ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Applicant:	T-mobile Usa, Inc. 12920 Se 38th Street, Bellevue, Washington, United States, 98006.
Manufacturer:	T-mobile Usa, Inc. 12920 Se 38th Street, Bellevue, Washington, United States, 98006.
Product Name:	SyncUP Kids Watch V2
Brand Name:	T-Mobile
Model No.:	TMUS-SKW-2
Report Number:	TERF2402000329ER
FCC ID	2ASXC-TMO-SKW-02
Date of EUT Received:	March 06, 2024
Date of Test:	March 06, 2024～April 17, 2024
Issue Date:	April 30, 2024

Approved By Jazz Huang

Jazz Huang

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI ANSI C63.26-2015 and the energy emitted by the sample EUT comply with FCC rule part 2 , 24E & 27 C.

The results of this report relate only to the sample identified in this report.

Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TERF2402000329ER	00	Original.	April 24, 2024	Kate Lai	
TERF2402000329ER	01	Revise: Product Name	April 30, 2024	Kate Lai	*

Note:

1、The remark "*" indicates modification of the report upon requests from certification body.

2、Variant information of main and 2nd source is provided by the applicant, test results of this report are applicable to the sample EUT(s) received.
The AC power line conducted Emissions and Spurious Emissions were added to measure the above differences. The rest of the internal circuit board wiring technology and radio frequency functions of the main components are the same. Please refer to the section 1.4 Basic Differences of Source for details.

Contents

1 GENERAL PRODUCT INFORMATION

1.1 Product Description

Product Name:	SyncUP Kids Watch V2
Brand Name:	T-Mobile
Model No.:	TMUS-SKW-2
Hardware Version:	N/A
Firmware Version:	N/A
EUT Series No.:	DA0X5AMBCC0
Power Supply:	3.87Vdc from Rechargeable Li-ion Battery
Test Software (Name/Version)	Connect with call box

1.2 Operation Frequency Range

LTE Band 2			
BW (MHz)	Operation Frequency (MHz)		
1.4	1850.7	-	1909.3
3	1851.5	-	1908.5
5	1852.5	-	1907.5
10	1855.0	-	1905.0
15	1857.5	-	1902.5
20	1860.0	-	1900.0

LTE Band 4			
BW (MHz)	Operation Frequency (MHz)		
1.4	1710.7	-	1754.3
3	1711.5	-	1753.5
5	1712.5	-	1752.5
10	1715.0	-	1750.0
15	1717.5	-	1747.5
20	1720.0	-	1745.0

LTE Band 12			
BW (MHz)	Operation Frequency (MHz)		
1.4	699.7	-	715.3
3	700.5	-	714.5
5	701.5	-	713.5
10	704.0	-	711.0

LTE Band 66			
BW (MHz)	Operation Frequency (MHz)		
1.4	1710.7	-	1779.3
3	1711.5	-	1778.5
5	1712.5	-	1777.5
10	1715.0	-	1775.0
15	1717.5	-	1772.5
20	1720.0	-	1770.0

LTE Band 71			
BW (MHz)	Operation Frequency (MHz)		
5	665.5	-	695.5
10	688.0	-	693.0
15	670.5	-	690.5
20	673.0	-	688.0

1.3 Antenna Designation

Antenna Type	Antenna Part No.	Antenna Model No.
PIFA	DQ623112500	Ant0
Note: Transmission frequencies in this test report are only available by the above antenna(s).		

Modulation	Frequency (MHz)			Peak Antenna Gain (dBi)
				Ant0
LTE-Band 2	1850	~	1910	-3.17
LTE-Band 4	1710	~	1755	-3.17
LTE-Band 12	699	~	716	-9.65
LTE-Band 66	1710	~	1780	-3.17
LTE-Band 71	663	~	698	-9.65

Note: Antenna information is provided by the applicant.

1.4 Basic Differences of Source

	Model No.	Supplier
USB Cable(Data Cable) Main source	KCA-ET-5-0329	KSD CO., LTD
USB Cable(Data Cable) 2nd source	WJE240010B	GREATLAND ELECTRONICS TAIWAN LTD
PCB Main source	QNT0733	AT&S(China)Co., LTD
PCB 2nd source	6590409-G00-0T	COMPEQ MANUFACTURING CO.,LTD.
Memory Main source	FAPEA3216-58C2930	Longsys Electronics Co., Ltd.
Memory 2nd source	32CP16-M4MTC2W-GA68	KINGSTON TECHNOLOGY COMPANY
B71 Duplexer Main source	B39681B1266P810	RF360 Europe GmbH
B71 Duplexer 2nd source	SAYRH634MBA0C0A	MURATA
A+G sensor Main source	LSM6DSOWTR	STMicroelectronics
A+G sensor 2nd source	ICM-42607-P	TDK TAIWAN CORP.TDK XIA-MEN CO.,LTD
Crystal for PMIC Main source	EXS00A-CS12755	Nihon Dempa Kogyo Co., Ltd.
Crystal for PMIC 2nd source	OW38470002	TAIWAN X'TAL CORPATION
Baromete Main source	LPS22DFTR	STMicroelectronics
Barometer 2nd source	ICP-20100	TDK TAIWAN CORP.TDK XIA-MEN CO.,LTD
Display Main source	TA014XVHM52-00	Tianma Micro-Electronics CO., LTD.
Display 2nd source	ONO-0141C40719	Truly Semiconductors Ltd.
Speaker Main source	MS07-015008-002H	Luxshare Precision Limited
Speaker 2nd source	KDSG150808C-08PF	KINGSTATE ELECTRONICS

