*FCC PART 15, SUBPART B, C, and E*

*TEST REPORT*

*for*

# SC4480 MIMO RADIO

## MODEL: SC4480E-520-SBST

Prepared for

SILVUS TECHNOLOGIES
10990 WILSHIRE BLVD., SUITE #1500
LOS ANGELES, CALIFORNIA 90024

Prepared by:_____

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Approved by:_____

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DATE: NOVEMBER 6, 2018

| | REPORT BODY | APPENDICES | | | | | TOTAL |
|---|---|---|---|---|---|---|---|
| | | ***A*** | ***B*** | ***C*** | ***D*** | ***E*** | |
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# 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: | SC4480 MIMO Radio<br>Model: SC4480E-520-SBST<br>S/N: N/A |
| Product Description: | The EUT is a stand-alone IP based, 4 antenna MIMO (multiple input multiple output), Coded OFDM radio that provides improved LOS (line-of-sight) range, greater connectivity in NLOS (non-line-of-sight) environments and high data throughput rates. |
| Modifications: | The EUT was modified during the testing. Please see Appendix B for the list of modifications. |
| Customer: | Silvus Technologies.<br>10990 Wilshire Boluevard, Suite 1500<br>Los Angeles, California 90024 |
| Test Dates: | September 24, 25, 26 and 28, 2018 |

Test Specifications covered by accreditation:

Emissions requirements
CFR Title 47, Part 15, Subpart B; and
Subpart C, sections 15.205, 15.207, and 15.209; and Subpart E, section 15.407

Test Procedure: ANSI C63.4 and ANSI C63.10

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# 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; and the limits of CFR Title 47, Part 15, Subpart C, section 15.207 |
| 2 | Spurious Radiated RF Emissions, 30 MHz – 1000 MHz | The EUT complies with the **Class B** limits of CFR Title 47, Part 15 Subpart B; and the limits of CFR Title 47, Part 15, Subpart C, section 15.209 |
| 3 | Spurious Radiated RF Emissions, 9 kHz – 30 MHz and 1000 MHz – 40000 MHz | The EUT complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; and CFR Title 47, Part 15, Subpart C, section 15.407 (b)(1) |
| 4 | Fundamental and Emissions produced by the intentional radiator in non-restricted bands, 9 kHz – 40 GHz | Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.407 (b)(1) |
| 5 | Emissions produced by the intentional radiator in restricted bands, 9 kHz – 40 GHz | Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.205, 15.209, and section 15.407 (b)(1) |
| 6 | EBW Bandwidth | This test was performed to determine setting for other tests, but does not have any compliance limits. |
| 7 | Peak Power Output | Complies with the relevant requirements of FCC Title 47, Part 15, Subpart C, section 15.407 (a)(1)(i) |
| 8 | Maximum Power Spectral Density from the Intentional Radiator to the Antenna | Complies with the relevant requirements of CFR Title 47, Part 15, Subpart C, section 15.407 (a)(1)(i) |
| 9 | Variation of the Input Power | Complies with the relevant requirements of CFR Title 47, Part 15, Subpart A, section 15.31 (e) |

## 1. PURPOSE

This document is a qualification test report based on the emissions tests performed on the SC4480 MIMO Radio, Model: SC4480E-520-SBST. The emissions measurements were performed according to the measurement procedure described in ANSI C63.10 and ANSI C63.4. 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 Subpart E, section 15.407.

# 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

Silvus Technologies

| | |
|---|---|
| Kathleen Smidt Cook | Vice President of Operations |

Compatible Electronics Inc.

| | |
|---|---|
| Kyle Fujimoto | Test Engineer |
| James Ross | Test Engineer |

## 2.4 Date Test Sample was Received

The test sample was received on September 24, 2018.

## 2.5 Disposition of the Test Sample

The test sample has not been returned to Silvus Technoloies as of the date of this test report.

## 2.6 Abbreviations and Acronyms

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

| | |
|---|---|
| RF | Radio Frequency |
| EMI | Electromagnetic Interference |
| EUT | Equipment Under Test |
| P/N | Part Number |
| S/N | Serial Number |
| HP | Hewlett Packard |
| ITE | Information Technology Equipment |
| CML | Corrected Meter Limit |
| LISN | Line Impedance Stabilization Network |
| N/A | Not Applicable |
| EBW | Emission Bandwidth |

## 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 E | FCC Rules – Radio frequency deices (including digital devices) – Unlicensed National Information Infrastructure Devices |
| ANSI C63.4 2014 | 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 |
| FCC Title 47, Part 15 Subpart B | FCC Rules - Radio frequency devices (including digital devices) – Unintentional Radiators |
| KDB 662911 D01 v02r01 | Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc) |
| KDB 789033 D02 v02r01 | Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E |

# 4. DESCRIPTION OF TEST CONFIGURATION

## 4.1 Description of Test Configuration – Emissions

The SC4480 MIMO Radio Model: SC4480E-520-SBST (EUT) was connected to a junction box, push to talk, and laptop via its PRI, PTT, and AUX ports, respectively. The junction box was also connected to a cable creation dongle and a power supply. The cable creation dongle was also connected to the laptop. The laptop was also connected to a mouse and AC Adapter via its USB and power ports, respectively. The EUT was continuous pinging the laptop on a continuous basis

The EUT was continuously transmitting at 5220 MHz and 5240 MHz during the testing.

The firmware used for the EUT is stored on the company's servers.

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. All initial investigations were performed with the measurement receiver in manual mode scanning the frequency range continuously. Photographs of the test setup are in Appendix D of this report.

### 4.1.1 Cable Construction and Termination

**Cable 1** This is a 1-meter unshielded cable connecting the Push to Talk to the EUT. The cable has a 7-pin LEMO connector at the EUT end and is hard wired into the Push to Talk.

**Cable 2** This is a 2-meter unshielded cable connecting the AC Adapter to the laptop. The cable has a 1-pin connector at the laptop end and is hard wired into the AC Adapter.

**Cable 3** This is a 2-meter braid shielded cable connecting the laptop to the mouse. The cable has a USB type 'A" connector at the laptop end and is hard wired into the mouse.

**Cable 4** This is a 10-centimeter unshielded cable connecting the laptop to the cable creation dongle. The cable has a USB type 'A' connector at the laptop end and is hard wired into the cable creation dongle.

**Cable 5** This is a 1.25-meter foil shielded cable connecting the cable creation dongle to the junction box. The cable has an RJ-45 connector at the cable creation dongle end and is hard wired into the junction box. The cable was bundled to a length of 1-meter. The shield of the cable was grounded to the chassis via the connector.

**Cable 6** This is a 1.5-meter unshielded cable connecting the power supply to the junction box. The cable is hard wired at each end. The cable has a molded ferrite at the junction box end.

**Cable 7** This is a 1.25-meter foil shielded cable connecting the EUT to the junction box. The cable a 10-pin LEMO connector at the EUT end and is hard wired into the junction box. The shield of the cable was grounded to the chassis via the connector.

# 5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

## 5.1 EUT and Accessory List

| EQUIPMENT | MANUFACTURER | MODEL NUMBER | SERIAL NUMBER | FCC ID |
|---|---|---|---|---|
| SC4480 MIMO RADIO | SILVUS TECHNOLOGIES | SC4480E-520-SBST | N/A | N2S-SC44-520 |
| MOUSE | LOGITECH | M-U0026 | N/A | N/A |
| AC ADAPTER FOR LAPTOP | ASUS | W15-065N1A | N/A | N/A |
| LAPTOP | ASUS | UX303U | G5N0CJ00L18619C | N/A |
| PUSH TO TALK | IMPACT | S2226 | N/A | N/A |
| JUNCTION BOX | N/A | N/A | N/A | N/A |
| FIRMWARE FOR EUT* | SILVUS TECNOLOGIES | 3.12.6.8 | N/A | N/A |

*****Used to program the EUT to transmit at 5220 MHz and 5240 MHz on a continuous basis.

## 5.2 Emissions Test Equipment

| EQUIPMENT TYPE | MANU-FACTURER | MODEL NUMBER | SERIAL NUMBER | CALIBRATION DATE | CAL. CYCLE |
|---|---|---|---|---|---|
| TDK TestLab | TDK RF Solutions, Inc. | 9.22 | 700145 | N/A | N/A |
| EMI Receiver, 20 Hz – 26.5 GHz | Keysight Technologies | N9038A | MY51210150 | July 26, 2018 | 1 Year |
| EMI Receiver | Rohde & Schwarz | ESIB40 | 100172 | March 5, 2018 | 1 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 |
| Digital Multimeter | Fluke | 115 | Asset #: 4168 | September 27, 2017 | 2 Year |
| Variable Transformer | Superior Electric | Type: 11560 | Spec: BP142056 | N/A | N/A |
| Loop Antenna | Com-Power | AL-130R | 121090 | February 9, 2017 | 2 Year |
| CombiLog Antenna | Com-Power | AC-220 | 61060 | July 27, 2017 | 2 Year |
| Horn Antenna | Com-Power | AH-118 | 071175 | February 22, 2018 | 2 Year |
| Horn Antenna | Com-Power | AH-826 | 71957 | N/A | N/A |
| Preamplifier | Com-Power | PAM-118A | 551024 | May 10, 2018 | 1 Year |
| Preamplifier | Com-Power | PA-840 | 711013 | May 10, 2018 | 1 Year |
| Computer | Hewlett Packard | p6716f | MXX1030PX0 | N/A | N/A |
| Power Sensor | ETS-Lindgren | 7002-006 | 0015018 | October 1, 2015 | 3 Year |
| LCD Monitor | Hewlett Packard | 52031a | 3CQ046N3MG | N/A | N/A |
| LISN (EUT) | Com-Power | LI-215A | 191951 | June 28, 2018 | 1 Year |
| LISN (ACC) | Com-Power | LI-215A | 191952 | June 28, 2018 | 1 Year |
| Transient Limiter | Com-Power | 252A910 | N/A | November 1, 2017 | 1 Year |
| Horn Antenna | Com-Power | AH840 | 91003 | N/A | N/A |

# 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.

# 7. CHARACTERISTICS OF THE TRANSMITTER

## 7.1 Channel Description and Frequencies

The EUT operates on two channels. The low channel is 5220 MHz and the high channel is 5240 MHz.

## 7.2 Antenna Gain

The EUT utilizes four collinear omni antennas with each antenna having a 6.0 dBi gain.

# 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 transient limiter 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 1.0.

**Test Results:**

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

### 8.1.2 Radiated Emissions (Spurious and Harmonics) Test

The EMI Receiver was used as the measuring meter. Below 1 GHz, a built-in, internal preamplifier was used to increase the sensitivity of the instrument. At frequencies above 1 GHz, external preamplifiers were used. 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. A quasi-peak reading was taken only for those readings, which are marked accordingly on the data sheets.

The frequencies above 1 GHz were averaged by using the RMS detector function on the EMI Receiver.

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 40 GHz | 1 MHz | Horn Antenna |

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 gunsight method was used when measuring with the horn antenna in order to ensure accurate results.

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; and the limits of CFR Title 47, Part 15, Subpart C, Sections 15.209 and 15.407 (b)(1) for radiated emissions. Please see Appendix E for the data sheets.

