Tantalus Systems Corp.

NC-900

Report of Measurements for FCC and IC Compliance

per

Industry Canada RSS-210 Issue 7

and

FCC CFR47 Part 15/C – 15.247

Revision 1.0

Sept 03, 2010

Approval		
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Industry Canada Registration Number IC3384

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Section 1: Information for Test Report of Measurements

Testing Details

TESTED BY: Amandeep Singh

TEST CONDITIONS: Temperature and Humidity: 22°, 47%

TEST VOLTAGE: 120V A.C.

Test Facilities

Protocol Datasystems Labs
4741 Olund Rd.
Abbotsford BC, Canada, V4X 2A1

FCC Registration Number 96437
Industry Canada Registration Number IC3384

Test Equipment List

Manufacturer	Model	Equipment Description	Serial No.	Next Cal
HP	85650A	CDN Quasi-Peak Adapter	2811A01080	12/08/11
HP	85662A	Spectrum Analyzer Display	2152A03569	11/08/11
HP	8566B	Spectrum Analyzer RF Section	2241A02102	11/08/11
HP	85685A	RF-Preselector	3107A01222	11/08/11
EMCO	3146	Ant Log Periodic 200-1000MHZ	9611-4699	08/08/11
EMCO	3110B	Ant Biconical 20-300MHz	9401-1850	08/08/11
EMCO	3115	Horn Antenna 1-18GHz	9403-4251	20/08/11
EMCO	3825/2	LISN	2470	20/07/11
Rhientech	Custom	Antenna Mast	N/A	N/A
Protocol EMC	Custom	Turntable	N/A	N/A

Company Tested

NAME: Tantalus Systems Corp.

ADDRESS: 301–3480 Gilmore Way
Burnaby, BC V5G 4Y1
Canada

CONTACT PERSON: Mr. Ivan Chan

PHONE NUMBER: 1-604-299-0458 x:203

Equipment Under Test

THE TEST SYSTEM:

EUT: Tantalus Systems have repackaged four (4) previously FCC-compliant transceivers through a combiner and dedicated TX and RX antennas as a new system product. No software changes were required to accomplish this change. All hardware changes consisted of the addition of coaxial cables, coaxial harmonic filters, a combiner, two external amplifiers and a dedicated TX and RX antenna, and are installed downstream of the previously FCC-compliant radios. The EUT has had all parametrics re-tested to ensure that the system continues to comply with FCC and IC requirements under DA 00-705.

Manufacturer: Tantalus Systems Corp.
Part Numbers: NC-900
Serial number: 000-0103

AUX equipment: Ethernet switch used for termination

Equipment: Ferrites
Manufacturer: Fair Rite
Part Numbers: 0443167251, 0431164281, 2x 0431164951

Equipment: IEEE 802.3, IEEE802.3u compliant switch
Manufacturer: AirLink
Part Numbers: ASW108 8-Port 10/100 Switch

TEST SETUP:

CABLING:

Cable	Pins	Connector	Load/Termination	Shielded	Ferrites
Power	3	Terminal	Ethernet	No	Yes

MODIFICATIONS: Ferrites were added to external amplifier power cables and the CAT5 cable during radiated emissions testing.

CONCLUSION: The NC-900 complies with the requirements of FCC CFR47 and the requirements of Industry Canada RSS-210.

Section II: IC RSS-210 Iss.7 & FCC CFR47 Part 15/B Report of Measurements

Markings

According to FCC Section 15.19 and ICES 003, a statement similar to the following must be included on an identification label, which also uniquely identifies the Manufactured date, either explicitly or through a Serial number etc.:

> “This equipment complies with FCC Rules, Part 15 and Industry Canada’s ICES 003 for a Class B Digital Device. Operation is subject to two conditions:
>
> 1) This device may not cause harmful interference, and
>
> 2) This device must accept any interference that may cause any undesired operation”

Additionally, if the manufacturer markets product to Quebec, the following supplemental information should be added to the label:

> “Cet Apparreil numerique de la Classe A respecte toutes les exigences du Reglement sur le material broilleur due Canada.”

Labeling

According to FCC Section 15.105, and ICES 003, the following statement must be included in a prominent location in your User’s Manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful intereference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

It is also required according to FCC Part B Section 15.21 that a caution is included such as:

> Caution: Changes or modifications to this equipment, not expressly approved by the manufacturer could void the user’s authority to operate the equipment.

This product is License Exempt for FCC and IC. There is a requirement for this product to be submitted for certification and requires both an FCC ID and an IC ID number to be added to the labels in accordance with FCC CFR47 Part 2 Subpart J (2.901 to 2.956) as well as IC Self-Marking standards.

Section III: IC RSS-210 Issue 7 Emissions Testing

Test Results – Summary

Testing was performed pursuant to Industry Canada RSS-210 Issue 7.

Test	Standard	Description	Result
Radiated Emissions Idle Mode Subclause 8.2	RSS-210 2.2(b)	The radiated emissions are measured in the 30-1000MHz range	Complies
Conducted Emissions Idle Mode Subclause 8.3	EN55022 Class B Limits	The Conducted Emissions are measured on the phase and neutral power lines in the 0.15 – 30.0 MHz range	Complies
Radiated Emissions Transmit Mode	RSS-210 A8.5	The radiated emissions are measured in the 30-9000MHz range	Complies
Output Power and EIRP Emissions	RSS-210 A8.4(1)	Output power shall not exceed 1.0 Watt	Complies

Part 1 – Radiated Emissions Testing

DATE Sept 01, 2010

TEST STANDARD: RSS-210 2.2(b)

TEST SETUP: The EUT was operated and tested at 120Vac 60Hz in its normal mode of operation. It was in receive mode for these tests.

MINIMUM STANDARD: Class B Limit:

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyzer with a 9kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with a 9kHz bandwidth, CISPR Quasi-Peak detector as well as an averaging meter. The EUT was set up in a 3 meter open field test site, using the manufacturer's specified normal cabling configuration, with all cables over 1 meter in length bundled at 1 meter and retained from the floor. A typical application was tested.

Emissions in both horizontal and vertical polarization were measured while rotating the EUT on a turntable to maximize the emissions signal strength and the results recorded on the attached plots.

Due to the presence of high ambient noise making it impossible to measure an emission at the required distance, the measurement was performed at 3 meters distance and the limit is adjusted per EN61000-6-3:2001

$$L2 = L1(d1/d2)$$

Where L1 is the specified limit in µV/m at the distance d1. L2 is the new limit at the new distance d2.

EMISSIONS DATA: See Table 2 in Appendix A for corresponding frequencies.

PERFORMANCE: Complies.

Part 2 – Conducted Emission Testing

DATE: Sept 01, 2010

TEST STANDARD: EN55022

MINIMUM STANDARD: Class B Limit:

TEST SETUP: The EUT was connected to the conducted emissions LISN appartus. The equipment was operated and tested at 120Vac 60Hz.

MINIMUM STANDARD: Class B Limit:

Frequency (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 – 0.50	66 to 56	56 to 46
0.50 – 5	56	46
5 – 30	60	50

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyzer with a 9kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with a 9kHz bandwidth, CISPR Quasi-Peak detector as well as an averaging meter.

MEASUREMENT DATA: See Appendix A for Plots.

EMISSIONS DATA: See Table 3 and Table 4 in Appendix A for corresponding frequencies.

PERFORMANCE: Complies.

Part 3 – Radiated Emissions – Transmit Mode

DATE: Aug 31, 2010

TEST STANDARD: RSS-210 Iss.7 A8.5 – Frequency Hopping Systems 902-928MHz Band.

MINIMUM STANDARD: **A8.1 – Frequency Hopping Systems (General Conditions)**

Frequency hopping systems are spread spectrum systems in which the carrier is modulated with coded information in a conventional manner causing a conventional spreading of the RF energy about the carrier frequency. The frequency of the carrier is not fixed but changes at fixed intervals under the direction of a coded sequence. Frequency hopping systems are not required to employ all available hopping frequencies during each transmission. However the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream.

Incorporation of intelligence into a frequency hopping system that enables it to recognize other users of the band and to avoid occupied frequencies is permitted, provided that the frequency hopping system does it individually, and independently chooses or adapts its hopset. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

(a) The bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The system RF bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset while the long-term distribution appears evenly distributed.

(b) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(c) For frequency hopping systems in the band 902-928 MHz: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 20 second period. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

A8.4 Transmitter Output Power and e.i.r.p. Requirements

(1) For frequency hopping systems operating in the band 902-928 MHz, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W, if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W, and the e.i.r.p. shall not exceed 1 W, if the hopset uses less than 50 hopping channels. As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power (see RSS-Gen).

A8.5 Out-of-band Emissions

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB.

TEST SETUP: The EUT was operated and tested at 120Vac 60Hz for the tests where the unit is in continuous transmit mode.

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyzer. The EUT was set up in a 1 meter open field test site, using the manufacturer’s specified normal cabling configuration, with all cables over 1 meter in length bundled at 1 meter and retained from the floor.

Emissions in both horizontal and vertical polarization were measured while rotating the EUT on a turntable to maximize the emissions signal strength and the results recorded on the attached plots.

The EUT was configured such that all four units were set to transmit with different pseudorandom sequences of the same set of 50 hops at accelerated transmit rates.

All frequencies 30-1000MHz were tested at 3m and all frequencies 1GHz and up were tested at 1m in accordance with ANSI c63.4.

EMISSIONS DATA: See Plots and Tables in Appendix A for corresponding data. A summary of the results as per the above requirements.

Test	Standard	Results
Spread Spectrum method of Modulation	RSS-210 A8.1	This product meets the requirements of a Frequency Hopping Spread Spectrum (FHSS) system operating in the 902-928MHz band
Channel Bandwidth	RSS-210 A8.1(a)	See Figure 4 to Figure 6 in Appendix A. The widest 20dB bandwidth was measured to be 119kHz.
Channel Separation	RSS-210 A8.1(c)	See Figure 7 in Appendix A. The Channel separation was measured to be 128.5 kHz.
Number of Hopping Channels	RSS-210 A8.1(c)	See Figure 8 to Figure 16 in Appendix A. The number of channels has been set to 50 channels.
Hopping Channels time of Occupancy	RSS-210 A8.1(c)	See Figure 17 in Appendix A; the time of occupancy is 4.96 milliseconds. Figure 18 shows that there is a maximum of 9 pulses in a 2.5s period, which equates to a worse case “ON” time of 357 milliseconds within a 20 second period.
Output Power and EIRP	RSS-210 A8.4(1)	See the Measurement Data section in Part 4 of this Section. The

		maximum conducted output power is 25.8dBm. Using a 10dBi gain flat panel antenna yields a maximum EIRP of 35.8dBm, or 3.8W.
Out of Band Emissions	RSS-210 A8.5	See Plots Figure 19 to Figure 28 in Appendix A. All conducted and radiated emissions were within the RSS-210 A8.5 limit.

PERFORMANCE: Complies.

Part 4 – Output Power and EIRP Emissions

DATE: Aug 31, 2010

TEST STANDARD: RSS-210 Iss.7 A8.4 – Frequency Hopping Spread Spectrum Systems 902-928MHz

MINIMUM STANDARD: For frequency hopping systems operating in the band 902-928 MHz, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W, if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W, and the e.i.r.p. shall not exceed 1 W, if the hopset uses less than 50 hopping channels.

TEST SETUP: Refer to setup in Part 3 above.

METHOD OF MEASUREMENT: The flat panel antenna was removed from the NC-900. The RF output of the NC-900 was connected into the spectrum analyzer through a 10dB pad and a reference cable.

The EUT was configured such that all four units were set to transmit CW at the same frequency, with a RBW wide enough to capture the output power of the four CWs.

The peak gain of the external flat panel antenna is 10dBi, hence the maximum conducted output power is 26dBm to meet the 4W (36dBm) EIRP specification.

MEASUREMENT DATA:

Freq(MHz)	Reading dBm	External Attenuation (dB)	Cable Loss	Total Value (dBm)
915	14.9	10	0.9	25.8
927.83	14.7	10	0.9	25.6
902.16	14.8	10	0.9	25.7

PERFORMANCE: Complies.

Part 5: Out of Band Emissions

DATE:	Sept 02, 2010
TEST STANDARD:	RSS-210 A8.5
MINIMUM STANDARD:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB.
TEST SETUP:	Refer to the setup in Part 3 above.
METHOD OF MEASUREMENT:	For the conducted portion of the test, the flat panel antenna was removed from the NC-900. The RF output of the NC-900 was connected into the spectrum analyzer through a 10dB pad and a reference cable. An application which transmitted a constant CW on all four transmitters was used to set the highest output power. The highest output power was previously tested to demonstrate compliance under the peak conducted power limits.

For the radiated portion of the test, measurements were made using a horn antenna connected into a pre-amplifier, then into a spectrum analyzer. The EUT was set up in a 1 meter open field test site, using the manufacturer's specified normal cabling configuration, with all cables over 1 meter in length bundled at 1 meter and retained from the floor. An application which transmitted a constant CW on all four transmitters was used to set the highest output power.

