



## FCC PART 15B, CLASS B

### MEASUREMENT AND TEST REPORT

For

#### Grandstream Networks, Inc.

126 Brookline Ave, 3rd Floor Boston, MA 02215, USA

**FCC ID: YZZGWN7600LR**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Long Range WiFi Access Point
<b>Report Number:</b> <u>RSZ170620008-00A</u>	
<b>Report Date:</b> <u>2017-09-08</u>	
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**Note:** This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

The *Grandstream Networks, Inc.* 's product, model number: *GWN7600LR* (*FCC ID: YZZGWN7600LR*) in this report was an *Long Range WiFi Access Point*, which was measured approximately: 290 mm (L) × 150 mm (W) × 56 mm (H), rated with input voltage: DC 48 V powered by POE supply. The highest operation frequency is 5825MHz.

*\*All measurement and test data in this report was gathered from production sample serial number: 1701427 (Assigned by BACL, shenzhen).The EUT supplied by the applicant was received on 2017-06-20.*

### Objective

This test report is prepared on behalf of *Grandstream Networks, Inc.* in accordance with Part 2-Subpart J, Part 15-Subparts A and B of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine the compliance of the EUT with FCC Part 15 B.

### Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS and Part 15E NII submissions with FCC ID: YZZGWN7600LR.

### Test Methodology

All measurements contained in this report were conducted with 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.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

### Measurement Uncertainty

Parameter	uncertainty
Conducted Emissions	±1.95dB
All emissions, radiated	±4.88dB

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

Bay Area Compliance Laboratories Corp. (Shenzhen) has been accredited to ISO/IEC 17025 by CNAS(Lab code: L2408). And accredited to ISO/IEC 17025 by NVLAP(Lab code: 200707-0), the FCC Designation No. CN5001 under the KDB 974614 D01.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Bay Area Compliance Laboratories Corp. (Shenzhen) was registered with ISED Canada under ISED Canada Registration Number 3062B.

## SYSTEM TEST CONFIGURATION (FCC §15.27)

### Justification

The system was configured for testing in normal condition.

PC ping EUT IP

### EUT Exercise Software

No exercise software was used.

### Equipment Modifications

No modification was made to the EUT tested.

### Support Equipment List and Details

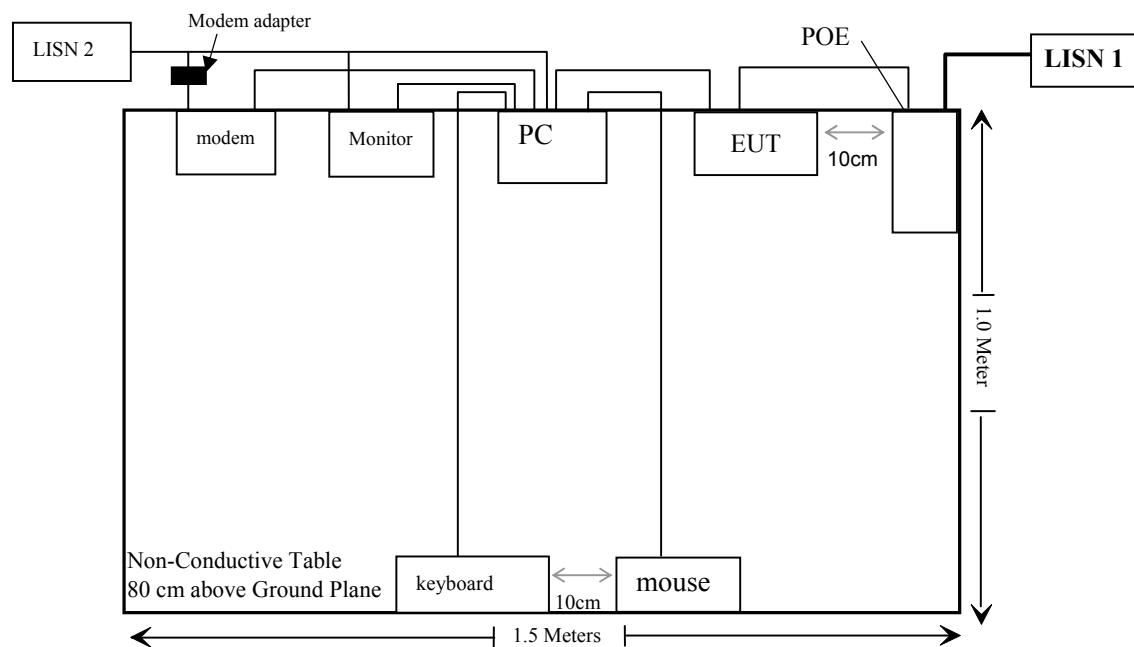
Manufacturer	Description	Model	Serial Number
DELL	PC	VOSTRO 220S	127BP2X
DELL	LCD Monitor	E178WFPC	CN-OWY564-64180-7C4-2SQH
DELL	Keyboard	L100	CNORH656658907BL05DC
DELL	Mouse	MOC5UO	G1900NKD
AST	Modem	AEM-2100	0293
NETGEAR	POE	FS108P	1DL294310006A

