RF TEST REPORT for Intentional Radiator
No. 151102240SHA-001

Applicant	:	Canton Elektronik GmbH & Co. KG Neugasse 21-23 – 61276 Weilrod / Niederlauken Germany
Manufacturer	:	Canton Elektronik GmbH & Co. KG Neugasse 21-23 – 61276 Weilrod / Niederlauken Germany
Product Name	:	Soundbar
Type/Model	:	911 SOUNDBAR
TEST RESULT	**:**	**PASS**

SUMMARY

The equipment complies with the requirements according to the following standard(s):

47CFR Part 15 (2015): Radio Frequency Devices

ANSI C63.10 (2013): American National Standard for Testing Unlicensed Wireless Devices

RSS-247 Issue 1 (May 2015): Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

RSS-Gen Issue 4 (November 2014): General Requirements for Compliance of Radio Apparatus

Date of issue: February 18, 2016

Prepared by:

Wade Zhang (*Project Engineer*)

Reviewed by:

Daniel Zhao (*Reviewer*)

Description of Test Facility

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Content

1. General Information

1.1 Applicant Information

Applicant	:	Canton Elektronik GmbH & Co. KG Neugasse 21-23, 61276 Weilrod / Niederlauken, Germany
Name of contact	:	Mr. Frank Goebl or Mr. Markus Brueckner
Tel	:	+49 6083 2870
Fax	:	+49 6083 287 48
Manufacturer	:	Canton Elektronik GmbH & Co. KG Neugasse 21-23, 61276 Weilrod / Niederlauken, Germany
Factory 1	:	Everbright audio (Shenzhen) company limited. No.19, fareast industry area, Hsin Ho, Fuyung, Bao An, Shenzhen, China
Factory 2	:	Canton Elektronik GmbH & Co. KG Neugasse 21-23, 61276 Weilrod / Niederlauken, Germany

1.2 Identification of the EUT

Equipment	:	Soundbar
Type/model	:	911 SOUNDBAR
FCC ID	:	WHZ-DM50
IC	:	7824A-DM50
Description of EUT	:	The EUT is a Soundbar and it supports BT function. The model 911 SOUNDBAR is a new model and it has same RF electrical with DM 50 except the appearance and power supply. We tested it and listed the result in this report.
Rating	:	100-240V ~ 50/60Hz, max 150W
Port identification	:	AC Input *1 Audio In*3 SUB Out*1
Category of EUT	:	Class B
EUT type	:	☒ Table top☐ Floor standing
Sample received date	:	December 04, 2015
Sample Identification No	:	*0151204-50-001*
Date of test	:	December 04, 2015 ~ December 25, 2015

1.3 Technical specification

Operation Frequency Band: 2402 - 2480 MHz

Protocol: BT 3.0 without EDR

Modulation: GFSK

Antenna Designation: Integral antenna

Gain of Antenna: 2.0dBi

Channel Description: There are 79 channels in all. The designed channel spacing is 1MHz.

Channel Identifier	Frequency (MHz)
low	2402
middle	2441
high	2480

1.4 Mode of operation during the test / Test peripherals used

While testing the transmitter mode of the EUT, the internal modulation is applied.
All the functions of the host device except the BT module were set on stand-by mode.

The test setting software is offered by the manufactory. The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

Radiated test mode:
Mode 1: EUT transmitted signal with BT antenna;

The worst case modulation configuration:

Worst Modulation Used for Conformance Testing			
Bluetooth Mode	**Data Rate**	**Packet Type**	**Worst Mode**
GFSK	BR-1Mbps	DH1,DH3,DH5	BR-1Mbps DH5
Note: The BR-1Mbps DH5 mode was chosen for Power testing, radiation emission bellow 1GHz and Conducted emission testing as representative in this report.			

The power setting parameter:

The worst case power setting parameter			
Test software Version	CSR Bluesuite 2.4.8		
Modulation Mode	2402MHz	2441MHz	2480MHz
BR-1Mbps	255,63	255,63	255,63

Test Peripherals:

Equipment	Brand Name	Model	Note
Notebook	HP	6470b	
Mobile Phone	Apple	IPhone 5	
Note: The accessories are used for configuration only and not used during test.			

