TEST REPORT

Application No.:	SUCR2411000446MO
Applicant:	Marquardt GmbH
Address of Applicant:	Schloss-Straße 16, 78604 Rietheim-Weilheim, Germany
Manufacturer:	Marquardt México, S. DE R.L. DE C.V
Address of Manufacturer:	Río Turia No. 505, Parque Industrial Castro del Río, 36814 Irapuato, Guanajuato, Mexico
EUT Description:	NFC Reader Center Console
Model No.:	UR1
Trade Mark:	Marquardt
FCC ID:	IYZUR1
Standards:	FCC 47 CFR Part 15, Subpart C 15.225
Date of Receipt:	October 29, 2024
Date of Test:	November 21, 2024 to November 22, 2024
Date of Issue:	November 27, 2024
Test Result :	**PASS ***

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Hayley Zhang

Cloud Peng

Prepared by: Hayley Zhang/ Project Manager

Approved by: Cloud Peng/ Technical Manager

Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		November 27, 2024		Original

Contents

1 Test Summary

Test Item	FCC Rules No.	Test Method	Test Result	Result
Antenna Requirement	15.203	--	Clause 3.1	PASS
AC Power Line Conducted Emission	15.207	ANSI C63.10 2013 Section 6.2	Clause 3.3	NA
20dB Spectrum Bandwidth & 99% Occupied Bandwidth	15.215(c)	ANSI C63.10 2013 Section 6.9.3	Clause 3.4	PASS
Frequency Stability	15.225(e)	ANSI C63.10 2013 Section 6.8	Clause 3.5	PASS
Field Strength of Fundamental Emissions	15.225(a)(b)(c)	ANSI C63.10 2013 Section 6.4.7	Clause 3.6	PASS
Radiated Spurious Emissions	15.225(d)/15.209	ANSI C63.10 2013 Section 6.4/6.5	Clause 3.7	PASS

2 General Information

2.1 Details of Client

Applicant:	Marquardt GmbH
Address of Applicant:	Schloss-Straße 16, 78604 Rietheim-Weilheim, Germany
Manufacturer:	Marquardt México, S. DE R.L. DE C.V
Address of Manufacturer:	Río Turia No. 505, Parque Industrial Castro del Río, 36814 Irapuato, Guanajuato, Mexico

2.2 Test Location

Company:	SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.
Address:	South of No. 6 Plant, No. 1, Runsheng Road, Suzhou Industrial Park, Suzhou Area, China (Jiangsu) Pilot Free Trade Zone
Post code:	215000
Test engineer:	King-p Li, Ives Cheng

2.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **A2LA (Certificate No. 6336.01)**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6336.01.

- **Innovation, Science and Economic Development Canada**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0120.

IC#: 27594.

- **FCC –Designation Number: CN1312**

SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized as an accredited testing laboratory.

Designation Number: CN1312.

Test Firm Registration Number: 717327

2.4 General Description of EUT

EUT Description:	NFC Reader Center Console
Model No.:	UR1
Trade Mark:	Marquardt
Hardware Version:	24.08.01
Software Version:	2.22.1
Power Supply:	12V
Operation Frequency:	13.56MHz
Modulation Type:	ASK
Antenna Type:	PCB Antenna
Remark: As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.	

2.5 Test Environment

Environment Parameter	101.0 kPa Selected Values During Tests	
Relative Humidity	44~46 % RH Ambient	
Value	Temperature(℃)	Voltage(V)
NTNV	22~23	12
Remark: The extreme Voltage and extreme Temperature are refer to the test data of Frequency Stability.		

2.6 Description of Support Units

The EUT has been tested as an independent unit.

