ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

FCC Applicant:	Askey computer corp. 10F, No. 119, JIANKANG RD. ZHONGHE DIST.NEW TAIPEI CITY Taiwan 23585
FCC Manufacturer:	Askey computer corp. 10F, No. 119, JIANKANG RD. ZHONGHE DIST.NEW TAIPEI CITY Taiwan 23585
Product Name:	Connected DashCAM
Brand Name:	ASKEY
Model No.:	CDR9030
Model Difference:	N/A
Report Number:	TERF2402000305E2
FCC ID	H8NCDR9030
Date of EUT Received:	January 31, 2024
Date of Test:	February 02, 2024～March 11, 2024
Issue Date:	June 13, 2024

Approved By Aken Huang
Aken 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 , 22H & 24E & 27 C & 90S.

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

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.
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Revision History

Report Number	Revision	Description	Issue Date	Revised By	Remark
TERF2402000305E2	00	Original.	June 6, 2024	Kate Lai	
TERF2402000305E2	01	Update applicant's address	June 13, 2024	Kate Lai	*

Note:

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

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1 GENERAL PRODUCT INFORMATION

1.1 Product Description

Product Name:	Connected DashCAM
Brand Name:	ASKEY
Model No.:	CDR9030
Model Difference:	N/A
Hardware Version:	DV rev5
Firmware Version:	sdm660_64-userdebug 9 1.0.0.240430240430.0407 test-keys
EUT Series No.:	E1D1V000015 (Conducted) E1D1V000035 (Radiated)
Power Supply:	12Vdc from car charger; 3.7Vdc from rechargeable Lithium-ion battery
Test Software (Name/Version)	Connect with call box

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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 5			
BW (MHz)	Operation Frequency (MHz)		
1.4	824.7	-	848.3
3	825.5	-	847.5
5	826.5	-	846.5
10	829.0	-	844.0

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 13			
BW (MHz)	Operation Frequency (MHz)		
5	779.5	-	784.5
10	782.0		

LTE Band 17			
BW (MHz)	Operation Frequency (MHz)		
5	706.5	-	713.5
10	709.0	-	711.0

LTE Band 26 Part 90			
BW (MHz)	Operation Frequency (MHz)		
1.4	814.7	-	823.3
3	815.5	-	822.5
5	816.5	-	821.5
10	819.0		

LTE Band 26			
BW (MHz)	Operation Frequency (MHz)		
1.4	824.7	-	848.3
3	825.5	-	847.5
5	826.5	-	846.5
10	829.0	-	844.0
15	831.5	-	841.5

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1.3 Antenna Designation

Antenna Type	Part No.	Antenna Model No.
Embedded	CDR9030	Ant0
Note: Transmission frequencies in this test report are only available by the above antenna(s).		

Type	Modulation	Frequency (MHz)			Peak Antenna Gain (dBi)
					Ant0
Embedded	LTE-Band 2	1850	~	1910	0.99
	LTE-Band 4	1710	~	1755	1.14
	LTE-Band 5	824	~	849	-0.63
	LTE-Band 12	699	~	716	-2.4
	LTE-Band 13	777	~	787	-0.99
	LTE-Band 17	704	~	716	-2.4
	LTE-Band 26	824	~	849	-0.04
	LTE-Band 26 Part 90	814	~	824	-0.63

Note: Antenna information is provided by the applicant.

