Elliott
An *NTS* company

EMC Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Contact:	Ron Seide		

Radio Test Report R76253

For The

Summit Data Communications

Model

SDC-MCF10G

Revision History

Rev #	Made By	Date	Comments
1.0	Mark Hill	31-Jul-09	Initial Release
2.0	Mark Briggs	11-Aug-09	Inserted additional photographs of the top and bottom sides of the circuit board and resized the existing photographs to better show the components. Added information about the rf shield being soldered in place to prevent access to rf circuitry. Separated 802.11b mode and 802.11g mode data for WW band. Added more detailed information regarding which measurements were made at normal, high and low voltages and which were made only at normal voltage. Added more plots so that there is a plot for each channel. Changed calculation for nominal output power. Included the actual value for the highest spurious emission and not just the margin in the summary tables
3.0	Mark Briggs	16-Aug-09	Added eirp values into the summary sheet and test data sheets for each operating mode.

Elliott
An *NTS* company

Product Information

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Product Information

Product Information

The Summit Data Communications model SDC-MCF10G and number is a 2.4GHz 802.11bg radio module that provides a wireless interface for a host devices such as a hand-held PC or PDA. The device was tested installed into a HP iPAQ PDA.
The serial number of the sample tested was 001723086B4F (MAC Address)

EUT Software

Summit Client Utility (SCU) - Driver v2.01.17, SCU v.2.01.12
Summit Regulatory Utility (SRU) - v2.1.12

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Test Environment

Temperature:	15-30 °C
Rel. Humidity:	20-75 %
Pressure:	86-106 kPa

Product Power Supply - Determination of Voltage Regulator

The device is designed to be powered from a nominal voltage of: **3.3 Vdc**

Elliott *An NTS company*		*Product Information*	
Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

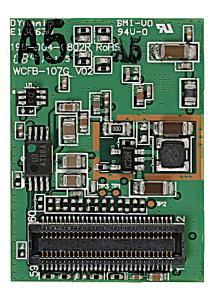**RF Accessibility (Article 2, Item (19) Notice 88 Appendix 43, 44, 45)**

Requirement

The EUT shall be constructed in such a way that sensitive RF parts, (like modulation and oscillator parts) cannot be reached easily by the user. These parts shall be covered by soldered metal caps or glue or by other mechanical covers. If the covers are fixed with screws, these shall be not the common type(s) like a Phillips, but special versions like Torx, so that the user cannot open the device with common tools.

Results

The outer enclosure covers all of the rf sensitive circuitry with the exception of the antenna connectors. The outer case is not designed to be removed (see first set of pictures below) because the rf shield is soldered into place to prevent its removal..
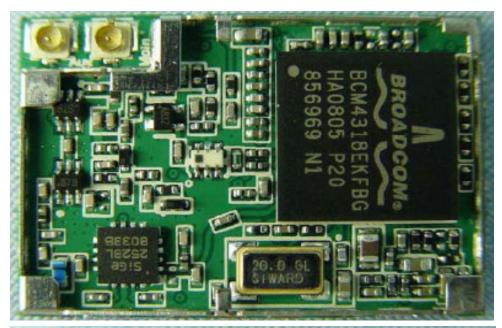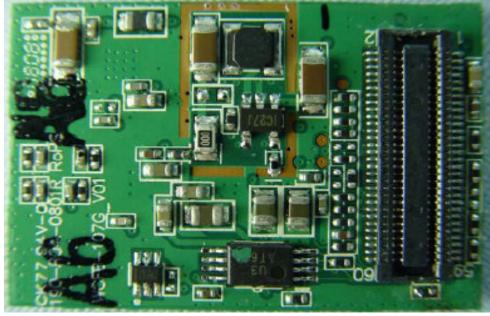
Product Information

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Additional photos showing the component side of the circuit board with the shield removed and the bottom side of the board showing the 60-pin connector used to interface to the host system.

Elliott
An NTS company

Radio Test Data - Antenna Gain

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

RADIO EQUIPMENT USED FOR 2.4 GHz BAND
WIDE-BAND LOW-POWER DATA COMMUNICATIONS SYSTEM
(Radio station using 2400 - 2483.5 MHz)

Antenna Gain(s)

Antenna	Mode	Requirement	Antenna Gain	Result
0dBi PCB Omnidirectional Antenna	802.11b and 802.11g (2400-2483.5MHz)	Omni-directional antennas: Maximum eirp is 12.15dBm/MHz. Based on the highest measured output power of 3.1mW/MHz (4.91 dBm/MHz) the maximum allowed omni-directional gain is 7.24dBi. See other data sheets for eirp calculations.	0 dBi	Pass
0dBi PCB Omnidirectional Antenna	802.11b (2471-2497MHz)	Omni-directional antennas: Maximum eirp is 12.15dBm/MHz. Based on the highest measured output power of 1.8mW/MHz (2.55 dBm/MHz) the maximum allowed omni-directional gain is 9.60dBi. See other data sheets for eirp calculations.	0 dBi	Pass

Antenna Gain
Refer to attached data sheets showing antenna gain and pattern for each antenna
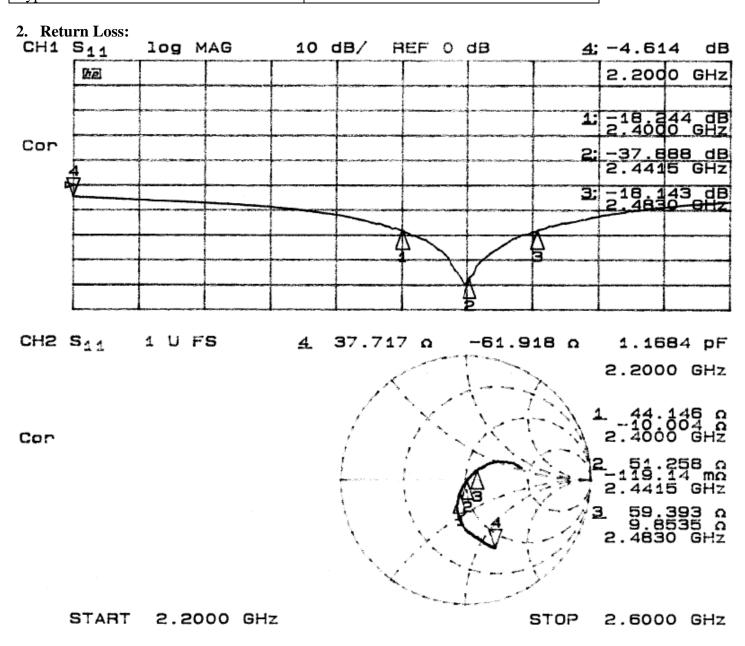
0dBi PCB Omnidirectional Antenna

Band	Gain
2.4 - 2.5 GHz	0 dBi

0dBi PCB Omnidirectional Antenna
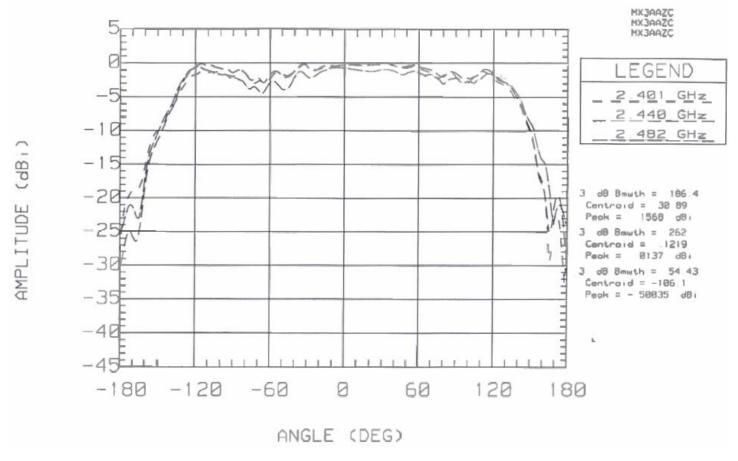
1. Specifications:

Operating Frequency	2.4 GHz to 2.483 GHz
Impedance	50 Ω
Typical Gain	0 dBi

2. Return Loss:

```
CH1  S11      log MAG      10 dB/   REF 0 dB        4: -4.614   dB
                                                       2.2000 GHz

                                                    1: -18.244 dB
                                                       2.4000 GHz
Cor
                                                    2: -37.888 dB
                                                       2.4415 GHz

                                                    3: -18.143 dB
                                                       2.4830 GHz
```

```
CH2  S11      1 U FS        4  37.717 Ω    -61.918 Ω    1.1684 pF
                                                        2.2000 GHz

                                                     1  44.146 Ω
                                                       -10.004 Ω
Cor                                                    2.4000 GHz

                                                     2  51.258 Ω
                                                       -119.14 mΩ
                                                        2.4415 GHz

                                                     3  59.393 Ω
                                                        9.8535 Ω
                                                        2.4830 GHz

     START  2.2000 GHz                          STOP  2.6000 GHz
```
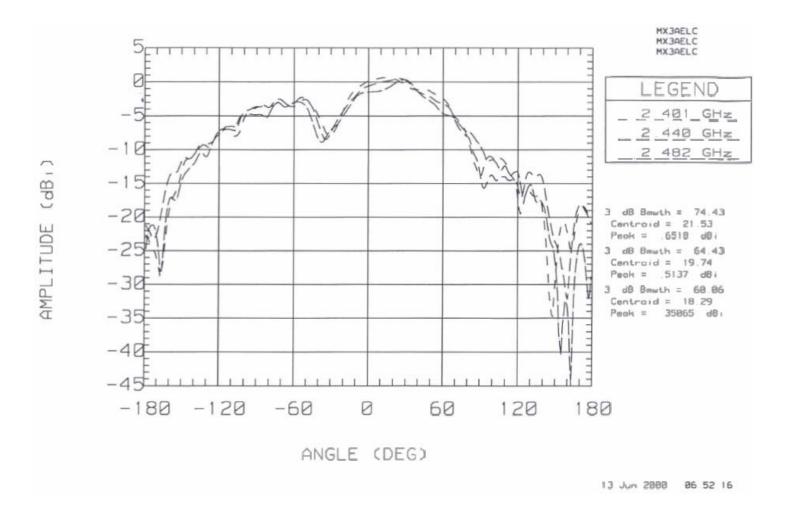
3. Radiation Patterns:

3.1 Azimuth:
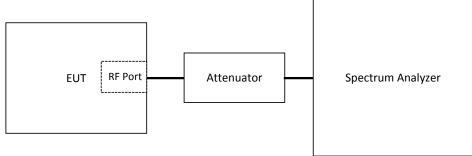
LEGEND
2_401_GHz
2_440_GHz
2_482_GHz

3 dB Bmwth = 186.4
Centroid = 30.89
Peak = 1568 dBi

3 dB Bmwth = 262
Centroid = .1219
Peak = 8137 dBi

3 dB Bmwth = 54.43
Centroid = -106.1
Peak = - 50835 dBi

AMPLITUDE (dBi)

ANGLE (DEG)

3.2 Elevation:

AMPLITUDE (dB₁)

ANGLE (DEG)

LEGEND

___ 2_401_GHz

___ 2_440_GHz

___ 2_482_GHz

3 dB Bmwth = 74.43
Centroid = 21.53
Peak = .6518 dBi

3 dB Bmwth = 64.43
Centroid = 19.74
Peak = .5137 dBi

3 dB Bmwth = 60.06
Centroid = 18.29
Peak = 35065 dBi

13 Jun 2000   06 52 16

Elliott
An NTS company

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

RADIO EQUIPMENT USED FOR 2.4 GHz BAND
WIDE-BAND LOW-POWER DATA COMMUNICATIONS SYSTEM
(Radio station using 2400 - 2483.5 MHz)

