

Prüfbericht-Nr.: <i>Test report no.:</i>	CN21H2XW(P15.249-ANT) 001	Auftrags-Nr.: <i>Order no.:</i>	238486434	Seite 1 von 26 Page 1 of 26	
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2020-05-12		
Auftraggeber: <i>Client:</i>	iSenseTek Technology Inc. 4F-1, No.15, Ln. 360, Sec. 1, Neihu Rd., Neihu Dist., Taipei, Taiwan				
Prüfgegenstand: <i>Test item:</i>	Bluetooth 5.0 BLE + ANT+ module				
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	ISBLE1506-X52				
Auftrags-Inhalt: <i>Order content:</i>	FCC Part 15C Test report				
Prüfgrundlage: <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.249				
Wareneingangsdatum: <i>Date of sample receipt:</i>	2020-05-08				
Prüfmuster-Nr.: <i>Test sample no.:</i>	A002822714-001				
Prüfzeitraum: <i>Testing period:</i>	2021-06-23, 2022-09-13				
Ort der Prüfung: <i>Place of testing:</i>	EMC/RF Taipei Testing Site				
Prüflaboratorium: <i>Testing laboratory:</i>	Taipei Testing Laboratories				
Prüfergebnis*: <i>Test result*:</i>	Pass				
zusammengestellt von: <i>compiled by:</i>	genehmigt von: <i>authorized by:</i>				
Datum: <i>Date:</i>	Ausstellungsdatum: <i>Issue date:</i>				
Stellung / Position:	Stellung / Position:				
Sonstiges / Other:					
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>					
Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>					
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar	5 = mangelhaft N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable	5 = poor N/T = not tested
Dieser 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. <i>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 duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

TEST SUMMARY

Report Section	FCC Clause	Test Item	Result
5.1.1	15.203	Antenna Requirement	Pass
5.1.2	15.249 (a)	Field Strength of Fundamental Emissions	Pass
5.1.3	15.249 (d)	Radiated Spurious Emissions	Pass
5.1.4	15.215 (c)	20 dB Bandwidth	Pass
5.1.5	2.1049	99% Occupied Bandwidth	Pass
5.2.1	15.207	Mains Conducted Emission	Pass

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

Contents

HISTORY OF THIS TEST REPORT	4
1. GENERAL REMARKS	5
1.1 COMPLEMENTARY MATERIALS.....	5
1.2 DECISION RULE OF CONFORMITY	5
2. TEST SITES	6
2.1 TEST LABORATORY	6
2.2 TEST FACILITY.....	6
2.3 TRACEABILITY	7
2.4 CALIBRATION	7
2.5 MEASUREMENT UNCERTAINTY	7
3. GENERAL PRODUCT INFORMATION.....	8
3.1 PRODUCT FUNCTION AND INTENDED USE	8
3.2 SYSTEM DETAILS AND RATINGS.....	8
3.3 NOISE GENERATING AND NOISE SUPPRESSING PARTS	9
3.4 SUBMITTED DOCUMENTS.....	9
4. TEST SET-UP AND OPERATION MODES.....	10
4.1 PRINCIPLE OF CONFIGURATION SELECTION	10
4.2 TEST OPERATION AND TEST SOFTWARE.....	10
4.3 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	11
4.4 TEST SETUP DIAGRAM	12
5. TEST RESULTS	13
5.1 TRANSMITTER REQUIREMENT & TEST SUITES	13
5.1.1 Antenna Requirement	13
5.1.2 Field Strength of Fundamental Emissions	14
5.1.3 Radiated Spurious Emissions	17
5.1.4 20 dB Bandwidth	21
5.1.5 99% Occupied Bandwidth	23
5.2 MAINS EMISSION	25
5.2.1 Mains Conducted Emission.....	25

APPENDIX A - TEST RESULT OF RADIATED EMISSIONS & MAINS CONDUCTED EMISSION

APPENDIX SP - PHOTOGRAPHS OF TEST SETUP

APPENDIX EP - PHOTOGRAPHS OF EUT

Prüfbericht - Nr.: CN21H2XW(P15.249-ANT) 001
Test Report No.

Seite 4 von 26
Page 4 of 26

HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
CN21H2XW(P15.249-ANT) 001	Original Release	2022-09-13

1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A - Test Result of Radiated Emissions & Mains Conducted Emission

Appendix SP - Photographs of Test Setup

Appendix EP - Photographs of EUT

Applied Standard and Test Levels

Radio
FCC 47CFR Part 15: Subpart C Section 15.249
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.

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

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 basis 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)	± 1.30 dB
Radiated Emission (200 MHz ~ 1 GHz)	± 1.30 dB
Radiated Emission (1 GHz ~ 18 GHz)	± 1.54 dB
Radiated Emission (18 GHz ~ 40 GHz)	± 2.52 dB
Mains Conducted Emission	± 1.65 dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Bluetooth 5.0 BLE + ANT+ module working at 2.4 GHz with ANT function.
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	Bluetooth 5.0 BLE + ANT+ module
Type Identification	ISBLE1506-X52
FCC ID	2AI2V-ISBLE1506X52

Technical Specification of EUT

Item	EUT information
Operating Frequency	2457 MHz
Operation Voltage	5Vdc
Modulation	GFSK
Antenna Information	Refer to 5.1.1
Accessory Device	Refer to 4.3

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

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 provided with a modified firmware which makes it possible to control them through a button on the evaluation board.

