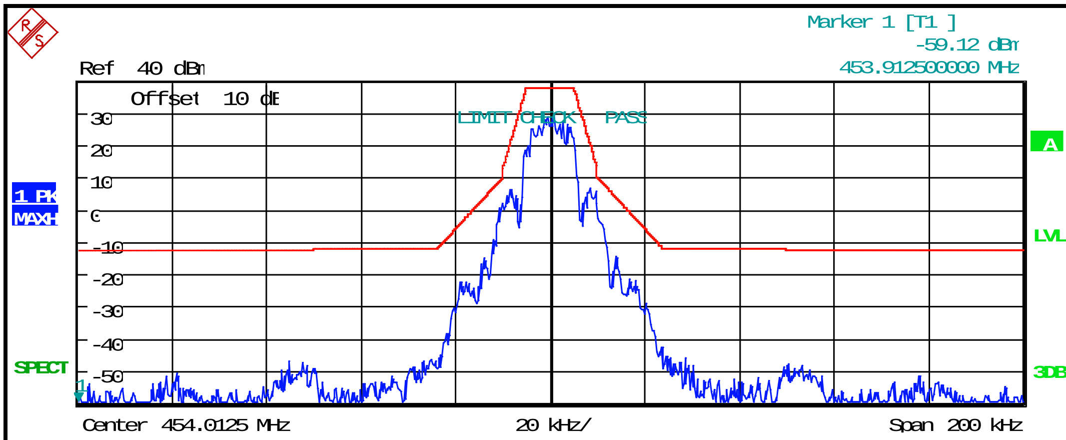
Plot 7-54: Occupied Bandwidth – 454.0125 MHz; EDACS Wideband 2-level FSK 9600 (Mask C)



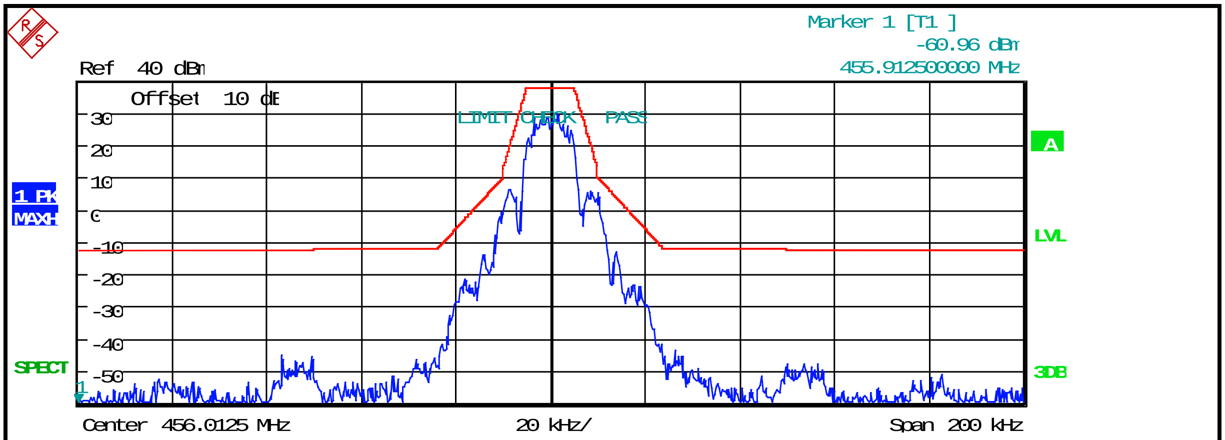
Tx Channel — None

Bandwidth 6.25 kHz — Power 38.19 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-100.000 k	-50.000 k	300.00	453.957100 M	-47.23	-85.43	-34.23
-50.000 k	-24.000 k	300.00	453.987300 M	-46.50	-84.69	-34.00
-24.000 k	-10.000 k	300.00	454.002300 M	1.51	-36.69	-7.88
-10.000 k	-5.000 k	300.00	454.003300 M	3.87	-34.33	-12.63
5.000 k	10.000 k	300.00	454.022100 M	5.27	-32.93	-9.23
10.000 k	24.000 k	300.00	454.022500 M	1.10	-37.10	-8.60
24.000 k	50.000 k	300.00	454.036900 M	-45.69	-83.88	-33.19
50.000 k	100.000 k	300.00	454.062900 M	-47.86	-86.05	-34.86

Date: 24.DEC.2014 17:01:44

Plot 7-55: Occupied Bandwidth – 456.0125 MHz; EDACS Wideband 2-level FSK 9600 (Mask C)

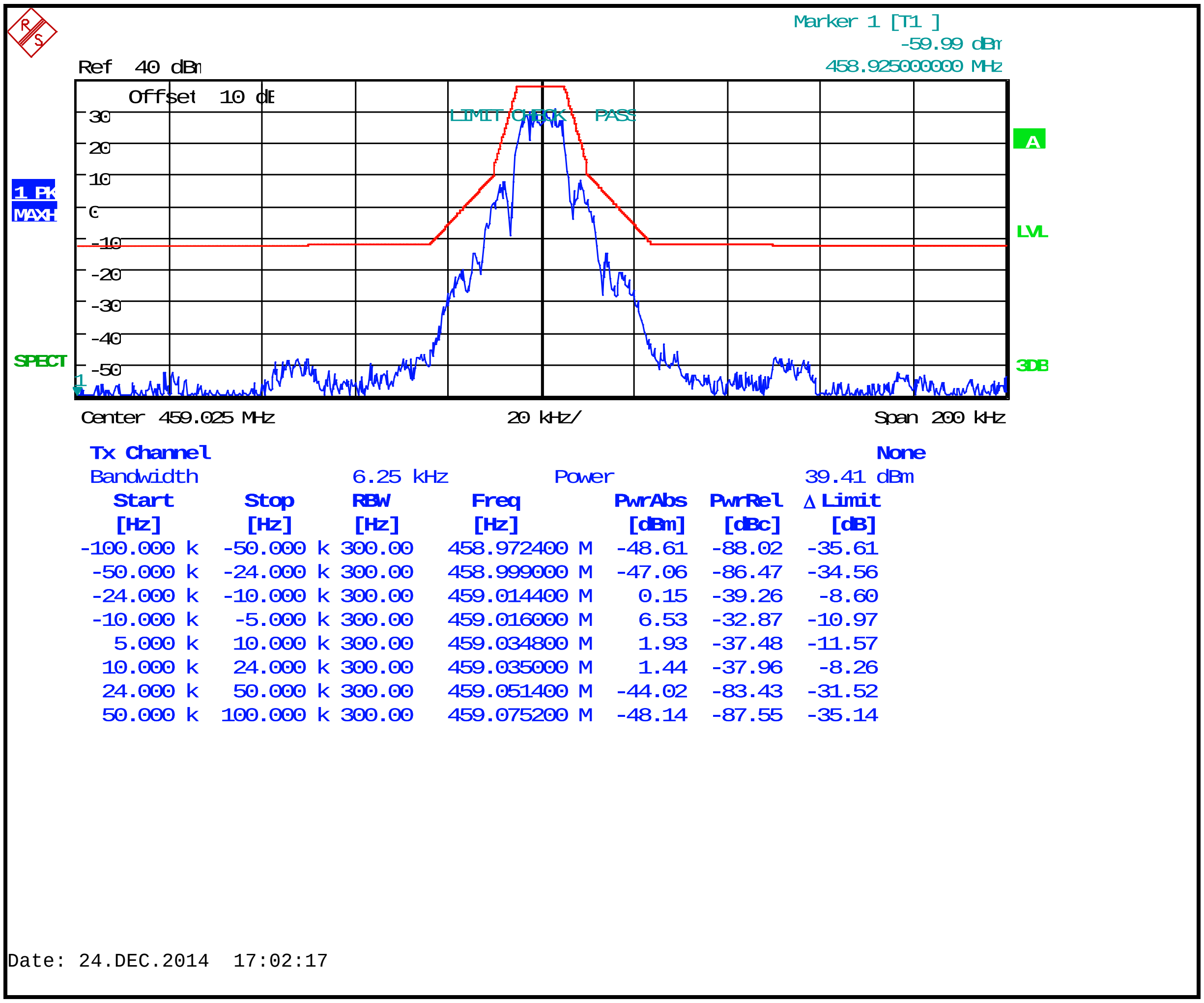


Tx Channel None
Bandwidth 6.25 kHz Power 38.89 dBm

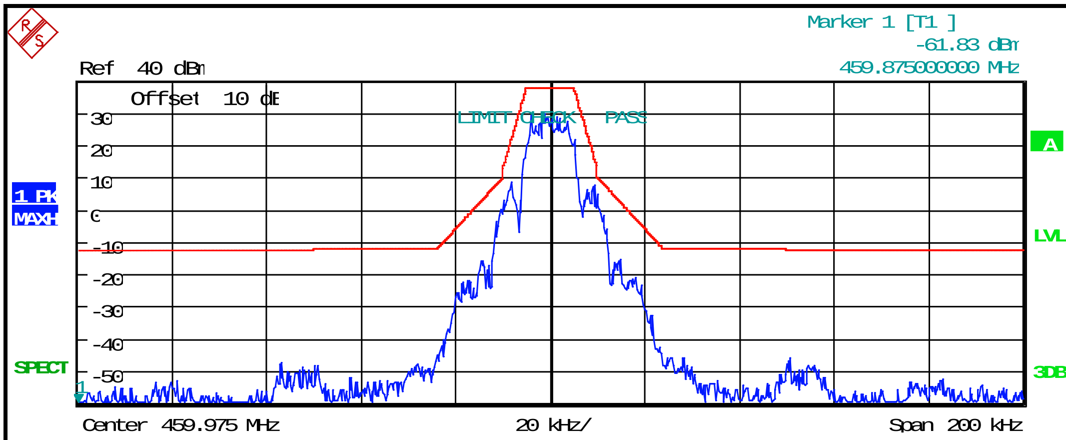
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-100.000 k	-50.000 k	300.00	455.960100 M	-47.66	-86.55	-34.66
-50.000 k	-24.000 k	300.00	455.987900 M	-46.12	-85.01	-33.62
-24.000 k	-10.000 k	300.00	456.002100 M	-1.27	-40.16	-10.34
-10.000 k	-5.000 k	300.00	456.002500 M	0.68	-38.21	-11.82
5.000 k	10.000 k	300.00	456.022100 M	3.09	-35.80	-11.41
10.000 k	24.000 k	300.00	456.022500 M	5.21	-33.68	-4.49
24.000 k	50.000 k	300.00	456.038900 M	-43.75	-82.64	-31.25
50.000 k	100.000 k	300.00	456.065900 M	-47.87	-86.76	-34.87

Date: 24.DEC.2014 17:02:02

Plot 7-56: Occupied Bandwidth – 459.0250 MHz; EDACS Wideband 2-level FSK 9600 (Mask C)



Plot 7-57: Occupied Bandwidth – 459.9750 MHz; EDACS Wideband 2-level FSK 9600 (Mask C)

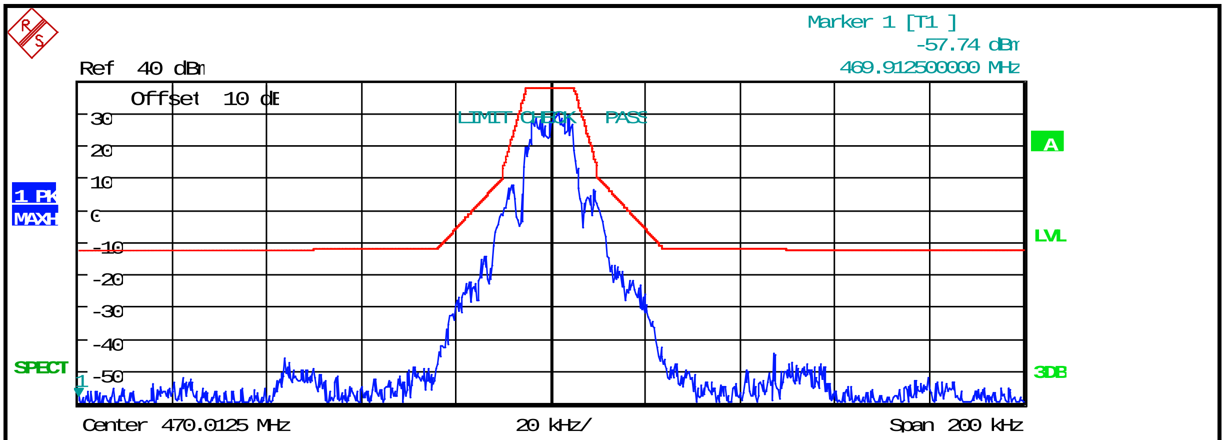


Tx Channel None
Bandwidth 6.25 kHz Power 38.64 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-100.000 k	-50.000 k	300.00	459.918000 M	-47.66	-86.30	-34.66
-50.000 k	-24.000 k	300.00	459.947000 M	-47.85	-86.49	-35.35
-24.000 k	-10.000 k	300.00	459.964600 M	-0.07	-38.71	-9.14
-10.000 k	-5.000 k	300.00	459.965000 M	2.19	-36.45	-10.31
5.000 k	10.000 k	300.00	459.984200 M	7.42	-31.22	-9.08
10.000 k	24.000 k	300.00	459.985000 M	4.67	-33.97	-5.03
24.000 k	50.000 k	300.00	460.003200 M	-45.97	-84.61	-33.47
50.000 k	100.000 k	300.00	460.025600 M	-46.29	-84.92	-33.29

Date: 24.DEC.2014 17:02:32

Plot 7-58: Occupied Bandwidth – 470.0125 MHz; EDACS Wideband 2-level FSK 9600 (Mask C)



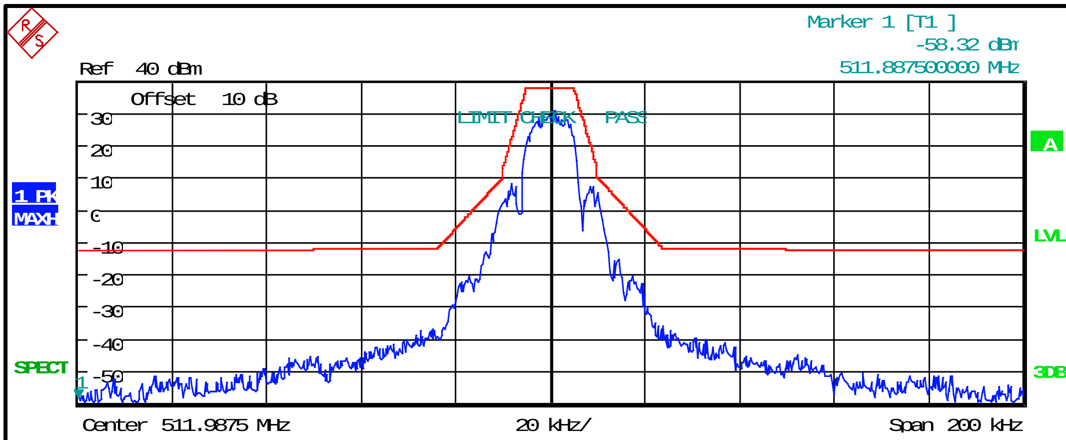
Tx Channel — None

Bandwidth 6.25 kHz — Power 38.72 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-100.000 k	-50.000 k	300.00	469.956300 M	-45.97	-84.69	-32.97
-50.000 k	-24.000 k	300.00	469.983500 M	-48.81	-87.54	-36.31
-24.000 k	-10.000 k	300.00	470.001500 M	-2.32	-41.04	-10.43
-10.000 k	-5.000 k	300.00	470.002500 M	0.51	-38.21	-11.99
5.000 k	10.000 k	300.00	470.021700 M	5.54	-33.19	-10.96
10.000 k	24.000 k	300.00	470.022500 M	0.53	-38.19	-9.17
24.000 k	50.000 k	300.00	470.059700 M	-44.90	-83.62	-32.40
50.000 k	100.000 k	300.00	470.063500 M	-47.72	-86.45	-34.72

Date: 24.DEC.2014 17:02:47

Plot 7-59: Occupied Bandwidth – 511.9875 MHz; EDACS Wideband 2-level FSK 9600 (Mask C)



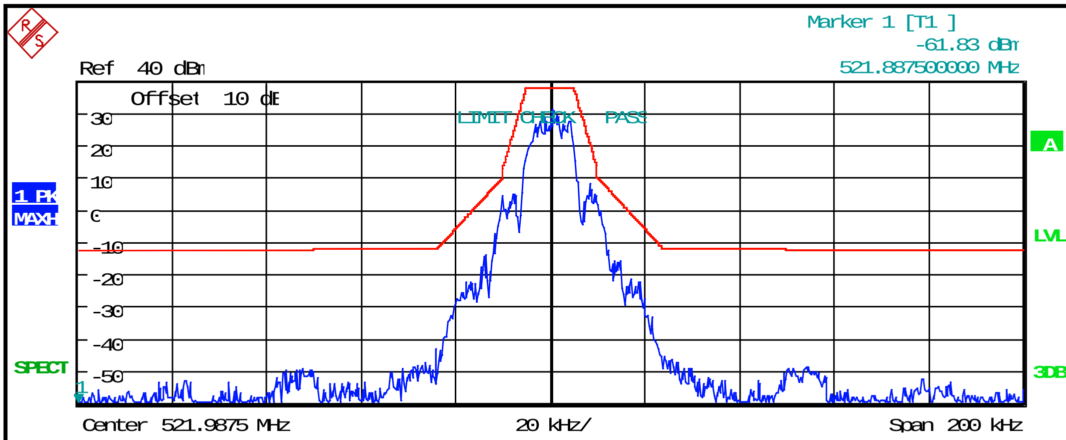
Tx Channel None

Bandwidth 6.25 kHz Power 39.85 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-100.000 k	-50.000 k	300.00	511.936700 M	-45.48	-85.33	-32.48
-50.000 k	-24.000 k	300.00	511.962700 M	-37.17	-77.03	-24.67
-24.000 k	-10.000 k	300.00	511.977300 M	1.91	-37.94	-7.47
-10.000 k	-5.000 k	300.00	511.977500 M	2.40	-37.46	-10.10
5.000 k	10.000 k	300.00	511.996700 M	6.60	-33.25	-9.90
10.000 k	24.000 k	300.00	511.997500 M	5.07	-34.78	-4.63
24.000 k	50.000 k	300.00	512.012900 M	-37.82	-77.67	-25.32
50.000 k	100.000 k	300.00	512.039700 M	-45.25	-85.10	-32.25

Date: 15.FEB.2015 21:23:59

Plot 7-60: Occupied Bandwidth – 521.9875 MHz; EDACS Wideband 2-level FSK 9600 (Mask C)



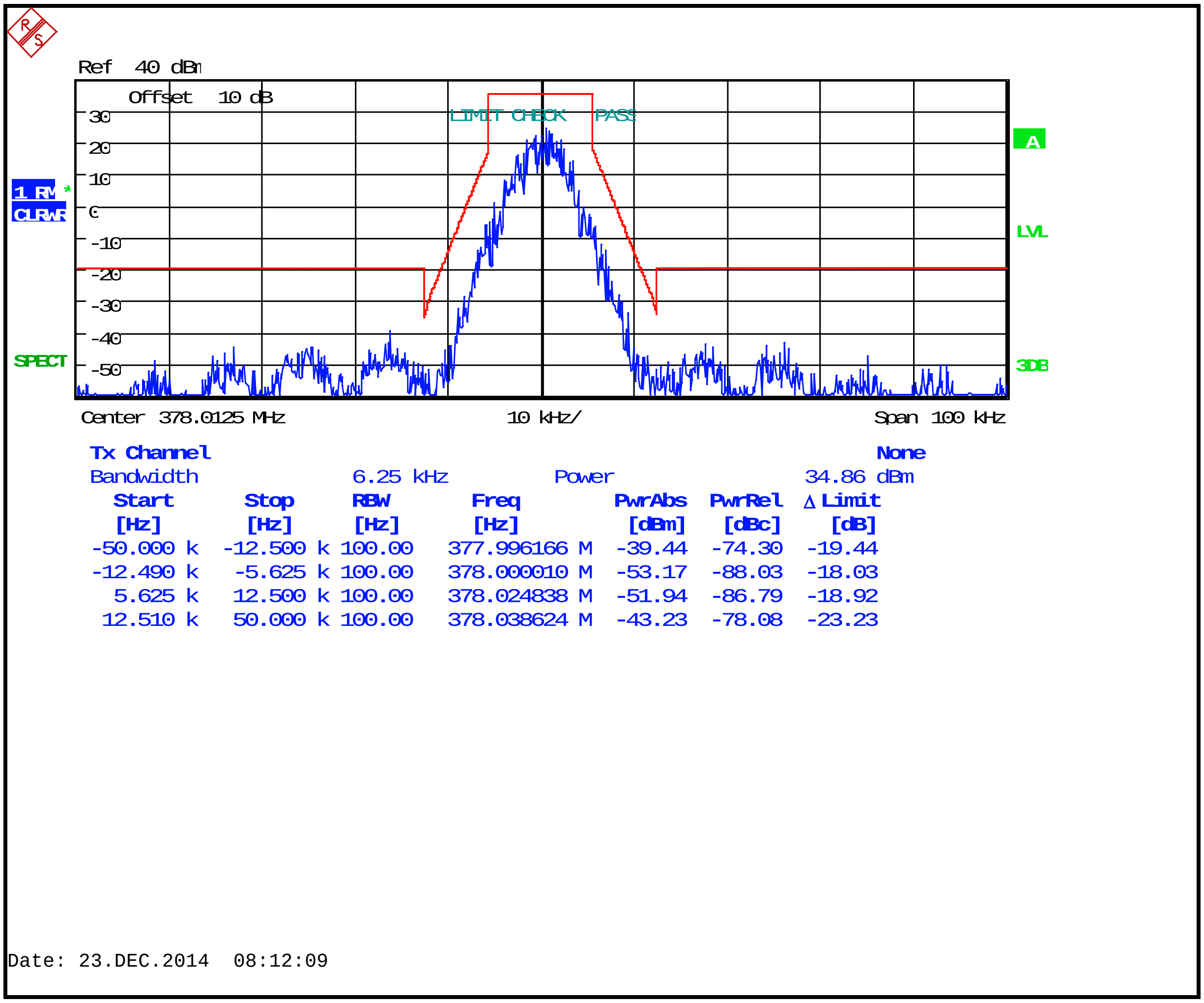
Tx Channel: None

Bandwidth 6.25 kHz — Power 38.61 dBm

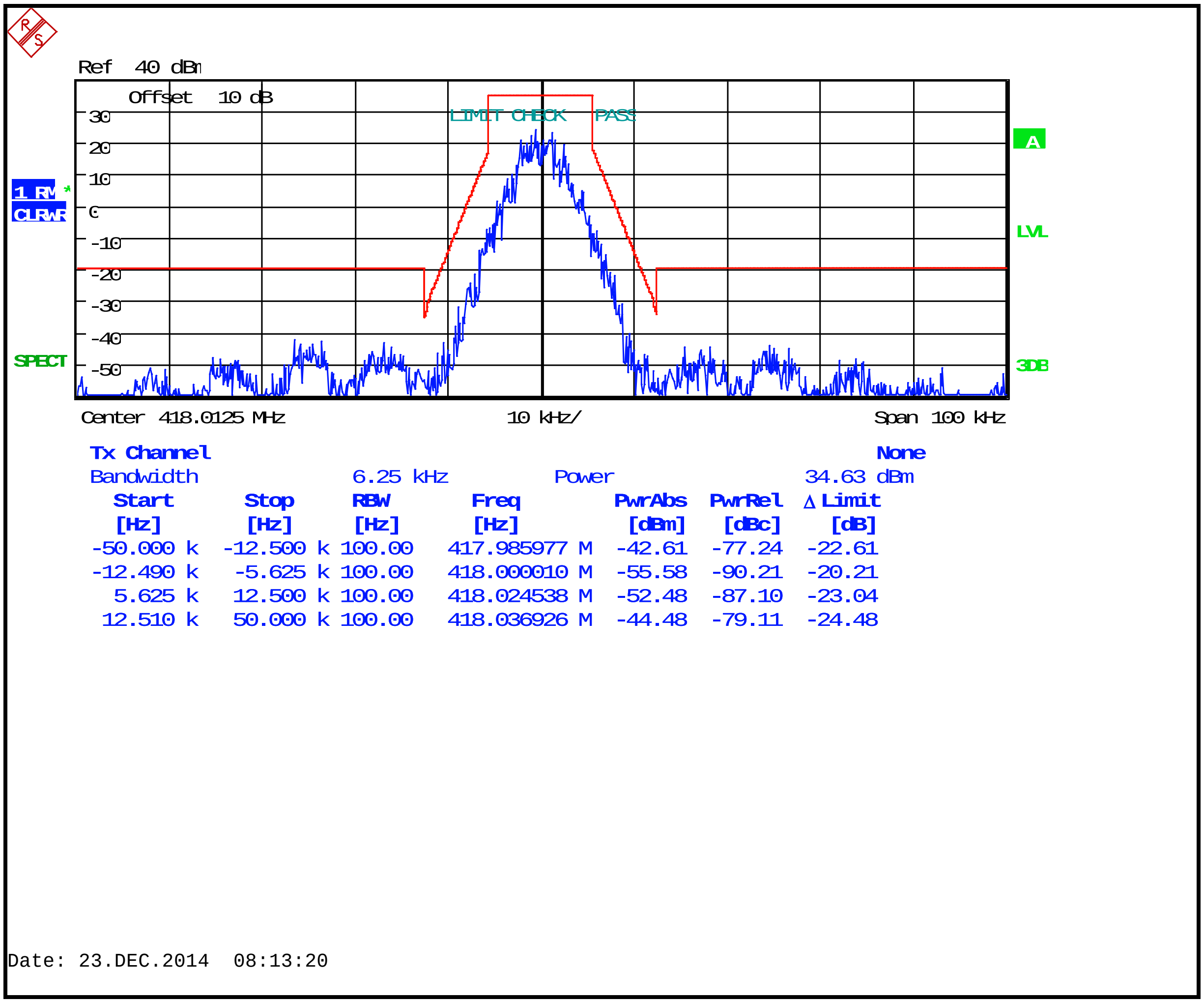
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-100.000 k	-50.000 k	300.00	521.935100 M	-49.55	-88.17	-36.55
-50.000 k	-24.000 k	300.00	521.963300 M	-43.31	-81.92	-30.81
-24.000 k	-10.000 k	300.00	521.977300 M	4.06	-34.55	-5.32
-10.000 k	-5.000 k	300.00	521.977500 M	0.07	-38.55	-12.43
5.000 k	10.000 k	300.00	521.997100 M	4.19	-34.43	-10.31
10.000 k	24.000 k	300.00	521.997900 M	1.89	-36.72	-7.17
24.000 k	50.000 k	300.00	522.011500 M	-45.48	-84.10	-32.98
50.000 k	100.000 k	300.00	522.041900 M	-49.02	-87.64	-36.02