Summary of Results

Test Performed	Mode	Requirement	Measurement	Result
Frequency Error	802.11b	50ppm or better	802.11b: 11.19 ppm	Pass
Occupied bandwidth (2400 - 2483.5MHz)	802.11b	DSSS: 500kHz < BW < 26MHz OFDM: < 38MHz	DSSS: 12.72 MHz	Pass
Spreading Rate (2400-2483.5MHz)	802.11b	5 or more	802.11b: 7.0	Pass
OFDM Carrier Spacing	802.11b	-	Not applicable	-
Spurious Emissions	802.11b	Below 2387MHz: < 2.5uW/MHz 2387 - 2400 MHz < 25uW/MHz 2483.5-2496.5MHz < 25uW/MHz (2497 - 2510 for #14) Above 2496.5 MHz: 2.5uW/MHz	0.224uW at 2700.02 MHz (10.5dB below the limit)	Pass

Antenna power	802.11b	Maximum permitted:
		  BW < 26MHz: 10mW/MHz
		  BW < 38MHz: 5mW/MHz
		Power Tolerance:
		  -80% to +20%
		EIRP not to exceed 12.15dBm/MHz
			Rated Power:
			  3.86 mW/MHz
			
			Tolerance:
			  -39.6% to -20.4%
			EIRP: 4.88dBm/MHz
				Pass

Test Configuration

Test Environment

Temperature:	15-30 °C
Rel. Humidity:	20-75 %
Pressure:	86-106 kPa
Nominal Supply Voltage	3.3 Vdc (provided by host device)

Duty Cycle and Transmission Cycle Time

Data Rate	Duty Cycle	Transmission cycle time
Mbs	%	ms
1	100	N/A - Continous
11	75	6.00
6	93.6	2.21
54	19.35	1.24

Elliott
An *NTS* company

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Run #1: Frequency Error

Date of Test: 7/21/2009 0:00   Test Engineer: Mark Hill

Test Location: ENV Chamber

One antenna position was evaluated based on verification that changing the diversity switch position did not affect the center frequency of the cente channel at nominal voltage on the center channel.

The center frequency was measured at nominal and extreme voltage conditions. Measurements showed no change in frequency stability due to voltage extremes, all other measurements taken at nominal voltage.

For CCK modulation with no provision for operating with an unmodulated signal measurements were made on a modulated signal at the top, center and bottom channels. The operating frequency was determined by measuring the frequency at the null created at the center of the signal. The analyzer was configured with , RB=10kHz, VB=1kHz, peak detector and max hold, as this gave the cleanest signal.

Nominal Frequency (MHz) - 802.11b						
Low Channel	2412.0	Center Channel	2437.0	High Channel	2472.0	

Measured Frequency (MHz)				Frequency Error (ppm)		
Voltage	Nominal -10%	Nominal	Nominal + 10%			
	3.0 V	3.3 V	3.6 V	3.0 V	3.3 V	3.6 V
Low Channel		2411.973000			11.19	
Center Channel	2436.974000	2436.974000	2436.974000	10.67	10.67	10.67
Center Channel (Aux Port)		2436.976000			9.85	
High Channel		2471.976000			9.71	

Requirement (ppm): **50.0**

Requirement (ppm): **50.0**

Notes:

All testing performed at 1Mbs for 802.11b (CCK) and 6Mbs for 802.11g (OFDM)

Unless otherwise noted, TX Diversity switch was set to main only.   Testing was performed on the Main connector

Elliott
An *ATAS* company

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Run #2: Occupied bandwidth and spreading bandwidth

       Date of Test: 7/22/2009 0:00   Test Engineer: Mark Hill
       Test Location: ENV Chamber

One antenna position was evaluated based on verification that changing the diversity switch position did not affect the occupied bandwidth of the center channel at nominal voltage.

The bandwidth was measured on the center channel at the lowest data rate at nominal and high and low voltages. As the bandwidth remained constant with input voltage all other channels and data rates were measured only at nominal voltage.

The occupied bandwidth was measured with the spectrum analyzer configured according to the table below. The occupied bandwidth was determined from the 99% power bandwidth by determining the highest and lowest frequencies at which 99.5% of the power was captured and then subtracting the two numbers. the calculation was done by either the analyzer directly or via the software used to capture the plot. One plot for each mode tested is provided for reference.

The spreading bandwidth was measured with the spectrum analyzer configured according to the table below. The spreading bandwidth was the 90% power bandwidth determined by the highest and lowest frequencies at which 95% of the power was captured and then subtracting the two numbers. This calculation was done by either the analyzer directly or via the software used to capture the plot. One plot for each mode tested is provided for reference.

Instrument Settings and Test Requirements

Modulation Type	Analyzer settings				Bandwidth Requirement	
	Span	RB	VB	Other	Occupied	Spreading
OFDM (e.g. 802.11gn)	76-133	≤ 1140kHz	300kHz	Sample detector, averaging (10 sweeps)[2], sweep time auto[1]	≤ 38.0MHz	
Direct Sequence (e.g. 802.11b)	52-91	≤ 780kHz	300kHz	Positive peak detector, max hold, sweep time auto[1]	≤ 26.0MHz	≥ 500 kHz

Note 1: For burst transmissions sweep time set to ensure dwell time in each bandwidth > transmission cycle time (sweep time = transmit cycle time x span/ measurement bandwidth)
Note 2: For burst transmissions trace set for max hold and detector set to positive peak

Test Results, 802.11b Mode (Direct Sequence, 500kHz≤ bandwidth ≤ 26MHz)

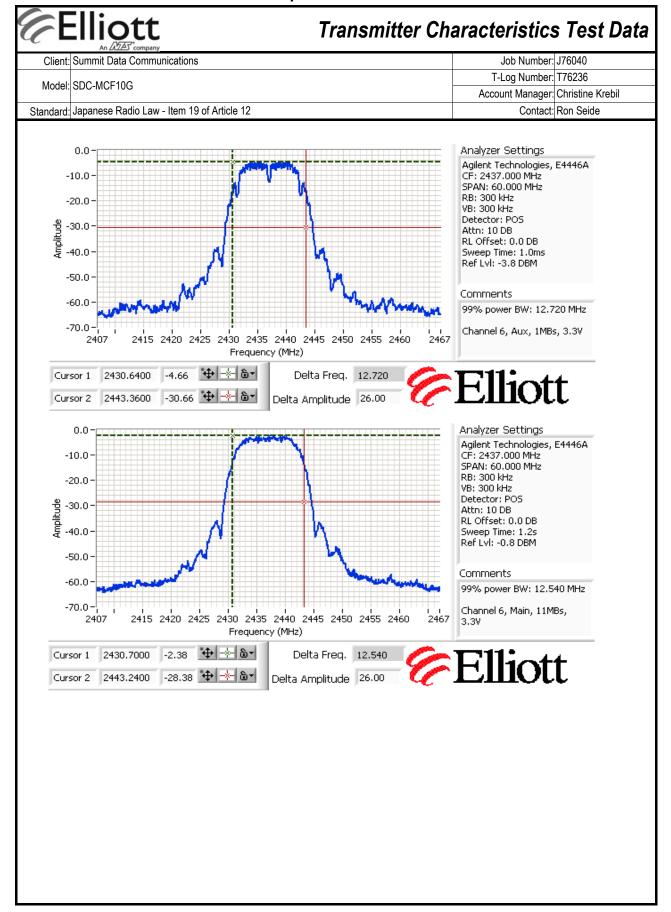| Channel	Mode	Port	Chain	Data Rate	Nominal -10% 3.0 V	Nominal 3.3 V	Nominal + 10% 3.6 V
1	802.11b	Main		1Mb/s		12.72	
6	802.11b	Main		1Mb/s	12.72	12.72	12.72
6	802.11b	Aux		1Mb/s		12.72	
13	802.11b	Main		1Mb/s		12.72	
1	802.11b	Main		11Mb/s		12.60	
6	802.11b	Main		11Mb/s		12.54	
6	802.11b	Aux		11Mb/s		12.54	
13	802.11b	Main		11Mb/s		12.66	

Test Results, 802.11b Mode (Direct Sequence, 500kHz≤ bandwidth ≤ 26MHz) - 90% Pwr Bandwidth

Channel	Mode	Port	Chain	Data Rate	Nominal -10% 3.0 V	Nominal 3.3 V	Nominal + 10% 3.6 V
1	802.11b	Main		1Mb/s		9.315	
6	802.11b	Main		1Mb/s		9.309	
13	802.11b	Main		1Mb/s		9.296	
1	802.11b	Main		11Mb/s		9.709	
6	802.11b	Main		11Mb/s		9.703	
13	802.11b	Main		11Mb/s		9.649	
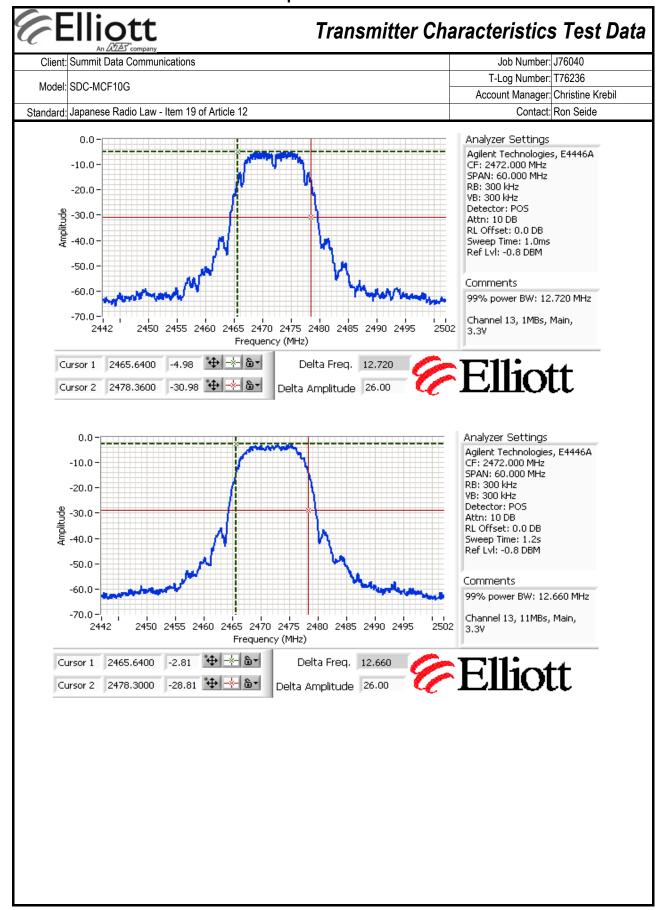
Test Report R76253 Rev 3.0

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
		T-Log Number:	T76236
Model:	SDC-MCF10G	Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Spreading bandwidth
Symbol rate for 802.11b is 1Msym/s for 1Mb/s and 1.375Msym/s for data rates of 5.5Mb/s and above

	Data rate	Symbol Rate (Msym/s)	90% Signal Bandwidth	Spreading rate	Requirement
2400 - 2483.5 MHz:	1Mb/s	1.000	9.296	9.3	5.0
2400 - 2483.5 MHz:	5.5Mb/s & 11Mb/s	1.375	9.649	**7.0**	5.0

Occupied (99%) Bandwidth and Spreading (90%) Bandwidth - Sample Plots 802.11b mode

