

# FCC Part 15B Measurement and Test Report

For

TOPICON HK LIMITED

Room 2113-2114, Tower C, Huangdu Plaza, Yitian Road, Futian District,

Shenzhen, China

**FCC ID: 2AHAF-CT2020**

<b>Test Rule(s):</b>	<u>FCC Part 15 Subpart B</u>	
<b>Product Description:</b>	<u>Connected DVR</u>	
<b>Tested Model:</b>	<u>CT2020</u>	
<b>Report No.:</b>	<u>STR17038096I-5</u>	
<b>Tested Date:</b>	<u>2017-03-09 to 2017-04-27</u>	
<b>Issued Date:</b>	<u>2017-04-28</u>	
<b>Tested By:</b>	<u>Neil Wong / Engineer</u>	<i>Neil Wong</i>
<b>Reviewed By:</b>	<u>Silin Chen / EMC Manager</u>	<i>Silin Chen</i>
<b>Approved &amp; Authorized By:</b>	<u>Jandy So / PSQ Manager</u>	<i>Jandy So</i>
<b>Prepared By:</b>		

**Shenzhen SEM.Test Technology Co., Ltd.**  
1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,  
Bao'an District, Shenzhen, P.R.C. (518101)  
Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

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 Shenzhen SEM.Test Technology Co., Ltd.

---

---

**TABLE OF CONTENTS**

<b>1. GENERAL INFORMATION .....</b>	<b>3</b>
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	3
1.2 TEST STANDARDS .....	4
1.3 TEST METHODOLOGY .....	4
1.4 TEST FACILITY .....	4
1.5 EUT SETUP AND OPERATION MODE .....	5
1.6 MEASUREMENT UNCERTAINTY .....	5
1.7 TEST EQUIPMENT LIST AND DETAILS .....	6
<b>2. SUMMARY OF TEST RESULTS .....</b>	<b>7</b>
<b>3. CONDUCTED EMISSIONS .....</b>	<b>8</b>
3.1 TEST PROCEDURE .....	8
3.2 BASIC TEST SETUP BLOCK DIAGRAM .....	8
3.3 ENVIRONMENTAL CONDITIONS .....	8
3.4 SUMMARY OF TEST RESULTS/PLOTS .....	8
3.5 CONDUCTED EMISSIONS TEST DATA .....	9
<b>4. RADIATED EMISSIONS .....</b>	<b>11</b>
4.1 TEST PROCEDURE .....	11
4.2 TEST RECEIVER SETUP .....	12
4.3 CORRECTED AMPLITUDE & MARGIN CALCULATION .....	12
4.4 ENVIRONMENTAL CONDITIONS .....	12
4.5 SUMMARY OF TEST RESULTS/PLOTS .....	12

## 1. GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

#### Client Information

Applicant: TOPICON HK LIMITED  
Address of applicant: Room 2113-2114, Tower C, Huangdu Plaza, Yitian Road,  
Futian District, Shenzhen, China

Manufacturer: TOPICON HK LIMITED  
Address of manufacturer: Room 2113-2114, Tower C, Huangdu Plaza, Yitian Road,  
Futian District, Shenzhen, China

General Description of EUT	
Product Name:	Connected DVR
Trade Name:	/
Model No.:	CT2020
Adding Model(s):	CT2030, CT202x(x=1-9), CT203x(x=1-9)
<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 CT2020, but the circuit and the electronic construction do not change, declared by the manufacturer.</i>	

Technical Characteristics of EUT	
Rated Voltage:	DC 12V/24V by vehicle battery
Rated Current:	2A
Rated Power:	10W
Power Adapter Model:	/
Battery Capacity:	1500mAh
Lowest Internal Frequency:	32.768kHz
Highest Internal Frequency:	1.2GHz
Classification of ITE:	Class B

## 1.2 Test Standards

The following report is prepared on behalf of the TOPICON HK LIMITED in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart B, and section 15.205, 15.107, and 15.109 rules.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result 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 C63.4-2014, 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

### **FCC – Registration No.: 934118**

Shenzhen SEM.Test Technology 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 934118.

### **Industry Canada (IC) Registration No.: 11464A**

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

### **CNAS Registration No.: L4062**

Shenzhen SEM.Test Technology 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 1/F, Building A, Hongwei Industrial Park, Liuxian 2<sup>nd</sup> Road, Bao'an District, Shenzhen, P.R.C (518101).

## 1.5 EUT Setup and Operation Mode

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted according to the operation manual for use, more detailed description as follows:

Test Mode List:

Test Mode	Description	Remark
TM1	Downloading	Connect to pc
TM2	Working	Connect to box and camera, DC 12V/24V

EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

Auxiliary Equipment List and Details

Description	Manufacturer	Model	Serial Number
Notebook	Lenovo	E10	/
TF card	Kinston	Class10	/
Connect-box	/	/	/

Special Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
USB cable	0.8	Unshielded	With Core
Camera 1 cable	2.0	Unshielded	With Core
Camera 2 cable	2.0	Unshielded	With Core

## 1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Conducted Emissions	Conducted	$\pm 2.88\text{dB}$
Transmitter Spurious Emissions	Radiated	$\pm 5.1\text{dB}$

## 1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2016-06-04	2017-06-03
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2016-06-04	2017-06-03
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2016-06-04	2017-06-03
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2016-06-04	2017-06-03
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2016-06-04	2017-06-03
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2016-06-04	2017-06-03
SEMT-1042	Horn Antenna	ETS	3117	00086197	2016-06-04	2017-06-03
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2016-06-04	2017-06-03
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2016-06-04	2017-06-03
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2016-06-04	2017-06-03
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2016-06-04	2017-06-03

