FCC / ISED Test Report

FOR:

HUF

Model Name:

HUF2718

Product Description:

Passive Entry Keyfob

FCC ID: YGOG21TB2
IC ID: 4008C-G21TB2

Applied Rules and Standards:
47 CFR Part: 15.231
RSS-210 & RSS-Gen Issue 5

REPORT #: EMC_HUFUS_017_18001_15.231_Rev1

DATE: 2019-05-07

A2LA Accredited

IC recognized #
3462B-1

***CETECOM* Inc.**
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1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.231 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-210 & RSS-Gen Issue 5.

No deviations were ascertained.

Company	Description	Model #
HUF	Passive Entry Keyfob	HUF2718

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2019-05-07	Compliance	Cindi Li (Lab Manager)	Cindy Li Digitally signed by Cindy Li DN: cn=Cindy Li, o=Cetecom Inc., ou=EMC, email=cindy.li@cetecom.com, c=US Date: 2019.05.07 14:48:23 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2019-05-07	Compliance	Kris Lazarov (Senior EMC Engineer)	Digitally signed by Kris Lazarov Date: 2019.05.07 14:38:32 -07'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Compliance Manager:	Cindi Li
Responsible Project Leader:	Kris Lazarov

2.2 Identification of the Client

Applicant's Name:	Huf Hülsbeck & Fürst GmbH & Co. KG
Street Address:	Steeger Str. 17
City/Zip Code	Velbert 42551
Country	Germany

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as applicant
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No:	HUF2718
HW Version :	B2UID
SW Version :	PreProduction
FCC-ID :	YGOG21TB2
IC-ID:	4008C-G21TB2
FVIN:	PreProduction
HVIN:	HUF2718
PMN:	B2 Passive Entry Keyfob
Product Description:	Passive Entry Keyfob
Frequency Range / number of channels:	433.2 MHz to 434.64 MHz / 3 channels
Type(s) of Modulation:	ASK / FSK
Modes of Operation:	Short term pulsed transmission
Antenna Information as declared:	Internal PCB
Power Supply/ Rated Operating Voltage Range:	Vmin: 2.4 VDC/ Vnom: 3 VDC / Vmax: 3.3VDC
Operating Temperature Range	Fob: -20 ºC to 70 ºC / Immobilizer: -40 ºC to 85 ºC
Other Radios included in the device:	125 kHz Immobilizer receiver
Sample Revision	☐Prototype Unit; ☐Production Unit; ■Pre-Production

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	Pre-Production Sample # 9712	B2UID	PreProduction	Radiated Measurements

3.3 Test Sample Configuration

Set-up #	EUT / AE used for set-up	Comments
1	EUT #1	Normal Battery
2	EUT #1	Powered with dummy battery

3.4 Mode of Operation

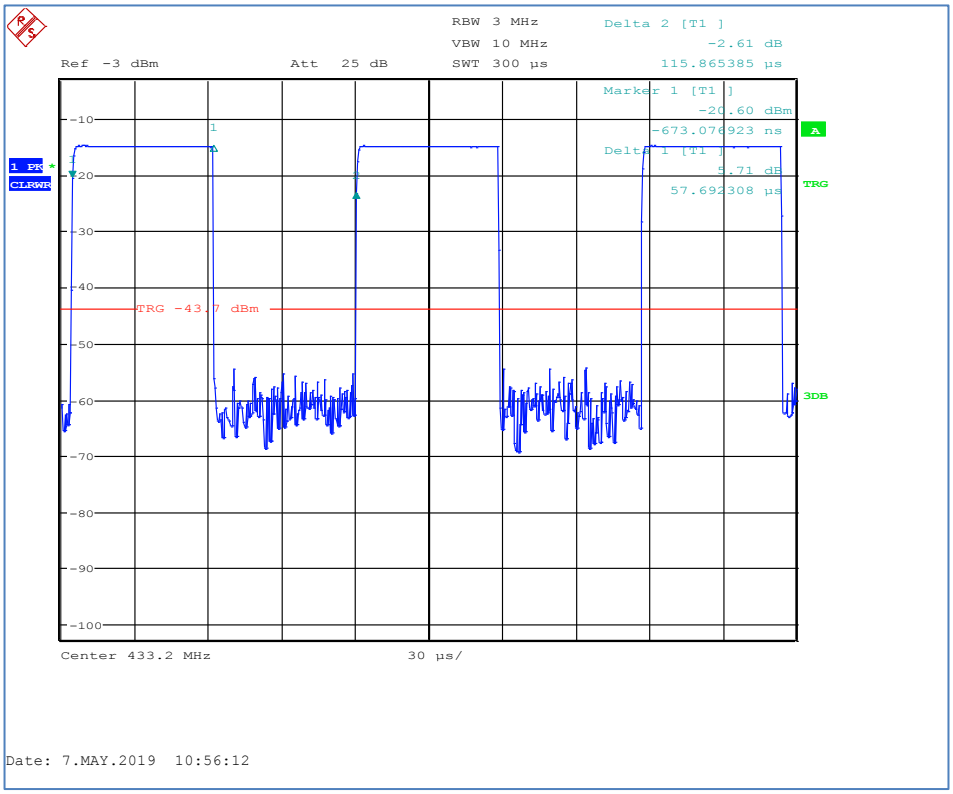
EUT Set-up #	Combination of AE used for test set up	Comments
1	ASK	Continuous ASK transmission at 433.2 MHz or 434.64 MHz
2	FSK	Continuous FSK transmission at 433.2 MHz or 434.64 MHz
3	Trigger	Short transmission triggered manually or with 125 kHz signal
4	CW	Unmodulated carrier at middle channel

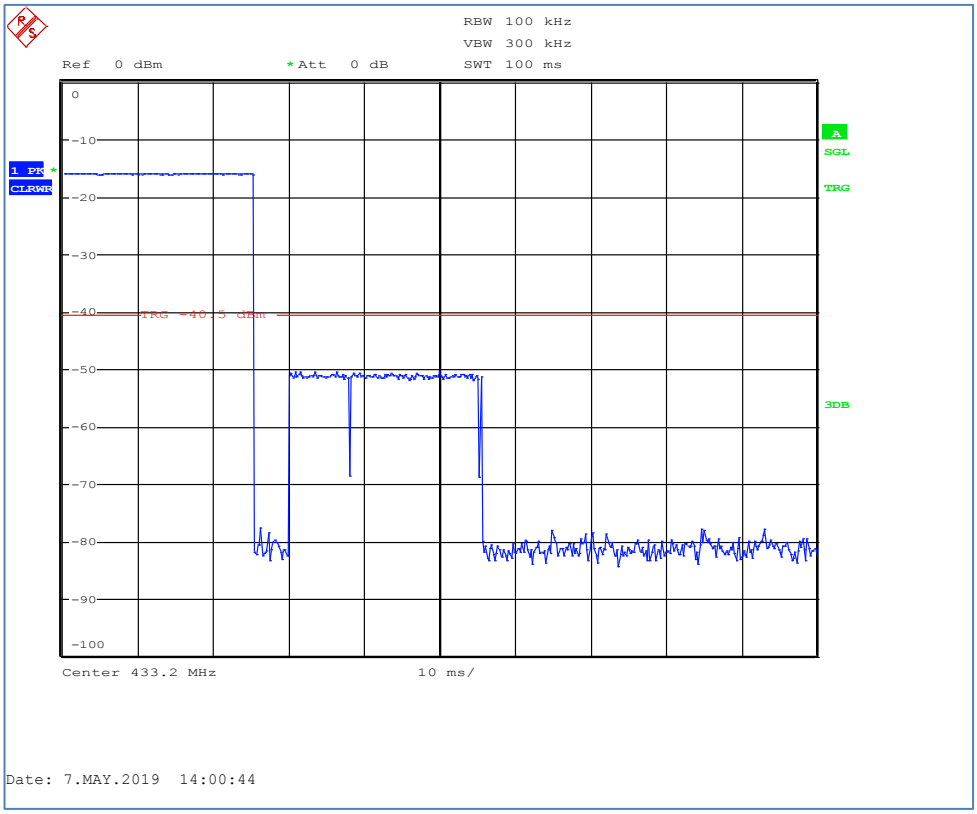
3.5 Justification for Worst Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on low and high channels, and highest possible duty cycle. For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT. It was determined during a pretesting that the worst emissions occur with the EUT at horizontal orientation.

