

**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.
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Japan

ISED Applicant: Alps Alpine Co., Ltd.
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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: TERF2405001540E2

FCC ID CWTUMNZ1A2

IC: 1788F-UMNZ1A2

Date of EUT Received: May 30, 2024

Date of Test: Jun. 13, 2024 ~ Sep. 30, 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 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, 192, 199.

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
TERF2405001540E2	00	Original.	Aug. 07, 2024	Yami Kuo	
TERF2405001540E2	01	Revise chapter 1.2	Sep. 26, 2024	Yami Kuo	*
TERF2405001540E2	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).

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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

NR Band 2			
BW (MHz)	Operation Frequency (MHz)		
5	1852.5	-	1907.5
10	1855.0	-	1905.0
15	1857.5	-	1902.5
20	1860.0	-	1900.0

NR Band 5			
BW (MHz)	Operation Frequency (MHz)		
5	826.5	-	846.5
10	829.0	-	844.0
15	831.5	-	841.5
20	834.0	-	839.0

NR Band 41			
BW (MHz)	Operation Frequency (MHz)		
20	2506.0	-	2680.0
30	2511.0	-	2675.0
40	2516.0	-	2670.0
50	2521.0	-	2665.0
60	2526.0	-	2660.0
80	2536.0	-	2650.0
90	2541.0	-	2645.0
100	2546.0	-	2640.0

NR Band 66			
BW (MHz)	Operation Frequency (MHz)		
5	1712.5	-	1777.5
10	1715.0	-	1775.0
15	1717.5	-	1772.5
20	1720.0	-	1770.0
40	1730.0	-	1760.0

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NR 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

NR Band 77 (lower)			
BW (MHz)	Operation Frequency (MHz)		
20	3460.0	-	3540.0
30	3465.0	-	3535.0
40	3470.0	-	3530.0
50	3475.0	-	3525.0
60	3480.0	-	3520.0
70	3485.0	-	3515.0
80	3490.0	-	3510.0
90	3495.0	-	3505.0
100	3500.0		

NR Band 77 (upper)			
BW (MHz)	Operation Frequency (MHz)		
20	3710.0	-	3970.0
30	3715.0	-	3965.0
40	3720.0	-	3960.0
50	3725.0	-	3955.0
60	3730.0	-	3950.0
70	3735.0	-	3945.0
80	3740.0	-	3940.0
90	3745.0	-	3935.0
100	3750.0	-	3930.0

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1.3 Antenna Designation

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

SIM 1

5G NR Bands	Frequency (MHz)	Peak Antenna Gain (dBi)			
		Ant1	Ant2	Ant3	Ant4
2	1850 ~ 1910	3.04	3.09	3.3	2.68
5	824 ~ 849	1.27	2.68	3.15	3.06
41	2496 ~ 2690	2.97	3.22	3.32	3.84
66	1710 ~ 1780	3.17	2.91	3.32	2.51
71	663 ~ 698	3.35	2.94	3.73	3.16
77	3450 ~ 3550	3.37	3.68	3.96	3.36
77	3700 ~ 3980	3.37	3.68	3.96	3.36

Note: Antenna information is provided by the applicant.

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

SIM 1_SISO

5G NR Band n2_Uplink frequency band : 1850 to 1910 MHz									
Bandwidth (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
5	1852.5	1907.5	DFT-s PI/2 BPSK	23.49	26.79	0.478	4.5559	4555.9	4M56G7W
			DFT-s QPSK	23.02	26.32	0.429	4.5729	4572.9	4M57G7W
			DFT-s QAM	22.39	25.69	0.371	4.5759	4575.9	4M58D7W
			CP QPSK	21.87	25.17	0.329	4.5729	4572.9	4M57G7W
			CP QAM	21.41	24.71	0.296	4.5729	4572.9	4M57D7W
10	1855	1905	DFT-s PI/2 BPSK	23.52	26.82	0.481	8.97	8970.0	8M97G7W
			DFT-s QPSK	23.15	26.45	0.442	8.9535	8953.5	8M95G7W
			DFT-s QAM	22.44	25.74	0.375	8.9687	8968.7	8M97D7W
			CP QPSK	21.93	25.23	0.333	8.9535	8953.5	8M95G7W
			CP QAM	21.32	24.62	0.290	8.9687	8968.7	8M97D7W
15	1857.5	1902.5	DFT-s PI/2 BPSK	23.37	26.67	0.465	13.477	13477.0	13M5G7W
			DFT-s QPSK	22.93	26.23	0.420	13.454	13454.0	13M5G7W
			DFT-s QAM	22.43	25.73	0.374	13.471	13471.0	13M5D7W
			CP QPSK	21.98	25.28	0.337	13.454	13454.0	13M5G7W
			CP QAM	21.39	24.69	0.294	13.454	13454.0	13M5D7W
20	1860	1900	DFT-s PI/2 BPSK	23.38	26.68	0.466	17.901	17901.0	17M9G7W
			DFT-s QPSK	22.94	26.24	0.421	17.92	17920.0	17M9G7W
			DFT-s QAM	22.38	25.68	0.370	17.921	17921.0	17M9D7W
			CP QPSK	21.99	25.29	0.338	17.92	17920.0	17M9G7W
			CP QAM	21.34	24.64	0.291	17.921	17921.0	17M9D7W

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5G NR Band n5_Uplink frequency band : 824 to 849 MHz									
Bandwidth (MHz)	Low Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	ERP Average (dBm)	ERP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
5	826.5	846.5	DFT-s PI/2 BPSK	23.09	24.09	0.256	4.5519	4551.9	4M55G7W
			DFT-s QPSK	22.66	23.66	0.232	4.5557	4555.7	4M56G7W
			DFT-s QAM	22.21	23.21	0.209	4.5814	4581.4	4M58D7W
			CP QPSK	21.54	22.54	0.179	4.5557	4555.7	4M56G7W
			CP QAM	20.99	21.99	0.158	4.5557	4555.7	4M56D7W
10	829	844	DFT-s PI/2 BPSK	23.05	24.05	0.254	8.9432	8943.2	8M94G7W
			DFT-s QPSK	22.56	23.56	0.227	8.9484	8948.4	8M95G7W
			DFT-s QAM	22.29	23.29	0.213	8.99	8990.0	8M99D7W
			CP QPSK	21.56	22.56	0.180	8.9484	8948.4	8M95G7W
			CP QAM	21.01	22.01	0.159	8.99	8990.0	8M99D7W
15	831.5	841.5	DFT-s PI/2 BPSK	22.95	23.95	0.248	13.465	13465.0	13M5G7W
			DFT-s QPSK	22.53	23.53	0.225	13.415	13415.0	13M4G7W
			DFT-s QAM	22.27	23.27	0.212	13.431	13431.0	13M4D7W
			CP QPSK	21.58	22.58	0.181	13.415	13415.0	13M4G7W
			CP QAM	21.09	22.09	0.162	13.415	13415.0	13M4D7W
20	834	839	DFT-s PI/2 BPSK	22.95	23.95	0.248	17.863	17863.0	17M9G7W
			DFT-s QPSK	22.50	23.50	0.224	17.897	17897.0	17M9G7W
			DFT-s QAM	22.24	23.24	0.211	17.9	17900.0	17M9D7W
			CP QPSK	21.59	22.59	0.182	17.897	17897.0	17M9G7W
			CP QAM	21.03	22.03	0.160	17.9	17900.0	17M9D7W

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FCC 5G NR Band n41_Uplink frequency band : 2496 to 2690 MHz