---

## 2. SUMMARY OF TEST RESULTS

---

<b>FCC Rules</b>	<b>Description of Test Item</b>	<b>Result</b>
§ 15.107 (a)	Conducted Emissions	Compliant
§ 15.109 (a)	Radiated Emissions	Compliant

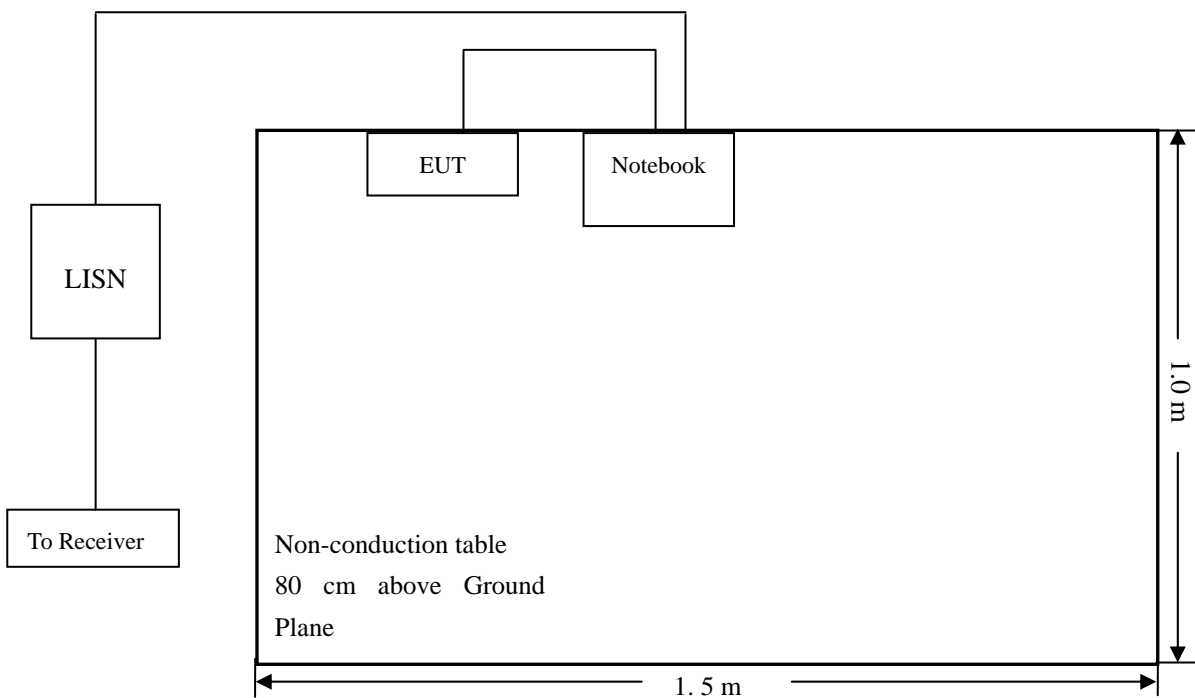
N/A: not applicable

### 3. Conducted Emissions

#### 3.1 Test Procedure

Test is conducting under the description of 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.

#### 3.2 Basic Test Setup Block Diagram



#### 3.3 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

#### 3.4 Summary of Test Results/Plots

According to the data in section 3.5, the EUT complied with the FCC Part 15.107(a) Conducted margin for a Class B device, with the *worst* margin reading of:

**-8.88 dB at 3.3860 MHz** in the **Neutral, QP** detector, 0.15-30MHz

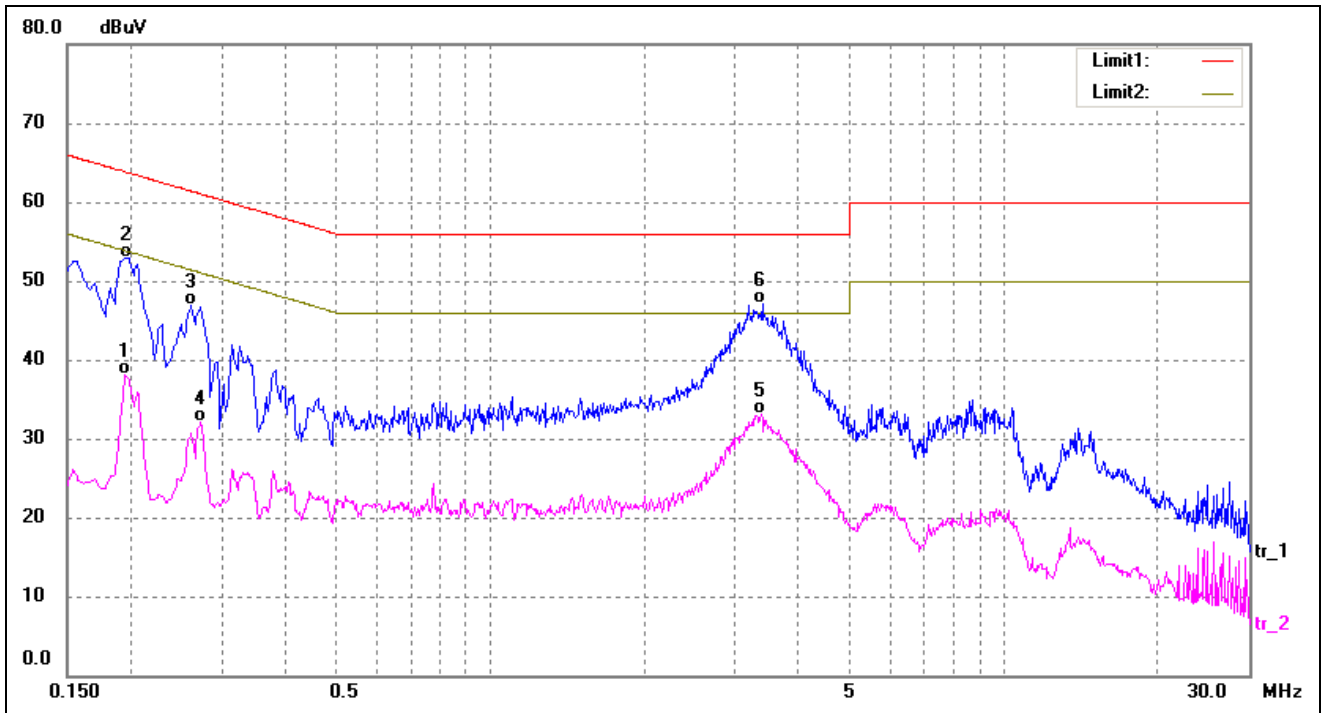


### 3.5 Conducted Emissions Test Data

#### Plot of Conducted Emissions Test Data

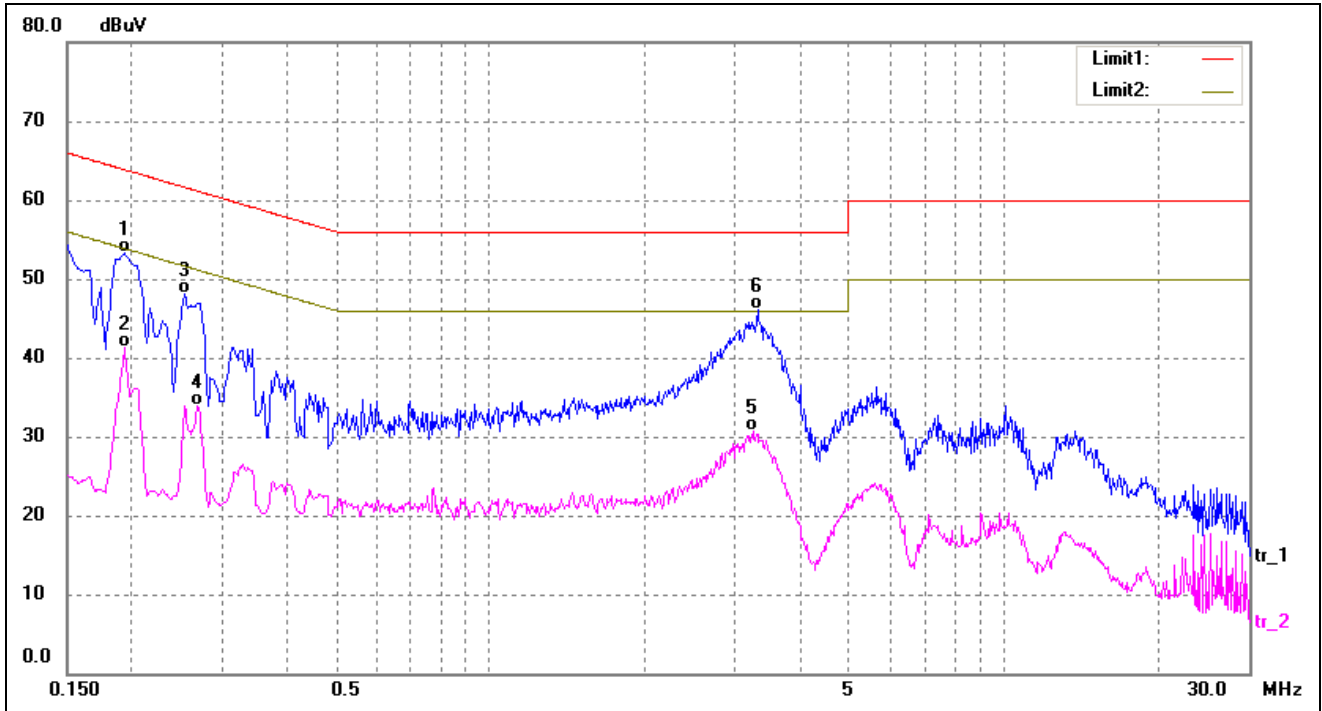
EUT: *Connected DVR*  
 Tested Model: *CT2020*  
 Operating Condition: *TM1*  
 Comment: *AC 120V/60Hz, USB 5V*

Test Specification: *Neutral*



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1940	28.32	9.81	38.13	53.86	-15.73	AVG
2	0.1980	43.12	9.80	52.92	63.69	-10.77	QP
3	0.2620	37.14	9.80	46.94	61.36	-14.42	QP
4	0.2740	22.33	9.80	32.13	50.99	-18.86	AVG
5	3.3740	23.34	9.70	33.04	46.00	-12.96	AVG
6*	3.3860	37.42	9.70	47.12	56.00	-8.88	QP

Test Specification: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1940	43.49	9.81	53.30	63.86	-10.56	QP
2	0.1940	31.53	9.81	41.34	53.86	-12.52	AVG
3	0.2540	38.22	9.80	48.02	61.63	-13.61	QP
4	0.2700	24.05	9.80	33.85	51.12	-17.27	AVG
5	3.2500	21.08	9.70	30.78	46.00	-15.22	AVG
6*	3.3140	36.41	9.70	46.11	56.00	-9.89	QP

