Test Certificate

A sample of the following product received on October 19, 2010 and tested on October 8 and November 11, 2011 and January 20, 2012 complied with the requirements of *AS/NZS 4268:2008 +A1:2010 Radio equipment and systems – Short range devices – limits and methods of measurement* given the measurement uncertainties detailed in Elliott report R86494.

Summit Data Communications
Model SDC-MSD40NBT

Mark E Hill
Staff Engineer

Summit Data Communications

Printed Name

Testing Cert #2016.01

Elliott Laboratories is accredited by the A2LA, certificate number 2016.01, to perform the test(s) listed in this report, except where noted otherwise. This report and the information contained herein represent the results of testing test articles identified and selected by the client performed to specifications and/or procedures selected by the client. National Technical Systems (NTS) makes no representations, expressed or implied, that such testing is adequate (or inadequate) to demonstrate efficiency, performance, reliability, or any other characteristic of the articles being tested, or similar products. This report should not be relied upon as an endorsement or certification by NTS of the equipment tested, nor does it represent any statement whatsoever as to its merchantability or fitness of the test article, or similar products, for a particular purpose. This report shall not be reproduced except in full

Elliott Laboratories
www.elliottlabs.com
41039 Boyce Road
Fremont, CA. 94538-2435
510-578-3500 Phone
510-440-9525 Fax

Radio Test Report
AS/NZS 4268:2008 +A1:2010
Radio equipment and systems – Short range devices –
limits and methods of measurement
Bluetooth Device Operating in
the 2400-2483.5 MHz Band

Model: SDC-MSD40NBT

COMPANY:	Summit Data Communications 526 South Main St. Suite 805 Akron, OH 44311
TEST SITE(S):	Elliott Laboratories 41039 Boyce Road. Fremont, CA. 94538-2435
REPORT DATE:	March 15, 2012
FINAL TEST DATES:	October 8 and November 11, 2011 and January 20, 2012
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PROGRAM MGR /
TECHNICAL REVIEWER:

Mark E Hill
Staff Engineer

QUALITY ASSURANCE DELEGATE /
FINAL REPORT PREPARER:

David Guidotti
Senior Technical Writer

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	3-15-2012	First release	

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SCOPE

Electromagnetic compatibility test data has been taken pursuant to the relevant requirements of AS/NZS 4268:2008 +A1:2010 "Radio Equipment and systems – Short range devices – Limits and methods of measurement". This standard references the following documents:

- ANSI C63.4 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
- EN 300 328-1 V1.7.1 Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques; Part 1 : Technical characteristics and test conditions
- EN 300 440-1 V1.4.1 Electromagnetic Compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range Part 1: Technical characteristics and test methods
- ETR 273-1-1 Electromagnetic Compatibility and Radio spectrum Matters (ERM); Improvement of radiated methods of measurement (using test sites) and evaluation of the corresponding measurement uncertainties
- Australian Communications Authority Radiocommunications (Low Interference Potential Devices) Class Licence 2000, compilation prepared on 15 September 2010 taking into account amendments up to Radiocommunications (Low Interference Potential Devices) Class Licence Variation Notice 2009 (No. 1)
- New Zealand Ministry for Economic development Radiocommunications Regulations (General User Radio Licence for Short Range Devices) July 29, 2010

For results of the WiFi operation, refer to Elliott report R86492.

OBJECTIVE

The objective of the manufacturer is to comply with AS/NZS 4268:2008 +A1:2010 for use with the following spectrum allocations and licenses:

- Australian Communications Authority Radiocommunications (Low Interference Potential Devices) Class Licence 2000 *(latest release dated July 27, 2011)*
- New Zealand Ministry for Economic development Radiocommunications Regulations (General User Radio Licence for Short Range Devices) Notice 2 2010 *(latest release dated April 7, 2011)*

In order to demonstrate compliance, the manufacturer or a contracted laboratory makes measurements and takes the necessary steps to ensure that the equipment complies with the appropriate technical standards.

STATEMENT OF COMPLIANCE

The tested sample of Summit Data Communications model SDC-MSD40NBT complied with the relevant requirements of AS/NZS 4268:2008 +A1:2010 based on classification of the system by the manufacturer in accordance with the guidelines of AS/NZS 4268:2008 +A1:2010.

The test results recorded herein are based on a single type test of Summit Data Communications model SDC-MSD40NBT and therefore apply only to the tested sample. The sample was selected and prepared by Ron Seide of Summit Data Communications.

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

TEST RESULTS

Transmitters employing FHSS techniques in the 2400 - 24835 MHz band – 15 channel device				
Section[1]	Description	Limit	Measured	Status
8.1	Maximum EIRP	Australia LIPD limit: *500mW (15 channels)* New Zealand GURL limit: *1000 mW output power* *4000 mW eirp*	GFSK: -3.3 dBm 8PSK: -1.1 dBm All values eirp	Complies
8.2	Transmitter Spurious Emissions	Australia LIPD / New Zealand GURL limit: *25 – 25 GHz: -20dBc (spurious and fundamental measured in 100kH)z*	-50.8dB/m @ 5241.5MHz (-3.8dB)	Complies
8.3, 8.4	Emission Bandwidth Operating Frequencies	Australia LIPD / New Zealand GURL allocated band: *2400 -2483.5 MHz*	GFSK: 2401.42 - 2480.46 MHz 8PSK: 2401.34 - 2480.61 MHz	Complies
LIPD	Minimum number of channels	Minimum of 15 channels	Max: 79 Min: 20	Complies
LIPD	20dB Bandwidth (note 1)	Information only	Basic: 1100kHz EDR: 1400kHz	-
LIPD	Channel separation	Greater than the larger of either 25 kHz or two thirds of the −20 dB bandwidth of the emission	1 MHz	Complies
LIPD	Channel occupation	The duration of the emission about any specific emission centre frequency shall not exceed 0.4 s.	Device complies with Bluetooth protocol	Complies
9	Receiver Spurious Emissions	25 MHz to 1 GHz *3.3 nW EIRP, or 2.0 nW ERP* 1 GHz to 40 GHz *32.8 nW EIRP, or 20 nW ERP*	-61.9dBm @ 660.52MHz (-4.9dB)	Complies
Note 1: Results taken from FCC 15.247 report, R86485.				

EXTREME CONDITIONS

Voltage extremes used during testing were 3.0VDC to 3.6VDC and are based on the manufacturer declared values for extremes.

Temperature extremes used during testing were those for unrestricted use, -20°C to +55°C.

[1] Reference to the either the section of AS/NZS 4268 or the Class License (LIPD or GURL) containing the requirement.

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2) and were calculated in accordance with NAMAS document NIS 81 and M3003.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF frequency	Hz	25 to 7000 MHz	1.7×10^{-7}
RF power, conducted	dBm	25 to 7000 MHz	± 0.52 dB
Conducted emission of transmitter	dBm	25 to 26500 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 26500 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 26500 MHz	± 2.5 dB
Radiated emission (field strength)	dBμV/m	25 to 1000 MHz	± 3.6 dB
Transmitter switch off time	Seconds	-	0.1 sec

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Summit Data Communications model SDC-MSD40NBT is an 802.11abgn 1x1 with Bluetooth 2.1 module.

The sample was received on October 19, 2010 and tested on October 8 and November 11, 2011 and January 20, 2012. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Summit	SDC-MSD40NBT	802.11abgn 1x with BT	Prototype	TWG-SDCMSD40NBT

PERFORMANCE ASSESSMENT

The primary function of the model SDC-MSD40NBT is to provide 802.11abgn and Bluetooth connectivity to a host device. All other characteristics of the product tested are detailed in the remainder of this report.

OTHER EUT DETAILS

The EUT supports 20MHz operation only.

The EUT supports the following antennas:

Monopole Antenna - 2.4 and 5GHz bands - Huber+Suhner, SOA 2459/360/5/0/V_C, 3dBi (2.4GHz), 6.5dBi (5GHz)
Dipole Antenna #1 - 2.4 and 5GHz bands - Larsen, R380.500.314, 1.6dBi (2.4GHz), 5dBi (5GHz)
Dipole Antenna #2 - 2.4 GHz only - Cisco Air-Ant 4941 2dBi(2.4GHz)
Magnetic Dipole - 2.4GHz and 5GHz bands – Ethertronics, 2.5dBi (2.4GHz), 5dBi (5GHz)

ENCLOSURE

The EUT has no enclosure. It is designed to be installed within the enclosure of a host computer.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at Elliott.