1.5 Type of Emission & Max ERP/EIRP Power Measurement Result:

LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
2	1.4	1850.7	1909.3	QPSK	19.60	EIRP	0.091	1.0898	1M09G7D
				16QAM	18.60	EIRP	0.072	1.0893	1M09D7W
2	3	1851.5	1908.5	QPSK	19.60	EIRP	0.091	2.6870	2M69G7D
				16QAM	18.58	EIRP	0.072	2.6867	2M69D7W
2	5	1852.5	1907.5	QPSK	19.59	EIRP	0.091	4.4779	4M48G7D
				16QAM	18.61	EIRP	**0.073**	4.4803	4M48D7W
2	10	1855.0	1905.0	QPSK	19.60	EIRP	0.091	8.9784	8M98G7D
				16QAM	18.57	EIRP	0.072	8.9528	8M95D7W
2	15	1857.5	1902.5	QPSK	19.59	EIRP	0.091	13.465	13M5G7D
				16QAM	18.57	EIRP	0.072	13.415	13M4D7W
2	20	1860.0	1900.0	QPSK	19.85	EIRP	**0.097**	17.877	17M9G7D
				16QAM	18.61	EIRP	**0.073**	17.912	17M9D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
4	1.4	1710.7	1754.3	QPSK	19.55	EIRP	0.090	1.0893	1M09G7D
				16QAM	18.56	EIRP	0.072	1.0906	1M09D7W
4	3	1711.5	1753.5	QPSK	19.56	EIRP	0.090	2.6865	2M69G7D
				16QAM	18.57	EIRP	**0.072**	2.6908	2M69D7W
4	5	1712.5	1752.5	QPSK	19.54	EIRP	0.090	4.4786	4M48G7D
				16QAM	18.55	EIRP	0.072	4.4815	4M48D7W
4	10	1715.0	1750.0	QPSK	19.54	EIRP	0.090	8.9819	8M98G7D
				16QAM	18.50	EIRP	0.071	8.9438	8M94D7W
4	15	1717.5	1747.5	QPSK	19.50	EIRP	0.089	13.4310	13M4G7D
				16QAM	18.55	EIRP	0.072	13.4240	13M4D7W
4	20	1720.0	1745.0	QPSK	19.72	EIRP	**0.094**	17.9040	17M9G7D
				16QAM	18.54	EIRP	0.071	17.9320	17M9D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
12	1.4	699.7	715.3	QPSK	11.74	ERP	0.015	1.0898	1M09G7D
				16QAM	10.78	ERP	0.012	1.0899	1M09D7W
12	3	700.5	714.5	QPSK	11.75	ERP	0.015	2.6871	2M69G7D
				16QAM	10.78	ERP	0.012	2.6871	2M69D7W
12	5	701.5	713.5	QPSK	11.79	ERP	0.015	4.4782	4M48G7D
				16QAM	10.67	ERP	0.012	4.4808	4M48D7W
12	10	704.0	711.0	QPSK	11.99	ERP	**0.016**	9.0046	9M00G7D
				16QAM	10.79	ERP	**0.012**	8.9685	8M97D7W

LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
66	1.4	1710.7	1779.3	QPSK	19.77	EIRP	0.095	1.0896	1M09G7D
				16QAM	18.79	EIRP	0.076	1.0907	1M09D7W
66	3	1711.5	1778.5	QPSK	19.77	EIRP	0.095	2.6864	2M69G7D
				16QAM	18.80	EIRP	0.076	2.6905	2M69D7W
66	5	1712.5	1777.5	QPSK	19.80	EIRP	0.095	4.4770	4M48G7D
				16QAM	18.82	EIRP	**0.076**	4.4791	4M48D7W
66	10	1715.0	1775.0	QPSK	19.80	EIRP	0.095	8.9837	8M98G7D
				16QAM	18.79	EIRP	0.076	8.9476	8M95D7W
66	15	1717.5	1772.5	QPSK	19.81	EIRP	0.096	13.4760	13M5G7D
				16QAM	18.78	EIRP	0.076	13.4350	13M4D7W
66	20	1720.0	1770.0	QPSK	20.05	EIRP	**0.101**	17.9460	17M9G7D
				16QAM	18.79	EIRP	0.076	17.9320	17M9D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
71	5	665.5	695.5	QPSK	11.86	ERP	0.015	4.4818	4M48G7D
				16QAM	10.87	ERP	0.012	4.4793	4M48D7W
71	10	688.0	693.0	QPSK	11.84	ERP	0.015	8.9815	8M98G7D
				16QAM	10.85	ERP	0.012	8.9669	8M97D7W
71	15	670.5	690.5	QPSK	11.85	ERP	0.015	13.4450	13M4G7D
				16QAM	10.86	ERP	0.012	13.4340	13M4D7W
71	20	673.0	688.0	QPSK	12.05	ERP	**0.016**	17.8810	17M9G7D
				16QAM	10.88	ERP	**0.012**	17.9080	17M9D7W

