





Prüfbericht-Nr.: Auftrags-Nr.: CN22R10F(P15C-315MHz) Seite 1 von 23 238544149 Order no .: Page 1 of 23 001 Test report no.: Kunden-Referenz-Nr.: N/A Auftragsdatum: 2022-07-06 Order date: Client reference no.: Auftraggeber: **Nutek Corporation** Client: No.167, Lane 235, Bauchiau Rd., Xindian District, New Taipei City 23145, Taiwan Prüfgegenstand: Transmitter Test item: Bezeichnung / Typ-Nr.: PP607402 Identification / Type no.: Auftrags-Inhalt: FCC Part 15C Test report Order content: Prüfgrundlage: Test specification: FCC CFR47 Part 15: Subpart C Section 15.231 Wareneingangsdatum: 2022-07-19 Date of sample receipt: Prüfmuster-Nr.: A003303373-002 Test sample no: Prüfzeitraum: 2022-08-08 - 2022-08-17 Testing period: Ort der Prüfung: EMC/RF Taipei Testing Site Place of testing: Prüflaboratorium: Taipei Testing Laboratories Testing laboratory: Prüfergebnis*: Pass Test result*: zusammengestellt von: genehmigt von: compiled by: authorized by: Ethan Shao Ausstellungsdatum: Datum: Date: 2022-08-24 Issue date: 2022-08-24 Ethan Shao Brenda Chen Stellung / Position: **Stellung** / Position: Assistant Project Engineer Senior Project Manager Sonstiges / Other: Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt Condition of the test item at delivery: Test item complete and undamaged * Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet 2 = good3 = satisfactory 4 = sufficient 5 = poor* Legend: 1 = very good P(ass) = passed a.m. test specification(s) N/A = not applicable F(ail) = failed a.m. test specification(s) N/T = not testedDieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.

This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be



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TEST SUMMARY

Report Section	FCC Clause	Test Item	Result
5.1.1	15.203	Antenna Requirement	Pass
5.1.2	15.231(c)	20 dB Bandwidth and Occupied Bandwidth	Pass
5.1.3	15.231(a)	Pulse Width / TX Gap	Pass
5.1.4	15.231(b)	Field Strength of Fundamental Emissions	Pass
5.1.5	15.231(b) & 15.205 & 15.209	Radiated Spurious Emissions	Pass
-	15.207	Mains Conducted Emission	Not Applicable

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



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APPENDIX SP - PHOTOGRAPHS OF TEST SETUP

APPENDIX EP - PHOTOGRAPHS OF EUT



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HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
CN22R10F(P15C-315MHz) 001	Original Release	2022-08-24



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1. General Remarks

1.1 Complementary Materials

The following attachments are integral parts of this test report:

Appendix A - Test Result of Radiated Emissions Appendix SP - Photographs of Test Setup Appendix EP - Photographs of EUT

Test Specifications

The following standards were applied.

Applied Standard and Test Levels

Radio

FCC 47CFR Part 15: Subpart C Section 15.231 ANSI C63.10:2013

1.2 Decision Rule of Conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.



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2. Test Sites

2.1 Test Laboratory

Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist. Taipei City 105
Taiwan (R.O.C.)

2.2 Test Facility

Taipei Testing Laboratories

No.458-18, Sec. 2, Fenliao Rd., Linkou Dist.,

New Taipei City 244 Taiwan (R.O.C.)

FCC Registration No.: 226631 ISED Registration No.: 25563



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2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

2.5 Measurement Uncertainty

All measurement uncertainty values are shown with a coverage factor of k=2 to indicate a 95% level of confidence.

Emission Measurement Uncertainty

Parameter	Uncertainty
Radiated Emission (9 kHz ~ 30 MHz)	± 1.15 dB
Radiated Emission (30 MHz ~ 200 MHz)	± 1.32 dB
Radiated Emission (200 MHz ~ 1 GHz)	± 1.31 dB
Radiated Emission (1 GHz ~ 18 GHz)	± 1.53 dB
Radiated Emission (18 GHz ~ 40 GHz)	± 2.50 dB
Mains Conducted Emission	± 1.65 dB



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3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Keyless Entry Transmitter working at 315 MHz. For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 System Details and Ratings

Basic Information of EUT

Item	EUT information
Kind of Equipment/Test Item	Transmitter
Type Identification	PP607402
FCC ID	ELVMTWA

Technical Specification of EUT

Item	EUT information
Operating Frequency	315 MHz
Operation Voltage	3Vdc (Battery)
Modulation	ASK
Antenna Information	Refer to 5.1.1
Accessory Device	Refer to 4.3



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3.3 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.4 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description



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4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum emission level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Setup for testing: Test samples are modified to continuous transmitter mode which makes it possible to transmit when power on.

