Test Report for FCC & ISED

Report Number		ESTRGC2405-001		
Applicant	Company name	Hana Technologies Inc.		
	Address	2061 Case Parkway South, Unit # 6, Twinsburg, OH 44087, U.S.A.		
	Telephone	+82-010-9165-5435		
Product	Product name	UTS-2 Wireless charger		
	Model No.	UTS-2	Manufacturer Country of origin	Hana Technologies Inc. (U.S.A), Hana Microelectronics Public Co.,Ltd.(Thailand), Hana Microelectronics Co., Ltd.(Cambodia)
	Serial No.	NONE		
Test date	22-April-24 ~ 16-May-24		Date of issue	17-May-24
Testing location	140-16, Eongmalli-ro, Majang-myeon, Icheon-si, Gyeonggi-do, Rep. of Korea			
FCC ID	2AWLH-UTS-2			
ISED ID	26177-UTS2			
FCC Rule Part(s)	Part 15.209, Part 15.207			
ISED Rule Part(s)	RSS-216 Issue 2 (January 2016)			
Test result				Complied
Measurement facility registration number	659627			
MRA Registration number	KR0019			
Tested by	Engineer Y.D. Kim			(Signature)
Reviewed by	Engineering Manager I.K. Hong			(Signature)
Abbreviation	OK, Pass = Complied, Fail = Failed, N/A = not applicable			

* Note
- This test report is not permitted to copy partly without our permission
- This test result is dependent on only equipment to be used
- This test report is not related to KOLAS accreditation
- This is the reissue report due to the change of the applicant

Contents

1. Laboratory Information

1.1 General

This EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards and is tested in accordance with the measurement procedures as indicated in this report.ESTECH Lab attests to accuracy of test data. All measurement reported herein were performed by ESTECH Co., Ltd.
ESTECH Lab assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

1.2 Test Lab.

Corporation Name : ESTECH Co., Ltd.

Head Office : Suite 1015 World Meridian II, 123 Gasan Digital 2-ro, Geumcheon-gu, Seoul 153-759, R. O. Korea

EMC/Telecom/Safety Test Lab : 140-16, Eongmalli-ro, Majang-myeon, Icheon-si, Gyeonggi-do, Rep. of Korea

1.3 Official Qualification(s)

MSIP : Granted Accreditation from Ministry of Information & Communication for EMC, Safety and Telecommunication

KOLAS : Accredited Lab By Korea Laboratory Accreditation Schema base on CENELEC

FCC : Filed Laboratory at Federal Communications Commission

VCCI : Granted Accreditation from Voluntary Control Council for Interference from ITE

ISED : Accredited Lab By Canada Laboratory Accreditation

2. Description of EUT

2.1 Summary of Equipment Under Test
Product : UTS-2 Wireless charger
Model Number : UTS-2
Serial Number : NONE
Manufacturer and Country of origin : Hana Technologies Inc. (U.S.A),
Hana Microelectronics Public Co.,Ltd.(Thailand),
Hana Microelectronics Co., Ltd. (Cambodia)
Operating Frequency : 124 kHz ~ 146 kHz
Antenna Type : LOOP Antenna
Modulation Type : ASK
Power Rating : INPUT: AC(100 - 240) V, (50-60)Hz, 0.65 A
OUTPUT: DC 5 V, 1.0 A, 5W, DC 5 V, 1.8 A, 9W,
Receipt Date : 2024-Mar-17
Software version: UTS-2 Rev. 1.02
Hardware version: UTS-2 Rev. 0.4

Test Mode List

Test Mode	Test Frepuency	Description	Remark	Power Supply Mode
TM1	124kHz	Wireless Charging	Connect to Adapter	AC(100 - 240) V, (50-60)Hz, Charging (9W)
TM2	145kHz	Wireless Charging	Connect to Adapter	AC(100 - 240) V, (50-60)Hz, Charging (5W)

3. Test Standards

Test Standard : FCC PART 15
This Standard sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an individual license. It also contains the technical specifications, administrative requirements and other conditions relating to the marketing of Part 15 devices.

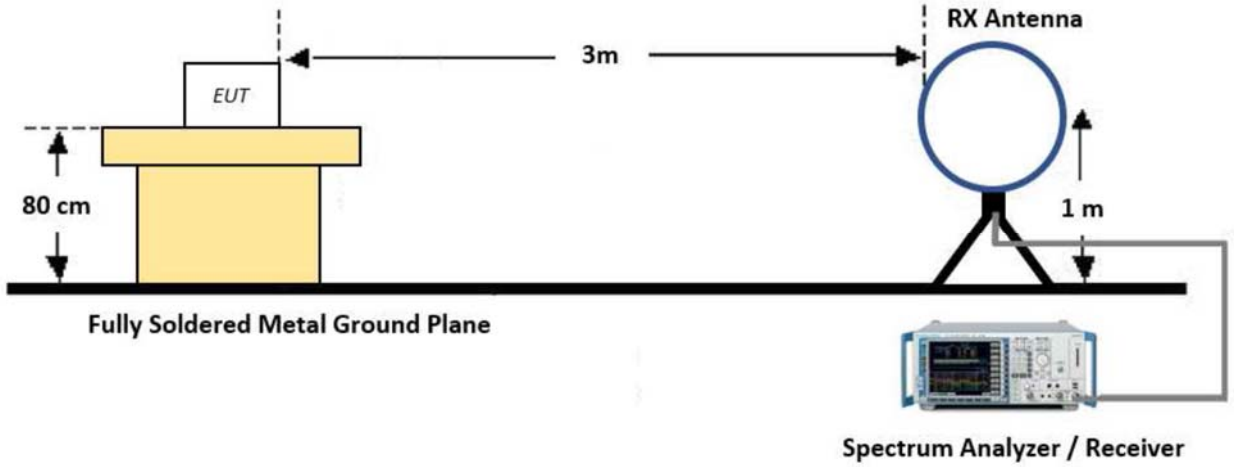
Test Standard : RSS-Gen
RSS-Gen must be used in conjunction with other RSSs, as applicable to the specific type of radio apparatus, for assessing its compliance with ISED requirements.

