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Project Number: 16E086-2b

Prepared for:

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By

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FCC Site Registration: 92592

FCC ID: QGGIPA248M

Date

30th June 2016

FCC EQUIPMENT AUTHORISATION

Test Report

EUT Description

Indoor Base Station.

**Authorised :
John McAuley**

A handwritten signature in blue ink, reading 'John McAuley', written over a horizontal line.

Exhibit A – Technical Report

Table of Contents

1.0	EUT OPERATION	3
2.0	RESULTS SUMMARY	4
3.0	CONDUCTED EMISSIONS MEASUREMENTS	5
4.0	FIELD STRENGTH OF SPURIOUS RADIATED EMISSIONS	12

Appendix A	Output Power Conducted
Appendix B	Occupied Bandwidth Conducted
Appendix C	Spurious Emissions Conducted
Appendix D	Band Edge Conducted
Appendix E	Spurious Emissions Radiated
Appendix F	Band Edge Emissions Radiated

1.0 EUT Operation

Operating Conditions during Test:

The EUT is an indoor base station powered from a 12v dc mains adapter operating on the following bands

Frequency Plan

Operating Band	Operating Band	Uplink	Downlink	Channel bandwidths	Modulations
		MHz	MHz	MHz	
2	PCS	1850– 1910	1930– 1990	5, 10, 15, 20	QPSK, 16QAM, 64QAM
4	AWS	1710– 1755	2110 – 2155	5, 10, 15, 20	QPSK, 16QAM, 64QAM
13	LTE Upper Band	777– 787	746 – 756	5, 10	QPSK, 16QAM, 64QAM
17	LTE Lower band	704– 716	734 – 746	5, 10	QPSK, 16QAM, 64QAM

Table 1

This report covers Band 2

Centre Frequencies for Bottom Middle and Top channels Band 2

	Bottom	Middle	Top
	MHz	MHz	MHz
5MHz Bandwidth Channels =>	1932.5	1962.5	1987.5
10MHz Bandwidth Channels =>	1935	1965	1985
15MHz Bandwidth Channels =>	1937.5	1967.5	1982.5
20MHz Bandwidth Channels =>	1940	1960	1980

The EUT was powered from 12V DC adapter
Manufacturer Pihong Model PSAA30R-120

For Conducted Measurements on antenna port, the un-used port was terminated in 50 ohm termination.

Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

☒ Normal

Temperature: +15 to +35 ° C

Humidity: 20-75 %

2.Results summary

Band 2

Description	FCC Part 24	FCC part 2	Test Result
Transmitter Carrier power	24.229 24.232a c d e	2.1046	Pass
Transmitter Occupied Bandwidth	24.238b	2.1049	Pass
Transmitter Conducted Emissions	24.238a ,b	2.1051	Pass
Transmitter Conducted Emissions at band edges	24.238a ,b	2.1051	Pass
Transmitter Radiated Spurious Emissions	24.238a ,b	2.1051	Pass
Transmitter Frequency Stability(Temperature/ Voltage Variation)	24.135a	2.1055	Pass
Frequency Plan	27.5h1	27.2b	Pass
Modulation Characteristics		2.1047	Pass

3 Emissions Measurements

3.1 Transmitter Carrier power Conducted

Channel	Bandwidth	Modulation	Antenna port TX1	Antenna port TX2	Total Conducted power	Total Conducted power
			dBm	dBm	mW	dBm
TOP	BW5MHz	QPSK	21.09	20.87	250.71	23.99
TOP	BW5MHz	64QAM	20.87	21.11	251.30	24.00
TOP	BW5MHz	16QAM	20.81	21.1	249.33	23.97
MIDDLE	BW5MHz	QPSK	20.93	21.08	252.11	24.02
MIDDLE	BW5MHz	64QAM	21.12	20.72	247.45	23.93
MIDDLE	BW5MHz	16QAM	21.02	20.9	249.50	23.97
BOTTOM	BW5MHz	QPSK	20.8	20.8	240.45	23.81
BOTTOM	BW5MHz	64QAM	20.96	20.93	248.62	23.96
BOTTOM	BW5MHz	16QAM	20.87	20.93	246.06	23.91
TOP	BW20MHz	QPSK	21.1	20.86	250.72	23.99
TOP	BW20MHz	64QAM	20.98	21.18	256.53	24.09
TOP	BW20MHz	16QAM	20.88	21.16	253.08	24.03
MIDDLE	BW20MHz	QPSK	20.87	20.85	243.80	23.87
MIDDLE	BW20MHz	64QAM	20.85	20.9	244.65	23.89
MIDDLE	BW20MHz	16QAM	20.87	20.87	244.36	23.88
BOTTOM	BW20MHz	QPSK	21	21.03	252.66	24.03
BOTTOM	BW20MHz	64QAM	21.08	21.09	256.76	24.10
BOTTOM	BW20MHz	16QAM	21.16	21.04	257.67	24.11
TOP	BW15MHz	QPSK	21.06	21.03	254.41	24.06
TOP	BW15MHz	64QAM	20.78	21.13	249.39	23.97
TOP	BW15MHz	16QAM	20.84	21.04	248.40	23.95
MIDDLE	BW15MHz	QPSK	20.93	21.08	252.11	24.02
MIDDLE	BW15MHz	64QAM	20.93	20.78	243.55	23.87
MIDDLE	BW15MHz	16QAM	21.06	20.92	251.24	24.00
BOTTOM	BW15MHz	QPSK	20.94	20.9	247.19	23.93
BOTTOM	BW15MHz	64QAM	20.83	21.04	248.12	23.95
BOTTOM	BW15MHz	16QAM	20.91	20.58	237.60	23.76
TOP	BW10MHz	QPSK	20.9	20.91	246.34	23.92
TOP	BW10MHz	64QAM	20.84	20.97	246.36	23.92
TOP	BW10MHz	16QAM	20.92	21.02	250.07	23.98
MIDDLE	BW10MHz	QPSK	20.96	20.99	250.34	23.99
MIDDLE	BW10MHz	64QAM	20.71	20.7	235.25	23.72
MIDDLE	BW10MHz	16QAM	21.07	20.96	252.68	24.03
BOTTOM	BW10MHz	QPSK	21.05	21.04	254.41	24.06
BOTTOM	BW10MHz	64QAM	21.04	20.81	247.56	23.94
BOTTOM	BW10MHz	16QAM	21.05	21.03	254.12	24.05

Max Level for TX1 Antenna port = 21.16dBm
 Max Level for TX2 Antenna port = 21.18dBm
 Total conducted Power =24.11dBm

Max ERP = 24.11dBm +4.7 dBi = 28.81 dBm = 760.45mW
 Ref appendix A for Scans

Test Result Pass

Max Power (EIRP)

Conducted power	Antenna Gain dBi	dBm	mW	Bandwidth
24.02	4.7	28.72	744.73	5MHz
24.06	4.7	28.76	751.62	10MHz
24.06	4.7	28.76	751.62	15MHz
24.11	4.7	28.81	760.45	20MHz

3.2 Occupied Bandwidth Conducted

Channel	Bandwidth	Modulation	Antenna port TX1 OBW MHz
BOTTOM	BW10MHz	16QAM	9.783
BOTTOM	BW10MHz	16QAM	9.783
BOTTOM	BW10MHz	64QAM	9.812
BOTTOM	BW10MHz	QPSK	9.841
MIDDLE	BW10MHz	16QAM	9.812
MIDDLE	BW10MHz	64QAM	9.812
MIDDLE	BW10MHz	QPSK	9.898
TOP	BW10MHz	16QAM	9.782
TOP	BW10MHz	64QAM	9.812
TOP	BW10MHz	QPSK	9.899
BOTTOM	BW15MHz	16QAM	14.718
BOTTOM	BW15MHz	64QAM	14.805
BOTTOM	BW15MHz	QPSK	14.849
MIDDLE	BW15MHz	16QAM	14.674
MIDDLE	BW15MHz	64QAM	14.761
MIDDLE	BW15MHz	QPSK	14.848
TOP	BW15MHz	16QAM	14.675
TOP	BW15MHz	64QAM	14.717
TOP	BW15MHz	QPSK	14.891
BOTTOM	BW20MHz	16QAM	19.45
BOTTOM	BW20MHz	64QAM	19.682
BOTTOM	BW20MHz	QPSK	19.681
MIDDLE	BW20MHz	16QAM	19.451
MIDDLE	BW20MHz	64QAM	19.623
MIDDLE	BW20MHz	QPSK	19.798
TOP	BW20MHz	16QAM	19.392
TOP	BW20MHz	64QAM	19.565
TOP	BW20MHz	QPSK	19.739
BOTTOM	BW5MHz	16QAM	4.636
BOTTOM	BW5MHz	64QAM	4.906
BOTTOM	BW5MHz	QPSK	4.935
MIDDLE	BW5MHz	16QAM	4.906
MIDDLE	BW5MHz	64QAM	4.921
MIDDLE	BW5MHz	QPSK	4.949
TOP	BW5MHz	16QAM	4.891
TOP	BW5MHz	64QAM	4.921
TOP	BW5MHz	QPSK	4.949

Max OBW measurements for TX1 = 4.949 MHz for 5MHz Bandwidth
 Max OBW measurements for TX1 = 9.899 MHz for 10MHz Bandwidth
 Max OBW measurements for TX1 = 14.891 MHz for 15MHz Bandwidth
 Max OBW measurements for TX1 = 19.798 MHz for 20MHz Bandwidth

Ref appendix B for Scans

Test Result Pass

3.3 Spurious Emissions Conducted

No spurious peaks evident

Ref Appendix C for Scans

Test Result Pass

3.3 Band Edge Emissions Conducted

Ref Appendix D for Scans

Band Edge	Bandwidth	Modulation	Antenna port TX1 dBm	Antenna port TX2 dBm	Total Conducted power dBm	Total Conducted power dBm
Lower	BW5MHz	16QAM	-28.68	-27.21	0.0033	-24.87
Lower	BW5MHz	64QAM	-39.26	-40.51	0.0002	-36.83
Lower	BW5MHz	QPSK	-38.96	-38.73	0.0003	-35.83
Lower	BW10MHz	16QAM	-38.85	-35.54	0.0004	-33.88
Lower	BW10MHz	64QAM	-36.72	-36.44	0.0004	-33.57
Lower	BW10MHz	QPSK	-36.34	-36.62	0.0005	-33.47
Lower	BW15MHz	16QAM	-33.79	-38.76	0.0006	-32.59
Lower	BW15MHz	64QAM	-36.41	-35.65	0.0005	-33.00
Lower	BW15MHz	QPSK	-35.37	-35.45	0.0006	-32.40
Lower	BW20MHz	16QAM	-38.09	-38.42	0.0003	-35.24
Lower	BW20MHz	64QAM	-38.11	-37.99	0.0003	-35.04
Lower	BW20MHz	QPSK	-37.03	-38.29	0.0003	-34.60
Upper	BW20MHz	16QAM	-37.81	-38.11	0.0003	-34.95
Upper	BW20MHz	64QAM	-38.25	-38.07	0.0003	-35.15
Upper	BW20MHz	QPSK	-38.14	-37.79	0.0003	-34.95
Upper	BW15MHz	16QAM	-35.19	-33.68	0.0007	-31.36
Upper	BW15MHz	64QAM	-35.67	-34.61	0.0006	-32.10
Upper	BW15MHz	QPSK	-34.86	-33.42	0.0008	-31.07
Upper	BW10MHz	16QAM	-33.76	-34.48	0.0008	-31.09
Upper	BW10MHz	64QAM	-35.12	-34.64	0.0007	-31.86
Upper	BW10MHz	QPSK	-35.38	-34.89	0.0006	-32.12
Upper	BW5MHz	16QAM	-28.43	-26.46	0.0037	-24.32
Upper	BW5MHz	64QAM	-27.78	-36.73	0.0019	-27.26
Upper	BW5MHz	QPSK	-26.94	-26.59	0.0042	-23.75

Power from antenna ports converted to mW, added and then converted back to dBm

Band Edge Max = -24.87dBm

Limit = -13dBm

Test Result Pass

4 Radiated Emissions

4.1 Results for Radiated emissions

Appendix E shows the results of the scans in the anechoic chamber.

Result: Pass

4.1.1 Spurious Emissions Measurements (30MHz to 1GHz)

Frequency	Sub antenna input	Sub Antenna Gain	EIRP	ERP	Limit	Margin
MHz	dBm	dBi	dBm	dBm	dBm	dB
300	-53.8	3.13	-50.67	-52.83	-13	39.83
375	-69.86	6.7	-63.16	-65.32	-13	52.32
400	-65.03	5.49	-59.54	-61.7	-13	48.7
500	-53.96	6.6	-47.36	-49.52	-13	36.52
600	-61.5	6.54	-54.96	-57.12	-13	44.12
625	-59.41	6.9	-52.51	-54.67	-13	41.67
675	-57.47	7.28	-50.19	-52.35	-13	39.35
700	-60.57	6.63	-53.94	-56.1	-13	43.1
750	-54.12	6.29	-47.83	-49.99	-13	36.99
800	-62.53	6.97	-55.56	-57.72	-13	44.72
900	-56.55	5.13	-51.42	-53.58	-13	40.58

4.1.2 Horn antenna measurements >1GHz

No spurious peaks evident above 1GHz

4.1.3 Substitution antenna for Band Edges Radiated

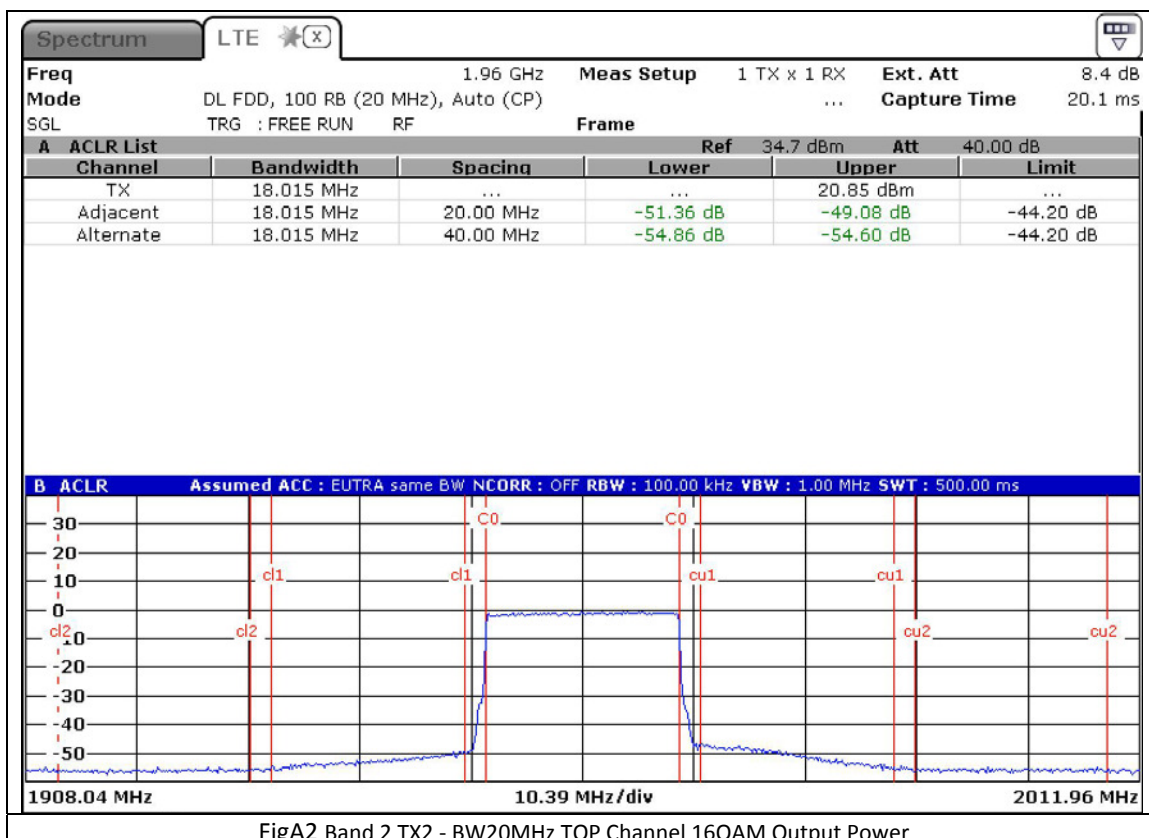
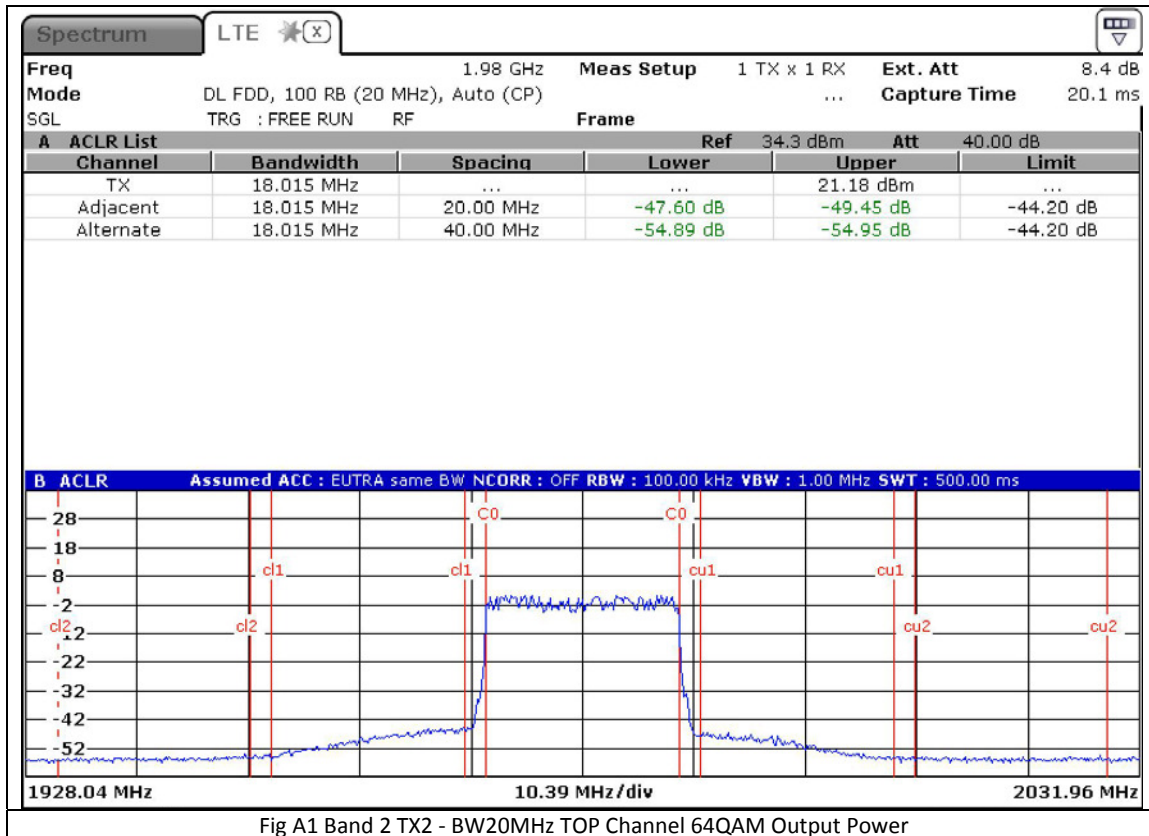
Frequency	Sub Ant input	Sub Antenna gain	EIRP	Limit	Margin
GHz	dBm	dBi	dBm	dBm	dB
1.93	-35.55	9.41	-26.14	-13	13.14
1.99	-33.5	9.41	-24.09	-13	11.09

