

Report No.: SEWM2311000471RG01  
 Rev.: 01  
 Page: 1 of 35



# TEST REPORT

**Application No.:** SEWM2311000471RG  
**Applicant:** Sony Corporation  
**Address of Applicant:** 1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan  
**Manufacturer:** Sony Corporation  
**Address of Manufacturer:** 1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan  
**EUT Description:** GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac, NFC and GNSS  
**Trade Mark:** Sony  
**FCC ID:** PY7-64228M  
**Standards:** 47 CFR Part 2  
 47 CFR Part 22  
 47 CFR Part 24  
 47 CFR Part 27  
**Date of Receipt:** 2023/11/28  
**Date of Test:** 2023/12/15 to 2024/01/31  
**Date of Issue:** 2024/01/31

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

Authorized Signature:


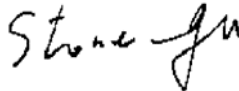
Well Wei  
 Wireless Laboratory Manager



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# 1 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2024/01/31		Original

<b>Prepared By</b>		 <hr/> <b>(Levi Li) / Test Engineer</b>
<b>Checked By</b>		 <hr/> <b>(Stone Gu) / Reviewer</b>



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## 2 Test Summary

### 2.1 GSM850/UMTS Band 5

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §22.913(a)(5)	ERP ≤ 7 W	Section 1 of Appendix B.1&B.4	Pass
Peak-Average Ratio	§22.913(d)	Limit ≤ 13 dB	Section 2 of Appendix B.1&B.4	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.1&B.4	Pass
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 4 of Appendix B.1&B.4	Pass
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 4 of Appendix B.1&B.4	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917(a)	FCC: ≤ -13 dBm/100 kHz.	Section 5 of Appendix B.1&B.4	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §22.355	±2.5ppm.	Section 6 of Appendix B.1&B.4	Pass
Modulation Characteristics	§2.1047	Digital modulation	Remark: Modulation can base on the operation theory of the specific radio technology to meet the modulation requirement directly without testing	



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## 2.2 LTE Band 5

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §22.913(a)(5)	ERP ≤ 7 W	Section 1 of Appendix B.6	Pass
Peak-Average Ratio	§22.913(d)	Limit≤13 dB	Section 2 of Appendix B.6	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.6	Pass
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 4 of Appendix B.6	Pass
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 5 of Appendix B.6	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917(a)	FCC: ≤ -13 dBm/100 kHz.	Section 6 of Appendix B.6	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §22.355	±2.5ppm.	Section 7 of Appendix B.6	Pass
Modulation Characteristics	§2.1047	Digital modulation	Remark: Modulation can base on the operation theory of the specific radio technology to meet the modulation requirement directly without testing	



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### 2.3 GSM 1900

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §24.232(c)	EIRP ≤ 2 W	Section 1 of Appendix B.2	Pass
Peak-Average Ratio	§24.232(d)	Limit ≤ 13 dB	Section 2 of Appendix B.2	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.2	Pass
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 4 of Appendix B.2	Pass
Spurious Emission at Antenna Terminals	§2.1051, §24.238(a)	≤ -13 dBm/1 MHz, from 9 kHz to 10 <sup>th</sup> harmonics but outside authorized operating frequency ranges.	Section 4 of Appendix B.2	Pass
Field Strength of Spurious Radiation	§2.1053, §24.238(a)	≤ -13 dBm/1 MHz.	Section 5 of Appendix B.2	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §24.235	Within authorized bands of operation/frequency block.	Section 6 of Appendix B.2	Pass
Modulation Characteristics	§2.1047	Digital modulation	Remark: Modulation can base on the operation theory of the specific radio technology to meet the modulation requirement directly without testing	



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### 2.4 UMTS Band 4

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(d)(4)	EIRP ≤ 1 W	Section 1 of Appendix B.3	Pass
Peak-Average Ratio	§27.50(d)(5)	Limit ≤ 13 dB	Section 2 of Appendix B.3	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.3	Pass
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 4 of Appendix B.3	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(h)	≤ -13 dBm/1 MHz, from 9 kHz to 10 <sup>th</sup> harmonics but outside authorized operating frequency ranges.	Section 4 of Appendix B.3	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(h)	≤ -13 dBm/1 MHz.	Section 5 of Appendix B.3	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §27.54	Within authorized bands of operation/frequency block.	Section 6 of Appendix B.3	Pass
Modulation Characteristics	§2.1047	Digital modulation	Remark: Modulation can base on the operation theory of the specific radio technology to meet the modulation requirement directly without testing	



