Variant FCC Test Report

Report No.:	RFBERD-WTW-P22060334-4
FCC ID:	HD5-CK65L0N
Test Model:	CK65L0N
Received Date:	Jun. 09, 2022
Test Date:	Jun. 25, 2022
Issued Date:	Jul. 27, 2022
Applicant:	Honeywell International Inc.
Address:	9680 Old Bailes Road, Fort Mill, SC 29707 USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, Taiwan
FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
RFBERD-WTW-P22060334-4	Original Release	Jul. 27, 2022

1 Certificate of Conformity

Product:	Mobile computer
Brand:	Honeywell
Test Model:	CK65L0N
Sample Status:	Engineering Sample
Applicant:	Honeywell International Inc.
Test Date:	Jun. 25, 2022
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.225) 47 CFR FCC Part 15, Subpart C (Section 15.215) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Gina Liu , **Date:** Jul. 27, 2022

Gina Liu / Specialist

Approved by : Jeremy Lin , **Date:** Jul. 27, 2022

Jeremy Lin / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.225, 15.215)			
FCC Clause	**Test Item**	**Result**	**Remarks**
15.207	Conducted emission test	N/A	Without AC power port of the EUT.
15.225 (a)	The field strength of any emissions within the band 13.553-13.567 MHz	Pass	Meet the requirement of limit. Minimum passing margin is -60.70 dB at 13.560 MHz.
15.225 (b)	The field strength of any emissions within the bands 13.410-13.553 MHz and 13.567-13.710 MHz	Pass	Meet the requirement of limit.
15.225 (c)	The field strength of any emissions within the bands 13.110-13.410 MHz and 13.710-14.010 MHz	Pass	Meet the requirement of limit.
15.225 (d)	The field strength of any emissions appearing outside of the 13.110-14.010 MHz band	Pass	Meet the requirement of limit. Minimum passing margin is -9.0 dB at 53.28 MHz.
15.225 (e)	The frequency tolerance	Pass	Meet the requirement of limit.
15.215 (c)	20 dB Bandwidth	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	**Frequency**	**Expanded Uncertainty (k=2) (±)**
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Mobile computer
Brand	Honeywell
Test Model	CK65L0N
Model Description	For India (BIS & WPC) information only : - Standard Version : CK65-L0N - Cold Storage Version : CK65-L0N-CS
Status of EUT	Engineering Sample
Power Supply Rating	3.6 Vdc or 3.7 Vdc (Battery)
Modulation Type	ASK
Data Rate	Type A: 106 kbit/s Type B: 106 kbit/s Type F: 212 kbit/s, 424 kbit/s Type V (ISO15693): 26.48 kbit/s
Operating Frequency	13.56 MHz
Field Strength (Maximum)	23.30 dBuV/m (30m)
Antenna Type	Loop Antenna
Accessory Device	Refer to Note
Data Cable Supplied	N/A
HW Version	V1.1
HW P/N	DVT1
SW Version	01.04.00.1392
SW P/N	91.00.00-DEBUG-(0574)

Note:

1. This report is issued as a supplementary report to BV CPS report no.: RFBERD-WTW-P21020547-4. The differences compared with original report is changing NFC chip and add new scanner (S0703VE、Gen8), and the change list is listed as below, therefore the EUT is re-tested in this report.
2. Change list:

Original Source			Second Source			
Vender	Vender P/N	Location	Vender	Vender P/N	TYPE	
					Phase 2	Phase 3
HON	N6703SR-WS-103-O	N/A	HON	S0703SR-W4-103O	v	v
NXP	NQ310A1EV/C101Y	U901	NXP	NQ410A1EV/C101Y	v	v
NXP	PCA9412AUKZ	U902	SGMICRO	SGM66055A-5.4YG/TR	v	v
ST	LSM6DSMTR	U1502	TDK	ICM-42607	v	x
			Bosch	BMI270	x	v

VISHAY	SIA483DJ-T1-GE3	Q2201,Q2204,Q2205	VISHAY	SIA483ADJ-T1-GE3	v	v
DIODES	DMN3730UFB4-7	Q1401,Q2203,Q2206 ,Q2303,Q2401	DIODES	DMN3731UFB4-7B	v	v
SAMSUNG MURATA	CL05A475KP5NRNC GRM15SR61A475KEAA D	STD: C2311 CS: C2311, C2515	Darfon	C1005X5R475KDTS	v	v
SIWARD	XTL741-E149-094	Y2001	Taitien	06172-W-087-3	v	v
YAGEO	CC0201MRX5R5BB225	CAM: C1308 No CAM: N/A	Darfon	C0603X5R225MCTS	v	v

3. The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery 1	Intermec Technologies Corporation	AB18	3.7 Vdc, 5.1 Ah, 18.9 Wh
Battery 2	Honeywell	CK65-BTCS	3.6 Vdc, 5200 mAh, 18.7 Wh
Battery 3	Honeywell	CK65-BTSC	3.6 Vdc, 7000 mAh,25.2 Wh R5480(RICHO)
Battery 4	Honeywell	CK65-BTSC	3.6 Vdc, 7000 mAh,25.2 Wh MM3722(MITSUMI)

4. There’re 8 configurations for the EUT listed as below. (New configuration is marked in gray.)

Sample	Scanner	Keypad
A	N6703	Alpha/Num
B	EX20	Alpha/Num
C	N6703	Num
D	EX20	Num
E	S0803	Alpha/Num
F	S0703	Alpha/Num
G	S0703VE	Alpha/Num
H	Gen8	Alpha

*From the above samples the worst cases were found in sample H. therefore only the test of the mode was recorded in the report.

