

TEST REPORT


Report Number	90899-22-72-22-PP001	
Date of issue	2022.11.09	
Tested by (+signature)	Duke Chen	<i>Duke Chen</i>
Approved by (+signature)	Jason Gao	<i>Jason gao</i>
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Applicant's name	Shenzhen Tongchuang Mechantronics Co., Ltd.	
Address	5th Floor, Building 8, Nangang Second Industrial Zone, 1026# SongBai Road, Xili Town, Nanshan District, Shenzhen, China	
Manufacturer's name	Shenzhen Tongchuang Mechantronics Co., Ltd.	
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Factory's name	Shenzhen Tongchuang Mechantronics Co., Ltd.	
Address	5th Floor, Building 8, Nangang Second Industrial Zone, 1026# SongBai Road, Xili Town, Nanshan District, Shenzhen, China	
Standard(s)	FCC Rules and Regulations Part 15 Subpart C, Section 209	
Test item description	TRL1 Safety interlock	
Trade Mark	 施莱格	
Test Model/Type reference	TRL1M0A1NE	
FCC ID	2A82Y-TRL1M0A1NE	
Date of receipt of test item	2022.10.20	
Date (s) of performance of test:	2022.10.20-2022.10.27	
Summary of Test Results	Pass	
The Summary of Test Results based on a technical opinion belongs to the standard(s).		
General disclaimer:		
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1. SUMMARY OF TEST RESULTS

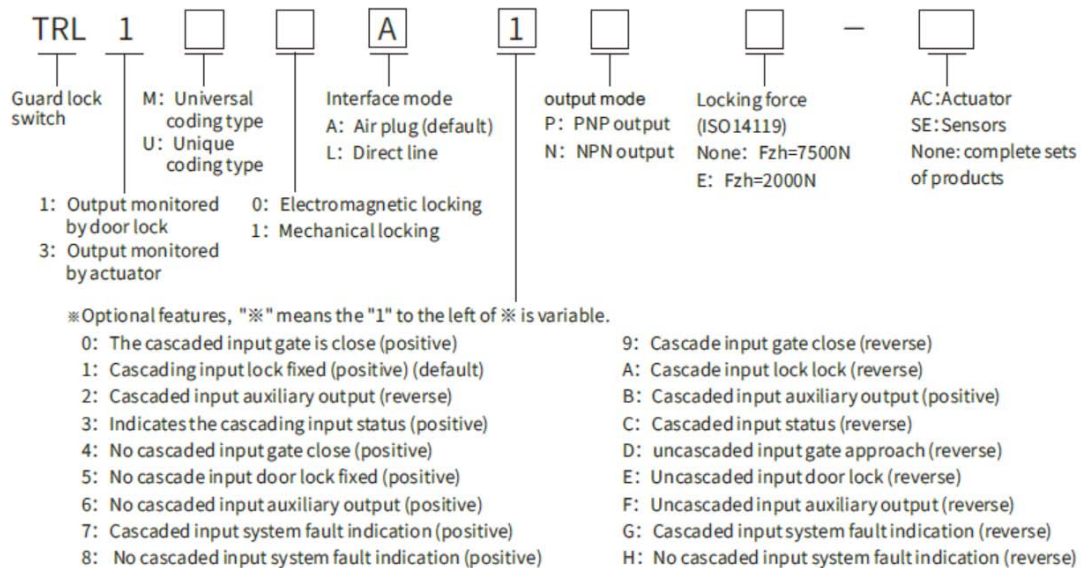
EMISSION		
Description of Test Item	Standard & Limits	Results
Conducted Emission	FCC Part 15, Subpart C- Section 15.207 ANSI C63.10-2013	N/A
Radiated Emission	FCC Part 15, Subpart C- Section 15.209 ANSI C63.10-2013	Pass
20dB Bandwidth	FCC Part 15, Subpart C- Section 15.215 ANSI C63.10-2013	Pass
Note: N/A is an abbreviation for Not Applicable.		

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Product Name	TRL1 Safety interlock
Trade Name	N/A
Test Model	TRL1M0N-AC, TRL1M0A1NE-SE, TRL1M0A1NE
Series Model	TRL1M0A1※P, TRL1M0A1※N, TRL1M1A1※P, TRL1M1A1※N, TRL1U0A1※P, TRL1U0A1※N, TRL1U1A1※P, TRL1U1A1※N, TRL1M0A1※PE, TRL1M0A1※NE, TRL1M1A1※PE, TRL1M1A1※NE, TRL1U0A1※PE, TRL1U0A1※NE, TRL1U1A1※PE, TRL1U1A1※NE ("※" means the "1" to the left of ※ is variable, see Model description for more details.)
Operation frequency	125KHz
Modulation Type	RFID
Connecting I/O Port(s)	Please refer to the User's Manual

