

8.5.1. OUT OF BAND EMISSIONS RESULT

LTE Band 12

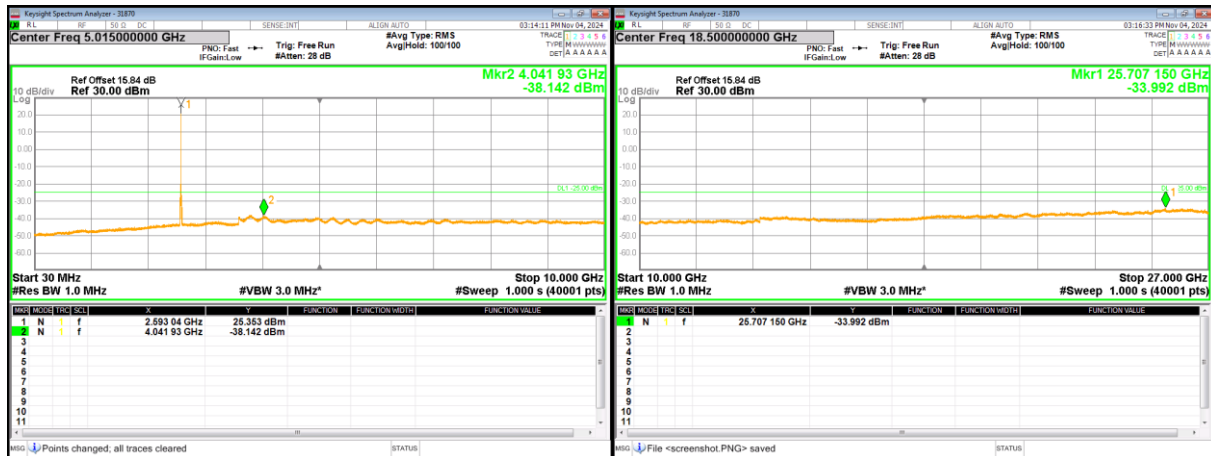


LTE Band 41

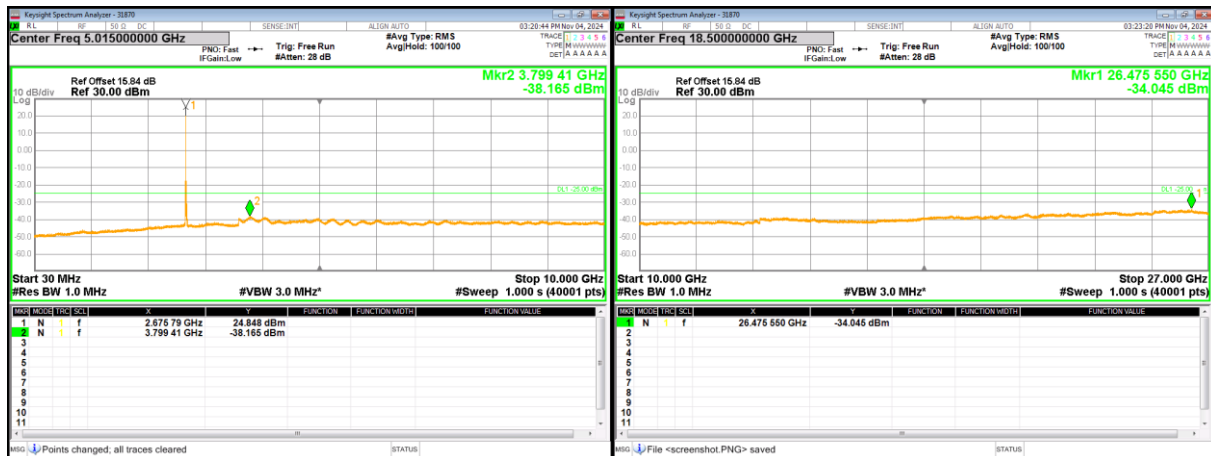
15 MHz QPSK



Low channel



Mid channel



High channel

8.6. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §27.54

LIMITS

§27.54

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

TEST PROCEDURE

Per KDB 971168 D01 Power Meas License Digital Systems v03r01

NOTE

Test were performed each lowest or highest frequency on the modulation condition of more wide bandwidth.(Please refer to OBW results)

RESULTS

See the following pages.