SUPPORT EQUIPMENT

Company	Model	Description	Serial Number	FCC ID
Lenovo	Inspiron 1545	Laptop Computer (Note 1)	953R2K1	DoC
Summit	-	Linux Test Fixture	-	-
-	-	AC/DC Adapter for test fixture	-	-

Note 1 - Used to configure the EUT and then disconnected prior to testing

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
AC/DC Adapter – DC out	Test Fixture	2wire	Unshielded	1.5m

EUT OPERATION

During testing, the EUT was configured to transmit continuously at the lowest data rate for the mode as this resulted in the highest output power.

TEST SITE

GENERAL INFORMATION

Antenna port measurements were taken at the Elliott Laboratories test site located at 41039 Boyce Road, Fremont, CA 94538-2435.

Final radiated spurious emissions measurements were taken at the Elliott Laboratories Anechoic Chambers listed below. The sites conform to the requirements of ANSI C63.4: 2003 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* and CISPR 16-1-4:2007 - *Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances*. They are registered with the VCCI and are on file with the FCC and\or Industry Canada.

Site	Registration Numbers			Location
	VCCI	FCC	Canada	
Chamber 3	R-1683 C-1795	769238	IC 2845B-3	41039 Boyce Road Fremont, CA 94538-2435
Chamber 4	R-1684 C-1796	211948	IC 2845B-4	
Chamber 5	R-1685 C-1797	211948	IC 2845B-5	

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions measurements are performed with the EUT's rf input/output connected to the input of a spectrum analyzer. When required an attenuator or dc block is placed between the EUT and the spectrum analyzer.

RADIATED EMISSIONS CONSIDERATIONS

CISPR has determined that radiated measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an Open Area Test Site or anechoic chamber, as defined in CISPR 16-1-4 and Annex A of EN 300 328 / EN 301 893 / EN 300 440-1. The test site is maintained free of conductive objects within the CISPR defined elliptical area.

EMISSIONS MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1-1 is used for radiated emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis.

Measurement bandwidths for the test instruments are set in accordance with the requirements of EN 300 220 and EN 300 330 as referenced in this document and in AS/NZS 4268.

INSTRUMENT CONTROL COMPUTER

Software control is used to convert the receiver measurements to the field strength at an antenna, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are exported in a graphic and/or tabular format, as appropriate.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer runs automated data collection programs that control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the EUT antenna port or receiving antenna and the test receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A combination of biconical, log periodic or bi-log antennas are used to cover the range from 25 MHz to 1000 MHz. Broadband antennas or tuned dipole antennas are used over the entire 25 to 1000 MHz frequency range as the reference antenna for substitution measurements.

Above 1000 MHz, a dual-ridge guide horn antenna or octave horn antenna are used as reference and measurement antennas.

The antenna calibration factors are included in site factors that are programmed into the test receivers and instrument control software when measuring the radiated field strength.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

EN 300 220 and EN 300 330 specify that the test height above ground for non-body worn devices shall be 150 centimeters. Floor mounted equipment will be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The standards require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of EN 300 220-1, and the worst-case orientation is used for final measurements.

OUTPUT POWER

Output power is measured using an average sensor head and corrected for transmit duty cycle. Power measurements are converted to an EIRP by adding the gain of the highest gain antenna that can be used with the device under test, as specified by the manufacturer.

FREQUENCY RANGE

Frequency range is measured by measuring the 99% bandwidth of the transmitted signal at normal and extreme conditions and at the upper and lower operating frequencies in each operating band for the device.

The highest and lowest frequencies that fall within the 99% bandwidth determine the frequency range of the device.

SPURIOUS EMISSIONS (ANTENNA)

Conducted emissions are measured at the output of the device using a RF cable and attenuator if required. Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode).

SPURIOUS EMISSIONS (RADIATED)

Radiated emissions measurements are performed in two phases. A preliminary scan of emissions is conducted in either an anechoic chamber or on an OATS during which all significant EUT frequencies are identified with the system in a nominal configuration.
At least two scans are performed across the complete frequency range of interest and at each operating frequency identified in the reference standard. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode).

During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit. The limit is a field strength limit derived from the ERP limit specified in the standard(s).

All signals within 10dB of this calculated limit are re-measured on an OATS or Semi-anechoic chamber. The field strength is recorded and the EUT is then replaced with a substitution antenna of known gain (typically a dipole antenna or a double-ridged horn antenna). The eirp of the substitution antenna is measured and used to calculate the erp/eirp of the EUT.

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS - CONDUCTED SPURIOUS EMISSIONS

Measurements are compared directly to the conducted emissions specification limit (decibel form). The calculation is as follows:

$$R_r - S = M$$

where:

R_r = Measured value in dBm
S = Specification Limit in dBm
M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED SPURIOUS EMISSIONS

Receiver readings are compared directly to a converted specification limit (decibel form). The conversion uses the effective radiated power limit specified in the standard to calculate the expected field strength in free space using the following formula:

$$E = \frac{\sqrt{30\,P\,G}}{d}$$

where:

E = Field Strength in V/m
P = Power in Watts
G = Gain of antenna in numeric gain[2]
D = distance in meters

The field strength limit is then converted to decibel form (dBuV/m) and the margin of a given emission peak relative to the limit is calculated as follows:

$$M = R_c - L_s$$

where:

R_c = Corrected Receiver Reading in dBuV/m
L_s = Calculated specification Limit in dBuV/m
M = Margin in dB Relative to Spec

When substitution measurements are required (all signals with less than 6dB of margin relative the field strength limit) the margin of the emissions relative to the effective radiated power limit is calculated from:

$$P_s - S = M$$

where:

P_s = effective radiated power determined from antenna substitution (dBm)
S = Specification Limit in dBm
M = Margin to Specification in +/- dB

[2] Although the gain relative to a dipole should be used for limits expressed as an erp, the isotropic gain is used as this produces a more conservative limit.

Appendix A Test Equipment Calibration Data

Radiated Emissions, 1 - 12.75 GHz, 20-Jan-12

Manufacturer	Description	Model	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18 GHz (SA40-Blu)	3115	1386	9/21/2012
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	2/23/2012
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	2415	7/28/2012

Radio Antenna Port (Power and Spurious Emissions), 01-Sep-11, 06-Sep-11, 8-Oct-11, 11-Nov-11, 10-Jan-12, 11-Jan-12

Manufacturer	Description	Model	Asset #	Cal Due
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1422	12/1/2011
Rohde & Schwarz	Power Sensor 100 uW - 10 Watts	NRV-Z53	1555	2/2/2012
Rohde & Schwarz	Attenuator, 20 dB , 50 ohm, 10W, DC-18 GHz	20dB, 10W, Type N	1556	2/2/2012
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	1/26/2012
Thermotron	Temp Chamber (w/ F4 Watlow Controller)	S1.2	2170	7/8/2012

Appendix B Test Data

T83340 Pages 18 - 34

Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		-
Emissions Standard(s):	EN 300 328, EN 301 893, AS/NZS 4268	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Summit Data Communications

Model

SDC-MSD40NBT

Date of Last Test: 3/1/2012

EMC Test Data

Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

Radiated Spurious Emissions
EN 300 328 v1.7.1, AS/NZS 4268: 2008

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 1/20/2012
Test Engineer: M. Birgani, J. Cadigal
Test Location: FT Chamber#5

Config. Used: 1
Config Change: none
Host Unit Voltage 230V / 50Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

The measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 20.4 °C
Rel. Humidity: 36 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
2	Spurious Emissions Transmit Mode 25 - 12750 MHz	EN 300 328	Pass	All radio emissions are > 10 dB below the equivalent field strength limit.
4	Spurious Emissions Receive/Stand-By Mode 25 - 12750 MHz	EN 300 328	Pass	All radio emissions are > 10 dB below the equivalent field strength limit.

