

Test Report for FCC & IC

Report Number		ESTRGC2409-001		
Applicant	Company name	Suprema Inc		
	Address	17F-5, Parkview office tower, 248, Jeongjail-ro Bundang-gu, Seongnam-si, Gyeonggi-do South Korea		
	Telephone	+82-031-710-2419		
Product	Product name	BioEntry W3		
	Model No.	BEW3-DB	Manufacturer	Suprema Inc
	Serial No.	NONE	Country of origin	KOREA
Test date	14-Aug-24 ~ 19-Aug-24		Date of issue	02-Sep-24
Testing location	140-16, Eongmalli-ro, Majang-myeon, Icheon-si, Gyeonggi-do, Rep. of Korea			
FCC ID	TKWBEW3-DB			
ISED ID	23080-BEW3DB			
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		FCC:659627		
Measurement facility registration number		ISED:4475A		
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 product is equipped with a constant voltage circuit and tested at 24V among 12v and 24V power supplies				

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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 : BioEntry W3
 Model Number : BEW3-DB
 Serial Number : NONE
 Manufacturer : Suprema Inc
 Transfer Rate : NFC(LF)125 kHz, NFC(HF)13.56 MHz, BLE
 Power Rating : DC 12 V, 1.2 A, DC 24 V, 0.6 A,
 Receipt Date : 29-Jul-24
 Software version:V1.0.0
 Hardware version:V1.0.0
 NFC (LF) 125 kHz duty : 57.14 %
 NFC (HF)13.56 MHz duty : 100 %

2.2 General descriptions of EUT

Category	Feature	Specification
Credential	Biometric	Face
	RF Option	• BEW3-DB: 125kHz EM & 13.56MHz MIFARE, MIFARE Plus, DESFire, DESFire EV1/EV2/EV3[®], FeliCa • BEW3-APB: 125kHz EM, HID Prox & 13.56MHz MIFARE, MIFARE Plus, DESFire, DESFire EV1/EV2/EV3[®], FeliCa, iCLASS SE/SR/Seos
	RF Read Range ²⁾	MIFARE/DESFire/EM/iCLASS: 50 mm, FeliCa/HID Prox: 30 mm
	Mobile	NFC, BLE
General	CPU	1.5 GHz Quad Core
	Memory	16 GB Flash + 2 GB RAM
	Crypto Chip	Supported
	LCD Type	1.3" PMOLED
	LED	Multi-color
	Sound	16 bit
	Operating Temperature	-20 °C ~ 50 °C
	Storage Temperature	-40 °C ~ 70 °C
	Operating Humidity	0 % ~ 80 %, non-condensing
	Storage Humidity	0 % ~ 90 %, non-condensing
	Camera	2 MP 2 EA
	Dimension (W x H x D)	160 x 50 x 34.2 (mm)
	Weight	• Device – BEW3-DB: 283 g – BEW3-APB: 291 g • Bracket: 36 g
	IP Rating	IP67
	IK Rating	IK08
	Certificates	CE, UKCA, KC, FCC, IC, RCM, BIS, ANATEL, SIG, RoHS, REACH, WEEE, EAC, TELEC

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)

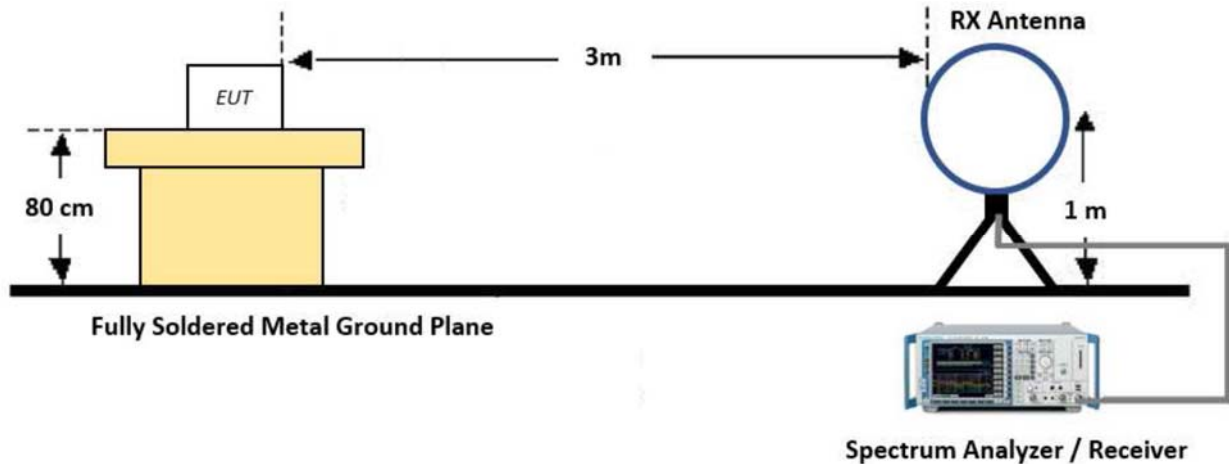
This standard sets forth uniform methods of measurement of radio-frequency (RF) signals and noise emitted from both unintentional and intentional emitters of RF energy in the frequency range 9 kHz to 40 GHz. Methods for the measurement of radiated and AC power-line conducted radio noise are covered and 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