Model description



Lockholding force	Type	lock type	PNP/NPN	Actuator	Sensors	Actuator + Sensor	Order No. <small>(Actuator + Sensor)</small>
F _{zh} :7500N	Universal coding type	Electromagnetic locking	PNP	TRL1M0P-AC	TRL1M0A1P-SE	TRL1M0A1*P	LOT136352299SCPE
			NPN	TRL1M0N-AC	TRL1M0A1N-SE	TRL1M0A1*N	LOT136352299SCNE
		Mechanical locking	PNP	TRL1M1P-AC	TRL1M1A1P-SE	TRL1M1A1*P	LOT136352299SCPO
			NPN	TRL1M1N-AC	TRL1M1A1N-SE	TRL1M1A1*N	LOT136352299SCNO
	Unique coding type	Electromagnetic locking	PNP	TRL1U0P-AC	TRL1U0A1P-SE	TRL1U0A1*P	LOT136352299UCPE
			NPN	TRL1U0N-AC	TRL1U0A1N-SE	TRL1U0A1*N	LOT136352299UCNE
		Mechanical locking	PNP	TRL1U1P-AC	TRL1U1A1P-SE	TRL1U1A1*P	LOT136352299UCPO
			NPN	TRL1U1N-AC	TRL1U1A1N-SE	TRL1U1A1*N	LOT136352299UCNO
F _{zh} :2000N	Universal coding type	Electromagnetic locking	PNP	TRL1M0P-AC	TRL1M0A1PE-SE	TRL1M0A1*PE	LOT1E36352299SCPE
			NPN	TRL1M0N-AC	TRL1M0A1NE-SE	TRL1M0A1*NE	LOT1E36352299SCNE
		Mechanical locking	PNP	TRL1M1P-AC	TRL1M1A1PE-SE	TRL1M1A1*PE	LOT1E36352299SCPO
			NPN	TRL1M1N-AC	TRL1M1A1NE-SE	TRL1M1A1*NE	LOT1E36352299SCNO
	Unique coding type	Electromagnetic locking	PNP	TRL1U0P-AC	TRL1U0A1PE-SE	TRL1U0A1*PE	LOT1E36352299UCPE
			NPN	TRL1U0N-AC	TRL1U0A1NE-SE	TRL1U0A1*NE	LOT1E36352299UCNE
		Mechanical locking	PNP	TRL1U1P-AC	TRL1U1A1PE-SE	TRL1U1A1*PE	LOT1E36352299UCPO
			NPN	TRL1U1N-AC	TRL1U1A1NE-SE	TRL1U1A1*NE	LOT1E36352299UCNO

※Optional: Optional items, "※" means the "1" to the left of ※ is variable.

Lock holding force F_{zh} complies with ISO14119 test standards

2.2. Independent Operation Modes

Mode	TEST MODE DESCRIPTION
1.	Normal mode
Note:	

2.3. Description of Test Facility

Site Description

EMC Lab. :

Accredited by ISED, October 04 2021
 CAB identifier: CN0126
 Company Number: 27767
 Accredited by A2LA, October 04 2021
 The Certificate Registration Number is 6325.01

Name of Firm : SLG-CPC Testlaboratory Co., Ltd.
 Site Location : No. 11, Wu Song Road, Dongcheng District, Dongguan,
 Guangdong Province, China 523117

2.4. Description of Support Device

No.	Equipment	Trade name	Model	S/N	Power Cord
1.	/	/	/	/	/
2.					
3.					
4.					

2.5. Measurement Uncertainty

Test Item	Uncertainty
Occupied Channel Bandwidth	: $\pm 2.3\%$
Conducted Emission Uncertainty	: 3.08dB
Radiated Emission Uncertainty (3m Chamber)	: 3.60dB (30M~1GHz) 4.48dB (1~6GHz)

3. MEASURING DEVICE AND TEST EQUIPMENT

3.1. MEASUREMENT EQUIPMENT USED

Equipment	Model	Manufacturer	S/N	Last Cal.	DUE Cal.
RF Connected Test					
Vector Signal Generator	Rohde & Schwarz	SMBV100B(6G)	101166	2022/06/29	1 year
Analog Signal Generator	Rohde & Schwarz	SMB100A(40G)	181333	2022/06/29	1 year
Signal Analyzer	Rohde & Schwarz	FSV40	101527	2022/04/19	1 year
Power Analyzer	Rohde & Schwarz	OSP-B157W8	N/A	2022/06/29	1 year
Wideband Radio Communication Tester	R&S	CMW270	101985	2022/07/05	1 year
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	166898	2022/07/14	1 year
Temperature&Humidity test chamber	ESPEC	VC 4018	/	2022/03/23	1 year
Radiated Emission Test					
EMI Test Receiver	KEYSIGHT	N9010A	MY56070465	2021/12/10	1 year
EMI Test Receiver	Rohde & Schwarz	FSV40	101511	2022/04/19	1 year
Bilog Antenna	Schwarzbeck	VULB 9163	01335	2020/04/28	3 year
Power Amplifier	EMEC	EM330	060676	2021/12/10	3 year
Cable	Tuyue	F4309	L-400-NmNm-1 2000	2021/12/10	1 year
Horn Antenna	Schwarzbeck	BBHA9120D	1779	2022/04/21	3 year
Horn Antenna	Schwarzbeck	BBHA9170	00954	2022/09/13	3 year
Power Amplifier	Rohde & Schwarz	SCU-18F	180118	2022/04/21	3 year
Active Loop Antenna	ETS LINDGREN	6512	41623	2022/04/23	3 year
Test Software	Farad	EZ-EMC	Ver.CPC-3A1	/	/
Conducted Emission Test					
LISN	Schwarzbeck	NSLK 8127	8127-892	2022/03/19	1 year
LISN	Schwarzbeck	NSLK 8127	8127-437	2022/08/26	1 year
EMI Test Receiver	R&S	ESR3	102124	2021/12/10	1 year
Pulse Limiter	R&S	ESH3-Z2	357.8810.52	2021/12/10	1 year
Test Software	Farad	EZ-EMC	Ver.CPC-3A1	/	/

