

Prüfbericht-Nr.: <i>Test report no.:</i>	CN22CWA7 (P15C-BLE) 001	Auftrags-Nr.: <i>Order no.:</i>	238546376	Seite 1 von 28 Page 1 of 28
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2022-08-05	
Auftraggeber: <i>Client:</i>	HP Inc. 3390 East Harmony Road, Fort Collins, CO 80528, USA			
Prüfgegenstand: <i>Test item:</i>	HyperX Pulsefire Haste 2 Wireless Gaming Mouse			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	PF009			
Auftrags-Inhalt: <i>Order content:</i>	FCC Part 15C Test report (BLE)			
Prüfgrundlage: <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.249			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2022-07-27			
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003308509-007 A003308509-009			
Prüfzeitraum: <i>Testing period:</i>	2022-08-09 - 2022-08-11			
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			
überprüft von: <i>compiled by:</i>		genehmigt von: <i>authorized by:</i>		
Datum: <i>Date:</i>	2022-09-02	Ausstellungsdatum: <i>Issue date:</i>	2022-09-02	
Stellung / Position:	Senior Project Manager	Stellung / Position:	Senior Project Manager	
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 N/A = nicht anwendbar	4 = ausreichend 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 N/A = not applicable	4 = sufficient N/T = not tested
<p>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></p>				

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.

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

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
CN22CWA7 (P15C-BLE) 001	Original Release	2022-09-02

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)	± 4.40 dB
Radiated Emission (30 MHz ~ 200 MHz)	± 2.82 dB
Radiated Emission (200 MHz ~ 1 GHz)	± 2.82 dB
Radiated Emission (1 GHz ~ 18 GHz)	± 2.42 dB
Radiated Emission (18 GHz ~ 40 GHz)	± 2.42 dB
Mains Conducted Emission	± 1.65 dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a HyperX Pulsefire Haste 2 Wireless Gaming Mouse. It contains a Bluetooth compatible module enabling the user to communicate data through a wireless interface.

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	HyperX Pulsefire Haste 2 Wireless Gaming Mouse
Type Identification	PF009
FCC ID	B94-PF009

Technical Specification of EUT

Item	EUT information
Operating Frequency	2402 ~ 2480 MHz
Operation Voltage	Battery: 3.7 Vdc USB: 5 Vdc
Modulation	GFSK
Antenna Information	Refer to 5.1.1
Accessory Device	Refer to 4.4

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 Carrier Frequency and Channel

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

4.3 Test Operation and Test Software

Setup for testing: It was used to enable the operation modes through pressing button listed as below.

The samples were used as follows:

A003308509-007

A003308509-009

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	20 dB Bandwidth & Occupied Bandwidth	Mains Conducted Emission	
-	√	√	√	√	-

Note:

1. "-" 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)
-	2402 to 2480	2402, 2440, 2480

Radiated Spurious Emission above 1 GHz

- 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)
-	2402 to 2480	2402, 2440, 2480

Radiated Spurious Emission below 1 GHz

- 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)
-	2402 to 2480	2480

20 dB 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)
-	2402 to 2480	2402, 2440, 2480

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)
-	2402 to 2480	2480

Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
Radiated Spurious Emissions	25 °C	44 %	Kevin Kuo
Field Strength of Fundamental Emissions	25 °C	44 %	Kevin Kuo
20 dB Bandwidth & Occupied Bandwidth	24.2-25.9 °C	57.4-69.6 %	Andy Chen
Mains Conducted Emission	21.9 °C	59 %	Ray Huang

4.4 Special Accessories and Auxiliary Equipment

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

Accessory of EUT

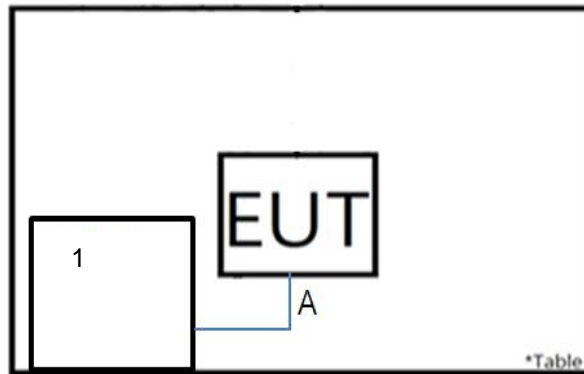
No.	Product	Brand	Model	Description
A	USB charge/data Cable	SIYOTO	640400189300	--
-	Polymer Li-ion Rechargeable Battery	Hangzhou Future Power Technology Co., Ltd.	FT442631P	--

Support Unit

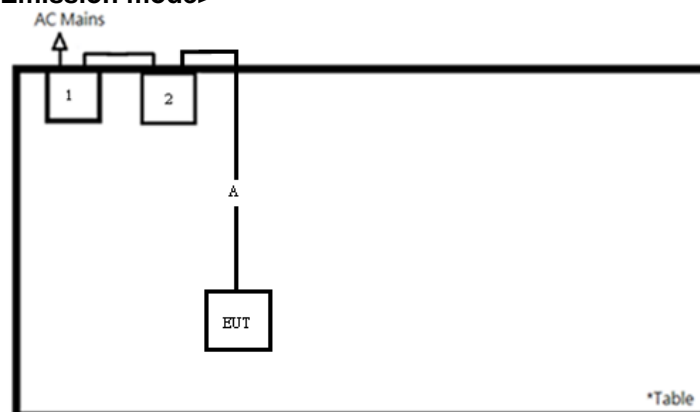
Support Unit								
No	Description	Brand	Model	S/N	Shielded	Ferrite Core (Qty)	Length (cm)	Remark
1	Notebook	Lenovo	E470	N/A	-	-	-	Radiated
1	Adapter	HP	PPP009D	N/A	YES	NO	179	Mains Conducted
2	Notebook	Lenovo	81BL	MP1DCD6Y	-	-	-	

4.5 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 2.79 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

