

Prüfbericht-Nr.: <i>Test report No.:</i>	CN22TEC5 001	Auftrags-Nr.: <i>Order No.:</i>	168402847	Seite 1 von 21 <i>Page 1 of 21</i>
Kunden-Referenz-Nr.: <i>Client reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2022-11-14	
Auftraggeber: <i>Client:</i>	Sunwoda Electronic Co., Ltd. 1/F, 2/F of Area A&B&D, 3-9F, Administration Building, No.2, Yihe Rd., Shilong Community, Shiyan Street, Bao'an District, SHENZHEN, 518108 China			
Prüfgegenstand: <i>Test item:</i>	HP USB-C Rechargeable MPP2.0 Tilt Pen			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	SPEN-HP-05 (Trademark: HP)			
Auftrags-Inhalt: <i>Order content:</i>	FCC and IC approval			
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 15: Subpart C Section 15.207 CFR47 FCC Part 15: Subpart C Section 15.209 RSS-210 Issue 10 October 2019 RSS-Gen Issue 5 February 2021 RSS-102 Issue 5 March 2015			
Wareneingangsdatum: <i>Date of receipt:</i>	2022-12-14	Please refer to photo documents		
Prüfmuster-Nr.: <i>Test sample No.:</i>	A003386899-001			
Prüfzeitraum: <i>Testing period:</i>	2022-12-14 – 2023-01-29			
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i> 2023-02-20				
	Signed by: Alex Lan		Signed by: Hardy Suo	
Stellung / Position	Assistant Project Manager	Stellung / Position	Reviewer	
Sonstiges / Other: FCC ID: 2ABWESPEN-HP-05, IC: 23012-SPENHP05, HVIN: SPEN-HP-05				
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 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 Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specifications(s) F(ail) = failed a.m. test specifications(s) N/A = not applicable 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

5.1.1. ANTENNA REQUIREMENT

RESULT: Pass

5.1.2. RADIATED SPURIOUS EMISSION

RESULT: Pass

5.1.3. CONDUCTED EMISSIONS

RESULT: Pass

Contents

1.	GENERAL REMARKS	4
1.1.	COMPLEMENTARY MATERIALS.....	4
2.	TEST SITES.....	4
2.1.	TEST FACILITIES	4
2.2.	LIST OF TEST AND MEASUREMENT INSTRUMENTS	5
2.3.	TRACEABILITY	6
2.4.	CALIBRATION.....	6
2.5.	MEASUREMENT UNCERTAINTY	6
2.6.	LOCATION OF ORIGINAL DATA	6
2.7.	STATUS OF FACILITY USED FOR TESTING	6
3.	GENERAL PRODUCT INFORMATION	7
3.1.	PRODUCT FUNCTION AND INTENDED USE	7
3.2.	RATINGS AND SYSTEM DETAILS.....	7
3.3.	INDEPENDENT OPERATION MODES.....	8
3.4.	NOISE GENERATING AND NOISE SUPPRESSING PARTS	8
3.5.	SUBMITTED DOCUMENTS.....	8
4.	TEST SET-UP AND OPERATION MODES.....	9
4.1.	PRINCIPLE OF CONFIGURATION SELECTION	9
4.2.	TEST OPERATION AND TEST SOFTWARE	9
4.3.	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	9
4.4.	COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE	9
4.5.	TEST SETUP DIAGRAM	10
5.	TEST RESULTS	11
5.1.	TRANSMITTER REQUIREMENT & TEST SUITES.....	11
5.1.1.	Antenna Requirement	11
5.1.2.	Radiated Spurious Emission	12
5.1.3.	Conducted emissions.....	18
6.	LIST OF TABLES.....	21
7.	LIST OF PHOTOGRAPHS.....	21

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 setup photos.

