FCC TEST REPORT

FCC ID: 2AT3Y-DVR-980

Product	:	Mobile DVR
Model Name	:	DVR-980-4CH-WIFI-4G, DVR-980-4CH, DVR-980-4CH-WIFI, DVR-980-4CH-4G, DVR-980-8CH-WIFI-4G, DVR-980-8CH, DVR-980-8CH-WIFI, DVR-980-8CH-4G
Brand	:	N/A
Report No.	:	PTC24041211101E-FC02
Prepared for		
Shenzhen Brandoo Technology Co.,LTD		
Room 803-805,8th floor,Bensi Building,Ganli 6 road Zhonghaixin Industrial park,Bulan Road, Longgang District,Shenzhen, China		
Prepared by		
Precise Testing & Certification Co., Ltd		
Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China		

1 Test Result Certification

Applicant's name	:	Shenzhen Brandoo Technology Co.,LTD
Address	:	Room 803-805,8th floor,Bensi Building,Ganli 6 road Zhonghaixin Industrial park,Bulan Road, Longgang District,Shenzhen, China
Manufacture's name	:	Shenzhen Brandoo Technology Co.,LTD
Address	:	Room 803-805,8th floor,Bensi Building,Ganli 6 road Zhonghaixin Industrial park,Bulan Road, Longgang District,Shenzhen, China
Product name	:	Mobile DVR
Model name	:	DVR-980-4CH-WIFI-4G, DVR-980-4CH, DVR-980-4CH-WIFI, DVR-980-4CH-4G, DVR-980-8CH-WIFI-4G, DVR-980-8CH, DVR-980-8CH-WIFI, DVR-980-8CH-4G
Standards	:	47 CFR FCC Part 24 Subpart E, ANSI C63.26-2015, ANSI TIA-603-E-2016, KDB 971168 D01 Power Meas License Digital Systems v03r01
Test Date	:	April. 30, 2024 to Aug. 09, 2024
Date of Issue	:	Aug. 09, 2024
Test Result	:	Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
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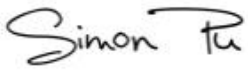
Test Engineer:

Jack zhou / Engineer

Technical Manager:



Simon Pu / Manager

TABLE OF CONTENTS

2. General Description Of Eut

Equipment Type:	Mobile DVR	
Model Name:	DVR-980-4CH-WIFI-4G	
Additional model:	DVR-980-4CH, DVR-980-4CH-WIFI, DVR-980-4CH-4G, DVR-980-8CH-WIFI-4G, DVR-980-8CH, DVR-980-8CH-WIFI, DVR-980-8CH-4G	
Hardware version:	HDVR9808F_MC6650_MB_V14	
Software version:	20240304-v205	
LTE Support Band:	E-UTRA Bands: ☒ E-UTRA Band 7	
Frequency	E-UTRA Band 7:	Tx:2500MHz-2570 MHz;Rx:2620 MHz-2690 MHz
Antenna Type:	External Antenna	
Modulation Type:	☒QPSK ☒16QAM ☒64QAM(Downlink Only)	
Antenna gain:	E-UTRA Band 7: -1.29dBi	
Adapter Information:	Input: 12 ~ 32VDC Output: 11.5V/1.5A	
Extreme Vol. Limits:	DC 11V to 13V (Normal: DC 12V)	

Table 2.1 The Basic Technical Specification for Working BAND(S).

OPERATION BAND(S)	Power Class	Mod.	Max ERP(dBm)
E-UTRA BAND 7	Class 3	QPSK	/
E-UTRA BAND 7	Class 3	16QAM	/

1. Facilities and Accreditations

1.1. Test Facility

Precise Testing & Certification Co., Ltd

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A

FCC Designation Number: CN1219

1.2. Description Of Test Channels And Test Modes

Test channels:

E-UTRA Band 7					
Test Frequency ID	Bandwidth[MHz]	N_{UL}	Frequency of Uplink [MHz]	N_{DL}	Frequency of Downlink[MHz]
Low Range	5	20775	2502.5	2775	2622.5
	10	20800	2505	2800	2625
	15	20825	2507.5	2825	2627.5
	20	20850	2510	2850	2630
Mid Range	5/10/15/20	21100	2535	3100	2655
High Range	5	21425	2567.5	3425	2687.5
	10	21400	2565	3400	2685
	15	21375	2562.5	3375	2682.5
	20	21350	2560	3350	2680

Note 1.both QPSK&16QAM modulation has been measured;
2. The worst condition was recorded in the test report if no other modes test data.