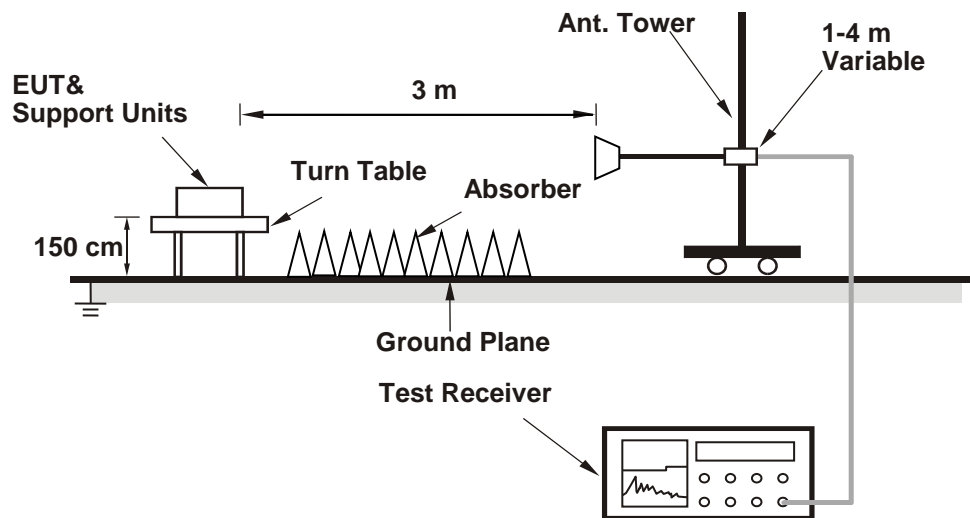
Limit

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

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Above 1 GHz					
Signal Analyzer	R&S	FSV40	100921	2022/7/7	2023/7/6
Horn Antenna	ETS-Lindgren	3117	00138160	2021/7/29	2022/11/24
HF-AMP + AC source	EM Electronics Corporation	EM01G18G	060558	2022/2/17	2023/2/16
HF-AMP + AC source	EMCI	EMC184045SE	980658	2022/4/9	2023/4/8
Horn Antenna	Com-Power Corp.	AH-840	101029	2022/3/29	2023/3/28
Test Software	Audix E3	20150914a	RK-001085	N/A	N/A
30 MHz ~ 1 GHz					
Receiver	R&S	ESR7	101549	2022/5/24	2023/5/23
Bilog Antenna	TESEQ	CBL 6111D	29803	2022/6/11	2023/6/10
LF-AMP	Agilent	8447D	2944A06641	2022/2/23	2023/2/22
Test Software	Audix E3	15914a_20191106 tuv	PK-001087	N/A	N/A
Receiver	R&S	ESR7	101549	2022/5/24	2023/5/23
Below 30 MHz					
Receiver	R&S	ESR7	101549	2022/5/24	2023/5/23
Loop Antenna	SCHWARZBECK	FMZB 1513	1513-076	2021/12/23	2022/12/22
Test Software	Audix E3	20150914a	RK-001085	N/A	N/A

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.
5. The calculation formula is explained as follows:
 Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
 Level (dBuV/m) = Reading (dBuV) + Factor (dB/m)

Test Results

Fundamental Frequency	Antenna Orientation	Detector Mode	Peak Power Level (dBuV/m)	Limit (dBuV/m)	Result
2402	Horizontal	Average	59.91	94.00	Pass
		Peak	93.84	114.00	Pass
	Vertical	Average	90.89	94.00	Pass
		Peak	91.07	114.00	Pass
2440	Horizontal	Average	59.84	94.00	Pass
		Peak	93.74	114.00	Pass
	Vertical	Average	86.11	94.00	Pass
		Peak	86.33	114.00	Pass
2480	Horizontal	Average	59.62	94.00	Pass
		Peak	93.51	114.00	Pass
	Vertical	Average	91.67	94.00	Pass
		Peak	92.07	114.00	Pass

Please refer to Appendix A.

5.1.3 Radiated Spurious Emissions

Limit

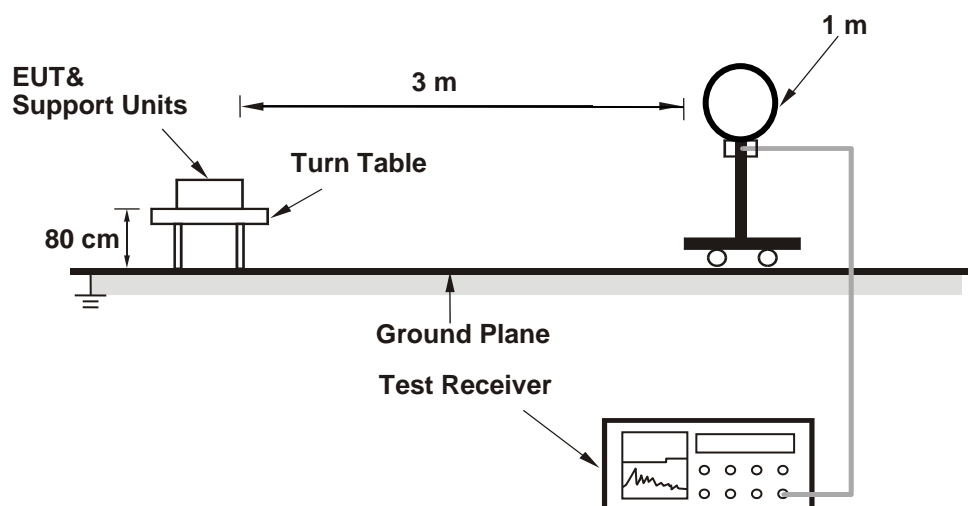
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits as below table, whichever is the lesser attenuation.

