SRT-2100B FCC Type Certification Report

Exhibit F

NOTICE: The following software was used to produce this document: Microsoft Word 2003 SP2

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CAGEC 4V792

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Exhibit F.1 SRT-2100B RF Power Output

1.1 FCC Requirements

The discussion and test results shown in this section address and meet the requirements of the following FCC requirements:

Section 2.1046 (a)

For transmissions other than simple sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the value of current and voltage on circuit elements specified in 2.1033 (c) (8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

Section 2.1033 (c)(8)

The dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range.

Section 87.131 Notes (1), (ii), (8)

(1) The power is measured at the transmitter output terminals and the type of power is determined according to the emission designator as follows:

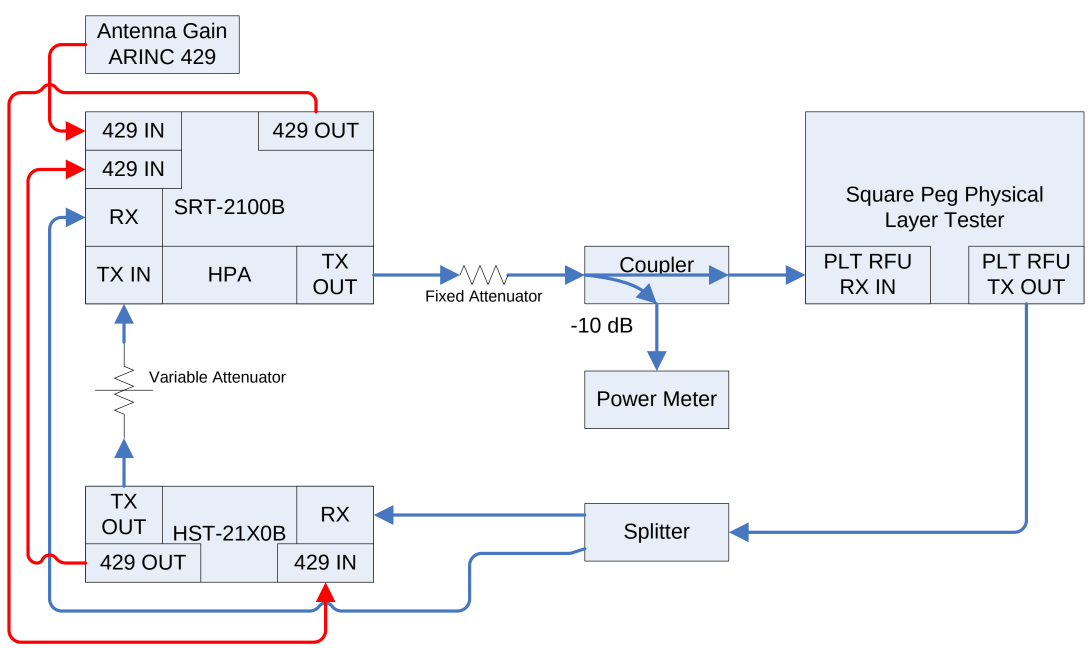
(ii) Peak Envelope power (pX) for all emissions designators other than those referred to in paragraph (l) of this note.

(8) Power may not exceed 60 watts per carrier. The maximum EIRP may not exceed 2000 watts per carrier.

1.2 Test Procedures

The following test configuration was used to perform the Classic Aero / Swift 64 and Classic Aero / Swift Broadband RF Power Output Measurements.

FCC 87.131 RF Power Output Test Configuration



1.2.1 Test Equipment

Item	Manufacturer	PN	SN	Notes
SRT-2100 B	Rockwell Collins	822-1785-001	147362	AC Powered
HST-2120 B	Rockwell Collins	270-2885-070	564	DC Powered
Physical Layer Tester	Square Peg Communications, Inc.	EM-907532C-04	PLTH_080	
Physical Layer Tester Radio Frequency Unit	Square Peg Communications, Inc.	EM-907516C-01	23	
Power Meter	HP	438A	22A05518	
Variable Attenuator	Weinschel	910-20-11	7936	
Fixed Attenuator (30dB)	Weinschel	58-30-34-LIM	PF562	
Fixed Attenuator (10dB)	Weinschel	2	BN0739	
Directional Coupler	Narda	3002-10	70612	
Splitter	Mini-circuits	ZAPD-2	460-0206-551	

1.2.2 RF Power Output – Classic Aero/ Swift Broadband

FCC Requirements detailed in sections 87.131 (RF Power Output) and 87.187(q) (Priority and Preemption) were tested with a combined procedure in which Classic Aero voice services were exercised in concert with Swift Broadband services. During the test procedure the output EIRP of the Classic Aero voice services and Swift Broadband data services was varied along with antenna gain in order to demonstrate accurate power control and, when necessary, the preemption of lower priority services in order to maintain output EIRP for higher priority services. Table 1 below documents the various conditions and records the predicted, measured and reported RF power output in order to demonstrate compliance.

1.2.3 RF Power Output – Classic Aero/ Swift 64

FCC Requirements detailed in sections 87.131 (RF Power Output) and 87.187(q) (Priority and Preemption) were tested with a combined procedure in which Classic Aero voice services were exercised in concert with Swift 64 services. During the test procedure the output EIRP of the Classic Aero voice services and Swift 64 data services were varied along with antenna gain in order to demonstrate accurate power control and, when necessary, the preemption of lower priority services in order to maintain output EIRP for higher priority services. Table 2 below documents the various conditions and records the predicted, measured and reported RF power output in order to demonstrate compliance.

Table 1 RF Power Output – Classic Aero/Swift 64

HPA -> ANT Cable Loss (dB)	2.00
Data Reservation (dBW)	10.50

		High Priority	Low Priority	Public Priority							
	Ant Gain (dBi)	Aero Call 1 (dBW EIRP)	Aero Call 2 (dBW EIRP)	HST Allocated EIRP (dBW)	HST Reported EIRP (dBW)	Calculated HPA Output (dBm)	Reported HPA Output (dBm)	Measured HPA Output (dBm)	Power Accuracy Results (P/F)	Calculated HPA Output (Watts)	Measured HPA Output (Watts)
	18.00	18.50	18.50	20.00	16.00	36.59	36.45	36.42	PASS	4.56	4.39
	17.00	18.50	17.50	20.00	16.00	37.22	37.11	37.27	PASS	5.28	5.33
	16.00	18.50	16.50	20.00	16.00	37.91	37.44	37.46	PASS	6.18	5.57
	15.00	18.50	15.50	20.00	16.00	38.65	38.26	38.22	PASS	7.32	6.64
	14.00	18.50	14.50	20.00	16.00	39.42	38.92	39.02	PASS	8.76	7.98
	13.00	18.50	13.50	20.00	16.00	40.24	39.41	39.74	PASS	10.56	9.42
	12.00	17.50	12.50	20.00	16.00	40.56	39.25	38.98	PASS	11.38	7.91
	11.00	16.50	11.50	20.00	16.00	40.94	39.41	39.31	PASS	12.41	8.53
	10.00	15.50	10.50	20.00	16.00	41.37	40.07	39.64	PASS	13.71	9.20
	9.00	14.50	10.50	20.00	16.00	41.99	41.06	41.21	PASS	15.81	13.21
	8.00	13.50	10.50	20.00	16.00	42.66	41.55	41.42	PASS	18.44	13.87
	7.00	12.50	10.50	20.00	16.00	43.38	42.38	42.30	PASS	21.76	16.98
HST Preempted	7.00	12.50	11.50	0.00	0.00	40.17	39.41	39.79	PASS	10.41	9.53
HST Preempted	7.00	16.50	18.50	0.00	0.00	45.66	45.84	45.82	PASS	36.83	38.19
HST Preempted	7.00	17.50	18.50	0.00	0.00	46.07	46.16	46.17	PASS	40.49	41.40
Low Priority Call Preempted	7.00	18.50	0.00	0.00	0.00	43.62	43.69	43.70	PASS	23.02	23.44
HST	7.00	17.50	18.50	0.00	0.00	46.07	46.16	46.17	PASS	40.49	41.40

HPA -> ANT Cable Loss (dB)	2.00
Data Reservation (dBW)	10.50

		High Priority	Low Priority	Public Priority							
	Ant Gain (dBi)	**Aero Call 1 (dBW EIRP)**	**Aero Call 2 (dBW EIRP)**	**HST Allocated EIRP (dBW)**	**HST Reported EIRP (dBW)**	**Calculated HPA Output (dBm)**	**Reported HPA Output (dBm)**	**Measured HPA Output (dBm)**	**Power Accuracy Results (P/F)**	**Calculated HPA Output (Watts)**	**Measured HPA Output (Watts)**
Preempted											
HST Preempted	8.00	0.00	18.50	0.00	0.00	42.62	42.71	42.68	PASS	18.29	18.54
	9.00	0.00	18.50	20.00	16.00	43.48	44.35	44.17	PASS	22.27	26.12
	10.00	0.00	12.50	20.00	16.00	39.68	40.89	40.84	PASS	9.29	12.13
	11.00	0.00	12.50	20.00	16.00	38.68	39.91	39.33	PASS	7.38	8.57
	12.00	0.00	12.50	20.00	16.00	37.68	38.92	38.64	PASS	5.86	7.31
	13.00	0.00	12.50	20.00	16.00	36.68	37.93	37.82	PASS	4.65	6.05
	14.00	0.00	12.50	20.00	16.00	35.68	36.94	36.91	PASS	3.70	4.91
	15.00	0.00	12.50	20.00	16.00	34.68	36.28	35.89	PASS	2.94	3.88
	16.00	0.00	12.50	20.00	16.00	33.68	34.96	34.16	PASS	2.33	2.61
	17.00	0.00	12.50	20.00	16.00	32.68	34.14	32.74	PASS	1.85	1.88
	18.00	0.00	12.50	20.00	16.00	31.68	33.15	32.75	PASS	1.47	1.88

Table 2 RF Power Output – Classic Aero/ Swift 64

Max Out dBW	16.53			Max Out dBW	16.53			Max Out dBW	16.53									
Max Out dBm :	46.53			Max Out dBm :	46.53			Max Out dBm :	46.53									
Ant to HPA Loss :	2			Ant to HPA Loss :	2			Ant to HPA Loss :	2									
HST max Out (dBm)	31.5			HST max Out (dB	31.5			HST max Out (dBm) :	31.5									
HST1 Offset (loss) :	-1.3			HST1 Offset (loss)	0.5			HST1 Offset (loss) :	1.4									
HST2 Offset (loss) :	-1.3			HST2 Offset (loss)	0.5			HST2 Offset (loss) :	1.4									
RFU to HPA Attn =	5	---------		RFU to HPA Attn :	5	-------		RFU to HPA Attn =	5	----------								
HST1 to HPA Attn =	3.7	0		HST1 to HPA Attn	5.5	1		HST1 to HPA Attn =	6.4	2								
HST2 to HPA Attn =	3.7	----------		HST2 to HPA Attn	5.5	----------		HST2 to HPA Attn =	6.4	----------								
Nominal Cable Loss										Calculated	Actual	Calculated	Actual		Dual HST			
Ant Gain	Total EIRP	Data	EIRP	EIRP	Avail EIRP	HST1 EIRP	2 HST EIRP	HST1 Out	HST2 Out	Rpt Avail	Rpt Avail	Back Off	Back Off		Measured HPA Out	Computed HPA at output Trace	error	Pass/Fail
dB	dBW	dBW	Call 1	Call 2	dBW	dBW	dBW	dBm	dBm	dBW	dBW	dB	dB		dBm	dBm	dB	(+2.5/- 1.0 dB)
12	26.53	10.50	-100	-100	26.42	22.5	19.5	12.00	12.00	24.17	26.00	10.00	10.00	44.26	44.68	44.19	-0.07	PASS
12	26.53	10.50	-100	-100	26.42	20.5	17.5	10.00	10.00	25.14	26.50	10.00	10.00	42.26	42.65	42.38	0.12	PASS
12	26.53	10.50	-100	-100	26.42	18.5	15.5	8.00	8.00	25.66	27.00	10.00	10.00	40.26	40.74	39.91	-0.35	PASS
12	26.53	10.50	12.5	-100	26.24	18.5	15.5	8.00	8.00	25.44	26.50	10.00	10.00	40.94	41.29	40.73	-0.21	PASS
12	26.53	10.50	11.5	-100	26.28	18.5	15.5	8.00	8.00	25.49	26.50	10.00	10.00	40.81	41.11	40.40	-0.41	PASS
12	26.53	10.50	10.5	-100	26.31	18.5	15.5	8.00	8.00	25.52	26.50	10.00	10.00	40.70	41.11	40.40	-0.30	PASS
12	26.53	10.50	10.5	12.5	26.13	18.5	15.5	8.00	8.00	25.30	26.50	10.00	10.00	41.31	41.68	41.22	-0.09	PASS
12	26.53	10.50	10.5	11.5	26.16	18.5	15.5	8.00	8.00	25.35	26.50	10.00	10.00	41.19	41.55	41.06	-0.13	PASS
12	26.53	10.50	10.5	10.5	26.19	18.5	15.5	8.00	8.00	25.39	26.50	10.00	10.00	41.10	41.47	40.89	-0.21	PASS
13	27.53	10.50	10.5	10.5	27.27	18.5	15.5	7.00	7.00	26.65	28.00	11.00	10.50	40.10	40.54	39.91	-0.19	PASS
14	28.53	10.50	10.5	10.5	28.32	18.5	15.5	6.00	6.00	27.84	29.00	12.00	11.50	39.10	39.52	38.92	-0.18	PASS
15	29.53	10.50	10.5	10.5	29.37	18.5	15.5	5.00	5.00	28.99	30.00	13.00	12.50	38.10	38.56	37.93	-0.17	PASS
16	30.53	10.50	10.5	10.5	30.40	18.5	15.5	4.00	4.00	30.11	31.00	14.00	13.50	37.10	37.51	36.94	-0.16	PASS
11	25.53	10.50	10.5	10.5	25.10	18.5	15.5	9.00	9.00	24.03	25.50	9.00	8.50	42.10	42.37	42.21	0.11	PASS
10	24.53	10.50	10.5	10.5	23.98	18.5	15.5	10.00	10.00	22.54	24.00	8.00	7.50	43.10	43.37	43.20	0.10	PASS
9	23.53	10.50	10.5	10.5	22.83	18.5	15.5	11.00	11.00	20.83	22.50	7.00	6.50	44.10	44.40	44.19	0.09	PASS
8	22.53	10.50	10.5	10.5	21.63	18.5	15.5	12.00	12.00	18.73	21.00	6.00	5.50	45.10	45.41	45.01	-0.09	PASS
7	21.53	10.50	10.5	10.5	20.36	18.5	15.5	13.00	13.00	15.78	22.00	5.00	6.50	46.10	46.31	46.00	-0.10	PASS
6	HSD Preempted											4.00						

1.3 RF Power Output Results

The SAT-2100 System output power to the antenna is equal to the power output from the High Power Amplifier (HPA) in SRT-2100, less the losses between the HPA and the antenna. These losses include cable loss, LAN/Diplexer loss, and other interconnection losses. They are installation dependent and are specified below:

Cable Loss = 1.70 dB maximum
LNA/Diplexer Loss = 0.8 dB maximum
Total HPA to Antenna Loss = 2.50dB maximum

Typical values for these losses measured are:

Cable Loss = 1.1 to 1.7 dB
LNA/Diplexer Loss = 0.5 to 0.8 dB
Total HPA to Antenna Loss = 1.6 to 2.5 dB

The HPA rated output power is 45 watts maximum for multiple carriers.
The DC supply voltages and typical DC current values for the HPA are listed in the table below.

Table 3 Voltages and Currents

DC Supply Voltage	Maximum DC Supply Current	Typical Measured DC Supply Current
+27 VDC	8.0 Amps	7.35 Amps
+15 VDC	1.0 Amps	0.53 Amps
-15 VDC	0.2 Amps	0.10 Amps
+5 VDC	0.3 Amps	0.12 Amps

Exhibit F.2 SRT-2100B Modulation Characteristics

Formatted data is used to phase modulate a subcarrier signal. Binary phase shift keying (BPSK) modulation is used for all data rates less than 2400 bps and Quadrature phase shift keying (QPSK) is used for all data rates greater than 2400 bps.

For BPSK modulation, the subcarrier signal phase value is varied by -90 or 90 degrees depending on the formatted data bit being a 0 or a 1, respectively. For QPSK modulation the 4 states of each 2 bits of the formatted data is used to vary the subcarrier signal phase value by 45, 135, -135 or -45 degrees, according to a specified state/phase mapping. All modulation characteristics supported by SRT-2100 are indicated in the table below.

Refer to the corresponding photo of eye pattern and the constellation pattern of modulation characteristics shown.

2.1 FCC Requirements

The discussion and test results show in this section address and meet the requirements of the following FCC requirements. For generating the modulation signals, the SRT-2100B uses the same identical channel module elements and DSP SW as the SRT-2000 and SRT-2100. Since the same hardware is used for the SRT-2100B, SRT-2100 and SRT-2000, the results for the SRT-2000 Modulation Characteristics are resubmitted here for reference.

Section 2.1047 (d)

A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

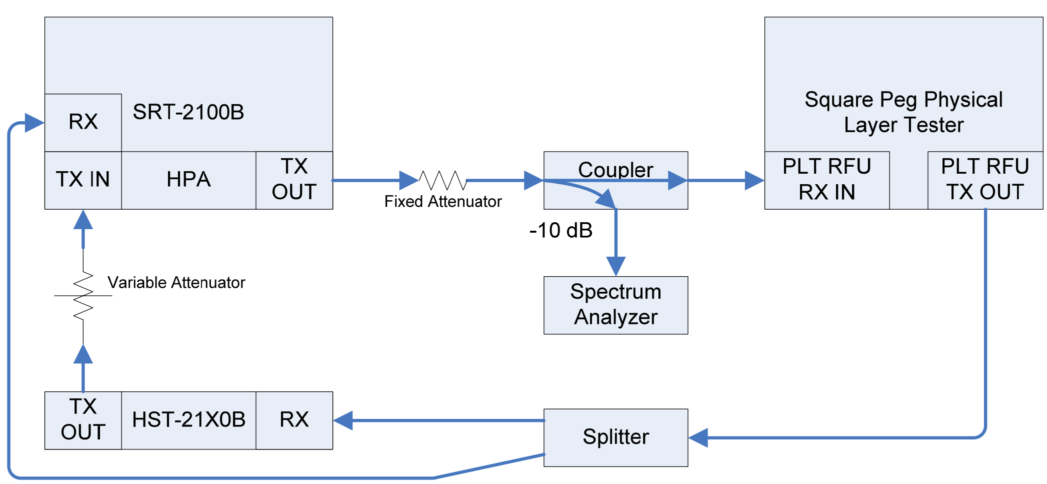
Section 87.141 (j)

Transmitters used as Aircraft earth stations must employ BPSK for transmissions rates up to and including 2400 bps, and QPSK for higher rates.

2.2 Test Procedure

The following test configuration was used to perform the Modulation Characteristics Measurements.

FCC 87.141 Modulation Characteristics Test Configuration



2.2.1 Test Equipment

Item	Manufacturer	PN	SN	Notes
SRT-2100 B	Rockwell Collins	822-1785-001	147362	AC Powered
HST-2120 B	Rockwell Collins	270-2885-070	564	DC Powered
Physical Layer Tester	Square Peg Communications, Inc.	EM-907532C-04	PLTH_080	
Physical Layer Tester Radio Frequency Unit	Square Peg Communications, Inc.	EM-907516C-01	23	
Spectrum Analyzer	Agilent	E4440	MY46185575	
Variable Attenuator	Weinschel	910-20-11	7936	
Fixed Attenuator (30dB)	Weinschel	58-30-34-LIM	PF562	
Fixed Attenuator (10dB)	Weinschel	2	BN0739	
Directional Coupler	Narda	3002-10	70612	
Splitter	Mini-circuits	ZAPD-2	460-0206-551	

2.3 Modulation Characteristics Results

The SRT-2100B uses the same modules as the SRT-2100 and SRT-2000 for generating the Classic Aero modulation signals. The results for the SRT-2000 modulation characteristics are included here. The HST-2110B and HST-2120B use the same hardware as the HST-2110 and HST-2120 respectively. The results for the HST-2110 Swift 64 modulating signals are included here.

See the following figures for Eye and Constellation plots and Timing Diagrams.

Table 4 Modulation Characteristics Results

Figure Number	Operational Mode	Modulation Type	Bit Rate (bps)	Symbol Rate (sym/s)	Description
Figure 1	Classic Aero	BPSK	600	600	Eye and Constellation Diagram
Figure 2	Classic Aero	BPSK	600	600	Timing Diagram
Figure 3	Classic Aero	BPSK	1200	1200	Eye and Constellation Diagram
Figure 4	Classic Aero	BPSK	1200	1200	Timing Diagram
Figure 5	Classic Aero	QPSK	8400	4200	Eye and Constellation Diagram
Figure 6	Classic Aero	QPSK	8400	4200	Timing Diagram
Figure 7	Classic Aero	QPSK	21,000	10,500	Eye and Constellation Diagram
Figure 8	Classic Aero	QPSK	21,000	10,500	Timing Diagram

Figure Number	Operational Mode	Modulation Type	Bit Rate (bps)	Symbol Rate (sym/s)	Description
Figure 9	Classic Aero	QPSK	10,500	5250	Eye and Constellation Diagram
Figure 10	Classic Aero	QPSK	10,500	5250	Timing Diagram
Figure 11	Swift64	BPSK	3000	3000	Constellation Diagram
Figure 12	Swift64	16-QAM	134,400	33,600	Constellation Diagram
Figure 13	Swift Broadband	QPSK	33,600	16,800	Constellation Diagram
Figure 14	Swift Broadband	QPSK	67,200	33,600	Constellation Diagram
Figure 15	Swift Broadband	QPSK	134,400	67,200	Constellation Diagram
Figure 16	Swift Broadband	QPSK	302,400	151,200	Constellation Diagram
Figure 17	Swift Broadband	16-QAM	134,400	33,600	Constellation Diagram
Figure 18	Swift Broadband	16-QAM	268,800	67,200	Constellation Diagram
Figure 19	Swift Broadband	16-QAM	604,800	151,200	Constellation Diagram

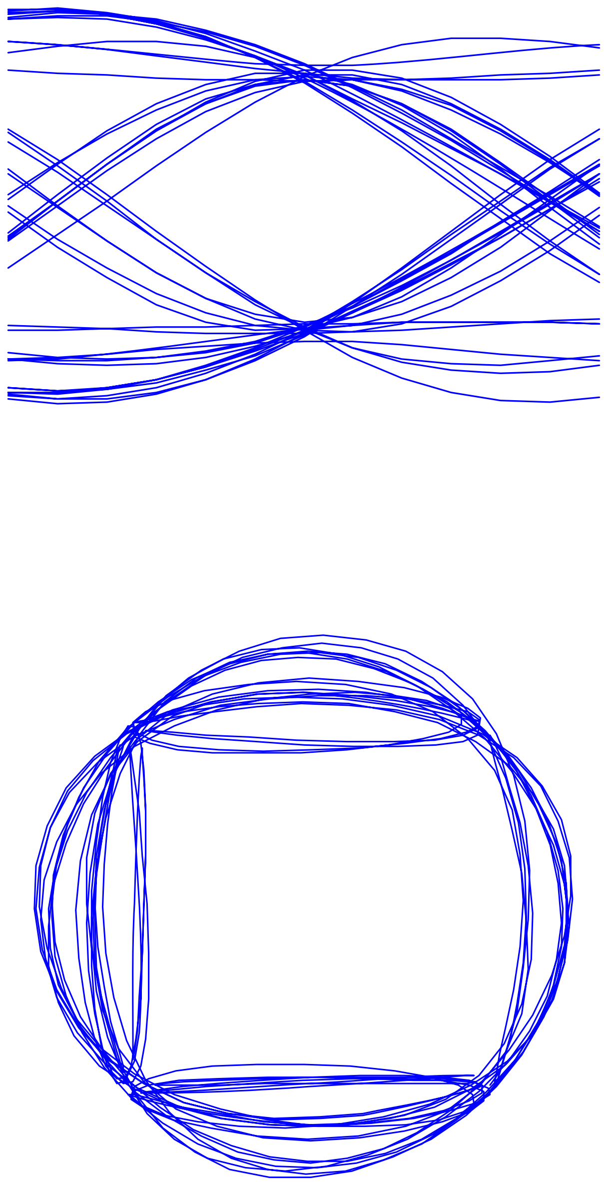


Figure 1 Eye and Constellation Diagram for Data Rate of 600 bps - ABPSK

Figure 2 Timing Diagram for Data Rate of 600 bps - ABPSK

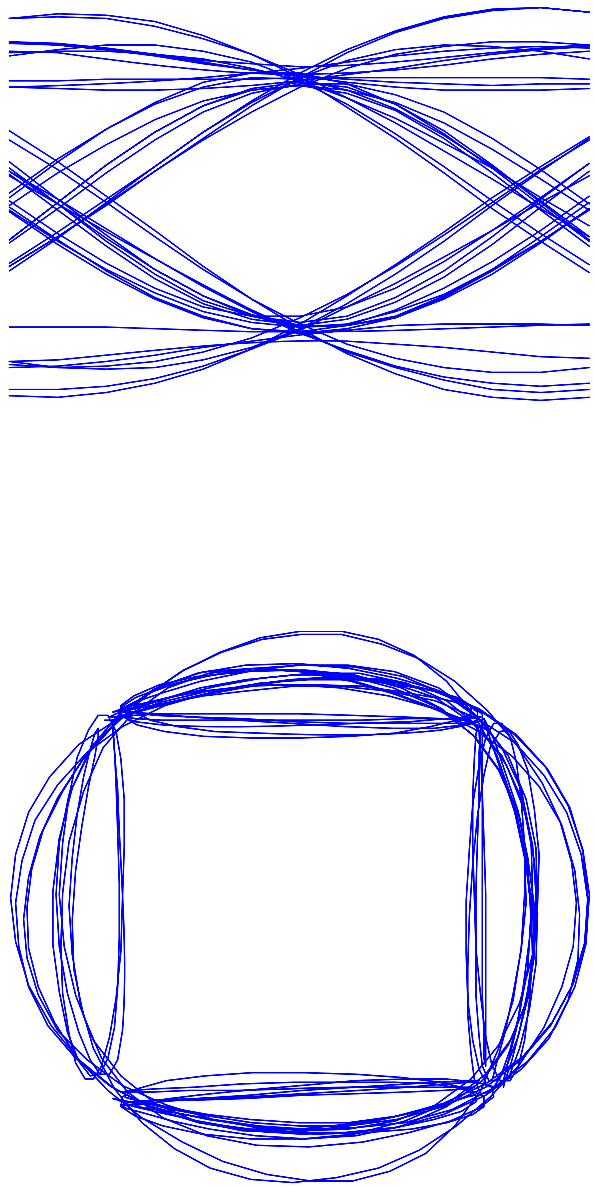


Figure 3 Eye and Constellation Diagram for Data Rate of 1200 bps - ABPSK

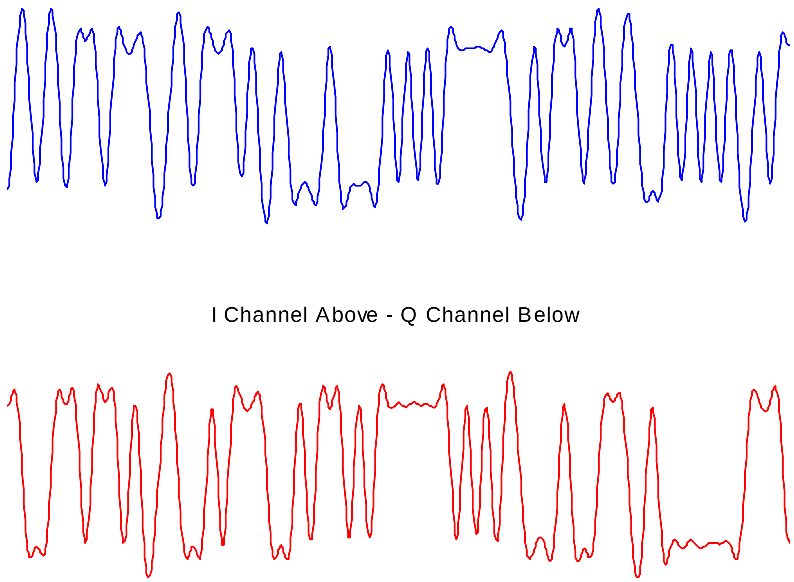


Figure 4 Timing Diagram for Data Rate of 1200 bps - ABPSK

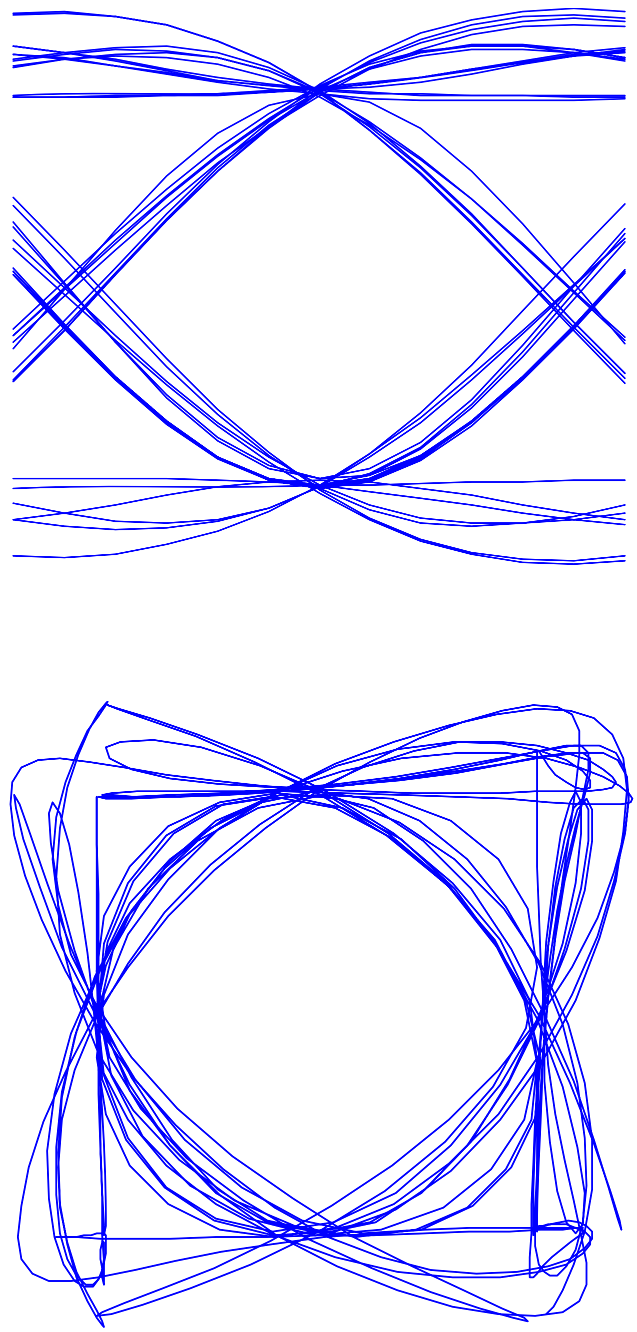


Figure 5 Eye and Constellation Diagram for Data Rate of 8400 bps – AQPSK

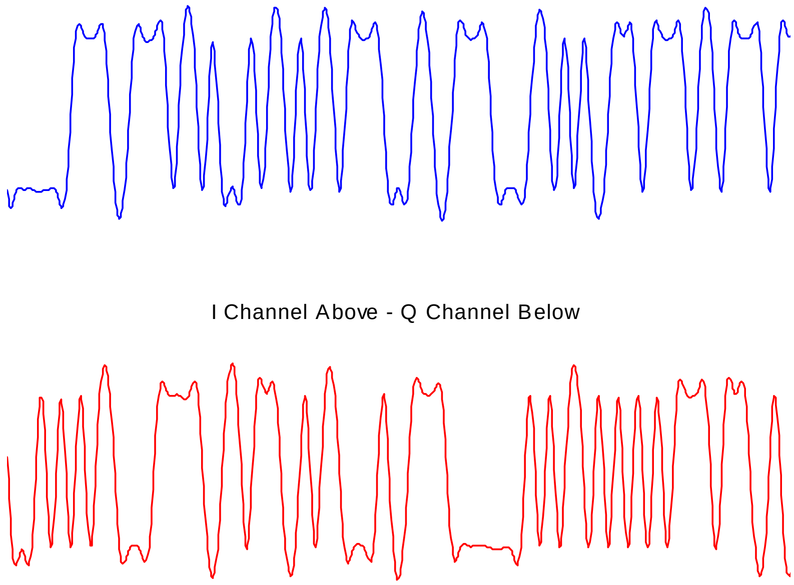


Figure 6 Timing Diagram for Data Rate of 8400 bps - AQPSK

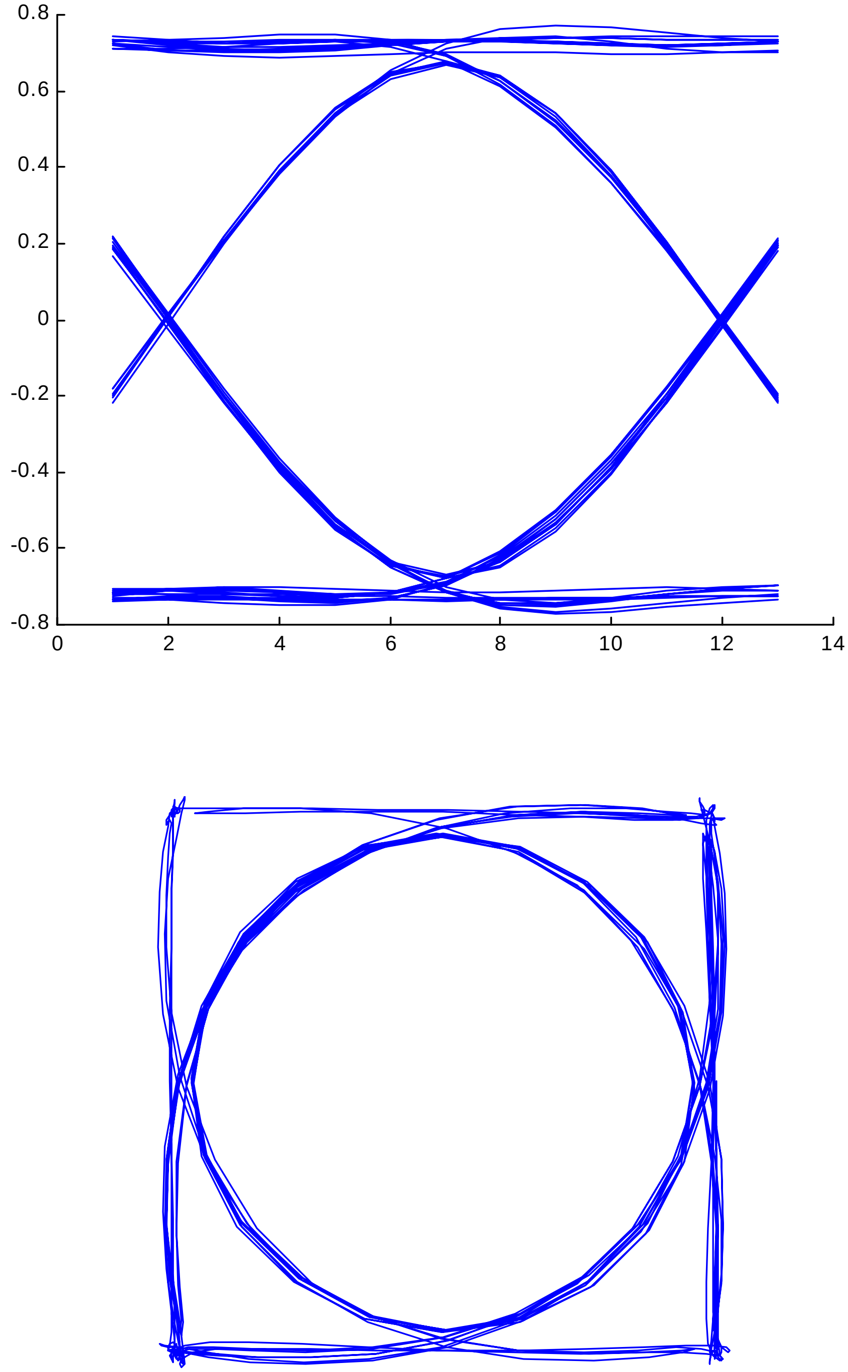


Figure 7 Eye and Constellation Diagram for Data Rate of 21,000 bps - AQPSK

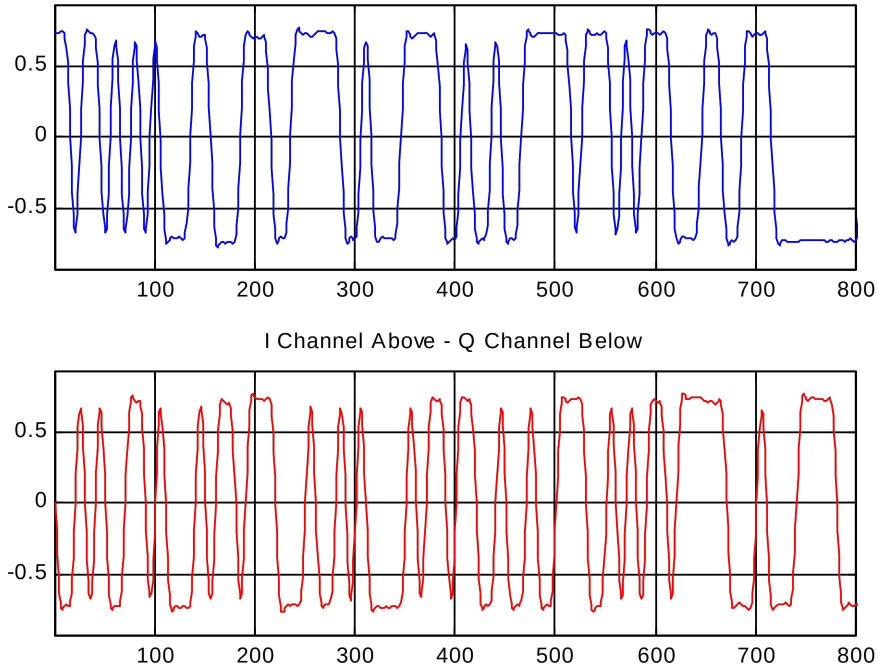
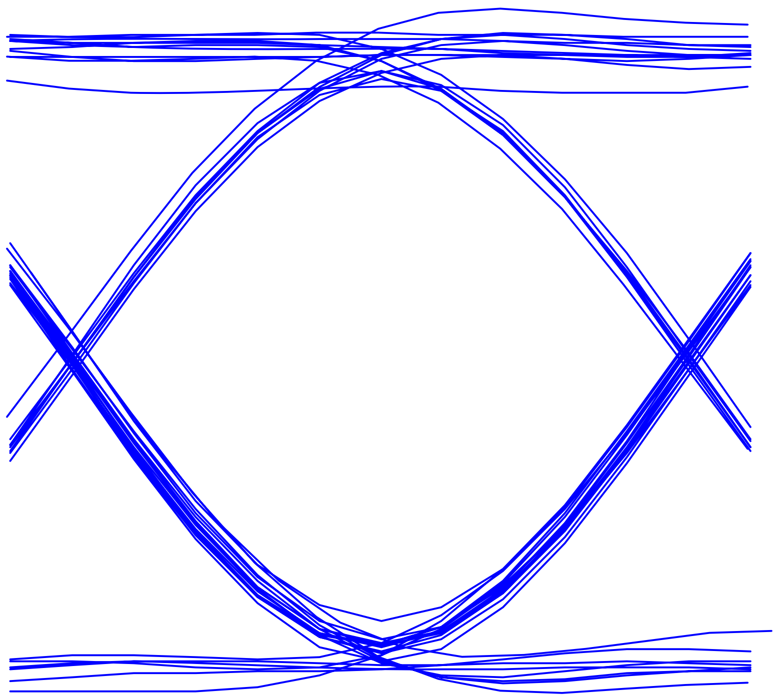


Figure 8 Timing Diagram for Data Rate of 21,000 bps -AQPSK



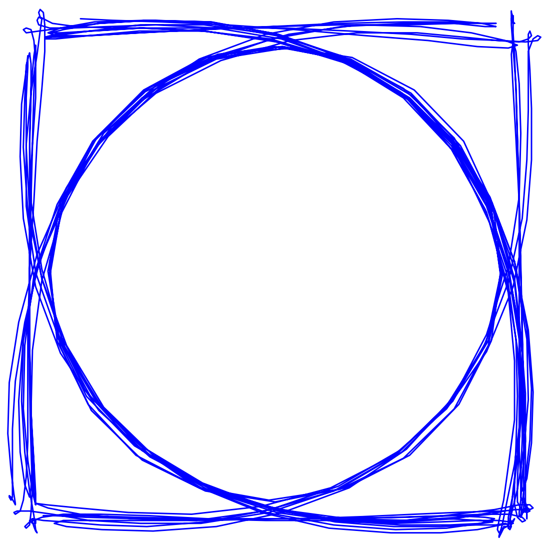


Figure 9 Eye and Constellation Diagram for Data Rate of 10,500 bps AQPSK

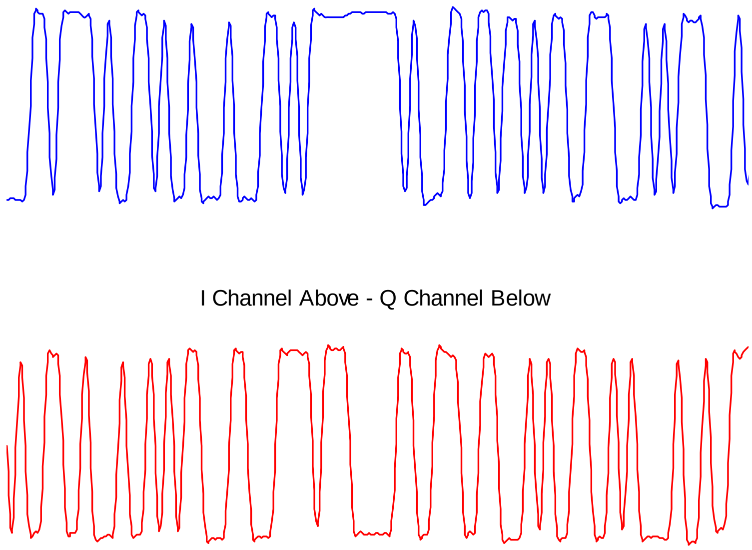


Figure 10 Timing Diagram for Data Rate of 10,500 bps -AQPSK

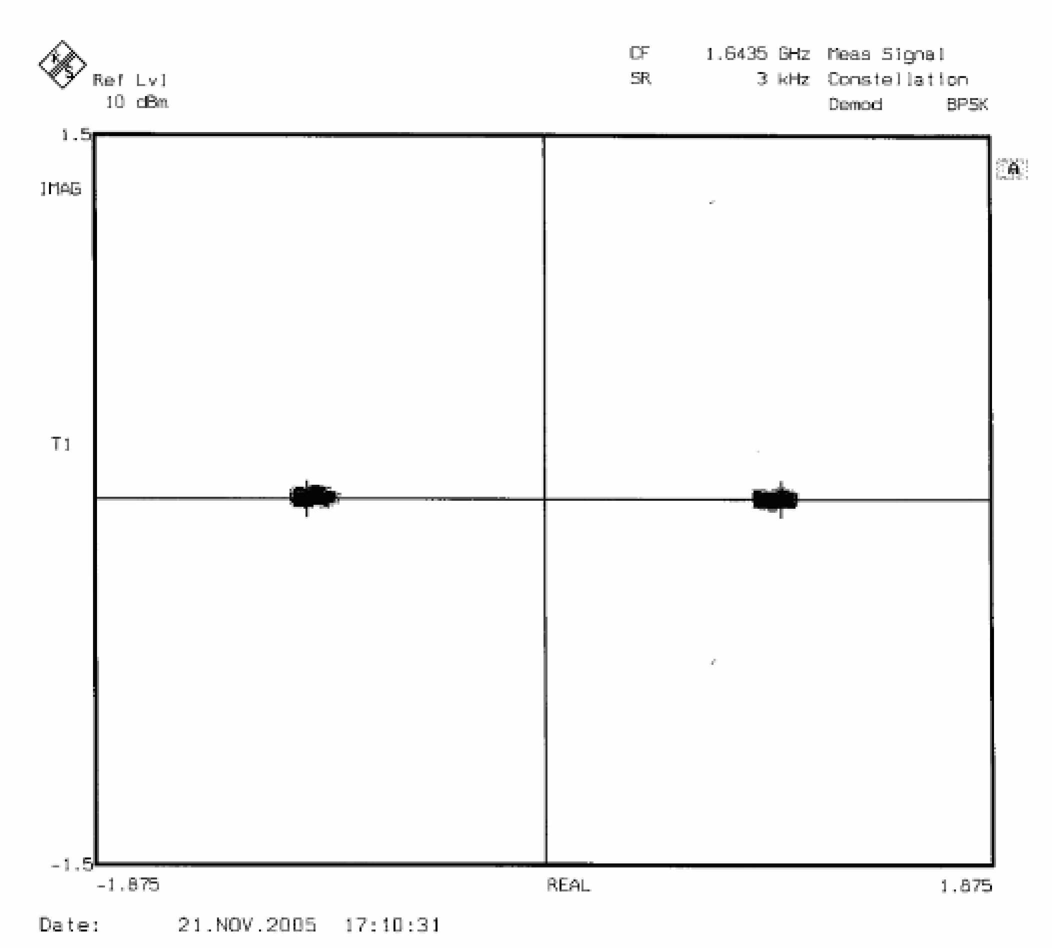


Figure 11 Constellation Diagram for Swift 64 Data Rate of 3000 bps BPSK

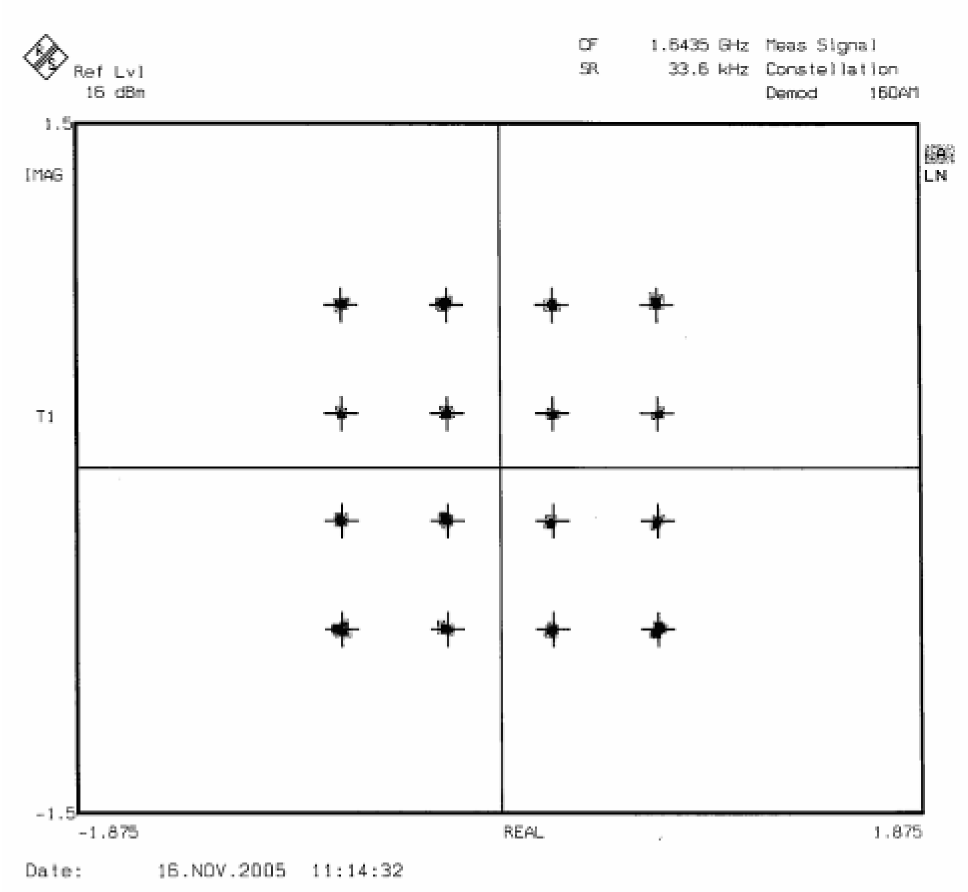


Figure 12 Constellation Diagram for Swift 64 Data Rate of 134,400 bps 16-QAM

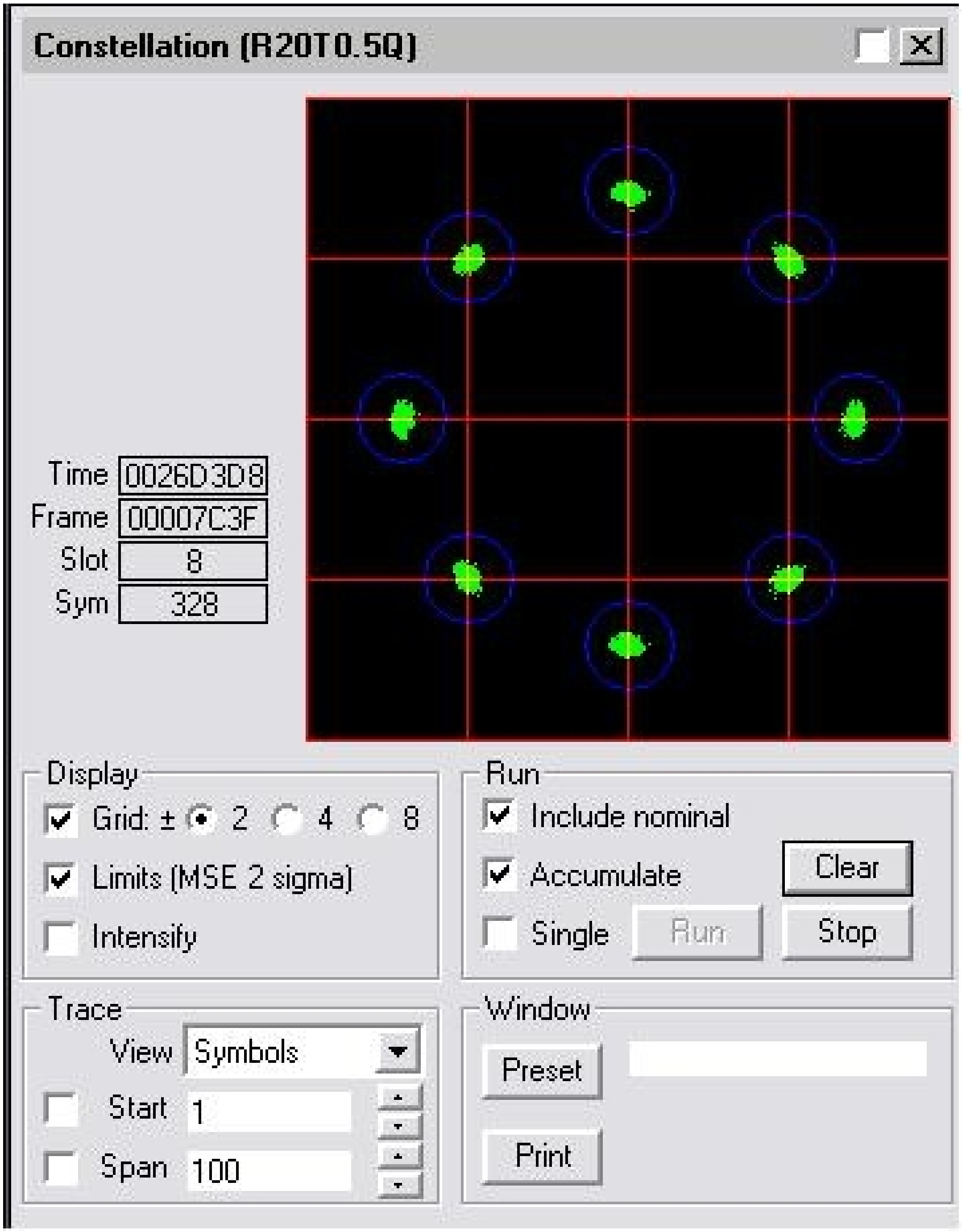


Figure 13 Constellation Diagram for Swift Broadband Data Rate of 33,600 bps QPSK

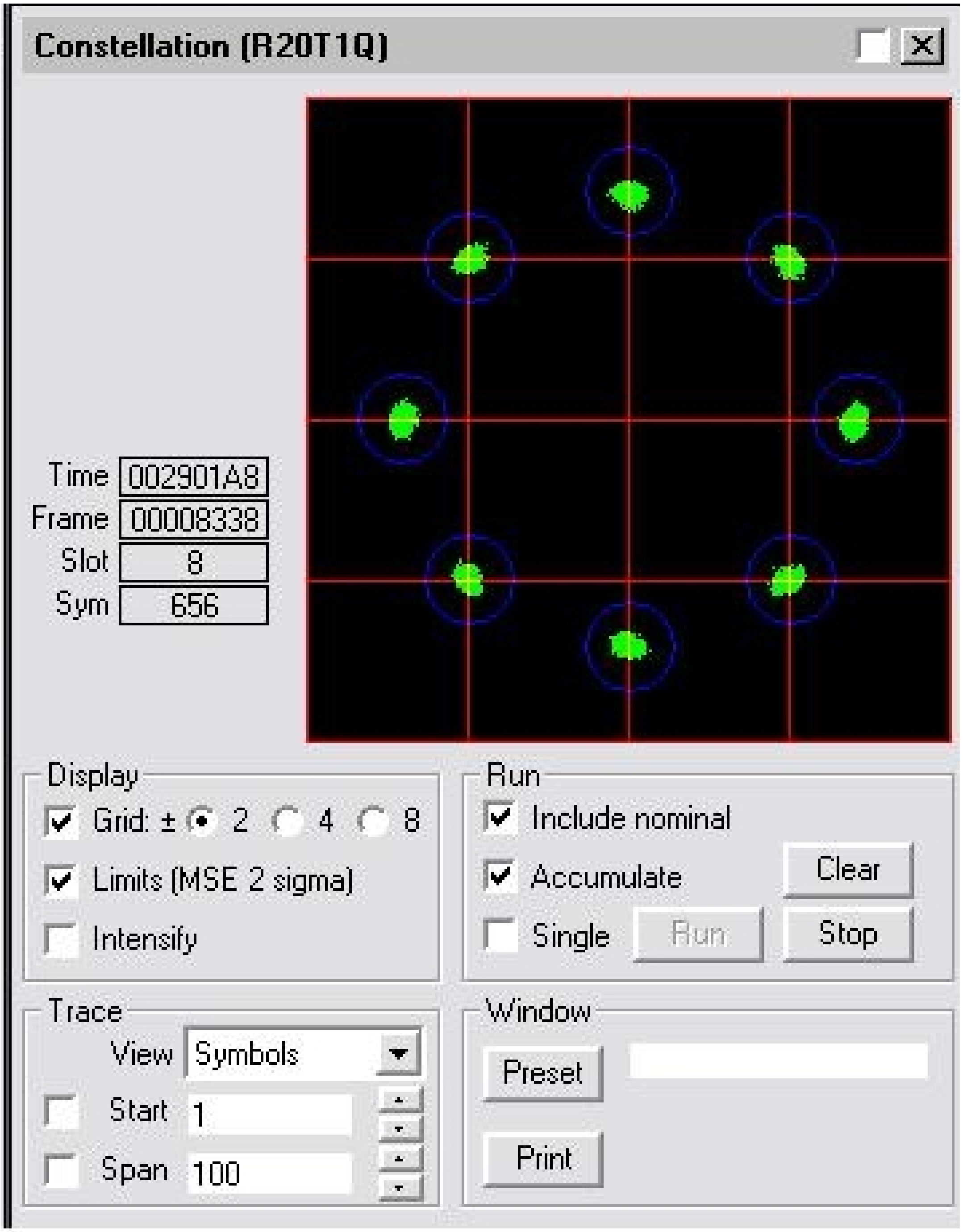


Figure 14 Constellation Diagram for Swift Broadband Data Rate of 67,200 bps QPSK

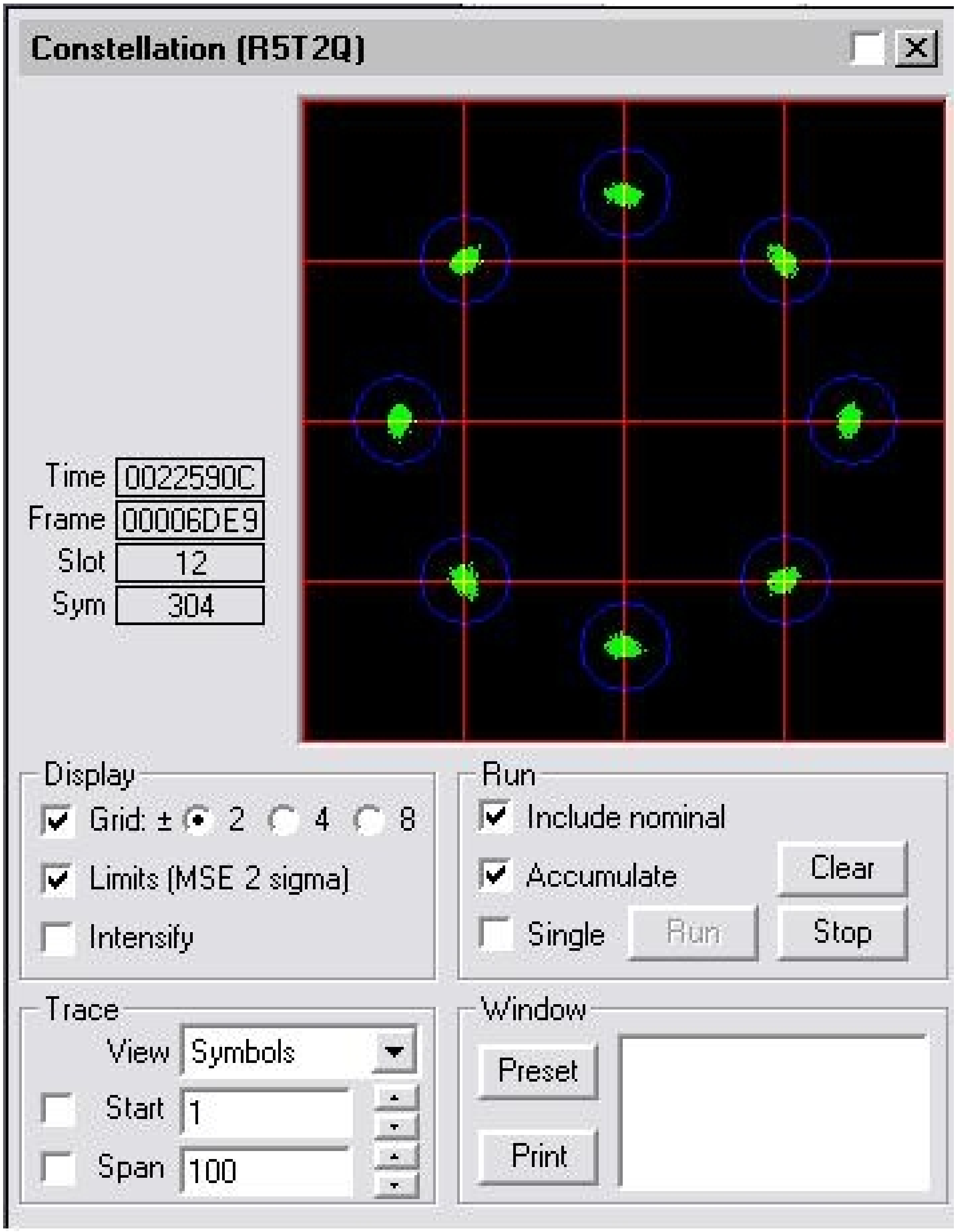


Figure 15 Constellation Diagram for Swift Broadband Data Rate of 134,400 bps QPSK

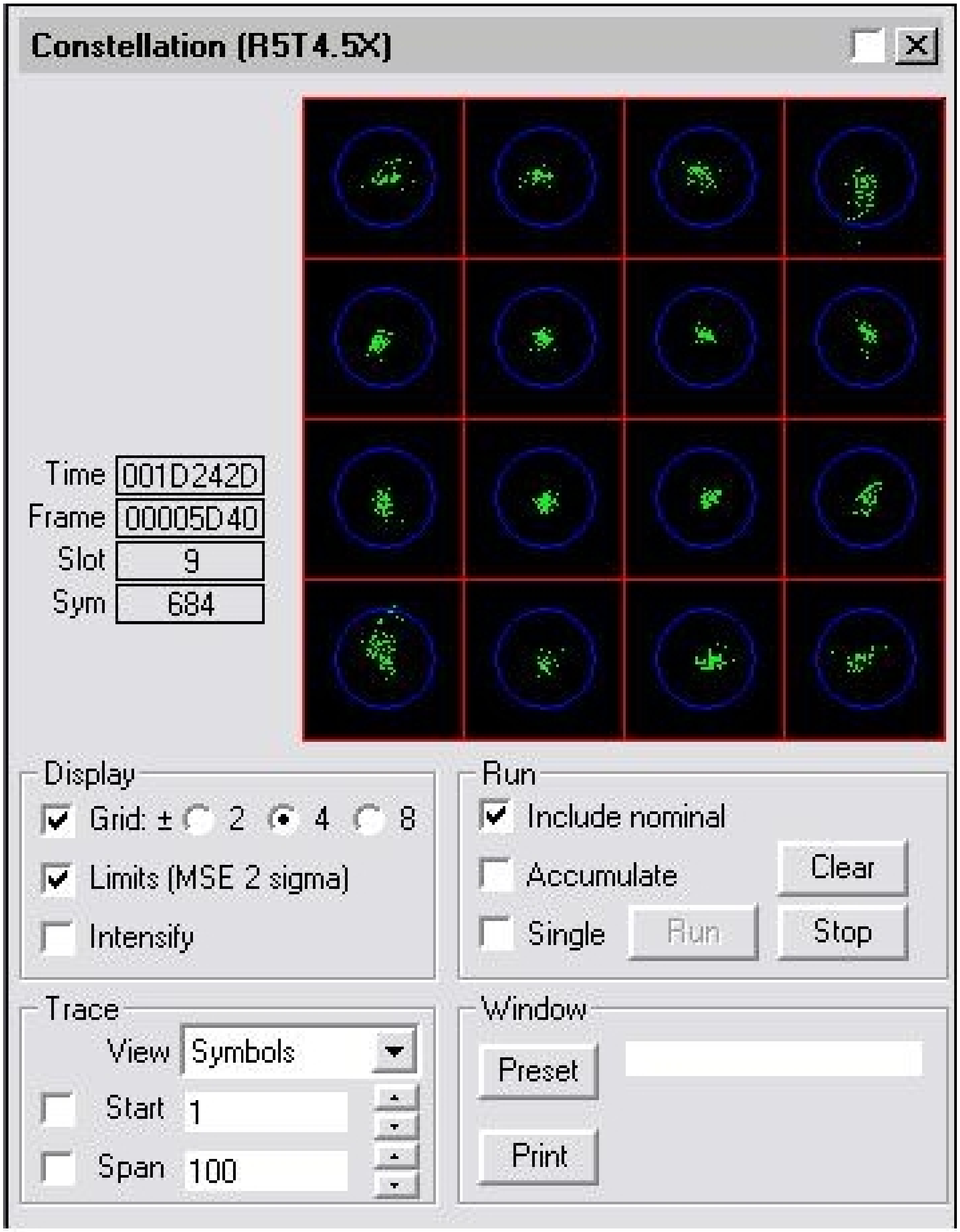


Figure 16 Constellation Diagram for Swift Broadband Data Rate of 302,400 bps QPSK

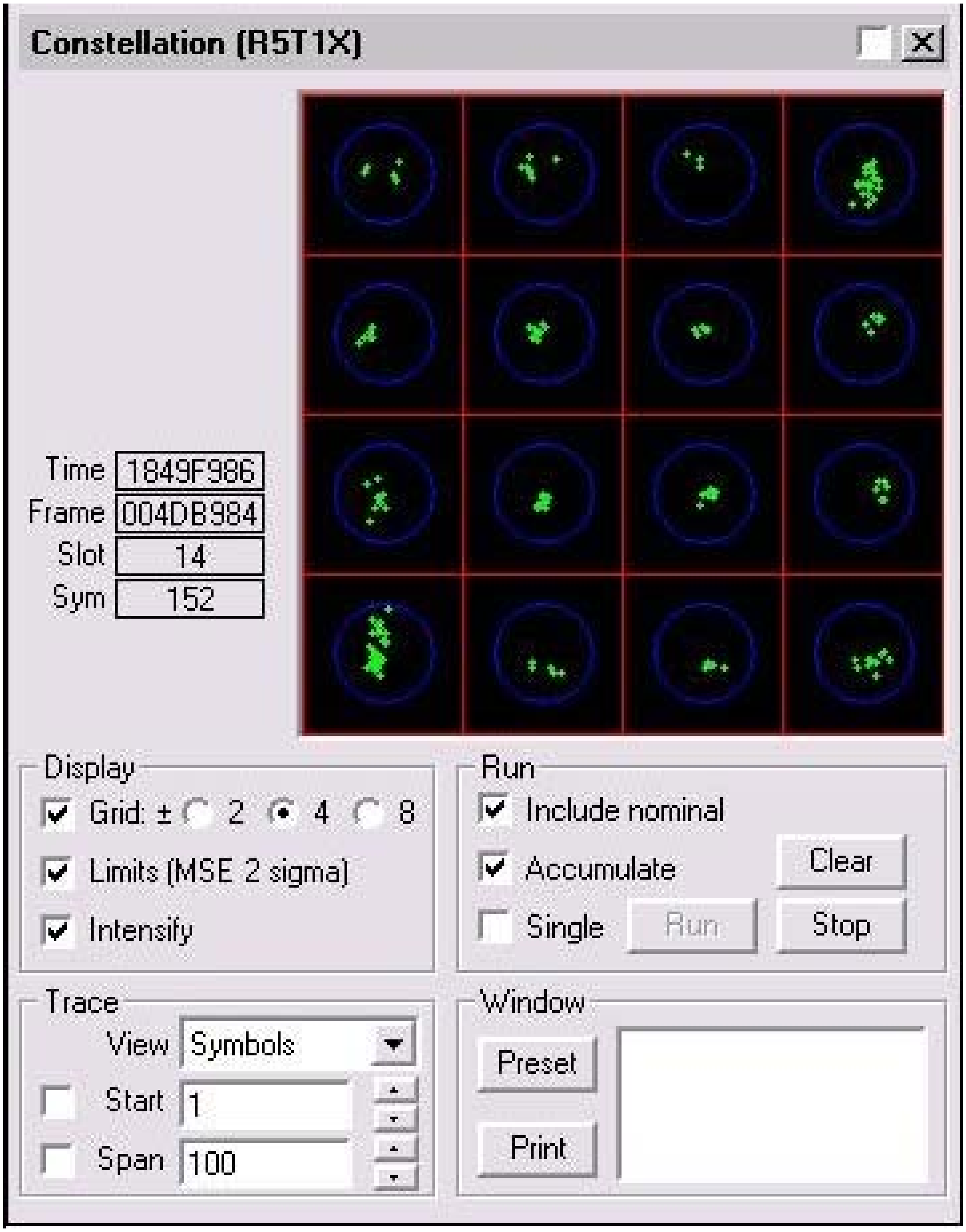


Figure 17 Constellation Diagram for Swift Broadband Data Rate of 134,400 bps 16-QAM

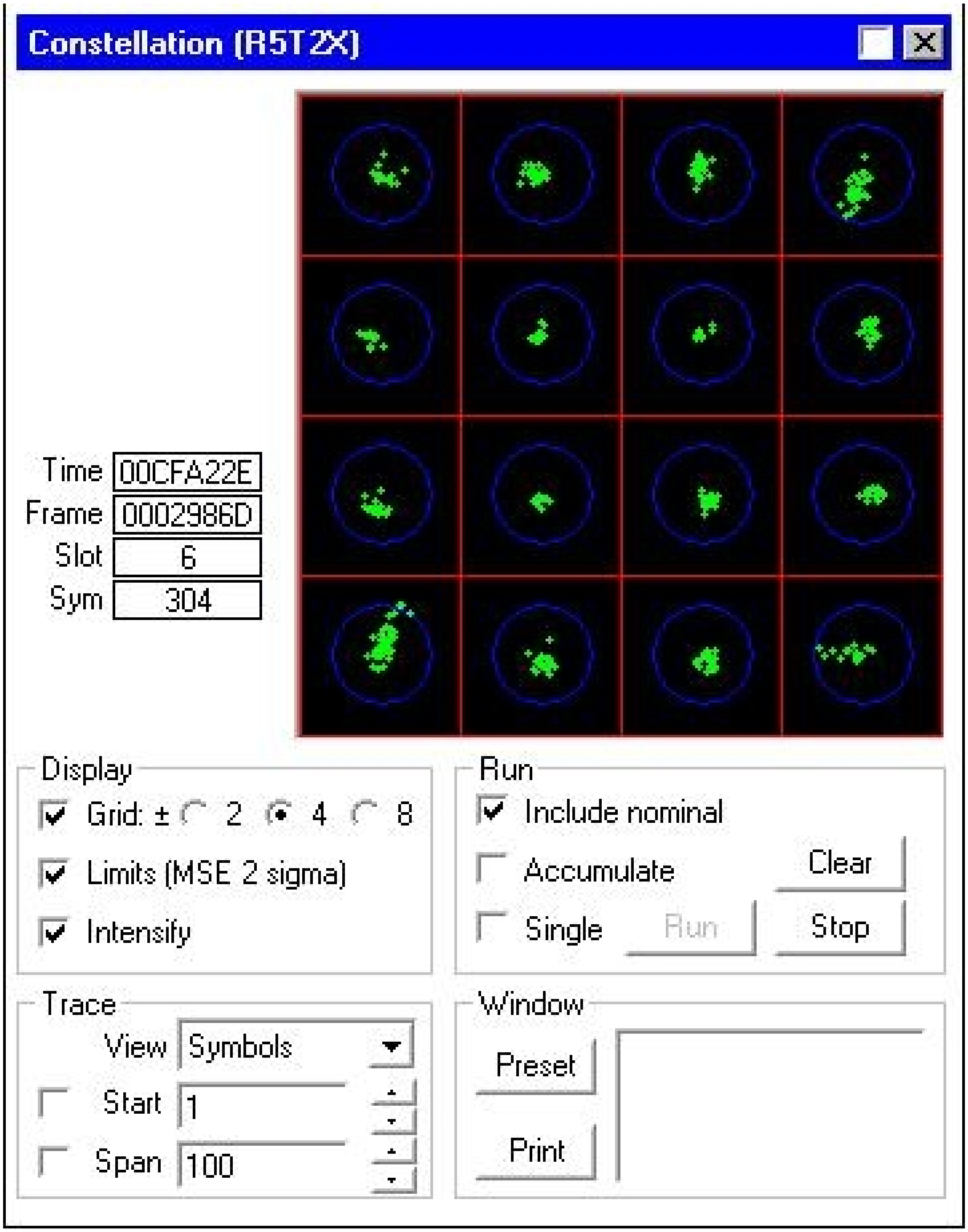


Figure 18 Constellation Diagram for Swift Broadband Data Rate of 268,800 bps 16-QAM

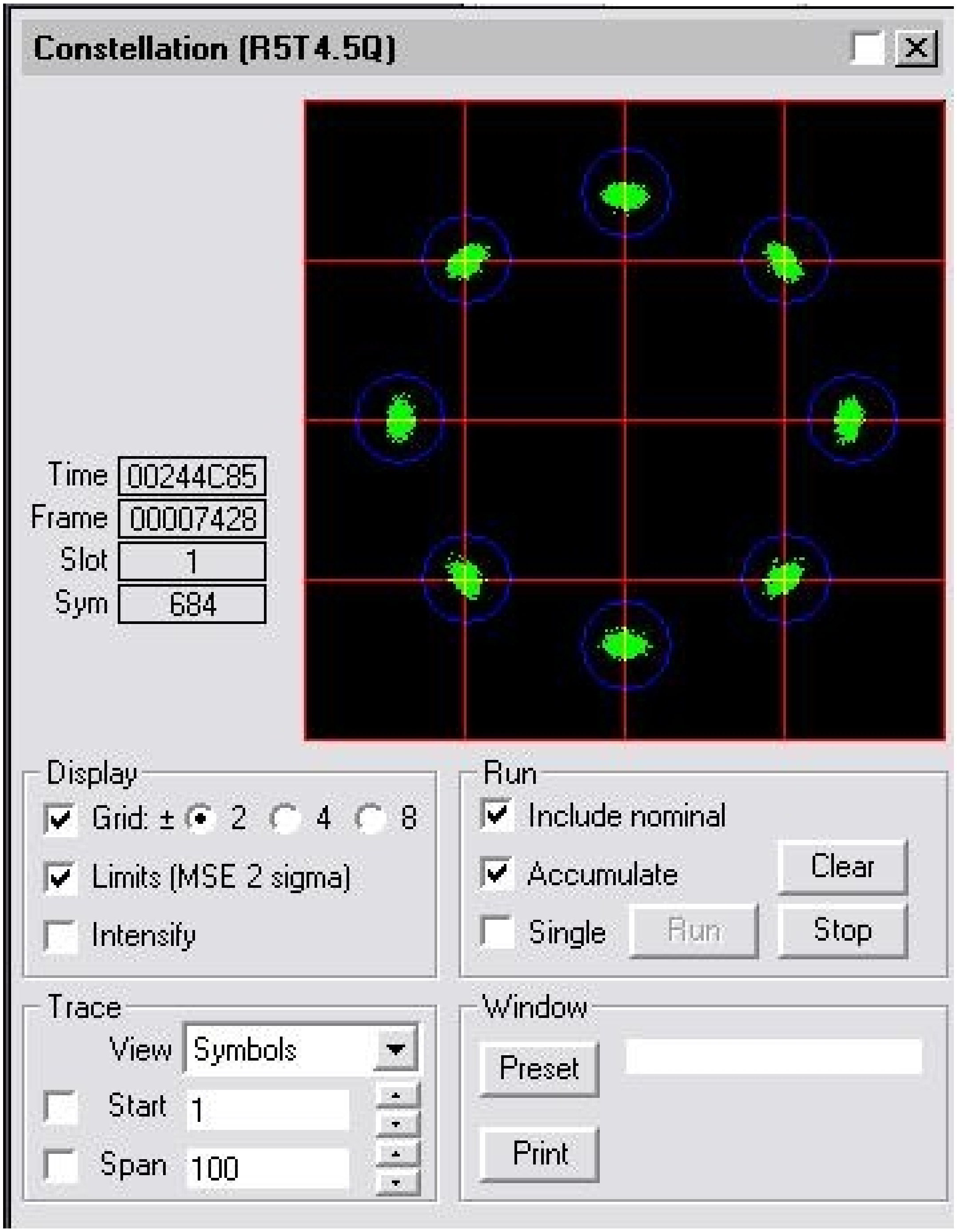


Figure 19 Constellation Diagram for Swift Broadband Data Rate of 604,800 bps 16-QAM

Exhibit F.3 SRT-2100B Occupied Bandwidth

3.1 FCC Requirements

The discussion and test results shown in this section address and meet the requirements of the following FCC requirements:

Section 2.1049

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable.

Section 2.1049 (h)

Transmitters employing digital modulation techniques – when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are operational at the discretion of the user.

Section 87.135 (a), (b), (c)

(a) - Occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are equal to 0.5 percent of the total mean power of a given emission.

(b) - The authorized bandwidth is the maximum occupied bandwidth authorized to be used by a station.

(c) - The necessary bandwidth for a given class of emission is the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions.

Section 87.137 (a)

The class of emissions, corresponding emission designators and authorized bandwidths for use by Aircraft Earth Stations are as follows:

Table 5 Emissions Classes

Class of Emission	Emission Designator	Authorized Bandwidth (kilohertz)
G1D[1]	21K0G1D	25
G1E[1]	21K0G1E	25
G1W[1]	21K0G1W	25

[1]Lower values of necessary and authorized bandwidths are permitted.

3.2 Test Procedure

The following test configuration was used to perform the Occupied Bandwidth measurements.

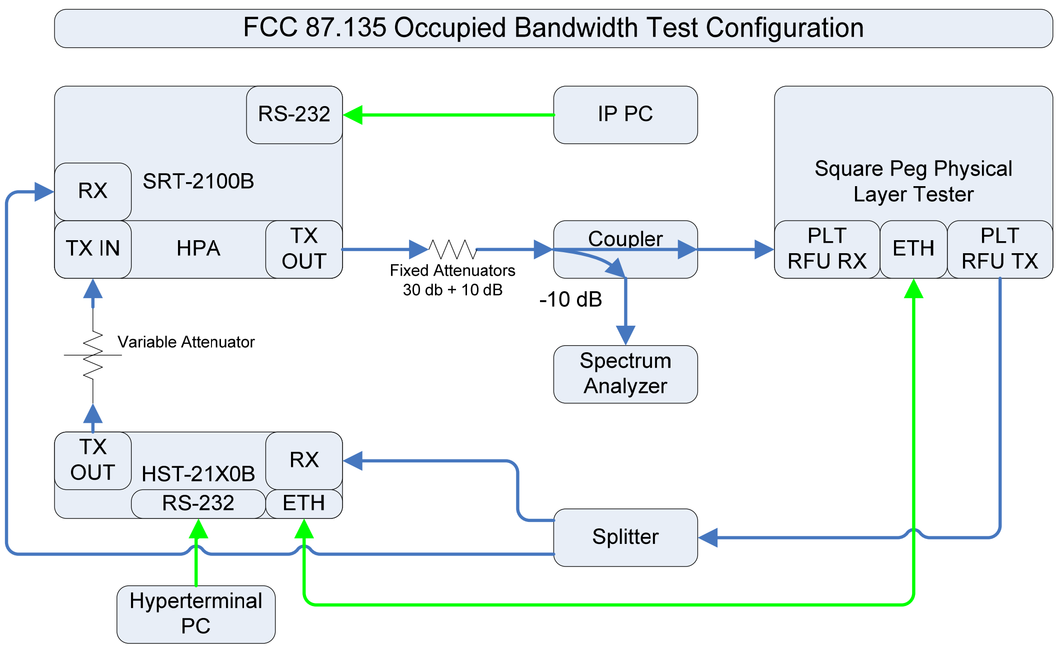


Figure 20 Test Configuration

3.2.1 Test Equipment

Item	Manufacturer	PN	SN	Notes
SRT-2100 B	Rockwell Collins	822-1785-001	147362	AC Powered
HST-2120 B	Rockwell Collins	270-2885-070	564	DC Powered
Physical Layer Tester	Square Peg Communications, Inc.	EM-907532C-04	PLTH_080	
Physical Layer Tester Radio Frequency Unit	Square Peg Communications, Inc.	EM-907516C-01	23	
Spectrum Analyzer	Agilent	E4440	MY46185575	
Variable Attenuator	Weinschel	910-20-11	7936	
Fixed Attenuator (30dB)	Weinschel	58-30-34-LIM	PF562	
Fixed Attenuator (10dB)	Weinschel	2	BN0739	
Directional Coupler	Narda	3002-10	70612	
Splitter	Mini-circuits	ZAPD-2	460-0206-551	

3.2.2 Occupied Bandwidth – Classic Aero

1. Connect the test equipment as shown in Figure 20.
2. Apply power to the SRT-2100B
3. Place the SRT-2100B into maintenance mode
4. Using the IP application, configure the SRT-2100B to radiate the following signals at 46.5 dBm using the modulation, bit rate and center frequency specified in the table below:

SRT-2100B Occupied Bandwidth Test Conditions			
Condition	**Modulation**	**Bit Rate (bps)**	**Frequency (MHz)**
1	BPSK	600	1626.50
2	BPSK	600	1643.50
3	BPSK	600	1660.50
4	BPSK	1,200	1626.50
5	BPSK	1,200	1643.50
6	BPSK	1,200	1660.50
7	QPSK	8,400	1626.50
8	QPSK	8,400	1643.50
9	QPSK	8,400	1660.50
10	QPSK	10,500	1626.50

11	QPSK	10,500	1643.50
12	QPSK	10,500	1660.50
13	QPSK	21,000	1626.50
14	QPSK	21,000	1643.50
15	QPSK	21,000	1660.50

5. Configure the spectrum analyzer to take occupied bandwidth measurements
6. Use the spectrum analyzer to take measurements using the settings detailed below for each of the conditions listed.

