



**FCC & Industry Canada Certification Test Report**  
**For the**  
**NBB Controls and Components AG**  
**NANO-M SMJ**

**FCC ID: SJ7NMSMJ915**  
**IC ID: 2634B-NMSMJ915**

WLL JOB# 14077-01 Rev 1  
**February 16, 2016**  
**Re-issued April 19, 2016**

Prepared for:

**NBB Controls and Components AG**  
**Otto-Hahn-Strasse 3-5**  
**Oelbronn-Duerrn, N-A 75248**

Prepared By:

Washington Laboratories, Ltd.  
7560 Lindbergh Drive  
Gaithersburg, Maryland 20879



**Testing Certificate AT-1448**

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Prepared by:



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James Ritter  
EMC Compliance Engineer

Reviewed by:



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Steven D. Koster  
President

## Abstract

This report has been prepared on behalf of NBB Controls and Components AG to support the attached Application for Equipment Authorization. The test report and application are submitted for an Intentional Radiator under Part 15.249(10/2014) of the FCC Rules and Regulations and Spectrum Management and Telecommunications Policy RSS-210 issue 8, 12/2010 of Industry Canada. This Certification Test Report documents the test configuration and test results for the NBB Controls and Components AG NANO-M SMJ.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. The Industry Canada OATS numbers are 3035A-1 and 3035A-2 for Washington Laboratories, Ltd. Site 1 and Site 2, respectively. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ACLASS under Certificate AT-1448 as an independent FCC test laboratory.

The NBB Controls and Components AG NANO-M SMJ complies with the limits for an Intentional Radiator device under FCC Part 15.249 and RSS-210 of Industry Canada.

| Revision History | Description of Change                                                                      | Date              |
|------------------|--------------------------------------------------------------------------------------------|-------------------|
| Rev 0            | Initial Release                                                                            | February 16, 2016 |
| Rev 1            | Corrected internal antennal classification and highest TX spurious emission note corrected | April 19, 2016    |

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## **1 Introduction**

### **1.1 Compliance Statement**

The NBB Controls and Components AG NANO-M SMJ complies with the limits for an Intentional Radiator device under FCC Part 15.249 (10/2014) and Industry Canada RSS-210 issue 8 December 2010.

### **1.2 Test Scope**

Tests for radiated and conducted emissions were performed. All measurements were performed in accordance 2013 version of ANSI C63.10. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

### **1.3 Contract Information**

|                   |                                                                                       |
|-------------------|---------------------------------------------------------------------------------------|
| Customer:         | NBB Controls and Components AG<br>Otto-Hahn-Strasse 3-5<br>Oelbronn-Duerrn, N-A 75248 |
| Quotation Number: | 68821                                                                                 |

### **1.4 Test Dates**

Testing was performed on the following date(s): 12/15/2015 and 2/4/2016

### **1.5 Test and Support Personnel**

|                              |                             |
|------------------------------|-----------------------------|
| Washington Laboratories, LTD | James Ritter, Misael Flores |
| Client Representative        | Thomas Burchard             |

## 1.6 Abbreviations

|             |                                                                      |
|-------------|----------------------------------------------------------------------|
| <b>A</b>    | <b>A</b> mpere                                                       |
| <b>ac</b>   | <b>a</b> lternating <b>c</b> urrent                                  |
| <b>AM</b>   | <b>A</b> mplitude <b>M</b> odulation                                 |
| <b>Amps</b> | <b>A</b> mperes                                                      |
| <b>b/s</b>  | <b>b</b> its per second                                              |
| <b>BW</b>   | <b>B</b> and <b>W</b> idth                                           |
| <b>CE</b>   | <b>C</b> onducted <b>E</b> mission                                   |
| <b>cm</b>   | <b>c</b> entimeter                                                   |
| <b>CW</b>   | <b>C</b> ontinuous <b>W</b> ave                                      |
| <b>dB</b>   | <b>d</b> eci <b>B</b> el                                             |
| <b>dc</b>   | <b>d</b> irect <b>c</b> urrent                                       |
| <b>EMI</b>  | <b>E</b> lectromagnetic <b>I</b> nterference                         |
| <b>EUT</b>  | <b>E</b> quipment <b>U</b> nder <b>T</b> est                         |
| <b>FM</b>   | <b>F</b> requency <b>M</b> odulation                                 |
| <b>G</b>    | <b>g</b> iga – prefix for $10^9$ multiplier                          |
| <b>Hz</b>   | <b>H</b> ertz                                                        |
| <b>IF</b>   | <b>I</b> ntermediate <b>F</b> requency                               |
| <b>k</b>    | <b>k</b> ilo – prefix for $10^3$ multiplier                          |
| <b>LISN</b> | <b>L</b> ine <b>I</b> mpedance <b>S</b> tabilization <b>N</b> etwork |
| <b>M</b>    | <b>M</b> ega – prefix for $10^6$ multiplier                          |
| <b>m</b>    | <b>m</b> eter                                                        |
| <b>μ</b>    | <b>μ</b> icro – prefix for $10^{-6}$ multiplier                      |
| <b>NB</b>   | <b>N</b> arrow <b>b</b> and                                          |
| <b>QP</b>   | <b>Q</b> uasi- <b>P</b> eak                                          |
| <b>RE</b>   | <b>R</b> adiated <b>E</b> missions                                   |
| <b>RF</b>   | <b>R</b> adio <b>F</b> requency                                      |
| <b>rms</b>  | <b>r</b> oot- <b>m</b> ean- <b>s</b> quare                           |
| <b>SN</b>   | <b>S</b> erial <b>N</b> umber                                        |
| <b>S/A</b>  | <b>S</b> pectrum <b>A</b> nalyzer                                    |
| <b>V</b>    | <b>V</b> olt                                                         |

## 2 Equipment Under Test

### 2.1 EUT Identification & Description

The NBB Controls and Components AG NANO-M SMJ is a Low Power Transmitter for industrial radio control purposes.

