



9.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung RRU(RF4461d) FCC ID: A3LRF4461D-13A** complies with all of the requirements of Part 22 & 27 FCC Rules.

FCC ID: A3LRF4461D-13A		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 8K23073101-00.A3L	Test Dates: 04/12/2023 - 08/03/2023	EUT Type: RRU(RF4461d)	Page 395 of 404	

10.0 APPENDIX. A

10.1 Conducted Average Output Power

Test Overview

A transmitter port of EUT is connected to the input of a signal analyzer. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Description

KDB 971168 D01 v03r01 – Section 5
 KDB 662911 D01 v02r01 – Section E)1) In-Band Power Measurements
 ANSI C63.26-2015 – Section 5.2.4.4.1

The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The spectrum analyzer settings were as follows:

1. Conducted power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 ~ 5% of the expected OBW
3. VBW \geq 3 x RBW
4. Span = 2 ~ 3 x OBW
5. No. of sweep points \geq 2 x span / RBW
6. Detector = RMS
7. Trigger Settings is set to "RF Power" for signals with non-continuous operation with the sweep times set to "auto". Refer test note 3 for details.
8. Trace mode = Trace-Averaging (RMS) set to average over 100 sweeps
9. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

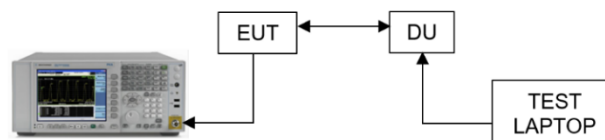




Figure 10-1. Test Instrument & Measurement Setup

Limit

N/A

FCC ID: A3LRF4461D-13A		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 8K23073101-00.A3L	Test Dates: 04/12/2023 - 08/03/2023	EUT Type: RRU(RF4461d)		Page 396 of 404

Note

1. Result for reference maximum average power level of Band 5 is under section 8.3.
2. MIMO Calculations are done considering output channel power for all ports and respective margins are calculated according to procedures in section 6.4 of ANSI C63.26 and section D of KDB 971168 D01 v03r01.
3. Consider the following factors for MIMO Power:
 Conducted power for each port is measured in dBm.
 Powers are summed up in linear using the measure-and-sum technique defined in KDB 971168 D01 v03r01-Section D.
 Conducted power per port (dBm) is converted to a linear value (mW). A summation of linear powers for all ports gives us the total MIMO conducted power in milliWatts (mW).
5. Sample Calculation:
 Let us assume the following numbers:
 c) Total MIMO Conducted Power as 59851.26 milliWatts
 d)

	Factors	Value	Unit
Summed MIMO Conducted Power (linear sum)		59851.26	mW
Summed MIMO Conducted Power (dBm)	$= 10 * \log (59851.26) =$	47.77	dBm

FCC ID: A3LRF4461D-13A		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 8K23073101-00.A3L	Test Dates: 04/12/2023 - 08/03/2023	EUT Type: RRU(RF4461d)	Page 397 of 404	

Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Average Power (dBm)	0	44.71	44.64	44.57	44.57
	1	44.81	44.77	44.81	44.83
Total MIMO Conducted Power (mW)		59851.26	59100.80	58912.91	59052.63
Total MIMO Conducted Power (dBm)		47.77	47.72	47.70	47.71
Middle Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Average Power (dBm)	0	44.55	44.56	44.58	44.63
	1	44.81	44.83	44.85	44.84
Total MIMO Conducted Power (mW)		58781.32	58986.76	59259.02	59521.18
Total MIMO Conducted Power (dBm)		47.69	47.71	47.73	47.75
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Average Power (dBm)	0	44.57	44.50	44.61	44.58
	1	44.83	44.78	44.80	44.83
Total MIMO Conducted Power (mW)		59052.63	58246.59	59108.32	59118.66
Total MIMO Conducted Power (dBm)		47.71	47.65	47.72	47.72

Table 10-1. Conducted Average Output Power Table (LTE B13_1C_5M_2T)

Mid Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Average Power (dBm)	0	47.55	47.34	47.39	47.41
	1	47.82	47.84	47.83	47.82
Total MIMO Conducted Power (mW)		117421.38	115015.59	115503.33	115616.86
Total MIMO Conducted Power (dBm)		50.70	50.61	50.63	50.63

Table 10-2. Conducted Average Output Power Table (LTE B13_1C_10M_2T)

FCC ID: A3LRF4461D-13A		MEASUREMENT REPORT (CERTIFICATION)			Approved by: Technical Manager
Test Report S/N: 8K23073101-00.A3L	Test Dates: 04/12/2023 - 08/03/2023	EUT Type: RRU(RF4461d)		Page 398 of 404	

Mid Channel	Port	QPSK	16QAM
Conducted Average Power (dBm)	0	47.50	47.41
	1	47.85	47.78
Total MIMO Conducted Power (mW)		117189.82	115061.88
Total MIMO Conducted Power (dBm)		50.69	50.61

Table 10-3. Conducted Average Output Power Table (LTE B13_2C_5M+5M_2T)

Low Channel	Port	QPSK
Conducted Average Power (dBm)	0	45.09
	1	45.03
Total MIMO Conducted Power (mW)		64126.92
Total MIMO Conducted Power (dBm)		48.07
Mid Channel	Port	QPSK
Conducted Average Power (dBm)	0	45.06
	1	44.98
Total MIMO Conducted Power (mW)		63540.18
Total MIMO Conducted Power (dBm)		48.03
High Channel	Port	QPSK
Conducted Average Power (dBm)	0	45.11
	1	45.01
Total MIMO Conducted Power (mW)		64129.64
Total MIMO Conducted Power (dBm)		48.07