8.6.1. FREQUENCY STABILITY RESULT

LTE Band 12 (Lowest Frequency: 16QAM / Highest Frequency: QPSK)

Test Date	2024-11-13
Test Engineer	31870

Limit		699	716	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	699.1557	715.8451		
Extreme (50C)		699.1557	715.8451	29.1	0.041
Extreme (40C)		699.1557	715.8451	28.3	0.040
Extreme (30C)		699.1557	715.8451	25.8	0.036
Extreme (10C)		699.1557	715.8451	22.1	0.031
Extreme (0C)		699.1557	715.8451	19.6	0.028
Extreme (-10C)		699.1557	715.8451	18.6	0.026
Extreme (-20C)		699.1557	715.8451	19.7	0.028
Extreme (-30C)		699.1557	715.8451	18.5	0.026
20C	15%	699.1557	715.8451	18.5	0.026
	-15%	699.1557	715.8451	13.1	0.019
	End Point	699.1557	715.8451	13.8	0.020

LTE Band 41 (Lowest Frequency: QPSK / Highest Frequency: 16QAM)

Test Date	2024-11-14
Test Engineer	31870

Limit		2496	2690	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	2496.2552	2689.7380		
Extreme (50C)		2496.2552	2689.7380	33.1	0.013
Extreme (40C)		2496.2552	2689.7380	30.3	0.012
Extreme (30C)		2496.2552	2689.7380	28.1	0.011
Extreme (10C)		2496.2552	2689.7380	25.6	0.010
Extreme (0C)		2496.2552	2689.7380	23.4	0.009
Extreme (-10C)		2496.2552	2689.7380	21.2	0.008
Extreme (-20C)		2496.2552	2689.7380	21.0	0.008
Extreme (-30C)		2496.2552	2689.7380	23.3	0.009
20C	15%	2496.2552	2689.7380	31.3	0.012
	-15%	2496.2552	2689.7380	20.2	0.008
	End Point	2496.2552	2689.7380	14.7	0.006

LTE Band 66 (Lowest Frequency: QPSK / Highest Frequency: 16QAM)

Test Date	2024-11-15
Test Engineer	31870

Limit		1710	1780	Delta (Hz)	Frequency Stability (ppm)
Condition		F low @ End of OBW	F high @ End of OBW		
Temperature	Voltage	(MHz)	(MHz)		
Normal (20C)	Normal	1710.1544	1779.8432		
Extreme (50C)		1710.1544	1779.8432	28.5	0.016
Extreme (40C)		1710.1544	1779.8432	26.1	0.015
Extreme (30C)		1710.1544	1779.8432	25.2	0.014
Extreme (10C)		1710.1544	1779.8432	21.6	0.012
Extreme (0C)		1710.1544	1779.8432	18.5	0.011
Extreme (-10C)		1710.1544	1779.8432	21.3	0.012
Extreme (-20C)		1710.1544	1779.8432	20.1	0.012
Extreme (-30C)		1710.1544	1779.8432	19.0	0.011
20C	15%	1710.1544	1779.8432	18.5	0.011
	-15%	1710.1544	1779.8432	10.3	0.006
	End Point	1710.1544	1779.8432	11.3	0.006

9. RADIATED RESULTS

9.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §27.50

LIMITS

§27.50:

(c) (10) - Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

(d)(4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

(h) The following power limits shall apply in the BRS and EBS:

(2) Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.17; ESU40 setting reference to 971168 D01 v03r01

For radiated output power measurement with a ESU40:

- a) Set the RBW $\geq$ OBW;
- b) Set VBW $\geq 3 \times$ RBW;
- c) Set span $\geq 2 \times$ RBW;
- d) Sweep time = auto couple or 1 second;
- e) Detector = rms;
- f) Ensure that the number of measurement points $\geq$ span/RBW;
- g) Trace Mode = average(LTE);

TEST RESULTS

See the following pages.

