

Report No.: ZR/2019/A000301-01
Rev.: 01
Page: 1 of 40

TEST REPORT

Application No.: ZR/2019/A0003
Applicant: Sony Mobile Communications INC
Address of Applicant: 4-12-3 Higashi-shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan
Manufacturer: Sony Mobile Communications INC
Address of Manufacturer: 4-12-3 Higashi-shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan
EUT Description: GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n, GPS and NFC
Model No.: PM-1291-BV
Trade Mark: Sony
FCC ID: PY7-50352P
Standards: 47 CFR Part 2
47 CFR Part 22
47 CFR Part 24
47 CFR Part 27
Date of Receipt: 2019/10/15
Date of Test: 2019/10/15 to 2019/12/15
2021/12/22 to 2022/1/9(For Tianjin Dongdian Testing Service Co., Ltd.)
Date of Issue: 2022/5/7

Test Result :	PASS *
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* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:

Jim Huang



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1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2022/4/29		Original
02		2022/5/7		Add Note On Section2

Prepared By	 <hr/> (Wick Feng) / Test Supervisor
Checked By	 <hr/> (Daniel Wang) / Reviewer

This report supersedes our previous report **ZR/2019/A000301**, issued on **2019-12-15**, which is hereby deemed null and void.



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2 Test Summary

2.1 GSM850/UMTS Band 5/LTE Band 5

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab ^[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §22.913(a)(5)	ERP ≤ 7 W	Section 1 of Appendix B	Pass	A
Peak-Average Ratio	§22.913(d)	Limit≤13 dB	Section 2 of Appendix B	Pass	A
Modulation Characteristics	§2.1047	Digital modulation	Section 3 of Appendix B	Pass	A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 4 of Appendix B	Pass	A
Band Edges Compliance	§2.1051, §22.917(a)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Section 5 of Appendix B	Pass	A
Spurious Emission at Antenna Terminals	§2.1051, §22.917(a)	FCC: ≤ -13 dBm/100 kHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	Section 6 of Appendix B	Pass	A
Field Strength of Spurious Radiation	§2.1053, §22.917(a)	FCC: ≤ -13 dBm/100 kHz.	Section 7 of Appendix B	Pass	B
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §22.355	≤ ±2.5ppm.	Section 8 of Appendix B	Pass	A

Note^[1]:
 Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
 Lab B Tianjin Dongdian Testing Service Co., Ltd.
 Test data from lab A is from the original version of this report with measurements made from 2019/10/15 to 2019/12/15. The measurement data for radiated emissions is from lab B and was taken from 2021/12/22 to 2022/1/9. This report also includes power verification measurements performed at lab B (refer to section 4.1) to confirm that devices tested at lab B were operating within the expected range of output powers. Refer to section 2 for full details.



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2.2 GSM 1900/UMTS Band 2 /LTE Band 2

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab ^[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §24.232(c)	EIRP ≤ 2 W	Section 1 of Appendix B	Pass	A
Peak-Average Ratio	§24.232(d)	Limit≤13 dB	Section 2 of Appendix B	Pass	A
Modulation Characteristics	§2.1047	Digital modulation	Section 3 of Appendix B	Pass	A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 4 of Appendix B	Pass	A
Band Edges Compliance	§2.1051, §24.238(a)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Section 5 of Appendix B	Pass	A
Spurious Emission at Antenna Terminals	§2.1051, §24.238(a)	≤ -13 dBm/1 MHz, from 9 kHz to 10 th harmonics but outside authorized operating frequency ranges.	Section 6 of Appendix B	Pass	A
Field Strength of Spurious Radiation	§2.1053, §24.238(a)	≤ -13 dBm/1 MHz.	Section 7 of Appendix B	Pass	B
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §24.235	Within authorized bands of operation/frequency block.	Section 8 of Appendix B	Pass	A

Note^[1]:
 Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
 Lab B Tianjin Dongdian Testing Service Co., Ltd.
 Test data from lab A is from the original version of this report with measurements made from 2019/10/15 to 2019/12/15. The measurement data for radiated emissions is from lab B and was taken from 2021/12/22 to 2022/1/9. This report also includes power verification measurements performed at lab B (refer to section 4.1) to confirm that devices tested at lab B were operating within the expected range of output powers. Refer to section 2 for full details.



2.3 UMTS Band 4 /LTE Band 4 /66

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab ^[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(d)(4)	EIRP ≤ 1 W	Section 1 of Appendix B	Pass	A
Peak-Average Ratio	§27.50(d)(5)	Limit≤13 dB	Section 2 of Appendix B	Pass	A
Modulation Characteristics	§2.1047	Digital modulation	Section 3 of Appendix B	Pass	A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 4 of Appendix B	Pass	A
Band Edges Compliance	§2.1051, §27.53(h)	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Section 5 of Appendix B	Pass	A
Spurious Emission at Antenna Terminals	§2.1051, §27.53(h)	≤ -13 dBm/1 MHz, from 9 kHz to 10 th harmonics but outside authorized operating frequency ranges.	Section 6 of Appendix B	Pass	A
Field Strength of Spurious Radiation	§2.1053, §27.53(h)	≤ -13 dBm/1 MHz.	Section 7 of Appendix B	Pass	B
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §27.54	Within authorized bands of operation/frequency block.	Section 8 of Appendix B	Pass	A

Note^[1]:

Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

Lab B Tianjin Dongdian Testing Service Co., Ltd.

Test data from lab A is from the original version of this report with measurements made from 2019/10/15 to 2019/12/15. The measurement data for radiated emissions is from lab B and was taken from 2021/12/22 to 2022/1/9. This report also includes power verification measurements performed at lab B (refer to section 4.1) to confirm that devices tested at lab B were operating within the expected range of output powers. Refer to section 2 for full details.



