FCC Part 15C
Measurement and Test Report

For

E-Concept S.A.S

FCC ID: 2AS38-SL-2112

FCC Rule(s):	FCC Part 15.249
Product Description:	METALTECH WIRELESS CONTROLLER-GOLD/RED/BLUE
Tested Model:	SL-2112
Report No.:	BSL190212160501RF
Tested Date:	March 06-07, 2019
Issued Date:	March 09, 2019
Tested By:	Messi Wang/ Engineer
Reviewed By:	Steven Wen/ EMC Manager
Approved & Authorized By:	Jandy So / PSQ Manager

Prepared By:

BSL Testing Co.,LTD.
NO. 24, ZH Park, Nantou, Shenzhen, 518000 China
Tel: 400-882-9628 Fax: 86- 755-26508703

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	E-Concept S.A.S
Address of applicant:	45 Route d'Apremont 73000 BARBERAZ France
Manufacturer:	Dongguan Kingsheng Electronics & Technology Co., Ltd
Address of manufacturer:	Building 39, Arising Sun Industrial City, Lincun Village, Tangxia Town, Dongguan, Guangdong, China

General Description of EUT	
Product Name:	METALTECH WIRELESS CONTROLLER-GOLD/RED/BLUE
Trade Name:	N/A
Model No.:	SL-2112
Adding Model(s):	JVAPS400114,JVAPS400115,JVAPS400116
Rated Voltage:	DC 5V from USB or 3.7V from battery
Power Adapter Model:	N/A
Note: The test data is gathered from a production sample, provided by the manufacturer.	

Technical Characteristics of EUT	
Frequency Range:	2409.6-2468.3MHz
Max. Field Strength:	92.41dBuV/m@1.5m
Data Rate:	1Mbps
Modulation:	GFSK
Quantity of Channels:	30
Antenna Type:	PCB antenna
Antenna Gain:	0dBi
Lowest Internal Frequency of EUT:	12MHz

1.2 Test Standards

The following report is prepared on behalf of the E-Concept S.A.S 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 C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, 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

BSL Testing Co.,LTD.
NO. 24, ZH Park, Nantou, Shenzhen, 518000 China
Designation Number : CN1217
Test Firm Registration Number: 866035
Tel: 86- 755-26508703
Fax: 86- 755-26508703

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	Low Channel	2409.6MHz
TM2	Middle Channel	2439.5MHz
TM3	High Channel	2468.3MHz

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
USB Line	0.5m	Unshielded	Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	±0.42dB
Occupied Bandwidth	Conducted	±1.5%
Conducted Spurious Emission	Conducted	±2.17dB
Conducted Emissions	Conducted	±2.88dB
Transmitter Spurious Emissions	Radiated	±5.1dB

1.7 Test Equipment List and Details

Dscription	Manufacturer	Model	Serial No.	Cal Date	Due. Date
Communication Tester	Rohde & Schwarz	CMW500	100358	2018-11-08	2019-11-07
Spectrum Analyzer	R&S	FSP40	100550	2018-10-08	2019-10-07
Test Receiver	R&S	ESCI7	US47140102	2018-10-08	2019-10-07
Signal Generator	HP	83630B	3844A01028	2018-10-08	2019-10-07
Test Receiver	R&S	ESPI-3	100180	2018-10-08	2019-10-07
Amplifier	Agilent	8449B	4035A00116	2018-10-08	2019-10-07
Amplifier	HP	8447E	2945A02770	2018-10-08	2019-10-07
Signal Generator	IFR	2023A	202307/242	2018-10-08	2019-10-07
Broadband Antenna	SCHAFFNER	2774	2774	2018-10-21	2019-10-20
Biconical and log periodic antennas	ELECTRO-METRICS	EM-6917B-1	171	2018-10-21	2019-10-20
Horn Antenna	R&S	HF906	100253	2018-10-21	2019-10-20
Horn Antenna	EM	EM-6961	6462	2018-10-21	2019-10-20
LISN	R&S	ESH3-Z5	100196	2018-10-08	2019-10-07
LISN	COM-POWER	LI-115	02027	2018-10-08	2019-10-07
3m Semi-Anechoic Chamber	Chengyu Electron	9 (L)*6 (W)* 6 (H)	BSL086	2018-10-08	2019-10-07
Horn Antenna	Schwarzbeck	BBHA9170	00814	2018-10-21	2019-10-20
Loop Antenna	Schwarz beck	FMZB 1519B	9773	2018-10-21	2019-10-20

2. SUMMARY OF TEST RESULTS

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

Note: PASS: applicable, N/A: not applicable.

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 a PCB antenna, fulfill the requirement of this section.

