

FCC Part 15C
Measurement and Test Report
For
DewertOkin GmbH
Weststr. 1, 32278 Kirchlingern, Germany

FCC ID: O3YRF151A

FCC Rule(s):	<u>FCC Part 15.249</u>
Product Description:	<u>REMOTE CONTROL ECO</u>
Tested Model:	<u>RF151A</u>
Report No.:	<u>STR18038234I</u>
Sample Receipt Date:	<u>2014-08-05; 2018-03-26</u>
Tested Date:	<u>2014-08-06 to 2014-08-11;</u> <u>2018-03-26 to 2018-04-12</u>
Issued Date:	<u>2018-04-13</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 Shenzhen SEM.Test Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: DewertOkin GmbH
Address of applicant: Weststr. 1, 32278 Kirchlengern, Germany

Manufacturer: Shenzhen C&D Electronics Co., Ltd
Address of manufacturer: Building 2, XiaYouSong Mountaintop Industrial District, YouSong Village, Longhua Town, BaoAn District, Shenzhen, Guangdong, China

General Description of EUT	
Product Name:	REMOTE CONTROL ECO
Trade Name:	
Model No.:	RF151A
Adding Model(s):	/
Rated Voltage:	DC 30V
Power Adapter Model:	/
<i>Note: The test data is gathered from a production sample, provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Frequency Range:	2403-2480MHz
Max. Field Strength:	80.67dBuV/m
Data Rate:	1Mbps
Modulation:	GFSK
Quantity of Channels:	78
Channel Separation:	1MHz
Antenna Type:	PCB Antenna
Antenna Gain:	0dBi
Lowest Internal Frequency of EUT:	16MHz

1.2 Test Standards

The following report is prepared on behalf of the DewertOkin GmbH 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

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

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.

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	2403MHz
TM2	Middle Channel	2440MHz
TM3	High Channel	2480MHz
TM4	Operating	Simulate the normal operating condition

Accessories Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
Power Supply DC Cable	1.9	Unshielded	Without Core
Power Supply AC Cable	1.9	Unshielded	Without Core
DC MOTOR Cable	1.3	Unshielded	Without Core

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
DC MOTOR	/	ZYT36S-03	/
Power Supply	/	PD12	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	$\pm 0.42\text{dB}$
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Conducted Emissions	Conducted	9-150kHz $\pm 3.74\text{dB}$
		0.15-30MHz $\pm 3.34\text{dB}$
Transmitter Spurious Emissions	Radiated	30-200MHz $\pm 4.52\text{dB}$
		0.2-1GHz $\pm 5.56\text{dB}$
		1-6GHz $\pm 3.84\text{dB}$
		6-18GHz $\pm 3.92\text{dB}$

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1016	Spectrum Analyzer	Agilent	E4402B	US41192821	2014-05-28	2015-05-27
SEMT-1021	Attenuator	ATTEN	ATS100-4-20	/	2014-05-28	2015-05-27
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2017-06-12	2018-06-11
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2017-06-12	2018-06-11
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2017-06-12	2018-06-11
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2017-06-12	2018-06-11
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2017-06-12	2018-06-11
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2018-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2018-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2018-06-07
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2018-06-07
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2017-06-12	2018-06-11
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2017-06-12	2018-06-11
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2017-06-12	2018-06-11
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2017-08-15	2018-08-14
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2017-08-15	2018-08-14
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2017-06-12	2018-06-11
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2018-03-19	2021-03-18
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2017-05-22	2018-05-21
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	2018-03-19	2019-03-18
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2018-03-19	2019-03-18
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2018-03-19	2019-03-18
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2018-03-19	2019-03-18
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18

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

Note: All test data (except Radiated Spurious Emissions and Conducted Emission) were copied from the original report (the original report No.: STR14078150I) because the PCB was electrically equal to the original equipment, the manufacturer just change the voltage of relay (K1-K4).

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.

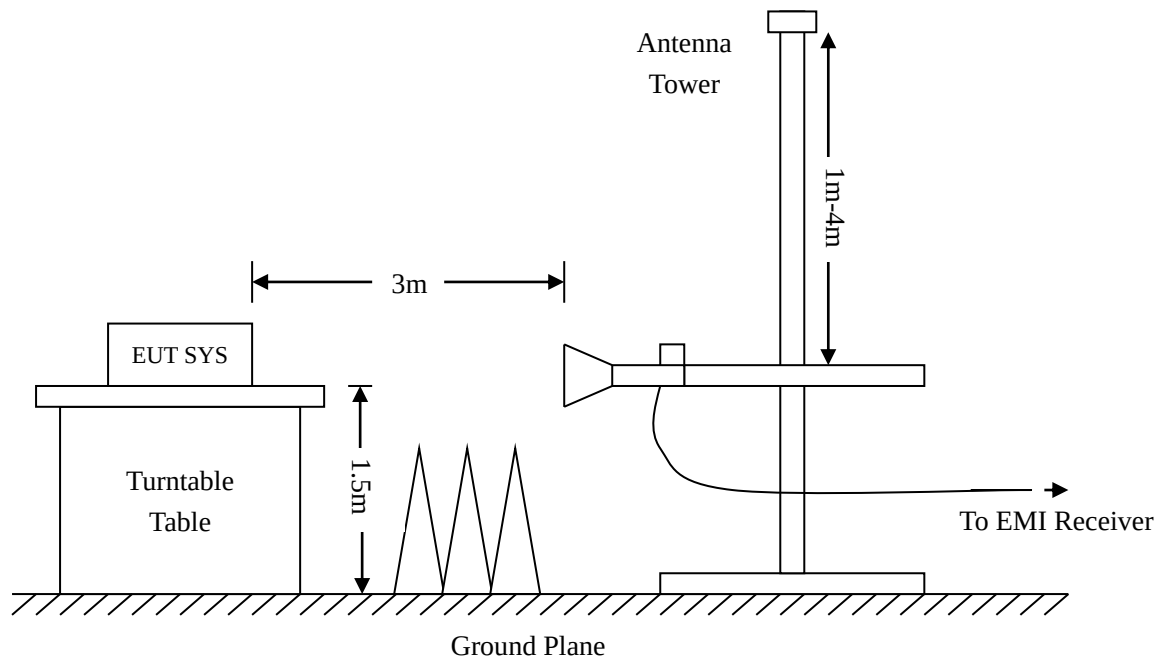
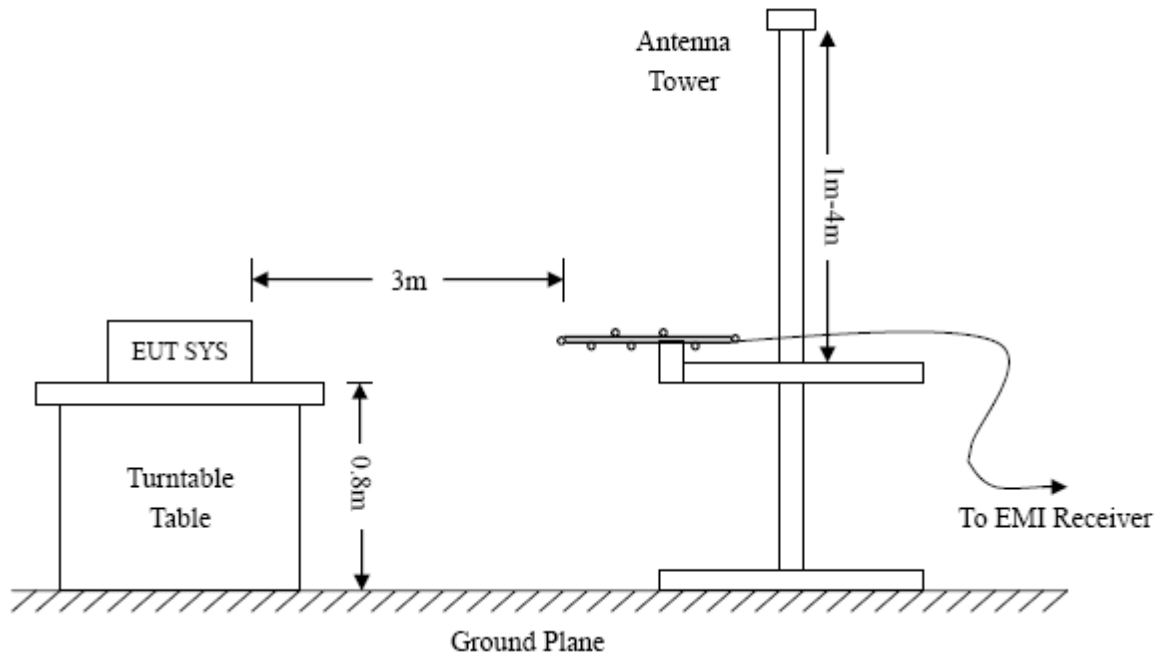
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

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
 RBW=10KHz,
 VBW =30KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak

Frequency :30MHz-1GHz
 RBW=120KHz,
 VBW=300KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak, QP

Frequency :Above 1GHz
 RBW=1MHz,
 VBW=3MHz(Peak), 10Hz(AV)
 Sweep time= Auto
 Trace = max hold
 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:

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

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

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

4.4 Environmental Conditions

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

4.5 Summary of Test Results/Plots

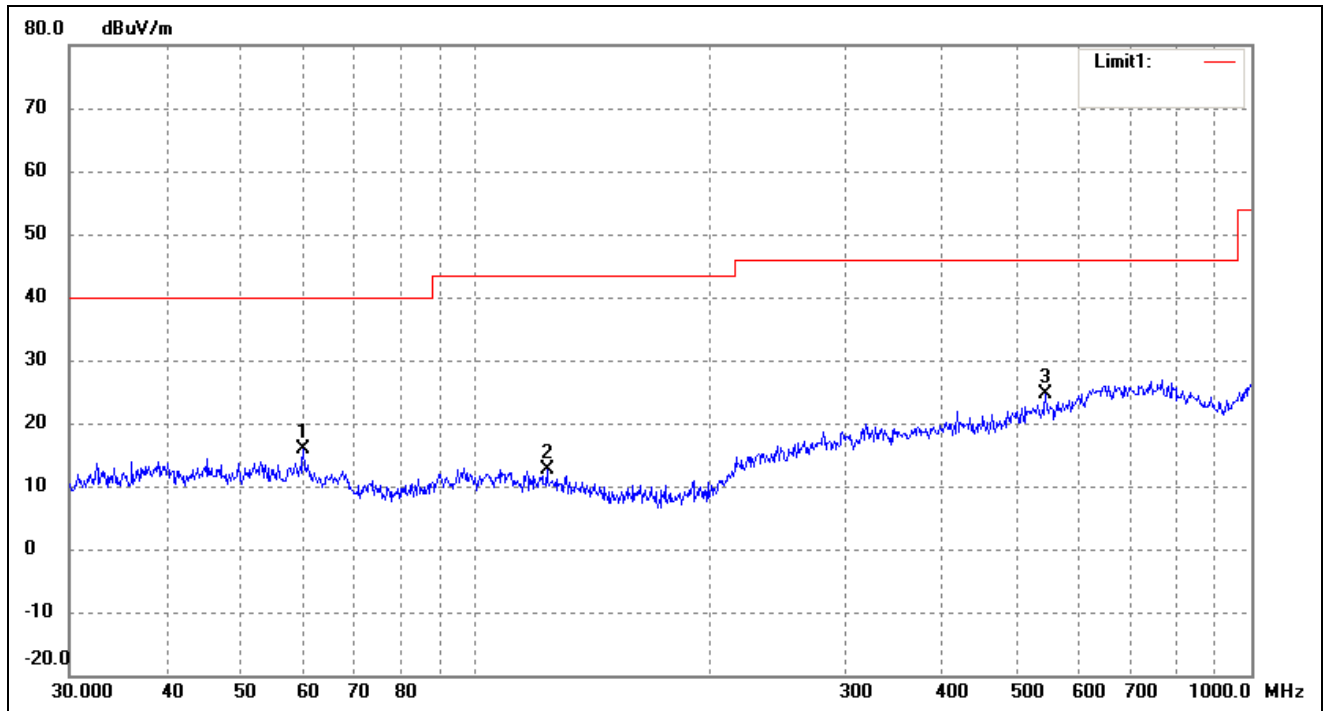
According to the data below, the [FCC Part 15.205](#), [15.209](#) and [15.249](#) standards, and had the worst margin of:

-18.52 dB at 59.8588 MHz in the Horizontal polarization, relay model SRD-24VDC-SL-C, Middle Channel of Antenna 1, 9 kHz to 25 GHz, 3Meters

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

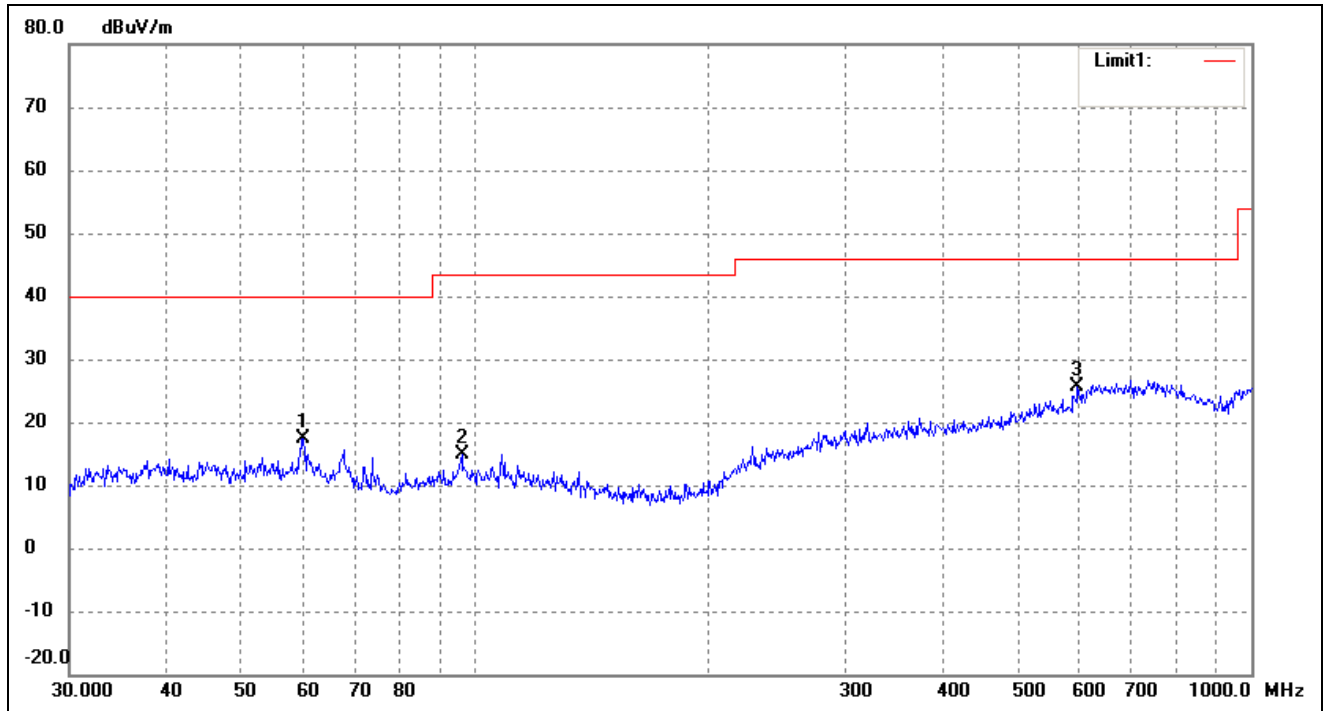
Plot of Radiated Emissions Test Data (30MHz to 1GHz)

EUT: REMOTE CONTROL ECO
 Tested Model: RF151A
 Operating Condition: Transmitting Low Channel (2403MHz)
 Comment: DC 30V
 Note: 18*18 is relay model HF3FF
 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	60.0691	32.42	-16.52	15.90	40.00	-24.10	100	100	peak
2	123.6985	29.58	-16.97	12.61	43.50	-30.89	178	100	peak
3	543.2742	29.86	-5.18	24.68	46.00	-21.32	68	100	peak

Test Specification: Vertical



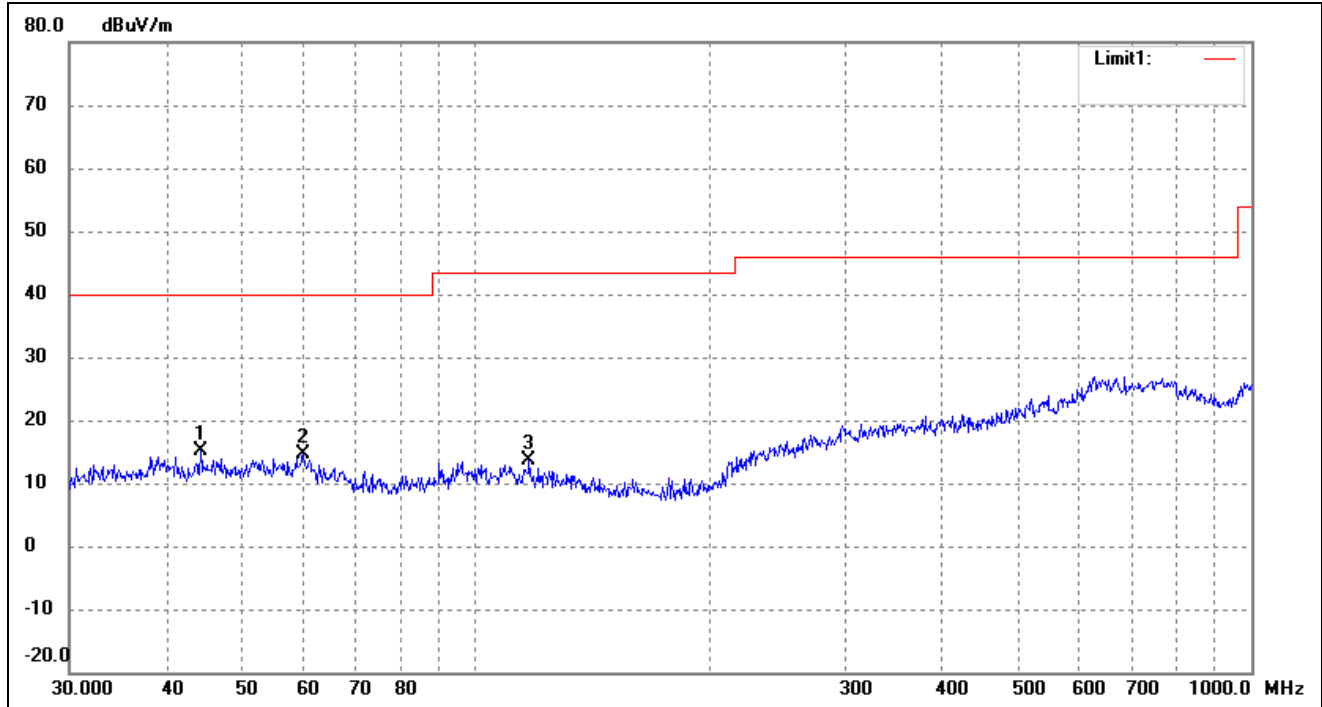
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	60.0691	33.88	-16.52	17.36	40.00	-22.64	251	100	peak
2	96.0986	32.05	-17.14	14.91	43.50	-28.59	272	100	peak
3	597.2234	26.31	-0.78	25.53	46.00	-20.47	71	100	peak

Operating Condition: Transmitting Middle Channel (2440MHz)