4. 20DB BANDWIDTH

4.1. Test Procedure

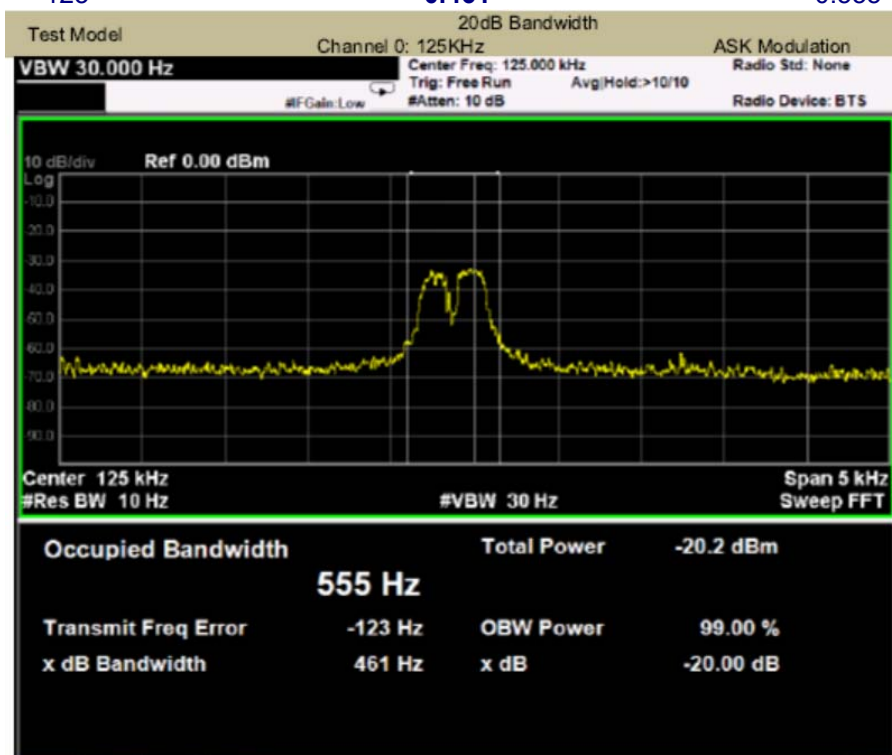
Set to the maximum power setting and enable the EUT transmit continuously

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.
 - b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW.
 - c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation.
 - d) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target “-xx dB down” requirement
 - e) Set detection mode to peak and trace mode to max hold.
 - f) Determine the “-xx dB down amplitude” using [(reference value) - xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument.
- Measure and record the results in the test report.

4.2. Test Results

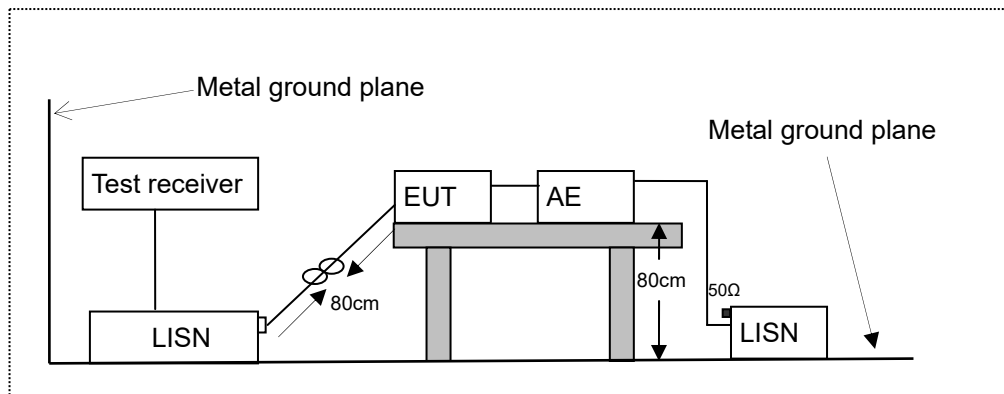
Note: Because the measured signal is CW-like, adjusting the RBW per C63.10 would not be practical since measurement bandwidth will always follow the RBW. The RBW is set to 300 Hz to perform the occupied bandwidth test.

Temperature:	24°C	Test Date:	2022.10.25
Humidity:	53 %	Test By:	Ken
Frequency	125 kHz	20 dB occupied bandwidth	0.461 KHz
		99% occupied bandwidth	0.555 KHz



5. POWER LINE CONDUCTED EMISSION MEASUREMENT

5.1. Block Diagram of Test Setup



LISN: Line Impedance Stabilization Network
 AE: Associated equipment
 EUT: Equipment under test

5.2. Limits

FCC Part 15.207

Frequency (MHz)	Limit (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0 ~ 56.0 *	56.0 ~ 46.0 *
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

NOTE1-The lower limit shall apply at the transition frequencies.
 NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

5.3. Test Procedure

The EUT was placed on a desk 0.8 m height from the metal ground plane and 0.4 m from the conducting wall of the shielding room and it was kept at least 0.8 m from any other grounded conducting surface. The size of the table will nominally be 1.5 m x1.0 m.