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

The samples were used as follows:

A002822714-001

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

EUT Configure Mode	Applicable To				Description
	Field Strength of Fundamental Emissions	Radiated Spurious Emissions	20dB Bandwidth & Occupied Bandwidth	Mains Conducted Emission	
-	√	√	√	√	-

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.

Field Strength of Fundamental 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)
-	2457	2457

Radiated Spurious Emission

- ☒ 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)
-	2457	2457

20dB Bandwidth & Occupied 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)
-	2457	2457

Mains Conducted Emission

- ☒ 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)
-	2457	2457

Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
Radiated Spurious Emissions	20-22 °C	59-62 %	Simon Tsai
Field Strength of Fundamental Emissions	20-22 °C	59-62 %	Simon Tsai
20dB Bandwidth & Occupied Bandwidth	22 °C	67 %	Andy Chen
Mains Conducted Emission	19.5 °C	61 %	Temo Chen

4.3 Special Accessories and Auxiliary Equipment

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

Accessory of EUT

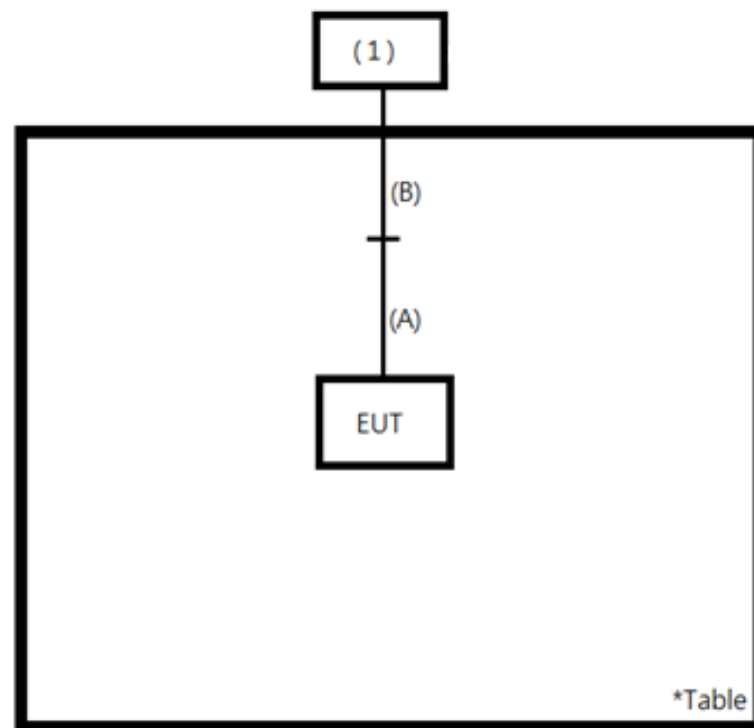
None.

Support Unit

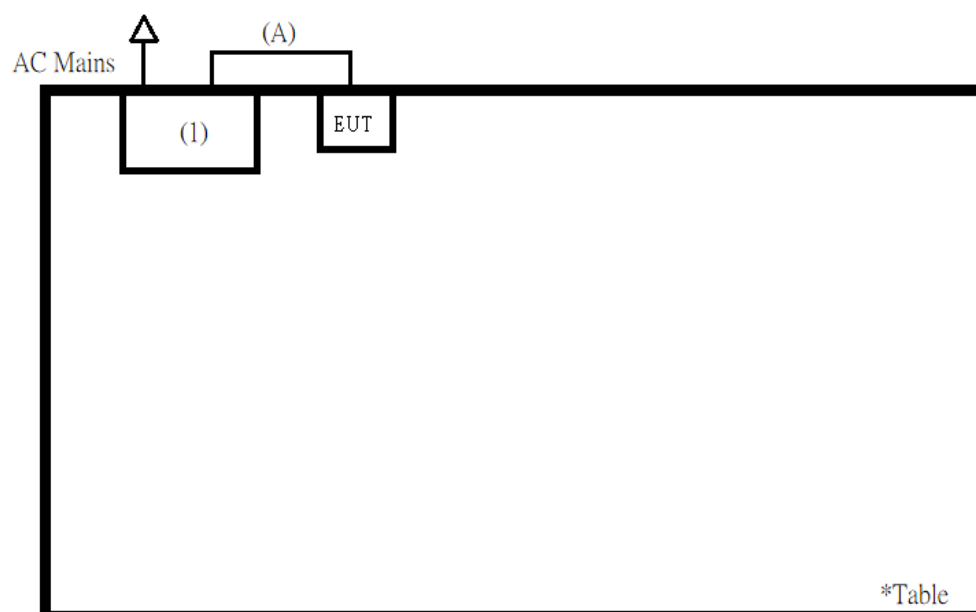
No.	Description	Brand	Model	S/N	Remark
Radiated Test					
A	Mirco USB Cable	isenseTek	isenseTek-001	-	100 cm shielded cable with core
B	USB Cable	Pro-Best	MK-USBMF-3M	-	300 cm shielded cable with core
1	NoteBook	HP	15s-du0007TX	CND93662VF	-
Mains Conducted Test					
A	Mirco USB Cable	isenseTek	isenseTek-001	-	100 cm shielded cable with core
1	Wireless Tester	R&S	CMW500	495677	-

4.4 Test Setup Diagram

<Radiated Spurious Emissions mode>



<Mains Conducted Emission mode>



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

Requirement Use of approved antennas only

According to the manufacturer declaration, the EUT has an antenna with a directional gain of -1.61 dBi. The antenna is a PCB antenna with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

