Si446x and ARIB STD-T67 Compliance at 426–429 MHz

1. Introduction

This application note demonstrates the compliance of Si446x (B0, B1, C0, C1, C2) RFICs with the regulatory requirements of ARIB STD-T67 (V1.1, dated November 30th 2005) in the 426/429 MHz band. Although other members and revisions of the Si446x family of chips may also be used to achieve compliance within this frequency band, the measurements within this document were taken with an Si4461-B0 RFIC on a 4461-TSC13D434 Direct Tie RF Test Card (see “7. Reference Design Schematic”).

The Si4461-B0 chip was configured to transmit at +10 dBm output power by appropriate settings of the DDAC[6:0] field in the PA_PWR_LVL property 0x2201 and the OB[5:0] field in the PA_BIAS_CLKDUTY property 0x2202. Various data rates and deviations were chosen in order to comply with the permissible channel spacings and occupied bandwidths. The tests were performed at a supply voltage of V_{DD}=3.3 V.

1.1. Summary of Measured Results

A summary of measured results is provided in Table 1.

Table 1. Summary of Measured Results

Spec Par	Parameter	Condition	Limit	Measured	Margin
3.2 (1)	TX Antenna Power		+10 dBm	+9.93 dBm	0.07 dB
3.2 (9)	AdjChan Leakage Power	25 kHz channel	–40 dBc	–63.59 dBc	23.59 dB
		12.5 kHz channel	–40 dBc	–61.85 dBc	21.85 dB
		12.5 kHz channel	–40 dBc	–65.78 dBc	25.78 dB
3.2 (10)	Occupied Bandwidth	25 kHz channel	16.0 kHz	8.12 kHz	7.88 kHz
		12.5 kHz channel	8.5 kHz	6.73 kHz	1.77 kHz
		12.5 kHz channel	8.5 kHz	6.69 kHz	1.81 kHz
3.2 (11)	Spurious Emissions		–26 dBm	–53.97 dBm	27.97 dB
3.3 (1)	Reference Sensitivity	25 kHz channel	–101 dBm	–119.7 dBm	18.7 dB
		12.5 kHz channel	–101 dBm	–119.9 dBm	18.9 dB
		12.5 kHz channel	–101 dBm	–120.6 dBm	19.6 dB
3.3 (2)	Spurious Selectivity	25 kHz channel	40 dB	41.9 dB	1.9 dB
		12.5 kHz channel	40 dB	41.6 dB	1.6 dB
		12.5 kHz channel	40 dB	41.2 dB	1.2 dB

Table 1. Summary of Measured Results (Continued)

Spec Par	Parameter	Condition	Limit	Measured	Margin
3.3 (3)	AdjChan Selectivity	25 kHz channel	30 dB	60.8 dB	30.8 dB
		12.5 kHz channel	30 dB	44.8 dB	14.8 dB
		12.5 kHz channel	30 dB	60.3 dB	30.3 dB
3.3 (5)	RX Secondary Emissions		–54 dBm	–73.34 dBm	19.34 dB

2. Summary ARIB STD-T67 Requirements in the 426/429 MHz Band

The main requirements of ARIB STD-T67 in the 426/429 MHz band are summarized in this section.

2.1. ARIB STD-T67 3.2(1) Antenna Power

The antenna power (the specified power that is supplied from the transmitter to the feeder of an antenna system in normal operation and is averaged over a sufficiently long period of time) shall be 0.01W (+10 dBm) or less. For transmission units using a frequency between 426.025 MHz and 426.1375 MHz, the antenna power shall be 0.001W (0 dBm) or less.

2.2. ARIB STD-T67 3.2(5) Modulation Method

The modulation method shall be one that conforms to the emission classes specified in ARIB STD-T67 3.1 (3). Among the allowed modulation classes listed is F1D = FSK/GFSK. All measurements performed in this document were taken with GFSK modulation.

2.3. ARIB STD-T67 3.2(6) Deviation

The standard does not provide for a specific value of frequency deviation. As a result, the frequency deviation is chosen (along with the data rate) to obtain a desired value of occupied bandwidth. The combination of data rate and frequency deviation is clearly summarized for each measurement within this document.

2.4. ARIB STD-T67 3.2(7) Modulation Rate

The standard does not provide for a specific data rate value. As a result, the data rate is chosen (along with the frequency deviation) to obtain a desired value of occupied bandwidth. The combination of data rate and frequency deviation is clearly summarized for each measurement within this document.

2.5. ARIB STD-T67 3.2(9) Adjacent Channel Leakage Power

As for the adjacent-channel leakage power in the 400 MHz band (the power radiated in a certain band of the adjacent channel separated from the carrier frequency at the specified frequency interval), the power radiated into the ±4.25 kHz band of the frequency 12.5 kHz distant from the carrier frequency shall be lower than the carrier power by 40 dB or more (when modulation is performed using the standard coded test signal at the same transmission speed as that of the modulation signal). However, for transmitters that emit radio waves in an occupied bandwidth over 8.5 kHz and up to 16 kHz, the power radiated into the ±8 kHz band of the frequency 25 kHz distant from the carrier frequency shall be lower than the carrier power by 40 dB or more.

2.6. ARIB STD-T67 3.2(10) Channel Spacing and Permissible Occupied Bandwidth

In the 426/429 MHz band, ARIB STD-T67 provides for two permissible channel spacings: 12.5 kHz and 25 kHz. A permissible occupied bandwidth is specified for both spacings:

- 12.5 kHz channel spacing allows an occupied bandwidth (99%) of up to 8.5 kHz.
- 25 kHz channel spacing allows an occupied bandwidth (99%) between 8.5 and 16 kHz.

2.7. ARIB STD-T67 3.2(11) Spurious Emissions

The permissible value of the intensity of spurious emissions in the out-of-band domain and the permissible value of the intensity of unwanted emissions in the spurious domain shall be 2.5 µW (-26 dBm) or lower, as measured in the average power. The out-of-band domain is that region immediately outside the allowed occupied bandwidth, while the spurious domain is that region at greater frequency offsets containing harmonic and sub-harmonic signals.

2.8. ARIB STD-T67 3.3(1) Receiver Sensitivity (Encoding Reference Sensitivity)

The encoding reference sensitivity (the necessary receiver input voltage such that the output bit error rate of the device will be 1×10^{-2} when the desired wave modulated by the standard coded test signal at the same transmission speed as that of the transmitter is applied) shall be 2 µV (–101 dBm in a 50 Ω load) or less for receivers with channel intervals of 12.5 kHz and 25 kHz.

2.9. ARIB STD-T67 3.3(2) Spurious Response Selectivity

The receiver spurious response at effective selectivity (the ratio of the jamming wave input voltage to the encoding reference sensitivity as the output bit error rate of the device becomes 1 x 10^{-2} when a non-modulated jamming wave is applied in a state in which a desired wave input voltage 3 dB higher than the encoding reference sensitivity is applied) shall be 40 dB or more.

The worst-case spurious response of a receiver is typically the mixer image response.

2.10. ARIB STD-T67 3.3(3) Adjacent Channel Selectivity

The adjacent-channel selectivity at effective selectivity in the 400 MHz band (the ratio of the jamming wave input voltage to the encoding reference sensitivity as the output bit error rate of the device becomes 1 x 10^{-2} when a jamming wave that is modulated by a signal of repetitive binary pseudo-noise with a code length of 32767 bits and is 12.5 kHz or 25 kHz distant from the desired wave is applied to a device with channel interval of 12.5 kHz or 25 kHz, respectively, in a state in which a desired wave input voltage 3 dB higher than the encoding reference sensitivity is applied) shall be 30 dB or more.

2.11. ARIB STD-T67 3.3(5) Secondary Spurious Emissions

The limit on secondary emissions radiated from the receiving equipment shall be, in terms of the power of a dummy antenna circuit that has the same electrical constant as the receiving antenna, 4 nW (–54 dBm) or lower.

3. TX Measurement Results

3.1. TX Measurement Details

All TX measurements were done with the following spectrum analyzer settings:

- Anritsu MS2692A Signal Analyzer
- Detector Mode = Peak
- ResBW = 300 Hz, VidBW = 300 Hz
- Average with 50 samples
- Amplitude correction for cable loss = 0.2 dB
- Frequency = 426.25 MHz, Modulation = 2GFSK, Data Rate and Deviation as shown in each measurement.
- WDS TX Scripts as shown in “5. Wireless Development Suite (WDS) TX Script Files” on page 20.

3.2. ARIB STD-T67 3.2(1) Antenna Power

The allowed transmitter antenna power is specified in ARIB STD-T67 3.2(1), and is specified as less than 10 mW (+10 dBm). The measured transmitter antenna power is shown in Figure 1 as approximately +9.93 dBm. The Si4461 chip complies with the requirements of ARIB STD-T67 3.2(1) for Transmit Antenna Power.

- Limit: +10 dBm (max)
- Measured: +9.93 dBm
- Margin: 0.07 dB (PASS)