2. Test Sites

2.1.Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, People's Republic of China

FCC Registration No.: 694916

IC Registration No.: 25069

2.2.List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Equipment	Manufacturer	Model No.	Serial No.	Cal. Until
Radio Spectrum Test				
Wireless Connectivity Tester	R&S	CMW270	101375	2023-08-02
Shielding Room 8#	Albatross	SR8	APC17151-SR8	2024-06-22
Spurious Emission				
EMI Test Receiver	R&S	ESR 7	102021	2024-08-02
Signal Analyzer	R&S	FSV 40	101439	2024-08-01
System Controller Interface	R&S	SCI-100	S10010038	N/A
Filterbank	R&S	Wlan	100759	2024-08-01
OSP	R&S	OSP 120	102040	N/A
Pre-amplifier	R&S	SCU08F1	08320031	2024-08-02
Amplifier	R&S	SCU-18F	180070	2024-08-02
Amplifier	R&S	SCU40A	100475	2024-08-02
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	2024-08-06
Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	2024-08-06
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	2024-08-07
Active Loop Antenna	Schwarzbeck	FMZB 1513	302	2024-08-06
Test software	R&S	EMC32 (V10.60.10)	N/A	N/A
Control PC	Dell	OptiPlex 7050	36NV9P2	N/A
3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC17151-SAC	2024-06-22

Conducted Emission on AC Mains

Equipment	Manufacturer	Model	Serial No.	Cal. until
EMI Test Receiver	R&S	ESR3	102680	2023-02-27
Artificial Mains Network	R&S	ENV216	101445	2023-02-27
EMC32 test software	R&S	EMC32(Ver.10.50.00)	N/A	N/A

2.3.Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4.Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5.Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table:

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-7}$
RF Power (conducted)	± 2.5 dB
Radiated Emission of Transmitter, valid up to 26.5 GHz	± 6 dB
Radiated Emission of Receiver, valid up to 26.5 GHz	± 6 dB
Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz)	± 3.70 dB / ± 3.30 dB
Radiated Emission (3m SAC), 30MHz to 1000MHz	± 4.52 dB
Radiated Emission (3m SAC), above 1000MHz	± 4.37 dB
Temperature	± 1 °C
Humidity	± 5 %
Voltage (DC)	± 1 %
Voltage (AC, <10kHz)	± 2 %

2.6.Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix 1 of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

2.7.Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. test facility located at No. 362 Huanguan Road Middle, Longhua District, Shenzhen 518110, People's Republic of China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3. General Product Information

3.1. Product Function and Intended Use

The EUTs are HP USB-C Rechargeable MPP2.0 Tilt Pen and operate with a drawing board, this product has two different colour of enclosure.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2. Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	HP USB-C Rechargeable MPP2.0 Tilt Pen
Type Designation	SPEN-HP-05
FCC ID	2ABWESPEN-HP-05
IC:	23012-SPENHP05
HVIN:	SPEN-HP-05
Extreme Temperature Range	0°C to +45°C
Operating Voltage	DC 5V, 0.24A via Type-C interface for charging DC 3.85V, 80mAh via built-in Lithium Battery
Technical Specification of Radio	
Operating Frequency	18-89 kHz & 111-210kHz
Channel Number	1
Type of Modulation	PWM
Antenna Type	Integral Antenna
Antenna number	1
Antenna Gain	0 dBi Max

Note: This device is too low to measure the actual occupied bandwidth and fundamental emissions, thus 50KHz maximum occupied bandwidth and 45.74 dBµV@3m declared by applicant. Also, IC inquiry for this provided.

3.3.Independent Operation Modes

The basic operation modes are:

- A. On, Operating
- B. On, Charging
- C. Off

3.4.Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5.Submitted Documents

- | | |
|-------------------------|----------------------|
| - Bill of Material | - Circuit Diagram |
| - PCB Layout | - Instruction Manual |
| - Photo Document | - 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 power level. The test modes were adapted accordingly in reference to the instructions for use.

4.2.Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10: 2013.

According to clause 3.1, all test were applied on model SPEN-HP-05 with Natural Silver enclosure.

4.3.Special Accessories and Auxiliary Equipment

The EUT was tested with following accessories

Description	Manufacturer	Model	S/N or Rating
Portable Laptop	Lenovo	ThinkPad T480	10Q67059
Adapter	Lenovo	ADLX65YLC3D	Input: AC 100-240V, 50/60Hz Output: DC 5V, 2A
Pad	HP		

4.4.Countermeasures to achieve EMC Compliance

The test sample, which has been tested, contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

4.5. Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 30MHz)