Comment: DC 30V

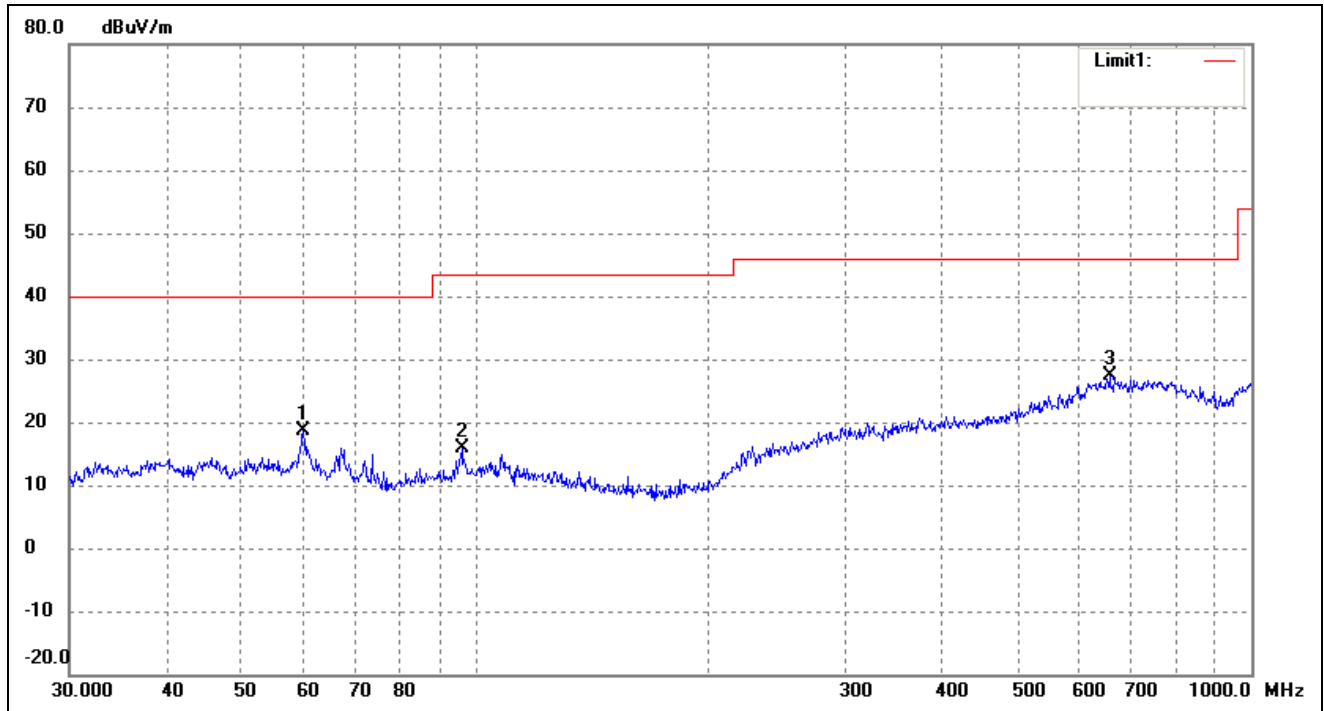
Note 18*18 is relay model HF3FF

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	44.2752	31.72	-16.49	15.23	40.00	-24.77	100	100	peak
2	60.0691	31.06	-16.52	14.54	40.00	-25.46	178	100	peak
3	117.3603	30.28	-16.65	13.63	43.50	-29.87	68	100	peak

Test Specification: Vertical



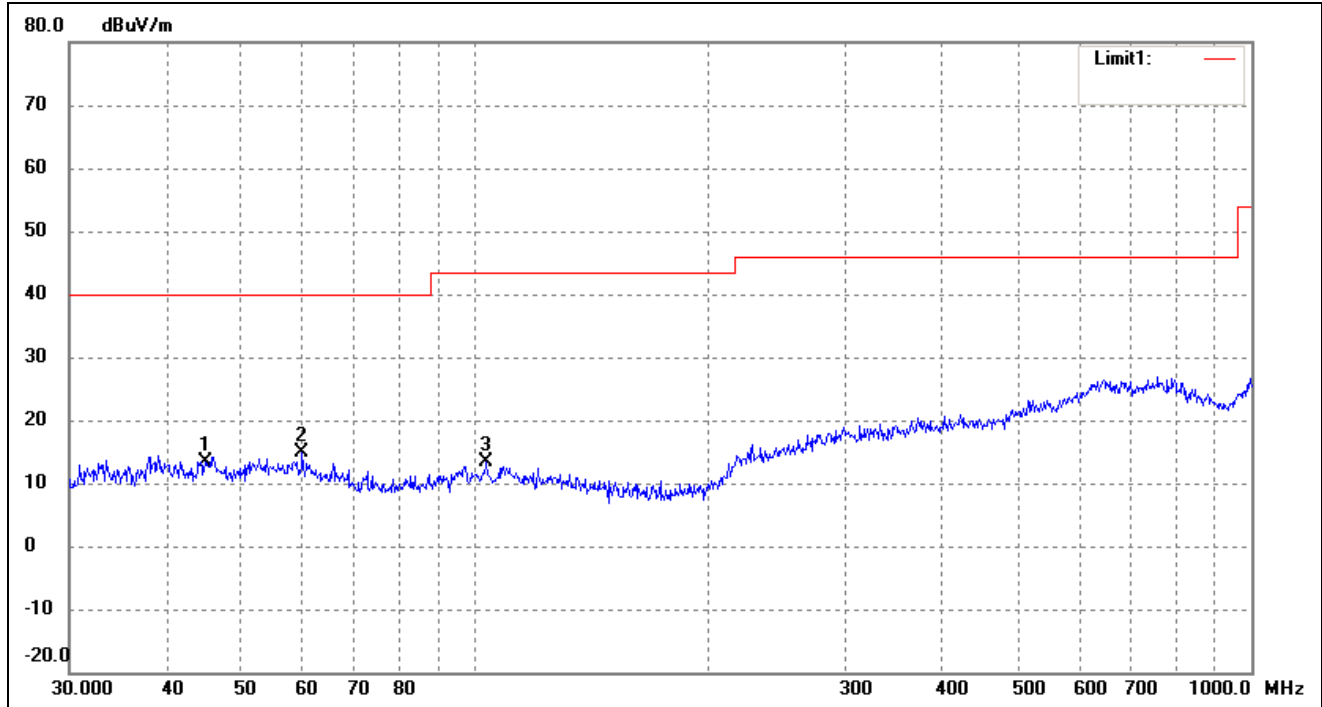
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	60.0691	35.04	-16.52	18.52	40.00	-21.48	253	100	peak
2	96.0986	32.95	-17.14	15.81	43.50	-27.69	174	100	peak
3	656.5300	28.86	-1.41	27.45	46.00	-18.55	99	100	peak

Operating Condition: Transmitting High Channel (2480MHz)

Comment: DC 30V

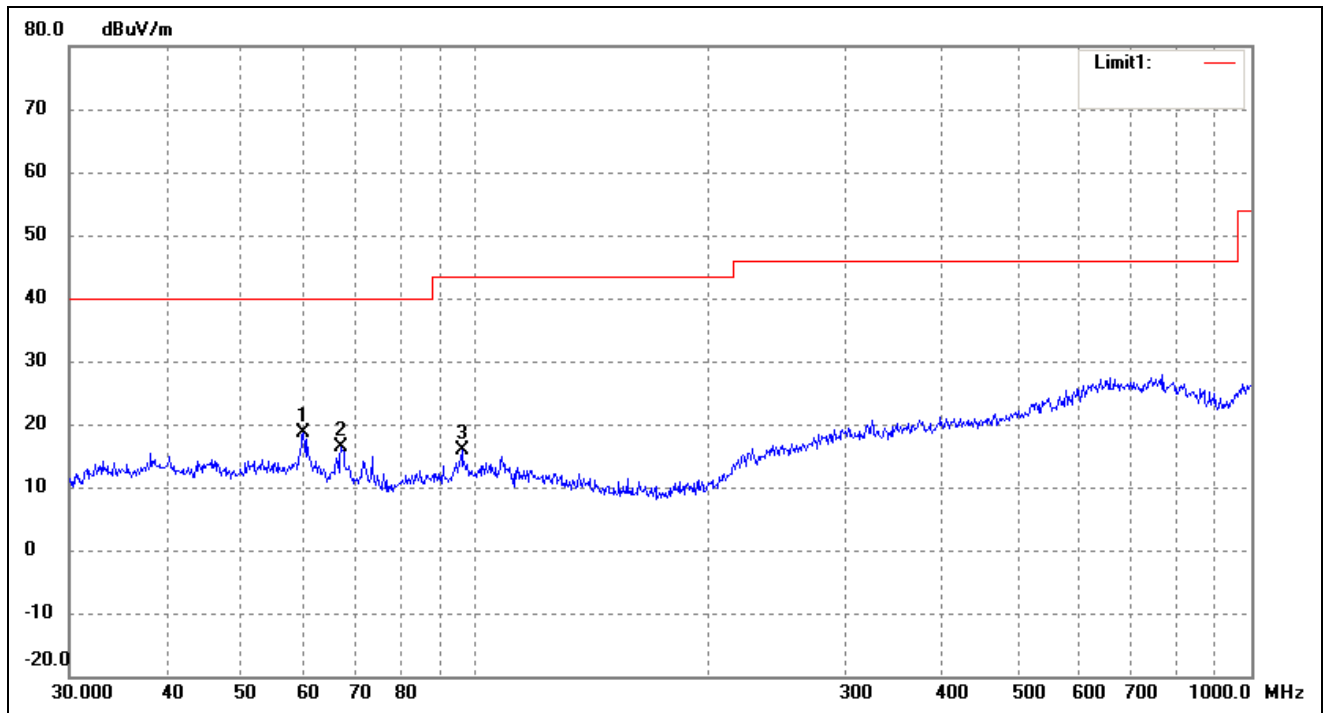
Note 18*18 is relay model HF3FF

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	44.9006	29.95	-16.48	13.47	40.00	-26.53	126	100	peak
2	59.8588	31.27	-16.51	14.76	40.00	-25.24	204	100	peak
3	103.4421	30.08	-16.59	13.49	43.50	-30.01	60	100	peak

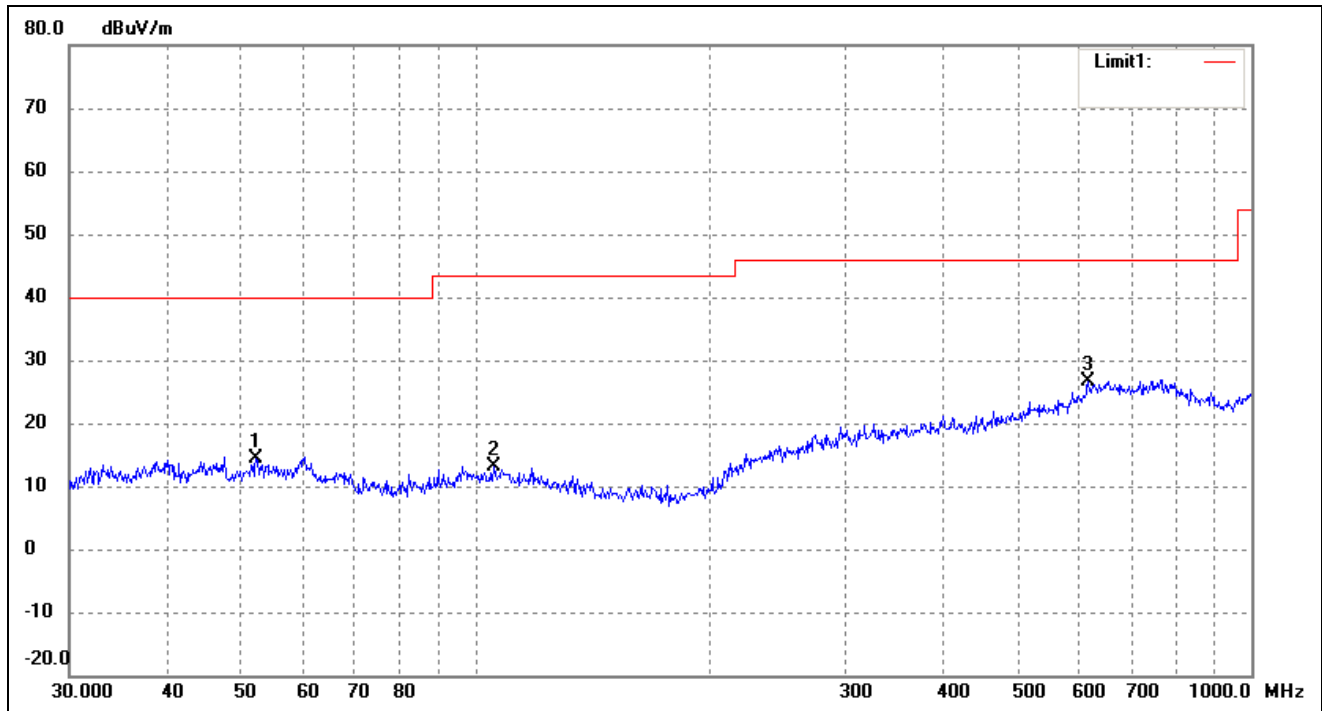
Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	60.0691	35.04	-16.52	18.52	40.00	-21.48	264	100	peak
2	67.2022	34.54	-18.08	16.46	40.00	-23.54	92	100	peak
3	96.0986	32.95	-17.14	15.81	43.50	-27.69	51	100	peak