5. The above Antenna information refers to the manufacturer's antenna specifications, the laboratory shall not be held responsible.
6. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.
7. The EUT supports NFC Type: Type A, B, F, V. The Type B is the worst for the final tests.

3.2 Description of Test Modes

One channel was provided to this EUT:

Channel	Frequency (MHz)
1	13.56

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE	PLC	FS	EB	
-	√	√	√	√	-

Where **RE:** Radiated Emission **PLC:** Power Line Conducted Emission
FS: Frequency Stability **EB:** 20 dB Bandwidth measurement

NOTE: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane**.

NOTE:"-" means no effect.

Radiated Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Axis
-	1	1	ASK	Y

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Axis
-	1	1	ASK	Y

Frequency Stability:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Axis
-	1	1	ASK	Y

20 dB Bandwidth:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Axis
-	1	1	ASK	Y

Test Condition:

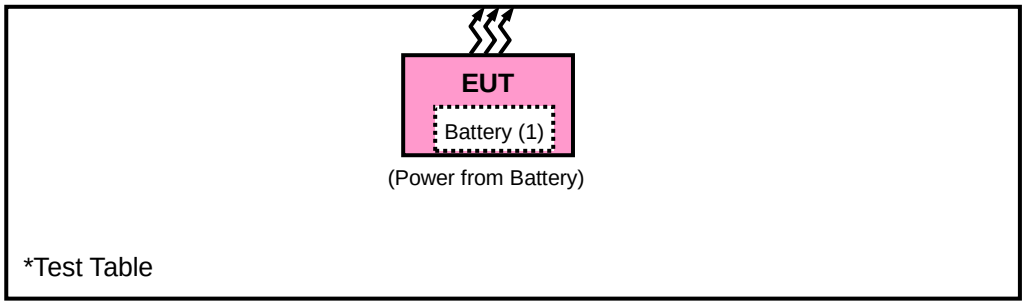
Applicable To	Environmental Conditions	Input Power	Tested By
RE	22 deg. C, 66 % RH; 22 deg. C, 70 % RH	3.6 Vdc	Tomas Cheng
FS	22 deg. C, 61 % RH	3.6 Vdc	Vincent Chen
EB	25 deg. C, 68 % RH	3.6 Vdc	Vincent Chen

3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Battery	Honeywell	CK65-BTCS	N/A	N/A

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards and references

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

FCC Part 15, Subpart C (15.225)
FCC Part 15, Subpart C (15.215)
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

References Test Guidance :

KDB 414788 D01 Radiated Test Site v01r01

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission Measurement

4.1.1 Limits of Radiated Emission Measurement

a. The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
b. Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
c. Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
d. The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209 as below table:

Frequencies (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 1000 MHz, 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 20 dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Spectrum Analyzer Agilent	N9010A	MY52220314	2021/12/03	2022/12/02
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	2022/04/11	2023/04/10
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	2021/10/28	2022/10/27
Loop Antenna	EM-6879	269	2021/09/16	2022/09/15
Preamplifier EMCI	EMC001340	980201	2021/09/15	2022/09/14
Preamplifier EMCI	EMC 012645	980115	2021/10/05	2022/10/04
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	2021/09/10	2022/09/09
DC Power Supply Topward	33010D	807748	NA	NA
Digital Multimeter Fluke	87-III	70360742	2022/06/23	2023/06/22

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Chamber 10.

4.1.3 Test Procedures

For Radiated Emission below 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. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode, except for the frequency band (9kHz-90kHz, 110Hz-490kHz) set to average detect function.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.
2. There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

For Radiated Emission above 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters 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. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

