

# TEST REPORT

FCC NFC Test for HP200

**APPLICANT**

Smart eLock Co., LTD.

**REPORT NO.**

HCT-RF-2108-FC033-R1

**DATE OF ISSUE**

August 27, 2021

**Tested by**  
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<h1 style="margin: 0;">TEST REPORT</h1> <p style="margin: 0;">FCC NFC Test for HP200</p>	<p><b>REPORT NO.</b> HCT-RF-2108-FC033-R1</p> <p><b>DATE OF ISSUE</b> August 27, 2021</p> <p><b>Additional model</b> HP200E, HP200-1, HP200-2, HP200-3, HP200E-1, HP200E-2, HP200E-3</p>
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<b>Applicant</b>	<b>Smart eLock Co., LTD.</b> 402, 403, Bi-dong, 4, 215, Galmachi-ro, Jungwon-gu, Seongnam-si Gyeonggi-do, Rep. of Korea (Sangdaewon-dong, Geumgang Penterium Tower)
<b>Eut Type</b>	HOTEL LOCK
<b>Model Name</b>	HP200
<b>FCC ID</b>	2AQAVHP200
<b>RF Output Field Strength</b>	12.19 dB $\mu$ V/m @30 m
<b>Frequency of Operation</b>	13.56 MHz
<b>Modulation type</b>	ASK
<b>FCC Classification</b>	Low Power Communication Device Transmitter (DXX)
<b>FCC Rule Part(s)</b>	FCC Part 15.225 Subpart C

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.  
This test results were applied only to the test methods required by the standard.

## REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	August 24, 2021	Initial Release
1	August 27, 2021	-Added the RF transparent material on page 5

### Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance. measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance.

If this report is required to confirmation of authenticity, please contact to [www.hct.co.kr](http://www.hct.co.kr)

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## 1. EUT DESCRIPTION

<b>Model</b>	HP200
<b>Additional model</b>	HP200E, HP200-1, HP200-2, HP200-3, HP200E-1, HP200E-2, HP200E-3
<b>EUT Type</b>	HOTEL LOCK
<b>Test Jig Material</b>	Acrylic
<b>Manufacturer Name Address</b>	<b>Smart eLock Co., LTD.</b> 402, 403, Bi-dong, 4, 215, Galmachi-ro, Jungwon-gu, Seongnam-si Gyeonggi-do, Rep. of Korea (Sangdaewon-dong, Geumgang Penterium Tower)
<b>Factory Name Address</b>	<b>Smart eLock Co., LTD.</b> 402, 403, Bi-dong, 4, 215, Galmachi-ro, Jungwon-gu, Seongnam-si Gyeonggi-do, Rep. of Korea (Sangdaewon-dong, Geumgang Penterium Tower)
<b>Power Supply</b>	6 V
<b>Frequency Range</b>	13.56 MHz
<b>Transmit Power</b>	12.19 dB $\mu$ V/m @30 m
<b>Modulation Type</b>	ASK
<b>Antenna type</b>	Antenna type: PCB Pattern Antenna
<b>Date(s) of Tests</b>	July 28, 2021~ August 19, 2021

## 2. TEST METHODOLOGY

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) is used in the measurement of the test device.

### EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

### EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.225 under the FCC Rules Part 15 Subpart C.

### GENERAL TEST PROCEDURES

#### Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and average detector modes.

#### Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 6.6.5 of ANSI C63.10. (Version: 2013).

## DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

## 3. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

## 4. FACILITIES AND ACCREDITATIONS

### FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032).

### EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."



## 5. ANTENNA REQUIREMENTS

According to FCC 47 CFR § 15.203:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- (1) The antennas of this E.U.T are permanently attached.
- (2) The E.U.T Complies with the requirement of § 15.203

## 6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

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

The measurement data shown herein meets or exceeds the  $U_{CISPR}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05 (Confidence level about 95 %, k=2)



## 7. DESCRIPTION OF TESTS

### 7.1. Radiated Test

#### Limit (Operation within the band 13.110 MHz – 14.010 MHz)

Frequency (MHz)	Field Strength ( $\mu\text{V}/\text{m}$ )	Measurement Distance (m)
13.553 – 13.567	15,848	30
13.410 $\leq$ f $\leq$ 13.553 13.567 $\leq$ f $\leq$ 13.710	334	30
13.110 $\leq$ f $\leq$ 13.410 13.710 $\leq$ f $\leq$ 14.010	106	30

Note:

1. 15,848  $\mu\text{V}/\text{m}$  = 84.0 dB $\mu\text{V}/\text{m}$
2. 334  $\mu\text{V}/\text{m}$  = 50.47 dB $\mu\text{V}/\text{m}$
3. 106  $\mu\text{V}/\text{m}$  = 40.51 dB $\mu\text{V}/\text{m}$

#### Limit (Radiated Spurious Emissions)

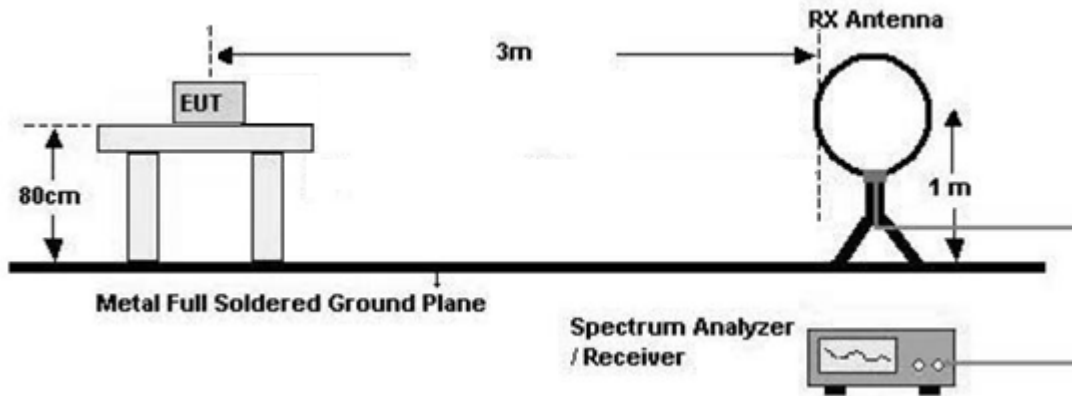
Frequency (MHz)	Field Strength ( $\mu\text{V}/\text{m}$ )	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	*100	3
88-216	*150	3
216-960	*200	3
Above 960	500	3

※:

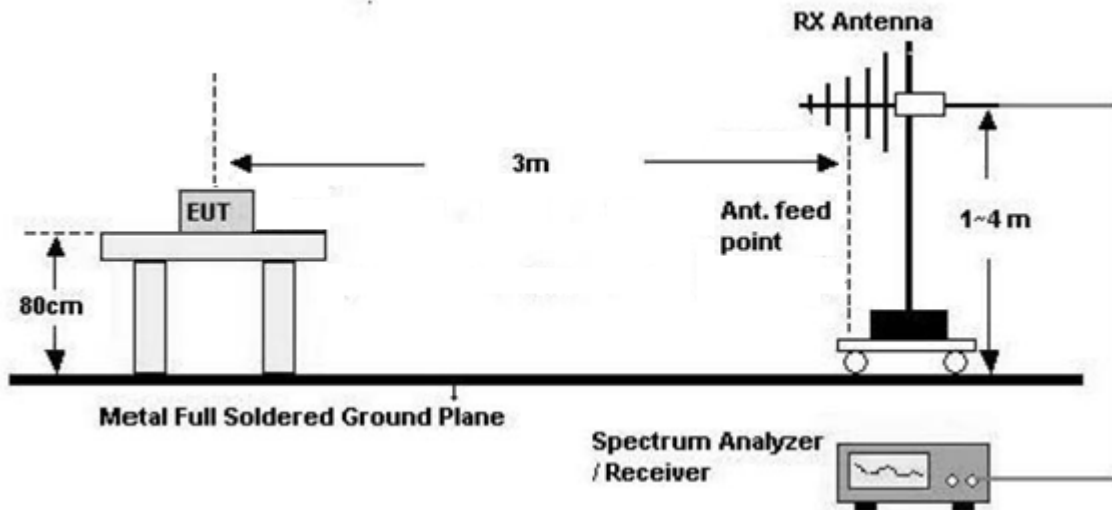
Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

**Test Configuration**

Below 30 MHz



30 MHz - 1 GHz



**Test Procedure of inband**

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3 m from the EUT
3. The EUT is placed on a turntable, which is 0.8 m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground

plane in detecting antenna.

5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

6. Distance Correction Factor =  $40\log(3\text{ m}/30\text{ m}) = -40\text{ dB}$

Measurement Distance : 3 m (Below 30 MHz)

7. Spectrum Setting

- Detector = Peak

- Trace = Maxhold

- RBW = 9 kHz

- VBW  $\geq 3 \times$  RBW

8. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

**Test Procedure of Radiated spurious emissions(Below 30 MHz)**

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.

