EMC TEST REPORT

Report No.:	SET2021-16437
Product Name:	RCP-P1
FCC ID:	2AHPN-HSA-20NP-PB
IC:	6434C-HSA20NPPB
Model No. :	HSA-20NP-PB,HSA-20NP-PA
Applicant:	Harman International Industries Incorporated
Address:	30001 , Cabot Drive, Novi, MI 48377, USA
Dates of Testing:	2021.11.12—2022.04.18
Issued by:	CCIC Southern Testing Co., Ltd.
Lab Location:	Electronic Testing Building, No. 43 Shahe Road, Xili Street, Nanshan District, Shenzhen, Guangdong, China. Tel: 86 755 26627338 Fax: 86 755 26627238

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Test Report

Product Name..... RCP-P1

Model No. HSA-20NP-PB, HSA-20NP-PA

Brand Name…… Ride Command Plus

Applicant..... Harman International Industries Incorporated

Applicant Address..... 30001 , Cabot Drive, Novi, MI 48377, USA

Manufacturer ..... Harman International Industries Incorporated

Manufacturer Address .... 30001 , Cabot Drive, Novi, MI 48377, USA

Test Standards..... 47 CFR Part 15 Subpart B
ICES-003 Issue 7

Test Result..... PASS

Tested by ..... Ruihong Xie

Ruihong Xie Test Engineer 2022.04.18

Reviewed by ..... Chris You

Chris You Senior Engineer 2022.04.18

Approved by ..... Shuangwen Zhang

2022.04.18

Shuangwen Zhang, Manager

TABLE OF CONTENTS

Change History		
Issue	Date	Reason for change
1.0	2022.04.18	First edition

1. GENERAL INFORMATION

1.1 EUT Description

EUT Name ..... .: RCP-P1
Brand Name……: Ride Command Plus
Hardware Version……...: V1.0
Software Version .....: N75NA_POPLS_R6.2.4

Note 1: The EUT is a RCP-P1;

Note 2: The prototype has two types of hardware, and all modes have been tested, with the report recording only the worst results

Note 3: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

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1.2 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart B:

No.	Identity	Document Title
1	47 CFR Part 15 Subpart B	Radio Frequency Devices
2	ICES-003 Issue 7	Information Technology Equipment (Including Digital Apparatus) — Limits and Methods of Measurement

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Result
1	15.107	Conducted Emission	PASS
2	15.109	Radiated Emission	PASS
1	ICES 003 Issue 7 Section3.2.1	Conducted Emission	PASS
2	ICES 003 Issue 7 Section3.2.2	Radiated Emission	PASS

NOTE:

(1) The EUT has been tested according to 47 CFR Part 15 Subpart B,Class B.The test procedure is according to ANSI C63.4:2014.

(2) The EUT has been tested according to ICES 003 Issue 7. The test procedure is according to ANSI C63.4:2014.

1.3 Facilities and Accreditations

1.3.1 Facilities

FCC-Registration No.: CN1283

CCIC Southern Testing Co., Ltd EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Designation Number: CN1283, valid time is until April 19th, 2023.

ISED Registration: 11185A-1

CCIC Southern Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on Aug. 04, 2016, valid time is until April 20th, 2023.

A2LA Code: 5721.01

CCIC-SET is a third party testing organization accredited by A2LA according to ISO/IEC 17025. The accreditation certificate number is 5721.01.

1.3.2 Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (℃):	15 ℃ - 35 ℃
Relative Humidity (%):	25% -75%
Atmospheric Pressure (kPa):	86kPa-106kPa

1.3.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission:	Uc = 3.2 dB (k=2)
Uncertainty of Radiated Emission: (30MHz~1GHz)	Uc = 5.8 dB (k=2)
Uncertainty of Radiated Emission: (1~6GHz)	Uc = 5.1 dB (k=2)
Uncertainty of Radiated Emission: (6~18GHz)	Uc = 5.5 dB (k=2)

test conditions setting

1.4 Test Peripherals

The following is a listing of the EUT and peripherals utilized during the performance of EMC test:

Support Equipment:

Description	Brand name	Model	Serial No.	FCCID
Notebook	ThinkPad	E430C	A131101550	N/A
Mouse	Logitech	M100r	25011051	N/A
AC Adapter	HUAJIN	HJ-0122000	N/A	N/A

1.5 Use of Software Checklist

Software	Version number	Manufacturer	Use the project
ES-K1	V1.73	ROHDE&SCHWARZ	Radiated Emissions below 1GHz
TS+	JS32-RE 2.5.2.0	Tonsceng	Radiated Emissions above 1GHz
EMC32	Version 10.35.10	ROHDE&SCHWARZ	Conducted Emission

1.6 Test Mode

Note1：The EUT have the following typical setups during the test:

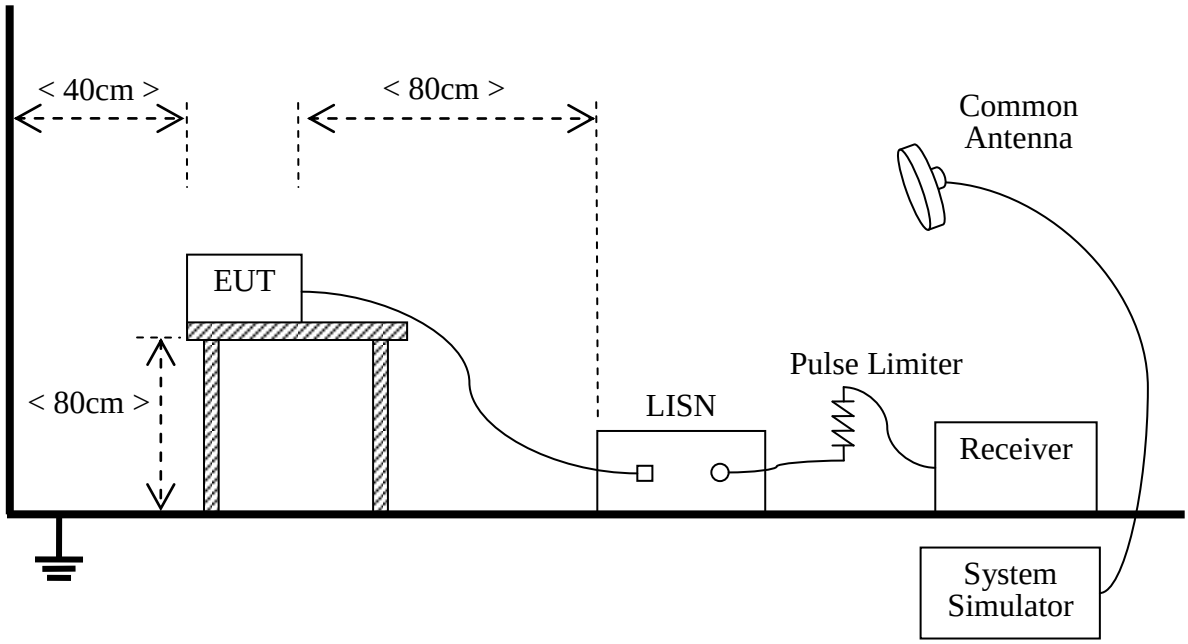
Setup1: Charger + EUT

Note3：Please refer to ANNEX I for the photographs of the EUT. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacture.

1.7 Test Setup and Equipments List

1.7.1 Conducted Emission

A. Test Setup:



The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides 50Ω/50μH of coupling impedance for the measuring instrument. The Common Antenna is used for the call between the EUT and the System Simulator (SS). A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

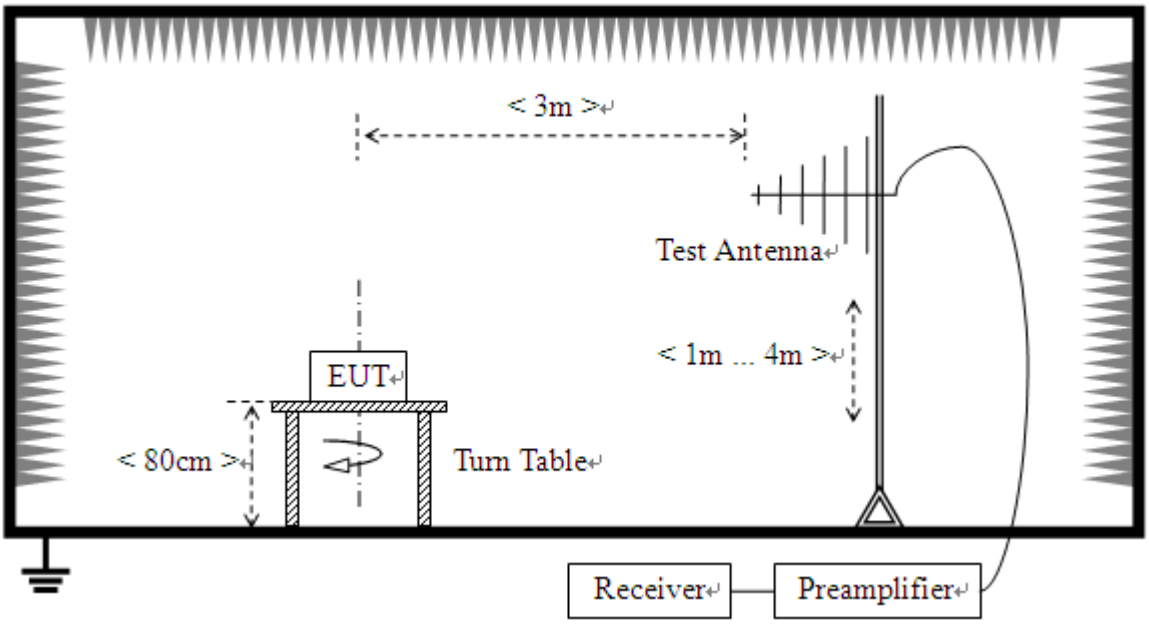
B. Equipments List:

Description	Manufacturer	Model	Serial No.	Calibration Date	Calibration Due. Date
Test Receiver	KEYSIGHT	N9038A	A141202036	2021.09.20	2022.08.04
LISN	ROHDE&SCHWARZ	ENV216	A140701847	2021.08.02	2022.08.02
Cable	MATCHING PAD	W7	/	2021.08.02	2022.08.02

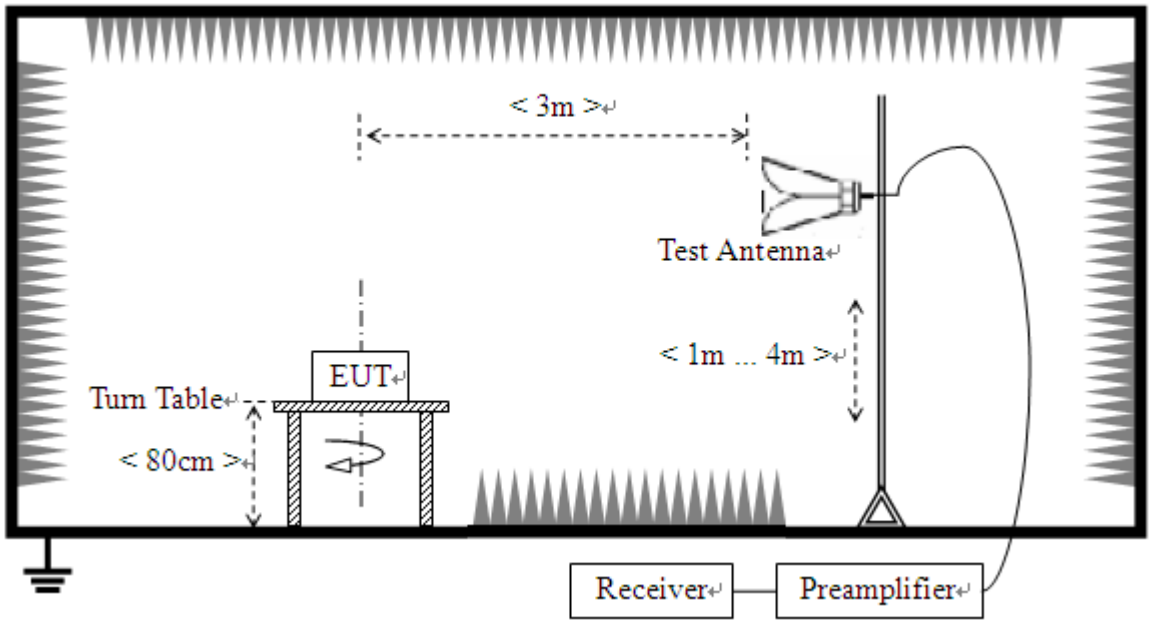
1.7.2 Radiated Emission

A. Test Setup:

1) For radiated emissions from 30MHz to1GHz



2) For radiated emissions above 1GHz



B. Test Procedure

The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower.

For the test Antenna:

1) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

C. Equipments List:

Description	Manufacturer	Model	Serial No.	Calibration Date	Calibration Due. Date
Test Receiver	KEYSIGHT	N9038A	A141202036	2021.09.20	2022.08.04
LISN	ROHDE&SCHWARZ	ENV216	A140701847	2021.09.21	2022.08.02
Shield Room	Xinju Electronics	L7300*W4500 *H3100	A181003226	2021.09.05	2024.07.29
EMI Test Receiver	ROHDE&SCHWARZ	ESCI	A0902601	2022.05.23	2023.04.17
Broadband Ant.	2786	ETC	A150402239	2021.09.16	2024.03.03
3M Anechoic Chamber	Albatross	SAC-3MAC 9*6*6m	A0412375	2019.03.26	2023.03.25
EMI Test Receiver	ROHDE&SCHWARZ	ESW26	A180502935	2021.08.12	2022.08.06
System Simulator	ROHDE&SCHWARZ	CMW500	A150802214	2021.08.02	2022.07.22
5M Anechoic Chamber	Albatross	SAC-5MAC 12.8x6.8x6.4m	A0304210	2019.03.25	2023.03.24
EMI Horn Ant.	ROHDE&SCHWARZ	HF906	A0304225	2019.04.17	2022.04.27

2. ICES-003&47 CFR PART 15B REQUIREMENTS

2.1 Conducted Emission

2.1.1 Requirement

According to FCC section 15.107, ICES-003, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

2.1.2 Test Description

See section 1.7.1 of this report.

2.1.3 Test Result

The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. All test modes are considered, refer to recorded points and plots below.