4. Radiated Emissions

4.1 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:

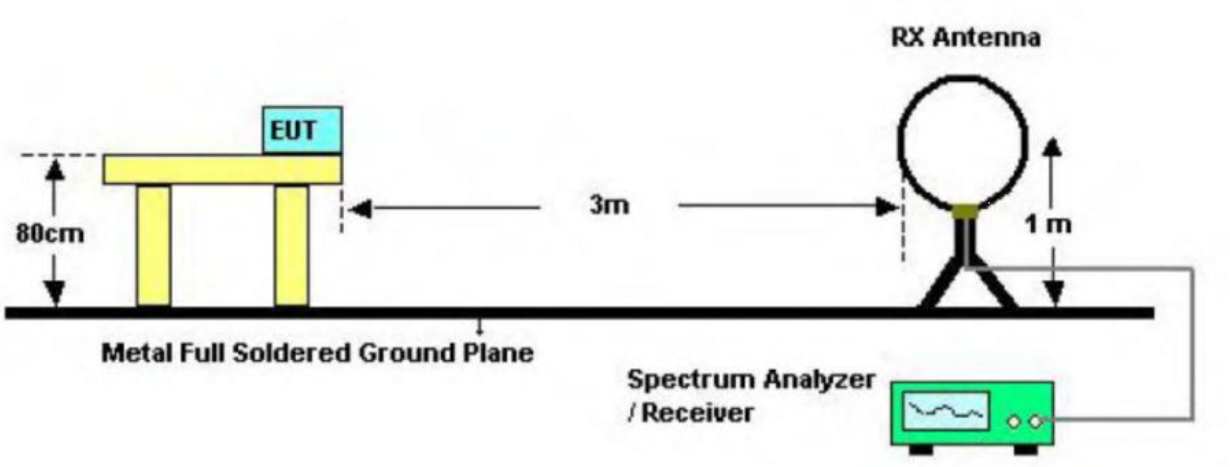
Fundamental Frequency	Field strength of fundamental (milli-volts/meter)	Field strength of Harmonics (micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

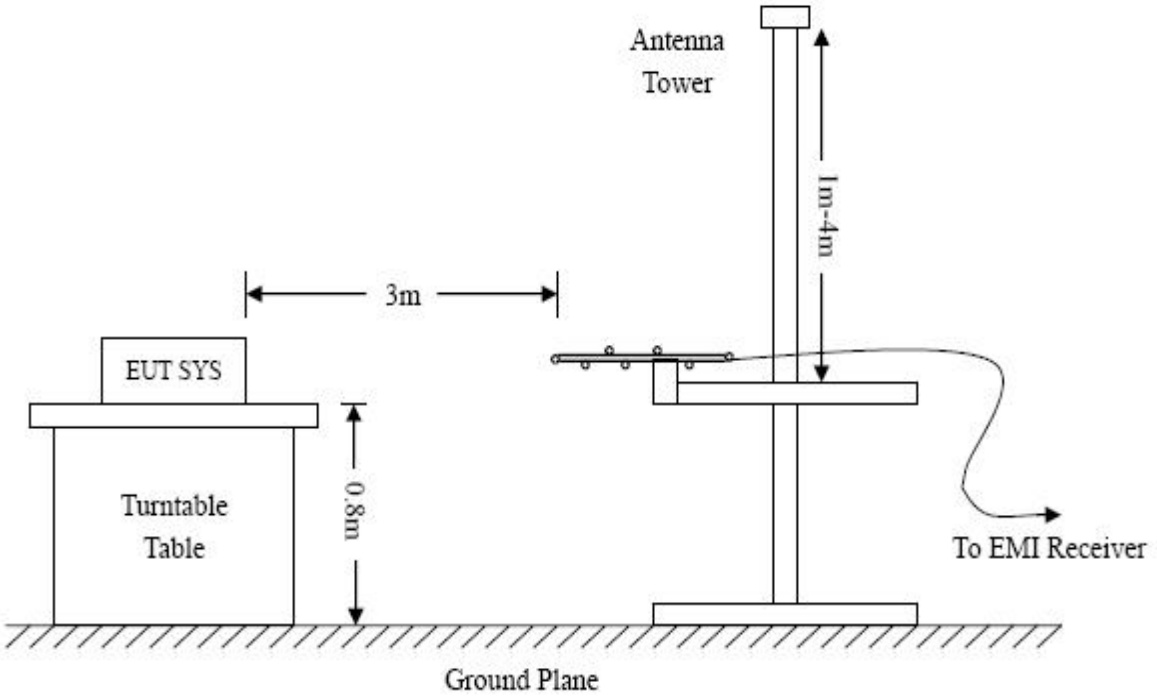
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

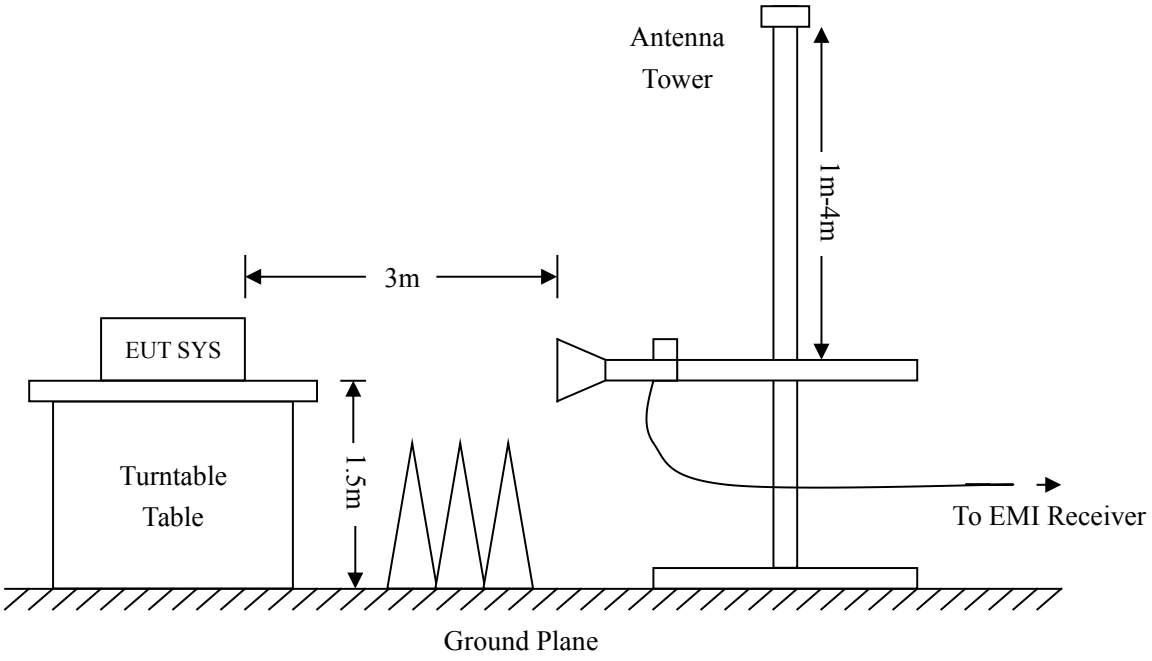
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

