

RADIO TEST REPORT

Product : MOTO GUZZI IC

Model Name : M19000

FCC ID : 2A6QF-19000

Test Regulation : FCC 47 CFR Part 15 Subpart C (Section 15.209)

Received Date : 2022/1/11

Test Date : 2022/1/12 ~ 2022/1/20

Issued Date : 2022/12/13

Applicant : Minda Instruments Limited
Gut No 287-295, Nanekarwadi, Chakan, Taluka Khed. Pune ,
Maharashtra – INDIA , 4101501

Issued By : Underwriters Laboratories Taiwan Co., Ltd.
Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd.,
Zhudong Township, Hsinchu County, Taiwan



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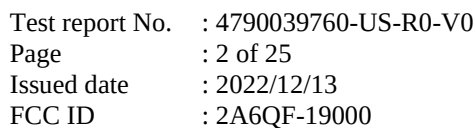
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Doc No: 17-EM-F0972 / 4.1



Original Test Report No.: 4790039760-US-R0-V0

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Doc No: 17-EM-F0972 / 4.1

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1. Attestation of Test Results

APPLICANT: Minda Instruments Limited
Gut No 287-295, Nanekarwadi, Chakan, Taluka Khed. Pune ,
Maharashtra – INDIA , 4101501

MANUFACTURER: Minda Instruments Limited
Gut No 287-295, Nanekarwadi, Chakan, Taluka Khed. Pune ,
Maharashtra – INDIA , 4101501

EUT DESCRIPTION: MOTO GUZZI IC

BRAND: PIAGGIO-MOTO GUZZI IC

MODEL: M19000

SAMPLE STAGE: Mass-Production

DATE of TESTED: 2022/1/12 ~ 2022/1/20

APPLICABLE STANDARDS	
STANDARD	Test Results
FCC 47 CFR PART 15 Subpart C (Section 15.209)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:



Sally Lu
Project Handler

Date : 2022/12/13

Approved and Authorized By:



Kent Liu
Senior Laboratory Engineer

Date : 2022/12/13

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2. Summary of Test Results

Summary of Test Results		
FCC Clause	Test Items	Result
15.209	Radiated Emissions	PASS
15.207	AC Power Conducted Emission	PASS
2.1049	20dB Bandwidth	PASS
15.203	Antenna Requirement	PASS

3. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398.

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5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.

Measurement	Frequency	Uncertainty
Conducted disturbance at mains terminals ports	150kHz ~ 30MHz	± 3.1 dB
Radiated disturbance below 30MHz	9 kHz - 30 MHz	± 1.9 dB
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	± 5.4 dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	± 4.7 dB

6. Equipment under Test

6.1. Description of EUT

Product	MOTO GUZZI IC
Brand Name	PIAGGIO-MOTO GUZZI IC
Model Name	M19000
Modulation	ASK
Operating Frequency	125 kHz
Normal Voltage	12Vdc
Sample ID	4567957

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

6.2. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Radiated Spurious Emission	966-2	22~24°C/ 57~62%RH	12Vdc	2022/01/12~ 2022/01/20	Patrick Kuan
AC power Line Conducted Emission	SR1	22~24°C/ 57~62%RH	12Vdc	2022/01/13~ 2022/01/14	Patrick Kuan

FCC Test Firm Registration Number: 498077

6.3. Channel List

1 channel is provided to this EUT:

Channel	Frequency (kHz)
1	125 kHz

6.4. Description of Available Antennas

Ant. No.	Ant. Type	Maximum Gain (dBi)
ANTENNA_A	Dipole	-
ANTENNA_B	Dipole	-

Note:

1. ANTENNA_A and ANTENNA_B will work simultaneously.
2. The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.

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6.5. Test Mode Applicability and Tested Channel Detail

- The EUT power source type: 12Vdc. Therefore the test data of the 12Vdc was recorded in this report.
- For AC power line conducted emissions, the pre-scan has been determined by AC power 120Vac/60Hz.
- The fundamental of the EUT was investigated in three orthogonal axes X-Y/Y-Z/X-Z, it was determined that X-Z plane was worst-case. Therefore, all final radiated testing was performed with the EUT in X-Z plane.
- For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.