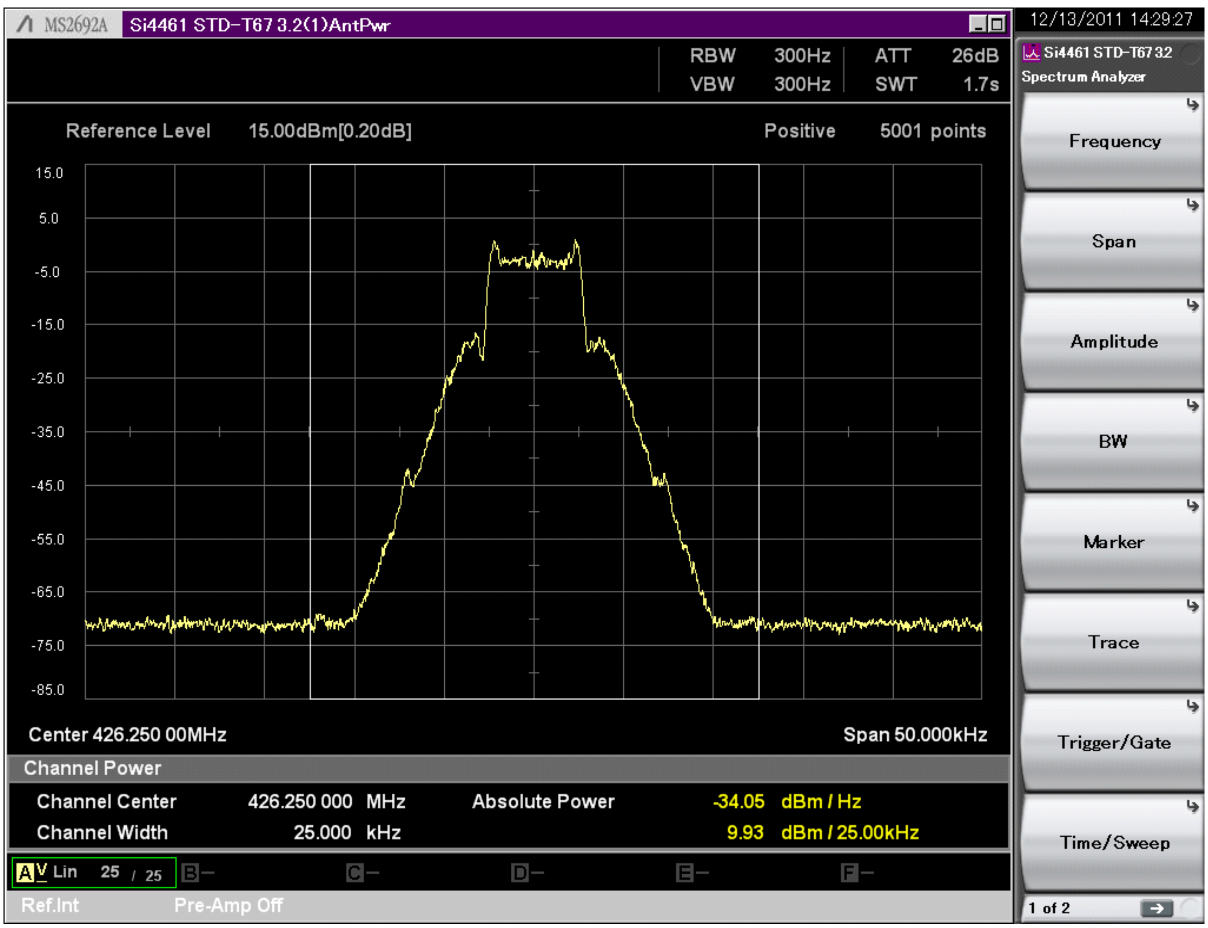


Figure 1. Transmitter Antenna Power

The Si446x family of chips provides for very fine control of the output power when operating near its maximum output power level (e.g., +13 to +14 dBm for the Si4461 chip). The output power on the Si4461 chip is adjusted by first selecting the output device bias current (as set by the PA_BIAS_CLKDUTY property 0x2202) and then selecting the number of output device fingers that are enabled (as set by the PA_PWR_LVL property 0x2201). The value of the PA_PWR_LVL property may range from 0 fingers enabled (minimum output power) to 127 fingers enabled (maximum output power). Silicon Labs recommends selection of the output device bias current to obtain nominal output power for the condition of 100 output device fingers enabled; further adjustments in output power may be made by adjusting only the PA_PWR_LVL property, and allows for adjustment range in both the upwards and downwards directions.

The output power shown in Figure 1 was obtained with PA_BIAS_CLKDUTY = 0x14. As the PA_PWR_LVL property was adjusted from the nominal value of PA_PWR_LVL = 0x64 (100 fingers), the output power levels shown in Table 2 were obtained:

Table 2. TX Output Power vs. PA_PWR_LVL Setting

PA_PWR_LVL	Device Fingers	POUT (dBm) VDD=3.3V	IDD (mA)
0x66	102	10.14 dBm	24.74 mA
0x65	101	10.05 dBm	24.61mA
0x64	100	9.95 dBm	24.48 mA
0x63	99	9.90 dBm	24.34 mA
0x23	35	0.43 dBm	16.09 mA
0x22	34	0.15 dBm	15.95 mA
0x21	33	–0.11 dBm	15.83 mA
0x20	32	–0.41 dBm	15.70 mA

These measurements illustrate the very fine control of output power that may be obtained with the Si4461 chip, when operated near its maximum output power level. As shown in the table, the output power level may be further reduced to 0 dBm (in order to comply with the requirements in the frequency band between 426.025 MHz and 426.1375 MHz) by adjusting only the PA_PWR_LVL property (to approximately 34 fingers enabled).

It is apparent that the step size between adjacent power levels is reduced when operated with fewer output device fingers enabled. This is self-evident; the percentage change in output power obtained by reducing the output device fingers from 100 to 99 is much less than when reducing the output device fingers from 33 to 32, for example. If extremely fine control of the output power in the low power band is required, it would be necessary to select a reduced value of output device bias current such that the nominal output power (i.e., 0 dBm) was obtained for a much larger value of PA_PWR_LVL.

The variation in output power as a function V_{DD} supply voltage is shown in Table 3. These measurements demonstrate the excellent power flatness of the Si4461 device when the PA is matched for the Switched Current mode of operation (see “AN627: Si4060/Si4460/61/67 Low Power PA Matching” for a detailed discussion of this mode of PA operation).

Table 3. TX Output Power Flatness vs. VDD

PA_OB	PA_PWR_LVL	Device Fingers	VDD (VDC)	POUT (dBm)	IDD (mA)
0x14	0x64	100	3.60 VDC	10.01 dBm	24.56 mA
			3.30 VDC	9.95 dBm	24.48 mA
			3.00 VDC	9.91 dBm	24.37 mA
			2.70 VDC	9.72 dBm	23.93 mA
			2.40 VDC	9.36 dBm	22.79 mA
			2.10 VDC	8.92 dBm	21.59mA
			1.80 VDC	8.32 dBm	20.60 mA

3.3. ARIB STD-T67 3.2(9) Adjacent Channel Leakage Power

The allowed adjacent channel leakage power is specified in ARIB STD-T67 3.2(9), and shall be lower than 40 dB below the carrier power. For a channel spacing of 12.5 kHz, the adjacent channel leakage power is measured in a 8.5 kHz bandwidth, centered at 12.5 kHz offset from the channel center frequency. For a channel spacing of 25 kHz, the adjacent channel leakage power is measured in a 16 kHz bandwidth, centered at 25 kHz offset from the channel center frequency.

The measured adjacent channel leakage power for several different combinations of data rates and deviations is shown in this section.

The modulation parameters for the measurement in Figure 2 were DR = 4.8 kbps and Deviation = 2.5 kHz. A continuously-looped PN9 sequence was used for the modulation pattern. The Si4461 chip easily complies with the requirements of ARIB STD-T67 3.2(9) for Adjacent Channel Leakage Power in a 16 kHz bandwidth at a frequency offset of 25 kHz for this set of modulation parameters.

- Limit: –40 dBc (max)
- Measured: –63.59 dBc
- Margin: 23.59 dB (PASS)

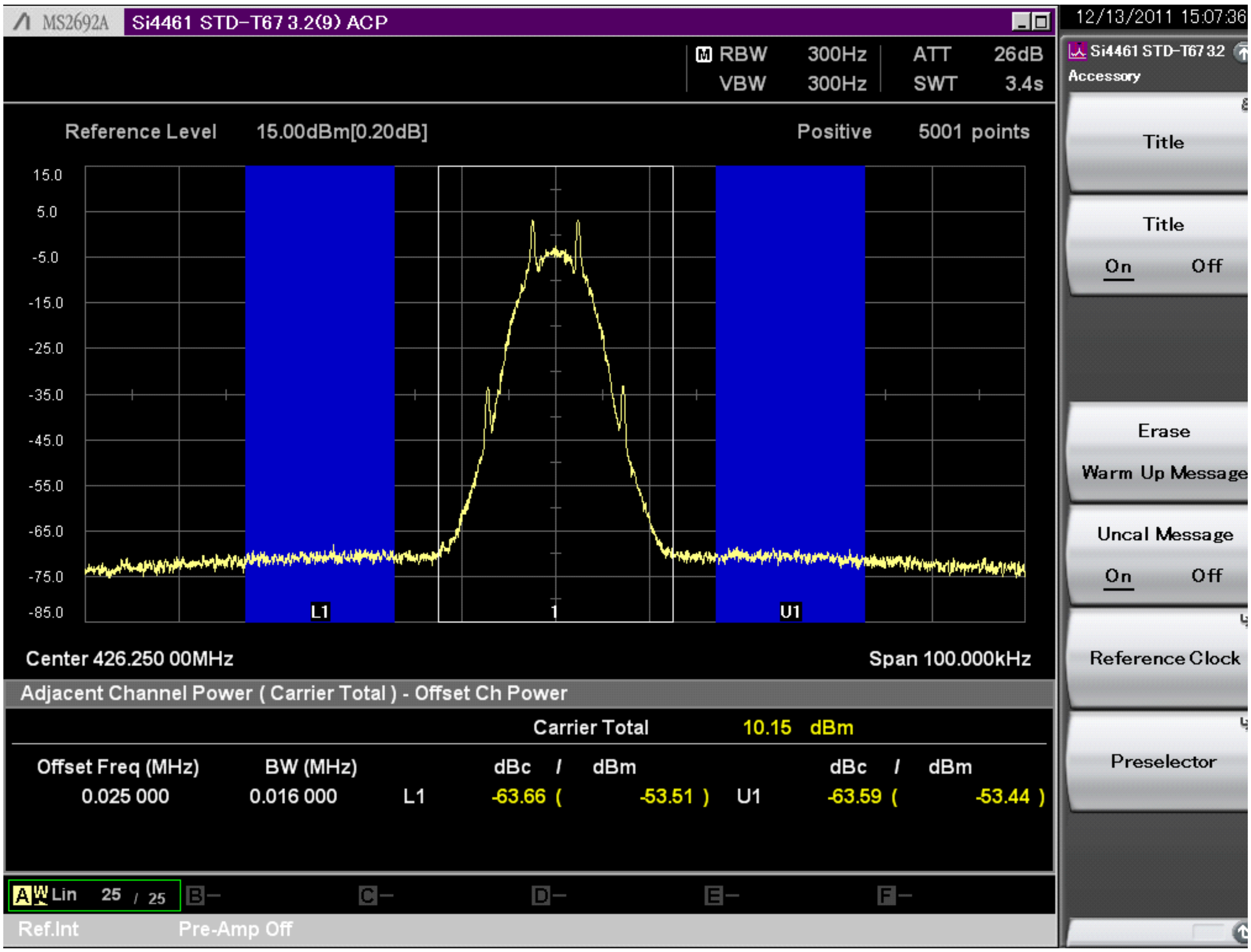


Figure 2. Adjacent Channel Leakage at 25 kHz Channel Spacing (DR=4.8 kbps Dev=2.5 kHz)

The modulation parameters for the measurement in Figure 3 were DR = 4.8 kbps and Deviation = 2.0 kHz. A continuously-looped PN9 sequence was used for the modulation pattern. The Si4461 chip easily complies with the requirements of ARIB STD-T67 3.2(9) for Adjacent Channel Leakage Power in a 8.5 kHz bandwidth at a frequency offset of 12.5 kHz for this set of modulation parameters.