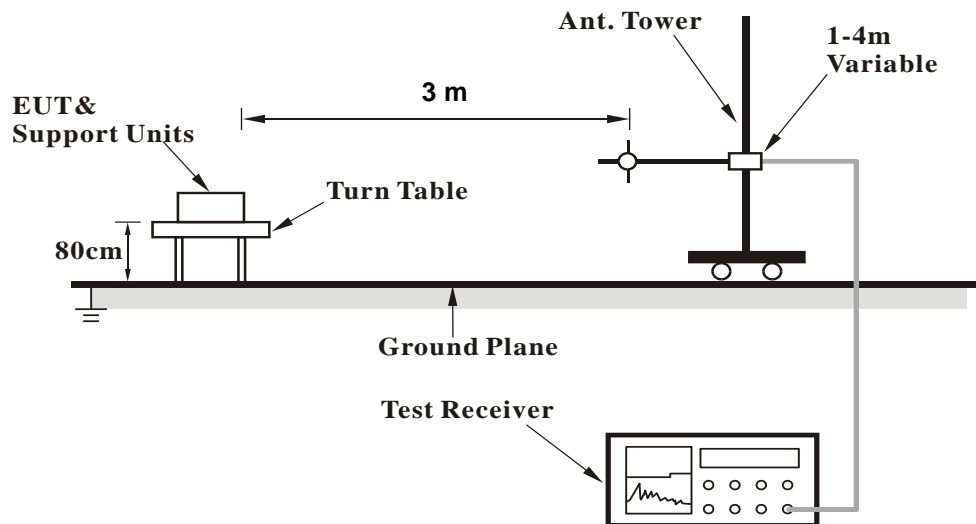
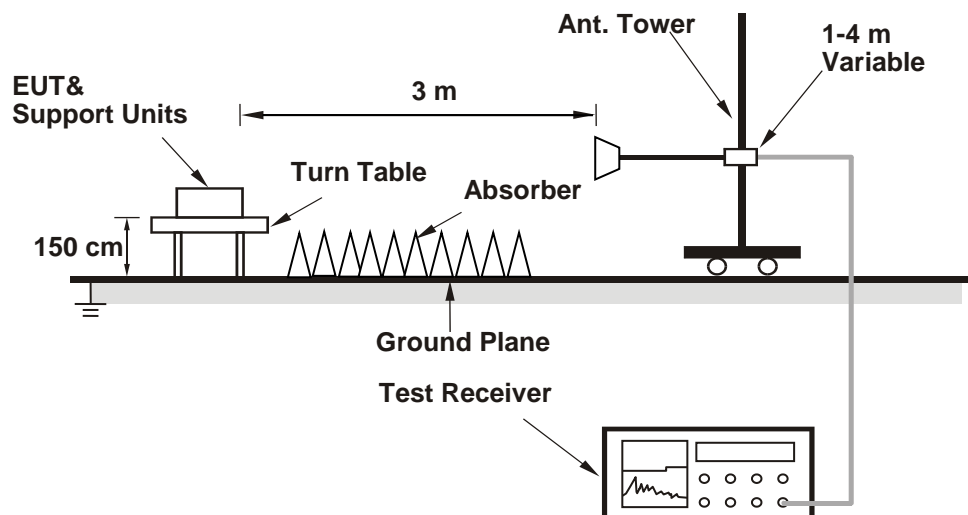
Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

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.

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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.

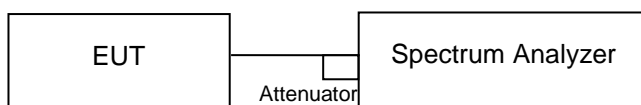
5.1.4 20 dB Bandwidth

Limit

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

Kind of Test Site 3m Semi-Anechoic Chamber

Test Setup



Test Instruments

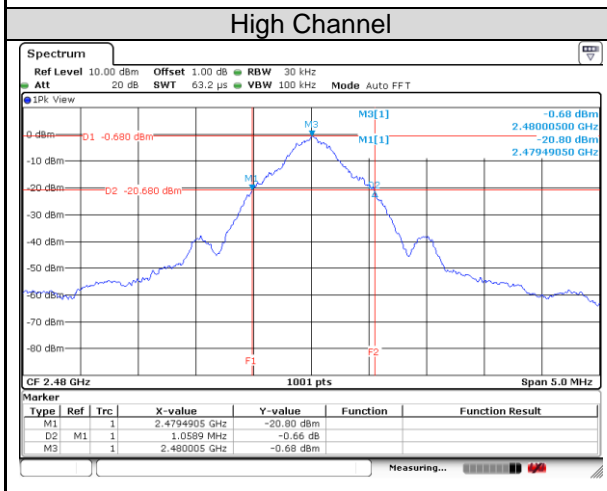
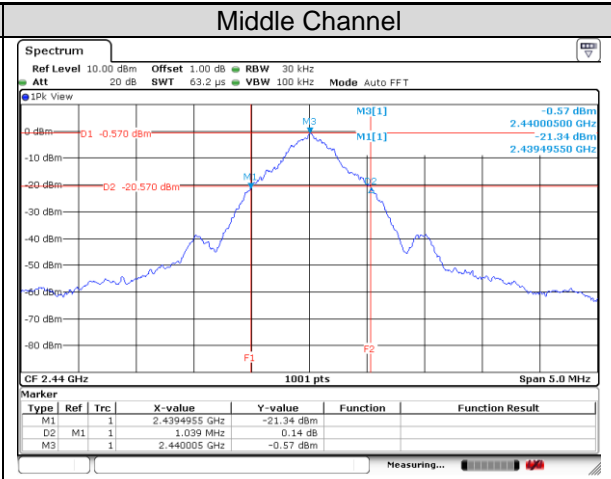
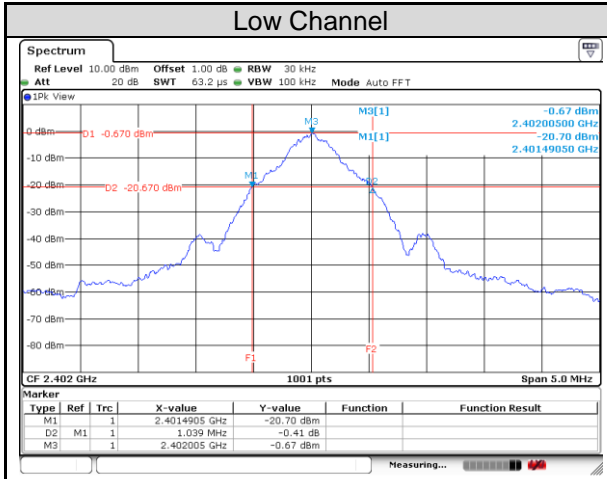
Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV40	101512	2022/2/24	2023/2/23	2022/8/8	2022/8/18

Test Procedure

- 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.