Test Item	Test Frequency
Tx Radiated Emissions (Below 1GHz)	125kHz
AC Power Line Conducted Emission	125kHz

7. Test Equipment

Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Expired date
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	2021/11/9	2022/11/8
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2021/12/10	2022/12/9
Loop Antenna	ETS lindgren	6502	00213440	2021/12/23	2022/12/22
Trilog-Broadband Antenna with 5dB Attenuator	SCHWARZBECK	VULB 9168 & N-6-05	9168-773 & AT-N0539	2021/3/11	2022/3/10
Preamplifier (30-1000 MHz)	EMC Instrument	EMC330E	980405	2021/6/8	2022/6/7
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2021/12/3	2022/12/2
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2021/11/15	2022/11/14
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2021/8/30	2022/8/29
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2021/8/26	2022/8/25
Cables	TITAN	CFD200	T0732ACFD20020A300-1	2021/3/2	2022/3/1

UL Software		
Description	Name	Version
Radiated measurement	e3	6.191211 (V6)
AC power Line Conducted Emission	EZ_EMG	UL-3A1.2

8. Description of Test Setup

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	DC Power Supply	GW-INSTEK	GPD-2303S	GEQ902318	PS302
B	Broad caster	Minda stoneridge	N/A	N/A	MOTO GUZZI

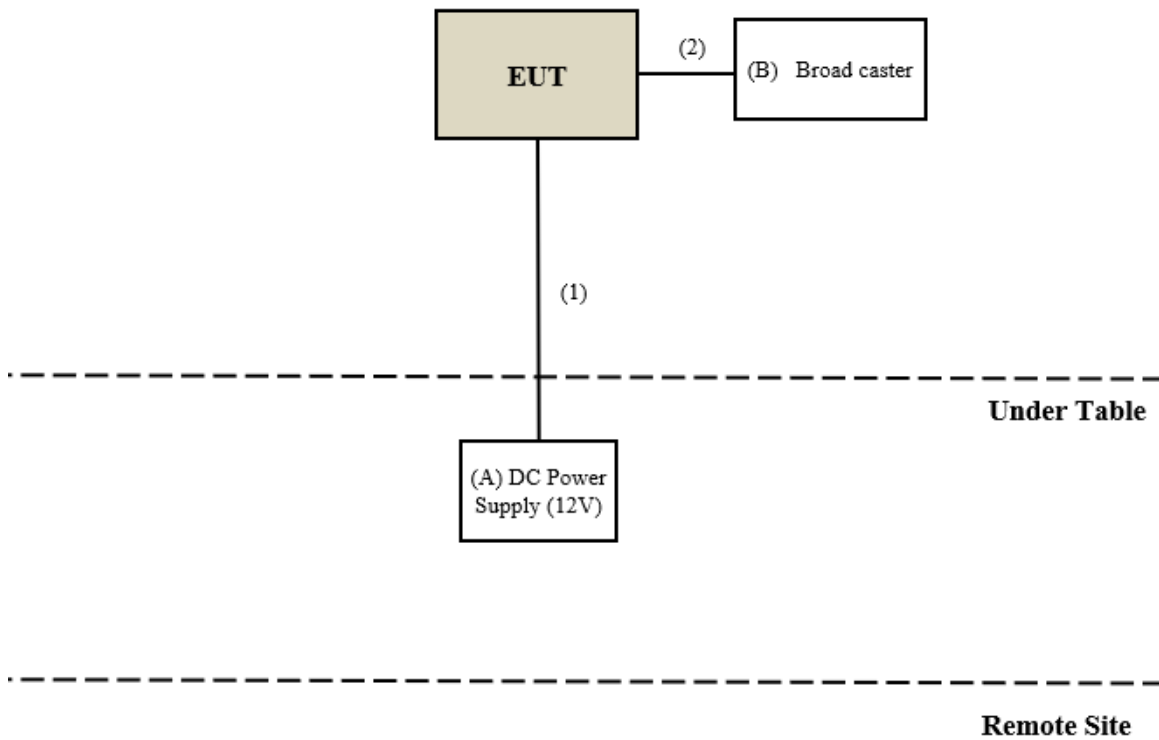
I/O Cables

ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	Test Lead	GW-INSTEK	GTL-104A	1	Provide by Lab
2	Cable harness	N/A	N/A	0.5	Provide by Client

Test Setup

Continuous transmission by power on.