Emissions in the horizontal and vertical polarization were measured while rotating the EUT on a turntable to maximize the emissions signal strength and the results recorded on the attached plots.

The following formula was used to convert the maximum field strength (FS) in volts/meter to calculate the EUT output power (TP) in Watts:

$$TP = ((FS \times D) \times 2) / (30 \times G)$$

Where D is the distance in meters between the two antennas and G is the EUT antenna numerical gain referenced to isotropic gain.

All spurious emissions outside the fundamental were measured via conducted and radiated methods and were verified to be at least 20dB below the fundamental output power of the device. Spurious activities inside the restricted bands as listed in RSS-210 2.7 Table 1 were verified to fall below the levels stated in RSS-210 2.7 Table 2.

MEASUREMENT DATA:	See Table 5 to Table 10 in Appendix A. All limit lines are referenced against the amplitude of the fundamental frequency.
PERFORMANCE:	Complies.

Section IV: FCC CFR47 Part 15/C Report of Measurements

General

Tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15 – Subpart C - Intentional Radiators. Additionally, the specific section used for compliance is 15.247 – Operation within the bands 902-928MHz – limited to frequency hopping intentional radiator. This includes the use of the FCC Public Notice DA 00-705 (Filing and Measurement Guidelines for Frequency hopping Spread Spectrum Systems) which was used as a guide to the tests to be performed.

Labeling Requirements

Please refer to labeling requirements as outlined above in Section 1.

Test Results - Summary

Testing was performed pursuant to FCC Part 15 released on July 10,2008.

Test	Standard	Description	Result
Radiated Emissions Idle Mode	FCC Part 15 Subpart B Class B Limits	The radiated emissions are measured in the 30-1000MHz range	Complies
Conducted Emissions Idle Mode	FCC Part 15 Subpart B Class B Limits	The conducted emissions are measured on the phase and neutral power lines in the 0.15 – 30.0 MHz range.	Complies
Antenna Requirement	FCC Part 15 Subpart 15.203	Proper antenna is specified and used	Complies
External Radio Frequency Power Amplifiers and Antenna Modifications	FCC Part 15 Subpart 15.204	Proper antenna and external amplifiers are specified and used.	Complies
Radiated Emissions Transmit Mode – Frequency Hopping Spread Spectrum Operation	FCC Part 15 Subpart C 15.247	Radiated emission characteristics for Spread Sprectrum devices operating in the range 902-928 MHz that use the Spread Spectrum Modulation technique. Emissions are measured in the 30-9000MHz range.	Complies

Part 1 – Radiated Emission Testing

DATE: Sept 02, 2010

TEST STANDARD: FCC CFR47, Part 15, Subpart B Class B and Subpart C-Section 15.247

TEST VOLTAGE: 120Vac 60Hz

TEST SETUP: The equipment was set up in a 3-meter open field test site. Emissions in both horizontal and vertical polarization's were measured while rotating the EUT on a turntable to maximize the emissions signal strength and the results recorded on the attached plots. In cases where the presence of high ambient noise makes it impossible to measure an emission at the required distance, the measurement is performed at a closer distance and the limit is adjusted 20dB per Decade using the formula

$$20*\text{Log}\,(d1/d2)$$

Where d1 is the required distance and d2 is the new distance.

MINIMUM STANDARD: When the EUT is operating in Receive mode FCC Part 15 Subpart B Unintentional Radiators Limits for a Class B product.:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

DEVICE DESCRIPTIONS: Refer to the Equipment Under Test information in the Section 1 above, for EUT Descriptions.

CABLING DETAILS: The EUT was set up using the manufacturer's specified normal cabling configuration.

CABLING:

Cable	Pins	Connector	Load/Termination	Shielded	Ferrites
Power	3	Terminal	Ethernet	No	Yes

MODIFICATIONS: Ferrites were added to external amplifier power cables and the CAT5 cable during radiated emissions testing.

MEASUREMENT DATA: See Appendix A for Plots.

EMISSIONS DATA: See Table 1 in Appendix A for corresponding frequencies.

PERFORMANCE: Complies.

Part 2 – Antenna Requirement – 15.203

2.1 APPLICABLE REGULATIONS:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

2.2 RESULTS:

The EUT is sold specifically to power utilities. The EUT is only installed professionally by qualified technicians, hence a standard SMA connector is permitted to be used. The installer shall be responsible for ensuring that the maximum conducted output power is below +26dBm at the input of the 10dBi flat panel antenna.

Part 3 – External Radio Frequency Power Amplifiers and Antenna Modifications – 15.204

3.1 APPLICABLE REGULATIONS:

(a) Except as otherwise described in paragraph (b) and (d) of this section, no person shall use, manufacture, sell or lease, offer for sale or lease (including advertising for sale or lease), or import, ship, or distribute for the purpose of selling or leasing, any external radio frequency power amplifier or amplifier kit intended for use with a Part 15 intentional radiator.

(b) A transmission system consisting of an intentional radiator, an external radio frequency power amplifier, and an antenna, may be authorized, marketed and used under this part. Except as described otherwise in this section, when a transmission system is authorized as a system, it must always be marketed as a complete system and must always be used in the configuration in which it was authorized. [Note – the system referenced in the latter sentence may or may not include an amplifier.]

(c) An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator. An intentional radiator may be authorized with multiple antenna types.

(1) The antenna type, as used in this paragraph, refers to antennas that have similar in-band and out-of-band radiation patterns.

(2) Compliance testing shall be performed using the highest gain antenna for each type of antenna to be certified with the intentional radiator. During this testing, the intentional radiator shall be operated at its maximum available output power level.

(3) Manufacturers shall supply a list of acceptable antenna types with the application for equipment authorization of the intentional radiator.

(4) Any antenna that is of the same type and of equal or less directional gain as an antenna that is authorized with the intentional radiator may be marketed with, and used with, that intentional radiator. No retesting of this system configuration is required. The marketing or use of a system configuration that employs an antenna of a different type, or that operates at a higher gain, than the antenna authorized with the intentional radiator is not permitted unless the procedures specified in Section 2.1043 of this chapter are followed.

(d) Except as described in this paragraph, an external radio frequency power amplifier or amplifier kit shall be marketed only with the system configuration with which it was approved and not as a separate product.

(1) An external radio frequency power amplifier may be marketed for individual sale provided it is intended for use in conjunction with a transmitter that operates in the 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz bands pursuant to § 15.247 of this part or a transmitter that operates in the 5.725 – 5.825 GHz band pursuant to § 15.407 of this part. The amplifier must be of a design such that it can only be connected as part of a system in which it has been previously authorized. (The use of a non-standard connector or a form of electronic system identification is acceptable.) The output power of such an amplifier must not exceed the maximum permitted output power of its associated transmitter.

(2) The outside packaging and user manual for external radio frequency power amplifiers sold in accordance with paragraph (d)(1) must include notification that

the amplifier can be used only in a system which it has obtained authorization. Such a notice must identify the authorized system by FCC Identifier.

3.2 RESULTS: The type of antenna used is a 10dBi flat panel 902-928MHz antenna. An external amplifier is mounted internal to the flat panel enclosure and is not sold as a separate product. The current antenna tested with the system is the PRA09010 from Itelite, but per Point 4 of Part 15.204, any antenna of the same type with equal or less gain may be used with the system without additional testing.

Part 4 – Conducted Emissions Tests – 15.207

4.1 Applicable Regulations

15.207 - (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dbµV)	
	Quasi-Peak	**Average**
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

*Decreases with the log of frequency

4.2 RESULT

MEASUREMENT DATA: See Appendix A for Plots.

EMISSIONS DATA: See Table 3 and Table 4 in Appendix A for corresponding frequencies.

PERFORMANCE: Complies.

Part 5 – Frequency Hopping Spread Spectrum Operation – 15.247

5.1 APPLICABLE REGULATIONS:

15.247(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

5.2 TEST PROCEDURES:

TEST STANDARD: FCC CFR47, Part 15, Subpart C 15.247

DEVICE DESCRIPTIONS: Refer to the Equipment Under Test Section, above, for EUT Descriptions.

TEST SETUP:

Frequency Range Measured	30MHz – 10000MHz
Test Distance	1m and 3m
Test Instrumentation Resolution	120kHz (30MHz to 1000MHz) 1MHz (1000MHz to 10000MHz)
Receive Antenna Scan Height	1m – 4m
Receive Antenna Polarization	Vertical and Horizontal

The EUT was set up in a 3-meter open field test site for tests up to 1GHz and tests were performed on a test bench at 1m for emissions 1GHz to 10GHz. Emissions in both horizontal and vertical polarizations were measured while rotating the EUT on a turntable to maximize the emissions signal strength and the results recorded on the attached plots. The EUT was programmable to broadcast on standalone frequencies at the low (902), middle (915) and high (928) channels; 2 channel hopping at the end frequencies (902.5 and 927.5); standalone hopping at the middle frequency (915) and full 50 channel hopping frequencies 902.5 to 927.5MHz.

The EUT was configured such that all four units were set to transmit with different pseudorandom sequences of the same set of 50 hops at accelerated transmit rates.

An average detector was not used in the taking of these measurements. Hence, Section 15.35(b) and (c) permit the allowance of peak radio frequency emissions of 20dB above the maximum permitted average emission level radiated by the device. As the transmitter operates longer than 100ms per transmission of 50 hops, the averaged interval was taken to be 100ms. The calculation of the Duty Cycle Correction Factor is computed by analyzing the worst case “ON” time in any 100ms time period using the formula:

Duty Cycle Correction Factor (dB) = 20*log(worst case ON time / 100ms)

For this product, the EUT worst case “ON” time was measured on Figure 17 to be 4.96ms per 100ms interval. This equates to a possible duty cycle correction factor of 26.09dB, but there is a cap of 20dB per Section 15.35(b), which is applied to the emissions data in Table 5 to Table 10.

CABLING DETAILS:

Cable	Pins	Connector	Load/Termination	Shielded	Ferrites
Power	3	Terminal	Ethernet	No	Yes

4.3 RESULTS:

MODIFICATIONS No additional modifications were required for the devices to pass the test.

MEASUREMENT DATA: See Plots Figure 4 to Figure 18 in Appendix A.

EXPLANATIONS Pseudorandom frequency hopping sequence:

The hopping sequence is derived by the EUT’s unique Network ID (NID). An algorithm translates the NID into a list of unique 50 hops with a specific sequence. Any unit downstream of its parent will adopt its parent's NID-derived hop sequence to communicate with each other.

Equal hopping frequency use:

Every packet transmitted by the device will utilize all 50 hops and each hop has a dwell time of 4.96ms, hence ensuring all hops used equally.

System Receiver Input Bandwidth:
The input bandwidth of the receiver matches the bandwidth its corresponding transmitter. EUT receivers receive signals from corresponding EUT transmitters. The receiver input bandwidth is as wide as the transmitted signal and has guard band to allow for +/- 10 ppm of frequency error at the hopping channel frequencies.

System Receiver Hopping Capability:
The EUT receivers and transmitters use the same hop sequence. The receiver is idle at a factory set frequency until it receives information and synchronizes to its corresponding transmitter to begin hopping. The receivers are time base frequency shifted at the same rate as that of the transmitter. The EUT is designed with a common frequency synthesizer which has identical phase locked loop characteristics for both transmitter and receiver modes of operation.

PERFORMANCE: Complies.

Part 6: Output Power and EIRP Emissions

DATE: Aug 31, 2010

TEST STANDARD: FCC 15.247(b)(2) – Hopping Frequency Systems 902-928MHz

MINIMUM STANDARD: **15.247(b)(2)** – For the band 902-928MHz, the transmitter output power shall not exceed 1.0 watt for systems employing at least 50 Hopping Channels.

TEST SETUP: Refer to setup in Part 1 above.

METHOD OF MEASUREMENT: The flat panel antenna was removed from the NC-900. The RF output of the NC-900 was connected into the spectrum analyzer through a 10dB pad and a reference cable.

The EUT was configured such that all four units were set to transmit CW at the same frequency, with a RBW wide enough to capture the output power of the four CWs.

The peak gain of the external flat panel antenna is 10dBi, hence the maximum conducted output power is 26dBm to meet the 4W (36dBm) EIRP specification.

MEASUREMENT DATA:

Freq(MHz)	Reading dBm	External Attenuation (dB)	Cable Loss	Total Value (dBm)
915	14.9	10	0.9	25.8
927.83	14.7	10	0.9	25.6
902.16	14.8	10	0.9	25.7

PERFORMANCE: Complies.

Part 7: Restricted Bands Review – 15.205(b)

7.1 APPLICABLE REGULATIONS:

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

7.2 RESULT

All of the measurements shown below were made when the EUT was set into a mode that transmits a CW tone on all four transmitters in order to facilitate measurements of the spurious emissions. CW tones were transmitted on low, middle, and high part of the 902-928MHz band. A 20dB duty cycle factor was added to the limit line under Section 15.35(b). The spurious frequencies that have been identified to fall into restricted bands are the various harmonics generated from 902 to 928 MHz. The restricted bands affected are 2655-2900MHz, 3600-4400MHz, 4500-5150MHz, 5350- 5460MHz, 7250-7750MHz, 8025-8500MHz and 9000-9200MHz. Measurements were taken with the horn antenna on both horizontal and vertical polarizations.