SRT-2100B Occupied Bandwidth Measurement Configuration				
Condition	**Freq. Span (KHz)**	**Resolution Bandwidth (Hz)**	**Occupied BW % Power**	**Trace Format**
1, 2, 3	75	300	99.00 %	Max Hold (10 sweeps minimum)
4, 5, 6	75	300	99.00 %	Max Hold (10 sweeps minimum)
7, 8, 9	75	300	99.00 %	Max Hold (10 sweeps minimum)
10, 11, 12	75	300	99.00 %	Max Hold (10 sweeps minimum)
13, 14, 15	75	300	99.00 %	Max Hold (10 sweeps minimum)

3.2.3 Occupied Bandwidth – Swift 64

1. Connect the test equipment as shown in Figure 20.
2. Apply power to the SRT-2100B and the HST-21X0B
3. Place the SRT-2100B into maintenance mode
4. Using the Hyper Terminal maintenance interface on the HST, power up the channel card and configure the HST to radiate the following signals with zero dB of channel card back off:

SRT-2100B Occupied Bandwidth Test Conditions			
Condition	**Modulation**	**Bit Rate (bps)**	**Frequency (MHz)**
1	BPSK	3,000	1626.50
2	BPSK	3,000	1643.50
3	BPSK	3,000	1660.50
4	16QAM	134,400	1626.50
5	16QAM	134,400	1643.50

6	16QAM	134,400	1660.50

5. Configure the spectrum analyzer to take occupied bandwidth measurements
6. Use the spectrum analyzer to take measurements using the settings detailed below for each of the conditions listed.

SRT-2100B Occupied Bandwidth Measurement Configuration				
Condition	**Freq. Span (KHz)**	**Resolution Bandwidth (Hz)**	**Occupied BW % Power**	**Trace Format**
1, 2, 3	100	300	99.00 %	Max Hold (10 sweeps minimum)
4, 5, 6	1000	3,000	99.00 %	Max Hold (10 sweeps minimum)

3.2.4 Occupied Bandwidth – Swift Broadband

1. Connect the test equipment as shown in Figure 20.
2. Apply power to the SRT-2100B and the HST-21X0B
3. Place the SRT-2100B into maintenance mode
4. Using the Hyper Terminal maintenance interface on the HST, force the power up of the HSTs Channel Card
5. Once the HSTs Channel Card is powered and connected via Ethernet to the Square Peg PLT, use the WinTerm application to place the Channel Card into MTR Test Mode
6. Start the BPLT application on the Square Peg PLT and run MTR test script MTR16a.scx
7. Using the interface provided by the test script, configure the HST to radiate the following signals:

SRT-2100B Occupied Bandwidth Test Conditions			
Condition	**Modulation**	**Bit Rate (bps)**	**Frequency (MHz)**
1	QPSK	33,600	1626.50
2	QPSK	33,600	1643.50
3	QPSK	33,600	1660.50
4	QPSK	67,200	1626.50
5	QPSK	67,200	1643.50
6	QPSK	67,200	1660.50
7	QPSK	134,400	1626.50
8	QPSK	134,400	1643.50
9	QPSK	134,400	1660.50
10	QPSK	302,400	1626.50

11	QPSK	302,400	1643.50
12	QPSK	302,400	1660.50
13	16QAM	134,400	1626.50
14	16QAM	134,400	1643.50
15	16QAM	134,400	1660.50
16	16QAM	268,800	1626.50
17	16QAM	268,800	1643.50
18	16QAM	268,800	1660.50
19	16QAM	604,800	1626.50
20	16QAM	604,800	1643.50
21	16QAM	604,800	1660.50

8. Configure the spectrum analyzer to take occupied bandwidth measurements
9. Use the spectrum analyzer to take measurements using the settings detailed below for each of the conditions listed.

SRT-2100B Occupied Bandwidth Measurement Configuration				
Condition	**Freq. Span (KHz)**	**Resolution Bandwidth (Hz)**	**Occupied BW % Power**	**Trace Format**
1, 2, 3	1,000	3,000	99.00 %	Max Hold (10 sweeps minimum)
4, 5, 6	1,000	3,000	99.00 %	Max Hold (10 sweeps minimum)
7, 8, 9	1,000	3,000	99.00 %	Max Hold (10 sweeps minimum)
10, 11, 12	1,000	3,000	99.00 %	Max Hold (10 sweeps minimum)
13, 14, 15	1,000	3,000	99.00 %	Max Hold (10 sweeps minimum)
16, 17, 18	1,000	3,000	99.00 %	Max Hold (10 sweeps minimum)
19, 20, 21	1,000	3,000	99.00 %	Max Hold (10 sweeps minimum)

3.3 Occupied Bandwidth Results

In all cases, the measured bandwidth falls within the 25 kHz limit authorized bandwidth specified in Section 87.137 for Classic Aero operation.

A waiver for Swift 64 operation has previously been granted for 40K0D1D, 40K0D1E and 40K0D1W emission designators authorizing a bandwidth of 45 kHz. In all cases, the measured bandwidth falls within this 45 kHz limit.

Rockwell Collins intends to submit a Request for Waiver to accommodate the higher data rate emission type utilized by the INMARSAT SwiftBroadband service and the associated occupied bandwidth.

The following table lists each of the test conditions and corresponding figure number of each measurement.

Occupied Bandwidth
List of Figures

Figure Number	Operational Mode	Condition Number	Modulation Type	Bit Rate (bps)	SRT used	HST used
21 – 23	Classic Aero	1 – 3	BPSK	600	SRT-2100B AC	none
24 – 26	Classic Aero	4 – 6	BPSK	1200	SRT-2100B AC	none
27 – 29	Classic Aero	7 - 9	QPSK	8400	SRT-2100B AC	none
30 – 32	Classic Aero	10 - 12	QPSK	10,500	SRT-2100B AC	none
33 – 35	Classic Aero	13 - 15	QPSK	21,000	SRT-2100B AC	none
36 – 38	Swift64	1 – 3	BPSK	3000	SRT-2100B AC	HST-2120B DC
39 – 41	Swift64	4 – 6	16-QAM	134,400	SRT-2100B AC	HST-2120B DC
42 – 44	Swift Broadband	1 – 3	QPSK	33,600	SRT-2100B AC	HST-2120B DC
45 – 47	Swift Broadband	4 – 6	QPSK	67,200	SRT-2100B AC	HST-2120B DC
48 – 50	Swift Broadband	7 - 9	QPSK	134,400	SRT-2100B AC	HST-2120B DC
51 – 53	Swift Broadband	10 - 12	QPSK	302,400	SRT-2100B AC	HST-2120B DC
54 – 56	Swift Broadband	13 - 15	16-QAM	134,400	SRT-2100B AC	HST-2120B DC
57 – 59	Swift Broadband	16 - 18	16-QAM	268,800	SRT-2100B AC	HST-2120B DC
60 – 62	Swift Broadband	19 - 21	16-QAM	604,800	SRT-2100B AC	HST-2120B DC

Carrier Frequencies: Low Band: 1626.5 MHz, Mid Band: 1643.5 MHz, High Band: 1660.5 MHz