### 8.1.3 RF Emissions Test Results

Table 1.0 CONDUCTED EMISSION RESULTS
SC4480 MIMO Radio, Model: SC4480E-520-SBST

| Frequency MHz | Corrected Reading* dBuV | Specification Limit dBuV | Delta (Cor. Reading – Spec. Limit) dB |
|---|---|---|---|
| 23.130 (WL) (5240 MHz) | 47.19 (Avg) | 50.00 | -2.81 |
| 23.130 (WL) (5220 MHz) | 46.71 (Avg) | 50.00 | -3.29 |
| 23.126 (BL) (5240 MHz) | 45.14 (Avg) | 50.00 | -4.86 |
| 23.126 (BL) (5220 MHz) | 44.58 (Avg) | 50.00 | -5.42 |
| 21.662 (WL) (5220 MHz) | 44.45 (Avg) | 50.00 | -5.55 |
| 21.662 (WL) (5240 MHz) | 44.30 (Avg) | 50.00 | -5.70 |

Table 2.0 RADIATED EMISSION RESULTS
SC4480 MIMO Radio, Model: SC4480E-520-SBST

| Frequency MHz | Corrected Reading* dBuV/m | Specification Limit dBuV | Delta (Cor. Reading – Spec. Limit) dB |
|---|---|---|---|
| 320.00 (H) (5220 MHz) | 43.61 (QP) | 46.00 | -2.39 |
| 320.00 (H) (5240 MHz) | 43.58 (QP) | 46.00 | -2.42 |
| 240.00 (H) (5240 MHz) | 39.97 (QP) | 46.00 | -6.03 |
| 320.00 (V) (5240 MHz) | 38.62 (QP) | 46.00 | -7.38 |
| 520.00 (V) (5240 MHz) | 38.26 (QP) | 46.00 | -7.74 |
| 240.00 (V) (5220 MHz) | 37.71 (QP) | 46.00 | -8.29 |

QP Quasi-Peak Reading
Avg Average Reading
H Horizontal Polarization
V Vertical Polarization

## 8.2 EBW Bandwidth

The EBW bandwidth was measured using the EMI Receiver. The bandwidth was measured using a direct connection from the EUT. The following steps were performed for measuring the EBW Bandwidth.

1. Set RBW = approximately 1% of the emission bandwidth
2. Set the VBW > RBW
3. Detector = Peak
4. Trace Mode = Max Hold
5. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

**Test Results:**

This test was performed to determine setting for other tests, but does not have any compliance limits.

## 8.3 Maximum Conducted Output Power

The Conducted Average Output Power was measured using the Power Meter. A duty cycle of 100% was used. The average output power was measured using the average power measurement procedure described in section E3 of KDB 789033 v02r01. The Maximum Conducted Output Power was then taken.

The power at each port was summed per section (E)(1) of KDB 662911 D01 v02r01.

**Test Results:**

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart E section 15.407 (a)(1)(i).

## 8.4 Emissions in Non-Restricted Bands

The emissions in the non-restricted frequency bands measurements were performed using the procedure described in section 8.1.2 of this test report. The final qualification data sheets are located in Appendix E.

The spec limit in dBuV/m was determined by the following formula:
E [dBuV/m] = EIRP [dBm] + 95.2

Where:

E [dBuV/m] is the spec limit in dBuV/m
EIRP [dBm] is the EIRP spec limit per FCC Title 47, Part 15, Subpart E, section 15.407 (b)(1).

**Test Results:**

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart E section 15.407 (b)(1).

## 8.5 RF Band Edges

The RF band edges were taken at 5150 MHz when the EUT was on the low channel and 5350 MHz when the EUT was on the high channel using the EMI Receiver. The fundamental was transmitting at a 100% duty cycle. A preamplifier was used to boost the signal level, with the plots being taken at a 3 meter test distance. The radiated emissions test procedure as describe in section 8.1.2 of this test report was used to maximize the emission.

**Test Results:**

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart E section 15.407 (b)(1). The RF power at the restricted bands closest to the band edges at 5150 MHz and 5350 MHz also meet the limits of section 15.209. Please see the data sheets located in Appendix E.

## 8.6 Spectral Density Test

The spectrum density output was measured using the EMI Receiver. The spectral density output was measured using a direct connection from the RF out on the EUT into the input of the EMI Receiver. The following steps were performed for measuring the spectral density.

1. Set span to encompass the entire emission bandwidth (EBW)
2. Set RBW = 1 MHz
3. Set VBW >= 3 MHz
4. Ensure that the number of measurement points in the sweep >= 2 x span/RBW
5. Sweep time = auto couple
6. Detector = power averaging (rms)
7. Manually set sweep time >=10 x (number of points in sweep) x (symbol period of the transmitted signal), but not less than the automatic default sweep time.
8. Perform a single sweep

The spectral density at each port was summed per Section (E)(2)(c) of KDB 662911 D01 v02r01.

**Test Results:**

The EUT complies with the relevant requirements of FCC Title 47, Part 15, Subpart E section 15.407 (a)(1)(i).

## 8.7 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 meets the requirements.

## 9. CONCLUSIONS

The SC4480 MIMO Radio, Model: SC4480E-520-SBST, 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 Subpart E section 15.407.

# APPENDIX A

# *LABORATORY ACCREDITATIONS AND RECOGNITIONS*

# LABORATORY ACCREDITATIONS AND RECOGNITIONS

NVLAP® TESTING
NVLAP LAB CODE 200528-0

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 15.407 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.

1. Add a Ferrite (FairRite P/N: 044164281) ferrite to each side of the push to talk cable. Total of two ferrites.

**APPENDIX C**

# *ADDITIONAL MODELS COVERED UNDER THIS REPORT*

# ADDITIONAL MODELS COVERED UNDER THIS REPORT

USED FOR THE PRIMARY TEST

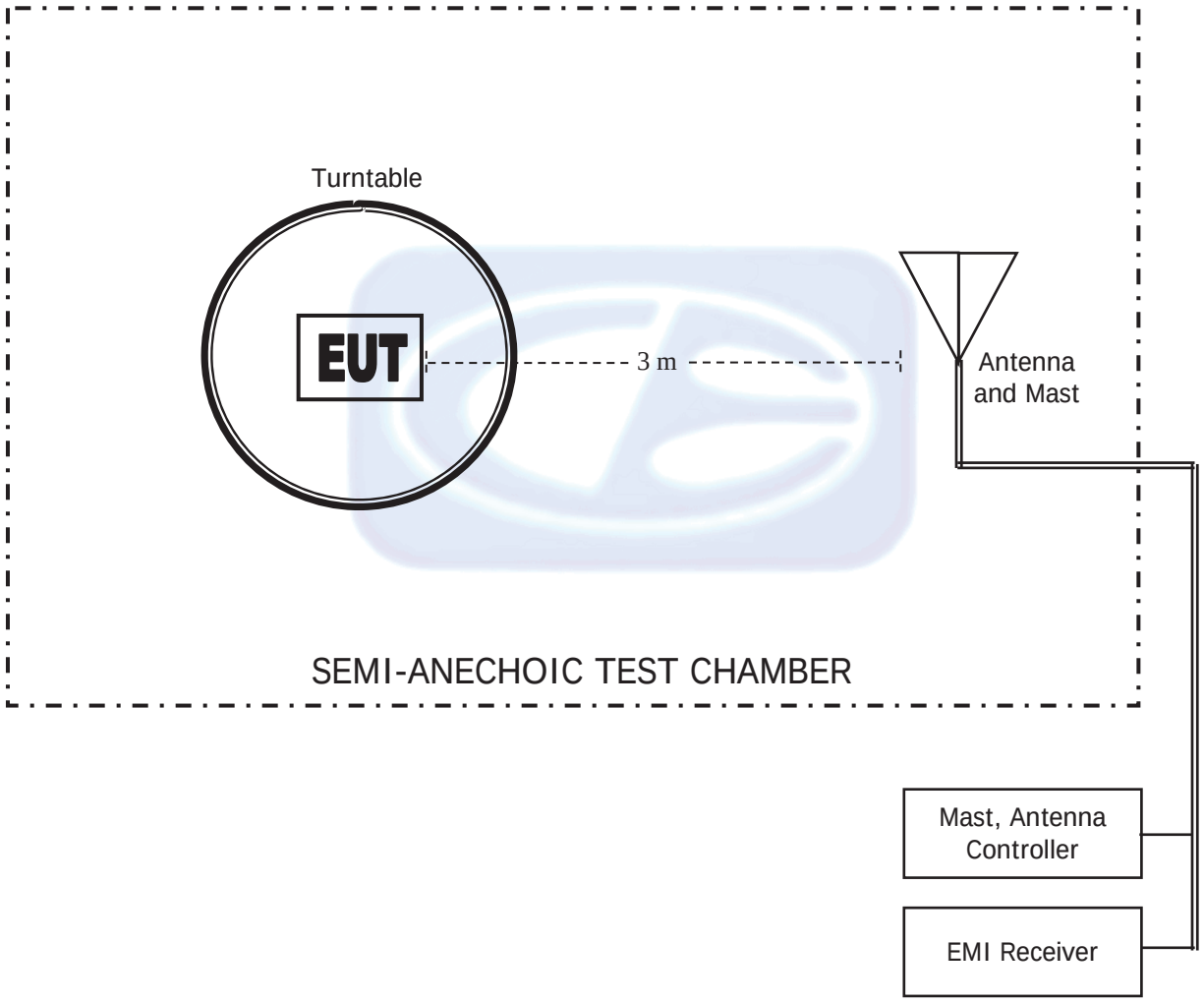
SC4480 MIMO Radio
Model: SC4480E-520-SBST
S/N: N/A

There are no additional models covered under this report.

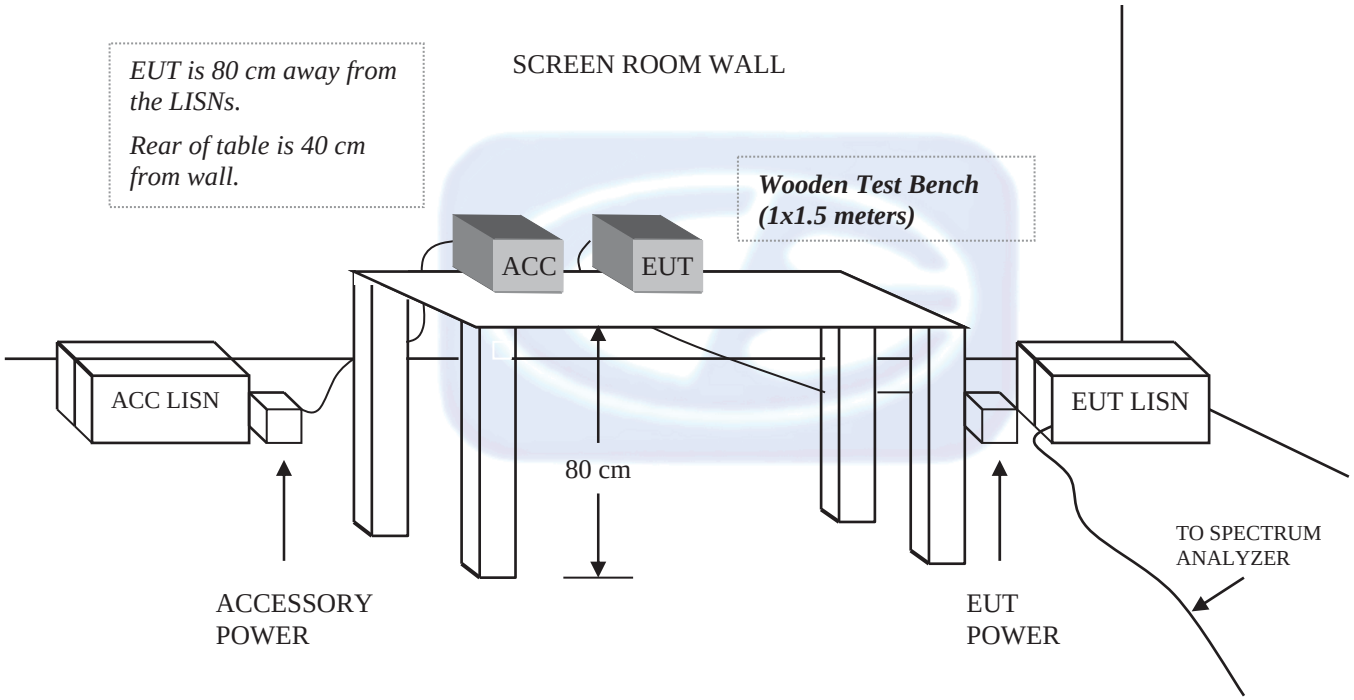
# APPENDIX D

# *DIAGRAMS AND CHARTS*

# *FIGURE 1: LAYOUT OF THE SEMI-ANECHOIC TEST CHAMBER*



# *FIGURE 2: CONDUCTED EMISSIONS TEST SETUP*



# COM-POWER AL-130R

# LOOP ANTENNA

# S/N: 121090

# CALIBRATION DATE: FEBRUARY 9, 2017

| FREQUENCY (MHz) | MAGNETIC (dB/m) | ELECTRIC (dB/m) |
|---|---|---|
| 0.009 | -36.17 | 15.33 |
| 0.01 | -35.86 | 15.64 |
| 0.02 | -37.30 | 14.20 |
| 0.03 | -36.58 | 14.92 |
| 0.04 | -36.99 | 14.51 |
| 0.05 | -37.66 | 13.84 |
| 0.06 | -37.53 | 13.97 |
| 0.07 | -37.64 | 13.86 |
| 0.08 | -37.52 | 13.98 |
| 0.09 | -37.62 | 13.88 |
| 0.1 | -37.59 | 13.91 |
| 0.2 | -37.79 | 13.71 |
| 0.3 | -37.80 | 13.70 |
| 0.4 | -37.70 | 13.80 |
| 0.5 | -37.79 | 13.71 |
| 0.6 | -37.79 | 13.71 |
| 0.7 | -37.69 | 13.81 |
| 0.8 | -37.49 | 14.01 |
| 0.9 | -37.39 | 14.11 |
| 1 | -37.39 | 14.11 |
| 2 | -37.09 | 14.41 |
| 3 | -37.09 | 14.41 |
| 4 | -37.19 | 14.31 |
| 5 | -36.98 | 14.52 |
| 6 | -37.17 | 14.33 |
| 7 | -37.05 | 14.45 |
| 8 | -36.85 | 14.65 |
| 9 | -36.84 | 14.66 |
| 10 | -36.75 | 14.75 |
| 15 | -37.16 | 14.34 |
| 20 | -36.44 | 15.06 |
| 25 | -37.88 | 13.62 |
| 30 | -39.14 | 12.36 |

