*FCC PART 15, SUBPART B and C; RSS-247 and RSS-GEN*
*TEST REPORT*

*for*

# SMART CONTROLLER

# MODEL: MMS915

Prepared for

NORTEK SECURITY & CONTROL, LLC
5919 SEA OTTER PLACE
CARLSBAD, CALIFORNIA 92010

Prepared by:_____

KYLE FUJIMOTO

Approved by:_____

JAMES ROSS

COMPATIBLE ELECTRONICS INC.
114 OLINDA DRIVE
BREA, CALIFORNIA 92823
(714) 579-0500

DATE: NOVEMBER 26, 2019

| | REPORT BODY | APPENDICES | | | | | TOTAL |
|---|---|---|---|---|---|---|---|
| | | ***A*** | ***B*** | ***C*** | ***D*** | ***E*** | |
| PAGES | 22 | 2 | 2 | 2 | 13 | 60 | **101** |



NVLAP® TESTING
NVLAP LAB CODE 200528-0

ilac-MRA

## 4. DESCRIPTION OF TEST CONFIGURATION

The Smart Controller, Model: MMS915 (EUT) was connected to two (2) garage door sensors and a switching power supply via its primary and secondary G, W, R, B; and DC in ports, respectively.

The EUT also had a cable connected to a power resistor via its Aux V+, Aux V-, C and NC ports.

Last, the EUT had two (2) unterminated cables connected to it via the following ports:

Unterminated Cable #1 was connected to the Lock V+, Lock V-, C, NO, NC ports of the EUT. Unterminated Cable #2 was connected to the COM, COM, CYCL, SAFE, EXIT, SHDW, OPEN EDGE, and CLOSE EDGE ports of the EUT.

When being programmed, the EUT was also connected to a laptop. The laptop was also connected to an AC Adapter. The programming allowed the EUT to operate at the low, middle, and high channels for 900 MHz FHSS in both transmit and receive modes. The laptop was removed prior to the testing.

It was determined that the emissions were at their highest level when the EUT was operating in the above configuration. The final emissions data was taken in this mode of operation and any cables were maximized. All initial investigations were performed with the EMI Receiver in manual mode scanning the frequency range continuously. Photographs of the test setup are in Appendix D of this report.

## LIST OF APPENDICES



## LIST OF FIGURES



## LIST OF TABLES

# GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product certification, approval or endorsement by NVLAP, NIST or any agency of the federal government.

| | |
|---|---|
| Device Tested: | Smart Controller<br>Model: MMS915<br>S/N: N/A |
| Product Description: | The EUT is an automatic gate controller that has a 900 MHz FHSS intentional radiator. |
| Modifications: | The EUT was not modified in order to meet the specifications. |
| Customer: | Nortek Security & Control, LLC<br>5919 Sea Otter Place<br>Carlsbad, California 92010 |
| Test Dates: | August 5 and 12, 2019; September 25, 2019; October 3 and 18, 2019; and April 8, 2020 |

Test Specifications covered by accreditation:

Emissions requirements
CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.247;
RSS-247 and RSS-GEN
Test Procedure: ANSI C63.4 and ANSI C63.10

NVLAP® TESTING
NVLAP LAB CODE 200528-0

ilac-MRA

# SUMMARY OF TEST RESULTS

| *TEST* | DESCRIPTION | RESULTS |
|---|---|---|
| 1 | Conducted RF Emissions, 150 kHz - 30 MHz | The EUT complies with the **Class B** limits of CFR Title 47, Part 15 Subpart B; the limits of CFR Title 47, Part 15, Subpart C, section 15.207; RSS-247 and RSS-GEN<br>See section 6.3 for Measurement Uncertainty |
| 2 | Radiated RF Emissions, 9 kHz – 9300 MHz | The EUT complies with the **Class B** limits of CFR Title 47, Part 15 Subpart B; the limits of CFR Title 47, Part 15, Subpart C, section 15.209; RSS-247 and RSS-GEN<br>See section 6.3 for Measurement Uncertainty |
| 3 | 20 dB Bandwidth | Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247 (a)(1)(i); RSS-247 and RSS-GEN |
| 4 | Peak Power Output | Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.247 (b)(2); RSS-247 and RSS-GEN |
| 5 | RF Band Edges | Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.247 (d); RSS-247 and RSS-GEN |
| 6 | Number of Hopping Frequencies | Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.247 (a)(1)(i); RSS-247 and RSS-GEN |
| 7 | RF Conducted Antenna Test | Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.247 (d); RSS-247 and RSS-GEN |
| 8 | Carrier Frequency Separation | Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247 (a)(1); RSS-247 and RSS-GEN |
| 9 | Average Time of Occupancy | Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.247 (a)(1)(i); RSS-247 and RSS-GEN |
| 10 | Variation of Input Power | Complies with the relevant requirements of CFR Title 47, Part 15, Subpart A, section 15.31 (e); RSS-247 and RSS-GEN |

## 1. PURPOSE

This document is a qualification test report based on the emissions tests performed on the Smart Controller, Model: MMS915. The emissions measurements were performed according to the measurement procedure described in ANSI C63.4 and ANSI C63.10. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the **Class B** specification limits defined by CFR Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.247; RSS-247 and RSS-GEN.

# 2. ADMINISTRATIVE DATA

## 2.1 Location of Testing

The emissions tests described herein were performed at the test facility of Compatible Electronics, 114 Olinda Drive, Brea, California 92823.

## 2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

## 2.3 Cognizant Personnel

Nortek Security & Control, LLC

| | |
|---|---|
| Josh Hansen | Engineering Manager, Regulatory |

Compatible Electronics Inc.

| | |
|---|---|
| Kyle Fujimoto | Test Engineer |
| Harvey Samaco | Test Technician |
| James Ross | Test Engineer |

## 2.4 Date Test Sample was Received

The test sample was received on prior to the initial test date.

## 2.5 Disposition of the Test Sample

The test sample has not been returned to Nortek Secuity & Control, LLC as of the date of this test report.

## 2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

| | |
|---|---|
| dB | Decibel |
| RF | Radio Frequency |
| EMI | Electromagnetic Interference |
| EUT | Equipment Under Test |
| P/N | Part Number |
| S/N | Serial Number |
| AC | Alternating Current |
| ITE | Information Technology Equipment |
| LISN | Line Impedance Stabilization Network |
| N/A | Not Applicable |
| Tx | Transmit |
| Rx | Receive |
| FHSS | Frequency Hopping Spread Spectrum |
| DC | Direct Current |

## 3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this emissions Test Report.

| SPEC | TITLE |
|---|---|
| FCC Title 47, Part 15 Subpart C | FCC Rules – Radio frequency devices (including digital devices) – Intentional Radiators |
| FCC Title 47, Part 15 Subpart B | FCC Rules – Radio frequency devices (including digital devices) – Unintentional Radiators |
| 558074 D01 DTS Meas Guidance v05 r02 | Guidance for Performing Compliance Measurements on Digital Transmissions Systems (DTS) Operating Under Section 15.247 |
| EN 50147-2: 1997 | Anechoic chambers. Alternative test site suitability with respect to site attenuation |
| ANSI C63.4 2014 | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |
| ANSI C63.10 2013 | American National Standard for Testing Unlicensed Wireless Devices |
| RSS-Gen Issue 5 April 2019 Amendment 1 | General Requirements for Compliance of Radio Apparatus |
| RSS-247 Issue 2 February 2017 | Digital Transmissions Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices |

## 4. DESCRIPTION OF TEST CONFIGURATION

The Smart Controller, Model: MMS915 (EUT) was connected to two (2) garage door sensors and a switching power supply via its primary and secondary G, W, R, B; and DC in ports, respectively.

The EUT also had a cable connected to a power resistor via its Aux V+, Aux V-, C and NC ports.

Last, the EUT had two (2) unterminated cables connected to it via the following ports:

Unterminated Cable #1 was connected to the Lock V+, Lock V-, C, NO, NC ports of the EUT. Unterminated Cable #2 was connected to the COM, COM, CYCL, SAFE, EXIT, SHDW, OPEN EDGE, and CLOSE EDGE ports of the EUT.

When being programmed, the EUT was also connected to a laptop. The laptop was also connected to an AC Adapter. The programming allowed the EUT to operate at the low, middle, and high channels for 900 MHz FHSS in both transmit and receive modes. The laptop was removed prior to the testing.

It was determined that the emissions were at their highest level when the EUT was operating in the above configuration. The final emissions data was taken in this mode of operation and any cables were maximized. All initial investigations were performed with the EMI Receiver in manual mode scanning the frequency range continuously. Photographs of the test setup are in Appendix D of this report.

## 4.1 Cable Construction and Termination

**Cable 1** This is a 1.2 meter unshielded cable connecting the EUT to the switching power supply. The cable has a 1/8 inch power connector at the EUT end and is hard wired into the switching power supply

**Cable 2** This is a 2 meter braid shielded cable connecting the EUT to the laptop. The cable has 3 jumpers at the EUT and a USB type 'A' connector at the laptop end. The shield of the cable was grounded to the chassis via the connector. This cable was removed prior to the testing as it was only used to program the EUT.

**Cable 3** This is a 2 meter unshielded cable connecting the laptop to the AC Adapter. The cable has a 1-pin connector at the laptop end and is hard wired into the AC Adapter. The cable has a molded ferrite at the EUT end. The cable was removed prior to the testing as it was only used with the laptop to program the EUT.

**Cable 4** This is a 7.37-meter unshielded cable connecting the EUT's primary G, W, R, B port to the garage door sensor. The cable is hard wired at each end. The cable was bundled to a length of 1-meter.

**Cable 5** This is a 1.47-meter unshielded cable connecting the EUT's secondary G, W, R, B port to the garage door sensor. The cable is hard wired at each end. The cable was bundled to a length of 1-meter.

**Cable 6** This is a 1.65-meter unshielded cable connecting the EUT to the resistor. The cable has a terminal block connector at the EUT end and is hard wired into the resistor. The cable was bundled to be 40-centimeters above the ground plane.

**Cable 7** This is a 1.42-meter unshielded cable connecting the EUT to an unterminated cable. The cable has a terminal block connector at the EUT end and is unterminated at the other end. The cable was bundled to be 40 centimeters above the ground plane.

**Cable 8** This is a 1.63-meter unshielded cable connecting the EUT to an unterminated cable. The cable has a terminal block connector at the EUT end and is unterminated at the other end. The cable was bundled to be 40 centimeters above the ground plane.

# 5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

## 5.1 EUT and Accessory List

| EQUIPMENT | MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | FCC ID |
|---|---|---|---|---|
| WIFI SMART CONTROLLER (EUT) | NORTEK SECURITY & CONTROL, LLC | MMS915 | N/A | I6H-MMS915 |
| POWER SUPPLY (EUT) | N/A | MKS-1902000H | N/A | N/A |
| LAPTOP | LENOVO | T430 | 101-2037 | DoC |
| FIRMWARE* | VIMPULSE | 0.2.4 | N/A | N/A |
| AC ADAPTER (LAPTOP) | LENOVO | DCWP CM-2 | 11592PN56Z1ZDX N01L1ND | N/A |
| (2) GARAGE DOOR SENSOR | N/A | 10017216 | N/A | N/A |
| 900 MHz ANTENNA | ASIAN CREATION | AC-Q915-24W | N/A | N/A |

***This is the software used to program the EUT so that it can transmit in the low, middle, and high channels and also transmit in its normal operation on a continuous basis.

## 5.2 Emissions Test Equipment

| EQUIPMENT TYPE | MANU-FACTURER | MODEL NUMBER | SERIAL NUMBER | CALIBRATION DATE | CAL. CYCLE |
|---|---|---|---|---|---|
| **RADIATED AND CONDUCTED EMISSIONS TEST EQUIPMENT** | | | | | |
| TDK TestLab | TDK RF Solutions, Inc. | 9.22 | 700145 | N/A | N/A |
| Computer | Hewlett Packard | p6716f | MXX1030PX0 | N/A | N/A |
| LCD Monitor | Hewlett Packard | 52031a | 3CQ046N3MG | N/A | N/A |
| EMI Receiver 20 Hz – 40 GHz | Rohde & Schwarz | ESIB40 | 100172 | March 22, 2019 | 1 Year |
| EMI Receiver, 20 Hz – 26.5 GHz | Keysight Technologies | N9038A | MY5120150 | August 23, 2019 | 1 Year |
| CombiLog Antenna | Com-Power | AC-220 | 061093 | June 5, 2019 | 2 Year |
| System Controller | Sunol Sciences Corporation | SC110V | 112213-1 | N/A | N/A |
| Turntable | Sunol Sciences Corporation | 2011VS | N/A | N/A | N/A |
| Antenna-Mast | Sunol Sciences Corporation | TWR95-4 | 112213-3 | N/A | N/A |
| Turntable | Com-Power | TT-100 | N/A | N/A | N/A |
| Antenna-Mast | Com-Power | AM-100 | N/A | N/A | N/A |
| Horn Antenna | Com-Power | AH-118 | 071175 | February 22, 2018 | 2 Year |
| Preamplifier | Com-Power | PA-118 | 181653 | January 25, 2019 | 1 Year |
| Loop Antenna | Com-Power | AL-130R | 121090 | February 5, 2019 | 2 Year |
| LISN (EUT) | Com-Power | LI-215A | 191951 | August 7, 2019 | 1 Year |
| LISN (ACC) | Com-Power | LI-215A | 191952 | August 7, 2019 | 1 Year |
| Attenuator 10 dB | SureCall | SC-ATT-10 | 17100025 | November 27, 2018 | 1 Year |

# 6. TEST SITE DESCRIPTION

## 6.1 Test Facility Description

Please refer to section 2.1 and 7.1 of this report for emissions test location.

## 6.2 EUT Mounting, Bonding and Grounding

**For frequencies 1 GHz and below:** The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

**For frequencies above 1 GHz:** The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 1.5 meters above the ground plane.

The EUT was not grounded.

## 6.3 Measurement Uncertainty

Compatible Electronics' $U_{lab}$ value is less than $U_{cispr}$, thus based on this − compliance is deemed to occur if no measured disturbance exceeds the disturbance limit

$$u_c(y) = \sqrt{\sum_i c_i^2 \; u^2(x_i)}$$

| MEASUREMENT TYPE | UNCERTAINTY VALUES |
|---|---|
| Radiated Emissions<br>30 MHz to 1000 MHz | 3.26 dB (Vertical)<br>3.19 dB (Horizontal) |
| Radiated Emissions<br>1 GHz to 40 GHz | 3.67 dB<br>(Both Vertical and Horizontal) |
| AC Line Conducted Emissions<br>0.15 MHz to 30 MHz | 2.72 dB<br>(Line and Neutral Leads) |

# 7. CHARACTERISTICS OF THE TRANSMITTER

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

## 7.1 Channel Description and Frequencies

The EUT operates on fifty channels. The low channel is at 902.3 MHz, the middle channel at 915 MHz, and the high channel at 927.8 MHz.

## 7.2 Antenna Gain

The gain of the antenna is 2.5 dBi.

# 8. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

## 8.1 RF Emissions

### 8.1.1 Conducted Emissions Test

The EMI Receiver was used as a measuring meter. A 10 dB Attenuator was used for the protection of the EMI Receiver input stage, and the offset was adjusted accordingly to read the actual data measured. The LISN output was measured using the EMI Receiver. The output of the second LISN was terminated by a 50-ohm termination. The effective measurement bandwidth used for this test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding, and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The conducted emissions from the EUT were maximized for operating mode as well as cable placement. The final data was collected under program control by computer software. The final qualification data is located in Appendix E.

The six highest reading are listed in Table 2.0.

**Test Results:**

The EUT complies with the **Class B** limits of **CFR** Title 47, Part 15, Subpart B; the limits of CFR Title 47, Part 15, Subpart C, Section 15.207; and RSS-GEN. Please see Appendix E for the data sheets.

### 8.1.2 Radiated Emissions Test

The EMI Receiver was used as the measuring meter. Preamplifiers were used to increase the sensitivity of the instrument. The EMI Receiver was initially used with the Analyzer mode feature activated. In this mode, the EMI receiver can then record the actual frequency to be measured. This final reading is then taken accurately in the EMI Receiver mode, which takes into account the cable loss, amplifier gain and antenna factors, so that a true reading is compared to the true limit. The effective measurement bandwidth used for the radiated emissions test was according to the frequency measured.

The frequencies below 1 GHz were quasi-peaked using the quasi-peak detector of the EMI Receiver.

The frequencies above 1 GHz were averaged using a duty cycle correction factor.

The EMI test chamber of Compatible Electronics, Inc. was used for radiated emissions testing. This test site is in full compliance with ANSI C63.4. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength).

The EUT was tested at a 3-meter test distance. The six highest emissions are listed in Table 1.0.

The measurement bandwidths and transducers used for the radiated emissions test were:

| FREQUENCY RANGE | EFFECTIVE MEASUREMENT BANDWIDTH | TRANSDUCER |
|---|---|---|
| 9 kHz to 150 kHz | 200 Hz | Loop Antenna |
| 150 kHz to 30 MHz | 9 kHz | Loop Antenna |
| 30 MHz to 1 GHz | 120 kHz | CombiLog Antenna |
| 1 GHz to 9.3 GHz | 1 MHz | Horn Antenna |

**Test Results:**

The EUT complies with the **Class B** limits of **CFR** Title 47, Part 15, Subpart B; and Subpart C sections 15.205, 15.209, and 15.247 (d); and RSS-247 and RSS-GEN for radiated emissions.

### 8.1.3 RF Emissions Test Results

Table 1.0 RADIATED EMISSION RESULTS
Smart Controller
Model: MMS915

| Frequency MHz | EMI Reading (dBuV/m) | Specification Limit (dBuV/m) | Delta (Cor. Reading – Spec. Limit) dB) |
|---|---|---|---|
| 2745 (V) (Y-Axis) | 53.36 (Avg) | 53.97 | -0.61 |
| 7422.40 (H) (Y-Axis) | 53.18 (Avg) | 53.97 | -0.79 |
| 7422.40 (V) (Y-Axis) | 52.45 (Avg) | 53.97 | -1.52 |
| 215.70 (H) (Tx) | 40.50 (QP) | 43.50 | -3.00 |
| 143.90 (H) (Tx) | 40.05 (QP) | 43.50 | -3.45 |
| 144.10 (H) (Tx) | 40.17 (QP) | 43.50 | -3.33 |

Notes:
(Avg) Average
(QP) Quasi -Peak
(H) Horizontal
(V) Vertical

Table 2.0 CONDUCTED EMISSION RESULTS
Smart Controller
Model: MMS915

| Frequency MHz | EMI Reading (dBuV/m) | Specification Limit (dBuV/m) | Delta (Cor. Reading – Spec. Limit) dB) |
|---|---|---|---|
| 0.490 (WL) (Tx) | 35.53 (Avg) | 46.16 | -10.63 |
| 0.486 (WL) (Tx) | 35.49 (Avg) | 46.22 | -10.73 |
| 0.490 (WL) (Rx) | 33.98 (Avg) | 46.16 | -12.18 |
| 0.158 (WL) (Tx) | 36.61 (Avg) | 55.05 | -18.44 |
| 0.198 (WL) (Tx) | 33.70 (Avg) | 53.28 | -19.57 |
| 0.154 (BL) (Rx) | 35.13 (Avg) | 55.25 | -20.12 |

Notes:
(BL) Black Lead
(WL) White Lead

## 8.2 20 dB Bandwidth

The 20 dB Bandwidth was measured using the EMI Receiver. The resolution bandwidth was within 1 % to 5 % of the occupied bandwidth and the video bandwidth was approximately ≥ RBW.

**Test Results:**

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.247 (a)(1)(i); and RSS-247. The 20 dB bandwidth is less than the separation between channels. Please see the data sheets located in Appendix E.

## 8.3 Peak Output Power

The Maximum Peak Conducted Output Power was measured using the EMI Receiver. The Maximum Peak Conducted Output Power was measured using the procedure described in section 7.8.5 of ANSI C63.10. The Maximum Peak Conducted Output Power was then taken. The following steps were performed for measuring the Maximum Peak Conducted Output Power.

1. Set the RBW ≥ 20 dB Bandwidth
2. Set VBW ≥ RBW
3. Set span ≥ [5 x RBW]
4. Sweep time = auto couple
5. Detector = peak
6. Trace mode = max hold
7. Allow trace to fully stabilize
8. Use peak marker function to determine the peak amplitude level

**Test Results:**

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.247 (b)(2); and RSS-247.

## 8.4 RF Antenna Conducted Test

The RF antenna conducted test was performed using the EMI Receiver. The RF antenna conducted test measured using a direct connection from the RF out on the EUT into the input of the EMI Receiver. The resolution bandwidth was 100 kHz, and the video bandwidth was 300 kHz. The spans were wide enough to include all the harmonics and emissions that were produced by the intentional radiator.

**Test Results:**

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.247 (d); and RSS-247.

## 8.5 RF Band Edges

The RF band edges were taken at the edges of the ISM spectrum (902 MHz when the EUT was on the low channel and 928 MHz when the EUT was on the high channel) using the EMI Receiver. The RBW was set to 100 kHz and the VBW was set to 300 kHz. Plots of the fundamental were taken to ensure the amplitude at the band edges were at least 20 dB down from the peak of the fundamental emission. The plots were taken in both frequency hopping mode and single channel mode.

**Test Results:**

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.247 (d). The RF power at the band edges at 902 MHz and 928 MHz meet the requirements of FCC Title 47, Part 15, Subpart C section 15.247 (d); and RSS-247. Please see the data sheets located in Appendix E.

## 8.6 Carrier Frequency Separation

The Channel Hopping Separation Test was measured using the EMI Receiver. The EUT was operating in its normal operating mode. The resolution bandwidth was approximately 30% of the channel spacing, and the video bandwidth ≥ RBW. The frequency span was wide enough to include the peaks of two adjacent channels.

**Test Results:**

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.247 (a)(1); and RSS-247. The Channel Hopping Separation is greater than the 20 dB bandwidth. Please see the data sheets located in Appendix E.

## 8.7 Number of Hopping Frequencies

The Number of Hopping Frequencies was measured using the EMI Receiver. The EUT was operating in its normal operating mode. The resolution bandwidth was set to approximately 30% of the channel spacing, and the video bandwidth was ≥ RBW. The frequency span was wide enough to include all of the peaks in the frequency band of operation.

**Test Results:**

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.247 (a)(1) and 15.247 (a)(1)(i); and RSS-247. Please see the data sheets located in Appendix E.

## 8.8 Average Time of Occupancy Test

The Average Time of Occupancy Test was measured using the EMI Receiver. The EUT was operating in normal operating mode. The frequency span was taken to 0 Hz to determine the time for each transmission and the number of transmissions over a 20 second period. The RBW was less than the channel spacing.

**Test Results:**

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart C section 15.247 (a)(1)(i). Please see the data sheets located in Appendix E.

## 8.9 Field Strength (Duty Cycle Calculations)

The Peak Transmit Radiated Field Strength was measured at a 3-meter test distance. The EMI Receiver was used to obtain the duty cycle. The data sheets are located in Appendix E.

*Where*

$$\delta(\mathrm{dB}) = 20\log\left[\sum\left(nt_1 + mt_2 + \ldots + \xi t_x\right)/T\right]$$

*n* is the number of pulses of duration *t*1
*m* is the number of pulses of duration *t*2
ξ is the number of pulses of duration *tx*
*T* is the period of the pulse train or 100 ms if the pulse train length is greater than 100 ms

Duty Cycle Correction Factor = -14.56 dB

Pulse = 1 * 18.70 ms

Total On Time = 18.70 ms

Pulse only appears once every 100 ms; therefore 100 mS span was used.

18.7 ms / 100 ms = 18.70%

20 log (0.1870) = -14.56 dB correction factor

## 8.10 Variation of the Input Power

The variation of the input power test was performed using the EMI Receiver. The EUT input power was varied between 85% and 115% of the nominal rated supply voltage. The carrier frequency was monitored for any change in amplitude.

**Test Results:**

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart A section 15.31 (e); and RSS-247.

## 9. CONCLUSIONS

The Smart Controller, Model: MMS915, as tested, meets all of the specification limits defined in FCC Title 47, Part 15, Subpart B; and Subpart C, sections 15.205, 15.207, 15.209, and 15.247; RSS-GEN and RSS-247.

# APPENDIX A

# *LABORATORY ACCREDITATIONS AND RECOGNITIONS*

# LABORATORY ACCREDITATIONS AND RECOGNITIONS

NVLAP® TESTING
NVLAP LAB CODE 200528-0

ilac-MRA

For US, Canada, Australia/New Zealand, Japan, Taiwan, Korea, and the European Union, Compatible Electronics is currently accredited by NVLAP to ISO/IEC 17025.
**For the most up-to-date version of our scopes and certificates please visit http://celectronics.com/quality/scope/**

Quote from ISO-ILAC-IAF Communiqué on 17025:
"A laboratory's fulfilment of the requirements of ISO/IEC 17025:2005 means the laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results and calibrations. The management system requirements in ISO/IEC 17025:2005 (Section 4) are written in language relevant to laboratory operations and meet the principles of ISO 9001:2008 Quality Management Systems — Requirements."

# APPENDIX B

# *MODIFICATIONS TO THE EUT*

# MODIFICATIONS TO THE EUT

The modifications listed below were made to the EUT to pass FCC Subpart B and FCC 15.247; RSS-GEN and RSS-210 specifications.

All the rework described below was implemented during the test in a method that could be reproduced in all the units by the manufacturer.

No modifications were made to the EUT during the testing.