Test Results

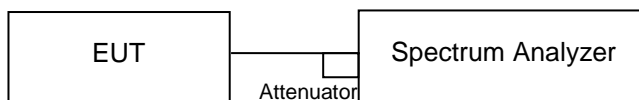
Channel	Channel Frequency (MHz)	20 dB Bandwidth (MHz)
Low Channel	2402	1.039
Middle Channel	2440	1.039
High Channel	2480	1.059



5.1.5 99% Occupied Bandwidth

Kind of Test Site Shielded room

Test Setup



Test Instruments

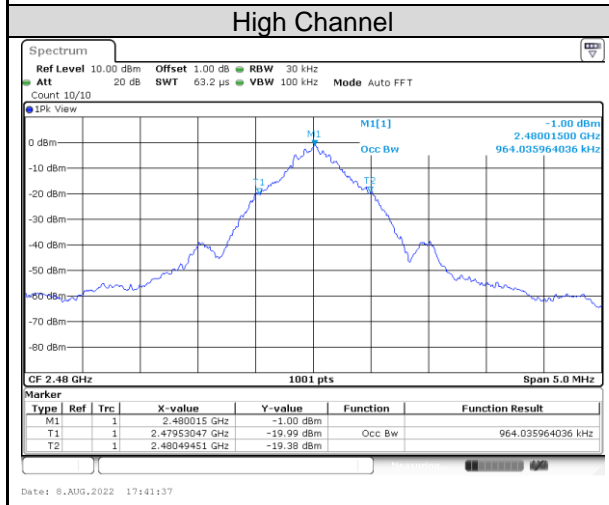
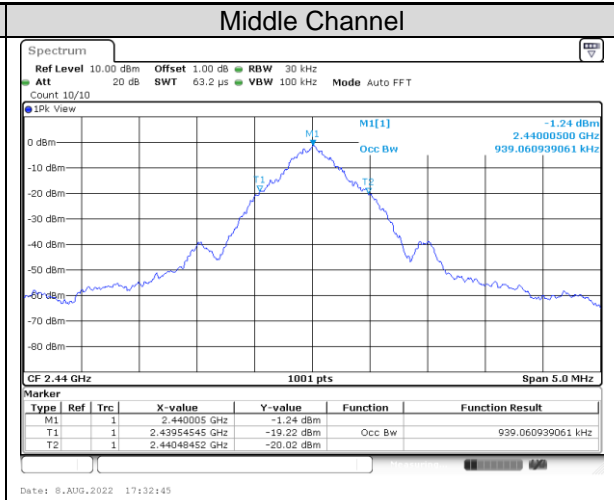
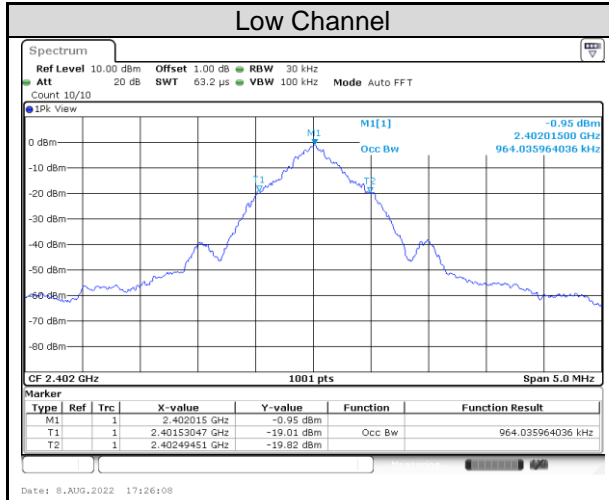
Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date	Test Date	
						From	Until
Spectrum Analyzer	R&S	FSV40	101512	2022/2/24	2023/2/23	2022/8/8	2022/8/18

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)
Low Channel	2402	964.04
Middle Channel	2440	939.06
High Channel	2480	964.04



5.2 Mains Emission

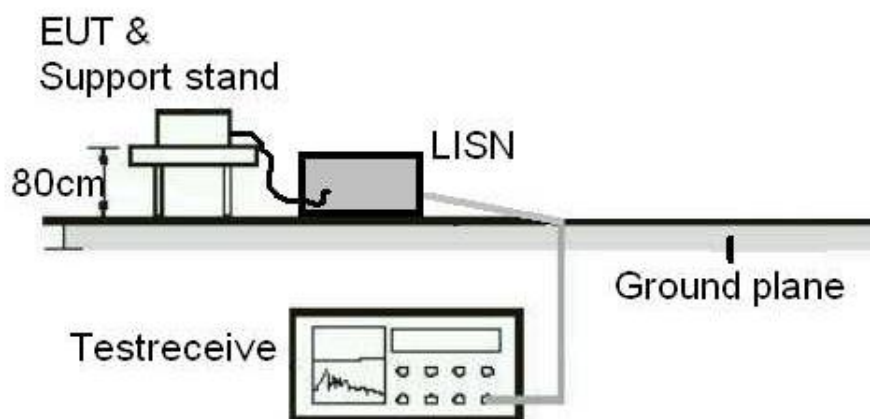
5.2.1 Mains Conducted Emission

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

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Two-Line V-Network	Rohde & Schwarz	ENV216	101938	2021/9/23	2022/9/22
EMI Test Receiver	R&S	ESCI	1816063	2021/11/15	2022/11/14

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 Spurious Emissions & Mains Conducted Emission Test

Fundamental

BLE_1M

Low Channel (Horizontal)	Low Channel (Vertical)																																																
<div style="text-align: right; font-size: small;"> 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 </div> <div style="text-align: center; margin-top: 10px;"> </div> <div style="text-align: right; font-size: x-small; margin-bottom: 5px;">Date: 2022-08-17</div> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <thead> <tr> <th>1</th> <th>2402.00</th> <th>59.91</th> <th>65.79</th> <th>-5.88</th> <th>94.00</th> <th>-34.09</th> <th>256</th> <th>120</th> <th>Average</th> <th>HORIZONTAL</th> <th>CF</th> </tr> <tr> <th>2</th> <th>2402.00</th> <th>93.84</th> <th>99.72</th> <th>-5.88</th> <th>114.00</th> <th>-20.16</th> <th>256</th> <th>120</th> <th>Peak</th> <th>HORIZONTAL</th> <th></th> </tr> </thead> </table>	1	2402.00	59.91	65.79	-5.88	94.00	-34.09	256	120	Average	HORIZONTAL	CF	2	2402.00	93.84	99.72	-5.88	114.00	-20.16	256	120	Peak	HORIZONTAL		<div style="text-align: right; font-size: small;"> 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 </div> <div style="text-align: center; margin-top: 10px;"> </div> <div style="text-align: right; font-size: x-small; margin-bottom: 5px;">Date: 2022-08-17</div> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <thead> <tr> <th>1</th> <th>2402.00</th> <th>90.89</th> <th>96.77</th> <th>-5.88</th> <th>94.00</th> <th>-3.11</th> <th>121</th> <th>157</th> <th>Average</th> <th>VERTICAL</th> <th></th> </tr> <tr> <th>2</th> <th>2402.00</th> <th>91.07</th> <th>96.95</th> <th>-5.88</th> <th>114.00</th> <th>-22.93</th> <th>121</th> <th>157</th> <th>Peak</th> <th>VERTICAL</th> <th></th> </tr> </thead> </table>	1	2402.00	90.89	96.77	-5.88	94.00	-3.11	121	157	Average	VERTICAL		2	2402.00	91.07	96.95	-5.88	114.00	-22.93	121	157	Peak	VERTICAL	
1	2402.00	59.91	65.79	-5.88	94.00	-34.09	256	120	Average	HORIZONTAL	CF																																						
2	2402.00	93.84	99.72	-5.88	114.00	-20.16	256	120	Peak	HORIZONTAL																																							
1	2402.00	90.89	96.77	-5.88	94.00	-3.11	121	157	Average	VERTICAL																																							
2	2402.00	91.07	96.95	-5.88	114.00	-22.93	121	157	Peak	VERTICAL																																							

