EMC Test Report
Application for Grant of Equipment Authorization
Class II Permissive Change/Reassessment
Industry Canada RSS-Gen Issue 3 / RSS 210 Issue 8
FCC Part 15, Subpart E

Model: PH30AG

IC CERTIFICATION #:	6616A-SDCMSD30AG
FCC ID:	TWG-SDCMSD30AG
APPLICANT:	Summit Data Communications 526 South Main St. Akron, OH 44311
TEST SITE(S):	Elliott Laboratories 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-3; 2845B-4, 2845B-5, 2845B-7
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Testing Cert #2016.01

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	09-15-2011	First release	

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SCOPE

An electromagnetic emissions test has been performed on the Summit Data Communications model PH30AG, pursuant to the following rules:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15, Subpart E requirements for UNII Devices (using FCC DA 02-2138, August 30, 2002)

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Elliott Laboratories test procedures:

ANSI C63.4:2003
FCC UNII test procedure 2002-08 DA-02-2138, August 2002

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of Summit Data Communications model PH30AG complied with the requirements of the following regulations:

RSS 210 Issue 8 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15, Subpart E requirements for UNII Devices

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.

The test results recorded herein are based on a single type test of Summit Data Communications model PH30AG and therefore apply only to the tested sample. The sample was selected and prepared by Ron Seide of Summit Data Communications.

DEVIATIONS FROM THE STANDARDS

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

TEST RESULTS SUMMARY

UNII / LELAN DEVICES

Operation in the 5.15 – 5.25 GHz Band

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.407(e)		Indoor operation only	Refer to user's manual	N/A	Complies
15.407(a) (2)		26dB Bandwidth	Testing not performed		
15.407 (a) (1)	A9.2(1)	Output Power	Power verified to be within 0.5dB of original filing		
15.407 (a) (1)	-	Power Spectral Density	Testing not performed		
-	A9.5 (2)				
15.407(b) (5) / 15.209	A9.3	RadiatedSpurious Emissions below 1GHz	53.2dBµV/m @ 5453.6MHz (-0.8dB)	Refer to page 21	Complie)

Operation in the 5.25 – 5.35 GHz Band

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.407(a) (2)		26dB Bandwidth	Testing not performed		
15.407(a) (2)	A9.2(2)	Output Power	Power verified to be within 0.5dB of original filing		
15.407(a) (2)	-	Power Spectral Density	Testing not performed		
-	A9.2(2) / A9.5 (2)	Power Spectral Density			
15.407(b) (5) / 15.209	A9.3	RadiatedSpurious Emissions below 1GHz	51.9dBµV/m @ 5350.0MHz (-2.1dB)	Refer to page 21	Complie)

Operation in the 5.47 – 5.725 GHz Band

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.407(a) (2)		26dB Bandwidth	Testing not performed		
15.407(a) (2)	A9.2(2)	Output Power	Power verified to be within 0.5dB of original filing		
15.407(a) (2))		Power Spectral Density	Testing not performed		
	A9.2(2) / A9.5 (2)	Power Spectral Density			
KDB 443999	A9	Non-operation in 5600 – 5650 MHz sub band	Device cannot operate in the 5600 – 5650 MHz band –refer to Operational Description		Complies
15.407(b) (5) / 15.209	A9.3	RadiatedSpurious Emissions below 1GHz	49.3dBµV/m @ 5459.8MHz (-4.7dB)	Refer to page 21	Complie)

Requirements for all U-NII/LELAN bands

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.407	A9.5a	Modulation	Digital Modulation is used	Digital modulation is required	Complies
15.407(a)(6)	-	Peak Excursion Ratio	Testing not performed		
	A9.5 (3)	Channel Selection	Spurious emissions tested at outermost channels in each band	Device was tested on the top, bottom and center channels in each band	N/A
15			Measurements on three channels in each band		Complies
15.407 (c)	A9.5(4)	Operation in the absence of information to transmit	Unchanged from original filing	Device shall automatically discontinue operation in the absence of information to transmit	Complies
15.407 (g)	A9.5 (5)	Frequency Stability	Unchanged from original filing	Signal shall remain within the allocated band	Complies
15.407 (h1)	A9.4	Transmit Power Control	TPC is not required as the device operates at below 500mW eirp	The U-NII device shall have the capability to operate with a mean EIRP value lower than 24dBm (250mW)	Complies
15.407 (h2)	A9.4	Dynamic frequency Selection (device without radar detection)	Testing not performed		
	A9.9g	User Manual information	Unchanged from original filing	Warning regarding interference from Satellite Systems	Complies

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	New module uses MMCX connector	Unique or integral antenna required	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	Testing not performed		
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	Testing not performed		
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	As the output power is the same as the original and the new antenna is lower gain, the RF exposure hazard will reduced from the original filing.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual	Unchanged from original	Statement required regarding non-interference	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual	Unchanged from original	Statement for products with detachable antenna	Complies
-	RSP 100 RSS GEN 4.4.1	99% Bandwidth	Unchanged from original	Information only	N/A

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 and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF power, conducted (power meter)	dBm	25 to 7000 MHz	± 0.52 dB
RF power, conducted (Spectrum analyzer)	dBm	25 to 7000 MHz	± 0.7 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
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dBµV	0.15 to 30 MHz	± 2.4 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Summit Data Communications model PH30AG is a 802.11ag compliant wireless LAN radio Module which is designed to provide wireless local area networking connectivity. Normally, the EUT would be embedded in various types of mobile and stationary computing devices such as handheld and vehicle mounted data terminals during operation. The EUT was, therefore, placed in this position during emissions testing to simulate the end user environment. The electrical rating of the EUT is 3.3 VDC =/-5%. It's typical power consumption is 400mA (1320mW) while in transmit mode, 180mA (594mW) while in receive mode and 10mA (33mW) while in standby mode.

The sample was received on July 19, 2011 and tested on July 19 and 20 and August 9, 2011. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Summit Data Communications Inc.	PH30AG	802.11AG Mini SDIO Module with antenna connectors	-	

ANTENNA SYSTEM

The antenna used for this C2PC: Larid, model MAF95291, Dipole Antenna. Gain: 2.15dBi @ 2.4GHz, 3.9 dBi @ 5GHz

ENCLOSURE

The EUT does not have an enclosure as it is designed to be installed within the enclosure of a host computer or system.

MODIFICATIONS

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

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Hewlett Packard	iPAQ	Handheld Computer	-	-

No remote support equipment was used during 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)
iPAQ Power	AC Mains	2wire	Unshielded	1.5
Flash Module	iPAQ Module Port	-	-	-

EUT OPERATION

During emissions testing the EUT was configured to transmit at the Low, Middle, and High Channel. Testing performed at 1Mbs for 802.11b mode, and 6Mbs for 802.11g and 802.11a modes.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken at the test sites listed below. Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission and with industry Canada.

Site	Registration Numbers		Location
	FCC	Canada	
Chamber 4	211948	2845B-4	41039 Boyce Road Fremont, CA 94538-2435
Chamber 7	A2LA accreditation	2845B-7	

ANSI C63.4:2003 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement. The test site(s) contain separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4:2003.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 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. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak measurements.

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. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, 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 printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which 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 receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

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. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.4:2003 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall 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.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The regulations 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 ANSI C63.4:2003, and the worst-case orientation is used for final measurements.