**APPENDIX C**

# *ADDITIONAL MODELS COVERED UNDER THIS REPORT*

# ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

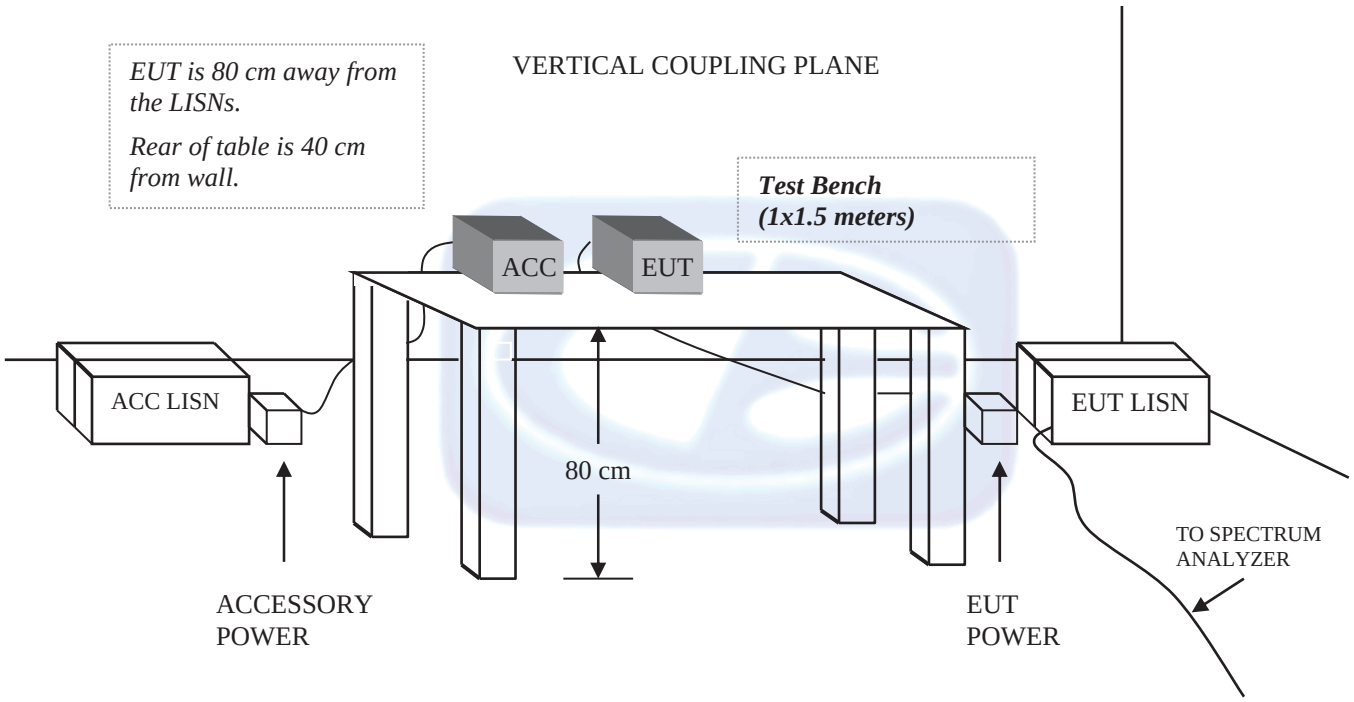
Smart Controller
Model: MMS915
S/N: N/A

There are no additional models covered under this report.

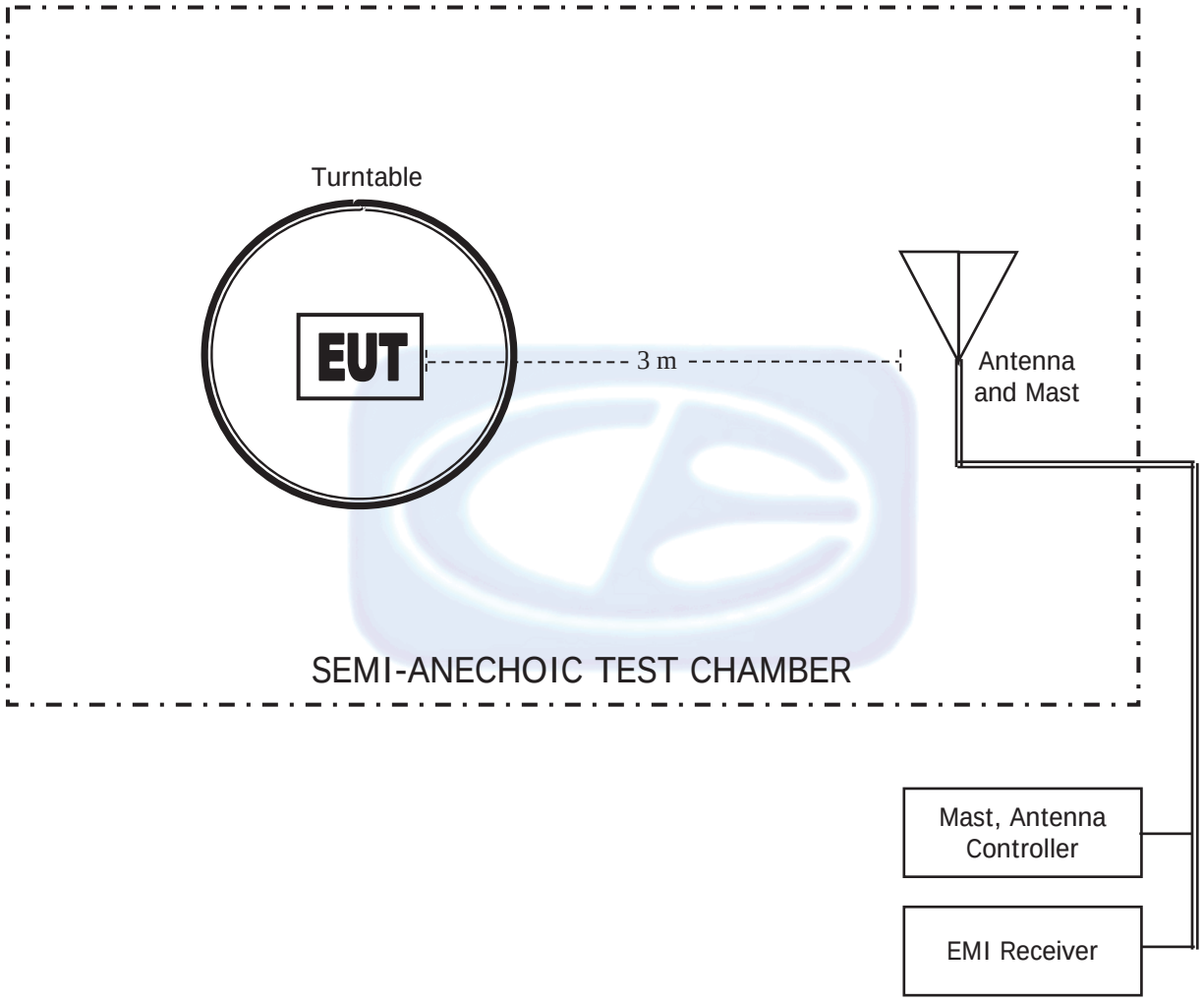
# APPENDIX D

# *DIAGRAMS AND CHARTS*

# *FIGURE 1: CONDUCTED EMISSIONS TEST SETUP*



# *FIGURE 2: LAYOUT OF THE SEMI-ANECHOIC TEST CHAMBER*



# COM-POWER AL-130R

# LOOP ANTENNA

# S/N: 121090

# CALIBRATION DATE: FEBRUARY 5, 2019

| FREQUENCY (MHz) | MAGNETIC (dB/m) | ELECTRIC (dB/m) |
|---|---|---|
| 0.01 | 15.6 | -35.9 |
| 0.02 | 14.8 | -36.7 |
| 0.03 | 15.6 | -35.9 |
| 0.04 | 15.1 | -36.4 |
| 0.05 | 14.4 | -37.0 |
| 0.06 | 14.6 | -36.9 |
| 0.07 | 14.4 | -37.1 |
| 0.08 | 14.3 | -37.1 |
| 0.09 | 14.5 | -36.9 |
| 0.10 | 14.1 | -37.3 |
| 0.20 | 14.1 | -37.3 |
| 0.30 | 14.0 | -37.4 |
| 0.40 | 14.0 | -37.4 |
| 0.50 | 14.2 | -37.2 |
| 0.60 | 14.2 | -37.2 |
| 0.70 | 14.2 | -37.2 |
| 0.80 | 14.2 | -37.3 |
| 0.90 | 14.3 | -37.2 |
| 1.00 | 14.5 | -37.0 |
| 2.00 | 14.5 | -36.9 |
| 3.00 | 14.5 | -36.9 |
| 4.00 | 14.7 | -36.8 |
| 5.00 | 14.6 | -36.9 |
| 6.00 | 14.6 | -36.9 |
| 7.00 | 14.6 | -36.9 |
| 8.00 | 14.6 | -36.9 |
| 9.00 | 14.6 | -36.9 |
| 10.00 | 14.8 | -36.6 |
| 11.00 | 14.9 | -36.6 |
| 12.00 | 14.8 | -36.6 |
| 13.00 | 14.8 | -36.7 |
| 14.00 | 14.6 | -36.8 |
| 15.00 | 14.5 | -36.9 |
| 16.00 | 14.5 | -37.0 |
| 17.00 | 14.6 | -36.9 |
| 18.00 | 14.7 | -36.7 |
| 19.00 | 14.8 | -36.6 |
| 20.00 | 14.9 | -36.6 |
| 21.00 | 14.6 | -36.8 |
| 22.00 | 14.2 | -37.2 |
| 23.00 | 13.7 | -37.7 |
| 24.00 | 13.3 | -38.2 |
| 25.00 | 13.0 | -38.5 |
| 26.00 | 12.9 | -38.6 |
| 27.00 | 13.0 | -38.5 |
| 28.00 | 13.1 | -38.4 |
| 29.00 | 13.1 | -38.4 |
| 30.00 | 12.9 | -38.5 |

# COM-POWER AC-220

# COMBILOG ANTENNA

# S/N: 61093

# CALIBRATION DATE: JUNE 5, 2019

| FREQUENCY (MHz) | FACTOR (dB) | FREQUENCY (MHz) | FACTOR (dB) |
|---|---|---|---|
| 30 | 22.10 | 200 | 15.30 |
| 35 | 20.90 | 250 | 16.80 |
| 40 | 20.10 | 300 | 19.00 |
| 45 | 19.40 | 350 | 19.60 |
| 50 | 18.40 | 400 | 21.70 |
| 60 | 15.10 | 450 | 21.60 |
| 70 | 12.00 | 500 | 22.20 |
| 80 | 11.60 | 550 | 22.70 |
| 90 | 13.50 | 600 | 24.20 |
| 100 | 14.70 | 650 | 24.40 |
| 120 | 15.90 | 700 | 24.50 |
| 125 | 15.90 | 750 | 25.40 |
| 140 | 14.80 | 800 | 26.30 |
| 150 | 15.50 | 850 | 26.70 |
| 160 | 19.80 | 900 | 27.50 |
| 175 | 15.20 | 950 | 27.80 |
| 180 | 14.90 | 1000 | 27.90 |

# COM POWER AH-118

# HORN ANTENNA

# S/N: 071175

# CALIBRATION DATE: FEBRUARY 22, 2018

| FREQUENCY (GHz) | FACTOR (dB) | FREQUENCY (GHz) | FACTOR (dB) |
|---|---|---|---|
| 1.0 | 23.71 | 10.0 | 40.08 |
| 1.5 | 25.46 | 10.5 | 40.75 |
| 2.0 | 29.26 | 11.0 | 41.78 |
| 2.5 | 27.95 | 11.5 | 41.02 |
| 3.0 | 29.03 | 12.0 | 40.32 |
| 3.5 | 29.70 | 12.5 | 40.96 |
| 4.0 | 30.71 | 13.0 | 40.29 |
| 4.5 | 31.62 | 13.5 | 39.48 |
| 5.0 | 33.23 | 14.0 | 39.89 |
| 5.5 | 35.07 | 14.5 | 42.75 |
| 6.0 | 34.43 | 15.0 | 40.98 |
| 6.5 | 34.98 | 15.5 | 38.54 |
| 7.0 | 36.75 | 16.0 | 39.40 |
| 7.5 | 37.10 | 16.5 | 39.40 |
| 8.0 | 37.66 | 17.0 | 41.74 |
| 8.5 | 39.29 | 17.5 | 42.58 |
| 9.0 | 37.75 | 18.0 | 44.68 |
| 9.5 | 38.23 | | |

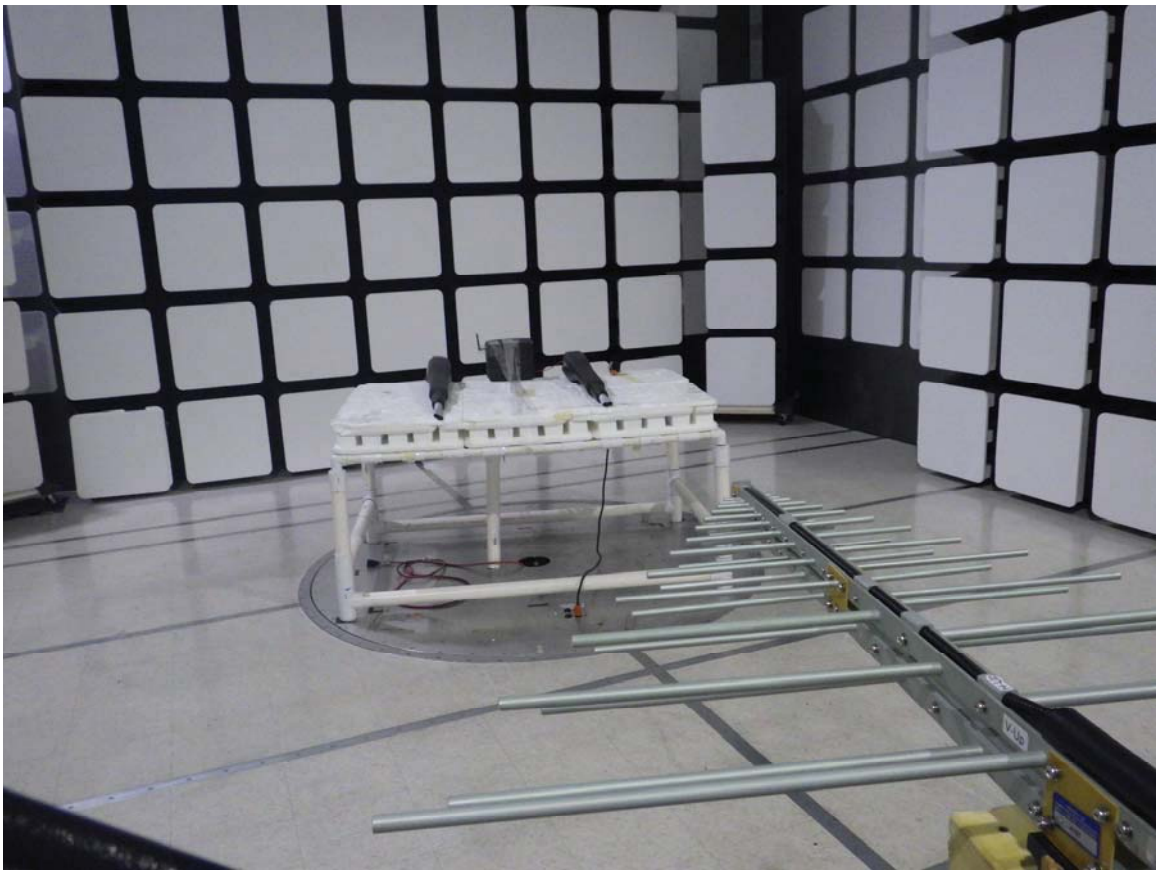
# COM-POWER PA-118

# PREAMPLIFIER

# S/N: 181653

# CALIBRATION DATE: JANUARY 25, 2019

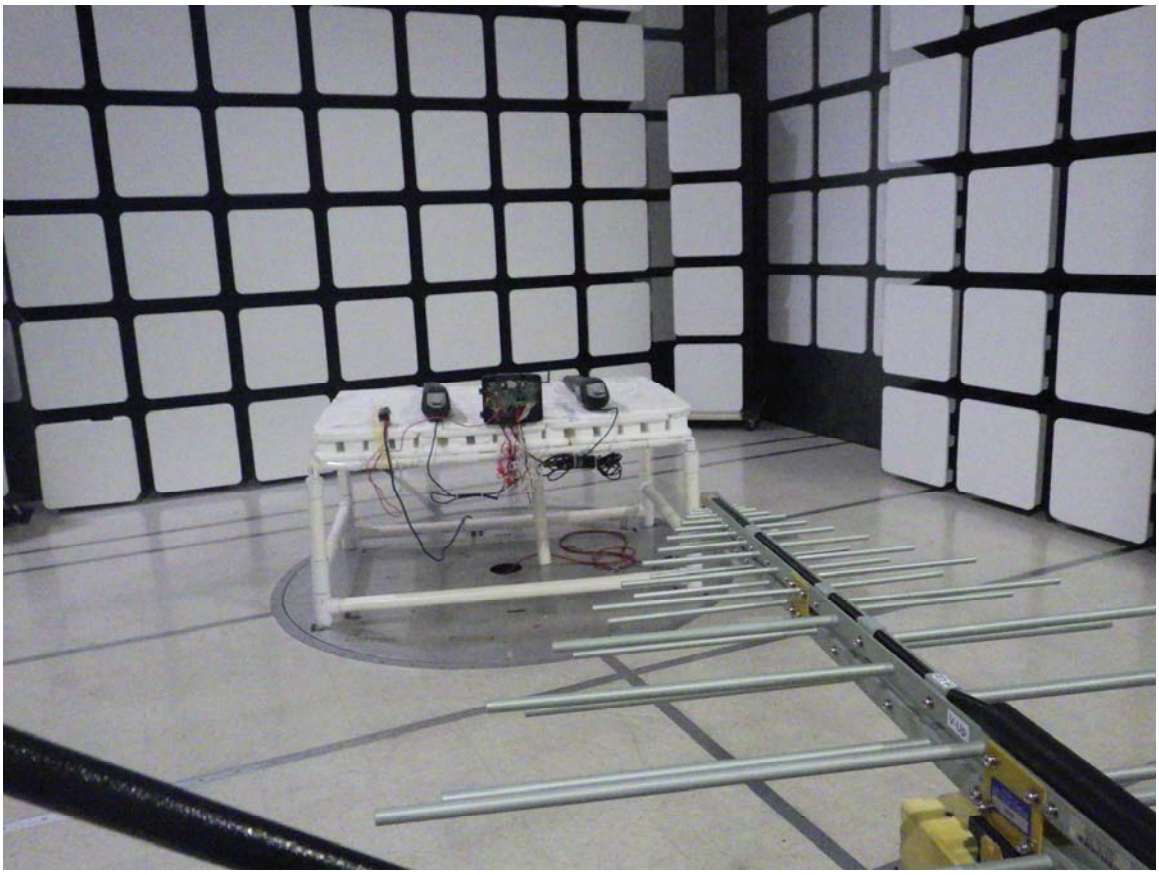
| FREQUENCY (GHz) | FACTOR (dB) | FREQUENCY (GHz) | FACTOR (dB) |
|---|---|---|---|
| 1.0 | 40.10 | 6.0 | 40.60 |
| 1.1 | 40.10 | 6.5 | 39.50 |
| 1.2 | 40.00 | 7.0 | 39.40 |
| 1.3 | 39.70 | 7.5 | 39.30 |
| 1.4 | 39.60 | 8.0 | 39.20 |
| 1.5 | 39.90 | 8.5 | 40.50 |
| 1.6 | 40.00 | 9.0 | 39.60 |
| 1.7 | 39.70 | 9.5 | 39.50 |
| 1.8 | 39.50 | 10.0 | 38.80 |
| 1.9 | 39.60 | 11.0 | 38.70 |
| 2.0 | 39.90 | 12.0 | 42.20 |
| 2.5 | 40.10 | 13.0 | 40.00 |
| 3.0 | 40.80 | 14.0 | 40.30 |
| 3.5 | 40.60 | 15.0 | 40.20 |
| 4.0 | 40.50 | 16.0 | 41.00 |
| 4.5 | 41.60 | 17.0 | 39.70 |
| 5.0 | 39.20 | 18.0 | 40.90 |
| 5.5 | 40.00 | | |



**FRONT VIEW**

NORTEK SECURITY & CONTROL, LLC
SMART CONTROLLER
MODEL: MMS915
FCC SUBPART B AND C; RSS-GEN and RSS-247 – RADIATED EMISSIONS – 30 MHz to 1000 MHz

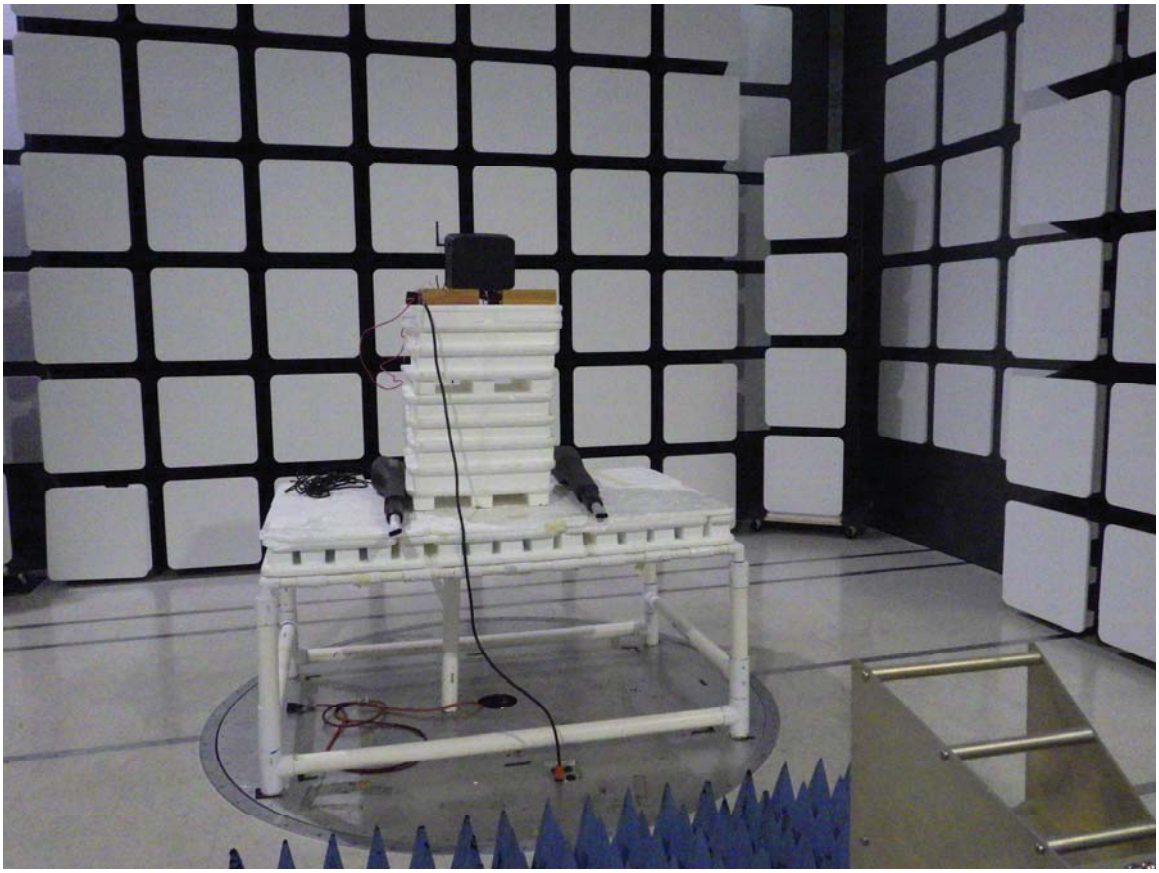
## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



**REAR VIEW**

NORTEK SECURITY & CONTROL, LLC
SMART CONTROLLER
MODEL: MMS915
FCC SUBPART B AND C; RSS-GEN and RSS-247 – RADIATED EMISSIONS – 30 MHz to 1000 MHz

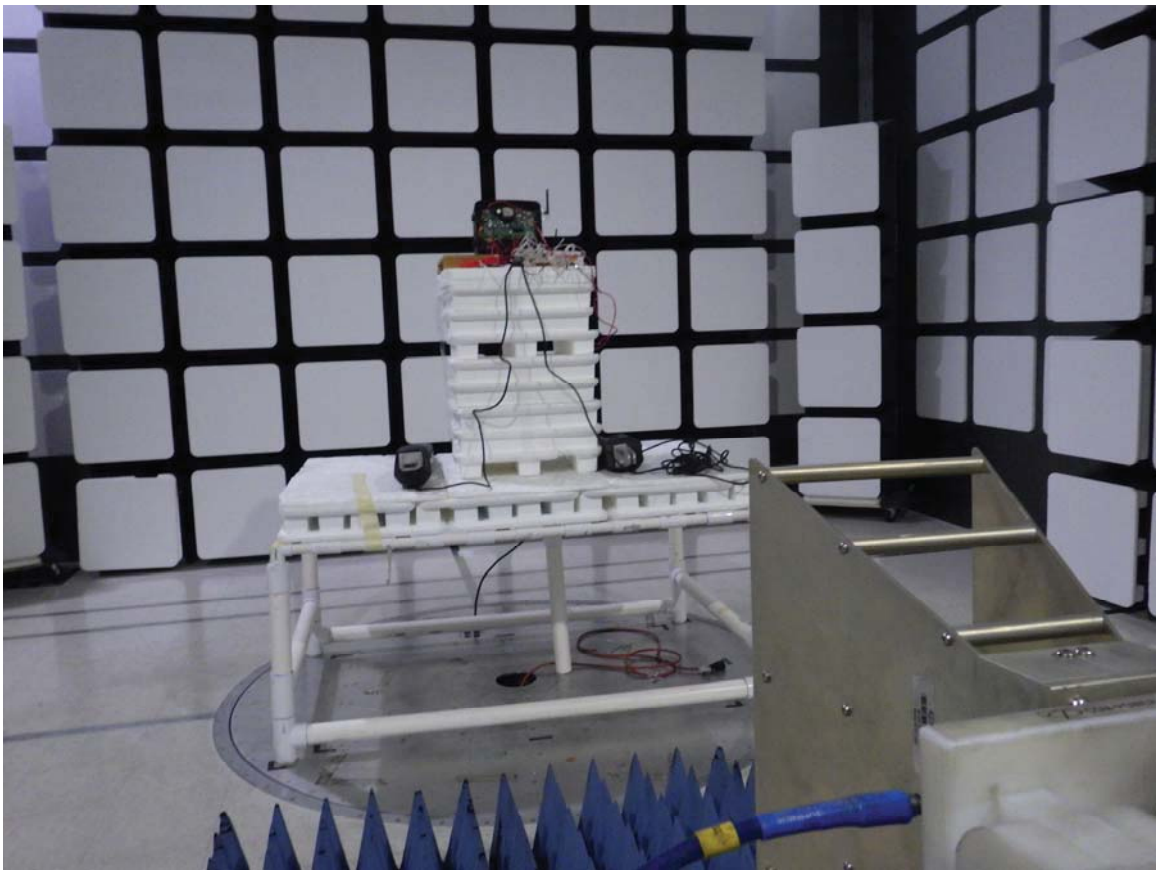
## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



