ACCREDITED
TESTING LABORATORY
CERTIFICATE # 4821.01

BACL
Bay Area Compliance Labs Corp.

FCC PART 22, 74 and 90

TEST REPORT

For

Hytera Communications Corporation Limited

Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, 518057 China

FCC ID: YAMEPOLE100F4

Report Type:	**Product Type:**
Original Report	Digital WANET Repeater

Report Number:	RDG171229011-00B
Report Date:	2018-03-17
Reviewed By:	Candy Li RF Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

Note: This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. * This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*".

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Hytera Communications Corporation Limited's* product, model number: *E-pole100 F4 (FCC ID: YAMEPOLE100F4)* in this report is a *Digital WANET Repeater*, which was measured approximately: 316 mm (L) x 223 mm (W) x 133 mm(H), rated input voltage: AC 100~240V or DC 13.5V-16.5V.

** All measurement and test data in this report was gathered from production sample serial number: 171229011 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2017-12-29.*

Objective

This test report is prepared on behalf of *Hytera Communications Corporation Limited* in accordance with Part 2, and Part 22, 74, 90 of the Federal Communication Commissions rules.

Related Submittal(s)/Grant(s)

FCC Part 22H & 24E PCB submissions with FCC ID: YAMEPOLE100F4.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of federal Regulations Title 47 Part 2, Sub-part J as well as the following individual parts:

Part 22 – Public Mobile Service
Part 74 – Experimental Radio, Auxiliary, Special Broadcast and other Program Distributonal Service
Part 90 – Private Land Mobile Radio Service

Applicable Standards: TIA 603-D.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF output power, conducted		±1.5dB
Unwanted Emission, conducted		±1.5dB
Emissions, radiated	Below 1GHz	±4.70dB
	Above 1GHz	±4.80dB
Temperature		±1℃
Supply voltages		±0.4%

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 382179, the FCC Designation No. : CN5001.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a test mode which has been done in the factory.

EUT Exercise Software

No exercise software was used.

Special Accessories

No special accessory was used.

Equipment Modifications

No modification was made to the EUT tested.

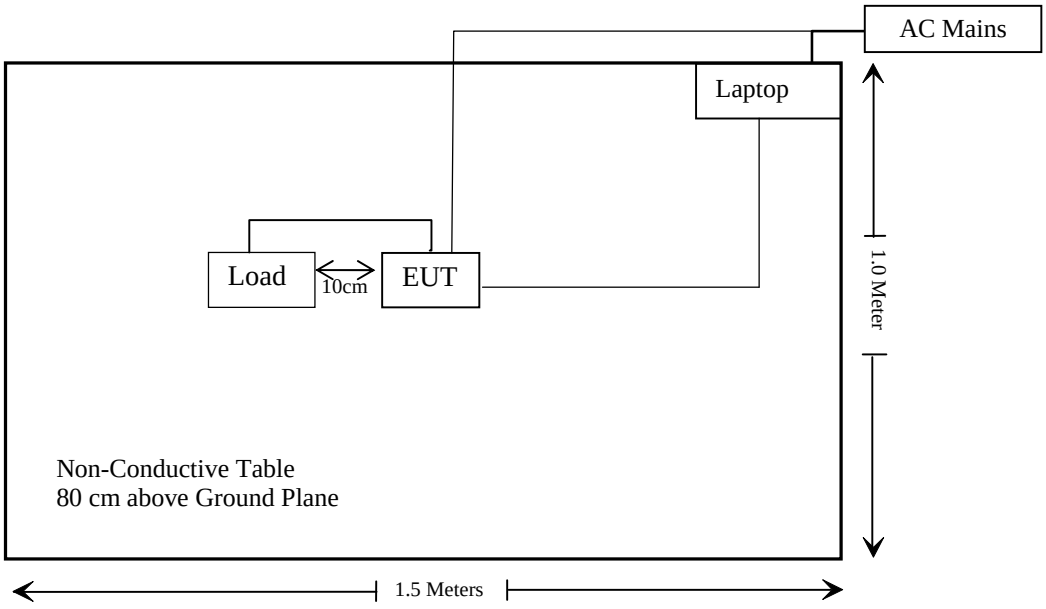
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
N/A	Load	N/A	N/A
HP	Laptop	516	Gjh511644g

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielding Detachable RJ45 Cable	1.0	Laptop	Data port Cable
Un-shielding Detachable Data port Cable	0.5	RJ45 Cable	EUT Data Port
Shielding Detachable RF Cable	0.5	EUT	Load

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1307(b), §2.1091	Maximum Permissible exposure (MPE)	Compliance
§2.1046; § 22.727; §74.461; §90.205	RF Output Power	Compliance
§2.1047; §74.463;§90.207	Modulation Characteristic	Not Applicable
§2.1049;§22.357; §22.731; §74.462; §90.209; §90.210	Occupied Bandwidth & Emission Mask	Compliance
§2.1051; §22.861; §74.462;§90.210	Spurious Emission at Antenna Terminal	Compliance
§2.1053; §22.861; §74.462;§90.210	Spurious Radiated Emissions	Compliance
§2.1055; § 22.355; §74.464;§90.213	Frequency Stability	Compliance
§90.214	Transient Frequency Behavior	Compliance

Note: This device can support two types of power supply, pre-test with AC and DC mode which will not affect the test result, and the worst case was performed for AC power supply except for frequency stability test item.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017-12-29	2020-12-28
Rohde & Schwarz	Signal Generator	FSIQ26	8386001028	2017-04-24	2018-04-24
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2017-12-17	2020-12-17
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-02-14	2018-02-14
HP	Amplifier	HP8447E	1937A01046	2017-11-19	2018-05-21
Anritsu	Signal Generator	68369B	004114	2017-12-05	2018-12-05
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2017-12-07	2018-12-07
COM POWER	Dipole Antenna	AD-100	041000	NCR	NCR
A.H. System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Ducommun technologies	RF Cable	UFA210A-1-4724-30050U	MFR64369 223410-001	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	104PEA	218124002	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	RG-214	1	2017-11-19	2018-05-21
Ducommun technologies	RF Cable	RG-214	2	2017-11-22	2018-05-22
RF Conducted Test					
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2017-11-22	2018-11-22
Changjiang	Contact Voltage Regulator	TDGC2-	N/A	NCR	NCR
TDK-Lambda	DC Power Supply	Z60-14-L-C	N/A	NCR	NCR
Fluke	Digital Multimeter	287	19000011	2017-04-09	2018-04-09
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2017-12-05	2018-12-05
Rohde & Schwarz	Signal Analyzer	FSIQ26	837405/023	2017-04-24	2018-04-24
N/A	30dB Attenuator	53-30-43	PG633	2017-11-22	2018-05-22

