
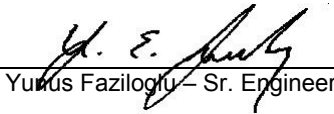




Test Report

Curtis-Straus LLC, a wholly owned subsidiary of BV CPS

Report No	ES0559-1
Client	Lear Corporation
Address	21557 Telegraph Road Southfield MI 48033
Phone	248.447.5040
Items tested FCC ID	Locomate Roadstar OBU KOBVXZ19A
FRN	0007378441
Equipment Type Equipment Code	Licensed Non-Broadcast Station Transmitter TNB
FCC/IC Rule Parts	CFR Title 47 FCC Part 95 Subpart L
Test Dates	July 27, 2018 – August 14, 2018
Results	As detailed within this report
Prepared by	 Christopher Hamel – EMC Engineer
Authorized by	 Yunus Faziloglu – Sr. Engineer
Issue Date	9/19/18
Conditions of Issue	This Test Report is issued subject to the conditions stated in the 'Conditions of Testing' section on page 22 of this report.

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Report REV Sep-08-2017 - YF



Summary

This test report supports an application for certification of a transmitter operating pursuant to: CFR Title 47 FCC Part 95 Subpart L for “Dedicated Short-Range Communications Service (DSRCS) On-Board Units”

EUT is the “Locomate Roadstar OBU”. It operates under the following channel plan in a 4x4 MIMO configuration.

Channel Bandwidth	Frequency, MHz	Channel
10 MHz	5860	172
	5870	174
	5880	176
	5890	178
	5900	180
	5910	182
	5920	184
20 MHz	5875	175
	5905	181

Antennas: 4 detachable 1dBi dipoles

We found that the EUT met the above requirements without modification.

Refer to Appendix A of this report for antenna port conducted measurements.

All test samples were received in good condition.

Test Methodology

All testing was performed according to the following rules/procedures/documents;

CFR Title 47 FCC Part 95 Subpart L

ANSI C63.26-2015 “American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services”

ASTM E2213-03 “Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems—5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications”

Radiated emissions were maximized by rotating the device around 3 orthogonal planes (X, Y and Z) as well as varying the test antenna’s height and polarity.

EUT is powered by an external 12V DC Adapter supplied by Lear Corporation.

Following bandwidths were used during radiated spurious emissions testing.

Frequency	RBW	VBW
30-1000MHz	120kHz	1MHz
1-40GHz	1MHz	3MHz

Product Tested - Configuration Documentation

EUT Configuration											
Work Order:	S0559										
Company:	Lear Corporation										
Company Address:	21557 Telegraph Road										
	Southfield MI 48033										
Contact:	Nazeer Shaik										
	MN			PN			SN				
EUT:	Locomate Roadstar OBU										
EUT Description:	on board Dedicated Short-Range Communications Service (DSRCS) Device										
EUT Max Frequency:	5920 MHz										
EUT Components	MN			SN							
OBU											
Port Label	Port Type	# ports	# populated	cable type	shielded	ferrites	length (m)	in/out	under test	comment	
12V DC power	Power DC	1	1	Power DC	Yes	Yes	2	in	yes		
Ethernet	Ethernet	1	1	Ethernet	No	No	2	in	yes		
Software Operating Mode Description:											
EUT constantly transmits on all 4 ports in 10MHz and 20MHz channel bandwidth modes via client supplied test software. Channels and data rates are selectable.											

BUREAU
VERITAS

Curtis-Straus LLC, a wholly owned subsidiary of BV CPS

One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8828



Test Results

Radiated Spurious Emissions

Limit: -25dBm EIRP per ASTM E2213-03 standard (incorporated by reference in FCC §95.3189)
-25dBm EIRP is equivalent to 70.2dBuV/m at 3m or 79.7dBuV/m at 1m

Preliminary measurements performed to identify worst case orientation by rotating the device around 3 orthogonal planes (X, Y and Z). Z orientation was found to be the worst. In addition, data rates were varied to identify the worst case configuration. All measurements below are from worst case orientation and configuration.

MEASUREMENTS / RESULTSTested **Low** (5860MHz), **Mid** (5890MHz), **High** (5920MHz) at 3Mbps**20MHz Low**(5875MHz), **20MHz High**(5905MHz) at 6Mbps

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 30-1000MHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW Low Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 12, 2018

Frequency (MHz)	Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Lim1: _FCC_95L (dBμV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
375.005	56.3	-12.5	43.9	70.2	-26.3	PASS	
494.994	49.7	-9.6	40.1	70.2	-30.1	PASS	
500.014	49.8	-9.6	40.2	70.2	-30	PASS	
544.488	48.1	-8.9	39.2	70.2	-31	PASS	
625.022	49.3	-7.3	42	70.2	-28.2	PASS	
750.007	55.8	-5.5	50.4	70.2	-19.8	PASS	-19.8

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 30-1000MHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW Low Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 12, 2018

Frequency (MHz)	Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Lim1: _FCC_95L (dBμV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
40.015	56.1	-15.3	40.9	70.2	-29.3	PASS	
375.005	59.1	-12.5	46.6	70.2	-23.6	PASS	
495.018	50.2	-9.6	40.6	70.2	-29.6	PASS	
499.989	54.4	-9.6	44.8	70.2	-25.4	PASS	
624.998	50.4	-7.3	43.1	70.2	-27.1	PASS	
749.982	53.2	-5.5	47.8	70.2	-22.4	PASS	-22.4

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 30-1000MHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW Mid Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 12, 2018

Frequency (MHz)	Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Lim1: _FCC_95L (dBμV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
375.005	56.1	-12.5	43.6	70.2	-26.6	PASS	
500.014	49.2	-9.6	39.6	70.2	-30.6	PASS	
544.464	48.5	-8.9	39.6	70.2	-30.6	PASS	
624.998	49	-7.3	41.7	70.2	-28.5	PASS	
643.476	45.8	-6.7	39.1	70.2	-31.1	PASS	
749.982	55.9	-5.5	50.4	70.2	-19.8	PASS	-19.8

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 30-1000MHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW Mid Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 12, 2018

Frequency (MHz)	Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Lim1: _FCC_95L (dBμV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
374.981	58.9	-12.5	46.4	70.2	-23.8	PASS	
494.994	50.7	-9.6	41.1	70.2	-29.1	PASS	
499.989	54	-9.6	44.4	70.2	-25.8	PASS	
624.998	50.6	-7.3	43.3	70.2	-26.9	PASS	
643.476	47.4	-6.7	40.7	70.2	-29.5	PASS	
749.982	53.3	-5.5	47.8	70.2	-22.4	PASS	-22.4

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 30-1000MHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW High Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 12, 2018

Frequency (MHz)	Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Lim1: _FCC_95L (dBμV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
374.981	57.2	-12.4	44.7	70.2	-25.5	PASS	
494.969	48.7	-9.5	39.2	70.2	-31	PASS	
500.014	49.7	-9.5	40.2	70.2	-30	PASS	
624.998	49.4	-7.2	42.1	70.2	-28.1	PASS	
643.501	46	-6.7	39.3	70.2	-30.9	PASS	
749.982	55.8	-5.4	50.4	70.2	-19.8	PASS	-19.8

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 30-1000MHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW High Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 12, 2018

Frequency (MHz)	Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Lim1: _FCC_95L (dBμV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
35.262	53.5	-11.6	41.9	70.2	-28.3	PASS	
375.005	58.9	-12.4	46.5	70.2	-23.7	PASS	
494.994	49.2	-9.5	39.7	70.2	-30.5	PASS	
499.989	54.1	-9.5	44.6	70.2	-25.6	PASS	
624.998	49.6	-7.2	42.3	70.2	-27.9	PASS	
749.982	53.3	-5.4	47.9	70.2	-22.3	PASS	-22.3

30-1000MHz (10MHz BW)

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 30-1000MHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 20MHz BW Low Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 12, 2018

Frequency (MHz)	Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Lim1: _FCC_95L (dBμV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
375.005	56.7	-12.5	44.3	70.2	-25.9	PASS	
499.989	49.1	-9.6	39.5	70.2	-30.7	PASS	
544.488	47.6	-8.9	38.7	70.2	-31.5	PASS	
624.998	51.7	-7.3	44.4	70.2	-25.8	PASS	
643.501	45.9	-6.7	39.2	70.2	-31	PASS	
749.982	55.1	-5.5	49.6	70.2	-20.6	PASS	-20.6

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 30-1000MHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 20MHz BW Low Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 12, 2018

Frequency (MHz)	Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Lim1: _FCC_95L (dBμV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
36.208	53.8	-12.4	41.4	70.2	-28.8	PASS	
375.005	58.4	-12.5	45.9	70.2	-24.3	PASS	
499.989	54.9	-9.6	45.3	70.2	-24.9	PASS	
624.998	49.6	-7.3	42.3	70.2	-27.9	PASS	
643.476	48.1	-6.7	41.4	70.2	-28.8	PASS	
750.007	53.7	-5.5	48.3	70.2	-21.9	PASS	-21.9

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 30-1000MHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 20MHz BW High Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 12, 2018

Frequency (MHz)	Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Lim1: _FCC_95L (dBμV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
374.981	57.4	-12.5	44.9	70.2	-25.3	PASS	
494.994	48.5	-9.6	38.9	70.2	-31.3	PASS	
499.989	49.7	-9.6	40.1	70.2	-30.1	PASS	
624.998	49.2	-7.3	41.9	70.2	-28.3	PASS	
643.476	45.9	-6.7	39.2	70.2	-31	PASS	
749.982	55.3	-5.5	49.9	70.2	-20.3	PASS	-20.3

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 30-1000MHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 20MHz BW High Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 12, 2018

Frequency (MHz)	Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Lim1: _FCC_95L (dBμV/m)	Lim1 Margin (dB)	Lim1 Test Results (Pass/Fail)	Worst Margin Lim1 (dB)
36.16	53.5	-12.4	41.1	70.2	-29.1	PASS	
375.005	57.9	-12.5	45.4	70.2	-24.8	PASS	
499.989	55	-9.6	45.4	70.2	-24.8	PASS	
624.998	49.4	-7.3	42.2	70.2	-28	PASS	
643.501	47.4	-6.7	40.7	70.2	-29.5	PASS	
750.007	53.5	-5.5	48.1	70.2	-22.1	PASS	-22.1

30-1000MHz (20MHz BW)

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 1-6GHz Test Site - CH1
 Operator: CCH[®] Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW Low Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: _FCC_95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Results (Pass/Fail)	Peak Limit Worst Margin (dB)
4.6075	44.684	2.786	47.47	70.2	-22.73	PASS	-22.73

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 1-6GHz Test Site - CH1
 Operator: CCH[®] Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW Low Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: _FCC_95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
4.61275	45.334	2.786	48.12	70.2	-22.08	PASS	-22.08

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 1-6GHz Test Site - CH1
 Operator: CCH[®] Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW Mid Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: _FCC_95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Results (Pass/Fail)	Peak Limit Worst Margin (dB)
4.5783	45.059	2.261	47.32	70.2	-22.88	PASS	22.88

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 1-6GHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW Mid Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: _FCC_95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
1241.5	45.2	-4.7	40.6	70.2	-29.6	PASS	
4.6559	45.2	2.8	48	70.2	-22.2	PASS	-22.2

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 1-6GHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW High Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: _FCC_95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Results (Pass/Fail)	Peak Limit Worst Margin (dB)
1314.75	45	-4.2	40.8	70.2	-29.4	PASS	
4615.75	45.8	2.8	48.6	70.2	-21.6	PASS	-21.6

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 1-6GHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW High Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: _FCC_95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
5.7461	43.7	4.8	48.5	70.2	-21.7	PASS	-21.7

1-6GHz (10MHz BW)

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 1-6GHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 20MHz BW Low Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: _FCC_95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Results (Pass/Fail)	Peak Limit Worst Margin (dB)
1257.13	45.3	-4.5	40.9	70.2	-29.3	PASS	
5.648	45.2	3.6	48.8	70.2	-21.4	PASS	-21.4

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 1-6GHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 20MHz BW Low Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: _FCC_95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
1364.13	45.4	-4.4	41	70.2	-29.2	PASS	
4606.75	45.4	2.8	48.2	70.2	-22	PASS	-22

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 1-6GHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 20MHz BW High Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: _FCC_95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Results (Pass/Fail)	Peak Limit Worst Margin (dB)
1277.88	45.1	-4.3	40.8	70.2	-29.4	PASS	
5.734	44.7	4.8	49.5	70.2	-20.7	PASS	-20.7

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 3m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 1-6GHz Test Site - CH1
 Operator: CCH[®] Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 20MHz BW High Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: _FCC_95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
5.09	44.8	3.2	48	70.2	-22.2	PASS	-22.2

1-6GHz (20MHz BW)

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 1m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 6-18GHz Test Site - CH1
 Operator: CCH[®] Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW Low Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: FCC 95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
17998.5	42.7	20.1	62.7	79.7	-17	PASS	-17

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 1m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 6-18GHz Test Site - CH1
 Operator: CCH[®] Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW Low Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: FCC 95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
17962.5	43.4	19.7	63.1	79.7	-16.6	PASS	-16.6



Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 1m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 6-18GHz Test Site - CH1
 Operator: CCH[®] Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW Mid Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: FCC 95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
17998.5	42.7	20.1	62.7	79.7	-17	PASS	-17

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 1m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 6-18GHz Test Site - CH1
 Operator: CCH[®] Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW Mid Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: FCC 95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
17962.5	43.4	19.7	63.1	79.7	-16.6	PASS	-16.6

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 1m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 6-18GHz Test Site - CH1
 Operator: CCH[®] Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW High Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: FCC 95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
17934.9	43.5	19.4	62.9	79.7	-16.8	PASS	-16.8

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 1m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 6-18GHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 10MHz BW High Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: FCC 95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
13543.8	45.1	13.9	59	79.7	-20.7	PASS	
17973.3	43.1	19.8	62.9	79.7	-16.8	PASS	-16.8

6-18GHz (10 MHz BW)

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 1m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 6-18GHz Test Site - CH1
 Operator: CCH Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 20MHz BW Low Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: FCC 95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
15953.1	45	15.8	60.7	79.7	-19	PASS	
17958.6	43.3	19.7	63	79.7	-16.7	PASS	-16.7

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 1m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 6-18GHz Test Site - CH1
 Operator: CCH[®] Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 20MHz BW Low Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: FCC 95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
17970.9	43.6	19.8	63.4	79.7	-16.3	PASS	-16.3

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 1m Distance EUT Power Input - 12V DC
 Top Peaks Horizontal 6-18GHz Test Site - CH1
 Operator: CCH[®] Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 20MHz BW High Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: FCC 95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
17943	44	19.5	63.5	79.7	-16.2	PASS	-16.2

Curtis Straus - a Bureau Veritas Company Work Order - S0559
 Radiated Emissions Electric Field 1m Distance EUT Power Input - 12V DC
 Top Peaks Vertical 6-18GHz Test Site - CH1
 Operator: CCH[®] Conditions - 24.2°C; 45%RH; 1010mBar
 Notes: Witnessed by - N/A
 EUT Tx 4 channels 20MHz BW High Channel EUT Maximum Frequency - 5922MHz

Data Taken at August 10, 2018

Frequency (MHz)	Raw Peak Reading (dBμV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBμV/m)	Pk Lim: FCC 95L (dBμV/m)	Margin to Peak Limit (dB)	Peak Limit Test Results (Pass/Fail)	Peak Limit Worst Margin (dB)
17963.7	43.6	19.7	63.3	79.7	-16.4	PASS	-16.4

6-18GHz (20MHz BW)



Radiated Emissions Table

Date: 14-Aug-18		Company: Lear Corp.					Work Order: S0559					
Engineer: Chris Hamel		EUT Desc: Roadstar OBU					EUT Operating Voltage/Frequency: 12V DC					
Temp: 24.2°C		Humidity: 38%			Pressure: 1010mBar							
Frequency Range: 18-40GHz							Measurement Distance: 0.1 m					
Notes: all channels 10 and 20MHz Bandwidth No emissions found							EUT Max Freq:					
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBuV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBuV/m)	FCC 95L			FCC 95L		
							Limit (dBuV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBuV/m)	Margin (dB)	Result (Pass/Fail)
			---	---	---	---	---	---	---	---	---	---
Table Result: Pass by N/A dB							Worst Freq: N/A MHz					
Test Site: EMI Chamber 2		Cable 1: Asset #2323					Cable 2: ---		Cable 3: ---			
Analyzer: Gold		Preamp: 18-26.5GHz					Antenna: 18-26.5GHz Horn		Preselector: ---			
CSsoft Radiated Emissions Calculator v 1.017.207							Copyright Curtis-Straus LLC 2000					
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor												
Test Site: EMI Chamber 2		Cable 1: Asset #2323					Cable 2: Asset #2324		Cable 3: ---			
Analyzer: Gold		Preamp: 40GHz Mixer					Antenna: 40GHz Mixer		Preselector: ---			
CSsoft Radiated Emissions Calculator v 1.017.207							Copyright Curtis-Straus LLC 2000					
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor												

18-40GHz All channels and BW

Rev. 8/13/2018

Spectrum Analyzers / Receivers /Preselectors		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Gold		100Hz-26.5 GHz	E4407B	Agilent	MY45113816	1284	I	3/19/2019
Rental MXE EMI Receiver(1170725)		20Hz-26.5GHz	N9038A	Agilent	MY51210151	1170725	I	4/10/2019
Radiated Emissions Sites		FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due
EMI Chamber 1		719150	2762A-6	A-0015	30-1000MHz	1685	I	12/21/2018
EMI Chamber 1		719150	2762A-6	A-0015	1-18GHz	1685	I	12/21/2018
EMI Chamber 2		719150	2762A-7	A-0015	1-18GHz	1686	I	12/21/2018
Mixers/Duplexers		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Mixer / Horn		26.5-40 GHz	11970A	Agilent	3003A10230	2154	I	3/12/2019
Preamps /Couplers Attenuators / Filters		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
2311 PA		1-1000MHz	PAM-103	COM-POWER	441174	2311	II	10/29/2018
2111 HF Preamp		0.5-18GHz	PAM-118A	COM-POWER	551063	2111	II	11/19/2018
HF (Yellow)		18-26.5GHz	AFS4-18002650-60-8P-4	CS	467559	1266	II	10/16/2018
Antennas		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Red-Black Bilog		30-2000MHz	JB1	Sunol	A091604-2	1106	I	2/28/2019
HF (White) Horn		18-26.5GHz	801-WLM	Waveline	758	758	III	Verify before Use
Blue Horn		1-18GHz	3117	ETS	157647	1861	I	2/14/2019
Meteorological Meters/Chambers			MN	Mfr	SN	Asset	Cat	Calibration Due
Weather Clock (Pressure Only)			BA928	Oregon Scientific	C3166-1	831	I	5/15/2020
TH A#2081			HTC-1	HDE		2081	II	3/22/2019
TH A#2084			HTC-1	HDE		2084	II	3/22/2019
Cables		Range		Mfr			Cat	Calibration Due
Asset #2456		9KHz-18GHz		MegaPhase			II	10/29/2018
Asset #2466		9KHz-18GHz		MegaPhase			II	10/29/2018
Asset #2480		9KHz-18GHz		MegaPhase			II	10/29/2018
Asset #2323		1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 002	2323	II	8/9/2019
Asset #2324		1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 001	2324	II	8/9/2019

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

TEU



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Measurement Uncertainty

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
Radiated Emissions (30-1000MHz)		
NIST	5.6dB	N/A
CISPR	4.6dB	5.2dB (Ucisp)
Radiated Emissions (1-26.5GHz)	4.6dB	N/A
Radiated Emissions (above 26.5GHz)	4.9dB	N/A
Magnetic Radiated Emissions	5.6dB	N/A
Conducted Emissions		
NIST	3.9dB	N/A
CISPR	3.6dB	3.6dB (Ucisp)
Telco Conducted Emissions (Current)	2.9dB	N/A
Telco Conducted Emissions (Voltage)	4.4dB	N/A
Electrostatic Discharge	11.5%	N/A
Radiated RF Immunity (Uniform Field)	1.6dB	N/A
Electrical Fast Transients	23.1%	N/A
Surge	23.1%	N/A
Conducted RF Immunity	3dB	N/A
Magnetic Immunity	12.8%	N/A
Dips and Interrupts	2.3V	N/A
Harmonics	3.5%	N/A
Flicker	3.5%	N/A
Radio frequency (@ 2.4GHz)	3.23×10^{-8}	1×10^{-7}
RF power, conducted	0.40dB	0.75dB
Maximum frequency deviation:		
• Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency	3.4% 0.3dB	5% 3dB
Adjacent channel power	1.9dB	3dB
Conducted spurious emission of transmitter, valid up to 12.75GHz	2.39dB	3dB
Conducted emission of receivers	1.3dB	3dB
Radiated emission of transmitter, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of transmitter, valid up to 80GHz	3.3dB	6dB
Radiated emission of receiver, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of receiver, valid up to 80GHz	3.3dB	6dB
Humidity	2.37%	5%
Temperature	0.7°C	1.0°C
Time	4.1%	10%
RF Power Density, Conducted	0.4dB	3dB
DC and low frequency voltages	1.3%	3%
Voltage (AC, <10kHz)	1.3%	2%
Voltage (DC)	0.62%	1%
The above reflects a 95% confidence level		

Conditions Of Testing

[Bureau Veritas Consumer Products Services, Inc., a Massachusetts corporation], and/or its affiliates (collectively, the "Company") will conduct, at the request of the Submitter ("Client"), the tests specified on the submitted Test Request Form or equivalent in accordance with, and subject to, the following terms and conditions (collectively, "Conditions"):

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("Test Report") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.