Date: 24.DEC.2014 17:03:20

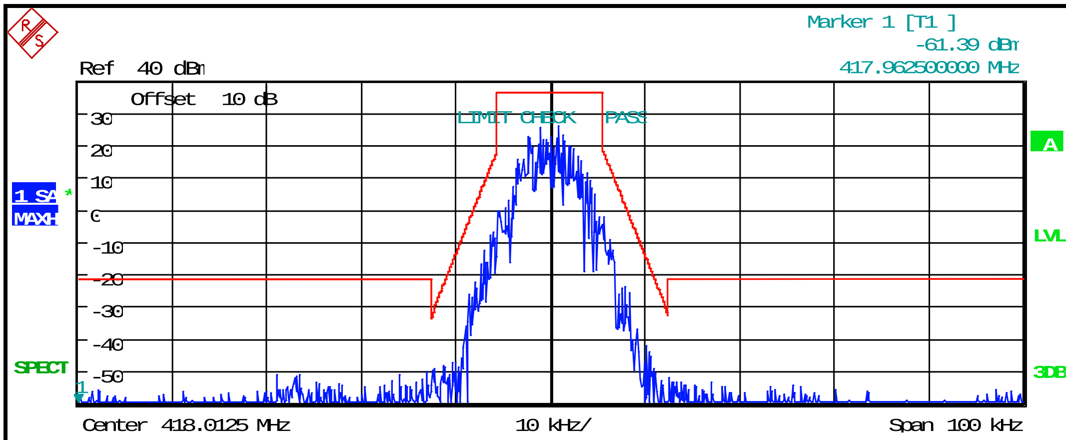
Plot 7-61: Occupied Bandwidth – 378.0125 MHz; C4FM (Mask D)



Plot 7-62: Occupied Bandwidth – 406.1000 MHz; C4FM (Mask D)



Plot 7-63: Occupied Bandwidth – 418.0125 MHz; C4FM (Mask D)



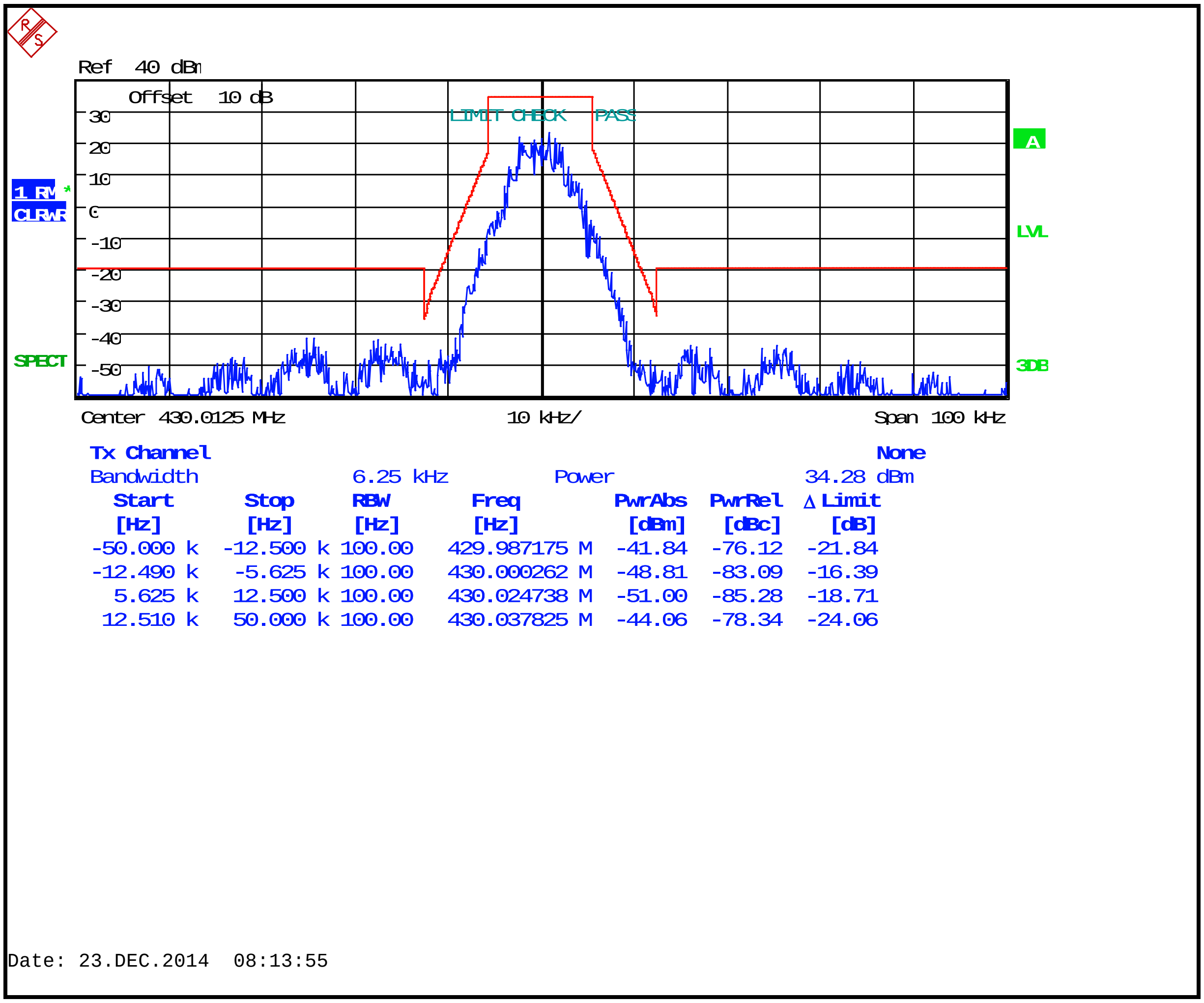
Tx Channel None

Bandwidth 11.25 kHz Power 35.95 dBm

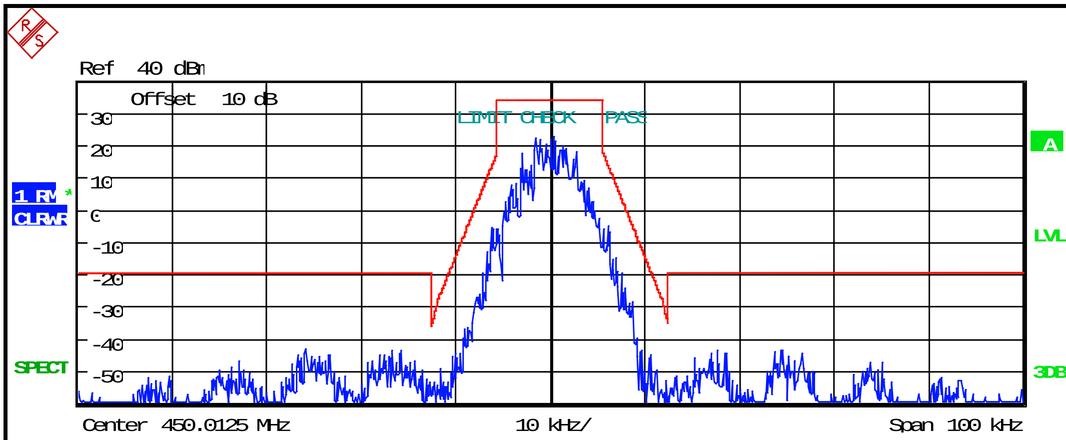
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	417.999363 M	-50.49	-86.44	-28.64
-12.490 k	-5.625 k	100.00	418.000010 M	-50.00	-85.95	-15.95
5.625 k	12.500 k	100.00	418.024938 M	-53.52	-89.46	-20.28
12.510 k	50.000 k	100.00	418.025337 M	-53.44	-89.38	-31.58

Date: 8.JAN.2015 16:47:32

Plot 7-64: Occupied Bandwidth – 430.0125 MHz; C4FM (Mask D)



Plot 7-65: Occupied Bandwidth – 450.0125 MHz; C4FM (Mask D)



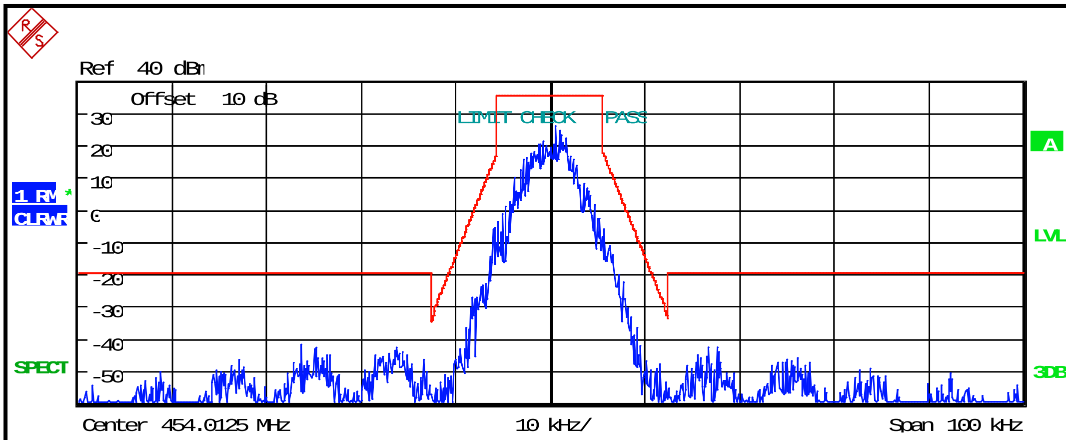
Tx Channel — **None**

Bandwidth 6.25 kHz Power 33.87 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	449.986576 M	-43.52	-77.39	-23.52
-12.490 k	-5.625 k	100.00	450.006256 M	-6.01	-39.88	-18.70
5.625 k	12.500 k	100.00	450.018644 M	-5.29	-39.16	-18.71
12.510 k	50.000 k	100.00	450.036826 M	-43.67	-77.55	-23.67

Date: 23.DEC.2014 08:14:28

Plot 7-66: Occupied Bandwidth – 454.0125 MHz; C4FM (Mask D)

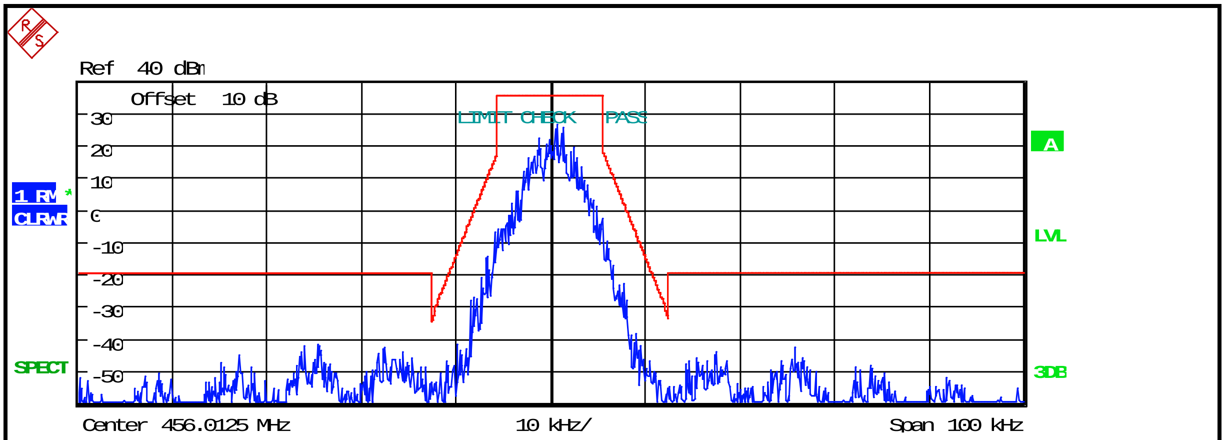


Tx Channel None
Bandwidth 6.25 kHz Power 35.00 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	453.986076 M	-41.99	-76.99	-21.99
-12.490 k	-5.625 k	100.00	454.006456 M	-6.36	-41.36	-20.51
5.625 k	12.500 k	100.00	454.024938 M	-55.38	-90.38	-21.20
12.510 k	50.000 k	100.00	454.030032 M	-42.69	-77.69	-22.69

Date: 23.DEC.2014 08:15:00

Plot 7-67: Occupied Bandwidth – 456.0125 MHz; C4FM (Mask D)



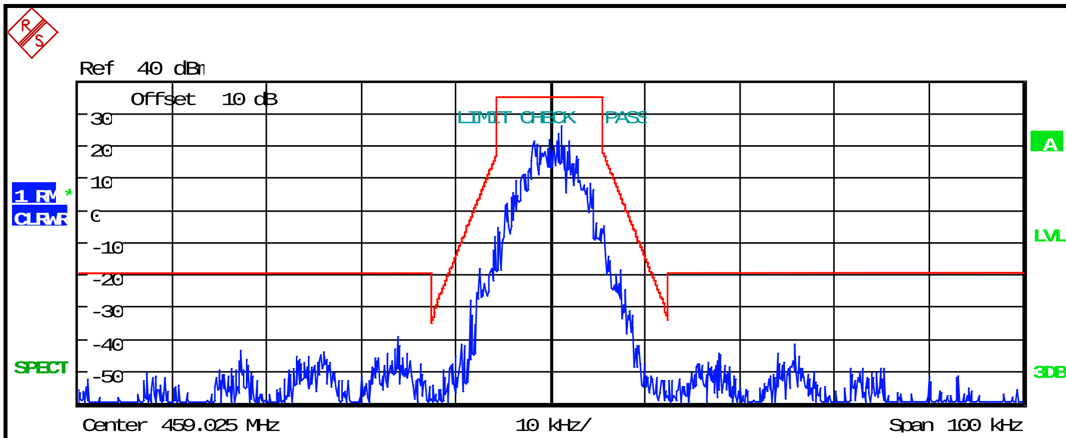
Tx Channel — None

Bandwidth 6.25 kHz — Power 35.08 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	455.987875 M	-42.06	-77.14	-22.06
-12.490 k	-5.625 k	100.00	456.000162 M	-54.31	-89.39	-21.38
5.625 k	12.500 k	100.00	456.024938 M	-55.49	-90.57	-21.38
12.510 k	50.000 k	100.00	456.038224 M	-42.76	-77.84	-22.76

Date: 23.DEC.2014 08:15:37

Plot 7-68: Occupied Bandwidth – 459.0250 MHz; C4FM (Mask D)



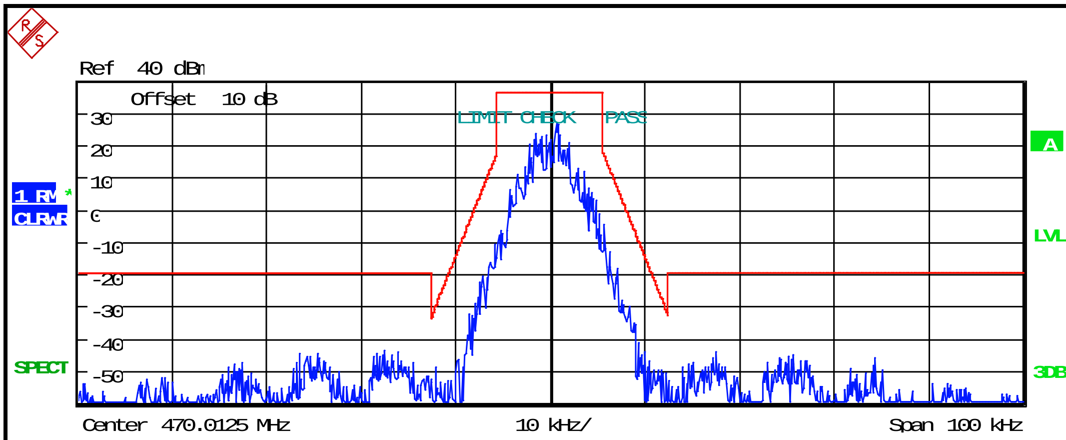
Tx Channel None

Bandwidth 6.25 kHz Power 34.69 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	459.008766 M	-39.64	-74.33	-19.64
-12.490 k	-5.625 k	100.00	459.012562 M	-54.63	-89.32	-20.01
5.625 k	12.500 k	100.00	459.037438 M	-53.13	-87.83	-18.65
12.510 k	50.000 k	100.00	459.050724 M	-41.85	-76.54	-21.85

Date: 23.DEC.2014 08:16:05

Plot 7-69: Occupied Bandwidth – 459.9750 MHz; C4FM (Mask D)

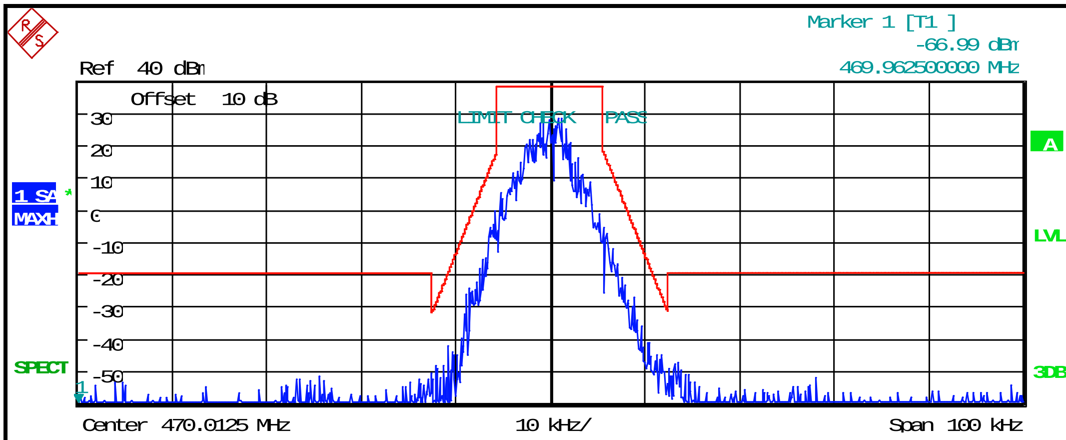


Tx Channel — None
Bandwidth 6.25 kHz — Power 36.01 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	469.994868 M	-43.80	-79.81	-23.80
-12.490 k	-5.625 k	100.00	470.000362 M	-48.91	-84.93	-18.68
5.625 k	12.500 k	100.00	470.024638 M	-50.90	-86.91	-20.73
12.510 k	50.000 k	100.00	470.029933 M	-44.07	-80.08	-24.07

Date: 23.DEC.2014 08:17:08

Plot 7-70: Occupied Bandwidth – 470.0125 MHz; C4FM (Mask D)



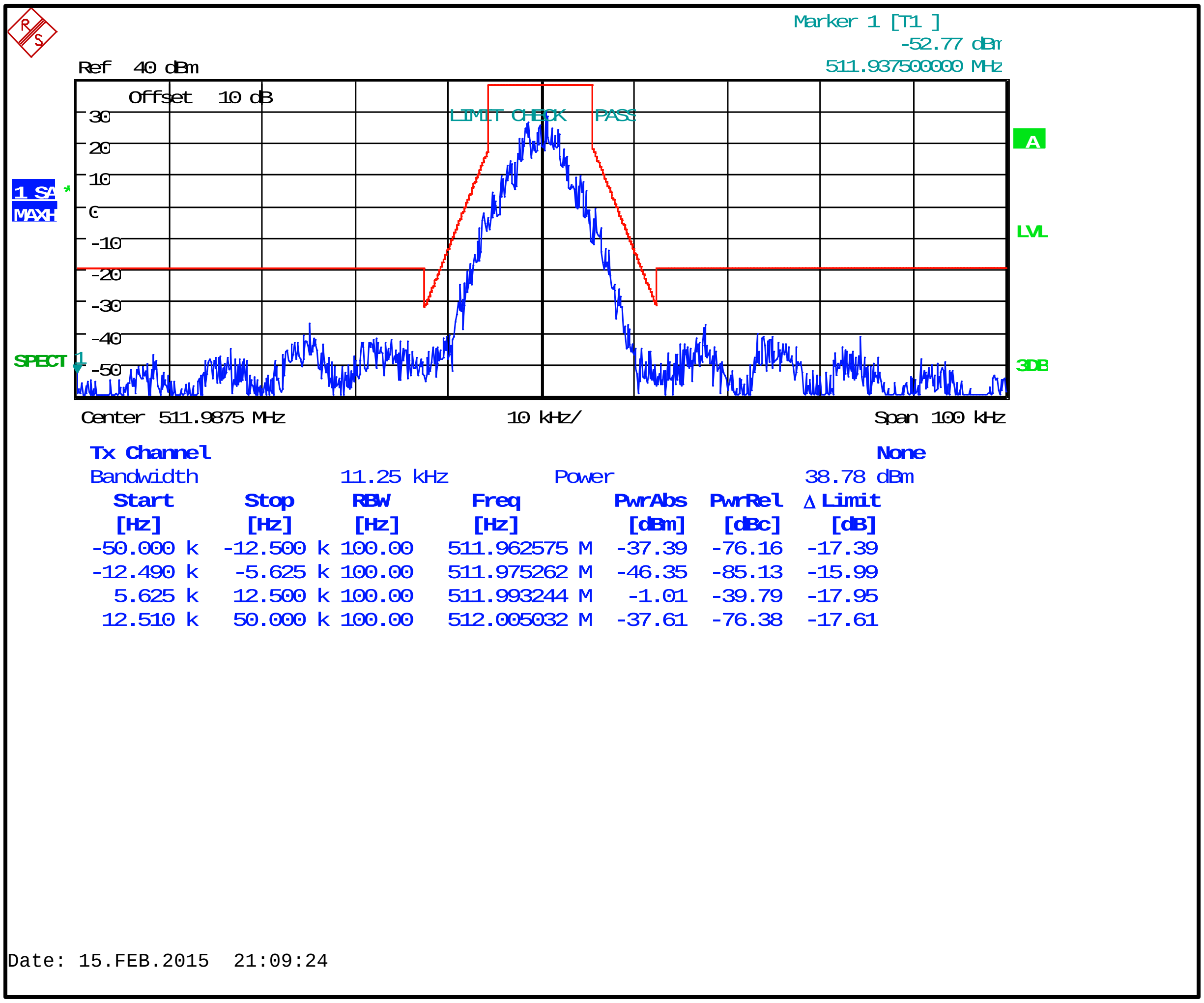
Tx Channel **None**

Bandwidth 11.25 kHz Power 39.30 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	469.969093 M	-60.76	-100.06	-40.02
-12.490 k	-5.625 k	100.00	470.006056 M	-5.94	-45.23	-17.78
5.625 k	12.500 k	100.00	470.024938 M	-49.66	-88.96	-17.54
12.510 k	50.000 k	100.00	470.025937 M	-47.41	-86.71	-26.67