## External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-Shielding Detachable USB Cable	1.5	Host PC	Mouse
Un-Shielding Detachable Serial Cable	1.5	Host PC	Modem
Un-Shielding Detachable K/B Cable	1.5	Host PC	Keyboard
Un-Shielding Detachable VGA Cable	1.5	Host PC	LCD Monitor
Un-Shielding Detachable RJ45 Cable	1.0	EUT	Host PC
Un-shielding Un-detachable DC Cable	1.0	Modem	Modem Adapter
Un-shielding detachable RJ45 cable	1.0	POE	EUT
Un-shielding detachable AC cable	1.5	PC	LISN 2
Un-shielding detachable AC cable	1.5	Monitor	LISN 2
Un-shielding detachable AC cable	1.5	Modem adapter	LISN 2
Un-shielding detachable AC cable	0.9	POE	LISN 1

## Block Diagram of Test Setup

For conducted emission:



## **SUMMARY OF TEST RESULTS**

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Results</b>
§15.107	AC Line Conducted Emissions	Compliance
§15.109	Radiated Emissions	Compliance

## TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>AC Line Conducted Emission Test</b>					
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2016-10-19	2017-10-19
Rohde & Schwarz	LISN	ENV216	3560.6650.12-101613-Yb	2016-12-07	2017-12-07
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2017-05-21	2017-11-19
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
N/A	Conducted Emission Cable	N/A	UF A210B-1-0720-504504	2017-05-12	2017-11-12
<b>Radiated Emission Test</b>					
Sunol Sciences	Horn Antenna	DRH-118	A052604	2014-12-29	2017-12-28
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2017-04-24	2018-04-24
Agilent	Spectrum Analyzer	8564E	3943A01781	2017-01-06	2018-01-06
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-17	2017-12-16
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-02-14	2018-02-14
HP	Amplifier	HP8447E	1937A01046	2017-05-21	2017-11-19
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2016-12-07	2017-12-07
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369 223410-001	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	104PEA	218124002	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	RG-214	1	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	RG-214	2	2017-05-22	2017-11-22
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2014-12-29	2017-12-28
Ducommun Technologies	Horn Antenna	ARH-4823-02	1007726-04	2014-12-29	2017-12-28
Ducommun Technologies	Pre-amplifier	ALN-22093530-01	991373-01	2017-08-03	2018-08-03