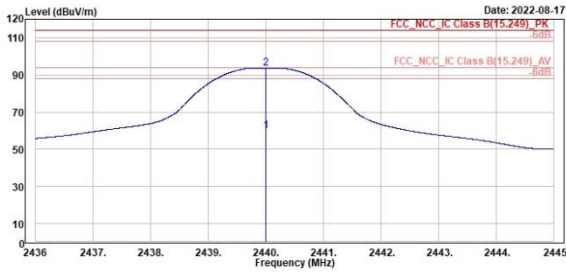
BLE_1M

Middle Channel (Horizontal)

Middle Channel (Vertical)



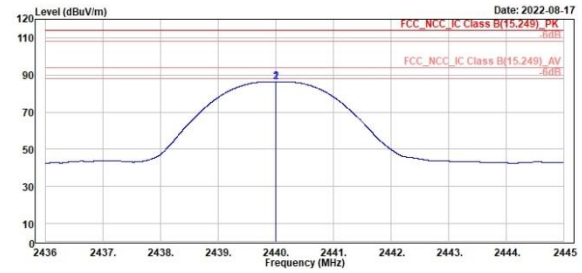
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1	2440.00	59.04	65.56	-5.72	94.00	-34.16	225	206	Average	HORIZONTAL	CF
2	2440.00	93.74	99.46	-5.72	114.00	-20.26	225	206	Peak	HORIZONTAL	



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1	2440.00	86.11	91.83	-5.72	94.00	-7.89	213	131	Average	VERTICAL
2	2440.00	86.33	92.05	-5.72	114.00	-27.67	213	131	Peak	VERTICAL

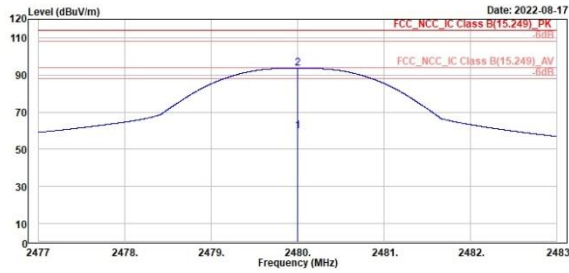
BLE_1M

High Channel (Horizontal)

High Channel (Vertical)



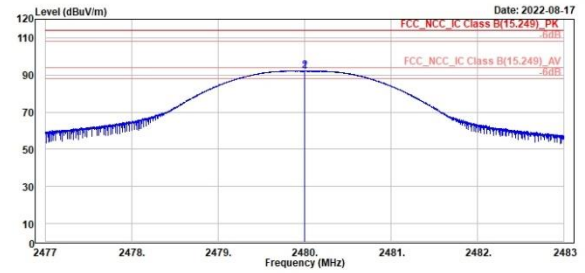
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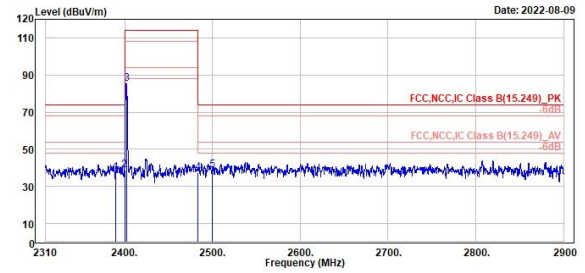
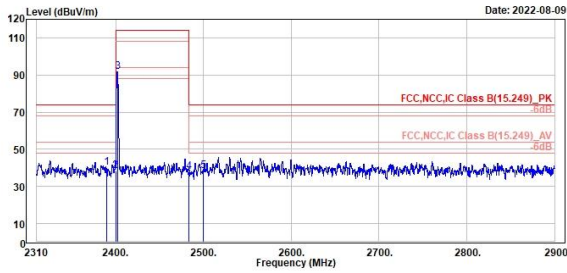
1	2480.00	59.62	65.24	-5.62	94.00	-34.38	137	145	Average	HORIZONTAL	CF
2	2480.00	93.51	99.13	-5.62	114.00	-20.49	137	145	Peak	HORIZONTAL	



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1	2480.00	91.67	97.29	-5.62	94.00	-2.33	145	237	Average	VERTICAL	
2	2480.00	92.07	97.69	-5.62	114.00	-21.93	145	237	Peak	VERTICAL	

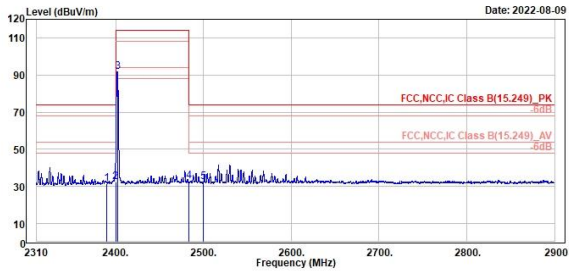
Band Edges, 2.31GHz ~ 2.9GHz
BLE_1M
Low Channel (Horizontal) Peak
Low Channel (Vertical) Peak


1	2	3	4	5
Peak	Peak	Peak	Peak	Peak
Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
2390.00	2400.00	2402.00	2483.50	2500.00
40.31	38.29	91.83	38.07	38.47
46.25	44.18	97.71	43.67	44.04
-5.94	-5.89	-5.68	-5.60	-5.57
74.00	74.00	114.00	74.00	74.00
-33.69	-35.71	-22.17	-35.93	-35.53
187	187	187	187	187
290	290	290	290	290
Peak	Peak	Peak	Peak	Peak
Horizontal	Horizontal	Horizontal	Horizontal	Horizontal