Analyzer Settings

Agilent Technologies, E4446A
CF: 2412.000 MHz
SPAN: 60.000 MHz
RB: 300 kHz
VB: 300 kHz
Detector: POS
Attn: 10 DB
RL Offset: 0.0 DB
Sweep Time: 1.0ms
Ref Lvl: -0.8 DBM

Comments

99% power BW: 12.720 MHz

Channel 1, 1MBs, Main, 3.3V

| Cursor 1 | 2405.6400 | -4.48 | | Delta Freq. | 12.720 |
| Cursor 2 | 2418.3600 | -30.48 | | Delta Amplitude | 26.00 |

Analyzer Settings

Agilent Technologies, E4446A
CF: 2412.000 MHz
SPAN: 60.000 MHz
RB: 300 kHz
VB: 300 kHz
Detector: POS
Attn: 10 DB
RL Offset: 0.0 DB
Sweep Time: 1.2s
Ref Lvl: -0.8 DBM

Comments

99% power BW: 12.600 MHz

Channel 1, 11MBs, Main, 3.3V

| Cursor 1 | 2405.7000 | -2.85 | | Delta Freq. | 12.600 |
| Cursor 2 | 2418.3000 | -28.85 | | Delta Amplitude | 26.00 |

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Analyzer Settings

Agilent Technologies, E4446A
CF: 2437.000 MHz
SPAN: 60.000 MHz
RB: 300 kHz
VB: 300 kHz
Detector: POS
Attn: 10 DB
RL Offset: 0.0 DB
Sweep Time: 1.0ms
Ref Lvl: -3.8 DBM

Comments

99% power BW: 12.720 MHz

Channel 6, Aux, 1MBs, 3.3V

Cursor 1	2430.6400	-4.66	
Cursor 2	2443.3600	-30.66	

Delta Freq. 12.720
Delta Amplitude 26.00

Analyzer Settings

Agilent Technologies, E4446A
CF: 2437.000 MHz
SPAN: 60.000 MHz
RB: 300 kHz
VB: 300 kHz
Detector: POS
Attn: 10 DB
RL Offset: 0.0 DB
Sweep Time: 1.2s
Ref Lvl: -0.8 DBM

Comments

99% power BW: 12.540 MHz

Channel 6, Main, 11MBs, 3.3V

Cursor 1	2430.7000	-2.38	
Cursor 2	2443.2400	-28.38	

Delta Freq. 12.540
Delta Amplitude 26.00

Test Report R76253 Rev 3.0

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
		T-Log Number:	T76236
Model:	SDC-MCF10G	Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Analyzer Settings

Agilent Technologies, E4446A
CF: 2472.000 MHz
SPAN: 60.000 MHz
RB: 300 kHz
VB: 300 kHz
Detector: POS
Attn: 10 DB
RL Offset: 0.0 DB
Sweep Time: 1.0ms
Ref Lvl: -0.8 DBM

Comments

99% power BW: 12.720 MHz

Channel 13, 1MBs, Main, 3.3V

| Cursor 1 | 2465.6400 | -4.98 | | | | Delta Freq. | 12.720 |
| Cursor 2 | 2478.3600 | -30.98 | | | | Delta Amplitude | 26.00 |

Analyzer Settings

Agilent Technologies, E4446A
CF: 2472.000 MHz
SPAN: 60.000 MHz
RB: 300 kHz
VB: 300 kHz
Detector: POS
Attn: 10 DB
RL Offset: 0.0 DB
Sweep Time: 1.2s
Ref Lvl: -0.8 DBM

Comments

99% power BW: 12.660 MHz

Channel 13, 11MBs, Main, 3.3V

| Cursor 1 | 2465.6400 | -2.81 | | | | Delta Freq. | 12.660 |
| Cursor 2 | 2478.3000 | -28.81 | | | | Delta Amplitude | 26.00 |

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

90% Bandwidth Plots, 1Mb/s data rate

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

90% Bandwidth Plots, 11Mb/s data rate

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Run #3: Spurious and unwanted emissions

Date of Test: 7/22/-0   Test Engineer: Mark Hill
Test Location: ENV Chamber

Test Requirements

Frequency Range (MHz)	Limit	
	uW/MHz	dBm/MHz
30 - 2387	2.5	-26.0
2387 - 2400	25.0	-16.0
2483.5 - 2496.5	25.0	-16.0
2496.5 - 12500	2.5	-26.0

The limit is for a 1MHz measurement bandwidth.

Measurement Summary - Highest emissions in each operating mode

All preliminary peak measurements were below the limit by more than 10dB.

Preliminary Measurements :

Instrument Settings: RB=VB=1MHz, Positive peak detector and maximum hold for a minimum of 10 sweeps, but until the spectrum displayed becomes stable and no new signals are observed.

The device transmits continuously so the analyzer sweep time is auto-coupled

The device transmits in a burst mode, sweep time is calculated for each band tested as shown below. The plots are composite plots of the individual frequency bands. so the analyzer sweep time is auto-coupled.

	Burst repetition frequency		**1.24** ms	
Frequency (MHz)		Bandwidth (MHz)		Sweep
Start	Stop	RB	VB	
30	1000	1	1	1203 ms
1000	2483.5	1	1	1840 ms
2374	2400	1	1	32 ms
2483.5	2900	1	1	516 ms
2900	6000	1	1	3844 ms
6000	12500	1	1	8060 ms

Channels 1 through 13

Transmitter Characteristics Test Data

Elliott
An *NTS* company

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Preliminary measurement - 802.11b mode, Channels 1,6 and 13 (2400 - 2483.5MHz)
All plots generated using a 1MHz RBW
For emissions below 2387 MHz and above 2496.5 MHz the limit is 2.5uW/MHz (-26dBm/MHz)
From 2387 - 2400 MHz the limit is 25uW/MHz (-16dBm/MHz). From 2483.5 - 2496.5 MHz the limit is 25uW/MHz (-16dBm/MHz)
Antenna ports tested were both main and aux ports, worst case result is reported

Frequency MHz	Level dBm	Antenna Port	Limit	Margin	Detector	Comments	Operating Voltage	Operating Channel
2700.020	-36.5	Main	-26.0	-10.5	Peak	Channel 13, 1Mbs	3.6	13
2699.160	-38.2	Main	-26.0	-12.2	Peak	Channel 13, 1Mbs	3.3	13
2703.886	-38.3	Main	-26.0	-12.3	Peak	Channel 13, 1Mbs	3	13
2643.080	-42.4	Main	-26.0	-16.4	Peak	Channel 1, 1Mbs	3.6	1
2664.430	-42.6	Main	-26.0	-16.6	Peak	Channel 6, 1Mbs	3.6	6
2183.870	-44.7	Main	-26.0	-18.7	Peak	Channel 1, 1Mbs	3.6	1
2208.940	-44.7	Main	-26.0	-18.7	Peak	Channel 6, 1Mbs	3.6	6
2483.930	-34.8	Main	-16.0	-18.8	Peak	Channel 13, 1Mbs	3.3	13
2248.290	-44.8	Main	-26.0	-18.8	Peak	Channel 13, 1Mbs	3.6	13
2483.930	-34.9	Main	-16.0	-18.9	Peak	Channel 13, 1Mbs	3.6	13
2387.007	-45.4	Main	-26.0	-19.4	Peak	Channel 1, 1Mbs	3.6	1
2484.144	-35.5	Main	-16.0	-19.5	Peak	Channel 13, 1Mbs	3	13
1607.940	-46.0	Main	-26.0	-20.0	Peak	Channel 1, 1Mbs	3.6	1
1624.620	-46.1	Main	-26.0	-20.1	Peak	Channel 6, 1Mbs	3.6	6
2399.890	-36.4	Main	-16.0	-20.4	Peak	Channel 1, 1Mbs	3.6	1
1647.960	-46.9	Main	-26.0	-20.9	Peak	Channel 13, 1Mbs	3.6	13
7310.720	-50.1	Main	-26.0	-24.1	Peak	Channel 6, 1Mbs	3.6	6
7235.840	-50.7	Main	-26.0	-24.7	Peak	Channel 1, 1Mbs	3.6	1
7415.620	-51.4	Main	-26.0	-25.4	Peak	Channel 13, 1Mbs	3.6	13
3245.130	-53.2	Main	-26.0	-27.2	Peak	Channel 1, 1Mbs	3.6	1
3286.360	-54.3	Main	-26.0	-28.3	Peak	Channel 6, 1Mbs	3.6	6

Final Measurements :
Instrument Settings: RB=VB=1MHz, Zero Span (Span = 0Hz), sample detector, single sweep and sweep time set to auto, or, if the device is not transmitting continuously, the sweep time is set to be at least 3 times the burst repetition frequency. If the highest signal level on the screen is above the limit then the average power is determined over the complete transmission burst.
Measurements are made only on those frequencies that exceed the limit during the preliminary measurements and at the operating voltage that produced the highest emission level.

Final (Zero-Span) measurement - 802.11b mode
Final Measurements :
Instrument Settings: RB=VB=1MHz, Zero Span (Span = 0Hz), sample detector, single sweep and sweep time set to auto, or, if the device is not transmitting continuously, the sweep time is set to be at least 3 times the burst repetition frequency. If the highest signal level on the screen is above the limit then the average power is determined over the complete transmission burst.

As there were no emissions above the limit during the preliminary (peak) scan, no final measurements were required

Transmitter Characteristics Test Data

Client: Summit Data Communications	Job Number: J76040
	T-Log Number: T76236
Model: SDC-MCF10G	Account Manager: Christine Krebil
Standard: Japanese Radio Law - Item 19 of Article 12	Contact: Ron Seide

Broadband plots from 30MHz to 12.5GHz for channels 1, 6 and 13

Plots are shown for an operating voltage of 3.6V (worst case operating voltage) and at a data rate of 1Mb/s (worst case data rate). Measurements were made at operating voltages of 3.6V, 3.3V and 3.0V and at data rates of 11Mb/s and 1Mb/s.

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
		T-Log Number:	T76236
Model:	SDC-MCF10G	Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Channel 1 - Emissions at band edge. Cursors are placed on the highest signal below 2387 MHz and the highest signal from 2387MHz to 2400 MHz

Analyzer Settings
Agilent Technologies, E4446A
CF: 2387.000 MHz
SPAN: 26.000 MHz
RB: 1.000 MHz
VB: 1.000 MHz
Detector: POS
Attn: 10 DB
RL Offset: 11.0 DB
Sweep Time: 2.0ms
Ref Lvl: 9.0 DBM

Comments
Channel 1, 1Mbs, Main

				Delta Freq.	12.886
Cursor 1	2387.0066	-45.42			
Cursor 2	2399.8928	-36.41		Delta Amplitude	9.01

Channel 13 emissions at band edge. Cursors placed on the highest signal above 2496.5 MHz and the highest signal between 2383.5 - 2496.5 MHz

Analyzer Settings
Agilent Technologies, E4446A
CF: 2691.750 MHz
SPAN: 416.500 MHz
RB: 1.000 MHz
VB: 1.000 MHz
Detector: POS
Attn: 20 DB
RL Offset: 11.0 DB
Sweep Time: 1.0ms
Ref Lvl: 11.0 DBM

Comments
Channel 13, 1MBs, Main,
3.6V

				Delta Freq.	216.735
Cursor 1	2483.9297	-34.88			
Cursor 2	2700.6643	-36.55		Delta Amplitude	1.67

Test Report R76253 Rev 3.0

Transmitter Characteristics Test Data

Elliott An NTS company

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Run #4: Antenna Power

Date of Test: 7/21/2009 0:00   Test Engineer: Mark Hill
Test Location: ENV Chamber

One antenna position was evaluated based on verification that changing the diversity switch position did not affect the output power at the center channel at nominal voltage.