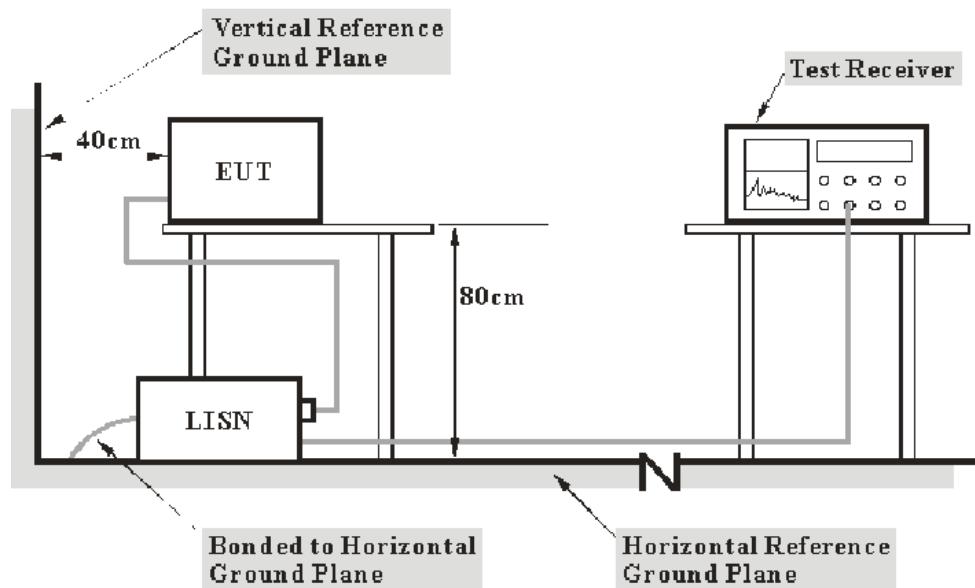
**\* Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## FCC §15.107 – AC LINE CONDUCTED EMISSIONS

### Applicable Standard

According to FCC§15.107

### EUT Setup



**Note:** 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.4-2014. The related limit was specified in FCC Part 15.107 Class B.

### EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

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

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

### Test Procedure

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

## Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

According to the recorded data in following table,

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(Lm)} \leq L_{\text{lim}} + U_{\text{cisp}}$$

In BACL,  $U_{(Lm)}$  is less than  $U_{\text{cisp}}$ , if  $L_m$  is less than  $L_{\text{lim}}$ , it implies that the EUT complies with the limit.

## Test Data

### Environmental Conditions

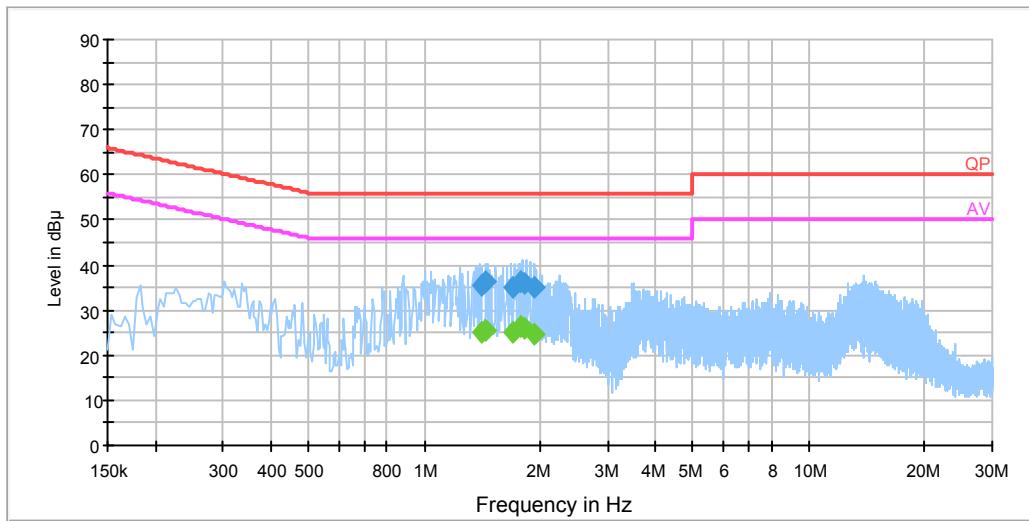
<b>Temperature:</b>	26 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Dylan Li on 2017-07-28.*