Setup Diagram for Test



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9. Test Results

9.1. 20dB Bandwidth

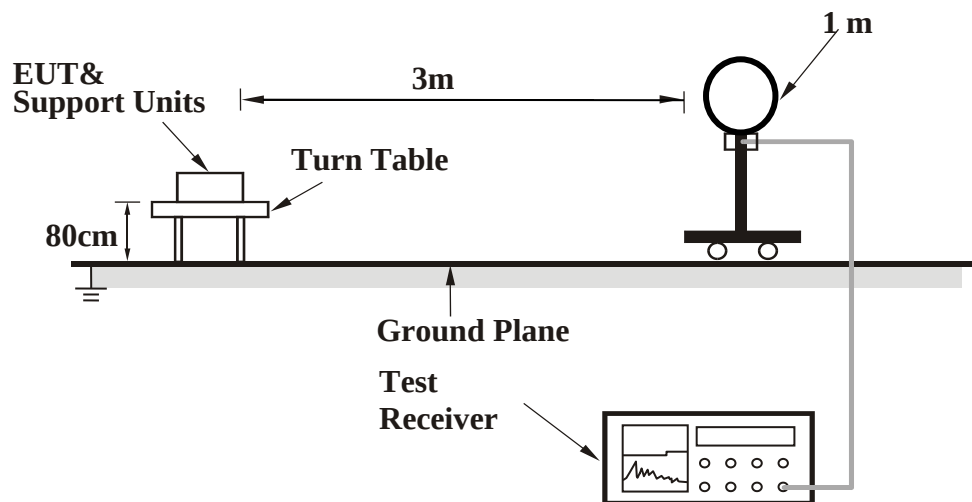
Requirements

The 20 dB bandwidth shall be specified in operating frequency band.

Test Procedures

- The testing follows the guidelines in ANSI C63.10-2013.
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The bandwidth of the fundamental frequency was measured by spectrum analyzer with 200Hz RBW and 620Hz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

Test Setup



For the actual test configuration, please refer to the Setup Configurations.

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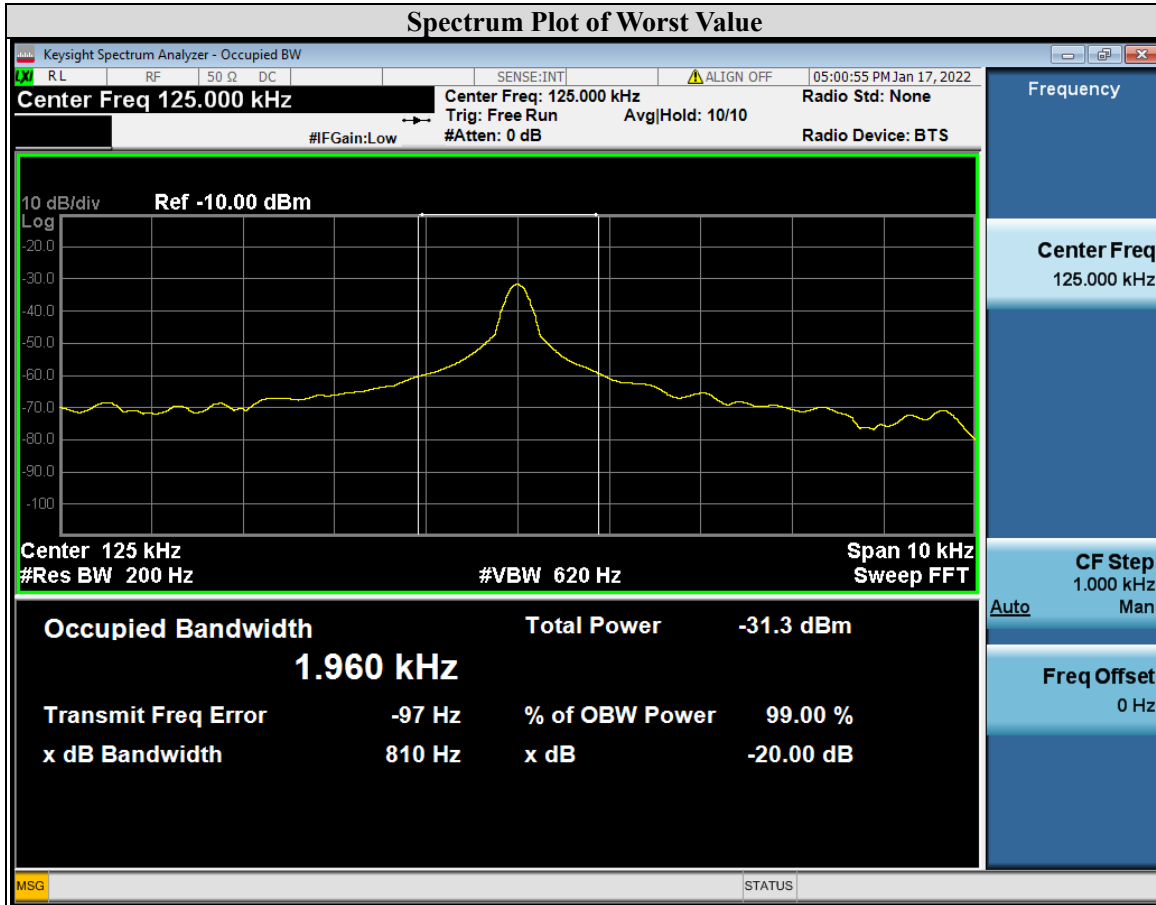
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Test Data