The rear of the arrangement shall be flush with the back of the supporting tabletop unless that would not be possible or typical of normal use.

All units of equipment forming the system under test (includes the EUT as well as connected peripherals and associated equipment or devices) shall be arranged such that a nominal 0.1 m separation is achieved between the neighboring units.

Connect EUT to the power mains through a line impedance stabilization network (LISN). Where the mains cable supplied by the manufacturer is longer than 1 m, the excess should be folded at the centre into a bundle no longer than 0.4 m, so that its length is shortened to 1 m.

All the support units are connecting to the other LISN.

The LISN provides 50 ohm coupling impedance for the measuring instrument.

Both sides of AC line were checked for maximum conducted interference.

The frequency range from 150 kHz to 30 MHz was sweep.

Set the test-receiver system to quasi peak detect function and average detect function, and to measure the conducted emissions values.

Test results were obtained from the following equation:

Emission Level (dB μ V) = LISN Factor (dB) + Cable Loss (dB) + Reading (dB μ V)

Margin (dB) = Emission Level (dB μ V) - Limit (dB μ V)

5.4. Measuring Results

PASS.

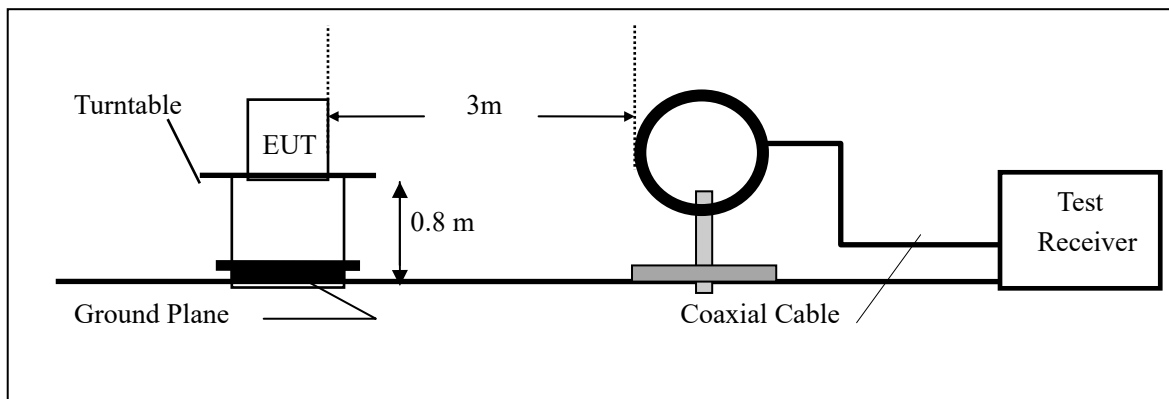
6. RADIATED EMISSION TEST

6.1. Measurement Procedure

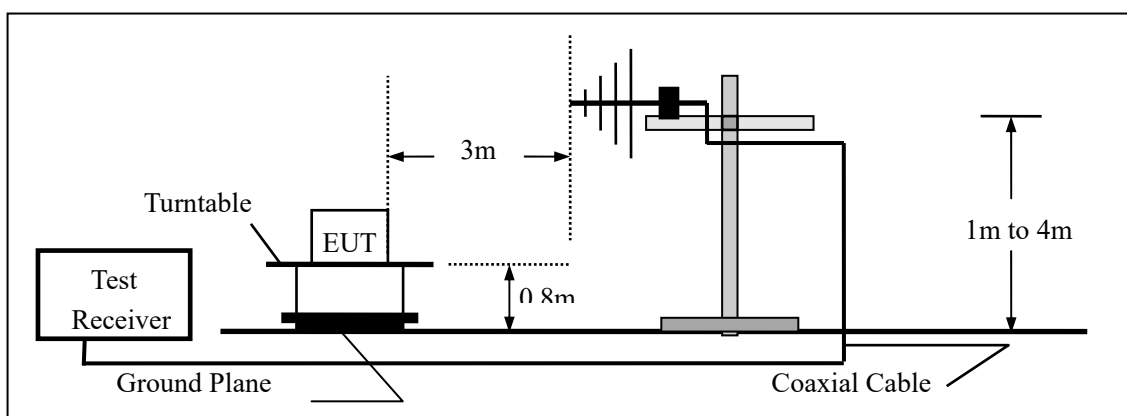
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.
5. Use the following receiver/spectrum analyzer settings:
 Span = wide enough to fully capture the emission being measured
 RBW=200Hz for 9KHz to 150KHz,
 RBW=9kHz for 150KHz to 30MHz,
 RBW=120KHz for 30MHz to 1GHz
 VBW $\geq 3 \times$ RBW
 Sweep = auto
 Detector function = QP
 Trace = max hold