4.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 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	Frequency :30MHz-1GHz	Frequency :Above 1GHz
RBW=10KHz,	RBW=120KHz,	RBW=1MHz,
VBW =30KHz	VBW=300KHz	VBW=3MHz(Peak), 10Hz(AV)
Sweep time= Auto	Sweep time= Auto	Sweep time= Auto
Trace = max hold	Trace = max hold	Trace = max hold
Detector function = peak	Detector function = peak, QP	Detector function = peak, AV

4.3 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:

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss – Ampl. Gain

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

Margin = Corr. Ampl. – FCC Part 15C Limit

4.4 Environmental Conditions

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

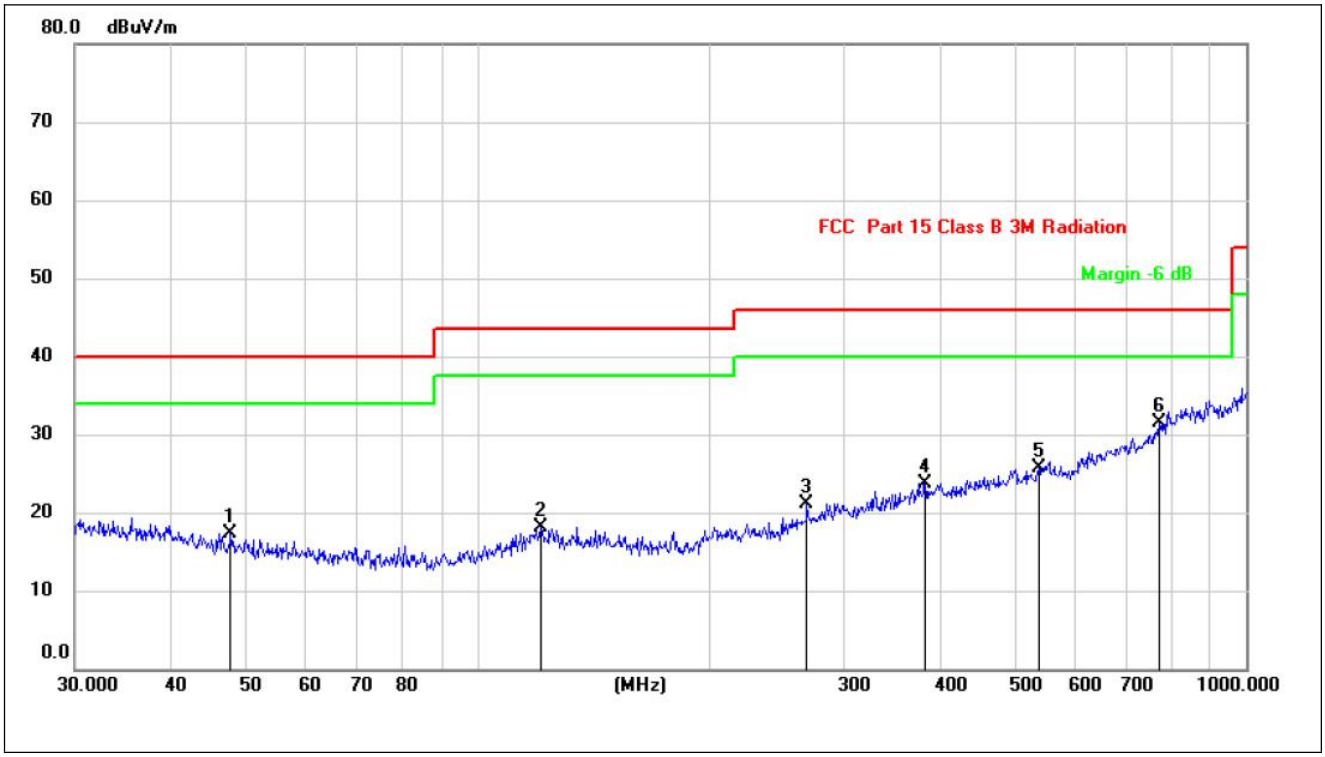
4.5 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.249 standards, and had the worst cases.

Note:
1. Worst-case radiated emission below 1GHz is CH High mode.
2. Worst-case radiated emission above 1GHz is CH Low, Middle, High mode.

