



FCC PART 80

TEST REPORT

For

Hytera Communications Corporation Limited

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

FCC ID: YAMRD98XSU2

Report Type: Class II Permissive Change	Product Type: Digital Base Station Repeater
Report Number: RDG170907016-00A1	
Report Date: 2017-09-25	
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Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Hytera Communications Corporation Limited's* product, model number: *RD982S U(2)* (FCC ID: *YAMRD98XSU2*) in this report is a *Digital Base Station Repeater* which was measured approximately: 1 366 mm (L) x 483 mm (W) x 88 mm (H), rated with input voltage: DC 13.6V.

** All measurement and test data in this report was gathered from production sample serial number: 170907016. (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2017-09-07.*

Objective

This test report is prepared on behalf of *Hytera Communications Corporation Limited* in accordance with Part 2, and Part 80 of the Federal Communication Commissions rules.

This is a CIIPC application of the device; the differences between the original device and the current one are as follows:

- (1). Adding standars FCC Part 80.
- (2). Changing the model number to “RD982S U(2)”.

Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s).

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 80 – Stantions in the Maritme 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	$\pm 5\%$
RF output power, conducted	$\pm 1.5\text{dB}$
Unwanted Emission, conducted	$\pm 1.5\text{dB}$
All emissions, radiated	$\pm 4.88\text{dB}$
Temperature	$\pm 1\text{ }^{\circ}\text{C}$
Supply voltages	$\pm 0.4\%$

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.

Bay Area Compliance Laboratories Corp. (Shenzhen) has been accredited to ISO/IEC 17025 by CNAS(Lab code: L2408). And accredited to ISO/IEC 17025 by NVLAP(Lab code: 200707-0), the FCC Designation No. CN5001 under the KDB 974614 D01.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Bay Area Compliance Laboratories Corp. (Shenzhen) was 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.

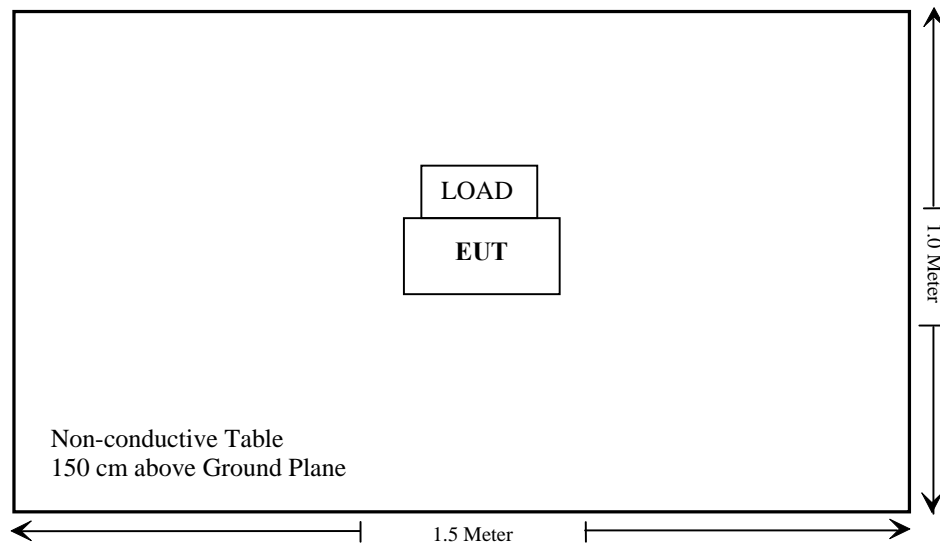
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
N/A	Load	N/A	N/A

