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FCC Proof of Performance and FCC Acceptance Test

Prepared by:

Rohde & Schwarz, Inc.

Prepared for:

FCC

Channel 39

**Rohde & Schwarz America
Columbia, MD**

Performed By:

**Glen P. Hurst
Transmission System Engineer**

Dated: January 4, 2011



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General Information

Transmitter Manufacture	Rohde & Schwarz
Model Number	SLX8000A
Part Number	2100.100K31
Serial Number	100144
Modulation	ATSC
Total Output Power of Transmitter (TPO)	150 W
Total Output Power of Filter (TPOF)	110 W
Pilot Frequency	620.309441 Mhz
Call Sign	
Customer	
Channel	39
License/CP	
Facility ID	
Filter Manufacturer	Dielectric
Type	Reflective
Part Number	11000011371
Insertion Loss	1.049 dB
Antenna Manufacturer	N/A
Part Number	
Line Manufacturer	
Size	
Line Length	
Transmitter Location / GPS Coordinates	
Address	
City	
State, zip	
Studio Location / GPS Coordinates	
Address	
City	
State, zip	



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Test Equipment Used

Type	Stock Number	Serial Number	Owner	Cal. Due date
ETL	2112.0004K13	101784	RSA	8/11
FSU	1166.1660.08	200274	RSA	12/11
NRP-Z91	1168.8004.02	100021	RSA	10/11
ZVL	1303.6509K06	101176	RSA	6/11

Installed Software

Device	Version
SLX800A	1.24.1

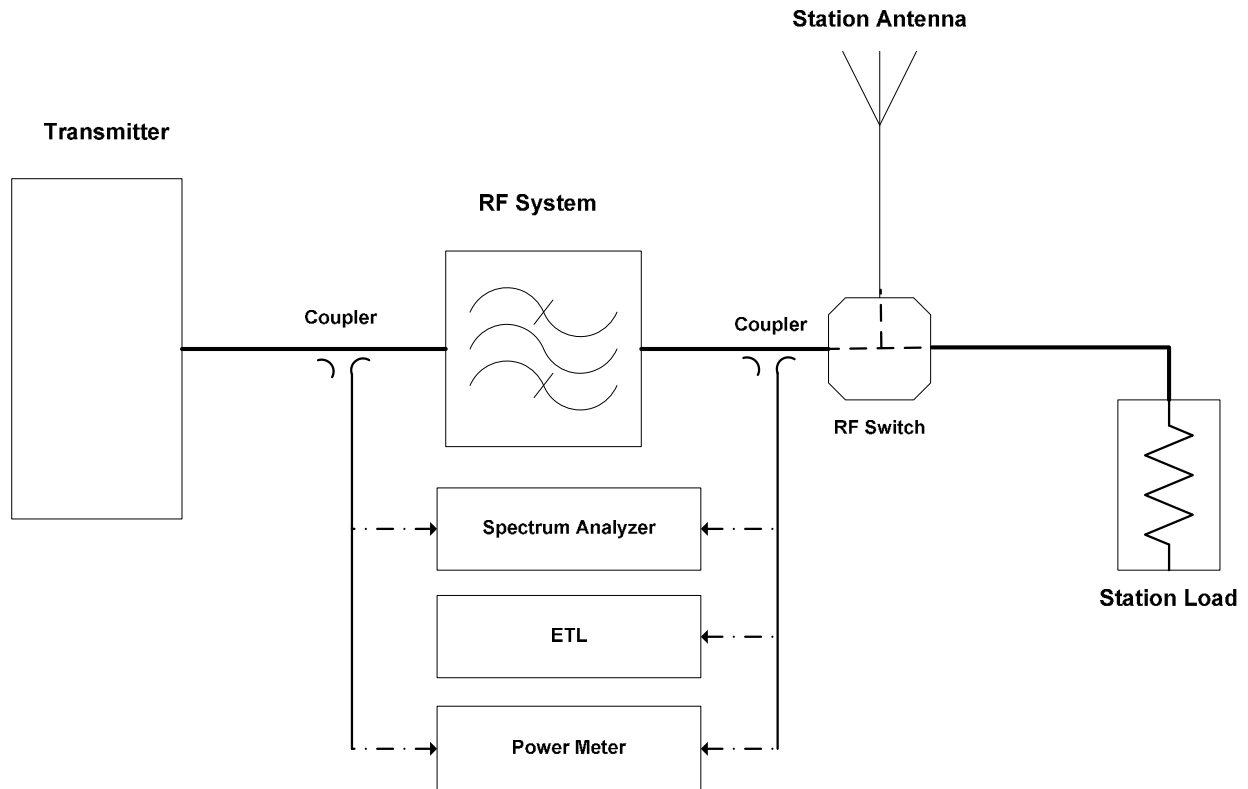
CH 39

Model # SLX800A

Part # 2100.100K31

Serial # 100144

Equipment Test Setup



Pads, cables, and notch filter were utilized as needed.



FCC Proof of Performance Test Data

1. Output Power Measurements	Rated	Actual	Result
1.1 Nominal output power from transmitter	150W	150.11 W See page 6	OK
1.2 Nominal output power after Mask Filter (TPOF)	110 W	109.75 W See page 6	OK
1.3 Read from display	+/- 5% of P_{rated}	149.3 W See page 7	OK
1.4 Coupling attenuation @ transmitter	36.50 dB	36.50 dB	OK
1.5 Coupling attenuation after Mask Filter	36.50 dB	36.50 dB	OK

2. Spectrum Measurements	Rated	Actual	Result
FCC Mask Filter Plot <i>Figures: 2.A and 2.A1</i>	Complies with FCC Mask	Complies See page 8	OK
Exciter B FCC Mask Filter Plot <i>Figures: 2.B and 2.B1</i>	N/A	N/A	OK
Harmonics <i>Figures: 2.1.A and 2.1.A1</i>	≥ -85 dBc	See pages 9 & 10	OK
Reference Plots		See page 11	OK
Post Filter Plot <i>Figure: 2.2.A</i>	≥ 37 dB	See page 12	OK
Exciter B Post Filter Plot <i>Figure: 2.2.B</i>	N/A	See Page 13	OK
Pilot Frequency <i>Figure: 2.3.A</i>	+/- 1000 hz	0.833 Hz See page 14	OK
Exciter B Pilot Frequency <i>Figure: 2.3.B</i>	N/A	N/A	OK

Measurement Results

Output of Transmitter via 36.50 dB Calibrated Coupler



Figure 1.1

Output of Mask Filter via 36.50 dB Calibrated Coupler (TPOF)



