

TEST REPORT

Reference No...... : WTX24X09214706W001
FCC ID..... : 2BLIW-VS
Applicant..... : Switched, Inc.
Address..... : 782 S River Rd, Ste 74, St. George, UT 84790
Manufacturer..... : The same as Applicant
Address..... : The same as Applicant
Product Name..... : Tool-Switch Adapter
Model No..... : VS-4301
Standards..... : **FCC PART15 SUBPART B**
Date of Receipt sample..... : 2024-09-12
Date of Test..... : 2024-09-12 to 2024-09-20
Date of Issue..... : 2024-09-20
Test Report Form No..... : WTX_FCC PART15B_001
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

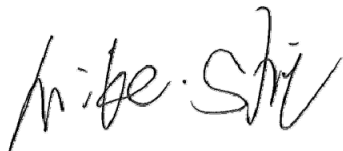
Prepared By:

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Tested by:



Mike Shi

Approved by:



Jason Su

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Report version

Version No.	Date of issue	Description
Rev.00	2024-09-20	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

General Description of EUT	
Product Name:	Tool-Switch Adapter
Trade Name:	/
Model No.:	VS-4301
Adding Model(s):	VS-4201, VS-4401
<i>Note: The test data is gathered from a production sample, provided by the manufacturer. All three models have the same exact PCB. VS-4301 is only a BLE transmitter; VS-4201 is only a BLE receiver; VS-4401 is only a BLE transmitter (internals same exactly as VS-4301 device; re-branded as normally close (NC) vs normally open (NO) for the mechanical relay of the VS-4201).</i>	

Technical Characteristics of EUT	
Rated Voltage:	120VAC-240VAC
Battery Capacity:	/
Rated Power:	/
Power Adapter Model:	/
Lowest Internal Frequency:	32.768kHz
Highest Internal Frequency:	2480MHz
Classification of ITE:	Class B

1.2 Test Standards

The tests were performed according to following standards:

FCC Rules Part 15 Subpart B:Unintentional Radiators.

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.

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

Address of the test laboratory

Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.

Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

FCC – Registration No.: 125990

Waltek Testing Group (Shenzhen) 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. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Waltek Testing Group (Shenzhen) 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 Operation Mode

The equipment under test (EUT) was configured to measure its highest possible emission. The test modes were provided by the manufacturer, more detailed description as follows:

Test Mode List			
Test Mode	Description	Remark	Power Supply Mode
TM1	Normal working	Powered by AC120/60Hz Voltage.	AC120V

EUT Cable List and Details				
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite	With / Without Chip
/	/	/	/	/

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

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Conducted Emissions	Conducted	9-150kHz ±3.74dB
		0.15-30MHz ±3.34dB
Radiated Emissions	Radiated	30-200MHz ±4.52dB
		0.2-1GHz ±5.56dB
		1-6GHz ±3.84dB
		6-18GHz ±3.92dB

1.7 Test Equipment List and Details

Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
☐ Chamber A:Below 1GHz					
Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2024-02-24	2025-02-23
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2024-03-19	2025-03-18
Amplifier	HP	8447F	2805A03475	2024-02-24	2025-02-23
Loop Antenna	Schwarz beck	FMZB 1516	9773	2024-02-26	2025-02-25
Trilog Broadband Antenna	Schwarz beck	VULB9163	9163-333	2024-02-24	2025-02-23
Coaxial Cable	/	RC_6G-N-M	/	2024-03-15	2025-03-14
Coaxial Cable	/	RC_6G-N-M	/	2024-03-15	2025-03-14
Coaxial Cable	/	RC_6G-N-M	/	2024-03-15	2025-03-14
☐ Chamber A:Above 1GHz					
Amplifier	C&D	PAP-1G18	2002	2024-02-27	2025-02-26
Horn Antenna	ETS	3117	00086197	2024-02-26	2025-02-25
Coaxial Cable	/	C16-07-07	/	2024-03-15	2025-03-14
Coaxial Cable	/	C16-07-07	/	2024-03-15	2025-03-14
Coaxial Cable	/	C16-07-07	/	2024-03-15	2025-03-14
☐ Chamber B:Below 1GHz					
EMI Test Receiver	Rohde & Schwarz	ESPI	101391	2024-02-24	2025-02-23
Trilog Broadband Antenna	Schwarz beck	VULB9163(B)	9163-635	2024-03-17	2027-03-16
Amplifier	Agilent	8447D	2944A10457	2024-02-24	2025-02-23
Coaxial Cable	/	1.5MRFC-LWB3	/	2024-07-03	2025-07-02
Coaxial Cable	/	RG 316	/	2024-07-03	2025-07-02
Coaxial Cable	/	RG 316	/	2024-07-03	2025-07-02
☒ Chamber C:Below 1GHz					
EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2024-02-27	2025-02-26
Trilog Broadband Antenna	Schwarz beck	VULB 9168	1194	2024-04-18	2027-04-17
Loop Antenna	Schwarz beck	FMZB 1516	9773	2024-02-26	2025-02-25
Amplifier	HP	8447F	2944A03869	2024-02-24	2025-02-23
Coaxial Cable	/	RC_6G-N-M	/	2024-07-03	2025-07-02
Coaxial Cable	/	RC_6G-N-M	/	2024-07-03	2025-07-02
Coaxial Cable	/	RC_6G-N-M	/	2024-07-03	2025-07-02
☒ Chamber C:Above 1GHz					

EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2024-02-27	2025-02-26
Horn Antenna	POAM	RTF-118A	1820	2023-03-10	2026-03-09
Amplifier	Tonscend	TAP010180 50	AP22E80623 5	2024-02-27	2025-02-26
DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2024-03-17	2025-03-16
Pre-amplifier	Schwarzbeck	BBV 9721	9721-031	2024-02-29	2025-02-28
Coaxial Cable	/	RC-18G-N- M	/	2024-07-03	2025-07-02
Coaxial Cable	/	RC-18G-N- M	/	2024-07-03	2025-07-02
Coaxial Cable	/	RC-18G-N- M	/	2024-07-03	2025-07-02
☐ Conducted Room 1#					
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2024-02-24	2025-02-23
EMI Test Receiver	Rohde & Schwarz	ESCI	100525	2023-12-12	2024-12-11
AC LISN	Schwarz beck	NSLK8126	8126-279	2024-02-24	2025-02-23
Coaxial Cable	/	RG 316	/	2024-07-03	2025-07-02
Coaxial Cable	/	6MRFC-DP	/	2024-07-03	2025-07-02
☒ Conducted Room 2#					
EMI Test Receiver	Rohde & Schwarz	ESPI	101259	2024-02-24	2025-02-23
LISN	Rohde & Schwarz	ENV 216	100097	2024-02-24	2025-02-23
Coaxial Cable	/	RG 316	/	2024-07-03	2025-07-02

Software List			
Description	Manufacturer	Model	Version
EMI Test Software (Radiated Emission A)	Farad	EZ-EMC	RA-03A1 (1.1.4.2)
EMI Test Software (Radiated Emission B)	Farad	EZ-EMC	RA-03A1 (1.1.4.2)
EMI Test Software (Radiated Emission C)	Farad	EZ-EMC	RA-03A1-2 (1.1.4.2)
EMI Test Software (Conducted Emission Room 1#)	Farad	EZ-EMC	3A1*CE-RE 1.1.4.3
EMI Test Software (Conducted Emission Room 2#)	Farad	EZ-EMC	3A1*CE-RE 1.1.4.3

*Remark: indicates software version used in the compliance certification testing.

2. SUMMARY OF TEST RESULTS

Description of Test	Result
§15.107(a) Conducted Emission	Compliant
§15.109(a) Radiated Emission	Compliant