2. The loop antenna was placed at a location 3 m from the EUT

3. The EUT is placed on a turntable, which is 0.8 m above ground plane.

4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.

5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

6. Distance Correction Factor(0.009 MHz – 0.490 MHz) =  $40\log(3\text{ m}/300\text{ m}) = -80\text{ dB}$

Measurement Distance : 3 m

7. Distance Correction Factor(0.490 MHz – 30 MHz) =  $40\log(3\text{ m}/30\text{ m}) = -40\text{ dB}$

Measurement Distance : 3 m

8. Spectrum Setting

- Frequency Range = 9 kHz ~ 30 MHz

- Detector = Peak

- Trace = Maxhold

- RBW = 9 kHz

- VBW  $\geq 3 \times$  RBW

9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

### KDB 414788 OFS and Chamber Correlation Justification

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

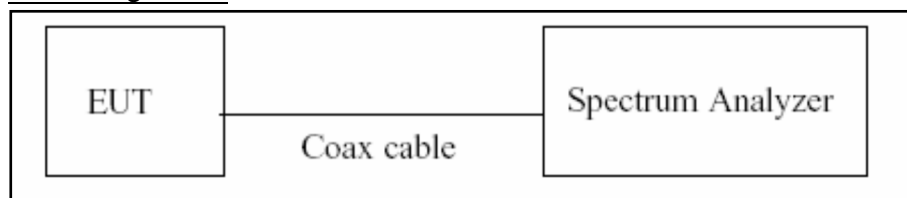
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

### Test Procedure of Radiated spurious emissions(Above 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. The Hybrid antenna was placed at a location 3 m from the EUT, which is varied from 1m to 4 m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
  - Frequency Range = 30 MHz ~ 1 GHz
  - Detector = Peak
  - Trace = Maxhold
  - RBW = 100 kHz
  - VBW  $\geq$  3 x RBW
7. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)
8. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

## 7.2. 20 dB Bandwidth

### Test Configuration



### Test Procedure

The 20 dB bandwidth was measured by using a spectrum analyzer.

(Procedure 6.9.2 in ANSI 63.10-2013)

- 1) RBW = 1 %~5 % of the OBW
- 2) VBW = approximately three times RBW
- 3) Span = between two times and five times the OBW
- 4) Detector = Peak
- 5) Trace mode = Max hold
- 6) Allow the trace to stabilize

Note :

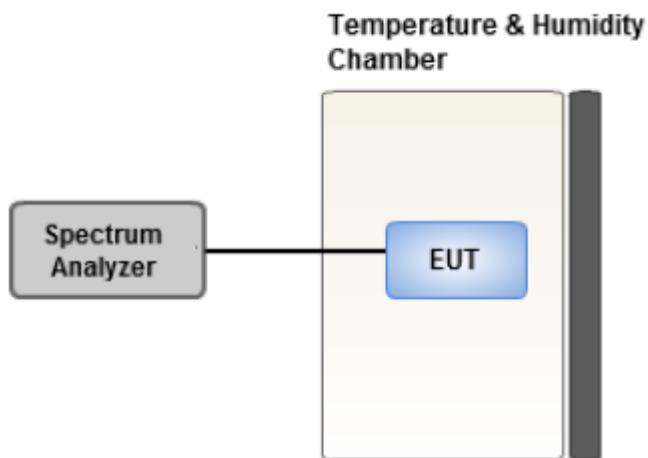
We tested Occupied Bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer.

### 7.3. Frequency Stability

#### Limit

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency.

#### Test Configuration



#### Test Procedure.

For battery operated equipment, the equipment tests shall be performed using a new battery.

- 1) Turn the EUT OFF and place it inside the environmental temperature chamber.  
For devices that have oscillator heaters, energize only the heater circuit.
- 2) Set the temperature control on the chamber to the highest specified in the regulatory requirements  
for the type of device and allow the oscillator heater and the chamber temperature to stabilize.
- 3) While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.
- 4) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency.

#### Note:

- 1) Temperature:  
The temperature is varied from  $-20\text{ }^{\circ}\text{C}$  to  $+50\text{ }^{\circ}\text{C}$  using an environmental chamber.
- 2) Primary Supply Voltage :  
The primary supply voltage is varied from 85 % to 115 % of the nominal value for non hand-



carried battery and AC powered equipment.

