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Project Number: 16E086-3b

Prepared for:

IP Access Ltd

By

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Clonross Lane

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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, appearing to read 'John McAuley', written over a horizontal line.

Exhibit A – Technical Report

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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 4

Centre Frequencies for Bottom Middle and Top channels Band 4

	Bottom	Middle	Top
	MHz	MHz	MHz
5MHz Bandwidth Channels =>	2112.5	2132.5	2152.5
10MHz Bandwidth Channels =>	2115	2135	2150
15MHz Bandwidth Channels =>	2117.5	2132.5	2147.5
20MHz Bandwidth Channels =>	2120	n/a	2145

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 4

Description	FCC Part 27	FCC part2	Test Result
Transmitter Carrier power	27.50 d	2.1046	Pass
Transmitter Occupied Bandwidth		2.1049	Pass
Transmitter Conducted Emissions	27.53 h1 h3	2.1051	Pass
Transmitter Conducted Emissions at band edges	27.53 h1 h3	2.1051	Pass
Transmitter Radiated Spurious Emissions	27.53 h1 h3	2.1053	Pass
Transmitter Frequency Stability(Temperature/ Voltage Variation)	27.54 .	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 dBm	Antenna port TX2 dBm	Total Conducted power mW	Total Conducted power dBm
TOP	BW5MHz	QPSK	21.1	21.11	257.95	24.12
TOP	BW5MHz	64QAM	20.83	21.12	250.48	23.99
TOP	BW5MHz	16QAM	21.01	21.07	254.12	24.05
MIDDLE	BW5MHz	QPSK	20.92	21.09	252.12	24.02
MIDDLE	BW5MHz	64QAM	21	20.95	250.34	23.99
MIDDLE	BW5MHz	16QAM	21.03	20.93	250.64	23.99
BOTTOM	BW5MHz	QPSK	21.09	20.9	251.56	24.01
BOTTOM	BW5MHz	64QAM	21.13	21.23	262.46	24.19
BOTTOM	BW5MHz	16QAM	21.05	21.05	254.70	24.06
TOP	BW20MHz	QPSK	21.11	20.99	254.72	24.06
TOP	BW20MHz	64QAM	21.28	21.14	264.29	24.22
TOP	BW20MHz	16QAM	21.08	20.98	253.55	24.04
MIDDLE	BW20MHz	QPSK	20.82	21.15	251.10	24.00
MIDDLE	BW20MHz	64QAM	20.57	20.75	232.88	23.67
MIDDLE	BW20MHz	16QAM	20.88	21.03	249.23	23.97
BOTTOM	BW20MHz	QPSK	20.94	20.91	247.48	23.94
BOTTOM	BW20MHz	64QAM	20.89	20.93	246.62	23.92
BOTTOM	BW20MHz	16QAM	20.91	20.92	246.91	23.93
TOP	BW15MHz	QPSK	21.04	21.1	255.88	24.08
TOP	BW15MHz	64QAM	21.01	20.85	247.80	23.94
TOP	BW15MHz	16QAM	20.84	21.07	249.28	23.97
MIDDLE	BW15MHz	QPSK	21.28	20.97	259.30	24.14
MIDDLE	BW15MHz	64QAM	20.86	20.98	247.21	23.93
MIDDLE	BW15MHz	16QAM	21.02	20.97	251.50	24.01
BOTTOM	BW15MHz	QPSK	20.84	20.63	236.95	23.75
BOTTOM	BW15MHz	64QAM	21.04	21.01	253.24	24.04
BOTTOM	BW15MHz	16QAM	20.96	20.81	245.24	23.90
TOP	BW10MHz	QPSK	20.8	20.61	235.31	23.72
TOP	BW10MHz	64QAM	20.79	20.88	242.41	23.85
TOP	BW10MHz	16QAM	20.86	20.79	241.85	23.84
MIDDLE	BW10MHz	QPSK	21.13	21.09	258.25	24.12
MIDDLE	BW10MHz	64QAM	20.77	21.03	246.16	23.91
MIDDLE	BW10MHz	16QAM	20.83	21.11	250.18	23.98
BOTTOM	BW10MHz	QPSK	21	20.64	241.77	23.83
BOTTOM	BW10MHz	64QAM	20.91	21.09	251.84	24.01
BOTTOM	BW10MHz	16QAM	21.05	21	253.24	24.04

Max Level for TX1 Antenna port = 21.28dBm
Max Level for TX2 Antenna port = 21.23dBm

Max EIRP = 24.22dBm +4.7 dBi = 28.92 dBm = 779.83mW

Ref appendix A for Scans

Test Result Pass

Max Power (EIRP)

Conducted power	Antenna Gain dBi	dBm	mW	Bandwidth
24.19	4.7	28.89	774.46	5MHz
24.12	4.7	28.82	762.08	10MHz
24.08	4.7	28.78	755.09	15MHz
24.22	4.7	28.92	779.83	20MHz

3.2 Occupied Bandwidth Conducted

Channel	Bandwidth	Modulation	Antenna port TX1 OBW MHz
BOTTOM	BW5MHz	16QAM	4.906
BOTTOM	BW5MHz	64QAM	4.921
BOTTOM	BW5MHz	QPSK	4.949
MIDDLE	BW5MHz	16QAM	4.906
MIDDLE	BW5MHz	64QAM	4.921
MIDDLE	BW5MHz	QPSK	4.949
TOP	BW5MHz	16QAM	4.906
TOP	BW5MHz	64QAM	4.921
TOP	BW5MHz	QPSK	4.949
BOTTOM	BW10MHz	16QAM	9.782
BOTTOM	BW10MHz	64QAM	9.812
BOTTOM	BW10MHz	QPSK	9.87
MIDDLE	BW10MHz	16QAM	9.812
MIDDLE	BW10MHz	64QAM	9.841
MIDDLE	BW10MHz	QPSK	9.841
TOP	BW10MHz	16QAM	9.812
TOP	BW10MHz	64QAM	9.87
TOP	BW10MHz	QPSK	9.841
BOTTOM	BW15MHz	16QAM	14.717
BOTTOM	BW15MHz	64QAM	14.804
BOTTOM	BW15MHz	QPSK	14.848
MIDDLE	BW15MHz	16QAM	14.761
MIDDLE	BW15MHz	64QAM	14.804
MIDDLE	BW15MHz	QPSK	14.891
TOP	BW15MHz	16QAM	14.718
TOP	BW15MHz	64QAM	14.804
TOP	BW15MHz	QPSK	14.848
BOTTOM	BW20MHz	16QAM	19.45
BOTTOM	BW20MHz	64QAM	19.624
BOTTOM	BW20MHz	QPSK	19.797
MIDDLE	BW20MHz	16QAM	19.45
MIDDLE	BW20MHz	64QAM	19.681
MIDDLE	BW20MHz	QPSK	19.797
TOP	BW20MHz	16QAM	19.45
TOP	BW20MHz	64QAM	19.682
TOP	BW20MHz	QPSK	19.682

Max OBW measurements for TX1 = 4.949 MHz for 5MHz Bandwidth

Max OBW measurements for TX1 = 9.87 MHz for 10MHz Bandwidth

Max OBW measurements for TX1 =14.891 MHz for 15MHz Bandwidth

Max OBW measurements for TX1 =19.797 MHz for 20MHz Bandwidth

Ref appendix B for Scans

Test Result Pass

3.3 Spurious Emissions Conducted

No Spurious peaks detected

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	-28.04	-27.92	0.0032	-24.97
Lower	BW5MHz	64QAM	-28.31	-26.93	0.0035	-24.56
Lower	BW5MHz	QPSK	-27.69	-27.92	0.0033	-24.79
Lower	BW10MHz	16QAM	-35.42	-34.95	0.0006	-32.17
Lower	BW10MHz	64QAM	-34.87	-36.19	0.0006	-32.47
Lower	BW10MHz	QPSK	-35.65	-36.2	0.0005	-32.91
Lower	BW15MHz	16QAM	-32.85	-34.25	0.0009	-30.48
Lower	BW15MHz	64QAM	-35.65	-35	0.0006	-32.30
Lower	BW15MHz	QPSK	-34.34	-34.12	0.0008	-31.22
Lower	BW20MHz	16QAM	-37.64	-36.91	0.0004	-34.25
Lower	BW20MHz	64QAM	-37.47	-37.2	0.0004	-34.32
Lower	BW20MHz	QPSK	-36.11	-36.68	0.0005	-33.38
Upper	BW20MHz	16QAM	-38.09	-36.99	0.0004	-34.49
Upper	BW20MHz	64QAM	-37.92	-37.12	0.0004	-34.49
Upper	BW20MHz	QPSK	-37.76	-37.58	0.0003	-34.66
Upper	BW15MHz	16QAM	-33.98	-33.48	0.0008	-30.71
Upper	BW15MHz	64QAM	-35.8	-34.44	0.0006	-32.06
Upper	BW15MHz	QPSK	-33.97	-34	0.0008	-30.97
Upper	BW10MHz	16QAM	-34.74	-33.59	0.0008	-31.12
Upper	BW10MHz	64QAM	-36.2	-34.69	0.0006	-32.37
Upper	BW10MHz	QPSK	-35.32	-35.77	0.0006	-32.53
Upper	BW5MHz	16QAM	-29.24	-28.31	0.0027	-25.74
Upper	BW5MHz	64QAM	-28.11	-26.93	0.0036	-24.47
Upper	BW5MHz	QPSK	-28.2	-26.84	0.0036	-24.46

Band Edge Max = -24.46dBm

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.

4.1.1 Spurious Emissions Measurements (30MHz to 1GHz)

Frequency	Sub antenna input	Sub Antenna Gain		ERP	Limit	Margin
MHz	dBm	dBi		dBm	dBm	dB
300	-54.2	3.13	-51.07	-53.23	-13	40.23
375	-69.76	6.7	-63.06	-52.02	-13	39.02
400	-65.22	5.49	-59.73	-56.12	-13	43.12
500	-56.46	6.6	-49.86	-52.02	-13	39.02
600	-60.5	6.54	-53.96	-56.12	-13	43.12
625	-59.01	6.9	-52.11	-54.27	-13	41.27
700	-57.77	6.63	-51.14	-53.3	-13	40.3
750	-56.22	6.29	-49.93	-52.09	-13	39.09
800	-62.43	6.97	-55.46	-57.62	-13	44.62
900	-56.85	5.13	-51.72	-53.88	-13	40.88

4.1.2 Horn antenna measurements >1GHz

No spurious peaks evident

4.1.3 Substitution antenna for Band Edges Radiated

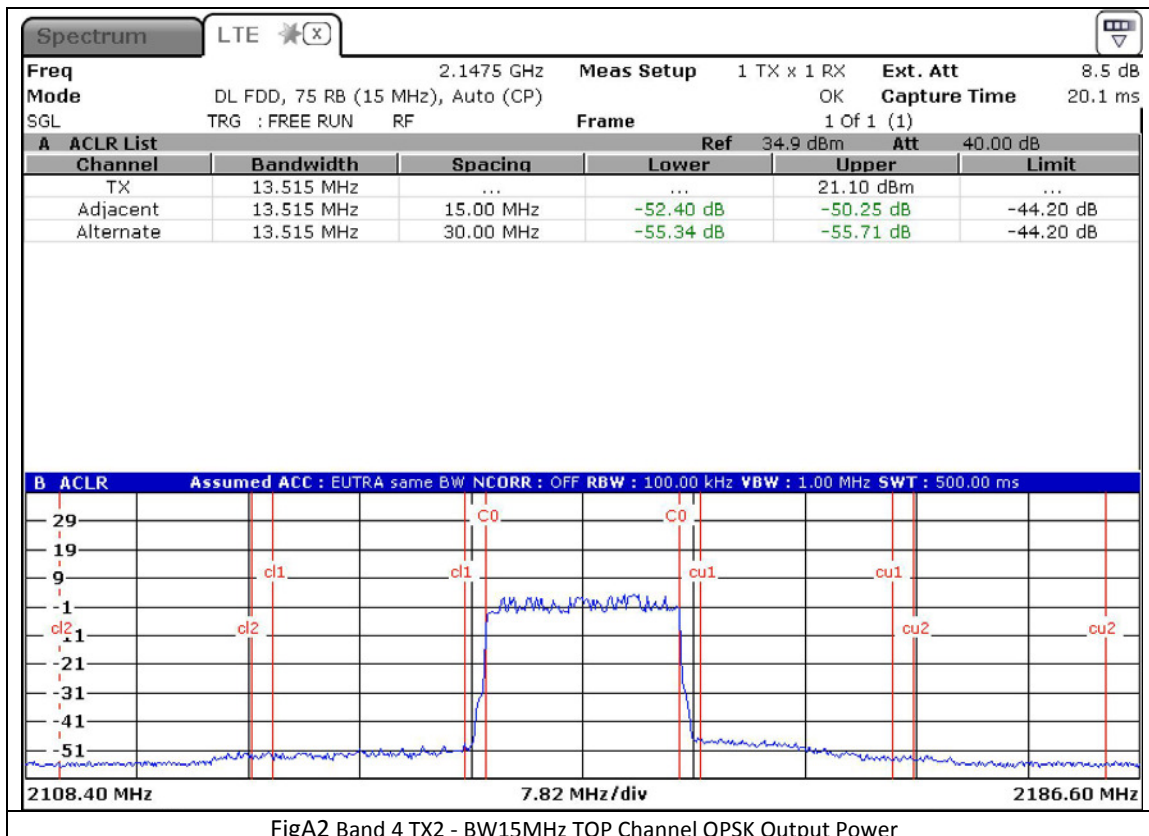
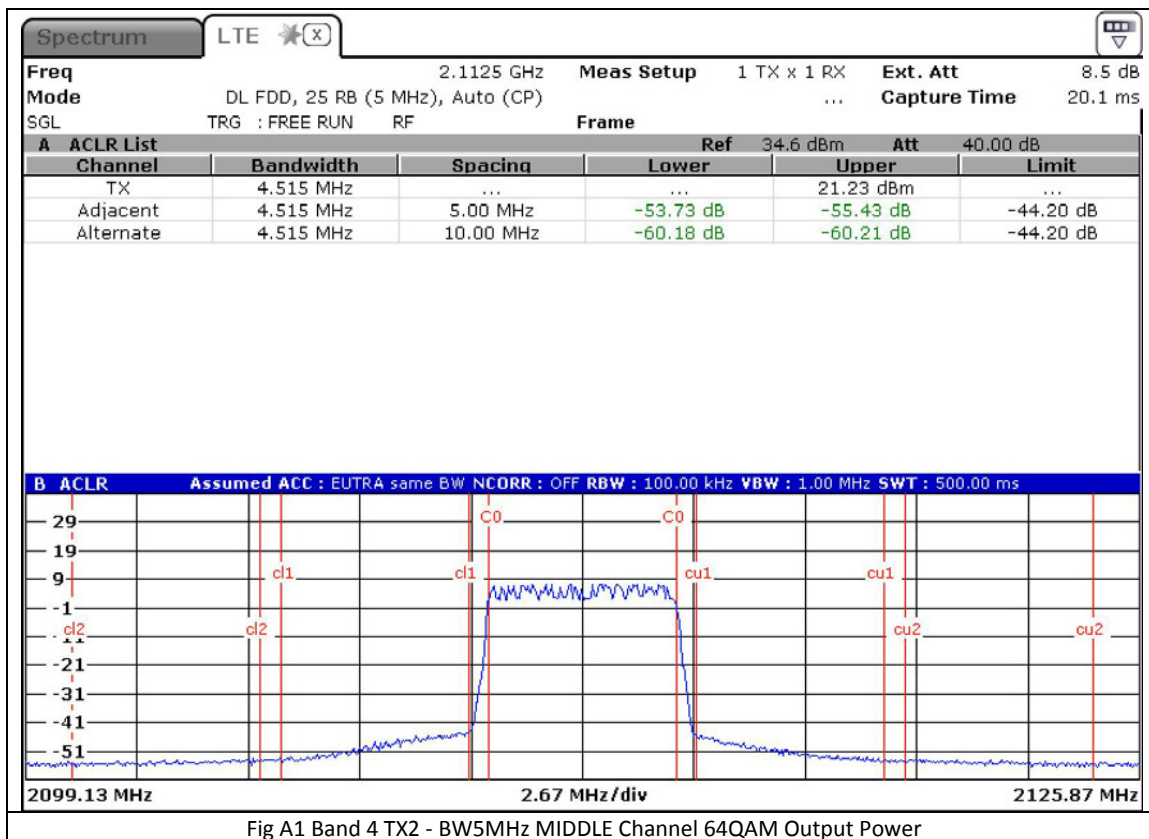
Frequency	Sub Ant input	Sub Antenna gain	EIRP	Limit	Margin
GHz	dBm	dBi	dBm	dBm	dB
2.11	-35.8	7.94	-27.86	-13	14.86
2.155	-35.21	7.94	-27.27	-13	14.27