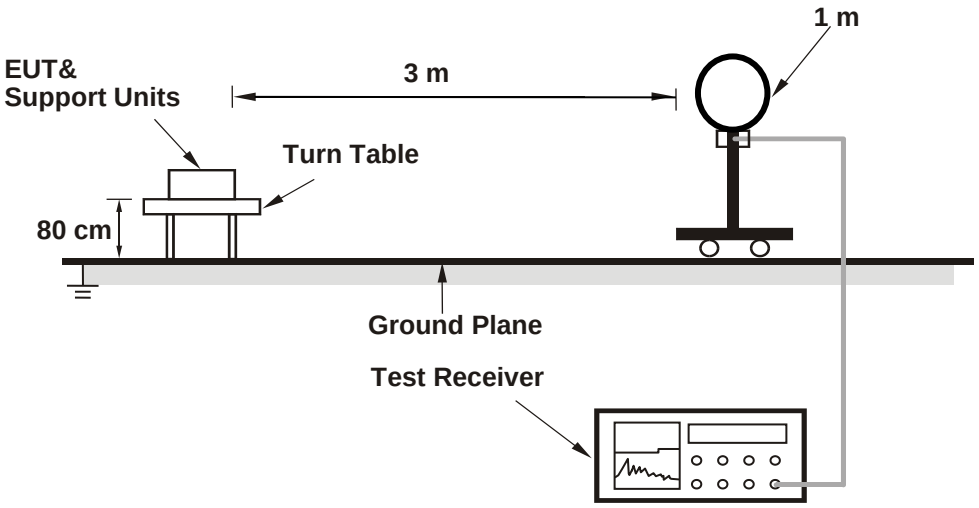
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98 %) or 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

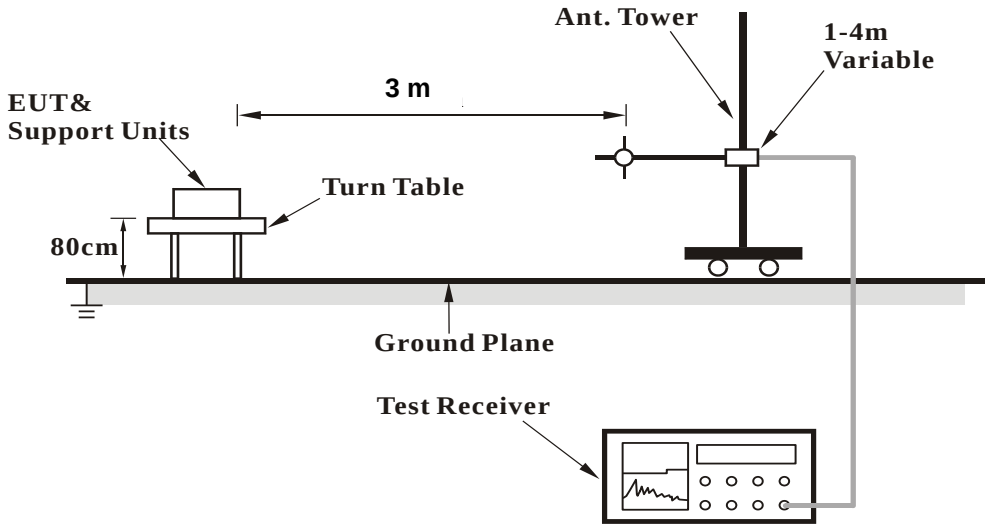
No deviation.

4.1.5 Test Set Up

<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

KDB 414788 OFS and Chamber Correlation Justification

- Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

- Open-field site and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

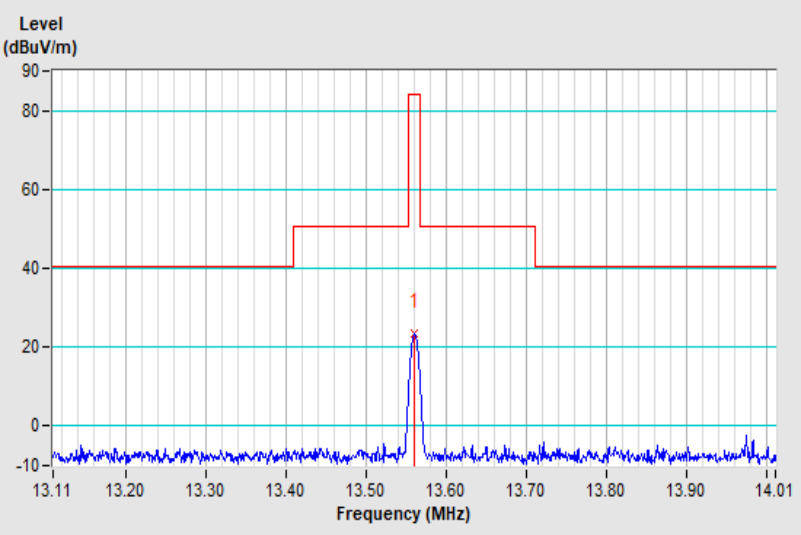
Type B

Test Mode	Tx		
RF Mode	NFC-13.56MHz	**Channel**	CH 1：13.56 MHz
Frequency Range	13.11 MHz ~ 14.01 MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 9 kHz
Input Power	3.6 Vdc	**Environmental Conditions**	22°C, 70% RH
Test Date	Thomas Cheng	**Tested By**	2022/6/25

Antenna Polarity : Parallel								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	*13.560	23.30 QP	84.00	-60.70	1.00	270	41.30	-18.00

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The test distance for 0.49 ~ 30 MHz is 3 m, extrapolate the measured field strength to a distance of 30 meters.
   Distance factor@30m = 40*log(3/30) = -40dB

