

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

OF

Applicant: Mobilehelp, LLC
5050 Conference Way N, Suite 125, Boca Raton, FL 33431,
United States of America

Product Name: Wall Mount Button IP67

Brand Name: MobileHelp

Model No.: DC-HBWM2-02

Model Difference: N/A

Report Number: ER/2019/A0132

FCC ID PXT-DC-HBWM2-02

FCC Rule Part Part 15.231

Issue Date: Dec. 04, 2019

Date of Test: Oct. 28, 2019 ~ Nov. 27, 2019

Date of EUT Received: Oct. 28, 2019

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.231.

The test results of this report relate only to the tested sample identified in this report

Approved By:

Jazz Huang

Jazz Huang / Asst. Supervisor



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Revision History

Revision	Description	Issue Date	Remark
Rev.00	Original.	Dec. 04, 2019	Revised By: Yuri Tsai

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1 GENERAL INFORMATION

1.1 Product Description

Product Name:	Wall Mount Button IP67
Brand Name:	MobileHelp
Model No.:	DC-HBWM2-02
Model Difference:	N/A
Hardware Version:	N/A
Software Version:	N/A
Power Supply:	3V lithium battery CR2032

Radio Technology:	433 MHz Short Range Radio
Operating Frequency	433.92MHz
Transmit Power	≤ 68.24 dBuV/m Max.
Modulation Technique	ASK
Number of Channels	1 Channel
Antenna Type	PCB Antenna

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1.2 Test Methodology

FCC Part 15, Subpart C §15.231
ANSI C63.10:2013

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory . (TAF code 0513)
No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan
24803
FCC Designation number: TW0001

1.4 Special Accessories

There are no special accessories used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

1.6 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*9m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.
There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

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

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. The Tx frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m 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 transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

EUT(TX)

Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
	N/A					

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	N/A
§15.231	Radiated Emission	Compliant
§15.231(c)	20dB Bandwidth	Compliant
§15.35 (c)	Duty Cycle Test (Pulse Modulation)	Compliant
§15.231(a)(1)	Release Time Measurement	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 Operated in 433.92 MHz Band

1 channels is provided

CH	FREQUENCY
01	433.92MHZ

4.2 The Worst Test Modes and Channel Details

RADIATED EMISSION TEST (BELOW 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	ANTENNA PORT
433 MHz	1	1	ASK	MAIN
RADIATED EMISSION TEST (ABOVE 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	ANTENNA PORT
433 MHz	1	1	ASK	MAIN

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 433MHz Transmitter for channel Low, Mid and High, the worst case E2 position was reported.

ANTENNA PORT CONDUCTED TEST				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	ANTENNA PORT
433 MHz	1	1	ASK	MAIN

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 1.55 dB
20dB Bandwidth	+/- 123.36 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Frequency Separation	+/- 123.36 Hz
Number of hopping frequency	+/- 123.36 Hz
Time of Occupancy	+/- 123.36 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission Measurement Uncertainty	
Polarization: Vertical	9kHz~30MHz: +/-2.3dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB
Polarization: Horizontal	9kHz~30MHz: +/-2.3dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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6 CONDUCTED EMISSIONS TEST

6.1 Standard Applicable

According to §15.207 and frequency within 150 kHz to 30MHz shall not exceed the limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

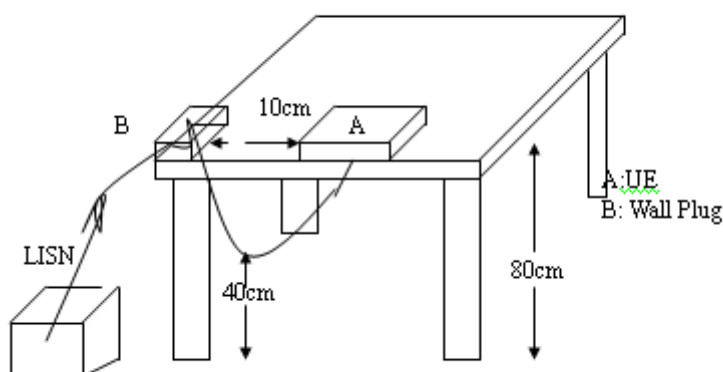
6.2 Measurement Equipment Used:

N/A

6.3 EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

6.4 Test SET-UP (Block Diagram of Configuration)



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6.5 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

6.6 Measurement Result

N/A; The EUT powered from 3V lithium battery CR2032.