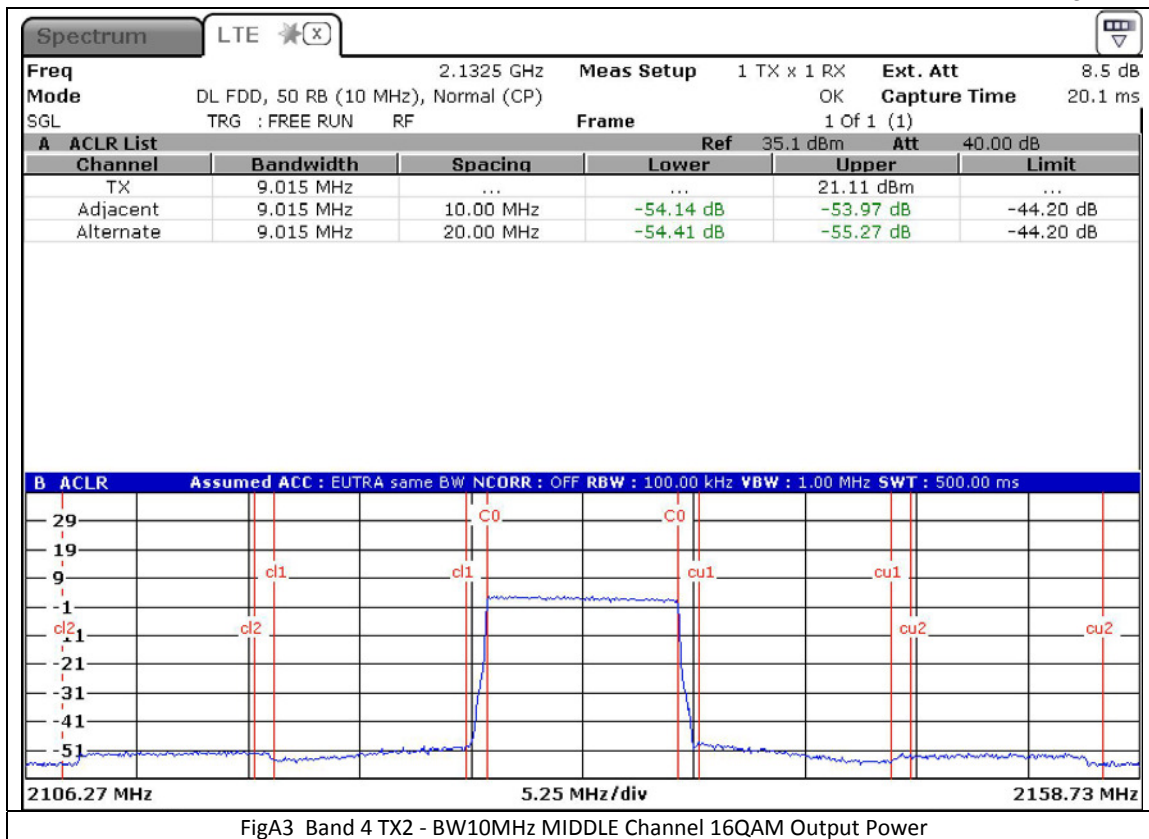
Result: Pass

Appendix A

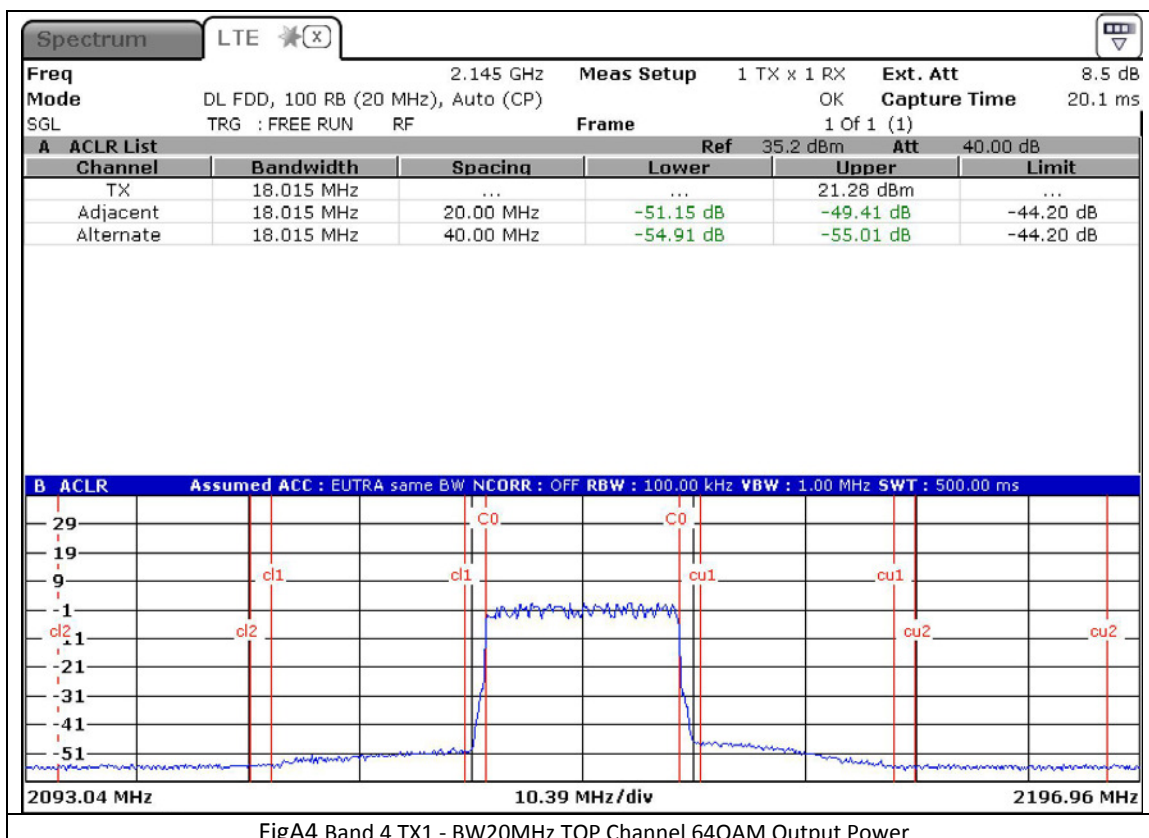
Transmitter Output Power

Conducted





FigA3 Band 4 TX2 - BW10MHz MIDDLE Channel 16QAM Output Power



FigA4 Band 4 TX1 - BW20MHz TOP Channel 64QAM Output Power

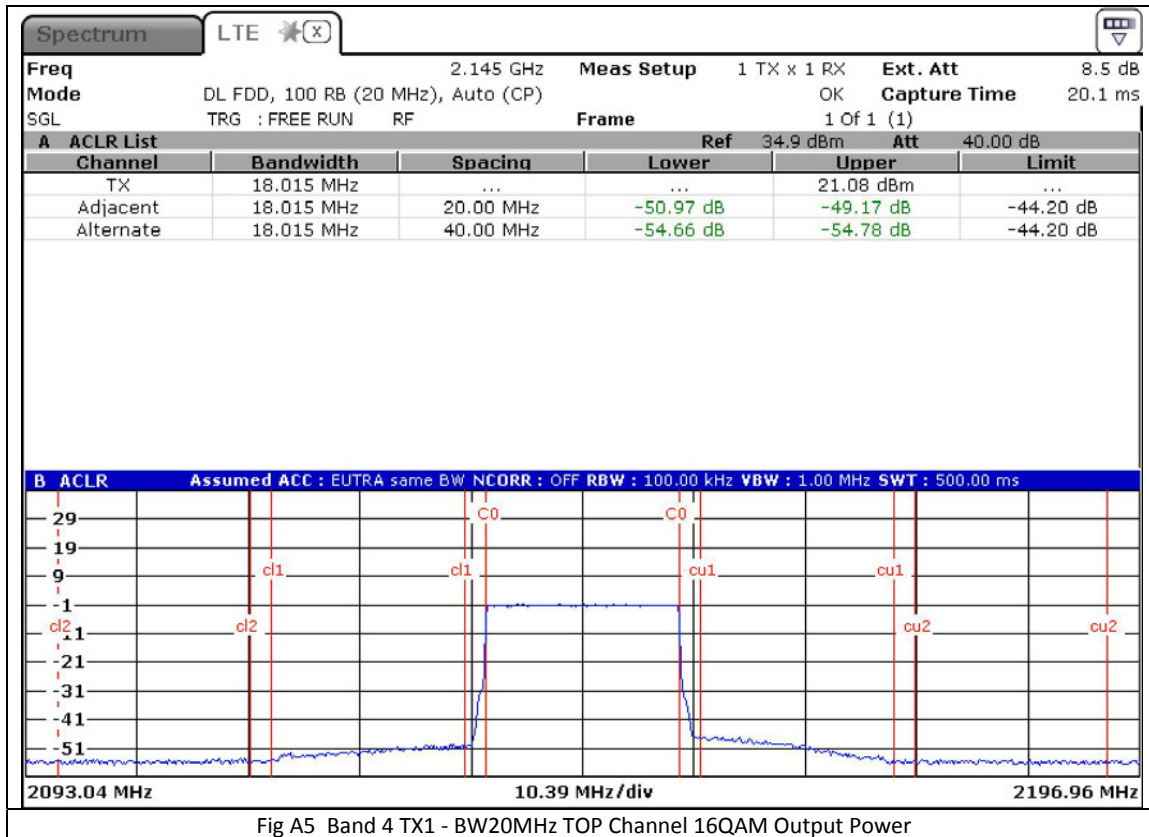