Figure 21 – Occupied BW - Classic 600 bps BPSK - Low Band

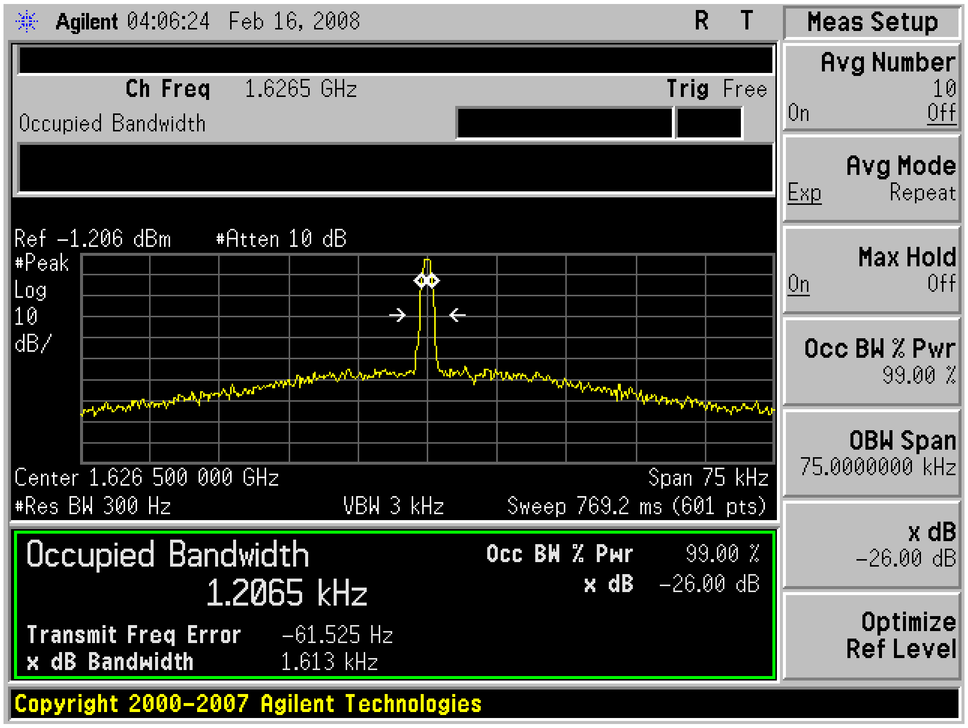


Figure 22 – Occupied BW - Classic 600 bps BPSK - Mid Band

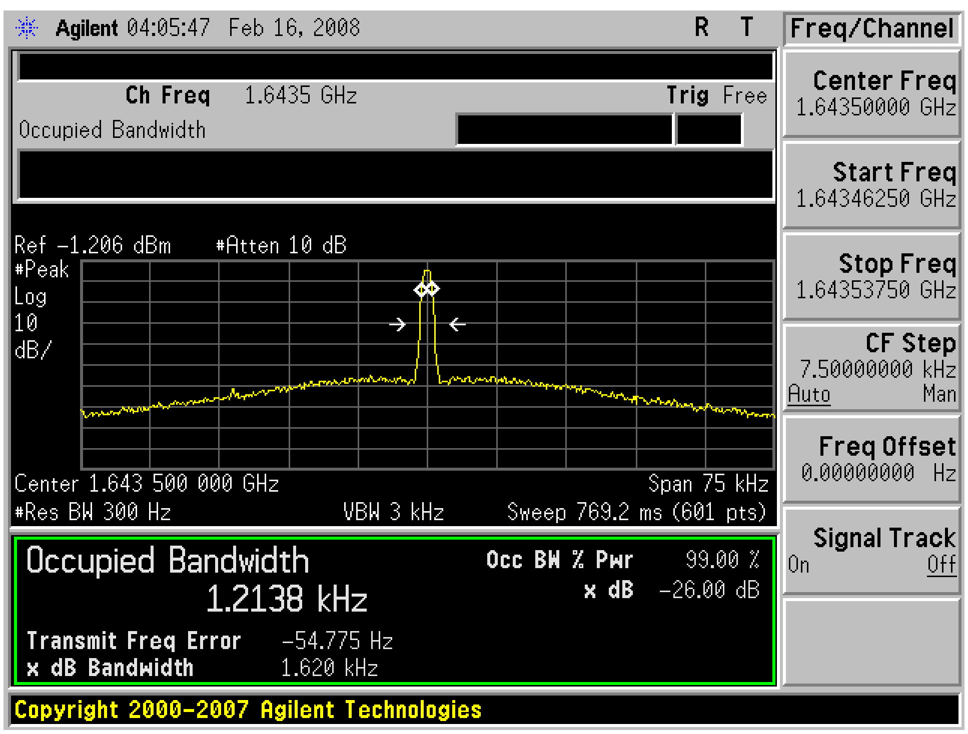


Figure 23 – Occupied BW - Classic 600 bps BPSK - High Band

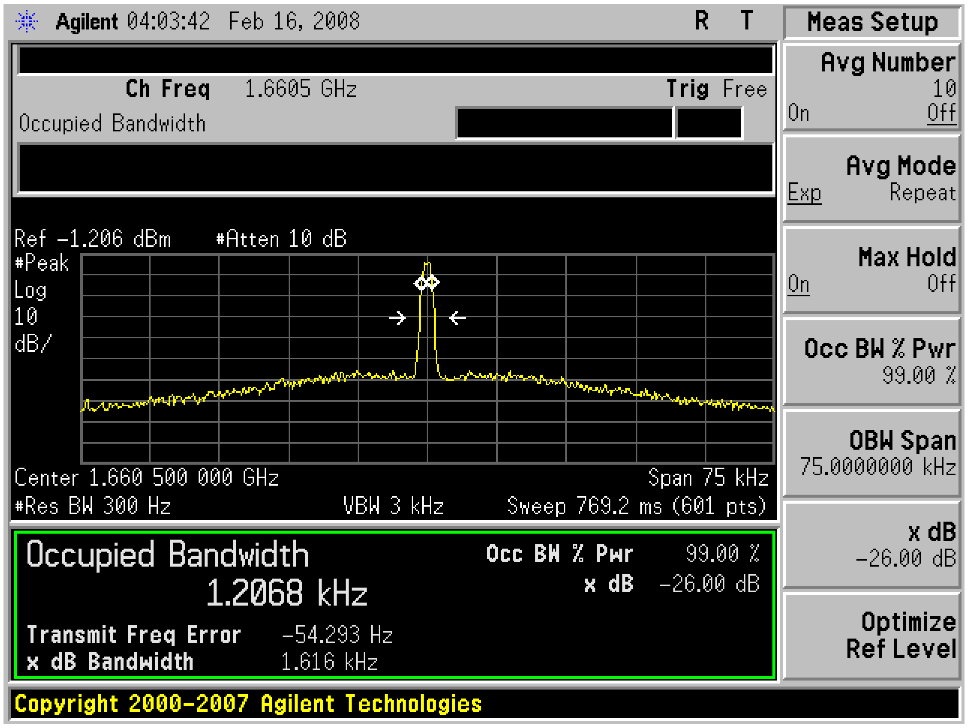


Figure 24– Occupied BW - Classic 1200 bps BPSK - Low Band

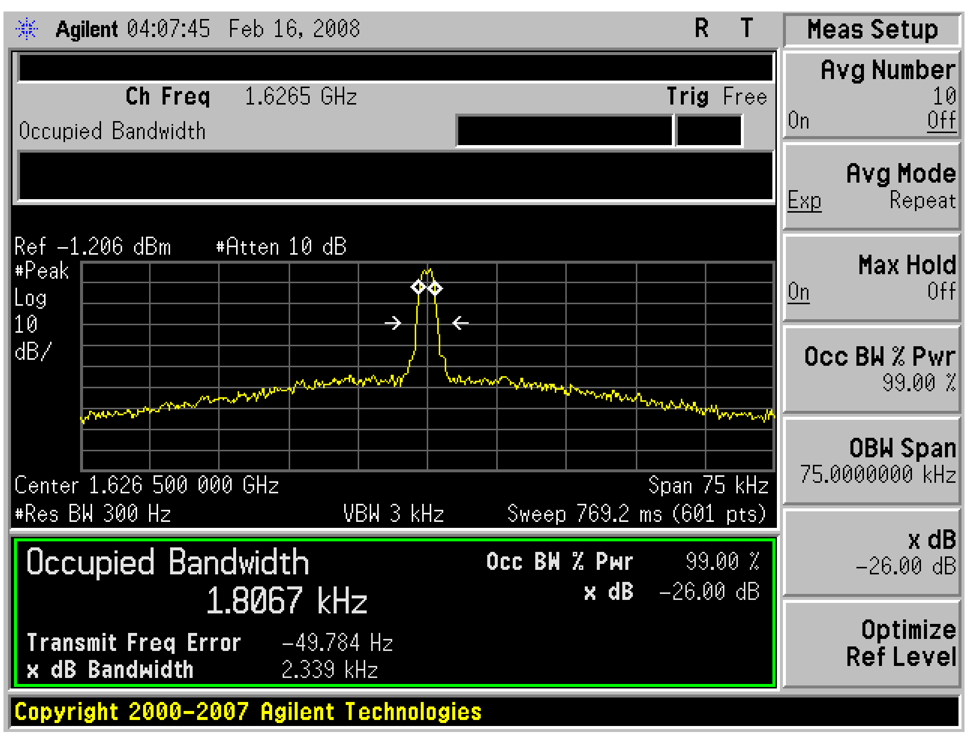


Figure 25 – Occupied BW - Classic 1200 bps BPSK - Mid Band

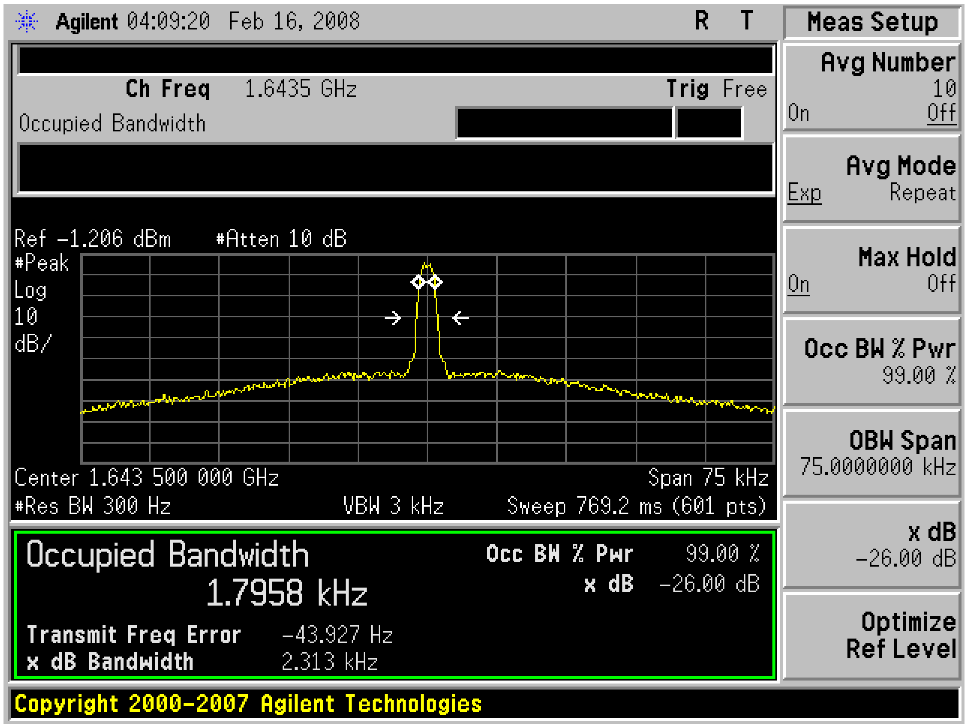


Figure 26 – Occupied BW - Classic 1200 bps BPSK - High Band

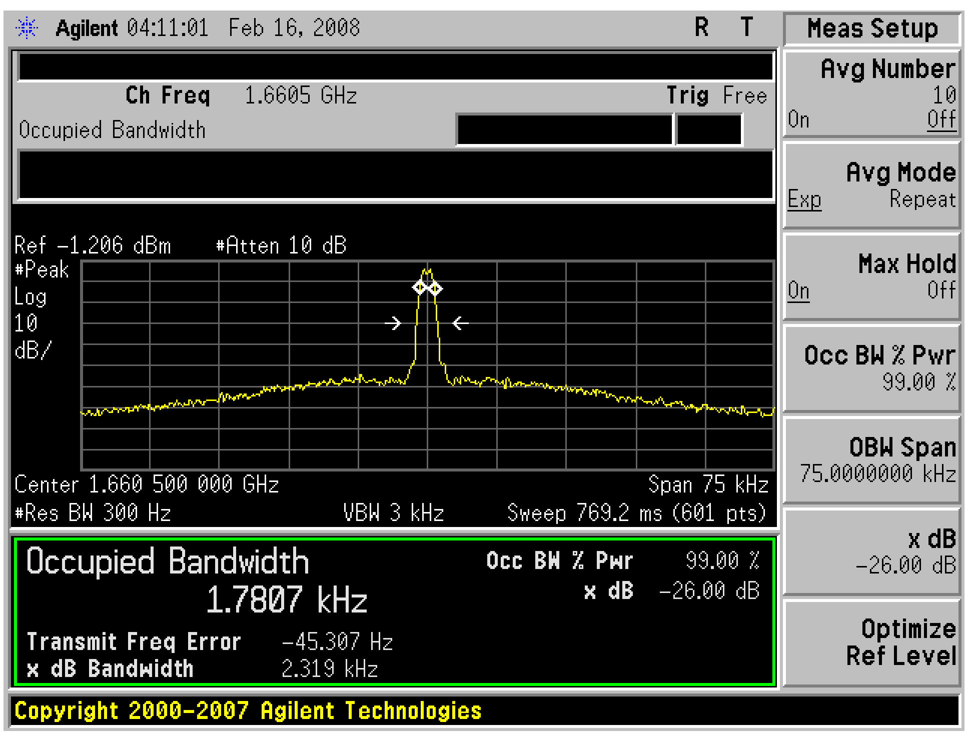


Figure 27 – Occupied BW - Classic 8400 bps QPSK - Low Band

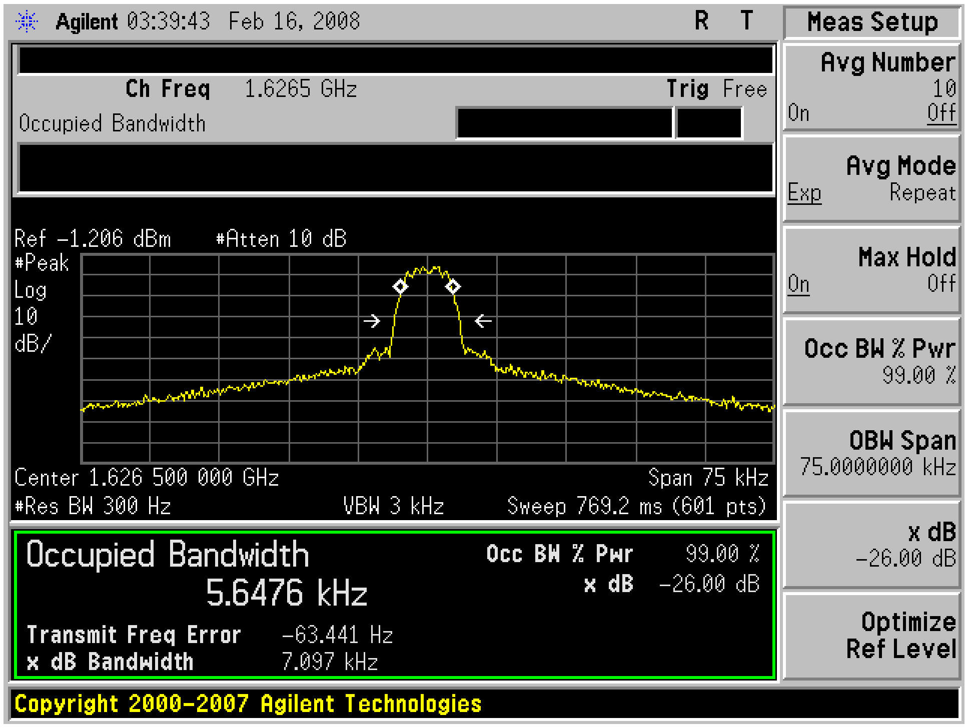


Figure 28 – Occupied BW - Classic 8400 bps QPSK - Mid Band

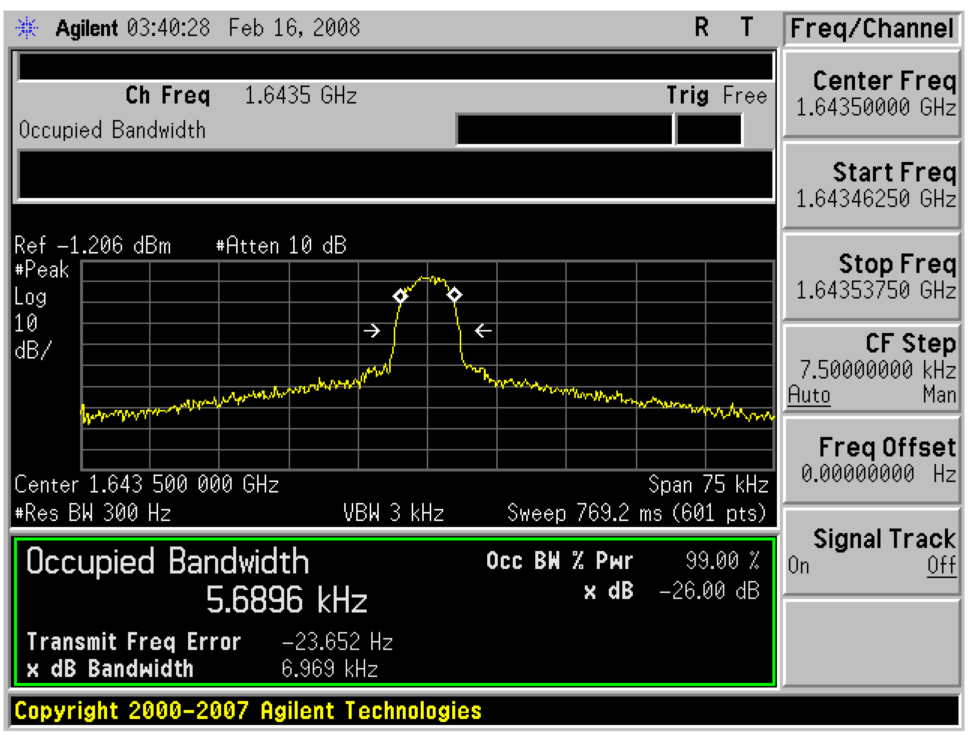


Figure 29 – Occupied BW - Classic 8400 bps QPSK - High Band

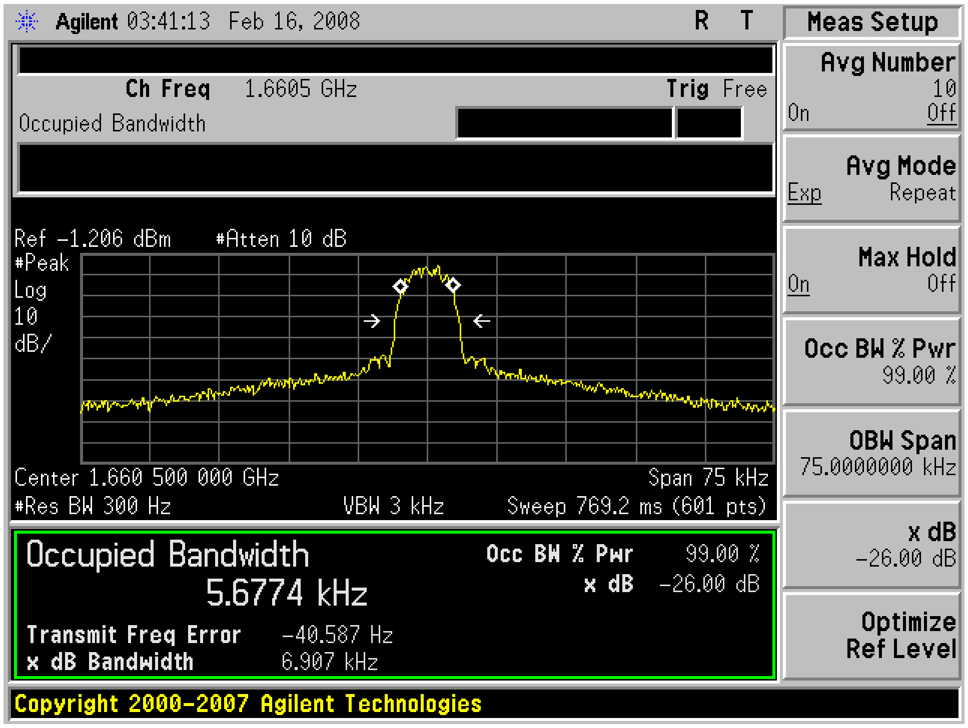


Figure 30 – Occupied BW - Classic 10,500 bps QPSK - Low Band

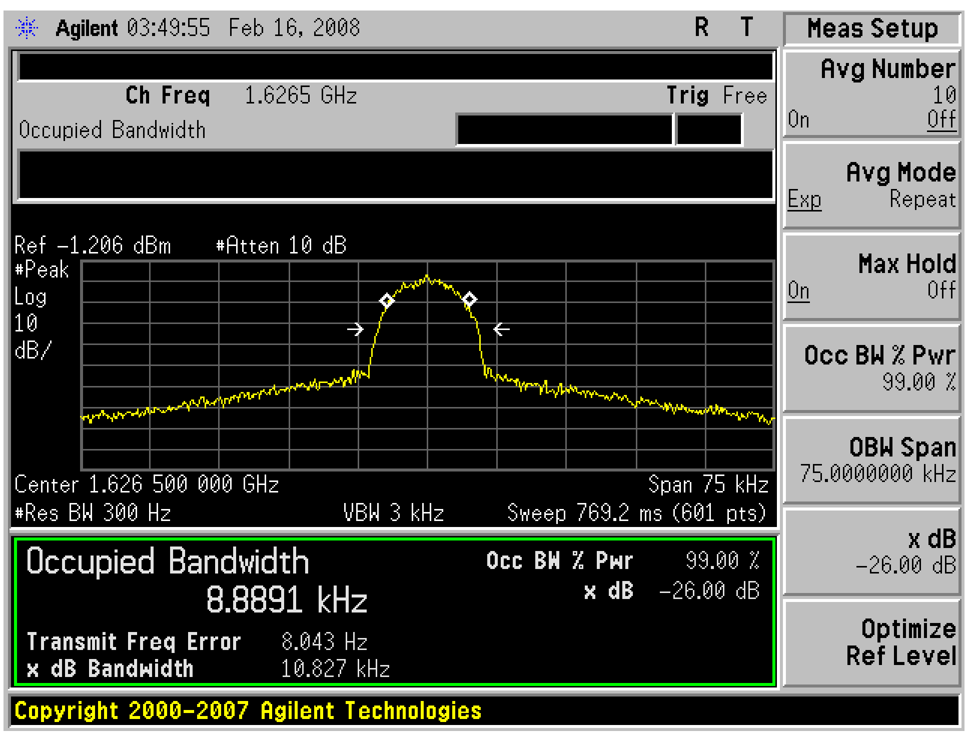


Figure 31 – Occupied BW - Classic 10,500 bps QPSK - Mid Band

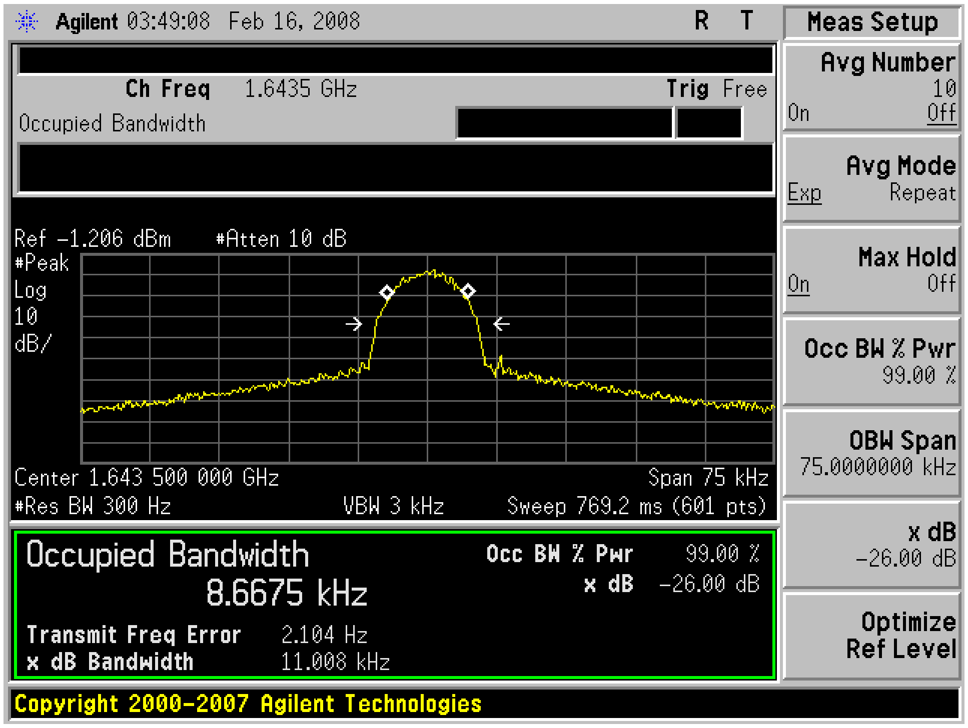


Figure 32 – Occupied BW - Classic 10,500 bps QPSK - High Band

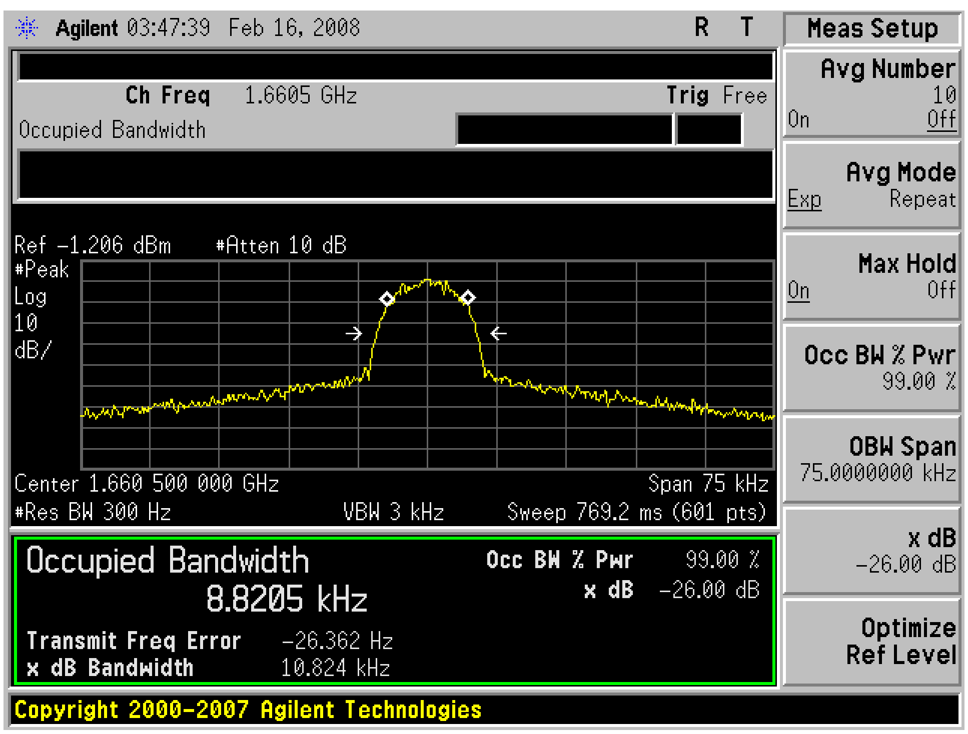


Figure 33 – Occupied BW - Classic 21,000 bps QPSK - Low Band

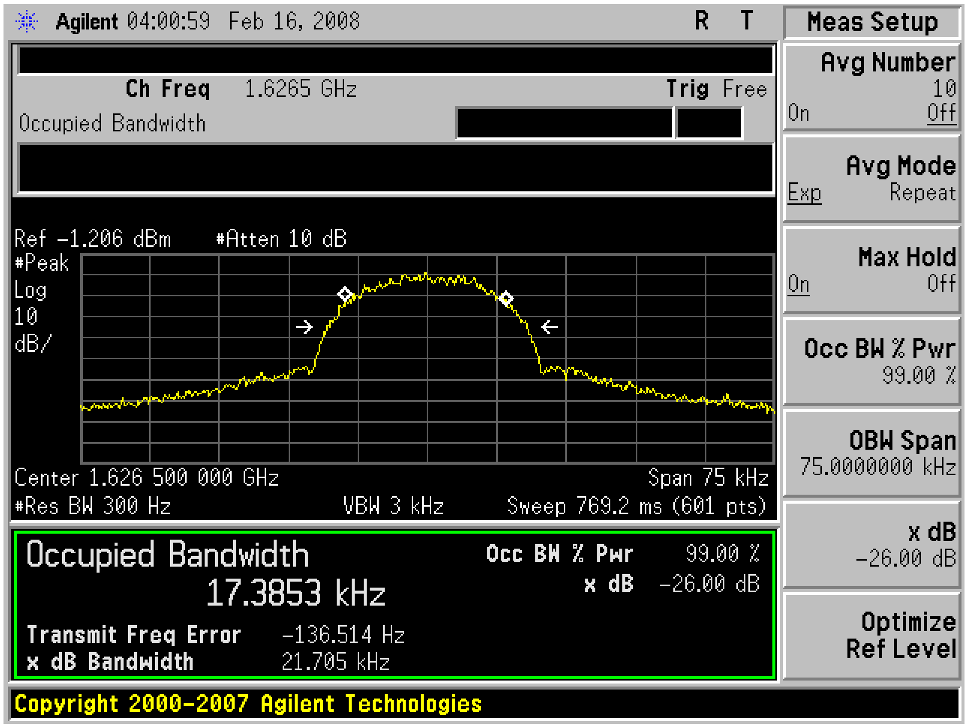


Figure 34 – Occupied BW - Classic 21,000 bps QPSK - Mid Band

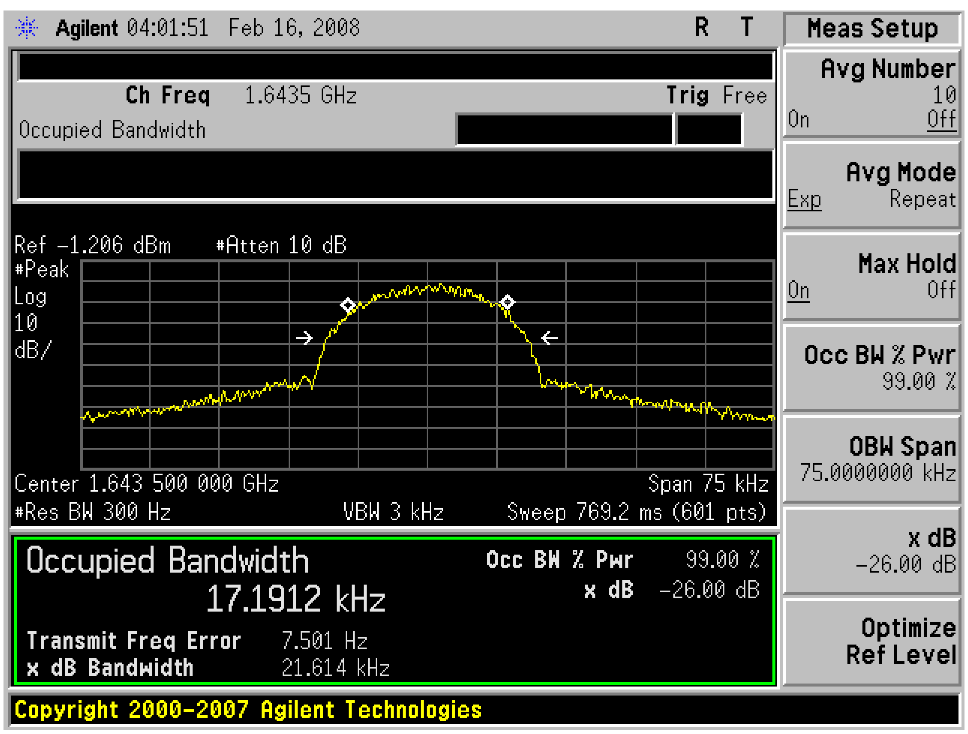


Figure 35 – Occupied BW - Classic 21,000 bps QPSK - High Band

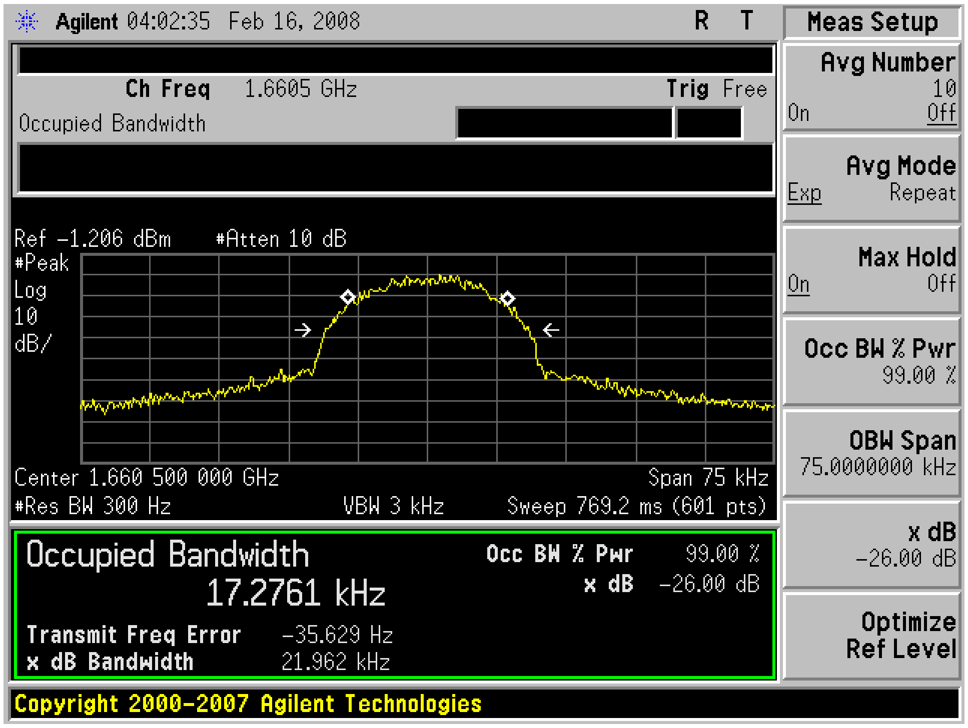


Figure 36 – Occupied BW - Swift 64 3000 bps BPSK - Low Band

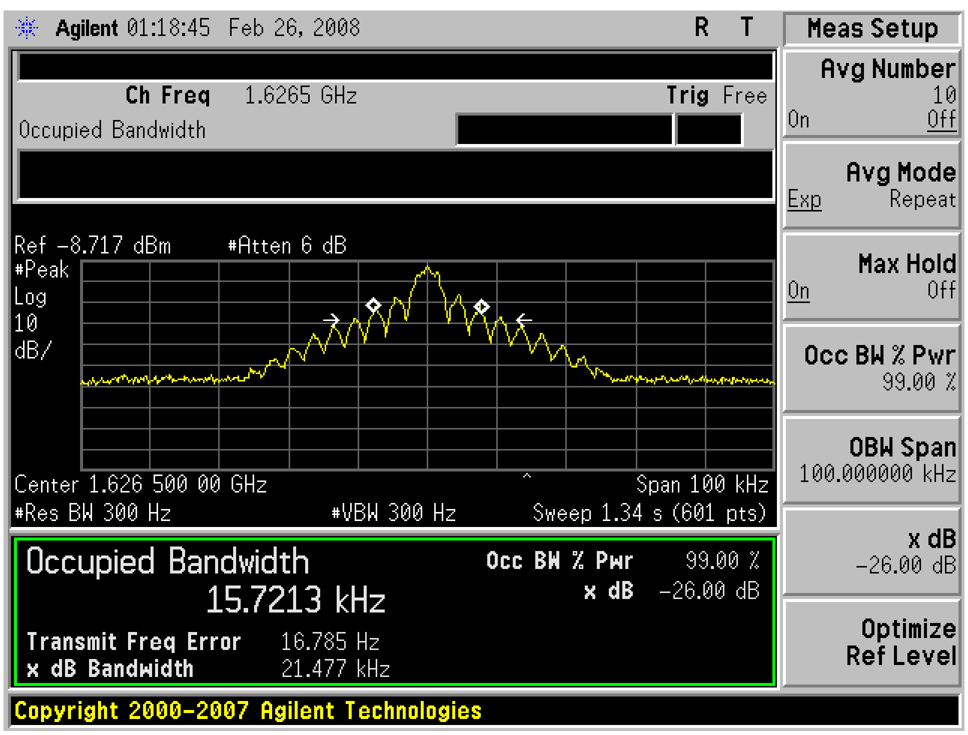


Figure 37 – Occupied BW - Swift 64 3000 bps BPSK - Mid Band

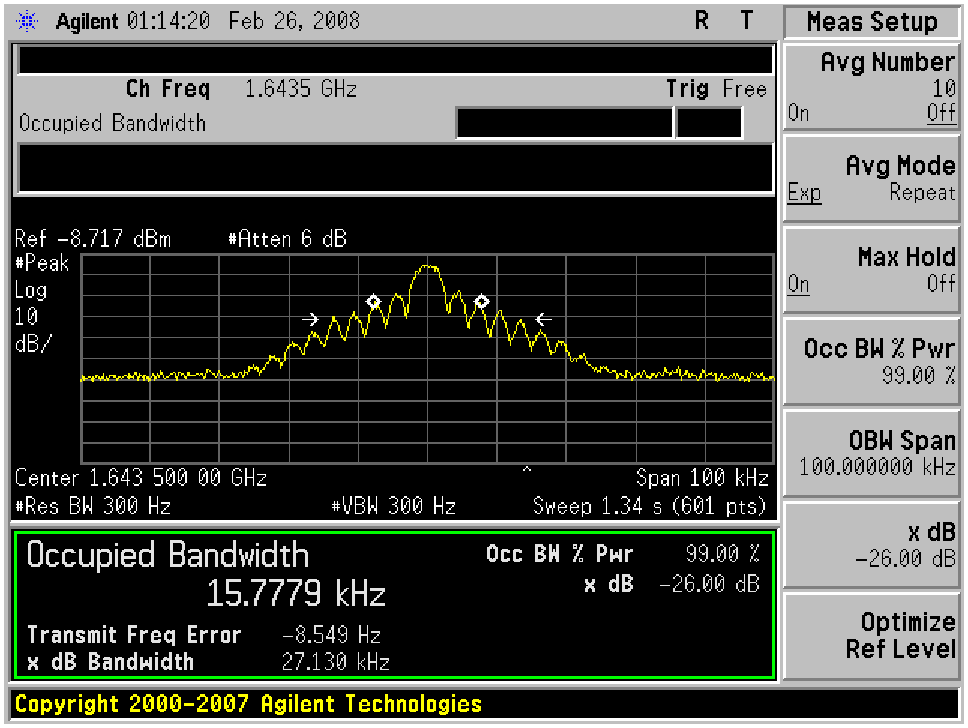


Figure 38 – Occupied BW - Swift 64 3000 bps BPSK - High Band

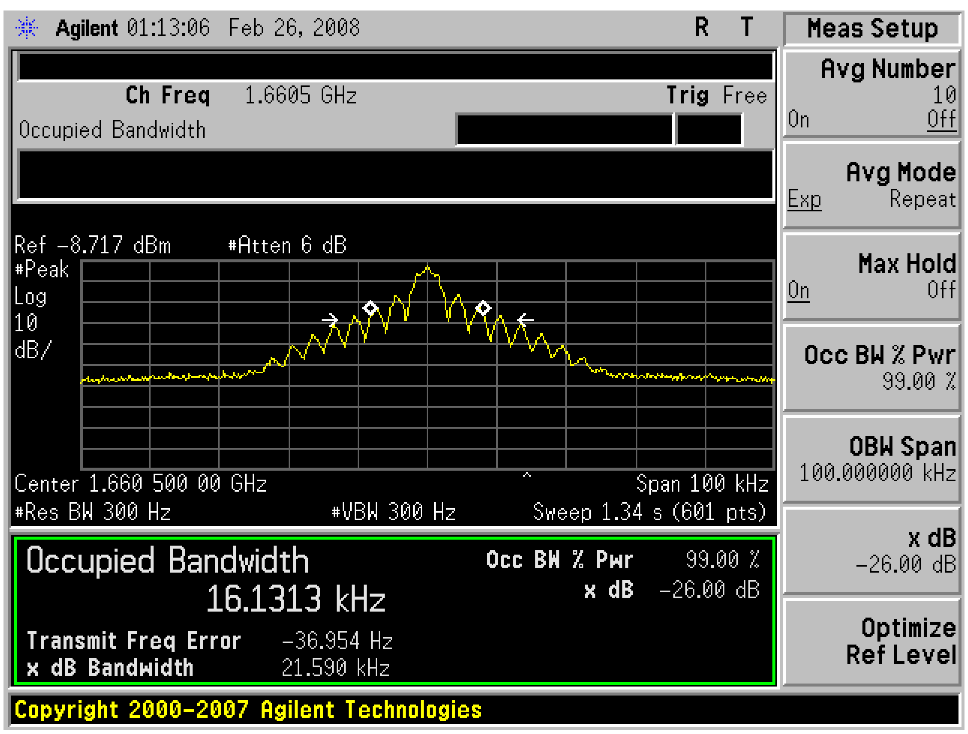


Figure 39 – Occupied BW - Swift 64 134,400 bps 16-QAM - Low Band

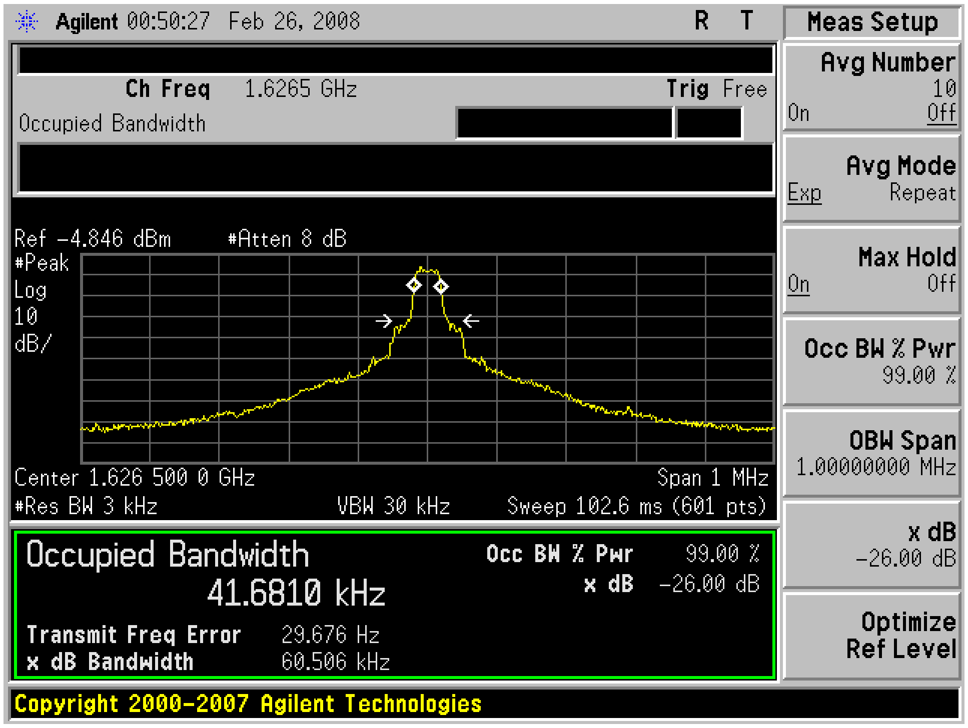


Figure 40 – Occupied BW - Swift 64 134,400 bps 16-QAM - Mid Band

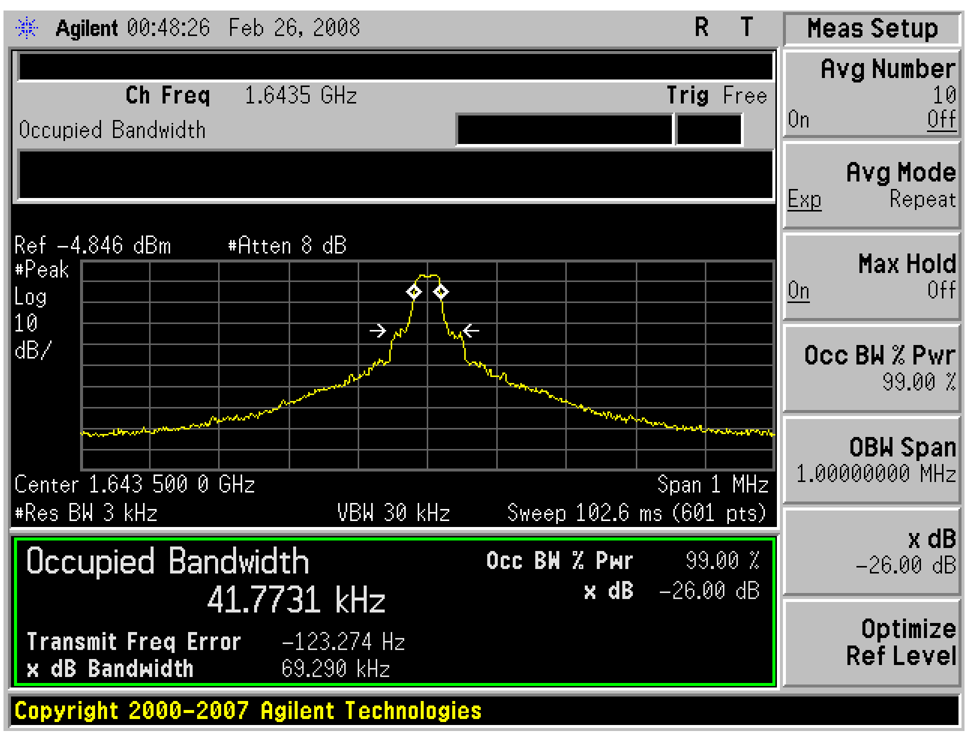


Figure 41 – Occupied BW - Swift 64 134,400 bps 16-QAM - High Band

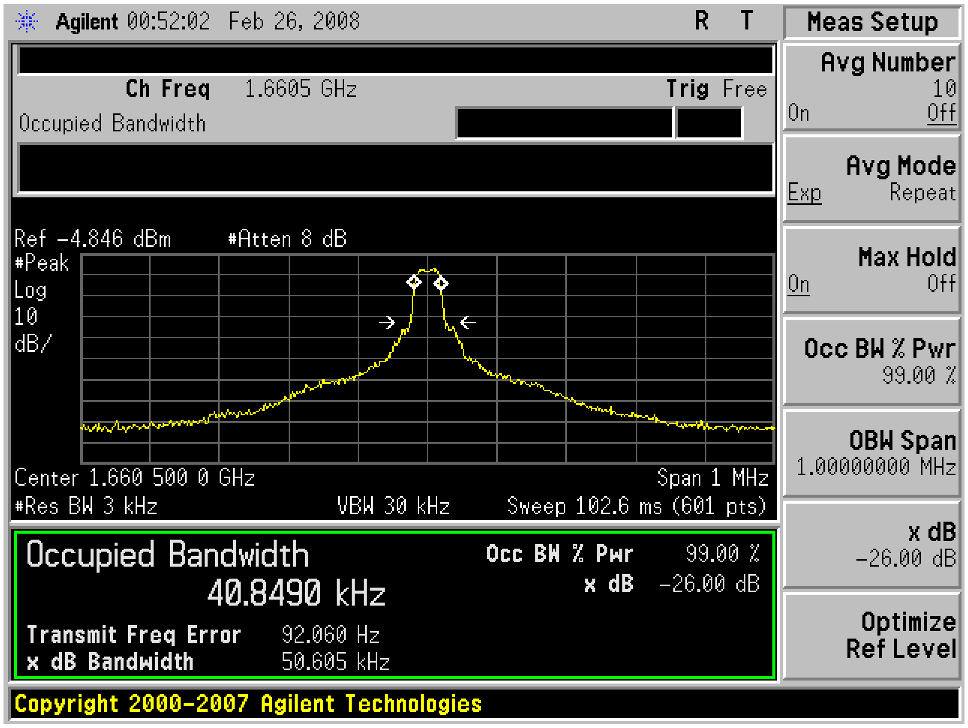


Figure 42 – Occupied BW - Swift Broadband 33,600 bps QPSK - Low Band

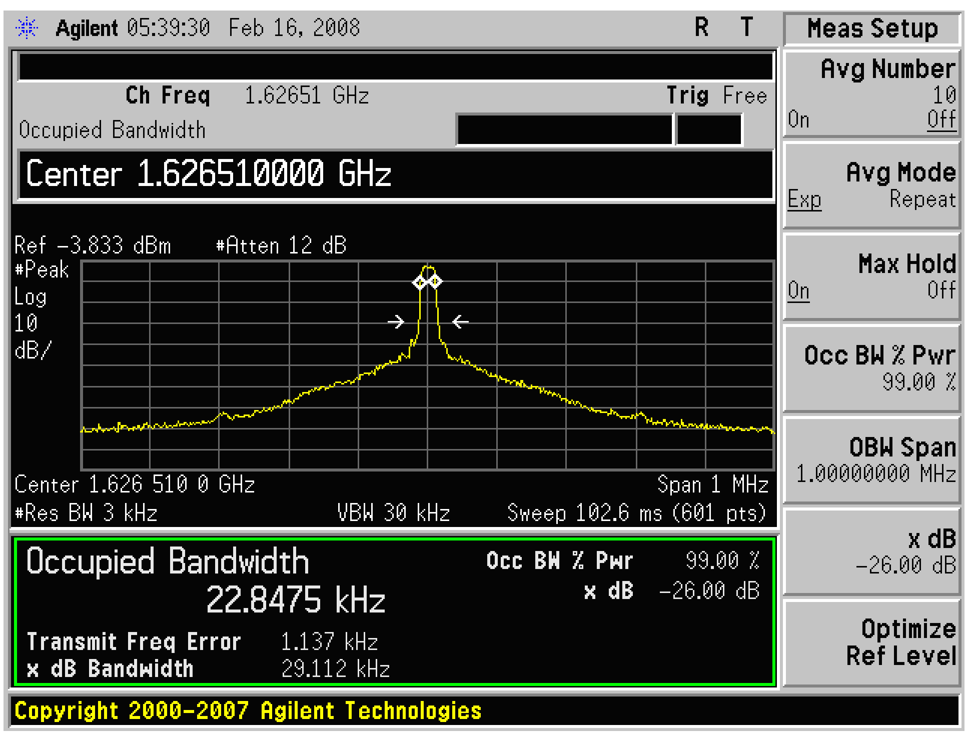


Figure 43 – Occupied BW - Swift Broadband 33,600 bps QPSK - Mid Band

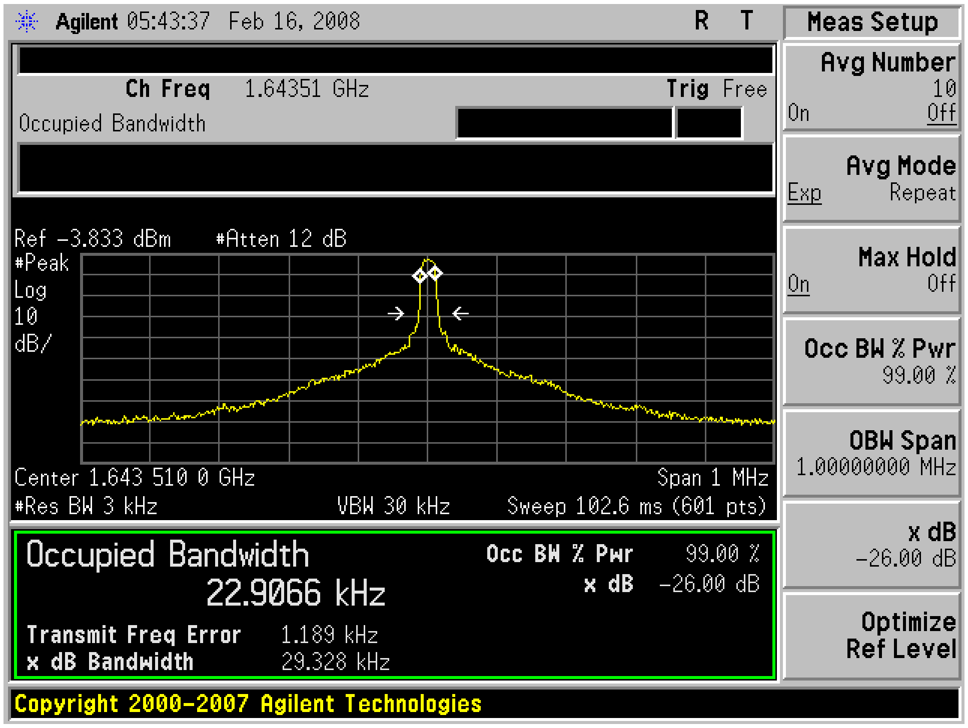


Figure 44 – Occupied BW - Swift Broadband 33,600 bps QPSK - High Band

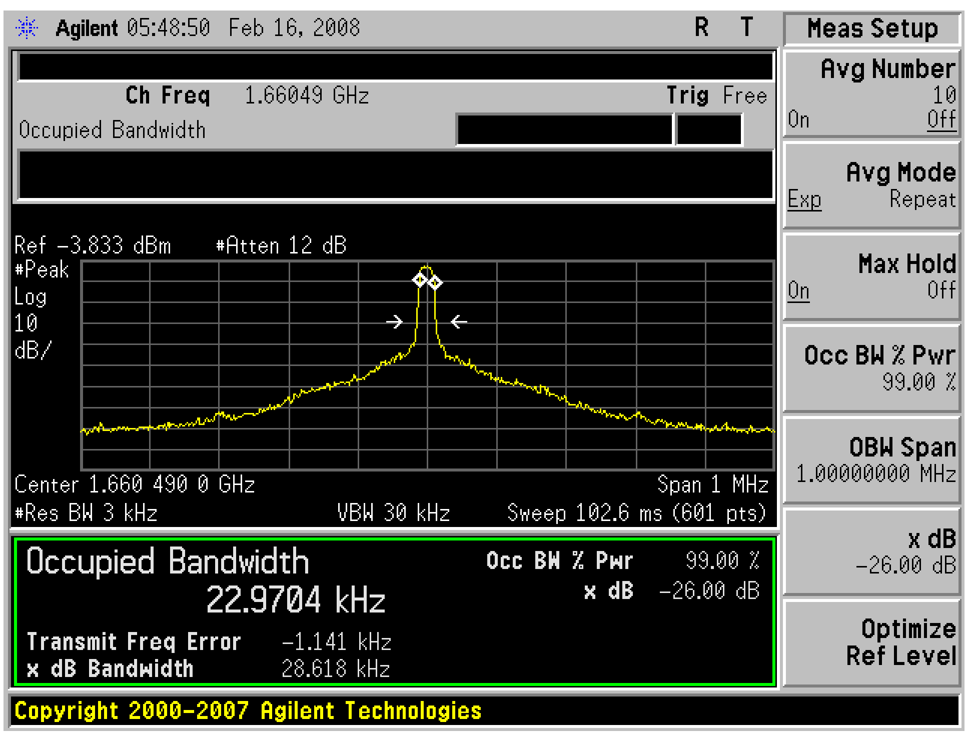


Figure 45 – Occupied BW - Swift Broadband 67,200 bps QPSK - Low Band

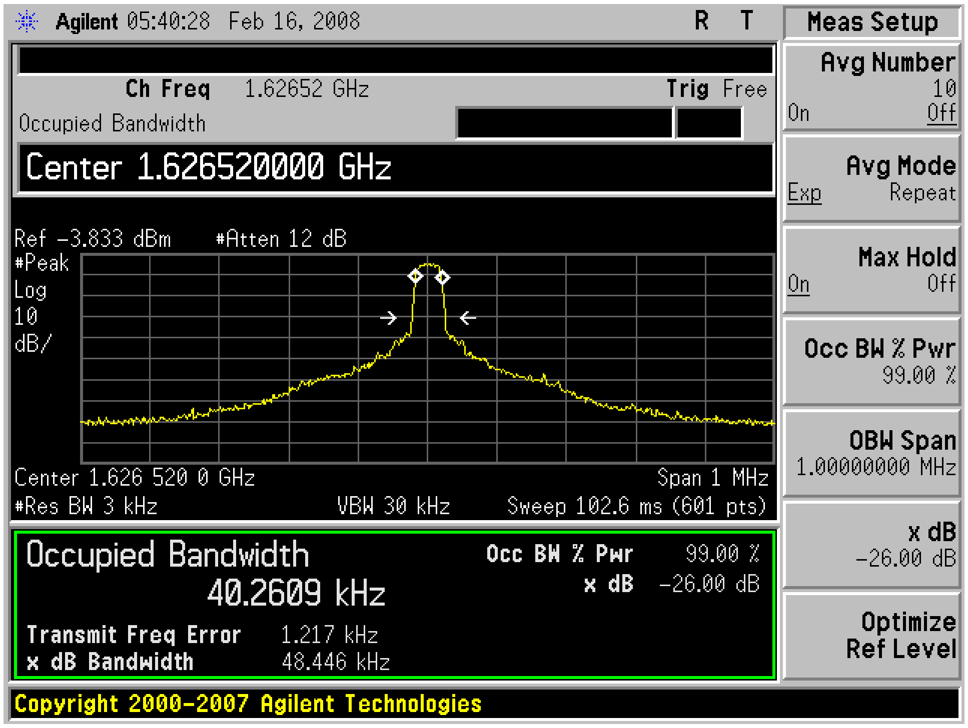


Figure 46 – Occupied BW - Swift Broadband 67,200 bps QPSK - Mid Band

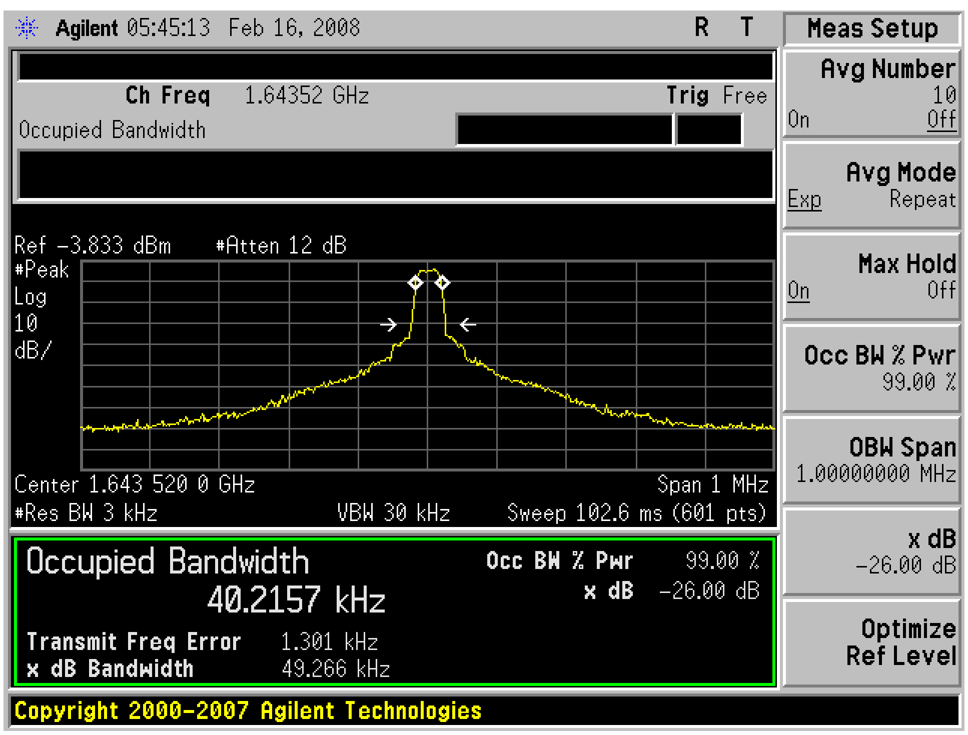


Figure 47 – Occupied BW - Swift Broadband 67,200 bps QPSK - High Band

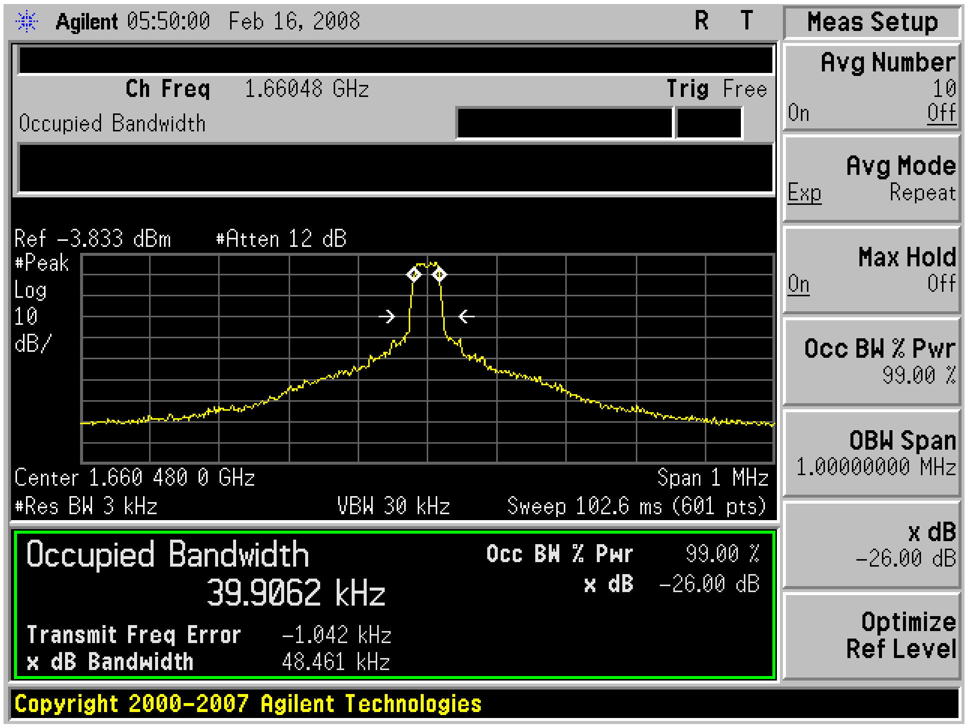


Figure 48 – Occupied BW - Swift Broadband 134,400 bps QPSK - Low Band

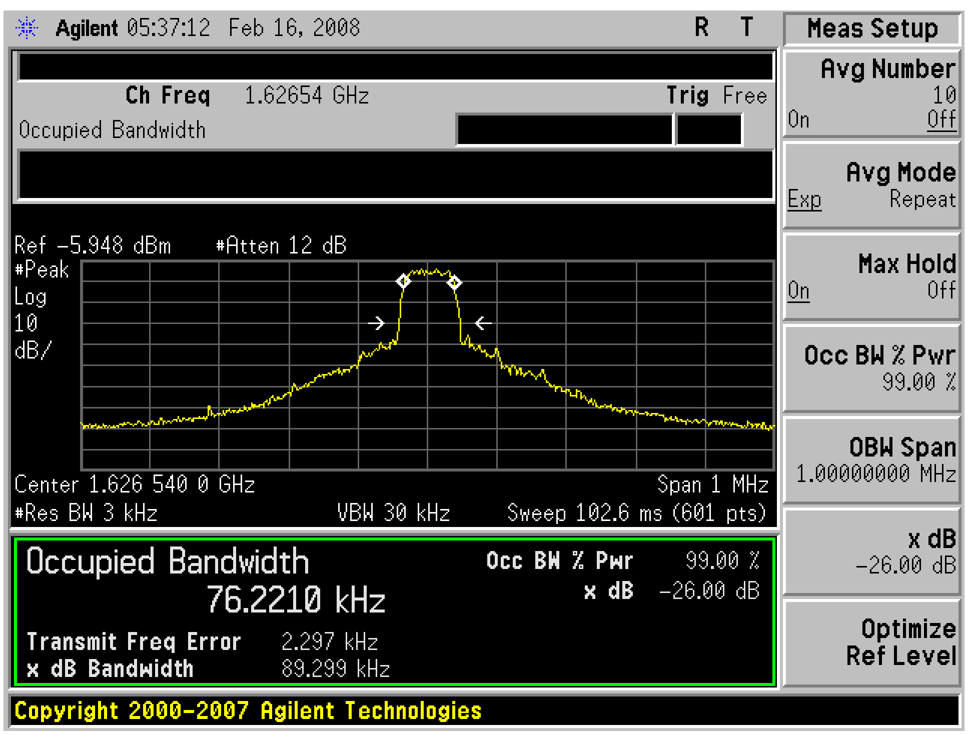


Figure 49 – Occupied BW - Swift Broadband 134,400 bps QPSK - Mid Band

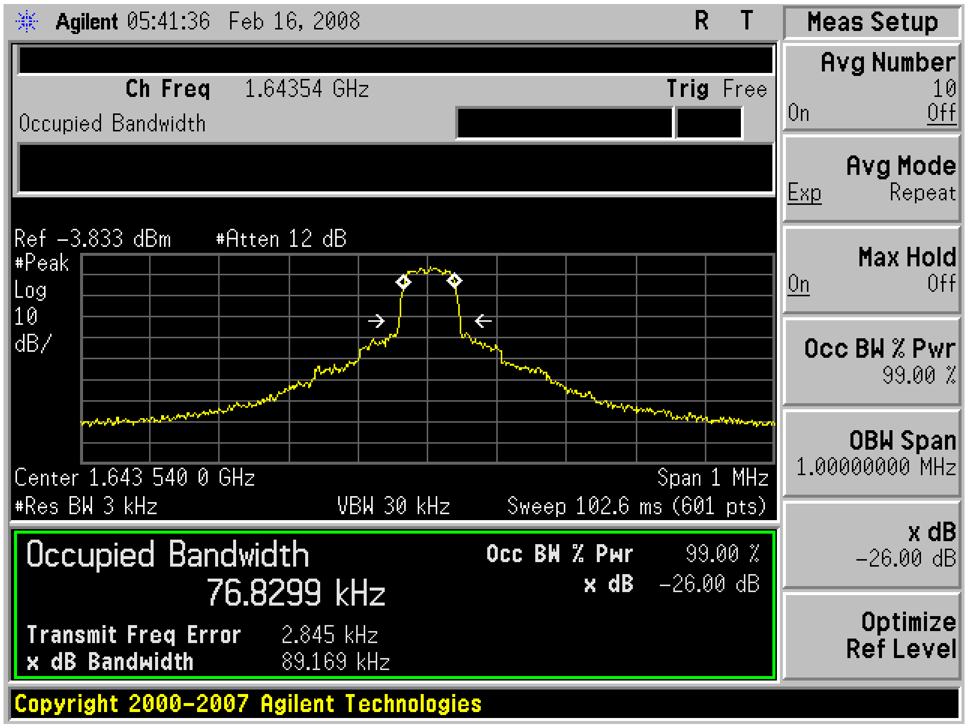


Figure 50 – Occupied BW - Swift Broadband 134,400 bps QPSK - High Band

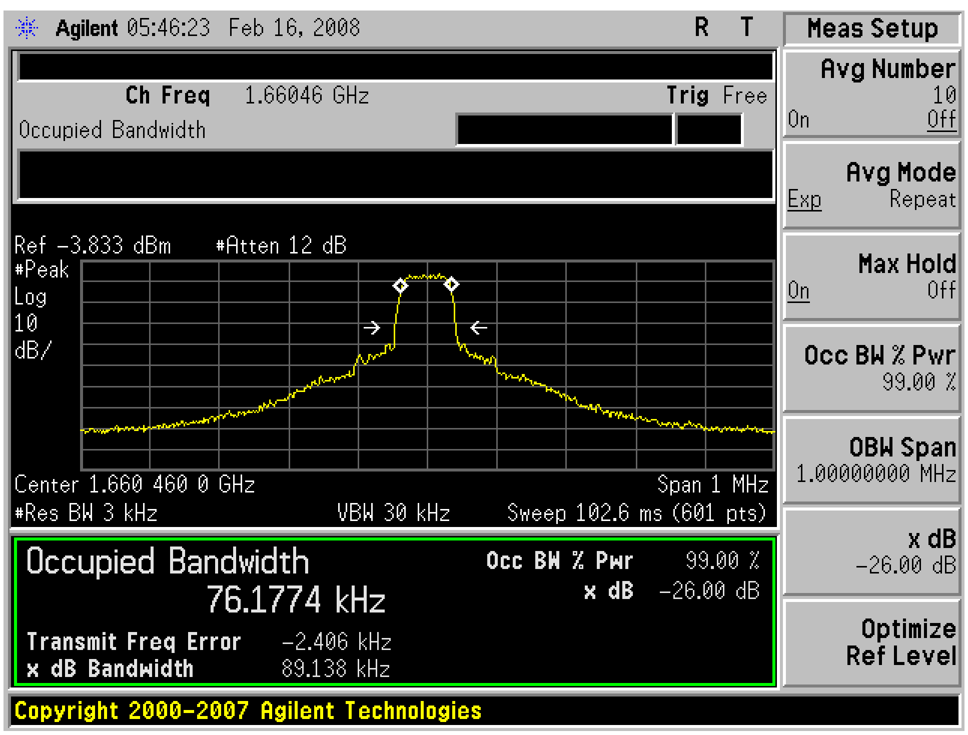


Figure 51 – Occupied BW - Swift Broadband 302,400 bps QPSK - Low Band

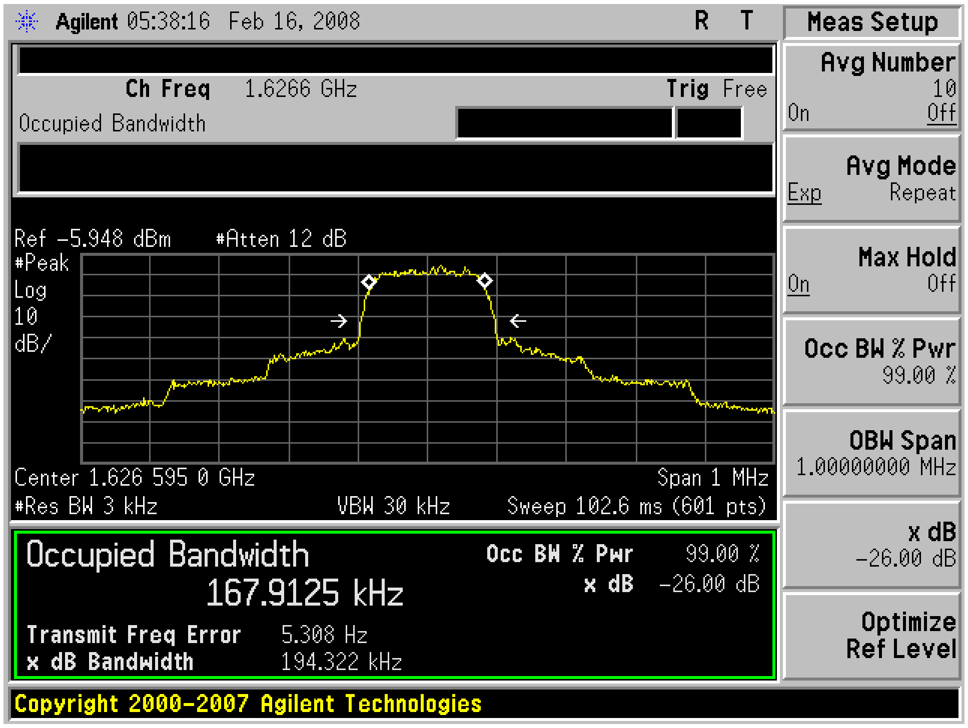


Figure 52 – Occupied BW - Swift Broadband 302,400 bps QPSK - Mid Band

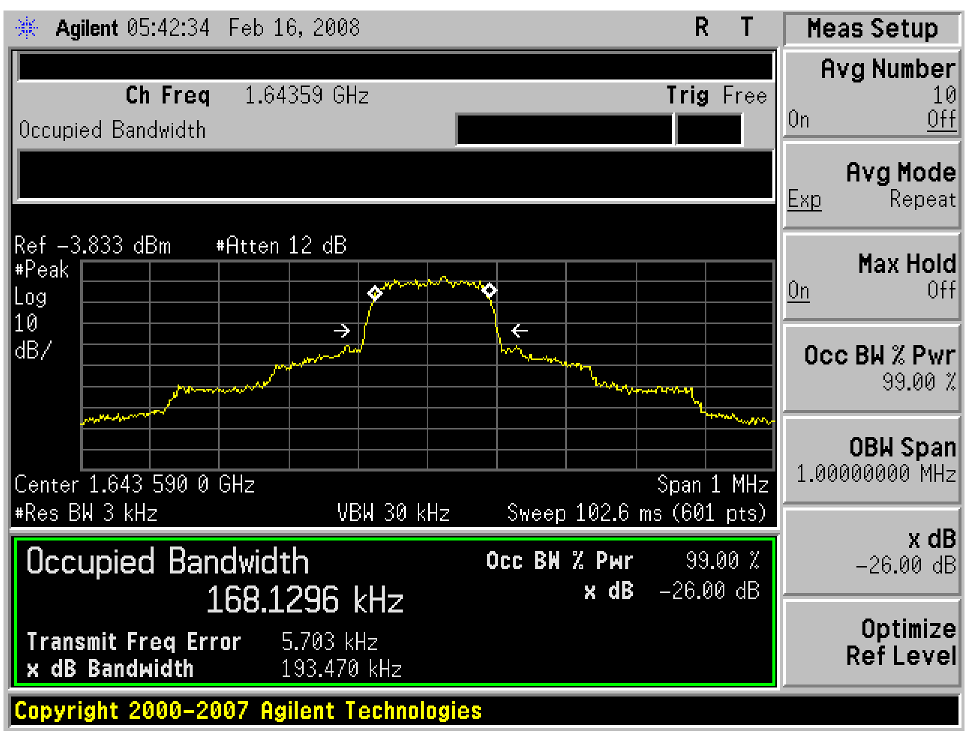


Figure 53 – Occupied BW - Swift Broadband 302,400 bps QPSK - High Band

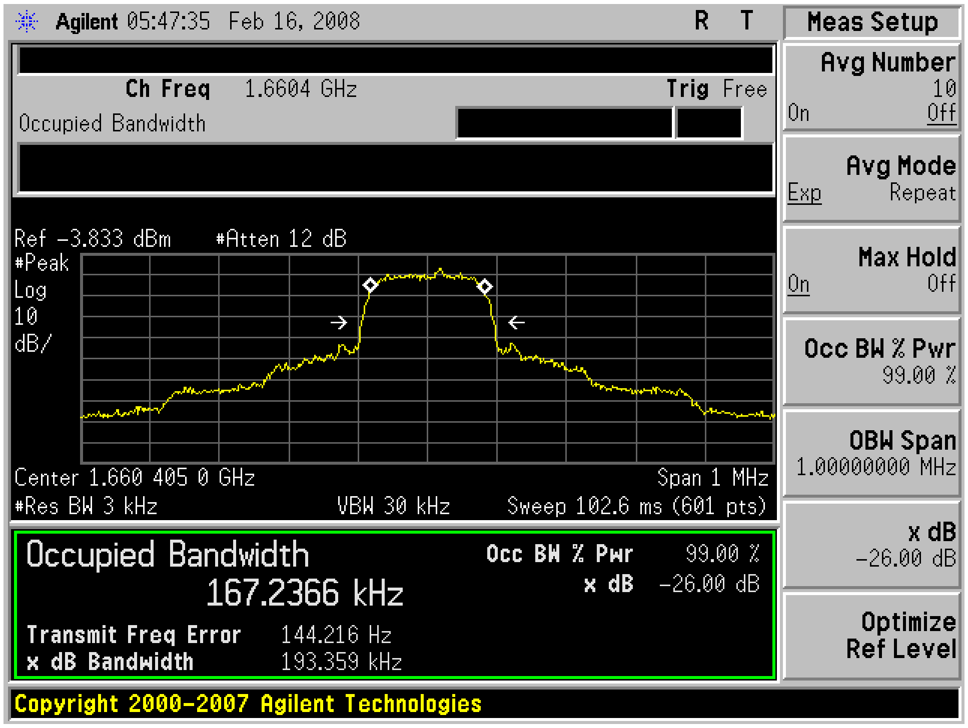


Figure 54 – Occupied BW - Swift Broadband 134,400 bps 16-QAM - Low Band

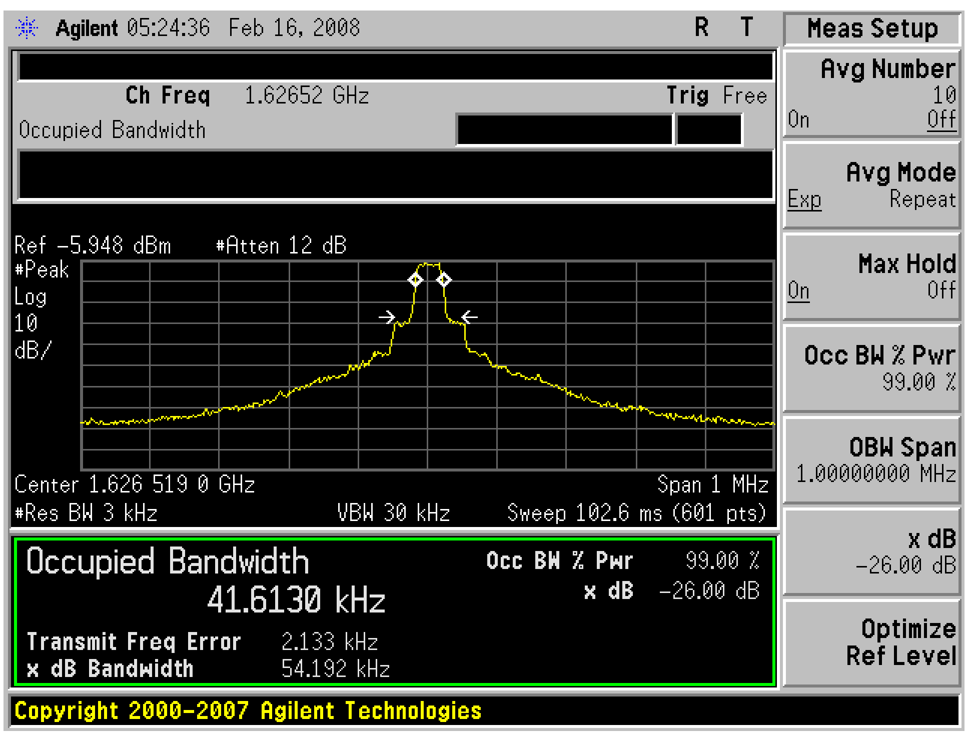


Figure 55 – Occupied BW - Swift Broadband 134,400 bps 16-QAM - Mid Band

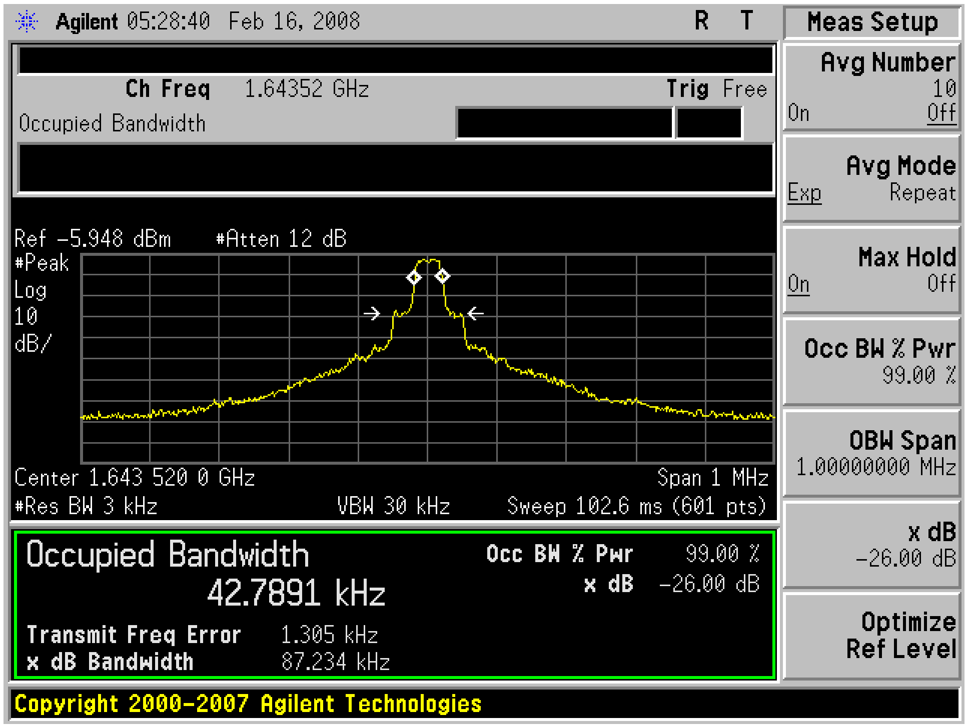


Figure 56 – Occupied BW - Swift Broadband 134,400 bps 16-QAM - High Band

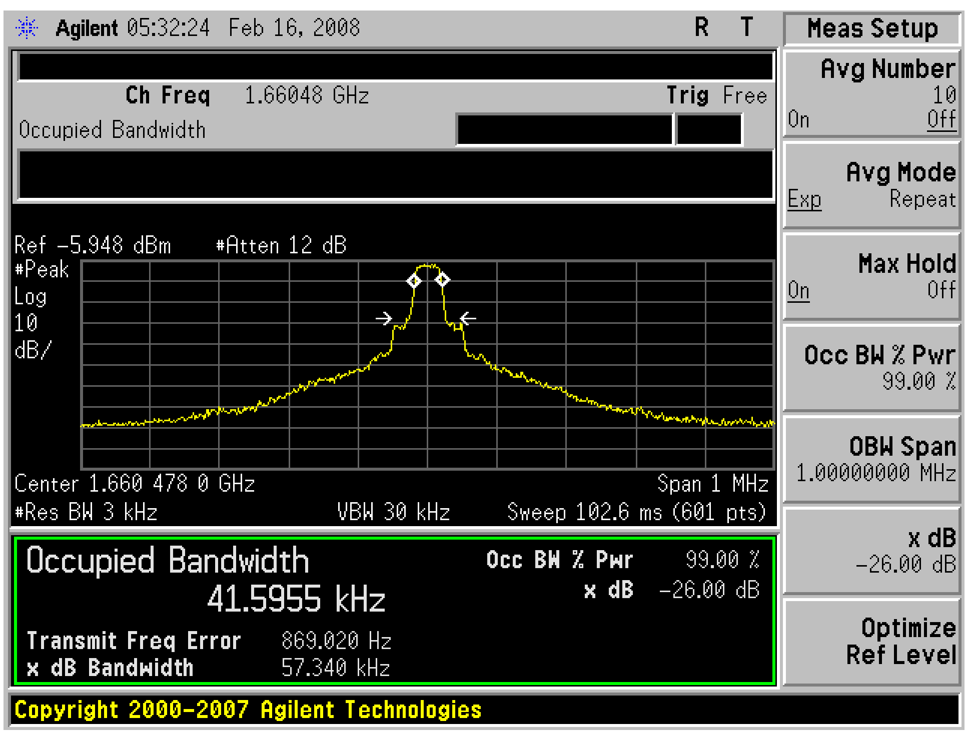


Figure 57 – Occupied BW - Swift Broadband 268,800 bps 16-QAM - Low Band

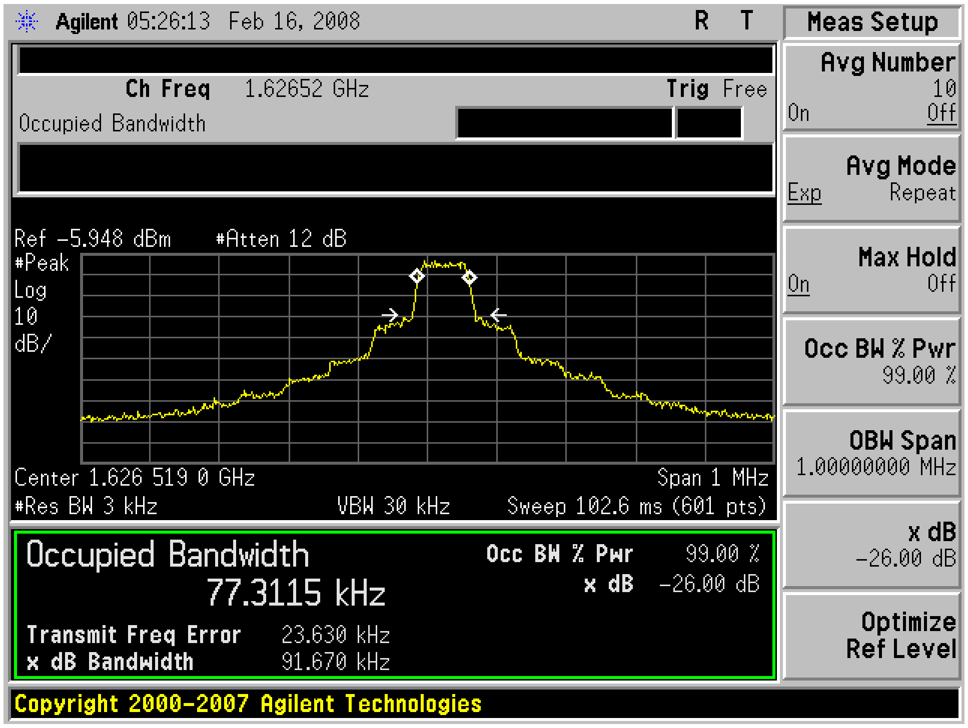


Figure 58 – Occupied BW - Swift Broadband 268,800 bps 16-QAM - Mid Band

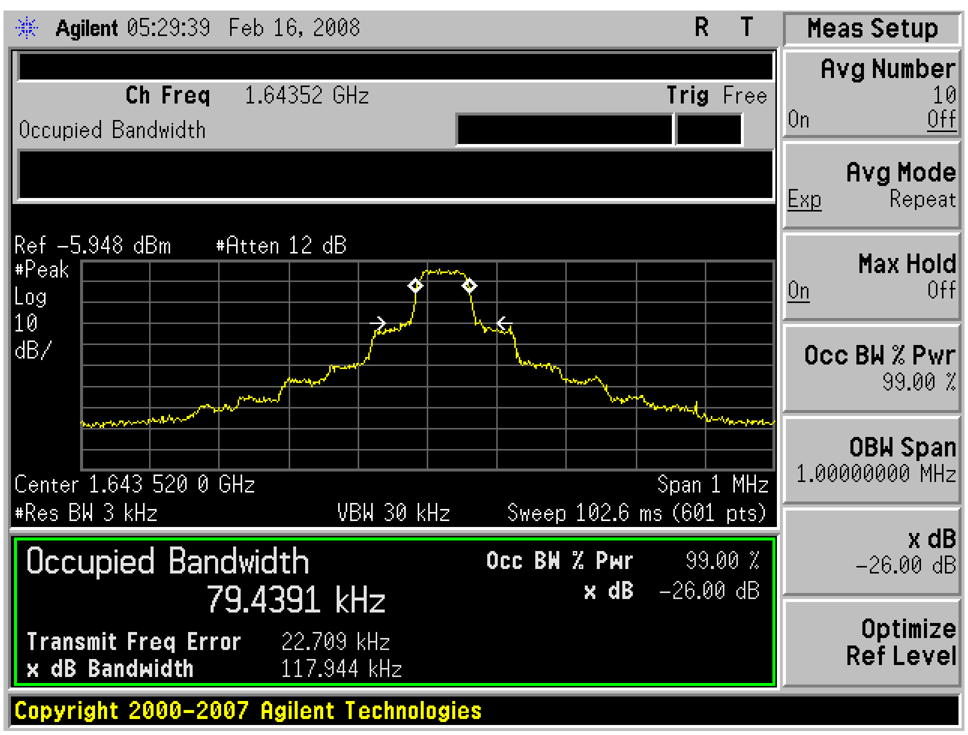


Figure 59 – Occupied BW - Swift Broadband 268,800 bps 16-QAM - High Band

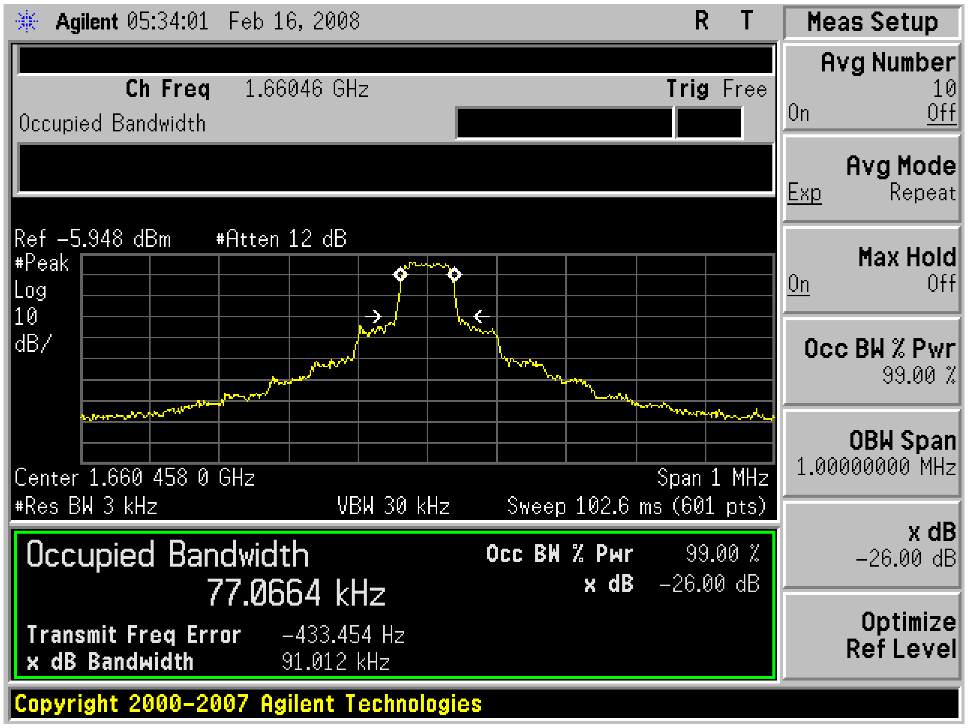


Figure 60 – Occupied BW - Swift Broadband 604,800 bps 16-QAM - Low Band

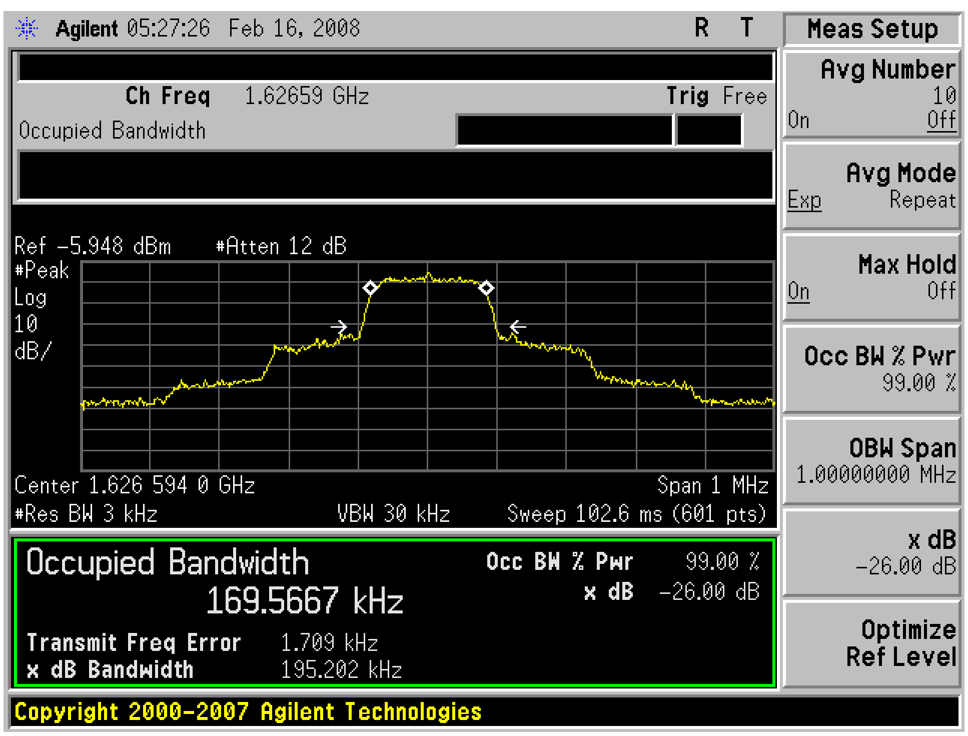


Figure 61 – Occupied BW - Swift Broadband 604,800 bps 16-QAM - Mid Band

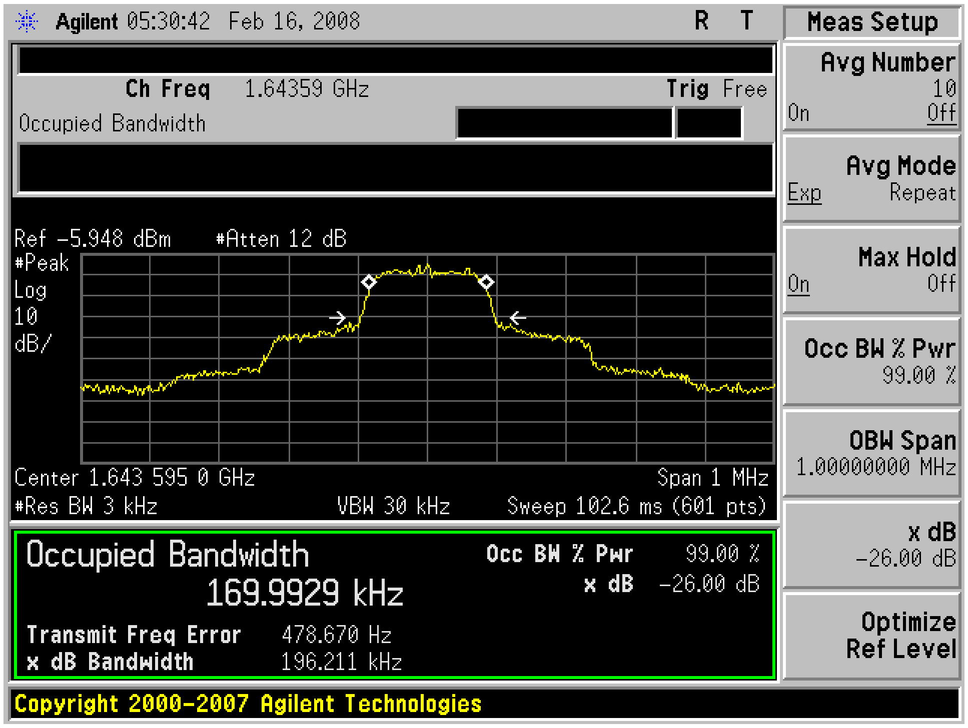


Figure 62 – Occupied BW - Swift Broadband 604,800 bps 16-QAM - High Band

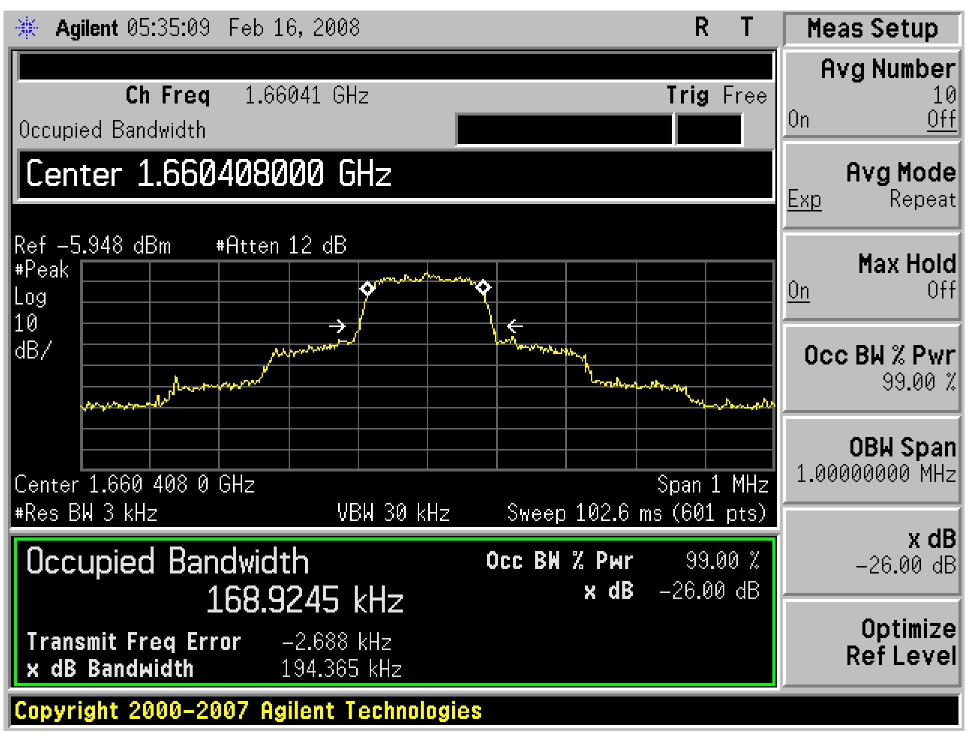


Exhibit F.4 SRT-2100B Spurious Emissions at Antenna Terminals and Frequency Spectrum

4.1 FCC Requirements

The discussion and test results show in this section address and meet the requirements of the following FCC requirements.

Section 2.1051

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emissions that can be detected when the equipment is operated under the conditions specified in Section 2.1049 (old 2.989) as appropriate. The magnitude of spurious emissions attenuated more than 20 dB below the permissible values need not be specified.

Section 2.1057 (a) (1)

In all of the measurements set forth in Section 2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to:

At least the tenth harmonic of the highest fundamental frequency or to 50 GHz, whatever is lower (if the equipment operates below 10 GHz).

Section 87.139 (i)(1), (2), (3), (4)

(i) – In case of conflict with other provisions of Section 87.139, the provisions of this paragraph shall govern for aircraft earth stations. When using G1D, G1E, or G1W emissions in the 1646.5 – 1660.5 MHz frequency band, the emissions must be attenuated as shown below.

(1) - At rated output power, while transmitting a modulated single carrier, the composite spurious and noise output shall be attenuated below the mean power of the transmitter, pY, by at least:

Frequency (MHz)	Attenuation (dB)[1]
.005 – 1559	83 or (65 + $10\log_{10}$(pY)), whichever is greater
1559 – 18000	55 or (37 + $10\log_{10}$(pY))[2], whichever is greater

[1] these values are expressed in dB below the carrier referenced to a 4 kHz bandwidth and relative to the maximum emission envelope level.

[2] excluding the frequency band of +/- 35 kHz or +/- 4.00 x Symbol Rate, about the carrier frequency, whichever is the greater exclusion.

(2) – The intermodulation requirements have been removed.

(3) - The transmitter emission limit is a function of the modulation type and the Symbol Rate (SR). Symbol Rate is expressed in symbols per second.

(4) - While transmitting a single modulated signal at the rated output power of the transmitter, the emissions must be attenuated below the maximum emission level by at least:

Frequency Offset (normalized to SR)	Attenuation (dB)
+/- 0.75 x SR	0
+/- 1.40 x SR	20
+/- 2.80 x SR	40
+/- 4.00 x SR or +/- 35 kHz Which ever is greater.	F_m

Where:

F_m = 55 or (37 + $10\log_{10}$(pY)), whichever is greater

SR = Symbol Rate

SR = 1 x channel rate for BPSK

SR = 0.5 x channel rate for QPSK

The mask shall be defined by drawing straight lines through the above points.

4.2 Spurious Emissions at Antenna Terminals Test Procedure

The following test configuration was used to perform the Spurious Emissions at Antenna Terminals measurements.

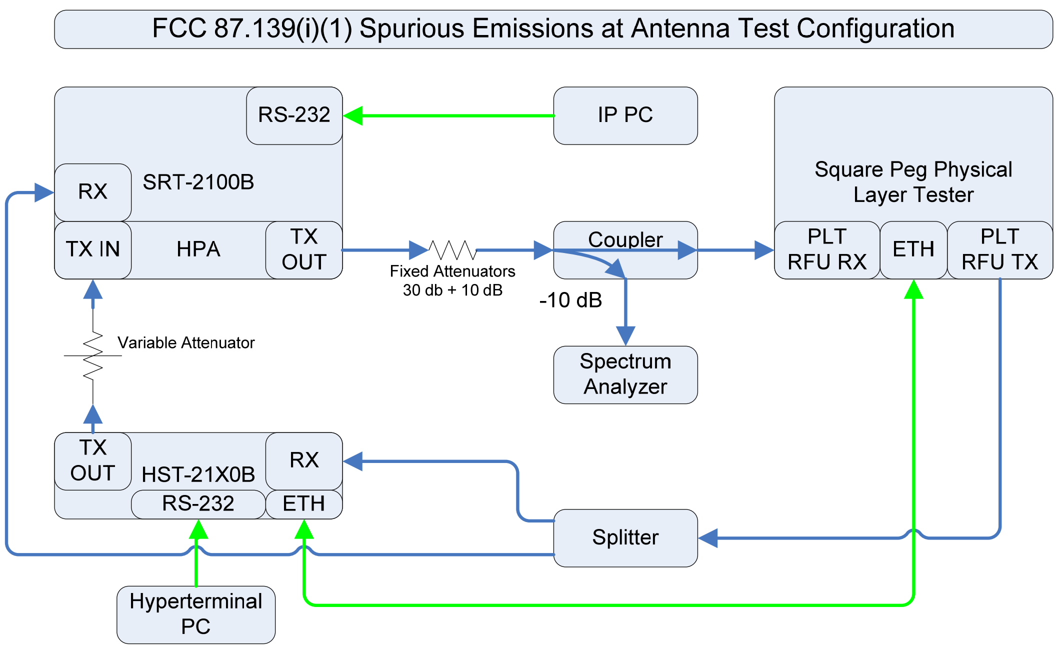


Figure 63 Spurious Emissions at Antenna Terminals Test Configuration

4.2.1 Spurious Emissions Test Equipment

Item	Manufacturer	PN	SN	Notes
SRT-2100 B	Rockwell Collins	822-1785-001	147362	AC Powered
SRT-2100 B	Rockwell Collins	822-1785-001	147362	DC Powered

Item	Manufacturer	PN	SN	Notes
HST-2110 B	Rockwell Collins	270-2885-050	16CYLR	AC Powered
HST-2120 B	Rockwell Collins	270-2885-070	564	DC Powered
Physical Layer Tester	Square Peg Communications, Inc.	EM-907532C-04	PLTH_080	
Physical Layer Tester Radio Frequency Unit	Square Peg Communications, Inc.	EM-907516C-01	23	
Spectrum Analyzer	Agilent	E4440	MY46185575	
Variable Attenuator	Weinschel	910-20-11	7936	
Fixed Attenuator (30dB)	Weinschel	58-30-34-LIM	PF562	
Fixed Attenuator (10dB)	Weinschel	2	BN0739	
Directional Coupler	Narda	3002-10	70612	
Splitter	Mini-circuits	ZAPD-2	460-0206-551	

4.2.2 Spurious Emissions at Antenna Terminals – Classic Aero

1. Connect the test equipment as shown in Figure 64.
2. Apply power to the SRT-2100B
3. Place the SRT-2100B into maintenance mode
4. Using the IP application, configure the SRT-2100B to radiate the following signals at 46.5 dBm using the modulation, bit rate and center frequency specified in the table below:

SRT-2100B Spurious Emissions at Antenna Terminals Test Conditions			
Condition	**Modulation**	**Bit Rate (bps)**	**Frequency (MHz)**
1	BPSK	600	1643.50
2	BPSK	1,200	1643.50
3	QPSK	8,400	1643.50
4	QPSK	10,500	1643.50
5	QPSK	21,000	1643.50

5. Use the spectrum analyzer to take measurements using the settings detailed below for each of the conditions listed above.

SRT-2100B Spurious Emissions at Antenna Terminals Measurement Configuration		
Start Freq. (MHz)	**Stop Freq. (MHz)**	**Resolution BW (Hz)**
0.01	1525.00	3,000
1525.00	1559.00	3,000
1559.00	1585.00	1,000,0000

SRT-2100B Spurious Emissions at Antenna Terminals Measurement Configuration		
Start Freq. (MHz)	**Stop Freq. (MHz)**	**Resolution BW (Hz)**
1585.00	1605.00	1,000,0000
1610.00	1610.60	1,000,0000
1610.60	1613.80	1,000,0000
1613.80	1614.00	1,000,0000
1614.00	1626.50	3,000
1626.50	1660.00	3,000
1660.00	1670.00	20,000
1670.00	1735.00	3,000
1735.00	12000.00	3,000
12000.00	18000.00	3,000

The spectrum analyzer measures signal power in a particular “resolution bandwidth” as it sweeps across the selected frequency band and plots the data.

If a wider bandwidth is used, more power is in that band and the point plotted is higher in amplitude. Section 87.139 (i) (1) footnote 1 states that “these values are expressed in dB below the carrier referenced to a 4 kHz bandwidth and relative to the maximum emission envelope level.” Since some scans in the table above are taken with a 3 kHz resolution bandwidth, they contain 75% of the power that a 4kHz bandwidth measurement would have. Therefore, the correction factor in dB is:

$$10\log10(4/3) = 1.25 \text{ dB.}$$

4.2.3 Spurious Emissions at Antenna Terminals – Swift64

1. Connect the test equipment as shown in Figure 63.
2. Apply power to the SRT-2100B and the HST-21X0B
3. Place the SRT-2100B into maintenance mode
4. Using the Hyper Terminal maintenance interface on the HST, power up the channel card and configure the HST to radiate the following signals with zero dB of channel card back off:

SRT-2100B Spurious Emissions at Antenna Terminals Test Conditions			
Condition	**Modulation**	**Bit Rate (bps)**	**Frequency (MHz)**
1	BPSK	3,000	1643.50
2	16QAM	134,400	1643.50

5. Adjust the Variable Attenuator between the HST’s TX Output and the SRT’s TX Input to obtain 46.5dBm of output power from the SRT’s HPA.

6. Use the spectrum analyzer to take measurements using the settings detailed below for each of the conditions listed above.

SRT-2100B Spurious Emissions at Antenna Terminals Measurement Configuration		
Start Freq. (MHz)	**Stop Freq. (MHz)**	**Resolution BW (Hz)**
0.01	1525.00	3,000
1525.00	1559.00	3,000
1559.00	1585.00	1,000,0000
1585.00	1605.00	1,000,0000
1610.00	1610.60	1,000,0000
1610.60	1613.80	1,000,0000
1613.80	1614.00	1,000,0000
1614.00	1626.50	3,000
1626.50	1660.00	3,000
1660.00	1670.00	20,000
1670.00	1735.00	3,000
1735.00	12000.00	3,000
12000.00	18000.00	3,000

4.2.4 Spurious Emissions at Antenna Terminals – Swift Broadband

1. Connect the test equipment as shown in Figure 63.
2. Apply power to the SRT-2100B and the HST-21X0B
3. Place the SRT-2100B into maintenance mode
4. Using the Hyper Terminal maintenance interface on the HST, force the power up of the HSTs Channel Card
5. Once the HSTs Channel Card is powered and connected via Ethernet to the Square Peg PLT, use the WinTerm application to place the Channel Card into MTR Test Mode
6. Start the BPLT application on the Square Peg PLT and run MTR test script MTR16a.scx
7. Using the interface provided by the test script, configure the HST to radiate the following signal:

SRT-2100B Spurious Emissions at Antenna Terminals Test Conditions			
Condition	**Modulation**	**Bit Rate (bps)**	**Frequency (MHz)**
1	16QAM	604,800	1643.50

7. Adjust the Variable Attenuator between the HST’s TX Output and the SRT’s TX Input to obtain 46.5dBm of output power from the SRT’s HPA.

8. Use the spectrum analyzer to take measurements using the settings detailed below for each of the conditions listed above.

SRT-2100B Spurious Emissions at Antenna Terminals Measurement Configuration		
Start Freq. (MHz)	**Stop Freq. (MHz)**	**Resolution BW (Hz)**
0.01	1525.00	3,000
1525.00	1559.00	3,000
1559.00	1585.00	1,000,0000
1585.00	1605.00	1,000,0000
1610.00	1610.60	1,000,0000
1610.60	1613.80	1,000,0000
1613.80	1614.00	1,000,0000
1614.00	1626.50	3,000
1626.50	1660.00	3,000
1660.00	1670.00	20,000
1670.00	1735.00	3,000
1735.00	12000.00	3,000
12000.00	18000.00	3,000

4.3 Frequency Spectrum Test Procedure

The following test configuration was used to perform the Frequency Spectrum measurements.

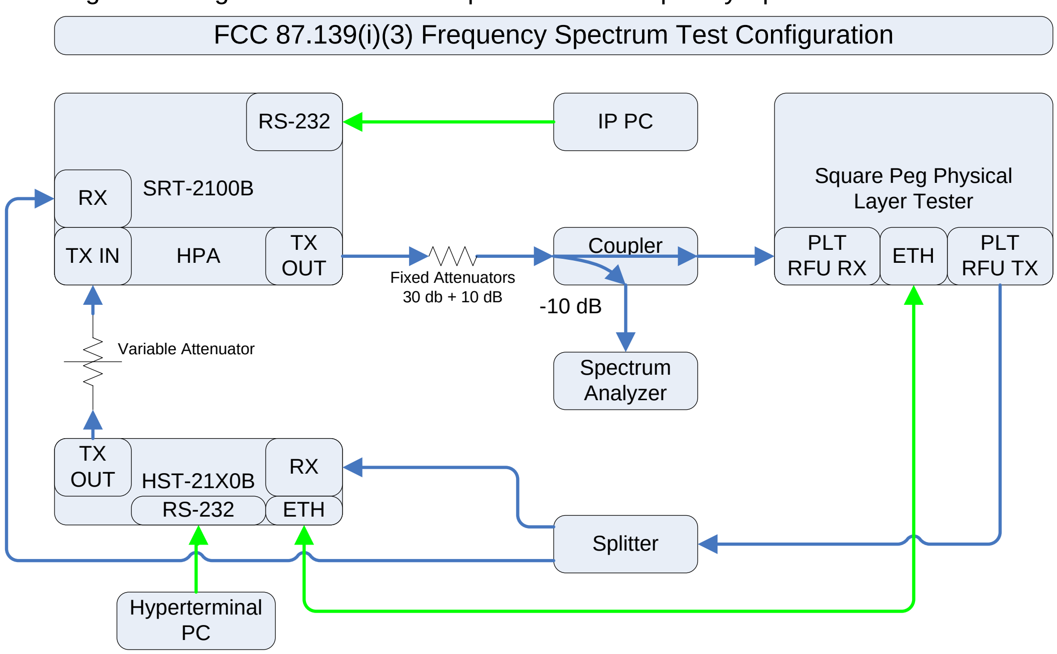


Figure 64 Frequency Spectrum Test Configuration

4.3.1 Frequency Spectrum Test Equipment

Item	Manufacturer	PN	SN	Notes
SRT-2100 B	Rockwell Collins	822-1785-001	147362	AC Powered
HST-2110 B	Rockwell Collins	270-2885-050	16CYLR	AC Powered
Physical Layer Tester	Square Peg Communications, Inc.	EM-907532C-04	PLTH_080	
Physical Layer Tester Radio Frequency Unit	Square Peg Communications, Inc.	EM-907516C-01	23	
Spectrum Analyzer	Agilent	E4440	MY46185575	
Variable Attenuator	Weinschel	910-20-11	7936	
Fixed Attenuator (30dB)	Weinschel	58-30-34-LIM	PF562	
Fixed Attenuator (10dB)	Weinschel	2	BN0739	
Directional Coupler	Narda	3002-10	70612	
Splitter	Mini-circuits	ZAPD-2	460-0206-551	

4.3.2 Frequency Spectrum – Classic Aero

1. Connect the test equipment as shown in Figure 64.
2. Apply power to the SRT-2100B
3. Place the SRT-2100B into maintenance mode
4. Using the IP application, configure the SRT-2100B to radiate an unmodulated carrier at 46.5 dBm with a center frequency of 1643.50 MHz
5. Set the spectrum analyzer to measure the carrier with a resolution bandwidth of 100 Hz
6. Set the power reference level of the spectrum analyzer to the peak of the measured carrier and use that reference for the remainder of the testing
7. Using the IP application, configure the SRT-2100B to radiate the following signals at 46.5 dBm using the modulation, symbol rate and center frequency specified in the table below:

SRT-2100B Frequency Spectrum Test Conditions			
Condition	**Modulation**	**Symbol Rate (Sym/S)**	**Frequency (MHz)**
1	BPSK	600	1643.50
2	BPSK	1,200	1643.50
3	QPSK	4,200	1643.50
4	QPSK	5,250	1643.50
5	QPSK	10,500	1643.50

8. Use the spectrum analyzer to take measurements using the settings detailed below for each of the conditions listed.

SRT-2100B Frequency Spectrum Measurement Configuration			
Condition	Freq. Span (Hz) 2.95 * 4 * (Symbol Rate)	Number of Averages	Resolution Bandwidth (Hz)
1	7,080	20	100
2	14,160	20	100
3	49,560	20	100
4	61,950	20	100
5	123,900	20	100

4.3.3 Frequency Spectrum – Swift64

1. Connect the test equipment as shown in Figure 64.
2. Apply power to the SRT-2100B and the HST-21X0B
3. Place the SRT-2100B into maintenance mode
4. Using the IP application, configure the SRT-2100B to radiate an unmodulated carrier at 46.5 dBm with a center frequency of 1643.50 MHz
5. Set the spectrum analyzer to measure the carrier with a resolution bandwidth of 100 Hz
6. Set the power reference level of the spectrum analyzer to the peak of the measured carrier and use that reference for the remainder of the testing
7. Using the Hyper Terminal maintenance interface on the HST, power up the channel card and configure the HST to radiate the following signals with zero dB of channel card back off:

SRT-2100B Frequency Spectrum Test Conditions			
Condition	Modulation	Symbol Rate (Sym/S)	Frequency (MHz)
1	BPSK	3,000	1643.50
2	16QAM	33,600	1643.50

8. Adjust the Variable Attenuator between the HST's TX Output and the SRT's TX Input to obtain 46.5dBm of output power from the SRT's HPA.
9. Use the spectrum analyzer to take measurements using the settings detailed below for each of the conditions listed.

SRT-2100B Frequency Spectrum Measurement Configuration			
Condition	Freq. Span (Hz) 2.95 * 4 * (Symbol Rate)	Number of Averages	Resolution Bandwidth (Hz)
1	35,400	20	100
2	396,480	20	100

4.3.4 Frequency Spectrum – Swift Broadband

1. Connect the test equipment as shown in Figure 64.
2. Apply power to the SRT-2100B and the HST-21X0B
3. Place the SRT-2100B into maintenance mode
4. Using the IP application, configure the SRT-2100B to radiate an unmodulated carrier at 46.5 dBm with a center frequency of 1643.50 MHz
5. Set the spectrum analyzer to measure the carrier with a resolution bandwidth of 100 Hz
6. Set the power reference level of the spectrum analyzer to the peak of the measured carrier and use that reference for the remainder of the testing
7. Using the Hyper Terminal maintenance interface on the HST, force the power up of the HSTs Channel Card
8. Once the HSTs Channel Card is powered and connected via Ethernet to the Square Peg PLT, use the WinTerm application to place the Channel Card into MTR Test Mode
9. Start the BPLT application on the Square Peg PLT and run MTR test script MTR16a.scx
10. Using the interface provided by the test script, configure the HST to radiate the following signals:

SRT-2100B Frequency Spectrum Test Conditions			
Condition	**Modulation**	**Symbol Rate (Sym/S)**	**Frequency (MHz)**
1	QPSK	16,800	1643.50
2	QPSK	33,600	1643.50
3	QPSK	67,200	1643.50
4	QPSK	151,200	1643.50
5	16QAM	33,600	1643.50
6	16QAM	67,200	1643.50
7	16QAM	151,200	1643.50

11. Adjust the Variable Attenuator between the HST’s TX Output and the SRT’s TX Input to obtain 46.5dBm of output power from the SRT’s HPA.
12. Use the spectrum analyzer to take measurements using the settings detailed below for each of the conditions listed.

SRT-2100B Frequency Spectrum Measurement Configuration			
Condition	Freq. Span (Hz) 2.95 * 4 * (Symbol Rate)	Number of Averages	Resolution Bandwidth (Hz)
1	198,240	20	100
2	396,480	20	100
3	792,960	20	100
4	1,784,160	20	100
5	396,480	20	100
6	792,960	20	100
7	1,784,160	20	100

4.3.5 Spurious Emissions at Antenna Terminals Results

No spurious or harmonic emissions were found to be out of the specifications. See attached plots.

Spurious Emissions at Antenna Terminals
List of Figures

Figure Number	Operational Mode	Modulation Type	Bit Rate (bps)	Symbol Rate (sym/s)	SRT used	HST used
65 – 78	Classic Aero	QPSK	21,000	10,500	SRT-2100B AC	none
79 - 92	Classic Aero	QPSK	21,000	10,500	SRT-2100B DC	none
93 - 106	Swift64	16-QAM	134,400	33,600	SRT-2100B AC	HST-2110B AC
107 - 120	Swift64	16-QAM	134,400	33,600	SRT-2100B DC	HST-2120B DC
121 - 134	Swift Broadband	16-QAM	604,800	151,200	SRT-2100B AC	HST-2110B AC
135 - 148	Swift Broadband	16-QAM	604,800	151,200	SRT-2100B DC	HST-2120B DC