Test Procedure:

Step 1:Determine the frequency of the signal with the highest power spectral density

Instrument Settings: RB=1MHz, VB=3MHz, Span > Occupied bandwidth, peak detector, max hold, sampling points > 400.

Once the display has settled (no more peaks added) the marker is paced at the peak of the signal

The spectrum analyzer center frequency is adjusted to the marker frequency (Mkr -> CF feature), the span is then set to zero spar

Step 2:Measure the output power

Instrument Settings: RB=VB=1MHz, continuous sweep, trace clear-write

The output power is the power measured by the average power meter connected to the IF output of the analyzer, corrected for the IF path loss, the value of the external attenuator (if used) and the duty cycle of the transmission sequence if the product is not transmitting continuously.

The eirp is calculated by adding the antenna gain (dBi) to the output power 9converted to dBm/MHz). The maximum permitted eirp is 12.15dB

802.11b mode - initial measurements on center channel to determine worst-case mode

Channel	Mode	Port	Chain	Data Rate	Nominal -10% 3.0 V	Nominal 3.3 V	Nominal + 10% 3.6 V
Center	802.11b	Main		1Mb/s	2.33 mw/MHz	2.50 mw/MHz	2.62 mw/MHz
Center	802.11b	Aux		1Mb/s	2.33 mw/MHz	2.44 mw/MHz	2.62 mw/MHz
Center	802.11b	Main		11Mb/s	1.79 mw/MHz	1.92 mw/MHz	2.06 mw/MHz

802.11b mode - final measurements.

Channel	Mode	Port	Chain	Data Rate	Nominal -10% 3.0 V	Nominal 3.3 V	Nominal + 10% 3.6 V
Low	802.11b	Main		1Mb/s	3.01 mw/MHz	3.01 mw/MHz	3.08 mw/MHz
Center	802.11b	Main		1Mb/s	2.33 mw/MHz	2.50 mw/MHz	2.62 mw/MHz
13	802.11b	Main		1Mb/s	2.56 mw/MHz	2.68 mw/MHz	2.87 mw/MHz

Lowest Output Power: **2.33 mw/MHz**
Highest Output Power: **3.08 mw/MHz**

Nominal Output Power: **3.86 mw/MHz**
Deviation In Output Power: **-39.6%**   to   **-20.4%**

EIRP

Highest Output Power: 3.08 mw/MHz
Highest Output Power: 4.88 dBm/MHz
Antenna Gain: 0.00 dBi
EIRP   4.88 dBm/MHz
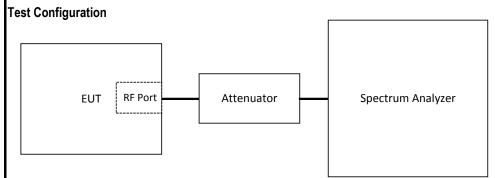
Transmitter Characteristics Test Data

Elliott
An NTS company

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

RADIO EQUIPMENT USED FOR 2.4 GHz BAND
WIDE-BAND LOW-POWER DATA COMMUNICATIONS SYSTEM
(Radio station using 2400 - 2483.5 MHz)

Summary of Results

Test Performed	Mode	Requirement	Measurement	Result
Frequency Error	802.11g	50ppm or better	802.11g: 11.19 ppm	Pass
Occupied bandwidth (2400 - 2483.5MHz)	802.11g	DSSS: 500kHz < BW < 26MHz OFDM: < 38MHz	OFDM: 17.55 MHz	Pass
Spreading Rate (2400-2483.5MHz)	802.11g	5 or more	802.11g: 59.9	Pass
OFDM Carrier Spacing	802.11g	-	52 carriers with a spacing of 0.3125MHz	-
Spurious Emissions	802.11g	Below 2387MHz: < 2.5uW/MHz 2387 - 2400 MHz < 25uW/MHz 2483.5-2496.5MHz < 25uW/MHz (2497 - 2510 for #14) Above 2496.5 MHz: 2.5uW/MHz	1.38uW at 2483.5 MHz 12.6dB below the limit 0.095uW at 2645.83 MHz 14.2dB below the limit	Pass

Antenna power	802.11g	Maximum permitted:
		  BW < 26MHz: 10mW/MHz
		  BW < 38MHz: 5mW/MHz
		Power Tolerance:
		  -80% to +20%
		EIRP not to exceed 12.15dBm/MHz
			Rated Power:
			  2.01 mW/MHz
			
			Tolerance:
			  -56.8% to -3.2%
			EIRP: 2.90 dBm/MHz
				Pass

Test Configuration

```
 ┌──────────────┐
 │ EUT  ┌ RF Port┐│────[ Attenuator ]────[ Spectrum Analyzer ]
 │      └ ─ ─ ─ ┘│
 └──────────────┘
```

EUT — RF Port — Attenuator — Spectrum Analyzer

Test Environment

Temperature:	15-30 °C	
Rel. Humidity:	20-75 %	
Pressure:	86-106 kPa	
Nominal Supply Voltage	3.3 Vdc	(provided by host device)

Duty Cycle and Transmission Cycle Time

Data Rate	Duty Cycle	Transmission cycle time
Mbs	%	ms
1	100	N/A - Continous
11	75	6.00
6	93.6	2.21
54	19.35	1.24

Transmitter Characteristics Test Data

Elliott
An NTS company

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Run #1: Frequency Error

Date of Test: 7/21/2009 0:00 Test Engineer: Mark Hill
Test Location: ENV Chamber

One antenna position was evaluated based on verification that changing the diversity switch position did not affect the center frequency of the cente channel at nominal voltage on the center channel.

The center frequency was measured at nominal and extreme voltage conditions. Measurements showed no change in frequency stability due to voltage extremes, all other measurements taken at nominal voltage.

For OFDM modulation with no provision for operating with an unmodulated signal measurements were made on a **modulated** signal at the top, center and bottom channels. The operating frequency was determined by measuring the frequency of the carrier observed at the center of the waveform that appears as a small peak within the central null. The analyzer was configured with RB=10kHz, VBW=1kHz, peak detector and max hold, as this gave the cleanest signal.

Nominal Frequency (MHz) - 802.11g						
Low Channel	2412.0	Center Channel	2437.0	High Channel	2472.0	

	Measured Frequency (MHz)			Frequency Error (ppm)		
Voltage	Nominal -10%	Nominal	Nominal + 10%	3.0 V	3.3 V	3.6 V
	3.0 V	3.3 V	3.6 V			
Low Channel		2411.973000			11.19	
Center Channel	2436.975000	2436.975000	2436.975000	10.26	10.26	10.26
High Channel		2471.976000			9.71	

Requirement (ppm): 50.0

Notes:
All testing performed at 1Mbs for 802.11b (CCK) and 6Mbs for 802.11g (OFDM)
Unless otherwise noted, TX Diversity switch was set to main only.   Testing was performed on the Main connector

Elliott — *Transmitter Characteristics Test Data*

An *NTS* company

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Run #2: Occupied bandwidth and spreading bandwidth

Date of Test: 7/22/2009 0:00   Test Engineer: Mark Hill
Test Location: ENV Chamber

One antenna position was evaluated based on verification that changing the diversity switch position did not affect the occupied bandwidth of the center channel at nominal voltage.

The bandwidth was measured on the center channel at the lowest data rate at nominal and high and low voltages. As the bandwidth remained constant with input voltage all other channels and data rates were measured only at nominal voltage.

The occupied bandwidth was measured with the spectrum analyzer configured according to the table below. The occupied bandwidth was determined from the 99% power bandwidth by determining the highest and lowest frequencies at which 99.5% of the power was captured and then subtracting the two numbers. the calculation was done by either the analyzer directly or via the software used to capture the plot. One plot for each mode tested is provided for reference.

The spreading bandwidth was measured with the spectrum analyzer configured according to the table below. The spreading bandwidth was the 90% power bandwidth determined by the highest and lowest frequencies at which 95% of the power was captured and then subtracting the two numbers. This calculation was done by either the analyzer directly or via the software used to capture the plot.

			Instrument Settings and Test Requirements			
Modulation Type	**Analyzer settings**				**Bandwidth Requirement**	
	Span	RB	VB	Other	Occupied	Spreading
OFDM (e.g. 802.11gn)	76-133	≤ 1140kHz	300kHz	Sample detector, averaging (10 sweeps)[2], sweep time auto[1]	≤ 38.0MHz	

Note 1: For burst transmissions sweep time set to ensure dwell time in each bandwidth > transmission cycle time (sweep time = transmit cycle time x span/ measurement bandwidth)
Note 2: For burst transmissions trace set for max hold and detector set to positive peak

Test Results, 802.11g Mode (OFDM, 500kHz ≤ bandwidth ≤ 38MHz)

Channel	Mode	Port	Chain	Data Rate	Nominal -10% 3.0 V	Nominal 3.3 V	Nominal + 10% 3.6 V
1	802.11g	Main		6Mb/s		17.55	
6	802.11g	Main		6Mb/s	17.55	17.55	17.55
6	802.11g	Aux		6Mb/s		17.55	
13	802.11g	Main		6Mb/s		17.55	
1	802.11g	Main		54Mb/s		17.28	
6	802.11g	Main		54Mb/s		17.28	
6	802.11g	Aux		54Mb/s		17.28	
13	802.11g	Main		54Mb/s		17.28	