5.1.2 Field Strength of Fundamental Emissions

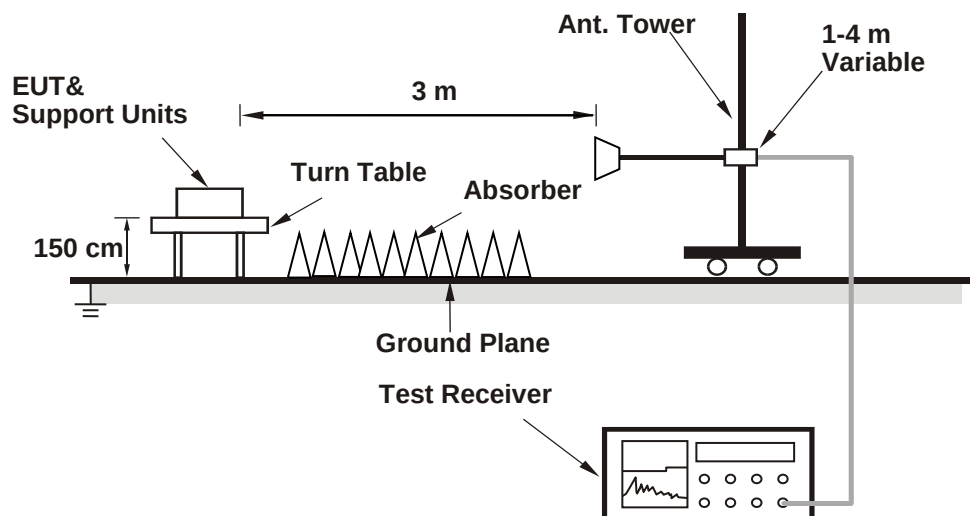
Limit

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field Strength of Fundamental (microvolts/meter)	Field Strength of Harmonics (microvolts/meters)
902 ~ 928 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500
24 ~ 24.25 GHz	250	2500

Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup



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

Test Instruments

Test Date: 2021/6/23

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Signal Analyzer	R&S	FSV40	101508	2021/3/16	2022/3/15
Receiver	R&S	ESR7	102109	2021/3/16	2022/3/15
Bilog Antenna	SCHWARZBECK	VULB-9168	00951	2021/2/18	2022/2/17
Horn Antenna	ETS-Lindgren	3117	00218930	2020/12/1	2021/11/30
LF-AMP	Agilent	8447D	2944A10772	2021/2/18	2022/2/17
HF-AMP + AC source	EMCI	EMC051845SE	980633	2021/2/9	2022/2/8
HF-AMP + AC source	EMCI	EMC184045SE	980657	2021/2/1	2022/1/31
Horn Antenna	SCHWARZBECK	BBHA 9170	00887	2021/4/8	2022/4/7
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104EA	800056/4EA	2021/3/17	2022/3/16
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104	804680/4	2021/3/17	2022/3/16
Microwave Cable	HUBER+SUHNER	SUCOFLEX 104	MY37202/4	2021/3/17	2022/3/16
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	800898/2EA	2021/4/16	2022/4/15
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	800901/2EA	2021/4/16	2022/4/15
Microwave Cable	HUBER+SUHNER	SUCOFLEX 102EA	801027/2EA	2021/4/16	2022/4/15
Loop Antenna	Chance Most	EMCILPA600 +calibration	287	2021/1/15	2022/1/14

Test Procedures

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

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. All modes of operation were investigated and the worst-case emissions are reported.
4. 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.

5.1.3 Radiated Spurious Emissions

Limit

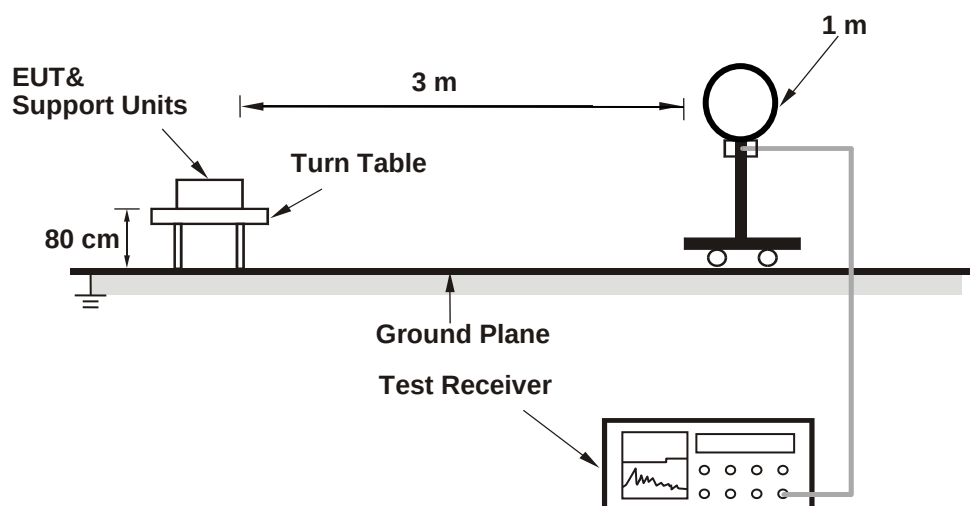
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation.