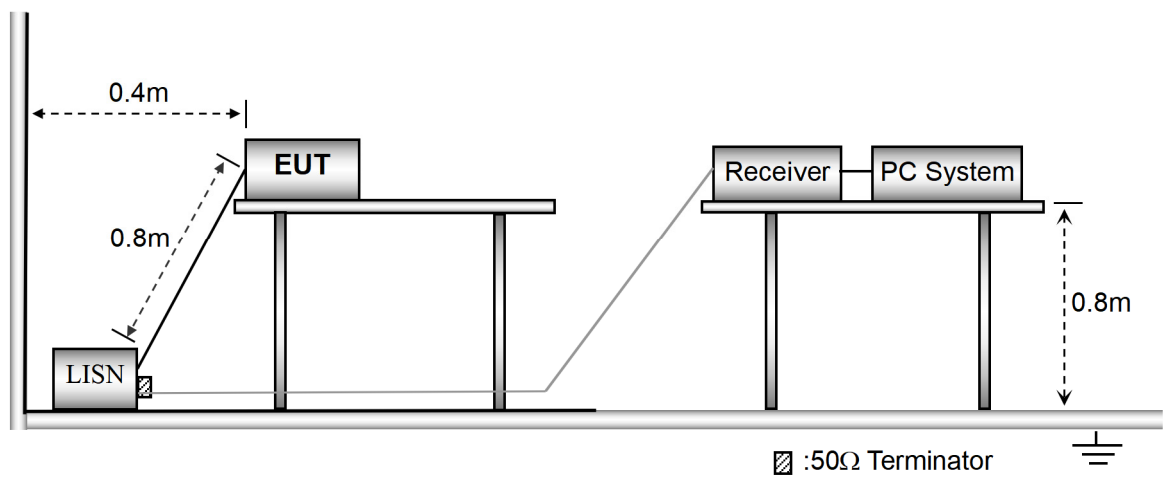
N/A: not applicable

3. CONDUCTED EMISSIONS

3.1 Test Procedure

The test is conducted 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



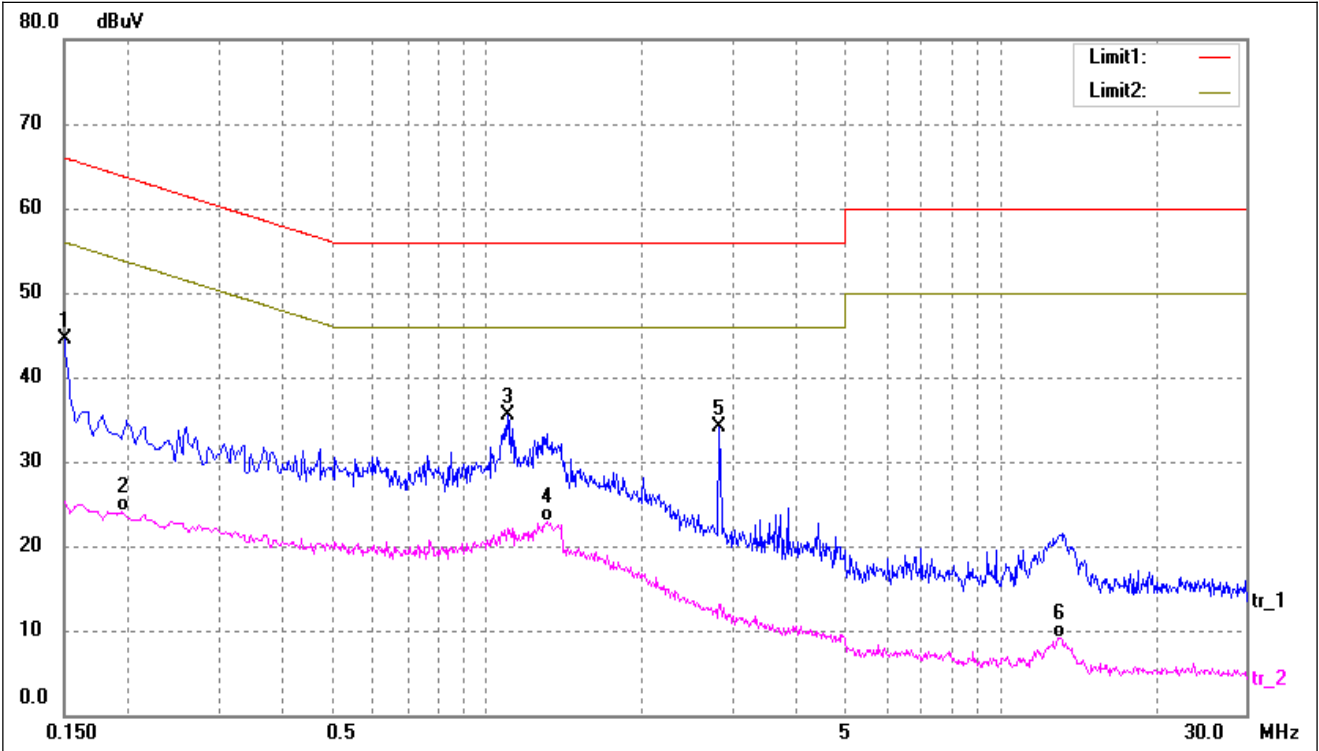
3.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	45 %
ATM Pressure:	1014 mbar