Test Results, 802.11g Mode (OFDM, 500kHz ≤ bandwidth ≤ 38MHz) - 90% Pwr Bandwidth
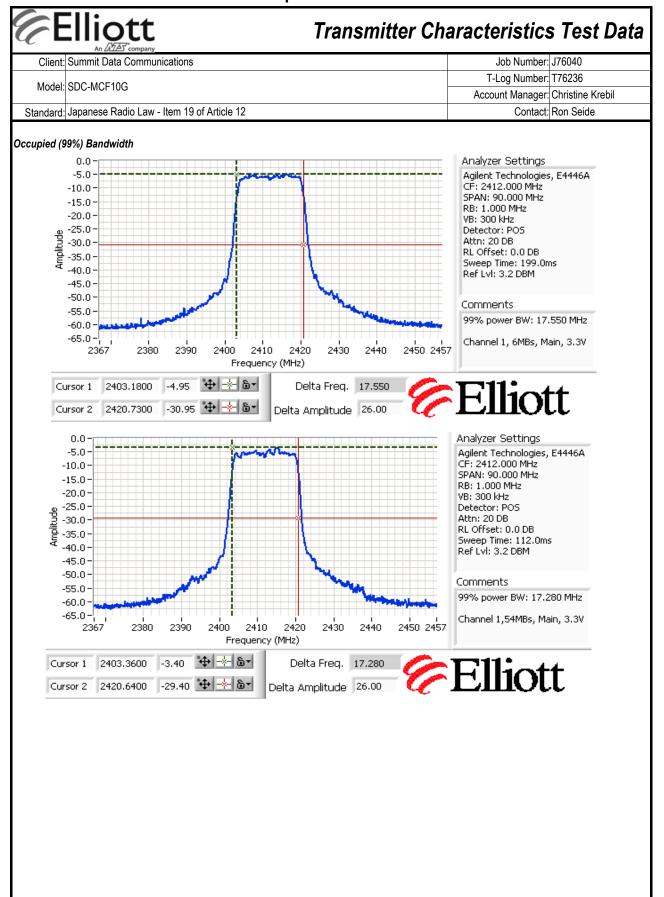
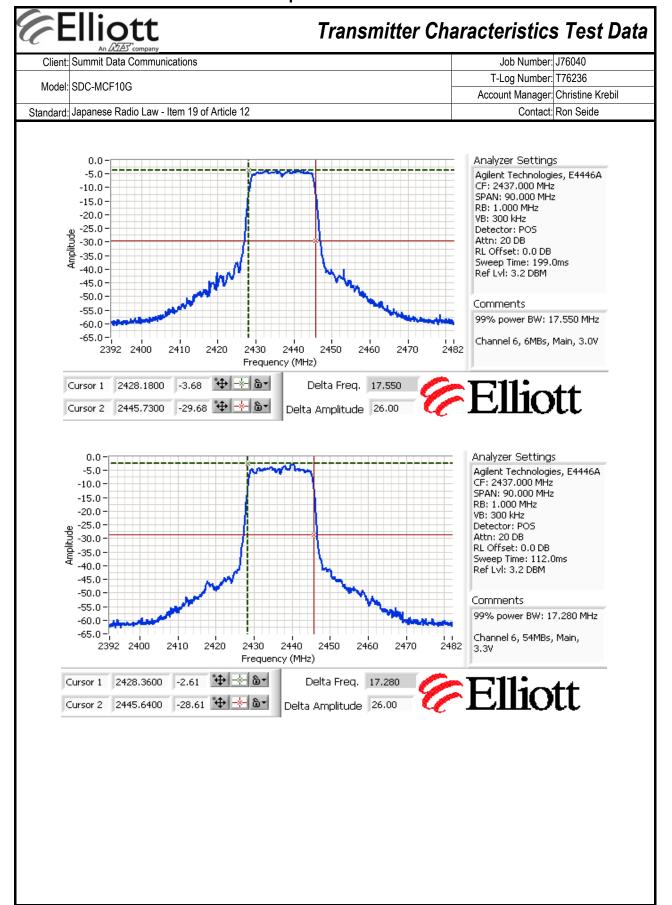| Channel	Mode	Port	Chain	Data Rate	Nominal -10% 3.0 V	Nominal 3.3 V	Nominal + 10% 3.6 V
1	802.11g	Main		6Mb/s		14.975	
6	802.11g	Main		6Mb/s		14.977	
13	802.11g	Main		6Mb/s		14.986	
1	802.11g	Main		54Mb/s		15.006	
6	802.11g	Main		54Mb/s		14.975	
13	802.11g	Main		54Mb/s		15.002	

Spreading bandwidth
Symbol rate for 802.11g has a 4us period (250kHz symbol rate) for all data rates

	Symbol Rate (Msym/s)	90% Signal Bandwidth	Spreading rate	Requirement
2400 - 2483.5 MHz:	0.250	14.975	59.9	5.0

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
		T-Log Number:	T76236
Model:	SDC-MCF10G	Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Occupied (99%) Bandwidth

Analyzer Settings

Agilent Technologies, E4446A
CF: 2412.000 MHz
SPAN: 90.000 MHz
RB: 1.000 MHz
VB: 300 kHz
Detector: POS
Attn: 20 DB
RL Offset: 0.0 DB
Sweep Time: 199.0ms
Ref Lvl: 3.2 DBM

Comments

99% power BW: 17.550 MHz

Channel 1, 6MBs, Main, 3.3V

Cursor 1	2403.1800	-4.95	Delta Freq.	17.550
Cursor 2	2420.7300	-30.95	Delta Amplitude	26.00

Analyzer Settings

Agilent Technologies, E4446A
CF: 2412.000 MHz
SPAN: 90.000 MHz
RB: 1.000 MHz
VB: 300 kHz
Detector: POS
Attn: 20 DB
RL Offset: 0.0 DB
Sweep Time: 112.0ms
Ref Lvl: 3.2 DBM

Comments

99% power BW: 17.280 MHz

Channel 1,54MBs, Main, 3.3V

Cursor 1	2403.3600	-3.40	Delta Freq.	17.280
Cursor 2	2420.6400	-29.40	Delta Amplitude	26.00

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Analyzer Settings

Agilent Technologies, E4446A
CF: 2437.000 MHz
SPAN: 90.000 MHz
RB: 1.000 MHz
VB: 300 kHz
Detector: POS
Attn: 20 DB
RL Offset: 0.0 DB
Sweep Time: 199.0ms
Ref Lvl: 3.2 DBM

Comments

99% power BW: 17.550 MHz

Channel 6, 6MBs, Main, 3.0V

Cursor 1	2428.1800	-3.68	
Cursor 2	2445.7300	-29.68	

Delta Freq. 17.550
Delta Amplitude 26.00

Analyzer Settings

Agilent Technologies, E4446A
CF: 2437.000 MHz
SPAN: 90.000 MHz
RB: 1.000 MHz
VB: 300 kHz
Detector: POS
Attn: 20 DB
RL Offset: 0.0 DB
Sweep Time: 112.0ms
Ref Lvl: 3.2 DBM

Comments

99% power BW: 17.280 MHz

Channel 6, 54MBs, Main, 3.3V

Cursor 1	2428.3600	-2.61	
Cursor 2	2445.6400	-28.61	

Delta Freq. 17.280
Delta Amplitude 26.00

Transmitter Characteristics Test Data

Client:	Summit Data Communications
Model:	SDC-MCF10G
Standard:	Japanese Radio Law - Item 19 of Article 12

Job Number:	J76040
T-Log Number:	T76236
Account Manager:	Christine Krebil
Contact:	Ron Seide

Analyzer Settings

Agilent Technologies, E4446A
CF: 2472.000 MHz
SPAN: 90.000 MHz
RB: 1.000 MHz
VB: 300 kHz
Detector: POS
Attn: 20 DB
RL Offset: 0.0 DB
Sweep Time: 199.0ms
Ref Lvl: 3.2 DBM

Comments

99% power BW: 17.550 MHz

Channel 13, 6MBs, Main, 3.3V

Cursor 1	2463.1800	-3.83	
Cursor 2	2480.7300	-29.83	

Delta Freq.	17.550
Delta Amplitude	26.00

Analyzer Settings

Agilent Technologies, E4446A
CF: 2472.000 MHz
SPAN: 90.000 MHz
RB: 1.000 MHz
VB: 300 kHz
Detector: POS
Attn: 20 DB
RL Offset: 0.0 DB
Sweep Time: 112.0ms
Ref Lvl: 3.2 DBM

Comments

99% power BW: 17.280 MHz

Channel 13,54MBs, Main, 3.3V

Cursor 1	2463.3600	-3.50	
Cursor 2	2480.6400	-29.50	

Delta Freq.	17.280
Delta Amplitude	26.00

Elliott — *Transmitter Characteristics Test Data*

Client: Summit Data Communications	Job Number: J76040
Model: SDC-MCF10G	T-Log Number: T76236
	Account Manager: Christine Krebil
Standard: Japanese Radio Law - Item 19 of Article 12	Contact: Ron Seide

Spreading (90%) Bandwidth For 6Mb/s

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Spreading (90%) Bandwidth For 54Mb/s

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
		T-Log Number:	T76236
Model:	SDC-MCF10G	Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Run #3: Spurious and unwanted emissions

Date of Test: 7/22/-0   Test Engineer: Mark Hill
Test Location: ENV Chamber

Test Requirements

Frequency Range (MHz)	Limit	
	uW/MHz	dBm/MHz
30 - 2387	2.5	-26.0
2387 - 2400	25.0	-16.0
2483.5 - 2496.5	25.0	-16.0
2496.5 - 12500	2.5	-26.0

The limit is for a 1MHz measurement bandwidth.

Measurement Summary - Highest emissions in each operating mode

   All preliminary peak measurements were below the limit by more than 10dB.

Preliminary Measurements :
Instrument Settings: RB=VB=1MHz, Positive peak detector and maximum hold for a minimum of 10 sweeps, but until the spectrum displayed becomes stable and no new signals are observed.
The device transmits continuously so the analyzer sweep time is auto-coupled
The device transmits in a burst mode, sweep time is calculated for each band tested as shown below. The plots are composite plots of the individual frequency bands. so the analyzer sweep time is auto-coupled.

Burst repetition frequency **1.24** ms

Frequency (MHz)		Bandwidth (MHz)		Sweep	
Start	Stop	RB	VB		
30	1000	1	1	1203 ms	
1000	2483.5	1	1	1840 ms	
2374	2400	1	1	32 ms	
2483.5	2900	1	1	516 ms	Channels 1 through 13
2900	6000	1	1	3844 ms	
6000	12500	1	1	8060 ms	

Transmitter Characteristics Test Data

Elliott
An *NTS* company

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Preliminary measurement - 802.11g mode

All plots generated using a 1MHz RBW

For emissions below 2387 MHz the limit is 2.5uW/MHz (-26dBm/MHz).

From 2387 - 2400 MHz the limit is 25uW/MHz (-16dBm/MHz). From 2483.5 - 2496.5 MHz the limit is 25uW/MHz (-16dBm/MHz)

Antenna ports tested were both main and aux ports, worst case result is reported

The device transmits in a burst mode, sweep time is calculated for each band tested as shown below. The plots are composite plots of the individual frequency bands. so the analyzer sweep time is auto-coupled.

Burst repetition frequency **1.24** ms

Frequency (MHz)		Bandwidth (MHz)		Sweep	
Start	Stop	RB	VB		
30	1000	1	1	1203 ms	
1000	2483.5	1	1	1840 ms	
2374	2400	1	1	32 ms	
2483.5	2900	1	1	516 ms	**Channels 1 through 13**
2900	6000	1	1	3844 ms	
6000	12500	1	1	8060 ms	

Emissions Test Data - 802.11g Preliminary Measurements

Frequency MHz	Level dBm	Antenna Port	Limit	Margin	Detector	Comments	Operating Voltage	
2483.500	-28.6	Aux	-16.0	-12.6	Peak	Channel 13, 54MBs (1.38uW)	3.6	
2645.830	-40.2	Aux	-26.0	-14.2	Peak	Channel 1, 54MBs (0.095uW)	3.6	
2400.000	-31.6	Aux	-16.0	-15.6	Peak	Channel 1, 54MBs	3.6	
2699.880	-42.2	Aux	-26.0	-16.2	Peak	Channel 13, 54MBs	3.6	
2669.630	-42.3	Aux	-26.0	-16.3	Peak	Channel 6, 54Mbs	3.6	
2700.450	-43.8	Aux	-26.0	-17.8	Peak	Channel 13, 54MBs	3.6	
2387.900	-44.1	Aux	-26.0	-18.1	Peak	Channel 1, 54MBs	3.6	
1647.600	-44.5	Aux	-26.0	-18.5	Peak	Channel 13, 54MBs	3.6	
7245.910	-44.6	Aux	-26.0	-18.6	Peak	Channel 1, 54MBs	3.6	
1624.560	-44.9	Aux	-26.0	-18.9	Peak	Channel 6, 54Mbs	3.6	
2240.590	-45.1	Aux	-26.0	-19.1	Peak	Channel 13, 54MBs	3.6	
2202.970	-45.2	Aux	-26.0	-19.2	Peak	Channel 6, 54Mbs	3.6	
2179.360	-45.4	Aux	-26.0	-19.4	Peak	Channel 1, 54MBs	3.6	
1607.870	-45.4	Aux	-26.0	-19.4	Peak	Channel 1, 54MBs	3.6	
7310.740	-46.3	Aux	-26.0	-20.3	Peak	Channel 6, 54Mbs	3.6	
7426.230	-47.7	Aux	-26.0	-21.7	Peak	Channel 13, 54MBs	3.6	

Final Measurements :

Instrument Settings: RB=VB=1MHz, Zero Span (Span = 0Hz), sample detector, single sweep and sweep time set to auto, or, if the device is not transmitting continuously, the sweep time is set to be at least 3 times the burst repetition frequency. If the highest signal level on the screen is above the limit then the average power is determined over the complete transmission burst.