Frequency (kHz)	20dB Bandwidth (kHz)
125	0.81



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9.2. Radiated Spurious Emission

Requirements

According to FCC Clause 15.209 (a), Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency(MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Test Procedures

[For 9 kHz ~ 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Note:

- a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- b. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported.

Test Setup

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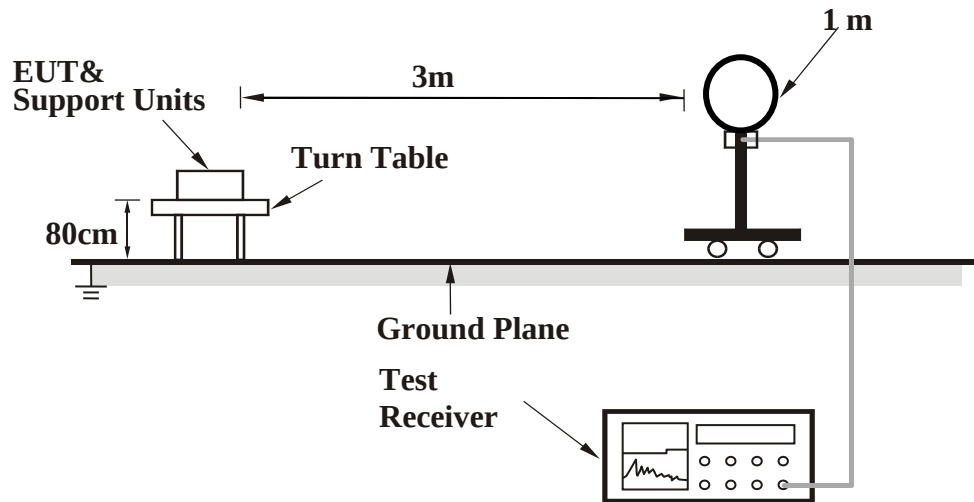
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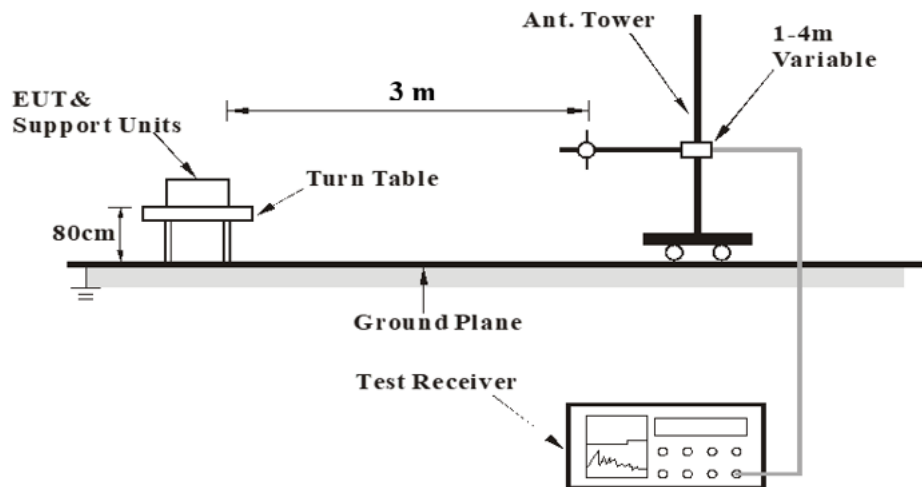
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<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range 30 MHz ~ 1 GHz >