Bandwidth (MHz)	Low Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
20	2506.02	2679.99	DFT-s PI/2 BPSK	23.94	27.26	0.532	17.913	17913.0	17M9G7W
			DFT-s QPSK	23.49	26.81	0.480	17.884	17884.0	17M9G7W
			DFT-s QAM	22.70	26.02	0.400	17.956	17956.0	18M0D7W
			CP QPSK	22.43	25.75	0.376	17.884	17884.0	17M9G7W
			CP QAM	21.66	24.98	0.315	17.956	17956.0	18M0D7W
30	2511	2674.98	DFT-s PI/2 BPSK	24.24	27.56	0.570	26.836	26836.0	26M8G7W
			DFT-s QPSK	23.86	27.18	0.522	26.85	26850.0	26M9G7W
			DFT-s QAM	22.71	26.03	0.401	26.858	26858.0	26M9D7W
			CP QPSK	22.43	25.75	0.376	26.85	26850.0	26M9G7W
			CP QAM	21.64	24.96	0.313	26.858	26858.0	26M9D7W
40	2516.01	2670	DFT-s PI/2 BPSK	24.06	27.38	0.547	35.711	35711.0	35M7G7W
			DFT-s QPSK	23.54	26.86	0.485	35.769	35769.0	35M8G7W
			DFT-s QAM	22.66	25.98	0.396	35.834	35834.0	35M8D7W
			CP QPSK	22.42	25.74	0.375	35.769	35769.0	35M8G7W
			CP QAM	21.56	24.88	0.308	35.834	35834.0	35M8D7W
50	2521.02	2664.99	DFT-s PI/2 BPSK	24.15	27.47	0.558	45.774	45774.0	45M8G7W
			DFT-s QPSK	23.74	27.06	0.508	45.782	45782.0	45M8G7W
			DFT-s QAM	22.67	25.99	0.397	45.832	45832.0	45M8D7W
			CP QPSK	22.41	25.73	0.374	45.782	45782.0	45M8G7W
			CP QAM	21.62	24.94	0.312	45.832	45832.0	45M8D7W
60	2526	2659.98	DFT-s PI/2 BPSK	23.59	26.91	0.491	57.901	57901.0	57M9G7W
			DFT-s QPSK	23.20	26.52	0.449	57.932	57932.0	57M9G7W
			DFT-s QAM	22.73	26.05	0.403	57.945	57945.0	57M9D7W
			CP QPSK	22.35	25.67	0.369	57.932	57932.0	57M9G7W
			CP QAM	21.57	24.89	0.308	57.945	57945.0	57M9D7W
80	2536.02	2649.99	DFT-s PI/2 BPSK	24.22	27.54	0.568	77.098	77098.0	77M1G7W
			DFT-s QPSK	23.66	26.98	0.499	77.177	77177.0	77M2G7W
			DFT-s QAM	22.70	26.02	0.400	77.198	77198.0	77M2D7W
			CP QPSK	22.42	25.74	0.375	77.177	77177.0	77M2G7W
			CP QAM	21.60	24.92	0.310	77.198	77198.0	77M2D7W
90	2541	2644.98	DFT-s PI/2 BPSK	24.13	27.45	0.556	86.668	86668.0	86M7G7W
			DFT-s QPSK	23.72	27.04	0.506	86.758	86758.0	86M8G7W
			DFT-s QAM	22.71	26.03	0.401	87.027	87027.0	87M0D7W
			CP QPSK	22.37	25.69	0.371	86.758	86758.0	86M8G7W
			CP QAM	21.63	24.95	0.313	87.027	87027.0	87M0D7W
100	2546.01	2640	DFT-s PI/2 BPSK	24.07	27.39	0.548	96.396	96396.0	96M4G7W
			DFT-s QPSK	23.67	26.99	0.500	96.377	96377.0	96M4G7W
			DFT-s QAM	22.70	26.02	0.400	96.512	96512.0	96M5D7W
			CP QPSK	22.40	25.72	0.373	96.377	96377.0	96M4G7W
			CP QAM	21.59	24.91	0.310	96.512	96512.0	96M5D7W

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IC 5G NR Band n41_Uplink frequency band : 2500 to 2690 MHz									
Bandwidth (MHz)	Low Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
20	2510.01	2679.99	DFT-s PI/2 BPSK	23.94	27.26	0.532	17.913	17913.0	17M9G7W
			DFT-s QPSK	23.49	26.81	0.480	17.87	17870.0	17M9G7W
			DFT-s QAM	22.70	26.02	0.400	17.956	17956.0	18M0D7W
			CP QPSK	22.43	25.75	0.376	17.87	17870.0	17M9G7W
			CP QAM	21.66	24.98	0.315	17.956	17956.0	18M0D7W
30	2515.02	2674.98	DFT-s PI/2 BPSK	24.22	27.54	0.568	26.836	26836.0	26M8G7W
			DFT-s QPSK	23.86	27.18	0.522	26.85	26850.0	26M9G7W
			DFT-s QAM	22.71	26.03	0.401	26.858	26858.0	26M9D7W
			CP QPSK	22.43	25.75	0.376	26.85	26850.0	26M9G7W
			CP QAM	21.64	24.96	0.313	26.858	26858.0	26M9D7W
40	2520	2670	DFT-s PI/2 BPSK	23.98	27.30	0.537	35.711	35711.0	35M7G7W
			DFT-s QPSK	23.54	26.86	0.485	35.769	35769.0	35M8G7W
			DFT-s QAM	22.66	25.98	0.396	35.834	35834.0	35M8D7W
			CP QPSK	22.42	25.74	0.375	35.769	35769.0	35M8G7W
			CP QAM	21.51	24.83	0.304	35.834	35834.0	35M8D7W
50	2525.01	2664.99	DFT-s PI/2 BPSK	24.15	27.47	0.558	45.774	45774.0	45M8G7W
			DFT-s QPSK	23.74	27.06	0.508	45.782	45782.0	45M8G7W
			DFT-s QAM	22.67	25.99	0.397	45.832	45832.0	45M8D7W
			CP QPSK	22.41	25.73	0.374	45.782	45782.0	45M8G7W
			CP QAM	21.62	24.94	0.312	45.832	45832.0	45M8D7W
60	2530.02	2659.98	DFT-s PI/2 BPSK	23.59	26.91	0.491	57.901	57901.0	57M9G7W
			DFT-s QPSK	23.20	26.52	0.449	57.932	57932.0	57M9G7W
			DFT-s QAM	22.65	25.97	0.395	57.945	57945.0	57M9D7W
			CP QPSK	22.35	25.67	0.369	57.932	57932.0	57M9G7W
			CP QAM	21.53	24.85	0.305	57.945	57945.0	57M9D7W
80	2540.01	2649.99	DFT-s PI/2 BPSK	24.22	27.54	0.568	77.098	77098.0	77M1G7W
			DFT-s QPSK	23.66	26.98	0.499	77.177	77177.0	77M2G7W
			DFT-s QAM	22.70	26.02	0.400	77.174	77174.0	77M2D7W
			CP QPSK	22.42	25.74	0.375	77.177	77177.0	77M2G7W
			CP QAM	21.60	24.92	0.310	77.174	77174.0	77M2D7W
90	2545.02	2644.98	DFT-s PI/2 BPSK	24.13	27.45	0.556	86.668	86668.0	86M7G7W
			DFT-s QPSK	23.72	27.04	0.506	86.758	86758.0	86M8G7W
			DFT-s QAM	22.71	26.03	0.401	86.87	86870.0	86M9D7W
			CP QPSK	22.37	25.69	0.371	86.758	86758.0	86M8G7W
			CP QAM	21.63	24.95	0.313	86.87	86870.0	86M9D7W
100	2550	2640	DFT-s PI/2 BPSK	24.05	27.37	0.546	96.363	96363.0	96M4G7W
			DFT-s QPSK	23.67	26.99	0.500	96.36	96360.0	96M4G7W
			DFT-s QAM	22.70	26.02	0.400	96.512	96512.0	96M5D7W
			CP QPSK	22.40	25.72	0.373	96.36	96360.0	96M4G7W
			CP QAM	21.59	24.91	0.310	96.512	96512.0	96M5D7W

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5G NR Band n66_Uplink frequency band : 1710 to 1780 MHz