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for Occupational/Controlled Exposure

Limits for occupational/Controlled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (Minutes)**
0.3-1.34	614	1.63	*(100)	6
1.34-30	1842/f	4.89/f	*($900/f^2$)	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,000	/	/	5.0	6

f = frequency in MHz
* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \le 1$$

Worst case as below:

Frequency (MHz)	Antenna Gain		Tune up Conducted Power		Tune up Average power	Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
	(dBi)	(numeric)	(dBm)	(mW)	(mW)			
824-849	1.0	1.26	32.5	1778.28	222.29	65	0.005	2.74
1850-1910	3.5	2.24	29.0	794.33	99.29	65	0.004	6.16
410-470	7.8	6.03	43.0	19952.62	9976.31	65	1.133	1.36

Note:
For GSM mode, the Time-base average power was consideration, Average power as below:
GSM850: 1778.28*(1/8)mW=222.29mW.
PCS1900: 794.33*(1/8)mW=99.29mW.

For DMR mode, the duty cycle of 50% was consideration, Average power as below:
19952.62*50%mW=9976.31mW.

Simultaneous transmitting consideration: GSM850 and DMR, or PCS1900 and DMR

The ratio=MPE/$limit_{824MHz}$+MPE/$limit_{410MHz}$=0.005/2.74+1.133/1.36=0.83＜1.0.

The ratio=MPE/$limit_{1850MHz}$+MPE/$limit_{410MHz}$=0.004/6.16+1.133/1.36=0.83＜1.0.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 65cm from nearby persons.

Result: Compliance

FCC §2.1046 & § 22.727 & §74.461 & §90.205 - RF OUTPUT POWER

Applicable Standard

FCC §2.1046, § 22.727, §74.461 and §90.205

Test Procedure

Conducted RF Output Power:

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

Spectrum Analyzer Setting:

R B/W	Video B/W
100 kHz	300 kHz

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Rocky Kang on 2018-01-22.

Test Mode: Transmitting

Test Result: Compliance. Please refer to following table.

Mode	Frequency Spacing (kHz)	Frequency (MHz)	Power level	Output (dBm)	Output Power(W)	Note
Digital	12.5	410.0125	High	42.87	19.36	PART 90
			Middle	40.17	10.40	
			Low	37.28	5.35	
		450.2125	High	42.85	19.28	PART 74 & 90
			Middle	40.16	10.38	
			Low	37.09	5.12	
		459.9875	High	42.86	19.32	PART 22
			Middle	40.14	10.33	
			Low	37.02	5.04	
		469.9875	High	42.89	19.45	PART 90
			Middle	40.16	10.38	
			Low	37.09	5.12	

Rated High power is 20W, limit is 16-24 W
Rated Middle power is 10W, limit is 8-12 W
Rated Low power is 5W, limit is 4-6W

FCC §2.1047 & §74.463 & §90.207 - MODULATION CHARACTERISTIC

Applicable Standard

According to FCC § 2.1047(d), Part 22, 74, 90 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

FCC §2.1049 & §22.357 & § 22.731 & §74.462 & §90.209 & §90.210 – OCCUPIED BANDWIDTH & EMISSION MASK

Applicable Standard

FCC §2.1049, §22.357, § 22.731, §74.462, §90.209 and §90.210

Emission Mask D - 12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

1) For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0, 0dB.

2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least 7.27 (f_d –2.88 kHz) dB.

3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 30 kHz or more. In the 60 kHz bands immediately outside and adjacent to the authorized frequency range or channel, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 30 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 100 Hz and the spectrum was recorded in the frequency band ±50 kHz from the carrier frequency.

Test Data

Environmental Conditions

Temperature:	24~27 ℃
Relative Humidity:	50~57 %
ATM Pressure:	100.9~101.0 kPa

The testing was performed by Rocky Kang from 2018-01-17 to 2018-01-20.

Test mode: transimitting

Modulation	Channel Separation (kHz)	Frequency (MHz)	Power Level	99% Occupied Bandwidth (kHz)	26 dB Emissions Bandwidth (kHz)	Note
Digital	12.5	450.2125	High	7.29	8.89	PART 74 & 90
	12.5		Middle	7.29	9.70	
	12.5		Low	7.29	9.13	
	12.5	459.9875	High	7.21	9.05	Part 22
	12.5		Middle	7.21	9.54	
	12.5		Low	7.13	9.29	

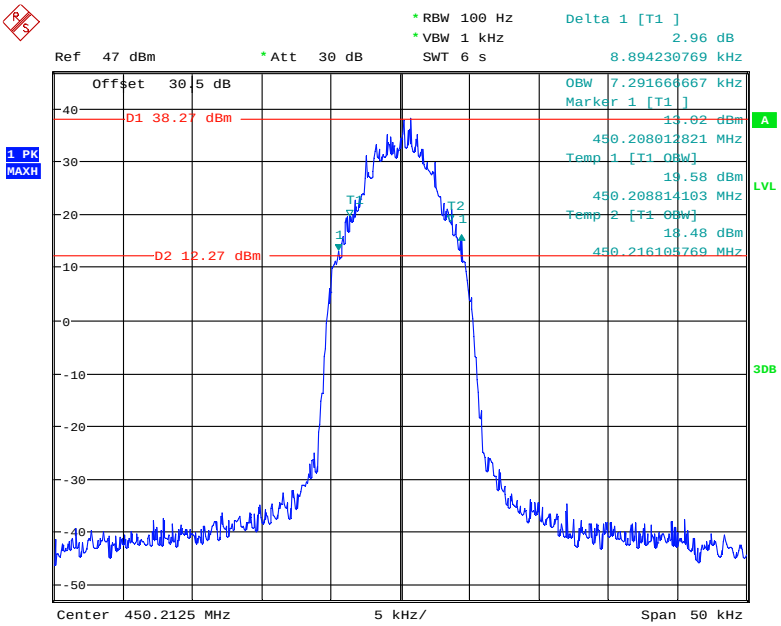
Note: Emission designator is base on calculation instead of measurement.

