

HOTECK INC.

TEST REPORT

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Radio Spectrum

TEST REPORT

Applicant:	HOTECK INC. 1F, No. 82, Sancun Rd., Fengyuan Dist., Taichung City 42047 Taiwan
Product:	Remote Controller
Model No.:	HTT20085A0, HTT20085B0, HTT20085B1, HTT20085B2
FCC ID:	2AWBS20085
Brand Name:	NIL
Test Method/ Standard:	47 CFR FCC Part 15.231
Test By:	Intertek Testing Services Taiwan Ltd., Hsinchu Laboratory No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li, Shiang-Shan District, Hsinchu City, Taiwan



Prepared and Checked by:

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Engineer

Revision History

Report No.	Issue Date	Revision Summary
200500176TWN-001	Jul. 22, 2020	Original report

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Summary of Test Data

Test Requirement	Applicable Rule	Result
Radiated Emission test	15.231(b), 15.209	Pass
Measured bandwidth	15.231(c)	Pass
Timing requirement of manually operated transmitter	15.231(a)(1)	Pass
Conducted Emission test	15.207	N/A
Antenna Requirement	15.203	Pass

Note: Please note that the test results with statement of conformity, the decision rules which are based on: Safety Testing: the specification, standard or IEC Guide 115.

Other Testing: the specification, standard and not taking into account the measurement uncertainty.

1. General Information

1.1 Identification of the EUT

Product:	Remote Controller
Model No.:	HTT20085A0
Operating Frequency:	433.908 MHz
Channel Number:	Single channel
Access scheme:	DSSS
Rated Power:	DC 3V from battery
Power Cord:	N/A
Sample receiving date:	May 26, 2020
Sample condition:	Workable
Test Date(s):	May 27, 2020 ~ Jun. 16, 2020

1.2 Additional Information about the EUT

The customer confirmed the models listed as below were series model to model HTT20085A0 (EUT), the difference between main model and series model are listed as below.

Model Number	Different
HTT20085A0	Black/ With out reversed Key / Dim key
HTT20085B0	Black/With reversed Key (Disable)/ Timer key
HTT20085B1	White/With reversed Key (Disable)/ Timer key
HTT20085B2	Black/With reversed Key(Enable) / Timer key

1.3 Antenna description

Antenna Type : Printed antenna

Connector Type : Fixed

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 2.1053 and the requirement in FCC Part 15 Subpart C Section 15.231.

2.2 Operation mode

TX mode: Press EUT button to transmit.

The signal is maximized through rotation and placement in the three orthogonal axes.



X axis



Y axis



Z axis

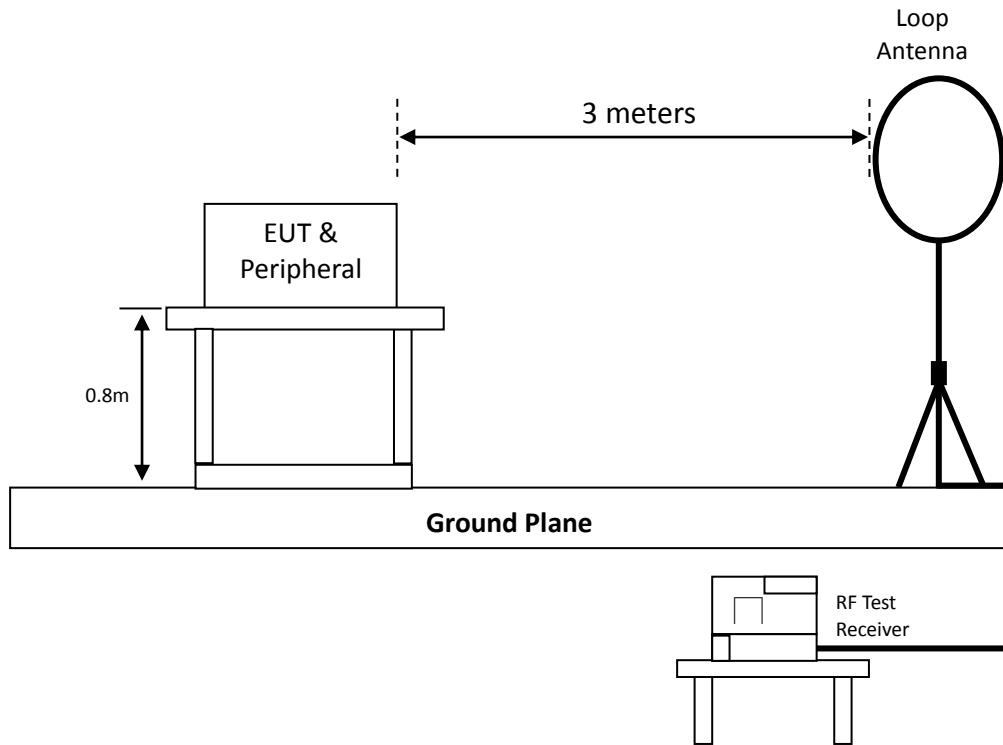
After verifying three axes, we found the maximum electromagnetic field was occurred at X axis. The final test data was executed under this configuration.