**Table 1: Device Summary**

| ITEM                         | DESCRIPTION                                  |
|------------------------------|----------------------------------------------|
| Manufacturer:                | NBB Controls and Components AG               |
| FCC ID:                      | SJ7NMSMJ915                                  |
| IC:                          | 2634B-NMSMJ915                               |
| Model:                       | NANO-M SMJ                                   |
| FCC Rule Parts:              | §15.249                                      |
| Industry Canada:             | RSS210                                       |
| Frequency Range:             | 915.00 to 916.65MHz                          |
| Maximum Output Power:        | 21350.7 uV/m at 3m                           |
| Modulation:                  | GFSK                                         |
| Occupied Bandwidth:          | 20.11kHz (20dB), (26.43kHz (99%))            |
| Keying:                      | Manual                                       |
| Type of Information:         | Control Data                                 |
| Number of Channels:          | 67 Channels                                  |
| Power Output Level           | Fixed                                        |
| Antenna Connector            | None                                         |
| Antenna Type                 | internal helix antenna                       |
| Interface Cables:            | None                                         |
| Power Source & Voltage:      | 2 x rechargeable Batteries NBB 7.2 Volt NiMH |
| Emission Designator          | 26K4F1D                                      |
| Highest TX spurious Emission | 4523.85MHz: 379.8 uV @ 3m                    |
| Highest RX Spurious Emission | 53.7MHz: 25.3uV/m @ 3m                       |

### 2.2 Test Configuration

The NANO-M SMJ was is a standalone unit that is battery powered only

The NANO-M SMJ was programmed to transmit on any of 67 channels via toggle buttons on the device that sequentially selected the frequency. The EUT was set to transmit continuously (modulated) on the desired test channel.

Worst case emission levels are provided in the test results data.

## 2.3 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. The Industry Canada OATS numbers are 3035A-1 and 3035A-2 for Washington Laboratories, Ltd. Site 1 and Site 2, respectively. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ACLASS under Certificate AT-1448 as an independent FCC test laboratory.

## 2.4 Measurements

### 2.4.1 References

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.10:2013 American National Standard for Methods of Procedures for Compliance Testing of Unlicensed Wireless Devices.

## 2.5 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 (R2002) with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1 to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see

Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

**Equation 1: Standard Uncertainty**

$$u_c = \pm \sqrt{\frac{a^2}{div_a^2} + \frac{b^2}{div_b^2} + \frac{c^2}{div_c^2} + \dots}$$

Where  $u_c$  = standard uncertainty

$a, b, c, \dots$  = individual uncertainty elements

$Div_{a, b, c}$  = the individual uncertainty element divisor based on the probability distribution

Divisor = 1.732 for rectangular distribution

Divisor = 2 for normal distribution

Divisor = 1.414 for trapezoid distribution

### Equation 2: Expanded Uncertainty

$$U = ku_c$$

Where U = expanded uncertainty  
 k = coverage factor  
 $k \leq 2$  for 95% coverage (ANSI/NCSL Z540-2 Annex G)  
 $u_c$  = standard uncertainty

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in Table 2 below.

**Table 2: Expanded Uncertainty List**

| Scope               | Standard(s)                            | Expanded Uncertainty |
|---------------------|----------------------------------------|----------------------|
| Conducted Emissions | CISPR11, CISPR22, CISPR14, FCC Part 15 | 2.63 dB              |
| Radiated Emissions  | CISPR11, CISPR22, CISPR14, FCC Part 15 | 4.55 dB              |

### 3 Test Equipment

Table 3 shows a list of the test equipment used for measurements along with the calibration information.

**Table 3: Test Equipment List**

| Test Name: <b>Radiated Emissions</b> |                                               | Test Date: <b>02/04/2016</b>  |                 |
|--------------------------------------|-----------------------------------------------|-------------------------------|-----------------|
| <b>Asset #</b>                       | <b>Manufacturer/Model</b>                     | <b>Description</b>            | <b>Cal. Due</b> |
| 528                                  | AGILENT - E4446A                              | 3HZ - 44GHZ ANALYZER SPECTRUM | 7/15/2016       |
| 65                                   | HP - 8447D                                    | PRE-AMPLIFIER RF 50KHZ-1GHZ   | 6/6/2016        |
| 644                                  | SUNOL SCIENCES CORPORATION - JB1 925-833-9936 | BICONALOG ANTENNA             | 8/14/2017       |
| 823                                  | AGILENT - N9010A                              | EXA SPECTRUM ANALYZER         | 8/5/2016        |
| 627                                  | AGILENT - 8449B                               | AMPLIFIER 1-26GHZ             | 6/6/2016        |
| 626                                  | ARA - DRG-118/A                               | ANTENNA HORN                  | 2/29/2016       |

## 4 Test Results

### 4.1 Occupied Bandwidth (FCC Part §2.1049 and RSS-Gen [6.6]):

Occupied bandwidth was performed by coupling the output of the EUT to the input of a spectrum analyzer.