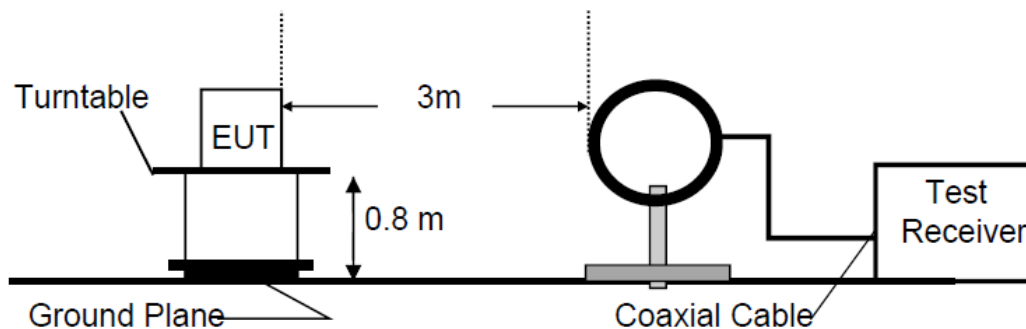


Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

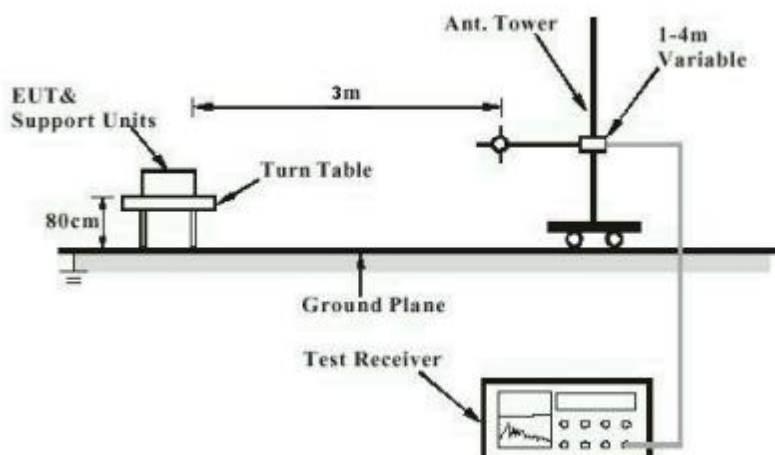
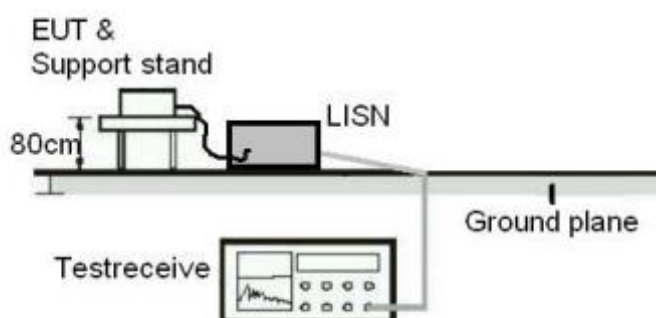


Diagram of Measurement Configuration for Mains Conduction Measurement



5. Test Results

5.1. Transmitter Requirement & Test Suites

5.1.1. Antenna Requirement

RESULT:

Pass

Test Specification

Test standard : FCC Part 15.203
RSS-Gen Clause 6.8

According to the manufacturer declared, the EUT has one internal antenna, the directional gain of antenna is 0 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

5.1.2. Radiated Spurious Emission

RESULT:

Pass

Test Specification

Test standard	: FCC 15.209 (a) & RSS-210
Basic standard	: ANSI C63.10: 2013
Limits	: Refer to 15.209(a) RSS-Gen Clause 8.9
Kind of test site	: 3m Semi-anechoic Chamber

Test Setup

Date of testing	: 2023-01-29
Input voltage	: DC 3.85V
Operation mode	: A
Ambient temperature	: 23 °C
Relative humidity	: 53 %
Atmospheric pressure	: 101 kPa