# COM-POWER AC-220

# COMBILOG ANTENNA

# S/N: 61060

# CALIBRATION DATE: JULY 27, 2017

| FREQUENCY (MHz) | FACTOR (dB) | FREQUENCY (MHz) | FACTOR (dB) |
|---|---|---|---|
| 30 | 23.80 | 200 | 14.10 |
| 35 | 24.00 | 250 | 15.30 |
| 40 | 24.70 | 300 | 17.70 |
| 45 | 22.90 | 350 | 17.70 |
| 50 | 22.10 | 400 | 19.00 |
| 60 | 17.60 | 450 | 21.30 |
| 70 | 12.70 | 500 | 21.00 |
| 80 | 11.20 | 550 | 22.30 |
| 90 | 13.10 | 600 | 23.40 |
| 100 | 14.40 | 650 | 22.90 |
| 120 | 15.30 | 700 | 24.60 |
| 125 | 15.00 | 750 | 24.50 |
| 140 | 12.80 | 800 | 25.40 |
| 150 | 16.50 | 850 | 26.40 |
| 160 | 12.90 | 900 | 27.20 |
| 175 | 14.30 | 950 | 27.80 |
| 180 | 14.50 | 1000 | 26.80 |

# 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 PAM-118A

# PREAMPLIFIER

## S/N: 551024

## CALIBRATION DATE: MAY 10, 2018

| FREQUENCY (GHz) | FACTOR (dB) | FREQUENCY (GHz) | FACTOR (dB) |
|---|---|---|---|
| 1.0 | 40.99 | 6.0 | 39.01 |
| 1.1 | 39.77 | 6.5 | 39.00 |
| 1.2 | 39.02 | 7.0 | 39.69 |
| 1.3 | 39.44 | 7.5 | 38.96 |
| 1.4 | 39.64 | 8.0 | 38.57 |
| 1.5 | 40.23 | 8.5 | 39.17 |
| 1.6 | 40.17 | 9.0 | 38.82 |
| 1.7 | 40.23 | 9.5 | 39.30 |
| 1.8 | 39.48 | 10.0 | 38.90 |
| 1.9 | 39.85 | 11.0 | 38.86 |
| 2.0 | 39.99 | 12.0 | 39.87 |
| 2.5 | 40.38 | 13.0 | 39.55 |
| 3.0 | 40.64 | 14.0 | 38.92 |
| 3.5 | 40.68 | 15.0 | 39.33 |
| 4.0 | 40.87 | 16.0 | 39.60 |
| 4.5 | 40.04 | 17.0 | 40.28 |
| 5.0 | 39.54 | 18.0 | 39.58 |
| 5.5 | 39.58 | | |

# COM-POWER AH-826

# HORN ANTENNA

# S/N: 71957

| FREQUENCY (GHz) | FACTOR (dB) | FREQUENCY (GHz) | FACTOR (dB) |
|---|---|---|---|
| 18.0 | 33.5 | 22.5 | 35.5 |
| 18.5 | 33.5 | 23.0 | 35.9 |
| 19.0 | 34.0 | 23.5 | 35.7 |
| 19.5 | 34.0 | 24.0 | 35.6 |
| 20.0 | 34.3 | 24.5 | 36.0 |
| 20.5 | 34.9 | 25.0 | 36.2 |
| 21.0 | 34.7 | 25.5 | 36.1 |
| 21.5 | 35.0 | 26.0 | 36.2 |
| 22.0 | 35.0 | 26.5 | 35.7 |

# COM-POWER PA-840

# MICROWAVE PREAMPLIFIER

## S/N: 711013

## CALIBRATION DATE: MAY 10, 2018

| FREQUENCY (GHz) | FACTOR (dB) | FREQUENCY (GHz) | FACTOR (dB) |
|---|---|---|---|
| 18.0 | 26.90 | 31.0 | 24.56 |
| 19.0 | 24.65 | 31.5 | 25.84 |
| 20.0 | 25.74 | 32.0 | 26.93 |
| 21.0 | 24.78 | 32.5 | 27.76 |
| 22.0 | 24.83 | 33.0 | 25.76 |
| 23.0 | 24.81 | 33.5 | 26.76 |
| 24.0 | 25.52 | 34.0 | 26.51 |
| 25.0 | 24.90 | 34.5 | 27.49 |
| 26.0 | 25.92 | 35.0 | 27.64 |
| 26.5 | 26.53 | 35.5 | 27.45 |
| 27.0 | 26.41 | 36.0 | 25.08 |
| 27.5 | 24.78 | 36.5 | 25.61 |
| 28.0 | 25.13 | 37.0 | 24.69 |
| 28.5 | 29.29 | 37.5 | 24.10 |
| 29.0 | 28.44 | 38.0 | 24.83 |
| 29.5 | 27.51 | 38.5 | 24.41 |
| 30.0 | 27.12 | 39.0 | 24.44 |
| 30.5 | 26.42 | 39.5 | 22.96 |
| | | 40.0 | 22.29 |

# COM-POWER AH840

# HORN ANTENNA

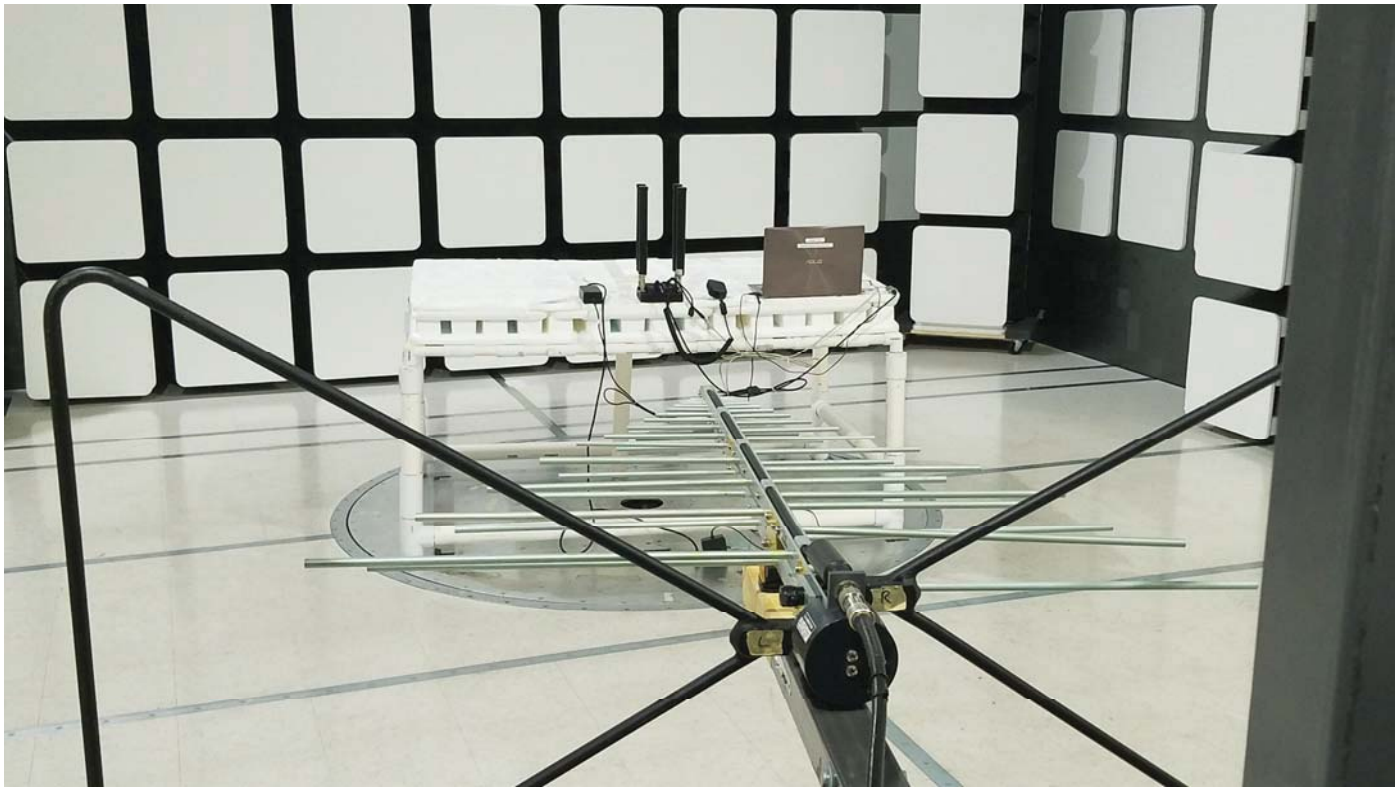
# S/N: 91003

| FREQUENCY (GHz) | FACTOR (dB) | FREQUENCY (GHz) | FACTOR (dB) |
|---|---|---|---|
| 26.5 | 41.0 | 31.0 | 40.9 |
| 27.0 | 40.3 | 31.5 | 41.8 |
| 27.5 | 41.6 | 32.0 | 40.0 |
| 28.0 | 41.9 | 32.5 | 40.8 |
| 28.5 | 41.8 | 33.0 | 40.6 |
| 29.0 | 41.2 | 33.5 | 40.6 |
| 29.5 | 40.8 | 34.0 | 40.6 |
| 30.0 | 41.0 | 34.5 | 40.8 |
| 30.5 | 41.5 | 40.0 | 41.0 |
| | | | |