3.6 Testing Notes

The device transmits with TX burst duty cycle of 50%, however only transmits for 24 ms on a single channel in any interval of 100 ms – see plots below. This allows for the use of duty cycle correction according to FCC 15.35. The correction offset of -12.4 dB was calculated using the following formula: 20 * log (Duty Cycle)


RBW 3 MHz
VBW 10 MHz
SWT 300 µs
Delta 2 [T1]
-2.61 dB
115.865385 µs
Marker 1 [T1]
-20.60 dBm
-673.076923 ns
Delta 1 [T1]
5.71 dB
57.692308 µs
Ref -3 dBm
Att 25 dB
TRG -43.7 dBm
Center 433.2 MHz
30 µs/
Date: 7.MAY.2019 10:56:12


RBW 100 kHz
VBW 300 kHz
SWT 100 ms
Ref 0 dBm
*Att 0 dB
TRG -40.5 dBm
Center 433.2 MHz
10 ms/
Date: 7.MAY.2019 14:00:44

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in FCC rules Part 15.231 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-210 & RSS-Gen Issue 5 of ISED Canada.

This test report is to support a request for new equipment authorization under the FCC ID: YGOG21TB2, and IC ID: 4008C-G21TB2

5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.231(c) RSS-210 A1.1.3	Emission Bandwidth	Nominal	ASK FSK	■	☐	☐	Complies
§15.231(b) RSS-210 A1.1	Field strength	Nominal	ASK FSK	■	☐	☐	Complies
§15.231(b); §15.205 RSS-210 A1.1	TX Spurious emissions-Radiated	Nominal	ASK FSK	■	☐	☐	Complies
§15.231(a,2) RSS Gen 210 A1.1.1	5 s Periodic Operation	Nominal	Auto/Manual Trigger	■	☐	☐	Complies
§2.1055; RSS-133 6.3	Frequency Stability	Extreme	CW	■	☐	☐	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	NA	☐	■	☐	See Note 2

Note1: NA= Not Applicable; NP= Not Performed.
Note2: This device does not connect to AC network; hence the test is not applicable.

6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=1.

Radiated measurement

9 kHz to 30 MHz	±2.5 dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	±2.0 dB (Biconilog Antenna)
1 GHz to 40 GHz	±2.3 dB (Horn Antenna)

Conducted measurement

150 kHz to 30 MHz	±0.7 dB (LISN)

RF conducted measurement	±0.5 dB

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: http://physics.nist.gov/cuu/Uncertainty/typeb.html. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3 dB to the limit.

6.1 Environmental Conditions During Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25° C
- Relative humidity: 40-60%