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7 RADIATED EMISSION TEST

7.1 Standard Applicable

According to 15.231(b), the field strength of emissions from Intentional Radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental		Field Strength of Spurious	
	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)
40.66 - 40.70	67.04	2,250	47	225
70 - 130	61.94	1,250	41.9	125
130 - 174	* 61.94 - 71.48	* 1,250 - 3,750	* 41.9 - 51.48	* 125 to 375
174 - 260	71.48	3,750	51.48	375
260 - 470	* 71.48 - 81.94	* 3,750 - 12,500	* 51.48 - 54	* 375 to 1250
above 470	81.94	12,500	74	1250

7.2 Remark:

1. Emission level in dBuV/m = $20 \log (\text{uV/m})$
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of § 15.205
4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of § 15.205, then the general radiated emission limits in § 15.209 apply.
5. For the band 130-174MHz, uV/m at 3meters = $56.81818(F) - 6136.3636$; For the band 260-470MHz uV/m at 3meters = $41.6667(F) - 7083.3333$; Where F is the frequency in MHz.
6. $433.92 \text{ MHz limit} = 41.6667 * 433.92 - 7083.3333 = 10996.6812 \text{ uV/m} = 80.82 \text{ dBuV/m}$

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7.3 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until all frequency of the interest measured were complete.

7.4 Auxiliary Procedure (Setting on Spectrum to capture the reading of emission level):

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Test was measured starting from 9kHz to 10th harmonic of the fundamental frequency, and data containing the worst result above 30MHz are shown on the test report.

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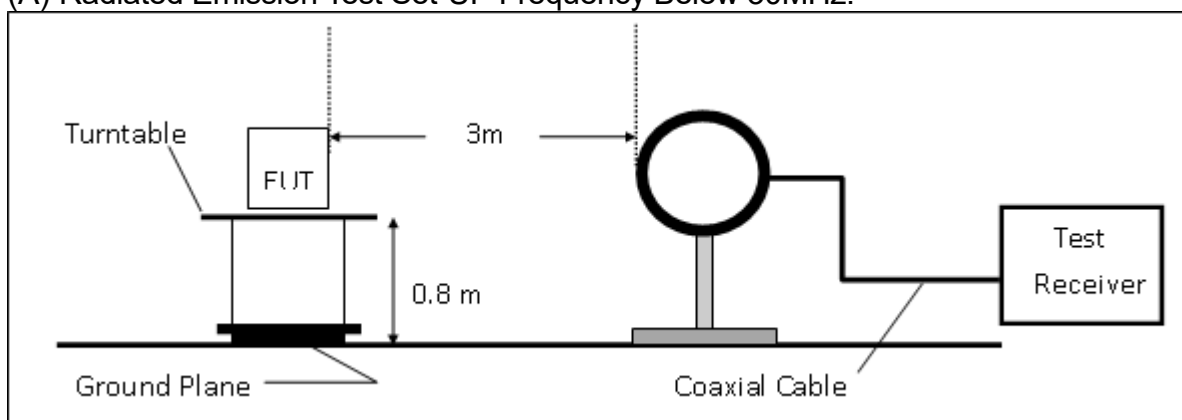
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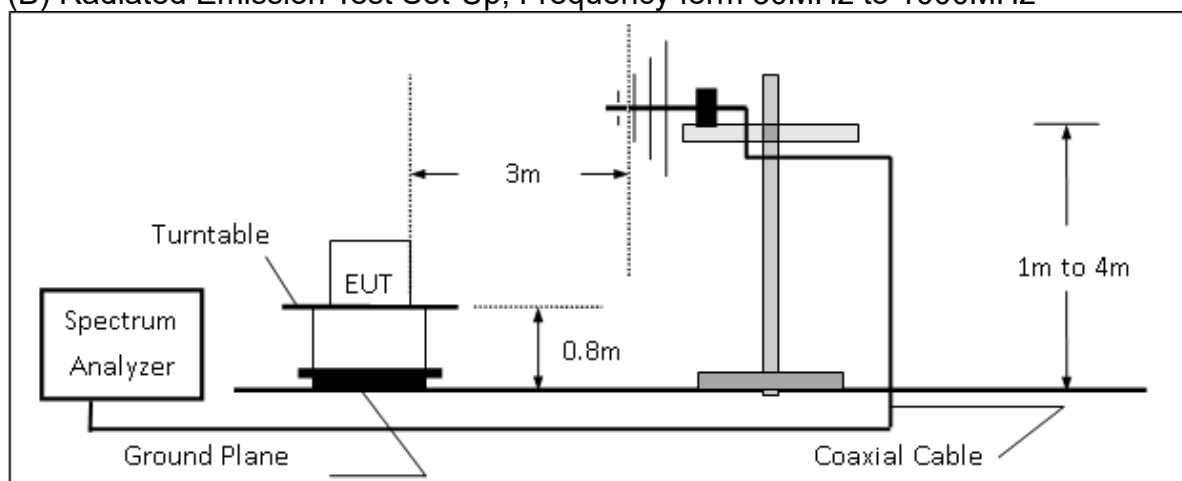
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7.5 Test SET-UP (Block Diagram of Configuration).