Test Software	None.
---------------	-------

The samples were used as follows:

A003303373-002

Full test was applied on all test modes, but only the worst case was shown.

	Applicable To					
EUT Configure Mode	20 dB Bandwidth	Pulse Width / TX Gap	Field Strength of Fundamental Emissions	Radiated Spurious Emissions	Mains Conducted Emission	Description
-	\checkmark	√	$\sqrt{}$	$\sqrt{}$	-	-

Note:

- 1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when position on Z-plane.
- 2. "-" means no effect.

20 dB Bandwidth

- Pre-Scan full test was applied on all test modes, but only worst case was shown.
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Frequency (MHz)	Tested Frequency (MHz)	
-	315	315	

Pulse Width / TX Gap

- Pre-Scan full test was applied on all test modes, but only worst case was shown.
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Frequency (MHz)	Tested Frequency (MHz)	
-	315	315	

Field Strength of Fundamental

- Pre-Scan full test was applied on all test modes, but only worst case was shown.
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Frequency (MHz)	Tested Frequency (MHz)	
-	315	315	

Radiated Spurious Emissions

- Pre-Scan full test was applied on all test modes, but only worst case was shown.
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Frequency (MHz)	Tested Frequency (MHz)	
-	315	315	



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Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
20 dB Bandwidth	22 °C	67 %	Andy Chen
Pulse Width / TX Gap	22 °C	67 %	Andy Chen
Field Strength of Fundamental	23.1-24.6 °C	52-55 %	Roger Liao
Radiated Spurious Emissions	23.1-24.6 °C	52-55 %	Roger Liao

4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

Accessory of EUT

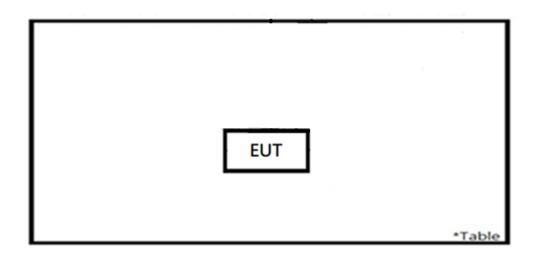
None.

Support Unit

Support Unit							
No. Description Brand Model S/N Remark					Remark		
-	Lithium Coin Battery	Panasonic	CR2032	-	3Vdc		

4.4 Test Setup Diagram

<Radiated Spurious Emissions mode>





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5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

Requirement Use of approved antennas only

The EUT which is equipped with an antenna permanently attached to the intentional radiator will be considered sufficient to comply with the provisions of this section.

Refer to EUT photo for details.



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5.1.2 20 dB Bandwidth and Occupied Bandwidth

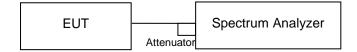
Limit

The bandwidth of the emission shall be no wider than 0.25 % of the center frequency for devices operating above 70 MHz and below 900 MHz.

Kind of Test Site

Shielded room

Test Setup



Test Instruments

Kind of	Manufacturer	Tuno	S/N	Calibration	Calibration	Test Date	
Equipment	Manufacturer	Туре	3/IN	Date	Due Date	From	Until
Spectrum Analyzer	R&S	FSV40	101512	2022/2/24	2023/2/23	2022/8/8	2022/8/9

Test Procedures

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
- d. Repeat above procedures until all frequencies measured were complete.
- e. For occupied bandwidth, the transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1 % to 5 % of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to Sampling. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.



Prüfbericht - Produkte

Test Report - Products

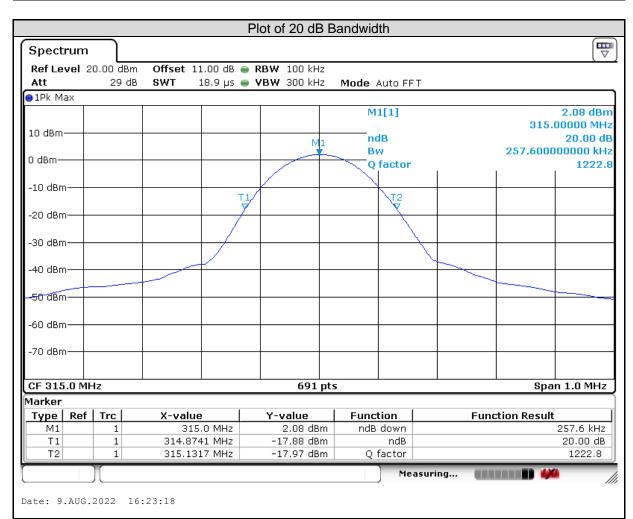
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Test Results

Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)
315	257.60	787.5



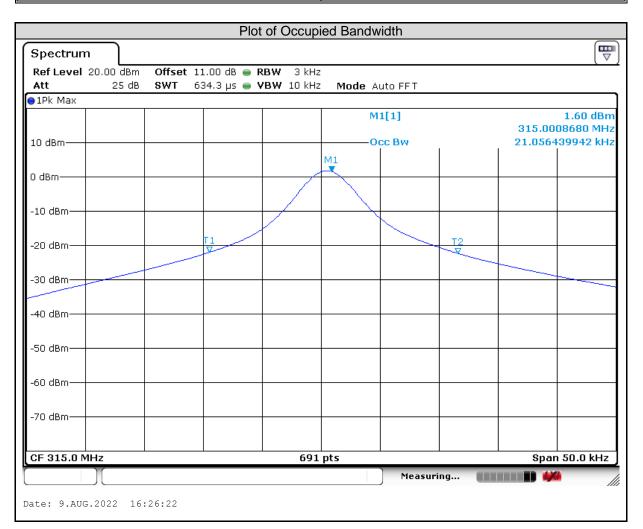


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Channel Frequency (MHz)	Occupied Bandwidth (kHz)
315	21.056





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5.1.3 Pulse Width/TX Gap

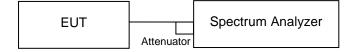
Limit

For operation in 314-316 MHz and 433-435 MHz: A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds being released. A transmitter activated automatically shall cease transmission within 5 seconds after activation.

Kind of Test Site

Shielded room

Test Setup



Test Instruments

Kind of	Manufacturer	Tuno	S/N	Calibration	Calibration	Test Date	
Equipment	Manufacturer	Туре	3/11	Date	Due Date	From	Until
Spectrum Analyzer	R&S	FSV40	101512	2022/2/24	2023/2/23	2022/8/8	2022/8/9

Test Procedures

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. Measure the transmission time (Pulse width) and stop duration of a transmission period (TX gap).
- d. Repeat above procedures until all frequencies measured were complete.



Prüfbericht - Produkte

Test Report - Products

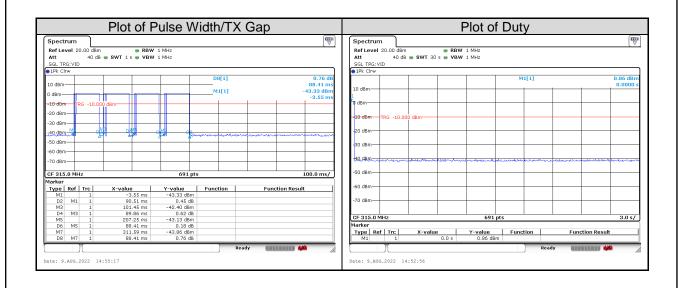
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Test Results

Channel Frequency (MHz) Pulse Width (ms)		Limit (ms)	Result
315	357.19	5000	Pass





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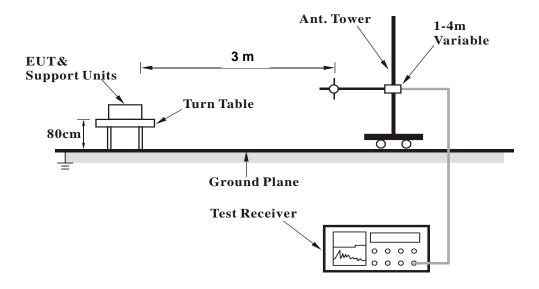
Test Report No.