No Limits are provided for this measurement. Since the operating range of this device is 1.65MHz the low and high channels was investigated.

**Table 4: Occupied Bandwidth Spectrum Analyzer Settings**

| Resolution Bandwidth | Video Bandwidth |
|----------------------|-----------------|
| 300Hz                | 3kHz            |

At full modulation, the occupied bandwidth was measured as shown:

Table 5 provides a summary of the Occupied Bandwidth Results.

**Table 5: Occupied Bandwidth Results**

| Frequency               | 20dB Bandwidth | 99% bandwidth | Limit | Pass/Fail |
|-------------------------|----------------|---------------|-------|-----------|
| Low Channel: 915.00MHz  | 20.10kHz       | 25.66kHz      | NA    | Pass      |
| High Channel: 916.65MHz | 20.11kHz       | 26.43kHz      | NA    | Pass      |

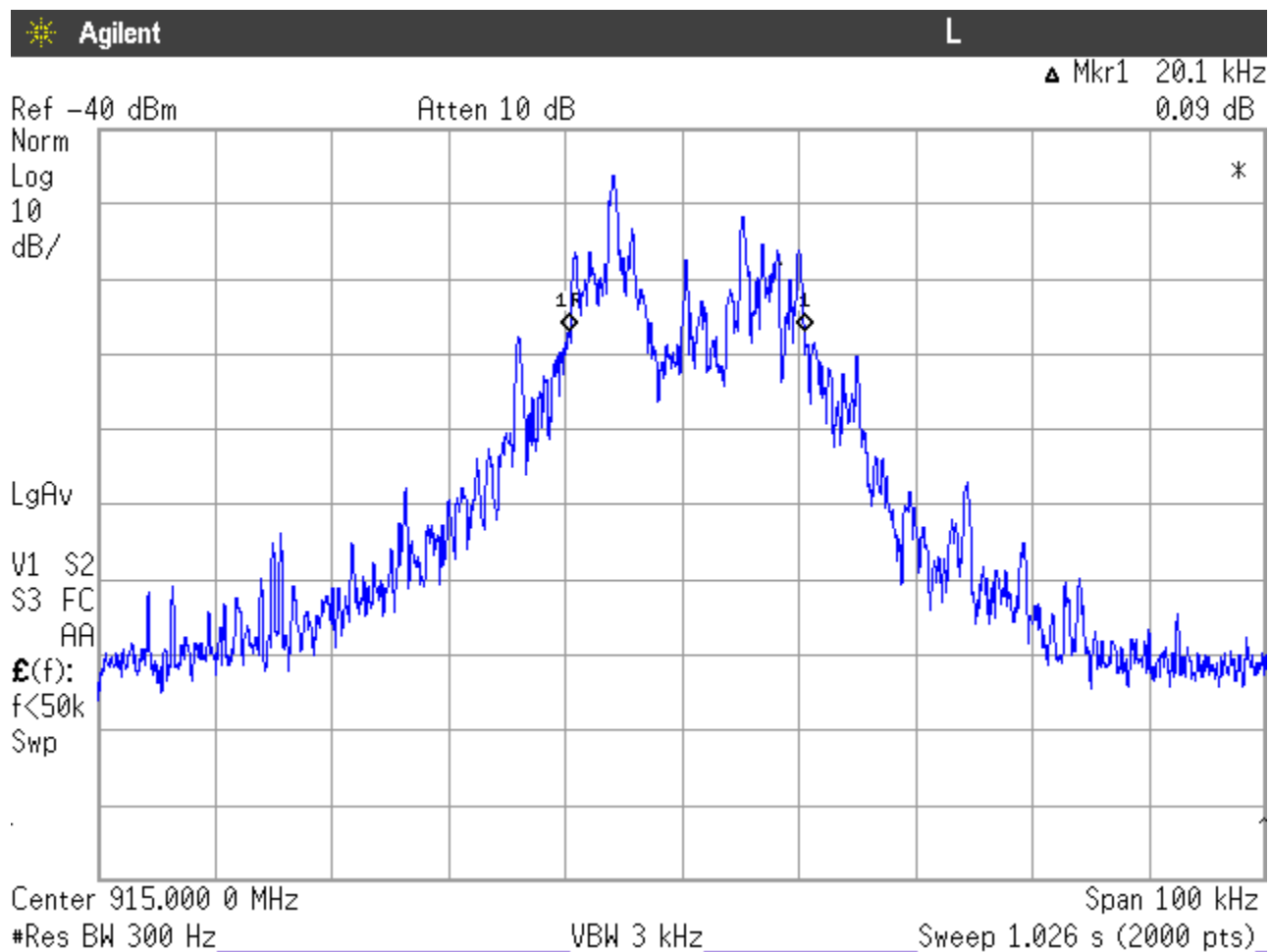
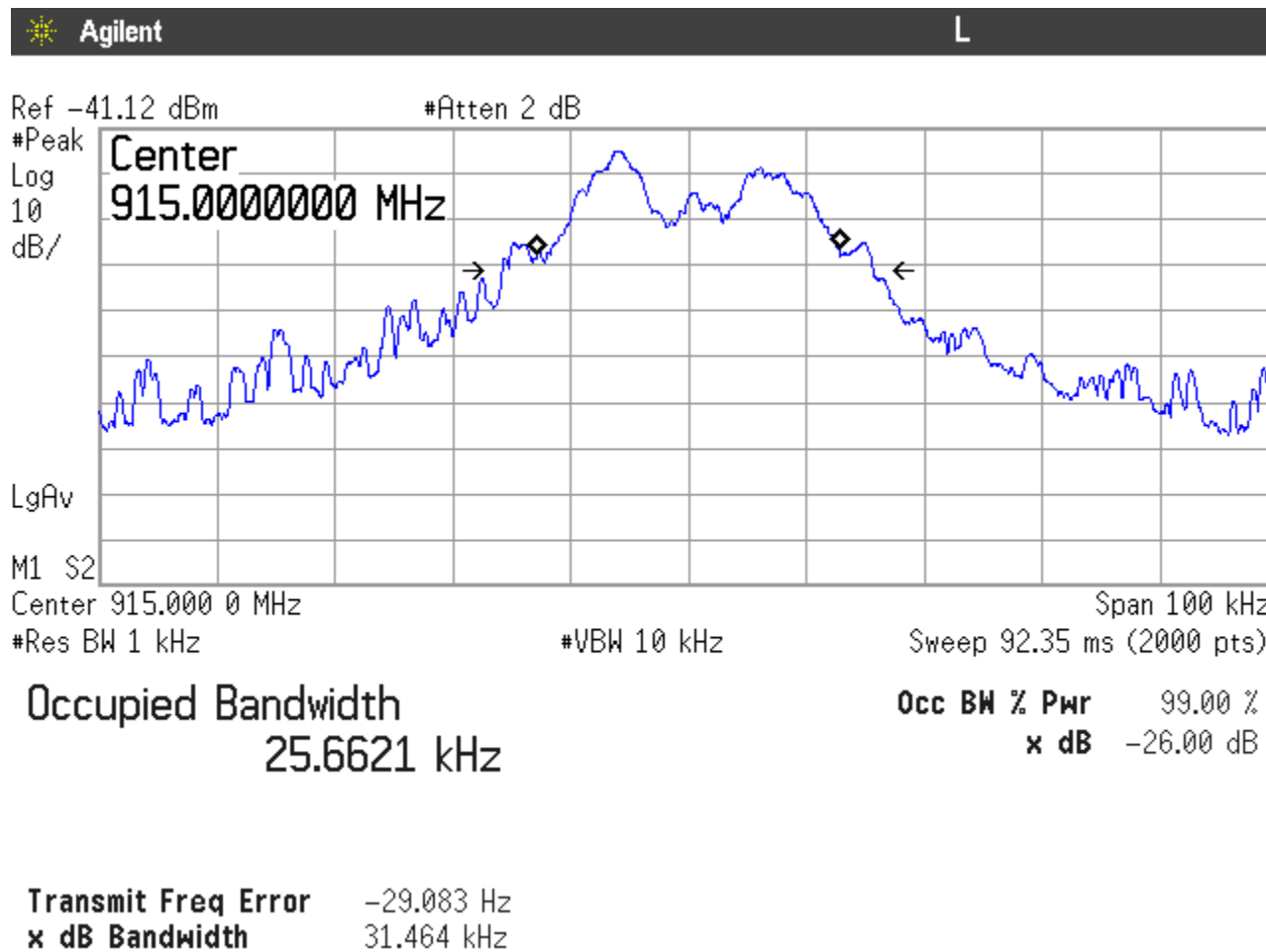
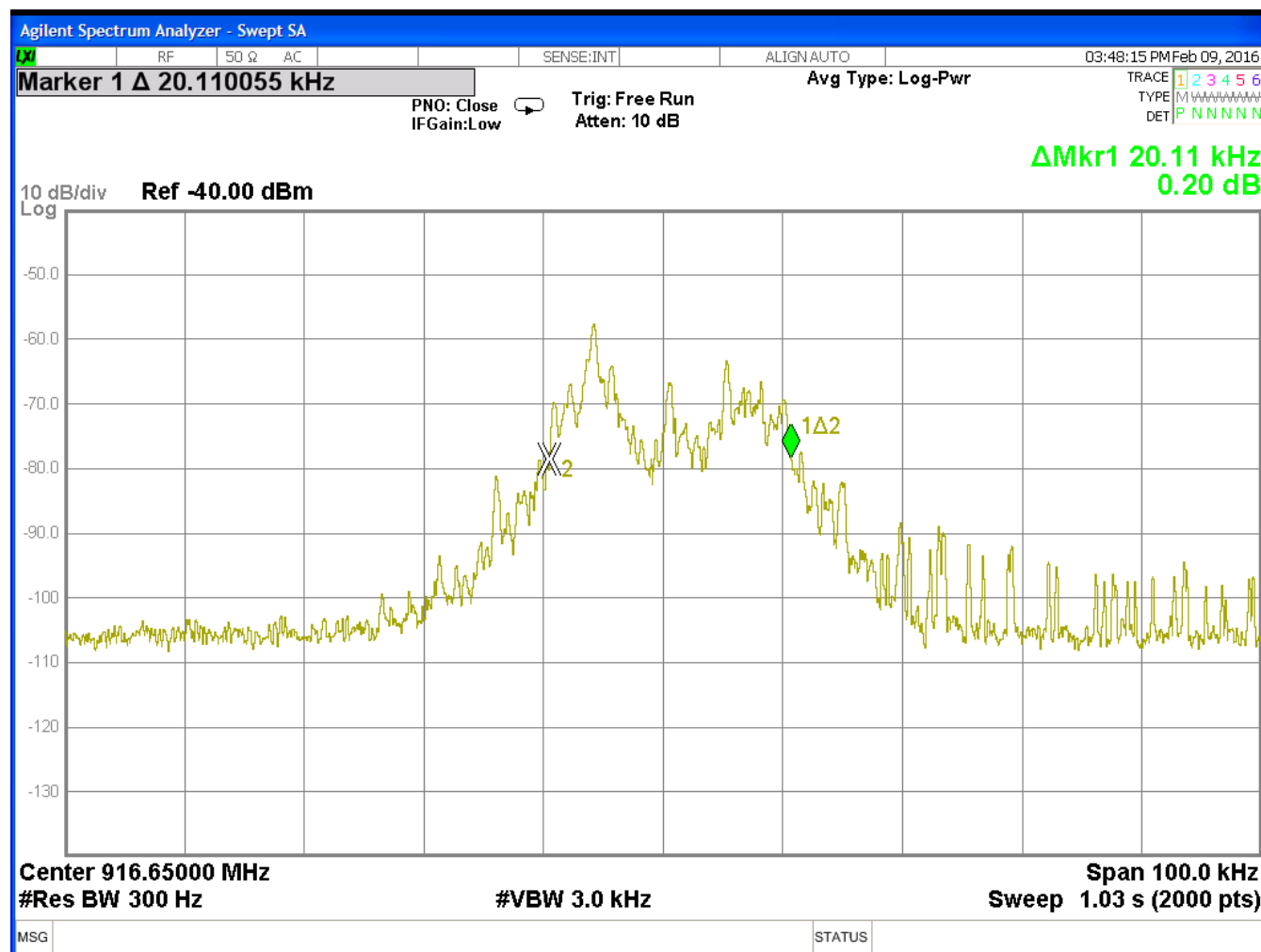