Test Range: 10 kHz to 18 GHz
Carrier Frequency: 1643.5 MHz

Figure 65 - 0.01 to 1525 MHz

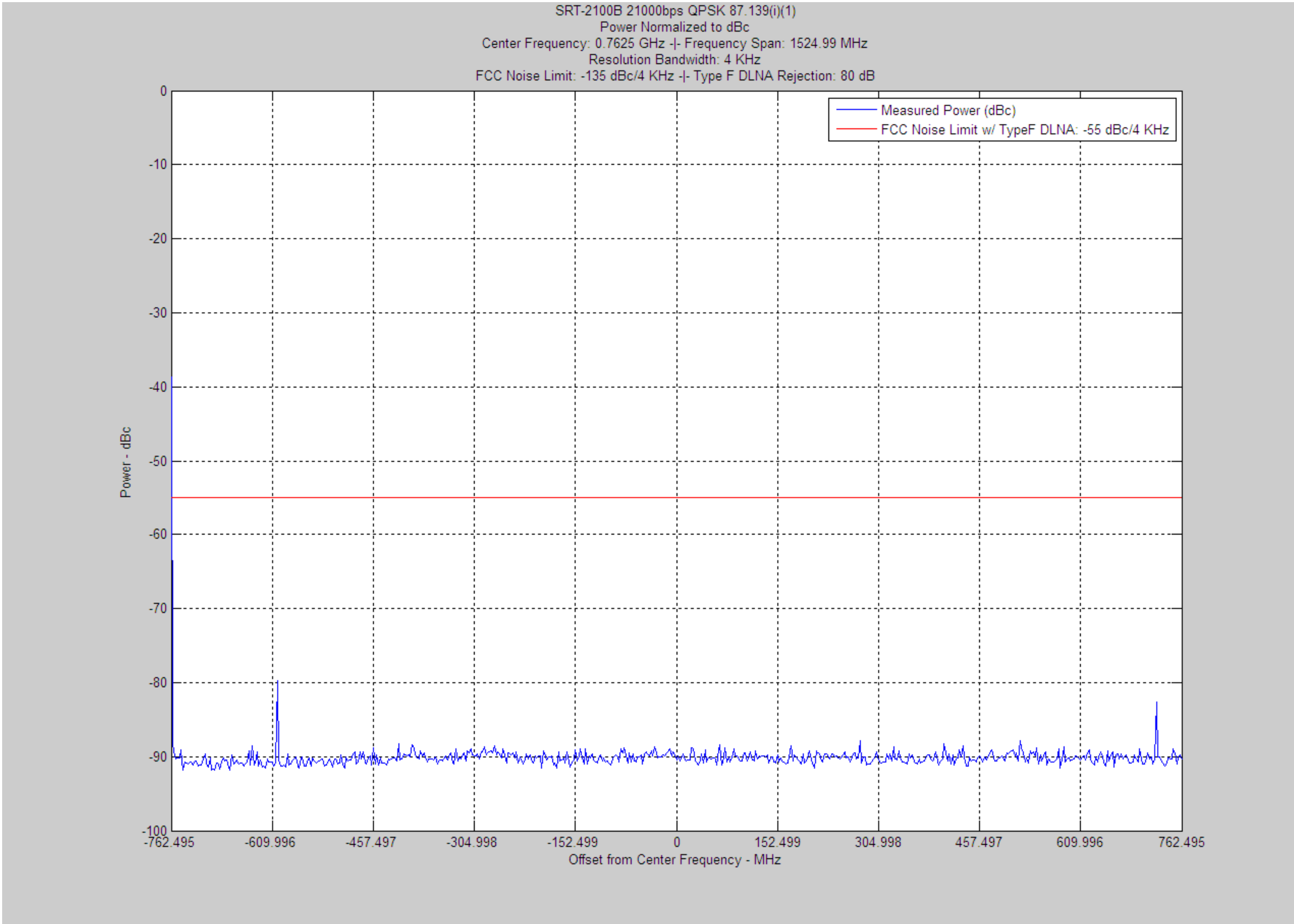


Figure 66 – 1525 to 1559 MHz

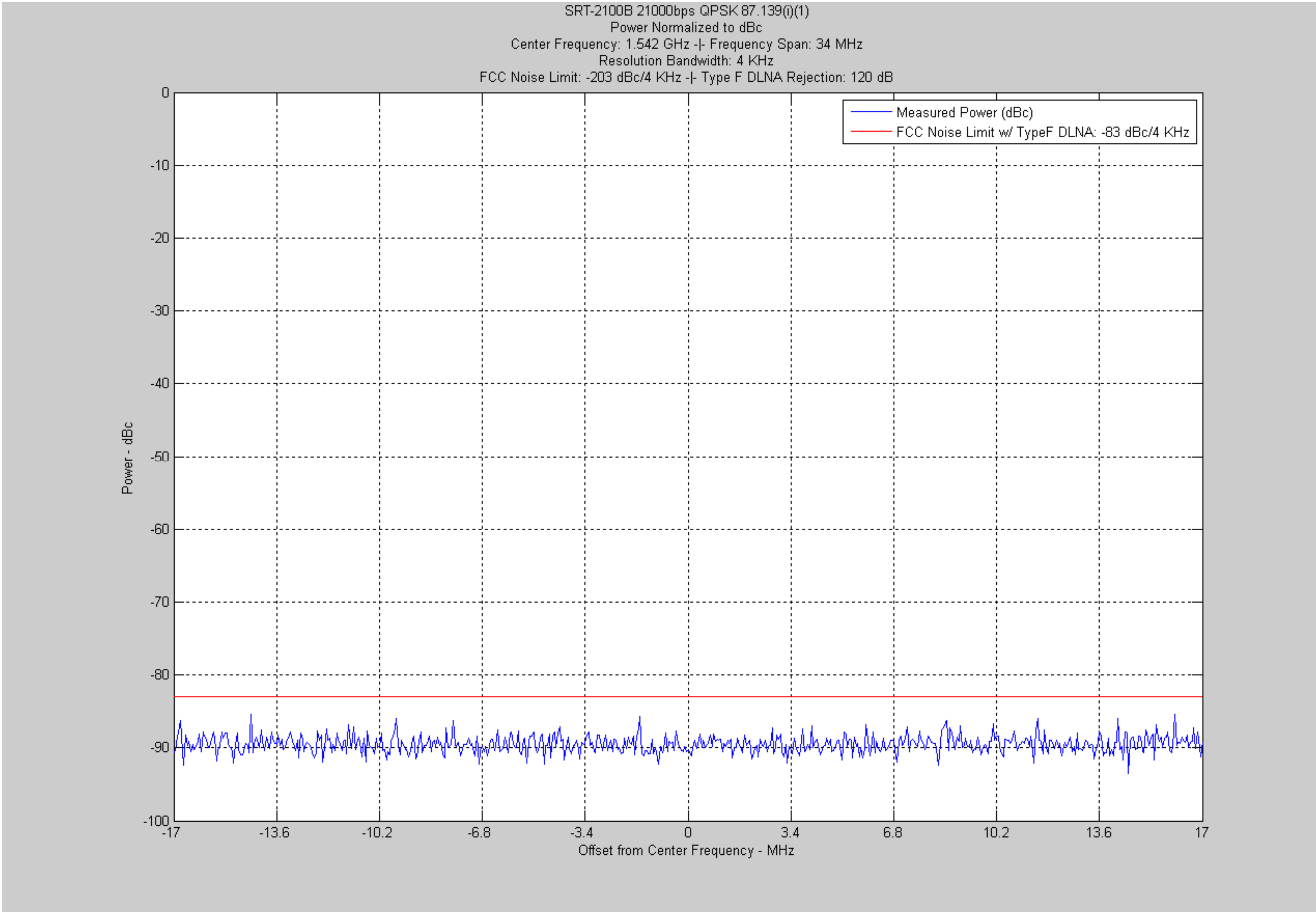


Figure 67 – 1559 to 1585 MHz

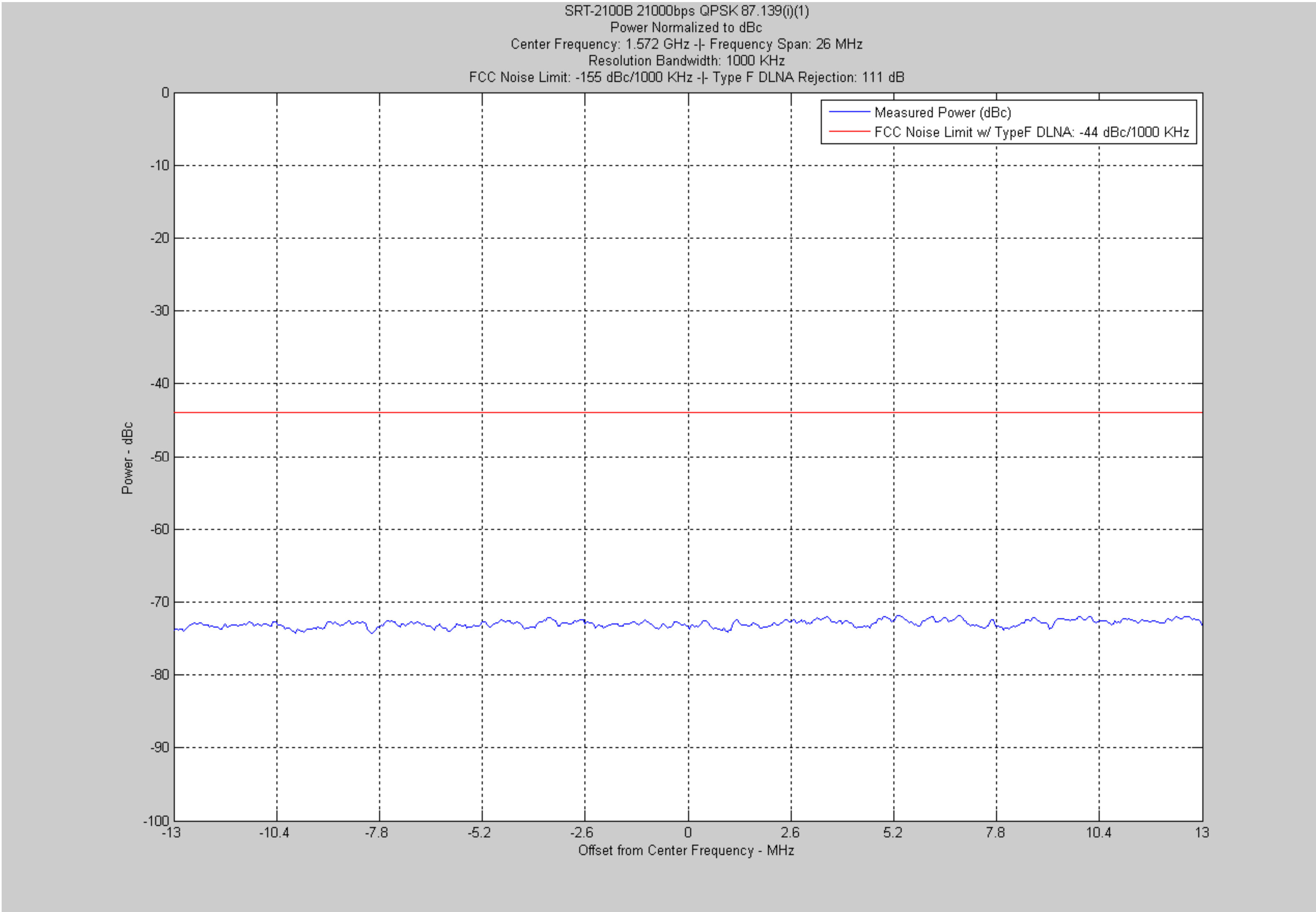


Figure 68 – 1585 to 1605 MHz

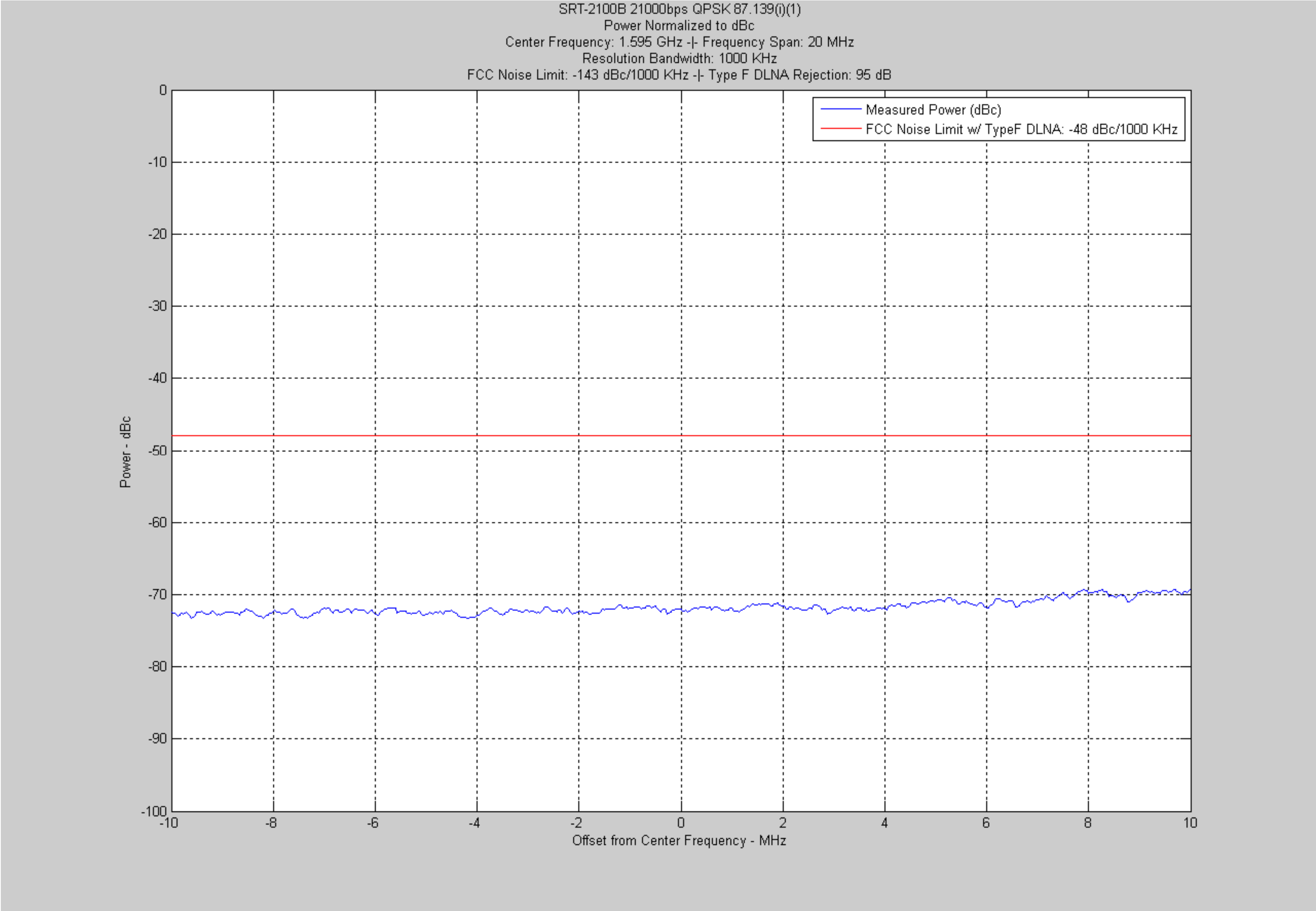


Figure 69 - 1605 to 1610 MHz

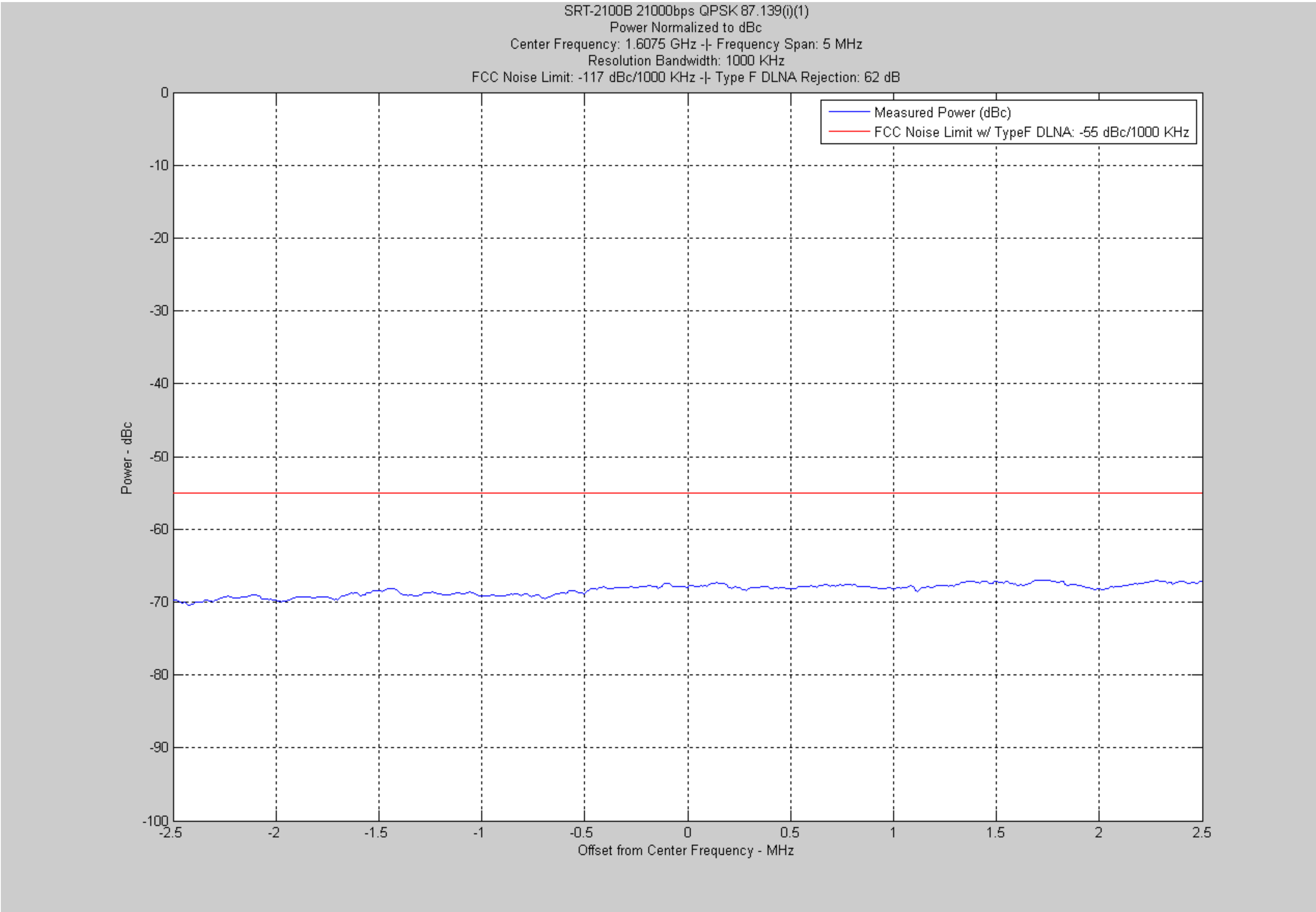


Figure 70 – 1610 to 1610.6 MHz

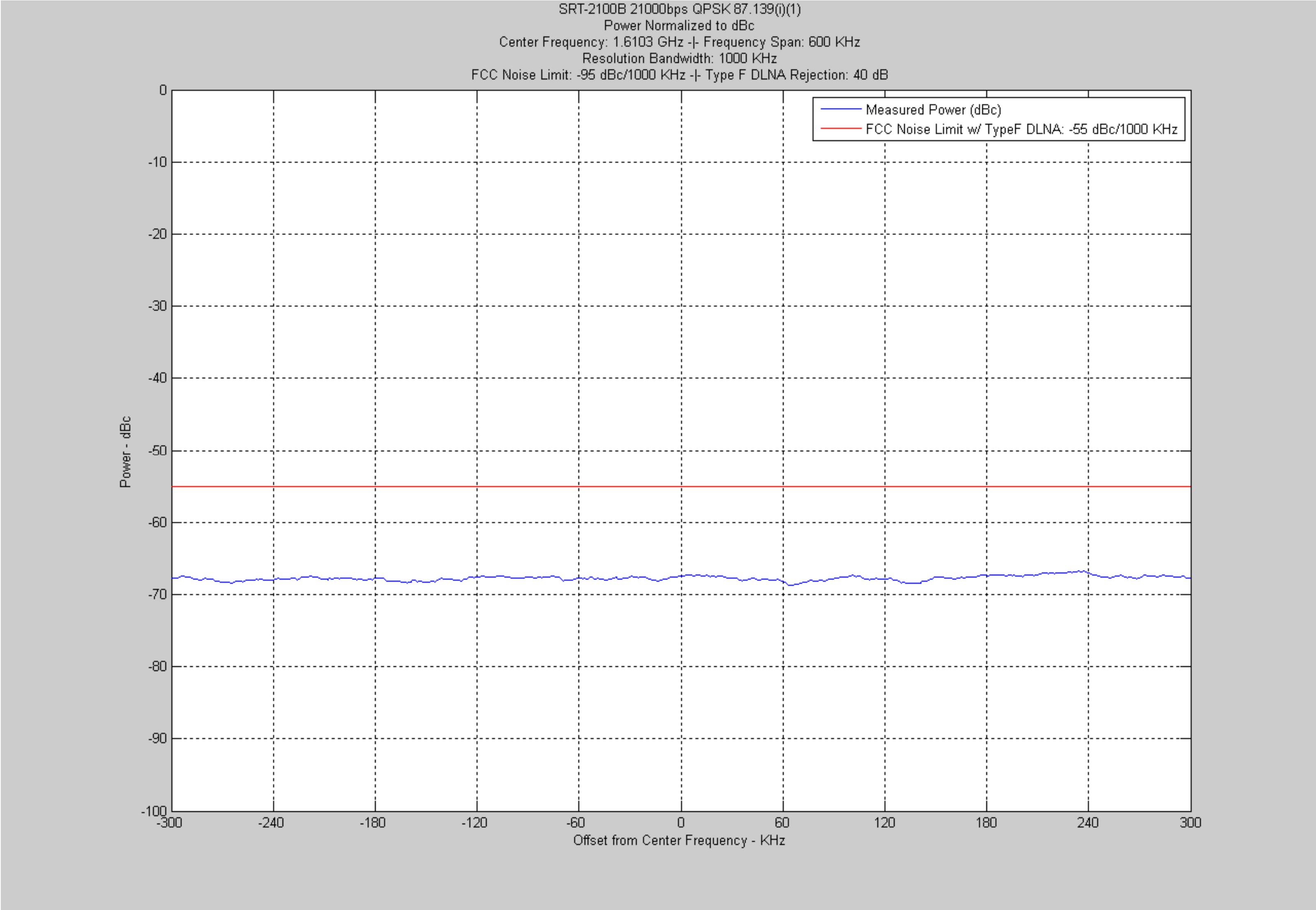


Figure 71 – 1610.6 to 1613.8 MHz

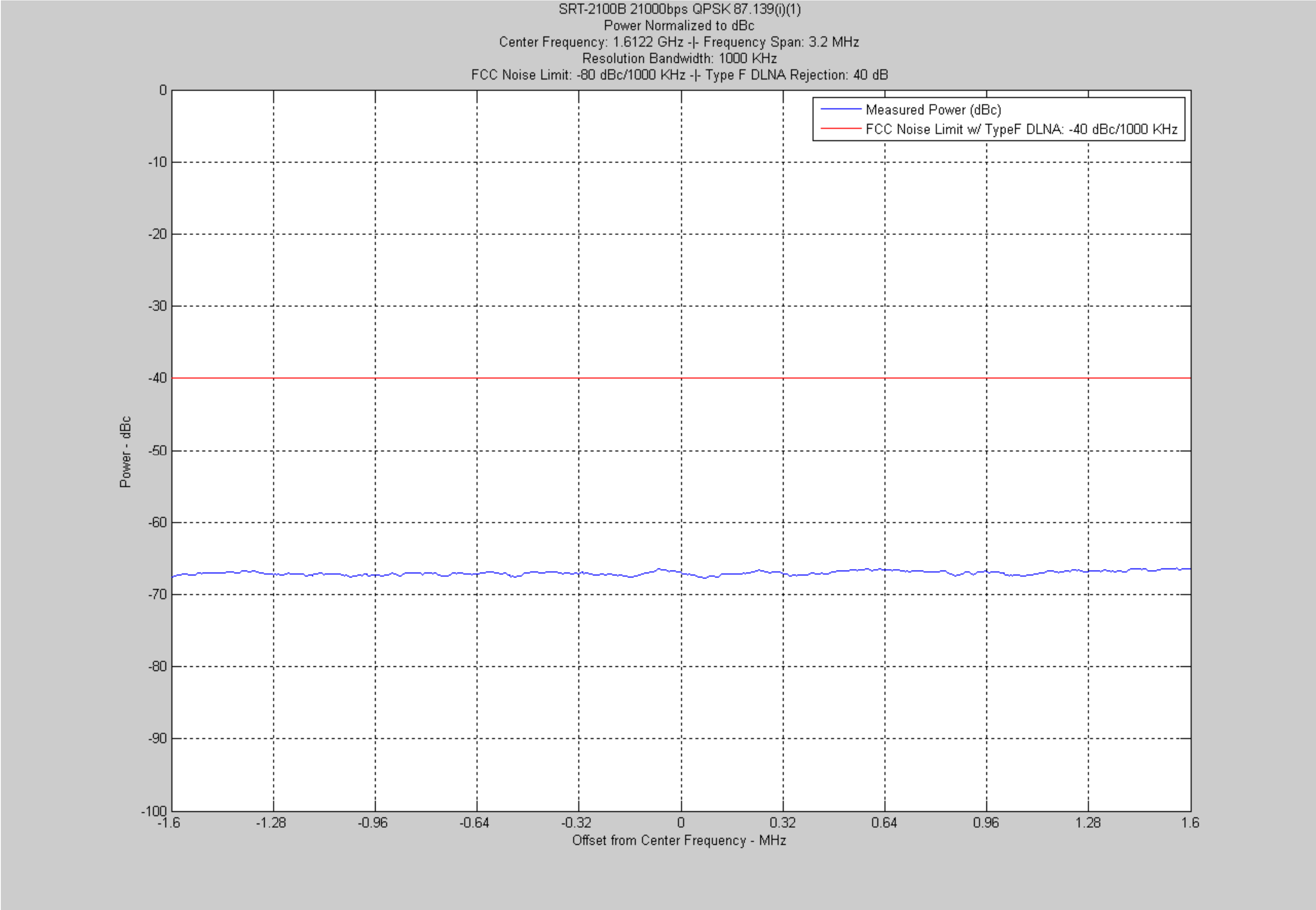


Figure 72 – 1613.8 to 1614 MHz

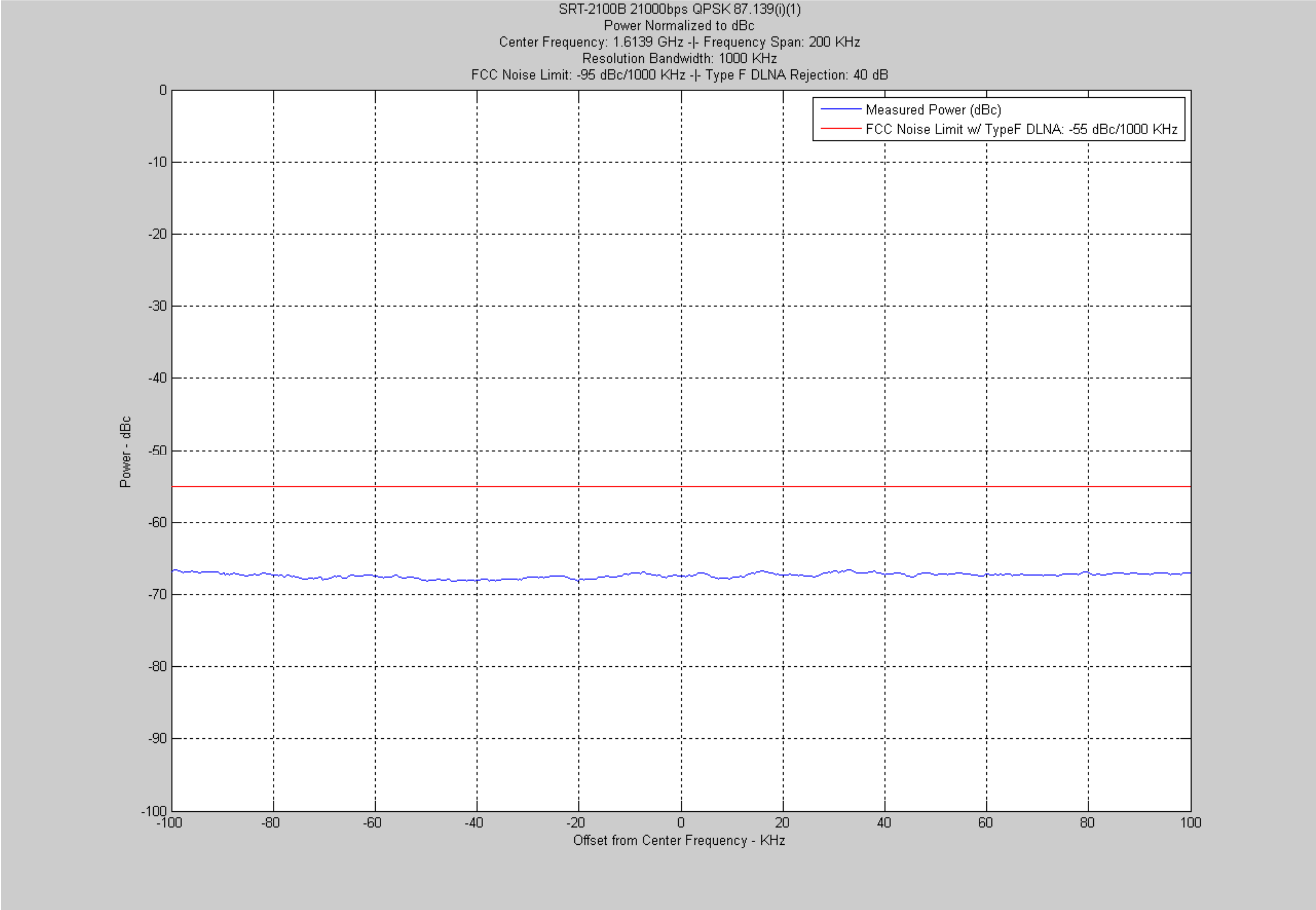


Figure 73 – 1614 to 1626.5 MHz

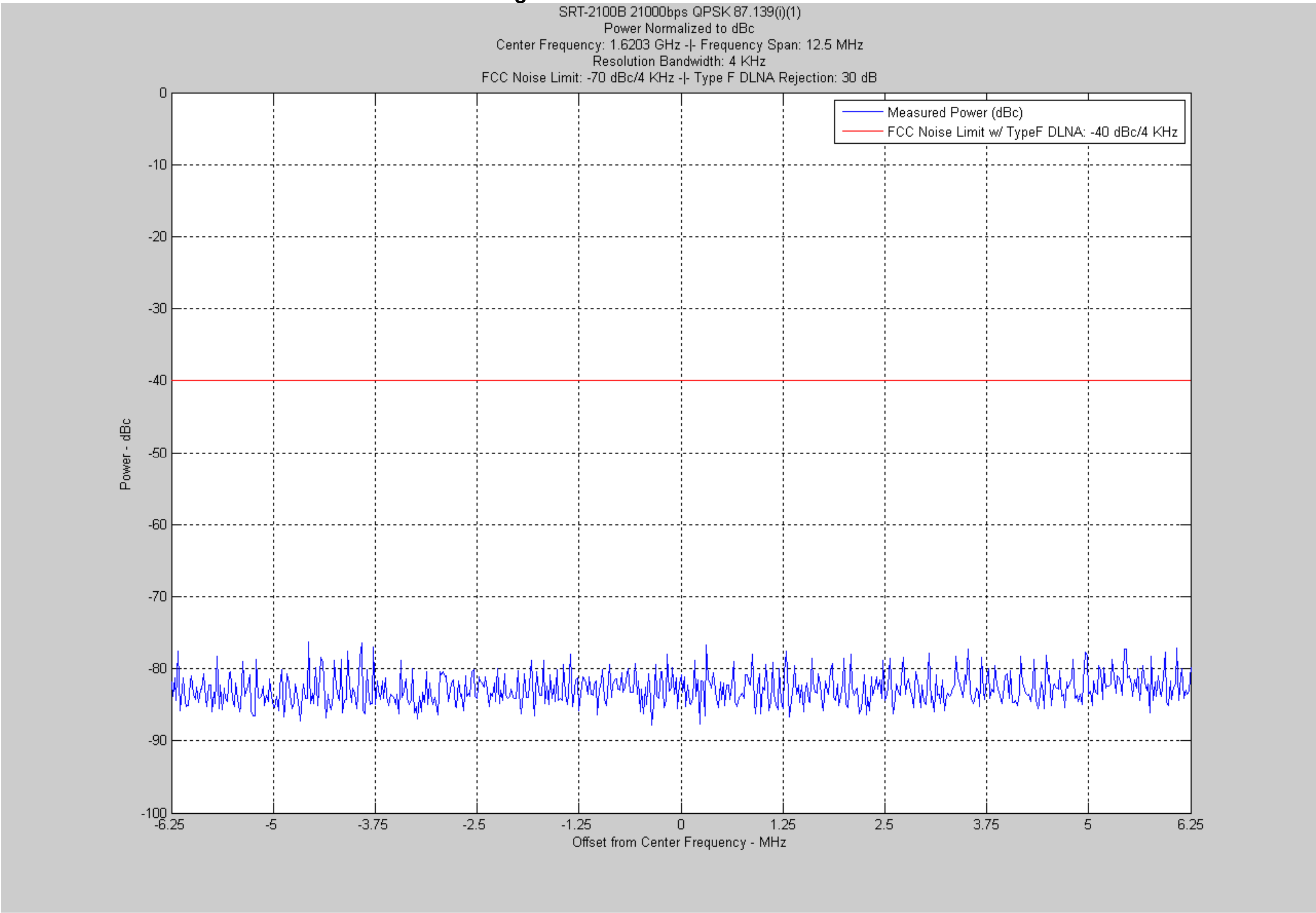


Figure 74 – 1626.5 to 1660 MHz

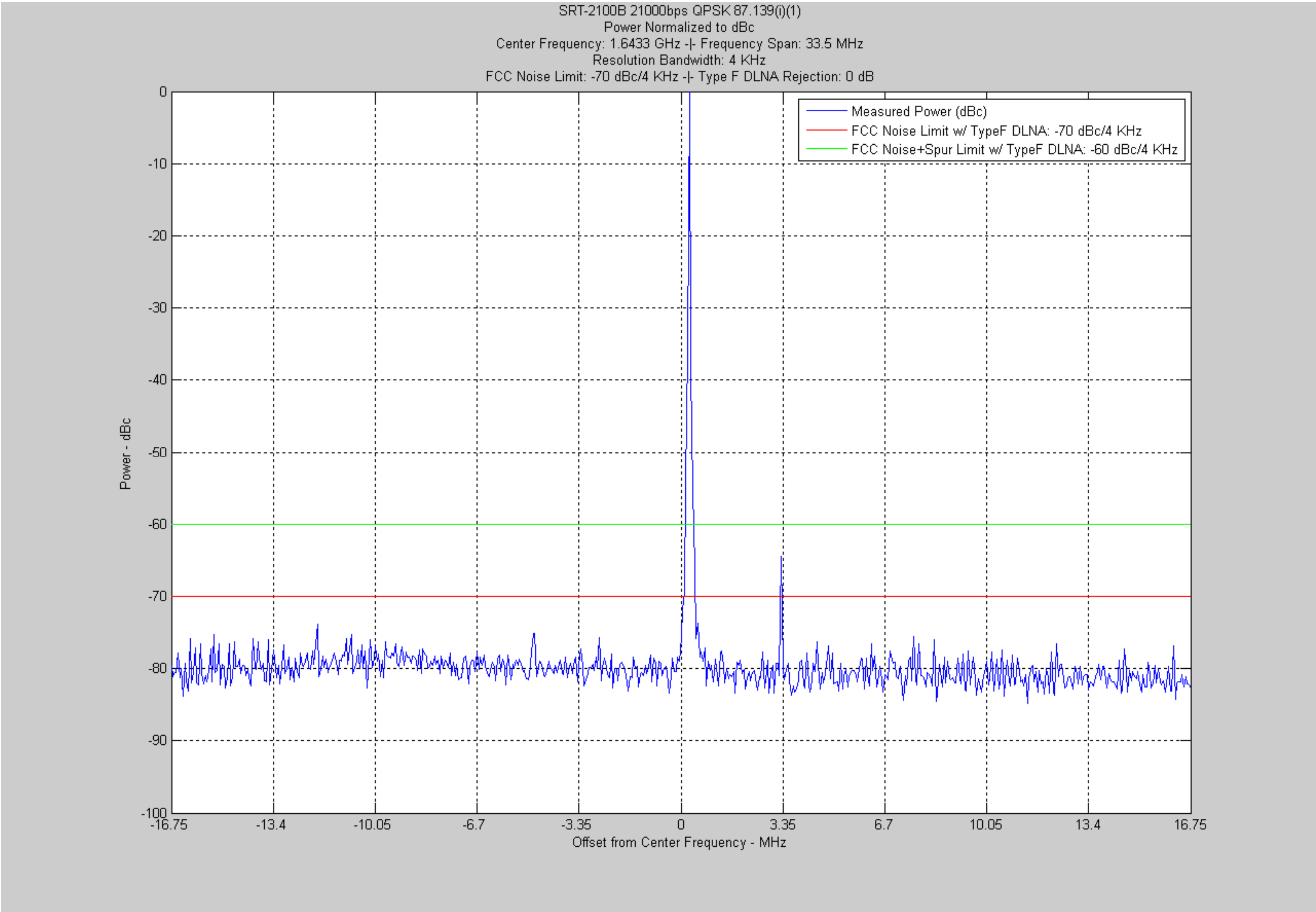


Figure 75 – 1660 to 1670 MHz

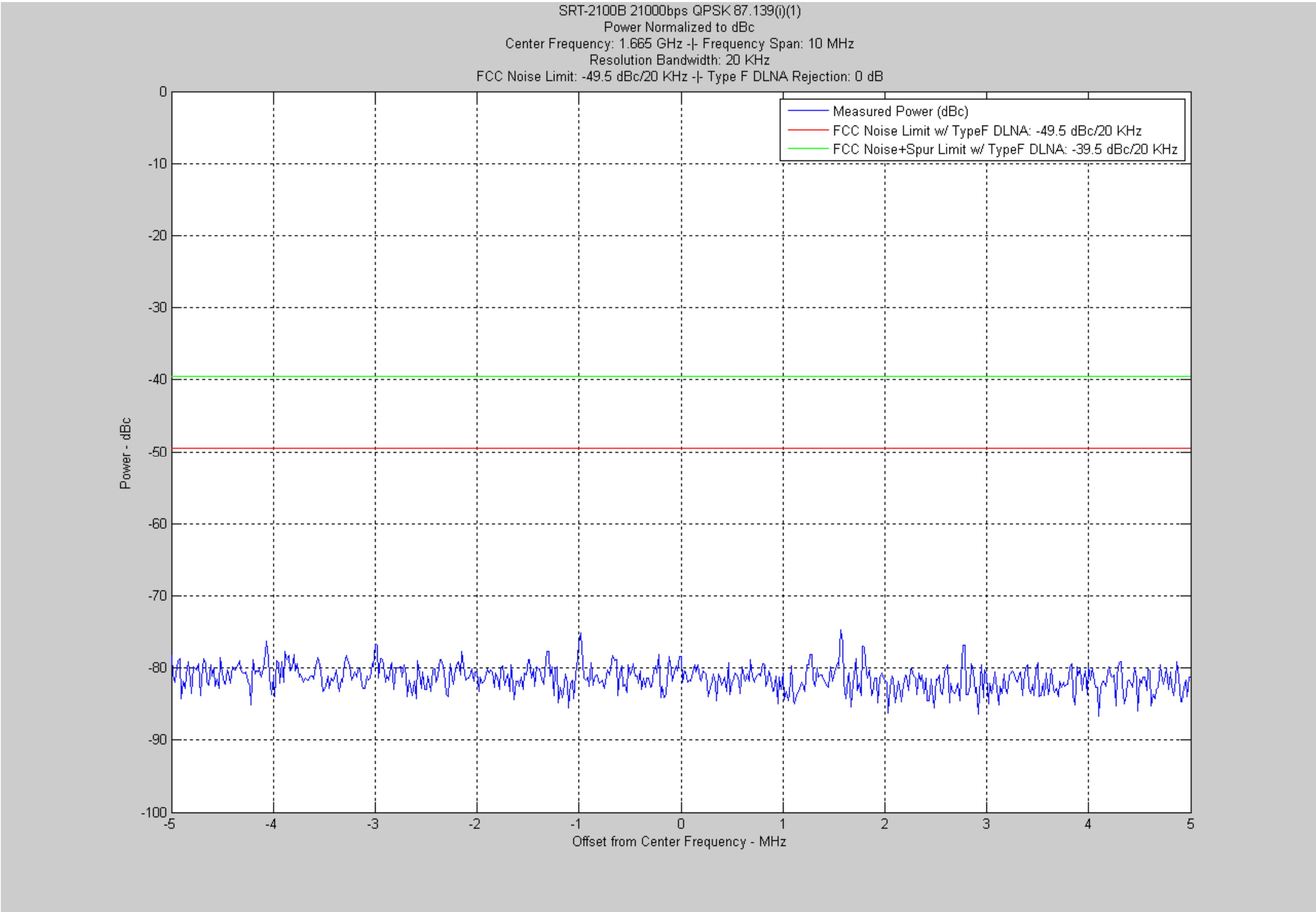


Figure 76 – 1670 to 1735 MHz

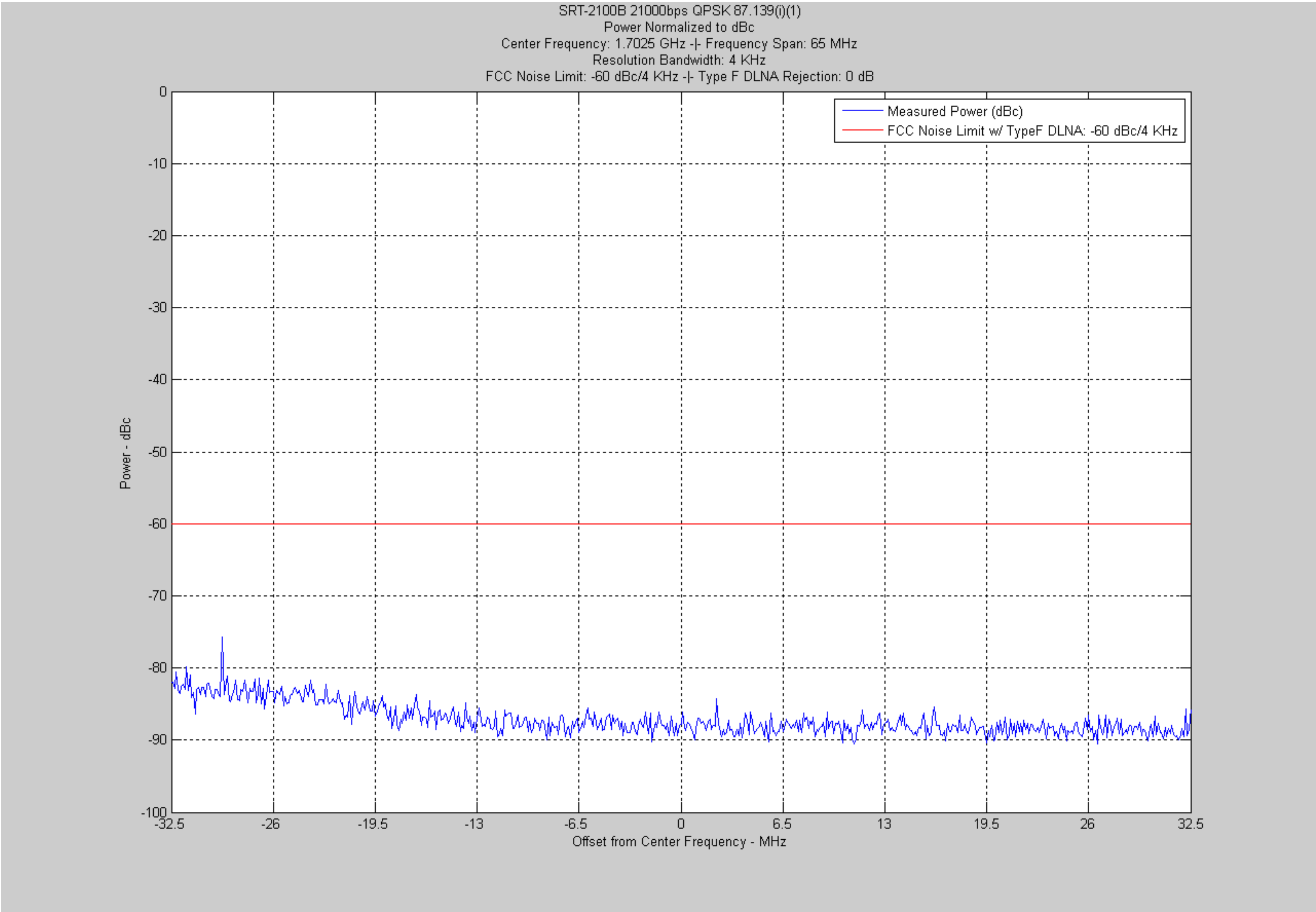


Figure 77 – 1735 to 12000 MHz

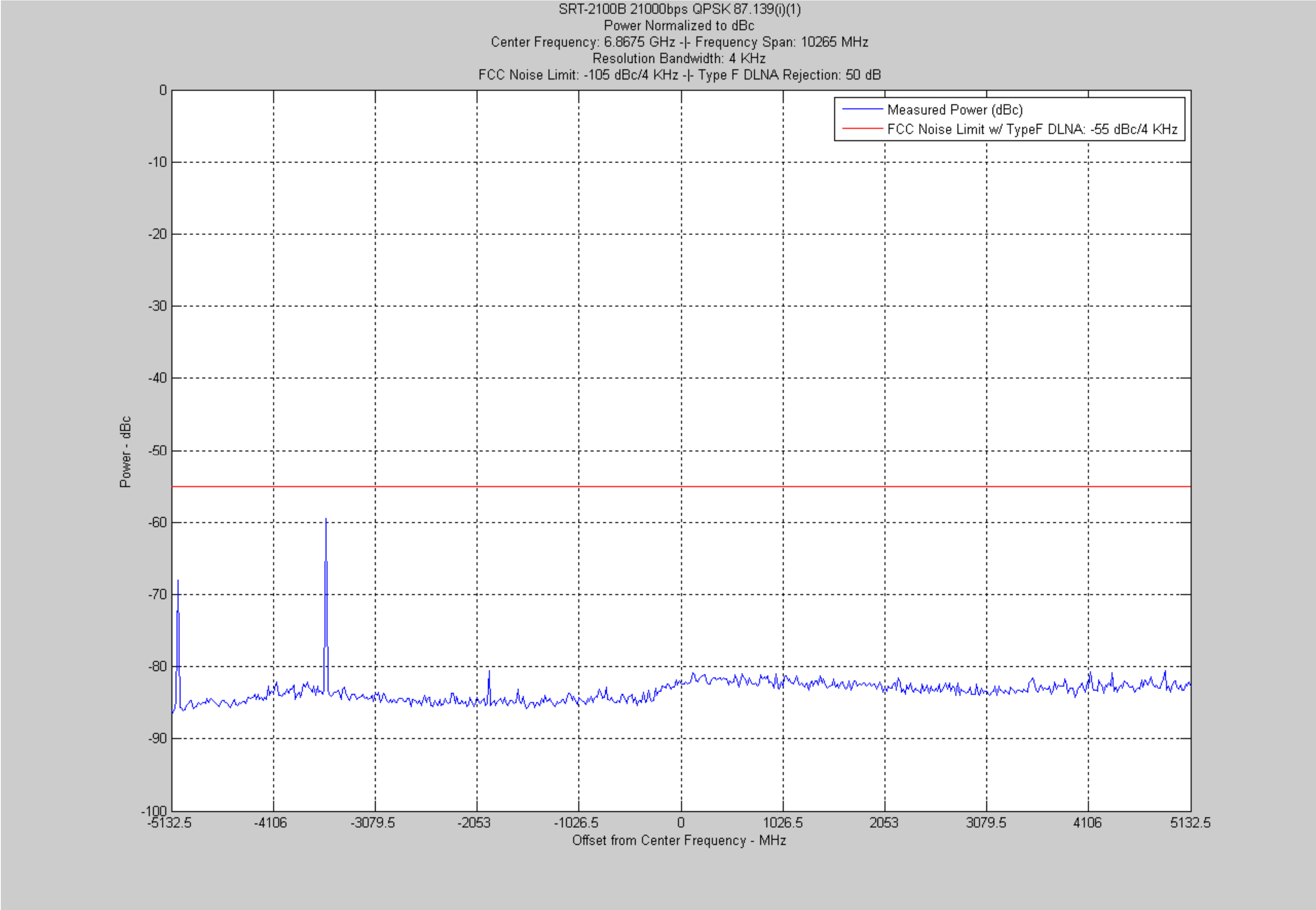


Figure 78 – 12000 to 18000 MHz

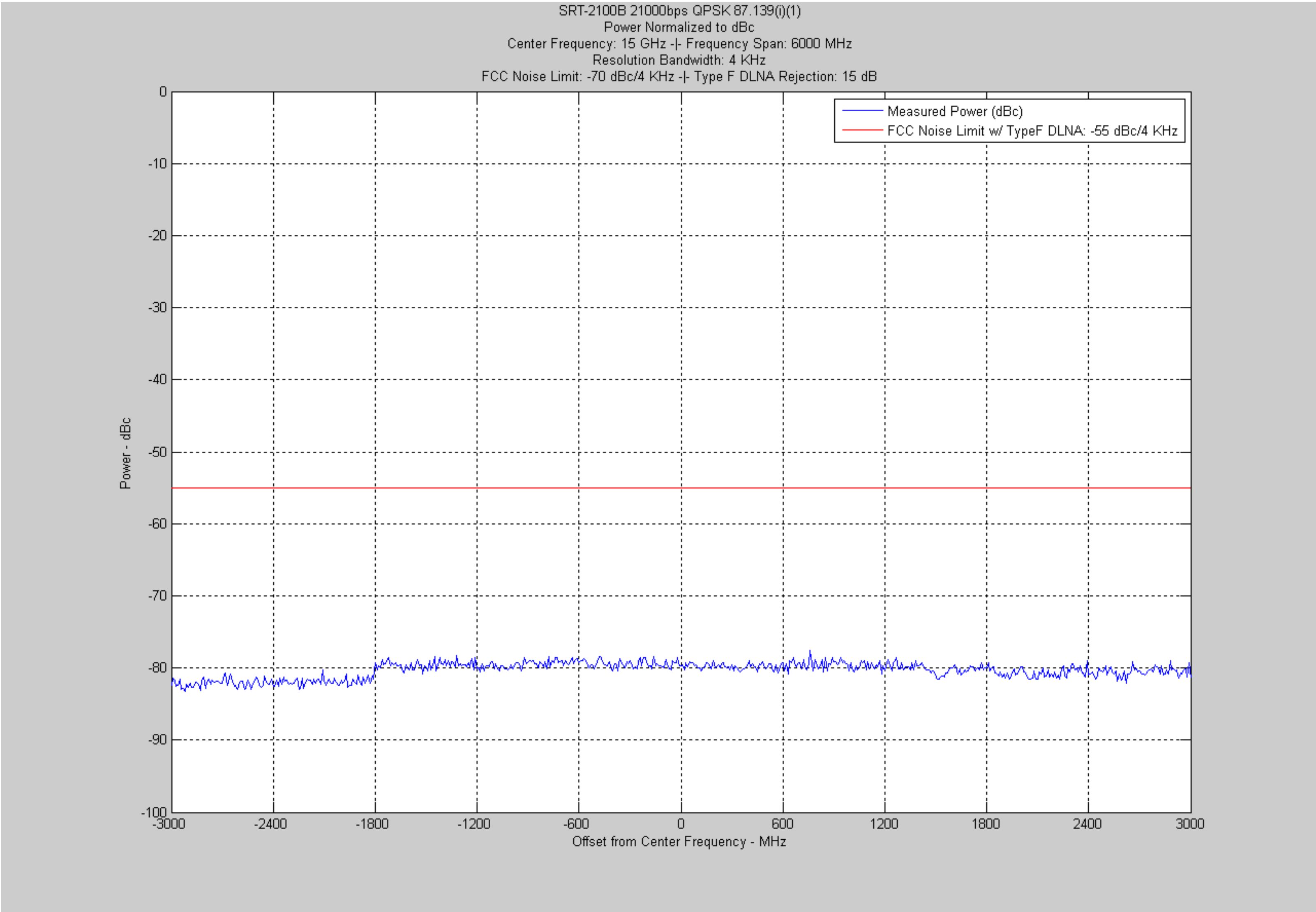


Figure 79 - 0.01 to 1525 MHz

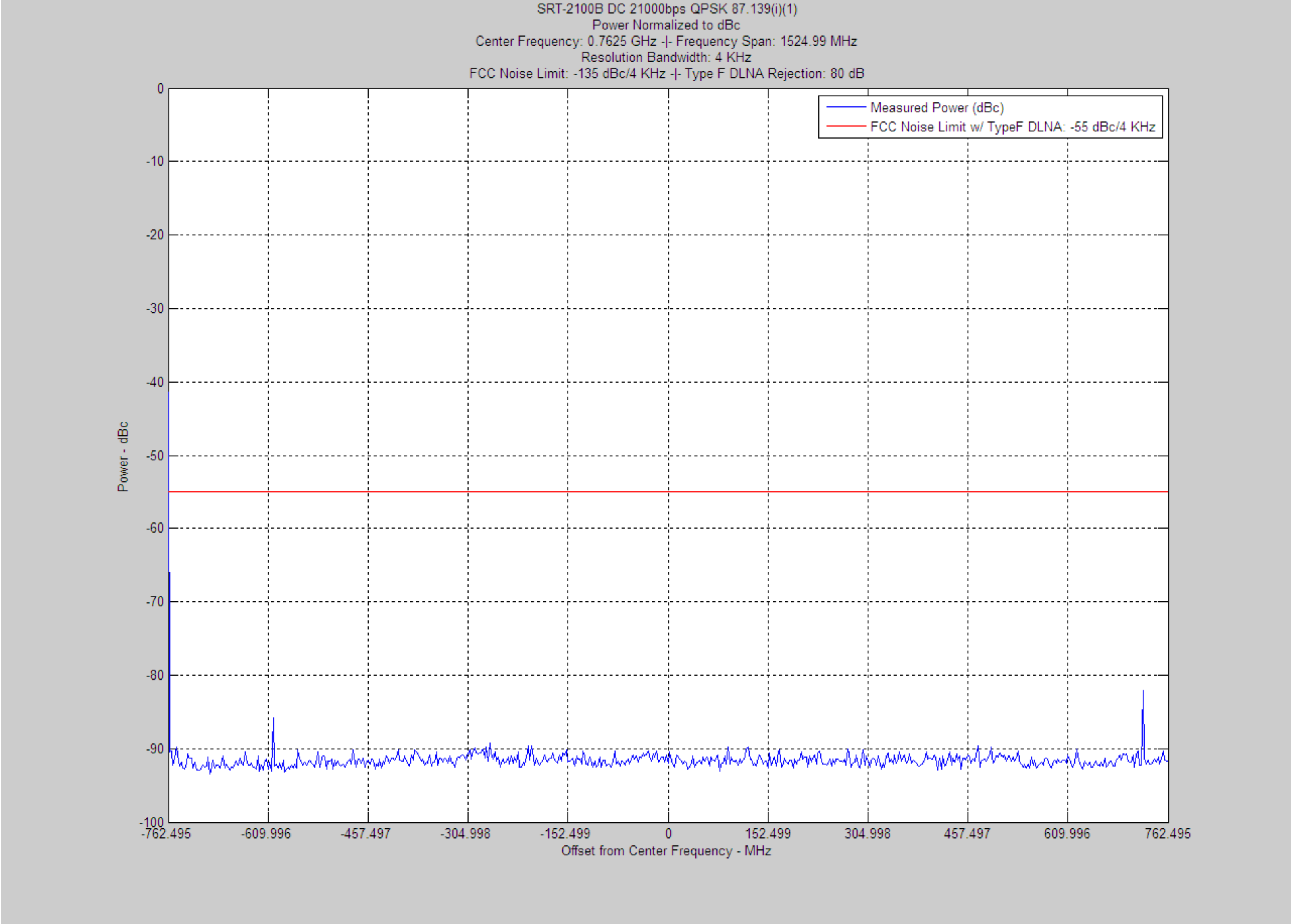


Figure 80 – 1525 to 1559 MHz

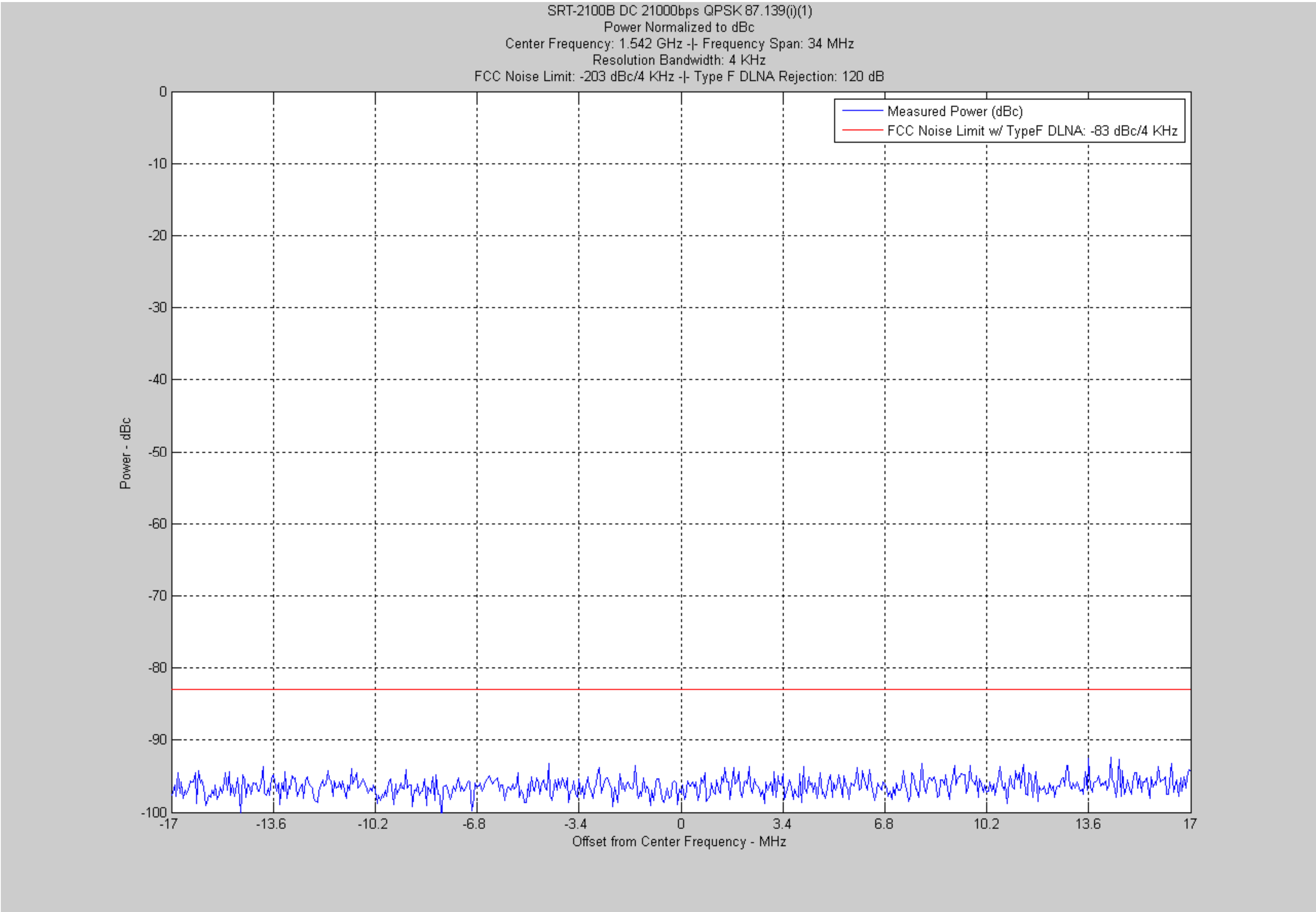


Figure 81 – 1559 to 1585 MHz

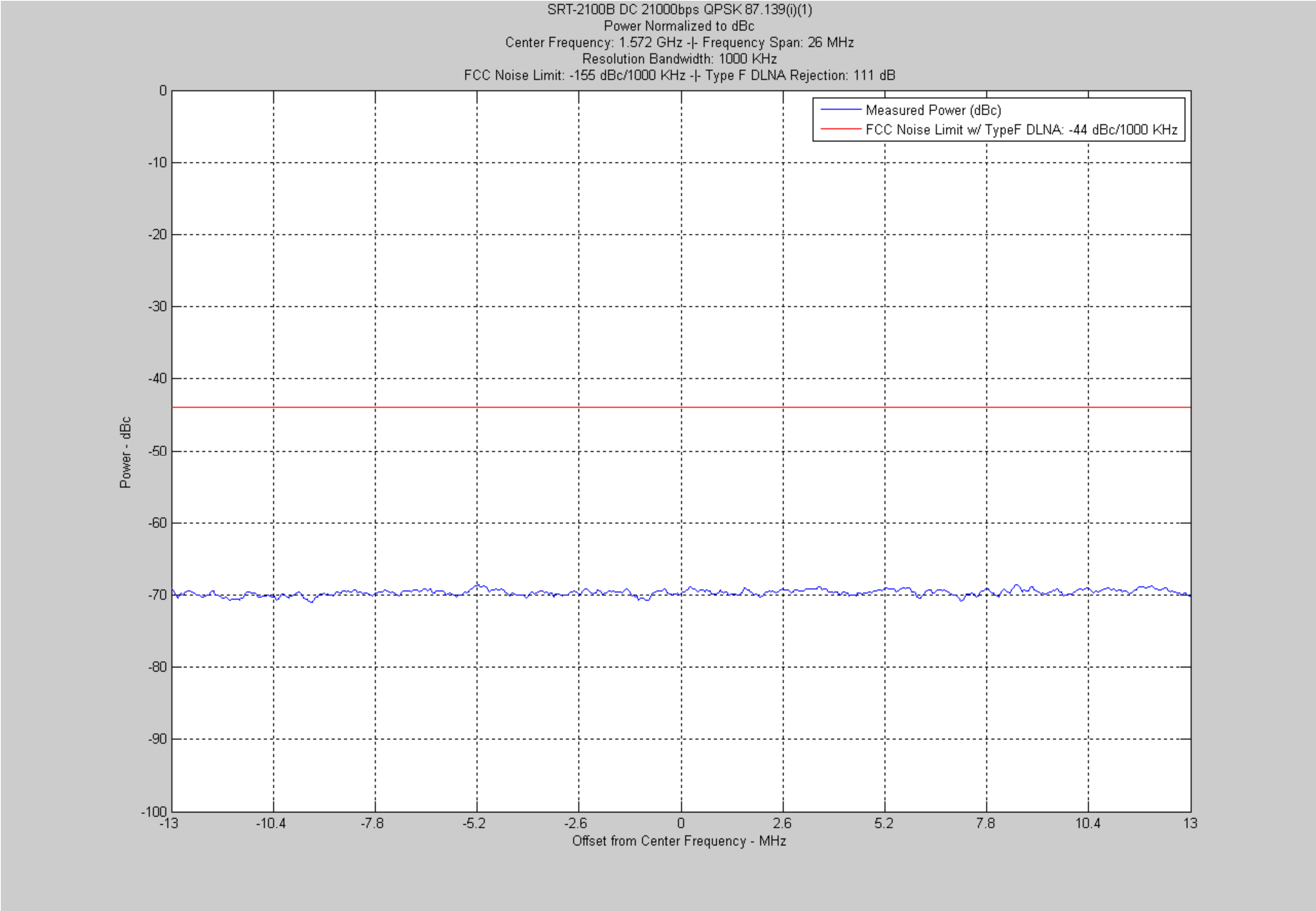


Figure 82 – 1585 to 1605 MHz

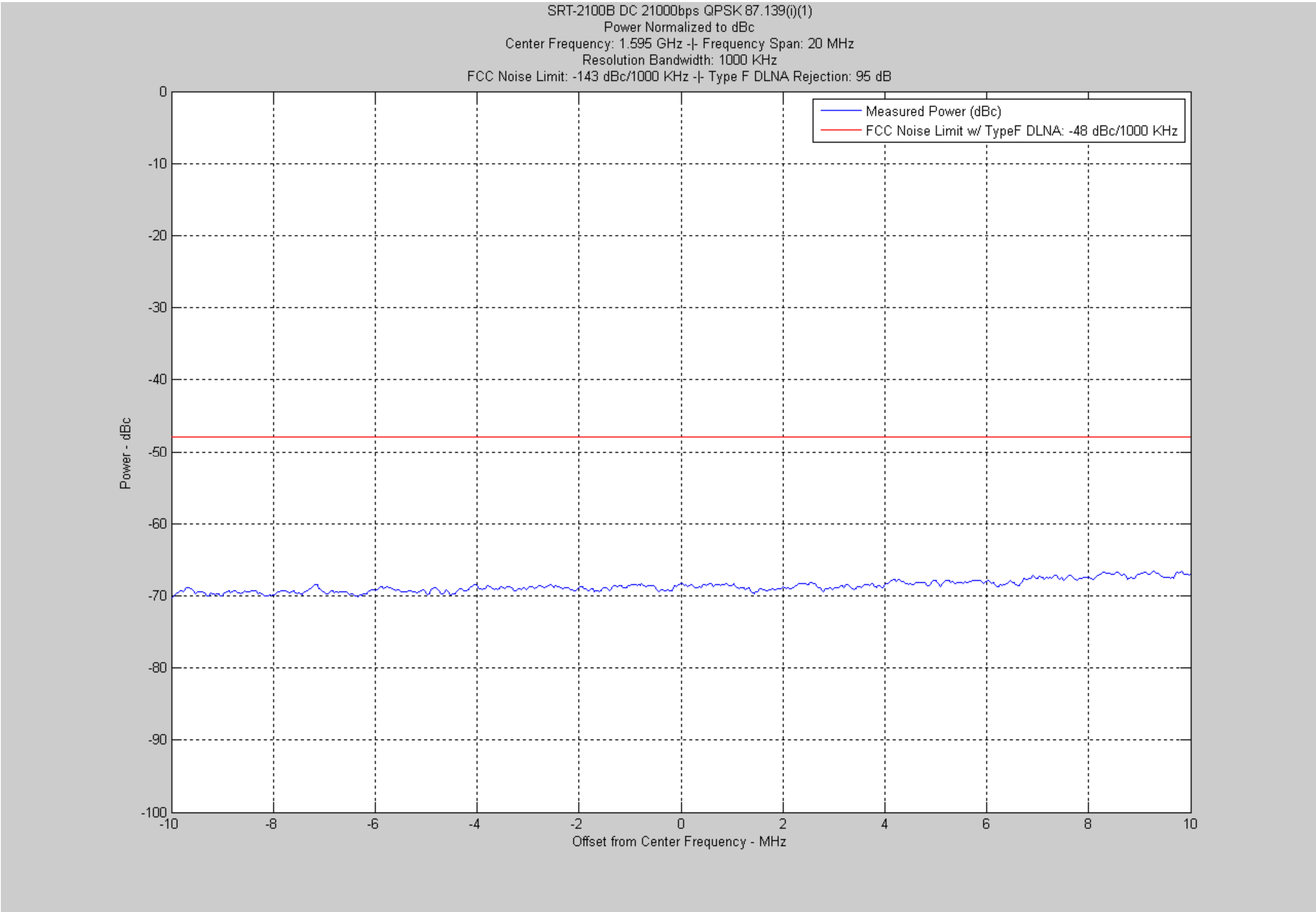


Figure 83 - 1605 to 1610 MHz

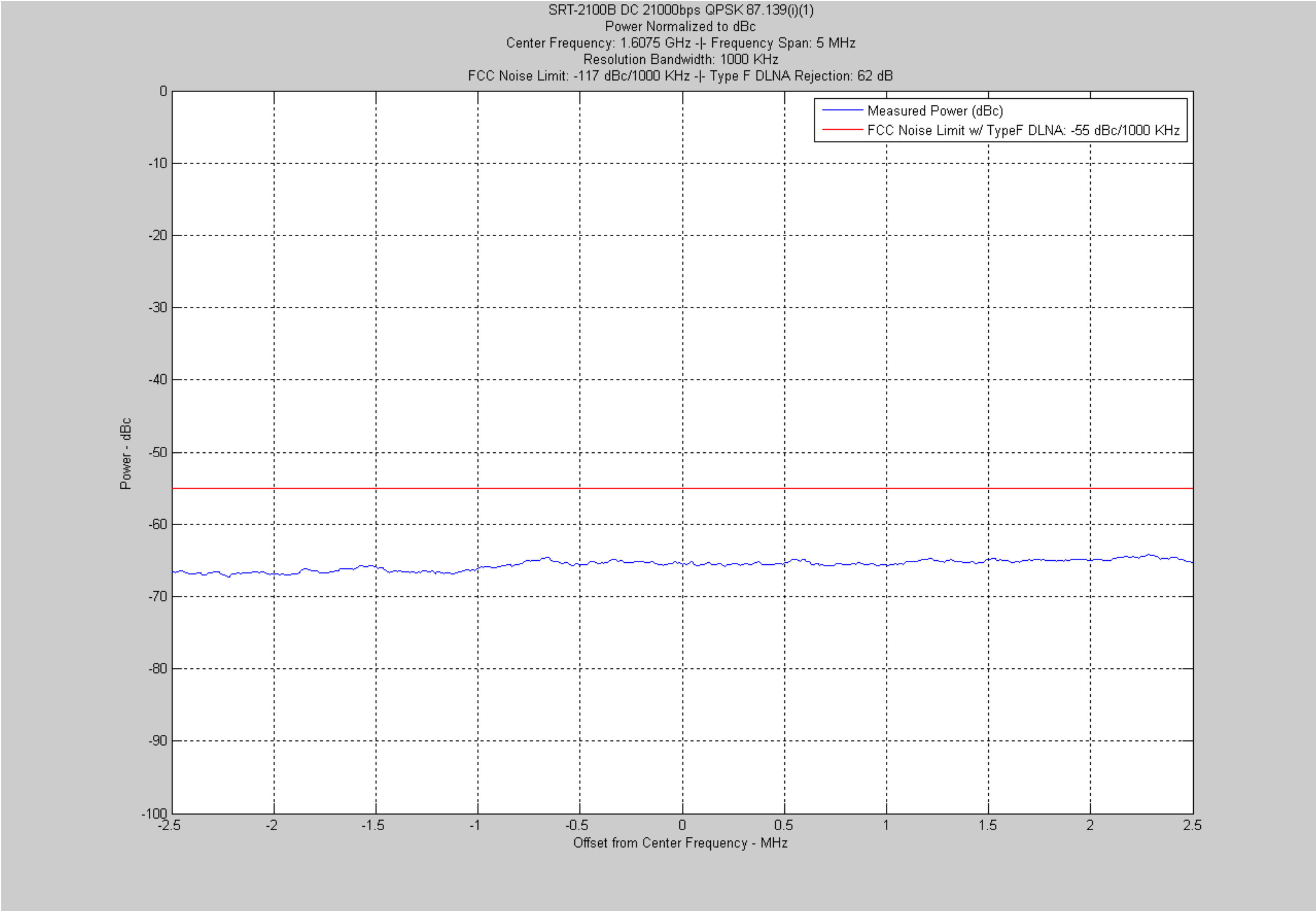


Figure 84 – 1610 to 1610.6 MHz

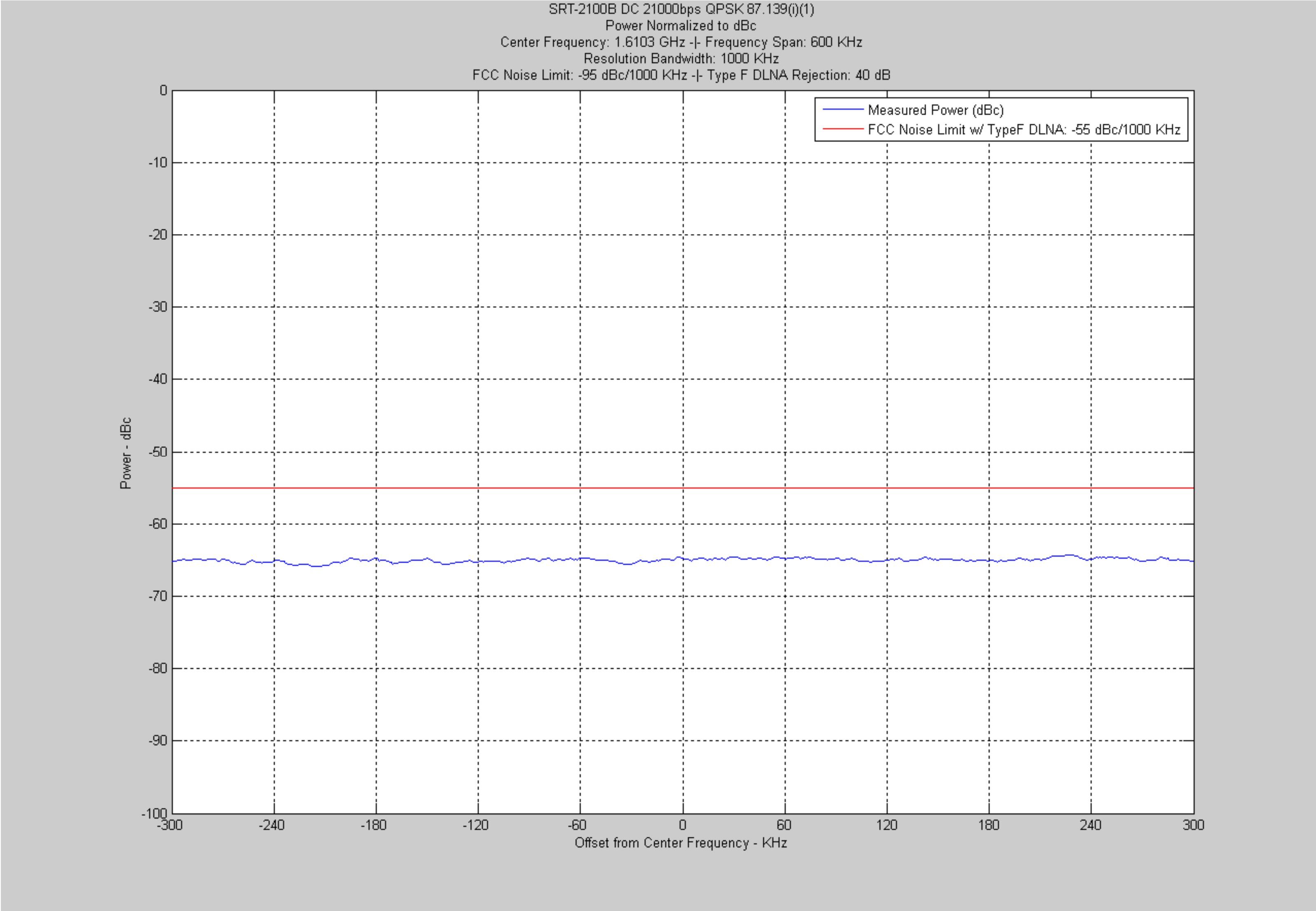


Figure 85 – 1610.6 to 1613.8 MHz

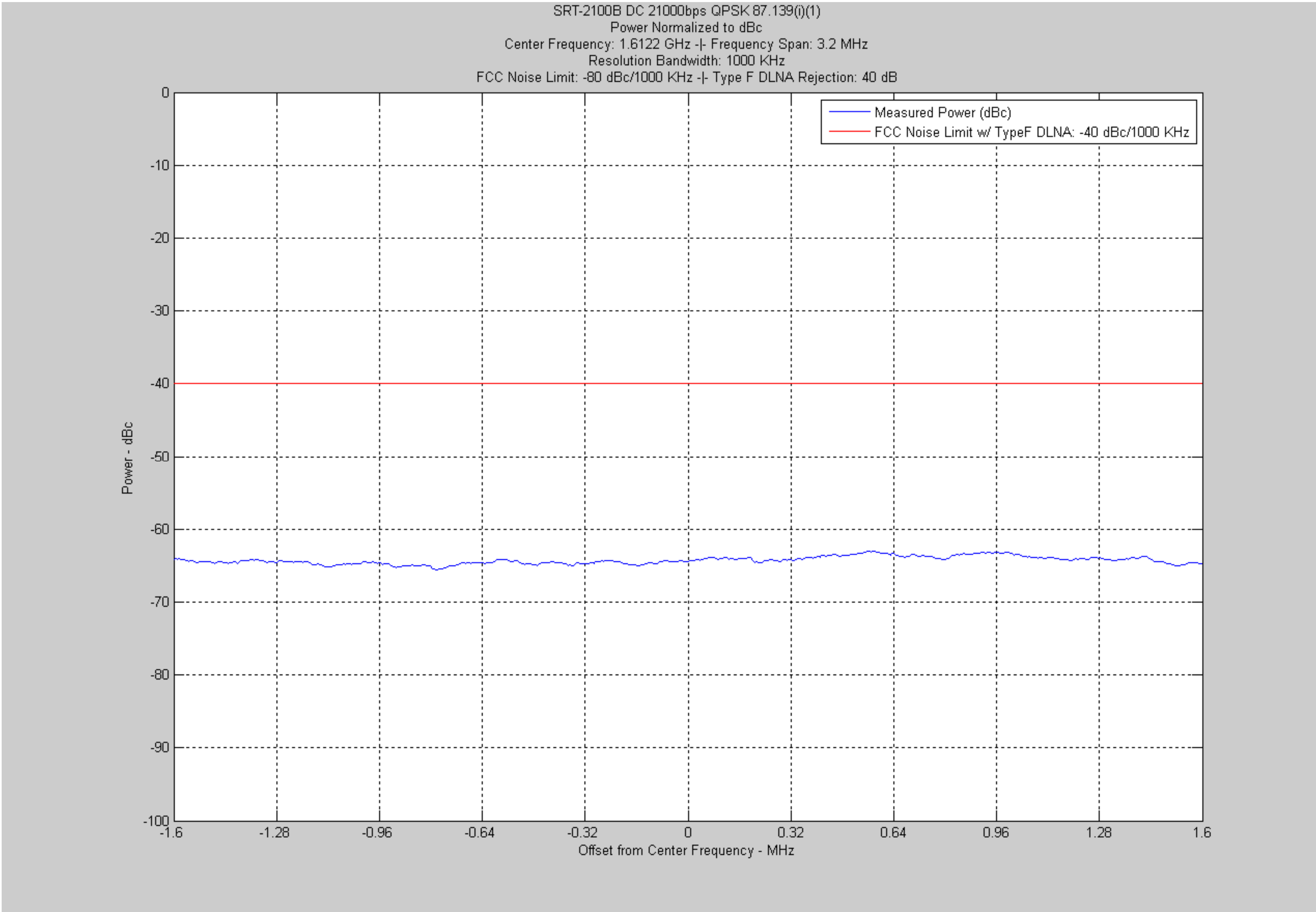


Figure 86 – 1613.8 to 1614 MHz

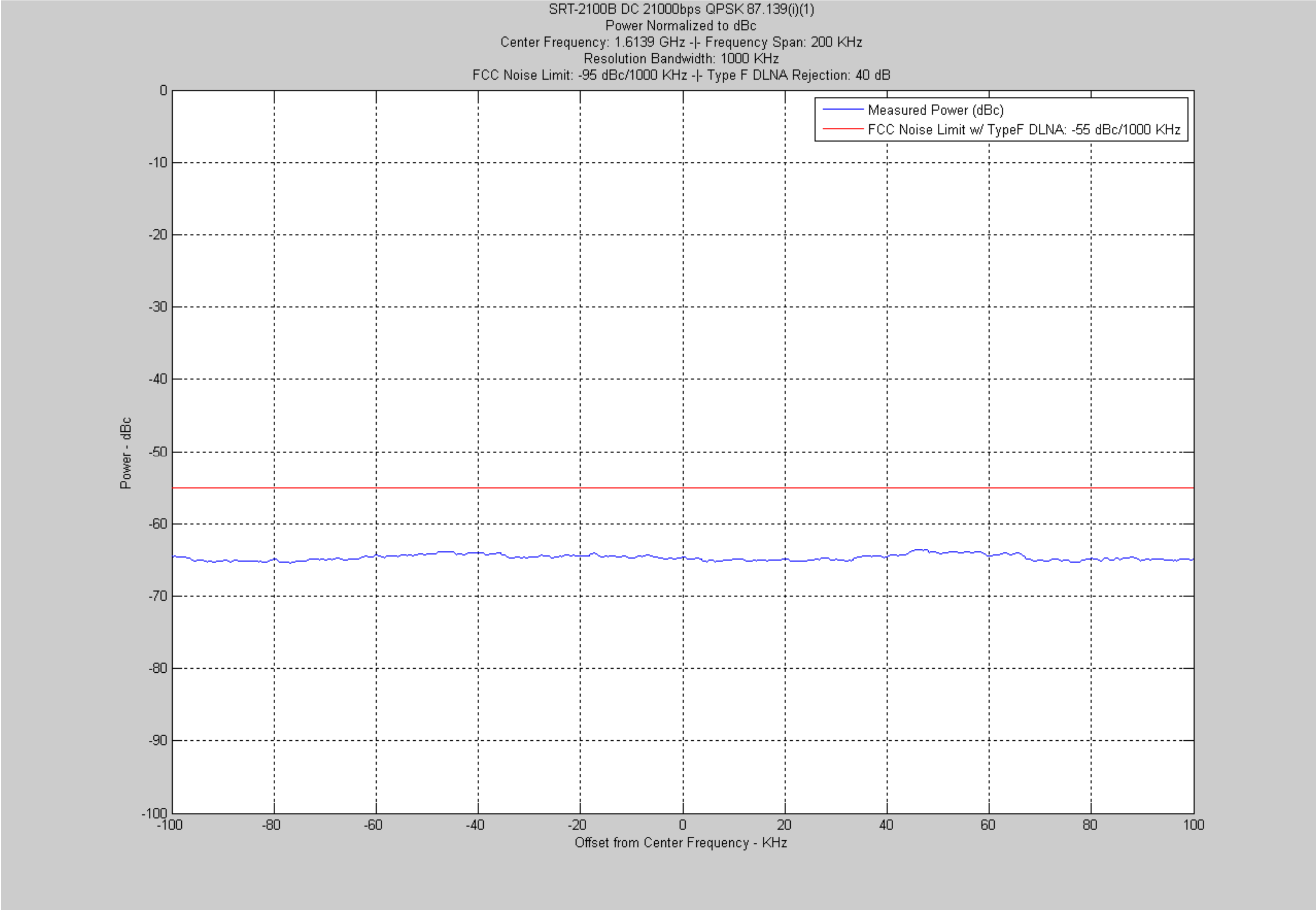


Figure 87 – 1614 to 1626.5 MHz

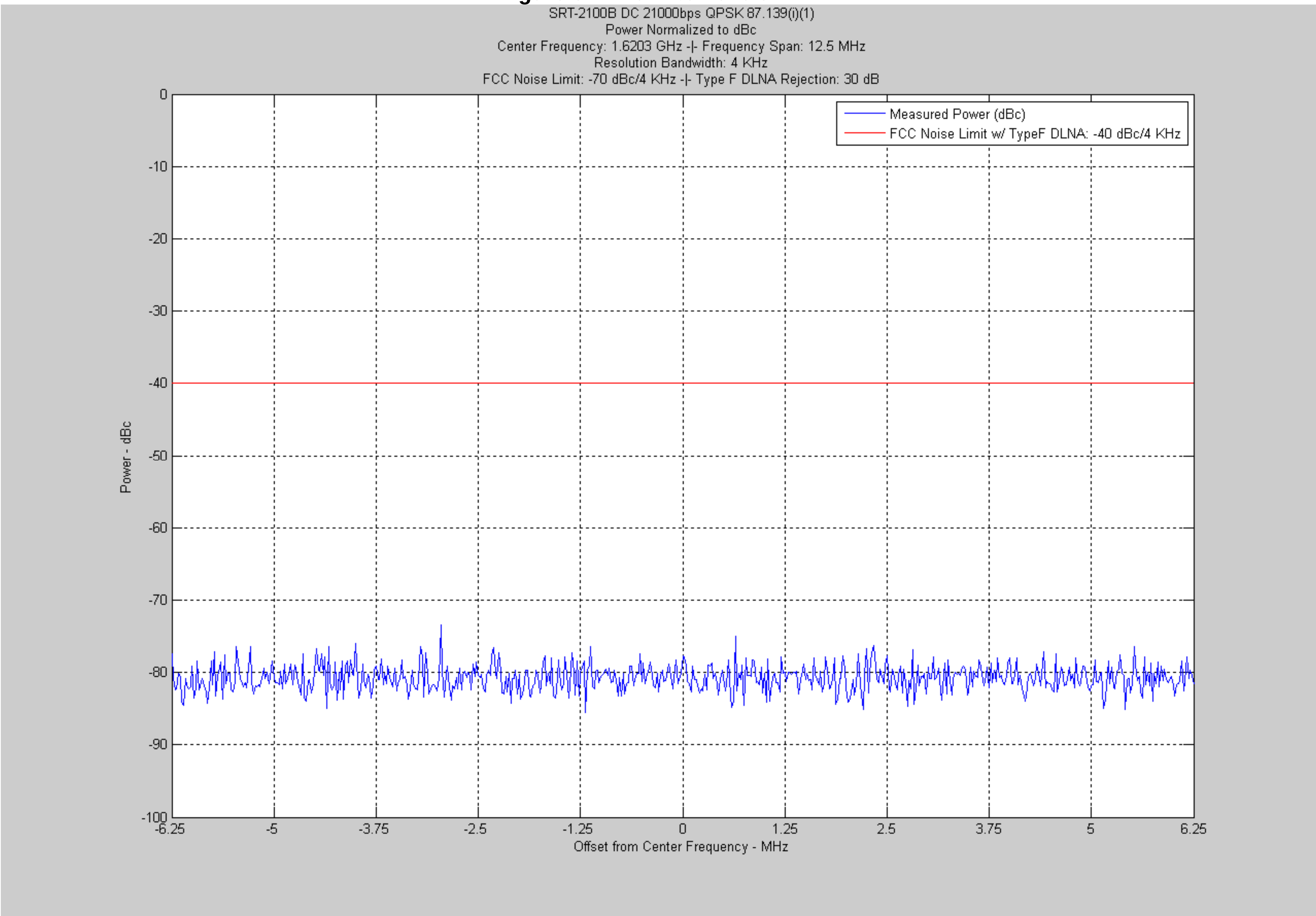


Figure 88 – 1626.5 to 1660 MHz

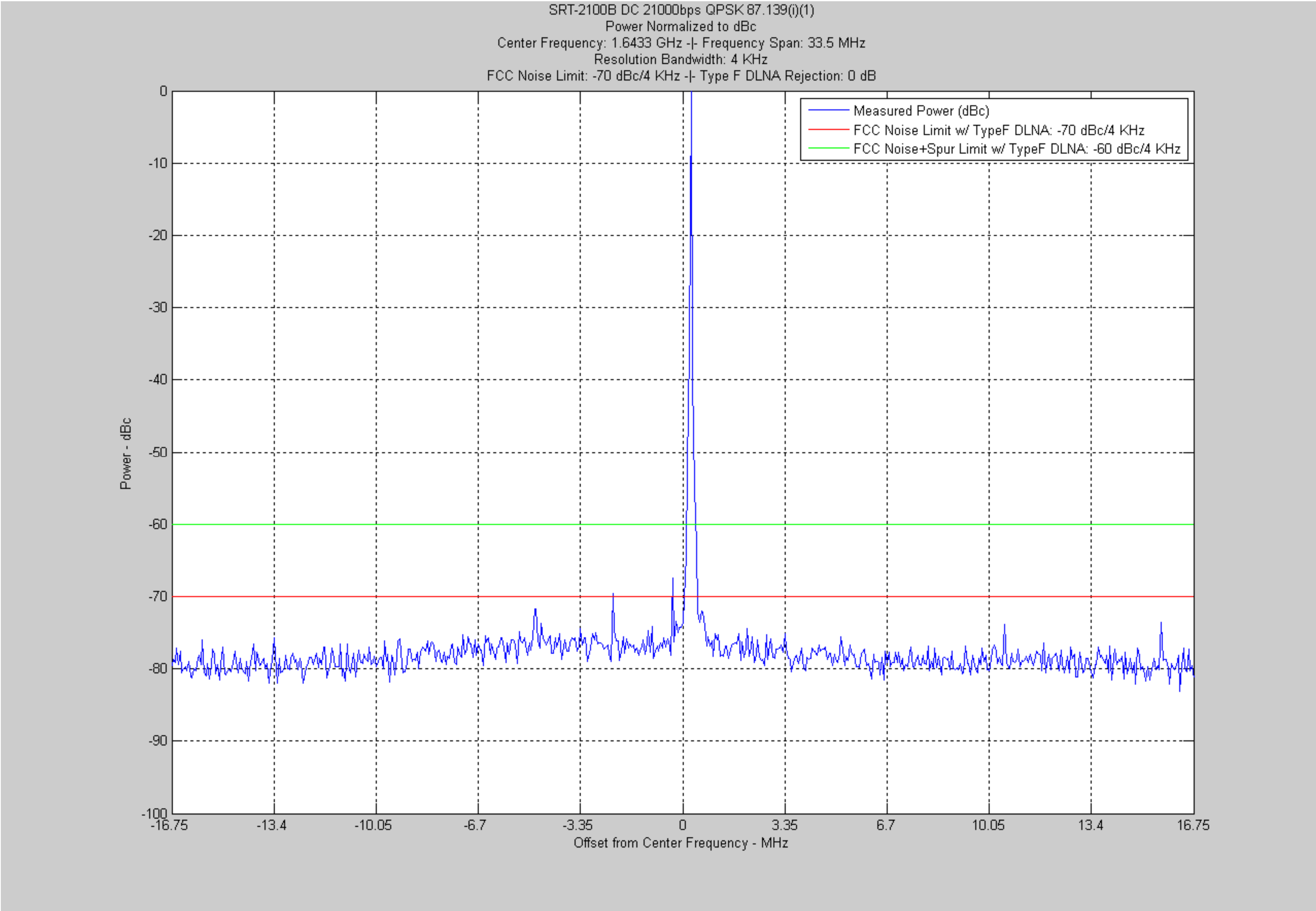


Figure 89 – 1660 to 1670 MHz

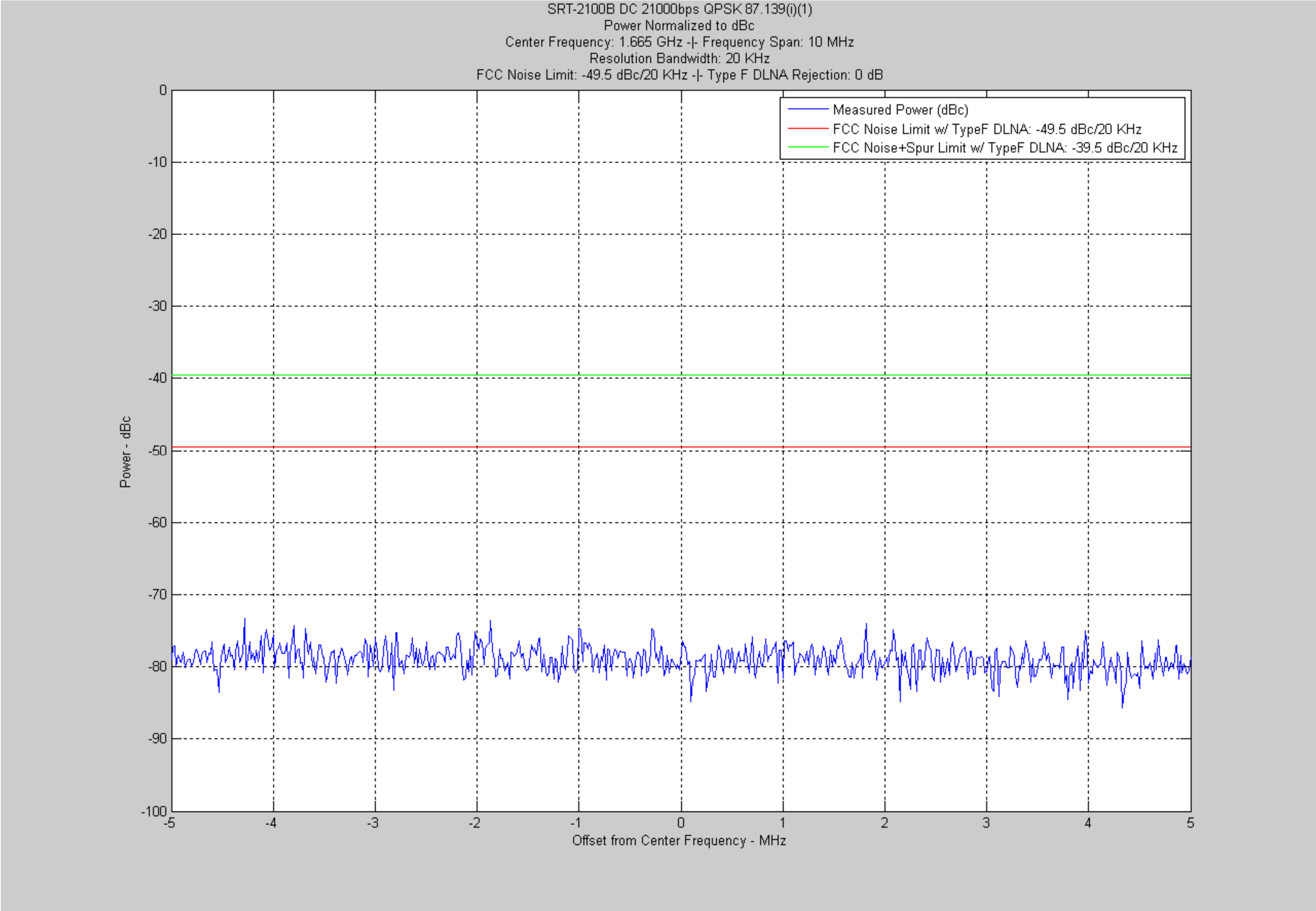