Fig A5 Band 4 TX1 - BW20MHz TOP Channel 16QAM Output Power

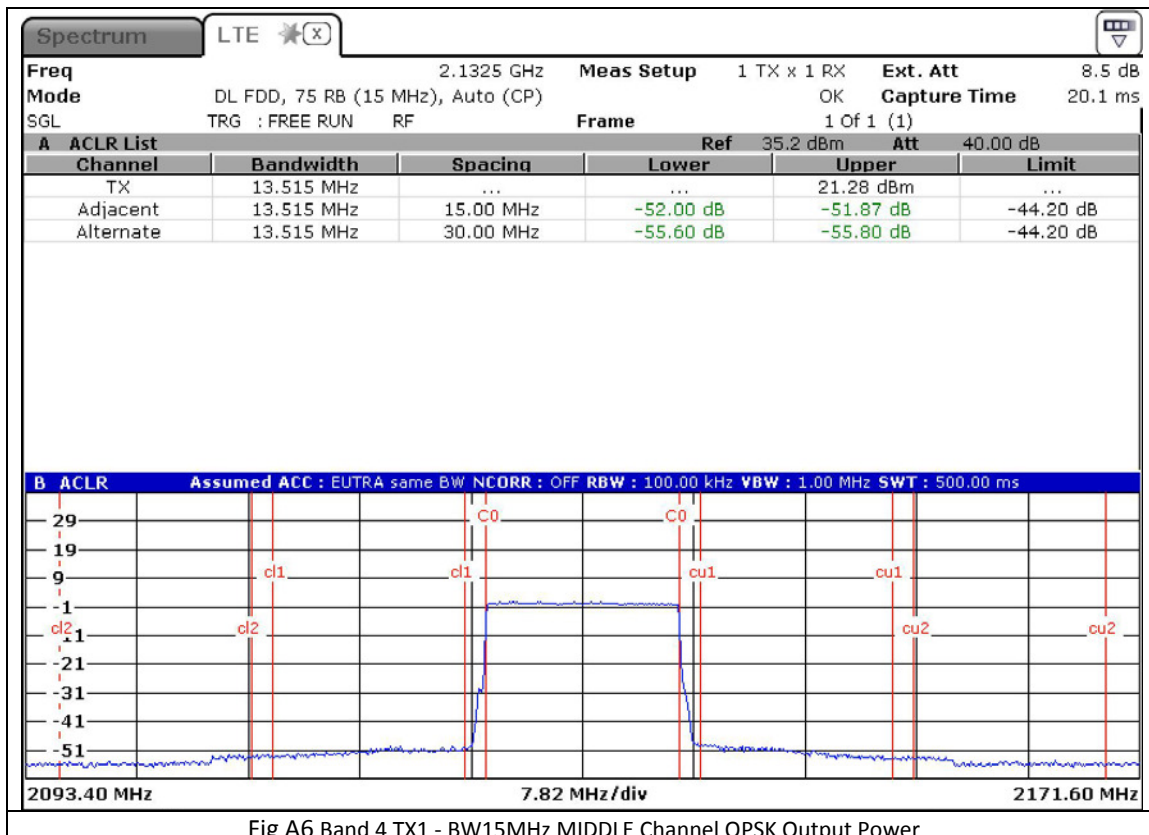


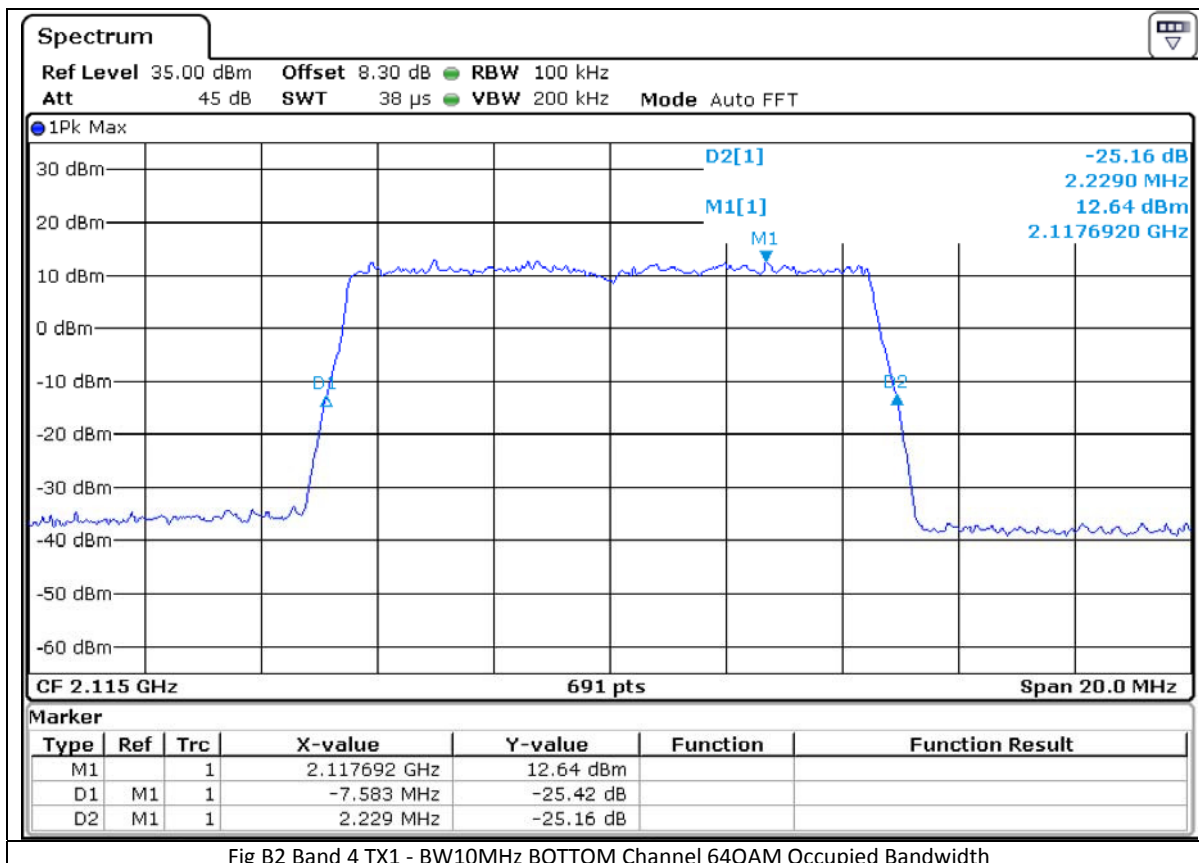
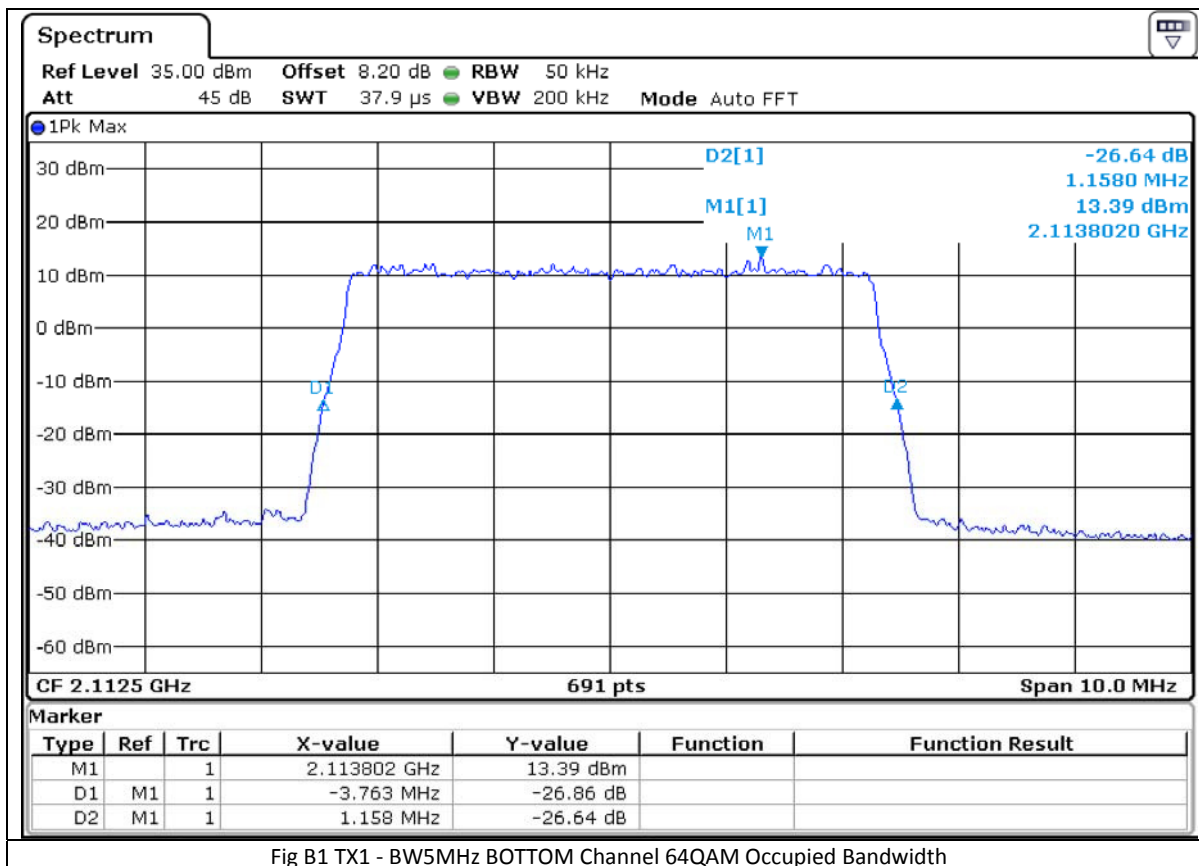
Fig A6 Band 4 TX1 - BW15MHz MIDDLE Channel QPSK Output Power

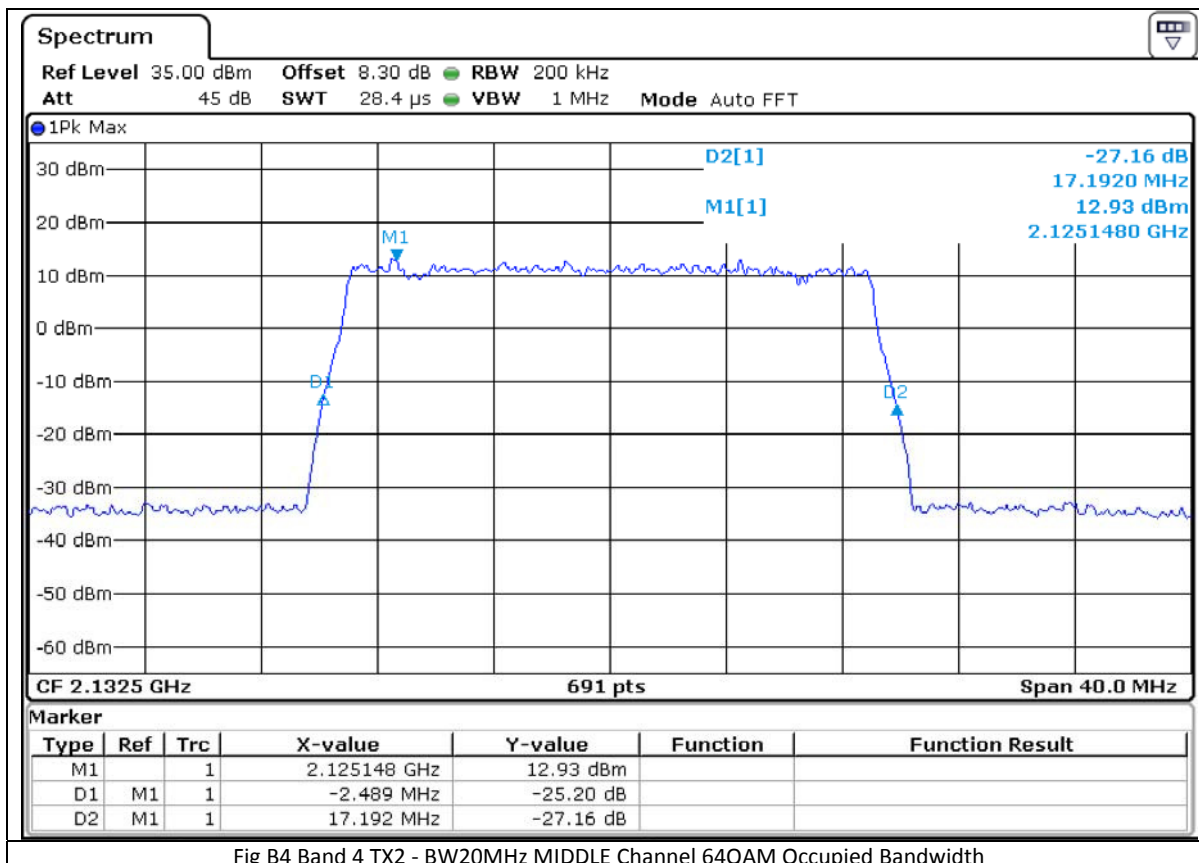
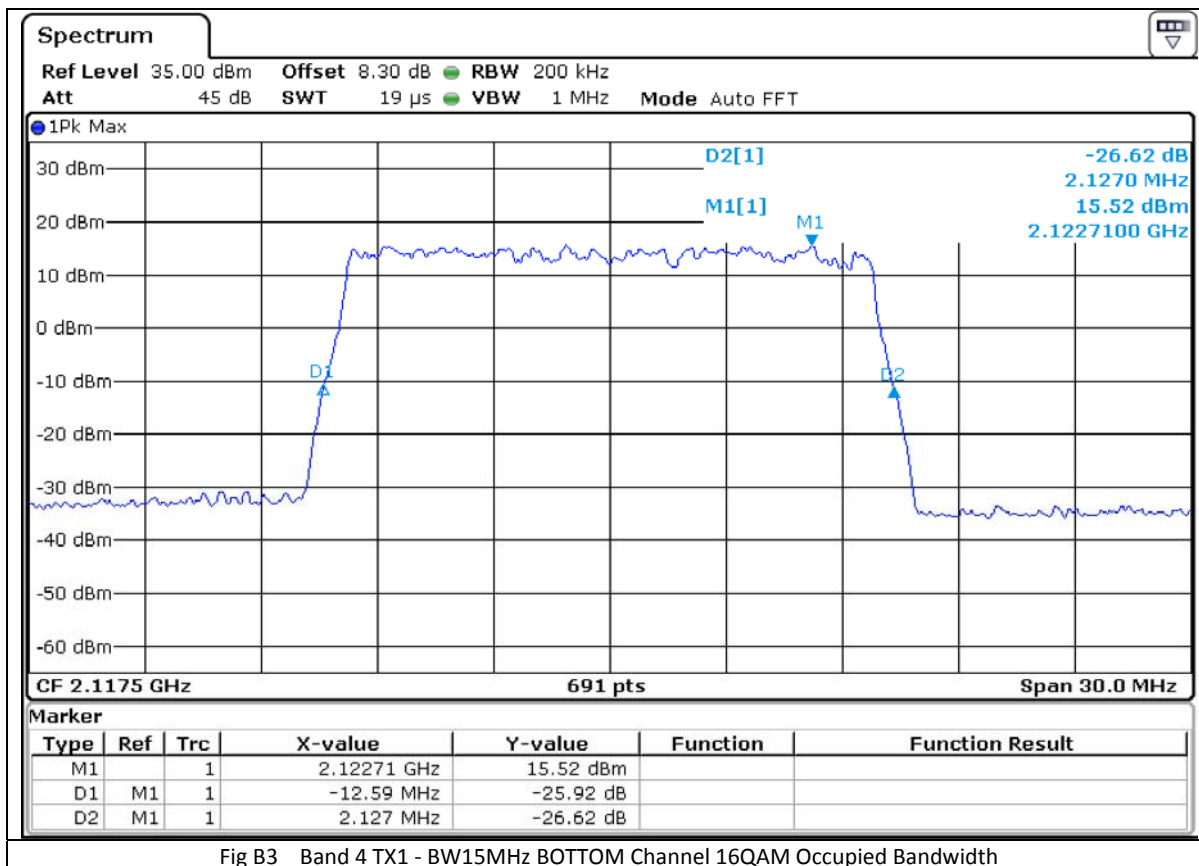
Appendix B