Tested mode: PC ping EUT

**AC 120V/60 Hz, Line**

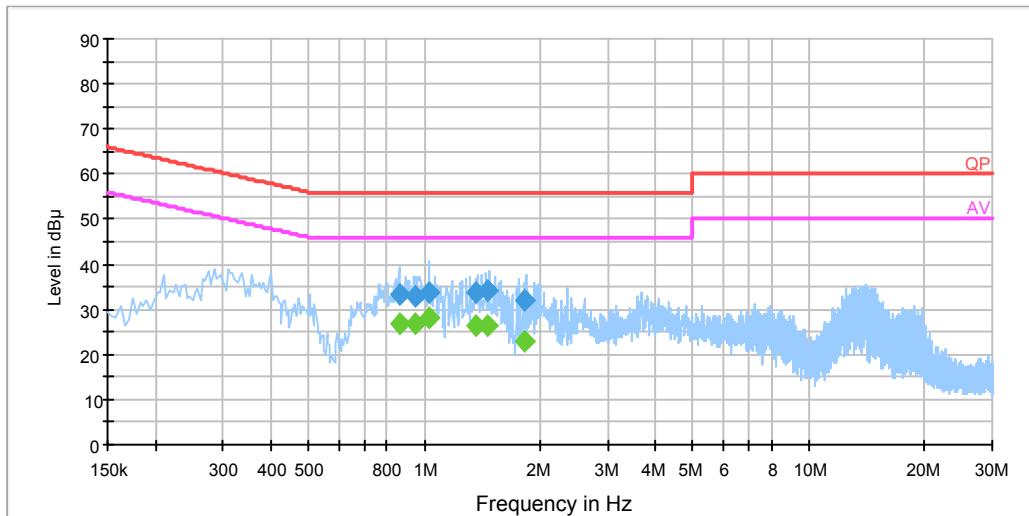
EMI Auto Test L



Frequency (MHz)	Corrected Amplitude (dB $\mu$ V)	Correction Factor (dB)	Limit (dB $\mu$ V)	Margin (dB)	Detector (PK/Ave./QP)
1.405030	35.7	19.8	56.0	20.3	QP
1.436250	36.2	19.8	56.0	19.8	QP
1.696890	35.0	19.8	56.0	21.0	QP
1.790910	36.3	19.8	56.0	19.7	QP
1.814370	36.0	19.8	56.0	20.0	QP
1.929050	35.2	19.8	56.0	20.8	QP
1.405030	25.1	19.8	46.0	20.9	Ave.
1.436250	25.7	19.8	46.0	20.3	Ave.
1.696890	25.1	19.8	46.0	20.9	Ave.
1.790910	26.5	19.8	46.0	19.5	Ave.
1.814370	25.9	19.8	46.0	20.1	Ave.
1.929050	24.7	19.8	46.0	21.3	Ave.

**AC 120V/60 Hz, Neutral**

EMI Auto Test N



Frequency (MHz)	Corrected Amplitude (dB $\mu$ V)	Correction Factor (dB)	Limit (dB $\mu$ V)	Margin (dB)	Detector (PK/Ave./QP)
0.861070	33.5	19.8	56.0	22.5	QP
0.947870	32.8	19.9	56.0	23.2	QP
1.030550	33.6	19.9	56.0	22.4	QP
1.357450	33.9	19.9	56.0	22.1	QP
1.459830	34.2	19.9	56.0	21.8	QP
1.830250	32.0	19.9	56.0	24.0	QP
0.861070	27.0	19.8	46.0	19.0	Ave.
0.947870	26.6	19.9	46.0	19.4	Ave.
1.030550	28.1	19.9	46.0	17.9	Ave.
1.357450	26.3	19.9	46.0	19.7	Ave.
1.459830	26.6	19.9	46.0	19.4	Ave.
1.830250	23.1	19.9	46.0	22.9	Ave.