2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.

3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.

4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.

5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "BUREAU VERITAS," "BUREAU VERITAS CONSUMER PRODUCTS SERVICES," "BVCPS," "MTL," "ACTS," "MTL-ACTS" and CURTIS-STRAUS (collectively, the "Marks") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.

6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.

7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.

8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.

9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.

10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.

11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only where such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.

12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.

13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.

14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.



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15. (A) IN NO EVENT WHATSOEVER SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE TEST REPORT OR THE SERVICES PROVIDED BY THE COMPANY HEREUNDER, INCLUDING WITHOUT LIMITATION LOSS OF OR DAMAGE TO PROPERTY; LOSS OF INCOME, PROFIT OR USE; OR ANY CLAIMS OR DEMANDS MADE AGAINST CLIENT OR ANY OTHER PERSON BY ANY THIRD PARTY IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE SERVICES PROVIDED BY THE COMPANY HEREUNDER.

(B) NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN, AND IN RECOGNITION OF THE RELATIVE RISKS AND BENEFITS TO CLIENT AND THE COMPANY ASSOCIATED WITH THE TESTING SERVICES CONTEMPLATED HEREBY, THE RISKS HAVE BEEN ALLOCATED SUCH THAT UNDER NO CIRCUMSTANCES WHATSOEVER SHALL THE LIABILITY OF THE COMPANY TO CLIENT OR ANY THIRD PARTY IN RESPECT OF ANY CLAIM FOR LOSS, DAMAGE OR EXPENSE, OF WHATSOEVER NATURE OR MAGNITUDE, AND HOWSOEVER ARISING, EXCEED AN AMOUNT EQUAL TO FIVE (5) TIMES THE AMOUNT OF THE FEES PAID TO THE COMPANY FOR THE SPECIFIC SERVICES WHICH GAVE RISE TO SUCH CLAIM OR U.S.\$10,000, WHICHEVER IS THE LESSER AMOUNT.

16. The Company shall not be liable for any loss or damage resulting from any delay or failure in performance of its obligations hereunder resulting directly or indirectly from any event of force majeure or any event outside the control of the Company. If any such event occurs, the Company may immediately cancel or suspend its performance hereunder without incurring any liability whatsoever to Client.

17. Company's services, including these Conditions, shall be governed by, and construed in accordance with, the local laws of the country where the Company performs the tests or, in the case of tests performed in the United States of America, the laws of Massachusetts without regard to conflicts of laws principles. If any aspect(s) of these Conditions is found to be illegal or unenforceable, the validity, legality and enforceability of all remaining aspects of these Conditions shall not in any way be affected or impaired thereby. Any proceeding related to the subject matter hereof shall be brought, if at all, in the courts of the country where the Company performs the tests or, in the case of tests performed in the United States of America, in the courts of Massachusetts. Client waives the right to interpose any counterclaim or setoffs of any nature in any litigation arising hereunder.

The complete list of the Approved Subcontractors Curtis-Straus may use to delegate the performance of work can be provided upon request.
Rev.160009121(2)_#684340 v14CS



Appendix A:

ES0559-1 Appendix A
CFR Title 47 FCC Part 95 Subpart L
Dedicated Short-Range Communications Service (DSRCS) On-Board Units

DUT Information

Model: Locomate Roadstar OBU
 Manufacturer: Lear Corporation
 Serial Number: GClocomate300ASD309

802.11p

Channel Bandwidth	Frequency, MHz	Channel
10 MHz	5860	172
	5870	174
	5880	176
	5890	178
	5900	180
	5910	182
	5920	184
20 MHz	5875	175
	5905	181

Antenna Gain	1dBi
Number of transmit chains	4
Equipment Type	LocoMate Roadstar OBU

Test Equipment Used:

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
FSV40 Signal/Spectrum Analyzer	10Hz-40GHz	FSV40	ROHDE & SCHWARZ	101551	2200	I	6/30/2019	6/30/2017
Signal Generators/Comparison Noise Emitter	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
SMBV100A Vector Signal Generator	9KHz-6GHz	SMBV100A	ROHDE & SCHWARZ	261919	2201	I	6/26/2019	6/26/2017
SMB100A Signal Generator	100kHz-40GHz	SMB100A	ROHDE & SCHWARZ	179846	2434	I	10/13/2019	10/13/2017
Power/Noise Meters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
OSP - open switch and control platform	30MHz-18GHz	OSP-B157W8	ROHDE & SCHWARZ	1527.1144.02-100955-Ck		I	2/1/2020	2/1/2018
Cables	Range		Mfr			Cat	Calibration Due	Calibrated on
DUT1	30MHz-26GHz		Micro-Coax			III	verify before use	
DUT2	30MHz-26GHz		Micro-Coax			III	verify before use	
DUT3	30MHz-26GHz		Micro-Coax			III	verify before use	
DUT4	30MHz-26GHz		Micro-Coax			III	verify before use	
Attenuators / Couplers	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
10dB Attenuator-01 Brown	30MHz-26GHz		Mini Curcuits			III	verify before use	
10dB Attenuator-02 Yellow	30MHz-26GHz		Mini Curcuits			III	verify before use	
10dB Attenuator-03 Red	30MHz-26GHz		Mini Curcuits			III	verify before use	
10dB Attenuator-04 orange	30MHz-26GHz		Mini Curcuits			III	verify before use	
API - 30dB 20W Attenuator	9KHz-40GHz	89-30-11	API Weinschel	703	2121	II	3/23/2019	3/23/2018
Directional Coupler	0.5GHz-18GHz	UDC	AA MCS	001040		III	verify before use	
Communication Tester	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
CMW270 Wideband Radio Communication Tester	DC to 6GHz	CMW270	ROHDE & SCHWARZ	1201.0002K75-101066-MV		I	6/13/2019	6/13/2018
Meteorological Meters/Chambers		MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Temp/Humidity Chamber #18		EPX-2H	Espec	137664	1645	I	1/5/2019	1/5/2018

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

Test Results Summary

Requirement	FCC Rule Part	Results
RF Output Power	95.3189	Pass
EIRP	95.3189	Pass
Transmit Spectrum Mask	95.3189	Pass
Conducted Spurious Emissions	2.1051, 95.3189	Pass
99% Occupied Bandwidth	2.1049, 95.3189	Pass
Frequency Stability	2.1055, 95.3189	Pass

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Conducted RMS Average Output Power and EIRP

Measurement Method: ANSI C63.26-2015 Section 5.2.4.2

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Combined Uncertainty of absolute Level Measurement (K=2) < 1 dB

10MHz Channel Bandwidth

Channel / Frequency (MHz)	Power Setting	Rate (Mbps)	RMS (dBm)				Total RMS (dBm)	Ant. Gain (dBi)	Total EIRP (dBm)	Limit Conducted/ EIRP (dBm)	Result
			Transmit Chains								
			TX1A	TX1B	TX2A	TX2B					
172 / 5860	Default	3	17.46	15.29	16.15	17.01	22.58	1.00	23.58	28.8 / 33	Pass
	Default	4.5	17.20	15.28	16.22	16.96	22.50	1.00	23.50	28.8 / 33	Pass
	Default	6	17.10	14.02	16.14	16.75	22.17	1.00	23.17	28.8 / 33	Pass
	Default	9	17.22	15.46	16.30	16.88	22.54	1.00	23.54	28.8 / 33	Pass
	Default	12	17.15	15.35	16.19	16.71	22.42	1.00	23.42	28.8 / 33	Pass
	Default	18	17.13	15.22	16.08	16.72	22.37	1.00	23.37	28.8 / 33	Pass
	Default	24	17.03	15.25	16.06	16.61	22.31	1.00	23.31	28.8 / 33	Pass
	Default	27	17.10	15.14	16.11	16.64	22.33	1.00	23.33	28.8 / 33	Pass
178 / 5890	Default	3	17.15	14.59	15.44	16.56	22.07	1.00	23.07	28.8 / 33	Pass
	Default	4.5	16.95	14.73	15.54	16.43	22.01	1.00	23.01	28.8 / 33	Pass
	Default	6	16.93	14.72	15.52	16.50	22.02	1.00	23.02	28.8 / 33	Pass
	Default	9	17.07	14.66	15.48	16.52	22.05	1.00	23.05	28.8 / 33	Pass
	Default	12	17.02	14.71	15.52	16.45	22.03	1.00	23.03	28.8 / 33	Pass
	Default	18	17.02	14.63	15.45	16.41	21.99	1.00	22.99	28.8 / 33	Pass
	Default	24	16.91	14.71	15.48	16.40	21.98	1.00	22.98	28.8 / 33	Pass
	Default	27	16.94	14.64	15.42	16.40	21.96	1.00	22.96	28.8 / 33	Pass
180 / 5900	-2	3	4.44	2.32	3.10	4.04	9.57	1.00	10.57	10.0 / 23	Pass
	-3	4.5	4.19	2.19	2.83	3.69	9.31	1.00	10.31	10.0 / 23	Pass
	-2	6	4.66	2.12	3.51	4.19	9.74	1.00	10.74	10.0 / 23	Pass
	-2	9	4.91	2.80	3.40	4.13	9.90	1.00	10.90	10.0 / 23	Pass
	-3	12	4.00	1.99	2.63	3.39	9.09	1.00	10.09	10.0 / 23	Pass
	-3	18	3.88	1.64	2.39	3.29	8.91	1.00	9.91	10.0 / 23	Pass
	-2	24	3.48	1.32	2.30	3.10	8.64	1.00	9.64	10.0 / 23	Pass
	-2	27	3.73	1.30	2.18	0.03	8.04	1.00	9.04	10.0 / 23	Pass
182 / 5910	-2	3	4.56	2.53	0.26	4.29	9.24	1.00	10.24	10.0 / 23	Pass
	-3	4.5	4.10	1.90	2.57	3.51	9.12	1.00	10.12	10.0 / 23	Pass
	-3	6	3.57	1.32	2.34	3.26	8.73	1.00	9.73	10.0 / 23	Pass
	-2	9	5.05	3.02	2.77	3.94	9.81	1.00	10.81	10.0 / 23	Pass
	-2	12	5.05	2.84	3.40	4.24	9.99	1.00	10.99	10.0 / 23	Pass
	-2	18	4.94	2.54	3.16	4.20	9.83	1.00	10.83	10.0 / 23	Pass
	-2	24	4.45	2.20	2.73	3.77	9.40	1.00	10.40	10.0 / 23	Pass
	-2	27	4.60	3.20	3.86	3.99	9.96	1.00	10.96	10.0 / 23	Pass
184 / 5920	Default	3	16.86	14.46	15.01	16.44	21.82	1.00	22.82	28.8 / 33	Pass
	Default	4.5	16.92	14.50	15.13	16.47	21.88	1.00	22.88	28.8 / 33	Pass
	Default	6	16.90	14.51	15.13	16.51	21.89	1.00	22.89	28.8 / 33	Pass
	Default	9	17.00	14.78	15.34	16.56	22.03	1.00	23.03	28.8 / 33	Pass
	Default	12	16.89	14.64	15.27	16.34	21.89	1.00	22.89	28.8 / 33	Pass
	Default	18	16.98	14.53	15.18	16.35	21.88	1.00	22.88	28.8 / 33	Pass
	Default	24	16.84	14.45	15.20	16.25	21.80	1.00	22.80	28.8 / 33	Pass
	Default	27	16.78	14.50	15.11	16.37	21.81	1.00	22.81	28.8 / 33	Pass

20MHz Channel Bandwidth

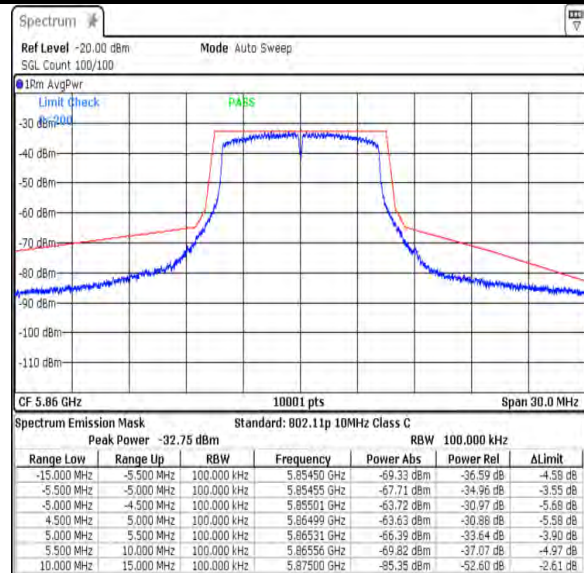
Channel / Frequency (MHz)	Power Setting	Rate (Mbps)	RMS (dBm)				Total RMS (dBm)	Ant. Gain (dBi)	Total EIRP (dBm)	Limit Conducted/ EIRP (dBm)	Result
			Transmit Chains								
			TX1A	TX1B	TX2A	TX2B					
175 / 5875	-2	6	4.377	2.92	3.51	4.053	9.77	1.00	10.77	10.0 / 23	Pass
	-1	9	4.293	2.874	3.824	3.758	9.74	1.00	10.74	10.0 / 23	Pass
	-2	12	4.419	2.93	3.469	3.826	9.72	1.00	10.72	10.0 / 23	Pass
	-2	18	3.408	2.03	2.504	2.653	8.70	1.00	9.70	10.0 / 23	Pass
	-1	24	4.113	2.292	2.99	3.352	9.26	1.00	10.26	10.0 / 23	Pass
	-1	36	2.636	0.618	1.31	1.43	7.58	1.00	8.58	10.0 / 23	Pass
	-1	48	3.546	1.786	2.448	2.737	8.70	1.00	9.70	10.0 / 23	Pass
	-1	54	4.208	2.416	3.076	3.571	9.39	1.00	10.39	10.0 / 23	Pass
181 / 5905	-2	6	4.193	2.012	1.993	3.183	8.96	1.00	9.96	10.0 / 23	Pass
	-2	9	4.015	1.912	1.79	3.045	8.81	1.00	9.81	10.0 / 23	Pass
	-1	12	4.767	2.815	3.451	4.395	9.94	1.00	10.94	10.0 / 23	Pass
	-1	18	2.23	-0.474	0.763	1.171	7.05	1.00	8.05	10.0 / 23	Pass
	-1	24	4.651	1.903	3.266	4.064	9.61	1.00	10.61	10.0 / 23	Pass
	-1	36	4.134	1.389	2.455	3.375	8.98	1.00	9.98	10.0 / 23	Pass
	-1	48	4.085	1.34	2.279	3.194	8.86	1.00	9.86	10.0 / 23	Pass
	-1	54	3.41	0.581	1.822	2.844	8.31	1.00	9.31	10.0 / 23	Pass

Transmit Spectrum Mask

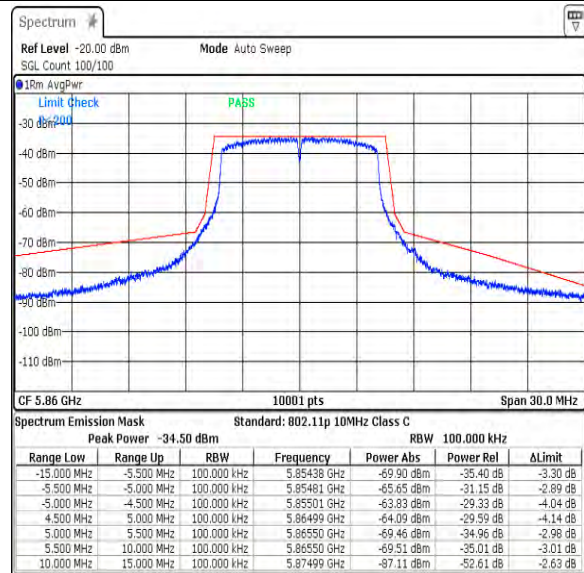
Measurement Method: ASTM E2213-03 "Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems—5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications" Section 8.10.2

