RF TEST REPORT

Applicant	Micron Electronics LLC.
FCC ID	ZKQ-MHA
Product	LTE Tracker
Brand	MobileHelp
Model	MH 1000
Marketing	MD4.0
Report No.	R1803A0116-R5
Issue Date	May 31, 2018

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15C (2018)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Zhengqiang Zhou

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Kai Xu

Approved by: Kai Xu

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Summary of measurement results

Number	Summary of measurements of results	Clause in FCC rules	Verdict
1	Silent Period Time Measurement	15.231(e)	PASS
2	Radiated Emissions	15.231(b),15.209	PASS
3	Occupied bandwidth	15.231(c)	PASS
Date of Testing: March 21,2018 ~ April 8, 2018			

1. Test Laboratory

1.1. Notes of the test report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2. Test facility

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3. Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City:	Shanghai
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E-mail:	xukai@ta-shanghai.com

2. General Description of Equipment under Test

Client Information

Applicant	Micron Electronics LLC.
Applicant address	1001 Yamato Road, Suite 400, Boca Raton, FL 33431, USA
Manufacturer	Micron Electronics LLC.
Manufacturer address	1001 Yamato Road, Suite 400, Boca Raton, FL 33431, USA

General information

EUT Description	
Model	MH 1000
IMEI	355285081019828
Hardware Version	F610_V2
Software Version	L200V01.01B03
Power Supply	Battery/AC adapter
Antenna Type	FPC monopole Antenna
Antenna Connector	A permanently attached antenna (meet with the standard FCC Part 15.203 requirement)
Antenna Gain	0.26 dBi
Modulation Type	/
Operating Frequency Range(s)	433.92MHz
EUT Accessory	
Adapter	Manufacturer: Shenzhen Jingrichang Electronics Technology Co., Ltd Model: JT-H050100
Battery	Manufacturer: Shenzhen BetterPower Battery Co.,Ltd. Model: PL 833338G
Note: The information of the EUT is declared by the manufacturer.	

3. Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards

- **FCC CFR47 Part 15C (2018) Radio Frequency Devices**
- **ANSI C63.10 (2013)**

4. Test Configuration

Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

5. Test Case Results

5.1. Silent Period Time Measurement

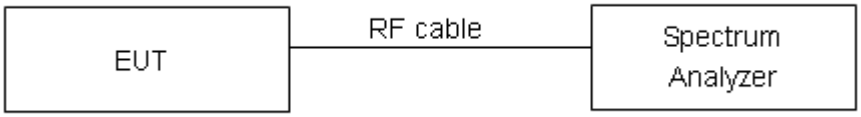
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set SPA Center Frequency = fundamental frequency, RBW,VBW=3MHz, Span=0Hz.
3. Set EUT Power on as normal operation.
4. Set SPA Max hold. Delta Mark.

Test Setup



Limits

15.231(e)devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Limit(ms)	>10s

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2.

Test Results

T1		T2		T3		T4		Ton
T (ms)	number	T (ms)	number	T (ms)	number	T (ms)	number	T (ms)
0.96	11	12	1	1.8	30	0.9	3	79.26
Tp T (s)		Silent Period T (s)		Limit (ms)				Conclusion
21.12		21.04074		> 10s and 30*Ton				PASS