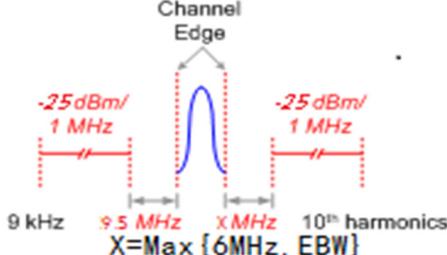
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2.4 LTE Band 7

Test Item	FCC Rule No.	Requirements	Test Result	Verdict	Test Lab ^[1]
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(h)(2)	EIRP ≤ 2W	Section 1 of Appendix B	Pass	A
Peak-Average Ratio	---	≤13 dB	Section 2 of Appendix B	Pass	A
Modulation Characteristics	§2.1047	Digital modulation	Section 3 of Appendix B	Pass	A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 4 of Appendix B	Pass	A
Band Edges Compliance	§2.1051, §27.53(m4)	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.	Section 5 of Appendix B	Pass	A
Spurious Emission at Antenna Terminals	§2.1051, §27.53(m)	<p style="text-align: center;">Channel Edge -25 dBm/1 MHz -25 dBm/1 MHz 9 kHz 9.5 MHz X MHz 10th harmonics X=Max {6MHz, EBW}</p>	Section 6 of Appendix B	Pass	A



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<p>Field Strength of Spurious Radiation</p>	<p>§2.1053, §27.53(m)</p>		<p>Section 7 of Appendix B</p>	<p>Pass</p>	<p>B</p>
<p>Frequency Stability</p>	<p>§2.1055(a)(1)(b) §2.1055(d)(2) §27.54</p>	<p>Within authorized bands of operation/frequency block.</p>	<p>Section 8 of Appendix B</p>	<p>Pass</p>	<p>A</p>
<p>Note^[1]: Lab A SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch Lab B Tianjin Dongdian Testing Service Co., Ltd. Test data from lab A is from the original version of this report with measurements made from 2019/10/15 to 2019/12/15. The measurement data for radiated emissions is from lab B and was taken from 2021/12/22 to 2022/1/9. This report also includes power verification measurements performed at lab B (refer to section 4.1) to confirm that devices tested at lab B were operating within the expected range of output powers. Refer to section 2 for full details.</p>					



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3 General Information

3.1 Details of Client

Applicant:	Sony Mobile Communications INC
Address of Applicant:	4-12-3 Higashi-shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan
Manufacturer:	Sony Mobile Communications INC
Address of Manufacturer:	4-12-3 Higashi-shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan

3.2 Test Location

Lab A:	
Company:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Address:	No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China
Post code:	518057
Test engineer:	Adam Liang
Lab B:	
Company:	Tianjin Dongdian Testing Service Co., Ltd.
Address:	Building D-1, No. 19, Weisi Road, Microelectronics Industrial Park, Development Area, Tianjin, China.
Tel:	+86-22-58038033
E-mail:	ddt@dgddt.com, http://www.ddttest.com
Test engineer:	Leon Li



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3.3 Test Facility

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

Lab A:
<ul style="list-style-type: none"> • A2LA (Certificate No. 3816.01) SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01. • VCCI The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively. • Innovation, Science and Economic Development Canada SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory. CAB identifier: CN0006. IC#: 4620C.
Lab B:
<p>Tianjin Dongdian Testing Service Co., Ltd.</p> <p>Address: Building D-1, No. 19, Weisi Road, Microelectronics Industrial Park Development Area, Tianjin, China., 300385</p> <p>Tel: +86-22-58038033, http://www.ddttest.com, Email: ddt@dgddt.com</p> <p>NVLAP (National Voluntary Laboratory Accreditation Program) CODE: 500036-0</p> <p>CNAS (China National Accreditation Service for Conformity Assessment) CODE: L13402</p> <p>FCC Designation Number: CN5004; FCC Test Firm Registration Number: 368676</p> <p>ISED (Innovation, Science and Economic Development Canada) Company Number: 27768</p> <p>Conformity Assessment Body Identifier: CN0125</p> <p>VCCI Facility Registration Number: C-20089, T-20093, R-20125, G-20122</p>



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3.4 General Description of EUT

EUT Description:	GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n, GPS and NFC		
Model No.:	PM-1291-BV		
Trade Mark:	Sony		
Hardware Version:	A		
Software Version:	0.96		
Antenna Type:	<input type="checkbox"/> External, <input checked="" type="checkbox"/> Integrated		
Antenna Gain*:	<input checked="" type="checkbox"/> Provided by client		
	GSM850:	-4.21dB i	GSM1900: -0.53dBi
	WCDMA Band II:	-0.53dBi	WCDMA Band V: -4.21dBi
	LTE Band 2:	-0.53dBi	LTE Band 5: -4.21dBi
	LTE Band 7:	0.59dBi	
RF Cable*:	<input checked="" type="checkbox"/> Provided by client		
	0.5dB(0.6~1GHz)	0.8dB(1.4~2GHz)	1.0dB(2.1~2.7GHz)
	1.5dB(3~4GHz)	1.8dB(4.4~6GHz)	
<p>Note: *Since the above data and/or information is provided by the client relevant results or conclusions of this report are only made for these data and/or information, SGS is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.</p> <p>Remark: As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.</p>			



3.5 Test Mode

Test Mode	Test Modes Description
GSM/TM1	GSM system, GSM/GPRS, GMSK modulation
GSM/TM2	GSM system, EGPRS, 8PSK modulation
UMTS/TM1	UMTS system, WCDMA, QPSK modulation
LTE/TM1	LTE system, QPSK modulation
LTE/TM2	LTE system, 16QAM modulation

Remark: The test mode(s) are selected according to relevant radio technology specifications.

3.6 Test Environment

Environment Parameter	86-106kPa Selected Values During Tests	
Relative Humidity	30-75% RH Ambient	
Value	Temperature(°C)	Voltage(V)
NTNV	25	3.8
LTLV	-30	3.45
LTHV	-30	4.38
HTLV	50	3.45
HTHV	50	4.38

Remark:
 NV: Normal Voltage
 NT: Normal Temperature
 LT: Low Extreme Test Temperature
 HT: High Extreme Test Temperature
 LV: Low Extreme Test Voltage
 HV: High Extreme Test Voltage

3.7 Description of Support Units

The EUT has been tested as an independent unit.



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3.8 Technical Specification

Characteristics	Description		
Radio System Type	<input checked="" type="checkbox"/> GSM	<input checked="" type="checkbox"/> UMTS	<input checked="" type="checkbox"/> LTE
Supported Frequency Range	Band	TX	RX
	GSM850	824 to 849 MHz	869 to 894 MHz
	GSM1900	1850 to 1910 MHz	1930 to 1990 MHz
	UMTS Band II	1850 to 1910 MHz	1930 to 1990 MHz
	UMTS Band V	824 to 849 MHz	869 to 894 MHz
	LTE Band 2	1850 to 1910 MHz	1930 to 1990 MHz
	LTE Band 5	824 to 849 MHz	869 to 894 MHz
	LTE Band 7	2500 to 2570 MHz	2620 to 2690 MHz
Supported Channel Bandwidth	GSM system:	<input checked="" type="checkbox"/> 0.2 MHz	
	UMTS system:	<input checked="" type="checkbox"/> 5 MHz	
	LTE Band 2	<input checked="" type="checkbox"/> 1.4 MHz <input checked="" type="checkbox"/> 3 MHz <input checked="" type="checkbox"/> 5 MHz <input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz	
	LTE Band 5	<input checked="" type="checkbox"/> 1.4 MHz <input checked="" type="checkbox"/> 3 MHz <input checked="" type="checkbox"/> 5 MHz <input checked="" type="checkbox"/> 10 MHz	
	Note1: WCDMA supports HSUPA, HSDPA, HSPA, but only the worst case was tested and the data displayed in this report.		
Characteristics	Description		
Designation of Emissions (Remark: the necessary bandwidth of which is the worst value from the measured occupied bandwidths for each type of channel bandwidth configuration.)	GSM:	GMSK	8PSK
	GSM850	249KGXW	246KG7W
	GSM1900	247KGXW	249KG7W
	UMTS:	QPSK	16QAM
	Band II	4M17F9W	4M17W7D
	Band V	4M15F9W	4M15W7D;
	E-UTRA:	QPSK	16QAM
	LTE Band 2	1M09G7D	1M09W7D
		2M69G7D	2M67W7D
		4M48G7D	4M49W7D
		8M93G7D	8M95W7D
		13M5G7D	13M5W7D
		17M9G7D	17M9W7D
LTE Band 5	1M09G7D	1M09W7D	
	2M69G7D	2M67W7D	