As there were no emissions above the limit during the preliminary (peak) scan, no final measurements were required

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Broadband plots from 30MHz to 12.5GHz for channels 1, 6 and 13

Plots are shown for an operating voltage of 3.6V (worst case operating voltage) and at a data rate of 54Mb/s (worst case data rate). Measurements were made at operating voltages of 3.6V, 3.3V and 3.0V and at data rates of 6Mb/s and 54Mb/s.

Elliott An NTS company	***Transmitter Characteristics Test Data***

Client:	Summit Data Communications	Job Number:	J76040
		T-Log Number:	T76236
Model:	SDC-MCF10G	Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Channel 1 - Emissions at band edge. Cursors are placed on the highest signal below 2387 MHz and the highest signal from 2387MHz to 2400 MHz

Analyzer Settings

Agilent Technologies, E4446A
CF: 2368.500 MHz
SPAN: 63.000 MHz
RB: 1.000 MHz
VB: 1.000 MHz
Detector: PK (CISPR)
Attn: 20 DB
RL Offset: 11.0 DB
Sweep Time: 78.0ms
Ref Lvl: 14.2 DBM

Comments

Channel 1, 54MBs

Cursor 1	2387.0090	-44.12	
Cursor 2	2400.0000	-31.61	

Delta Freq. 12.991
Delta Amplitude 12.51

Channel 13 emissions at band edge. Cursors placed on the highest signal above 2496.5 MHz and the highest signal between 2383.5 - 2496.5 MHz

Analyzer Settings

Agilent Technologies, E4446A
CF: 2691.750 MHz
SPAN: 416.500 MHz
RB: 1.000 MHz
VB: 1.000 MHz
Detector: PK (CISPR)
Attn: 20 DB
RL Offset: 11.0 DB
Sweep Time: 0.5s
Ref Lvl: 14.2 DBM

Comments

Channel 13, 54MBs

Cursor 1	2483.5000	-28.58	
Cursor 2	2699.8799	-42.21	

Delta Freq. 216.380
Delta Amplitude 13.63

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Run #4: Antenna Power and effective isotropic radiated power (eirp)

  Date of Test: 7/21/2009 0:00   Test Engineer: Mark Hill
  Test Location: ENV Chamber

One antenna position was evaluated based on verification that changing the diversity switch position did not affect the output power at the center channel at nominal voltage.

Test Procedure:

Step 1:Determine the frequency of the signal with the highest power spectral density

Instrument Settings: RB=1MHz, VB=3MHz, Span > Occupied bandwidth, peak detector, max hold, sampling points > 400.

Once the display has settled (no more peaks added) the marker is paced at the peak of the signal

The spectrum analyzer center frequency is adjusted to the marker frequency (Mkr -> CF feature), the span is then set to zero span

Step 2:Measure the output power

Instrument Settings: RB=VB=1MHz, continuous sweep, trace clear-write

The output power is the power measured by the average power meter connected to the IF output of the analyzer, corrected for the IF path loss, the value of the external attenuator (if used) and the duty cycle of the transmission sequence if the product is not transmitting continuously.

The eirp is calculated by adding the antenna gain (dBi) to the output power 9converted to dBm/MHz). The maximum permitted eirp is 12.15dB

Channel	Mode	Port	Chain	Data Rate	Nominal -10% 3.0 V	Nominal 3.3 V	Nominal + 10% 3.6 V
802.11g mode - initial measurements on center channel to determine worst-case mode/antenna							
Center	802.11g	Aux		6Mb/s	1.16 mw/MHz	1.24 mw/MHz	1.36 mw/MHz
Center	802.11g	Main		6Mb/s	0.79 mw/MHz	0.86 mw/MHz	0.88 mw/MHz
Center	802.11g	Aux		54Mb/s	1.66 mw/MHz	1.82 mw/MHz	1.95 mw/MHz
802.11g mode - final measurements.							
Low	802.11g	Aux		54Mb/s	0.89 mw/MHz	0.91 mw/MHz	0.98 mw/MHz
Center	802.11g	Aux		54Mb/s	1.66 mw/MHz	1.82 mw/MHz	1.95 mw/MHz
High	802.11g	Aux		54Mb/s	0.87 mw/MHz	0.93 mw/MHz	0.98 mw/MHz

  Lowest Output Power: 0.9 mw/MHz
  Highest Output Power: 2.0 mw/MHz

  Nominal Output Power: 2.01 mw/MHz
  Deviation In Output Power: -56.8%   to   -3.2%

  EIRP
  Highest Output Power: 1.95 mw/MHz
  Highest Output Power: 2.90 dBm/MHz
  Antenna Gain: 0.00 dBi
      EIRP   2.90 dBm/MHz
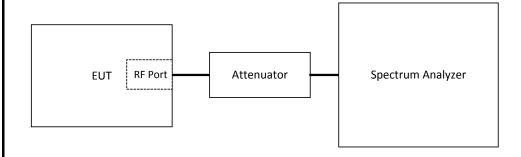
Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

RADIO EQUIPMENT USED FOR 2.4 GHz BAND
WIDE-BAND LOW-POWER DATA COMMUNICATIONS SYSTEM
(Radio station using 2471 - 2497 MHz)

Summary of Results

Test Performed	Mode	Requirement	Measurement	Result
Frequency Error	802.11b	50ppm or better	802.11b: 10.47 ppm	Pass
Occupied bandwidth (2484 MHz)	802.11b	DSSS: 500kHz < BW < 26MHz	DSSS: 18.6 MHz	Pass
Spreading Rate (2484 MHz)	802.11b	10 or more	802.11b: 10.8	Pass
Spurious Emissions	802.11b	Below 2387 MHz: < 2.5uW/MHz 2387 - 2400 MHz < 25uW/MHz 2497-2510 MHz < 25uW/MHz Above 2496.5 MHz: 2.5uW/MHz	4.47uW at 2469.440 MHz 7.5dB below the limit 0.079uW at 2510.094 MHz 15.0dB below the limit	Pass

Antenna power	802.11b	Maximum permitted:
		  BW < 26MHz: 10mW/MHz
		  BW < 38MHz: 5mW/MHz
		Power Tolerance:
		  -80% to +20%
		EIRP not to exceed 12.15dBm/MHz
			Rated Power
			  2.29 mW/MHz
			Tolerance:
			  -39.2% to -20.8%
			EIRP: 2.58dBm/MHz
				Pass

Test Configuration

Test Environment

Temperature:	15-30 °C	
Rel. Humidity:	20-75 %	
Pressure:	86-106 kPa	
Nominal Supply Voltage	3.3 Vdc	(provided by host device)

Elliott
An *NTS* company

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Duty Cycle and Transmission Cycle Time

Data Rate	Duty Cycle	Transmission cycle time
Mbs	%	ms
1	100	N/A - Continous
11	75	6

Run #1: Frequency Error

Date of Test: 7/21/2009 0:00   Test Engineer: Mark Hill

Test Location: ENV Chamber

One antenna position was evaluated based on verification that changing the diversity switch position did not affect the center frequency of the cente channel at nominal voltage on the center channel.

The center frequency was measured at nominal and extreme voltage conditions. Measurements showed no change in frequency stability due to voltage extremes, all other measurements taken at nominal voltage.

For CCK modulation with no provision for operating with an unmodulated signal measurements were made on a **modulated** signal at the top, center and bottom channels. The operating frequency was determined by measuring the frequency at the null created at the center of the signal. The analyzer was configured with , RB=10kHz, VB=1kHz, peak detector and max hold, as this gave the cleanest signal.

	Nominal Frequency (MHz) - 802.11b					
Low Channel		Center Channel	2484.0		High Channel	

	Measured Frequency (MHz)			Frequency Error (ppm)		
Voltage	Nominal -10%	Nominal	Nominal + 10%			
	3.0 V	3.3 V	3.6 V	3.0 V	3.3 V	3.6 V
Center Channel	2483.974000	2483.974000	2483.974000	10.47	10.47	10.47
Center Channel (Aux Port)		2483.980000			8.05	
				Requirement (ppm):	50.0	

Notes:

All testing performed at 1Mbs for 802.11b (CCK).

Unless otherwise noted, TX Diversity switch was set to main only. Testing was performed on the Main connector

Elliott

An [ATS] company

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Run #2: Occupied bandwidth and spreading bandwidth

Date of Test: 7/22/2009 0:00   Test Engineer: Mark Hill
Test Location: ENV Chamber

One antenna position was evaluated based on verification that changing the diversity switch position did not affect the occupied bandwidth of the center channel at nominal voltage.

The bandwidth was measured on the center channel at the lowest data rate at nominal and high and low voltages. As the bandwidth remained constant with input voltage all other channels and data rates were measured only at nominal voltage.

The occupied bandwidth was measured with the spectrum analyzer configured according to the table below. The occupied bandwidth was determined from the 99% power bandwidth by determining the highest and lowest frequencies at which 99.5% of the power was captured and then subtracting the two numbers. the calculation was done by either the analyzer directly or via the software used to capture the plot. One plot for each mode tested is provided for reference.

The spreading bandwidth was measured with the spectrum analyzer configured according to the table below. The spreading bandwidth was the 90% power bandwidth determined by the highest and lowest frequencies at which 95% of the power was captured and then subtracting the two numbers. This calculation was done by either the analyzer directly or via the software used to capture the plot. One plot for each mode tested is provided for reference.