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### 2.5 LTE Band 4

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(d)(4)	EIRP ≤ 1 W	Section 1 of Appendix B.5	Pass
Peak-Average Ratio	§27.50(d)(5)	Limit ≤ 13 dB	Section 2 of Appendix B.5	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.5	Pass
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 4 of Appendix B.5	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(h)	≤ -13 dBm/1 MHz, from 9 kHz to 10 <sup>th</sup> harmonics but outside authorized operating frequency ranges.	Section 5 of Appendix B.5	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(h)	≤ -13 dBm/1 MHz.	Section 6 of Appendix B.5	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §27.54	Within authorized bands of operation/frequency block.	Section 7 of Appendix B.5	Pass
Modulation Characteristics	§2.1047	Digital modulation	Remark: Modulation can base on the operation theory of the specific radio technology to meet the modulation requirement directly without testing	



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### 2.6 LTE Band 41

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
Effective (Isotropic) Radiated Power Output Data	§2.1046, §27.50(h)(2)	$EIRP \leq 2W$	Section 1 of Appendix B.7	Pass
Peak-Average Ratio	---	$\leq 13 \text{ dB}$	Section 2 of Appendix B.7	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Section 3 of Appendix B.7	Pass
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 that 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 4 of Appendix B.7	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(m)		Section 5 of Appendix B.7	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(m)		Section 6 of Appendix B.7	Pass
Frequency Stability	§2.1055(a)(1)(b) §2.1055(d)(2) §27.54	Within authorized bands of operation/frequency block.	Section 7 of Appendix B.7	Pass



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Modulation Characteristics	§2.1047	Digital modulation	Remark: Modulation can base on the operation theory of the specific radio technology to meet the modulation requirement directly without testing
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Wireless Laboratory

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### 3 General Information

#### 3.1 Details of Client

Applicant:	Sony Corporation
Address of Applicant:	1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan
Manufacturer:	Sony Corporation
Address of Manufacturer:	1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan

#### 3.2 Test Location

Company:	SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd.
Address:	South of No. 6 Plant, No. 1, Runsheng Road, Suzhou Industrial Park, Suzhou Area, China (Jiangsu) Pilot Free Trade Zone
Post code:	215000
Test engineer:	Levi Li, King-p Li

#### 3.3 Test Facility

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

<ul style="list-style-type: none"> <li> <b>• A2LA (Certificate No. 6336.01)</b>            SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6336.01.         </li> <li> <b>• Innovation, Science and Economic Development Canada</b>            SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized by ISED as an accredited testing laboratory.            CAB identifier: CN0120.            IC#: 27594.         </li> <li> <b>• FCC –Designation Number: CN1312</b>            SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized as an accredited testing laboratory.            Designation Number: CN1312.            Test Firm Registration Number: 717327         </li> </ul>
--



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### 3.4 General Description of EUT

EUT Description:	GSM/WCDMA/LTE Phone with BT, DTS/UNII a/b/g/n/ac, NFC and GNSS		
Trade Mark:	Sony		
Hardware Version:	A		
Software Version:	1.88		
Power Supply:	Battery 3.89V		
SN:	RF Conducted	HQ63B10340	
	RSE	HQ63B104B3	
Antenna Type:	PIFA Antenna		
Antenna Gain:	GSM850:	-1.6dBi (Ant0)	GSM1900: 0.9dBi (Ant1)
	WCDMA Band IV:	1.1dBi (Ant1)	WCDMA Band V: -1.6dBi (Ant0)
	LTE Band 4:	1.1dBi (Ant1)	LTE Band 5: -1.6dBi (Ant0)
	LTE Band 41:	0.4dBi (Ant0)	
	Note: The antenna gain are derived from the gain information report provided by the manufacturer.		
RF Cable:	4dB(Below 1GHz)	4.2dB(1.0~2.4GHz)	4.5dB(2.4~3.4GHz)
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.		