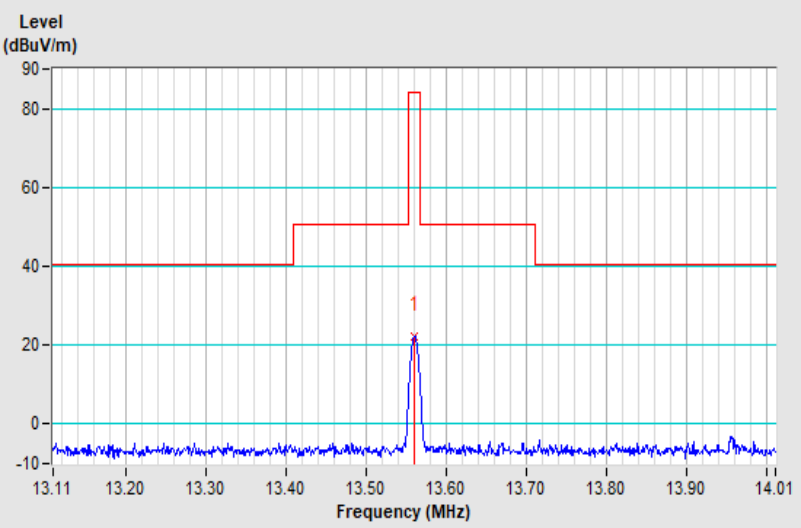


Test Mode	Tx		
RF Mode	NFC-13.56MHz	Channel	CH 1：13.56 MHz
Frequency Range	13.11 MHz ~ 14.01 MHz	Detector Function & Bandwidth	Quasi-Peak (QP), 9 kHz
Input Power	3.6 Vdc	Environmental Conditions	22°C, 70% RH
Test Date	Thomas Cheng	Tested By	2022/6/25

Antenna Polarity : Perpendicular								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*13.560	22.40 QP	84.00	-61.60	1.00	267	40.40	-18.00

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The test distance for 0.49 ~ 30 MHz is 3 m, extrapolate the measured field strength to a distance of 30 meters.
   Distance factor@30m = 40*log(3/30) = -40dB

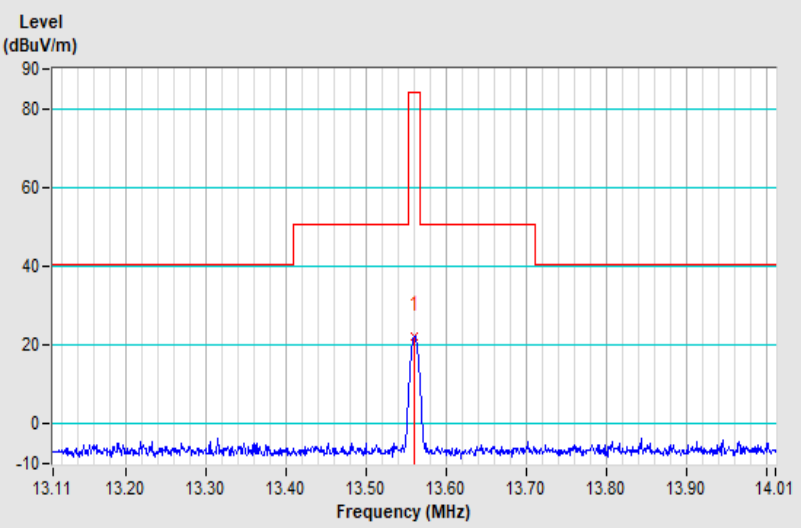


Test Mode	Tx		
RF Mode	NFC-13.56MHz	**Channel**	CH 1：13.56 MHz
Frequency Range	13.11 MHz ~ 14.01 MHz	**Detector Function & Bandwidth**	Quasi-Peak (QP), 9 kHz
Input Power	3.6 Vdc	**Environmental Conditions**	22°C, 70% RH
Test Date	Thomas Cheng	**Tested By**	2022/6/25

Antenna Polarity : Ground-parallel								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	*13.560	22.30 QP	84.00	-61.70	1.00	97	40.30	-18.00

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. The test distance for 0.49 ~ 30 MHz is 3 m, extrapolate the measured field strength to a distance of 30 meters.
   Distance factor@30m = 40*log(3/30) = -40dB