3.4 Summary of Test Results

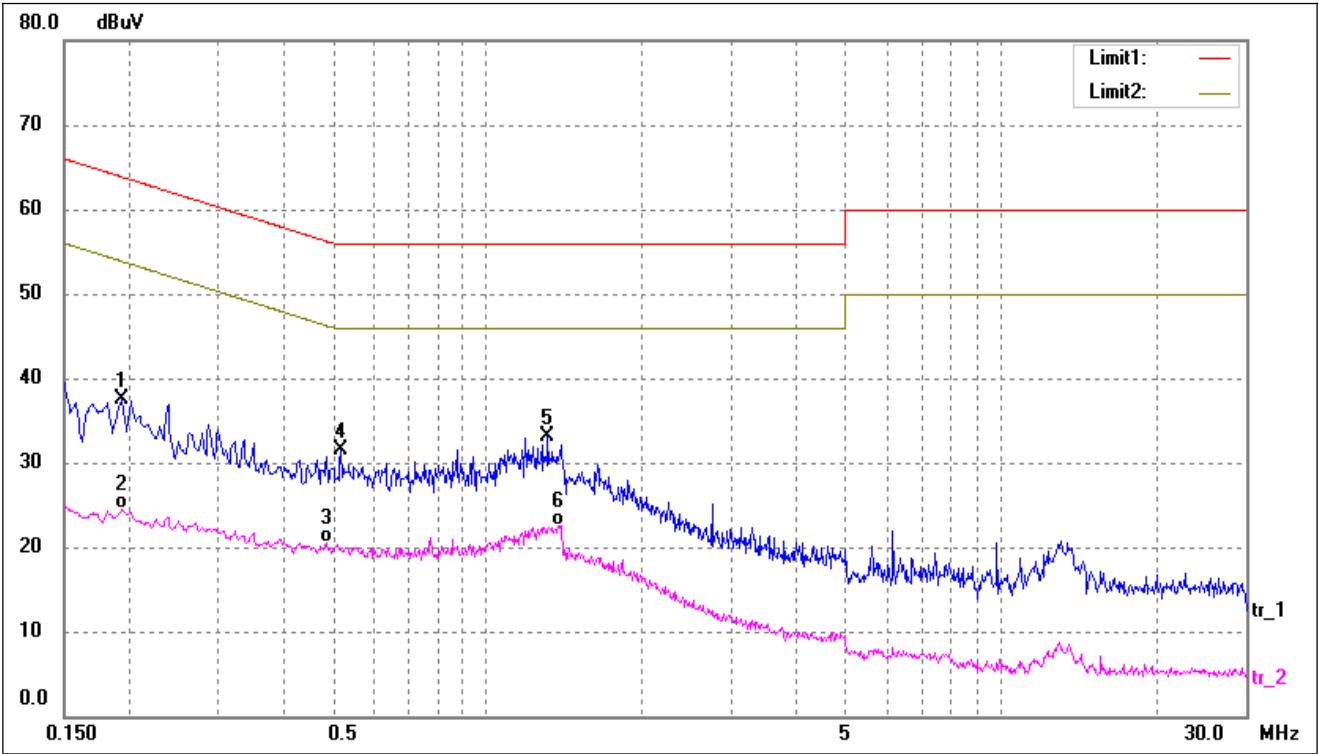
Please find the results below:

Test mode:	TM1	Polarity:	Line
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1500	34.82	9.77	44.59	66.00	-21.41	peak
2	0.1940	14.43	9.59	24.02	53.86	-29.84	AVG
3*	1.0980	25.82	9.67	35.49	56.00	-20.51	peak
4	1.3100	13.26	9.65	22.91	46.00	-23.09	AVG
5	2.8380	24.55	9.62	34.17	56.00	-21.83	peak
6	13.0180	-0.80	9.92	9.12	50.00	-40.88	AVG

Test mode:	TM1	Polarity:	Neutral
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1940	27.89	9.59	37.48	63.86	-26.38	peak
2	0.1940	14.88	9.59	24.47	53.86	-29.39	AVG
3	0.4860	10.74	9.73	20.47	46.24	-25.77	AVG
4	0.5180	21.83	9.74	31.57	56.00	-24.43	peak
5*	1.3100	23.44	9.65	33.09	56.00	-22.91	peak
6	1.3780	12.85	9.65	22.50	46.00	-23.50	AVG