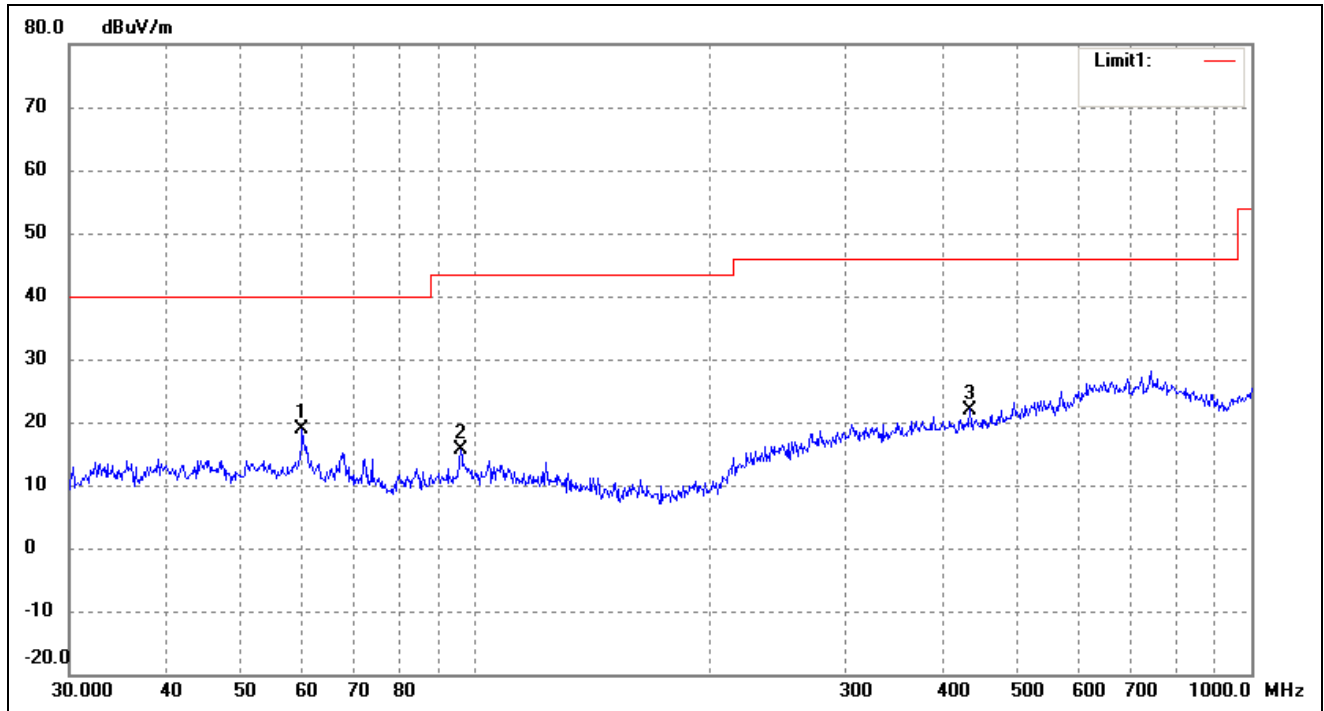
Plot of Radiated Emissions Test Data (30MHz to 1GHz)

EUT: REMOTE CONTROL ECO
 Tested Model: RF151A
 Operating Condition: Transmitting Low Channel (2403MHz)
 Comment: DC 30V
 Note: 18*24 is relay model SRD-24VDC-SL-C
 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	52.2079	30.76	-16.50	14.26	40.00	-25.74	259	100	peak
2	105.6415	29.80	-16.61	13.19	43.50	-30.31	92	100	peak
3	616.3718	28.11	-1.43	26.68	46.00	-19.32	124	100	peak

Test Specification: Vertical



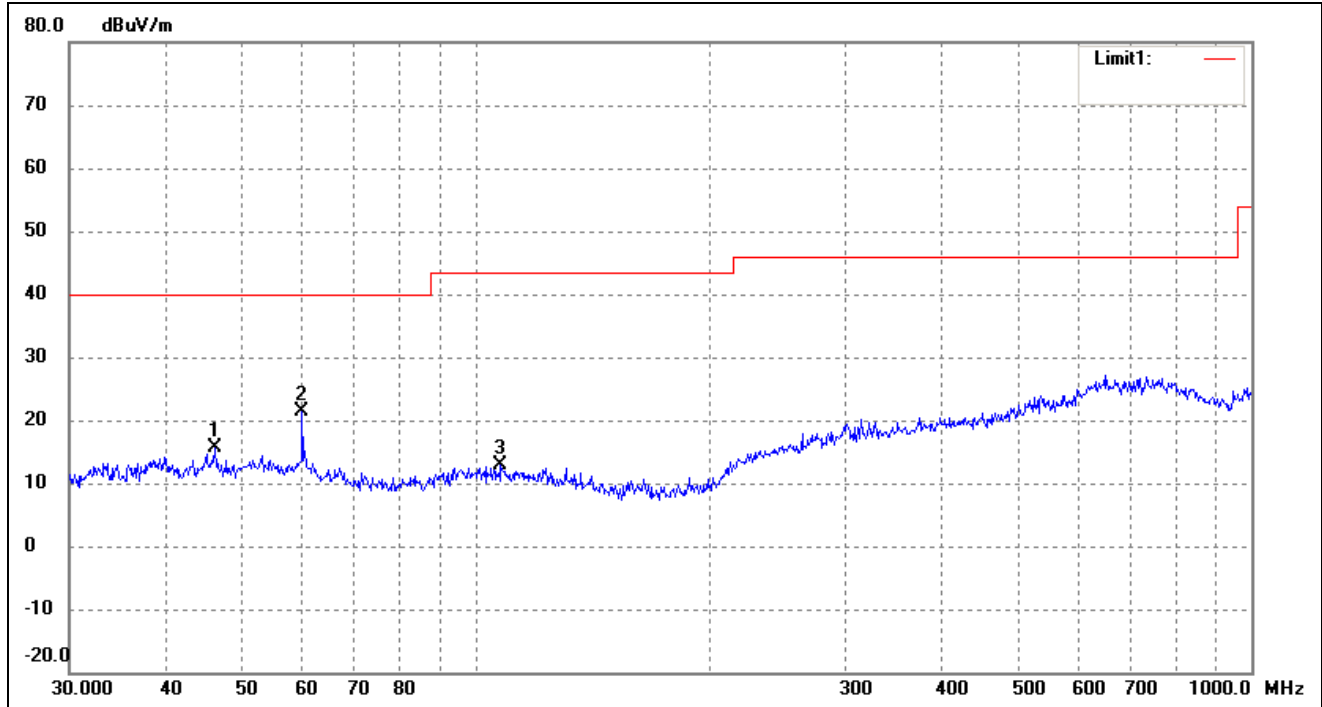
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	59.8588	35.36	-16.51	18.85	40.00	-21.15	357	100	peak
2	95.7622	32.74	-17.19	15.55	43.50	-27.95	94	100	peak
3	434.0651	29.74	-7.74	22.00	46.00	-24.00	312	100	peak

Operating Condition: Transmitting Middle Channel (2440MHz)

Comment: DC 30V

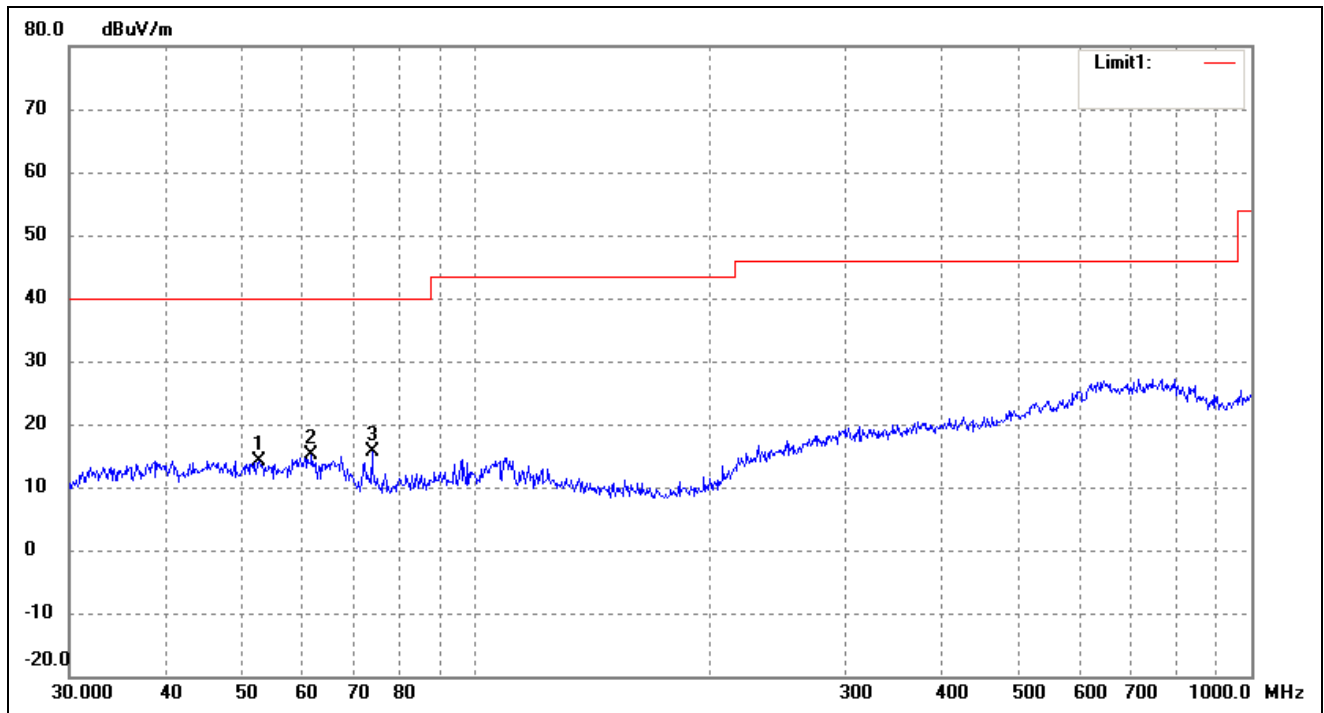
Note 18*24 is relay model SRD-24VDC-SL-C

