ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

FCC Applicant:	ALPS ALPINE CO., LTD. 6-3-36, Furukawanakazato, Osaki-city Miyagi-pref, 989-6181, Japan
FCC Manufacturer:	ALPS ALPINE CO., LTD. 6-3-36, Furukawanakazato, Osaki-city Miyagi-pref, 989-6181, Japan
ISED Applicant:	Alps Alpine Co., Ltd. 6-3-36, Furukawanakazato, Osaki-city Miyagi-pref, 989-6181, Japan
ISED Manufacturer:	Alps Alpine Co., Ltd. 6-3-36, Furukawanakazato, Osaki-city Miyagi-pref, 989-6181, Japan
Product Name:	5G Communication Module
Brand Name:	ALPS ALPINE CO., LTD.
Model No./ISED HVIN:	UMNZ1A2
Report Number:	TERF2405001538E2
FCC ID	CWTUMNZ1A2
IC:	1788F-UMNZ1A2
Date of EUT Received:	May 30, 2024
Date of Test:	Jun. 05, 2024～Sep. 12, 2024
Issue Date:	Oct. 04, 2024

Approved By _____
Vito Pei

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 and ISED RSS-Gen, 130, 132, 133, 139.

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
TERF2405001538E2	00	Original.	Aug. 07, 2024	Yami Kuo	
TERF2405001538E2	01	Revise chapter 1.4	Sep. 26, 2024	Yami Kuo	*
TERF2405001538E2	02	Revise chapter 1.3	Oct. 04, 2024	Yami Kuo	*

Note:

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

2、Variant information of model numbers is provided by the applicant, test results of this report are applicable to the sample EUT(s) received.
And are assessed as electrically identical in RF characteristics, therefore, no further assessment required for the variant(s).

Contents

1 GENERAL PRODUCT INFORMATION

1.1 Product Description

Product Name:	5G Communication Module
Brand Name:	ALPS ALPINE CO., LTD.
Model No./ISED HVIN:	UMNZ1A2
Hardware Version:	1.0
Firmware Version:	HI3.1
EUT Series No.:	440283005924
Power Supply:	3.7Vdc
Test Software (Name/Version)	default(Link 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 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 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	668.0	-	693.0
15	670.5	-	690.5
20	673.0	-	688.0

1.3 Antenna Designation

Antenna Type	Antenna Model No.
PCB monopole	Ant1
	Ant2
	Ant3
	Ant4
	Ant5
	Ant6
Note: Transmission in frequencies in this test report are only available by the above antenna(s).	

SIM 1

Modulation	Frequency (MHz)			Peak Antenna Gain (dBi)			
				Ant1	Ant2	Ant3	Ant4
LTE-Band 2	1850	~	1910	3.04	3.09	3.3	2.68
LTE-Band 4	1710	~	1755	3.17	2.91	3.32	2.51
LTE-Band 5	824	~	849	1.27	2.68	3.15	3.06
LTE-Band 12	699	~	716	3.2	3.09	3.37	3.14
LTE-Band 13	777	~	787	3.2	3.09	3.37	3.14
LTE-Band 66	1710	~	1780	3.17	2.91	3.32	2.51
LTE-Band 71	663	~	698	3.35	2.94	3.73	3.16

SIM 2

Modulation	Frequency (MHz)			Peak Antenna Gain (dBi)	
				Ant5	Ant6
LTE-Band 2	1850	~	1910	2.64	2.98
LTE-Band 4	1710	~	1755	2.64	2.16
LTE-Band 5	824	~	849	3.22	1.05
LTE-Band 12	699	~	716	1.02	1.79
LTE-Band 13	777	~	787	1.02	1.79
LTE-Band 66	1710	~	1780	2.64	2.16
LTE-Band 71	663	~	698	3.33	4.21

Note: Antenna information is provided by the applicant.

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

SIM 1

LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
2	1.4	1850.7	1909.3	QPSK	26.39	EIRP	0.436	1.0871	1M09G7D
				16QAM	25.66	EIRP	0.368	1.0900	1M09D7W
				64QAM	24.53	EIRP	0.284	1.0902	1M09D7W
2	3	1851.5	1908.5	QPSK	26.26	EIRP	0.423	2.6926	2M69G7D
				16QAM	25.75	EIRP	0.376	2.6953	2M70D7W
				64QAM	24.74	EIRP	**0.298**	2.6898	2M69D7W
2	5	1852.5	1907.5	QPSK	26.36	EIRP	0.433	4.4959	4M50G7D
				16QAM	26.00	EIRP	**0.398**	4.4969	4M50D7W
				64QAM	24.47	EIRP	0.280	4.4941	4M49D7W
2	10	1855.0	1905.0	QPSK	26.35	EIRP	0.432	8.9649	8M96G7D
				16QAM	25.27	EIRP	0.337	8.9709	8M97D7W
				64QAM	24.13	EIRP	0.259	8.9704	8M97D7W
2	15	1857.5	1902.5	QPSK	26.33	EIRP	0.430	13.458	13M5G7D
				16QAM	25.43	EIRP	0.349	13.438	13M4D7W
				64QAM	24.70	EIRP	0.295	13.470	13M5D7W
2	20	1860.0	1900.0	QPSK	26.46	EIRP	**0.443**	17.898	17M9G7D
				16QAM	25.71	EIRP	0.372	17.903	17M9D7W
				64QAM	24.49	EIRP	0.281	17.931	17M9D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
4	1.4	1710.7	1754.3	QPSK	26.46	EIRP	0.443	1.0882	1M09G7D
				16QAM	25.86	EIRP	0.385	1.0896	1M09D7W
				64QAM	24.86	EIRP	**0.306**	1.0897	1M09D7W
4	3	1711.5	1753.5	QPSK	26.55	EIRP	0.452	2.7009	2M70G7D
				16QAM	25.80	EIRP	0.380	2.6989	2M70D7W
				64QAM	24.51	EIRP	0.282	2.6965	2M70D7W
4	5	1712.5	1752.5	QPSK	26.57	EIRP	**0.454**	4.5053	4M51G7D
				16QAM	25.72	EIRP	0.373	4.4948	4M49D7W
				64QAM	24.77	EIRP	0.300	4.4927	4M49D7W
4	10	1715.0	1750.0	QPSK	26.21	EIRP	0.418	8.9700	8M97G7D
				16QAM	25.70	EIRP	0.372	8.9647	8M96D7W
				64QAM	24.60	EIRP	0.288	8.9717	8M97D7W
4	15	1717.5	1747.5	QPSK	26.45	EIRP	0.442	13.4990	13M5G7D
				16QAM	25.65	EIRP	0.367	13.4750	13M5D7W
				64QAM	24.61	EIRP	0.289	13.4420	13M4D7W
4	20	1720.0	1745.0	QPSK	26.38	EIRP	0.435	17.9310	17M9G7D
				16QAM	26.08	EIRP	**0.406**	17.9120	17M9D7W
				64QAM	24.84	EIRP	0.305	17.9360	17M9D7W

LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
5	1.4	824.7	848.3	QPSK	23.85	ERP	**0.243**	1.0870	1M09G7D
				16QAM	23.21	ERP	0.209	1.0871	1M09D7W
				64QAM	22.05	ERP	0.160	1.0854	1M09D7W
5	3	825.5	847.5	QPSK	23.73	ERP	0.236	2.6942	2M69G7D
				16QAM	23.57	ERP	**0.228**	2.6963	2M70D7W
				64QAM	21.92	ERP	0.156	2.6972	2M70D7W
5	5	826.5	846.5	QPSK	23.63	ERP	0.231	4.4988	4M50G7D
				16QAM	22.93	ERP	0.196	4.4936	4M49D7W
				64QAM	22.05	ERP	0.160	4.4952	4M50D7W
5	10	829.0	844.0	QPSK	23.61	ERP	0.230	8.9847	8M98G7D
				16QAM	23.22	ERP	0.210	8.9770	8M98D7W
				64QAM	22.31	ERP	**0.170**	8.9743	8M97D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
12	1.4	699.7	715.3	QPSK	24.00	ERP	0.251	1.0865	1M09G7D
				16QAM	23.30	ERP	0.214	1.0892	1M09D7W
				64QAM	22.26	ERP	0.168	1.0856	1M09D7W
12	3	700.5	714.5	QPSK	24.04	ERP	0.254	2.6954	2M70G7D
				16QAM	23.26	ERP	0.212	2.6960	2M70D7W
				64QAM	22.11	ERP	0.163	2.6976	2M70D7W
12	5	701.5	713.5	QPSK	24.13	ERP	**0.259**	4.5596	4M56G7D
				16QAM	23.45	ERP	**0.221**	4.4882	4M49D7W
				64QAM	22.41	ERP	**0.174**	4.4953	4M50D7W
12	10	704.0	711.0	QPSK	23.99	ERP	0.251	8.9545	8M95G7D
				16QAM	23.22	ERP	0.210	8.9494	8M95D7W
				64QAM	22.26	ERP	0.168	8.9662	8M97D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
13	5	779.5	784.5	QPSK	23.85	ERP	0.243	4.4955	4M50G7D
				16QAM	23.32	ERP	**0.215**	4.4840	4M48D7W
				64QAM	22.42	ERP	**0.175**	4.5066	4M51D7W
13	10	782.0	782.0	QPSK	23.86	ERP	**0.243**	8.9670	8M97G7D
				16QAM	22.71	ERP	0.187	8.9557	8M96D7W
				64QAM	22.06	ERP	0.161	8.9479	8M95D7W

LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
66	1.4	1710.7	1779.3	QPSK	26.39	EIRP	0.436	1.0876	1M09G7D
				16QAM	25.95	EIRP	**0.394**	1.0879	1M09D7W
				64QAM	24.69	EIRP	0.294	1.0862	1M09D7W
66	3	1711.5	1778.5	QPSK	26.14	EIRP	0.411	2.6950	2M70G7D
				16QAM	25.92	EIRP	0.391	2.6952	2M70D7W
				64QAM	24.76	EIRP	0.299	2.6962	2M70D7W
66	5	1712.5	1777.5	QPSK	25.90	EIRP	0.389	4.5006	4M50G7D
				16QAM	25.59	EIRP	0.362	4.4947	4M49D7W
				64QAM	24.69	EIRP	0.294	4.4918	4M49D7W
66	10	1715.0	1775.0	QPSK	26.46	EIRP	**0.443**	8.9827	8M98G7D
				16QAM	25.73	EIRP	0.374	8.9624	8M96D7W
				64QAM	24.97	EIRP	**0.314**	8.9711	8M97D7W
66	15	1717.5	1772.5	QPSK	26.23	EIRP	0.420	13.4570	13M5G7D
				16QAM	25.81	EIRP	0.381	13.4750	13M5D7W
				64QAM	24.76	EIRP	0.299	13.4590	13M5D7W
66	20	1720	1770	QPSK	26.36	EIRP	0.433	17.9440	17M9G7D
				16QAM	25.75	EIRP	0.376	17.9260	17M9D7W
				64QAM	24.63	EIRP	0.290	17.9390	17M9D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
71	5	665.5	695.5	QPSK	25.03	ERP	0.318	4.4856	4M49G7D
				16QAM	24.04	ERP	0.254	4.4943	4M49D7W
				64QAM	22.99	ERP	0.199	4.4941	4M49D7W
71	10	668.0	693.0	QPSK	25.09	ERP	0.323	8.9734	8M97G7D
				16QAM	24.35	ERP	**0.272**	8.9585	8M96D7W
				64QAM	23.38	ERP	**0.218**	8.9534	8M95D7W
71	15	670.5	690.5	QPSK	24.92	ERP	0.310	13.4290	13M4G7D
				16QAM	24.22	ERP	0.264	13.4190	13M4D7W
				64QAM	23.22	ERP	0.210	13.4400	13M4D7W
71	20	673.0	688.0	QPSK	25.13	ERP	**0.326**	17.8770	17M9G7D
				16QAM	24.10	ERP	0.257	17.9370	17M9D7W
				64QAM	22.98	ERP	0.199	17.8900	17M9D7W

