

FCC Test Report

Client Name : Langshixing Electronic(Shenzhen) Co.,Ltd

Client Address : 2/F,Building A6,Junye Industrial Park,
Tangtou,Shiyan Street,Baoan District,
Shenzhen,China

Product Name : IP camera

Report Date : Feb. 03, 2023

Shenzhen Anbotek Compliance Laboratory Limited



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TEST REPORT

Applicant : Langshixing Electronic(Shenzhen) Co.,Ltd
Manufacturer : Langshixing Electronic(Shenzhen) Co.,Ltd
Product Name : IP camera
Model No. : TZ5-SH330EU, TZ-SH330US, TZ-SH330EU, TZ-SH330, TZ-SH430US,
TZ-SH430EU, TZ-SG330EU, TZ-SG330US, TZ-SG330EU, TZ-SG430US,
TZ-SG430EU, MZ-C8-4G-EU, MZ-C8-4G-US, TC18, ZQS099, ZQS099-4G,
ZY-G3, TP-4G-U3MP, UB6, UB9, TXXX(X=A-Z or 0-9, stand for model)
Trade Mark : N.A.
Rating(s) : Input: 5V= 1A (with DC 3.7V, 4800mAh Battery inside)

Test Standard(s) : FCC PART 2, FCC Part 22(H), FCC Part 27(C)

Test Method(s) : ANSI C63.26-2015

KDB 971168 D01 Power Meas License Digital Systems v03r01

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 22, FCC Part 27 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt

Dec. 08, 2022

Date of Test :

Dec. 08, 2022~ Jan. 03, 2023

Prepared by :

(Ella Liang)

Approved & Authorized Signer :

(Kingkong Jin)



Revision History

Report Version	Description	Issued Date
R00	Original Issue.	Jan. 06, 2023
R01	Change the Product Name to "IP camera"	Feb. 03, 2023



1. General Information

1.1. Client Information

Applicant	:	Langshixing Electronic(Shenzhen) Co.,Ltd
Address	:	2/F,Building A6,Junye Industrial Park, Tangtou,Shiyan Street,Baoan District, Shenzhen,China
Manufacturer	:	Langshixing Electronic(Shenzhen) Co.,Ltd
Address	:	2/F,Building A6,Junye Industrial Park, Tangtou,Shiyan Street,Baoan District, Shenzhen,China
Factory	:	Langshixing Electronic(Shenzhen) Co.,Ltd
Address	:	2/F,Building A6,Junye Industrial Park, Tangtou,Shiyan Street,Baoan District, Shenzhen,China

1.2. Description of Device (EUT)

Product Name	:	IP camera
Model No.	:	TZ5-SH330EU, TZ-SH330US, TZ-SH330EU, TZ-SH330, TZ-SH430US, TZ-SH430EU, TZ-SG330EU, TZ-SG330US, TZ-SG330EU, TZ-SG430US, TZ-SG430EU, MZ-C8-4G-EU, MZ-C8-4G-US, TC18, ZQS099, ZQS099-4G, ZY-G3, TP-4G-U3MP, UB6, UB9, TXXX(X=A-Z or 0-9, stand for model) (Note: All samples are the same except the model number and appearance, so we prepare "TZ5-SH330EU" for test only.)
Trade Mark	:	N.A.
Test Power Supply	:	DC 3.7V battery inside
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)
Adapter	:	N.A.
RF Specification		
Support Band	:	☐ FDD Band 2 ☐ FDD Band 4 ☒ FDD Band 5 ☒ FDD Band 7 ☐ FDD Band 12 ☐ FDD Band 13 ☐ FDD Band 14 ☐ FDD Band 17 ☐ FDD Band 25 ☐ FDD Band 26 ☐ TDD Band 38 ☐ TDD Band 41 ☐ FDD Band 66 ☐ FDD Band 71
Transmit Frequency	:	FDD Band 5: 824.7 MHz – 848.3 MHz FDD Band 7: 2502.5 MHz – 2567.5 MHz
Receive Frequency	:	FDD Band 5: 869.7 MHz – 893.3 MHz FDD Band 7: 2622.5 MHz – 2687.5 MHz
Modulation Type	:	QPSK, 16QAM
Power Class	:	Class 3



Antenna Type	:	External antenna
Antenna Gain(Peak):		FDD Band 5: 2.51dBi (Provided by customer) FDD Band 7: 2.54dBi (Provided by customer)
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.		



1.3. Auxiliary Equipment Used During Test

Description	Rating(s)
Adapter	M/N: ETA-U90CBC S/N: RT6FB17ZS/B-E Input: 100-240V~ 50-60Hz, 0.35A Output: DC 5V, 2A

1.4. Operation State

Test frequency list:

Band	Frequency (MHz)					
FDD Band 5	Test Frequency ID	Bandwidth [MHz]	N _{UL}	Frequency of Uplink [MHz]	N _{DL}	Frequency of Downlink [MHz]
	Low Range	1.4	20407	824.7	2407	869.7
		3	20415	825.5	2415	870.5
		5	20425	826.5	2425	871.5
		10 ⁽¹⁾	20450	829	2450	874
	Mid Range	1.4/3/5	20525	836.5	2525	881.5
		10 ⁽¹⁾				
	High Range	1.4	20643	848.3	2643	893.3
		3	20635	847.5	2635	892.5
		5	20625	846.5	2625	891.5
		10 ⁽¹⁾	20600	844	2600	889
FDD 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 ⁽¹⁾	20850	2510	2850	2630
	Mid Range	5/10/15	21100	2535	3100	2655
		20 ⁽¹⁾				
	High Range	5	21425	2567.5	3425	2687.5
		10	21400	2565	3400	2685
		15	21375	2562.5	3375	2682.5
		20 ⁽¹⁾	21350	2560	3350	2680