**FRONT VIEW**

NORTEK SECURITY & CONTROL, LLC
SMART CONTROLLER
MODEL: MMS915
FCC SUBPART B AND C – RADIATED EMISSIONS – ABOVE 1 GHz

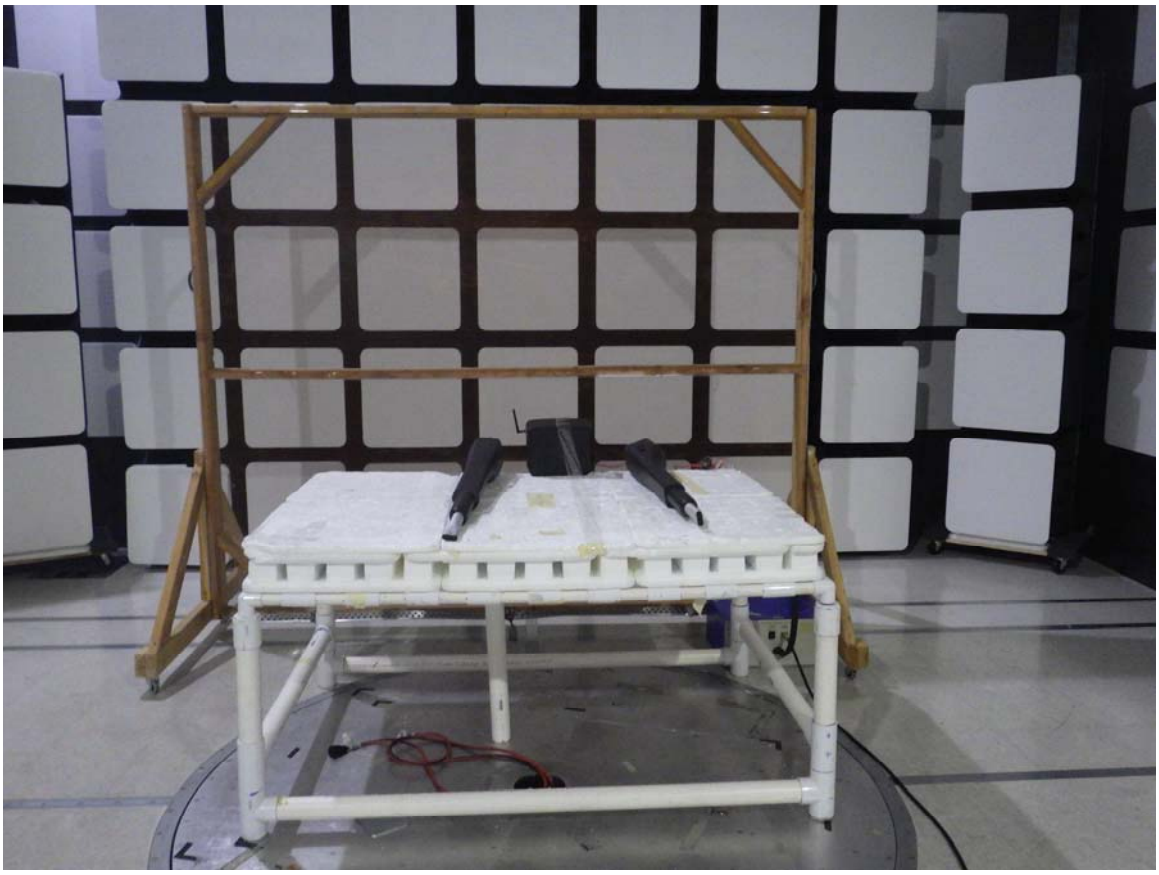
## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



**REAR VIEW**

NORTEK SECURITY & CONTROL, LLC
SMART CONTROLLER
MODEL: MMS915
FCC SUBPART B AND C – RADIATED EMISSIONS – ABOVE 1 GHz

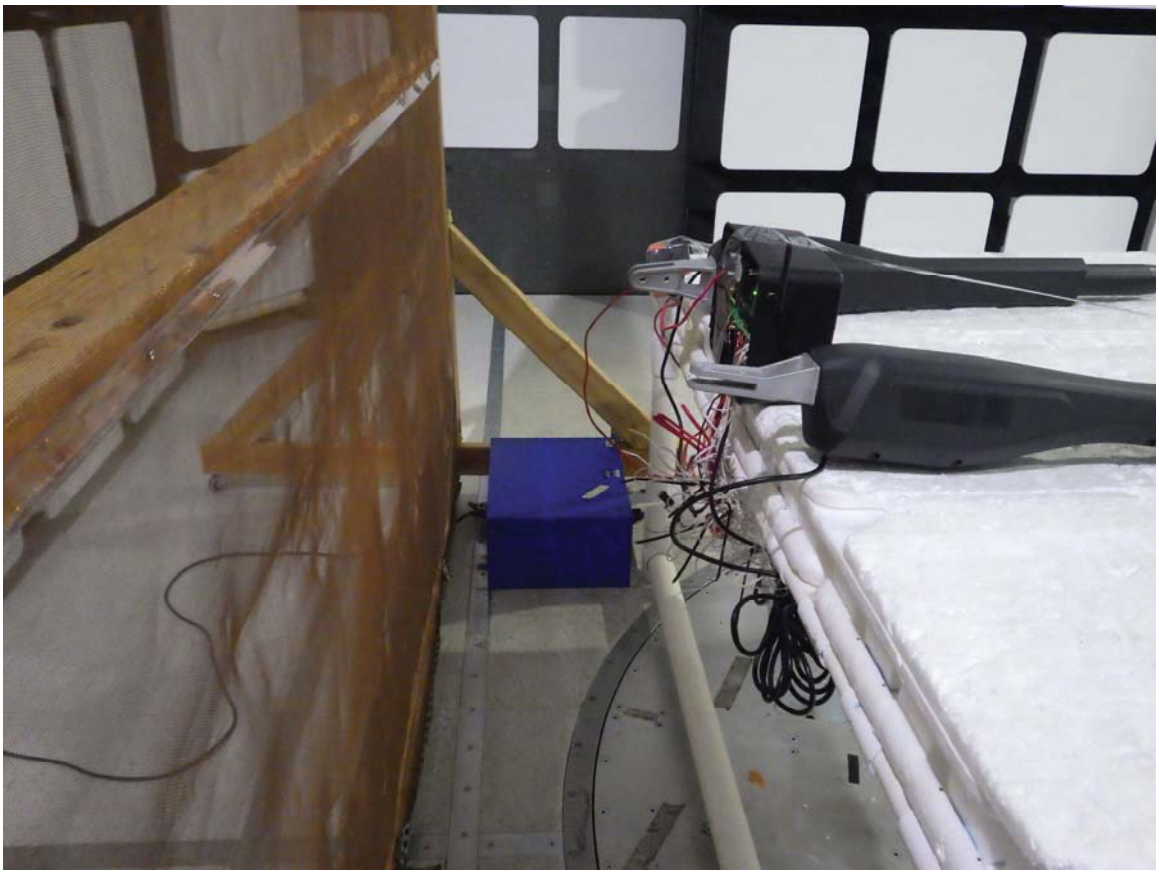
## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



**FRONT VIEW**

NORTEK SECURITY & CONTROL, LLC
SMART CONTROLLER
MODEL: MMS915
FCC SUBPART B AND C – CONDUCTED EMISSIONS

## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



**REAR VIEW**

NORTEK SECURITY & CONTROL, LLC
SMART CONTROLLER
MODEL: MMS915
FCC SUBPART B AND C – CONDUCTED EMISSIONS

## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

# APPENDIX E

# *DATA SHEETS*

# *RADIATED EMISSIONS DATA SHEETS*

**FCC 15.247**
Nortek Security & Control, LLC
Smart Controller
Model: MMS915

Date: 08/05/2019
Lab: D
Tested By: Harvey Samaco

**Harmonics - Low Channel**
**Transmit Mode - Y-Axis**
**Duty Cycle: 18.60%**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| 1804.60 | | | | | | | | **N/A - Done via Conducted** |
| 1804.60 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 2706.90 | 58.72 | V | 73.97 | -15.25 | Peak | 337.00 | 167.68 | |
| 2706.90 | 44.12 | V | 53.97 | -9.85 | Avg | 337.00 | 167.68 | |
| | | | | | | | | |
| 3609.20 | 53.83 | V | 73.97 | -20.14 | Peak | 143.00 | 100.00 | |
| 3609.20 | 39.23 | V | 53.97 | -14.74 | Avg | 143.00 | 100.00 | |
| | | | | | | | | |
| 4511.50 | 52.98 | V | 73.97 | -20.99 | Peak | 204.50 | 162.85 | |
| 4511.50 | 38.38 | V | 53.97 | -15.59 | Avg | 204.50 | 162.85 | |
| | | | | | | | | |
| 5413.80 | 57.21 | V | 73.97 | -16.76 | Peak | 122.00 | 100.00 | |
| 5413.80 | 42.61 | V | 53.97 | -11.36 | Avg | 122.00 | 100.00 | |
| | | | | | | | | |
| 6316.10 | | | | | | | | **N/A - Done via Conducted** |
| 6316.10 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 7218.40 | | | | | | | | **N/A - Done via Conducted** |
| 7218.40 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 8120.70 | 57.34 | V | 73.97 | -16.63 | Peak | 230.75 | 102.97 | |
| 8120.70 | 42.74 | V | 53.97 | -11.23 | Avg | 230.75 | 102.97 | |
| | | | | | | | | |
| 9023.00 | 50.97 | V | 73.97 | -23.00 | Peak | 202.50 | 220.46 | |
| 9023.00 | 36.37 | V | 53.97 | -17.60 | Avg | 202.50 | 220.46 | |
| | | | | | | | | |

**FCC 15.247**
Nortek Security & Control, LLC
Smart Controller
Model: MMS915

Date: 08/05/2019
Lab: D
Tested By: Harvey Samaco

**Harmonics - Low Channel**
**Transmit Mode - Y-Axis**
**Duty Cycle: 18.60%**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| 1804.60 | | | | | | | | **N/A - Done via Conducted** |
| 1804.60 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 2706.90 | 63.48 | H | 73.97 | -10.49 | Peak | 183.50 | 250.00 | |
| 2706.90 | 48.88 | H | 53.97 | -5.09 | Avg | 183.50 | 250.00 | |
| | | | | | | | | |
| 3609.20 | 57.48 | H | 73.97 | -16.49 | Peak | 188.00 | 133.05 | |
| 3609.20 | 42.88 | H | 53.97 | -11.09 | Avg | 188.00 | 133.05 | |
| | | | | | | | | |
| 4511.50 | 54.19 | H | 73.97 | -19.78 | Peak | 200.25 | 110.31 | |
| 4511.50 | 39.59 | H | 53.97 | -14.38 | Avg | 200.25 | 110.31 | |
| | | | | | | | | |
| 5413.80 | 57.41 | H | 73.97 | -16.56 | Peak | 150.00 | 121.05 | |
| 5413.80 | 42.81 | H | 53.97 | -11.16 | Avg | 150.00 | 121.05 | |
| | | | | | | | | |
| 6316.10 | | | | | | | | **N/A - Done via Conducted** |
| 6316.10 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 7218.40 | | | | | | | | **N/A - Done via Conducted** |
| 7218.40 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 8120.70 | 62.15 | H | 73.97 | -11.82 | Peak | 147.25 | 122.49 | |
| 8120.70 | 47.55 | H | 53.97 | -6.42 | Avg | 147.25 | 122.49 | |
| | | | | | | | | |
| 9023.00 | 55.69 | H | 73.97 | -18.28 | Peak | 132.50 | 136.52 | |
| 9023.00 | 41.09 | H | 53.97 | -12.88 | Avg | 132.50 | 136.52 | |
| | | | | | | | | |

**FCC 15.247**
Nortek Security & Control, LLC
Smart Controller
Model: MMS915

Date: 08/05/2019
Lab: D
Tested By: Harvey Samaco

**Harmonics - Middle Channel**
**Transmit Mode - Y-Axis**
**Duty Cycle: 18.60%**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| 1830.00 | | | | | | | | **N/A - Done via Conducted** |
| 1830.00 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 2745.00 | 67.96 | V | 73.97 | -6.01 | Peak | 172.00 | 156.28 | |
| 2745.00 | 53.36 | V | 53.97 | -0.61 | Avg | 172.00 | 156.28 | |
| | | | | | | | | |
| 3660.00 | 54.59 | V | 73.97 | -19.38 | Peak | 206.00 | 118.37 | |
| 3660.00 | 39.99 | V | 53.97 | -13.98 | Avg | 206.00 | 118.37 | |
| | | | | | | | | |
| 4575.00 | 51.94 | V | 73.97 | -22.03 | Peak | 201.00 | 135.98 | |
| 4575.00 | 37.34 | V | 53.97 | -16.63 | Avg | 201.00 | 135.98 | |
| | | | | | | | | |
| 5490.00 | | | | | | | | **N/A - Done via Conducted** |
| 5490.00 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 6405.00 | | | | | | | | **N/A - Done via Conducted** |
| 6405.00 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 7320.00 | 56.00 | V | 73.97 | -17.97 | Peak | 146.25 | 100.04 | |
| 7320.00 | 41.40 | V | 53.97 | -12.57 | Avg | 146.25 | 100.04 | |
| | | | | | | | | |
| 8235.00 | 48.14 | V | 73.97 | -25.83 | Peak | 150.50 | 100.00 | |
| 8235.00 | 33.54 | V | 53.97 | -20.43 | Avg | 150.50 | 100.00 | |
| | | | | | | | | |
| 9150.00 | 45.28 | V | 73.97 | -28.69 | Peak | 148.50 | 120.16 | |
| 9150.00 | 30.68 | V | 53.97 | -23.29 | Avg | 148.50 | 120.16 | |
| | | | | | | | | |

**FCC 15.247**
Nortek Security & Control, LLC
Smart Controller
Model: MMS915

Date: 08/05/2019
Lab: D
Tested By: Harvey Samaco

**Harmonics - Middle Channel**
**Transmit Mode - Y-Axis**
**Duty Cycle: 18.60%**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| 1830.00 | | | | | | | | **N/A - Done via Conducted** |
| 1830.00 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 2745.00 | 64.61 | H | 73.97 | -9.36 | Peak | 181.50 | 100.34 | |
| 2745.00 | 50.01 | H | 53.97 | -3.96 | Avg | 181.50 | 100.34 | |
| | | | | | | | | |
| 3660.00 | 57.01 | H | 73.97 | -16.96 | Peak | 131.75 | 164.34 | |
| 3660.00 | 42.41 | H | 53.97 | -11.56 | Avg | 131.75 | 164.34 | |
| | | | | | | | | |
| 4575.00 | 51.74 | H | 73.97 | -22.23 | Peak | 194.50 | 170.79 | |
| 4575.00 | 37.14 | H | 53.97 | -16.83 | Avg | 194.50 | 170.79 | |
| | | | | | | | | |
| 5490.00 | | | | | | | | **N/A - Done via Conducted** |
| 5490.00 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 6405.00 | | | | | | | | **N/A - Done via Conducted** |
| 6405.00 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 7320.00 | 60.13 | H | 73.97 | -13.84 | Peak | 157.25 | 100.00 | |
| 7320.00 | 45.53 | H | 53.97 | -8.44 | Avg | 157.25 | 100.00 | |
| | | | | | | | | |
| 8235.00 | 49.03 | H | 73.97 | -24.94 | Peak | 227.75 | 158.13 | |
| 8235.00 | 34.43 | H | 53.97 | -19.54 | Avg | 227.75 | 158.13 | |
| | | | | | | | | |
| 9150.00 | 47.62 | H | 73.97 | -26.35 | Peak | 138.50 | 106.43 | |
| 9150.00 | 33.02 | H | 53.97 | -20.95 | Avg | 138.50 | 106.43 | |
| | | | | | | | | |

**FCC 15.247**
Nortek Security & Control, LLC
Smart Controller
Model: MMS915

Date: 08/05/2019
Lab: D
Tested By: Harvey Samaco

**Harmonics - High Channel**
**Transmit Mode - Y-Axis**
**Duty Cycle: 18.60%**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| 1855.60 | | | | | | | | **N/A - Done via Conducted** |
| 1855.60 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 2783.40 | 64.94 | V | 73.97 | -9.03 | Peak | 154.00 | 195.80 | |
| 2783.40 | 50.34 | V | 53.97 | -3.63 | Avg | 154.00 | 195.80 | |
| | | | | | | | | |
| 3711.20 | 52.24 | V | 73.97 | -21.73 | Peak | 184.75 | 159.50 | |
| 3711.20 | 37.64 | V | 53.97 | -16.33 | Avg | 184.75 | 159.50 | |
| | | | | | | | | |
| 4639.00 | 54.69 | V | 73.97 | -19.28 | Peak | 155.75 | 116.04 | |
| 4639.00 | 40.09 | V | 53.97 | -13.88 | Avg | 155.75 | 116.04 | |
| | | | | | | | | |
| 5566.80 | | | | | | | | **N/A - Done via Conducted** |
| 5566.80 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 6494.60 | | | | | | | | **N/A - Done via Conducted** |
| 6494.60 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 7422.40 | 67.05 | V | 73.97 | -6.92 | Peak | 148.75 | 116.94 | |
| 7422.40 | 52.45 | V | 53.97 | -1.52 | Avg | 148.75 | 116.94 | |
| | | | | | | | | |
| 8350.20 | 60.13 | V | 73.97 | -13.84 | Peak | 156.50 | 111.02 | |
| 8350.20 | 45.53 | V | 53.97 | -8.44 | Avg | 156.50 | 111.02 | |
| | | | | | | | | |
| 9278.00 | | | | | | | | **N/A - Done via Conducted** |
| 9278.00 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |

**FCC 15.247**
Nortek Security & Control, LLC
Smart Controller
Model: MMS915

Date: 08/05/2019
Lab: D
Tested By: Harvey Samaco

**Harmonics - High Channel**
**Transmit Mode - Y-Axis**
**Duty Cycle: 18.60%**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| 1855.60 | | | | | | | | **N/A - Done via Conducted** |
| 1855.60 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 2783.40 | 64.32 | H | 73.97 | -9.65 | Peak | 185.25 | 109.29 | |
| 2783.40 | 49.72 | H | 53.97 | -4.25 | Avg | 185.25 | 109.29 | |
| | | | | | | | | |
| 3711.20 | 53.63 | H | 73.97 | -20.34 | Peak | 275.25 | 173.71 | |
| 3711.20 | 39.03 | H | 53.97 | -14.94 | Avg | 275.25 | 173.71 | |
| | | | | | | | | |
| 4639.00 | 55.02 | H | 73.97 | -18.95 | Peak | 193.25 | 205.95 | |
| 4639.00 | 40.42 | H | 53.97 | -13.55 | Avg | 193.25 | 205.95 | |
| | | | | | | | | |
| 5566.80 | | | | | | | | **N/A - Done via Conducted** |
| 5566.80 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 6494.60 | | | | | | | | **N/A - Done via Conducted** |
| 6494.60 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |
| 7422.40 | 67.78 | H | 73.97 | -6.19 | Peak | 284.00 | 214.79 | |
| 7422.40 | 53.18 | H | 53.97 | -0.79 | Avg | 284.00 | 214.79 | |
| | | | | | | | | |
| 8350.20 | 59.83 | H | 73.97 | -14.14 | Peak | 154.00 | 105.59 | |
| 8350.20 | 45.23 | H | 53.97 | -8.74 | Avg | 154.00 | 105.59 | |
| | | | | | | | | |
| 9278.00 | | | | | | | | **N/A - Done via Conducted** |
| 9278.00 | | | | | | | | **Not in Restricted Band** |
| | | | | | | | | |

**FCC 15.247 and FCC Class B**
Nortek Security & Control, LLC
Smart Controller
Model: MMS915

Date: 08/05/2019
Lab: D
Tested By: Harvey Samaco

**Non Harmonic Emissions from the Tx and Digital Portion - 9 kHz to 30 MHz**
**Non Harmonic Emissions from the Tx and Digital Portion - 1 GHz to 9.3 GHz**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | No Emissions Detected |
| | | | | | | | | from 9 kHz to 30 MHz |
| | | | | | | | | for the digital portion |
| | | | | | | | | of the EUT |
| | | | | | | | | |
| | | | | | | | | No Emissions Detected |
| | | | | | | | | from 9 kHz to 30 MHz |
| | | | | | | | | for the Non-Harmonic Emissions |
| | | | | | | | | of the Transmitter for the EUT |
| | | | | | | | | |
| | | | | | | | | No Emissions Detected |
| | | | | | | | | from 1 GHz to 9.3 GHz |
| | | | | | | | | for the digital portion |
| | | | | | | | | of the EUT |
| | | | | | | | | |
| | | | | | | | | No Emissions Detected |
| | | | | | | | | from 1 GHz to 9.3 GHz |
| | | | | | | | | for the Non-Harmonic Emissions |
| | | | | | | | | of the Transmitter for the EUT |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**FCC 15.247 and FCC Class B**

Nortek Security & Control, LLC
Smart Controller
Model: MMS915

Date: 08/05/2019
Lab: D
Tested By: Harvey Samaco

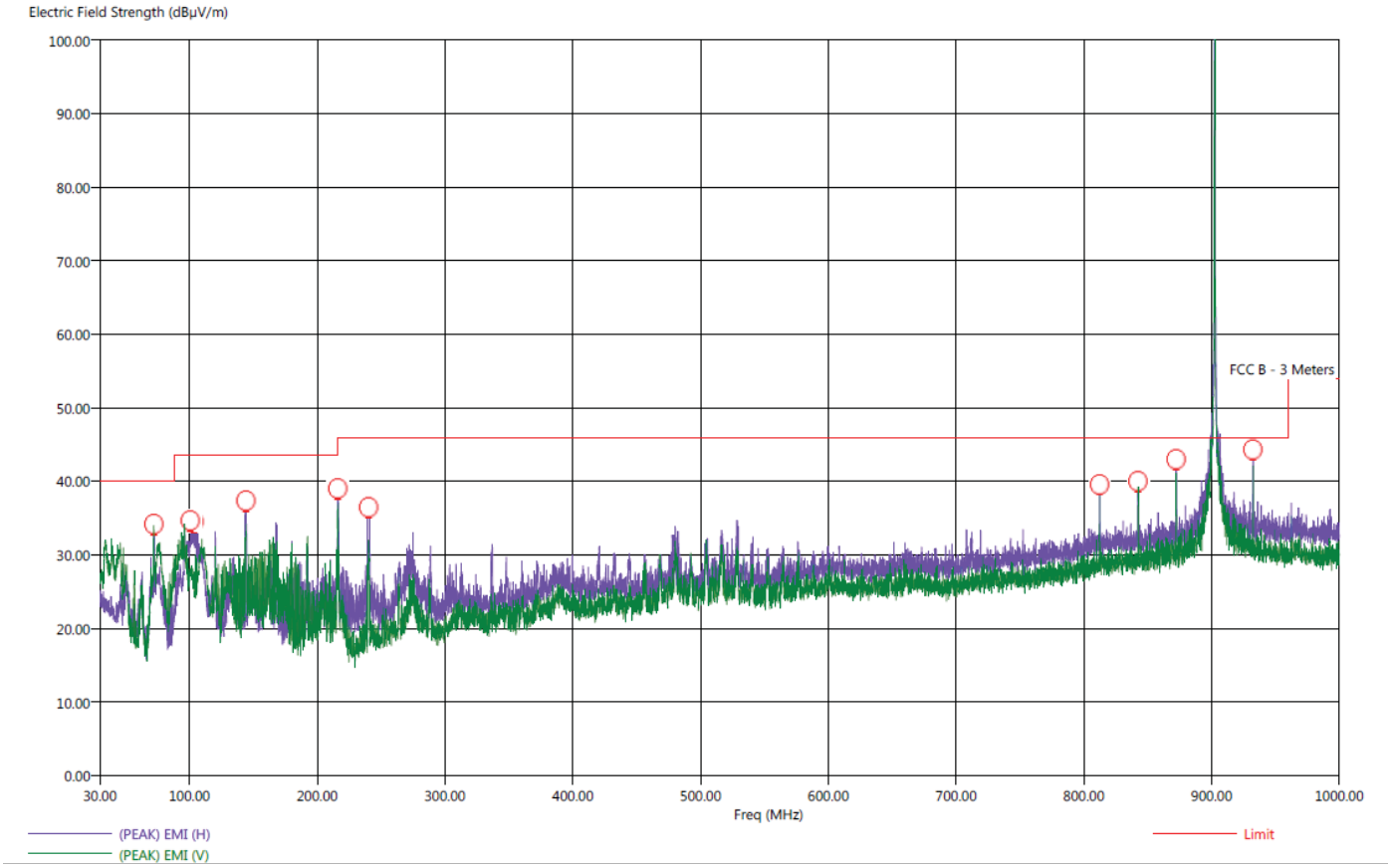
**Non Harmonic Emissions from the Receiver Portion - 9 kHz to 30 MHz**
**Non Harmonic Emissions from the Receiver Portion - 1 GHz to 9.3 GHz**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | No Emissions Detected |
| | | | | | | | | from 9 kHz to 30 MHz |
| | | | | | | | | for the receiver portion |
| | | | | | | | | of the EUT |
| | | | | | | | | |
| | | | | | | | | No Emissions Detected |
| | | | | | | | | from 1 GHz to 9.3 GHz |
| | | | | | | | | for the receiver portion |
| | | | | | | | | of the EUT |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Title: Pre-Scan - FCC Class B
File: 1 - RS - Pre-Scan - Tx Mode - FCC Class B - Low Channel - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously transmitting at 902.3 MHz
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A
The frequency at 902.3 MHz is from the intentional radiator and is subject to the limits of FCC 15.247 instead.

8/12/2019 8:16:38 AM
Sequence: Preliminary Scan

Note: The frequencies at 812.30 MHz, 842.40 MHz, 872.30 MHz, and 932.30 MHz are sidebands of the intentional radiator and not in the restricted band, thus are subject to the limits of FCC 15.247 (d) instead.



Title: Radiated Final - FCC Class B
File: 1 - RS - Final Scan - Tx Mode - FCC Class B - Low Channel - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously transmitting at 902.3 MHz
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A
The frequency at 902.3 MHz is from the intentional radiator and is subject to the limits of FCC 15.247 instead.