Bandwidth (MHz)	Low Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
5	1712.5	1777.5	DFT-s PI/2 BPSK	23.47	26.79	0.478	4.569	4569.0	4M57G7W
			DFT-s QPSK	23.01	26.33	0.430	4.5679	4567.9	4M57G7W
			DFT-s QAM	22.08	25.40	0.347	4.5754	4575.4	4M58D7W
			CP QPSK	21.47	24.79	0.301	4.5679	4567.9	4M57G7W
			CP QAM	21.18	24.50	0.282	4.5679	4567.9	4M57D7W
10	1715	1775	DFT-s PI/2 BPSK	23.26	26.58	0.455	8.9628	8962.8	8M96G7W
			DFT-s QPSK	22.86	26.18	0.415	8.9567	8956.7	8M96G7W
			DFT-s QAM	22.10	25.42	0.348	8.9723	8972.3	8M97D7W
			CP QPSK	21.46	24.78	0.301	8.9567	8956.7	8M96G7W
			CP QAM	21.14	24.46	0.279	8.9723	8972.3	8M97D7W
15	1717.5	1772.5	DFT-s PI/2 BPSK	23.56	26.88	0.488	13.438	13438.0	13M4G7W
			DFT-s QPSK	23.08	26.40	0.437	13.482	13482.0	13M5G7W
			DFT-s QAM	22.06	25.38	0.345	13.476	13476.0	13M5D7W
			CP QPSK	21.45	24.77	0.300	13.482	13482.0	13M5G7W
			CP QAM	21.10	24.42	0.277	13.482	13482.0	13M5D7W
20	1720	1770	DFT-s PI/2 BPSK	23.25	26.57	0.454	17.887	17887.0	17M9G7W
			DFT-s QPSK	22.81	26.13	0.410	17.877	17877.0	17M9G7W
			DFT-s QAM	22.02	25.34	0.342	17.937	17937.0	17M9D7W
			CP QPSK	21.36	24.68	0.294	17.877	17877.0	17M9G7W
			CP QAM	21.17	24.49	0.281	17.937	17937.0	17M9D7W
40	1730	1760	DFT-s PI/2 BPSK	23.39	26.71	0.469	38.544	38544.0	38M5G7W
			DFT-s QPSK	23.35	26.67	0.465	38.615	38615.0	38M6G7W
			DFT-s QAM	22.10	25.42	0.348	38.635	38635.0	38M6D7W
			CP QPSK	21.46	24.78	0.301	38.615	38615.0	38M6G7W
			CP QAM	21.13	24.45	0.279	38.635	38635.0	38M6D7W

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5G NR Band n71_Uplink frequency band : 663 to 698 MHz

Bandwidth (MHz)	Low Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	ERP Average (dBm)	ERP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
5	665.5	695.5	DFT-s PI/2 BPSK	23.51	25.09	0.323	4.5566	4556.6	4M56G7W
			DFT-s QPSK	23.10	24.68	0.294	4.561	4561.0	4M56G7W
			DFT-s QAM	22.35	23.93	0.247	4.5781	4578.1	4M58D7W
			CP QPSK	21.88	23.46	0.222	4.561	4561.0	4M56G7W
			CP QAM	21.15	22.73	0.187	4.561	4561.0	4M56D7W
10	668	693	DFT-s PI/2 BPSK	23.20	24.78	0.301	8.9693	8969.3	8M97G7W
			DFT-s QPSK	22.83	24.41	0.276	8.9579	8957.9	8M96G7W
			DFT-s QAM	22.38	23.96	0.249	8.9863	8986.3	8M99D7W
			CP QPSK	21.92	23.50	0.224	8.9579	8957.9	8M96G7W
			CP QAM	21.06	22.64	0.184	8.9863	8986.3	8M99D7W
15	670.5	690.5	DFT-s PI/2 BPSK	23.49	25.07	0.321	13.43	13430.0	13M4G7W
			DFT-s QPSK	22.85	24.43	0.277	13.465	13465.0	13M5G7W
			DFT-s QAM	22.31	23.89	0.245	13.467	13467.0	13M5D7W
			CP QPSK	21.90	23.48	0.223	13.465	13465.0	13M5G7W
			CP QAM	21.15	22.73	0.187	13.465	13465.0	13M5D7W
20	673	688	DFT-s PI/2 BPSK	23.59	25.17	0.329	17.84	17840.0	17M8G7W
			DFT-s QPSK	23.13	24.71	0.296	17.835	17835.0	17M8G7W
			DFT-s QAM	22.43	24.01	0.252	17.893	17893.0	17M9D7W
			CP QPSK	21.92	23.50	0.224	17.835	17835.0	17M8G7W
			CP QAM	21.12	22.70	0.186	17.893	17893.0	17M9D7W

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5G NR Band n77_Part27_Uplink frequency band : 3700 to 3980 MHz

Bandwidth (MHz)	Low Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
20	3710.01	3969.99	DFT-s PI/2 BPSK	22.97	26.93	0.493	17.946	17946.0	17M9G7W
			DFT-s QPSK	22.54	26.50	0.447	17.92	17920.0	17M9G7W
			DFT-s QAM	21.75	25.71	0.372	17.979	17979.0	18M0D7W
			CP QPSK	21.37	25.33	0.341	17.92	17920.0	17M9G7W
			CP QAM	20.61	24.57	0.286	17.979	17979.0	18M0D7W
30	3715.02	3964.98	DFT-s PI/2 BPSK	23.18	27.14	0.518	26.739	26739.0	26M7G7W
			DFT-s QPSK	22.52	26.48	0.445	26.827	26827.0	26M8G7W
			DFT-s QAM	21.75	25.71	0.372	26.839	26839.0	26M8D7W
			CP QPSK	21.33	25.29	0.338	26.827	26827.0	26M8G7W
			CP QAM	20.63	24.59	0.288	26.839	26839.0	26M8D7W
40	3720	3960	DFT-s PI/2 BPSK	23.15	27.11	0.514	35.82	35820.0	35M8G7W
			DFT-s QPSK	22.78	26.74	0.472	35.804	35804.0	35M8G7W
			DFT-s QAM	21.76	25.72	0.373	35.794	35794.0	35M8D7W
			CP QPSK	21.33	25.29	0.338	35.804	35804.0	35M8G7W
			CP QAM	20.74	24.70	0.295	35.794	35794.0	35M8D7W
50	3725.01	3954.99	DFT-s PI/2 BPSK	22.78	26.74	0.472	45.758	45758.0	45M8G7W
			DFT-s QPSK	22.34	26.30	0.427	45.882	45882.0	45M9G7W
			DFT-s QAM	21.79	25.75	0.376	45.852	45852.0	45M9D7W
			CP QPSK	21.38	25.34	0.342	45.882	45882.0	45M9G7W
			CP QAM	20.65	24.61	0.289	45.852	45852.0	45M9D7W
60	3730.02	3949.98	DFT-s PI/2 BPSK	23.10	27.06	0.508	57.933	57933.0	57M9G7W
			DFT-s QPSK	22.62	26.58	0.455	57.997	57997.0	58M0G7W
			DFT-s QAM	21.68	25.64	0.366	58.21	58210.0	58M2D7W
			CP QPSK	21.40	25.36	0.344	57.997	57997.0	58M0G7W
			CP QAM	20.71	24.67	0.293	58.21	58210.0	58M2D7W
70	3735	3945	DFT-s PI/2 BPSK	23.05	27.01	0.502	64.255	64255.0	64M3G7W
			DFT-s QPSK	22.73	26.69	0.467	64.363	64363.0	64M4G7W
			DFT-s QAM	21.78	25.74	0.375	64.374	64374.0	64M4D7W
			CP QPSK	21.35	25.31	0.340	64.363	64363.0	64M4G7W
			CP QAM	20.74	24.70	0.295	64.374	64374.0	64M4D7W
80	3740.01	3939.99	DFT-s PI/2 BPSK	23.02	26.98	0.499	77.124	77124.0	77M1G7W
			DFT-s QPSK	22.71	26.67	0.465	77.319	77319.0	77M3G7W
			DFT-s QAM	21.73	25.69	0.371	77.117	77117.0	77M1D7W
			CP QPSK	21.40	25.36	0.344	77.319	77319.0	77M3G7W
			CP QAM	20.63	24.59	0.288	77.117	77117.0	77M1D7W
90	3745.02	3934.98	DFT-s PI/2 BPSK	23.05	27.01	0.502	87.064	87064.0	87M1G7W
			DFT-s QPSK	22.69	26.65	0.462	86.876	86876.0	86M9G7W
			DFT-s QAM	21.80	25.76	0.377	87.022	87022.0	87M0D7W
			CP QPSK	21.41	25.37	0.344	86.876	86876.0	86M9G7W
			CP QAM	20.68	24.64	0.291	87.022	87022.0	87M0D7W
100	3750	3930	DFT-s PI/2 BPSK	23.01	26.97	0.498	96.405	96405.0	96M4G7W
			DFT-s QPSK	22.60	26.56	0.453	96.55	96550.0	96M6G7W
			DFT-s QAM	21.75	25.71	0.372	96.695	96695.0	96M7D7W
			CP QPSK	21.39	25.35	0.343	96.55	96550.0	96M6G7W
			CP QAM	20.68	24.64	0.291	96.695	96695.0	96M7D7W