1.5. Environmental Conditions

Temperature range:	21-25℃
Humidity range:	40-75%
Pressure range:	86-106kPa



1.6. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Preamplifier	SKET Electronic	LNPA-0118G-45	SKET-PA-002	Oct. 13, 2022	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 23, 2022	1 Year
3.	Double Ridged Horn Antenna	SCHWARZBECK	BBHA 9120D	02555	Oct. 16, 2022	3 Year
4.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Oct. 23, 2022	2 Year
5.	Pre-amplifier	SONOMA	310N	186860	Oct. 23, 2022	1 Year
6.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
7.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 13, 2022	1 Year
8.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 13, 2022	1 Year
9.	DC Power Supply	LW	TPR-6420D	374470	Oct. 22, 2022	1 Year
10.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Nov. 01, 2021	1 Year
11.	Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	167336	Oct. 13, 2022	1 Year
12.	High-Pass Filter	CDKMV	ZHPF-BM1100-4000-0730	B2015094550	Oct. 22, 2022	1 Year
13.	High-Pass Filter	CDKMV	ZHPF-M3.5-18G-3834	1307006523	Oct. 22, 2022	1 Year



1.7. Measurement Uncertainty

Maximum measurement uncertainty

Parameter	Uncertainty
RF output power, conducted	±1,5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±1 °C
Humidity	±5 %
DC and low frequency voltages	±3 %
Time	±5 %
Confidence interval: 95%. Confidence factor:k=2	

1.8. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111.

ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102



2. Summary of Test

2.1. Summary of test result

Description of Test	FCC Rules	Requirements	Result
Conducted Output Power	Part 2.1046 Part 22.913(a) Part 27.50(h)	N/A	Compliance
Peak-Average Ratio	Part 22.913 Part 27.50	≤13dB	Compliance
Modulation Characteristics	§ 2.1047	Digital modulation	N/A
99% Occupied Bandwidth & 26 dB Bandwidth	Part 2.1049	OBW: No limit EBW: No limit	Compliance
Conducted Spurious Emission	Part 2.1051 Part 22.917 Part 27.53(m)	≤ -13dBm(LTE Band5) ≤ -25dBm(LTE Band7)	Compliance
Band Edge	Part 2.1051 Part 22.917 Part 27.53(m)	≤ -13dBm (LTE Band5) Refer to clause 8.1 for LTE Band7)	Compliance
Frequency stability VS. temperature	Part 2.1055(a)(1)(b) Part 22.355 Part 27.54	≤ ±2.5ppm	Compliance
Frequency stability VS. voltage	Part 2.1055(d)(1)(2) Part 22.355 Part 27.54	≤ ±2.5ppm	Compliance
ERP and EIRP	Part 2.1046 Part 22.913(a) Part 27.50(h)	ERP≤ 7W(LTE Band 5) EIRP≤ 2W(LTE Band 7)	Compliance
Radiated Spurious Emission	Part 2.1053 Part 22.917 Part 27.53(m)	≤ -13dBm(LTE Band5) ≤ -25dBm(LTE Band7)	Compliance

Note:

1. "N/A" is an abbreviation for Not Applicable.
2. Testing was performed by configuring EUT to maximum output power status, the declared output power class for different

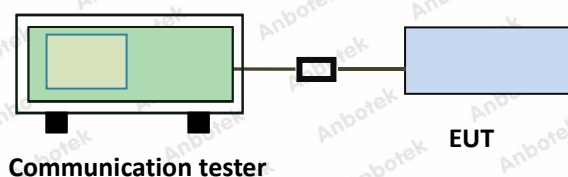


3. Conducted Output Power Test

3.1. Test Standard and Limit

Applicable Standard:	Part 2.1046 Part 22.913(a) Part 27.50(h)
Limit:	N/A

3.2. Test Setup



3.3. Test Procedure

1. The EUT output port was connected to communication tester.
2. Set EUT at maximum power through communication tester.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power.

3.4. Test Data

Pass

Please refer to Appendix A of the Appendix Test Data.

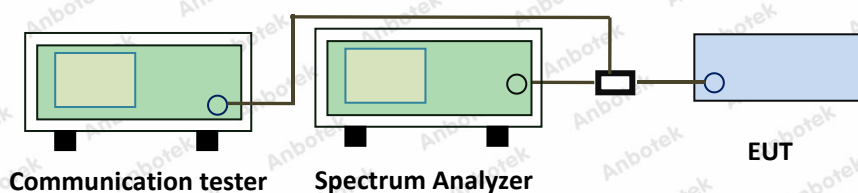


4. Peak-Average Ratio

4.1. Test Standard and Limit

Applicable Standard:	Part 22.913 Part 27.50
Limit:	≤13dB

4.2. Test Setup



4.3. Test Procedure

According with KDB 971168 D01 Section 5.7:

1. The EUT was connected to the spectrum analyzer and communication tester via a power splitter.
2. Set EUT in maximum power output.
3. Center Frequency = Carrier frequency, RBW > Emission bandwidth of signal.
4. The signal analyzer was set to collect one million samples to generate the CCDF curve.
5. The measurement interval was set depending on the type of signal analyzed.
 - i. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms.
 - ii. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power
6. Record the maximum PAPR level associated with a probability of 0.1%.