**FRONT VIEW**

SILVUS TECHNOLOGIES
SC4480 MIMO RADIO
MODEL: SC4480E-520-SBST
FCC SUBPART B, C, and E – RADIATED EMISSIONS – BELOW 1 GHz

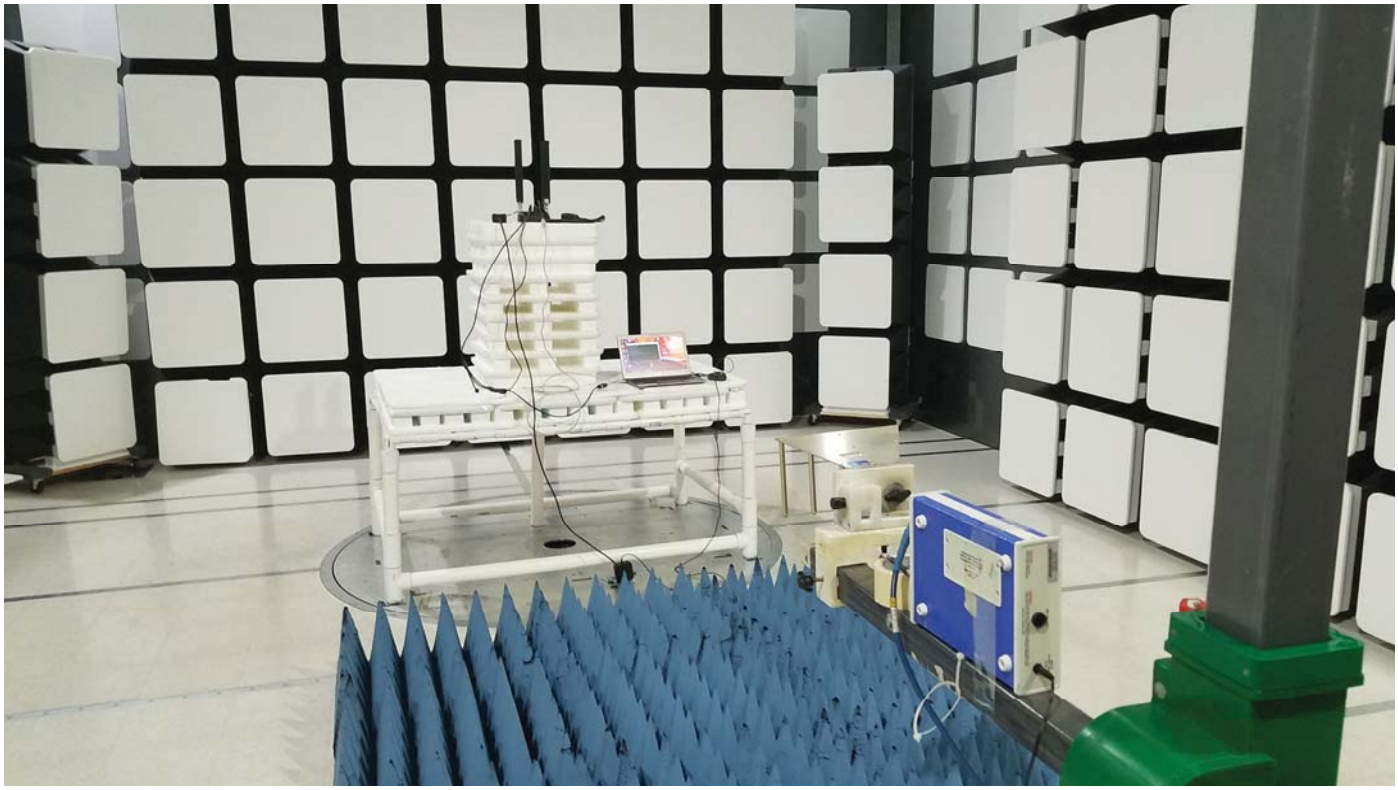
## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



**REAR VIEW**

SILVUS TECHNOLOGIES
SC4480 MIMO RADIO
MODEL: SC4480E-520-SBST
FCC SUBPART B, C, and E – RADIATED EMISSIONS – BELOW 1 GHz

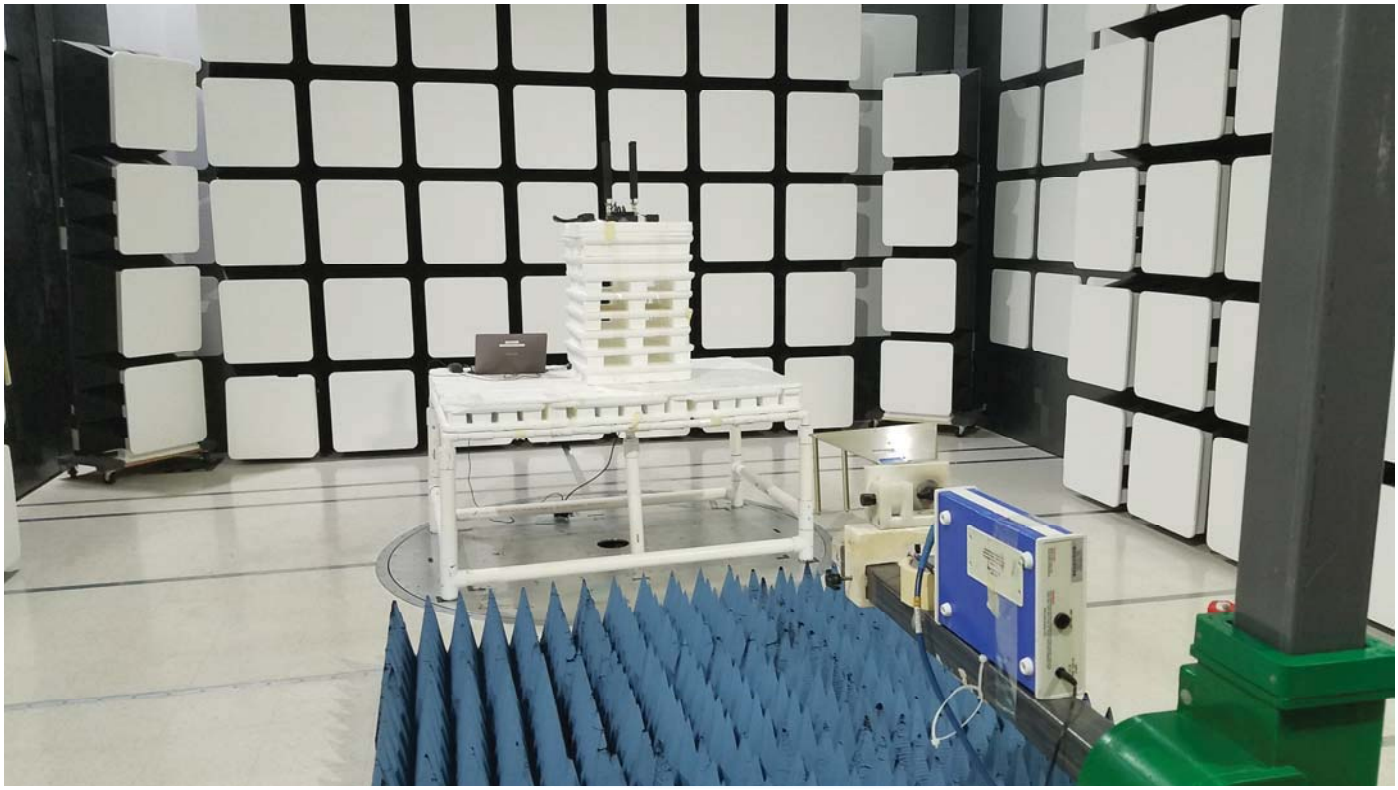
## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



**FRONT VIEW**

SILVUS TECHNOLOGIES
SC4480 MIMO RADIO
MODEL: SC4480E-520-SBST
FCC SUBPART B, C, and E – RADIATED EMISSIONS – ABOVE 1 GHz

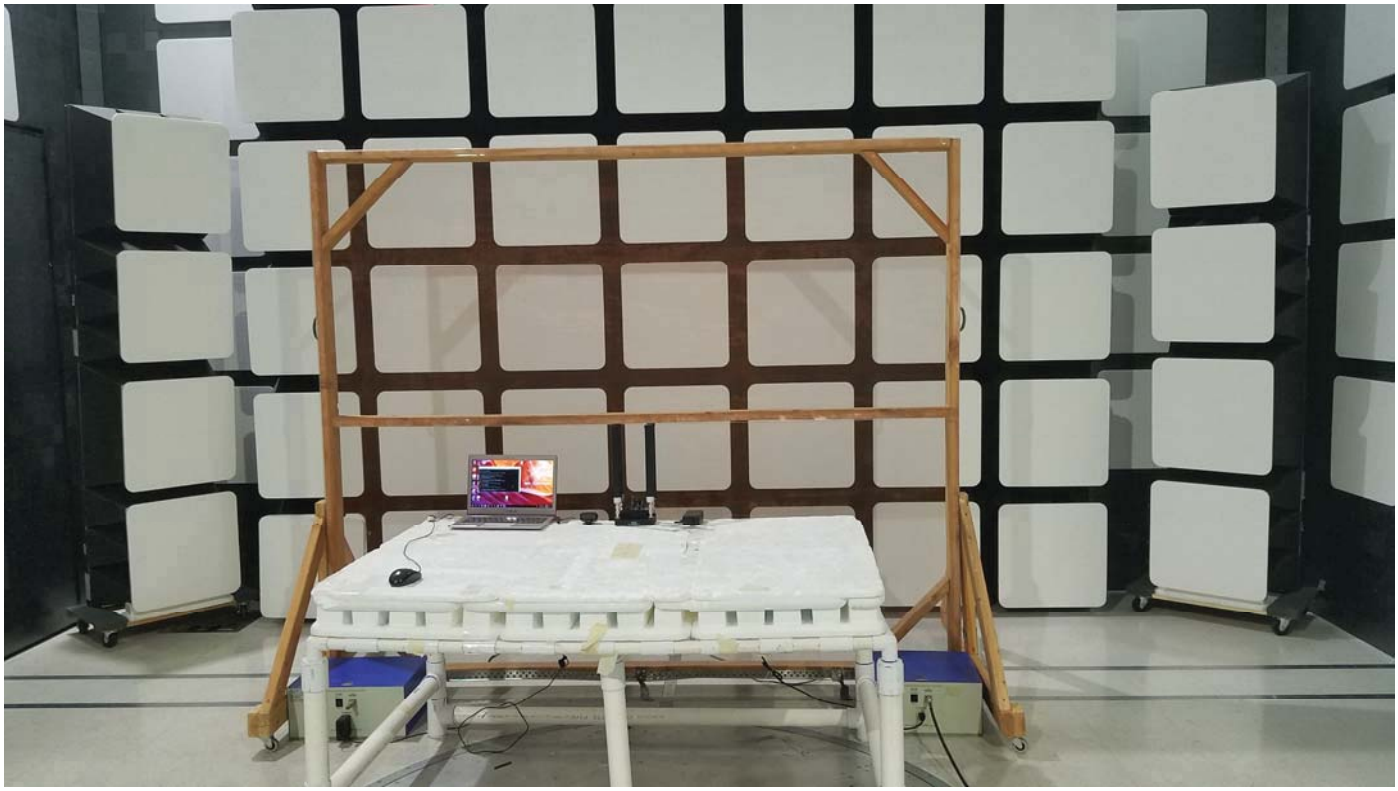
## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



**REAR VIEW**

SILVUS TECHNOLOGIES
SC4480 MIMO RADIO
MODEL: SC4480E-520-SBST
FCC SUBPART B, C, and E – RADIATED EMISSIONS – ABOVE 1 GHz

## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS



**FRONT VIEW**

SILVUS TECHNOLOGIES
SC4480 MIMO RADIO
MODEL: SC4480E-520-SBST
FCC SUBPART B, C, and E – CONDUCTED EMISSIONS

## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

**REAR VIEW**

SILVUS TECHNOLOGIES
SC4480 MIMO RADIO
MODEL: SC4480E-520-SBST
FCC SUBPART B, C, and E – CONDUCTED EMISSIONS

## PHOTOGRAPH SHOWING THE EUT CONFIGURATION FOR MAXIMUM EMISSIONS

# APPENDIX E

# *DATA SHEETS*

# *RADIATED EMISSIONS*

# *DATA SHEETS*

**FCC 15.407**
Silvus Technologies, Inc.
SC4480 MIMO Radio
Model: SC4480E-520-SBST

Date: 09/26/2018
Lab: D
Tested By: Kyle Fujimoto

**5220 MHz Fundamental**
**Transmit Mode**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| 10440 | 45.84 | V | 68.20 | -22.36 | Peak | 359.50 | 179.56 | |
| | | | | | | | | |
| 15660 | 49.13 | V | 73.97 | -24.84 | Peak | 8.75 | 128.88 | |
| 15660 | 36.84 | V | 53.97 | -17.13 | Avg | 8.75 | 128.88 | |
| | | | | | | | | |
| 20880 | | | | | | | | **No Emissions** |
| 20880 | | | | | | | | **Detected** |
| | | | | | | | | |
| 26100 | | | | | | | | **No Emissions** |
| 26100 | | | | | | | | **Detected** |
| | | | | | | | | |
| 31320 | | | | | | | | **No Emissions** |
| 31320 | | | | | | | | **Detected** |
| | | | | | | | | |
| 36540 | | | | | | | | **No Emissions** |
| 36540 | | | | | | | | **Detected** |
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**FCC 15.407**
Silvus Technologies, Inc.
SC4480 MIMO Radio
Model: SC4480E-520-SBST