5860MHz 10MHz 3Mbps

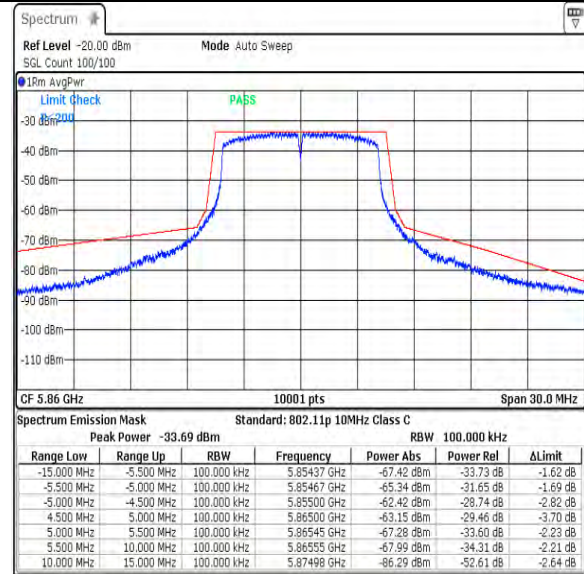
Ch172 Tx1



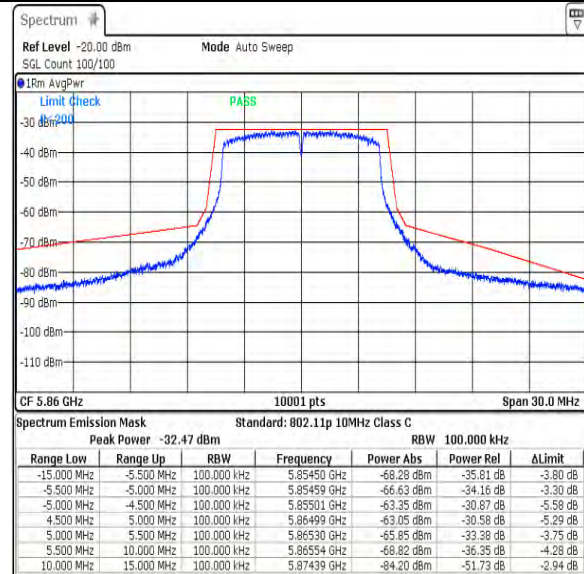
Ch172 Tx2



Ch172 Tx3

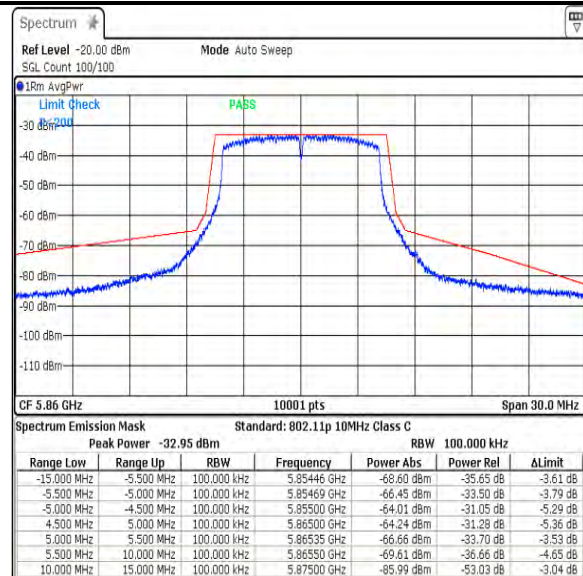


Ch172 Tx4

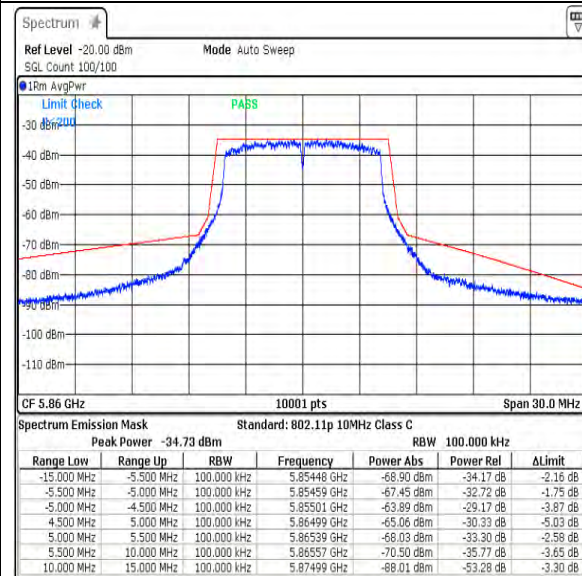


5860MHz 10MHz 27Mbps

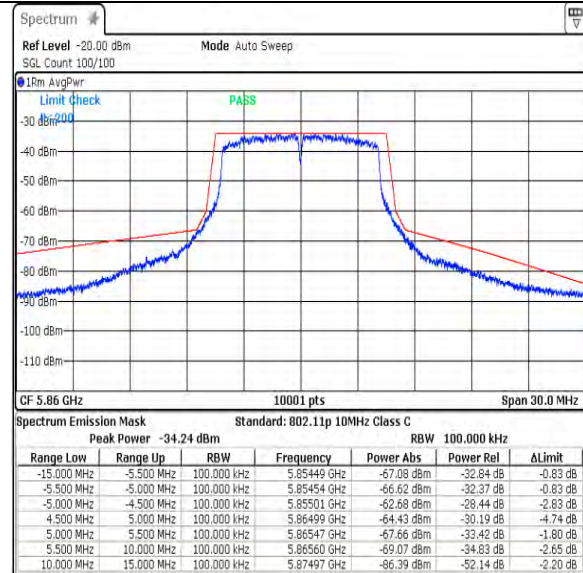
Ch172 Tx1



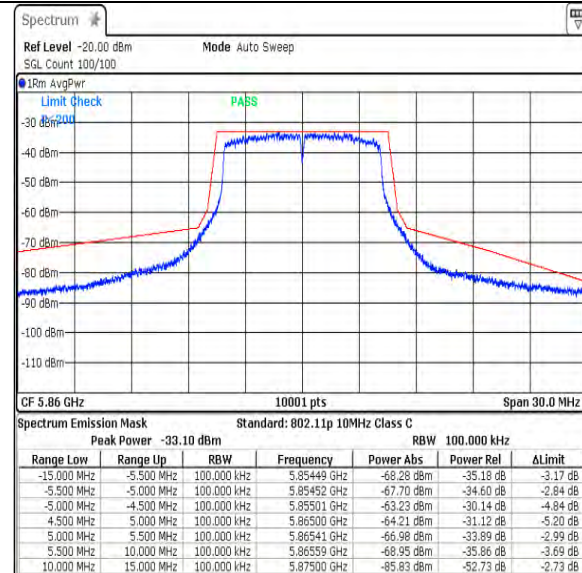
Ch172 Tx2



Ch172 Tx3



Ch172 Tx4

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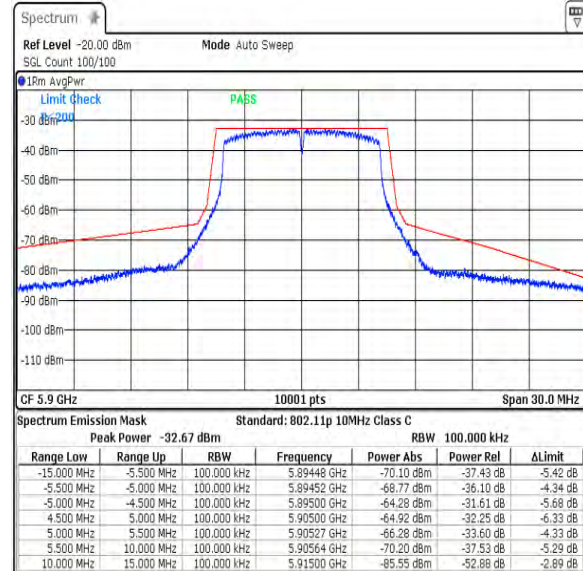
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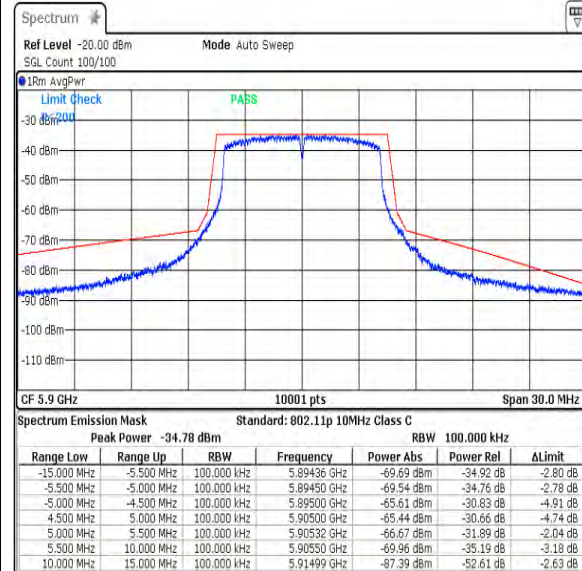


5900MHz 10MHz 3Mbps

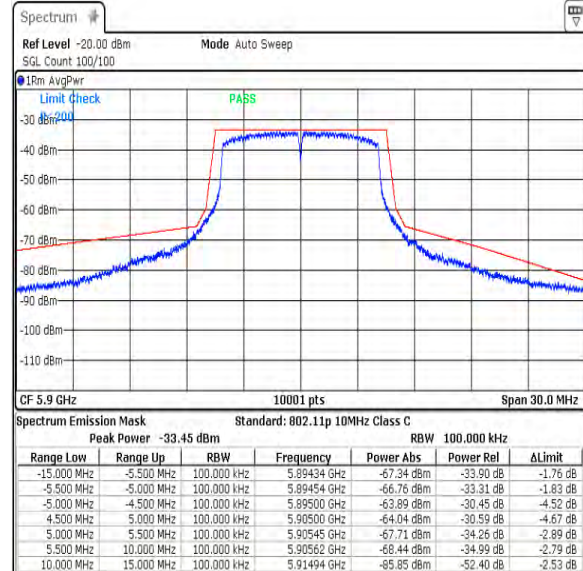
Ch180 Tx1



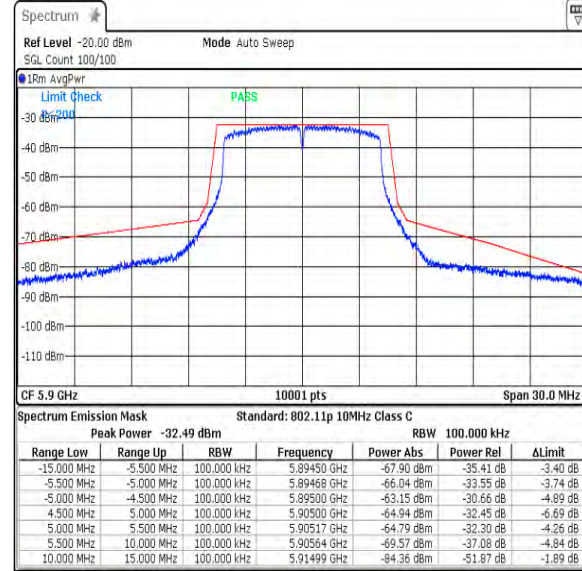
Ch180 Tx2



Ch180 Tx3



Ch180 Tx4

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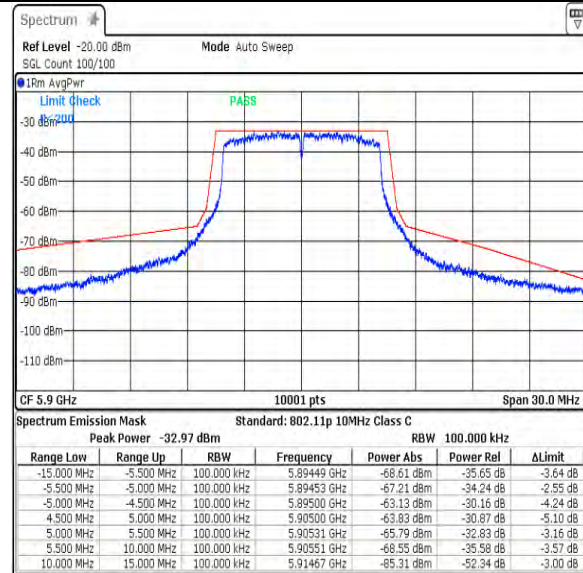
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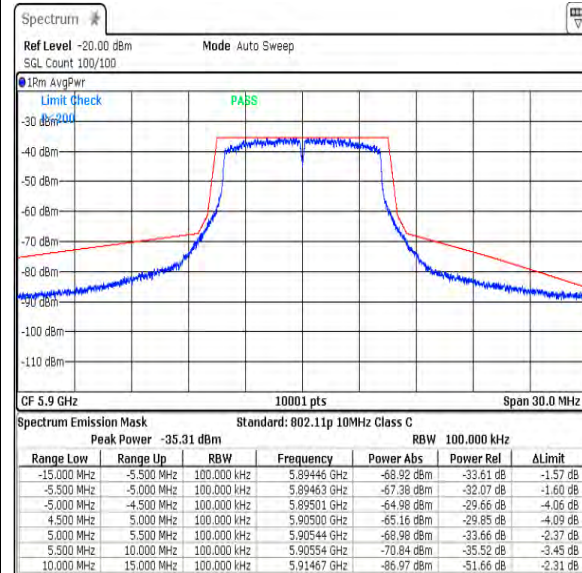


5900MHz 10MHz 27Mbps

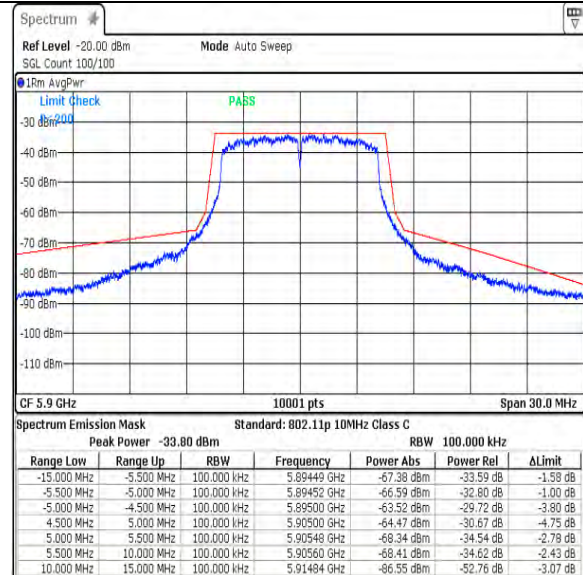
Ch180 Tx1



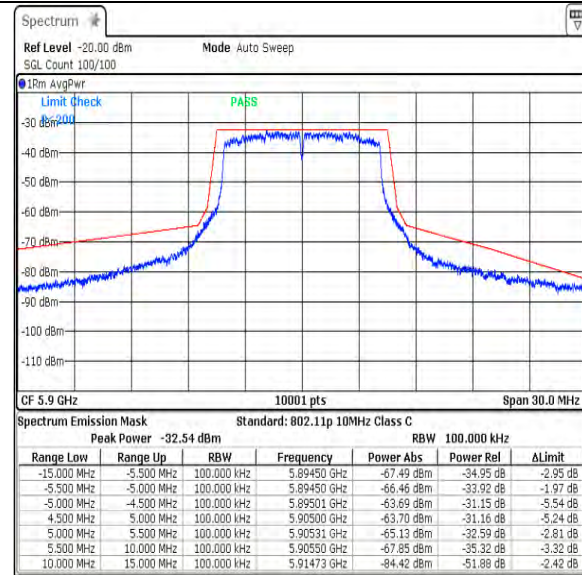
Ch180 Tx2



Ch180 Tx3



Ch180 Tx4

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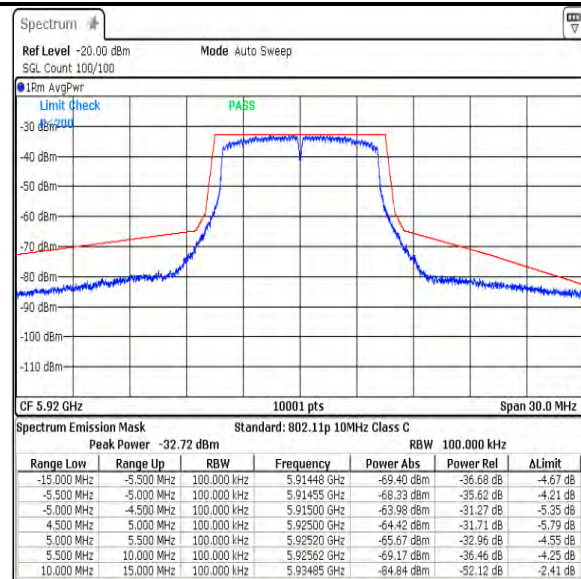
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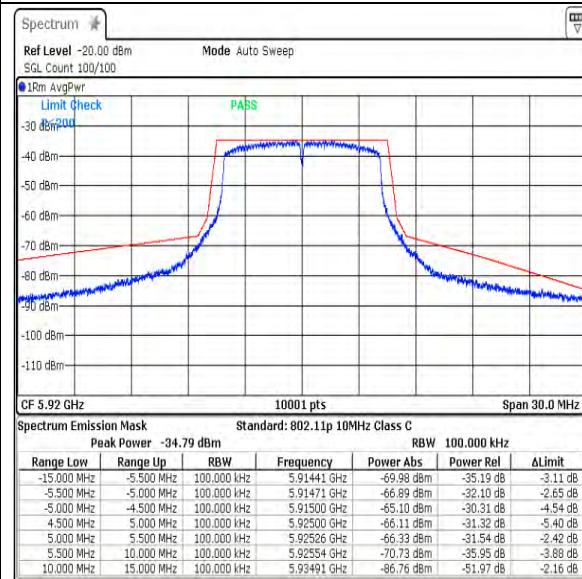


5920MHz 10MHz 3Mbps

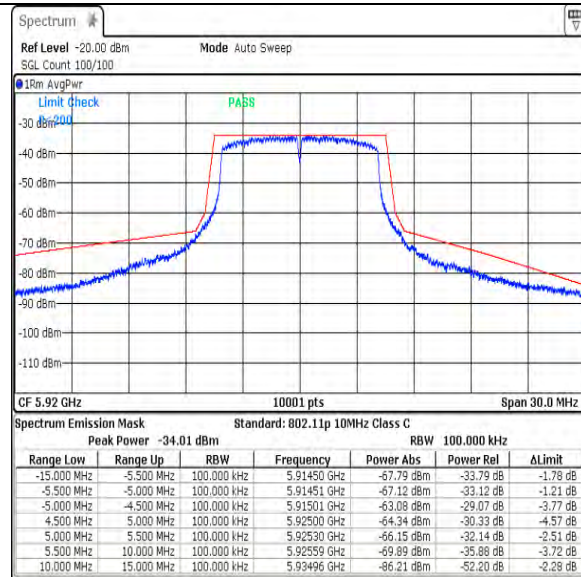
Ch184 Tx1



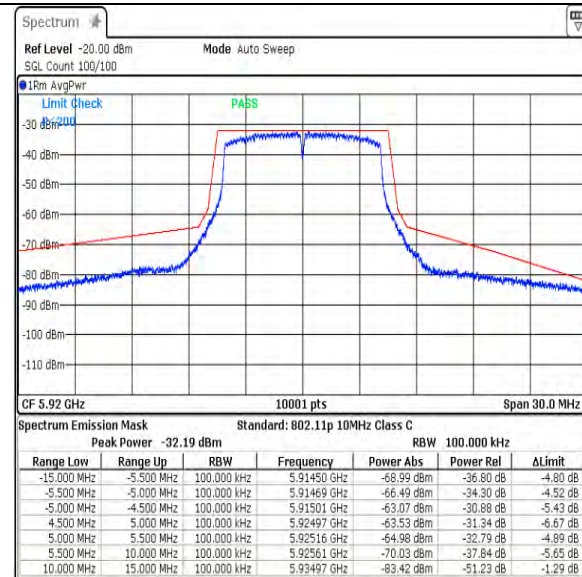
Ch184 Tx2



Ch184 Tx3



Ch184 Tx4

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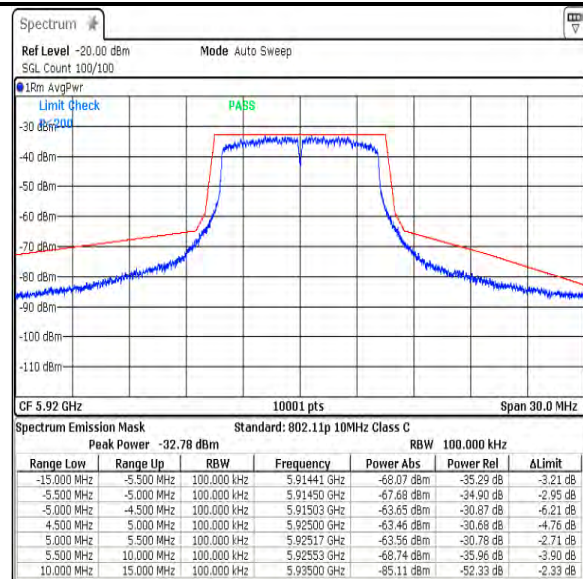
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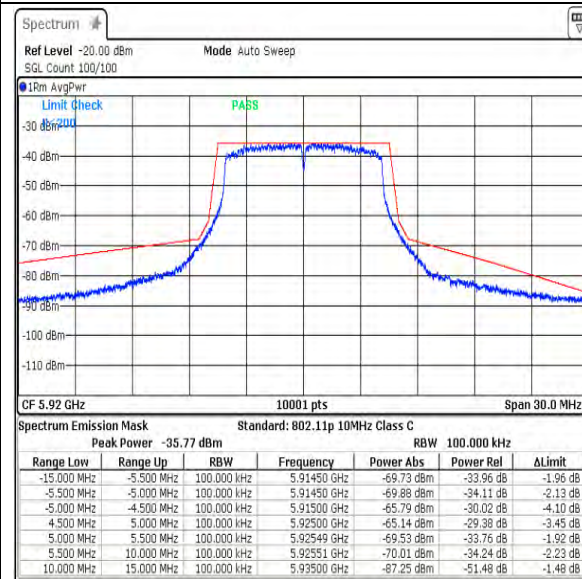


