

Test Report for FCC & IC

Report Number		ESTRGC2309-003		
Applicant	Company name	Suprema Inc		
	Address	17F-5, Parkview office tower, 248, Jeongjail-ro Bundang-gu, Seongnam-si, Gyeonggi-do South Korea		
	Telephone	+82-031-240-4333		
Product	Product name	Biostation 2a		
	Model No.	BS2A-OAPWB	Manufacturer	Suprema Inc
	Serial No.	NONE	Country of origin	KOREA
Test date	13-Sep-23 ~ 22-Sep-23		Date of issue	27-Sep-23
Testing location	140-16, Eongmalli-ro, Majang-myeon, Icheon-si, Gyeonggi-do, Rep. of Korea			
FCC ID	TKWBS2A-OAPWB			
ISED ID	23080-BS2AOAPWB			
FCC Rule Part(s)	Part 15.225, Part 15.209, Part 15.207			
ISED Rule Part(s)	RSS-210 Issue 10 (April 2020)			
Test result				Complied
Measurement facility registration number		659627		
MRA Registration number		KR0019		
Tested by	Engineer H.G. Lee			(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 - Additional models name: BS2A-ODPB(Delete wifi module)				

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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 : Biostation 2a
 Model Number : BS2A-OAPBW
 Serial Number : NONE
 Manufacturer : Suprema Inc
 Transfer Rate : 127 kHz, 13.56 MHz
 Power Rating : INPUT: AC(100 - 240) V, (50-60)Hz, 1.7 A
 OUTPUT: DC 24 V, 2.5 A
 Receipt Date : 2023-Aug-28

X-tal list(s) or Frequencies generated : 13.56 MHz

Software version:V01

Hardware version:V1.0.0

2.2 General descriptions of EUT

General Characteristics	Dimensions	78mm/3.07inch(W) x 112mm/4.41inch(H) x 30mm/1.18inch(D)
	Weight	164g
	Communication	C Type USB Host : USB2.0 High Speed / 18PIN (USB Client/Host)
DATA CAPTURE	Fingerprint Reader	IB DANNO FAP 30 TFT PIV Certified Sensor Type : Light-emitting sensor (LES) TFT camera Resolution : 500 ppi Gray Scale : 256 grayscale dynamic range Image Size : 400W x 500H pixels Supported Image Formats : RAW, JPEG2000, BMP, PNG, WSQ FBI Certification / Image Certifications : PIV 071006, FIPS 201, FAP 30 Speed : Minimum frame rate > 10FPS Capture Types : Single-finger flat
	HID RFID Reader	HID OMNYKEY 5127CK-MINI 13.56 HF / 125K LF RFID ISO14443A/B ISO15693, FeliCa™ (IDm), CEPAS (CSN) Broad Credential Support NFC support for Mobile devices Dual frequency allowingsimultaneous support f or HF and LF credentials HID Prox, Indala® and EM Prox,iCLASS, iCLASS SE®, iCLASS Seos®, MIFARE Classic®, MIFARE DESFire EV1®iCLASS SE Processor Provides support for processing of PACS data and secure keystorage and communication
User Environment	Operating Temp	-0°C ~ 50°C (-32°F ~ 122°F)
	Storage Temp	-20°C ~ 60°C (-4°F ~ 140°F)
	Humidity	Non-condensing, 93%
	Drop	1.5m (5ft.)
Compatible Device		RP1500, RP1600, RP1600X

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)

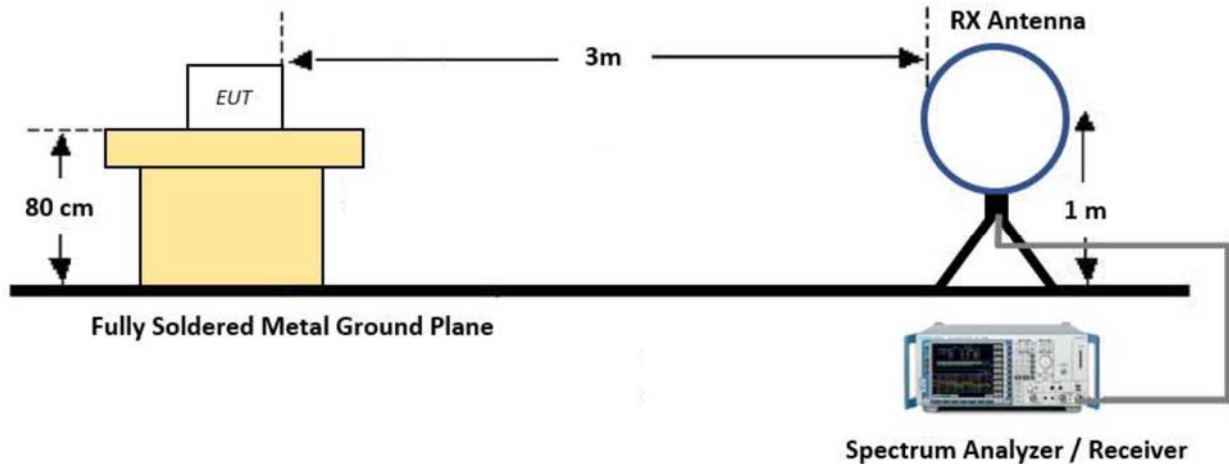
This standard sets forth uniform methods of measurement of radio-frequency (RF) signals and noise emitted from both unintentional and intentional emitters of RF energy in the frequency range 9 kHz to 40 GHz. Methods for the measurement of radiated and AC power-line conducted radio noise are covered and may be applied to any such equipment unless otherwise specified by individual equipment requirements. These methods cover measurement of certain devices 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 methods 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
20 dB Bandwidth	§15.215 (c)	-	N/A		PASS
Radiated E-Field Emissions 13.553 MHz - 13.567 MHz	§15.225 (a)	Annex B.6 (a)(i) RSS-210	cf. Section 7.3		N/A 1)
Radiated E-Field Emissions 13.410 MHz ≤ f ≤ 13.553 MHz 13.567 MHz ≤ f ≤ 13.710 MHz	§15.225 (b)	Annex B.6 (a)(ii) RSS-210	cf. Section 7.3		N/A 1)
Radiated E-Field Emissions 13.110 MHz ≤ f ≤ 13.410 MHz 13.710 MHz ≤ f ≤ 14.010 MHz	§15.225 (c)	Annex B.6(a)(iii) RSS-210	cf. Section 7.3		N/A 1)
Radiated Spurious Emissions	15.209	Section 8.9 RSS-GEN	cf. Section 7.3		PASS
Frequency Stability	§15.225 (e)	RSS-210, B.6	cf. Section 7.2		PASS
AC Power line Conducted Emissions	§15.207	RSS-GEN, 8.8	cf. Section 7.4	Conducted	PASS