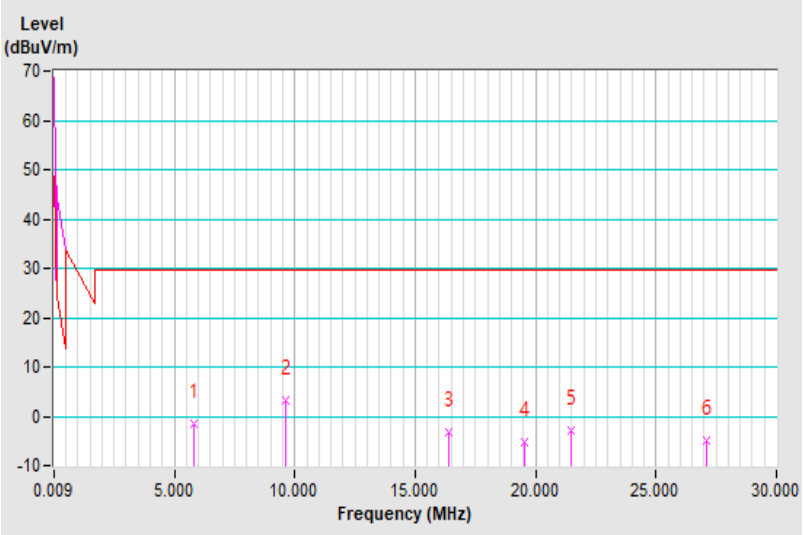


Test Mode	Tx		
RF Mode	NFC-13.56MHz	Channel	CH 1：13.56 MHz
Frequency Range	9 kHz ~ 30 MHz	Detector Function & Bandwidth	Peak (PK), 9 kHz
Input Power	3.6 Vdc	Environmental Conditions	22°C, 70% RH
Test Date	Thomas Cheng	Tested By	2022/6/25

Antenna Polarity : Parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5.800	-1.60 PK	29.50	-31.10	1.00	177	17.90	-19.50
2	9.640	3.10 PK	29.50	-26.40	1.00	115	21.30	-18.20
3	16.410	-3.20 PK	29.50	-32.70	1.00	287	14.70	-17.90
4	19.560	-5.30 PK	29.50	-34.80	1.00	231	12.50	-17.80
5	21.480	-3.00 PK	29.50	-32.50	1.00	109	14.80	-17.80
6	27.120	-5.00 PK	29.50	-34.50	1.00	45	12.90	-17.90

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for 0.49 ~ 30 MHz is 3 m, extrapolate the measured field strength to a distance of 30 meters.
   Distance factor@30m = 40*log(3/30) = -40dB

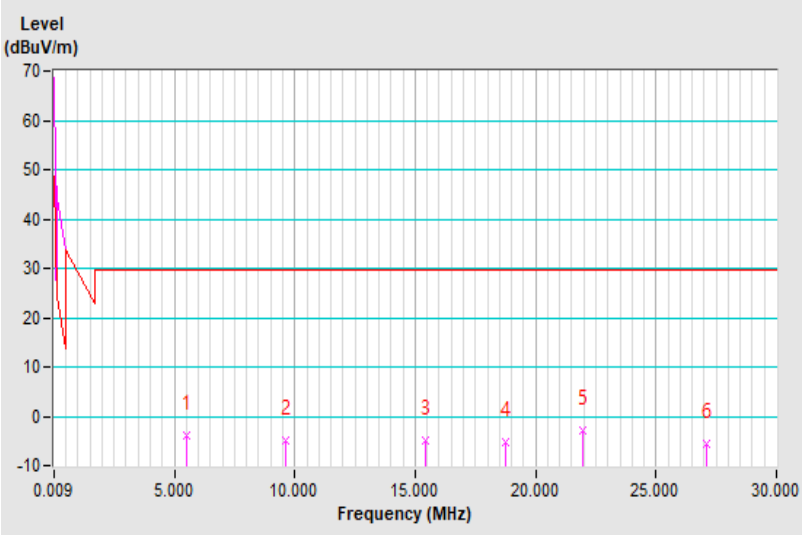


Test Mode	Tx		
RF Mode	NFC-13.56MHz	Channel	CH 1：13.56 MHz
Frequency Range	9 kHz ~ 30 MHz	Detector Function & Bandwidth	Peak (PK), 9 kHz
Input Power	3.6 Vdc	Environmental Conditions	22°C, 70% RH
Test Date	Thomas Cheng	Tested By	2022/6/25

Antenna Polarity : Perpendicular								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5.500	-3.80 PK	29.50	-33.30	1.00	227	15.80	-19.60
2	9.640	-5.00 PK	29.50	-34.50	1.00	189	13.20	-18.20
3	15.420	-4.90 PK	29.50	-34.40	1.00	206	13.00	-17.90
4	18.750	-5.30 PK	29.50	-34.80	1.00	69	12.50	-17.80
5	21.930	-2.80 PK	29.50	-32.30	1.00	125	15.00	-17.80
6	27.120	-5.50 PK	29.50	-35.00	1.00	271	12.40	-17.90

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for 0.49 ~ 30 MHz is 3 m, extrapolate the measured field strength to a distance of 30 meters.
   Distance factor@30m = 40*log(3/30) = -40dB