Figure 1.2

Transmitter Displayed Output Power



Figure 1.3



FCC Mask Filter Plot

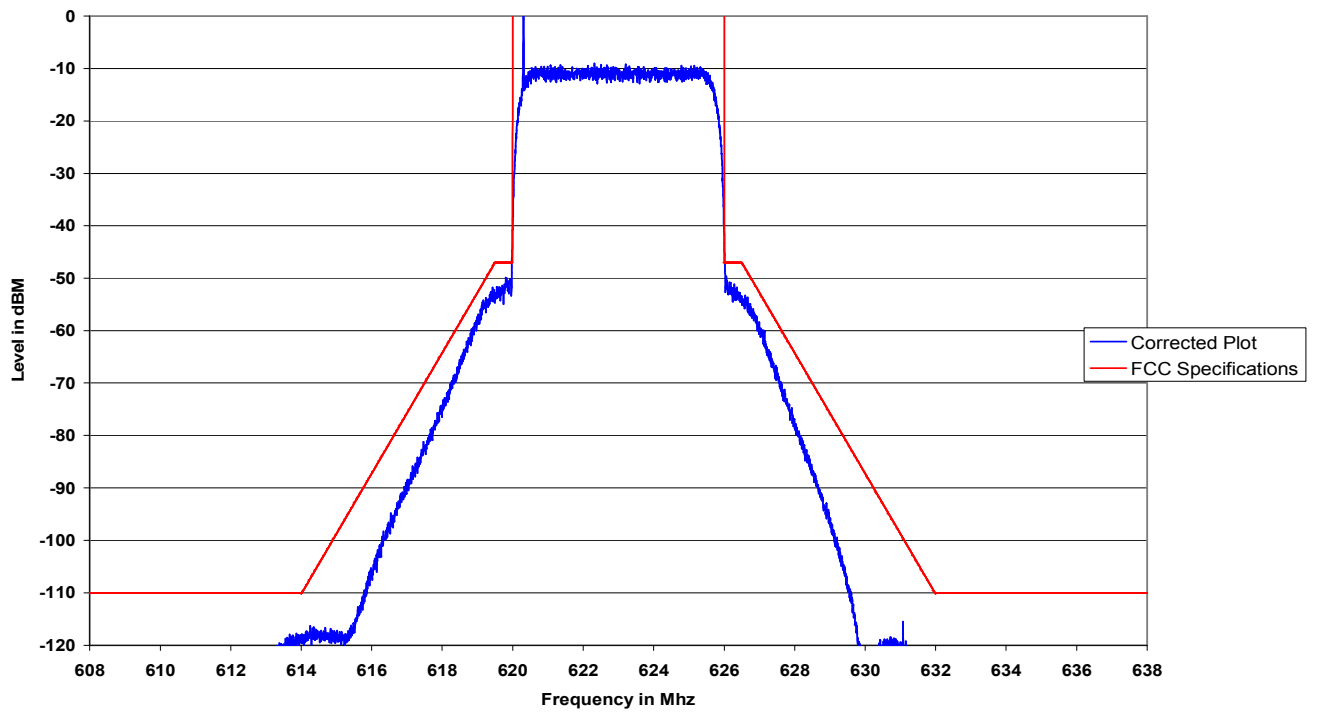


Figure 2.A

FCC Wide Band Plot

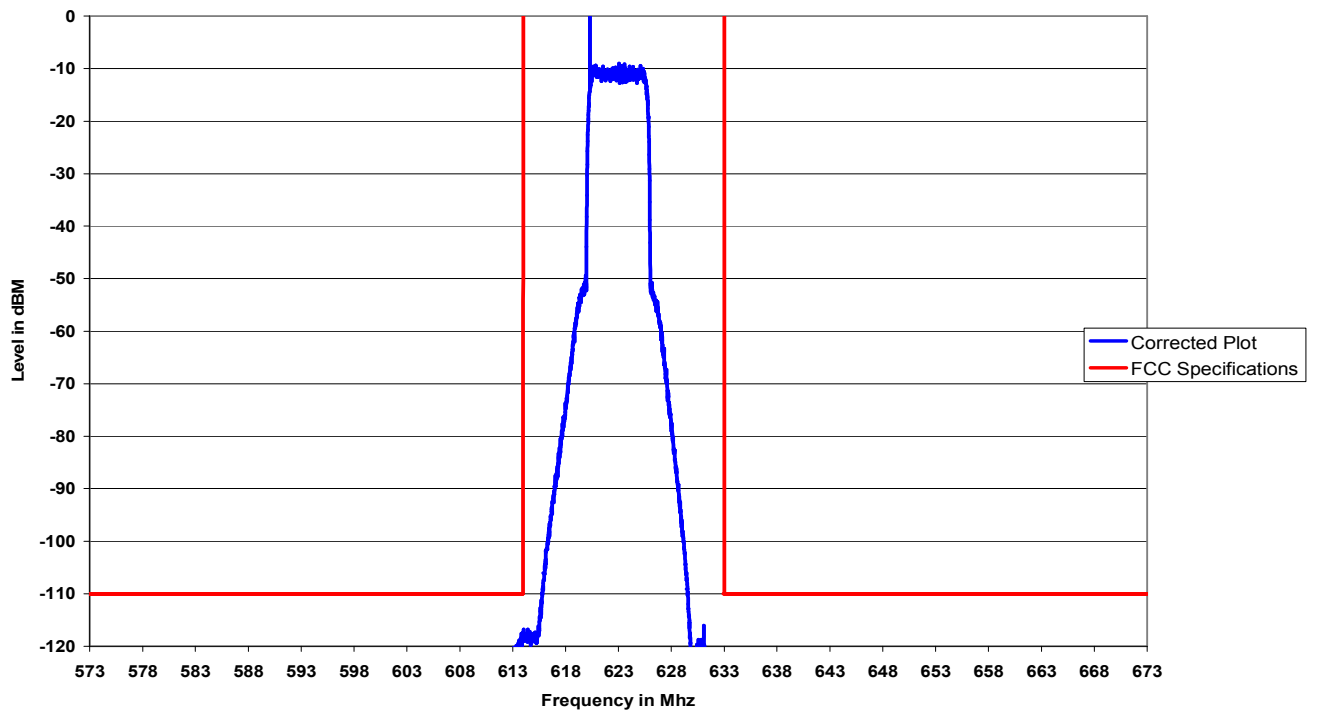
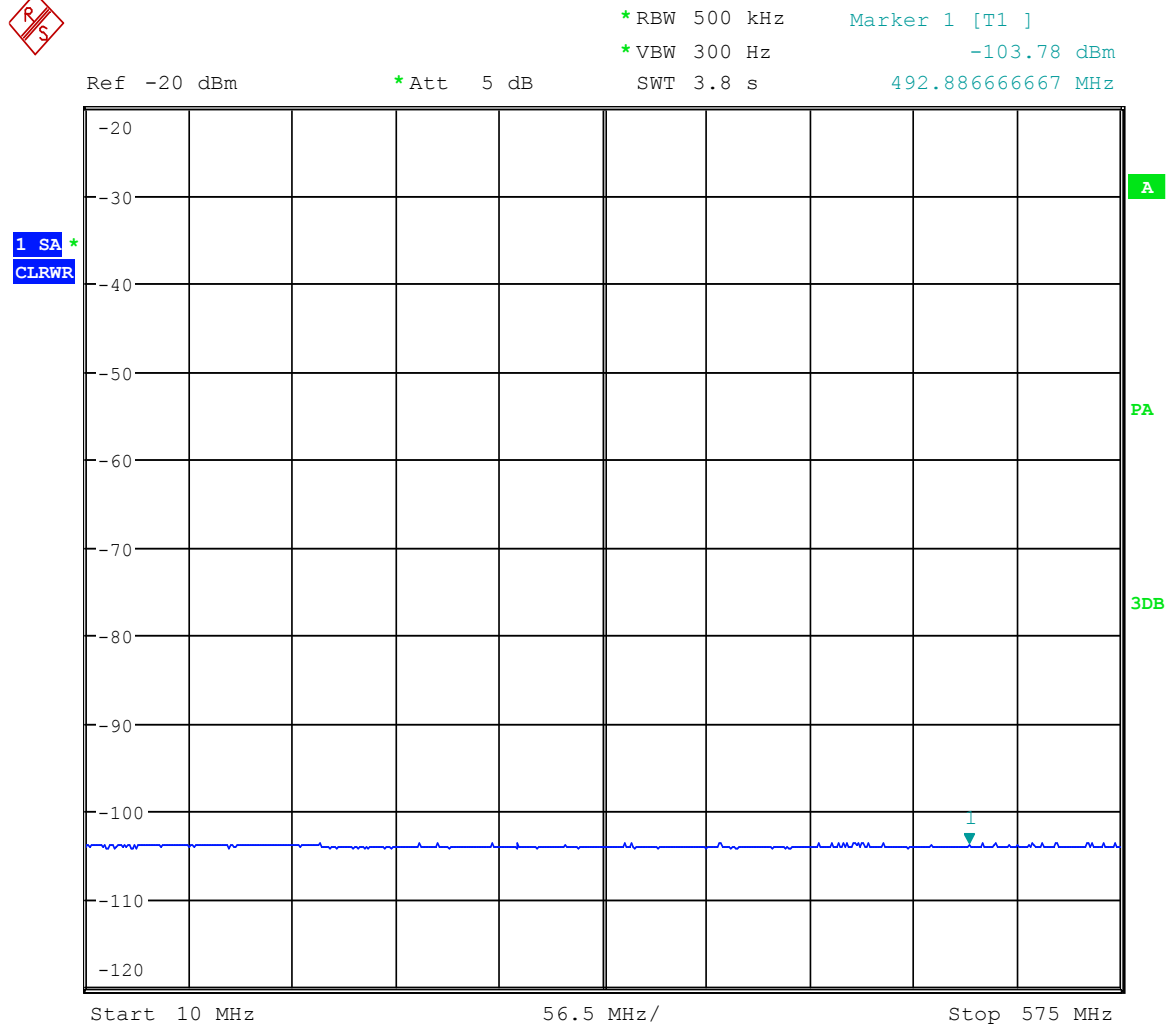


Figure 2.A1



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Harmonics and Spurious plot 10Mhz to 575Mhz