2.3 Peripherals equipment

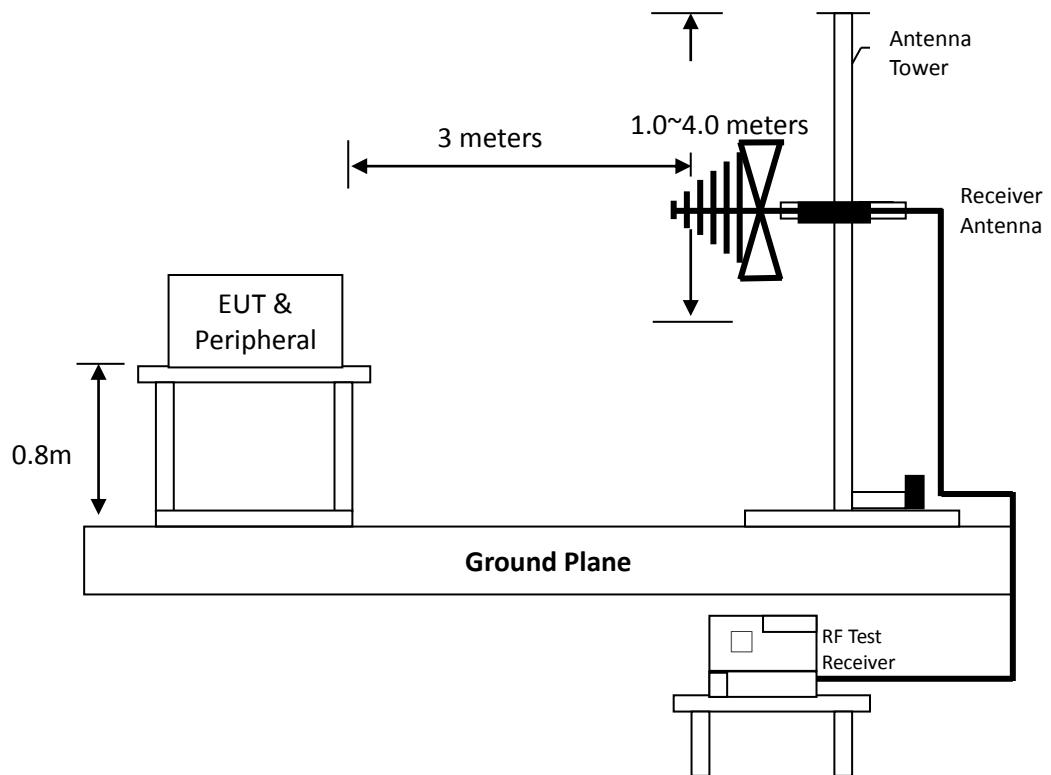
Peripherals	Brand	Model No.	Serial No.	Data cable
Battery	KTS	CR2032	N/A	N/A