Emission Designator Per CFR 47 §2.201& §2.202&, Bn = 2M + 2D

For Digital Mode (Channel Spacing: 12.5 kHz)
Emission Designator 7K60F1D and 7K60F1E
The 99% energy rule (title 47CFR 2.1049) was used for digital mode. It basically states that 99% of the modulation energy falls within X kHz, in this case, 7.29 kHz. The emission mask was obtained from 47CFR 90.210(d).
F1D and F1E portion of the designator indicates digital information.
Therefore, the entire designator for 12.5 kHz channel spacing digital mode is 7K60F1D and 7K60F1E.

Digital Modulation:

Frequency 450.2125 MHz: 99% Occupied & 26 dB Bandwidth, High Power



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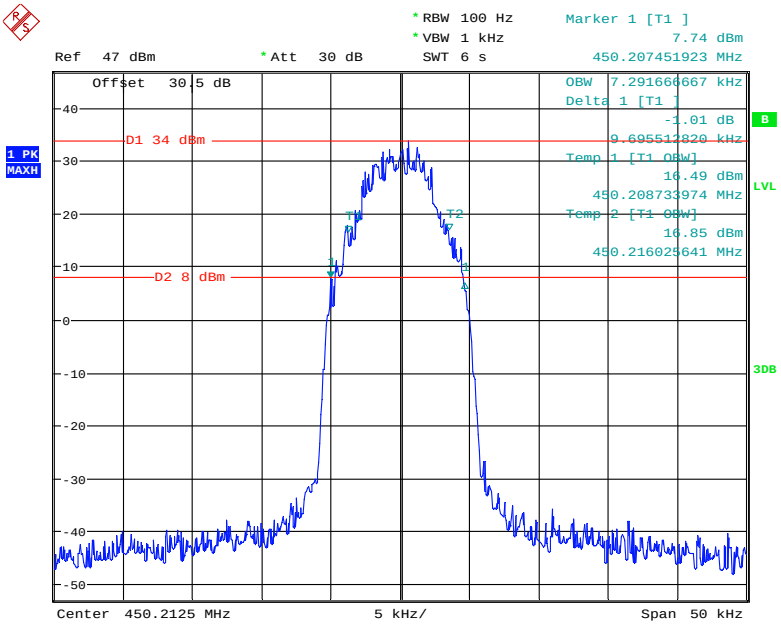
Frequency 450.2125 MHz: 99% Occupied & 26 dB Bandwidth, Middle Power



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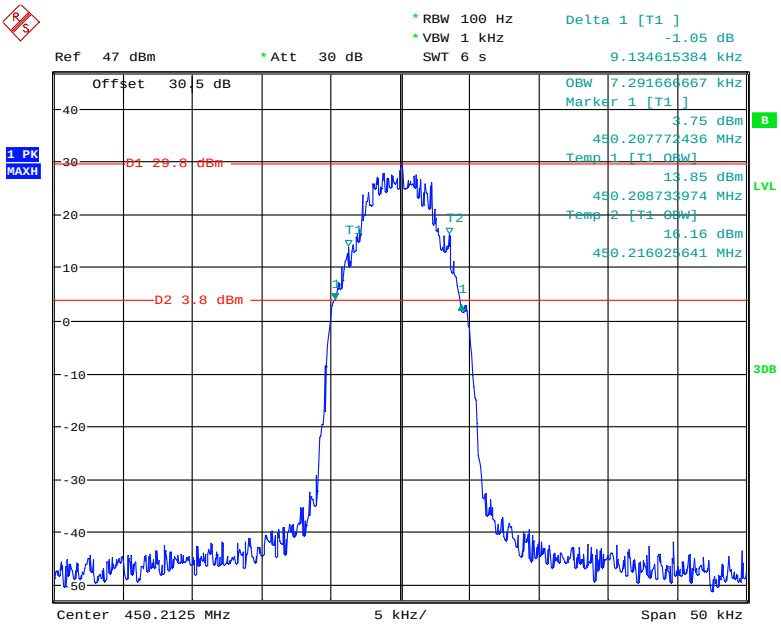
Frequency 450.2125 MHz: 99% Occupied & 26 dB Bandwidth, Low Power



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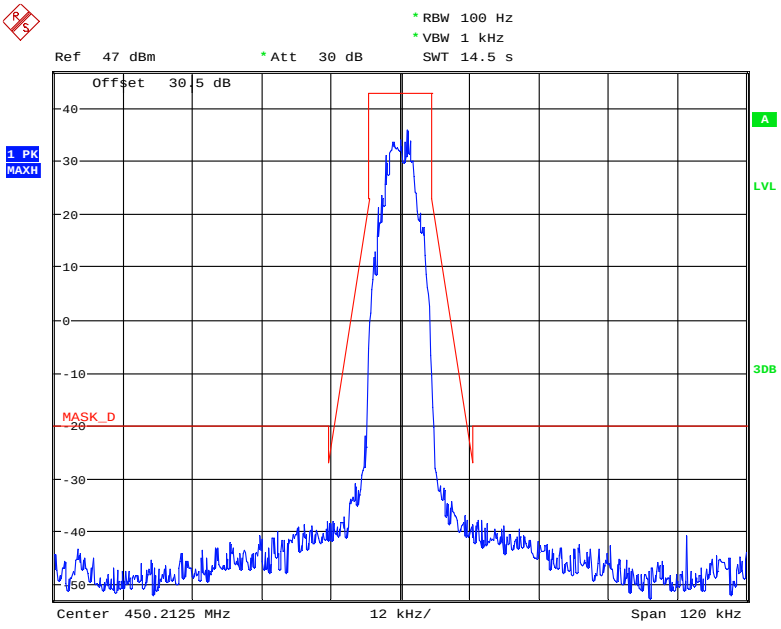
Frequency 450.2125 MHz: Emission Mask D, High Power



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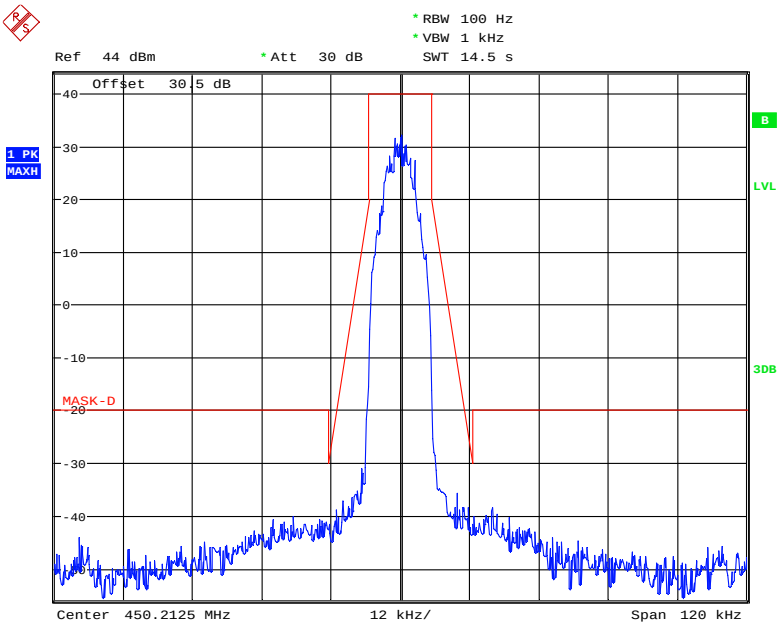
Frequency 450.2125 MHz: Emission Mask D, Middle Power