1.3. Equipment Modifications

Not available for this EUT intended for grant.

2. Summary Of Test Requirements And Results

E-UTRA Band 7(Transmit: 2500 MHz - 2570 MHz; Receive: 2620MHz -2690MHz);

Test Item	FCC Rule No.	Requirements	Judgement
Effective (Isotropic) Radiated Power	§2.1046, §27.50(h)	EIRP ≤ 2W(33dBm)	Pass
Peak-Average Ratio	§2.1046, §27.5(d)	FCC: Limit≤ 13dB	Pass
Modulation Characteristics	§2.1047	Digital modulation	N/A
Occupied Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Pass
Emission Bandwidth	§2.1049	EBW: No limit.	Pass
Band Edges Compliance	§27.53(m)(4)	§27.53(m)(4)	Pass
Spurious Emission at Antenna Terminals	§27.53(m)(4)	-25dBm/MHz	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(m)(4)	-25dBm/MHz	Pass
Frequency Stability	§2.1055, §27.54	the fundamental emissions stay within the authorized bands of operation. (2.5ppm)	Pass
Note: For the Judgement, the "N/A" denotes "not applicable", the "N/Tde notes “not tested”.			

3. Measurement Instruments

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Last Calibration	Calibration Interval
MXG Signal Analyzer	Agilent	N9020A	SER MY5111038	10Hz-30GHz	Aug.17, 2023	1 Year
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Aug.17, 2023	1 Year
Power Meter	Anritsu	ML2495A	0949003	300MHz-40GHz	Aug.17, 2023	1 Year
Power Sensor	Anritsu	MA2411B	0917017	300MHz-40GHz	Aug.17, 2023	1 Year
Signal Analyzer 40GHZ	Rohde&Schwarz	FSV40	101456	10Hz-40GHz	Aug.17, 2023	1 Year
Wireless Communication Tester	Rohde&Schwar	CMW500	134930	/	Aug.17, 2023	1 year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Last Calibration	Calibration Interval
EMI Test Receiver	Rohde&Schwarz	ESCI7	101671	9KHz-7GHz	Aug. 17,2023	1 Year
Loop Antenna	Schwarzbeck	FMZB 1519B	192	9 KHz -30MHz	Aug. 17,2023	1 Year
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Aug. 17,2023	1 Year
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Mar. 23,2024	1 Year
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Aug. 17,2023	1 Year
Spectrum Analyzer	Rohde&Schwarz	FSV40	6625-01-588-5515	9KHz-40GHz	Aug.17, 2023	1 Year
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Aug. 17, 2023	1 Year
Power Amplifier	ZHINAN	ZN3380C	15002	1GHz-26.5GHz	Aug. 17, 2023	1 Year

Horn Antenna	SCHWARZBECK	BBHA 9170	9170-1066	15GHz-40GHz	Jul. 19, 2023	1 Year
Amplifier	SCHWARZBECK	BBV 9721	9721-205	18GHz-40GHz	Jul. 19, 2023	1 Year
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Aug. 17,2023	1 Year
RF Cable	R&S	R204	R21X	1GHz-40GHz	Aug. 17,2023	1 Year
MXG Vector Signal Generator	Agilent	N5182A	MY49060455	-	Aug. 17,2023	1 Year
ESG Series Analog signal generator	Agilent	E4421B	GB40051240	-	Aug. 17,2023	1 Year

4. EFFECTIVE (ISOTROPIC) RADIATED POWER

4.1. Conducted Output Power

Measurement Procedure: FCC KDB 971168 D01 V03r01
The transmitter output was connected to a calibrated coaxial cable, attenuator and power meter, the other end of which was connected to a Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The power output at the transmitter antenna port was determined by adding the value of the cable insertion loss to the power reading. The tests were performed at three frequencies (low channel, middle channel and high channel) and on the highest power levels, which can be setup on the transmitters.