Date: 8.JAN.2015 16:50:18

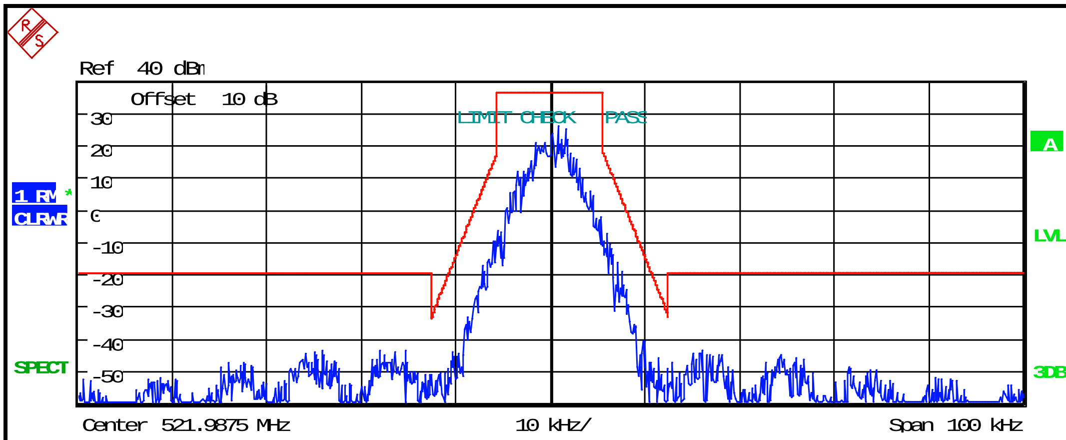
Plot 7-71: Occupied Bandwidth – 511.9875 MHz; C4FM (Mask D)



Tx Channel None
Bandwidth 11.25 kHz Power 38.78 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	511.962575 M	-37.39	-76.16	-17.39
-12.490 k	-5.625 k	100.00	511.975262 M	-46.35	-85.13	-15.99
5.625 k	12.500 k	100.00	511.993244 M	-1.01	-39.79	-17.95
12.510 k	50.000 k	100.00	512.005032 M	-37.61	-76.38	-17.61

Plot 7-72: Occupied Bandwidth – 521.9875 MHz; C4FM (Mask D)

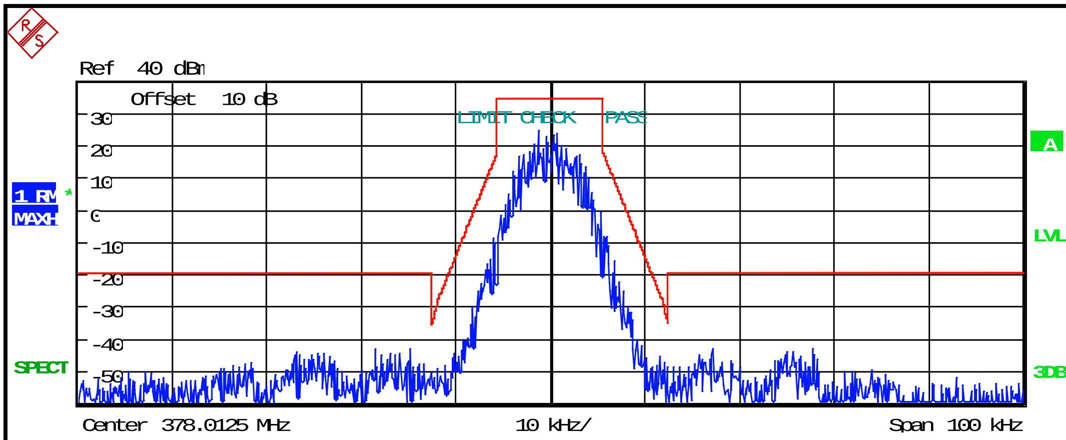


Tx Channel — None

Bandwidth		6.25 kHz	Power			35.84 dBm
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	521.963374 M	-43.73	-79.57	-23.73
-12.490 k	-5.625 k	100.00	521.975062 M	-55.01	-90.85	-21.53
5.625 k	12.500 k	100.00	521.999838 M	-49.25	-85.09	-17.21
12.510 k	50.000 k	100.00	522.003434 M	-43.76	-79.60	-23.76

Date: 23.DEC.2014 08:19:04

Plot 7-73: Occupied Bandwidth – 378.0125 MHz; C4FM Phase 2 (Mask D)

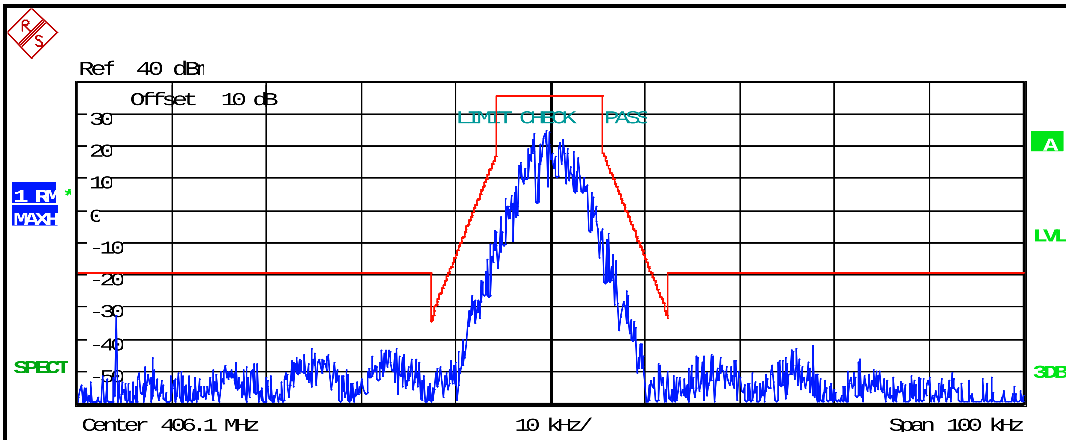


Tx Channel **None**
Bandwidth 6.25 kHz Power 34.00 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	377.997565 M	-43.48	-77.48	-23.48
-12.490 k	-5.625 k	100.00	378.000162 M	-52.28	-86.28	-16.87
5.625 k	12.500 k	100.00	378.024538 M	-47.54	-81.54	-16.19
12.510 k	50.000 k	100.00	378.028234 M	-45.17	-79.17	-25.17

Date: 23.DEC.2014 11:11:02

Plot 7-74: Occupied Bandwidth – 406.1000 MHz; C4FM Phase 2 (Mask D)



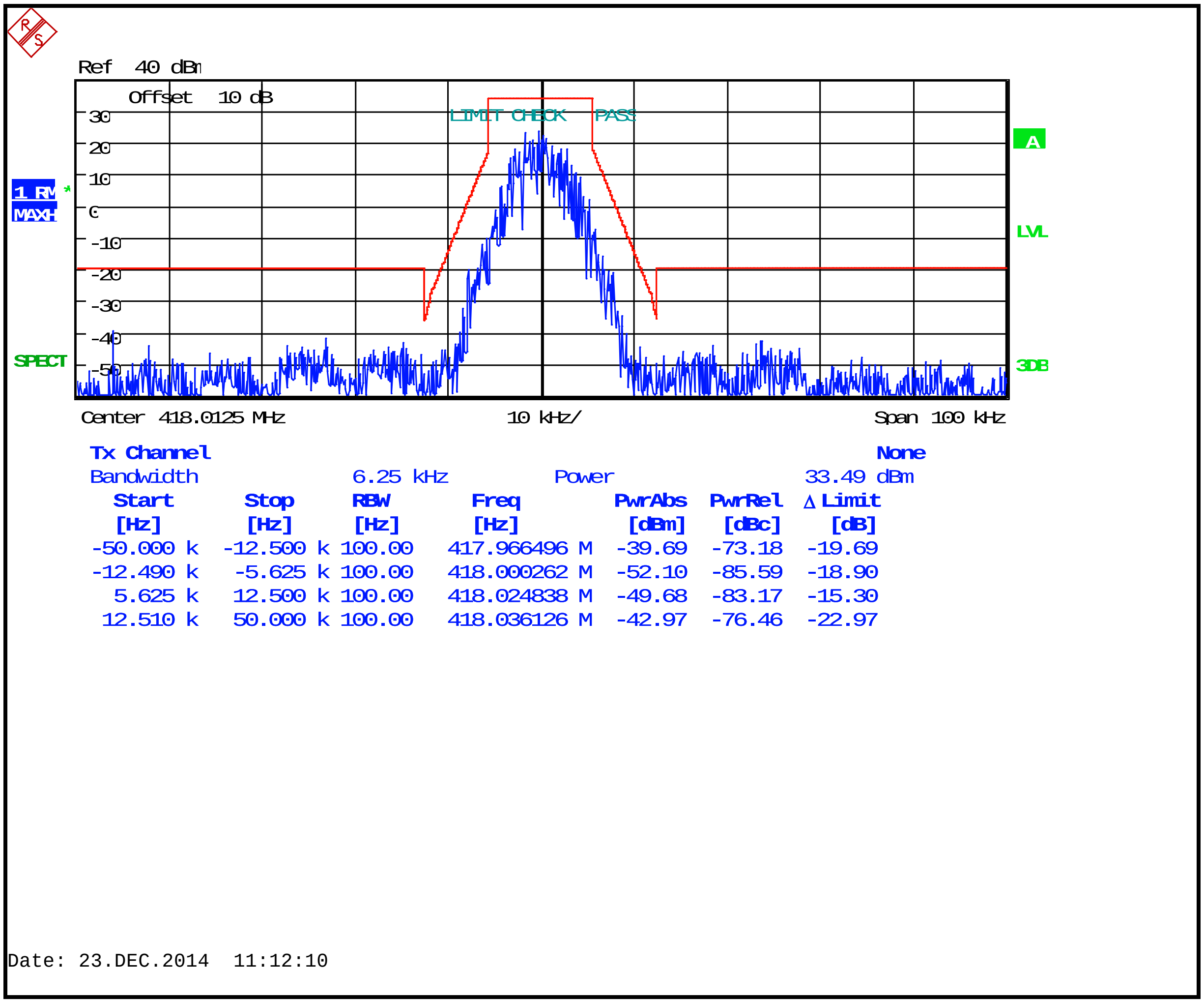
Tx Channel None

Bandwidth 6.25 kHz Power 35.06 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	406.054096 M	-33.17	-68.23	-13.17
-12.490 k	-5.625 k	100.00	406.087962 M	-49.43	-84.49	-18.26
5.625 k	12.500 k	100.00	406.112338 M	-50.40	-85.46	-15.43
12.510 k	50.000 k	100.00	406.127622 M	-42.57	-77.63	-22.57

Date: 23.DEC.2014 11:11:33

Plot 7-75: Occupied Bandwidth – 418.0125 MHz; C4FM Phase 2 (Mask D)

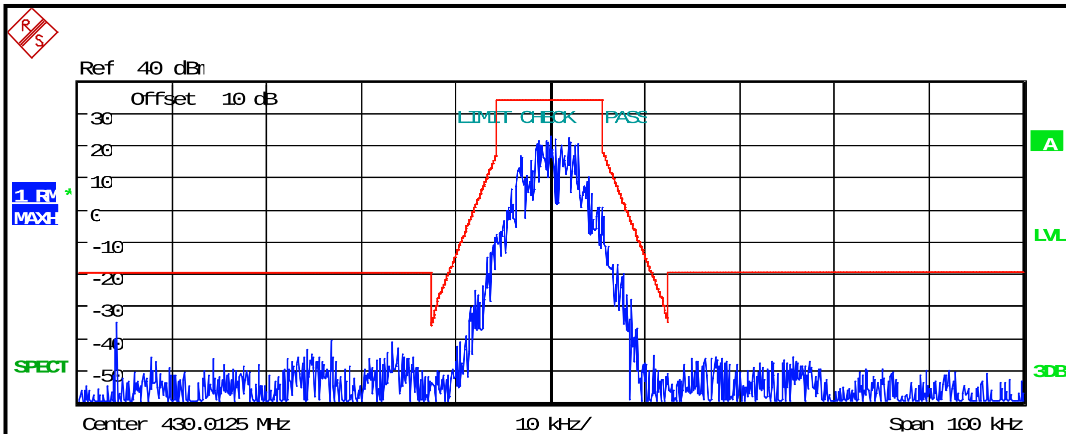


Tx Channel — None

Bandwidth 6.25 kHz — Power 33.49 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	417.966496 M	-39.69	-73.18	-19.69
-12.490 k	-5.625 k	100.00	418.000262 M	-52.10	-85.59	-18.90
5.625 k	12.500 k	100.00	418.024838 M	-49.68	-83.17	-15.30
12.510 k	50.000 k	100.00	418.036126 M	-42.97	-76.46	-22.97

Plot 7-76: Occupied Bandwidth – 430.0125 MHz; C4FM Phase 2 (Mask D)



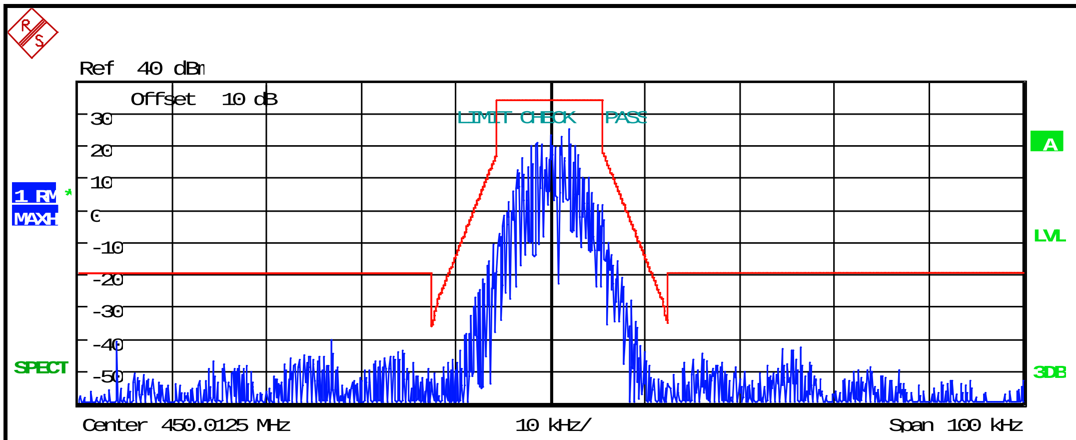
Tx Channel **None**

Bandwidth 6.25 kHz Power 33.86 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	429.966596 M	-35.36	-69.23	-15.36
-12.490 k	-5.625 k	100.00	430.000010 M	-54.50	-88.37	-18.37
5.625 k	12.500 k	100.00	430.024838 M	-51.27	-85.14	-17.26
12.510 k	50.000 k	100.00	430.029933 M	-45.94	-79.80	-25.94

Date: 23.DEC.2014 11:12:40

Plot 7-77: Occupied Bandwidth – 450.0125 MHz; C4FM Phase 2 (Mask D)



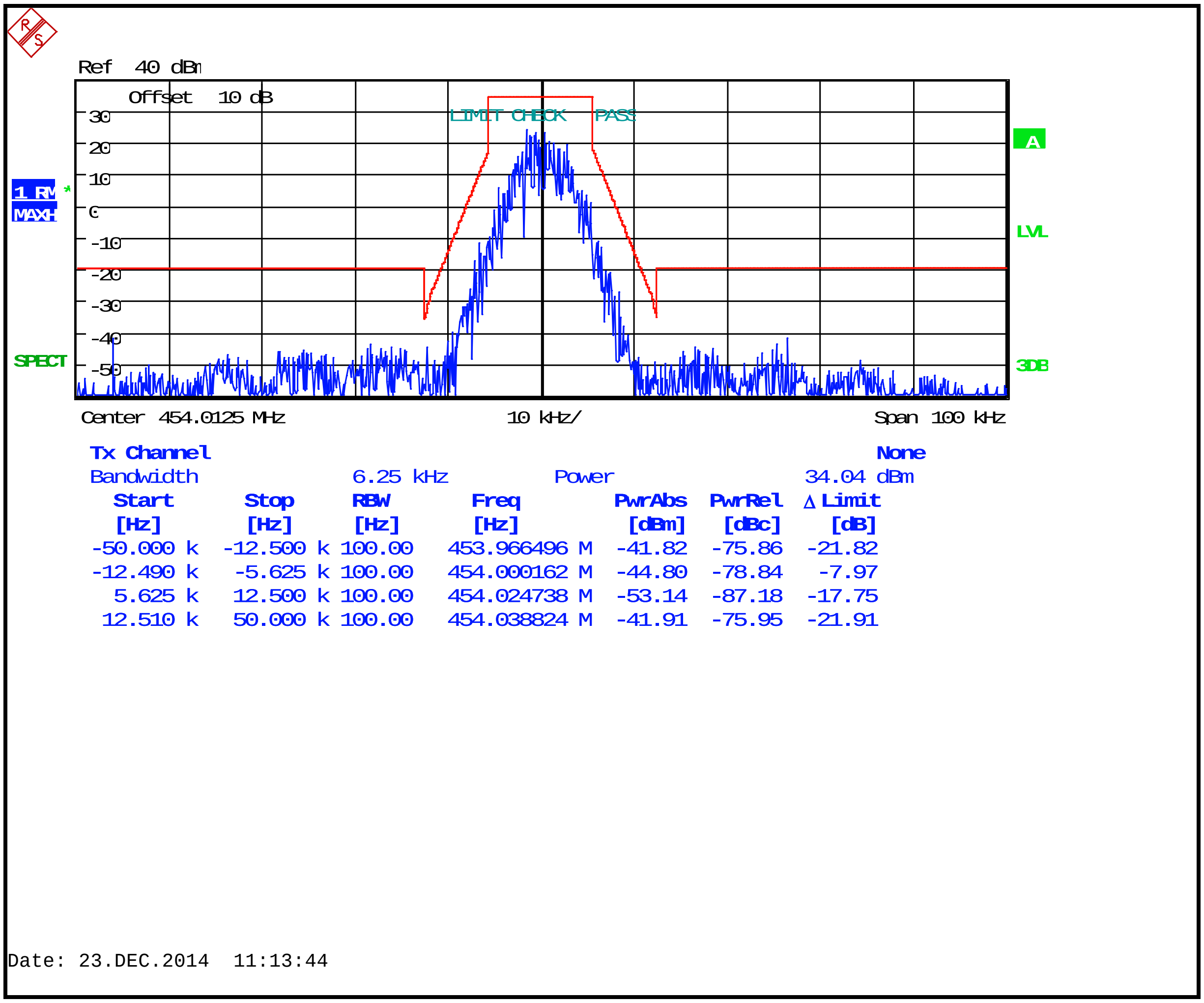
Tx Channel None

Bandwidth 6.25 kHz Power 33.66 dBm

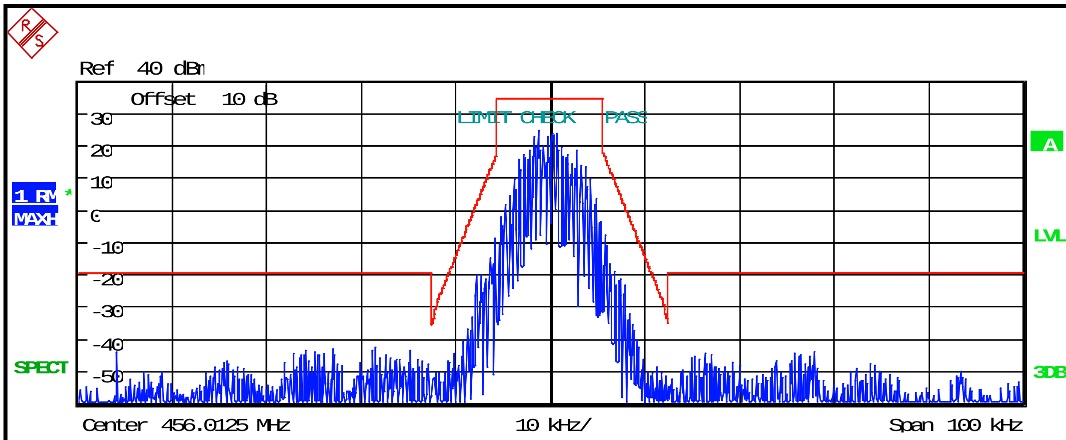
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	449.989373 M	-40.64	-74.30	-20.64
-12.490 k	-5.625 k	100.00	450.000162 M	-53.79	-87.46	-18.47
5.625 k	12.500 k	100.00	450.024938 M	-56.29	-89.96	-19.80
12.510 k	50.000 k	100.00	450.037025 M	-43.39	-77.05	-23.39

Date: 23.DEC.2014 11:13:10

Plot 7-78: Occupied Bandwidth – 454.0125 MHz; C4FM Phase 2 (Mask D)



Plot 7-79: Occupied Bandwidth – 456.0125 MHz; C4FM Phase 2 (Mask D)



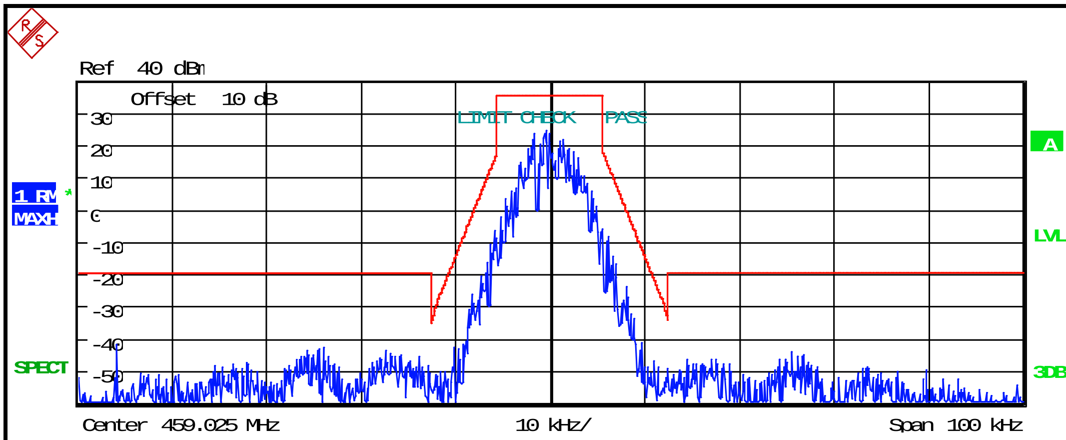
Tx Channel None

Bandwidth 6.25 kHz Power 34.05 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	455.989473 M	-43.51	-77.56	-23.51
-12.490 k	-5.625 k	100.00	456.000062 M	-52.80	-86.85	-16.16
5.625 k	12.500 k	100.00	456.024938 M	-57.12	-91.17	-20.61
12.510 k	50.000 k	100.00	456.038324 M	-44.79	-78.84	-24.79