8/12/2019 9:07:32 AM
Sequence: Final Measurements

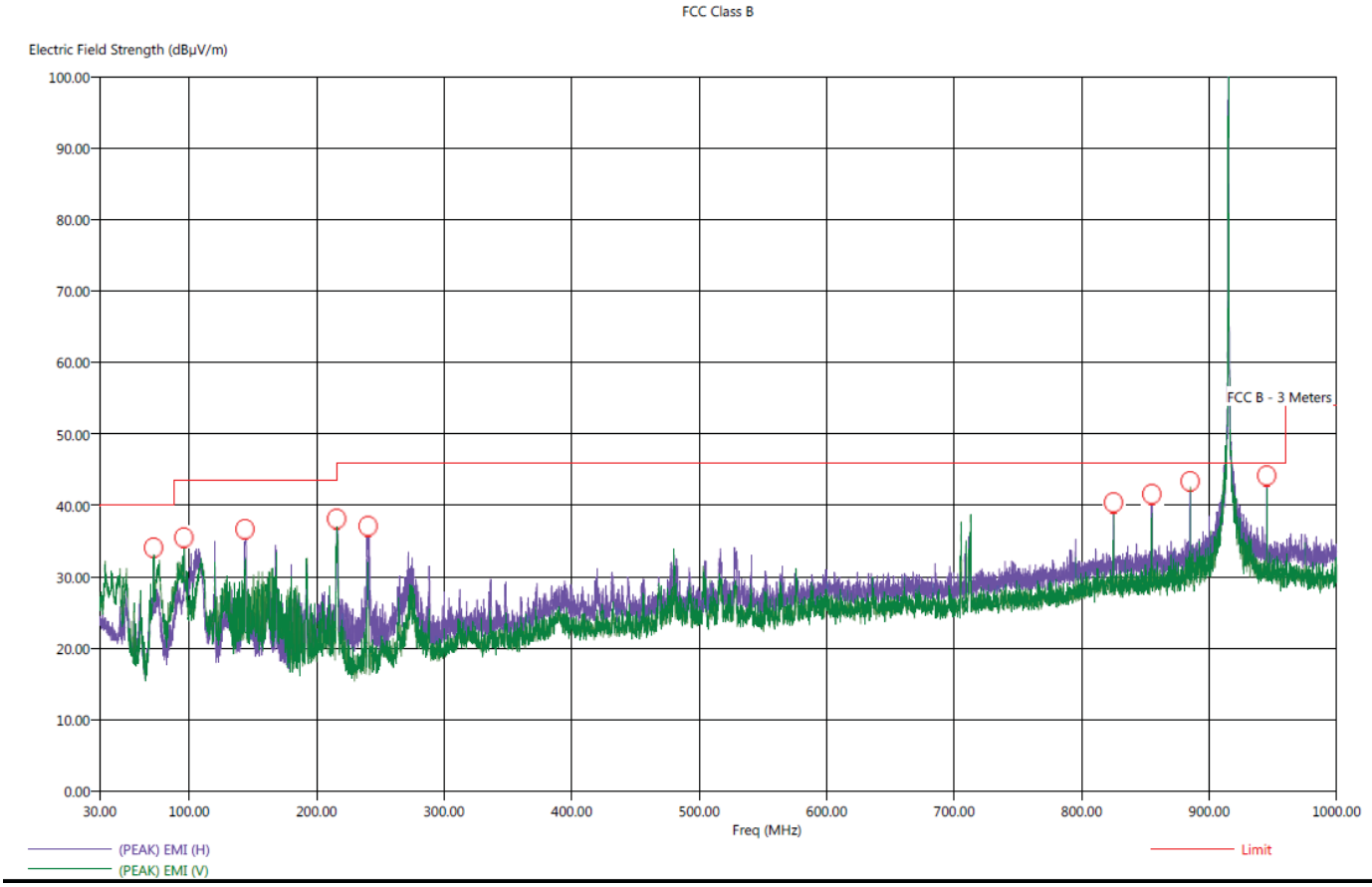
FCC Class B

| Freq (MHz) | Pol | (PEAK) EMI (dBµV/m) | (QP) EMI (dBµV/m) | (PEAK) Margin (dB) | (QP) Margin (dB) | Limit (dBµV/m) | Transducer (dB) | Cable (dB) | Ttbl Aql (deq) | Twr Ht (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 72.20 | H | 36.58 | 33.45 | -3.42 | -6.55 | 40.00 | 11.59 | 1.02 | 290.25 | 400.10 |
| 100.60 | H | 31.95 | 27.30 | -11.55 | -16.20 | 43.50 | 14.74 | 1.10 | 102.50 | 209.77 |
| 103.60 | H | 30.14 | 26.47 | -13.36 | -17.03 | 43.50 | 14.96 | 1.12 | 48.75 | 340.88 |
| 144.20 | H | 41.16 | 39.85 | -2.34 | -3.65 | 43.50 | 14.81 | 1.28 | 130.50 | 160.34 |
| 216.10 | H | 42.99 | 41.28 | -3.01 | -4.72 | 46.00 | 15.60 | 1.57 | 145.00 | 144.28 |
| 240.20 | H | 44.22 | 41.94 | -1.78 | -4.06 | 46.00 | 16.50 | 1.60 | 147.00 | 111.32 |

Title: Pre-Scan - FCC Class B
File: 1 - RS - Pre-Scan - Tx Mode - FCC Class B - Mid Channel - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously transmitting at 915 MHz
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A
The frequency at 915 MHz is from the intentional radiator and is subject to the limits of FCC 15.247 instead.

8/12/2019 9:45:51 AM
Sequence: Preliminary Scan

Note: The frequencies at 825.10 MHz, 855.00 MHz, 855.10 MHz, and 945.10 MHz are sidebands of the intentional radiator and not in the restricted band, thus are subject to the limits of FCC 15.247 (d) instead.



Title: Radiated Final - FCC Class B
File: 1 - RS - Final Scan - Tx Mode - FCC Class B - Mid Channel - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously transmitting at 915 MHz
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A

8/12/2019 10:46:38 AM
Sequence: Final Measurements

FCC Class B

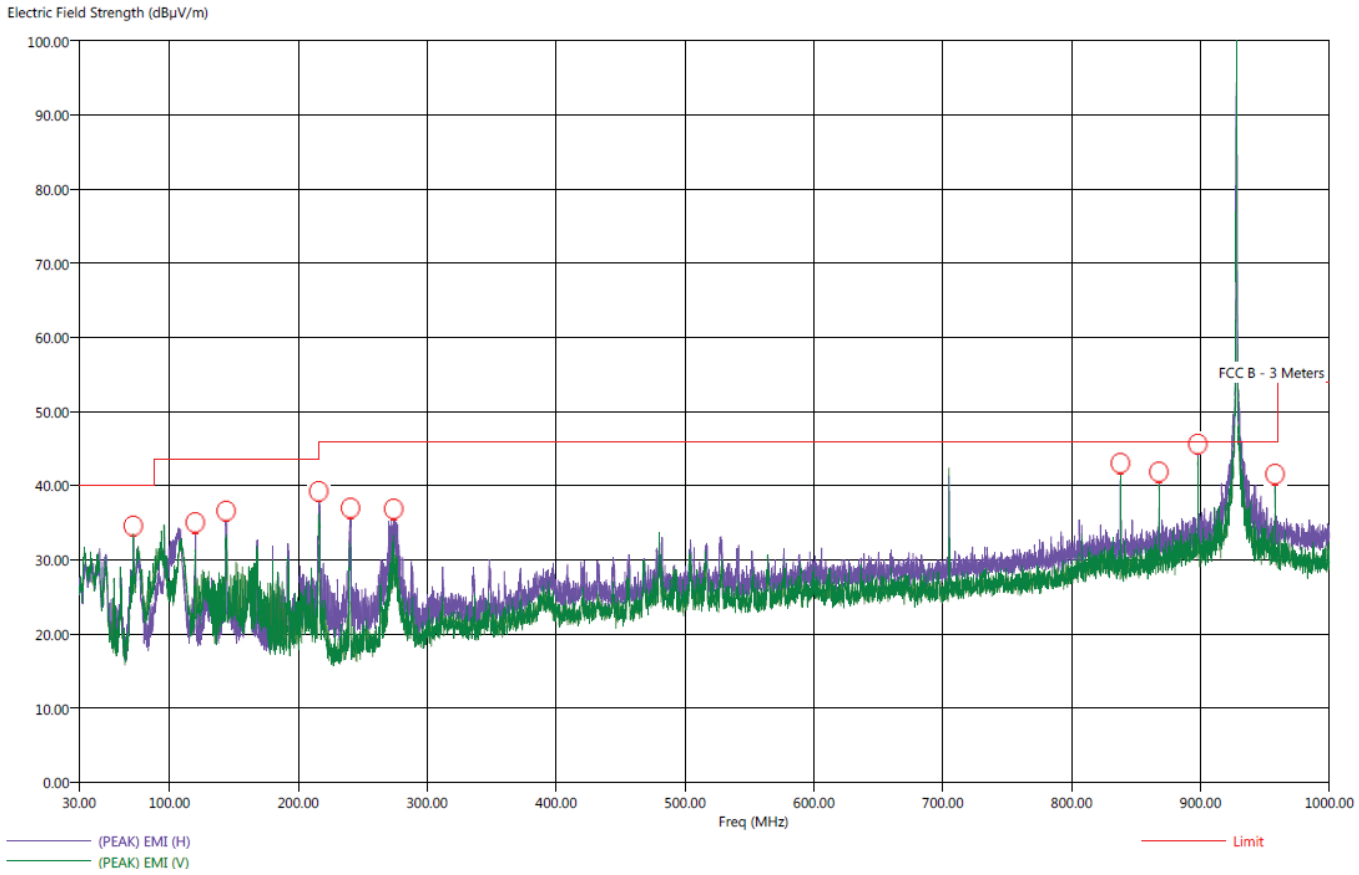
| Freq (MHz) | Pol | (PEAK) EMI (dBµV/m) | (QP) EMI (dBµV/m) | (PEAK) Margin (dB) | (QP) Margin (dB) | Limit (dBµV/m) | Transducer (dB) | Cable (dB) | Ttbl Aql (deg) | Twr Ht (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 72.10 | H | 36.40 | 32.76 | -3.60 | -7.24 | 40.00 | 11.62 | 1.02 | 279.25 | 275.02 |
| 96.00 | V | 37.23 | 33.75 | -6.27 | -9.75 | 43.50 | 14.30 | 1.10 | 184.00 | 111.38 |
| 143.90 | H | 41.43 | 40.05 | -2.07 | -3.45 | 43.50 | 14.81 | 1.28 | 128.00 | 193.41 |
| 215.70 | H | 42.56 | 40.50 | -0.94 | -3.00 | 43.50 | 15.59 | 1.57 | 140.50 | 127.74 |
| 216.30 | H | 43.11 | 41.28 | -2.89 | -4.72 | 46.00 | 15.60 | 1.57 | 143.00 | 144.28 |
| 240.30 | H | 43.17 | 41.32 | -2.83 | -4.68 | 46.00 | 16.51 | 1.60 | 138.50 | 111.32 |

Title: Pre-Scan - FCC Class B
File: 1 - RS - Pre-Scan - Tx Mode - FCC Class B - High Channel - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously transmitting at 927.8 MHz
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A
The frequency at 927.8 MHz is from the intentional radiator and is subject to the limits of FCC 15.247 instead.

8/12/2019 11:45:20 AM
Sequence: Preliminary Scan

Note: The frequencies at 837.90 MHz, 867.80 MHz, 897.90 MHz, and 957.80 MHz are sidebands of the intentional radiator and not in the restricted band, thus are subject to the limits of FCC 15.247 (d) instead.

FCC Class B



Title: Radiated Final - FCC Class B
File: 1 - RS - Final Scan - Tx Mode - FCC Class B - High Channel - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously transmitting at 927.8 MHz
Comments: Company: Nortek Security & Control, LLC
Model: MM37X/MM57X
S/N: N/A
The frequency at 927.8 MHz is from the intentional radiator and is subject to the limits of FCC 15.247 instead.
High Channel

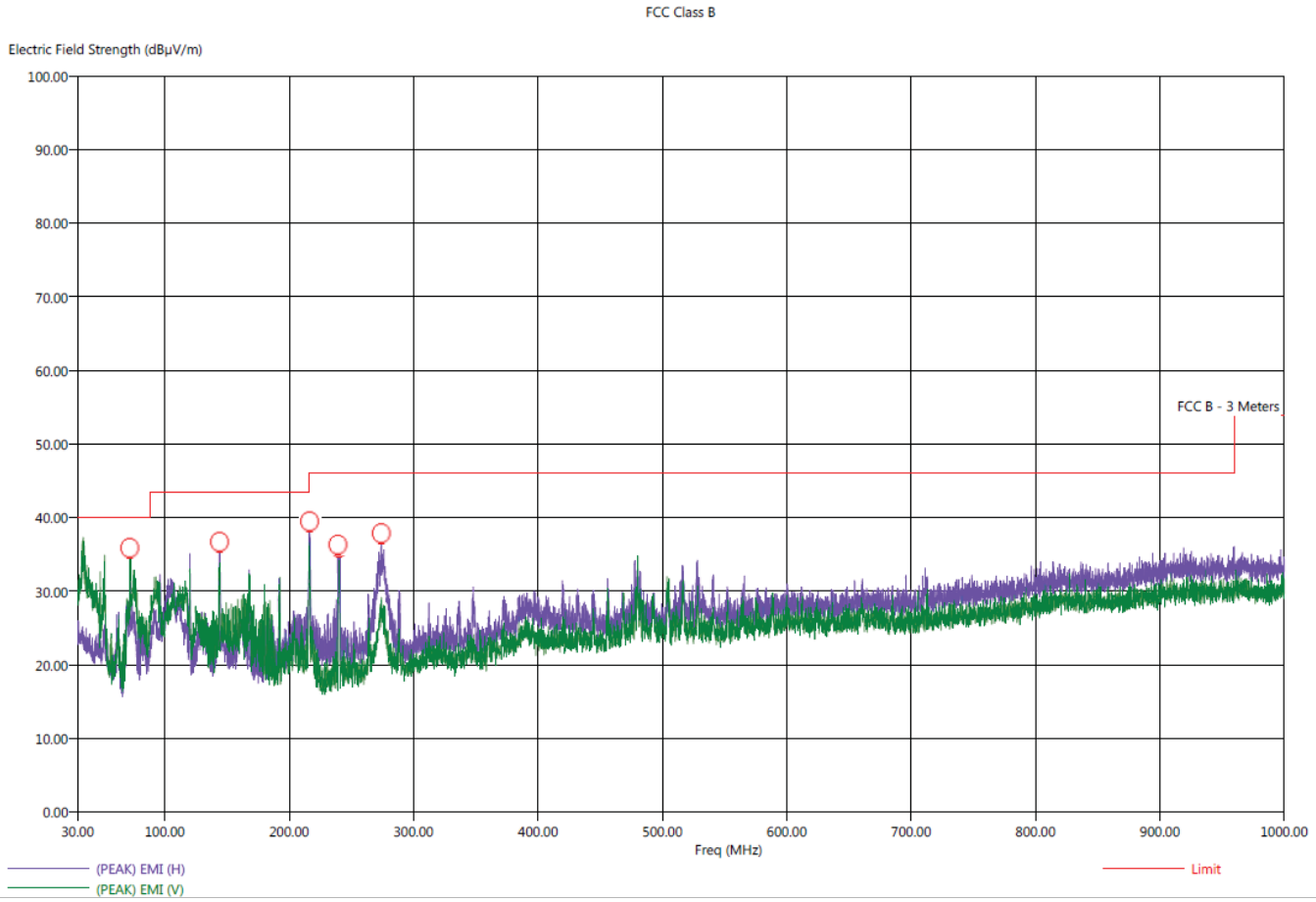
8/12/2019 12:12:20 PM
Sequence: Final Measurements

FCC Class B

| Freq (MHz) | Pol | (PEAK) EMI (dBµV/m) | (QP) EMI (dBµV/m) | (PEAK) Margin (dB) | (QP) Margin (dB) | Limit (dBµV/m) | Transducer (dB) | Cable (dB) | Ttbl Agl (deg) | Twr Ht (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 72.00 | H | 36.77 | 33.56 | -3.23 | -6.44 | 40.00 | 11.62 | 1.02 | 289.50 | 400.10 |
| 120.10 | H | 36.77 | 34.50 | -6.73 | -9.00 | 43.50 | 15.90 | 1.18 | 109.75 | 275.26 |
| 144.10 | H | 41.73 | 40.17 | -1.77 | -3.33 | 43.50 | 14.80 | 1.28 | 130.50 | 209.71 |
| 215.90 | H | 42.77 | 40.96 | -3.23 | -5.04 | 46.00 | 15.60 | 1.57 | 136.00 | 127.68 |
| 240.60 | H | 42.51 | 39.65 | -3.49 | -6.35 | 46.00 | 16.56 | 1.60 | 138.50 | 144.10 |
| 274.10 | H | 35.02 | 31.07 | -10.98 | -14.93 | 46.00 | 18.49 | 1.70 | 48.75 | 275.08 |

Title: Pre-Scan - FCC Class B
File: 1 - RS - Pre-Scan - Rx Mode - FCC Class B - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously receiving at 902.3 MHz - Worst Case
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A

8/12/2019 1:23:43 PM
Sequence: Preliminary Scan



Title: Radiated Final - FCC Class B
File: 1 - RS - Final Scan - Rx Mode - FCC Class B - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously receiving at 902.3 MHz - Worst Case
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A

8/12/2019 1:48:30 PM
Sequence: Final Measurements

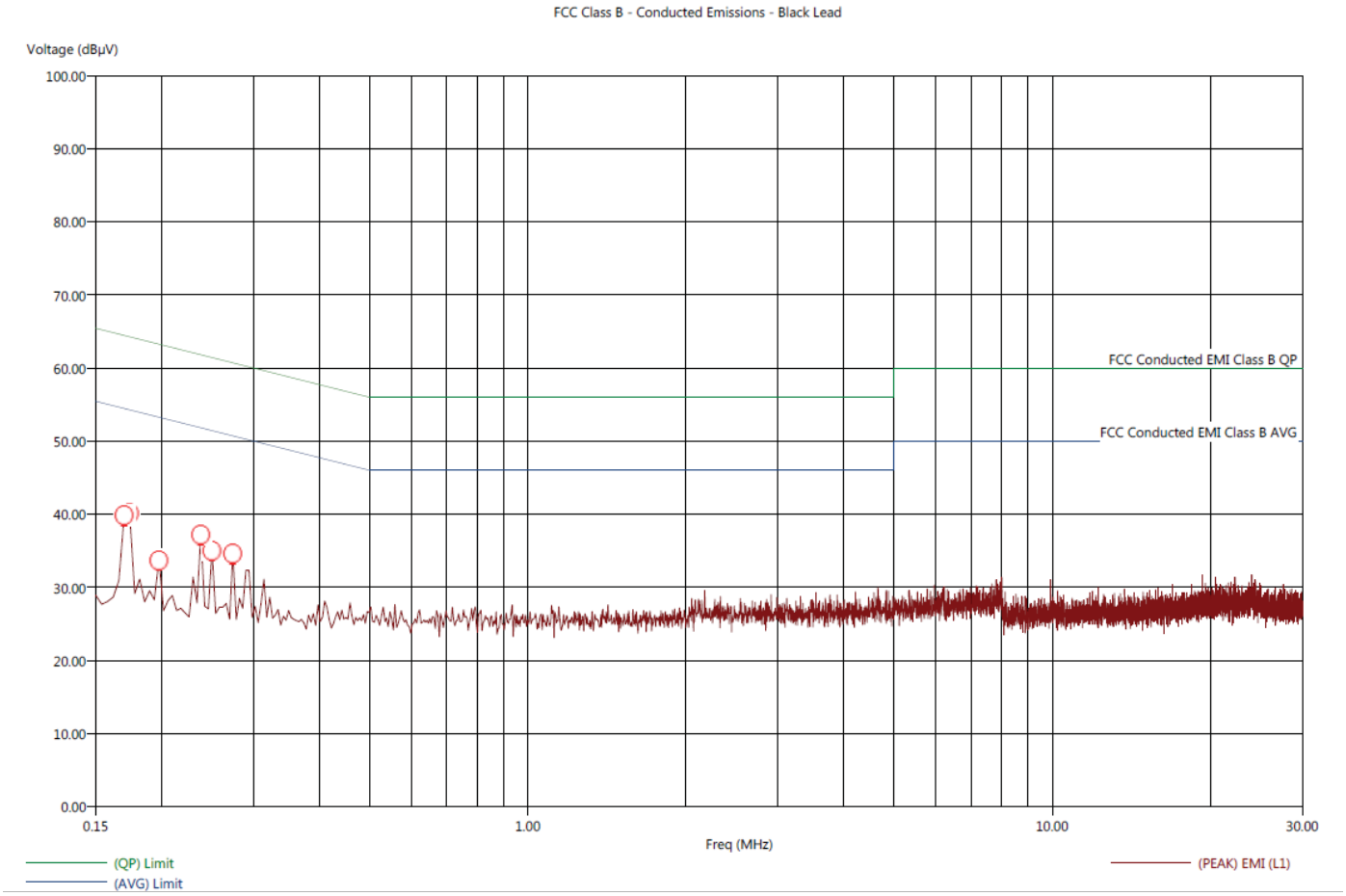
FCC Class B

| Freq (MHz) | Pol | (PEAK) EMI (dBµV/m) | (QP) EMI (dBµV/m) | (PEAK) Margin (dB) | (QP) Margin (dB) | Limit (dBµV/m) | Transducer (dB) | Cable (dB) | Ttbl Agl (deg) | Twr Ht (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 71.90 | V | 37.68 | 34.85 | -2.32 | -5.15 | 40.00 | 11.60 | 1.02 | 280.50 | 111.20 |
| 144.00 | H | 41.55 | 39.83 | -1.95 | -3.67 | 43.50 | 14.80 | 1.28 | 131.50 | 209.29 |
| 216.40 | H | 43.38 | 41.25 | -2.62 | -4.75 | 46.00 | 15.60 | 1.57 | 142.50 | 111.20 |
| 239.10 | H | 42.16 | 35.03 | -3.84 | -10.97 | 46.00 | 16.50 | 1.60 | 146.25 | 127.44 |
| 240.10 | H | 44.14 | 41.75 | -1.86 | -4.25 | 46.00 | 16.50 | 1.60 | 144.50 | 111.32 |
| 274.00 | H | 33.55 | 29.13 | -12.45 | -16.87 | 46.00 | 18.50 | 1.70 | 48.75 | 275.14 |

# *CONDUCTED EMISSIONS DATA SHEETS*

Title: FCC B - Conducted Emissions - Black Lead
File: 1 - RS - Pre-Scan - Black Lead -Tx Mode - FCC Class B - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously transmitting at 902.3 MHz - Worst Case
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A

8/12/2019 3:04:17 PM
Sequence: Preliminary Scan



Title: FCC B - Conducted Emissions - Black Lead
File: 1 - RS - Final Scan - Black Lead - Tx Mode - FCC Class B - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously transmitting at 902.3 MHz - Worst Case
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A

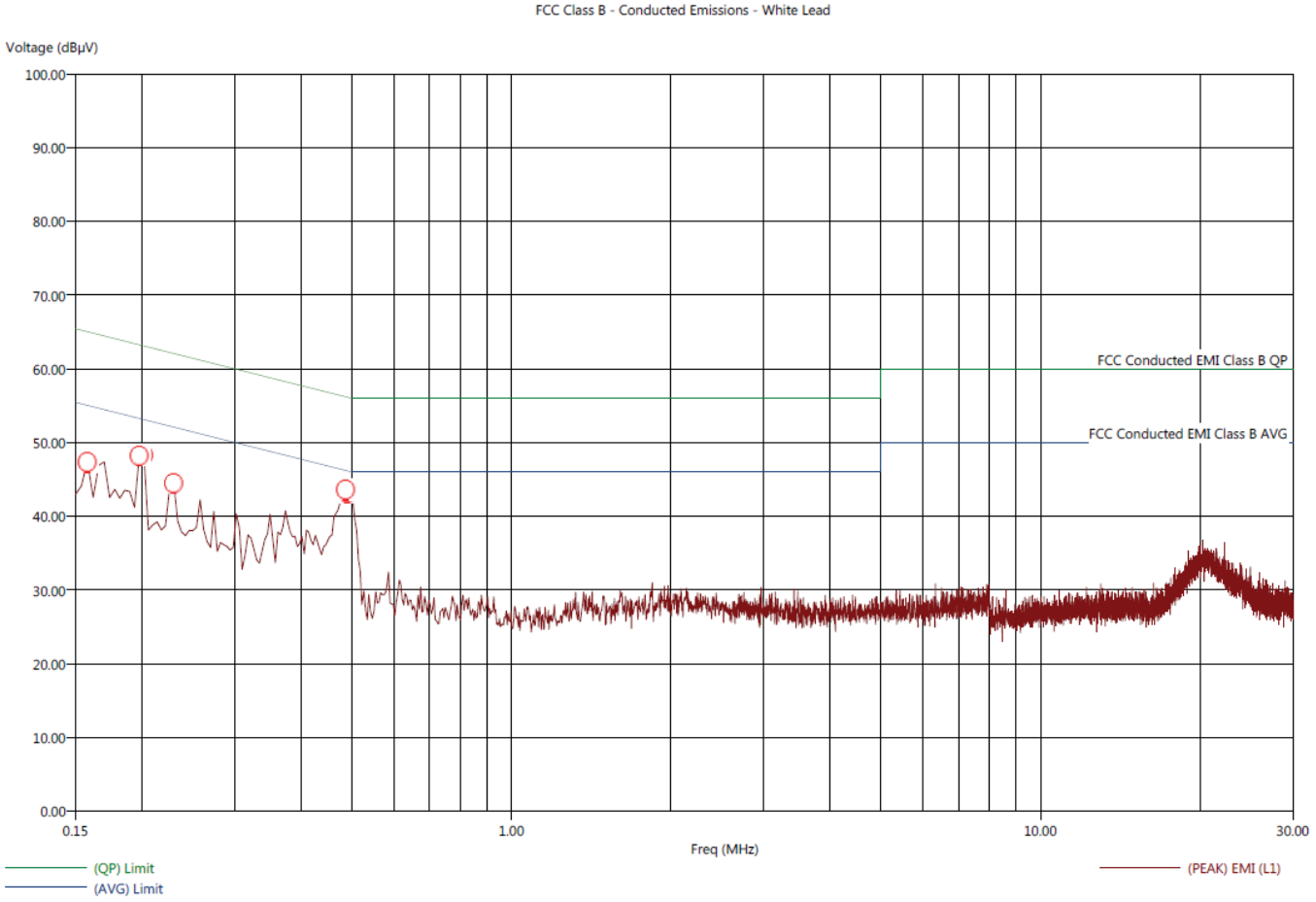
8/12/2019 3:14:08 PM
Sequence: Final Measurements

FCC Class B - Conducted Emissions - Black Lead

| Freq (MHz) | (PEAK) EMI (dBµV) | (AVG) EMI (dBµV) | (PEAK) Margin AVL (dB) | (AVG) Margin AVL (dB) | (AVG) Limit (dBµV) | Cable (dB) | Transducer (dB) | Filter (dB) |
|---|---|---|---|---|---|---|---|---|
| 0.170 | 39.83 | 7.76 | -14.65 | -46.71 | 54.47 | 0.00 | 0.44 | 9.80 |
| 0.174 | 44.83 | 5.98 | -9.46 | -48.31 | 54.29 | 0.00 | 0.43 | 9.80 |
| 0.198 | 38.83 | 2.54 | -14.45 | -50.74 | 53.28 | 0.00 | 0.37 | 9.80 |
| 0.238 | 32.70 | 1.55 | -19.14 | -50.28 | 51.83 | 0.02 | 0.29 | 9.78 |
| 0.250 | 38.55 | 2.78 | -12.89 | -48.66 | 51.45 | 0.02 | 0.27 | 9.78 |
| 0.274 | 34.00 | 1.87 | -16.72 | -48.86 | 50.73 | 0.03 | 0.23 | 9.77 |

Title: FCC B - Conducted Emissions - White Lead
File: 2 - RS - Pre-Scan - White Lead - Tx Mode - FCC Class B - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously transmitting at 902.3 MHz - Worst Case
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A

8/12/2019 3:26:11 PM
Sequence: Preliminary Scan



Title: FCC B - Conducted Emissions - White Lead
File: 2 - RS - Final Scan - White Lead - Tx Mode - FCC Class B - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously transmitting at 902.3 MHz - Worst Case
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A