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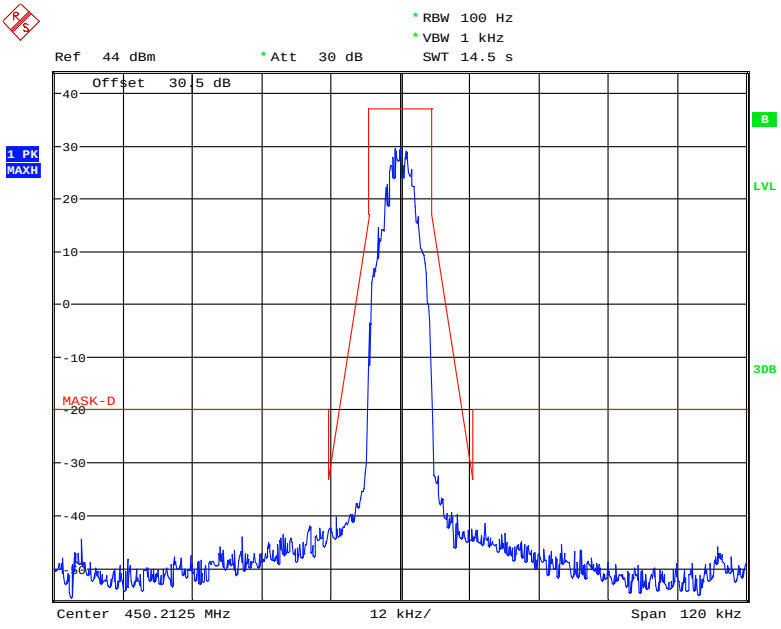
Frequency 450.2125 MHz: Emission Mask D, Low Power



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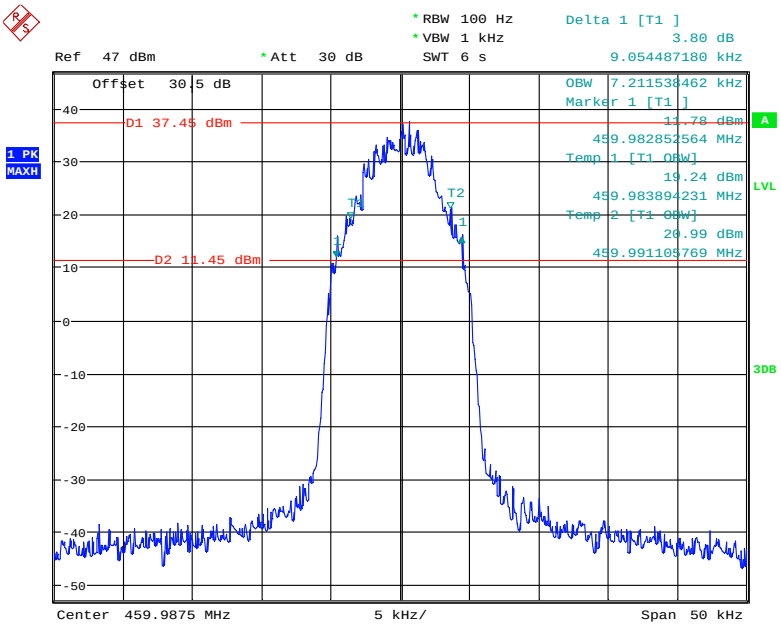
Frequency 459.9875 MHz: 99% Occupied & 26 dB Bandwidth, High Power



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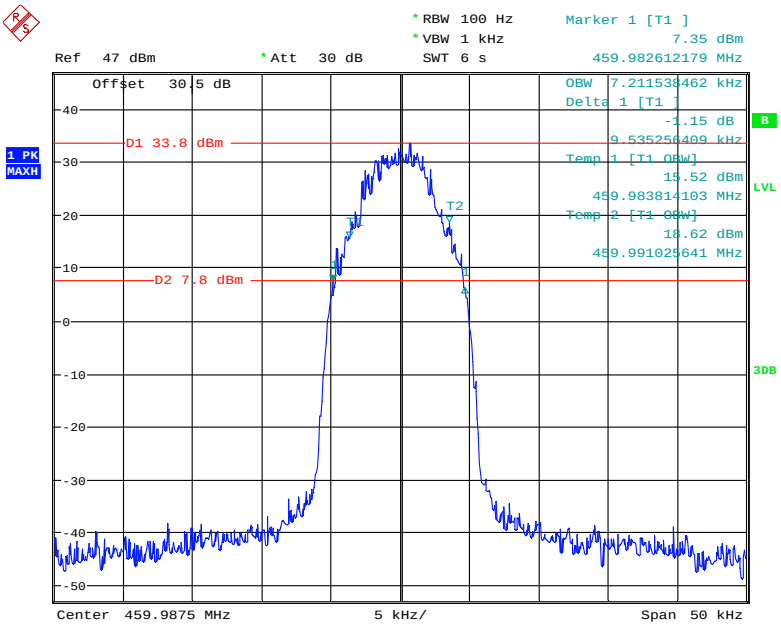
Frequency 459.9875 MHz: 99% Occupied & 26 dB Bandwidth, Middle Power