Figure 90 – 1670 to 1735 MHz

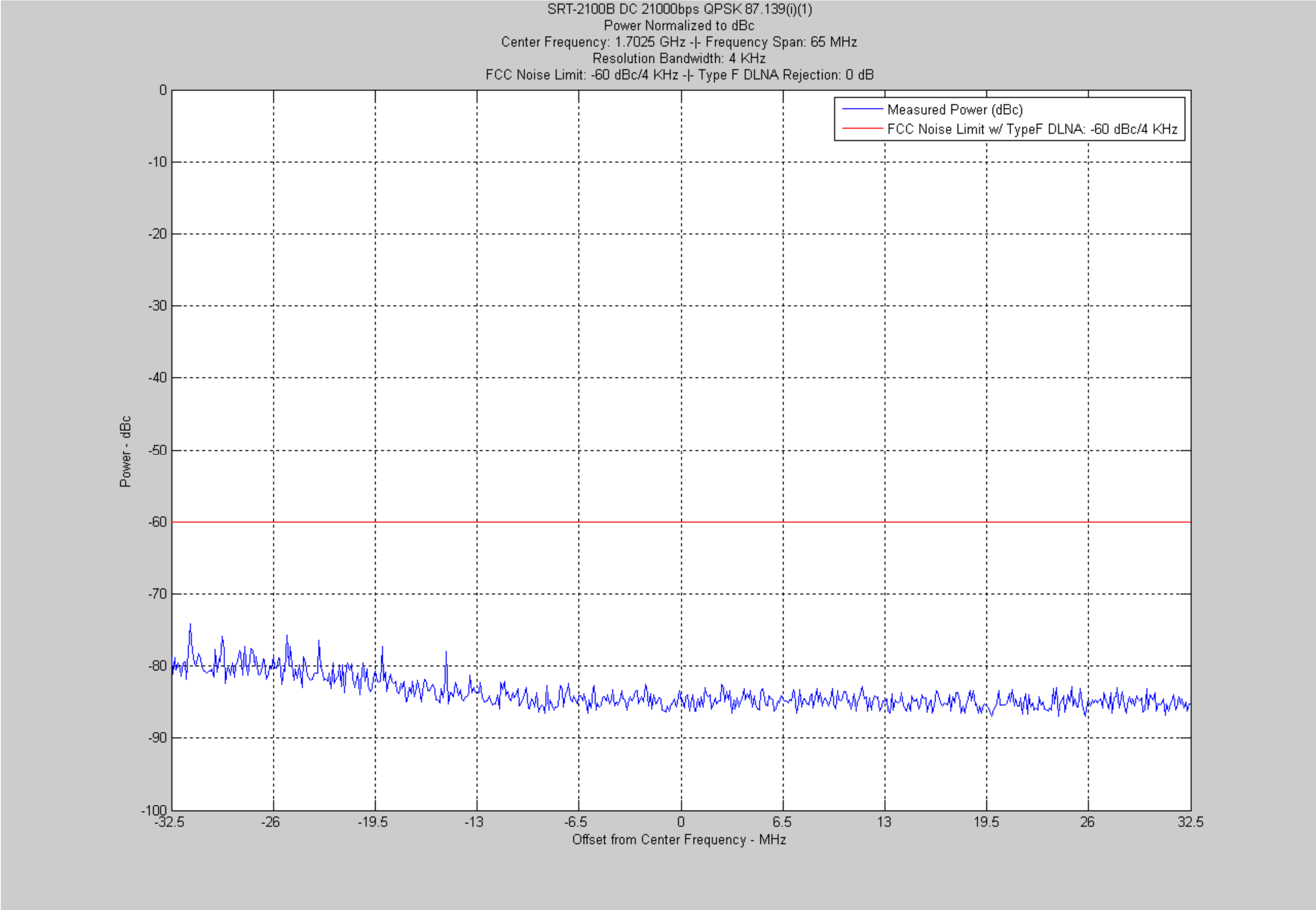


Figure 91 – 1735 to 12000 MHz

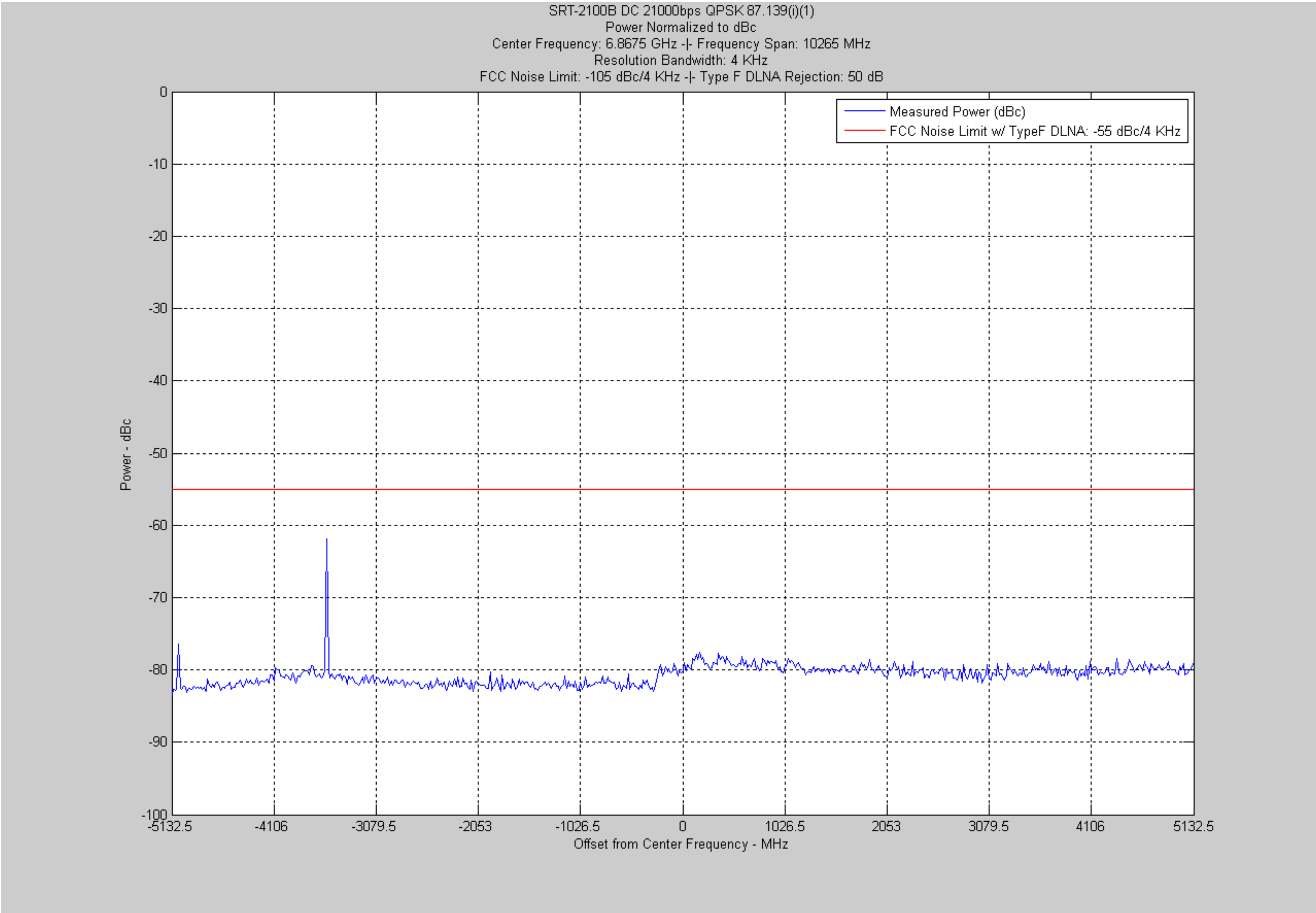


Figure 92 – 12000 to 18000 MHz

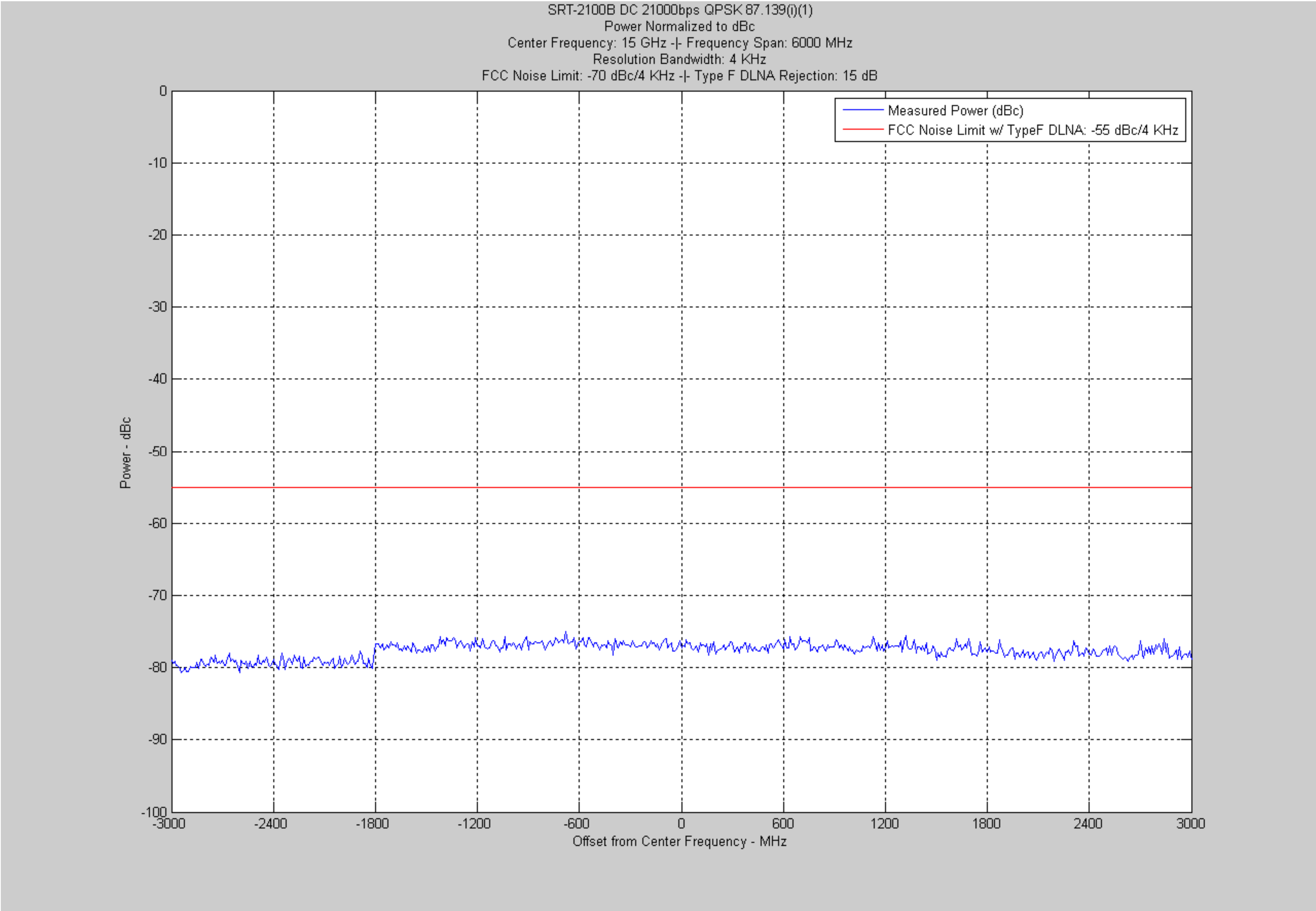


Figure 93 - 0.01 to 1525 MHz

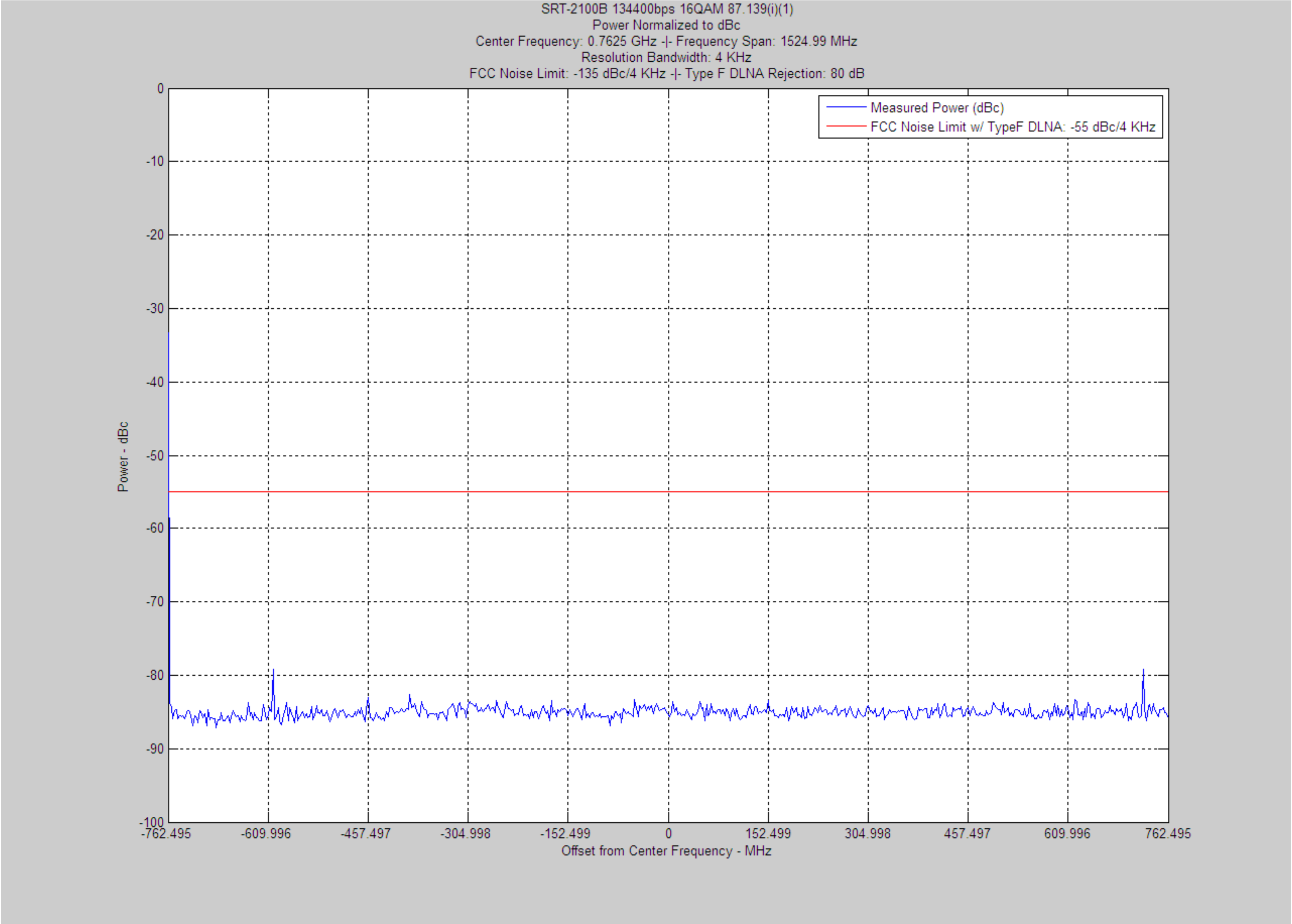


Figure 94 – 1525 to 1559 MHz

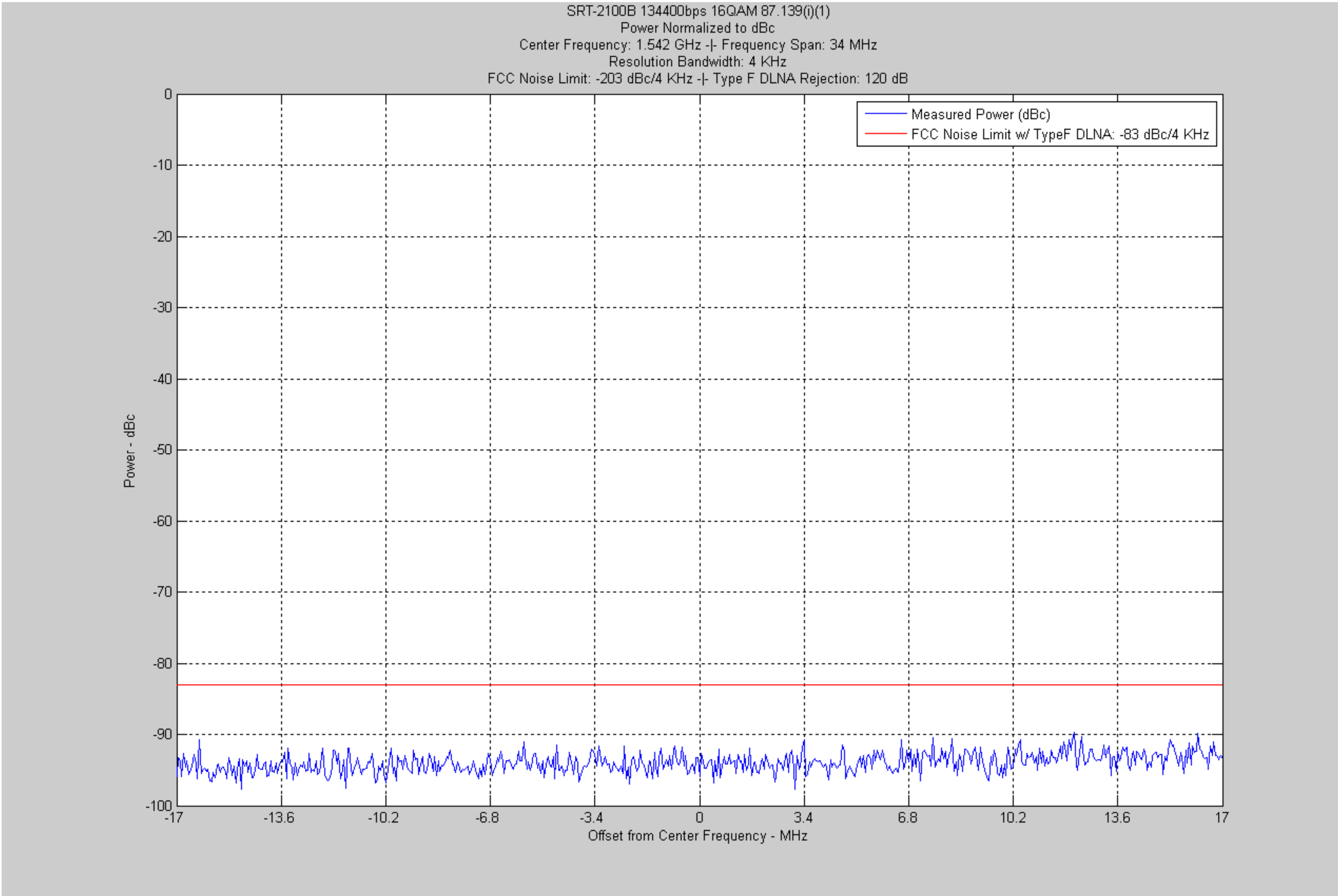


Figure 95 – 1559 to 1585 MHz

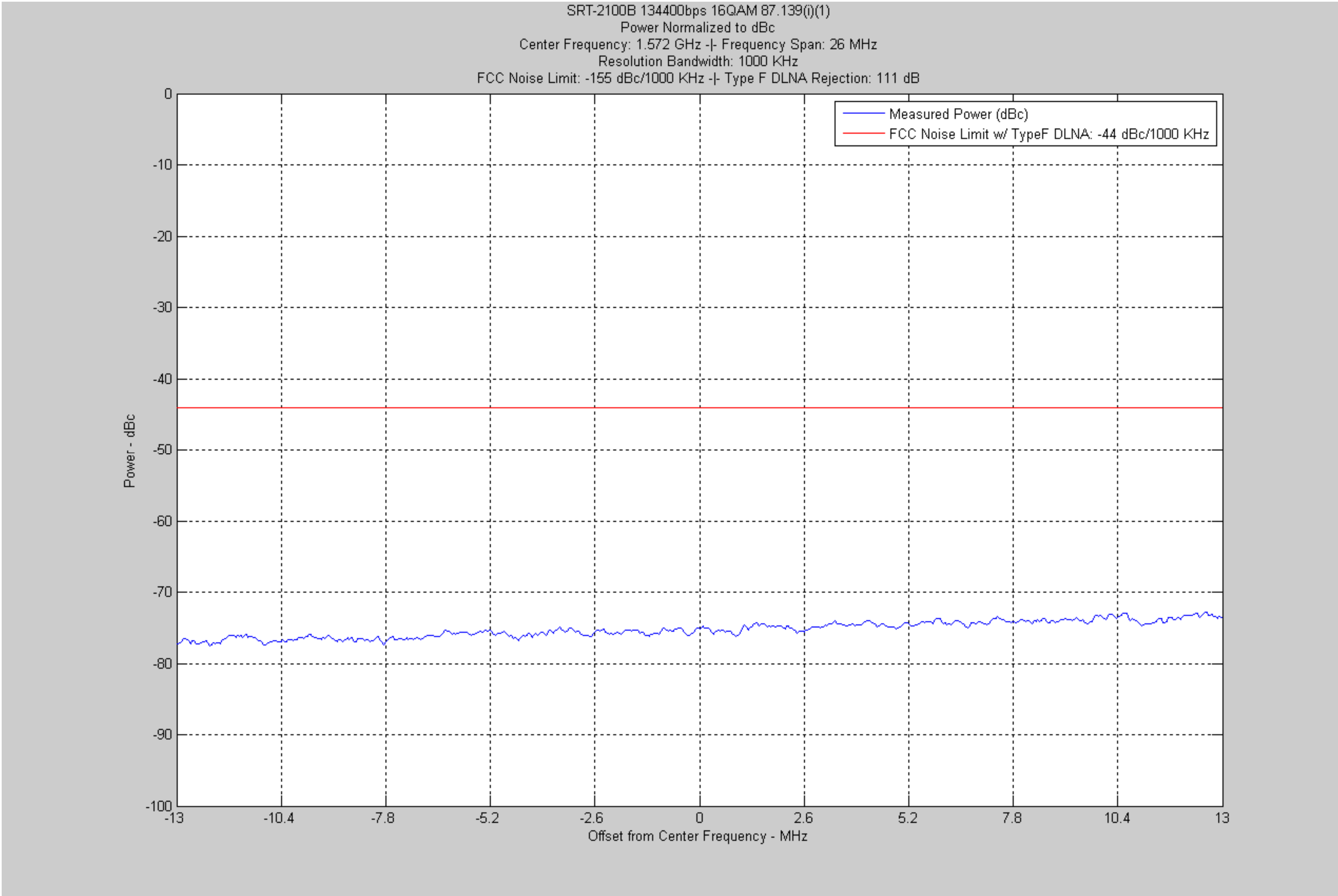


Figure 96 – 1585 to 1605 MHz

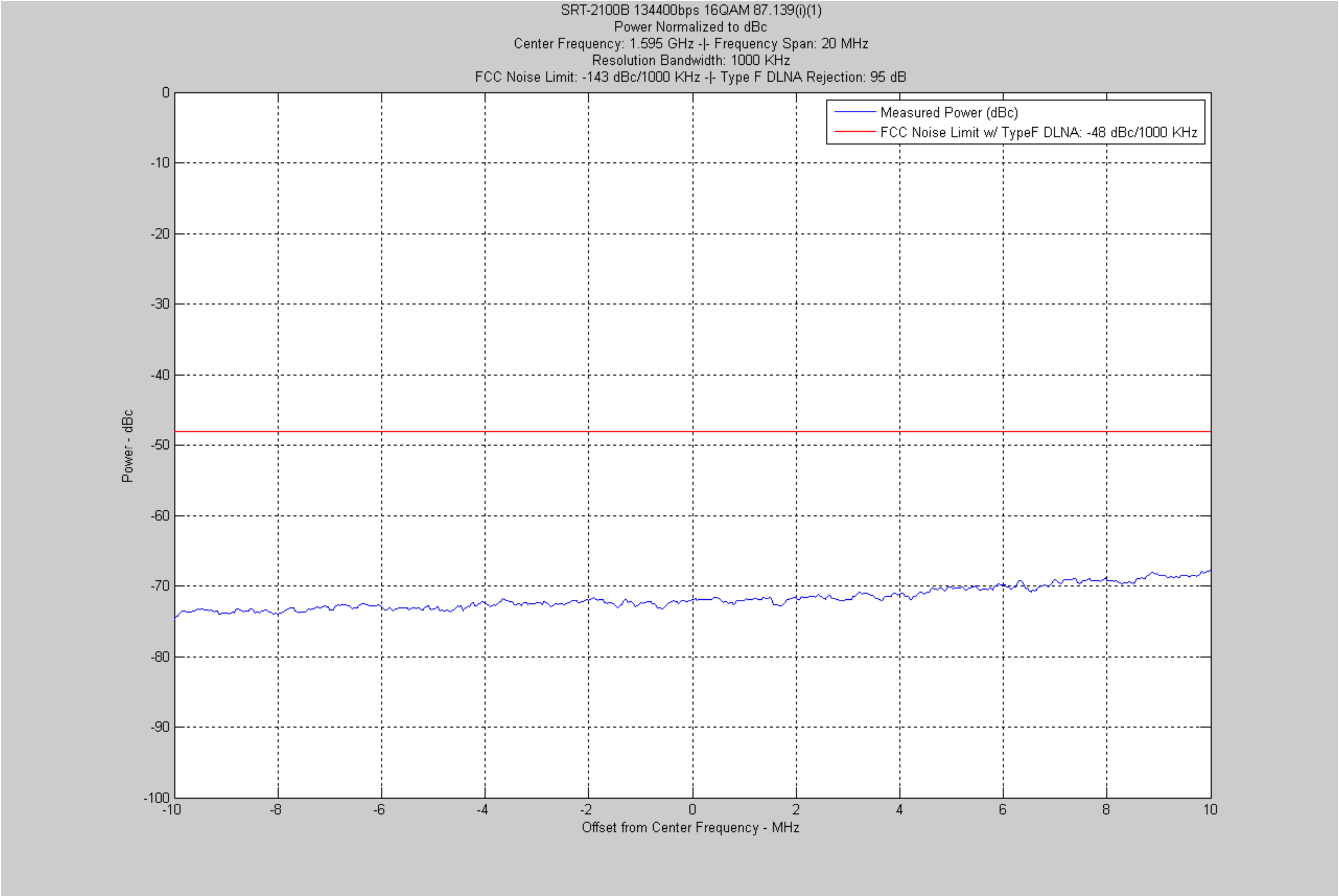


Figure 97 - 1605 to 1610 MHz

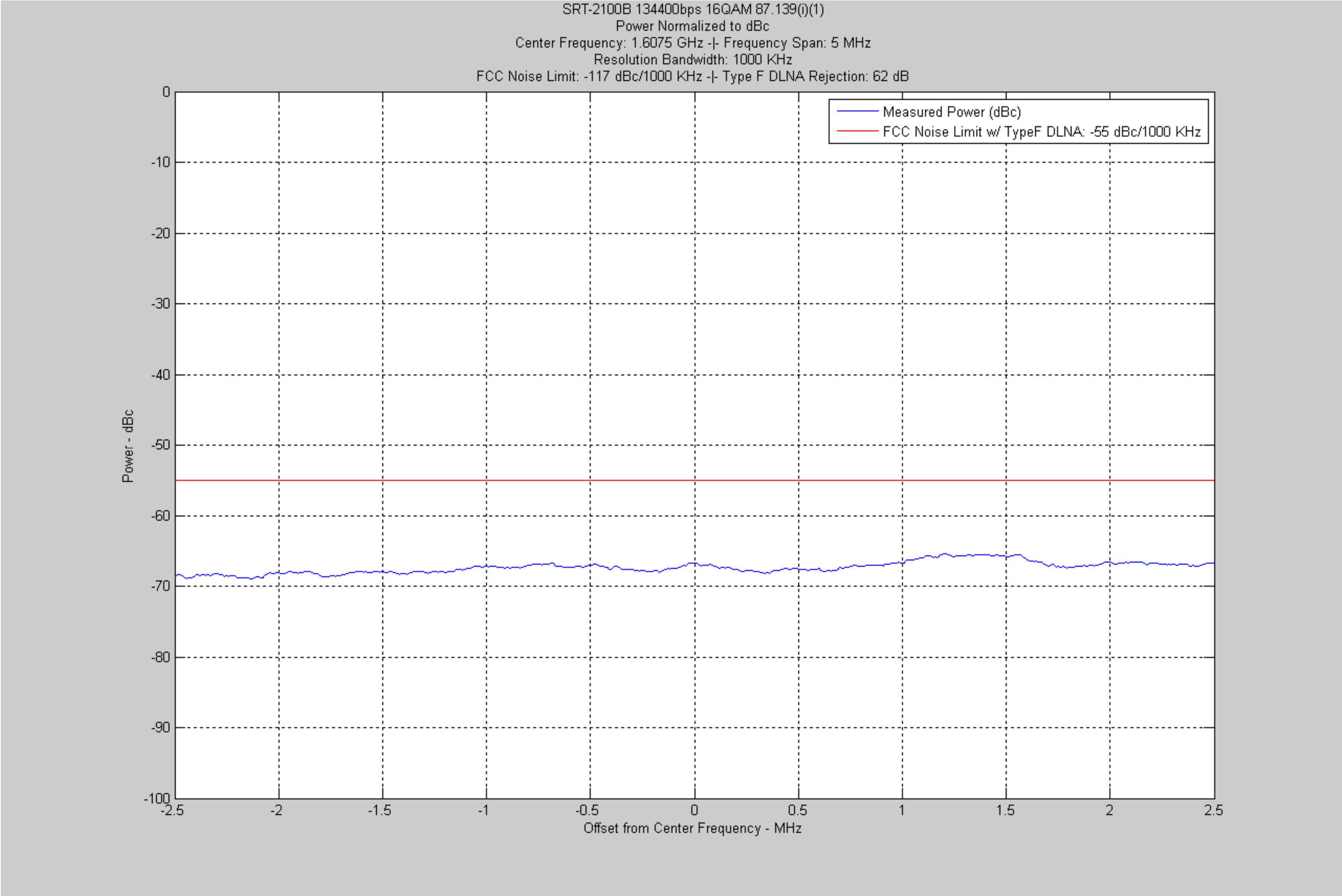


Figure 98 – 1610 to 1610.6 MHz

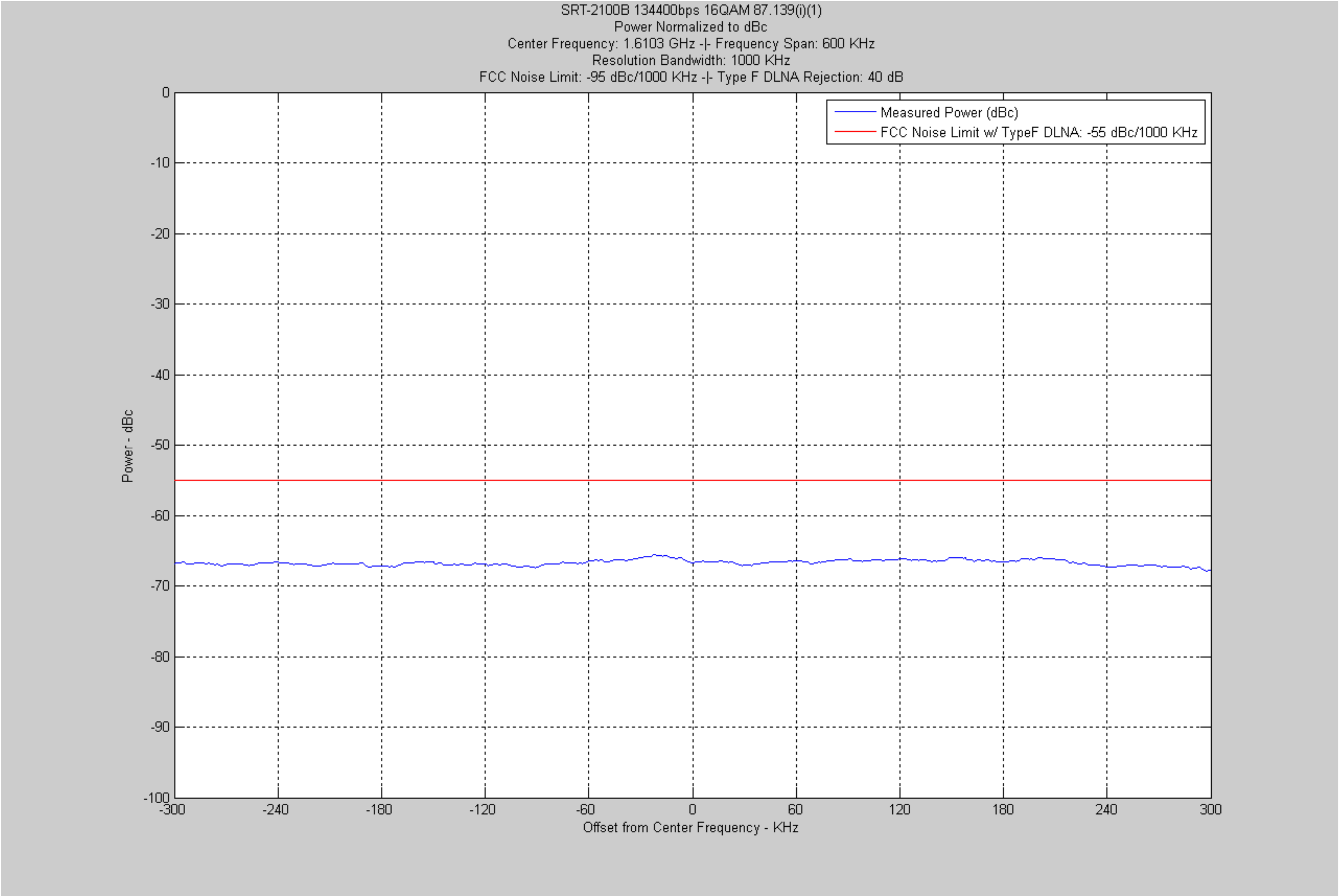


Figure 99 – 1610.6 to 1613.8 MHz

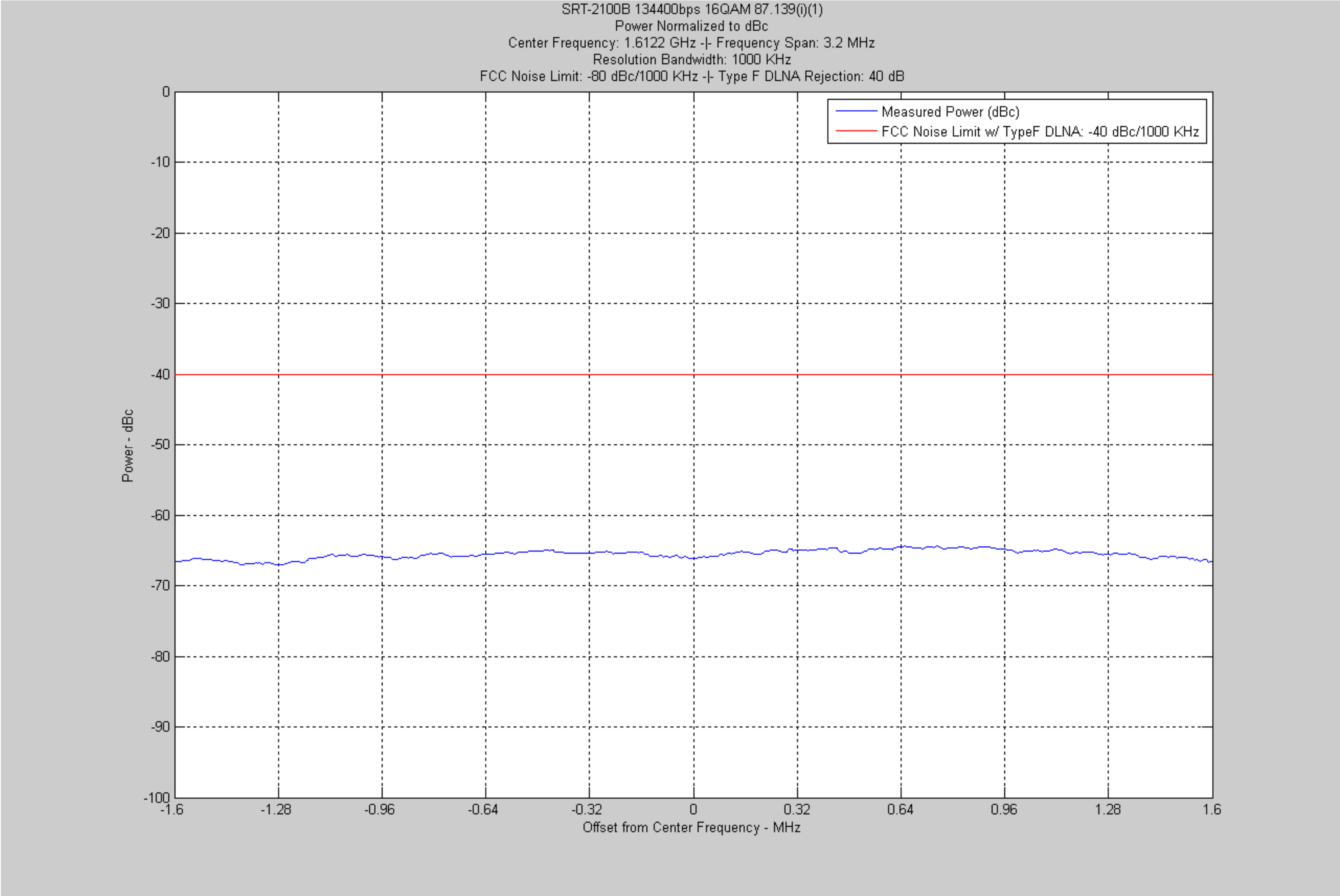


Figure 100 – 1613.8 to 1614 MHz

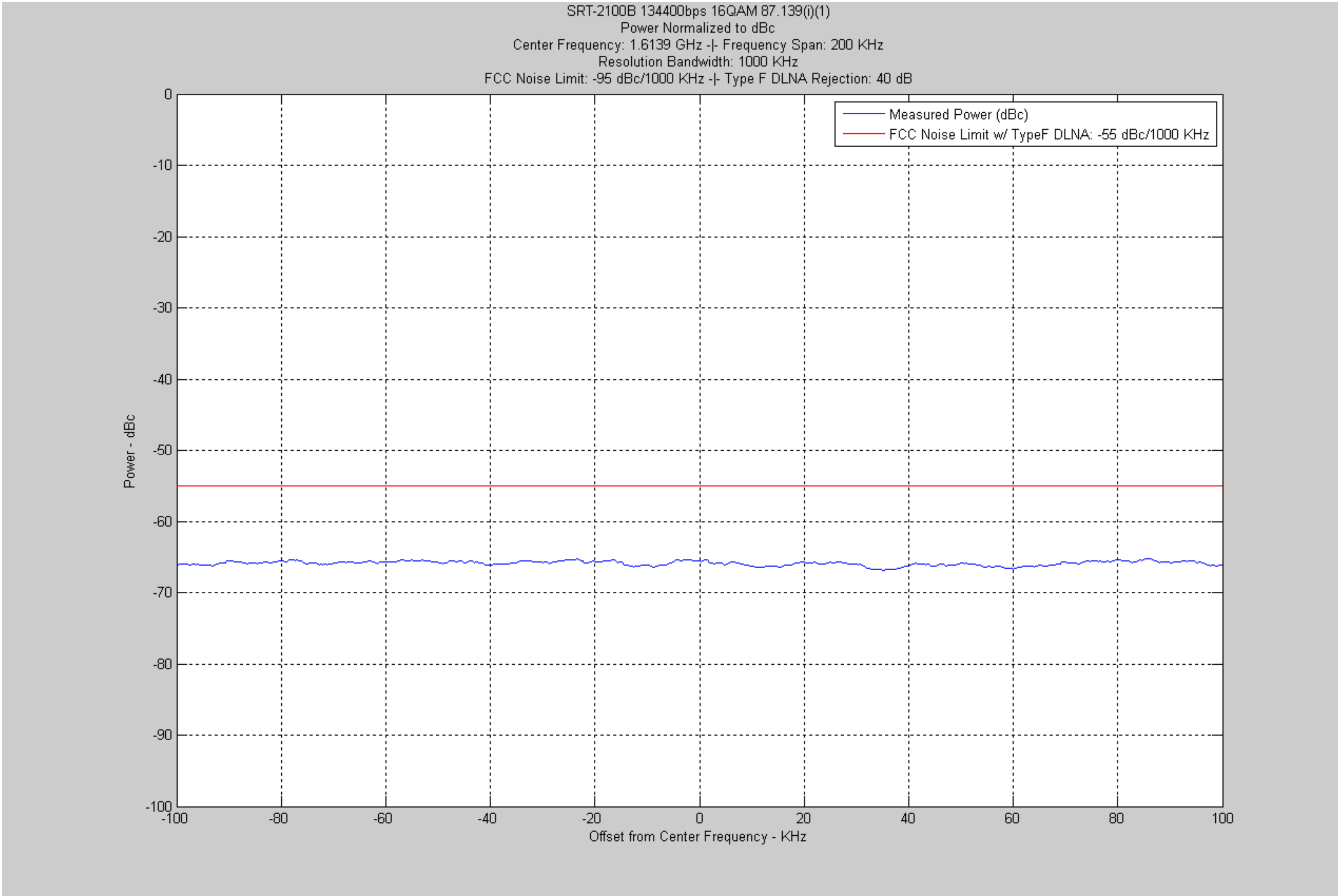


Figure 101 – 1614 to 1626.5 MHz

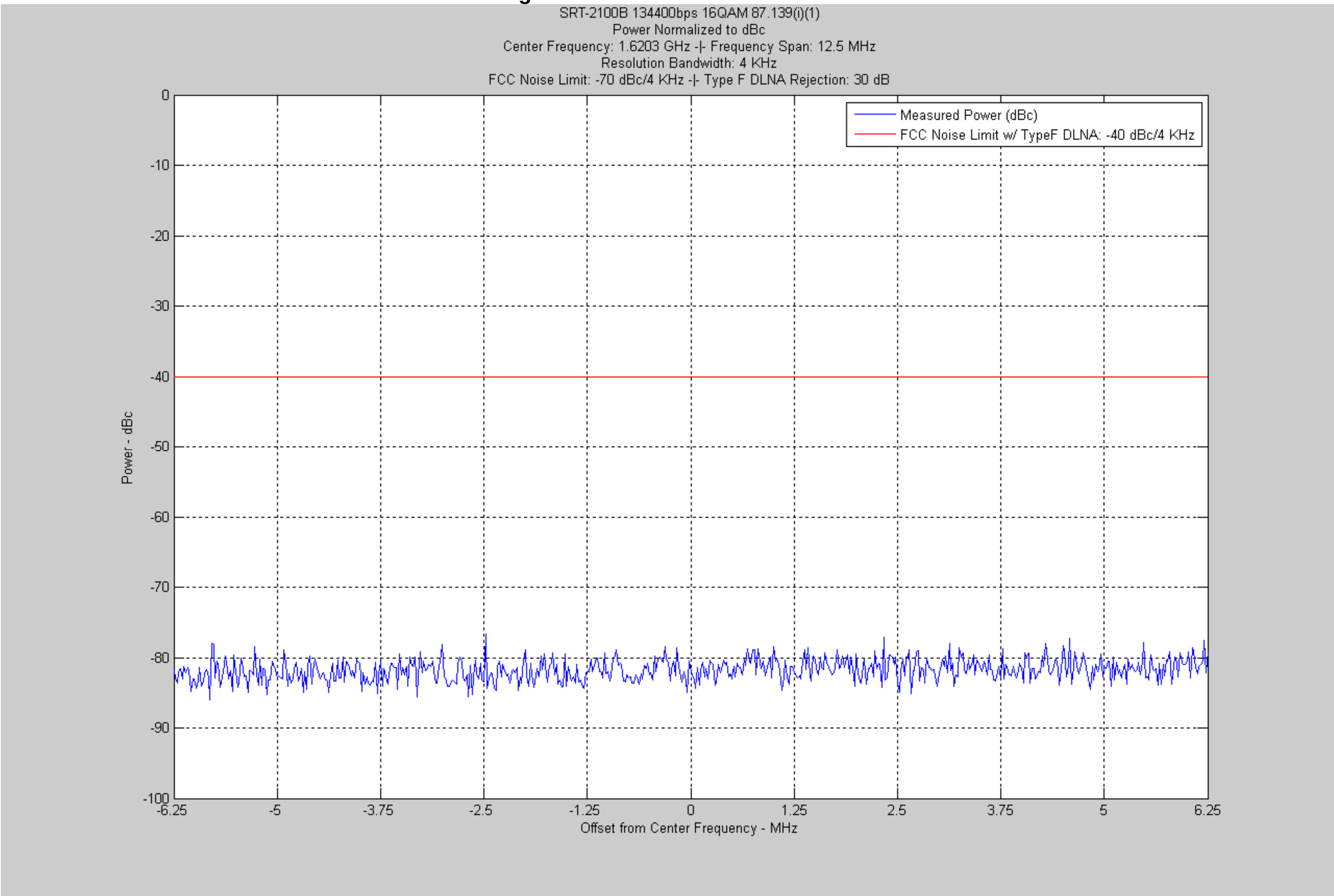


Figure 102 – 1626.5 to 1660 MHz

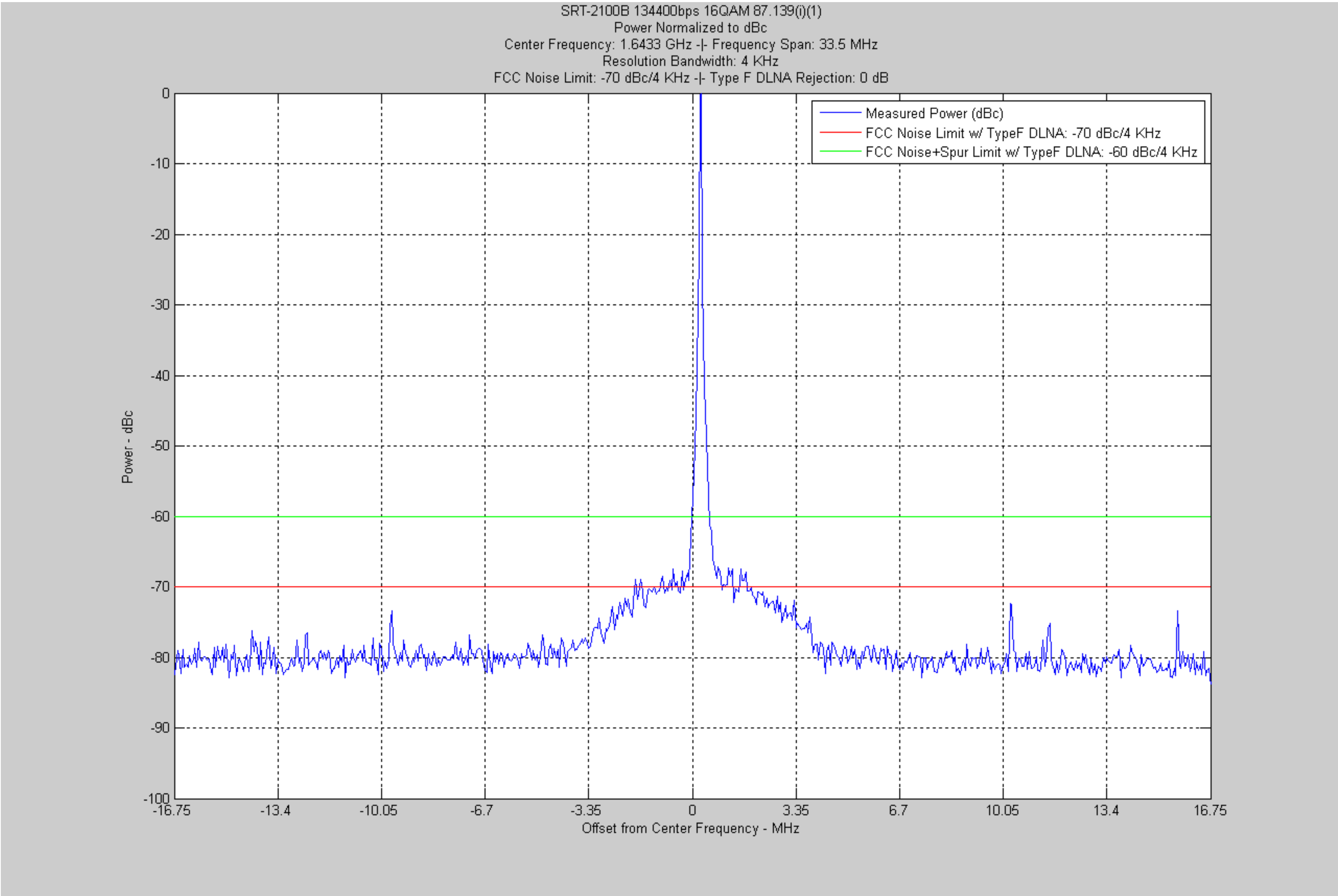


Figure 103 – 1660 to 1670 MHz

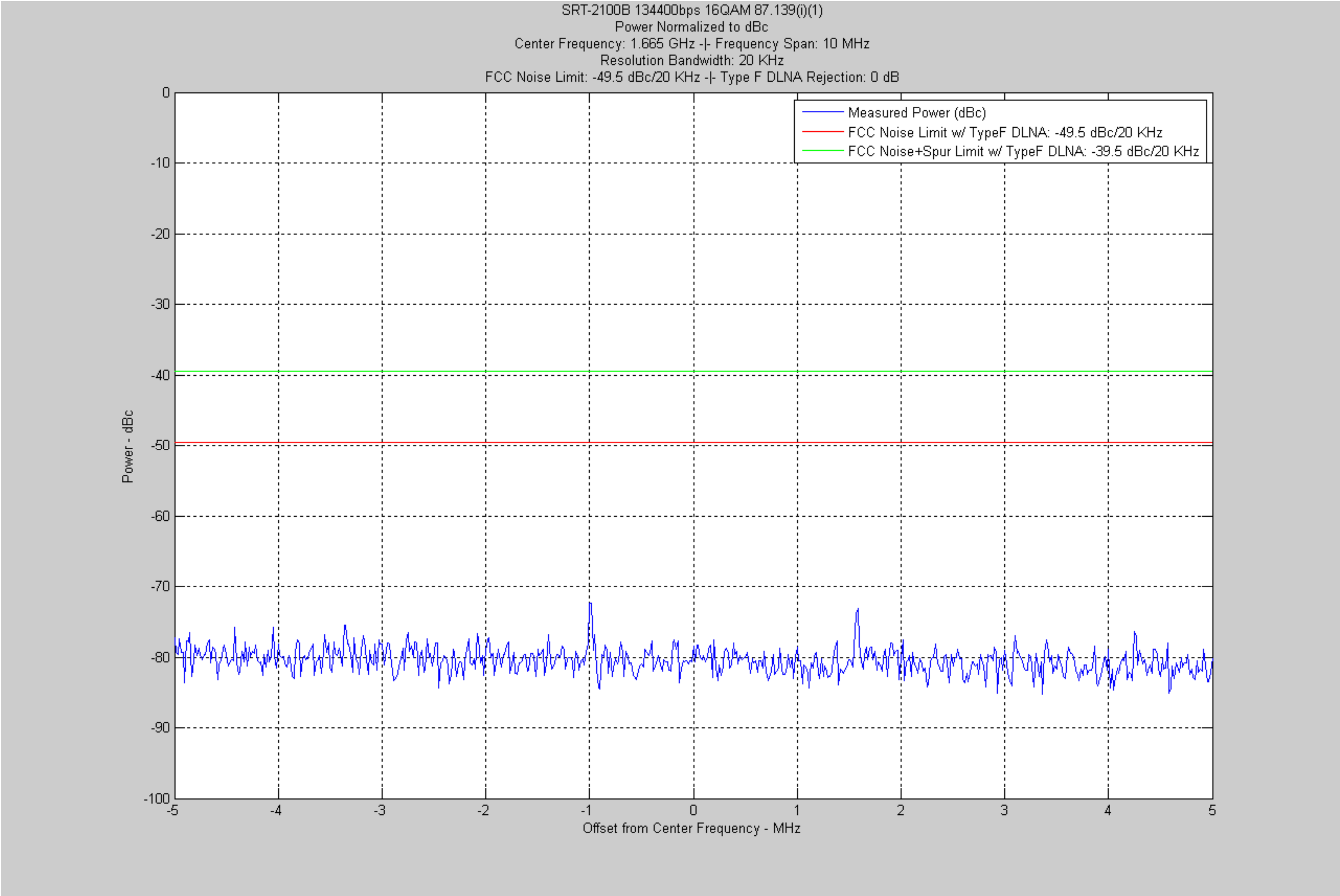


Figure 104 – 1670 to 1735 MHz

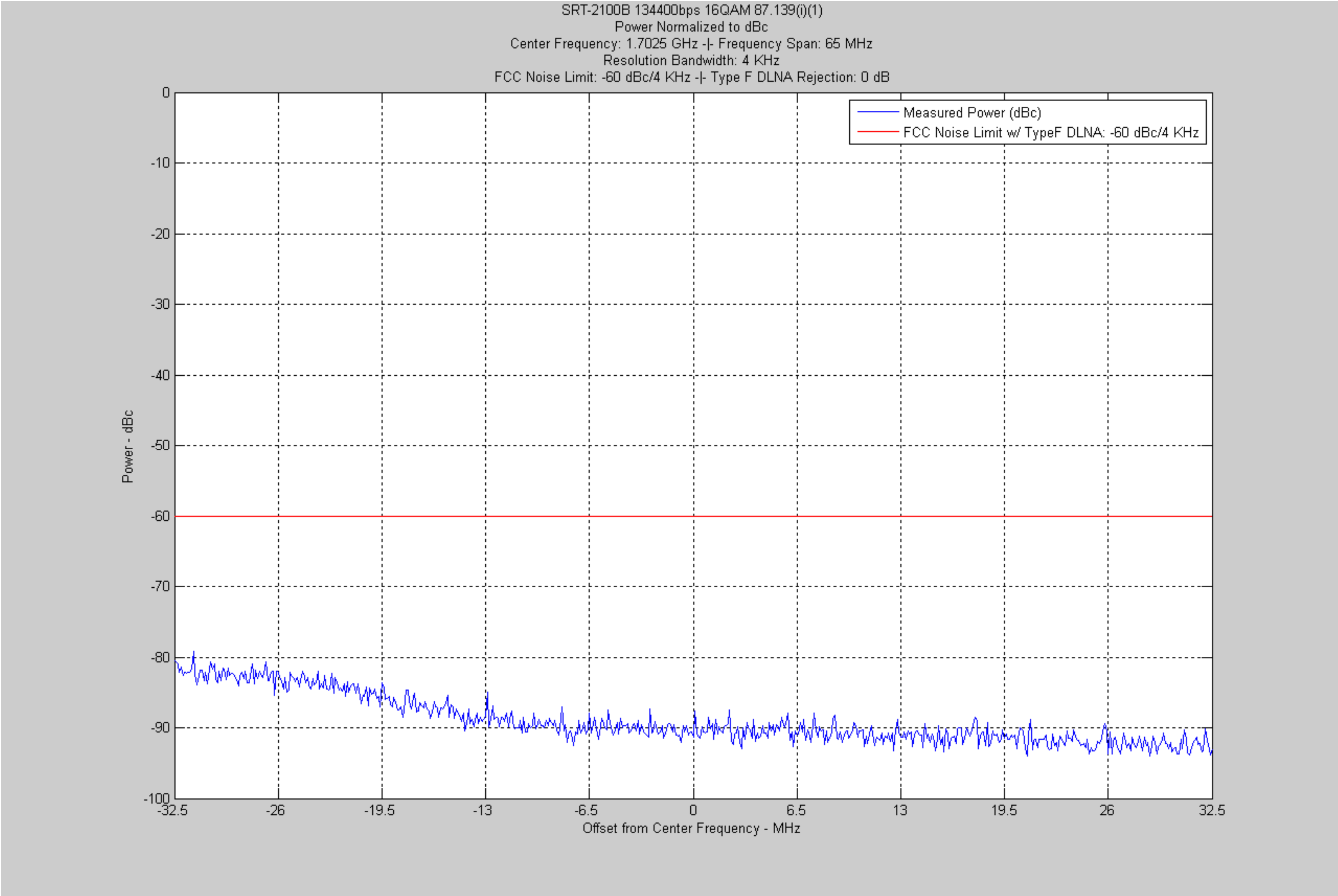


Figure 105 – 1735 to 12000 MHz

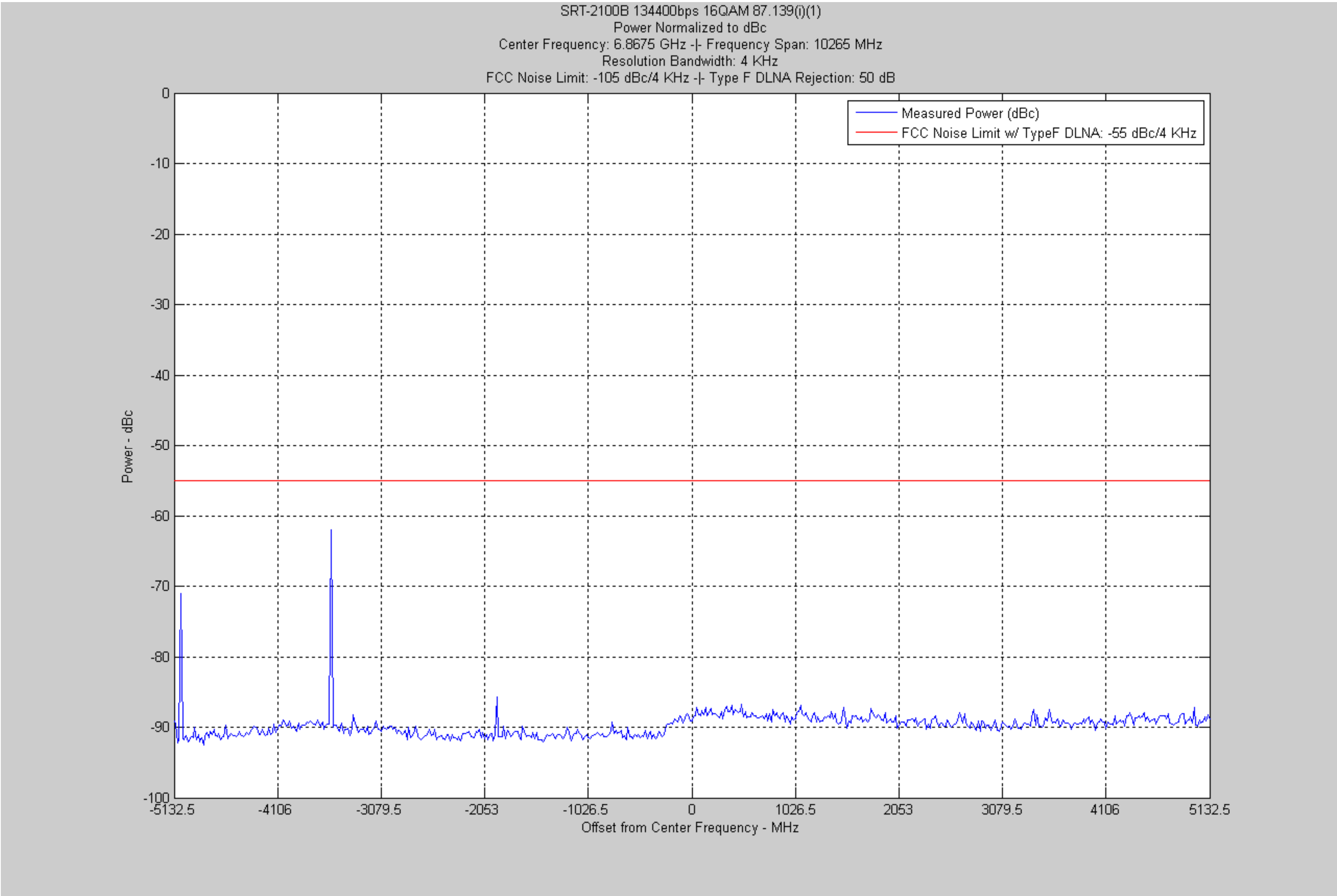


Figure 106 – 12000 to 18000 MHz

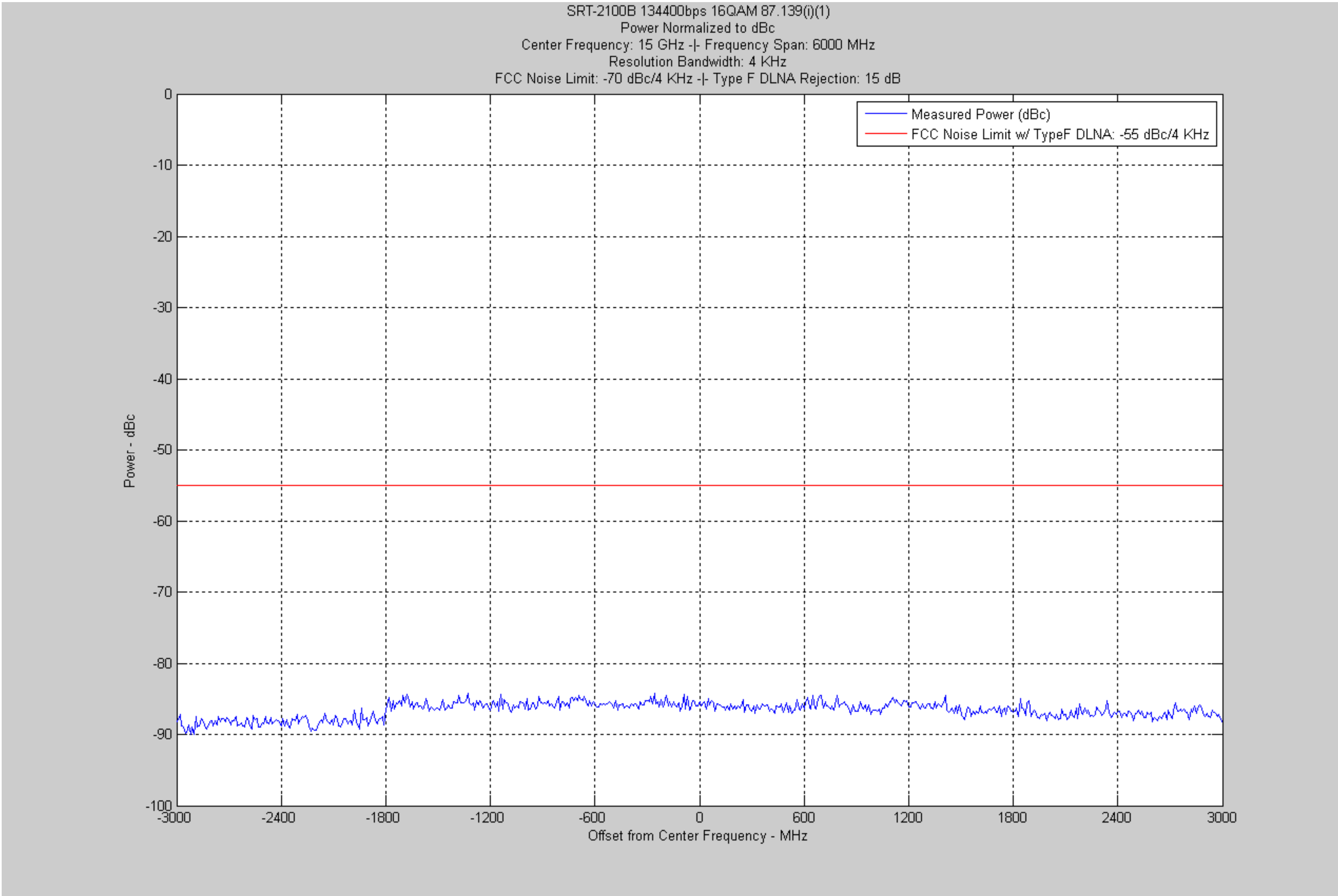


Figure 107 - 0.01 to 1525 MHz

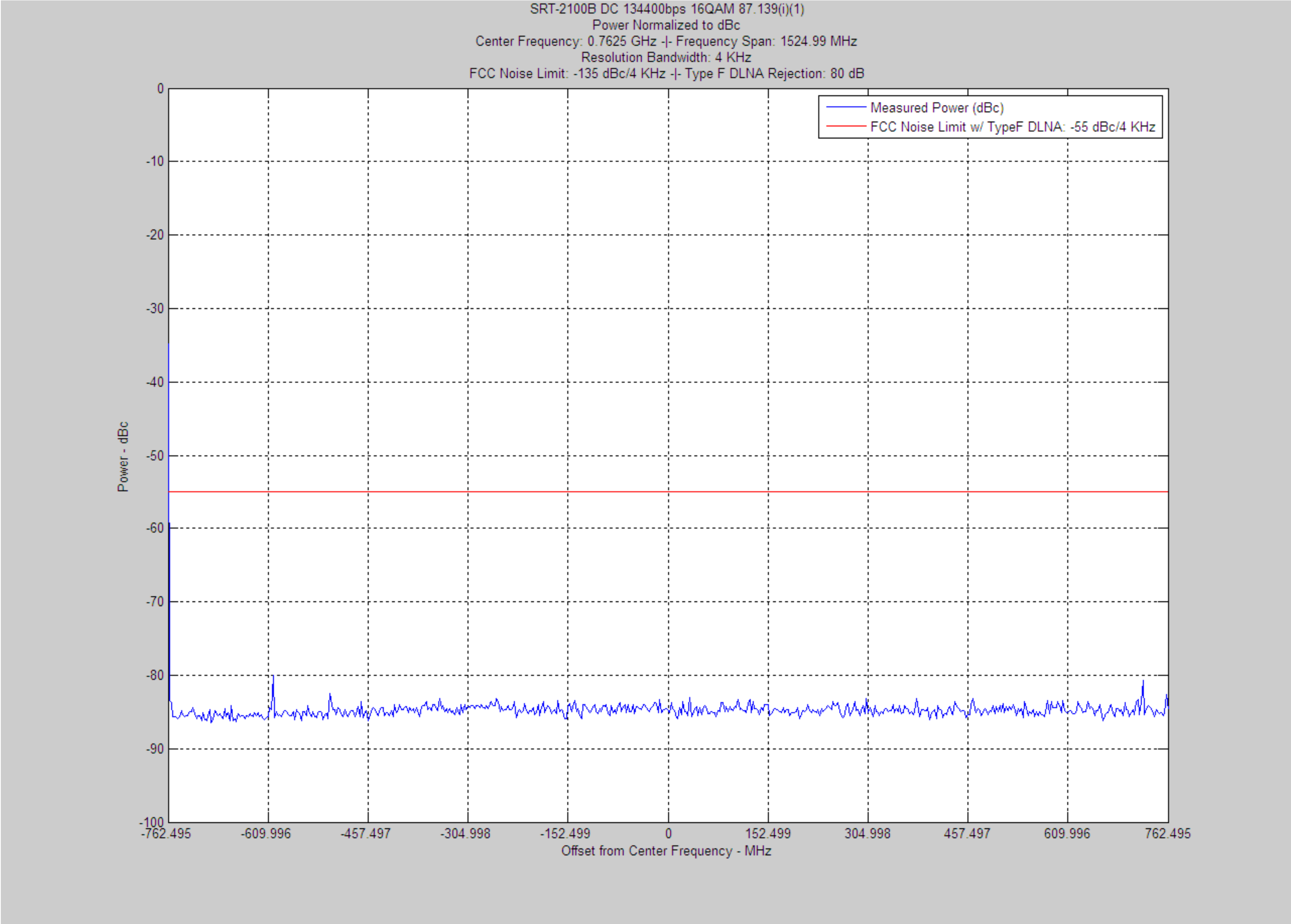


Figure 108 – 1525 to 1559 MHz

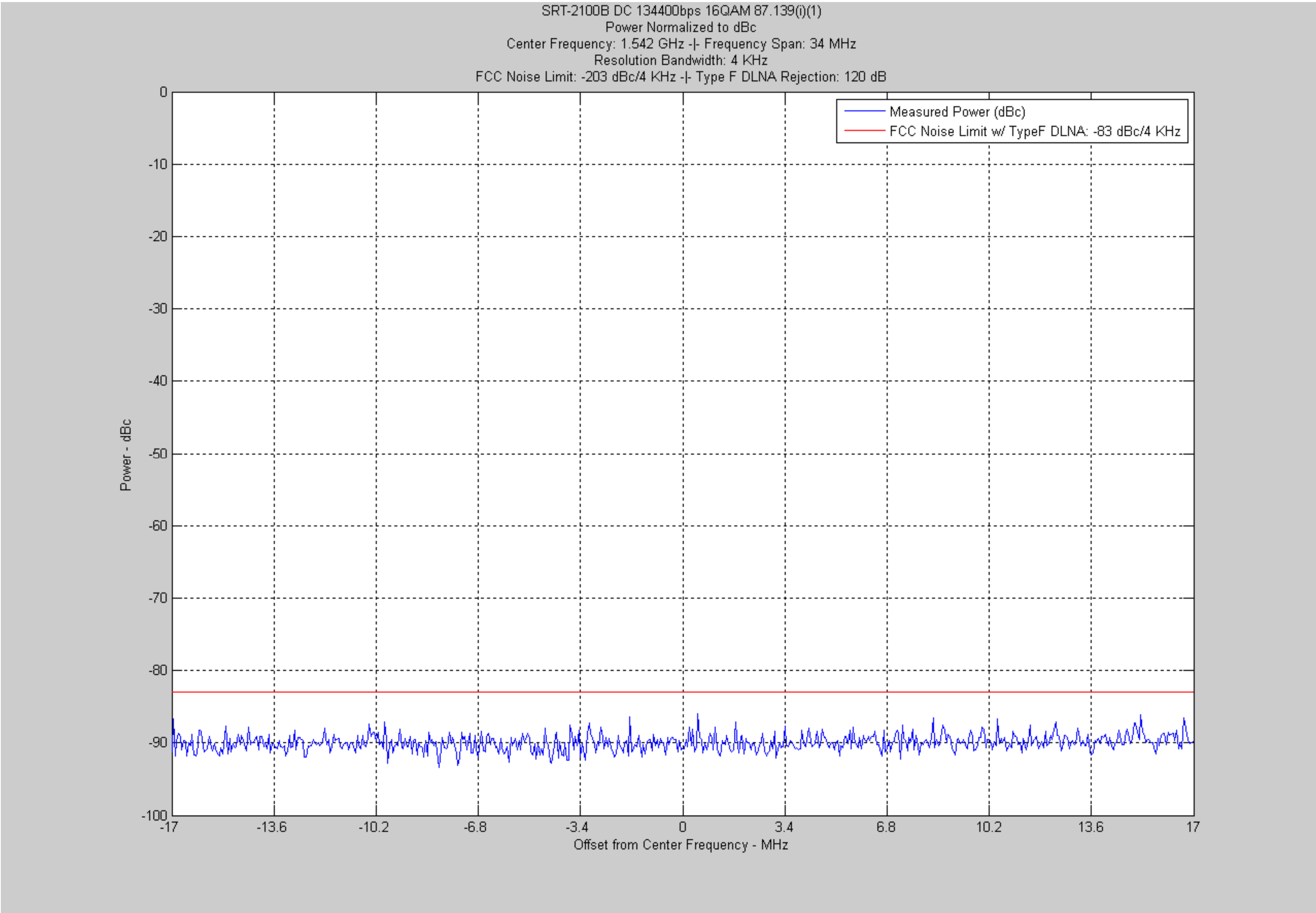


Figure 109 – 1559 to 1585 MHz

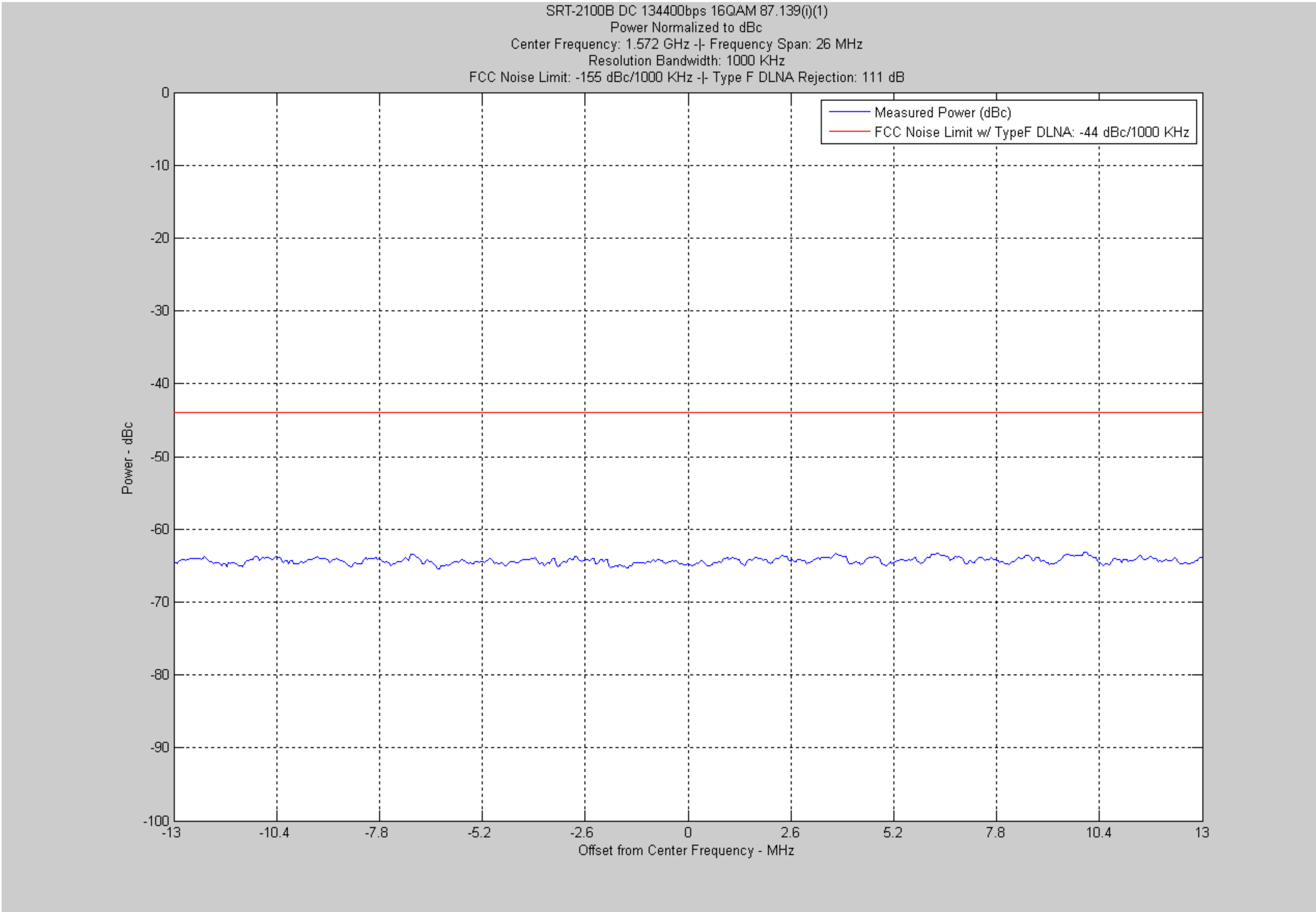


Figure 110 – 1585 to 1605 MHz

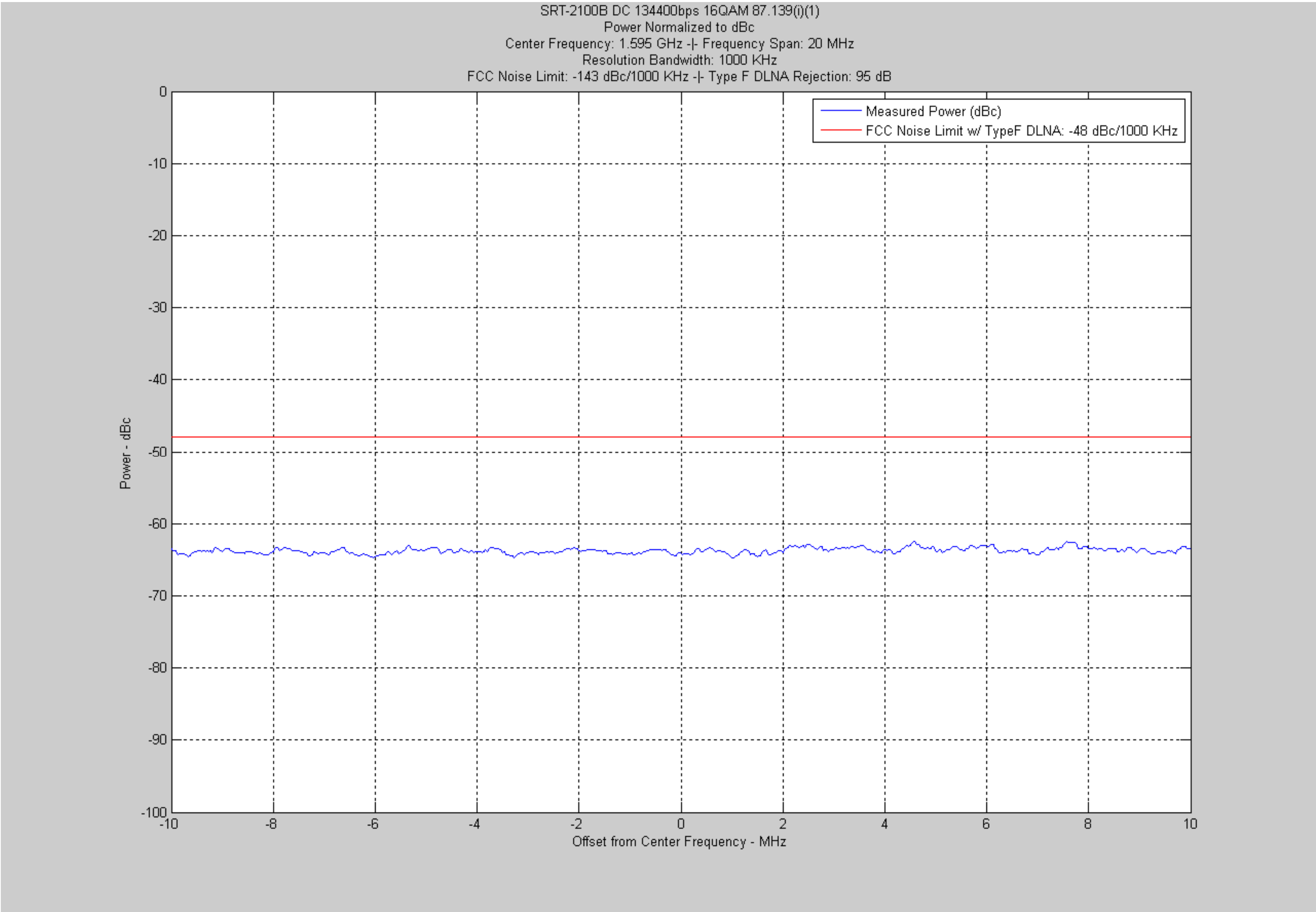


Figure 111 - 1605 to 1610 MHz

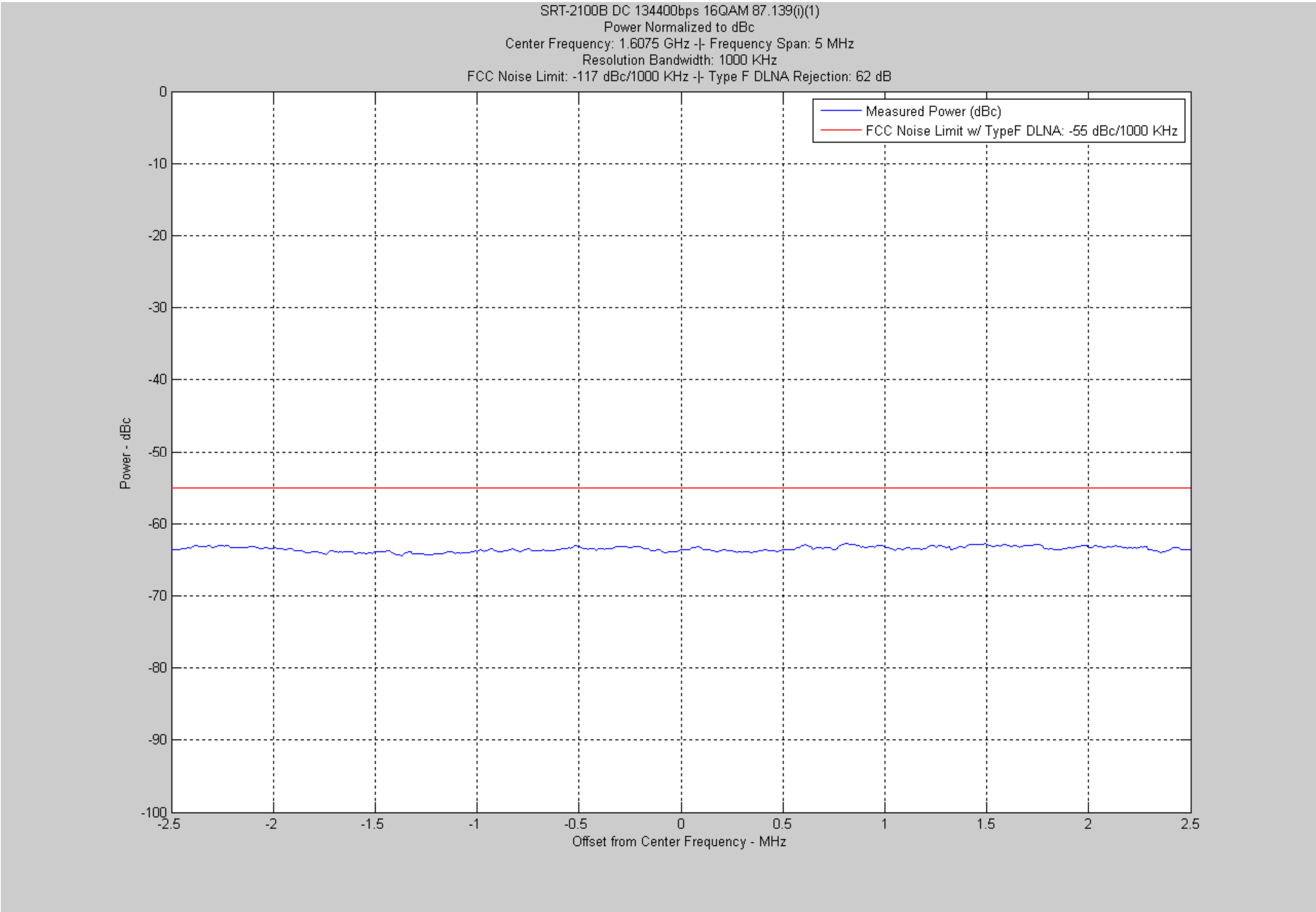


Figure 112 – 1610 to 1610.6 MHz

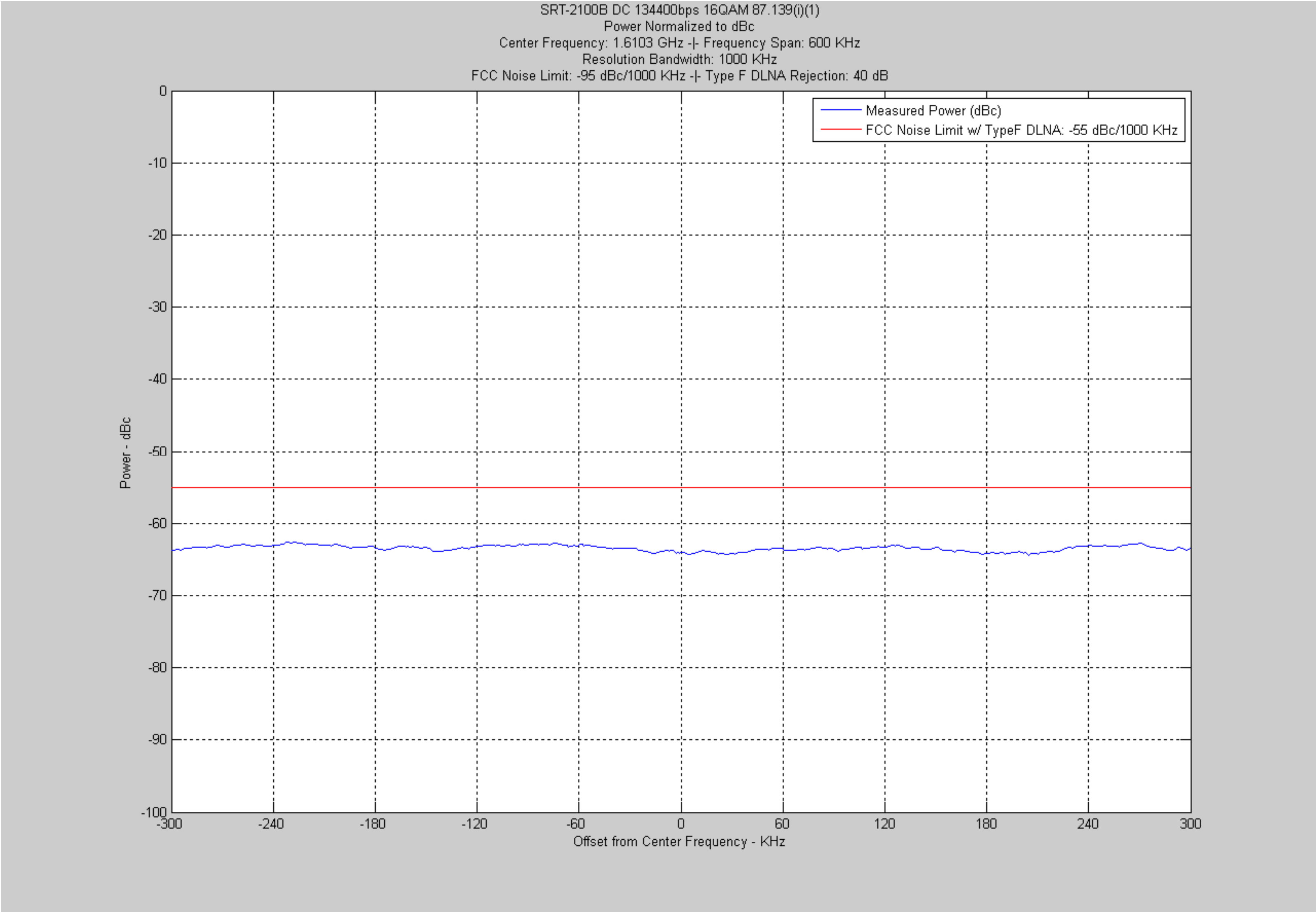


Figure 113 – 1610.6 to 1613.8 MHz

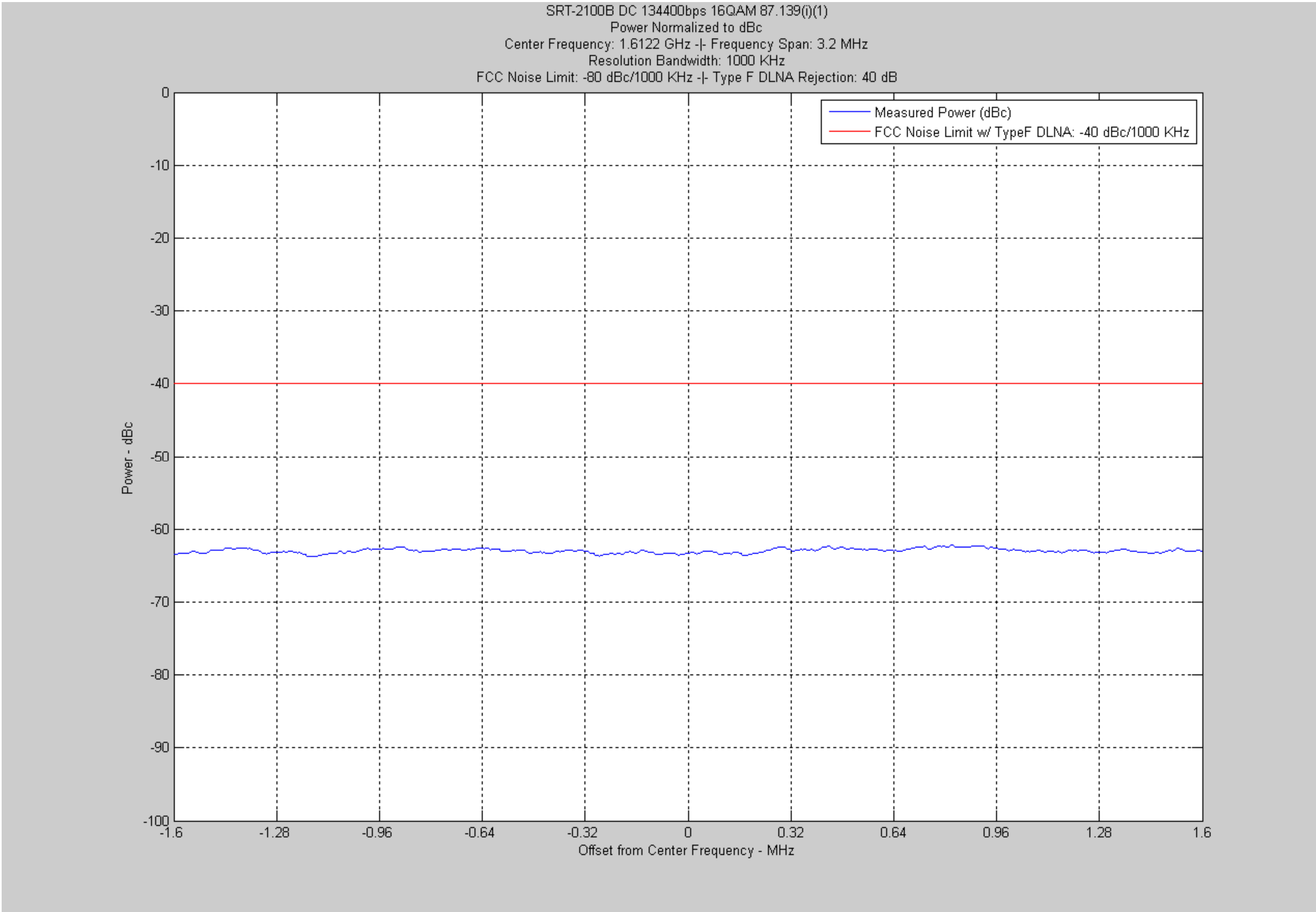


Figure 114 – 1613.8 to 1614 MHz

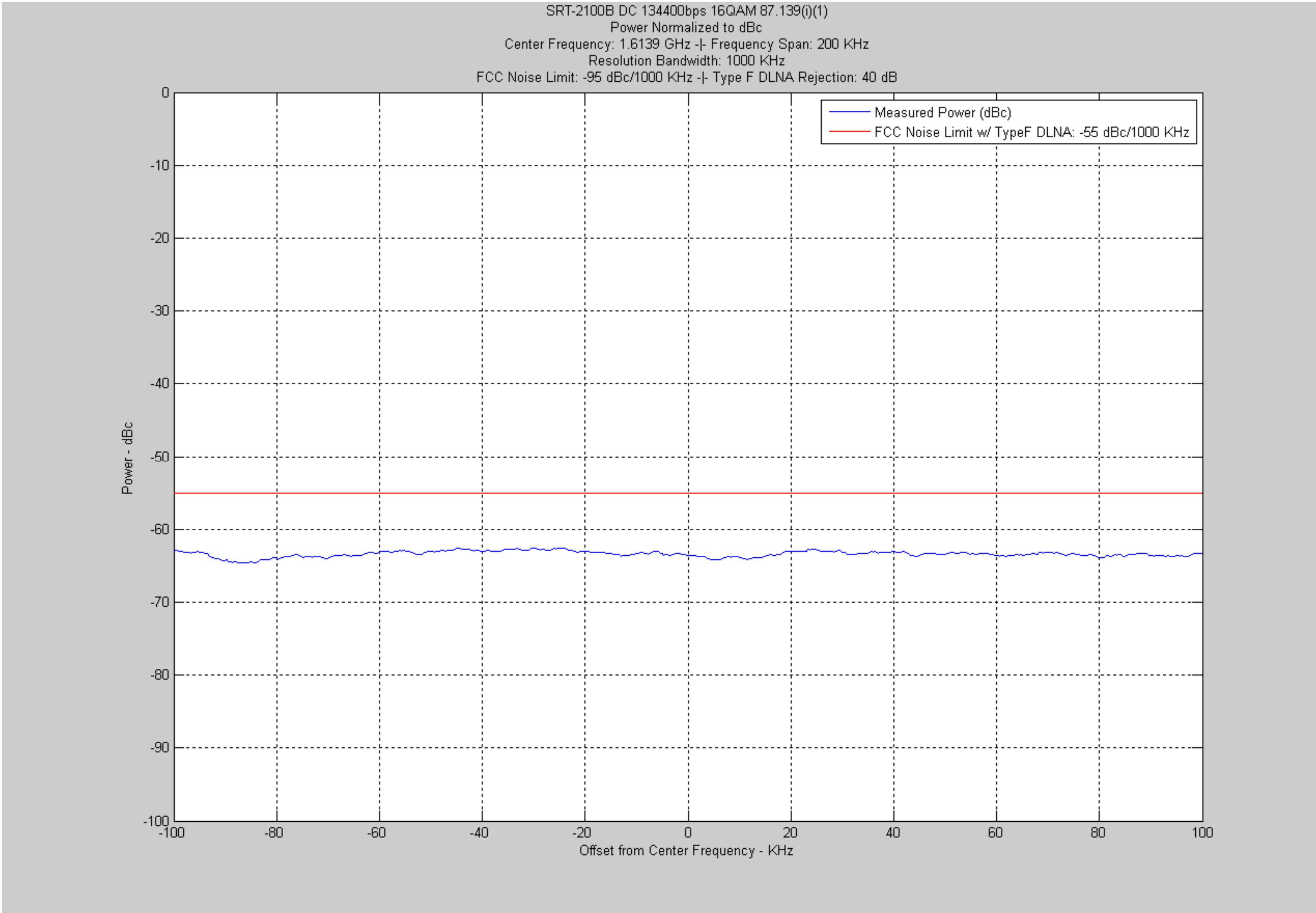


Figure 115 – 1614 to 1626.5 MHz

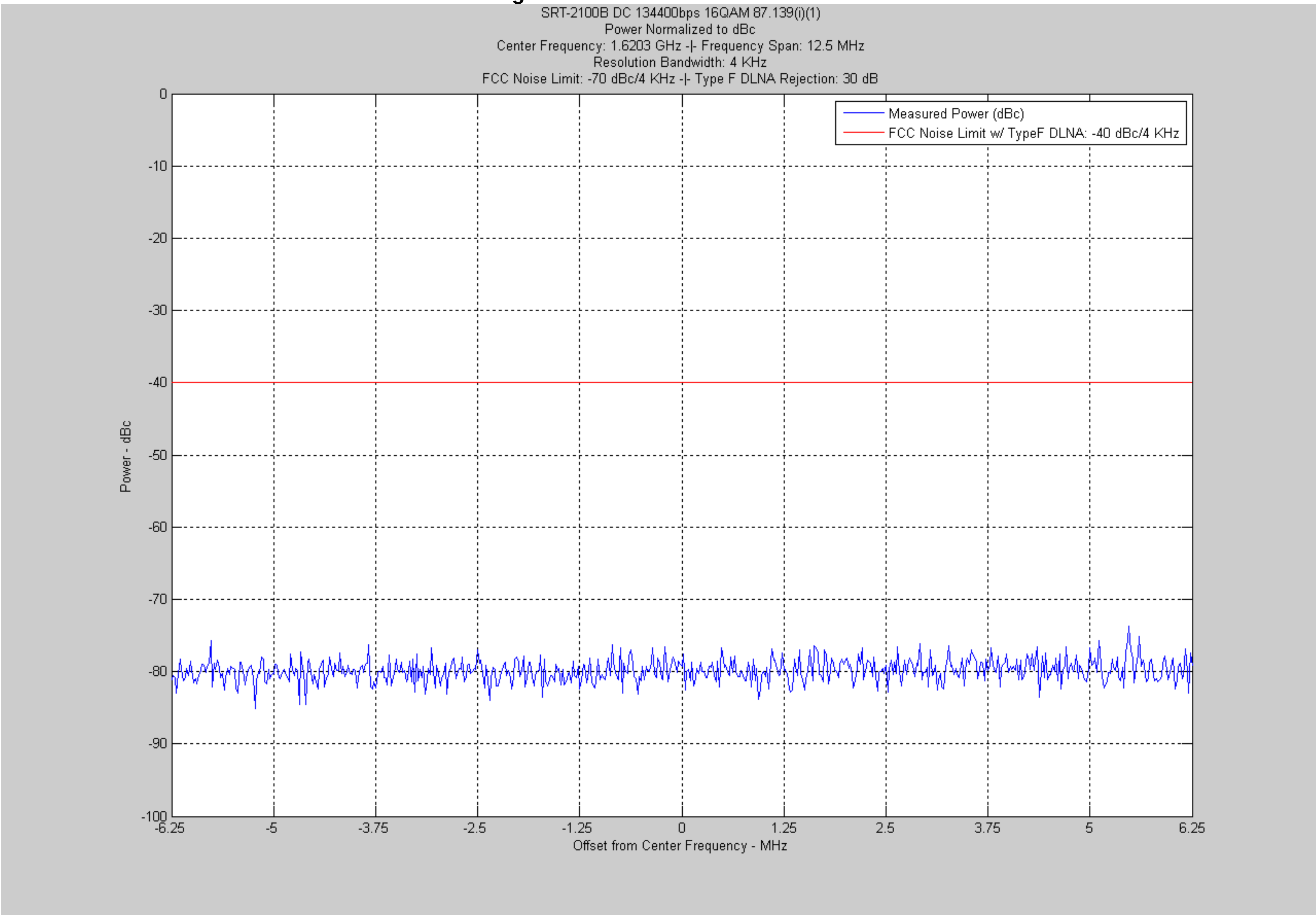