3 Test results and Measurement Data

3.1 Antenna Requirement

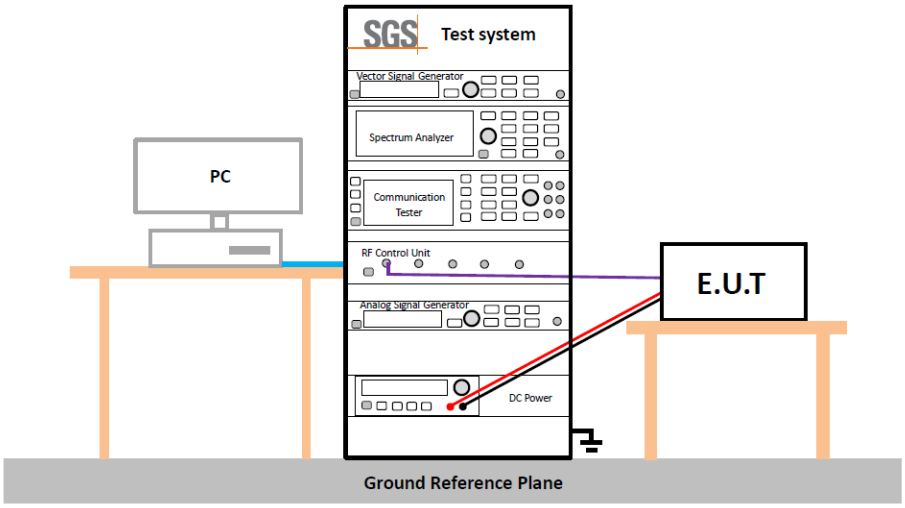
Standard requirement:	47 CFR Part 15C Section 15.203
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
The antenna of the EUT are permanently attached.	

3.2 Worst-case configuration and mode

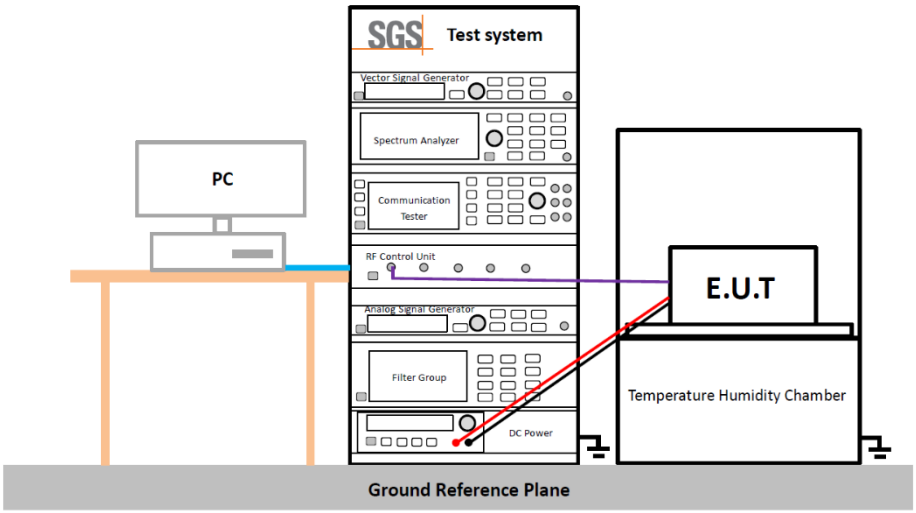
The fundamental of the EUT was investigated under three orthogonal orlentations X, Y, and Z. The X orientation was determined to be the worst-case orientation.

Although these tests were performed ther than open area test site, adequate comparison measurements were confirmed against 30m open are test site. Therefore sufficient tests were made to demonstrate that the altemative site prduces results that correlate with the ones of tests made in an ope field based on KDB 414788.

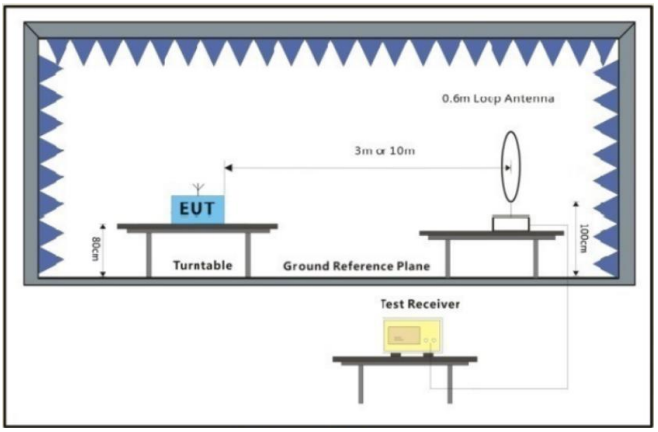
3.3 20dB Spectrum Bandwidth & 99% Occupied Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.215(c)
Test Method:	ANSI C63.10: 2013 Section 6.9.3
Test Setup:	
Instruments Used:	Refer to section 6 for details
Limit:	Intentional radiators must be designed to ensure that the 20dB and 99% emission bandwidth in the specific band 13.553~13.567MHz.
Test Results:	Pass
The detailed test data see: **Appendix**	

3.4 Frequency Stability

Test Requirement:	47 CFR Part 15C Section 15.225(e)
Test Method:	ANSI C63.10: 2013 Section 6.8
Test Setup:	
Instruments Used:	Refer to section 6 for details
Limit:	The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% (100ppm) of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery. While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.
Test Results:	Pass
The detailed test data see: **Appendix**	