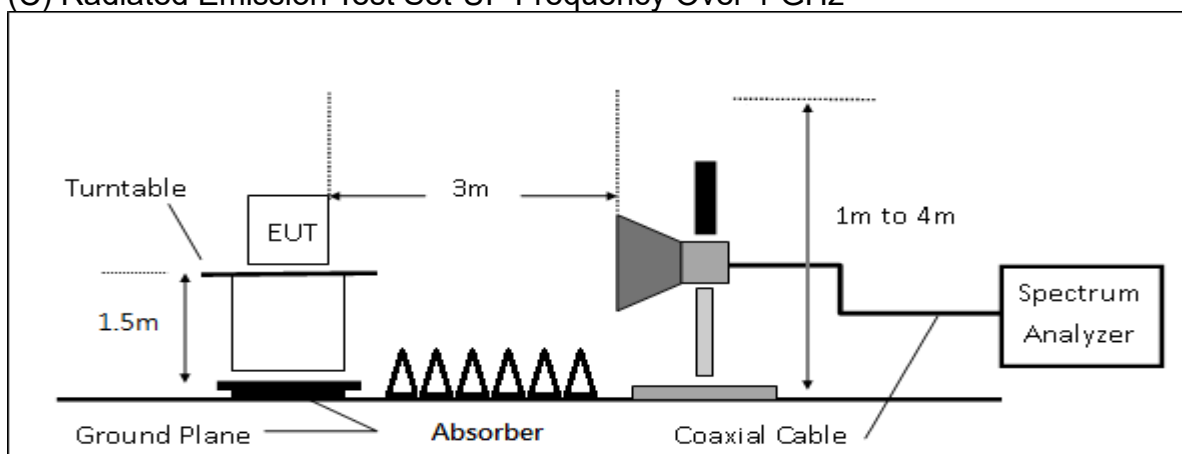
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-UP, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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7.6 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWAZBECK	VULB9168	378	01/04/2019	01/03/2020
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/20/2019	08/19/2020
3m Site NSA	SGS	966 chamber	N/A	01/02/2019	01/01/2020
Loop Antenna	ETS.LINDGREN	6502	148045	10/15/2019	10/14/2020
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	04/22/2019	04/21/2020
Pre-Amplifier	HP	8449B	3008A00578	01/02/2019	01/01/2020
Pre-Amplifier	HP	8447D	2944A07676	01/02/2019	01/01/2020
1GHz High Pass Filter	Micro-Tronics	HPM50108	32	01/02/2019	01/01/2020
Low Loss Cable	Huber Suhner	966_RX	9	01/02/2019	01/01/2020

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7.7 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Remark:

The limit of the emission level is expressed in dBuV/m, which converts $20 \cdot \log(uV/m)$

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

7.8 Test Results of Radiated Spurious Emissions form 9 KHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

7.9 Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

7.10 Measurement Result

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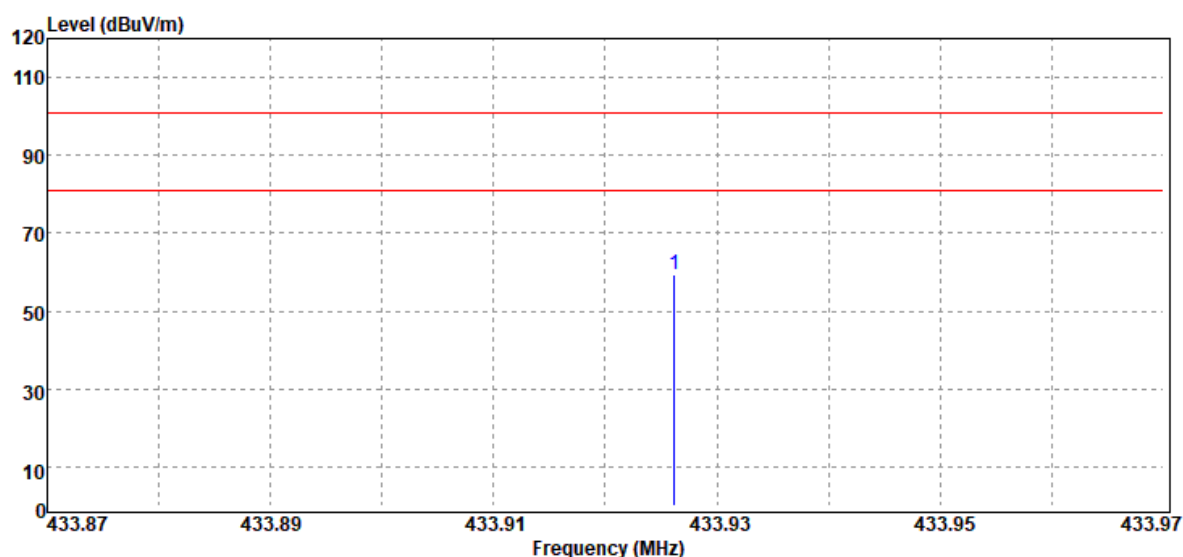
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7.10.1 Radiated emission Main

Report Number	:ER/2019/A0132	Test Date	:2019-11-26
Operation Mode	:433M	Temp./Humi.	:24.3/58
Test Channel	:433.92 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Main	Engineer	:Kane
EUT Pol	:E2 Plane		