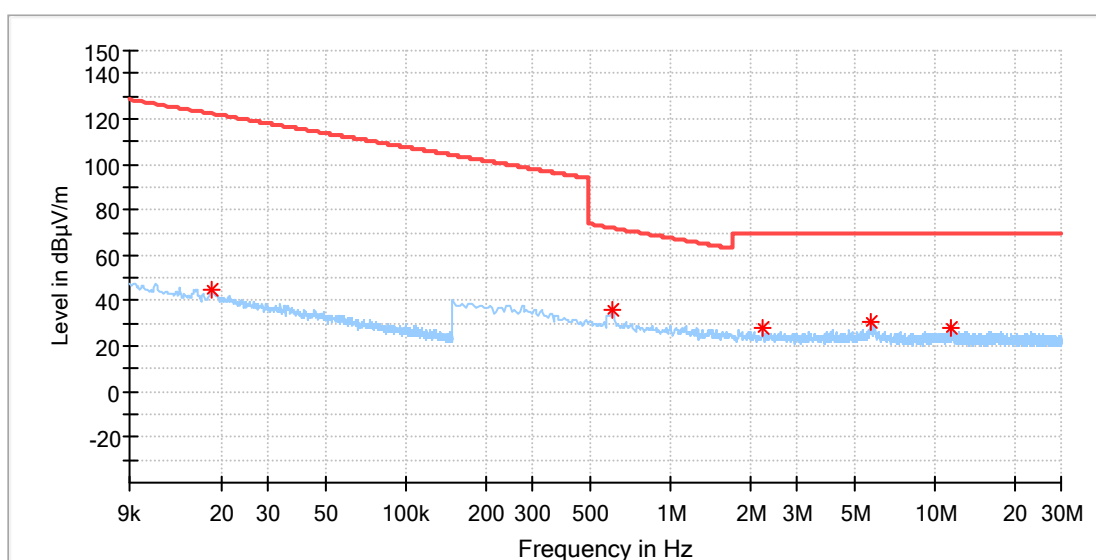
Remark:

Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

For the measurement records, refer to the following test plots.

EUT Information

EUT Name: HP USB-C Rechargeable MPP2.0 Tilt Natural Pen
Model: Avicii Pen
Test Mode: NA
Order No/Sample No: 168405546/A003388402-002
Test Voltage:: Battery
Remark: Temp 23 Humi:53%
Test Standard: FCC Part 15C
Tested By: Kei Zhang
Reviewed By: Terry Yin

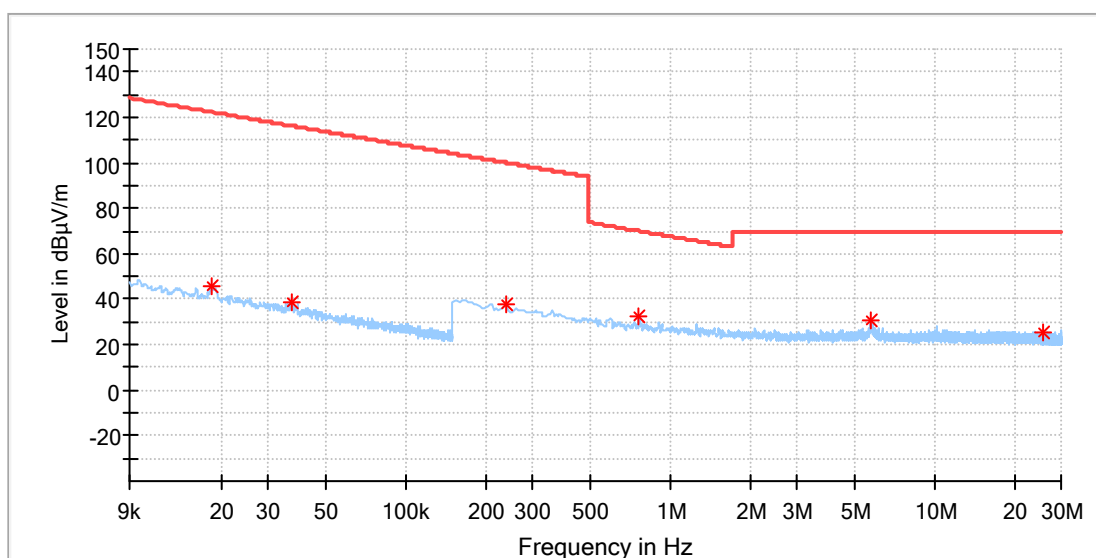


Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.018266	45.22	122.36	77.13	100.0	X	338.0	20.1
0.602140	36.43	72.02	35.58	100.0	X	0.0	20.1
2.221941	28.19	69.50	41.31	100.0	X	8.0	20.2
5.707368	30.38	69.50	39.12	100.0	X	218.0	20.3
11.523728	28.44	69.50	41.06	100.0	X	343.0	20.4