3.5 Field Strength of Fundamental Emissions

Test Requirement:	47 CFR Part 15C Section 15.225				
Test Method:	ANSI C63.10 :2013 Section 6.4.7				
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Limit:	Frequency	Field Strength (μ V/m) at 30m	Field Strength (dB μ V/m) at 30m	Field Strength (dB μ V/m) at 10m	Field Strength (dB μ V/m) at 3m
	1.705~13.110 MHz	30	29.5	48.58	69.5
	13.110-13.410 MHz	106	40.5	59.58	80.5
	13.410-13.553 MHz	334	50.5	69.58	90.5
	13.553-13.567 MHz	15,848	84.0	103.08	124.0
	13.567-13.710 MHz	334	50.5	69.58	90.5
	13.710-14.010 MHz	106	40.5	59.58	80.5
	14.010~30.000 MHz	30	29.5	48.58	69.5
Test Setup:	 Figure 1. Below 30MHz				
Test Procedure:	a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height 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(for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case. g. Repeat above procedures until all frequencies measured was complete. h. RBW set to 9kHz.
Exploratory Test Mode:	Transmitting with modulation. Charge + Transmitting mode.
Final Test Mode:	**Transmitting with modulation.** Pretest the EUT at Charge + Transmitting mode.Only the worst case is recorded in the report.
Instruments Used:	Refer to section 6 for details
Test Results:	Pass
The detailed test data see: **Appendix**	

3.6 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.225				
Test Method:	ANSI C63.10 :2013 Section 6.4&6.5				
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	Above 960MHz	500	54.0	Quasi-peak	3
	Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.				

Test Setup:

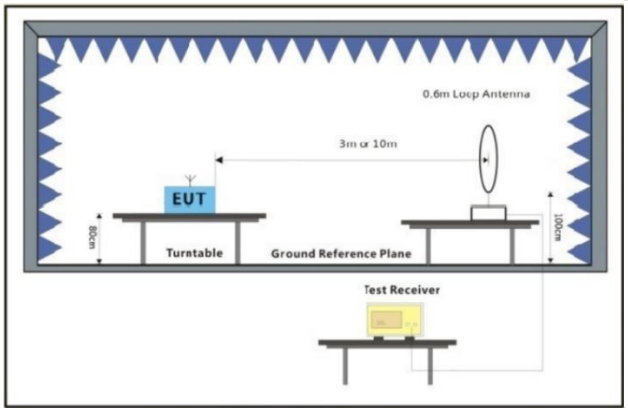


Figure 1. Below 30MHz

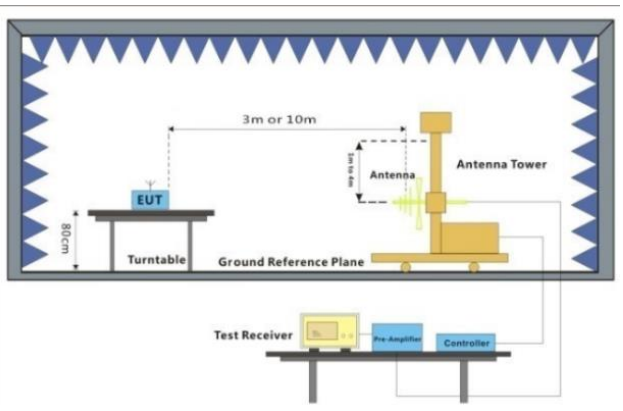


Figure 2. Above 30MHz

Test Procedure:	i. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. j. The EUT was set 3 meters away from the interference-receiving antenna, which

	was mounted on the top of a variable-height antenna tower. k. The antenna height 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. l. 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(for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. m. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. n. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case. o. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with modulation. Charge + Transmitting mode.
Final Test Mode:	Transmitting with modulation. Pretest the EUT at Charge + Transmitting mode.Only the worst case is recorded in the report.
Instruments Used:	Refer to section 6 for details
Test Results:	Pass
The detailed test data see: **Appendix**	

4 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	±1.0 %
2	Occupied Bandwidth	±1.0 %
3	Radiated Emission	± 3.13dB (9k -30MHz)
		± 4.8dB (30M -1GHz)

Remark:
The U_{lab} (lab Uncertainty) is less than $U_{cispr/ETSI}$ (CISPR/ETSI Uncertainty), so the test results
– compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
– non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