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dB μ V	dB	dB μ V/m	dB μ V/m	dB
433.93	Peak	63.08	-3.60	59.48	100.82	-41.34
433.93	Average	---	-8.00	51.48	80.82	-29.34

Note: Average Actual = Peak Actual + Average Factor (-8.00)

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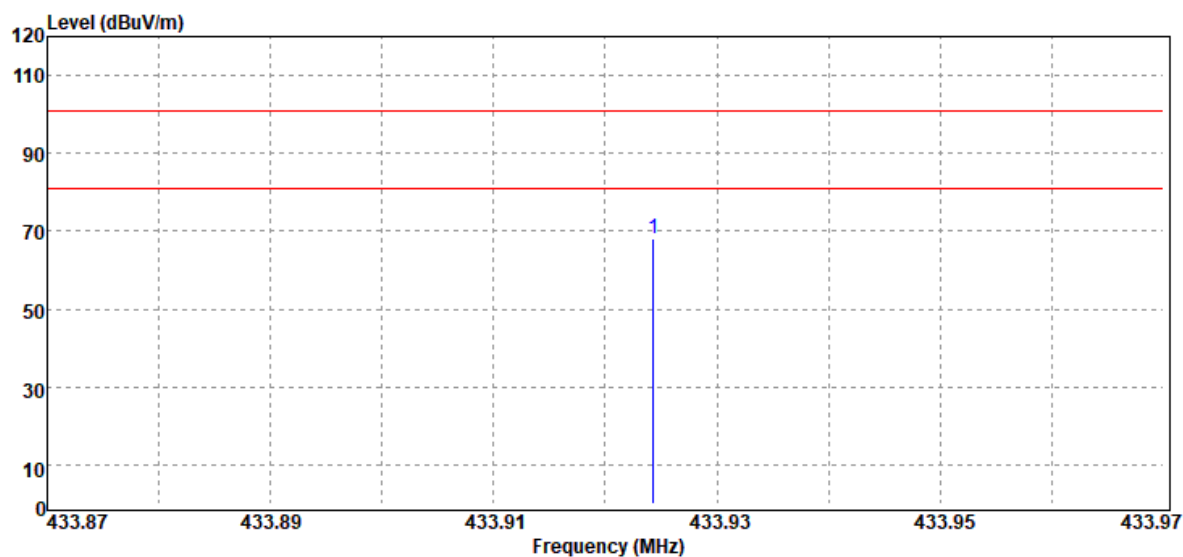
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Report Number	:ER/2019/A0132	Test Date	:2019-11-26
Operation Mode	:433M	Temp./Humi.	:24.3/58
Test Channel	:433.92 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:Main	Engineer	:Kane
EUT Pol	:E2 Plane		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
433.92	Peak	71.84	-3.60	68.24	100.82	-32.58
433.92	Average	---	-8.00	60.24	80.82	-20.58

Note: Average Actual = Peak Actual + Average Factor (-8.00)

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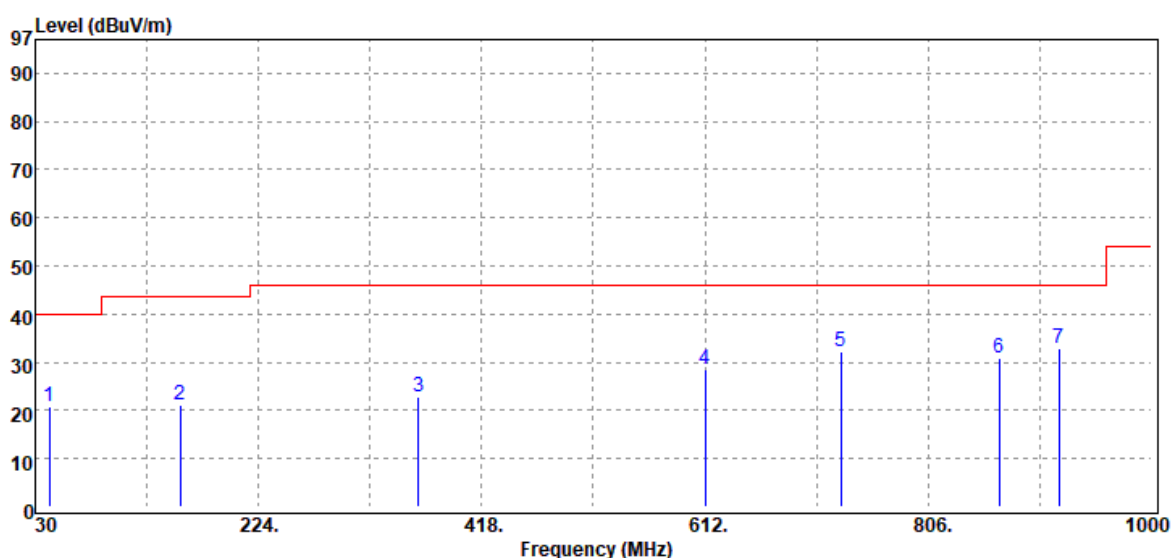
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7.10.2 Radiated Spurious Emission