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

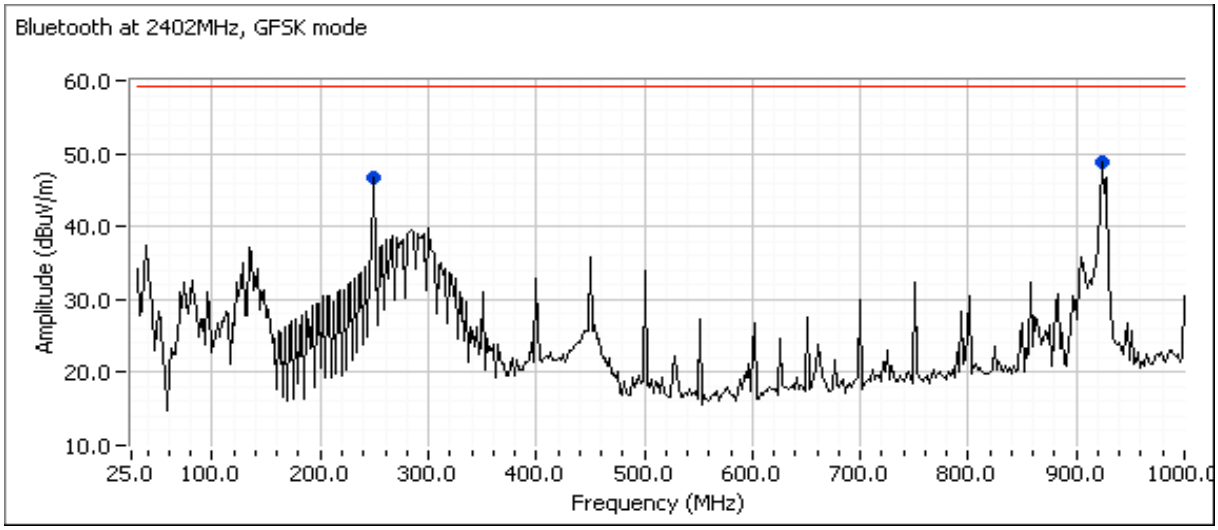
No deviations were made from the requirements of the standard.