4.4. Test Data

Pass

Please refer to Appendix B of the Appendix Test Data.



5. Modulation Characteristic

According to FCC § 2.1047, Part 22H, Part 27C there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

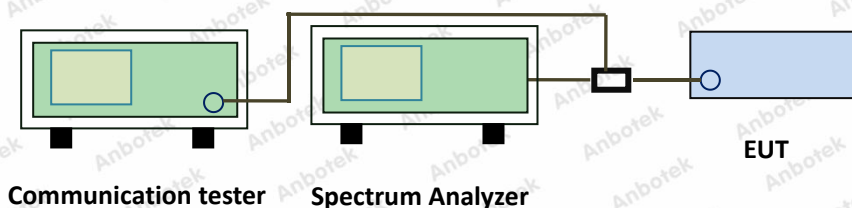


6. 99% Occupied Bandwidth & 26 dB Bandwidth

6.1. Test Standard and Limit

Applicable Standard:	Part 2.1049
Limit:	N/A

6.2. Test Setup



6.3. Test Procedure

1. The EUT was connected to the spectrum analyzer and communication tester via a power splitter.
2. Set EUT in maximum power output.
3. Spectrum analyzer setting as follow:
Center Frequency= Carrier frequency, RBW=1% to 5% of anticipated OBW, VBW= 3 *
RBW, Detector=Peak,
Trace maximum hold.
4. Record the value of 99% Occupied bandwidth and -26dB bandwidth.

6.4. Test Data

Pass

Please refer to Appendix C of the Appendix Test Data.

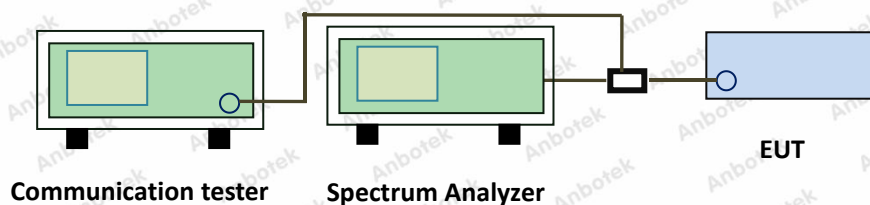


7. Conducted Spurious Emission

7.1. Test Standard and Limit

Applicable Standard:	Part 2.1051 Part 22.917 Part 27.53(m)
Limit:	$\leq -13\text{dBm}$ (LTE Band 5) $\leq -25\text{dBm}$ (LTE Band 7)

7.2. Test Setup



7.3. Test Procedure

1. The EUT was connected to the spectrum analyzer and communication tester via a power splitter.
2. Set EUT in maximum power output.
3. Spectrum analyzer setting as follow:
Below 1GHz, RBW=100KHz, VBW = 300KHz, Detector=Peak, Sweep time= Auto
Above 1GHz, RBW=1MHz, VBW=3MHz, Detector=Peak, Sweep time= Auto
Scan frequency range up to 10th harmonic.
4. Record the test plot.

7.4. Test Data

Pass

Please refer to Appendix E of the Appendix Test Data.

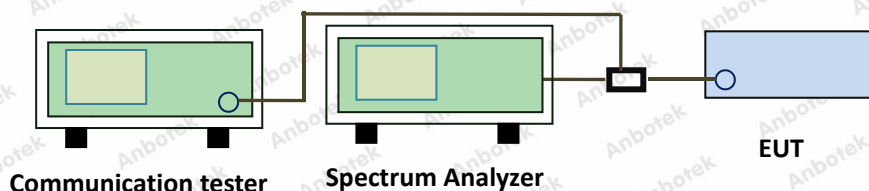


8. Band Edge

8.1. Test Standard and Limit

Applicable Standard:	Part 2.1051 Part 22.917 Part 27.53(m)
Limit:	$\leq -13\text{dBm}$ (LTE Band 5) For LTE Band 7: For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

8.2. Test Setup



8.3. Test Procedure

1. The EUT was connected to the spectrum analyzer and communication tester via a power splitter.
2. Set EUT in maximum power output.
3. The band edges of low and high channels were measured.
4. Spectrum analyzer setting as follow:
RBW=3KHz, VBW = 10KHz, Sweep time= Auto
5. Record the test plot.

8.4. Test Data

Pass

Please refer to Appendix D of the Appendix Test Data.