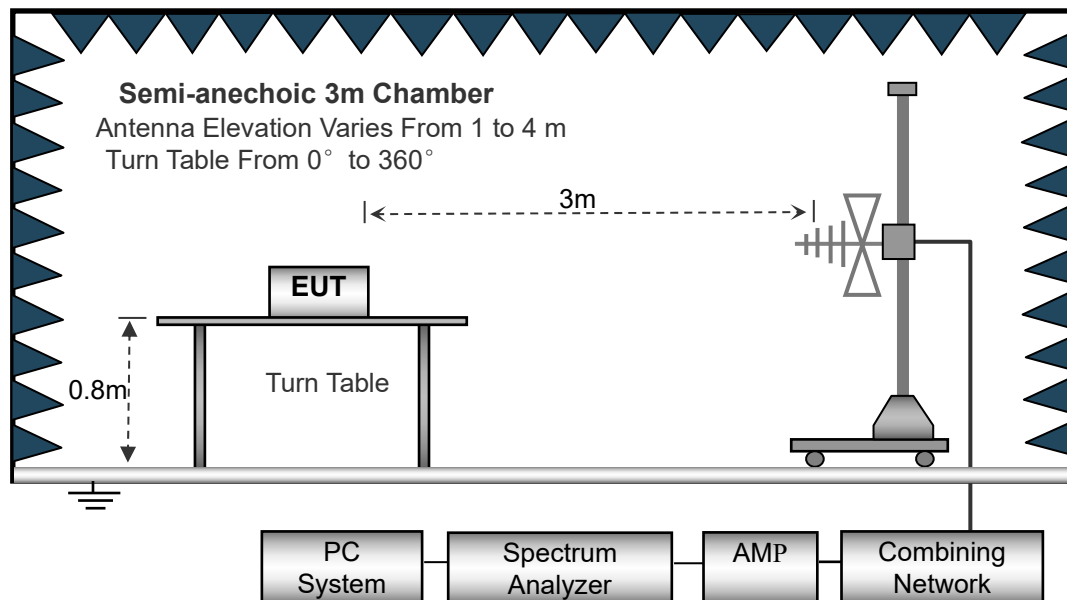
4. RADIATED EMISSION

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 Block Diagram of Test Setup



4.3 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

4.4 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:

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

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

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

4.5 Environmental Conditions

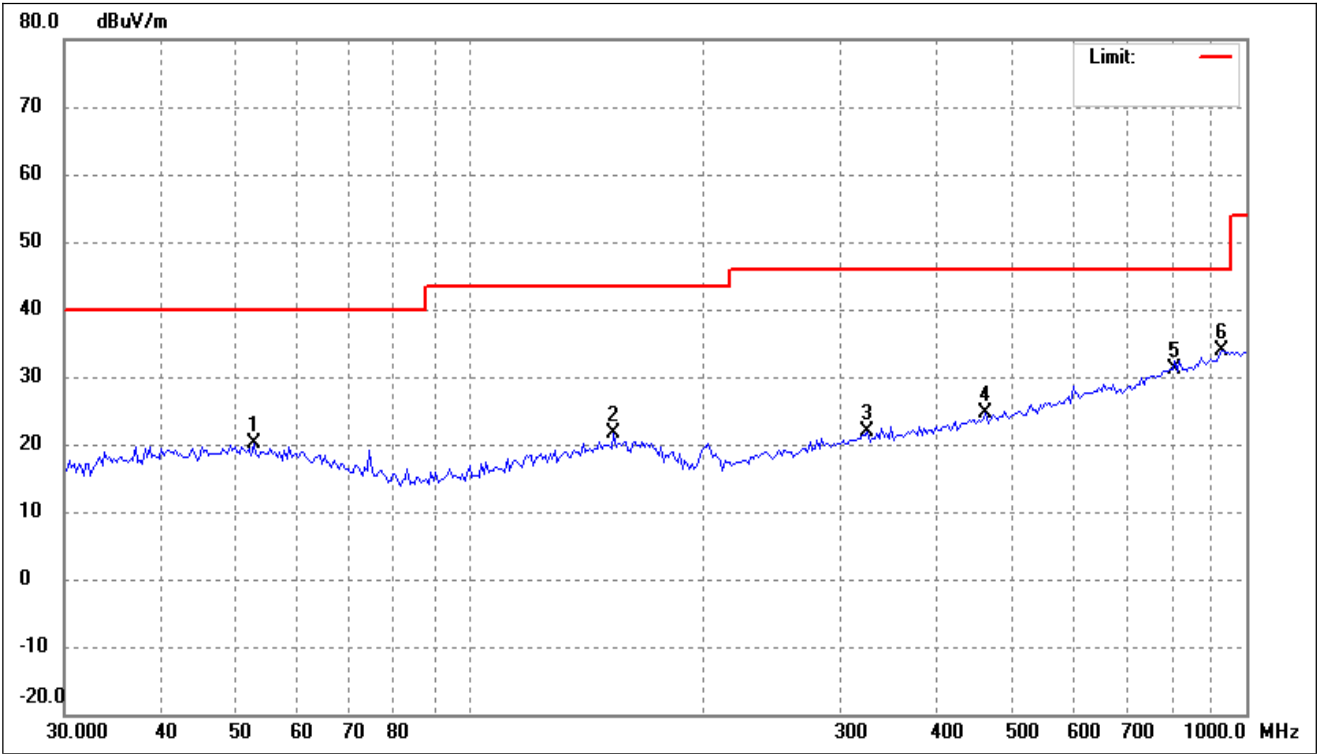
Temperature:	26.5 °C
Relative Humidity:	52 %
ATM Pressure:	1011 mbar