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### 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
LTE/TM3	LTE system, 64QAM modulation

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

### 3.6 Test Environment

Environment Parameter	101.0 kPa Selected Values During Tests	
Relative Humidity	44-46 % RH Ambient	
Value	Temperature(°C)	Voltage(V)
NTNV	22~23	3.89
LTLV	-30	3.4
LTHV	-30	4.48
HTLV	50	3.4
HTHV	50	4.48

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

### 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 IV	1710 to 1755 MHz	2110 to 2155 MHz	
	UMTS Band V	824 to 849 MHz	869 to 894 MHz	
	LTE Band 4	1710 to 1755 MHz	2110 to 2155 MHz	
	LTE Band 5	824 to 849 MHz	869 to 894 MHz	
	LTE Band 41	2496 to 2690MHz	2496 to 2690MHz	
Supported Channel Bandwidth	GSM system:	<input checked="" type="checkbox"/> 0.2 MHz		
	UMTS system:	<input checked="" type="checkbox"/> 5 MHz		
	LTE Band 4	<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		
	LTE Band 41	<input checked="" type="checkbox"/> 5 MHz <input checked="" type="checkbox"/> 10 MHz <input checked="" type="checkbox"/> 15 MHz <input checked="" type="checkbox"/> 20 MHz		
	Note: WCDMA supports HSUPA, HSDPA, 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	247KGXW	251KG7W	
	GSM1900	246KGXW	242KG7W	
	UMTS:	QPSK		
	Band IV	4M18F9W		
	Band V	4M17F9W		
	E-UTRA:	QPSK	16QAM	64QAM
	LTE Band 4	1M10G7D	1M11W7D	1M11W7D
		2M70G7D	2M70W7D	2M70W7D
		4M48G7D	4M49W7D	4M48W7D
		8M95G7D	8M94W7D	8M94W7D
13M5G7D		13M5W7D	13M5W7D	
18M0G7D		18M0W7D	17M9W7D	



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	LTE Band 5	1M11G7D	1M11W7D	1M10W7D
		2M69G7D	2M70W7D	2M70W7D
		4M47G7D	4M48W7D	4M47W7D
		8M91G7D	8M91W7D	8M92W7D
	LTE Band 41	4M49G7D	4M48W7D	4M48W7D
		8M95G7D	8M95W7D	8M95W7D
		13M5G7D	13M5W7D	13M5W7D
		17M9G7D	17M9W7D	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 IV	TX	Channel 1312	Channel 1413	Channel 1513
		1712.4MHz	1732.6 MHz	1752.6 MHz
	RX	Channel 1537	Channel 1638	Channel 1738
		2112.4 MHz	2132.6 MHz	2152.6 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 4	1.4MHz	TX	Channel 19957 1710.7 MHz	Channel 20175 1732.5 MHz	Channel 20393 1754.3 MHz
		RX	Channel 1975 2112.5 MHz	Channel 2175 2132.5MHz	Channel 2375 2152.5 MHz
	3MHz	TX	Channel 19965 1711.5 MHz	Channel 20175 1732.5 MHz	Channel 20385 1753.5 MHz
		RX	Channel 2000 2115 MHz	Channel 2175 2132.5MHz	Channel 2350 2150 MHz
	5MHz	TX	Channel 19975 1712.5 MHz	Channel 20175 1732.5 MHz	Channel 20375 1752.5 MHz
		RX	Channel 1975 2112.5 MHz	Channel 2175 2132.5MHz	Channel 2375 2152.5 MHz
	10MHz	TX	Channel 20000 1715 MHz	Channel 20175 1732.5 MHz	Channel 20350 1750 MHz
		RX	Channel 2000 2115 MHz	Channel 2175 2132.5MHz	Channel 2350 2150 MHz
	15MHz	TX	Channel 20025 1717.5 MHz	Channel 20175 1732.5 MHz	Channel 20325 1747.5 MHz
		RX	Channel 2025 2117.5 MHz	Channel 2175 2132.5MHz	Channel 2325 2147.5 MHz
	20MHz	TX	Channel 20050 1720 MHz	Channel 20175 1732.5 MHz	Channel 20300 1745 MHz
		RX	Channel 2050 2120 MHz	Channel 2175 2132.5MHz	Channel 2300 2145 MHz