EMISSIONS DATA:

See Table 5 to Table 10 in Appendix A for corresponding data.

Appendix A: Test Plots

Unintentional Radiated Emissions

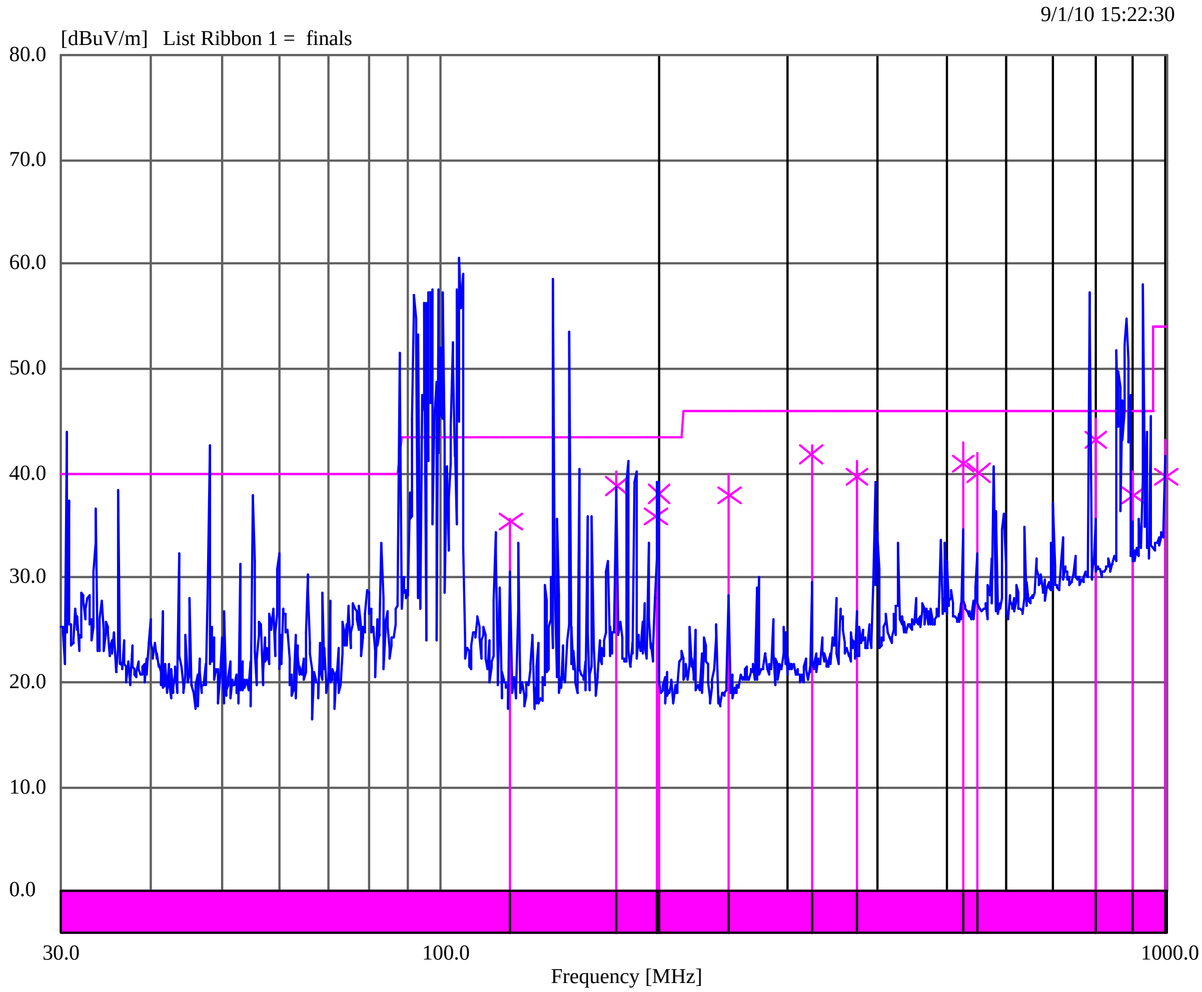


Figure 1: Unintentional Radiated Emissions

Table 1: FCC 15/B Class B Emissions with Unit in Idle/Receive Mode - 3m

Frequency	Pol	Hgt	Angle	Uncor-Pk	Tot Corr	Peak	QP Lmt	DelLim-Pk	QP	DelLim-QP
(MHz)		(m)	(deg)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dB)
124.992	V	1	360	21.4	14.22	35.62	43.5	-7.88	35.41	-8.09
174.9892	H	1	270	24.2	16.07	40.27	43.5	-3.23	38.76	-4.74
198.6401	H	1	270	18.9	18.26	37.16	43.5	-6.34	35.87	-7.63
200.0077	H	2	180	25	13.8	38.8	43.5	-4.7	38.01	-5.49
249.9934	H	1	90	25.4	14.62	40.02	46	-5.98	37.95	-8.05
324.9938	H	1	180	25.4	17.26	42.66	46	-3.34	41.86	-4.14
375.0025	H	1	45	22.8	18.49	41.29	46	-4.71	39.72	-6.28
525.0036	V	1	180	20.9	21.98	42.88	46	-3.13	40.97	-5.03
550.0038	V	1	180	19.5	22.35	41.85	46	-4.15	40.1	-5.9
800.0037	H	1	90	19.4	25.8	45.2	46	-0.8	43.19	-2.81
900.0141	V	1	180	12.6	27.5	40.1	46	-5.9	37.86	-8.14
999.9945	H	1	90	13.8	29.4	43.2	54	-10.8	39.64	-14.36

Table 2: IC Class B with Unit in Idle/Receive Mode – 3m

Frequency	Pol	Hgt	Angle	Uncor-Pk	Tot Corr	Peak	QP Lmt	DelLim-Pk	QP	DelLim-QP
(MHz)		(m)	(deg)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dB)
124.992	V	1	360	21.4	14.22	35.62	43.5	-7.88	35.41	-8.09
174.9892	H	1	270	24.2	16.07	40.27	43.5	-3.23	38.76	-4.74
198.6401	H	1	270	18.9	18.26	37.16	43.5	-6.34	35.87	-7.63
200.0077	H	2	180	25	13.8	38.8	43.5	-4.7	38.01	-5.49
249.9934	H	1	90	25.4	14.62	40.02	46	-5.98	37.95	-8.05
324.9938	H	1	180	25.4	17.26	42.66	46	-3.34	41.86	-4.14
375.0025	H	1	45	22.8	18.49	41.29	46	-4.71	39.72	-6.28
525.0036	V	1	180	20.9	21.98	42.88	46	-3.13	40.97	-5.03
550.0038	V	1	180	19.5	22.35	41.85	46	-4.15	40.1	-5.9
800.0037	H	1	90	19.4	25.8	45.2	46	-0.8	43.19	-2.81
900.0141	V	1	180	12.6	27.5	40.1	46	-5.9	37.86	-8.14
999.9945	H	1	90	13.8	29.4	43.2	54	-10.8	39.64	-14.36

A.C. Mains Conducted Emissions

FCC/CE Class B - Emissions
Table 3: AC Conducted Emissions Line 1
120VAC 60Hz – Line 1 Averages

Freq	Peak	Delta from Avg limit
(MHz)	(dBuV)	(dB)
18.34	42.9	-7.1
19.75	41.4	-8.6
17.76	41.0	-9.0
18.93	40.5	-9.5
21.72	39.7	-10.3
21.95	37.7	-12.3

Table 4: AC Conducted Emission Line 2
120VAC 60Hz – Line 2 - Peaks

Freq	Peak	Delta from Avg limit
(MHz)	(dBuV)	(dB)
9.716	48.4	-1.6
25.06	46.1	-3.9
9.924	45.3	-4.7
2.728	40.3	-5.7
10.46	43.9	-6.1
17.67	43.8	-6.2