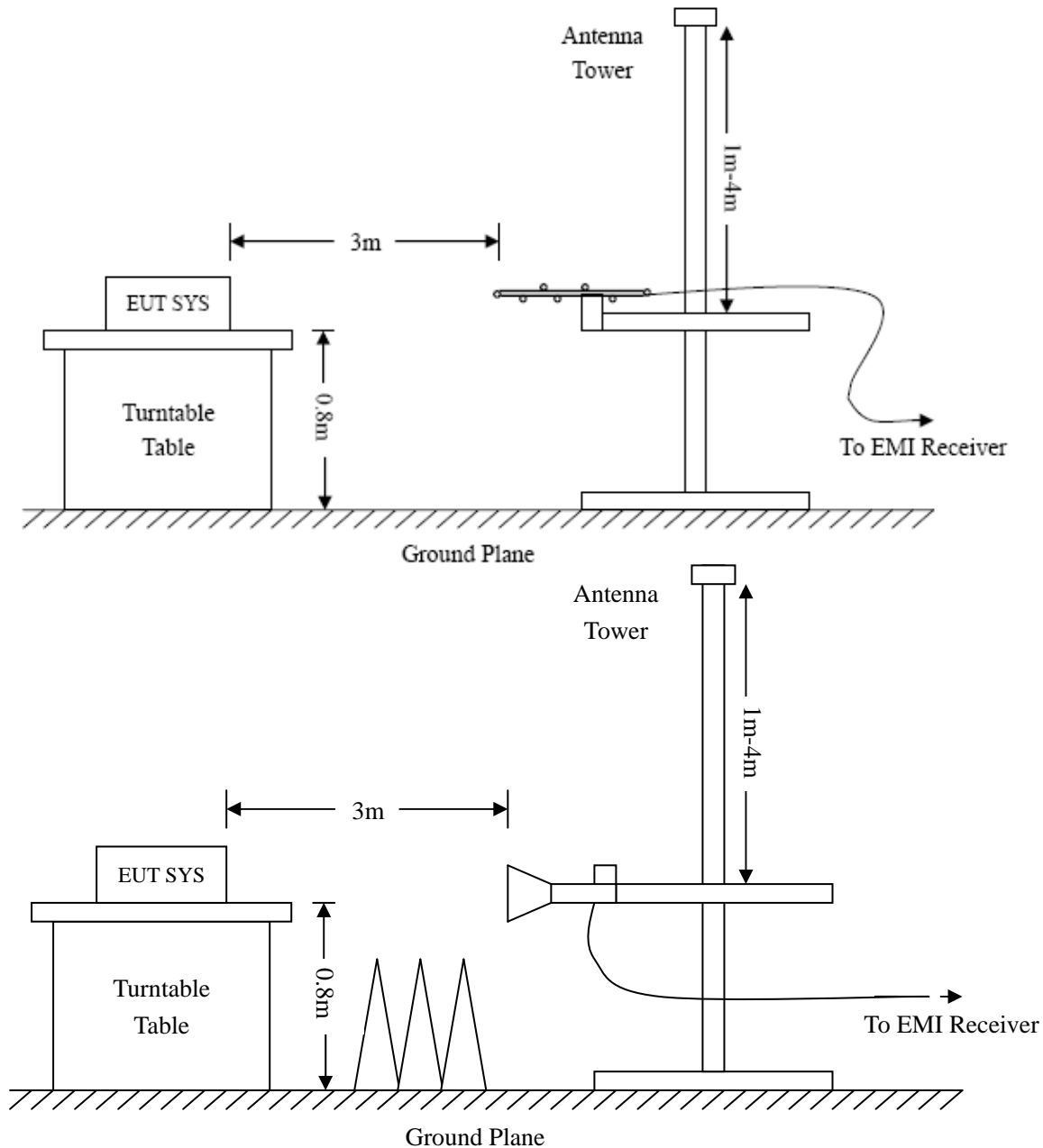
## 4. Radiated Emissions

### 4.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.109 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.



### 4.2 Test Receiver Setup

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:

$$\text{Corr. Ampl.} = \text{Indicated Reading} - \text{Corr. Factor}$$

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

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15.109(a) Limit}$$

### 4.4 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	55 %
ATM Pressure:	1011 mbar

### 4.5 Summary of Test Results/Plots

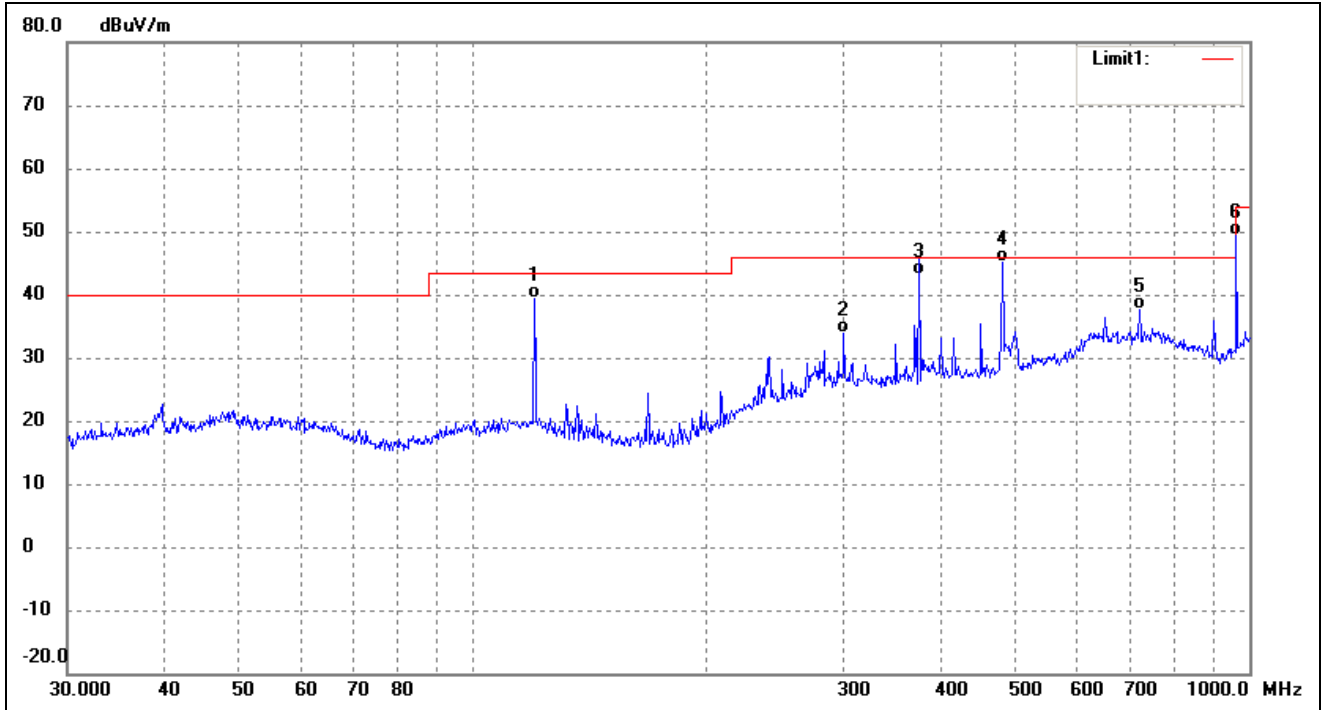
According to the data, the EUT complied with the FCC Part 15.109(a) rule, and had the worst margin of:

**-0.91 dB at 480.5276 MHz in the Horizontal polarization at TM1, 30MHz to 12.75 GHz, 3Meters**

**Plot of Radiated Emissions Test Data**

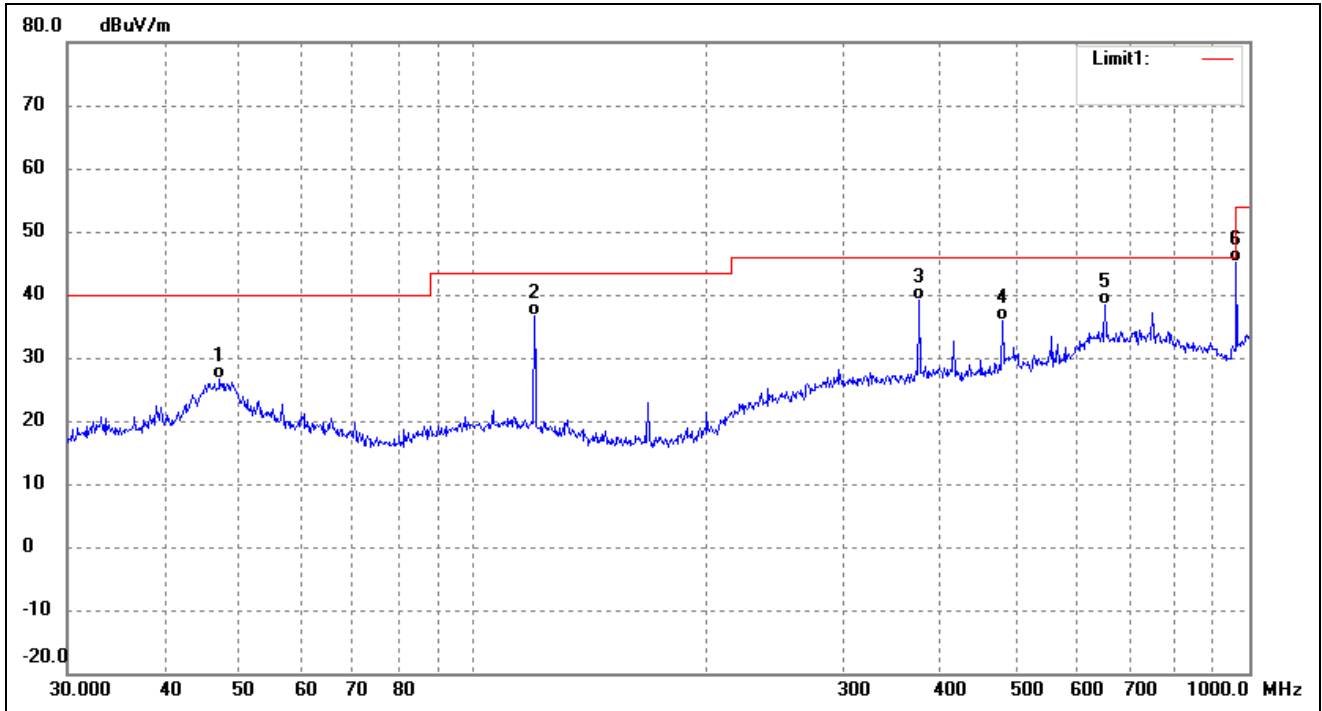
EUT: *Connected DVR*  
 Tested Model: *CT2020*  
 Operating Condition: *TM1*  
 Comment: *AC 120V/60Hz, USB 5V*