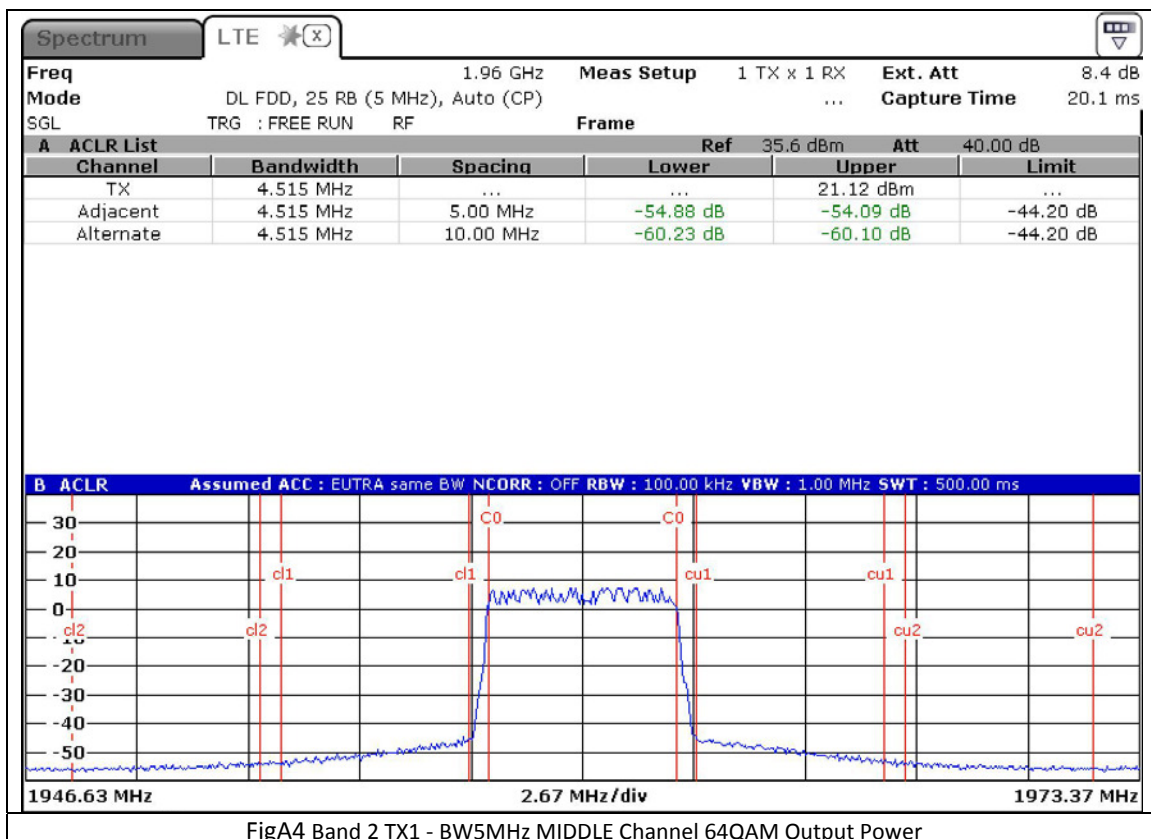
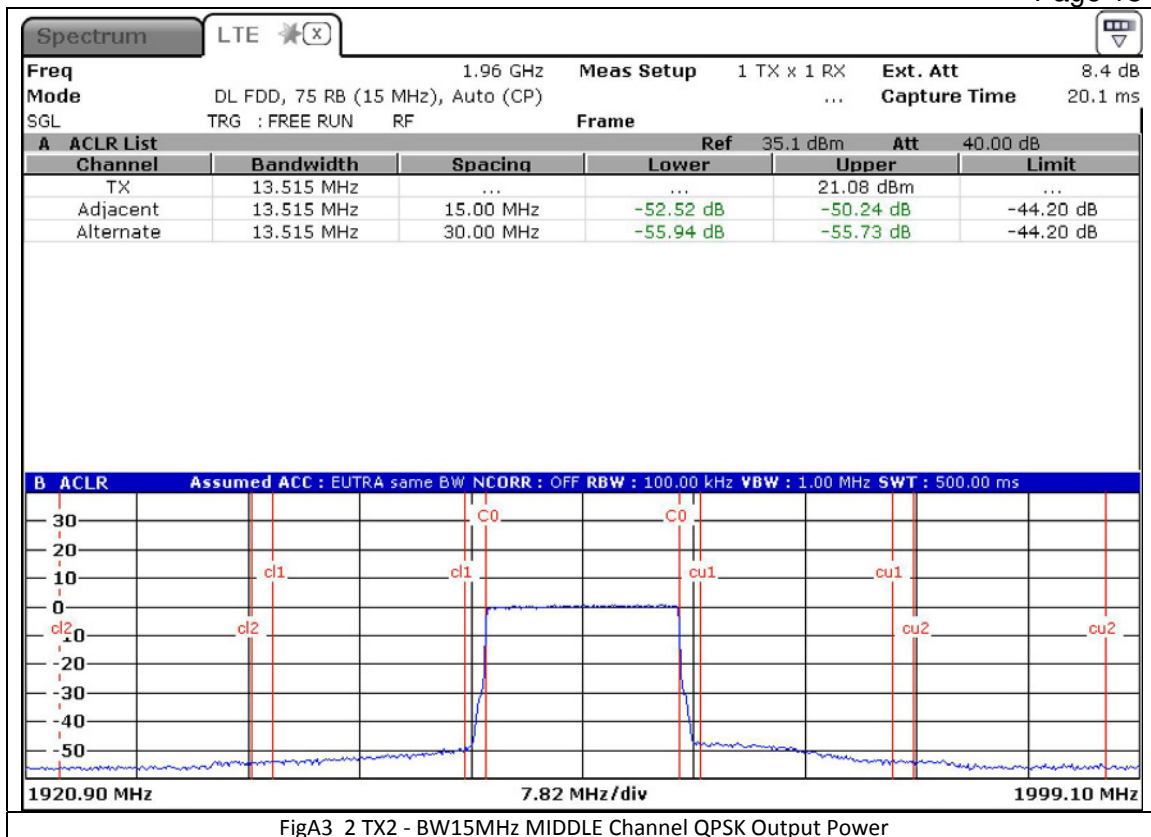
Result: Pass

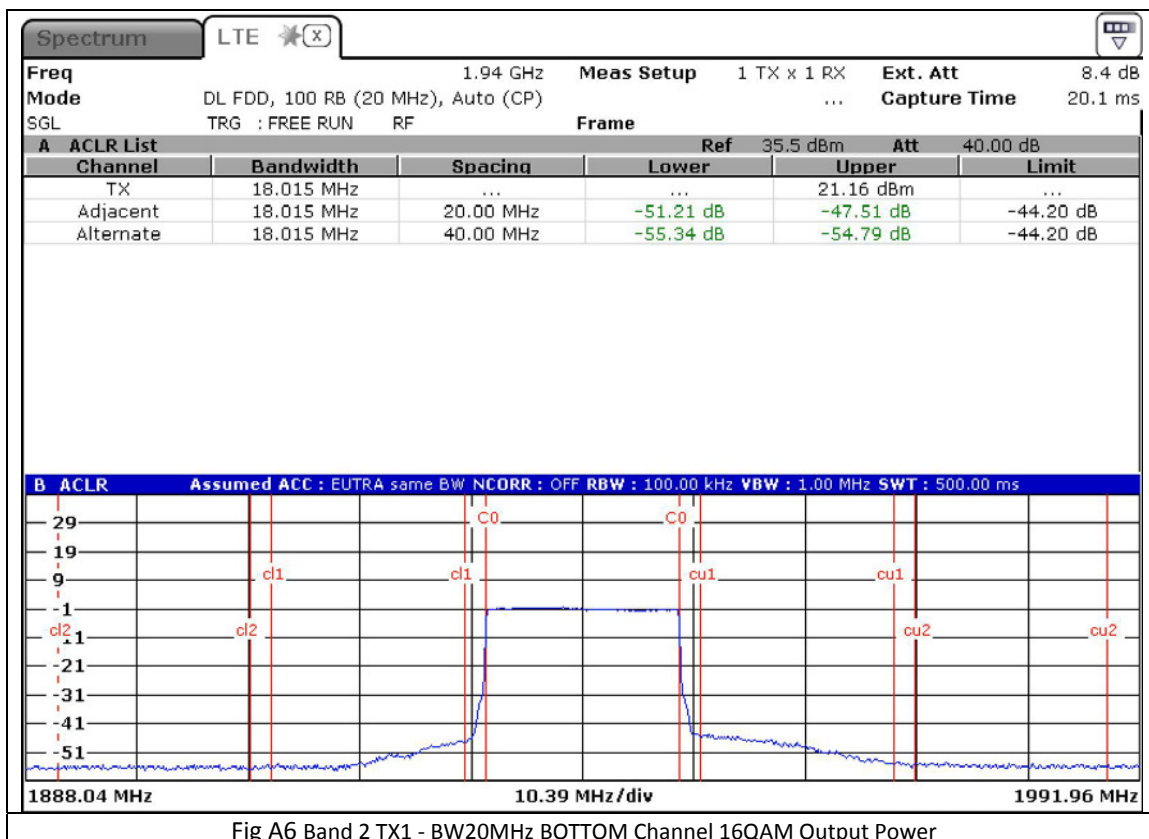
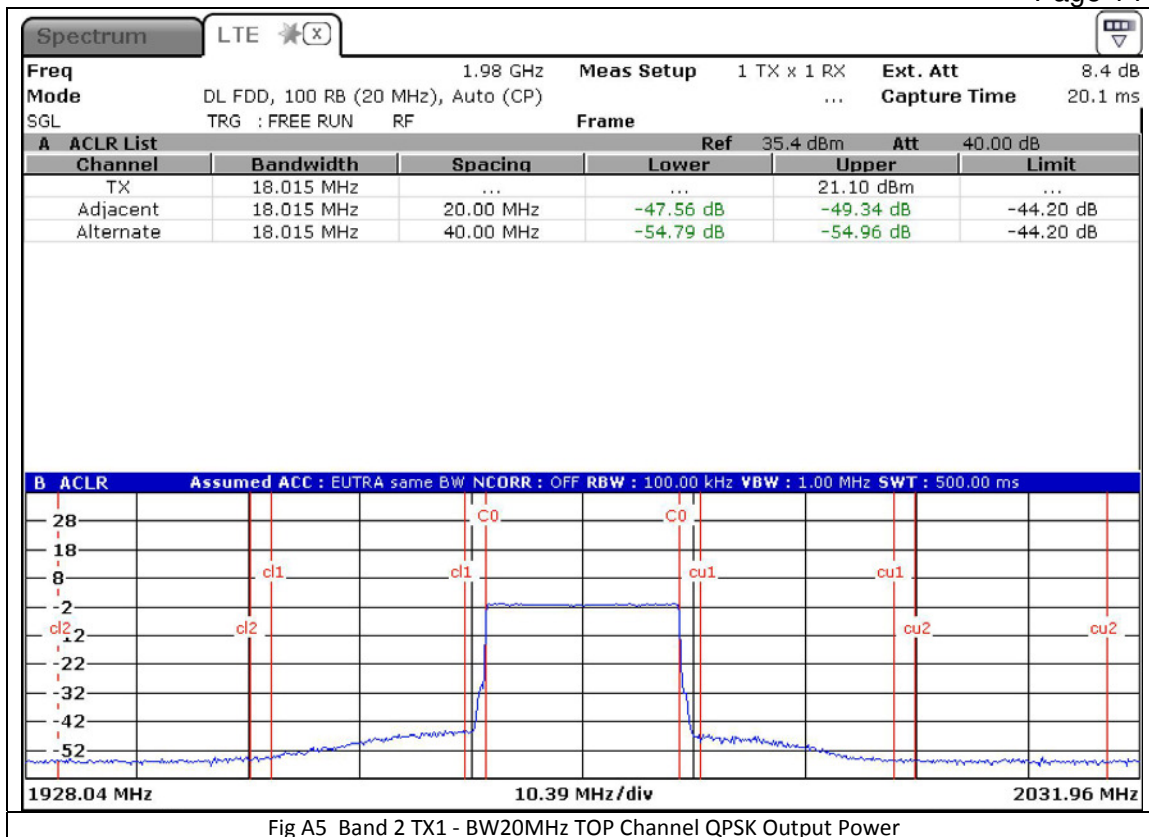
Appendix A

Transmitter Output Power

Conducted



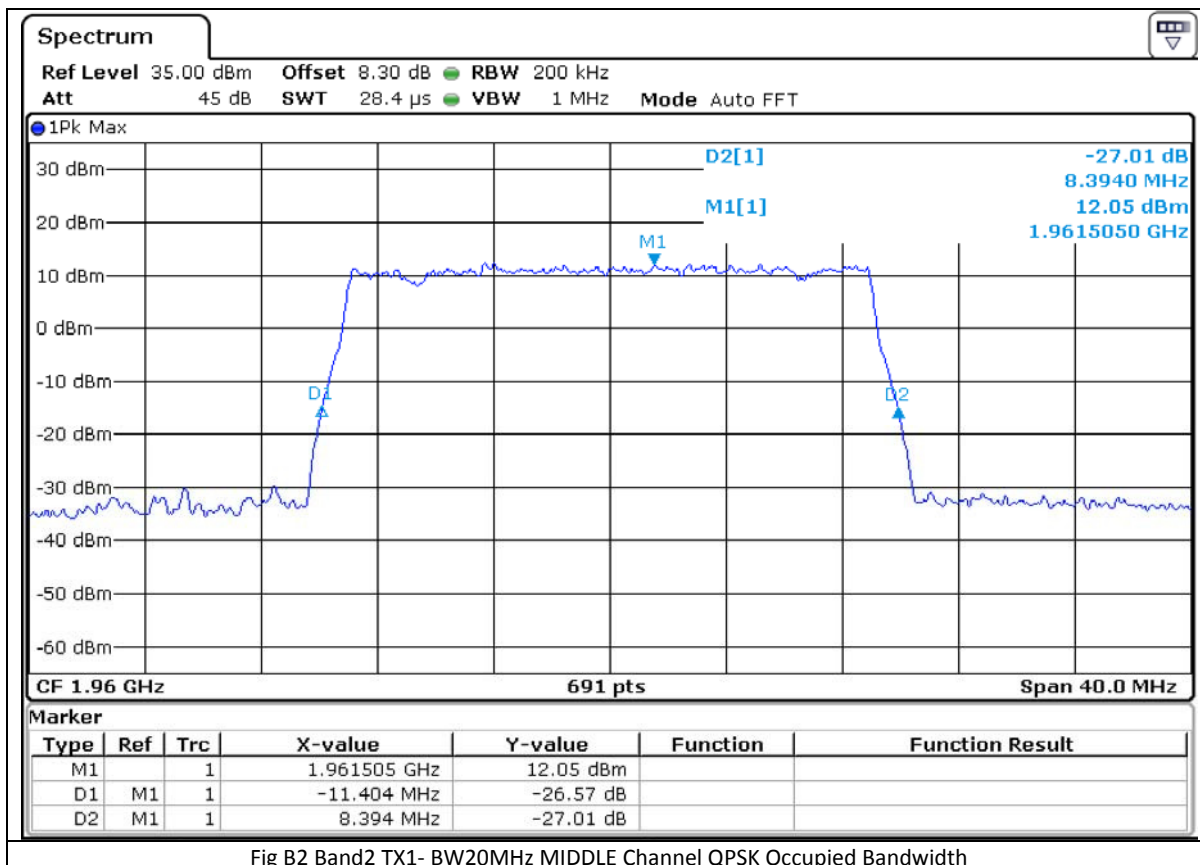
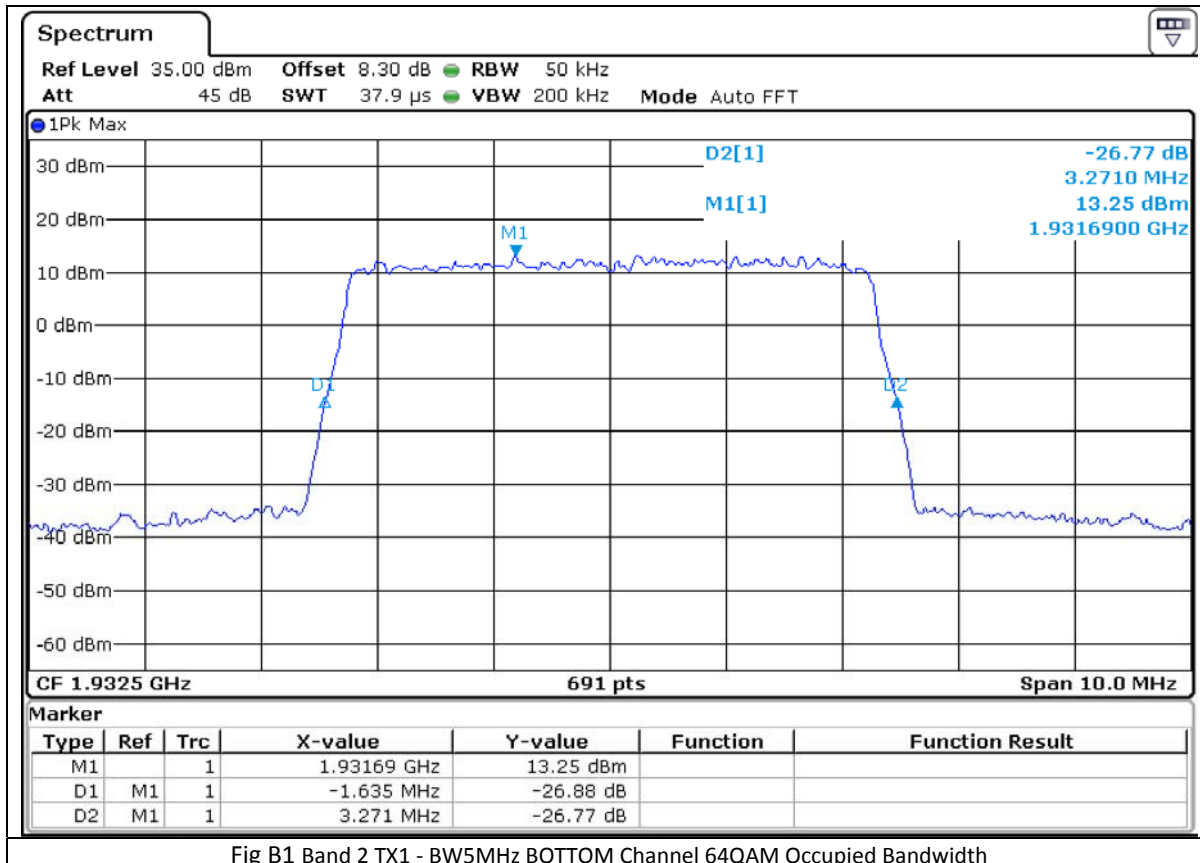