5920MHz 10MHz 27Mbps

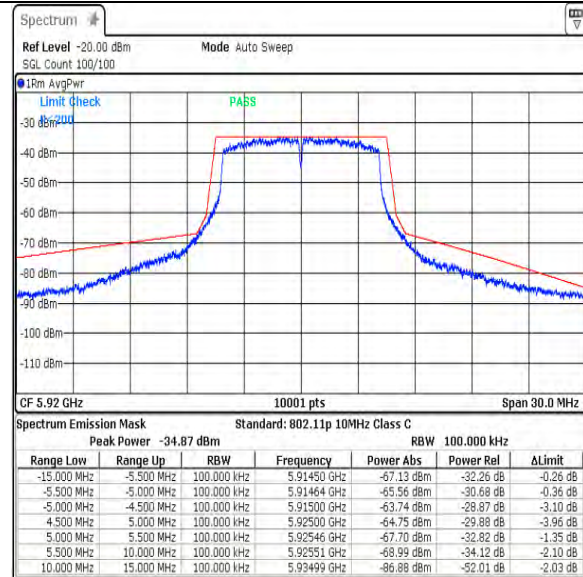
Ch184 Tx1



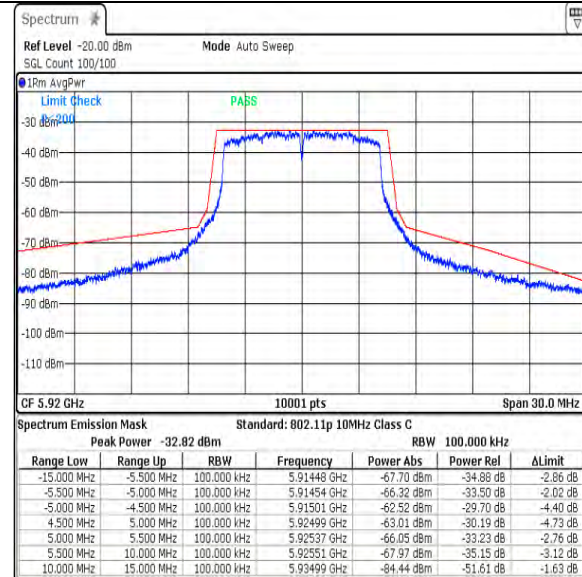
Ch184 Tx2



Ch184 Tx3



Ch184 Tx4

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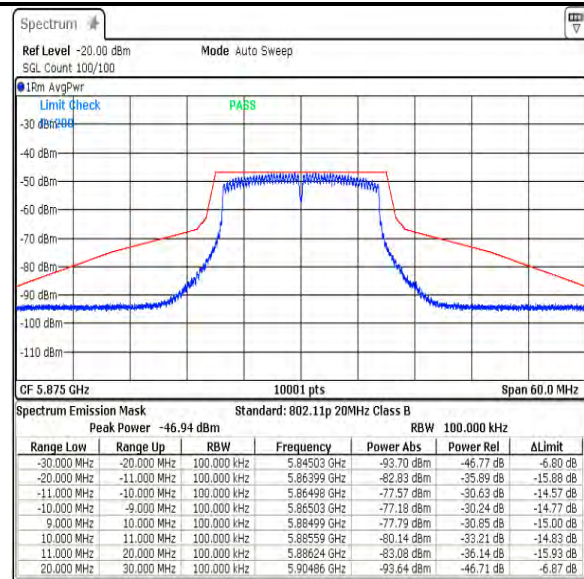
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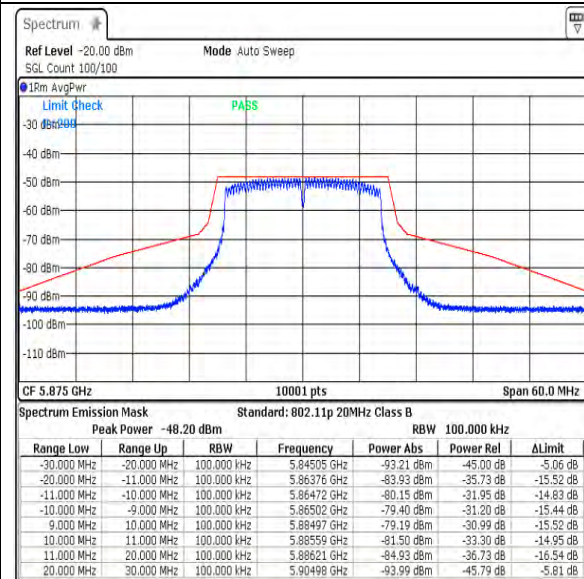


5875MHz 20MHz 6Mbps

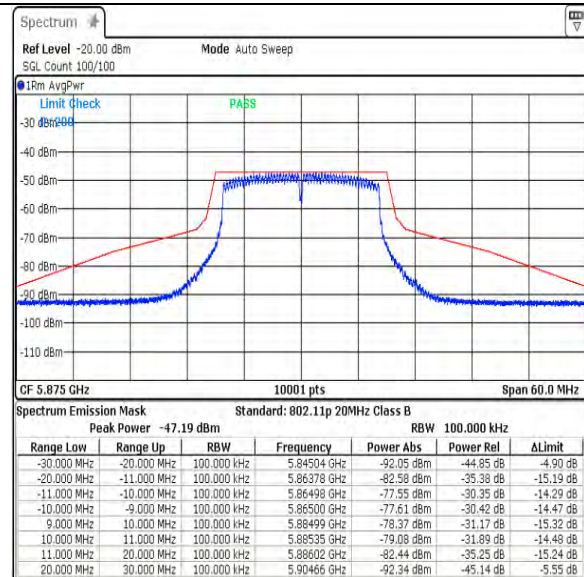
Ch175 Tx1



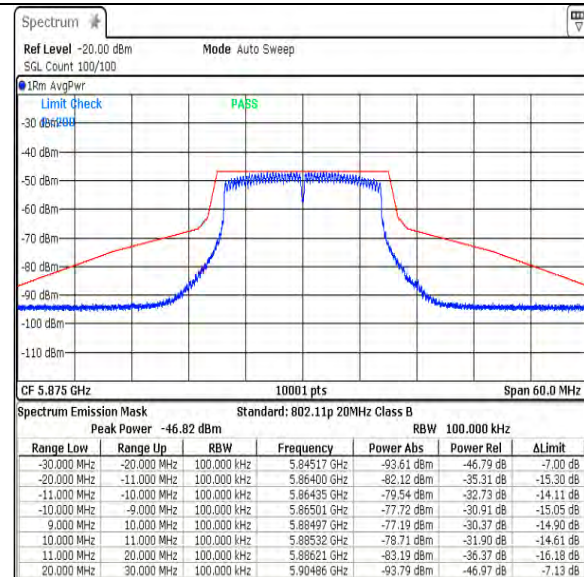
Ch175 Tx2



Ch175 Tx3



Ch175 Tx4

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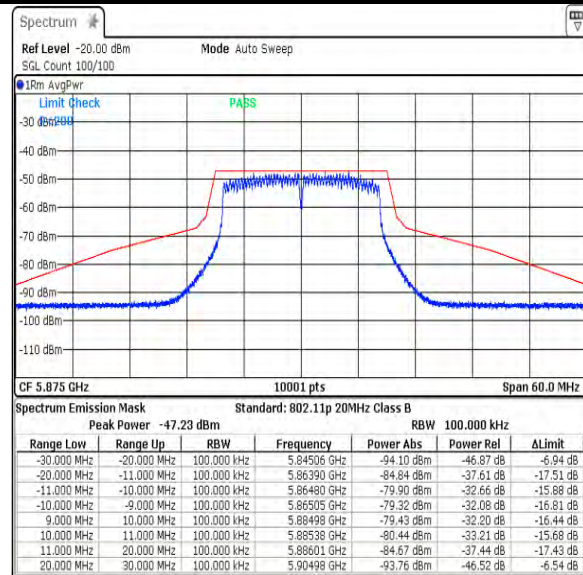
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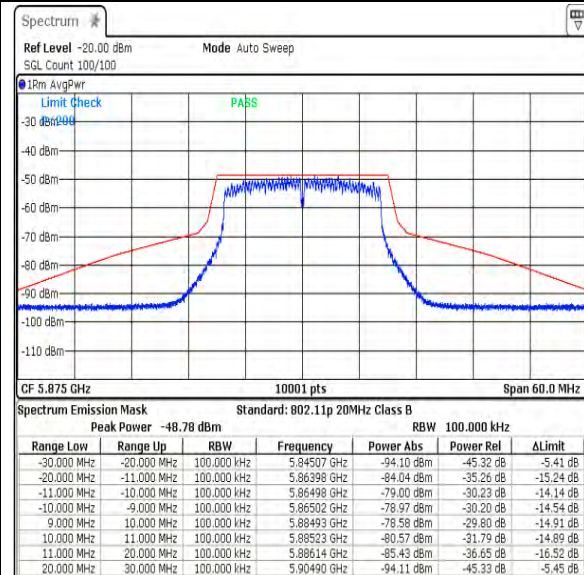


5875MHz 20MHz 54Mbps

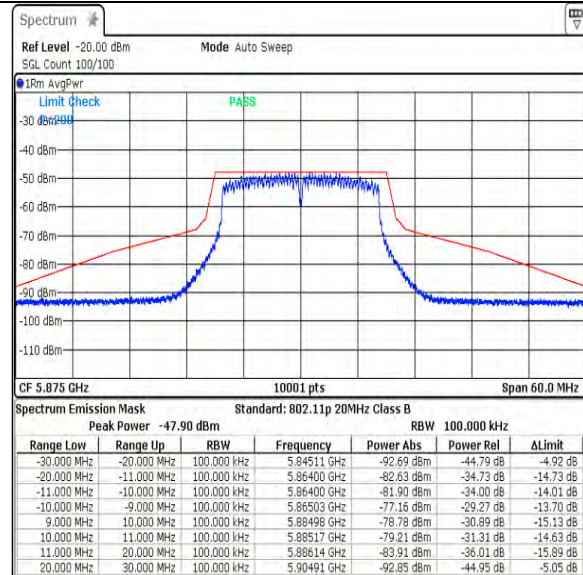
Ch175 Tx1



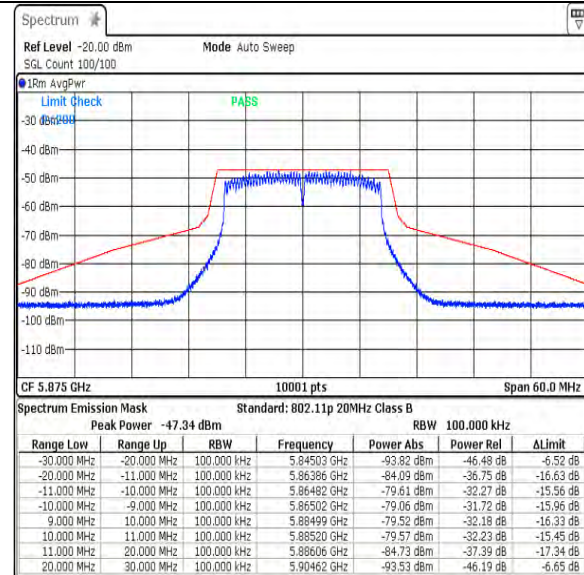
Ch175 Tx2



Ch175 Tx3



Ch175 Tx4

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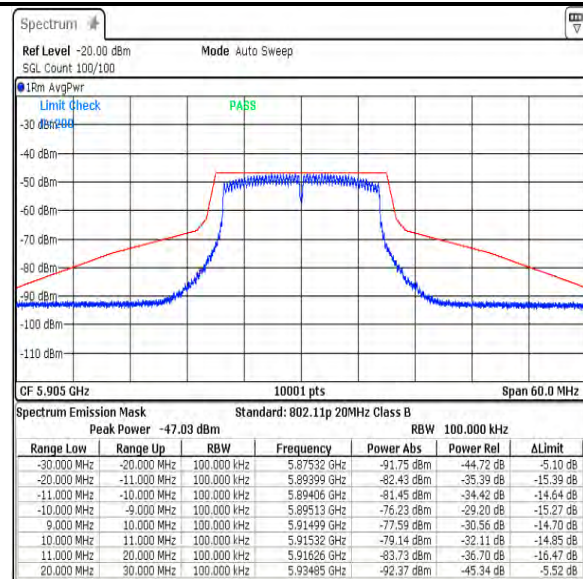
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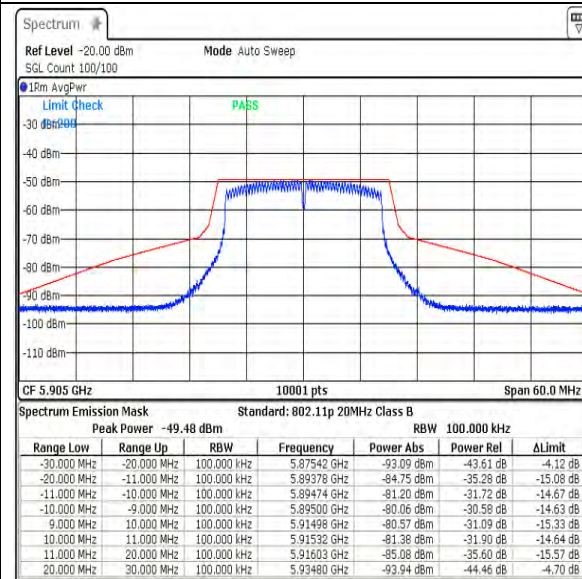
page 36 of 63

5905MHz 20MHz 6Mbps

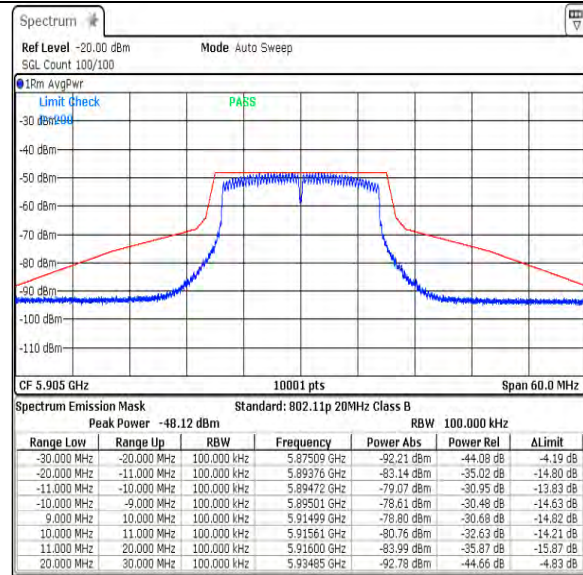
Ch181 Tx1



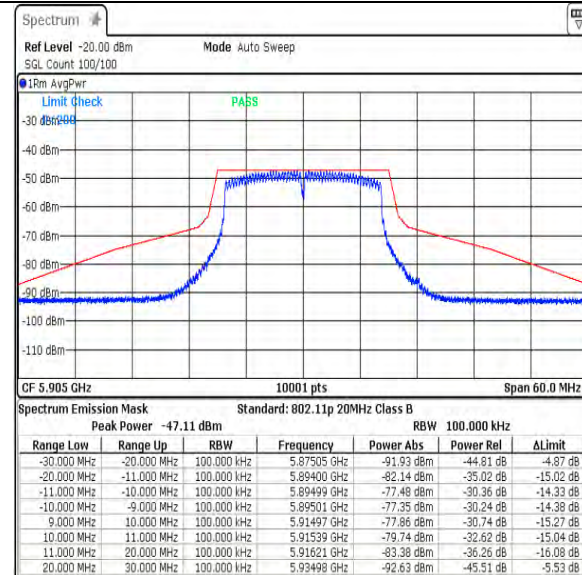
Ch181 Tx2



Ch181 Tx3



Ch181 Tx4

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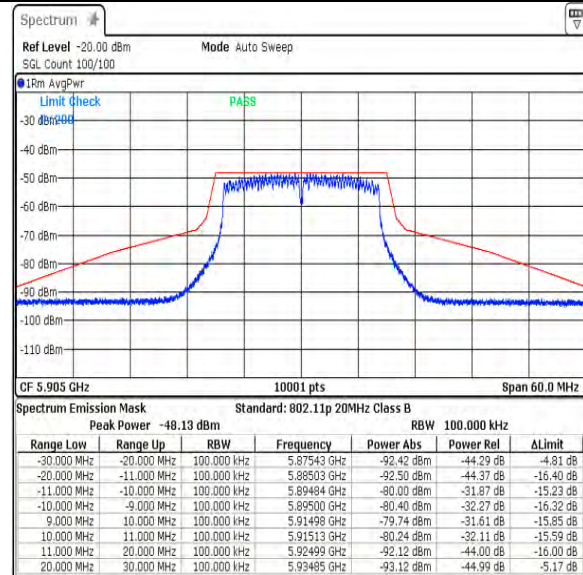
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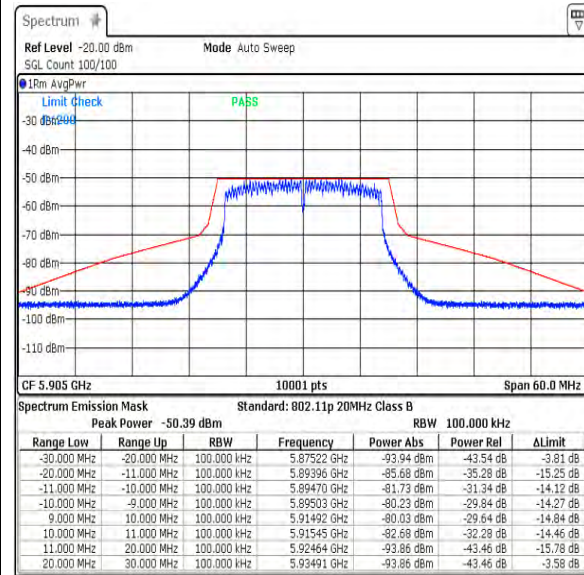


5905MHz 20MHz 54Mbps

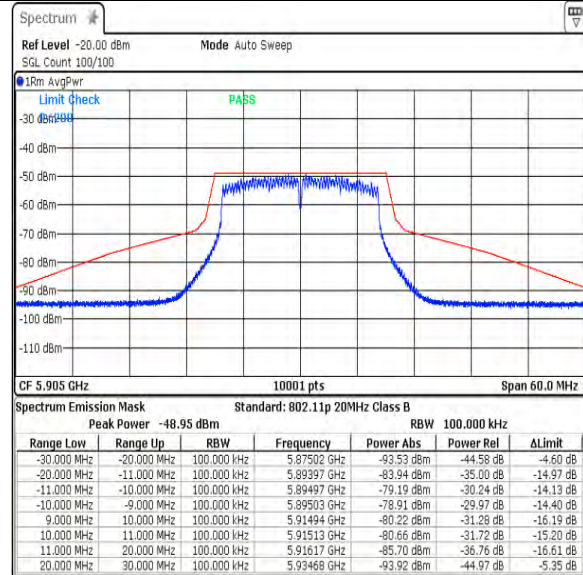
Ch181 Tx1



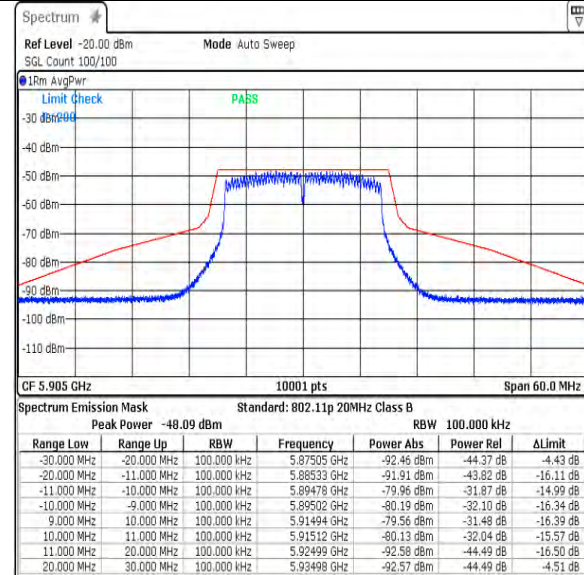
Ch181 Tx2



Ch181 Tx3



Ch181 Tx4

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Occupied Bandwidth 99%

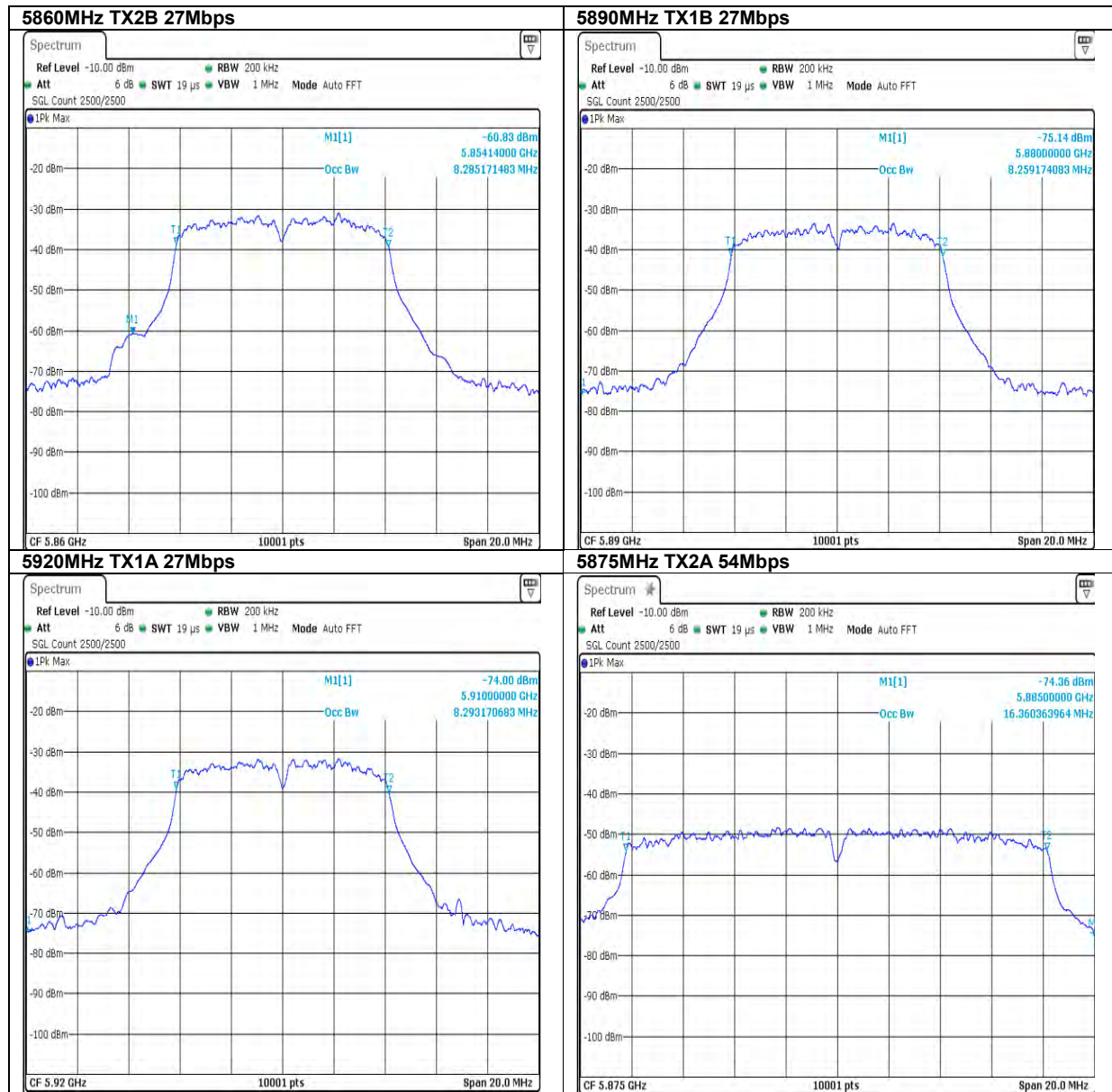
Measurement Method: ANSI C63.26-2015 Section 5.4.4