Notes:

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

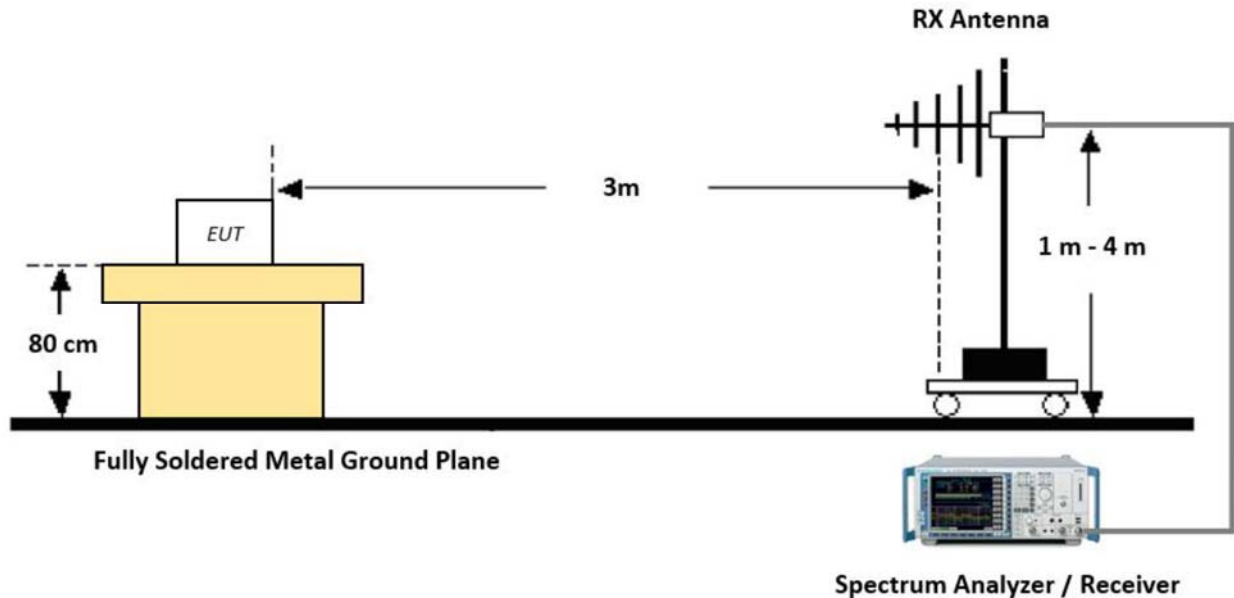
Test Configuration Below 30 MHz



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)

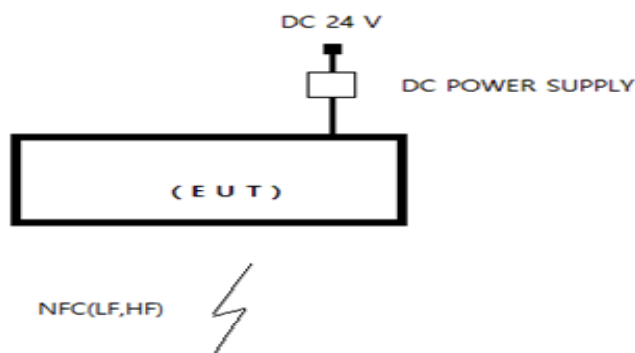
4. Measurement Condition

4.1 EUT Operation.

The EUT was tested, under transmission / receiving

1. Normal communication with RF OUT Frequency 13.56 MHz NFC (HF), 125 kHz NFC (LF).
2. Monitoring the operation status of frequency by using RF CARD.
3. Set the unlicensed wireless device to operate in continuous transmit mode. For unlicensed wireless devices unable to be configured for 100% duty cycle even in test mode, configure the system for the maximum duty cycle supported.