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	46.1780	32.08	-16.49	15.59	40.00	-24.41	166	100	peak
2	59.8588	37.99	-16.51	21.48	40.00	-18.52	238	100	peak
3	107.8877	29.57	-16.61	12.96	43.50	-30.54	69	100	peak

Test Specification: Vertical



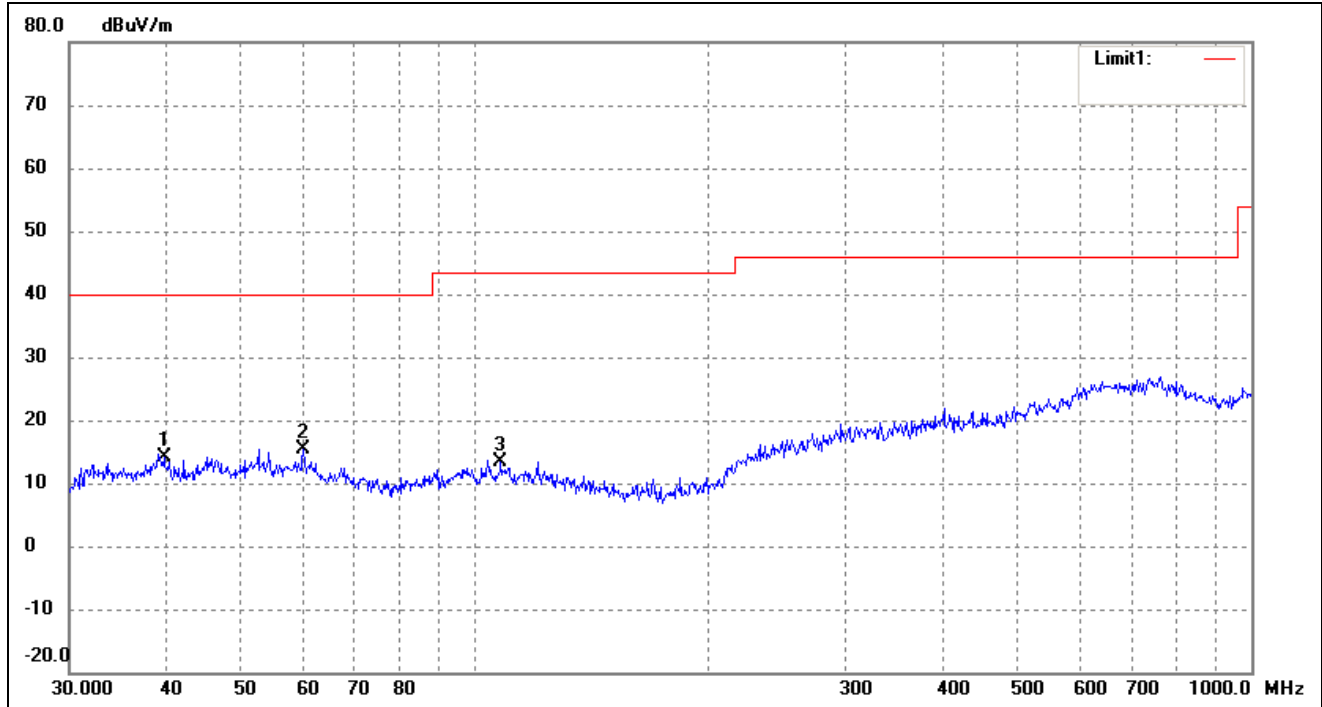
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	52.7600	30.60	-16.48	14.12	40.00	-25.88	67	100	peak
2	61.5618	31.84	-16.83	15.01	40.00	-24.99	186	100	peak
3	73.6170	34.75	-19.13	15.62	40.00	-24.38	115	100	peak

Operating Condition: Transmitting High Channel (2480MHz)

Comment: DC 30V

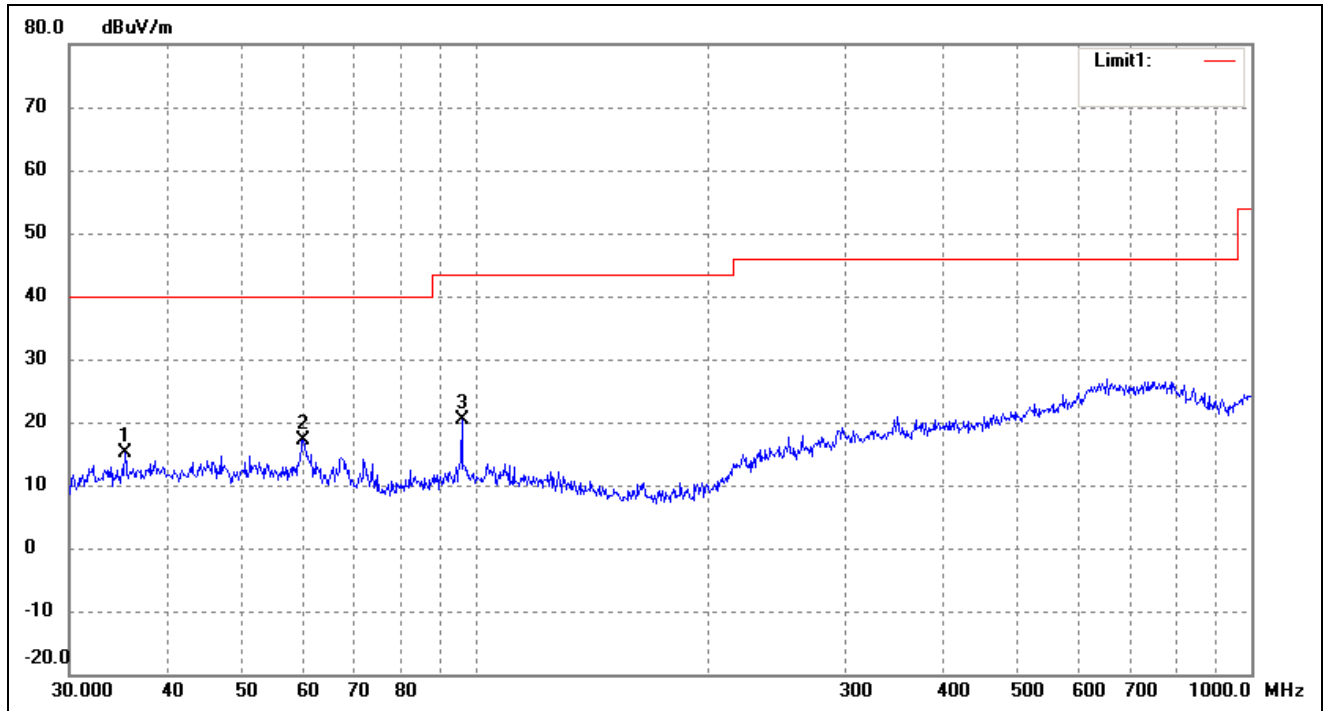
Note 18*24 is relay model SRD-24VDC-SL-C

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	39.7147	30.81	-16.57	14.24	40.00	-25.76	144	100	peak
2	60.0691	31.79	-16.52	15.27	40.00	-24.73	336	100	peak
3	107.8877	30.10	-16.61	13.49	43.50	-30.01	72	100	peak

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	35.3750	32.29	-17.26	15.03	40.00	-24.97	87	100	peak
2	60.0691	33.70	-16.52	17.18	40.00	-22.82	118	100	peak
3	96.0986	37.43	-17.14	20.29	43.50	-23.21	73	100	peak

Spurious Emissions Above 1GHz

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2403MHz							
2403.000	84.04	-3.51	80.53	114	-33.47	H	PK
2403.000	74.45	-3.51	70.94	94	-23.06	H	AV
4806.000	44.06	0.54	44.60	74	-29.40	H	PK
4806.000	32.36	0.54	32.90	54	-21.10	H	AV
7209.000	35.33	3.67	39.00	74	-35.00	H	PK
7209.000	23.50	3.67	27.17	54	-26.83	H	AV
2403.000	84.04	-3.51	80.53	114	-33.47	V	PK
2403.000	76.90	-3.51	73.39	94	-20.61	V	AV
4806.000	46.14	0.54	46.68	74	-27.32	V	PK
4806.000	31.74	0.54	32.28	54	-21.72	V	AV
7209.000	34.43	3.67	38.10	74	-35.90	V	PK
7209.000	23.06	3.67	26.73	54	-27.27	V	AV
Middle Channel-2440MHz							
2440.000	84.03	-3.43	80.60	114	-33.4	H	PK
2440.000	73.71	-3.43	70.28	94	-23.72	H	AV
4880.000	45.68	0.65	46.33	74	-27.67	H	PK
4880.000	31.60	0.65	32.25	54	-21.75	H	AV
7320.000	38.46	3.75	42.21	74	-31.79	H	PK
7320.000	25.75	3.75	29.50	54	-24.50	H	AV
2440.000	84.03	-3.43	80.60	114	-33.4	V	PK
2440.000	76.33	-3.43	72.90	94	-21.1	V	AV
4880.000	47.12	0.65	47.77	74	-26.23	V	PK
4880.000	31.77	0.65	32.42	54	-21.58	V	AV
7320.000	38.29	3.75	42.04	74	-31.96	V	PK
7320.000	25.83	3.75	29.58	54	-24.42	V	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2480MHz							
2480.000	84.00	-3.33	80.67	114	-33.33	H	PK
2480.000	73.78	-3.33	70.45	94	-23.55	H	AV
4960.000	42.79	0.77	43.56	74	-30.44	H	PK
4960.000	31.01	0.77	31.78	54	-22.22	H	AV
7440.000	37.15	3.85	41.00	74	-33.00	H	PK
7440.000	26.35	3.85	30.20	54	-23.80	H	AV
2480.000	84.00	-3.33	80.67	114	-33.33	V	PK
2480.000	75.99	-3.33	72.66	94	-21.34	V	AV
4960.000	42.67	0.77	43.44	74	-30.56	V	PK
4960.000	31.14	0.77	31.91	54	-22.09	V	AV
7440.000	36.78	3.85	40.63	74	-33.37	V	PK
7440.000	26.24	3.85	30.09	54	-23.91	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