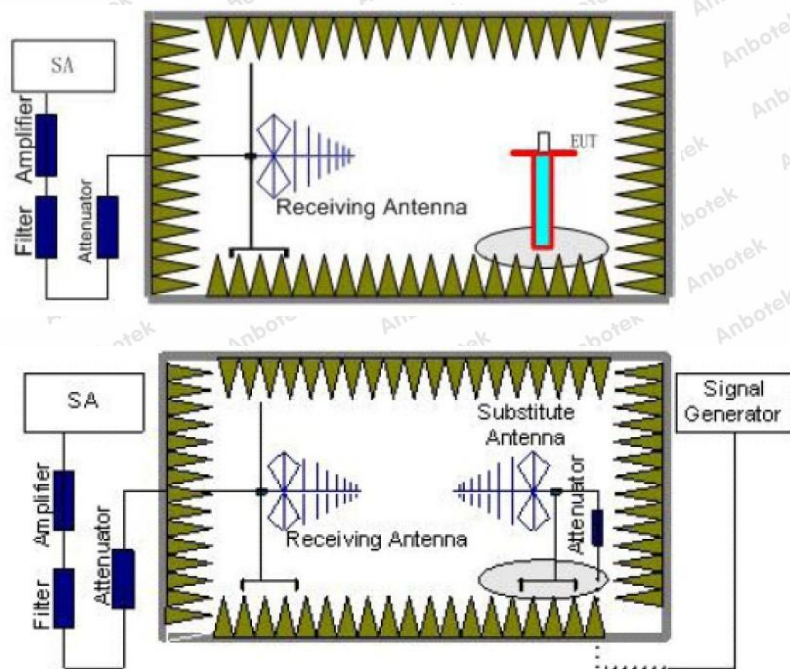


9. Radiated Spurious Emission

9.1. Test Standard and Limit

Applicable Standard:	Part 2.1053 Part 22.917 Part 27.53(m)
Limit:	$\leq -13\text{dBm}$ (LTE Band 5) $\leq -25\text{dBm}$ (LTE Band 7)

9.2. Test Setup



9.3. Test Procedure

- Place the EUT in the center of the turntable.
 - For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on a RF-transparent table at a nominal height of 80 cm above the reference ground plane
 - For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table at a nominal height of 1.5 m above the ground plane.
- Unless the EUT uses an integral antenna, the EUT shall be terminated with a non-radiating transmitter load. In cases where the EUT uses an adjustable antenna, the antenna shall be adjusted through typical positions and lengths to maximize emissions levels.
- The EUT shall be tested while operating on the frequency per manufacturer specification. Set the transmitter to operate in continuous transmit mode.
- Receiver or Spectrum set as follow:

Below 1GHz, RBW=100kHz, VBW=300kHz, Detector=Peak, Sweep time=Auto



Above 1GHz, RBW=1MHz, VBW=3MHz, Detector=Peck, Sweep time=Auto

5. Each emission under consideration shall be evaluated:
 - a) Raise and lower the measurement antenna from 1 m to 4 m, as necessary to enable detection of the maximum emission amplitude relative to measurement antenna height.
 - b) Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.
 - c) Return the turntable to the azimuth where the highest emission amplitude level was observed.
 - d) Vary the measurement antenna height again through 1 m to 4 m again to find the height associated with the maximum emission amplitude.
 - e) Record the measured emission amplitude level and frequency
6. Repeat step 5 for each emission frequency with the measurement antenna oriented in both the horizontal and vertical polarizations to determine the orientation that gives the maximum emissions amplitude.
7. Set-up the substitution measurement with the reference point of the substitution antenna located as near as possible to where the center of the EUT radiating element was located during the initial EUT measurement.
8. Maintain the previous measurement instrument settings and test set-up, with the exception that the EUT is removed and replaced by the substitution antenna.
9. Connect a signal generator to the substitution antenna; locate the signal generator so as to minimize any potential influences on the measurement results. Set the signal generator to the frequency where emissions are detected, and set an output power level such that the radiated signal can be detected by the measurement instrument, with sufficient dynamic range relative to the noise floor.
10. For each emission that was detected and measured in the initial test
 - a) Vary the measurement antenna height between 1 m to 4 m to maximize the received (measured) signal amplitude.
 - b) Adjust the signal generator output power level until the amplitude detected by the measurement instrument equals the amplitude level of the emission previously measured directly in step 5 and step 6.
 - c) Record the output power level of the signal generator when equivalence is achieved in step b).
11. Repeat step 8 through step 10 with the measurement antenna oriented in the opposite polarization.
12. Calculate the emission power in dBm referenced to a half-wave dipole using the following equation:
$$Pe = Ps(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dBd)}$$
where
 Pe = equivalent emission power in dBm
 Ps = source (signal generator) power in dBm
NOTE—dBd refers to the measured antenna gain in decibels relative to a half-wave dipole.
13. Correct the antenna gain of the substitution antenna if necessary to reference the emission power to a half-wave dipole. When using measurement antennas with the gain specified in dBi, the equivalent dipole-referenced gain can be determined from:
$$\text{gain (dBd)} = \text{gain (dBi)} - 2.15 \text{ dB.}$$
If necessary, the antenna gain can be calculated from calibrated antenna factor information
14. Provide the complete measurement results as a part of the test report.