Below 1GHz Worst-Case Data:

Report Number :ER/2019/A0132
 Operation Mode :433M
 Test Channel :433.92 MHz
 Test Mode :Tx
 EUT Pol :E2 Plane

Test Date :2019-11-26
 Temp./Humi. :24.3/58
 Antenna Pol. :HORIZONTAL
 Engineer :Kane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
42.61	Peak	28.81	-7.95	20.86	40.00	-19.14
156.10	Peak	28.26	-7.06	21.20	43.50	-22.30
362.71	Peak	27.62	-4.83	22.79	46.00	-23.21
612.00	Peak	28.70	-0.34	28.36	46.00	-17.64
730.34	Peak	30.59	1.48	32.07	46.00	-13.93
867.84	Peak	27.78	3.18	30.96	46.00	-15.04
919.49	Peak	27.60	5.38	32.98	46.00	-13.02

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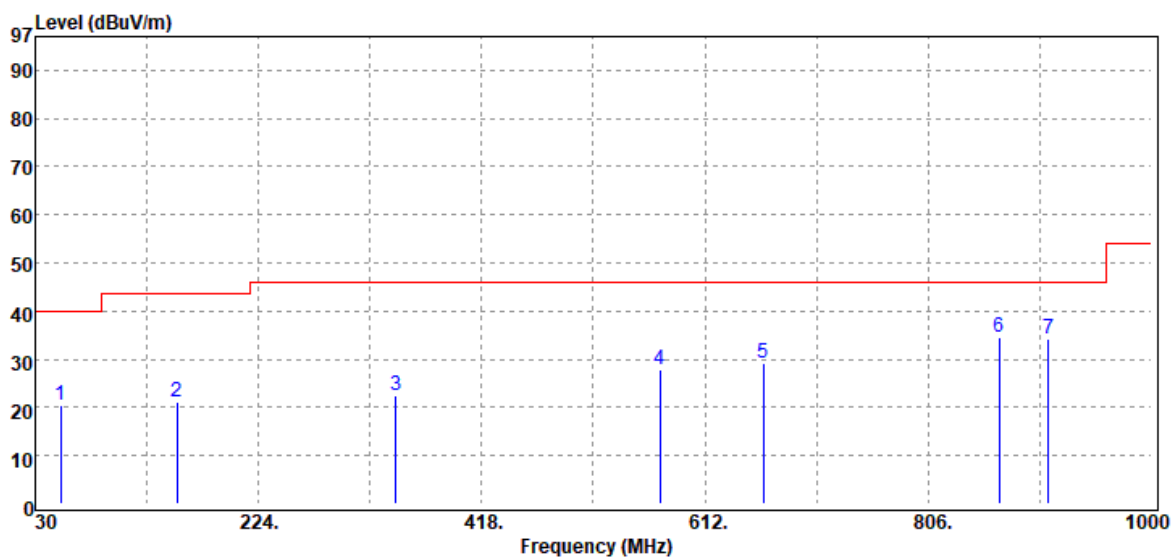
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Report Number	:ER/2019/A0132	Test Date	:2019-11-26
Operation Mode	:433M	Temp./Humi.	:24.3/58
Test Channel	:433.92 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:Tx	Engineer	:Kane
EUT Pol	:E2 Plane		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
52.31	Peak	28.17	-7.72	20.45	40.00	-19.55
153.19	Peak	28.18	-7.05	21.13	43.50	-22.37
343.31	Peak	27.69	-5.12	22.57	46.00	-23.43
573.20	Peak	29.12	-1.23	27.89	46.00	-18.11
662.44	Peak	28.96	0.31	29.27	46.00	-16.73
867.84	Peak	31.43	3.18	34.61	46.00	-11.39
910.76	Peak	28.55	5.62	34.17	46.00	-11.83

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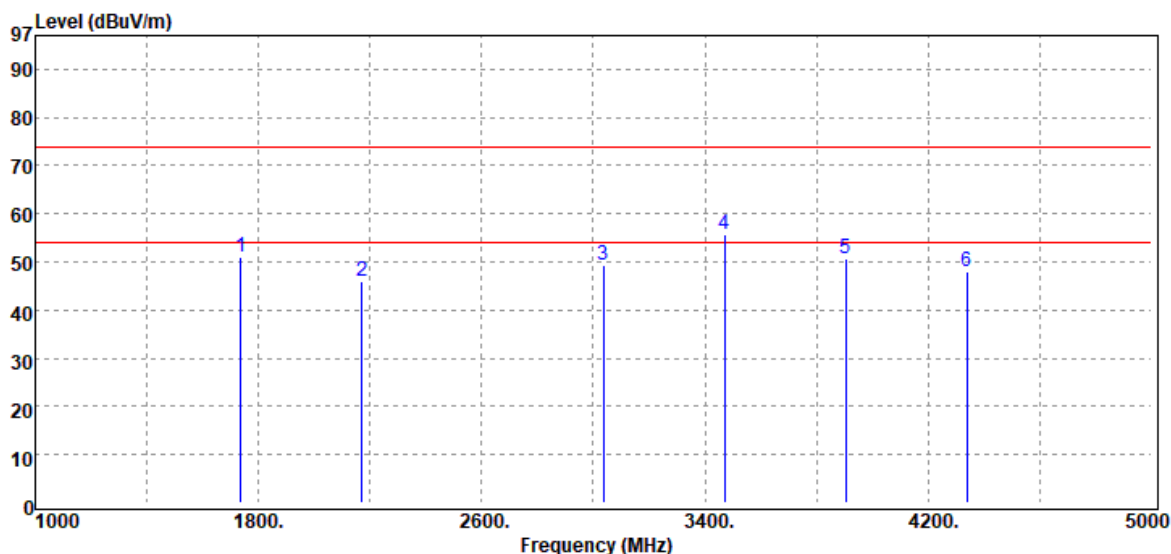
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Above 1GHz Worst-Case Data:

Report Number :ER/2019/A0132
Operation Mode :433M
Test Channel :433.92 MHz
Test Mode :Tx
EUT Pol :E2 Plane

Test Date :2019-11-26
Temp./Humi. :24.3/58
Antenna Pol. :VERTICAL
Engineer :Kane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
1735.68	Peak	54.16	-3.12	51.04	74.00	-22.96
2169.60	Peak	45.93	-0.03	45.90	74.00	-28.10
3037.44	Peak	47.79	1.67	49.46	74.00	-24.54
3471.36	Peak	54.18	1.60	55.78	74.00	-18.22
3471.36	Average	---	-8.00	47.78	54.00	-6.22
3905.28	Peak	47.46	3.20	50.66	74.00	-23.34
4339.20	Peak	43.54	4.55	48.09	74.00	-25.91

Note: Average Actual = Peak Actual + Average Factor (-8.00)

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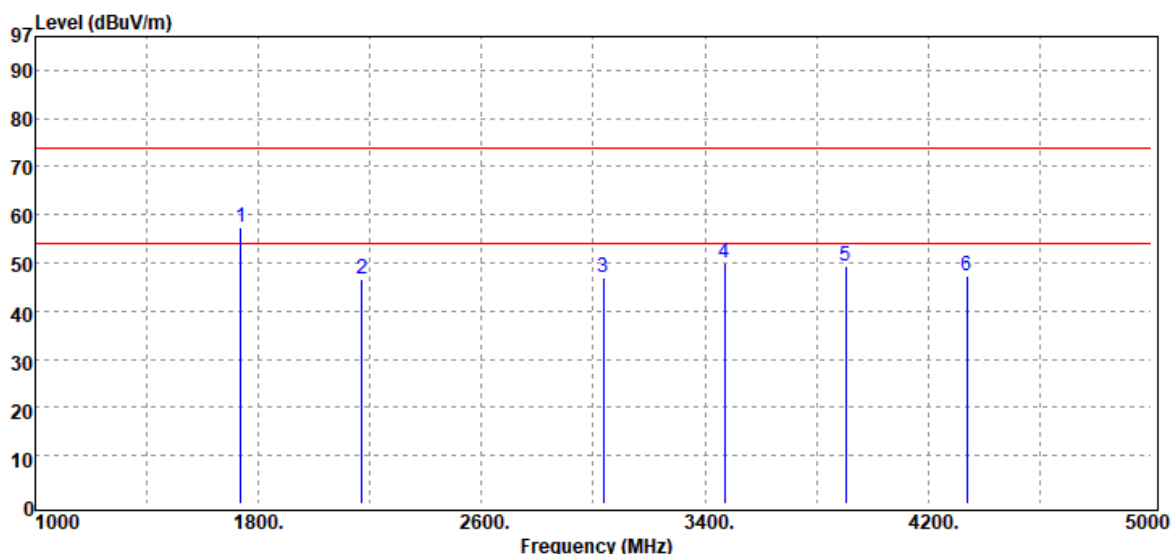
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Report Number	:ER/2019/A0132	Test Date	:2019-11-26
Operation Mode	:433M	Temp./Humi.	:24.3/58
Test Channel	:433.92 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:Tx	Engineer	:Kane
EUT Pol	:E2 Plane		



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
1735.68	Peak	60.45	-3.12	57.33	74.00	-16.67
1735.68	Average	---	-8.00	49.33	54.00	-4.67
2169.60	Peak	46.55	-0.03	46.52	74.00	-27.48
3037.44	Peak	45.42	1.67	47.09	74.00	-26.91
3471.36	Peak	48.29	1.60	49.89	74.00	-24.11
3905.28	Peak	46.02	3.20	49.22	74.00	-24.78
4339.20	Peak	42.75	4.55	47.30	74.00	-26.70

Note: Average Actual = Peak Actual + Average Factor (-8.00)

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8 20 DB OCCUPIED BANDWIDTH

8.1 Applicable Standard

According to 15.231 (c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

8.2 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation
3. Set SPA Center Frequency = fundamental frequency, RBW, VBW= 10KHz, Span =100KHz.
4. Set SPA -20dB Occupied bandwidth.