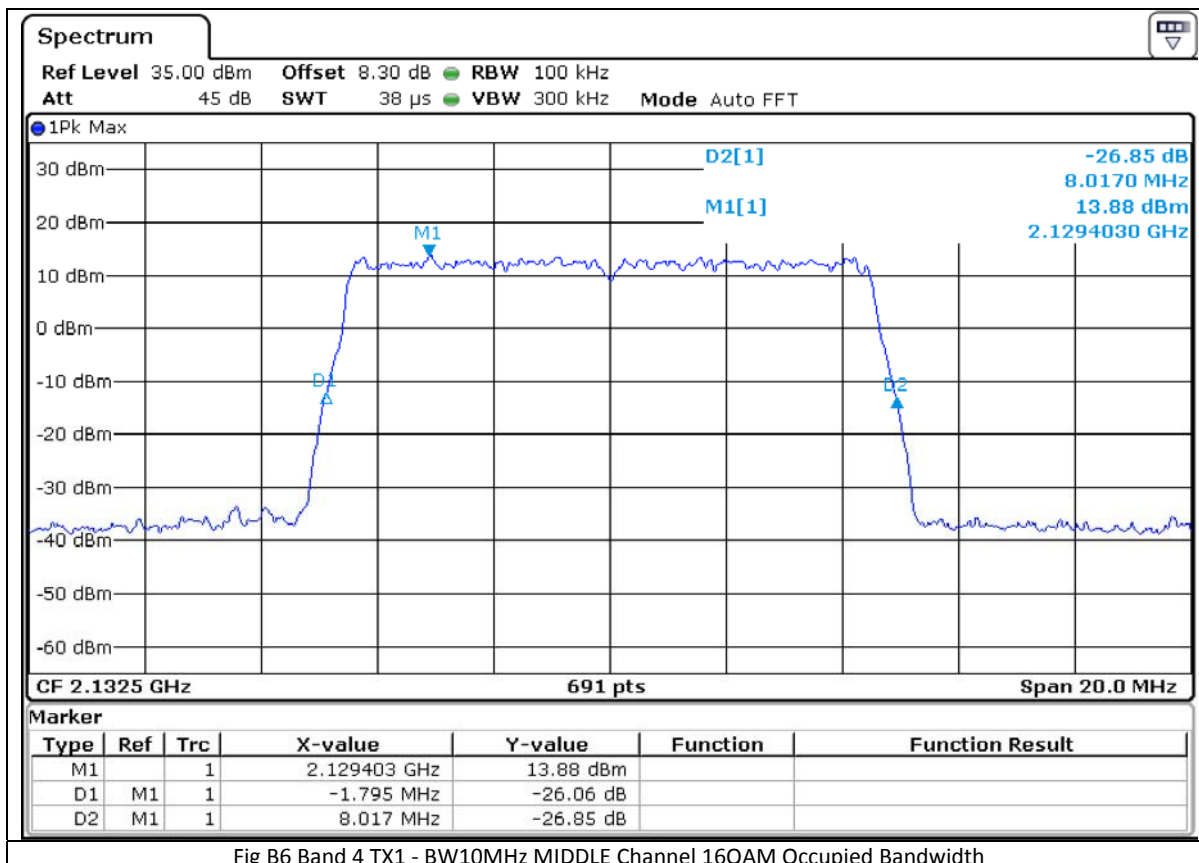
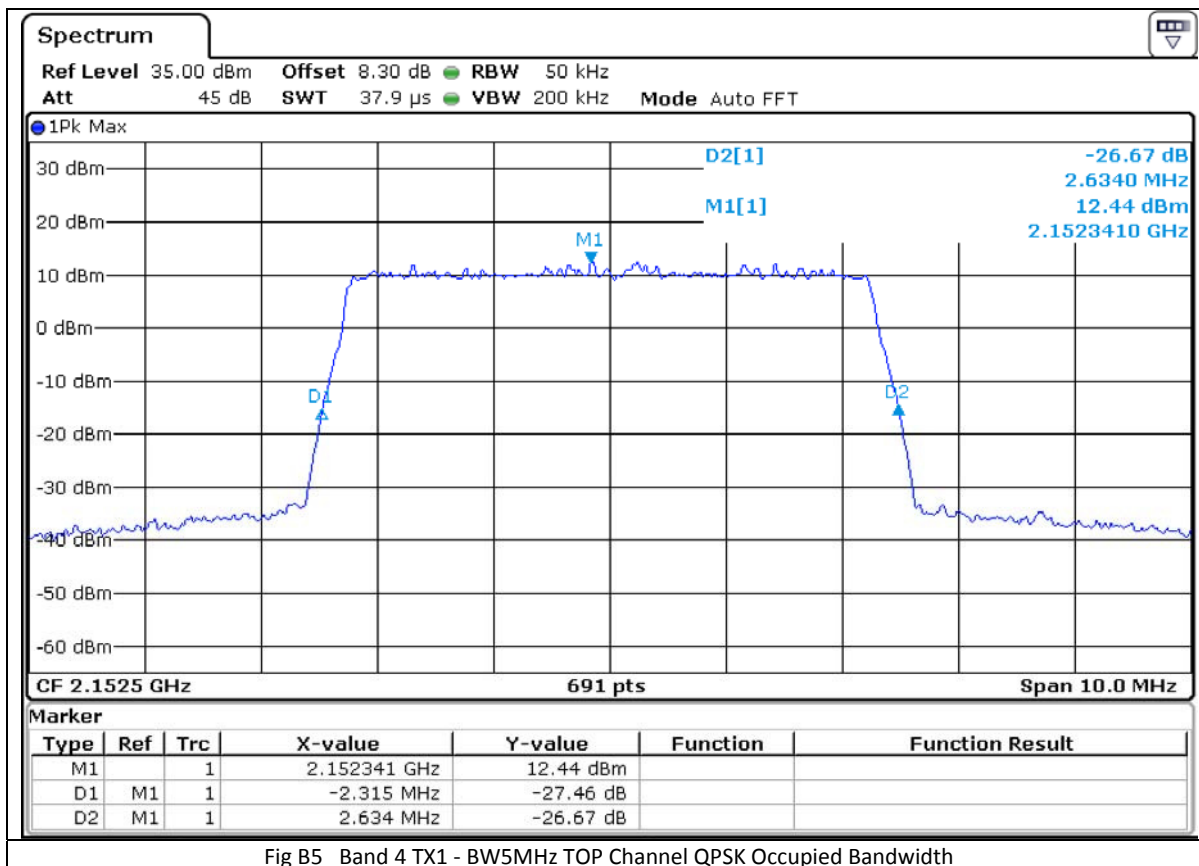
Occupied Bandwidth

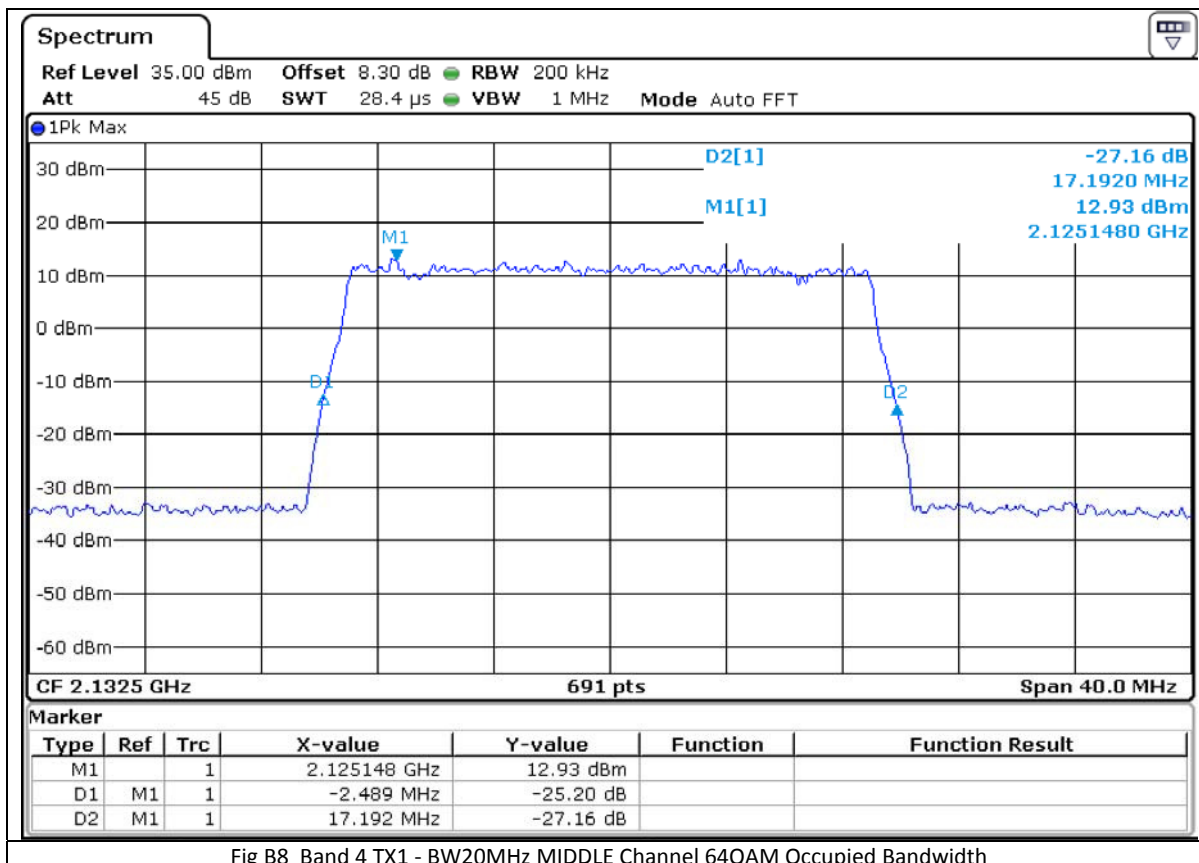
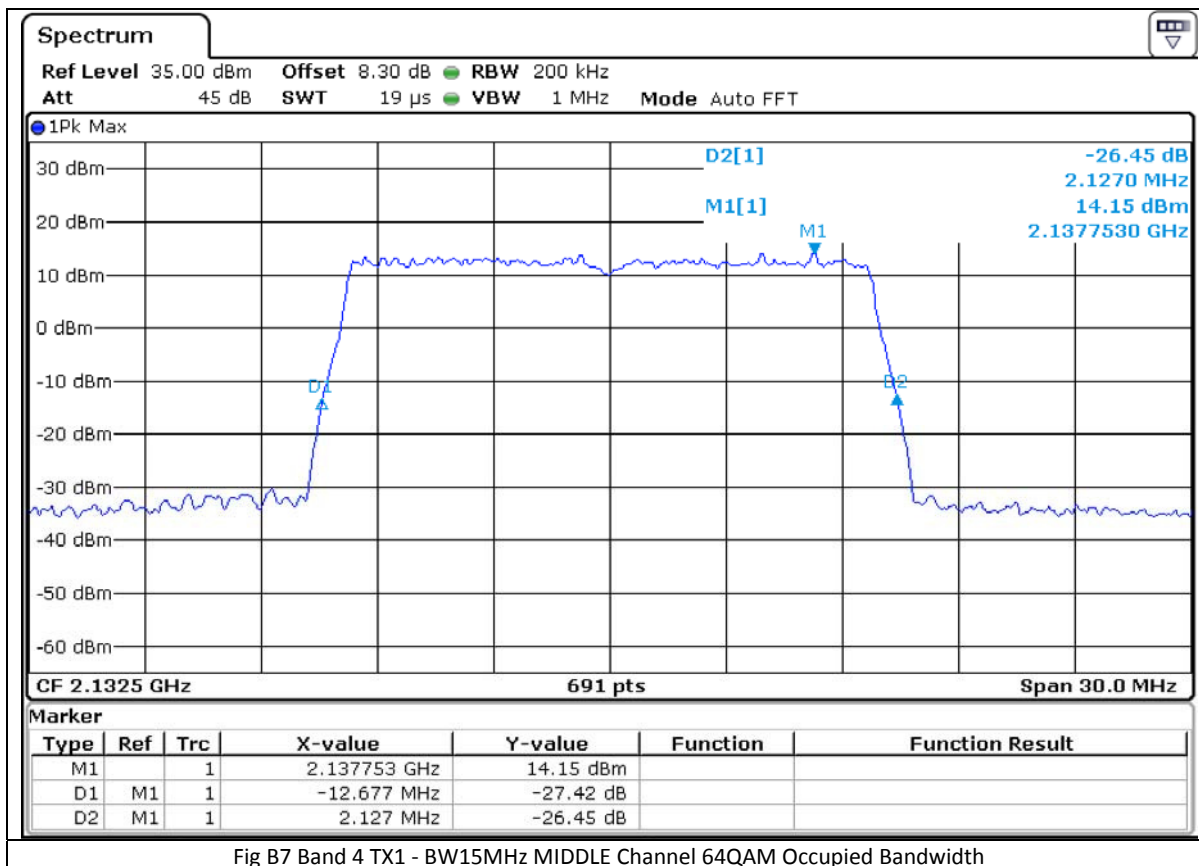
Conducted