External I/O Cable

Cable Description	Length (m)	From Port	To
N/A	N/A	N/A	N/A

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; § 80.215	RF Output Power	Compliance
§2.1047	Modulation Characteristic	Compliance
§2.1049; § 80.205; § 80.207; § 80.211	Occupied Bandwidth & Emission Mask	Compliance
§2.1051; § 80.211	Spurious Emission at Antenna Terminal	Compliance
§2.1053; § 80.211	Spurious Radiated Emissions	Compliance
§2.1055; § 80.209	Frequency Stability	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Sunol Sciences	Horn Antenna	DRH-118	A052604	2014-12-29	2017-12-28
Rohde & Schwarz	Signal Generator	FSIQ26	8386001028	2017-04-24	2018-04-24
Sunol Sciences	Bi-log Antenna	JB1	A040904-2	2014-12-17	2017-12-16
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2017-02-14	2018-02-14
HP	Amplifier	HP8447E	1937A01046	2017-05-21	2017-11-19
Anritsu	Signal Generator	68369B	004114	2016-12-05	2017-12-05
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2016-12-07	2017-12-07
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	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	104PEA	218124002	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	RG-214	1	2017-05-21	2017-11-19
Ducommun technologies	RF Cable	RG-214	2	2017-05-22	2017-11-22
RF Conducted Test					
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2016-12-05	2017-12-05
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2016-11-22	2017-11-22
Long Wei	DC Power Supply	TPR-6420D	398363	NCR	NCR
HP Agilent	RF Communication Test Set	HP8920	3325U00859	2017-05-07	2018-05-07
Ducommun technologies	RF Cable	RG-214	3	2017-05-22	2017-11-22
WEINSCHEL	30dB Attenuator	53-30-43	PG633	2017-05-22	2017-11-22

* **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).

§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 General Population/Controlled Exposure

Limits for General Population/Uncontrolled 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	1824/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/cm²)

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)

Frequency Range (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	Strictest MPE Limit (mW/cm ²)
	(dBi)	(numeric)	dBm	(mW)			
450-520	6.5	4.47	47.71	59020	350	0.17	1.50

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 350cm from nearby persons.

Result: Compliance

FCC §2.1046 & §80.215 - RF OUTPUT POWER**Applicable Standard**

FCC §2.1046, § 80.215

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 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Kong on 2017-09-17.

Test Mode: Transmitting

Test Result: Compliance. Please refer to following table.

Modulation	Channel Separation (kHz)	Frequency (MHz)	Power	Conducted Output Power (dBm)	Conducted Output Power (W)
Analog	25	465.0125	H	47.14	51.76
			L	37.46	5.57

Note: The high rated power is 50W, Limit is 40W-60W.
The low rated power is 5W, Limit is 4W-6W.

FCC §2.1047 - MODULATION CHARACTERISTIC

Applicable Standard

FCC§2.1047:

- (a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. for equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.
- (b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

Test Procedure

Test Method: TIA/EIA-603 2.2.3

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Kong on 2017-09-17.