6.2 Dates of Testing:

03/25/2019 - 04/10/2019

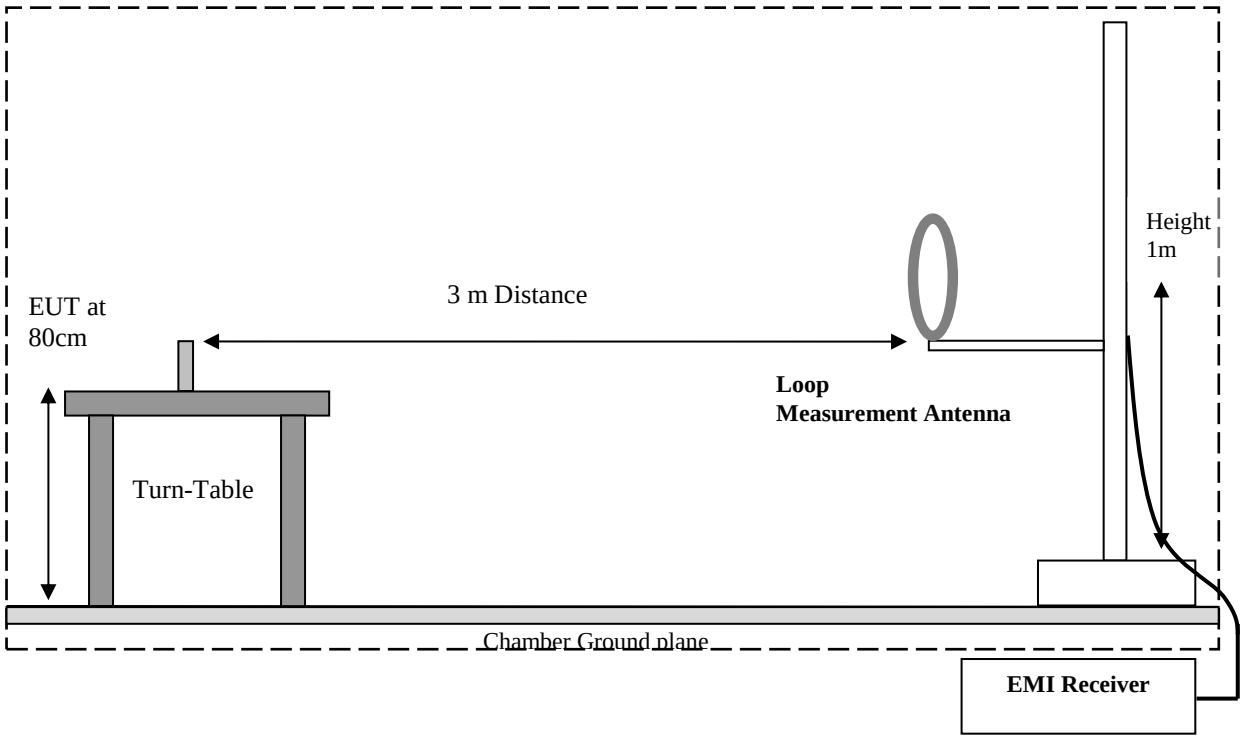
7 Measurement Procedures

7.1 Radiated Measurement

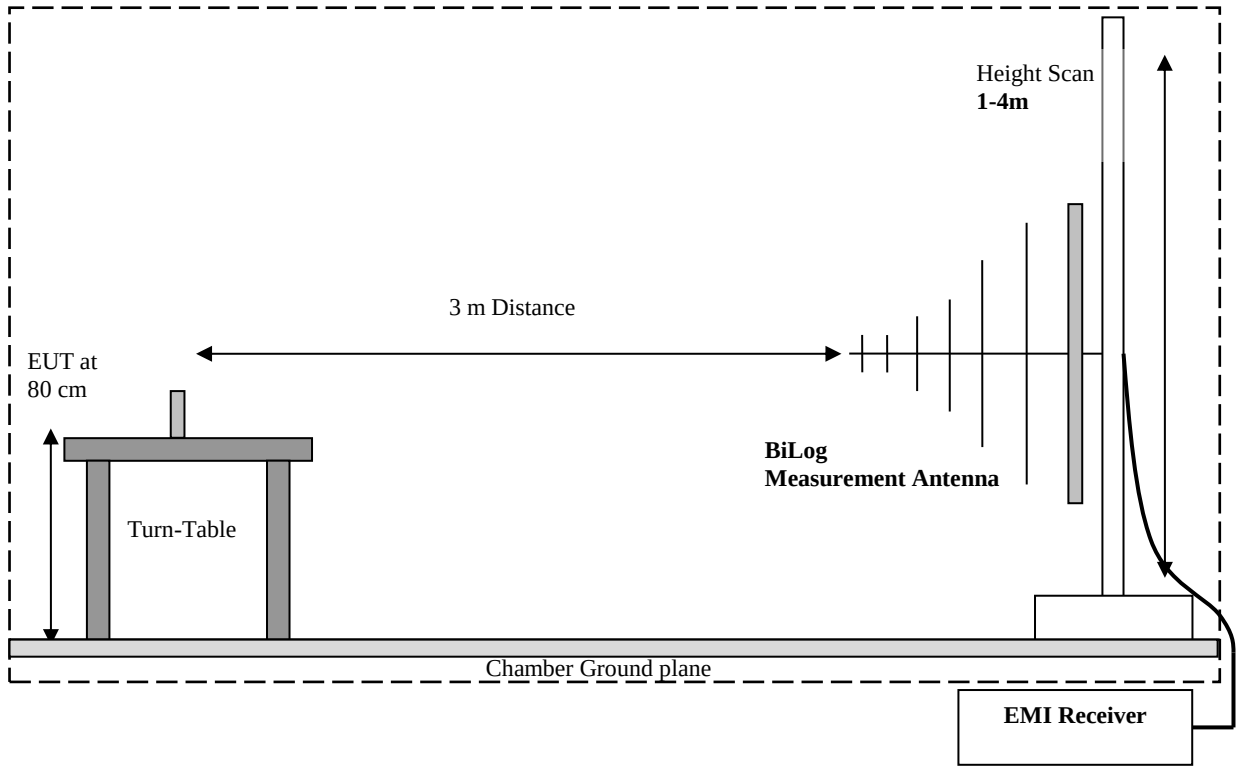
The radiated measurement is performed according to ANSI C63.10 (2013)

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.

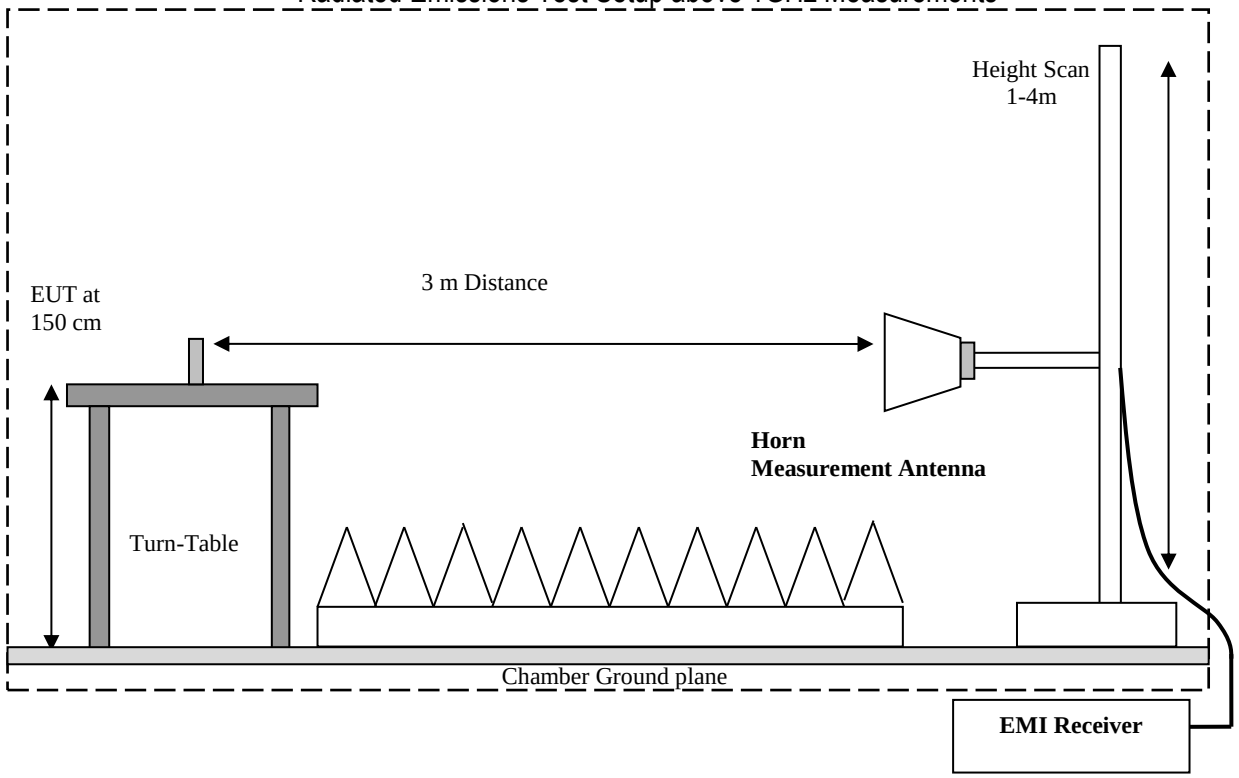
Radiated Emissions Test Setup below 30MHz Measurements



Radiated Emissions Test Setup 30MHz-1GHz Measurements



Radiated Emissions Test Setup above 1GHz Measurements



7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dBµV
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

FS (dBµV/m) = Measured Value on SA (dBµV) + Cable Loss (dB) + Antenna Factor (dB/m)

Example:

Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB/m)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

8 Test Result Data

8.1 Field strength

8.1.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer settings:

- RBW ≥ DTS bandwidth
- VBW ≥ 3 x RBW
- Span ≥ 3 x RBW
- Sweep = Auto couple
- Detector function = RMS
- Trace = Max hold
- Use peak marker function to determine the peak amplitude level

8.1.2 Limits:

Maximum Peak Output Power:

- §15.231(b) and RSS 210 A1.1: In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)
260-470	3,750 to 12,500 Linear interpolations

8.1.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23° C	1	433.2 MHz / 434.64 MHz	3 V Battery