Date: 23.DEC.2014 11:14:57

Plot 7-80: Occupied Bandwidth – 459.0250 MHz; C4FM Phase 2 (Mask D)



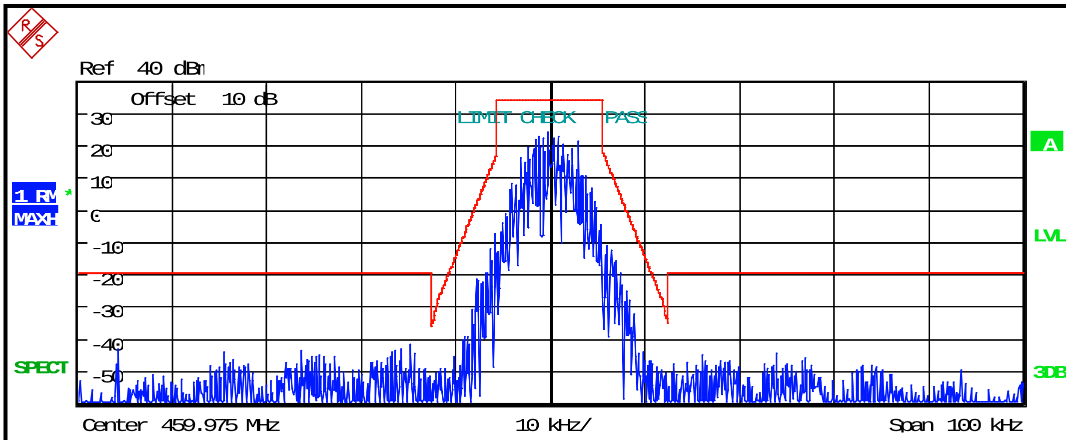
Tx Channel **None**

Bandwidth 6.25 kHz Power 34.87 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	458.979096 M	-42.14	-77.01	-22.14
-12.490 k	-5.625 k	100.00	459.012862 M	-51.43	-86.30	-20.92
5.625 k	12.500 k	100.00	459.037338 M	-49.24	-84.12	-16.24
12.510 k	50.000 k	100.00	459.050425 M	-44.50	-79.37	-24.50

Date: 23.DEC.2014 11:21:51

Plot 7-81: Occupied Bandwidth – 459.9750 MHz; C4FM Phase 2 (Mask D)

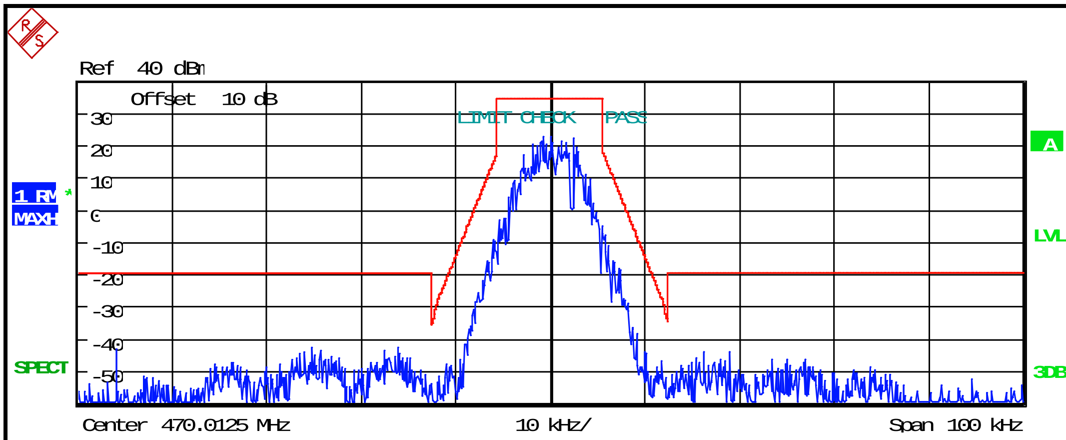


Tx Channel None
Bandwidth 6.25 kHz Power 33.74 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	459.960065 M	-41.77	-75.52	-21.77
-12.490 k	-5.625 k	100.00	459.962762 M	-51.08	-84.82	-18.13
5.625 k	12.500 k	100.00	459.987138 M	-50.65	-84.39	-19.13
12.510 k	50.000 k	100.00	459.998826 M	-44.68	-78.42	-24.68

Date: 23.DEC.2014 11:15:33

Plot 7-82: Occupied Bandwidth – 470.0125 MHz; C4FM Phase 2 (Mask D)



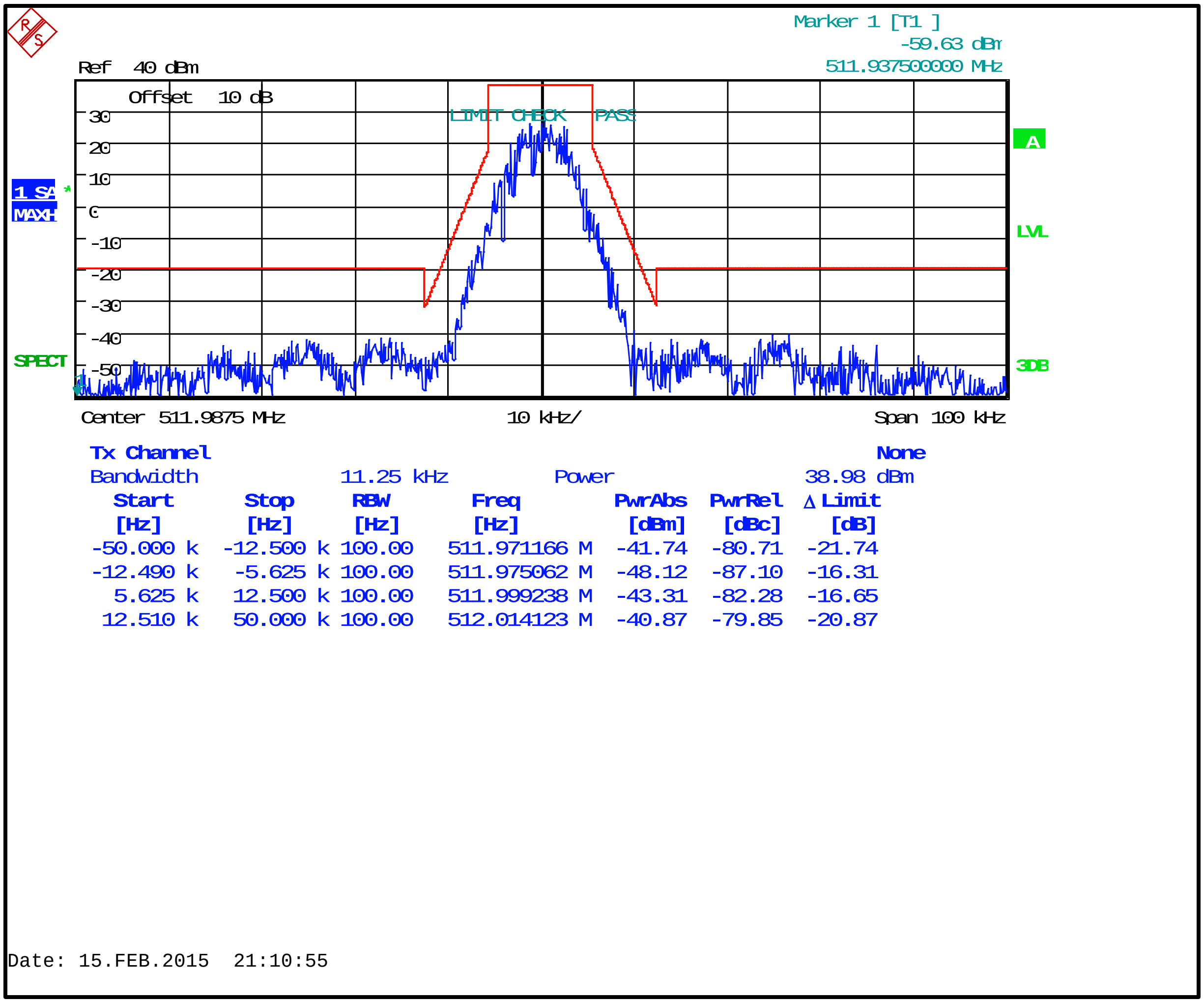
Tx Channel | **None**

Bandwidth 6.25 kHz Power 34.15 dBm

Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	PwrRel [dBc]	Δ Limit [dB]
-50.000 k	-12.500 k	100.00	469.987275 M	-42.86	-77.01	-22.86
-12.490 k	-5.625 k	100.00	470.000010 M	-57.42	-91.57	-21.57
5.625 k	12.500 k	100.00	470.024138 M	-47.01	-81.15	-20.47
12.510 k	50.000 k	100.00	470.028734 M	-44.14	-78.28	-24.14

Date: 23.DEC.2014 11:16:05

Plot 7-83: Occupied Bandwidth – 511.9875 MHz; C4FM Phase 2 (Mask D)



Plot 7-84: Occupied Bandwidth – 521.9875 MHz; C4FM Phase 2 (Mask D)

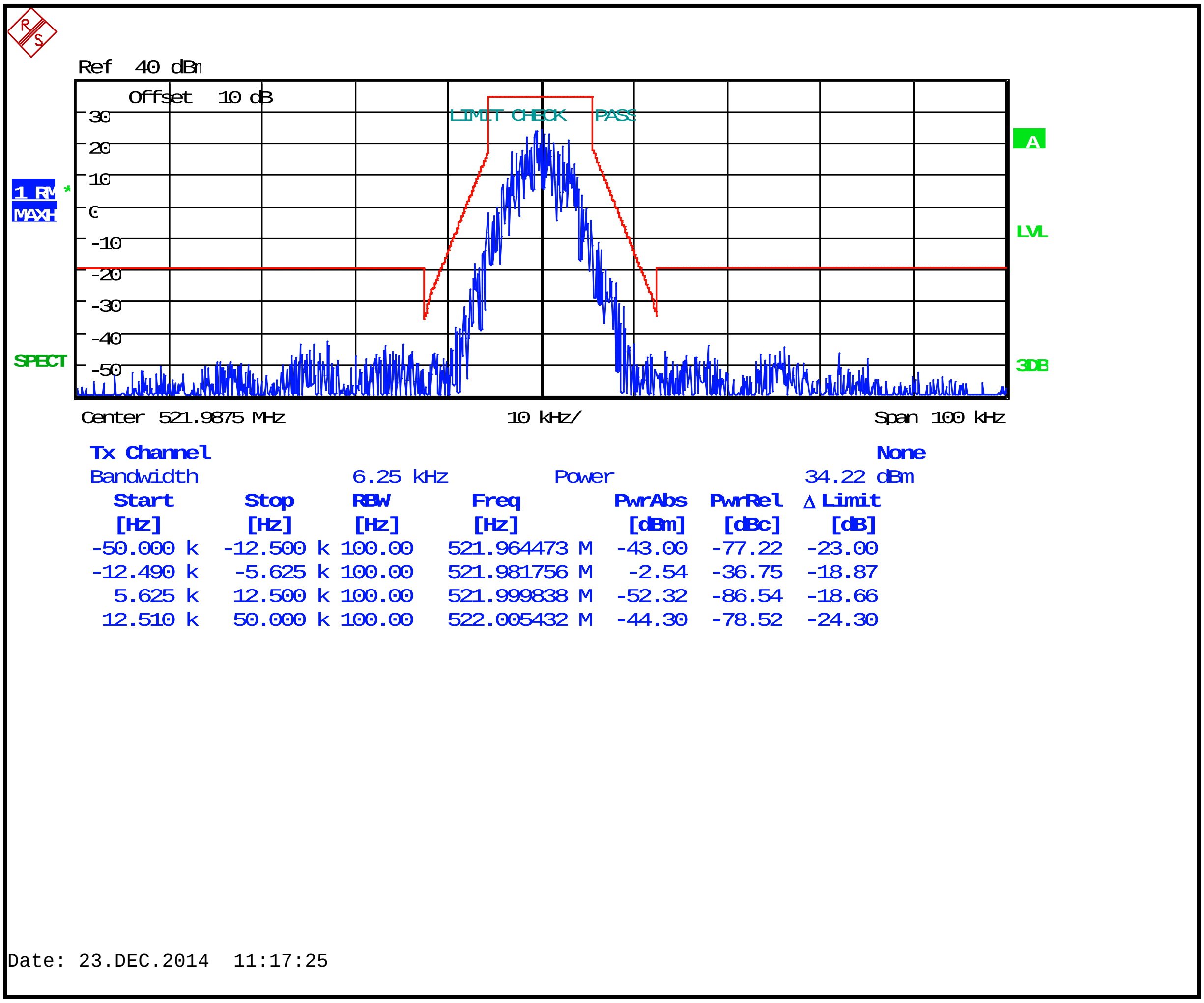


Table 7-1: Test Equipment Used For Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901581	Rohde & Schwarz	FSU	Spectrum Analyzer	1166.1660.50	11/13/15
900819	Weinschel Corporation	2	10 dB Attenuator; 5 W	BF0830	7/1/15
900948	Weinschel Corporation	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	6/16/15

Test Personnel:

Daniel Baltzell	*(signature)*	December 19 2014 – February 18, 2015
Test Engineer	Signature	Dates of Tests

8 FCC Rules and Regulation Part 2.1055: Frequency Stability; Part 90.213: Frequency Stability; Part 80.209: Frequency Stability; Part 74.464: Frequency Tolerance

8.1 Test Procedure

ANSI/TIA-603-D 2010, section 2.2.2

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The EUT was evaluated over the temperature range -30°C to +60°C.

The temperature was initially set to -30°C and a 1-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10 degrees centigrade through the range. A ½-hour period was observed to stabilize the EUT at each measurement step and the frequency stability was measured within one minute after application of primary power to the transmitter. Additionally, the power supply voltage of the EUT was varied +/-15% nominal input voltage.

§74.464: 30 to 300 MHz: 3 W or less - .005%; over 3 W - .0005%; 300 to 500 MHz: all powers - .0005%

§80.209: 10 ppm. 400-466 MHz 5 ppm

§90.213: Mobile stations over 2 W operating power - 1.5 ppm.

§90.213 Frequency Stability
(a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

MINIMUM FREQUENCY STABILITY
[Parts per million (ppm)]

Frequency range (MHz)	Fixed and base stations	Mobile stations: Over 2 watts output power	Mobile stations: 2 watts or less output power
Below 25	[1,2,3] 100	100	200
25–50	20	20	50
72–76	5	....	50
150–174	[5,11] 5	[6] 5	[4,6] 50
216–220	1.0	....	1.0
220–222 [12]	0.1	1.5	1.5
421–512	[7,11,14] 2.5	[8] 5	[8] 5
806–809	[14] 1.0	1.5	1.5
809–824	[14] 1.5	2.5	2.5
851–854	1.0	1.5	1.5
854–869	1.5	2.5	2.5
896–901	[14] 0.1	1.5	1.5
902–928	2.5	2.5	2.5
902–928 [13]	2.5	2.5	2.5
929–930	1.5	....	....
935–940	0.1	1.5	1.5
1427–1435	[9] 300	300	300
Above 2450 [10]	....	....	....

8.2 Test Data

Table 8-1: Temperature Frequency Stability – 378.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	378.0125166	0.04
-20	378.0125287	0.08
-10	378.0125261	0.07
0	378.0125000	0.00
10	378.0124901	-0.03
20 (reference)	378.0125000	0.00
30	378.0124114	-0.23
40	378.0124534	-0.12
50	378.0124817	-0.05
60	378.0125215	0.06

Table 8-2: Temperature Frequency Stability – 406.1000 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	406.1000184	0.05
-20	406.1000314	0.08
-10	406.1000273	0.07
0	406.1000000	0.00
10	406.0999896	-0.03
20 (reference)	406.1000000	0.00
30	406.0999294	-0.17
40	406.0999517	-0.12
50	406.0999822	-0.04
60	406.1000246	0.06

Table 8-3: Temperature Frequency Stability – 418.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	418.0125188	0.04
-20	418.0125311	0.07
-10	418.0125280	0.07
0	418.0125000	0.00
10	418.0124886	-0.03
20 (reference)	418.0125000	0.00
30	418.0124283	-0.17
40	418.0124505	-0.12
50	418.0124798	-0.05
60	418.0125229	0.05

Table 8-4: Temperature Frequency Stability – 430.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	430.0125192	0.04
-20	430.0125320	0.07
-10	430.0125278	0.06
0	430.0125000	0.00
10	430.0124882	-0.03
20 (reference)	430.0125000	0.00
30	430.0124262	-0.17
40	430.0124498	-0.12
50	430.0124782	-0.05
60	430.0125264	0.06

Table 8-5: Temperature Frequency Stability – 450.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	450.0125194	0.04
-20	450.0125333	0.07
-10	450.0125291	0.06
0	450.0125000	0.00
10	450.0124870	-0.03
20 (reference)	450.0125000	0.00
30	450.0124240	-0.17
40	450.0124464	-0.12
50	450.0124768	-0.05
60	450.0125217	0.05

Table 8-6: Temperature Frequency Stability – 454.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	454.0125192	0.04
-20	454.0125342	0.08
-10	454.0125295	0.06
0	454.0125000	0.00
10	454.0124866	-0.03
20 (reference)	454.0125000	0.00
30	454.0124214	-0.17
40	454.0124446	-0.12
50	454.0124713	-0.06
60	454.0125245	0.05

Table 8-7: Temperature Frequency Stability – 456.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm

-30	456.0125176	0.04
-20	456.0125343	0.08
-10	456.0125305	0.07
0	456.0125000	0.00
10	456.0124863	-0.03
20 (reference)	456.0125000	0.00
30	456.0124179	-0.18
40	456.0124446	-0.12
50	456.0124738	-0.06
60	456.0125222	0.05

Table 8-8: Temperature Frequency Stability – 459.0250 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	459.0250172	0.04
-20	459.0250347	0.08
-10	459.0250294	0.06
0	459.0250000	0.00
10	459.0249856	-0.03
20 (reference)	459.0250000	0.00
30	459.0249179	-0.18
40	459.0249427	-0.12
50	459.0249705	-0.06
60	459.0250187	0.04

Table 8-9: Temperature Frequency Stability – 459.9750 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	459.9750179	0.04
-20	459.9750346	0.08
-10	459.9750260	0.06
0	459.9750000	0.00
10	459.9749848	-0.03
20 (reference)	459.9750000	0.00
30	459.9749229	-0.17
40	459.9749436	-0.12
50	459.9749744	-0.06
60	459.9751198	0.26

Table 8-10: Temperature Frequency Stability – 470.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	470.0125133	0.03
-20	470.0125321	0.07
-10	470.0125328	0.07
0	470.0125000	0.00
10	470.0124849	-0.03
20 (reference)	470.0125000	0.00
30	470.0124239	-0.16
40	470.0124416	-0.12
50	470.0124762	-0.05
60	470.0125264	0.06

Table 8-11: Temperature Frequency Stability – 511.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	511.987514	0.03
-20	511.987540	0.08
-10	511.987535	0.07
0	511.987500	0.00
10	511.987483	-0.03
20 (reference)	511.987500	0.00
30	511.987427	-0.14
40	511.987438	-0.12
50	511.987478	-0.04
60	511.987527	0.05

Table 8-12: Temperature Frequency Stability – 521.9875 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	521.9875170	0.03
-20	521.9875401	0.08
-10	521.9875357	0.07
0	521.9875000	0.00
10	521.9874822	-0.03
20 (reference)	521.9875000	0.00
30	521.9874199	-0.15
40	521.9874369	-0.12
50	521.9874775	-0.04
60	521.9875282	0.05

Result: The EUT is compliant.

8.2.1 Frequency Stability/Voltage Variation

Table 8-13: Frequency Stability/Voltage Variation – 378.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	378.012480	-0.05
6.12	378.012260	-0.63
7.20	378.012500	0.00
8.28	378.012470	-0.08

Table 8-14: Frequency Stability/Voltage Variation – 406.1000 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	406.099920	-0.20
6.12	406.099940	-0.15
7.20	406.100000	0.00
8.28	406.099950	-0.12

Table 8-15: Frequency Stability/Voltage Variation – 418.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	418.012310	-0.45
6.12	418.012320	-0.43
7.20	418.012500	0.00
8.28	418.012450	-0.12

Table 8-16: Frequency Stability/Voltage Variation – 430.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	430.012300	-0.47
6.12	430.012290	-0.49
7.20	430.012500	0.00
8.28	430.012400	-0.23

Table 8-17: Frequency Stability/Voltage Variation – 450.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	450.012610	0.24
6.12	450.012620	0.27
7.20	450.012500	0.00
8.28	450.012600	0.22

Table 8-18: Frequency Stability/Voltage Variation – 454.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	454.012720	0.48
6.12	454.012740	0.53
7.20	454.012500	0.00
8.28	454.012730	0.51

Table 8-19: Frequency Stability/Voltage Variation – 456.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	456.012450	-0.11

6.12	456.012450	-0.11
7.20	456.012500	0.00
8.28	456.012500	0.00

Table 8-20: Frequency Stability/Voltage Variation – 459.0250 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	459.025000	0.00
6.12	459.025010	0.02
7.20	459.025000	0.00
8.28	459.024990	-0.02

Table 8-21: Frequency Stability/Voltage Variation – 459.9750 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	459.975130	0.28
6.12	459.975120	0.26
7.20	459.975000	0.00
8.28	459.975130	0.28

Table 8-22: Frequency Stability/Voltage Variation – 470.0125 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	470.012770	0.57
6.12	470.012480	-0.04
7.20	470.012500	0.00
8.28	470.012760	0.55

Table 8-23: Frequency Stability/Voltage Variation – 511.9875 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	511.987510	0.02
6.12	511.987830	0.64
7.20	511.987500	0.00
8.28	511.987850	0.68

Table 8-24: Frequency Stability/Voltage Variation – 521.9875 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
6.0 (Battery End Point)	521.987660	0.31
6.12	521.987640	0.27
7.20	521.987500	0.00
8.28	521.987840	0.65

Table 8-25: Test Equipment Used For Testing Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	1/13/16

901118	Hewlett Packard	HP8901B	Modulation Analyzer 150kHz-1300MHz	901057	4/1/15
900948	Weinschel Corporation	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	6/16/15
901124	Alinco	DM-33MVT 32A	Power Supply	1638	N/A
901350	Meterman	33XR	Multimeter	040402802	3/20/15

Test Personnel:

Daniel Baltzell		January 2, 2015
EMC Test Engineer	Signature	Date of Test

9 FCC Part 2.1047: Modulation Characteristics; Part 80.213: Modulation Requirements; Part 74.463: Modulation Requirements.

§74.463 Modulation requirements.

(a) Each new remote pickup broadcast station authorized to operate with a power output in excess of 3 watts shall be equipped with a device which will automatically prevent modulation in excess of the limits set forth in this subpart.
(b) If amplitude modulation is employed, modulation shall not exceed 100 percent on negative peaks.
(c) If frequency modulation is employed, emission shall conform to

§80.213 Modulation requirements.

(a)(2) When Phase or frequency modulation is used in the 156–162 MHz band, the peak modulation must be maintained between 75 and 100 percent. A frequency deviation of ±5 kHz is defined as 100 percent peak modulation.
(b) Radiotelephone transmitters using A3E, F3E and G3E emission must have a modulation limiter to prevent any modulation over 100 percent. This requirement does not apply to survival craft transmitters, to transmitters that do not require a license, or to transmitters whose output power does not exceed 3 watts.
(d) Ship and coast station transmitters operating in the 156–162 MHz and 216–220 MHz bands must be capable of proper operation with a frequency deviation that does not exceed ±5 kHz when using any emission authorized by §80.207.
(e) Coast station transmitters operating in the 156–162 MHz band must be equipped with an audio low-pass filter. The filter must be installed between the modulation limiter and the modulated radio frequency stage. At frequencies between 3 kHz and 20 kHz it must have an attenuation greater than at 1 kHz by at least 60log10(f/3) dB where ''f'' is the audio frequency in kilohertz. At frequencies above 20 kHz the attenuation must be at least 50 dB greater than at 1 kHz.