4.2 Configuration and Peripherals



4.3 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark
BioEntry W3	BEW3-DB	NONE	Suprema Inc	EUT
Adapter	DZ036DL	NONE	Channel Well technology (Guangzhou)Co.,Ltd.	

4.4 Measurement equipments (Conducted)

Description	Model	Serial Number	Cal. Date	Cal. Due Date
Spectrum Analyzer	E440A	US42041291	27-Nov-23	27-Nov-24
Spectrum Analyzer	FSV40	100939	27-Nov-23	27-Nov-24
RF Cable	Length: 100 cm	-		

4.5 Measurement equipments (Radiated)

Equipment Name	Type	Manufacturer	Serial No.	Cal. Date	Cal. Due Date
TEST Receiver	ESCI7	ROHDE & SCHWARZ	100916	03-Jun-24	03-Jun-25
LOOP Antenna	HFH2-Z2	ROHDE & SCHWARZ	100188	29-Aug-22	29-Aug-24
Logbicon Antenna	VULB 9168	SCHWARZBECK	193	25-Dec-23	25-Dec-25
Turn Table	DT3000-2t	Innco System GmbH	N/A	-	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-	-
PREAMPLIFIER	8449B	HP	3008A00581	04-Jun-24	04-Jun-25
Horn Antenna	LB-42-15-C-SF	A-INFOMF	J2020079000055	01-Nov-23	01-Nov-24
Horn Antenna	BBHA9120D	SCHWARZBECK	469	26-Oct-23	26-Oct-24
TEST Receiver	ESU	ROHDE & SCHWARZ	100529	03-Jun-24	03-Jun-25
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	-	-

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.

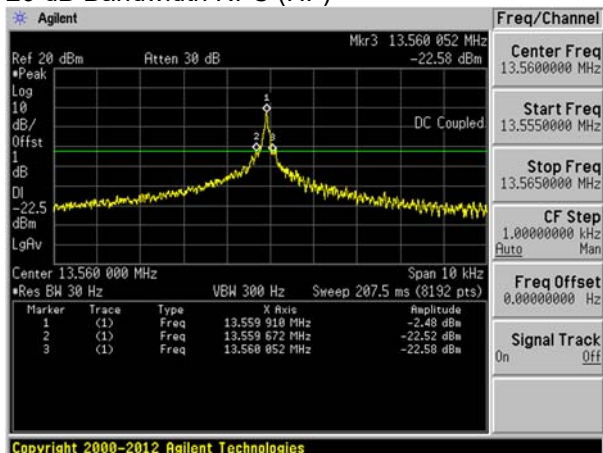
5.2 Test results

NFC HF				
Frequency(MHz)	Modulation	20 ^{dB} Bandwidth(kHz)	99% Bandwidth (kHz)	Limit
13.56	ASK	0.38	1.79	N/A

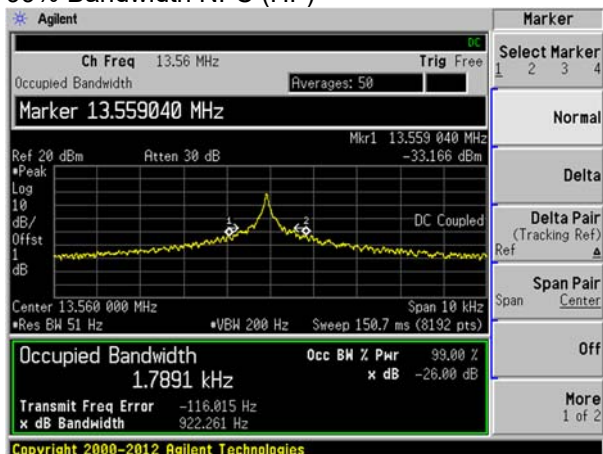
NFC LF			
Frequency(MHz)	Modulation	99% Bandwidth (kHz)	Limit
0.122	ASK	3.12	N/A