2. Test Specification

2.1 Instrument list

Selected	Instrument	EC no.	Model	Valid until date
☒	Semi anechoic chamber	EC 3048	-	2016-5-10
☒	EMI test receiver	EC 3045	ESIB26	2016-10-18
☒	Broadband antenna	EC 4206	CBL 6112D	2016-4-26
☒	Horn antenna	EC 3049	HF906	2016-4-26
☒	Pre-amplifier	EC 5262	pre-amp 18	2016-5-24
☒	Pre-amplifier	EC 4792-2	TPA0118-40	2016-4-9
☒	High Pass Filter	EC 4797-1	WHKX 1.0/15G-10SS	2017-1-6
☒	High Pass Filter	EC 4797-2	WHKX 2.8/18G-12SS	2017-1-6
☒	High Pass Filter	EC 4797-3	WHKX 7.0/1.8G-8SS	2017-1-6
☒	Band Reject Filter	EC 4797-4	WRCGV2400/2483/10SS	2017-1-6
☒	Fully anechoic chamber	EC 3047	-	2016-5-10
☒	PXA Signal Analyzer	EC5338	N9030A	2016-11-16
☒	Test Receiver	EC 4501	ESCI 7	2017-1-12
☒	Power sensor/Power meter	EC4318	N1911A/N1921A	2016-4-19
☒	Power sensor	EC5338-1	U2021XA	2016-10-1
☒	MXG Analog Signal Generator	EC5338-2	N5181A	2016-11-5
☒	MXG Vector Signal Generator	EC5338-1	N51812B	2016-12-28

2.2 Test Standard

47CFR Part 15 (2015)
ANSI C63.10 (2013)
DA 00-705
RSS-247 Issue 1 (May 2015)
RSS-Gen Issue 4 (November 2014)

2.3 Test Summary

This report applies to tested sample only. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Radiated Spurious Emissions	15.205 & 15.209	RSS-247 Issue 1 Clause 5	Pass
Power line conducted emission	15.207	RSS-Gen Issue 4 Clause 8.8	Pass

Note: “NA” means “not applied”.

2.4 Frequency Hopping System Requirement

Test Requirement: Section 15.247 (a)(1), (g), (h) requirement:

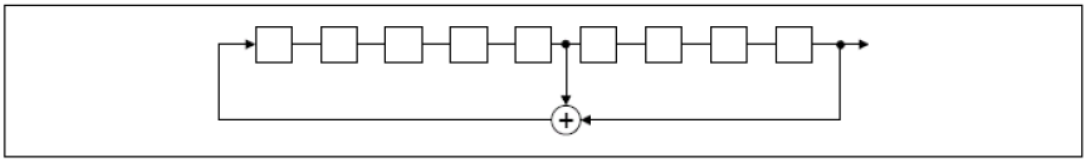
The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop sets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

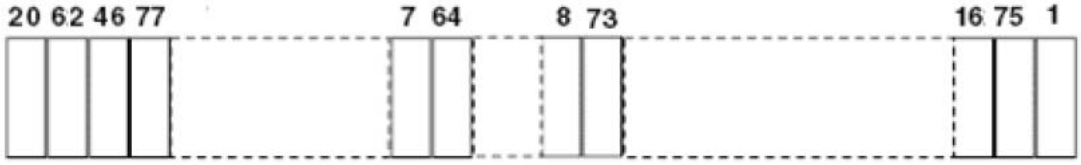
Compliance for section 15.247(a)(1)

According to Bluetooth Core Specification, the pseudorandom sequence may be generated in a nine stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs;
i.e. the shift register is initialized with nine ones.
• Number of shift register stages: 9
• Length of pseudo-random sequence: 2^9 -1 = 511 bits
• Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.
According to Bluetooth Core Specification, Bluetooth receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any Bluetooth transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g)