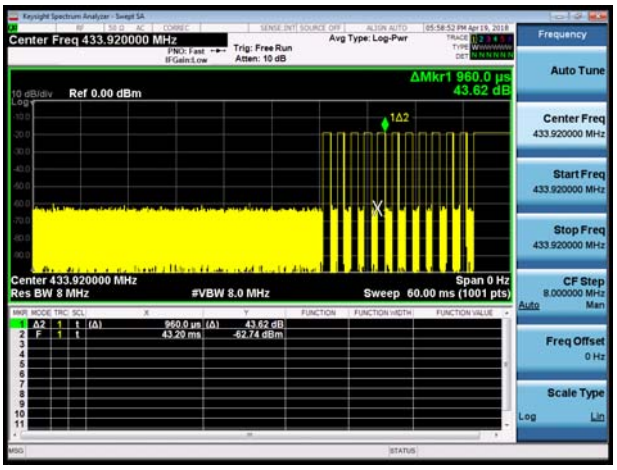
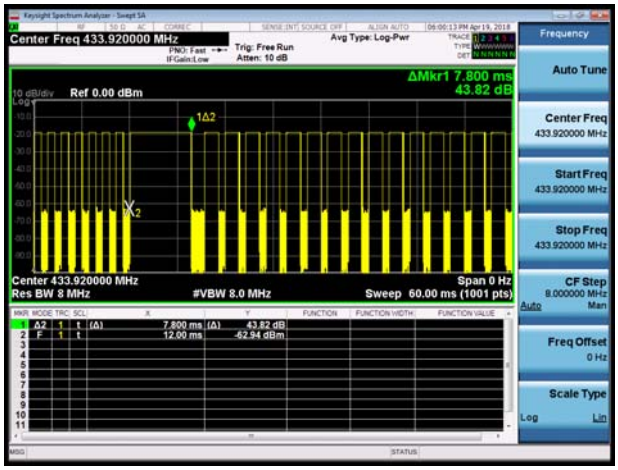
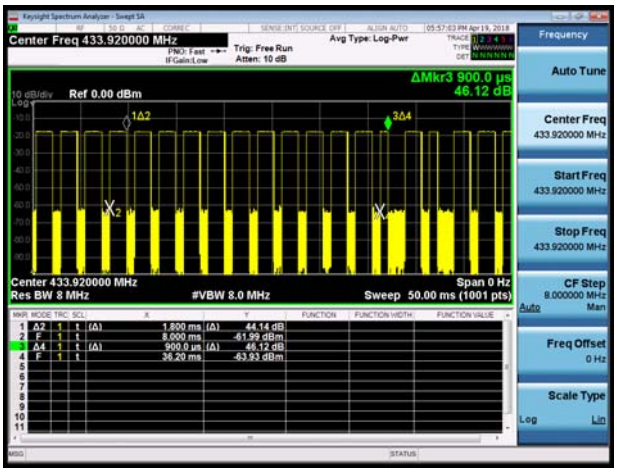
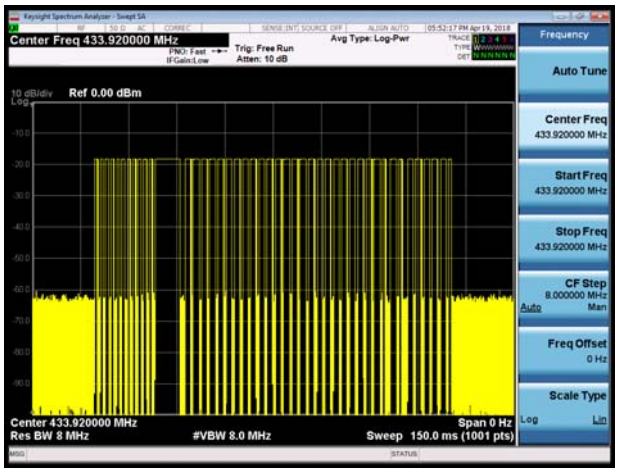
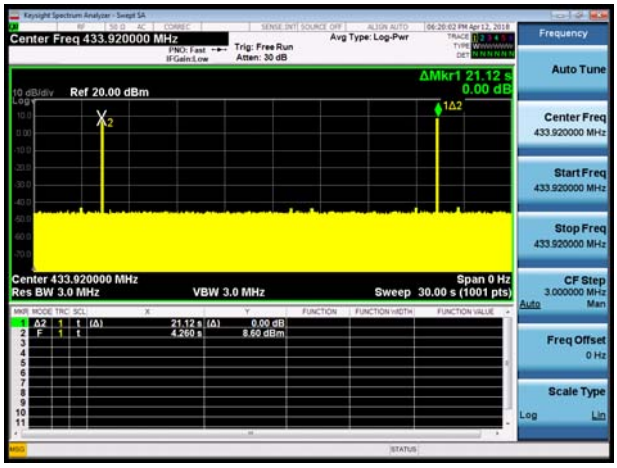
Total transmission time of transmission calculation：

Ton: 79.26ms, <1s

Tp: 21.12s

Silent period limit: ＞10s and 0.07926*30=2.3778sT Silent period=21.12s-79.26ms/1000=21.04074s>10s

The result: PASS

Carrier frequency (MHz): 433.92 **TXON-1**	Carrier frequency (MHz): 433.92 **TXON-2**
	
Carrier frequency (MHz): 433.92 **TXON-3**	Carrier frequency (MHz): 433.92 **TXON-Total**
	
Carrier frequency (MHz): 433.92 Tp	
	

5.2. Radiates Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	102.5kPa

Method of Measurement

The test set-up was made in accordance to the general provisions of ANSI C63.10-2013.The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.