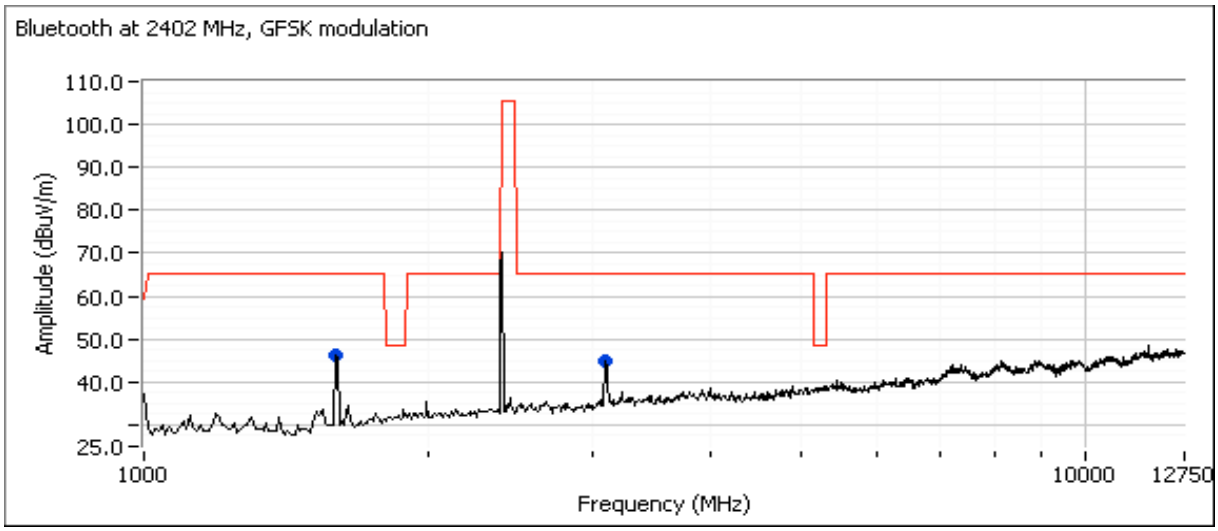
EMC Test Data

Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

Run #1: Radiated Spurious Emissions, Transmit Mode, 25 - 12750 MHz

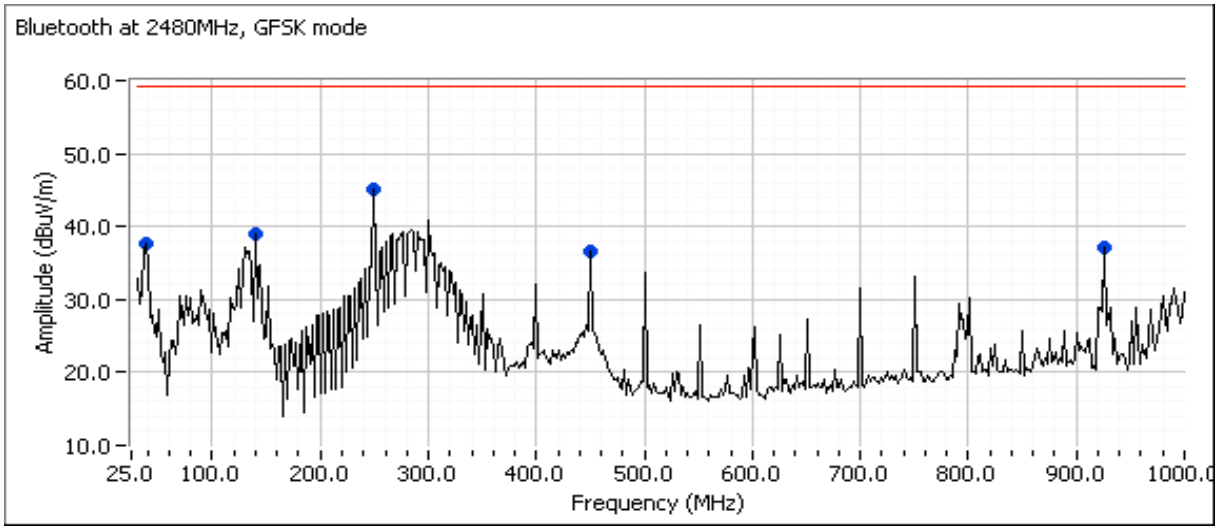
Graph - Channel: 2402 MHz, Mode: GFSK

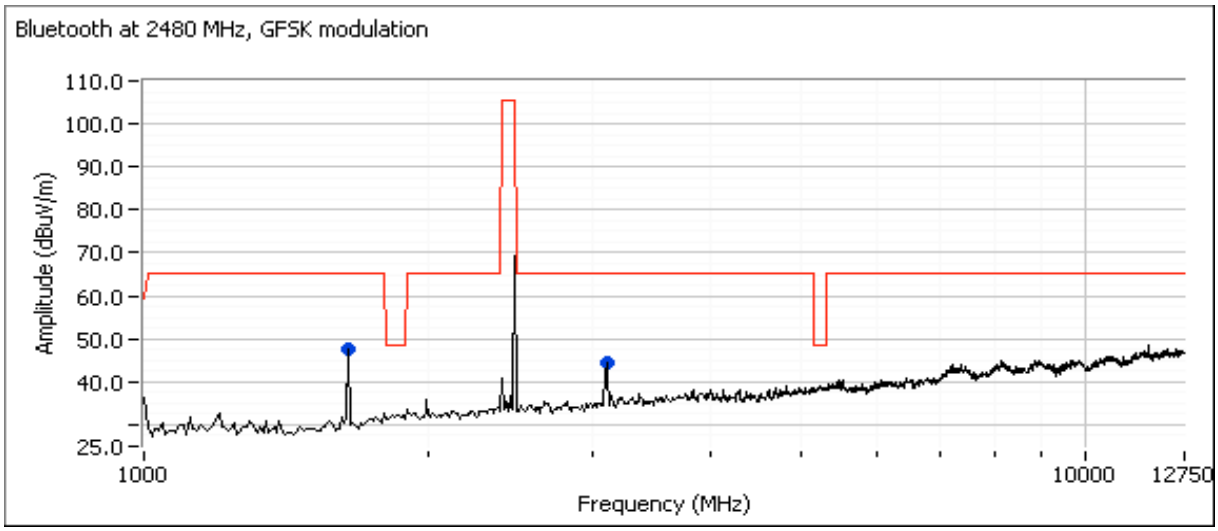




Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

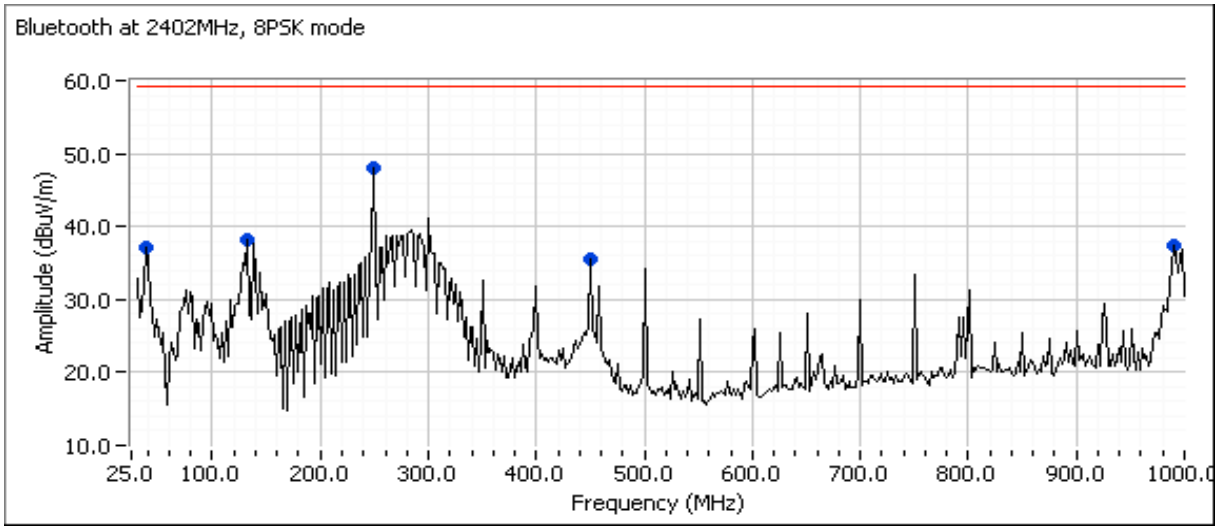
Graph - Channel: 2480 MHz, Mode: GFSK

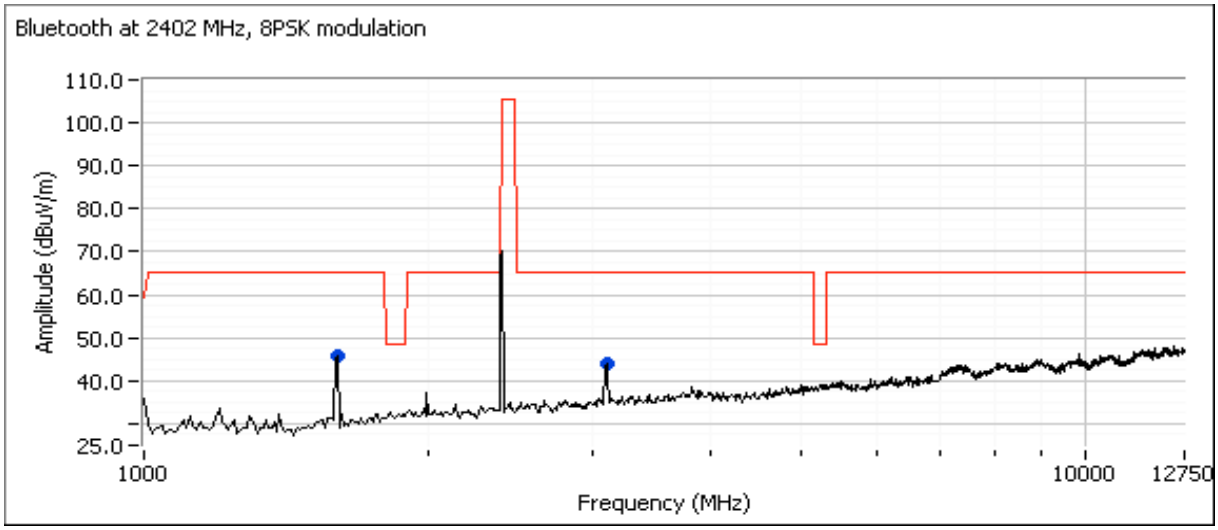




Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

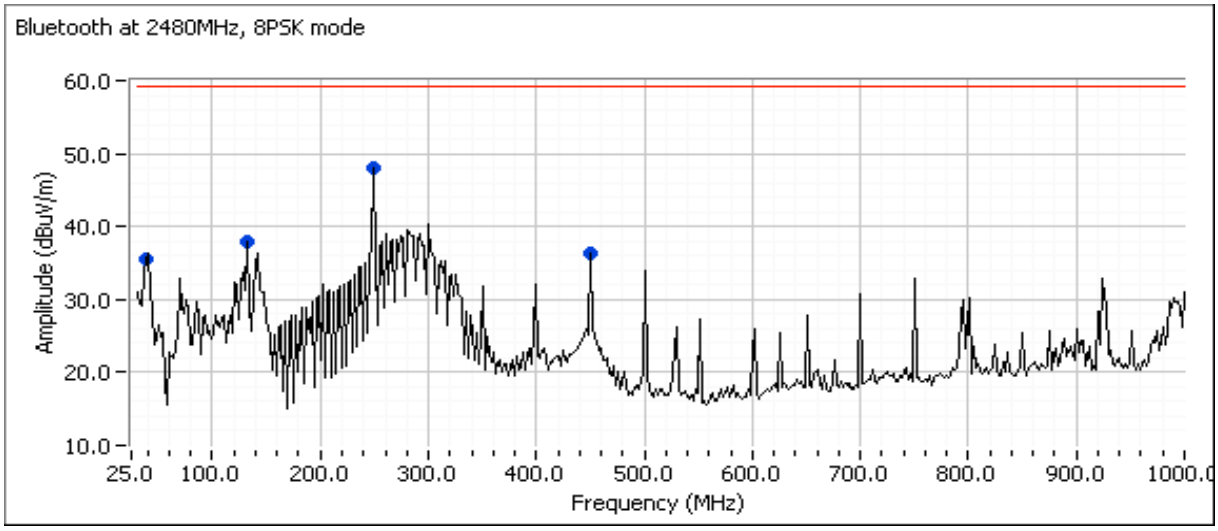
Graph - Channel: 2402 MHz, Mode: 8PSK

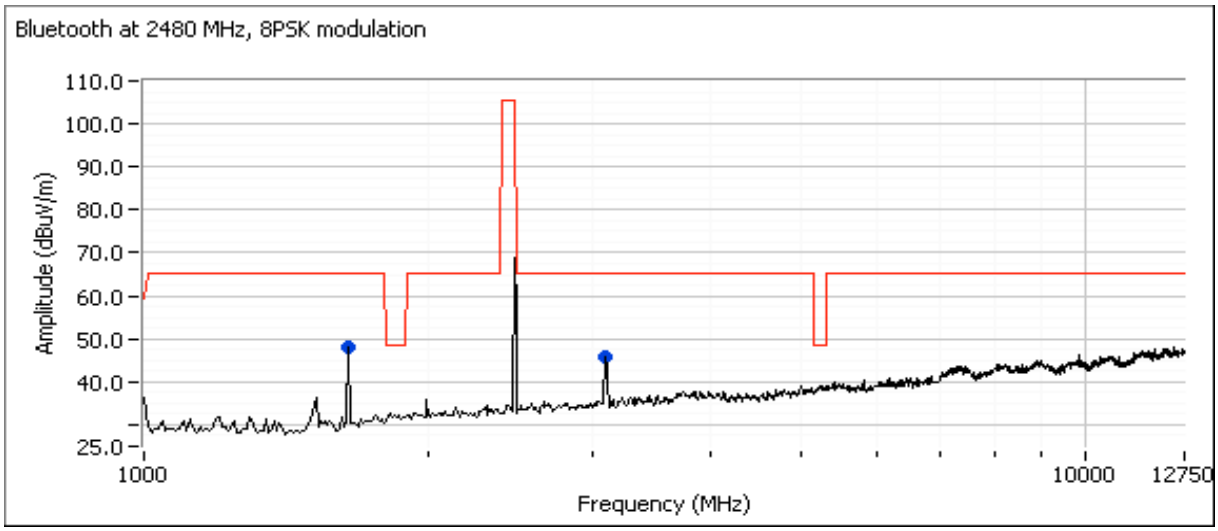




Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

Graph - Channel: 2480 MHz, Mode: 8PSK





EMC Test Data

Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

Results Table - All channels

Frequency MHz	Level dBμV/m	Pol V/H	EN 300 328 Note 1 Limit	Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments	Channel and mode
37.018	35.5	V	59.3	-23.8	Peak	58	1.5		8PSK, 2480
37.376	37.6	V	59.3	-21.7	Peak	308	1.0		GFSK, 2480
37.554	37.0	V	59.3	-22.3	Peak	17	1.0		8PSK, 2402
132.548	37.8	H	59.3	-21.5	Peak	26	2.0		8PSK, 2480
134.826	38.1	V	59.3	-21.2	Peak	238	1.0		8PSK, 2402
139.694	38.9	H	59.3	-20.4	Peak	5	1.5		GFSK, 2480
250.005	48.1	H	59.3	-11.2	Peak	287	2.5		8PSK, 2402
250.005	47.9	H	59.3	-11.4	Peak	269	2.5		8PSK, 2480
250.005	46.8	H	59.3	-12.5	Peak	273	2.5		GFSK, 2402