3. Radiated emission test FCC 15.231 (b)**3.1 Operating environment**

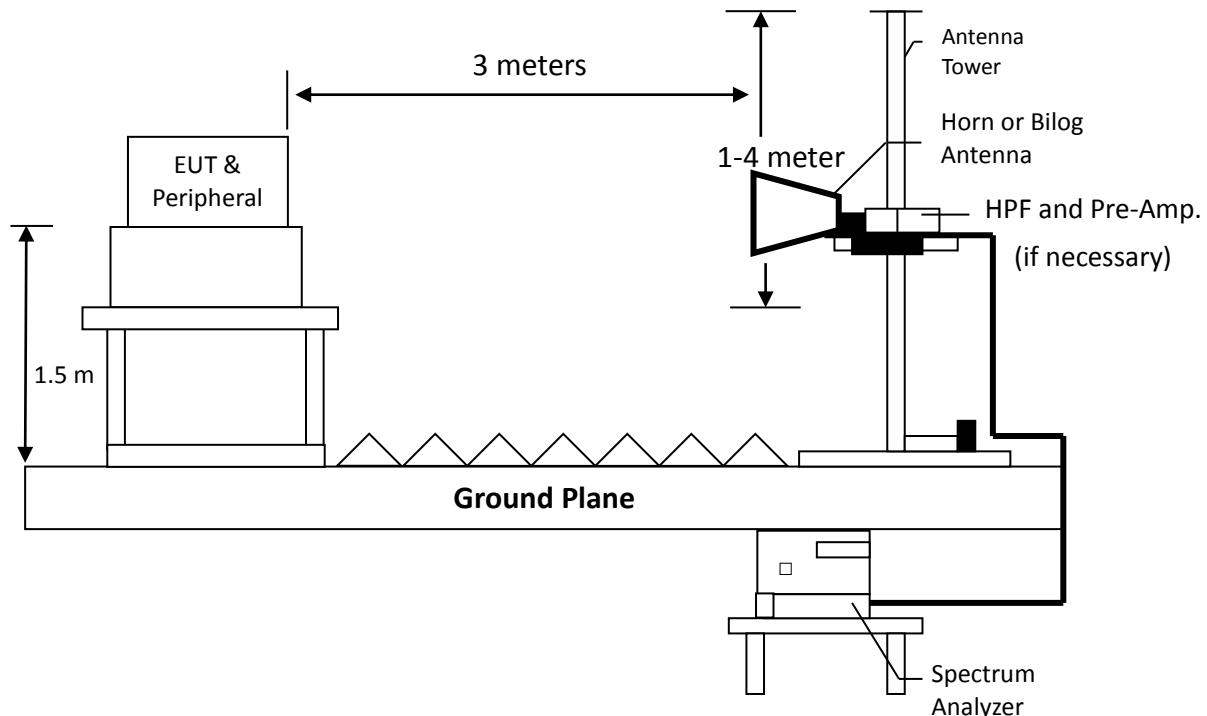
Temperature: 28 °C
Relative Humidity: 55 %

3.2 Test setup & procedure**3.2.1 Radiated emission from 9kHz to 30MHz uses Loop Antenna:**

3.2.2 Radiated emission below 1GHz using Bilog Antenna



3.2.3 Radiated emission above 1GHz using Horn Antenna



3.3 Radiated emission limit

3.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(uV/m@3 m)	(dBuV/m@3 m)	(uV/m@3 m)	(dBuV/m@3 m)
433.908	10999.6	80.82	1099.9	60.82

3.3.2 General radiated emission limit

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency MHz	15.209 Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

3.4 Radiated emission test data FCC 15.231**3.4.1 Measurement results: Fundamental emission**

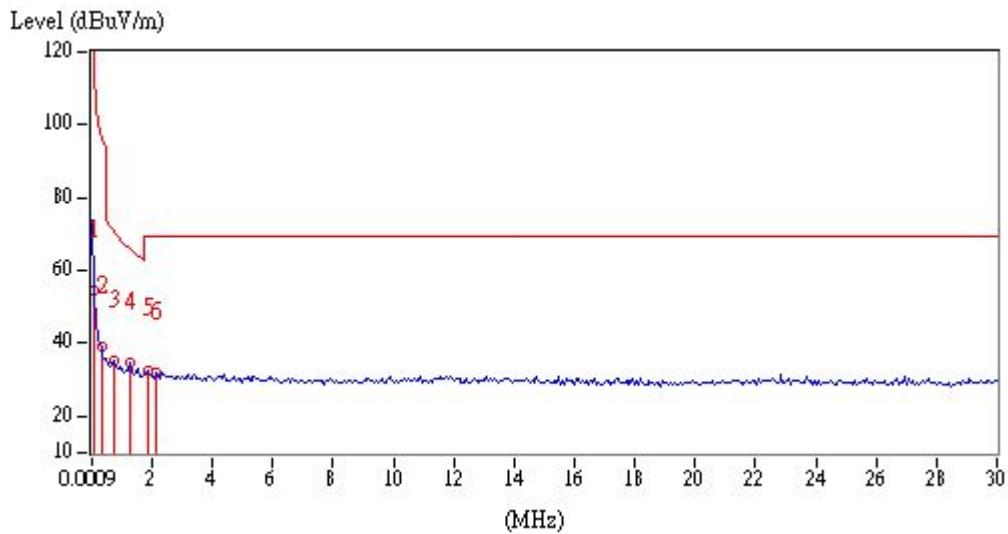
Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dB μ V)	Corrected Reading (dB μ V/m)	Limit @ 3 m (dB μ V/m)	Margin (dB)
Pulse	433.908	PK	V	25.67	40.28	65.95	100.82	-34.87
	433.908	AV	V	25.67	30.93	56.60	80.82	-24.22
	433.908	PK	H	25.67	50.85	76.52	100.82	-24.30
	433.908	AV	H	25.67	40.93	66.60	80.82	-14.22