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



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Test Mode	Bandwidth	TX / RX	RF Channel		
			Low (L)	Middle (M)	High (H)
LTE Band 41	5MHz	TX / RX	Channel 39675	Channel40620	Channel 41565
			2498.5 MHz	2593 MHz	2687.5 MHz
	10MHz	TX / RX	Channel 39700	Channel40620	Channel 41540
			2501 MHz	2593 MHz	2685 MHz
	15MHz	TX / RX	Channel 39725	Channel40620	Channel 41515
			2503.5 MHz	2593 MHz	2682.5 MHz
	20MHz	TX / RX	Channel 39750	Channel40620	Channel 41490
			2506 MHz	2593 MHz	2680 MHz



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## 4 Description of Tests

### 4.1 Conducted Output Power

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 5.2.1

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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## 4.2 Effective (Isotropic) Radiated Power of Transmitter

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 5.8.4

Calculate power in dBm by the following formula:

ERP (dBm) = Conducted Power (dBm) + antenna gain (dBi)

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 & 4.3

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 ≥ 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 Section 6.0

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 9kHz and stop frequency was set to at least 10\* 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 5.7.2

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

Measurement Procedure: FCC KDB 971168 D01 V03r01 Section 5.8

**Below 1GHz test procedure as below:**

- 1). The EUT was powered ON and placed on a 80cm high table in the chamber. The antenna of the transmitter was extended to its maximum length.
- 2). The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
- 3). Steps 1) and 2) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
- 4). Test the EUT in the lowest channel, the middle channel ,the Highest channel.
- 5). The radiation measurements are performed in X, Y, Z axis positioning. And found the Y axis positioning which it is worse case, Only the test worst case mode is recorded in the report.
- 6). Repeat above procedures until all frequencies measured was complete.

$$E \text{ (dB}\mu\text{V/m)} = \text{Measured amplitude level (dB}\mu\text{V)} + (\text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)} - \text{AMP(dB)})$$

$$\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20 \log D - 104.8; \text{ where D is the measurement distance in meters}$$

**Above 1GHz test procedure as below:**

- 1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber
- 2) Calculate power in dBm by the following formula:  

$$E \text{ (dB}\mu\text{V/m)} = \text{Measured amplitude level (dB}\mu\text{V)} + (\text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)} - \text{AMP(dB)})$$

$$\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20 \log D - 104.8; \text{ where D is the measurement distance in meters}$$
- 3). Test the EUT in the lowest channel, the middle channel the Highest channel
- 4). The radiation measurements are performed in X, Y, Z axis positioning. And found the Y axis positioning which it is worse case, Only the test worst case mode is recorded in the report.
- 5). Repeat above procedures until all frequencies measured was complete

Remark1: Reference test setup 2

Remark2: The emission below 18G were measured at a 3m test distance, while emissions above 18GHz were measured at a 1m test distance. At a measurement distance of 1 meter the limit line was increased by  $20 \cdot \text{LOG}(3/1) = 9.54 \text{ dB}$ .

**Remark: Reference test setup 2**

Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & AMP. The basic equation with a sample calculation is as follows:  

$$\text{AF} = \text{Antenna Factor(dB/m)}$$

$$\text{Factor} = \text{Cable Factor(dB)} - \text{Preamplifier (dB)}$$

$$\text{Level} = \text{Reading Level} + \text{AF} + \text{Factor} - 95.26$$

$$\text{Margin} = \text{Limit} - \text{Level}$$
- 2) Scan from 9kHz to 40GHz, The disturbance between 9KHz to 30MHz and 18GHz to 40GHz was very low, and the harmonics were the highest point could be found when testing, so only the harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 3) All modes have been tested, but only the worst case data displayed in this report.



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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; Section 9

. 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 ±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**