5.3 Test Plots

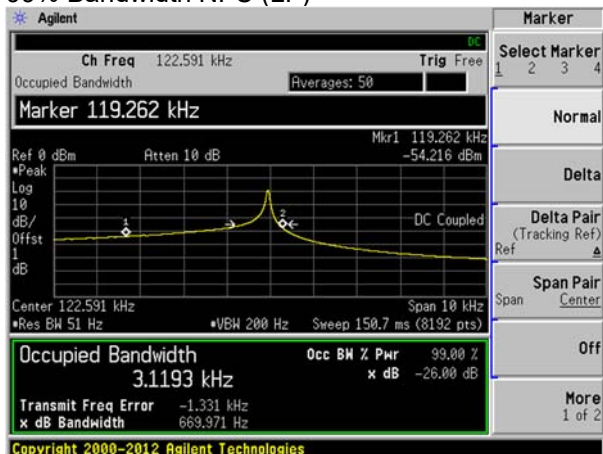
20 dB Bandwidth NFC (HF)



99% Bandwidth NFC (HF)



99% Bandwidth NFC (LF)



6. Frequency Tolerance

6.1 Frequency stability Data

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)	13,559,887	0.000833
100		-20	13,559,876	0.000914
100		-10	13,559,871	0.000951
100		0	13,560,330	-0.002434
100		10	13,560,289	-0.002131
100		20	13,560,240	-0.001770
100		30	13,560,596	-0.004395
100		40	13,560,655	-0.004830
100		50	13,560,935	-0.006895
85	20.4	20	13,560,453	-0.003341
115	27.6	20	13,559,902	0.000723

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 NFC (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	48.70	0	Y	0.8	19.46	0.55	124.0	68.7	-55.3
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. * This test was tested when transmitted. NFC (HF)								

7.3 125 kHz NFC (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)
121.4	36.7	0.0	0.8	19.69	0.08	105.67	56.47	-49.20
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; $3 \text{ m Limit (dBuV/m)} = 20\log(2400/F(\text{KHz})) + 40\log(300/10) = 20\log(2400/125.0) + 40\log(300/3)$ * This test was tested when transmitted.(LF)							

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

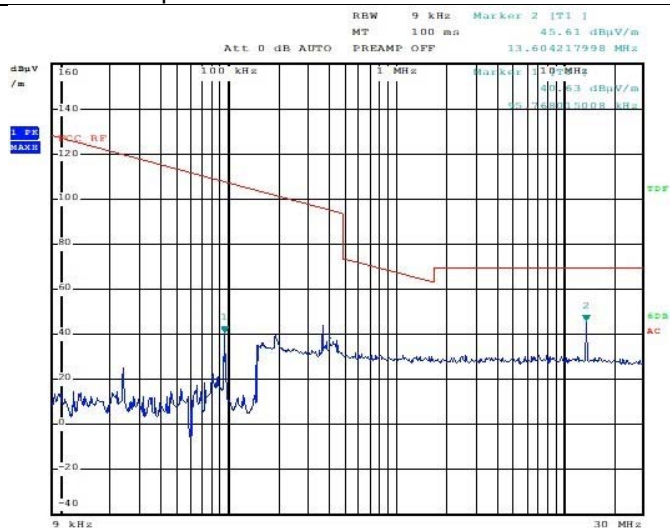
Frequency (MHz)	Reading (dB μV)	Position (V/H)	Height (m)	Correction Factor		Result Value(Quasi-peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB $\mu V/m$)	Result (dB $\mu V/m$)	Margin (dB)
36	23.99	V	1.0	12.26	0.78	40.00	37.03	2.96
67.8	15.13	V	1.4	12.11	1.07	40.00	28.31	11.68
86.3	19.19	V	1.3	8.02	1.25	40.00	28.46	11.53
189.8	24.40	H	1.1	10.52	1.87	43.50	36.78	6.71
250	27.26	V	1.0	11.70	2.17	46.00	41.13	4.86
700	13.46	V	1.0	20.80	3.84	46.00	38.10	7.89
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 * This test was tested when transmitted. NFC (LF)							