Test Method : ANSI C 63.10 (2013)
This standard sets forth uniform methods of measurement of radio-frequency (RF) signals and noise emitted from both unintentional and intentional emitters of RF energy in the frequency range 9 kHz to 40 GHz. Methods for the measurement of radiated and AC power-line conducted radio noise are covered and may be applied to any such equipment unless otherwise specified by individual equipment requirements. These methods cover measurement of certain decides that deliberately radiate energy, such as intentional emitters, but does not cover licensed transmitters. This standard is not intended for certification/approval of avionic equipment or for industrial, scientific, and medical (ISM) equipment These method apply to the measurement of individual units or systems comprised of multiple units

Test Description	FCC Part Section(s)	ISED Part Section(s)	Test Limit	Test Condition	Test Result
Occupied Bandwidth	-	Section 6.7 RSS-GEN	N/A	Radiated	PASS
Radiated Spurious Emissions	15.209	Section 8.9 RSS-GEN	cf. Section 8.9		PASS
AC Power line Conducted Emissions	15.207	RSS-GEN, 8.8	cf. Section 8.8	Conducted	PASS

Notes:
1. No tests were applied because the fundamental level did not exceed the spurious limit per part 15.209.

Test Configuration
Below 30 MHz

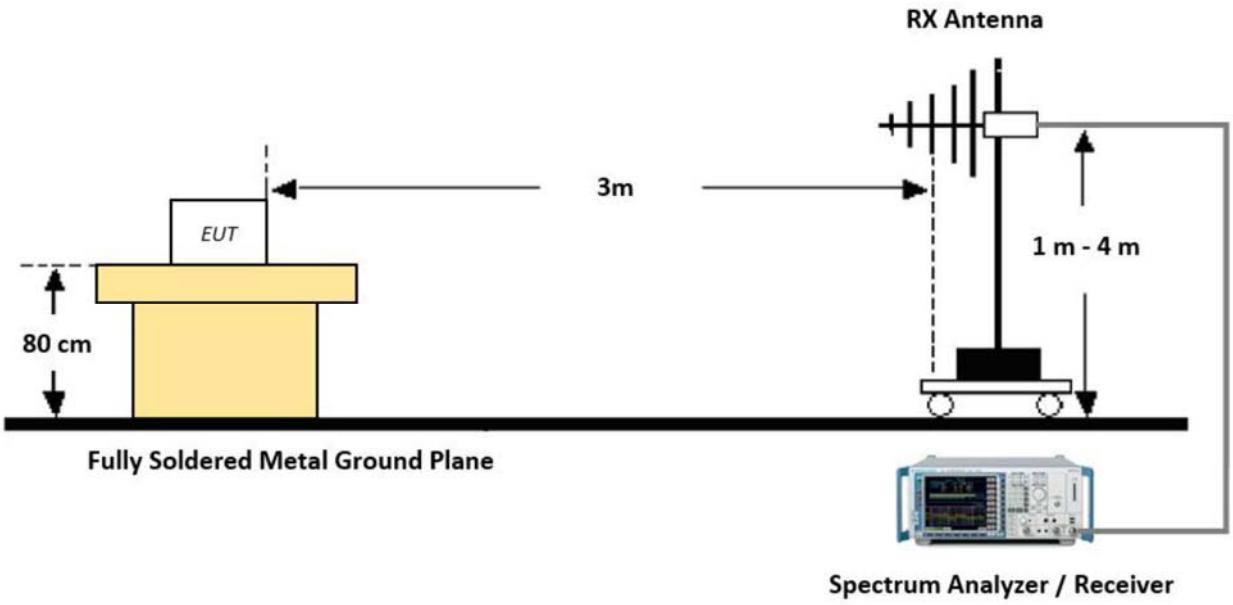


Test Procedure of Radiated spurious emissions (Below 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor (0.009 MHz – 0.490 MHz) = 40*log(3 m/300 m) = - 80 dB
Measurement Distance: 3 m
7. Distance Correction Factor (0.490 MHz – 30 MHz) = 40*log(3 m/30 m) = - 40 dB
Measurement Distance: 3 m
8. Spectrum Setting
- Frequency Range = 9 kHz ~ 30 MHz
- Detector = Peak
- Trace = Max hold
- RBW = 9 kHz
- VBW ≥ 3*RBW

9. Total = Reading Value + Antenna Factor (A.F) + Cable Loss (C.L) + Distance Factor (D.F)
Adequate comparison measurements were confirmed against an open field site since the test was performed at alternative site (3m SAC) other than the open area test site. Sufficient test was made to demonstrate that the alternative site produces result that correlate with the one of test made at the open field site based on KDB 414788.