1	2	3	4	5
Peak	Peak	Peak	Peak	Peak
Vertical	Vertical	Vertical	Vertical	Vertical
2390.00	2400.00	2402.00	2483.50	2500.00
37.29	38.69	85.35	37.49	38.98
43.23	44.58	91.23	43.09	44.47
-5.94	-5.89	-5.88	-5.60	-5.57
74.00	74.00	114.00	74.00	74.00
-36.71	-35.31	-28.65	-36.51	-35.10
189	189	189	189	189
251	251	251	251	251
Peak	Peak	Peak	Peak	Peak
Vertical	Vertical	Vertical	Vertical	Vertical

BLE_1M
Low Channel (Horizontal) Average
Low Channel (Vertical) Average

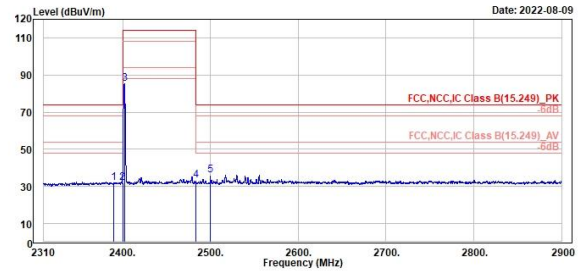

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Freq	Level	Read	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	2390.00	31.26	37.20	-5.94	54.00	-22.74	187	290 Average	Horizontal
2	2400.00	32.22	36.11	-5.89	54.00	-21.78	187	290 Average	Horizontal
3	2402.00	91.62	97.50	-5.88	94.00	-2.38	187	290 Average	Horizontal
4	2483.50	32.69	38.29	-5.60	54.00	-21.31	187	290 Average	Horizontal
5	2500.00	32.36	37.93	-5.57	54.00	-21.64	187	290 Average	Horizontal



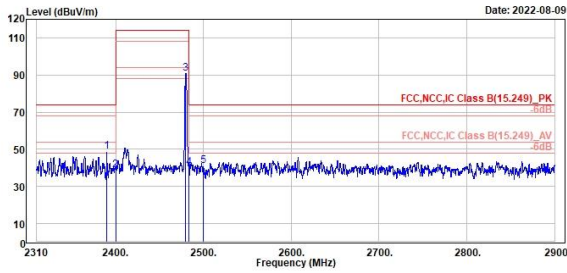
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Freq	Level	Read	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	2390.00	32.15	38.09	-5.94	54.00	-21.85	189	251 Average	Vertical
2	2400.00	31.75	37.64	-5.89	54.00	-22.25	189	251 Average	Vertical
3	2402.00	85.10	90.98	-5.88	94.00	-8.90	189	251 Average	Vertical
4	2483.50	33.12	38.72	-5.60	54.00	-20.88	189	251 Average	Vertical
5	2500.00	36.07	41.64	-5.57	54.00	-17.93	189	251 Average	Vertical

BLE_1M
High Channel (Horizontal) Peak
High Channel (Vertical) Peak

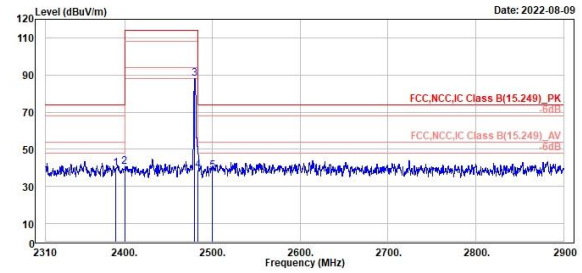

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Peak	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	2390.00	48.68	54.54	-5.94	74.00	-25.48	199	291	291	Peak	Horizontal	
2	2490.00	38.72	44.61	-5.89	74.00	-35.28	199	291	291	Peak	Horizontal	
3	2480.00	90.68	96.30	-5.62	114.00	-23.32	199	291	291	Peak	Horizontal	
4	2483.50	40.10	45.70	-5.60	74.00	-33.90	199	291	291	Peak	Horizontal	
5	2500.00	40.89	46.46	-5.57	74.00	-33.11	199	291	291	Peak	Horizontal	



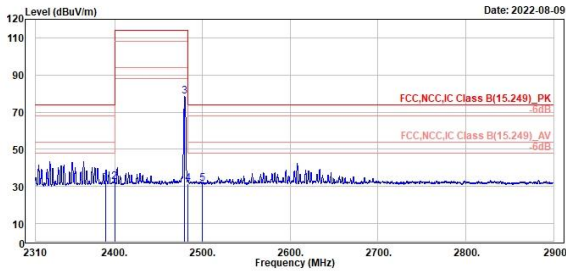
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Peak	Freq	Level	Read	Level	Factor	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	dB	cm	deg			
1	2390.00	39.90	45.84	-5.94	74.00	-34.10	214	265	265	Peak	Vertical	
2	2490.00	40.80	46.69	-5.89	74.00	-33.20	214	265	265	Peak	Vertical	
3	2480.00	88.11	93.73	-5.62	114.00	-25.89	214	265	265	Peak	Vertical	
4	2483.50	38.68	44.28	-5.60	74.00	-35.32	214	265	265	Peak	Vertical	
5	2500.00	38.37	43.94	-5.57	74.00	-35.63	214	265	265	Peak	Vertical	

BLE_1M
High Channel (Horizontal) Average
High Channel (Vertical) Average

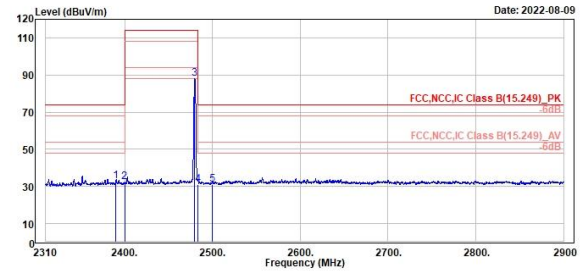

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1	2	3	4	5
Freq	Level	Read	Limit	Over
MHz	dBuV/m	Level	Line	Limit
		Factor		
		dB/m	dBuV/m	dB
2390.00	32.59	38.53	-5.94	54.00
2400.00	32.59	38.48	-5.89	54.00
2480.00	78.33	83.95	-5.62	94.00
2483.50	31.63	37.23	-5.60	54.00
2500.00	31.35	36.92	-5.57	54.00