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5G NR Band n77_Part27_Uplink frequency band : 3450 to 3550 MHz

Bandwidth (MHz)	Low Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
20	3460.02	3540	DFT-s PI/2 BPSK	23.25	27.21	0.526	17.905	17905.0	17M9G7W
			DFT-s QPSK	22.84	26.80	0.479	17.928	17928.0	17M9G7W
			DFT-s QAM	21.73	25.69	0.371	17.962	17962.0	18M0D7W
			CP QPSK	21.35	25.31	0.340	17.928	17928.0	17M9G7W
			CP QAM	20.77	24.73	0.297	17.962	17962.0	18M0D7W
30	3465	3534.99	DFT-s PI/2 BPSK	23.15	27.11	0.514	26.905	26905.0	26M9G7W
			DFT-s QPSK	22.72	26.68	0.466	26.88	26880.0	26M9G7W
			DFT-s QAM	21.79	25.75	0.376	26.919	26919.0	26M9D7W
			CP QPSK	21.26	25.22	0.333	26.88	26880.0	26M9G7W
			CP QAM	20.71	24.67	0.293	26.919	26919.0	26M9D7W
40	3470.01	3529.98	DFT-s PI/2 BPSK	23.18	27.14	0.518	35.719	35719.0	35M7G7W
			DFT-s QPSK	22.77	26.73	0.471	35.757	35757.0	35M8G7W
			DFT-s QAM	21.74	25.70	0.372	35.793	35793.0	35M8D7W
			CP QPSK	21.42	25.38	0.345	35.757	35757.0	35M8G7W
			CP QAM	20.65	24.61	0.289	35.793	35793.0	35M8D7W
50	3475.02	3525	DFT-s PI/2 BPSK	22.97	26.93	0.493	45.724	45724.0	45M7G7W
			DFT-s QPSK	22.62	26.58	0.455	45.799	45799.0	45M8G7W
			DFT-s QAM	21.72	25.68	0.370	45.862	45862.0	45M9D7W
			CP QPSK	21.42	25.38	0.345	45.799	45799.0	45M8G7W
			CP QAM	20.74	24.70	0.295	45.862	45862.0	45M9D7W
60	3480	3519.99	DFT-s PI/2 BPSK	23.15	27.11	0.514	57.884	57884.0	57M9G7W
			DFT-s QPSK	22.67	26.63	0.460	57.847	57847.0	57M8G7W
			DFT-s QAM	21.80	25.76	0.377	58.004	58004.0	58M0D7W
			CP QPSK	21.38	25.34	0.342	57.847	57847.0	57M8G7W
			CP QAM	20.73	24.69	0.294	58.004	58004.0	58M0D7W
70	3485.01	3514.98	DFT-s PI/2 BPSK	23.15	27.11	0.514	64.453	64453.0	64M5G7W
			DFT-s QPSK	22.65	26.61	0.458	64.565	64565.0	64M6G7W
			DFT-s QAM	21.77	25.73	0.374	64.464	64464.0	64M5D7W
			CP QPSK	21.27	25.23	0.333	64.565	64565.0	64M6G7W
			CP QAM	20.74	24.70	0.295	64.464	64464.0	64M5D7W
80	3490.02	3510	DFT-s PI/2 BPSK	23.09	27.05	0.507	77.114	77114.0	77M1G7W
			DFT-s QPSK	22.60	26.56	0.453	77.19	77190.0	77M2G7W
			DFT-s QAM	21.68	25.64	0.366	77.182	77182.0	77M2D7W
			CP QPSK	21.35	25.31	0.340	77.19	77190.0	77M2G7W
			CP QAM	20.77	24.73	0.297	77.182	77182.0	77M2D7W
90	3495	3504.99	DFT-s PI/2 BPSK	23.04	27.00	0.501	86.756	86756.0	86M8G7W
			DFT-s QPSK	22.54	26.50	0.447	86.744	86744.0	86M7G7W
			DFT-s QAM	21.76	25.72	0.373	86.827	86827.0	86M8D7W
			CP QPSK	21.37	25.33	0.341	86.744	86744.0	86M7G7W
			CP QAM	20.74	24.70	0.295	86.827	86827.0	86M8D7W
100	3500.01	3500.01	DFT-s PI/2 BPSK	22.94	26.90	0.490	96.011	96011.0	96M0G7W
			DFT-s QPSK	22.53	26.49	0.446	96.382	96382.0	96M4G7W
			DFT-s QAM	21.65	25.61	0.364	96.48	96480.0	96M5D7W
			CP QPSK	21.27	25.23	0.333	96.382	96382.0	96M4G7W
			CP QAM	20.62	24.58	0.287	96.48	96480.0	96M5D7W

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SIM 1_MIMO

FCC 5G NR Band n41_Uplink frequency band : 2496 to 2690 MHz

Bandwidth (MHz)	Low Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
20	2506.02	2679.99	CP QPSK	22.35	28.51	0.709	18.259	18259.0	18M3G7W
			CP QAM	21.41	27.57	0.571	18.303	18303.0	18M3D7W
30	2511	2674.98	CP QPSK	22.44	28.60	0.724	27.903	27903.0	27M9G7W
			CP QAM	21.55	27.70	0.589	27.93	27930.0	27M9D7W
40	2516.01	2670	CP QPSK	22.51	28.67	0.736	37.932	37932.0	37M9G7W
			CP QAM	21.49	27.65	0.582	37.887	37887.0	37M9D7W
50	2521.02	2664.99	CP QPSK	22.12	28.28	0.673	47.545	47545.0	47M5G7W
			CP QAM	21.44	27.60	0.575	47.58	47580.0	47M6D7W
60	2526	2659.98	CP QPSK	22.34	28.50	0.708	57.905	57905.0	57M9G7W
			CP QAM	21.38	27.53	0.567	57.983	57983.0	58M0D7W
80	2536.02	2649.99	CP QPSK	22.21	28.37	0.687	77.504	77504.0	77M5G7W
			CP QAM	21.32	27.47	0.559	77.555	77555.0	77M6D7W
90	2541	2644.98	CP QPSK	22.34	28.50	0.708	87.366	87366.0	87M4G7W
			CP QAM	21.57	27.72	0.592	87.53	87530.0	87M5D7W
100	2546.01	2640	CP QPSK	22.58	28.73	0.747	97.423	97423.0	97M4G7W
			CP QAM	21.49	27.65	0.582	97.504	97504.0	97M5D7W