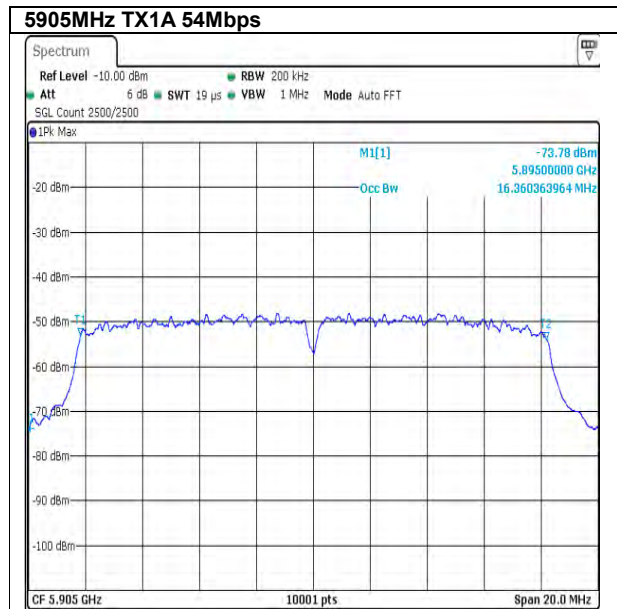
10MHz

Frequency (MHz)	Data Rate (Mbps)	TX1A (MHz)	TX1B (MHz)	TX2A (MHz)	TX2B (MHz)
5860 MHz	3	8.1651	8.1812	8.1792	8.1592
	27	8.2711	8.2632	8.2552	8.2852
5890 MHz	3	8.1592	8.1812	8.1972	8.1592
	27	8.2511	8.2592	8.2532	8.2492
5920 MHz	3	8.1632	8.1932	8.1892	8.1592
	27	8.2932	8.2732	8.2292	8.2772

20MHz

Frequency (MHz)	Data Rate (Mbps)	TX1A (MHz)	TX1B (MHz)	TX2A (MHz)	TX2B (MHz)
5875 MHz	6	16.2544	16.2404	16.2424	16.2764
	54	16.3564	16.3524	16.3604	16.3484
5905 MHz	6	16.2444	16.3484	16.2204	16.2664
	54	16.3604	16.3484	16.3384	16.3544



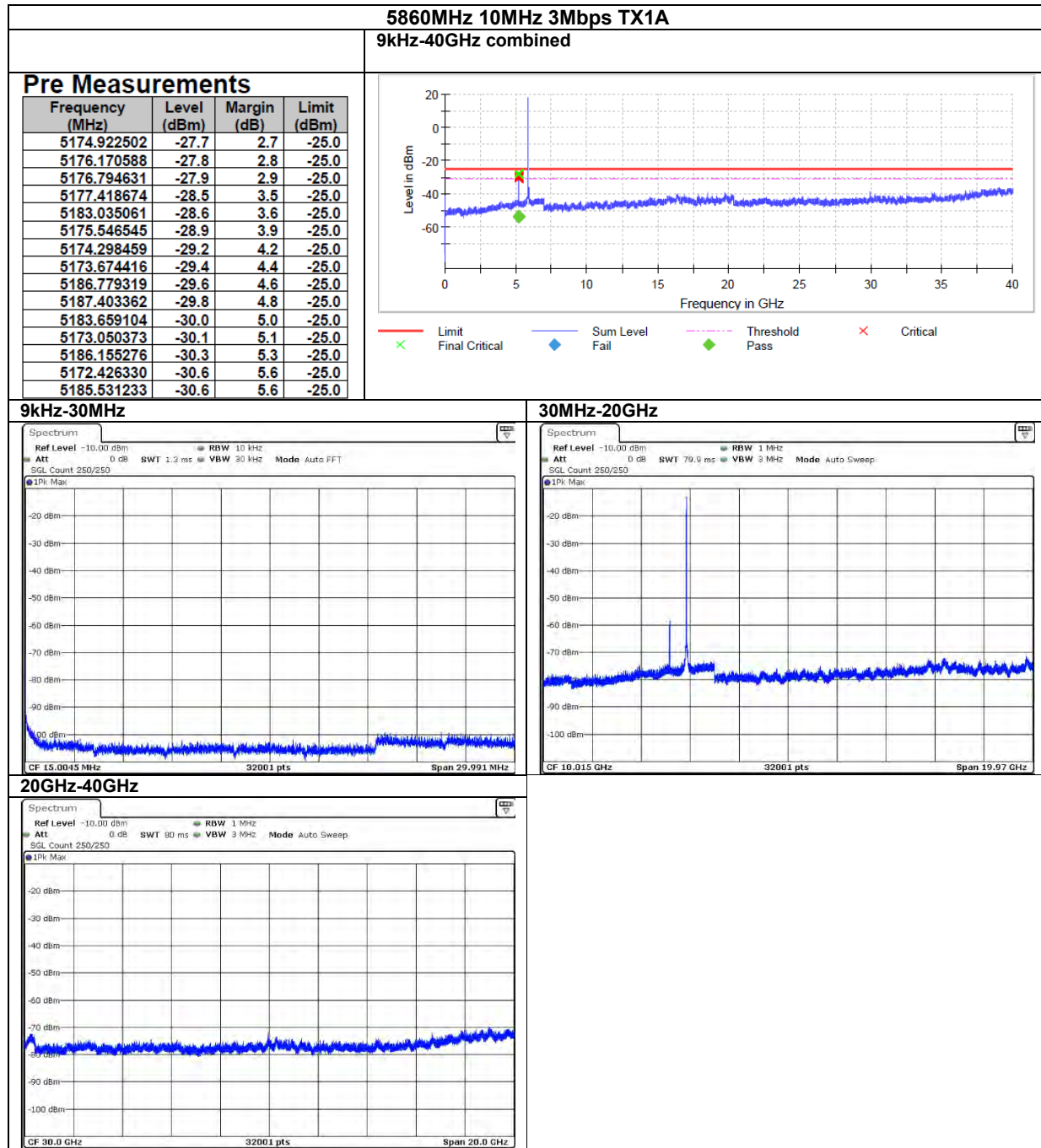


Conducted Spurious Emissions

Measurement Method: ANSI C63.26-2015 Section 5.7

Mode	Result
5860MHz 10MHz 3Mbps TX1A, TX1B, TX2A, TX2B	Pass
5890MHz 10MHz 3Mbps TX1A, TX1B, TX2A, TX2B	Pass
5920MHz 10MHz 9Mbps TX1A, TX1B, TX2A, TX2B	Pass
5875MHz 20MHz 6Mbps TX1A, TX1B, TX2A, TX2B	Pass
5905MHz 20MHz 12Mbps TX1A, TX1B, TX2A, TX2B	Pass

See plots on following pages

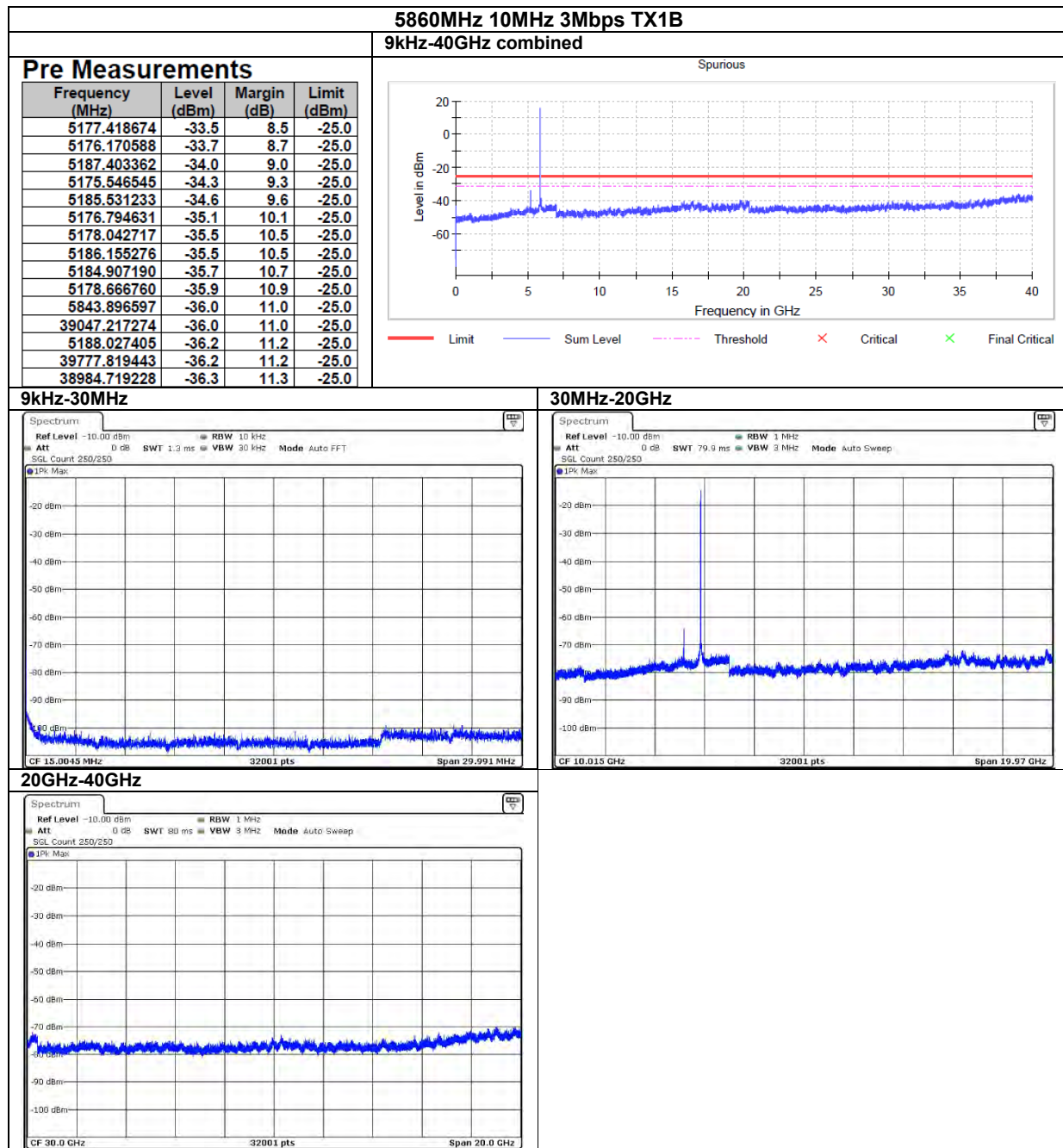


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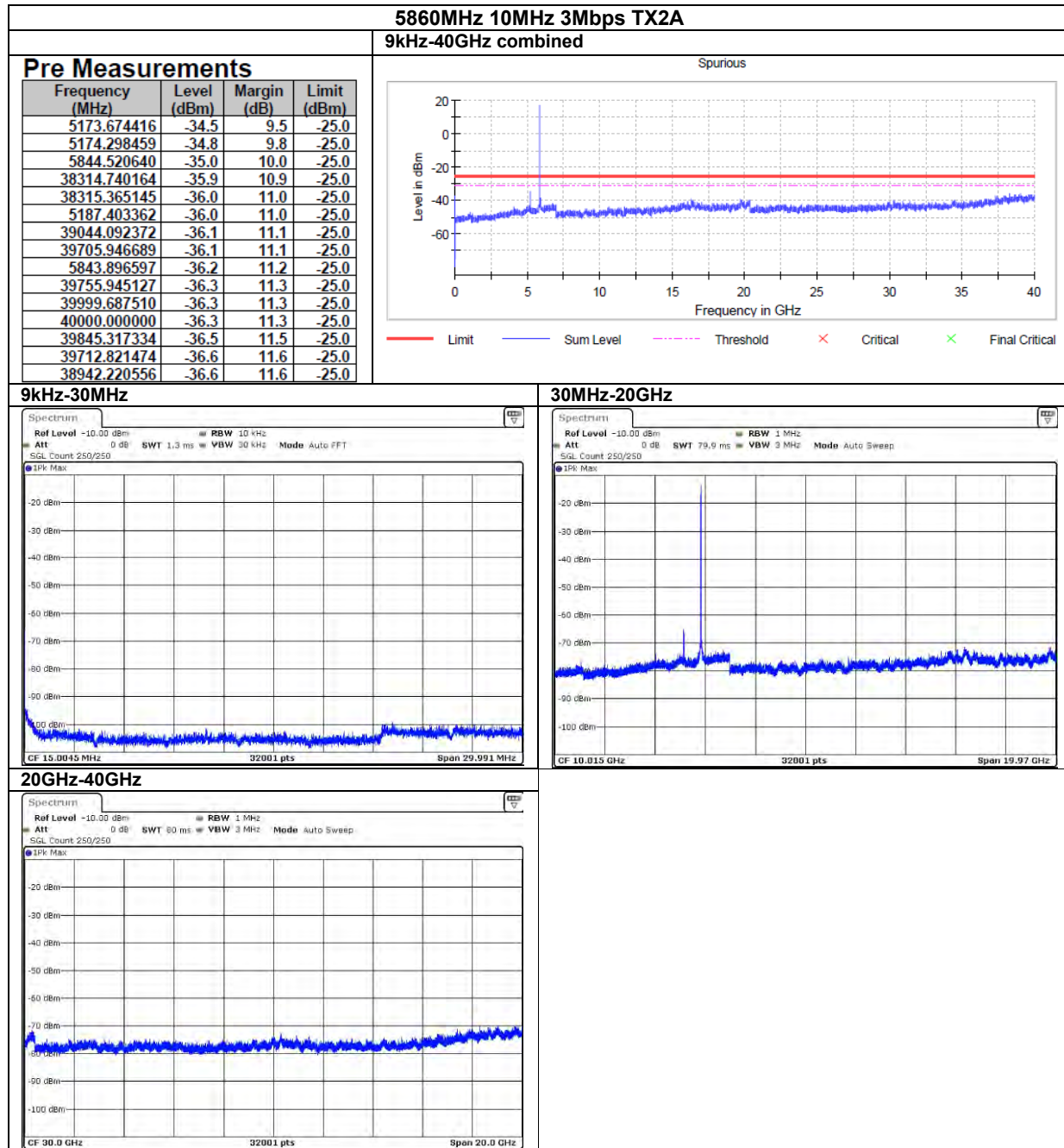


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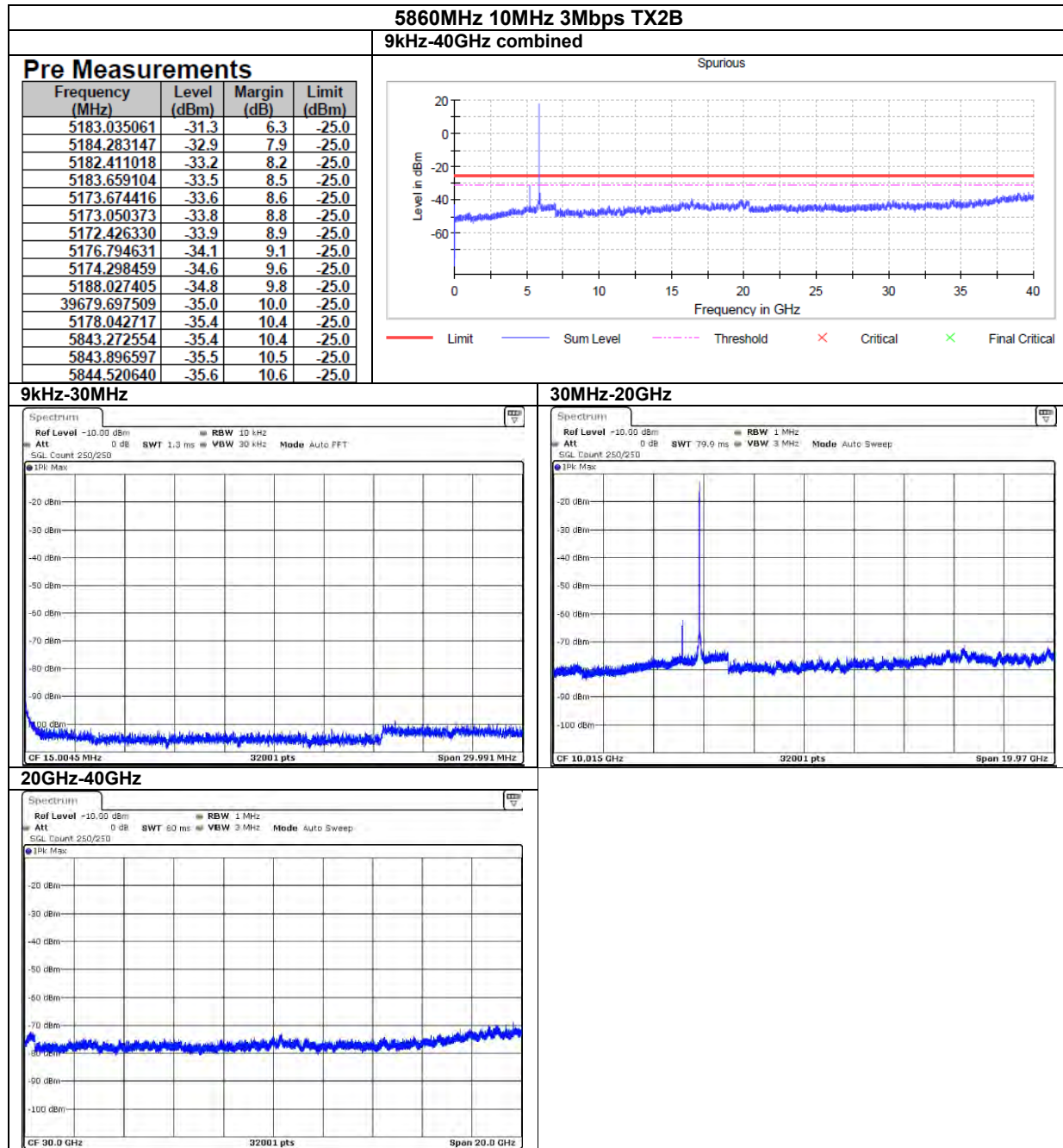