9.1.1. ERP/EIRP RESULT

LTE Band 12

BW (MHz)	Modulation	Frequency (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	ERP (dBm)	ERP (mW)	Limit (dBm)	Delta (dB)	RB
10	QPSK	704.00	20.31	H	2.79	-1.34	16.17	41.40	34.77	-18.60	1/49
		707.50	20.27	H	2.80	-1.34	16.14	41.11	34.77	-18.63	1/49
		711.00	21.22	H	2.81	-1.33	17.09	51.17	34.77	-17.68	1/49
	16-QAM	704.00	17.61	H	2.79	-1.34	13.47	22.23	34.77	-21.30	1/0
		707.50	19.37	H	2.80	-1.34	15.24	33.42	34.77	-19.53	1/49
		711.00	19.00	H	2.81	-1.33	14.87	30.69	34.77	-19.90	1/0
5	QPSK	701.50	18.86	H	2.79	-1.35	14.72	29.65	34.77	-20.05	1/0
		707.50	20.26	H	2.80	-1.34	16.13	41.02	34.77	-18.64	1/12
		713.50	20.42	H	2.81	-1.32	16.29	42.56	34.77	-18.48	1/12
	16-QAM	701.50	17.96	H	2.79	-1.35	13.82	24.10	34.77	-20.95	1/0
		707.50	18.69	H	2.80	-1.34	14.56	28.58	34.77	-20.21	1/0
		713.50	19.26	H	2.81	-1.32	15.13	32.58	34.77	-19.64	1/0
3	QPSK	700.50	18.32	H	2.79	-1.35	14.18	26.18	34.77	-20.59	1/0
		707.50	19.87	H	2.80	-1.34	15.74	37.50	34.77	-19.03	1/0
		714.50	20.70	H	2.82	-1.32	16.56	45.29	34.77	-18.21	1/0
	16-QAM	700.50	17.15	H	2.79	-1.35	13.01	20.00	34.77	-21.76	1/0
		707.50	18.90	H	2.80	-1.34	14.77	29.99	34.77	-20.00	1/8
		714.50	19.61	H	2.82	-1.32	15.47	35.24	34.77	-19.30	1/8
1.4	QPSK	699.70	18.79	H	2.78	-1.35	14.65	29.17	34.77	-20.12	1/3
		707.50	19.89	H	2.80	-1.34	15.76	37.67	34.77	-19.01	1/0
		715.30	21.11	H	2.82	-1.32	16.98	49.89	34.77	-17.79	1/3
	16-QAM	699.70	17.75	H	2.78	-1.35	13.61	22.96	34.77	-21.16	1/3
		707.50	18.84	H	2.80	-1.34	14.71	29.58	34.77	-20.06	1/0
		715.30	19.96	H	2.82	-1.32	15.83	38.28	34.77	-18.94	1/3

LTE Band 41

BW (MHz)	Modulation	Frequency (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)	RB
20	QPSK	2506.00	18.67	H	5.25	10.04	23.46	221.82	33.00	-9.54	1/0
		2593.00	19.48	H	5.34	9.90	24.04	253.51	33.00	-8.96	1/49
		2680.00	18.35	H	5.44	9.88	22.78	189.67	33.00	-10.22	1/49
	16-QAM	2506.00	18.03	H	5.25	10.04	22.82	191.43	33.00	-10.18	1/49
		2593.00	19.03	H	5.34	9.90	23.59	228.56	33.00	-9.41	1/49
		2680.00	17.66	H	5.44	9.88	22.09	161.81	33.00	-10.91	1/49
15	QPSK	2503.50	18.71	H	5.25	10.05	23.51	224.39	33.00	-9.49	1/37
		2593.00	19.47	H	5.34	9.90	24.03	252.93	33.00	-8.97	1/37
		2682.50	18.17	H	5.44	9.88	22.61	182.39	33.00	-10.39	1/0
	16-QAM	2503.50	18.19	H	5.25	10.05	22.99	199.07	33.00	-10.01	1/37
		2593.00	18.94	H	5.34	9.90	23.50	223.87	33.00	-9.50	1/37
		2682.50	17.28	H	5.44	9.88	21.72	148.59	33.00	-11.28	1/37
10	QPSK	2501.00	18.62	H	5.24	10.05	23.43	220.29	33.00	-9.57	1/25
		2593.00	19.34	H	5.34	9.90	23.90	245.47	33.00	-9.10	1/25
		2685.00	18.34	H	5.45	9.89	22.77	189.23	33.00	-10.23	1/25
	16-QAM	2501.00	17.85	H	5.24	10.05	22.66	184.50	33.00	-10.34	1/0
		2593.00	18.80	H	5.34	9.90	23.36	216.77	33.00	-9.64	1/49
		2685.00	17.79	H	5.45	9.89	22.22	166.72	33.00	-10.78	1/25
5	QPSK	2498.50	18.70	H	5.24	10.06	23.52	224.91	33.00	-9.48	1/24
		2593.00	19.29	H	5.34	9.90	23.85	242.66	33.00	-9.15	1/12
		2687.50	18.28	H	5.45	9.89	22.72	187.07	33.00	-10.28	1/12
	16-QAM	2498.50	18.14	H	5.24	10.06	22.96	197.70	33.00	-10.04	1/24
		2593.00	18.65	H	5.34	9.90	23.21	209.41	33.00	-9.79	1/12
		2687.50	17.92	H	5.45	9.89	22.36	172.19	33.00	-10.64	1/0