6.2. Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



6.3. Radiated Emission Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table 15.209(a):

FCC Part 15.209				
Frequency (MHz)	Field Strength Limitation		Field Strength Limitation Frequency tion at 3m Measurement Dist	
	(uV/m)	Dist	(uV/m)	(dBuV/m)
0.009 – 0.490	2400 / F(KHz)	300m	10000 * 2400/F(KHz)	20log 2400/F(KHz) + 80
0.490 – 1.705	24000 / F(KHz)	30m	100 * 24000/F(KHz)	20log 24000/F(KHz) + 40
1.705 – 30.00	30	30m	100* 30	20log 30 + 40
30.0 – 88.0	100	3m	100	20log 100
88.0 – 216.0	150	3m	150	20log 150
216.0 – 960.0	200	3m	200	20log 200
Above 960.0	500	3m	500	20log 500

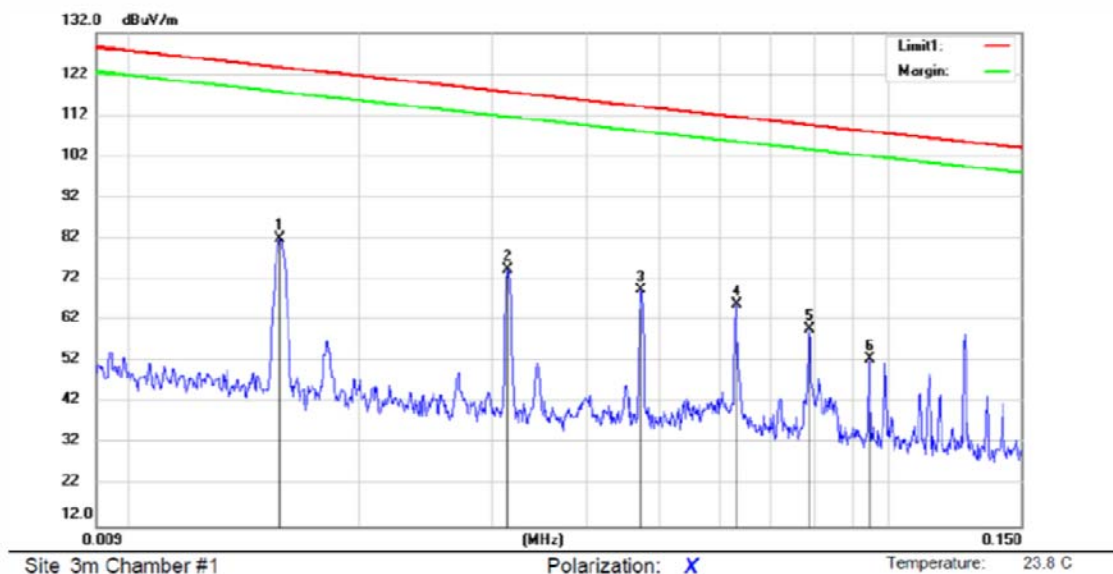
15.205 Restricted bands of operation

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)

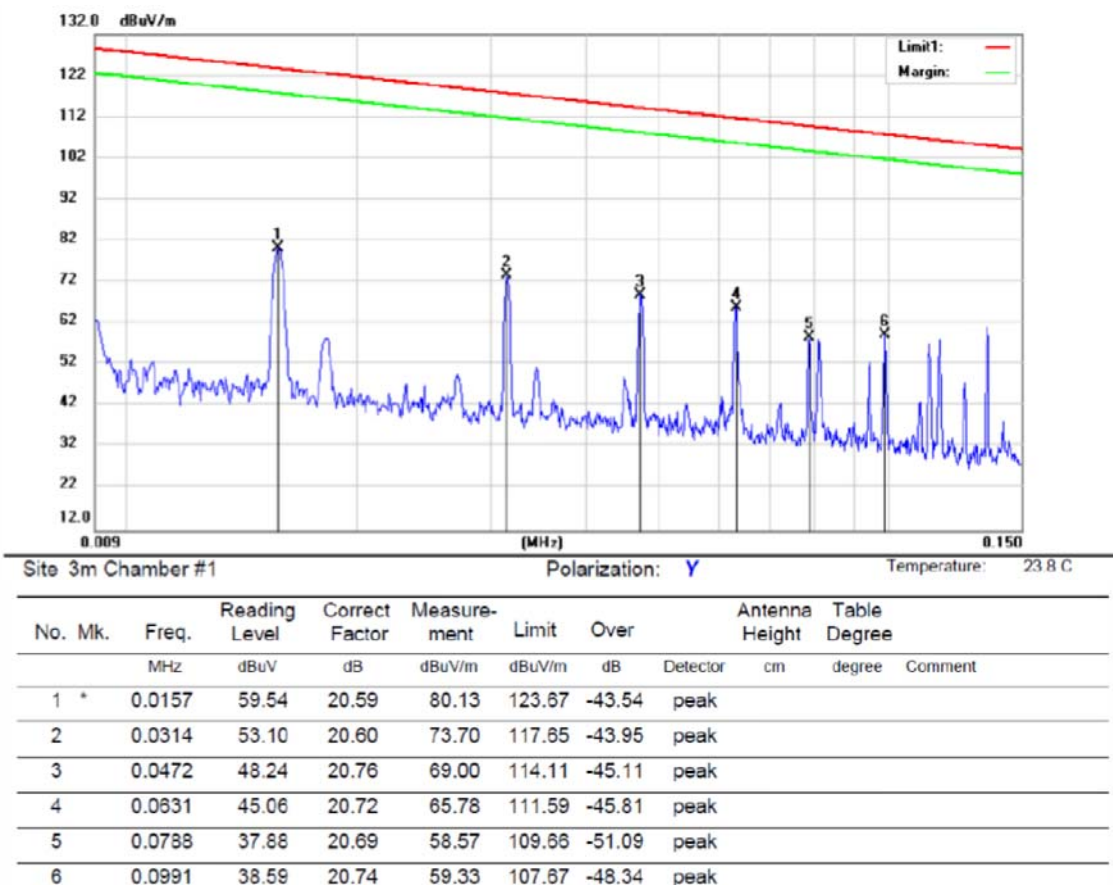
- Remark:
1. Emission level in dBuV/m=20 log (uV/m)
 2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
 3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205, and the emissions located in restricted bands also comply with 15.209 limit.