EUT Information

EUT Name: HP USB-C Rechargeable MPP2.0 Tilt Natural Pen
Model: Avicii Pen
Test Mode: NA
Order No/Sample No: 168405546/A003388402-002
Test Voltage:: Battery
Remark: Temp 23 Humi:53%
Test Standard: FCC Part 15C
Tested By: Kei Zhang
Reviewed By: Terry Yin

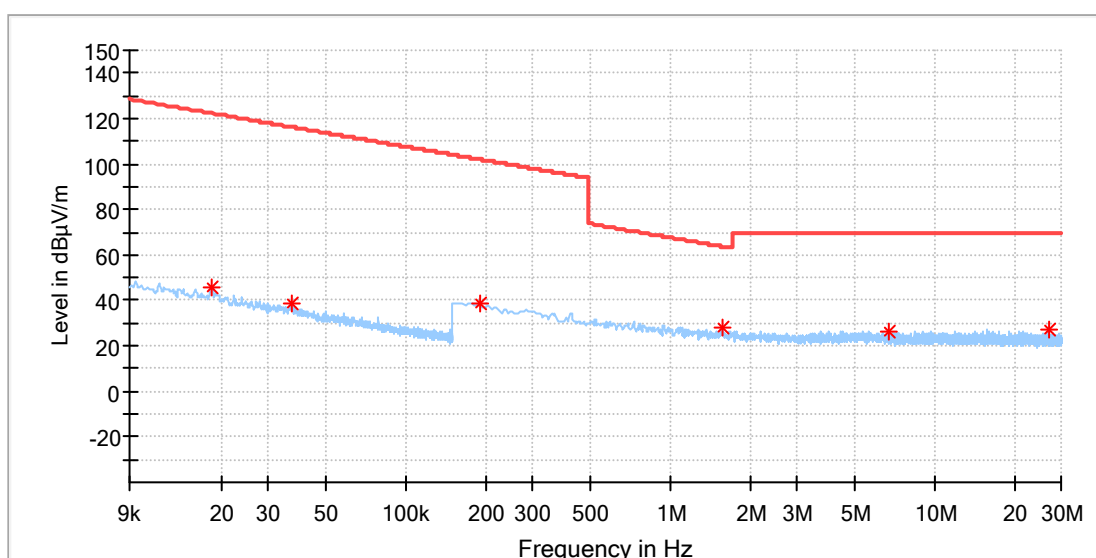


Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.018366	45.73	122.31	76.58	100.0	Y	295.0	20.1
0.036999	38.70	116.23	77.52	100.0	Y	87.0	20.1
0.237794	37.70	100.08	62.38	100.0	Y	143.0	20.1
0.760169	32.32	70.00	37.68	100.0	Y	301.0	20.1
5.707368	30.46	69.50	39.04	100.0	Y	346.0	20.3
25.684919	25.75	69.50	43.75	100.0	Y	135.0	20.7

EUT Information

EUT Name: HP USB-C Rechargeable MPP2.0 Tilt Natural Pen
Model: Avicii Pen
Test Mode: NA
Order No/Sample No: 168405546/A003388402-002
Test Voltage:: Battery
Remark: Temp 23 Humi:53%
Test Standard: FCC Part 15C
Tested By: Kei Zhang
Reviewed By: Terry Yin