Note:

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a Nominal 120V AC,50/60Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

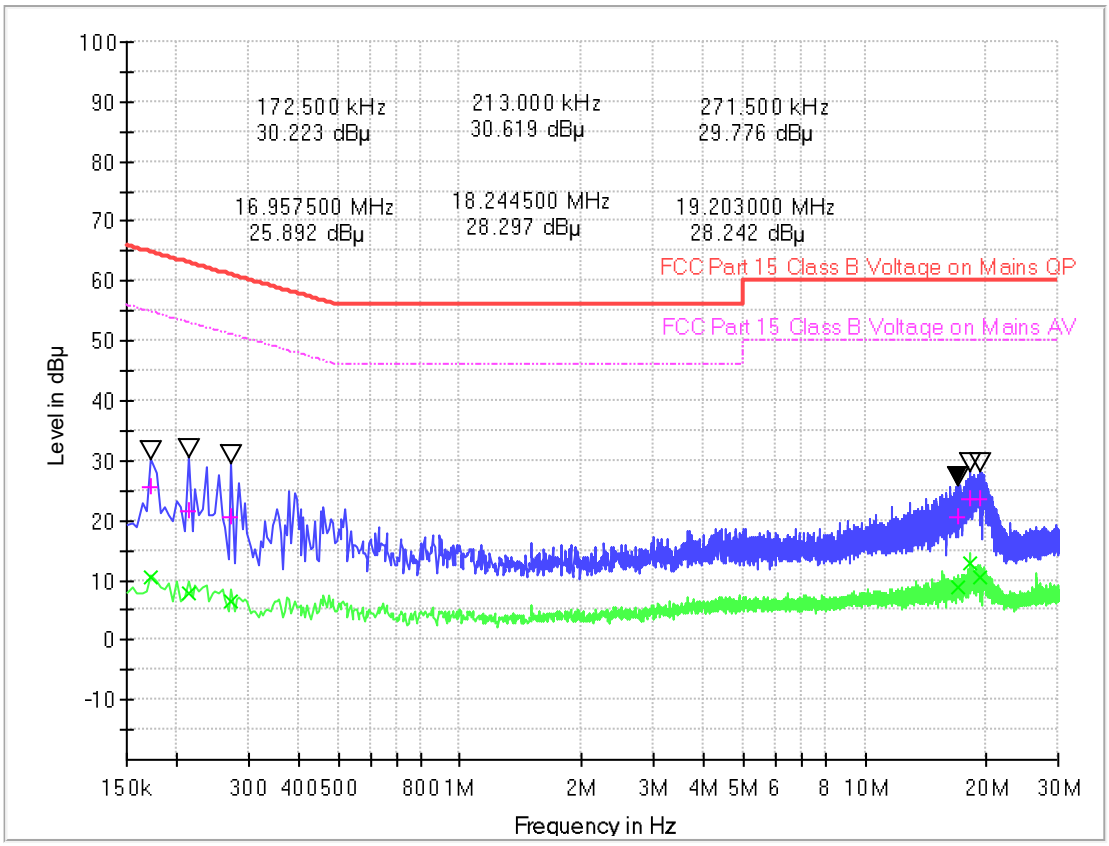
-Level(dBuv)=Read Level(dBuv)+Correction Factor(dB)

-Margin= Read Level(dBuv)-Limit Line(dBuv)

-Correction factor= LISN Factor(dB)+Cable Loss(dB)+ attenuation factor(dB)

Test voltage and frequency (120V AC,60Hz)