1.6 Test Methodology of Applied Standards

FCC 47 CFR Part 2, 24E, 27C.
ANSI C63.26-2015
KDB971168 D01 Power Meas license Digital System v03r01
KDB412172 D01 Determining ERP and EIRP v01r01

1.7 Test Facility

Laboratory	Test Site Address	Test Site Name	FCC Designation number	IC CAB identifier
SGS Taiwan Ltd. Central RF Lab. (TAF code 3702)	No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan.	SAC 1	TW0027	TW3702
		SAC 2		
		SAC 3		
		Conduction 1		
		Conducted 1		
		Conducted 2		
		Conducted 3		
		Conducted 4		
		Conducted 5		
		Conducted 6		
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	Conduction C	TW0028	
		SAC C		
		SAC D		
		SAC G		
		Conducted A		
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		

Note: Test site name is remarked on the equipment list in each section of this report as an indication where measurements occurred in specific test site and address.

1.8 Special Accessories

No special accessories were used during testing.

1.9 Equipment Modifications

There was no modifications incorporated into the EUT.

1.10 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*6m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.
There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT (Transmitter) was operated in the continuous transmission mode employed with the simulator of the Base Station that fixates at test default channels to fix the Tx frequency which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Measurement at Antenna Port

The EUT is placed on a table which is 0.8 m above ground plane. A low loss of RF cable was used to connect the antenna port of EUT to measurement equipment.

2.3.2 Radiated Emissions (ERP/EIRP)

The EUT is placed on a turn table, for emission measurements below 1 GHz is 0.8 m above ground plane, for emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both Horizontal and Vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

For all conducted test items:
The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.
Note:
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

2.5 Final Amplifier Voltage and Current Information:

LTE Band 2

Test mode	DC voltage (V)	DC current (mA)
LTE Band 2_20M QPSK	3.87	710

LTE Band 66

Test mode	DC voltage (V)	DC current (mA)
LTE Band 66_20M QPSK	3.87	650

LTE Band 4

Test mode	DC voltage (V)	DC current (mA)
LTE Band 4_20M QPSK	3.87	780

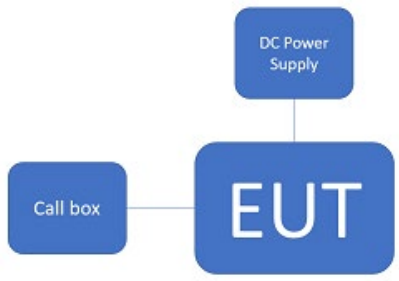
LTE Band 71

Test mode	DC voltage (V)	DC current (mA)
LTE Band 71_20M QPSK	3.87	680

LTE Band 12

Test mode	DC voltage (V)	DC current (mA)
LTE Band 12_10M QPSK	3.87	660

2.6 Test Configuration

Conducted Setup	Radiated Setup
	

Note: Radio Communication Analyzer is placed in remote side for radiated test.

2.7 Control Unit(s)

N/A

3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§2.1046(a)	RF Power Output	Compliant
§24.232(c) §27.50(c)(10) §27.50(d)(4) §27.50(c)(9)	ERP/ EIRP measurement	Compliant
§2.1049(h)	99% & 26dB Occupied Bandwidth	Compliant
§2.1051 §24.238(a)(b) §27.53(h) §27.53(h)(1)&(3) §27.53(g)	Out of Band Emissions at Antenna Terminals and Band Edge / Emission mask requirements	Compliant
§2.1053 §24.238(a)(b) §27.53(g) §27.53(h) §27.53(h)(1)&(3)	Field Strength of Spurious Radiation	Compliant
§24.232(d) §27.50(d)(5) §27.50(a)(1)(B)	Peak to Average Ratio	Compliant
§2.1055(a)(1) §24.235 §27.54	Frequency Stability	Compliant

4 DESCRIPTION OF TEST MODES

4.1 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Pre-Scan has been conducted to determine the worst-case scenario from all possible combinations among available modulations, data rates and antenna ports, the worst case configurations listed below for the final test.
3. The field strength of radiated emission was measured as the EUT positioned in different orthogonal planes (E1/E2/H) based on actual usage of the EUT to pre-scan the emissions for determining the worst case scenario.