9.4. Test Data

Pass

Please to see the following pages



LTE Band 5								
Bandwidth	Channel	Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
			Polarization	reading (dBm)	factor (dB)	Level (dBm)		
1.4MHz	Low	1649.40	Vertical	-43.24	7.29	-35.95	-13.00	PASS
		2474.10	V	-52.80	9.41	-43.39		
		3298.80	V	-56.80	12.69	-44.11		
		1649.40	Horizontal	-44.95	7.29	-37.66	-13.00	PASS
		2474.10	H	-54.81	9.41	-45.40		
		3298.80	H	-58.63	12.69	-45.94		
	Mid	1673.00	Vertical	-42.76	7.32	-35.44	-13.00	PASS
		2509.50	V	-52.30	9.39	-42.91		
		3346.00	V	-56.34	12.78	-43.56		
		1673.00	Horizontal	-44.46	7.32	-37.14	-13.00	PASS
		2509.50	H	-54.30	9.39	-44.91		
		3346.00	H	-58.26	12.78	-45.48		
	High	1696.60	Vertical	-42.19	7.33	-34.86	-13.00	PASS
		2544.90	V	-51.90	9.46	-42.44		
		3393.20	V	-55.82	12.71	-43.11		
		1696.60	Horizontal	-42.45	7.33	-35.12	-13.00	PASS
		2544.90	H	-51.66	9.46	-42.20		
		3393.20	H	-56.24	12.71	-43.53		
3MHz	Low	1651.00	Vertical	-41.17	7.36	-33.81	-13.00	PASS
		2476.50	V	-50.96	9.51	-41.45		
		3302.00	V	-54.99	12.72	-42.27		
		1651.00	Horizontal	-41.79	7.36	-34.43	-13.00	PASS
		2476.50	H	-51.06	9.51	-41.55		
		3302.00	H	-55.70	12.72	-42.98		
	Mid	1673.00	Vertical	-40.70	7.41	-33.29	-13.00	PASS
		2509.50	V	-50.48	9.52	-40.96		
		3346.00	V	-54.54	12.73	-41.81		
		1673.00	Horizontal	-40.91	7.41	-33.50	-13.00	PASS
		2509.50	H	-50.32	9.52	-40.80		
		3346.00	H	-55.00	12.73	-42.27		
	High	1695.00	Vertical	-39.67	7.52	-32.15	-13.00	PASS
		2542.50	V	-49.38	9.46	-39.92		



		3390.00	V	-53.64	12.81	-40.83	-13.00	PASS
		1695.00	Horizontal	-40.17	7.52	-32.65		
		2542.50	H	-49.46	9.46	-40.00		
		3390.00	H	-54.40	12.81	-41.59		
5MHz	Low	1653.00	Vertical	-37.65	7.61	-30.04	-13.00	PASS
		2479.50	V	-48.10	9.49	-38.61		
		3306.00	V	-51.96	12.86	-39.10		
		1653.00	Horizontal	-40.77	7.61	-33.16	-13.00	PASS
		2479.50	H	-49.97	9.49	-40.48		
		3306.00	H	-54.86	12.86	-42.00		
	Mid	1673.00	Vertical	-38.14	7.72	-30.42	-13.00	PASS
		2509.50	V	-48.50	9.53	-38.97		
		3346.00	V	-52.28	12.84	-39.44		
		1673.00	Horizontal	-41.03	7.72	-33.31	-13.00	PASS
		2509.50	H	-50.13	9.53	-40.60		
		3346.00	H	-54.96	12.84	-42.12		
	High	1693.00	Vertical	-38.68	7.79	-30.89	-13.00	PASS
		2539.50	V	-48.93	9.53	-39.40		
		3386.00	V	-52.74	12.89	-39.85		
		1693.00	Horizontal	-40.22	7.79	-32.43	-13.00	PASS
		2539.50	H	-49.31	9.53	-39.78		
		3386.00	H	-54.31	12.89	-41.42		
10MHz	Low	1658.00	Vertical	-38.10	7.81	-30.29	-13.00	PASS
		2487.00	V	-48.45	9.56	-38.89		
		3316.00	V	-52.33	12.91	-39.42		
		1658.00	Horizontal	-40.92	7.81	-33.11	-13.00	PASS
		2487.00	H	-49.98	9.56	-40.42		
		3316.00	H	-54.87	12.91	-41.96		
	Mid	1673.00	Vertical	-38.63	7.83	-30.80	-13.00	PASS
		2509.50	V	-48.96	9.59	-39.37		
		3346.00	V	-52.81	12.94	-39.87		
		1673.00	Horizontal	-41.13	7.83	-33.30	-13.00	PASS
		2509.50	H	-50.16	9.59	-40.57		
		3346.00	H	-55.05	12.94	-42.11		
	High	1688.00	Vertical	-38.92	7.89	-31.03	-13.00	PASS
		2532.00	V	-49.20	9.62	-39.58		



		3376.00	V	-53.03	12.96	-40.07		
		1688.00	Horizontal	-41.37	7.89	-33.48		
		2532.00	H	-50.36	9.62	-40.74	-13.00	PASS
		3376.00	H	-55.21	12.96	-42.25		