IC 5G NR Band n41_Uplink frequency band : 2500 to 2690 MHz

Bandwidth (MHz)	Low Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
20	2510.01	2679.99	CP QPSK	22.35	28.51	0.709	18.259	18259.0	18M3G7W
			CP QAM	21.21	27.36	0.545	18.303	18303.0	18M3D7W
30	2515.02	2674.98	CP QPSK	22.44	28.60	0.724	27.903	27903.0	27M9G7W
			CP QAM	21.35	27.50	0.563	27.93	27930.0	27M9D7W
40	2520	2670	CP QPSK	22.51	28.67	0.736	37.932	37932.0	37M9G7W
			CP QAM	21.32	27.48	0.560	37.887	37887.0	37M9D7W
50	2525.01	2664.99	CP QPSK	22.11	28.27	0.671	47.545	47545.0	47M5G7W
			CP QAM	21.27	27.42	0.552	47.58	47580.0	47M6D7W
60	2530.02	2659.98	CP QPSK	22.34	28.50	0.708	57.905	57905.0	57M9G7W
			CP QAM	21.12	27.27	0.534	57.949	57949.0	57M9D7W
80	2540.01	2649.99	CP QPSK	22.21	28.37	0.687	77.504	77504.0	77M5G7W
			CP QAM	21.14	27.30	0.537	77.554	77554.0	77M6D7W
90	2545.02	2644.98	CP QPSK	22.34	28.50	0.708	87.288	87288.0	87M3G7W
			CP QAM	21.35	27.50	0.563	87.53	87530.0	87M5D7W
100	2550	2640	CP QPSK	22.58	28.73	0.747	97.423	97423.0	97M4G7W
			CP QAM	21.30	27.45	0.556	97.504	97504.0	97M5D7W

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5G NR Band n77_Part27_Uplink frequency band : 3700 to 3980 MHz									
Bandwidth (MHz)	Low Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
20	3710.01	3969.99	CP QPSK	21.74	28.57	0.719	18.252	18252.0	18M3G7W
			CP QAM	20.91	27.74	0.595	18.316	18316.0	18M3D7W
30	3715.02	3964.98	CP QPSK	21.78	28.61	0.726	27.859	27859.0	27M9G7W
			CP QAM	20.94	27.77	0.599	27.969	27969.0	28M0D7W
40	3720	3960	CP QPSK	21.78	28.61	0.726	37.924	37924.0	37M9G7W
			CP QAM	20.87	27.70	0.589	37.99	37990.0	38M0D7W
50	3725.01	3954.99	CP QPSK	21.93	28.76	0.752	47.468	47468.0	47M5G7W
			CP QAM	20.81	27.64	0.580	47.721	47721.0	47M7D7W
60	3730.02	3949.98	CP QPSK	22.05	28.88	0.773	57.887	57887.0	57M9G7W
			CP QAM	20.96	27.79	0.602	58.159	58159.0	58M2D7W
70	3735	3945	CP QPSK	21.90	28.73	0.746	67.486	67486.0	67M5G7W
			CP QAM	21.11	27.94	0.623	67.576	67576.0	67M6D7W
80	3740.01	3939.99	CP QPSK	21.91	28.74	0.748	77.546	77546.0	77M5G7W
			CP QAM	20.13	26.96	0.497	77.606	77606.0	77M6D7W
90	3745.02	3934.98	CP QPSK	21.96	28.79	0.757	87.71	87710.0	87M7G7W
			CP QAM	21.19	28.02	0.633	87.639	87639.0	87M6D7W
100	3750	3930	CP QPSK	22.14	28.97	0.789	97.599	97599.0	97M6G7W
			CP QAM	20.99	27.82	0.605	97.702	97702.0	97M7D7W
5G NR Band n77_Part27_Uplink frequency band : 3450 to 3550 MHz									
Bandwidth (MHz)	Low Frequency (MHz)	Upper Frequency (MHz)	Modulation	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Average (W)	99% BW (MHz)	99% BW (kHz)	Type of Emission
20	3460.02	3540	CP QPSK	21.83	28.66	0.735	18.276	18276.0	18M3G7W
			CP QAM	21.14	27.97	0.627	18.285	18285.0	18M3D7W
30	3465	3534.99	CP QPSK	21.86	28.69	0.739	27.884	27884.0	27M9G7W
			CP QAM	21.10	27.93	0.620	27.894	27894.0	27M9D7W
40	3470.01	3529.98	CP QPSK	21.79	28.62	0.728	37.859	37859.0	37M9G7W
			CP QAM	21.06	27.89	0.615	37.947	37947.0	37M9D7W
50	3475.02	3525	CP QPSK	21.95	28.78	0.755	47.567	47567.0	47M6G7W
			CP QAM	20.92	27.75	0.595	47.587	47587.0	47M6D7W
60	3480	3519.99	CP QPSK	21.98	28.81	0.760	57.937	57937.0	57M9G7W
			CP QAM	21.12	27.95	0.623	57.978	57978.0	58M0D7W
70	3485.01	3514.98	CP QPSK	21.92	28.75	0.750	67.54	67540.0	67M5G7W
			CP QAM	21.32	28.15	0.654	67.752	67752.0	67M8D7W
80	3490.02	3510	CP QPSK	21.91	28.74	0.748	77.656	77656.0	77M7G7W
			CP QAM	20.31	27.15	0.518	77.648	77648.0	77M6D7W
90	3495	3504.99	CP QPSK	21.87	28.70	0.741	87.636	87636.0	87M6G7W
			CP QAM	21.42	28.25	0.669	87.615	87615.0	87M6D7W
100	3500.01	3500.01	CP QPSK	22.10	28.93	0.782	96.848	96848.0	96M8G7W
			CP QAM	21.18	28.01	0.632	97.43	97430.0	97M4D7W

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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

ISED RSS-199 Issue 4 July 2023

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.				

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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:

SIM 1_SISO

5G NR BAND n2		
CP-OFDM_SCS 15 kHz		
Test mode	DC voltage (V)	DC current (mA)
Bandwidth:5MHz Mod:256QAM	3.7	460
Bandwidth:10MHz Mod:256QAM	3.7	460
Bandwidth:15MHz Mod:256QAM	3.7	480
Bandwidth:20MHz Mod:256QAM	3.7	490
5G NR BAND n5		
CP-OFDM_SCS 15 kHz		
Test mode	DC voltage (V)	DC current (mA)
Bandwidth:5MHz Mod:256QAM	3.7	370
Bandwidth:10MHz Mod:256QAM	3.7	370
Bandwidth:15MHz Mod:256QAM	3.7	390
Bandwidth:20MHz Mod:256QAM	3.7	420
5G NR BAND n41		
CP-OFDM_SCS 30 kHz		
Test mode	DC voltage (V)	DC current (mA)
Bandwidth:20MHz Mod:256QAM	3.7	300
Bandwidth:30MHz Mod:256QAM	3.7	310
Bandwidth:40MHz Mod:256QAM	3.7	330
Bandwidth:50MHz Mod:256QAM	3.7	350
Bandwidth:60MHz Mod:256QAM	3.7	370
Bandwidth:80MHz Mod:256QAM	3.7	400
Bandwidth:90MHz Mod:256QAM	3.7	400
Bandwidth:100MHz Mod:256QAM	3.7	430
5G NR BAND n66		
CP-OFDM_SCS 15 kHz		
Test mode	DC voltage (V)	DC current (mA)
Bandwidth:5MHz Mod:256QAM	3.7	450
Bandwidth:10MHz Mod:256QAM	3.7	460
Bandwidth:15MHz Mod:256QAM	3.7	480
Bandwidth:20MHz Mod:256QAM	3.7	480
Bandwidth:40MHz Mod:256QAM	3.7	540

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5G NR BAND n71		
CP-OFDM_SCS 15 kHz		
Test mode	DC voltage (V)	DC current (mA)
Bandwidth:5MHz Mod:256QAM	3.7	370
Bandwidth:10MHz Mod:256QAM	3.7	380
Bandwidth:15MHz Mod:256QAM	3.7	400
Bandwidth:20MHz Mod:256QAM	3.7	410
5G NR BAND n77		
CP-OFDM_SCS 30 kHz		
Test mode	DC voltage (V)	DC current (mA)
Bandwidth:20MHz Mod:256QAM	3.7	300
Bandwidth:30MHz Mod:256QAM	3.7	320
Bandwidth:40MHz Mod:256QAM	3.7	330
Bandwidth:50MHz Mod:256QAM	3.7	340
Bandwidth:60MHz Mod:256QAM	3.7	350
Bandwidth:70MHz Mod:256QAM	3.7	370
Bandwidth:80MHz Mod:256QAM	3.7	390
Bandwidth:90MHz Mod:256QAM	3.7	410
Bandwidth:100MHz Mod:256QAM	3.7	430