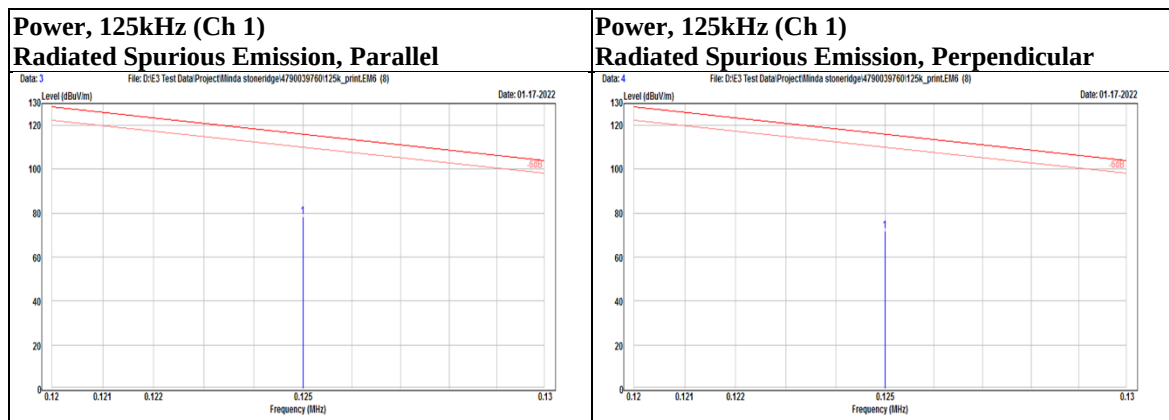
For the actual test configuration, please refer to the Setup Configurations.

Test Data

Below 1 GHz

Mode	125kHz	Channel	1
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Parallel		0.125	66.32	11.91	78.23	105.66	-27.43	PK
Perpendicular		0.125	60.09	11.91	72	105.66	-33.66	PK



Mode	125kHz	Channel	1
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Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Parallel		0.00988	43.16	17.7	60.86	127.71	-66.85	PK
		0.01803	43.47	15.84	59.31	122.48	-63.17	PK
		0.02599	41.85	14.7	56.55	119.31	-62.76	PK
		0.04474	39.17	13.48	52.65	114.59	-61.94	PK
		0.08355	36.49	12.16	48.65	109.16	-60.51	PK
		0.14874	39.9	12.03	51.93	104.15	-52.22	PK
		0.20944	43.8	12.26	56.06	101.18	-45.12	PK
		0.31999	41.27	12.5	53.77	97.5	-43.73	PK
		0.71219	32.09	12.5	44.59	70.55	-25.96	PK
		2.422	27.93	12.17	40.1	69.54	-29.44	PK
		4.772	18.37	12.15	30.52	69.54	-39.02	PK
		27.271	20.62	10.96	31.58	69.54	-37.96	PK
		127	47.78	-13.65	34.13	43.5	-9.37	PK
		241.46	55.81	-12.07	43.74	46	-2.26	PK
		323.91	41.64	-9.18	32.46	46	-13.54	PK
		497.54	36.57	-4.79	31.78	46	-14.22	PK
		687.66	32.48	-0.58	31.9	46	-14.1	PK
		861.29	31.76	2.27	34.03	46	-11.97	PK
Perpendicular		0.01216	44.48	17.05	61.53	125.9	-64.37	PK
		0.01549	45.25	16.31	61.56	123.8	-62.24	PK
		0.02064	42.43	15.42	57.85	121.31	-63.46	PK
		0.0515	37.3	13.2	50.5	113.37	-62.87	PK
		0.07424	35.55	12.41	47.96	110.19	-62.23	PK
		0.14832	35.44	12.03	47.47	104.18	-56.71	PK
		0.23409	43.44	12.34	55.78	100.22	-44.44	PK
		0.35955	38.3	12.48	50.78	96.49	-45.71	PK
		0.89441	31.32	12.55	43.87	68.57	-24.7	PK
		1.949	31.96	12.27	44.23	69.54	-25.31	PK
		2.5	33.56	12.15	45.71	69.54	-23.83	PK
		27.271	25.85	10.96	36.81	69.54	-32.73	PK
		31.94	47.58	-12.47	35.11	40	-4.89	PK
		149.31	45.18	-11.46	33.72	43.5	-9.78	PK
		296.75	42.32	-10.08	32.24	46	-13.76	PK
		323.91	42.66	-9.18	33.48	46	-12.52	PK
		687.66	32.68	-0.58	32.1	46	-13.9	PK
		769.14	31.58	0.97	32.55	46	-13.45	PK