LTE Band 7								
Bandwidth	Channel	Frequency (MHz)	Spurious Emission				Limit (dBm)	Result
			Polarization	reading (dBm)	factor (dB)	Level (dBm)		
5MHz	Low	5005.00	Vertical	-55.74	15.62	-40.12	-25.00	PASS
		7507.50	V	-58.44	17.86	-40.58		
		10010.00	V	-66.04	23.84	-42.20		
		5005.00	Horizontal	-57.08	15.62	-41.46	-25.00	PASS
		7507.50	H	-60.08	17.86	-42.22		
		10010.00	H	-67	23.84	-43.16		
	Mid	5070.00	Vertical	-55.1	15.66	-39.44	-25.00	PASS
		7605.00	V	-57.45	17.87	-39.58		
		10140.00	V	-65.24	23.88	-41.36		
		5070.00	Horizontal	-55.28	15.66	-39.62	-25.00	PASS
		7605.00	H	-58.53	17.87	-40.66		
		10140.00	H	-66	23.88	-42.12		
	High	5135.00	Vertical	-53.23	15.69	-37.54	-25.00	PASS
		7702.50	V	-55.73	17.88	-37.85		
		10270.00	V	-63.63	23.91	-39.72		
		5135.00	Horizontal	-54.05	15.69	-38.36	-25.00	PASS
		7702.50	H	-57.35	17.88	-39.47		
		10270.00	H	-65.02	23.91	-41.11		
10MHz	Low	5010.00	Vertical	-52.39	15.71	-36.68	-25.00	PASS
		7515.00	V	-55.04	17.92	-37.12		
		10020.00	V	-63.04	23.94	-39.10		
		5010.00	Horizontal	-54.78	15.71	-39.07	-25.00	PASS
		7515.00	H	-58.06	17.92	-40.14		
		10020.00	H	-65.62	23.94	-41.68		
	Mid	5070.00	Vertical	-52.88	15.66	-37.22	-25.00	PASS
		7605.00	V	-55.49	17.87	-37.62		
		10140.00	V	-63.45	23.88	-39.57		



		5070.00	Horizontal	-55.59	15.66	-39.93	-25.00	PASS
		7605.00	H	-58.71	17.87	-40.84		
		10140.00	H	-66.22	23.88	-42.34		
	High	5130.00	Vertical	-53.89	15.79	-38.10	-25.00	PASS
		7695.00	V	-56.4	17.98	-38.42		
		10260.00	V	-64.35	24.02	-40.33		
		5130.00	Horizontal	-56.29	15.79	-40.50	-25.00	PASS
		7695.00	H	-59.36	17.98	-41.38		
		10260.00	H	-66.81	24.02	-42.79		
15MHz	Low	5015.00	Vertical	-50.87	15.81	-35.06	-25.00	PASS
		7522.50	V	-57.34	17.96	-39.38		
		10030.00	V	-61.77	24.11	-37.66		
		5015.00	Horizontal	-56.11	15.81	-40.30	-25.00	PASS
		7522.50	H	-56.09	17.96	-38.13		
		10030.00	H	-66.63	24.11	-42.52		
	Mid	5070.00	Vertical	-51.25	15.66	-35.59	-25.00	PASS
		7605.00	V	-52.99	17.87	-35.12		
		10140.00	V	-61.29	23.88	-37.41		
		5070.00	Horizontal	-57.42	15.66	-41.76	-25.00	PASS
		7605.00	H	-59.95	17.87	-42.08		
		10140.00	H	-67.17	23.88	-43.29		
	High	5125.00	Vertical	-50.58	15.88	-34.70	-25.00	PASS
		7687.50	V	-54.03	18.03	-36.00		
		10250.00	V	-62.41	24.16	-38.25		
		5125.00	Horizontal	-53.95	15.88	-38.07	-25.00	PASS
		7687.50	H	-57.15	18.03	-39.12		
		10250.00	H	-65.23	24.16	-41.07		
20MHz	Low	5020.00	Vertical	-52.31	16.03	-36.28	-25.00	PASS
		7530.00	V	-58.15	18.11	-40.04		
		10040.00	V	-62.03	24.19	-37.84		
		5020.00	Horizontal	-54.47	16.03	-38.44	-25.00	PASS
		7530.00	H	-54.97	18.11	-36.86		
		10040.00	H	-65.24	24.19	-41.05		
	Mid	5070.00	Vertical	-51.03	15.66	-35.37	-25.00	PASS
		7605.00	V	-52.81	17.87	-34.94		
		10140.00	V	-61.19	23.88	-37.31		



		5070.00	Horizontal	-56.47	15.66	-40.81	-25.00	PASS
		7605.00	H	-58.53	17.87	-40.66		
		10140.00	H	-66.05	23.88	-42.17		
	High	5120.00	Vertical	-50.59	16.15	-34.44	-25.00	PASS
		7680.00	V	-54.13	18.19	-35.94		
		10240.00	V	-62.45	24.26	-38.19		
		5120.00	Horizontal	-55.37	16.15	-39.22	-25.00	PASS
		7680.00	H	-57.98	18.19	-39.79		
		10240.00	H	-66.22	24.26	-41.96		