Table 10-4. Conducted Average Output Power Table (LTE B13_1C_5M+NB-IoT(11B)_2T)

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Test Report S/N: 8K23073101-00.A3L	Test Dates: 04/12/2023 - 08/03/2023	EUT Type: RRU(RF4461d)	Page 399 of 404	

Mid Channel	Port	LTE10M+NB-IoT (2GB)	LTE10M+NB-IoT (1GB+1IB)	LTE10M+NB-IoT (1IB+1GB)	LTE10M+NB-IoT (2IB)
Conducted Average Power (dBm)	0	47.92	47.87	47.82	48.15
	1	47.69	47.50	47.57	48.05
Total MIMO Conducted Power (mW)		120693.04	117471.17	117683.95	129139.40
Total MIMO Conducted Power (dBm)		50.82	50.70	50.71	51.11

Table 10-5. Conducted Average Output Power Table (LTE B13_1C_10M+NB-IoT_2T)

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Test Report S/N: 8K23073101-00.A3L	Test Dates: 04/12/2023 - 08/03/2023	EUT Type: RRU(RF4461d)		Page 400 of 404

Low Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Average Power (dBm)	0	43.33	43.29	43.41	43.43
	1	43.03	42.99	43.01	43.02
	2	43.03	43.03	43.05	43.06
	3	43.24	43.24	43.22	43.27
Total MIMO Conducted Power (mW)		82795.96	82414.39	83099.73	83536.62
Total MIMO Conducted Power (dBm)		49.18	49.16	49.20	49.22
Middle Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Average Power (dBm)	0	43.43	43.44	43.48	43.54
	1	42.99	43.00	43.00	43.03
	2	43.08	43.03	43.00	43.10
	3	43.25	43.29	43.24	43.31
Total MIMO Conducted Power (mW)		83394.46	83454.05	83275.88	84531.57
Total MIMO Conducted Power (dBm)		49.21	49.21	49.21	49.27
High Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Average Power (dBm)	0	43.47	43.48	43.42	43.47
	1	42.96	42.96	43.02	43.03
	2	43.08	43.11	43.00	43.07
	3	43.22	43.20	43.24	43.25
Total MIMO Conducted Power (mW)		83315.76	83411.46	83062.22	83735.74
Total MIMO Conducted Power (dBm)		49.21	49.21	49.19	49.23

Table 10-6. Conducted Average Output Power Table (LTE B13_1C_5M_4T)

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Test Report S/N: 8K23073101-00.A3L	Test Dates: 04/12/2023 - 08/03/2023	EUT Type: RRU(RF4461d)		Page 401 of 404

Middle Channel	Port	QPSK	16QAM	64QAM	256QAM
Conducted Average Power (dBm)	0	46.47	46.30	46.39	46.31
	1	46.06	45.95	46.05	46.04
	2	46.16	45.97	46.04	46.03
	3	46.23	46.19	46.22	46.18
Total MIMO Conducted Power (mW)		168006.05	163140.68	165881.33	164517.45
Total MIMO Conducted Power (dBm)		52.25	52.13	52.20	52.16

Table 10-7. Conducted Average Output Power Table (LTE B13_1C_10M_4T)

Middle Channel	Port	QPSK	16QAM
Conducted Average Power (dBm)	0	46.33	46.48
	1	46.05	45.99
	2	46.03	46.00
	3	46.19	46.21
Total MIMO Conducted Power (mW)		164903.08	165776.04
Total MIMO Conducted Power (dBm)		52.17	52.20

Table 10-8. Conducted Average Output Power Table (LTE B13_2C_5M+5M_4T)

FCC ID: A3LRF4461D-13A		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 8K23073101-00.A3L	Test Dates: 04/12/2023 - 08/03/2023	EUT Type: RRU(RF4461d)	Page 402 of 404	

Low Channel	Port	QPSK
Conducted Average Power (dBm)	0	43.33
	1	43.21
	2	43.06
	3	43.49
Total MIMO Conducted Power (mW)		85034.86
Total MIMO Conducted Power (dBm)		49.30
Mid Channel	Port	QPSK
Conducted Average Power (dBm)	0	43.37
	1	43.31
	2	43.14
	3	43.56
Total MIMO Conducted Power (mW)		86460.87
Total MIMO Conducted Power (dBm)		49.37
High Channel	Port	QPSK
Conducted Average Power (dBm)	0	43.30
	1	43.30
	2	43.19
	3	43.55
Total MIMO Conducted Power (mW)		86250.59
Total MIMO Conducted Power (dBm)		49.36

Table 10-9. Conducted Average Output Power Table (LTE B13_1C_5M+NB-IoT(11B)_4T)

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Test Report S/N: 8K23073101-00.A3L	Test Dates: 04/12/2023 - 08/03/2023	EUT Type: RRU(RF4461d)		Page 403 of 404

Mid Channel	Port	LTE10M+NB-IoT (2GB)	LTE10M+NB-IoT (1GB+1IB)	LTE10M+NB-IoT (1IB+1GB)	LTE10M+NB-IoT (2IB)
Conducted Average Power (dBm)	0	46.34	46.27	46.18	46.55
	1	45.95	45.81	45.79	46.45
	2	45.83	45.75	45.72	46.29
	3	45.99	45.90	45.87	46.70
Total MIMO Conducted Power (mW)		160409.30	156959.13	155388.62	178675.99
Total MIMO Conducted Power (dBm)		52.05	51.96	51.91	52.52

Table 10-10. Conducted Average Output Power Table (LTE B13_1C_10M+NB-IoT_4T)

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Test Report S/N: 8K23073101-00.A3L	Test Dates: 04/12/2023 - 08/03/2023	EUT Type: RRU(RF4461d)		Page 404 of 404