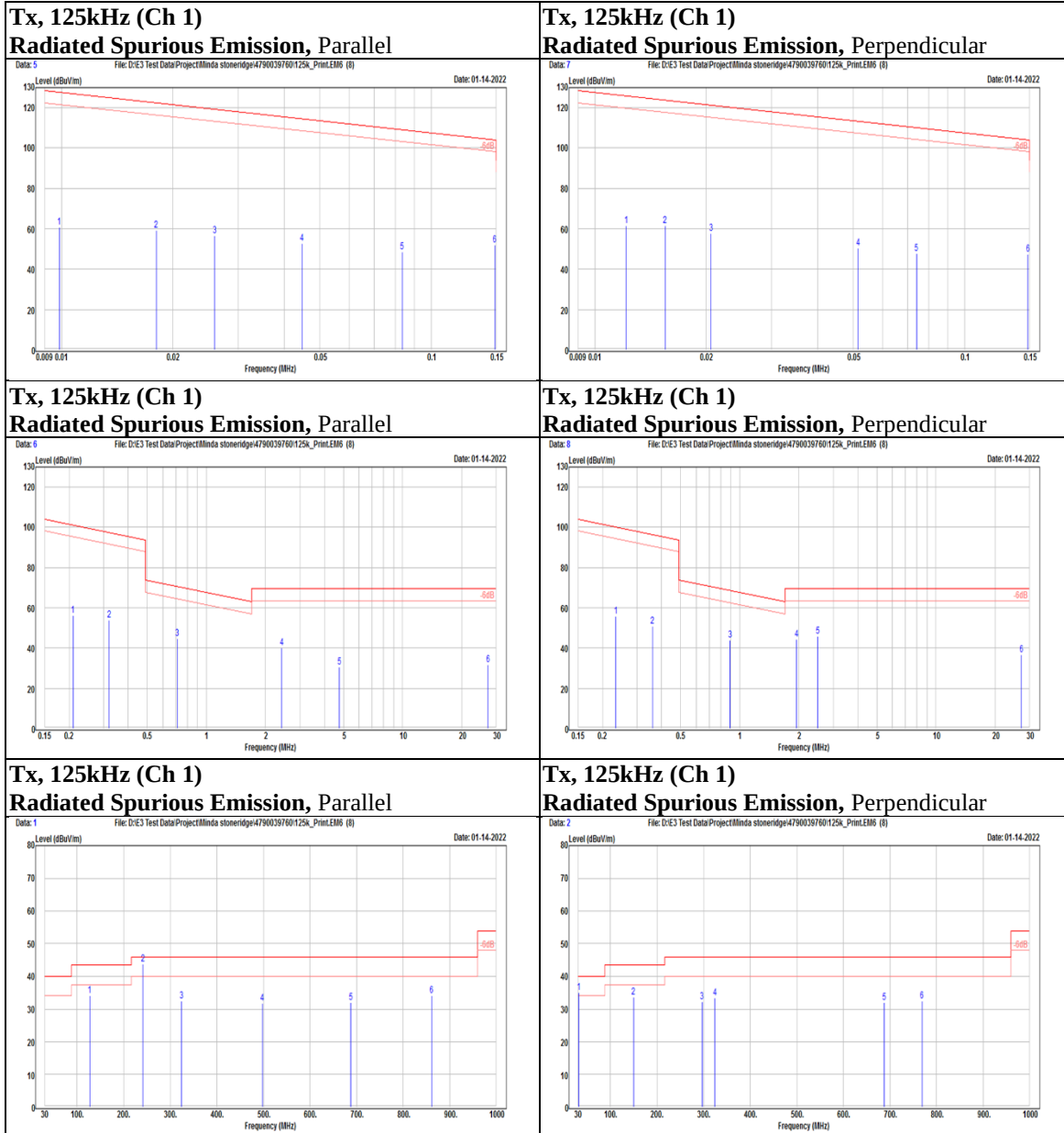
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9.3. AC Power Line Conducted Emission