SIM 2

LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
2	1.4	1850.7	1909.3	QPSK	26.35	EIRP	0.432	1.0878	1M09G7D
				16QAM	25.85	EIRP	**0.385**	1.0893	1M09D7W
				64QAM	24.52	EIRP	0.283	1.0886	1M09D7W
2	3	1851.5	1908.5	QPSK	26.30	EIRP	0.427	2.6980	2M70G7D
				16QAM	25.60	EIRP	0.363	2.6999	2M70D7W
				64QAM	24.46	EIRP	0.279	2.6994	2M70D7W
2	5	1852.5	1907.5	QPSK	26.42	EIRP	0.439	4.4951	4M50G7D
				16QAM	25.70	EIRP	0.372	4.4888	4M49D7W
				64QAM	24.71	EIRP	**0.296**	4.4960	4M50D7W
2	10	1855.0	1905.0	QPSK	26.43	EIRP	**0.440**	8.9783	8M98G7D
				16QAM	25.32	EIRP	0.340	8.9644	8M96D7W
				64QAM	24.20	EIRP	0.263	8.9858	8M99D7W
2	15	1857.5	1902.5	QPSK	26.42	EIRP	0.439	13.456	13M5G7D
				16QAM	25.48	EIRP	0.353	13.462	13M5D7W
				64QAM	24.20	EIRP	0.263	13.462	13M5D7W
2	20	1860.0	1900.0	QPSK	26.40	EIRP	0.437	17.931	17M9G7D
				16QAM	25.59	EIRP	0.362	17.937	17M9D7W
				64QAM	24.54	EIRP	0.284	17.933	17M9D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
4	1.4	1710.7	1754.3	QPSK	25.49	EIRP	0.354	1.0870	1M09G7D
				16QAM	24.81	EIRP	0.303	1.0914	1M09D7W
				64QAM	23.72	EIRP	0.236	1.0900	1M09D7W
4	3	1711.5	1753.5	QPSK	25.52	EIRP	0.356	2.6920	2M69G7D
				16QAM	24.92	EIRP	0.310	2.7022	2M70D7W
				64QAM	23.50	EIRP	0.224	2.6974	2M70D7W
4	5	1712.5	1752.5	QPSK	25.55	EIRP	0.359	4.4987	4M50G7D
				16QAM	25.12	EIRP	**0.325**	4.5089	4M51D7W
				64QAM	23.90	EIRP	**0.245**	4.4884	4M49D7W
4	10	1715.0	1750.0	QPSK	25.61	EIRP	0.364	8.9754	8M98G7D
				16QAM	25.01	EIRP	0.317	8.9676	8M97D7W
				64QAM	23.82	EIRP	0.241	8.9671	8M97D7W
4	15	1717.5	1747.5	QPSK	25.76	EIRP	**0.377**	13.4610	13M5G7D
				16QAM	24.89	EIRP	0.308	13.4660	13M5D7W
				64QAM	23.70	EIRP	0.234	13.4330	13M4D7W
4	20	1720.0	1745.0	QPSK	25.63	EIRP	0.366	17.9210	17M9G7D
				16QAM	24.91	EIRP	0.310	17.9130	17M9D7W
				64QAM	23.87	EIRP	0.244	17.9140	17M9D7W

LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
5	1.4	824.7	848.3	QPSK	21.74	ERP	**0.149**	1.0874	1M09G7D
				16QAM	21.20	ERP	0.132	1.0878	1M09D7W
				64QAM	20.10	ERP	0.102	1.0903	1M09D7W
5	3	825.5	847.5	QPSK	21.56	ERP	0.143	2.6965	2M70G7D
				16QAM	21.22	ERP	0.132	2.6981	2M70D7W
				64QAM	20.18	ERP	**0.104**	2.6966	2M70D7W
5	5	826.5	846.5	QPSK	21.63	ERP	0.146	4.5015	4M50G7D
				16QAM	21.31	ERP	**0.135**	4.4842	4M48D7W
				64QAM	19.90	ERP	0.098	4.4895	4M49D7W
5	10	829.0	844.0	QPSK	21.54	ERP	0.143	8.9661	8M97G7D
				16QAM	20.87	ERP	0.122	8.9657	8M97D7W
				64QAM	19.92	ERP	0.098	8.9791	8M98D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
12	1.4	699.7	715.3	QPSK	22.93	ERP	0.196	1.0890	1M09G7D
				16QAM	22.06	ERP	0.161	1.0912	1M09D7W
				64QAM	21.17	ERP	0.131	1.0866	1M09D7W
12	3	700.5	714.5	QPSK	22.92	ERP	0.196	2.6974	2M70G7D
				16QAM	22.59	ERP	**0.182**	2.6902	2M69D7W
				64QAM	21.12	ERP	0.129	2.6985	2M70D7W
12	5	701.5	713.5	QPSK	23.02	ERP	**0.200**	4.4862	4M49G7D
				16QAM	22.27	ERP	0.169	4.4852	4M49D7W
				64QAM	21.15	ERP	0.130	4.4901	4M49D7W
12	10	704.0	711.0	QPSK	22.85	ERP	0.193	8.9681	8M97G7D
				16QAM	22.14	ERP	0.164	8.9774	8M98D7W
				64QAM	21.24	ERP	**0.133**	8.9614	8M96D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
13	5	779.5	784.5	QPSK	23.06	ERP	**0.202**	4.4963	4M50G7D
				16QAM	22.40	ERP	**0.174**	4.4936	4M49D7W
				64QAM	21.41	ERP	**0.138**	4.4962	4M50D7W
13	10	782.0	782.0	QPSK	22.87	ERP	0.194	8.9734	8M97G7D
				16QAM	22.40	ERP	**0.174**	8.9516	8M95D7W
				64QAM	21.27	ERP	0.134	8.9519	8M95D7W

LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
66	1.4	1710.7	1779.3	QPSK	25.47	EIRP	0.352	1.0894	1M09G7D
				16QAM	24.72	EIRP	0.296	1.0898	1M09D7W
				64QAM	23.84	EIRP	0.242	1.0919	1M09D7W
66	3	1711.5	1778.5	QPSK	25.58	EIRP	0.361	2.7018	2M70G7D
				16QAM	24.84	EIRP	0.305	2.6921	2M69D7W
				64QAM	23.66	EIRP	0.232	2.6975	2M70D7W
66	5	1712.5	1777.5	QPSK	25.53	EIRP	0.357	4.4934	4M49G7D
				16QAM	24.59	EIRP	0.288	4.4883	4M49D7W
				64QAM	23.48	EIRP	0.223	4.4990	4M50D7W
66	10	1715.0	1775.0	QPSK	25.60	EIRP	0.363	8.9752	8M98G7D
				16QAM	24.89	EIRP	**0.308**	9.0022	9M00D7W
				64QAM	23.90	EIRP	**0.245**	8.9863	8M99D7W
66	15	1717.5	1772.5	QPSK	25.49	EIRP	0.354	13.4680	13M5G7D
				16QAM	24.76	EIRP	0.299	13.4710	13M5D7W
				64QAM	23.78	EIRP	0.239	13.4660	13M5D7W
66	20	1720	1770	QPSK	25.63	EIRP	**0.366**	17.9520	18M0G7D
				16QAM	24.58	EIRP	0.287	17.9300	17M9D7W
				64QAM	23.49	EIRP	0.223	17.9370	17M9D7W
LTE Band	BW	Frequency		Modulation	ERP / EIRP (dBm)		(W)	99%	Type of Emission
71	5	665.5	695.5	QPSK	25.50	ERP	0.355	4.4962	4M50G7D
				16QAM	24.53	ERP	0.284	4.4989	4M50D7W
				64QAM	23.47	ERP	0.222	4.4833	4M48D7W
71	10	668.0	693.0	QPSK	25.55	ERP	0.359	8.9721	8M97G7D
				16QAM	24.87	ERP	**0.307**	8.9776	8M98D7W
				64QAM	23.89	ERP	**0.245**	8.9835	8M98D7W
71	15	670.5	690.5	QPSK	25.47	ERP	0.352	13.4470	13M4G7D
				16QAM	24.69	ERP	0.294	13.4570	13M5D7W
				64QAM	23.70	ERP	0.234	13.4580	13M5D7W
71	20	673	688	QPSK	25.63	ERP	**0.366**	17.8910	17M9G7D
				16QAM	24.49	ERP	0.281	17.9010	17M9D7W
				64QAM	23.46	ERP	0.222	17.8810	17M9D7W

1.5 Test Methodology of Applied Standards

FCC 47 CFR Part 2, 22H, 24E, 27C.
ISED RSS-GEN Issue 5 Amendment 2 Feb. 2021
ISED RSS-130 Issue 2 Feb. 2019
ISED RSS-132 Issue 4 Jan. 2023
ISED RSS-133 Issue 6, Amendment 1 Jan. 18, 2018
ISED RSS-139 Issue 4 Amendment Oct. 2022
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.

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:

SIM 1

LTE Band 2

Test mode	DC voltage (V)	DC current (mA)
LTE Band 2_20M QPSK	3.7	710

LTE Band 4

Test mode	DC voltage (V)	DC current (mA)
LTE Band 4_20M QPSK	3.7	640

LTE Band 5

Test mode	DC voltage (V)	DC current (mA)
LTE Band 5_10M QPSK	3.7	540

LTE Band 12

Test mode	DC voltage (V)	DC current (mA)
LTE Band 12_10M QPSK	3.7	560

LTE Band 13

Test mode	DC voltage (V)	DC current (mA)
LTE Band 13_10M QPSK	3.7	450

LTE Band 66

Test mode	DC voltage (V)	DC current (mA)
LTE Band 66_20M QPSK	3.7	520

LTE Band 71

Test mode	DC voltage (V)	DC current (mA)
LTE Band 71_20M QPSK	3.7	570

SIM 2

LTE Band 2

Test mode	DC voltage (V)	DC current (mA)
LTE Band 2_20M QPSK	3.7	710

LTE Band 4

Test mode	DC voltage (V)	DC current (mA)
LTE Band 4_20M QPSK	3.7	640

LTE Band 5

Test mode	DC voltage (V)	DC current (mA)
LTE Band 5_10M QPSK	3.7	540

LTE Band 12

Test mode	DC voltage (V)	DC current (mA)
LTE Band 12_10M QPSK	3.7	560

LTE Band 13

Test mode	DC voltage (V)	DC current (mA)
LTE Band 13_10M QPSK	3.7	450

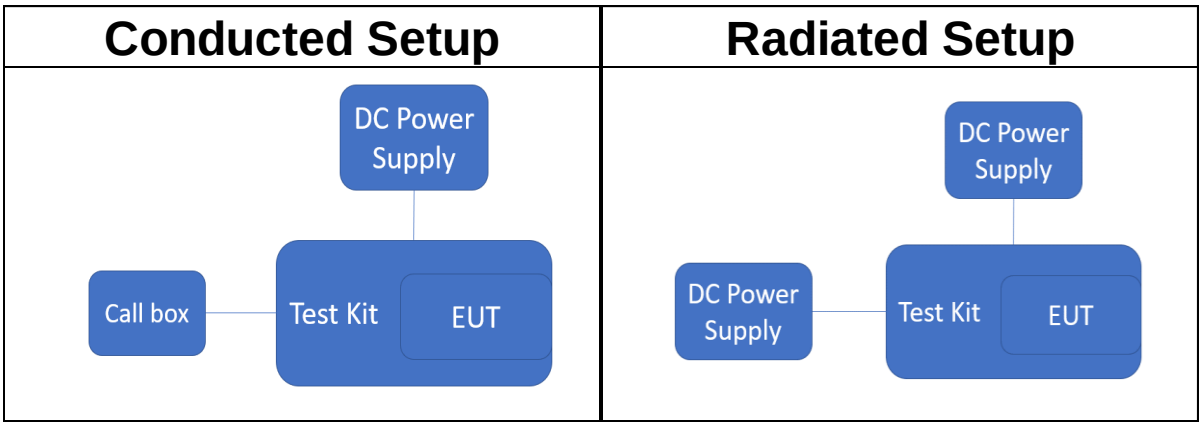
LTE Band 66

Test mode	DC voltage (V)	DC current (mA)
LTE Band 66_20M QPSK	3.7	520

LTE Band 71

Test mode	DC voltage (V)	DC current (mA)
LTE Band 71_20M QPSK	3.7	570

2.6 Test Configuration



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

2.7 Control Unit(s)

Setup units & cable					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	Provided by Applicant	Provided by Lab
EVB2	ALPSALPINE	FY0212Z11-2	N/A	V	

Setup units & cable					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	Provided by Applicant	Provided by Lab
EVB2	ALPSALPINE	FY0212Z11-2	N/A	V	

3 SUMMARY OF TEST RESULTS

FCC Rules	IC Rules	Description Of Test	Result
§2.1046(a)	RSS-GEN §6.12	RF Power Output	Compliant
§22.913(a)(5) §24.232(c) §27.50(b)(10) §27.50(c)(10) §27.50(d)(4)	RSS-130 §4.6 RSS-132 §5.4 RSS-133 §6.4 RSS-139 §5.5	ERP/ EIRP measurement	Compliant
§2.1049(h)	RSS-GEN §6.7	99% & 26dB Occupied Bandwidth	Compliant
§2.1051 §22.917(a) §24.238(a) §27.53(c)(2),(5) §27.53(g) §27.53(h)	RSS-GEN §6.13 RSS-130 §4.7 RSS-132 §5.5 RSS-133 §6.5 RSS-139 §5.6	Out of Band Emissions at Antenna Terminals and Band Edge / Emission mask requirements	Compliant
§2.1053 §22.917(a) §24.238(a) §27.53(c)(2)~(6) §27.53(f) §27.53(g) §27.53(h)	RSS-GEN §6.13 RSS-130 §4.7 RSS-132 §5.5 RSS-133 §6.5 RSS-139 §5.6	Field Strength of Spurious Radiation	Compliant
§22.913(d) §24.232(d) §27.50(a)(1)(B) §27.50(d)(5)	RSS-130 §4.6.1 RSS-132 §5.4 RSS-133 §6.4 RSS-139 §5.5 RSS-140 §4.3	Peak to Average Ratio	Compliant
§2.1055(a)(1) §22.355 §24.235 §27.54	RSS-130 §4.5 RSS-132 §5.3 RSS-133 §6.3 RSS-139 §5.4	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.

4.2 Measurement Configuration

SIM 1

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	1	Half	Full
2	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
5	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
13	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	v
71	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
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	64QAM	1	Half	Full
2	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
5	v	v	v	v	v	v	v	-	-	v	v	v	-	-	v
12	v	v	v	v	v	v	v	-	-	v	v	v	-	-	v
13	v	v	v	-	-	v	v	-	-	v	v	v	-	-	v
66	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
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
5	v	v	v	v	v	v	v	-	-	-	-	v	-	-	v
12	v	v	v	v	v	v	v	-	-	-	-	v	-	-	v
13	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	64QAM	1	Half	Full
2	V	-	V	V	V	V	V	V	V	V	-	-	V	-	V
4	V	-	V	V	V	V	V	V	V	V	-	-	V	-	V
5	V	-	V	V	V	V	V	-	-	V	-	-	V	-	V
12	V	-	V	V	V	V	V	-	-	V	-	-	V	-	V
13	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	Conducted Emission														
2	V	V	V	V	V	V	V	V	V	V	-	-	V	-	-
4	V	V	V	V	V	V	V	V	V	V	-	-	V	-	-
5	V	V	V	V	V	V	V	-	-	V	-	-	V	-	-
12	V	V	V	V	V	V	V	-	-	V	-	-	V	-	-
13	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	-	-

SIM 2

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	1	Half	Full
2	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
5	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
13	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	V
71	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
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	64QAM	1	Half	Full
2	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
5	V	V	V	V	V	V	V	-	-	V	V	V	-	-	V
12	V	V	V	V	V	V	V	-	-	V	V	V	-	-	V
13	V	V	V	-	-	V	V	-	-	V	V	V	-	-	V
66	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
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
5	V	V	V	V	V	V	V	-	-	-	-	V	-	-	V
12	V	V	V	V	V	V	V	-	-	-	-	V	-	-	V
13	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	64QAM	1	Half	Full
2	V	-	V	V	V	V	V	V	V	V	-	-	V	-	V
4	V	-	V	V	V	V	V	V	V	V	-	-	V	-	V
5	V	-	V	V	V	V	V	-	-	V	-	-	V	-	V
12	V	-	V	V	V	V	V	-	-	V	-	-	V	-	V
13	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				Conducted Emission											
2	V	V	V	V	V	V	V	V	V	V	-	-	V	-	-
4	V	V	V	V	V	V	V	V	V	V	-	-	V	-	-
5	V	V	V	V	V	V	V	-	-	V	-	-	V	-	-
12	V	V	V	V	V	V	V	-	-	V	-	-	V	-	-
13	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	-	-