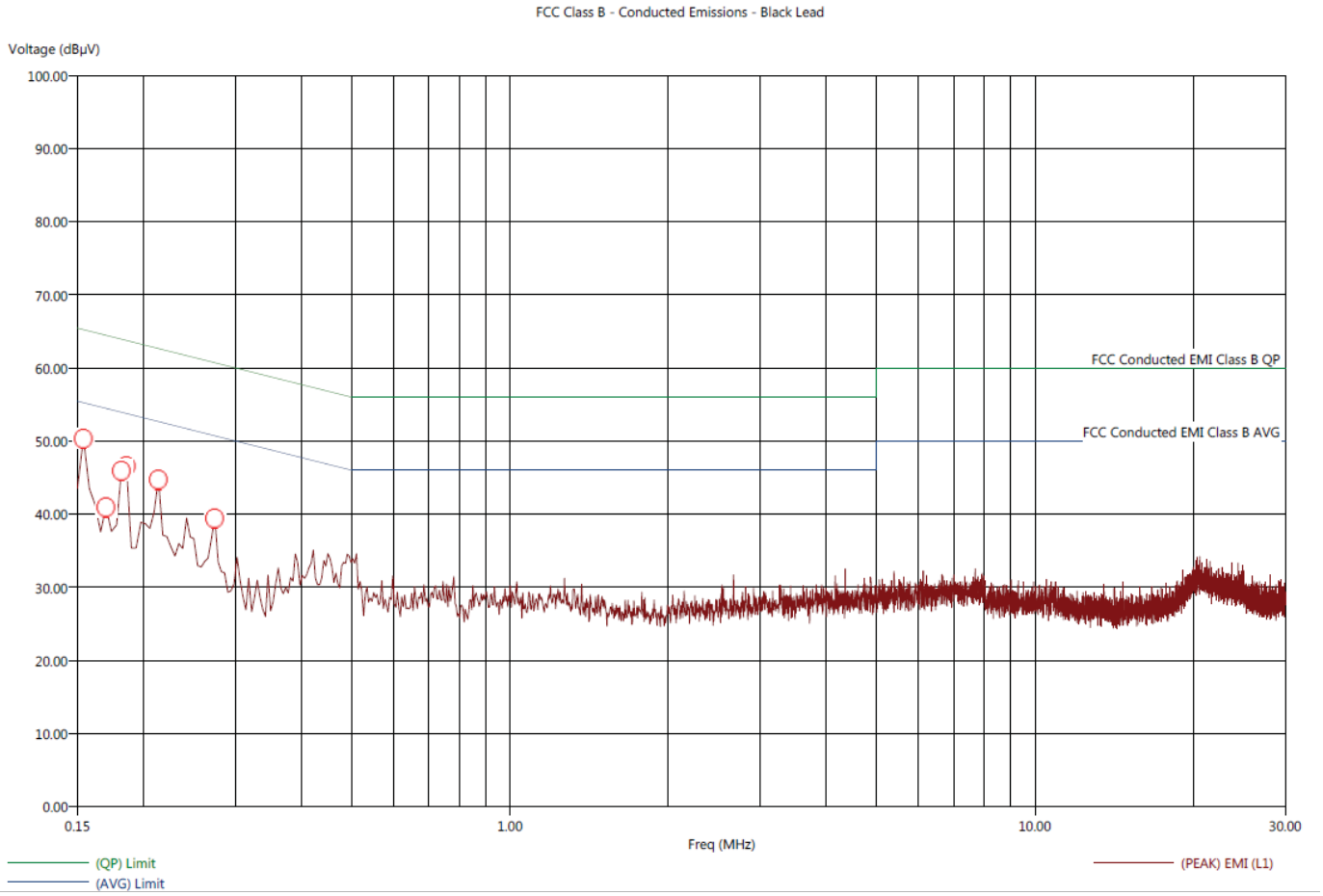
8/12/2019 3:33:14 PM
Sequence: Final Measurements

FCC Class B - Conducted Emissions - White Lead

| Freq (MHz) | (PEAK) EMI (dBµV) | (AVG) EMI (dBµV) | (PEAK) Margin AVL (dB) | (AVG) Margin AVL (dB) | (AVG) Limit (dBµV) | Cable (dB) | Transducer (dB) | Filter (dB) |
|---|---|---|---|---|---|---|---|---|
| 0.158 | 53.24 | 36.61 | -1.81 | -18.44 | 55.05 | 0.00 | 0.47 | 9.80 |
| 0.198 | 48.05 | 33.70 | -5.22 | -19.57 | 53.28 | 0.00 | 0.37 | 9.80 |
| 0.202 | 48.80 | 32.34 | -4.32 | -20.78 | 53.12 | 0.00 | 0.36 | 9.80 |
| 0.230 | 45.05 | 30.99 | -7.05 | -21.11 | 52.10 | 0.02 | 0.31 | 9.78 |
| 0.486 | 44.20 | 35.49 | -2.02 | -10.73 | 46.22 | 0.10 | 0.12 | 9.70 |
| 0.490 | 44.32 | 35.53 | -1.84 | -10.63 | 46.16 | 0.10 | 0.12 | 9.70 |

Title: FCC B - Conducted Emissions - Black Lead
File: 3 - RS - Pre-Scan - Black Lead - Rx Mode - FCC Class B - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously receiving at 902.3 MHz - Worst Case
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A

8/12/2019 3:49:04 PM
Sequence: Preliminary Scan



Title: FCC B - Conducted Emissions - Black Lead
File: 3 - RS - Final Scan - Black Lead - Rx Mode - FCC Class B - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously receiving at 902.3 MHz - Worst Case
Comments: Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A

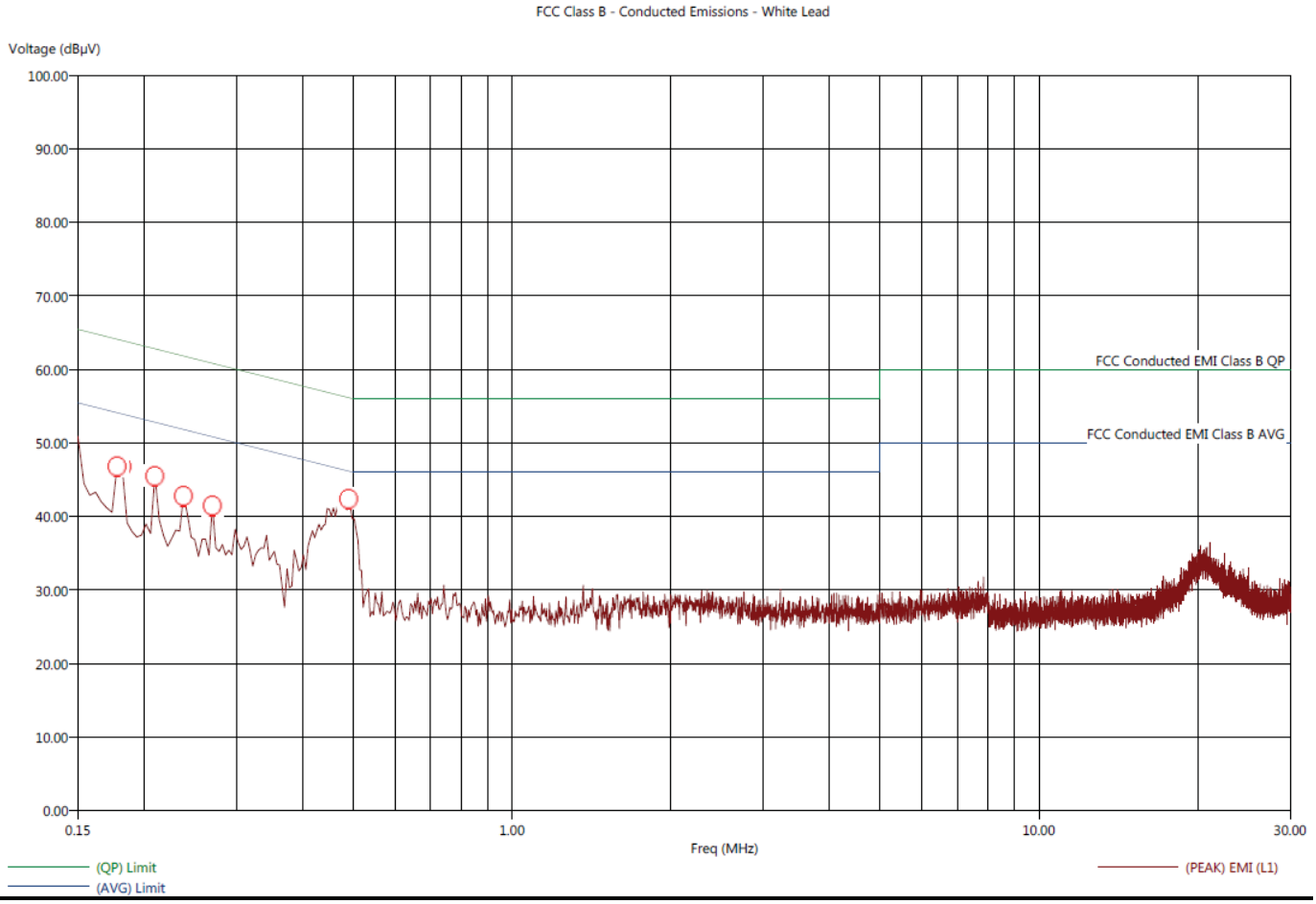
8/12/2019 3:53:47 PM
Sequence: Final Measurements

FCC Class B - Conducted Emissions - Black Lead

| Freq (MHz) | (PEAK) EMI (dBµV) | (AVG) EMI (dBµV) | (PEAK) Margin AVL (dB) | (AVG) Margin AVL (dB) | (AVG) Limit (dBµV) | Cable (dB) | Transducer (dB) | Filter (dB) |
|---|---|---|---|---|---|---|---|---|
| 0.154 | 50.50 | 35.13 | -4.75 | -20.12 | 55.25 | 0.00 | 0.48 | 9.80 |
| 0.170 | 48.31 | 32.54 | -6.17 | -21.93 | 54.47 | 0.00 | 0.44 | 9.80 |
| 0.182 | 47.41 | 31.70 | -6.53 | -22.24 | 53.94 | 0.00 | 0.41 | 9.80 |
| 0.186 | 46.48 | 31.45 | -7.29 | -22.32 | 53.77 | 0.00 | 0.40 | 9.80 |
| 0.214 | 44.55 | 30.36 | -8.12 | -22.30 | 52.67 | 0.00 | 0.34 | 9.79 |
| 0.274 | 38.65 | 23.49 | -12.08 | -27.23 | 50.73 | 0.00 | 0.23 | 9.77 |

Title: FCC B - Conducted Emissions - White Lead
File: 4 - RS - Pre-Scan - White Lead - Rx Mode - FCC Class B - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously receiving at 902.3 MHz - Worst Case
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A

8/12/2019 4:02:57 PM
Sequence: Preliminary Scan



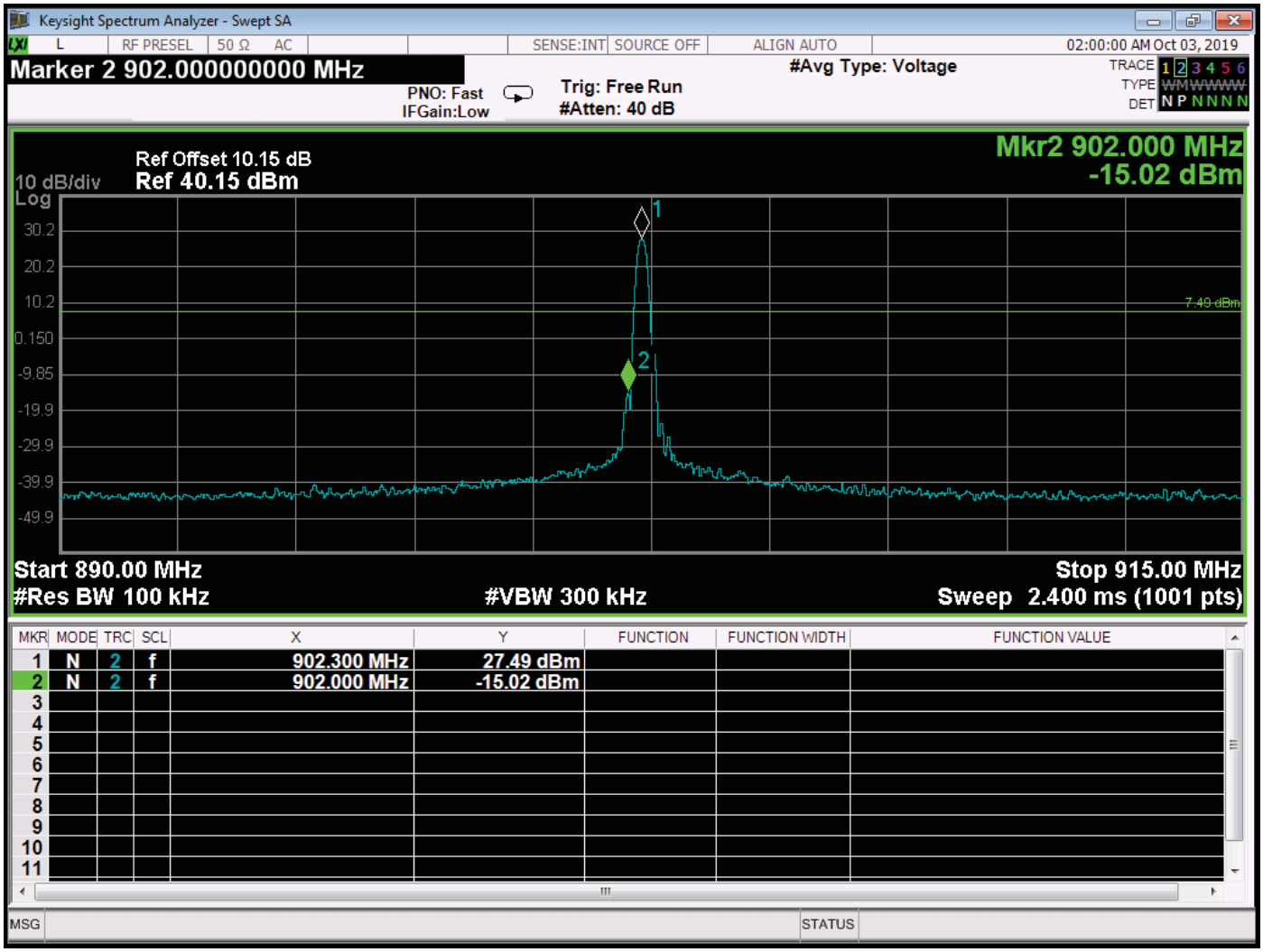
Title: FCC B - Conducted Emissions - White Lead
File: 4 - RS - Final Scan - White Lead - Rx Mode - FCC Class B - 30 MHz to 1000 MHz.set
Operator: Harvey Samaco
EUT Type: Smart Controller
EUT Condition: The EUT is continuously receiving at 902.3 MHz - Worst Case
Company: Nortek Security & Control, LLC
Model: MMS915
S/N: N/A

8/12/2019 4:06:17 PM
Sequence: Final Measurements

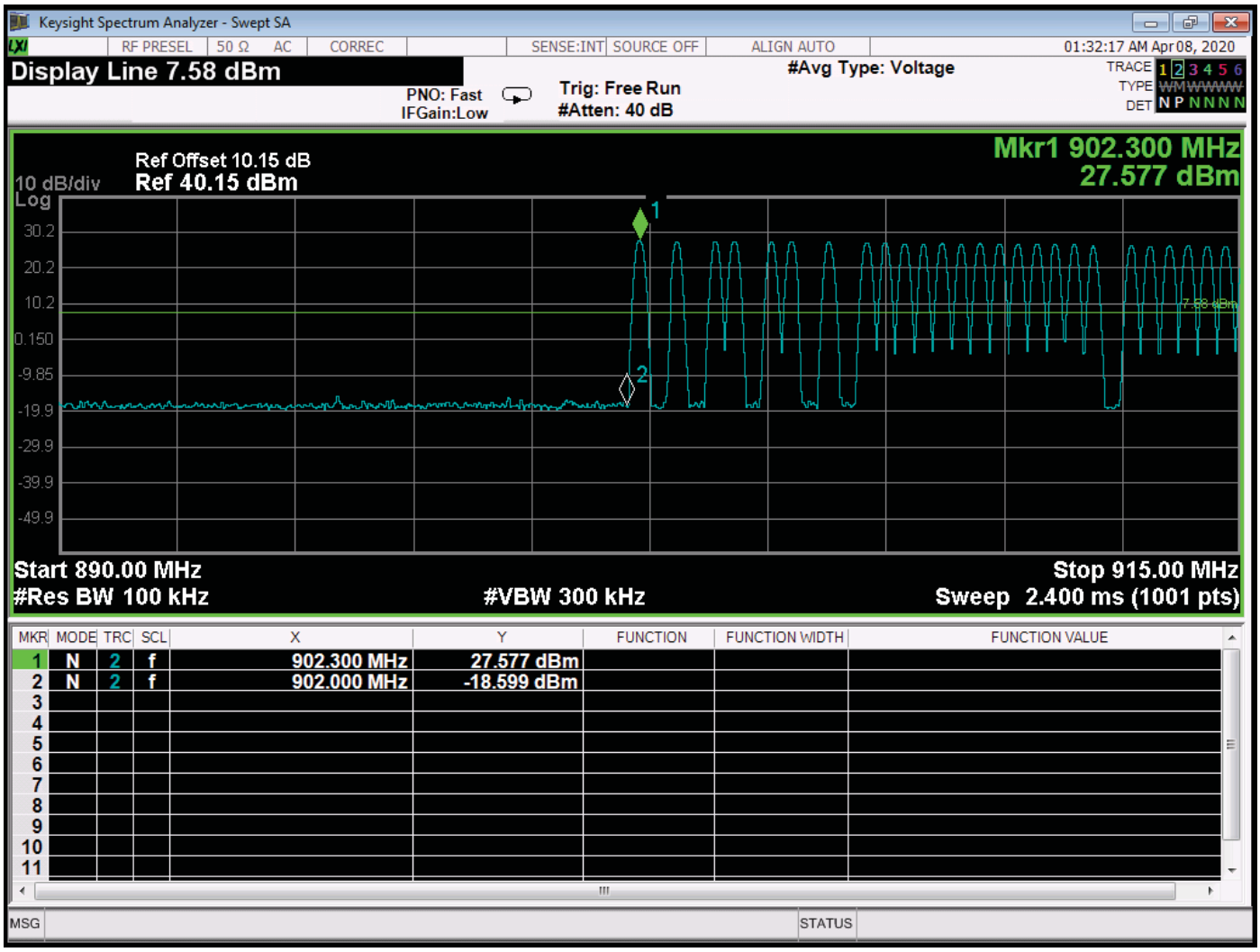
FCC Class B - Conducted Emissions - White Lead

| Freq (MHz) | (PEAK) EMI (dBµV) | (AVG) EMI (dBµV) | (PEAK) Margin AVL (dB) | (AVG) Margin AVL (dB) | (AVG) Limit (dBµV) | Cable (dB) | Transducer (dB) | Filter (dB) |
|---|---|---|---|---|---|---|---|---|
| 0.178 | 47.87 | 32.57 | -6.25 | -21.54 | 54.11 | 0.00 | 0.42 | 9.80 |
| 0.182 | 47.86 | 32.72 | -6.08 | -21.22 | 53.94 | 0.00 | 0.41 | 9.80 |
| 0.210 | 45.10 | 30.31 | -7.71 | -22.50 | 52.81 | 0.01 | 0.35 | 9.79 |
| 0.238 | 43.61 | 30.60 | -8.22 | -21.23 | 51.83 | 0.02 | 0.29 | 9.78 |
| 0.270 | 40.65 | 27.76 | -10.19 | -23.09 | 50.84 | 0.03 | 0.24 | 9.77 |
| 0.490 | 41.76 | 33.98 | -4.40 | -12.18 | 46.16 | 0.10 | 0.12 | 9.70 |