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		4M47G7D	4M49W7D
		8M93G7D	8M93W7D
	LTE Band 7	4M48G7D	4M49W7D
		8M93G7D	8M93W7D
		13M5G7D	13M5W7D
		17M9G7D	17M9W7D



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3.9 Test Frequencies

Test Mode	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
GSM850	TX	Channel 128	Channel 190	Channel 251
		824.2MHz	836.6 MHz	848.8 MHz
	RX	Channel 128	Channel 190	Channel 251
		869.2 MHz	881.6 MHz	893.8 MHz

Test Mode	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
GSM1900	TX	Channel 512	Channel 661	Channel 810
		1850.2MHz	1880.0 MHz	1909.8 MHz
	RX	Channel 512	Channel 661	Channel 810
		1930.2 MHz	1960.0 MHz	1989.8 MHz

Test Mode	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
WCDMA Band II	TX	Channel 9262	Channel 9400	Channel 9538
		1852.4 MHz	1880.0 MHz	1907.6 MHz
	RX	Channel 9662	Channel 9800	Channel 9938
		1932.4 MHz	1960.0 MHz	1987.6 MHz

Test Mode	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
WCDMA Band V	TX	Channel 4132	Channel 4182	Channel 4233
		826.4MHz	836.4 MHz	846.6 MHz
	RX	Channel 4357	Channel 4407	Channel 4458
		871.4 MHz	881.4 MHz	891.6 MHz



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Test Mode	Bandwidth	TX / RX	RF Channel		
			Low (L)	Middle (M)	High (H)
LTE Band 2	1.4MHz	TX	Channel 18607	Channel 18900	Channel 19193
			1850.7 MHz	1880 MHz	1909.3 MHz
		RX	Channel 607	Channel 900	Channel 1193
			1930.7 MHz	1960 MHz	1989.3 MHz
	3MHz	TX	Channel 18615	Channel 18900	Channel 19185
			1851.5 MHz	1880 MHz	1908.5 MHz
		RX	Channel 615	Channel 900	Channel 1185
			1931.5 MHz	1960 MHz	1988.5 MHz
	5MHz	TX	Channel 18625	Channel 18900	Channel 19175
			1852.5 MHz	1880 MHz	1907.5 MHz
		RX	Channel 625	Channel 900	Channel 1175
			1932.5 MHz	1960 MHz	1987.5 MHz
	10MHz	TX	Channel 18650	Channel 18900	Channel 19150
			1855 MHz	1880 MHz	1905 MHz
		RX	Channel 650	Channel 900	Channel 1150
			1935 MHz	1960 MHz	1985 MHz
	15MHz	TX	Channel 18675	Channel 18900	Channel 19125
			1857.5 MHz	1880 MHz	1902.5 MHz
		RX	Channel 675	Channel 900	Channel 1125
			1937.5 MHz	1960 MHz	1982.5 MHz
	20MHz	TX	Channel 18700	Channel 18900	Channel 19100
			1860 MHz	1880 MHz	1900 MHz
		RX	Channel 700	Channel 900	Channel 1100
			1940 MHz	1960 MHz	1980 MHz



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Test Mode	Bandwidth	TX / RX	RF Channel		
			Low (L)	Middle (M)	High (H)
LTE Band 5	1.4MHz	TX	Channel 20407	Channel 20525	Channel 20643
			824.7 MHz	836.5 MHz	848.3 MHz
		RX	Channel 2407	Channel 2525	Channel 2643
			869.7 MHz	881.5 MHz	893.3 MHz
	3MHz	TX	Channel 20415	Channel 20525	Channel 20635
			825.5 MHz	836.5 MHz	847.5 MHz
		RX	Channel 2415	Channel 2525	Channel 2635
			870.5 MHz	881.5 MHz	892.5 MHz
	5MHz	TX	Channel 20425	Channel 20525	Channel 20625
			826.5 MHz	836.5 MHz	846.5 MHz
		RX	Channel 2425	Channel 2525	Channel 2625
			871.5 MHz	881.5 MHz	891.5 MHz
10MHz	TX	Channel 20450	Channel 20525	Channel 20600	
		829 MHz	836.5 MHz	844 MHz	
	RX	Channel 2450	Channel 2525	Channel 2600	
		874 MHz	881.5 MHz	889 MHz	

Test Mode	Bandwidth	TX / RX	RF Channel		
			Low (L)	Middle (M)	High (H)
LTE Band 7	5MHz	TX	Channel 20775	Channel 21100	Channel 21425
			2502.5 MHz	2535 MHz	2567.5 MHz
		RX	Channel 2775	Channel 3100	Channel 5825
			2622.5 MHz	2655 MHz	2687.5 MHz
	10MHz	TX	Channel 20800	Channel 21100	Channel 21400
			2505 MHz	2535 MHz	2565 MHz
		RX	Channel 2800	Channel 3100	Channel 3400
			2625 MHz	2655 MHz	2685 MHz
	15MHz	TX	Channel 20825	Channel 21100	Channel 21375
			2507.5 MHz	2535 MHz	2562.5 MHz
		RX	Channel 2825	Channel 3100	Channel 3375
			2627.5 MHz	2655 MHz	2682.5 MHz
	20MHz	TX	Channel 20850	Channel 21100	Channel 21350
			2510 MHz	2535 MHz	2560 MHz
		RX	Channel 2850	Channel 3100	Channel 3350
			2630 MHz	2655 MHz	2680 MHz



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4 Description of Tests

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.

Remark: Reference test setup 1



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4.1.1 Re-Test statement

The EUT is operating at the same power level with the original testing of SGS-CSTC Standards Technical Services, Co., Ltd. Shenzhen Branch.

Item	The Original Reports	Re-Test Reports
File name:	test report RF	RF test report
Test location:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch	Tianjin Dongdian Testing Service Co., Ltd.