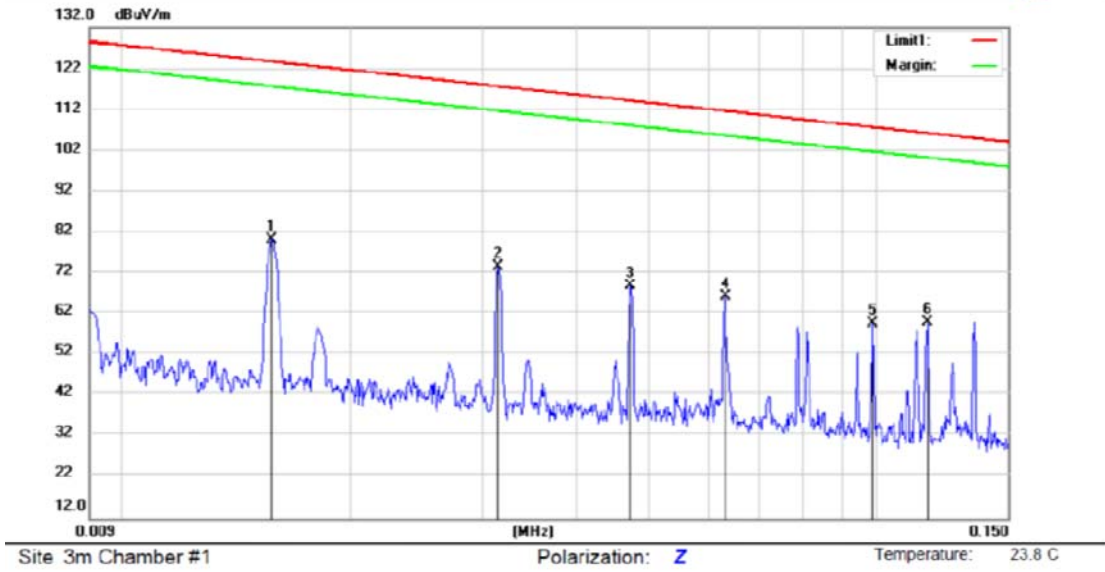
6.4.Measurement Result

9kHz-150kHz:



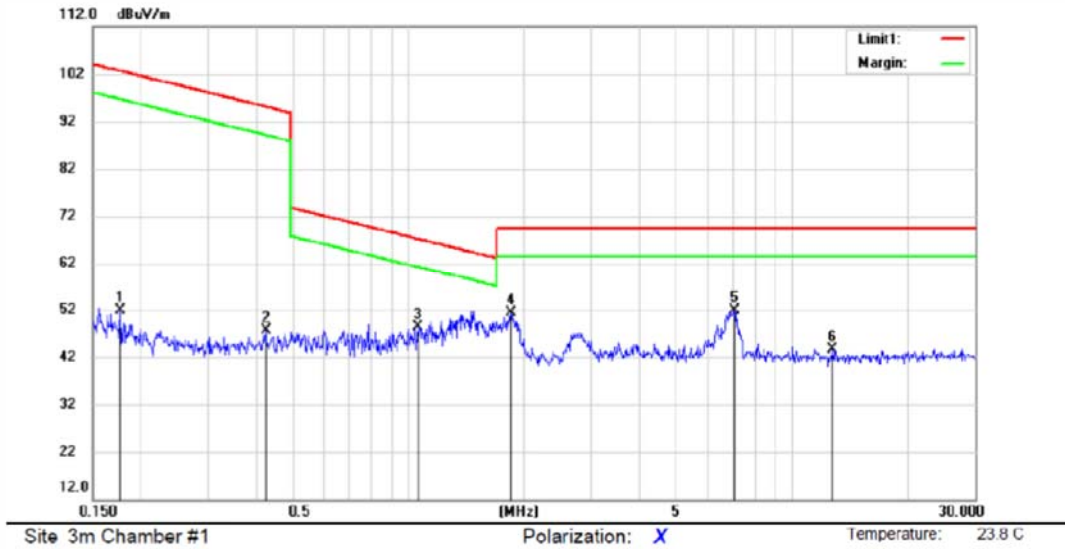
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1	*	0.0157	61.32	20.59	81.91	123.67	-41.76	peak			
2		0.0314	53.92	20.80	74.52	117.65	-43.13	peak			
3		0.0472	48.55	20.76	69.31	114.11	-44.80	peak			
4		0.0631	45.07	20.72	65.79	111.59	-45.80	peak			
5		0.0788	39.08	20.69	59.77	109.66	-49.89	peak			
6		0.0946	31.92	20.71	52.63	108.08	-55.45	peak			