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

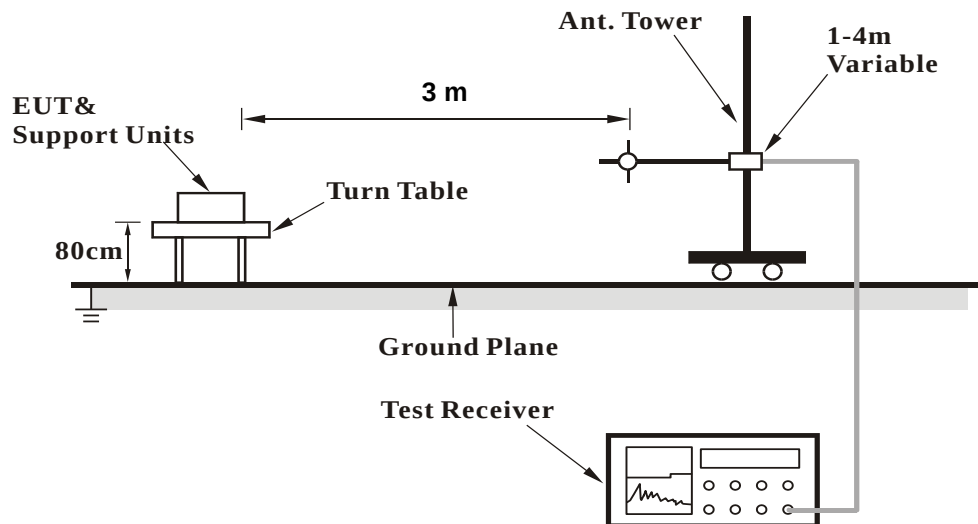
Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup

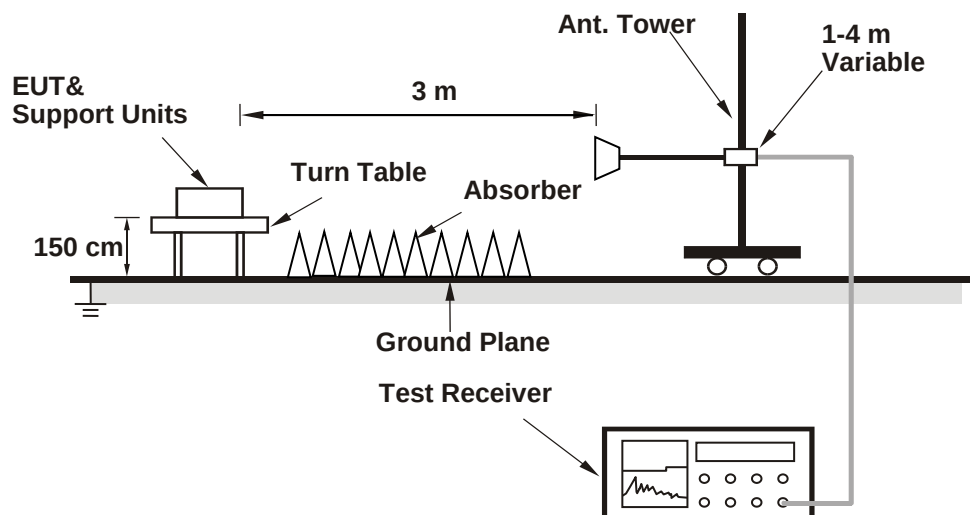
<Radiated Emissions below 30 MHz>



<Radiated Emissions 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



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

Test Instruments

Please refer to 5.1.2 Instruments

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:

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. All modes of operation were investigated and the worst-case emissions are reported.
4. 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.

Prüfbericht - Nr.: CN21H2XW(P15.249-ANT) 001
Test Report No.

Seite 20 von 26
Page 20 of 26

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.

5.1.4 20 dB Bandwidth

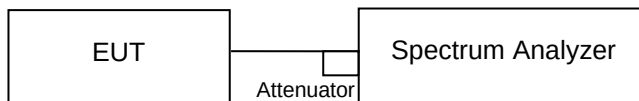
Limit

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field Strength of Fundamental (microvolts/meter)	Field Strength of Harmonics (microvolts/meters)
902 ~ 928 MHz	50	500
2400 ~ 2483.5 MHz	50	500
5725 ~ 5875 MHz	50	500
24 ~ 24.25 GHz	250	2500

Kind of Test Site Shielded room

Test Setup



Test Instruments

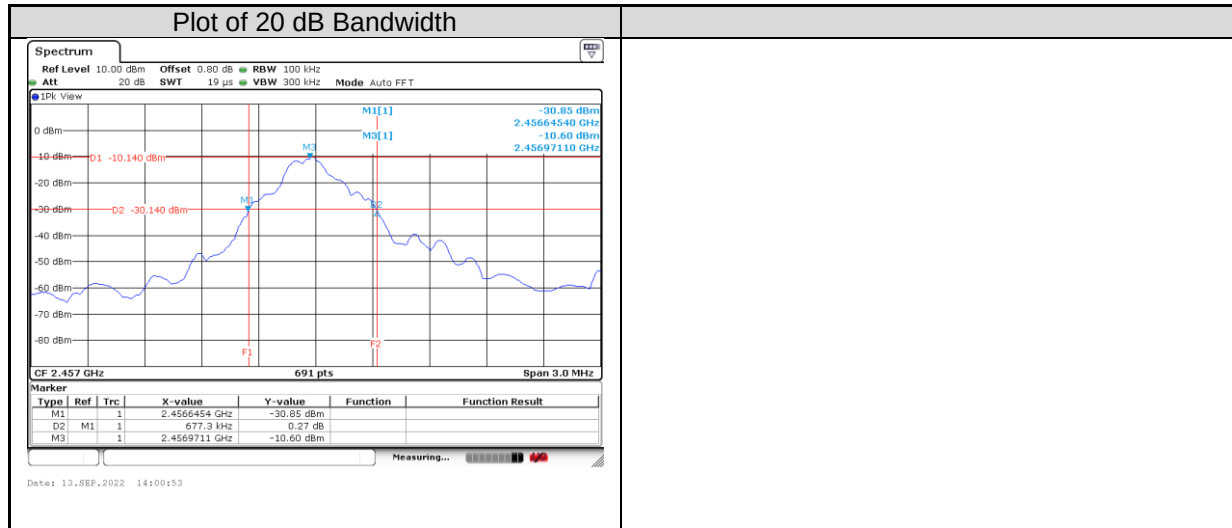
Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV40	101512	2022/2/24	2023/2/23	2022/9/13	2022/9/13

Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 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.
- Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.
- 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 PEAK. 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.

Test Results

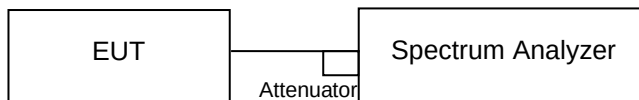
Channel	Channel Frequency (MHz)	20dB Bandwidth (kHz)
-	2457	677.3



5.1.5 99% Occupied Bandwidth

Kind of Test Site Shielded room

Test Setup



Test Instruments

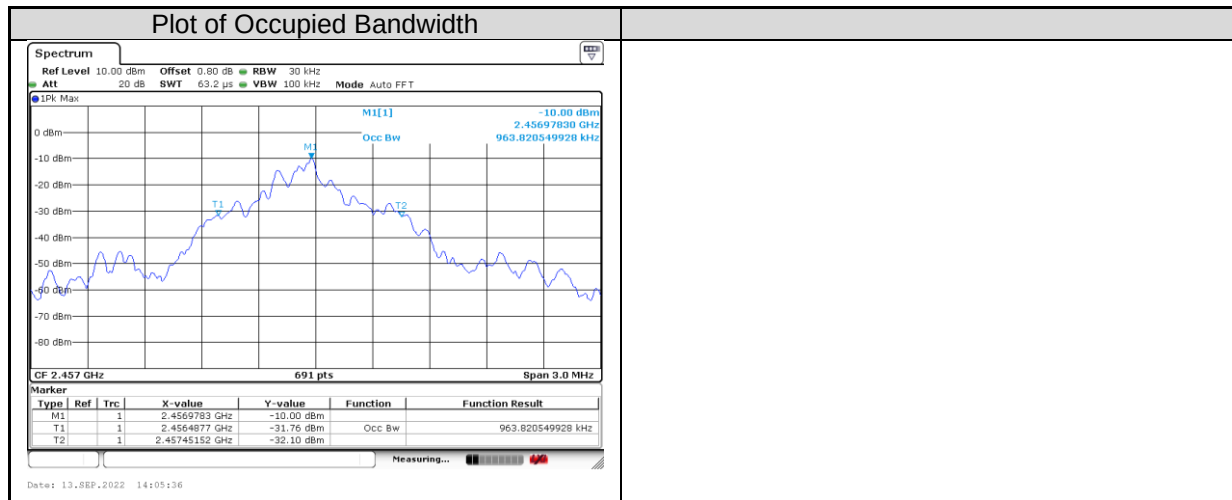
Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV40	101512	2022/2/24	2023/2/23	2022/9/13	2022/9/13

Test Procedure

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.

Test Results

Channel	Channel Frequency (MHz)	99% Bandwidth (kHz)
28	2457	963.82



5.2 Mains Emission

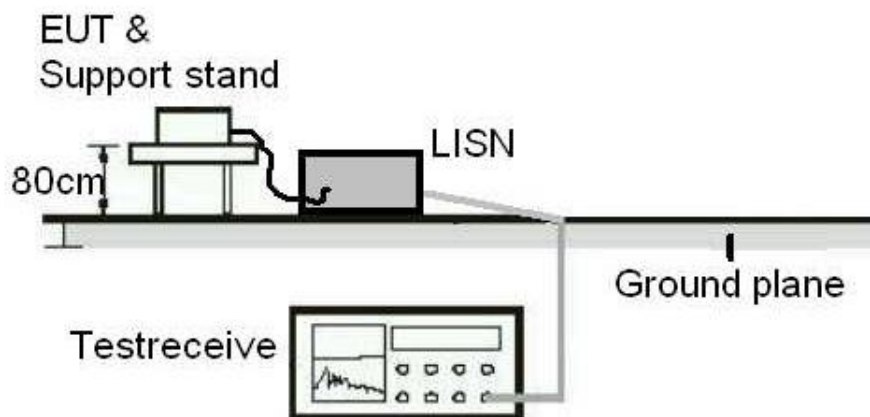
5.2.1 Mains Conducted Emission

Limit

Mains Conducted emissions as defined in §15.207 must comply with the mains conducted emission limits.

Kind of Test Site Shielded room

Test Setup



Test Instruments

Test Date: 2021/6/23

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
TWO-LINE V-NETWORK	R&S	ENV216	1816064	2020/9/10	2021/9/9
EMI Test Receiver	R&S	ESCI	1816063	2020/11/17	2021/11/16
RF Cable	N/A	N/A	EMC-003	2020/11/15	2021/11/14

Test Procedures

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

Test Results

Please refer to Appendix A.