30 MHz - 1 GHz



Test Procedure of Radiated spurious emissions (Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Spectrum Setting

(1) Measurement Type (Peak):

- Measured Frequency Range: 30 MHz – 1 GHz
- Detector = Peak
- Trace = Max hold
- RBW = 100 kHz
- VBW ≥ 3*RBW

(2) Measurement Type(Quasi-peak):

- Measured Frequency Range: 30 MHz – 1 GHz
- Detector = Quasi-Peak
- RBW = 120 kHz

In general, the method (1) is mainly used

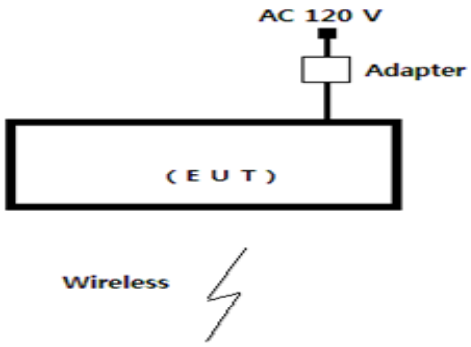
6. Total = Reading Value + Antenna Factor (A.F) + Cable Loss (C.L)

4. Measurement Condition

4.1 EUT Operation.

'The EUT was tested, under transmission / receiving
1. Normal communication with RF OUT Frequeny124 kHz ~ 146 kHz

4.2 Configuration and Peripherals



4.3 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark
UTS-2 Wireless charger	UTS-2	NONE	Hana Technologies Inc.	EUT
PD Charger	ZX-2U63T	NONE	Shenzhen ZONSAN	
Cable	C to C Cable	NONE	-	

4.4 Measurement equipments (Conducted)

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E4440A	US42041291	27-Nov-24
Spectrum Analyzer	FSV40	100939	27-Nov-24
RF Cable	Length: 100 cm	-	

4.5 Measurement equipments (**Radiated**)

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
TEST Receiver	ESCI7	ROHDE & SCHWARZ	100916	12-Jun-24
LOOP Antenna	HFH2-Z2	ROHDE & SCHWARZ	100188	29-Aug-24
Logbicon Antenna	VULB 9168	SCHWARZBECK	193	25-Dec-25
Turn Table	DT3000-2t	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-

4.6 AC Power line Conducted Emissions Measurement equipments

Equipment Name	**Type**	**Manufacturer**	**Serial No.**	**Next Calibration date**
TEST Receiver	ESHS 30	Rohde & Schwarz	828765/002	28-Jun-24
LISN	ESH2-Z5	Rohde & Schwarz	836679/025	12-Jun-24
Pulse Limiter	ESH3-Z2	Rohde & Schwarz	NONE	12-Jun-24

5. 99% Bandwidth

5.1 Test settings

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
• The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
• The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

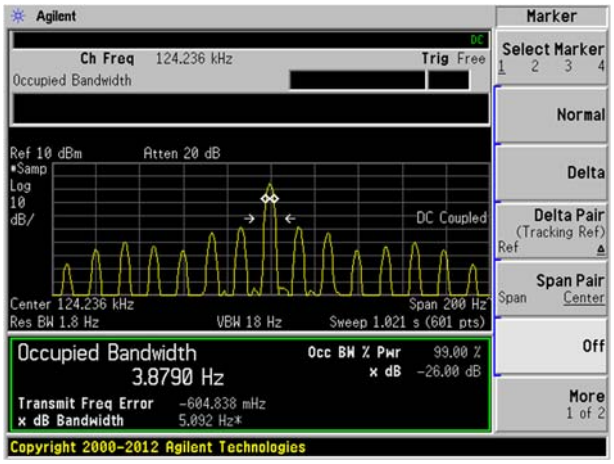
5.2 Test results

TM1			
Frequency(MHz)	Modulation	99% Bandwidth (kHz)	Limit
0.124	ASK	0.004	N/A

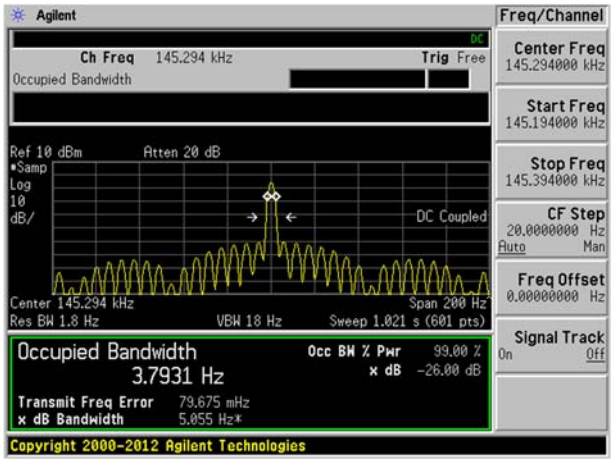
TM2			
Frequency(MHz)	Modulation	99% Bandwidth (kHz)	Limit
0.145	ASK	0.004	N/A