Remark: Correction Factor = Antenna Factor + Cable Loss

3.4.2 Measurement results: frequencies equal to or less than 1 GHz

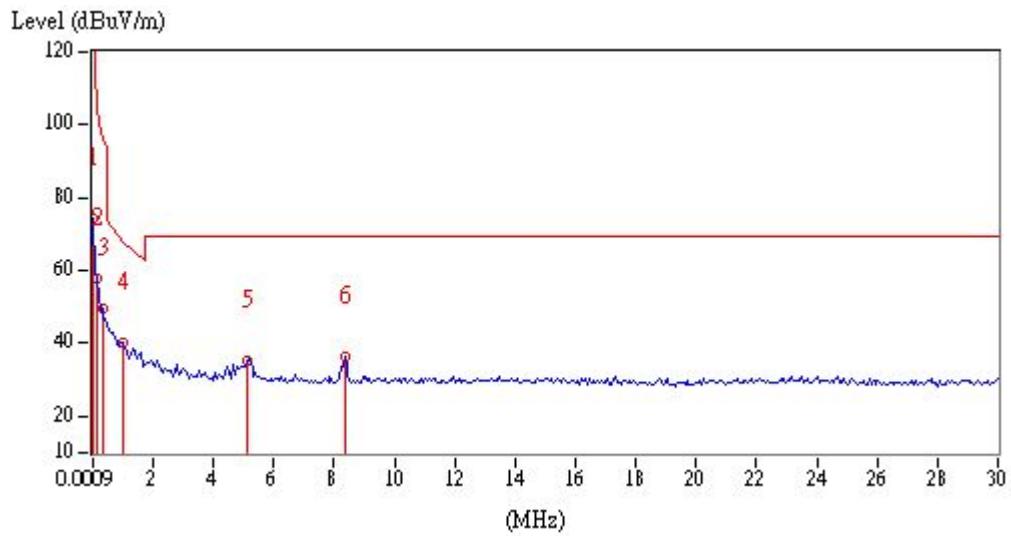
EUT: HTT20085A0

Polarity (circle)	Frequency (MHz)	Spectrum Analyzer Detector	Factor (dB/m)	Reading (dB μ V)	Value (dB μ V/m)	Limit @ 3m (dB μ V/m)	Margin (dB)
Perpendicular	0.07	AV	18.36	36.34	54.70	110.70	-56.00
Perpendicular	0.31	AV	18.52	20.38	38.90	97.78	-58.88
Perpendicular	0.73	QP	18.45	16.71	35.16	70.34	-35.18
Perpendicular	1.27	QP	18.46	16.22	34.68	65.53	-30.85
Perpendicular	1.87	QP	18.47	14.34	32.81	69.54	-36.73
Perpendicular	2.11	QP	18.47	13.36	31.83	69.54	-37.71