Notes:

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

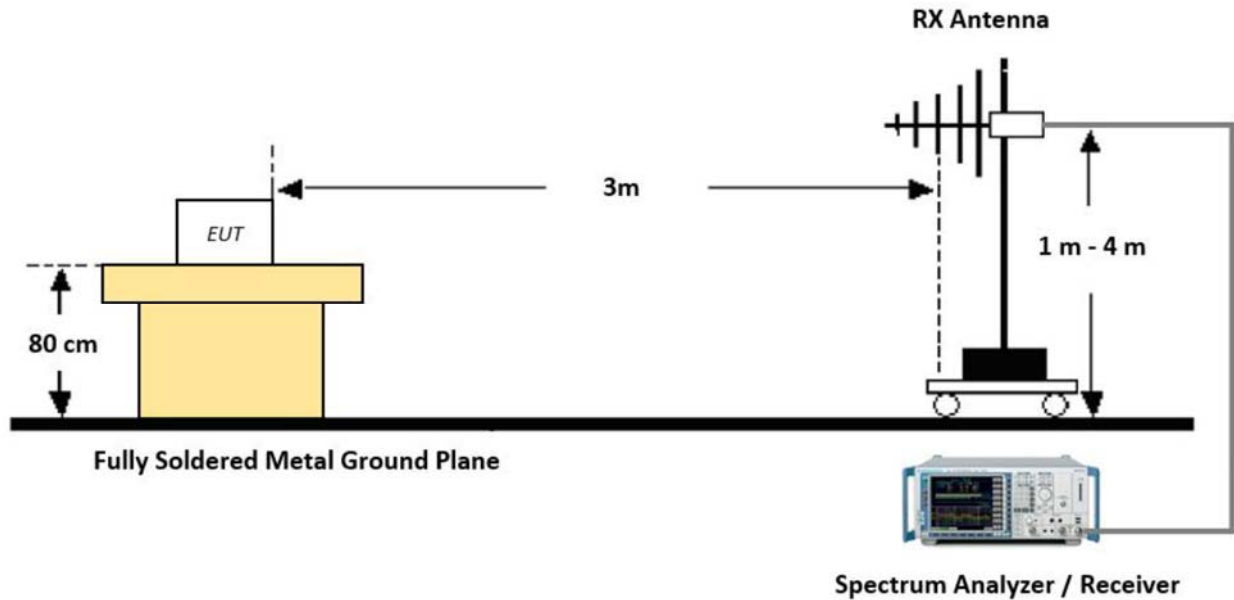
Test Configuration Below 30 MHz



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) = $40 \cdot \log(3 \text{ m}/300 \text{ m}) = -80 \text{ dB}$
Measurement Distance: 3 m
 7. Distance Correction Factor (0.490 MHz – 30 MHz) = $40 \cdot \log(3 \text{ m}/30 \text{ m}) = -40 \text{ dB}$
Measurement Distance: 3 m
 8. Spectrum Setting
 - Frequency Range = 9 kHz ~ 30 MHz
 - Detector = Peak
 - Trace = Max hold
 - RBW = 9 kHz
 - VBW $\geq 3 \cdot \text{RBW}$
 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 $\geq 3 \times \text{RBW}$

(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)

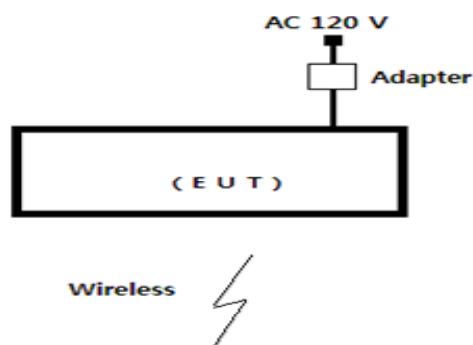
4. Measurement Condition

4.1 EUT Operation.

The EUT was tested, under transmission / receiving

1. Normal communication with RF OUT Frequency 13.56 MHz(HF), 125 kHz(LF).
2. Monitoring the operation status of frequency by using RF CARD.