- Limit: –40 dBc (max)
- Measured: –61.85 dBc
- Margin: 21.85 dB (PASS)

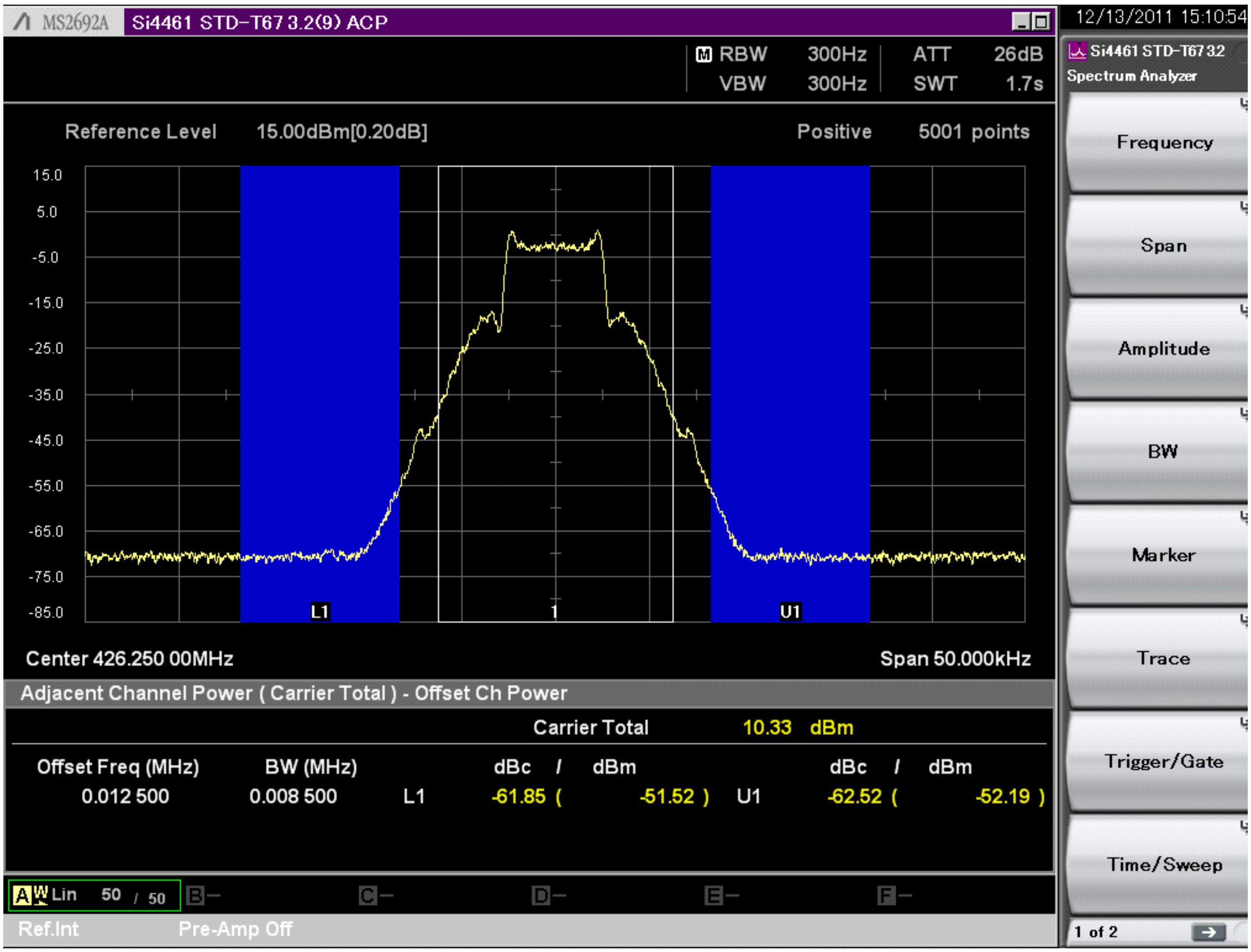


Figure 3. Adjacent Channel Leakage at 12.5 kHz Channel Spacing (DR=4.8 kbps Dev=2.0 kHz)

The modulation parameters for the measurement in Figure 4 were DR = 2.4 kbps and Deviation = 2.5 kHz. A continuously-looped PN9 sequence was used for the modulation pattern. The Si4461 chip easily complies with the requirements of ARIB STD-T67 3.2(9) for Adjacent Channel Leakage Power in a 8.5 kHz bandwidth at a frequency offset of 12.5 kHz for this alternate set of modulation parameters.

- Limit: –40 dBc (max)
- Measured: –65.78 dBc
- Margin: 25.78 dB (PASS)

Figure 4. Adjacent Channel Leakage at 12.5 kHz Channel Spacing (DR=2.4 kbps Dev=2.5 kHz)

3.4. ARIB STD-T67 3.2(10) Permissible Occupied Bandwidth

The allowed permissible occupied bandwidth is specified in ARIB STD-T67 3.2(10) and provides for two different values of occupied bandwidth, dependent upon channel spacing. For a channel spacing of 25 kHz, the occupied bandwidth must be between 8.5 kHz and 16 kHz. For a channel spacing of 12.5 kHz, the occupied bandwidth must be less than 8.5 kHz.

The measured occupied bandwidths for several different combinations of data rates and deviations are shown in this section.

The modulation parameters for the measurement of Figure 5 were DR = 4.8 kbps and Deviation = 2.5 kHz. A continuously-looped PN9 sequence was used for the modulation pattern. The Si4461 chip easily complies with the specification limits for 25 kHz channel spacing when transmitting 4.8 kbps, 2.5 kHz deviation, as the measured occupied bandwidth falls well below 16 kHz. The deviation may even be increased slightly if use of 25 kHz channel spacing is desired.

- Limit: 16 kHz max (for 25 kHz channel spacing)
- Measured: 8.12 kHz
- Margin: 7.88 kHz (PASS)

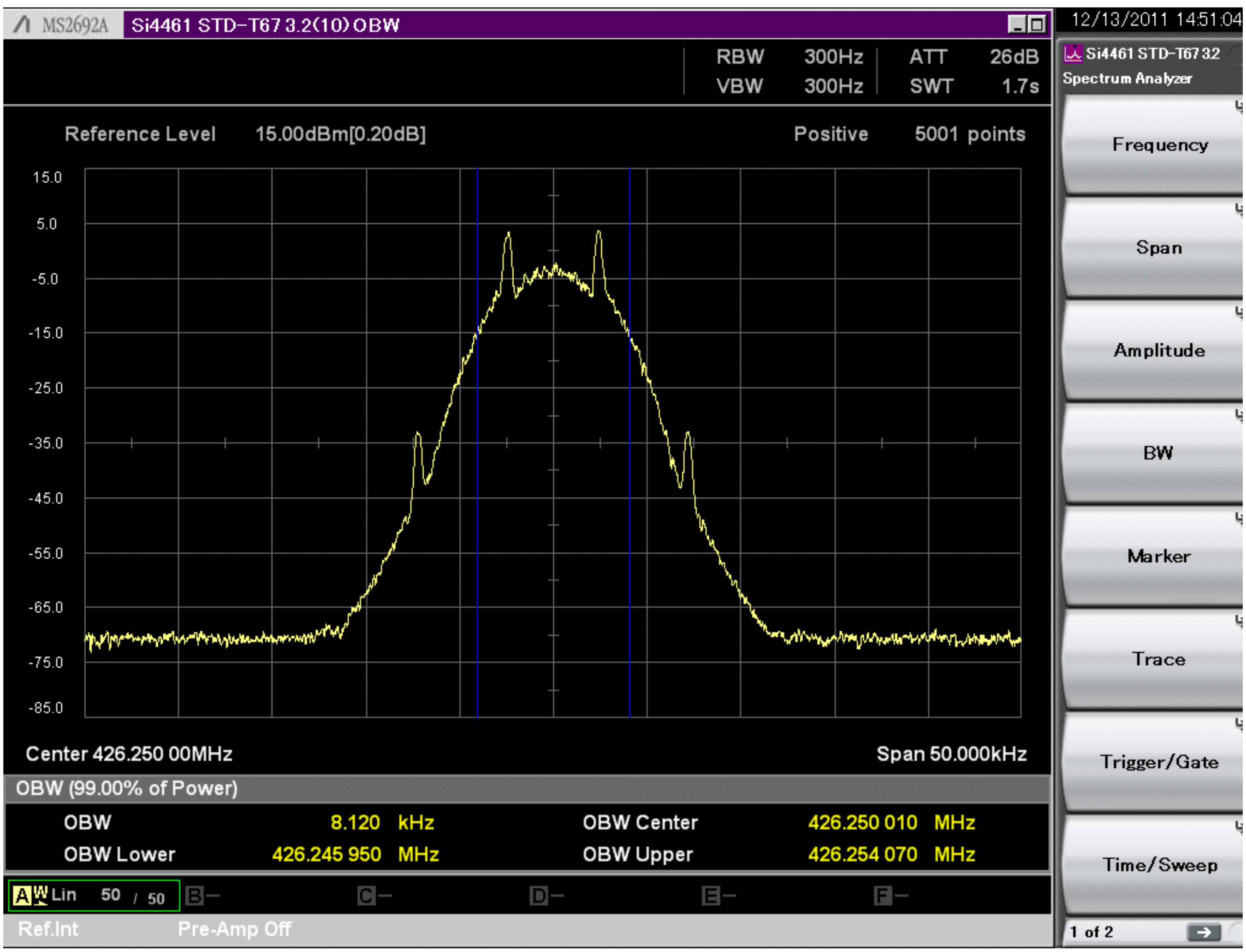


Figure 5. Occupied Bandwidth (DR=4.8 kbps Dev=2.5 kHz)

The modulation parameters for the measurement of Figure 6 were DR = 4.8 kbps and Deviation = 2.0 kHz. A continuously-looped PN9 sequence was used for the modulation pattern. The Si4461 chip easily complies with the specification limits for 12.5 kHz channel spacing when transmitting 4.8 kbps, 2.0 kHz deviation, as the measured occupied bandwidth falls well below 8.5 kHz.

- Limit: 8.5 kHz max (for 12.5 kHz channel spacing)
- Measured: 6.73 kHz
- Margin: 1.77 kHz (PASS)

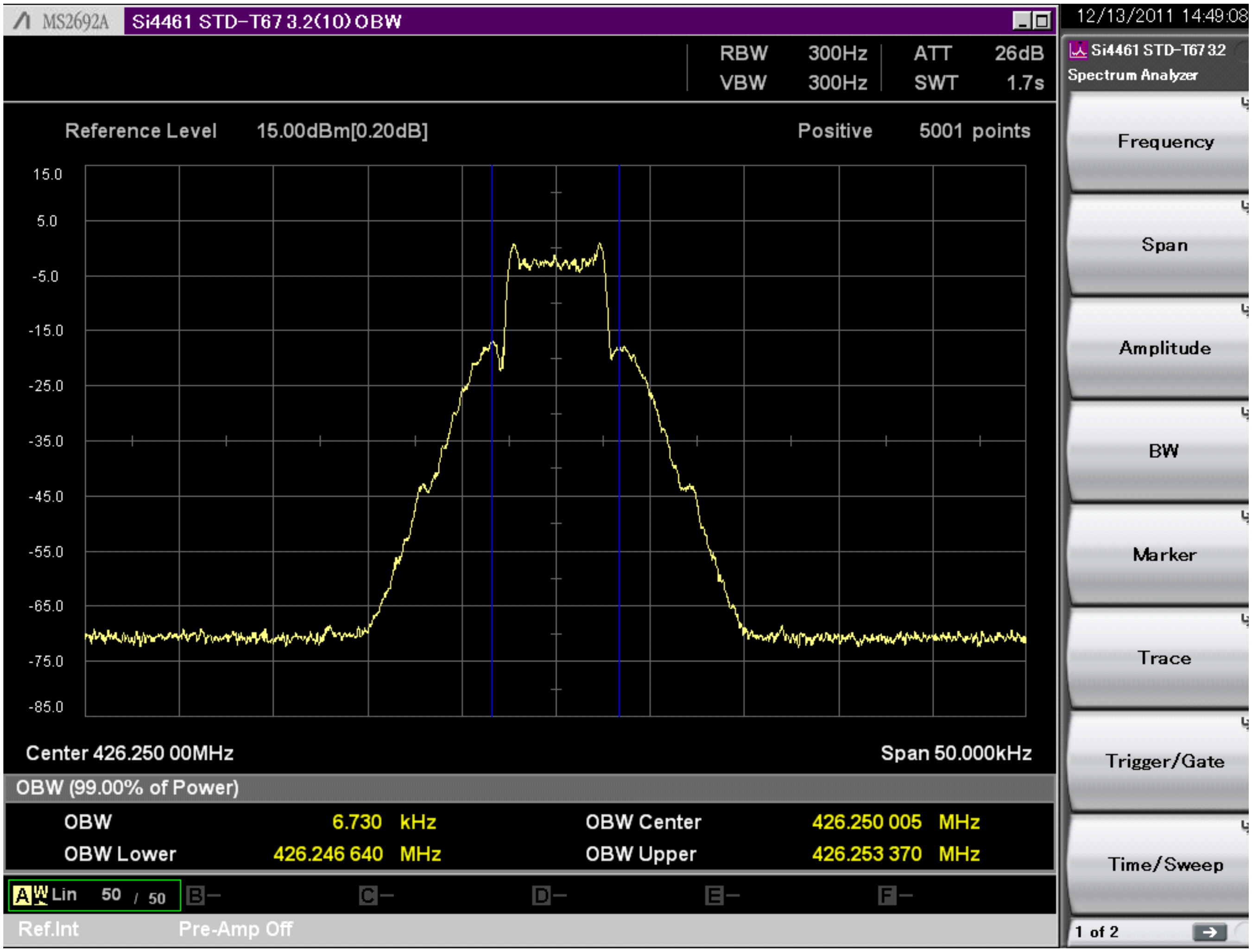


Figure 6. Occupied Bandwidth (DR=4.8 kbps Dev=2.0 kHz)

The modulation parameters for the measurement in Figure 7 were DR = 2.4 kbps and Deviation = 2.5 kHz. A continuously-looped PN9 sequence was used for the modulation pattern. The Si4461 chip easily complies with the specification limits for 12.5 kHz channel spacing when transmitting 2.4 kbps, 2.5 kHz deviation, as the measured occupied bandwidth again falls below 8.5 kHz. This combination of modulation parameters may therefore also be used for 12.5 kHz channel spacing.