Figure 1: 20dB Occupied Bandwidth, Low Channel



**Figure 2: 99% Occupied Bandwidth, Low Channel**



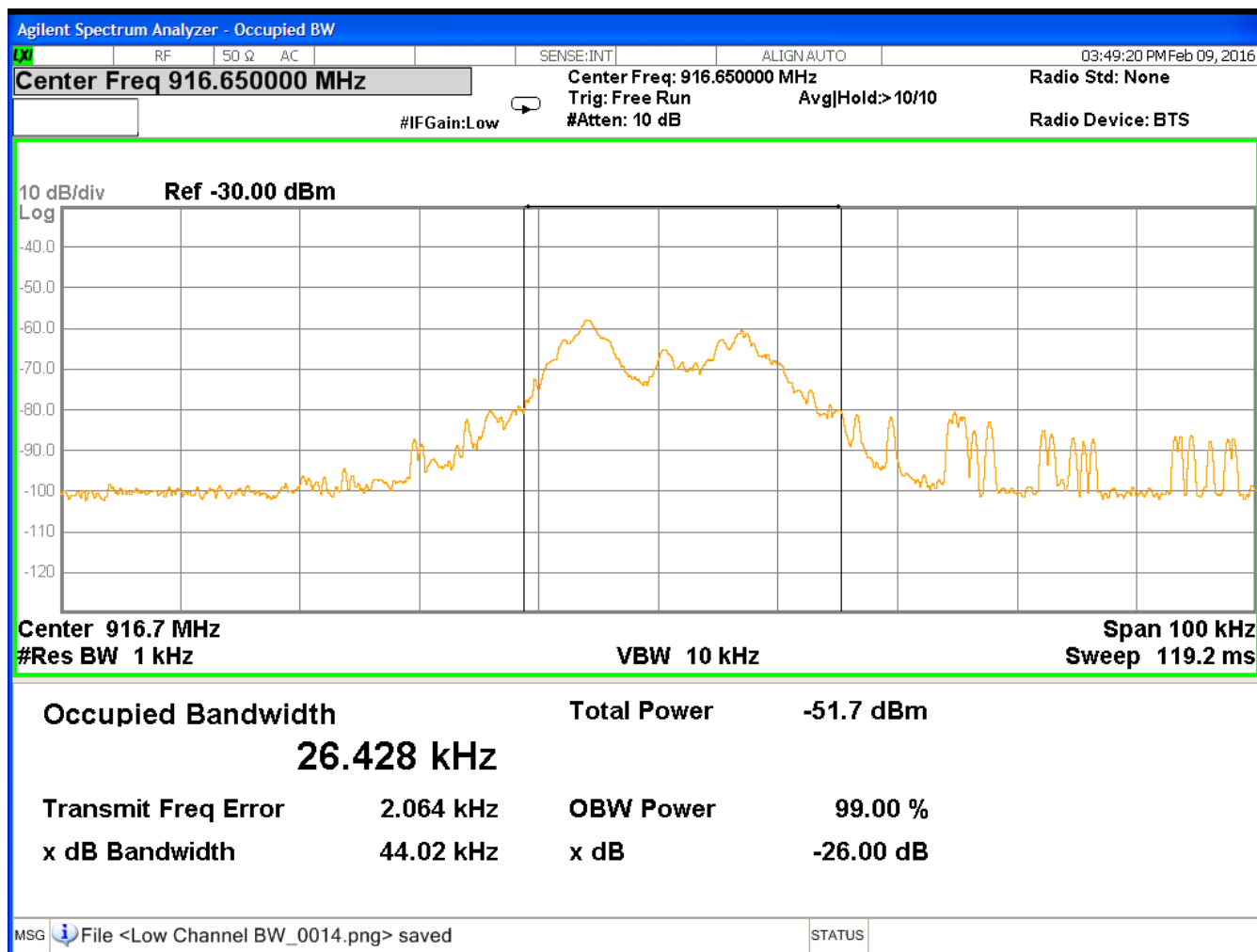


Figure 4: 99% Occupied Bandwidth, High Channel

## 4.2 Radiated Spurious Emissions: (FCC Part §15.249(a), RSS210 A2.9)

### 4.2.1 Limits

The EUT must comply with the radiated emission limits of 15.249(a) & RSS210 A2.9. The limits are as shown in the following table.

**Table 6: Radiated Emissions Limits**

| Fundamental Frequency | Field Strength of Fundamental<br>( $\mu\text{V/m}$ ) | Field Strength of Harmonics<br>( $\mu\text{V/m}$ ) |
|-----------------------|------------------------------------------------------|----------------------------------------------------|
| 902 – 928 MHz         | 50,000                                               | 500                                                |

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

### 4.2.2 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

In accordance with ANSI C63.10 measurements above 1GHz were conducted with RF absorber between the EUT and Receive antenna with the EUT placed 1.5meters above the ground.

Since the operating range of this device is less than 10 MHz only the Low and High channels were investigated.

The emissions were measured using the following resolution bandwidths:

**Table 7: Spectrum Analyzer Settings**

| Frequency Range | Resolution Bandwidth | Video Bandwidth           |
|-----------------|----------------------|---------------------------|
| 30MHz-1000 MHz  | 120kHz               | >100 kHz                  |
| >1000 MHz       | 1 MHz                | 10 Hz (Avg.), 1MHz (Peak) |

Average measurements made with the Spectrum analyzer set to the linear mode with a Video bandwidth of 10Hz, and the resultant reading converted to dBuV. Correction factors were then applied and the resulting value was compared to the limit.

**Table 8: Radiated Emission Test Data, Low Channel**

| Frequency (MHz) | Polarity H/V | Azimuth (Degree) | Ant. Height (m) | SA Level (dBuV) | Corr Factors (dB) | Corr. Level (uV/m) | Limit (uV/m) | Margin (dB) | Comments |
|-----------------|--------------|------------------|-----------------|-----------------|-------------------|--------------------|--------------|-------------|----------|
| 915.00          | V            | 25.00            | 1.00            | 84.77           | 1.8               | 21350.7            | 50000.0      | -7.4        | Pk       |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| 1830.00         | V            | 90.00            | 3.50            | 45.74           | -5.4              | 103.5              | 5000.0       | -33.7       | pk       |
| 1830.00         | V            | 90.00            | 3.50            | 34.73           | -5.4              | 29.1               | 500.0        | -24.7       | avg      |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| 2745.00         | V            | 0.00             | 3.40            | 44.77           | -0.7              | 158.9              | 5000.0       | -30.0       | pk       |
| 2745.00         | V            | 0.00             | 3.40            | 22.80           | -0.7              | 12.7               | 500.0        | -31.9       | avg      |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| Non Harmonics   |              |                  |                 |                 |                   |                    |              |             |          |
| 57.30           | V            | 90.00            | 1.00            | 48.08           | -20.0             | 25.3               | 100.0        | -11.9       |          |
| 116.25          | V            | 180.00           | 1.00            | 39.04           | -13.0             | 20.1               | 150.0        | -17.5       |          |
| 221.18          | V            | 135.00           | 2.25            | 44.41           | -14.8             | 30.1               | 200.0        | -16.5       |          |
| 250.67          | V            | 260.00           | 2.15            | 45.62           | -13.6             | 39.9               | 200.0        | -14.0       |          |