For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

#### 7.4. Worst case configuration and mode

##### Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
  - Mode : Stand alone
  - Worstcase : Stand alone
2. EUT Axis : X
3. All type and bitrate were investigated and the worst case results are reported.
  - Worst case : Type A, 106 kbps
4. All mode of without tag and with tag were investigated and the worst case configuration results are reported.
  - Worstcase : Without Tag
5. All position of loop antenna were investigated and the worst case configuration results are reported.
  - Position : Horizontal, Vertical, Parallel to the ground plane
  - Worstcase : Horizontal
6. HP200, HP200E, HP200-1, HP200-2, HP200-3, HP200E-1, HP200E-2, HP200E-3 were tested and the worst case results are reported.
  - Worst case : HP200-02

##### AC Power line Conducted Emissions

1. We don't perform powerline conducted emission test. Because this EUT is used DC.

##### 20 dB Bandwidth & Frequency Stability

1. All type and bitrate were investigated and the worst case results are reported.
  - Worst case : Type A, 106 kbps
2. HP200, HP200E were tested and the worst case results are reported.
  - Worst case : HP200



## 8. TEST SUMMARY

Regulation	Requirement	Result
Part 15.225 (a)	Radiated Electric Field Emissions (13.553 MHz to 13.567 MHz)	Pass
Part 15.225 (b)	Radiated Electric Field Emissions ( $13.410 \leq f \leq 13.553$ , $13.567 \leq f \leq 13.710$ )	Pass
Part 15.225 (c)	Radiated Electric Field Emissions ( $13.110 \leq f \leq 13.410$ , $13.710 \leq f \leq 14.010$ )	Pass
Part 15.209	Radiated Electric Field Emissions (9 kHz to 30 MHz)	Pass
Part 15.209	Radiated Electric Field Emissions (30 MHz to 1 GHz)	Pass
Part 15.225 (e)	Frequency Stability	Pass
Part 15.207	AC power conducted emissions (150 kHz to 30 MHz)	Pass
Part 15.215 (c)	20 dB Bandwidth	Pass

## 9. TEST RESULT

### 9.1. Operation within the band 13.110 MHz – 14.010 MHz

- HP200-02

Measured Frequency Range :

13.553 MHz-13.567 MHz

Frequency (MHz)	Read Level (dB $\mu$ V/m) @3 m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dB $\mu$ V/m) @30 m	Limit (dB $\mu$ V/m) @30 m	Margin (dB)
13.560 1	<b>32.52</b>	19.67	-40.00	X-H	12.19	84.00	71.81
13.559 3	29.86	19.67	-40.00	X-V	9.53	84.00	74.47

Measured Frequency Range :

13.410 MHz-13.553 MHz and 13.567 MHz-13.710 MHz

Frequency (MHz)	Read Level (dB $\mu$ V/m) @3 m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dB $\mu$ V/m) @30 m	Limit (dB $\mu$ V/m) @30 m	Margin (dB)
13.553 1	27.98	19.67	-40.00	X-H	7.65	50.47	42.82
13.567 0	27.37	19.67	-40.00	X-H	7.04	50.47	43.43

Measured Frequency Range :

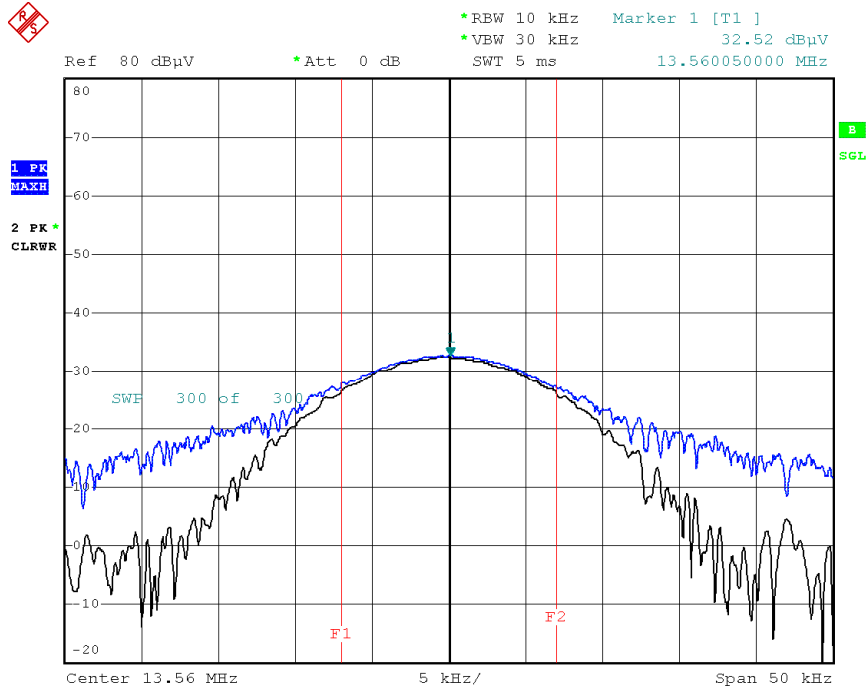
13.110 MHz – 13.410 MHz and 13.710 MHz-14.010 MHz