- Limit: 8.5 kHz max (for 12.5 kHz channel spacing)
- Measured: 6.69 kHz
- Margin: 1.81 kHz (PASS)

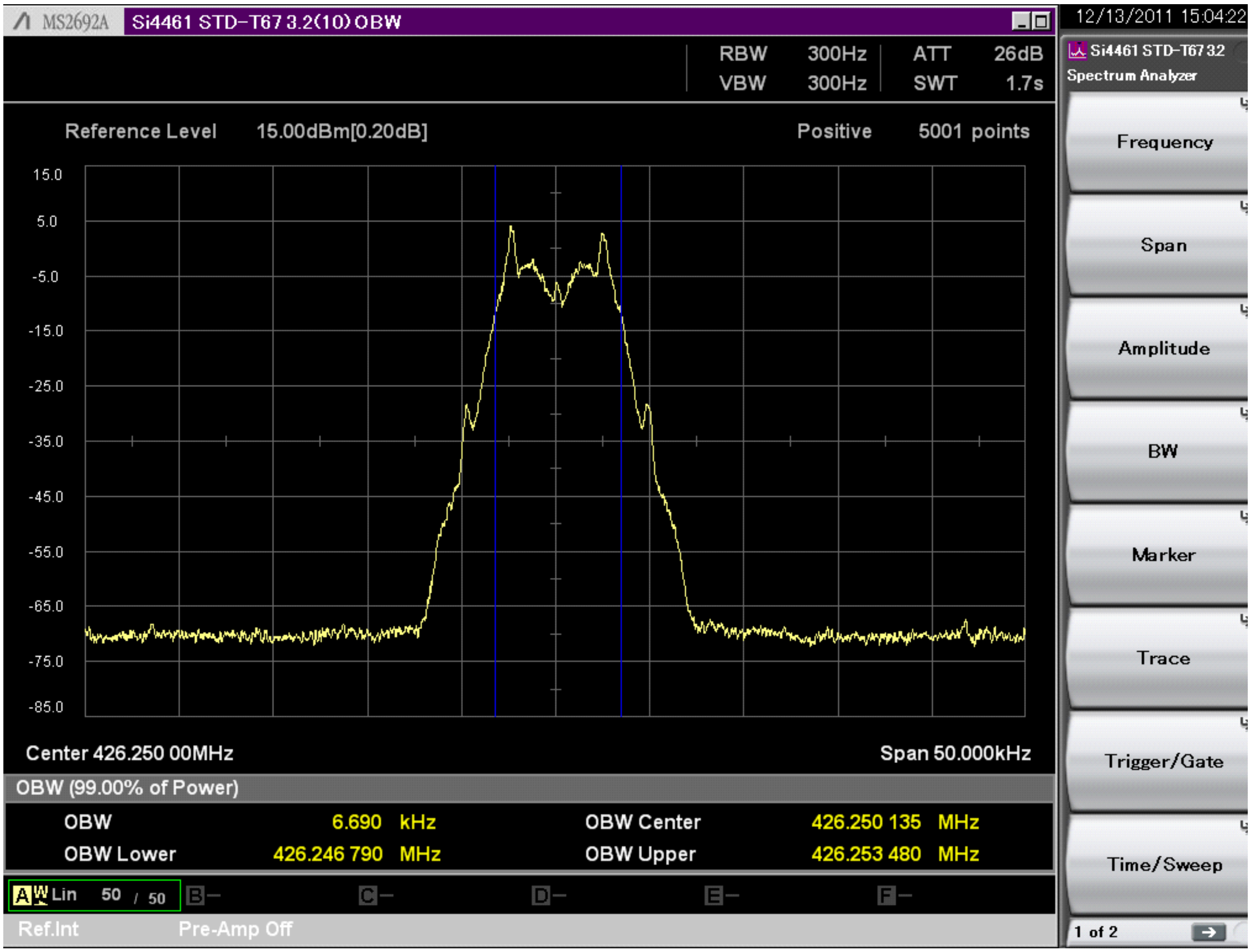


Figure 7. Occupied Bandwidth (DR=2.4 kbps Dev=2.5 kHz)

3.5. ARIB STD-T67 3.2(11) Spurious Emissions

The allowed level of spurious emissions is specified in ARIB STD-T67 3.2(11)(b), and shall be a maximum of 2.5 µW (–26 dBm). This specification is applicable to signals immediately outside the allowed occupied bandwidth (out-of-band domain) as well as to harmonic and sub-harmonic signals falling much further away (spurious domain).

The measured spurious emissions within the band from 30 MHz to 425.25 MHz is shown in Figure 8. The upper limit (i.e., 425.25 MHz) for this frequency segment was chosen to end at 1 MHz offset below the desired operating frequency of 426.25 MHz; in the absence of clear definition in a regulatory standard, this seemed a reasonable definition of the Spurious Domain. The Si4461 chip easily complies with the requirements of ARIB STD-T67 3.2(11) for Spurious Emissions within this frequency segment.

- Limit: –26 dBm (max)
- Measured: –63.41 dBm
- Margin: 37.41 dB (PASS)

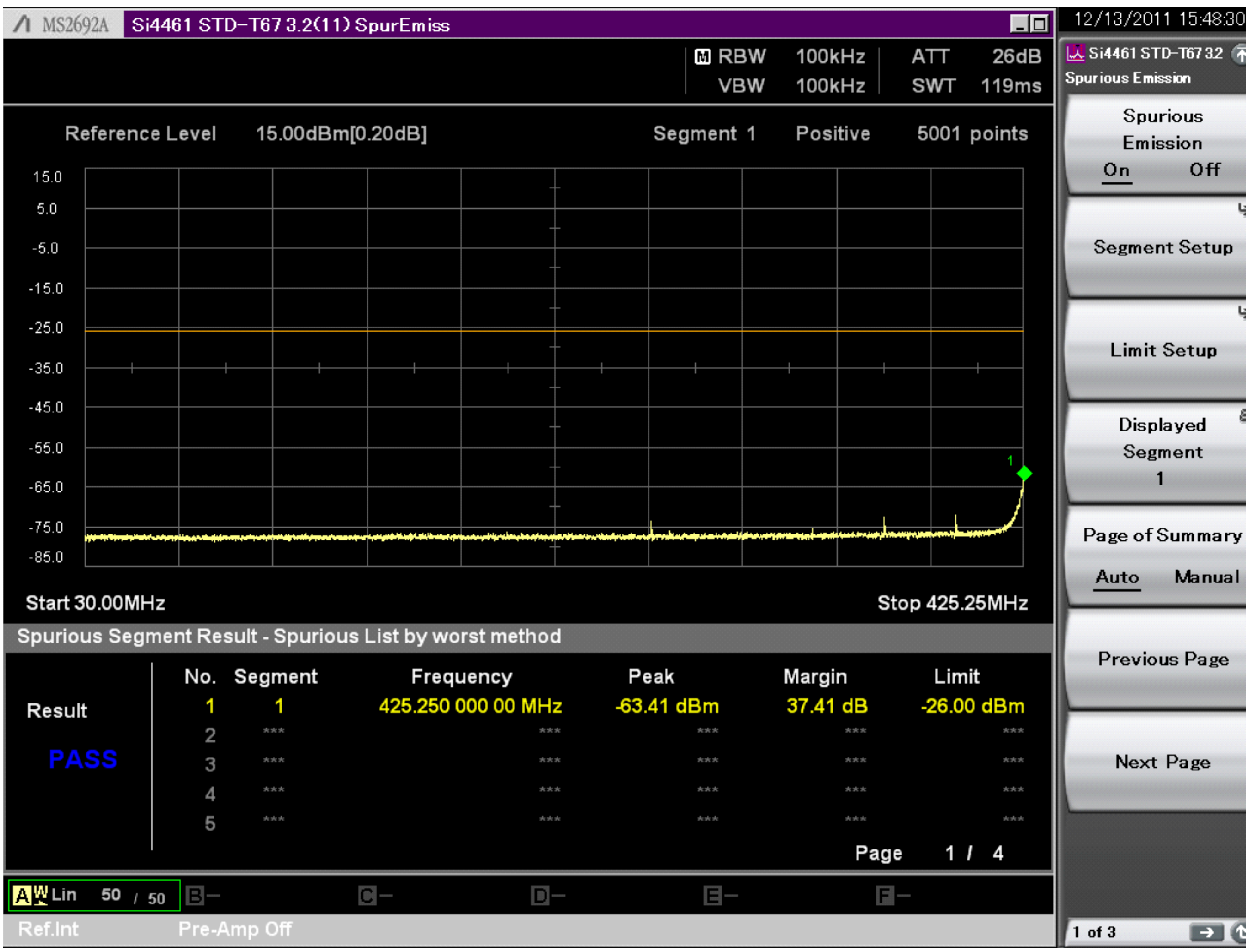


Figure 8. Spurious Emissions (30-425 MHz)

The measured spurious emissions within the band from 427.25 MHz to 1.0 GHz is shown in Figure 9. The lower limit (i.e., 427.25 MHz) for this frequency segment was chosen to begin at 1 MHz offset above the desired operating frequency of 426.25 MHz; in the absence of clear definition in a regulatory standard, this again seemed a reasonable definition of the Spurious Domain. The Si4461 chip easily complies with the requirements of ARIB STD-T67 3.2(11) for Spurious Emissions within this frequency segment. The largest spurious signal observed within this frequency segment is the 2nd harmonic at 852.5 MHz; this signal may be attenuated to arbitrarily low levels by additional sections of lowpass filtering in the TX output path.