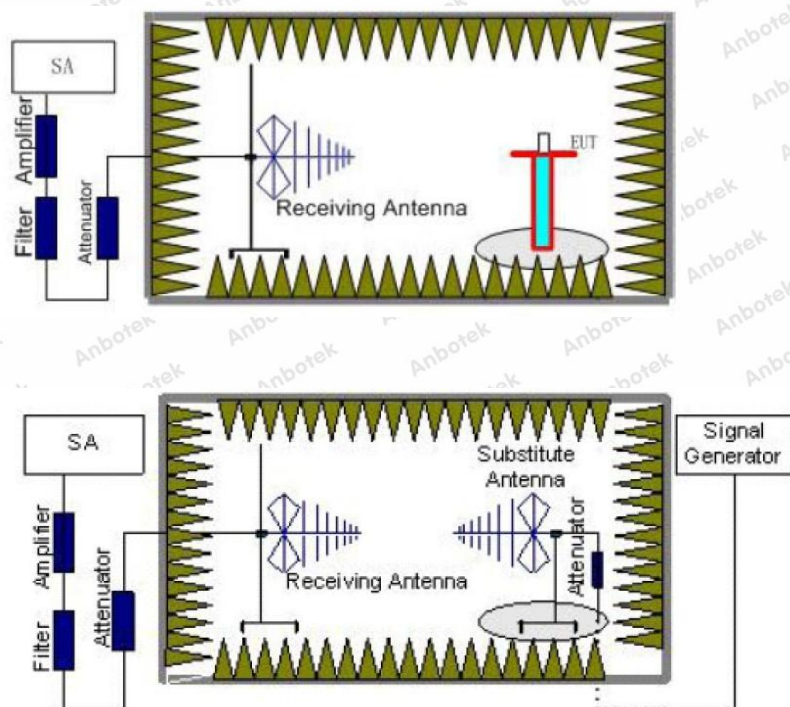


10. ERP and EIRP

10.1. Test Standard and Limit

Applicable Standard:	Part 2.1046 Part 22.913(a) Part 27.50(h)
Limit:	ERP ≤ 7W(38.45dBm) (LTE Band 5) EIRP ≤ 2W(33.00dBm) (LTE Band 7)

10.2. Test Setup



10.3. Test Procedure

- Place the EUT in the center of the turntable.
 - For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on a RF-transparent table at a nominal height of 80 cm above the reference ground plane
 - For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table at a nominal height of 1.5 m above the ground plane.
- Unless the EUT uses an integral antenna, the EUT shall be terminated with a non-radiating transmitter load. In cases where the EUT uses an adjustable antenna, the antenna shall be adjusted through typical positions and lengths to maximize emissions levels.
- The EUT shall be tested while operating on the frequency per manufacturer specification. Set the transmitter to operate in continuous transmit mode.



4. Receiver or Spectrum set as follow:

Below 1GHz, RBW=100kHz, VBW=300kHz, Detector=Peak, Sweep time=Auto

Above 1GHz, RBW=1MHz, VBW=3MHz, Detector=Peck, Sweep time=Auto

5. Each emission under consideration shall be evaluated:

- Raise and lower the measurement antenna from 1 m to 4 m, as necessary to enable detection of the maximum emission amplitude relative to measurement antenna height.
- Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.
- Return the turntable to the azimuth where the highest emission amplitude level was observed.
- Vary the measurement antenna height again through 1 m to 4 m again to find the height associated with the maximum emission amplitude.
- Record the measured emission amplitude level and frequency

6. Repeat step 5 for each emission frequency with the measurement antenna oriented in both the horizontal and vertical polarizations to determine the orientation that gives the maximum emissions amplitude.

7. Set-up the substitution measurement with the reference point of the substitution antenna located as near as possible to where the center of the EUT radiating element was located during the initial EUT measurement.

8. Maintain the previous measurement instrument settings and test set-up, with the exception that the EUT is removed and replaced by the substitution antenna.

9. Connect a signal generator to the substitution antenna; locate the signal generator so as to minimize any potential influences on the measurement results. Set the signal generator to the frequency where emissions are detected, and set an output power level such that the radiated signal can be detected by the measurement instrument, with sufficient dynamic range relative to the noise floor.

10. For each emission that was detected and measured in the initial test

- Vary the measurement antenna height between 1 m to 4 m to maximize the received (measured) signal amplitude.
- Adjust the signal generator output power level until the amplitude detected by the measurement instrument equals the amplitude level of the emission previously measured directly in step 5 and step 6.
- Record the output power level of the signal generator when equivalence is achieved in step b).

11. Repeat step 8 through step 10 with the measurement antenna oriented in the opposite polarization.

12. Calculate the emission power in dBm referenced to a half-wave dipole using the following equation:

$$P_e = P_s(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dBd)}$$

where

P_e = equivalent emission power in dBm

P_s = source (signal generator) power in dBm

NOTE—dBd refers to the measured antenna gain in decibels relative to a half-wave dipole.

13. Correct the antenna gain of the substitution antenna if necessary to reference the emission power to a half-wave dipole. When using measurement antennas with the gain specified in dBi, the equivalent dipole-referenced gain can be determined from:

$$\text{gain (dBd)} = \text{gain (dBi)} - 2.15 \text{ dB.}$$



If necessary, the antenna gain can be calculated from calibrated antenna factor information

14. Provide the complete measurement results as a part of the test report.

10.4. Test Data

Pass

Please to see the following pages



LTE Band 5						
Bandwidth	Modulation	Channel	ERP (dBm)		Limit (dBm)	Result
			Vertical	Horizontal		
1.4MHz	QPSK	Low	22.13	20.73	38.45	PASS
		Mid	22.32	21.05		
		High	22.30	20.97		
	16QAM	Low	20.72	19.33		PASS
		Mid	20.73	19.81		
		High	20.76	19.56		
3MHz	QPSK	Low	23.04	20.34	38.45	PASS
		Mid	22.73	20.63		
		High	22.38	20.41		
	16QAM	Low	20.64	19.81		PASS
		Mid	20.72	19.62		
		High	20.75	19.40		
5MHz	QPSK	Low	22.70	20.56	38.45	PASS
		Mid	22.50	20.85		
		High	22.16	20.55		
	16QAM	Low	21.12	19.83		PASS
		Mid	20.95	20.11		
		High	20.91	19.96		
10MHz	QPSK	Low	22.64	20.58	38.45	PASS
		Mid	22.45	20.87		
		High	22.12	20.56		
	16QAM	Low	21.13	19.54		PASS
		Mid	21.18	20.04		
		High	21.25	19.81		