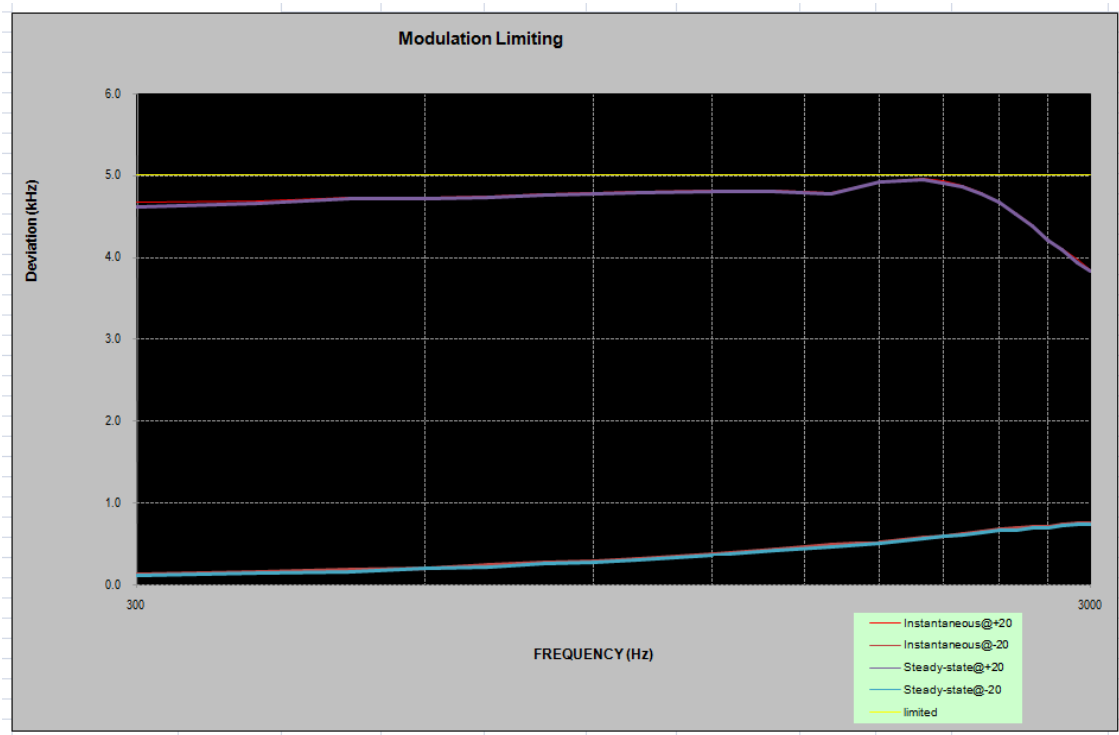
Test Mode: Transmitting

Result: Compliance.

Analog Modulation:**MODULATION LIMITING**

Carrier Frequency: 465.0125 MHz, Channel Separation= 25 kHz

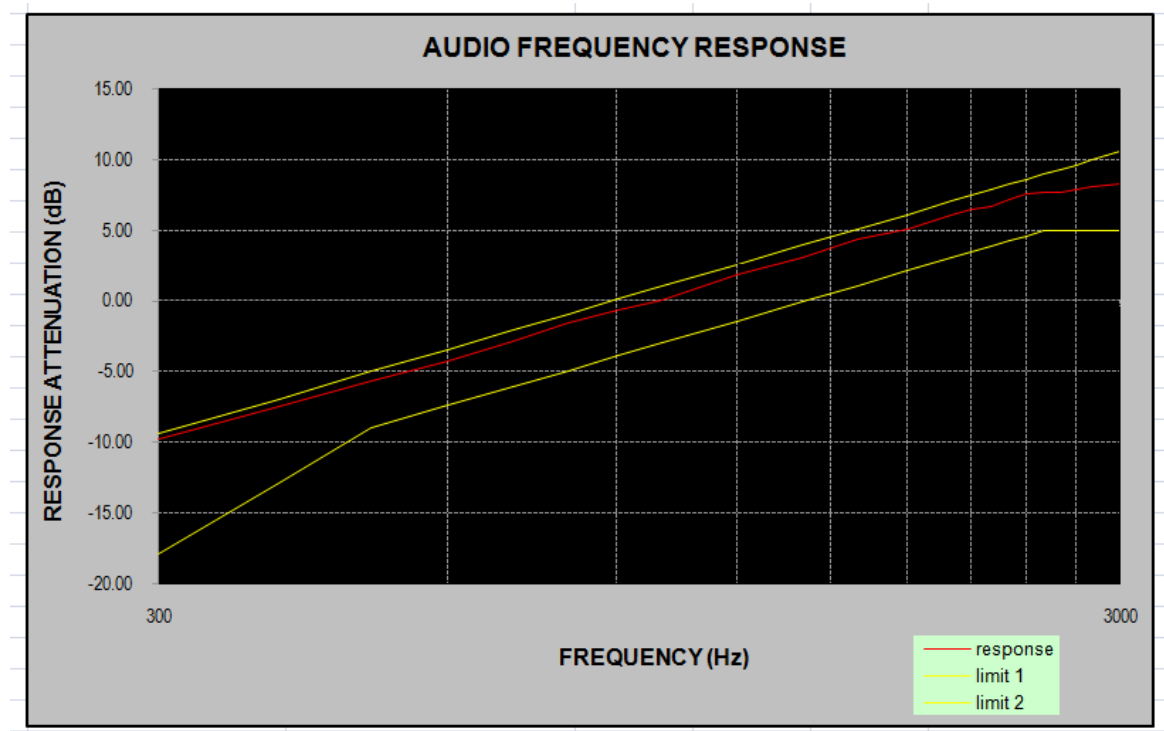
Audio Frequency (Hz)	Instantaneous		Steady-state		FCC Limit [kHz]
	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	DEVIATION (@+20dB) [kHz]	DEVIATION (@-20dB) [kHz]	
300	4.675	0.123	4.607	0.106	5.000
400	4.678	0.156	4.661	0.134	5.000
500	4.726	0.178	4.715	0.156	5.000
600	4.732	0.203	4.713	0.198	5.000
700	4.745	0.235	4.731	0.214	5.000
800	4.771	0.265	4.758	0.247	5.000
900	4.785	0.285	4.772	0.269	5.000
1000	4.795	0.312	4.781	0.303	5.000
1200	4.814	0.375	4.802	0.356	5.000
1400	4.817	0.422	4.806	0.412	5.000
1600	4.787	0.483	4.773	0.462	5.000
1800	4.923	0.518	4.915	0.508	5.000
2000	4.959	0.578	4.948	0.558	5.000
2100	4.927	0.591	4.909	0.583	5.000
2200	4.868	0.615	4.855	0.601	5.000
2300	4.791	0.646	4.778	0.627	5.000
2400	4.672	0.672	4.668	0.659	5.000
2500	4.538	0.685	4.526	0.663	5.000
2600	4.398	0.708	4.385	0.694	5.000
2700	4.211	0.703	4.205	0.691	5.000
2800	4.109	0.738	4.086	0.725	5.000
2900	3.975	0.748	3.935	0.731	5.000
3000	3.843	0.751	3.835	0.732	5.000