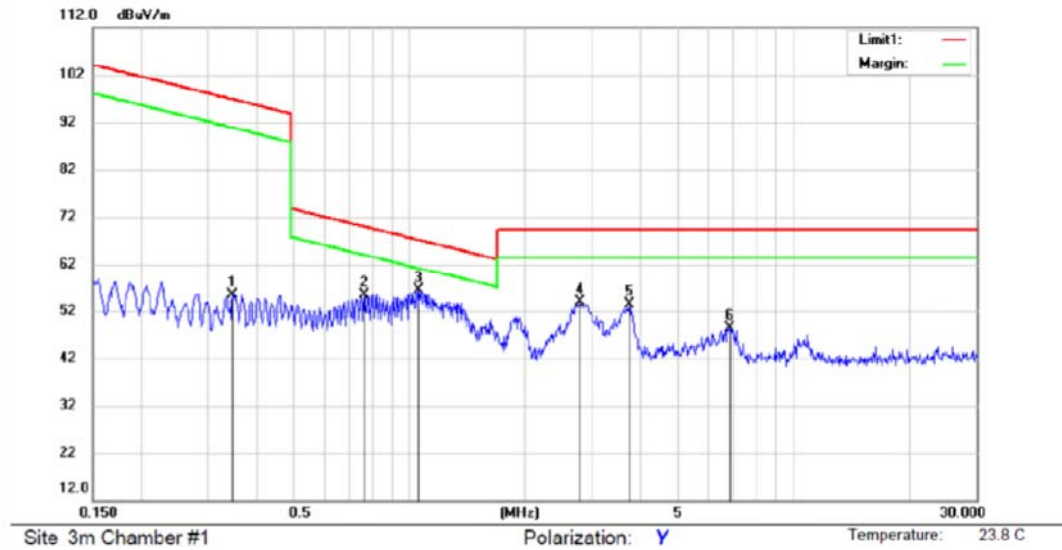


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	*	0.0157	59.57	20.59	80.16	123.67	-43.51	peak			
2		0.0314	53.07	20.60	73.67	117.65	-43.98	peak			
3		0.0472	48.12	20.76	68.88	114.11	-45.23	peak			
4		0.0631	45.38	20.72	66.10	111.59	-45.49	peak			
5		0.0991	38.78	20.74	59.52	107.67	-48.15	peak			
6		0.1171	39.11	20.61	59.72	106.23	-46.51	peak			

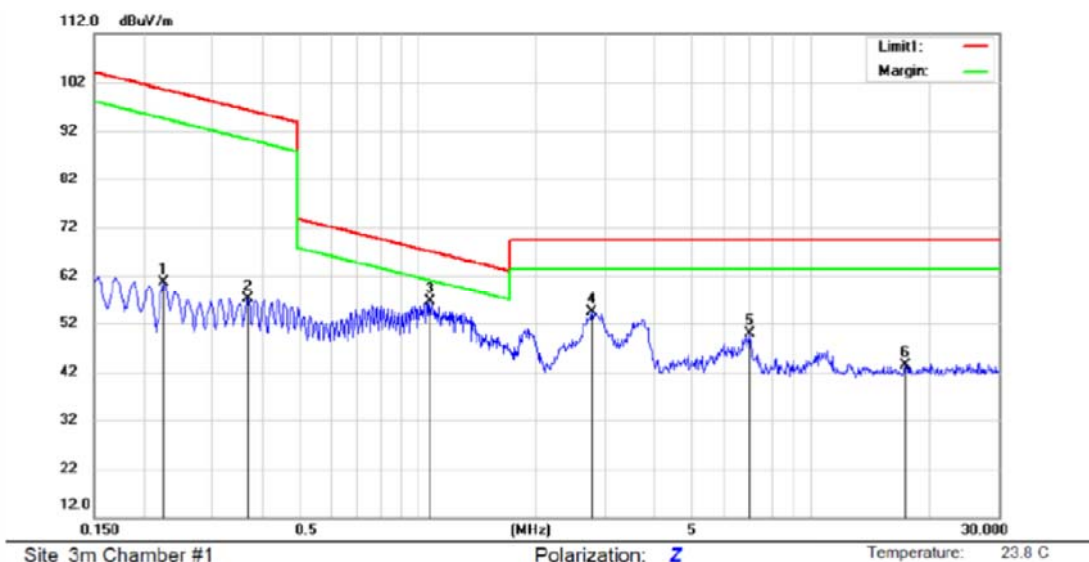
150kHz-30MHz:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		0.1768	31.51	20.34	51.85	102.65	-50.80			peak
2		0.4237	26.87	20.85	47.72	95.06	-47.34			peak
3		1.0541	27.23	21.09	48.32	67.17	-18.85			peak
4		1.8483	30.43	20.90	51.33	69.50	-18.17			peak
5	*	7.0622	31.28	20.58	51.86	69.50	-17.64			peak
6		12.7161	23.40	20.25	43.65	69.50	-25.85			peak