9.1 Test Procedures

9.1.1 Audio Frequency Response

ANSI/TIA-603-D 2010, section 2.2.6

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

The input audio level at 1000 Hz was set to produce 20% of the rated system deviation. This point is shown as the 0 dB reference level, noted DEVref. The audio signal generator was varied from 100 Hz to 5 kHz with the input level held constant. The deviation in kHz was recorded using a modulation analyzer as DEVfreq. The response in dB relative to 1 kHz was calculated as follows:

Audio Frequency Response = 20 LOG (DEVfreq/DEVref)

9.1.2 Audio Low Pass Filter Response

ANSI/TIA-603-D 2010, 2.2.15

The Audio Low Pass Filter Response is the frequency response of the post limiter low pass filter circuit above 3000 Hz.

9.1.3 Modulation Limiting

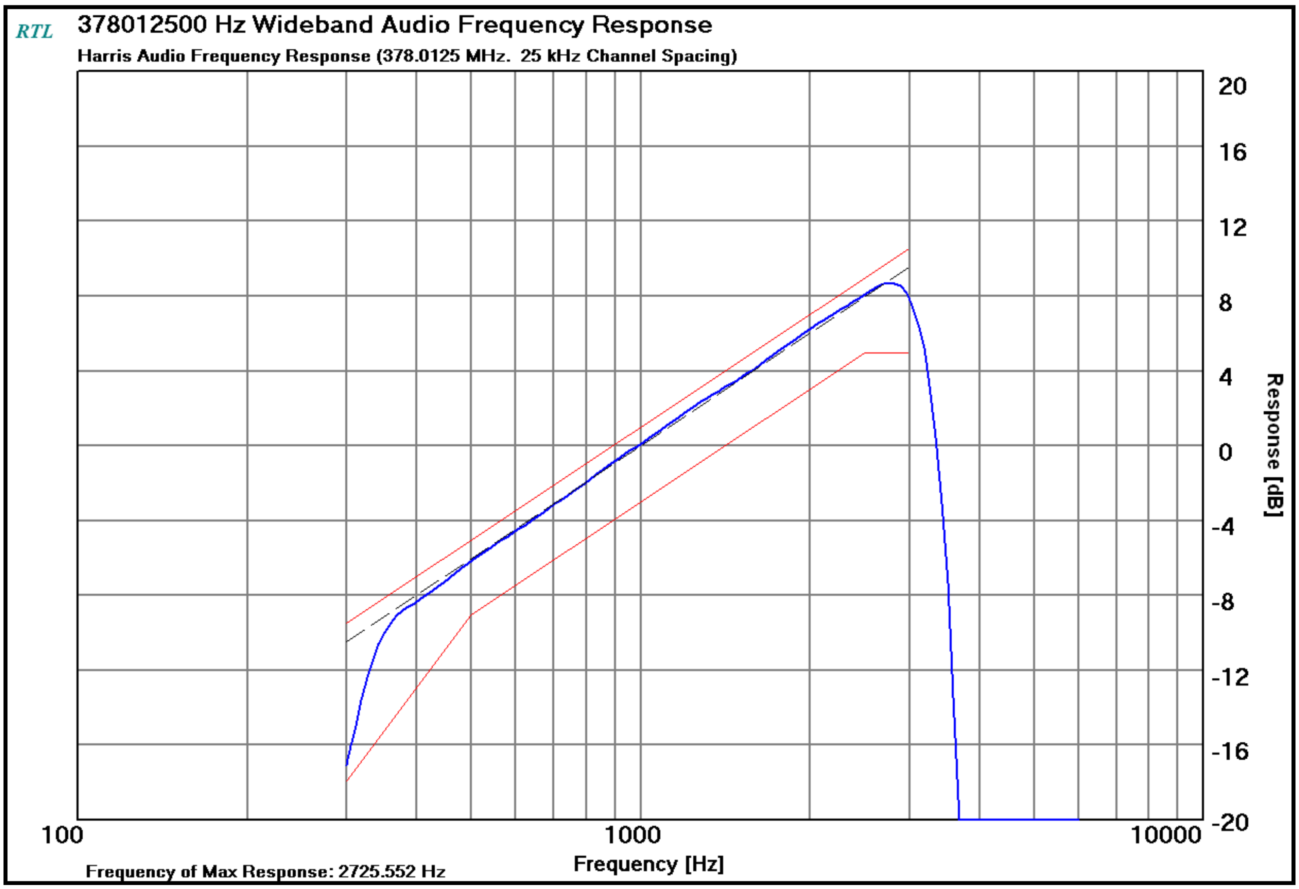
ANSI/TIA-603-D 2010, section 2.2.3

The transmitter was adjusted for full rated system deviation. The audio input level was adjusted for 60% of rated system deviation at 1000 Hz. Using this level (0 dB) as a reference, the audio input level was varied from the reference +/-20 dB for modulation frequencies of 300 Hz, 1,000 Hz, and 2,500 Hz. The system deviation obtained as a function of the input level was recorded. Both positive and negative peak deviations were recorded.

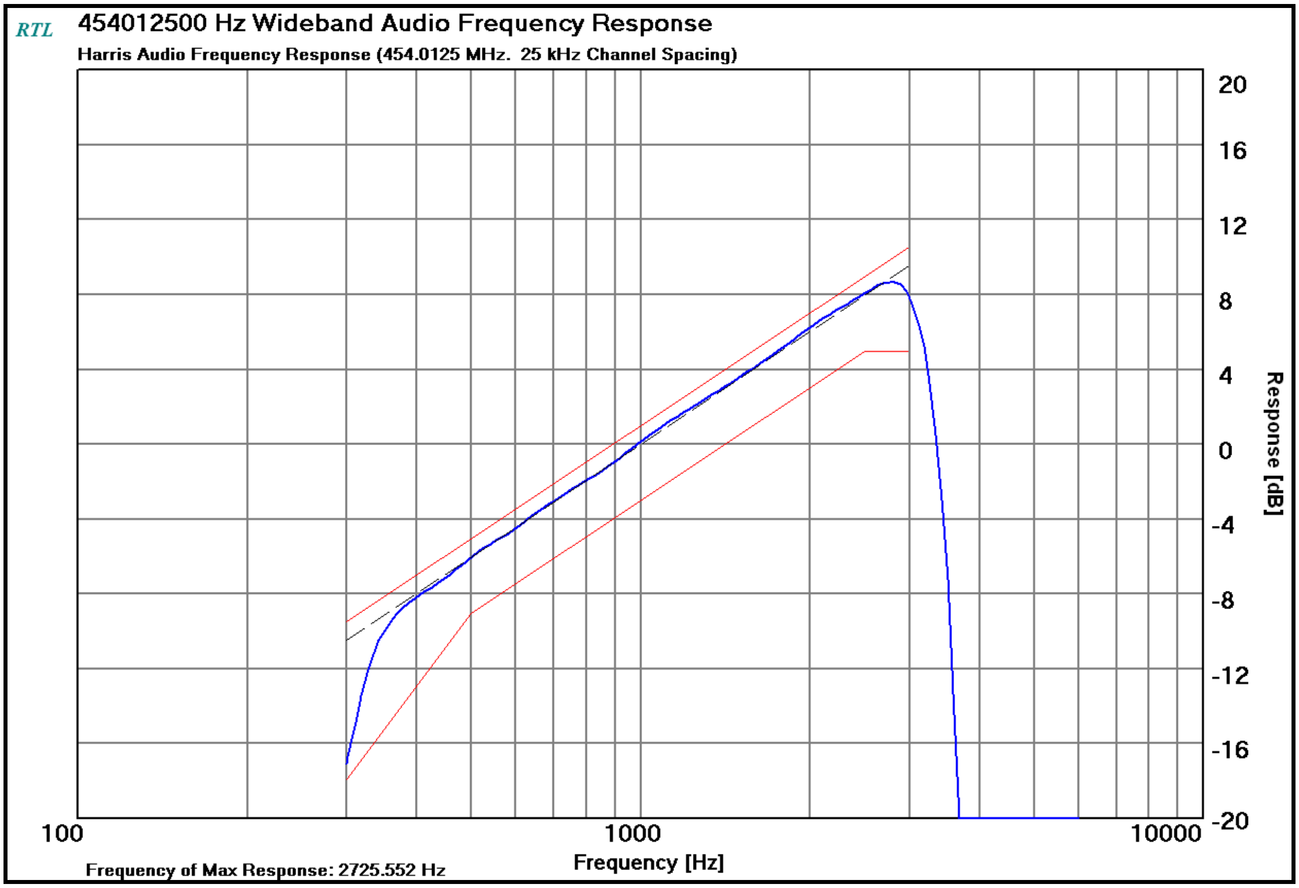
9.2 Test Data

9.2.1 Audio Frequency Response

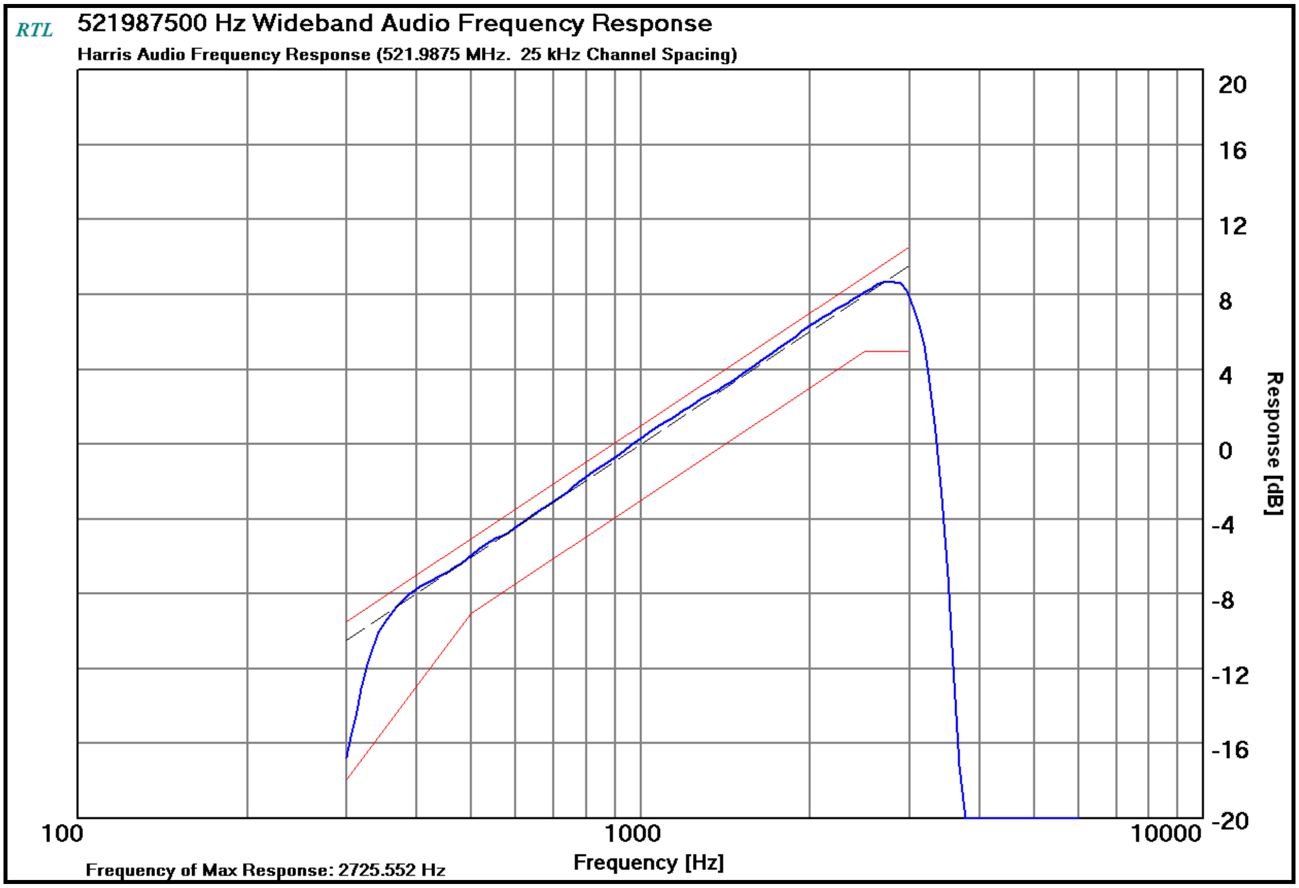
Plot 9-1: Modulation Characteristics - Audio Frequency Response – 378.0125 MHz



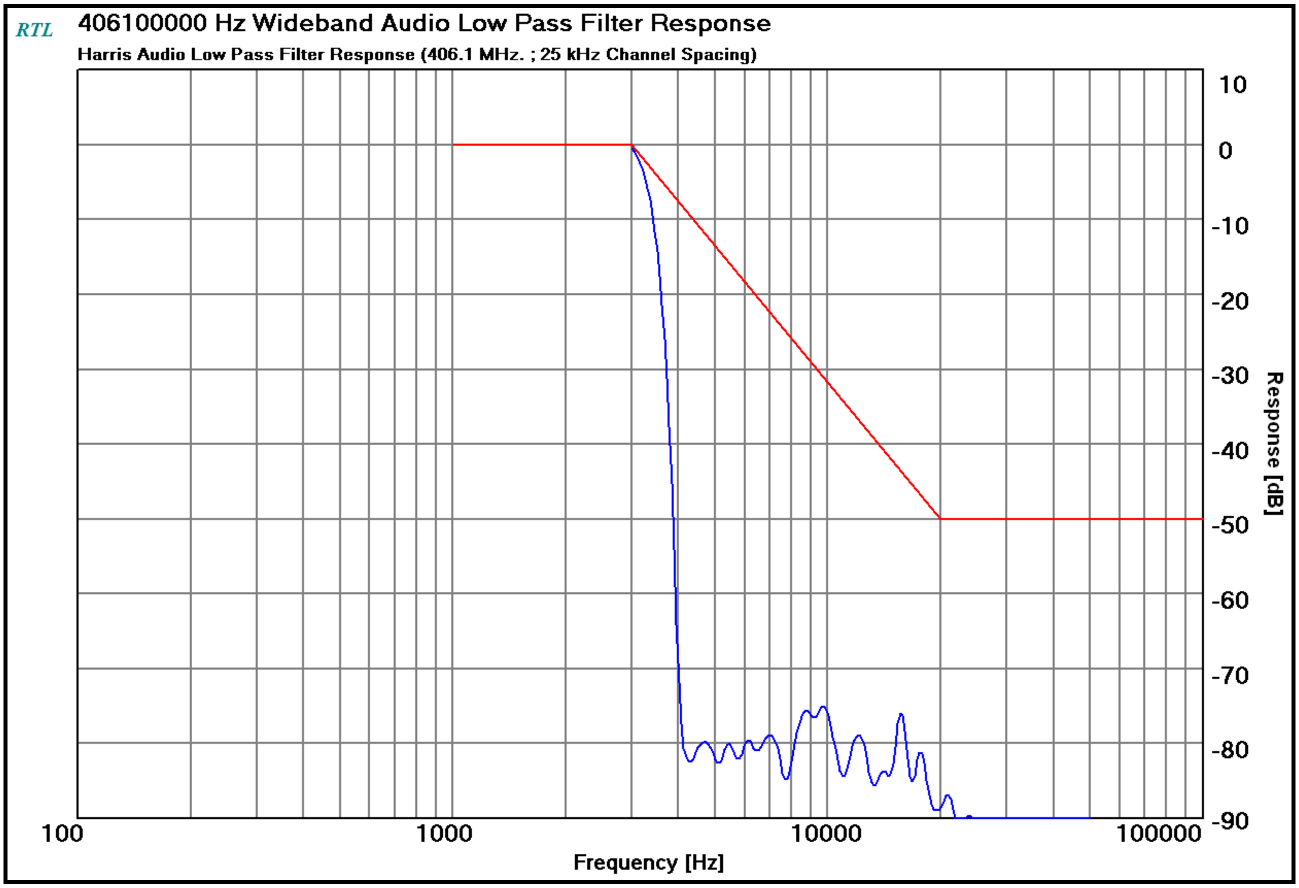
Plot 9-2: Modulation Characteristics - Audio Frequency Response – 454.0125 MHz



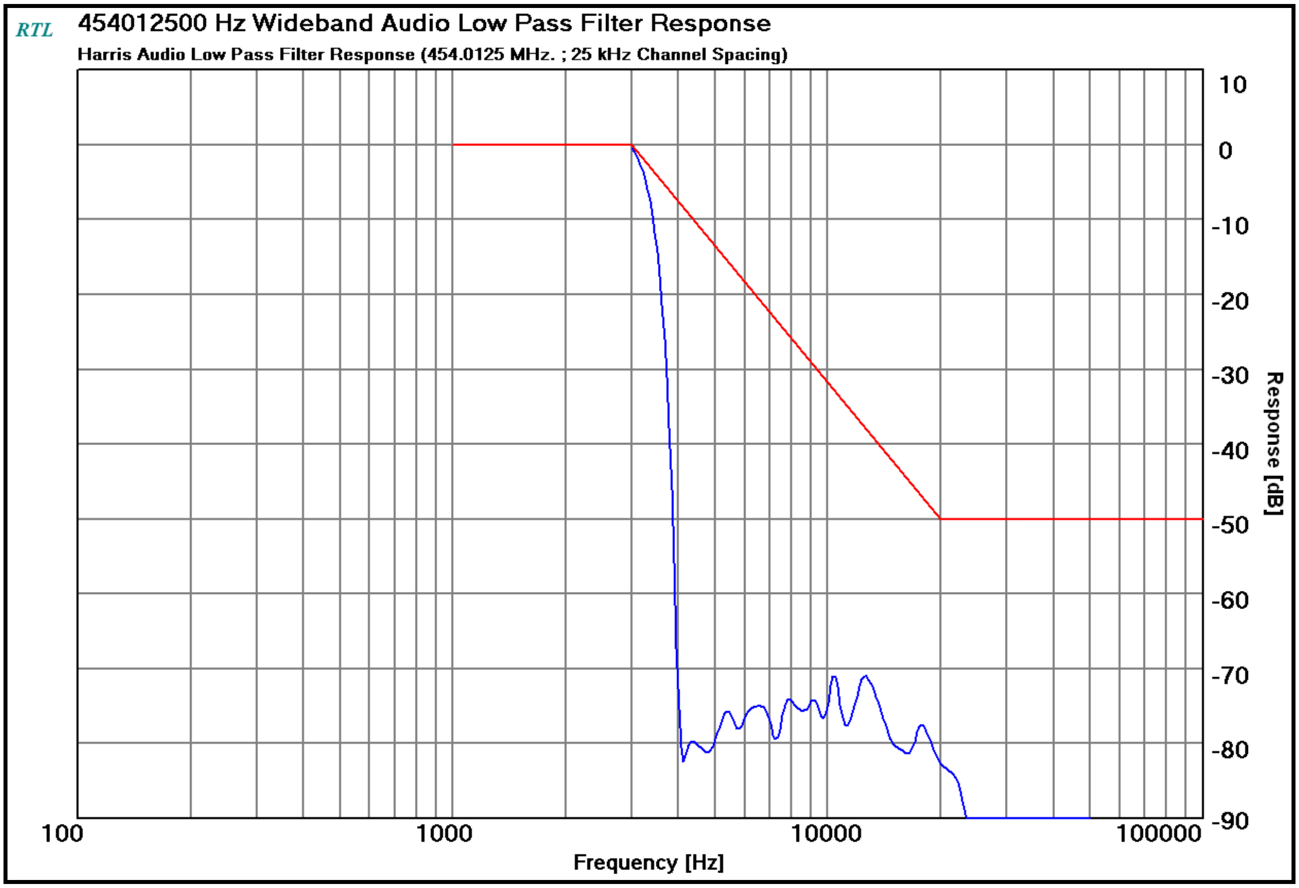
Plot 9-3: Modulation Characteristics - Audio Frequency Response – 521.9875 MHz



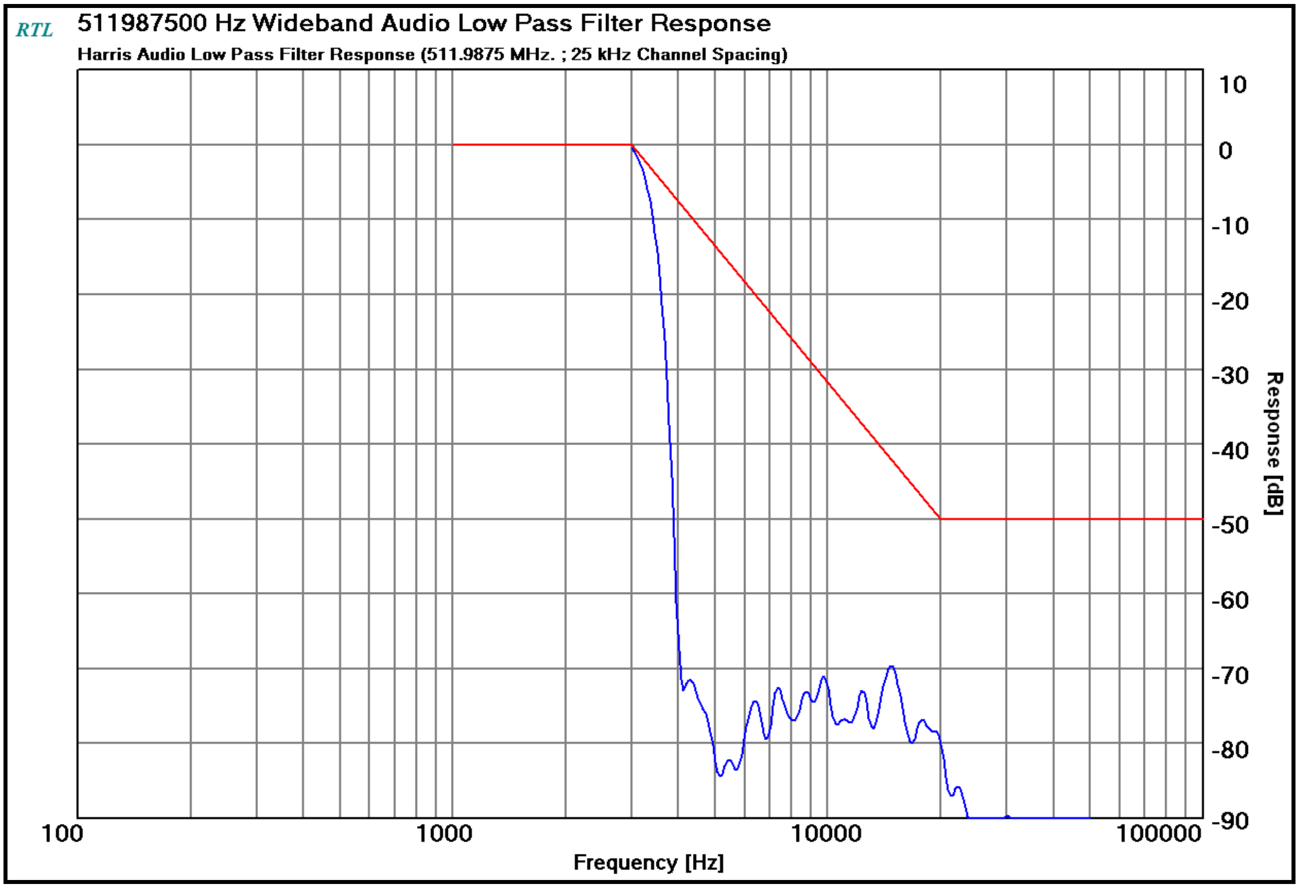
Plot 9-4: Modulation Characteristics – Audio Low Pass Filter – 406.1000 MHz (WB)