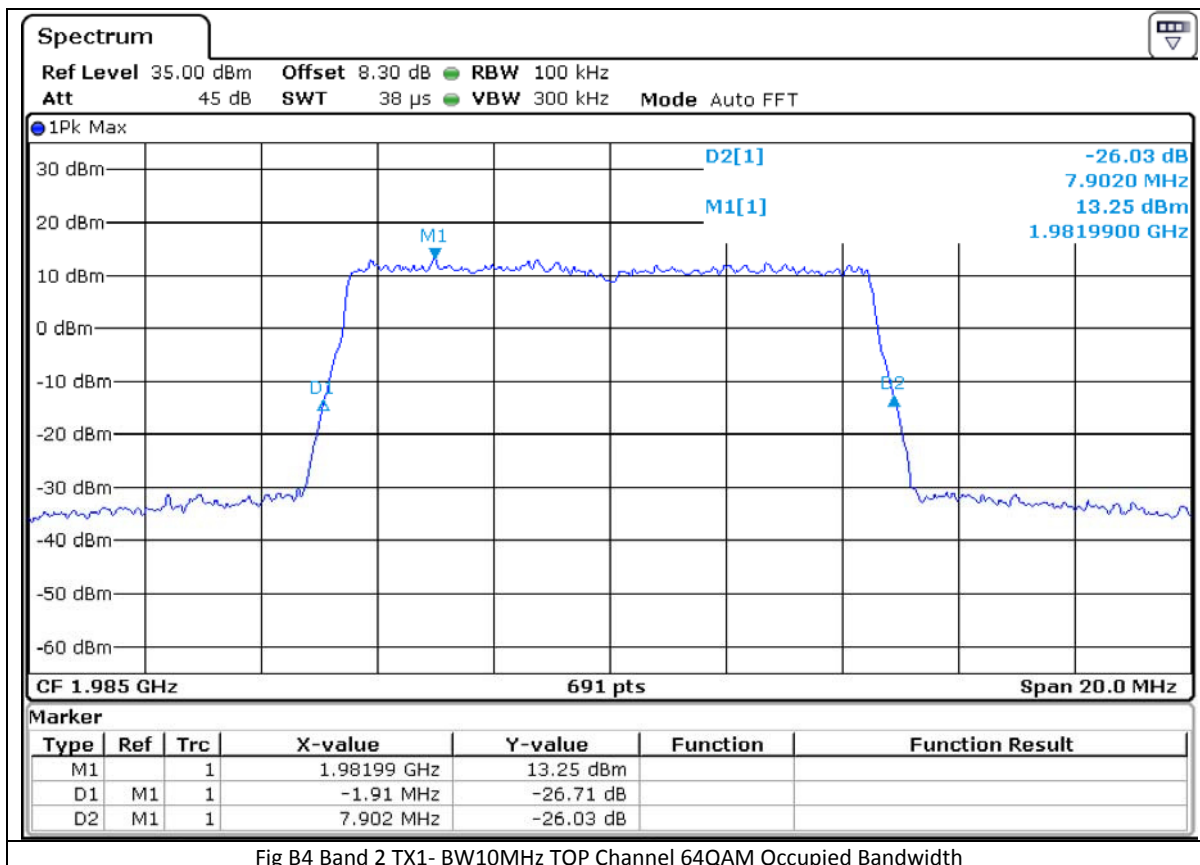
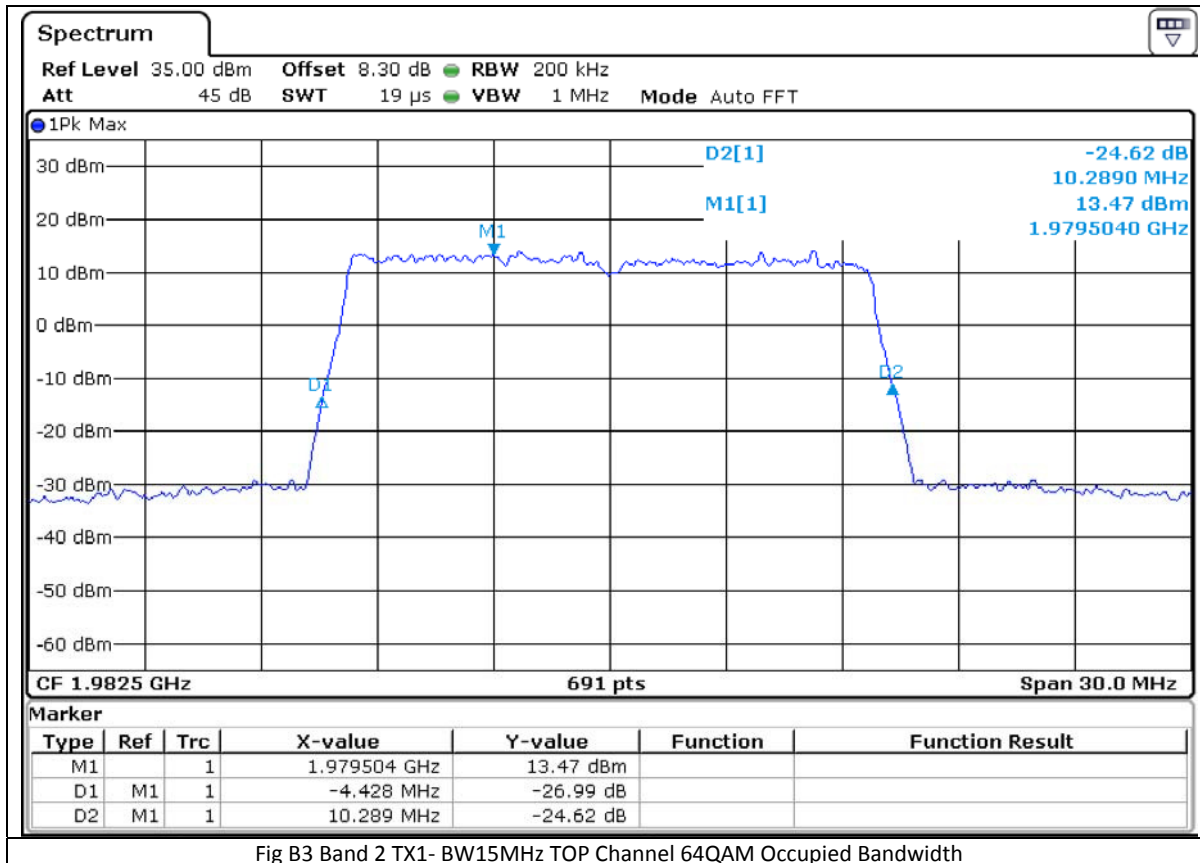


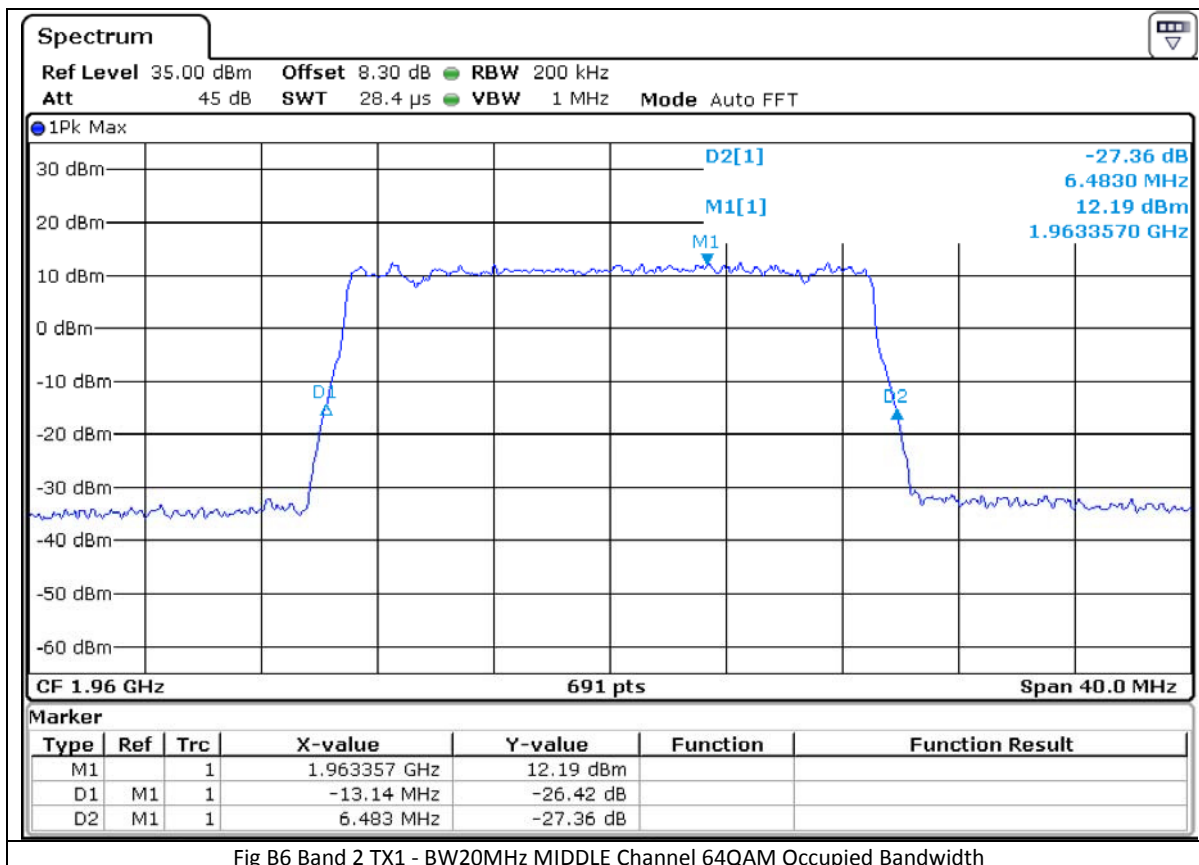
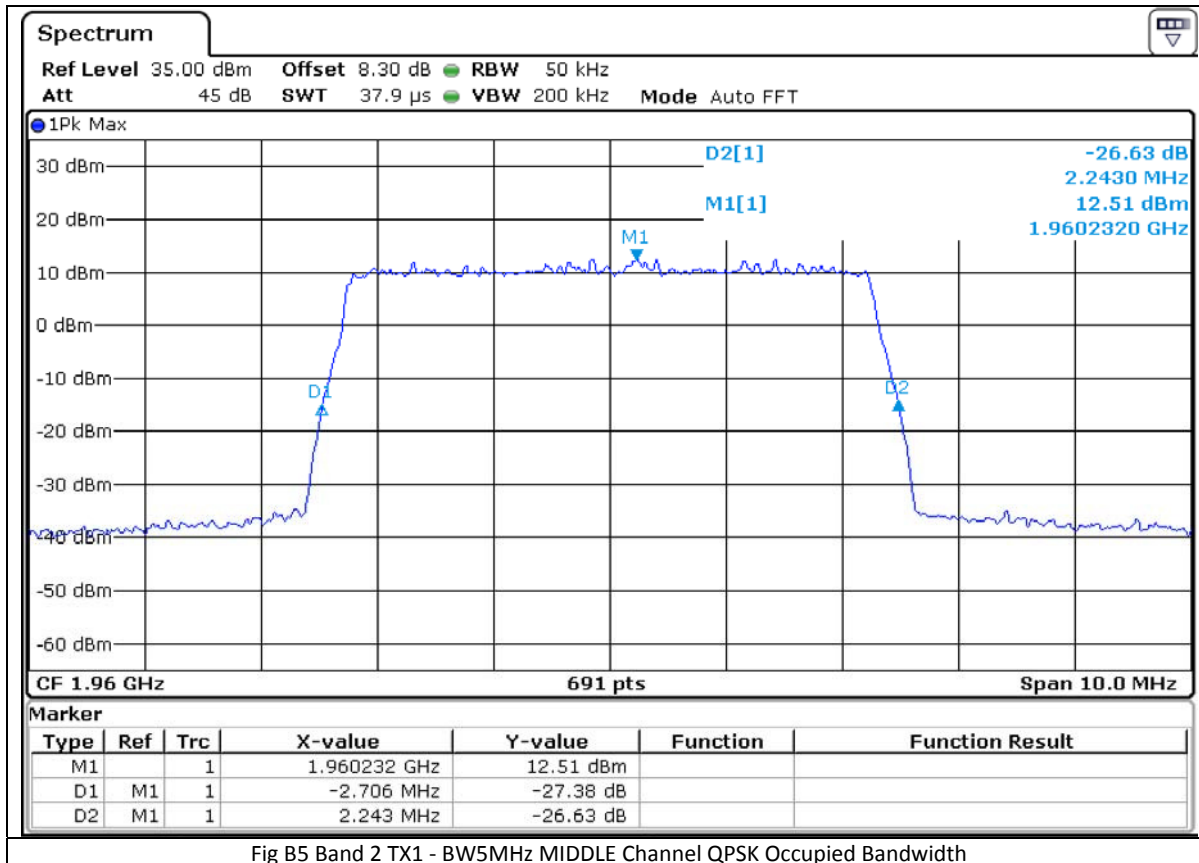
Appendix B

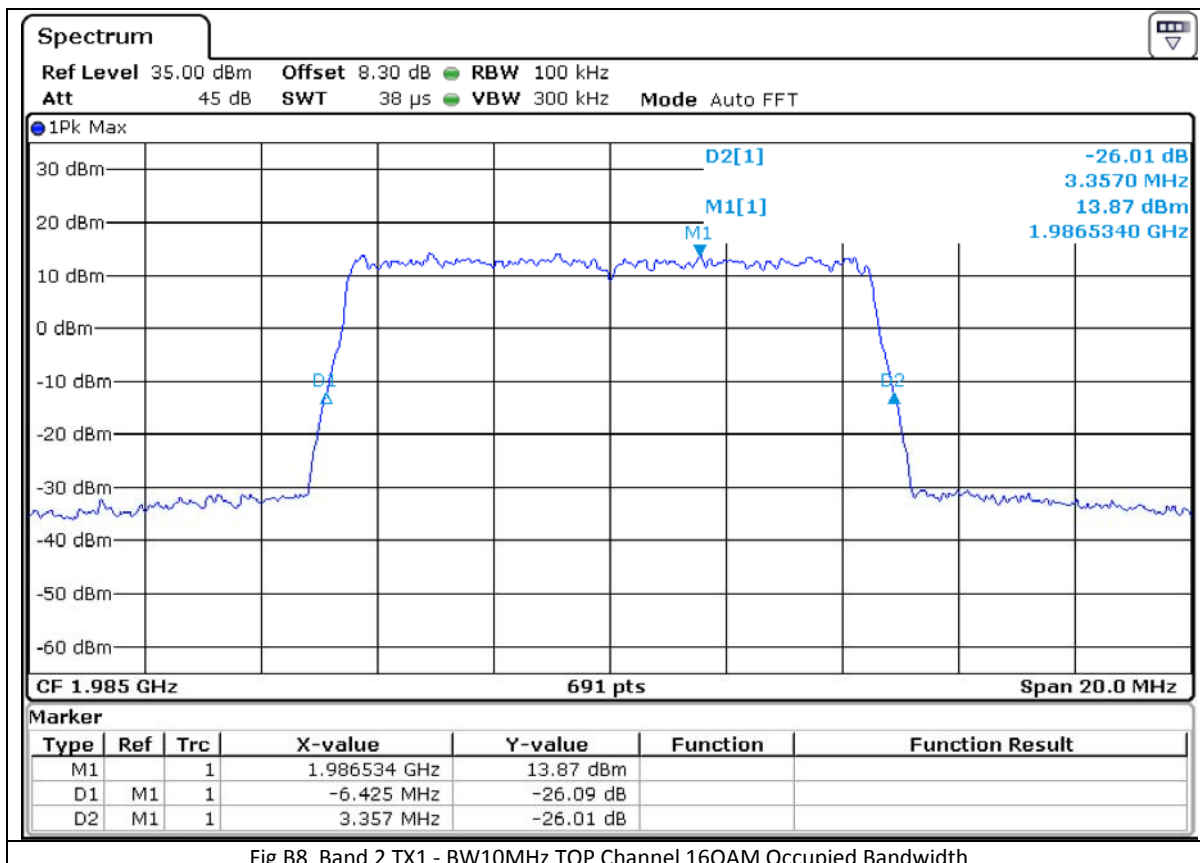
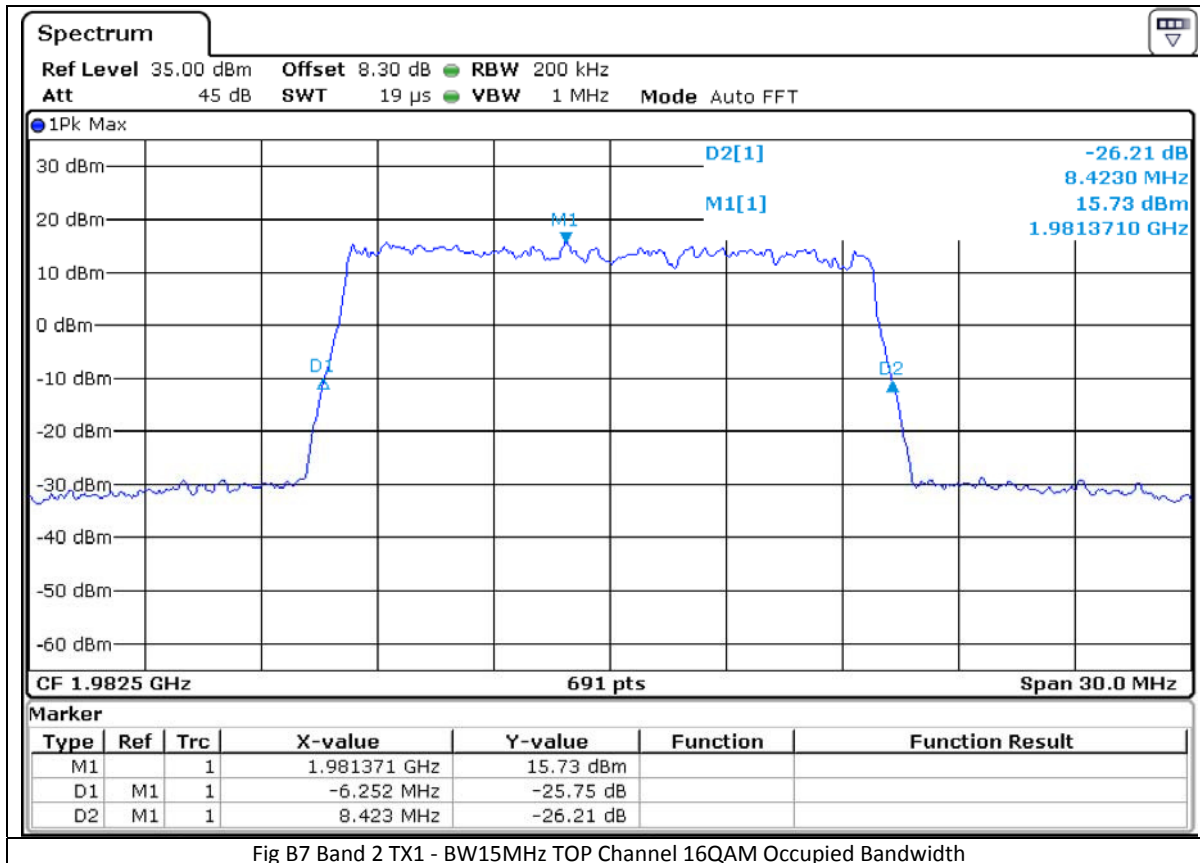
Occupied Bandwidth

Conducted







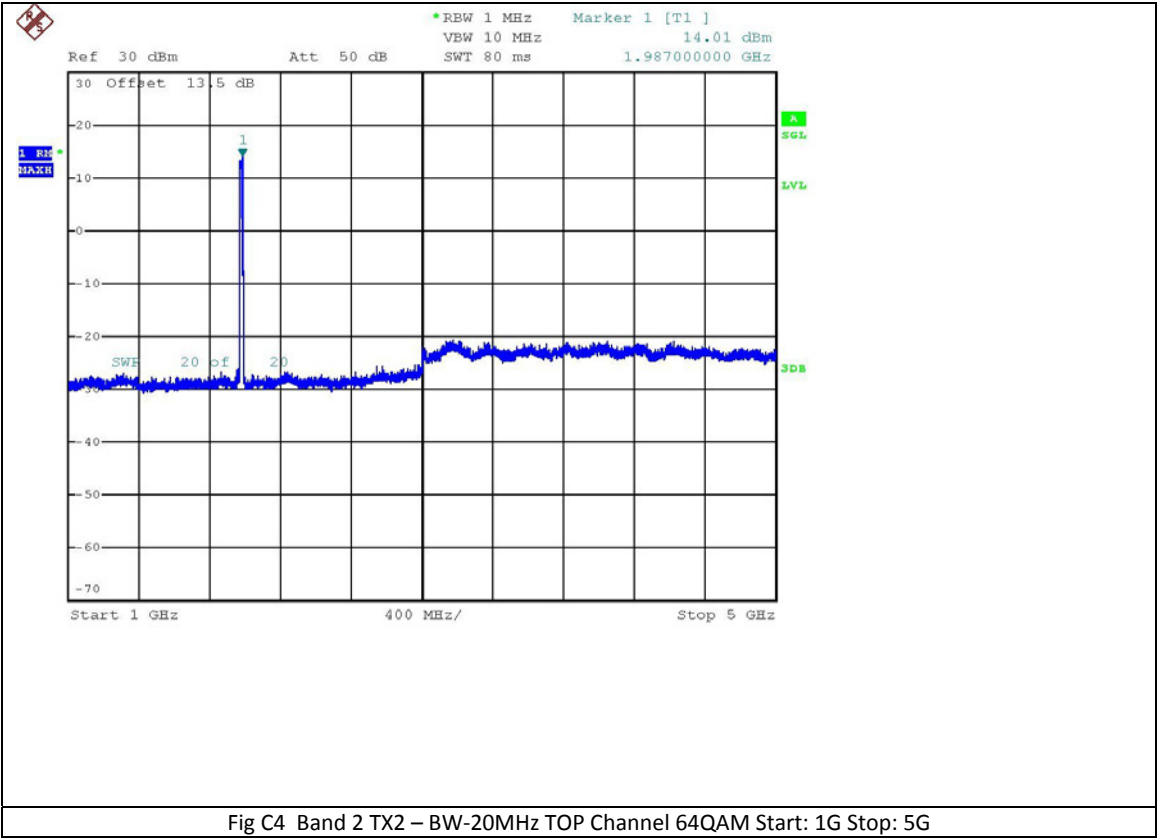
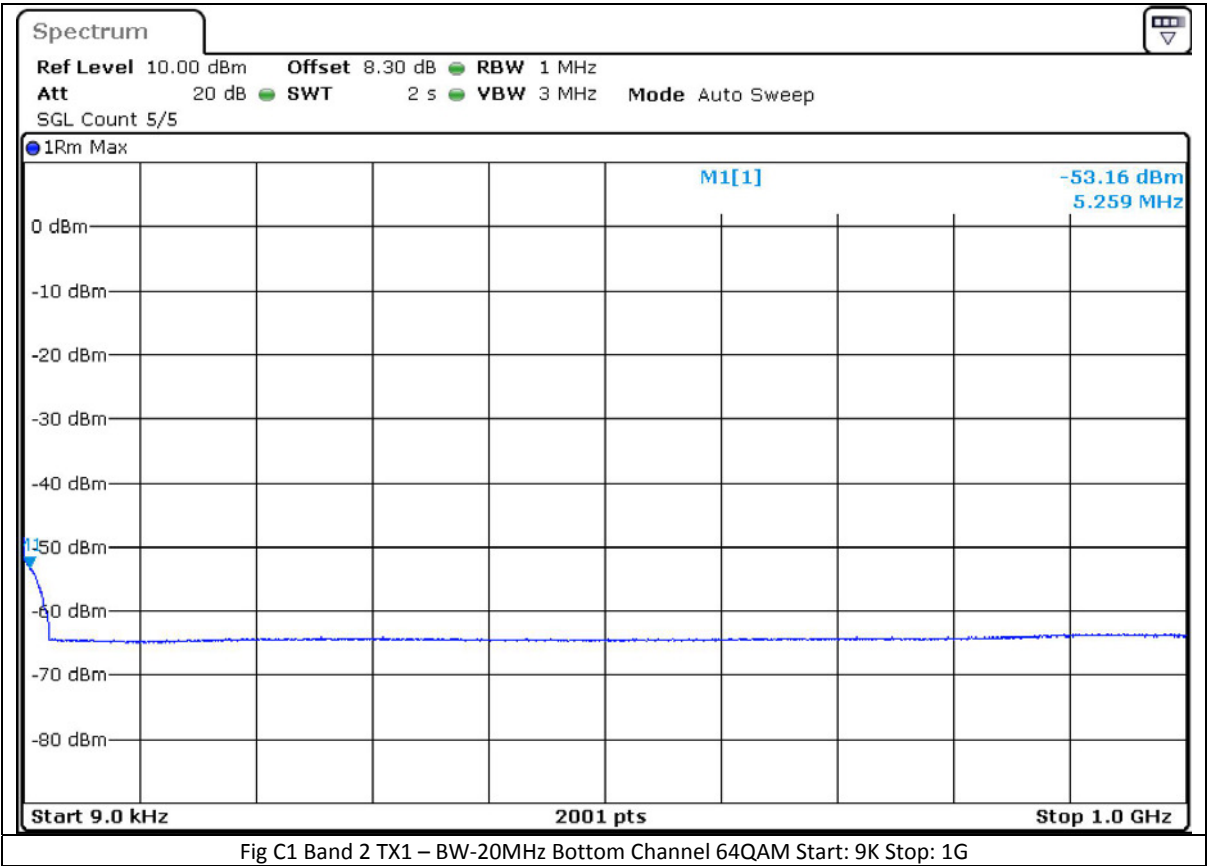