4.2. Effective (Isotropic) Radiated Power

Measurement Procedure: FCC KDB 971168 D01 V03r01 ; C63.26 (2015).
Calculate power in dBm by the following formula:
ERP (dBm) = Conducted Power (dBm) + antenna gain (dBd)
EIRP(dBm) = Conducted Power (dBm) + antenna gain (dBi)
EIRP=ERP+2.15dB
Test Result:
1.For E-UTRA Band 7, please refer to Appendix Band 2: Section Appendix A.

5. SPURIOUS EMISSION (Conducted and Radiated)

5.1. Measurement Result (Pre-measurement)

We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of E-UTRA Band 7: recorded worst case foreach Channel Bandwidth of E-UTRA Band 7.

Note: Radiated spurious emission, All RB configurations combined with QPSK and 16QAM all pretested and recorded the worst case.

Test Plot(s)

Conducted method

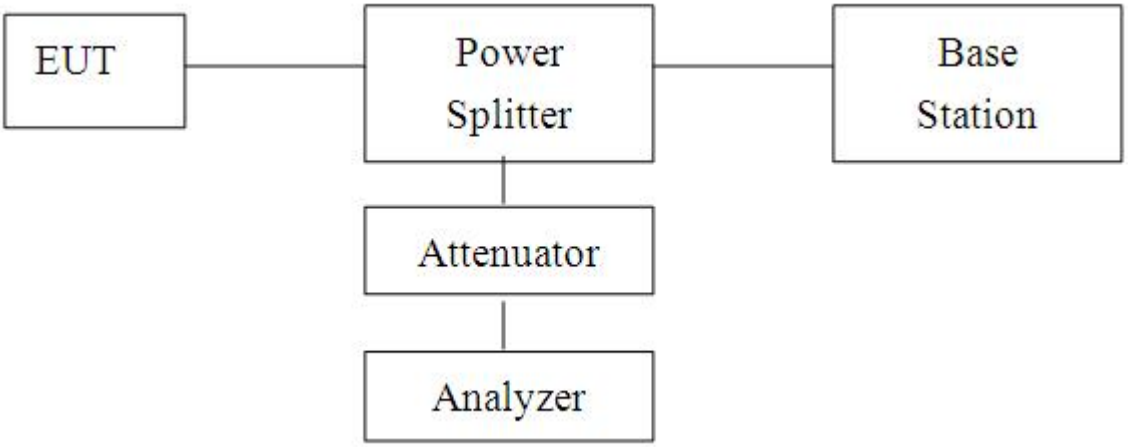
Test limit:

The spurious (unwanted) emission limits specified in the individual FCC rule parts applicable to licensed digital transmitters (typically referred to under the heading ‘emission limits’) normally apply to any and all emissions that are present outside of the authorized frequency band/block and apply to emissions in both the out-of-band and spurious domains. In some rule parts, the unwanted emission limits are specified by an emission mask that defines the applicable limit as a function of the frequency range relative to the authorized frequency block.
Typically, unwanted emissions are required by the licensed rule parts to be attenuated below the transmitter power by a factor of at least X + 10log(P) dB, where P represents the transmitter power expressed in watts and X is a specified scalar value (e.g., 43). This specification can be interpreted in one of two equivalent ways. First, the required attenuation can be construed to be relative to the mean carrier power, with the resultant of the equation X + 10log(P) being expressed in dBc (dB relative to the maximum carrier power). Alternatively, the specification can be interpreted as an absolute limit when the specified attenuation is actually subtracted from the maximum permissible transmitter power [i.e., 10log(P) – {X + 10log(P)}], resulting in an absolute level of -X dBW [or (-X + 30) dBm]. See section 4.

Test procedure:

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

Conducted Emission Test-Up:



Test data:

1.For E-UTRA Band 7, please refer to Appendix Band 2: Section Appendix E.