Audio Frequency Response

Carrier Frequency: 465.0125 MHz, Channel Separation= 25 kHz

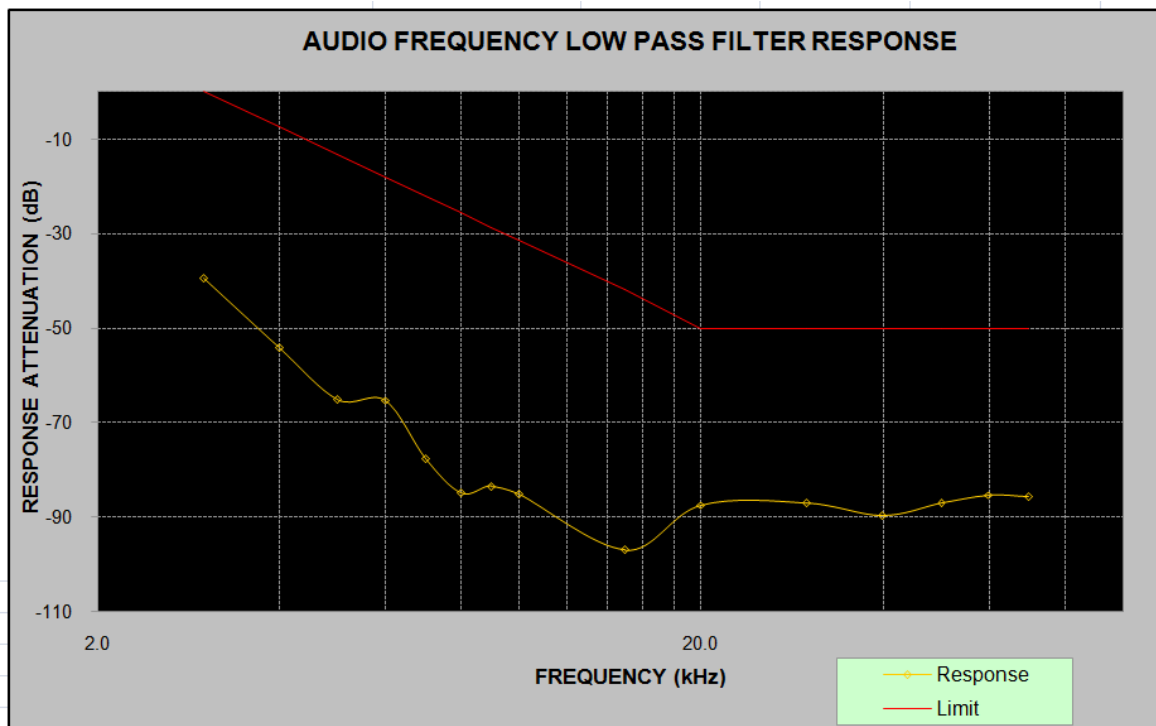
Audio Frequency (Hz)	Response Attenuation (dB)
300	-9.79
400	-7.45
500	-5.66
600	-4.28
700	-2.83
800	-1.60
900	-0.69
1000	0.00
1200	1.83
1400	2.99
1600	4.38
1800	5.04
2000	6.06
2100	6.41
2200	6.66
2300	7.10
2400	7.51
2500	7.61
2600	7.62
2700	7.83
2800	8.09
2900	8.18
3000	8.29