5.3 Test Plots

99% Bandwidth-TM1



99% Bandwidth-TM2



6. Measurement of radiated disturbance

6.1 Radiated emission limits, general requirements

FCC : 47 CFR § 15.209		
Frequency (MHz)	Distance(Meters)	Field strength (uV/m)
0.009 to 0.490	300	2400/F(kHz)
0.490 to 1.705	30	24000/F(kHz)
1.705 to 30	30	30
30 to 88	3	100
88 to 216	3	150
216 to 960	3	200
> 960	3	500

ISED : RSS-GEN Section 8.9		
Frequency (MHz)	Distance(Meters)	Field strength (uA/m)
0.009 to 0.490	300	6.37/F(kHz)
0.490 to 1.705	30	63.7/F(kHz)
1.705 to 30	30	0.08
30 to 88	3	100
88 to 216	3	150
216 to 960	3	200
> 960	3	500

6.2 TM1 Test data(9 kHz ~ 30 MHz)

Frequency (kHz)	Reading (dB ㎶)	Horizontal Position [Angle]	Height (m)	Correction Factor		Result Value(Qeas-Peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB ㎶/m)	Result (dB ㎶/m)	Margin (dB)
124.2	25.03	360.0	0.8	19.69	0.08	105.72	44.80	60.92
Remark	H : Horizontal, V : Vertical There did not measure any radiated spurious emission in the range 9 kHz to 30 MHz *There is no found Restricted bands. *The 300 m limit was converted to 3 m Limit using square factor(x) as it was found by measurements as follows; 3 m Limit(dBuV/m) = 20log(2400/F(KHz))+40log(300/10)= 20log(2400/124.2)+40log(300/3)							

6.3 TM2 Test data(9 kHz ~ 30 MHz)

Frequency (kHz)	Reading (dB ㎶)	Horizontal Position [Angle]	Height (m)	Correction Factor		Result Value(Qeas-Peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB ㎶/m)	Result (dB ㎶/m)	Margin (dB)
145.32	23.34	360.0	0.8	19.68	0.08	104.36	43.10	61.26
Remark	H : Horizontal, V : Vertical There did not measure any radiated spurious emission in the range 9 kHz to 30 MHz *There is no found Restricted bands. *The 300 m limit was converted to 3 m Limit using square factor(x) as it was found by measurements as follows; 3 m Limit(dBuV/m) = 20log(2400/F(KHz))+40log(300/10)= 20log(2400/124.2)+40log(300/3)							

6.5 TM1 Test data(30 MHz ~ 1 000 MHz)

Frequency (MHz)	Reading (dB ㎶)	Position (V/H)	Height (m)	Correction Factor		Result Value(Quasi-peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB ㎶/m)	Result (dB ㎶/m)	Margin (dB)
67.90	7.45	H	1.0	12.09	1.08	40.00	20.62	19.38
162.00	2.59	H	1.0	12.86	1.71	44.00	17.16	26.84
183.00	8.24	V	1.0	11.18	1.83	44.00	21.25	22.75
238.00	6.60	V	1.0	11.06	2.11	46.00	19.77	26.23
464.70	2.31	V	1.0	17.09	3.07	46.00	22.47	23.53
987.80	3.97	H	1.0	24.22	4.74	54.00	32.93	21.07
Remark	H : Horizontal, V : Vertical *Result Value = Reading + Antenna + Cable loss *Correction Factor = Ant Factor + Cable *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection							

TM2 Test data(30 MHz ~ 1 000 MHz)

Frequency (MHz)	Reading (dB ㎶)	Position (V/H)	Height (m)	Correction Factor		Result Value(Quasi-peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB ㎶/m)	Result (dB ㎶/m)	Margin (dB)
64.20	16.41	V	1.0	12.61	1.05	40.00	30.07	9.93
161.80	9.62	V	1.0	12.86	1.71	44.00	24.19	19.81
248.50	10.34	V	1.0	11.67	2.16	46.00	24.17	21.83
747.60	4.68	V	1.0	21.85	3.98	46.00	30.51	15.49
925.00	4.40	H	1.0	23.70	4.57	46.00	32.67	13.33
976.70	4.24	V	1.0	24.30	4.71	54.00	33.25	20.75
Remark	H : Horizontal, V : Vertical *Result Value = Reading + Antenna + Cable loss *Correction Factor = Ant Factor + Cable *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection							

7. Measurement of conducted disturbance

According to RSS-Gen(8.8), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

7.1 Test Data TM1

Frequency (MHz)	Correction Factor		Line (H/N)	Quasi-peak Value			Average Value		
	Lisn (dB)	Cable (dB)		Limit (dB μV)	Reading (dB μV)	Result (dB μV)	Limit (dB μV)	Reading (dB μV)	Result (dB)
0.17	0.05	0.17	N	65.21	50.89	51.11	55.21	32.26	32.48
0.37	0.04	0.19	H	58.46	47.34	47.57	48.46	42.31	42.54
0.62	0.04	0.20	H	56.00	45.50	45.74	46.00	42.36	42.60
0.87	0.04	0.21	H	56.00	46.52	46.77	46.00	42.27	42.52
1.12	0.04	0.21	H	56.00	46.45	46.70	46.00	41.96	42.21
9.19	0.14	0.32	N	60.00	37.95	38.41	50.00	28.89	29.35
Remark	H : Hot Line, N : Neutral Line *Correction Factor = Lisn + Cable *Result = Correction Factor + Reading								