Frequency (MHz)	Read Level (dB $\mu$ V/m) @3 m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dB $\mu$ V/m) @30 m	Limit (dB $\mu$ V/m) @30 m	Margin (dB)
13.410 0	9.41	19.67	-40.00	X-H	-10.92	40.51	51.43
13.774 0	14.18	19.67	-40.00	X-H	-6.15	40.51	46.66



Test Plot

13.553 MHz ~ 13.567 MHz\_HP200



Date: 6.AUG.2021 11:03:19

Note:

Plot of worst case are only reported.

- HP200E-02

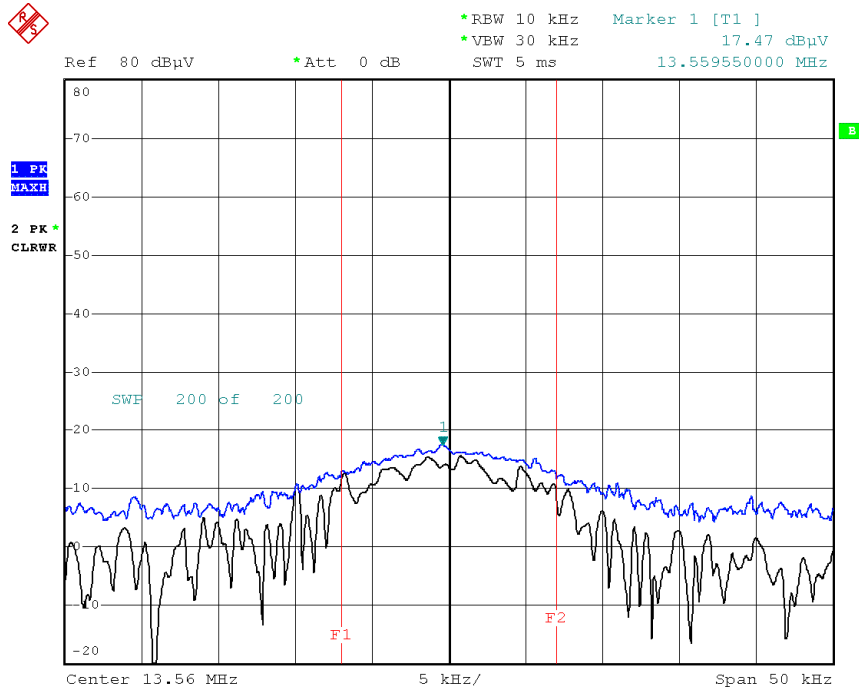
Measured Frequency Range :

13.553 MHz-13.567 MHz

Frequency (MHz)	Read Level (dB $\mu$ V/m) @3 m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dB $\mu$ V/m) @30 m	Limit (dB $\mu$ V/m) @30 m	Margin (dB)
13.560 1	<b>17.47</b>	19.67	-40.00	X-H	-2.86	84.00	86.86
13.559 3	16.25	19.67	-40.00	X-V	-4.08	84.00	88.08

☐ Test Plot

13.553 MHz ~ 13.567 MHz\_ HP200E



Date: 6.AUG.2021 12:07:59

**Note:**

Plot of worst case are only reported.

## 9.2. Radiated Emission 9 kHz – 30 MHz

### - HP200-02

Measured Frequency Range :

9 kHz - 30 MHz

Frequency (MHz)	Read Level (dB $\mu$ V/m) @3 m	Ant.Factor +Cable Loss (dB/m)	Distance Correction (dB)	Ant. POL	Total (dB $\mu$ V/m) @30 m	Limit (dB $\mu$ V/m) @30 m	Margin (dB)
7.006 0	9.56	19.53	-40.00	2nd-H	-10.91	29.54	40.45
21.178 0	8.69	20.24	-40.00	2nd-H	-11.07	29.54	40.61
28.212 0	8.69	20.19	-40.00	2nd-H	-11.12	29.54	40.66
28.358 0	8.92	20.19	-40.00	2nd-V	-10.89	29.54	40.43