Audio frequency lows pass filter response

Carrier Frequency: 465.0125 MHz, Channel Separation= 25 kHz

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
1.0	0.0	/
3.0	-39.36	0.0
4.0	-54.24	-7.5
5.0	-65.03	-13.3
6.0	-65.21	-18.1
7.0	-77.58	-22.1
8.0	-84.82	-25.6
9.0	-83.42	-28.6
10.0	-85.22	-31.4
15.0	-96.94	-41.9
20.0	-87.38	-50.0
30.0	-86.94	-50.0
40.0	-89.66	-50.0
50.0	-87.07	-50.0



FCC §2.1049 & § 80.205 & § 80.207 & § 80.211 – OCCUPIED BANDWIDTH & EMISSION MASK

Applicable Standard

FCC §2.1049, § 80.205, § 80.207, § 80.211

(f) The mean power when using emissions other than those in paragraphs (a), (b), (c) and (d) of this section:

(1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB;

(2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB; and

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) dB.

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 300 Hz and the spectrum was recorded in the frequency band ± 50 kHz from the carrier frequency.

Test Data

Environmental Conditions

Temperature:	24~27 °C
Relative Humidity:	50~57 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Jacob Kong from 2017-09-17 to 2017-09-24.

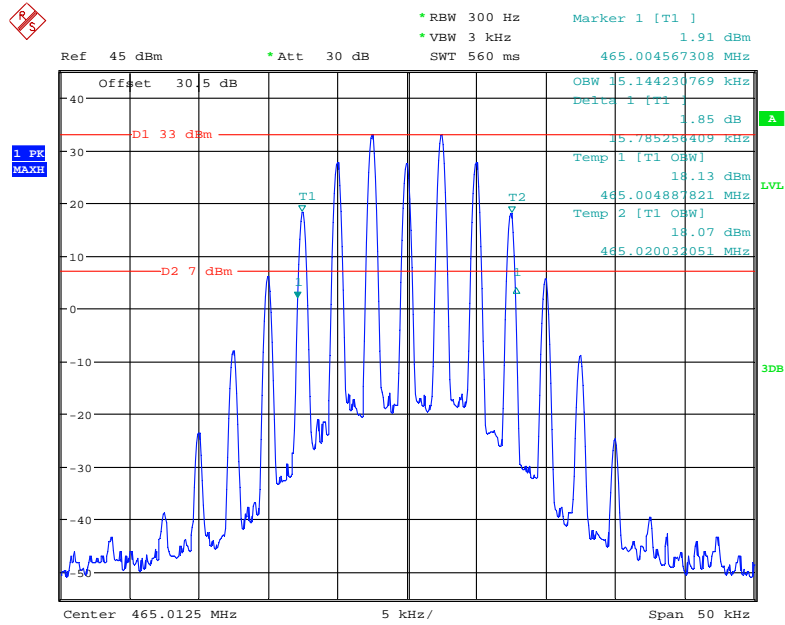
Modulation	Channel Separation (kHz)	Frequency (MHz)	Power Level	99% Occupied Bandwidth (kHz)	26 dB Emissions Bandwidth (kHz)
Analog	25	465.0125	High	15.14	15.78
			Low	15.14	15.78

For FM Mode (Channel Spacing: 25 kHz)

Emission Designator 16K0F3E In this case, the maximum modulating frequency is 5.0 kHz with a 3.0 kHz deviation. $BW = 2(M+D) = 2*(5.0 \text{ kHz} + 3.0 \text{ kHz}) = 16 \text{ kHz} \rightarrow 16K0$
F3E portion of the designator represents an FM voice transmission Therefore, the entire designator for 25 kHz channel spacing FM mode is 16K0F3E.