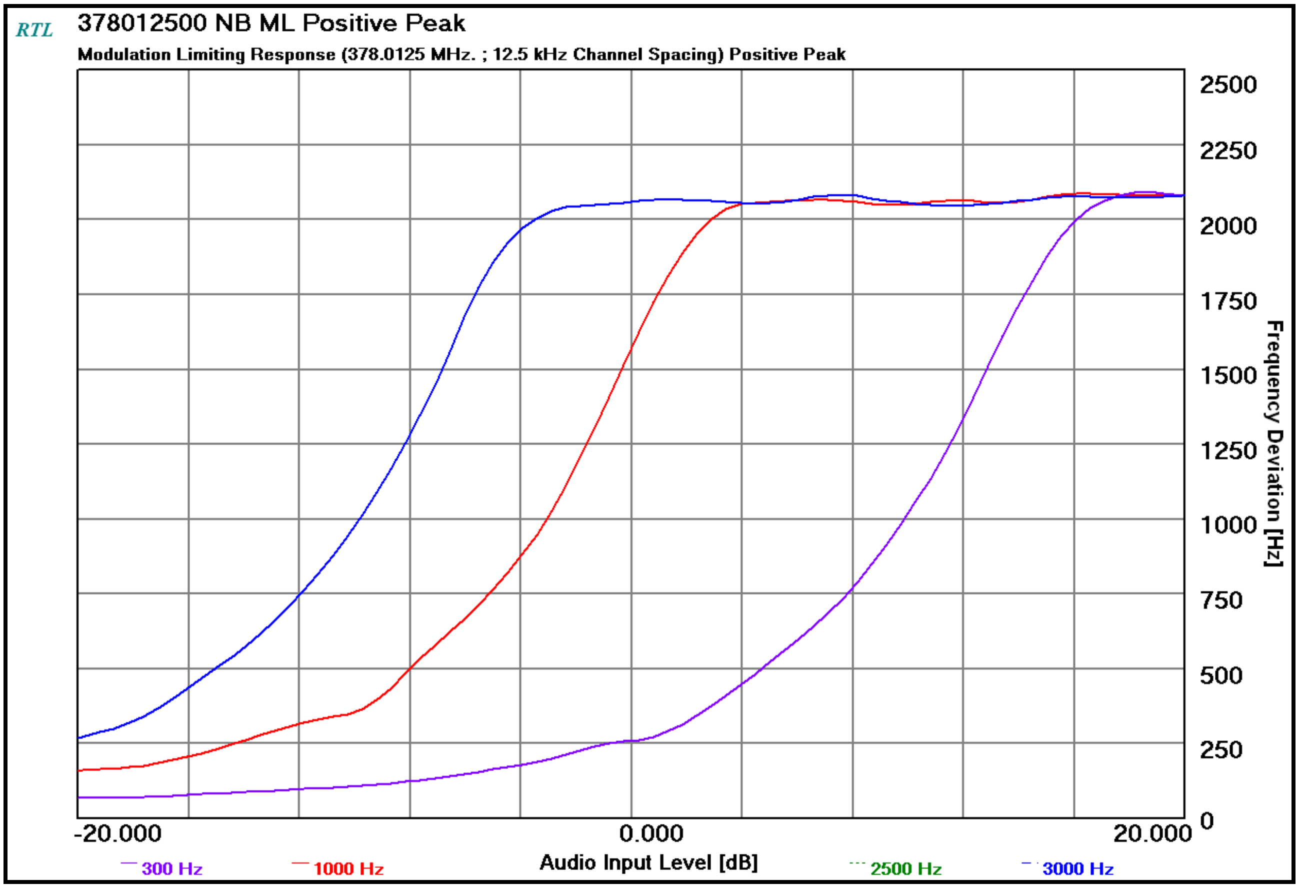
Plot 9-5: Modulation Characteristics – Audio Low Pass Filter – 454.0125 MHz (WB)



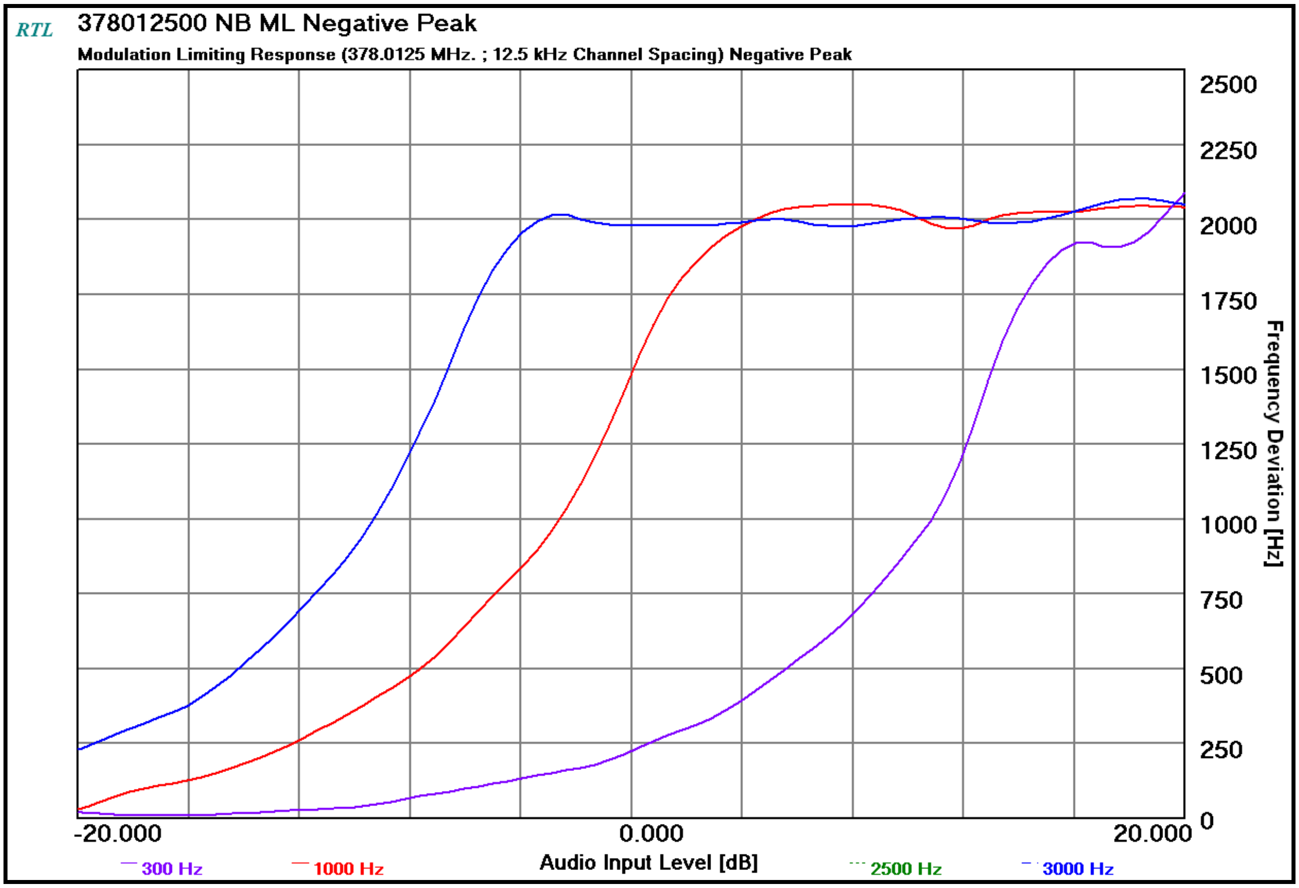
Plot 9-6: Modulation Characteristics – Audio Low Pass Filter – 511.9875 MHz (NB)



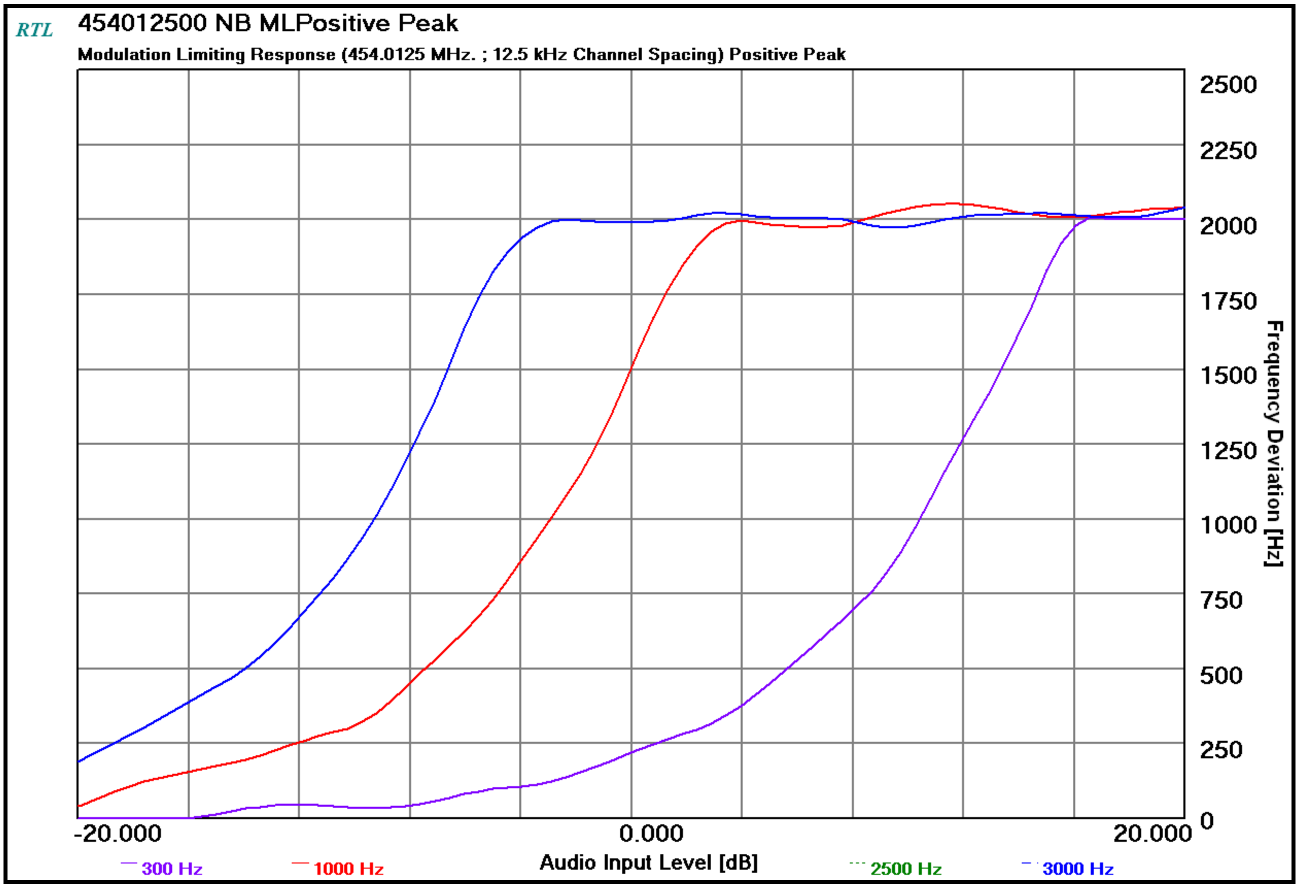
Plot 9-7: Modulation Characteristics – Modulation Limiting – 378.0125 MHz; Positive Peak; NB



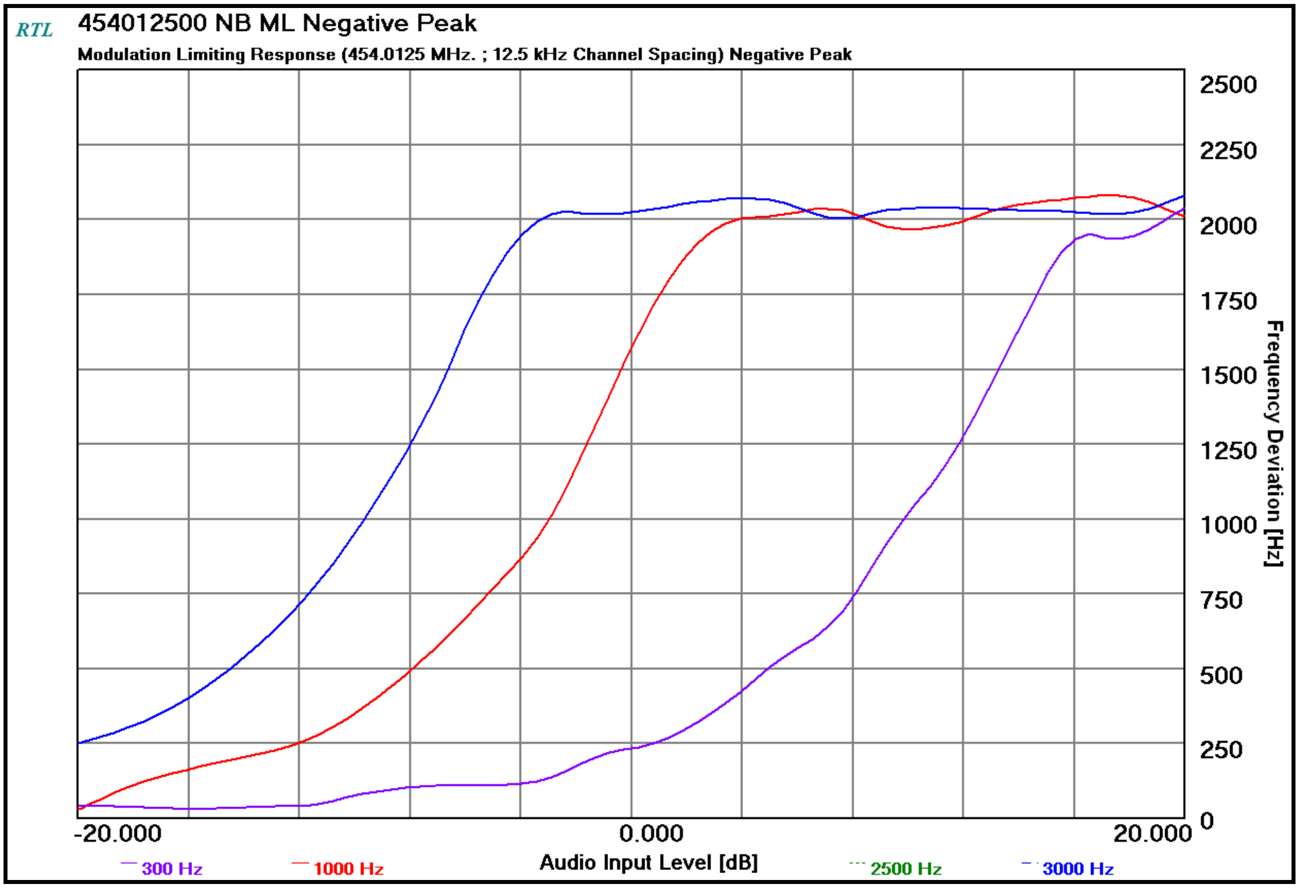
Plot 9-8: Modulation Characteristics – Modulation Limiting – 378.0125 MHz; Negative Peak; NB



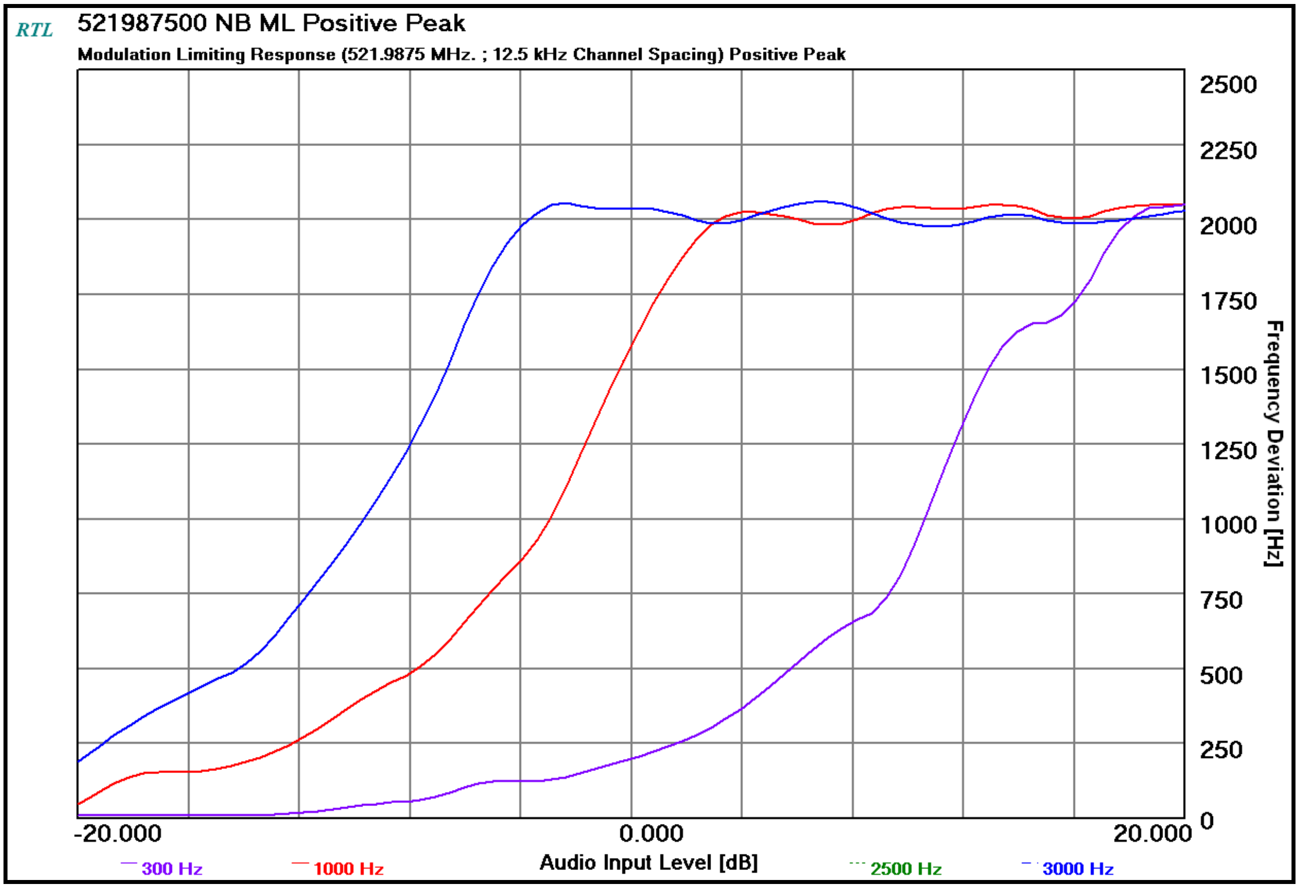
Plot 9-9: Modulation Characteristics – Modulation Limiting – 454.0125 MHz; Positive Peak; NB



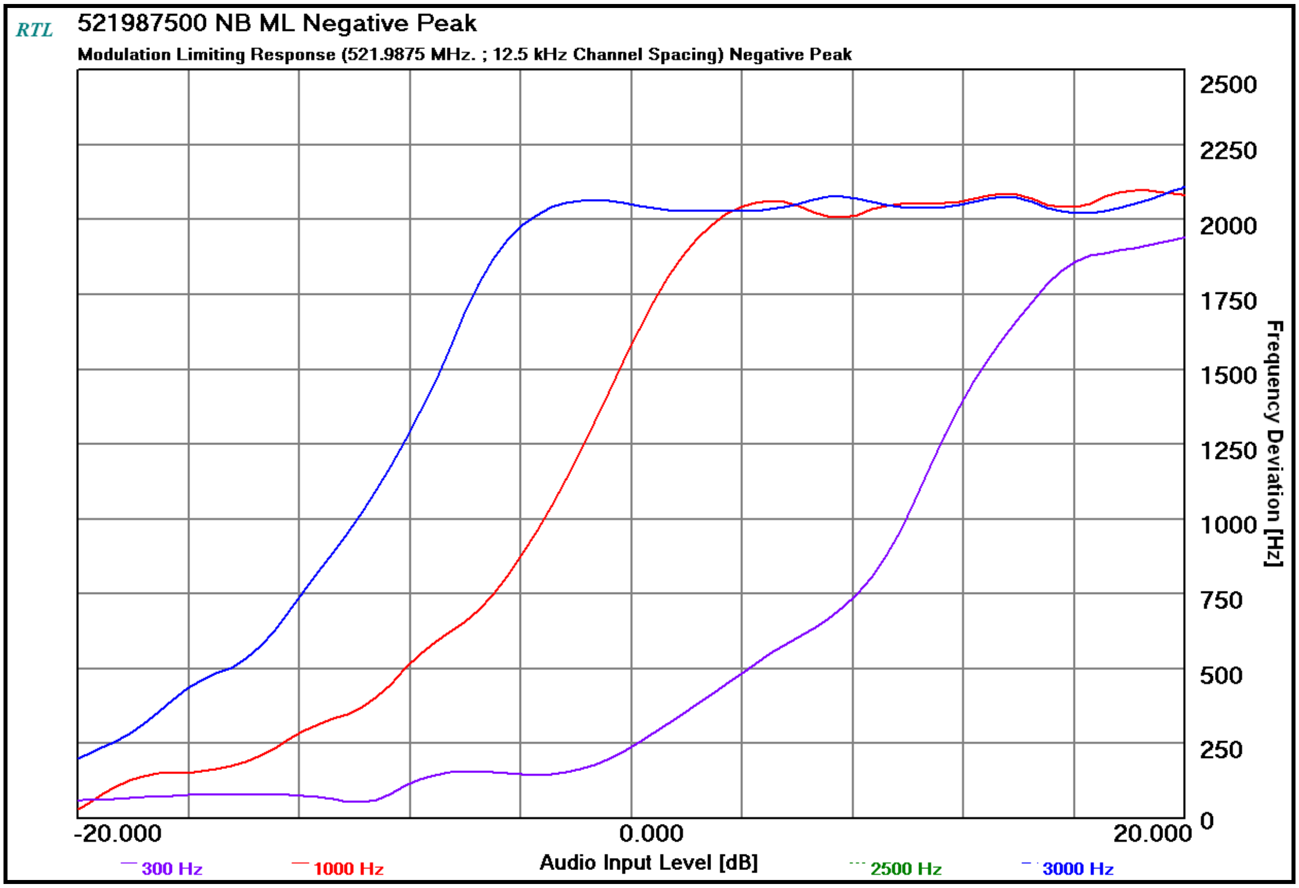
Plot 9-10: Modulation Characteristics – Modulation Limiting – 454.0125 MHz; Negative Peak; NB



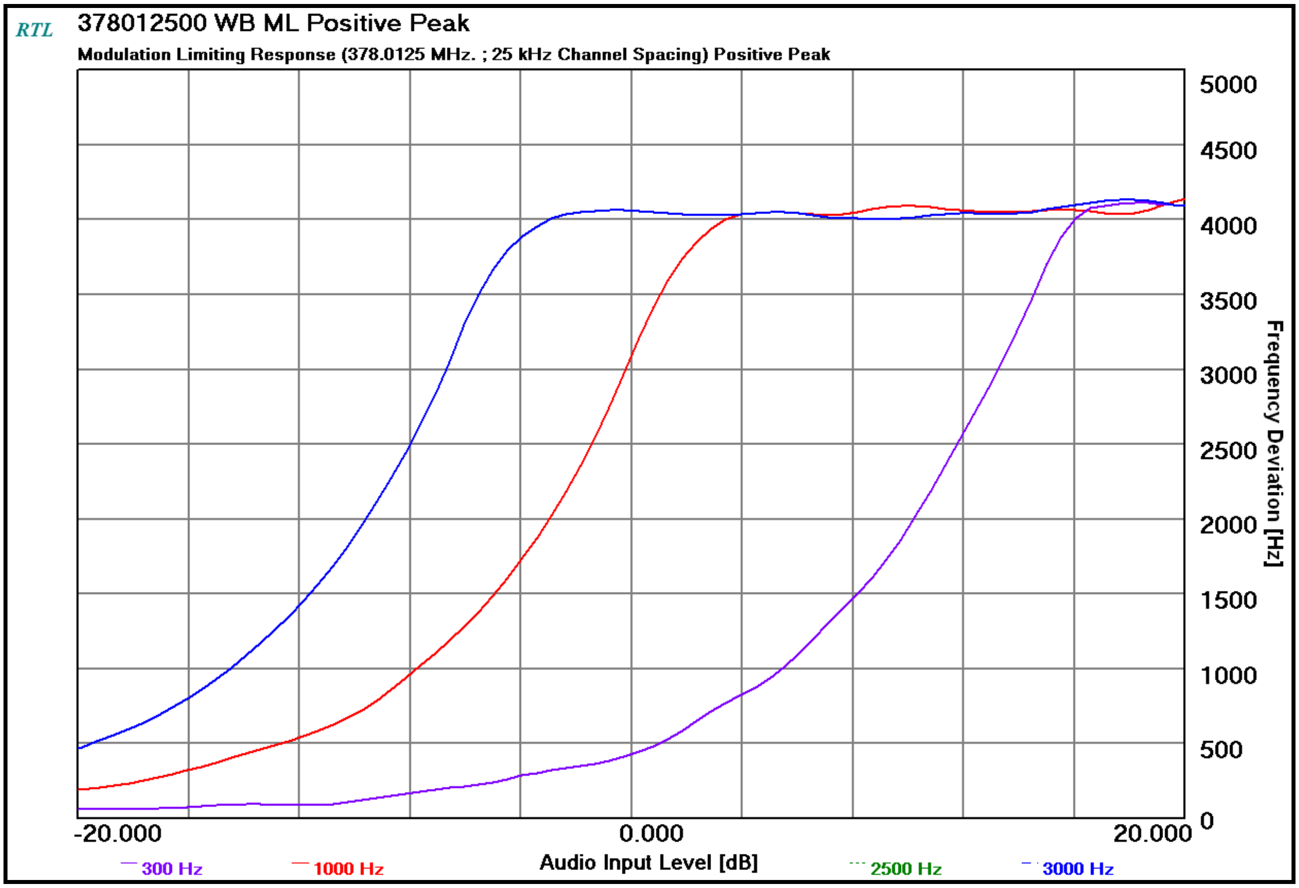
Plot 9-11: Modulation Characteristics – Modulation Limiting – 521.9875 MHz; Positive Peak; NB