4.2 Configuration and Peripherals



4.3 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark
Biostation 2a	BS2A-OAPBW	NONE	Suprema Inc	EUT
Adapter	KPL-060M-VI	NONE	Channel Well technology (Guangzhou)Co.,Ltd.	

4.4 Measurement equipments (Conducted)

Description	Model	Serial Number	Cal. Due Date
Spectrum Analyzer	E440A	US42041291	28-Nov-23
Spectrum Analyzer	FSV40	100939	28-Nov-23
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	28-Jun-24
LOOP Antenna	HFH2-Z2	ROHDE & SCHWARZ	100188	29-Aug-24
Logbicon Antenna	VULB 9168	SCHWARZBECK	193	9-Dec-23
Turn Table	DT3000-2t	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-
PREAMPLIFIER	8449B	HP	3008A00581	28-Jun-24
Horn Antenna	LB-42-15-C-SF	A-INFOMF	J2020079000055	11-Nov-23
Horn Antenna	BBHA9120D	SCHWARZBECK	469	08-Nov-23
TEST Receiver	ESU	ROHDE & SCHWARZ	100529	28-Jun-24
Turn Table	DT1500-S	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-
Antenna Master & Turn table controller	CO2000-P	Innco System GmbH	CO2000/642 /28051111/L	-

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	28-Jun-24
Pulse Limiter	ESH3-Z2	Rohde & Schwarz	NONE	28-Jun-24

5. 20dB Bandwidth / 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.

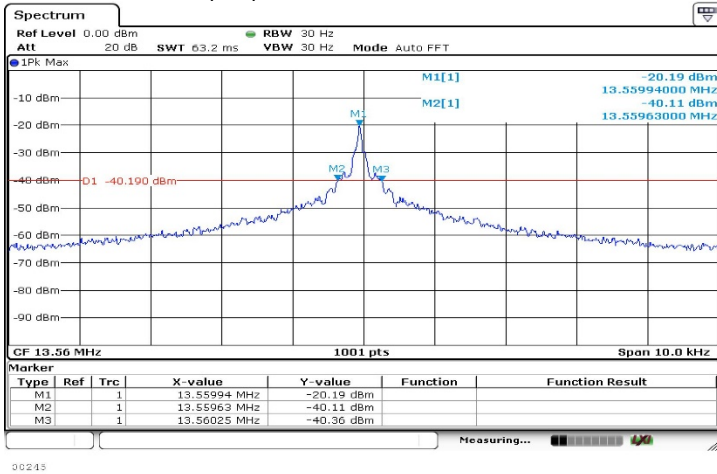
5.2 Test results

HF				
Frequency(MHz)	Modulation	20dB Bandwidth(kHz)	99% Bandwidth (kHz)	Limit
13.56	ASK	0.62	2.917	N/A

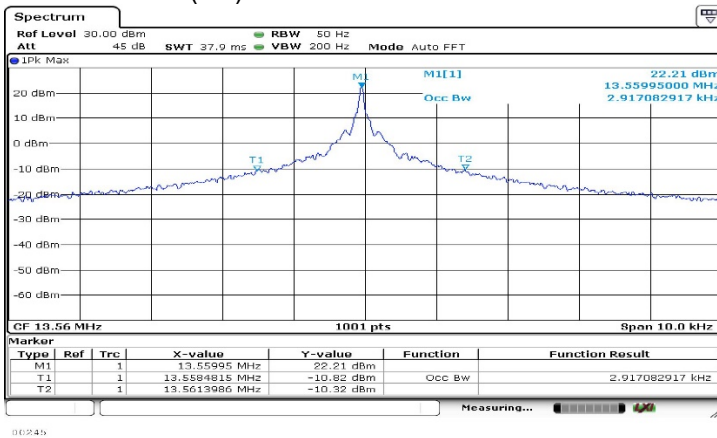
LF			
Frequency(MHz)	Modulation	99% Bandwidth (kHz)	Limit
0.1267	ASK	4.795	N/A

5.3 Test Plots

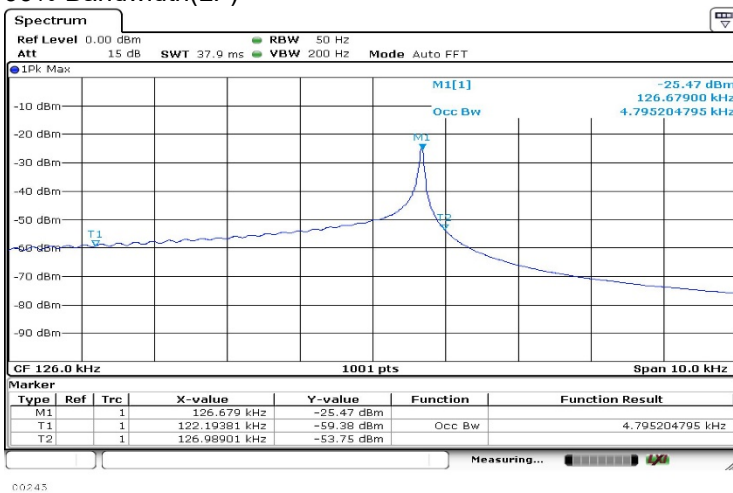
20 dB Bandwidth(HF)