### 9.3. Radiated Emission 30 MHz – 1000 MHz

#### - HP200-02

Measured Frequency Range :

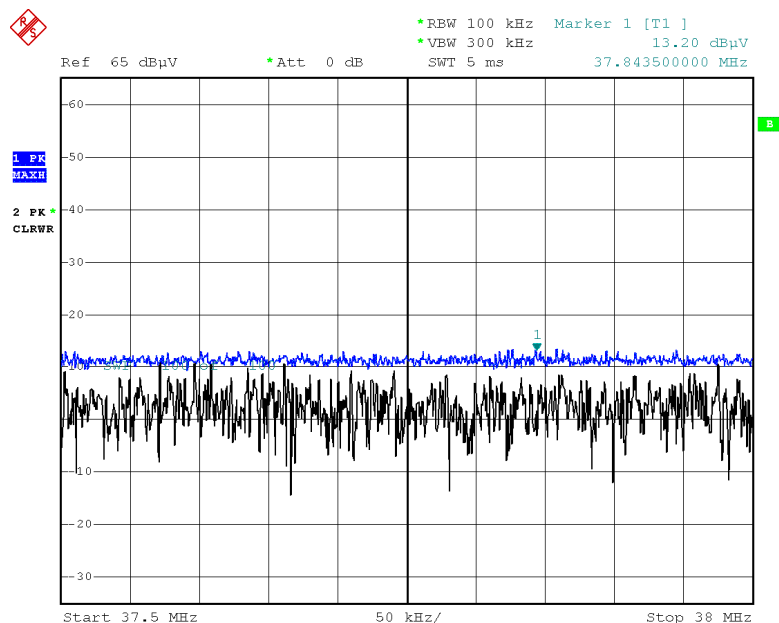
30 MHz - 1000 MHz

Frequency (MHz)	Read Level (dB $\mu$ V/m) @3 m	Ant.Factor (dB/m)	Cable Loss (dB)	Ant. Pol (H/V)	Total (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
#37.843 5	13.200	18.40	0.51	V	32.11	40.00	7.89
60.266 0	12.510	18.80	0.72	V	32.03	40.00	7.97
#73.549 0	12.870	16.90	0.77	V	30.54	40.00	9.46
84.354 0	12.730	14.10	0.84	H	27.67	40.00	12.33
#114.646 0	12.440	16.90	1.00	H	30.34	43.50	13.16
179.854 0	12.970	17.20	1.23	V	31.40	43.50	12.10

**Note:**

1. “#” is the result for restricted band.

**Test Plot**



Date: 6.AUG.2021 11:42:23

**Note:**

Plot of worst case are only reported

- HP200E-02

Measured Frequency Range :

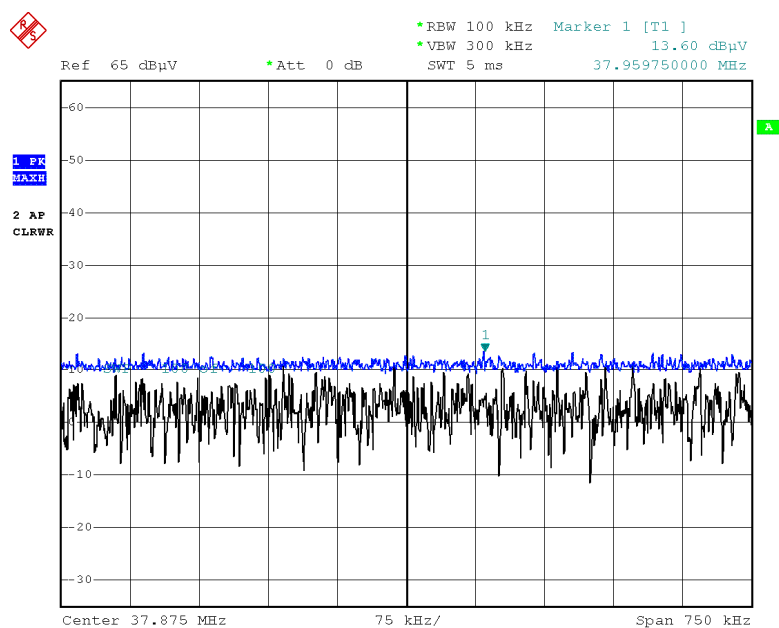
30 MHz - 1000 MHz

Frequency (MHz)	Read Level (dBμV/m) @3 m	Ant.Factor (dB/m)	Cable Loss (dB)	Ant. Pol (H/V)	Total (dBμV/m)	Limit (dBμV/m)	Margin (dB)
#37.959 8	13.600	18.40	0.51	V	32.51	40.00	7.49

**Note:**

1. “#” is the result for restricted band.