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1.4 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	23.98	EIRP	0.250	1.0874	1M09G7D
				16QAM	23.33	EIRP	0.215	1.0861	1M09D7W
				64QAM	23.16	EIRP	0.207	1.0855	1M09D7W
2	3	1851.5	1908.5	QPSK	23.95	EIRP	0.248	2.6849	2M68G7D
				16QAM	23.28	EIRP	0.213	2.6887	2M69D7W
				64QAM	23.20	EIRP	0.209	2.6926	2M69D7W
2	5	1852.5	1907.5	QPSK	23.94	EIRP	0.248	4.4846	4M48G7D
				16QAM	23.45	EIRP	0.221	4.4850	4M49D7W
				64QAM	23.21	EIRP	0.209	4.4871	4M49D7W
2	10	1855.0	1905.0	QPSK	23.99	EIRP	0.251	8.9754	8M98G7D
				16QAM	23.47	EIRP	**0.222**	8.9452	8M95D7W
				64QAM	23.22	EIRP	0.210	8.9753	8M98D7W
2	15	1857.5	1902.5	QPSK	23.89	EIRP	0.245	13.460	13M5G7D
				16QAM	23.28	EIRP	0.213	13.444	13M4D7W
				64QAM	23.28	EIRP	**0.213**	13.440	13M4D7W
2	20	1860.0	1900.0	QPSK	24.02	EIRP	**0.252**	17.902	17M9G7D
				16QAM	23.36	EIRP	0.217	17.912	17M9D7W
				64QAM	23.17	EIRP	0.207	17.929	17M9D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
4	1.4	1710.7	1754.3	QPSK	24.33	EIRP	0.271	1.0870	1M09G7D
				16QAM	23.66	EIRP	0.232	1.0866	1M09D7W
				64QAM	23.51	EIRP	0.224	1.0839	1M08D7W
4	3	1711.5	1753.5	QPSK	24.27	EIRP	0.267	2.6853	2M69G7D
				16QAM	23.73	EIRP	0.236	2.6865	2M69D7W
				64QAM	23.40	EIRP	0.219	2.6915	2M69D7W
4	5	1712.5	1752.5	QPSK	24.29	EIRP	0.269	4.4829	4M48G7D
				16QAM	23.62	EIRP	0.230	4.4840	4M48D7W
				64QAM	23.49	EIRP	0.223	4.4835	4M48D7W
4	10	1715.0	1750.0	QPSK	24.25	EIRP	0.266	8.9855	8M99G7D
				16QAM	23.79	EIRP	**0.239**	8.9519	8M95D7W
				64QAM	23.65	EIRP	**0.232**	8.9701	8M97D7W
4	15	1717.5	1747.5	QPSK	24.33	EIRP	0.271	13.4630	13M5G7D
				16QAM	23.71	EIRP	0.235	13.4440	13M4D7W
				64QAM	23.45	EIRP	0.221	13.4520	13M5D7W
4	20	1720.0	1745.0	QPSK	24.34	EIRP	**0.272**	17.9050	17M9G7D
				16QAM	23.60	EIRP	0.229	17.9490	17M9D7W
				64QAM	23.58	EIRP	0.228	17.9130	17M9D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
5	1.4	824.7	848.3	QPSK	20.32	ERP	0.108	1.0863	1M09G7D
				16QAM	19.49	ERP	0.089	1.0844	1M08D7W
				64QAM	19.54	ERP	0.090	1.0841	1M08D7W
5	3	825.5	847.5	QPSK	20.36	ERP	0.109	2.6835	2M68G7D
				16QAM	19.87	ERP	**0.097**	2.6862	2M69D7W
				64QAM	19.59	ERP	**0.091**	2.6923	2M69D7W
5	5	826.5	846.5	QPSK	20.34	ERP	0.108	4.4836	4M48G7D
				16QAM	19.68	ERP	0.093	4.4813	4M48D7W
				64QAM	19.52	ERP	0.090	4.4811	4M48D7W
5	10	829.0	844.0	QPSK	20.39	ERP	**0.109**	8.9719	8M97G7D
				16QAM	19.68	ERP	0.093	8.9471	8M95D7W
				64QAM	19.48	ERP	0.089	8.9721	8M97D7W