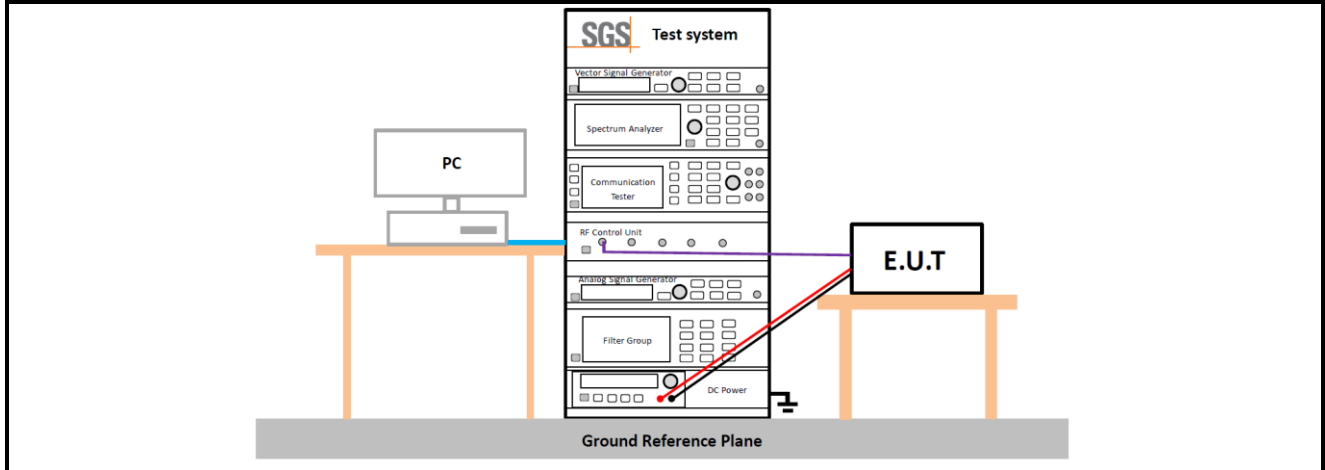


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## 4.9 Test Setups

### 4.9.1 Test Setup 1



### 4.9.2 Test Setup 2

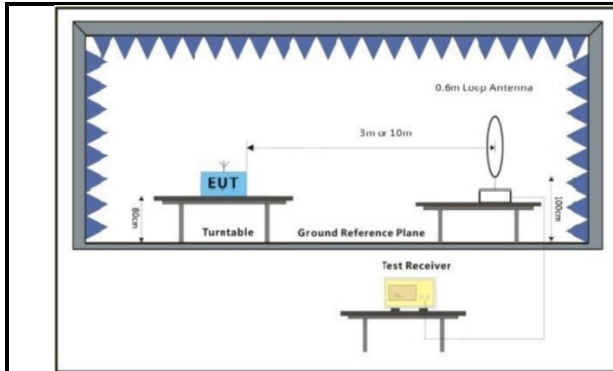


Figure 1. Below 30MHz

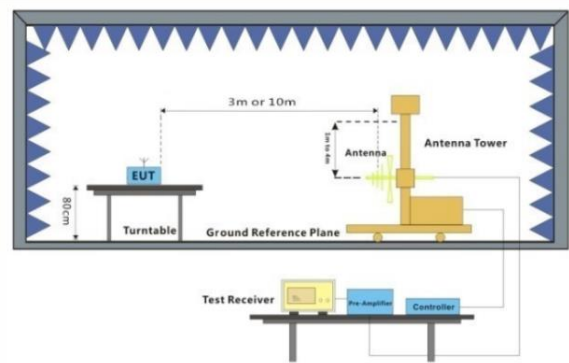


Figure 2. 30MHz to 1GHz

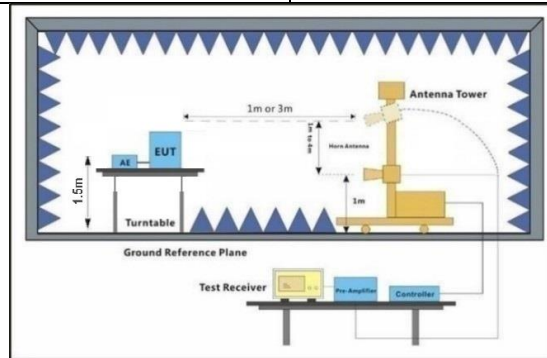


Figure 3. above 1GHz



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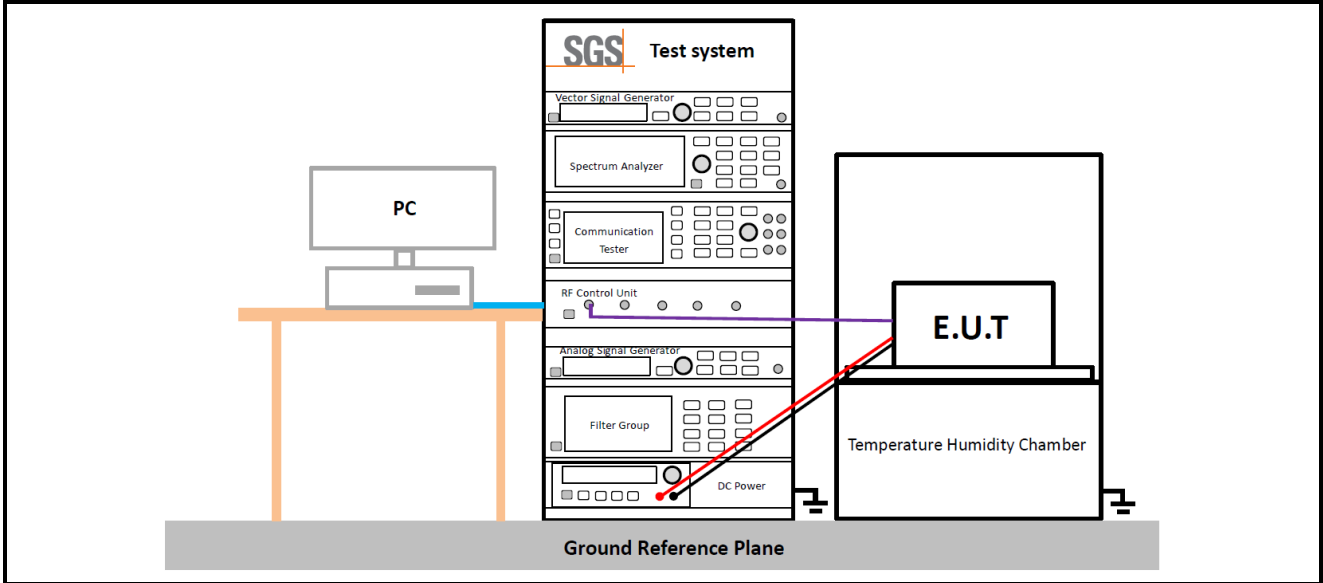
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### 4.9.3 Test Setup 3



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**4.10 Test Conditions**

<b>Transmit Output Power Data - Average Power, Total</b>	
<b>Test Case</b>	<b>Test Conditions</b>
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;LTE/TM1;LTE/TM2;LTE/TM3
<b>Peak-to-Average Ratio</b>	
<b>Test Case</b>	<b>Test Conditions</b>
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;LTE/TM1;LTE/TM2;LTE/TM3
<b>Bandwidth - Occupied Bandwidth</b>	
<b>Test Case</b>	<b>Test Conditions</b>
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;LTE/TM1;LTE/TM2;LTE/TM3
<b>Bandwidth - Emission Bandwidth</b>	
<b>Test Case</b>	<b>Test Conditions</b>
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;LTE/TM1;LTE/TM2;LTE/TM3
<b>Band Edges Compliance</b>	
<b>Test Case</b>	<b>Test Conditions</b>
Test Environment	Ambient Climate & Rated Voltage
Test Setup	Test Setup 1
RF Channels (TX)	L, H (L= low channel, H= high channel)
Test Mode	GSM/TM1;GSM/TM2;UMTS/TM1;LTE/TM1
<b>Spurious Emission at Antenna Terminals</b>	
<b>Test Case</b>	<b>Test Conditions</b>



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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;LTE/TM1
Field Strength of Spurious Radiation	
Test Case	Test Conditions
Test Environment	Ambient Climate & Rated Voltage
Test Setup	Test Setup 2
RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
Test Mode	GSM/TM1;UMTS/TM1;LTE/TM1 Remark: All bandwidth and modulation of GSM/UMTS/LTE have been pre tested, and only the worst results are reflected in the report.
Frequency Stability	
Test Case	Test Conditions
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.
Test Setup	Test Setup 3
RF Channels (TX)	M (M= middle channel)
Test Mode	GSM/TM1;GSM/TM2;UMTS/TM1;LTE/TM1 The report only show the bandwidth with the worst case.