5 Equipment List

RF Test Equipment					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Shielding Room	Brilliant-emc	N/A	SUWI-04-08-01	11/9/2022	11/8/2025
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-07	2/18/2024	2/17/2025
Signal Analyzer	ROHDE&SCHWARZ	FSV3030	SUWI-01-02-02	5/8/2024	5/7/2025
Measurement Software	Tonscend	JS1120-3 Test System V 3.3.20	SUWI-02-09-09	NCR	NCR
Measurement Software	Tonscend	TST272 V2.0	SUWI-03-55-03	NCR	NCR
Temperature Chamber	ESPEC	SU-242	SUWI-01-13-02	5/9/2024	5/8/2025
DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	2/4/2024	2/3/2025

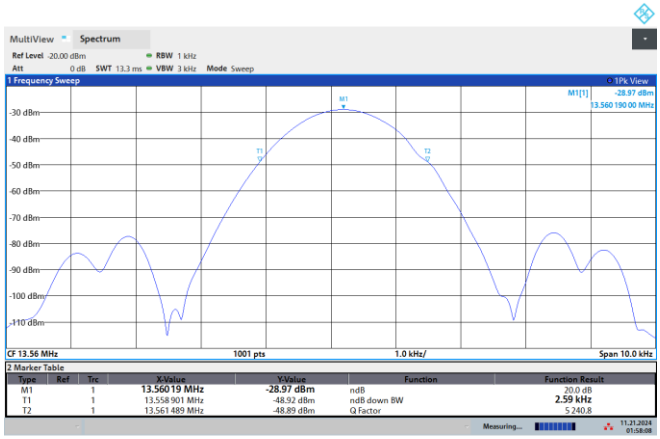
RSE Test Equipment					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Semi-Anechoic Chamber	Brilliant-emc	N/A	SUWI-04-02-01	6/3/2023	6/2/2026
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-05	2/18/2024	2/17/2025
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2/1/2024	1/31/2025
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	VULB 9163	SUWI-01-11-01	5/13/2023	5/12/2025
Active Loop Antenna	SCHWRZBECK MESS-ELEKTRONIK	FMZB 1519B	SUWI-01-21-01	5/13/2023	5/12/2025
Amplifier	Tonscend	TAP9K3G40	SUWI-01-14-01	2/1/2024	1/31/2025
Measurement Software	Tonscend	JS32-RE V4.0.0.0	SUWI-02-09-04	NCR	NCR

6 Photographs - Setup Photos

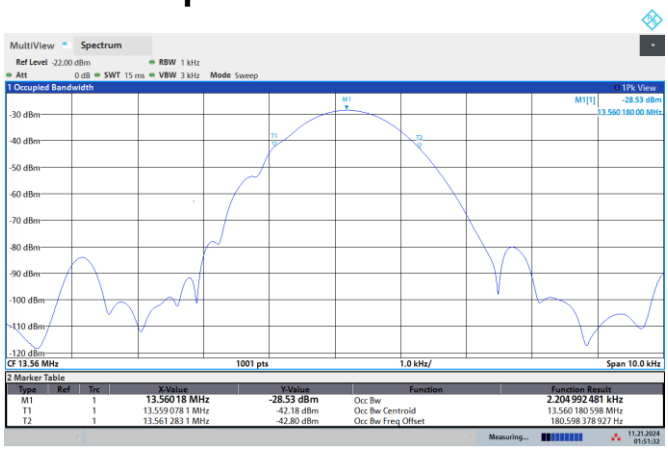
Refer to Appendix A.2 NFC Setup Photos.

7 Appendix

20dB Bandwidth



99% Occupied Bandwidth



Note:

Because the measured signal is CW or CW-like adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.

Frequency tolerance

Declared Frequency (MHz)		13.56MHz			
Startup					
Temperature (°C)	Voltage(VDC)	Measurement Frequency(MHz)	Frequency Tolerance (%)	Limit (%)	Result
50	12.00	13.56020	0.001	±0.01	Pass
40		13.56018	0.001		Pass
30		13.56021	0.002		Pass
20		13.56018	0.001		Pass
10		13.56018	0.001		Pass
0		13.56020	0.001		Pass
-10		13.56018	0.001		Pass
-20		13.56018	0.001		Pass
20	16.00	13.56020	0.001		Pass
	9.00	13.56018	0.001		Pass