A. Mains terminal disturbance voltage, L phase

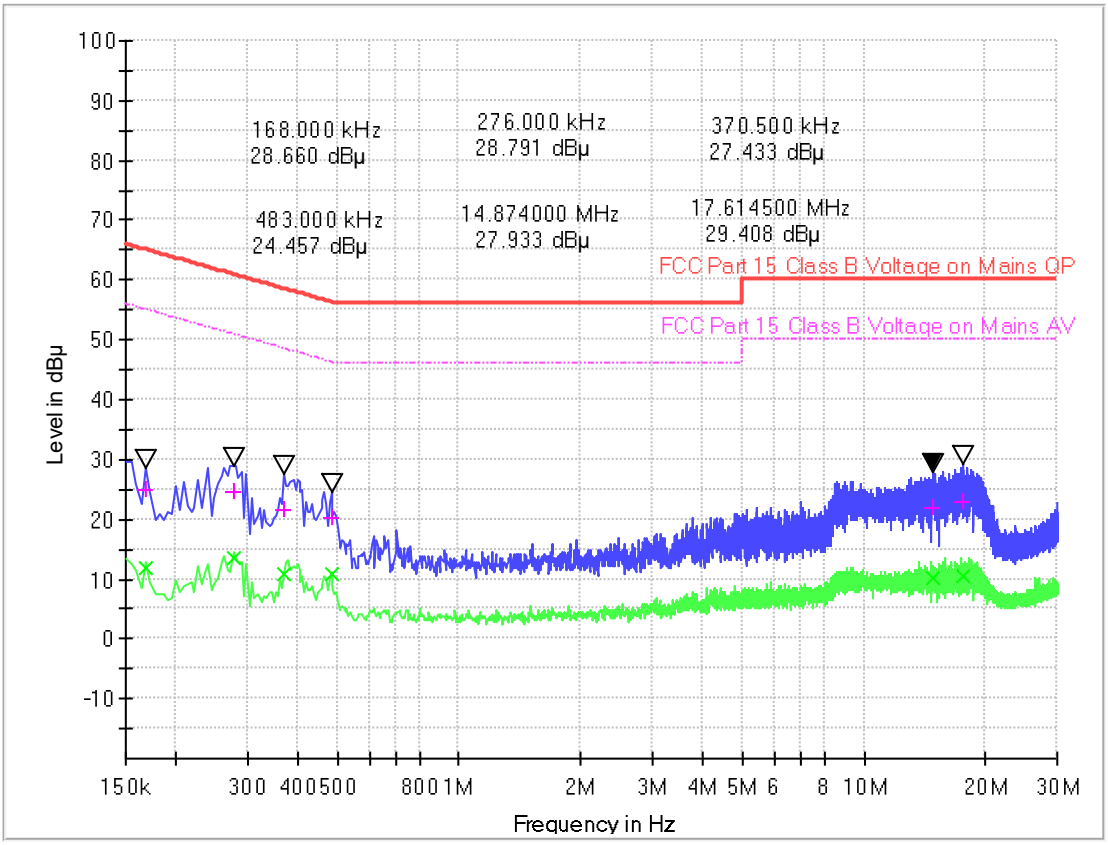


(Plot A: L Phase)

Frequency (MHz)	QuasiPeak	CAverage (dB µ V)	Cabel Loss (dB)	Corr. (dB)	Margin - QPK	Limit - QPK	Margin - AV	Limit - AV
0.172500	25.58	10.34	0.1	10.3	39.26	64.8	44.50	54.8
0.213000	21.65	7.87	0.1	10.3	41.44	63.1	45.22	53.1
0.271500	20.58	6.37	0.2	10.3	40.49	61.1	44.70	51.1
16.957500	20.53	8.78	0.2	11.1	39.47	60.0	41.22	50.0
18.244500	23.58	12.89	0.2	11.2	36.42	60.0	37.11	50.0
19.203000	23.51	10.44	0.1	11.2	36.49	60.0	39.56	50.0

Note: Correction factor=Cabel loss+ attenuation factor
attenuation factor=10dB

B. Mains terminal disturbance voltage, N phase



(Plot B: N Phase)

Frequency (MHz)	QuasiPeak	CAverage (dB µ V)	Cabel Loss (dB)	Corr. (dB)	Margin - QPK	Limit - QPK	Margin - AV	Limit - AV (dB µ V)
0.168000	24.76	11.91	0.1	10.2	40.30	65.1	43.15	55.1
0.276000	24.72	13.41	0.2	10.3	36.22	60.9	37.53	50.9
0.370500	21.61	10.98	0.2	10.3	36.88	58.5	37.51	48.5
0.483000	20.37	10.77	0.1	10.2	35.92	56.3	35.52	46.3
14.874000	21.98	10.31	0.2	10.9	38.02	60.0	39.69	50.0
17.614500	23.03	10.59	0.3	11.1	36.97	60.0	39.41	50.0

2.2 Radiated Emission

2.2.1 Requirement

According to FCC section 15.109, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency range (MHz)	Field Strength		Field Strength Limitation at 3m Measurement Dist	
	μV/m	Dist	(uV/m)	(dBuV/m)
30.0 - 88.0	100	3m	100	20log 100
88.0 - 216.0	150	3m	150	20log 150
216.0 - 960.0	200	3m	200	20log 200
Above 960.0	500	3m	500	20log 500

According to ICES-003 the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency range (MHz)	Field Strength Limitation at 3m Measurement Dist	
	Class A(3m) QP (dBμV/m)	Class B(3m) QP (dBμV/m)
30 - 88	50.0	40.0
88 - 216	54.0	43.5
216 - 230	56.9	46.0
230 - 960	57.0	47.0
960-1000	60.0	54.0
Frequency range (MHz)	Field Strength Limitation at 3m Measurement Dist	
	Class A(3m) (dBμV/m)	Class B(3m) (dBμV/m)
Above 1G	60(AV) /80(PK)	54(AV) /74(PK)

a) For frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

b) Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

c) For below 1G :QP detector RBW 120kHz ,VBW 300kHz.

d) For Above 1G: PK detector RBW 1MHz,VBW 3MHz for PK value ;AV detector RBW 1MHz, VBW 10Hz for AV value.

Note:

1) The tighter limit shall apply at the boundary between two frequency range.
2) Limitation expressed in dBuV/m is calculated by 20log Emission Level(uV/m).
3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of Ld1 = Ld2 * $(d2/d1)^{2.}$
   Example:
   F.S Limit at 30m distance is 30uV/m, then F.S Limitation at 3m distance is adjusted as
   Ld1 = L1 = 30uV/m * $(10)^2$ = 100 * 30uV/m.

2.2.2 Test Description

See section 2.3.2 of this report.