- Limit: –26 dBm (max)
- Measured: –57.59 dBm
- Margin: 31.59 dB (PASS)

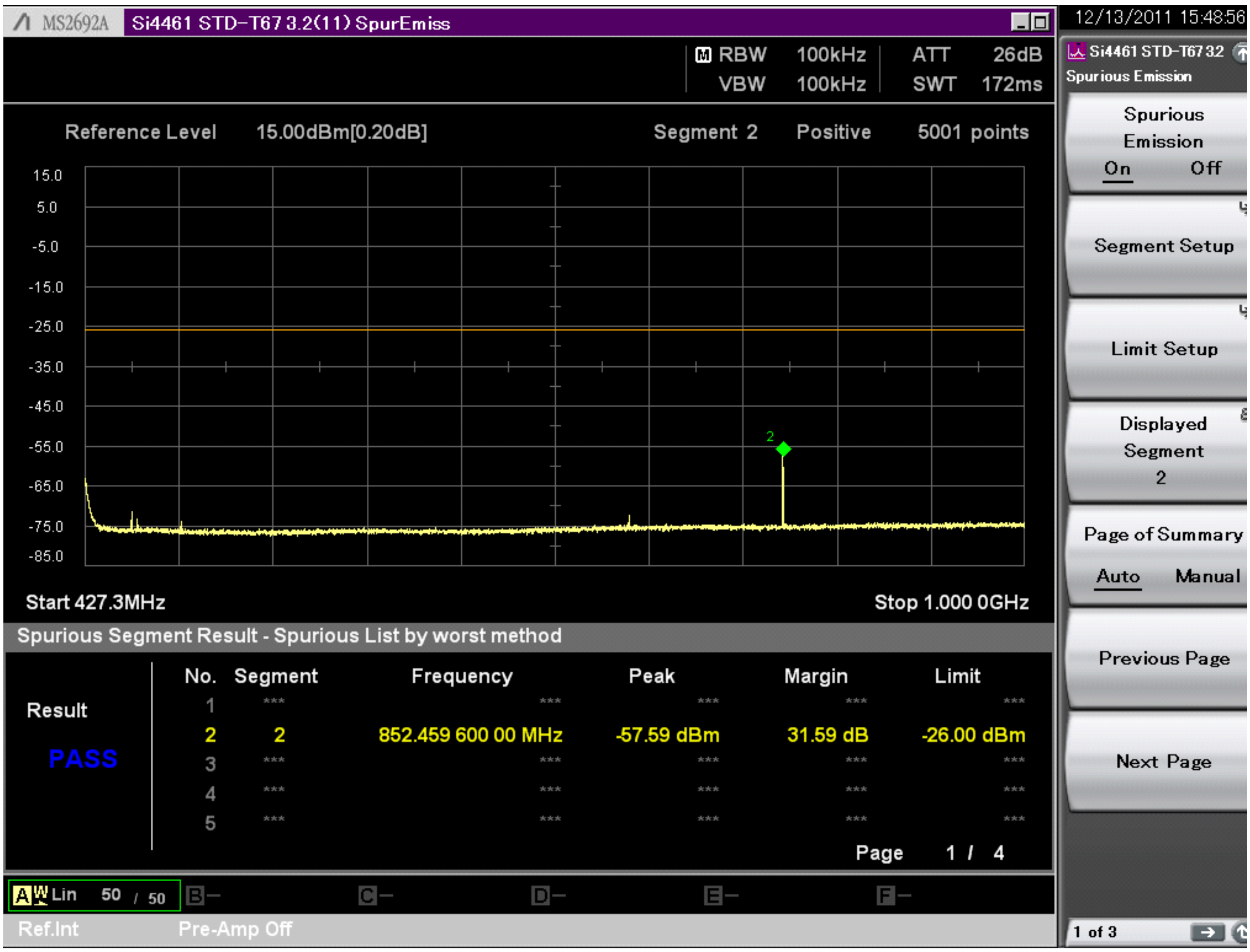


Figure 9. Spurious Emissions (427–1000 MHz)

The measured spurious emissions within the band from 1.0 GHz to 3.0 GHz is shown in Figure 10. The Si4461 chip easily complies with the requirements of ARIB STD-T67 3.2(11) for Spurious Emissions within this frequency segment. Again, the dominant spurious signals observed within this frequency segment are harmonics of the desired signal; they may be attenuated to arbitrarily low levels by additional sections of lowpass filtering in the TX output path.

- Limit: –26 dBm (max)
- Measured: –53.97 dBm
- Margin: 27.97 dB (PASS)

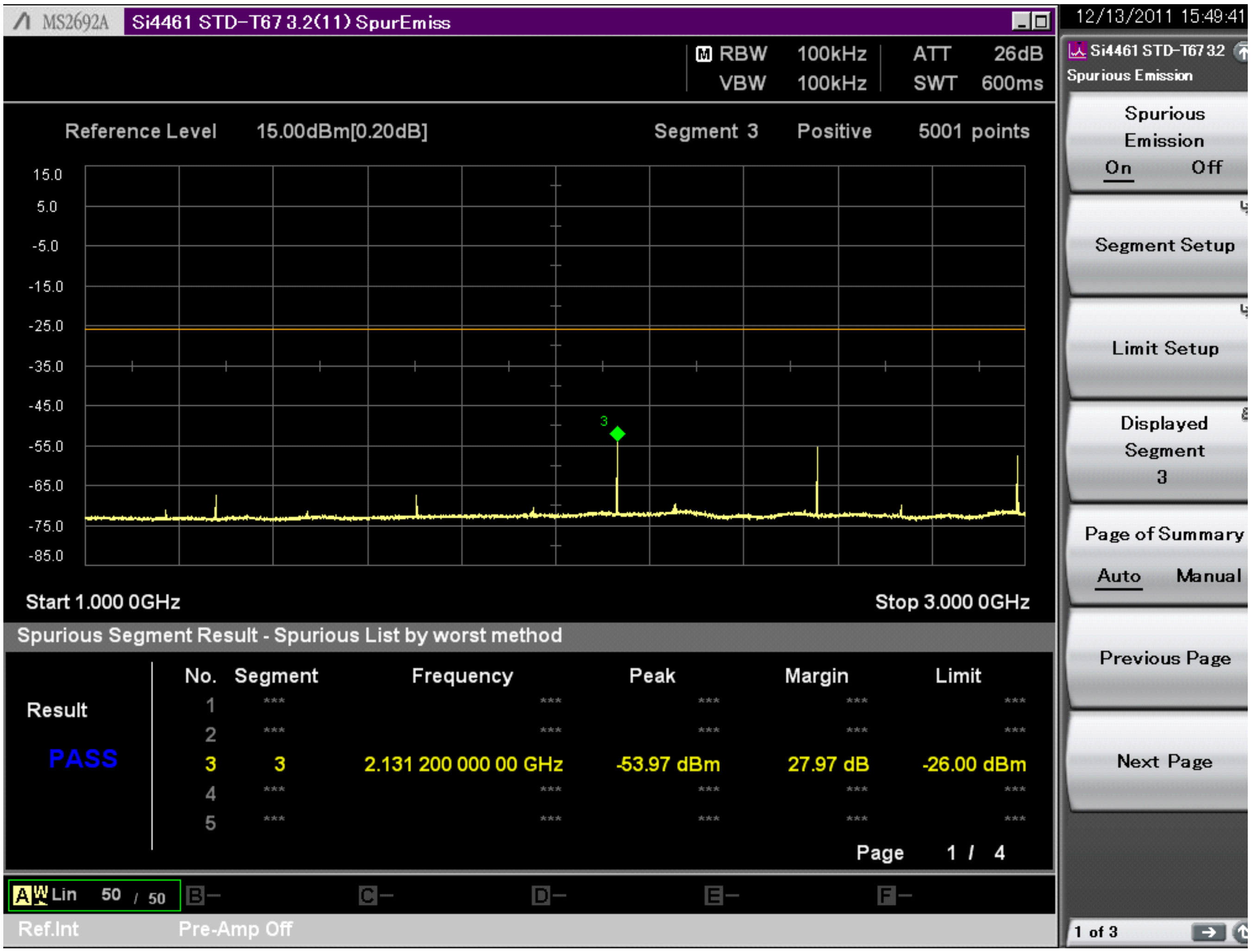


Figure 10. Spurious Emissions (1–3 GHz)

4. RX Measurement Results

4.1. RX Measurement Details

All RX measurements were done with the following settings:

- Agilent ESG-4433B Signal Generators (for both desired and interfering signals)
- PN9 data pattern for desired signal
- PN15 data pattern for interfering signal
- Crystal oscillator and/or Signal Generator adjusted for zero relative frequency error

The RX script files used are shown in “6. Wireless Development Suite (WDS) RX Script Files” on page 24.

4.2. ARIB STD-T67 3.3(1) Encoding Reference Sensitivity

The receiver encoding reference sensitivity is specified in ARIB STD-T67 3.3(1), and is specified as less than 2 µV (-101 dBm into 50 Ω) for a bit error rate (BER) of 1E-2 (1%). This requirement applies to both 12.5 kHz and 25 kHz channel spacing applications. The Si4461 chip complies with the requirements of ARIB STD-T67 3.3(1) for Encoding Reference Sensitivity, as shown in Table 4. As the modulation bandwidth of the signals used in ARIB STD-T67 are quite narrow, it is necessary to adjust the crystal oscillator and/or signal generator for zero relative frequency error, or to use a TCXO as an external reference source to the RFIC.

Table 4. Receive BER

RX Sensitivity			
Channel Spacing	25.0 kHz	12.5 kHz	12.5 kHz
Data Rate/ Dev	4.8 kbps/2.5 kHz	4.8 kbps/2.0 kHz	2.4 kbps/2.5 kHz
RX IF BW	10.3 kHz	9.5 kHz	7.2 kHz
RX Sens (BER=1%)	–119.7 dBm	–119.9 dBm	–120.6 dBm

4.3. ARIB STD-T67 3.3(2) Spurious Response Selectivity

The receiver spurious response at effective selectivity is specified in ARIB STD-T67 3.3(2), and is specified as the ratio of the jamming wave input voltage to the encoding reference sensitivity as the output bit error rate of the device becomes 1×10^{-2} in a state in which the desired wave input voltage is 3 dB higher than the encoding reference sensitivity, and a non-modulated jamming signal is applied. The requirement for this specification is a minimum of 40 dB spurious selectivity. The Si4461 chip complies with the requirements of ARIB STD-T67 3.3(2) for Spurious Response Selectivity, as shown in Table 5.

The worst-case frequency at which to apply the jamming signal is the mixer image frequency, located at 937.5 kHz (i.e., twice the IF frequency of 468.75 kHz) below the desired channel frequency. The measurements shown in Table 5 were taken for this spurious condition. The spurious selectivity performance of the Si4461 chip may be increased to over 55 dB (i.e., greater than 15 dB margin of compliance) by performing an on-chip I-Q calibration sequence prior to taking the measurement.

Table 5. Spurious Response Selectivity

Sensitivity @ 1% BER P_{SENS}	Desired Signal Level P_{DES}	Interferer Signal Level P_{INT}	Spurious Selectivity $P_{INT}–P_{SENS}$	Margin
Channel Spacing =25 kHz, DR=4.8 kbps, Dev=2.5 kHz				
–119.7 dBm	–116.7 dBm	–77.8 dBm	41.9 dB	1.9 dB
Channel Spacing =12.5 kHz, DR=4.8 kbps, Dev=2.0 kHz				
–119.9 dBm	–116.9 dBm	–78.3 dBm	41.6 dB	1.6 dB
Channel Spacing =12.5 kHz, DR=2.4 kbps, Dev=2.5 kHz				
–120.6 dBm	–117.6 dBm	–79.4 dBm	41.2 dB	1.2 dB

4.4. ARIB STD-T67 3.3(3) Adjacent Channel Selectivity

According to ARIB STD-T67 3.3(3), the adjacent channel selectivity is the ratio of the jamming wave input voltage to the encoding reference sensitivity as the output bit error rate of the device becomes 1 x 10^{-2} in a state in which the desired wave input voltage is 3 dB higher than the encoding reference sensitivity, and the jamming signal is modulated with a PN15 sequence. The requirement for this specification is a minimum of 30 dB adjacent channel selectivity.