Radiated method

Test limit:

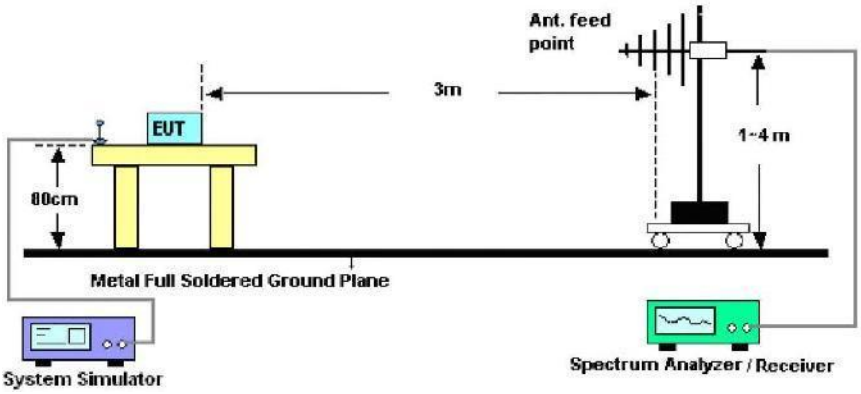
The spurious (unwanted) emission limits specified in the individual FCC rule parts applicable to licensed digital transmitters (typically referred to under the heading ‘emission limits’) normally apply to any and all emissions that are present outside of the authorized frequency band/block and apply to emissions in both the out-of-band and spurious domains. In some rule parts, the unwanted emission limits are specified by an emission mask that defines the applicable limit as a function of the frequency range relative to the authorized frequency block.
Typically, unwanted emissions are required by the licensed rule parts to be attenuated below the transmitter power by a factor of at least X + 10log(P) dB, where P represents the transmitter power expressed in watts and X is a specified scalar value (e.g., 43). This specification can be interpreted in one of two equivalent ways. First, the required attenuation can be construed to be relative to the mean carrier power, with the resultant of the equation X + 10log(P) being expressed in dBc (dB relative to the maximum carrier power). Alternatively, the specification can be interpreted as an absolute limit when the specified attenuation is actually subtracted from the maximum permissible transmitter power [i.e., 10log(P) – {X + 10log(P)}], resulting in an absolute level of -X dBW [or (-X + 30) dBm]. See section 4.

Test procedure:

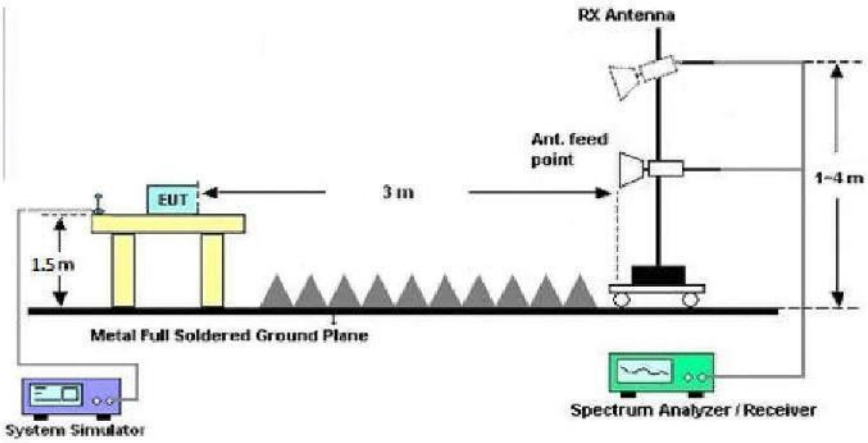
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site. The resolution bandwidth of the spectrum analyzer was set at 100 kHz below 1 GHz and 1 MHz above 1 GHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonics.

Test setup:

（A）Radiated Emission Test-Up Frequency 30MHz~1GHz



（B）Radiated Emission Test-Up Frequency Above 1GHz



Note:

***1**, Below 30MHz no Spurious found.*
2, UE is poistioned at 3 axis at the pre-scan stage, and only the measurement of the worst case(bandwidth:20MHz /Full RB /QPSK) is reported in this part.

List of final test modes:

E-UTRA BANDS
This is the worst pattern data
E-UTRA Band 7:

Mode	Bandwidth	UL Channel	Frequency	Modulation	Judgement
1	5	21100	2535	QPSK	Pass

Test record:

E-UTRA BANDS Radiated spurious emissions Spot-check :
E-UTRA band 7_5MHz bandwidth_ Middle Channel

Frequency(MHz)	Reading level(dBm)	Factor(dB)	Level (dBm)	Limit (dBm)	Margin (dBm)	Polarity
5070.00	-49.94	4.20	-45.74	-25	20.74	Horizontal
7605.00	-50.21	11.35	-38.86	-25	13.86	Horizontal
10140.00	-52.71	18.37	-34.34	-25	9.34	Horizontal
5070.00	-51.29	3.72	-47.57	-25	22.57	Vertical
7605.00	-51.08	10.84	-40.24	-25	15.24	Vertical
10140.00	-52.26	17.09	-35.17	-25	10.17	Vertical

Note:1. The emission levels of below 1 GHz are lower than the limit 10dB, so not show in test report.
2. Level= Reading level+ Factor; Margin= Limit- Level.