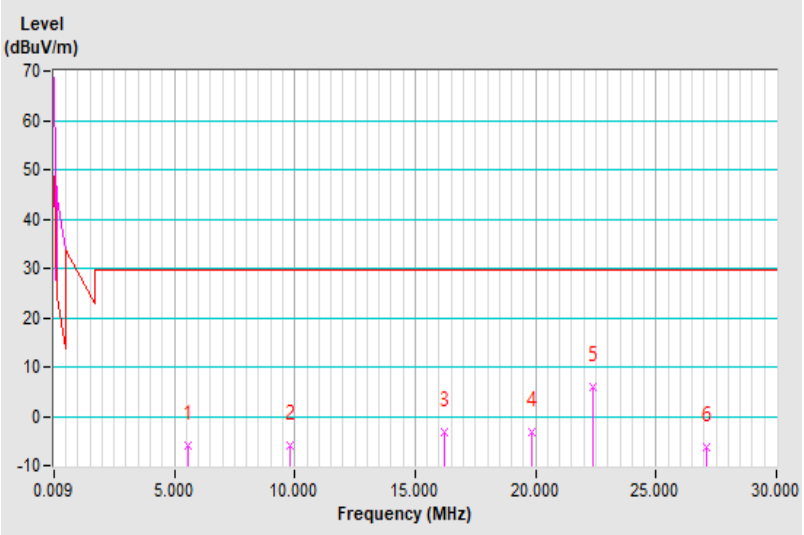


Test Mode	Tx		
RF Mode	NFC-13.56MHz	Channel	CH 1：13.56 MHz
Frequency Range	9 kHz ~ 30 MHz	Detector Function & Bandwidth	Peak (PK), 9 kHz
Input Power	3.6 Vdc	Environmental Conditions	22°C, 70% RH
Test Date	Thomas Cheng	Tested By	2022/6/25

Antenna Polarity : Ground-parallel								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	5.560	-5.90 PK	29.50	-35.40	1.00	234	13.70	-19.60
2	9.790	-5.80 PK	29.50	-35.30	1.00	144	12.40	-18.20
3	16.230	-3.30 PK	29.50	-32.80	1.00	214	14.60	-17.90
4	19.860	-3.10 PK	29.50	-32.60	1.00	133	14.70	-17.80
5	**22.410**	**5.80 PK**	**29.50**	**-23.70**	**1.00**	**351**	**23.60**	**-17.80**
6	27.120	-6.30 PK	29.50	-35.80	1.00	53	11.60	-17.90

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB) + Distance Factor
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. The test distance for 0.49 ~ 30 MHz is 3 m, extrapolate the measured field strength to a distance of 30 meters.
   Distance factor@30m = 40*log(3/30) = -40dB

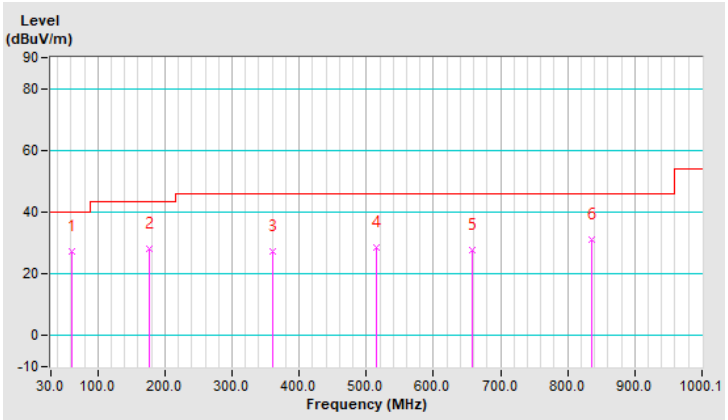


RF Mode	TX NFC-13.56MHz	Channel	CH 1：13.56 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 66% RH
Tested By	Thomas Cheng	Test Date	2022/6/25

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	61.04	27.2 QP	40.0	-12.8	1.47 H	223	40.7	-13.5
2	177.46	28.1 QP	43.5	-15.4	3.09 H	111	42.1	-14.0
3	359.83	27.3 QP	46.0	-18.7	2.50 H	230	37.5	-10.2
4	515.05	28.4 QP	46.0	-17.6	2.18 H	172	34.2	-5.8
5	658.62	27.6 QP	46.0	-18.4	1.94 H	338	30.1	-2.5
6	835.18	31.1 QP	46.0	-14.9	3.75 H	273	30.0	1.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

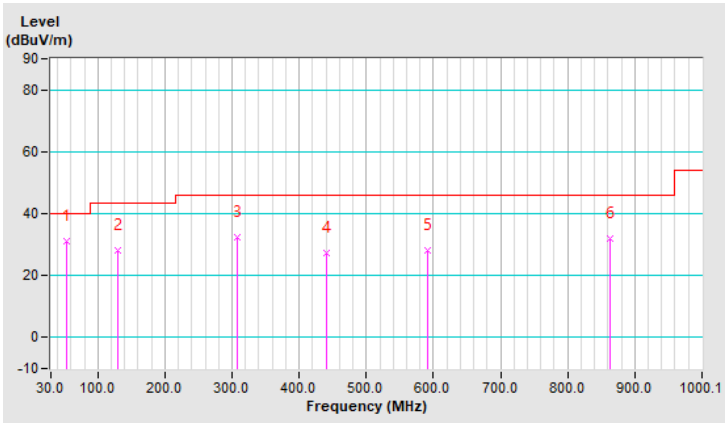


RF Mode	TX NFC-13.56MHz	Channel	CH 1：13.56 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 66% RH
Tested By	Thomas Cheng	Test Date	2022/6/25