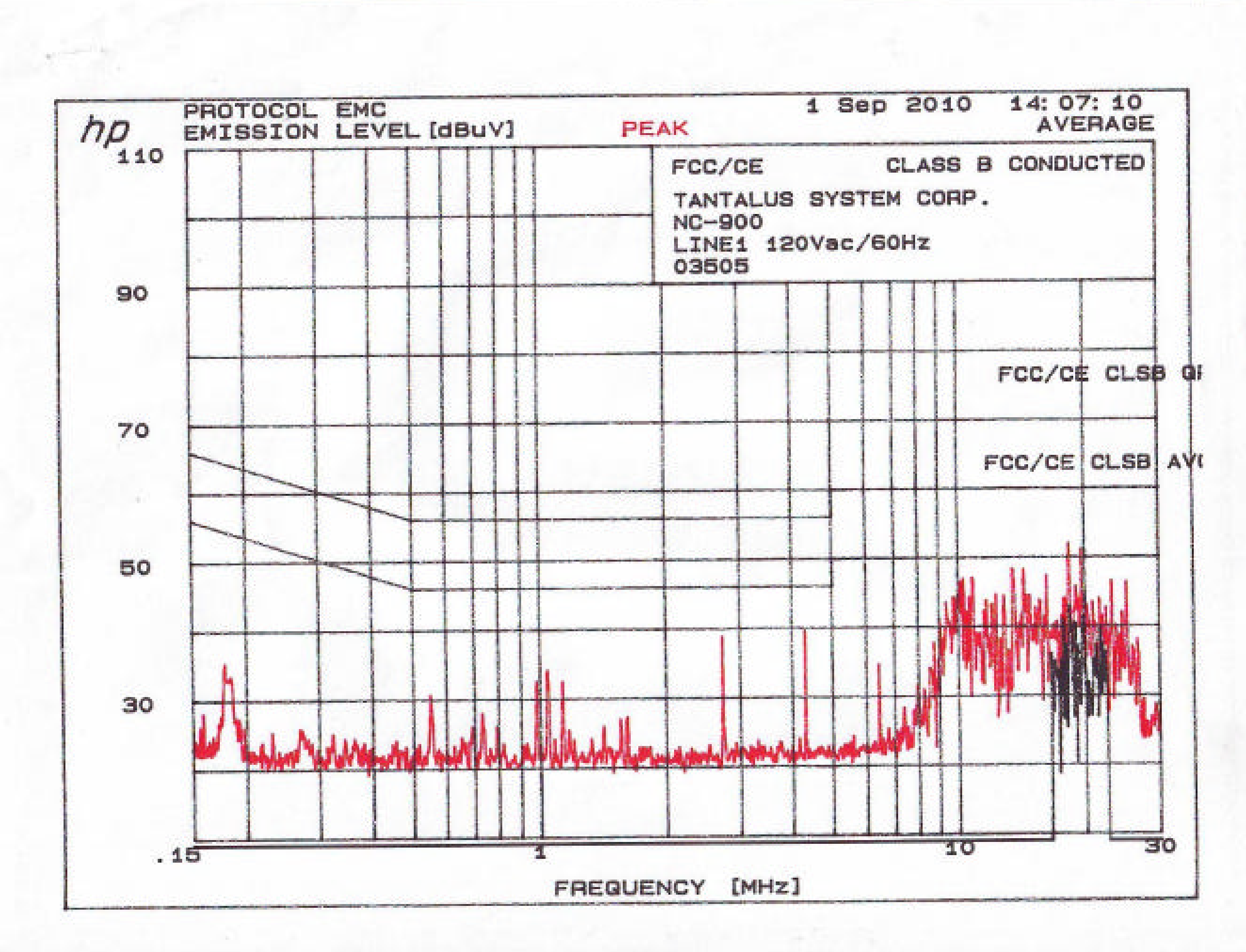


Figure 2: AC Conducted Emissions - Line 1 Average

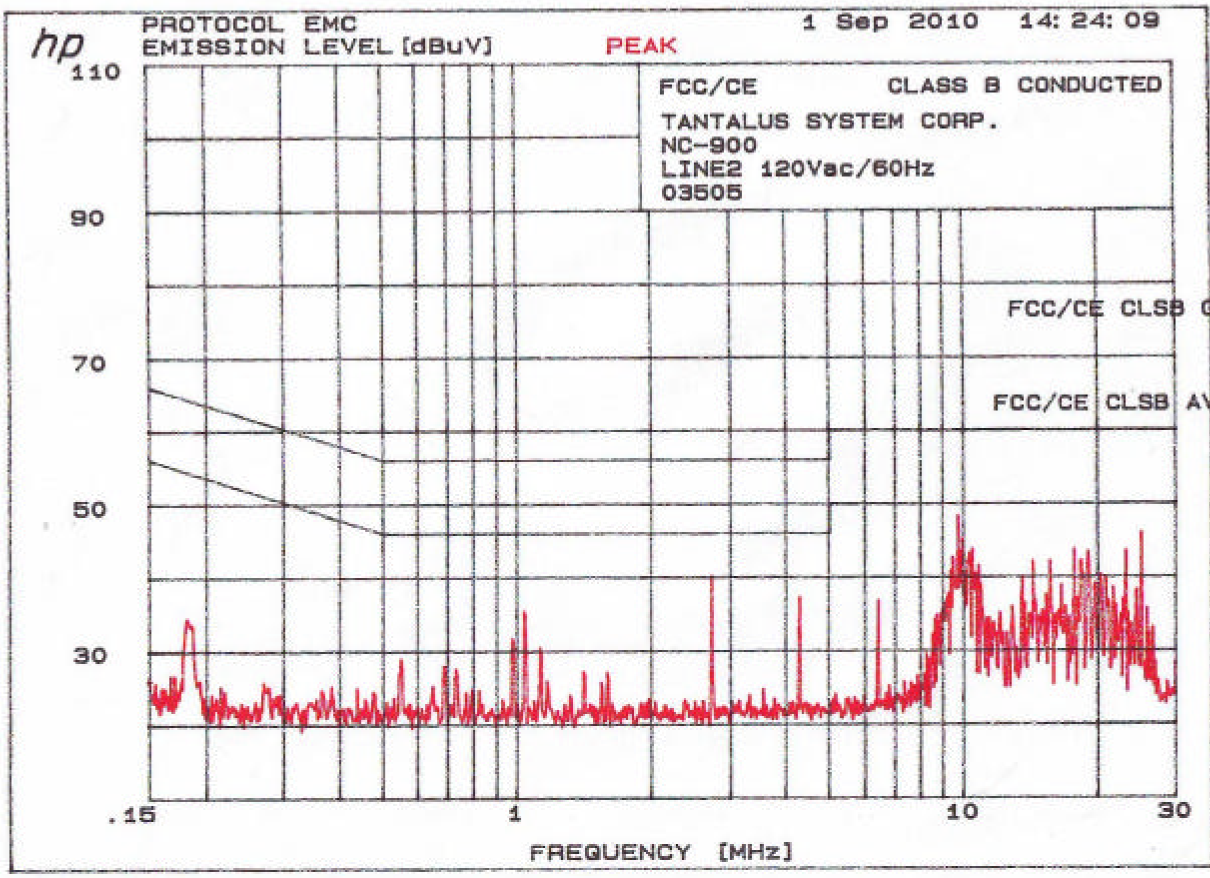


Figure 3: AC Conducted Emissions - Line 2 Peaks

20 dB Bandwidth

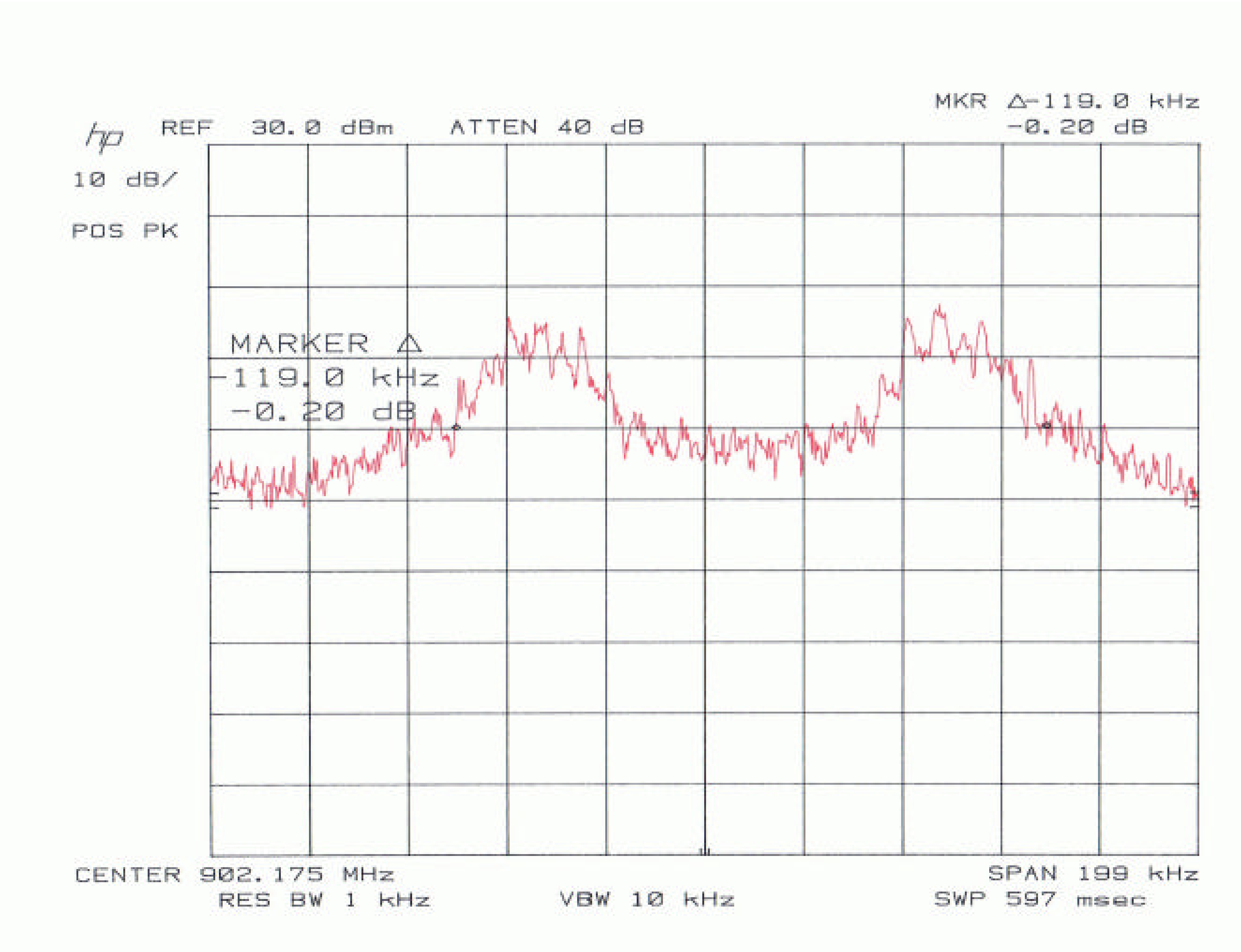


Figure 4: 20dB Bandwidth - Lower Frequency Band

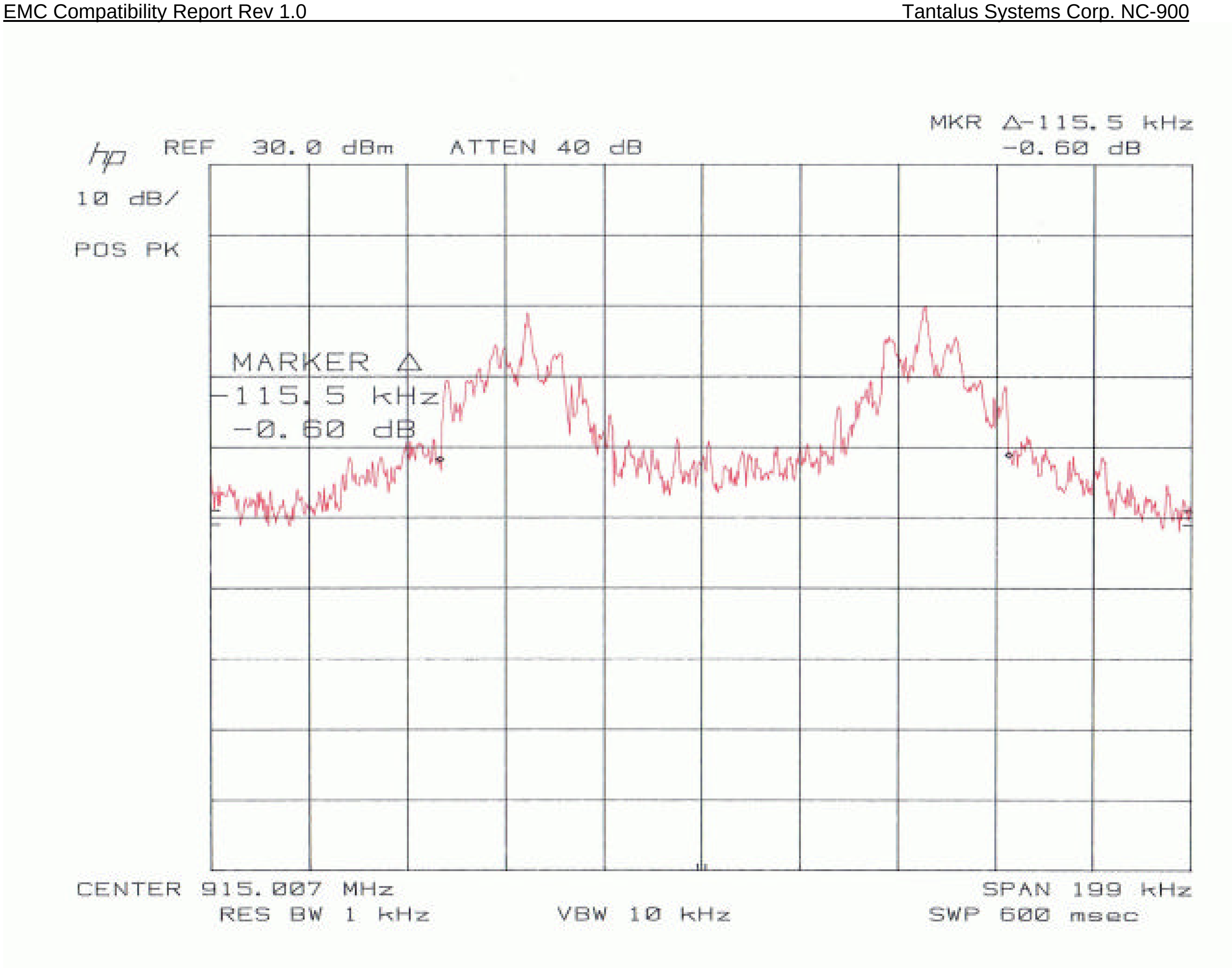


Figure 5: 20dB Bandwidth - Middle Frequency Band

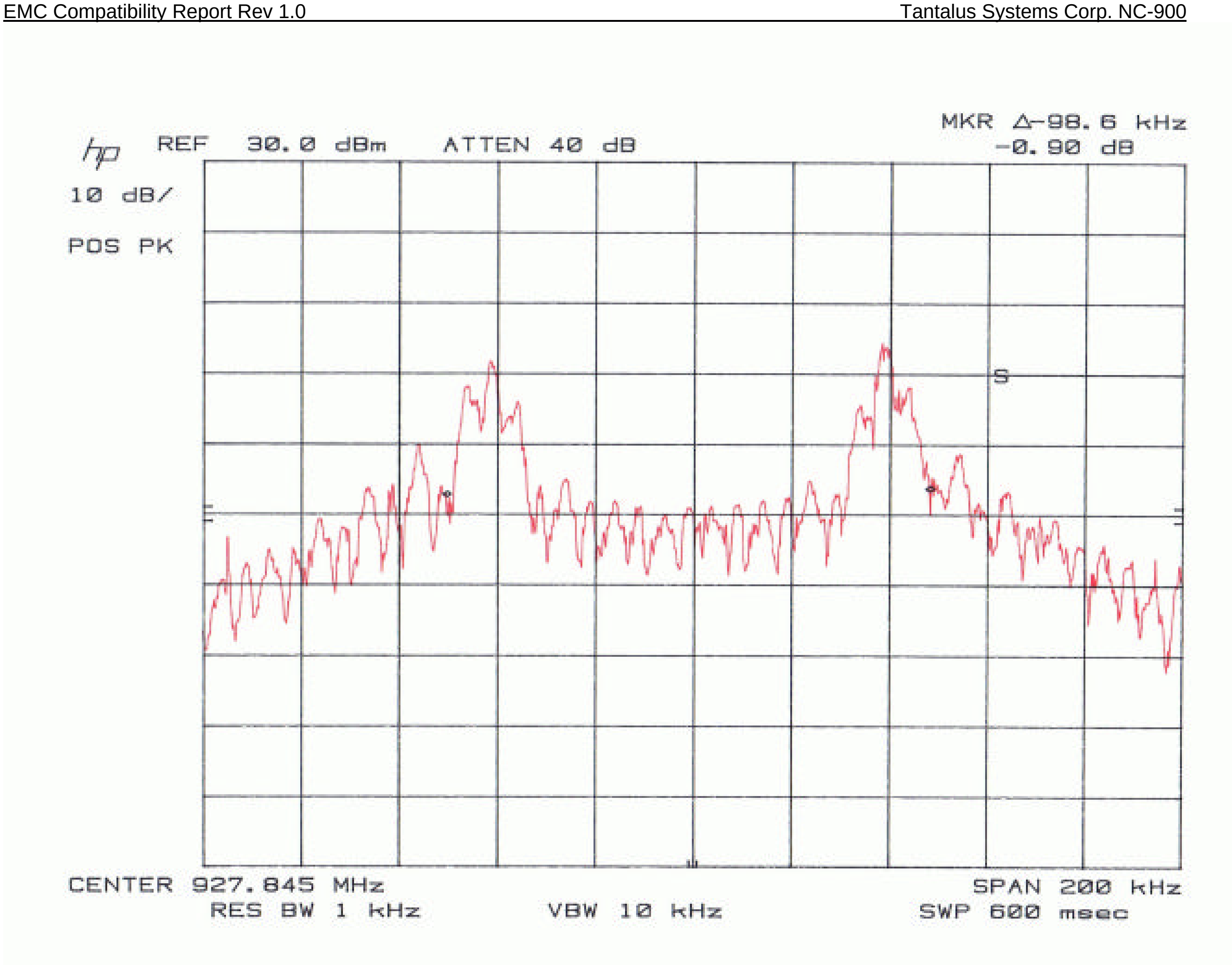