According to Bluetooth Core Specification, the Bluetooth system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h)

According to Bluetooth Core specification, the Bluetooth system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.
According to the Bluetooth Core specification, the Bluetooth system is designed not have the ability to coordinate with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

3. Radiated Spurious Emissions

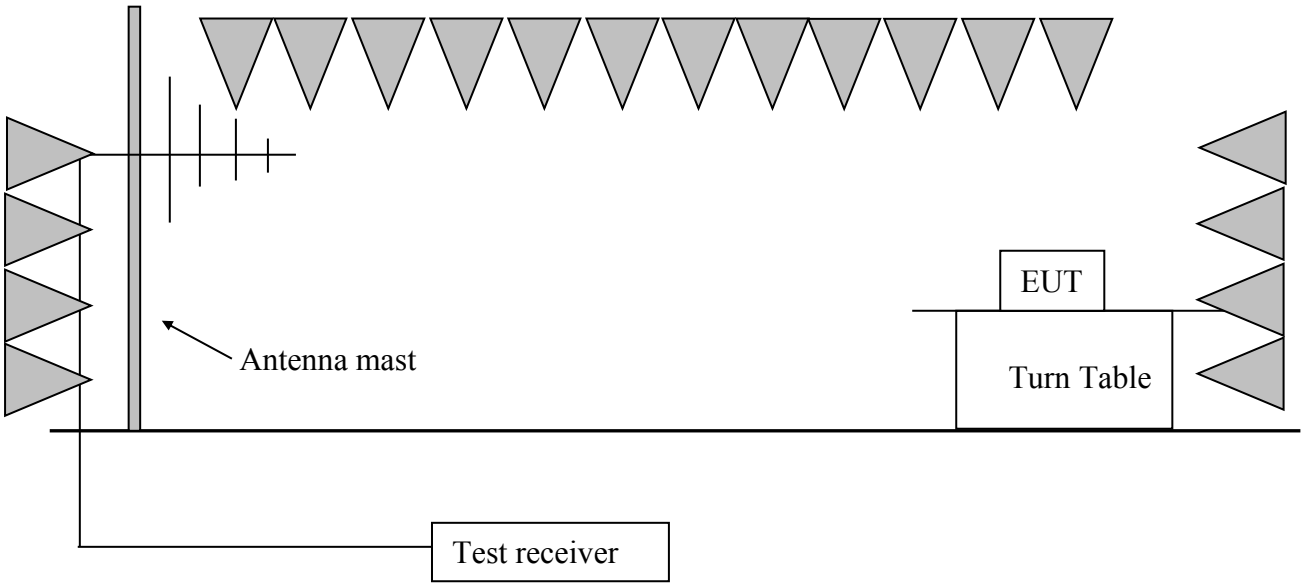
Test result: Pass

3.1 Test limit

The radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) showed as below:

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

3.2 Test Configuration



3.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, if applied, the pre-amplifier would be equipped just at the output terminal of the antenna.

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m. For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m.

The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW = 100 kHz, VBW = 300 kHz (30MHz~1GHz)
RBW = 1MHz, VBW = 3MHz (>1GHz for PK);
RBW = 1MHz, VBW = 10Hz (>1GHz for AV);

If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”.

3.4 Test protocol

Temperature : 25 °C
Relative Humidity : 55 %

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

GFSK (DH5) Modulation:

H	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.00	30.70	99.60	Fundamental	/	PK
	H	2389.90	30.20	51.80	74.00	22.20	PK
	H	2389.90	30.20	42.60	54.00	11.40	AV
	V	35.83	17.00	36.40	40.00	3.60	QP
	V	49.44	10.40	34.40	40.00	5.60	PK
	V	121.36	14.40	40.40	43.50	3.10	PK
	V	529.58	21.30	43.60	46.00	2.40	PK
	H	405.17	19.40	40.50	46.00	5.50	PK
	H	504.31	20.90	41.60	46.00	4.40	PK
	H	4804.00	-1.50	52.60	74.00	21.40	PK
M	H	2441.00	30.70	99.80	Fundamental	/	PK
	V	35.83	17.00	36.50	40.00	3.50	QP
	V	49.44	10.40	34.30	40.00	5.70	PK
	V	121.36	14.40	40.50	43.50	3.00	PK
	V	529.58	21.30	43.50	46.00	2.50	PK
	H	405.17	19.40	40.40	46.00	5.60	PK
	H	504.31	20.90	41.60	46.00	4.40	PK
	H	4882.00	-1.10	52.50	74.00	21.50	PK
H	H	2480.00	30.70	100.30	Fundamental	/	PK
	H	2483.56	31.52	50.60	74.00	3.40	PK
	H	2483.56	31.52	40.50	54.00	13.50	AV
	V	35.83	17.00	36.30	40.00	3.70	QP
	V	49.44	10.40	34.50	40.00	5.50	PK
	V	121.36	14.40	40.40	43.50	3.10	PK
	V	529.58	21.30	43.30	46.00	2.70	PK
	H	405.17	19.40	40.50	46.00	5.50	PK
	H	504.31	20.90	41.40	46.00	4.60	PK
	H	4960.00	-0.80	51.50	54.00	2.50	PK

Remark: 1. For fundamental emission, no amplifier is employed.
2. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed)
3. Corrected Reading = Original Receiver Reading + Correct Factor
4. Margin = limit – Corrected Reading
5. If the PK reading is lower than AV limit, the AV test can be elided.
6. The emission was conducted from 30MHz to 25GHz.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10dBuV.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m; Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m
Assuming limit = 54dBuV/m, Corrected Reading = 10.20dBuV/m, then Margin = 54 -10.20 = 43.80dBuV/m

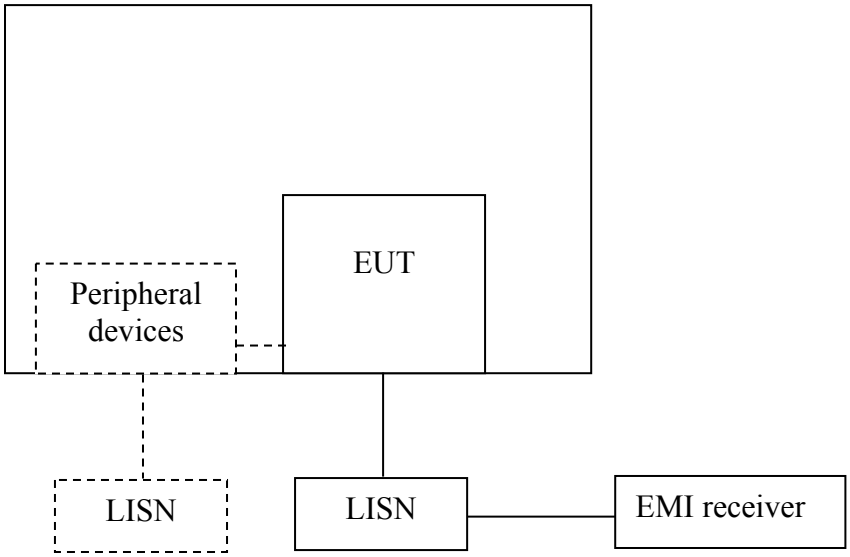
4. Power line conducted emission

Test result: **Pass**

4.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
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.		

4.2 Test configuration



☒ For table top equipment, wooden support is 0.8m height table

☐ For floor standing equipment, wooden support is 0.12m height rack.