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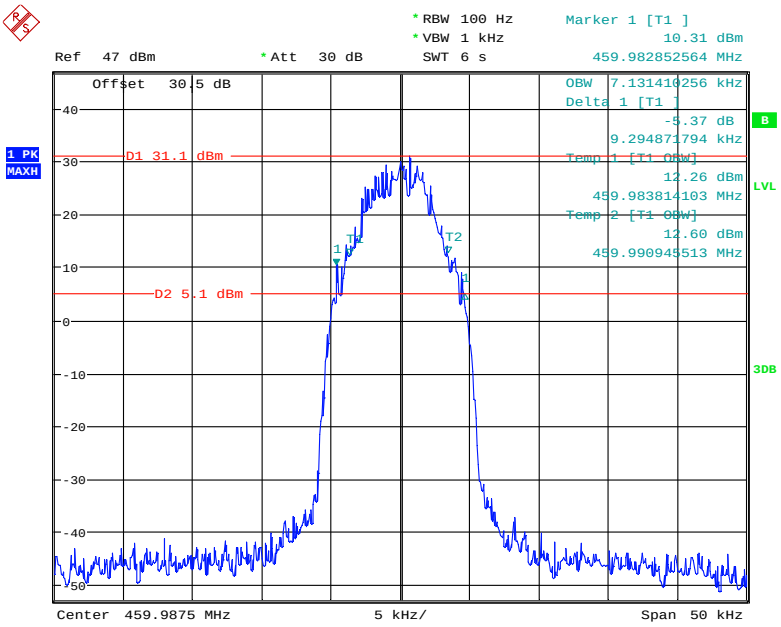
Frequency 459.9875 MHz: 99% Occupied & 26 dB Bandwidth, Low Power



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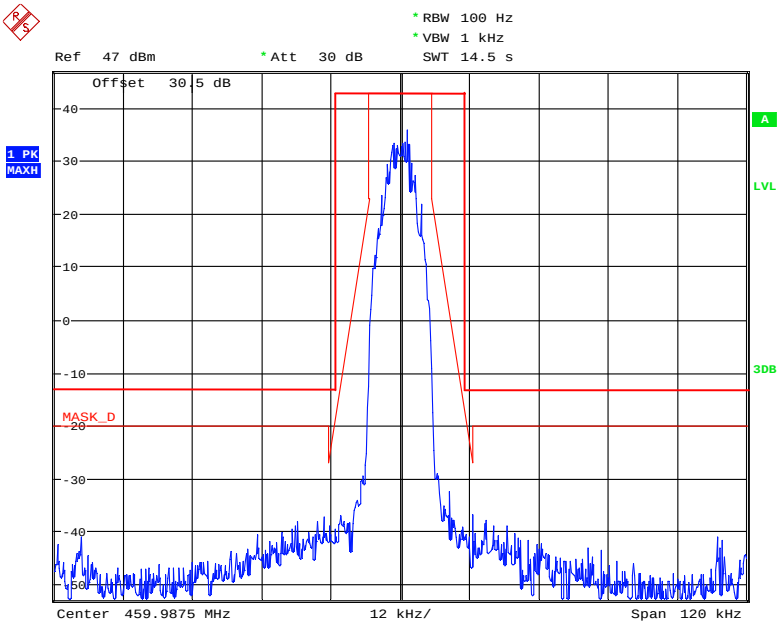
Frequency 459.9875 MHz: Emission Mask, High Power, FCC part 22.359



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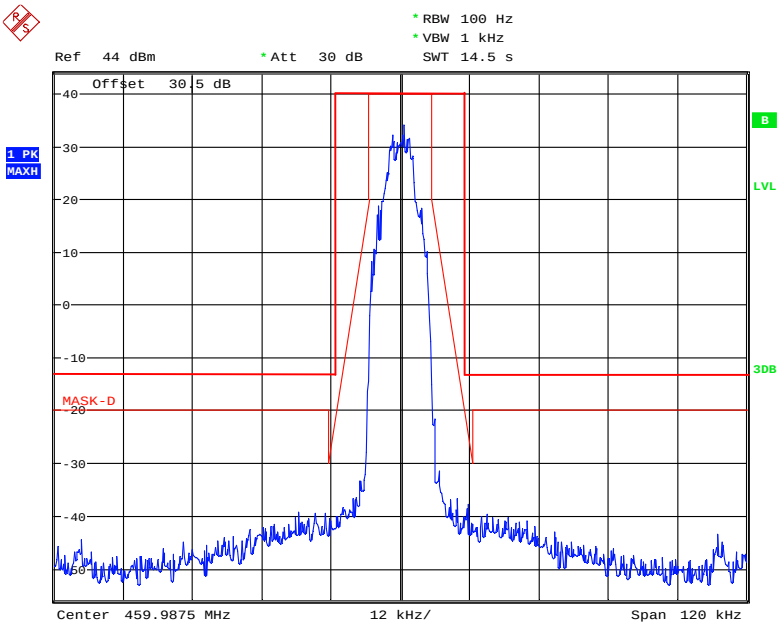
Frequency 459.9875 MHz: Emission Mask, Middle Power, FCC part 22.359



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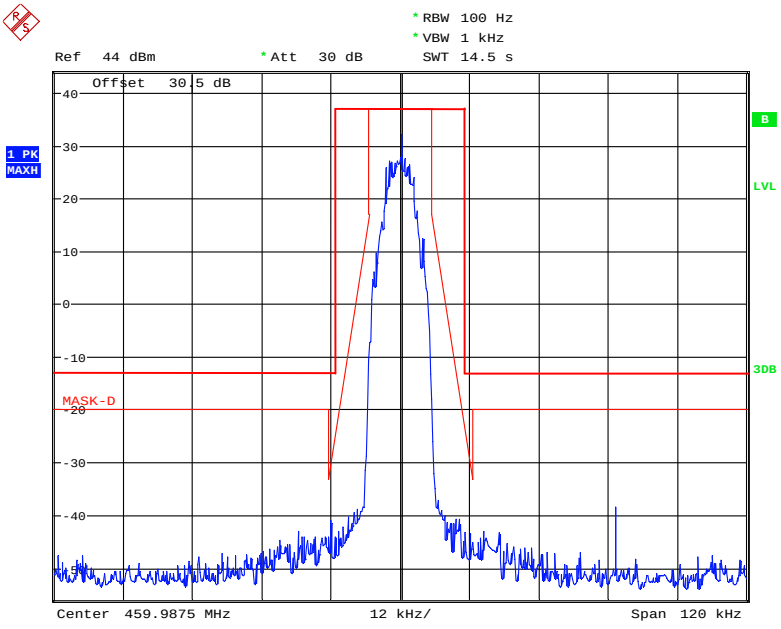
Frequency 459.9875 MHz: Emission Mask, Low Power, FCC part 22.359



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FCC §2.1051 & §22.861 & §74.462 & §90.210 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

Emission Mask D—12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

1) For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0, 0 dB.

2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least 7.27 (f_d –2.88 kHz) dB.