E-UTRA Band	Test Channel	Channel Band-width (MHz)	Modulation	Resource Block Allocation	
				RBs allocated	RB Offset
2	18700	20	QPSK	1	0
2	18900	20	QPSK	1	0
2	19100	20	QPSK	1	0
4	20050	20	QPSK	1	0
4	20175	20	QPSK	1	0
4	20300	20	QPSK	1	0
12	23060	10	QPSK	1	0
12	23095	10	QPSK	1	0
12	23130	10	QPSK	1	0
66	132072	20	QPSK	1	0
66	132322	20	QPSK	1	0
66	132572	20	QPSK	1	0
71	133222	20	QPSK	1	0
71	133297	20	QPSK	1	0
71	133372	20	QPSK	1	0

2nd Source

E-UTRA Band	Test Channel	Channel Band-width (MHz)	Modulation	Resource Block Allocation	
				RBs allocated	RB Offset
2	18700	20	QPSK	1	0
4	20050	20	QPSK	1	0
12	23095	10	QPSK	1	0
66	132322	20	QPSK	1	0
71	133297	20	QPSK	1	0

4.2 Measurement Configuration

Test Items				Max. Output Power										
Band	Test Channel			Bandwidth (MHz)						Modulation		RB #		
	L	M	H	1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full
2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
12	v	v	v	v	v	v	v	-	-	v	v	v	v	v
66	v	v	v	v	v	v	v	v	v	v	v	v	v	v
71	v	v	v	-	-	v	v	v	v	v	v	v	v	v
Test Items				Freqency Stability										
2	-	v	-	-	-	-	v	-	-	v	-	-	-	v
4	-	v	-	-	-	-	v	-	-	v	-	-	-	v
12	-	v	-	-	-	-	v	-	-	v	-	-	-	v
66	-	v	-	-	-	-	v	-	-	v	-	-	-	v
71	-	v	-	-	-	-	v	-	-	v	-	-	-	v
Test Items				26dB and 99% Bandwidth										
Band	Test Channel			Bandwidth (MHz)						Modulation		RB #		
	L	M	H	1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full
2	v	v	v	v	v	v	v	v	v	v	v	-	-	v
4	v	v	v	v	v	v	v	v	v	v	v	-	-	v
12	v	v	v	v	v	v	v	-	-	v	v	-	-	v
66	v	v	v	v	v	v	v	v	v	v	v	-	-	v
71	v	v	v	-	-	v	v	v	v	v	v	-	-	v
Test Items				Peak-to-Av erage Ratio										
2	v	v	v	v	v	v	v	v	v	-	v	-	-	v
4	v	v	v	v	v	v	v	v	v	-	v	-	-	v
12	v	v	v	v	v	v	v	-	-	-	v	-	-	v
66	v	v	v	v	v	v	v	v	v	-	v	-	-	v
71	v	v	v	-	-	v	v	v	v	-	v	-	-	v
Test Items				Band Edge										
Band	Test Channel			Bandwidth (MHz)						Modulation		RB #		
	L	M	H	1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full
2	v	-	v	v	v	v	v	v	v	v	-	v	v	v
4	v	-	v	v	v	v	v	v	v	v	-	v	v	v
12	v	-	v	v	v	v	v	-	-	v	-	v	v	v
66	v	-	v	v	v	v	v	v	v	v	-	v	v	v
71	v	-	v	-	-	v	v	v	v	v	-	v	v	v
Test Items				Conducted Emission										
2	v	v	v	-	-	-	-	-	v	v	-	v	-	-
4	v	v	v	-	-	-	-	-	v	v	-	v	-	-
12	v	v	v	-	-	-	v	-	-	v	-	v	-	-
66	v	v	v	-	-	-	-	-	v	v	-	v	-	-
71	v	v	v	-	-	-	-	-	v	v	-	v	-	-
Test Items				Radiated Emission										
Band	Test Channel			Bandwidth (MHz)						Modulation		RB #		
	L	M	H	1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full
2	v	v	v	-	-	-	-	-	v	v	-	v	-	-
4	v	v	v	-	-	-	-	-	v	v	-	v	-	-
12	v	v	v	-	-	-	v	-	-	v	-	v	-	-
66	v	v	v	-	-	-	-	-	v	v	-	v	-	-
71	v	v	v	-	-	-	-	-	v	v	-	v	-	-

5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty		
Power Density	+/-	0.61	dB
RF Power Output	+/-	0.97	dB
ERP/ EIRP measurement	+/-	2.15	dB
	+/-	2.15	dB
Emission Bandwidth	+/-	1.38	Hz
Out of Band Emissions at Antenna Terminals and Band Edge	+/-	0.77	dB
Peak to Average Ratio	+/-	0.97	dB
Frequency Stability vs. Temperature	+/-	1.48	Hz
Frequency Stability vs. Voltage	+/-	1.48	Hz
Temperature	+/-	0.6	°C
Humidity	+/-	3	%
DC / AC Power Source	+/-	1	%