6. Occupied Bandwidth and Emission Bandwidth

Test limit:

The occupied bandwidth (OBW), that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission, shall be measured when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user. [¡ì2.1049(h)]

Many of the individual rule parts specify a relative OBW in lieu of the 99% OBW. In such cases, the OBW 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 by at least X dB below the transmitter power, where the value of X is typically specified as 26.

The relative OBW must be measured and reported when it is specified in the applicable rule part; otherwise, the 99% OBW shall be measured and reported. The test report shall specify which OBW is reported.

A spectrum/signal analyzer or other instrument providing a spectral display is recommended for these measurements and the video bandwidth shall be set to a value at least three times greater than the IF/resolution bandwidth to avoid any amplitude smoothing. Video filtering shall not be used during occupied bandwidth tests.

The OBW shall be measured for all operating conditions that will affect the bandwidth results (e.g. variable modulations, coding, or channel bandwidth settings). See section 4.

Test procedure:

Occupied bandwidth – relative measurement procedure

The reference value is the highest level of the spectral envelope of the modulated signal.

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.

b) The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.

c) Set the reference level of the instrument as required to prevent the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.

d) NOTE—Steps a) through c) may require iteration to adjust within the specified tolerances.

e) The dynamic range of the spectrum analyzer at the selected RBW shall be at least 10 dB below the target “-X dB down” requirement (i.e., if the requirement calls for measuring the –26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference value).

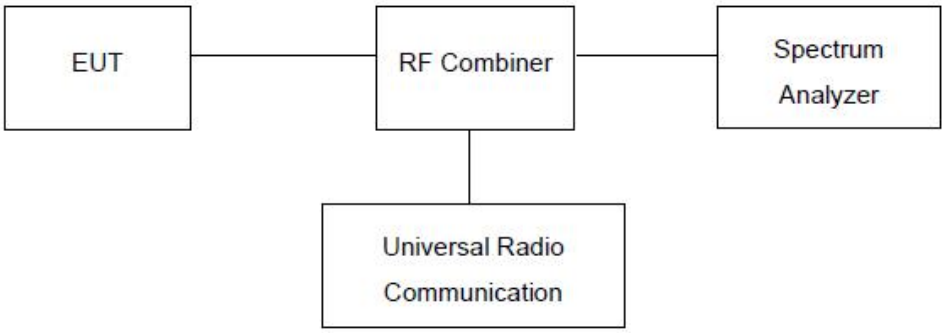
f) Set the detection mode to peak, and the trace mode to max hold.

g) Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).

h) Determine the “-X dB down amplitude” as equal to (Reference Value – X). Alternatively,

this calculation can be performed by the analyzer by using the marker-delta function.
i) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “–X dB down amplitude” determined in step g). If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
j) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display. The frequency and amplitude axes and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).
Occupied bandwidth – power bandwidth (99%) measurement procedure
The following procedure shall be used for measuring (99 %) power bandwidth
a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the OBW).
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.
d) NOTE—Steps a) through c) may require iteration to adjust within the specified tolerances.
e) Set the detection mode to peak, and the trace mode to max hold..
f) Use the 99 % power bandwidth function of the spectrum analyzer (if available) and report the measured bandwidth.
g) If the instrument does not have a 99 % power bandwidth function, the trace data points are to be recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99 % power bandwidth is the difference between these two frequencies.
h) The OBW shall be reported by providing plot(s) of the measuring instrument display. The frequency and amplitude axes and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

Test setup:



Measurement Result:

1.For E-UTRA Band 7, please refer to Appendix Band 7: Section Appendix C.