LTE Band 66

BW (MHz)	Modulation	Frequency (MHz)	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Limit (dBm)	Delta (dB)	RB
20	QPSK	1720.00	15.68	V	4.33	9.50	20.85	121.62	30.00	-9.15	1/99
		1745.00	16.94	V	4.37	9.58	22.16	164.44	30.00	-7.84	1/99
		1770.00	17.56	V	4.40	9.62	22.79	190.11	30.00	-7.21	1/99
	16-QAM	1720.00	14.60	V	4.33	9.50	19.77	94.84	30.00	-10.23	1/49
		1745.00	16.09	V	4.37	9.58	21.31	135.21	30.00	-8.69	1/49
		1770.00	16.59	V	4.40	9.62	21.82	152.05	30.00	-8.18	1/49
15	QPSK	1717.50	15.60	V	4.32	9.49	20.76	119.12	30.00	-9.24	1/37
		1745.00	17.16	V	4.37	9.58	22.38	172.98	30.00	-7.62	1/37
		1772.50	17.80	V	4.40	9.63	23.03	200.91	30.00	-6.97	1/37
	16-QAM	1717.50	14.75	V	4.32	9.49	19.91	97.95	30.00	-10.09	1/37
		1745.00	16.27	V	4.37	9.58	21.49	140.93	30.00	-8.51	1/74
		1772.50	16.80	V	4.40	9.63	22.03	159.59	30.00	-7.97	1/37
10	QPSK	1715.00	15.35	V	4.32	9.48	20.51	112.46	30.00	-9.49	1/0
		1745.00	17.03	V	4.37	9.58	22.25	167.88	30.00	-7.75	1/25
		1775.00	17.80	V	4.40	9.63	23.03	200.91	30.00	-6.97	1/25
	16-QAM	1715.00	14.30	V	4.32	9.48	19.46	88.31	30.00	-10.54	1/49
		1745.00	16.09	V	4.37	9.58	21.31	135.21	30.00	-8.69	1/49
		1775.00	16.85	V	4.40	9.63	22.08	161.44	30.00	-7.92	1/25
5	QPSK	1712.50	15.28	V	4.32	9.47	20.43	110.41	30.00	-9.57	1/12
		1745.00	16.87	V	4.37	9.58	22.09	161.81	30.00	-7.91	1/24
		1777.50	17.05	V	4.40	9.63	22.29	169.43	30.00	-7.71	1/0
	16-QAM	1712.50	14.46	V	4.32	9.47	19.61	91.41	30.00	-10.39	1/0
		1745.00	15.80	V	4.37	9.58	21.02	126.47	30.00	-8.98	1/12
		1777.50	16.16	V	4.40	9.63	21.40	138.04	30.00	-8.60	1/0
3	QPSK	1711.50	15.10	V	4.31	9.47	20.26	106.17	30.00	-9.74	1/14
		1745.00	16.73	V	4.37	9.58	21.95	156.68	30.00	-8.05	1/14
		1778.50	16.85	V	4.40	9.63	22.09	161.81	30.00	-7.91	1/0
	16-QAM	1711.50	14.18	V	4.31	9.47	19.34	85.90	30.00	-10.66	1/0
		1745.00	15.70	V	4.37	9.58	20.92	123.59	30.00	-9.08	1/14
		1778.50	15.86	V	4.40	9.63	21.10	128.82	30.00	-8.90	1/0
1.4	QPSK	1710.70	14.53	V	4.31	9.47	19.68	92.90	30.00	-10.32	1/3
		1745.00	16.80	V	4.37	9.58	22.02	159.22	30.00	-7.98	1/5
		1779.30	16.87	V	4.40	9.63	22.10	162.18	30.00	-7.90	1/0
	16-QAM	1710.70	13.54	V	4.31	9.47	18.69	73.96	30.00	-11.31	1/5
		1745.00	15.64	V	4.37	9.58	20.86	121.90	30.00	-9.14	1/5
		1779.30	15.90	V	4.40	9.63	21.13	129.72	30.00	-8.87	1/0