Radiated Spurious Emission Measurement Uncertainty				
Polarization: Vertical	**+/-**	**1.89**	**dB**	9kHz~30MHz
	+/-	**4.15**	**dB**	30MHz - 1000MHz
	+/-	**3.43**	**dB**	1GHz - 18GHz
	+/-	**3.86**	**dB**	18GHz - 40GHz
Polarization: Horizontal	**+/-**	**1.89**	**dB**	9kHz~30MHz
	+/-	**4.02**	**dB**	30MHz - 1000MHz
	+/-	**3.43**	**dB**	1GHz - 18GHz
	+/-	**3.86**	**dB**	18GHz - 40GHz
Radiated Spurious Emission	**+/-**	**2**	**dB**	33GHz-50GHz
	+/-	**1.59**	**dB**	50GHz-60GHz
	+/-	**1.7**	**dB**	60GHz-90GHz
	+/-	**1.64**	**dB**	90GHz-140GHz
	+/-	**3.83**	**dB**	140GHz-220GHz

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

6 MEASUREMENT EQUIPMENT USED

6.1 Conducted Measurement

Conducted Emission Test Site: Conducted 4					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	05/03/2023	05/02/2024
Radio Communication Analyer	Anritsu	MT8821C	6262044670	08/23/2023	08/22/2024
Test Software	SGS	Radio Test Software	Ver. 21	N.C.R	N.C.R
Temperature Chamber	Giant Force	GTH-150-40-CP-AR	MAA0512-018	05/24/2023	05/23/2024
DC Power Supply	Gwinstek	SPS-3610	GEV856733	12/04/2023	12/03/2024
Attenuator	Mini-Circuits	BW-S10W2+	12	12/12/2023	12/11/2024
DC Block	Mini-Circuits	BLK-18-S+	8	12/12/2023	12/11/2024
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPF412-017	12/12/2023	12/11/2024

6.2 Radiated Measurement

Radiated Emission Test Site: SAC 1					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWARZBECK	VULB9168	1208	07/21/2023	07/20/2024
Horn Antenna	SCHWARZBECK	BBHA9120D	603	05/11/2023	05/10/2024
Horn Antenna	SCHWARZBECK	BBHA9170	184	12/28/2023	12/27/2024
Horn Antenna	RF SPIN	DRH0844	LE2D05A0844	07/03/2023	07/02/2024
Horn Antenna	SCHWARZBECK	BBHA9120D	D803	01/12/2024	01/11/2025
Bi-log Antenna	TESEO	CBL 6112D	35242 & AT-N0555	12/18/2023	12/17/2024
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY60242081	10/17/2023	10/16/2024
Network Analyzer	Anritsu	MS4644A	1216312	12/07/2023	12/06/2024
Radio Communication Analyer	Anritsu	MT8821C	6261786084	01/16/2024	01/15/2025
Test Software	Audix	e3	Ver. 9.210616	N.C.R	N.C.R
Site Cal	SGS	SAC 1	N/A	08/31/2023	08/30/2024
Pre-Amplifier	EMCI	EMC184045B	980135	08/31/2023	08/30/2024
Pre-Amplifier	HP	8447D	2944A09469	08/31/2023	08/30/2024
Pre-Amplifier	EMCI	EMC118A45SEE	980933	07/31/2023	07/30/2024
3.1G High Pass Filter	Woken	WFIL-H3100-18000F-01	WRGBAFWC2B6	12/12/2023	12/11/2024
1G High Pass Filter	Micro-Tronics	HPM50108	32	12/12/2023	12/11/2024
Band Reject Filter 635-920	WI	WRCGV695/920-635/980-40/12SS	1	12/12/2023	12/11/2024
Band Reject Filter 1700-2000	EWT	EWT-54-0038	M1	12/12/2023	12/11/2024
Coaxial Cables	Huber Suhner	SUCOFLEX 102	RX Cable 18G-40G MY2630/2+805062/2	08/31/2023	08/30/2024
Coaxial Cables	Huber Suhner	SUCOFLEX 102+SUCOFLEX 106	TX Cable 30M-40G 23051/2+76096/6+22962/2	08/31/2023	08/30/2024
Coaxial Cable	EMCI	EMC104-SM-SM-8000+EMC106-SM-SM-7600	RX Cable 9K-18G(160125+150817)	09/12/2023	09/11/2024

2nd Source

Radiated Emission Test Site: SAC 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Horn Antenna	SCHWARZBECK	BBHA9120D	603	05/11/2023	05/10/2024
Horn Antenna	SCHWARZBECK	BBHA9170	184	12/28/2023	12/27/2024
Horn Antenna	RF SPIN	DRH0844	LE2D05A0844	07/03/2023	07/02/2024
Horn Antenna	SCHWARZBECK	BBHA9120D	1441	09/23/2023	09/22/2024
EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY63440386	02/06/2024	02/05/2025
Network Analyzer	Anritsu	MS4644A	1216312	12/07/2023	12/06/2024
Radio Communication Analyer	Anritsu	MT8821C	6262044751	10/31/2023	10/30/2024
Test Software	Audix	e3	Ver. 9.210616	N.C.R	N.C.R
Site Cal	SGS	SAC 3	N/A	08/31/2023	08/30/2024
Pre-Amplifier	EMCI	EMC184045B	980135	08/31/2023	08/30/2024
Pre-Amplifier	EMCI	EMC118A45SEE	980868	08/31/2023	08/30/2024
1.3G High Pass Filter	Woken	WHKX10-1066	19	12/12/2023	12/11/2024
3G High Pass Filter	Titan	T04H300018000 70S01	23040703-34	12/12/2023	12/11/2024
Band Reject Filter 635-920	WI	WRCGV695/920-635/980-40/12SS	1	12/12/2023	12/11/2024
Band Reject Filter 1700-2000	EWT	EWT-54-0038	M1	12/12/2023	12/11/2024
Coaxial Cables	Huber Suhner	SUCOFLEX 102	RX Cable 18G-40G MY2630/2+805062/2	08/31/2023	08/30/2024
Coaxial Cables	Huber Suhner	SUCOFLEX 102+SUCOFLEX 106	TX Cable 30M-40G 23051/2+76096/6+22962/2	08/31/2023	08/30/2024
Coaxial Cables	EMCI+Huber Suhner	EMC107-SM-SM-1000+EMC107-SM-SM-1500+EMC107-SM-SM-8000+SUCOFLEX 104PEA	RX Cable 9K-18G (221110+221106+221212+MY4251/4PEA)	08/31/2023	08/30/2024