Appendix C

Spurious Emissions

Conducted

Band 2



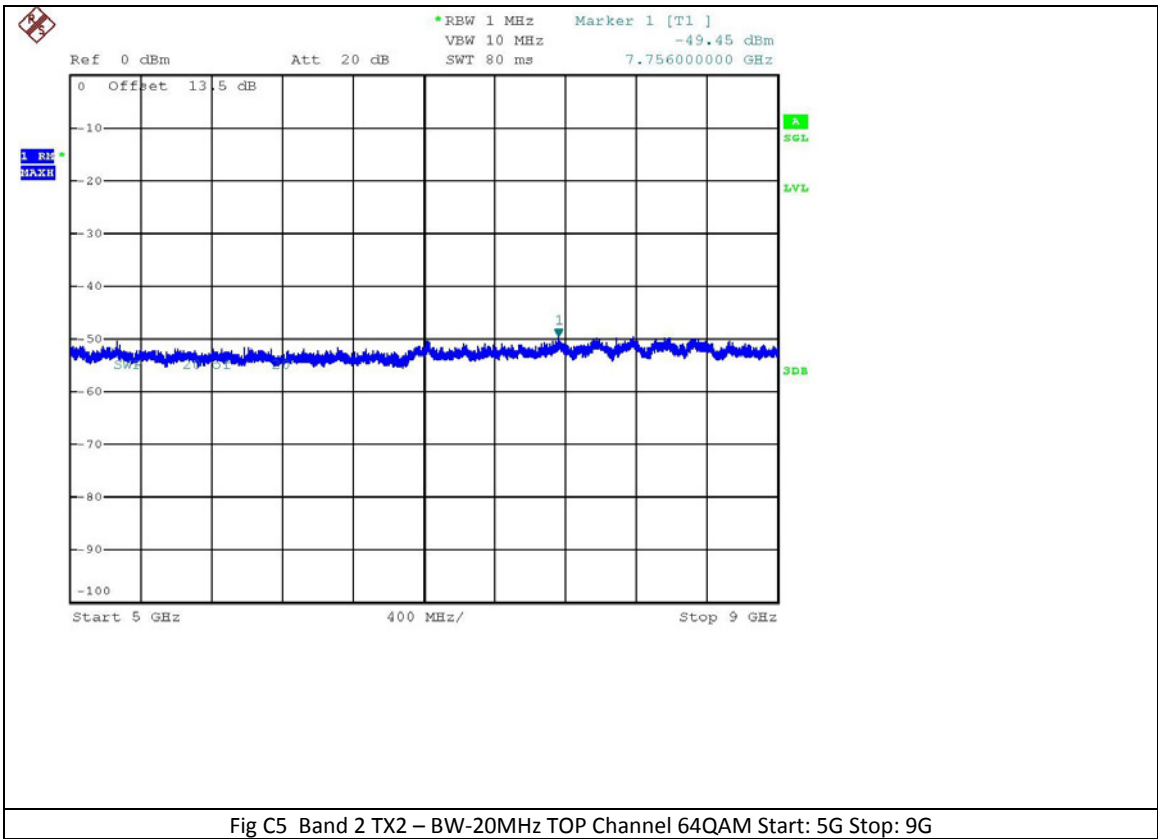


Fig C5 Band 2 TX2 – BW-20MHz TOP Channel 64QAM Start: 5G Stop: 9G

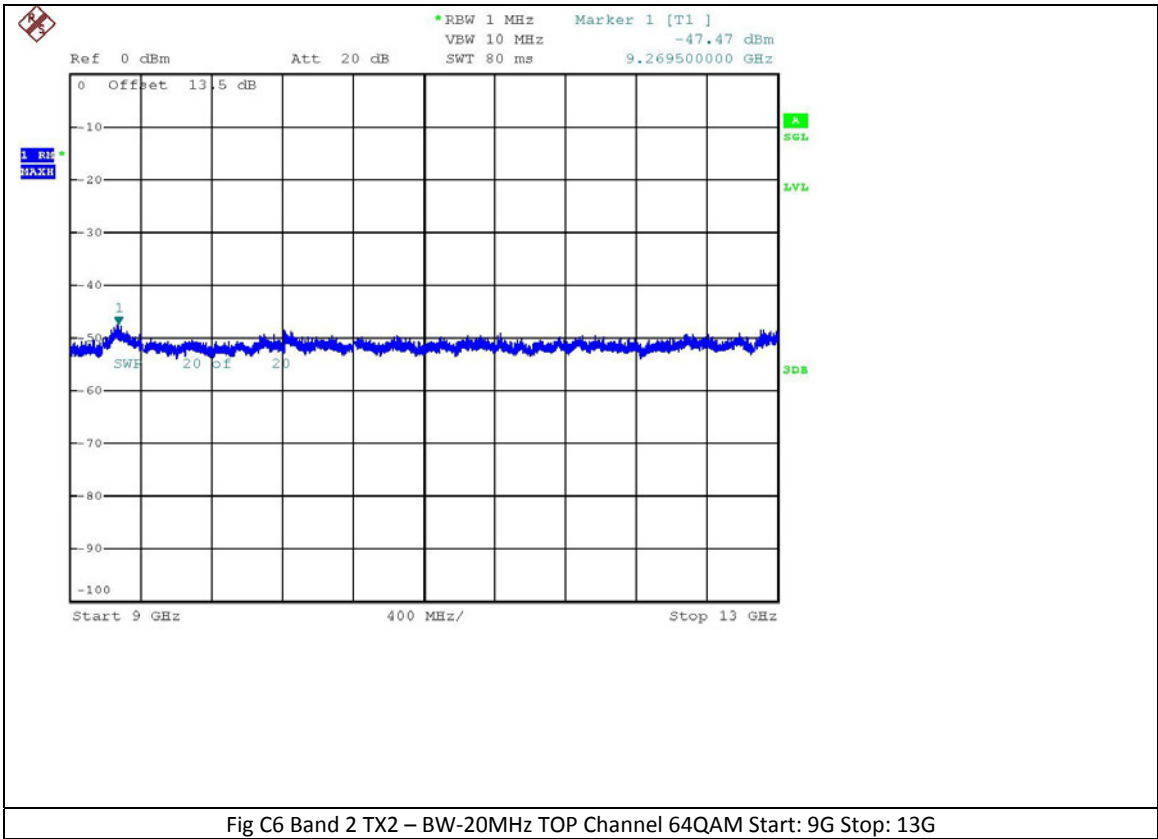
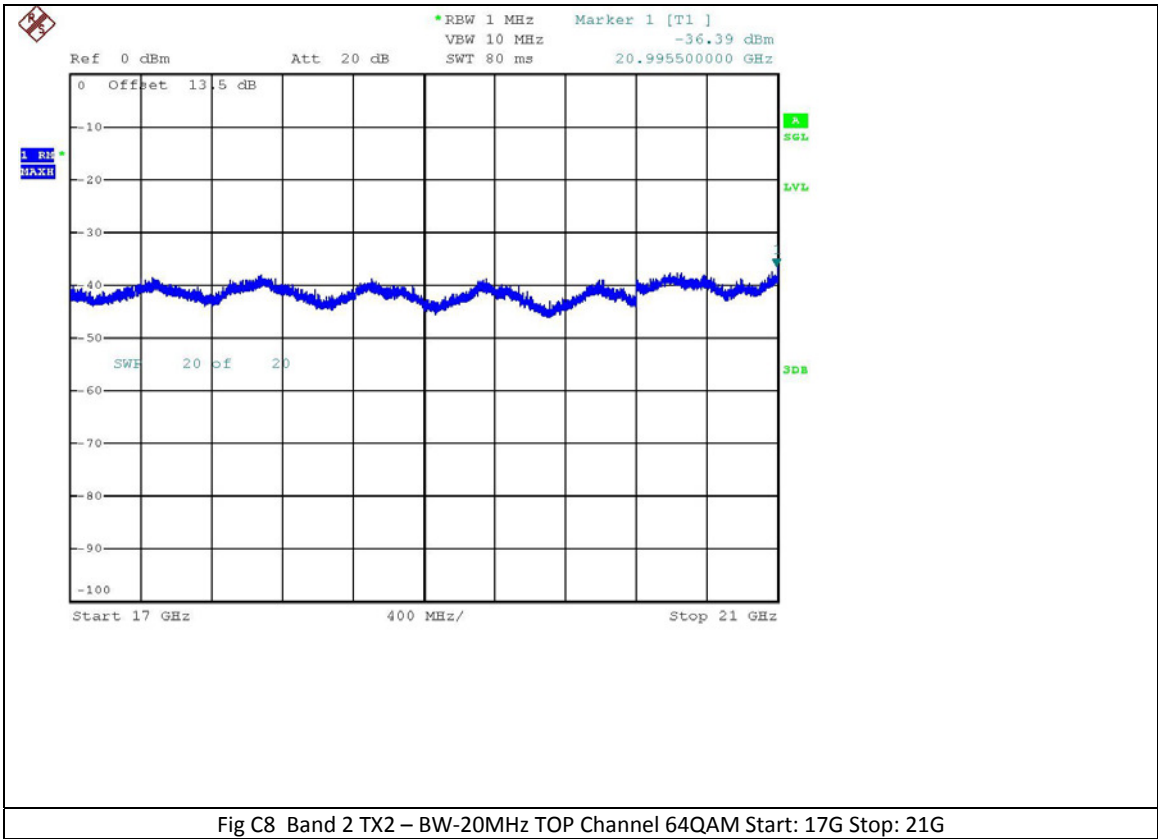
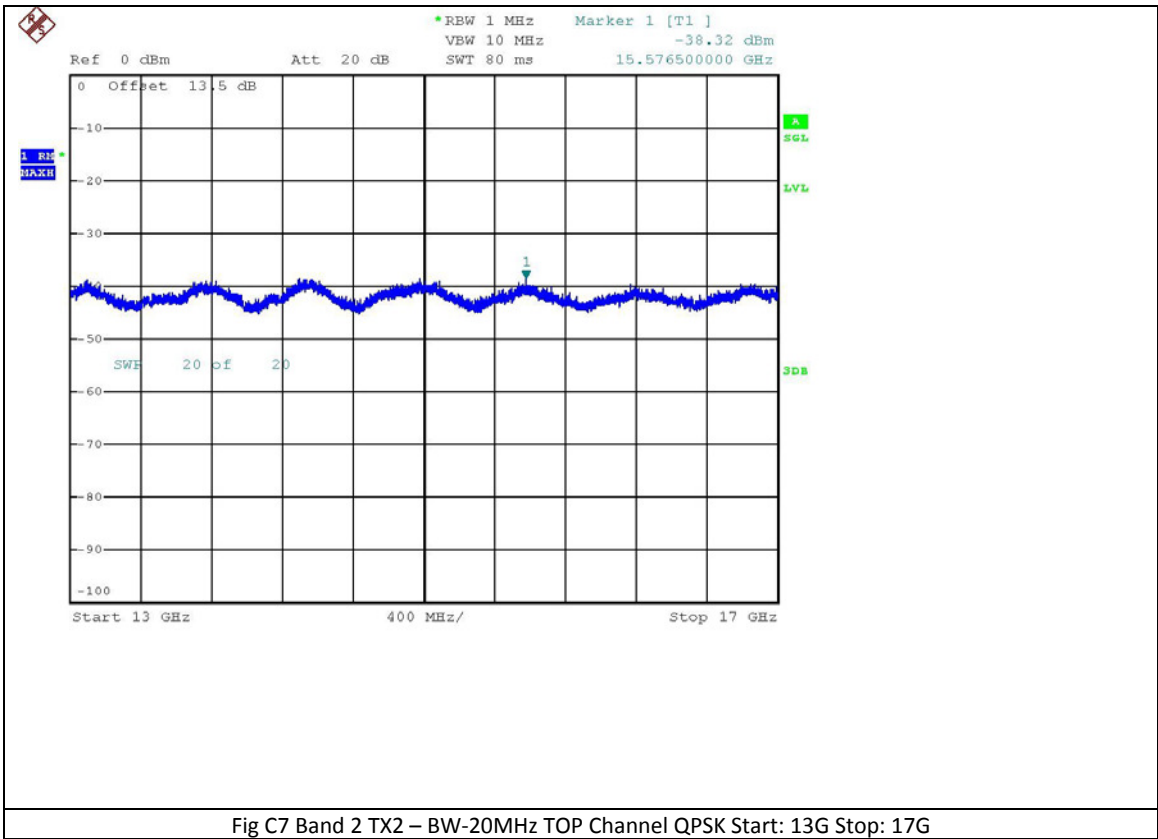
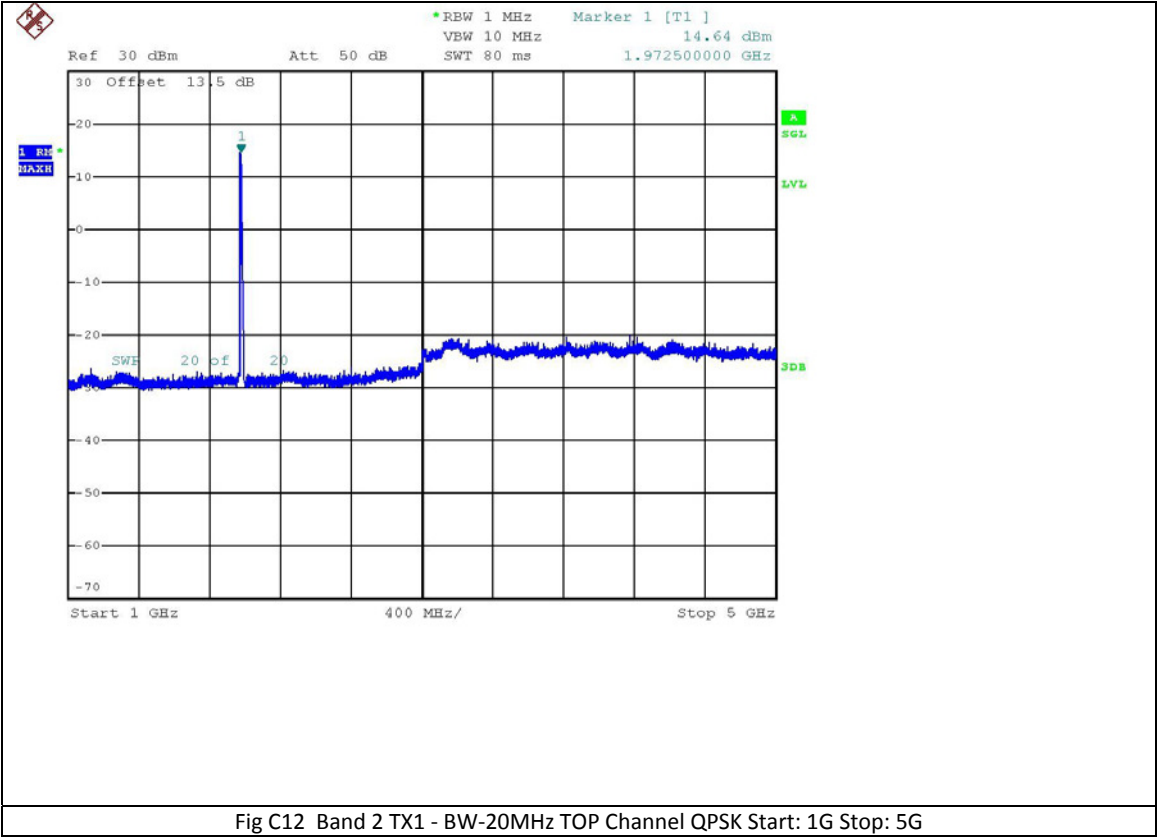
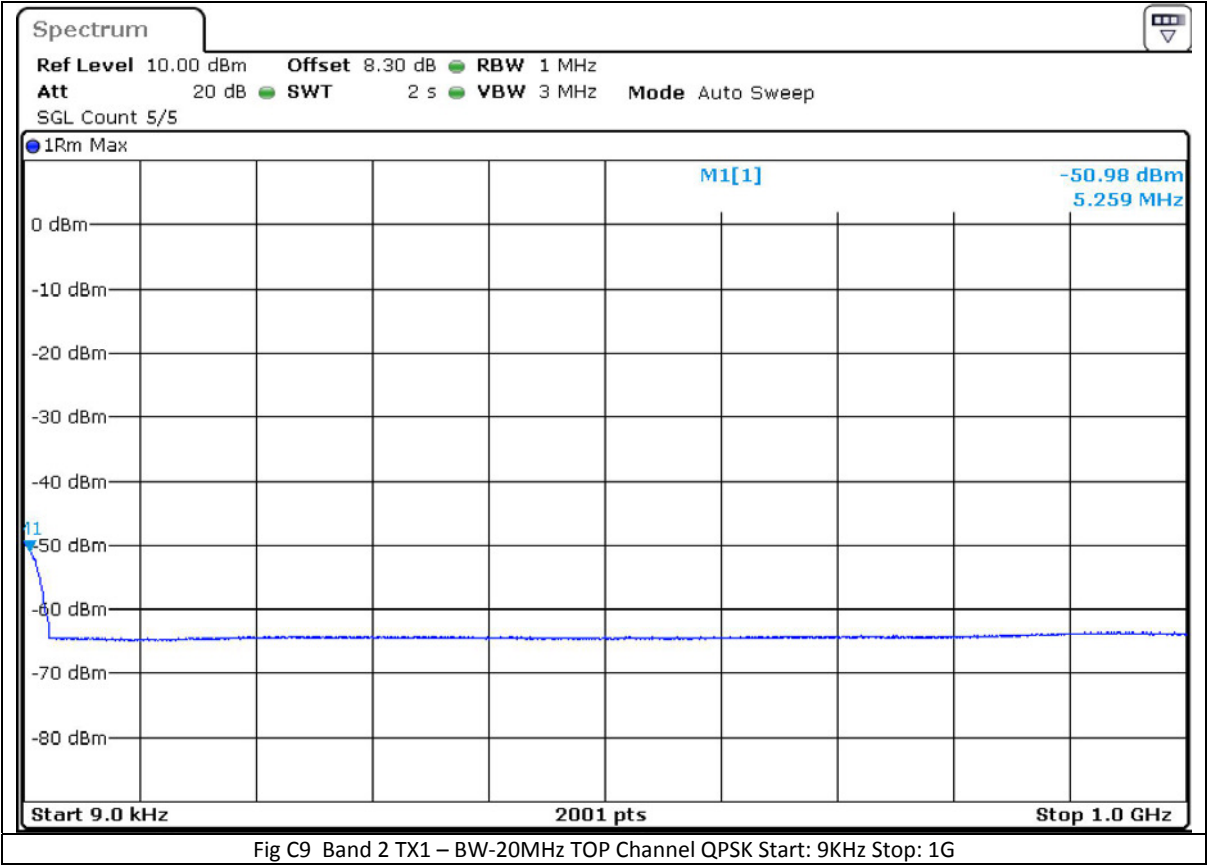
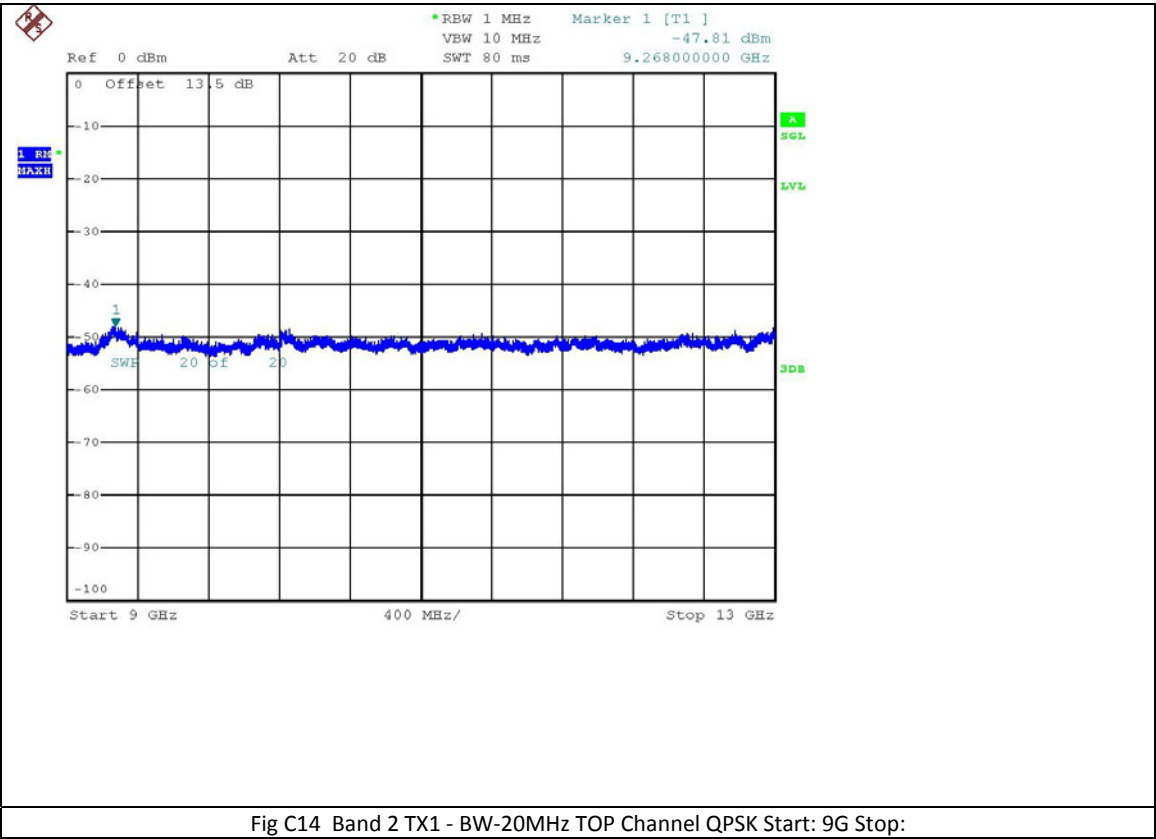
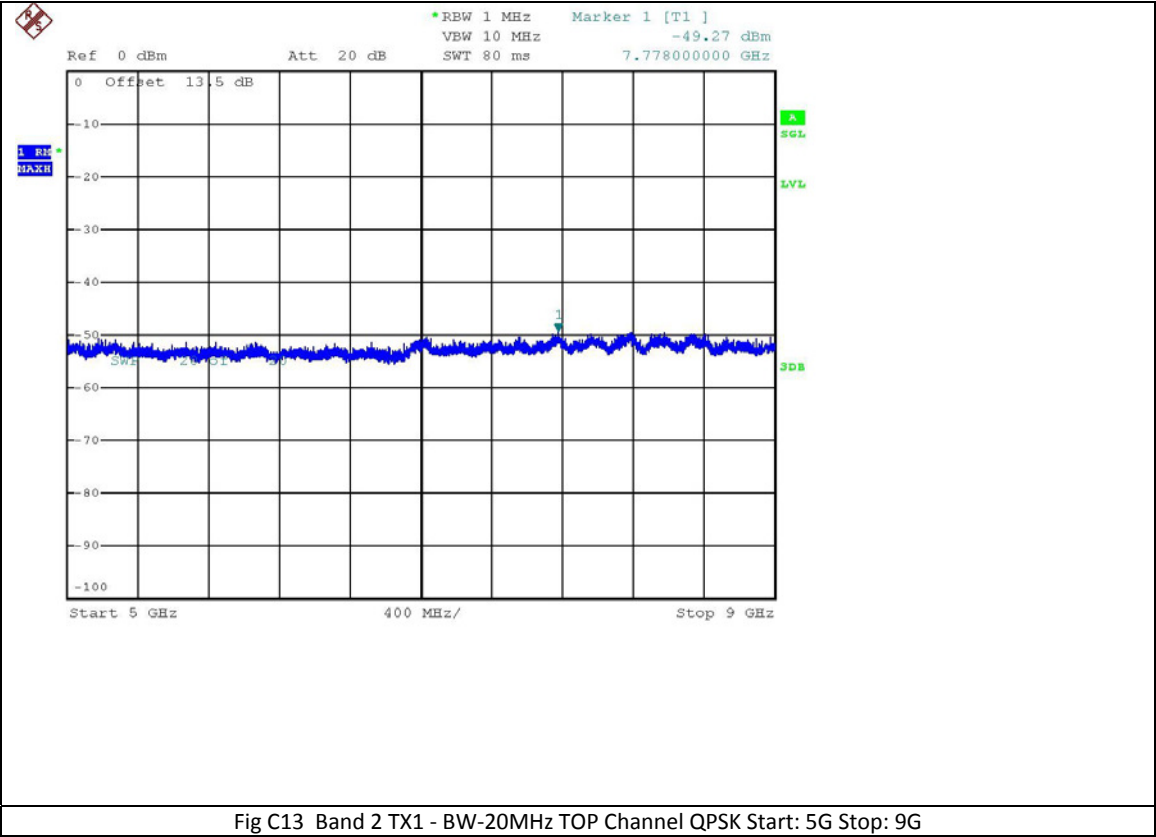
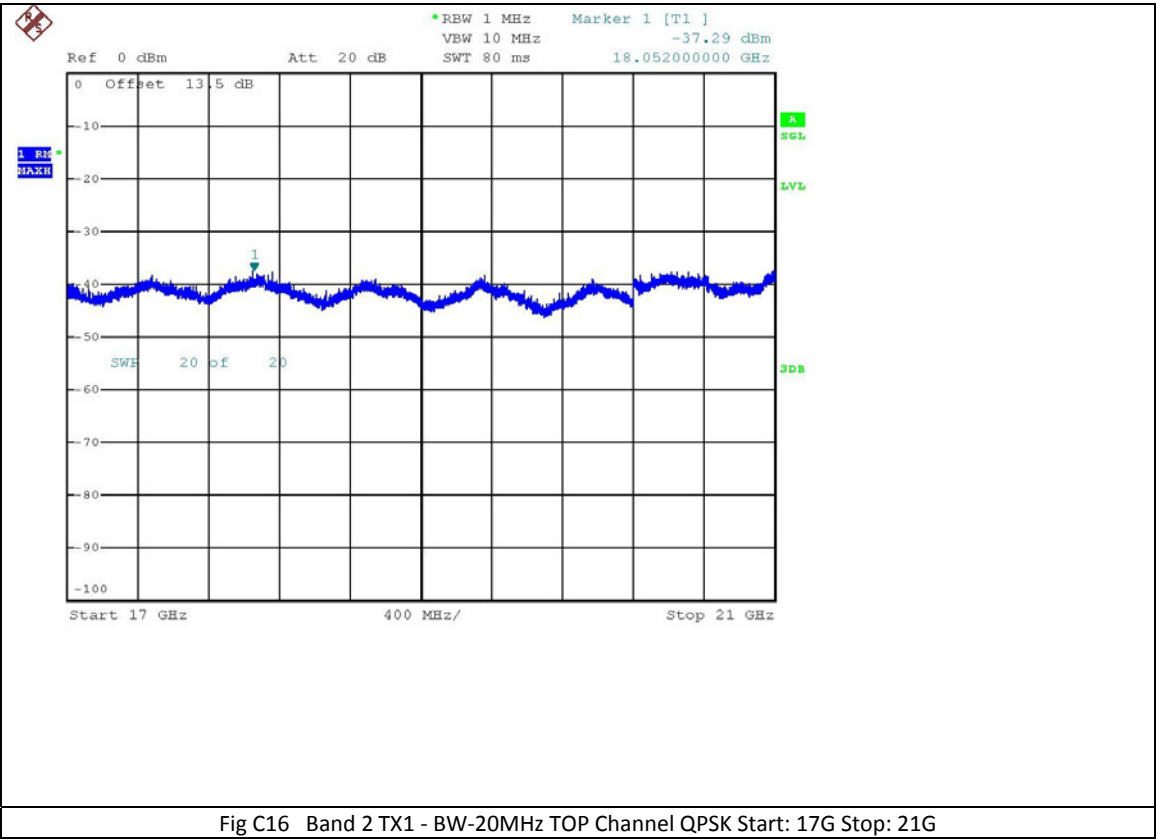
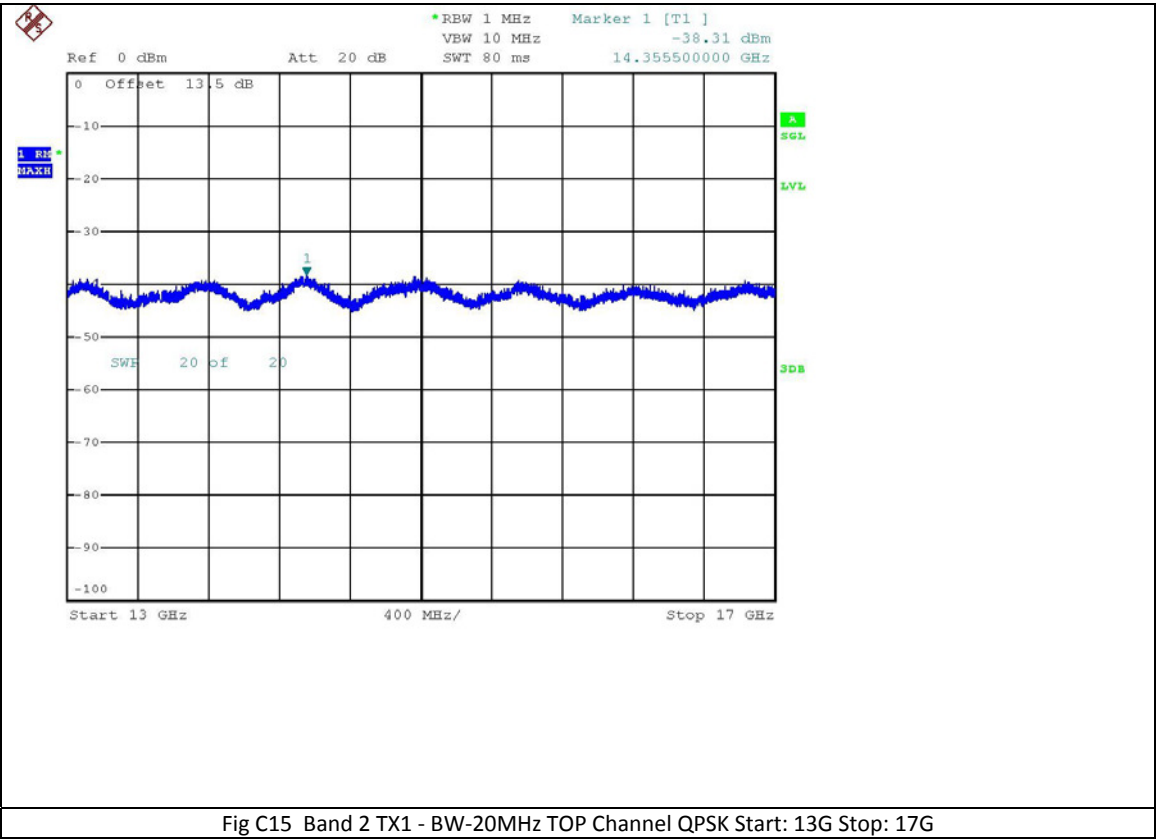