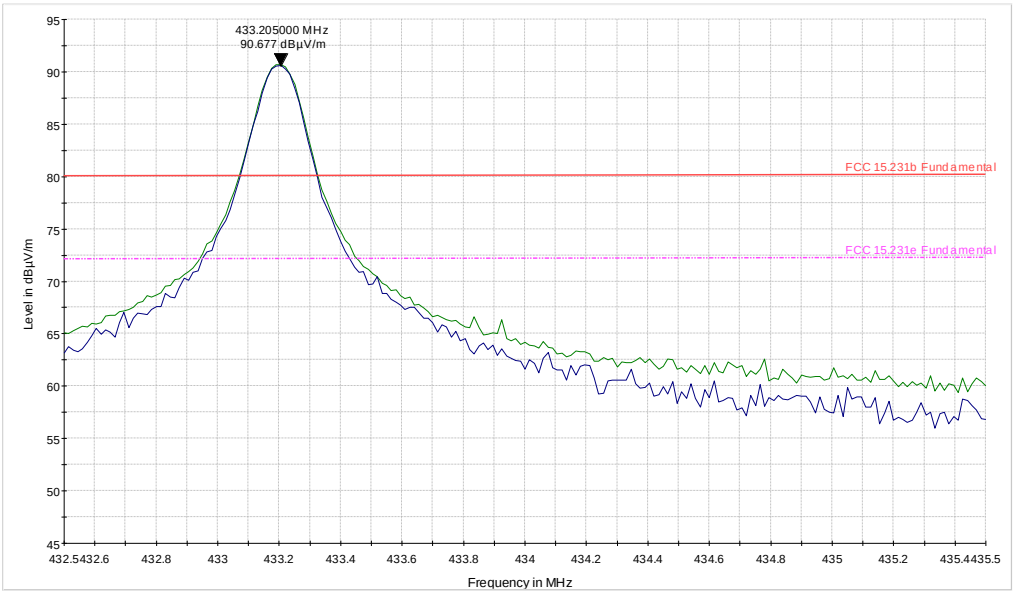
8.1.4 Measurement result:

Plot #	Fundamental frequency (MHz)	Modulation	Fundamental Field Strength (dBµV/m)	Corrected For Duty Cycle* (dBµV/m)	Limit (dBµV/m)	Result
1	433.2	ASK	90.68	78.68	80.8	Pass
2	433.2	FSK	90.88	78.88	80.8	Pass
3	434.64	ASK	91.09	79.09	80.8	Pass
4	434.64	FSK	91.13	79.13	80.8	Pass

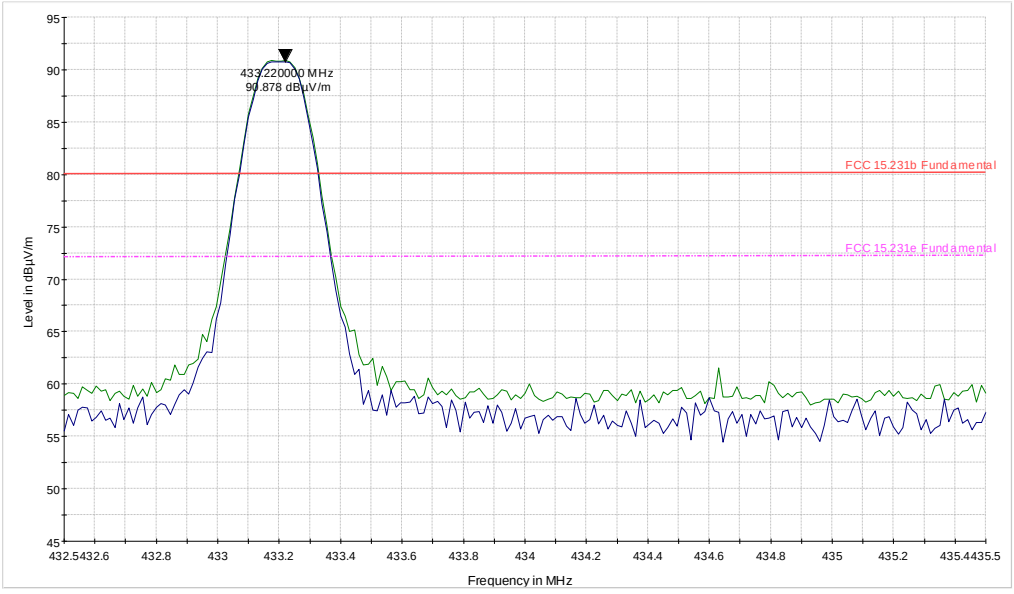
* The field strength results were corrected for the maximum duty cycle of 24% for the device by applying an offset of -12.4 dB calculated using the following formula: 20 * log (Duty Cycle) = 20 * log 0.24 = (-12.4 dB)