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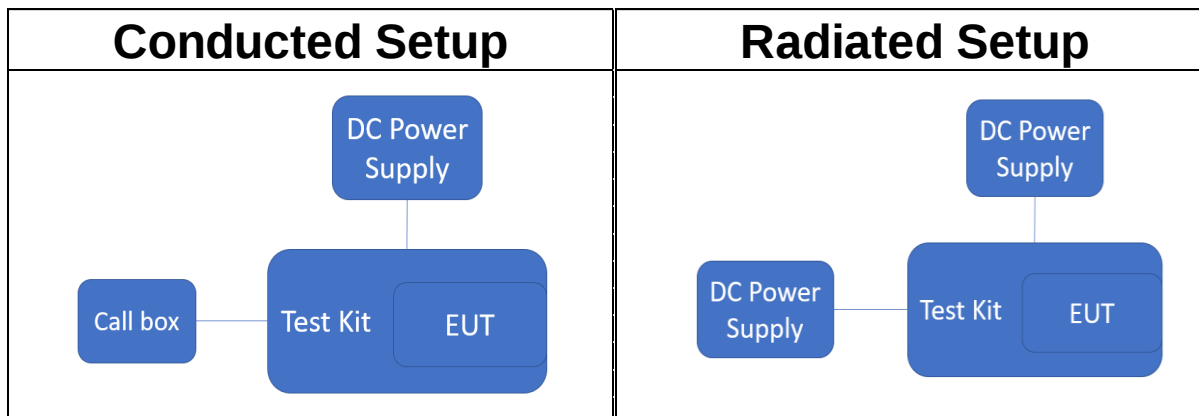
5G NR BAND n41		
CP-OFDM_SCS 30 kHz		
Test mode	DC voltage (V)	DC current (mA)
Bandwidth:20MHz Mod:256QAM	3.7	310
Bandwidth:30MHz Mod:256QAM	3.7	320
Bandwidth:40MHz Mod:256QAM	3.7	340
Bandwidth:50MHz Mod:256QAM	3.7	340
Bandwidth:60MHz Mod:256QAM	3.7	370
Bandwidth:80MHz Mod:256QAM	3.7	390
Bandwidth:90MHz Mod:256QAM	3.7	390
Bandwidth:100MHz Mod:256QAM	3.7	430
5G NR BAND n77		
CP-OFDM_SCS 30 kHz		
Test mode	DC voltage (V)	DC current (mA)
Bandwidth:20MHz Mod:256QAM	3.7	320
Bandwidth:30MHz Mod:256QAM	3.7	320
Bandwidth:40MHz Mod:256QAM	3.7	350
Bandwidth:50MHz Mod:256QAM	3.7	350
Bandwidth:60MHz Mod:256QAM	3.7	360
Bandwidth:70MHz Mod:256QAM	3.7	380
Bandwidth:80MHz Mod:256QAM	3.7	390
Bandwidth:90MHz Mod:256QAM	3.7	430
Bandwidth:100MHz Mod:256QAM	3.7	440

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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	

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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(c)(10) §27.50(d)(4) §27.50(h)(2) §27.50(j)(3) §27.50(k)(3)	RSS-130 §4.6 RSS-132 §5.4 RSS-133 §6.4 RSS-139 §5.5 RSS-199 §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(g) §27.53(h) §27.53(l)(2) §27.53(m)(4)(6) §27.53(n)(2)	RSS-GEN §6.13 RSS-130 §4.7 RSS-132 §5.5 RSS-133 §6.5 RSS-139 §5.6 RSS-199 §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(g) §27.53(h) §27.53(l)(2) §27.53(m)(4) §27.53(n)(2)	RSS-GEN §6.13 RSS-130 §4.7 RSS-132 §5.5 RSS-133 §6.5 RSS-139 §5.6 RSS-199 §5.6	Field Strength of Spurious Radiation	Compliant
§24.232(d) §27.50(d)(5) §27.50(j)(4) §27.50 (k)(4)	RSS-130 §4.6.1 RSS-132 §5.4 RSS-133 §6.4 RSS-139 §5.5 RSS-199 §5.5	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 RSS-199 §5.4	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

SIM 1_SISO

Test Items	Band	Test Channel			Bandwidth (MHz)																Modulation DFT-s-OFDM					Modulation CP-OFDM				RB #							
		L	M	H	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	BPSK	QPSK	16 QAM	64 QAM	256 QAM	QPSK	16 QAM	64 QAM	256 QAM	Edge 1RB_Left	Edge 1RB_Right	Inner 1RB_Left	Inner 1RB_Right	Inner Full	Outer Full			
Conducted Power	2	v	v	v	v	v	v	v	v											v	v	v	v	v	v	v	v	v					v	v	v	v	
Frequency Stability			v																																	v	
Occupied Bandwidth			v	v	v	v	v	v	v	v											v	v	v	v	v											v	
Bandedge			v			v	v	v	v	v											v								v	v							v
Mask																																					
Conducted Emission			v	v	v	v	v	v	v	v											v													v			
CCDF			v	v	v	v	v	v	v	v															v												v
Test Items	Band	Test Channel			Bandwidth (MHz)																Modulation DFT-s-OFDM					Modulation CP-OFDM				RB #							
		L	M	H	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	BPSK	QPSK	16 QAM	64 QAM	256 QAM	QPSK	16 QAM	64 QAM	256 QAM	Edge 1RB_Left	Edge 1RB_Right	Inner 1RB_Left	Inner 1RB_Right	Inner Full	Outer Full			
Conducted Power	5	v	v	v	v	v	v	v	v											v	v	v	v	v	v	v	v	v					v	v	v	v	
Frequency Stability			v																																	v	
Occupied Bandwidth			v	v	v	v	v	v	v	v											v	v	v	v	v											v	
Bandedge			v			v	v	v	v	v											v									v	v						v
Mask																																					
Conducted Emission			v	v	v	v	v	v	v	v											v													v			
CCDF			v	v	v	v	v	v	v	v															v												v
Test Items	Band	Test Channel			Bandwidth (MHz)																Modulation DFT-s-OFDM					Modulation CP-OFDM				RB #							
		L	M	H	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	BPSK	QPSK	16 QAM	64 QAM	256 QAM	QPSK	16 QAM	64 QAM	256 QAM	Edge 1RB_Left	Edge 1RB_Right	Inner 1RB_Left	Inner 1RB_Right	Inner Full	Outer Full			
Conducted Power	41	v	v	v					v											v	v	v	v	v	v	v	v	v					v	v	v	v	
Frequency Stability			v																																	v	
Occupied Bandwidth			v	v	v					v											v	v	v	v	v											v	
Bandedge																																					
Mask			v	v	v					v																			v	v							v
Conducted Emission			v	v	v					v											v																
CCDF			v	v	v					v																											v
Test Items	Band	Test Channel			Bandwidth (MHz)																Modulation DFT-s-OFDM					Modulation CP-OFDM				RB #							
		L	M	H	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	BPSK	QPSK	16 QAM	64 QAM	256 QAM	QPSK	16 QAM	64 QAM	256 QAM	Edge 1RB_Left	Edge 1RB_Right	Inner 1RB_Left	Inner 1RB_Right	Inner Full	Outer Full			
Conducted Power	66	v	v	v	v	v	v	v	v											v	v	v	v	v	v	v	v	v					v	v	v	v	
Frequency Stability			v																																	v	
Occupied Bandwidth			v	v	v	v	v	v	v	v											v	v	v	v	v											v	
Bandedge			v			v	v	v	v	v																				v	v						v
Mask																																					
Conducted Emission			v	v	v	v	v	v	v	v																											
CCDF			v	v	v	v	v	v	v	v																											