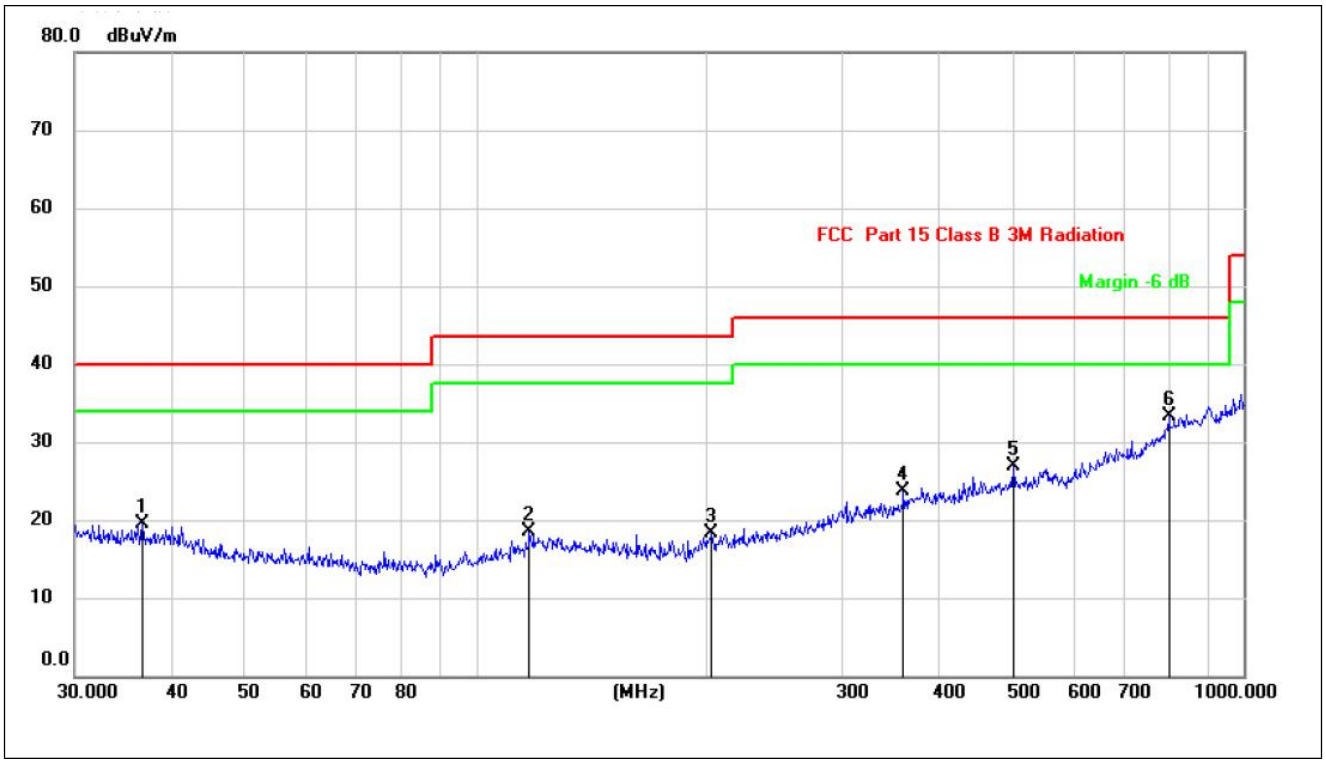
Plot of Radiated Emissions Test Data (30MHz to 1GHz): CH High mode:

Test Specification: *Horizontal*



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		47.8260	14.66	2.67	17.33	40.00	-22.67	QP	100	265	
2		121.1231	14.03	4.17	18.20	43.50	-25.30	QP	200	114	
3		268.4853	15.26	5.87	21.13	46.00	-24.87	QP	100	126	
4		382.5879	14.46	9.30	23.76	46.00	-22.24	QP	100	185	
5		537.5891	14.27	11.34	25.61	46.00	-20.39	QP	100	274	
6	*	771.4486	15.90	15.65	31.55	46.00	-14.45	QP	100	155	

Test Specification: *Vertical*



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dBuV/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		36.7662	14.68	4.77	19.45	40.00	-20.55	QP	100	125	
2		117.3603	14.80	3.80	18.60	43.50	-24.90	QP	100	217	
3		202.8104	14.82	3.56	18.38	43.50	-25.12	QP	100	103	
4		360.4476	14.86	8.84	23.70	46.00	-22.30	QP	200	289	
5		501.1790	16.01	10.95	26.96	46.00	-19.04	QP	100	305	
6	*	798.9797	16.33	16.97	33.30	46.00	-12.70	QP	100	147	

Note:

1. Measurement = Reading + Correct Factor.
2. Correct Factor =Ant. Factor + Cable Loss – Ampl. Gain.

Spurious Emissions Above 1GHz :CH Low, Middle, High mode.