8.1.5 Measurement Plots:

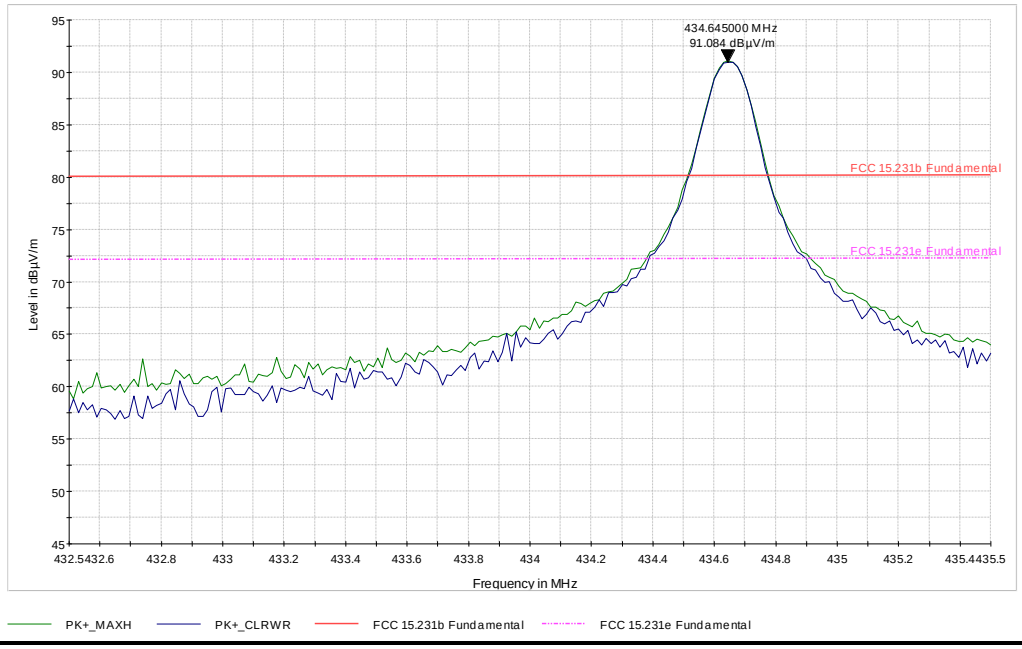
Plot # 1



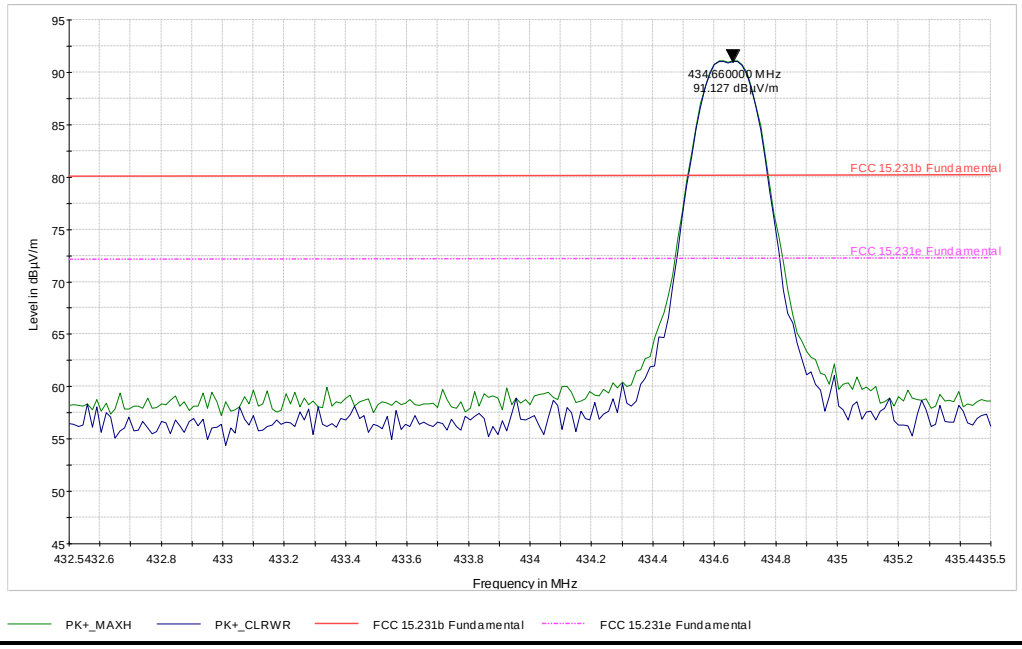
Plot # 2



Plot # 3


434.645000 MHz
91.084 dBµV/m
FCC 15.231b Fundamental
FCC 15.231e Fundamental
Level in dBµV/m
Frequency in MHz
PK+_MAXH
PK+_CLRWR
FCC 15.231b Fundamental
FCC 15.231e Fundamental

Plot # 4


434.660000 MHz
91.127 dBµV/m
FCC 15.231b Fundamental
FCC 15.231e Fundamental
Level in dBµV/m
Frequency in MHz
PK+_MAXH
PK+_CLRWR
FCC 15.231b Fundamental
FCC 15.231e Fundamental

8.2 Emission Bandwidth

8.2.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer settings:

- Set RBW = 100 kHz
- Set the video bandwidth (VBW) ≥ 3 x RBW
- Detector = Peak
- Trace mode = Max hold
- Sweep = Auto couple
- Allow the trace to stabilize
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

8.2.2 Limits:

- FCC §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. Bandwidth is determined at the points 20 dB down from the modulated carrier.
- RSS-210 A1.1.3: The 99% bandwidth shall be no wider than 0.25% of the center frequency for devices operating between 70 MHz and 900 MHz.

8.2.3 Test conditions and setup:

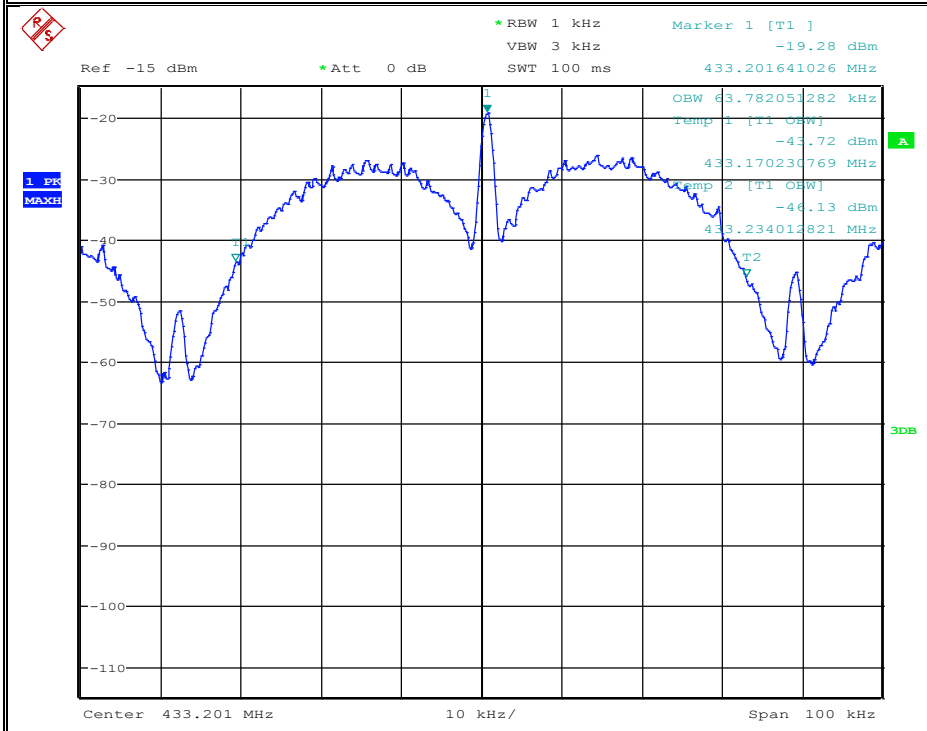
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23° C	1	433.2 MHz / 434.64 MHz	3 V Battery

8.2.4 Measurement result:

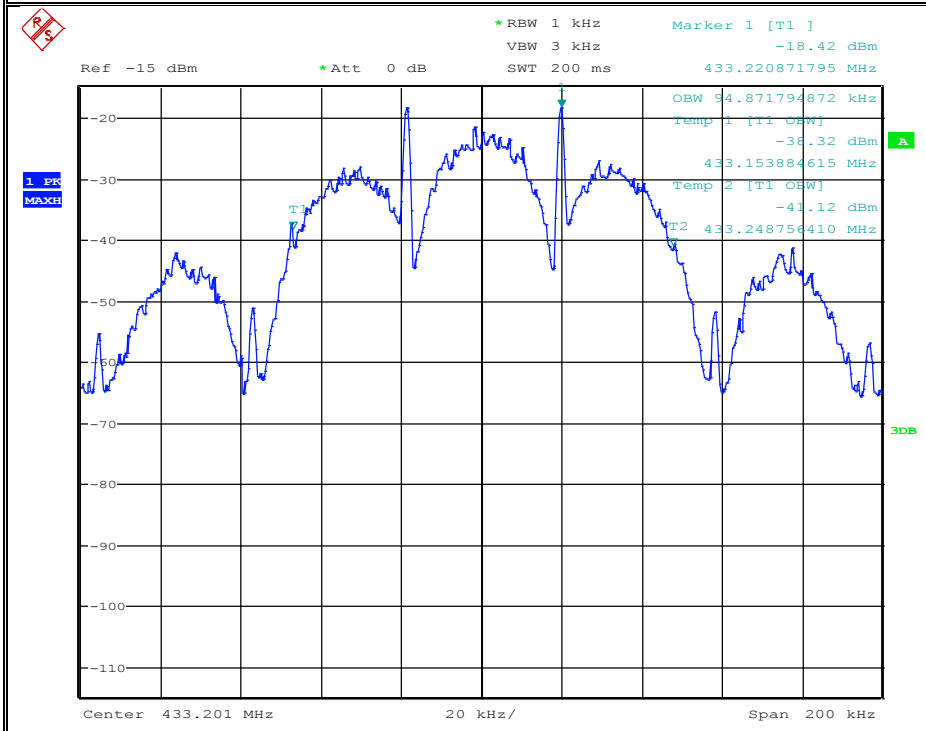
Plot #	Frequency (MHz)	Modulation	99% Emissions Bandwidth (MHz)	Limit (MHz)	Result
1	433.2	ASK	63.8	1.082	Pass
2	433.2	FSK	94.9	1.082	Pass
3	434.64	ASK	63.1	1.082	Pass
4	434.64	FSK	95.5	1.082	Pass