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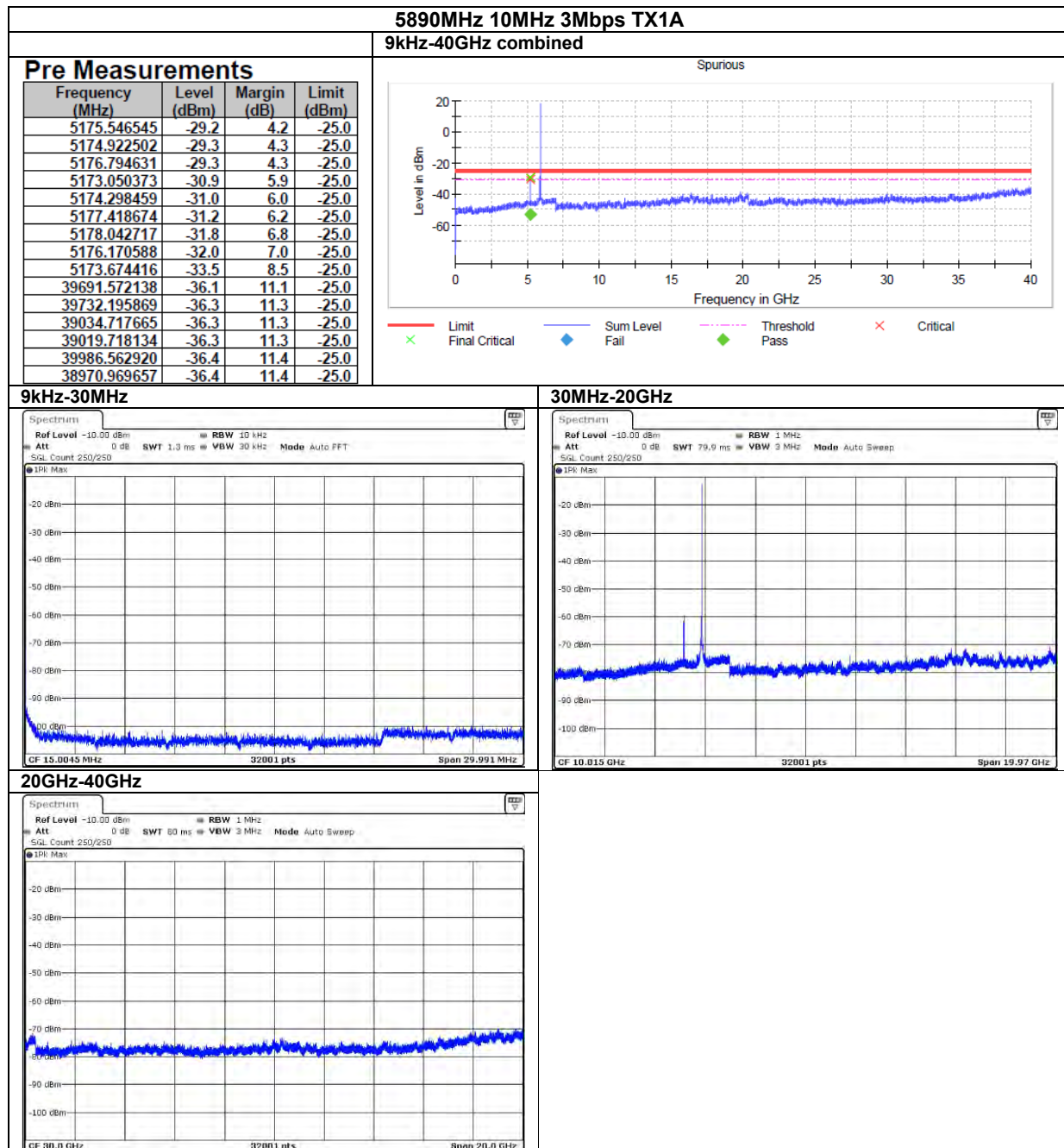




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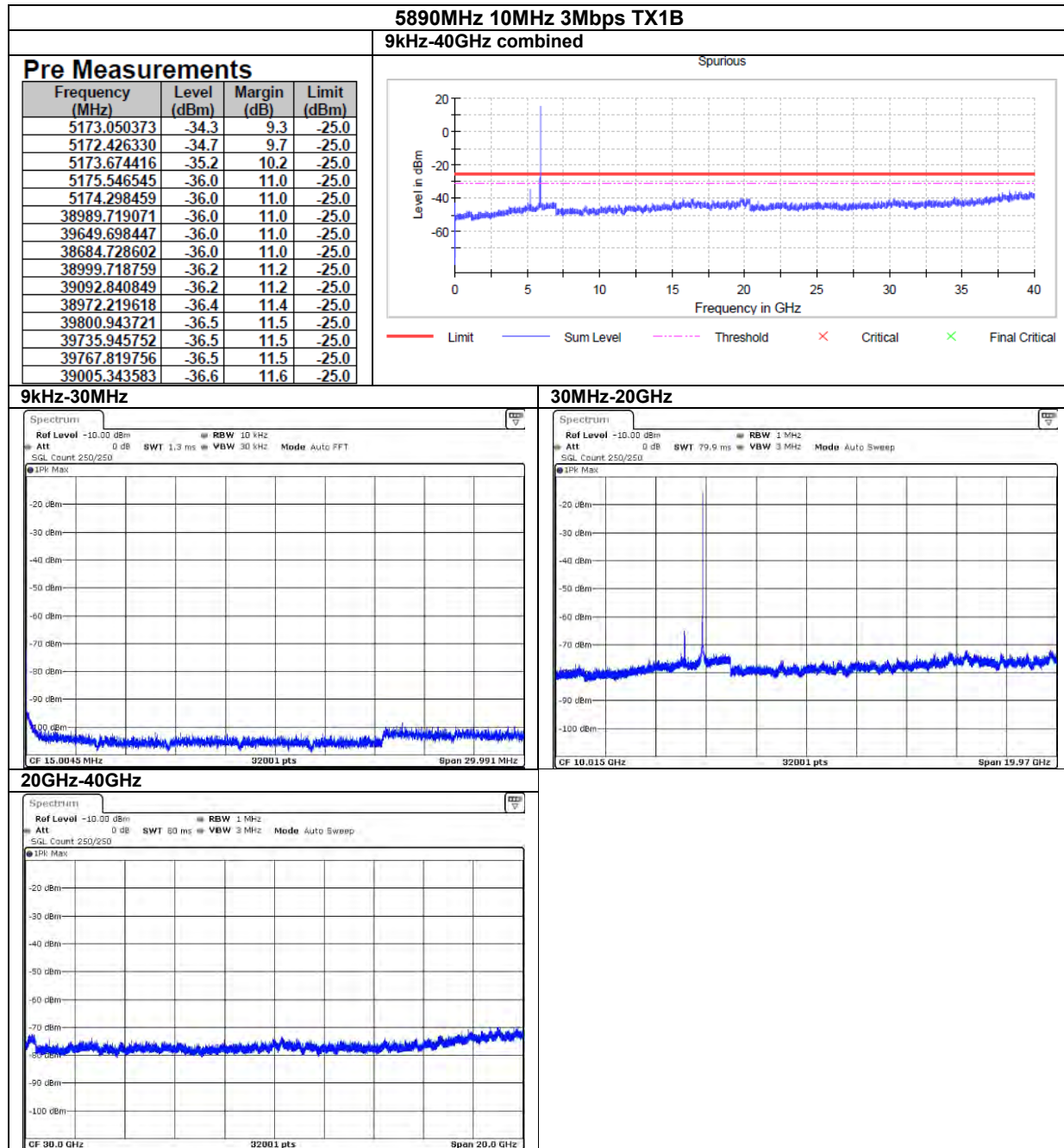
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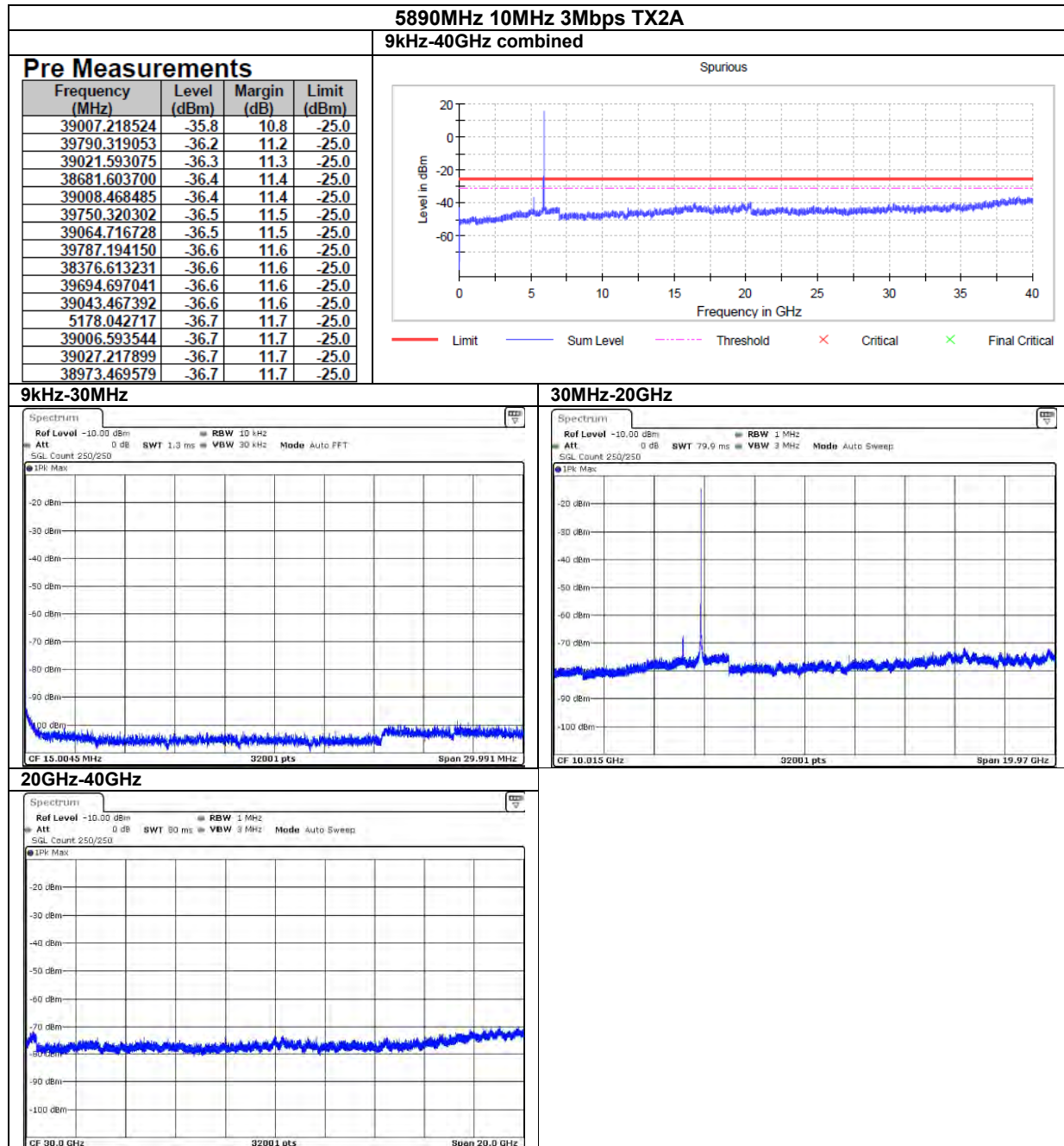


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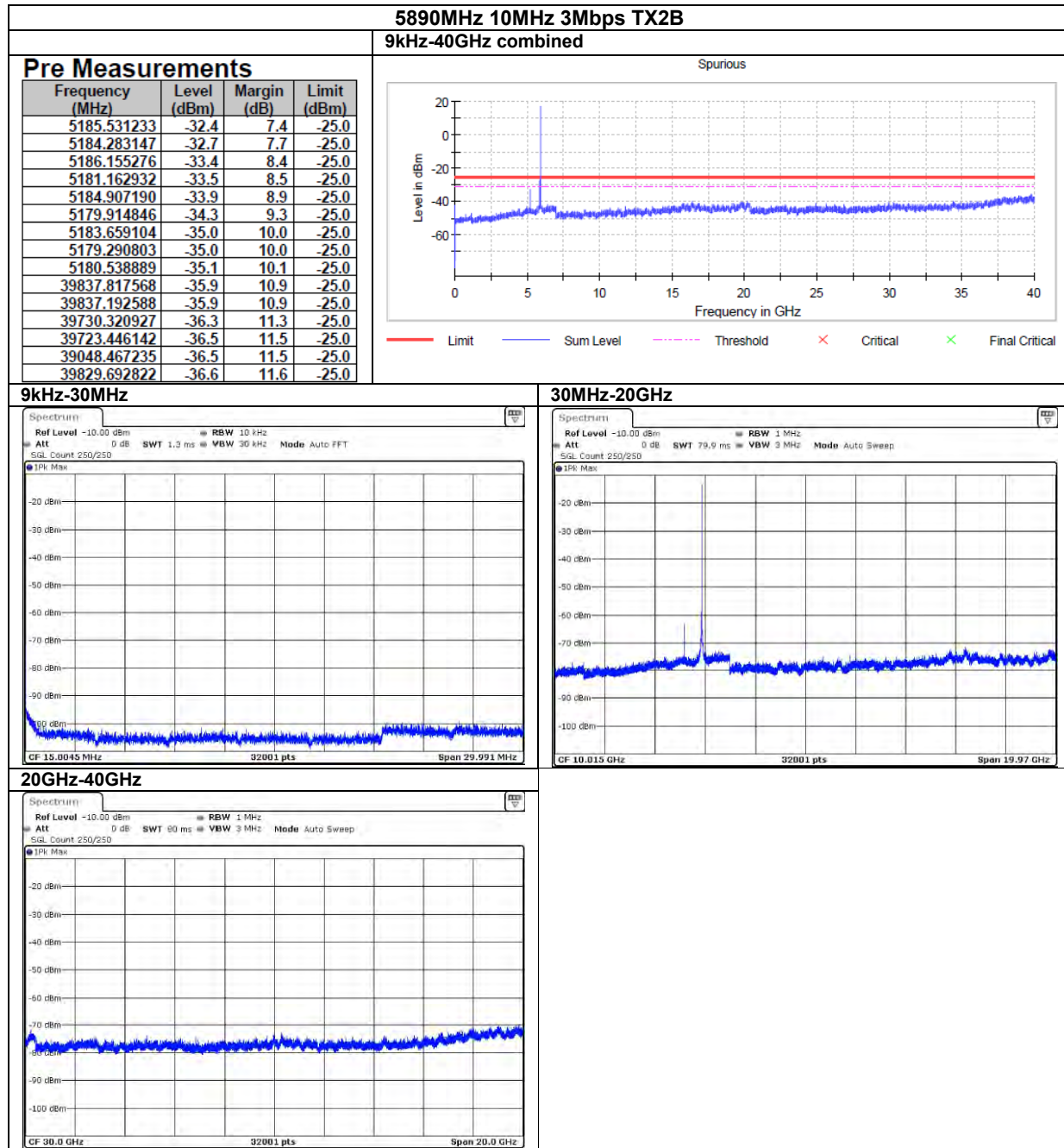


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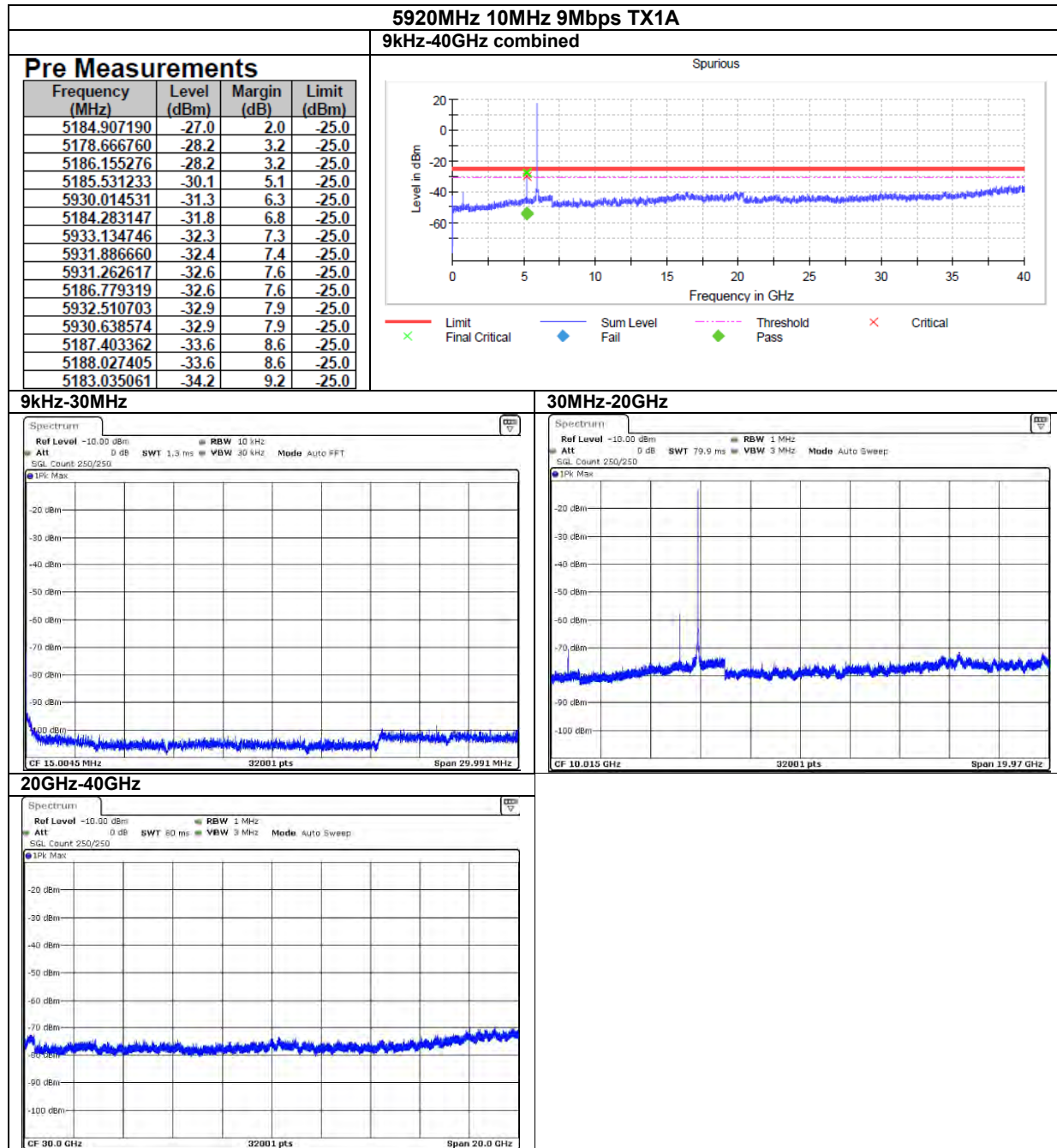




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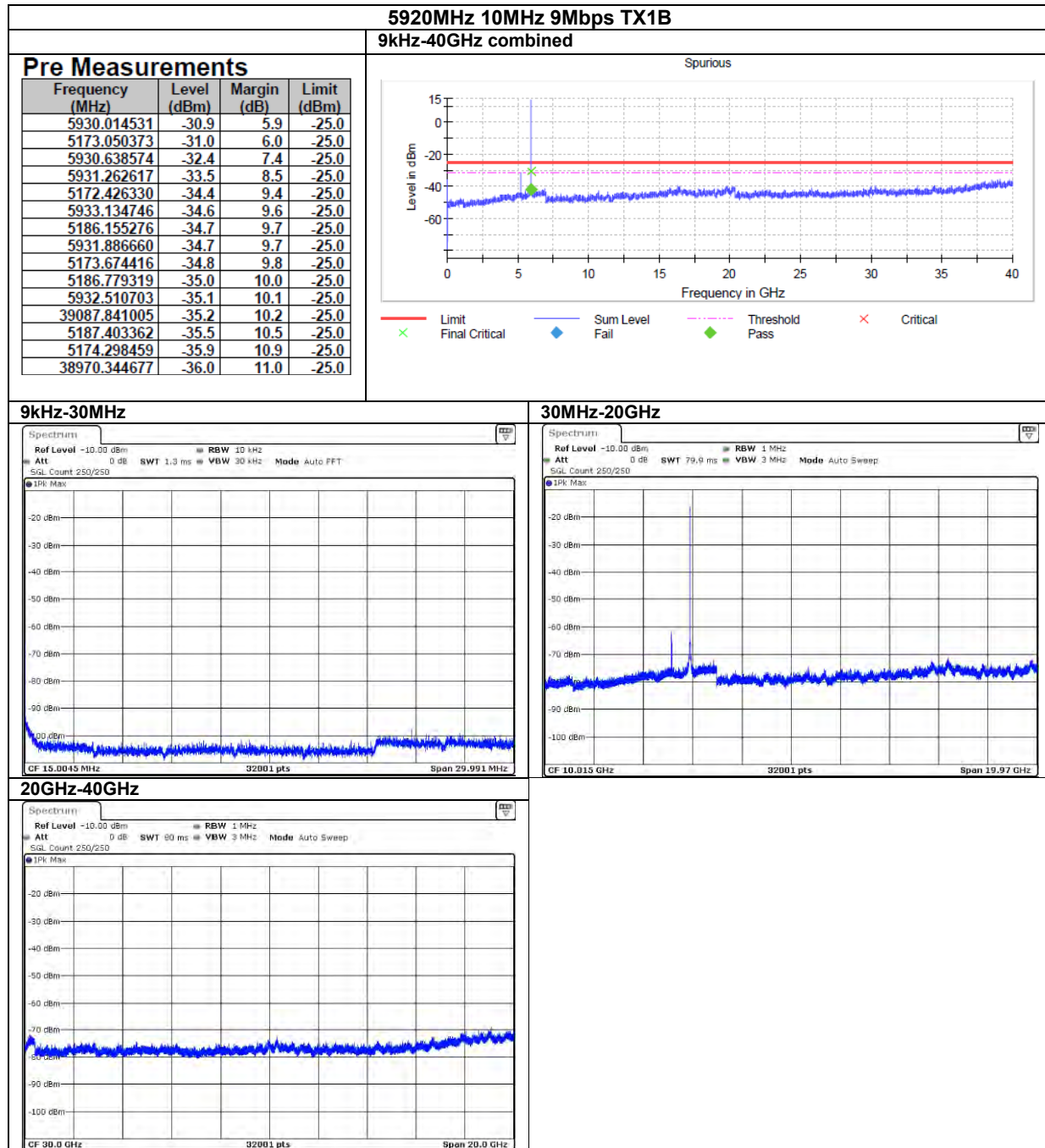