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Test Items	Band	Test Channel			Bandwidth (MHz)																Modulation DFT-s-OFDM					Modulation CP-OFDM			RB #							
		L	M	H	5	10	15	20	25	30		40	45	50	60	70	80	90	100	BPSK	QPSK	16 QAM	64 QAM	256 QAM	QPSK	16 QAM	64 QAM	256 QAM	Edge 1RB_Left	Edge 1RB_Right	Inner 1RB_Left	Inner 1RB_Right	Inner Full	Outer Full		
Conducted Power	71	v	v	v	v	v	v	v	v												v	v	v	v	v	v	v	v					v	v	v	v
Frequency Stability			v					v																			v								v	
Occupied Bandwidth		v	v	v	v	v	v	v	v												v	v	v	v	v										v	
Bandedge		v		v	v	v	v	v	v																	v			v	v					v	
Mask																																				
Conducted Emission		v	v	v	v	v	v	v	v												v											v				
CCDF		v	v	v	v	v	v	v	v																v											v
Test Items	Band	Test Channel			Bandwidth (MHz)																Modulation DFT-s-OFDM					Modulation CP-OFDM			RB #							
		L	M	H	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	BPSK	QPSK	16 QAM	64 QAM	256 QAM	QPSK	16 QAM	64 QAM	256 QAM	Edge 1RB_Left	Edge 1RB_Right	Inner 1RB_Left	Inner 1RB_Right	Inner Full	Outer Full		
Conducted Power	77	v	v	v				v		v		v		v	v	v	v	v	v	v	v	v	v	v	v	v	v	v				v	v	v	v	
Frequency Stability			v																								v								v	
Occupied Bandwidth		v	v	v				v		v		v		v	v	v	v	v	v	v	v	v	v	v											v	
Bandedge		v		v				v		v		v		v	v	v	v	v	v	v						v			v	v					v	
Mask																																				
Conducted Emission		v	v	v				v		v		v		v	v	v	v	v	v	v												v				
CCDF		v	v	v				v		v		v		v	v	v	v	v	v					v												v

SIM 1 MIMO

Test Items	Band	Test Channel			Bandwidth (MHz)																Modulation CP-OFDM				RB #					
		L	M	H	5	10	15	20	25	30	40	50	60	70	80	90	100	QPSK	16 QAM	64 QAM	256 QAM	Edge 1RB_Left	Edge 1RB_Right	Inner 1RB_Left	Inner 1RB_Right	Inner Full	Outer Full			
Conducted Power	41	v	v	v				v		v	v	v	v		v	v	v	v	v	v	v				v	v	v	v		
Frequency Stability			v															v	v									v		
Occupied Bandwidth		v	v	v				v		v	v	v	v		v	v	v	v	v	v	v							v		
Bandedge																														
Mask		v	v	v				v		v	v	v	v		v	v	v	v	v				v	v				v		
Conducted Emission		v	v	v				v		v	v	v	v		v	v	v	v	v						v					
CCDF		v	v	v				v		v	v	v	v		v	v	v				v							v		
Test Items	Band	Test Channel			Bandwidth (MHz)																Modulation CP-OFDM				RB #					
		L	M	H	5	10	15	20	25	30	40	50	60	70	80	90	100	QPSK	16 QAM	64 QAM	256 QAM	Edge 1RB_Left	Edge 1RB_Right	Inner 1RB_Left	Inner 1RB_Right	Inner Full	Outer Full			
Conducted Power	77	v	v	v				v		v	v	v	v	v	v	v	v	v	v	v				v	v	v	v			
Frequency Stability			v															v	v								v			
Occupied Bandwidth		v	v	v				v		v	v	v	v		v	v	v	v	v	v	v						v			
Bandedge		v		v				v		v	v	v	v		v	v	v	v	v			v	v				v			
Mask																														
Conducted Emission		v	v	v				v		v	v	v	v		v	v	v	v	v						v					
CCDF		v	v	v				v		v	v	v	v		v	v	v	v			v							v		

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
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 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	PASTERNAK	PE8210	RF157	11/15/2023	11/14/2024
DC Power Supply	Gwinstek	SPD-3606	GEV923152	05/17/2024	05/16/2025
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
UXM 5G Wireless Test Platform	KEYSIGHT	E7515B	MY59321566	02/15/2024	02/14/2025
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
Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	04/10/2024	04/09/2025
UXM 5G Wireless Test Platform	KEYSIGHT	E7515B	MY60192462	06/02/2024	06/01/2025
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.

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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(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.

FCC 27, 50(h)

(2) Mobile and other user stations transmitting in the BRS and EBS bands are limited to 2 W EIRP.

FCC 27, 50(j)

(3) Mobile and portable stations are limited to 1 Watt EIRP. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

FCC 27, 50(k)

(3) Mobile devices are limited to 1Watt (30 dBm) EIRP. Mobile devices operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

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.

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.

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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

RSS-199 §5.5

For mobile subscriber equipment operating in the Band 2500-2690MHz, the e.i.r.p. shall not exceed 2 W.

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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, RSS-199 §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)

(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 §27.53(l)(2)

For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz. Compliance with this paragraph (l)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be either one percent of the emission bandwidth of the fundamental emission of the transmitter or 350 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

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FCC §27.53(m) (4) (6)

For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

FCC §27.53(n)(2)

For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz. Compliance with this paragraph (n)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, but limited to a maximum of 200 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

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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 $43 + 10 \log_{10} p$ (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-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 $43 + 10 \log_{10} p$ (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 $43 + 10 \log_{10} p$ (watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

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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).

a. RSS-199 §5.6

In the 1 MHz band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth for base station and fixed subscriber equipment, and 2% for mobile subscriber equipment. Beyond the 1 MHz band, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% or 2% of the occupied bandwidth, as applicable.

Equipment shall comply with the following unwanted emission limits:

for base station and fixed subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least:

- 40 + 10 $\log_{10} p$ from the channel edges to 5 MHz away
 - 43 + 10 $\log_{10} p$ between 5 MHz and X MHz from the channel edges, and
 - 55 + 10 $\log_{10} p$ at X MHz and beyond from the channel edges
 - In addition, the attenuation shall not be less than $43 + 10 \log_{10} p$ on all frequencies between 2490.5 MHz and 2496 MHz, and $55 + 10 \log_{10} p$ at or below 2490.5 MHz.
- In (a) and (b), p is the transmitter power measured in watts and X is 6 MHz or the equipment occupied bandwidth, whichever is greater.

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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)

RSS-130 §4.7, RSS-132 §5.5, RSS-133 §6.5.1, RSS-139 §5.6, RSS-199 §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.

FCC §27.53(l)(2)

For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz. Compliance with this paragraph (l)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be either one percent of the emission bandwidth of the fundamental emission of the transmitter or 350 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

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FCC §27.53(m) (4) (6)

For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

FCC §27.53(n)(2)

For mobile operations in the 3450-3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz. Compliance with this paragraph (n)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, but limited to a maximum of 200 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

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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 $43 + 10 \log_{10} p$ (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-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 $43 + 10 \log_{10} p(\text{watts})$.
- 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 $43 + 10 \log_{10} p(\text{watts})$. If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

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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).

RSS-199 §5.6

In the 1 MHz band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth for base station and fixed subscriber equipment, and 2% for mobile subscriber equipment. Beyond the 1 MHz band, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% or 2% of the occupied bandwidth, as applicable.

Equipment shall comply with the following unwanted emission limits:

for base station and fixed subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least:

$40 + 10 \log_{10} p$ from the channel edges to 5 MHz away

$43 + 10 \log_{10} p$ between 5 MHz and X MHz from the channel edges, and

$55 + 10 \log_{10} p$ at X MHz and beyond from the channel edges

In addition, the attenuation shall not be less than $43 + 10 \log_{10} p$ on all frequencies between 2490.5 MHz and 2496 MHz, and $55 + 10 \log_{10} p$ at or below 2490.5 MHz.

In (a) and (b), p is the transmitter power measured in watts and X is 6 MHz or the equipment occupied bandwidth, whichever is greater.