7. Band Edge

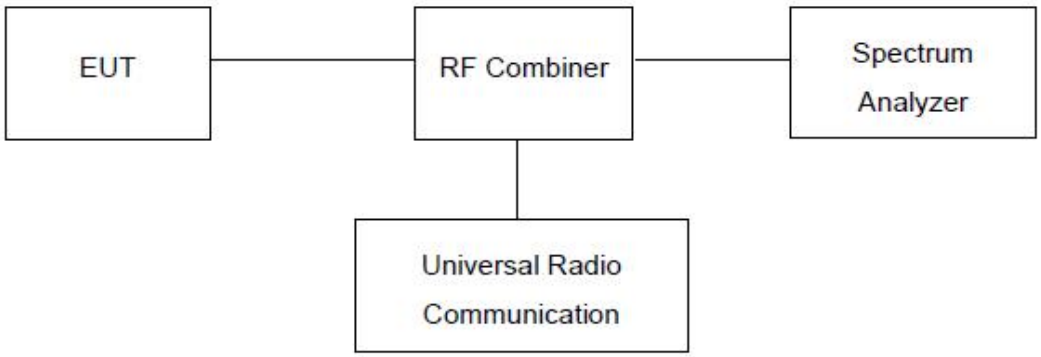
Test Limit:

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified. See section 4.

Test procedure:

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

Test setup:



Measurement Result

1.For E-UTRA Band 7, please refer to Appendix Band 7: Section Appendix C.

8. Frequency Stability

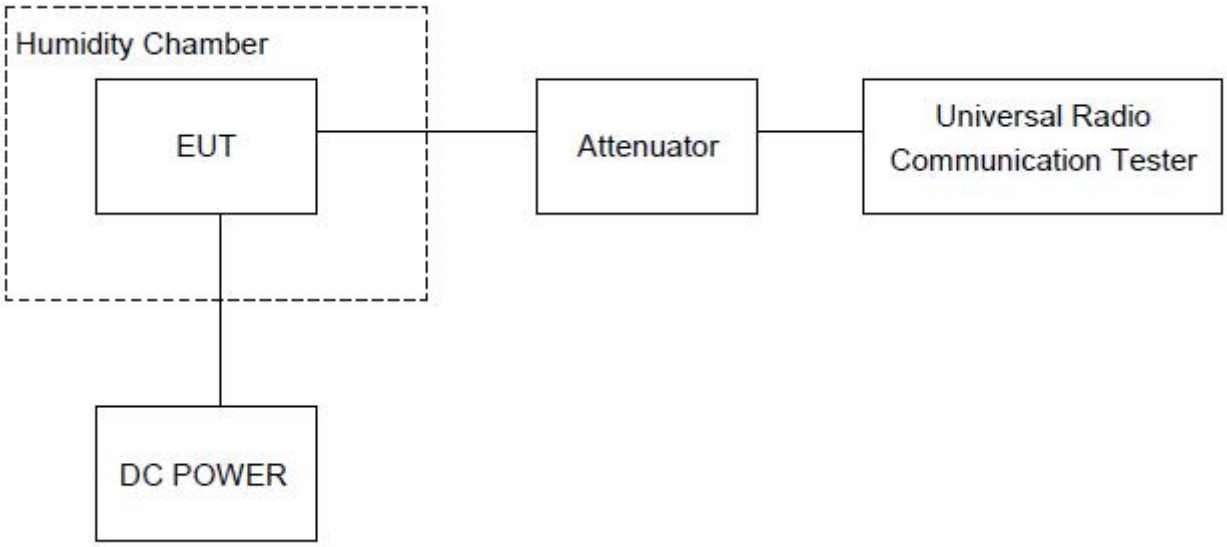
Test limit:

The frequency stability of the transmitter shall be measured while varying the ambient temperatures and supply voltages over the ranges specified in §2.1055. The specific frequency stability limits are provided in the relevant rules section(s). see section 4.

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 communication test set 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.

Test setup:



8.1. Measurement Result (Worst)

1.For E-UTRA Band 7, please refer to Appendix Band 7: Section Appendix F.

15 APPENDIX I -- TEST SETUP PHOTOGRAPH

Refer to ”Test Setup Photos”.

16 APPENDIX II -- EUT PHOTOGRAPH

Refer to “ External Photos” and “Internal Photos”.

******THE END REPORT******