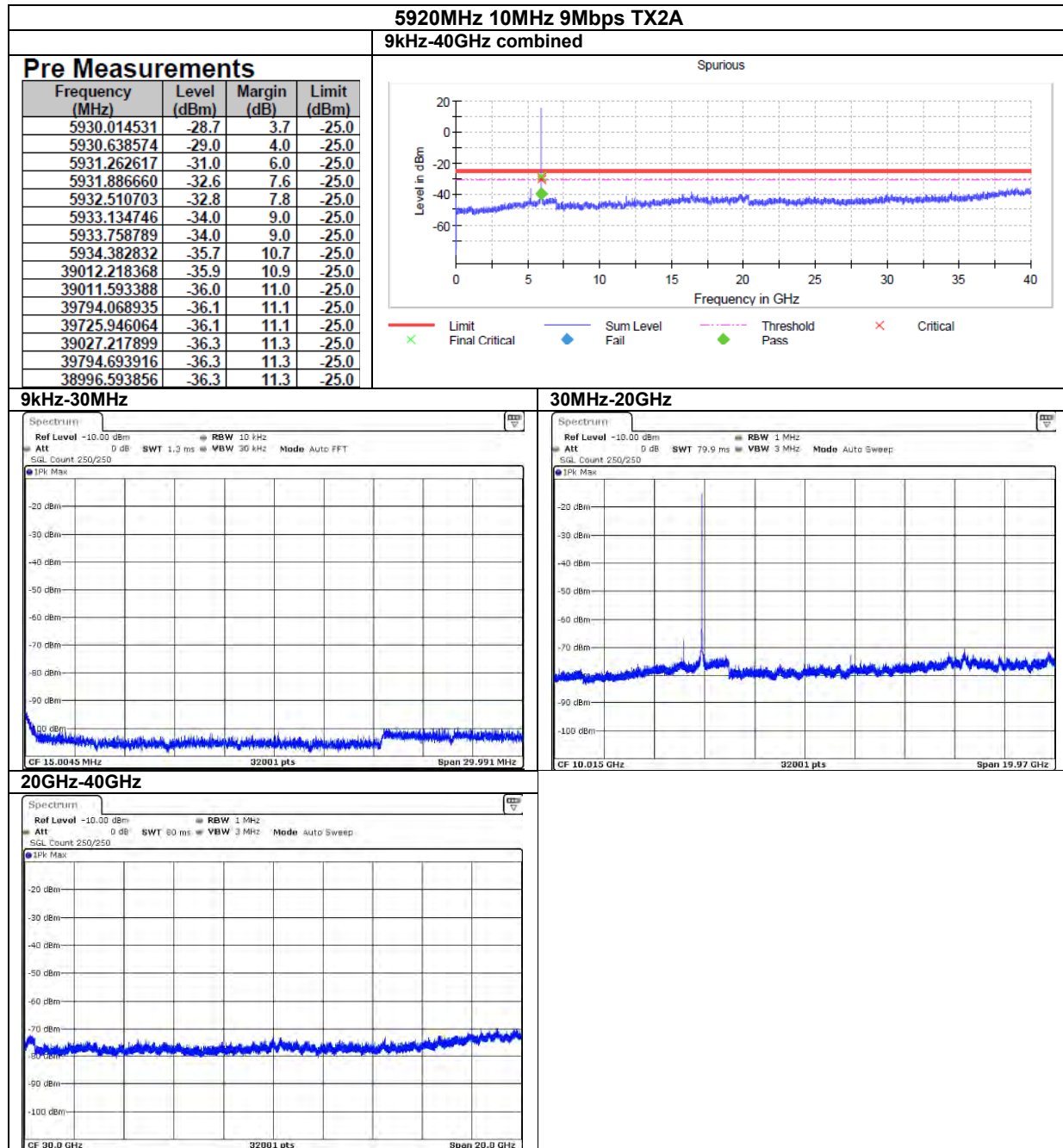


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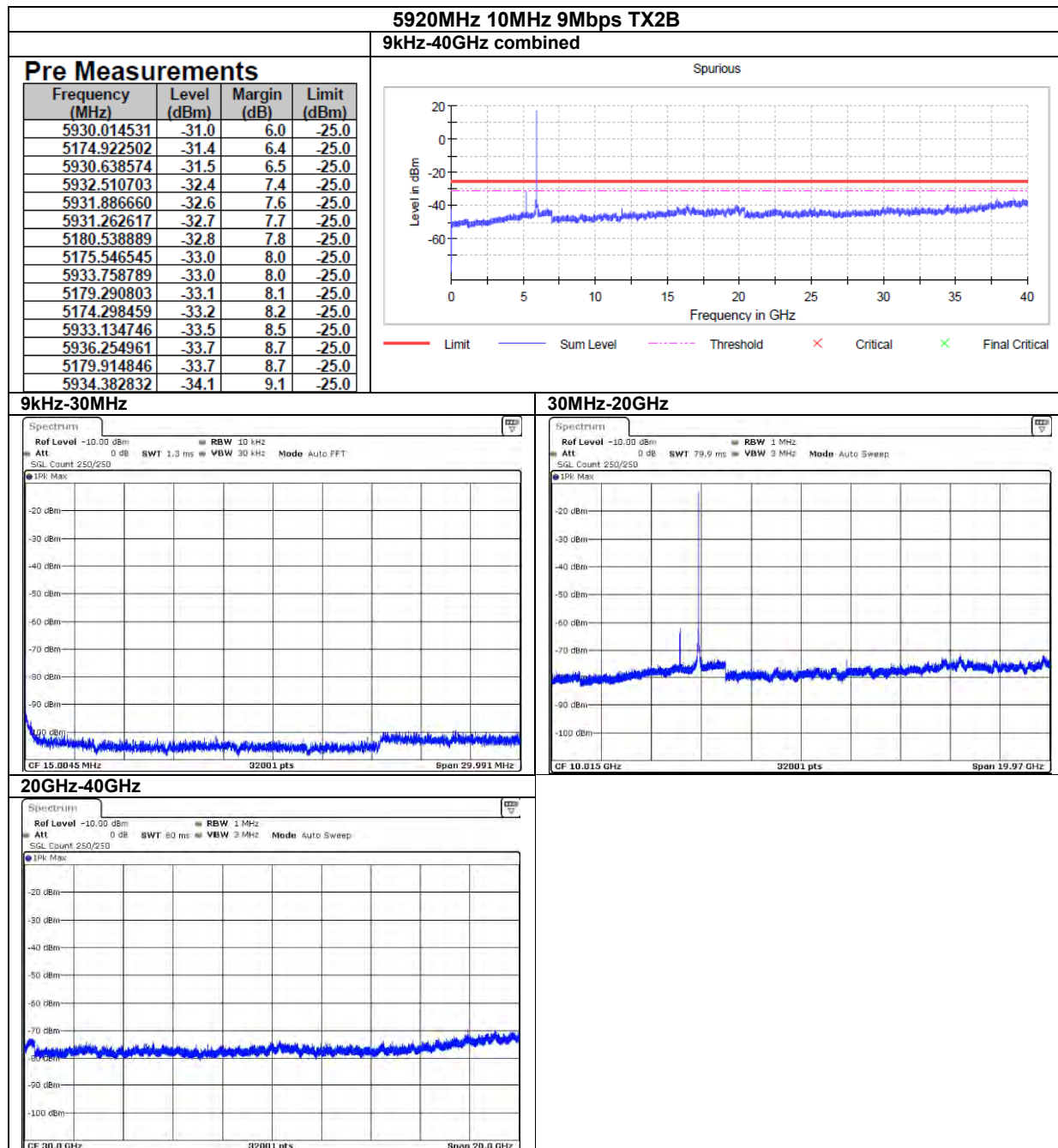


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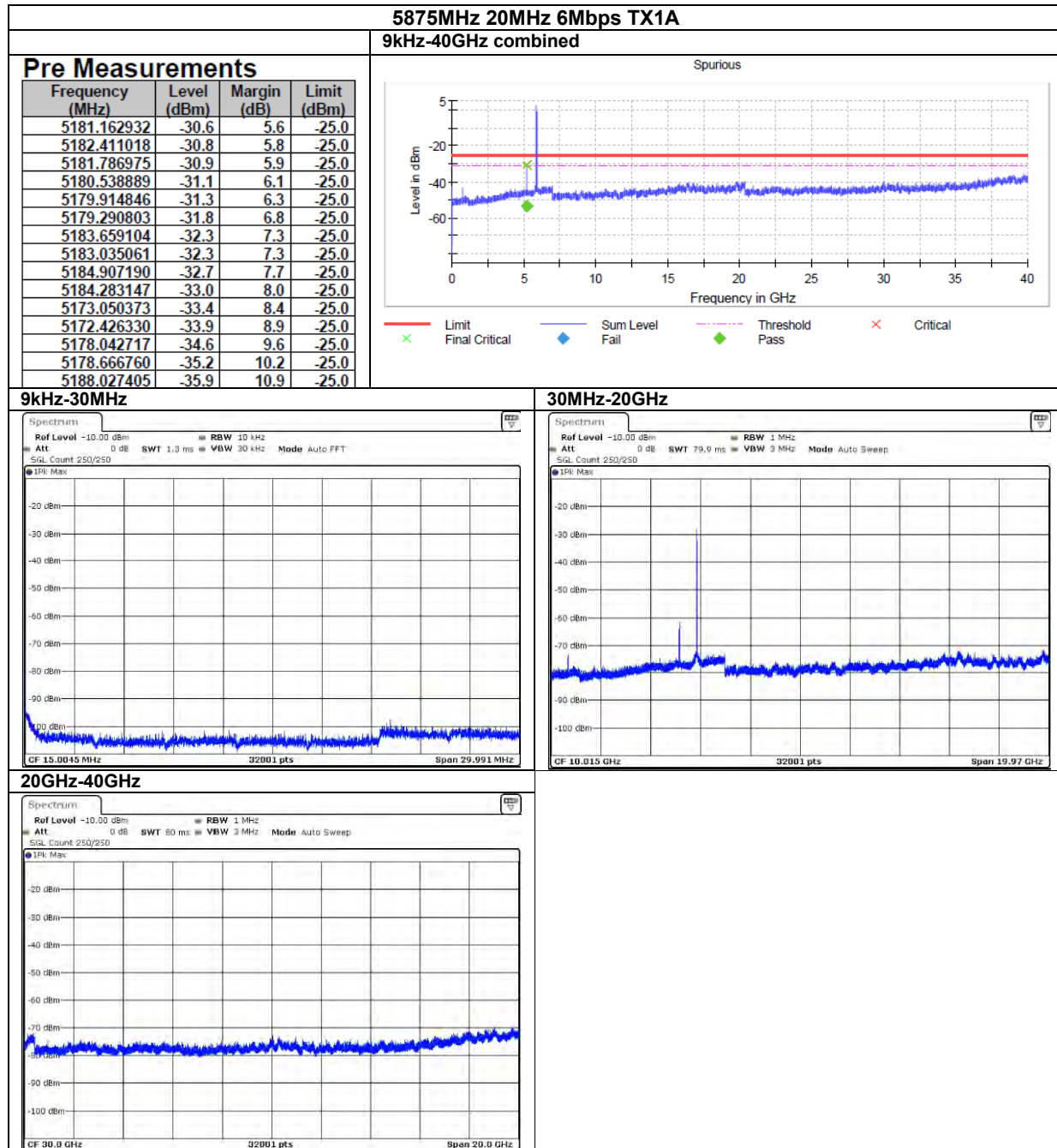




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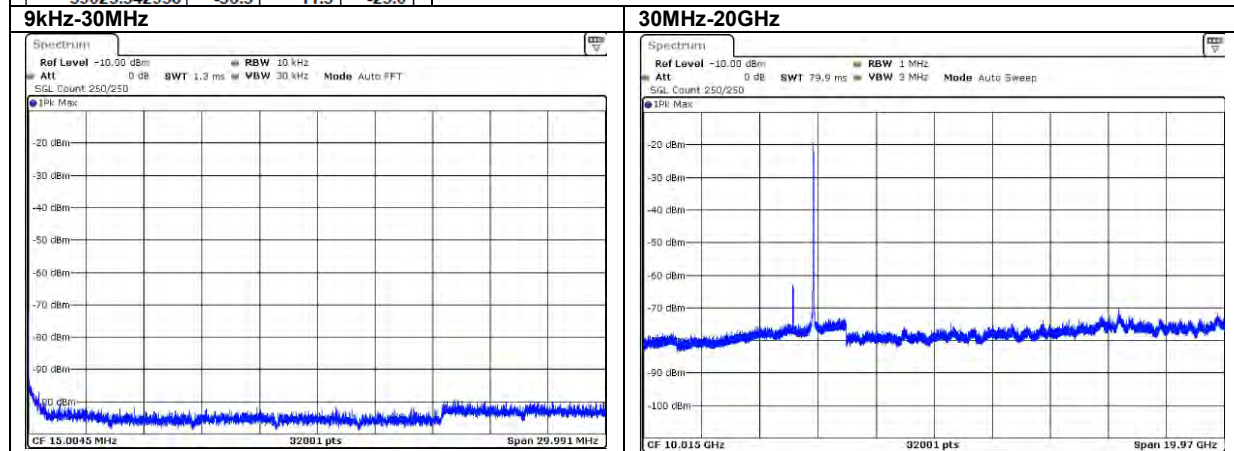
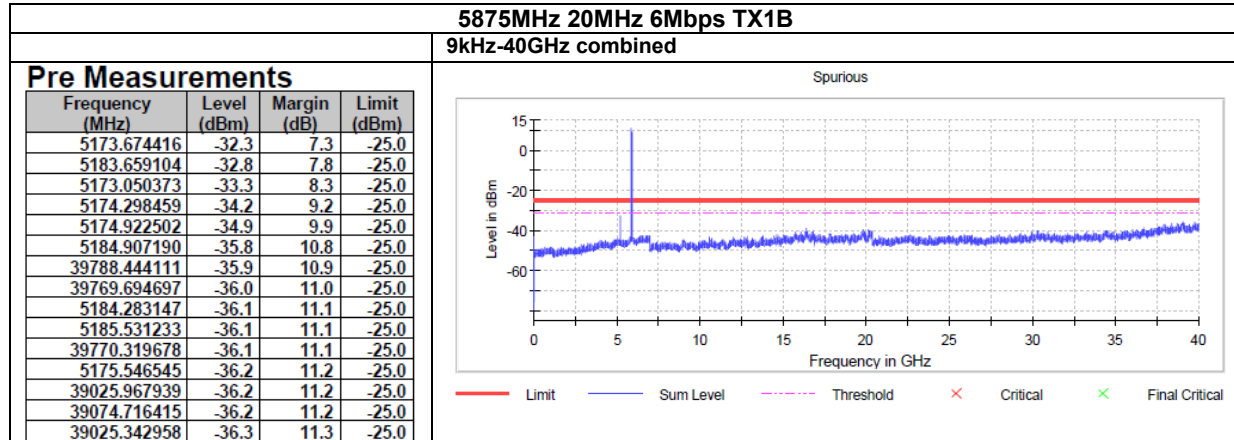




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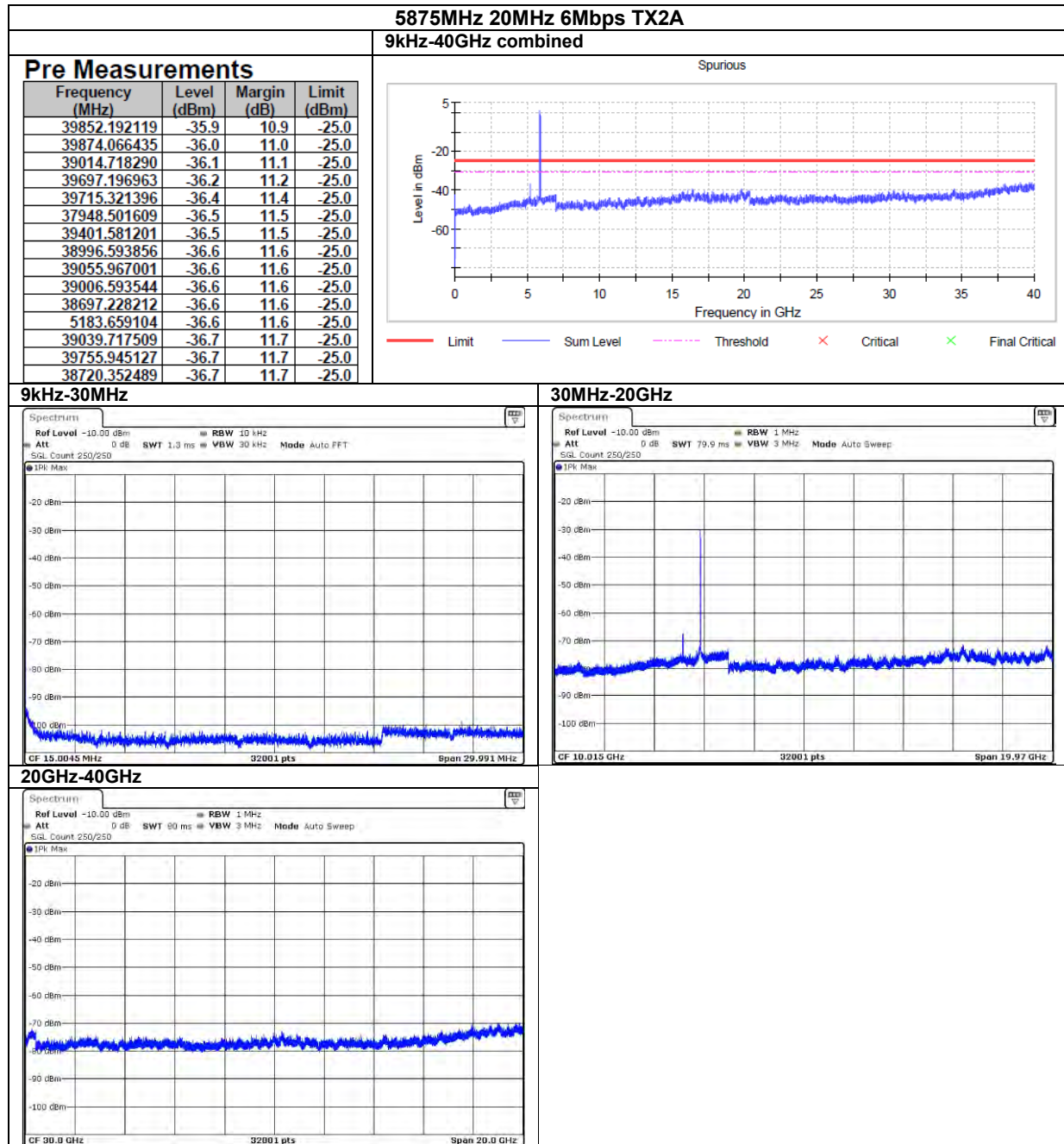