Frequency	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2409.6MHz					
2409.6	90.15	114	-23.85	H	PK
2409.6	79.25	94	-14.75	H	AV
4819.2	61.63	74	-12.37	H	PK
4819.2	38.84	54	-15.16	H	AV
7228.8	50.58	74	-23.42	H	PK
7228.8	40.47	54	-13.53	H	AV
2409.6	88.52	114	-25.48	V	PK
2409.6	79.61	94	-14.39	V	AV
4819.2	57.52	74	-16.48	V	PK
4819.2	40.84	54	-13.16	V	AV
7228.8	61.58	74	-12.42	V	PK
7228.8	39.68	54	-14.32	V	AV
Middle Channel-2439.5MHz					
2439.5	89.52	114	-24.48	H	PK
2439.5	78.48	94	-15.52	H	AV
4879	57.63	74	-16.37	H	PK
4879	38.85	54	-15.15	H	AV
7318.5	51.21	74	-22.79	H	PK
7318.5	36.54	54	-17.46	H	AV
2439.5	88.81	114	-25.19	V	PK
2439.5	79.96	94	-14.04	V	AV
4879	59.35	74	-14.65	V	PK
4879	41.24	54	-12.76	V	AV
7318.5	54.81	74	-19.19	V	PK
7318.5	41.53	54	-12.47	V	AV

Frequency	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	H/V	
High Channel-2468.3MHz					
2468.3	87.36	114	-26.64	H	PK
2468.3	78.25	94	-15.75	H	AV
4936.6	61.14	74	-12.86	H	PK
4936.6	42.52	54	-11.48	H	AV
7404.9	50.84	74	-23.16	H	PK
7404.9	42.96	54	-11.04	H	AV
2468.3	86.35	114	-27.65	V	PK
2468.3	75.24	94	-18.76	V	AV
4936.6	51.81	74	-22.19	V	PK
4936.6	38.54	54	-15.46	V	AV
7404.9	46.96	74	-27.04	V	PK
7404.9	37.35	54	-16.65	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5th 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 9kHz 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 Procedure

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2483.5MHz, than mark the higher-level emission for comparing with the FCC rules.

5.3 Environmental Conditions

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

5.4 Summary of Test Results/Plots

Modulation	Frequency	Measurement (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Result
GFSK	2390.00	48.25	74	-25.75	Peak Detector	PASS
	2400.00	50.14	74	-23.86	Peak Detector	PASS
	2483.50	51.62	74	-22.38	Peak Detector	PASS
	2488.39	49.35	74	-24.65	Peak Detector	PASS

The edge Emissions are below the FCC 15.209 Limits or complies with the 15.249 requirements.the Peak Detector is less than the limit,so the Average value is not required

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 Procedure

According to the ANSI 63.10-2013, 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 ≥1% 20dB Bandwidth, VBW ≥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.

6.3 Environmental Conditions

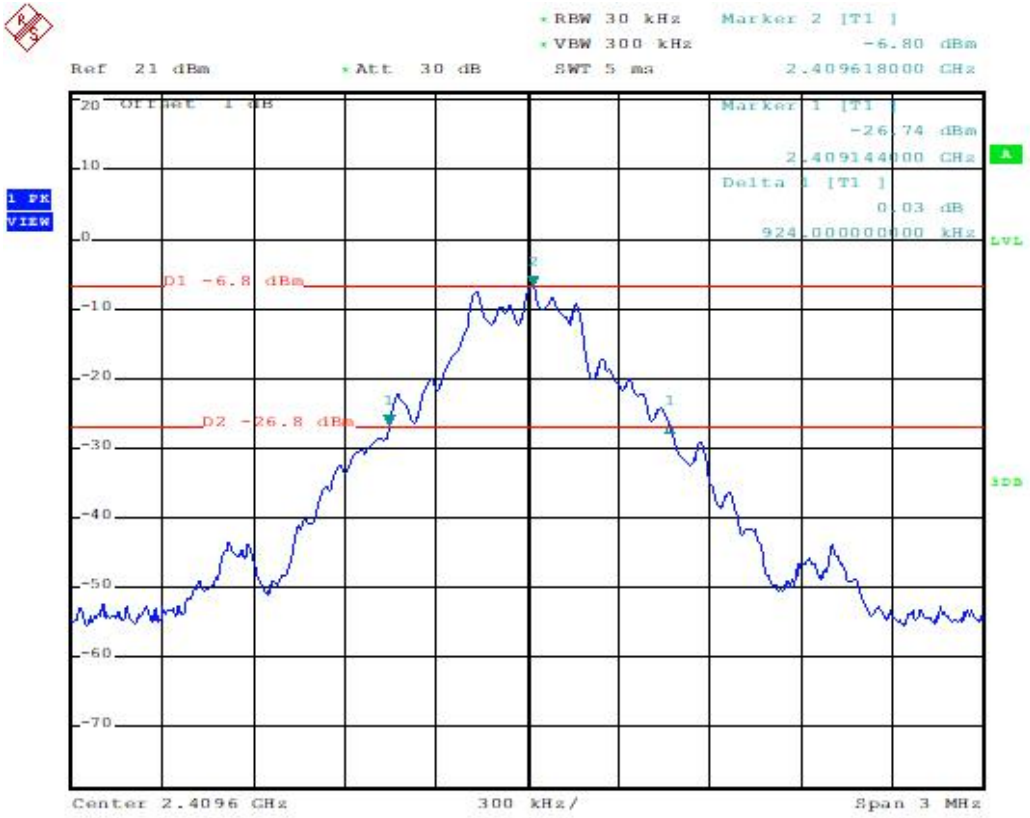
Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.4 Summary of Test Results/Plots