3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100kHz for below 1GHz, and 1MHz for above 1GHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

Test Data

Environmental Conditions

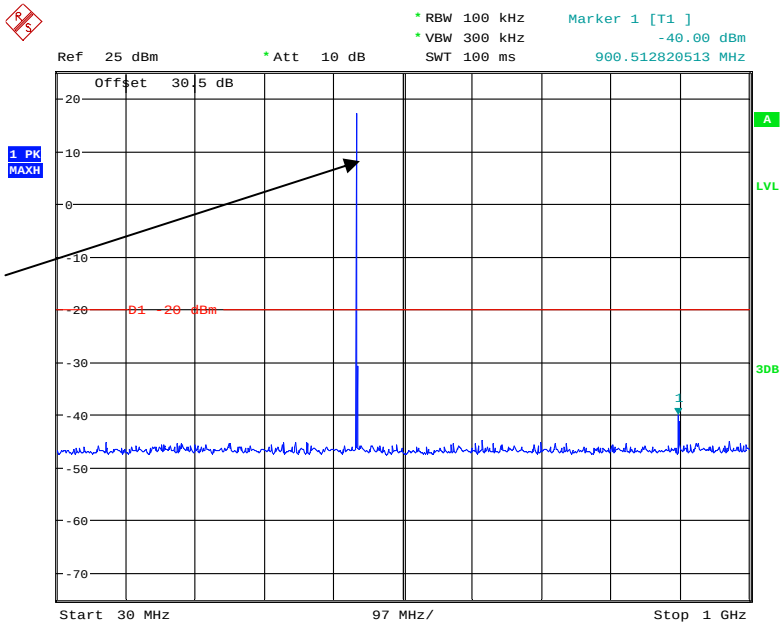
Temperature:	24~27 ℃
Relative Humidity:	50~57 %
ATM Pressure:	100.9~101.0 kPa

The testing was performed by Rocky Kang from 2018-01-17 to 2018-01-20.

Test Mode: Transmitting, worst case for High power level, please refer to the following plots.

Digital Modulation:

30MHz – 1 GHz, 450.2125 MHz



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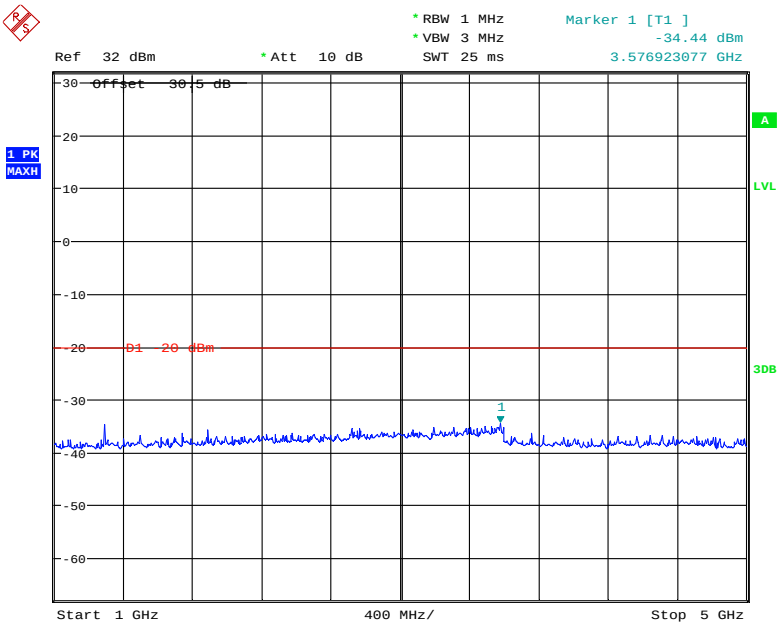
1 GHz – 5 GHz, 450.2125 MHz



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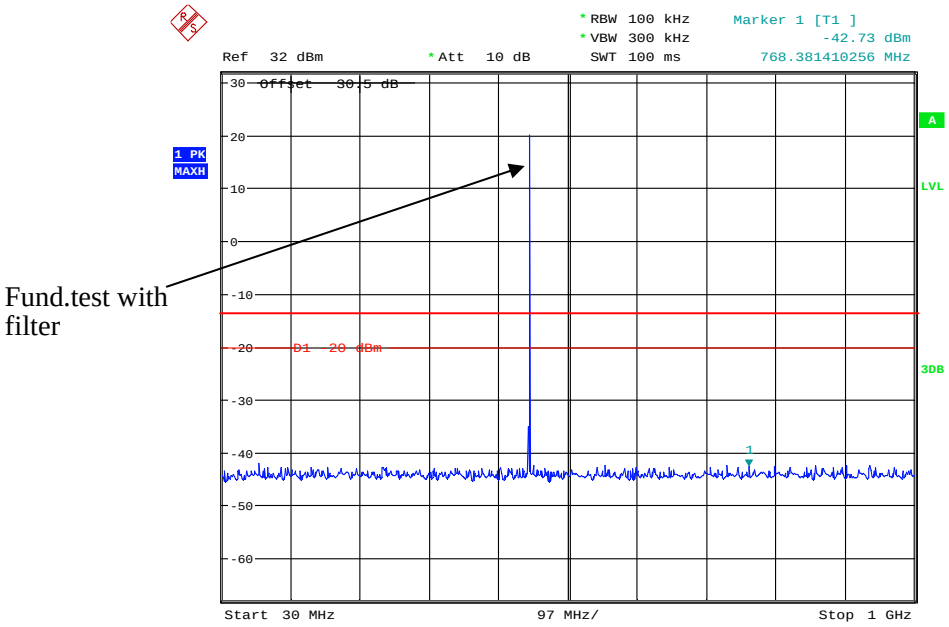
30MHz – 1 GHz, 459.9875 MHz