Fig C6 Band 2 TX2 – BW-20MHz TOP Channel 64QAM Start: 9G Stop: 13G









Appendix D

Band Edge Emissions

Conducted

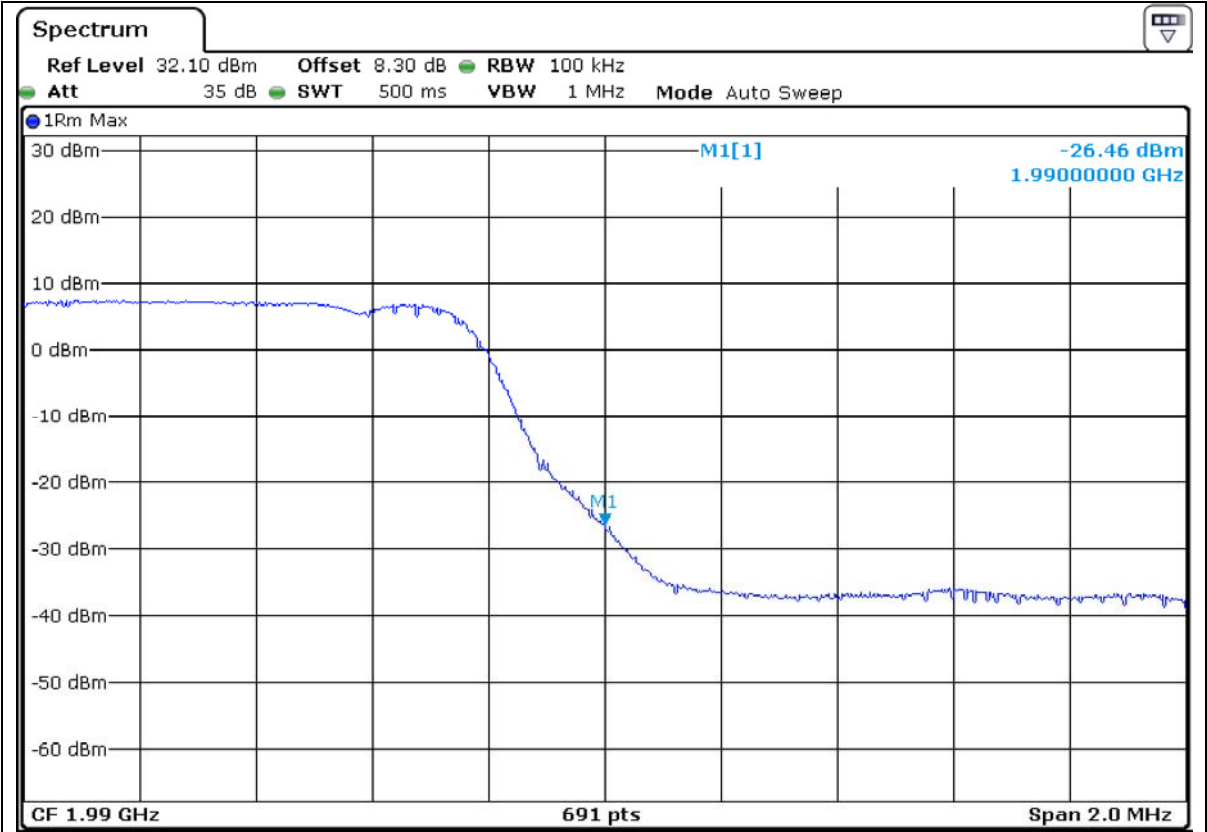


Fig D1 Band 2 TX2 - BW-5MHz TOP Channel 16QAM Band Edge Upper

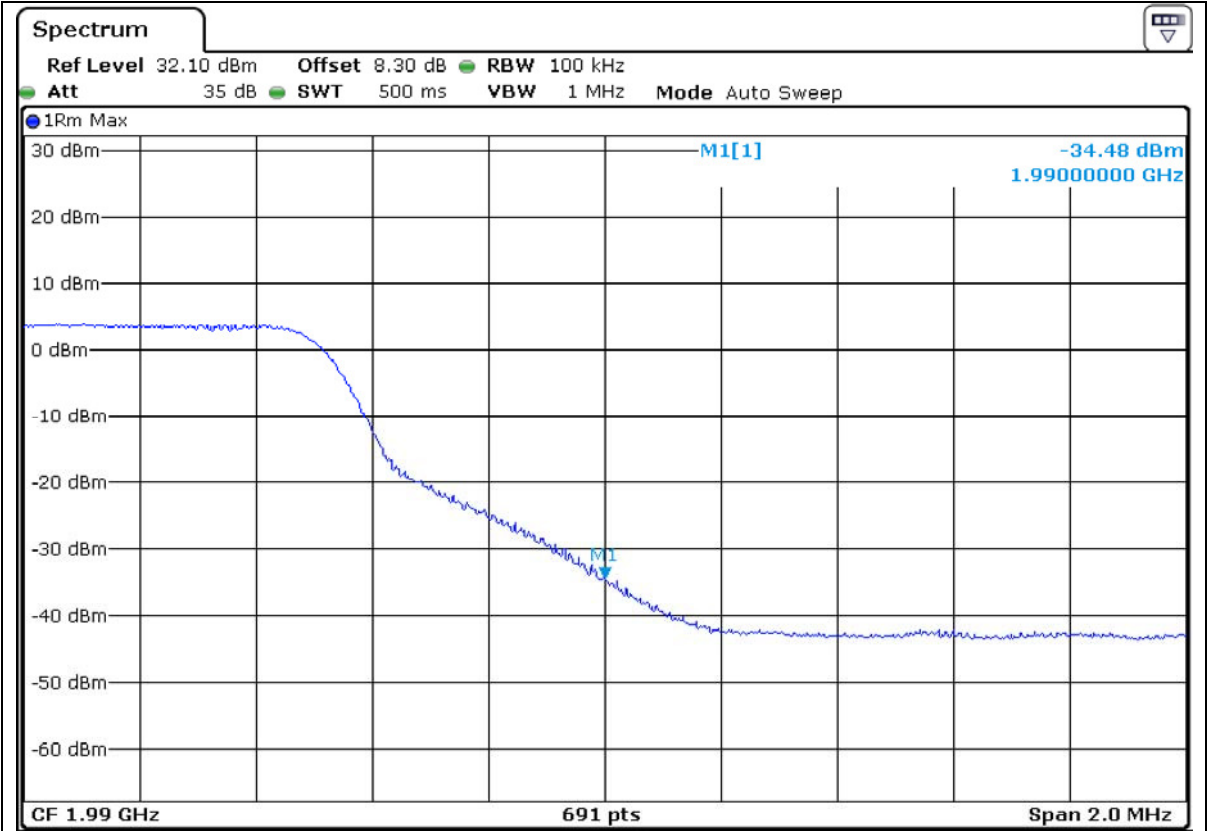


Fig D2 Band 2 TX2 - BW-10MHz TOP Channel 16QAM Band Edge Upper

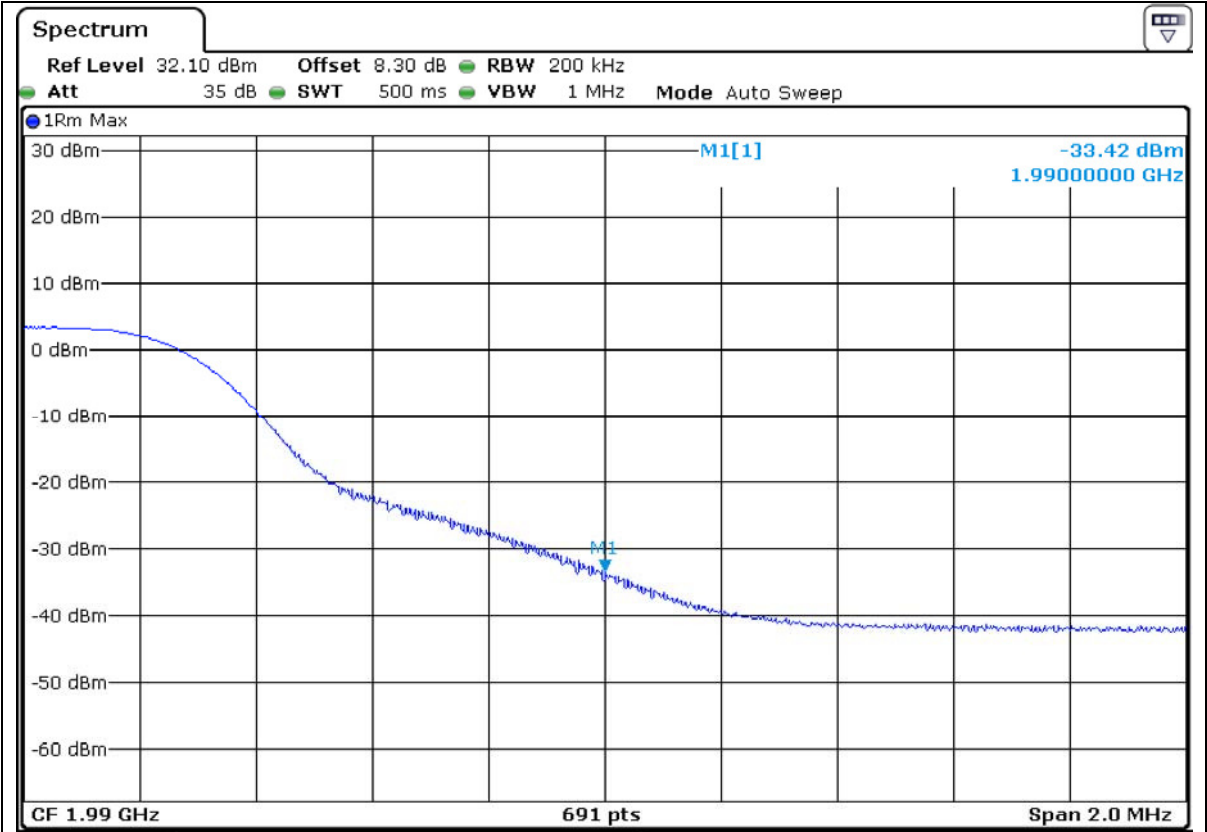


Fig D3 Band 2 TX2 - BW-15MHz TOP Channel 16QAM Band Edge Upper

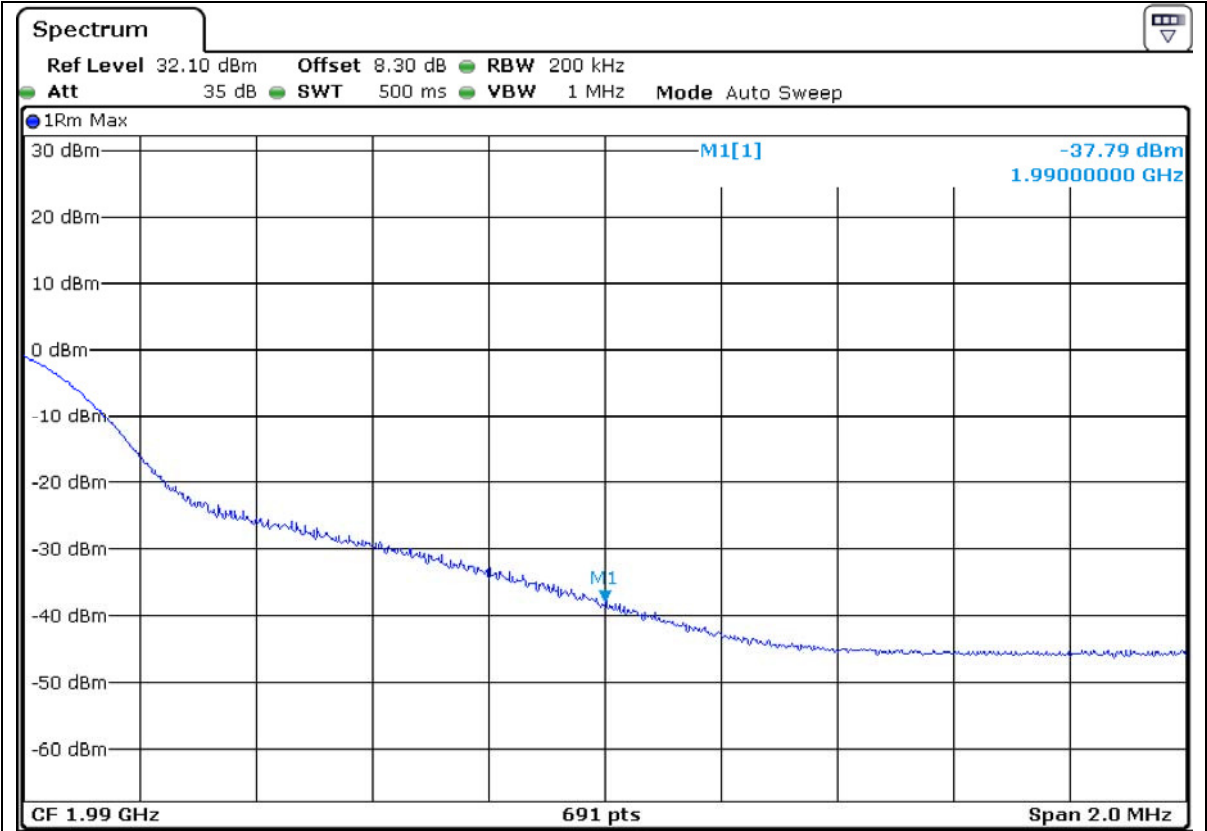


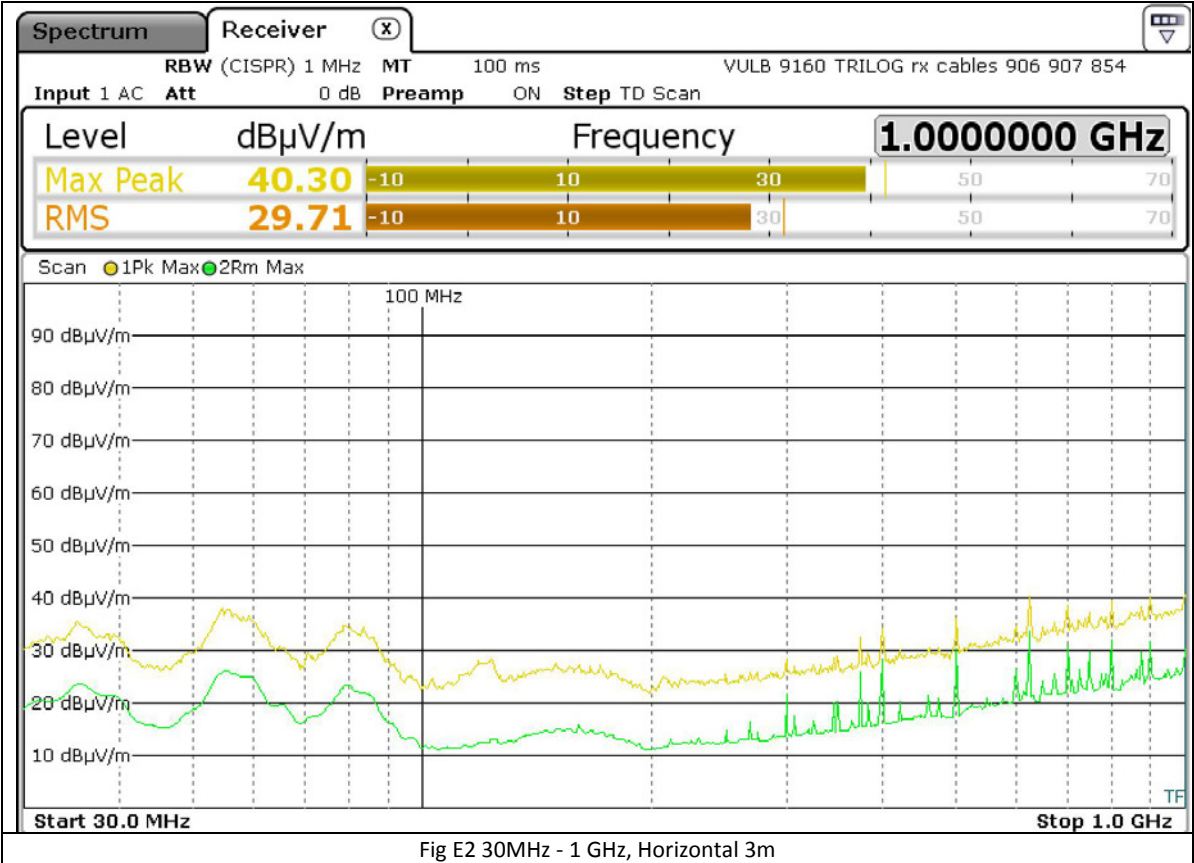
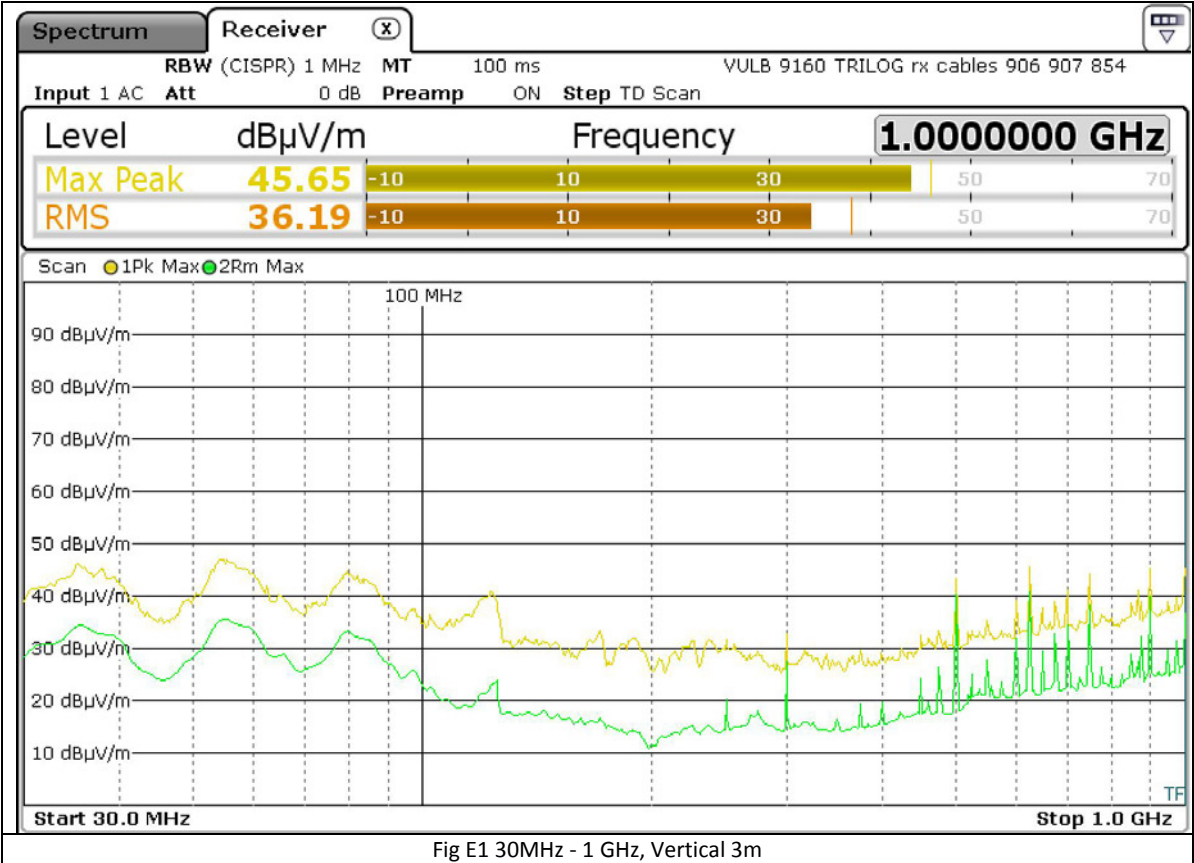
Fig D4 Band 2 TX2 - BW-20MHz TOP Channel QPSK Band Edge Upper

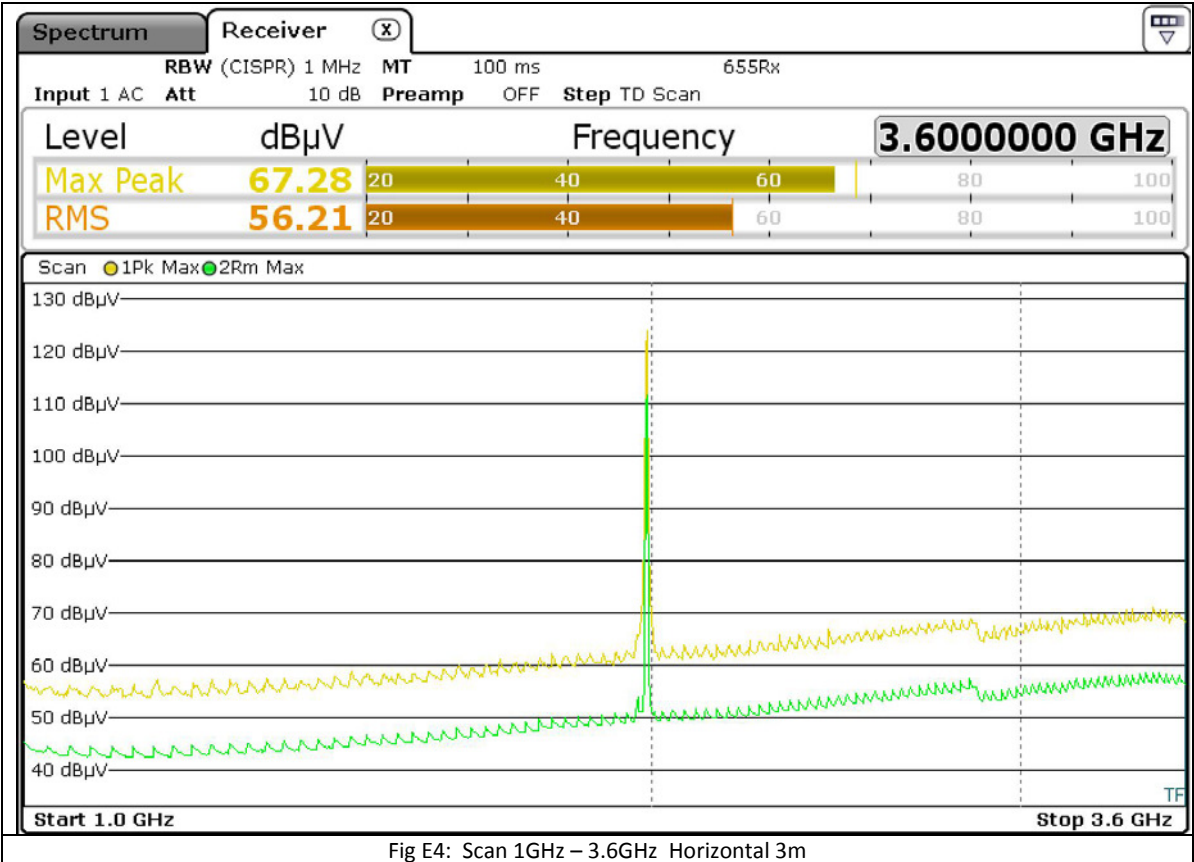
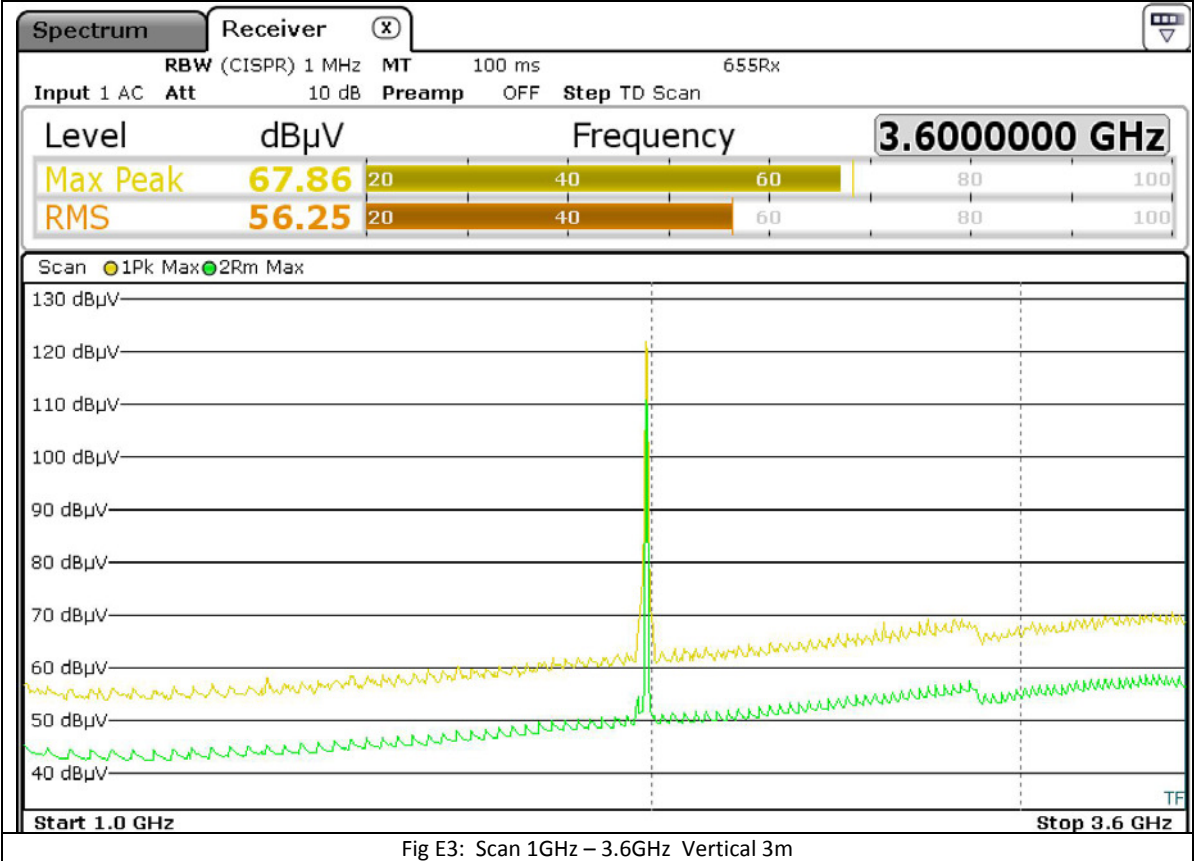
Appendix E

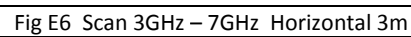
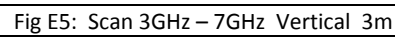
Spurious Emissions