Test Specification: *Horizontal*



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	119.8555	34.66	4.82	39.48	43.50	-4.02	327	100	QP
2	300.3673	21.94	11.95	33.89	46.00	-12.11	94	100	QP
3	375.9384	31.20	11.81	43.01	46.00	-2.99	228	100	QP
4	480.5276	32.51	12.58	45.09	46.00	-0.91	103	100	QP
5	721.7259	19.65	17.91	37.56	46.00	-8.44	231	100	QP
6	962.1622	34.59	14.67	49.26	54.00	-4.74	334	100	QP

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	47.1599	21.62	4.96	26.58	40.00	-13.42	224	100	QP
2	119.8556	31.77	4.82	36.59	43.50	-6.91	100	100	QP
3	375.9385	27.42	11.81	39.23	46.00	-6.77	360	100	QP
4	480.5276	23.20	12.58	35.78	46.00	-10.22	91	100	QP
5	651.9417	20.53	17.77	38.30	46.00	-7.70	147	100	QP
6	962.1623	30.38	14.67	45.05	54.00	-8.95	141	100	QP

**Plot of Radiated Emissions Test Data**

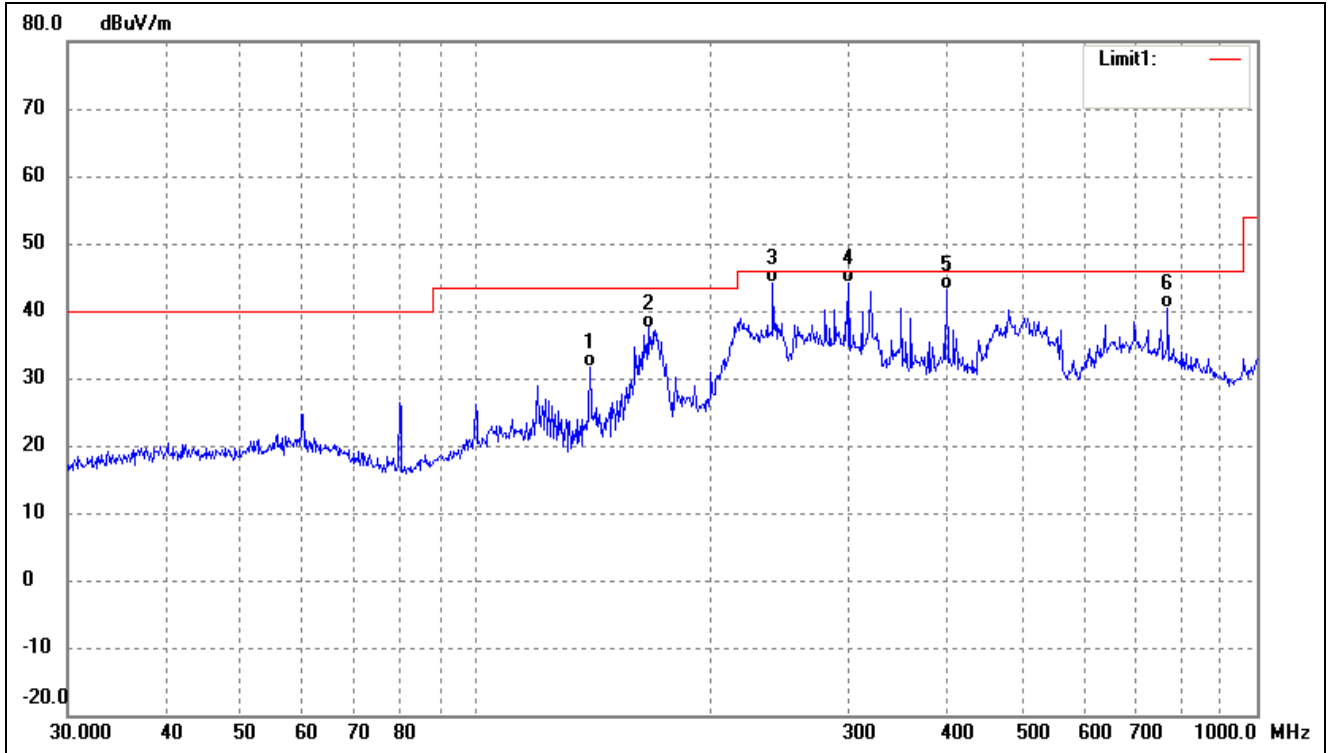
EUT: *Connected DVR*