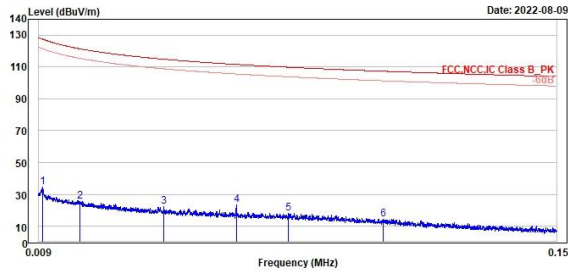
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1	2	3	4	5
Freq	Level	Read	Limit	Over
MHz	dBuV/m	Level	Line	Limit
		Factor		
		dB/m	dBuV/m	dB
2390.00	32.65	38.59	-5.94	54.00
2400.00	32.18	38.07	-5.89	54.00
2480.00	87.87	93.49	-5.62	94.00
2483.50	31.13	36.73	-5.60	54.00
2500.00	31.10	36.67	-5.57	54.00

Spurious Emissions, Tx Mode, 9kHz ~ 30MHz
BLE_1M
High Channel (Open) 9kHz~150kHz
High Channel (Open) 150kHz~30MHz

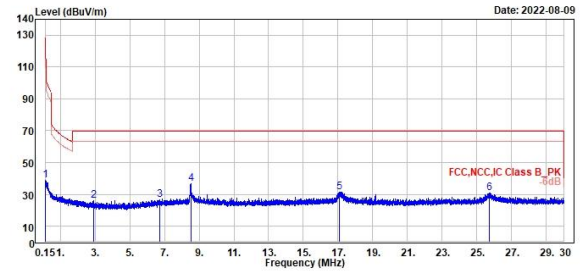

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Freq	Level	Read	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	0.01	34.59	15.94	17.65	127.53	-92.94	100	204 QP	Open
2	0.02	25.61	7.07	18.54	121.47	-95.86	100	217 QP	Open
3	0.04	22.20	3.23	18.97	114.91	-92.71	100	152 QP	Open
4	0.06	23.27	4.66	18.61	111.63	-88.36	100	127 QP	Open
5	0.08	17.97	-0.36	18.33	109.87	-91.90	100	143 QP	Open
6	0.10	14.60	-3.37	17.97	107.36	-92.76	100	39 QP	Open



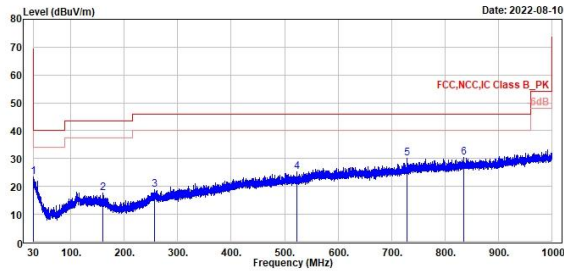
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Freq	Level	Read	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	0.15	38.81	20.59	18.22	103.00	-65.17	100	145 QP	Open
2	2.90	26.14	6.78	19.36	69.50	-43.36	100	272 QP	Open
3	6.72	26.67	6.66	20.01	69.50	-42.83	100	197 QP	Open
4	8.52	36.69	15.95	20.74	69.50	-32.81	100	36 QP	Open
5	17.07	31.49	9.91	21.58	69.50	-38.01	100	82 QP	Open
6	25.71	31.12	9.13	21.99	69.50	-38.38	100	227 QP	Open

Spurious Emissions, Tx Mode, 30MHz ~ 1GHz
BLE_1M
High Channel (Horizontal)
High Channel (Vertical)

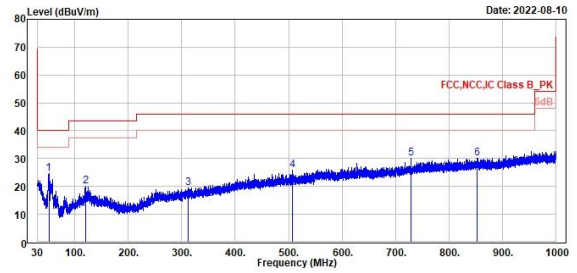

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Freq	Level	Read	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	30.00	23.30	26.17	-2.87	40.00	-16.70	400	182 QP	Horizontal
2	169.32	17.68	27.00	-10.12	43.50	-25.82	200	170 QP	Horizontal
3	256.41	18.74	25.64	-6.90	46.00	-27.26	200	143 QP	Horizontal
4	523.22	25.35	27.57	-2.22	46.00	-20.65	200	293 QP	Horizontal
5	728.63	30.24	28.68	1.56	46.00	-15.76	228	304 QP	Horizontal
6	835.73	30.27	26.90	3.29	46.00	-15.73	124	360 QP	Horizontal



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Freq	Level	Read	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	51.05	34.68	30.26	-13.58	40.00	-15.32	118	360 QP	Vertical
2	119.87	20.09	29.35	-9.26	43.50	-23.41	132	360 QP	Vertical
3	312.21	19.39	25.61	-6.22	46.00	-26.61	400	132 QP	Vertical
4	507.70	25.83	28.05	-2.22	46.00	-20.17	100	55 QP	Vertical
5	728.46	30.17	28.62	1.55	46.00	-15.83	294	208 QP	Vertical
6	852.85	30.21	26.67	3.54	46.00	-15.79	400	7 QP	Vertical

Spurious Emissions, Tx Mode, 1GHz ~ 26.5GHz

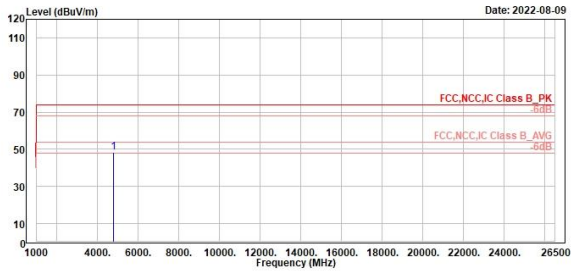
BLE_1M

Low Channel (Horizontal)

Low Channel (Vertical)



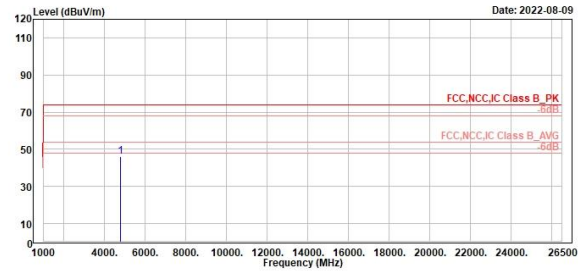
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Freq	Level	Read	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	4884.00	48.37	48.62	-0.25	74.00	-25.63	300	221 Peak	Horizontal