GSM BAND	Channel	Test Original Reports Level(dBm)	Re-Test Reports Level(dBm)
GSM850	128	33.02	33.22
GSM850	190	33.06	33.27
GSM850	251	33.07	33.15
GSM1900	512	30.18	30.19
GSM1900	661	30.13	30.16
GSM1900	810	30.11	30.19

WCDMA BAND	Modulation	Channel	Test Original Reports Level(dBm)	Re-Test Reports Level(dBm)
WCDMA Band II	QPSK	9262	23.54	23.51
WCDMA Band II	QPSK	9400	23.52	23.53
WCDMA Band II	QPSK	9538	23.46	23.50
WCDMA Band V	QPSK	4132	23.83	23.62
WCDMA Band V	QPSK	4182	23.78	23.69
WCDMA Band V	QPSK	4233	23.79	23.71

LTE BAND	Bandwidth	Modulation	Channel	RB Configuration	Test Original Reports Level(dBm)	Re-Test Reports Level(dBm)
Band 2	20MHz	QPSK	18700	1RB#0	23.75	23.84
Band 2	20MHz	QPSK	18900	1RB#0	23.76	23.98
Band 2	20MHz	QPSK	19100	1RB#0	23.74	23.81
Band 5	10MHz	QPSK	20450	1RB#0	24.09	24.24
Band 5	10MHz	QPSK	20525	1RB#0	24.12	24.29
Band 5	10MHz	QPSK	20600	1RB#0	24.15	24.23
Band 7	20MHz	QPSK	20850	1RB#0	24.16	24.17
Band 7	20MHz	QPSK	21100	1RB#0	24.07	23.12
Band 7	20MHz	QPSK	21350	1RB#0	24.06	24.09



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4.2 Effective (Isotropic) Radiated Power of Transmitter

Measurement Procedure: FCC KDB 971168 D01 V03r01 ; ANSI/C63.26 (2015)

Note: **Reference test setup 1.**

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are calculated by adding highest antenna gain to maximum measured conducted output power. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

- a) The transmitter antenna port was connected to a Base Station Simulator through the calibrated coaxial cable.
- b) Setup the Base Station Simulator to force the transmitter to the maximum power setting.
- 3) The tests were performed at three channels (low channel, middle channel and high channel) and on the highest power levels, which can be setup on the transmitters.

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



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4.3 Occupied Bandwidth

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 4.2

The occupied bandwidth, 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. The transmitter output was connected to a calibrated coaxial cable, attenuator and Spectrum analyser, 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 tests were performed at three frequencies (low channel, middle channel and high channel). The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1 percent of the selected span as is possible without being below 1 percent. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual. The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 percent of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

Remark: Reference test setup 1

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW \geq 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7



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4.4 Band Edge at Antenna Terminals

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 6.0

The transmitter output was connected to a calibrated coaxial cable, attenuator and Spectrum analyser, 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 tests were performed at two frequencies (low channel and high channel), in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of 100kHz or 1% of the emission bandwidth of the fundamental emission of the transmitter may be employed. The EUT emission bandwidth is measured as the width of the signal between two points, outside of which all emission are attenuated at least 26dB below the transmitter power. The video bandwidth of the spectrum analyzer was set at thrice the resolution bandwidth. Detector Mode was set to rms.

Remark: Reference test setup 1

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW \geq 1% of the emission bandwidth
4. VBW \geq 3 x RBW
5. Detector = RMS
6. Number of sweep points \geq 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize



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4.5 Spurious And Harmonic Emissions at Antenna Terminal

Measurement Procedure: FCC KDB 971168 D01 V03r01

The transmitter output was connected to a calibrated coaxial cable, attenuator and Spectrum analyzer, 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 tests were performed at three frequencies (low channel and high channel). The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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 emission are attenuated at least 26 dB below the transmitter power.

Remark: Reference test setup 1

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least $10 \times$ the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings



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4.6 Peak-Average Ratio

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 5.7.1

A peak to average ratio measurement is performed at the conducted port of the EUT. For WCDMA signals, the spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level. For GSM signals, an average and a peak trace are used on a spectrum analyzer to determine the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth. The traces are generated with the spectrum analyzer set to zero span mode.

Remark: Reference test setup 1

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > 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. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. 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



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4.7 Field Strength of Spurious Radiation

Test Procedure: FCC KDB 971168 D01 V03r01.

Note: **Reference test setup 2.**

- a) Place the EUT in the center of the turntable. The EUT shall be configured to transmit into the standard non-radiating load (for measuring radiated spurious emissions), connected with cables of minimal length unless specified otherwise. If the EUT uses an adjustable antenna, the antenna shall be positioned to the length that produces the worst case emission at the fundamental operating frequency.
- b) Each emission under consideration shall be evaluated:
 - 1) Raise and lower the measurement antenna, as necessary to enable detection of the maximum emission amplitude relative to measurement antenna height.
 - 2) Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.
 - 3) Return the turntable to the azimuth where the highest emission amplitude level was observed.
 - 4) Vary the measurement antenna height again through 1 m to 4 m again to find the height associated with the maximum emission amplitude.
- c) Repeat step b) 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.
- d) $EIRP (dBm) = E (dB\mu V/m) + 20 \log D - 104.8$; where D is the measurement distance in meters.
- e) Test the EUT in the lowest channel, the middle channel the Highest channel
- f) The radiation measurements are performed in X, Y, Z axis positioning. Only the test worst case mode is recorded in the report.



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Worst-case Radiated test

- The EUT was tested in three orthogonal planes(X, Y, Z) and in all possible test configurations and positioning.
- All modes of operation were investigated and the worst-case configuration results are reports.
- In the case of radiated spurious emissions, only result that confirmed the maximum radiated power was reported
- The worst case is reported with the EUT positioning, modulations, and paging service configurations shown in the test data.
- All modes of operation were tested and the worst case results are reported.
- Below table show the worst case details:

Test Item	Test Mode	Band	Channel	Modulation	Bandwidth	Communication
Field Strength of Spurious Radiation	Mode1	GSM850	L	GMSK	0.2MHz	Circuit
			M	GMSK	0.2MHz	Circuit
			H	GMSK	0.2MHz	Circuit
	Mode2	GSM1900	L	GMSK	0.2MHz	Circuit
			M	GMSK	0.2MHz	Circuit
			H	GMSK	0.2MHz	Circuit
	Mode3	WCDMA Band II	L	QPSK	5MHz	Circuit
			M	QPSK	5MHz	Circuit
			H	QPSK	5MHz	Circuit
	Mode4	WCDMA Band V	L	QPSK	5MHz	Circuit
			M	QPSK	5MHz	Circuit
			H	QPSK	5MHz	Circuit
	Mode5	LTE Band 2	L	QPSK	20MHz	1@0
			M	QPSK	20MHz	1@0
			H	QPSK	20MHz	1@0
	Mode6	LTE Band 5	L	QPSK	10MHz	1@0
			M	QPSK	10MHz	1@0
			H	QPSK	10MHz	1@0
	Mode7	LTE Band 7	L	QPSK	20MHz	1@0
			M	QPSK	20MHz	1@0
			H	QPSK	20MHz	1@0



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4.8 Frequency Stability / Temperature Variation

Measurement Procedure:

Frequency stability testing is performed in accordance with the guidelines of FCC KDB 971168 D01 V03r01; ANSI/C63.26 (2015)

. The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ (± 2.5 ppm) of the center frequency.

Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

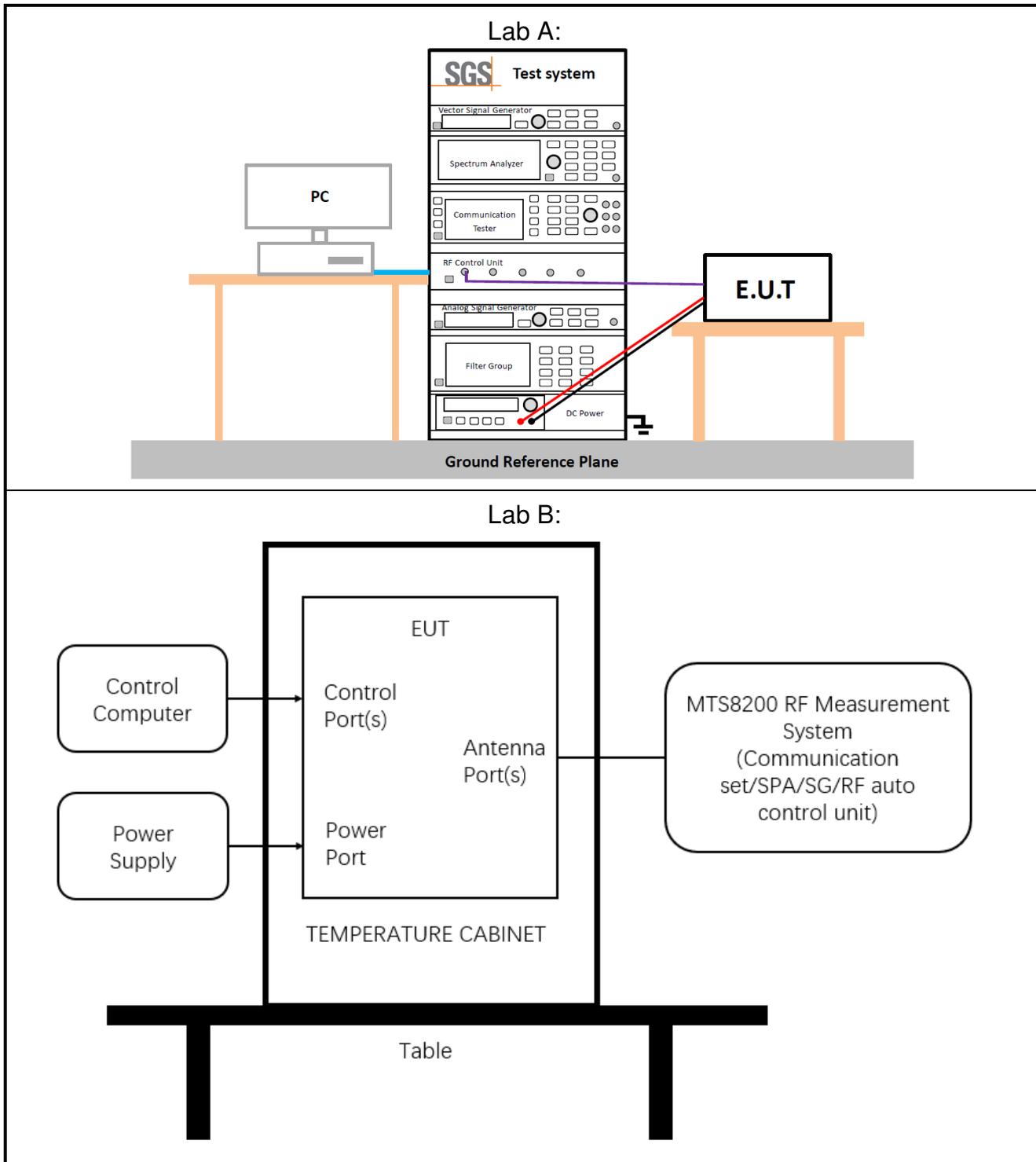
Remark: Reference test setup 3



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4.9 Test Setups

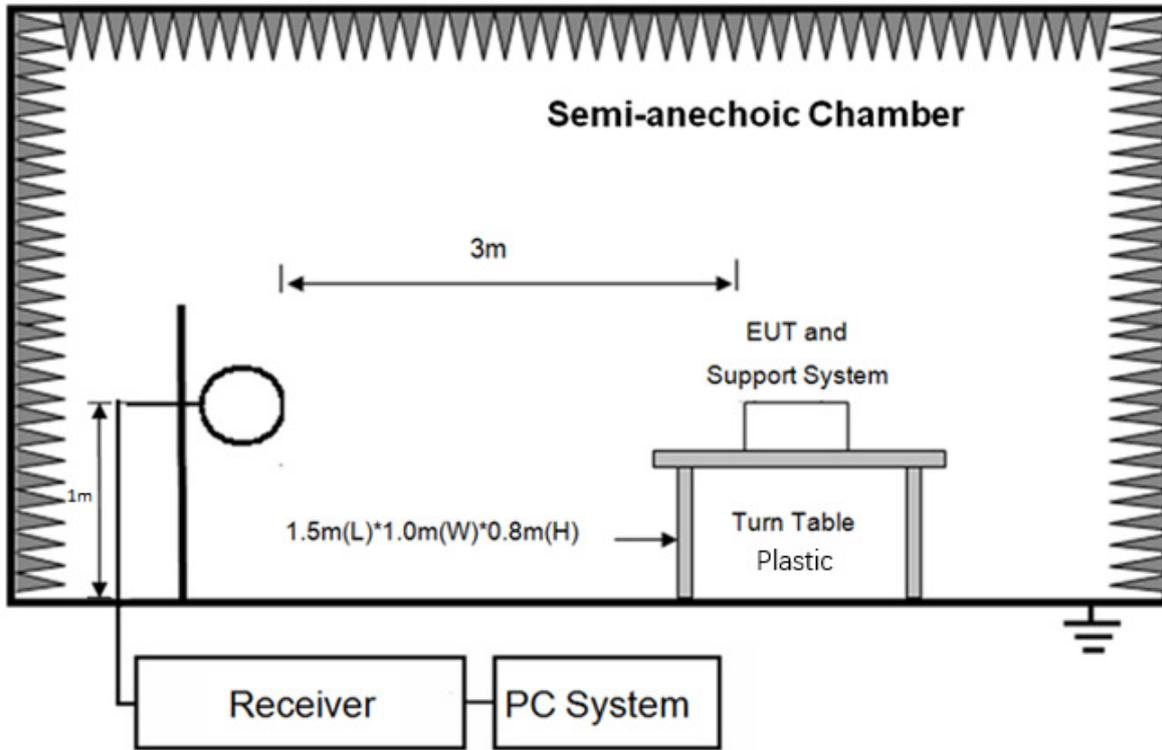
4.9.1 Test Setup 1