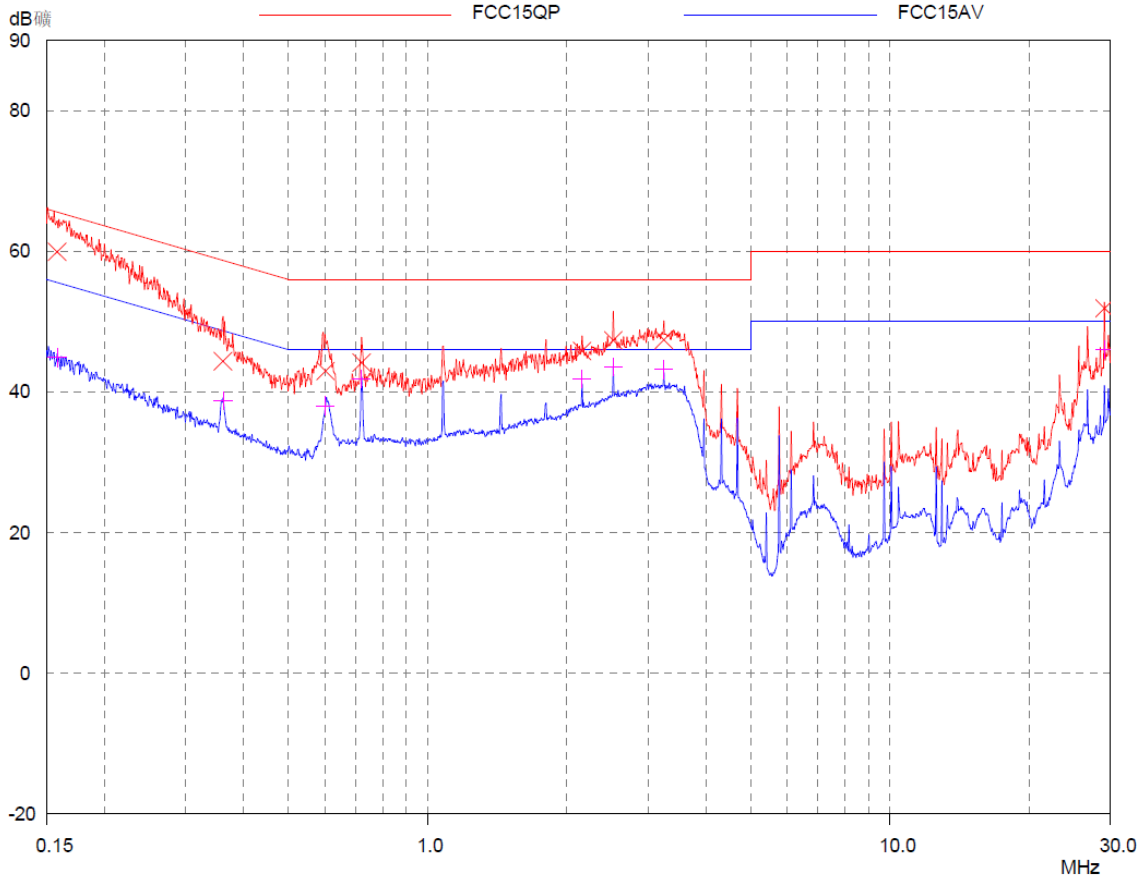
4.3 Test procedure and test set up

The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50Ω/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50Ω/50uH coupling impedance with 50Ω termination.
Both sides (Line and Neutral) of AC 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 C63.4 on conducted measurement.
The bandwidth of the test receiver is set at 9 kHz.
The EUT was tested according to DA 00-705 (Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems)