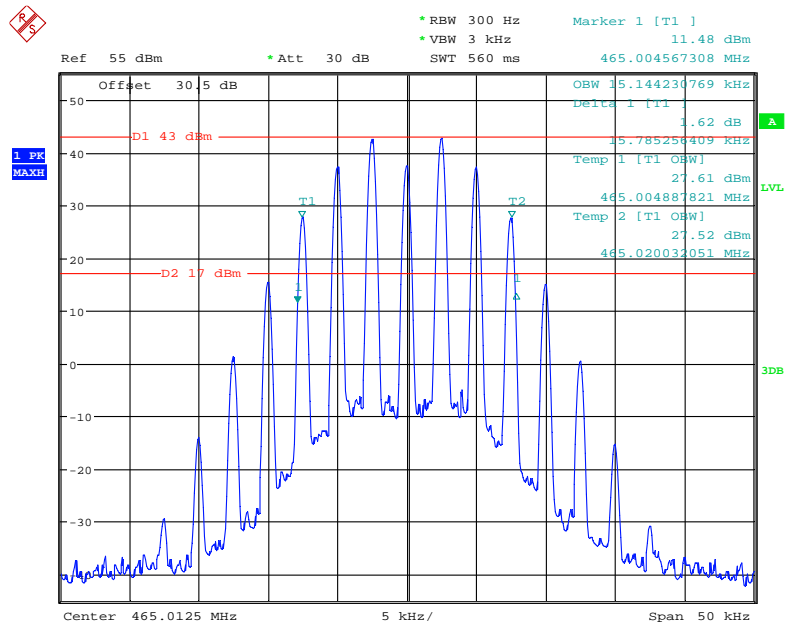
Analog Modulation:

Frequency 465.0125 MHz: 99% Occupied & 26 dB Bandwidth, Low Power, 25 kHz

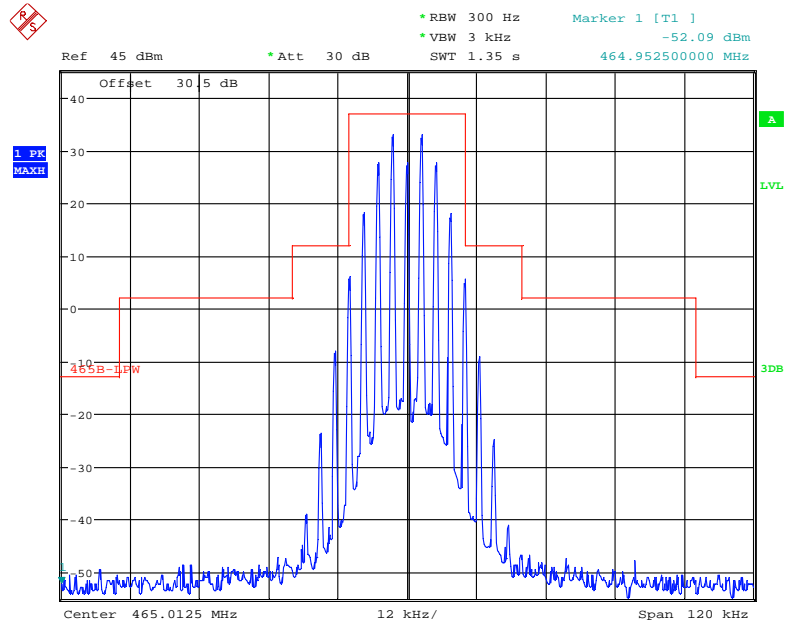


Date: 17.SEP.2017 14:47:53

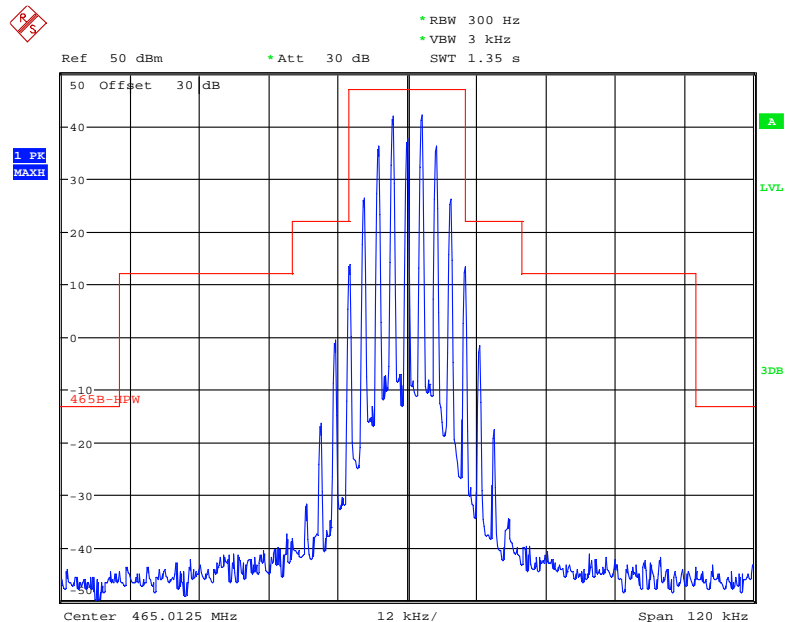
Frequency 465.0125 MHz: 99% Occupied & 26 dB Bandwidth, High Power, 25 kHz



Date: 17.SEP.2017 14:46:50

Frequency 465.0125 MHz: Emission Mask 80.211, Low Power, 25 kHz

Date: 17.SEP.2017 15:38:06

Frequency 465.0125 MHz: Emission Mask 80.211, High Power, 25 kHz

Date: 24.SEP.2017 11:01:17

FCC §2.1051 & § 80.211 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

(f) The mean power when using emissions other than those in paragraphs (a), (b), (c) and (d) of this section:

(1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB;

(2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB; and

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) dB.

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

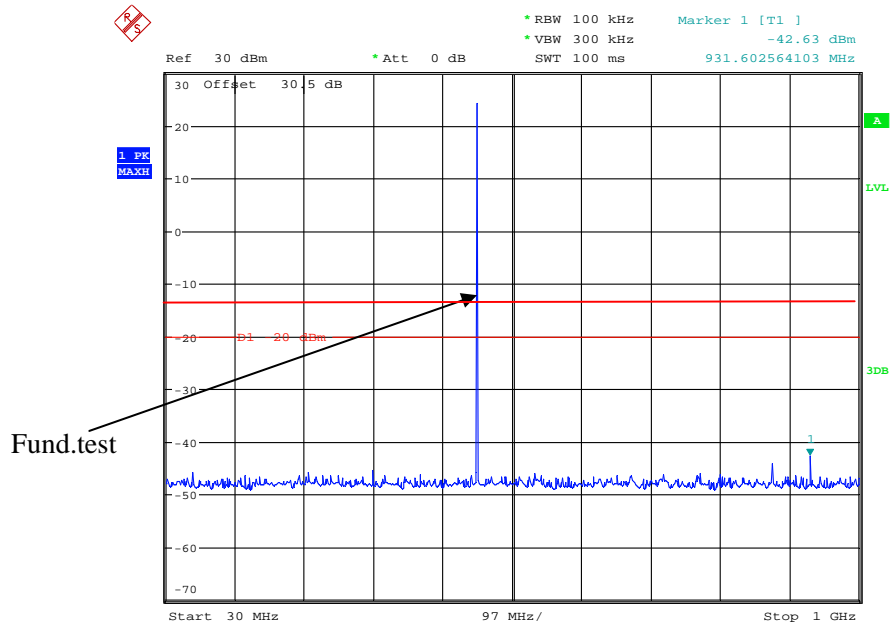
Environmental Conditions

Temperature:	26 °C
Relative Humidity:	56 %
ATM Pressure:	101.5 kPa

The testing was performed by Jacob Kong on 2017-09-17.