Requirements

Frequency (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Procedures

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

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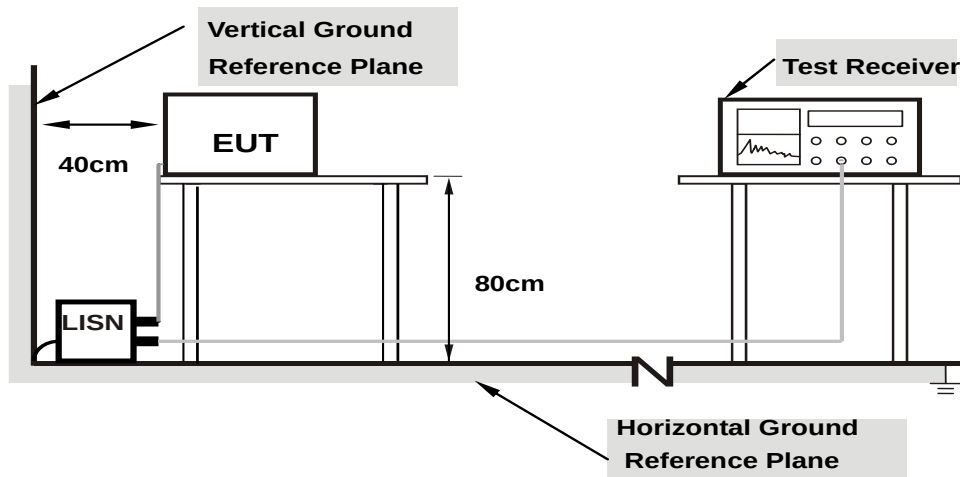
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Test Setup

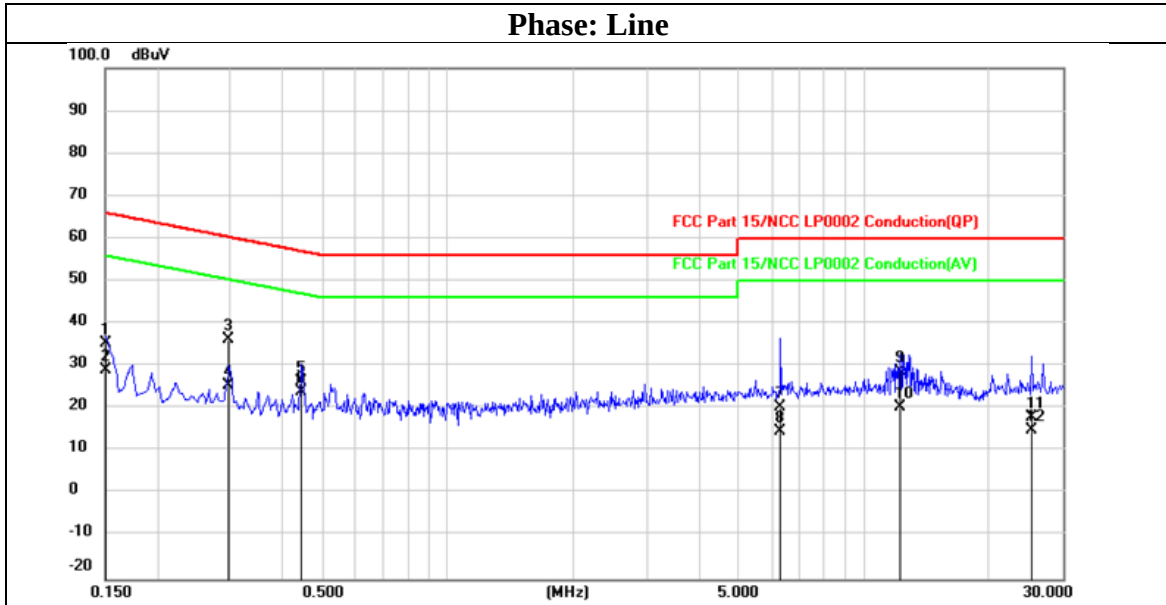


Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the Setup Configurations.