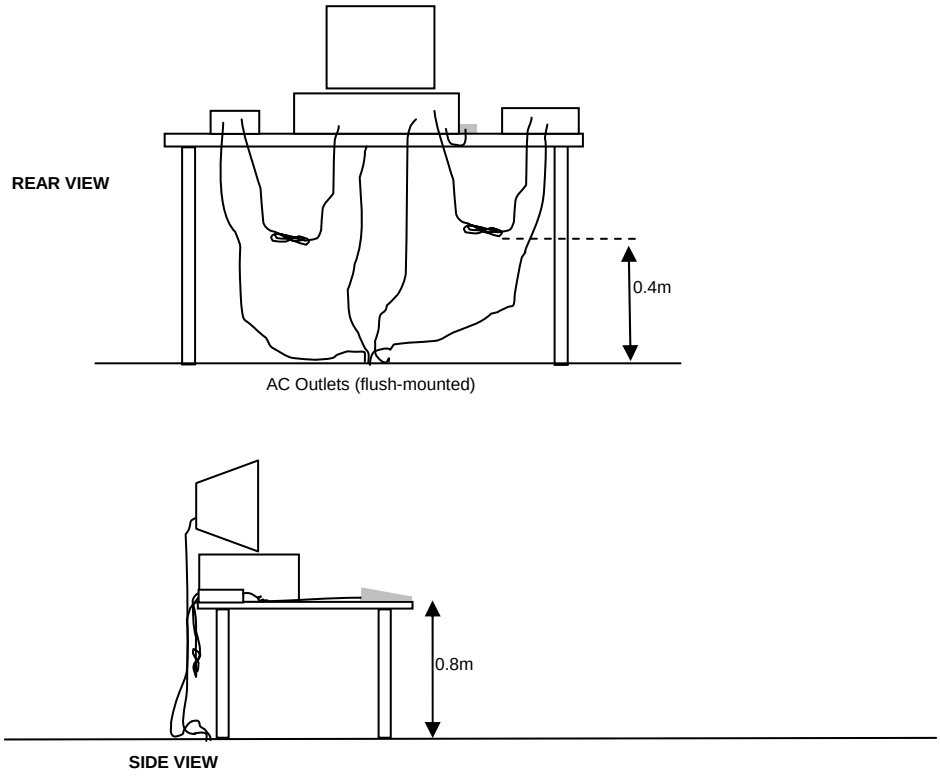
RADIATED EMISSIONS

A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

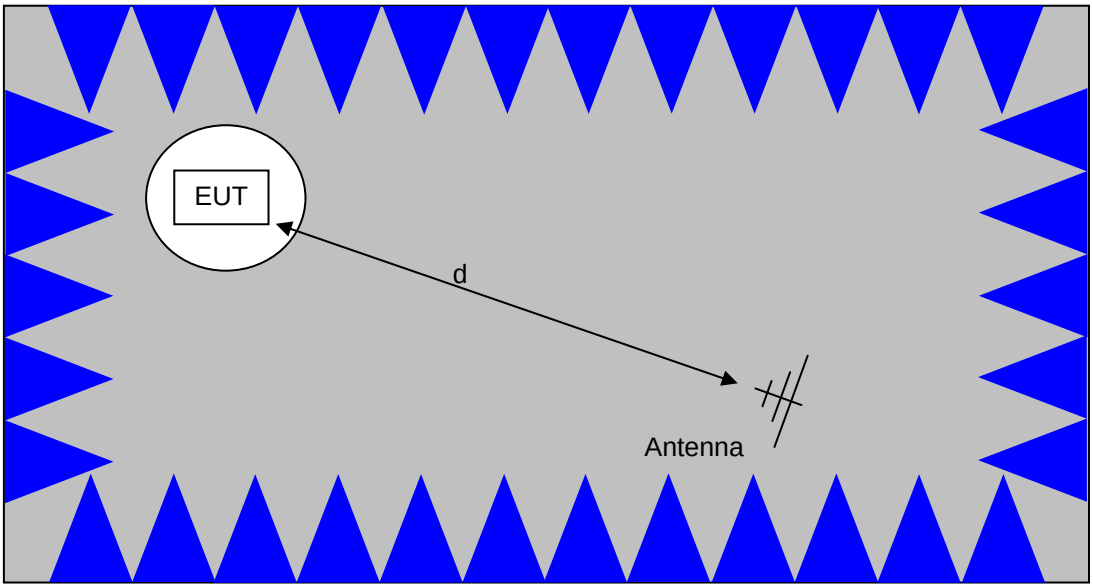
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

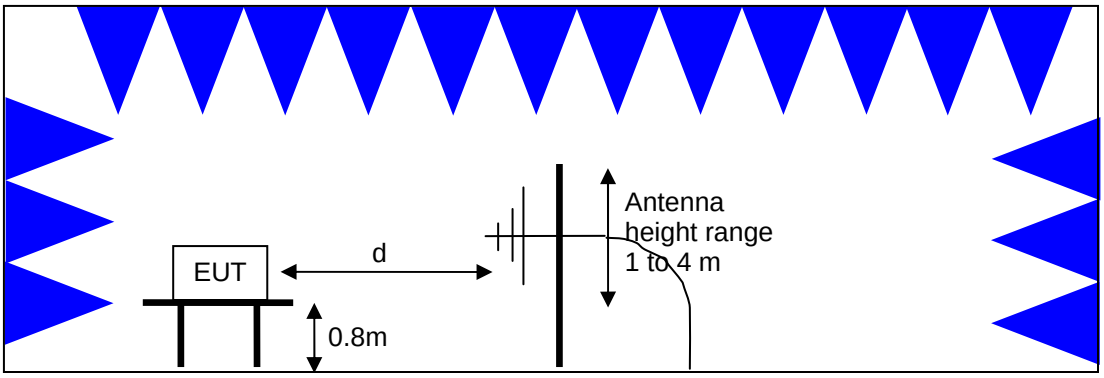


Typical Test Configuration for Radiated Field Strength Measurements



The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used.

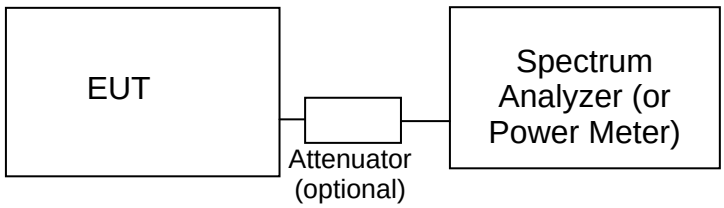
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



Test Configuration for Radiated Field Strength Measurements
Semi-Anechoic Chamber, Plan and Side Views

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements of power, bandwidth and power spectral density are performed, where possible, with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.



Test Configuration for Antenna Port Measurements

Measurement bandwidths (video and resolution) are set in accordance with the relevant standards and Elliott's test procedures for the type of radio being tested. When power measurements are made using a resolution bandwidth less than the signal bandwidth the power is calculated by summing the power across the signal bandwidth using either the analyzer channel power function or by capturing the trace data and calculating the power using software. In both cases the summed power is corrected to account for the equivalent noise bandwidth (ENBW) of the resolution bandwidth used.

If power averaging is used (typically for certain digital modulation techniques), the EUT is configured to transmit continuously. Power averaging is performed using either the built-in function of the analyzer or, if the analyzer does not feature power averaging, using external software. In both cases the average power is calculated over a number of sweeps (typically 100). When the EUT cannot be configured to continuously transmit then either the analyzer is configured to perform a gated sweep to ensure that the power is averaged over periods that the device is transmitting or power averaging is disabled and a max-hold feature is used.

If a power meter is used to make output power measurements the sensor head type (peak or average) is stated in the test data table.

BANDWIDTH MEASUREMENTS

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1] (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

[1] The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

FCC 15.407 (a) OUTPUT POWER LIMITS

The table below shows the limits for output power and output power density. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Output Power	Power Spectral Density
5150 – 5250	50mW (17 dBm)	4 dBm/MHz
5250 – 5350	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm)	17 dBm/MHz

For system using antennas with gains exceeding 6dBi, the output power and power spectral density limits are reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

The peak excursion envelope is limited to 13dB.

OUTPUT POWER LIMITS –LELAN DEVICES

The table below shows the limits for output power and output power density defined by RSS 210. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Output Power	Power Spectral Density
5150 – 5250	200mW (23 dBm) eirp	10 dBm/MHz eirp
5250 – 5350	250 mW (24 dBm)[2] 1W (30dBm) eirp	11 dBm/MHz
5470 – 5725	250 mW (24 dBm)[3] 1W (30dBm) eirp	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm) 4W eirp	17 dBm/MHz

In addition, the power spectral density limit shall be reduced by 1dB for every dB the highest power spectral density exceeds the "average" power spectral density) by more than 3dB. The "average" power spectral density is determined by dividing the output power by 10log(EBW) where EBW is the 99% power bandwidth.

Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

[2] If EIRP exceeds 500mW the device must employ TPC
[3] If EIRP exceeds 500mW the device must employ TPC

SPURIOUS EMISSIONS LIMITS –UNII and LELAN DEVICES

The spurious emissions limits for signals below 1GHz are the FCC/RSS-GEN general limits. For emissions above 1GHz, signals in restricted bands are subject to the FCC/RSS GEN general limits. All other signals have a limit of –27dBm/MHz, which is a field strength of 68.3dBuV/m/MHz at a distance of 3m. This is an average limit so the peak value of the emission may not exceed –7dBm/MHz (88.3dBuV/m/MHz at a distance of 3m). For devices operating in the 5725-5850Mhz bands under the LELAN/UNII rules, the limit within 10Mhz of the allocated band is increased to –17dBm/MHz.