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LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
12	1.4	699.7	715.3	QPSK	18.49	ERP	0.071	1.0877	1M09G7D
				16QAM	17.74	ERP	0.059	1.0865	1M09D7W
				64QAM	17.69	ERP	0.059	1.0854	1M09D7W
12	3	700.5	714.5	QPSK	18.44	ERP	0.070	2.6854	2M69G7D
				16QAM	18.02	ERP	0.063	2.6890	2M69D7W
				64QAM	17.80	ERP	**0.060**	2.6954	2M70D7W
12	5	701.5	713.5	QPSK	18.47	ERP	0.070	4.4896	4M49G7D
				16QAM	17.97	ERP	0.063	4.4885	4M49D7W
				64QAM	17.61	ERP	0.058	4.4860	4M49D7W
12	10	704.0	711.0	QPSK	18.53	ERP	**0.071**	8.9884	8M99G7D
				16QAM	18.03	ERP	**0.064**	8.9703	8M97D7W
				64QAM	17.78	ERP	0.060	8.9954	9M00D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
13	5	779.5	784.5	QPSK	19.71	ERP	0.094	4.4991	4M50G7D
				16QAM	19.15	ERP	**0.082**	4.4939	4M49D7W
				64QAM	18.86	ERP	**0.077**	4.4873	4M49D7W
13	10	782.0	782.0	QPSK	19.78	ERP	**0.095**	8.9603	8M96G7D
				16QAM	18.78	ERP	0.076	8.9324	8M93D7W
				64QAM	18.52	ERP	0.071	8.9482	8M95D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
17	5	706.5	713.5	QPSK	18.40	ERP	0.069	4.4895	4M49G7D
				16QAM	17.88	ERP	0.061	4.4851	4M49D7W
				64QAM	17.68	ERP	**0.059**	4.4881	4M49D7W
17	10	709.0	711.0	QPSK	18.41	ERP	**0.069**	8.9978	9M00G7D
				16QAM	17.95	ERP	**0.062**	8.9759	8M98D7W
				64QAM	17.65	ERP	0.058	8.9780	8M98D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
26 Part 90	1.4	814.7	823.3	QPSK	20.60	ERP	0.115	1.0863	1M09G7D
				16QAM	20.07	ERP	0.102	1.0858	1M09D7W
				64QAM	19.89	ERP	0.097	1.0849	1M08D7W
26 Part 90	3	815.5	822.5	QPSK	20.61	ERP	0.115	2.6853	2M69G7D
				16QAM	20.01	ERP	0.100	2.6854	2M69D7W
				64QAM	19.93	ERP	0.098	2.6913	2M69D7W
26 Part 90	5	816.5	821.5	QPSK	20.53	ERP	0.113	4.4829	4M48G7D
				16QAM	19.98	ERP	0.100	4.4768	4M48D7W
				64QAM	19.97	ERP	**0.099**	4.4807	4M48D7W
26 Part 90	10	819.0	819.0	QPSK	20.64	ERP	**0.116**	8.9522	8M95G7D
				16QAM	20.11	ERP	**0.103**	8.9266	8M93D7W
				64QAM	19.91	ERP	0.098	8.9405	8M94D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
26	1.4	824.7	848.3	QPSK	20.37	ERP	0.109	1.0869	1M09G7D
				16QAM	19.79	ERP	0.095	1.0852	1M09D7W
				64QAM	19.52	ERP	0.090	1.0842	1M08D7W
26	3	825.5	847.5	QPSK	20.35	ERP	0.108	2.6859	2M69G7D
				16QAM	19.83	ERP	**0.096**	2.6871	2M69D7W
				64QAM	19.65	ERP	**0.092**	2.6920	2M69D7W
26	5	826.5	846.5	QPSK	20.32	ERP	0.108	4.4825	4M48G7D
				16QAM	19.72	ERP	0.094	4.4851	4M49D7W
				64QAM	19.59	ERP	0.091	4.4837	4M48D7W
26	10	829.0	844.0	QPSK	20.36	ERP	0.109	8.9669	8M97G7D
				16QAM	19.68	ERP	0.093	8.9491	8M95D7W
				64QAM	19.36	ERP	0.086	8.9709	8M97D7W
26	15	831.5	841.5	QPSK	20.38	ERP	**0.109**	13.4530	13M5G7D
				16QAM	19.73	ERP	0.094	13.4290	13M4D7W
				64QAM	19.09	ERP	0.081	13.4200	13M4D7W