Test Data

Mode	125KHz	Channel	1
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	15.71	19.49	35.20	66.00	-30.80	QP
2	0.1500	9.68	19.49	29.17	56.00	-26.83	AVG
3	0.2980	16.85	19.49	36.34	60.30	-23.96	QP
4	0.2980	6.09	19.49	25.58	50.30	-24.72	AVG
5	0.4460	6.99	19.49	26.48	56.95	-30.47	QP
6	0.4460	4.57	19.49	24.06	46.95	-22.89	AVG
7	6.3140	0.66	19.63	20.29	60.00	-39.71	QP
8	6.3140	-5.04	19.63	14.59	50.00	-35.41	AVG
9	12.1899	9.09	19.71	28.80	60.00	-31.20	QP
10	12.1899	0.77	19.71	20.48	50.00	-29.52	AVG
11	25.2860	-1.83	19.75	17.92	60.00	-42.08	QP
12	25.2860	-4.77	19.75	14.98	50.00	-35.02	AVG

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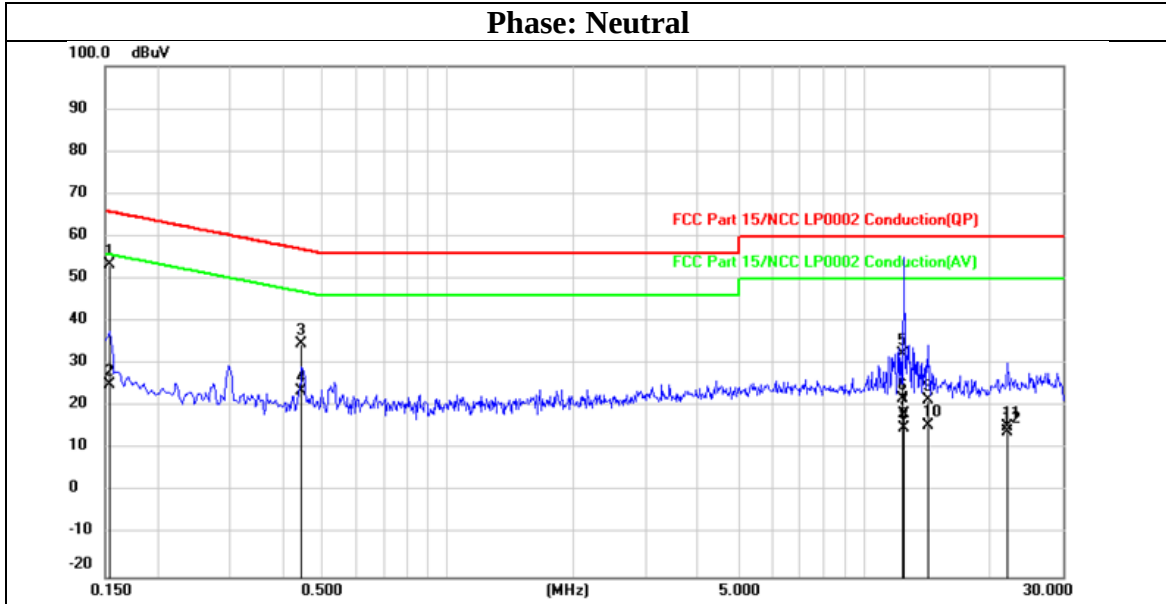
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Mode	125KHz	Channel	1
------	--------	---------	---



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1539	33.87	19.49	53.36	65.79	-12.43	QP
2	0.1539	5.75	19.49	25.24	55.79	-30.55	AVG
3	0.4460	15.30	19.49	34.79	56.95	-22.16	QP
4	0.4460	4.29	19.49	23.78	46.95	-23.17	AVG
5	12.3500	12.58	19.74	32.32	60.00	-27.68	QP
6	12.3500	2.19	19.74	21.93	50.00	-28.07	AVG
7	12.4540	-1.51	19.74	18.23	60.00	-41.77	QP
8	12.4540	-4.69	19.74	15.05	50.00	-34.95	AVG
9	14.2580	1.64	19.79	21.43	60.00	-38.57	QP
10	14.2580	-4.35	19.79	15.44	50.00	-34.56	AVG
11	22.0660	-4.46	19.84	15.38	60.00	-44.62	QP
12	22.0660	-5.74	19.84	14.10	50.00	-35.90	AVG

END OF REPORT

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