5.1.4 Field Strength of Fundamental Emissions

Limit Refer to §15.231(b) for reference

Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup



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



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Test Instruments

Test Date: 2022/8/17

Kind of Equipment	Manufacturer	Туре	S/N	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV40	101509	2022/4/22	2023/4/21
Horn Antenna	ETS-Lindgren	3117	00218929	2021/11/25	2022/11/24
HF-AMP + AC source	EMCI	EMC051845SE	980635	2022/1/20	2023/1/19
HF-AMP + AC source	EMCI	EMC184045SE	980656	2022/1/20	2023/1/19
Horn Antenna	SCHWARZBECK	BBHA 9170	00887	2022/3/29	2023/3/28
		30MHz-1GI	Hz		
Receiver	R&S	ESR7	102109	2022/2/25	2023/2/24
Bilog Antenna	SCHWARZBECK	VULB-9168	00949	2022/5/29	2023/5/28
LF-AMP	Agilent	8447D	2727A05146	2022/2/16	2023/2/15
		Below 30MI	Hz		
Receiver	R&S	ESR7	102109	2022/2/25	2023/2/24
Microwave Cable	SUCOFLEX 104EA	800056/4EA	804680/4	2022/3/22	2023/3/21
Loop Antenna	SCHWARZBECK	FMZB 1519B	00215	2021/12/8	2022/12/7



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Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) 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 peak and average detect function and specified bandwidth with maximum hold mode.

Note:

- 1. All modes of operation were investigated and the worst-case emissions are reported.
- 2. The Radiated Emissions testing was performed in the X(E1), Y(H) and Z(E2) axis orientation. The worst-case Axis orientation is recorded in this test report.

Test Results

The EUT employs pulsed operation.

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Antenna Orientation	Detector or calculated value
315	79.44	95.62	Harizantal	Peak
315	73.30	75.62	Horizontal	Average
315	66.74	95.62	Vartical	Peak
315	61.00	75.62	Vertical	Average

FCC 15.231(a), NCC LP0002 4.4.2.5(1)

Note: With linear interpolations, the formulas for calculating the maximum permitted fundamental field strengths is as follows:

315MHz, μ V/m at 3 meters = 41.6667 x (315MHz) - 7083.3333 = 6041.6772 μ V/m 20log (6041.6772) = 75.62 dB μ V/m (Average Limit)

 $75.62 + 20 = 95.62 \text{ dB } \mu \text{ V/m (Peak Limit)}$



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5.1.5 Radiated Spurious Emissions

Limit

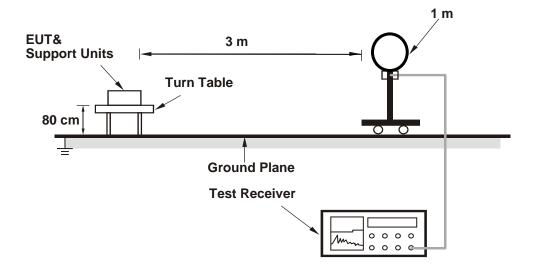
Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emission limits specified in §15.209(a).

Kind of Test Site

3m Semi-Anechoic Chamber

Test Setup

<Radiated Emissions below 30 MHz>



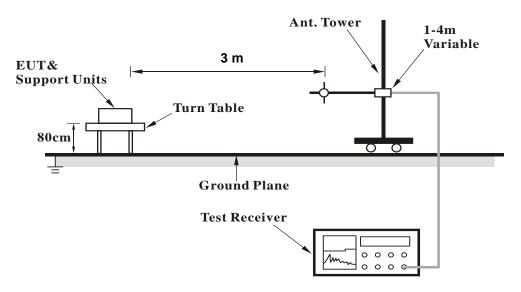


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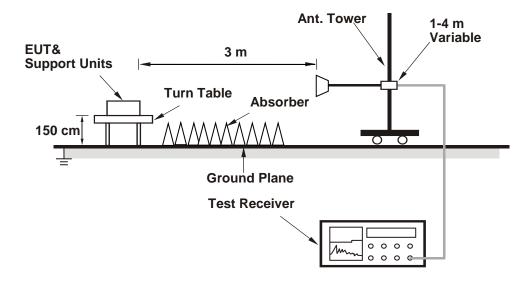
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<Radiated Emissions 30 MHz to 1 GHz>



<Radiated Emissions above 1 GHz>



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

Test Instruments

Please refer to 5.1.4 Instruments



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Test Procedures

For Radiated Emissions 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 (OPEN), perpendicular (CLOSE), and ground-parallel (GROUND) 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.

Note:

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.
- 2. All modes of operation were investigated and the worst-case emissions are reported.

For Radiated Emissions above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) 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:

- 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. All modes of operation were investigated and the worst-case emissions are reported.
- 3. The Radiated Emissions testing was performed in the X(E1), Y(H) and Z(E2) axis orientation. The worst-case Axis orientation is recorded in this test report.