Date: 3.JAN.2011 09:02:58

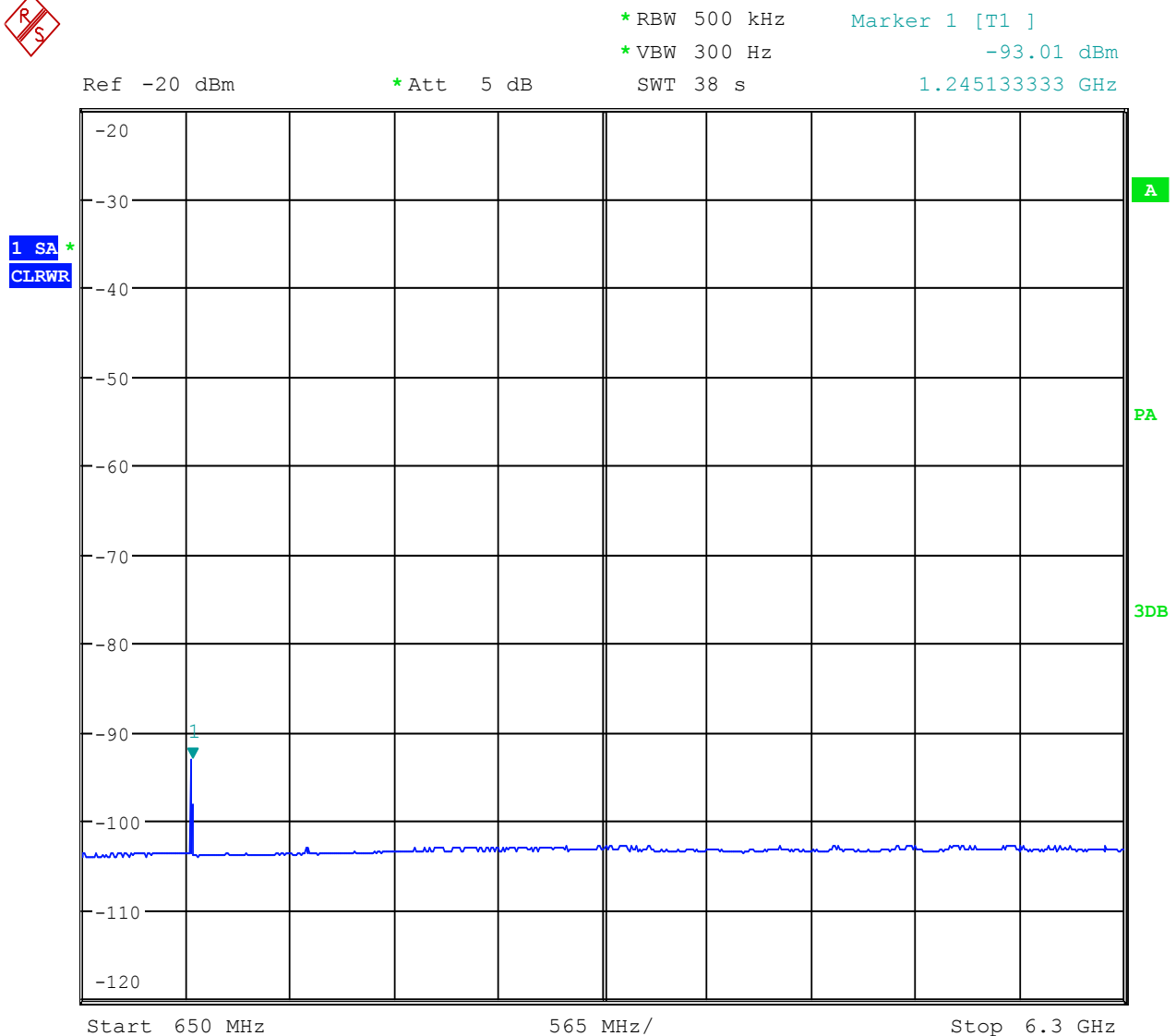
Figure 2.1.A

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Harmonics and Spurious plot 650MHz to 6.3GHz



Date: 3.JAN.2011 09:01:11

Figure 2.1.A1

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Model # SLX800A

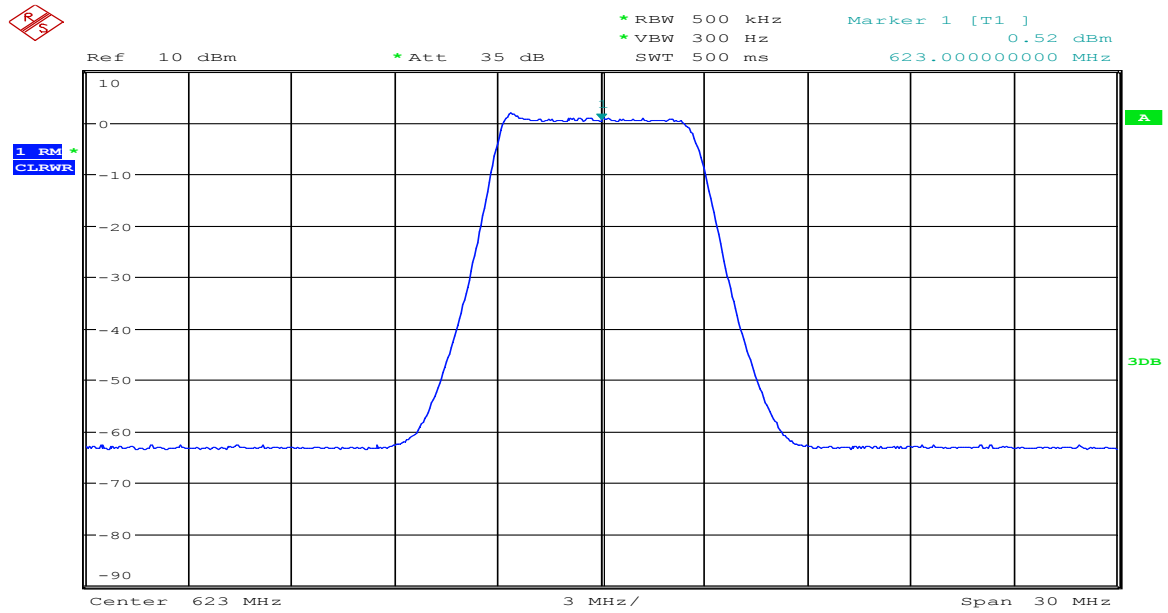
Part # 2100.100K31

Serial # 100144



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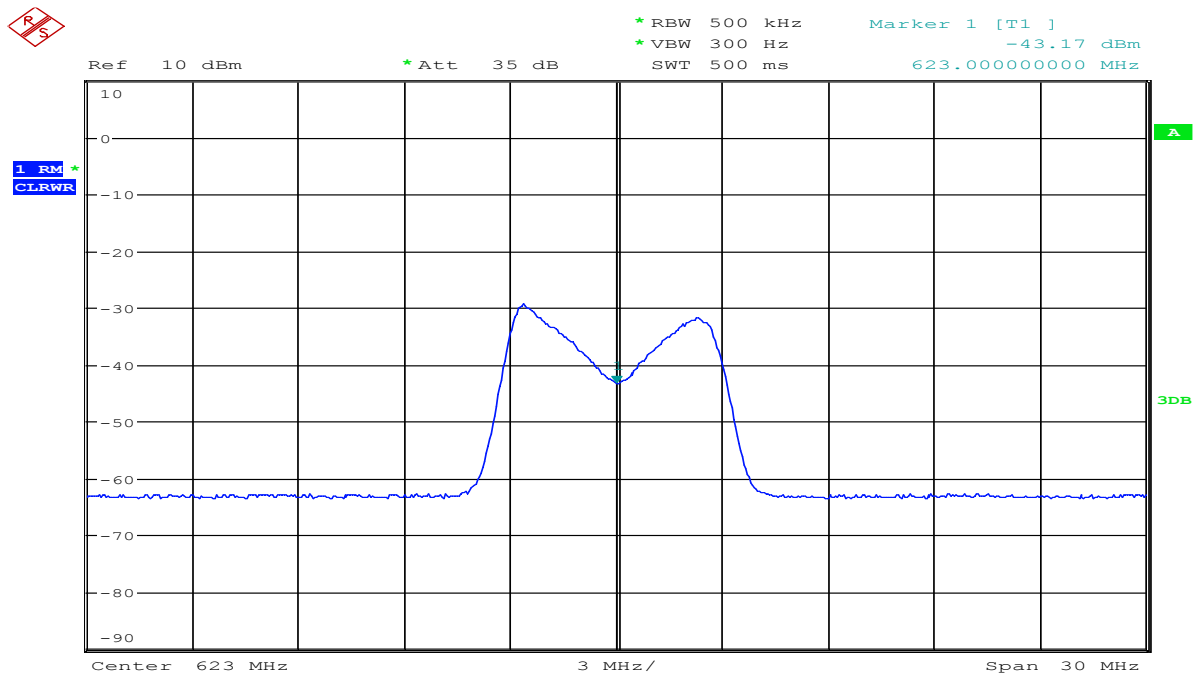
Harmonics and Spurious 0dbm Reference Plot