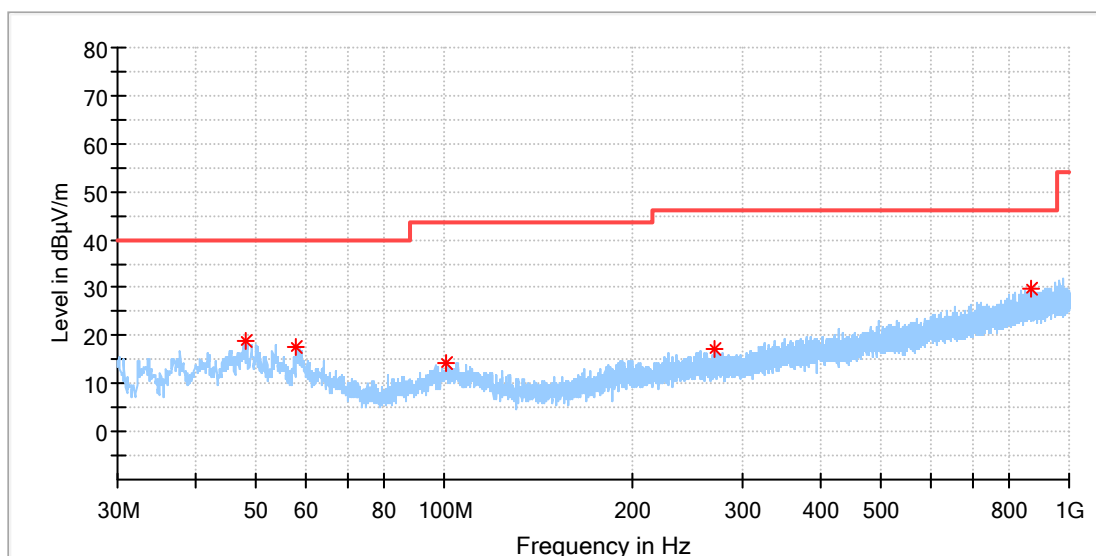


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.018366	45.74	122.31	76.56	100.0	Z	120.0	20.1
0.036999	38.88	116.23	77.35	100.0	Z	180.0	20.1
0.189508	38.22	102.05	63.83	100.0	Z	240.0	20.1
1.567875	27.74	63.73	35.99	100.0	Z	277.0	20.1
6.734559	26.62	69.50	42.88	100.0	Z	194.0	20.3
27.028169	26.96	69.50	42.54	100.0	Z	356.0	20.7

EUT Information

EUT Name: HP USB-C Rechargeable MPP2.0 Tilt Natural Pen
Model: Avicii Pen
Test Mode: NA
Order No/Sample No: 168405546/A003388402-002
Test Voltage:: Battery
Remark: Temp 23 Humi:53%
Test Standard: FCC Part 15C
Tested By: Kei Zhang
Reviewed By: Terry Yin

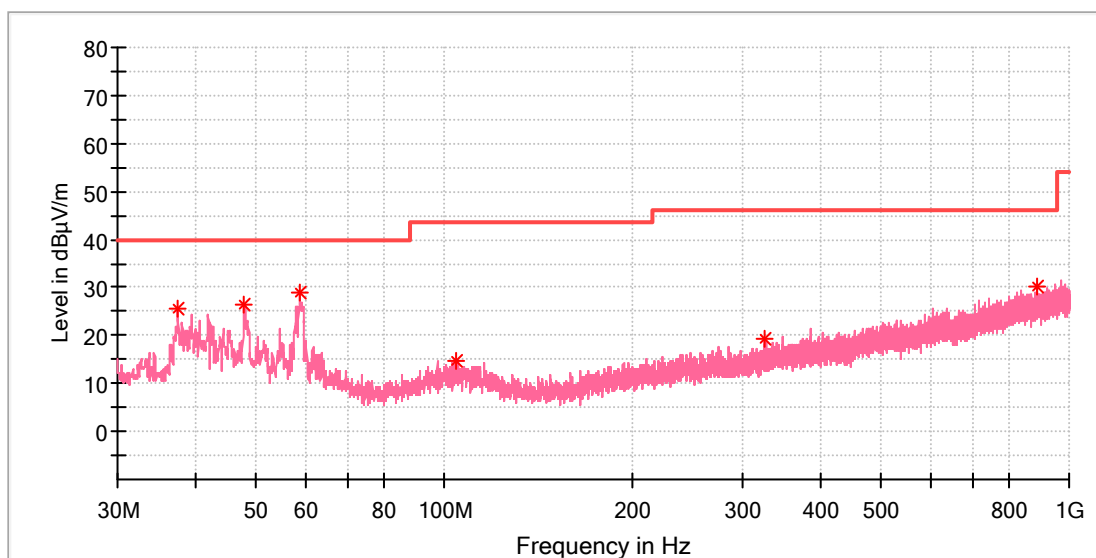


Critical_Freqs

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
48.236000	18.80	40.00	21.20	100.0	H	211.0	-18.4
58.033000	17.66	40.00	22.34	100.0	H	189.0	-18.8
100.567500	14.41	43.50	29.09	100.0	H	59.0	-19.0
270.123500	17.17	46.00	28.83	100.0	H	336.0	-17.0
866.625000	29.75	46.00	16.25	100.0	H	358.0	-5.3