Appendix A: Test Results of Radiated Emissions & Mains Conducted Emission Test

Fundamental, 2.31GHz ~ 2.9GHz

ANT

(Horizontal) Peak

TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec. 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel: +886-2172-1000 Fax: +886-2172-1322

Level (dBuV/m) Date: 2021-06-23

Frequency (MHz)

	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	2328.96	52.28	15.18	37.10	74.00	-21.72		383	334	Peak	Horizontal	
2	2457.00	89.41	51.89	37.52	114.00	-24.59		383	334	Peak	Horizontal	
3	2831.68	52.48	14.27	38.21	74.00	-21.52		383	334	Peak	Horizontal	

(Vertical) Peak

TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec. 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel: +886-2172-1000 Fax: +886-2172-1322

Level (dBuV/m) Date: 2021-06-23

Frequency (MHz)

	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	2345.45	51.16	13.94	37.22	74.00	-22.84		341	162	Peak	Vertical	
2	2457.00	88.01	50.49	37.52	114.00	-25.99		341	162	Peak	Vertical	
3	2817.67	52.71	14.51	38.20	74.00	-21.29		341	162	Peak	Vertical	

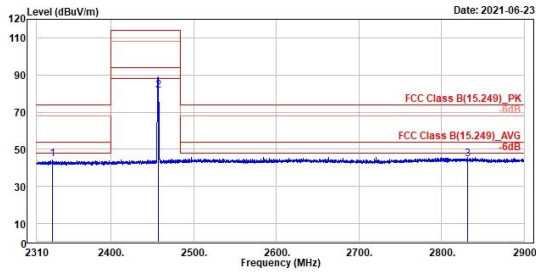
ANT

(Horizontal) Average

(Vertical) Average



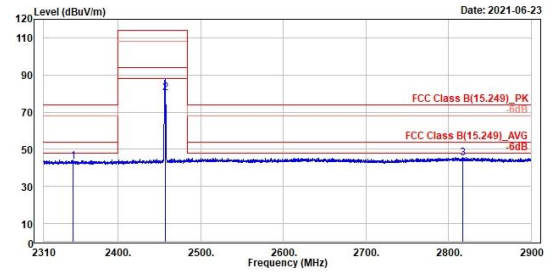
TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec. 2, Fenliiao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel: +886-2172-1000 Fax: +886-2172-1322



	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg				
1	2328.96	44.83	7.73	37.10	54.00	-9.17	383	334	Average	Horizontal	CF	
2	2457.00	81.66	44.14	37.52	94.00	-12.34	383	334	Average	Horizontal	CF	
3	2831.68	44.72	6.51	38.21	54.00	-9.28	383	334	Average	Horizontal	CF	



TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec. 2, Fenliiao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel: +886-2172-1000 Fax: +886-2172-1322



	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg				
1	2345.45	43.40	6.18	37.22	54.00	-10.60	341	162	Average	Vertical	CF	
2	2457.00	80.26	42.74	37.52	94.00	-13.74	341	162	Average	Vertical	CF	
3	2817.67	44.96	6.76	38.20	54.00	-9.04	341	162	Average	Vertical	CF	

Spurious Emissions, Tx Mode, 9kHz ~ 30MHz

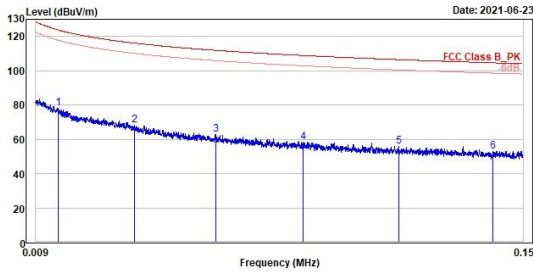
ANT

(Open) 9kHz~150kHz

(Close) 150kHz~30MHz



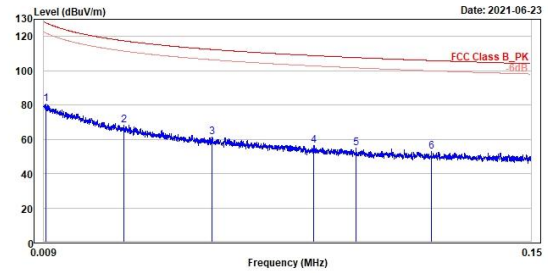
TÜV Rheinland Taiwan Ltd.
 No. 458-18, Sec 2, Penliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
 Tel: +886-2172-1000 Fax: +886-2172-1322



	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg				
1	0.02	78.07	2.62	75.45	123.84	-45.77	100	62	QP	Open		
2	0.04	68.23	-0.09	68.32	116.09	-47.86	100	98	QP	Open		
3	0.06	62.99	-0.53	63.52	111.89	-48.90	100	9	QP	Open		
4	0.09	58.23	-2.51	60.74	108.87	-50.64	100	173	QP	Open		
5	0.11	55.79	-2.65	58.44	106.46	-50.67	100	347	QP	Open		
6	0.14	53.09	-3.77	56.86	104.60	-51.51	100	112	QP	Open		



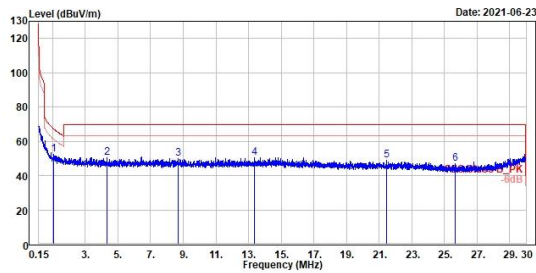
TÜV Rheinland Taiwan Ltd.
 No. 458-18, Sec 2, Penliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
 Tel: +886-2172-1000 Fax: +886-2172-1322