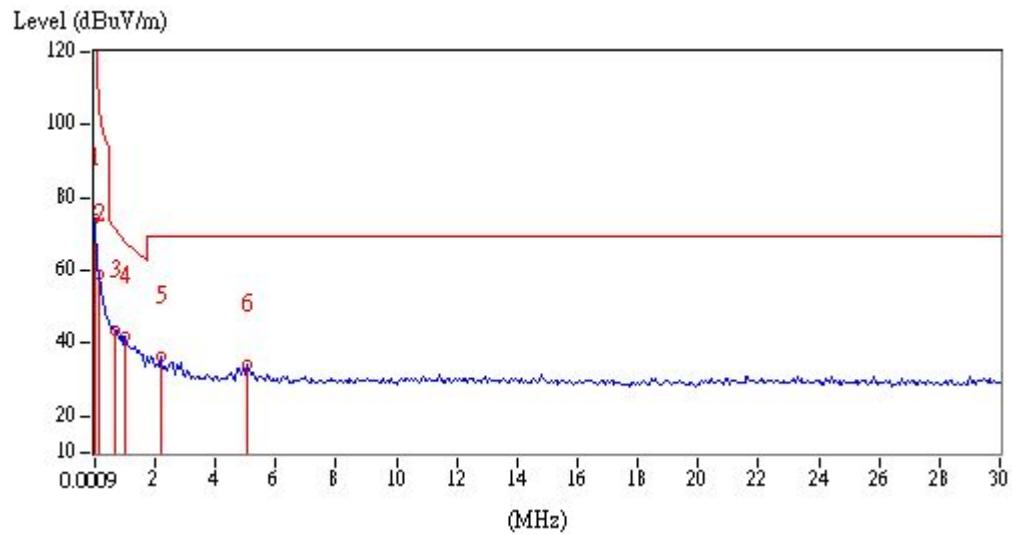
EUT: HTT20085A0

Polarity (circle)	Frequency (MHz)	Spectrum Analyzer Detector	Factor (dB/m)	Reading (dB μ V)	Value (dB μ V/m)	Limit @ 3m (dB μ V/m)	Margin (dB)
Parallel	0.01	AV	18.28	55.91	74.19	127.60	-53.41
Parallel	0.13	AV	17.91	39.94	57.85	105.33	-47.48
Parallel	0.31	AV	18.52	31.23	49.75	97.78	-48.03
Parallel	1.03	QP	18.46	21.74	40.20	67.35	-27.15
Parallel	5.11	QP	19.23	16.05	35.28	69.54	-34.26
Parallel	8.35	QP	19.98	16.38	36.36	69.54	-33.18



EUT: HTT20085A0

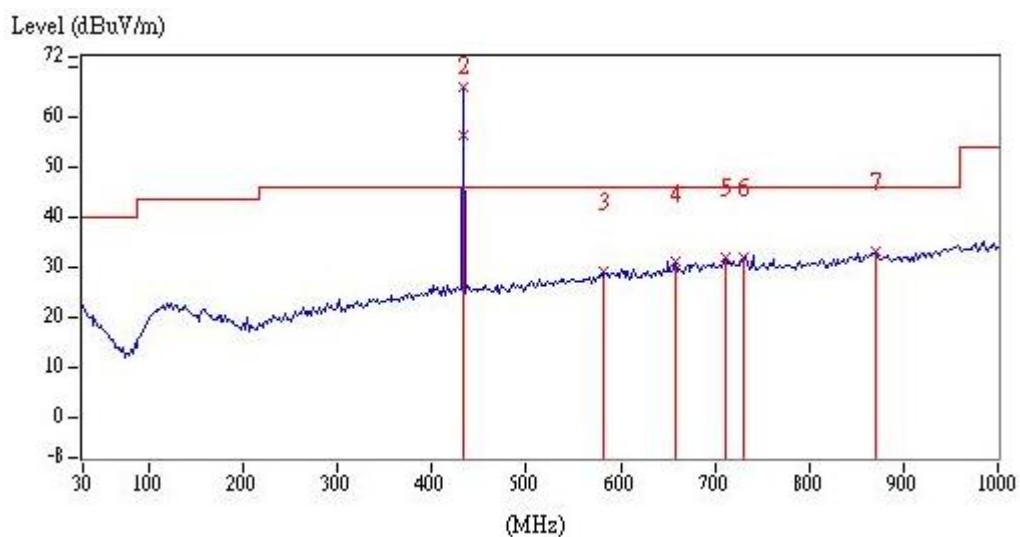
Polarity (circle)	Frequency (MHz)	Spectrum Analyzer Detector	Factor	Reading (dB μ V)	Value (dB μ V/m)	Limit @ 3m (dB μ V/m)	Margin (dB)
Ground-parallel	0.01	AV	18.28	56.07	74.35	127.60	-53.25
Ground-parallel	0.13	AV	17.91	41.23	59.14	105.33	-46.19
Ground-parallel	0.67	QP	18.45	25.20	43.65	71.08	-27.43
Ground-parallel	1.03	QP	18.46	23.30	41.76	67.35	-25.59
Ground-parallel	2.17	QP	18.47	17.78	36.25	69.54	-33.29
Ground-parallel	5.05	QP	19.22	14.76	33.98	69.54	-35.56