Band 4





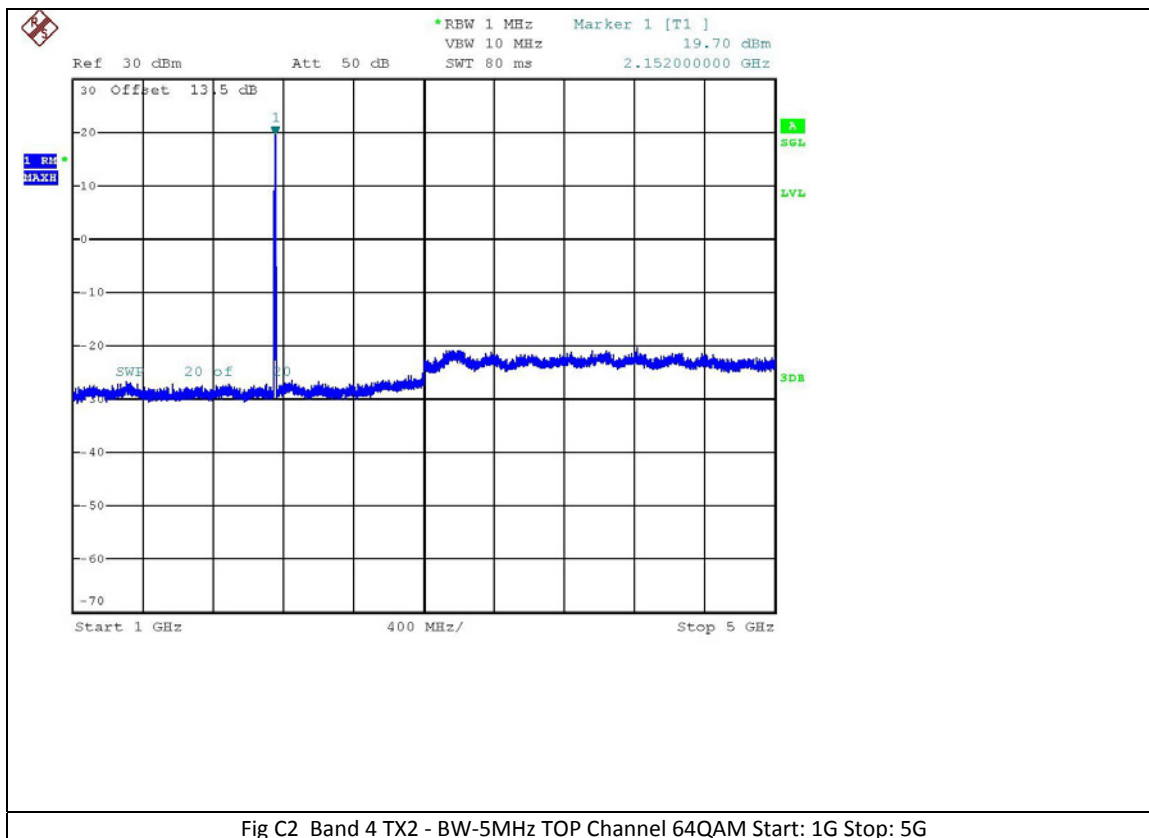
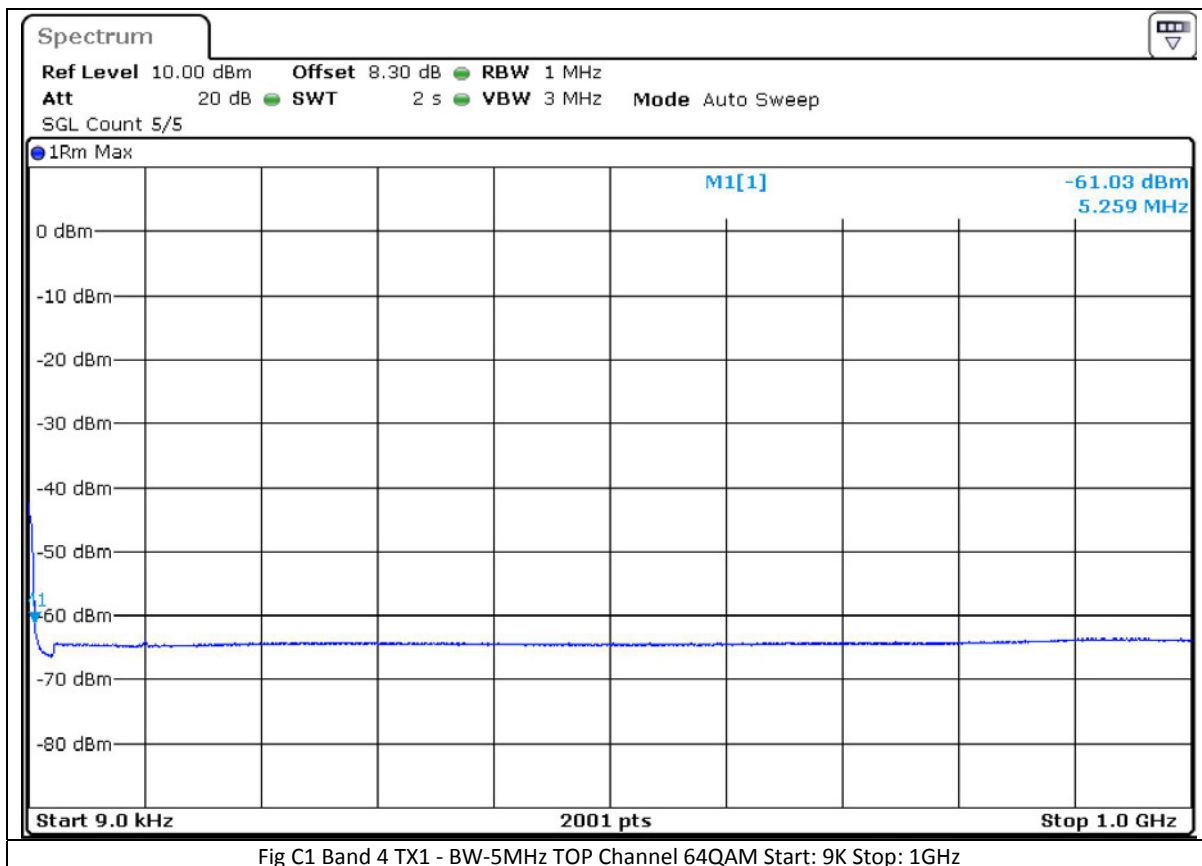