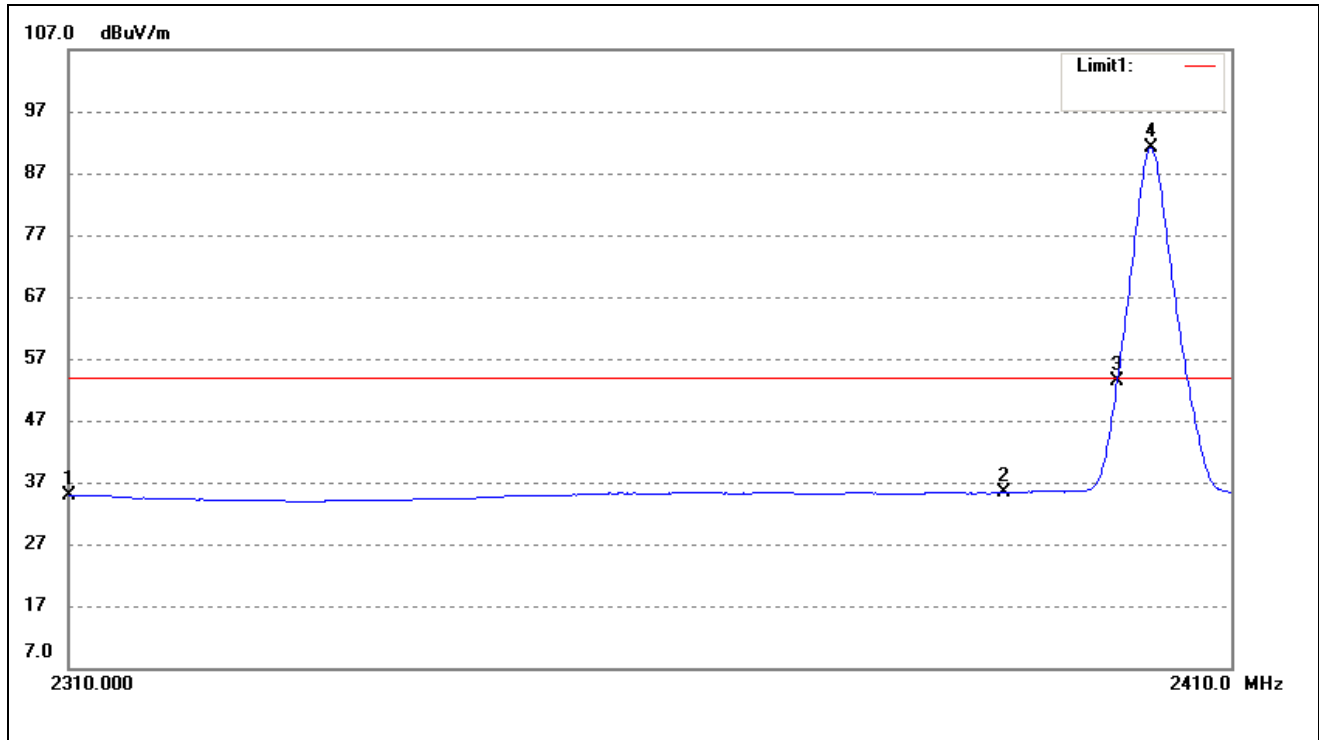
5.4 Summary of Test Results/Plots

Test mode	Frequency	Limit	Result
	MHz	dBuV / dBc	
Lowest	2310.00	<54 dBuV	Pass
	2390.00	<54 dBuV	Pass
	2400.00	<54 dBuV	Pass
Highest	2483.50	<54 dBuV	Pass
	2500.00	<54 dBuV	Pass

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

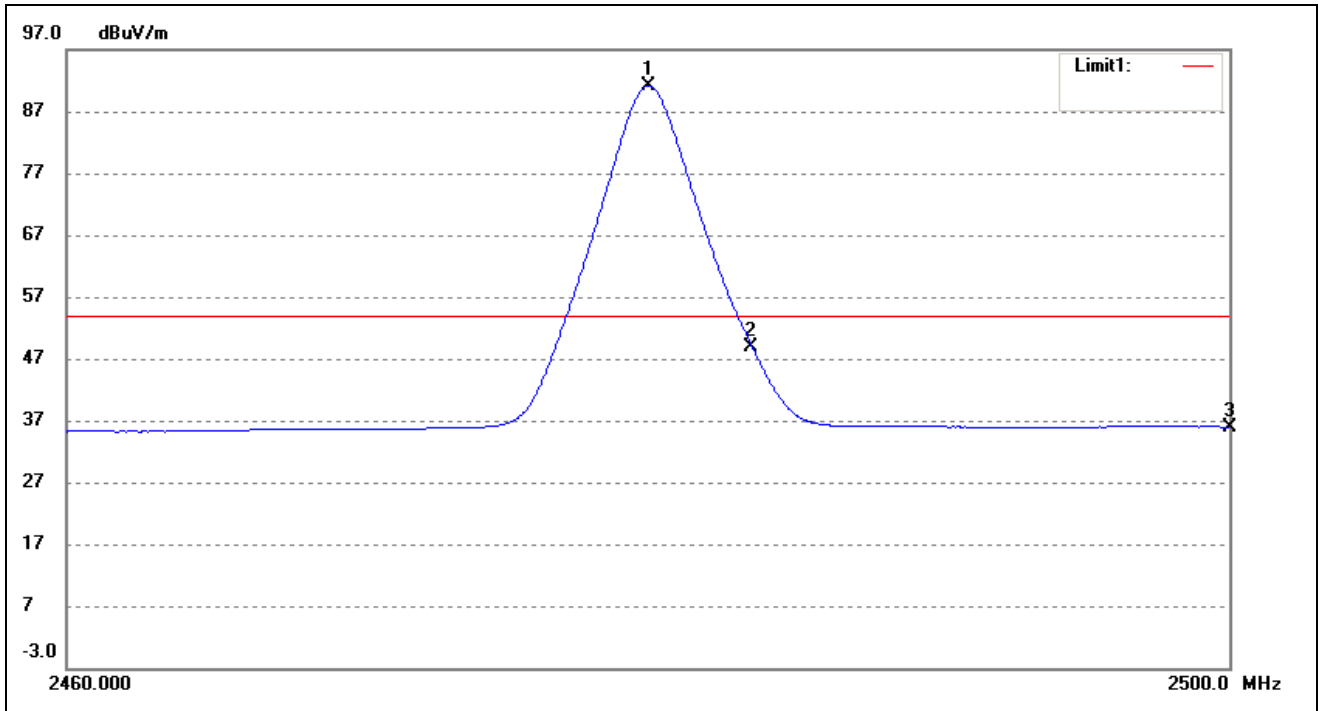
Please refer to the test plots as below.

Lowest Bandedge
Horizontal (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	18.57	16.34	34.91	54.00	-19.09	Ave Detector
	2310.000	31.57	16.34	47.91	74.00	-26.09	Peak Detector
2	2390.000	18.27	17.03	35.30	54.00	-18.70	Ave Detector
	2390.000	30.72	17.03	47.75	74.00	-26.25	Peak Detector
3	2400.000	36.39	17.11	53.50	54.00	-0.50	Ave Detector
	2400.000	39.31	17.11	56.42	74.00	-17.58	Peak Detector

Highest Bandedge
Horizontal (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2	2483.500	31.15	17.73	48.88	54.00	-5.12	Ave Detector
	2483.500	35.20	17.73	52.93	74.00	-21.07	Peak Detector
3	2500.000	18.15	17.85	36.00	54.00	-18.00	Ave Detector
	2500.000	30.52	17.86	48.38	74.00	-25.62	Peak Detector

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 $\geq$ 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.

6.3 Environmental Conditions

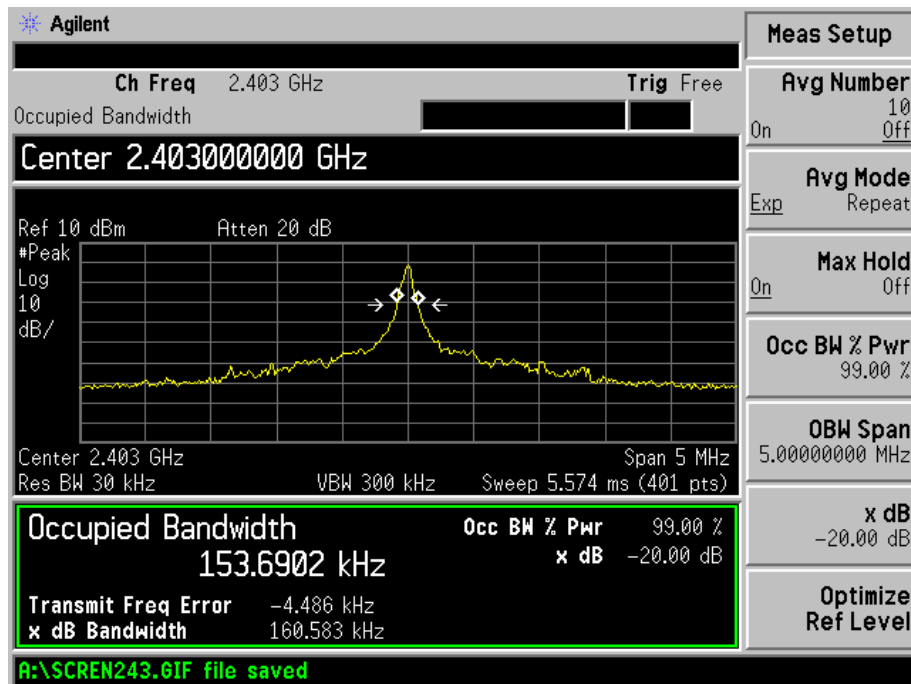
Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.4 Summary of Test Results/Plots