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Freq	Level	Read	Limit	Over	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	4884.00	46.17	46.42	-0.25	74.00	-27.83	300	132 Peak	Vertical

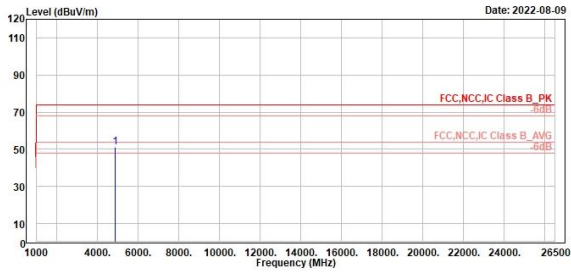
BLE_1M

Middle Channel (Horizontal)

Middle Channel (Vertical)



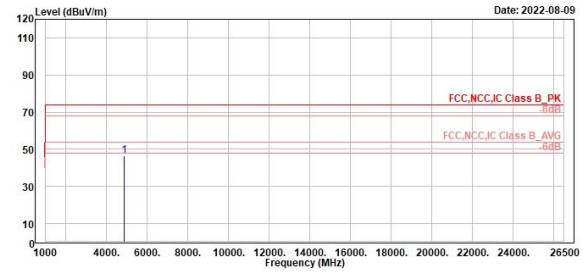
TUV Rheinland Taiwan Ltd.
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Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1 4880.00	50.95	51.00	-0.05	74.00	-23.05	102	360	Peak	Horizontal	



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Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1 4880.00	46.38	46.43	-0.05	74.00	-27.62	300	198	Peak	Vertical	

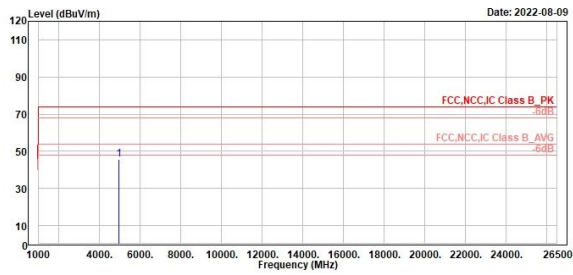
BLE_1M

High Channel (Horizontal)

High Channel (Vertical)



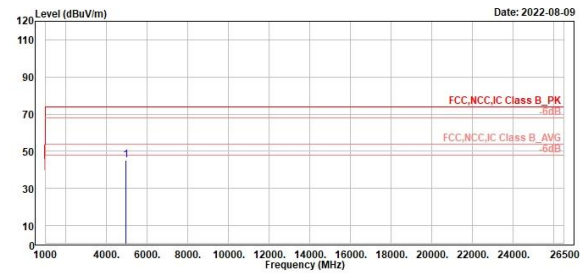
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Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	4960.00	45.82	45.74	0.08	74.00	-28.18	213	172 Peak	Horizontal	



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Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	4960.00	45.19	45.11	0.08	74.00	-28.81	257	129 Peak	Vertical	

Mains Conducted Emission, Tx Mode, 150kHz ~ 30MHz

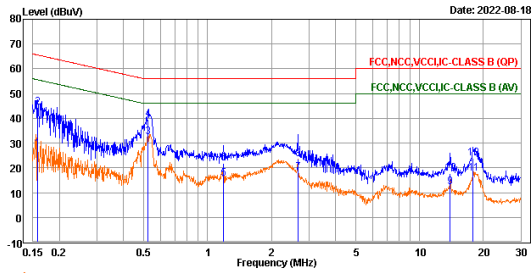
BLE_1M

(Line)

(Neutral)



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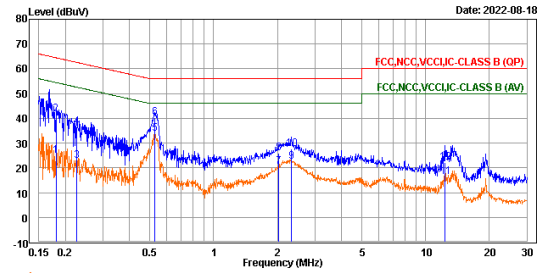


Trace: 1

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark	Pol/Phase	Note
	MHz	dBuV	dBuV	dB	dBuV	dB			
1	0.16	27.57	17.96	9.61	55.59	-28.02	Average	line1	
2	0.16	44.44	34.83	9.61	65.59	-21.15	QP	line1	
3	0.52	32.50	22.88	9.62	46.00	-13.50	Average	line1	
4	0.52	39.78	30.16	9.62	56.00	-16.22	QP	line1	
5	1.19	15.54	5.91	9.63	46.00	-30.46	Average	line1	
6	1.19	21.73	12.10	9.63	56.00	-34.27	QP	line1	
7	2.06	18.18	8.53	9.65	46.00	-27.82	Average	line1	
8	2.06	23.71	14.06	9.65	56.00	-32.29	QP	line1	
9	13.92	12.31	2.58	9.73	50.00	-37.69	Average	line1	
10	13.92	17.70	7.97	9.73	60.00	-42.30	QP	line1	
11	17.86	17.73	8.00	9.73	50.00	-32.27	Average	line1	
12	17.86	24.03	14.30	9.73	60.00	-35.97	QP	line1	



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Trace: 1

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Remark	Pol/Phase	Note
	MHz	dBuV	dBuV	dB	dBuV	dB			
1	0.18	24.89	15.30	9.59	54.47	-29.58	Average	neutral	
2	0.18	41.66	32.07	9.59	64.47	-22.81	QP	neutral	
3	0.23	22.74	13.15	9.59	52.61	-29.87	Average	neutral	
4	0.23	36.50	26.91	9.59	62.61	-26.11	QP	neutral	
5	0.53	33.63	24.03	9.60	46.00	-12.37	Average	neutral	
6	0.53	40.41	30.81	9.60	56.00	-15.59	QP	neutral	
7	2.03	20.58	10.95	9.63	46.00	-25.42	Average	neutral	
8	2.03	25.98	16.35	9.63	56.00	-30.02	QP	neutral	
9	2.33	22.58	12.95	9.63	46.00	-23.42	Average	neutral	
10	2.33	27.60	17.97	9.63	56.00	-28.40	QP	neutral	
11	12.35	16.24	6.48	9.76	50.00	-33.76	Average	neutral	
12	12.35	22.33	12.57	9.76	60.00	-37.67	QP	neutral	