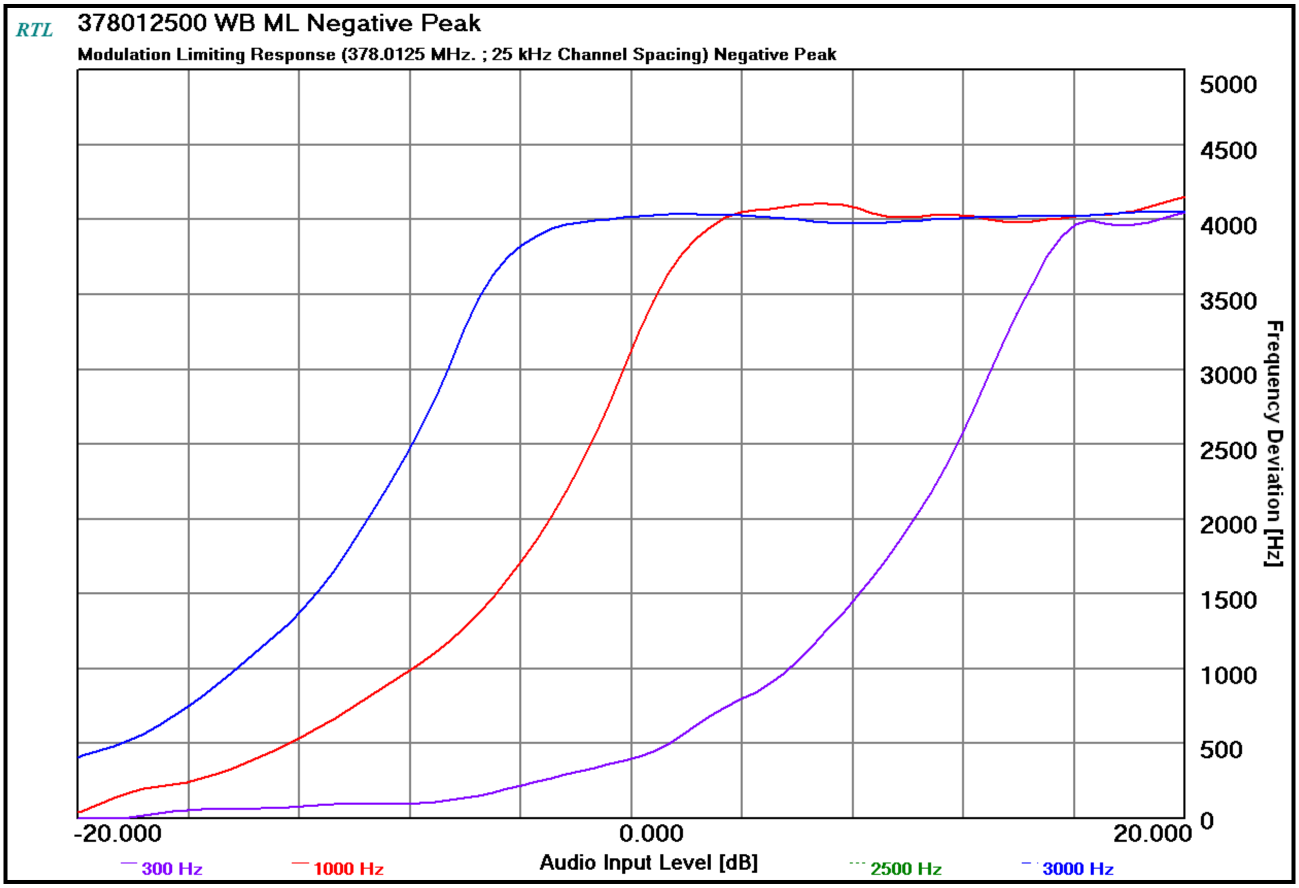
Plot 9-12: Modulation Characteristics – Modulation Limiting - 521.9875 MHz; Negative Peak; NB



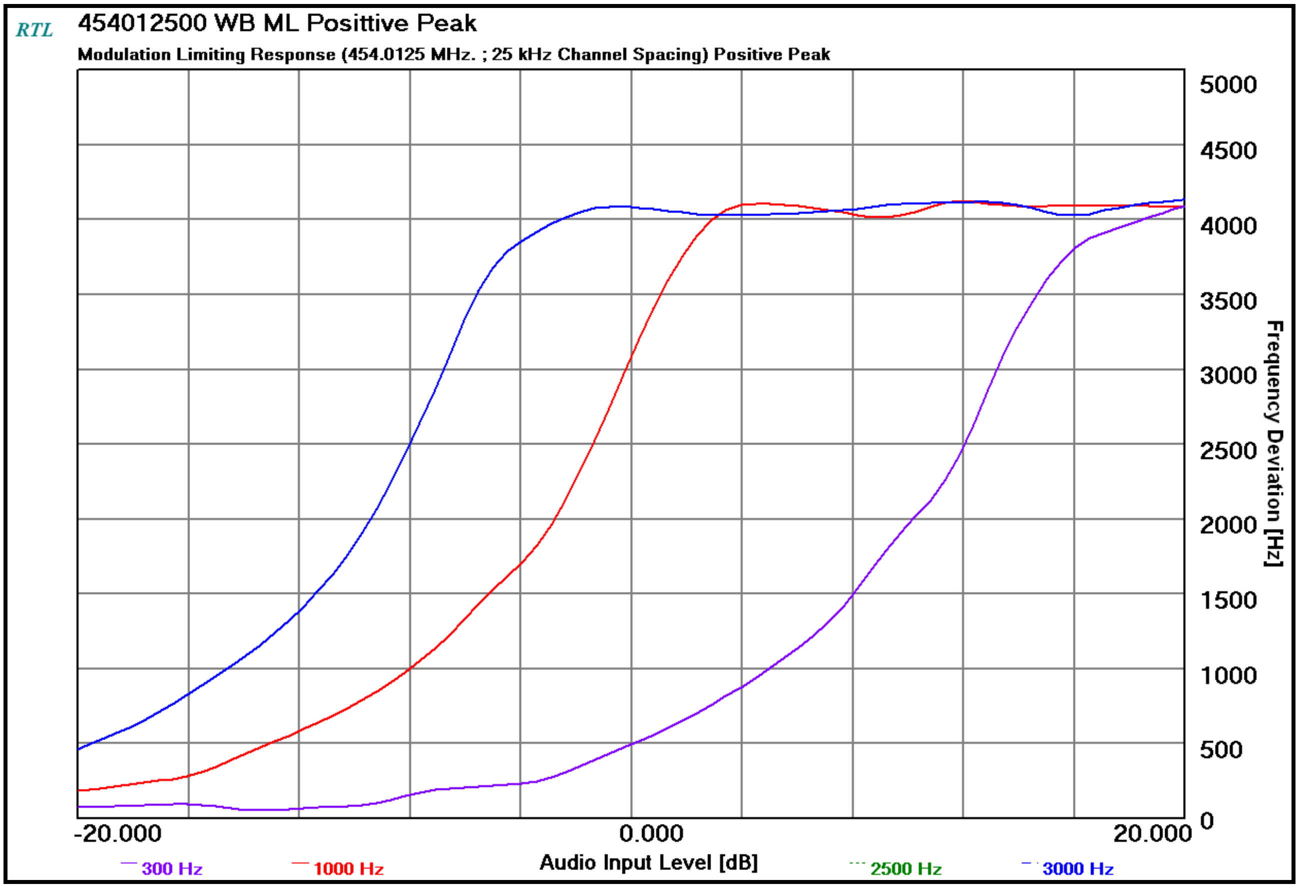
Plot 9-13: Modulation Characteristics – Modulation Limiting – 378.0125 MHz; Positive Peak; WB



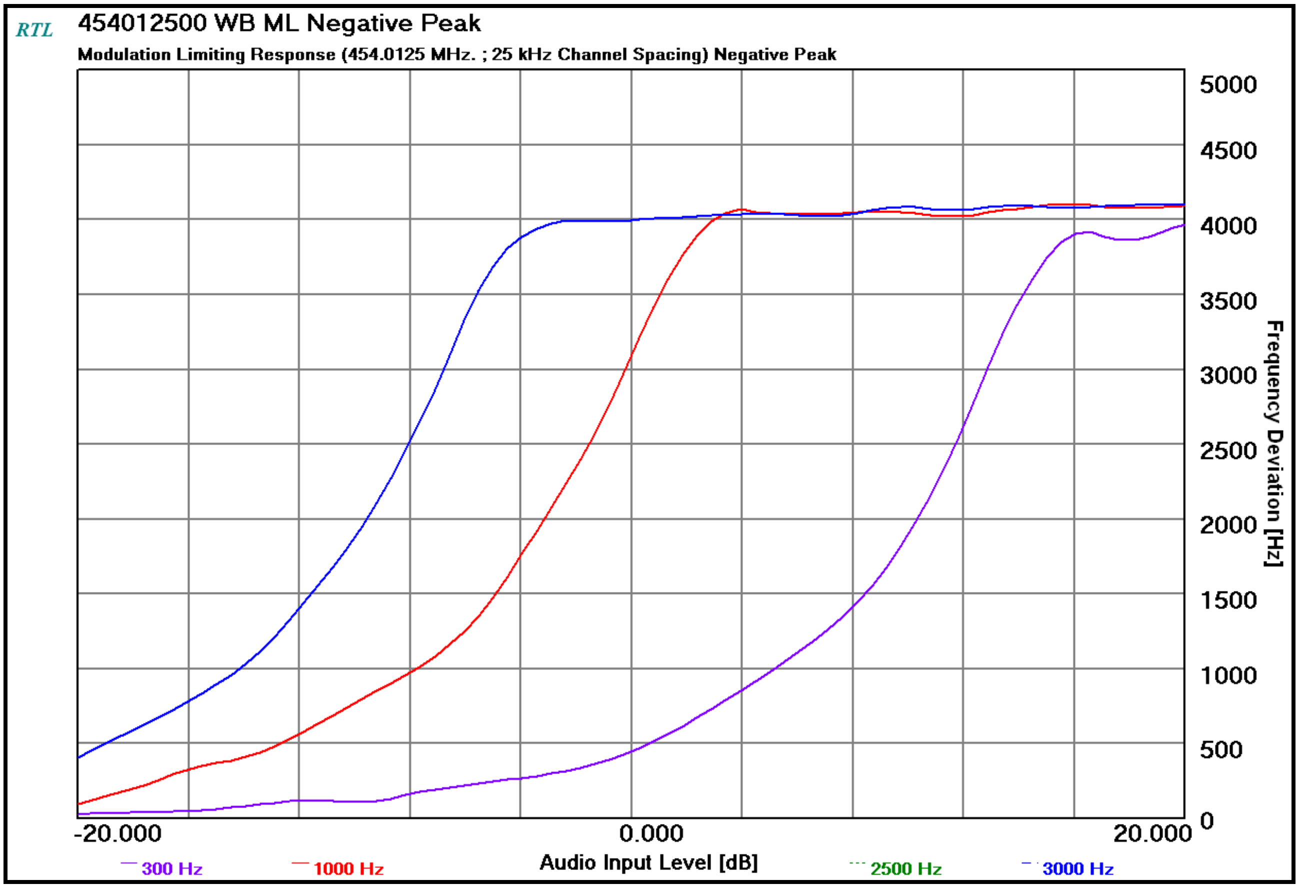
Plot 9-14: Modulation Characteristics – Modulation Limiting – 378.0125 MHz; Negative Peak; WB



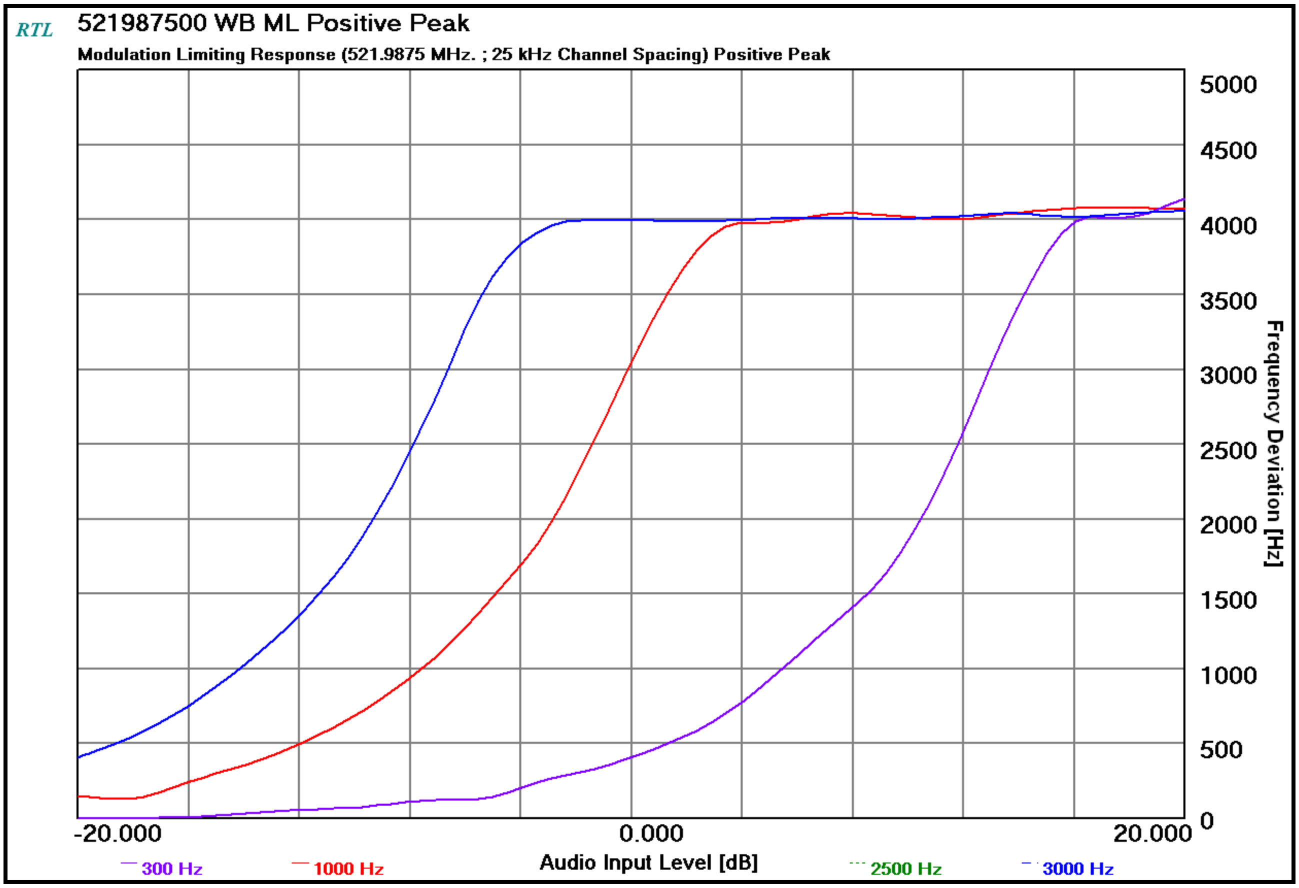
Plot 9-15: Modulation Characteristics – Modulation Limiting – 454.0125 MHz; Positive Peak; WB



Plot 9-16: Modulation Characteristics – Modulation Limiting – 454.0125 MHz; Negative Peak; WB



Plot 9-17: Modulation Characteristics – Modulation Limiting – 521.9875 MHz; Positive Peak; WB



Plot 9-18: Modulation Characteristics – Modulation Limiting - 521.9875 MHz; Negative Peak; WB

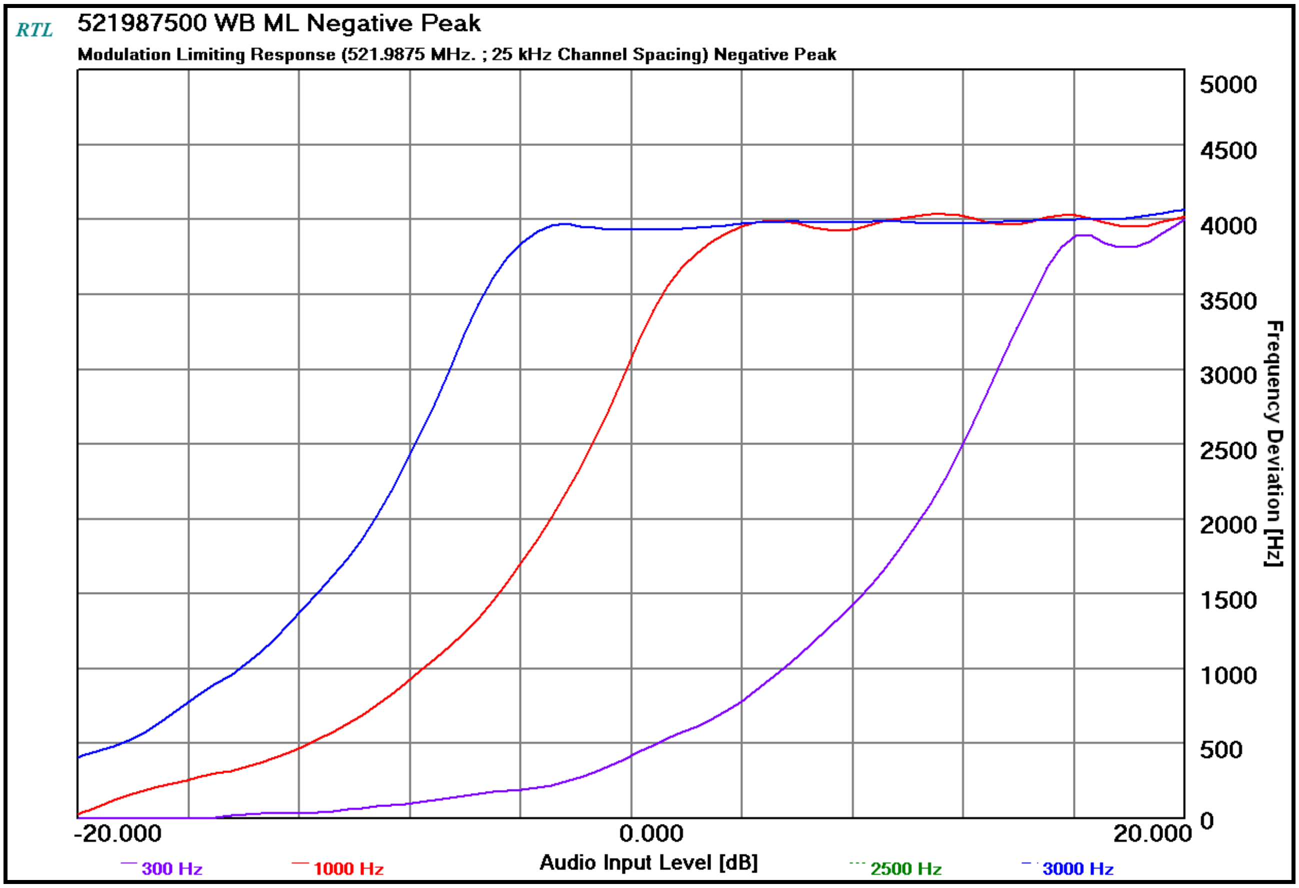


Table 9-1: Test Equipment Used For Modulation Requirements

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	4/17/15
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	4/1/15
901054	Hewlett Packard	3586B	Selective Level Meter	1928A01892	4/9/15
900948	Weinschel Corporation	47-10-43	10 dB Attenuator DC-18 GHz 50W	BH1487	6/16/15

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	January 3-8, 2015
Test Engineer	Signature	Dates of Tests

10 FCC Rules and Regulations Part 90.214: Transient Frequency Response; Part 74.462(c): Authorized Bandwidth and Emissions

10.1 Test Procedure

TIA-EIA-603-C 2004, section 2.2.3. Transmitter plots were taken with the radio set at high power.

§90.214 Transient Frequency Behavior

Transmitters designed to operate in the 150–174 MHz and 421–512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time intervals [1,2]	Maximum frequency difference [3]	All equipment: 150 to 174 MHz	All equipment: 421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
t_1 [4]	±25.0 kHz	5.0 ms	10.0 ms
t_2	±12.5 kHz	20.0 ms	25.0 ms
t_3 [4]	±25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
t_1 [4]	±12.5 kHz	5.0 ms	10.0 ms
t_2	±6.25 kHz	20.0 ms	25.0 ms
t_3 [4]	±12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels			
t_1 [4]	±6.25 kHz	5.0 ms	10.0 ms
t_2	±3.125 kHz	20.0 ms	25.0 ms
t_3 [4]	±6.25 kHz	5.0 ms	10.0 ms

[1] t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

t_1 is the time period immediately following t_{on}.

t_2 is the time period immediately following t_1.

t_3 is the time period from the instant when the transmitter is turned off until t_{off}.

t_{off} is the instant when the 1 kHz test signal starts to rise.

[2] During the time from the end of t_2 to the beginning of t_3, the frequency difference must not exceed the limits specified in § 90.213.