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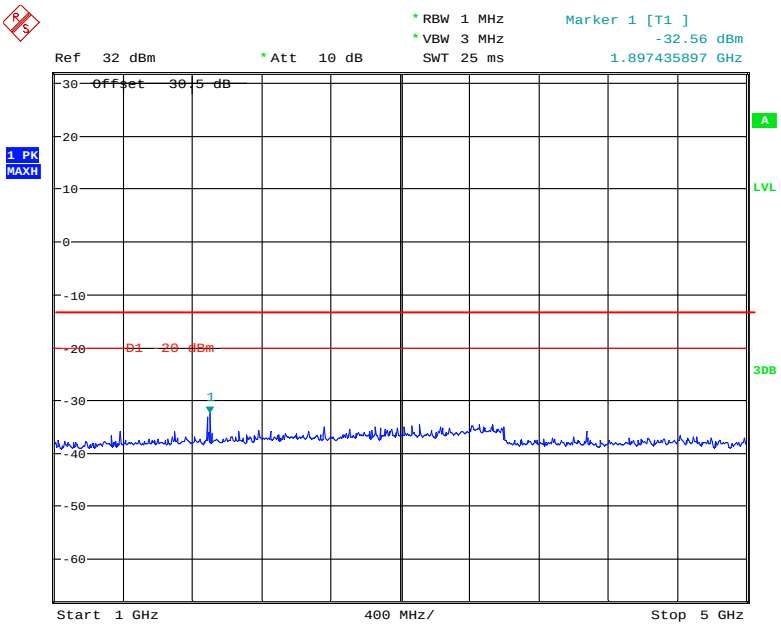
1 GHz – 5 GHz, 459.9875 MHz



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FCC §2.1053 & §22.861 & §74.462 & §90.210 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §2.1053, §22.861, §74.462 and §90.210

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT .The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to teeth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =10 1g (TXpwr in Watts/0.001)-the absolute level

Spurious attenuation limit in dB =50+10 Log_{10} (power out in Watts) for EUT with a 12.5 kHz channel bandwidth.

Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Rocky Kang on 2018-01-22.

Test Mode: Transmitting, worst case for High power level.

30MHz - 5GHz:

Frequency (MHz)	Receiver Reading (dBμV)	Turn Table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
Digital Modulation 450.2125MHz-12.5 kHz										
900.425	39.14	143	1.1	H	-55.9	0.70	0	-56.60	-20	36.60
900.425	39.58	211	1.2	V	-54.4	0.70	0	-55.10	-20	35.10
1350.64	45.83	302	1.8	H	-62.1	1.60	8.30	-55.40	-20	35.40
1350.64	45.03	147	2.2	V	-63.2	1.60	8.30	-56.50	-20	36.50
1800.85	46.7	234	2.1	H	-59.7	1.30	8.50	-52.50	-20	32.50
1800.85	47.08	30	2.0	V	-59.0	1.30	8.50	-51.80	-20	31.80
Digital Modulation 459.9875MHz-12.5 kHz										
919.975	37.92	280	1.3	H	-57.1	0.70	0	-57.80	-13	44.80
919.975	37.84	92	1.5	V	-56.2	0.70	0	-56.90	-13	43.90
1379.97	47.03	336	1.2	H	-60.9	1.60	8.30	-54.20	-13	41.20
1379.97	45.56	69	1.9	V	-62.7	1.60	8.30	-56.00	-13	43.00
1839.95	47.27	62	1.0	H	-59.2	1.30	8.50	-52.00	-13	39.00
1839.95	50.9	324	1.6	V	-55.1	1.30	8.50	-47.90	-13	34.90

Note:
Absolute Level = Substituted Level - Cable loss + Antenna Gain
Margin = Limit- Absolute Level

FCC §2.1055 & § 22.355 & §74.464 & §90.213 - FREQUENCY STABILITY

Applicable Standard

FCC §2.1055, § 22.355, §74.464 and §90.213

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external AC/DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The power cable and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Rocky Kang on 2018-01-22.

Test Mode: Transmitting

Note: The device is intended for fixed using.

For AC power supply:

For 12.5 kHz:

Digital Modulation, Reference Frequency: 450.2125 MHz, Limit: ±1.5 ppm			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (℃)	Voltage Supplied (V_{AC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	120	450.212474	-0.058
40	120	450.212463	-0.082
30	120	450.212482	-0.040
20	120	450.212469	-0.069
10	120	450.212473	-0.060
0	120	450.212466	-0.076
-10	120	450.212487	-0.029
-20	120	450.212469	-0.069
-30	120	450.212469	-0.069
Frequency Stability versus Input Voltage			
20	102	450.2124238	-0.169

Digital Modulation, Reference Frequency: 459.9875 MHz, Limit: ±2.5 ppm			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (℃)	Voltage Supplied (V_{AC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	120	459.987465	-0.076
40	120	459.987475	-0.054
30	120	459.987465	-0.076
20	120	459.987435	-0.141
10	120	459.987485	-0.033
0	120	459.987452	-0.104
-10	120	459.987438	-0.135
-20	120	459.987438	-0.135
-30	120	459.987452	-0.104
Frequency Stability versus Input Voltage			
20	102	459.987435	-0.141

For DC power supply:

For 12.5 kHz:

Digital Modulation, Reference Frequency: 450.2125 MHz, Limit: ±1.5 ppm			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (℃)	Voltage Supplied (V_{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	13.5	450.212465	-0.078
40	13.5	450.212454	-0.102
30	13.5	450.212489	-0.024
20	13.5	450.212461	-0.087
10	13.5	450.212470	-0.067
0	13.5	450.212468	-0.071
-10	13.5	450.212481	-0.042
-20	13.5	450.212465	-0.078
-30	13.5	450.212463	-0.082
Frequency Stability versus Input Voltage			
20	11.4	450.2124242	-0.168

Digital Modulation, Reference Frequency: 459.9875 MHz, Limit: ±2.5 ppm			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (℃)	Voltage Supplied (V_{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	13.5	459.987460	-0.087
40	13.5	459.987459	-0.089
30	13.5	459.987463	-0.080
20	13.5	459.987447	-0.115
10	13.5	459.987473	-0.059
0	13.5	459.987464	-0.078
-10	13.5	459.987451	-0.107
-20	13.5	459.987440	-0.130
-30	13.5	459.987466	-0.074
Frequency Stability versus Input Voltage			
20	11.4	459.987458	-0.091

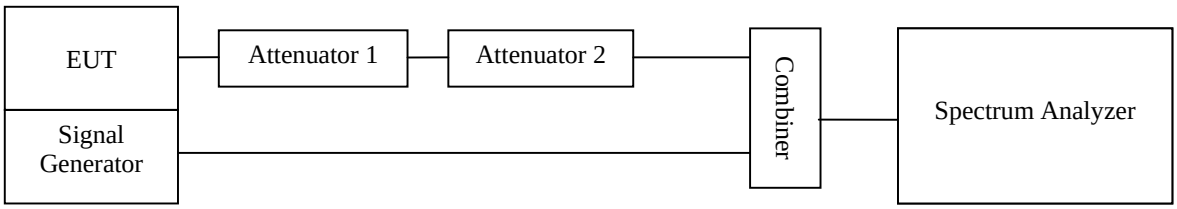
FCC §90.214 - TRANSIENT FREQUENCY BEHAVIOR