Date: 09/26/2018
Lab: D
Tested By: Kyle Fujimoto

**5220 MHz Fundamental**
**Transmit Mode**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| 10440 | 43.03 | H | 68.20 | -25.17 | Peak | 106.00 | 105.71 | |
| | | | | | | | | |
| 15660 | 44.78 | H | 73.97 | -29.19 | Peak | 248.25 | 101.53 | |
| 15660 | 33.42 | H | 53.97 | -20.55 | Avg | 248.25 | 104.53 | |
| | | | | | | | | |
| 20880 | | | | | | | | **No Emissions** |
| 20880 | | | | | | | | **Detected** |
| | | | | | | | | |
| 26100 | | | | | | | | **No Emissions** |
| 26100 | | | | | | | | **Detected** |
| | | | | | | | | |
| 31320 | | | | | | | | **No Emissions** |
| 31320 | | | | | | | | **Detected** |
| | | | | | | | | |
| 36540 | | | | | | | | **No Emissions** |
| 36540 | | | | | | | | **Detected** |
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**FCC 15.407**

Silvus Technologies, Inc.
SC4480 MIMO Radio
Model: SC4480E-520-SBST

Date: 09/26/2018
Lab: D
Tested By: Kyle Fujimoto

**5240 MHz Fundamental**
**Transmit Mode**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| 10480 | 51.32 | V | 68.20 | -16.88 | Peak | 270.50 | 123.14 | |
| | | | | | | | | |
| 15720 | 56.01 | V | 73.97 | -17.96 | Peak | 215.50 | 117.77 | |
| 15720 | 42.67 | V | 53.97 | -11.30 | Avg | 215.50 | 117.77 | |
| | | | | | | | | |
| 20960 | | | | | | | | **No Emissions** |
| 20960 | | | | | | | | **Detected** |
| | | | | | | | | |
| 26200 | | | | | | | | **No Emissions** |
| 26200 | | | | | | | | **Detected** |
| | | | | | | | | |
| 31440 | | | | | | | | **No Emissions** |
| 31440 | | | | | | | | **Detected** |
| | | | | | | | | |
| 36680 | | | | | | | | **No Emissions** |
| 36680 | | | | | | | | **Detected** |
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**FCC 15.407**

Silvus Technologies, Inc.
SC4480 MIMO Radio
Model: SC4480E-520-SBST

Date: 09/26/2018
Lab: D
Tested By: Kyle Fujimoto

**5240 MHz Fundamental**
**Transmit Mode**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| 10480 | 45.52 | H | 68.20 | -22.69 | Peak | 328.50 | 146.91 | |
| | | | | | | | | |
| 15720 | 55.63 | H | 73.97 | -18.34 | Peak | 62.00 | 117.77 | |
| 15720 | 42.68 | H | 53.97 | -11.29 | Avg | 62.00 | 117.77 | |
| | | | | | | | | |
| 20960 | | | | | | | | **No Emissions** |
| 20960 | | | | | | | | **Detected** |
| | | | | | | | | |
| 26200 | | | | | | | | **No Emissions** |
| 26200 | | | | | | | | **Detected** |
| | | | | | | | | |
| 31440 | | | | | | | | **No Emissions** |
| 31440 | | | | | | | | **Detected** |
| | | | | | | | | |
| 36680 | | | | | | | | **No Emissions** |
| 36680 | | | | | | | | **Detected** |
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**FCC 15.407**

Silvus Technologies, Inc.
SC4480 MIMO Radio
Model: SC4480E-520-SBST

Date: 09/24/2018
Lab: D
Tested By: Kyle Fujimoto

**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 40 GHz**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | No Emissions Found for the |
| | | | | | | | | Digital Portion |
| | | | | | | | | from 9 kHz to 30 MHz |
| | | | | | | | | for both Vertical and Horizontal |
| | | | | | | | | Polarizations |
| | | | | | | | | |
| | | | | | | | | No Non Harmonic Emissions Found |
| | | | | | | | | for the Tx Mode |
| | | | | | | | | from 9 kHz to 30 MHz |
| | | | | | | | | for both Vertical and Horizontal |
| | | | | | | | | Polarizations |
| | | | | | | | | |
| | | | | | | | | No Emissions Found for the |
| | | | | | | | | Digital Portion |
| | | | | | | | | from 1 GHz to 40 GHz |
| | | | | | | | | for both Vertical and Horizontal |
| | | | | | | | | Polarizations |
| | | | | | | | | |
| | | | | | | | | No Non Harmonic Emissions Found |
| | | | | | | | | for the Tx Mode |
| | | | | | | | | from 1 GHz to 40 GHz |
| | | | | | | | | for both Vertical and Horizontal |
| | | | | | | | | Polarizations |
| | | | | | | | | |
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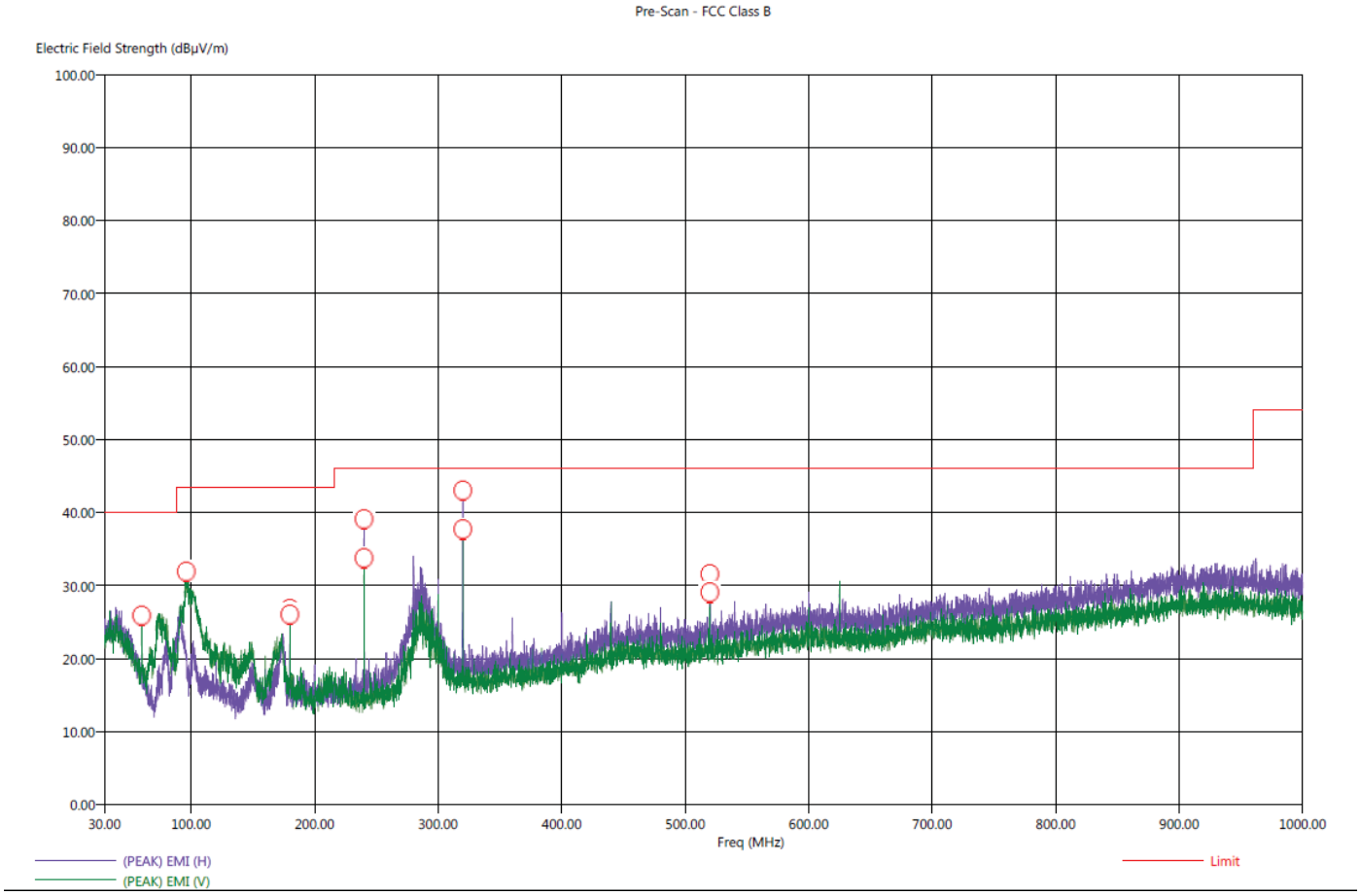
Title: Pre-Scan, 30-1000 MHz, FCC Class B
File: Agilent - Pre-Scan - 5220 MHz - FCC Class B - 30 MHz to 1000 MHz - 09-26-2018.set
Operator: Kyle Fujimoto
EUT Type: SC4480 MIMO Radio
EUT Condition: The EUT is continuously transmitting at 5220 MHz on all four antenna ports
Customer: Silvus Technologies, Inc.
Model: SC4480E-520-SBST
S/N: N/A

9/26/2018 9:52:41 AM
Sequence: Preliminary Scan



Title: Radiated Final - FCC Class B
File: Agilent - Final Scan - 5220 MHz - FCC Class B - 30 MHz to 1000 MHz - 09-26-2018.set
Operator: Kyle Fujimoto
EUT Type: SC4480 MIMO Radio
EUT Condition: The EUT is continuously transmitting at 5220 MHz on all for antenna ports
Customer: Silvus Technologies, Inc.
Model: SC4480E-520-SBST
S/N: N/A

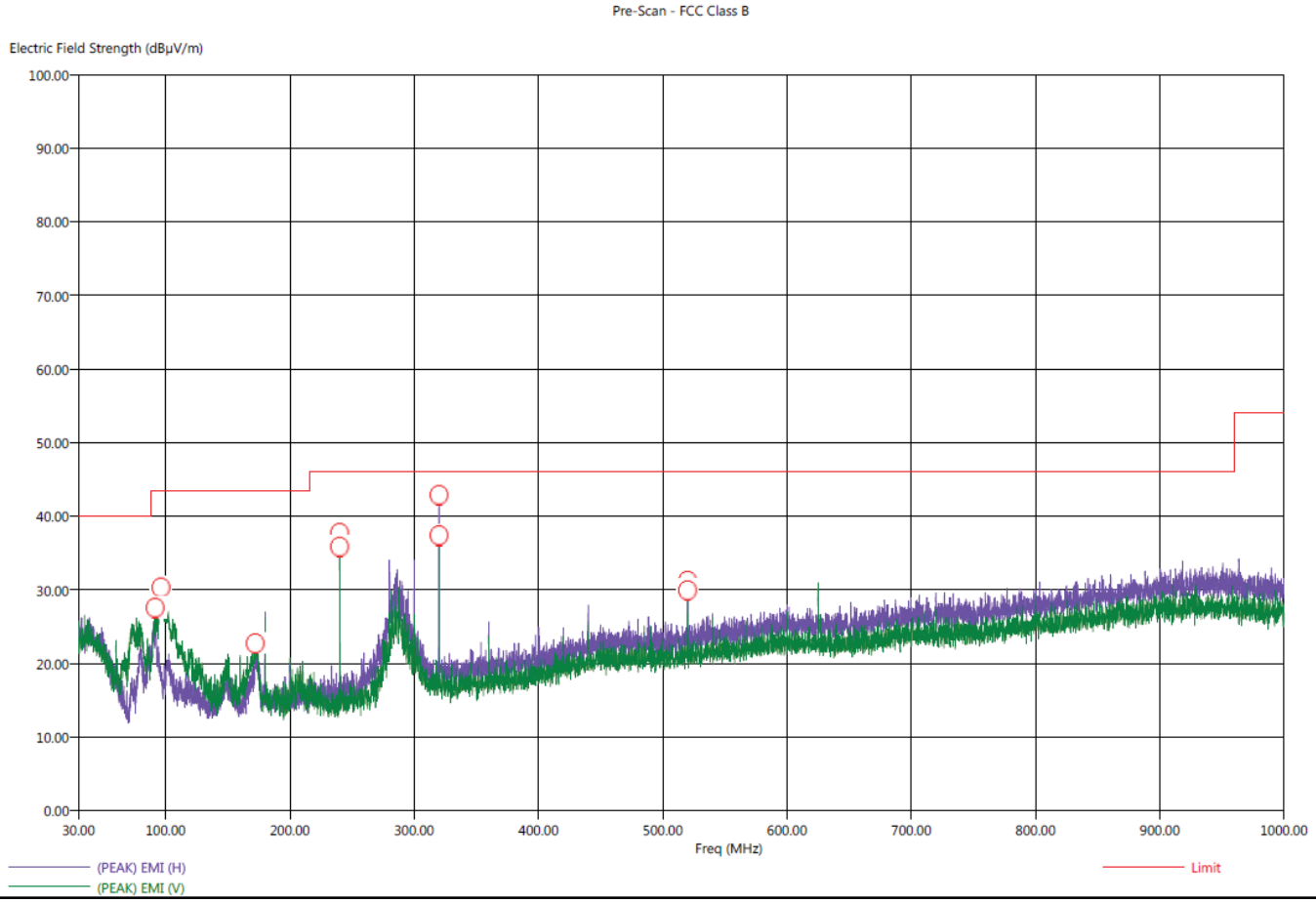
9/26/2018 10:02:45 AM
Sequence: Final Measurements