During the test, below 30MHz, the center of the loop shall be 1 meters; above 30MHz, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.
Set the spectrum analyzer in the following:
For Peak value:
RBW=100 kHz for f<1GHz, 1MHz for f≥1GHz
VBW≥RBW
Sweep=auto
Detector function=Peak
Trance=max hold
For AV value:
For harmonic emission:
Average = Peak value + 20log(Duty cycle),
For other unwanted emissions:
RBW=100 kHz for f<1GHz, 1MHz for f≥1GHz
Sweep=auto
VBW=10Hz
Detector function=Peak
Trance=max hold

The receice was scanned from the lowest frequency generated within the EUT TO 5GHz. When an Emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. The worst case was recorded.
An initial pre-scan was performed

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

An initial pre-scan was performed in the 3m chamber using the spectrum analyzer in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bilog antenna with 2 orthogonal polarities.

The field strength is calculated by adding the Antenna Factor, Cable Factor & Peramplifier. The basic equation with a sample calculated is as follows:

Final Test Level=Receiver Reading+ Antenna Factor +Cable Factor- Peramplifier Factor.

The following test results were performed on the EUT.

Since the peak emission level is lower than the average limit, the average emission level does not need to show.

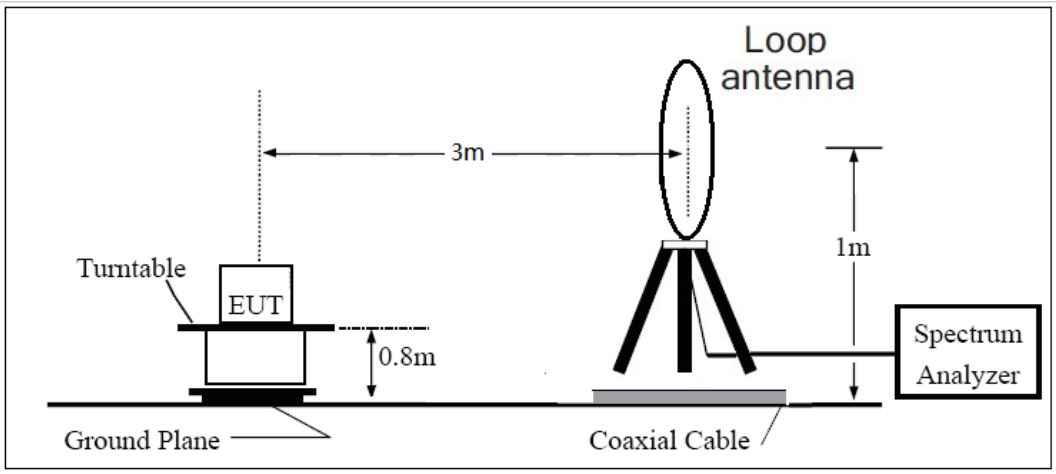
15.35(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrumentation using the CISPR quasi-peak detector can be found in ANSI C63.4-2014, clause 4 (incorporated by reference, see §15.38). As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function as long at the same bandwidth as indicated for CISPR quasi-peak measurements are employed.

15.35(b) Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.The test is in transmitting mode.