9.2. RADIATED SPURIOUS EMISSION

RULE PART(S)

FCC: §2.1053, §27. 53

LIMIT

§27.53:

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a 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, by at least $43 + 10 \log (P)$ dB.

(h) 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.

(m) (4) 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.

TEST PROCEDURE

ANSI / TIA / EIA 603 E Clause 2.2.12; ESU40 setting reference to 971168 D01 v03r01

For peak power measurement with a ESU40:

- a) Set the RBW = 100 kHz for emission below 1 GHz and 1 MHz for emissions above 1 GHz
- b) Set VBW $\geq 3 \times$ RBW;
- c) Set span ≥ 1.5 times the OBW;
- d) Sweep time = auto couple;
- e) Detector = rms;
- f) Ensure that the number of measurement points $\geq$ span/RBW;
- g) Trace Mode = average(LTE FDD), Maxhold(LTE TDD);

NOTE1

LTE: It was tested at 1RB QPSK as worst case (the highest output power and density).

NOTE2

Please refer to section 5.4 for bandwidth and RB setting about LTE bands.

RESULTS

See the following pages.

9.2.1. SPURIOUS RADIATION RESULT

LTE Band 12

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		4791511838							
Date:		2024-11-05							
Test Engineer:		26087							
Configuration:		EUT / AC Adapter, Y-Position							
Location:		Chamber 2							
Mode:		LTE_QPSK Band 12 Harmonics, 10MHz Bandwidth							
Test Voltage:		AC 120 V, 60 Hz							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 704MHz									
1408.00	-5.3	V	3.0	41.9	1.0	-46.2	-13.0	-33.2	
2112.00	-9.8	V	3.0	42.1	1.0	-50.8	-13.0	-37.8	
2816.00	-11.4	V	3.0	42.6	1.0	-53.0	-13.0	-40.0	
1408.00	-5.3	H	3.0	41.9	1.0	-46.3	-13.0	-33.3	
2112.00	-8.5	H	3.0	42.1	1.0	-49.5	-13.0	-36.5	
2816.00	-11.4	H	3.0	42.6	1.0	-53.1	-13.0	-40.1	
Mid Ch, 707.5MHz									
1415.00	-6.8	V	3.0	41.9	1.0	-47.7	-13.0	-34.7	
2122.50	-11.7	V	3.0	42.1	1.0	-52.8	-13.0	-39.8	
2830.00	-11.2	V	3.0	42.6	1.0	-52.8	-13.0	-39.8	
3537.50	-7.5	V	3.0	43.0	1.0	-49.5	-13.0	-36.5	
4245.00	-9.1	V	3.0	43.2	1.0	-51.3	-13.0	-38.3	
1415.00	-10.8	H	3.0	41.9	1.0	-51.7	-13.0	-38.7	
2122.50	-11.8	H	3.0	42.1	1.0	-52.9	-13.0	-39.9	
2830.00	-11.3	H	3.0	42.6	1.0	-53.0	-13.0	-40.0	
3537.50	-7.5	H	3.0	43.0	1.0	-49.5	-13.0	-36.5	
4245.00	-8.8	H	3.0	43.2	1.0	-51.0	-13.0	-38.0	
High Ch, 711MHz									
1422.00	-5.3	V	3.0	41.9	1.0	-46.3	-13.0	-33.3	
2133.00	-8.9	V	3.0	42.1	1.0	-50.0	-13.0	-37.0	
2844.00	-11.0	V	3.0	42.6	1.0	-52.6	-13.0	-39.6	
3555.00	-7.5	V	3.0	43.0	1.0	-49.5	-13.0	-36.5	
4266.00	-9.0	V	3.0	43.2	1.0	-51.2	-13.0	-38.2	
1422.00	-2.6	H	3.0	41.9	1.0	-43.6	-13.0	-30.6	
2133.00	-8.0	H	3.0	42.1	1.0	-49.1	-13.0	-36.1	
2844.00	-11.1	H	3.0	42.6	1.0	-52.7	-13.0	-39.7	
3555.00	-8.6	H	3.0	43.0	1.0	-50.6	-13.0	-37.6	
4266.00	-8.6	H	3.0	43.2	1.0	-50.9	-13.0	-37.9	