Note: The bit rate and deviation are not specified for either the desired or the interferer signal.

The measurement method used an Agilent ESG-4433B signal generator with Real-Time Baseband I/Q Modulation option to generate the desired signal using a PN9 sequence as the modulation data pattern. The interfering signal was also generated using an Agilent ESG-4433B signal generator with the same modulation option, but configured for a PN15 sequence to ensure non-correlation between the modulation patterns. The interfering signal was configured for the same data rate and deviation as the desired signal. As required by ARIB STD-T67 3.3(3), the desired signal was set 3 dB higher than the receive encoding reference sensitivity (BER = 1%).

Table 6. Adjacent Channel Selectivity

Sensitivity @ 1% BER P_{SENS}	Desired Signal Level P_{DES}	Low-Side Interferer P_{INT}	High-Side Interferer P_{INT}	Low-Side AdjChSel $P_{INT}–P_{SENS}$	High-Side AdjChSel $P_{INT}–P_{SENS}$	Margin
Channel Spacing =25 kHz, DR=4.8 kbps, Dev=2.5 kHz						
–119.7 dBm	–116.7 dBm	–58.7 dBm	–58.9 dBm	61.0 dB	60.8 dB	30.8 dB
Channel Spacing =12.5 kHz, DR=4.8 kbps, Dev=2.0 kHz						
–119.9 dBm	–116.9 dBm	–75.1 dBm	–74.9 dBm	44.8 dB	45.0 dB	14.8 dB
Channel Spacing =12.5 kHz, DR=2.4 kbps, Dev=2.5 kHz						
–120.6 dBm	–117.6 dBm	–60.1 dBm	–60.3 dB	60.5 dB	60.3 dB	30.3 dB

The measured results show that the Si4461 chip easily complies with the adjacent channel selectivity requirements with a margin of greater than 14 dB.

4.5. ARIB STD-T67 3.3(5) Secondary Radiated Emissions

The allowed level of unwanted secondary spurious emissions in RX mode is specified in ARIB STD-T67 3.3(5), and shall be a maximum of 4 nW (–54 dBm).

The measured spurious emissions within the band from DC to 4 GHz is shown in Figure 11. The Si4461 chip easily complies with the requirements of ARIB STD-T67 3.3(5) for Secondary Spurious Emissions. The largest secondary spurious signal observed occurs at 3.4 GHz, and is the result of the internal VCO signal coupling to the bond wires of the LNA and then re-radiating out the antenna port.

- Limit: –54 dBm (max)
- Measured: –73.34 dBm
- Margin: 19.34 dB (PASS)

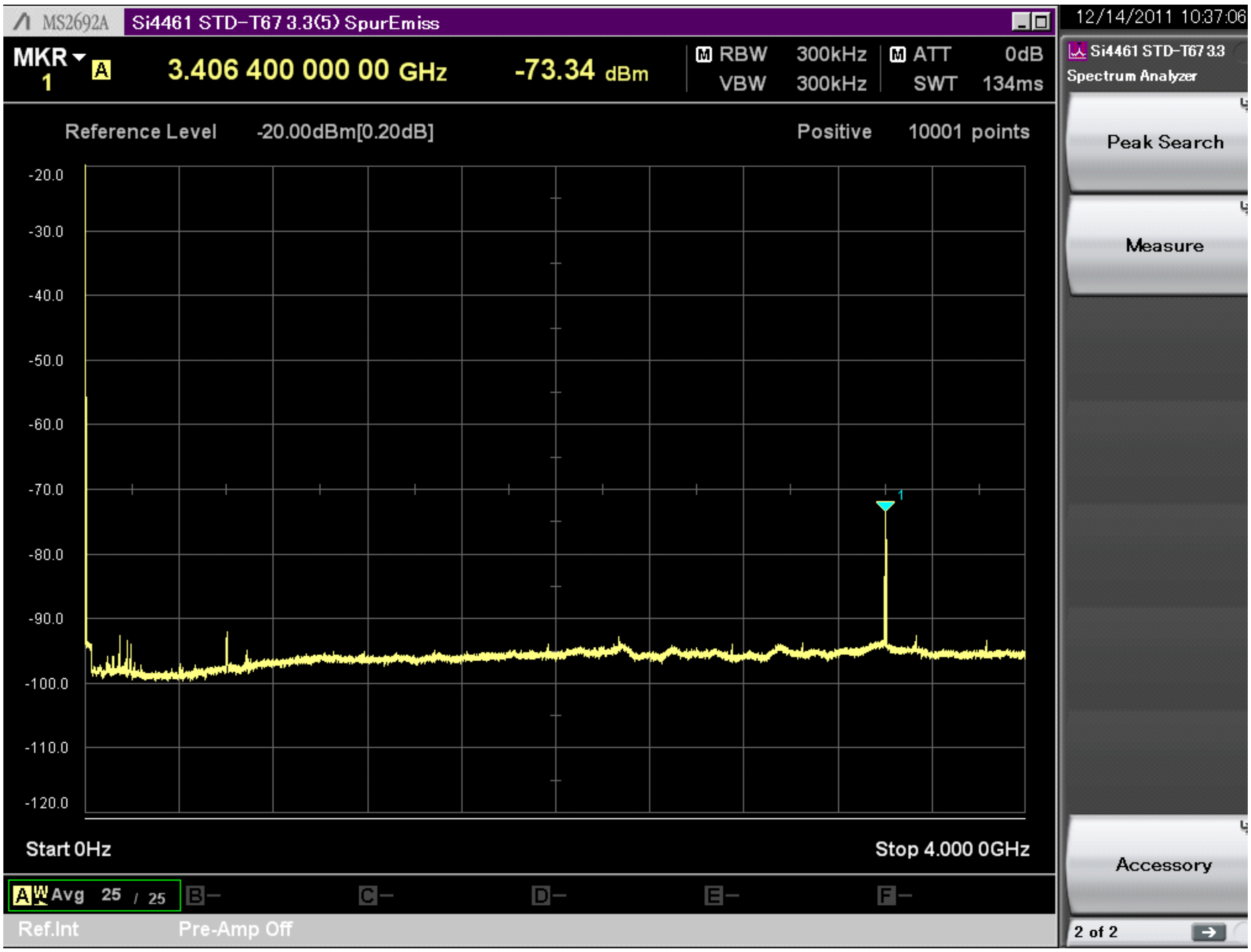


Figure 11. Secondary Spurious Emissions (DC–4 GHz)

5. Wireless Development Suite (WDS) TX Script Files

5.1. WDS TX Script File for 25 kHz Channel Spacing TX Measurements

All TX measurements for the 25 kHz channel spacing scenario were performed using the following script file (unless noted otherwise). The modulation parameters for measurements using this script were DR = 4.8 kbps and Deviation = 2.5 kHz (i.e., a modulation index of h = 1.04).

```
#BatchName TX 426.25MHz SwCurr +10dBm 2GFSK PN9 DR=4.8 kbps Dev=2.5 kHz

# Revision Date:  12/14/2011

# Start

RESET

'POWER_UP' 01

'PART_INFO'

'FUNC_INFO'

'SET_PROPERTY' 'GLOBAL_XO_TUNE' 4A

# Modem control group = 2GFSK Internal PN Seq

# PN polynomial = PN9 by default

'SET_PROPERTY' 'MODEM_MOD_TYPE' 13

'SET_PROPERTY' 'MODEM_MAP_CONTROL' 00

'SET_PROPERTY' 'MODEM_CLKGEN_BAND' 0A

# Freq control group = 426.25 MHz

'SET_PROPERTY' 'FREQ_CONTROL_INTE' 37

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_2' 0E

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_1' AA

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_0' AA

'SET_PROPERTY' 'FREQ_CONTROL_W_SIZE' 20

# PA control group = SwCurr, +10 dBm

'SET_PROPERTY' 'PA_MODE' 21

'SET_PROPERTY' 'PA_PWR_LVL' 64

'SET_PROPERTY' 'PA_BIAS_CLKDUTY' 14

# Tx parameters, DR=4.8kbps, Dev=2.5kHz, TXOSR=40

'SET_PROPERTY' 'MODEM_DATA_RATE_2' 00

'SET_PROPERTY' 'MODEM_DATA_RATE_1' 4B

'SET_PROPERTY' 'MODEM_DATA_RATE_0' 00

'SET_PROPERTY' 'MODEM_TX_NCO_MODE_3' 04

'SET_PROPERTY' 'MODEM_TX_NCO_MODE_2' 2D

'SET_PROPERTY' 'MODEM_TX_NCO_MODE_1' C6

'SET_PROPERTY' 'MODEM_TX_NCO_MODE_0' C0
```

'SET_PROPERTY' 'MODEM_FREQ_DEV_2' 00

'SET_PROPERTY' 'MODEM_FREQ_DEV_1' 00

'SET_PROPERTY' 'MODEM_FREQ_DEV_0' AF

Start transmitting

'START_TX' 00 00 00

5.2. WDS TX Script File for 12.5 kHz Channel Spacing TX Measurements

Certain TX measurements for the 12.5 kHz channel spacing scenario were performed using the following script file. The modulation parameters for measurements using this script were DR = 4.8 kbps and Deviation = 2.0 kHz (i.e., a modulation index of h = 0.83).

#BatchName TX 426.25MHz SwCurr +10dBm 2GFSK PN9 DR=4.8 kbps Dev=2.0 kHz

Revision Date: 12/14/2011

Start

RESET

'POWER_UP' 01

'PART_INFO'

'FUNC_INFO'

'SET_PROPERTY' 'GLOBAL_XO_TUNE' 4A

Modem control group = 2GFSK Internal PN Seq

PN polynomial = PN9 by default

'SET_PROPERTY' 'MODEM_MOD_TYPE' 13

'SET_PROPERTY' 'MODEM_MAP_CONTROL' 00

'SET_PROPERTY' 'MODEM_CLKGEN_BAND' 0A

Freq control group = 426.25 MHz

'SET_PROPERTY' 'FREQ_CONTROL_INTE' 37

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_2' 0E

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_1' AA

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_0' AA

'SET_PROPERTY' 'FREQ_CONTROL_W_SIZE' 20

PA control group = SwCurr, +10 dBm

'SET_PROPERTY' 'PA_MODE' 21

'SET_PROPERTY' 'PA_PWR_LVL' 64

'SET_PROPERTY' 'PA_BIAS_CLKDUTY' 14

Tx parameters, DR=4.8 kbps, Dev=2.0 kHz, TXOSR=40

'SET_PROPERTY' 'MODEM_DATA_RATE_2' 00

'SET_PROPERTY' 'MODEM_DATA_RATE_1' 4B

'SET_PROPERTY' 'MODEM_DATA_RATE_0' 00

'SET_PROPERTY' 'MODEM_TX_NCO_MODE_3' 04

'SET_PROPERTY' 'MODEM_TX_NCO_MODE_2' 2D

'SET_PROPERTY' 'MODEM_TX_NCO_MODE_1' C6

'SET_PROPERTY' 'MODEM_TX_NCO_MODE_0' C0

'SET_PROPERTY' 'MODEM_FREQ_DEV_2' 00

'SET_PROPERTY' 'MODEM_FREQ_DEV_1' 00

'SET_PROPERTY' 'MODEM_FREQ_DEV_0' 8C

Start transmitting

'START_TX' 00 00 00

5.3. WDS TX Script File for 12.5 kHz Channel Spacing TX Measurements (Alternate)

Certain TX measurements for the 12.5 kHz channel spacing scenario were performed using the following script file. The modulation parameters for measurements using this script were DR = 2.4 kbps and Deviation = 2.5 kHz (i.e., a modulation index of h = 2.08).