Declared Frequency (MHz)		13.56MHz			
2mins					
Temperature (°C)	Voltage(VDC)	Measurement Frequency(MHz)	Frequency Tolerance (%)	Limit (%)	Result
50	12.00	13.56021	0.002	±0.01	Pass
40		13.56018	0.001		Pass
30		13.56020	0.001		Pass
20		13.56018	0.001		Pass
10		13.56019	0.001		Pass
0		13.56020	0.001		Pass
-10		13.56018	0.001		Pass
-20		13.56019	0.001		Pass
20	16.00	13.56019	0.001		Pass
	9.00	13.56018	0.001		Pass

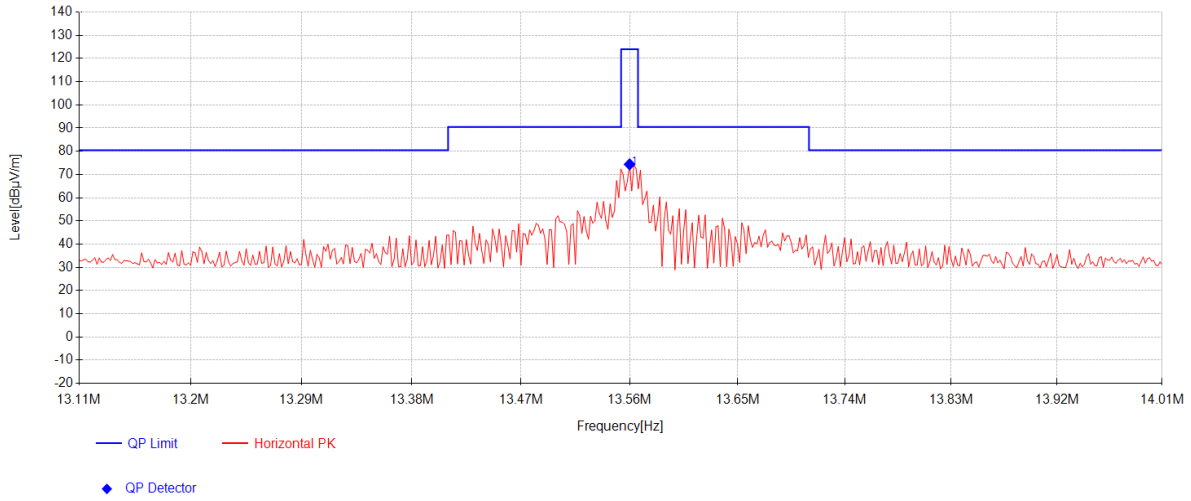
Declared Frequency (MHz)		13.56MHz			
5mins					
Temperature (°C)	Voltage(VDC)	Measurement Frequency(MHz)	Frequency Tolerance (%)	Limit (%)	Result
50	12.00	13.56020	0.001	±0.01	Pass
40		13.56019	0.001		Pass
30		13.56019	0.001		Pass
20		13.56018	0.001		Pass
10		13.56020	0.001		Pass
0		13.56020	0.001		Pass
-10		13.56018	0.001		Pass
-20		13.56018	0.001		Pass
20	16.00	13.56018	0.001		Pass
	9.00	13.56018	0.001		Pass

Declared Frequency (MHz)		13.56MHz			
10mins					
Temperature (°C)	Voltage(VDC)	Measurement Frequency(MHz)	Frequency Tolerance (%)	Limit (%)	Result
50	12.00	13.56021	0.002	±0.01	Pass
40		13.56019	0.001		Pass
30		13.56019	0.001		Pass
20		13.56017	0.001		Pass
10		13.56019	0.001		Pass
0		13.56020	0.001		Pass
-10		13.56019	0.001		Pass
-20		13.56018	0.001		Pass
20	16.00	13.56018	0.001		Pass
	9.00	13.56019	0.001		Pass