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1.5 Test Methodology of Applied Standards

FCC 47 CFR Part 2, 22H, 24E, 27C, Part 90.
ANSI C63.26-2015
KDB971168 D01 Power Meas license Digital System v03r01
KDB412172 D01 Determining ERP and EIRP v01r01

1.6 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.

1.7 Special Accessories

No special accessories were used during testing.

1.8 Equipment Modifications

There was no modifications incorporated into the EUT.

1.9 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.

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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.

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2.5 Final Amplifier Voltage and Current Information:

LTE Band 2

Test mode	DC voltage (V)	DC current (mA)
LTE Band 2_20M QPSK	12	600

LTE Band 4

Test mode	DC voltage (V)	DC current (mA)
LTE Band 4_20M QPSK	12	577

LTE Band 5

Test mode	DC voltage (V)	DC current (mA)
LTE Band 5_10M QPSK	12	557

LTE Band 12

Test mode	DC voltage (V)	DC current (mA)
LTE Band 5_10M QPSK	12	563

LTE Band 13

Test mode	DC voltage (V)	DC current (mA)
LTE Band 13_10M QPSK	12	576

LTE Band 17

Test mode	DC voltage (V)	DC current (mA)
LTE Band 17_10M QPSK	12	559

LTE Band 26 for Part 90S

Test Mode	DC voltage (V)	DC current (mA)
LTE Band 26_10M QPSK	12	603

LTE Band 26

Test mode	DC voltage (V)	DC current (mA)
LTE Band 26_15M QPSK	12	589

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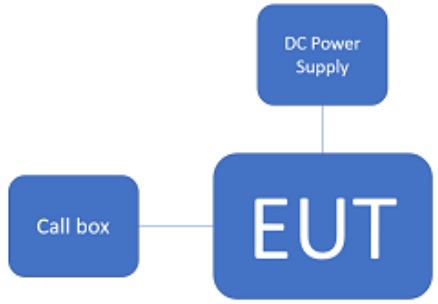
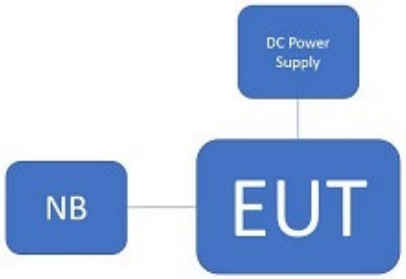
2.6 Test Configuration

Conducted Setup	Radiated Setup
	

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

2.7 Control Unit(s)

Conducted Emission Test Site: Conducted 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Car Charger	SUNNY	SYD1208-1505	N/A	N/A	N/A
Radiated Emission Test Site: SAC 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Notebook	Lenovo	L440	R9-00W5LW 14/03	N/A	N/A

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§2.1046(a)	RF Power Output	Compliant
§24.232(c) §27.50(d)(4) §22.913(a)(5) §27.50(c)(10) §27.50(b)(10) §90.635(b)	ERP/ EIRP measurement	Compliant
§2.1049(h)	99% & 26dB Occupied Bandwidth	Compliant
§2.1051 §24.238(a)(b) §27.53(h)(1)(3) §22.917(a)(b) §27.53(g) §27.53(c)(2)(5) §90.691(a)	Out of Band Emissions at Antenna Terminals and Band Edge / Emission mask requirements	Compliant
§2.1053 §24.238(a)(b) §27.53(h)(1)&(3) §22.917(a)(b) §27.53(g) §27.53(c)(2)~(6) §27.53 (f) §90.691(a)	Field Strength of Spurious Radiation	Compliant
§24.232(d) §27.50(d)(5) §22.913(d) §27.50(a)(1)(B) §24.232(d)	Peak to Average Ratio	Compliant
§2.1055(a)(1) §24.235 §27.54 §22.355	Frequency Stability	Compliant

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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.