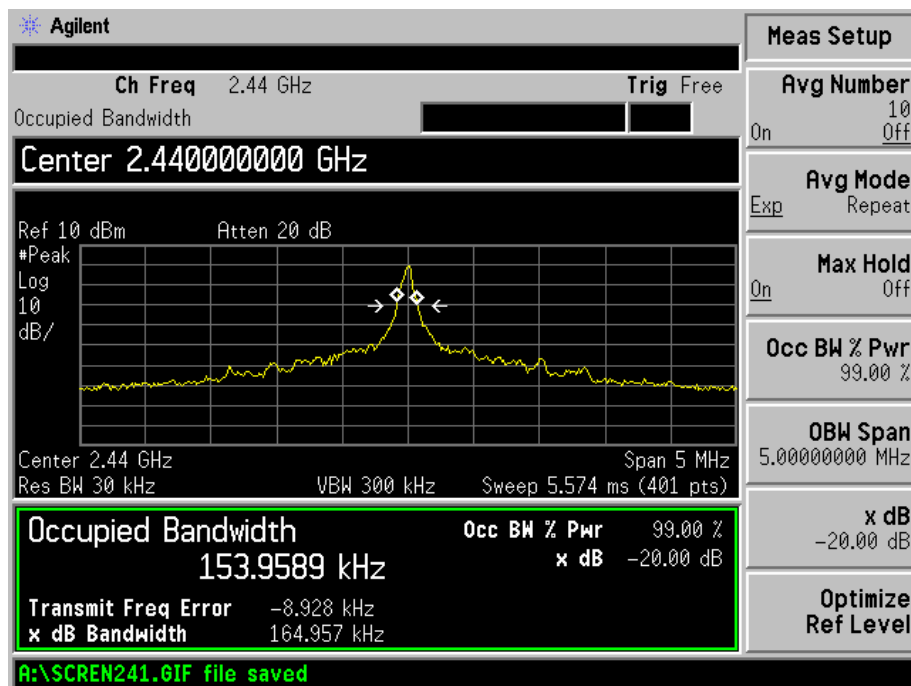
Channel	Frequency MHz	20dB Bandwidth kHz	99% Bandwidth kHz
Low Channel	2403	160.583	153.6902
Middle Channel	2440	164.957	153.9589
High Channel	2479	177.731	163.5885

Please refer to the following test plots

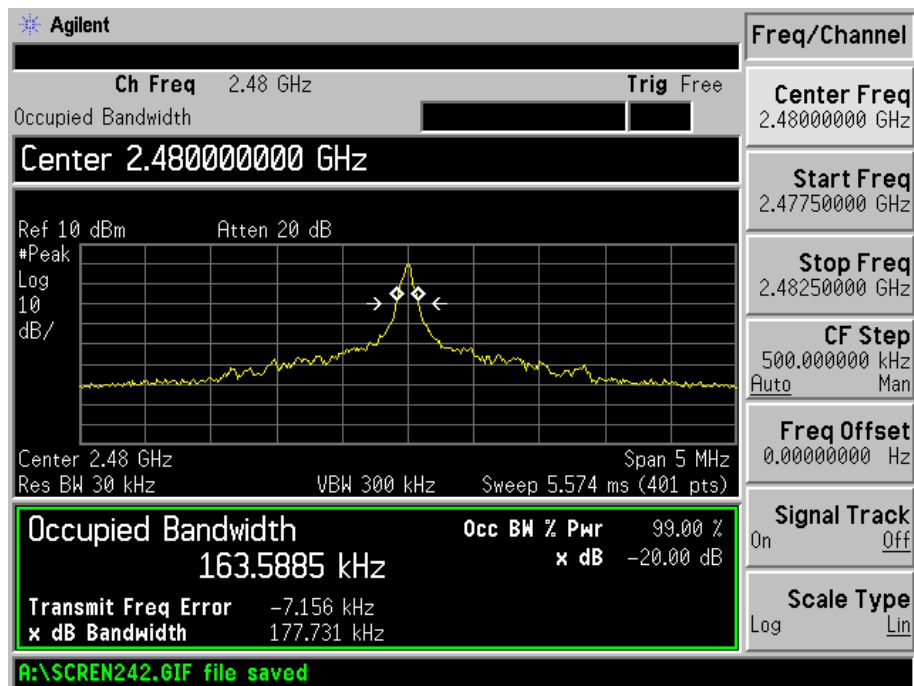
Low Channel:



Middle Channel:



High Channel:



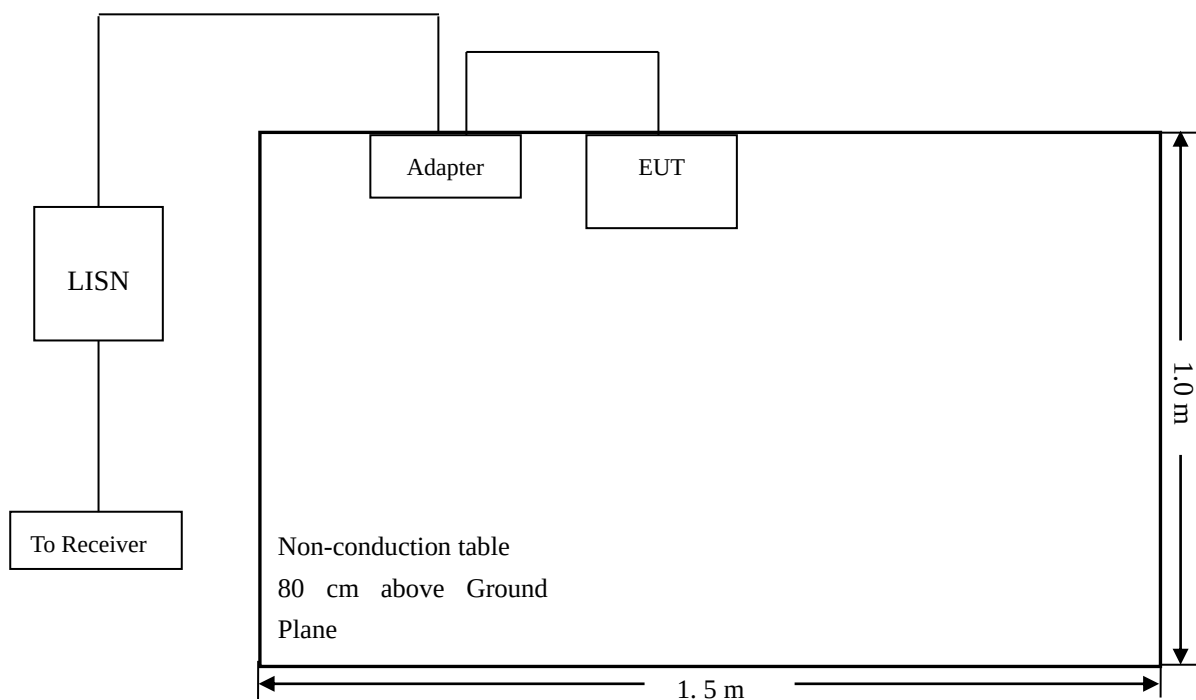
7. Conducted Emissions

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

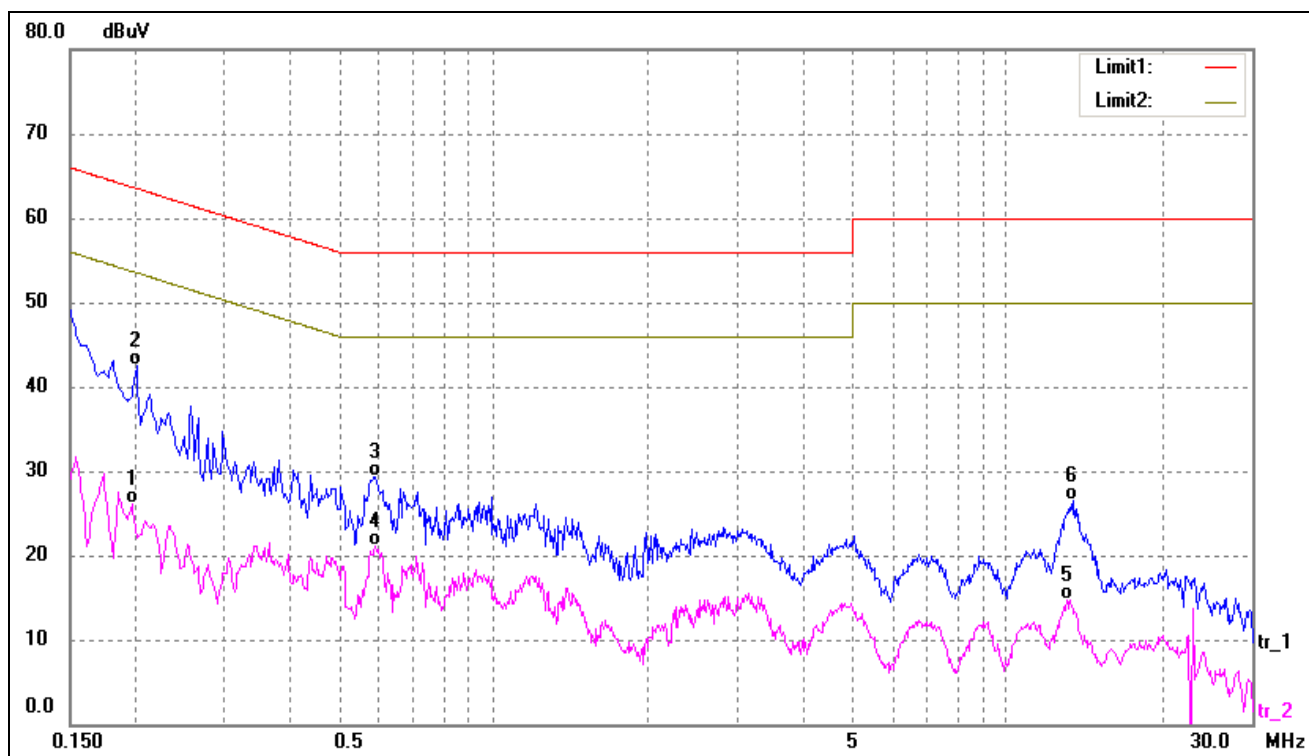
According to the data in section 7.6, the EUT complied with the FCC Part 15.207 Conducted margin for this device, with the *worst* margin reading of:

-20.74 dB at 0.1940 MHz in the Line mode, QP detector, relay model HF3FF, 0.15-30MHz