#BatchName TX 426.25MHz SwCurr +10dBm 2GFSK PN9 DR=2.4kbps Dev=2.5 kHz

Revision Date: 12/14/2011

Start

RESET

'POWER_UP' 01

'PART_INFO'

'FUNC_INFO'

'SET_PROPERTY' 'GLOBAL_XO_TUNE' 4A

Modem control group = 2GFSK Internal PN Seq

PN polynomial = PN9 by default

'SET_PROPERTY' 'MODEM_MOD_TYPE' 13

'SET_PROPERTY' 'MODEM_MAP_CONTROL' 00

'SET_PROPERTY' 'MODEM_CLKGEN_BAND' 0A

Freq control group = 426.25 MHz

'SET_PROPERTY' 'FREQ_CONTROL_INTE' 37

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_2' 0E

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_1' AA

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_0' AA

'SET_PROPERTY' 'FREQ_CONTROL_W_SIZE' 20

PA control group = SwCurr, +10 dBm

'SET_PROPERTY' 'PA_MODE' 21

'SET_PROPERTY' 'PA_PWR_LVL' 64

'SET_PROPERTY' 'PA_BIAS_CLKDUTY' 14

Tx parameters, DR=2.4 kbps, Dev=2.5 kHz, TXOSR=40

'SET_PROPERTY' 'MODEM_DATA_RATE_2' 00

```
'SET_PROPERTY' 'MODEM_DATA_RATE_1' 25
'SET_PROPERTY' 'MODEM_DATA_RATE_0' 80
'SET_PROPERTY' 'MODEM_TX_NCO_MODE_3' 04
'SET_PROPERTY' 'MODEM_TX_NCO_MODE_2' 2D
'SET_PROPERTY' 'MODEM_TX_NCO_MODE_1' C6
'SET_PROPERTY' 'MODEM_TX_NCO_MODE_0' C0
'SET_PROPERTY' 'MODEM_FREQ_DEV_2' 00
'SET_PROPERTY' 'MODEM_FREQ_DEV_1' 00
'SET_PROPERTY' 'MODEM_FREQ_DEV_0' AF
# Start transmitting
'START_TX' 00 00 00
```

6. Wireless Development Suite (WDS) RX Script Files

6.1. WDS RX Script File for 25 kHz Channel Spacing RX Measurements

All RX measurements for the 25 kHz channel spacing scenario were performed using the following script file (unless noted otherwise). The modulation parameters for measurements using this script were DR = 4.8 kbps and Deviation = 2.5 kHz (i.e., a modulation index of h = 1.04). The IF filter bandwidth was set to 10.3 kHz. The RX Modem parameters used in this script file are the values recommended by the IQ_Calculator contained within the Radio Control Panel application of WDS.

```
#BatchName RX 426.25 MHz BER 2GFSK DR4.8K Dev2.5K StdPream

# Revision Date:  12/13/2011

# Start

RESET

'POWER_UP' 01

'PART_INFO'

'FUNC_INFO'

'SET_PROPERTY' 'GLOBAL_XO_TUNE' 4B

# General parameters, Mod Type = 2GFSK

'SET_PROPERTY' 'MODEM_MOD_TYPE' 03

'SET_PROPERTY' 'MODEM_MAP_CONTROL' 00

'SET_PROPERTY' 'MODEM_CLKGEN_BAND' 0A

# Freq control group = 426.25 MHz

'SET_PROPERTY' 'FREQ_CONTROL_INTE' 37

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_2' 0E

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_1' AA

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_0' AA

'SET_PROPERTY' 'FREQ_CONTROL_W_SIZE' 20

# Rx parameters

'SET_PROPERTY' 'FREQ_CONTROL_VCOCNT_RX_ADJ' FE

# Use Standard Detector as source for BCR/Slicer

'SET_PROPERTY' 'MODEM_MDM_CTRL' 00

'SET_PROPERTY' 'MODEM_IF_CONTROL' 08

'SET_PROPERTY' 'MODEM_IF_FREQ_2' 03

'SET_PROPERTY' 'MODEM_IF_FREQ_1' 80

'SET_PROPERTY' 'MODEM_IF_FREQ_0' 00

'SET_PROPERTY' 'MODEM_DECIMATION_CFG1' B0

'SET_PROPERTY' 'MODEM_DECIMATION_CFG0' 21

'SET_PROPERTY' 'MODEM_BCR_OSR_1' 00

'SET_PROPERTY' 'MODEM_BCR_OSR_0' 62
```

```
'SET_PROPERTY' 'MODEM_BCR_NCO_OFFSET_2' 05
'SET_PROPERTY' 'MODEM_BCR_NCO_OFFSET_1' 3E
'SET_PROPERTY' 'MODEM_BCR_NCO_OFFSET_0' 2E
'SET_PROPERTY' 'MODEM_BCR_GAIN_1' 05
'SET_PROPERTY' 'MODEM_BCR_GAIN_0' 04
'SET_PROPERTY' 'MODEM_BCR_GEAR' 02
# bcrfbbyp=1, slcrfbbyp=1, dis_midpt=0
'SET_PROPERTY' 'MODEM_BCR_MISC1' C0
'SET_PROPERTY' 'MODEM_BCR_MISC0' 00
'SET_PROPERTY' 'MODEM_AFC_GEAR' 00
'SET_PROPERTY' 'MODEM_AFC_WAIT' 12
# Disable AFC
'SET_PROPERTY' 'MODEM_AFC_GAIN_1' 00
'SET_PROPERTY' 'MODEM_AFC_GAIN_0' 2A
'SET_PROPERTY' 'MODEM_AFC_LIMITER_1' 01
'SET_PROPERTY' 'MODEM_AFC_LIMITER_0' E4
# enfbpll=0, en2Tb_est=1
'SET_PROPERTY' 'MODEM_AFC_MISC' A0
'SET_PROPERTY' 'MODEM_AGC_CONTROL' E0
'SET_PROPERTY' 'MODEM_AGC_WINDOW_SIZE' 11
'SET_PROPERTY' 'MODEM_AGC_RFPD_DECAY' 15
'SET_PROPERTY' 'MODEM_AGC_IFPD_DECAY' 15
'SET_PROPERTY' 'MODEM_RAW_SEARCH' D6
# unstdpk=0 (use Std Detector), pm_pattern=2'b00 (std preamble)
'SET_PROPERTY' 'MODEM_RAW_CONTROL' 02
'SET_PROPERTY' 'MODEM_RAW_EYE_1' 00
'SET_PROPERTY' 'MODEM_RAW_EYE_0' AA
## RX channel filter coeff
# WB filter k1=4 (BW=10.3 kHz), NB filter k2=4 (BW=10.3 kHz)
'SET_PROPERTY' 21 0C 00 A2 81 26 AF 3F EE C8 C7 DB F2 02 08
'SET_PROPERTY' 21 06 0C 07 03 15 FC 0F 00
'SET_PROPERTY' 21 0C 12 A2 81 26 AF 3F EE C8 C7 DB F2 02 08
'SET_PROPERTY' 21 06 1E 07 03 15 FC 0F 00
# Skip sync detection, Std Preamble, PreDetTh=8 bits
#  (9-bit preamble may be found in PN9 or higher sequences)
'SET_PROPERTY' 'PREAMBLE_CONFIG_STD_1' 88
```

'SET_PROPERTY' 'PREAMBLE_CONFIG' 01

GPIO configuration

RxClk/RxData/PreambleDet

'GPIO_PIN_CFG' 11 14 18 00 00 00

Start receiving

'START_RX' 00 00 00 00 00 01

6.2. WDS RX Script File for 12.5 kHz Channel Spacing RX Measurements

Certain RX measurements for the 12.5 kHz channel spacing scenario were performed using the following script file. The modulation parameters for measurements using this script were DR = 4.8 kbps and Deviation = 2.0 kHz (i.e., a modulation index of h = 0.83). The IF filter bandwidth was set to 9.5 kHz. The RX Modem parameters used in this script file are the values recommended by the IQ_Calculator contained within the Radio Control Panel application of WDS.

#BatchName RX 426.25 MHz BER 2GFSK DR4.8K Dev2.0K StdPream

Revision Date: 12/13/2011

Start

RESET

'POWER_UP' 01

'PART_INFO'

'FUNC_INFO'

'SET_PROPERTY' 'GLOBAL_XO_TUNE' 4B

General parameters, Mod Type = 2GFSK

'SET_PROPERTY' 'MODEM_MOD_TYPE' 03

'SET_PROPERTY' 'MODEM_MAP_CONTROL' 00

'SET_PROPERTY' 'MODEM_CLKGEN_BAND' 0A

Freq control group = 426.25 MHz

'SET_PROPERTY' 'FREQ_CONTROL_INTE' 37

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_2' 0E

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_1' AA

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_0' AA

'SET_PROPERTY' 'FREQ_CONTROL_W_SIZE' 20

Rx parameters

'SET_PROPERTY' 'FREQ_CONTROL_VCOCNT_RX_ADJ' FE

Use Standard Detector as source for BCR/Slicer

'SET_PROPERTY' 'MODEM_MDM_CTRL' 00

'SET_PROPERTY' 'MODEM_IF_CONTROL' 08

'SET_PROPERTY' 'MODEM_IF_FREQ_2' 03

'SET_PROPERTY' 'MODEM_IF_FREQ_1' 80

```
'SET_PROPERTY' 'MODEM_IF_FREQ_0' 00
'SET_PROPERTY' 'MODEM_DECIMATION_CFG1' B0
'SET_PROPERTY' 'MODEM_DECIMATION_CFG0' 11
'SET_PROPERTY' 'MODEM_BCR_OSR_1' 00
'SET_PROPERTY' 'MODEM_BCR_OSR_0' 41
'SET_PROPERTY' 'MODEM_BCR_NCO_OFFSET_2' 07
'SET_PROPERTY' 'MODEM_BCR_NCO_OFFSET_1' DD
'SET_PROPERTY' 'MODEM_BCR_NCO_OFFSET_0' 44
'SET_PROPERTY' 'MODEM_BCR_GAIN_1' 07
'SET_PROPERTY' 'MODEM_BCR_GAIN_0' FF
'SET_PROPERTY' 'MODEM_BCR_GEAR' 02
# bcrfbbyp=1, slcrfbbyp=1, dis_midpt=0
'SET_PROPERTY' 'MODEM_BCR_MISC1' C0
'SET_PROPERTY' 'MODEM_BCR_MISC0' 00
'SET_PROPERTY' 'MODEM_AFC_GEAR' 00
'SET_PROPERTY' 'MODEM_AFC_WAIT' 12
# Disable AFC
'SET_PROPERTY' 'MODEM_AFC_GAIN_1' 00
'SET_PROPERTY' 'MODEM_AFC_GAIN_0' 2A
'SET_PROPERTY' 'MODEM_AFC_LIMITER_1' 01
'SET_PROPERTY' 'MODEM_AFC_LIMITER_0' BF
# enfbpll=0, en2Tb_est=1
'SET_PROPERTY' 'MODEM_AFC_MISC' A0
'SET_PROPERTY' 'MODEM_AGC_CONTROL' E0
'SET_PROPERTY' 'MODEM_AGC_WINDOW_SIZE' 11
'SET_PROPERTY' 'MODEM_AGC_RFPD_DECAY' 0E
'SET_PROPERTY' 'MODEM_AGC_IFPD_DECAY' 0E
'SET_PROPERTY' 'MODEM_RAW_SEARCH' D6
# unstdpk=0 (use Std Detector), pm_pattern=2'b00 (std preamble)
'SET_PROPERTY' 'MODEM_RAW_CONTROL' 02
'SET_PROPERTY' 'MODEM_RAW_EYE_1' 00
'SET_PROPERTY' 'MODEM_RAW_EYE_0' CC
## RX channel filter coeff
# WB filter k1=1 (BW=9.5 kHz), NB filter k2=1 (BW=9.5 kHz)
'SET_PROPERTY' 21 0C 00 FF BA 0F 51 CF A9 C9 FC 1B 1E 0F 01
'SET_PROPERTY' 21 06 0C 03 00 15 FF 00 00
```