EUT Information

EUT Name: HP USB-C Rechargeable MPP2.0 Tilt Natural Pen
Model: Avicii Pen
Test Mode: NA
Order No/Sample No: 168405546/A003388402-002
Test Voltage:: Battery
Remark: Temp 23 Humi:53%
Test Standard: FCC Part 15C
Tested By: Kei Zhang
Reviewed By: Terry Yin



Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.517500	25.54	40.00	14.46	100.0	V	21.0	-21.0
47.896500	26.39	40.00	13.61	100.0	V	68.0	-18.4
58.712000	29.13	40.00	10.87	100.0	V	30.0	-18.8
104.399000	14.87	43.50	28.63	100.0	V	170.0	-18.8
326.626000	19.40	46.00	26.60	100.0	V	297.0	-15.6
891.117500	29.99	46.00	16.01	100.0	V	0.0	-5.1

5.1.3. Conducted emissions

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.207(a)
	: RSS-Gen, 7.2.2
Basic standard	: ANSI C63.10: 2013
Frequency range	: 150KHz - 30MHz
Classification	: Class B
Limit	FCC Part 15.207(a) & FCC Part 15.107(a)
Kind of test site	: Shielded Room

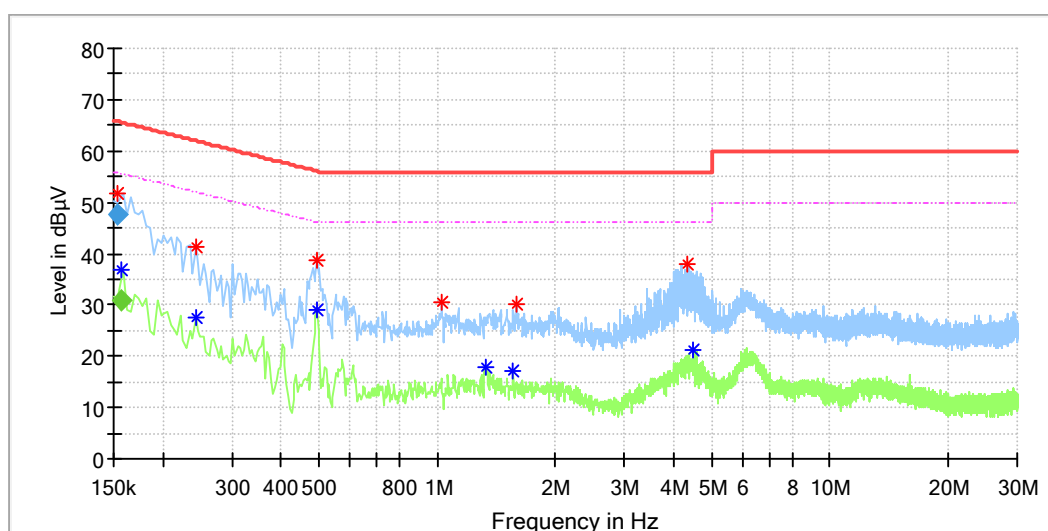
Test Setup

Date of testing	: 2022-12-14 to 2023-01-29
Input voltage	: DC 5V
Operation mode	: B
Earthing	: Not connected
Ambient temperature	: 23 °C
Relative humidity	: 53 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the following test plots.