Tested Model: *CT2020*

Operating Condition: *TM2*

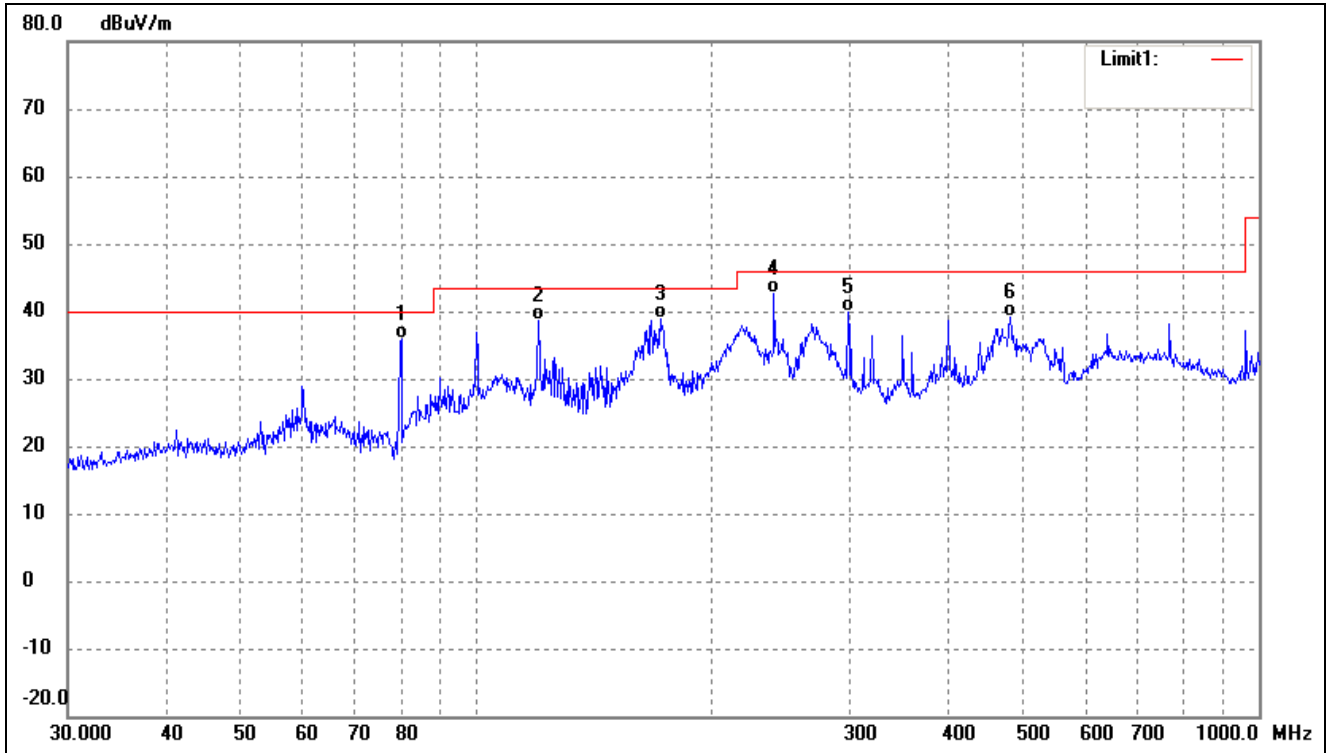
Comment: *DC 12V*

Test Specification: *Horizontal*



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	139.8508	28.37	3.17	31.54	43.50	-11.96	129	100	QP
2	166.0680	35.05	2.45	37.50	43.50	-6.00	12	100	QP
3	239.9874	35.11	8.93	44.04	46.00	-1.96	34	100	QP
4	300.3673	32.20	11.95	44.15	46.00	-1.85	11	100	QP
5	400.4319	30.34	12.67	43.01	46.00	-2.99	31	100	QP
6	768.7482	22.83	17.60	40.43	46.00	-5.57	23	100	QP

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	80.0806	34.12	1.73	35.85	40.00	-4.15	76	100	QP
2	119.8556	33.73	4.82	38.55	43.50	-4.95	241	100	QP
3	171.9946	36.41	2.46	38.87	43.50	-4.63	22	100	QP
4	239.9874	33.67	8.93	42.60	46.00	-3.40	74	100	QP
5	298.2681	28.05	11.89	39.94	46.00	-6.06	71	100	QP
6	480.5276	26.45	12.58	39.03	46.00	-6.97	63	100	QP