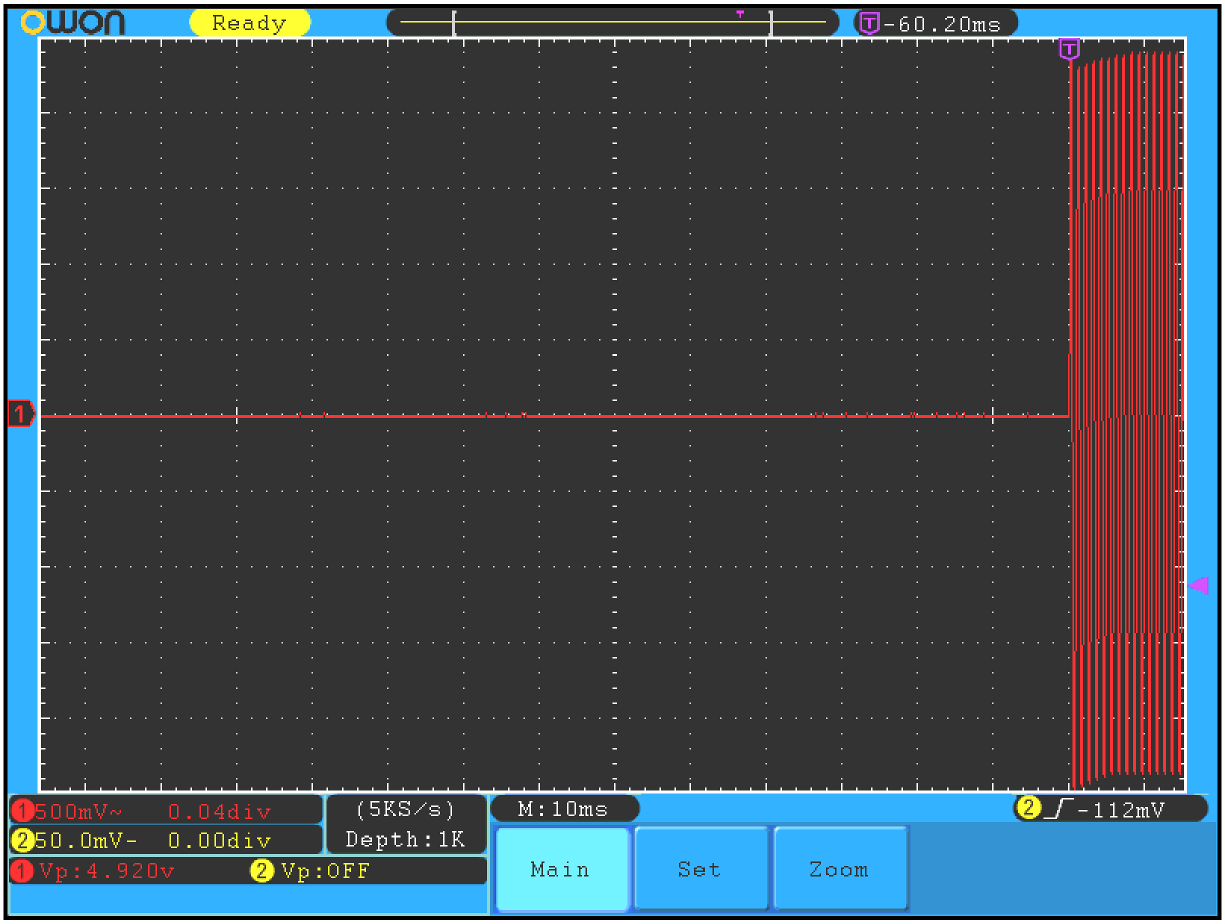
[3] Difference between the actual transmitter frequency and the assigned transmitter frequency.

[4] If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

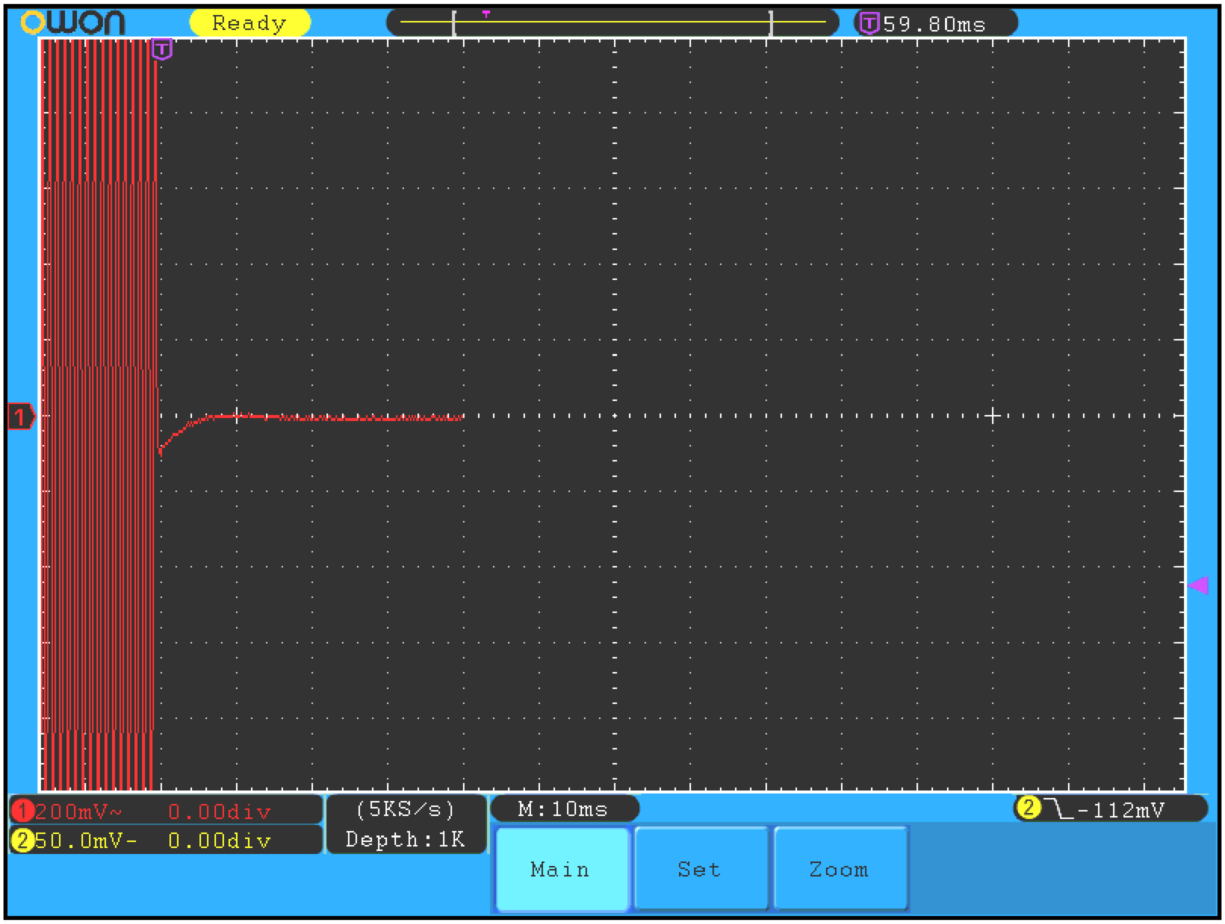
10.2 Test Data

Plot 10-1: Transient Frequency Behavior – 430.0125 MHz; Wide Band; Carrier ON Time

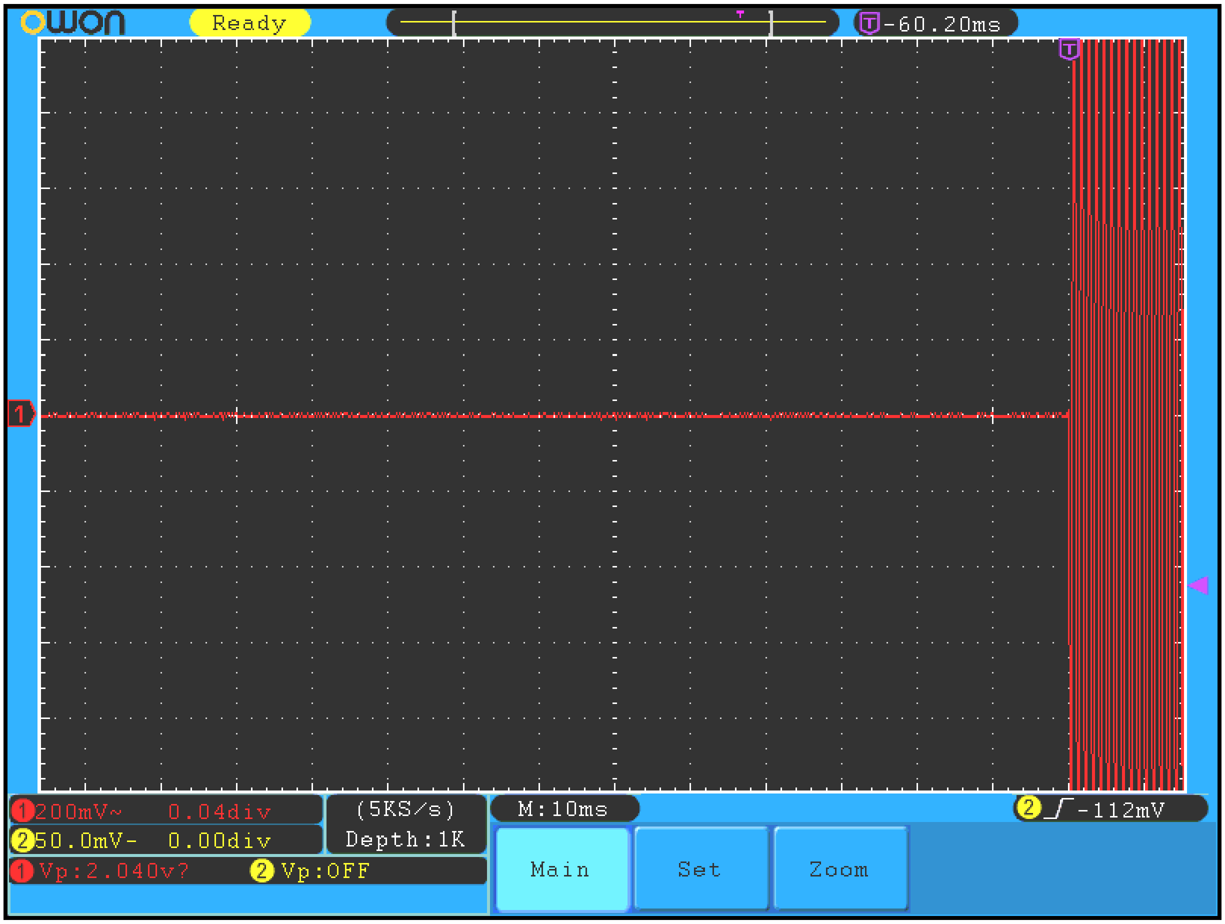
Plot 10-2: Transient Frequency Behavior – 430.0125 MHz; Wide Band; Carrier OFF Time



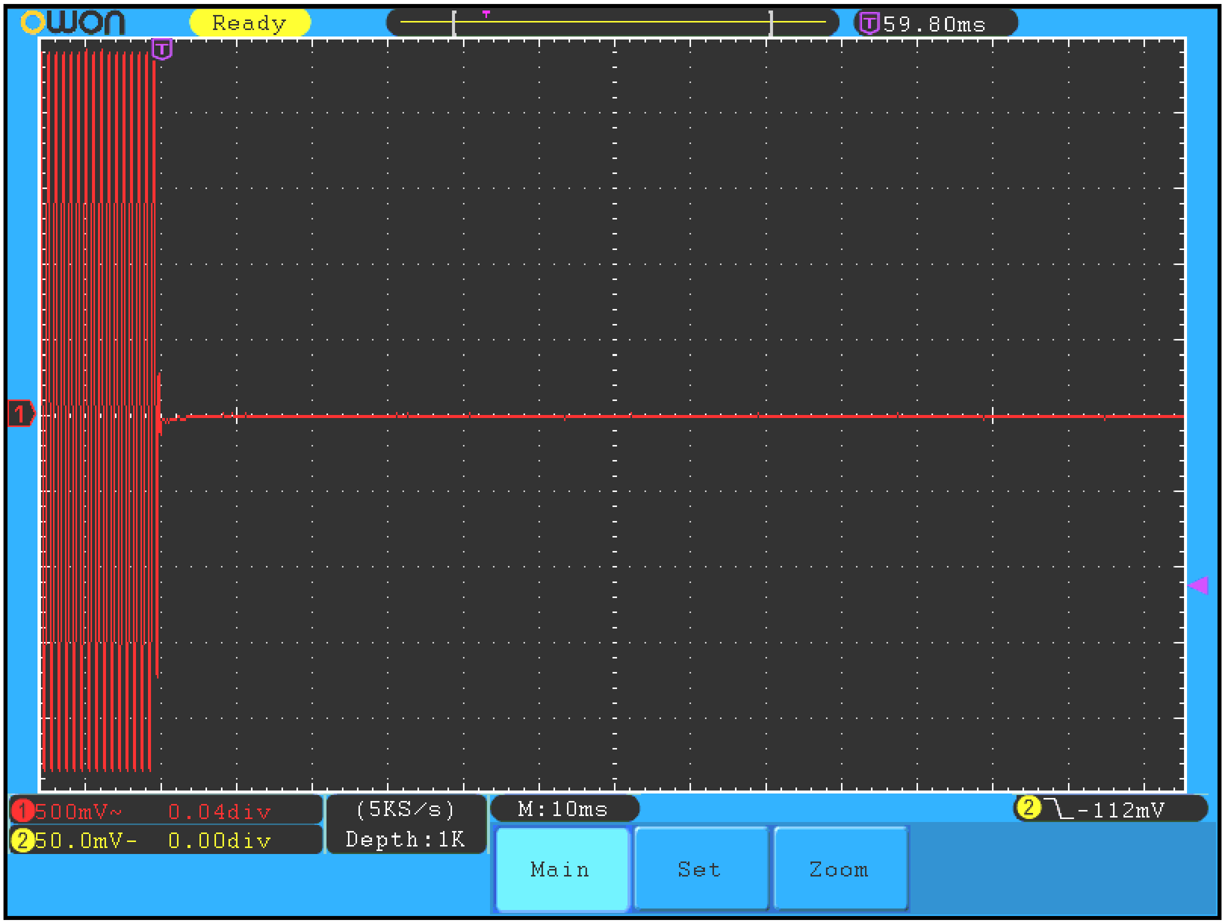
Plot 10-3: Transient Frequency Behavior – 430.0125 MHz; Narrow Band; Carrier ON Time



Plot 10-4: Transient Frequency Behavior – 430.0125 MHz; Narrow Band; Carrier OFF Time



Plot 10-5: Transient Frequency Behavior – 470.0125 MHz; Wide Band; Carrier ON Time

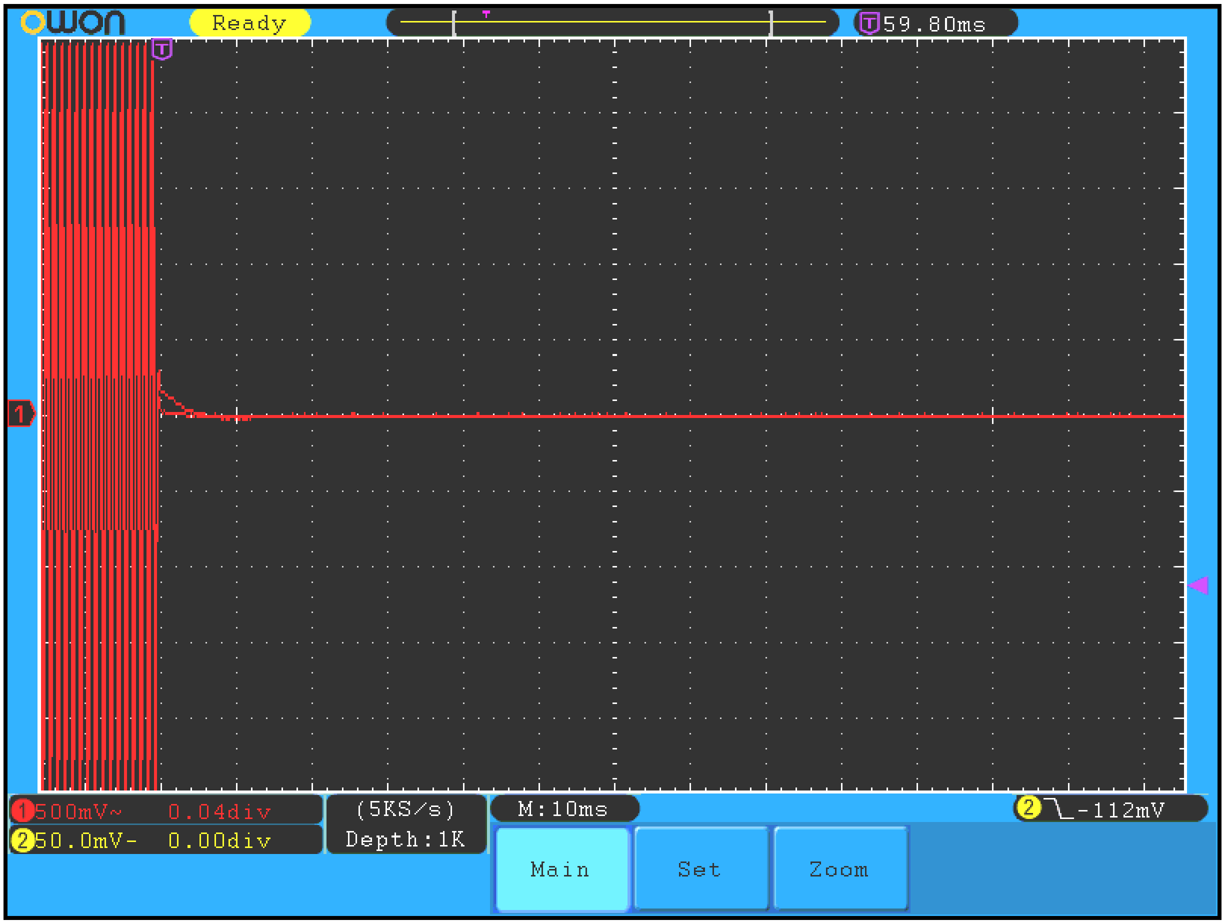


Plot 10-6: Transient Frequency Behavior – 470.0125 MHz; Wide Band; Carrier OFF Time

Plot 10-7: Transient Frequency Behavior – 470.0125 MHz; Narrow Band; Carrier ON Time

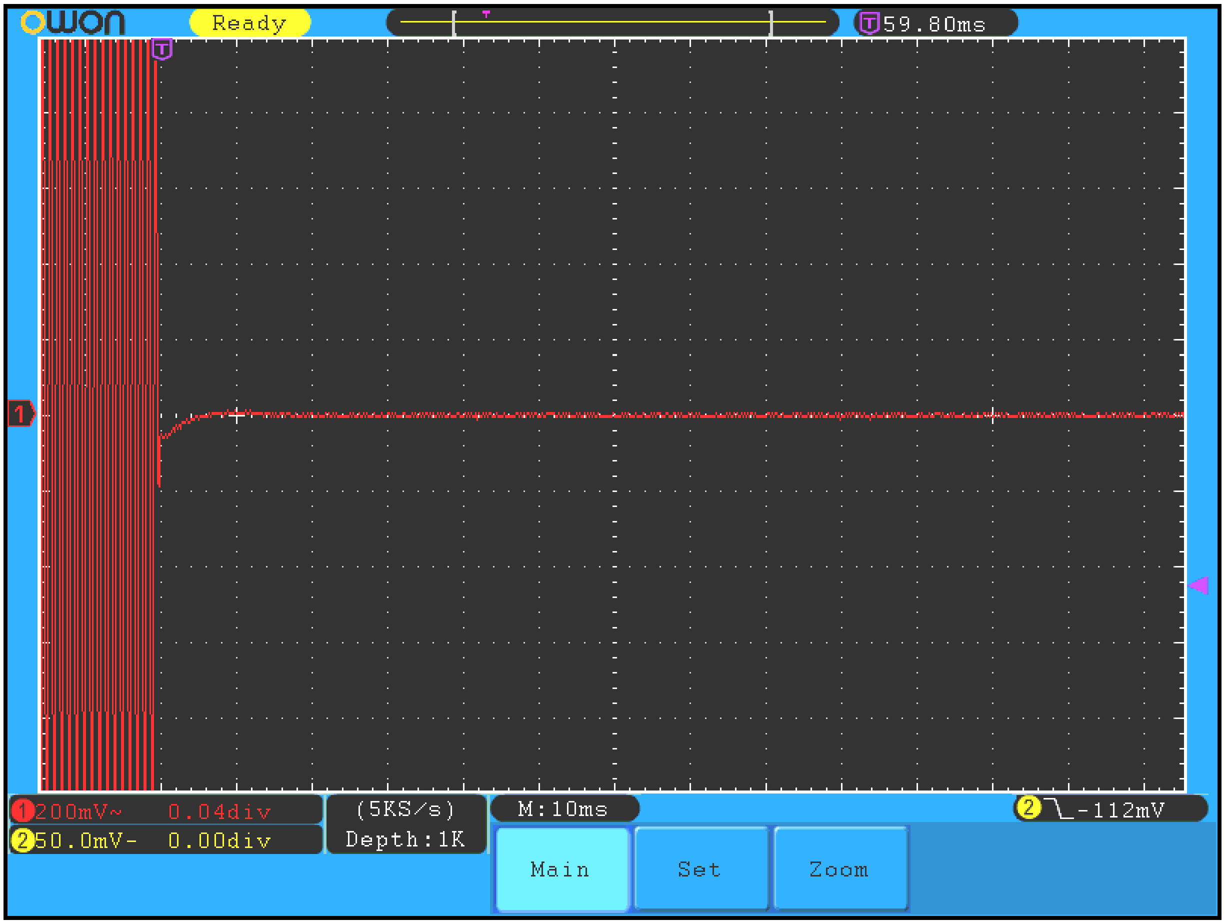
Plot 10-8: Transient Frequency Behavior – 470.0125 MHz; Narrow Band; Carrier OFF Time

Plot 10-9: Transient Frequency Behavior – 511.9875 MHz; Wide Band; Carrier ON Time



Plot 10-10: Transient Frequency Behavior – 511.9875 MHz; Wide Band; Carrier OFF Time

Plot 10-11: Transient Frequency Behavior – 511.9875 MHz; Narrow Band; Carrier ON Time



Plot 10-12: Transient Frequency Behavior – 511.9875 MHz; Narrow Band; Carrier OFF Time

Table 10-1: Test Equipment Used For Testing Transient Frequency Behavior

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900917	Hewlett Packard	8648C	Synthesized Signal Generator (9 KHz - 3200 MHz)	3537A01741	2/17/16
901118	Hewlett Packard	HP8901B	Modulation Analyzer (150 kHz – 1300 MHz)	2406A00178	4/1/15
901651	OWON	SDS7102V	Oscilloscope	B020129	10/20/16

Test Personnel:

Daniel Baltzell		January 8, 2015
Test Engineer	Signature	Date of Tests

11 FCC Rules and Regulations Part 2.202: Necessary Bandwidth and Emission Bandwidth

Voice – FM Analog (25 kHz)
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 5
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 16.0 kHz
Emission designator: 16K0F3E

Voice – FM Analog (12.5 kHz)
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 2.5
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 11.0 kHz
Emission designator: 11K0F3E

EDACS WB 9600 Digital Voice/Data (25 kHz)
Calculation:
Data rate in bps (R) =9600
Deviation Peak deviation of carrier (D) = 3474
Constant factor (K): 1 (default)
Bn = 3.86D+0.27RK = 3.86(3474) + 0.27(9600)(1) =16.0 kHz
Emission designator: 16K0F1D/E

EDACS NB 9600 Digital Voice/Data (12.5 kHz)
Calculation:
Data rate in bps (R) =9600
Deviation Peak deviation of carrier (D) = 2359.585
Constant factor (K): 1 (default)
Bn = 3.86D+0.27RK = 3.86(2359.585) + 0.27(9600)(1) =11.7 kHz
Emission designator: 11K7F1D/E

EDACS XNB 4800 Digital Voice/Data (12.5 kHz)
Calculation:
Data rate in bps (R) =4800
Deviation Peak deviation of carrier (D) = 1503.626
Constant factor (K): 1 (default)
Bn = 3.86D+0.27RK = 3.86(1503.626) + 0.27(4800)(1) =7.1 kHz
Emission designator: 7K10F1D/E

P25 Phase 1 Data/Voice (C4FM) (12.5 kHz)
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = 1800
Bn = [9600/$\log_2$(4) + 2 (1800) (1) = 8.400 kHz
Emission designator: 8K40F1D, 8K40F1E

P25 Phase 2 Data/Voice (H-CPM TDMA) (12.5 kHz)
Calculation:
Data rate in bps (R) =12000
Peak deviation of carrier (D) = 1050
Bn = [12000/$\log_2$(4) + 2 (1050) (1) = 8.1 kHz
Emission designator: 8K10DXW

12 Conclusion

The data in this measurement report shows that the **Harris Corporation** Model **XL-185P UHF Portable Land Mobile Radio, FCC ID: OWDTR-0149-E, IC: 3636B-0149**, complies with the applicable requirements of FCC Parts 90, 80, 74, 22, 15 and 2, and Industry Canada RSS-119.