Radiated

Band 2







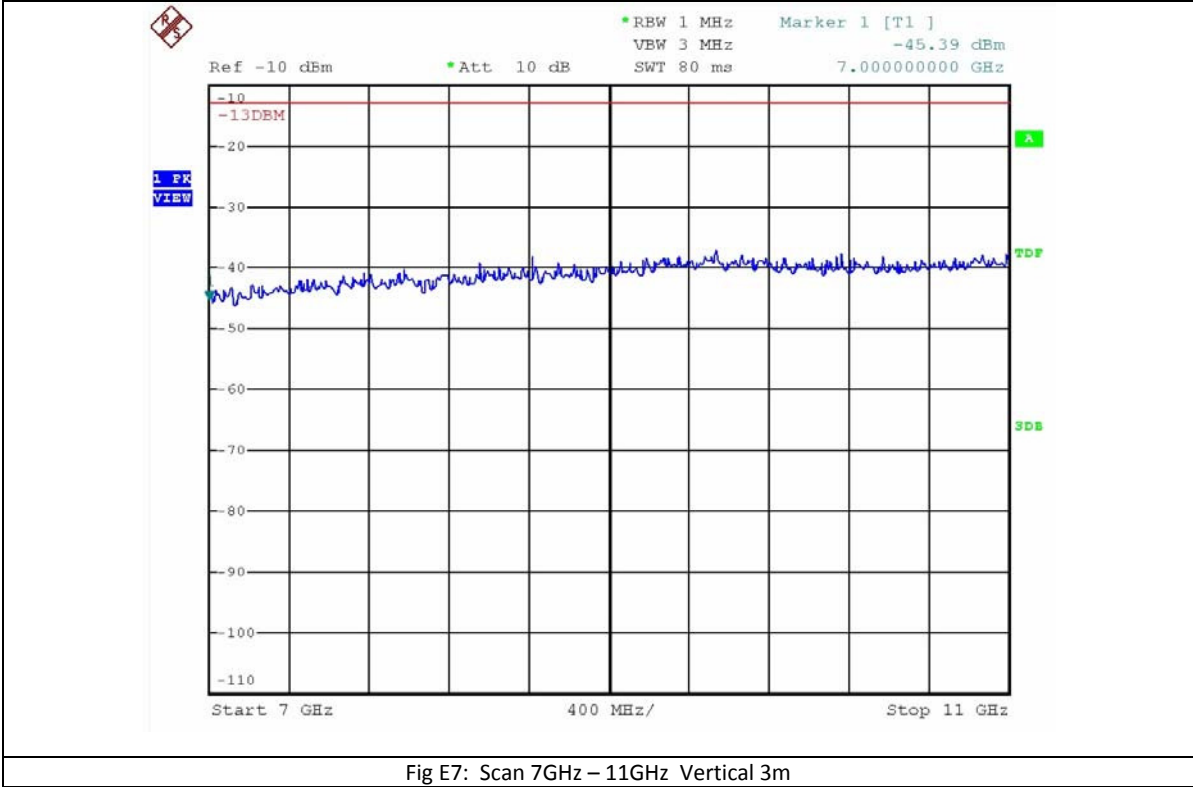


Fig E7: Scan 7GHz – 11GHz Vertical 3m

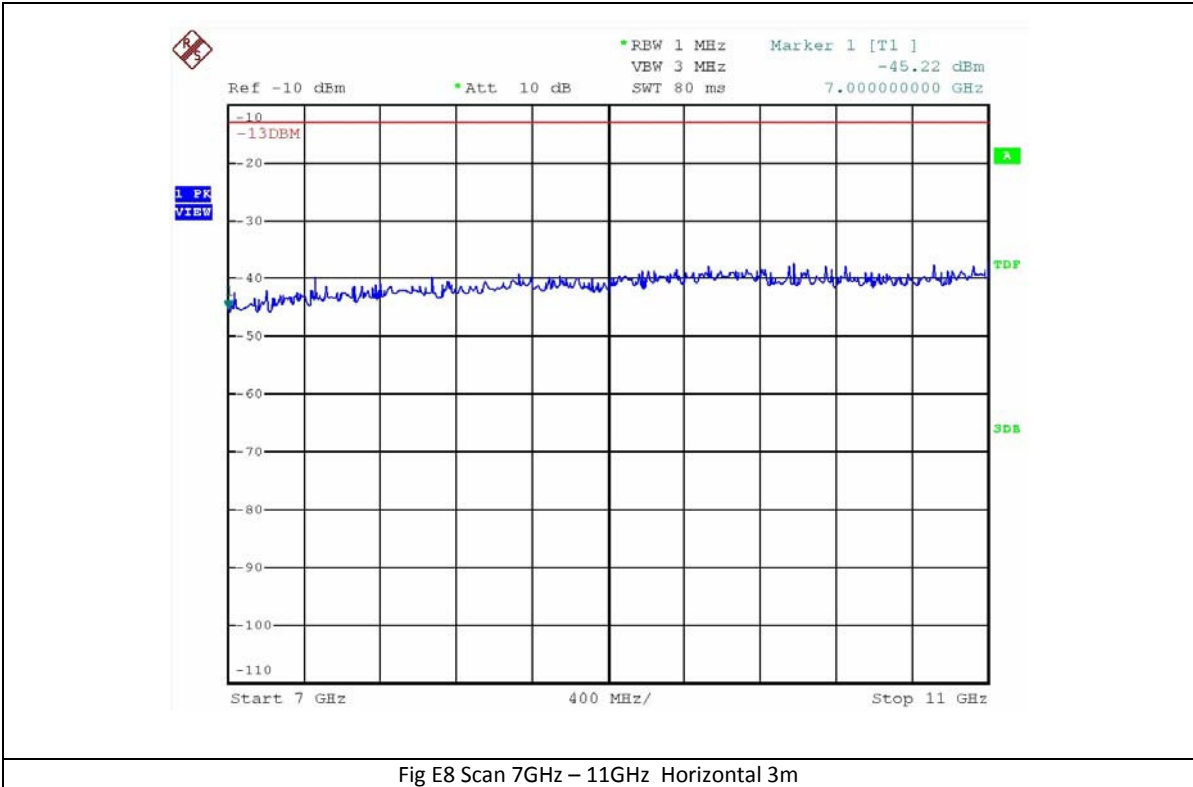
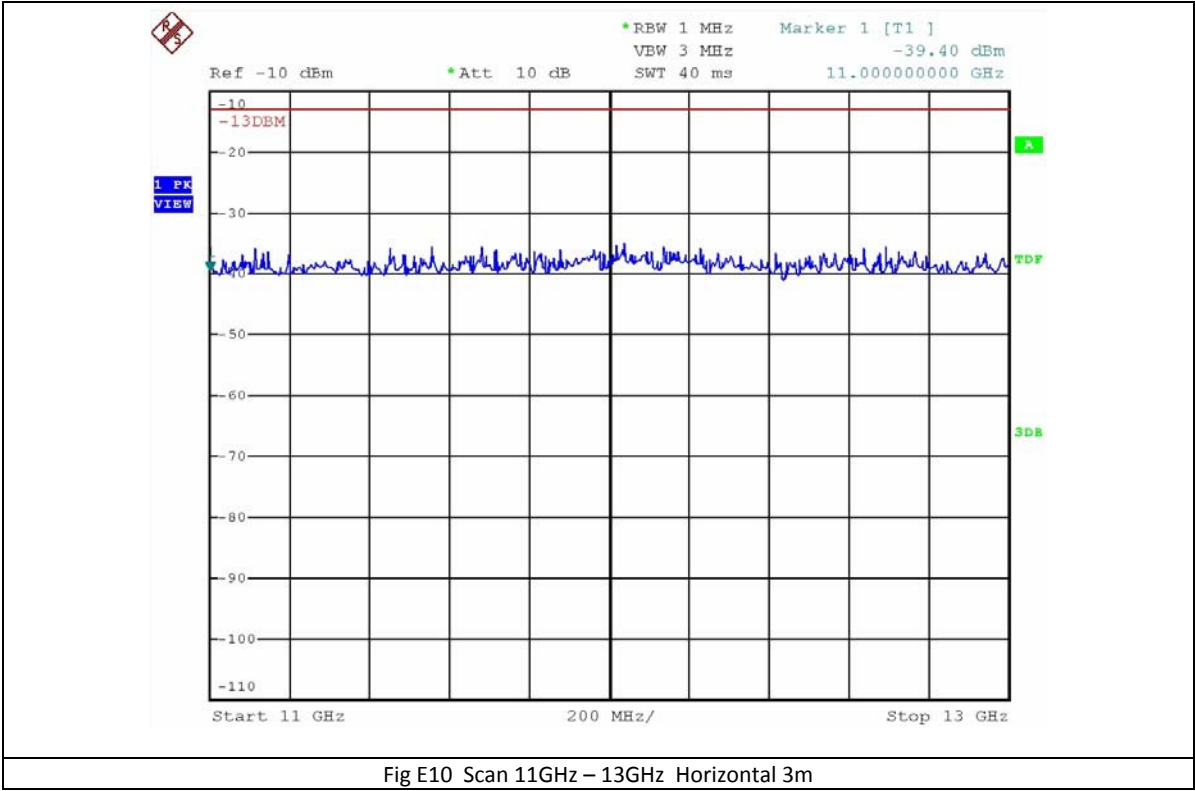
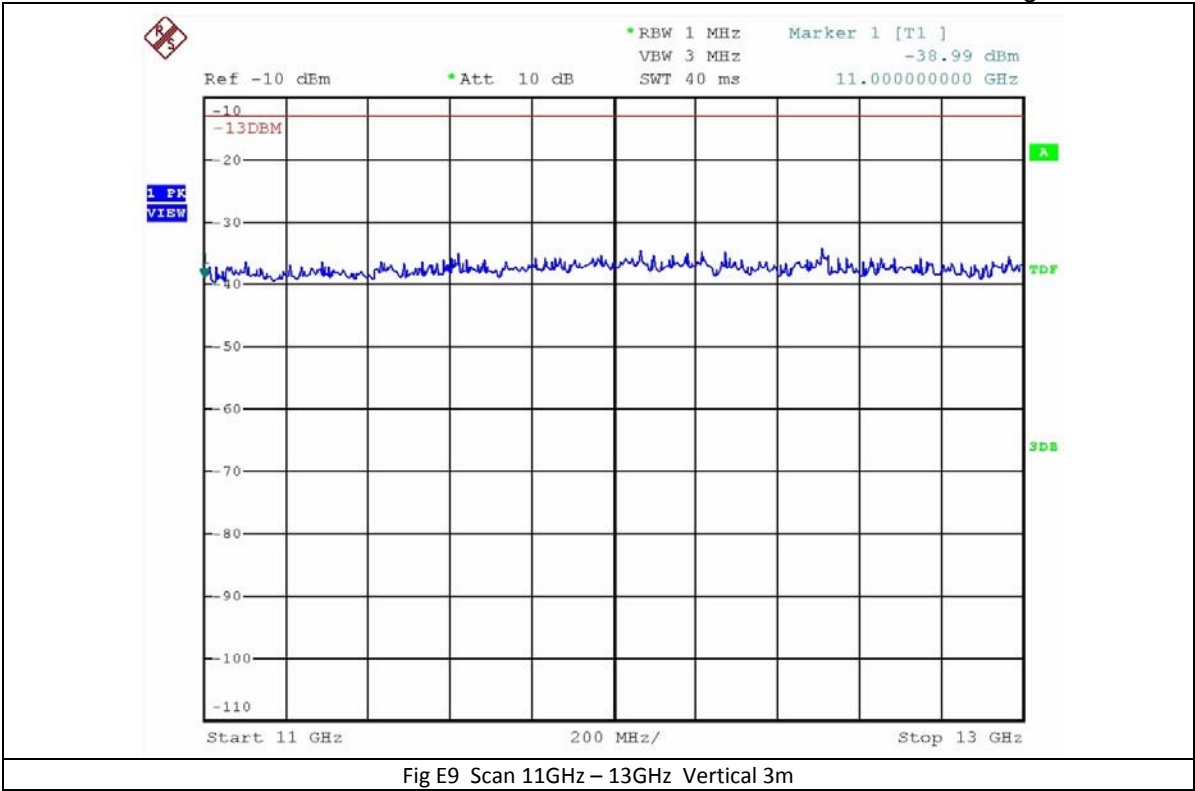