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - S = M$$

where:

R_r = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of d (meters) from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{d} \quad \text{microvolts per meter}$$

where P is the eirp (Watts)

For a measurement at 3m the conversion from a logarithmic value for field strength (dBuV/m) to an eirp power (dBm) is -95.3dB.

Appendix A Test Equipment Calibration Data

Radiated Emissions (Spurious Emissions), 20-Jul-11

Manufacturer	Description	Model	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	12/8/2011
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/6/2012
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	8/12/2011
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1683	8/10/2011

Radiated Emissions, Bandedge, 09-Aug-11

Manufacturer	Description	Model	Asset #	Cal Due
Rohde & Schwarz	Test Receiver, 9 kHz-2750 MHz	ESCS 30	1337	11/24/2011
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	6/24/2012

Appendix B Test Data

T83840 Pages 25 - 43

Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		-
Emissions Standard(s):	FCC 15.247/15.E	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Summit Data Communications

Model

PH30AG

Date of Last Test: 8/30/2011

Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A

RSS 210 and FCC 15.407 (UNII) Radiated Spurious Emissions

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: Refer to individual runs
Test Engineer: Refer to individual runs
Test Location: Refer to individual runs

Config. Used: 1
Config Change: None
Host Unit Voltage 120V/60Hz

General Test Configuration

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

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 20.1 °C
Rel. Humidity: 38 %

Summary of Results

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1	802.11a Chain A	5150-5250 Low	Max	-	Restricted Band Edge at 5150 MHz	15.209	48.2dBµV/m @ 5149.9MHz (-5.8dB)
	802.11a Chain A	5150-5250 Low	Max	-	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	50.4dBµV/m @ 5453.8MHz (-3.6dB)
	802.11a Chain A	5150-5250 Center	Max	-	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	51.9dBµV/m @ 5454.5MHz (-2.1dB)
	802.11a Chain A	5150-5250 High	Max	-	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	53.2dBµV/m @ 5453.6MHz (-0.8dB)
2	802.11a Chain A	5250-5350 Low	Max	-	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	47.4dBµV/m @ 1345.5MHz (-6.6dB)
	802.11a Chain A	5250-5350 Center	Max	-	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	48.9dBµV/m @ 5437.5MHz (-5.1dB)
	802.11a Chain A	5250-5350 High	Max	-	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	46.7dBµV/m @ 5436.9MHz (-7.3dB)
	802.11a Chain A	5250-5350 High	Max	-	Restricted Band Edge at 5350 MHz	15.209	51.9dBµV/m @ 5350.0MHz (-2.1dB)

Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
3	802.11a Chain A	5470-5725 Low	Max	-	Restricted Band Edge at 5460 MHz	15.209	49.3dBµV/m @ 5459.8MHz (-4.7dB)
	802.11a Chain A	5470-5725 Low	Max	-	Restricted Band Edge at 5470 MHz	FCC 15.209 / 15 E	51.2dBµV/m @ 5469.6MHz (-17.1dB)
	802.11a Chain A	5470-5725 Low	Max	-	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	45.6dBµV/m @ 1306.5MHz (-8.4dB)
	802.11a Chain A	5470-5725 Center	Max	-	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	48.7dBµV/m @ 1345.4MHz (-5.3dB)
	802.11a Chain A	5470-5725 High	Max	-	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	46.8dBµV/m @ 1033.5MHz (-7.2dB)

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.

Note: No spurious emissions were detected below 1 GHz
802.11a was tested at 6Mbps. This was the highest output power data rate.

Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A

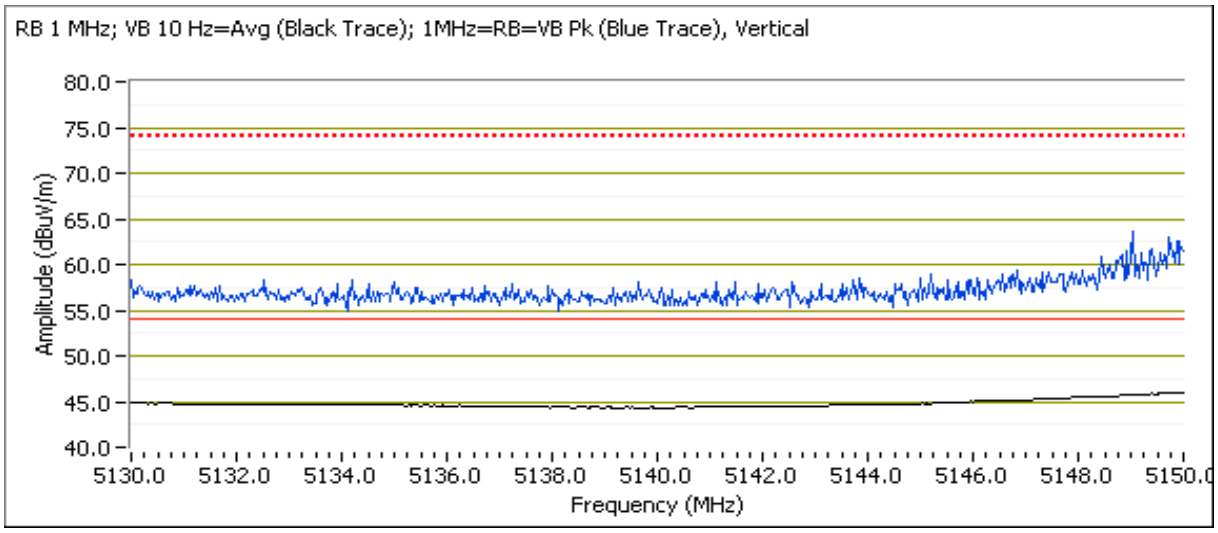
Run #1, Radiated Spurious Emissions, 30 - 40,000 MHz. Operation in the 5150-5250 MHz Band

Date of Test: 7/20/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #4

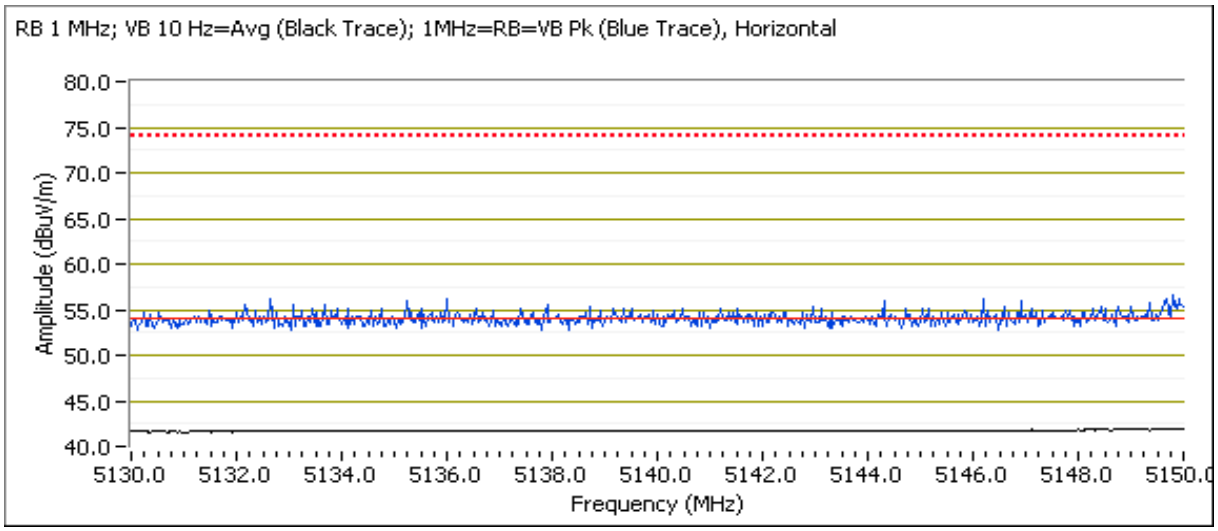
Run #1a: Low Channel

5150 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5149.940	48.2	V	54.0	-5.8	AVG	92	1.2	RB 1 MHz;VB 10 Hz;Pk
5149.910	63.4	V	74.0	-10.6	PK	92	1.2	RB 1 MHz;VB 3 MHz;Pk
5148.400	43.9	H	54.0	-10.1	AVG	142	1.0	RB 1 MHz;VB 10 Hz;Pk
5149.840	57.4	H	74.0	-16.6	PK	142	1.0	RB 1 MHz;VB 3 MHz;Pk



Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A

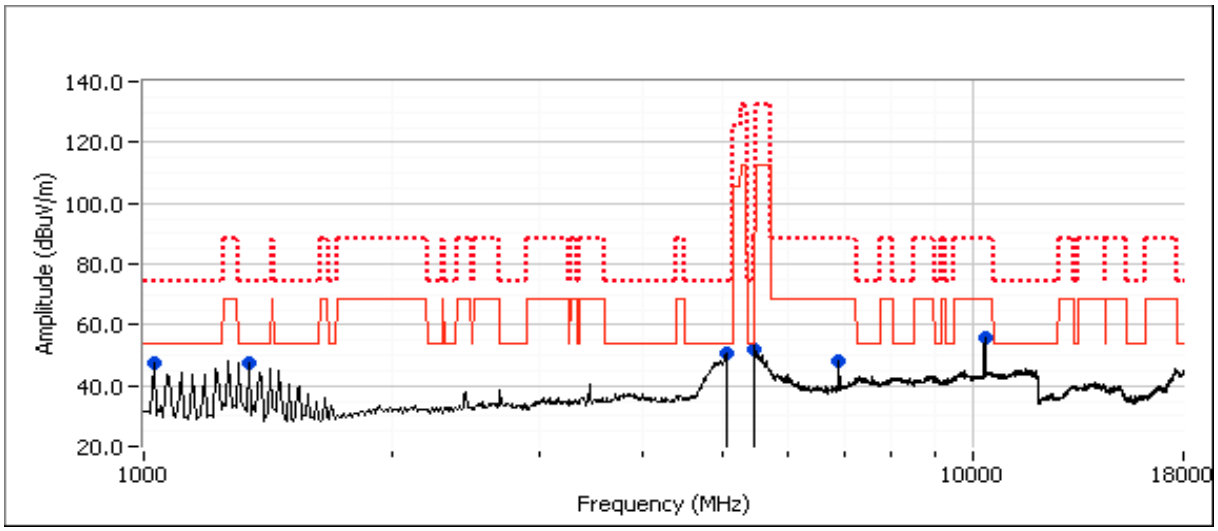


Spurious Radiated Emissions:

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5453.770	50.4	V	54.0	-3.6	AVG	272	1.0	RB 1 MHz;VB 10 Hz;Pk
5453.550	61.3	V	74.0	-12.7	PK	272	1.0	RB 1 MHz;VB 3 MHz;Pk
5037.200	49.9	V	54.0	-4.1	AVG	91	1.2	RB 1 MHz;VB 10 Hz;Pk
5047.000	60.6	V	74.0	-13.4	PK	91	1.2	RB 1 MHz;VB 3 MHz;Pk
1033.470	47.5	V	54.0	-6.5	AVG	157	1.0	RB 1 MHz;VB 10 Hz;Pk
1033.460	49.3	V	74.0	-24.7	PK	157	1.0	RB 1 MHz;VB 3 MHz;Pk
1345.500	48.0	H	54.0	-6.0	AVG	243	1.1	RB 1 MHz;VB 10 Hz;Pk
1345.400	50.0	H	74.0	-24.0	PK	243	1.1	RB 1 MHz;VB 3 MHz;Pk
6906.730	47.9	V	68.3	-20.4	Peak	150	1.0	
10361.950	56.0	V	68.3	-12.3	Peak	246	1.6	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
Note 2:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is the same measurement method used to determine the in-band power spectral density or a peak measurement (RB=1MHz, VB>1MHz). Pavg indicates that the power averaging method of measurement was used for the measurement of emissions outside of the restricted bands. PK indicates that a peak measurement was made.
Note 3:	No significant signals found between 18-40GHz

Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A



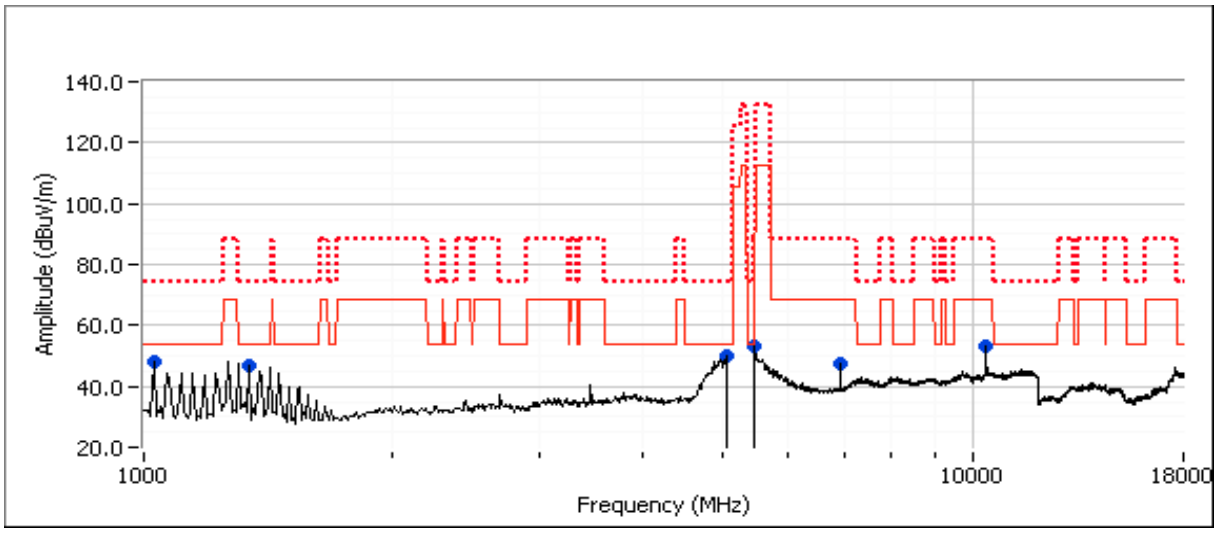
Run #1b: Center Channel

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5454.530	51.9	V	54.0	-2.1	AVG	279	1.0	RB 1 MHz;VB 10 Hz;Pk
5456.790	62.8	V	74.0	-11.2	PK	279	1.0	RB 1 MHz;VB 3 MHz;Pk
1033.450	47.9	V	54.0	-6.1	AVG	178	1.0	RB 1 MHz;VB 10 Hz;Pk
1033.570	49.8	V	74.0	-24.2	PK	178	1.0	RB 1 MHz;VB 3 MHz;Pk
1345.430	47.7	H	54.0	-6.3	AVG	254	1.0	RB 1 MHz;VB 10 Hz;Pk
1345.510	49.8	H	74.0	-24.2	PK	254	1.0	RB 1 MHz;VB 3 MHz;Pk
5034.630	48.3	V	54.0	-5.7	AVG	348	1.4	RB 1 MHz;VB 10 Hz;Pk
5034.870	58.8	V	74.0	-15.2	PK	348	1.4	RB 1 MHz;VB 3 MHz;Pk
6933.490	47.4	V	68.3	-20.9	Peak	99	1.6	
10399.990	53.5	V	68.3	-14.8	Peak	243	1.6	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
Note 2:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is the same measurement method used to determine the in-band power spectral density or a peak measurement (RB=1MHz, VB>1MHz). Pavg indicates that the power averaging method of measurement was used for the measurement of emissions outside of the restricted bands. PK indicates that a peak measurement was made.
Note 3:	No significant signals found between 18-40GHz

Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A



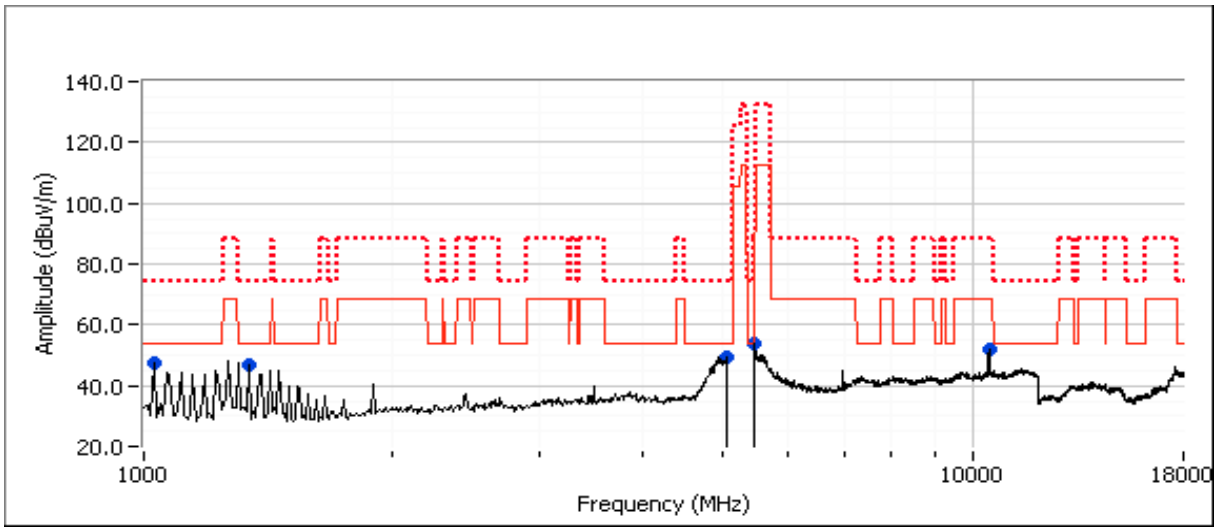
Run #1c: High Channel

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5453.570	53.2	V	54.0	-0.8	AVG	13	1.0	RB 1 MHz;VB 10 Hz;Pk
5455.250	63.8	V	74.0	-10.2	PK	13	1.0	RB 1 MHz;VB 3 MHz;Pk
5042.710	47.3	V	54.0	-6.7	AVG	1	1.1	RB 1 MHz;VB 10 Hz;Pk
5036.010	58.6	V	74.0	-15.4	PK	1	1.1	RB 1 MHz;VB 3 MHz;Pk
1033.400	48.0	V	54.0	-6.0	AVG	164	1.0	RB 1 MHz;VB 10 Hz;Pk
1033.490	49.9	V	74.0	-24.1	PK	164	1.0	RB 1 MHz;VB 3 MHz;Pk
1345.400	47.8	H	54.0	-6.2	AVG	245	1.0	RB 1 MHz;VB 10 Hz;Pk
1345.660	49.7	H	74.0	-24.3	PK	245	1.0	RB 1 MHz;VB 3 MHz;Pk
10480.470	51.7	V	68.3	-16.6	Peak	22	1.3	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
Note 2:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is the same measurement method used to determine the in-band power spectral density or a peak measurement (RB=1MHz, VB>1MHz). Pavg indicates that the power averaging method of measurement was used for the measurement of emissions outside of the restricted bands. PK indicates that a peak measurement was made.
Note 3:	No significant signals found between 18-40GHz

Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A



Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A

Run #2, Radiated Spurious Emissions, 30 - 40,000 MHz. Operation in the 5250-5350 MHz Band

Date of Test: 7/20/2011
Test Engineer: Joseph Cadigal
Test Location: FT Chamber#4

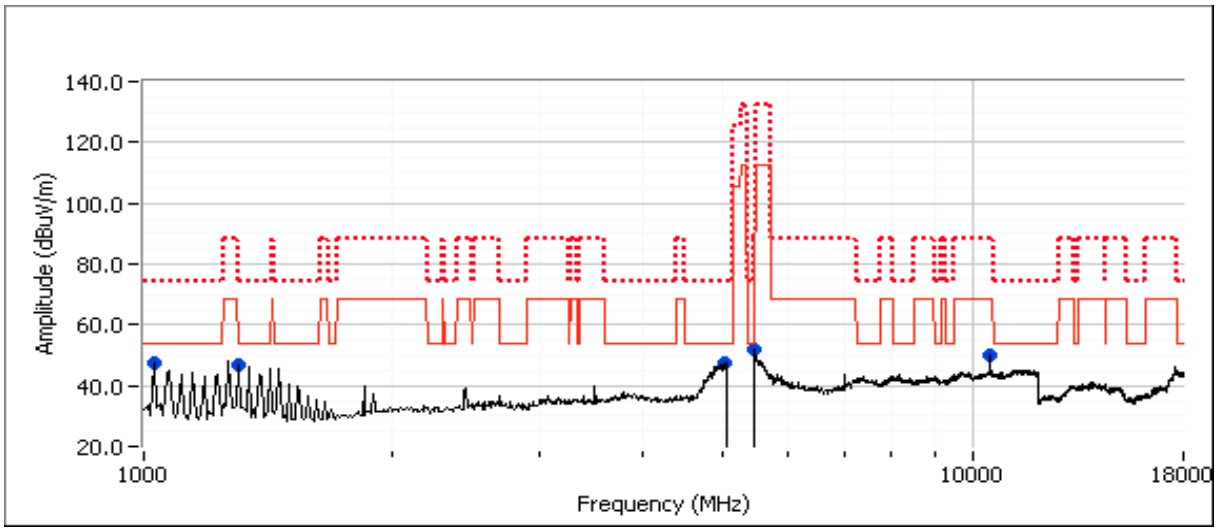
Run #2a: Low Channel

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1345.470	47.4	H	54.0	-6.6	AVG	244	1.0	RB 1 MHz;VB 10 Hz;Pk
5441.380	46.4	V	54.0	-7.6	AVG	18	1.0	RB 1 MHz;VB 10 Hz;Pk
5040.000	43.3	V	54.0	-10.7	AVG	5	1.0	RB 1 MHz;VB 10 Hz;Pk
5440.150	58.4	V	74.0	-15.6	PK	18	1.0	RB 1 MHz;VB 3 MHz;Pk
5040.620	54.8	V	74.0	-19.2	PK	5	1.0	RB 1 MHz;VB 3 MHz;Pk
1345.500	49.5	H	74.0	-24.5	PK	244	1.0	RB 1 MHz;VB 3 MHz;Pk
10523.640	43.7	V	68.3	-24.6	AVG	23	1.9	RB 1 MHz;VB 10 Hz;Pk
1030.060	29.1	V	54.0	-24.9	AVG	165	1.0	RB 1 MHz;VB 10 Hz;Pk
1031.610	45.1	V	74.0	-28.9	PK	165	1.0	RB 1 MHz;VB 3 MHz;Pk
10525.430	55.8	V	88.3	-32.5	PK	23	1.9	RB 1 MHz;VB 3 MHz;Pk

Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
Note 2:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is the same measurement method used to determine the in-band power spectral density or a peak measurement (RB=1MHz, VB>1MHz). Pavg indicates that the power averaging method of measurement was used for the measurement of emissions outside of the restricted bands. PK indicates that a peak measurement was made.

Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A



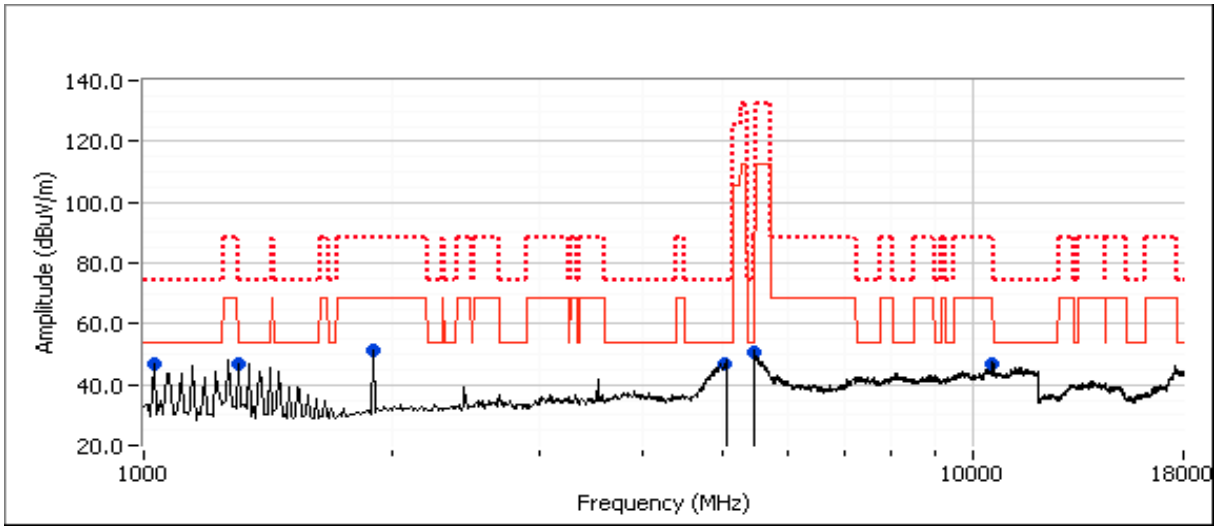
Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A