7.6 Conducted Emissions Test Data

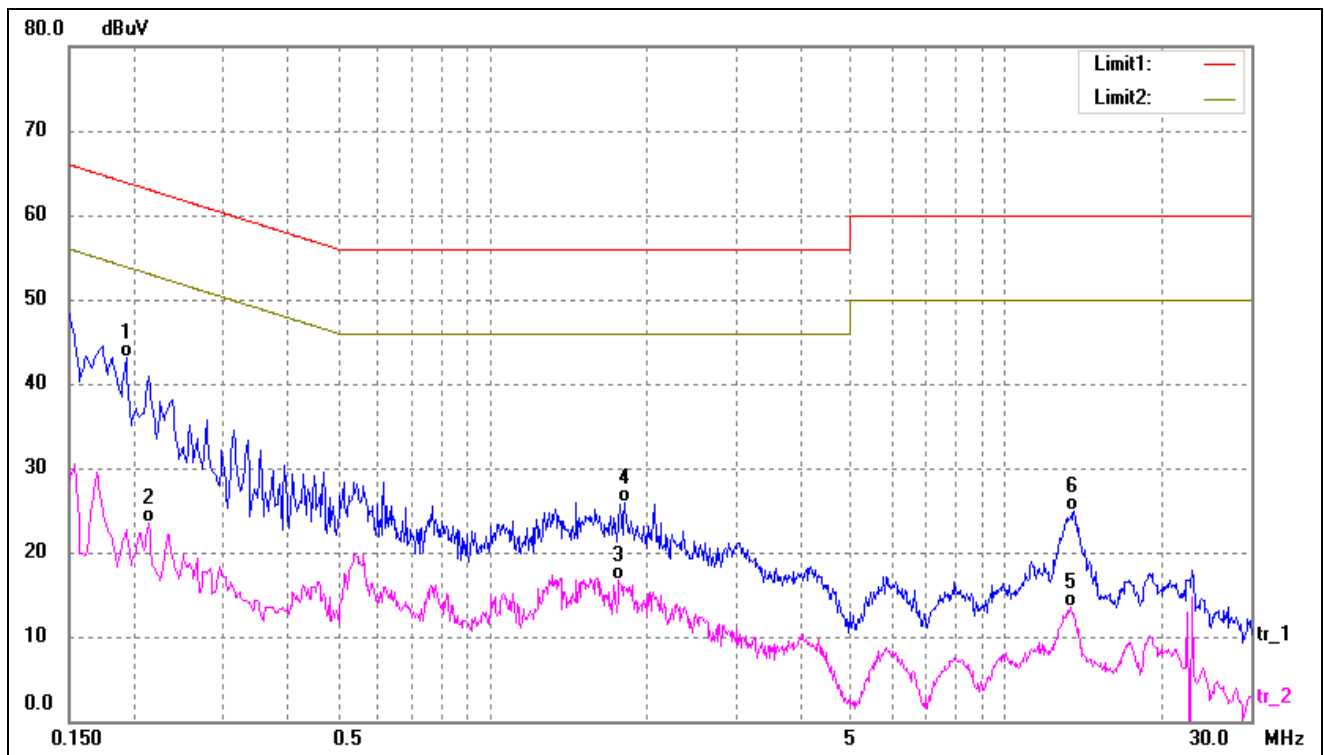
Plot of Conducted Emissions Test Data

EUT: REMOTE CONTROL ECO
 Tested Model: RF151A
 Operating Condition: Transmitting
 Comment: AC 120V/60Hz; DC Power supply DC 30V
 Note: 18*18 is relay model HF3FF
 Test Specification: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1980	25.31	0.76	26.07	53.69	-27.62	AVG
2*	0.2020	41.74	0.76	42.50	63.53	-21.03	QP
3	0.5900	28.50	0.76	29.26	56.00	-26.74	QP
4	0.5900	20.31	0.76	21.07	46.00	-24.93	AVG
5	13.0900	13.87	0.78	14.65	50.00	-35.35	AVG
6	13.5140	25.80	0.78	26.58	60.00	-33.42	QP

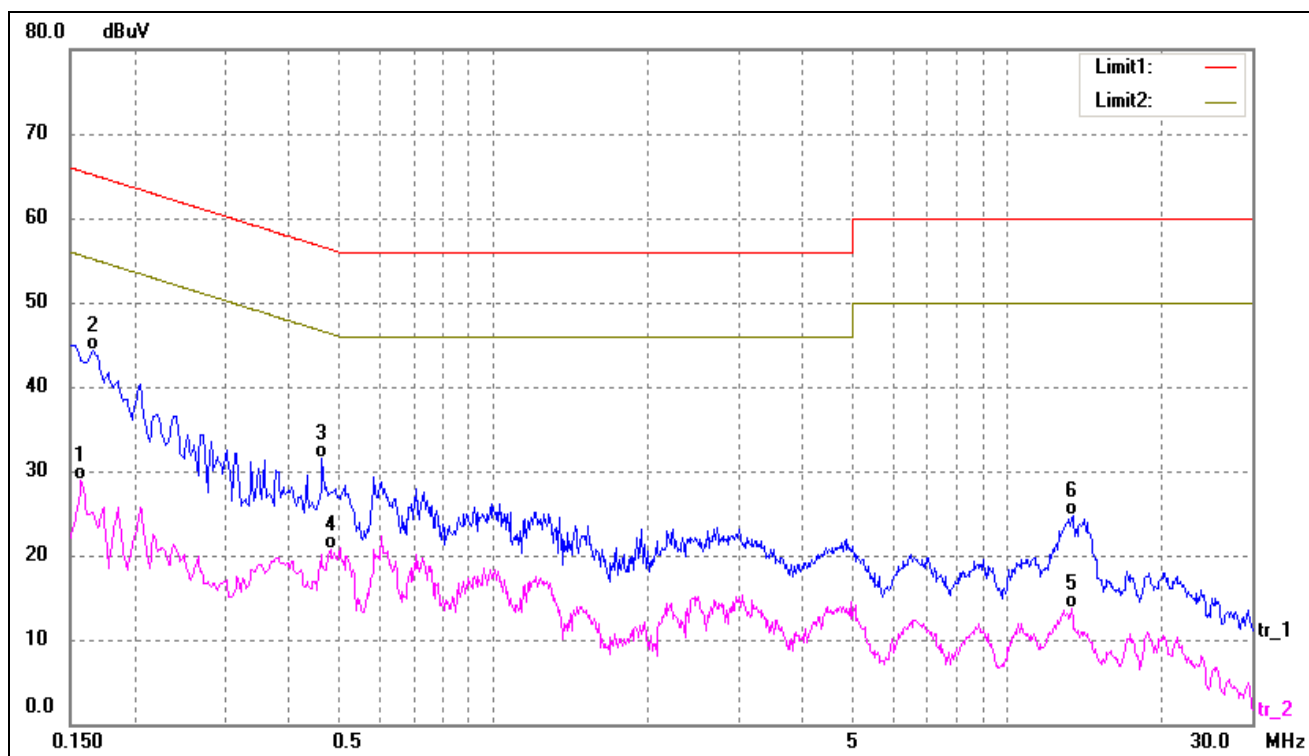
Test Specification: Line



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1*	0.1940	42.36	0.76	43.12	63.86	-20.74	QP
2	0.2140	22.67	0.76	23.43	53.05	-29.62	AVG
3	1.7700	16.01	0.76	16.77	46.00	-29.23	AVG
4	1.8180	25.11	0.76	25.87	56.00	-30.13	QP
5	13.3540	12.81	0.78	13.59	50.00	-36.41	AVG
6	13.5660	24.16	0.78	24.94	60.00	-35.06	QP

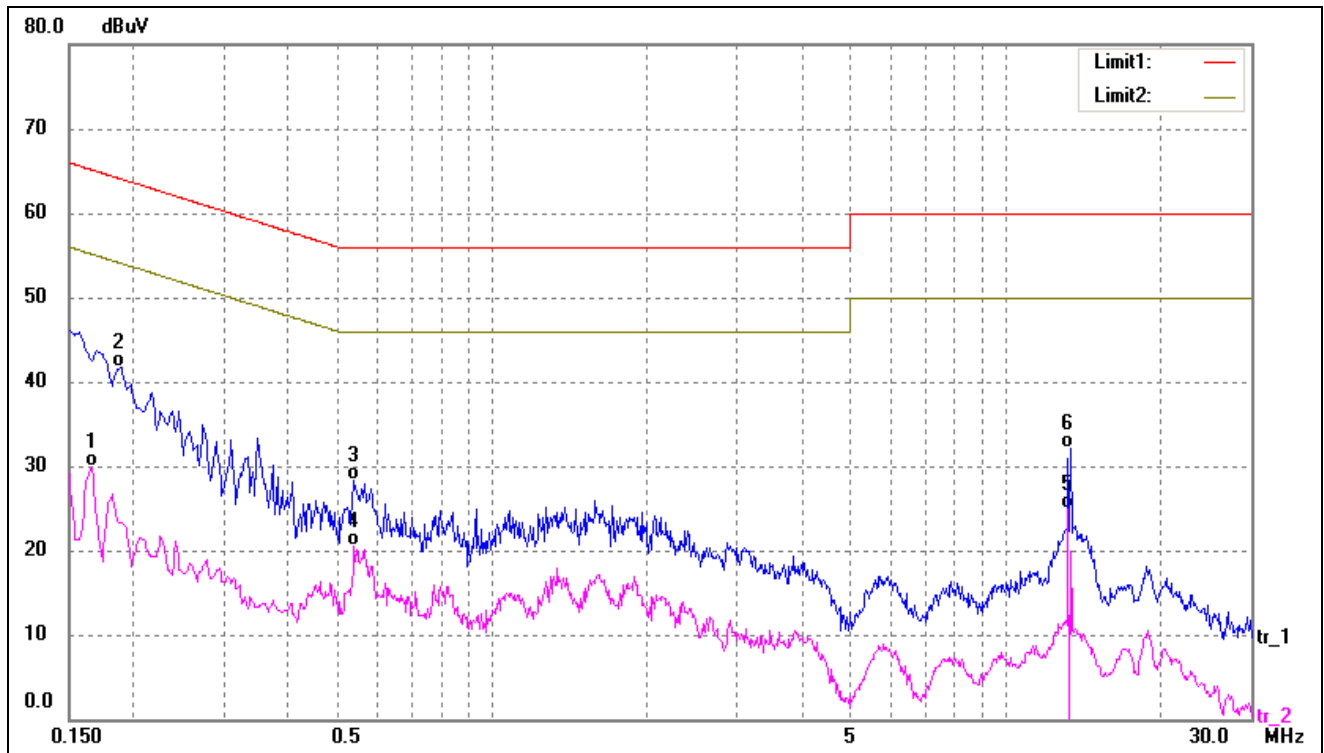
Plot of Conducted Emissions Test Data

EUT: REMOTE CONTROL ECO
 Tested Model: RF151A
 Operating Condition: Transmitting
 Comment: AC 120V/60Hz; DC Power supply DC 30V
 Note: 18*24 is relay model SRD-24VDC-SL-C
 Test Specification: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1580	28.12	0.76	28.88	55.57	-26.69	AVG
2*	0.1660	43.49	0.76	44.25	65.16	-20.91	QP
3	0.4660	30.75	0.76	31.51	56.58	-25.07	QP
4	0.4820	19.90	0.76	20.66	46.30	-25.64	AVG
5	13.3420	13.01	0.78	13.79	50.00	-36.21	AVG
6	13.4100	23.99	0.78	24.77	60.00	-35.23	QP

Test Specification: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1660	29.15	0.76	29.91	55.16	-25.25	AVG
2*	0.1900	41.04	0.76	41.80	64.04	-22.24	QP
3	0.5380	27.60	0.76	28.36	56.00	-27.64	QP
4	0.5380	19.75	0.76	20.51	46.00	-25.49	AVG
5	13.2580	24.09	0.78	24.87	50.00	-25.13	AVG
6	13.3620	31.40	0.78	32.18	60.00	-27.82	QP

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