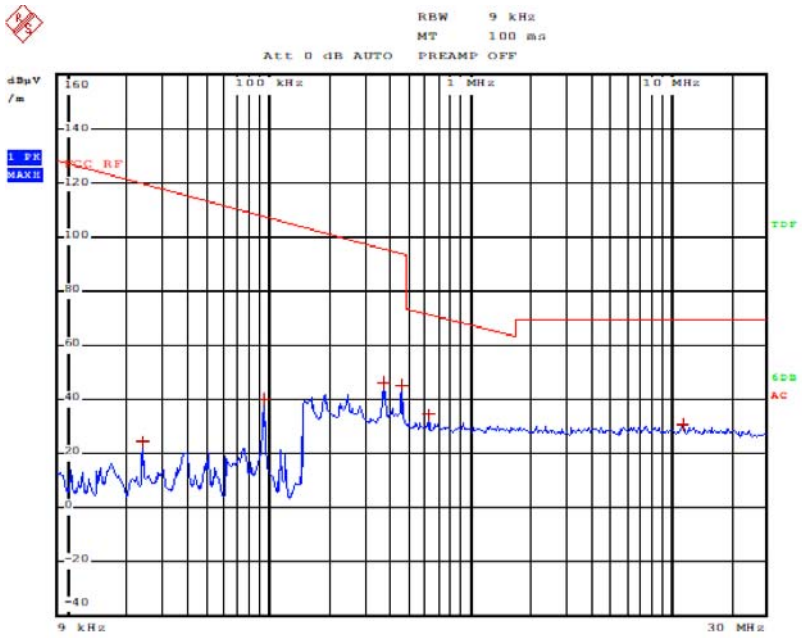
Test Data TM2

Frequency (MHz)	Correction Factor		Line (H/N)	Quasi-peak Value			Average Value		
	Lisn (dB)	Cable (dB)		Limit (dB μV)	Reading (dB μV)	Result (dB μV)	Limit (dB μV)	Reading (dB μV)	Result (dB)
0.15	0.05	0.17	N	65.84	50.28	50.50	55.84	30.42	30.64
0.29	0.05	0.18	H	60.50	48.33	48.56	50.50	43.46	43.69
0.73	0.04	0.20	H	56.00	47.12	47.36	46.00	42.52	42.76
1.16	0.04	0.21	H	56.00	46.78	47.04	46.00	42.48	42.74
1.60	0.05	0.22	H	56.00	44.52	44.79	46.00	40.14	40.41
3.49	0.07	0.26	H	56.00	43.42	43.76	46.00	38.27	38.61
Remark	H : Hot Line, N : Neutral Line *Correction Factor = Lisn + Cable *Result = Correction Factor + Reading								