Applicable Standard

Regulations: FCC §90.214
Test method: ANSI/TIA-603-D 2010, section 2.2.19.3

Test Procedure

a) Connect the EUT and test equipment as shown on the following block diagram.
b) Set the Spectrum Analyzer to measure FM deviation, and tune the RF frequency to the transmitter assigned frequency.
c) Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at ±12.5 kHz deviation and set its output level to -100dBm.
d) Turn on the transmitter.
e) Supply sufficient attenuation via the RF attenuator to provide an input level to the Spectrum Analyzer that is 40 dB below the maximum allowed input power when the transmitter is operating at its rated power level. Note this power level on the Spectrum Analyzer as P_0.
f) Turn off the transmitter.
g) Adjust the RF level of the signal generator to provide RF power equal to P_0. This signal generator RF level shall be maintained throughout the rest of the measurement.
h) Remove the attenuation 1, so the input power to the Spectrum Analyzer is increased by 30 dB when the transmitter is turned on.
i) Adjust the vertical amplitude control of the spectrum analyzer to display the 1000 Hz at ±4 divisions vertically centered on the display. Set trigger mode of the Spectrum Analyzer to "Video", and tune the "trigger level" on suitable level. Then set the "tiger offset" to -10ms for turn on and -15ms for turn off.
j) Turn on the transmitter and the transient wave will be captured on the screen of Spectrum Analyzer. Observe the stored display. The instant when the 1 kHz test signal is completely suppressed is considered to be t_{on}. The trace should be maintained within the allowed divisions during the period t_1 and t_2.
k) Then turn off the transmitter, and another transient wave will be captured on the screen of Spectrum Analyzer. The trace should be maintained within the allowed divisions during the period t_3.



Test Data

Environmental Conditions

Temperature:	23 ℃
Relative Humidity:	54 %
ATM Pressure:	101.1 kPa

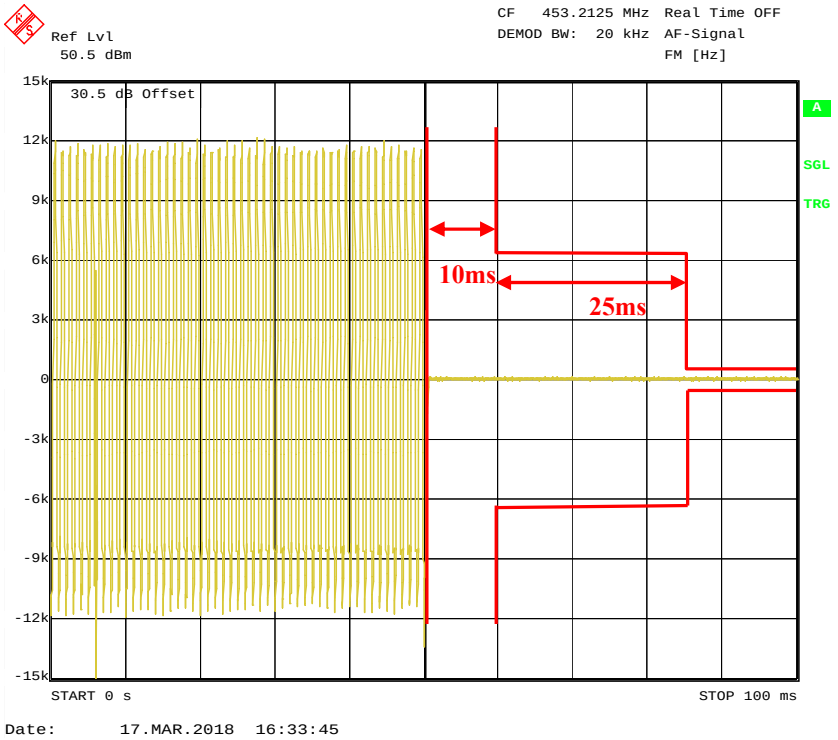
The testing was performed by Rocky Kang on 2018-03-17.

Channel Separation (kHz)	Transient Period (ms)	Transient Frequency	Result
12.5	10 (t1)	<+/-12.5 kHz	Pass
	25(t2)	<+/-6.25 kHz	
	10 (t3)	<+/-12.5 kHz	

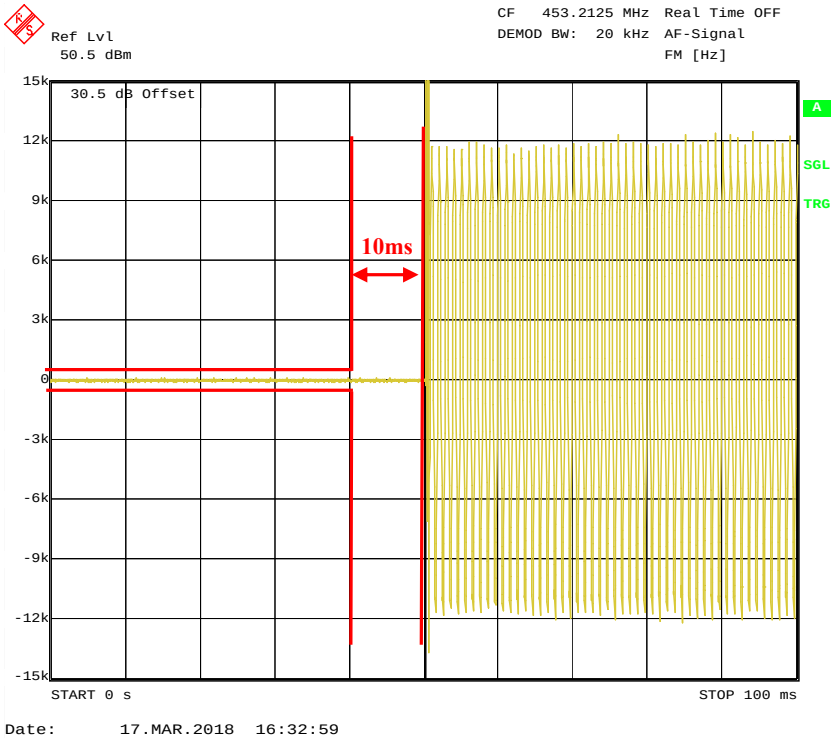
Please refer to the following plots.

Channel: 453.2125 MHz, 12.5 kHz

Turn on



Turn off



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