4.2 Measurement Configuration

E-UTRA Band	Test Channel	Channel Band-width (MHz)	Modulation	Resource Block Allocation	
				RBs allocated	RB Offset
2	18700 ,18900 ,19100	20	QPSK	1	0
4	20050 ,20175 ,20300	20	QPSK	1	0
5	20450 ,20525 ,20600	10	QPSK	1	0
12	23060 ,23095 ,23130	10	QPSK	1	0
13	23230	10	QPSK	1	0
17	23780 ,23790 ,23800	10	QPSK	1	0
26	26865 ,26915 ,26965	15	QPSK	1	0
26(part90)	26740	10	QPSK	1	0

Test Items				Max. Output Power												
Band	Test Channel			Bandwidth (MHz)						Modulation				RB #		
	L	M	H	1.4	3	5	10	15	20	QPSK	16QAM	64QAM	256QAM	1	Half	Full
2	v	v	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	v	v
5	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	v	v
13	v	v	v	-	-	v	v	-	-	v	v	v	v	v	v	v
17	v	v	v	-	-	v	v	-	-	v	v	v	v	v	v	v
26	v	v	v	v	v	v	v	v	-	v	v	v	v	v	v	v
26 P90	v	v	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
5	-	v	-				v	-	-	v	-	-	-	-	-	v
12	-	v	-				v	-	-	v	-	-	-	-	-	v
13	-	v	-	-	-		v	-	-	v	-	-	-	-	-	v
17	-	v	-	-	-		v	-	-	v	-	-	-	-	-	v
26	-	v	-				v		-	v	-	-	-	-	-	v
26 P90	-	v	-				v	-	-	v	-	-	-	-	-	v

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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	64QAM	64QAM	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
5	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
13	v	v	v	-	-	v	v	-	-	v	v	v	v	-	-	v
17	v	v	v	-	-	v	v	-	-	v	v	v	v	-	-	v
26	v	v	v	v	v	v	v	v	-	v	v	v	v	-	-	v
26 P90	v	v	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			-	-	v
4	v	v	v	v	v	v	v	v	v	v	v			-	-	v
5	v	v	v	v	v	v	v	-	-	v	v			-	-	v
12	v	v	v	v	v	v	v	-	-	v	v			-	-	v
13	v	v	v	-	-	v	v	-	-	v	v			-	-	v
17	v	v	v	-	-	v	v	-	-	v	v			-	-	v
26	v	v	v	v	v	v	v	v	-	v	v			-	-	v
26 P90	v	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	64QAM	64QAM	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
5	v	-	v	v	v	v	v	-	-	v	-	-	-	v	v	v
12	v	-	v	v	v	v	v	-	-	v	-	-	-	v	v	v
13	v	-	v	-	-	v	v	-	-	v	-	-	-	v	v	v
17	v	-	v	-	-	v	v	-	-	v	-	-	-	v	v	v
26	v	-	v	v	v	v	v	v	-	v	-	-	-	v	v	v
26 P90	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		
5	v	v	v				v	-	-	v				v		
12	v	v	v				v	-	-	v				v		
13	v	v	v	-	-		v	-	-	v				v		
17	v	v	v	-	-		v	-	-	v				v		
26	v	v	v					v	-	v				v		
26 P90	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	64QAM	256QAM	1	Half	Full
2	v	v	v						v	v				v		
4	v	v	v						v	v				v		
5	v	v	v				v	-	-	v				v		
12	v	v	v				v	-	-	v				v		
13	v	v	v	-	-		v	-	-	v				v		
17	v	v	v	-	-		v	-	-	v				v		
26	v	v	v					v	-	v				v		
26 P90	v	v	v				v	-	-	v				v		

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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.