EUT: HTT20085A0

Ant. Pol. (H/V)	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dB μ V)	Corrected Reading (dB μ V/m)	Limit @ 3 m (dB μ V/m)	Margin (dB)
Vertical	582.90	QP	27.91	1.46	29.37	60.82	-31.45
Vertical	658.56	QP	29.04	1.98	31.02	60.82	-29.80
Vertical	710.94	QP	29.89	2.23	32.12	60.82	-28.70
Vertical	730.34	QP	30.01	1.99	32.00	60.82	-28.82
Vertical	870.02	QP	31.49	1.76	33.25	60.82	-27.57

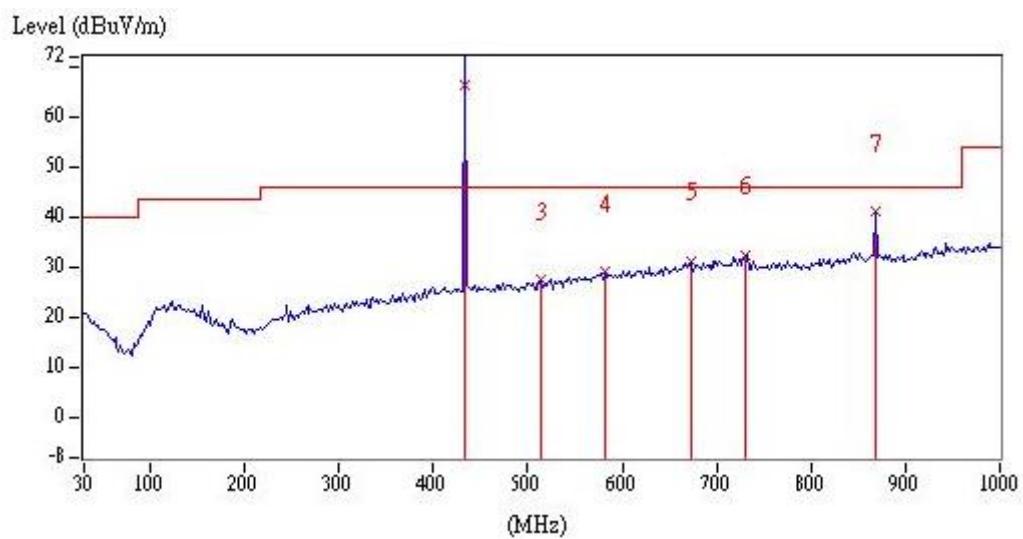
Remark: Corr. Factor = Antenna Factor + Cable Loss



EUT: HTT20085A0

Ant. Pol. (H/V)	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dB μ V)	Corrected Reading (dB μ V/m)	Limit @ 3 m (dB μ V/m)	Margin (dB)
Horizontal	513.06	QP	26.71	0.83	27.54	60.82	-33.28
Horizontal	582.90	QP	27.91	1.19	29.10	60.82	-31.72
Horizontal	672.14	QP	29.30	1.96	31.26	60.82	-29.56
Horizontal	730.34	QP	30.01	2.53	32.54	60.82	-28.28
Horizontal	867.80	QP	31.48	9.69	41.17	60.82	-19.65

Remark: Corr. Factor = Antenna Factor + Cable Loss



3.4.3 Measurement results: frequency above 1GHz

EUT: HTT20085A0

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dB μ V)	Corrected Reading (dB μ V/m)	Limit @ 3 m (dB μ V/m)	Margin (dB)
1735.60	PK	V	31.91	13.69	45.60	80.82	-35.22
1301.70	PK	H	30.17	13.24	43.41	80.82	-37.41
1735.60	PK	H	31.91	18.79	50.70	60.82	-10.12