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	53.28	31.0 QP	40.0	-9.0	1.21 V	122	43.7	-12.7
2	129.92	28.1 QP	43.5	-15.4	3.76 V	272	41.5	-13.4
3	308.42	32.3 QP	46.0	-13.7	2.23 V	239	44.0	-11.7
4	440.35	27.5 QP	46.0	-18.5	3.33 V	341	34.9	-7.4
5	590.72	28.3 QP	46.0	-17.7	1.67 V	356	32.1	-3.8
6	862.35	32.0 QP	46.0	-14.0	2.13 V	146	30.8	1.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30 MHz ~ 1 GHz.
5. The emission levels were very low against the limit of frequency range 9 kHz ~ 30 MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

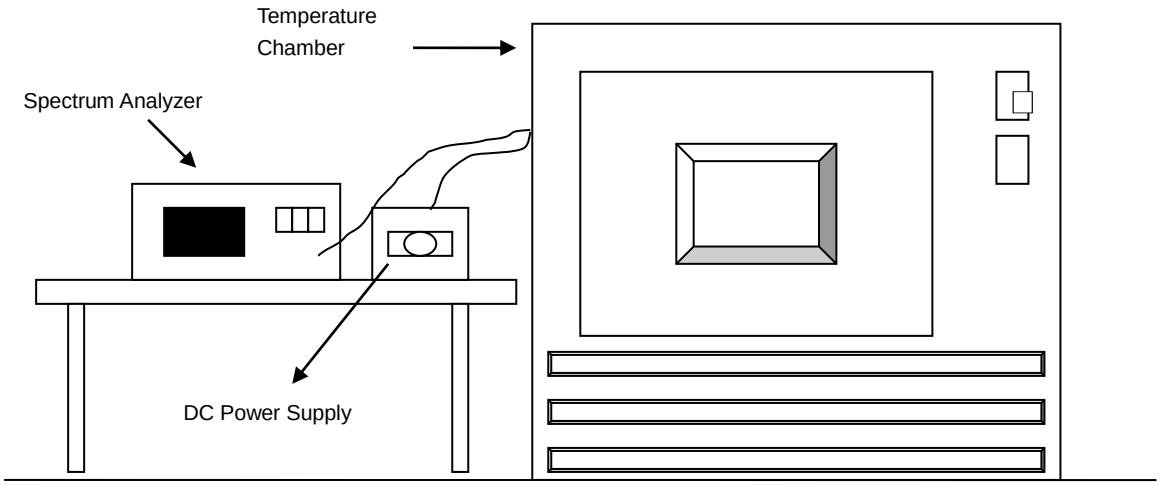


4.2 Frequency Stability

4.2.1 Limits of Frequency Stability Measurement

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01 % 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.

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
b. Turned the EUT on and coupled its output to a spectrum analyzer.
c. Turned the EUT off and set the chamber to the highest temperature specified.
d. Allowed sufficient time (approximately 30 min) for the temperature of the chamber to stabilize then turned the EUT on and measured the operating frequency after 2, 5, and 10 minutes.
e. Repeated step c and d with the every 10 degrees reduction until the lowest temperature achieved.
f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85 % to 115 % and the frequency record.

4.2.5 Deviation from Test Standard

No deviation.

4.2.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Set the EUT under transmission condition continuously at specific channel frequency.

4.2.7 Test Results

Type B

Frequency Stability Versus Temperature									
Temp. (℃)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift %	Measured Frequency (MHz)	Frequency Drift %	Measured Frequency (MHz)	Frequency Drift %	Measured Frequency (MHz)	Frequency Drift %
50	3.6	13.55999	-0.00007	13.55999	-0.00007	13.56	0.00000	13.55998	-0.00015
40	3.6	13.55995	-0.00037	13.55996	-0.00029	13.55996	-0.00029	13.55996	-0.00029
30	3.6	13.55995	-0.00037	13.55996	-0.00029	13.55996	-0.00029	13.55996	-0.00029
20	3.6	13.55998	-0.00015	13.55997	-0.00022	13.55998	-0.00015	13.55998	-0.00015
10	3.6	13.56001	0.00007	13.55999	-0.00007	13.56	0.00000	13.56	0.00000
0	3.6	13.55996	-0.00029	13.55995	-0.00037	13.55996	-0.00029	13.55996	-0.00029
-10	3.6	13.55996	-0.00029	13.55995	-0.00037	13.55995	-0.00037	13.55995	-0.00037
-20	3.6	13.56	0.00000	13.56001	0.00007	13.56	0.00000	13.56	0.00000

Frequency Stability Versus Voltage									
Temp. (℃)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Frequency Drift %	Measured Frequency (MHz)	Frequency Drift %	Measured Frequency (MHz)	Frequency Drift %	Measured Frequency (MHz)	Frequency Drift %
20	4.14	13.55998	-0.00015	13.55997	-0.00022	13.55998	-0.00015	13.55998	-0.00015
	3.6	13.55998	-0.00015	13.55997	-0.00022	13.55998	-0.00015	13.55998	-0.00015
	3.06	13.55998	-0.00015	13.55997	-0.00022	13.55998	-0.00015	13.55998	-0.00015

4.3 20 dB Bandwidth

4.3.1 Limits of 20 dB Bandwidth Measurement

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

4.3.2 Test Setup

Refer to section 4.1.5.