	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg				
1	0.01	80.44	3.19	77.25	128.02	-47.58	100	190	QP	Close		
2	0.03	68.37	0.18	68.19	117.45	-49.08	100	250	QP	Close		
3	0.06	61.23	-1.56	62.79	112.36	-51.13	100	47	QP	Close		
4	0.09	56.59	-2.31	58.90	108.78	-52.19	100	267	QP	Close		
5	0.10	54.95	-2.36	57.31	107.65	-52.70	100	0	QP	Close		
6	0.12	52.97	-3.34	56.31	105.93	-52.96	100	79	QP	Close		

ANT
(Open) 9kHz~150kHz
(Close) 150kHz~30MHz

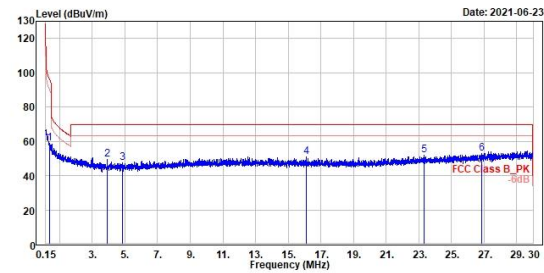

TÜV Rheinland Taiwan Ltd.
 No. 458-18, Sec. 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
 Tel: +886-2172-1000 Fax: +886-2172-1322



	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB		cm	deg			
1	1.07	52.25	12.35	39.90	67.05	-14.80	100	237	QP	Open		
2	4.32	50.23	11.90	38.33	69.50	-19.27	100	167	QP	Open		
3	8.68	49.84	11.96	37.88	69.50	-19.66	100	99	QP	Open		
4	13.36	50.33	12.85	37.48	69.50	-19.17	100	127	QP	Open		
5	21.48	48.89	12.92	35.97	69.50	-20.61	100	196	QP	Open		
6	25.68	46.83	12.63	34.20	69.50	-22.67	100	157	QP	Open		



TÜV Rheinland Taiwan Ltd.
 No. 458-18, Sec. 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
 Tel: +886-2172-1000 Fax: +886-2172-1322



	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB		cm	deg			
1	0.40	50.86	12.02	46.84	95.61	-36.75	100	62	QP	Close		
2	3.90	49.23	12.55	36.68	69.50	-20.27	100	80	QP	Close		
3	4.83	47.60	11.19	36.41	69.50	-21.90	100	240	QP	Close		
4	16.12	51.00	13.13	37.87	69.50	-18.50	100	250	QP	Close		
5	23.32	51.72	12.54	39.18	69.50	-17.78	100	314	QP	Close		
6	26.84	53.10	12.25	40.85	69.50	-16.40	100	360	QP	Close		

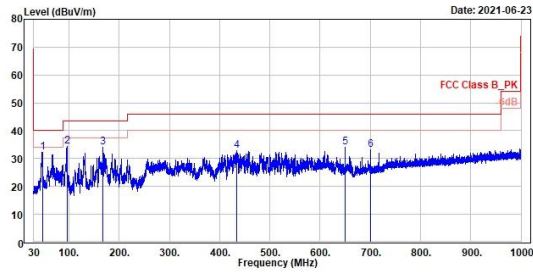
Spurious Emissions, Tx Mode, 30MHz ~ 1GHz

ANT

(Horizontal)



TÜV Rheinland Taiwan Ltd.
 No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
 Tel: +886-2172-1000 Fax: +886-2172-1322

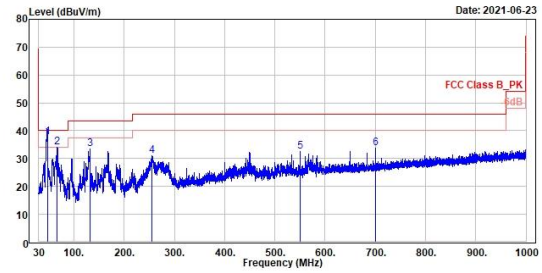


	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg				
1	46.98	32.29	39.83	-7.54	40.00	-7.71	200	77	QP	horizontal		
2	96.15	34.42	47.78	-13.36	43.50	-9.08	200	116	QP	horizontal		
3	167.84	34.18	41.39	-7.21	43.50	-9.32	200	282	QP	horizontal		
4	433.71	32.75	36.75	-4.00	46.00	-13.25	100	134	QP	horizontal		
5	650.12	34.08	34.65	-0.57	46.00	-11.92	100	234	QP	horizontal		
6	700.00	33.19	33.04	0.15	46.00	-12.81	100	184	QP	horizontal		

(Vertical)



TÜV Rheinland Taiwan Ltd.
 No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
 Tel: +886-2172-1000 Fax: +886-2172-1322



	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg				
1	47.07	37.79	45.33	-7.54	40.00	-2.21	100	4	QP	vertical		
2	66.76	34.12	43.52	-9.40	40.00	-5.88	100	351	QP	vertical		
3	131.56	33.48	42.38	-8.90	43.50	-10.02	100	147	QP	vertical		
4	255.72	31.16	39.12	-7.96	46.00	-14.84	100	250	QP	vertical		
5	550.11	32.57	34.99	-2.42	46.00	-13.43	100	193	QP	vertical		
6	700.00	33.64	33.49	0.15	46.00	-12.36	100	270	QP	vertical		