NOTE: *N.C.R refers to Not Calibrated Required.*

7 STANDARD APPLICABLE

7.1 Maximum Output Power

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals.

7.1.1 ERP/EIRP LIMIT

According to FCC §2.1046

FCC 24.232(c)

Mobile and portable stations are limited to 2 W EIRP.

FCC 27.50(c)

(10) Portable stations (hand-held devices) are limited to 3 watts ERP.

FCC 27.50(d)

(4) Mobile, and portable (hand-held) stations operating in the 1710-1755 MHz, 1695-1710 MHz and 1755-1780 MHz bands are limited to 1W EIRP.

7.2 Occupied Bandwidth Measurement

The occupied bandwidth 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.

7.3 Out Of Band Emission At Antenna Terminals

FCC §24.238(a), §27.53(h)

Out of band emissions.The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

FCC §27.53(g)

Compliance for operations in the 600 MHz, 698-746 MHz, 746-758 MHz and the 776-788 MHz band with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

FCC §27.53(h)(1)

(h) *AWS emission limits*—(1) *General protection levels.* Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.

7.4 Field Strength Of Spurious Radiation Measurement

According to FCC §2.1053,

FCC §24.238(a), §27.53(h)

Out of band emissions.The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

FCC §27.53(g)

Compliance for operations in the 600 MHz, 698-746 MHz, 746-758 MHz and the 776-788 MHz band with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

FCC §27.53(h)(1)

(h) *AWS emission limits*—(1) *General protection levels.* Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.

7.5 Frequency Stability Measurement

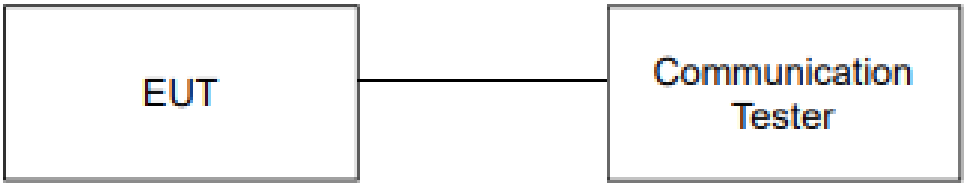
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

7.6 Peak to Average Ratio

The peak-to-average ratio (PAR) of the transmission may not exceed 13dB.

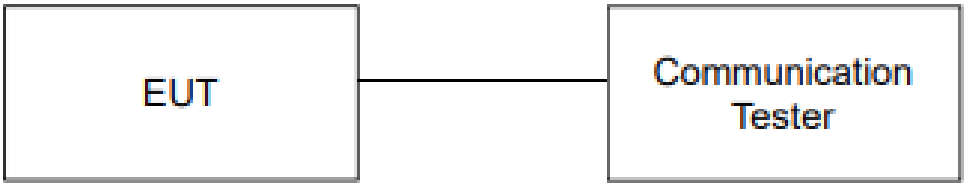
8 TEST SETUP

8.1 Maximum Output Power



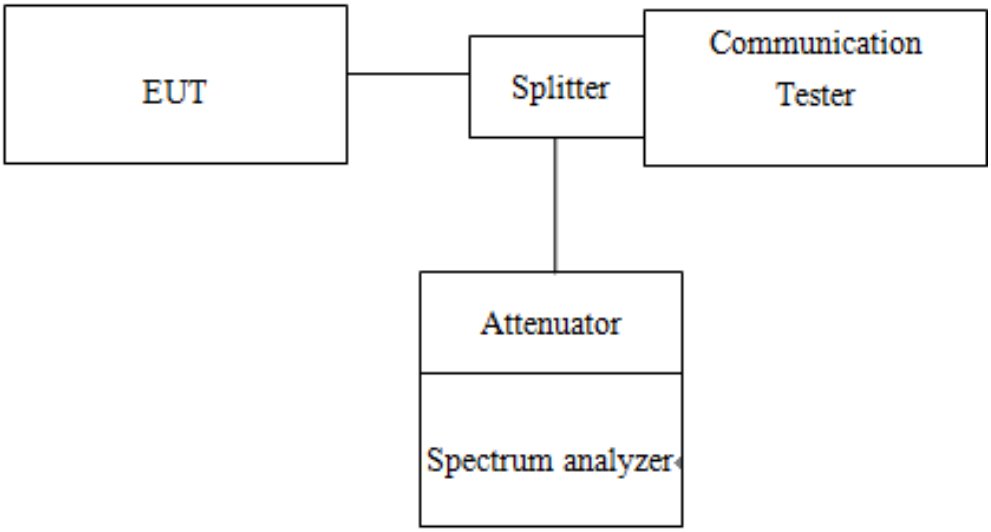
Note: *Measurement setup for testing on Antenna connector*