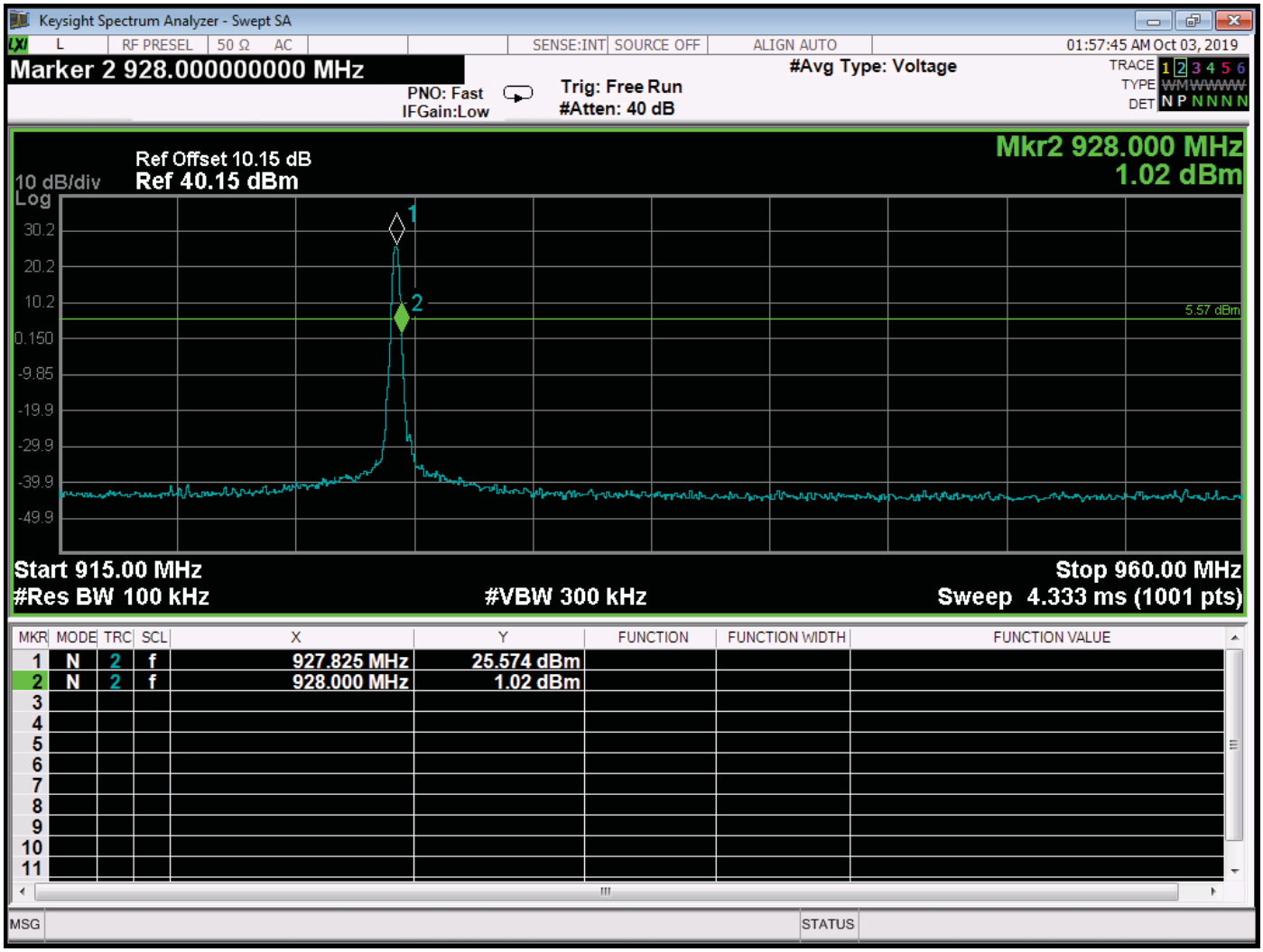
# *BAND EDGES DATA SHEETS*



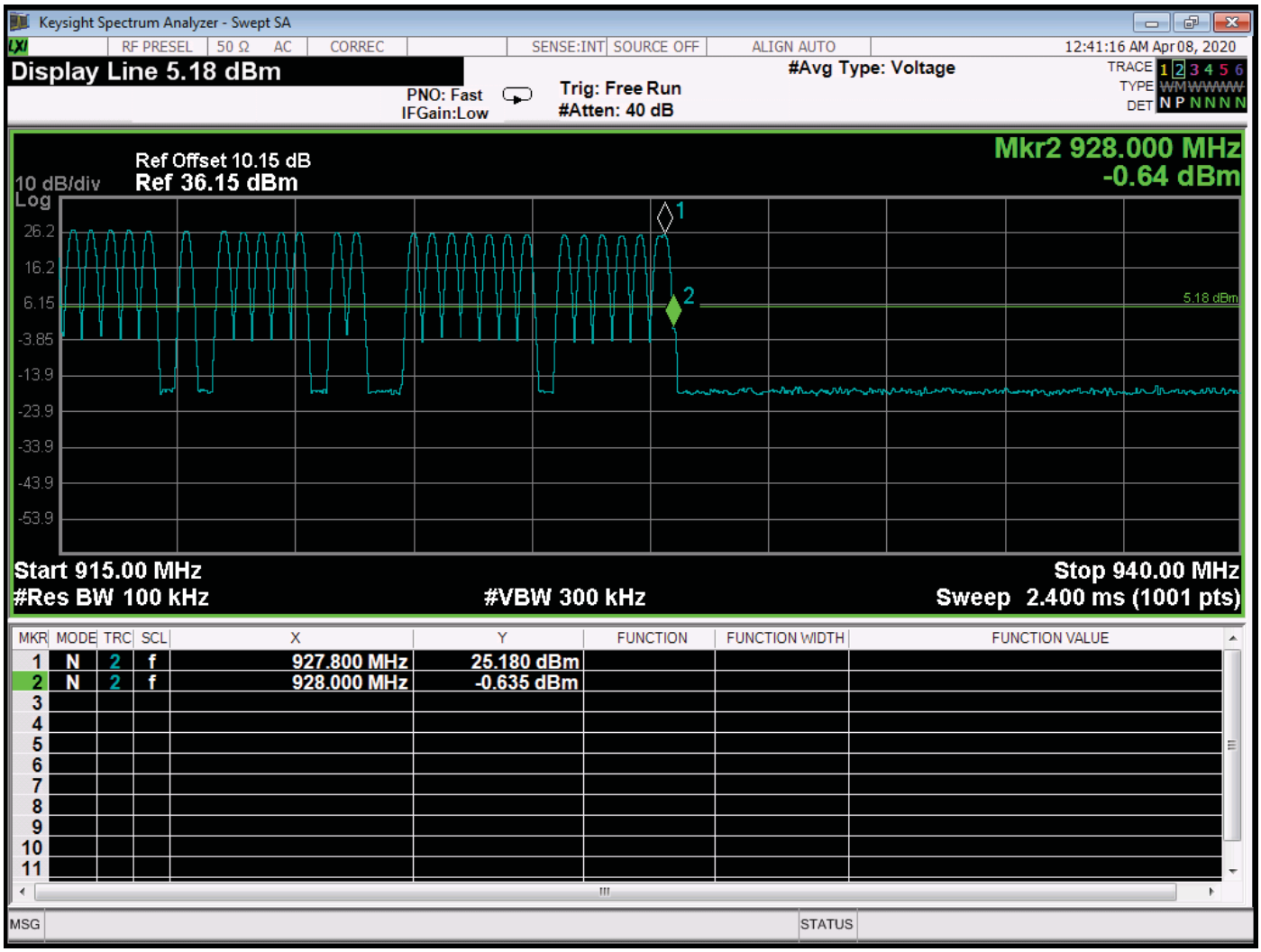

Band Edge – Low Channel – Fixed Frequency Mode




Band Edge – Low Channel – Frequency Hopping Mode

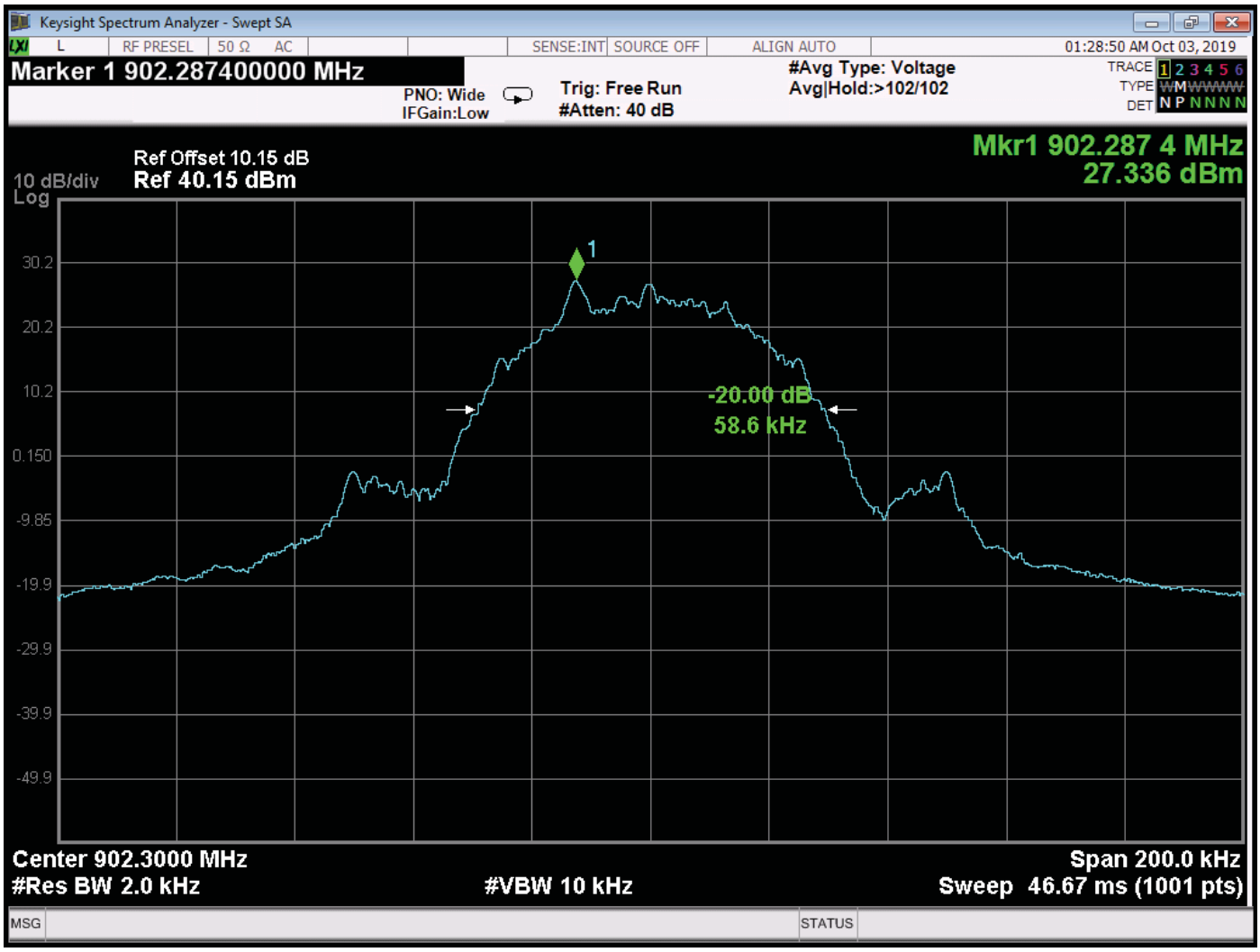



Band Edge – High Channel – Fixed Frequency Mode

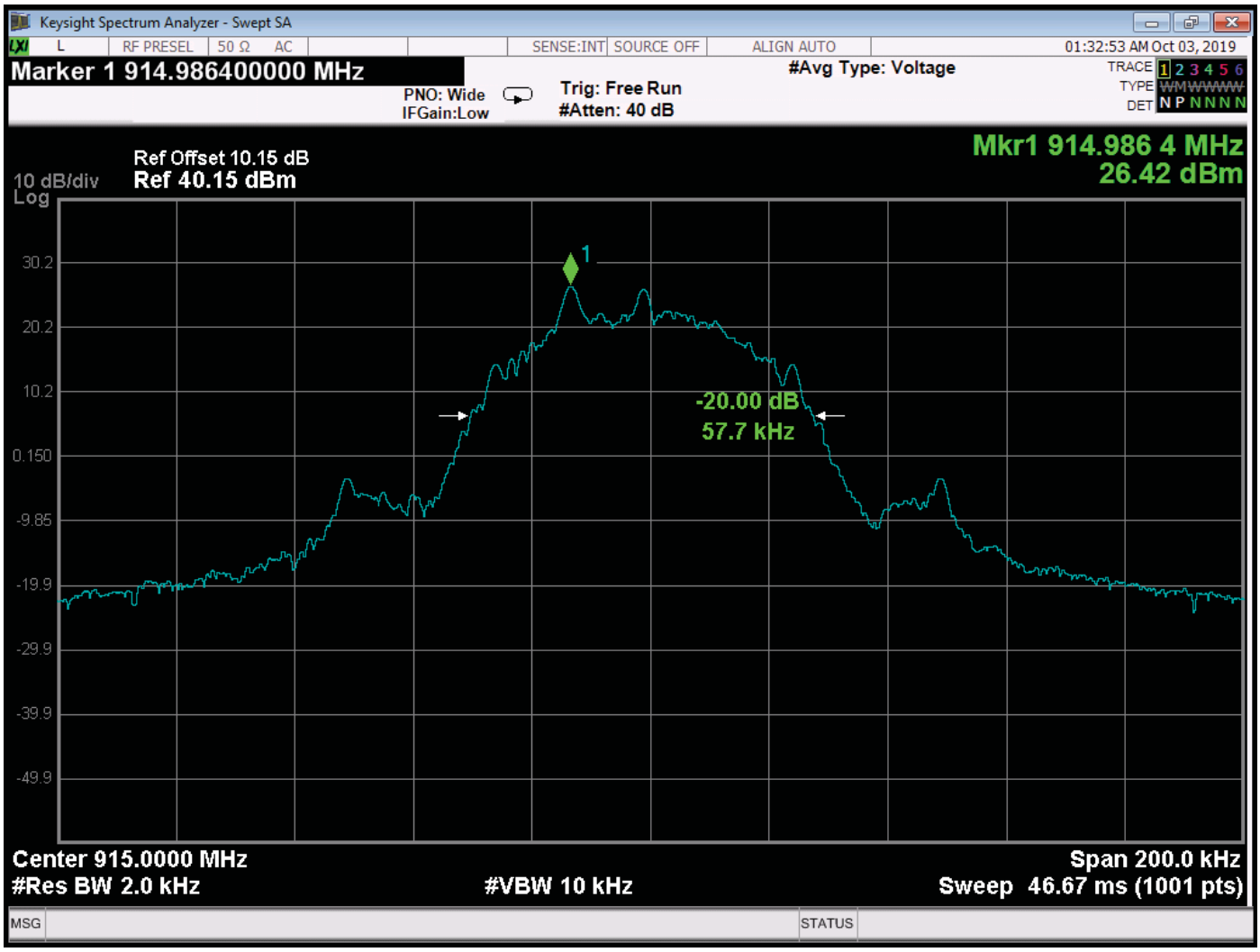



Band Edge – High Channel – Frequency Hopping Mode

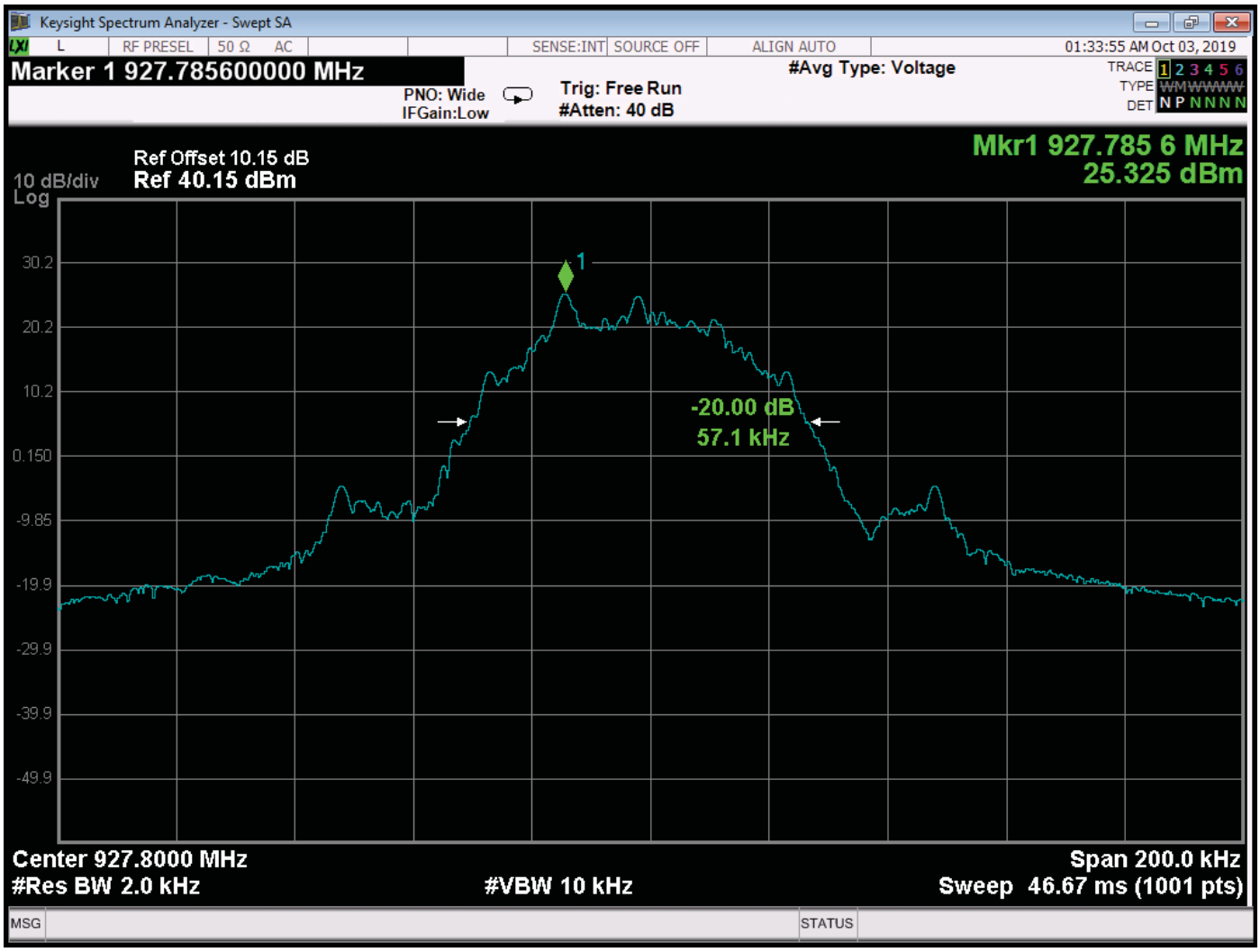
# *-20 dB BANDWIDTH DATA SHEETS*




-20 dB Bandwidth – Low Channel

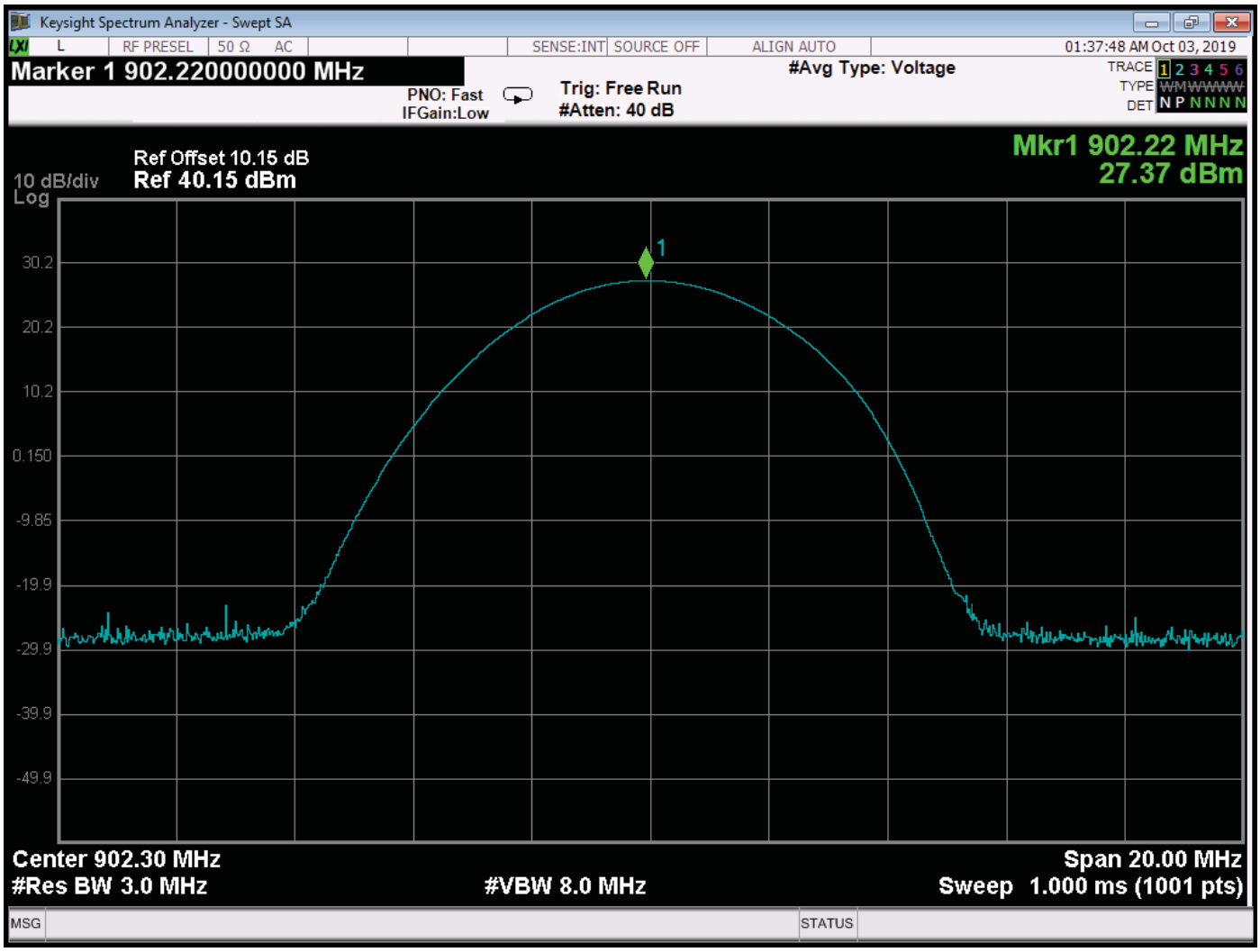



-20 dB Bandwidth – Middle Channel

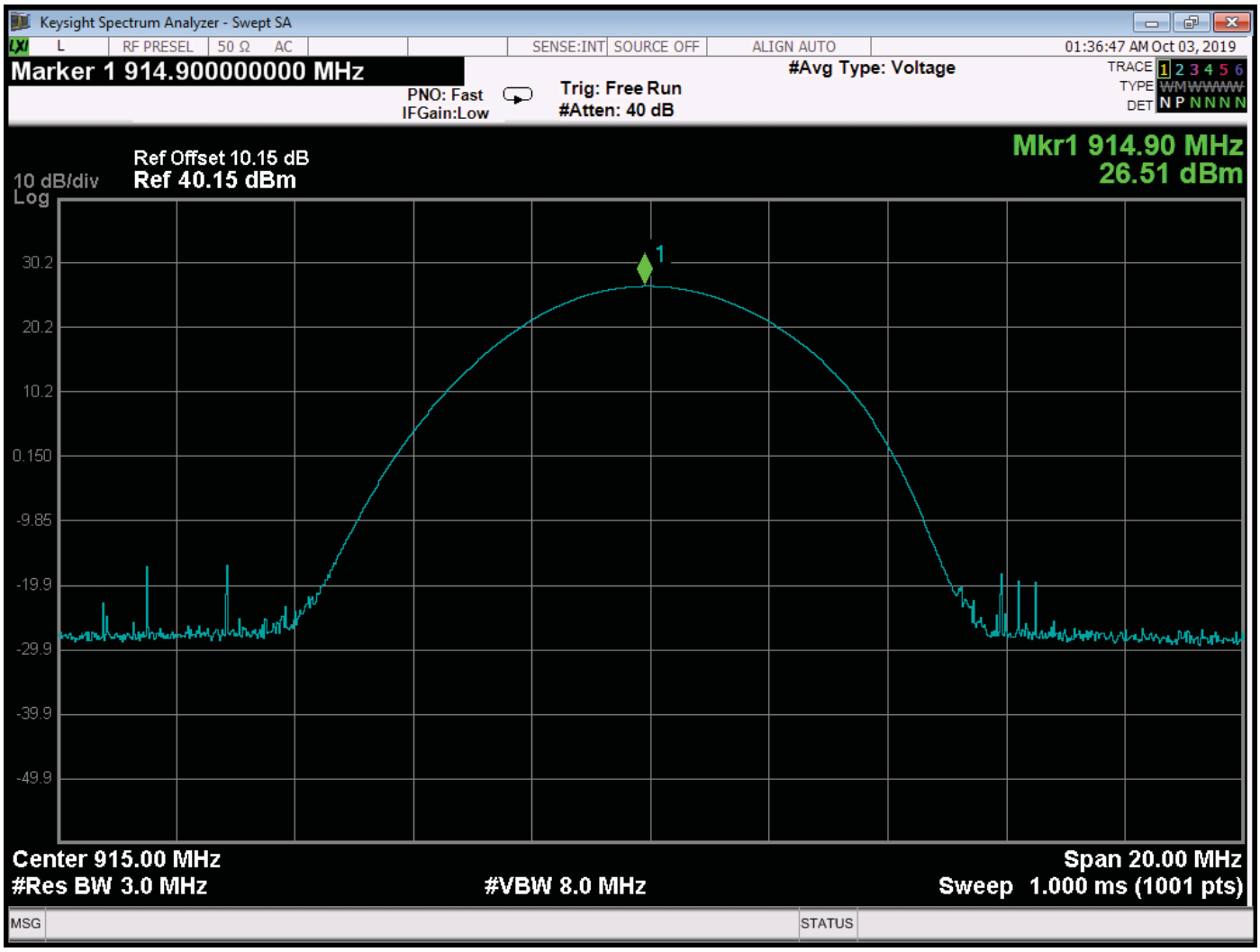



-20 dB Bandwidth – High Channel

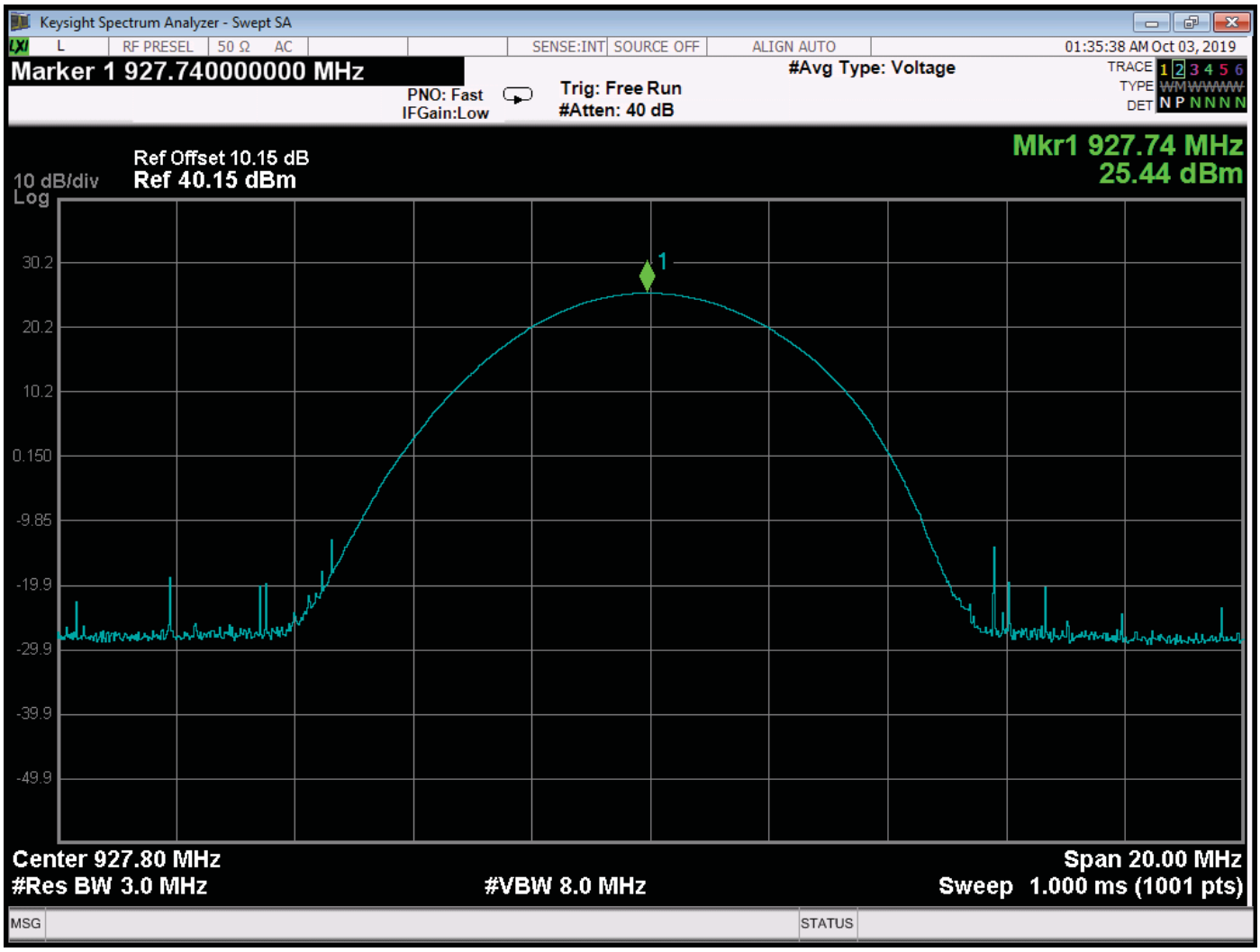
# *PEAK POWER OUTPUT DATA SHEETS*




Peak Power Output – Low Channel

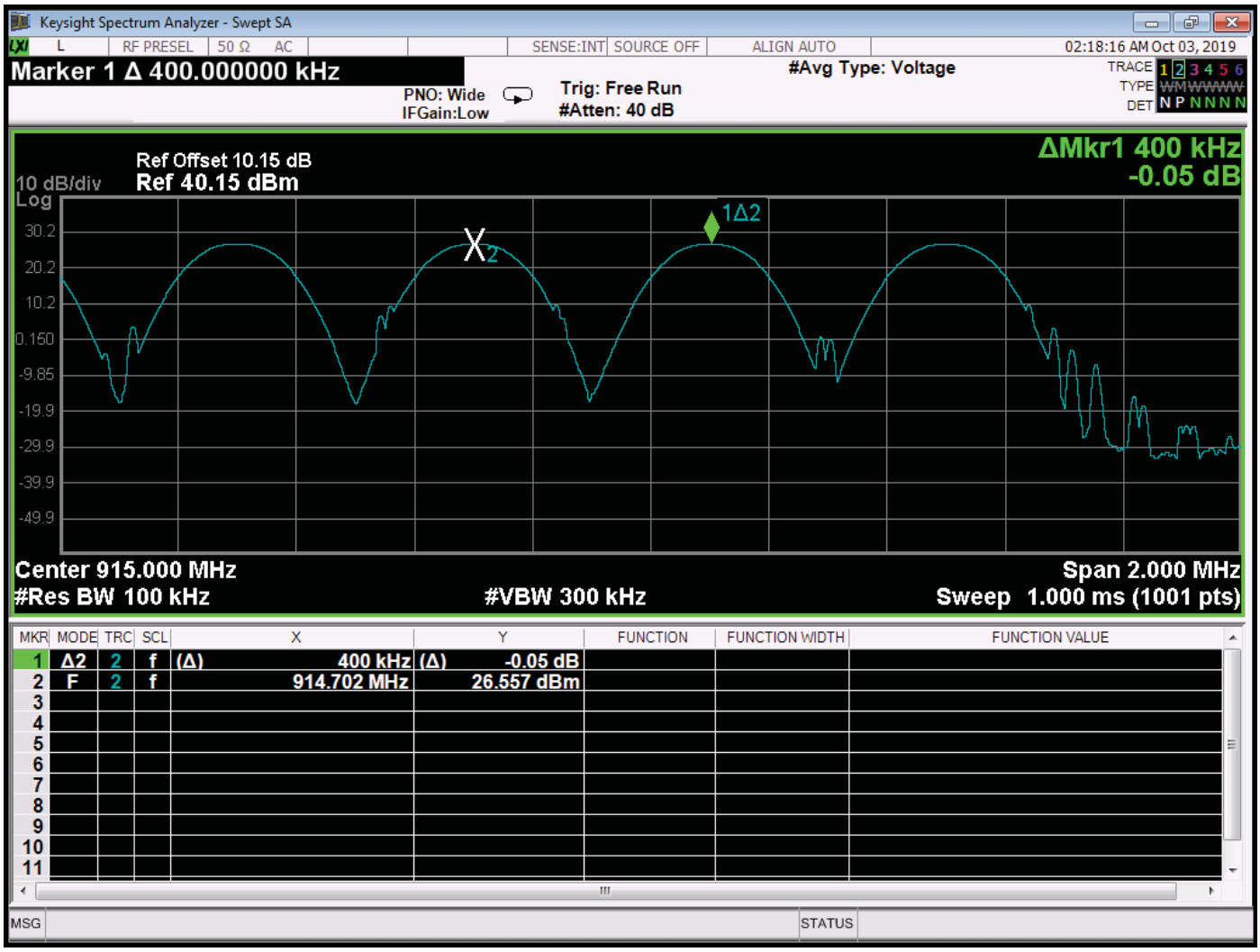



Peak Power Output – Middle Channel




Peak Power Output – High Channel

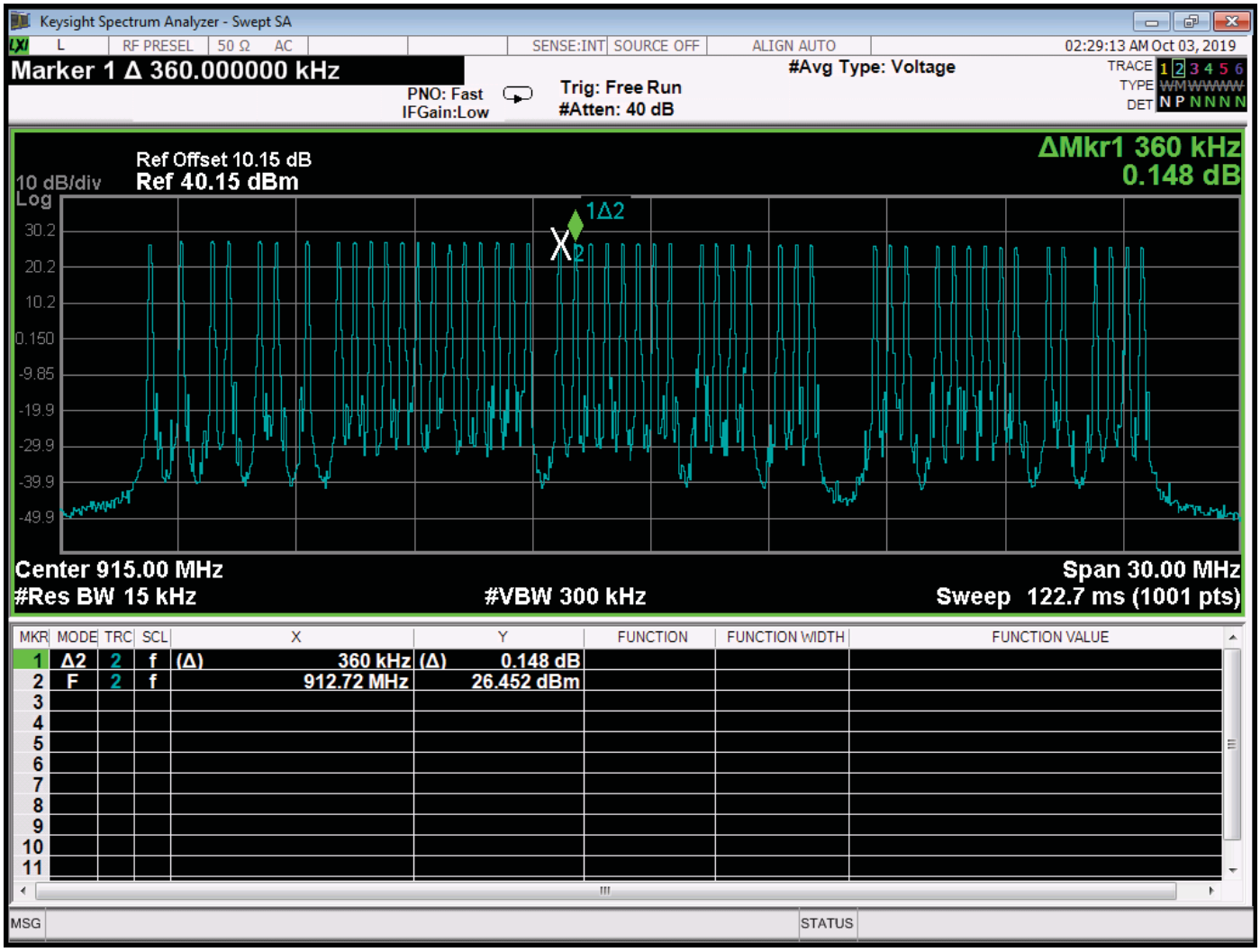
# *CHANNEL FREQUENCY SEPARATION DATA SHEET*