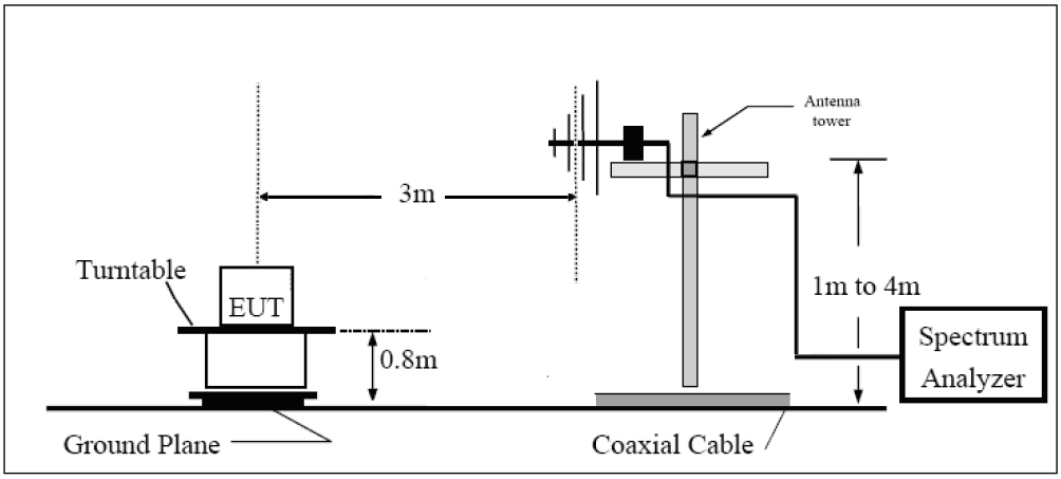
The average correction factor is computed by analyzing the on time in 100ms over one complete pulse train. Analysis of the remote transmitter on time in one complete pulse train, therefore the average value of fundamental frequency is: Average= Peak value +20log(Duty cycle).

Test setup

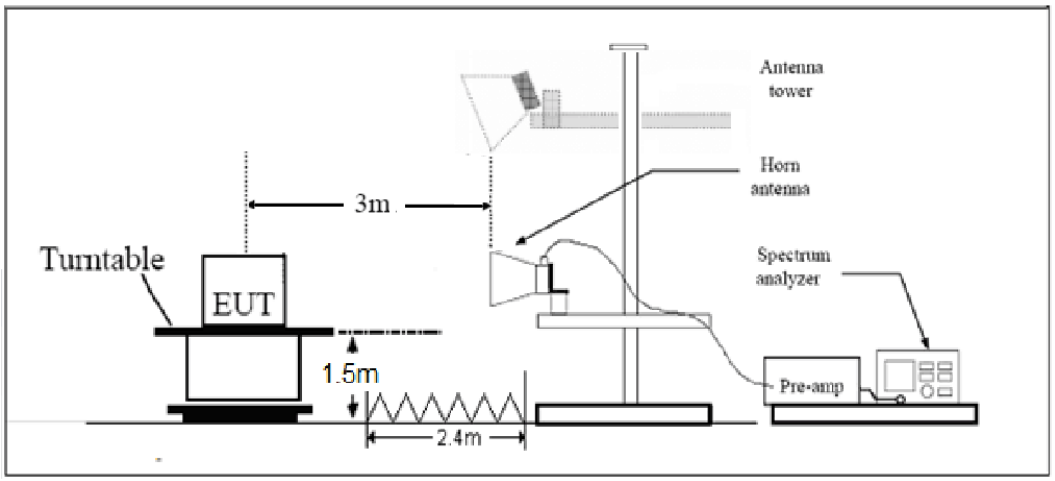
9KHz ~ 30MHz



30MHz ~ 1GHz



1GHz ~ 40GHz



Note: Area side:2.4mX3.6m

Limits

The limit for average or QP field strength dBuV/m for the fundamental emission=80.8dBuV/m
No fundamental is allowed in the restricted bands.
The limit for average field strength dBuV/m for the spurious emission=60.8dBuV/m. Spurious in the restricted bands must be less than 60.8dBuV/m or 15.209, whichever limit permits a higher field strength.

§15.35(b)
There is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor *k* = 1.96.

Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.19 dB
200MHz-1GHz	3.63 dB
Above 1GHz	3.68 dB

Test Results

Fundamental Emission:

The measurement is performed for both of horizontal and vertical antenna Polarization, and only the data of worst mode is recorded in this report.

Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Margin (dB)	Limit (dBuV/m)
433.92	56.049	--	200.0	V	135	44.751	100.8
433.92	--	32.049	200.0	V	135	48.751	80.8

Unwanted Emissions:

Sweep from 9 kHz to 30MHz, and the emissions more than 20 dB below the permissible value are not reported.

The following graphs display the maximum values of horizontal and vertical by software.