| 301.01          | V            | 270.00           | 1.75            | 45.66           | -11.6             | 50.3               | 200.0        | -12.0       |          |
| 324.40          | V            | 245.00           | 1.50            | 40.21           | -10.9             | 29.1               | 200.0        | -16.7       |          |
| 693.81          | V            | 290.00           | 1.95            | 44.06           | -2.9              | 114.3              | 200.0        | -4.9        | QP       |
| 701.18          | V            | 120.00           | 1.60            | 44.93           | -2.7              | 129.3              | 200.0        | -3.8        | QP       |
| 708.55          | V            | 290.00           | 1.78            | 44.88           | -2.4              | 133.8              | 200.0        | -3.5        | QP       |
| 715.93          | V            | 290.00           | 1.86            | 40.95           | -2.3              | 85.8               | 200.0        | -7.3        | QP       |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| 915.00          | H            | 180.00           | 1.00            | 82.45           | 1.8               | 16346.1            | 50000.0      | -9.7        | pk       |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| 1830.00         | H            | 180.00           | 3.20            | 47.48           | -5.4              | 126.5              | 5000.0       | -31.9       | pk       |
| 1830.00         | H            | 180.00           | 3.20            | 36.90           | -5.4              | 37.4               | 500.0        | -22.5       | avg      |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| 2745.00         | H            | 90.00            | 3.50            | 45.66           | -0.7              | 175.9              | 5000.0       | -29.1       | pk       |
| 2745.00         | H            | 90.00            | 3.50            | 32.70           | -0.7              | 39.6               | 500.0        | -22.0       | avg      |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| Non Harmonics   |              |                  |                 |                 |                   |                    |              |             |          |
| 54.65           | H            | 270.00           | 4.00            | 38.13           | -20.0             | 8.0                | 100.0        | -21.9       |          |
| 114.88          | H            | 45.00            | 4.00            | 44.64           | -13.1             | 37.6               | 150.0        | -12.0       | QP       |
| 221.18          | H            | 45.00            | 1.62            | 42.93           | -14.8             | 25.4               | 200.0        | -17.9       |          |
| 249.98          | H            | 45.00            | 1.83            | 39.84           | -13.6             | 20.5               | 200.0        | -19.8       |          |
| 301.01          | H            | 235.00           | 1.00            | 45.63           | -11.6             | 50.2               | 200.0        | -12.0       |          |
| 315.02          | H            | 270.00           | 1.00            | 40.34           | -11.2             | 28.8               | 200.0        | -16.8       |          |
| 350.02          | H            | 320.00           | 1.00            | 37.31           | -10.1             | 23.0               | 200.0        | -18.8       |          |
| 693.82          | H            | 315.00           | 1.21            | 43.26           | -2.9              | 104.3              | 200.0        | -5.7        | QP       |
| 701.18          | H            | 180.00           | 1.17            | 45.13           | -2.7              | 132.3              | 200.0        | -3.6        | QP       |
| 708.56          | H            | 185.00           | 1.16            | 44.36           | -2.4              | 126.0              | 200.0        | -4.0        | QP       |
| 715.94          | H            | 285.00           | 1.14            | 42.63           | -2.3              | 104.2              | 200.0        | -5.7        |          |