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## 5 Main Test Instruments

RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date (yyyy/mm/dd)	Cal.Due date (yyyy/mm/dd)
Shielding Room	Brilliant-emc	N/A	SUWI-04-01-06	2021/05/08	2024/05/07
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-07	2023/02/06	2024/02/05
Signal Analyzer	ROHDE&SCHWARZ	FSV3030	SUWI-01-02-02	2023/05/11	2024/05/10
Measurement Software	Tonscend	JS1120-3 Test System V 2.6.88.0336	SUWI-02-09-09	NCR	NCR
Measurement Software	TST	TST-271-2.0	SUWI-03-55-01	NCR	NCR
Radio Communication Analyzer	Anritsu	MT8821C	SUWI-01-26-03	2023/11/21	2024/11/20
Wideband Radio Communication Tester	ROHDE&SCHWARZ	CMW500	SUWI-01-16-05	2023/02/06	2024/02/05
DC Power Supply	HYELEC	HY3005B	SUWI-01-18-01	2023/02/06	2024/02/05
Temperature Chamber	ESPEC	SU-242	SUWI-01-13-01	2023/02/06	2024/02/05
Receiving antenna	SCHWRZBECK MESS- ELEKTRONIK	BBHA 9120D	SUWI-01-11-02	2023/05/13	2024/05/12
Wideband Radio Communication Test Ststion	Anritsu	MT8000A	SUWI-01-34-02	2023/09/12	2024/09/11
Signal Analyzer	ROHDE&SCHWARZ	FSW43	SUWI-01-02-04	2023/05/11	2024/05/10

Remark: NCR=No Calibration Requirement.



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RSE Test System					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date (yyyy/mm/dd)	Cal Due Date (yyyy/mm/dd)
Semi-Anechoic Chamber	Brilliant-emc	N/A	SUWI-04-02-01	2021/05/08	2024/05/07
Temperature and humidity meter	MingGao	TH101B	SUWI-01-01-05	2023/02/07	2024/02/06
Signal Analyzer	KEYSIGHT	N9020A	SUWI-01-02-07	2023/11/21	2024/11/20
Test receiver	ROHDE&SCHWARZ	ESR7	SUWI-01-10-01	2023/02/08	2024/02/07
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	VULB 9163	SUWI-01-11-01	2023/05/13	2024/05/12
Receiving antenna	SCHWRZBECK MESS-ELEKTRONIK	BBHA 9120D	SUWI-01-11-02	2023/05/13	2024/05/12
Active Loop Antenna	SCHWRZBECK MESS-ELEKTRONIK	FMZB 1519B	SUWI-01-21-01	2023/05/13	2024/05/12
Amplifier	Tonscend	TAP9K3G40	SUWI-01-14-01	2023/02/06	2024/02/05
Amplifier	Tonscend	TAP01018050	SUWI-01-14-02	2023/02/06	2024/02/05
Wideband Radio Communication Tester	Anritsu	MT8820C	SUWI-01-26-01	2023/09/13	2024/09/12
Wideband Radio Communication Tester	ROHDE&SCHWARZ	CMW500	SUWI-01-16-09	2023/09/16	2024/09/15
Measurement Software	Tonscend	JS32-RE 4.0.0.0	SUWI-02-09-04	NCR	NCR

Remark: NCR=No Calibration Requirement.



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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:

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	$\pm 0.54\text{dB}$
2	RF power density, conducted	$\pm 1.03\text{dB}$
3	Spurious emissions, conducted	$\pm 0.54\text{dB}$
4	Radio Frequency	$\pm 1.0\%$
5	Duty Cycle	$\pm 0.37\%$
6	Occupied Bandwidth	$\pm 1.0\%$
7	Radiated Emission	$\pm 3.13\text{dB}$ (9k -30MHz)
		$\pm 4.8\text{dB}$ (30M -1GHz)
		$\pm 4.8\text{dB}$ (1GHz to 18GHz)

**Remark:**

The  $U_{\text{lab}}$  (lab Uncertainty) is less than  $U_{\text{CISPR/ETSI}}$  (CISPR/ETSI Uncertainty), so the test results  
 – compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;  
 – non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



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## 7 Appendixes

Appendix A.1	WWAN Setup Photos
Appendix B.1	GSM 850
Appendix B.2	GSM 1900
Appendix B.3	WCDMA Band IV
Appendix B.4	WCDMA Band V
Appendix B.5	LTE Band 4
Appendix B.6	LTE Band 5
Appendix B.7	LTE Band 41

---End of Report---



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