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1	0.3465	34.73	20.68	55.41	96.81	-41.40	peak			
2	0.7630	34.23	21.05	55.28	69.96	-14.68	peak			
3 *	1.0541	35.24	21.09	56.33	67.17	-10.84	peak			
4	2.7794	33.19	20.69	53.88	69.50	-15.62	peak			
5	3.7395	32.84	20.60	53.44	69.50	-16.06	peak			
6	6.8051	27.87	20.58	48.45	69.50	-21.05	peak			



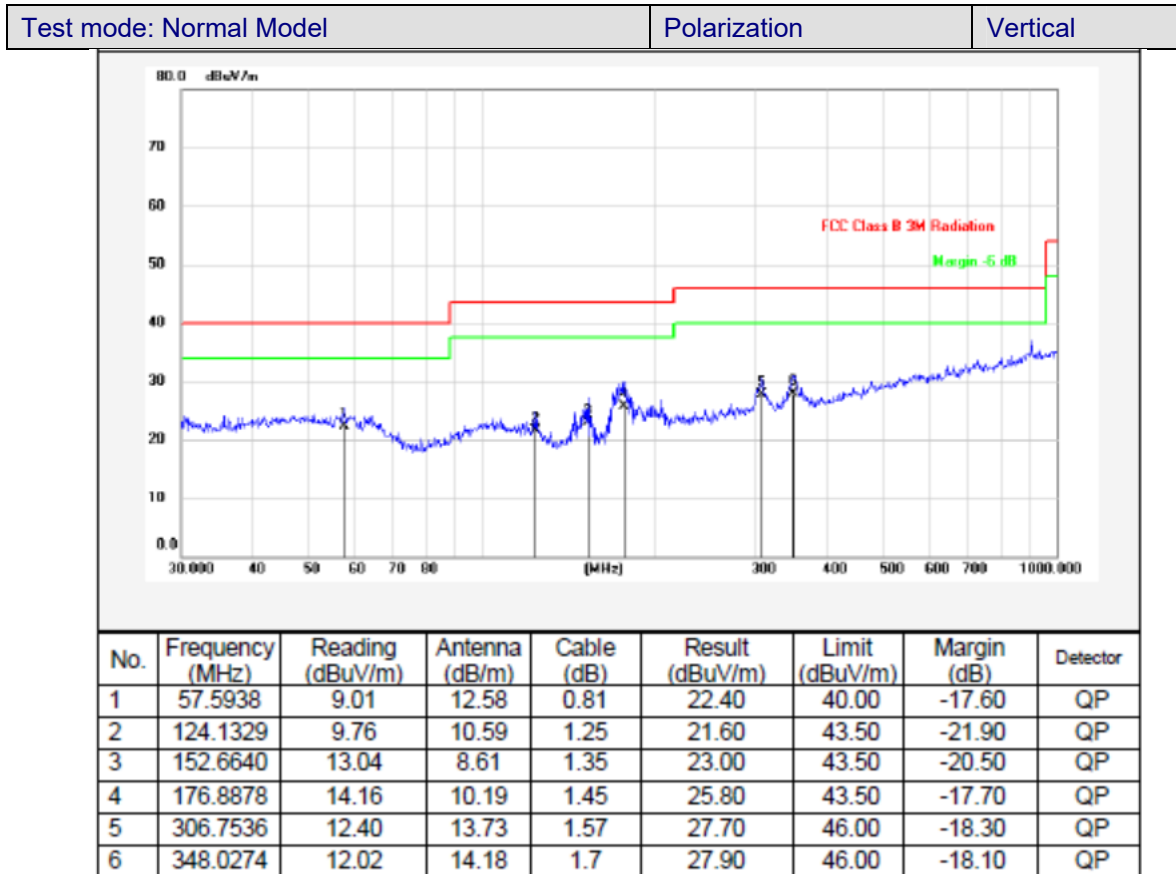
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		0.2256	40.12	20.44	60.56	100.53	-39.97	peak			
2		0.3692	36.43	20.73	57.16	96.26	-39.10	peak			
3	*	1.0710	35.45	21.08	56.53	67.03	-10.50	peak			
4		2.7648	33.75	20.69	54.44	69.50	-15.06	peak			
5		6.9878	29.42	20.58	50.00	69.50	-19.50	peak			
6		17.3826	23.30	20.10	43.40	69.50	-26.10	peak			

30MHz-1GHz:

Test mode: Normal Model	Polarization	Horizontal
-------------------------	--------------	------------



No.	Frequency (MHz)	Reading (dBuV/m)	Antenna (dB/m)	Cable (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	50.7637	7.41	13.99	0.7	22.10	40.00	-17.90	QP
2	102.0014	6.68	12.62	1.2	20.50	43.50	-23.00	QP
3	153.7384	13.60	8.65	1.35	23.60	43.50	-19.90	QP
4	178.7583	14.47	10.07	1.46	26.00	43.50	-17.50	QP
5	303.5437	15.49	13.76	1.55	30.80	46.00	-15.20	QP
6	345.5951	14.45	14.28	1.67	30.40	46.00	-15.60	QP



-----The end-----