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4.9.2 Test Setup 2

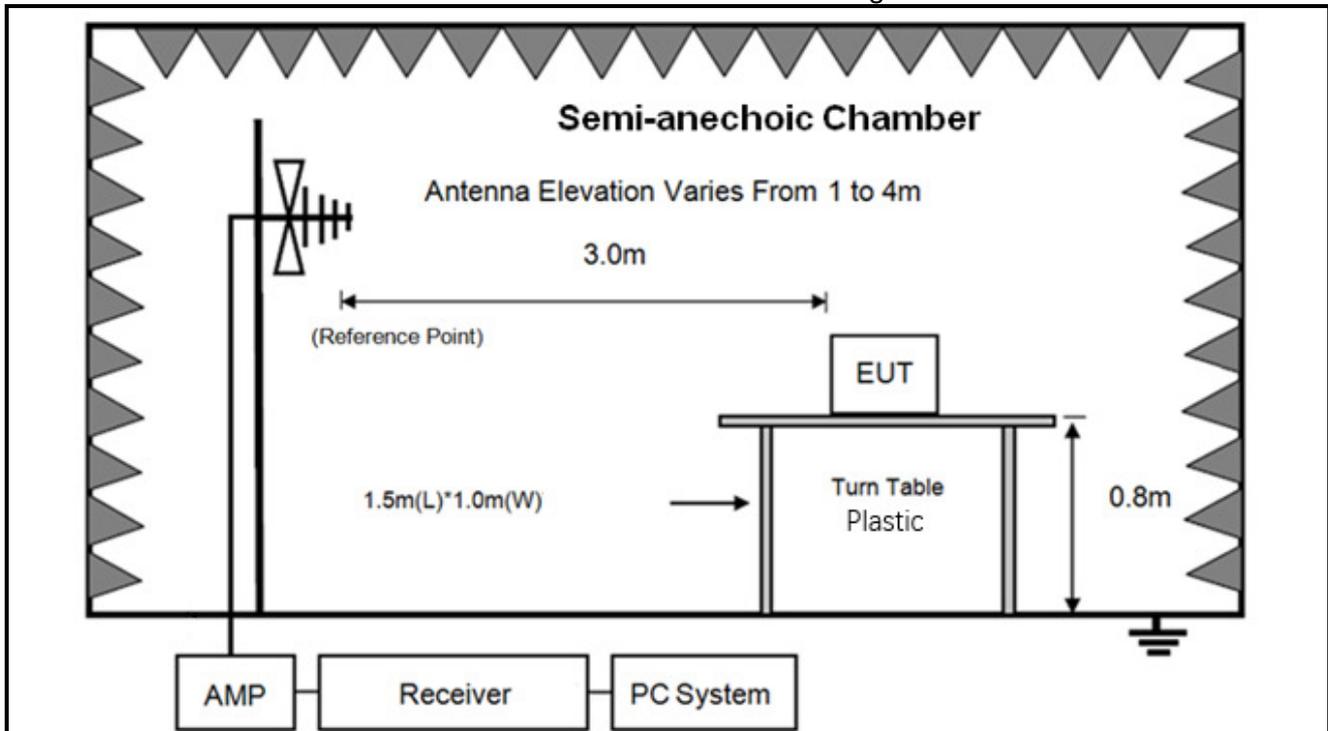
In 3 m Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:



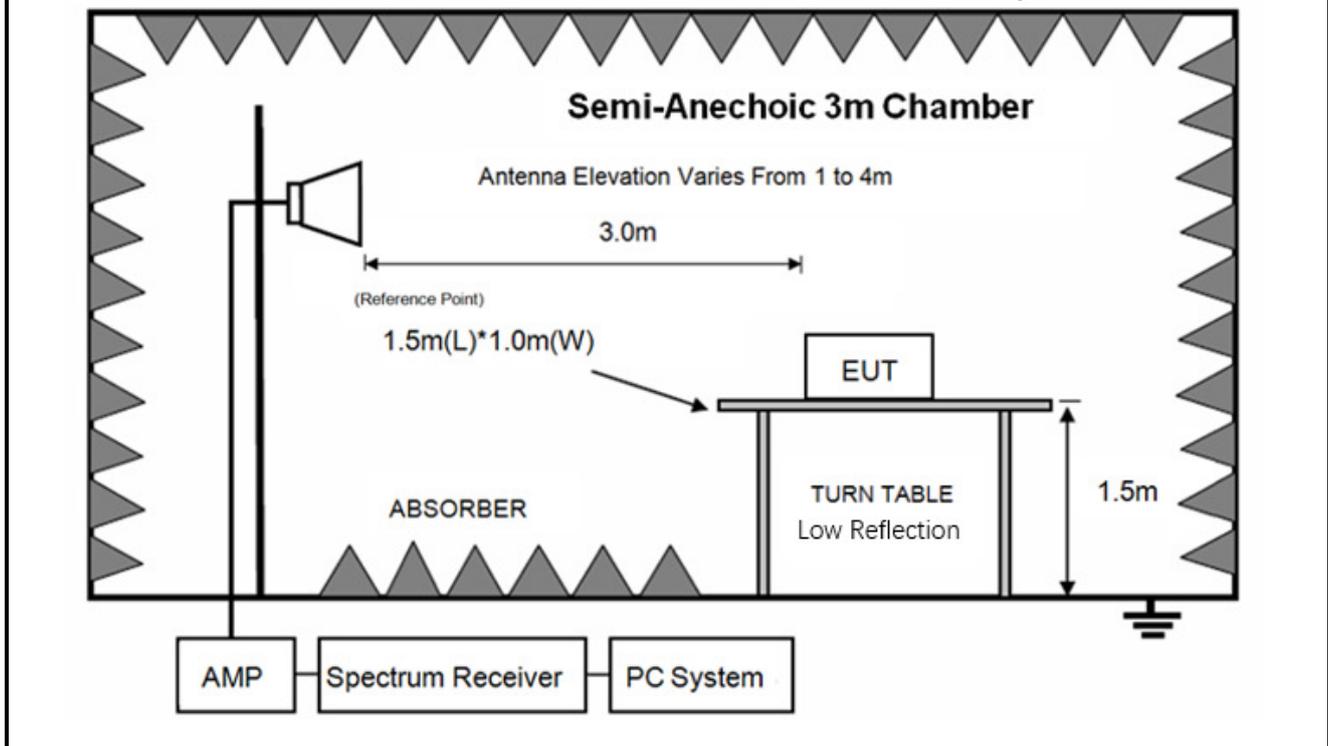
In 3 m Anechoic Chamber, test setup diagram for 30 MHz – 1 GHz:



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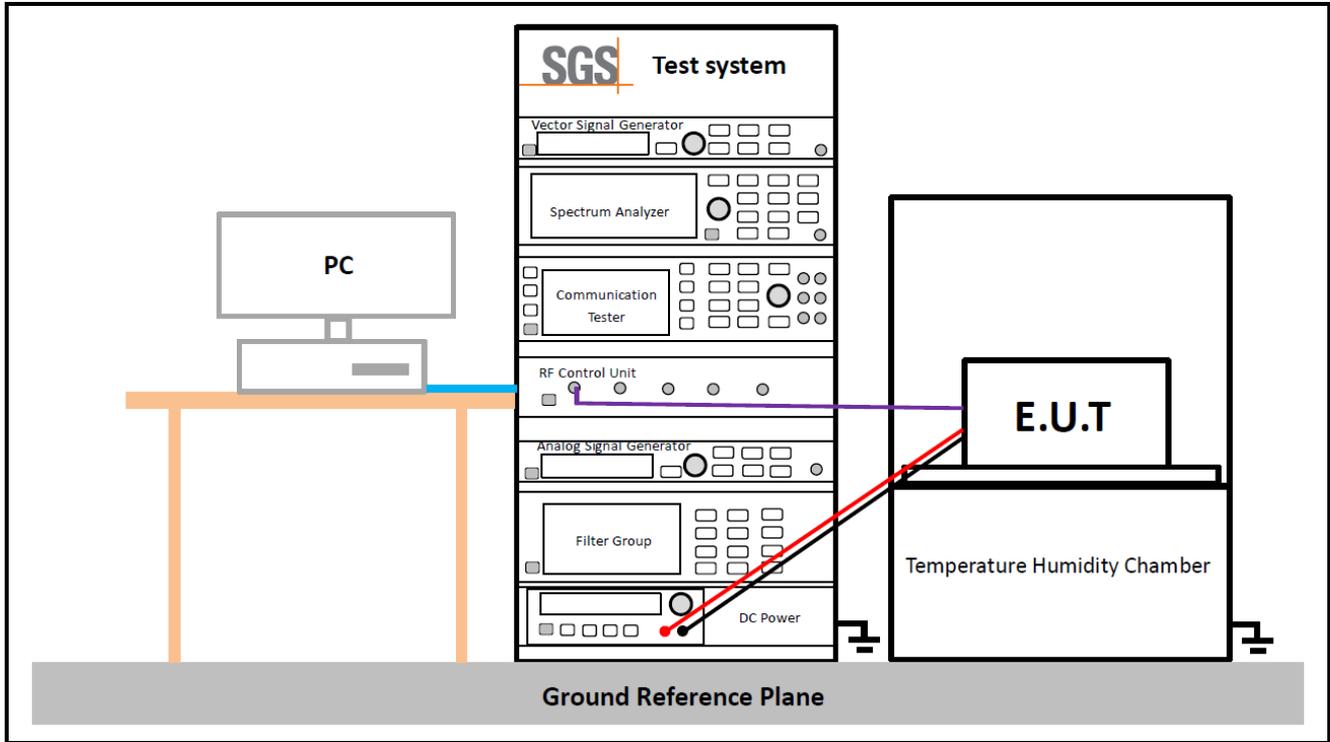


In 3 m Anechoic Chamber, test setup diagram for frequency above 1 GHz:



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4.9.3 Test Setup 3



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4.10 Test Conditions

Test Case		Test Conditions	
Transmit Output Power Data	Average Power, Total	Test Environment	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1;GSM/TM2;UMTS/TM1;UMTS/TM2;LTE/TM1;LTE/TM2;
	Average Power, Spectral Density (if required)	Test Environment	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1;GSM/TM2;UMTS/TM1;UMTS/TM2;LTE/TM1;LTE/TM2;
Peak-to-Average Ratio (if required)	Test Environment	Ambient Climate & Rated Voltage	
	Test Setup	Test Setup 1	
	RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)	
	Test Mode	GSM/TM1;GSM/TM2;UMTS/TM1;UMTS/TM2;LTE/TM1;LTE/TM2;	
Modulation Characteristics	Test Environment	Ambient Climate & Rated Voltage	
	Test Setup	Test Setup 1	
	RF Channels (TX)	M (M= middle channel)	
	Test Mode	GSM/TM1;GSM/TM2;UMTS/TM1;UMTS/TM2;LTE/TM1;LTE/TM2;	
Bandwidth	Occupied Bandwidth	Test Environment	Ambient Climate & Rated Voltage
		Test Setup	Test Setup 1
		RF	L, M, H (L= low channel, M= middle channel, H= high channel)



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	Channels (TX)	Test Mode	GSM/TM1;GSM/TM2;UMTS/TM1;UMTS/TM2;LTE/TM1;LTE/TM2;
		Test Environment	Ambient Climate & Rated Voltage
	Emission Bandwidth (if required)	Test Setup	Test Setup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1;GSM/TM2;UMTS/TM1;UMTS/TM2;LTE/TM1;LTE/TM2;
		Test Environment	Ambient Climate & Rated Voltage
Band Edges Compliance	Test Setup	Test Setup 1	
	RF Channels (TX)	L, H (L= low channel, H= high channel)	
	Test Mode	GSM/TM1;GSM/TM2;UMTS/TM1;UMTS/TM2;LTE/TM1;LTE/TM2;	
	Test Environment	Ambient Climate & Rated Voltage	
Spurious Emission at Antenna Terminals	Test Setup	Test Setup 1	
	RF Channels (TX)	L,M, H (L= low channel, M= middle channel, H= high channel)	
	Test Mode	GSM/TM1;UMTS/TM1; LTE/TM1;	
	Test Environment	Ambient Climate & Rated Voltage	
Field Strength of Spurious Radiation	Test Setup	Test Setup 2	
	Test Mode	GSM/TM1; UMTS/TM1;LTE/TM1; Remark: If applicable, the EUT conf. that has maximum power density (based on the equivalent power level) is selected.	
	RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)	
	Test Environment	Ambient Climate & Rated Voltage	
Frequency Stability	Test Environment	(1) -30 °C to +50 °C with step 10 °C at Rated Voltage; (2) VL, VN and VH of Rated Voltage at Ambient Climate.	