Fig E8 Scan 7GHz – 11GHz Horizontal 3m



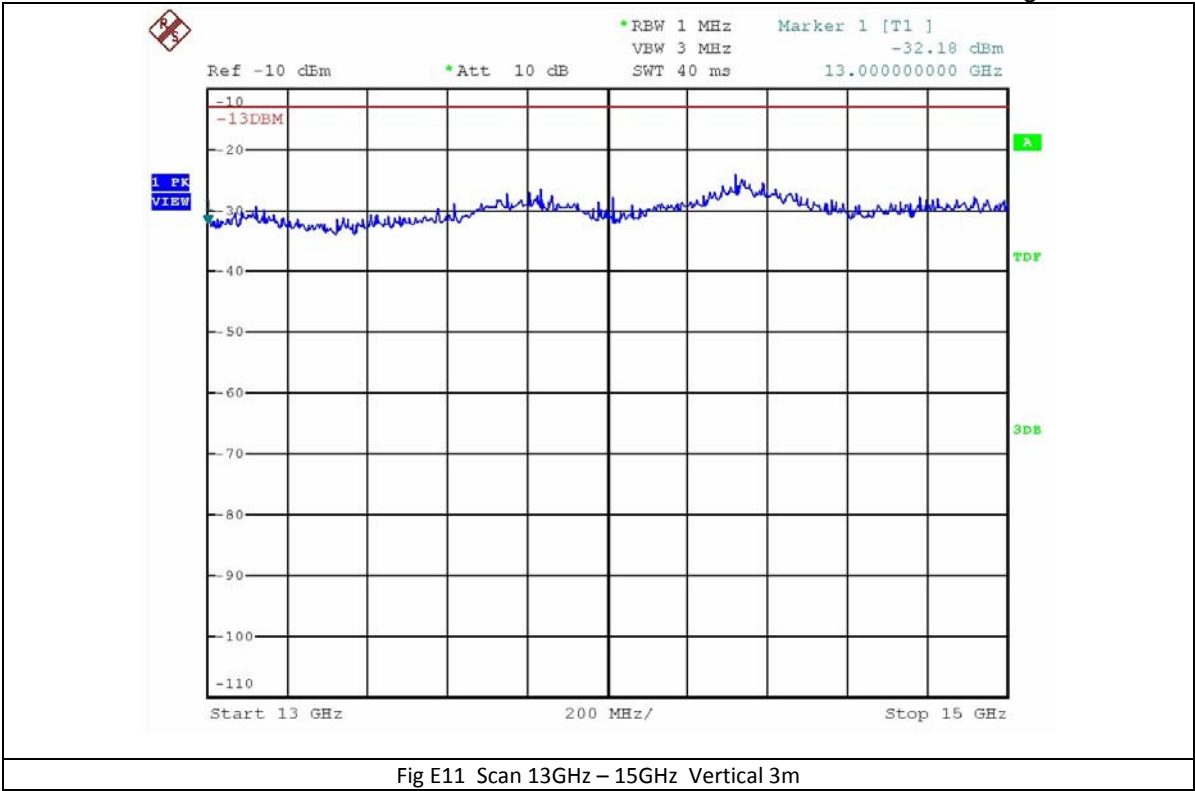


Fig E11 Scan 13GHz – 15GHz Vertical 3m

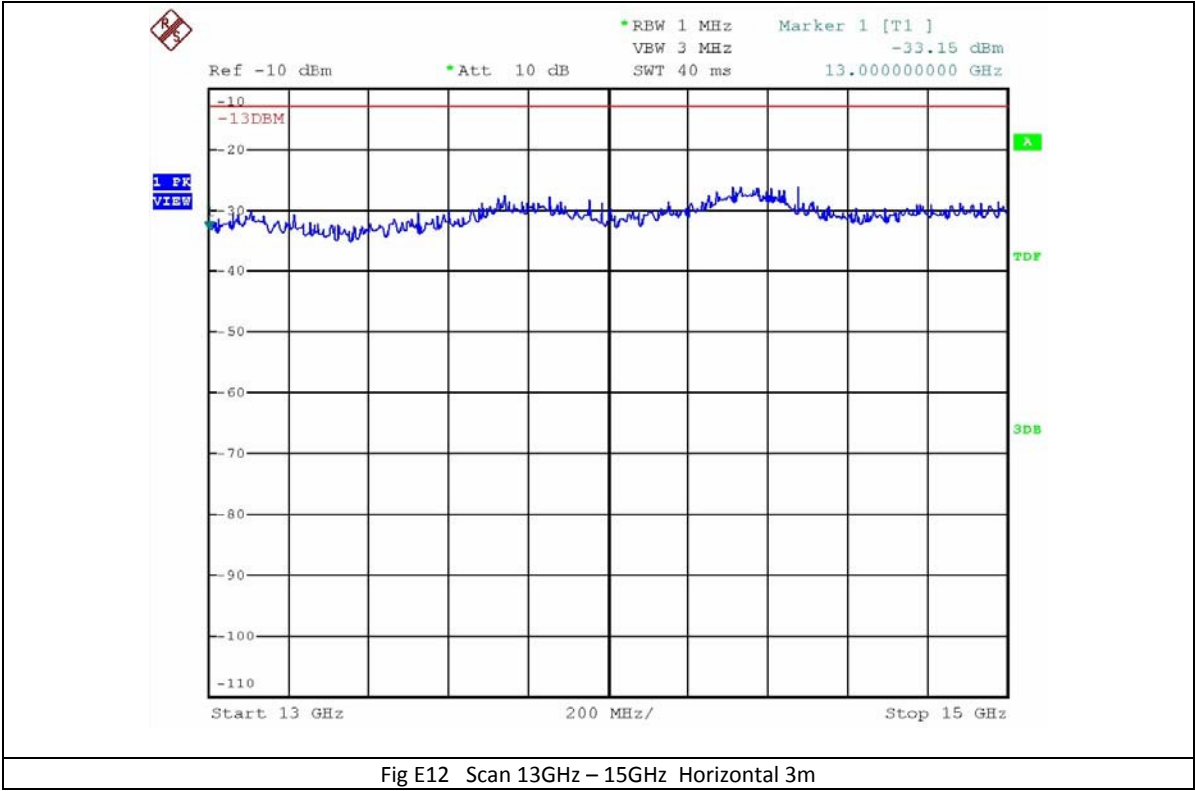


Fig E12 Scan 13GHz – 15GHz Horizontal 3m

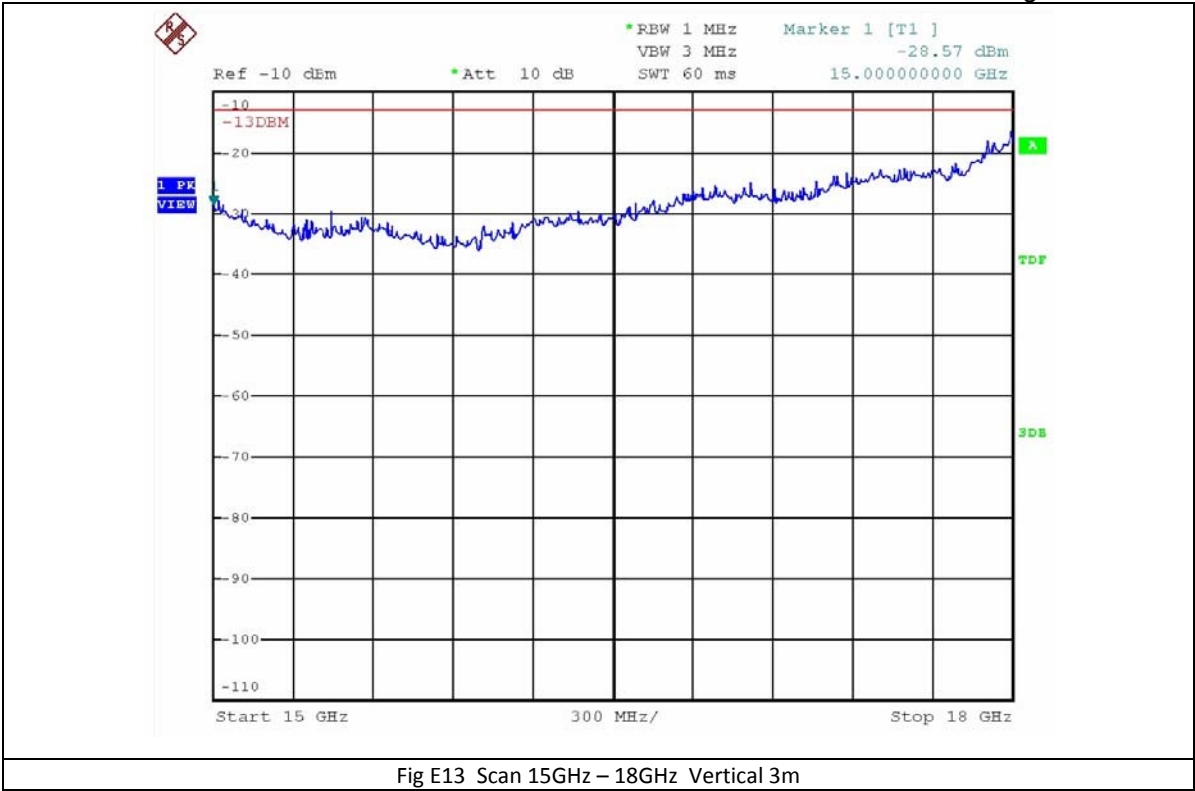


Fig E13 Scan 15GHz – 18GHz Vertical 3m

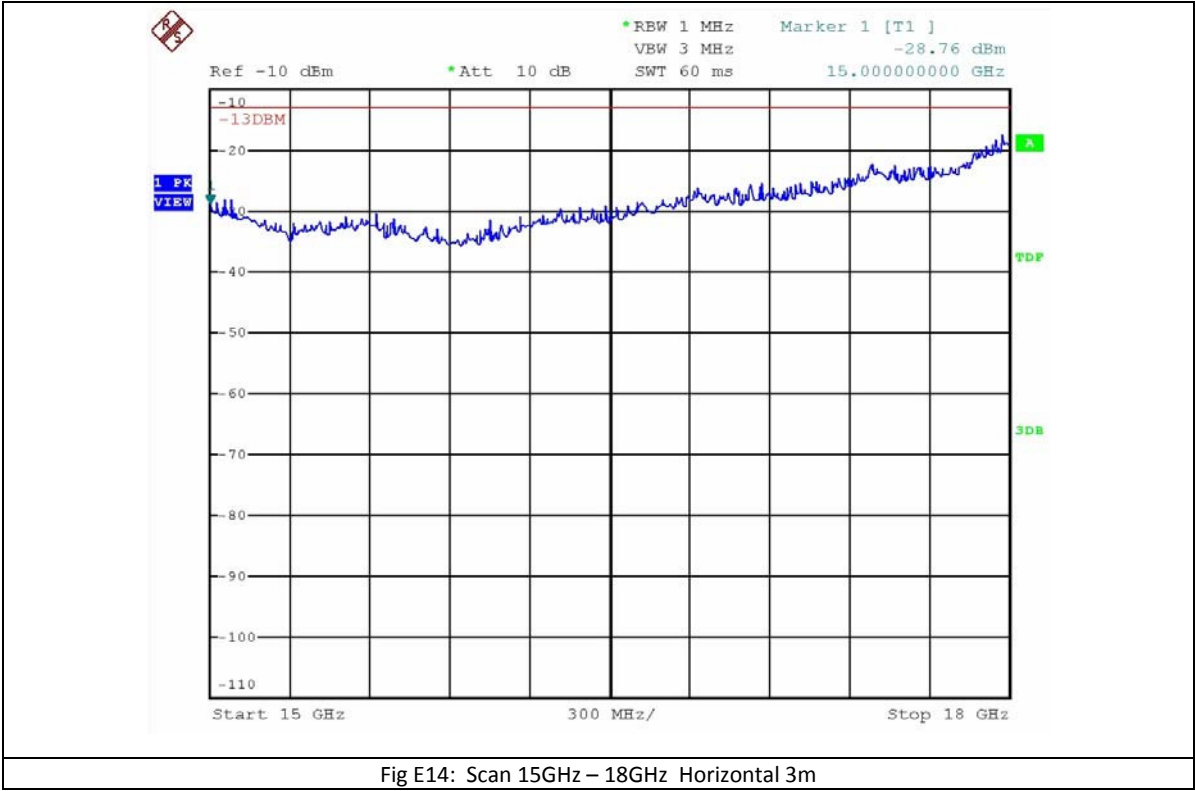