2.2.3 Test Result

The maximum radiated emission is searched using PK, QP and AV detectors; the emission levels more than the limits, and that have narrow margins from the limits will be re-measured with AV and QP detectors. Both the vertical and the horizontal polarizations of the Test Antenna are considered to perform the tests. All test modes are considered, refer to recorded points and plots below.

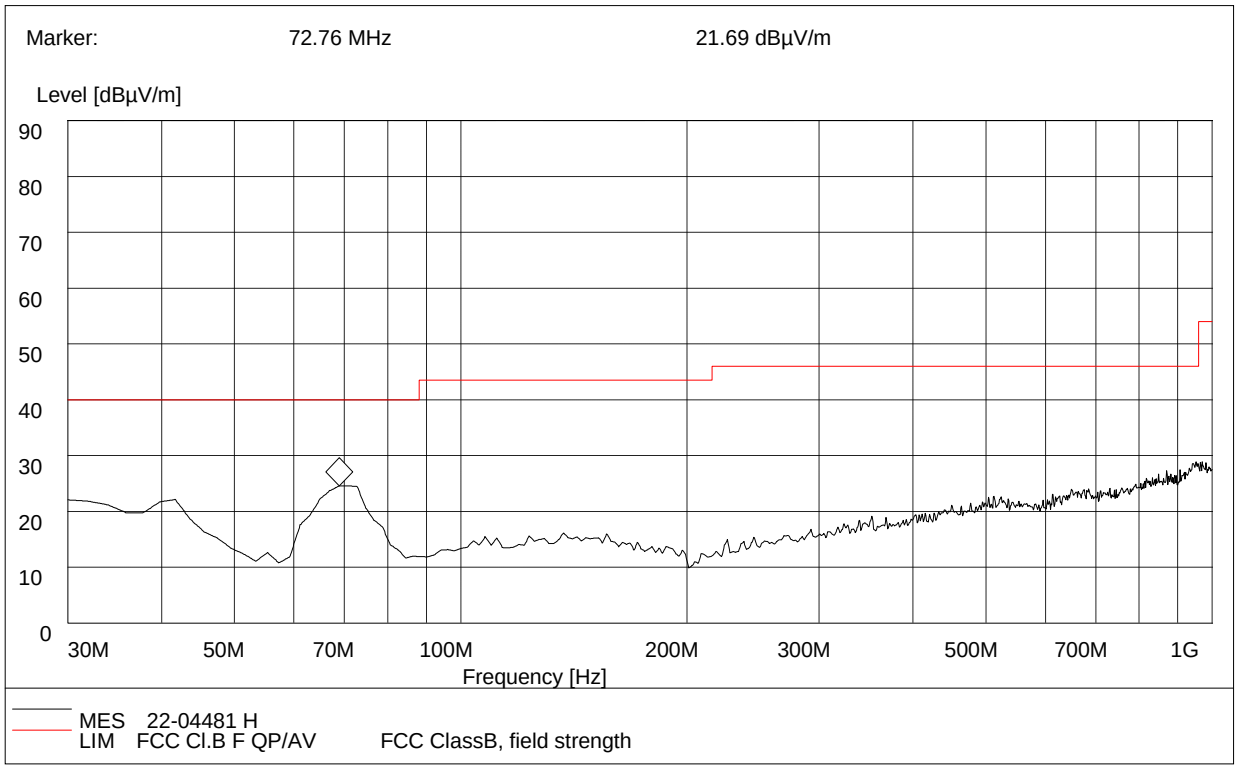
The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

Note: All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.

-Emission Level(dBuV/m)= 20log Emission Level(uV/m)