Field Strength of Fundamental Emissions

NFC_Emission Mask

Polarization:	Coplanar

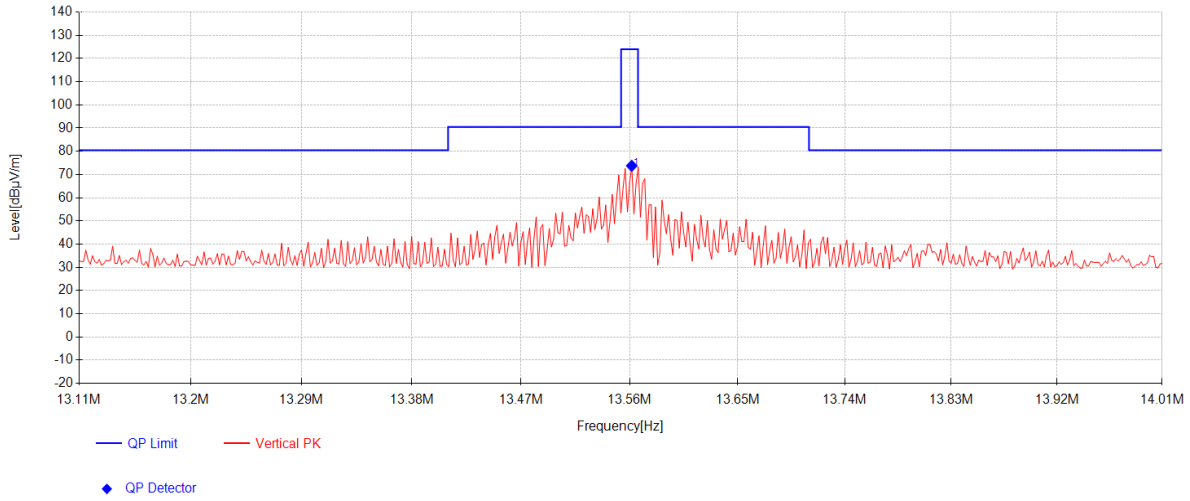


Final Data List

NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	13.56	53.91	19.80	0.69	74.40	124.00	49.60	100	136	Coplanar

Remark:
1. The Quasi-Peak measurements were performed on the EUT.
2. Value = Reading + Antenna Factor + Factor.
3. Factor=Cable loss.

Polarization:	Coaxial



Final Data List

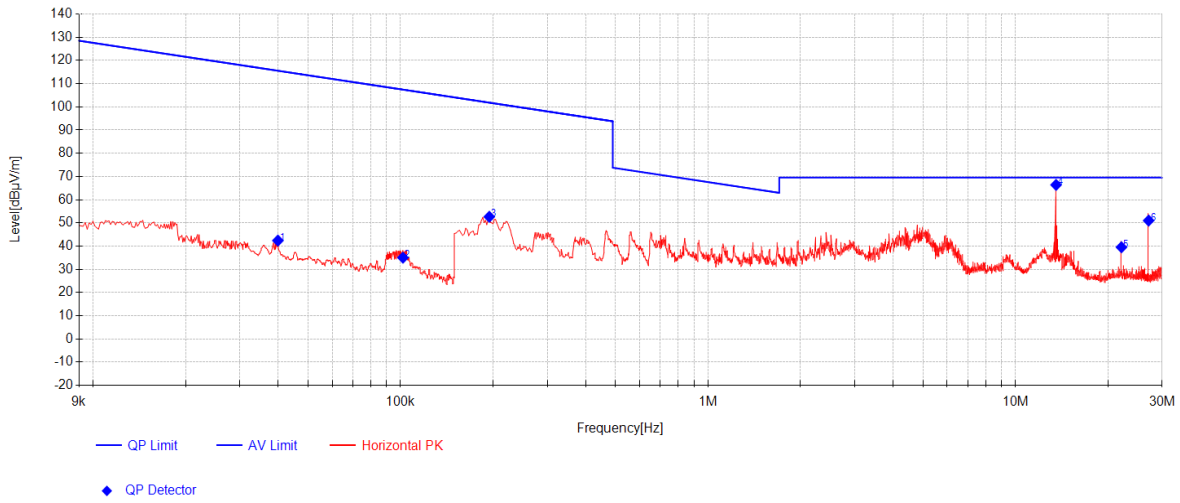
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	13.5618	53.25	19.80	0.69	73.74	124.00	50.26	100	154	Coaxial

Remark:
1. The Quasi-Peak measurements were performed on the EUT.
2. Value = Reading + Antenna Factor + Factor.
3. Factor=Cable loss.