4.6 Summary of Test Results

Please find the results below:

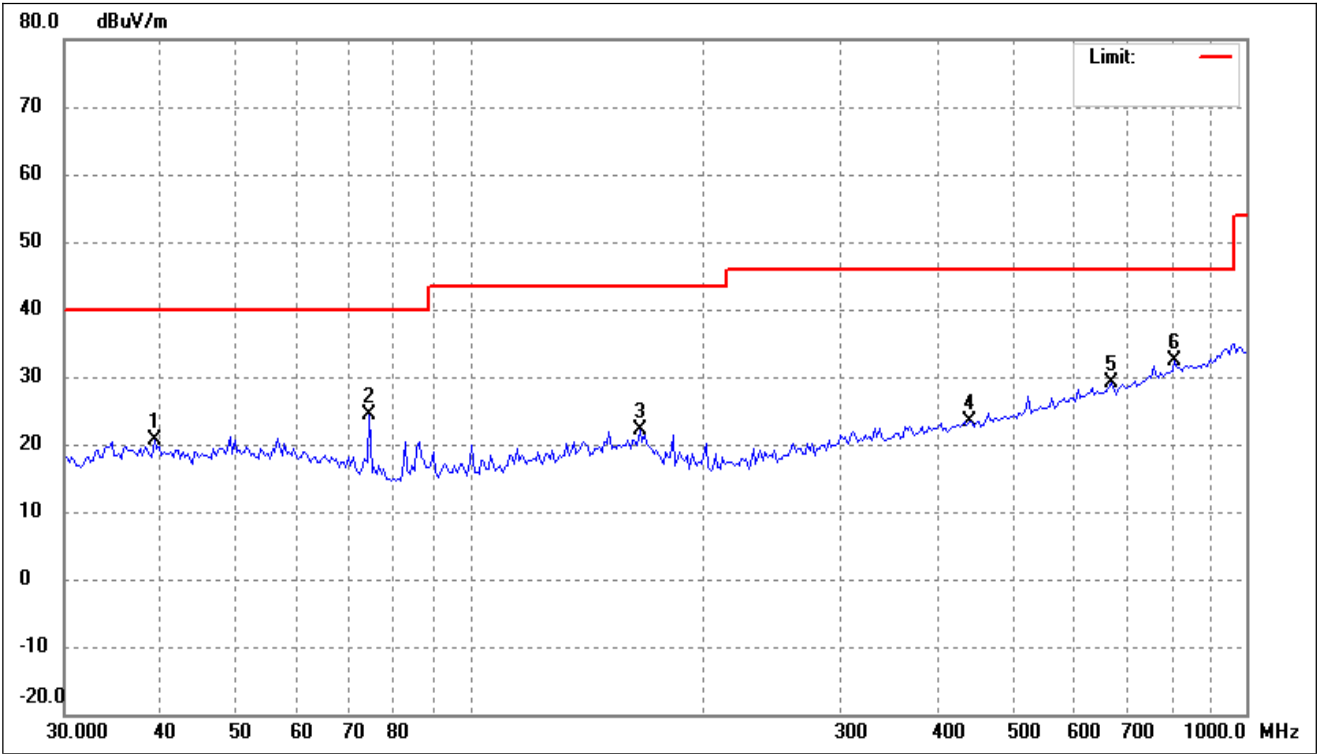
Below 1GHz

Test mode:	TM1	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	52.6345	27.96	-7.87	20.09	40.00	-19.91	-	-	QP
2	153.1627	29.80	-8.05	21.75	43.50	-21.75	-	-	QP
3	324.8645	29.19	-7.33	21.86	46.00	-24.14	-	-	QP
4	461.6313	29.78	-5.09	24.69	46.00	-21.31	-	-	QP
5	804.2523	30.16	1.05	31.21	46.00	-14.79	-	-	QP
6	932.1405	31.09	2.87	33.96	46.00	-12.04	-	-	QP