Figure 116 – 1626.5 to 1660 MHz

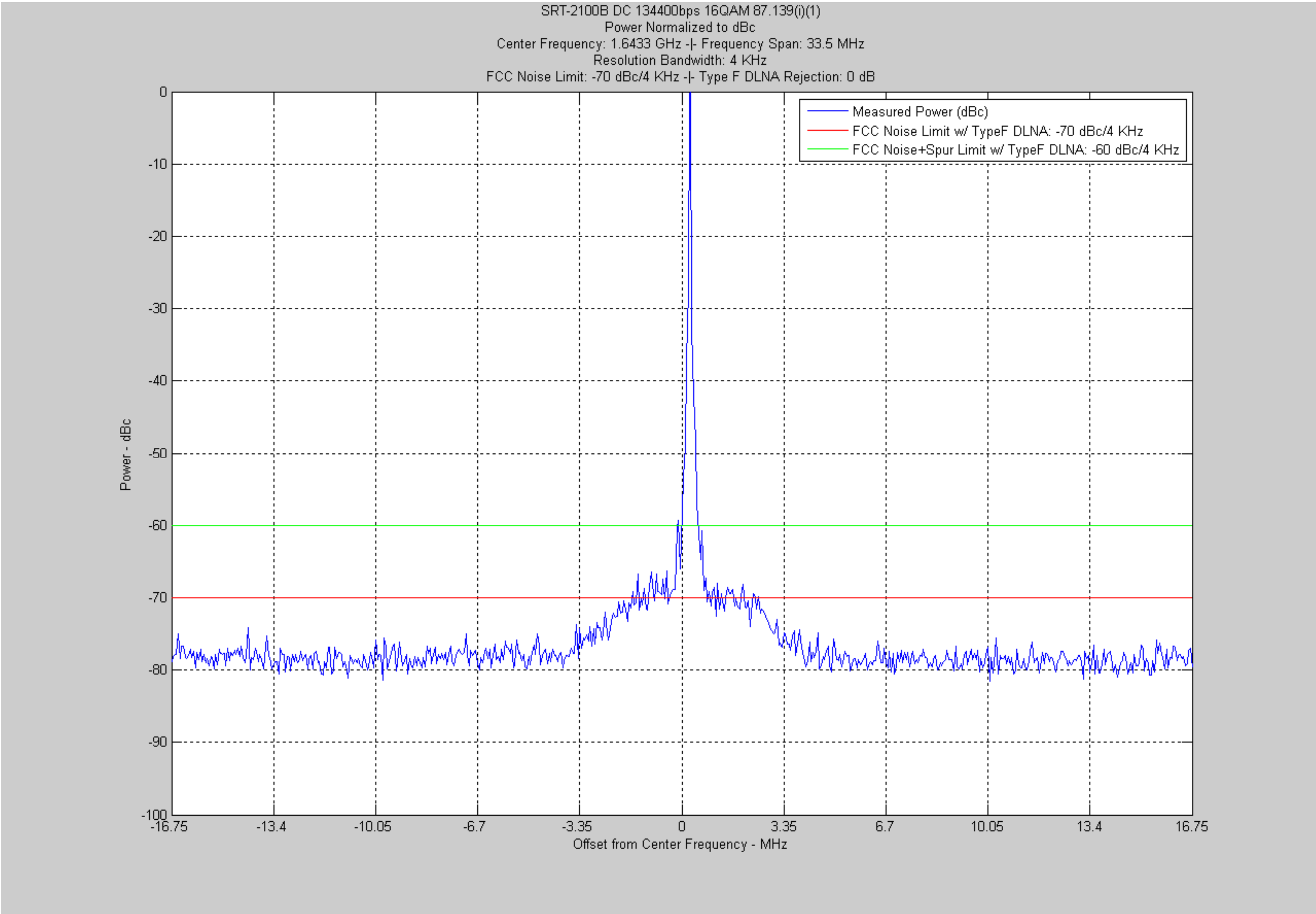


Figure 117 – 1660 to 1670 MHz

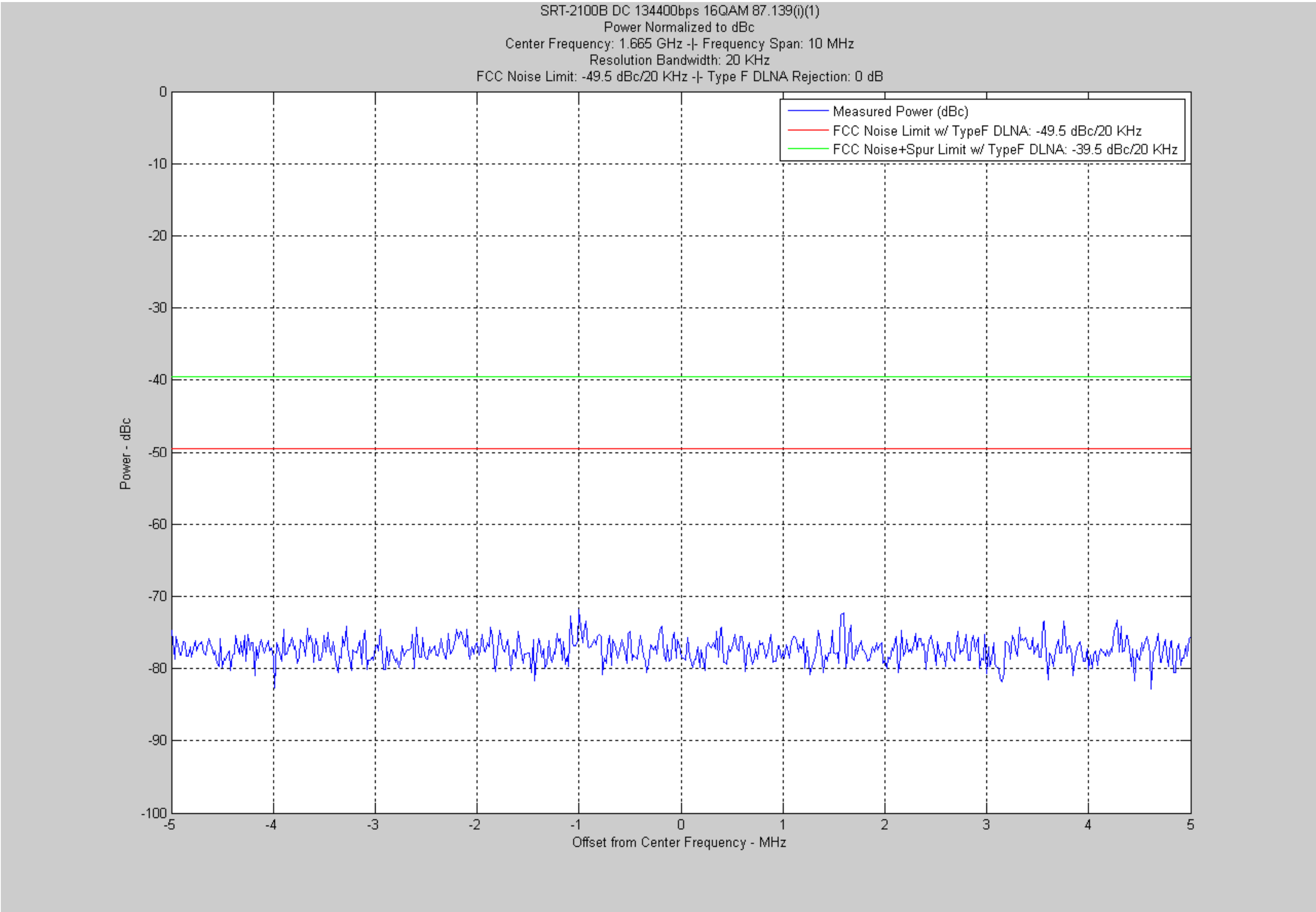


Figure 118 – 1670 to 1735 MHz

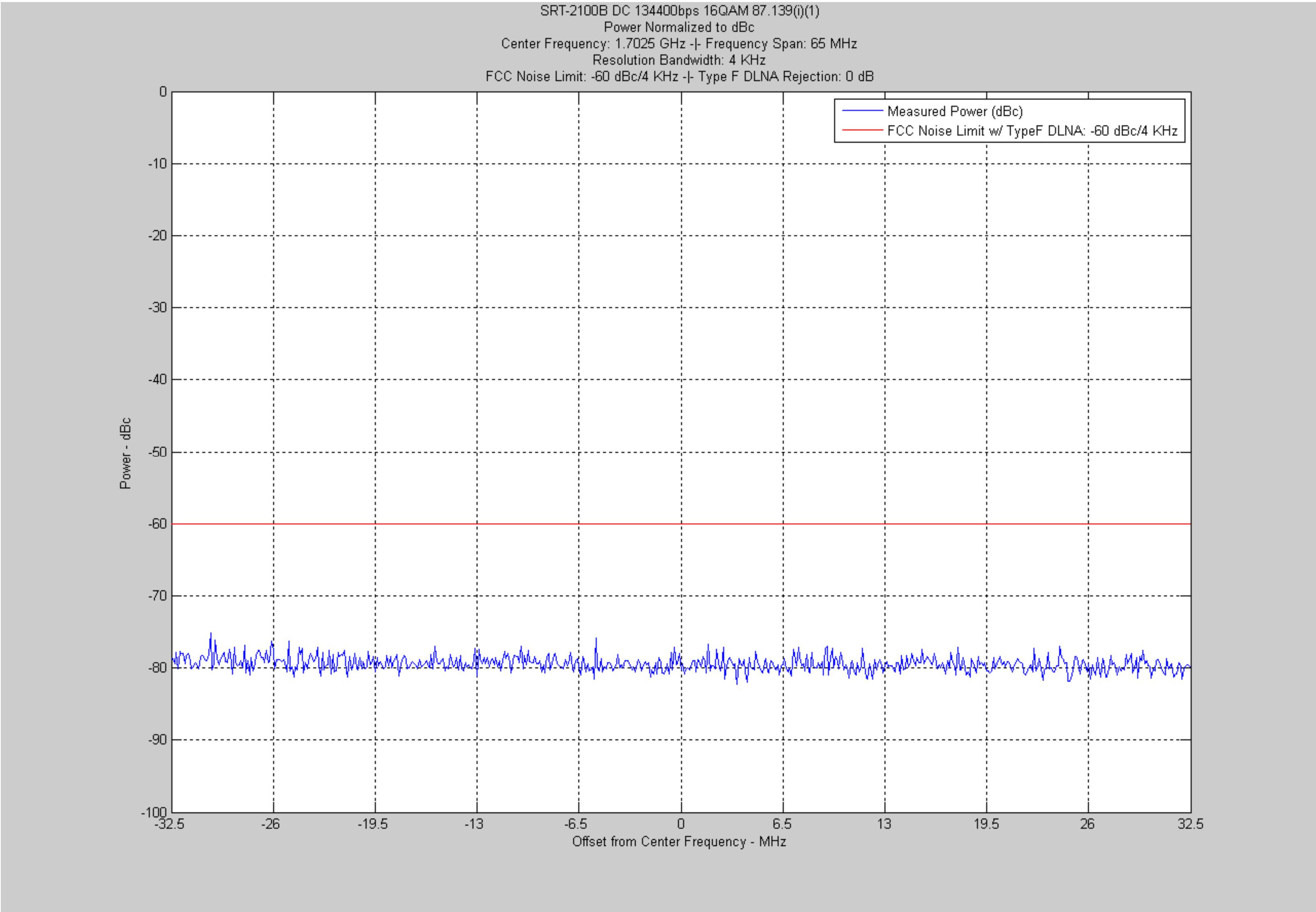


Figure 119 – 1735 to 12000 MHz

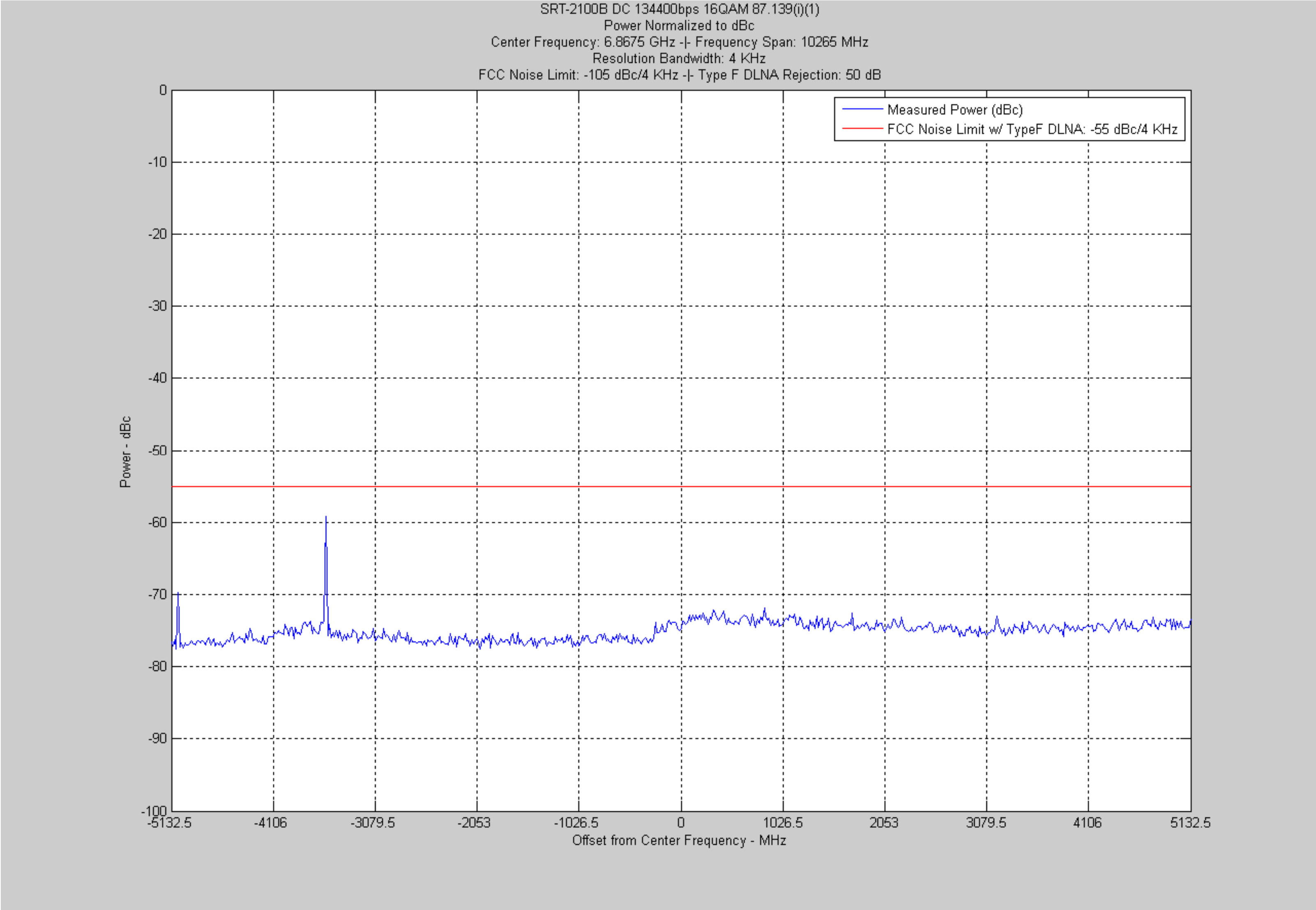


Figure 120 – 12000 to 18000 MHz

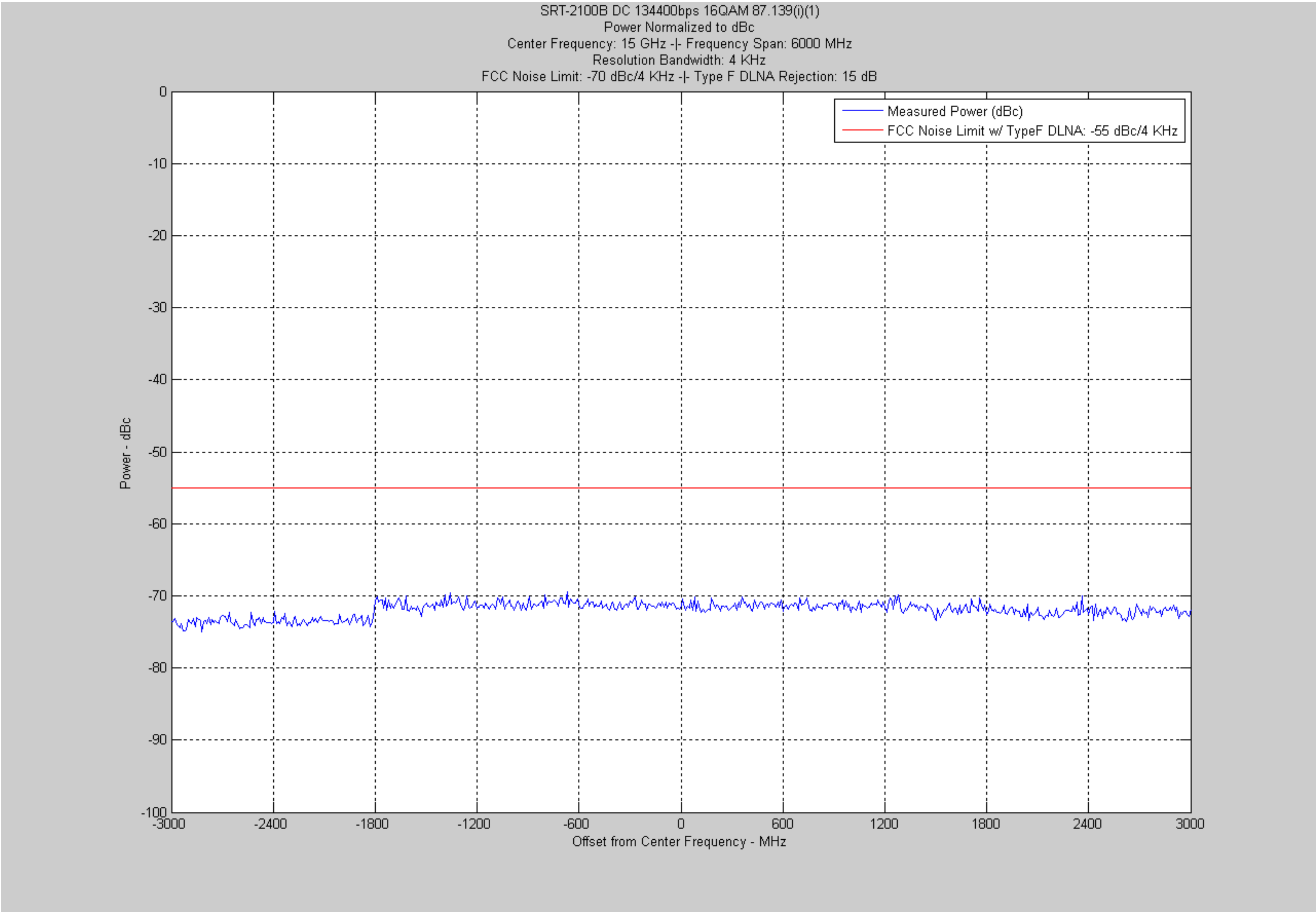


Figure 121 - 0.01 to 1525 MHz

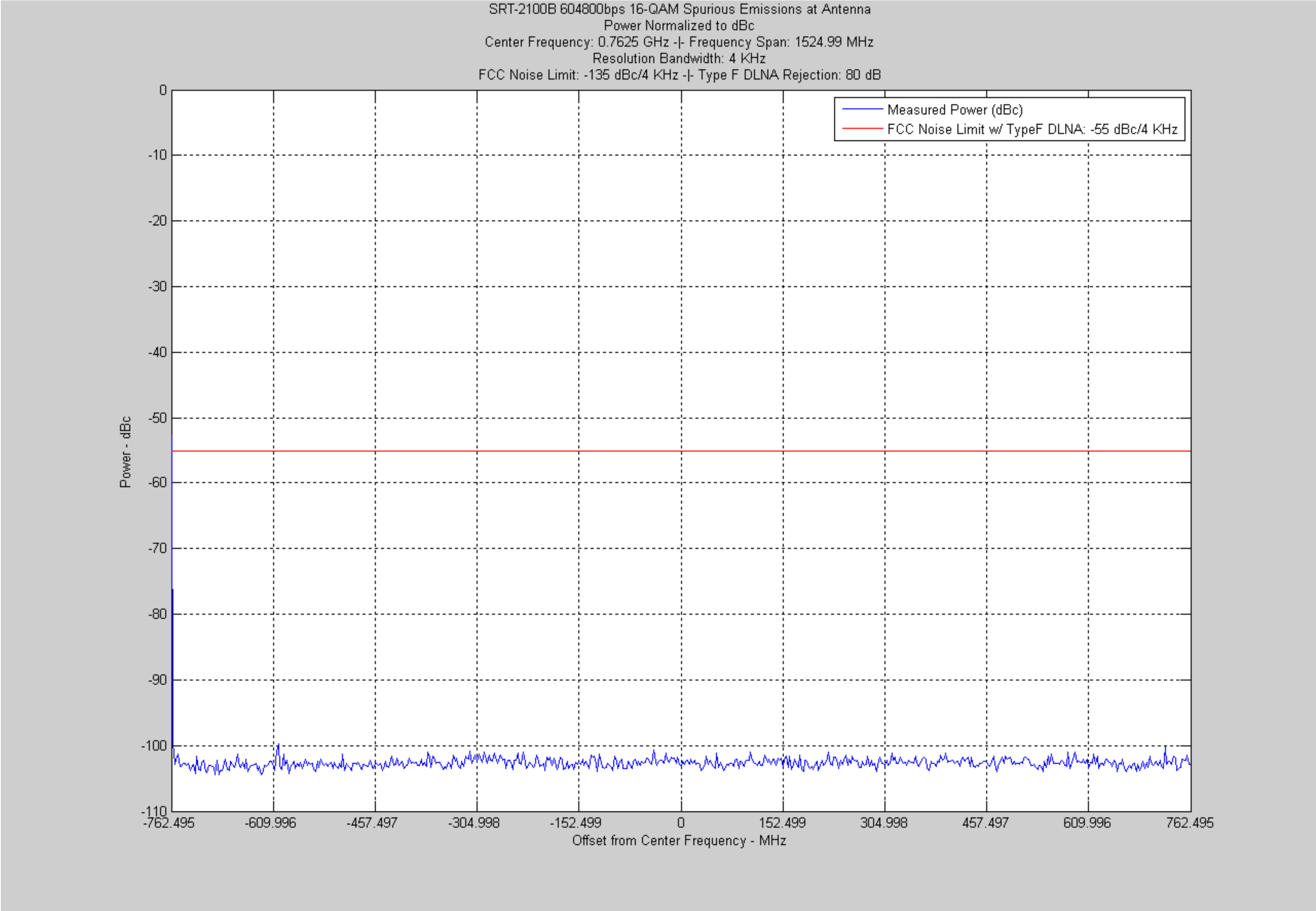


Figure 122 – 1525 to 1559 MHz

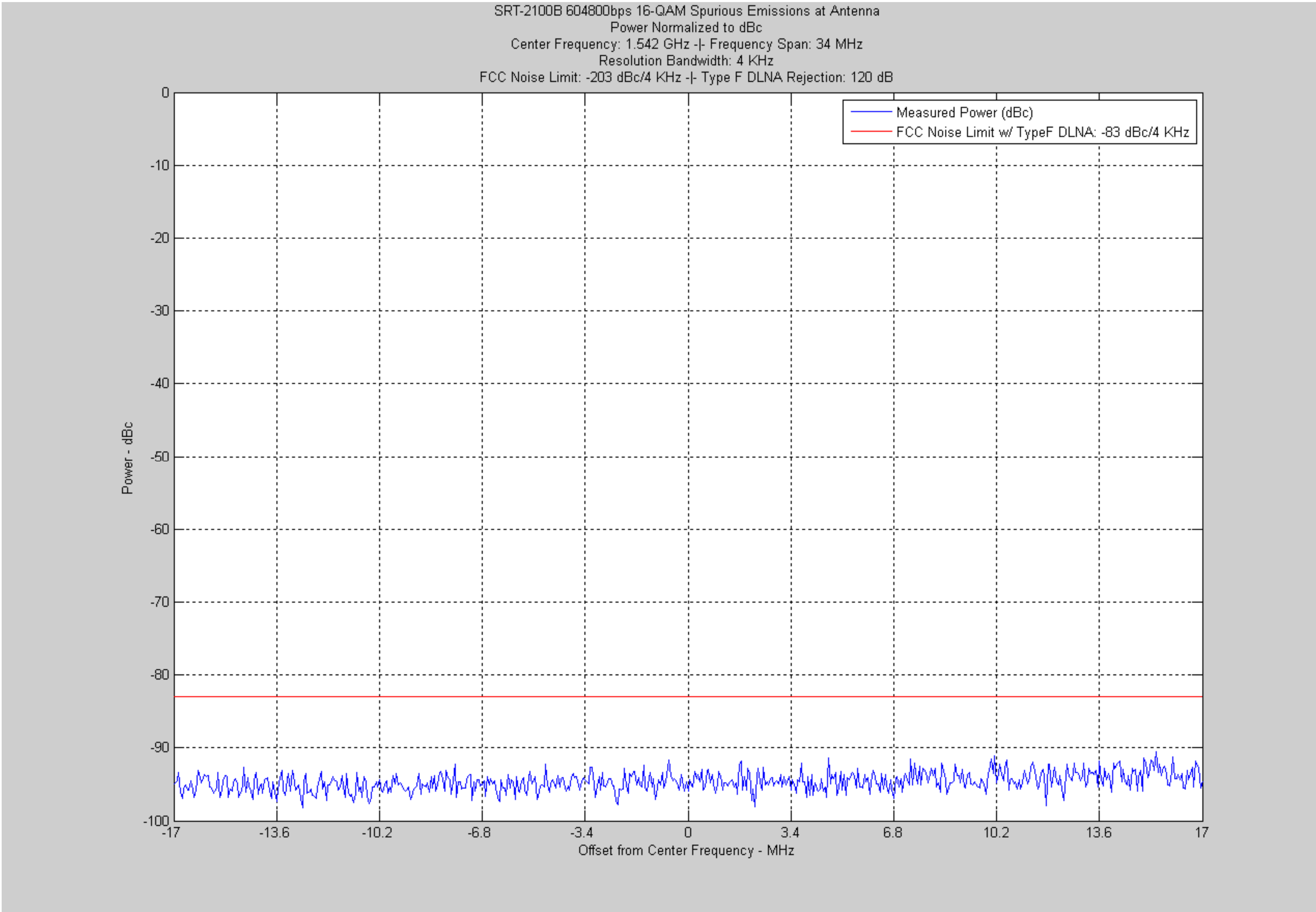


Figure 123 – 1559 to 1585 MHz

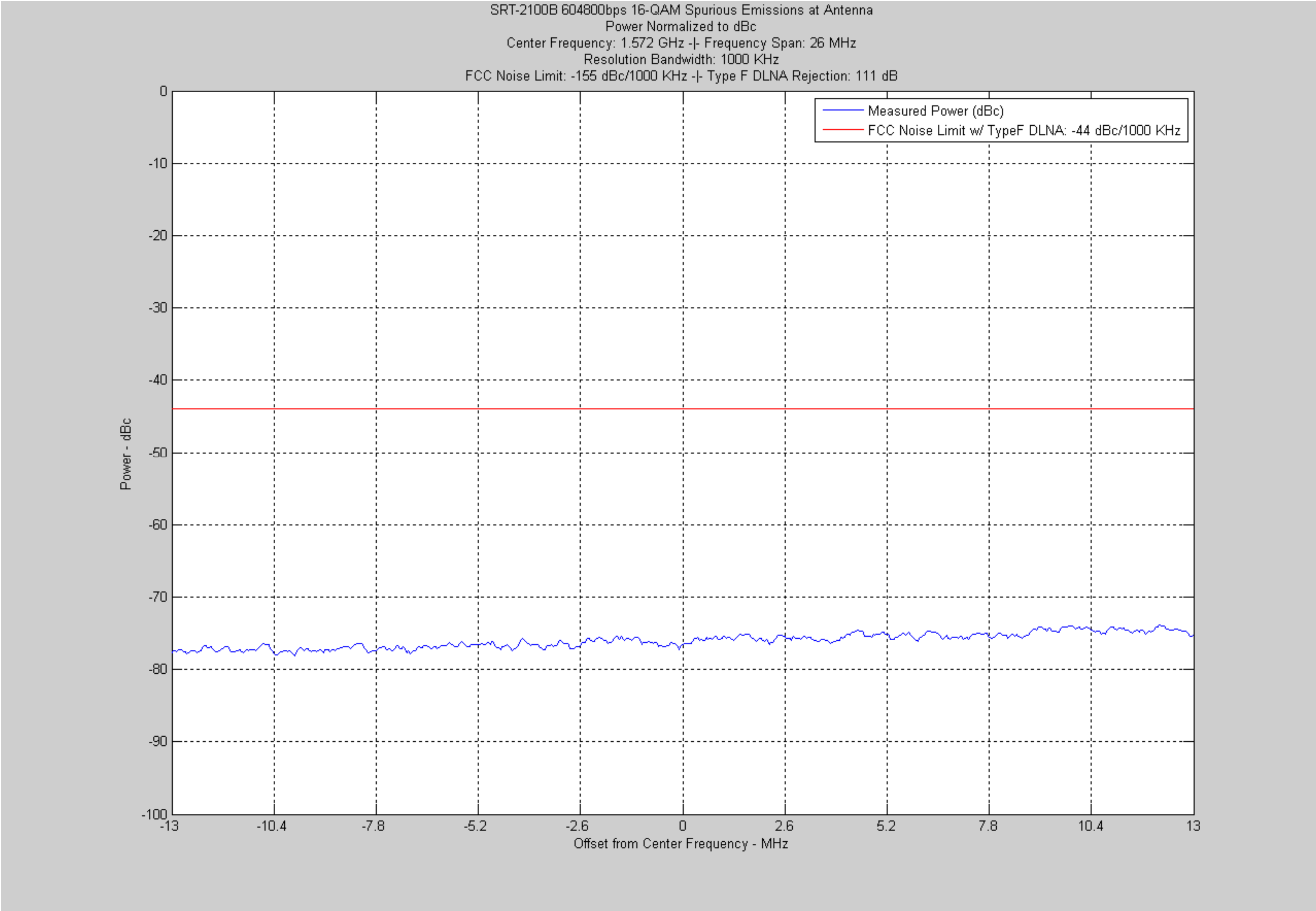


Figure 124 – 1585 to 1605 MHz

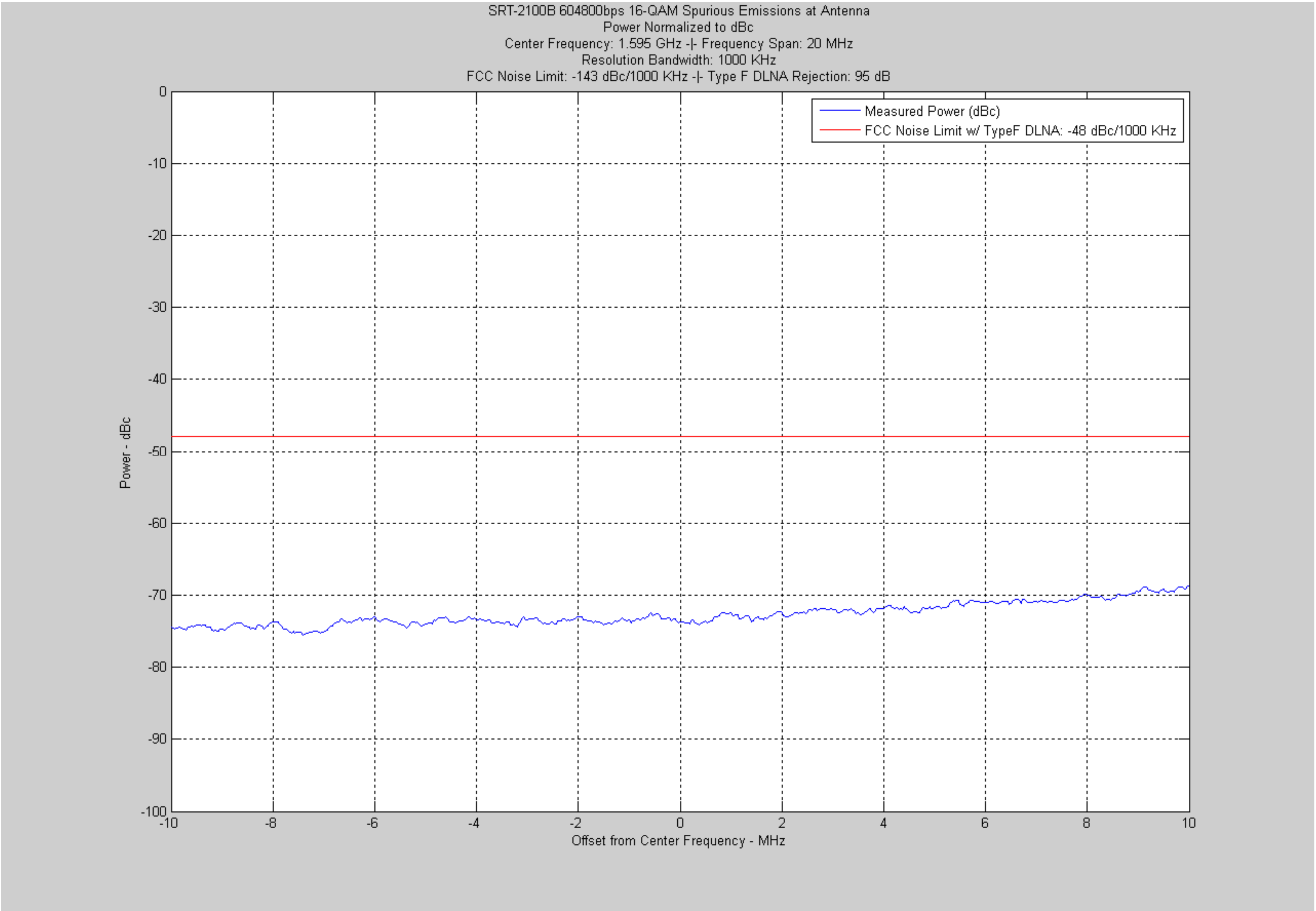


Figure 125 - 1605 to 1610 MHz

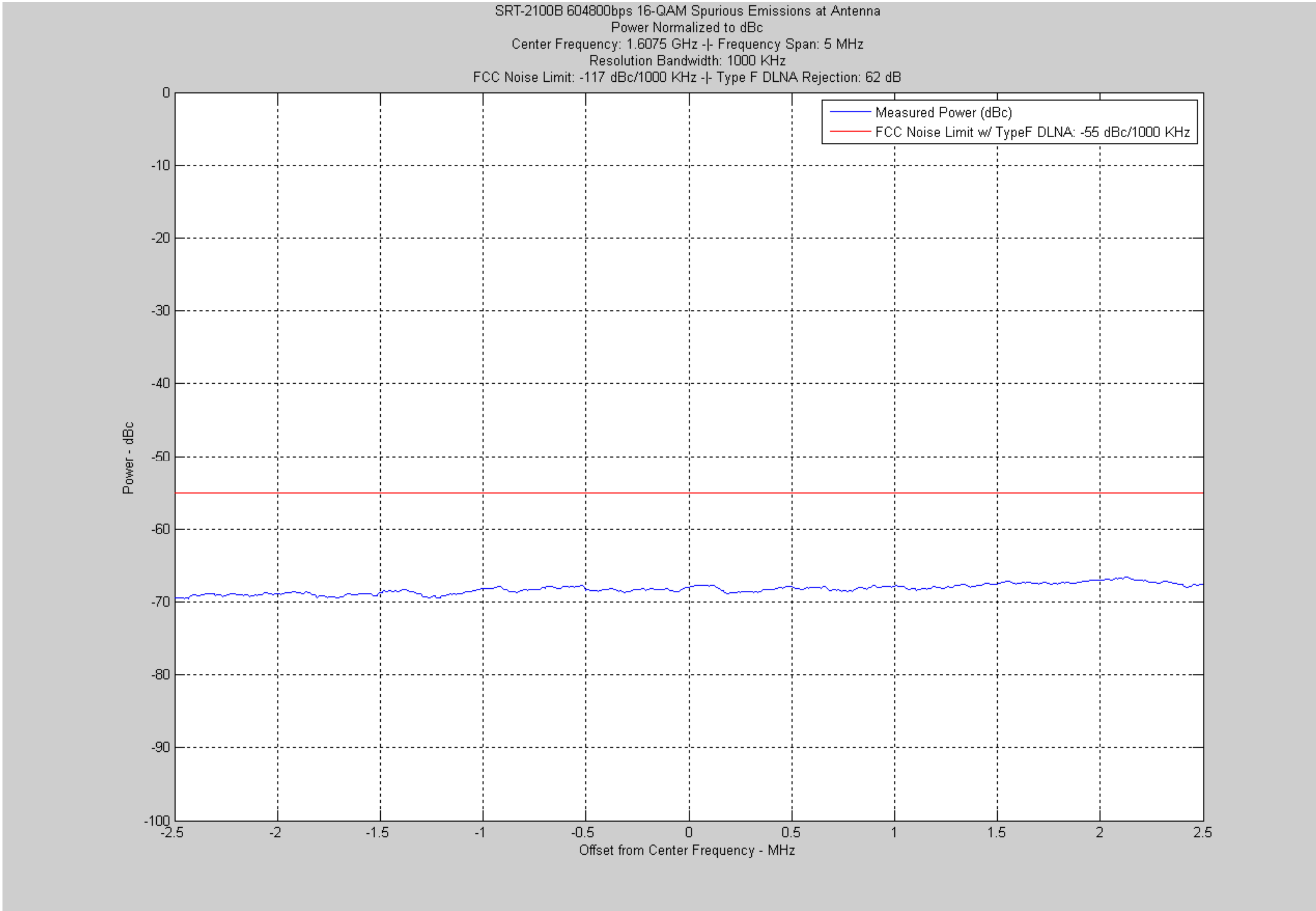


Figure 126 – 1610 to 1610.6 MHz

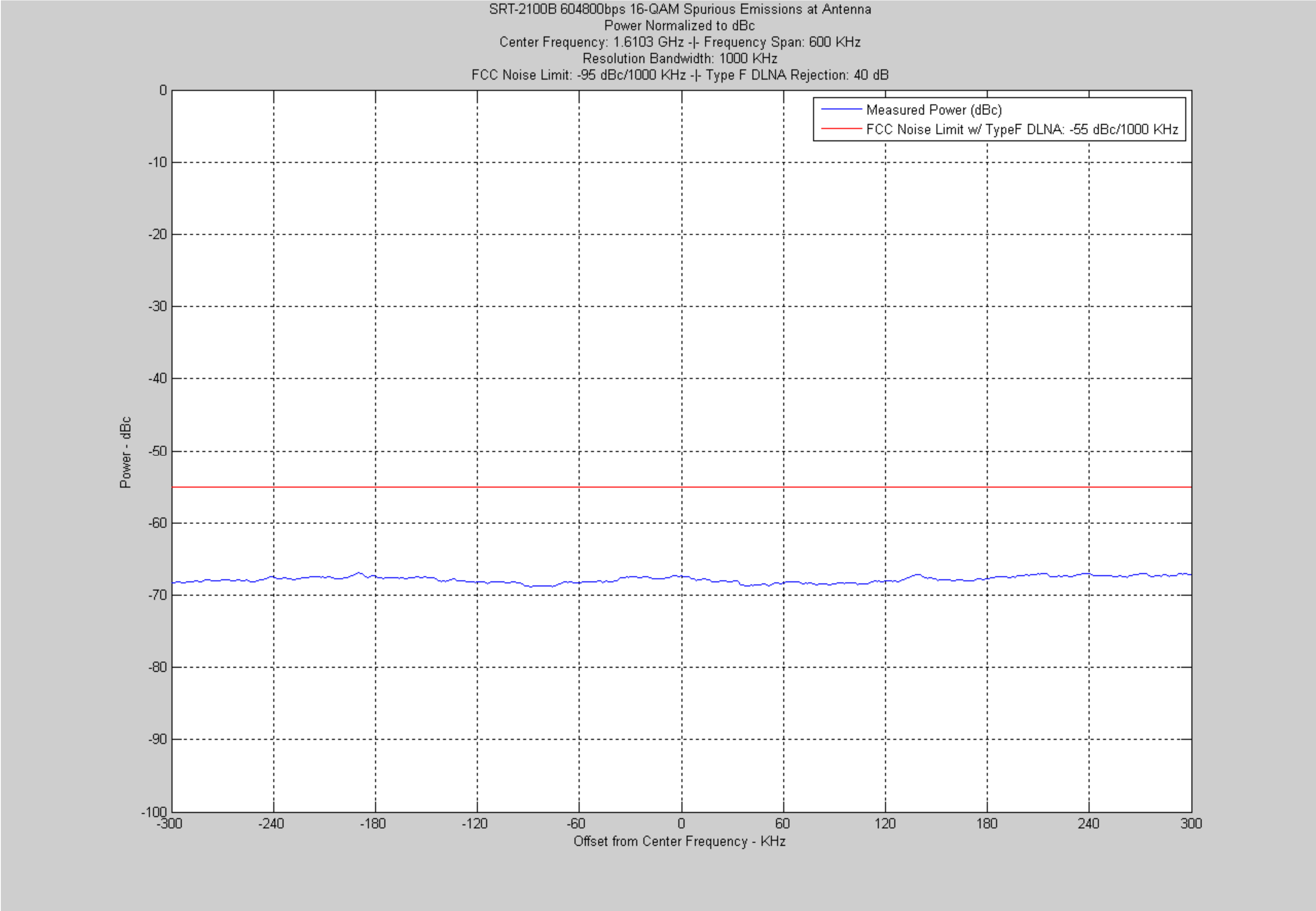


Figure 127 – 1610.6 to 1613.8 MHz

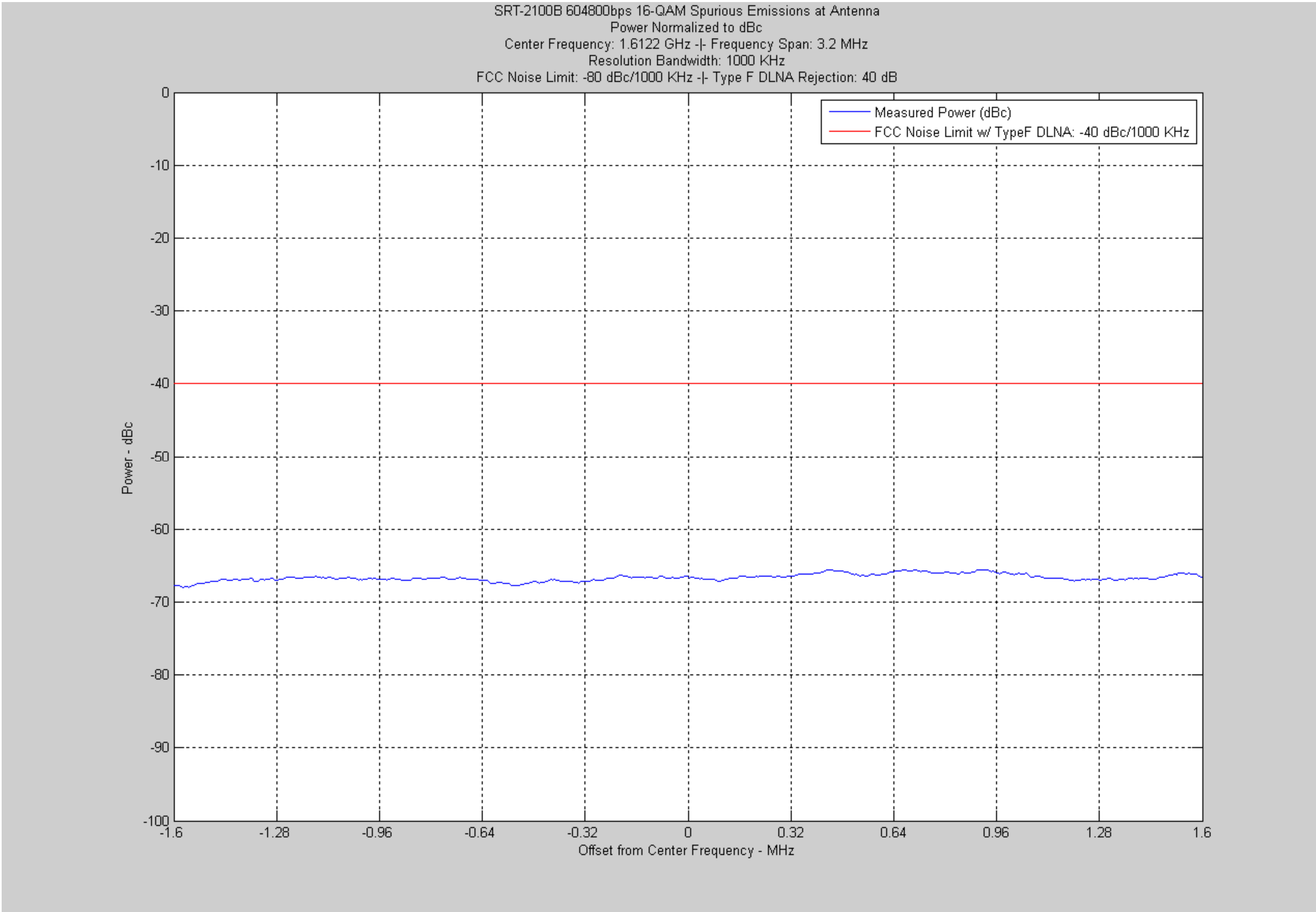


Figure 128 – 1613.8 to 1614 MHz

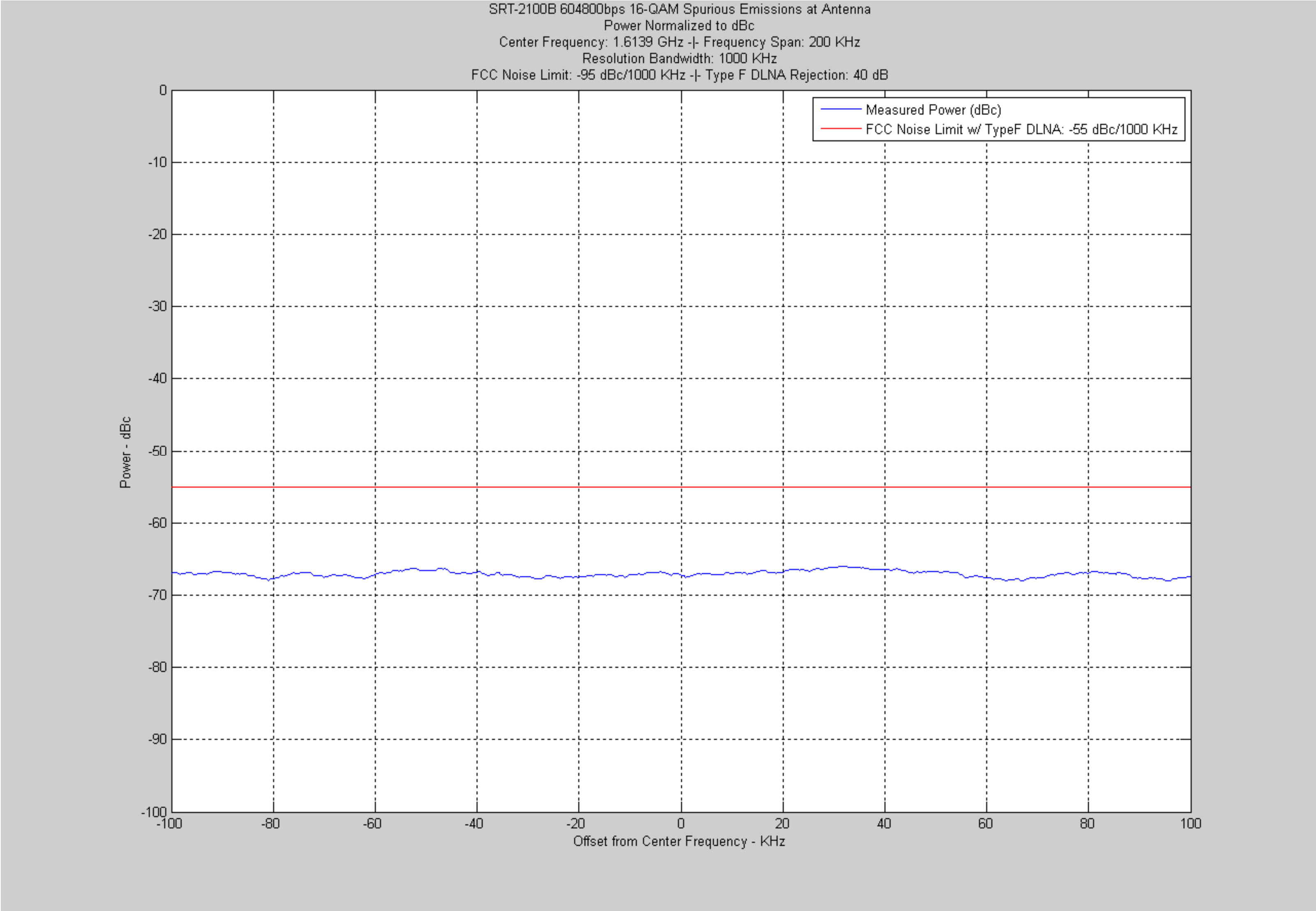


Figure 129 – 1614 to 1626.5 MHz

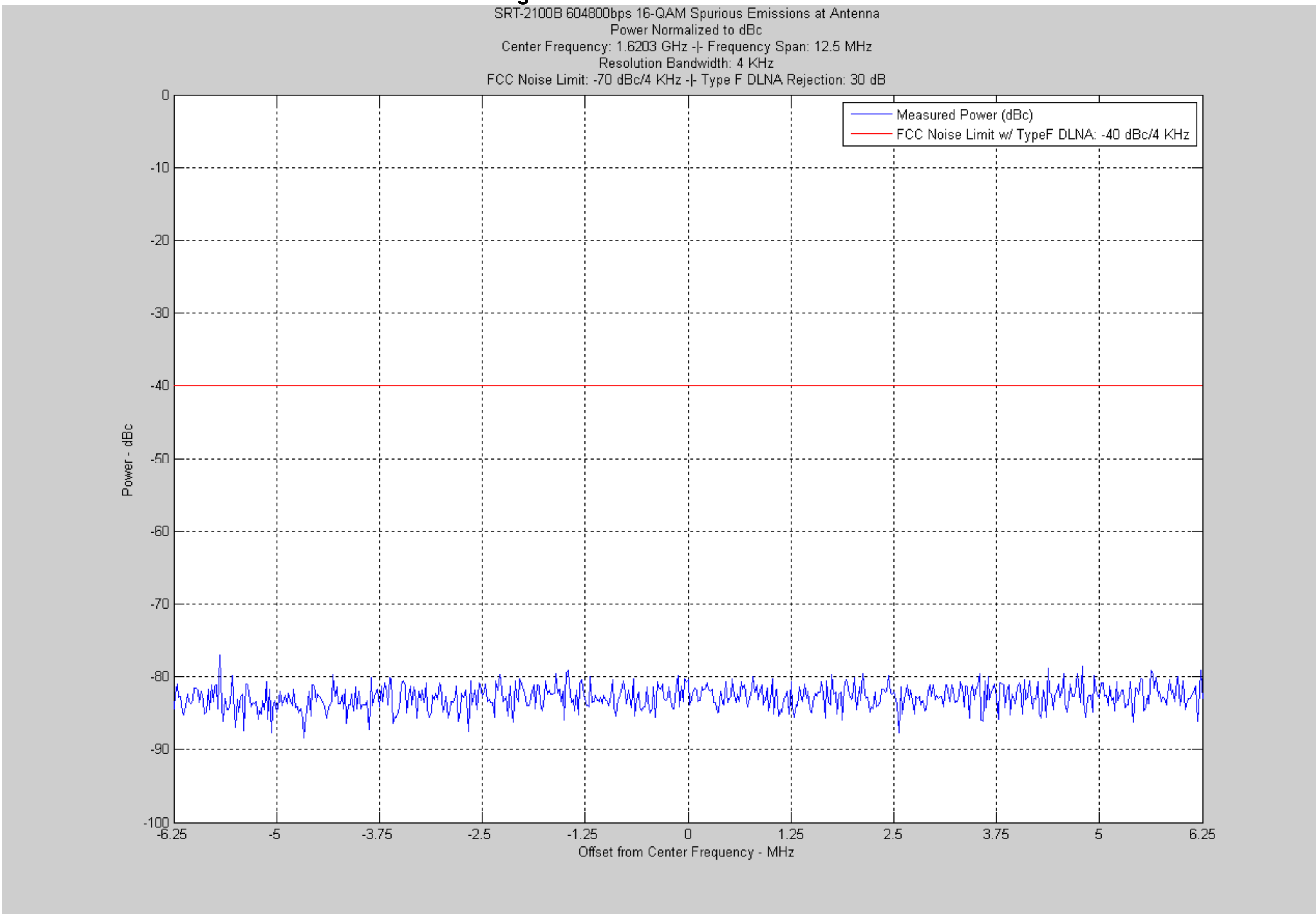


Figure 130 – 1626.5 to 1660 MHz

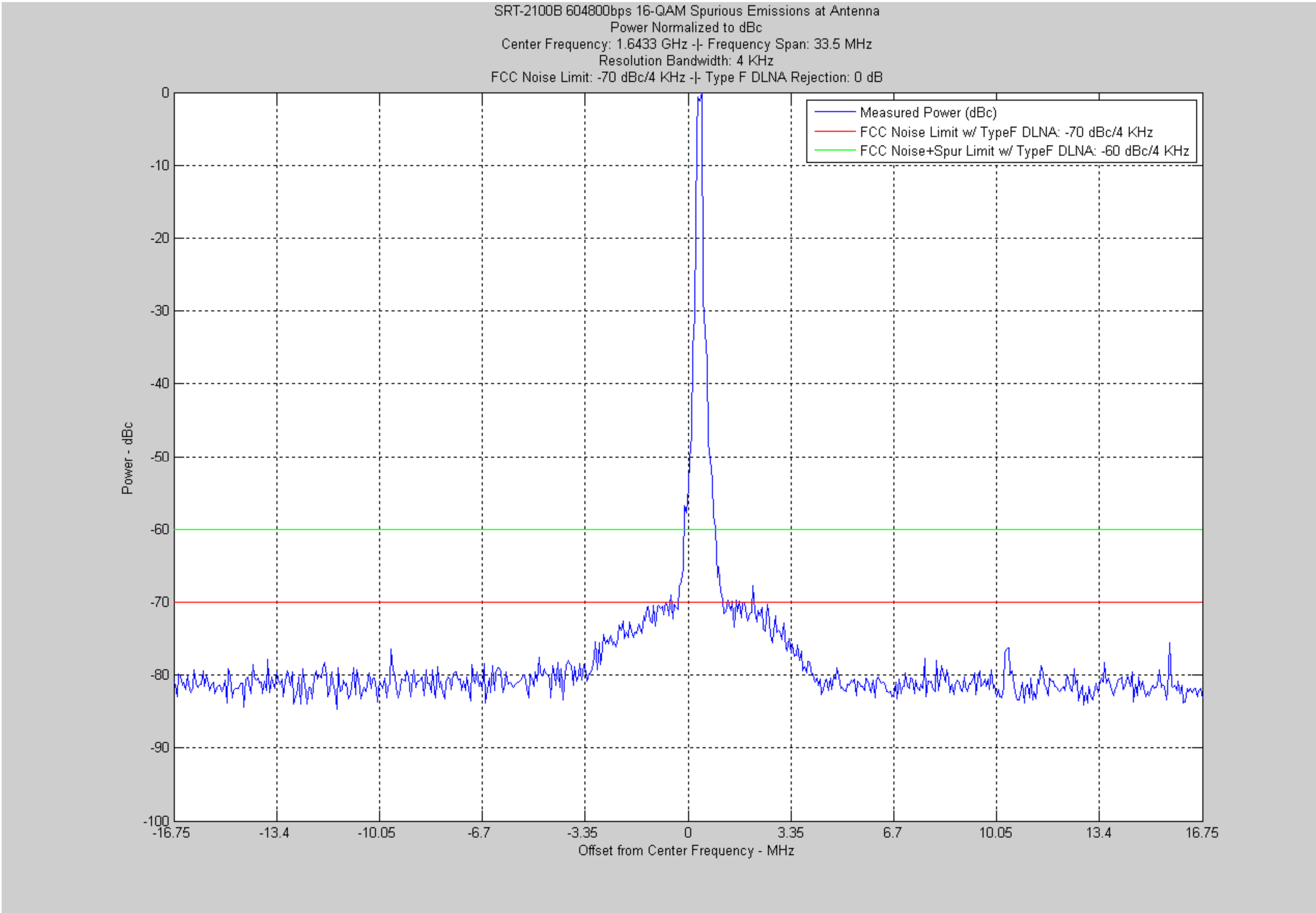


Figure 131 – 1660 to 1670 MHz

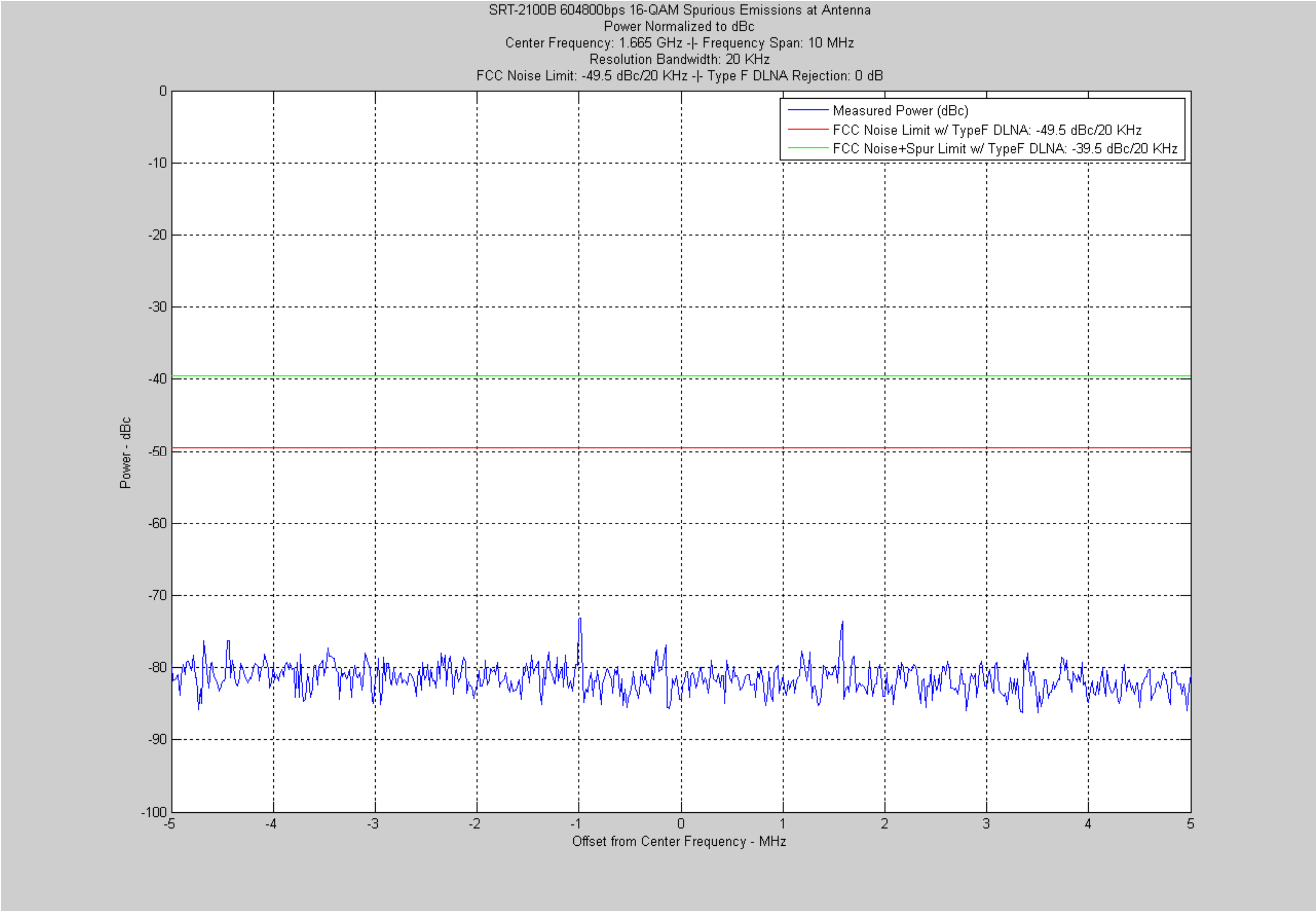


Figure 132 – 1670 to 1735 MHz

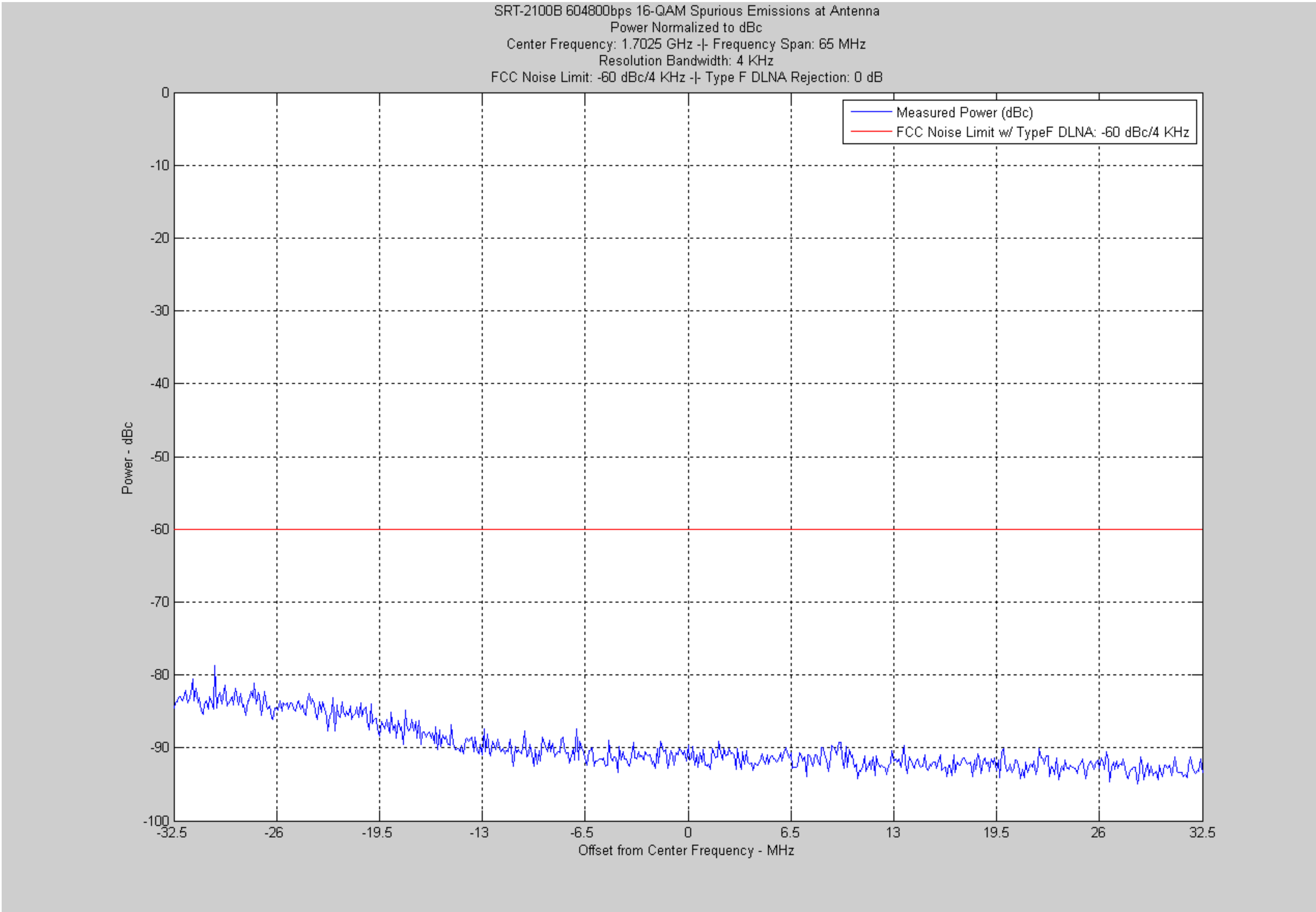


Figure 133 – 1735 to 12000 MHz

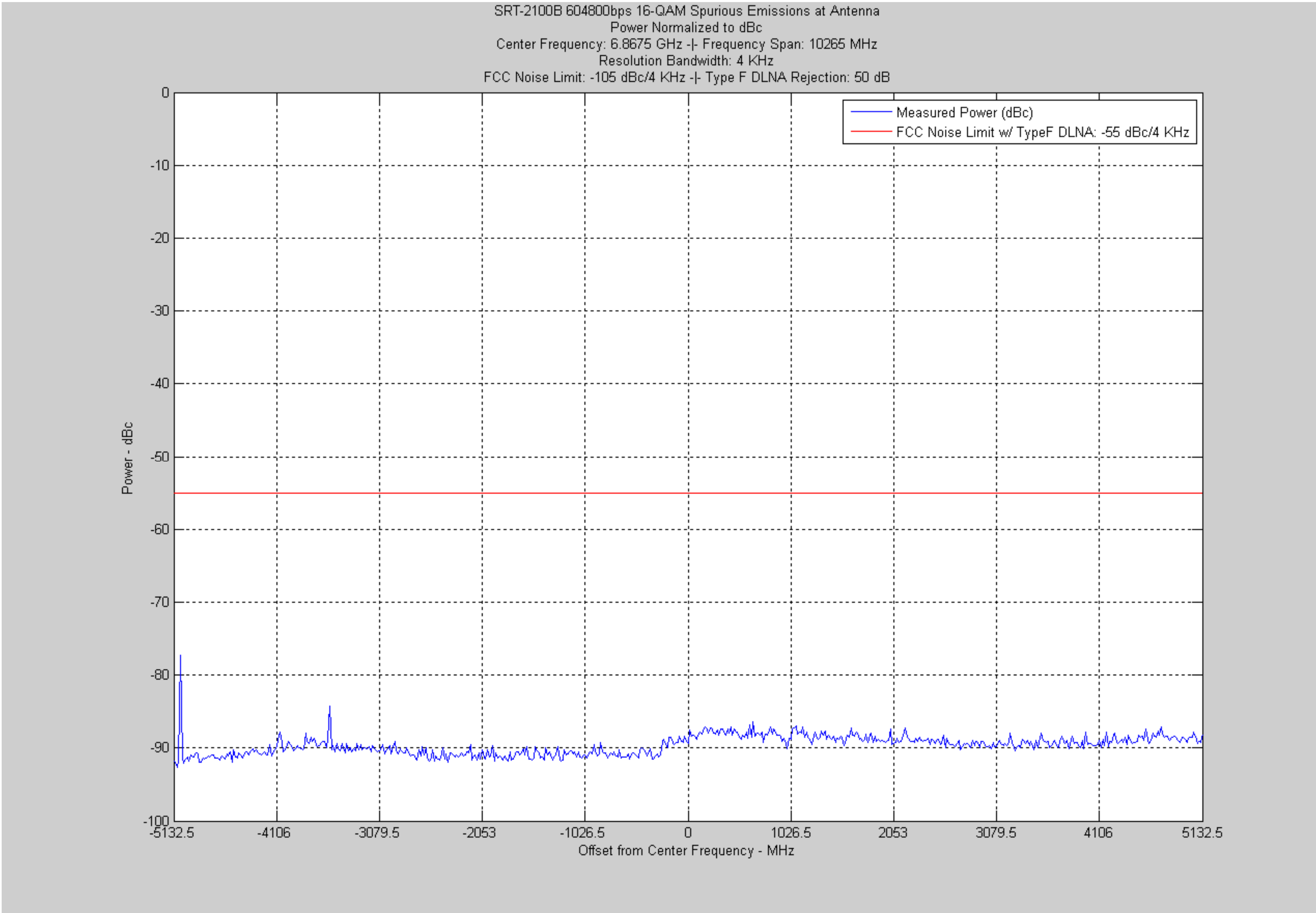


Figure 134 – 12000 to 18000 MHz

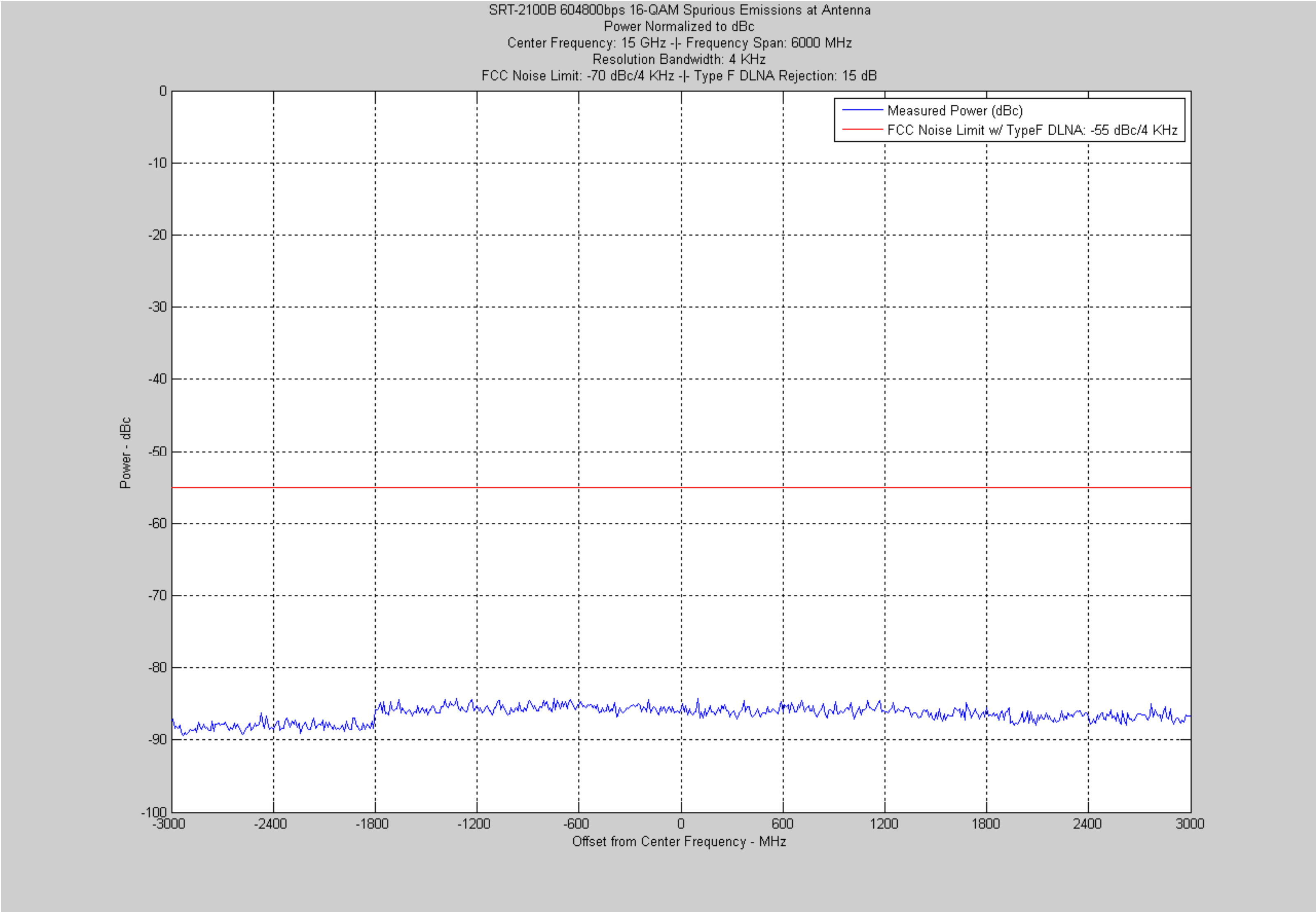


Figure 135 - 0.01 to 1525 MHz

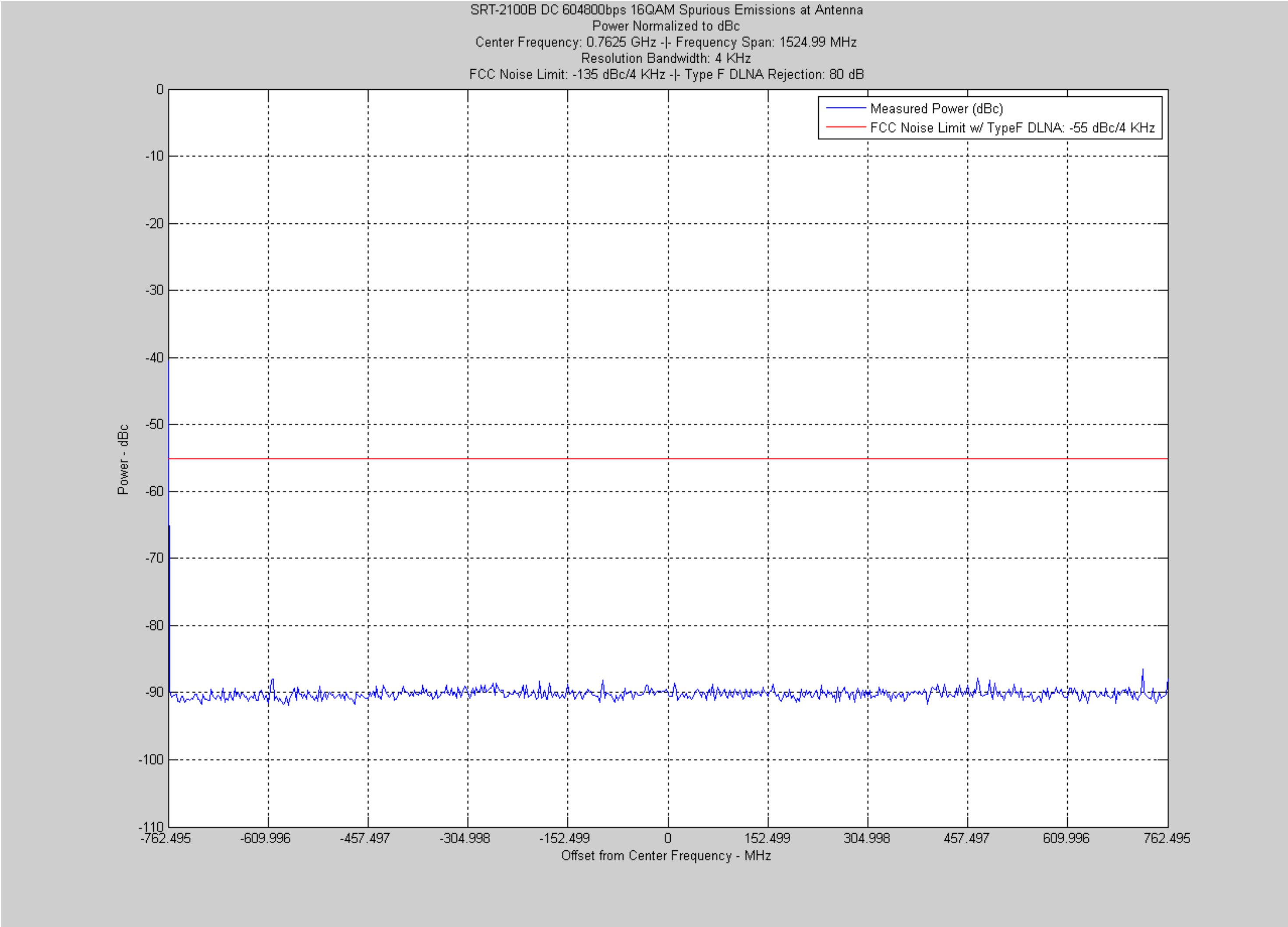


Figure 136 – 1525 to 1559 MHz

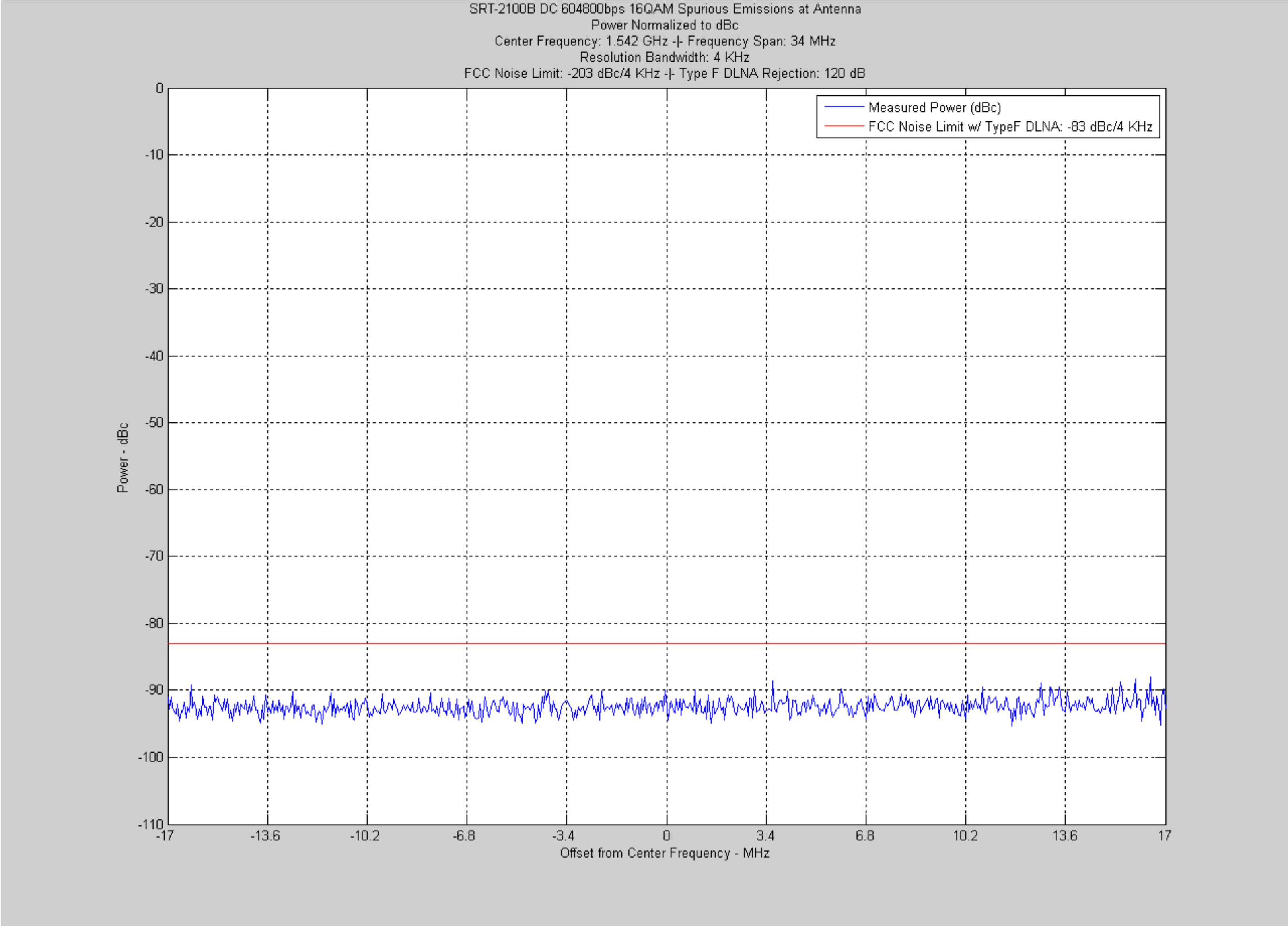


Figure 137 – 1559 to 1585 MHz

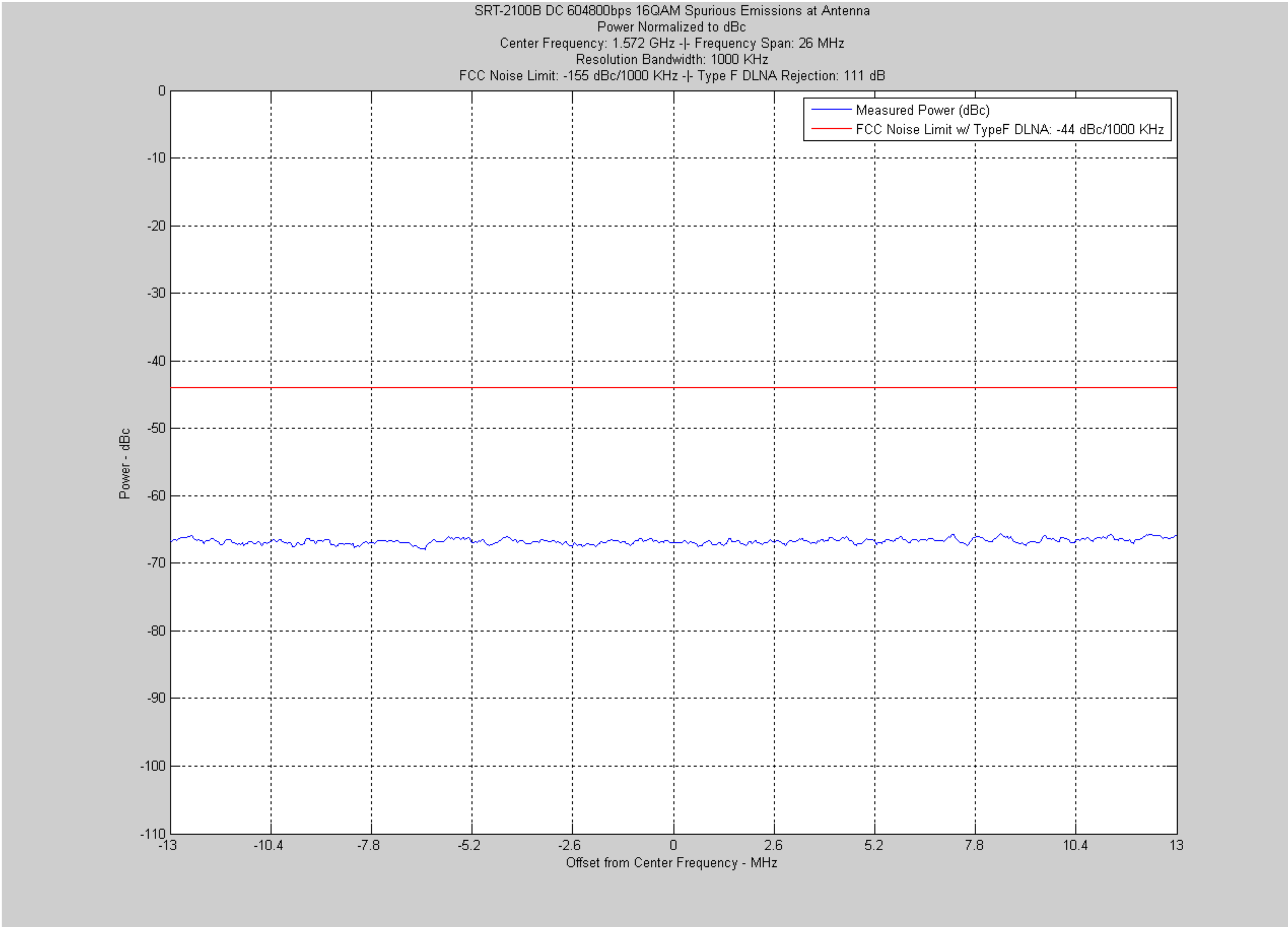


Figure 138 – 1585 to 1605 MHz

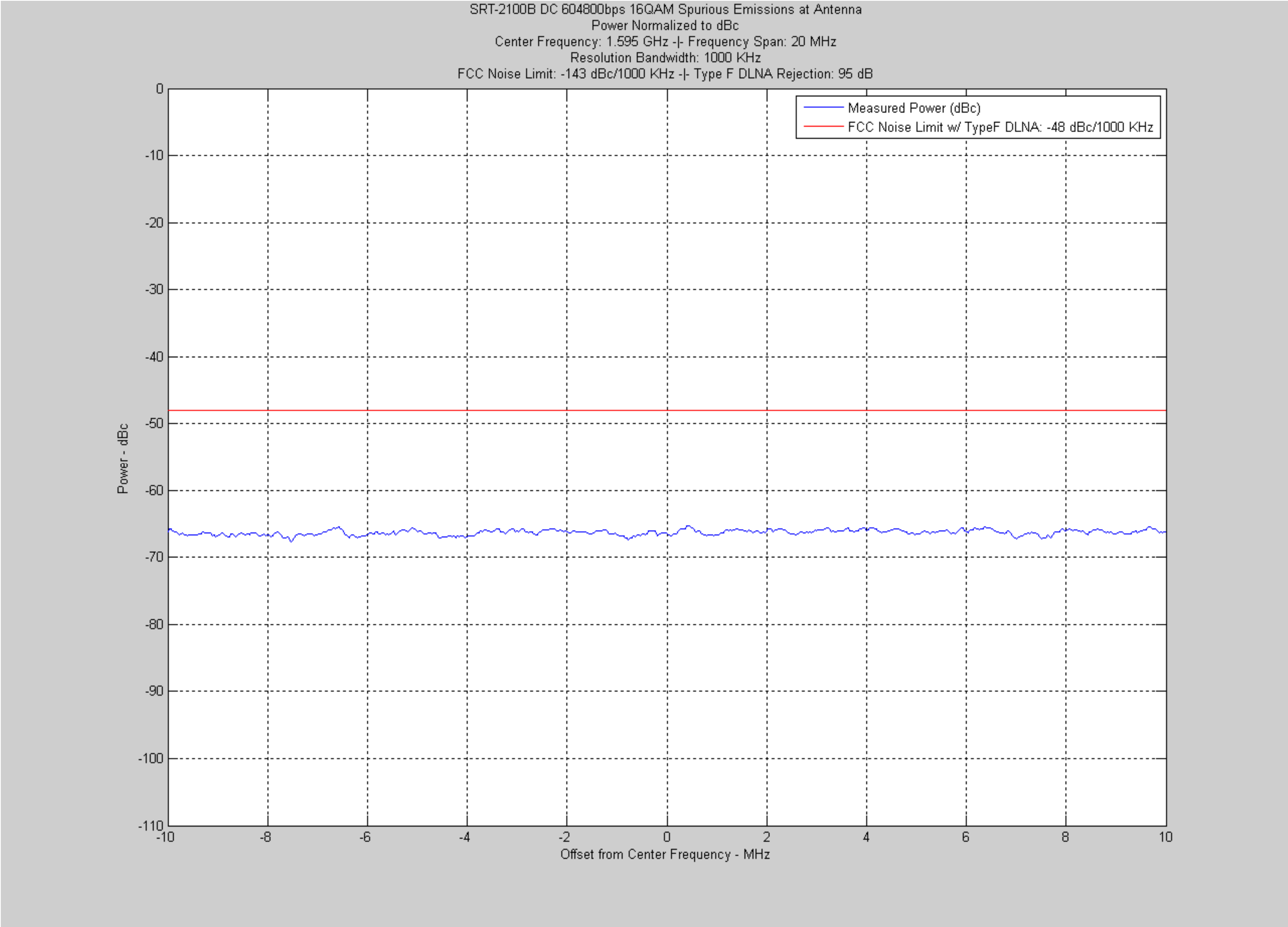


Figure 139 - 1605 to 1610 MHz

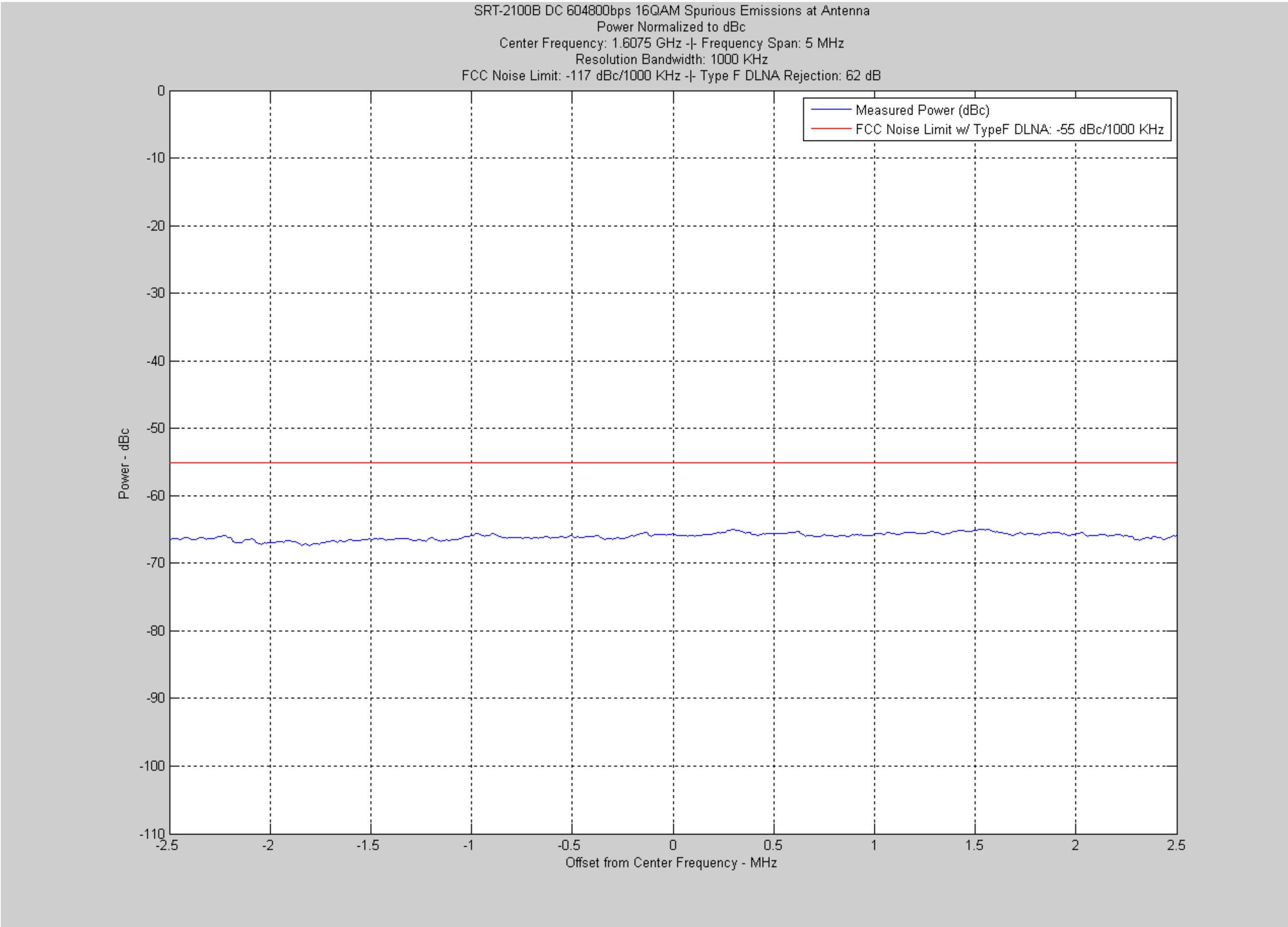


Figure 140 – 1610 to 1610.6 MHz

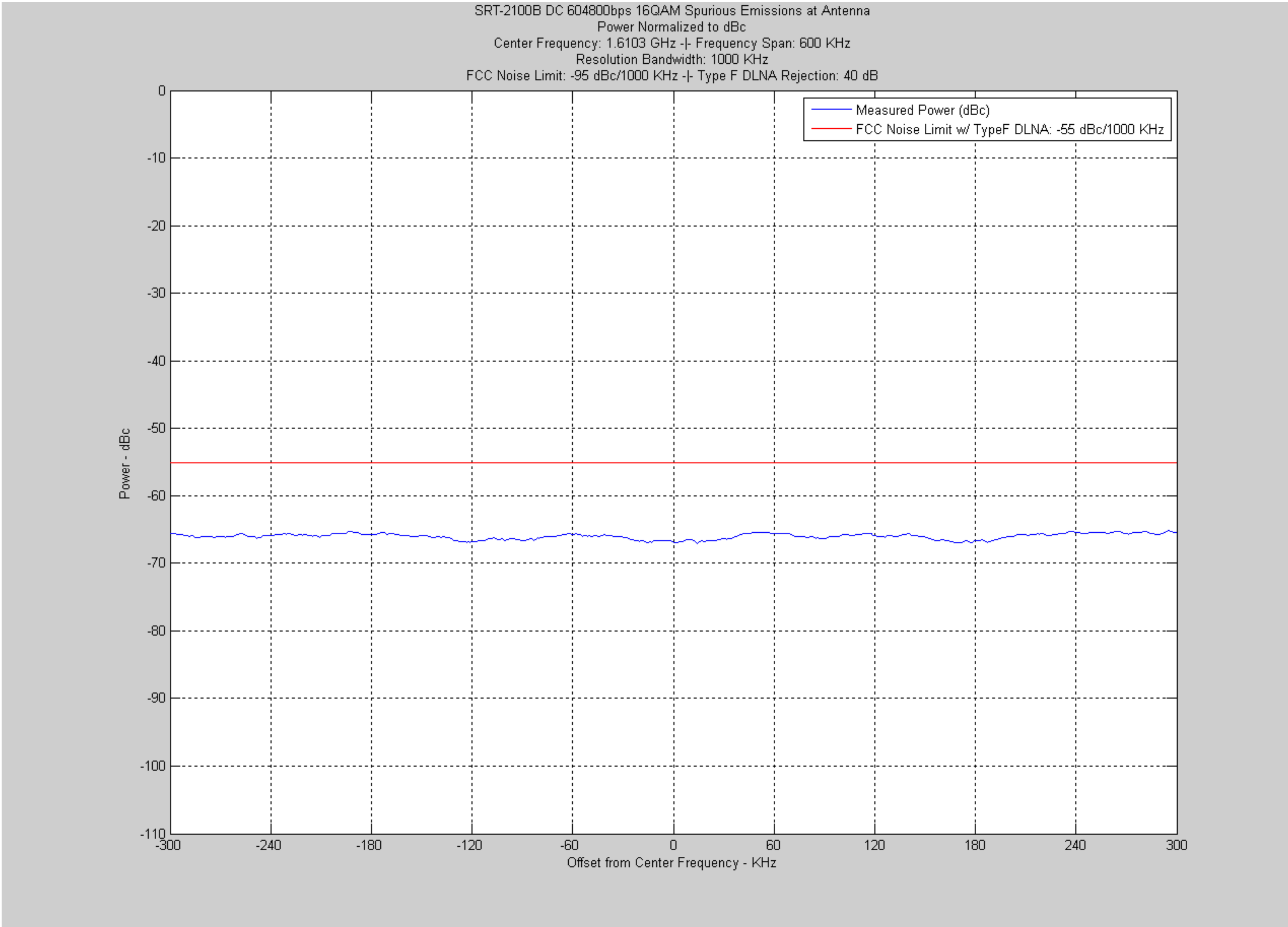


Figure 141 – 1610.6 to 1613.8 MHz