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6 MEASUREMENT EQUIPMENT USED

6.1 Conducted Measurement

Conducted Emission Test Site: Conducted 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
PXA Spectrum Analyzer	Keysight	N9030B	MY61330494	03/20/2023	03/19/2024
Radio Communication Analyer	Anritsu	MT8820C	6201465317	03/22/2023	03/21/2024
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+	8	12/12/2023	12/11/2024
DC Block	Mini-Circuits	BLK-18-S+	2	12/12/2023	12/11/2024
Splitter	RF-LAMBDA	RFLT2W1G18G	11-JSPF412-018	12/12/2023	12/11/2024

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6.2 Radiated Measurement

Radiated Emission Test Site: SAC 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Horn Antenna	RF SPIN	DRH0844	LE2D05A0844	07/03/2023	07/02/2024
Horn Antenna	SCHWARZBECK	BBHA9120D	1441	09/23/2023	09/22/2024
Bi-log Antenna	SCHWARZBECK	VULB9168	378	08/09/2023	08/08/2024
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
Spectrum Analyzer	Agilent	E4446A	MY51100003	10/25/2023	10/24/2024
Network Analyzer	Anritsu	MS4644A	1216312	12/07/2023	12/06/2024
DC Power Supply	HILA	DP-3003N	11233K1019035	03/17/2023	03/16/2024
Pre-Amplifier	EMC Instruments	EMC118A45SEE	980868	08/31/2023	08/30/2024
Pre-Amplifier	HP	8447D	2944A07676	08/31/2023	08/30/2024
Pre-Amplifier	EMC Instruments	EMC184045B	980135	08/31/2023	08/30/2024
Bandreject Filter 635-920	WI	WRCGV695/920-635/980-40/12SS	1	12/12/2023	12/11/2024
Bandreject Filter 800-1000	EWT	EWT-54-0037	M3R	12/12/2023	12/11/2024
Bandreject Filter 1700-2000	EWT	EWT-54-0038	M1	12/12/2023	12/11/2024
1G High Pass Filter	Micro-Tronics	HPM50108	32	12/12/2023	12/11/2024
2G High Pass Filter	Micro-Tronics	HPM50110	36	12/12/2023	12/11/2024
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
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
Radio Communication Analyer	Anritsu	MT8820C	6200995019	03/27/2023	03/26/2024
Site Cal	SGS	SAC 3	N/A	08/31/2023	08/30/2024
Test Software	audix	e3	Ver. 9.210616	N.C.R	N.C.R

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

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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 22.913(a)

(5) mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

FCC 24.232(c)

Mobile and portable stations are limited to 2 W EIRP.

FCC 27.50 (b)

(10) Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

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.

FCC 90.635(b)

Mobile station is limited to 100W ERP

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 §22.917(a), §24.238(a), §27.53(h), §90.543(e)(3)

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.

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FCC §27.53(c)

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(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 (-13dBm)

(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(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.

FCC §90.691 Emission mask requirements for EA-based systems

(a) Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

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7.4 Field Strength Of Spurious Radiation Measurement

According to FCC §2.1053,

FCC §22.917(a), §24.238(a), §27.53(h), §90.543(e)(3)

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.

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(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.

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(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

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.

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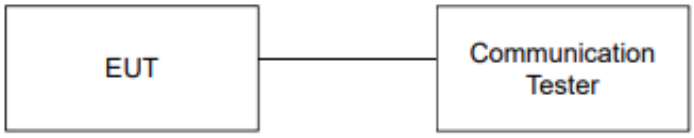
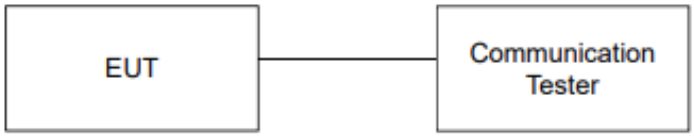
8 TEST SETUP