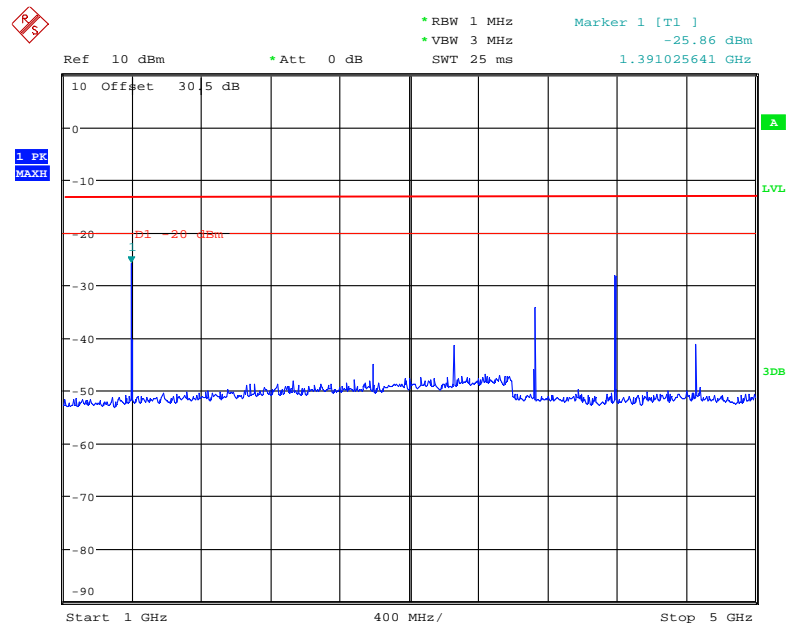
Test Mode: Transmitting, please refer to the following plots.

30MHz – 1 GHz, Channel Spacing 25 kHz, 465.0125 MHz



Date: 17.SEP.2017 15:46:00

1 GHz – 5 GHz, Channel Spacing 25 kHz, 465.0125 MHz



Date: 17.SEP.2017 15:49:42

FCC §2.1053 & § 80.211 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §2.1053, § 80.211

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 lg (TXpwr in Watts/0.001)-the absolute level

Spurious attenuation limit in dB = 43 + 10 log (P) for EUT with a 25 kHz channel bandwidth.

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Kong on 2017-09-23.

Test Mode: Transmitting

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)			
Analog 465.0125MHz-25 kHz										
930.025	36.61	122	2.0	H	-60.4	0.70	0	-61.10	-13	43.10
930.025	36.73	340	1.0	V	-60.3	0.70	0	-61.00	-13	53.00
2325.06	46.34	153	1.2	H	-58.9	1.30	9.10	-51.10	-13	38.10
2325.06	45.81	340	1.8	V	-59.3	1.30	9.10	-51.50	-13	38.50

Note:

Absolute Level = Substituted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

FCC §2.1055 § 80.209 - FREQUENCY STABILITY

Applicable Standard

FCC §2.1055, § 80.209

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads 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:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Kong on 2017-09-17.

Test Mode: Transmitting

Digital Modulation, Reference Frequency: 465.0125 MHz, Limit: ± 5.0 ppm, 25 kHz			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (°C)	Voltage Supplied (V _{DC})	Measured Frequency (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	13.60	465.01247	-0.0645
40	13.60	465.01243	-0.1505
30	13.60	465.01249	-0.0215
20	13.60	465.01246	-0.0860
10	13.60	465.01245	-0.1075
0	13.60	465.01249	-0.0215
-10	13.60	465.01256	0.1290
-20	13.60	465.01250	0
-30	13.60	465.01244	-0.1290
Frequency Stability versus Input Voltage			
20	11.0	465.01248	-0.0430

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