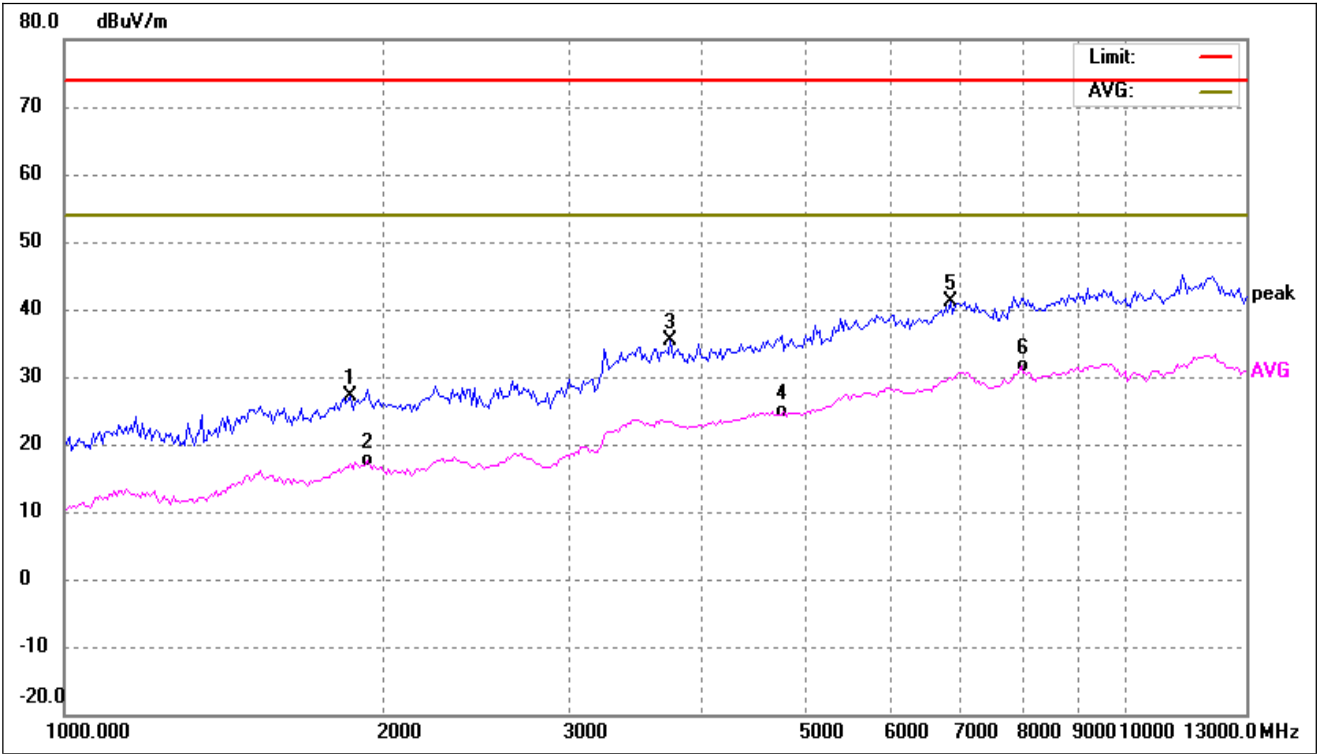
Test mode:	TM1	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	39.1825	28.87	-8.12	20.75	40.00	-19.25	-	-	QP
2	74.2696	35.60	-11.18	24.42	40.00	-15.58	-	-	QP
3	165.4716	30.32	-8.19	22.13	43.50	-21.37	-	-	QP
4	439.4730	28.91	-5.42	23.49	46.00	-22.51	-	-	QP
5	669.9523	30.44	-1.42	29.02	46.00	-16.98	-	-	QP
6	809.9238	31.35	1.11	32.46	46.00	-13.54	-	-	QP