Appendix C

Spurious Emissions

Conducted



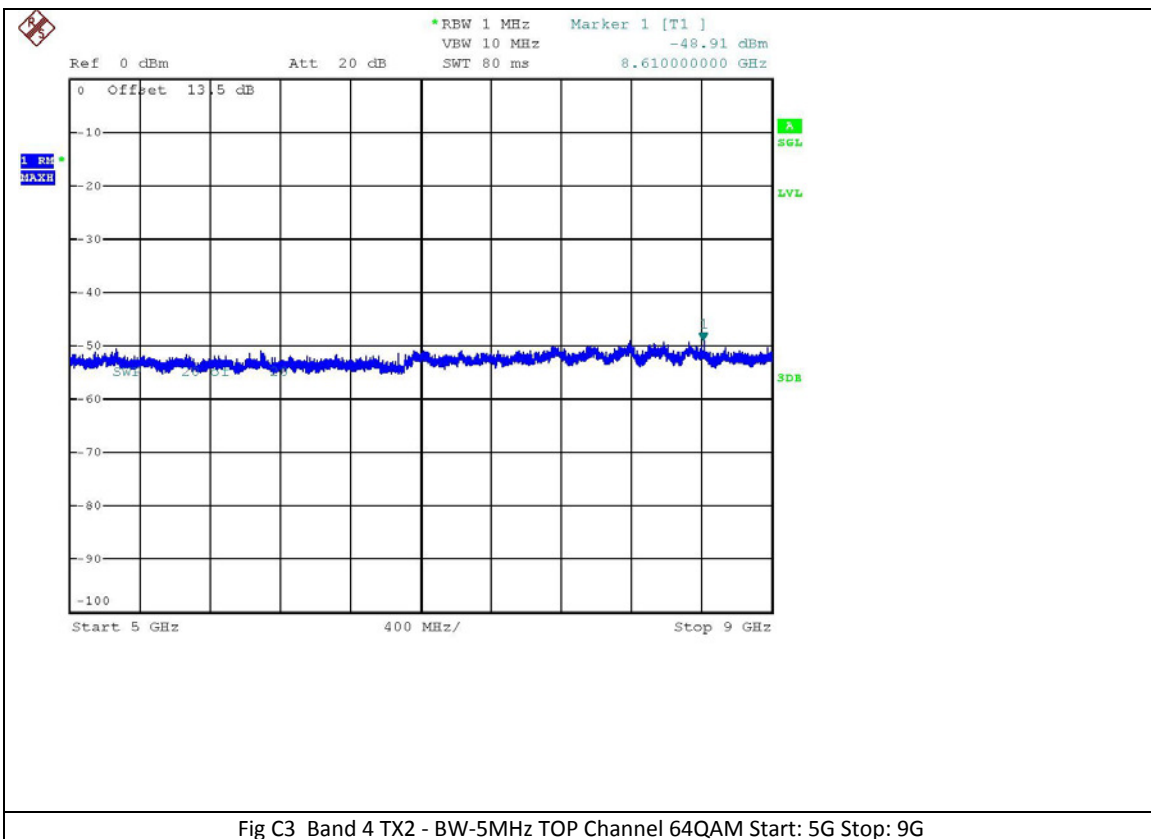


Fig C3 Band 4 TX2 - BW-5MHz TOP Channel 64QAM Start: 5G Stop: 9G

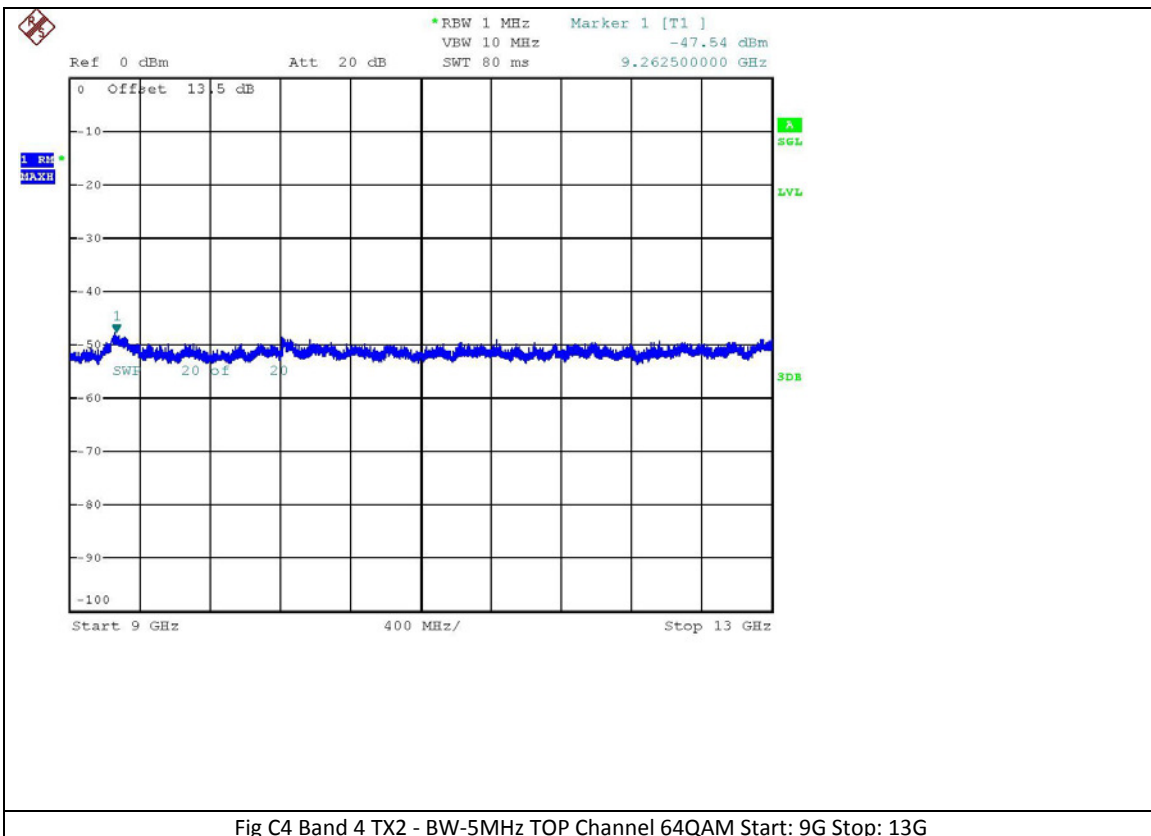


Fig C4 Band 4 TX2 - BW-5MHz TOP Channel 64QAM Start: 9G Stop: 13G

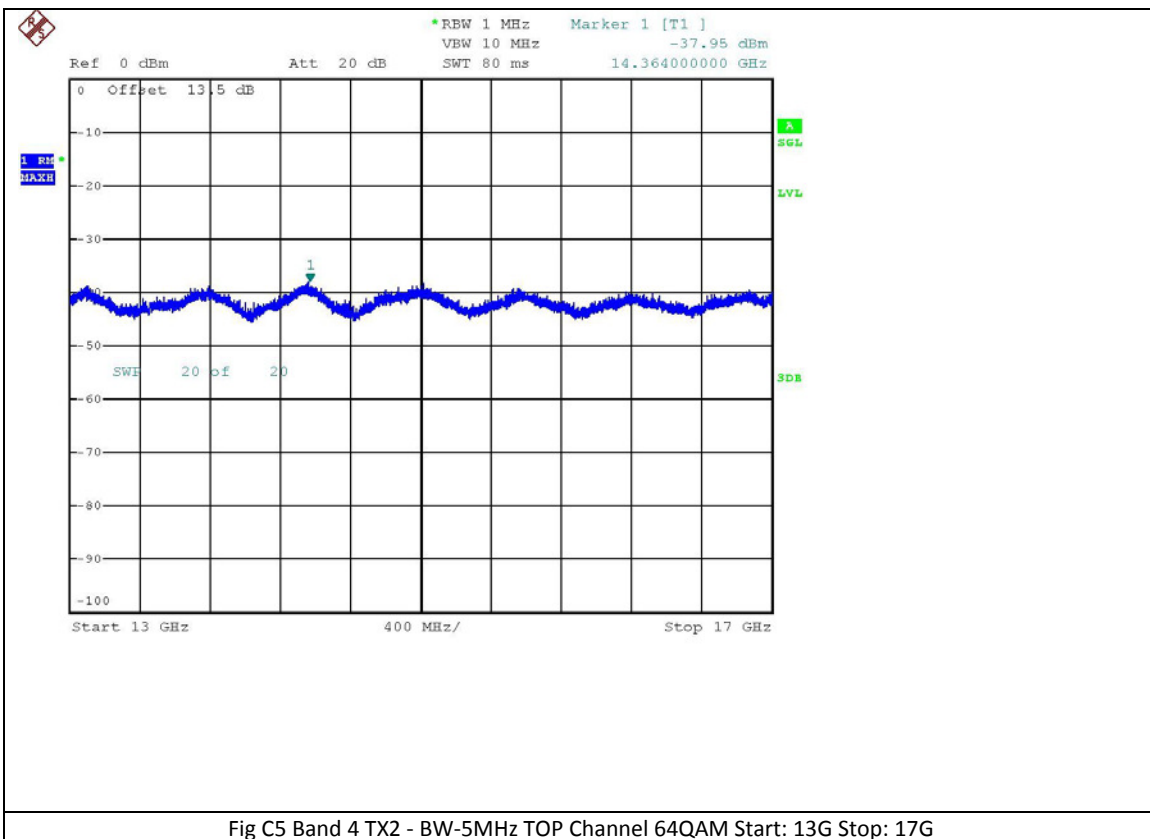


Fig C5 Band 4 TX2 - BW-5MHz TOP Channel 64QAM Start: 13G Stop: 17G

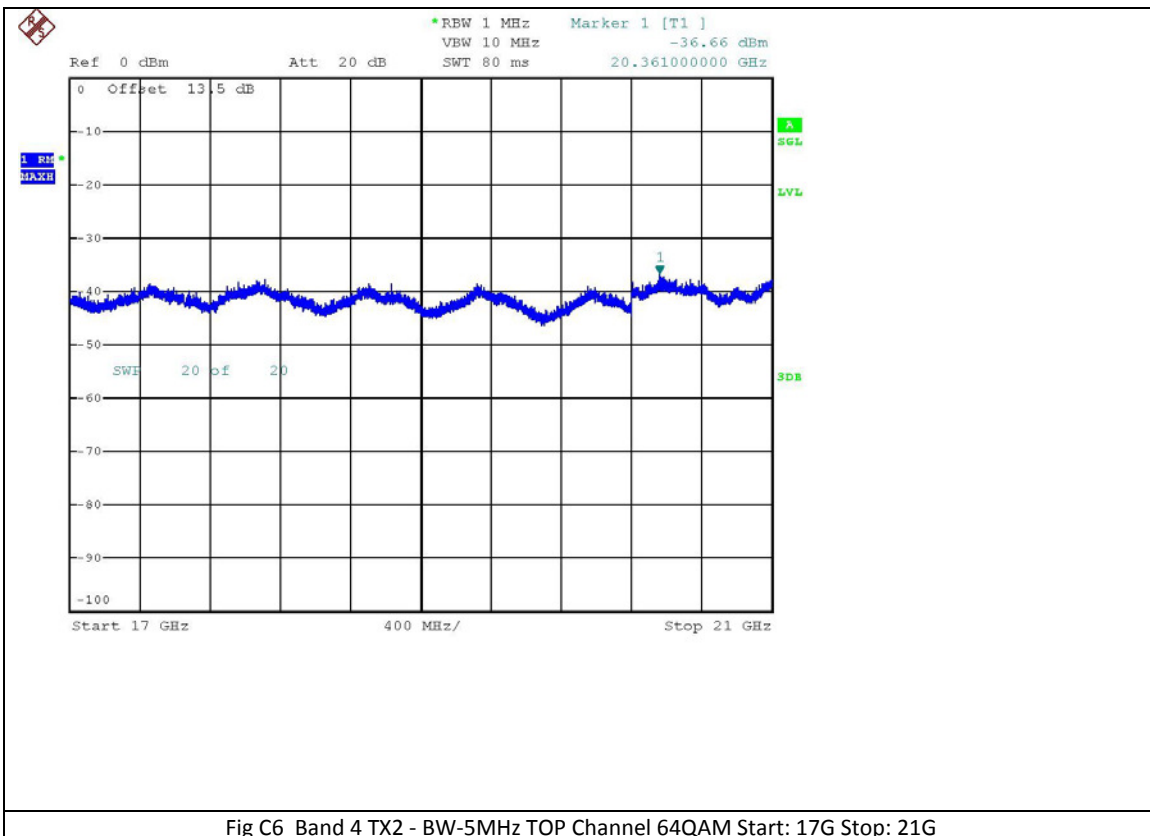


Fig C6 Band 4 TX2 - BW-5MHz TOP Channel 64QAM Start: 17G Stop: 21G

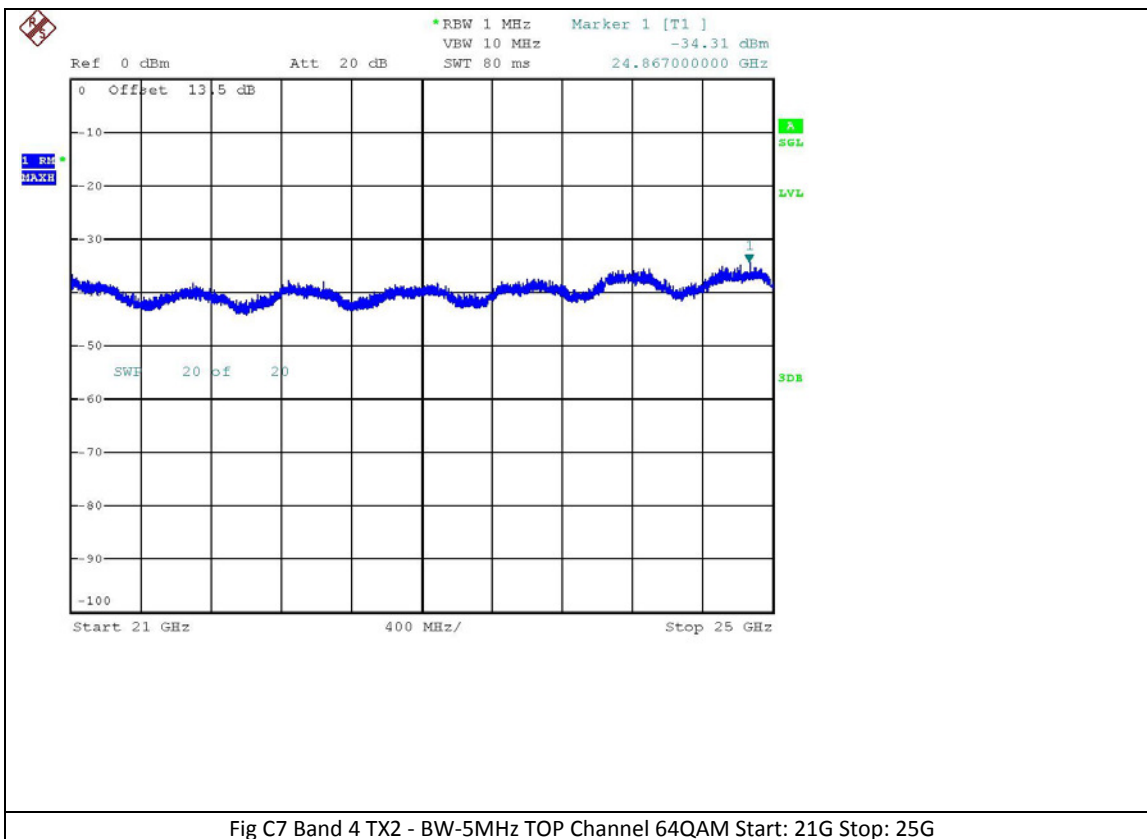


Fig C7 Band 4 TX2 - BW-5MHz TOP Channel 64QAM Start: 21G Stop: 25G

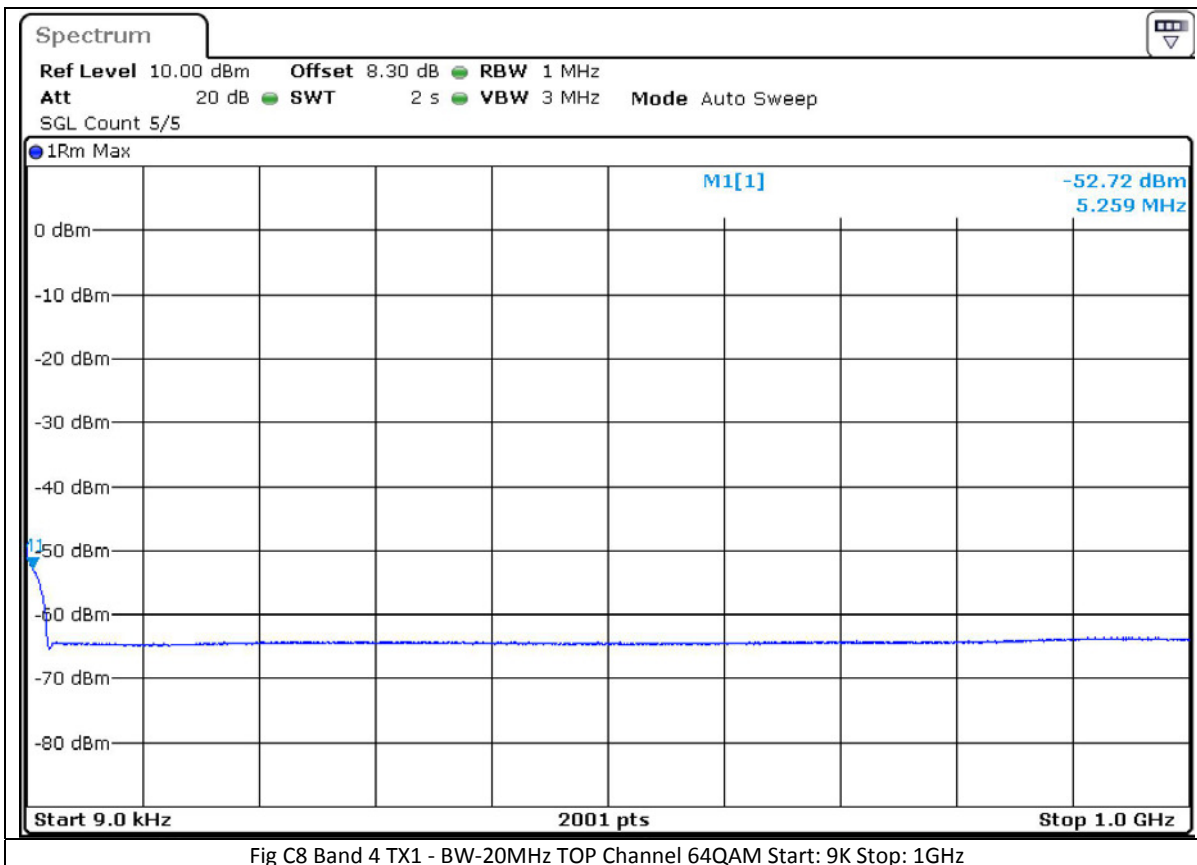
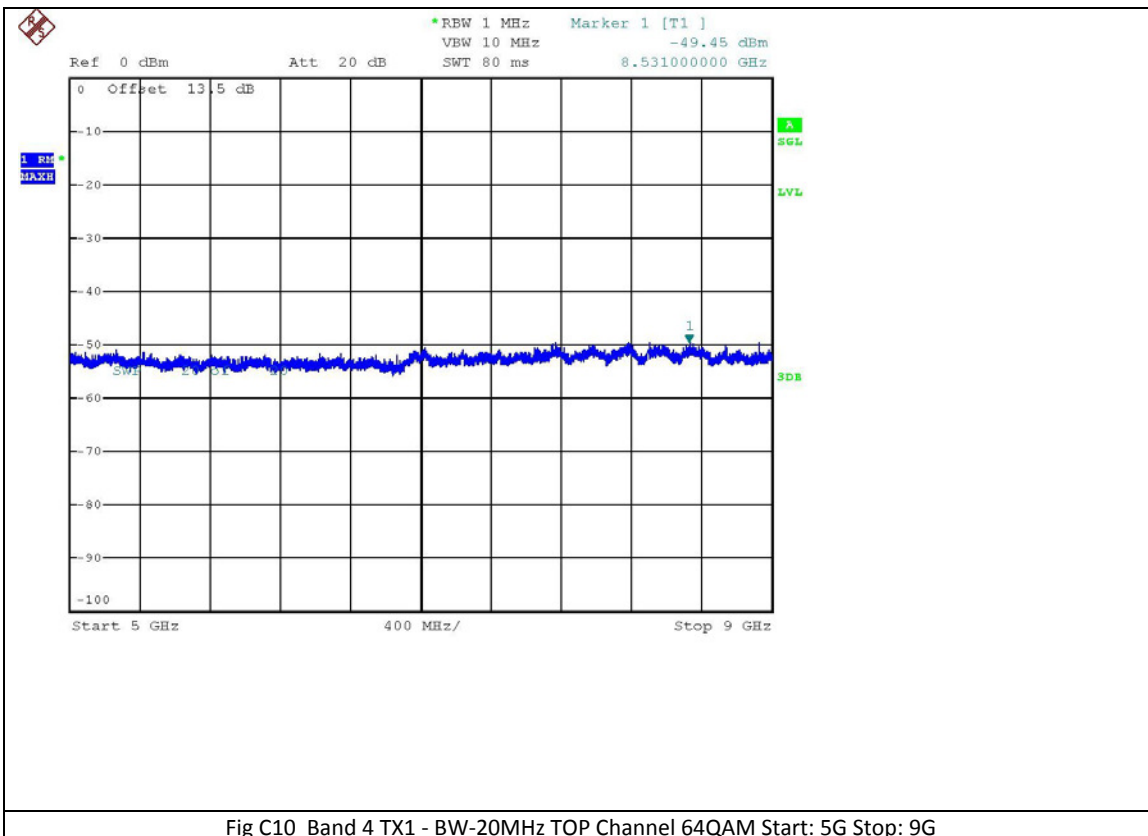
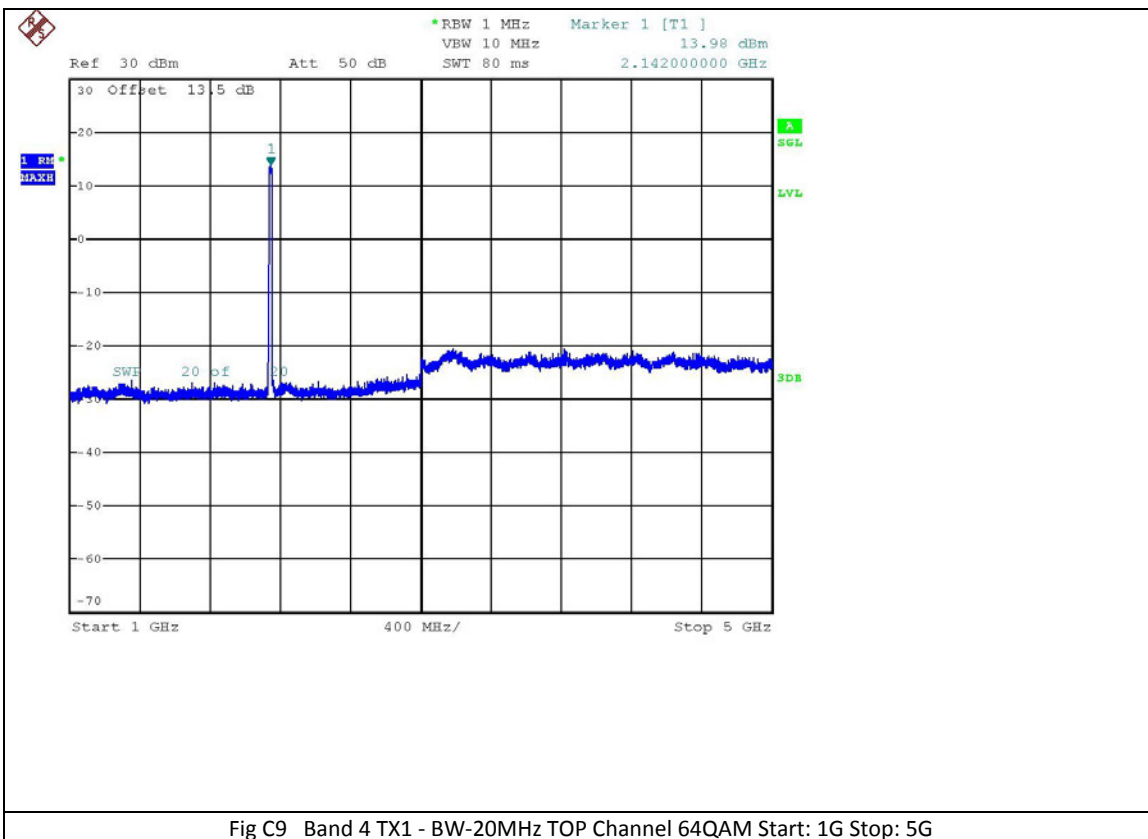