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 Agl (deg) | Twr Ht (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 60.00 | V | 35.95 | 29.77 | -4.05 | -10.23 | 40.00 | 17.66 | 0.90 | 359.25 | 175.20 |
| 96.20 | V | 36.85 | 32.44 | -6.65 | -11.06 | 43.50 | 13.90 | 1.10 | 284.75 | 127.14 |
| 180.00 | H | 35.90 | 31.54 | -7.60 | -11.96 | 43.50 | 14.50 | 1.34 | 146.00 | 175.02 |
| 180.00 | V | 35.54 | 28.74 | -7.96 | -14.76 | 43.50 | 14.50 | 1.34 | 156.50 | 143.20 |
| 240.00 | H | 43.10 | 36.98 | -2.90 | -9.02 | 46.00 | 15.08 | 1.60 | 274.75 | 111.38 |
| 240.00 | V | 39.76 | 37.71 | -6.24 | -8.29 | 46.00 | 15.08 | 1.60 | 359.75 | 143.14 |
| 320.00 | H | 45.81 | 43.61 | -0.19 | -2.39 | 46.00 | 17.70 | 1.78 | 45.00 | 111.26 |
| 320.00 | V | 40.70 | 32.99 | -5.30 | -13.01 | 46.00 | 17.70 | 1.78 | 184.00 | 270.91 |
| 520.00 | H | 41.85 | 36.64 | -4.15 | -9.36 | 46.00 | 21.54 | 2.24 | 117.50 | 302.37 |
| 520.00 | V | 42.33 | 37.11 | -3.67 | -8.89 | 46.00 | 21.53 | 2.24 | 293.25 | 350.37 |

Title: Pre-Scan, 30-1000 MHz, FCC Class B
File: Agilent - Pre-Scan - 5240 MHz - FCC Class B - 30 MHz to 1000 MHz - 09-26-2018.set
Operator: Kyle Fujimoto
EUT Type: SC4480 MIMO Radio
EUT Condition: The EUT is continuously transmitting at 5240 MHz on all four antenna ports
Customer: Silvus Technologies, Inc.
Model: SC4480E-520-SBST
S/N: N/A

9/26/2018 10:29:54 AM
Sequence: Preliminary Scan



Title: Radiated Final - FCC Class B
File: Agilent - Final Scan - 5240 MHz - FCC Class B - 30 MHz to 1000 MHz - 09-26-2018.set
Operator: Kyle Fujimoto
EUT Type: SC4480 MIMO Radio
EUT Condition: The EUT is continuously transmitting at 5240 MHz on all for antenna ports
Customer: Silvus Technologies, Inc.
Model: SC4480E-520-SBST
S/N: N/A

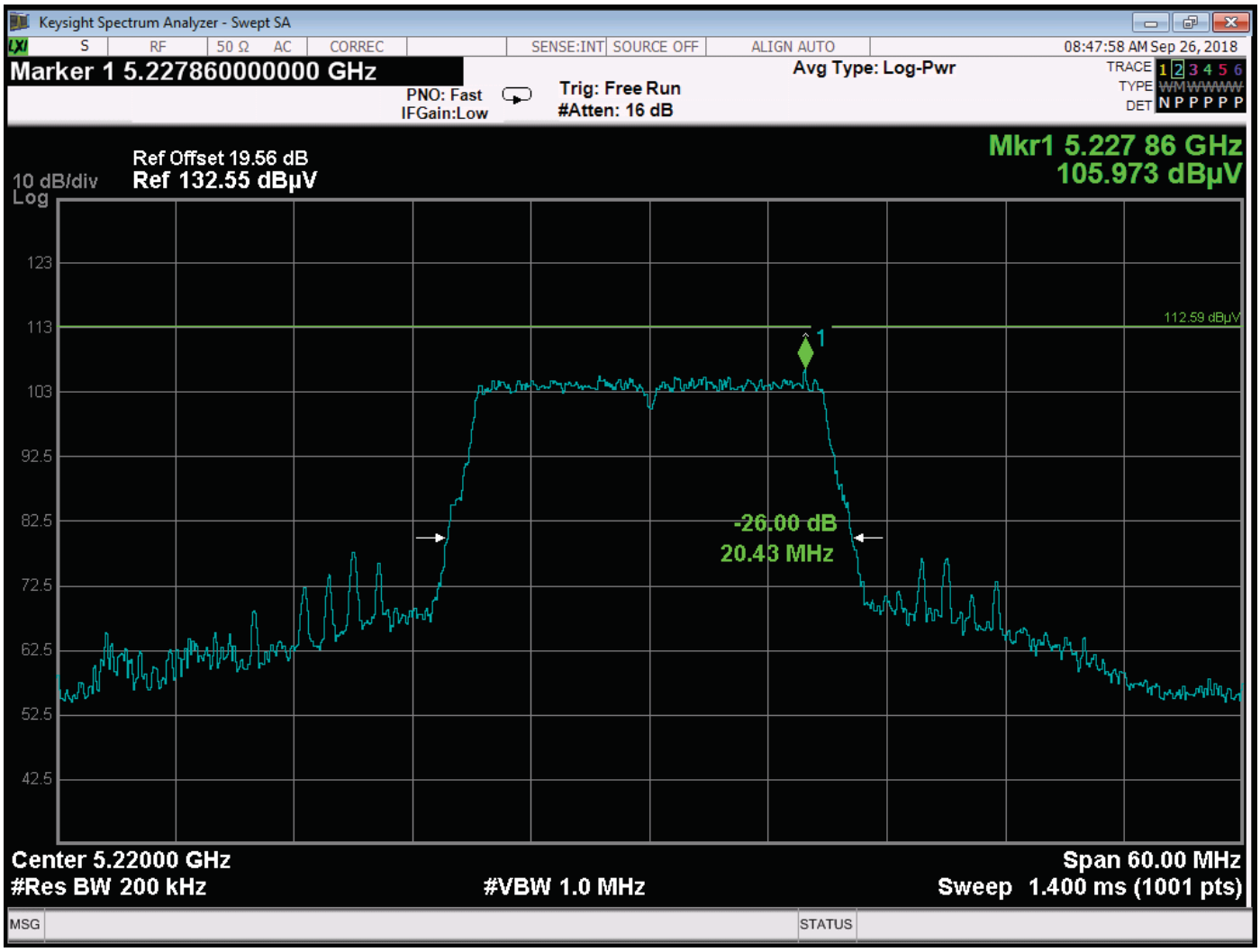
9/26/2018 10:38:41 AM
Sequence: Final Measurements

FCC Class B

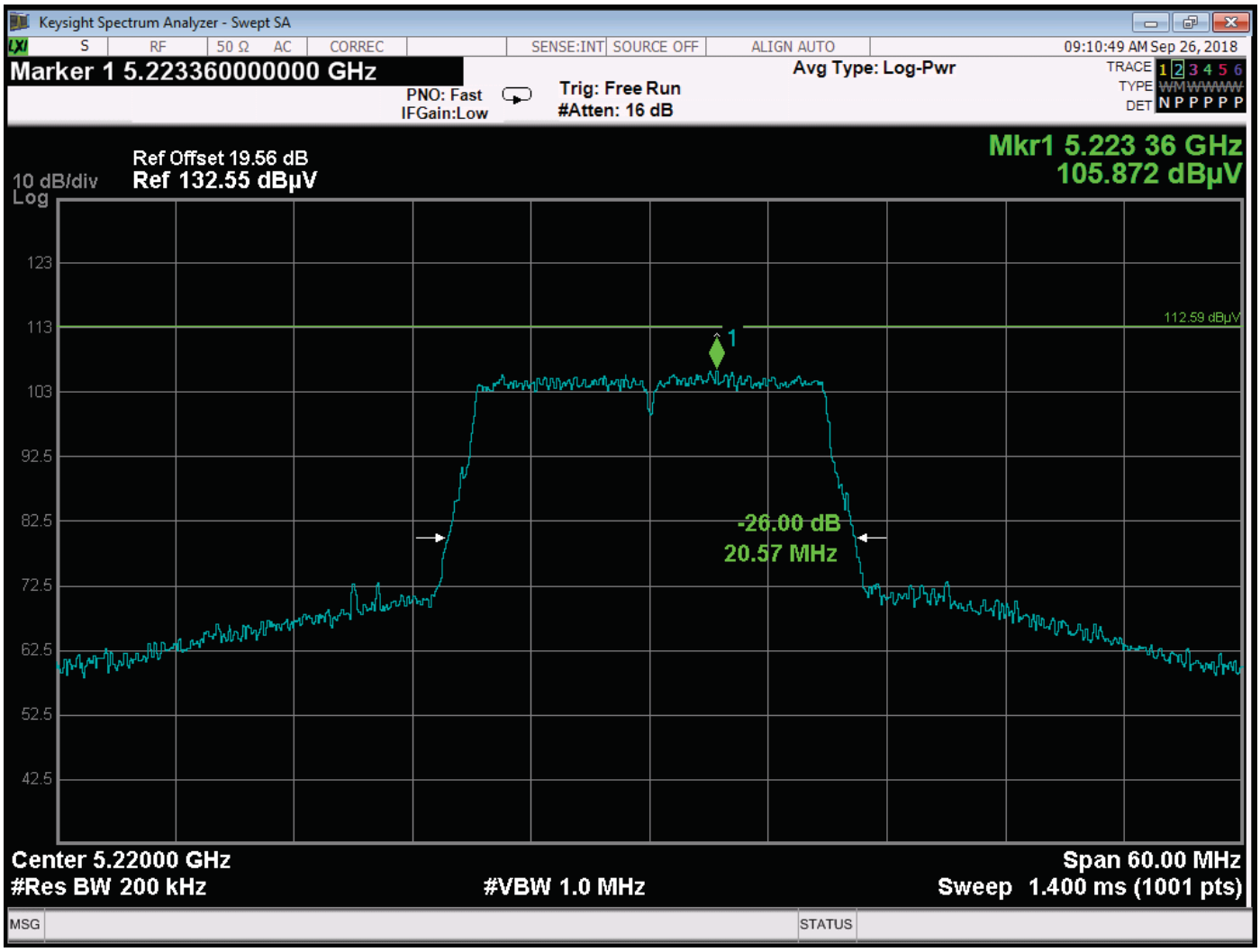
| Freq (MHz) | Pol | (PEAK) EMI (dBµV/m) | (QP) EMI (dBµV/m) | (PEAK) Margin (dB) | (QP) Margin (dB) | Limit (dBµV/m) | Transducer (dB) | Cable (dB) | Ttbl Agl (deg) | Twr Ht (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| 91.60 | V | 34.00 | 29.18 | -9.50 | -14.32 | 43.50 | 13.30 | 1.10 | 307.75 | 143.44 |
| 96.30 | V | 36.01 | 31.33 | -7.49 | -12.17 | 43.50 | 13.95 | 1.10 | 308.25 | 159.32 |
| 172.10 | V | 33.30 | 27.89 | -10.20 | -15.61 | 43.50 | 14.04 | 1.30 | 100.00 | 207.02 |
| 240.00 | H | 41.43 | 39.97 | -4.57 | -6.03 | 46.00 | 15.08 | 1.60 | 260.25 | 159.26 |
| 240.00 | V | 40.36 | 34.59 | -5.64 | -11.41 | 46.00 | 15.08 | 1.60 | 344.50 | 158.25 |
| 320.00 | H | 46.01 | 43.58 | 0.01 | -2.42 | 46.00 | 17.70 | 1.78 | 176.25 | 111.26 |
| 320.00 | V | 41.94 | 38.62 | -4.06 | -7.38 | 46.00 | 17.70 | 1.78 | 289.00 | 286.55 |
| 520.00 | H | 41.78 | 36.65 | -4.22 | -9.35 | 46.00 | 21.53 | 2.24 | 350.75 | 159.02 |
| 520.00 | V | 43.91 | 38.26 | -2.09 | -7.74 | 46.00 | 21.53 | 2.24 | 77.75 | 190.85 |