**Table 9: Radiated Emission Test Data, High Channel**

| Frequency (MHz) | Polarity H/V | Azimuth (Degree) | Ant. Height (m) | SA Level (dBuV) | Corr Factors (dB) | Corr. Level (uV/m) | Limit (uV/m) | Margin (dB) | Comments |
|-----------------|--------------|------------------|-----------------|-----------------|-------------------|--------------------|--------------|-------------|----------|
| 916.65          | V            | 45.00            | 1.50            | 83.28           | 1.4               | 17134.6            | 50000.0      | -9.3        | pk Power |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| 1833.30         | V            | 270.00           | 4.00            | 55.19           | -5.4              | 308.2              | 5000.0       | -24.2       | pk       |
| 1833.30         | V            | 270.00           | 4.00            | 41.53           | -5.4              | 63.9               | 500.0        | -17.9       | Avg      |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| 2749.95         | V            | 45.00            | 4.00            | 49.79           | -0.8              | 283.0              | 5000.0       | -24.9       | pk       |
| 2749.95         | V            | 45.00            | 4.00            | 43.27           | -0.8              | 133.6              | 500.0        | -11.5       | Avg      |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| 4583.25         | V            | 105.00           | 4.00            | 48.03           | 3.6               | 379.8              | 5000.0       | -22.4       | pk       |
| 4583.25         | V            | 105.00           | 4.00            | 39.75           | 3.6               | 146.4              | 500.0        | -10.7       | Avg      |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| Non Harmonics   |              |                  |                 |                 |                   |                    |              |             |          |
| 57.30           | V            | 90.00            | 1.00            | 48.08           | -20.0             | 25.3               | 100.0        | -11.9       |          |
| 116.25          | V            | 180.00           | 1.00            | 39.04           | -13.0             | 20.1               | 150.0        | -17.5       |          |
| 221.18          | V            | 135.00           | 2.25            | 44.41           | -14.8             | 30.1               | 200.0        | -16.5       |          |
| 250.67          | V            | 260.00           | 2.15            | 45.62           | -13.6             | 39.9               | 200.0        | -14.0       |          |
| 301.01          | V            | 270.00           | 1.75            | 45.66           | -11.6             | 50.3               | 200.0        | -12.0       |          |
| 324.40          | V            | 245.00           | 1.50            | 40.21           | -10.9             | 29.1               | 200.0        | -16.7       |          |
| 698.31          | V            | 290.00           | 1.95            | 44.06           | -2.9              | 114.3              | 200.0        | -4.9        | QP       |
| 705.68          | V            | 120.00           | 1.60            | 44.93           | -2.7              | 129.3              | 200.0        | -3.8        | QP       |
| 713.05          | V            | 290.00           | 1.78            | 44.88           | -2.4              | 133.8              | 200.0        | -3.5        | QP       |
| 720.43          | V            | 290.00           | 1.86            | 40.95           | -2.3              | 85.8               | 200.0        | -7.3        | QP       |
| 1145.18         | V            | 45.00            | 4.00            | 48.58           | -8.7              | 98.5               | 500.0        | -14.1       |          |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| 916.65          | H            | 180.00           | 1.00            | 75.38           | 1.4               | 6902.8             | 50000.0      | -17.2       | pk Power |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| 1833.30         | H            | 205.00           | 4.00            | 51.36           | -5.4              | 198.3              | 5000.0       | -28.0       | pk       |
| 1833.30         | H            | 205.00           | 4.00            | 43.10           | -5.4              | 76.6               | 500.0        | -16.3       | Avg      |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| 2749.95         | H            | 90.00            | 3.20            | 51.67           | -0.8              | 351.3              | 5000.0       | -23.1       | pk       |
| 2749.95         | H            | 90.00            | 3.20            | 43.52           | -0.8              | 137.4              | 500.0        | -11.2       | Avg      |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| 4583.25         | H            | 205.00           | 4.00            | 49.20           | 3.6               | 434.5              | 5000.0       | -21.2       | pk       |
| 4583.25         | H            | 205.00           | 4.00            | 41.17           | 3.6               | 172.4              | 500.0        | -9.2        | Avg      |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| Non Harmonics   |              |                  |                 |                 |                   |                    |              |             |          |
| 54.65           | H            | 270.00           | 4.00            | 38.13           | -20.0             | 8.0                | 100.0        | -21.9       |          |
| 114.88          | H            | 45.00            | 4.00            | 44.64           | -13.1             | 37.6               | 150.0        | -12.0       | QP       |
| 221.18          | H            | 45.00            | 1.62            | 42.93           | -14.8             | 25.4               | 200.0        | -17.9       |          |
| 249.98          | H            | 45.00            | 1.83            | 39.84           | -13.6             | 20.5               | 200.0        | -19.8       |          |