EUT Information

EUT Name: HP USB-C Rechargeable MPP2.0 Tilt Natural Pen
Order Number: 168402847
Model: Avicii Pen
Test Mode: Type C charging (DC 5V, 0.24A),
Test Voltage: AC 120V/60Hz
Test By:/Review By: Eric Guo/Gary Chen
Test Standard: FCC Part 15B
Tem./Hum./Pressure: 24.6°C/49.5%/101kPa
Remark: SR2



Critical Freqs

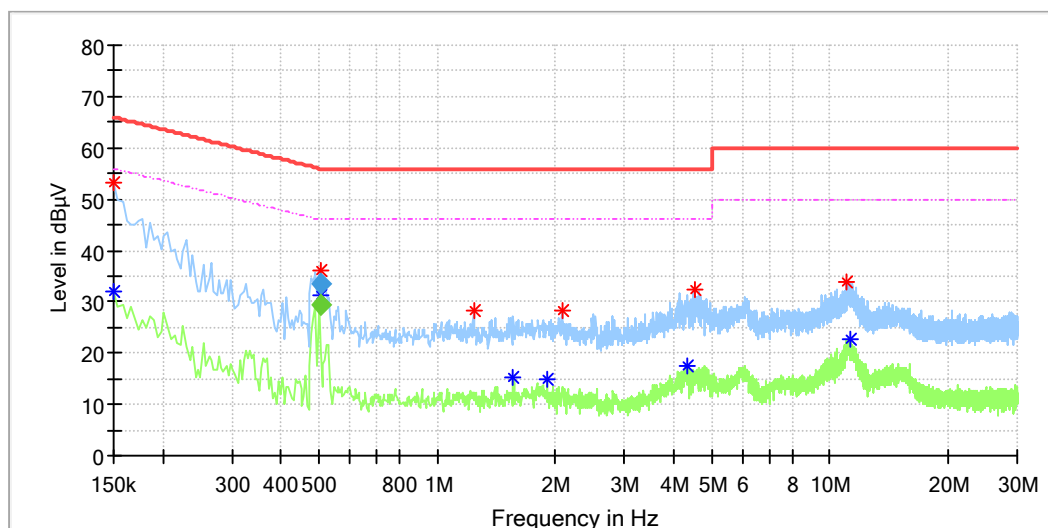
Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.153500	51.71	---	65.57	13.85	L1	9.9
0.157500	---	36.67	55.57	18.90	L1	9.9
0.242000	---	27.46	52.03	24.56	L1	9.9
0.242000	41.46	---	62.03	20.56	L1	9.9
0.494000	---	29.03	46.10	17.07	L1	10.0
0.494000	38.62	---	56.10	17.48	L1	10.0
1.026000	30.36	---	56.00	25.64	L1	10.0
1.326000	---	17.87	46.00	28.13	L1	10.1
1.562000	---	17.16	46.00	28.84	L1	10.1
1.590000	30.25	---	56.00	25.75	L1	10.1
4.326000	37.77	---	56.00	18.23	L1	10.2
4.502000	---	21.17	46.00	24.83	L1	10.2

Final Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.153500	47.63	---	65.81	18.18	1000.0	9.000	L1	9.9
0.157500	---	30.84	55.60	24.76	1000.0	9.000	L1	9.9

EUT Information

EUT Name: HP USB-C Rechargeable MPP2.0 Tilt Natural Pen
Order Number: 168402847
Model: Avicii Pen
Test Mode: Type C charging (DC 5V, 0.24A),
Test Voltage: AC 120V/60Hz
Test By./Review By: Eric Guo/Gary Chen
Test Standard: FCC Part 15B
Tem./Hum./Pressure: 24.6°C/49.5%/101kPa
Remark: SR2



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.150000	53.25	---	66.00	12.75	N	9.8
0.150000	---	32.16	56.00	23.84	N	9.8
0.505500	---	31.07	46.00	14.93	N	9.8
0.506500	36.04	---	56.00	19.96	N	9.8
1.238000	28.14	---	56.00	27.86	N	9.8
1.562000	---	15.41	46.00	30.59	N	9.8
1.906000	---	14.84	46.00	31.16	N	9.8
2.078000	28.34	---	56.00	27.66	N	9.9
4.326000	---	17.59	46.00	28.41	N	9.9
4.546000	32.27	---	56.00	23.73	N	9.9
11.078000	34.03	---	60.00	25.97	N	10.0
11.234000	---	22.79	50.00	27.21	N	10.0

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.505500	---	29.50	46.00	16.50	1000.0	9.000	N	9.8
0.506500	33.65	---	56.00	22.35	1000.0	9.000	N	9.8

6. List of Tables

Table 1: List of Test and Measurement Equipment.....	5
Table 2: Technical Specification of EUT.....	7

7. List of Photographs

Refer to appendix A.