99% Bandwidth(HF)



99% Bandwidth(LF)



6. Frequency Tolerance

6.1 Frequency stability Data (Adapter)

Operating Frequency :	13,560,000 Hz
Reference Voltage :	24.0 Vd.c.
Deviation Limit :	± 0.01 %

Voltage (%)	Power (Vdc)	Temperature (°C)	Frequency (Hz)	Deviation (%)
100	24.0	+20 °C (Ref)	13,560,108	0.000796
100		-20	13,560,016	0.000118
100		-10	13,560,124	0.000914
100		0	13,560,090	0.000664
100		10	13,559,951	-0.000361
100		20	13,559,969	-0.000229
100		30	13,559,919	-0.000597
100		40	13,559,926	-0.000546
100		50	13,559,583	-0.003075
85	20.4	20	13,560,229	0.001689
115	27.6	20	13,560,177	0.001305

7. Measurement of radiated disturbance

7.1 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

Operation within the band 13.110 MHz – 14.010 MHz

FCC : 47 CFR § 15.225 (a), (b), (c), (d) / ISED : RSS-210 ANNEX B.6		
Frequency (MHz)	Distance(Meters)	Field strength (uV/m)
13.553 – 13.567	30	15,848
13.410 ≤ f ≤ 13.553 13.567 ≤ f ≤ 13.71	30	334
13.110 ≤ f ≤ 13.410 13.710 ≤ f ≤ 14.010	30	106

7.2 13.56 MHz(HF)Test data(9 kHz ~ 30 MHz)

Frequency (MHz)	Reading (dB μV)	Vertical Position [Angle]	EUT Position	Height (m)	Correction Factor		Result Value(Quasi-Peak)		
					Ant Factor (dB)	Cable (dB)	Limit (dB $\mu V/m$)	Result (dB $\mu V/m$)	Margin (dB)
Below 13.110 MHz									
Noise Floor	-	-	-	-	19.48	0.5	69.5	-	-
13.110 MHz to 13.410 MHz									
Noise Floor	-	-	-	-	19.46	0.5	80.5	-	-
13.410 MHz to 13.552 MHz									
Noise Floor	-	-	-	-	19.46	0.5	90.5	-	-
13.553 MHz to 13.567 MHz									
13.5600	56.44	13.0	X	0.8	19.56	0.5	124.0	76.51	-47.49
13.567 MHz to 13.710 MHz									
Noise Floor	-	-	-	-	19.45	0.5	90.5	-	-
13.710 MHz to 14.010 MHz									
Noise Floor	-	-	-	-	19.44	0.6	80.5	-	-
14.010 MHz to 30 MHz									
Noise Floor	-	-	-	-	19.44	0.6	69.5	-	-
Remark	*The 30 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(X)+40log(30/3)= 20log(15848)+40log(30/3) = 124 dBuV *3 m Limit(dBuV/m) = 20log(X)+40log(30/3)= 20log(30)+40log(30/3) = 69.5 dBuV * The EUT was measured for the worst case by rotating of antenna angle. * The EUT performed at X,Y,Z and recorded the worst data in the report.								

7.3 125 kHz(LF)Test data(9 kHz ~ 30 MHz)

Frequency (kHz)	Reading (dB μV)	Horizontal Position [Angle]	Height (m)	Correction Factor		Result Value(Qeas-Peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB $\mu V/m$)	Result (dB $\mu V/m$)	Margin (dB)
127.00	55.22	0.0	0.8	19.80	0.03	105.67	75.05	-30.62
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) = $20\log(2400/F(KHz))+40\log(300/10)= 20\log(2400/125.0)+40\log(300/3)$							

7.4 13.56 MHz(HF)Test data(30 MHz ~ 1 000 MHz)

Frequency (MHz)	Reading (dB μV)	Position (V/H)	Height (m)	Correction Factor		Result Value(Quasi-peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB $\mu V/m$)	Result (dB $\mu V/m$)	Margin (dB)
150.00	21.85	V	1.0	11.80	2.33	43.50	35.98	7.52
312.00	19.78	H	1.4	13.57	2.63	46.00	35.98	10.02
650.00	14.95	H	1.3	17.90	3.54	46.00	36.39	9.61
720.00	13.35	H	1.1	20.35	3.96	46.00	37.66	8.34
750.00	10.09	H	1.0	23.10	4.70	46.00	37.89	8.11
800.00	10.15	H	1.0	24.20	5.08	46.00	39.43	6.57
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							

7.5 125 kHz(LF)Test data(30 MHz ~ 1 000 MHz)

Frequency (MHz)	Reading (dB μV)	Position (V/H)	Height (m)	Correction Factor		Result Value(Quasi-peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB $\mu V/m$)	Result (dB $\mu V/m$)	Margin (dB)
150.00	21.78	V	1.0	11.80	2.33	43.50	35.91	7.59
720.00	22.08	H	1.0	13.57	2.63	46.00	38.28	7.72
750.00	17.00	H	1.0	17.90	3.54	46.00	38.44	7.56
800.00	13.70	H	1.0	20.35	3.96	46.00	38.01	7.99
850.00	8.33	H	1.0	23.10	4.70	46.00	36.13	9.87
950.00	7.09	H	1.0	24.20	5.08	46.00	36.37	9.63
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							

8. 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 kHz to 30 MHz, 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.