Date: 30.DEC.2010 16:03:35

Figure 2.1.B

Harmonics and Spurious Notch Filter plot



Date: 30.DEC.2010 16:06:35

Figure 2.1.B1

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Model # SLX800A

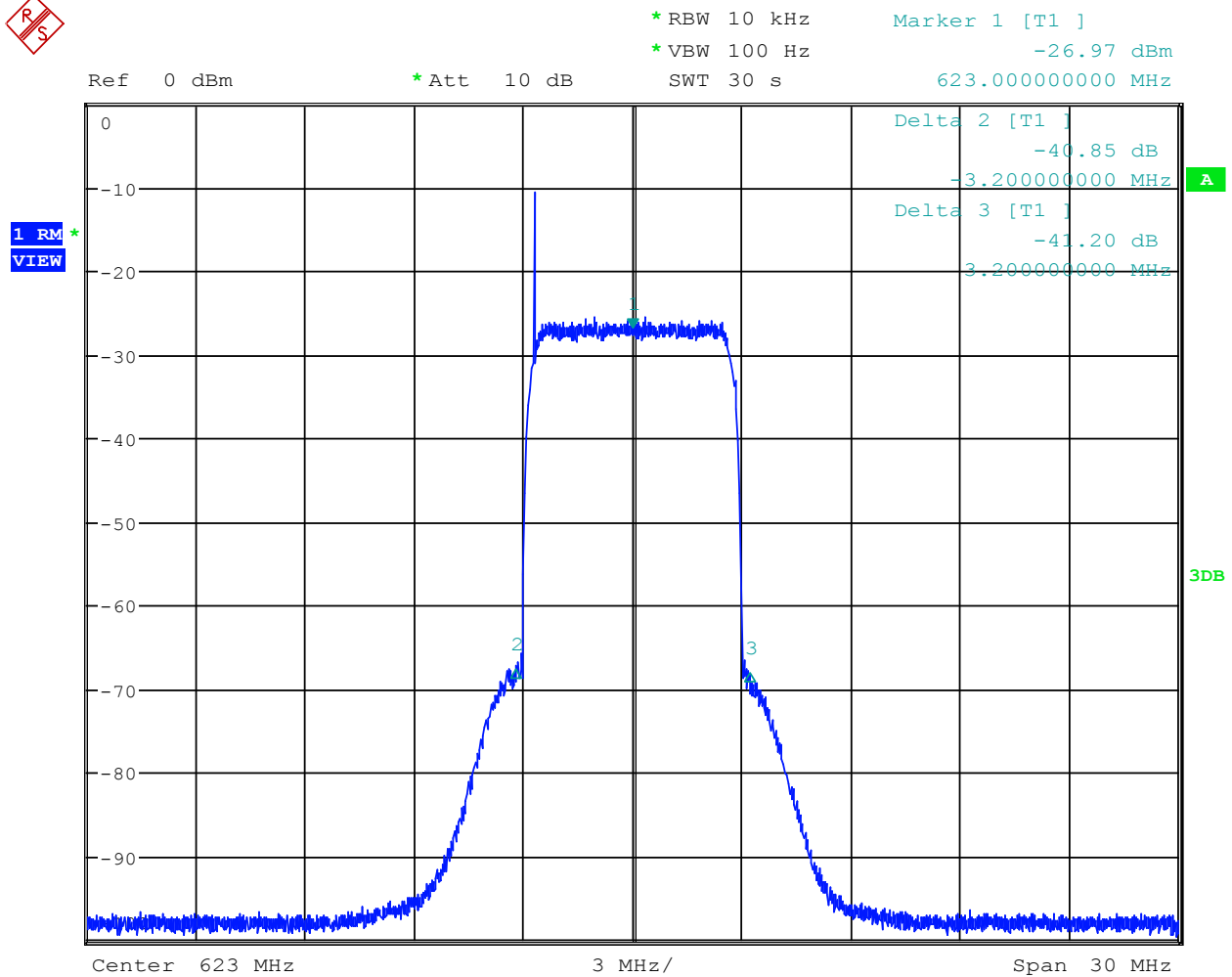
Part # 2100.100K31

Serial # 100144



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Post Filter Shoulder Plot



Date: 3.JAN.2011 09:17:38

Figure 2.2.A

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Exciter B Post Filter Shoulder Plot