Radiated Spurious Emissions

NFC_RSE

Polarization:	Coplanar

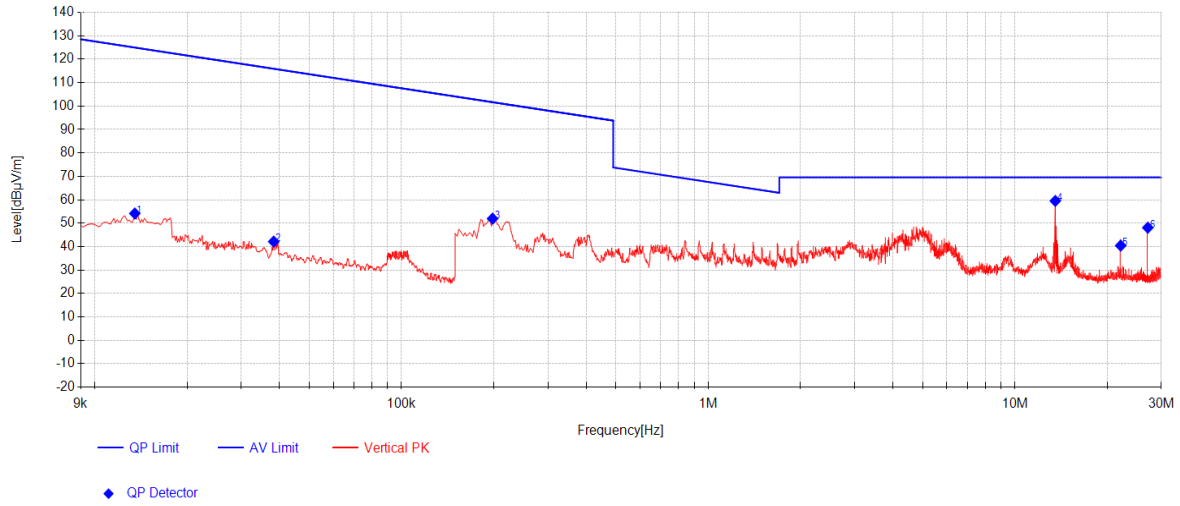


Final Data List

NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
2	0.1018	14.38	20.22	0.43	35.03	107.45	72.42	100	300	Coplanar
4	13.559	45.89	19.80	0.69	66.38	69.54	3.16	100	150	Coplanar
5	22.127	18.98	19.70	0.85	39.53	69.54	30.01	100	39	Coplanar
6	27.125	30.28	19.79	0.95	51.02	69.54	18.52	100	328	Coplanar
NO.	Frequency [MHz]	AV Reading [dBµV]	AF [dB/m]	Factor [dB]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	0.0399	21.87	20.10	0.43	42.40	115.58	73.18	100	45	Coplanar
3	0.1944	31.94	20.29	0.43	52.66	101.83	49.17	100	343	Coplanar

Remark:
1. The Quasi-Peak measurements were performed on the EUT.
2. Value = Reading + Antenna Factor + Factor.
3. Factor=Cable loss.

Polarization:	Coaxial



Final Data List

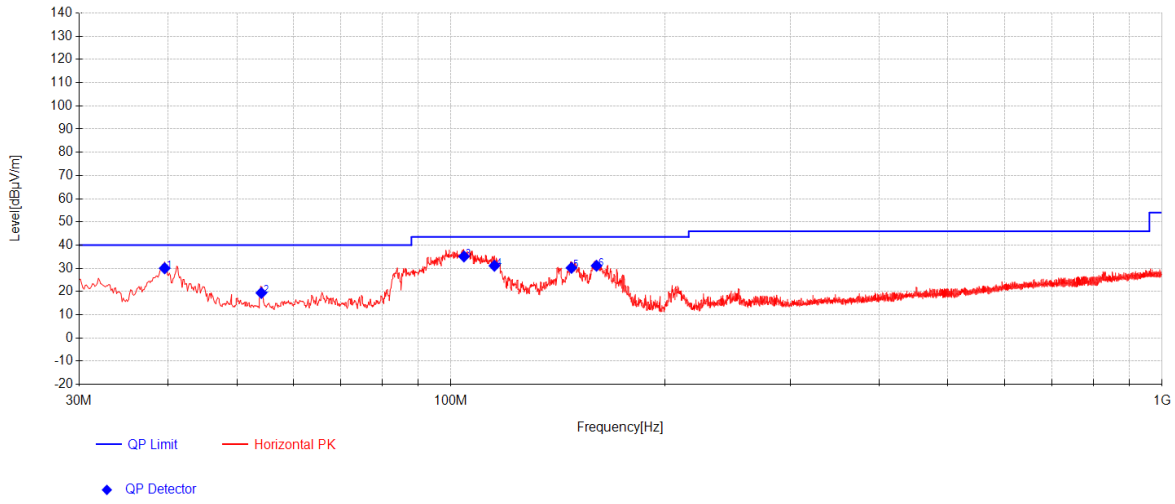
NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
4	13.542	39.01	19.80	0.69	59.50	69.54	10.04	100	86	Coaxial
5	22.127	19.89	19.70	0.85	40.44	69.54	29.10	100	286	Coaxial
6	27.125	27.35	19.79	0.95	48.09	69.54	21.45	100	265	Coaxial