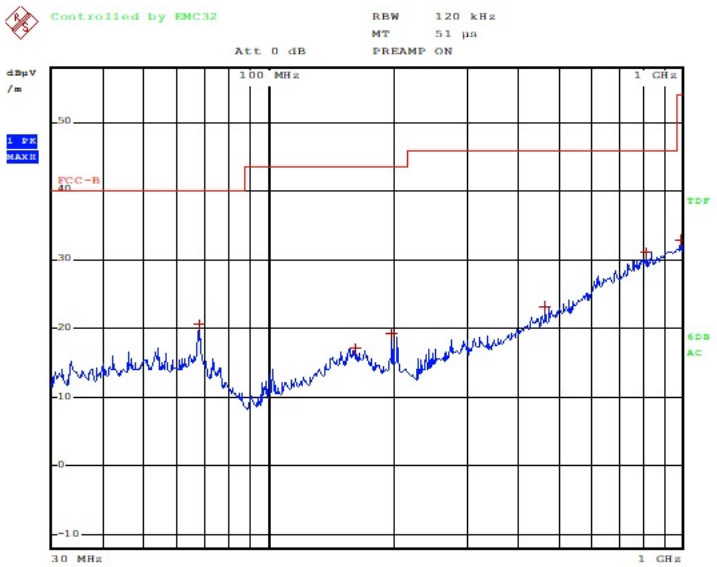
TEST PLOT

*** Horizontal**

Radiated Spurious Emission 9 kHz – 30 MHz : LF ASK TM1



Radiated Spurious Emission 30 MHz – 1 GHz : LF ASK TM1



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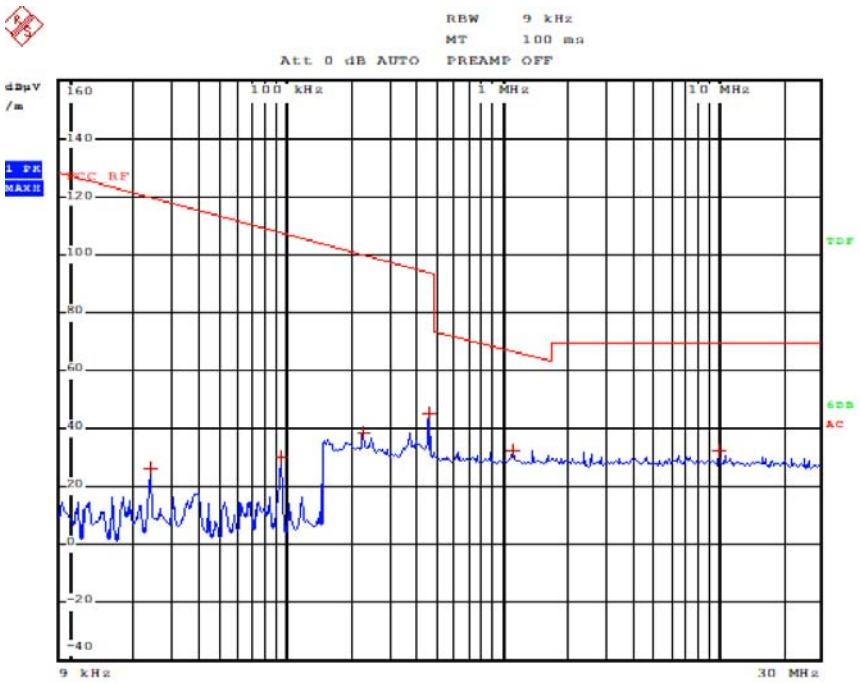
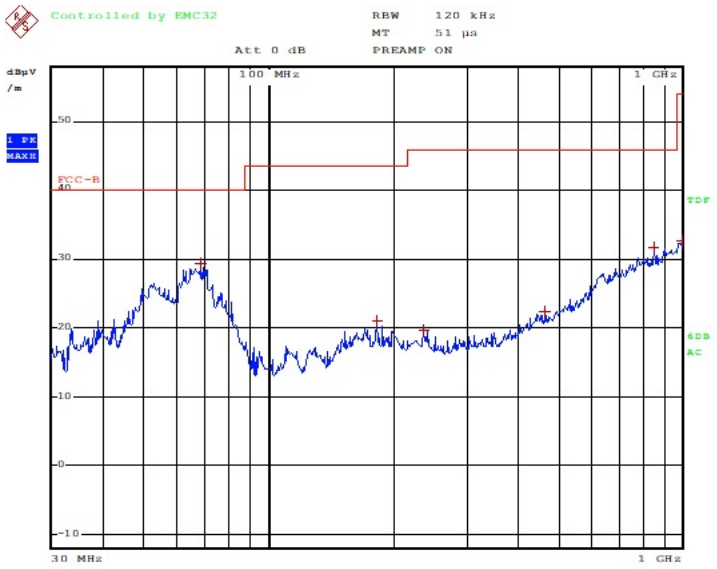
*** Vertical**

Radiated Spurious Emission 9 kHz – 30 MHz : LF ASK TM1



Radiated Spurious Emission 30 MHz – 1 GHz : LF ASK TM1



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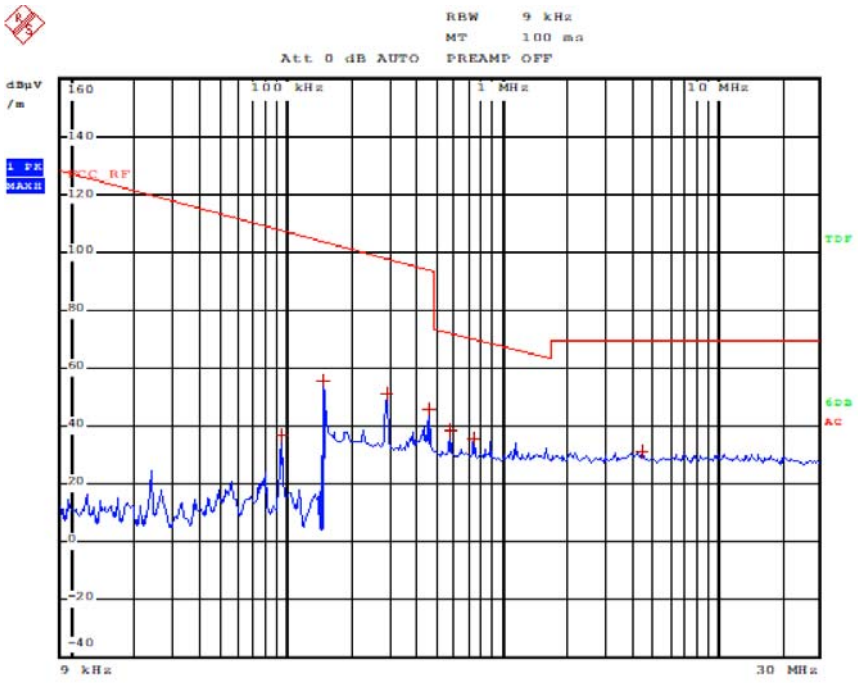
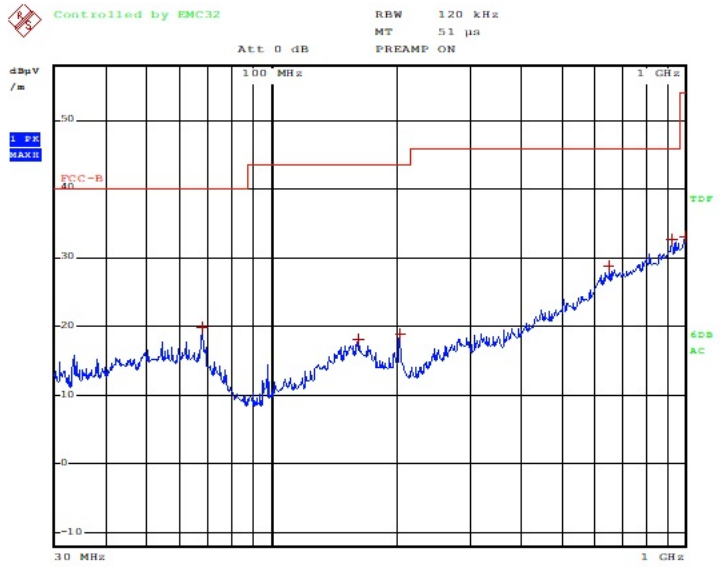
*** Horizontal**