Run #2b: Center Channel

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5437.500	48.9	V	54.0	-5.1	AVG	265	1.0	RB 1 MHz;VB 10 Hz;Pk
5044.980	44.9	V	54.0	-9.1	AVG	102	1.3	RB 1 MHz;VB 10 Hz;Pk
10602.770	43.7	V	54.0	-10.3	AVG	21	1.9	RB 1 MHz;VB 10 Hz;Pk
1306.390	41.7	H	54.0	-12.3	AVG	120	1.3	RB 1 MHz;VB 10 Hz;Pk
5437.680	59.9	V	74.0	-14.1	PK	265	1.0	RB 1 MHz;VB 3 MHz;Pk
5045.420	56.9	V	74.0	-17.1	PK	102	1.3	RB 1 MHz;VB 3 MHz;Pk
10602.940	55.5	V	74.0	-18.5	PK	21	1.9	RB 1 MHz;VB 3 MHz;Pk
1030.080	28.7	V	54.0	-25.3	AVG	191	1.0	RB 1 MHz;VB 10 Hz;Pk
1306.740	44.7	H	74.0	-29.3	PK	120	1.3	RB 1 MHz;VB 3 MHz;Pk
1031.660	42.5	V	74.0	-31.5	PK	191	1.0	RB 1 MHz;VB 3 MHz;Pk
1898.040	28.0	V	68.3	-40.3	AVG	0	1.6	RB 1 MHz;VB 10 Hz;Pk
1897.650	39.8	V	88.3	-48.5	PK	0	1.6	RB 1 MHz;VB 3 MHz;Pk

Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
Note 2:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is the same measurement method used to determine the in-band power spectral density or a peak measurement (RB=1MHz, VB>1MHz). Pavg indicates that the power averaging method of measurement was used for the measurement of emissions outside of the restricted bands. PK indicates that a peak measurement was made.

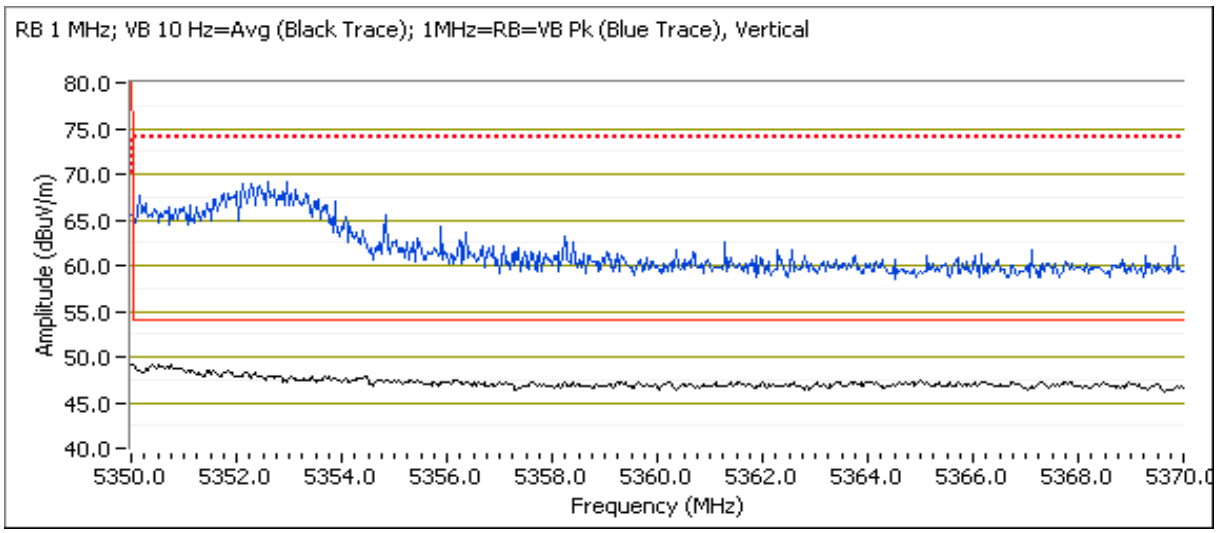


Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A

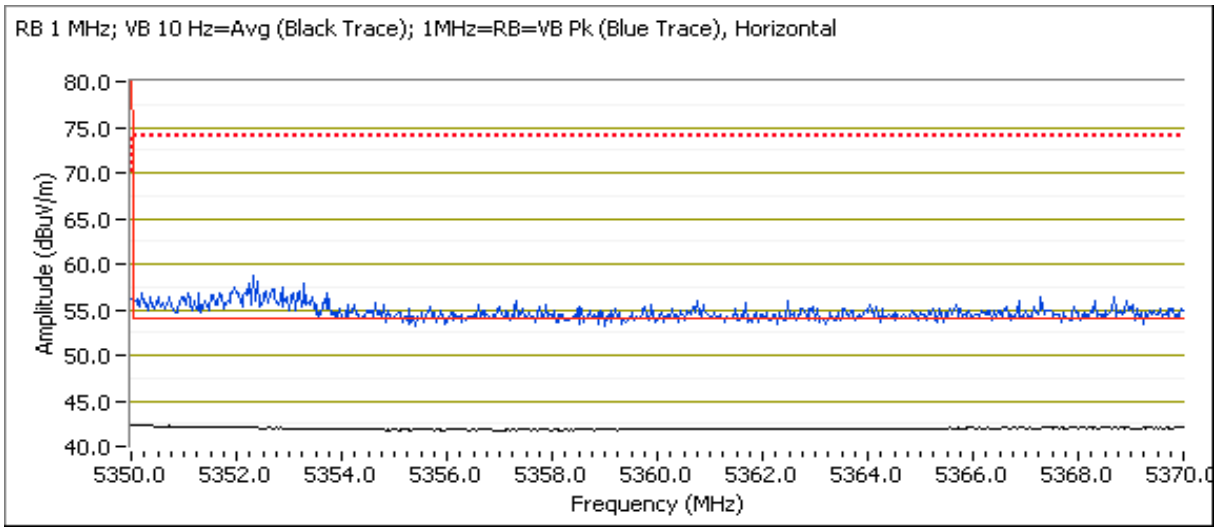
Run #2c: High Channel

5350 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5350.040	51.9	V	54.0	-2.1	AVG	16	1.0	RB 1 MHz;VB 10 Hz;Pk
5352.330	68.1	V	74.0	-5.9	PK	16	1.0	RB 1 MHz;VB 3 MHz;Pk
5350.190	44.3	H	54.0	-9.7	AVG	349	1.1	RB 1 MHz;VB 10 Hz;Pk
5352.710	58.1	H	74.0	-15.9	PK	349	1.1	RB 1 MHz;VB 3 MHz;Pk



Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A

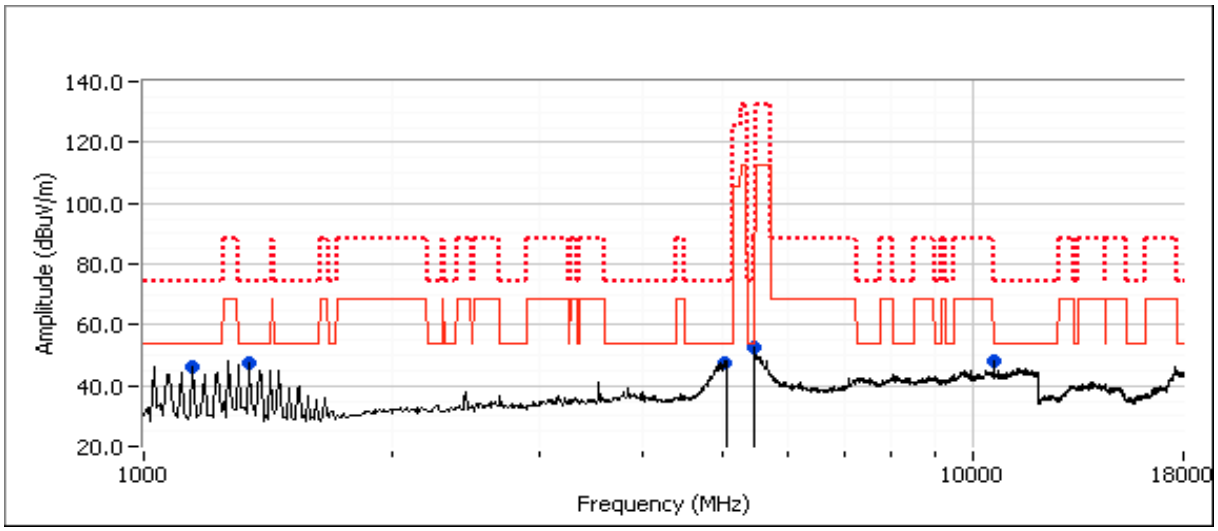


Spurious Radiated Emissions:

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5436.850	46.7	V	54.0	-7.3	AVG	14	1.0	RB 1 MHz;VB 10 Hz;Pk
1345.440	45.9	H	54.0	-8.1	AVG	240	1.0	RB 1 MHz;VB 10 Hz;Pk
1150.510	45.0	H	54.0	-9.0	AVG	216	1.3	RB 1 MHz;VB 10 Hz;Pk
5044.560	43.7	V	54.0	-10.3	AVG	14	1.0	RB 1 MHz;VB 10 Hz;Pk
10651.160	42.7	V	54.0	-11.3	AVG	261	1.0	RB 1 MHz;VB 10 Hz;Pk
5437.910	58.3	V	74.0	-15.7	PK	14	1.0	RB 1 MHz;VB 3 MHz;Pk
5044.160	55.1	V	74.0	-18.9	PK	14	1.0	RB 1 MHz;VB 3 MHz;Pk
10651.140	54.6	V	74.0	-19.4	PK	261	1.0	RB 1 MHz;VB 3 MHz;Pk
1345.400	47.9	H	74.0	-26.1	PK	240	1.0	RB 1 MHz;VB 3 MHz;Pk
1150.390	47.7	H	74.0	-26.3	PK	216	1.3	RB 1 MHz;VB 3 MHz;Pk

Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
Note 2:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is the same measurement method used to determine the in-band power spectral density or a peak measurement (RB=1MHz, VB>1MHz). Pavg indicates that the power averaging method of measurement was used for the measurement of emissions outside of the restricted bands. PK indicates that a peak measurement was made.

Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A



Run #3, Radiated Spurious Emissions, 30 - 40,000 MHz. Operation in the 5470-5725 MHz Band

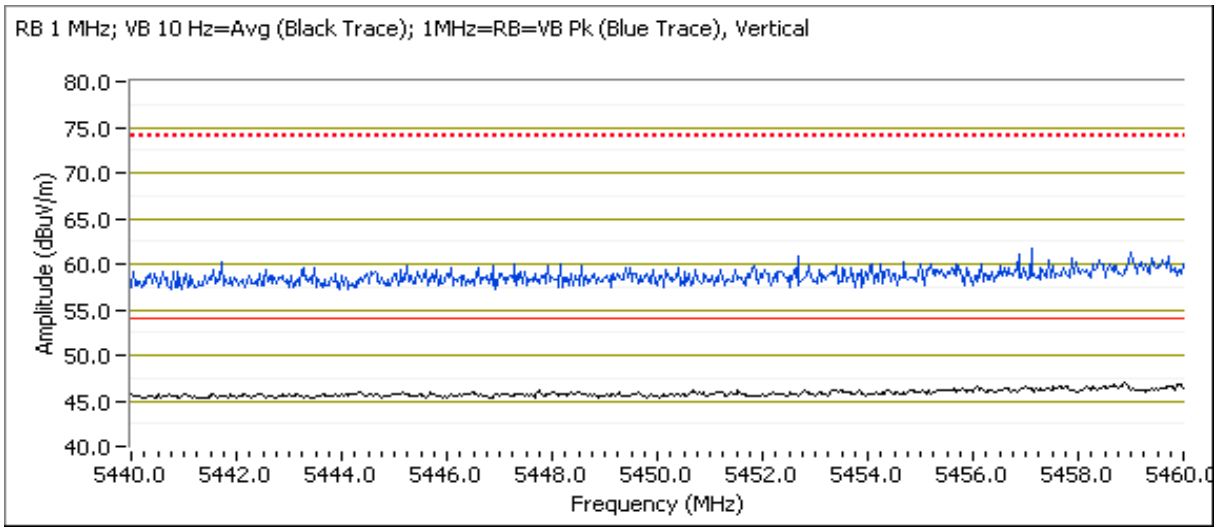
Date of Test: 7/20/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #4

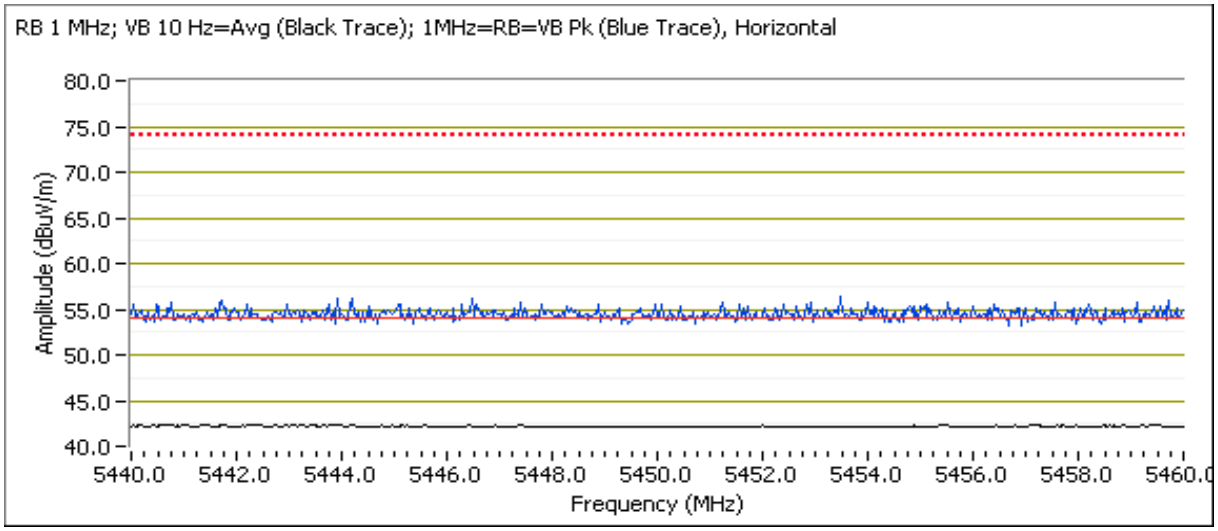
Run #3a: Low Channel

5350-5460 MHz Restricted Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5459.830	49.3	V	54.0	-4.7	AVG	360	1.0	RB 1 MHz;VB 10 Hz;Pk
5459.810	60.8	V	74.0	-13.2	PK	360	1.0	RB 1 MHz;VB 3 MHz;Pk
5459.670	44.3	H	54.0	-9.7	AVG	146	1.0	RB 1 MHz;VB 10 Hz;Pk
5457.130	55.4	H	74.0	-18.6	PK	146	1.0	RB 1 MHz;VB 3 MHz;Pk

Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A





Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A

5460 - 5470 MHz Band Edge Radiated Field Strength

Frequency	Level	Pol	15 E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5469.630	51.2	V	68.3	-17.1	Pavg	360	1.0	
5469.820	45.0	H	68.3	-23.3	Pk	146	1.0	

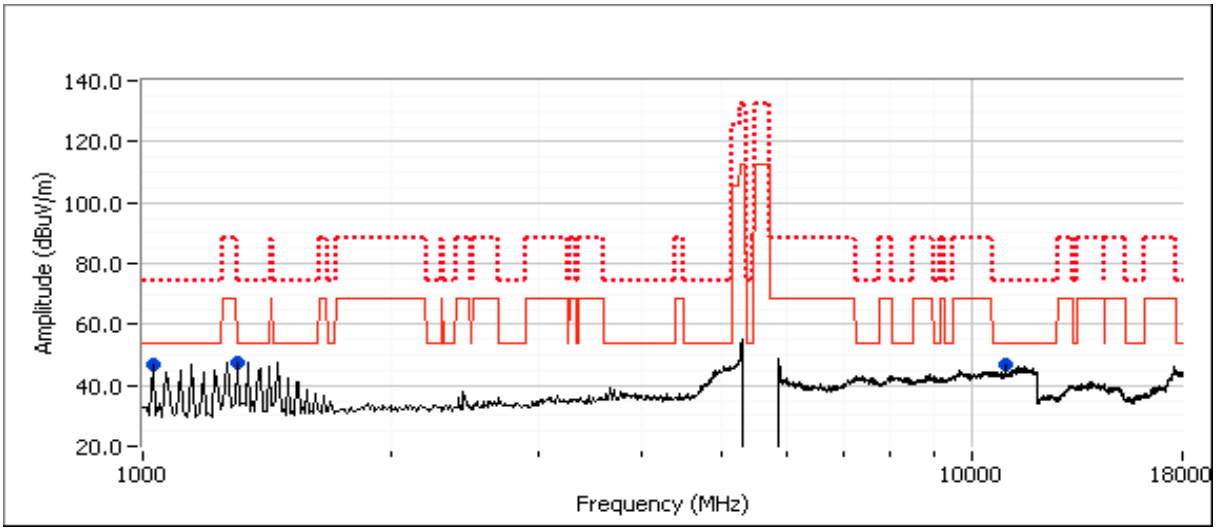
For emissions in the 5460-5470MHz frequency range the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is the same measurement method used to determine the in-band power spectral density or a peak measurement (RB=1MHz, VB>1MHz). Pavg indicates that the power averaging method of measurement was used, PK indicates that a peak measurement was made.