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 E					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Attenuator	Marvelous	MVE2213-10	RF06	11/15/2023	11/14/2024
Coaxial Cables	Woken	00100A1F1A185C	RF72	11/15/2023	11/14/2024
DC Block	PASTERNACK	PE8210	RF157	11/15/2023	11/14/2024
DC Power Supply	Gwinstek	SPD-3606	GEV923152	05/17/2024	05/16/2025
Radio Communication Analyer	Anritsu	MT8820C	6201107337	07/14/2023	07/13/2024
Radio Communication Analyer	Anritsu	MT8821C	6262044739	11/30/2023	11/29/2024
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	04/10/2024	04/09/2025
Splitter	Woken	DOM35LW1A2	RF255	11/15/2023	11/14/2024
Temperature Chamber	Haich	HC-TOPH-30-CHP	QHC20230320-100-2	08/24/2023	08/23/2024
Temperature Chamber	Haich	HC-TOPH-30-CHP	QHC20230320-100-2	08/23/2024	08/22/2025
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R

6.2 Radiated Measurement

Radiated Emission Test Site: SAC C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
3m Site NSA	SGS	966 chamber C	N/A	03/02/2024	03/01/2025
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-300	11/02/2023	11/01/2024
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-617	12/14/2023	12/13/2024
Coaxial Cable	Huber+Suhner	EMC106-SM-SM-9100	150704	11/15/2023	11/14/2024
Coaxial Cable	Huber+Suhner	RG 214/U	W22.03	11/15/2023	11/14/2024
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	MY17388/4	11/15/2023	11/14/2024
DC Power Supply	DHA	DPS-3003	9411005787	08/21/2023	08/20/2024
DC Power Supply	Gwinstek	SPS-3610	GEW902165	01/17/2024	01/16/2025
Horn Antenna	Schwarzbeck	BBHA9120D	1187	01/24/2024	01/23/2025
Horn Antenna	Schwarzbeck	BBHA9120D	1341	05/30/2024	05/29/2025
Horn Antenna	Schwarzbeck	BBHA9170	184	12/28/2023	12/27/2024
Horn Antenna	Schwarzbeck	BBHA9170	185	08/21/2023	08/20/2024
Pre-Amplifier	EMC Instruments	EMC118A45SE	980789	11/15/2023	11/14/2024
Pre-Amplifier	EMC Instruments	EMC18405SEE	980881	11/15/2023	11/14/2024
Pre-Amplifier	EMC Instruments	EMC330	980096	11/15/2023	11/14/2024
Radio Communication Analyer	Anritsu	MT8821C	6262044732	11/16/2023	11/15/2024
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	04/10/2024	04/09/2025
Test Software	audix	e3	E3 20923 SGS Ver.9 (C)	N.C.R	N.C.R

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 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)

(9) Control stations and mobile stations transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 30 watts ERP.
(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)

(9) Control and mobile stations in the 698-746 MHz band are limited to 30 watts ERP.
(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.

RSS-130 §4.6

The e.r.p. shall not exceed 3 watts for mobile equipment, fixed subscriber equipment and portable equipment operating in the Band 617-652 and 663-698MHz.
The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment operating in 698-756 and 777-787 MHz.

RSS-132 §5.4

The transmitter output power shall be measured in terms of average power. The equivalent radiated power (e.r.p.) shall not exceed 7 watts for mobile equipment and 3 watts for portable equipment.

The effective isotropic radiated power (e.i.r.p.) shall not exceed the limits specified in SRSP-503 for base station equipment.

RSS-133 §6.4

The equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510.
According to section 5.1.2 of SRSP-510, Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p. The equipment shall employ means to limit the power to the minimum necessary for successful communication.

RSS-139 §5.5

The maximum output power of the equipment shall comply with the limits specified below. In the tables, maximum power refers to the equivalent isotropically radiated power (e.i.r.p.) or total radiated power (TRP), measured in terms of average values.

The limits in this RSS are specified for the purpose of certification and may not apply to all deployment scenarios. Consult SRSP-513 and SRSP-519 for more details on the bands 2110-2180 MHz and 2180-2200 MHz respectively

Table 3: Maximum power of equipment in the band 1710-1780 MHz	
Equipment type	**Maximum power**
Fixed station and base station	30 dBm e.i.r.p./channel bandwidth
Subscriber equipment	30 dBm e.i.r.p./channel bandwidth

Table 4: Maximum power of equipment in the band 2110-2180 MHz	
Equipment type	**Maximum power**
Non-AAS fixed station and base station	65 dBm e.i.r.p./MHz
AAS fixed station and base station	46 dBm TRP/MHz
Subscriber equipment	30 dBm e.i.r.p./channel bandwidth

Table 5: Maximum power of equipment in the band 2180-2200 MHz	
Equipment type	Maximum power
Non-AAS base station	65 dBm e.i.r.p./MHz
AAS base station	46 dBm TRP/MHz

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)
RSS-130 §4.7, RSS-132 §5.5, RSS-133 §6.5.1, RSS-139 §5.6

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(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;

ISED RSS-130 §4.7.1

Compliance for operations in the 617-652 MHz, 663-698 MHz, 698-756 MHz and the 777-787 MHz band, the unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

ISED RSS-130 §4.7.2

In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:
the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:

76 + 10 log10 p (watts), dB, for base and fixed equipment and
65 + 10 log10 p (watts), dB, for mobile and portable equipment

the e.i.r.p. in the band 1559-1610 MHz shall not exceed −70 dBW/MHz for wideband signal and −80 dBW for discrete emission with bandwidth less than 700 Hz.