**Plot of Radiated Emissions Test Data**

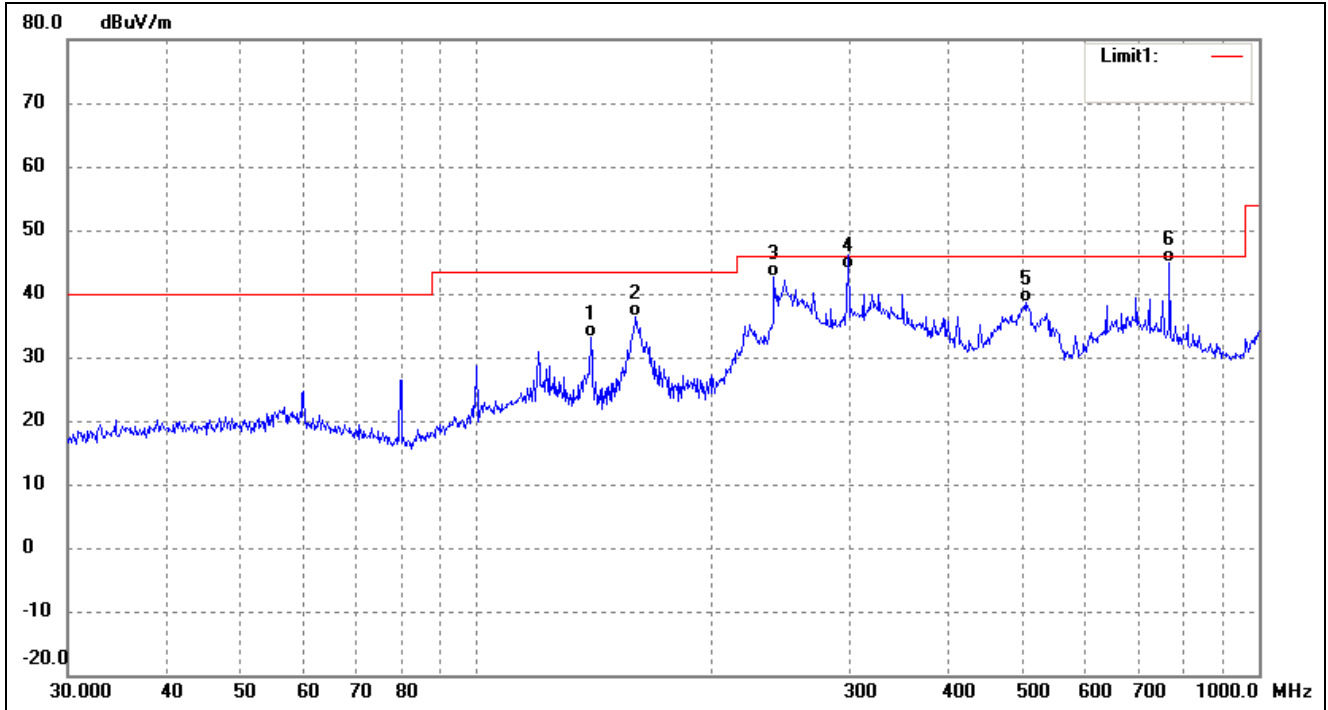
EUT: *Connected DVR*

Tested Model: *CT2020*

Operating Condition: *TM2*

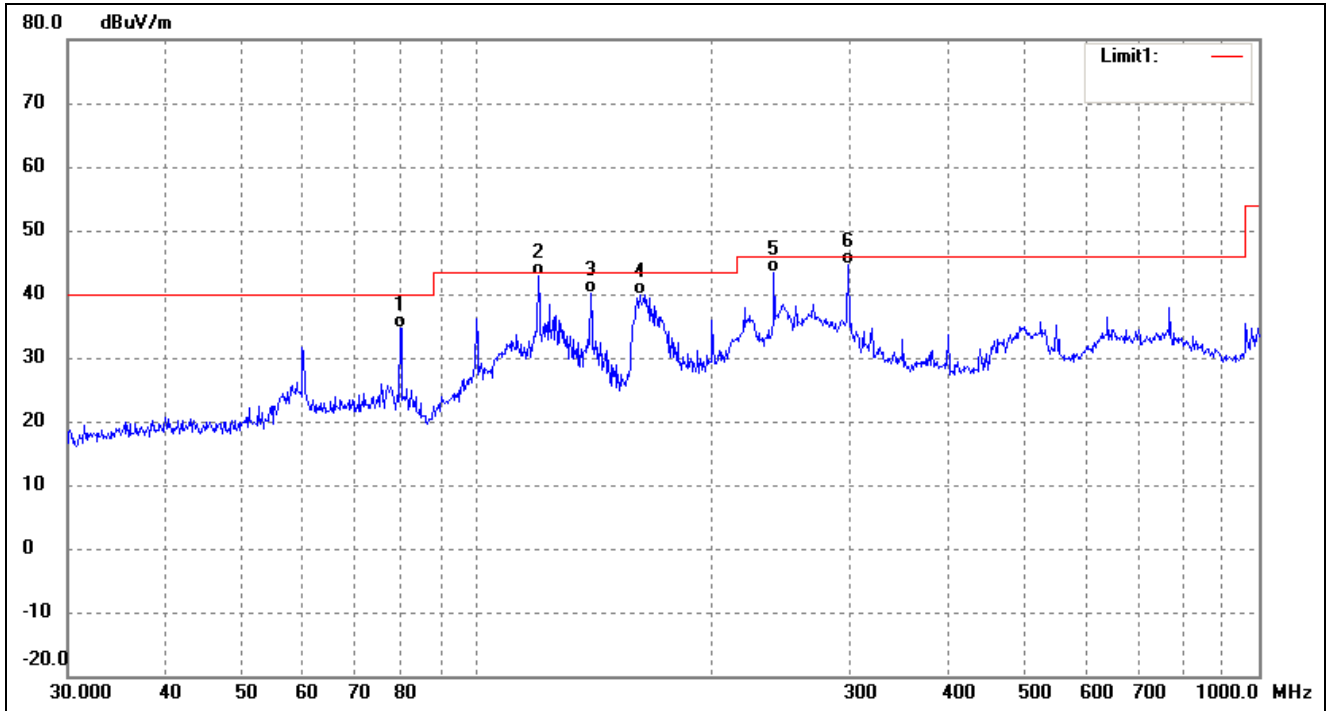
Comment: *DC 24V*

Test Specification: *Horizontal*



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	139.8508	29.84	3.17	33.01	43.50	-10.49			QP
2	159.7844	34.09	2.41	36.50	43.50	-7.00			QP
3	239.9874	33.59	8.93	42.52	46.00	-3.48			QP
4	298.2681	32.10	11.89	43.99	46.00	-2.01			QP
5	502.9395	25.20	13.41	38.61	46.00	-7.39			QP
6	768.7482	27.16	17.60	44.76	46.00	-1.24			QP

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	79.8003	32.87	1.74	34.61	40.00	-5.39			QP
2	119.8556	37.96	4.82	42.78	43.50	-0.72			QP
3	139.8508	37.03	3.17	40.20	43.50	-3.30			QP
4	161.4742	37.44	2.41	39.85	43.50	-3.65			QP
5	239.9874	34.44	8.93	43.37	46.00	-2.63			QP
6	298.2681	32.68	11.89	44.57	46.00	-1.43			QP

Note: Testing is carried out with frequency rang 30MHz to the 12.75GHz, which above 1GHz are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

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