8.2 Occupied Bandwidth Measurement



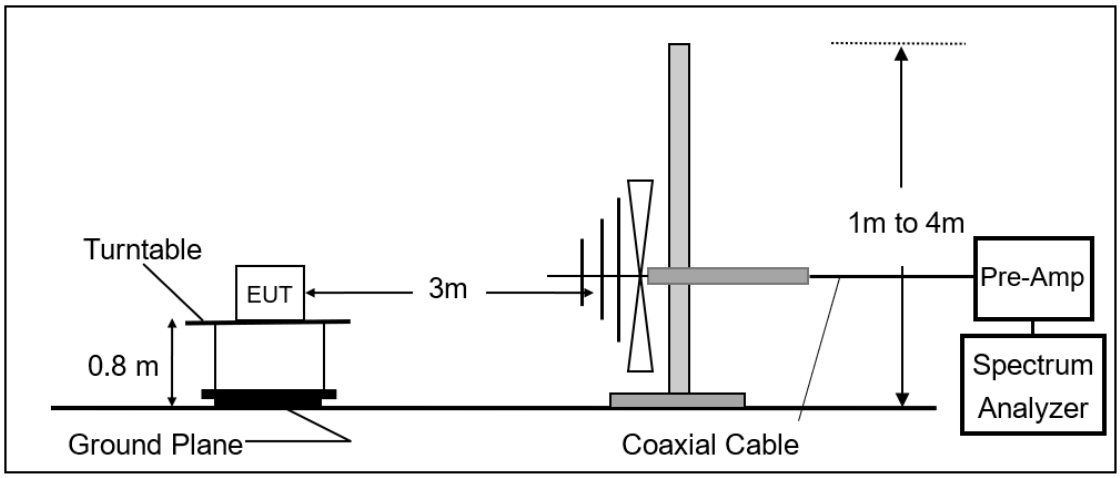
Note: *Measurement setup for testing on Antenna connector*