# *EBW BANDWIDTH*

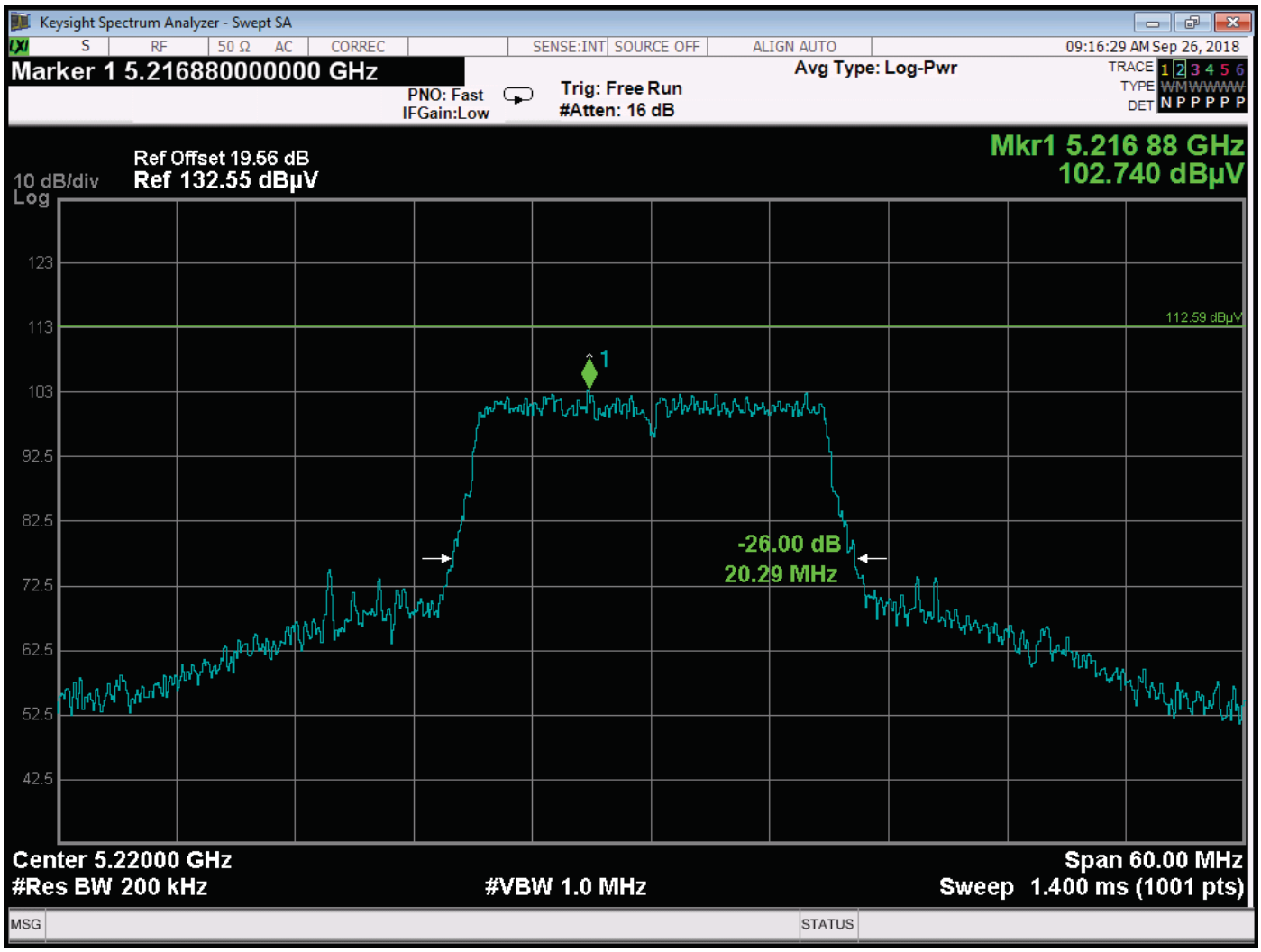
# *DATA SHEETS*



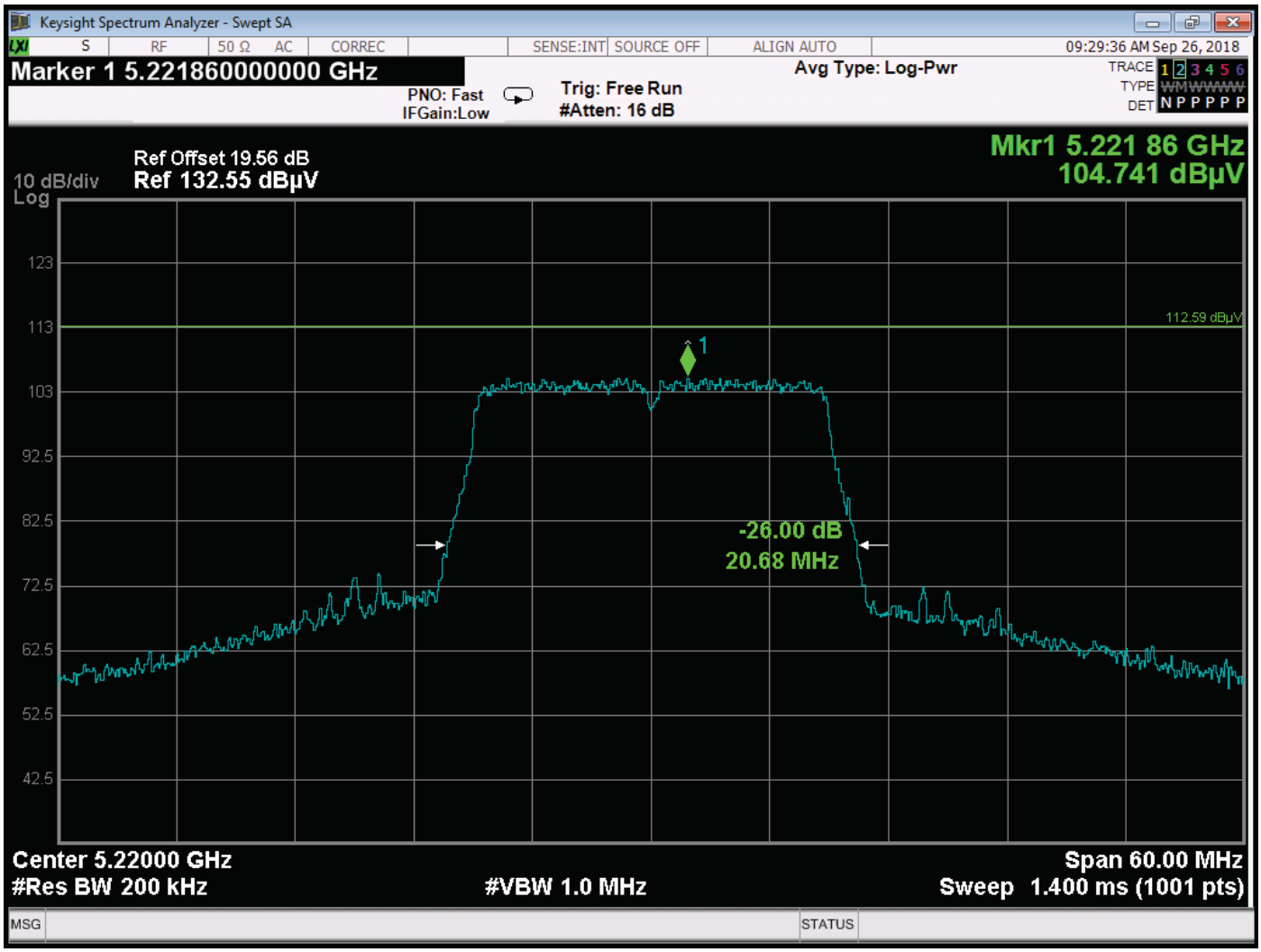

EBW Bandwidth – 5220 MHz – Port #1



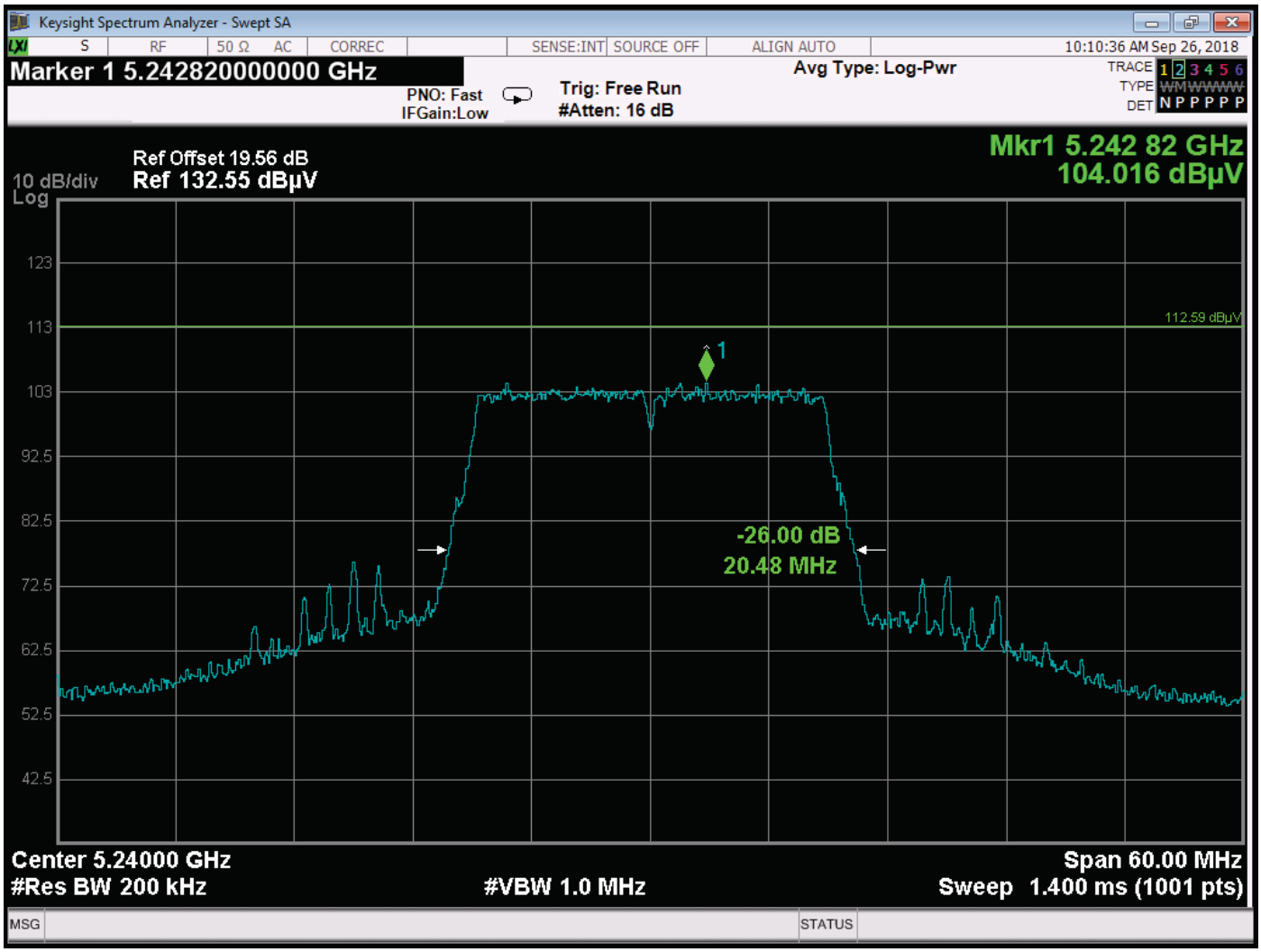

EBW Bandwidth – 5220 MHz – Port #2