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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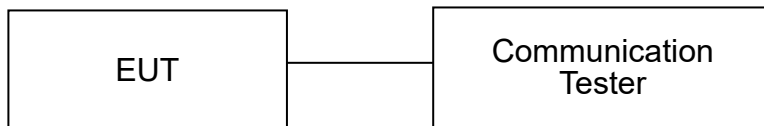
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8 TEST SETUP

8.1 Maximum Output Power



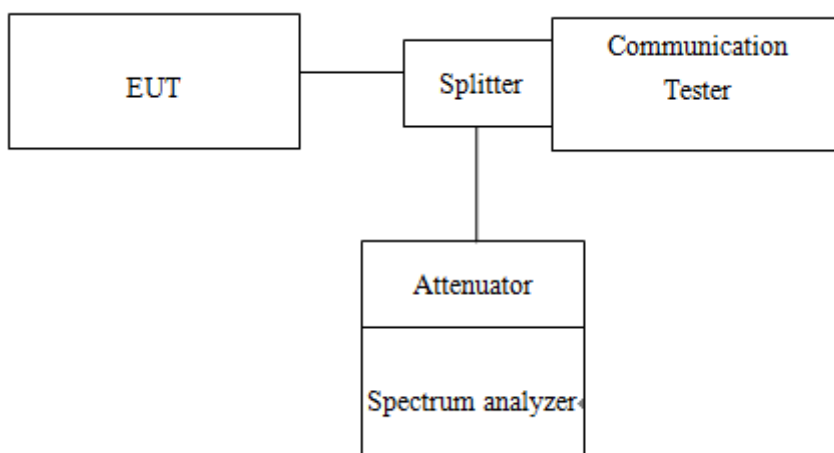
Note: Measurement setup for testing on Antenna connector

8.2 Occupied Bandwidth Measurement



Note: Measurement setup for testing on Antenna connector

8.3 Out of Band Emission At Antenna Terminals

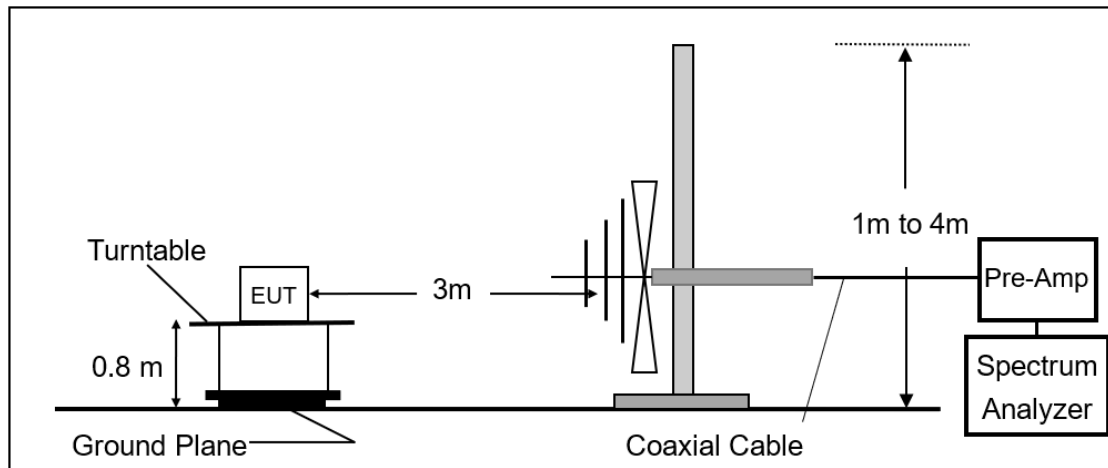


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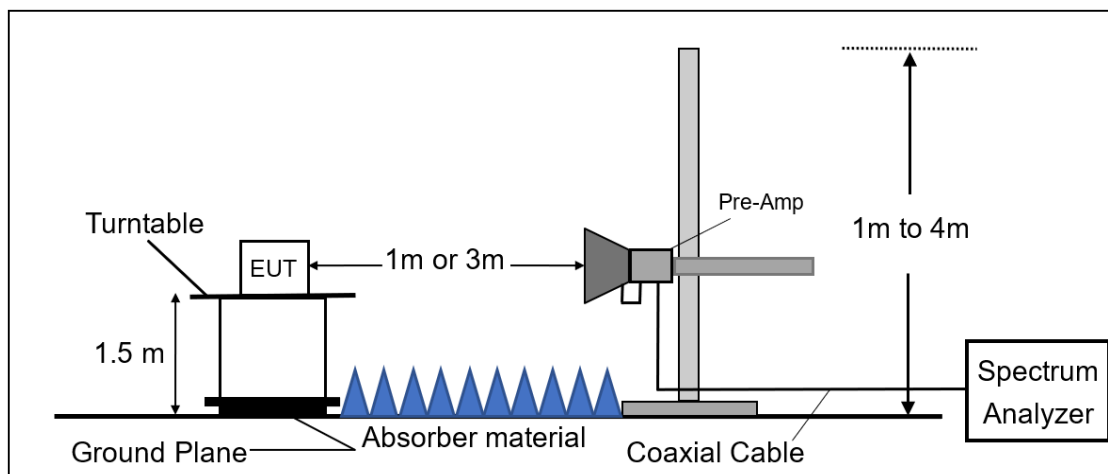
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8.4 Field Strength of Spurious Radiation Measurement

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



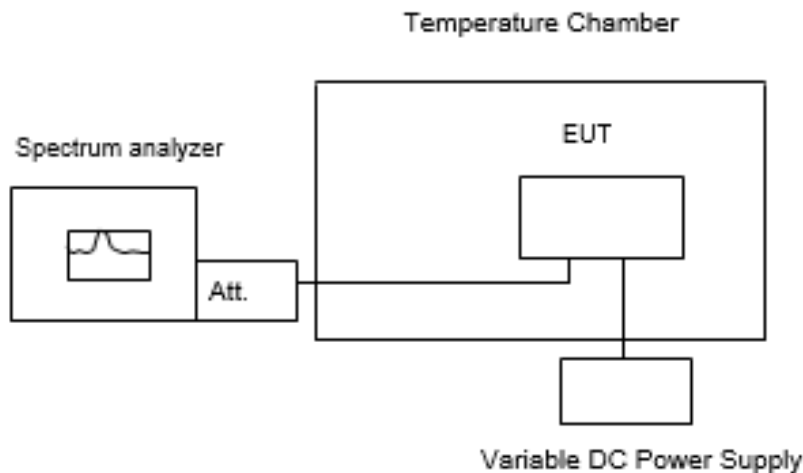
Radiated Emission Test Set-Up, Frequency Above 1GHz.



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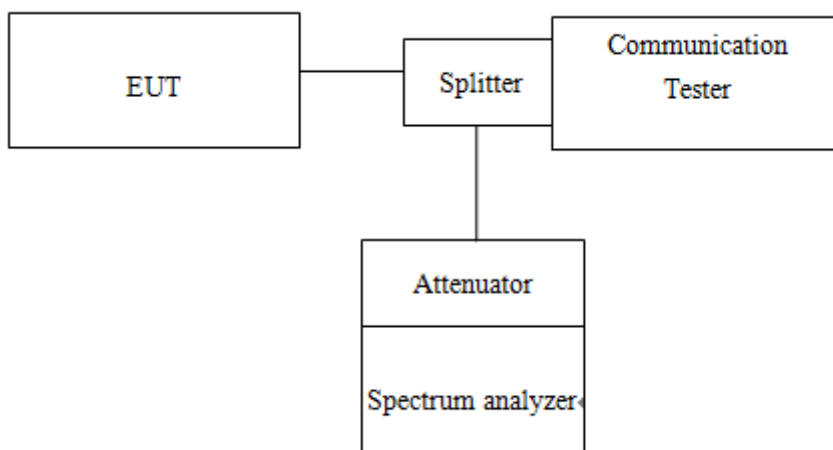
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8.5 Frequency Stability Measurement



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 Guidance

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 P_T , 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%.

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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 $RBW \geq 1\% EBW$.
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.

$$ERP \text{ (dBm)} = SG \text{ Level(dBm)} + \text{Antenna Gain(dBd)} + \text{Cable Loss(dB)}$$

$$EIRP \text{ (dBm)} = SG \text{ Level(dBm)} + \text{Antenna Gain(dBi)} + \text{Cable Loss(dB)}$$

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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 $\geq$ 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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