250.005	45.1	H	59.3	-14.2	Peak	75	2.5		GFSK, 2480
450.001	36.3	V	59.3	-23.0	Peak	342	1.5		8PSK, 2480
450.008	36.7	V	59.3	-22.6	Peak	343	1.5		GFSK, 2480
450.008	35.6	V	59.3	-23.7	Peak	337	1.5		8PSK, 2402
924.884	37.2	V	59.3	-22.1	Peak	237	1.0		GFSK, 2480
925.195	48.8	H	59.3	-10.5	Peak	351	3.0		GFSK, 2402
990.915	37.3	H	59.3	-22.0	Peak	266	2.5		8PSK, 2402
1595.830	46.3	H	65.3	-19.0	Peak	218	1.6		GFSK, 2402
1605.000	45.7	H	65.3	-19.6	Peak	222	1.6		8PSK, 2402
1650.830	48.0	H	65.3	-17.3	Peak	232	1.3		8PSK, 2480
1650.830	47.8	H	65.3	-17.5	Peak	326	1.6		GFSK, 2480
3090.000	45.6	V	65.3	-19.7	Peak	62	2.5		8PSK, 2480
3090.000	44.7	V	65.3	-20.6	Peak	57	2.5		GFSK, 2402
3099.170	43.8	V	65.3	-21.5	Peak	61	1.3		8PSK, 2402
3099.170	44.5	V	65.3	-20.8	Peak	50	2.5		GFSK, 2480

Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: E=√(30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than 10dB of margin relative to this field strength limit is determined using substitution measurements.

Run #2: Radiated Spurious Emissions, Transmit Mode: Final Field Strength and Substitution Measurements

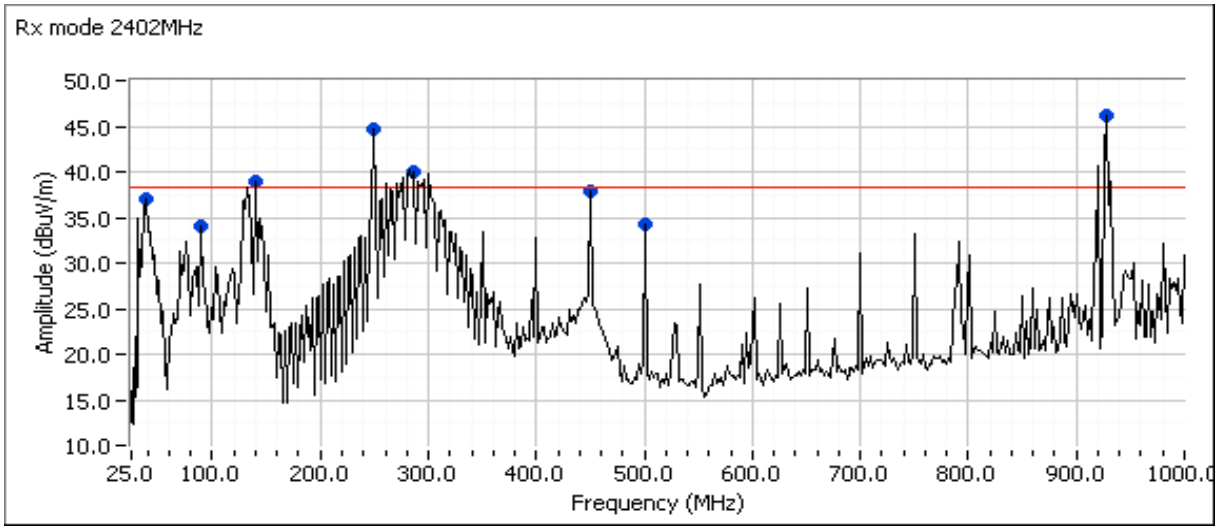
No radio related emissions within 10dB of the limit, no subsitutions performed.

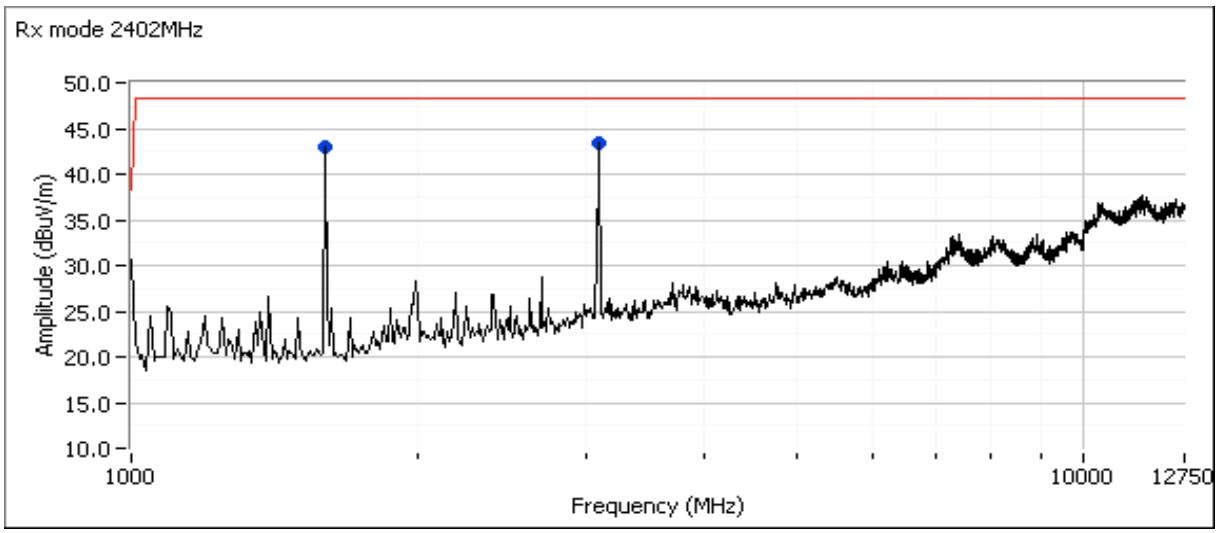
Signals determined to be from the test fixture/setup (digital signals) and not the radio function of the MSD40NBT by comparison of results from different channels and operating modes.

Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

Run #3: Radiated Spurious Emissions, Receive Mode, 25 - 12750 MHz

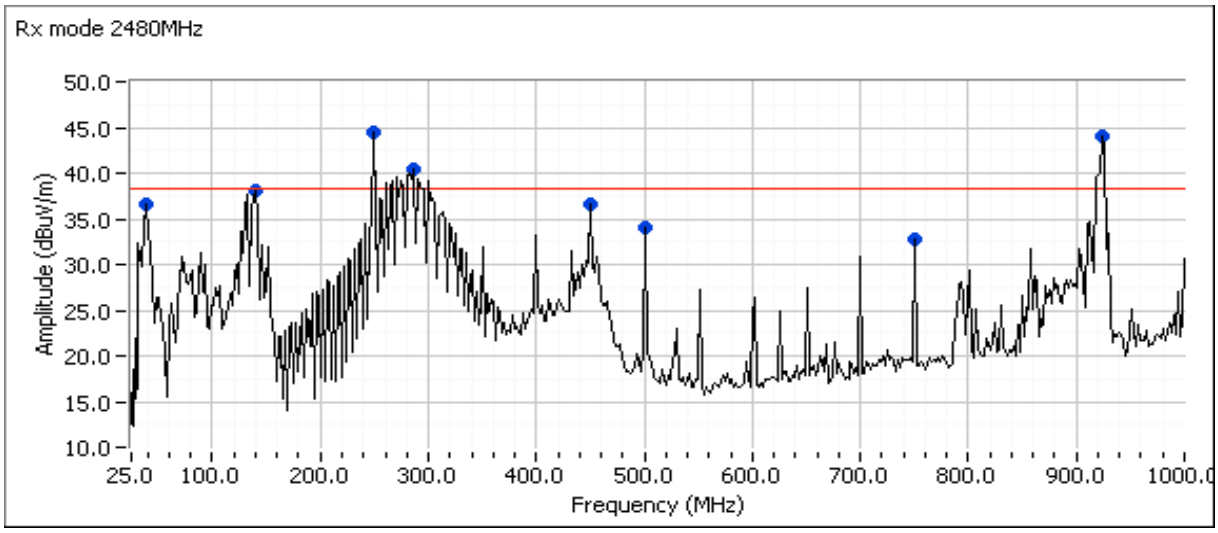
Graph - Channel: 2402 MHz

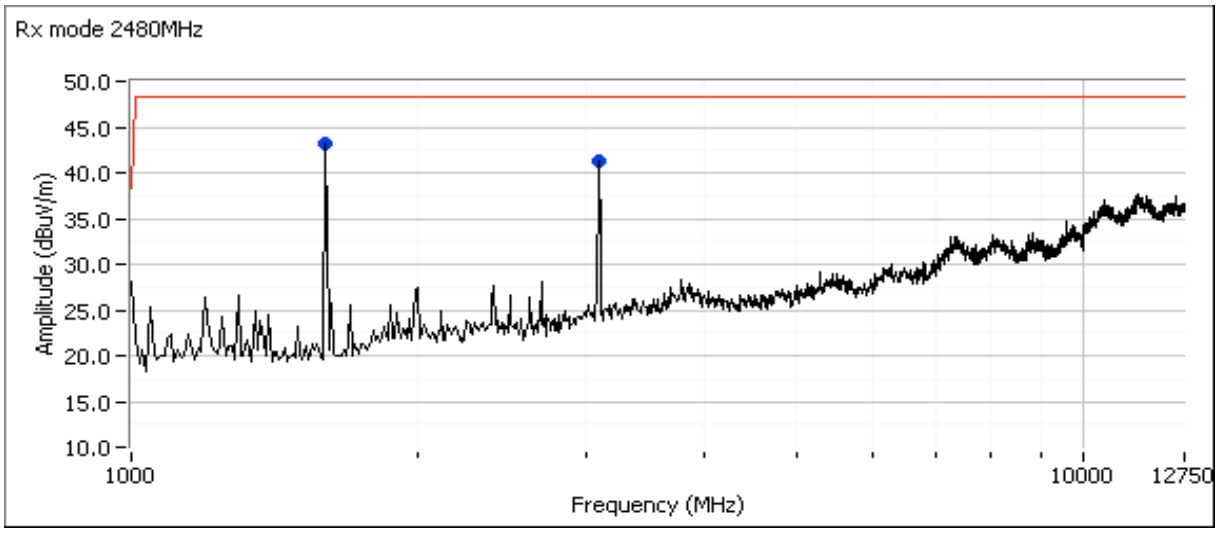




Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

Graph - Channel: 2480 MHz





EMC Test Data

Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

Results Table - All channels

Frequency MHz	Level dBμV/m	Pol V/H	EN 300 328 Note 1 Limit	Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments	Channel and mode
36.155	36.7	V	38.3	-1.6	Peak	324	1.5	Note 2	2480
37.912	37.1	V	38.3	-1.2	Peak	62	1.5		2402
92.038	34.0	V	38.3	-4.3	Peak	316	1.0		2402
139.414	39.0	H	38.3	0.7	Peak	31	2.0		2402
141.871	38.1	H	38.3	-0.2	Peak	348	2.0		2480
250.005	44.7	H	38.3	6.4	Peak	84	2.5		2402
250.005	44.4	H	38.3	6.1	Peak	285	2.5		2480
285.889	39.9	H	38.3	1.6	Peak	90	2.0		2402
286.270	40.4	H	38.3	2.1	Peak	267	2.0		2480
450.008	37.8	V	38.3	-0.5	Peak	321	1.5		2402
450.008	36.5	V	38.3	-1.8	Peak	181	1.5		2480
500.005	34.2	H	38.3	-4.1	Peak	10	1.0		2402
500.005	34.0	H	38.3	-4.3	Peak	1	1.0		2480
750.004	32.8	H	38.3	-5.5	Peak	352	1.0		2480
922.543	44.1	V	38.3	5.8	Peak	129	2.5		2480
927.209	46.2	H	38.3	7.9	Peak	274	3.0		2402
1602.790	43.6	H	48.3	-4.7	Peak	33	1.6		2402
1602.790	43.2	H	48.3	-5.1	Peak	31	1.6		2480
3094.540	47.3	V	48.3	-1.0	Peak	156	1.6		2402
3103.170	41.2	V	48.3	-7.1	Peak	142	1.6		2480

Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: E=√(30PG)/d. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than 10dB of margin relative to this field strength limit is determined using substitution measurements.
Note 2	Non-radio signals. These signals do not change when the channel is changed.

Run #4: Radiated Spurious Emissions, Receive Mode: Final Field Strength and Substitution Measurements

No radio related emissions within 10dB of the limit, no subsitutions performed.

Signals determined to be from the test fixture/setup (digital signals) and not the radio function of the MSD40NBT by comparison of results from different channels and operating modes.

Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

Radio Performance Test - EN 300 328

RF Port Measurements

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 10/8 & 11/11/2011 12:00:00 AM
Test Engineer: Rafael Varelas
Test Location: FT Lab #4

Config. Used: 1
Config Change: None
EUT Voltage: 3.3V

General Test Configuration

The EUT's rf port was connected to the measurement instrument's rf port, via an attenuator or dc-block if necessary.

Summary of Results

Run #	Test Performed	Limit	Result	Value / Margin
1	Output Power over extreme conditions	EN 300 328, 20dBm (100mW) eirp	Pass	GFSK: -3.3 dBm 8PSK: -1.1 dBm
2	Frequency Range over extreme conditions	EN 300 328 2400 - 2483.5 MHz	Pass	GFSK: 2401.45 - 2480.54 MHz 8PSK: 2401.29 - 2480.68 MHz
2	Frequency Range over extreme conditions	AS/NZS 4268	Pass	GFSK: 2401.42 - 2480.46 MHz 8PSK: 2401.34 - 2480.61 MHz
3	Transmitter spurious emissions, 30MHz - 12,750MHz (rf port)	EN 300 328	Pass	-63.2 dBm @ 1654.22 MHz (-33.2 dB)
3	Receiver spurious emissions, 30MHz - 12,750MHz (rf port)	EN 300 328	Pass	-65.1 dBm @ 1603.2 MHz (-18.1 dB)

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.

Normal and Extreme Operating Conditions:

Test Notes

Voltage extremes (nominal/normal voltage defined as 3.3 V):

X	Voltage extremes for DC-powered equipment +/10% of nominal

Temperature extremes:

X	-20°C to +55°C (Limits for unrestricted use taken from EN 300 328 / EN 300 220)

EMC Test Data

Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

Ambient (Normal) Conditions:

Temperature: 20.4 °C
Rel. Humidity: 36 %

Run #1: Power Measurements - Frequency Hopping Spread Spectrum (FHSS)

Cable Loss: - Attenuator: - Total Loss: 10.5 dB
Cable ID(s): EL540 Attenuator IDs: 2033.0

Notes for power and power spectral density measurements

Note 1:	Average Power measured using a wideband, calibrated RF power meter with a thermocouple detector (or an equivalent thereof).
Note 2:	PSD measured using a thermocouple detector (or an equivalent thereof) connected to the IF output of the spectrum analyzer, with the analyzer set to positive peak detector with RB=VB= 1MHz for digital modulation and RB=VB= 100kHz for FHSS.
Note 3:	Gain is the maximum gain of the antenna assembly that can be used with the EUT at this power level.
Note 4:	Duty Cycle - the duty cycle of the transmitter during the power measurement [time on /(time off + time on)]. Measured using diode detector and oscilloscope or directly from the analyzer.
Note 5:	EIRP levels are the measured levels corrected for duty cycle [10log(duty cycle)] and EUT antenna gain. For MIMO modes the total power is the aggregated eirp for each transmit chain.