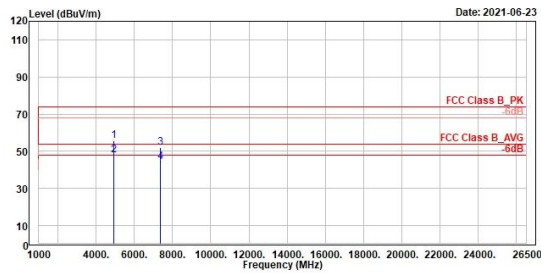
Spurious Emissions, Tx Mode, 1GHz ~ 26.5GHz

ANT

(Horizontal)



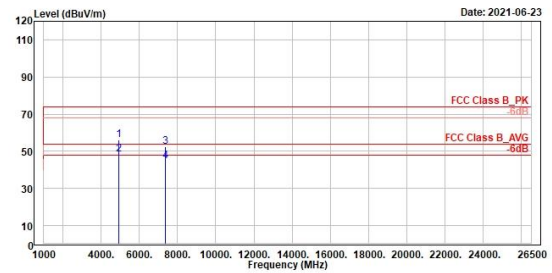
TÜV Rheinland Taiwan Ltd.
 No. 458-18, Sec. 2, Fenliiao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
 Tel: +886-2172-1000 Fax: +886-2172-1322



(Vertical)



TÜV Rheinland Taiwan Ltd.
 No. 458-18, Sec. 2, Fenliiao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
 Tel: +886-2172-1000 Fax: +886-2172-1322



Mains Conducted Emission, 150kHz ~ 30MHz

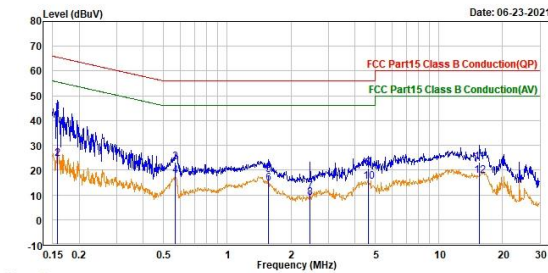
Worst Band

(Line)

(Neutral)



TUV Rheinland Taiwan Ltd(New Taipei City Branch).
 No. 458-19, Sec. 2, Fenliao Rd., Linkou Dist., New Taipei City 244
 Tel:+886-2172-1000 Fax:+886-2172-1322

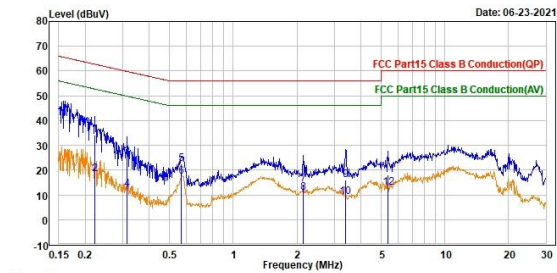


Trace: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase	Note
	MHz	dBuV	dB	dBuV	dBuV	dB			
1	0.158	33.63	9.66	43.29	65.59	-22.30	QP	line1	
2	0.158	14.91	9.66	24.57	55.59	-31.02	Average	line1	
3	0.570	13.66	9.65	23.31	56.00	-32.69	QP	line1	
4	0.570	7.90	9.65	17.55	46.00	-28.45	Average	line1	
5	1.569	8.47	9.68	18.15	56.00	-37.85	QP	line1	
6	1.569	5.07	9.68	14.75	46.00	-31.25	Average	line1	
7	2.470	1.44	9.68	11.12	56.00	-44.88	QP	line1	
8	2.470	-0.74	9.68	8.94	46.00	-37.06	Average	line1	
9	4.628	11.16	9.71	20.87	56.00	-35.13	QP	line1	
10	4.628	5.68	9.71	15.39	46.00	-30.61	Average	line1	
11	15.538	13.40	9.76	23.16	60.00	-36.84	QP	line1	
12	15.538	7.99	9.76	17.75	50.00	-32.25	Average	line1	



TUV Rheinland Taiwan Ltd(New Taipei City Branch).
 No. 458-19, Sec. 2, Fenliao Rd., Linkou Dist., New Taipei City 244
 Tel:+886-2172-1000 Fax:+886-2172-1322



Trace: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase	Note
	MHz	dBuV	dB	dBuV	dBuV	dB			
1	0.221	24.61	9.67	34.28	62.77	-28.49	QP	neutral	
2	0.221	8.79	9.67	18.46	52.77	-34.31	Average	neutral	
3	0.315	15.58	9.66	25.24	59.83	-34.59	QP	neutral	
4	0.315	2.63	9.66	12.29	49.83	-37.54	Average	neutral	
5	0.568	12.86	9.66	22.52	56.00	-33.48	QP	neutral	
6	0.568	7.62	9.66	17.28	46.00	-28.72	Average	neutral	
7	2.137	4.50	9.70	14.20	56.00	-41.80	QP	neutral	
8	2.137	1.22	9.70	10.92	46.00	-35.08	Average	neutral	
9	3.381	6.34	9.71	16.05	56.00	-39.95	QP	neutral	
10	3.381	-0.40	9.71	9.31	46.00	-36.69	Average	neutral	
11	5.401	8.47	9.74	18.21	60.00	-41.79	QP	neutral	
12	5.401	3.11	9.74	12.85	50.00	-37.15	Average	neutral	