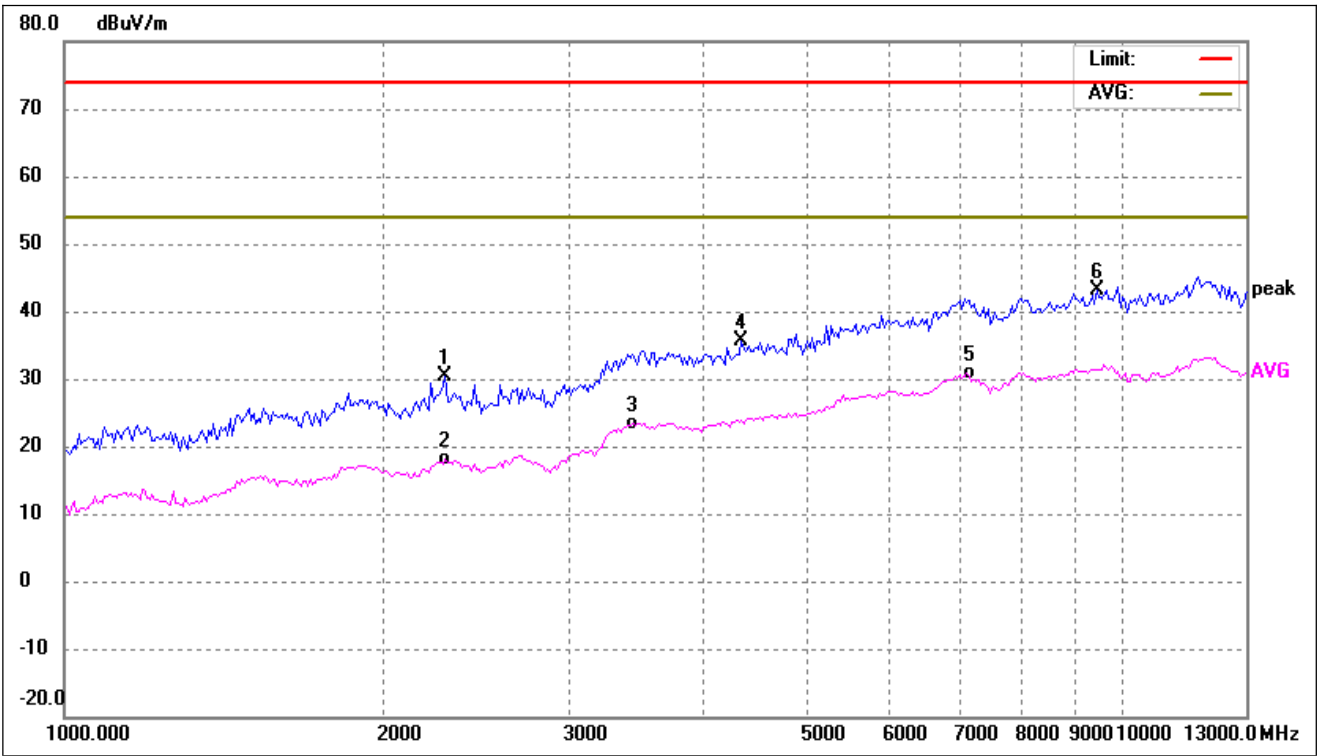
Above 1GHz

Test mode:	TM1	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	1862.578	48.29	-21.04	27.25	74.00	-46.75	-	-	peak
2	1930.816	38.29	-20.70	17.59	54.00	-36.41	-	-	AVG
3	3728.052	50.48	-15.06	35.42	74.00	-38.58	-	-	peak
4	4771.279	38.35	-13.55	24.80	54.00	-29.20	-	-	AVG
5	6837.533	48.56	-7.47	41.09	74.00	-32.91	-	-	peak
6	7977.558	38.36	-6.63	31.73	54.00	-22.27	-	-	AVG

Test mode:	TM1	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2287.750	50.10	-19.72	30.38	74.00	-43.62	-	-	peak
2	2287.750	37.80	-19.72	18.08	54.00	-35.92	-	-	AVG
3	3433.716	38.67	-15.19	23.48	54.00	-30.52	-	-	AVG
4	4349.632	50.02	-14.33	35.69	74.00	-38.31	-	-	peak
5	7088.036	37.81	-7.00	30.81	54.00	-23.19	-	-	AVG
6	9403.840	48.67	-5.46	43.21	74.00	-30.79	-	-	peak

Remark: '-' Means' the test Degree and Height are not recorded by the test software and only show the worst case in the test report.

APPENDIX PHOTOGRAPHS

Please refer to “ANNEX”

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