8.2.5 Measurement Plots:

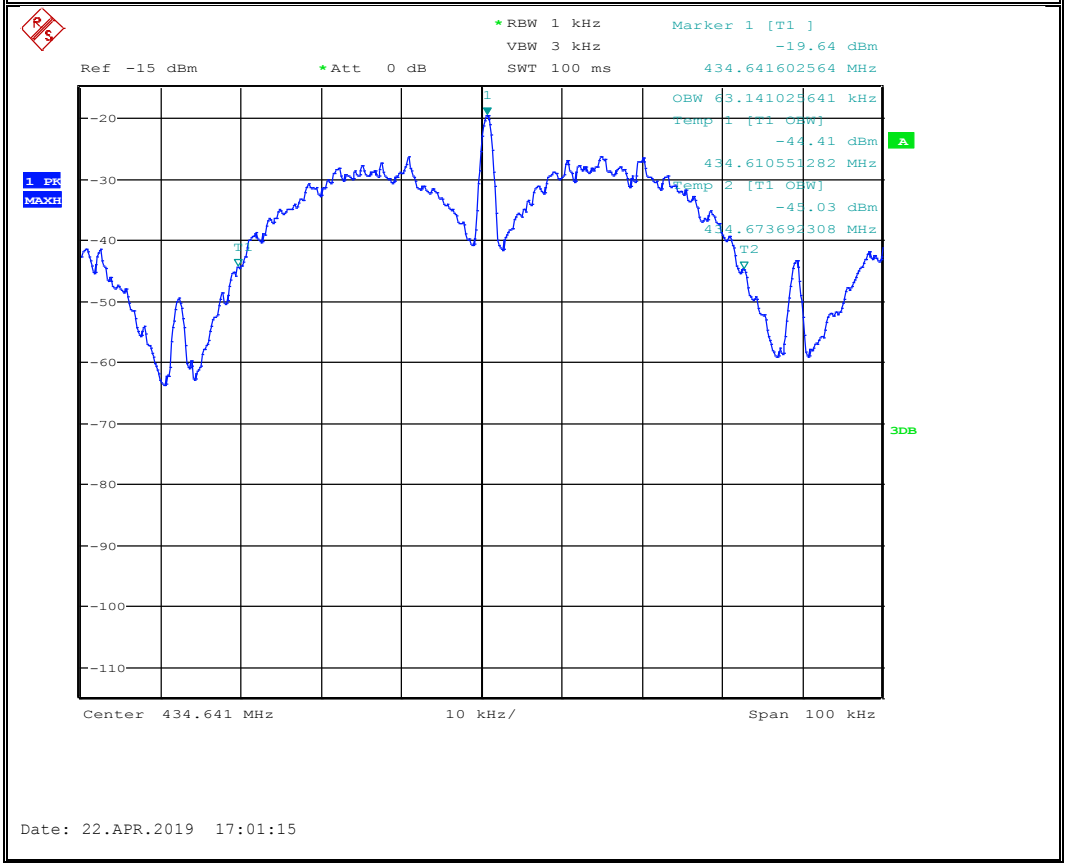
Plot #1


RBW 1 kHz
VBW 3 kHz
SWT 100 ms
Marker 1 [T1]
-19.28 dBm
433.201641026 MHz
OBW 63.782051282 kHz
Temp 1 [T1 OBW]
-43.72 dBm
433.170230769 MHz
Temp 2 [T1 OBW]
-46.13 dBm
433.234012821 MHz
Ref -15 dBm
Att 0 dB
1 PK
MAXH
A
3DB
T1
T2
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Center 433.201 MHz
10 kHz/
Span 100 kHz
Date: 22.APR.2019 17:05:37

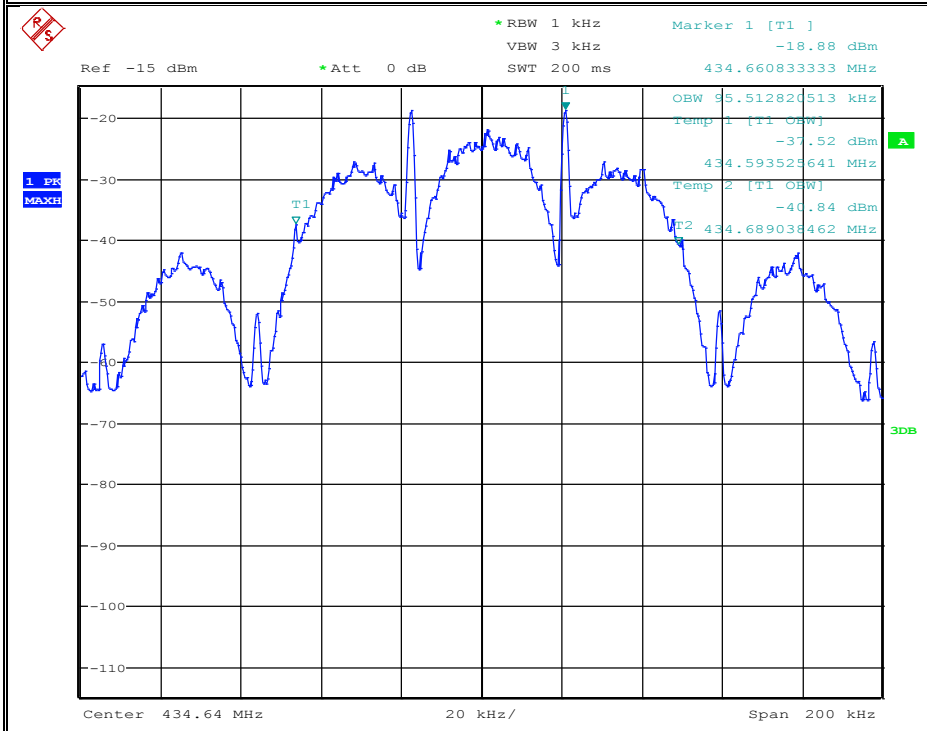
Plot #2


RBW 1 kHz
VBW 3 kHz
SWT 200 ms
Marker 1 [T1]
-18.42 dBm
433.220871795 MHz
OBW 94.871794872 kHz
Temp 1 [T1 OBW]
-38.32 dBm
433.153884615 MHz
Temp 2 [T1 OBW]
-41.12 dBm
433.248756410 MHz
Ref -15 dBm
Att 0 dB
1 PK
MAXH
A
3DB
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Center 433.201 MHz
20 kHz/
Span 200 kHz
Date: 22.APR.2019 17:09:45

Plot #3


RBW 1 kHz
VBW 3 kHz
SWT 100 ms
Marker 1 [T1]
-19.64 dBm
434.641602564 MHz
Ref -15 dBm
Att 0 dB
OBW 63.141025641 kHz
Temp 1 [T1 OBW]
-44.41 dBm
434.610551282 MHz
Temp 2 [T1 OBW]
-45.03 dBm
434.673692308 MHz
1 PK
MAXH
A
3DB
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Center 434.641 MHz
10 kHz/
Span 100 kHz
Date: 22.APR.2019 17:01:15