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
51.901250	12.3	100.0	V	206.0	-0.8	13.1	48.5	60.8
57.441250	11.6	100.0	V	229.0	-1.0	12.6	49.2	60.8
120.007500	24.6	175.0	H	332.0	14.0	10.6	36.2	60.8
298.770000	31.2	100.0	H	255.0	15.8	15.4	29.6	60.8
340.596250	28.9	125.0	V	344.0	12.1	16.8	31.9	60.8
796.863750	25.4	202.0	H	287.0	0.3	25.1	35.4	60.8

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1152.000000	46.1	100.0	V	356.0	43.8	2.3	34.7	80.8
1708.000000	46.0	100.0	H	184.0	41.9	4.1	34.8	80.8
2070.000000	46.9	200.0	V	285.0	41.4	5.5	33.9	80.8
2450.500000	51.4	100.0	H	324.0	44.4	7.0	29.4	80.8
3656.000000	51.2	100.0	V	0.0	40.8	10.4	29.6	80.8
4926.000000	53.2	100.0	H	184.0	38.0	15.2	27.6	80.8

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1152.000000	36.5	100.0	V	356.0	34.2	2.3	24.3	60.8
1708.000000	37.3	100.0	H	184.0	33.2	4.1	23.5	60.8
2070.000000	39.6	200.0	V	285.0	34.1	5.5	21.2	60.8
2450.500000	43.6	100.0	H	324.0	36.6	7.0	17.2	60.8
3656.000000	42.1	100.0	V	0.0	31.7	10.4	18.7	60.8
4926.000000	44.2	100.0	H	184.0	29.0	15.2	16.6	60.8

Remark: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

3. Margin = Limit – Quasi-Peak

5.3. Occupied Bandwidth

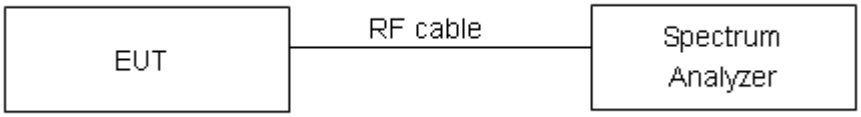
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 10 kHz; VBW is set to 30 kHz on spectrum analyzer.
Dector=Peak, Trace mode=max hold.

Test Setup



Limits

Rule Part 15.230 (c) specifies that “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.”

Limits	<1.0848MHz

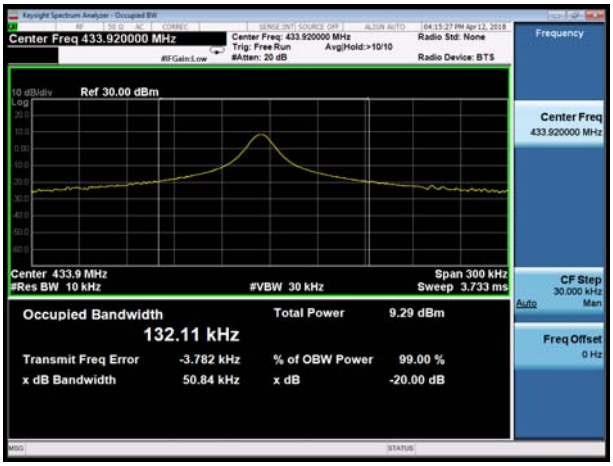
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936 Hz.

Test Results:

Carrier frequency (MHz)	Occupied bandwidth (MHz)	Limit (MHz)	Conclusion
433.92	0.13211	<1.0848	PASS

Carrier frequency (MHz): 433.92



6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Spectrum Analyzer	R&S	FSV30	100815	2017-12-17	2018-12-16
EMI Test Receiver	R&S	ESCI	100948	2017-05-20	2018-05-19
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-201	2017-11-18	2020-11-17
Double Ridged Waveguide Horn Antenna	R&S	HF907	100126	2014-12-06	2019-12-05
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2017-11-18	2020-11-17
Standard Gain Horn	ETS-Lindgren	3160-09	00102644	2015-01-30	2020-01-29
EMI Test Receiver	R&S	ESR	101667	2017-09-06	2018-09-05
LISN	R&S	ENV216	101171	2016-12-16	2019-12-15
Spectrum Analyzer	Agilent	N9010A	MY47191109	2017-05-20	2018-05-19
RF Cable	Agilent	SMA 15cm	0001	/	/
Software (CE)	ROHDE&SCHWARZ	EMC32	9.26.0	/	/
Software (RE/RSE)	ROHDE&SCHWARZ	EMC32	8.52.0	/	/

*******END OF REPORT *******