Fig C8 Band 4 TX1 - BW-20MHz TOP Channel 64QAM Start: 9K Stop: 1GHz



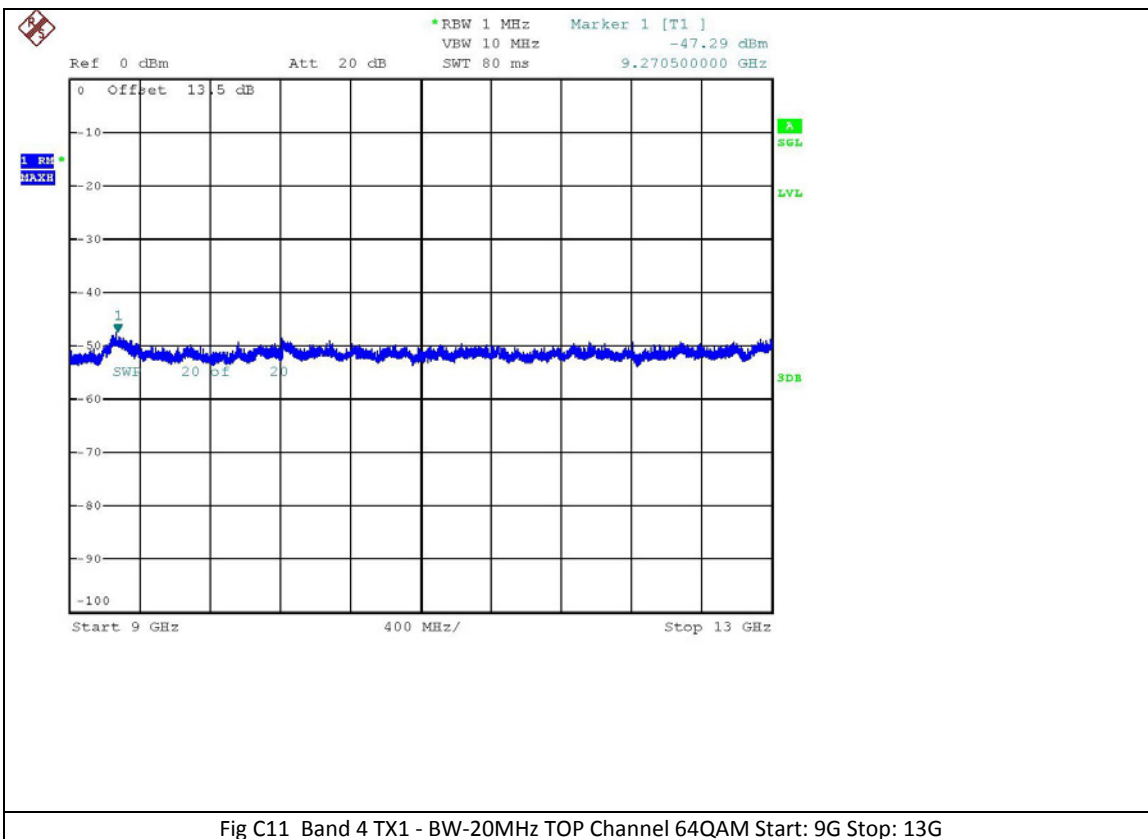


Fig C11 Band 4 TX1 - BW-20MHz TOP Channel 64QAM Start: 9G Stop: 13G

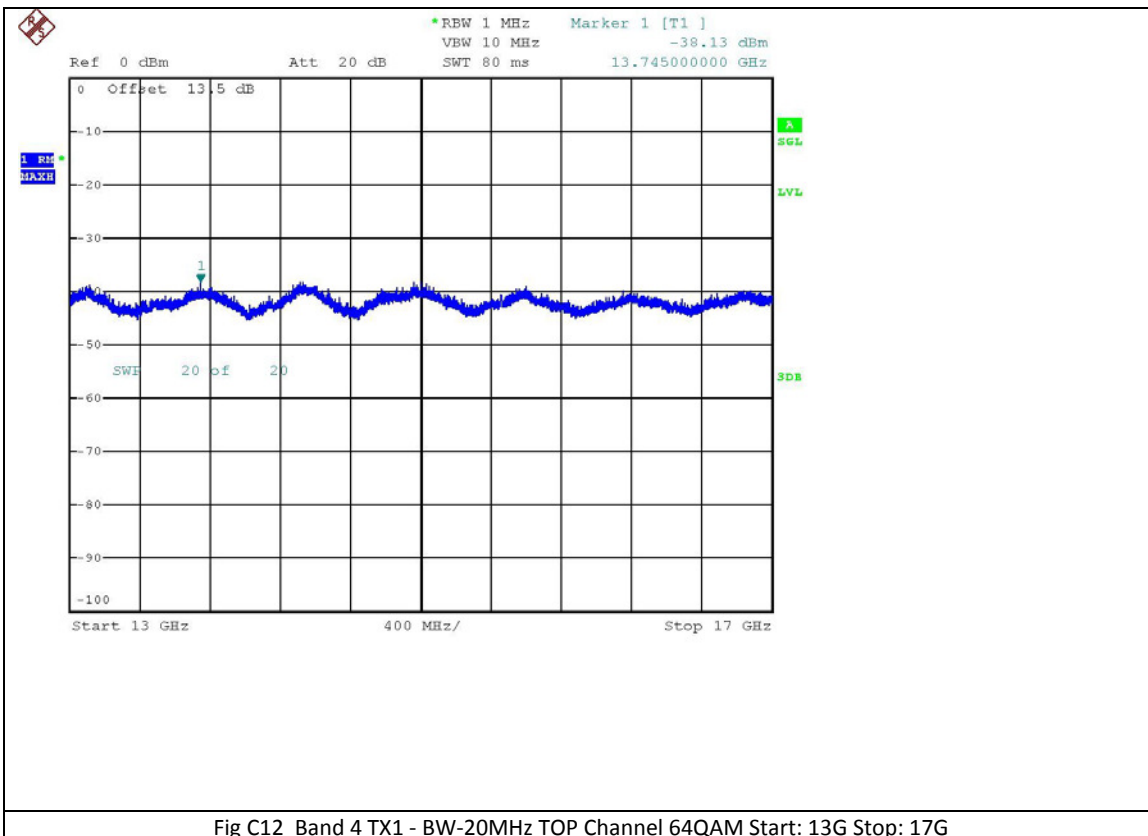


Fig C12 Band 4 TX1 - BW-20MHz TOP Channel 64QAM Start: 13G Stop: 17G

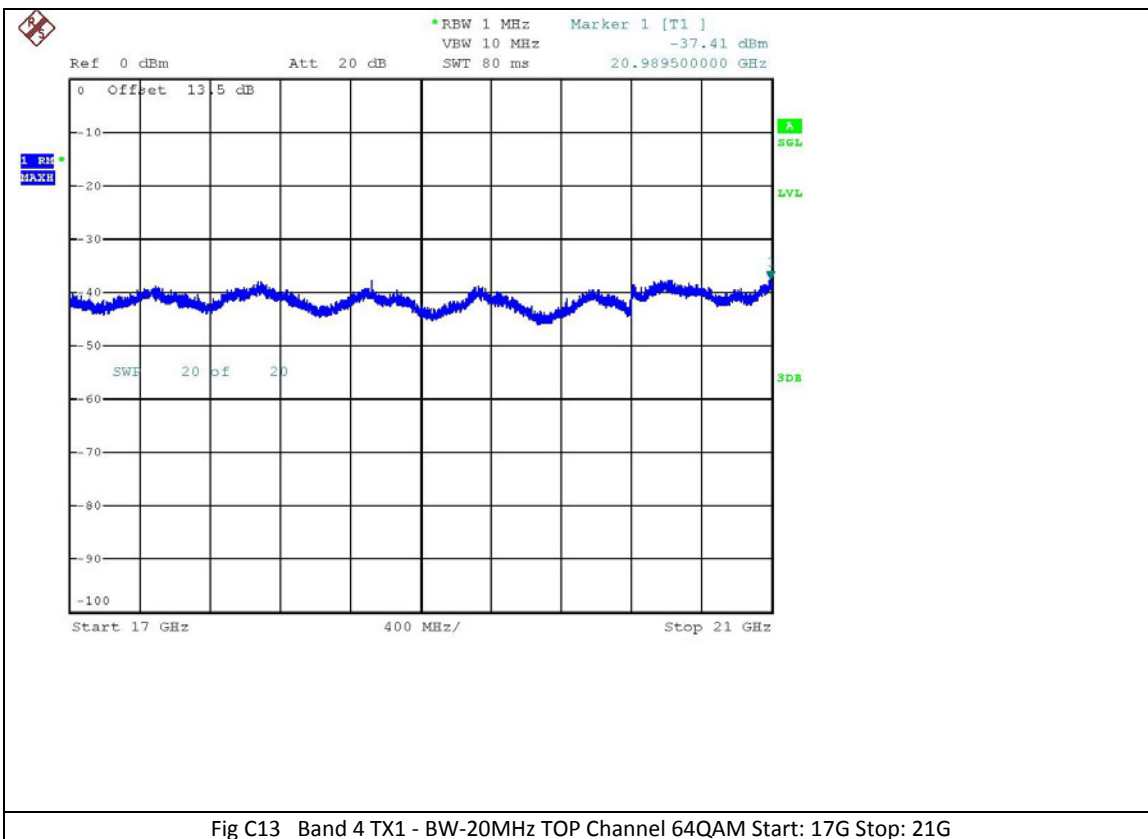


Fig C13 Band 4 TX1 - BW-20MHz TOP Channel 64QAM Start: 17G Stop: 21G

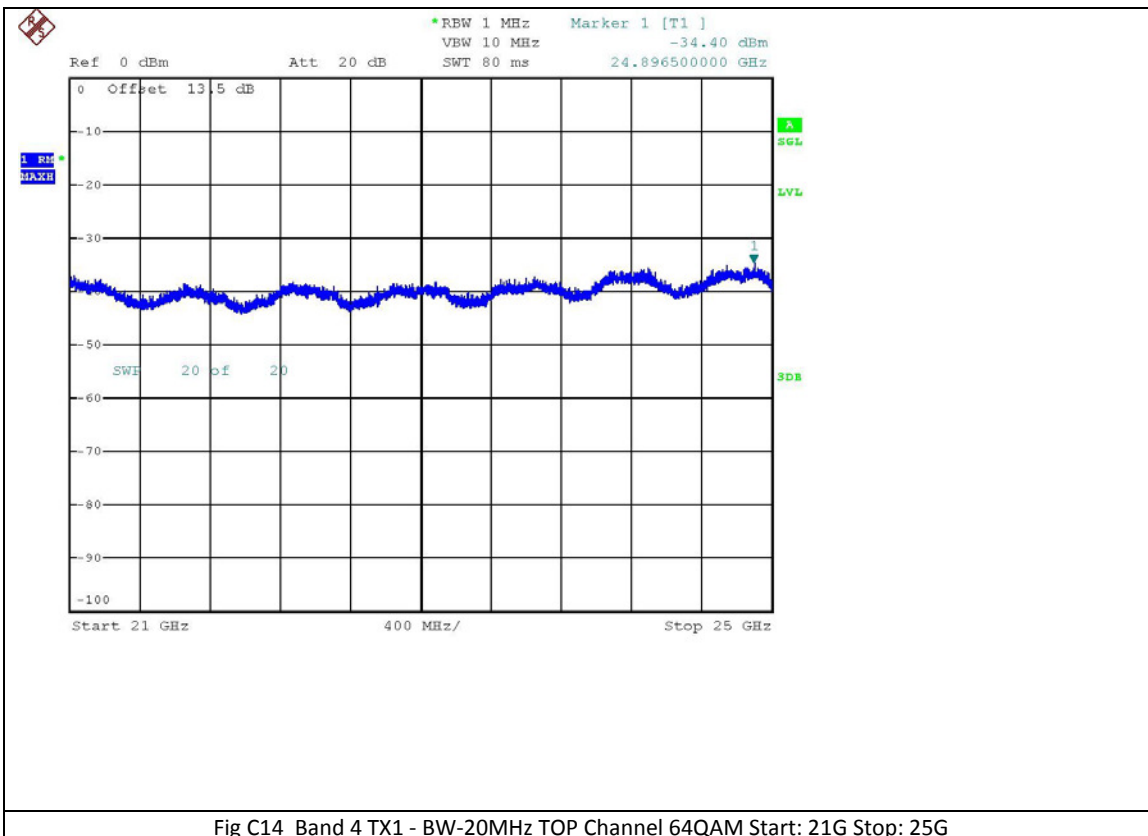
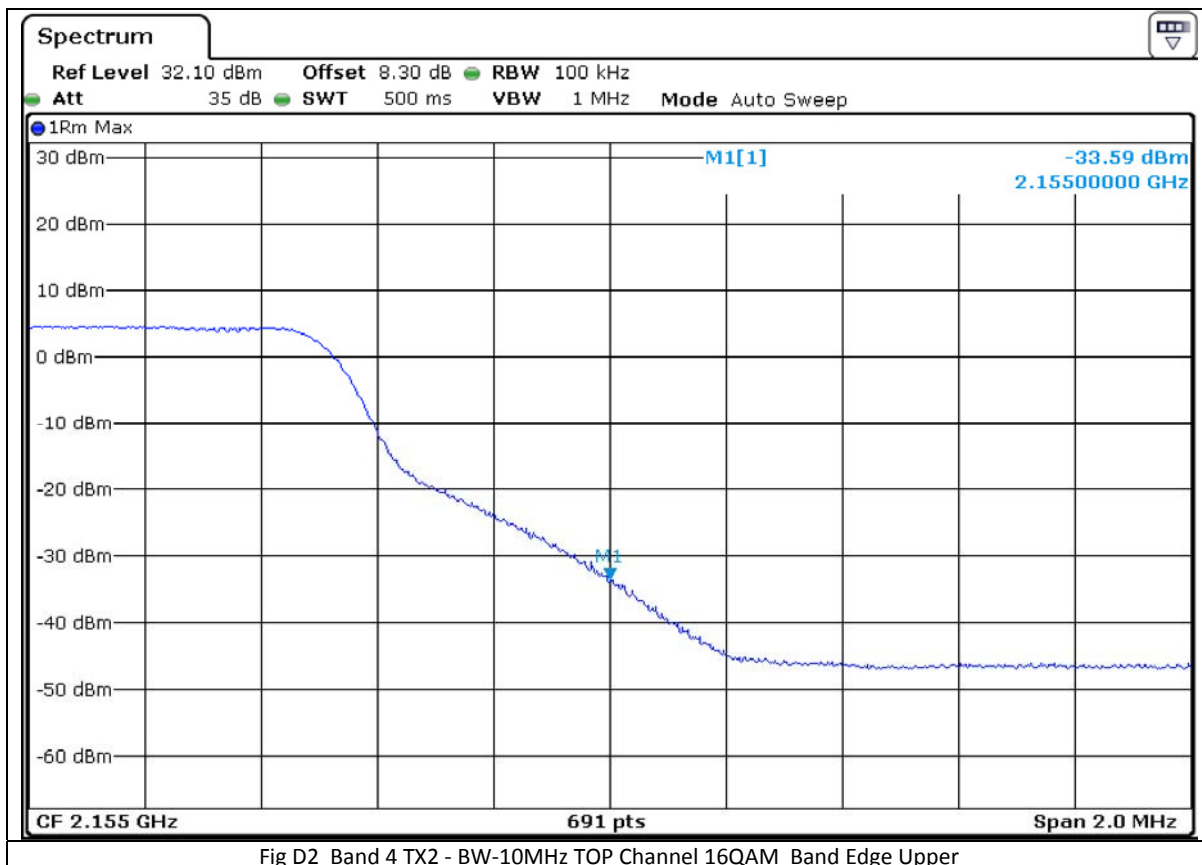
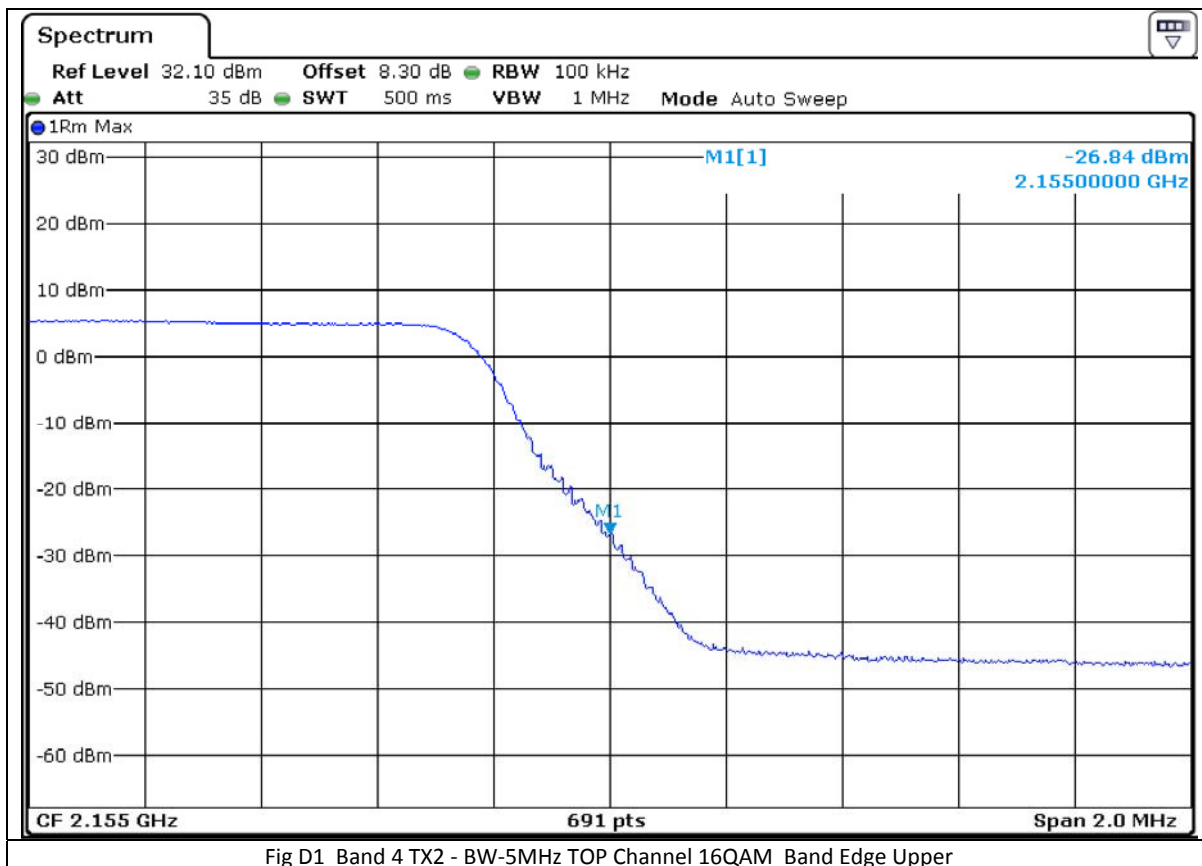