|        |   |        |      |       |       |       |       |       |                |
|--------|---|--------|------|-------|-------|-------|-------|-------|----------------|
| 301.01 | H | 235.00 | 1.00 | 45.63 | -11.6 | 50.2  | 200.0 | -12.0 | QP<br>QP<br>QP |
| 315.02 | H | 270.00 | 1.00 | 40.34 | -11.2 | 28.8  | 200.0 | -16.8 |                |
| 350.02 | H | 320.00 | 1.00 | 37.31 | -10.1 | 23.0  | 200.0 | -18.8 |                |
| 698.31 | H | 315.00 | 1.21 | 43.26 | -2.9  | 104.3 | 200.0 | -5.7  |                |
| 705.68 | H | 180.00 | 1.17 | 45.13 | -2.7  | 132.3 | 200.0 | -3.6  |                |
| 713.05 | H | 185.00 | 1.16 | 44.36 | -2.4  | 126.0 | 200.0 | -4.0  |                |
| 720.43 | H | 285.00 | 1.14 | 42.63 | -2.3  | 104.2 | 200.0 | -5.7  |                |

### 4.3 Receiver Radiated Spurious Emissions

The EUT must comply with the requirements for radiated spurious emissions that fall within the restricted bands. These emissions must meet the limits specified in §15.209 and §15.35(b) for peak measurements.

#### 4.3.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters.. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

Measurements above 1GHz were performed with RF absorber material placed on the site between the receive antenna and the EUT unit.

The emissions were measured using the following resolution bandwidths:

**Table 10: Spectrum Analyzer Settings**

| Frequency Range | Resolution Bandwidth | Video Bandwidth           |
|-----------------|----------------------|---------------------------|
| 30MHz-1000 MHz  | 120kHz               | >100 kHz                  |
| >1000 MHz       | 1 MHz                | 10 Hz (Avg.), 1MHz (Peak) |

Average measurements above 1GHz were made with the Spectrum analyzer set to the linear mode with a Video bandwidth of 10Hz, and the resultant reading mathematically converted to dBuV. Correction factors were then applied and the resulting value was compared to the limit.

**Table 11: Radiated Emission Test Data, Receiver**

| Frequency (MHz) | Polarity H/V | Azimuth (Degree) | Ant. Height (m) | SA Level (dBuV) | Corr Factors (dB) | Corr. Level (uV/m) | Limit (uV/m) | Margin (dB) | Comments |
|-----------------|--------------|------------------|-----------------|-----------------|-------------------|--------------------|--------------|-------------|----------|
| 57.30           | V            | 90.00            | 1.00            | 48.08           | -20.0             | 25.3               | 100.0        | -11.9       | QP       |
| 116.25          | V            | 180.00           | 1.00            | 39.04           | -13.0             | 20.1               | 150.0        | -17.5       |          |
| 221.18          | V            | 135.00           | 2.25            | 44.41           | -14.8             | 30.1               | 200.0        | -16.5       |          |
| 250.67          | V            | 260.00           | 2.15            | 45.62           | -13.6             | 39.9               | 200.0        | -14.0       |          |
| 301.01          | V            | 270.00           | 1.75            | 45.66           | -11.6             | 50.3               | 200.0        | -12.0       |          |
| 324.40          | V            | 245.00           | 1.50            | 40.21           | -10.9             | 29.1               | 200.0        | -16.7       |          |
|                 |              |                  |                 |                 |                   |                    |              |             |          |
| 54.65           | H            | 270.00           | 4.00            | 38.13           | -20.0             | 8.0                | 100.0        | -21.9       |          |
| 114.88          | H            | 45.00            | 4.00            | 44.64           | -13.1             | 37.6               | 150.0        | -12.0       |          |
| 221.18          | H            | 45.00            | 1.62            | 42.93           | -14.8             | 25.4               | 200.0        | -17.9       |          |
| 249.98          | H            | 45.00            | 1.83            | 39.84           | -13.6             | 20.5               | 200.0        | -19.8       |          |
| 301.01          | H            | 235.00           | 1.00            | 45.63           | -11.6             | 50.2               | 200.0        | -12.0       |          |
| 315.02          | H            | 270.00           | 1.00            | 40.34           | -11.2             | 28.8               | 200.0        | -16.8       |          |
| 350.02          | H            | 320.00           | 1.00            | 37.31           | -10.1             | 23.0               | 200.0        | -18.8       |          |