☐ Test Plot



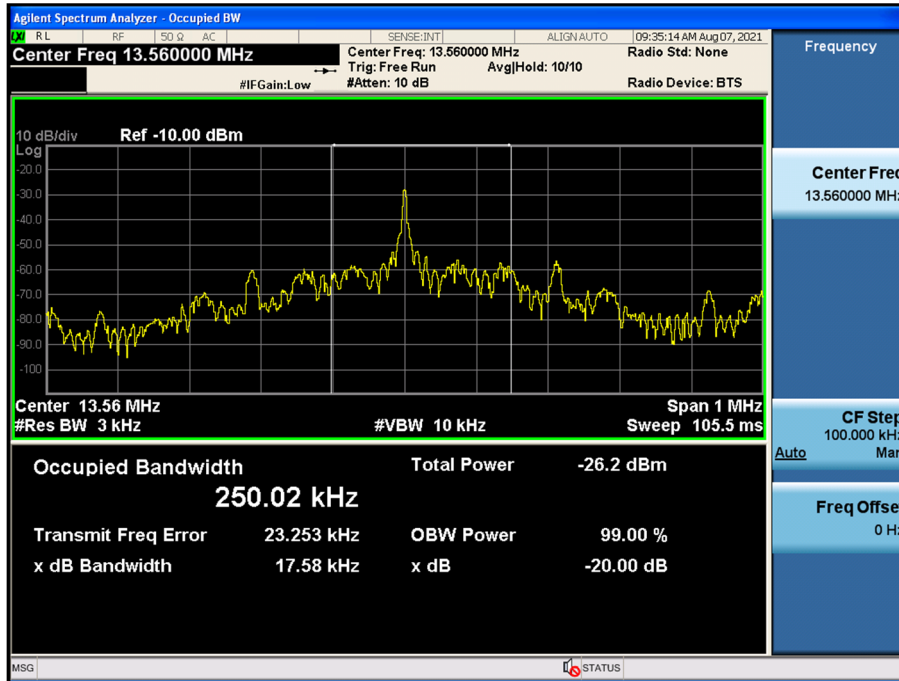
Date: 18.AUG.2021 14:55:38

**Note:**

Plot of worst case are only reported



### 9.4. 20 dB Bandwidth







### 9.5. Frequency Stability

**- HP200**

**Startup**

PERATING FREQUENCY: 13.56 MHz  
 REFERENCE VOLTAGE: 6.00 VDC  
 DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VDC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	6	-20	13.560 067	67	0.000 495 1
100%		-10	13.560 019	19	0.000 141 6
100%		0	13.560 081	81	0.000 596 0
100%		+10	13.560 038	38	0.000 280 7
100%		+20(Ref.)	13.560 077	77	0.000 565 8
100%		+30	13.560 003	3	0.000 021 9
100%		+40	13.560 061	61	0.000 449 4
100%		+50	13.560 097	97	0.000 718 2
LOW		5.1	+20	13.560 039	39
HIGH	6.9	+20	13.560 094	94	0.000 696 5



**2 minutes**

PERATING FREQUENCY: 13.56 MHz

REFERENCE VOLTAGE: 6.00 VDC

DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VDC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	6	-20	13.560 026	26	0.000 195 4
100%		-10	13.560 026	26	0.000 189 3
100%		0	13.560 095	95	0.000 699 7
100%		+10	13.560 012	12	0.000 089 5
100%		+20(Ref.)	13.560 054	54	0.000 400 6
100%		+30	13.560 029	29	0.000 213 3
100%		+40	13.560 067	67	0.000 490 5
100%		+50	13.560 100	100	0.000 735 8
LOW		5.1	+20	13.560 080	80
HIGH	6.9	+20	13.560 018	18	0.000 134 1



**5 minutes**

PERATING FREQUENCY: 13.56 MHz

REFERENCE VOLTAGE: 6.00 VDC

DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VDC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	6	-20	13.560 022	22	0.000 159 1
100%		-10	13.560 005	5	0.000 034 2
100%		0	13.560 040	40	0.000 298 1
100%		+10	13.560 099	99	0.000 727 9
100%		+20(Ref.)	13.560 041	41	0.000 301 8
100%		+30	13.560 029	29	0.000 214 2
100%		+40	13.560 062	62	0.000 457 7
100%		+50	13.560 034	34	0.000 252 7
LOW		5.1	+20	13.560 018	18
HIGH	6.9	+20	13.560 032	32	0.000 232 3