Figure 6: 20dB Bandwidth - Upper Frequency Band

Channel Separation

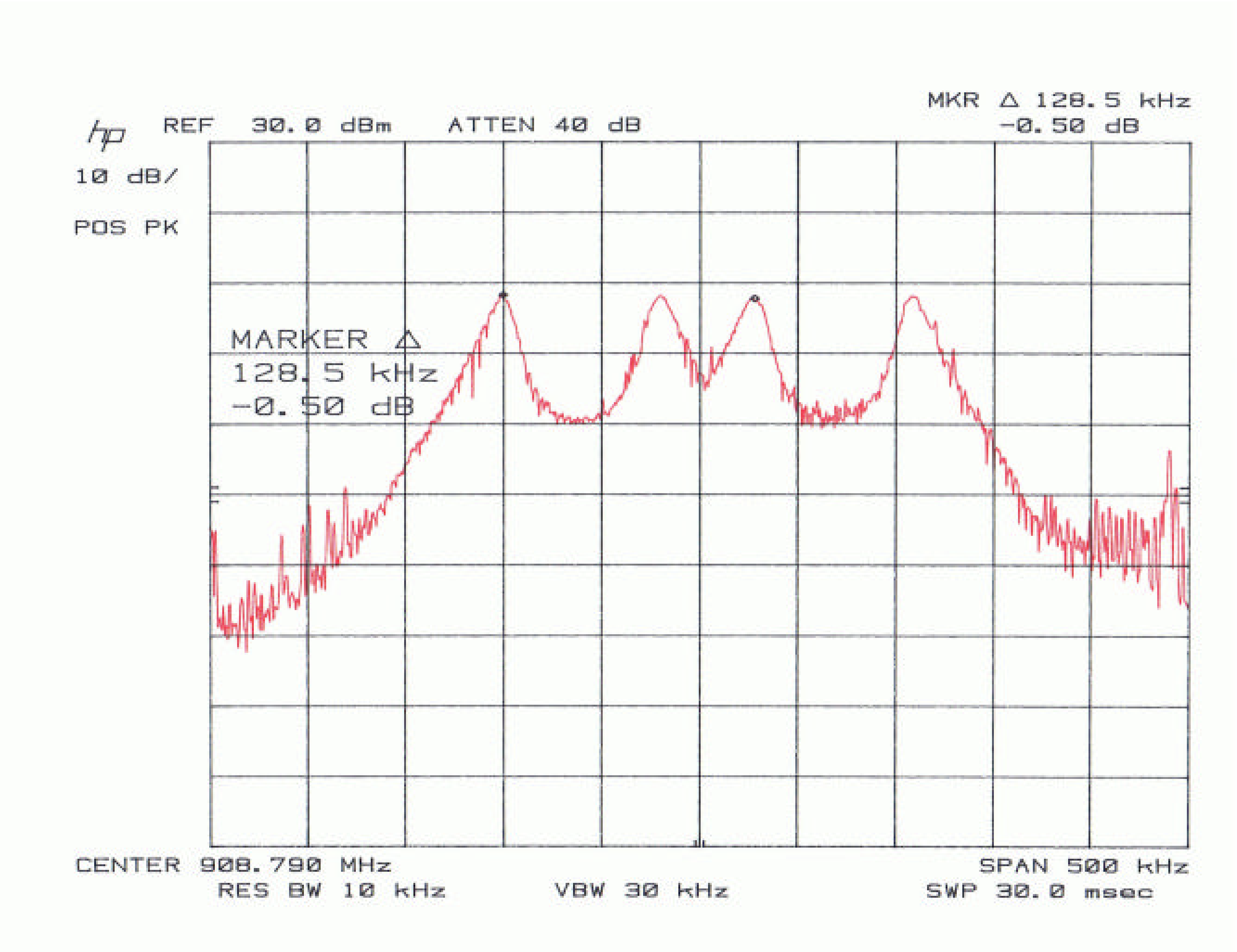


Figure 7: Channel Separation

Number of Hopping Channels

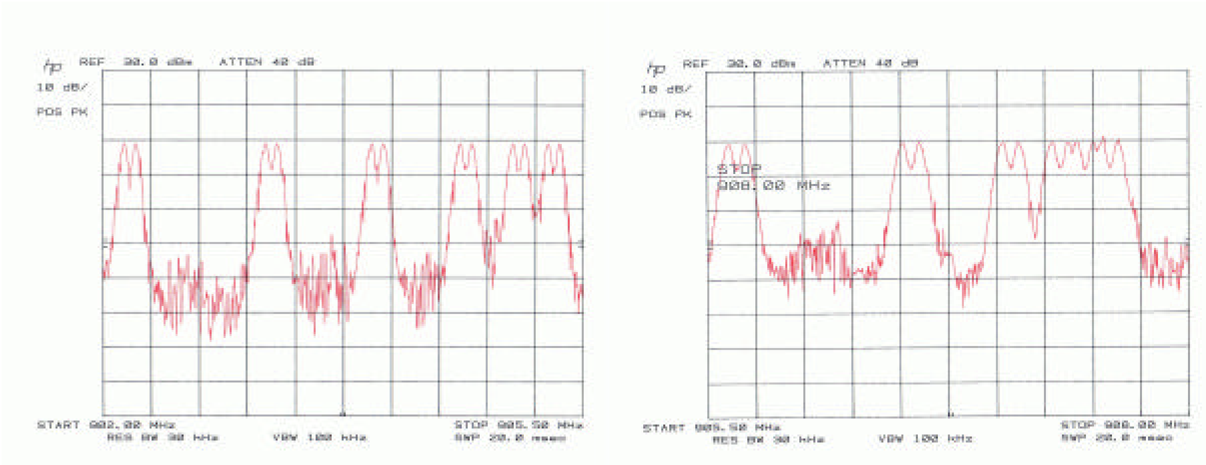


Figure 8,9: 902 - 905.5MHz - 6 hops, 905.5 – 908MHz – 6 hops

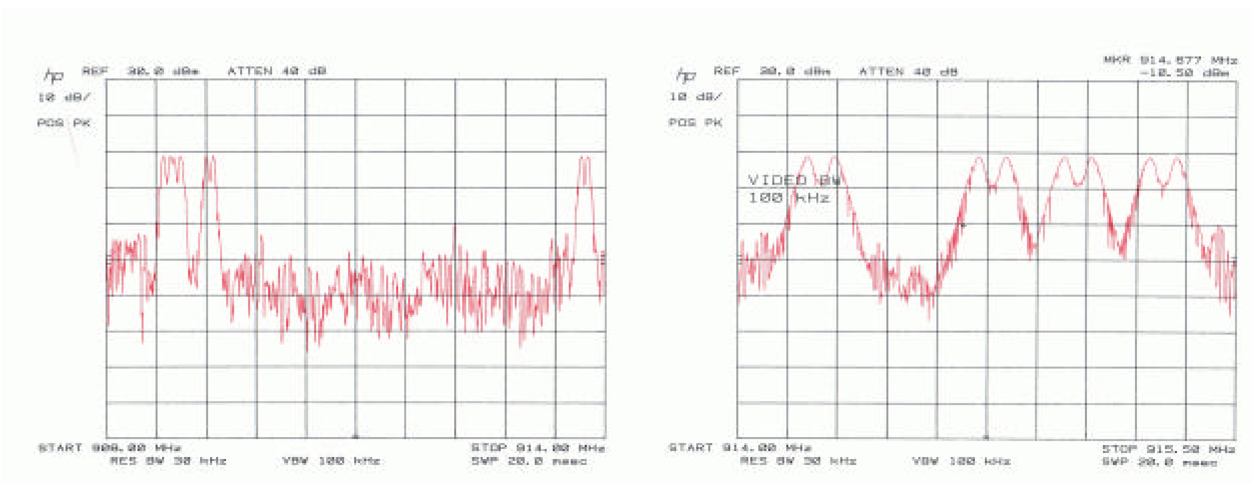


Figure 10, 11: 908 – 914 MHz – 4 hops, 914 – 915.5MHz – 4 hops

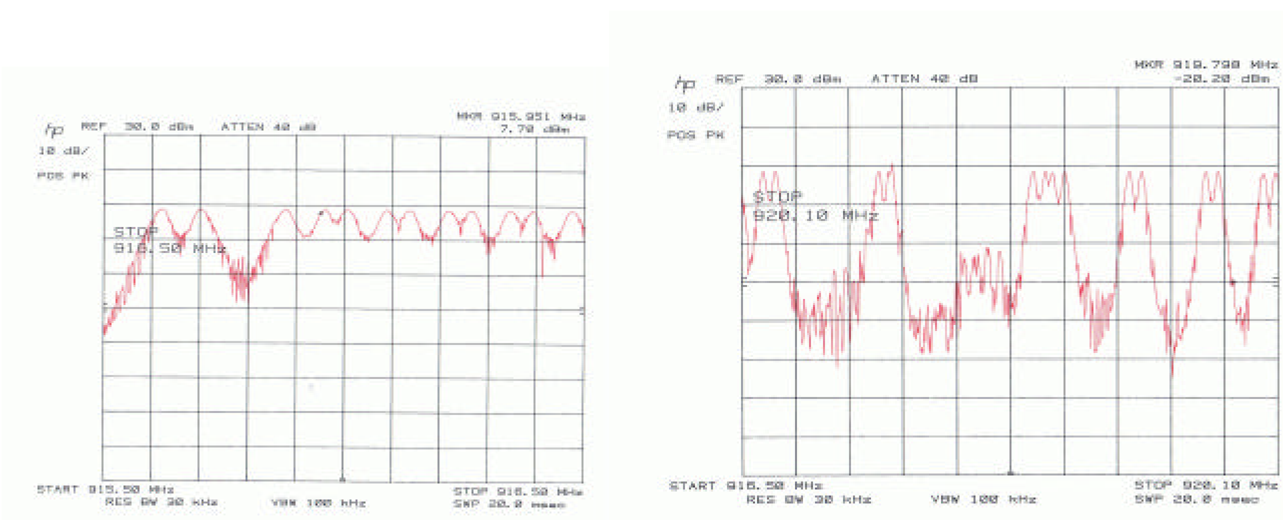
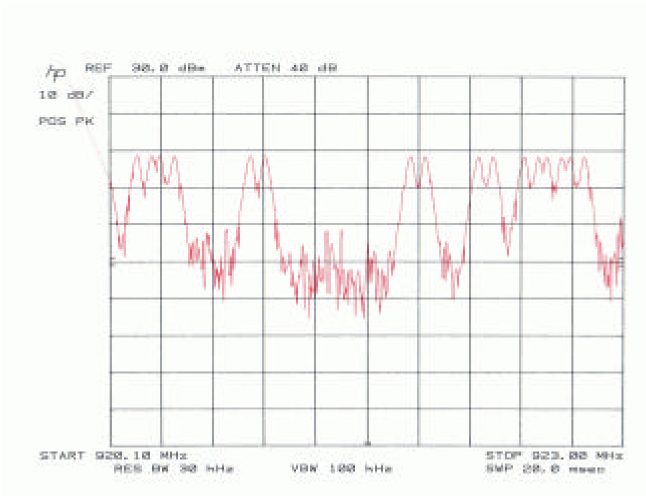