Plot #4


RBW 1 kHz
VBW 3 kHz
SWT 200 ms
Marker 1 [T1]
-18.88 dBm
434.660833333 MHz
OBW 95.51282051 kHz
Temp 1 [T1 OBW]
-37.52 dBm
434.593525641 MHz
Temp 2 [T1 OBW]
-40.84 dBm
434.689038462 MHz
Ref -15 dBm
Att 0 dB
1 PK MAXH
A
3DB
T1
T2
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
Center 434.64 MHz
20 kHz/
Span 200 kHz
Date: 22.APR.2019 16:59:04

8.3 Radiated Transmitter Spurious Emissions and Restricted Bands

8.3.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak

- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)

- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz

- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing at distance other than the specified in the standard, the limit conversion is calculated by using 40 dB/decade extrapolation factor as follow: Conversion factor (CF) = 40 log (D/d) = 40 log (300m / 3m) = 80dB

8.3.2 Limits:

- §15.231(b) and RSS 210 A1.1: In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

- FCC §15.205 & RSS-Gen 8.10: Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

- 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 (see §15.205(b)).

8.3.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23° C	1	433.2 MHz / 434.64 MHz	3 V Battery

8.3.4 Measurement result:

Table #	Frequency (MHz)	Modulation	Scan Frequency	Limit	Result
1	433.2	ASK	9 kHz – 5 GHz	See section 8.3.2	Pass
2	433.2	FSK	9 kHz – 5 GHz	See section 8.3.2	Pass
3	434.64	ASK	9 kHz – 5 GHz	See section 8.3.2	Pass
4	434.64	FSK	9 kHz – 5 GHz	See section 8.3.2	Pass

Note 1: The field strength results were corrected for the maximum duty cycle of 24% for the device by applying an offset of -12.4 dB calculated using the following formula: 20 * log (Duty Cycle) = 20 * log 0.24 = (-12.4 dB)

Note 2: The device complies with CFR 47 Part 2.1055, with measured frequency stability better than 1ppm.

Table # 1								
Modulation: ASK	**Fundamental @ 433.2 MHz**				**24% Duty Cycle**			
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Result
125.009028	20.49	43.52	23.03	100	140.0	H	148.0	Pass
866.406941	46.22	60.80	14.58	100	186.0	H	20.0	Pass
1299.612	34.21	53.98	19.77	1000	164.0	H	0	Pass
1732.698	37.54	53.98	16.44	1000	136.0	H	192	Pass
3465.640000	36.40	53.98	17.58	1000	212.0	H	259.0	Pass
3898.687000	34.90	53.98	19.08	1000	249.0	V	331.0	Pass
4331.949000	37.18	53.98	16.80	1000	152.0	H	209.0	Pass

Table # 2								
Modulation: FSK	**Fundamental @ 433.2 MHz**				**24% Duty Cycle**			
Frequency (MHz)	MaxPeak* (dBµV/m)	Limit** (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Result
124.996854	20.22	43.52	23.30	100	158.0	H	205.0	Pass
866.450603	46.40	60.80	14.40	100	175.0	H	14.0	Pass
1299.541	35.28	53.98	18.70	1000	238.0	H	40	Pass
1732.804	37.59	53.98	16.39	1000	166.0	H	62	Pass
3465.458666	35.10	53.98	18.88	1000	175.0	H	47.0	Pass
3898.972334	35.03	53.98	18.95	1000	247.0	V	312.0	Pass
4332.306334	37.19	53.98	16.79	1000	247.0	H	213.0	Pass

Table # 3								
Modulation: ASK	**Fundamental @ 434.64 MHz**				**24% Duty Cycle**			
Frequency (MHz)	MaxPeak* (dBµV/m)	Limit** (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Result
125.003458	20.80	43.52	22.72	100	157.0	H	69.0	Pass
869.283627	49.42	60.80	11.38	100	180.0	H	15.0	Pass
1304.016	36.89	53.98	17.09	1000	163.0	H	0	Pass
1738.516	37.42	53.98	16.56	1000	315.0	H	34	Pass
3477.100000	34.99	53.98	18.99	1000	186.0	H	72.0	Pass
4346.573667	35.21	53.98	18.77	1000	166.0	H	15.0	Pass

Table # 4								
Modulation: FSK	**Fundamental @ 434.64 MHz**				**24% Duty Cycle**			
Frequency (MHz)	MaxPeak* (dBµV/m)	Limit** (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Result
125.011358	20.98	43.52	22.54	100	140.0	H	233.0	Pass
869.328027	49.31	60.80	11.49	100	183.0	H	21.0	Pass
1304.031	37.18	53.98	16.80	1000	118.0	H	57	Pass
1738.519	37.03	53.98	16.95	1000	141.0	H	35	Pass
3477.060000	34.01	53.98	19.97	1000	140.0	H	65.0	Pass
4346.627000	35.01	53.98	18.97	1000	286.0	H	209.0	Pass

8.4 5 s Periodic Operation

8.4.1 Measurement according to FCC 15.231

Spectrum Analyzer settings:

- Center Frequency = Mid Channel Frequency
- Span = Zero Span
- Set RBW = 3 MHz
- Set the video bandwidth (VBW) ≥ 3 x RBW
- Detector = Peak
- Trace mode = Max hold
- Trigger = Video
- Sweep Time = Sufficient to capture complete transmission
- Use marker delta to measure the duration of transmission

8.4.2 Limits:

- FCC §15.231 (a) The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:
    - (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
    - (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

- RSS-210 A1.1: Devices shall comply with the following for momentary operation:
    - A manually operated transmitter shall be equipped with a push-to-operate switch and be under manual control at all times during transmission. When released, the transmitter shall cease transmission within no more than 5 seconds of being released.
    - A transmitter that has been activated automatically shall cease transmission within 5 seconds of activation.