Channel Frequency Separation

# *NUMBER OF FREQUENCIES*

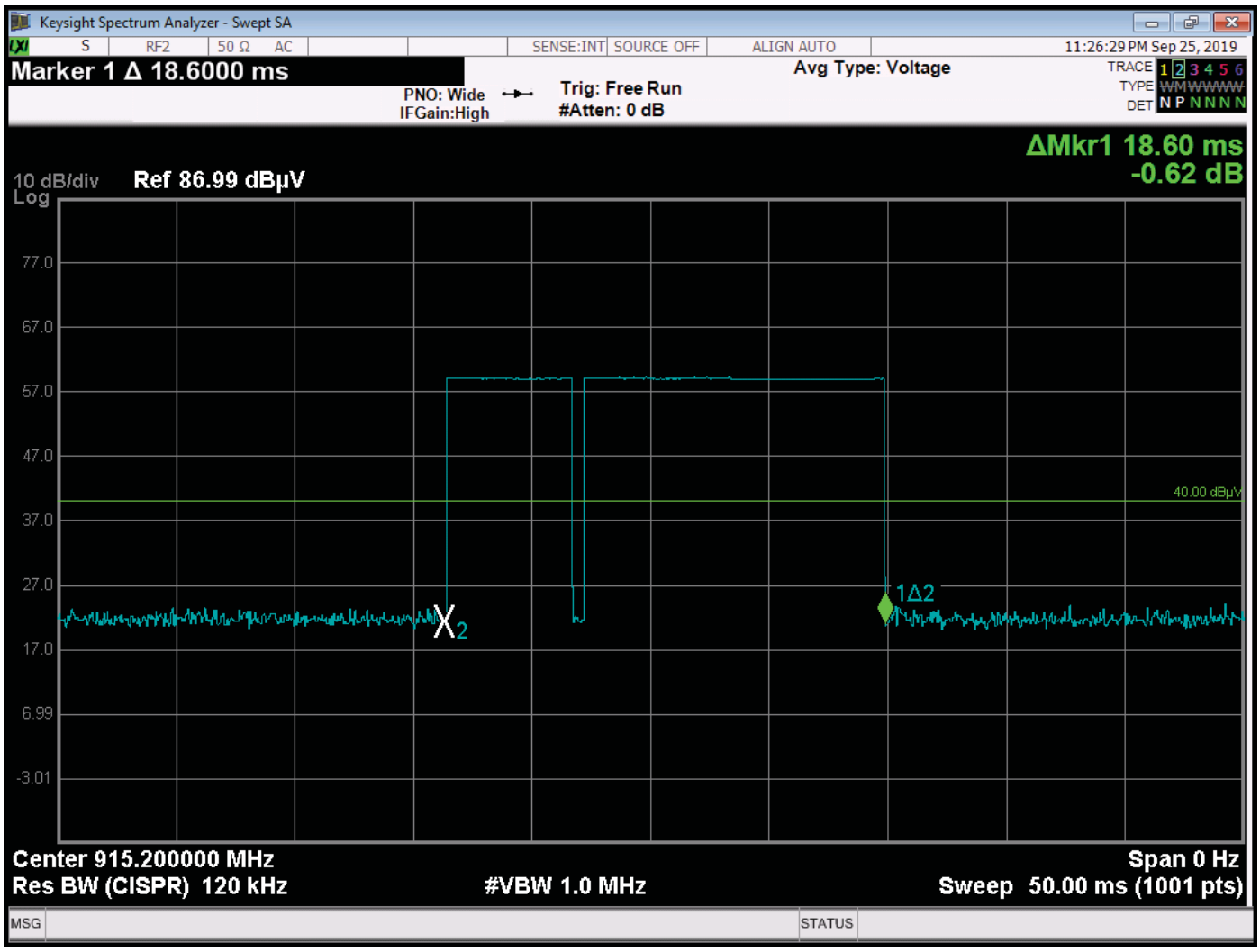
# *DATA SHEET*



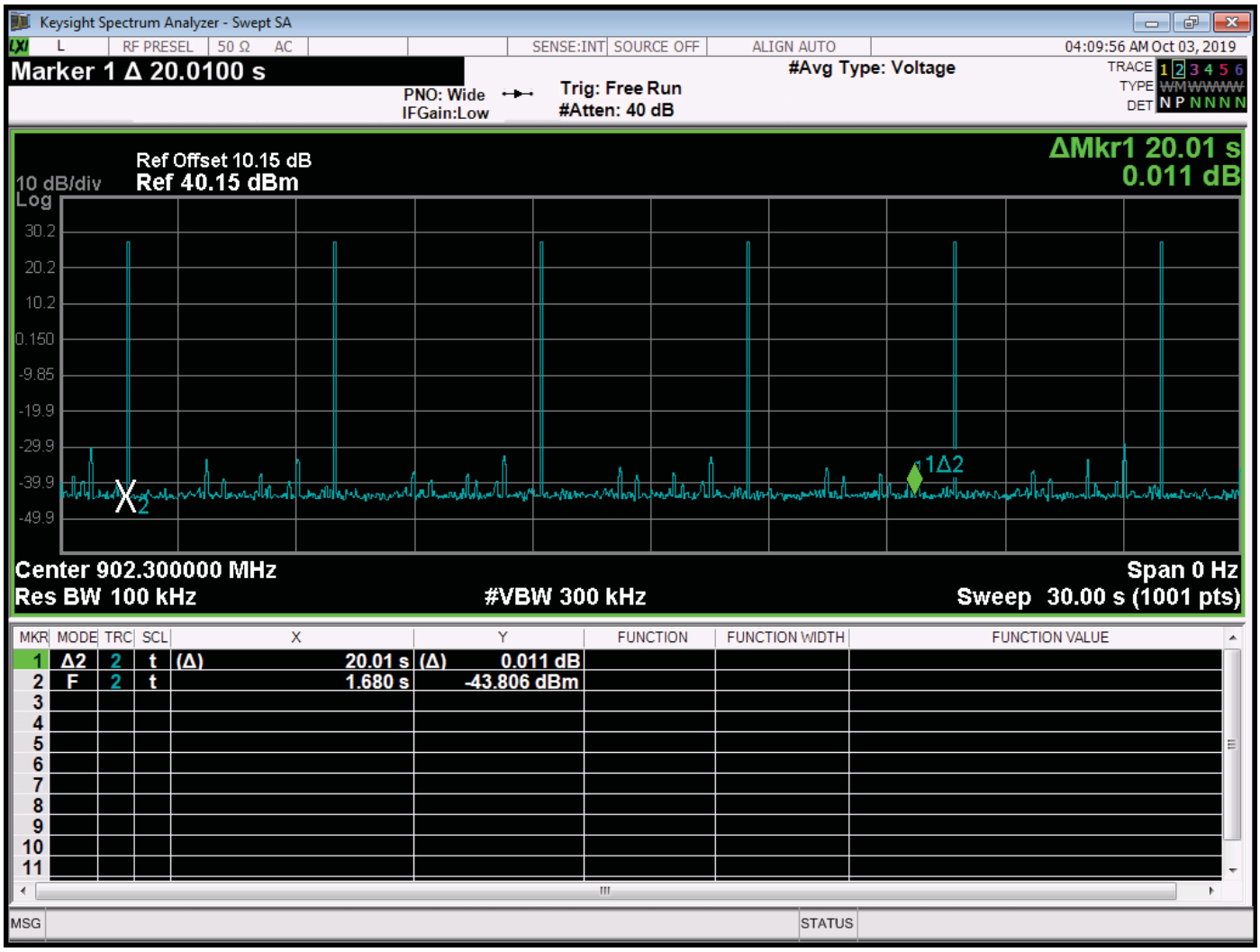

Number of Channels is 50

# *TIME OF OCCUPANCY*

# *DATA SHEETS*



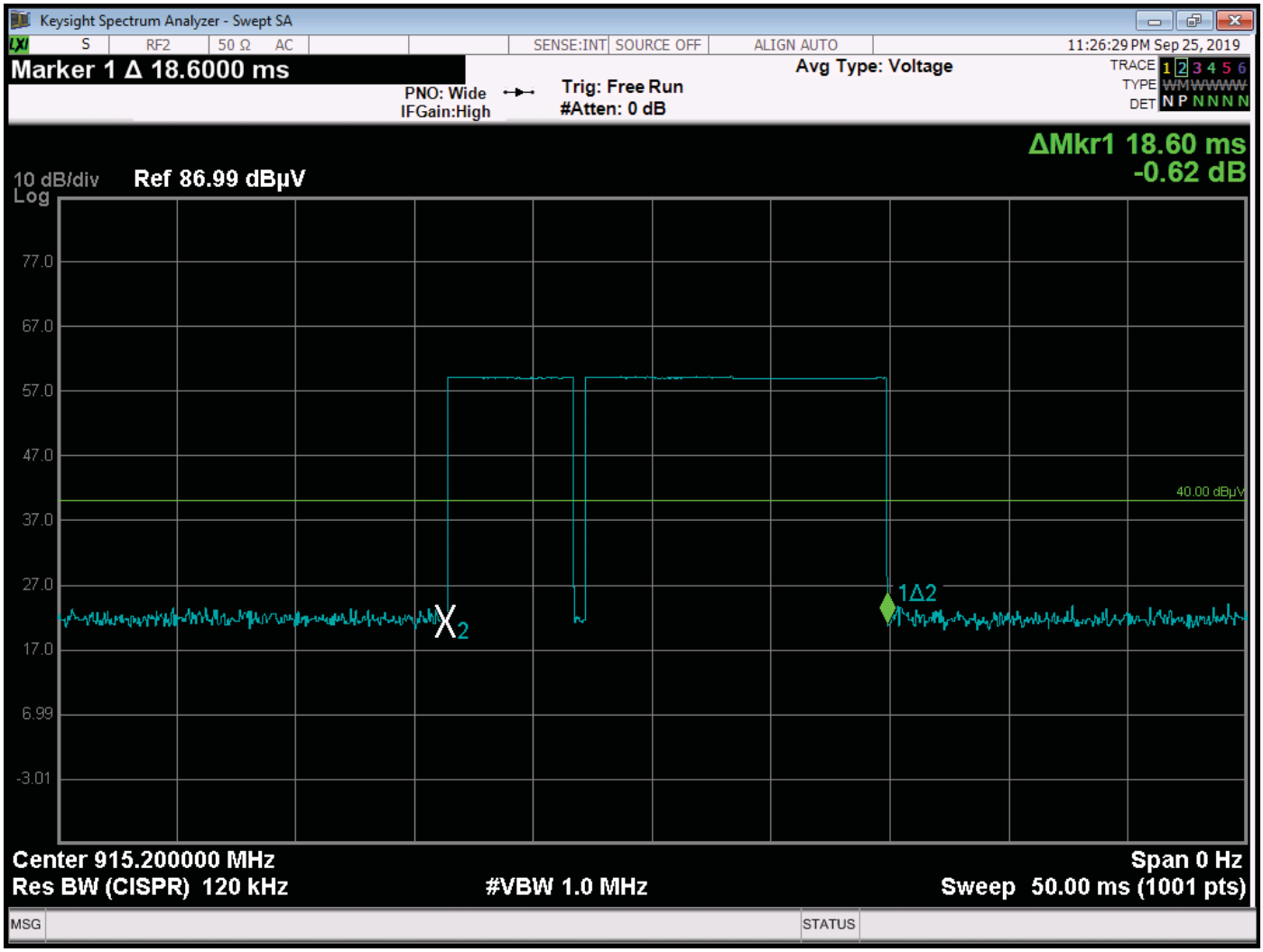

Time of One Pulse – 18.60 ms



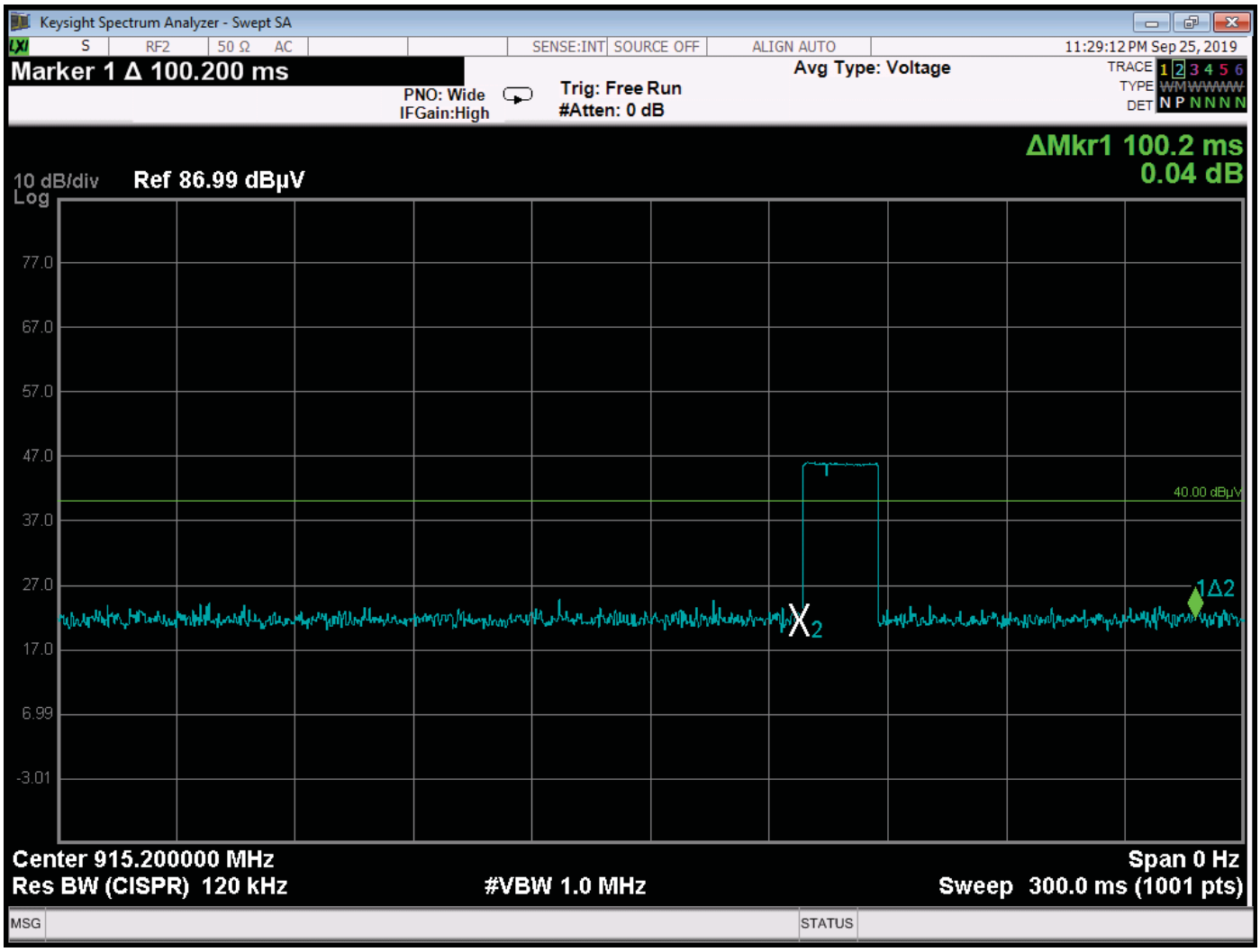

Four Pulses in 20 seconds
Total Time = 74.4 ms per 20 seconds
Limit = 400 ms per 20 seconds
Note: Please see the previous plot on the previous page for the time of one pulse