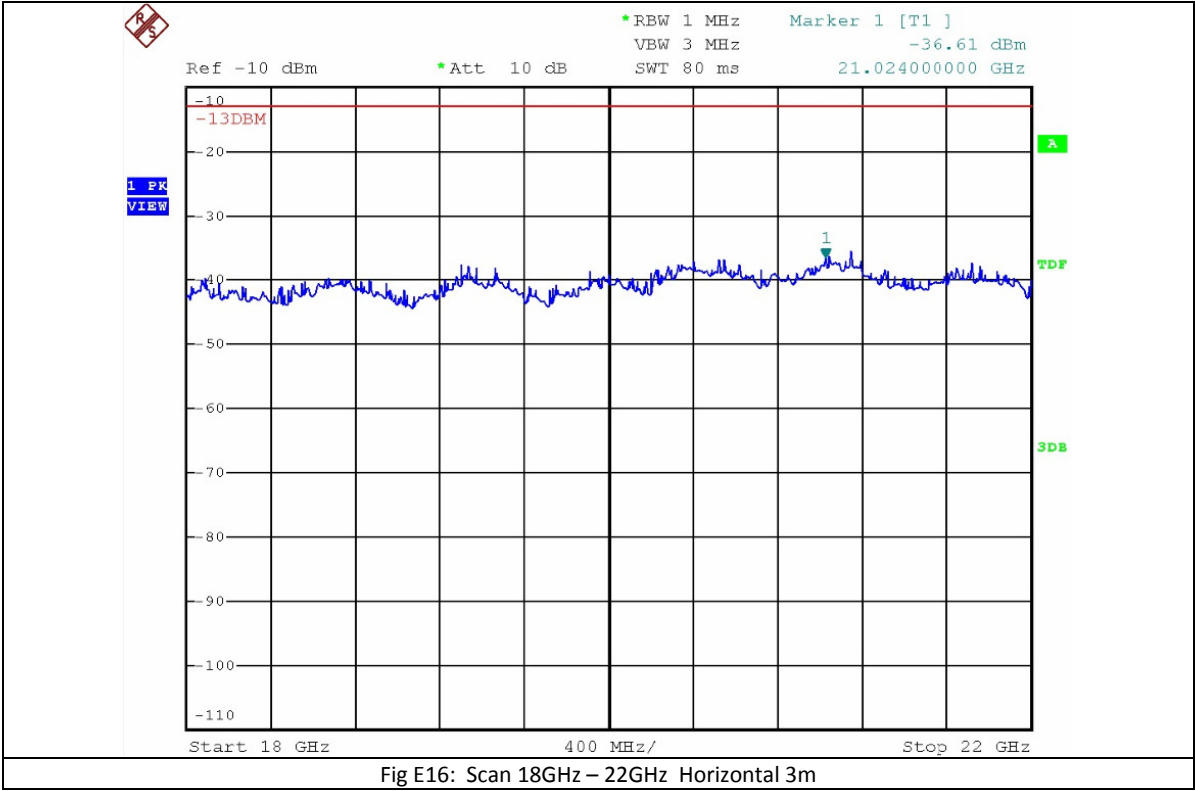
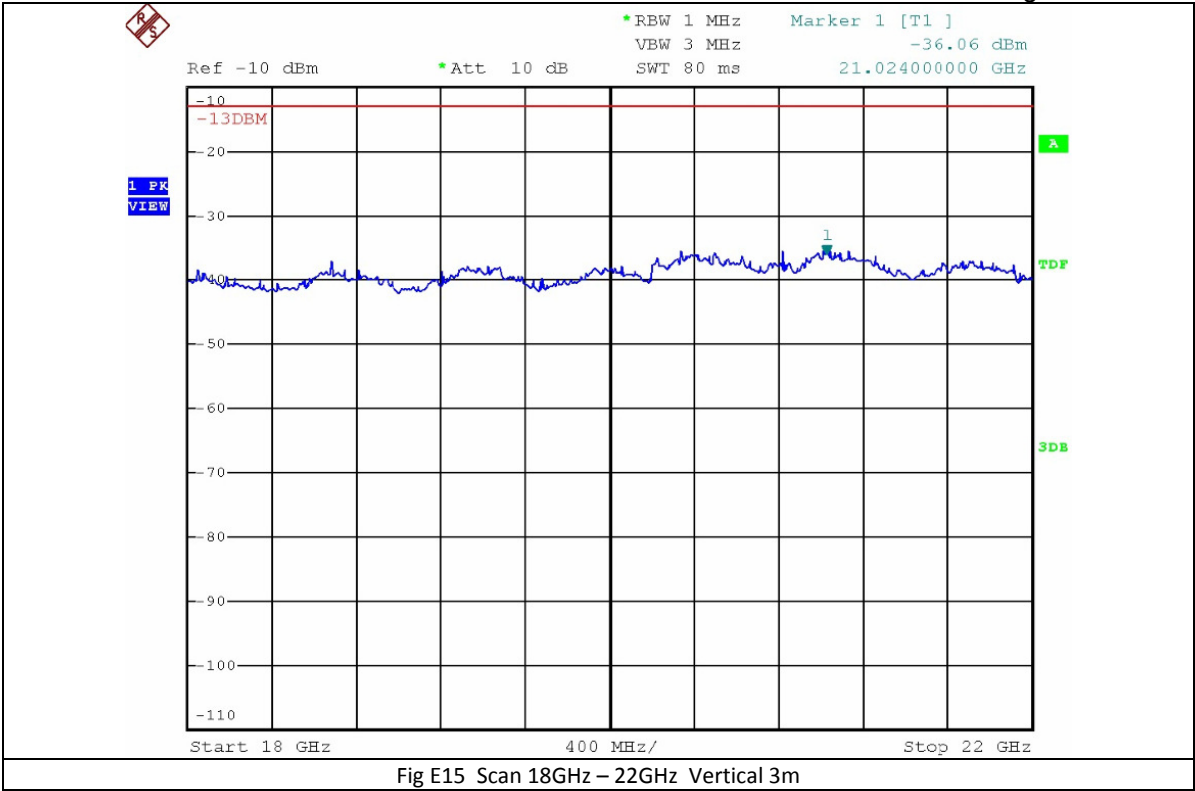


Fig E14: Scan 15GHz – 18GHz Horizontal 3m

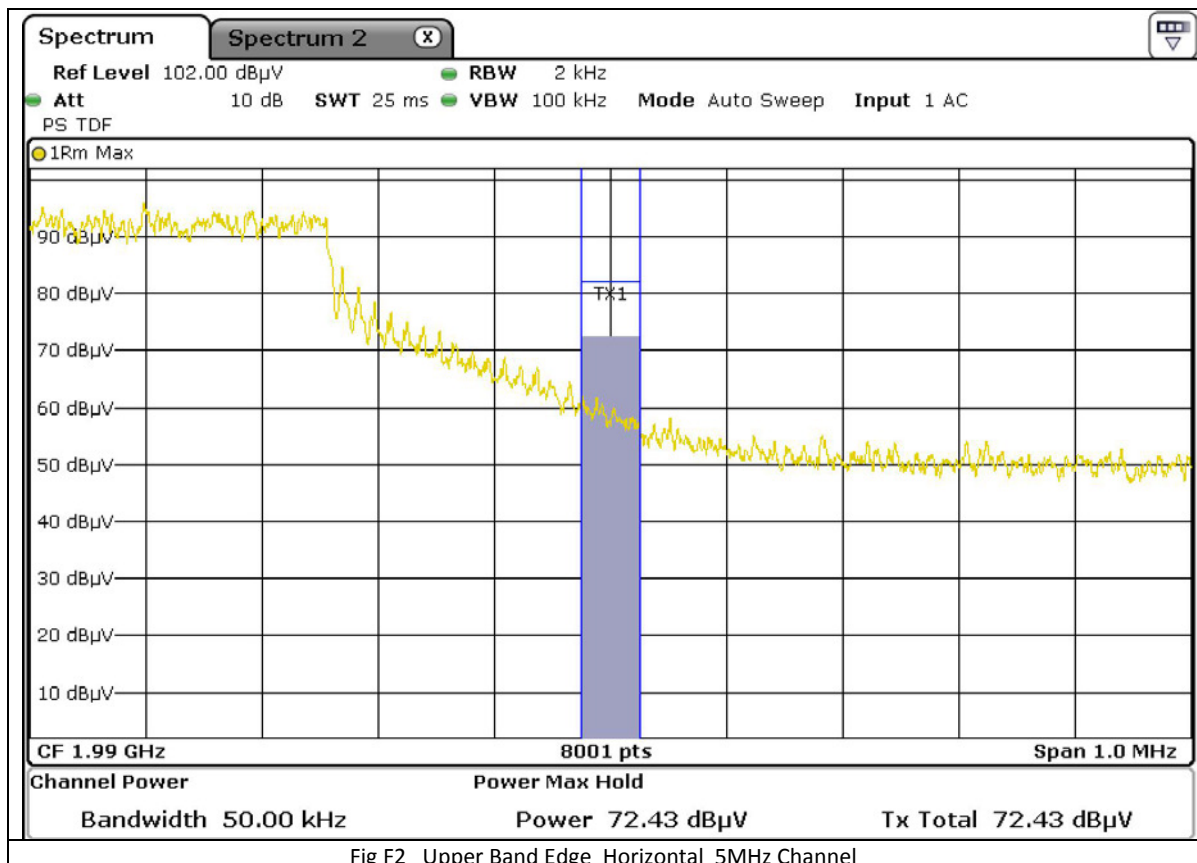
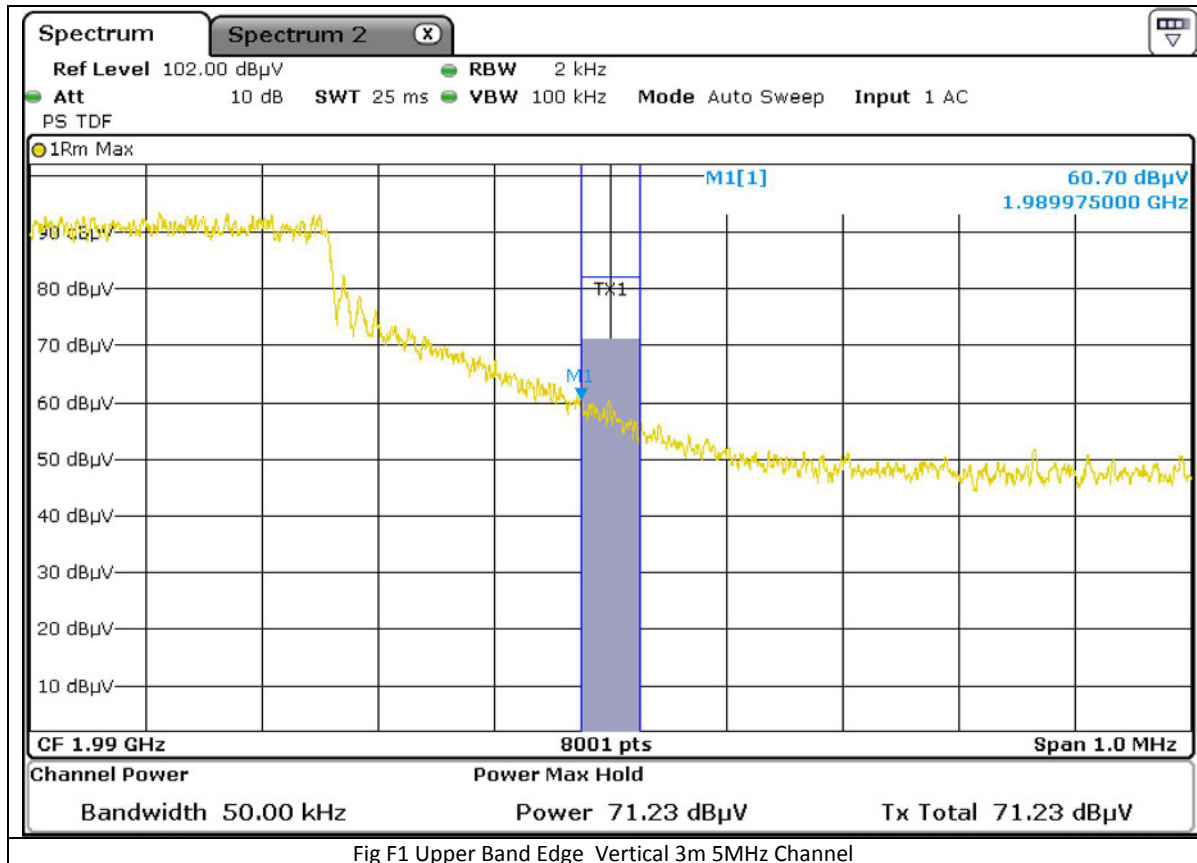


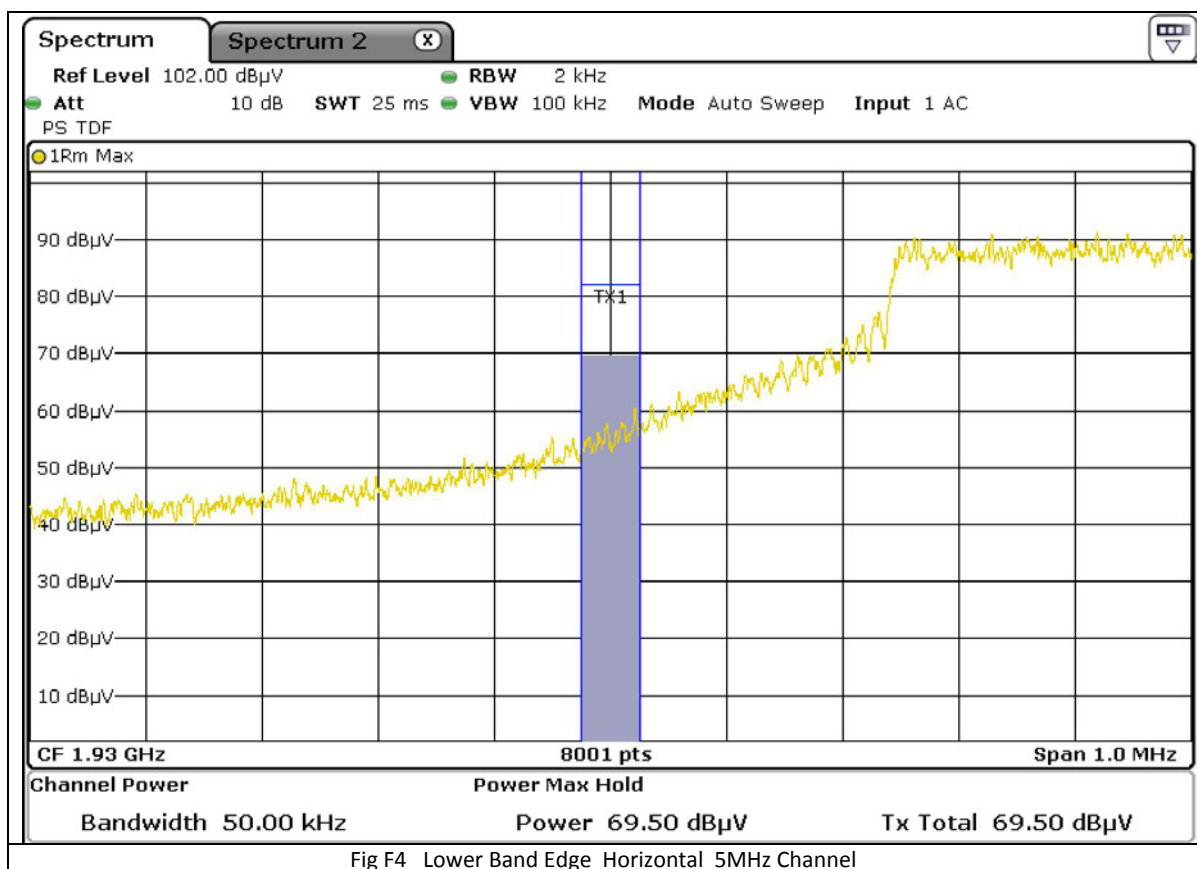
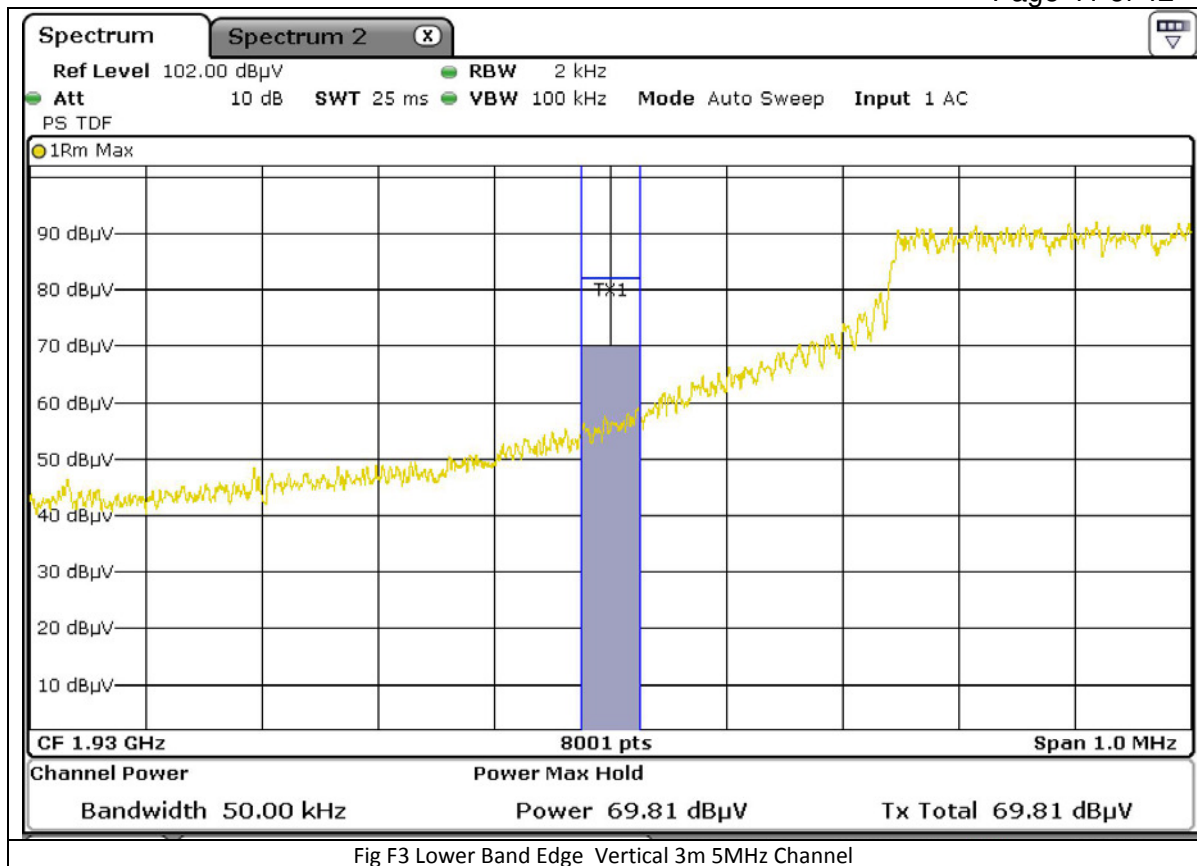
Appendix F

Band Edge Emissions

Radiated

Band 2





End of Report