8.1 Maximum Output Power



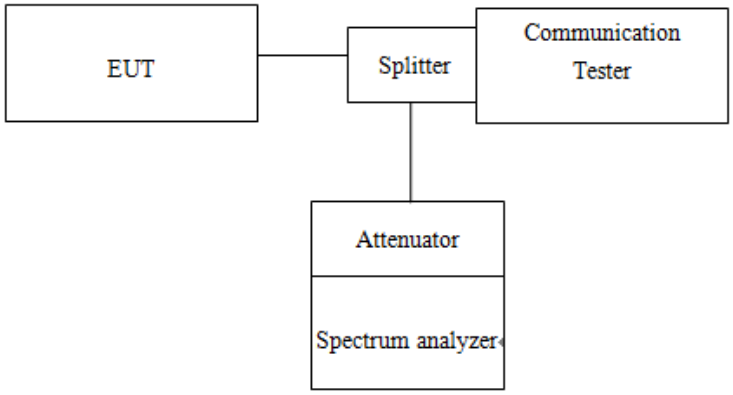
Note: *Measurement setup for testing on Antenna connector*

8.2 Occupied Bandwidth Measurement



Note: *Measurement setup for testing on Antenna connector*

8.3 Out of Band Emission At Antenna Terminals



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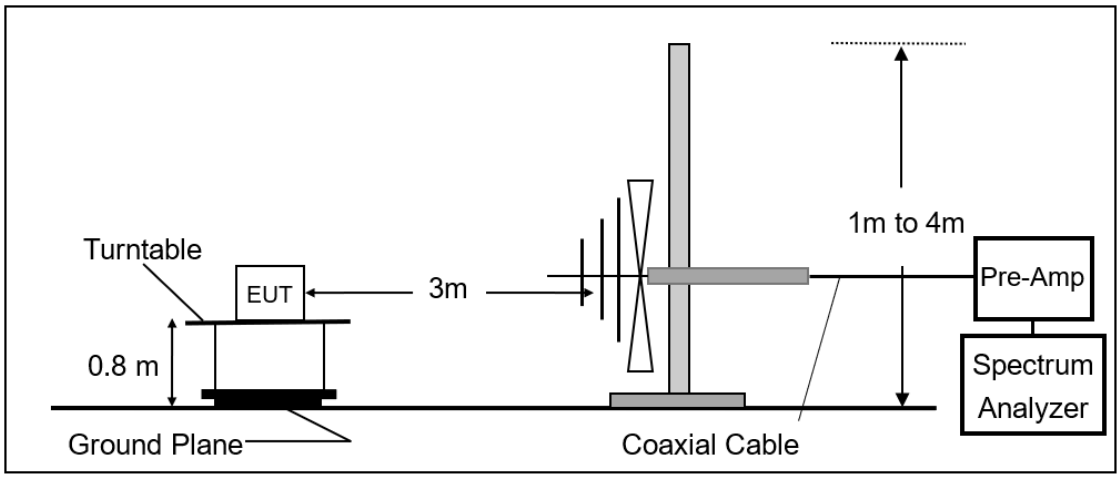
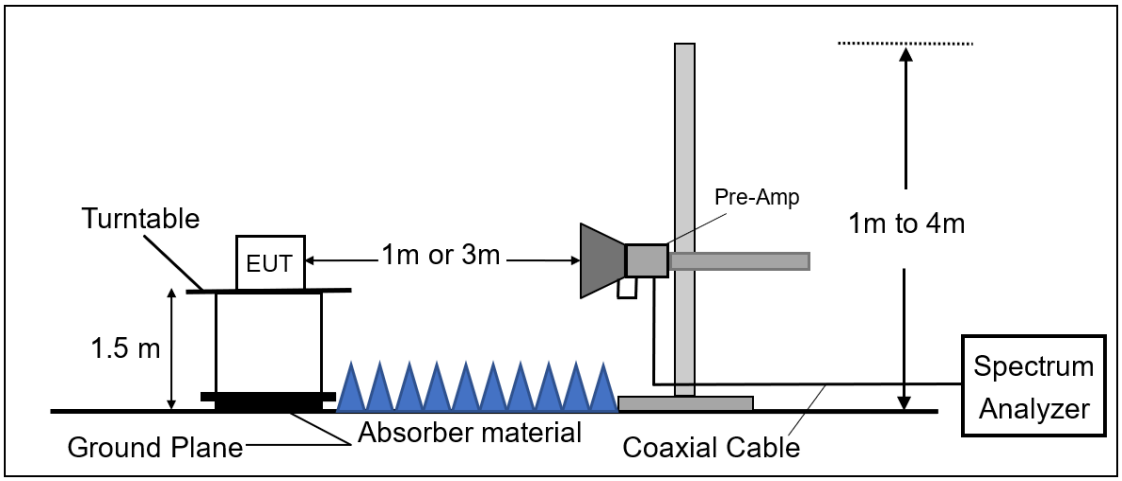
8.4 Field Strength of Spurious Radiation Measurement