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Rev.: 01

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Test Setup	Test Setup 3
RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
Test Mode	GSM/TM1;GSM/TM2;UMTS/TM1;UMTS/TM2;LTE/TM1;LTE/TM2;



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5 Main Test Instruments

Lab A:

RF conducted					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2019/4/9	2020/4/8
DC Power Supply	Agilent Technologies Inc	66311B	W009-09	2019/7/15	2020/7/15
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019/7/14	2020/7/13
Humidity/ Temperature Indicator	MingGao	TH101B	W006-05	2019/6/27	2020/6/26
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2019/11/21	2020/11/20
				2018/11/28	2019/11/27
Wideband Radio Communication Tester	Anristu	MT8821C	W061-05	2019/6/25	2020/6/24



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Lab B:

Test System					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
PSA Series Spectrum Analyzer	Agilent(Keysight)	E4440A	MY48251036	2021/03/04	1 Year
EXA Signal Analyzer	Keysight	N9010A	MY53281492	2021/03/31	1 Year
RF SELECTOR	TOYO	NS4900	N/A	N/A	N/A
Band SELECTOR	TOYO	NS5800	N/A	N/A	N/A
BiLog Antenna	TESEQ	CBL 6143A	26683	2021/03/18	1 Year
Broadband Amplifier	SONOMA	317	292953	2021/03/03	1 Year
Low noise amplifier	MITEQ	TPA0118-36	0914	2021/02/03	1 Year
Double-Ridged Guide Horn Antenna	ETS-LINDGREN	3115	00102808	2021/03/16	1 Year
Test software	TOYO	EP5/RSE	Ver 1.9.1	N/A	N/A
Test software	Audix	E3	V 6.11111b	N/A	N/A
Active Loop Antenna	R&S	HFH2-Z2	100269	2021/05/08	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	2021/05/28	1 Year
Broadband Horn Antenna	TESEQ	BHA 9118	31754	2021/10/12	1 Year
Low noise amplifier	MITEQ	TPA0118-36	0914	2021/02/03	1 Year
EMI Test Receiver	R&S	ESCI	101024	2021/03/03	1 Year
EMI Test Receiver	R&S	ESCI	101030	2021/05/15	1 Year
Bilog Antenna	TESEQ	CBL6112D	29068	2020/10/12	2 Year
Bilog Antenna	TESEQ	CBL6112D	29069	2020/10/12	2 Year
Amplifier	Sonoma	310N	300913	2021/03/03	1 Year
Amplifier	Sonoma	310N	300914	2021/03/03	1 Year
Ant Mast	Innco	MA4000	N/A	N/A	N/A
Ant Mast	Innco	MA4000	N/A	N/A	N/A
Mast Controller	Innco	CO2000	N/A	N/A	N/A
Mast Controller	Innco	CO2000	N/A	N/A	N/A
RF Selector 4CH	TOYO	NS4904N	Selector1	N/A	N/A
RF Selector 4CH	TOYO	NS4904N	Selector2	N/A	N/A
PSG Analog Signal Generator	Agilent(Keysight)	E8257D	MY49060493	2021/03/08	1 Year
Wideband Radio	Rohde &	CMW500	158800	2021/05/14	1 Year



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Communication Tester	Schwarz				
8960 Series 10 Wireless Communications Test Set	Agilent(Keysight)	E5515C	MY48280272	2021/05/25	1 Year
Radio Communication Test Station	Anritsu	MT8000A	6262302490	2021/03/26	1 Year
Radio Communication Analyzer	Anritsu	MT8821C	6262257930	2021/03/22	1 Year
Coupler-Antenna	European Antenna	PSA-7501R/170	406310-0001	N/A	N/A
tunable notch-filter 820/860Mhz	Wainwright	WRCT 820/860-0.4/40-5SSK	SN8	N/A	N/A
tunable notch-filter 840/920Mhz	Wainwright	WRCT 840/920-0.4/40-5SSK	SN9	N/A	N/A
tunable notch-filter 1700/1800Mhz	Wainwright	WRCD 1700/1800-0.2/40-5SSK	SN41	N/A	N/A
tunable notch-filter 1800/2000Mhz	Wainwright	WRCD 1800/2000-0.2/40-5SSK	SN31	N/A	N/A
band reject filter 1870/1890Mhz	Wainwright	WRCG 1877/1883-1870/1890-40/6EE	SN20	N/A	N/A
band reject filter 1940/1960Mhz	Wainwright	WRCG 1947/1953-1940/1960-40/6SS	SN28	N/A	N/A
band reject filter 2400/2483.5Mhz	Wainwright	WRCTF 2402/2480-2400/2483.5-35/12+9SS	SN42	N/A	N/A
Low pass filter 1.5Ghz	Wainwright	WLK1.5/18G-10SS	SN5	N/A	N/A
High pass filter 1.5G	Wainwright	WHKX1.5/15G-10SS	SN50	N/A	N/A
High pass filter 2.5G	Wainwright	WHKX 2.5/18G-12SS	SN5	N/A	N/A
High pass filter 3G	Kangmaiwei	ZHPF6-M3000-18000-996	03210746	N/A	N/A
High pass filter 6.5G	Kangmaiwei	ZHPF6-M6500-18000-547	03210747	N/A	N/A
High pass filter 1.0G	Kangmaiwei	ZHPF6-C1000-3000-548	11210354	N/A	N/A



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6 Measurement Uncertainty

For a 95% confidence level ($k = 2$), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Lab A:

Test Item	Extended Uncertainty	Data
Transmit Output Power Data	Power [dBm]	$U = \pm 0.37$ dB
Bandwidth	Magnitude [%]	$U = \pm 0.2\%$
Band Edge Compliance	Disturbance Power [dBm]	$U = \pm 2.0$ dB
Spurious Emissions, Conducted	Disturbance Power [dBm]	$U = \pm 2.0$ dB
Frequency Stability	Frequency Accuracy [ppm]	$U = \pm 0.24$ ppm

Lab B:

Item	Measurement Uncertainty
Transmitter maximum output power	$\pm 0,7$ dB
Radiated Emission	± 2.72 dB (30MHz-1GHz) ± 2.74 dB (1 - 6 GHz) ± 2.72 dB (6 GHz - 18 GHz) ± 3.54 dB (18 GHz - 26 GHz) ± 4.30 dB (26 GHz - 40 GHz)



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7 Appendixes

Appendix A.3	WWAN Setup Photos
Appendix B.1	GSM 850 & 1900
Appendix B.2	WCDMA Band II & V
Appendix B.3	LTE Band 2
Appendix B.4	LTE Band 5
Appendix B.5	LTE Band 7

The End



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