'SET_PROPERTY' 21 0C 12 FF C4 30 7F F5 B5 B8 DE 05 17 16 0C

'SET_PROPERTY' 21 06 1E 03 00 15 FF 00 00

Skip sync detection, Std Preamble, PreDetTh=8 bits

(9-bit preamble may be found in PN9 or higher sequences)

'SET_PROPERTY' 'PREAMBLE_CONFIG_STD_1' 88

'SET_PROPERTY' 'PREAMBLE_CONFIG' 01

GPIO configuration

RxClk/RxData/PreambleDet

'GPIO_PIN_CFG' 11 14 18 00 00 00

Start receiving

'START_RX' 00 00 00 00 00 01

6.3. WDS RX Script File for 12.5 kHz Channel Spacing RX Measurements (Alternate)

Certain RX measurements for the 12.5 kHz channel spacing scenario were performed using the following script file. The modulation parameters for measurements using this script were DR = 2.4 kbps and Deviation = 2.5 kHz (i.e., a modulation index of h = 2.08). The IF filter bandwidth was set to 7.2 kHz. The RX Modem parameters used in this script file are the values recommended by the IQ_Calculator contained within the Radio Control Panel application of WDS.

#BatchName RX 426.25 MHz BER 2GFSK DR2.4K Dev2.5K StdPream

Revision Date: 12/14/2011

Start

RESET

'POWER_UP' 01

'PART_INFO'

'FUNC_INFO'

'SET_PROPERTY' 'GLOBAL_XO_TUNE' 4B

General parameters, Mod Type = 2GFSK

'SET_PROPERTY' 'MODEM_MOD_TYPE' 03

'SET_PROPERTY' 'MODEM_MAP_CONTROL' 00

'SET_PROPERTY' 'MODEM_CLKGEN_BAND' 0A

Freq control group = 426.25 MHz

'SET_PROPERTY' 'FREQ_CONTROL_INTE' 37

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_2' 0E

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_1' AA

'SET_PROPERTY' 'FREQ_CONTROL_FRAC_0' AA

'SET_PROPERTY' 'FREQ_CONTROL_W_SIZE' 20

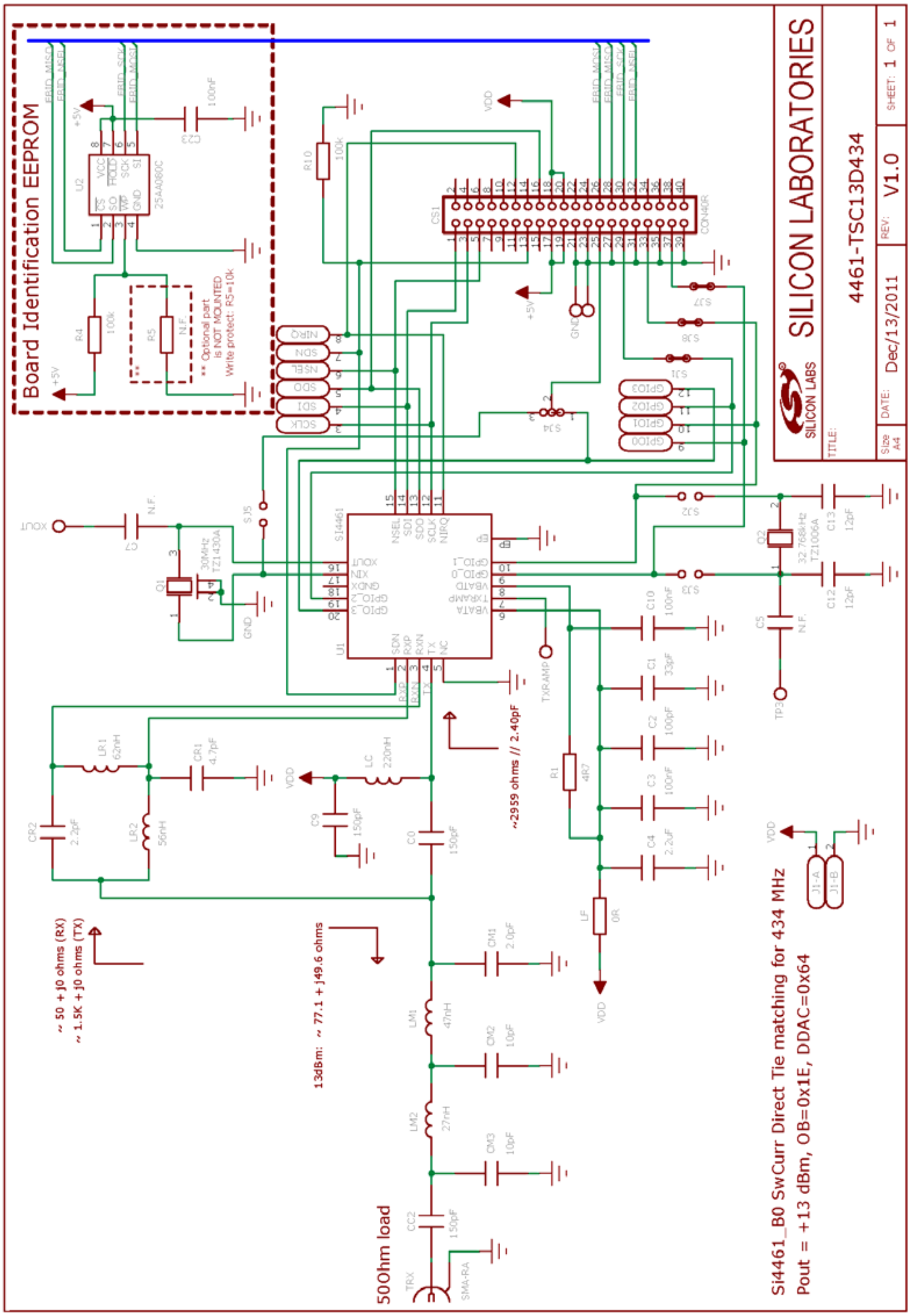
Rx parameters

'SET_PROPERTY' 'FREQ_CONTROL_VCOCNT_RX_ADJ' FE

```
# Use Standard Detector as source for BCR/Slicer
'SET_PROPERTY' 'MODEM_MDM_CTRL' 00
'SET_PROPERTY' 'MODEM_IF_CONTROL' 08
'SET_PROPERTY' 'MODEM_IF_FREQ_2' 03
'SET_PROPERTY' 'MODEM_IF_FREQ_1' 80
'SET_PROPERTY' 'MODEM_IF_FREQ_0' 00
'SET_PROPERTY' 'MODEM_DECIMATION_CFG1' F0
'SET_PROPERTY' 'MODEM_DECIMATION_CFG0' 21
'SET_PROPERTY' 'MODEM_BCR_OSR_1' 00
'SET_PROPERTY' 'MODEM_BCR_OSR_0' 62
'SET_PROPERTY' 'MODEM_BCR_NCO_OFFSET_2' 05
'SET_PROPERTY' 'MODEM_BCR_NCO_OFFSET_1' 3E
'SET_PROPERTY' 'MODEM_BCR_NCO_OFFSET_0' 2E
'SET_PROPERTY' 'MODEM_BCR_GAIN_1' 02
'SET_PROPERTY' 'MODEM_BCR_GAIN_0' 9D
'SET_PROPERTY' 'MODEM_BCR_GEAR' 02
# bcrfbbyp=1, slcrfbbyp=1, dis_midpt=0
'SET_PROPERTY' 'MODEM_BCR_MISC1' C0
'SET_PROPERTY' 'MODEM_BCR_MISC0' 00
'SET_PROPERTY' 'MODEM_AFC_GEAR' 00
'SET_PROPERTY' 'MODEM_AFC_WAIT' 12
# Disable AFC
'SET_PROPERTY' 'MODEM_AFC_GAIN_1' 00
'SET_PROPERTY' 'MODEM_AFC_GAIN_0' 15
'SET_PROPERTY' 'MODEM_AFC_LIMITER_1' 02
'SET_PROPERTY' 'MODEM_AFC_LIMITER_0' 9E
# enfbpll=0, en2Tb_est=1
'SET_PROPERTY' 'MODEM_AFC_MISC' A0
'SET_PROPERTY' 'MODEM_AGC_CONTROL' E0
'SET_PROPERTY' 'MODEM_AGC_WINDOW_SIZE' 11
'SET_PROPERTY' 'MODEM_AGC_RFPD_DECAY' 15
'SET_PROPERTY' 'MODEM_AGC_IFPD_DECAY' 15
'SET_PROPERTY' 'MODEM_RAW_SEARCH' D6
# unstdpk=0 (use Std Detector), pm_pattern=2'b00 (std preamble)
'SET_PROPERTY' 'MODEM_RAW_CONTROL' 03
'SET_PROPERTY' 'MODEM_RAW_EYE_1' 02
```

```
'SET_PROPERTY' 'MODEM_RAW_EYE_0' 8E
## RX channel filter coeff
# WB filter k1=1 (BW=7.2 kHz), NB filter k2=1 (BW=7.2 kHz)
'SET_PROPERTY' 21 0C 00 FF BA 0F 51 CF A9 C9 FC 1B 1E 0F 01
'SET_PROPERTY' 21 06 0C FC FD 15 FF 00 0F
'SET_PROPERTY' 21 0C 12 FF BA 0F 51 CF A9 C9 FC 1B 1E 0F 01
'SET_PROPERTY' 21 06 1E FC FD 15 FF 00 0F
# Skip sync detection, Std Preamble, PreDetTh=8 bits
#  (9-bit preamble may be found in PN9 or higher sequences)
'SET_PROPERTY' 'PREAMBLE_CONFIG_STD_1' 88
'SET_PROPERTY' 'PREAMBLE_CONFIG' 01
# GPIO configuration
# RxClk/RxData/PreambleDet
'GPIO_PIN_CFG' 11 14 18 00 00 00
# Start receiving
'START_RX' 00 00 00 00 00 01
```

7. Reference Design Schematic



Document Change List

Revision 0.1 to Revision 0.2

- Corrected limits of Rx Adjacent Channel Selectivity to 30 dB.

Revision 0.2 to Revision 0.3

- Changed “members” to “members and revisions” on page 1.
- Added B1, C0, C1, and C2 to Si446x-B0 on page 1.
- Changed Si4461-B0 to Si4461 on several pages.
- Changed AN627: Si4460/61 to AN627: Si4060/ Si4460/61/67 on page 7.

NOTES:

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Silicon Laboratories Inc.
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Austin, TX 78701
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