N/A

Figure 2.2.B

CH 39

Model # SLX800A

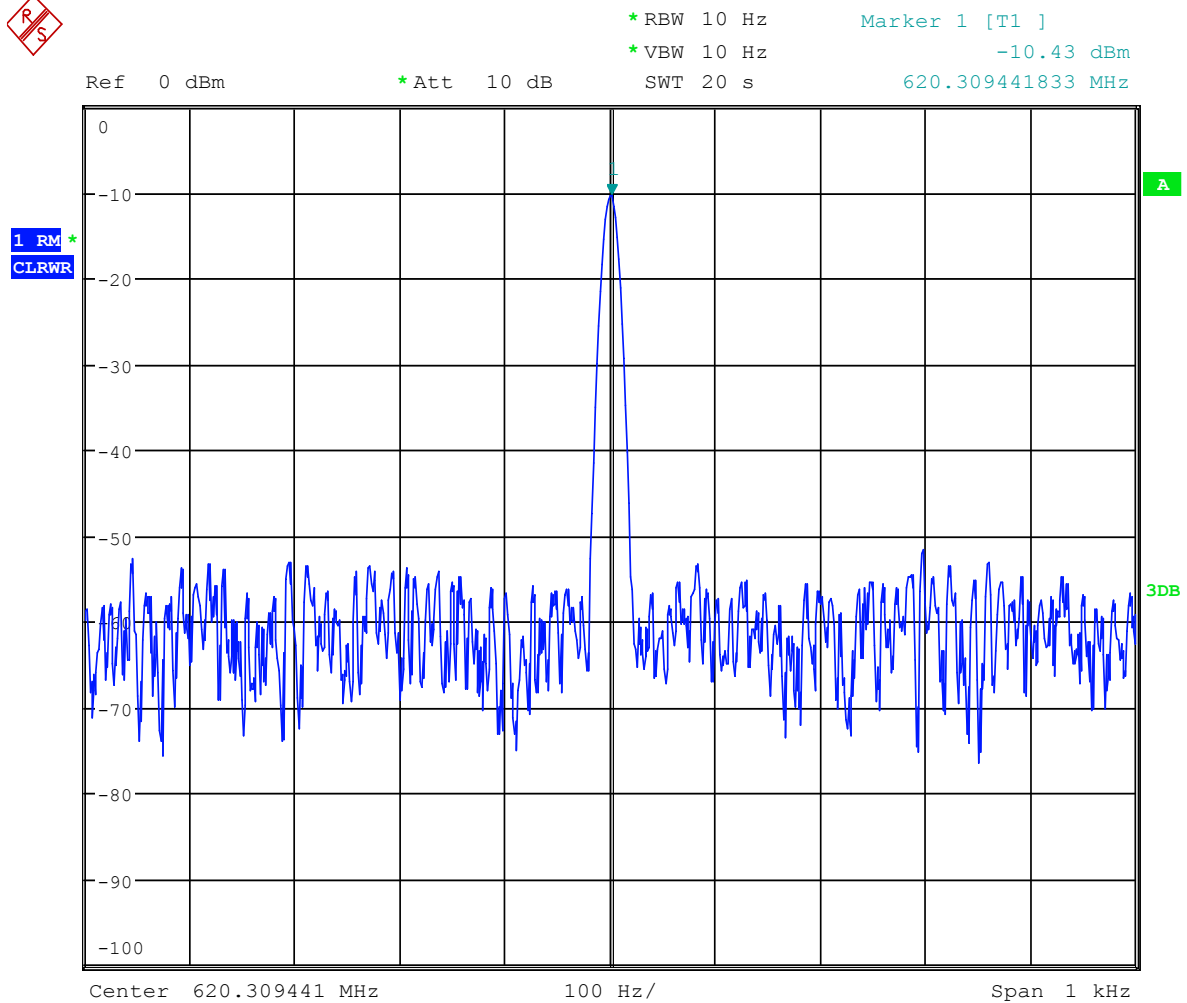
Part # 2100.100K31

Serial # 100144



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Pilot Frequency



Date: 3.JAN.2011 09:28:09

Figure 2.3.A

**Site Acceptance Test Data**

Measurement	Typical	Actual	Result
3.1.a MER Equalizer On	>30 dB	38.2 dB	OK
3.1.b MER Equalizer On Exciter B	>30 dB	N/A	OK
3.2.a MER Equalizer Off	>27 dB	37.4 dB	OK
3.2.b MER Equalizer Off Exciter B	>27 dB	N/A	OK
3.3.a EVM Equalizer Off	< 3%	0.85 %	OK
3.3.b EVM Equalizer Off Exciter B	< 3%	N/A	OK
3.4.a Amplitude Flatness	0.5 dB pk-pk	0.29 dB	OK
3.4.b Amplitude Flatness Exciter B	0.5 dB pk-pk	N/A	OK
3.5.a Phase	<3.0 °	1.48 °	OK
3.5.b Phase Exciter B	<3.0 °	N/A	OK
3.6.a Group Delay	< 50nSec pk-pk	19.14nSec	OK
3.6.b Group Delay Exciter B	< 50nSec pk-pk	N/A	OK
3.7.a BER before Reed Solomon	<1*10E-09	0.0e0	OK
3.7.b BER before Reed Solomon Exciter B	<1*10E-09	N/A	OK
3.8.a BER after Reed Solomon	<1*10E-09	0.0e0	OK
3.8.b BER after Reed Solomon Exciter B	<1*10E-09	N/A	OK
3.9.a Lower Shoulder	>47dB	51.3	OK
3.9.b Lower Shoulder Exciter B	>47dB	N/A	OK
3.10.a Upper Shoulder	>47dB	51.5	OK
3.10.b Upper Shoulder Exciter B	>47dB	N/A	OK
3.11.a Transmitter Quality Value	>70	91	OK
3.11.b Transmitter Quality Value Exciter B	>70	N/A	OK



Site Acceptance Test

ETL TX CHECK TEST REPORT

Date: 03.01.2011
Time: 15:47:26
Filename: SLX FCC Test.ETLtxc



Operator:		Test Receiver:	
Name:	Glen Hurst	Manufacturer:	Rohde&Schwarz
Department:	Division 7	Device:	ETL-3
Phone Number:	443-31-3628	Serial Number:	101784/013

Commentary:
FCC Testing of SLV8100A SN 100144

ETL Settings

☐ Use Local ETL Settings (will load appropriate standard profile during measurement)

TV Standard:	ATSC	Input Impedance:	50 Ohm
RF [MHz]:	623.000000	RF Edit:	Center
Level Unit:	dBm	Symbol Rate [MHz]:	10.7622000
Sideband Position:	Normal	System Optimization:	Medium
Symbol Loop:	Low	AgcLoop:	Low
CarrierLoop:	Medium	Equalizer State:	Off
NTSC rejection Filter:	☐	FEC Sync:	FEC Sync required

10 MHz Reference: Internal

Measurement Results

	Measurement	Poor	Excellent	Weight	Result
Sync Lock	Yes	No	Yes		
			100 %		
[x] Level	0.9 dBm	± 15.0 dB	0.0 dBm	20	19 points
			93 %		1 % of sum
[x] Carrier Freq Offset	-35.5 Hz	± 1000 Hz	0 Hz	80	77 points
			96 %		7 % of sum



[x] Symbol Rate Offset	37.2 Hz	$\pm$ 1000 Hz	0 Hz	40	39 points
			96 %		3 % of sum
[x] MER (rms) dB (Equalizer On)	38.2 dB	30.0 dB	43.0 dB	80	50 points
			62 %		5 % of sum
[x] MER (rms) dB (Equalizer Off)	37.4 dB	27.0 dB	33.0 dB	80	80 points
			100 %		8 % of sum
[x] EVM (rms) (Equalizer Off)	0.85 %	3.00 %	1.00 %	80	80 points
			100 %		8 % of sum
[x] Amplitude	0.29 dB	0.50 dB	0.25 dB	70	59 points
			83 %		5 % of sum
[x] Phase	1.48 °	3.00 °	1.50 °	70	70 points
			100 %		7 % of sum
[x] Group Delay	19.14 ns	50.00 ns	10.00 ns	50	39 points
			77 %		3 % of sum
[x] Pilot Value	1.267	$\pm$ 0.200	1.250	20	18 points
			91 %		1 % of sum
[x] Data Signal/Pilot	11.1 dB	10.0 dB	11.5 dB	60	44 points
			73 %		4 % of sum
[x] Pilot Ampl Error	0.1 dB	$\pm$ 0.3 dB	0.0 dB	20	11 points
			53 %		1 % of sum
[x] BER before RS	0.0e0	1e-7	1e-9	50	50 points
			100 %		5 % of sum
[x] BER after RS	0.0e0	1e-7	1e-9	60	60 points
			100 %		6 % of sum
[x] Packet Error Ratio	0.0e0	1e-7	1e-9	60	60 points
			100 %		6 % of sum

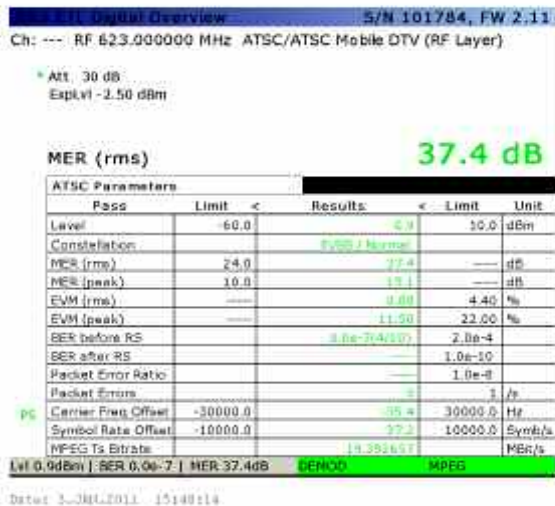


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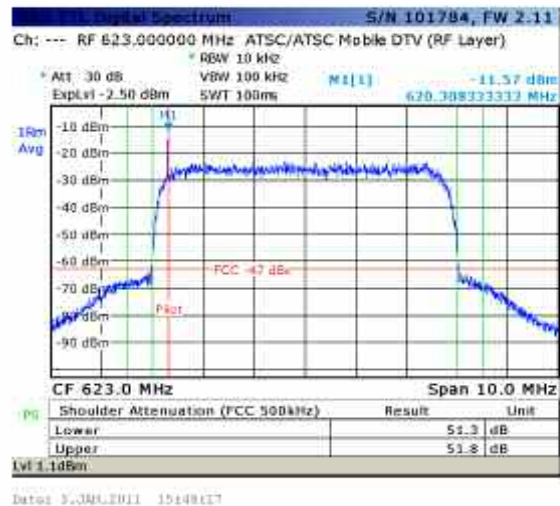
[x] Packet Errors	0 /s	3 /s	0 /s	50	50 points
			100 %		5 % of sum
[x] Shoulder Att Lower	51.3 dB	47.0 dB	50.0 dB	90	90 points
			100 %		9 % of sum
[x] Shoulder Att Upper	51.5 dB	47.0 dB	50.0 dB	90	90 points
			100 %		9 % of sum
[x] Crest	7.91 dB	± 1.00 dB	8.50 dB	20	8 points
			40 %		0 % of sum