NO.	Frequency [MHz]	AV Reading [dBµV]	AF [dB/m]	Factor [dB]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity
1	0.0135	33.74	19.99	0.43	54.16	124.99	70.83	100	55	Coaxial
2	0.0383	21.62	20.10	0.43	42.15	115.93	73.78	100	357	Coaxial
3	0.1981	31.22	20.29	0.43	51.94	101.66	49.72	100	26	Coaxial

Remark:
1. The Quasi-Peak measurements were performed on the EUT.
2. Value = Reading + Antenna Factor + Factor.
3. Factor=Cable loss.

NFC_RE

Polarization:	Horizontal

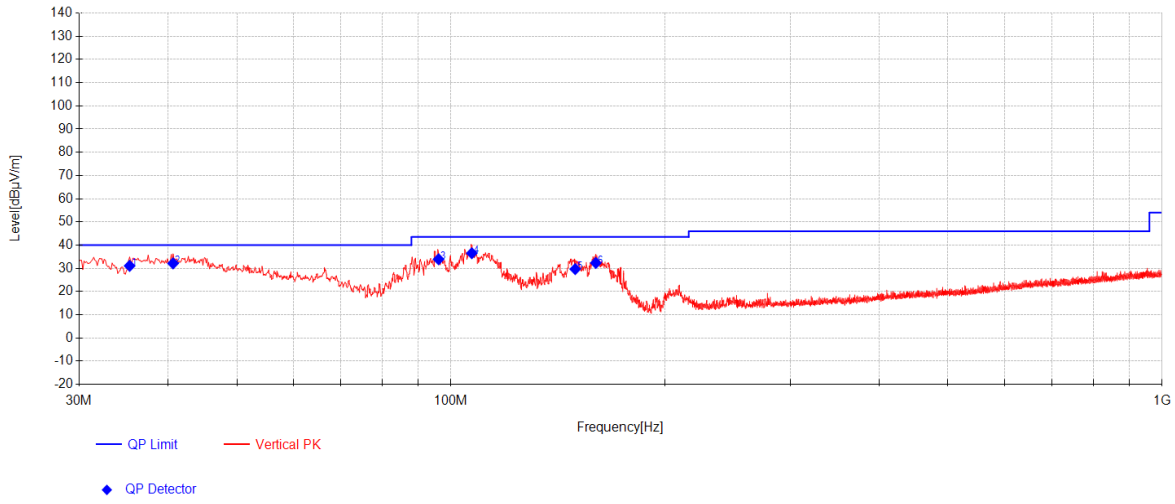


Final Data List

NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	39.5788	45.32	18.72	-34.00	30.04	40.00	9.96	102	320	Horizontal
2	54.1288	35.21	18.11	-33.93	19.39	40.00	20.61	265	342	Horizontal
3	104.3262	53.21	15.37	-33.44	35.13	43.50	8.37	284	360	Horizontal
4	115.1175	48.35	16.12	-33.36	31.11	43.50	12.39	174	356	Horizontal
5	147.7337	44.53	18.88	-33.20	30.21	43.50	13.29	142	356	Horizontal
6	160.2225	45.32	18.87	-33.06	31.12	43.50	12.38	263	356	Horizontal

Remark:
1. The Quasi-Peak measurements were performed on the EUT.
2. Final Value Level = Reading + Antenna Factor + Factor.
3. Factor=Cable loss – Preamplifier Factor.

Polarization:	Vertical



Final Data List

NO.	Frequency [MHz]	Reading [dBµV]	AF [dB/m]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	35.335	46.85	18.23	-34.00	31.08	40.00	8.92	102	10	Vertical
2	40.67	47.33	18.80	-33.99	32.14	40.00	7.86	142	342	Vertical
3	96.0812	53.24	14.21	-33.52	33.93	43.50	9.57	263	63	Vertical
4	106.9938	54.32	15.60	-33.42	36.50	43.50	7.00	254	42	Vertical
5	149.5525	43.86	19.01	-33.19	29.68	43.50	13.82	174	2	Vertical
6	159.8587	46.58	18.81	-33.07	32.33	43.50	11.17	158	0	Vertical

Remark:
1. The Quasi-Peak measurements were performed on the EUT.
2. Final Value Level = Reading + Antenna Factor + Factor.
3. Factor=Cable loss – Preamplifier Factor.

---End of Report---