-Corrected Reading=Antenna factor+Cable Loss+Read Level-Preamp Factor= Level

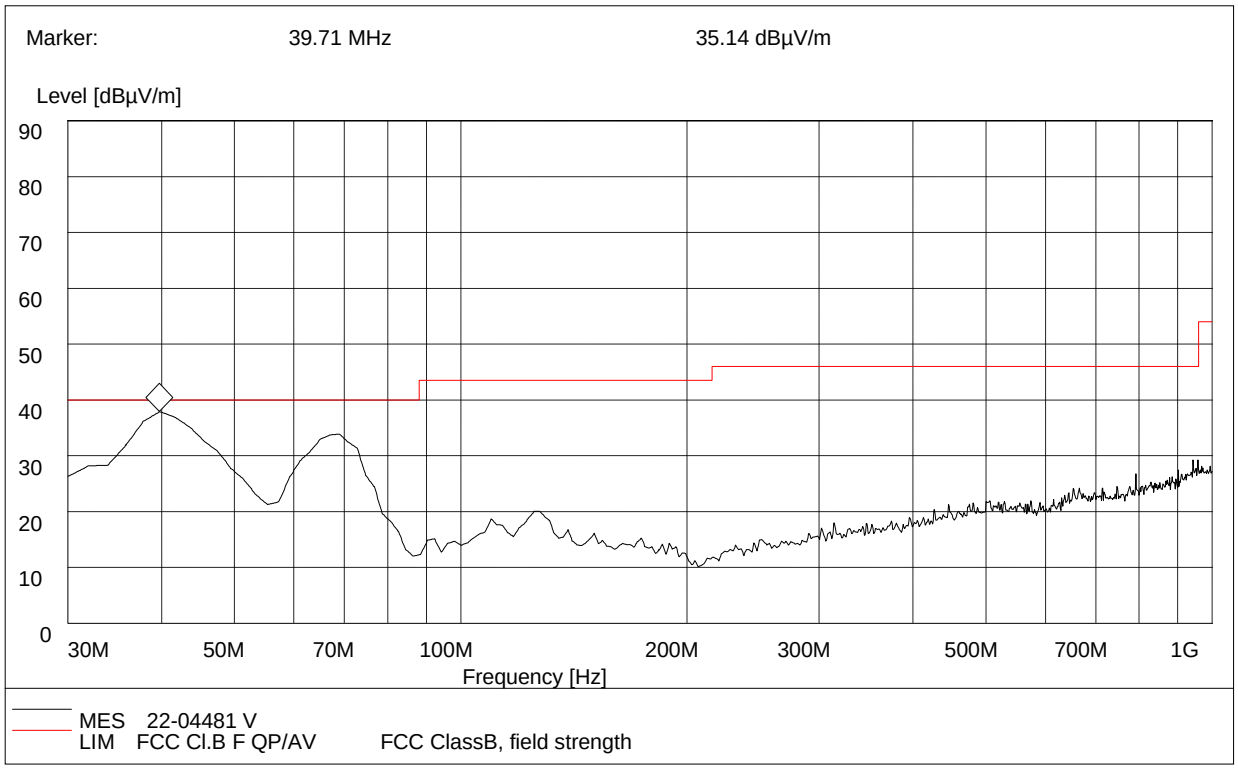
A.Radiation disturbances, antenna polarization: Horizontal



(Plot C: Test Antenna Horizontal 30M - 1G)

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Cable Loss(dB)	ANT. Factor(dB)	Verdict
30.00	20.14	120.000	134	40.0	19.86	Horizon	0.4	26.1	Pass
41.66	20.18	120.000	118	40.0	19.82	Horizon	0.5	26.2	Pass
72.76	21.69	120.000	139	40.0	18.31	Horizon	0.5	26.0	Pass
107.75	13.25	120.000	124	43.5	30.25	Horizon	0.4	26.2	Pass
226.33	14.05	120.000	177	46.0	31.95	Horizon	0.5	29.3	Pass
512.08	21.63	120.000	109	46.0	24.37	Horizon	0.6	29.1	Pass

B.Radiation disturbances, antenna polarization: Vertical

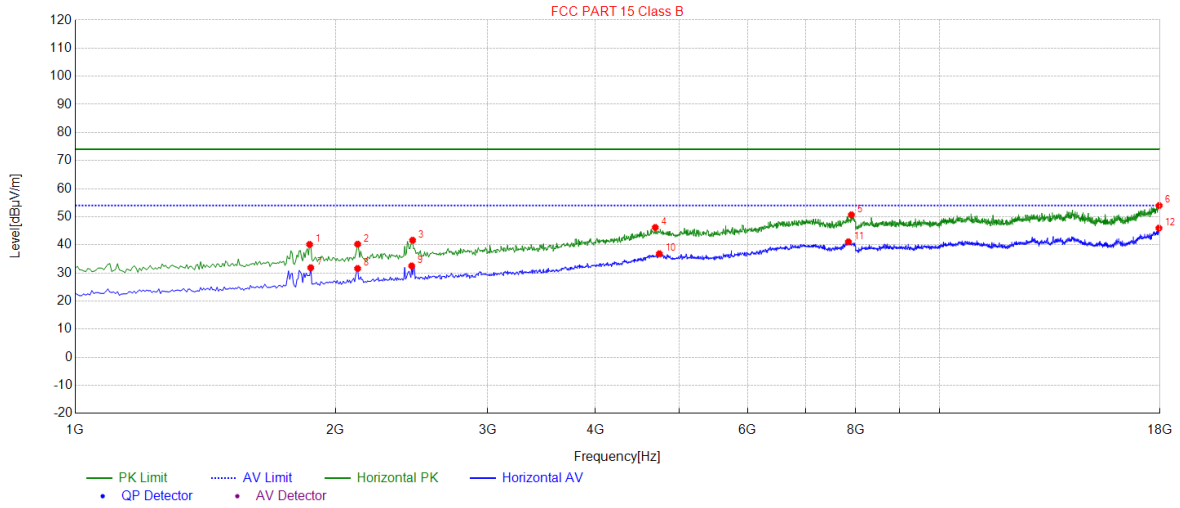


(Plot D: Test Antenna Vertical 30M - 1G)

Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Cable Loss(dB)	ANT. Factor(dB)	Verdict
39.71	35.14	120.000	251	40.0	4.86	Vertical	0.2	26.2	Pass
68.87	31.25	120.000	142	40.0	8.75	Vertical	0.3	26.0	Pass
109.69	16.52	120.000	89	43.5	26.98	Vertical	0.3	26.3	Pass
125.25	18.46	120.000	144	43.5	25.04	Vertical	0.3	26.5	Pass
313.80	15.24	120.000	111	46.0	30.76	Vertical	0.4	28.7	Pass
653.98	22.04	120.000	321	46.0	23.96	Vertical	0.5	29.0	Pass

Test Result: PASS

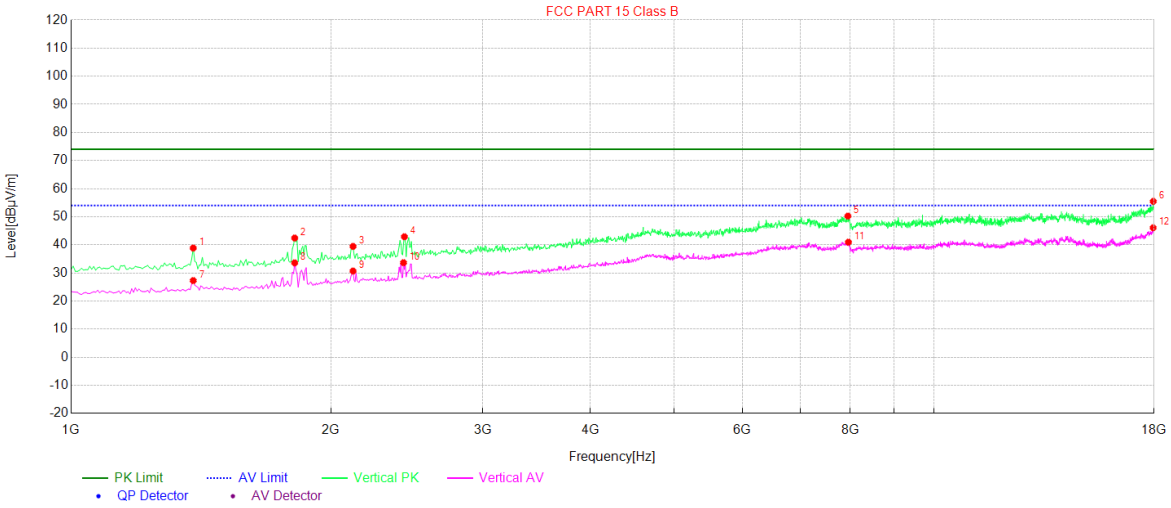
A.Radiation disturbances, antenna polarization: Horizontal



(Plot E: Test Antenna Horizontal 1G – 18G)

NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity
1	1867.2891	40.14	-12.44	74.00	33.86	PK	132	124	Horizontal
2	2122.3741	40.23	-11.55	74.00	33.77	PK	117	279	Horizontal
3	2456.8189	41.63	-10.42	74.00	32.37	PK	150	45	Horizontal
4	4690.2301	46.20	-1.13	74.00	27.80	PK	164	130	Horizontal
5	7909.97	50.69	4.10	74.00	23.31	PK	133	287	Horizontal
6	17960.3201	54.00	14.78	74.00	20.00	PK	127	218	Horizontal
7	1872.9577	31.87	-12.41	54.00	22.13	AV	109	37	Horizontal
8	2122.3741	31.59	-11.55	54.00	22.41	AV	183	102	Horizontal
9	2451.1504	32.51	-10.45	54.00	21.49	AV	151	245	Horizontal
10	4741.2471	36.84	-0.98	54.00	17.16	AV	157	123	Horizontal
11	7847.6159	41.07	4.02	54.00	12.93	AV	143	110	Horizontal
12	17948.983	45.96	14.76	54.00	8.04	AV	123	149	Horizontal

B.Radiation disturbances, antenna polarization: Vertical



(Plot F: Test Antenna Vertical 1G – 18G)

NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity
1	1385.4618	38.86	-14.41	74.00	35.14	PK	146	307	Vertical
2	1816.2721	42.44	-12.67	74.00	31.56	PK	127	243	Vertical
3	2122.3741	39.46	-11.55	74.00	34.54	PK	109	38	Vertical
4	2434.1447	42.89	-10.52	74.00	31.11	PK	134	334	Vertical
5	7949.6499	50.25	4.08	74.00	23.75	PK	127	261	Vertical
6	17960.3201	55.49	14.78	74.00	18.51	PK	116	317	Vertical
7	1385.4618	27.29	-14.41	54.00	26.71	AV	183	149	Vertical
8	1816.2721	33.59	-12.67	54.00	20.41	AV	142	157	Vertical
9	2122.3741	30.69	-11.55	54.00	23.31	AV	109	164	Vertical
10	2428.4762	33.67	-10.54	54.00	20.33	AV	138	223	Vertical
11	7960.987	40.95	4.08	54.00	13.05	AV	140	104	Vertical
12	17954.6516	46.08	14.77	54.00	7.92	AV	132	344	Vertical

-----End of Report-----