Figure 12, 13: 915.5 – 916.5 MHz – 6 hops, 916.5 – 920.1MHz – 7 hops



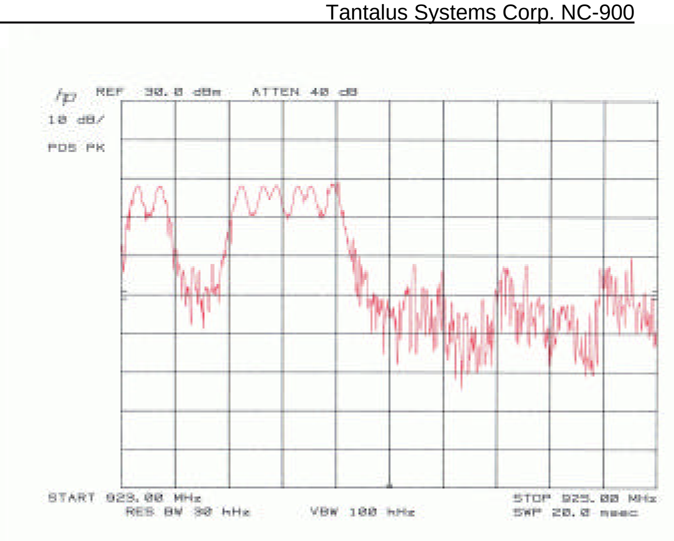


Figure 14, 15: 920.1 – 923 MHz – 8 hops, 923 - 925MHz – 4 hops

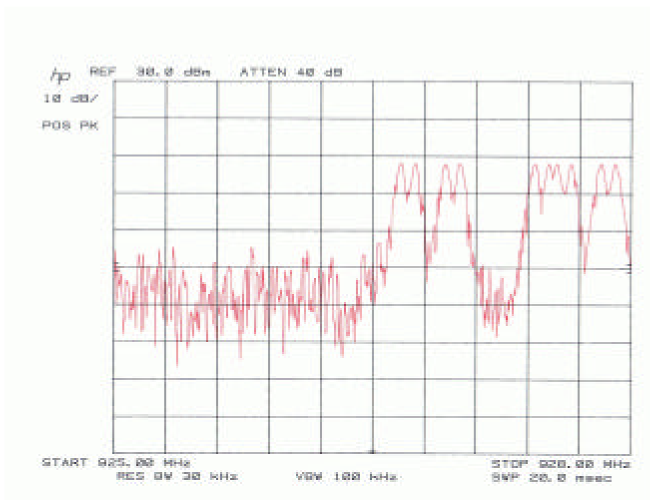


Figure 16: 925 – 928 MHz – 5 hops

Total: 6 + 6 + 4 + 4 + 6 + 7 + 8 + 4 + 5 = 50 hops

Hopping Channels Time of Occupancy

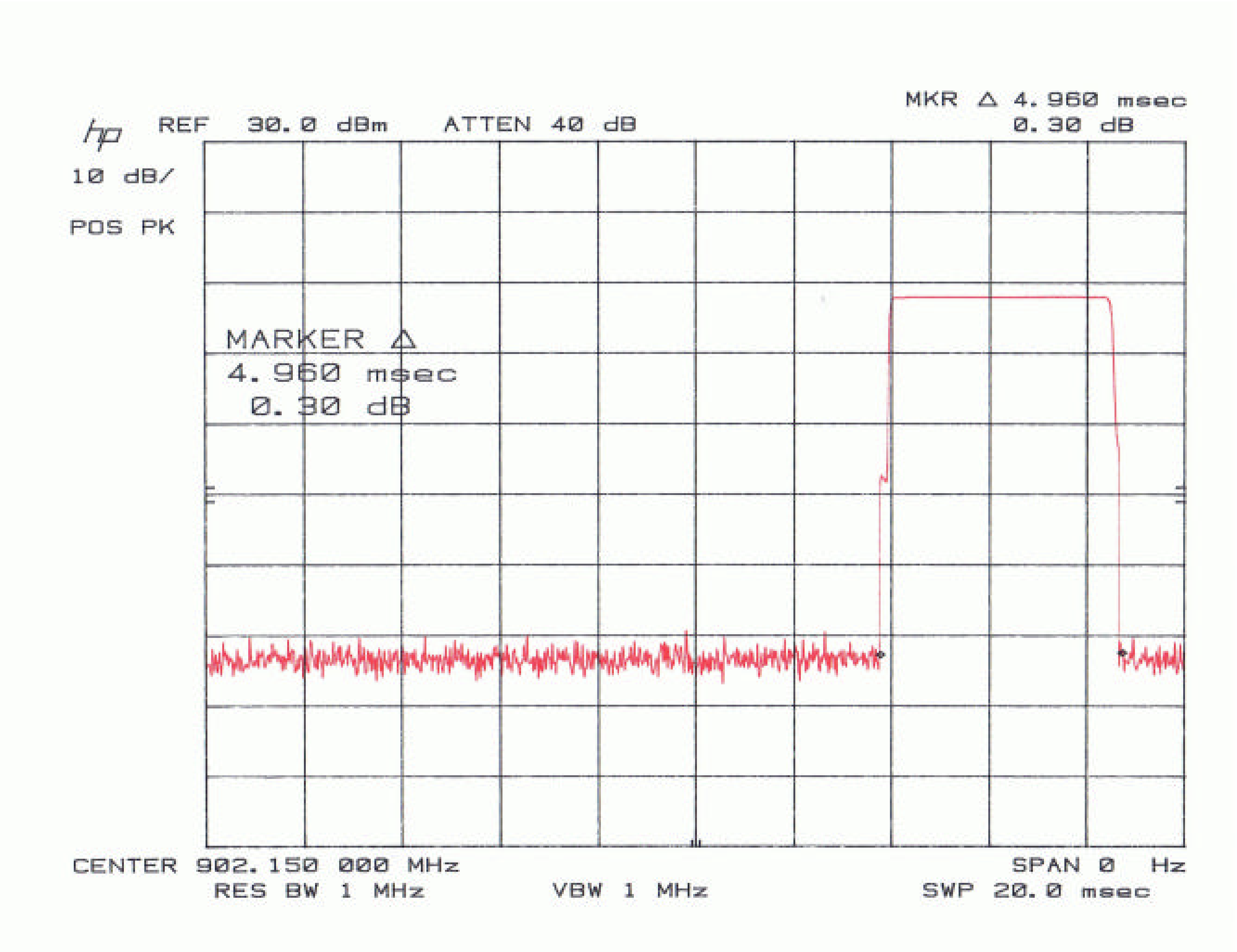


Figure 17: Time of Occupancy per Pulse

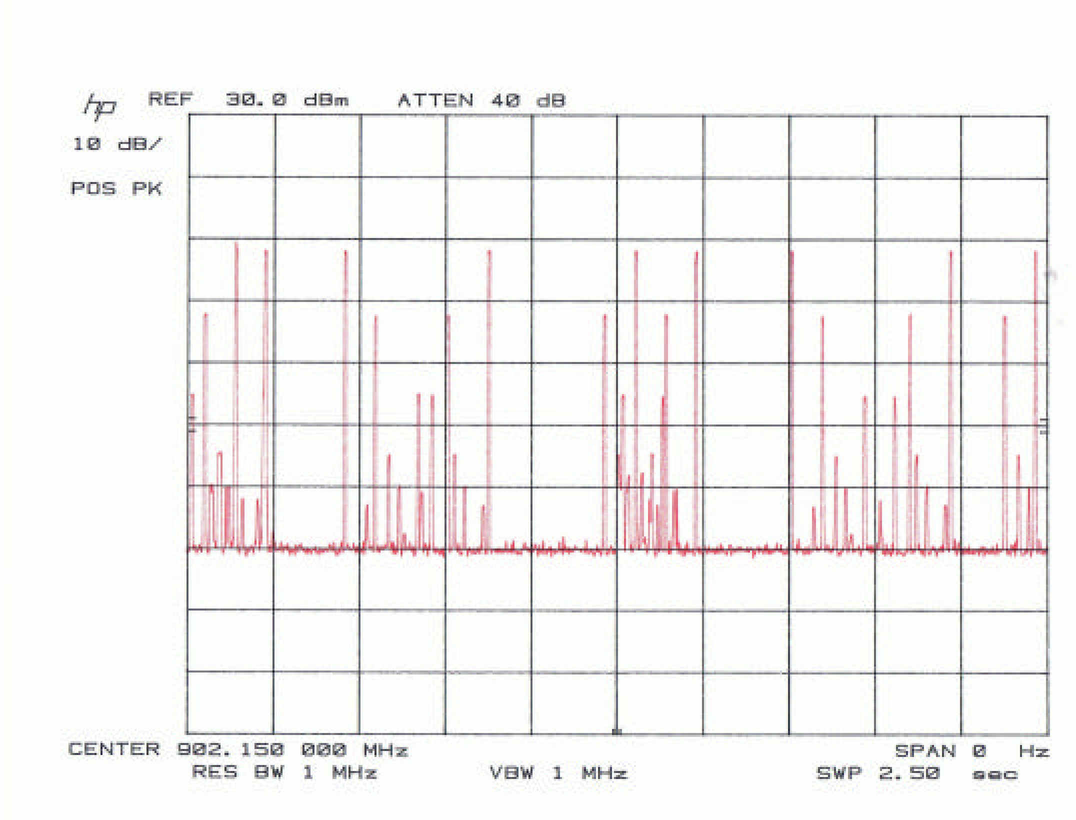


Figure 18: Number of Pulses in a 2.5s Period – 9 Pulses

Note: The lower peaks are due to the wide RBW picking up adjacent channel hops and were not counted as part of the number of transmitted pulses.

Channel Bandedge

NOTE: When measuring the bandedge plots, the four units were set to transmit with different pseudorandom sequences of the same set of 50 hops at accelerated transmit rates to determine the worst case bandedge emissions.

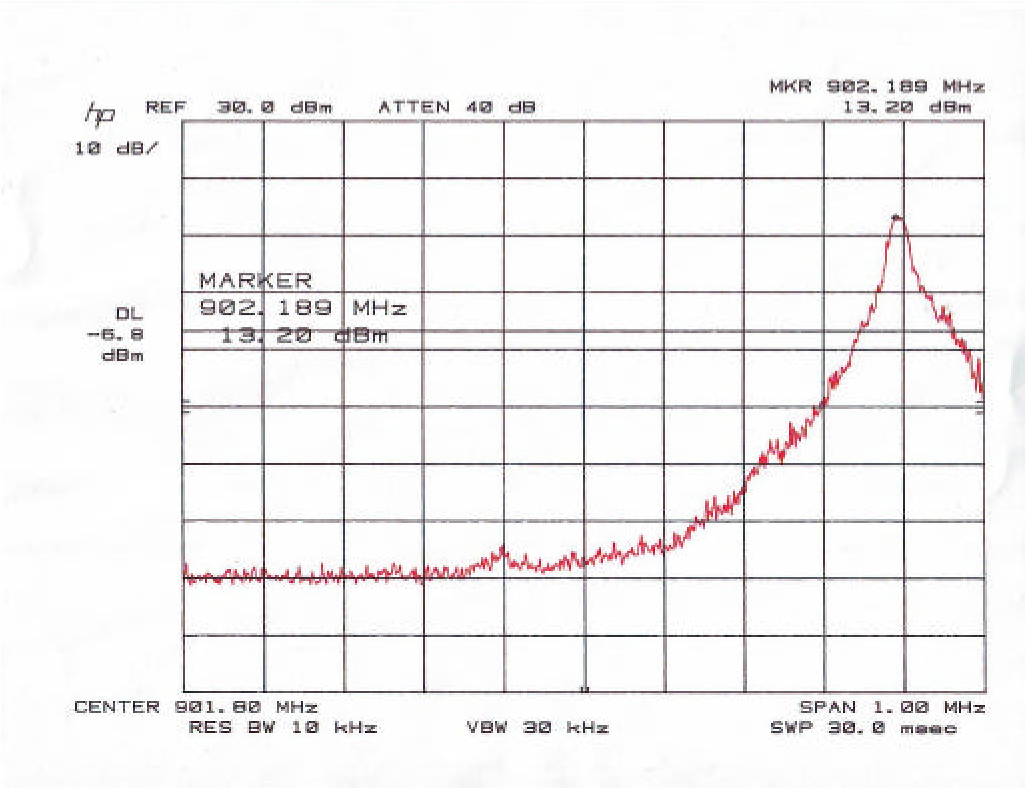


Figure 19: Low Channel Bandedge - Nonhopping Plot

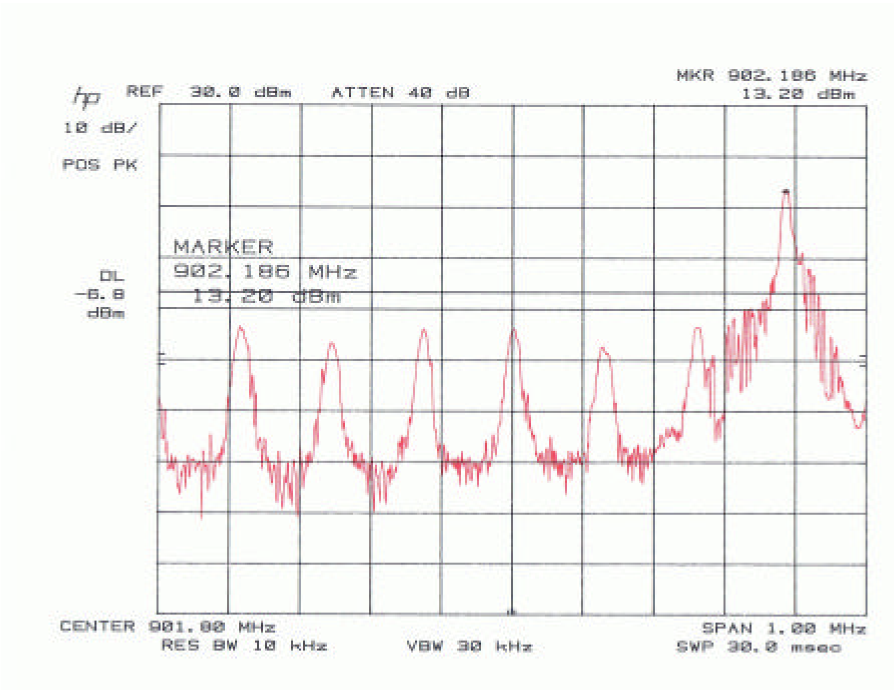


Figure 20: Low Channel Bandedge - Hopping Plot

NOTE: When measuring the bandedge plots, the four units were set to transmit with different pseudorandom sequences of the same set of 50 hops at accelerated transmit rates to determine the worst case bandedge emissions.