ETL Graphics

[x] Overview



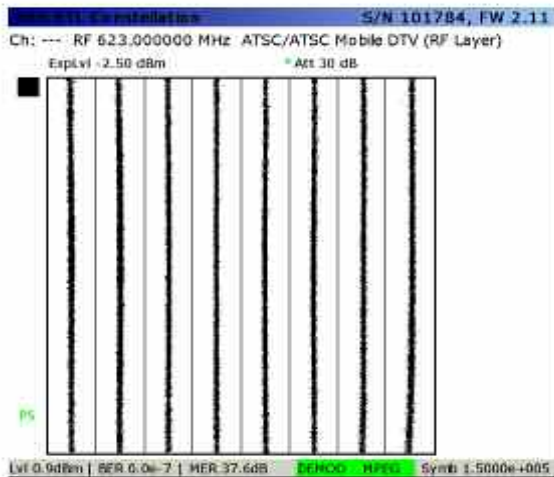
[x] Spectrum





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[x] Constellation



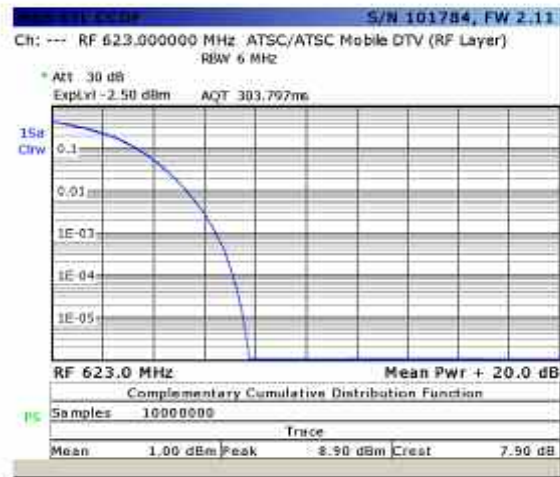
Date: 3. JAN. 2011 15:48:23

[x] Amplitude and Phase



Date: 3. JAN. 2011 15:48:25

[x] CCDF



Date: 3. JAN. 2011 15:48:26

[x] Amplitude and Group Delay



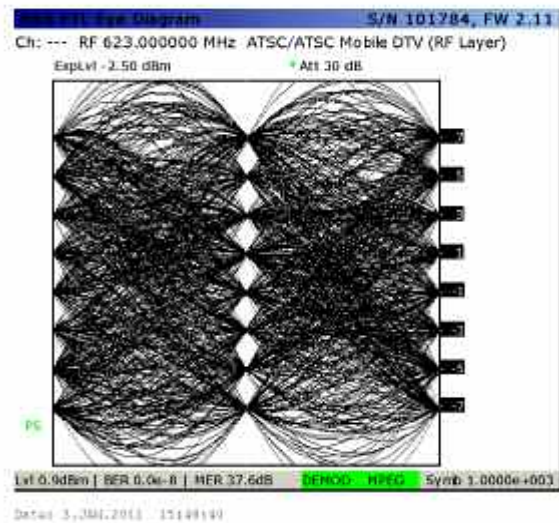
Date: 3. JAN. 2011 15:48:27



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☐ Echo Pattern

☒ Eye Diagram



WARNINGS

No warnings

SUMMARY

Taken into account: 20 measurements

Sum result:  994 points of total: 1090 points

ETL TxCheck Quality Value: 91%





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Exciter B Site Acceptance Test

N/A

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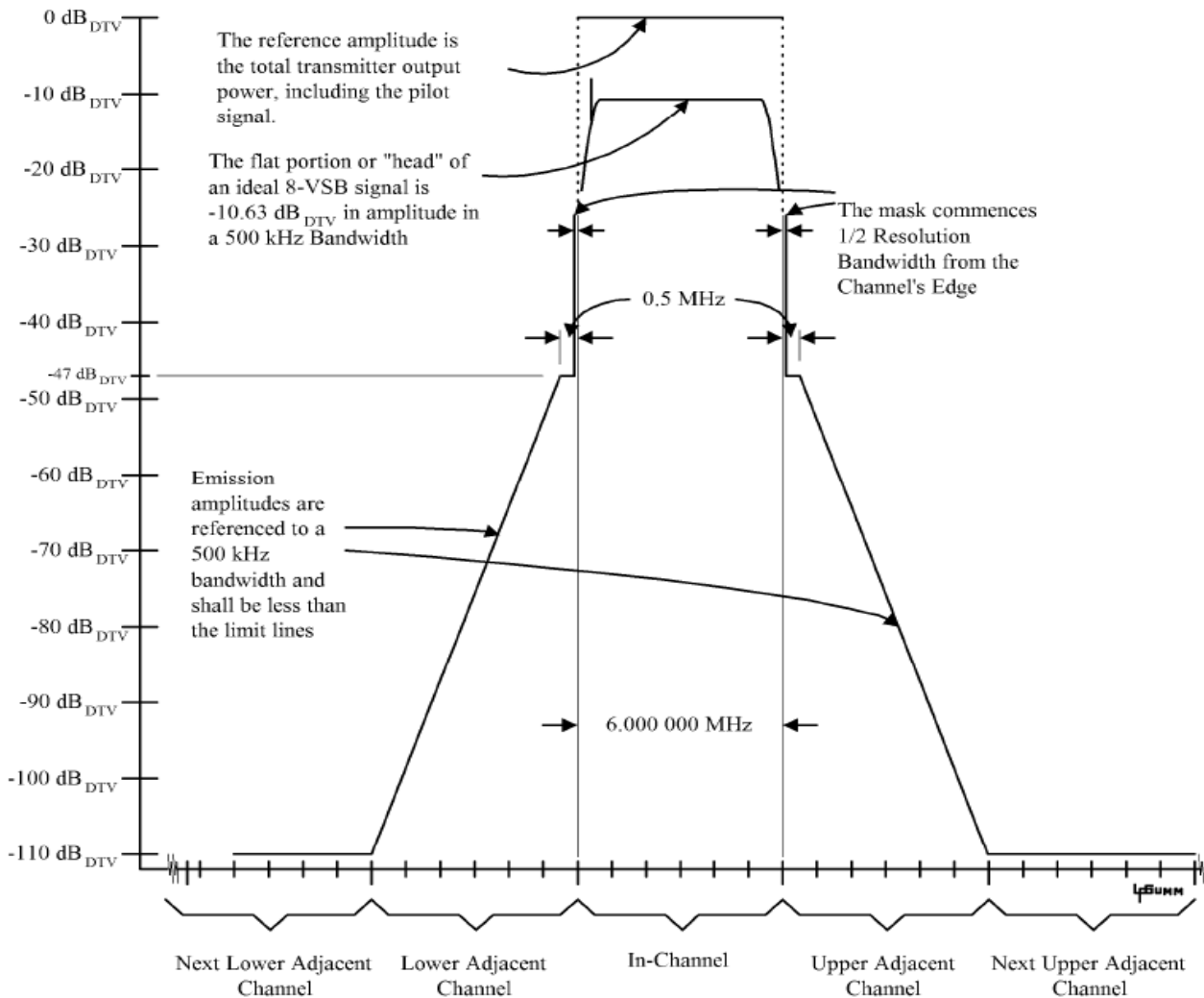
Model # SLX800A

Part # 2100.100K31

Serial # 100144



8-VSB Full Service Transmitter Emission Limits



Full-service transmitters should meet the following out-of-channel emissions requirements [FCC 47CFR§73.622(h)]:

- a) In the range between one half the width of the resolution bandwidth filter used and 500 kHz from the channel edge, as shown in Equation (4):

$$\text{Emissions} \leq -47 \text{ dB}_{\text{DTV}} \quad (4)$$

- b) More than 6 MHz from the channel edge, as shown in Equation (5):

$$\text{Emissions} \leq -110 \text{ dB}_{\text{DTV}} \quad (5)$$

- c) At any frequency between 500 kHz and 6 MHz from the channel edge, as shown in Equation (6):

$$\text{Emissions} \leq -(11.5(|\Delta F| - 0.5) + 47) \text{ dB}_{\text{DTV}} \quad (6)$$

where

ΔF is the frequency difference, in megahertz, from the channel edge

Notes for Mask Measurements

4.6.5 Notes for all masks

NOTE 1—Measurements need not be made any closer to the channel edge than one half of the width of the resolution bandwidth filter used in the measurement instrument.

NOTE 2—Although Figure 3 through Figure 5 depict only the band of frequencies near the transmitter's output signal, the FCC's ultimate attenuation requirement specifically applies to all emissions greater than 6.0 MHz away from the transmitter's channel edges, including harmonics, subharmonics, or other spurious signals.