Instrument Settings and Test Requirements						
Modulation Type	**Analyzer settings**				**Bandwidth Requirement**	
	Span	RB	VB	Other	Occupied	Spreading
Direct Sequence (e.g. 802.11b)	52-91	≤ 780kHz	300kHz	Positive peak detector, max hold, sweep time auto[1]	≤ 26.0MHz	≥ 500 kHz

Note 1: For burst transmissions sweep time set to ensure dwell time in each bandwidth > transmission cycle time (sweep time = transmit cycle time x span/ measurement bandwidth)
Note 2: For burst transmissions trace set for max hold and detector set to positive peak

Test Results, 802.11b Mode (Direct Sequence, 500kHz ≤ bandwidth ≤ 26MHz)							
Channel	Mode	Port	Chain	Data Rate	Nominal -10% 3.0 V	Nominal 3.3 V	Nominal + 10% 3.6 V
#14	802.11b	Main		1Mb/s		18.60	
#14	802.11b	Main		11Mb/s	18.48	18.48	18.48
#14	802.11b	Aux		1Mb/s		18.60	
#14	802.11b	Aux		11Mb/s		18.54	

Test Results, 802.11b Mode (Direct Sequence, 500kHz ≤ bandwidth ≤ 26MHz) - 90% Pwr Bandwidth							
Channel	Mode	Port	Chain	Data Rate	Nominal -10% 3.0 V	Nominal 3.3 V	Nominal + 10% 3.6 V
#14	802.11b	Main		1Mb/s		15.091	
#14	802.11b	Main		11Mb/s		14.853	
#14	802.11b	Aux		1Mb/s		15.094	
#14	802.11b	Aux		11Mb/s		14.893	
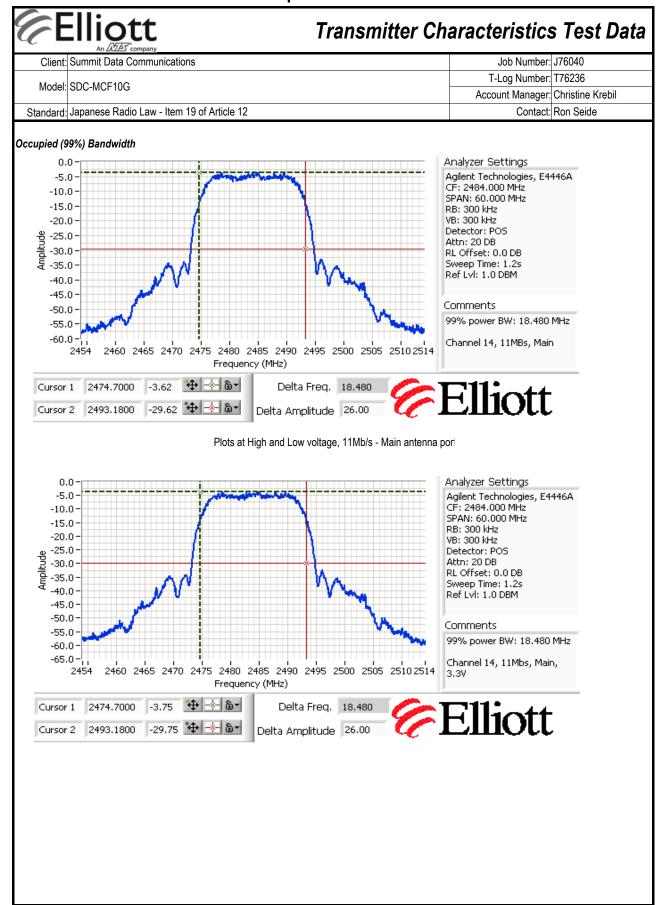
Spreading bandwidth
Symbol rate for 802.11b is 1Msym/s for 1Mb/s and 1.375Msym/s for data rates of 5.5Mb/s and above

	Data rate	Symbol Rate (Msym/s)	90% Signal Bandwidth	Spreading rate	Requirement
2484 MHz:	1Mb/s	1.000	15.091	15.1	10.0
2484 MHz:	5.5Mb/s & 11Mb/s	1.375	14.853	**10.8**	10.0

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
		T-Log Number:	T76236
Model:	SDC-MCF10G	Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Occupied (99%) Bandwidth

Analyzer Settings

Agilent Technologies, E4446A
CF: 2484.000 MHz
SPAN: 60.000 MHz
RB: 300 kHz
VB: 300 kHz
Detector: POS
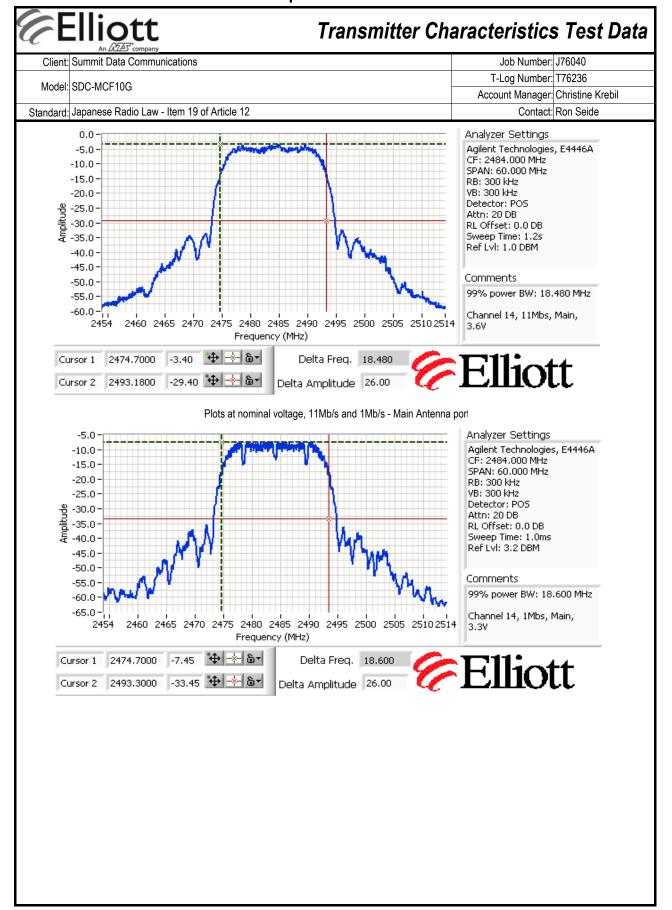Attn: 20 DB
RL Offset: 0.0 DB
Sweep Time: 1.2s
Ref Lvl: 1.0 DBM

Comments

99% power BW: 18.480 MHz

Channel 14, 11MBs, Main

| Cursor 1 | 2474.7000 | -3.62 | | Delta Freq. | 18.480 |
| Cursor 2 | 2493.1800 | -29.62 | | Delta Amplitude | 26.00 |

Plots at High and Low voltage, 11Mb/s - Main antenna port

Analyzer Settings

Agilent Technologies, E4446A
CF: 2484.000 MHz
SPAN: 60.000 MHz
RB: 300 kHz
VB: 300 kHz
Detector: POS
Attn: 20 DB
RL Offset: 0.0 DB
Sweep Time: 1.2s
Ref Lvl: 1.0 DBM

Comments

99% power BW: 18.480 MHz

Channel 14, 11Mbs, Main, 3.3V

| Cursor 1 | 2474.7000 | -3.75 | | Delta Freq. | 18.480 |
| Cursor 2 | 2493.1800 | -29.75 | | Delta Amplitude | 26.00 |

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
		T-Log Number:	T76236
Model:	SDC-MCF10G	Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Analyzer Settings

Agilent Technologies, E4446A
CF: 2484.000 MHz
SPAN: 60.000 MHz
RB: 300 kHz
VB: 300 kHz
Detector: POS
Attn: 20 DB
RL Offset: 0.0 DB
Sweep Time: 1.2s
Ref Lvl: 1.0 DBM

Comments

99% power BW: 18.480 MHz

Channel 14, 11Mbs, Main, 3.6V

Cursor 1	2474.7000	-3.40	Delta Freq.	18.480
Cursor 2	2493.1800	-29.40	Delta Amplitude	26.00

Plots at nominal voltage, 11Mb/s and 1Mb/s - Main Antenna port

Analyzer Settings

Agilent Technologies, E4446A
CF: 2484.000 MHz
SPAN: 60.000 MHz
RB: 300 kHz
VB: 300 kHz
Detector: POS
Attn: 20 DB
RL Offset: 0.0 DB
Sweep Time: 1.0ms
Ref Lvl: 3.2 DBM

Comments

99% power BW: 18.600 MHz

Channel 14, 1Mbs, Main, 3.3V

Cursor 1	2474.7000	-7.45	Delta Freq.	18.600
Cursor 2	2493.3000	-33.45	Delta Amplitude	26.00

Transmitter Characteristics Test Data

Client: Summit Data Communications	Job Number: J76040
	T-Log Number: T76236
Model: SDC-MCF10G	Account Manager: Christine Krebil
Standard: Japanese Radio Law - Item 19 of Article 12	Contact: Ron Seide

Spreading (90%) Bandwidth - Main Antenna Port, 1Mb/s (Left) and 11Mb/s (Right)

Spreading (90%) Bandwidth - Aux Antenna Port, 1Mb/s (Left) and 11Mb/s (Right)

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
		T-Log Number:	T76236
Model:	SDC-MCF10G	Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Run #3: Spurious and unwanted emissions

Date of Test: 7/22/2009 0:00 Test Engineer: Mark Hill
Test Location: ENV Chamber

Test Requirements

Frequency Range	Limit	
(MHz)	uW/MHz	dBm/MHz
30 - 2458	2.5	-26.0
2458 - 2471	25.0	-16.0
2497 - 2510	25.0	-16.0
2496.5 - 12500	2.5	-26.0

The limit is for a 1MHz measurement bandwidth.

Measurement Summary - Highest emissions in each operating mode

All preliminary peak measurements were below the limit by more than 10dB.

Preliminary Measurements :
Instrument Settings: RB=VB=1MHz, Positive peak detector and maximum hold for a minimum of 10 sweeps, but until the spectrum displayed becomes stable and no new signals are observed.
The device transmits continuously so the analyzer sweep time is auto-coupled

Preliminary measurement - 802.11b mode - GZ Band
All plots generated using a 1MHz RBW
For emissions below 2458 MHz the limit is 2.5uW/MHz (-26dBm/MHz).
From 2458 - 2471 MHz the limit is 25uW/MHz (-16dBm/MHz). From 2497 - 2510 MHz the limit is 25uW/MHz (-16dBm/MHz)
Antenna ports tested were both main and aux ports, worst case result is reported

Frequency MHz	Level dBm	Antenna Port	Limit	Margin	Detector	Comments	Operating Voltage	Operating Channel
2469.440	-23.5	Main	-16.0	-7.5	Peak	1MBs, 4.47uW	3.3	14
2469.343	-23.7	Main	-16.0	-7.7	Peak	1MBs	3.6	14
2469.343	-23.7	Main	-16.0	-7.7	Peak	1MBs	3	14
2498.625	-24.5	Main	-16.0	-8.5	Peak	1MBs	3.6	14
2498.625	-24.6	Main	-16.0	-8.6	Peak	1MBs	3	14
2498.527	-24.6	Main	-16.0	-8.6	Peak	1MBs	3.3	14
2510.094	-41.0	Main	-26.0	-15.0	Peak	1MBs	3.3	14
2454.137	-41.0	Main	-26.0	-15.0	Peak	1MBs	3.3	14
2456.899	-41.0	Main	-26.0	-15.0	Peak	1MBs	3.6	14
2511.101	-41.1	Main	-26.0	-15.1	Peak	1MBs	3.6	14
2510.321	-41.6	Main	-26.0	-15.6	Peak	1MBs	3	14
2707.240	-42.1	Main	-26.0	-16.1	Peak	1MBs	3.3	14
2457.516	-42.2	Main	-26.0	-16.2	Peak	1MBs	3	14
1655.930	-46.6	Main	-26.0	-20.6	Peak	1MBs	3.3	14
2264.100	-46.8	Main	-26.0	-20.8	Peak	1MBs	3.3	14
7458.870	-52.5	Main	-26.0	-26.5	Peak	1MBs	3.3	14

![Elliott logo] An *NTS* company	*Transmitter Characteristics Test Data*

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

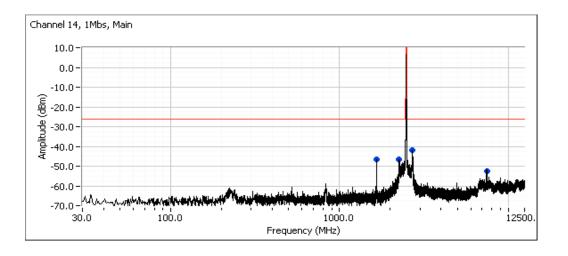**Final (Zero-Span) measurement**
Final Measurements :
Instrument Settings: RB=VB=1MHz, Zero Span (Span = 0Hz), sample detector, single sweep and sweep time set to auto, or, if the device is not transmitting continuously, the sweep time is set to be at least 3 times the burst repetition frequency. If the highest signal level on the screen is above the limit then the average power is determined over the complete transmission burst.