8.3 Out of Band Emission At Antenna Terminals

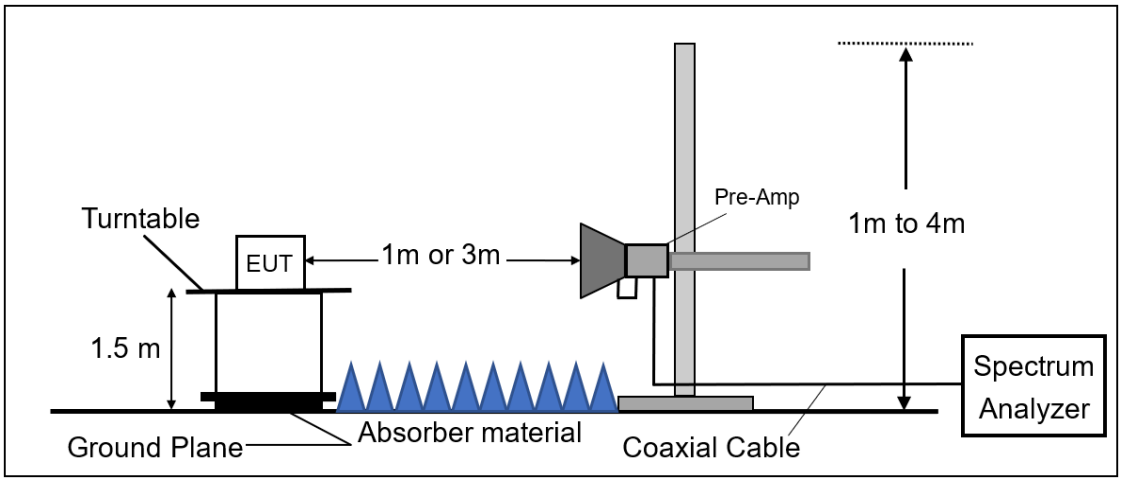


8.4 Field Strength of Spurious Radiation Measurement

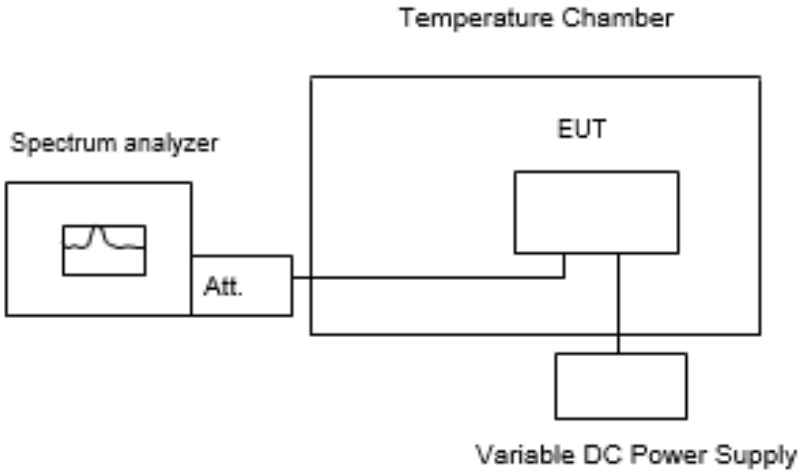
Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.



Radiated Emission Test Set-Up, Frequency Above 1GHz.

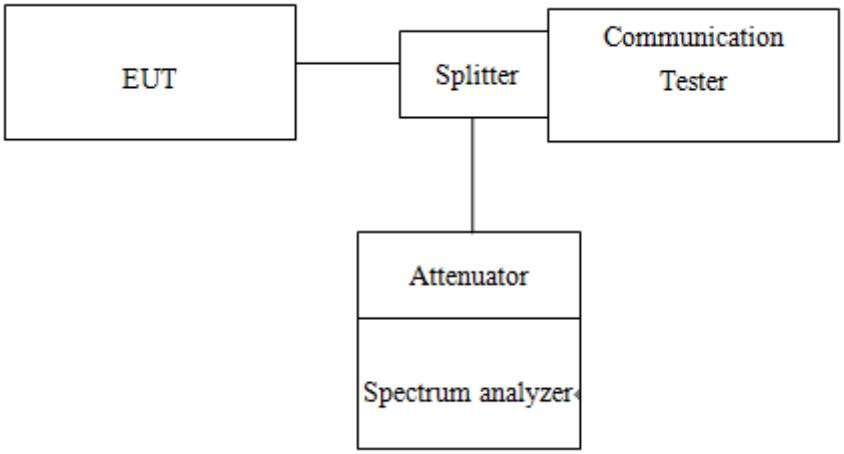


8.5 Frequency Stability Measurement



Note: *Measurement setup for testing on Antenna connector*

8.6 Peak To Average Ratio



9 TEST PROCEDURE

9.1 Maximum Output Power

9.1.1 Output Power Measurement Applicable Guideance

The transmitter output was connected to a communication tester. Transmitter output was read off the communication tester in dBm. The power output at the transmitter antenna port was determined by the communication tester reading.
KDB 971168 D01 Power Meas License Digital System as the supplemental test methodology to adjust the proper setting obtaining the measurement results.
All LTE bands conducted average power is obtained from the simulator telecommunication test set.

9.1.2 Determining ERP and/or EIRP from conducted RF output power measurements

According to KDB 412172 D01 Power Approach,

$EIRP = P_T + G_T - L_C$,

$ERP = EIRP - 2.15$,

Where:

ERP or EIRP	= effective radiated power or equivalent isotropically radiated power (expressed in the same units as PT, typically dBW, dBm, or power spectral density (PSD)2), relative to either a dipole antenna (ERP) or an isotropic antenna (EIRP);
P_T	= transmitter output power, expressed in dBW, dBm, or PSD;
G_T	= gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
L_C	= signal attenuation in the connecting cable between the transmitter and antenna, in dB.

9.2 Occupied Bandwidth Measurement

99% &26dB Bandwidth with detector peak

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW= 3 times RBW, -26dBc display line was placed on the screen (or 26dB bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace. Then set RBW to 99% bandwidth, RBW= 1%, VBW= 3 * RBW, with span > 2 * Signal BW, set % Power = 99%.

9.3 Out of Band Emission at Antenna Terminals

9.3.1 Conducted Emission

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 1MHz & VBW = 1MHz on Spectrum.
3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

9.3.2 Band Edge

1. To connect Antenna Port of EUT to Spectrum.
2. The band edge of low and high channels for the highest RF powers was measured. Setting RBW ≥ 1% EBW.
3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

9.4 Field Strength of Spurious Radiation Measurement

The EUT was placed on a non-conductive; the measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

ERP (dBm) = SG Level(dBm) + Antenna Gain(dBd) + Cable Loss(dB)

EIRP (dBm) = SG Level(dBm) + Antenna Gain(dBi) + Cable Loss(dB)

9.5 Frequency Stability Measurement

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to –30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.
Set chamber temperature to 25℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint as declared by the manufacturer, record the maximum frequency change.

9.6 Peak to Average Ratio

1. KDB 971168 D01 is employed as the following procedure is proper adjusted accordingly:
2. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth; & internal =1ms
3. Set the number of counts to a value that stabilizes the measured CCDF curve.

10 MEASUREMENT RESULTS

Please refer to the Annex A-Measurement Results.

~ End of Report ~