8.3 Test SET-UP (Block Diagram of Configuration)



8.4 Measurement Equipment Used:

SGS Conducted Emission Test Site No.A					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	05/02/2019	05/01/2020
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2019	01/01/2020

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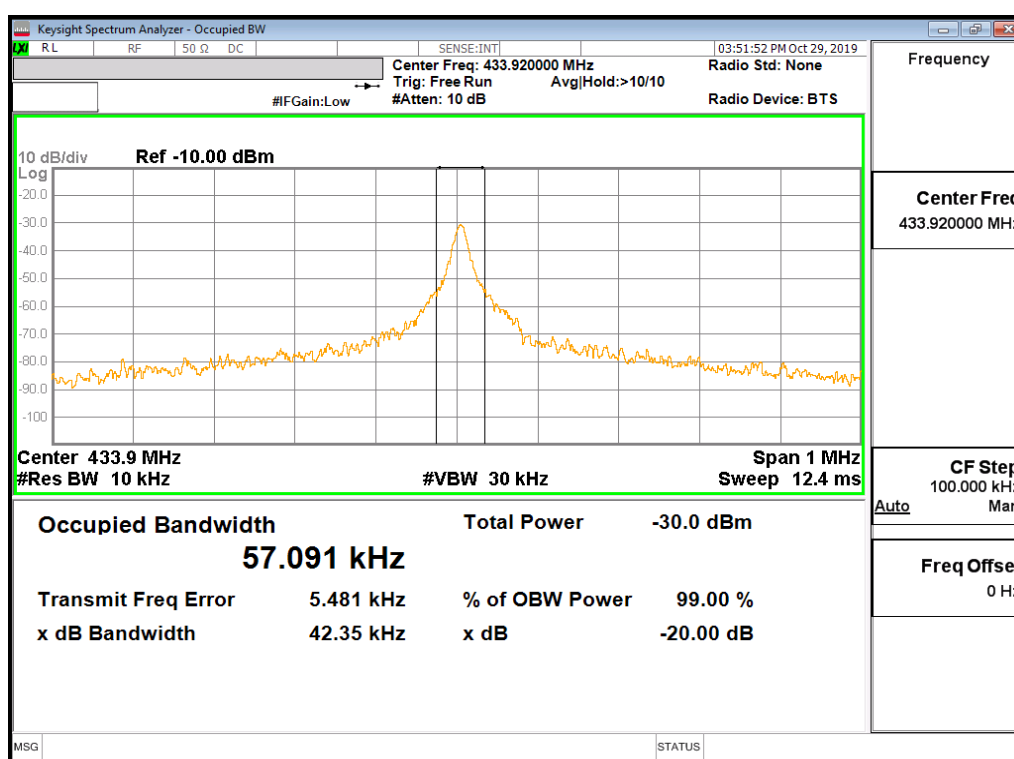
8.5 Measurement Results

The center frequency f_c is **433.92MHz**, according to the Rules, section 15.231(C), the Bandwidth of Center Frequency at -20dB should be calculated as following:

$$433.92 \times 0.0025 = 1.0848 \text{ (MHz)}$$

20dB Bandwidth (kHz)
42.35
Limit = 1084.8 kHz

20dB Band Width Test Data



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9 DUTY CYCLE MEASUREMENT

9.1 Applicable Standard

According to 15.35(c) Unless otherwise specified, e.g., §§15.255(b), and 15.256(l)(5), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to Supplier's Declaration of Conformity.

9.2 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set ETU normal operating mode.
3. Set SPA Center Frequency = fundamental frequency, RBW, VBW= 100kHz, Span =0 Hz. Adjacent sweep.
4. Set SPA View. Mark delta.

9.3 Test SET-UP (Block Diagram of Configuration)

Same as 8.3 Radiated Emission Measurement.

9.4 Measurement Equipment Used:

Same as 8.3 Radiated Emission Measurement.