8.4.3 Test conditions and setup:

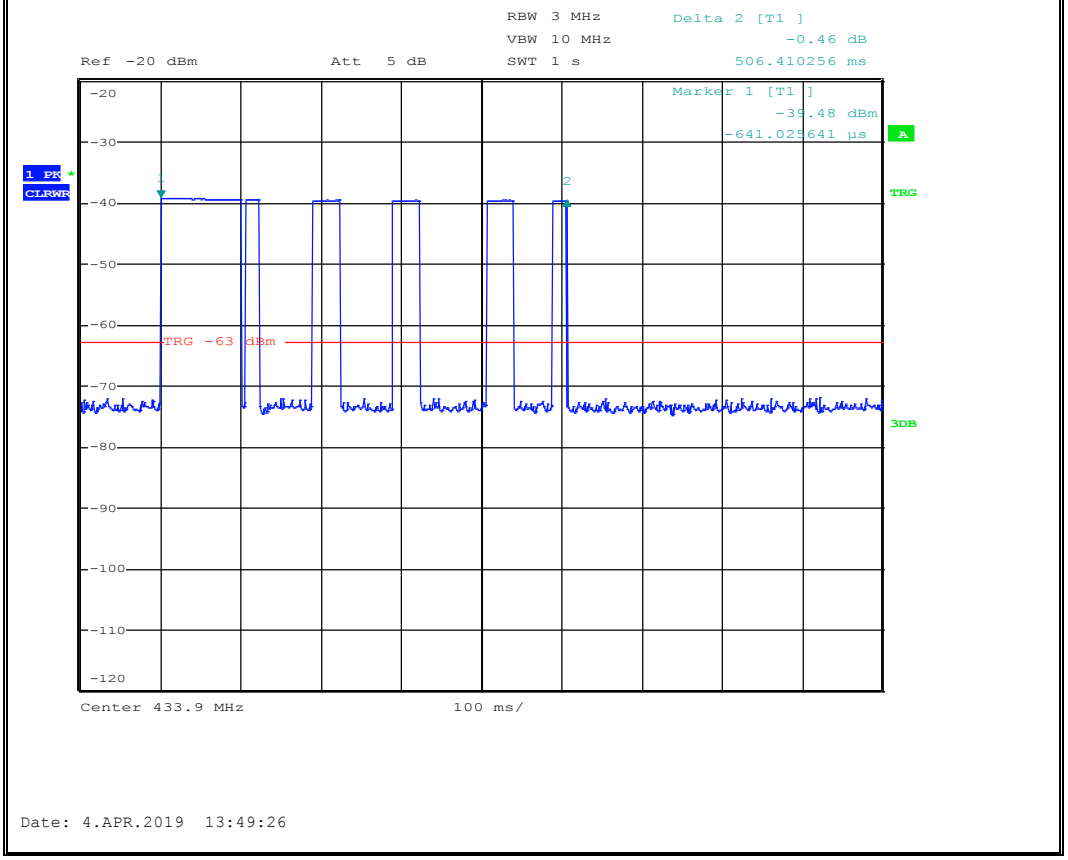
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23° C	1	433.2 MHz Triggered	3 V Battery

8.4.4 Measurement result:

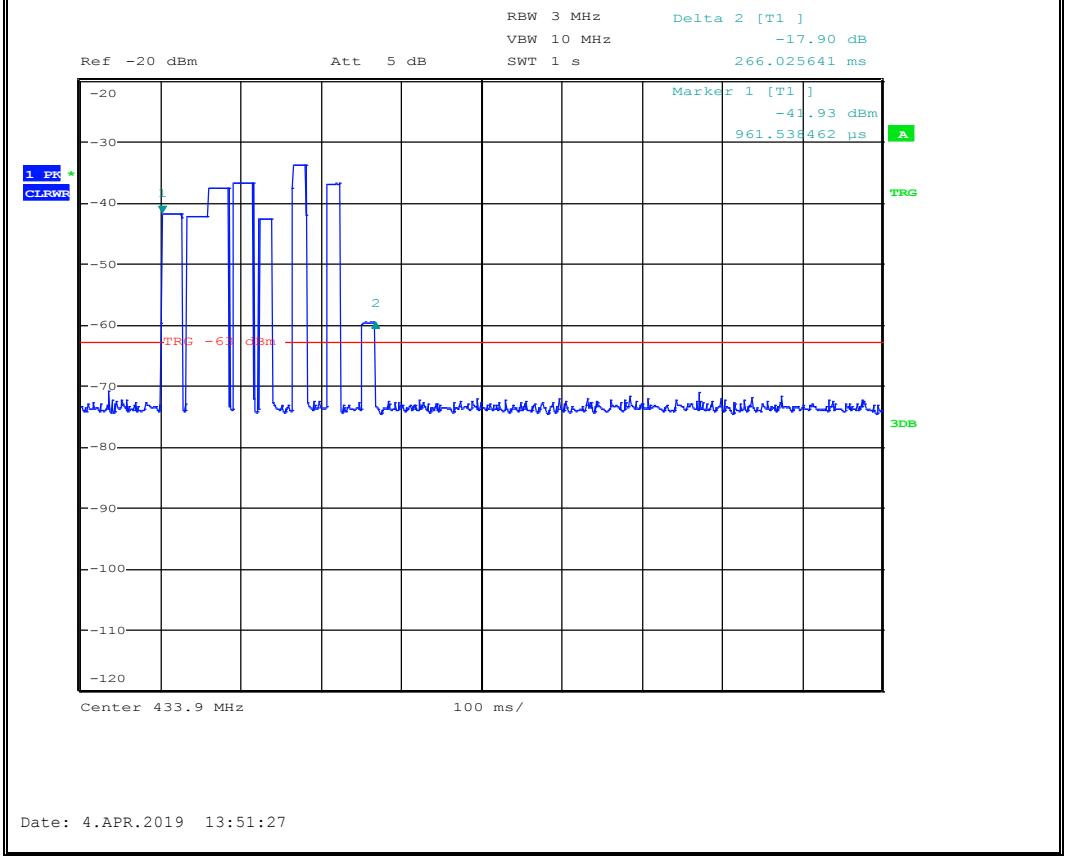
Plot #	Frequency (MHz)	Trigger	Total transmission time (s)	Limit (s)	Result
1	433.2	Manual	0.5	<5	Pass
2	433.2	Remote	0.3	<5	Pass

8.4.5 Measurement Plots:

Plot #1


RBW 3 MHz
VBW 10 MHz
SWT 1 s
Delta 2 [T1]
-0.46 dB
506.410256 ms
Ref -20 dBm
Att 5 dB
Marker 1 [T1]
-39.48 dBm
-641.025641 µs
1 PK
CLRWR
A
TRG
3DB
TRG -63 dBm
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
Center 433.9 MHz
100 ms/
Date: 4.APR.2019 13:49:26

Plot #2


RBW 3 MHz
VBW 10 MHz
SWT 1 s
Delta 2 [T1]
-17.90 dB
266.025641 ms
Ref -20 dBm
Att 5 dB
Marker 1 [T1]
-41.93 dBm
961.538462 µs
1 PK
CLRWR
A
TRG
3DB
TRG -63 dBm
Center 433.9 MHz
100 ms/
Date: 4.APR.2019 13:51:27

9 Test setup photos

Setup photos are included in supporting file name: "EMC_HUFUS-017-18001_15.231_Setup_Photos.pdf"

10 Test Equipment And Ancillaries Used For Testing

Item Name	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Antenna Biconilog 3142E	EMCO	3142E	166067	3 years	6/27/2017
Magnetic Loop Antenna	ETS Lindgren	6512	164698	3 years	7/8/2017
Antenna Horn 3115	ETS Lindgren	3115	35114	3 years	31/6/2017
Antenna Horn 3117-PA	ETS Lindgren	3117-PA	169547	3 years	8/8/2017
Digital Barometer	Control Company	35519-055	91119547	2 Years	6/8/2017
FSV40	R&S	FSV40	101022	2 years	5/7/2017
FSU26	R&S	FSU26	200302	2 years	7/5/2017
Digital Thermometer	Control Company	36934-164	221197993	2 Years	4/27/2018

Note: Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.
Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

11 History

Date	Report Name	Changes to report	Report prepared by
2019-04-29	EMC_HUFUS_017_18001_15.231	Initial Version	Kris Lazarov
2019-05-07	EMC_HUFUS_017_18001_15.231_Rev1	Added section 3.6 Testing Notes; Updated the tables in section 8.3.4	Kris Lazarov