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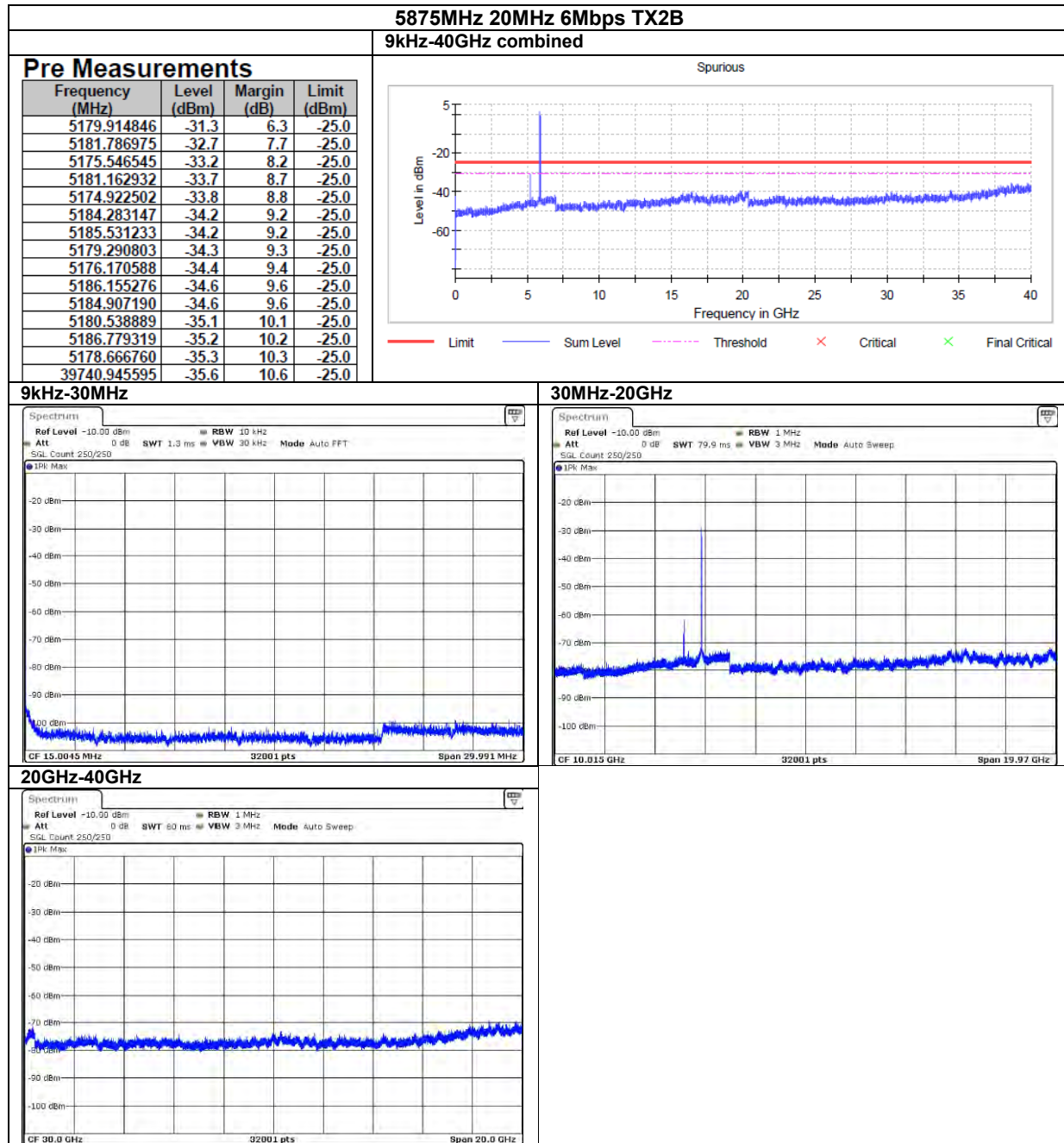


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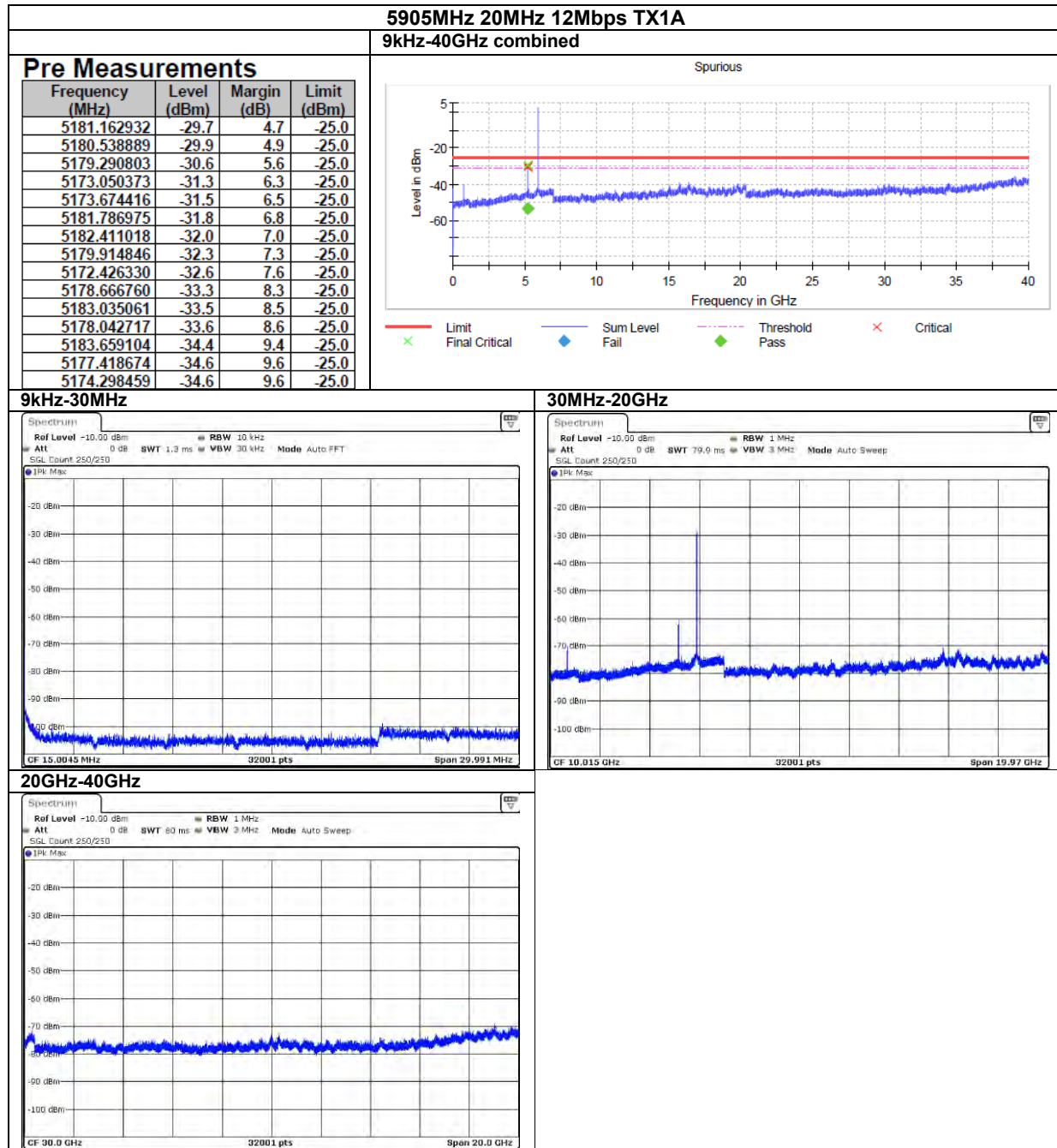


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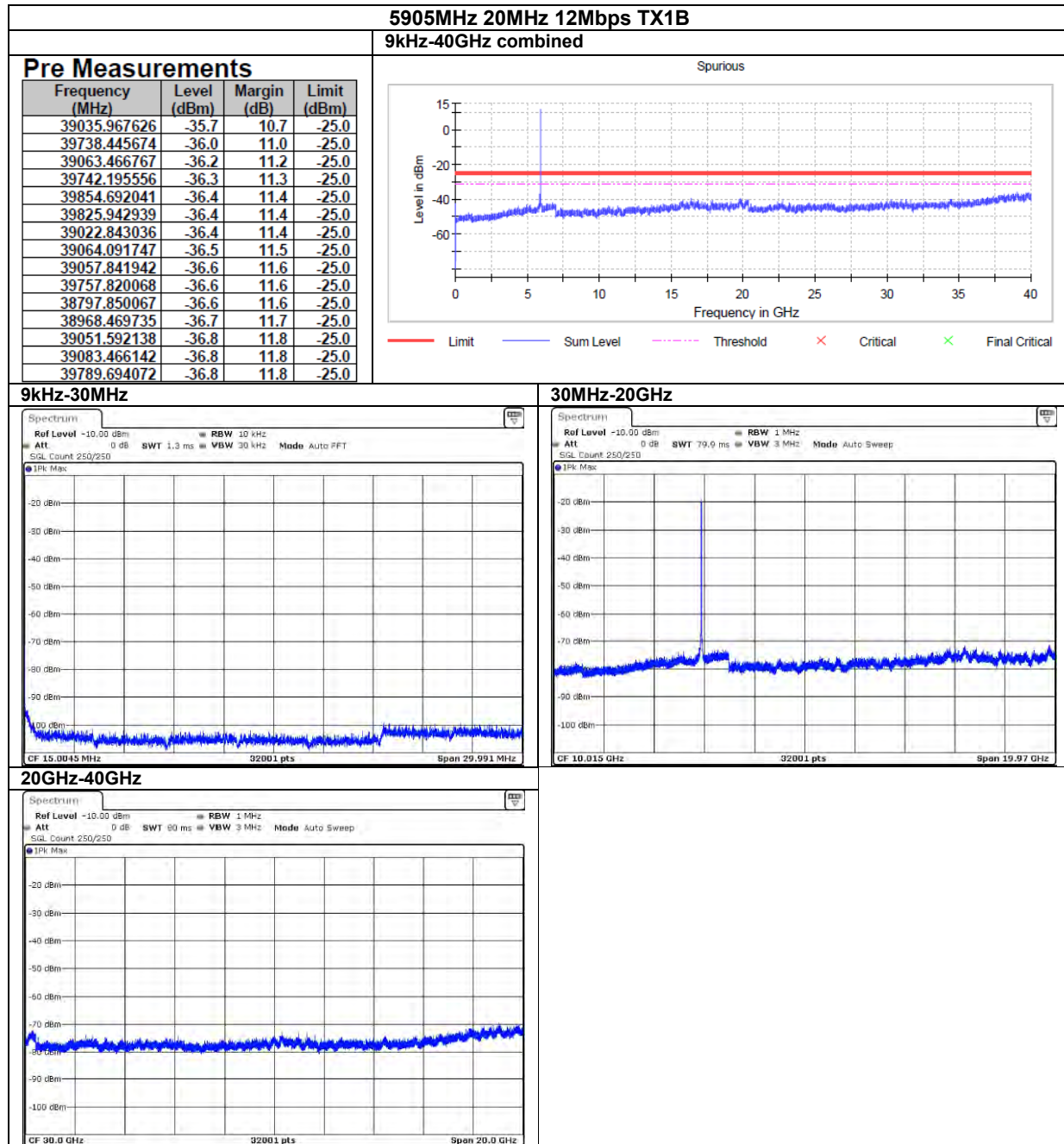


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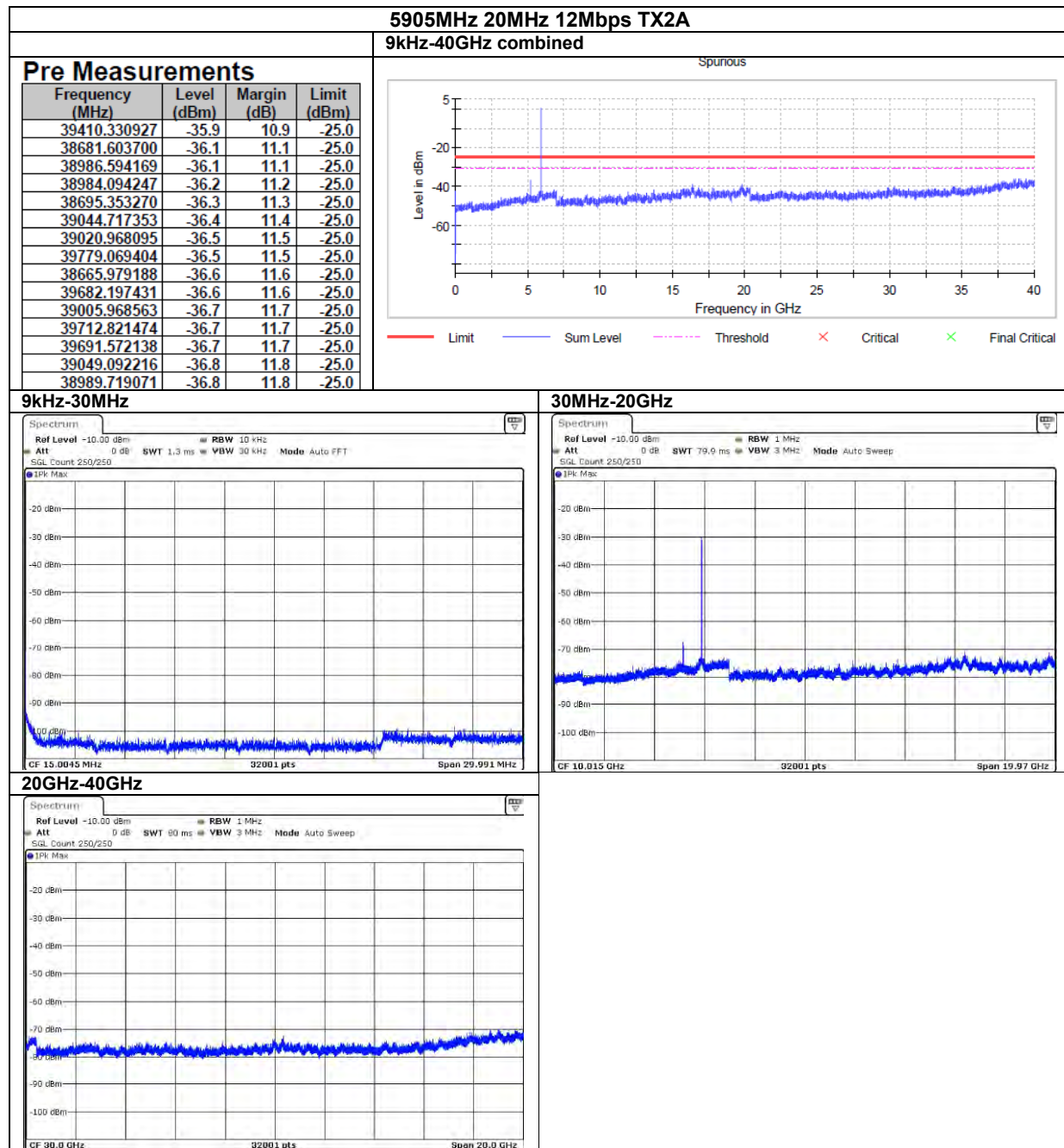
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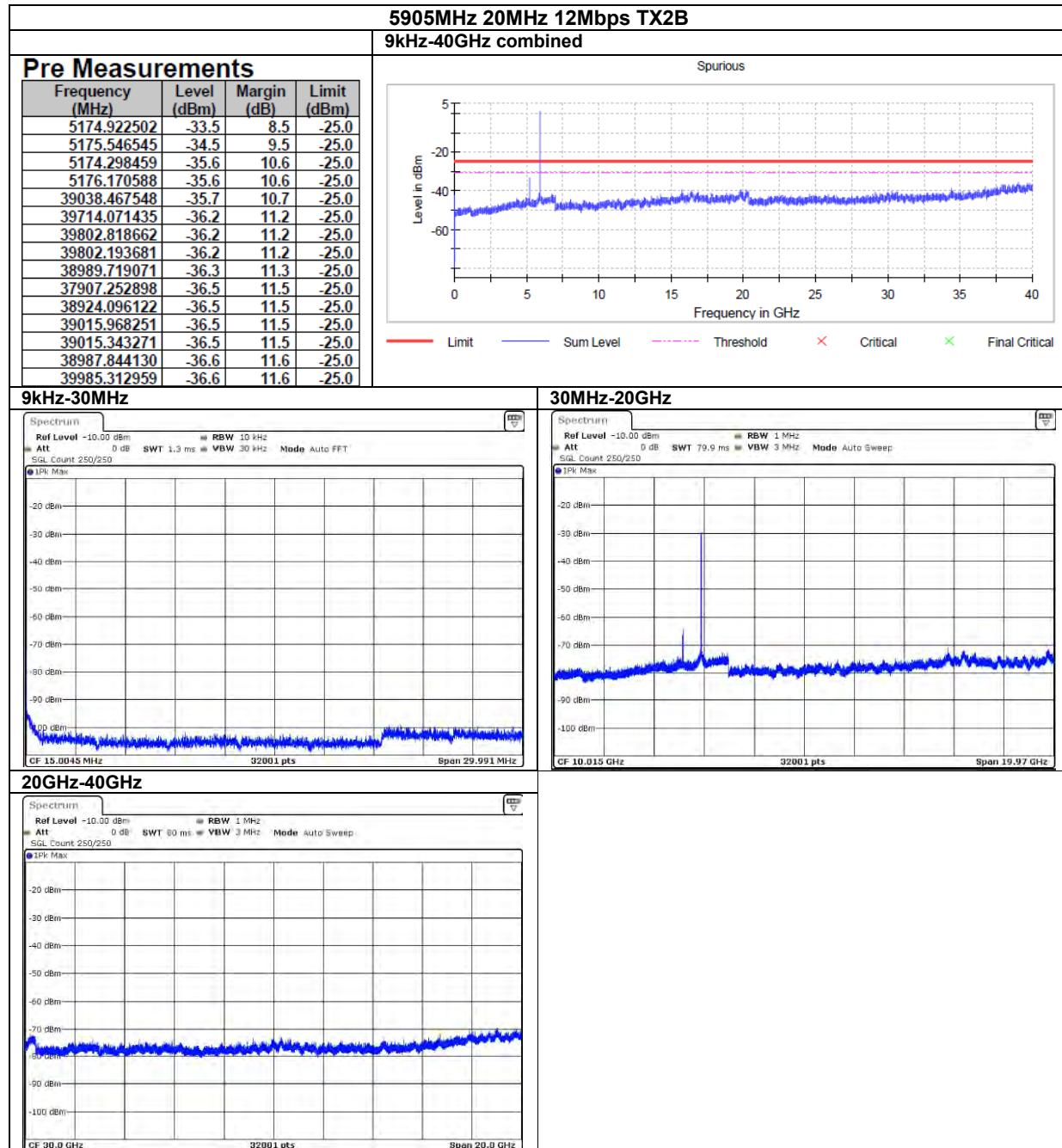




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Frequency Stability

Measurement Method: ANSI C63.26-2015 Section 5.6

Port: TX2A

Channel: 5890 MHz

At Nominal Voltage (120VAC)				
Temperature (°C)	Measured Frequency (MHz)	Frequency Drift (MHz)	Frequency Drift (ppm)	Limit (ppm)
-40	5.889947	1.6641E-05	2.82533	±10
-30	5.889939	8.141E-06	1.382189	±10
-20	5.889936	4.891E-06	0.8304	±10
-10	5.889922	-8.312E-06	-1.41122	±10
0	5.889932	8.59E-07	0.145842	±10
10	5.889921	-1.0281E-05	-1.74552	±10
20	5.88993078	Reference	Reference	±10
30	5.889935315	4.532E-06	0.769448771	±10
40	5.889951002	2.0219E-05	3.432807743	±10
50	5.889969	3.8226E-05	6.490059291	±10

At Nominal Temperature 20°C				
Voltage (VAC)	Measured Frequency (MHz)	Frequency Drift (MHz)	Frequency Drift (ppm)	Limit (ppm)
100	5.8899244	-6.383E-06	-1.08371392	±10
120	5.88993078	Reference	Reference	±10
240	5.88991	-2.0783E-05	-3.52856439	±10