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

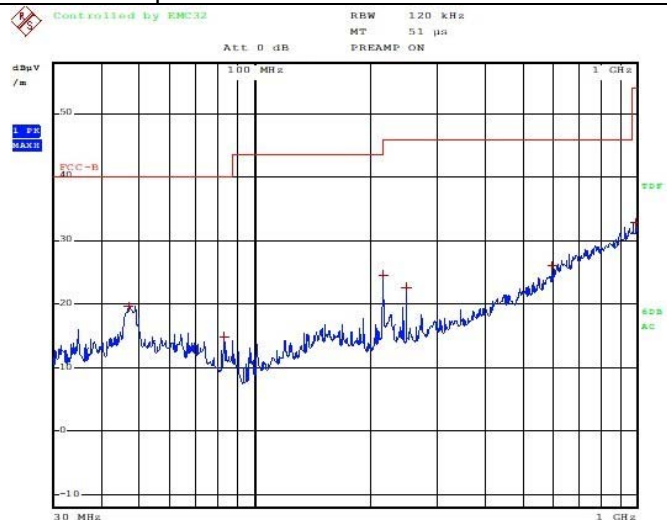
Frequency (MHz)	Reading (dB μV)	Position (V/H)	Height (m)	Correction Factor		Result Value(Quasi-peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB $\mu V/m$)	Result (dB $\mu V/m$)	Margin (dB)
47.6	23.60	V	1.0	13.56	0.92	40.00	38.08	1.91
86.3	18.18	V	1.0	8.02	1.25	40.00	27.45	12.54
250	26.80	V	1.0	11.70	2.17	46.00	40.67	5.32
550	15.01	V	1.0	18.50	3.33	46.00	36.84	9.15
700	12.27	V	1.0	20.80	3.84	46.00	36.91	9.08
750	8.93	V	1.0	21.90	3.99	46.00	34.81	11.18
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 * This test was tested when transmitted. NFC (HF)							