4.4 Test protocol

Temperature : 25 °C
Relative Humidity : 55 %

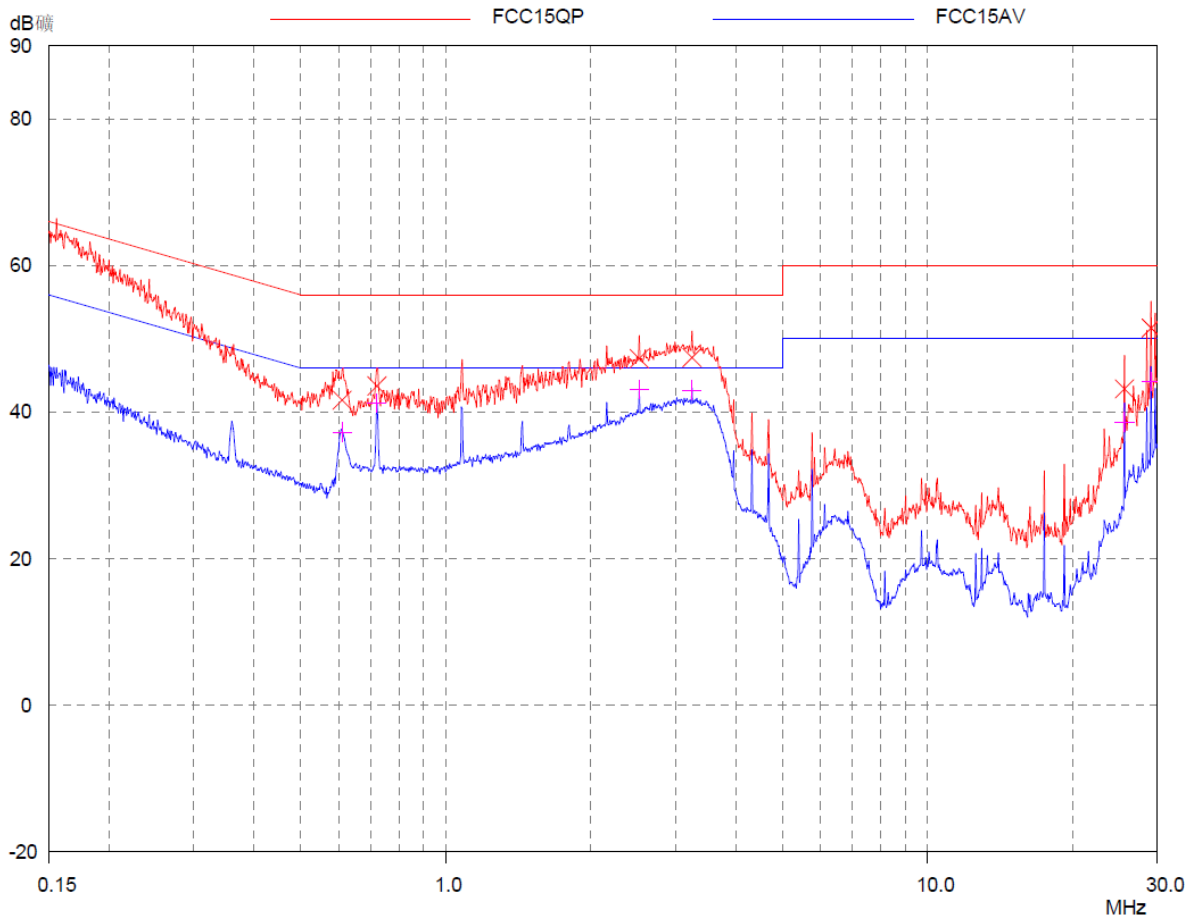
L line



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.158	59.94	65.57	5.63	44.89	55.57	10.68
0.361	44.37	58.71	14.34	38.74	48.71	9.97
0.602	42.97	56.00	13.03	38.04	46.00	7.96
0.720	44.20	56.00	11.80	41.80	46.00	4.20
2.159	45.84	56.00	10.16	41.82	46.00	4.18
2.522	47.36	56.00	8.64	43.52	46.00	2.48
3.244	47.41	56.00	8.59	43.19	46.00	2.81
29.147	51.91	60.00	8.09	46.03	50.00	3.97

N line



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.609	41.63	56.00	14.37	37.26	46.00	8.74
0.720	43.57	56.00	12.43	41.25	46.00	4.75
2.522	47.30	56.00	8.70	43.04	46.00	2.96
3.244	47.45	56.00	8.55	42.99	46.00	3.01
25.652	43.18	60.00	16.82	38.69	50.00	11.31
29.147	51.49	60.00	8.51	44.14	50.00	5.86

Note: The worst test results of channel L (2402MHz, BR-1Mbps DH5) was chosen to list in the report as representative.