Average Power[1] under normal and extreme operating conditions

Power Setting	Channel / Mode	Average Power (dBm)[1] For Operating Condition					Max Antenna Gain[3]	Duty Cycle[4]	Max Average Power (EIRP)[5]	Maximum permitted EIRP (dBm)
		Normal	Extreme							
		20°C	-20°C		55°C					
		3.3 V	3.0 V	3.6 V	3.0 V	3.6 V				
GFSK										
Default	2402	-5.0	-4.6	-4.6	-5.3	-5.3	3.0	1.0	-1.6	20.0
Default	2441	-3.8	-3.3	-3.3	-4.3	-4.3	3.0	1.0	-0.3	20.0
Default	2480	-3.9	-3.3	-3.3	-4.4	-4.4	3.0	1.0	-0.3	20.0
8PSK										
Default	2402	-2.6	-2.0	-2.0	-3.3	-3.3	3.0	1.0	1.0	20.0
Default	2441	-1.7	-1.1	-1.1	-2.3	-2.3	3.0	1.0	1.9	20.0
Default	2480	-1.8	-1.1	-1.1	-2.6	-2.6	3.0	1.0	1.9	20.0

Note: Pk sensor was used for measuring power

Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

Run #2: Frequency Range Under Normal and Extreme Conditions - EN 300 328

	Mode	Antenna Gain	Power Setting	Measured Frequency (MHz) For Operating Condition					Low F_L High F_H	Result
				Normal	Extreme					
				20°C	-20°C		55°C			
				3.3 V	3.0 V	3.6 V	3.0 V	3.6 V		
F_L (MHz)	GFKS	3.0	Default	2401.45	2401.470	2401.470	2401.450	2401.460	2401.450	PASS
F_H (MHz)	GFSK	3.0	Default	2480.49	2480.540	2480.530	2480.500	2480.470	2480.540	PASS
F_L (MHz)	8PSK	3.0	Default	2401.29	2401.310	2401.310	2401.300	2401.290	2401.290	PASS
F_H (MHz)	8PSK	3.0	Default	2480.65	2480.680	2480.680	2480.640	2480.640	2480.680	PASS

FL and Fh are the lowest and highest frequencies above the spurious emission limit of -30dBm/100kHz eirp for the operating mode (data rate and modulation) that produced the widest frequency range.

If the device meets the frequency range requirements at the highest power setting and with the highest gain antenna then no further tests are required. If it does not then tests are made for each power setting using the highest gain that can be used with each power setting.

Run #2: Frequency Range Under Normal and Extreme Conditions - 2400 - 2483.5MHz - AS/NZS 4268

	Mode	Antenna Gain	Power Setting	Measured Frequency (MHz) For Operating Condition					Low F_L High F_H	Result
				Normal	Extreme					
				20°C	0°C		55°C			
				3.3 V	3.0 V	3.6 V	3.0 V	3.6 V		
F_L (MHz)	GFKS	3.0	Default	2401.48	2401.523	2401.509	2401.423	2401.423	2401.423	PASS
F_H (MHz)	GFSK	3.0	Default	2480.44	2480.468	2480.468	2479.479	2480.438	2480.468	PASS
F_L (MHz)	8PSK	3.0	Default	2401.34	2401.369	2401.369	2401.356	2401.349	2401.343	PASS
F_H (MHz)	8PSK	3.0	Default	2480.57	2480.617	2480.597	2480.587	2480.587	2480.617	PASS

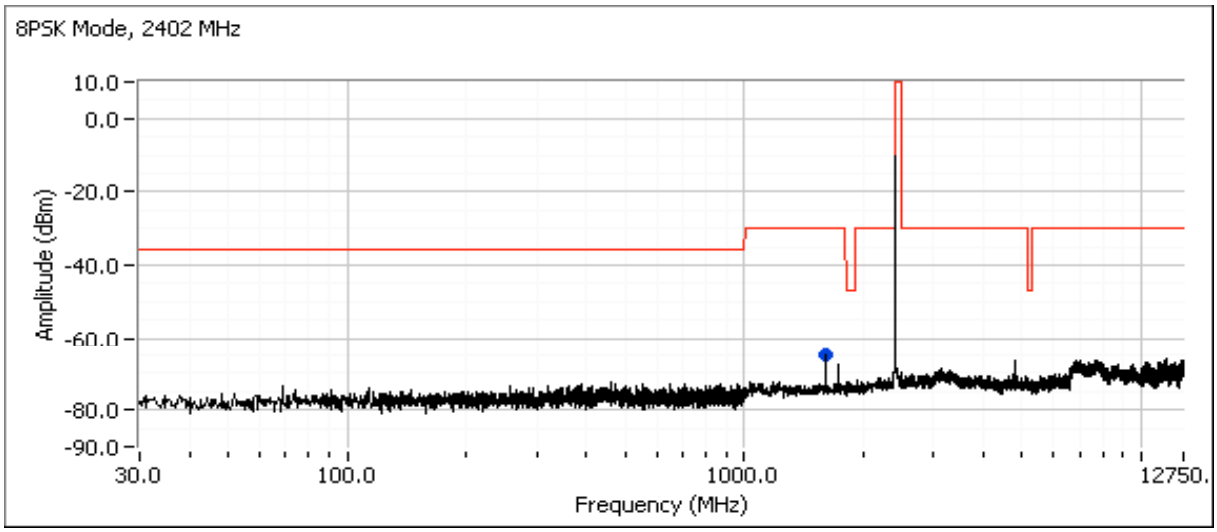
FL and F_H are the frequencies the define the upper and lower limits of the 99% signal bandwidth. F_L is taken from the 99% bandwidth plot for the lowest operating frequency and F_H from the 99% bandwidth plot for the highest operating frequency.