ISED RSS-132 §5.5

i. Equipment shall meet the unwanted emission limits specified below:

In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB.

ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB. If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

p is the output power specified in watts.

ISED RSS-133 §6.5.1

Equipment shall comply with the limits in (i) and (ii) below.

iii. In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10p(watts).

iv. After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10p(watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

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.

RSS-139 §5.6

Unwanted emissions shall be measured in terms of average values.

For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors) of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in table 6.

Table 6: Table 6: Unwanted emission limits	
Offset from the edge of the frequency block or frequency block group	**Unwanted emission limits**
1 MHz	-13 dBm/(1% of OB*)
>1 MHz	-13 dBm/MHz
Subscriber equipment	30 dBm e.i.r.p./channel bandwidth

*OB is the occupied bandwidth.

In addition to complying with the above limits, equipment operating in the band 2180-2200 MHz may require additional filtering (see SRSP-519).

7.4 Field Strength Of Spurious Radiation Measurement

According to FCC §2.1053,

FCC §22.917(a), §24.238(a), §27.53(h)

RSS-130 §4.7, RSS-132 §5.5, RSS-133 §6.5.1, RSS-139 §5.6

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.

RSS-130 §4.7.1

Compliance for operations in the 617-652 MHz, 663-698 MHz, 698-756 MHz and the 777-787 MHz band, the unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

RSS-130 §4.7.2

In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:
the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:

76 + 10 log10 p (watts), dB, for base and fixed equipment and
65 + 10 log10 p (watts), dB, for mobile and portable equipment

the e.i.r.p. in the band 1559-1610 MHz shall not exceed −70 dBW/MHz for wideband signal and −80 dBW for discrete emission with bandwidth less than 700 Hz.

RSS-132 §5.5

i. Equipment shall meet the unwanted emission limits specified below:

In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB.

ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB. If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

p is the output power specified in watts.

RSS-133 §6.5.1

Equipment shall comply with the limits in (i) and (ii) below.

i. In the 1.0 MHz bands immediately outside and adjacent to the equipment’s operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10p(watts).

ii. After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10p(watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

RSS-139 §5.6 for LTE B4, 10, 66

Unwanted emissions shall be measured in terms of average values.

For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors) of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in table 6.

Table 6: Table 6: Unwanted emission limits

Offset from the edge of the frequency block or frequency block group	Unwanted emission limits
1 MHz	-13 dBm/(1% of OB*)
>1 MHz	-13 dBm/MHz
Subscriber equipment	30 dBm e.i.r.p./channel bandwidth

*OB is the occupied bandwidth.

In addition to complying with the above limits, equipment operating in the band 2180-2200 MHz may require additional filtering (see SRSP-519).

7.5 Frequency Stability Measurement

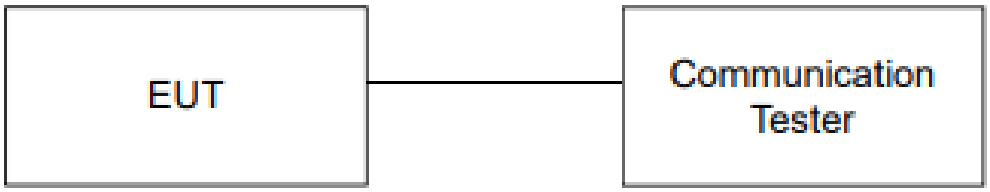
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