4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedures

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 958 Hz RBW and 3 kHz VBW. The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

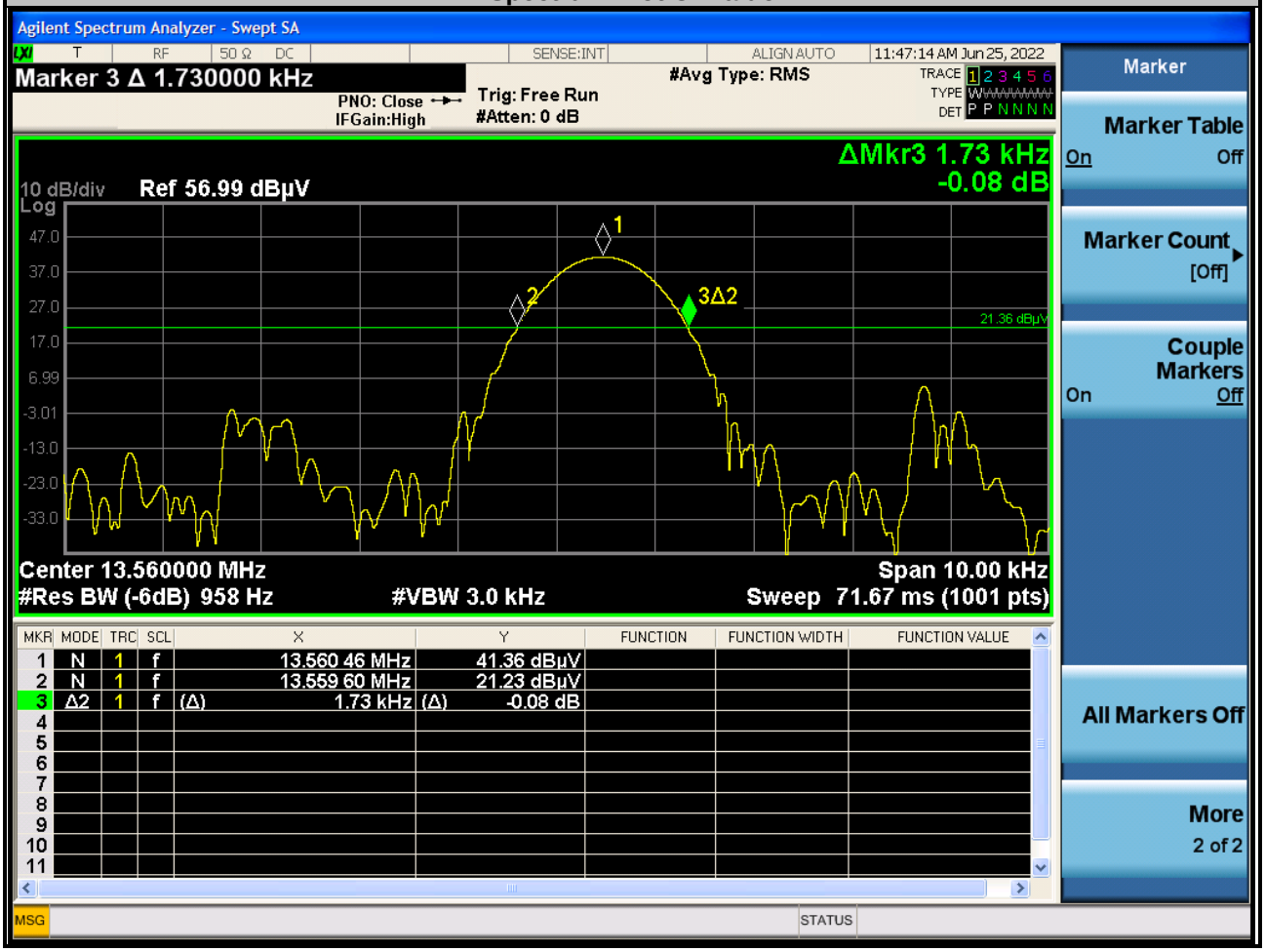
a. Placed the EUT on the testing table.
b. Set the EUT under transmission condition continuously at specific channel frequency.

4.3.7 Test Results

Type B

20 dBc Point (Low)	20 dBc Point (High)	Operating Frequency Band (MHz)	20 dBc Bandwidth (kHz)	Pass / Fail
13.55960 MHz	13.56133 MHz	13.553~13.567	1.73	Pass

Spectrum Plot Of Value



Note: The signal look like CW signal, so RBW can't be match 1~5 % OBW.

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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