LTE Band 7						
Bandwidth	Modulation	Channel	EIRP (dBm)		Limit (dBm)	Result
			Vertical	Horizontal		
5MHz	QPSK	Low	22.16	19.65	33.00	PASS
		Mid	22.45	19.44		
		High	22.22	19.43		
	16QAM	Low	18.57	16.48		PASS
		Mid	18.88	16.56		
		High	18.72	16.91		
10MHz	QPSK	Low	21.90	18.86	33.00	PASS
		Mid	22.01	19.30		
		High	21.82	19.15		
	16QAM	Low	19.41	17.42		PASS
		Mid	19.30	16.97		
		High	19.22	17.43		
15MHz	QPSK	Low	23.61	20.62	33.00	PASS
		Mid	24.13	20.40		
		High	23.92	20.31		
	16QAM	Low	20.17	17.39		PASS
		Mid	20.24	17.39		
		High	20.00	17.65		
20MHz	QPSK	Low	23.53	20.78	33.00	PASS
		Mid	23.91	20.49		
		High	23.74	20.58		
	16QAM	Low	19.56	17.23		PASS
		Mid	20.00	17.59		
		High	19.67	17.69		

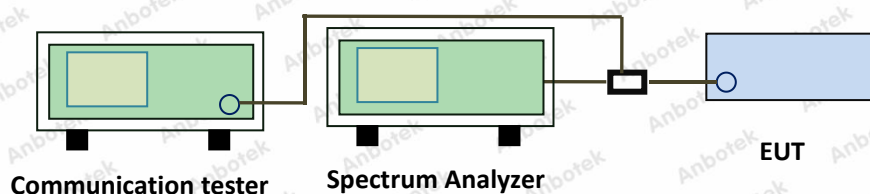


11. Frequency stability VS Voltage measurement

11.1. Test Standard and Limit

Applicable Standard:	Part 2.1055(d)(1)(2) Part 22.355 Part 27.54
Limit:	$\leq \pm 2.5\text{ppm}$

11.2. Test Setup



11.3. Test Procedure

1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. The EUT output port was connected to communication tester.
3. The EUT was placed inside the temperature chamber at 25°C.
4. The power supply voltage to the EUT was varied $\pm 15\%$ of the nominal value measured at the input to the EUT.
5. Record the maximum frequency change.

11.4. Test Data

Pass

Please refer to Appendix F of the Appendix Test Data.

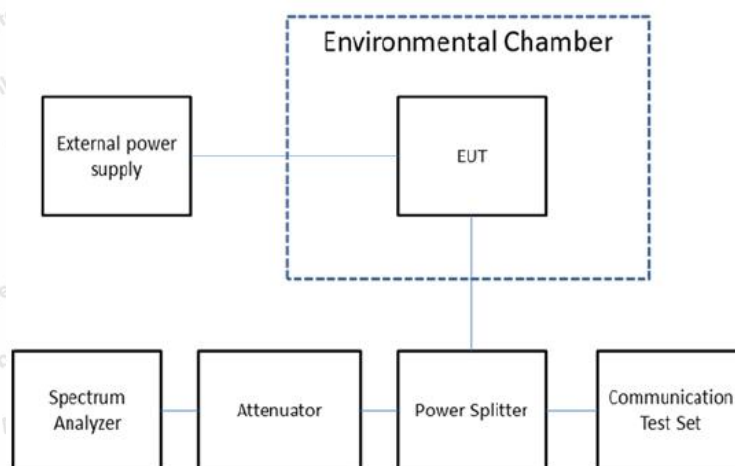


12. Frequency stability VS Temperature measurement

12.1. Test Standard and Limit

Applicable Standard:	Part 2.1055(a)(1)(b) Part 22.355 Part 27.54
Limit:	$\leq \pm 2.5\text{ppm}$

12.2. Test Setup



12.3. Test Procedure

1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. The EUT output port was connected to communication tester.
3. The EUT was placed inside the temperature chamber.
4. Turn EUT off and set the chamber temperature to -30°C . After the temperature stabilized for approximately 30 minutes recorded the frequency.
5. Repeat step 4 measure with 10°C increased per stage until the highest temperature of $+50^{\circ}\text{C}$ reached.

12.4. Test Data

Pass

Please refer to Appendix G of the Appendix Test Data.



APPENDIX I -- TEST SETUP PHOTOGRAPH

Please refer to separated files Appendix I -- Test Setup Photograph

APPENDIX II -- EXTERNAL PHOTOGRAPH

Please refer to separated files Appendix II -- External Photograph

APPENDIX III -- INTERNAL PHOTOGRAPH

Please refer to separated files Appendix III -- Internal Photograph

----- End of Report -----