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

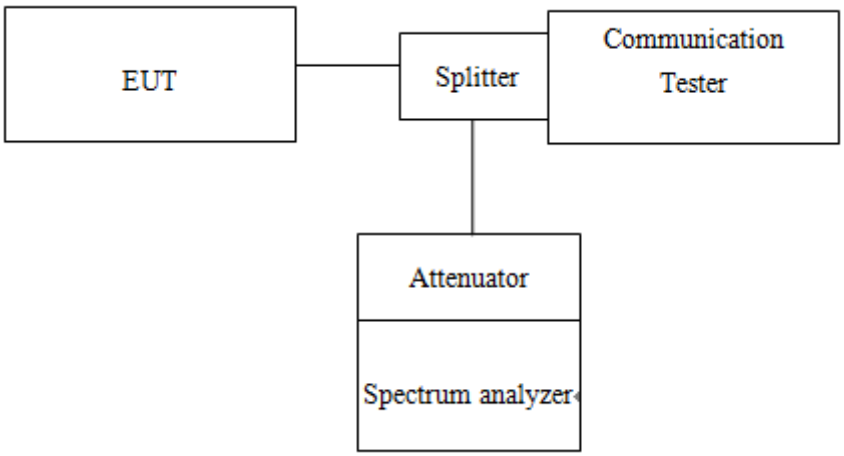


Note: *Measurement setup for testing on Antenna connector*

8.2 Occupied Bandwidth Measurement

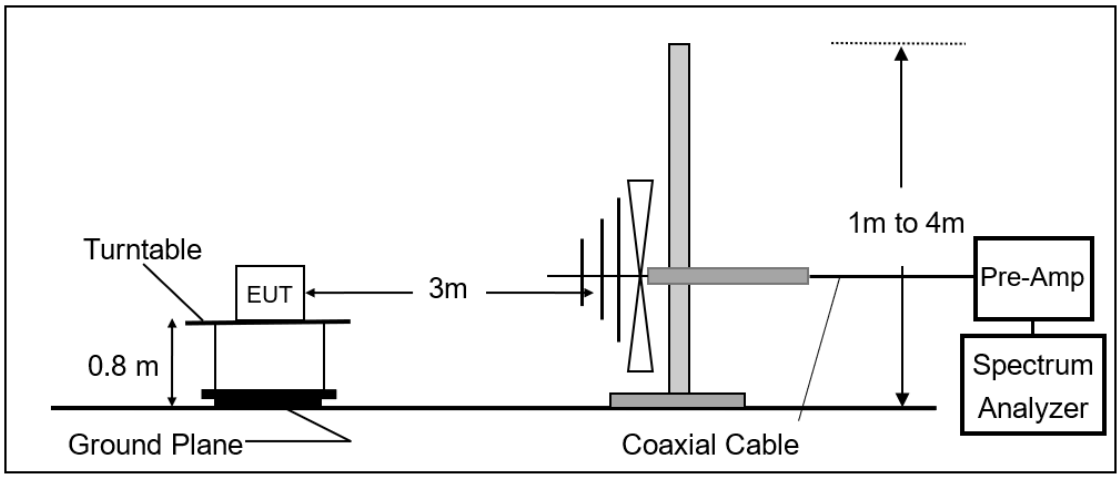
Note: *Measurement setup for testing on Antenna connector*

8.3 Out of Band Emission At Antenna Terminals

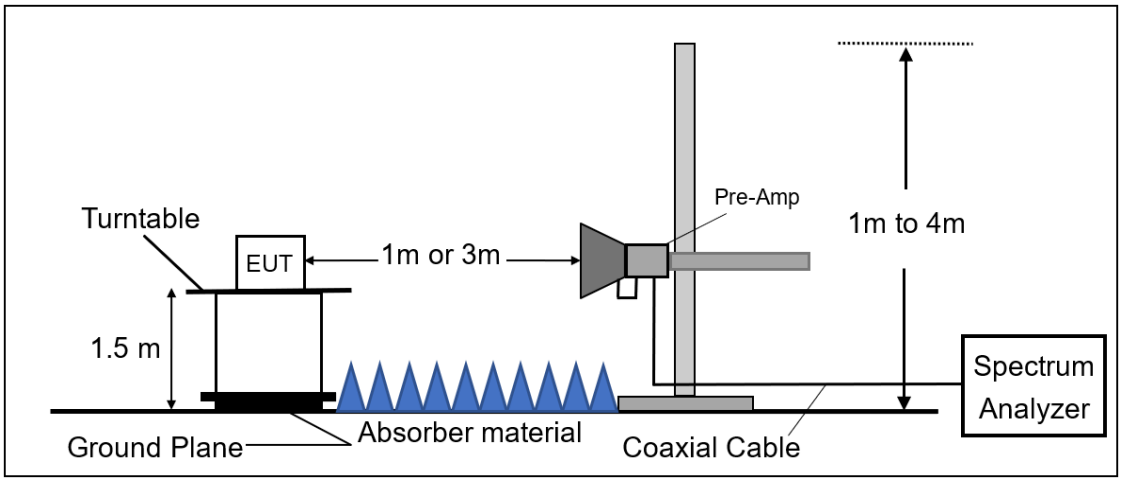


8.4 Field Strength of Spurious Radiation Measurement

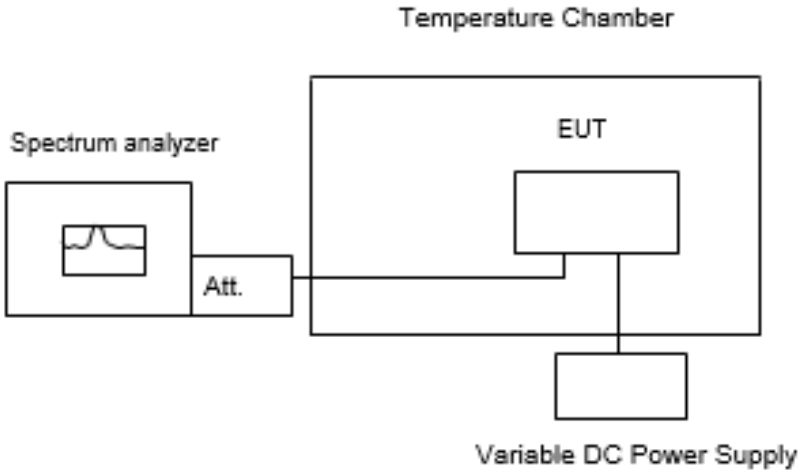
Radiated Emission Test Set-Up, Frequency From 30MHz to 1000MHz.



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

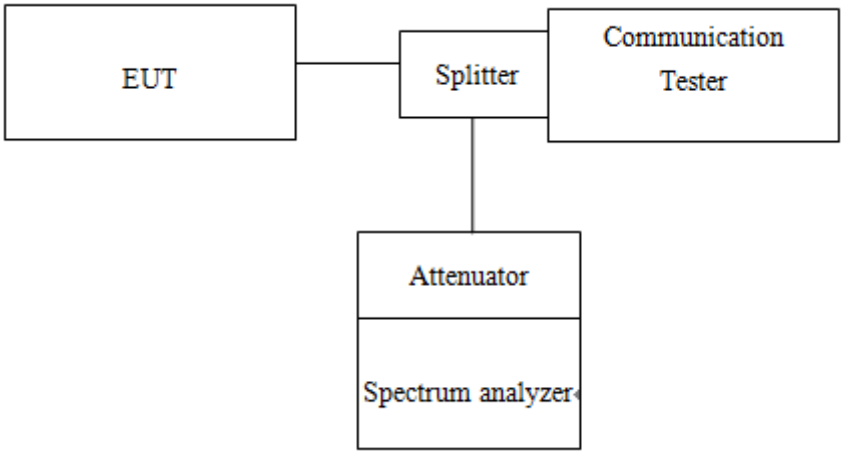


8.5 Frequency Stability Measurement



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%.

99% Bandwidth with detector sample

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% ~ 5% of emission BW, VBW= 3 times RBW.
Set RBW= 1% ~ 5%, 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 20°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 20°C. 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 ~