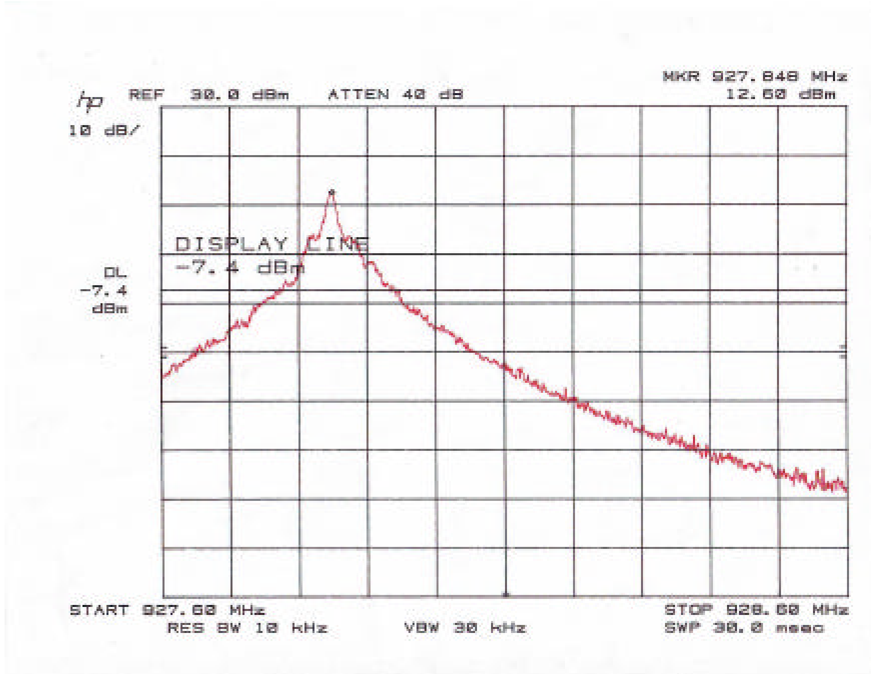


Figure 21: High Channel Bandedge - Nonhopping Plot

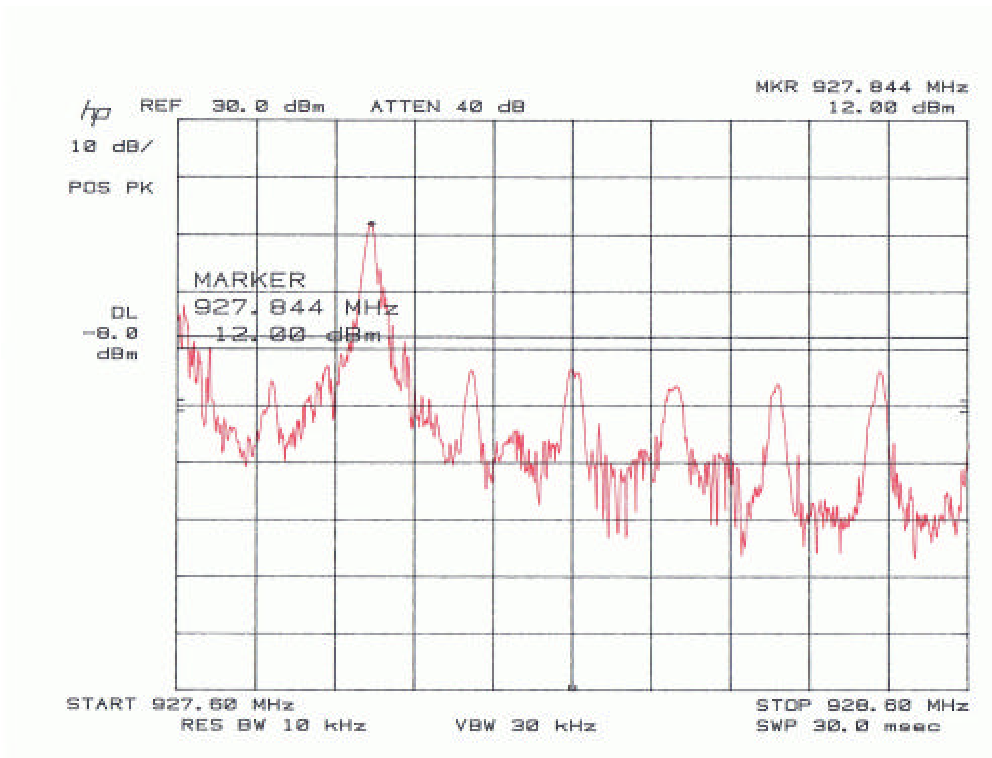


Figure 22: High Channel Bandedge - Hopping Plot

Conducted Output Power and Harmonics

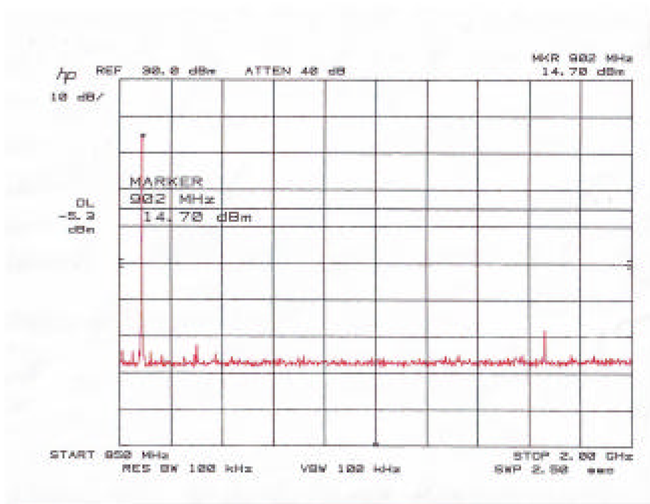


Figure 23: Conducted Output Power - Low Frequency: Fundamental and 2nd Harmonic

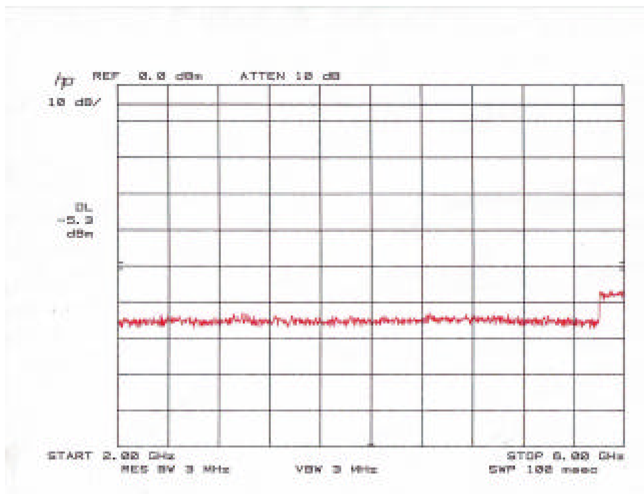


Figure 24: Conducted Output Power – Low Frequency: 3rd to 6th Harmonic

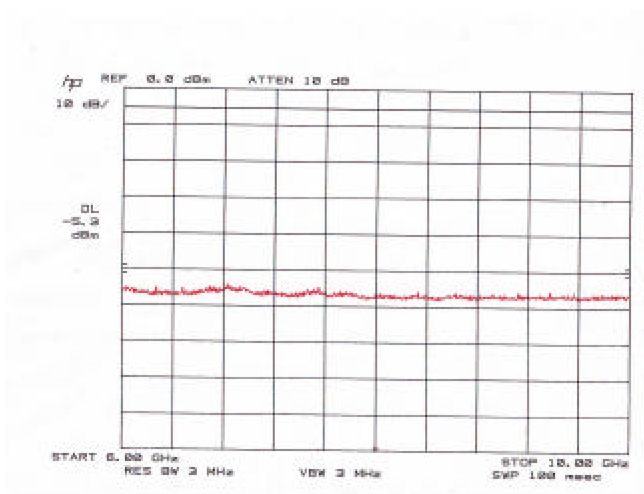


Figure 25: Conducted Output Power – Low Frequency: 7th to 10th Harmonic

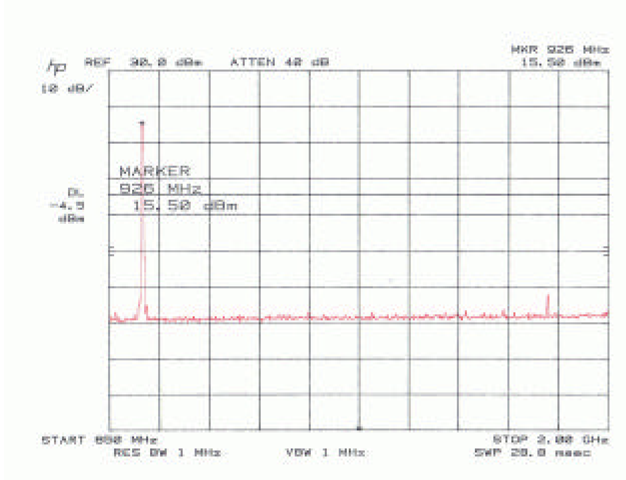


Figure 26: Conducted Output Power – High Frequency: Fundamental and 2nd Harmonic

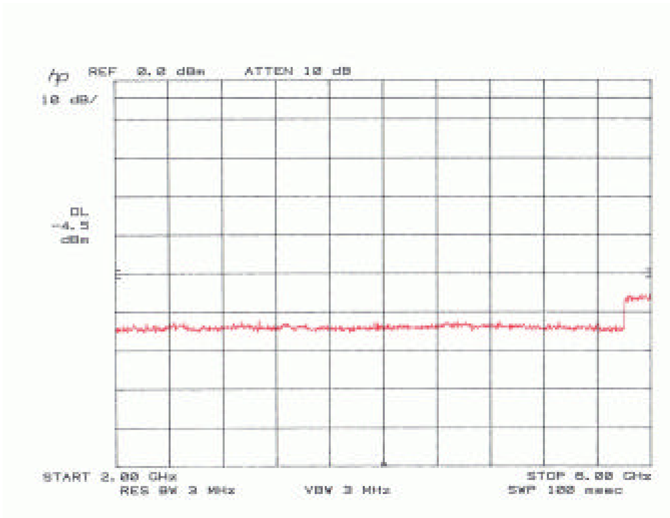


Figure 27: Conducted Output Power – High Frequency: 3rd to 6th Harmonic

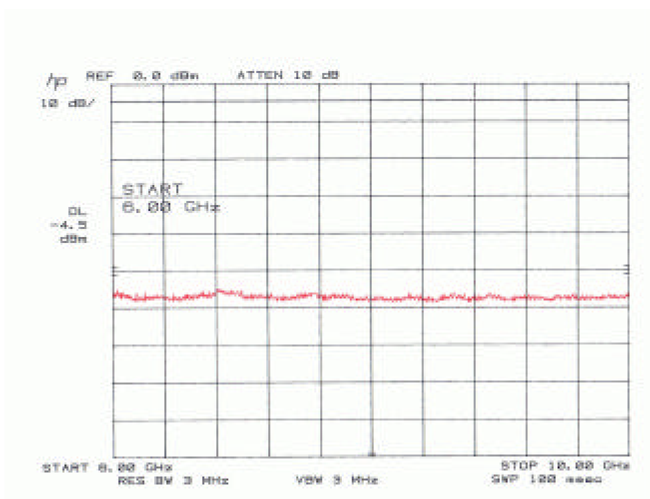


Figure 28: Conducted Output Power – High Frequency: 6rd to 10th Harmonic

Measurement Settings for Harmonics:

RBW: 1MHz
VBW: 10Hz
Span: 10kHz
NOTE: A pre-amplifier was used to amplify harmonics, but was disconnected when measuring the fundamental in fear of damaging the input of the pre-amplifier.
NOTE: Hopping was disabled for all spurious and harmonic emissions testing.

NOTE: For this product, the EUT worst case "ON" time was measured on Figure 17 to be 4.960ms per 100ms. This equates to a possible duty cycle correction factor of -26.08dB, but there is a cap of 20dB per Section 15.35(b), which is applied to the emissions data in Table 5 to Table 10.

NOTE: Harmonic frequencies above the 4th harmonic were below the spectrum analyzer noise floor even after reducing the RBW to 1kHz. Hence, all harmonics data provided only include up to the 4th harmonic.