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1306.450	45.6	H	54.0	-8.4	AVG	111	1.3	RB 1 MHz;VB 10 Hz;Pk
10996.570	43.2	V	54.0	-10.8	AVG	256	1.3	RB 1 MHz;VB 10 Hz;Pk
10996.190	57.2	V	74.0	-16.8	PK	256	1.3	RB 1 MHz;VB 3 MHz;Pk
1031.600	29.7	V	54.0	-24.3	AVG	164	1.0	RB 1 MHz;VB 10 Hz;Pk
1306.610	48.2	H	74.0	-25.8	PK	111	1.3	RB 1 MHz;VB 3 MHz;Pk
1031.610	44.0	V	74.0	-30.0	PK	164	1.0	RB 1 MHz;VB 3 MHz;Pk

Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
Note 2:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is the same measurement method used to determine the in-band power spectral density or a peak measurement (RB=1MHz, VB>1MHz). Pavg indicates that the power averaging method of measurement was used for the measurement of emissions outside of the restricted bands. PK indicates that a peak measurement was made.

Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A



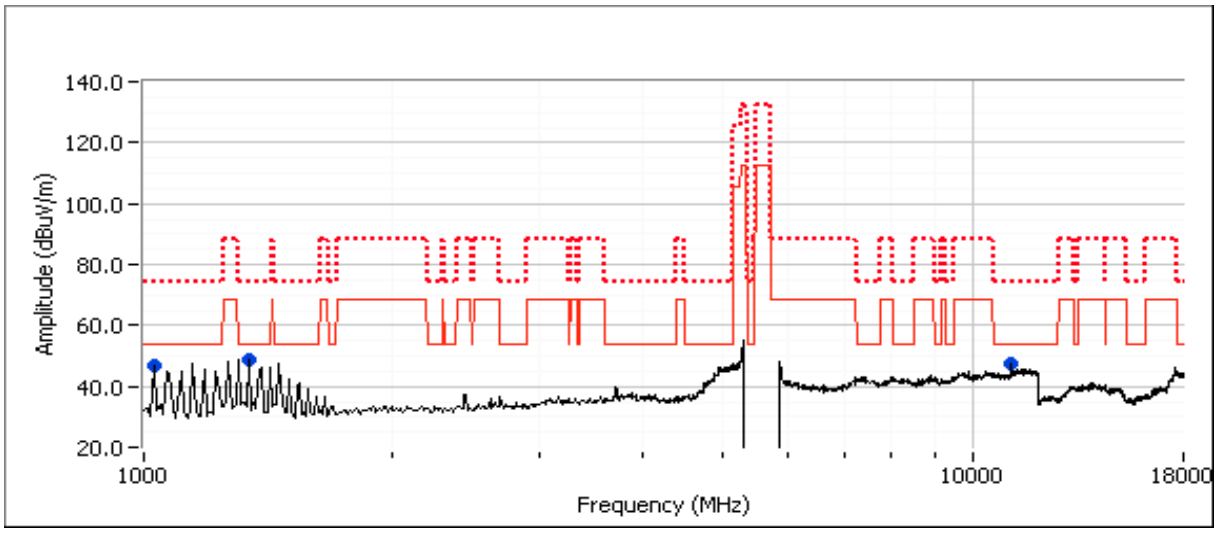
Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A

Run #3b: Center Channel

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1345.430	48.7	H	54.0	-5.3	AVG	240	1.0	RB 1 MHz;VB 10 Hz;Pk
11158.070	41.3	V	54.0	-12.7	AVG	35	1.9	RB 1 MHz;VB 10 Hz;Pk
11158.620	54.7	V	74.0	-19.3	PK	35	1.9	RB 1 MHz;VB 3 MHz;Pk
1345.490	50.8	H	74.0	-23.2	PK	240	1.0	RB 1 MHz;VB 3 MHz;Pk
1030.120	29.2	V	54.0	-24.8	AVG	171	1.0	RB 1 MHz;VB 10 Hz;Pk
1030.260	42.8	V	74.0	-31.2	PK	171	1.0	RB 1 MHz;VB 3 MHz;Pk

Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
Note 2:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is the same measurement method used to determine the in-band power spectral density or a peak measurement (RB=1MHz, VB>1MHz). Pavg indicates that the power averaging method of measurement was used for the measurement of emissions outside of the restricted bands. PK indicates that a peak measurement was made.



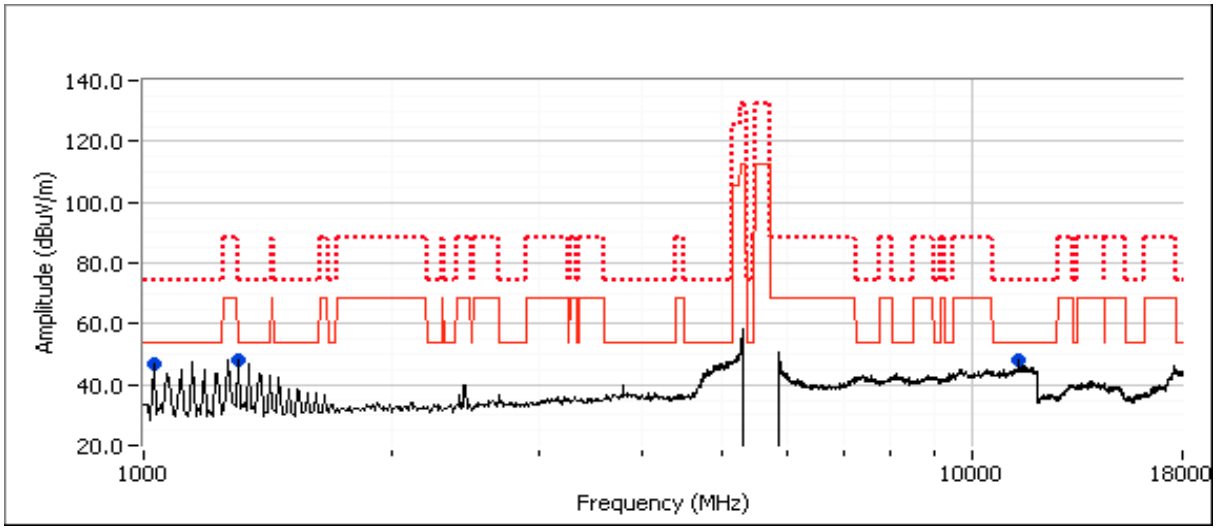
Client:	Summit Data Communications	Job Number:	J83780
Model:	PH30AG	T-Log Number:	T83840
		Account Manager:	Christine Krebill
Contact:	Ron Seide		
Standard:	FCC 15.247/15.E	Class:	N/A

Run #3c: High Channel

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1033.490	46.8	V	54.0	-7.2	AVG	164	1.0	RB 1 MHz;VB 10 Hz;Pk
1306.440	44.8	H	54.0	-9.2	AVG	245	1.3	RB 1 MHz;VB 10 Hz;Pk
11400.370	42.4	V	54.0	-11.6	AVG	279	1.9	RB 1 MHz;VB 10 Hz;Pk
11402.440	56.2	V	74.0	-17.8	PK	279	1.9	RB 1 MHz;VB 3 MHz;Pk
1033.550	48.8	V	74.0	-25.2	PK	164	1.0	RB 1 MHz;VB 3 MHz;Pk
1306.500	47.7	H	74.0	-26.3	PK	245	1.3	RB 1 MHz;VB 3 MHz;Pk

Note 1:	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
Note 2:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is the same measurement method used to determine the in-band power spectral density or a peak measurement (RB=1MHz, VB>1MHz). Pavg indicates that the power averaging method of measurement was used for the measurement of emissions outside of the restricted bands. PK indicates that a peak measurement was made.



End of Report

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