Fig C14 Band 4 TX1 - BW-20MHz TOP Channel 64QAM Start: 21G Stop: 25G

Appendix D

Band Edge Emissions

Conducted



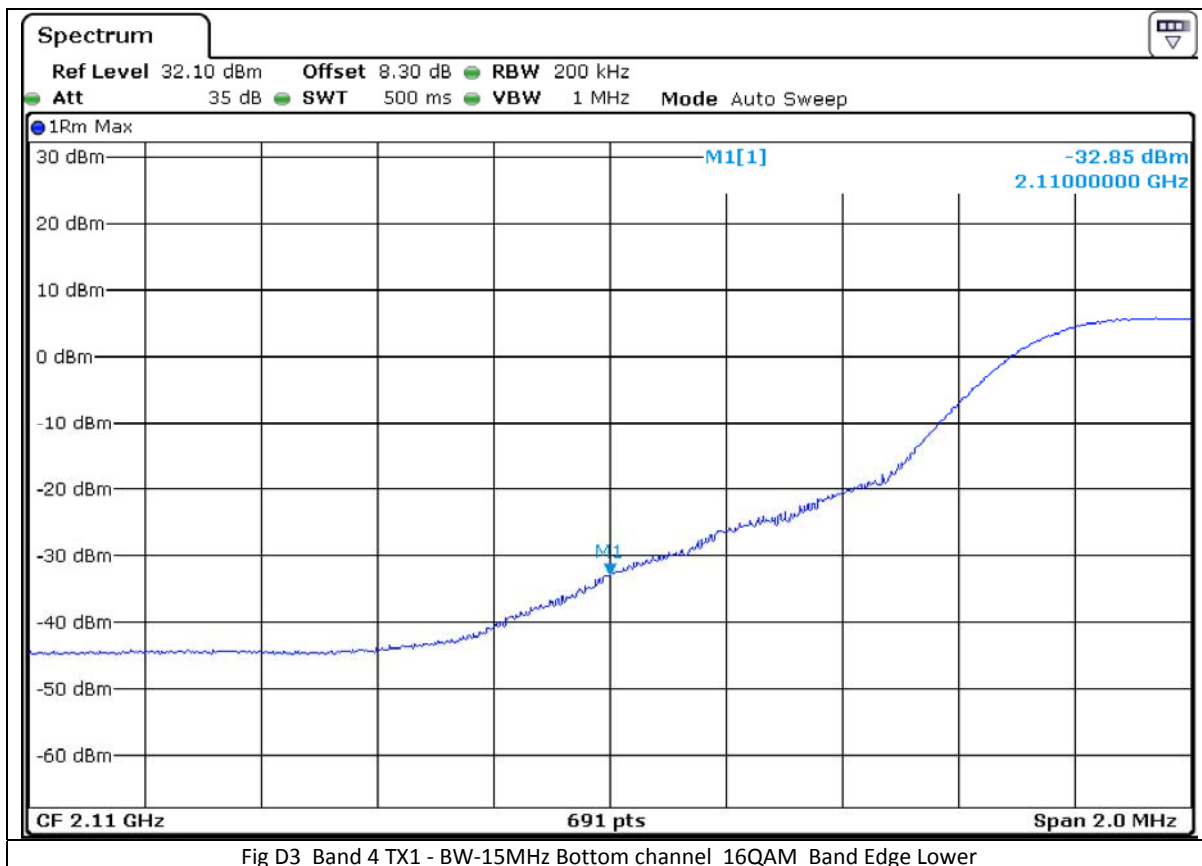


Fig D3 Band 4 TX1 - BW-15MHz Bottom channel 16QAM Band Edge Lower

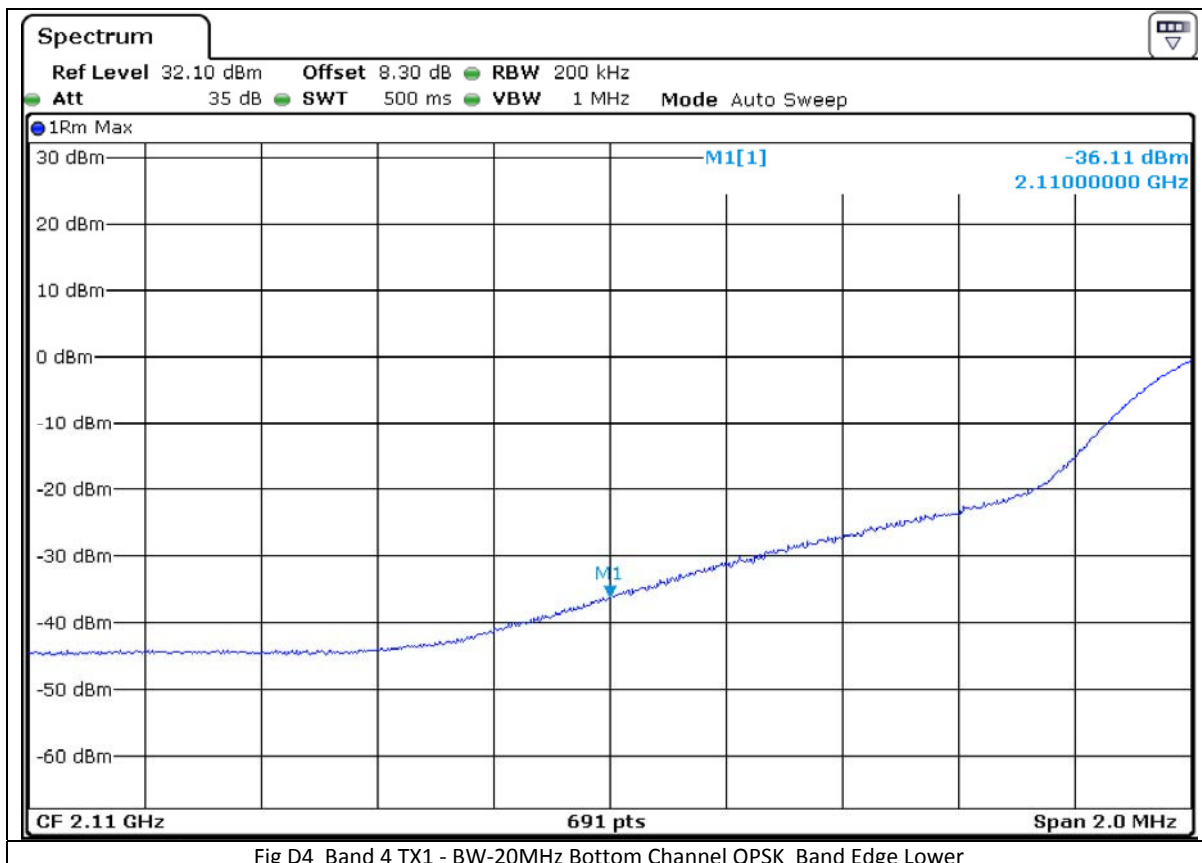


Fig D4 Band 4 TX1 - BW-20MHz Bottom Channel QPSK Band Edge Lower

Ref report 16E086-3b part 2

For

Appendix E

Band 4 Spurious Emissions

Radiated

Appendix F

Band 4 Spurious Emissions Band Edge

Radiated

Appendix G

Peak to Average power Ratio

Conducted