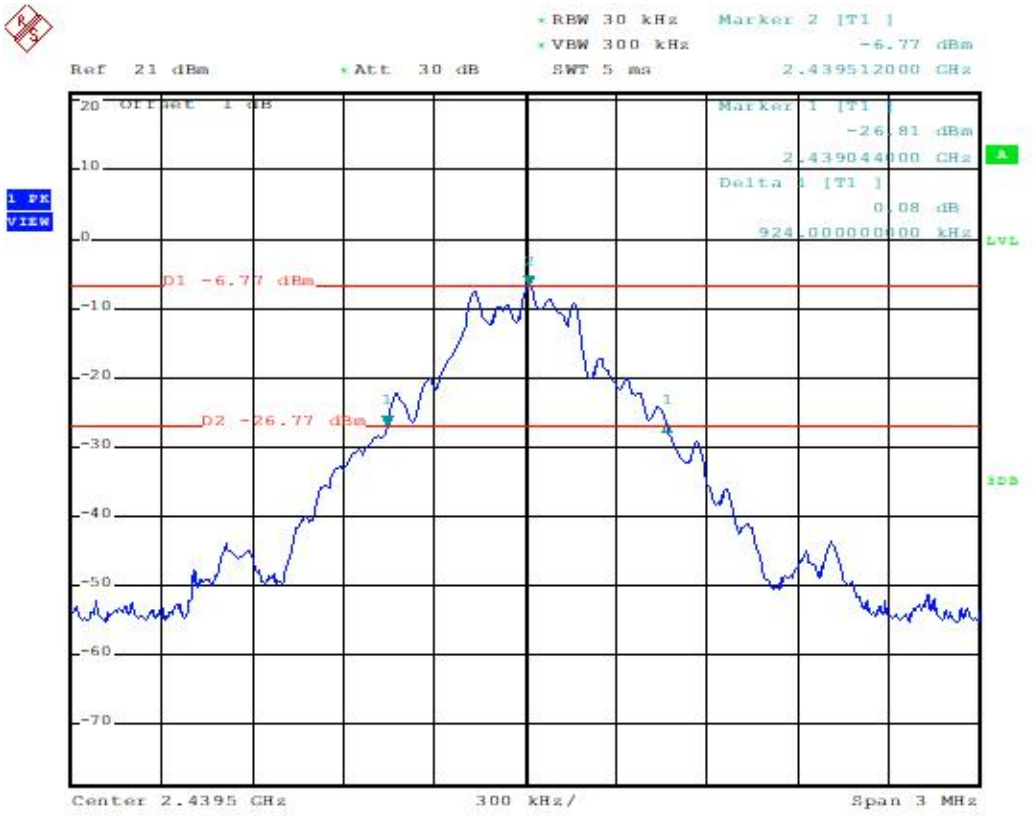
Channel	Frequency MHz	20dB Bandwidth kHz
Low Channel	2402	924
Middle Channel	2441	924
High Channel	2480	918

Please refer to the following test plots

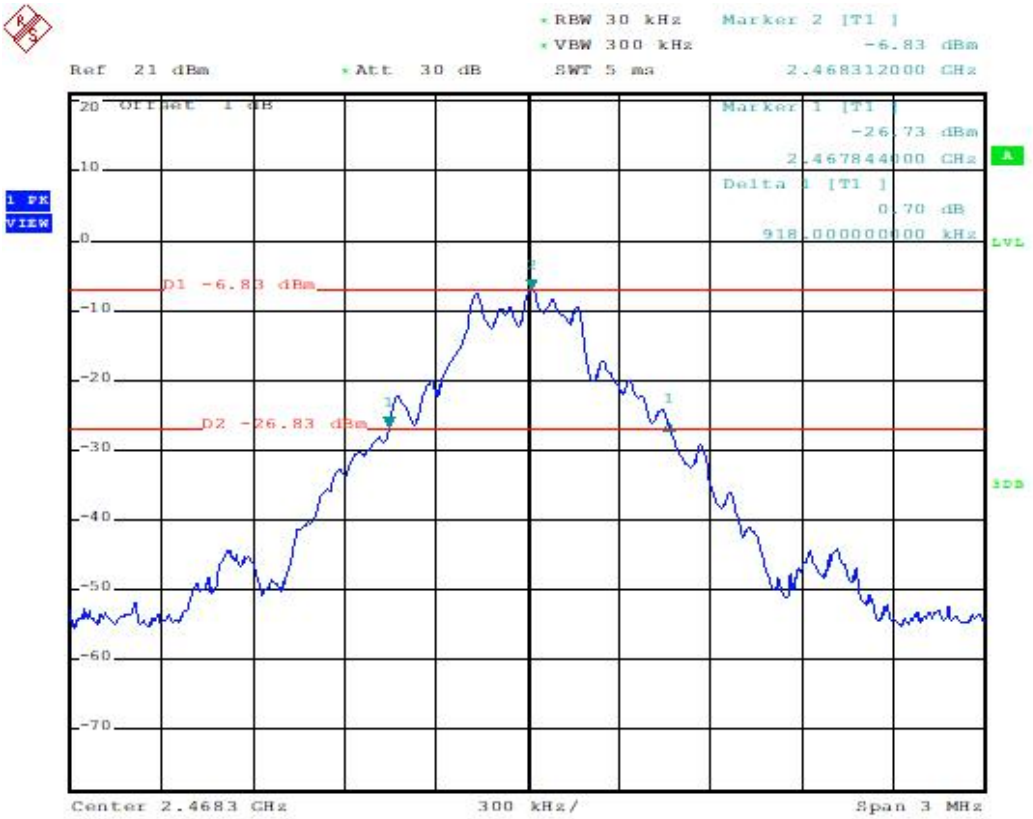
Low Channel:



Middle Channel:



High Channel:

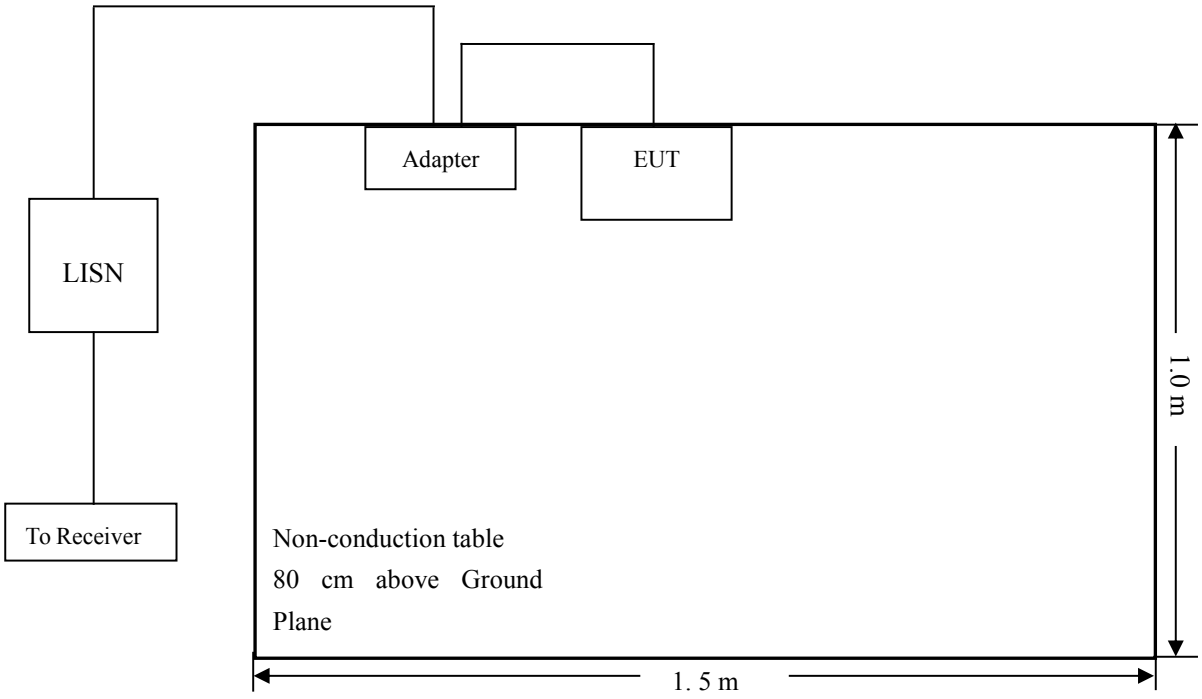


7. Conducted Emissions

7.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 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.

7.2 Basic Test Setup Block Diagram



7.3 Environmental Conditions

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

7.4 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

7.5 Summary of Test Results/Plots

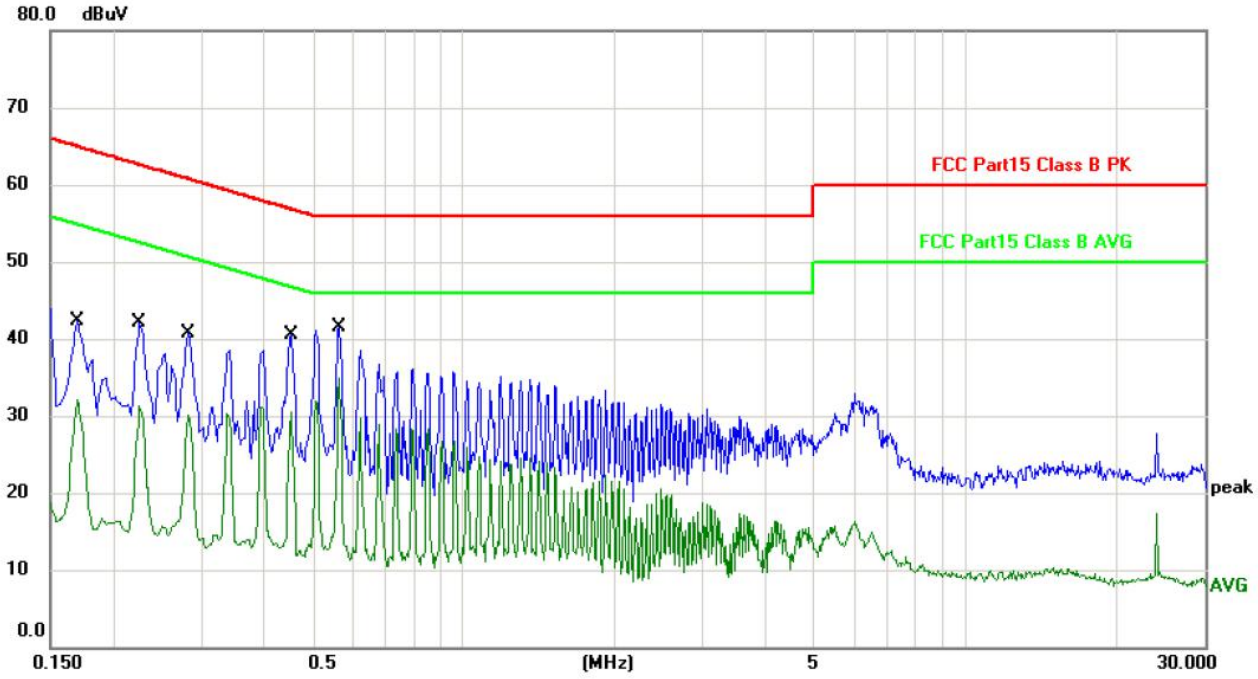
According to the data in section 7.7, the EUT complied with the FCC Part 15.207 Conducted margin for this device.