Radiated Spurious Emission 9 kHz – 30 MHz : LF ASK TM2



Radiated Spurious Emission 30 MHz – 1 GHz : LF ASK TM2



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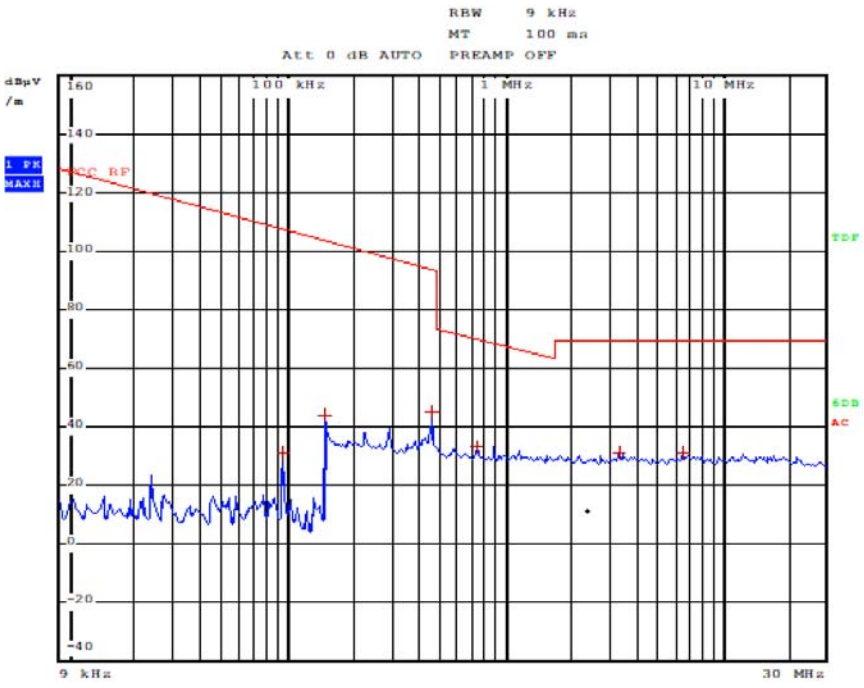
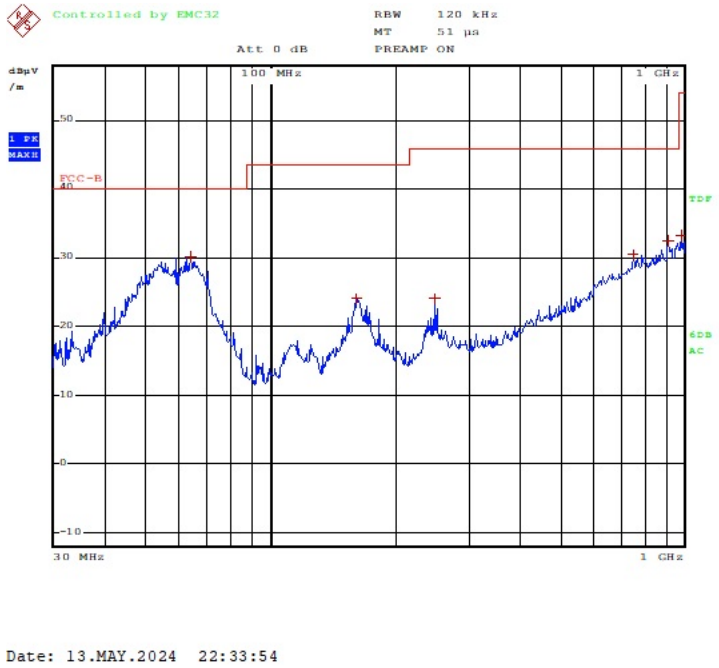
*** Vertical**