**Note:**

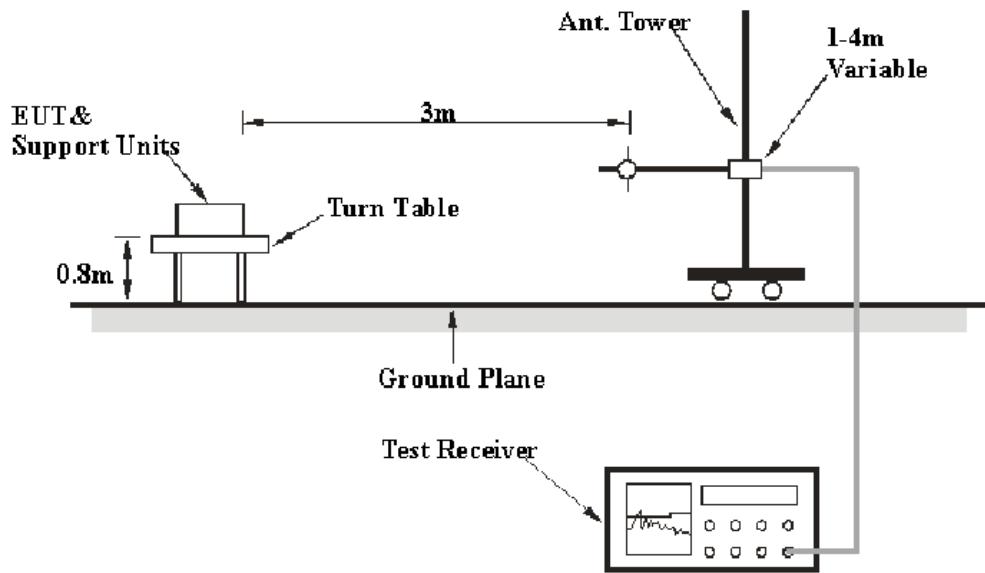
- 1) Corrected Amplitude = Reading + Correction Factor
- 2) Correction Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation
- 3) Margin = Limit – Corrected Amplitude

## FCC §15.109 - RADIATED EMISSIONS

### Applicable Standard

According to FCC§15.109

### Test System Setup



The radiated emission tests were performed in the 3 meters chamber test site.

### EMI Test Receiver Setup

According to FCC 15.33 requirements, the EUT system was measured from 30 MHz to 30 GHz.

During the radiated emission test, the EMI test receiver Setup was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	-	Peak
Above 1 GHz	1 MHz	10 Hz	-	Average

### Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in the Quasi-peak detection mode for below 1 GHz, and Peak and Average for above 1 GHz.

## Corrected Amplitude & Margin Calculation

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

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

According to the recorded data in following table

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{\text{lim}} + U_{\text{cisp}}$$

In BACL.,  $U_{(Lm)}$  is less than  $U_{\text{cisp}}$ , if  $L_m$  is less than  $L_{\text{lim}}$ , it implies that the EUT complies with the limit.

## Test Data

### Environmental Conditions

<b>Temperature:</b>	26 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Dylan Li on 2017-07-28.*

*Tested mode: downloading & playing*

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dB $\mu$ V/m)	FCC Part 15B	
	Reading (dB $\mu$ V)	Detector (PK/QP/Ave.)		Height (m)	Polar (H / V)			Limit (dB $\mu$ V/m)	Margin (dB)
42.68	43.74	QP	68	1.1	V	-8.1	35.64	40	4.4
43.75	46.34	QP	68	1.1	V	-8.9	37.44	40	2.6
58.39	47.21	QP	256	2.4	V	-11.7	35.51	40	4.5
60.23	44.9	QP	256	2.4	V	-11.9	33	40	7
178.70	34.59	QP	74	1.5	V	-5.5	29.09	43.5	14
647.62	22.57	QP	68	1.1	V	4.3	26.87	46	19
1624.53	43.61	PK	140	1.9	H	-5.35	38.26	74	35.74
1624.53	32.69	Ave.	140	1.9	H	-5.35	27.34	54	26.66
1624.53	42.59	PK	134	2.0	V	-5.35	37.24	74	36.76
1624.53	31.55	Ave.	134	2.0	V	-5.35	26.20	54	27.80

**Note:**

- 1) Corrected Amplitude = Meter Reading + Correction Factor
- 2) Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain
- 3) Margin = Limit – Corrected Amplitude
- 4) The emission more than 20dB below the limit was not required to be recorded.

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