8.1 Test data (13.56 MHz HF)

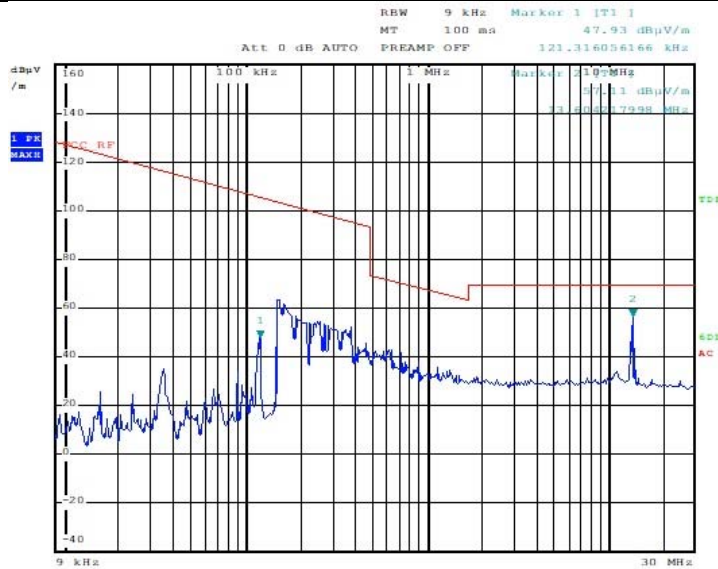
Frequency (MHz)	Correction Factor		Line (H/N)	Quasi-peak Value			Average Value		
	Lisn (dB)	Cable (dB)		Limit (dB μ V)	Reading (dB μ V)	Result (dB μ V)	Limit (dB μ V)	Reading (dB μ V)	Result (dB)
0.15	0.06	0.15	H	59.83	40.83	41.04	49.83	25.81	26.02
0.16	0.06	0.15	H	58.93	38.24	38.45	48.93	24.32	24.53
0.17	0.06	0.15	N	58.00	37.49	37.69	48.00	24.92	25.12
0.19	0.05	0.14	N	57.93	34.68	34.87	47.93	25.16	25.35
0.42	0.05	0.14	H	56.81	43.33	43.52	46.81	36.00	36.19
24.00	0.05	0.14	N	56.76	40.60	40.79	46.76	39.51	39.70
Remark	H : Hot Line, N : Neutral Line *Correction Factor = Lisn + Cable *Result = Correction Factor + Reading								

(125 kHz LF)

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)
0.16	0.06	0.15	H	59.83	38.43	38.64	49.83	24.13	24.34
0.17	0.06	0.15	H	58.93	37.68	37.89	48.93	25.42	25.63
0.21	0.06	0.15	N	58.00	31.47	31.67	48.00	20.35	20.55
0.42	0.05	0.14	H	57.93	44.18	44.37	47.93	36.43	36.62
22.11	0.05	0.14	N	56.81	32.49	32.68	46.81	30.08	30.27
24.01	0.05	0.14	N	56.76	39.97	40.16	46.76	38.78	38.97
Remark	H : Hot Line, N : Neutral Line *Correction Factor = Lisn + Cable *Result = Correction Factor + Reading								