**10 minutes**

PERATING FREQUENCY: 13.56 MHz  
 REFERENCE VOLTAGE: 6.00 VDC  
 DEVIATION LIMIT: ±0.01 % = ±1356 Hz

Voltage	Power	Temp.	Frequency	Frequency Dev.	Frequency
(%)	(VDC)	(°C)	(MHz)	(Hz)	Dev (%)
100%	6	-20	13.560 097	97	0.000 718 3
100%		-10	13.560 023	23	0.000 168 7
100%		0	13.560 063	63	0.000 465 4
100%		+10	13.560 054	54	0.000 395 4
100%		+20(Ref.)	13.560 040	40	0.000 294 7
100%		+30	13.560 030	30	0.000 221 8
100%		+40	13.560 081	81	0.000 595 1
100%		+50	13.560 007	7	0.000 048 2
LOW		5.1	+20	13.560 054	54
HIGH	6.9	+20	13.560 066	66	0.000 485 3



## 10. LIST OF TEST EQUIPMENT

### Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	09/04/2021	Annual
Test Receiver	ESCI	Rohde & Schwarz	100033	06/15/2022	Annual
Temperature Chamber	SU-642	ESPAC	0093008124	03/15/2022	Annual
Signal Analyzer	N9020A	Agilent	MY47380318	01/28/2022	Annual
Signal Analyzer	N9030A	Agilent	MY49431210	01/11/2022	Annual
Power Meter	N1911A	Agilent	MY45100523	04/08/2022	Annual
Power Sensor	N1921A	Agilent	MY57820067	04/08/2022	Annual
Directional Coupler	87300B	Agilent	3116A03621	11/10/2021	Annual
Power Splitter	11667B	Hewlett Packard	05001	05/20/2022	Annual
DC Power Supply	E3632A	Hewlett Packard	KR75303960	06/10/2022	Annual
Attenuator (10 dB)	5910-N-50-010	H+S	00801	10/28/2021	Annual
Software	EMC32	Rohde & Schwarz	N/A	N/A	N/A
FCC WLAN&BT&BLE Conducted Test Software v3.0	FCC WLAN&BT&BLE Conducted Test Software v3.0	HCT CO., LTD.	N/A	N/A	N/A
Bluetooth Tester	CBT	Rohde & Schwarz	100422	05/04/2022	Annual

### Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

**Radiated Test**

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
Controller (Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	N/A	N/A	N/A
Controller	2090	Emco	060520	N/A	N/A
Turn Table	Turn Table	Ets	N/A	N/A	N/A
Loop Antenna	Loop Antenna	Rohde & Schwarz	1513-333	03/19/2022	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	09/04/2022	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1191	11/18/2021	Biennial
Horn Antenna (15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170541	11/29/2021	Biennial
Spectrum Analyzer	FSP (9 kHz ~ 30 GHz)	Rohde & Schwarz	836650/016	09/14/2021	Annual
Spectrum Analyzer	FSV40-N	Rohde & Schwarz	101068-SZ	09/22/2021	Annual
Band Reject Filter	WRCJV2400/2483.5-2370/2520-60/12SS	Wainwright Instruments	2	01/06/2022	Annual
Band Reject Filter	WRCJV5100/5850-40/50-8EEK	Wainwright Instruments	1	02/08/2022	Annual
Attenuator (10 dB)	CBLU1183540B-01	CERNEX	N/A	12/23/2021	Annual
56-10	56-10	WEINSCHTEL			
Broadband Low Noise Amplifier	CBL06185030	CERNEX	N/A	12/23/2021	Annual
Attenuator (3 dB)	18B-03	Api tech.			
High Pass Filter	WHKX10-2700-3000-18000-40SS	Wainwright Instruments	N/A	12/23/2021	Annual
High Pass Filter	WHKX8-6090-7000-18000-40SS	Wainwright Instruments	N/A	12/23/2021	Annual
Thru	COAXIAL ATTENUATOR	T&M SYSTEM	N/A	12/23/2021	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/04/2021	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/23/2022	Annual
Bluetooth Tester	TC-3000C	TESCOM	3000C000276	03/09/2022	Annual

**Note:**

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
3. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5(Version : 2017).



### 11. ANNEX A\_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2108-FC033-P