Radiated Spurious Emission 9 kHz – 30 MHz : LF ASK TM2

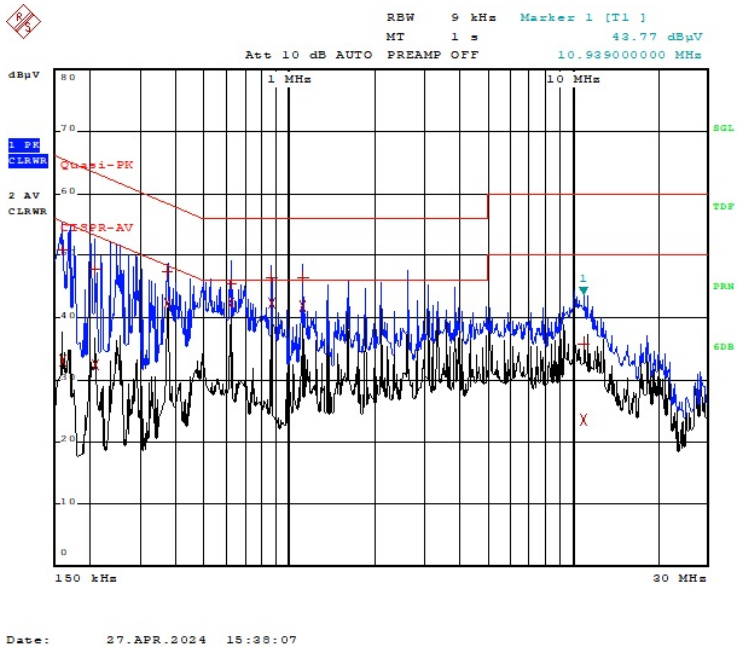


Radiated Spurious Emission 30 MHz – 1 GHz : LF ASK TM2



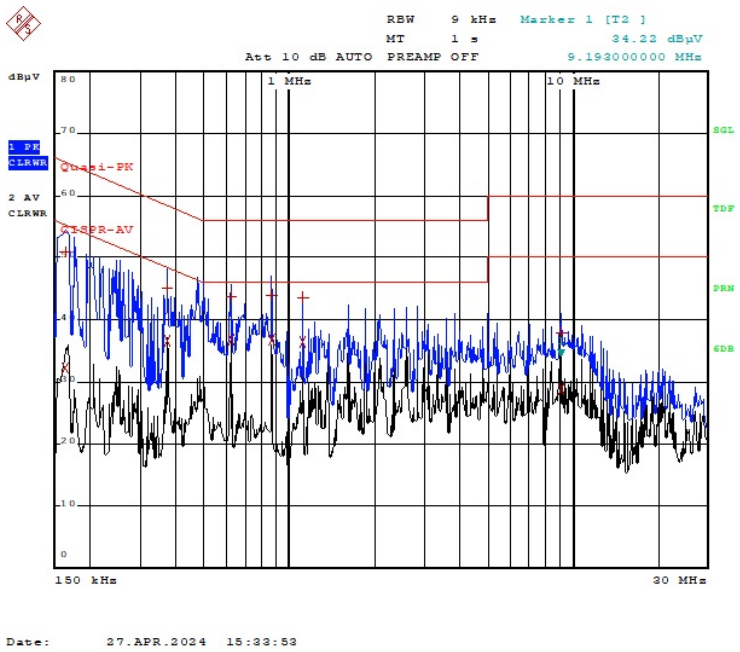
*** HOT LINE**

AC Line Conducted Emission Device with antenna connected(LF) TM1



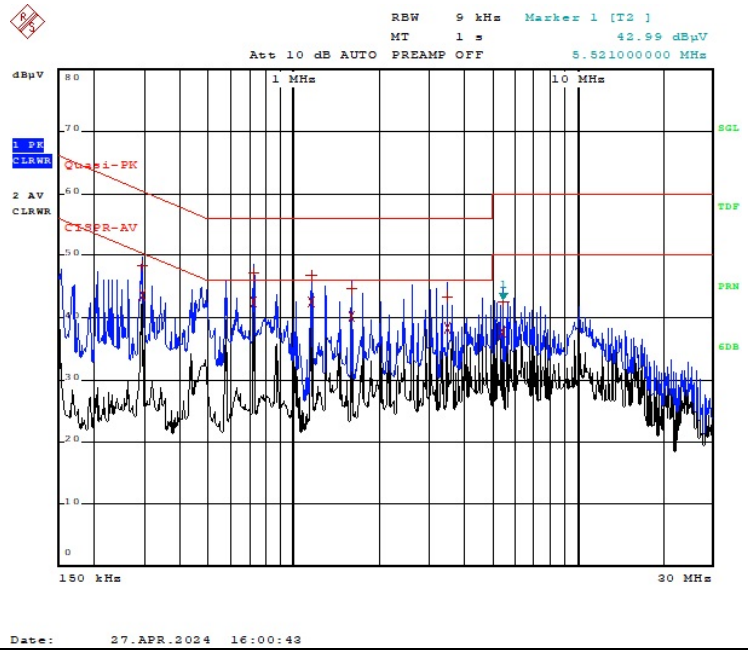
*** NEUTRAL LINE**

AC Line Conducted Emission Device with antenna connected(LF) TM1



*** HOT LINE**

AC Line Conducted Emission Device with antenna connected(LF) TM2



*** NEUTRAL LINE**

AC Line Conducted Emission Device with antenna connected(LF) TM2