7.6 Conducted Emissions Test Data

Note: We pre-scan all mode, the worst data is Low channel.

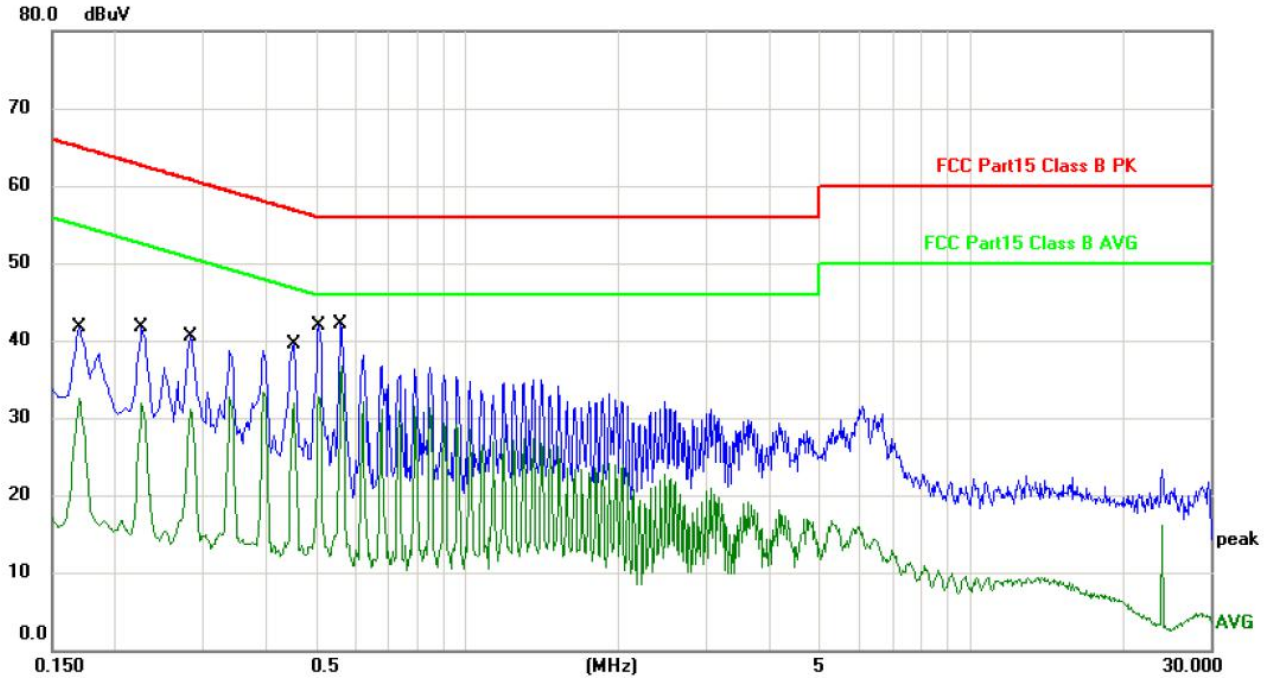
Plot of Conducted Emissions The Worst Test Data Low channel:

Test Specification: *Neutral*



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1700	41.80	0.60	42.40	64.96	-22.56	QP	
2		0.1700	20.84	0.60	21.44	54.96	-33.52	AVG	
3		0.2260	41.54	0.61	42.15	62.59	-20.44	QP	
4		0.2260	25.26	0.61	25.87	52.59	-26.72	AVG	
5		0.2819	40.12	0.61	40.73	60.76	-20.03	QP	
6		0.2819	16.17	0.61	16.78	50.76	-33.98	AVG	
7		0.4540	39.79	0.65	40.44	56.80	-16.36	QP	
8		0.4540	39.79	0.65	40.44	56.80	-16.36	QP	
9		0.4540	11.27	0.65	11.92	46.80	-34.88	AVG	
10		0.4540	11.27	0.65	11.92	46.80	-34.88	AVG	
11	*	0.5660	40.82	0.66	41.48	56.00	-14.52	QP	
12		0.5660	12.74	0.66	13.40	46.00	-32.60	AVG	

Test Specification: *Line*



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1700	41.27	0.50	41.77	64.96	-23.19	QP	
2		0.1700	26.75	0.50	27.25	54.96	-27.71	AVG	
3		0.2260	41.15	0.50	41.65	62.59	-20.94	QP	
4		0.2260	19.69	0.50	20.19	52.59	-32.40	AVG	
5		0.2819	40.01	0.49	40.50	60.76	-20.26	QP	
6		0.2819	16.10	0.49	16.59	50.76	-34.17	AVG	
7		0.4540	38.93	0.49	39.42	56.80	-17.38	QP	
8		0.4540	21.91	0.49	22.40	46.80	-24.40	AVG	
9		0.5100	41.35	0.48	41.83	56.00	-14.17	QP	
10		0.5100	12.80	0.48	13.28	46.00	-32.72	AVG	
11	*	0.5620	41.52	0.51	42.03	56.00	-13.97	QP	
12		0.5620	28.95	0.51	29.46	46.00	-16.54	AVG	

NOTE:

Corret Factor=LISN Factor+Cable loss.

Measurementt=Reading level+Corret Factor.

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