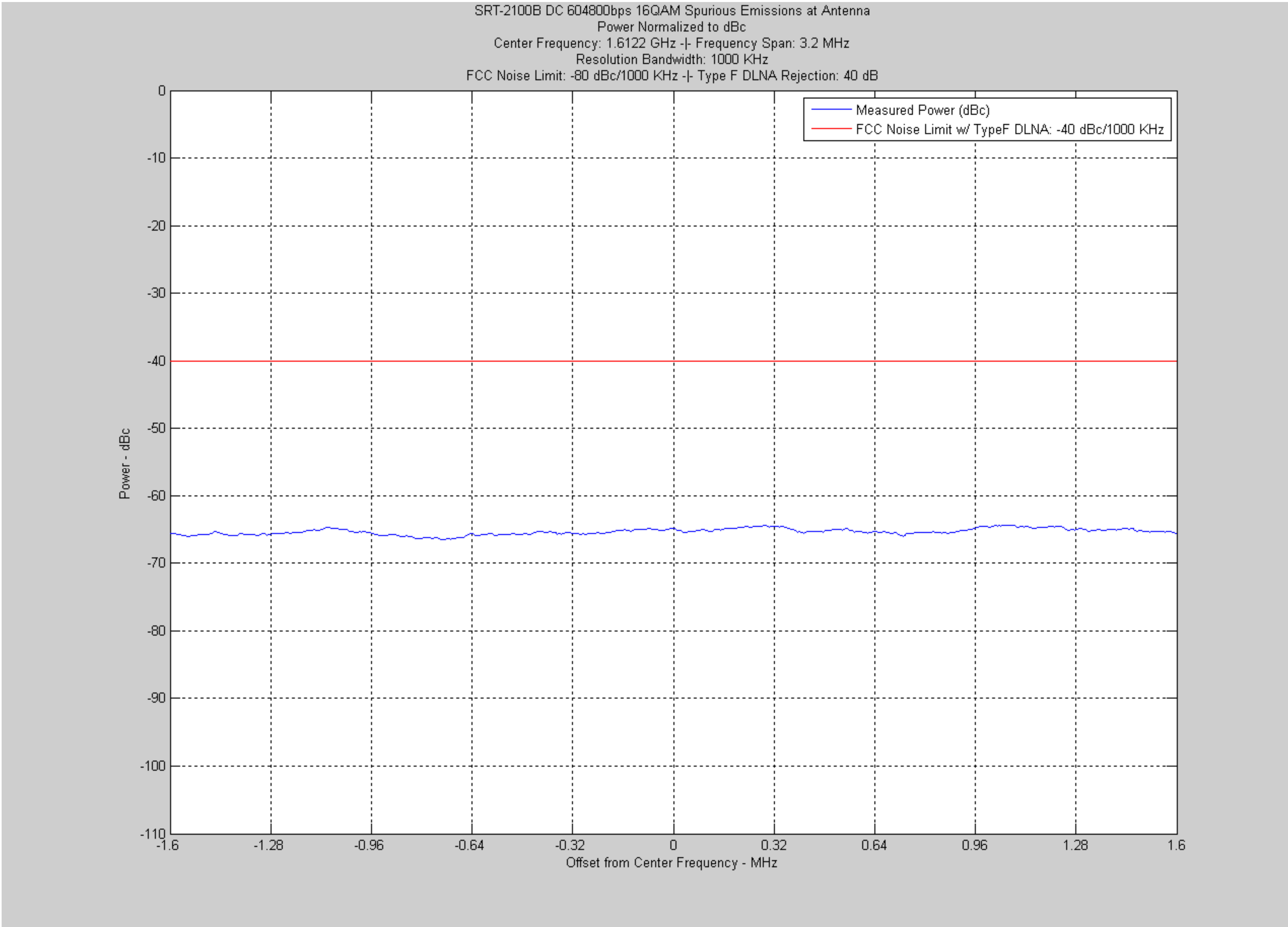


Figure 142 – 1613.8 to 1614 MHz

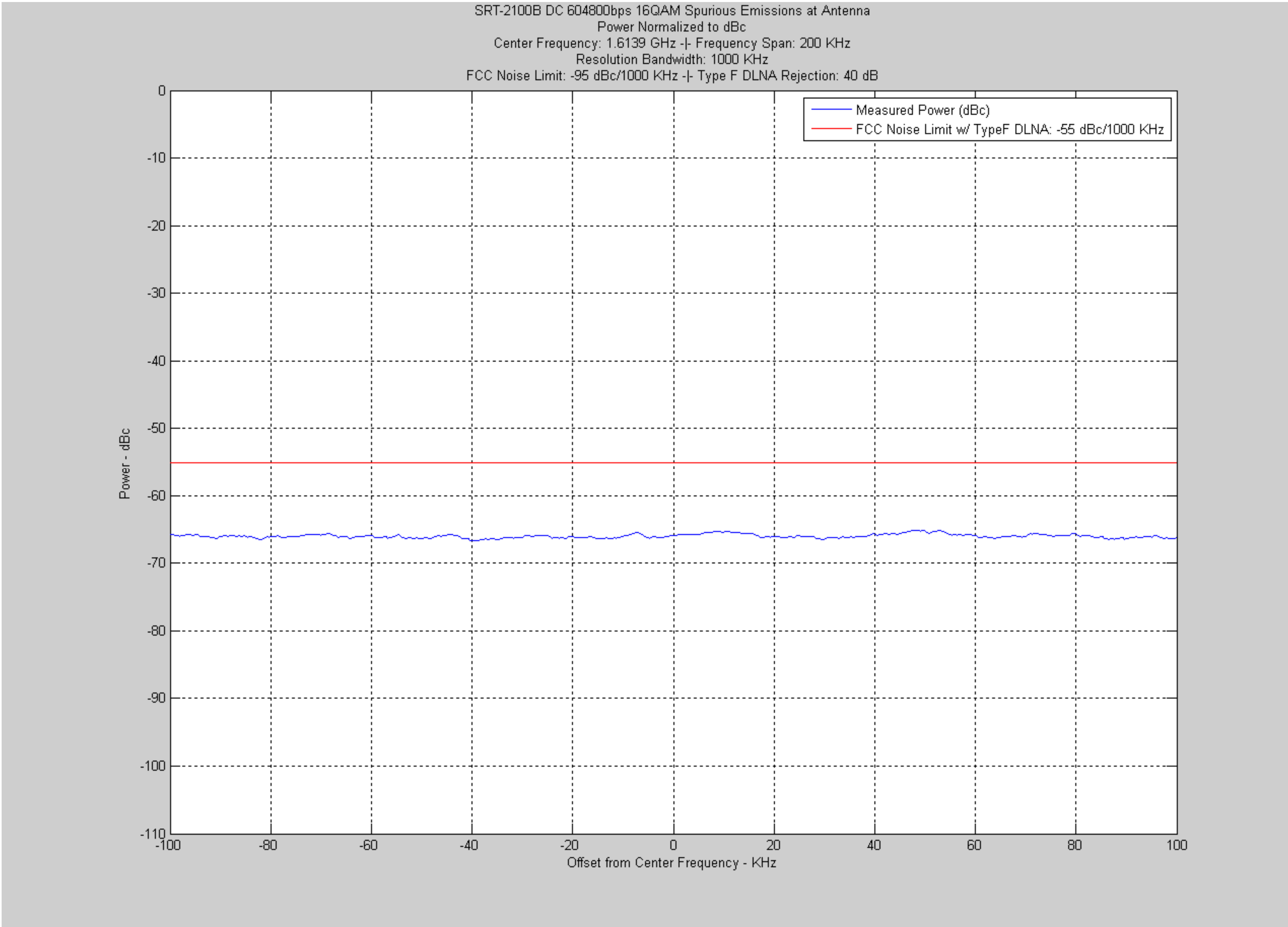


Figure 143 – 1614 to 1626.5 MHz

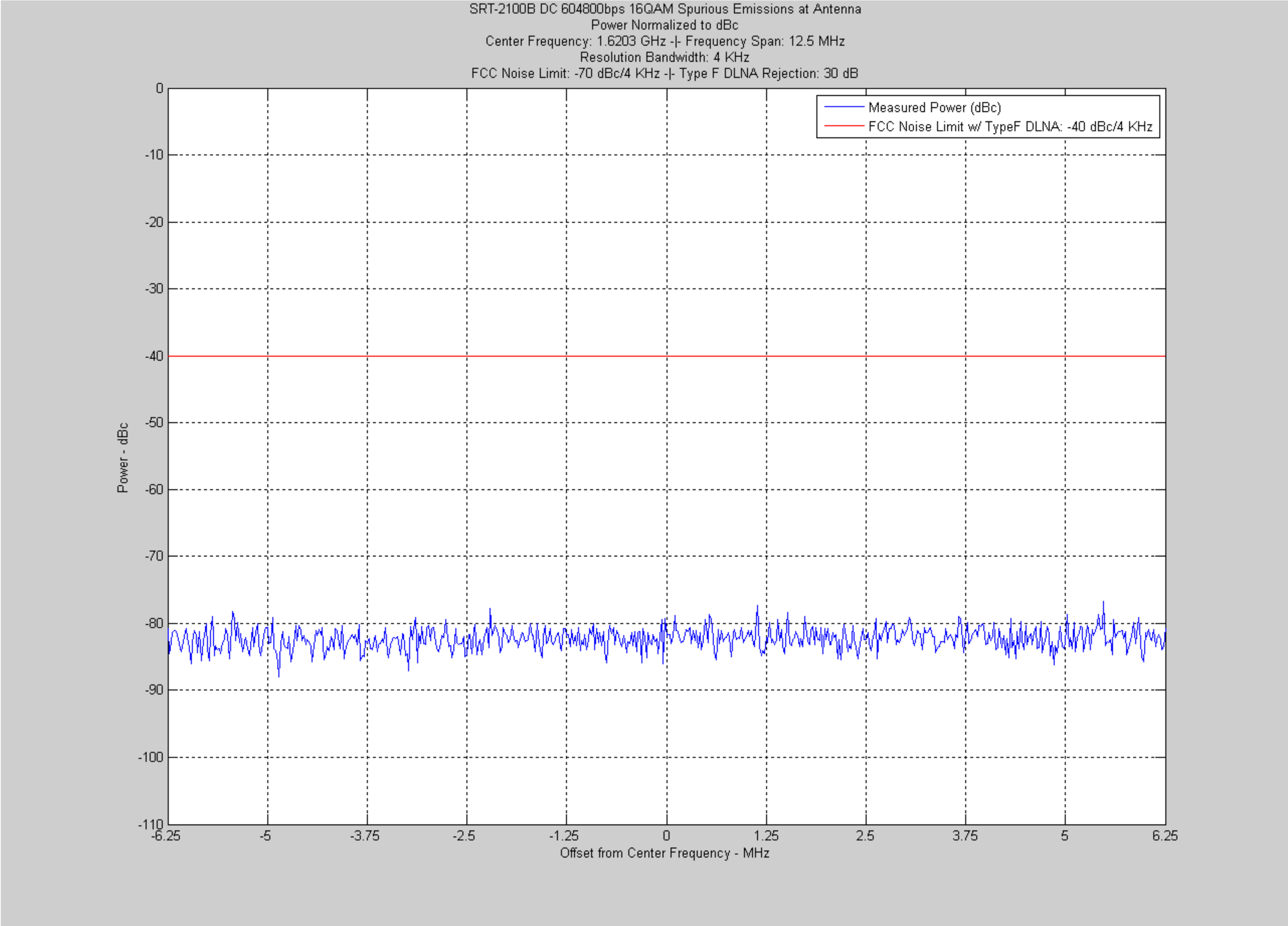


Figure 144 – 1626.5 to 1660 MHz

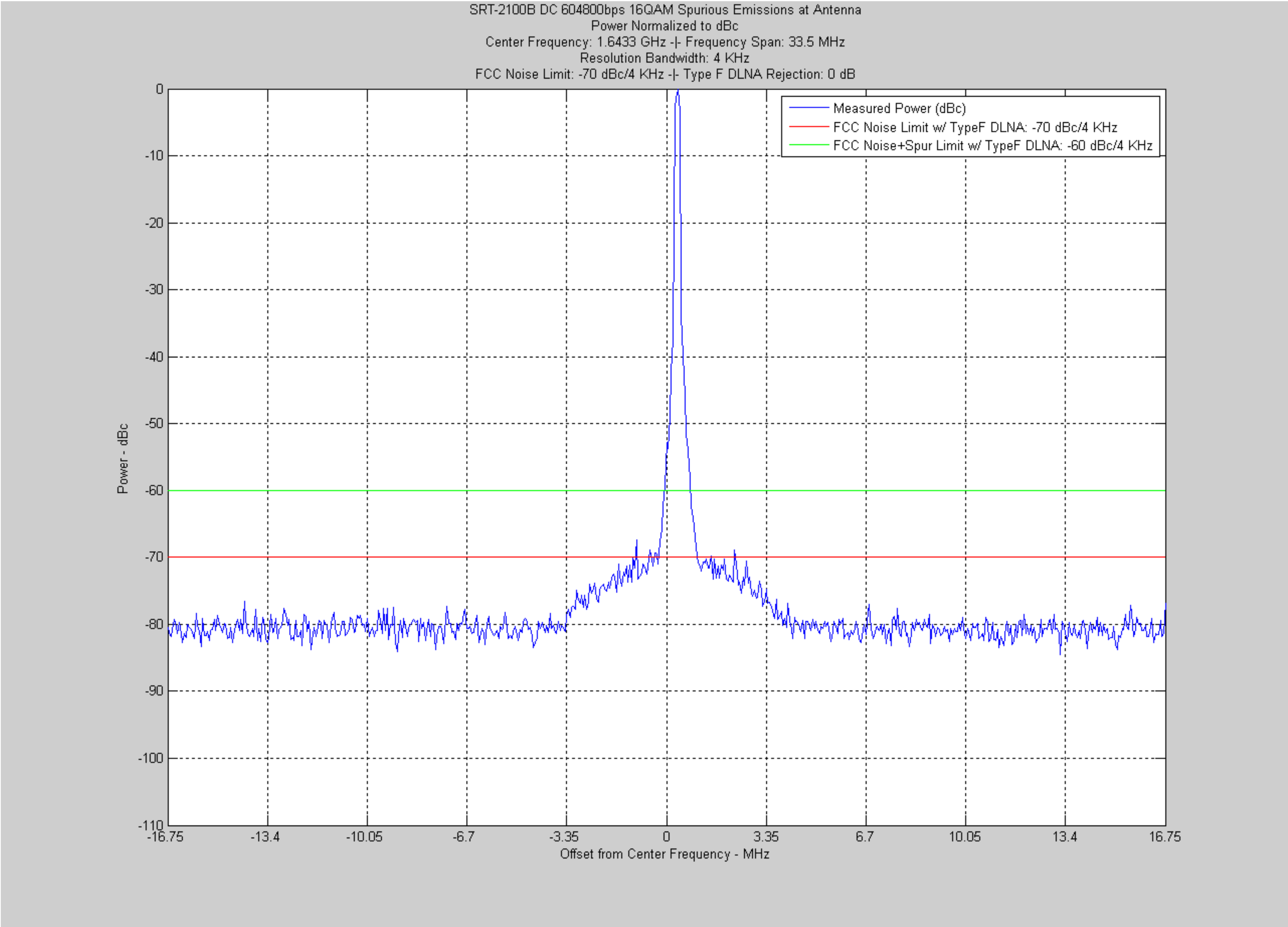


Figure 145 – 1660 to 1670 MHz

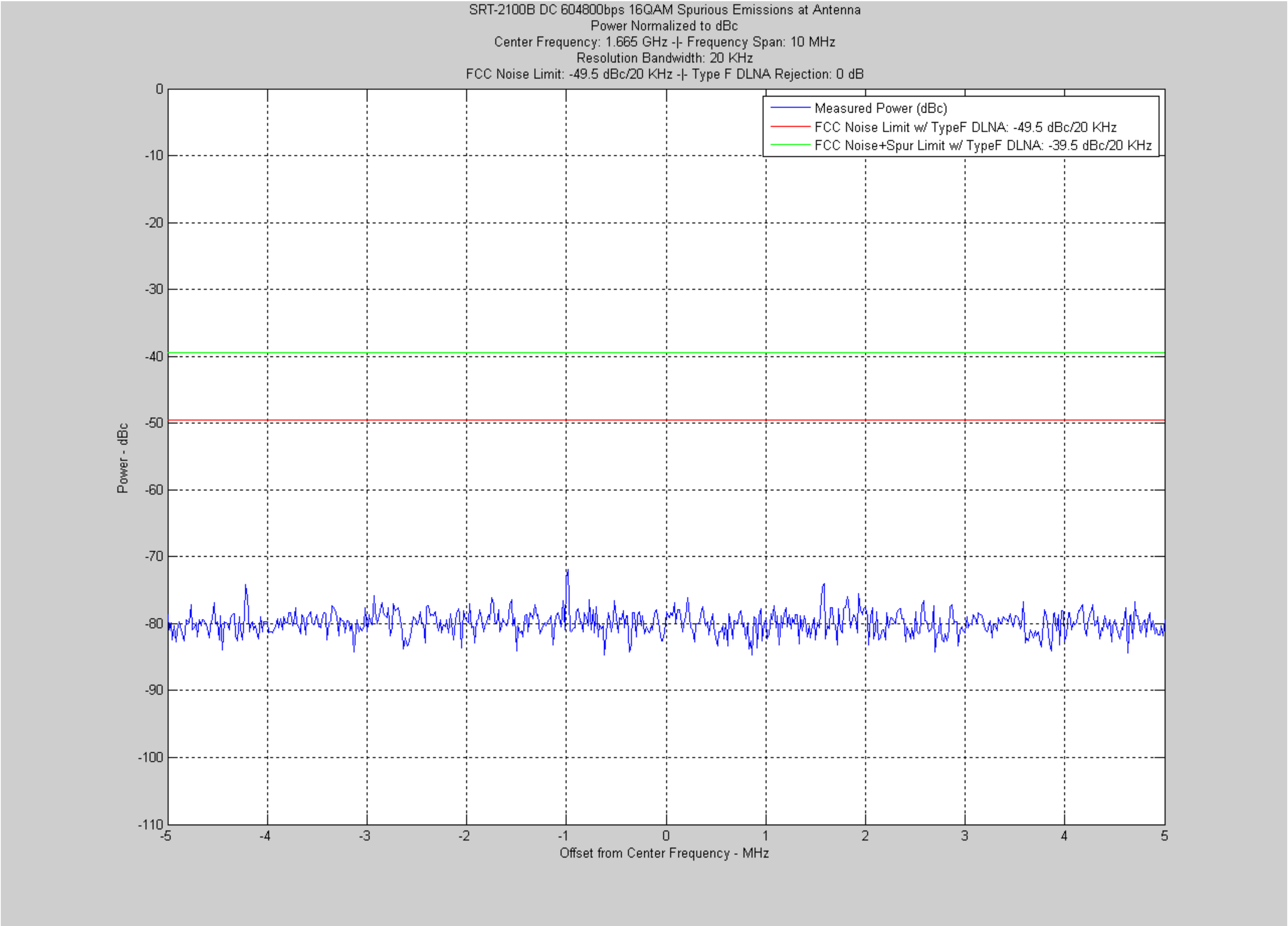


Figure 146 – 1670 to 1735 MHz

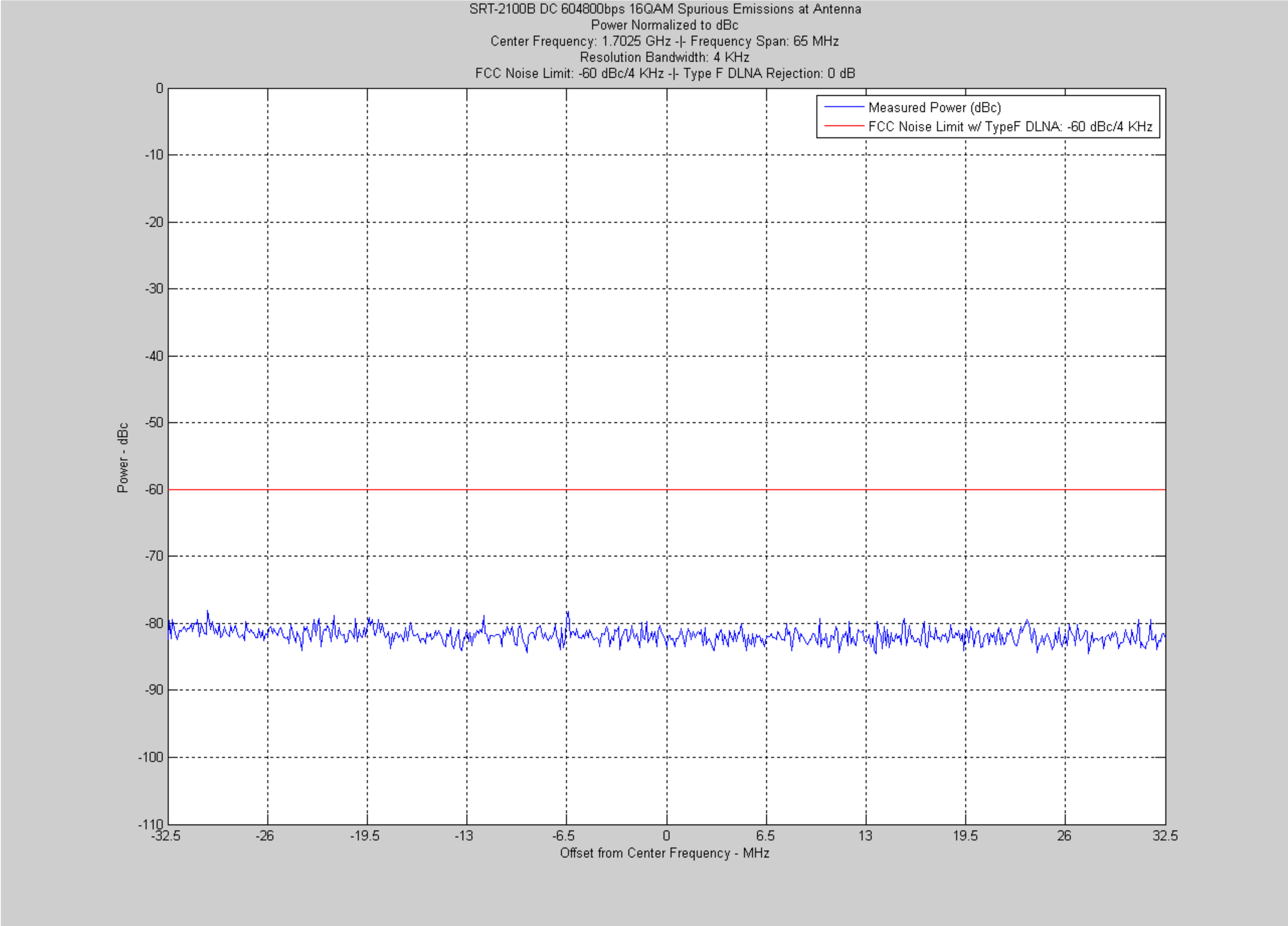


Figure 147 – 1735 to 12000 MHz

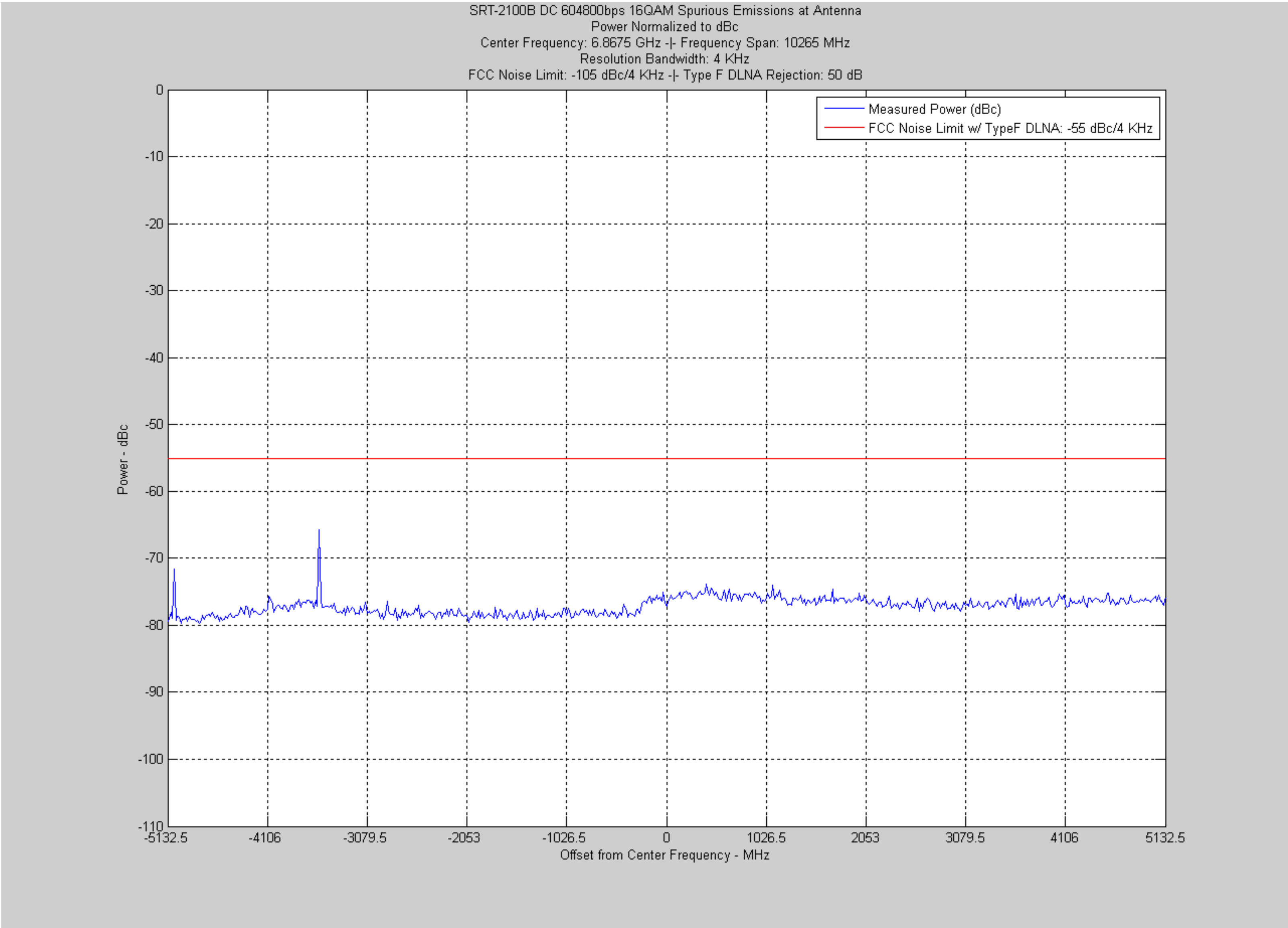
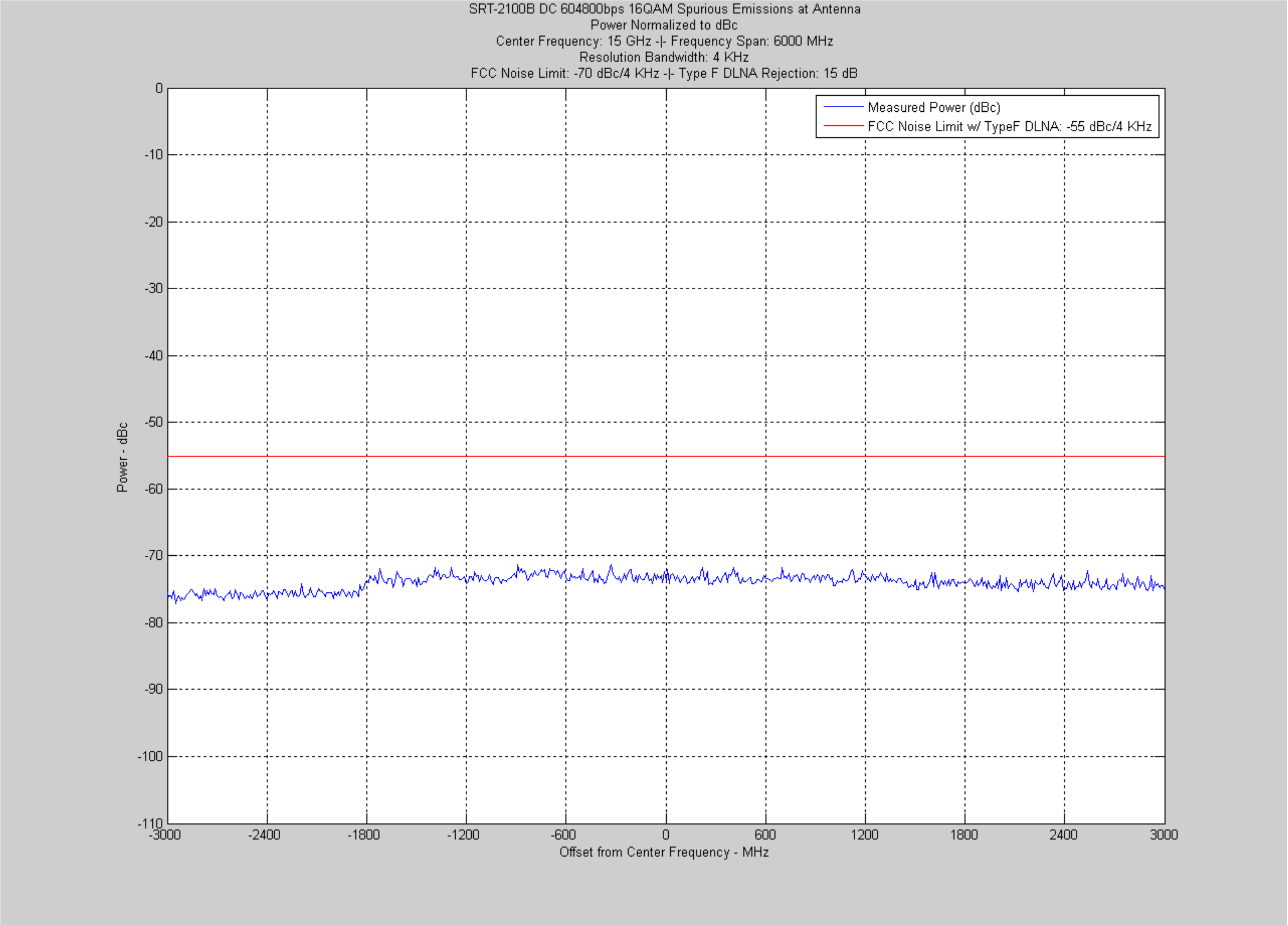


Figure 148 – 12000 to 18000 MHz



4.3.6 Frequency Spectrum Results

All signals were within the specifications for Frequency Spectrum. See attached plots.

Frequency Spectrum

List of Figures

Figure Number	Operational Mode	Modulation Type	Bit Rate (bps)	Symbol Rate (sym/s)	Frequency Span (Hz)	HST used
149	Classic Aero	BPSK	600	600	7080	none
150	Classic Aero	BPSK	1200	1200	14,160	none
151	Classic Aero	QPSK	8400	4200	49,560	none
152	Classic Aero	QPSK	10,500	5250	61,950	none
153	Classic Aero	QPSK	21,000	10,500	123,900	none
154	Swift64	BPSK	3000	3000	160,000[1]	HST-2110B AC
155	Swift64	16-QAM	134,400	33,600	396,480	HST-2110B AC
156	Swift Broadband	QPSK	33,600	16,800	198,240	HST-2110B AC
157	Swift Broadband	QPSK	67,200	33,600	396,480	HST-2110B AC
158	Swift Broadband	QPSK	134,400	67,200	792,960	HST-2110B AC
159	Swift Broadband	QPSK	302,400	151,200	1,784,160	HST-2110B AC
160	Swift Broadband	16-QAM	134,400	33,600	396,480	HST-2110B AC
161	Swift Broadband	16-QAM	268,800	67,200	792,960	HST-2110B AC
162	Swift Broadband	16-QAM	604,800	151,200	1,784,160	HST-2110B AC

SRT used: SRT-2100B AC

Carrier Frequency: 1643.50 MHz unmodulated at 46.5 dBm

Spectrum analyzer resolution bandwidth: 100 Hz

[1] Inmarsat Swift64 specifications require the use of “unfiltered” BPSK that does not meet the FCC frequency mask formula. A waiver was previously granted for the discrepancy.