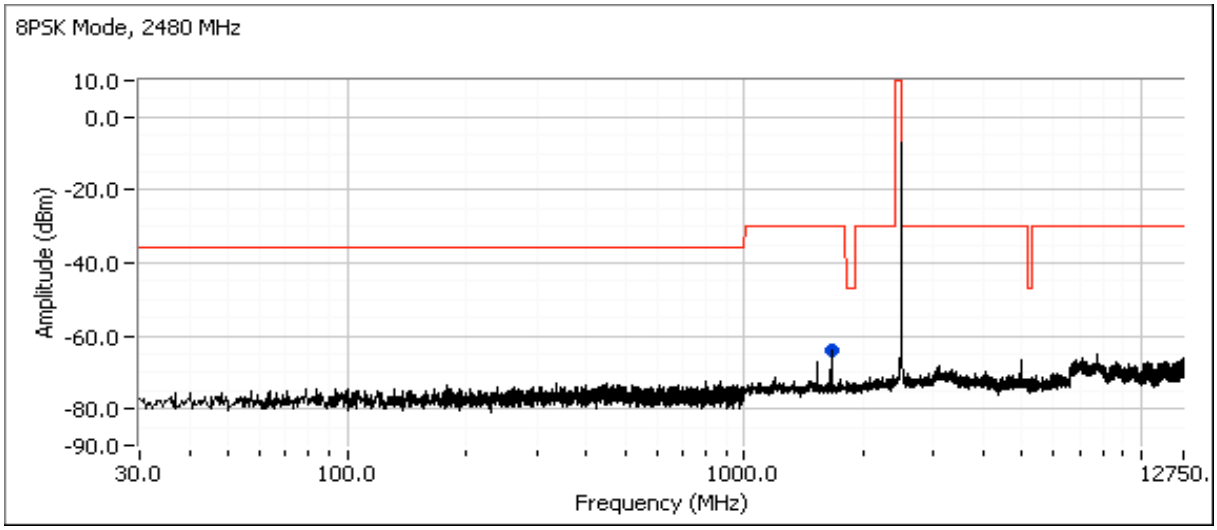
EMC Test Data

Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

Run #3: Antenna Port Conducted Spurious Emissions, Transmit Mode, 30 - 12750 MHz

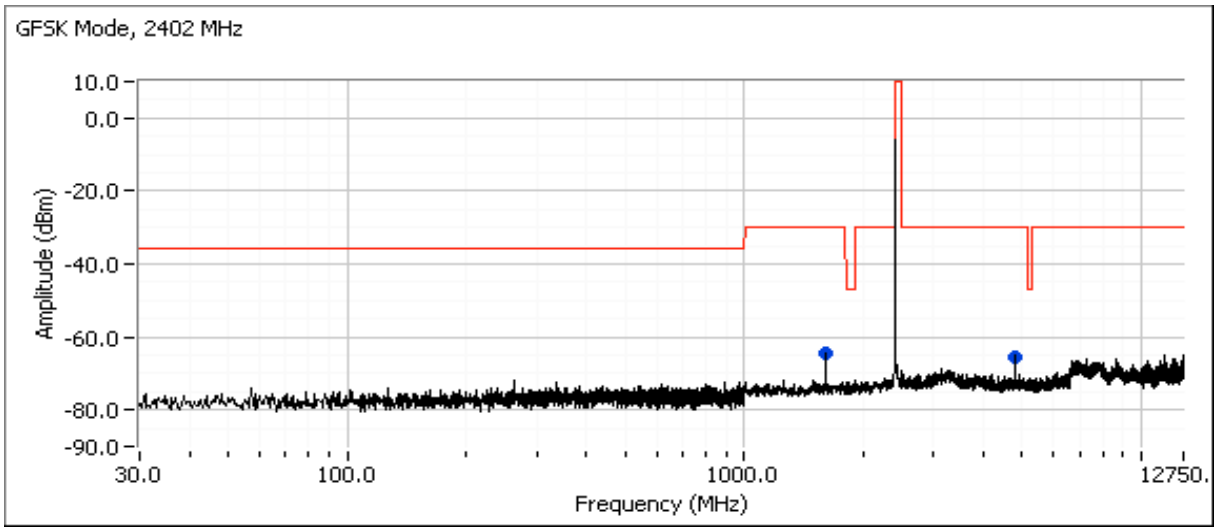
Frequency MHz	Level dBm	Port	EN 300 328 Limit	EN 300 328 Margin	Detector	Channel	Mode	Comments
1600.200	-64.6	RF Port	-30.0	-34.6	Peak	0	GFSK	
4805.270	-65.4	RF Port	-30.0	-35.4	Peak	0	GFSK	
1654.220	-63.2	RF Port	-30.0	-33.2	Peak	79	GFSK	
4961.320	-63.6	RF Port	-30.0	-33.6	Peak	79	GFSK	
1600.200	-65.2	RF Port	-30.0	-35.2	Peak	0	8PSK	
1654.220	-64.2	RF Port	-30.0	-34.2	Peak	79	8PSK	

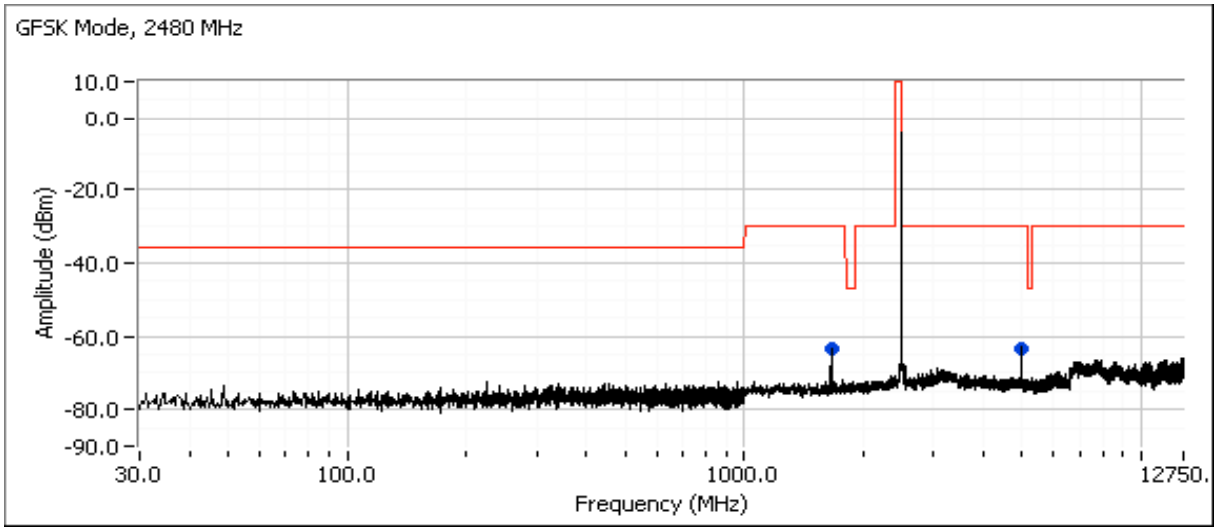




EMC Test Data

Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A



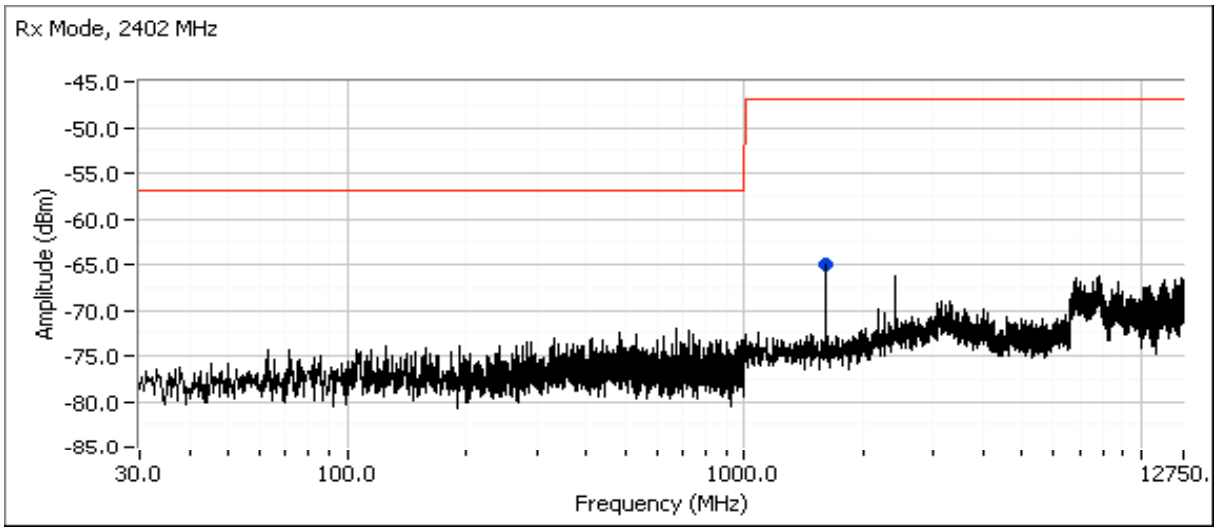


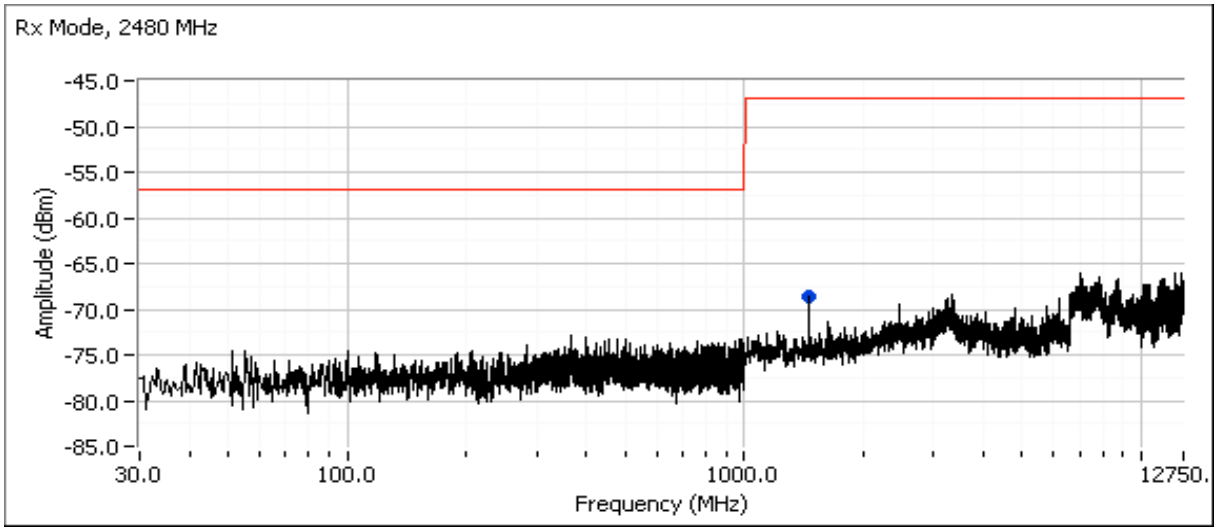
EMC Test Data

Client:	Summit Data Communications	Job Number:	J78403
Model:	SDC-MSD40NBT	T-Log Number:	T83340
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	EN 300 328, EN 301 893, AS/NZS 4268	Class:	N/A

Run #4: Antenna Port Conducted Spurious Emissions, Receive Mode, 30 - 12,750 MHz

Frequency MHz	Level dBm	Port	EN 300 328 Limit	EN 300 328 Margin	Detector	Channel	Mode	Comments
1603.200	-65.1	RF Port	-47.0	-18.1	Peak	0	Rx	
1453.150	-68.6	RF Port	-47.0	-21.6	Peak	79	Rx	





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