As there were no emissions above the limit during the preliminary (peak) scan, no final measurements were required
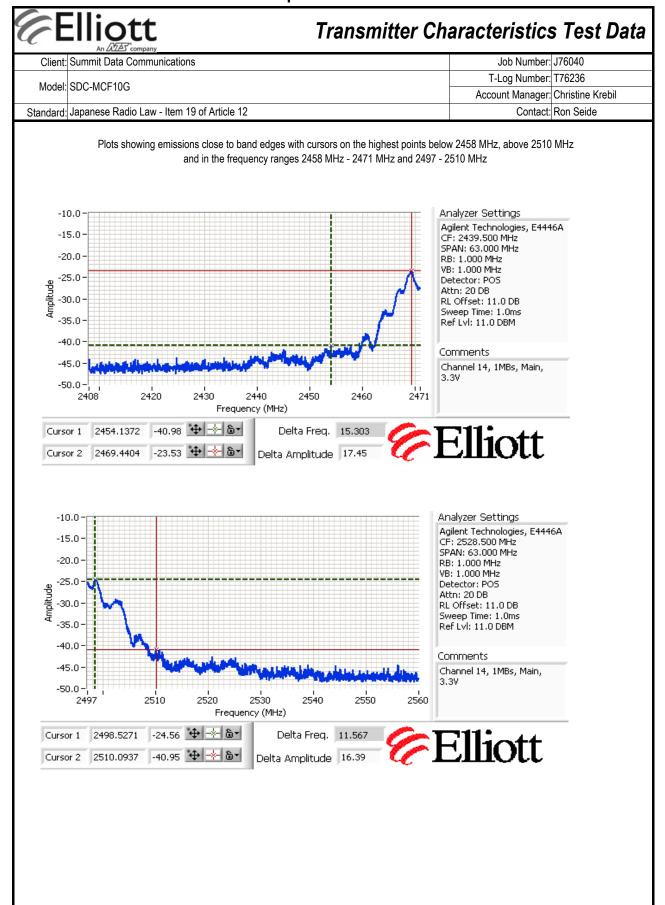
Preliminary measurement scans - 802.11b mode - GZ Band
Plots are shown for an operating voltage of 3.6V (worst case operating voltage) and at a data rate of 1Mb/s (worst case data rate). Measurements were made at operating voltages of 3.6V, 3.3V and 3.0V and at data rates of 11Mb/s and 1Mb/s.

Broadband plot from 30MHz to 12.5GHz for channel 14

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Plots showing emissions close to band edges with cursors on the highest points below 2458 MHz, above 2510 MHz
and in the frequency ranges 2458 MHz - 2471 MHz and 2497 - 2510 MHz

Analyzer Settings

Agilent Technologies, E4446A
CF: 2439.500 MHz
SPAN: 63.000 MHz
RB: 1.000 MHz
VB: 1.000 MHz
Detector: POS
Attn: 20 DB
RL Offset: 11.0 DB
Sweep Time: 1.0ms
Ref Lvl: 11.0 DBM

Comments

Channel 14, 1MBs, Main, 3.3V

Cursor 1	2454.1372	-40.98	Delta Freq.	15.303
Cursor 2	2469.4404	-23.53	Delta Amplitude	17.45

Analyzer Settings

Agilent Technologies, E4446A
CF: 2528.500 MHz
SPAN: 63.000 MHz
RB: 1.000 MHz
VB: 1.000 MHz
Detector: POS
Attn: 20 DB
RL Offset: 11.0 DB
Sweep Time: 1.0ms
Ref Lvl: 11.0 DBM

Comments

Channel 14, 1MBs, Main, 3.3V

Cursor 1	2498.5271	-24.56	Delta Freq.	11.567
Cursor 2	2510.0937	-40.95	Delta Amplitude	16.39

Transmitter Characteristics Test Data

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Run #4: Antenna Power

Date of Test: 7/21/2009 0:00   Test Engineer: Mark Hill
Test Location: ENV Chamber

One antenna position was evaluated based on verification that changing the diversity switch position did not affect the output power at the center channel at nominal voltage.

Test Procedure:

Step 1:Determine the frequency of the signal with the highest power spectral density

Instrument Settings: RB=1MHz, VB=3MHz, Span > Occupied bandwidth, peak detector, max hold, sampling points > 400.

Once the display has settled (no more peaks added) the marker is paced at the peak of the signal

The spectrum analyzer center frequency is adjusted to the marker frequency (Mkr -> CF feature), the span is then set to zero span

Step 2:Measure the output power

Instrument Settings: RB=VB=1MHz, continuous sweep, trace clear-write

The output power is the power measured by the average power meter connected to the IF output of the analyzer, corrected for the IF path loss, the value of the external attenuator (if used) and the duty cycle of the transmission sequence if the product is not transmitting continuously.

The eirp is calculated by adding the antenna gain (dBi) to the output power 9converted to dBm/MHz). The maximum permitted eirp is 12.15dB

Channel	Mode	Port	Chain	Data Rate	Nominal -10% 3.0 V	Nominal 3.3 V	Nominal + 10% 3.6 V
14	802.11b	Main		1Mb/s	1.69 mw/MHz	1.77 mw/MHz	1.81 mw/MHz
14	802.11b	Aux		1Mb/s	1.58 mw/MHz	1.69 mw/MHz	1.81 mw/MHz
14	802.11b	Main		11Mb/s	1.39 mw/MHz	1.46 mw/MHz	1.52 mw/MHz

Lowest Output Power: **1.4 mw/MHz**
Highest Output Power: **1.8 mw/MHz**

Nominal Output Power: **2.29 mw/MHz**
Deviation In Output Power: **-39.2%**   to   **-20.8%**

EIRP

Highest Output Power: 1.81 mw/MHz
Highest Output Power: 2.58 dBm/MHz
Antenna Gain: 0.00 dBi
EIRP   2.58 dBm/MHz
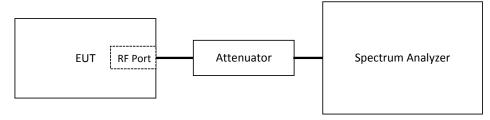
Radio Test Data - Spurious Emissions

Elliott An *NTS* company

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

RADIO EQUIPMENT USED FOR 2.4 GHz BAND
WIDE-BAND LOW-POWER DATA COMMUNICATIONS SYSTEM
(Radio station using 2400 - 2483.5 MHz and 2471 - 2497 MHz)

Frequency Error

Test Performed	Mode	Requirement	Measurement	Result
Secondary Radiated Emissions (Receiver Spurious Emissions)	-	30-1000MHz: 4nW or less >1000MHz: 20nW or less	All signals more than 10dB below the limit	Pass

Test Configuration

EUT — RF Port —— Attenuator —— Spectrum Analyzer

Test Environment

Temperature: 15-30 °C
Rel. Humidity: 20-75 %
Pressure: 86-106 kPa

Secondary Radiated Emissions

Date of Test: 7/24/2009 0:00   Test Engineer: Mark Hill
Test Location: ENV Chamber

Test Requirements						
	Limit					
Frequency Range (MHz)	Single Chain		2x2 MIMO, per Chain		3x3 MIMO, per Chain	
	nW	dBm/MHz	uW/MHz	dBm/MHz	uW/MHz	dBm/MHz
30 - 1000	4.0	-54.0	2.0	-57.0	1.3	-58.8
1000 - 8000	20.0	-47.0	10.0	-50.0	6.7	-51.8

Measurement Summary - Emission with the least margin from all measurements

Frequency MHz	Level nW	Antenna Port	Limit nW	Margin dB	Detector	Comments	Voltage	Channel	
30 - 1000	0.04	Main	4.0	-20.0	Peak	Highest level below 1GHz	3.3	-	
1000 - 8000	0.63	Main	20.0	-15.0	Peak	Highest level above 1GHz	3.3	-	

Radio Test Data - Spurious Emissions

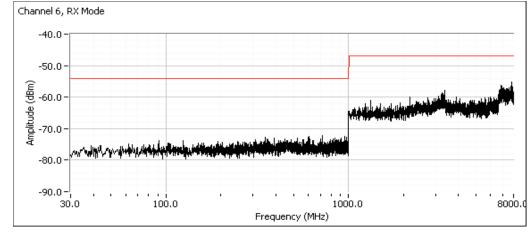|	
Client: Summit Data Communications	Job Number: J76040
	T-Log Number: T76236
Model: SDC-MCF10G	Account Manager: Christine Krebil
Standard: Japanese Radio Law - Item 19 of Article 12	Contact: Ron Seide

Preliminary Measurements :
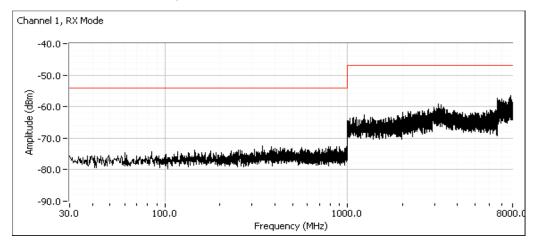
Instrument Settings: RB and VB as detailed below, Positive peak detector and maximum hold for a minimum of 10 sweeps, but until the spectrum displayed becomes stable and no new signals are observed.

Sweep Settings

Frequency (MHz)		Bandwidth (MHz)		Sweep Time
Start	Stop	RB	VB	
30	1000	0.1	0.1	AUTO ms
1000	8000	1	1	AUTO ms
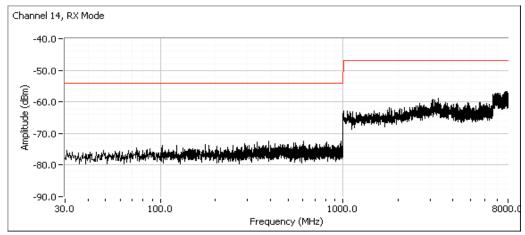
Broadband plots from 30MHz to 12.5GHz for channels 1, 6 and 13 and 14

Radio Test Data - Spurious Emissions

Client:	Summit Data Communications	Job Number:	J76040
Model:	SDC-MCF10G	T-Log Number:	T76236
		Account Manager:	Christine Krebil
Standard:	Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Channel 13, RX Mode

Channel 14, RX Mode

All signals were below a level of -74dBm for the frequency range 30 - 1000 MHz and below -62dBm for the frequency range of 1 - 8 GHz. These levels are 15dB or more the limit.

Final (Zero-Span) measurement

Final Measurements :

Instrument Settings: RB=VB=100kHz (below 1GHz) or RB=VB=1MHz (above 1GHz), Zero Span (Span = 0Hz), sample detector, single sweep and sweep time set to auto.

As there were no emissions above the limit during the preliminary (peak) scan, no final measurements were required

Test Equipment Used

Client: Summit Data Communications	Job Number:	J76040
	T-Log Number:	T76236
Model: SDC-MCF10G	Account Manager:	Christine Krebil
Standard: Japanese Radio Law - Item 19 of Article 12	Contact:	Ron Seide

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz-26.5 GHz	8593EM	1141	29-Dec-09
Fluke	Mulitmeter, True RMS	175	1447	18-Jun-10
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1786	28-Jan-10
Rohde & Schwarz	Power Sensor, 1 nW-20 mW, 10 MHz-18 GHz, 50ohms	NRV-Z1	2114	18-Sep-09
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	30-Dec-09
Rohde & Schwarz	Power Sensor, 1 uW-100 mW, DC-18 GHz, 50ohms	NRV-Z51	2152	02-Mar-10