# *DUTY CYCLE*

# *DATA SHEETS*



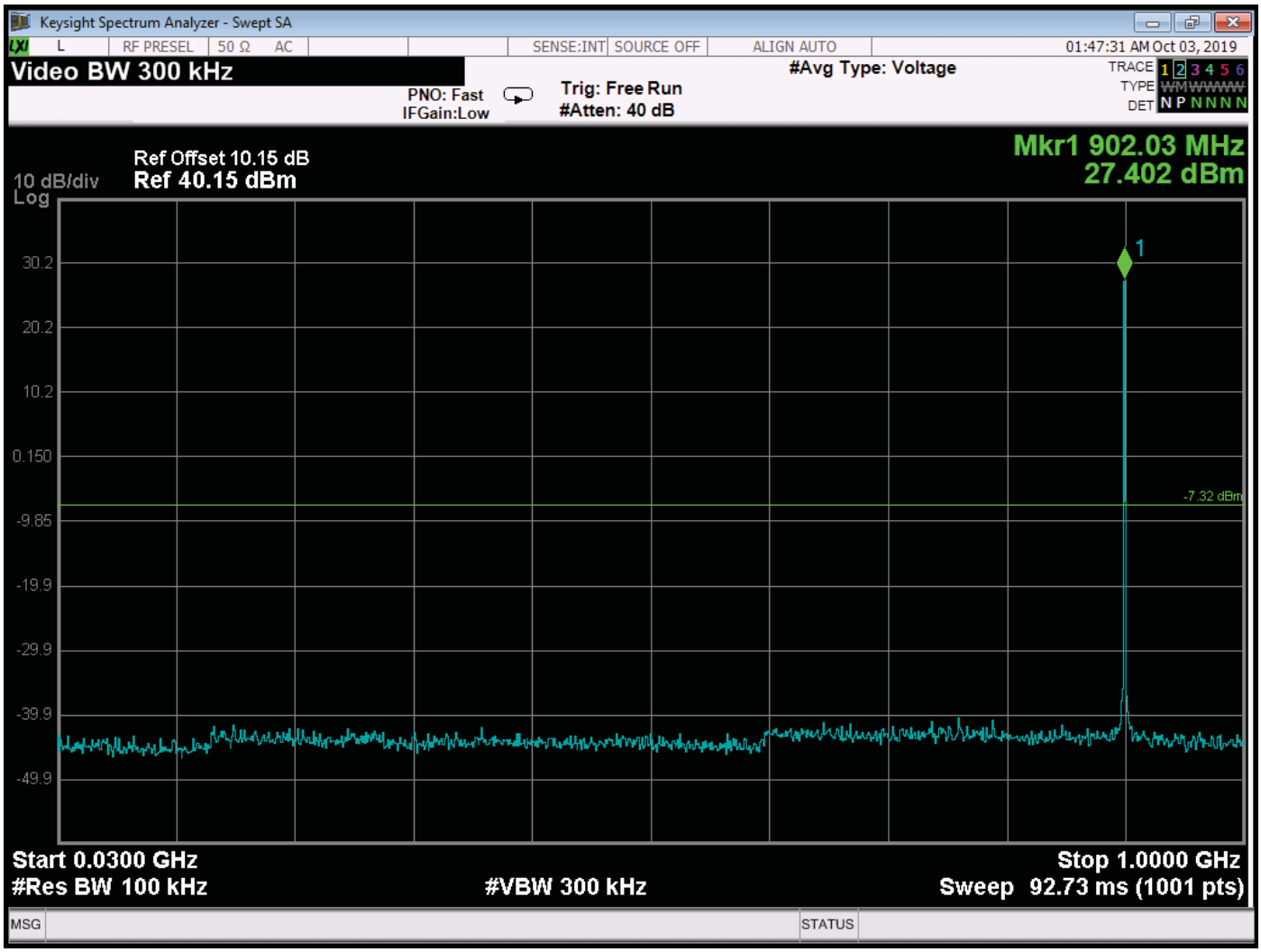

Time of One Pulse – 18.60 ms



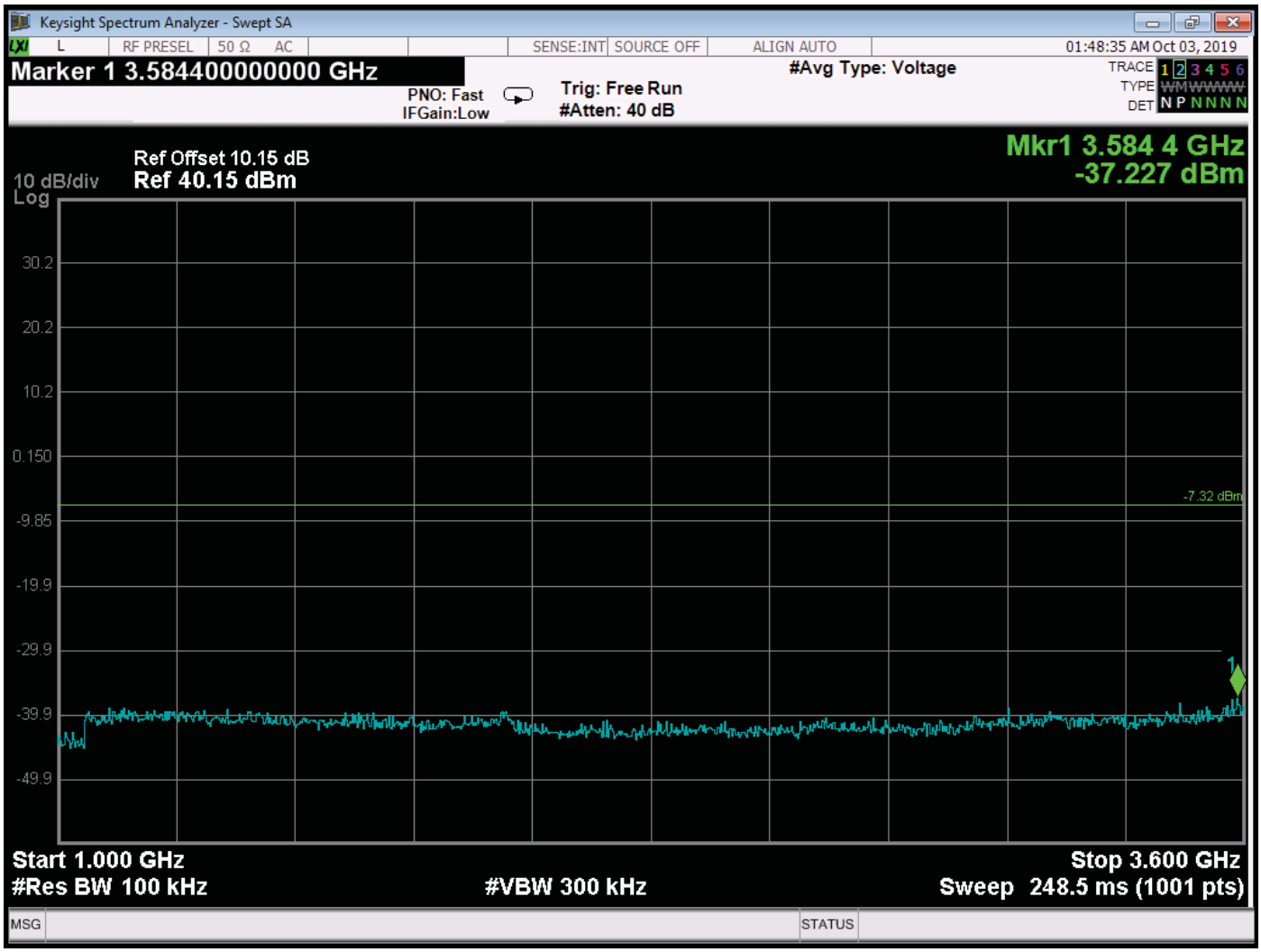

One pulse worst case per 100 ms
Total duty cycle = 18.60 ms / 100 ms = 18.6%

# *RF ANTENNA CONDUCTED*

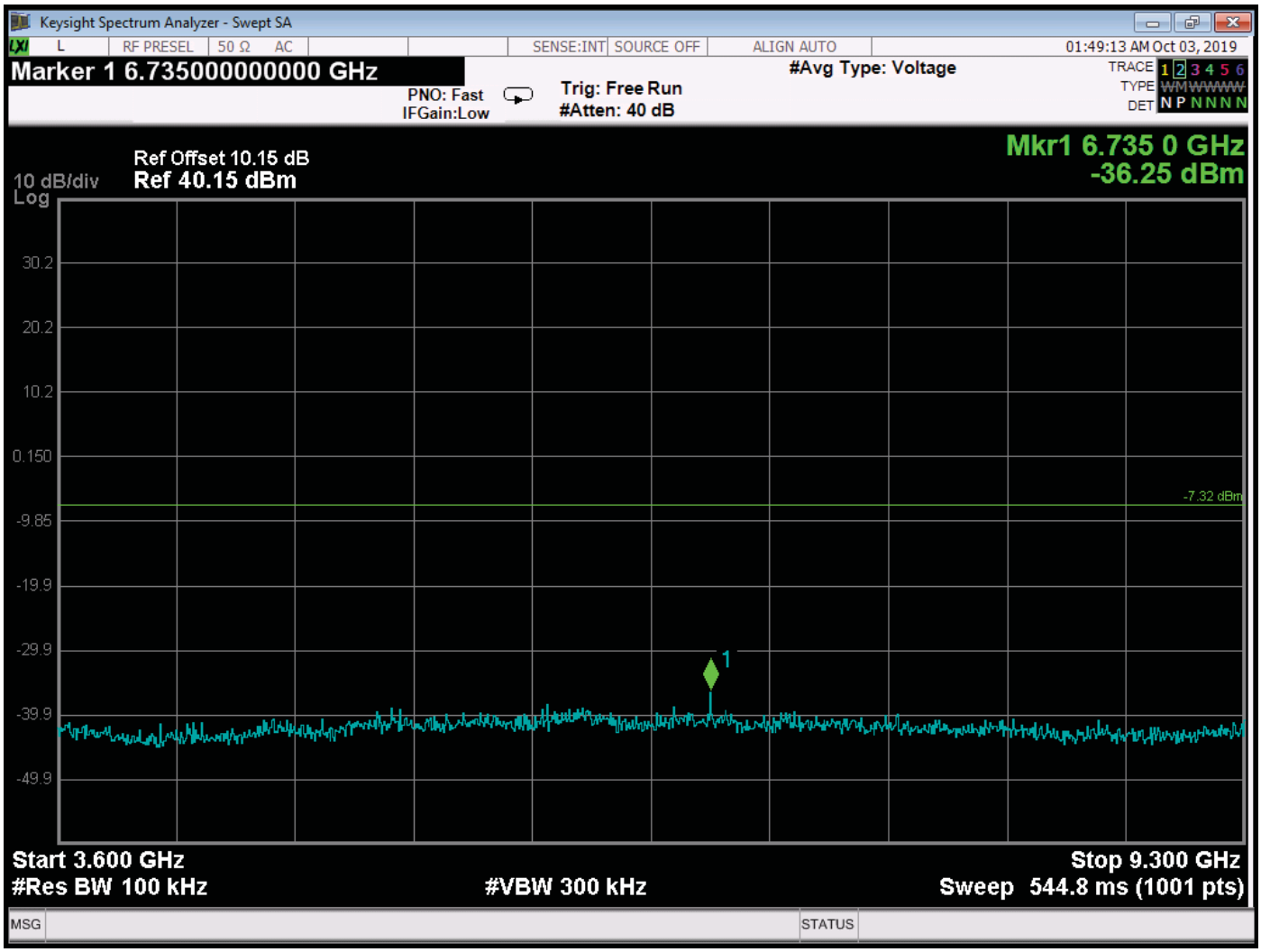
# *DATA SHEETS*



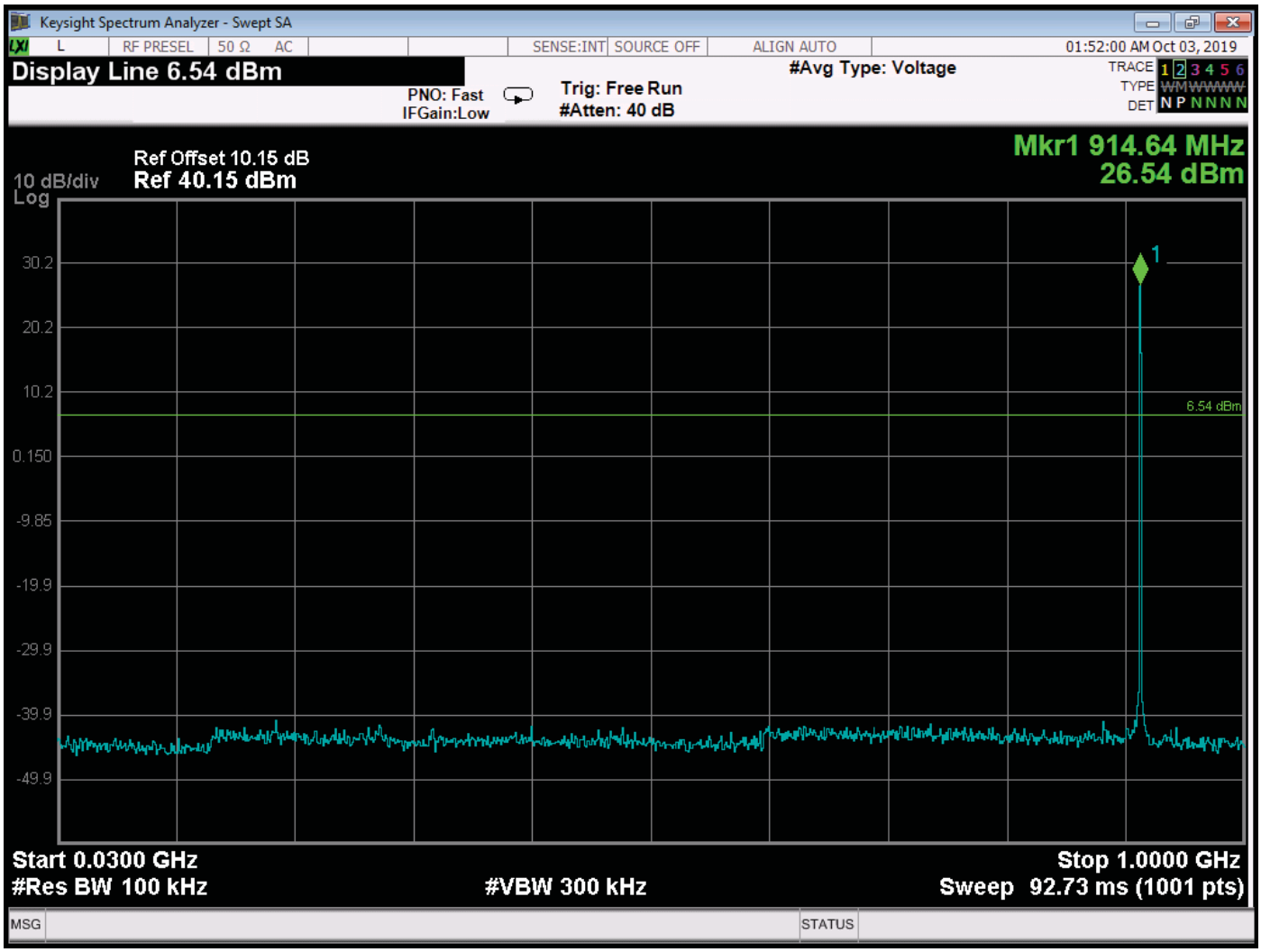

RF Antenna Conducted – Low Channel – 30 MHz to 1000 MHz



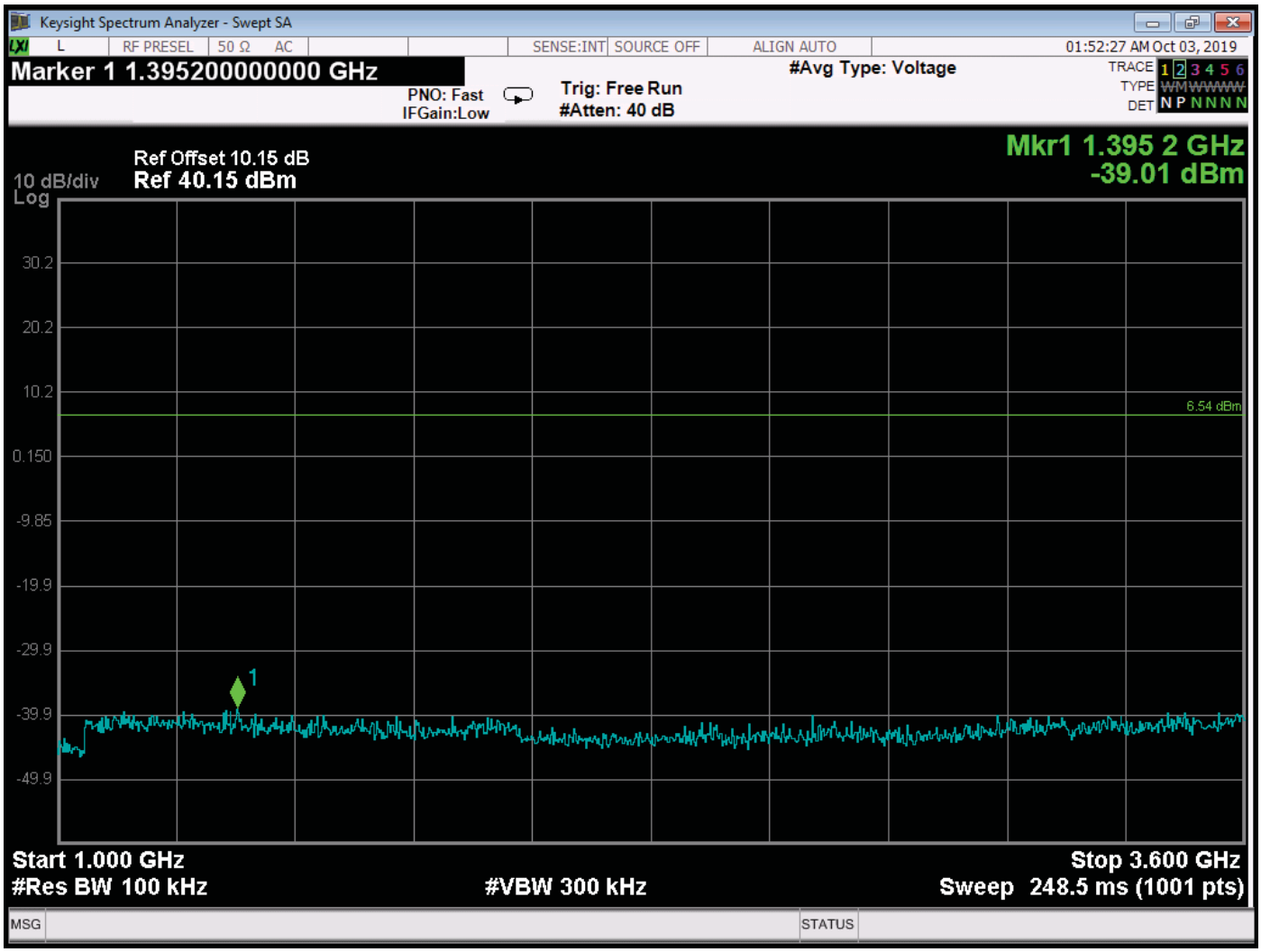

RF Antenna Conducted – Low Channel – 1000 MHz to 3600 MHz



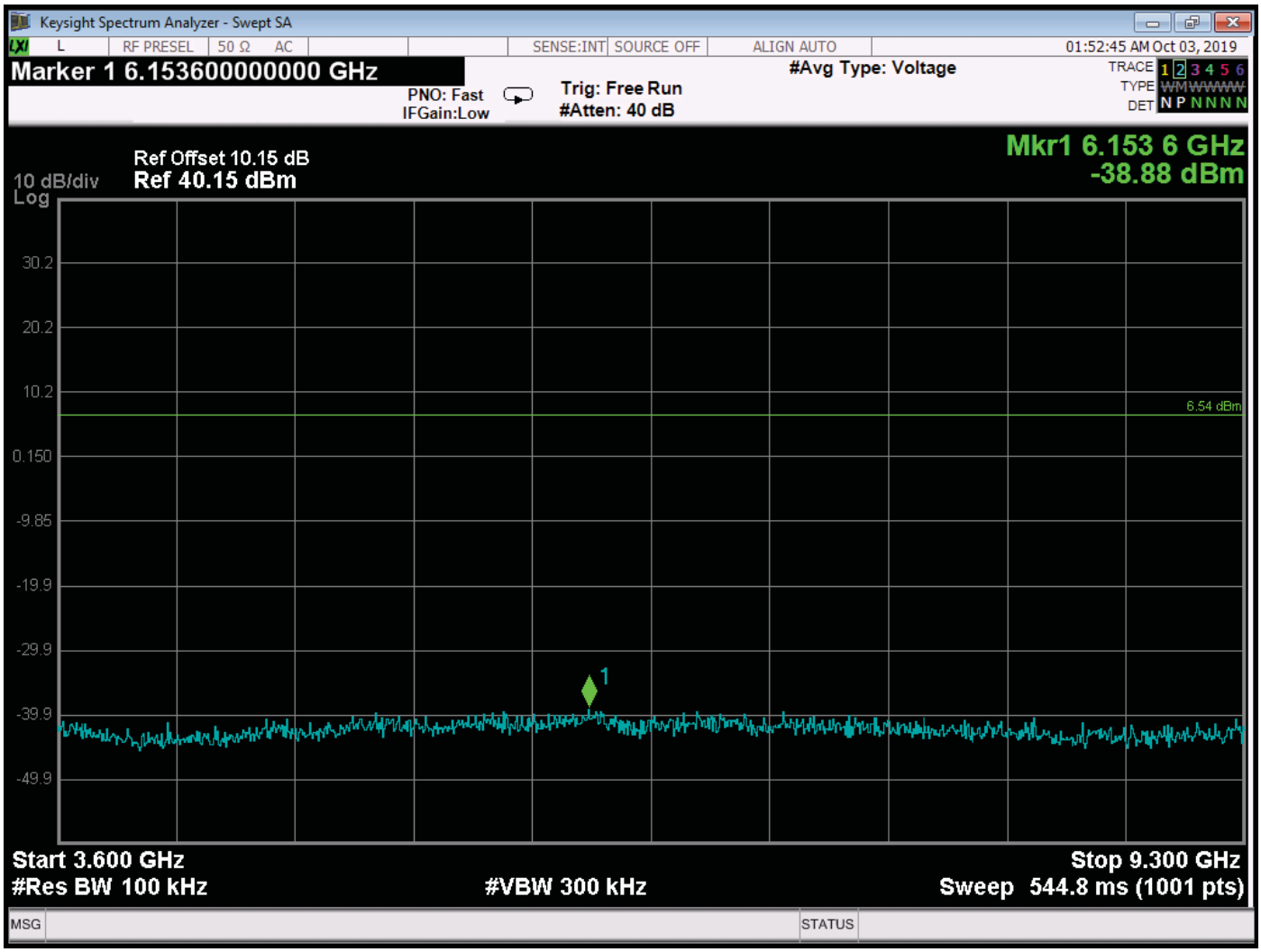

RF Antenna Conducted – Low Channel – 3600 MHz to 9300 MHz



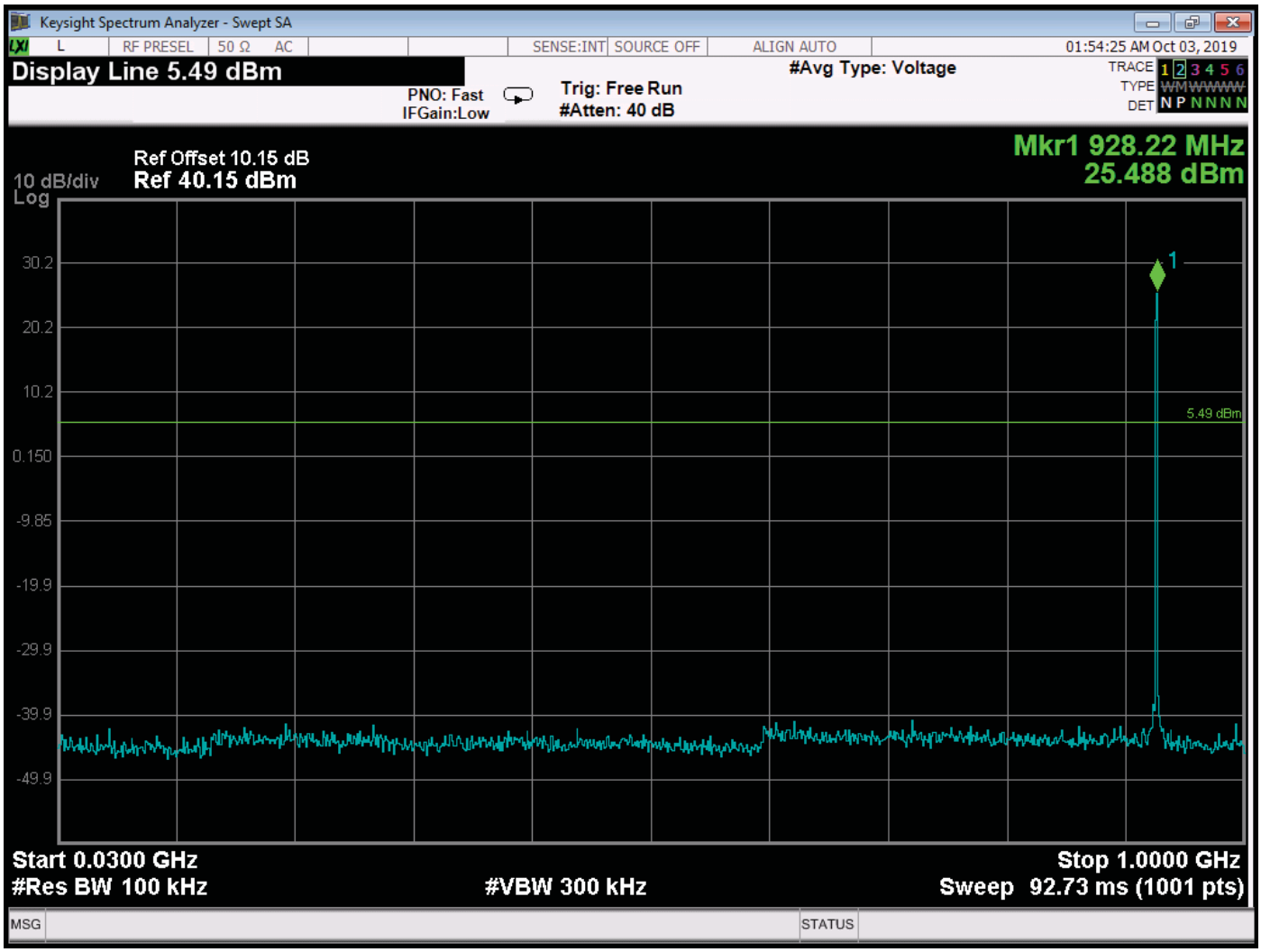

RF Antenna Conducted – Middle Channel – 30 MHz to 1000 MHz



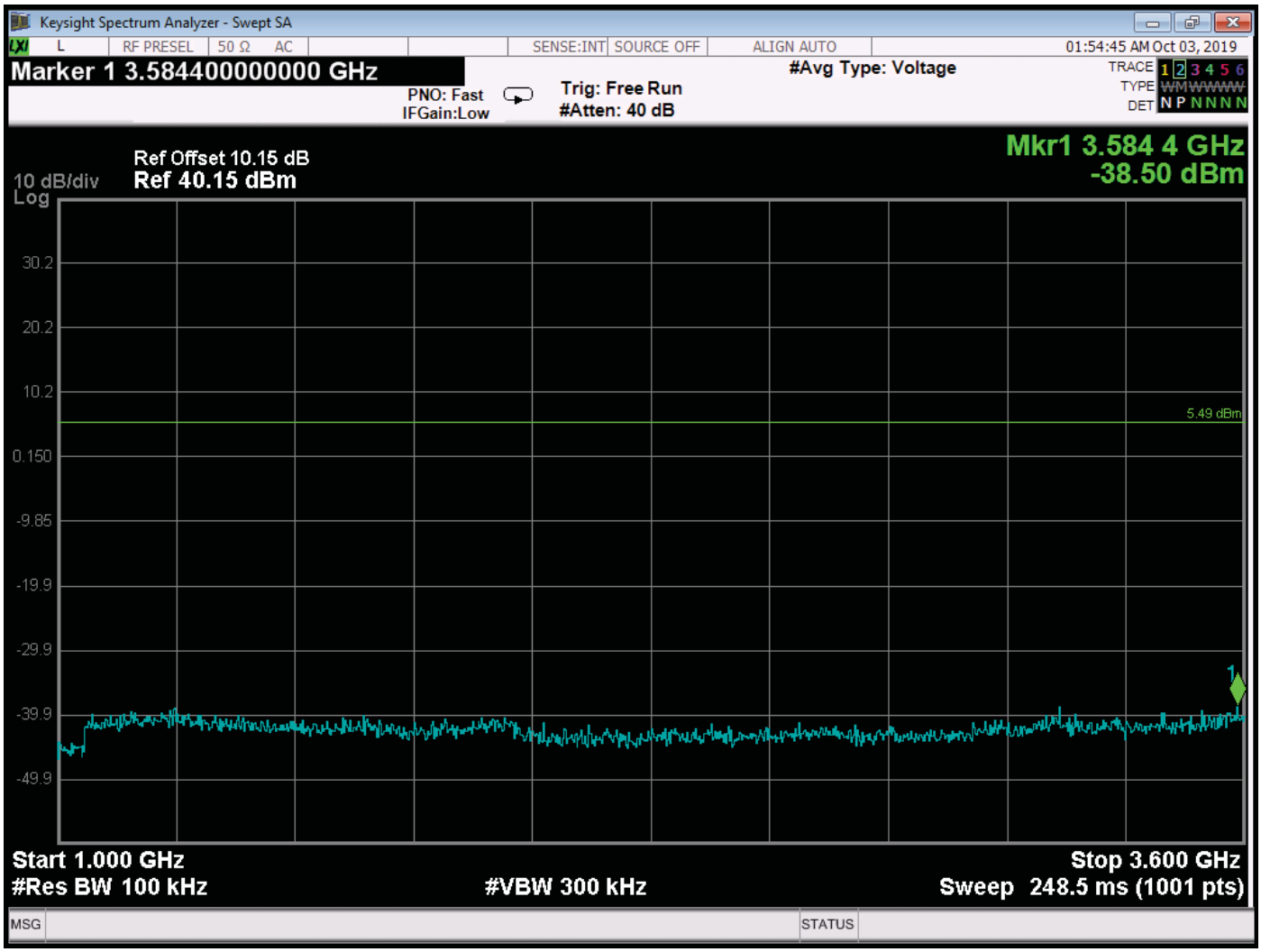

RF Antenna Conducted – Middle Channel – 1000 MHz to 3600 MHz



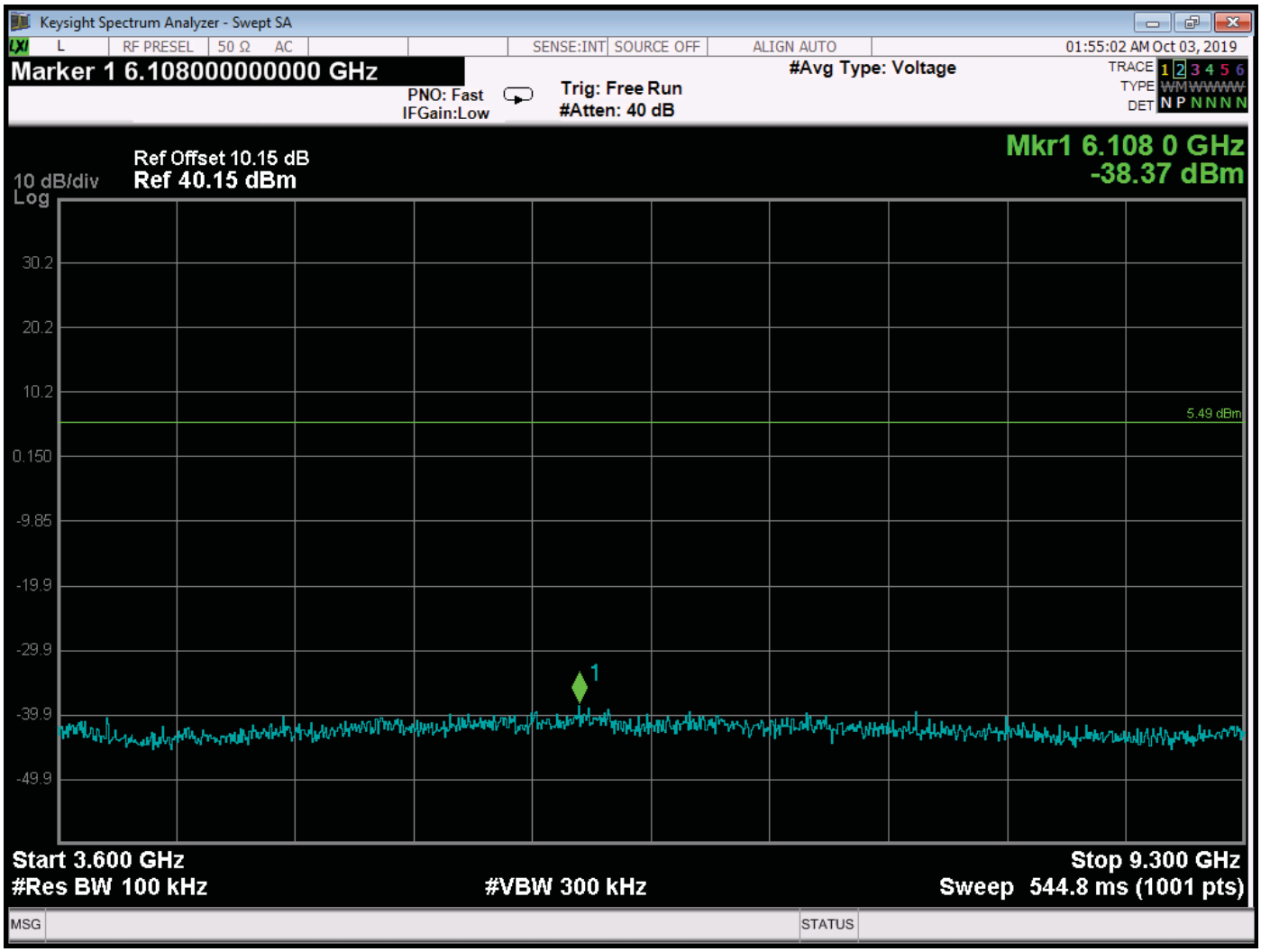

RF Antenna Conducted – Middle Channel – 3600 MHz to 9300 MHz




RF Antenna Conducted – High Channel – 30 MHz to 1000 MHz




RF Antenna Conducted – High Channel – 1000 MHz to 3600 MHz




RF Antenna Conducted – High Channel – 3600 MHz to 9300 MHz