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre_Amplifier Gain

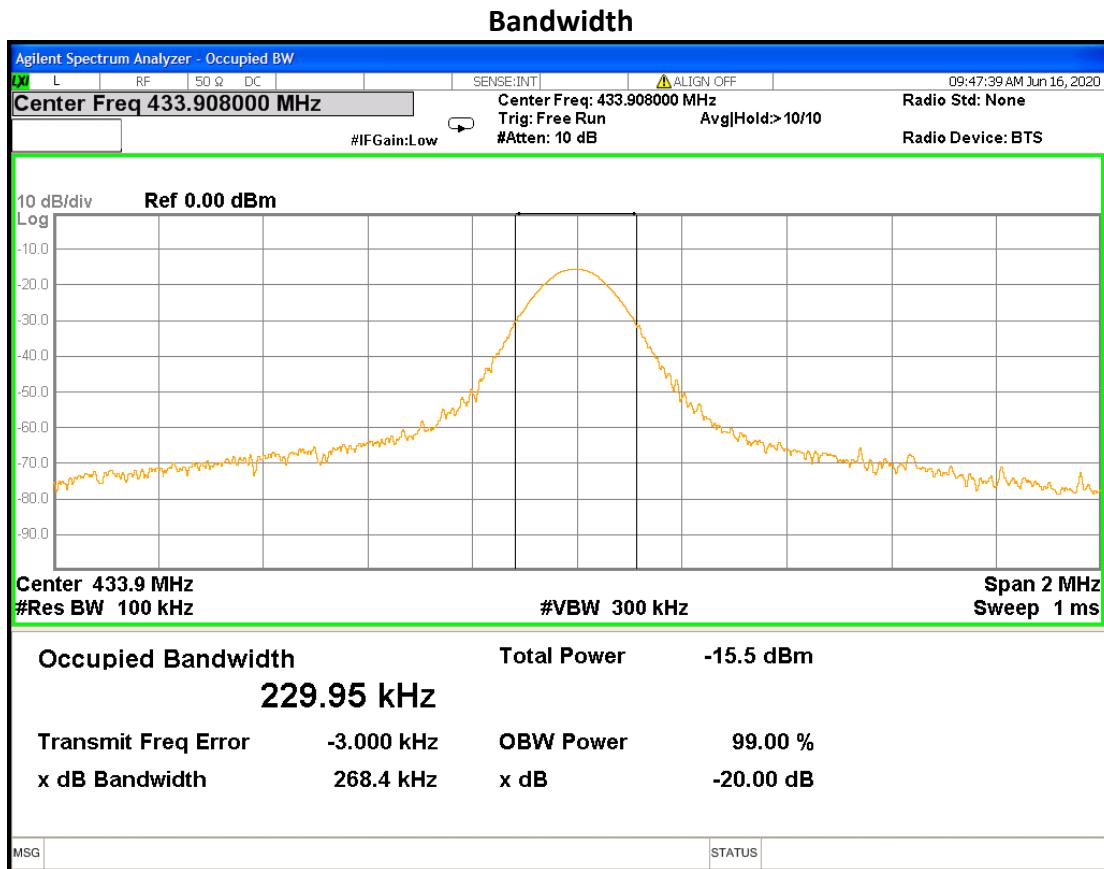
4. Measured bandwidth FCC 15.231(C)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20dB down from the modulated carrier.

$$B.W(20\text{dBc}) \text{ Limit} = 0.25\% \times f(\text{MHz}) = 0.25\% \times 433.908 \text{ MHz} = 1.085 \text{ MHz}$$

From the plot, the bandwidth is observed to be 268.4 kHz at 20dBc, where the bandwidth limit is 1.08497 MHz.

Please see the plot below.



5. Timing requirement of manual activation operated transmitter**A transmitter manual activation shall cease transmission within 5 seconds after activation****Transmitter pulse duration**

6. Conducted emission FCC 15.207

Since the EUT is not connected to AC source, therefore, the test can be waived.

Appendix A: Test equipment list

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	Rohde & Schwarz	ESR-7	101232	2020/01/18	2021/01/16
Signal Analyzer	Agilent	N9030A	MY51380492	2019/08/21	2020/08/19
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONI C	FMZB1519	1519-067	2020/04/13	2021/04/12
Bi_log Hybrid Antenna	ETC	MCTD 2786B	BLB17J04019 & JB-5-019	2019/07/12	2020/07/10
Horn Antenna	SHWARZBECK	BBHA 9120 D	9120D-456	2020/01/20	2021/01/18
966-2(A) Cable	SUHNER	SMA / EX 100	N/A	2019/08/19	2020/08/17
966-2(B) Cable	SUHNER	SUCOFLEX 104P	CB0005	2019/08/19	2020/08/17
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2020/02/23	2021/02/22

Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of $k=2$.

Item	Uncertainty
Timing requirement of manually operated transmitter	1.15 dB
20dB Bandwidth	7.69 %
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	2.99 dB
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	4.90 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	4.89 dB
Vertically polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	4.29 dB
Horizontally polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	4.29 dB
AC Power Line Conducted Emission	2.52 dB