NOTE: As the 2nd harmonic is not in a restricted band, the level of radiated emissions only has to be 20dB below the fundamental per RSS210 A8.5 and Part 15.247(d).

Table 5: 902.164MHz Horizontal Polarization Data

Frequency	Total Correction Value	Measured Value at 1m (dBuV/m)	Corrected Value at 1m (dBuV/m)	Corrected Value at 3m (dBuV/m)	Limit dB(uV/m) at 3m	Margin	Includes 20dB Duty Cycle Factor	Final Margin
902	34.5	102.5	137.0	127.5	N/A			
1804.286	12.1	89.9	102.0	92.5	107.5	-15.0	20.0	-35.0
2706.417	12.3	***61***	73.3	63.8	54.0	9.8	20.0	-10.2
3608.617	12.3	***42.3***	54.6	45.1	54.0	-8.9	20.0	-28.9

Table 6: 902.164MHz Vertical Polarization Data

Frequency	Total Correction Value	Measured Value at 1m (dBuV/m)	Corrected Value at 1m (dBuV/m)	Corrected Value at 3m (dBuV/m)	Limit dB(uV/m) at 3m	Margin	Includes 20dB Duty Cycle Factor	Final Margin
902	34.5	88.6	123.1	113.6	N/A			
1804.33	12.1	58.8	70.9	61.4	93.6	-32.2	20.0	-52.2
2706.5	12.3	***59.2***	71.5	62.0	54.0	8.0	20.0	-12.0
3608.59	12.3	***36.2***	48.5	39.0	54.0	-15.0	20.0	-35.0

Measurement Settings for Harmonics:

RBW: 1MHz
VBW: 10Hz
Span: 10kHz
NOTE: A pre-amplifier was used to amplify harmonics, but was disconnected when measuring the fundamental in fear of damaging the input of the pre-amplifier.
NOTE: Hopping was disabled for all spurious and harmonic emissions testing.

NOTE: For this product, the EUT worst case "ON" time was measured on Figure 17 to be 4.960ms per 100ms. This equates to a possible duty cycle correction factor of -26.08dB, but there is a cap of 20dB per Section 15.35(b), which is applied to the emissions data in Table 5 to Table 10.

NOTE: Harmonic frequencies above the 4th harmonic were below the spectrum analyzer noise floor even after reducing the RBW to 1kHz. Hence, all harmonics data provided only include up to the 4th harmonic.

NOTE: As the 2nd harmonic is not in a restricted band, the level of radiated emissions only has to be 20dB below the fundamental per RSS210 A8.5 and Part 15.247(d).

Table 7: 915MHz Horizontal Polarization Data

Frequency	Total Correction Value	Measured Value at 1m (dBuV/m)	Corrected Value at 1m (dBuV/m)	Corrected Value at 3m (dBuV/m)	Limit dB(uV/m) at 3m	Margin	Includes 20dB Duty Cycle Factor	Final Margin
914.96	34.5	103	137.5	128.0	N/A			
1829.9	12.3	89.6	101.9	92.4	108.0	-15.6	20.0	-35.6
2745	12.5	***61.9***	74.4	64.9	54.0	10.9	20.0	-9.1
3659.95	12.3	***40.9***	53.2	43.7	54.0	-10.3	20.0	-30.3

Table 8: 915MHz Vertical Polarization Data

Frequency	Total Correction Value	Measured Value at 1m (dBuV/m)	Corrected Value at 1m (dBuV/m)	Corrected Value at 3m (dBuV/m)	Limit dB(uV/m) at 3m	Margin	Includes 20dB Duty Cycle Factor	Final Margin
914.97	34.5	88.8	123.3	113.8	N/A			
1829.93	12.3	64.9	77.2	67.7	93.8	-26.1	20.0	-46.1
2744.025	12.5	***55.5***	68.0	58.5	54.0	4.5	20.0	-15.5
3659.94	12.3	***37.2***	49.5	40.0	54.0	-14.0	20.0	-34.0

Measurement Settings for Harmonics:

RBW: 1MHz
VBW: 10Hz
Span: 10kHz
NOTE: A pre-amplifier was used to amplify harmonics, but was disconnected when measuring the fundamental in fear of damaging the input of the pre-amplifier.
NOTE: Hopping was disabled for all spurious and harmonic emissions testing.

NOTE: For this product, the EUT worst case "ON" time was measured on Figure 17 to be 4.960ms per 100ms. This equates to a possible duty cycle correction factor of -26.08dB, but there is a cap of 20dB per Section 15.35(b), which is applied to the emissions data in Table 5 to Table 10

NOTE: Harmonic frequencies above the 4th harmonic were below the spectrum analyzer noise floor even after reducing the RBW to 1kHz. Hence, all harmonics data provided only include up to the 4th harmonic.

NOTE: As the 2nd harmonic is not in a restricted band, the level of radiated emissions only has to be 20dB below the fundamental per RSS210 A8.5 and Part 15.247(d).

Table 9: 927.84 MHz Horizontal Polarization Data

Frequency	Total Correction Value	Measured Value at 1m (dBuV/m)	Corrected Value at 1m (dBuV/m)	Corrected Value at 3m (dBuV/m)	Limit dB(uV/m) at 3m	Margin	Includes 20dB Duty Cycle Factor	Final Margin
928	34.5	100.6	135.1	125.6	N/A			
1855.68	11.8	88.8	100.6	91.1	105.6	-14.5	20.0	-34.5
2784.01	12.8	***61***	73.8	64.3	54.0	10.3	20.0	-9.7
3711.33	12.4	***43.3***	55.7	46.2	54.0	-7.8	20.0	-27.8

Table 10: 927.84MHz Vertical Polarization Data

Frequency	Total Correction Value	Measured Value at 1m (dBuV/m)	Corrected Value at 1m (dBuV/m)	Corrected Value at 3m (dBuV/m)	Limit dB(uV/m) at 3m	Margin	Includes 20dB Duty Cycle Factor	Final Margin
928	34.5	85.7	120.2	110.7	N/A			
1855.64	11.8	60.5	72.3	62.8	90.7	-27.9	20.0	-47.9
2783.46	12.8	***52.3***	65.1	55.6	54.0	1.6	20.0	-18.4

Appendix B: Test Setup Photos

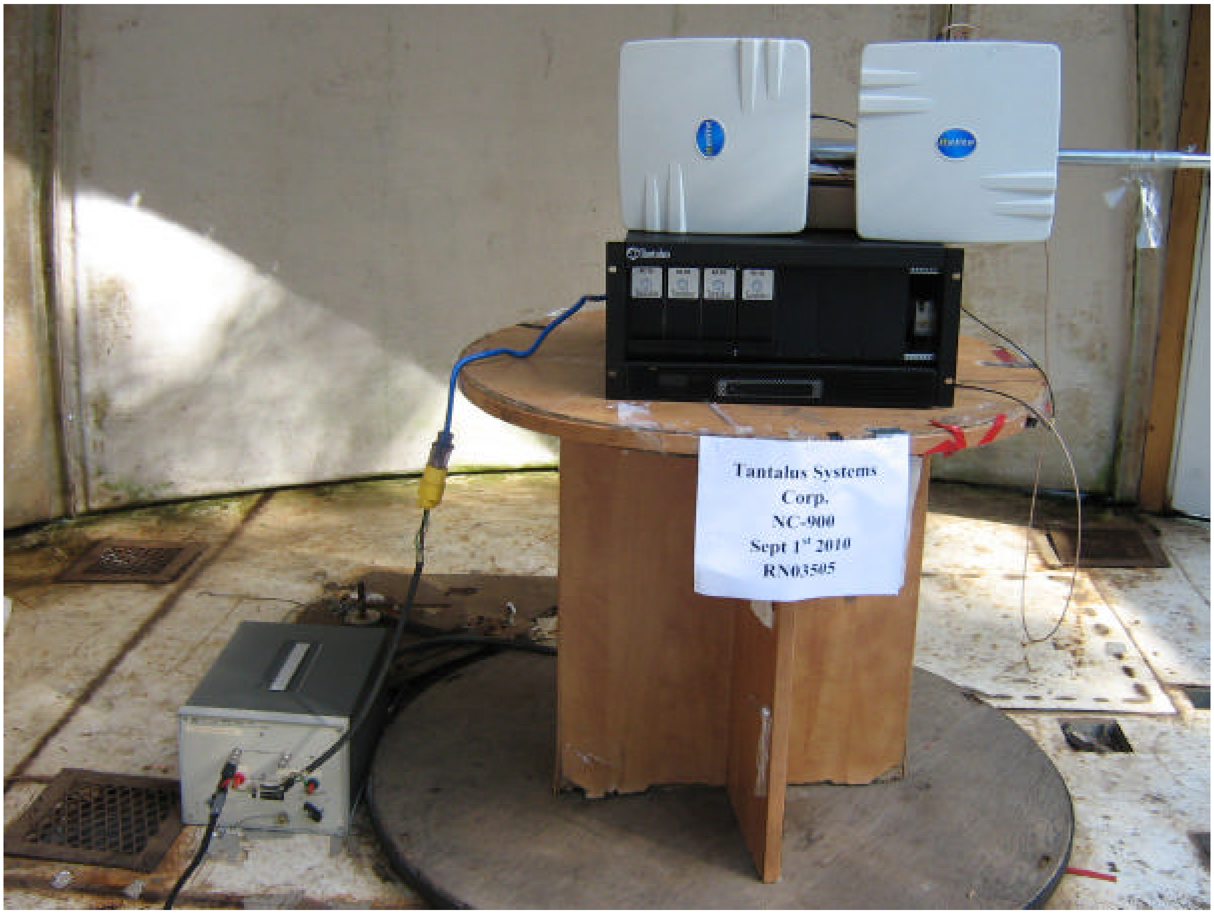


Figure 29 - AC Conducted Test Setup - Front View

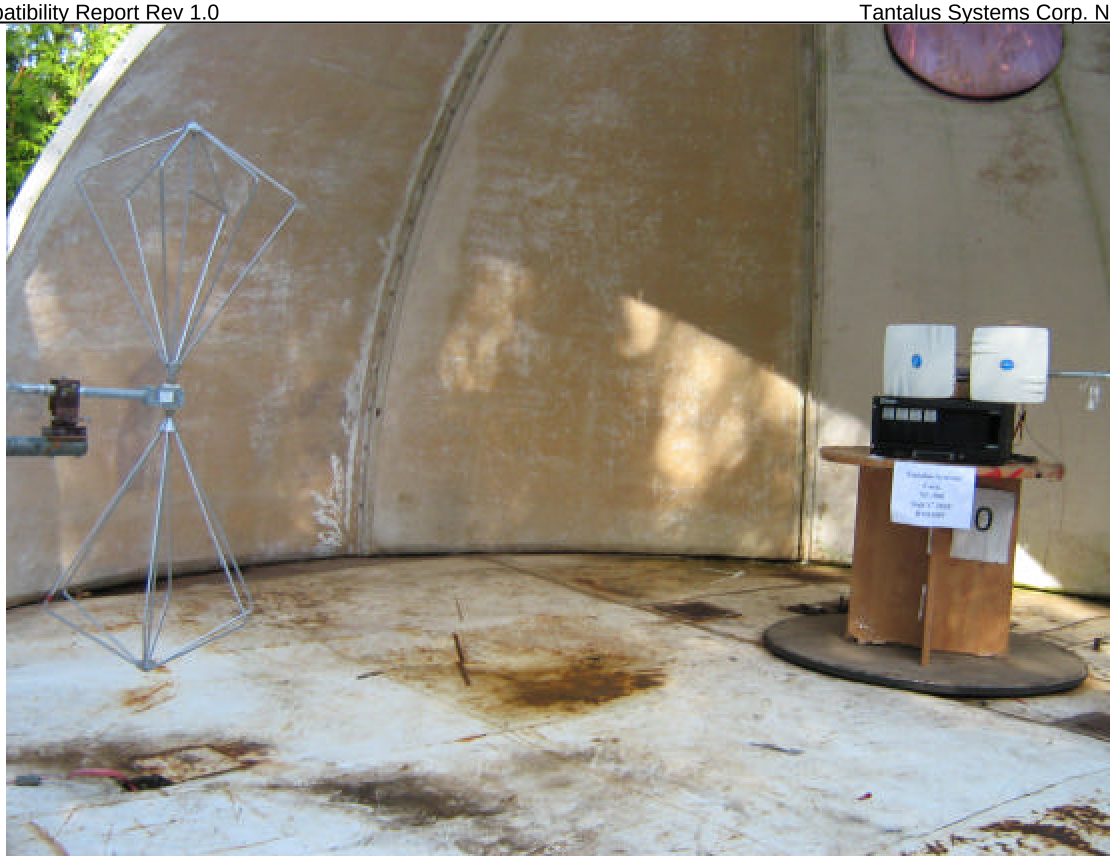


Figure 30 - Emissions Test Setup – Radiated Emissions

Figure 31 - Emissions Test Setup – Ferrites Added to Cabling