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



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



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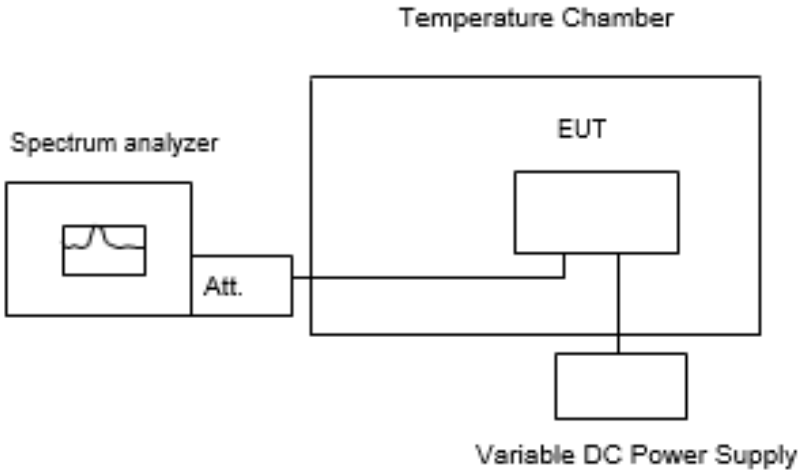
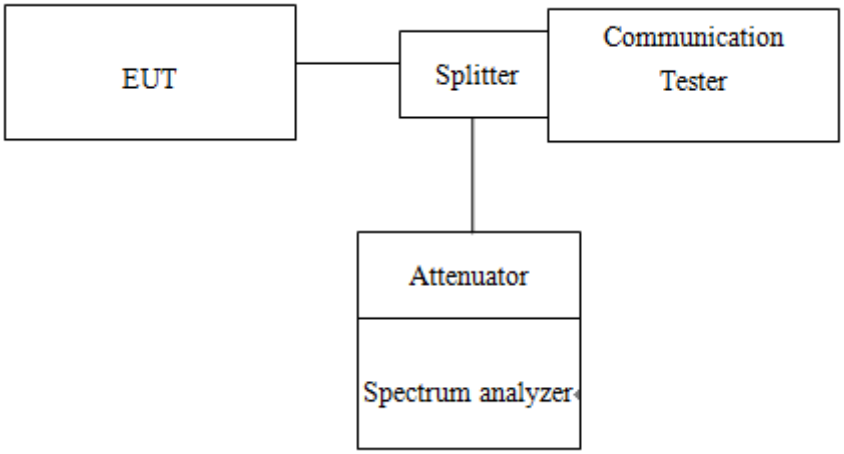
8.5 Frequency Stability Measurement



Note: *Measurement setup for testing on Antenna connector*

8.6 Peak To Average Ratio



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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.

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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.

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10 MEASUREMENT RESULTS

Please refer to the Annex A-Measurement Results.

~ End of Report ~

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