LTE Band 41

UL Verification Services, Inc. Above 1GHz High Frequency Substitution Measurement									
Company:		Samsung							
Project #:		4791511838							
Date:		2024-11-06							
Test Engineer:		26087							
Configuration:		EUT / AC Adapter, Z-Position							
Location:		Chamber 2							
Mode:		LTE_QPSK Band 41 Harmonics, 20MHz Bandwidth							
Test Votage:		AC 120 V, 60 Hz							
f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	EIRP (dBm)	Limit (dBm)	Delta (dB)	Notes
Low Ch, 2506MHz									
5012.00	-12.7	V	3.0	43.3	1.0	-54.9	-25.0	-29.9	
7518.00	5.0	V	3.0	42.9	1.0	-37.0	-25.0	-12.0	
10024.00	-10.3	V	3.0	41.5	1.0	-50.9	-25.0	-25.9	
12530.00	-3.5	V	3.0	39.9	1.0	-42.4	-25.0	-17.4	
15036.00	-4.2	V	3.0	40.1	1.0	-43.3	-25.0	-18.3	
5012.00	-11.8	H	3.0	43.3	1.0	-54.1	-25.0	-29.1	
7518.00	2.8	H	3.0	42.9	1.0	-39.1	-25.0	-14.1	
10024.00	-7.4	H	3.0	41.5	1.0	-48.0	-25.0	-23.0	
12530.00	-5.6	H	3.0	39.9	1.0	-44.5	-25.0	-19.5	
15036.00	-4.1	H	3.0	40.1	1.0	-43.2	-25.0	-18.2	
Mid Ch, 2593MHz									
5186.00	-9.4	V	3.0	43.3	1.0	-51.7	-25.0	-26.7	
7779.00	3.6	V	3.0	42.8	1.0	-38.1	-25.0	-13.1	
10372.00	-10.9	V	3.0	41.3	1.0	-51.2	-25.0	-26.2	
12965.00	-5.3	V	3.0	40.0	1.0	-44.2	-25.0	-19.2	
15558.00	-3.2	V	3.0	40.2	1.0	-42.4	-25.0	-17.4	
5186.00	-5.4	H	3.0	43.3	1.0	-47.7	-25.0	-22.7	
7779.00	-1.6	H	3.0	42.8	1.0	-43.4	-25.0	-18.4	
10372.00	-11.1	H	3.0	41.3	1.0	-51.3	-25.0	-26.3	
12965.00	-5.5	H	3.0	40.0	1.0	-44.5	-25.0	-19.5	
15558.00	-3.2	H	3.0	40.2	1.0	-42.4	-25.0	-17.4	
High Ch, 2680MHz									
5360.00	-0.5	V	3.0	43.4	1.0	-42.9	-25.0	-17.9	
8040.00	4.6	V	3.0	42.6	1.0	-37.0	-25.0	-12.0	
10720.00	-10.2	V	3.0	41.0	1.0	-50.1	-25.0	-25.1	
13400.00	-3.0	V	3.0	40.0	1.0	-42.0	-25.0	-17.0	
16080.00	-1.7	V	3.0	40.3	1.0	-41.0	-25.0	-16.0	
5360.00	-2.8	H	3.0	43.4	1.0	-45.2	-25.0	-20.2	
8040.00	4.9	H	3.0	42.6	1.0	-36.7	-25.0	-11.7	
10720.00	-9.6	H	3.0	41.0	1.0	-49.5	-25.0	-24.5	
13400.00	-2.1	H	3.0	40.0	1.0	-41.1	-25.0	-16.1	
16080.00	-2.2	H	3.0	40.3	1.0	-41.5	-25.0	-16.5	

20 MHz
QPSK