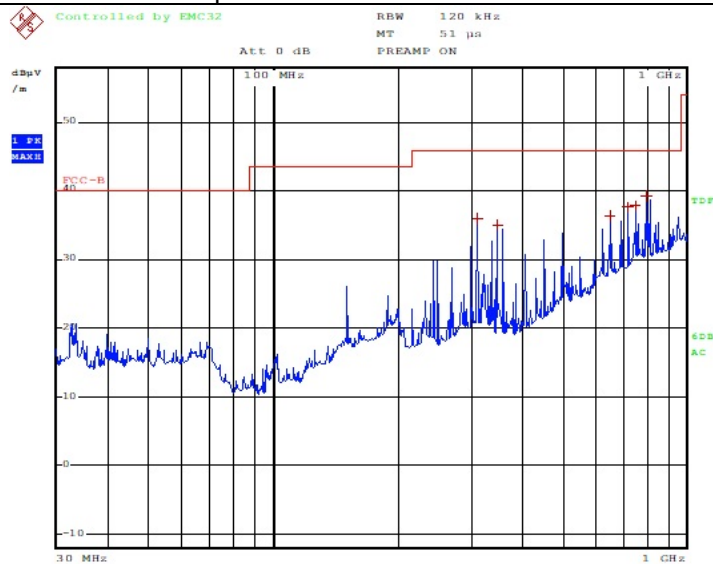
TEST PLOT
* Horizontal

Radiated Spurious Emission 9 kHz – 30 MHz : HF ASK



ESTR_23_00245

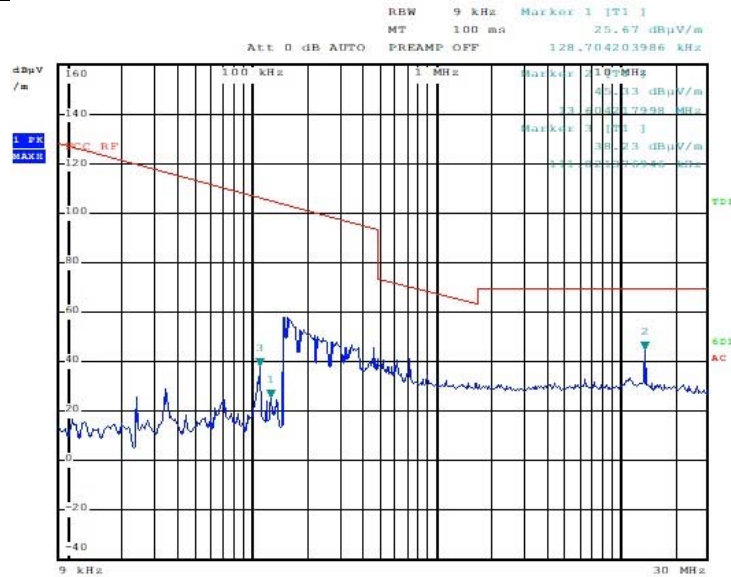
Radiated Spurious Emission 30 MHz – 1 GHz : HF ASK



ESTR-23-00245

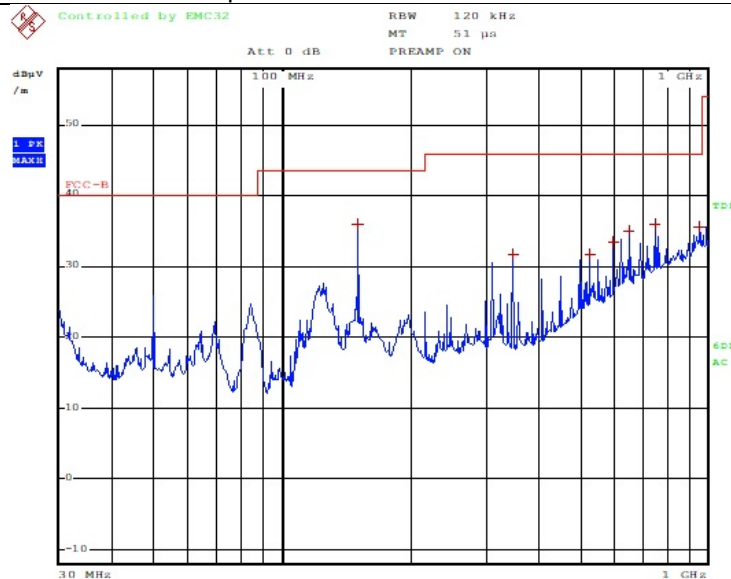
*** Vertical**

Radiated Spurious Emission 9 kHz – 30 MHz : HF ASK



ESTR_23_00245

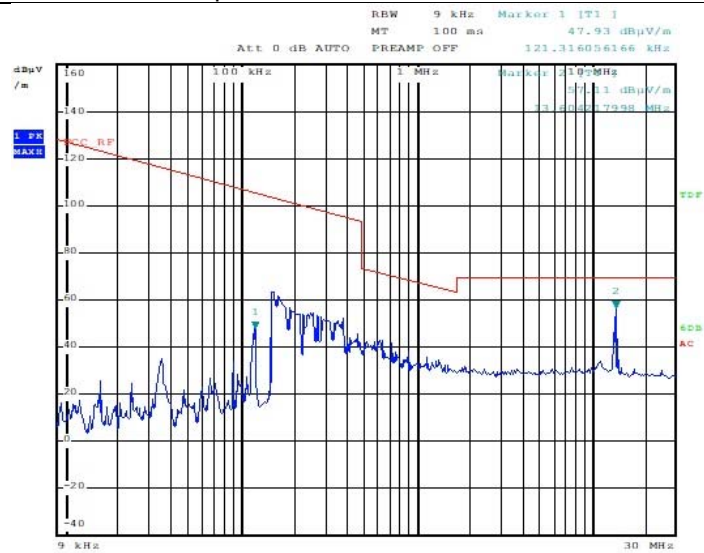
Radiated Spurious Emission 30 MHz – 1 GHz : HF ASK