Test Results

Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) Level (dBuV/m) = Reading (dBuV) + Factor (dB/m)

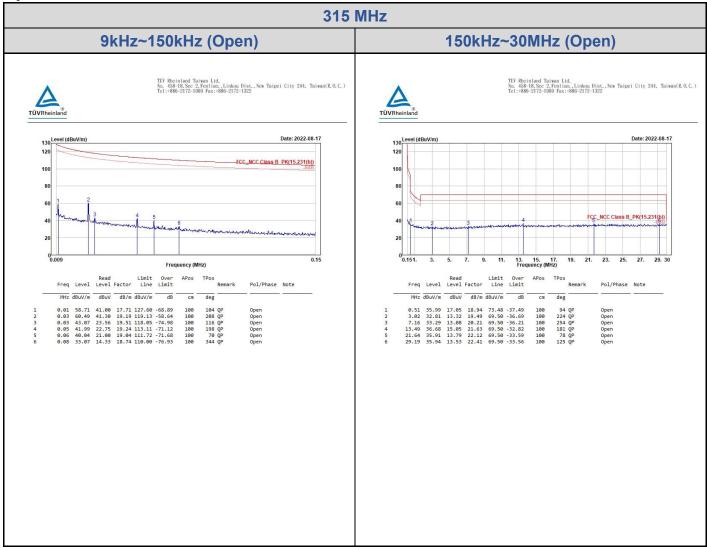
Please refer to Appendix A.

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Appendix A: Test Results of Radiated Emissions

Spurious Emissions, Tx Mode, 9kHz ~ 30MHz

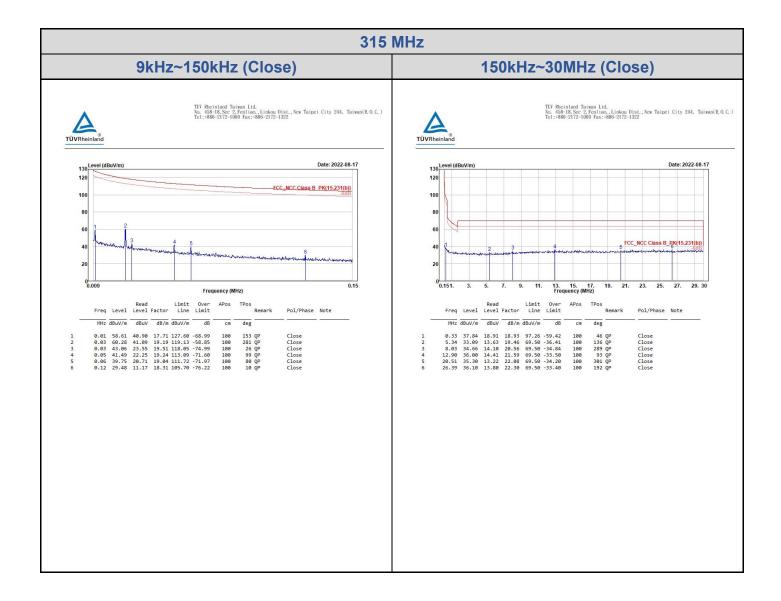




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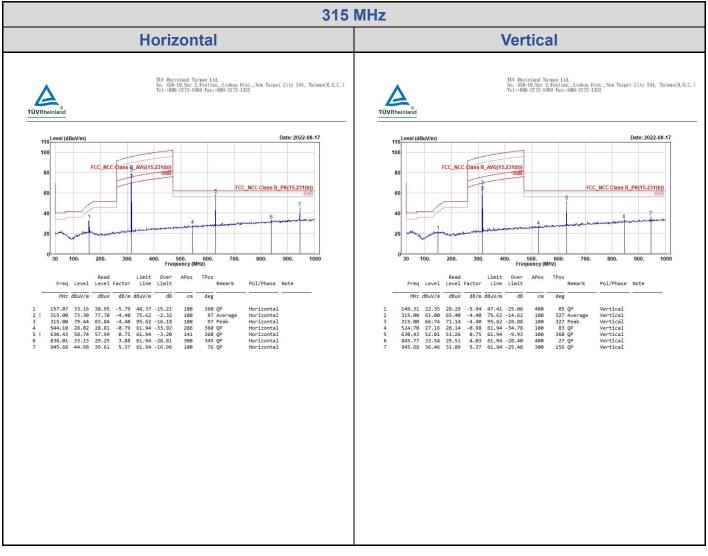
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Spurious Emissions, Tx Mode, 30MHz ~ 1GHz





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Spurious Emissions, Tx Mode, 1GHz ~ 5GHz