NOTE 3—The FCC accepts measurements made using one of two methods (FCC Public Notice DA-05-1321A1):

Method 1: Measure the emissions in a narrow resolution bandwidth (30 kHz, 10 kHz, or narrower). Either scale the measured *power* to a 500 kHz bandwidth based on $10 \log(500 \text{ kHz/noise bandwidth of the resolution filter})$ or scale the measured *attenuation* (i.e., $10 \log(\text{measured power/total signal power})$) based on $10 \log(\text{noise bandwidth of the resolution filter/500 kHz})$. These values are then compared *point by point* with the emission mask.

Method 2: Sum the power across a 500 kHz window in order to implement an effective measurement bandwidth of 500 kHz; this power is then compared with the emission mask value computed for the *center* frequency of the 500 kHz sub-band. This method may be performed either by manually summing the measurements or by using a measurement instrument's band power measurement function. It is sufficient to measure a contiguous sequence of twelve 500 kHz windows across each adjacent channel, plotting the measured value at the center of the 500 kHz sub-band window.

The FCC allows a single method to be used for all measurements, or if desired, one of the above methods may be employed in the 500 kHz window adjacent to each channel edge and the other method for all other measurements further from the channel edge. The FCC requires that the frequency bin spacing on the measurement test instrument is to be less than or equal to the resolution bandwidth as displayed.

NOTE 4. Mask measurements performed in accordance with IEEE-1631-2008 section 4.6.2 using method 4.6.5 NOTE-3 Method 1 (described above). To overcome the limitations of direct measurement with the test equipment, the spectral response was measured prior to the mask filter with a RBW of 10Khz, span of 30Mhz and utilizing 6001 points. The mask filter was directly swept using a 30Mhz span and utilizing 6001 points. The data from both sweeps are imported into a spreadsheet, corrected for RBW and coupler frequency response on a point by point basis. The result is then plotted against the FCC mask requirements for verification of mask compliance.

Notes for Harmonic Measurement.

NOTE 1. A coupler was characterized across the test frequencies. A reference value is then measured for the fundamental using a spectrum analyzer. A characterized high pass filter is then inserted between the spectrum analyzer and the coupler to avoid overloading the spectrum analyzer. The plot is divided to a low and high side while omitting the fundamental. The fundamental plot is covered in the FCC mask filter measurements.



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Notes for Pilot Frequency Measurement.

NOTE 1. <100 HZ RBW and VBW shall be used.

NOTE 2. When available, the test equipment shall be locked to a GPS provided 10Mhz reference. The minimum acceptable method is to have the device under test and the transmitter locked to a shared 10Mhz reference.



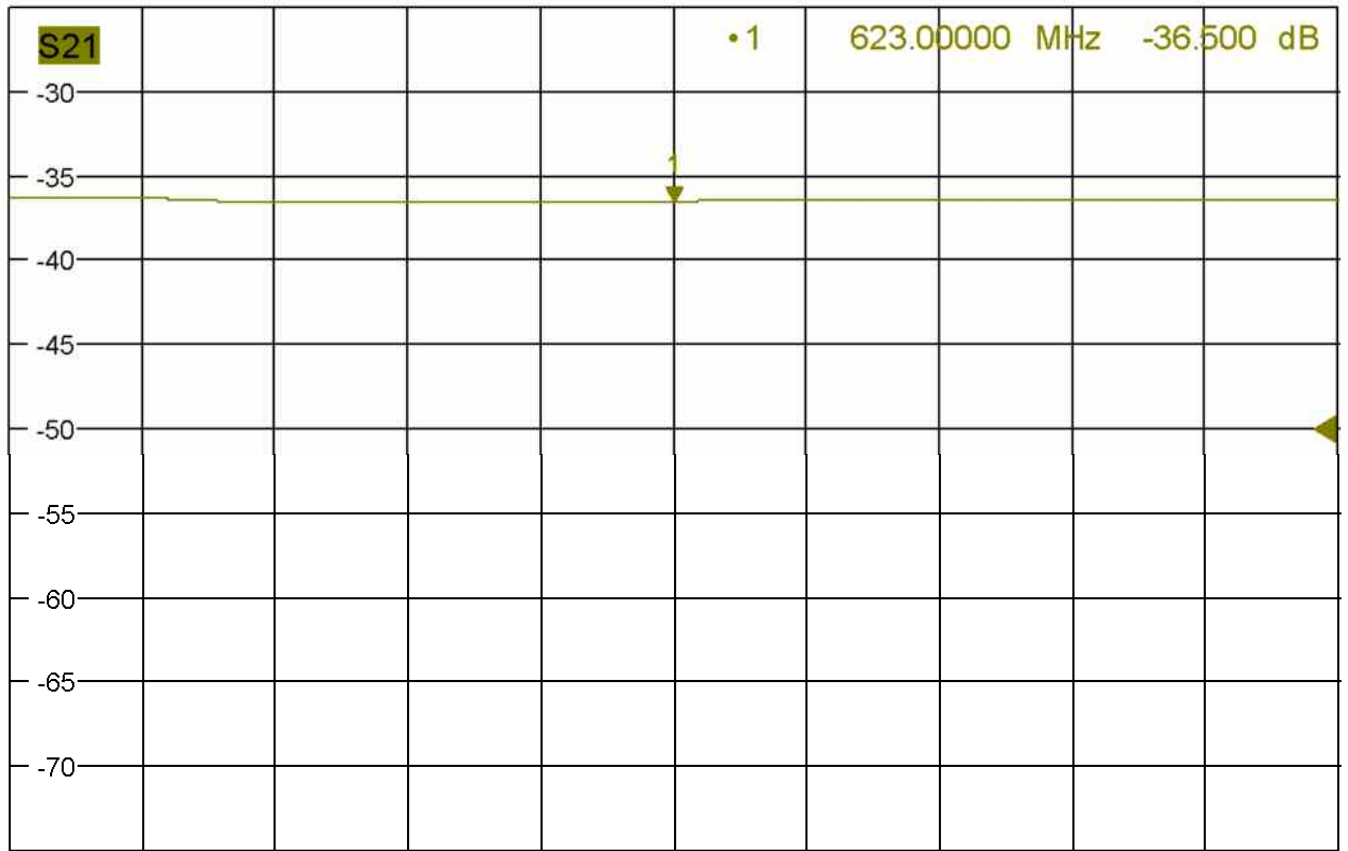
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Coupler Plot