9.5 Measurement Results:

Ton (ms)	TP=Ton+Toff (ms)	Avg correction(dB) = 20log(Ton/TP)
39.8	100	-8.002

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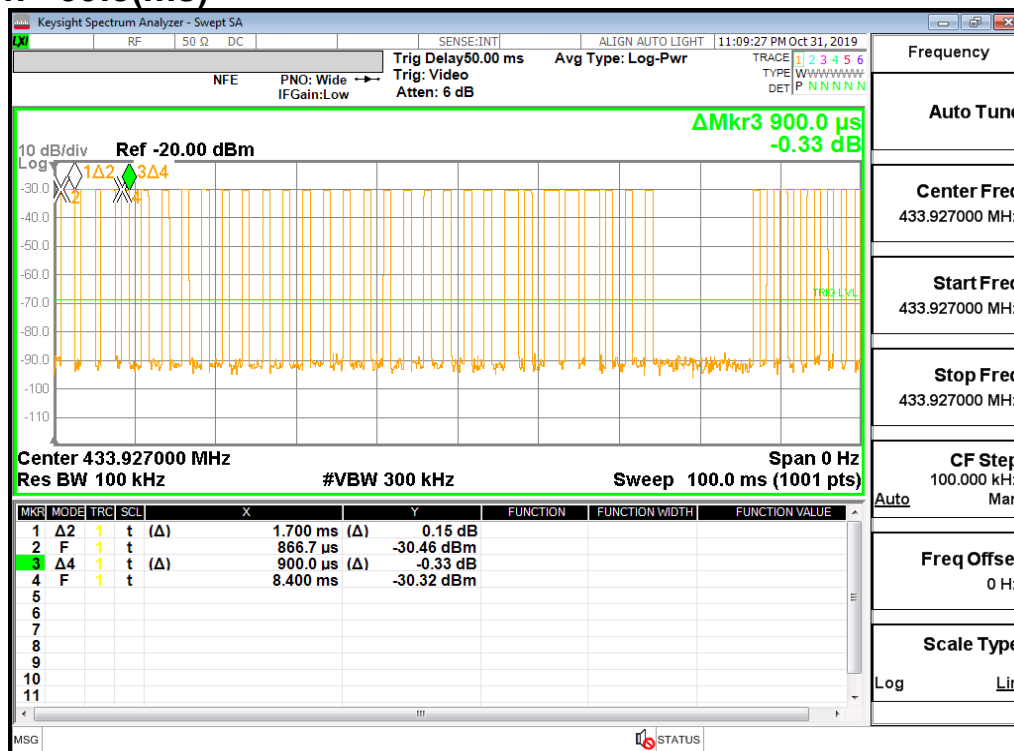
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.Ton =39.8(ms)



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10 RELEASE TIME MEASUREMENT:

15.231 (a) (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

10.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set SPA Center Frequency = fundamental frequency, RBW=100KHz, VBW=100KHz, Span=0Hz. Sweep Time= 5s.
3. Set EUT as normal operation and press Transmitter bottom for 2 s approximately,
4. Set SPA Max hold. Delta Mark.

10.2 Test SET-UP (Block Diagram of Configuration)

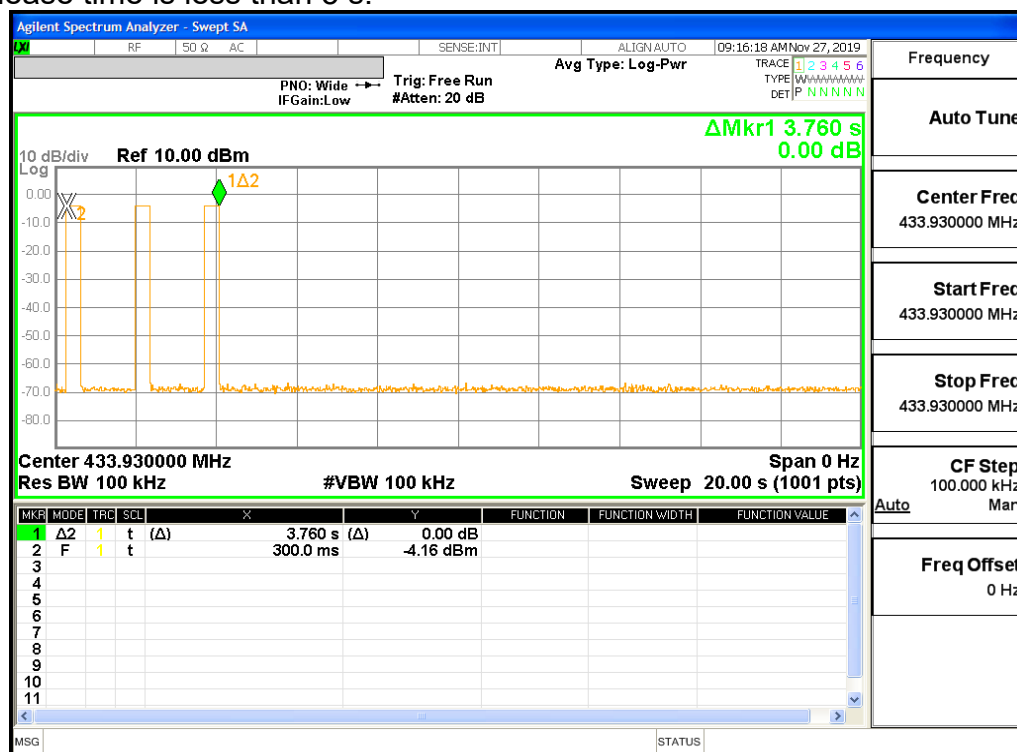
Same as 8.3 Radiated Emission Measurement.

10.3 Measurement Equipment Used:

Same as 8.3 Radiated Emission Measurement.

10.4 Measurement Results

The release time is less than 5 s.



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11 ANTENNA REQUIREMENT

11.1 Standard Applicable:

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

11.2 Antenna Connected Construction:

The antenna is designed with unique RF connector and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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