ESTR-23-00245

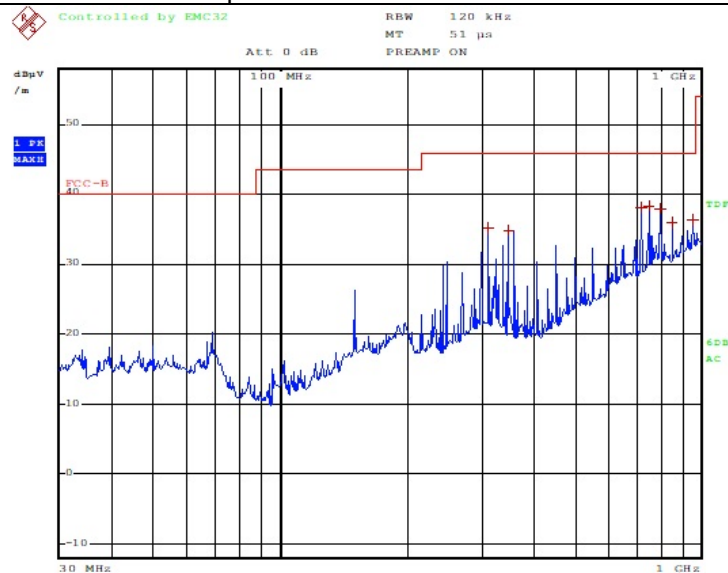
*** Horizontal**

Radiated Spurious Emission 9 kHz – 30 MHz : LF ASK



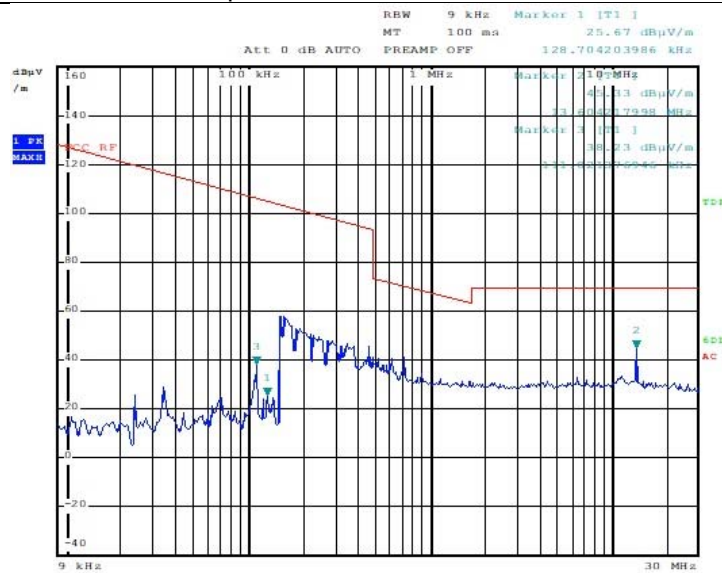
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Radiated Spurious Emission 30 MHz – 1 GHz : LF ASK



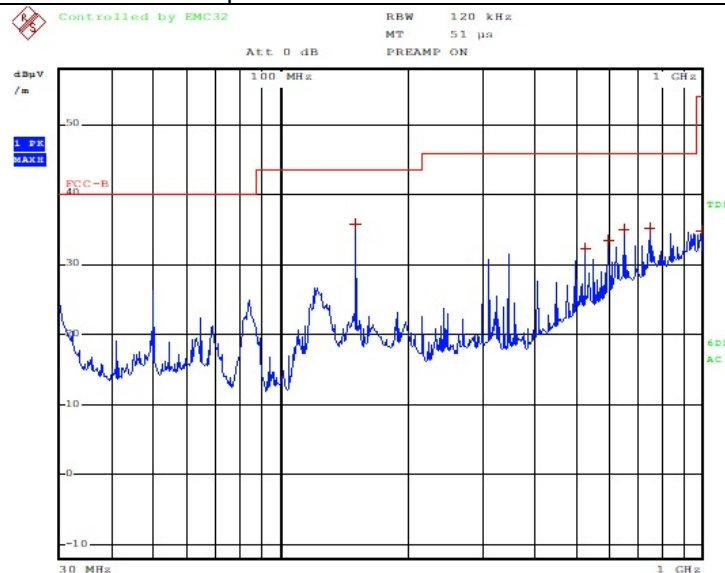
ESTR-23-00245

Radiated Spurious Emission 9 kHz – 30 MHz : LF ASK



ESTR_23_00245

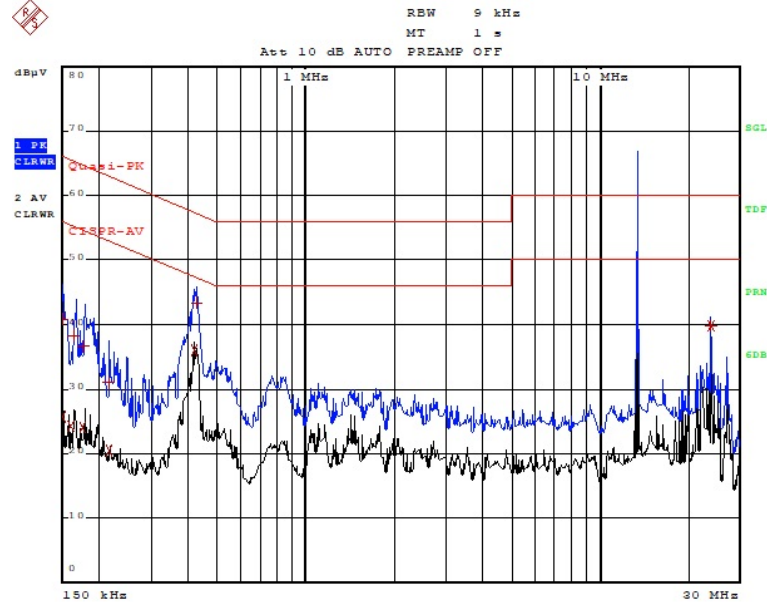
Radiated Spurious Emission 30 MHz – 1 GHz : LF ASK