Trc1 **S21** dB Mag 5 dB / Ref -50 dB Cal int Smo

1



Ch1 Center 623 MHz

Pwr -10 dBm

Span 10 MHz

Date: 30.DEC.2010 11:38:05

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Model # SLX800A

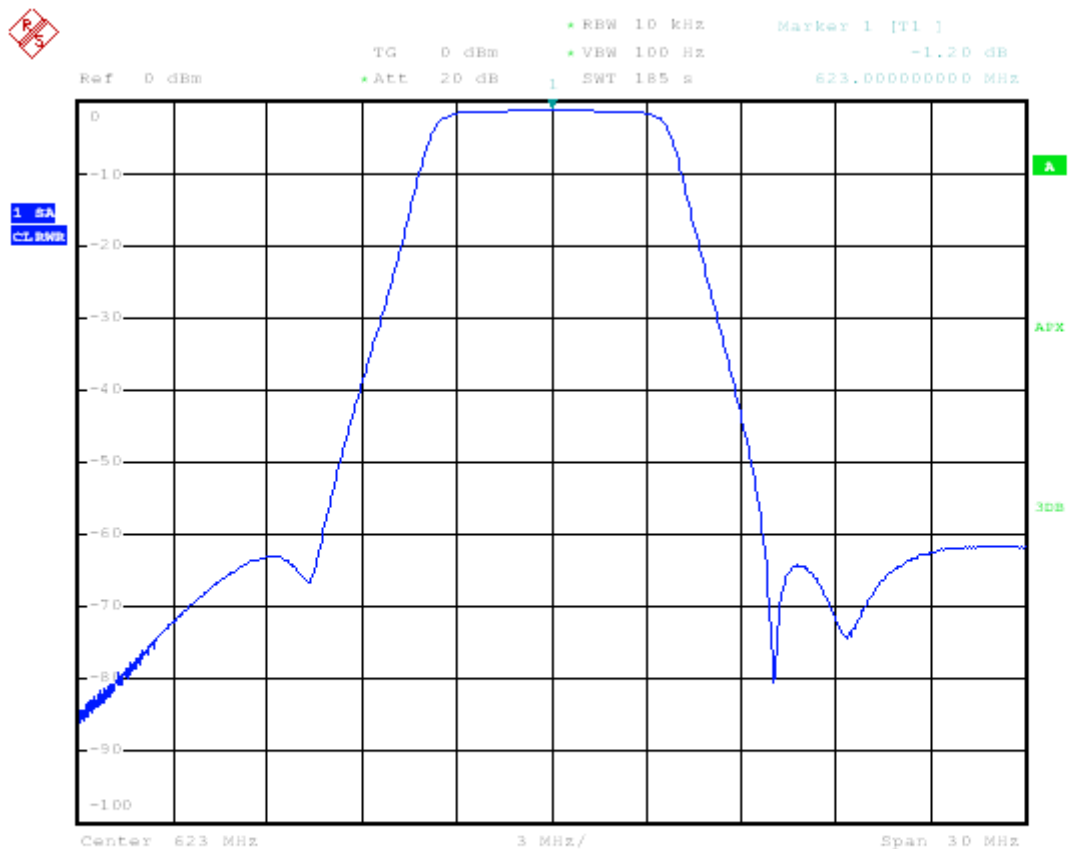
Part # 2100.100K31

Serial # 100144



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Filter Plot



Date: 30.DEC.2010 13:51:29

CH 39

Model # SLX800A

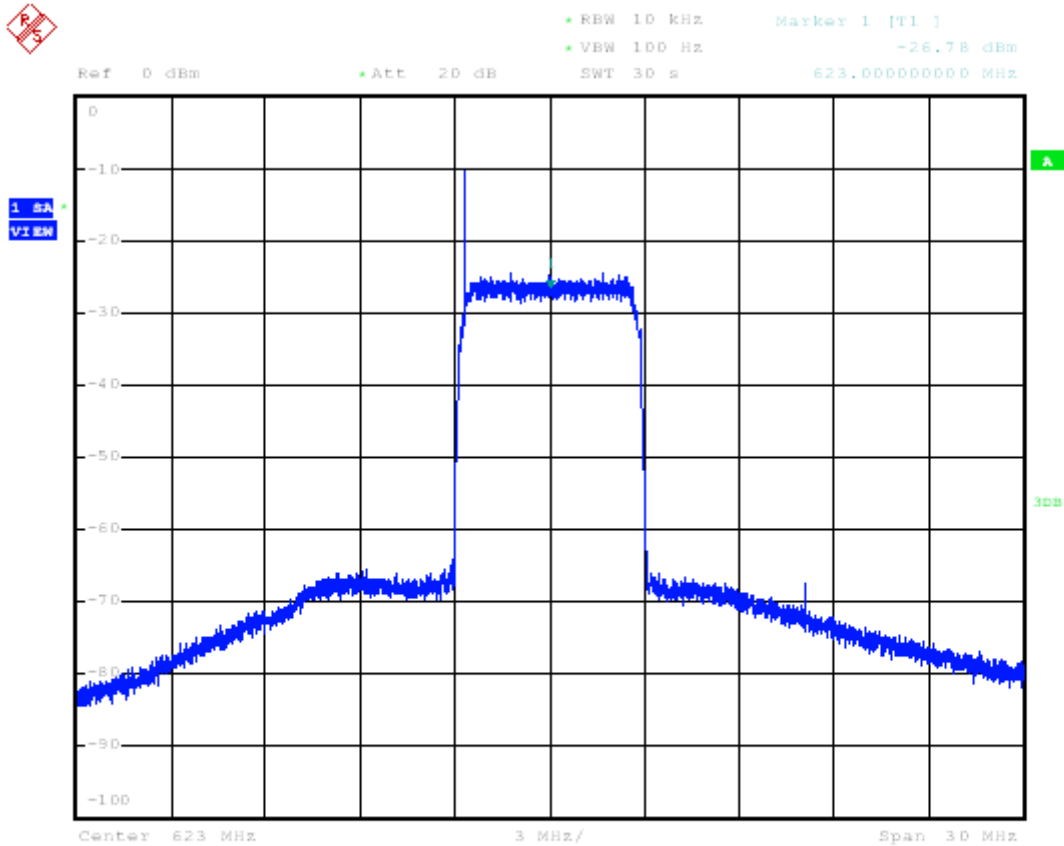
Part # 2100.100K31

Serial # 100144



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Transmitter Output Plot



Date: 30.DEC.2010 13:04:44

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Model # SLX800A
Part # 2100.100K31
Serial # 100144



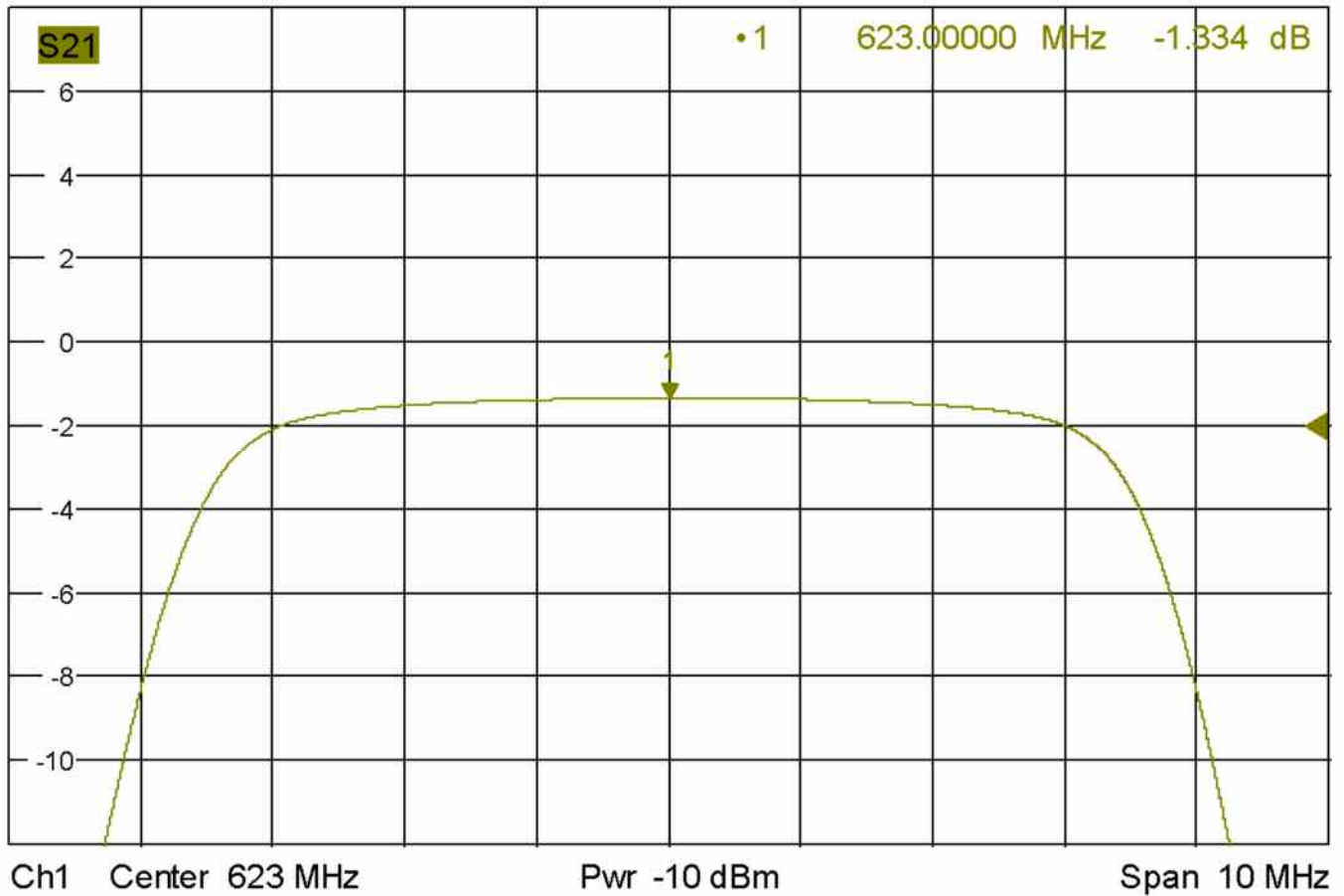
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Insertion Loss of Band Pass and Harmonic Filter



Trc1 **S21** dB Mag 2 dB / Ref -2 dB Cal int Smo

1



Date: 3.JAN.2011 16:53:47

CH 39
Model # SLX800A
Part # 2100.100K31
Serial # 100144