz	29.13	-16.86
1 Max Peak	1.798 MHz	47.50	-8.49
1 Max Peak	3.03 MHz	44.96	-11.03
1 Max Peak	5.49 MHz	41.66	-18.33

***** END OF REPORT *****