TEST PLOT
* Horizontal

Radiated Spurious Emission 9 kHz – 30 MHz : NFC HF ASK

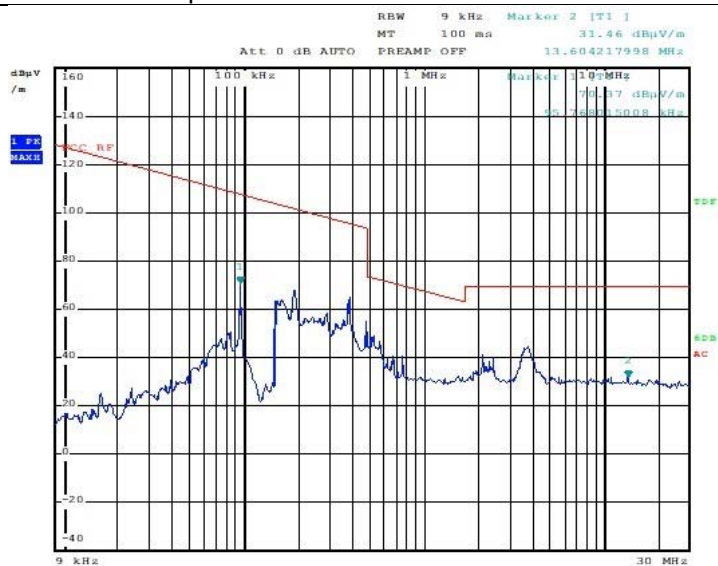


Radiated Spurious Emission 30 MHz – 1 GHz : NFC HF ASK

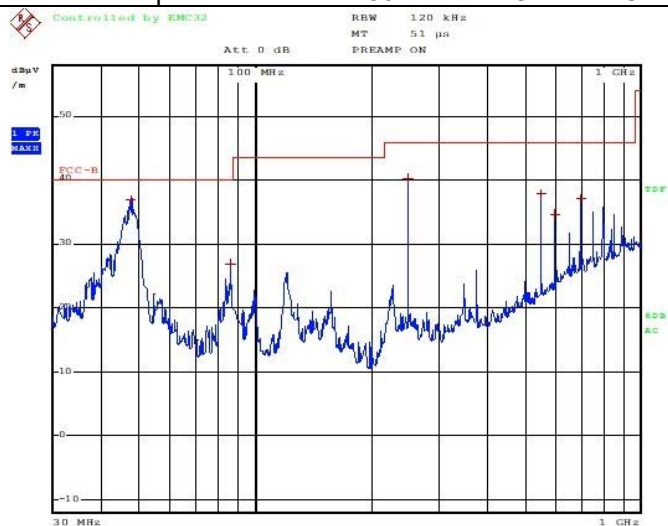


*** Vertical**

Radiated Spurious Emission 9 kHz – 30 MHz : NFC HF ASK

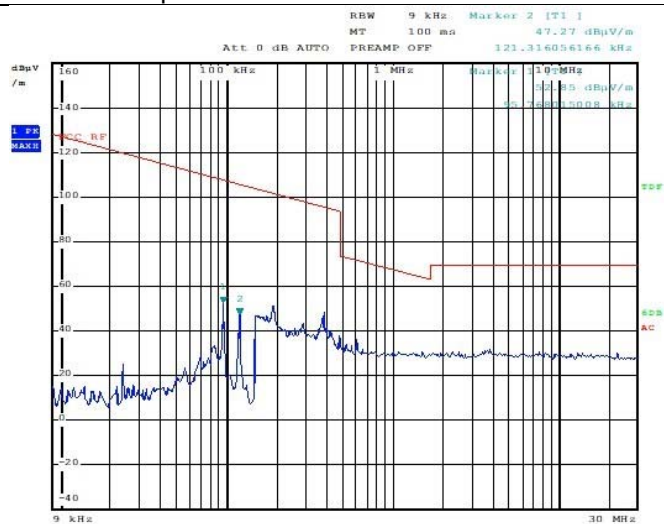


Radiated Spurious Emission 30 MHz – 1 GHz : NFC HF ASK

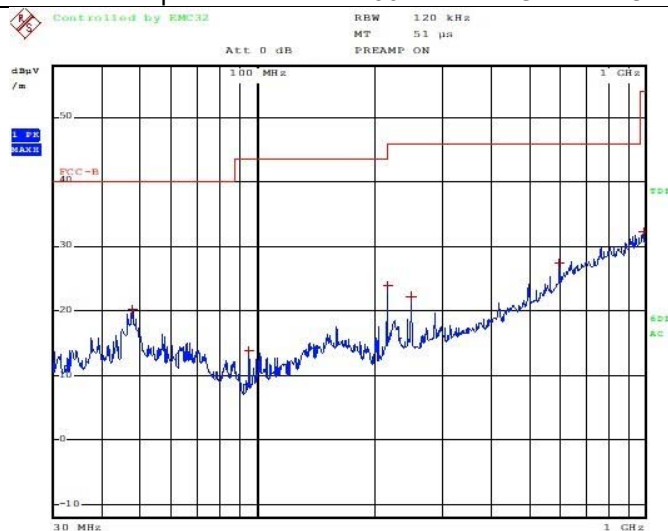


*** Horizontal**

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

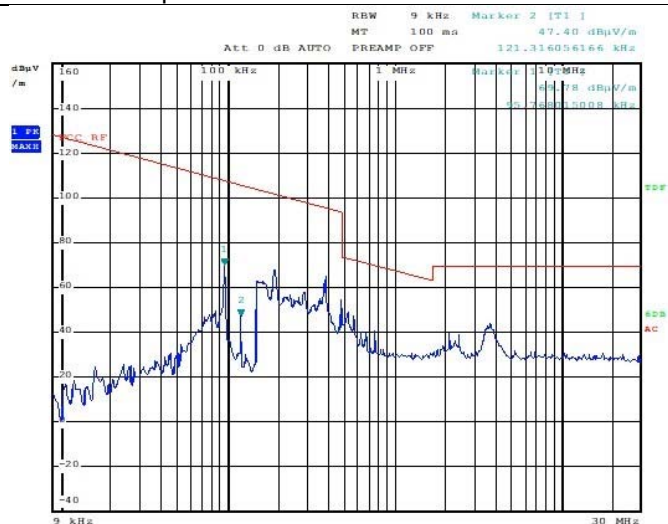


Radiated Spurious Emission 30 MHz – 1 GHz : NFC LF ASK



*** Vertical**

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



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