Figure 149 – Frequency Spectrum

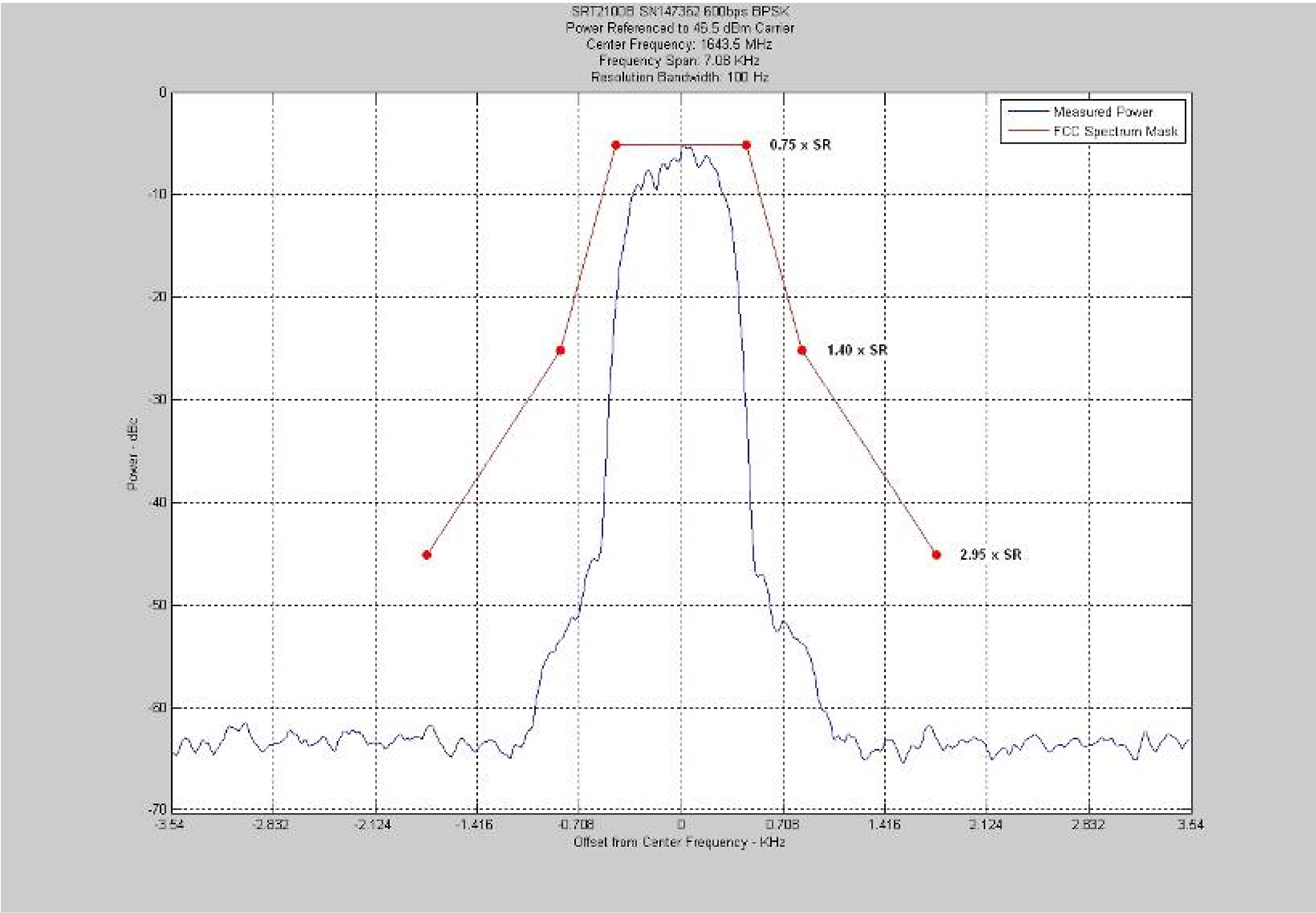


Figure 150 – Frequency Spectrum

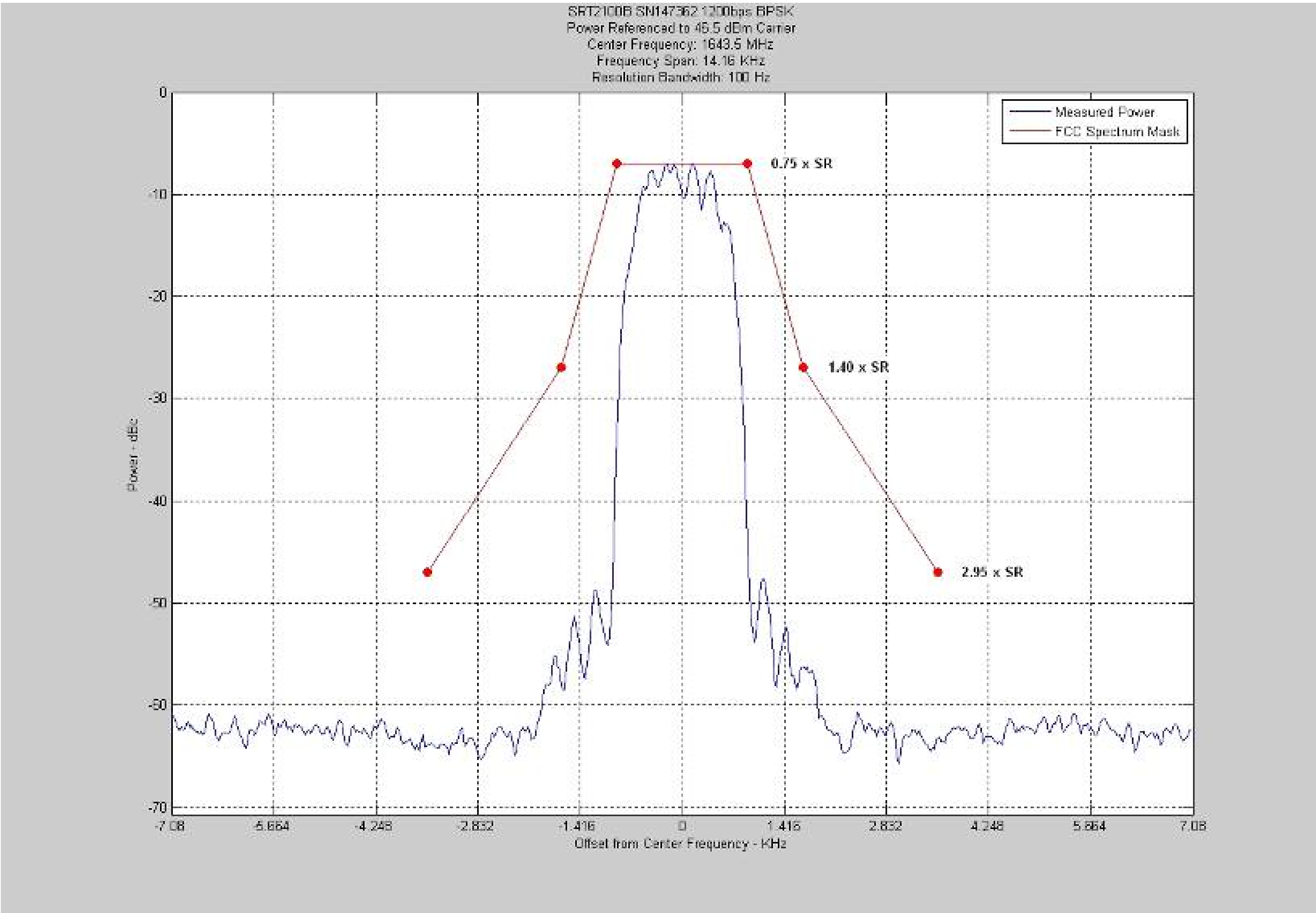


Figure 151 – Frequency Spectrum

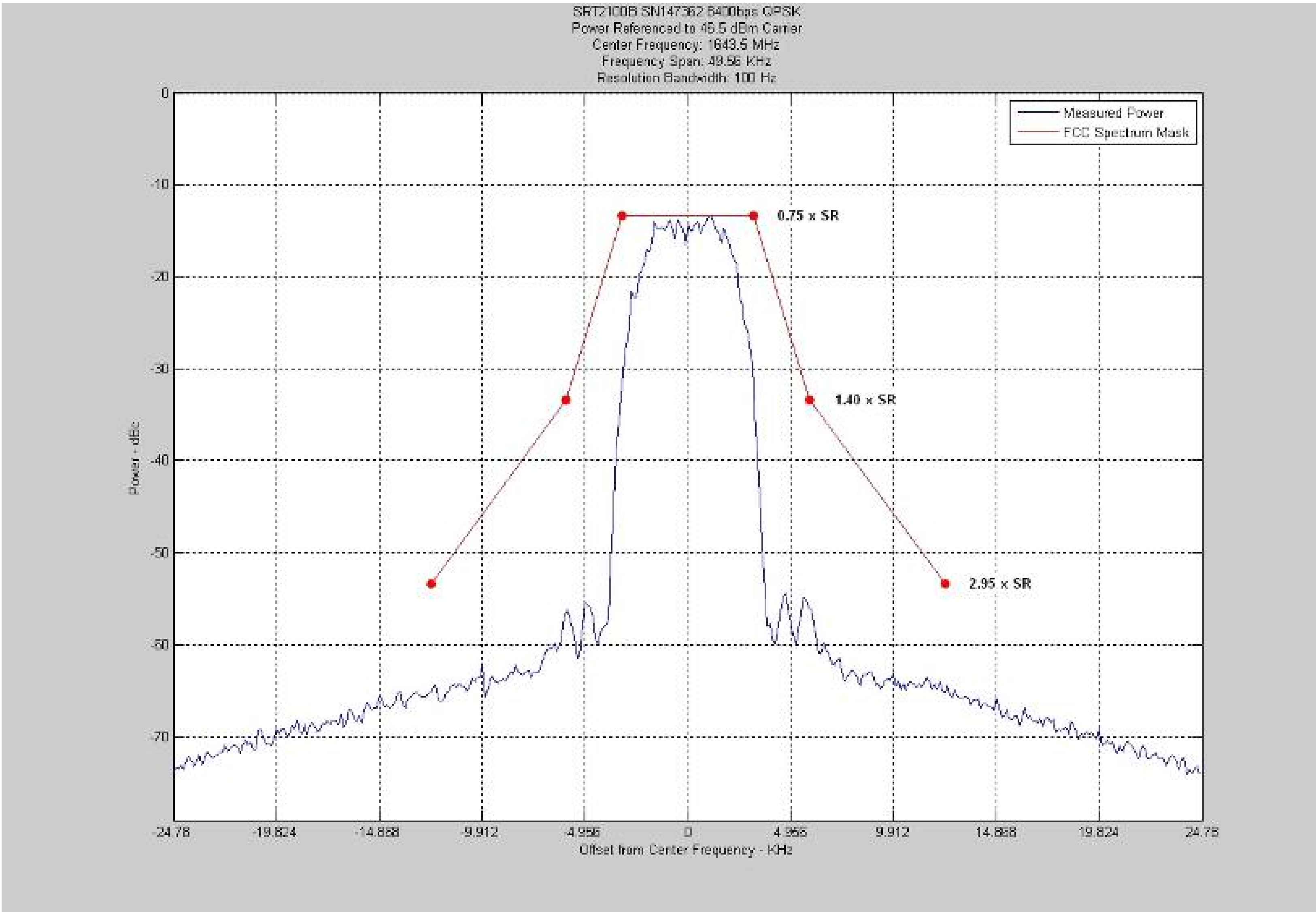


Figure 152 – Frequency Spectrum

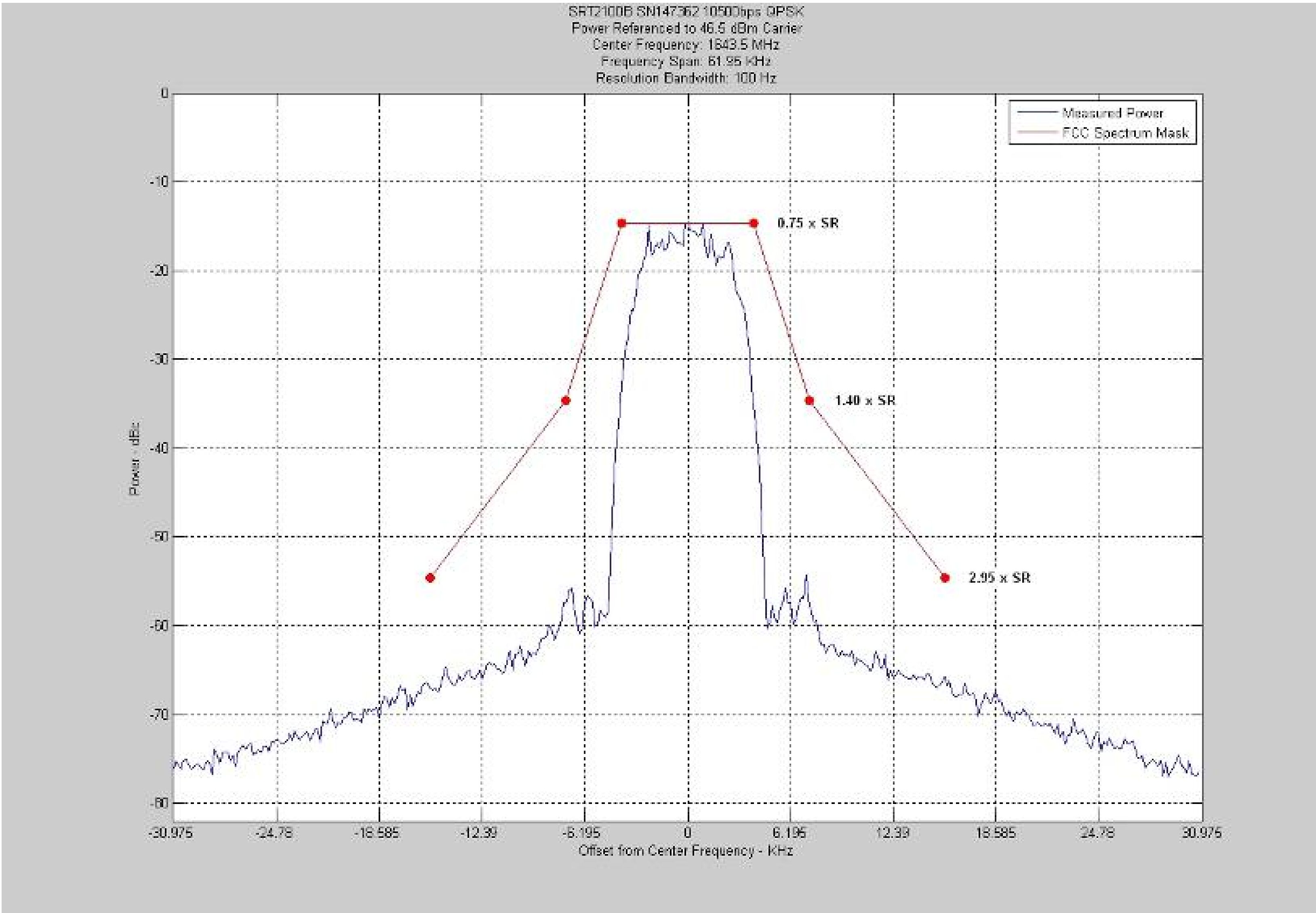


Figure 153 – Frequency Spectrum

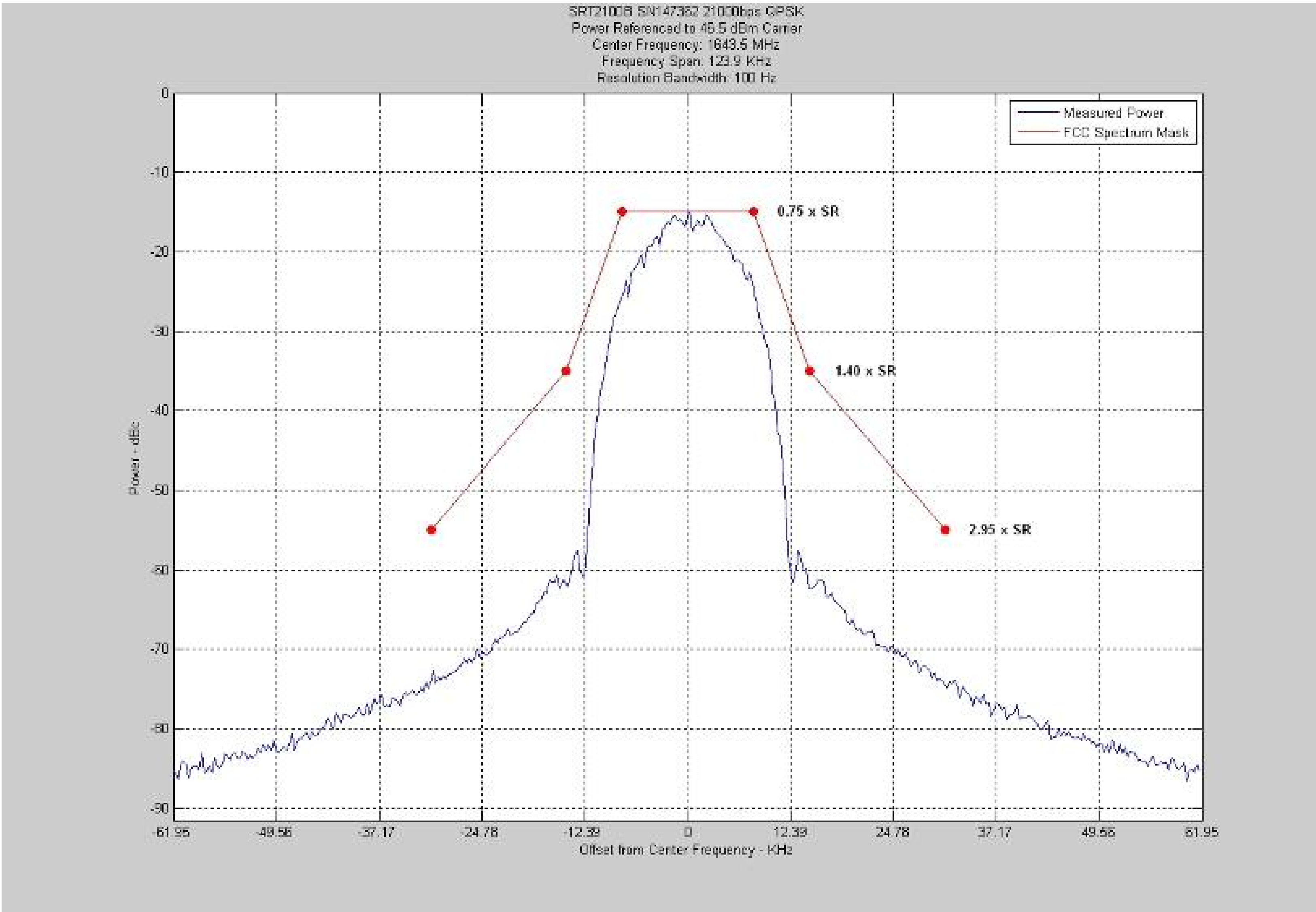


Figure 154 – Frequency Spectrum

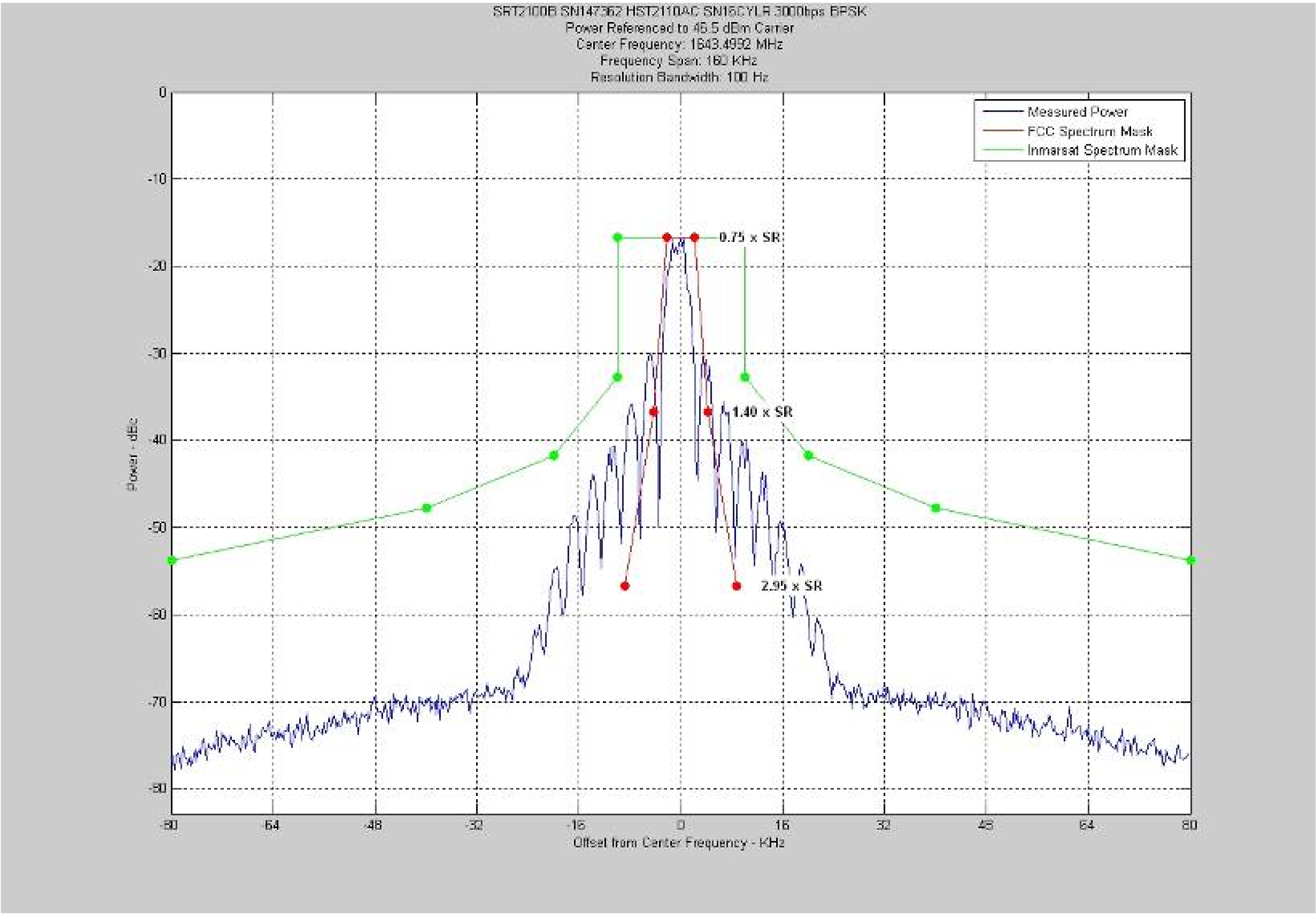


Figure 155 – Frequency Spectrum

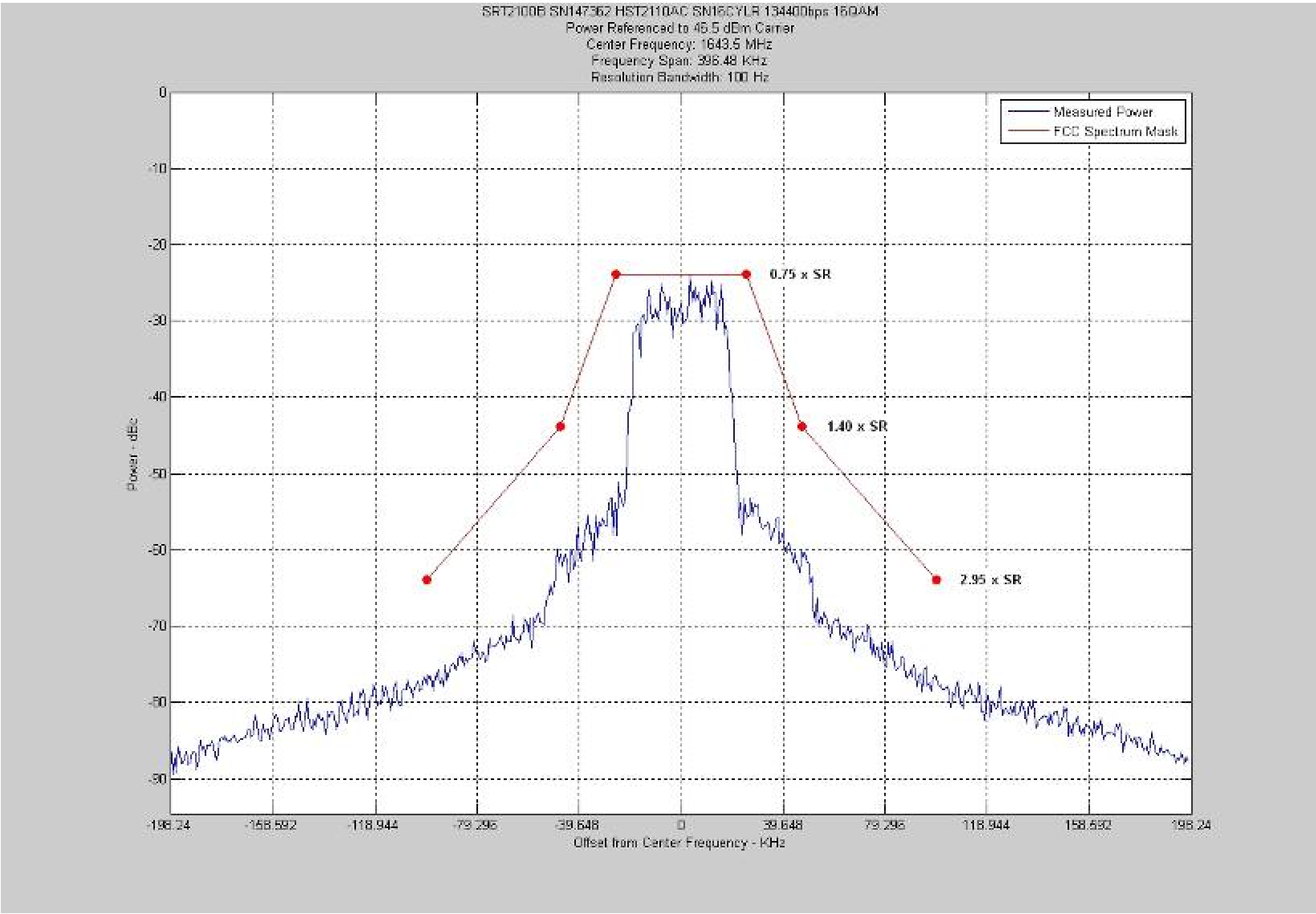


Figure 156 – Frequency Spectrum

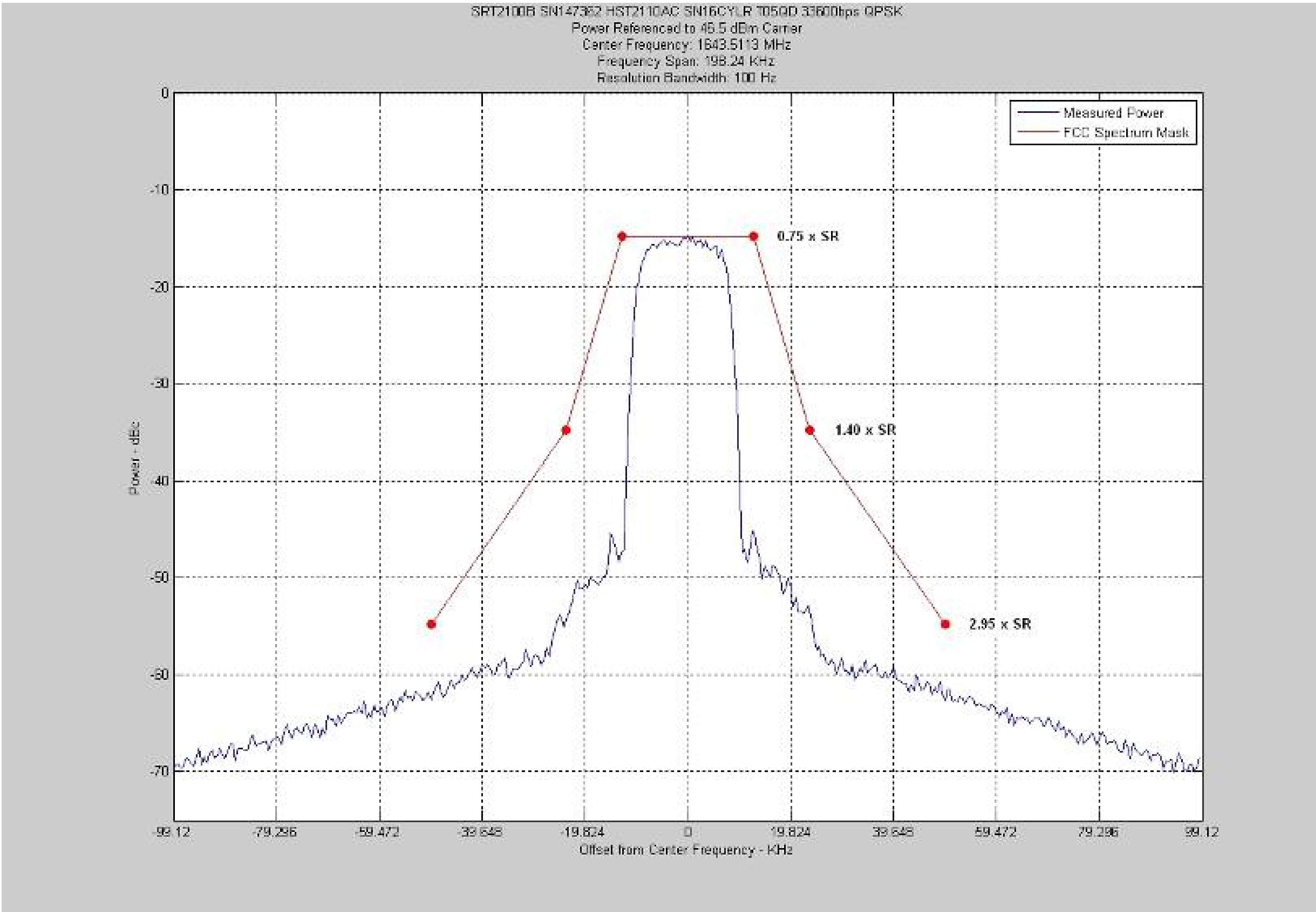


Figure 157 – Frequency Spectrum

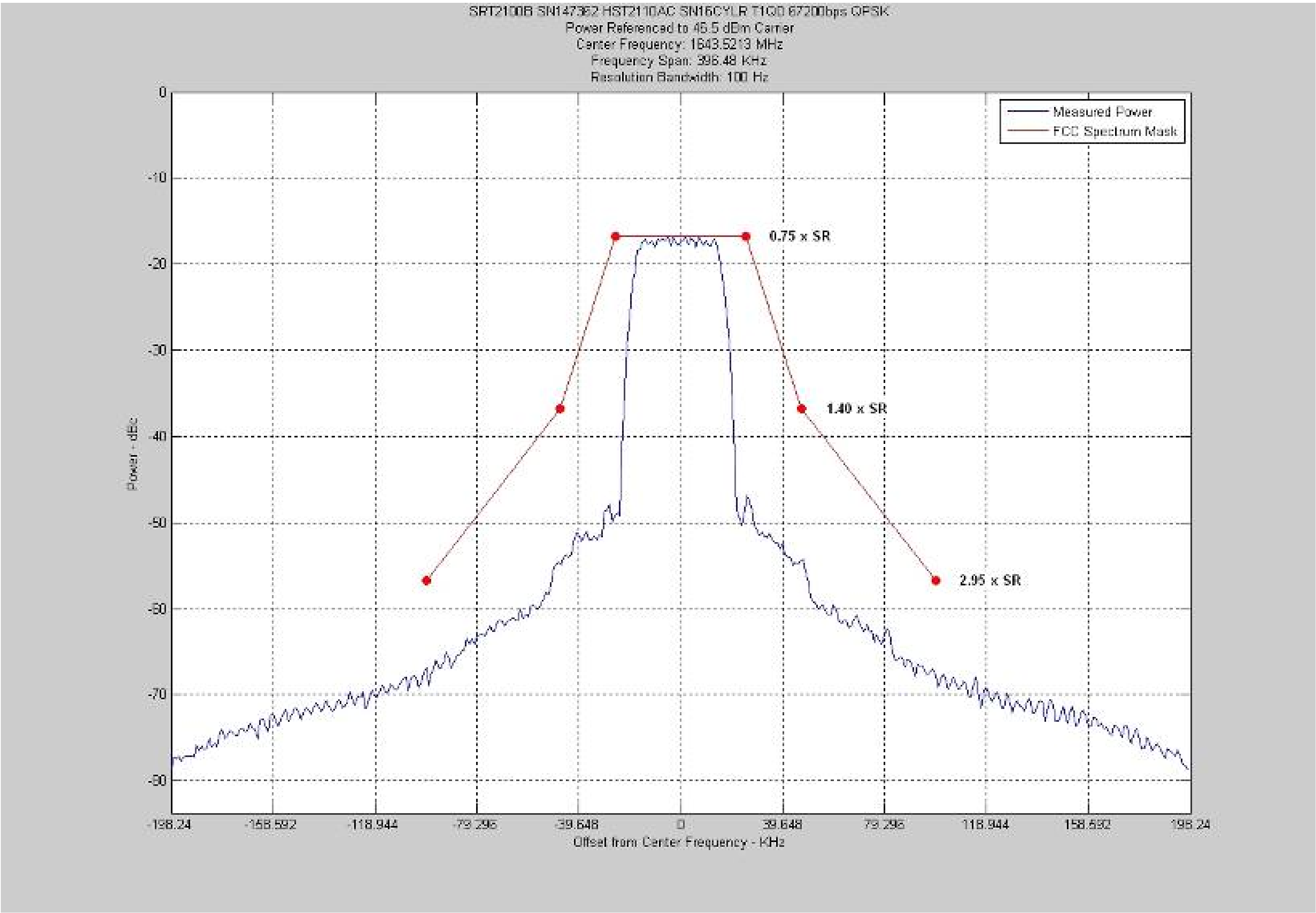


Figure 158 – Frequency Spectrum

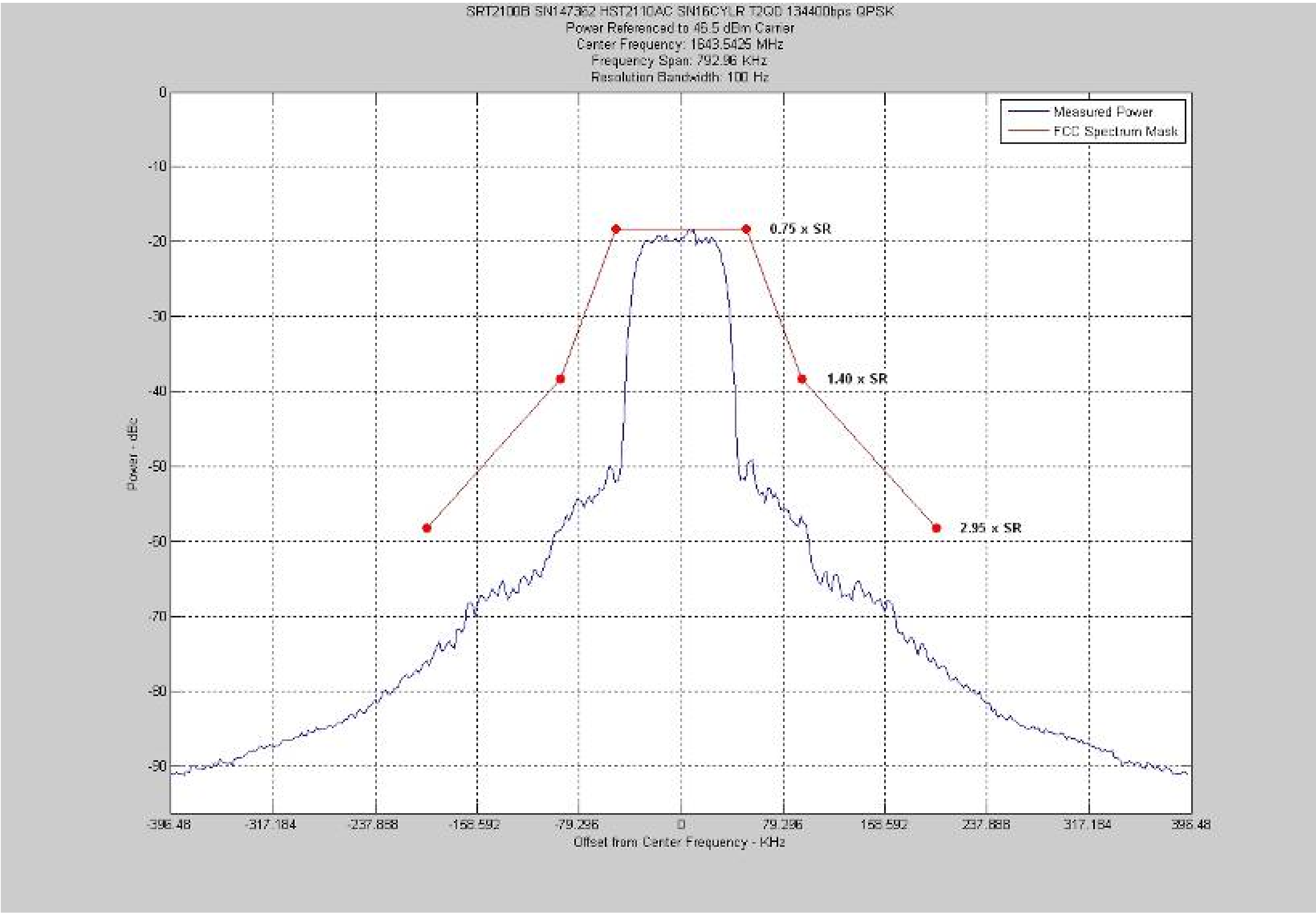


Figure 159 – Frequency Spectrum

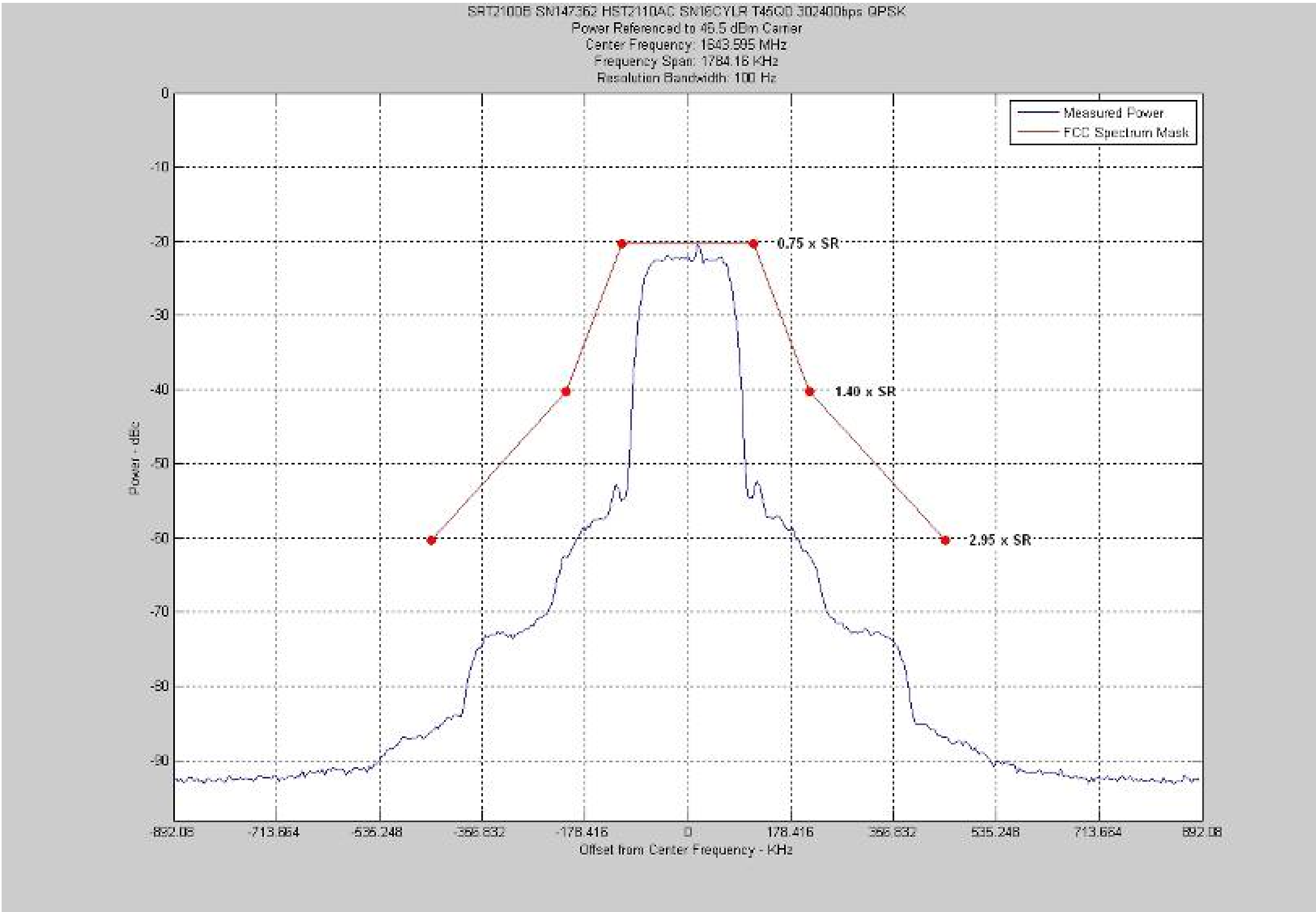


Figure 160 – Frequency Spectrum

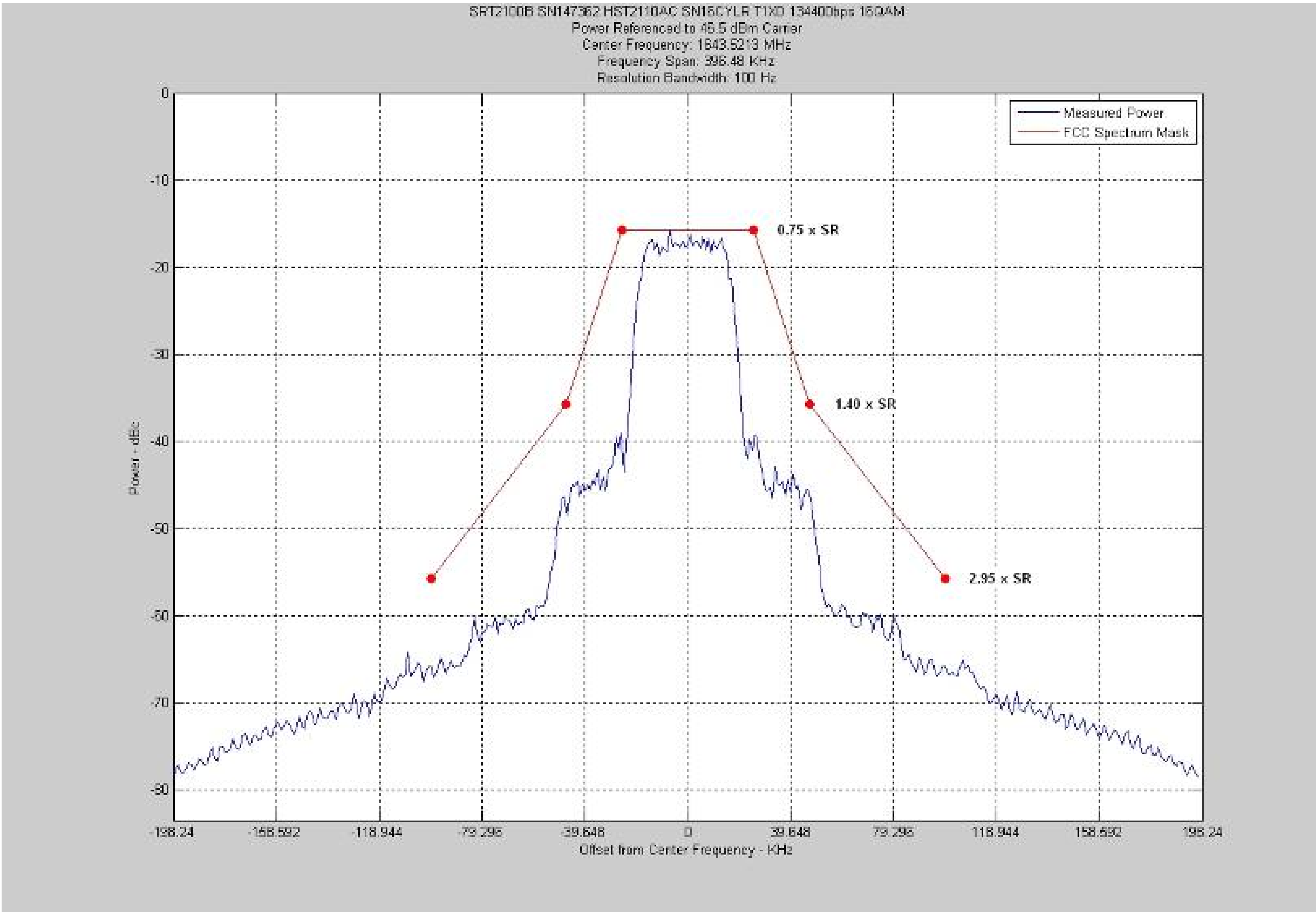


Figure 161 – Frequency Spectrum

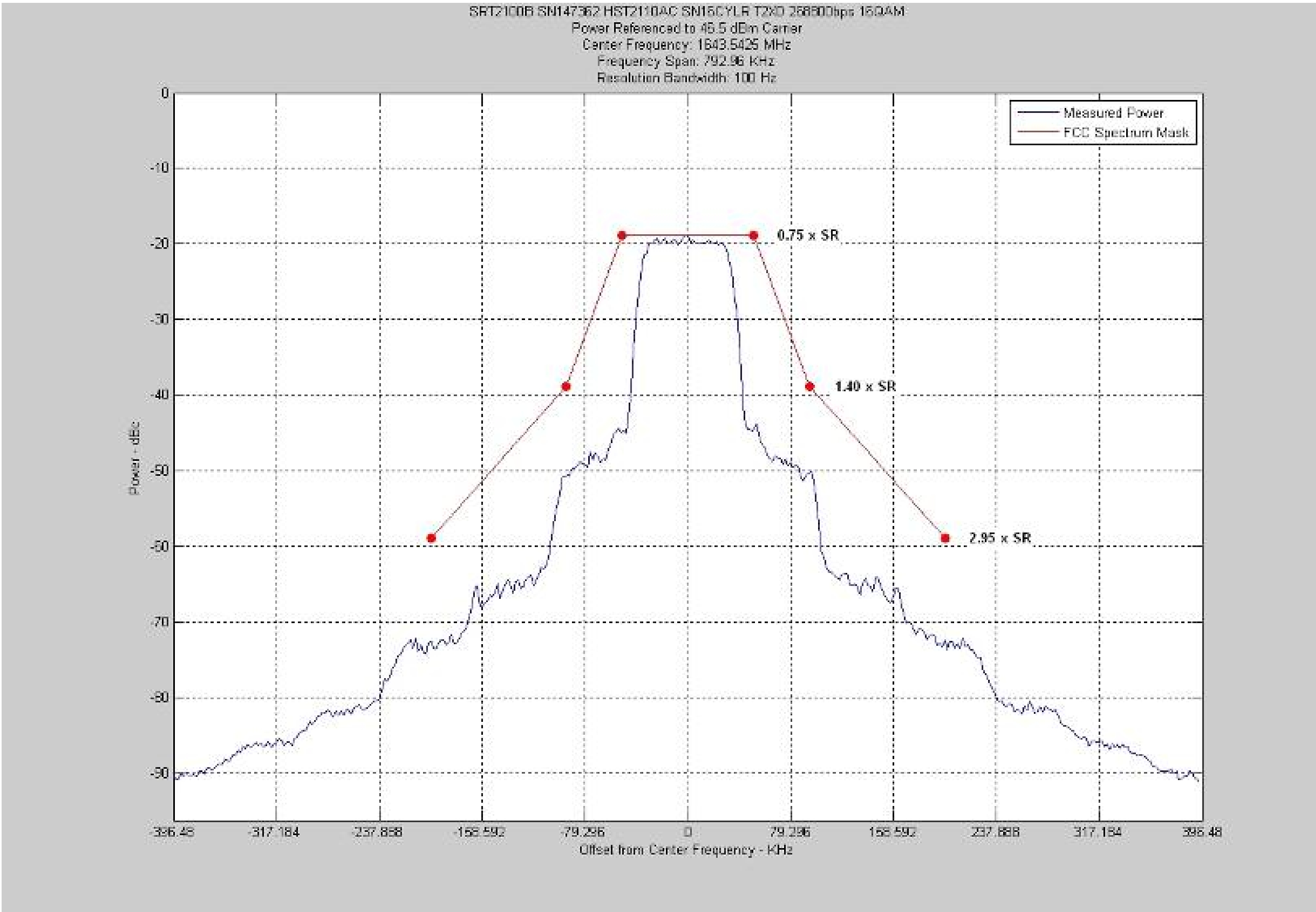


Figure 162 – Frequency Spectrum

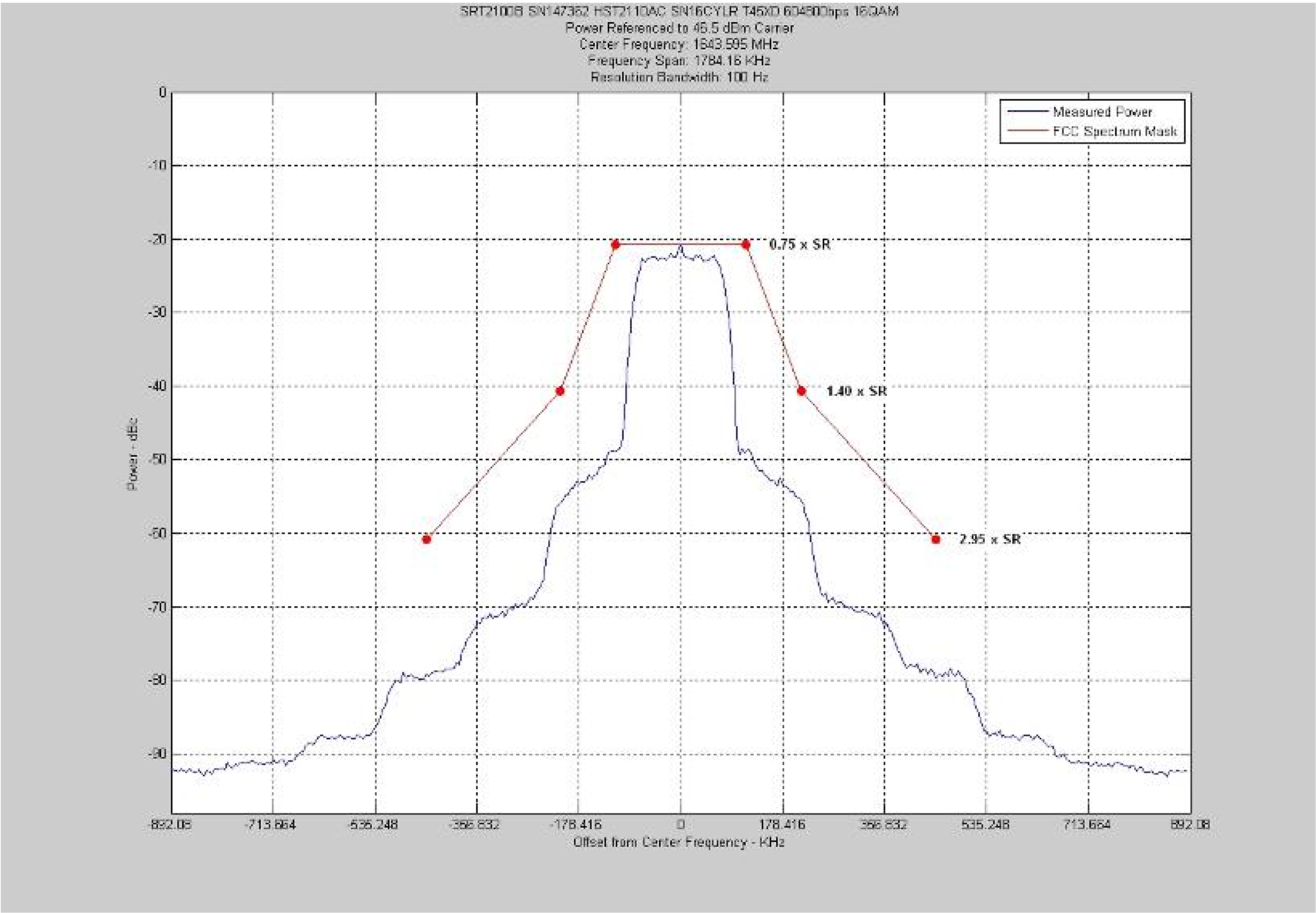


Exhibit F.5 SRT-2100B Field Strength of Spurious Radiation

5.1 FCC Requirements

This discussion and test results shown in this section address and meet the requirements of the following FCC requirements.

Section 2.1053 (a) (b) (2) (3)

(a). Measurements shall be made to detect spurious emissions that may be *radiated* directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emissions. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible reflections, which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the radiated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antenna.

(b). The measurements specified in paragraph (a) of this section shall be made for all equipment:

(2). Operating on frequencies higher than 25 MHz

(3). All equipment where the antenna is an integral part of, and attached directly to the transmitter.

Section 87.139 (i)(1)

(i) – In case of conflict with other provisions of Section 87.139, the provisions of this paragraph shall govern for aircraft earth stations. When using G1D, G1E, or G1W emissions in the 1646.5 – 1660.5 MHz frequency band, the emissions must be attenuated as shown below.

(1) - At rated output power, while transmitting a modulated single carrier, the composite spurious and noise output shall be attenuated below the mean power of the transmitter, pY, by at least:

Frequency (MHz)	Attenuation (dB)[1]
.005 – 1559	83 or (65 + $10\log_{10}$(pY)), whichever is greater
1559 – 18000	55 or (37 + $10\log_{10}$(pY))[2], whichever is greater

[1] these values are expressed in dB below the carrier referenced to a 4 kHz bandwidth and relative to the maximum emission envelope level.

[2] excluding the frequency band of +/- 35 kHz or +/- 4.00 x Symbol Rate, about the carrier frequency, whichever is the greater exclusion.

5.2 Test Procedures

The following procedure is derived from DO-160E, Section 21 and adapted for testing the requirements of section 87.139(i) of FCC Part 87. While RTCA DO-160E does not specify testing above 6 GHz, the same setup and methodology were used to measure radiated emissions up to 18 GHz.

5.2.1 Test Equipment

The following test equipment (or equivalent) shall be used to perform this test:

Equipment	Manufacturer and Model Number	Frequency Range (Bandwidth)
Active whip	RVA-30	10 kHz to 30 MHz
Biconical	EMCO 3104C	25 MHz to 200 MHz
Conical Log Spiral	Stoddart 93490-1	200 MHz to 1 GHz
Double Ridged Guide	EMCO 3115	1 GHz to 18 GHz
Calibrated Cable	RG-400, Adams Russell	NA
LISN	Fischer, FCC-LISN-DO-160	100 kHz - 400 MHz
10 μf Capacitor	Solar 6512-106R	N/A
Spectrum Analyzer	Hewlett Packard, 8566B w/OPT 462	100 Hz - 22 GHz
Preselector	HP 85685A	20 Hz - 2 GHz
Printer	HP Laser Jet	NA
Computer	Gateway	NA
Bus Extender	HP 37204	NA

5.2.2 Conditions

1. Set up the radiated emissions test equipment as shown in Figure 163.
2. Unit operation during radiate emissions measurements will exercise I/O discretes, ARINC 429 buses and the RS-422 antenna bus via loop-back. In addition, all four analog audio circuits and the CEPT-E1 circuit will be tested using loop-backs through individual channel modules. An RF loop-back through a channel module will be performed to check the transmit and receive path, and a CW carrier will be enabled for monitoring.

5.2.3 Measurements

1. Measure and record emissions over the range from 2 MHz to 18,000 MHz using the automated emissions measurement system.
2. Change antennas as required.

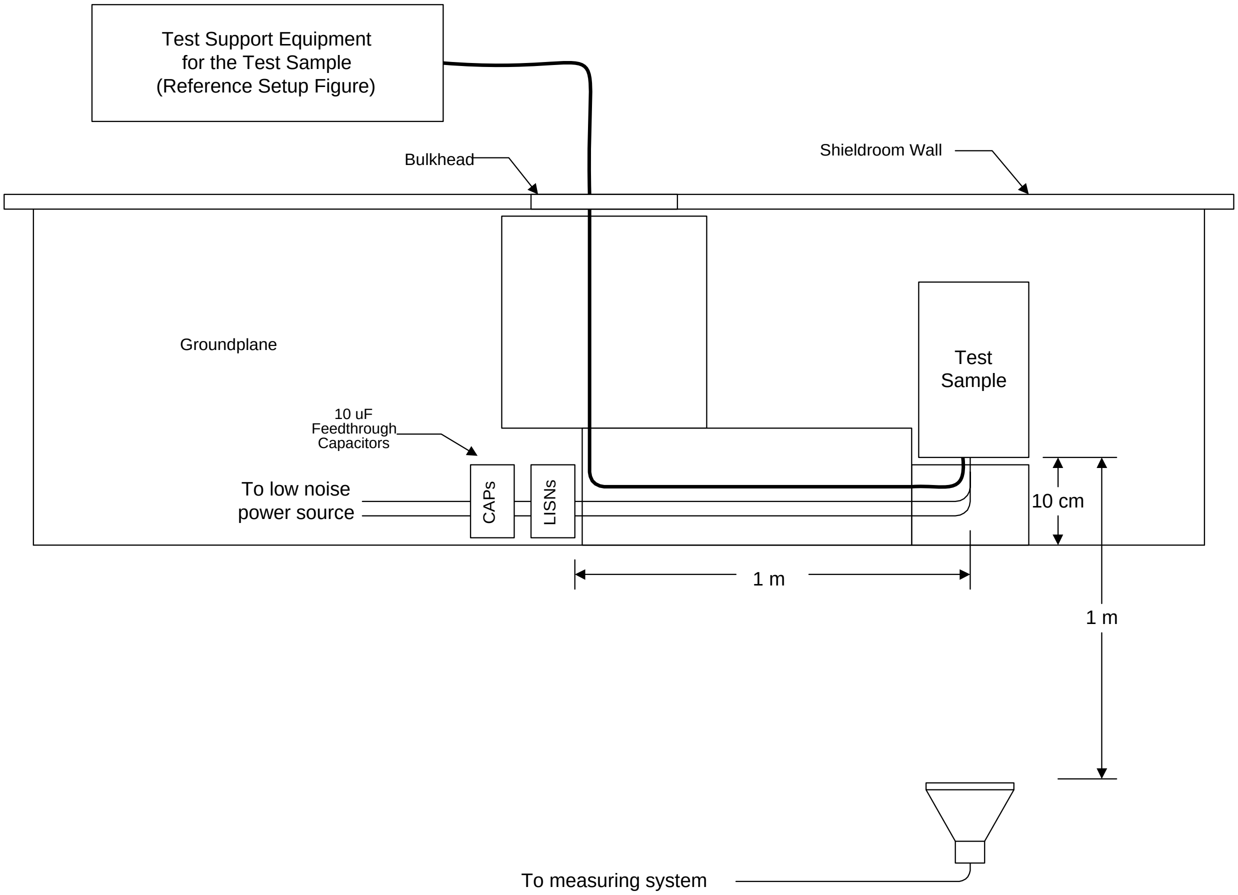


Figure 163 – Typical Test Setup for DO-160E, Paragraph 21.4 Radiated RF Interference

Notes:

1. Terminate all LISN monitor output terminals with 50 ohms.
2. DC Bond resistance between the groundplane and enclosure shall not exceed 2.5 milliohms.
3. The lengths of the power leads from the test sample to the LISNs shall not exceed 1 meter.
4. Excess interconnect cable bundle length will be zigzagged at the back of the test bench, approximately 5 cm above the ground plane. At least 1 meter of EUT cable is to be 10 cm from the front of the test bench and parallel to its front edge.

5.2.4 Reference Field Level Calculations

According to Section 87.139 (I), the radiated spurious emissions are to be attenuated to the same degree as the spurious emissions at the antenna terminals. A reference field level was calculated for comparison with the measured narrow-band data and based on these requirements. The following assumptions were made for these calculations:

1. The intended transmitted signal is radiated through a dipole antenna at 1-meter distance from the point at which the measurements are made.
2. This distance is sufficiently greater than the distance at which the radial component of the E-field is negligible.
3. The peak power available at the dipole antenna is calculated with maximum cable loss at the rated output power. This power would be 16.53 dBW (45 watts) – 2.5 dB (cable loss) = 14.03 dBW (25.29 watts).
4. The duty cycle of the operation is 100%.
5. Section 87.139(i) attenuation requirement is 83 dB.
6. The calculation proceeded as follow:

For a half-wave dipole antenna in free space, in the direction of maximum radiation, the field strength is

$$E = (49.2 * P_t)^{0.5 / R}$$

Where

R = distance in meters

P_t = transmitted power in watts

For a distance of R = 1 meter and the transmitted power of 23.29 watts, the field strength is calculated to be:

$$E = (49.2 * 25.29)^{0.5 / 1} = 35.27 \text{ Volts/meter} = 35.27 * 10^6 \text{ Micro-Volts/meter} = 150.95 \text{ dB}\mu\text{V/meter.}$$

The maximum field strength of the radiated spurious component is then:

150.95 dBµV/M - 83 dB = 67.95 dBµV/M (.005 – 1559 MHz) and 150.95 dBµV/M – 55 dB = 95.95 dBµV/M (1559 – 18000 MHz).

5.3 Field Strength of Spurious Radiation Results

The following data show that all spurious emissions are lower than the limit indicated above. Note that the limit indicated on the plots limits placed by the DO-160E measurement procedure used to plot the data and is not the FCC limit. As per the limits above, they are 67.95 dBµV/M (.005 – 1559 MHz and 95.95 dBµV/M (1559 – 18000 MHz).

Field Strength of Spurious Radiation
List of Figures

Figure Number	Test Frequency Range	Antenna Polarity	SRT used
164	2 MHz to 1 GHz	Vertical	SRT-2100B AC
165	1 GHz to 18 GHz	Vertical	SRT-2100B AC
166	25 MHz to 1 GHz	Horizontal	SRT-2100B AC
167	1 GHz to 18 GHz	Horizontal	SRT-2100B AC
168	2 MHz to 1 GHz	Vertical	SRT-2100B DC
169	1 GHz to 18 GHz	Vertical	SRT-2100B DC
170	25 MHz to 1 GHz	Horizontal	SRT-2100B DC
171	1 GHz to 18 GHz	Horizontal	SRT-2100B DC

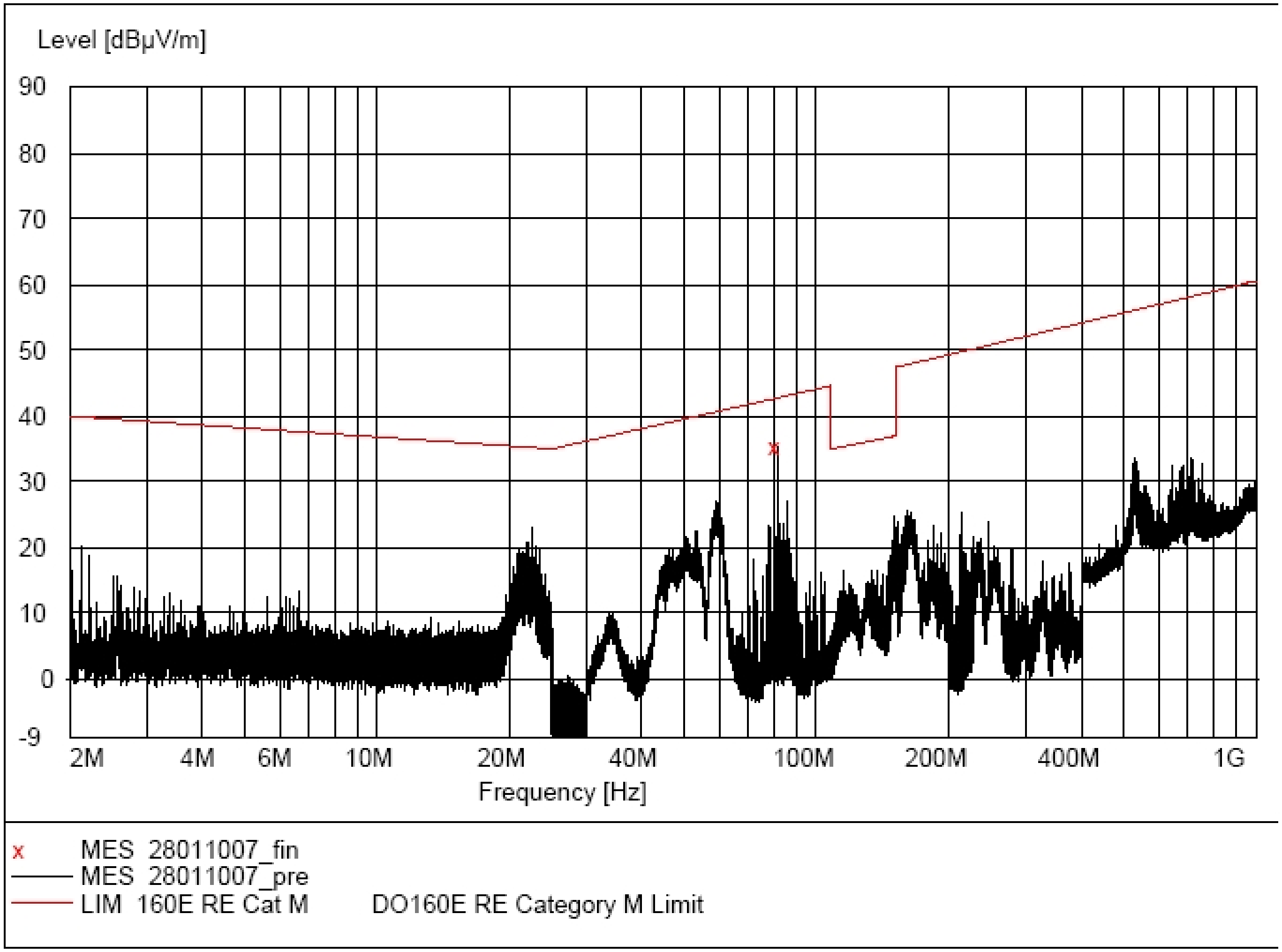


Figure 164 - Field Strength of Spurious Radiation
2 MHz to 1 GHz Vertical - SRT-2100B AC

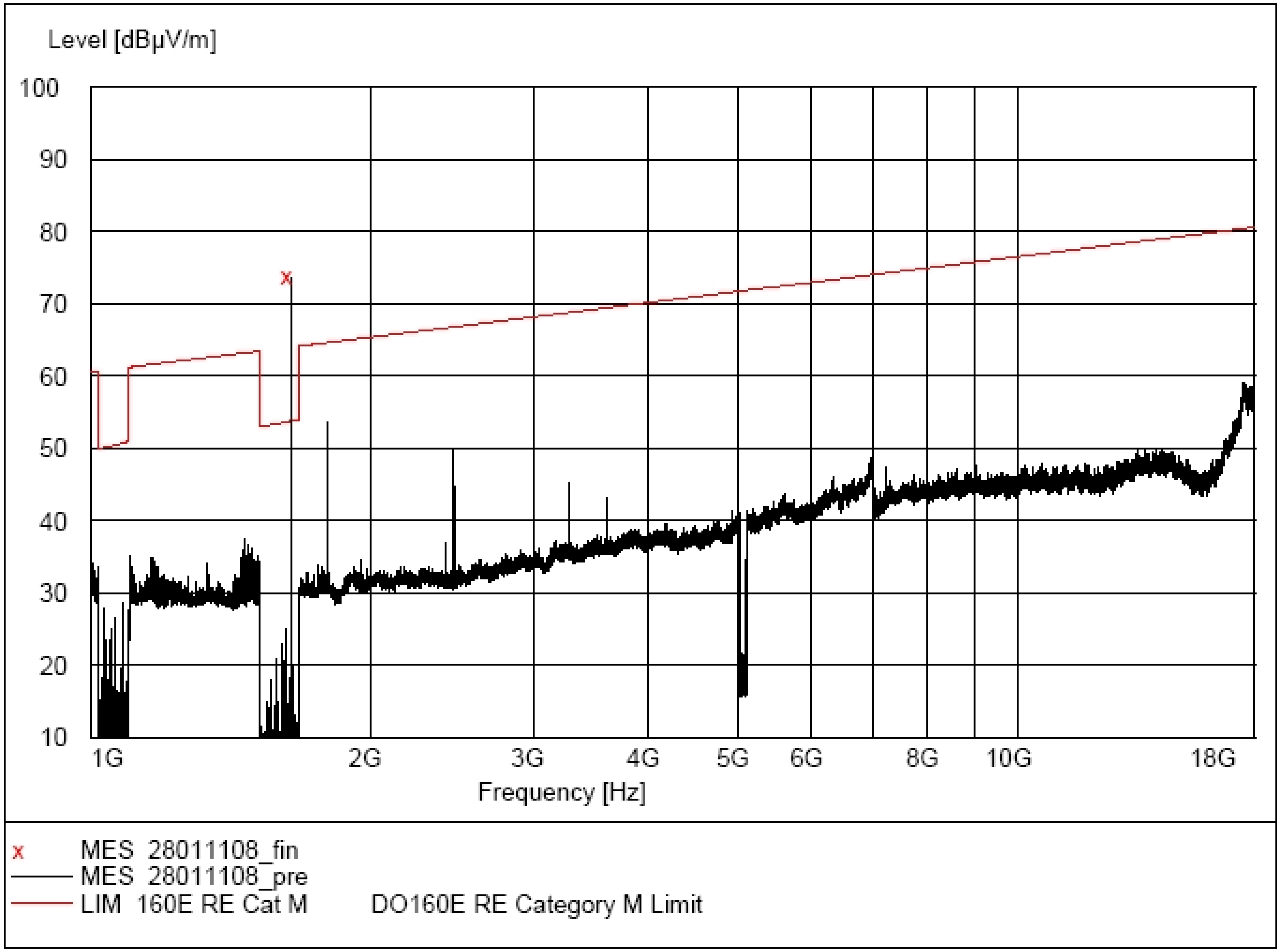


Figure 165 - Field Strength of Spurious Radiation
1 GHz to 18 GHz Vertical - SRT-2100B AC

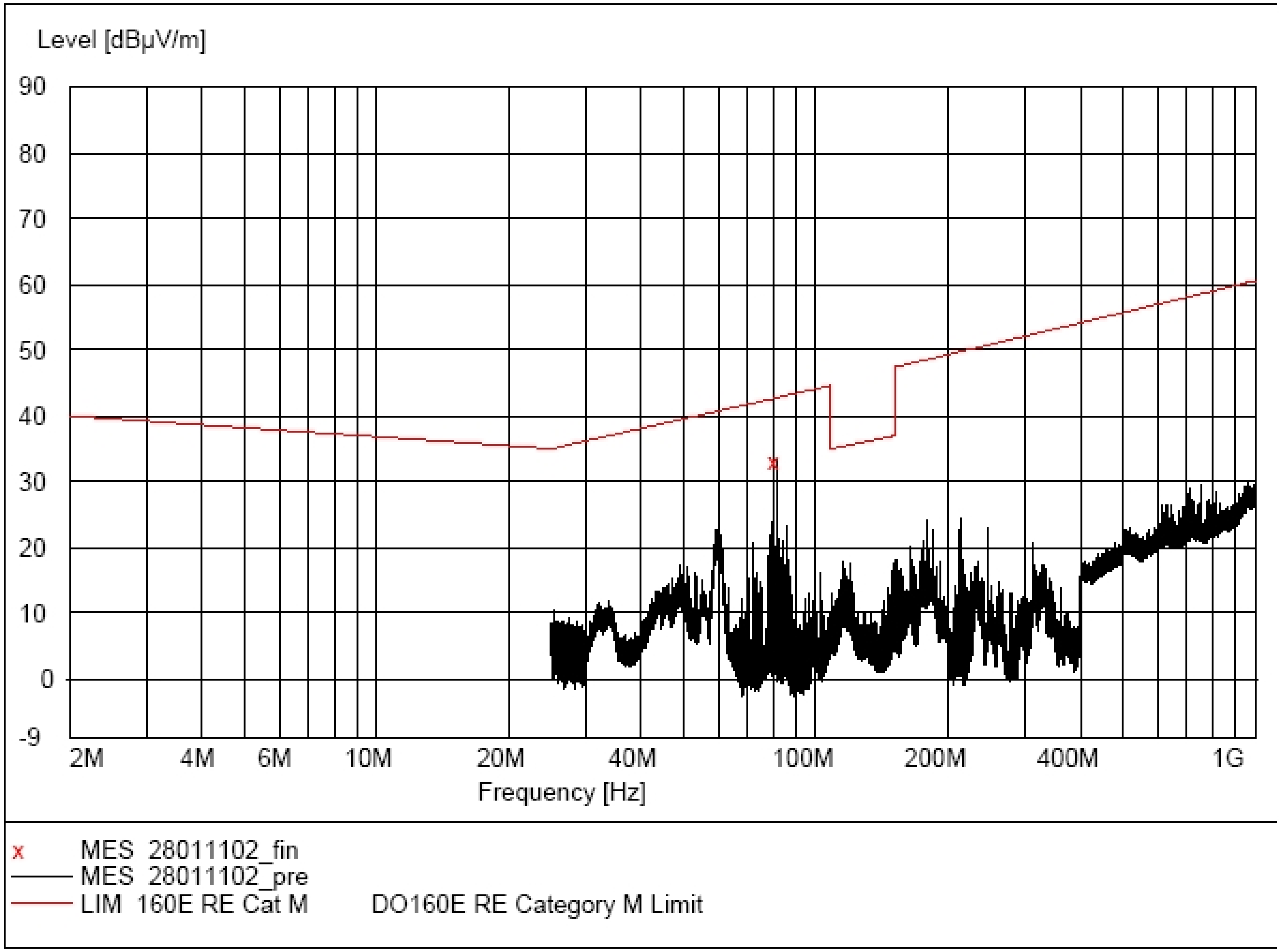


Figure 166 - Field Strength of Spurious Radiation
25 MHz to 1 GHz Horizontal - SRT-2100B AC

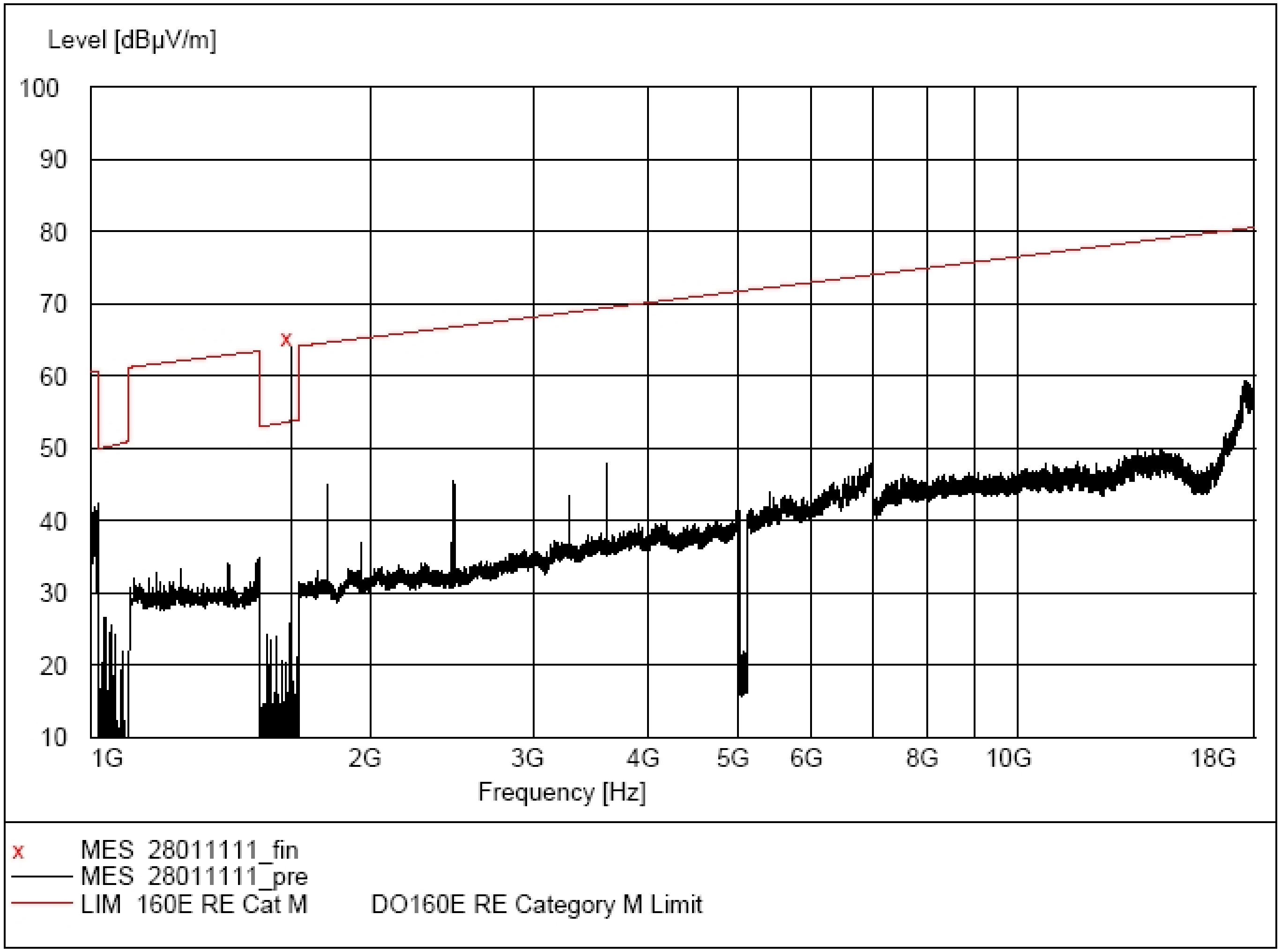


Figure 167 - Field Strength of Spurious Radiation
1 GHz to 18 GHz Horizontal - SRT-2100B AC

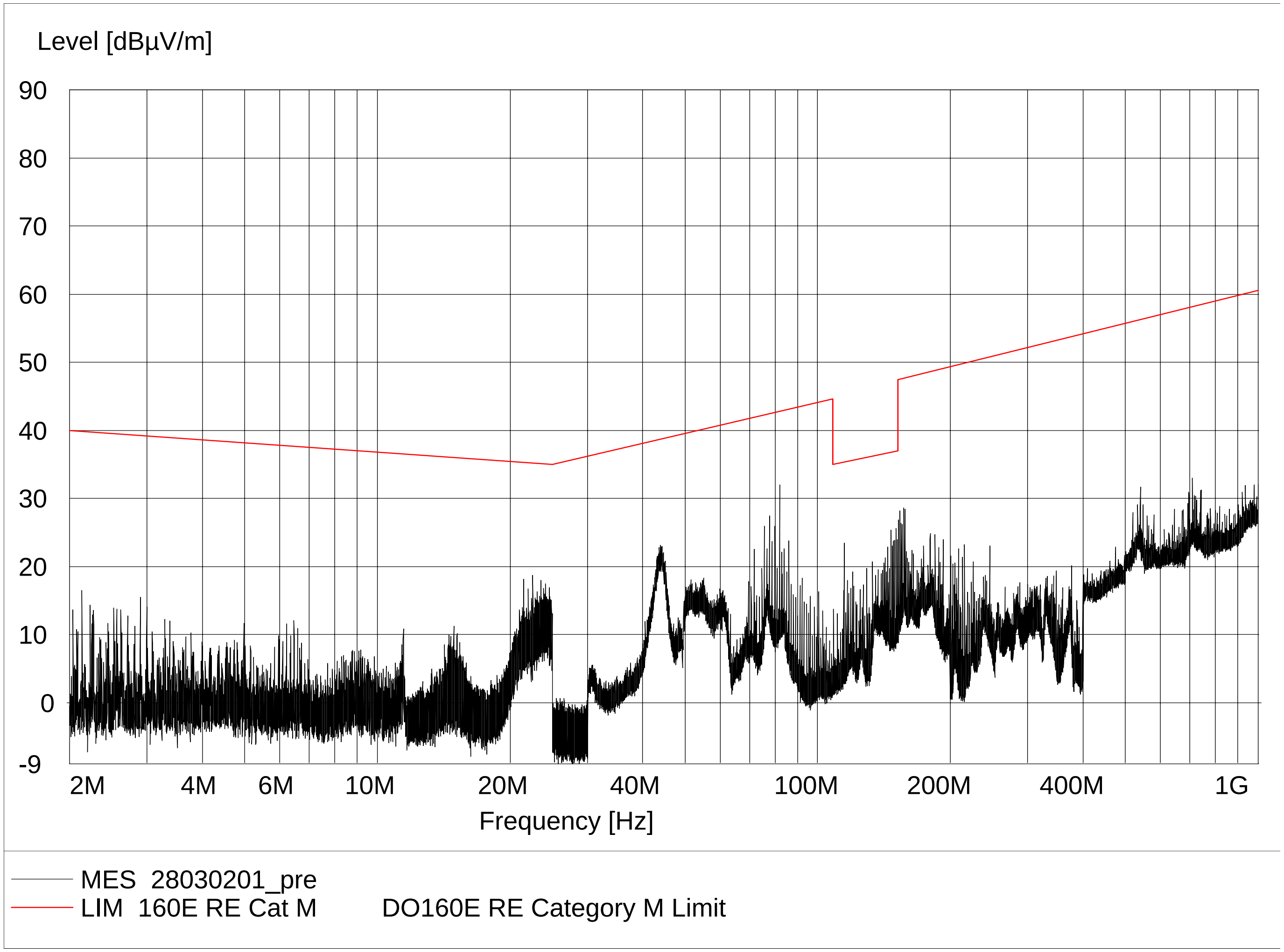


Figure 168 - Field Strength of Spurious Radiation

2 MHz to 1 GHz Vertical - SRT-2100B DC

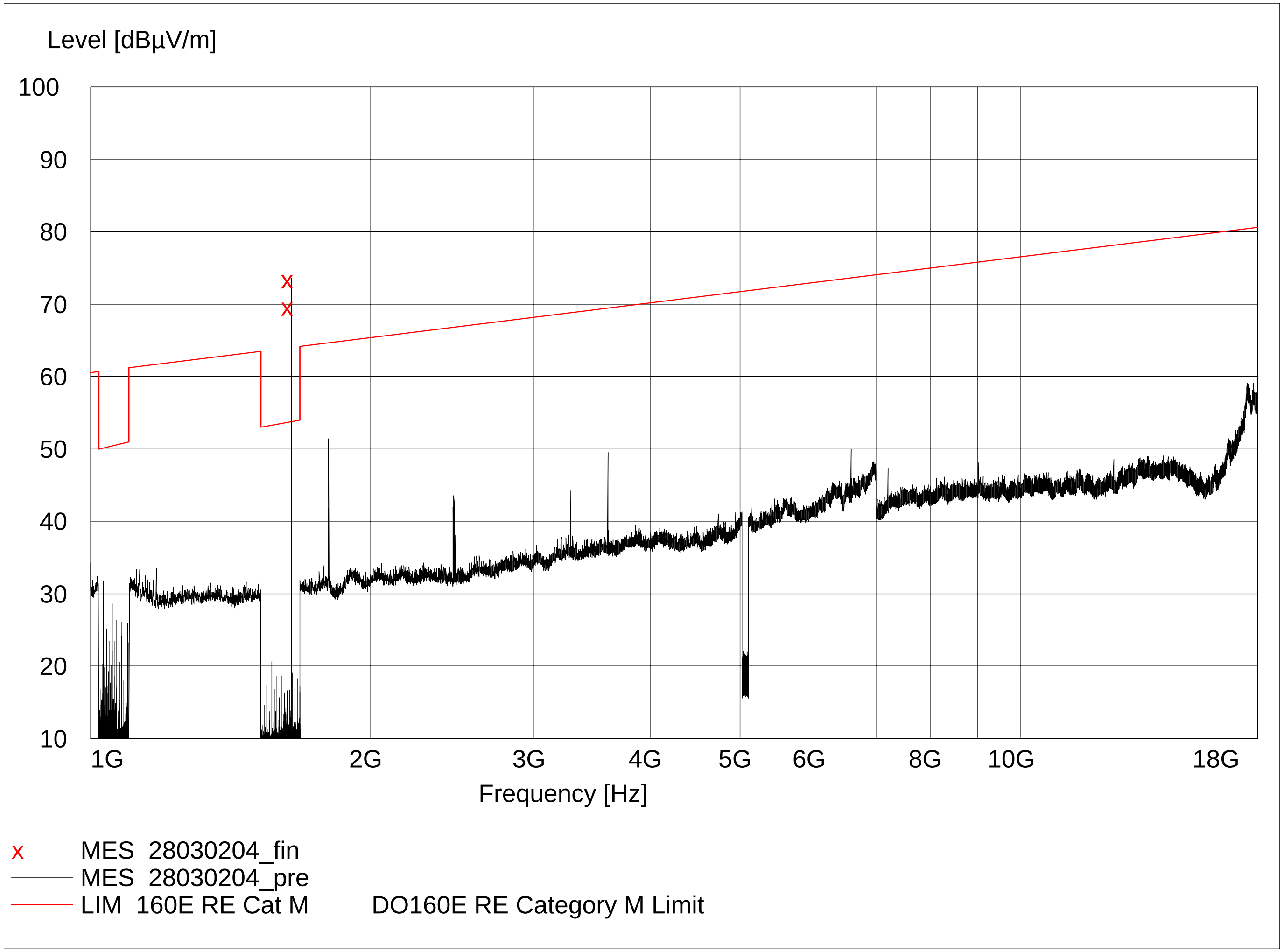


Figure 169 - Field Strength of Spurious Radiation
1 GHz to 18 GHz Vertical - SRT-2100B DC

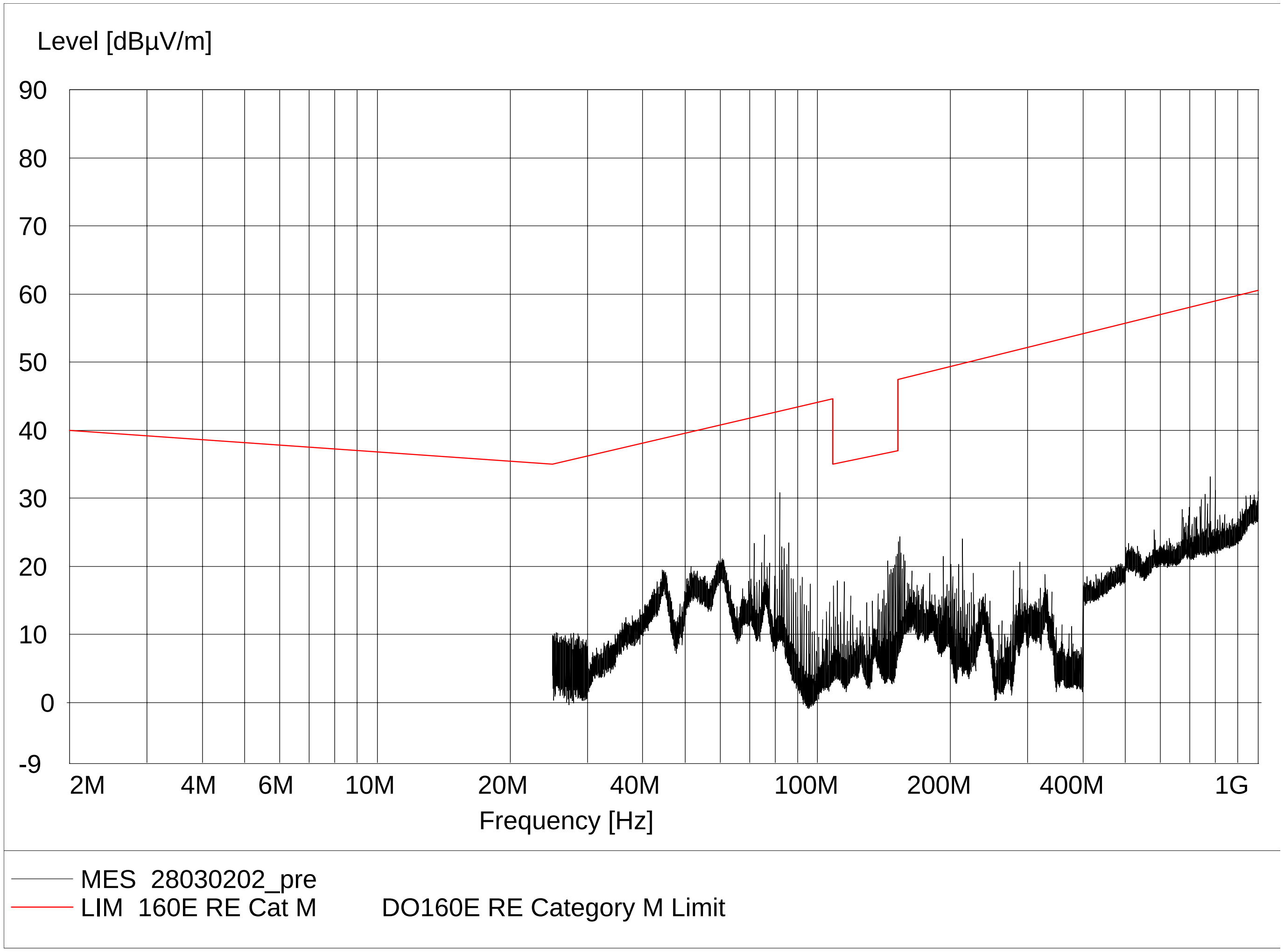


Figure 170 - Field Strength of Spurious Radiation
25 MHz to 1 GHz Horizontal - SRT-2100B DC

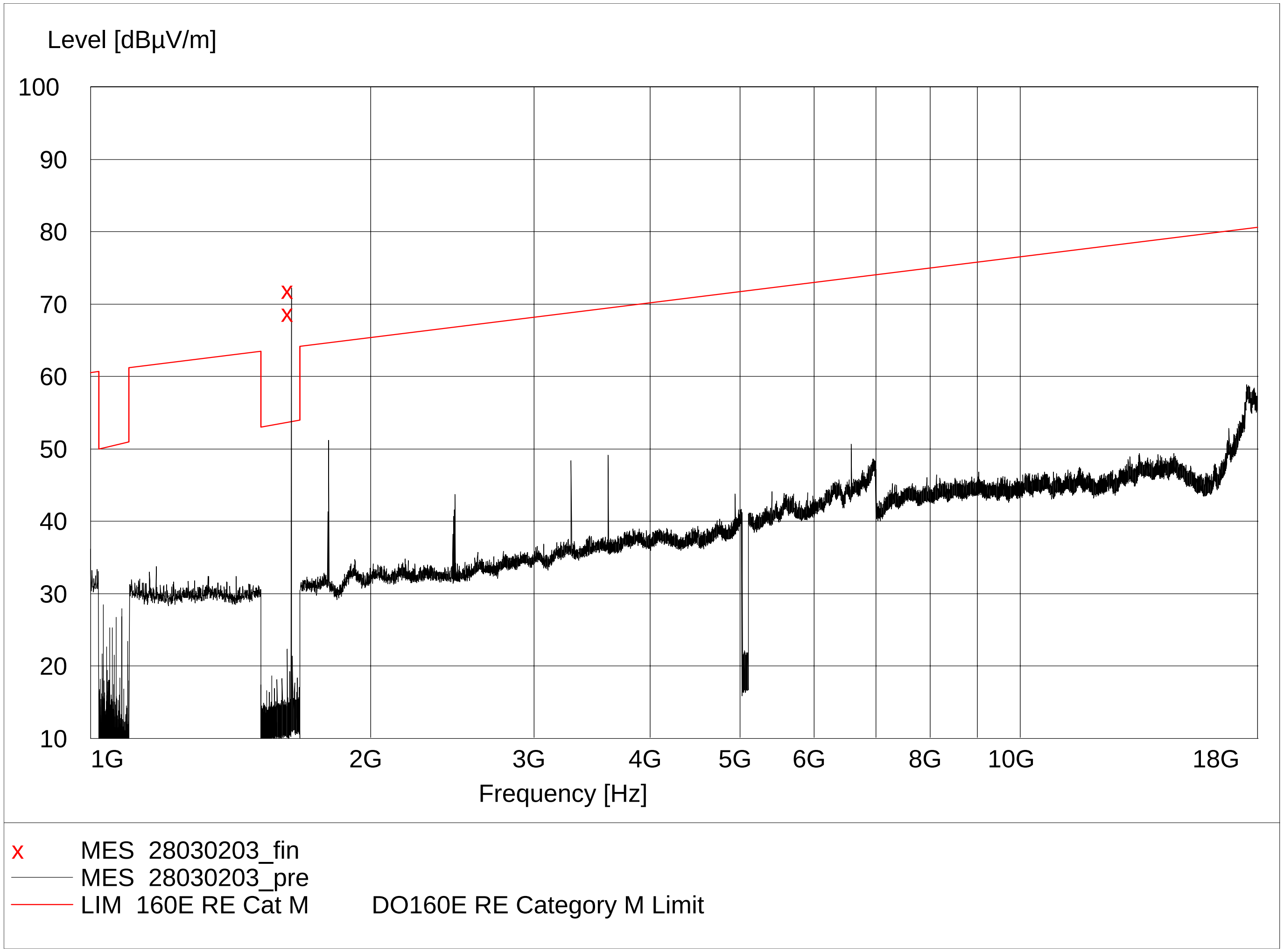


Figure 171 - Field Strength of Spurious Radiation
1 GHz to 18 GHz Horizontal - SRT-2100B DC

Exhibit F.6 SRT-2100B Frequency Stability

6.1 FCC Requirements

The discussion and test results in this section address and meet the requirements of the following FCC requirements:

Section 2.1055 (a) (2), (b), (d) (1) (3)

(a) (2) The frequency stability shall be measured with variation of ambient temperature from –20 to +50 centigrade for equipment licensed for use aboard aircraft in the Aviation Services under part 87 of FCC Code of Federal Regulations Title 47.

(b) The frequency measurements shall be made at the extremes and at intervals of not more than 10 0 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying shall be shown.

(d) (1) (3) The frequency stability shall be measured with variation of primary supply voltage of 85 to 115 percent of the nominal value. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

Section 87.133

The carrier frequency of each station must be maintained within these tolerances:

Frequency band (lower limit exclusive, upper limit inclusive), and categories of stations	Tolerance
Band – 470 to 2450 MHz Aircraft Earth Station	 320 Hz[1]

[1] For purposes of certification, a tolerance of 160 Hz applies to the reference oscillator of the AES transmitter. This is a bench test.

6.2 Frequency Stability Test Procedures

The following test configuration was used to perform the Frequency Stability measurements.

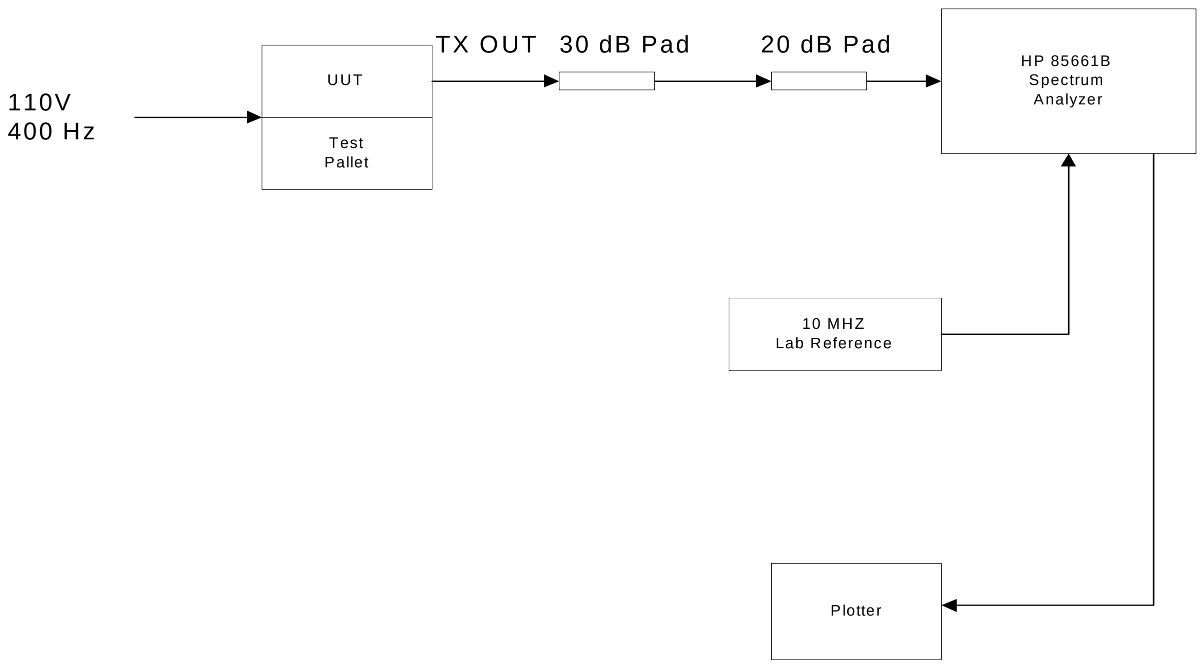


Figure 172 Frequency Stability Setup

6.2.1 Test Equipment

Quantity	Item Description
1	HP8566B1 Spectrum analyzer
1	Test pallet with IP & EM monitoring functions
1	30 dB pad, 25 Watt pad
1	20 dB pad
1	10 MHz high stability reference (stability > 19.2 PPB)
1	temperature chamber
1	400 Hz Variable Transformer

6.2.2 Frequency Drift vs. Temperature (FCC)

1. Place UUT and mount in temperature chamber. Connect UUT and test equipment as shown in Figure 172. Place the UUT in maintenance mode.
2. Bring up an unmodulated carrier from the UUT at 1660.5 MHz. Set the channel module attenuator to 14 dB. Adjust to the RFU attenuator so that the HPA out put power level is at least 2 Watts.
3. Adjust the spectrum analyzer as follows: center frequency = 1660.5 MHz, span = 1 kHz, resolution bandwidth = 10 Hz, video bandwidth = 30 Hz.
4. Bring ambient temperature of UUT up to 50 degrees C. Allow temperature of unit to stabilize.
5. Place marker of spectrum analyzer on peak, plot data and record data on data sheet.
6. Reduce ambient temperature of UUT by 10 degrees C. Allow temperature of unit to stabilize.
7. Place marker of spectrum analyzer on peak, plot data and record data on data sheet.
8. Repeat Steps 6 and 7 until data for –20 degrees C is taken.

6.3 Frequency Stability Results

The SRT-2100B uses the same HSR as the SRT-2100 and the SRT-2000. The results for Frequency Stability for the SRT-2000 are included here.

FCC Frequency Stability Data – AC Power

UUT Type SRT-2000 **UUT S/N** E5

Engineer G. M. Reyes **Date** 3/19/99

Temperature and Voltage Variation

Carrier Frequency 1660.500000 MHz

Low voltage (L): 85 x 115 VAC = 97.8 VAC, 400 Hz
Nominal Voltage (N): 1x115 VAC, 400 Hz
High Voltage (H): 1.15 x 115 VAC = 132.3 VAC, 400 Hz

Table 6 Frequency Stability AC Powered

Temp (°C)	Voltage (AC, 400Hz)	Measured Frequency (Hz)	Expected Carrier - Measured Carrier (Hz)	Pass/Fail
+50	L	1660500037	37	P
	N	1660500037	37	P
	H	1660500037	37	P
+40	L	1660500037	37	P
	N	1660500038	38	P
	H	1660500039	39	P
+30	L	1660500040	40	P
	N	1660500039	39	P
	H	1660500040	40	P
+20	L	1660500038	38	P
	N	1660500038	38	P
	H	1660500038	38	P
+10	L	1660500039	39	P
	N	1660500039	39	P
	H	1660500038	38	P
0	L	1660500043	43	P
	N	1660500044	44	P
	H	1660500043	43	P

Temp (°C)	Voltage (AC, 400Hz)	Measured Frequency (Hz)	Expected Carrier - Measured Carrier (Hz)	Pass/Fail
-10	L	1660500048	48	P
	N	1660500048	48	P
	H	1660500048	48	P
-20	L	1660500040	40	P
	N	1660500038	38	P
	H	1660500039	39	P

UUT passes if the frequency deviation between expected carrier and measured carrier is within ± 160Hz.

FCC Frequency Stability Data – DC Power

UUT Type SRT-2000 **UUT S/N** E5
Engineer G. M. Reyes **Date** 3/29/99

Temperature and Voltage Variation

Carrier Frequency 1660.500000 MHz

Low voltage .85 x 28 VDC = 23.8 VDC
Nominal Voltage = 28 VDC
High Voltage = 1.15 x 28 VDC = 32.2 VDC

Table 7 Frequency Stability DC Powered

Temp (°C)	Input DC Voltage	Measured Frequency (Hz)	Expected Carrier - Measured Carrier (Hz)	Pass/Fail
+50	L	1660500016	16	P
	N	1660500021	21	P
	H	1660500016	16	P
+40	L	1660500017	17	P
	N	1660500017	17	P
	H	1660500016	16	P
+30	L	1660500015	15	P
	N	1660500015	15	P
	H	1660500014	14	P
+20	L	1660500014	14	P
	N	1660500014	14	P

Temp (°C)	Input DC Voltage	Measured Frequency (Hz)	Expected Carrier - Measured Carrier (Hz)	Pass/Fail
	H	1660500014	14	P
+10	L	1660500012	12	P
	N	1660500012	12	P
	H	1660500012	12	P
0	L	1660500016	16	P
	N	1660500016	16	P
	H	1660500016	16	P
-10	L	1660500021	21	P
	N	1660500021	21	P
	H	1660500021	21	P
-20	L	1660500014	14	P
	N	1660500015	15	P
	H	1660500015	15	P

UUT passes if the frequency deviation between expected carrier and measured carrier is within ± 160Hz.

Exhibit F.7 SRT-2100B Priority and Preemption

The SRT-2100 AES dedicates one of its available channels to a continuous data link capability with the GES to which it is logged on. This data channel continuously monitors the GES P channel signal, and transmits R or T channel messages to the GES. Transmission is based on need to respond to GES requests, to request channel assignments (as may be required to place air to ground calls) or to transmit data from the onboard data link sources. GES to AES call requests are made on the P channel – providing information such as C channel frequency selection and the priority of the call. AES to GES calls are initiated by the AES on the R channel – providing call priority and destination information. In return, when accepted by GES, AES is provided a C channel frequency assignment.

The priority, which is assigned to each call, as it originates, provides the basis for handling of the call within the AES and GES. These priorities are established and the requirements for their use are defined in Inmarsat System Definition Manual. Inmarsat also specifies a number of protocol tests, which must be completed to verify that the AES complies with the priority and preemption requirements. For AES to GES calls, the pilot specifies the nature (priority) of the call as a part of the call set up procedure. If the AES resources are exhausted, the pilot is prompted to select whether to preempt a lower priority call (cabin call), or have the call queued until resources are available. This operation is in “real time” in the sense that the pilot makes the decision at the time that the call is placed. If he elects to queue the call, he can later use the preempt feature if the situation warrants. Selection of the preemption feature will terminate one of cabin calls which is in progress and will make that channel resource available for the call. For GES to AES calls, the pilot involvement is not practical. As an upcoming call request is made to the AES, the SRT-2100 system processor examines the status of the channel modules to determine if any channel is available for assignment. The processor also examines the status of the cockpit lines to determine their availability. If the incoming call priority is “Cockpit Safety” or greater and a cockpit line is available and all channel modules are in use, one of the cabin calls will be terminated and that channel module resource will be used to complete the call. If the cockpit line(s) are busy and the incoming call is of greater priority than one of calls currently placed, that call will be terminated and the resources used for the incoming call. In the event that call has the same or lower priority than the cockpit calls already placed, it will be rejected by the AES.

7.1 FCC Requirements

The discussion and test results shown in this section address and meet the requirements of the following FCC requirements:

Section 87.187 (q)

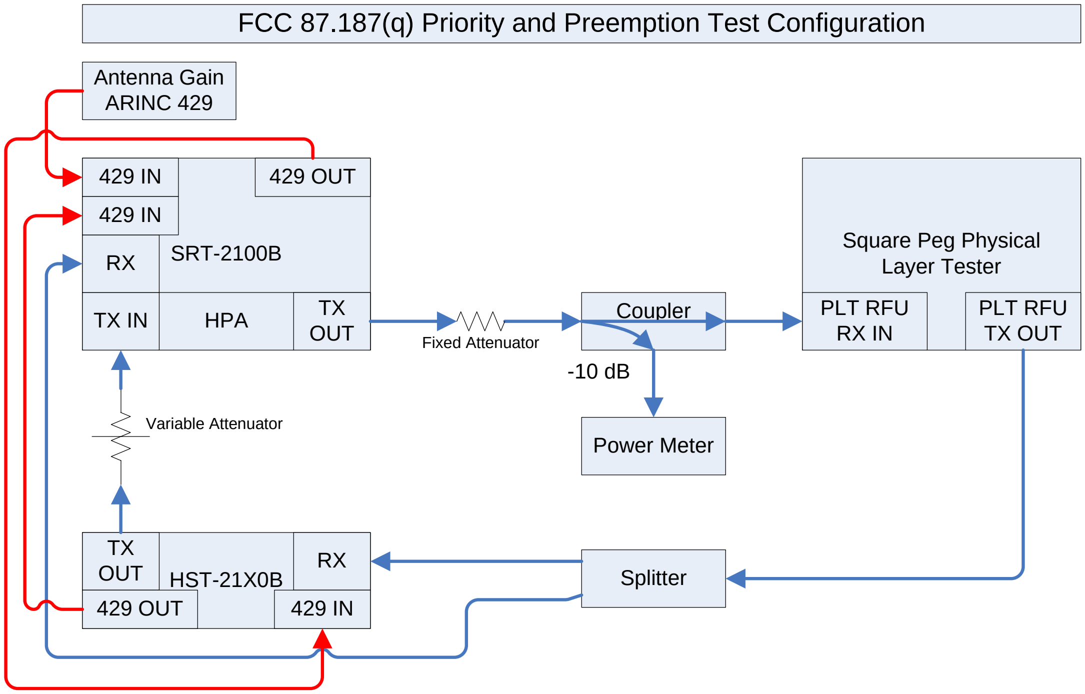
In the frequency bands 1549.500-1558.500 MHz and 1651.000-1660.000 MHz, the Aeronautical Mobile-Satellite requirements that cannot be accommodated in the distress and safety frequency bands 1544.0-1545.0 MHz and 1645-1646.5 MHz shall have priority access with real-time preemptive capability for communications in the Mobile-Satellite Service.

Section 87.189 (e)

Transmission of public correspondence must be suspended when such operation will delay or interfere with message pertaining to safety of life and property or regularity of flight, or when ordered by the captain of the aircraft.

7.2 Test Procedures

The following test configuration was used to perform the Classic Aero / Swift 64 and Classic Aero / Swift Broadband Priority and Preemption Measurements.



7.2.1 Test Equipment

Item	Manufacturer	PN	SN	Notes
SRT-2100 B	Rockwell Collins	822-1785-001	147362	AC Powered
HST-2120 B	Rockwell Collins	270-2885-070	564	DC Powered
Physical Layer Tester	Square Peg Communications, Inc.	EM-907532C-04	PLTH_080	
Physical Layer Tester Radio Frequency Unit	Square Peg Communications, Inc.	EM-907516C-01	23	
Power Meter	HP	438A	22A05518	
Variable Attenuator	Weinschel	910-20-11	7936	
Fixed Attenuator (30dB)	Weinschel	58-30-34-LIM	PF562	
Fixed Attenuator (10dB)	Weinschel	2	BN0739	
Directional Coupler	Narda	3002-10	70612	
Splitter	Mini-circuits	ZAPD-2	460-0206-551	

7.2.2 Priority and Preemption – Classic Aero/ Swift Broadband

FCC Requirements detailed in sections 87.131 (RF Power Output) and 87.187(q) (Priority and Preemption) were tested with a combined procedure in which Classic Aero voice services were exercised in concert with Swift Broadband services. During the test procedure the output EIRP of the Classic Aero voice services and Swift Broadband data services were varied along with antenna gain in order to demonstrate accurate power control and, when necessary, the preemption of lower priority services in order to maintain output EIRP for higher priority services. Table 8 below documents the various conditions and records the predicted, measured and reported RF power output in order to demonstrate compliance.

7.2.3 Priority and Preemption – Classic Aero/ Swift 64

FCC Requirements detailed in sections 87.131 (RF Power Output) and 87.187(q) (Priority and Preemption) were tested with a combined procedure in which Classic Aero voice services were exercised in concert with Swift 64 services. During the test procedure the output EIRP of the Classic Aero voice services and Swift 64 data services were varied along with antenna gain in order to demonstrate accurate power control and, when necessary, the preemption of lower priority services in order to maintain output EIRP for higher priority services. Table 9 below documents the various conditions and records the predicted, measured and reported RF power output in order to demonstrate compliance.

Table 8 RF Power Output – Classic Aero/ Swift Broadband

HPA -> ANT Cable Loss (dB)	2.00
Data Reservation (dBW)	10.50

		High Priority	Low Priority	Public Priority										
	Ant Gain (dBi)	Aero Call 1 (dBW EIRP)	Aero Call 2 (dBW EIRP)	HST Allocated EIRP (dBW)	HST Reported EIRP (dBW)	Calculated HPA Output (dBm)	Reported HPA Output (dBm)	Measured HPA Output (dBm)	Power Accuracy Results (P/F)	Calculated HPA Output (Watts)	Measured HPA Output (Watts)	Available HPA Output (Watts)	Margin	Preemption Results (P/F)
	18.00	18.50	18.50	20.00	16.00	36.59	36.45	36.42	PASS	4.56	4.39	43.21	38.82	PASS
	17.00	18.50	17.50	20.00	16.00	37.22	37.11	37.27	PASS	5.28	5.33	42.74	37.41	PASS
	16.00	18.50	16.50	20.00	16.00	37.91	37.44	37.46	PASS	6.18	5.57	42.16	36.59	PASS
	15.00	18.50	15.50	20.00	16.00	38.65	38.26	38.22	PASS	7.32	6.64	41.42	34.78	PASS
	14.00	18.50	14.50	20.00	16.00	39.42	38.92	39.02	PASS	8.76	7.98	40.49	32.51	PASS
	13.00	18.50	13.50	20.00	16.00	40.24	39.41	39.74	PASS	10.56	9.42	39.33	29.91	PASS
	12.00	17.50	12.50	20.00	16.00	40.56	39.25	38.98	PASS	11.38	7.91	37.86	29.95	PASS
	11.00	16.50	11.50	20.00	16.00	40.94	39.41	39.31	PASS	12.41	8.53	36.01	27.48	PASS
	10.00	15.50	10.50	20.00	16.00	41.37	40.07	39.64	PASS	13.71	9.20	33.68	24.48	PASS
	9.00	14.50	10.50	20.00	16.00	41.99	41.06	41.21	PASS	15.81	13.21	30.75	17.54	PASS
	8.00	13.50	10.50	20.00	16.00	42.66	41.55	41.42	PASS	18.44	13.87	27.06	13.20	PASS
	7.00	12.50	10.50	20.00	16.00	43.38	42.38	42.30	PASS	21.76	16.98	22.42	5.44	PASS
HST Preempted	7.00	12.50	11.50	0.00	0.00	40.17	39.41	39.79	PASS	10.41	9.53	41.45	31.92	PASS
HST Preempted	7.00	16.50	18.50	0.00	0.00	45.66	45.84	45.82	PASS	36.83	38.19	41.45	3.26	PASS
HST Preempted	7.00	17.50	18.50	0.00	0.00	46.07	46.16	46.17	PASS	40.49	41.40	41.45	0.05	PASS
Low Priority Call Preempted	7.00	18.50	0.00	0.00	0.00	43.62	43.69	43.70	PASS	23.02	23.44	41.45	18.01	PASS
HST Preempted	7.00	17.50	18.50	0.00	0.00	46.07	46.16	46.17	PASS	40.49	41.40	41.45	0.05	PASS
HST Preempted	8.00	0.00	18.50	0.00	0.00	42.62	42.71	42.68	PASS	18.29	18.54	42.18	23.65	PASS
	9.00	0.00	18.50	20.00	16.00	43.48	44.35	44.17	PASS	22.27	26.12	30.75	4.63	PASS
	10.00	0.00	12.50	20.00	16.00	39.68	40.89	40.84	PASS	9.29	12.13	33.68	21.55	PASS
	11.00	0.00	12.50	20.00	16.00	38.68	39.91	39.33	PASS	7.38	8.57	36.01	27.44	PASS
	12.00	0.00	12.50	20.00	16.00	37.68	38.92	38.64	PASS	5.86	7.31	37.86	30.55	PASS
	13.00	0.00	12.50	20.00	16.00	36.68	37.93	37.82	PASS	4.65	6.05	39.33	33.27	PASS
	14.00	0.00	12.50	20.00	16.00	35.68	36.94	36.91	PASS	3.70	4.91	40.49	35.59	PASS
	15.00	0.00	12.50	20.00	16.00	34.68	36.28	35.89	PASS	2.94	3.88	41.42	37.54	PASS
	16.00	0.00	12.50	20.00	16.00	33.68	34.96	34.16	PASS	2.33	2.61	42.16	39.55	PASS
	17.00	0.00	12.50	20.00	16.00	32.68	34.14	32.74	PASS	1.85	1.88	42.74	40.86	PASS
	18.00	0.00	12.50	20.00	16.00	31.68	33.15	32.75	PASS	1.47	1.88	43.21	41.32	PASS

Table 9 RF Power Output – Classic Aero/ Swift 64

Minimal Cable Loss				Nominal Cable Loss				Maximum Cable Loss		Total EIRP = Max OutdBW + Ant Gain - Ant to HPA Loss								
HPA ref (Watts)	45			HPA ref (Watts)	45			HPA ref (Watts)	45	HST1 Out = HST EIRP - Ant Gain + Ant to HPA Loss - 31 + HST Offset (Loss) + 30								
Max HPA out (dB) :	0			Max HPA out (dB	0			Max HPA out (dB) :	0									
Max Out dBW	16.53			Max Out dBW	16.53			Max Out dBW	16.53									
Max Out dBm :	46.53			Max Out dBm :	46.53			Max Out dBm :	46.53									
Ant to HPA Loss :	2			Ant to HPA Loss :	2			Ant to HPA Loss :	2									
HST max Out (dBm)	31.5			HST max Out (dB	31.5			HST max Out (dBm) :	31.5									
HST1 Offset (loss) :	-1.3			HST1 Offset (loss)	0.5			HST1 Offset (loss) :	1.4									
HST2 Offset (loss) :	-1.3			HST2 Offset (loss)	0.5			HST2 Offset (loss) :	1.4									
RFU to HPA Attn =	5	---------		RFU to HPA Attn :	5	-------		RFU to HPA Attn =	5	-----------								
HST1 to HPA Attn =	3.7	0		HST1 to HPA Attn	5.5	1		HST1 to HPA Attn =	6.4	2								
HST2 to HPA Attn =	3.7	-----------		HST2 to HPA Attn	5.5	-----------		HST2 to HPA Attn =	6.4	-----------								
Nominal Cable Loss										Calculated	Actual	Calculated	Actual		Dual HST			
Ant Gain	Total EIRP	Data	EIRP Call 1	EIRP Call 2	Avail EIRP	HST1 EIRP	2 HST EIRP	HST1 Out	HST2 Out	Rpt Avail	Rpt Avail	Back Off	Back Off		Measured HPA Out	Computed HPA at output Trace	error	Pass/Fail
dB	dBW	dBW			dBW	dBW	dBW	dBm	dBm	dBW	dBW	dB	dB		dBm	dBm	dB	(+2.5/- 1.0 dB)
12	26.53	10.50	-100	-100	26.42	22.5	19.5	12.00	12.00	24.17	26.00	10.00	10.00	44.26	44.68	44.19	-0.07	PASS
12	26.53	10.50	-100	-100	26.42	20.5	17.5	10.00	10.00	25.14	26.50	10.00	10.00	42.26	42.65	42.38	0.12	PASS
12	26.53	10.50	-100	-100	26.42	18.5	15.5	8.00	8.00	25.66	27.00	10.00	10.00	40.26	40.74	39.91	-0.35	PASS
12	26.53	10.50	12.5	-100	26.24	18.5	15.5	8.00	8.00	25.44	26.50	10.00	10.00	40.94	41.29	40.73	-0.21	PASS
12	26.53	10.50	11.5	-100	26.28	18.5	15.5	8.00	8.00	25.49	26.50	10.00	10.00	40.81	41.11	40.40	-0.41	PASS
12	26.53	10.50	10.5	-100	26.31	18.5	15.5	8.00	8.00	25.52	26.50	10.00	10.00	40.70	41.11	40.40	-0.30	PASS
12	26.53	10.50	10.5	12.5	26.13	18.5	15.5	8.00	8.00	25.30	26.50	10.00	10.00	41.31	41.68	41.22	-0.09	PASS
12	26.53	10.50	10.5	11.5	26.16	18.5	15.5	8.00	8.00	25.35	26.50	10.00	10.00	41.19	41.55	41.06	-0.13	PASS
12	26.53	10.50	10.5	10.5	26.19	18.5	15.5	8.00	8.00	25.39	26.50	10.00	10.00	41.10	41.47	40.89	-0.21	PASS
13	27.53	10.50	10.5	10.5	27.27	18.5	15.5	7.00	7.00	26.65	28.00	11.00	10.50	40.10	40.54	39.91	-0.19	PASS
14	28.53	10.50	10.5	10.5	28.32	18.5	15.5	6.00	6.00	27.84	29.00	12.00	11.50	39.10	39.52	38.92	-0.18	PASS
15	29.53	10.50	10.5	10.5	29.37	18.5	15.5	5.00	5.00	28.99	30.00	13.00	12.50	38.10	38.56	37.93	-0.17	PASS
16	30.53	10.50	10.5	10.5	30.40	18.5	15.5	4.00	4.00	30.11	31.00	14.00	13.50	37.10	37.51	36.94	-0.16	PASS
11	25.53	10.50	10.5	10.5	25.10	18.5	15.5	9.00	9.00	24.03	25.50	9.00	8.50	42.10	42.37	42.21	0.11	PASS
10	24.53	10.50	10.5	10.5	23.98	18.5	15.5	10.00	10.00	22.54	24.00	8.00	7.50	43.10	43.37	43.20	0.10	PASS
9	23.53	10.50	10.5	10.5	22.83	18.5	15.5	11.00	11.00	20.83	22.50	7.00	6.50	44.10	44.40	44.19	0.09	PASS
8	22.53	10.50	10.5	10.5	21.63	18.5	15.5	12.00	12.00	18.73	21.00	6.00	5.50	45.10	45.41	45.01	-0.09	PASS
7	21.53	10.50	10.5	10.5	20.36	18.5	15.5	13.00	13.00	15.78	22.00	5.00	6.50	46.10	46.31	46.00	-0.10	PASS
6	HSD Preempted											4.00						

7.3 Priority and Preemption Results

In all cases, the priority and preemption test results shown in Tables 8 and 9 meet the requirements.