ESTR-23-00245

*** HOT LINE**

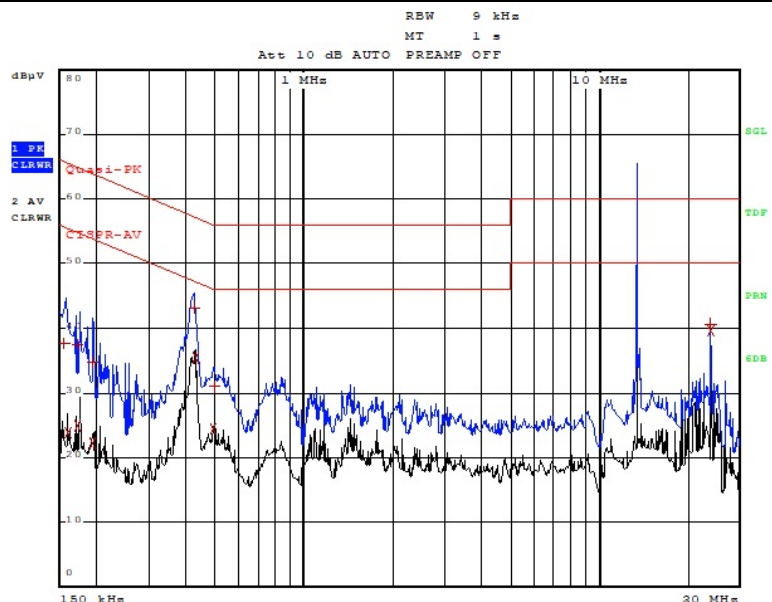
AC Line Conducted Emission Device with antenna connected(HF)



Comment: ESTR-23-00245

*** NEUTRAL LINE**

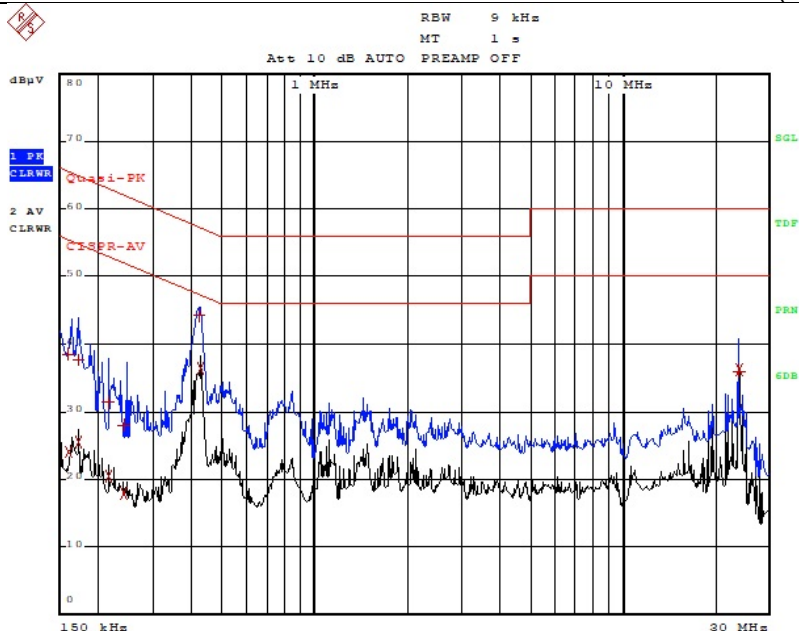
AC Line Conducted Emission Device with antenna connected(HF)



Comment: ESTR-23-00245

*** HOT LINE**

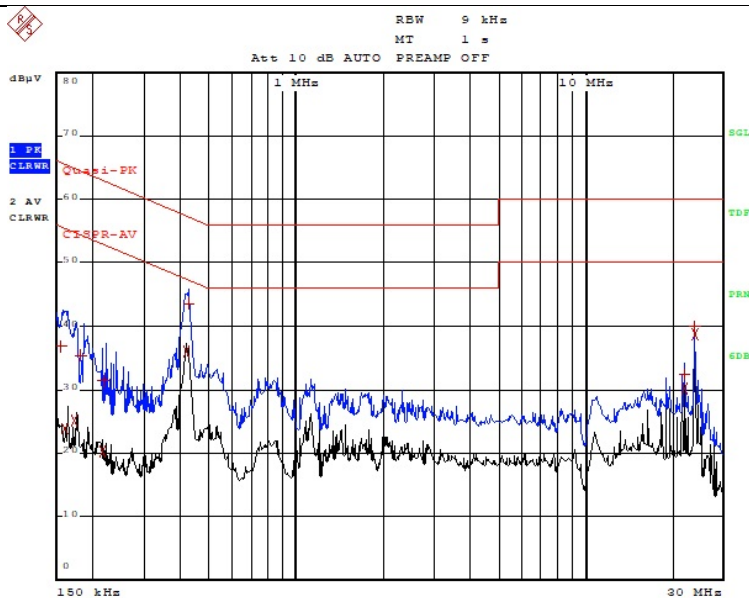
AC Line Conducted Emission Device with antenna connected(LF)



Comment : ESTR-23-00245

*** NEUTRAL LINE**

AC Line Conducted Emission Device with antenna connected(LF)



Comment : ESTR-23-00245