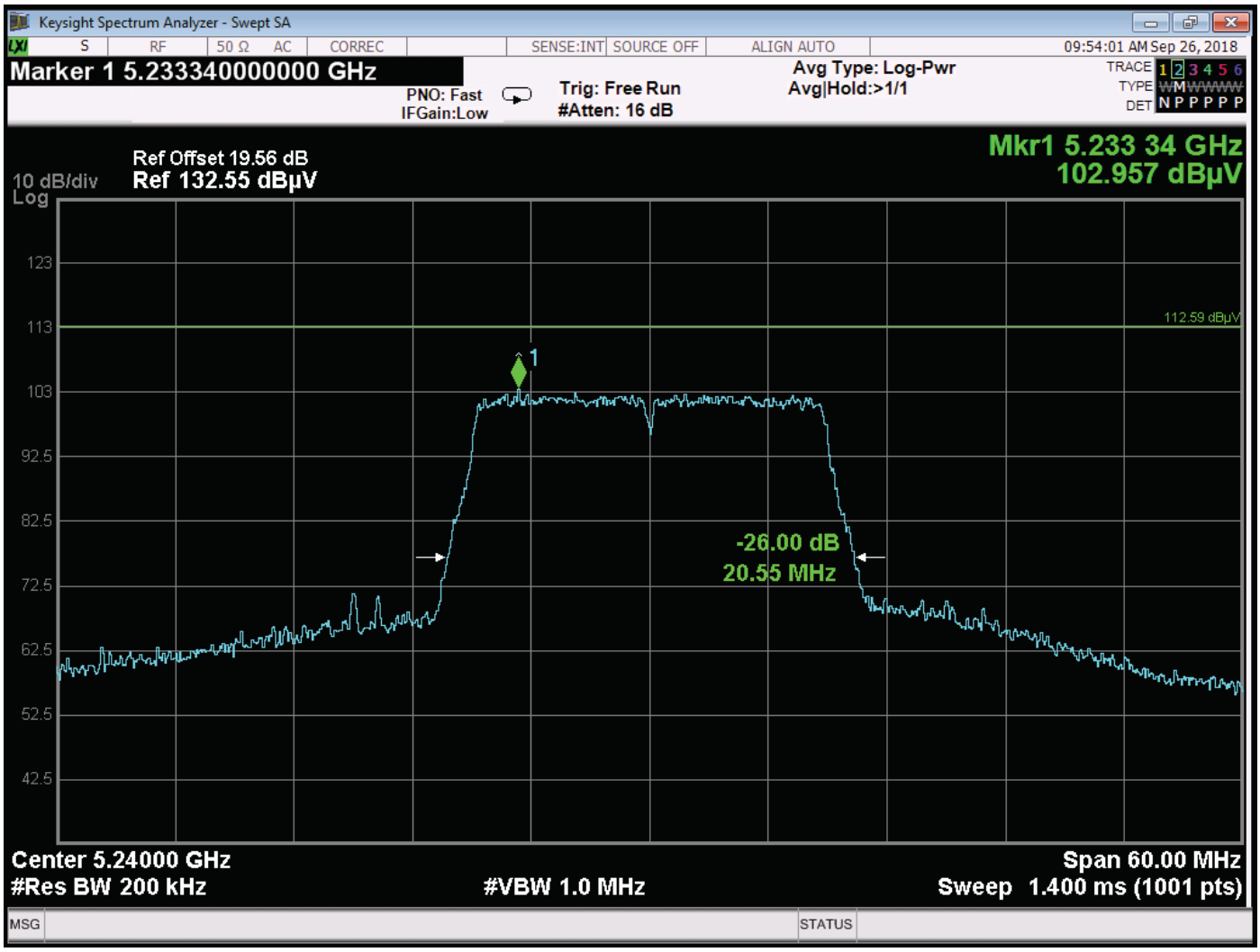

EBW Bandwidth – 5220 MHz – Port #3



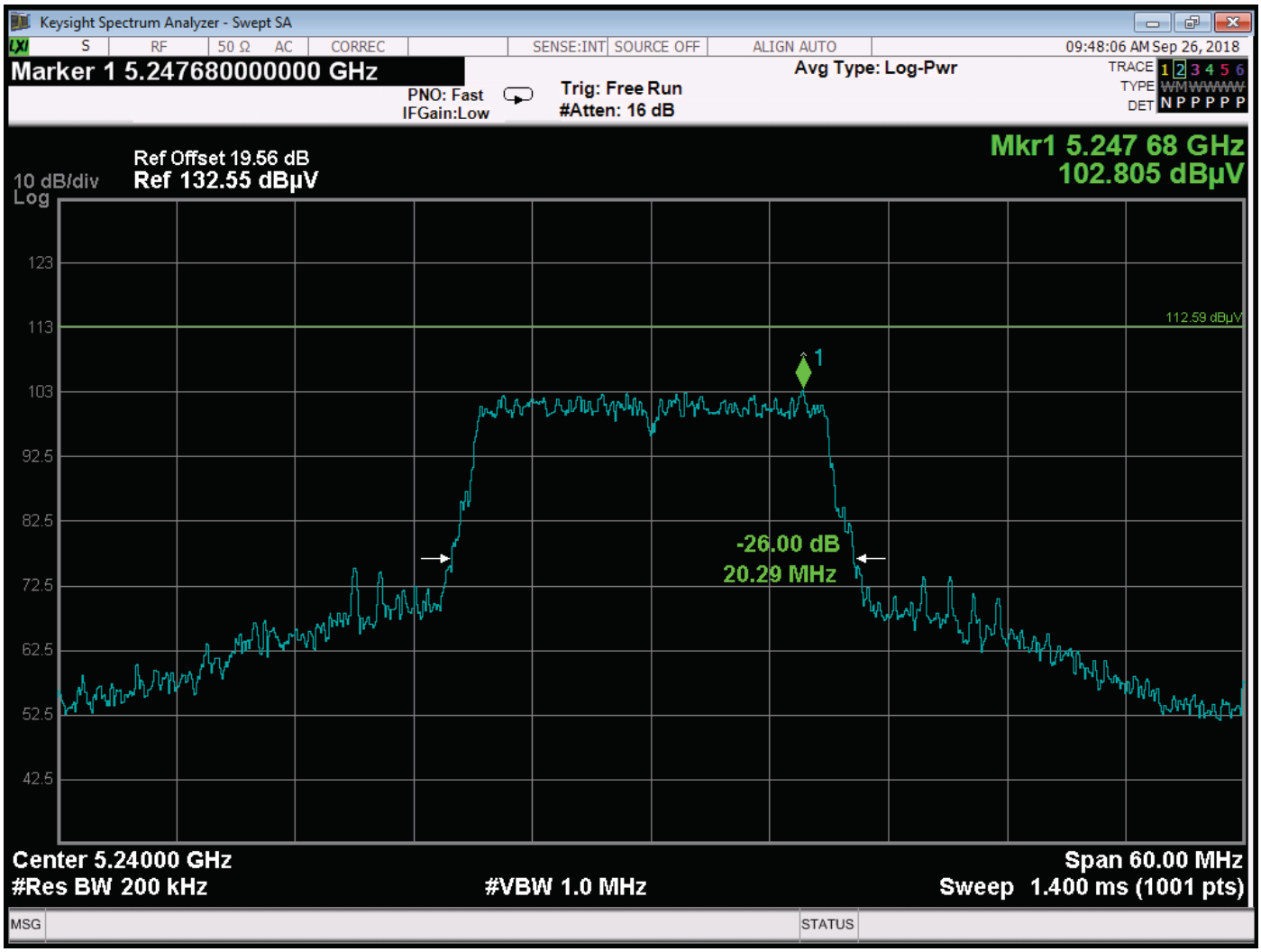

EBW Bandwidth – 5220 MHz – Port #4



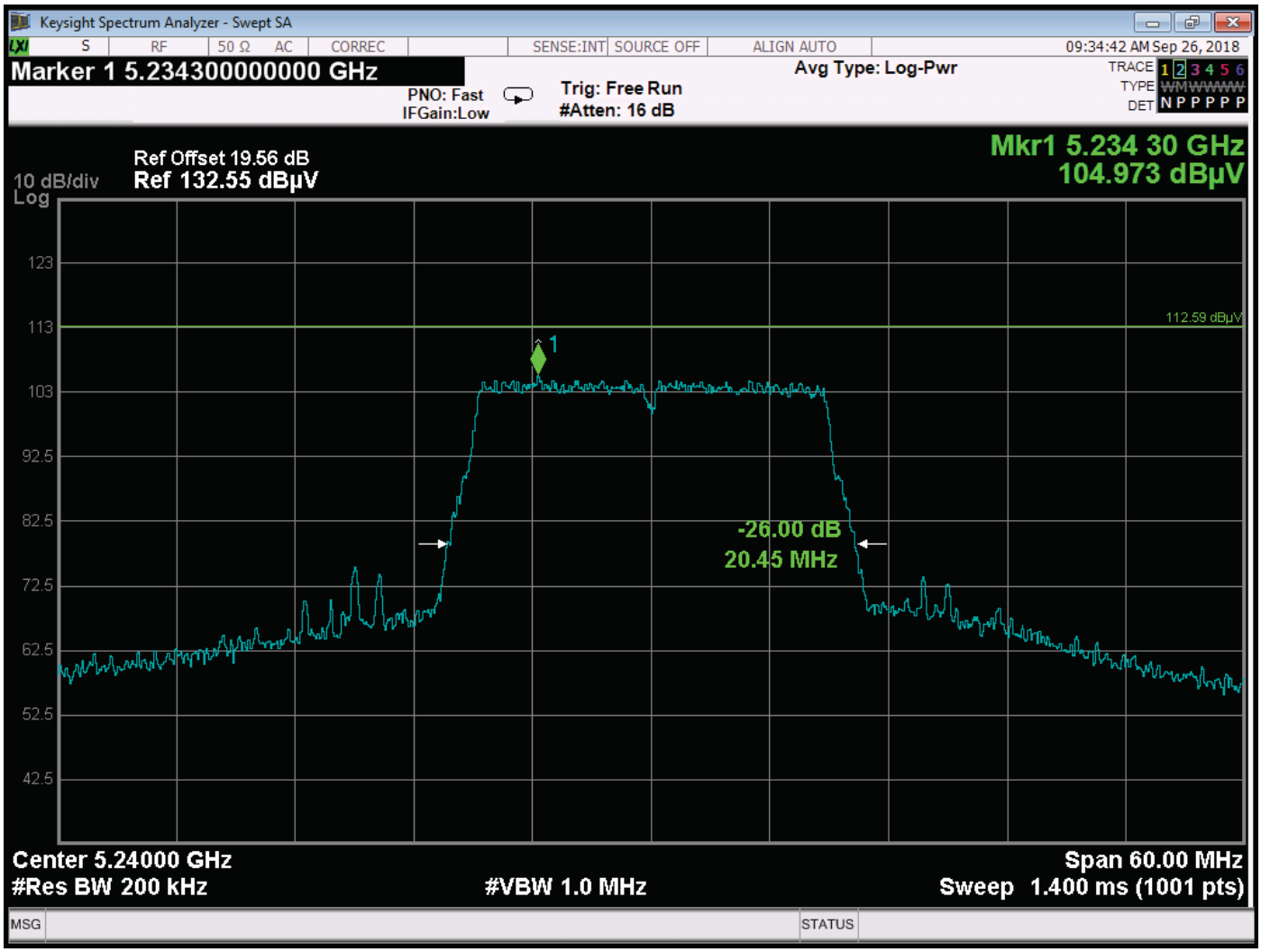

EBW Bandwidth – 5240 MHz – Port #1




EBW Bandwidth – 5240 MHz – Port #2



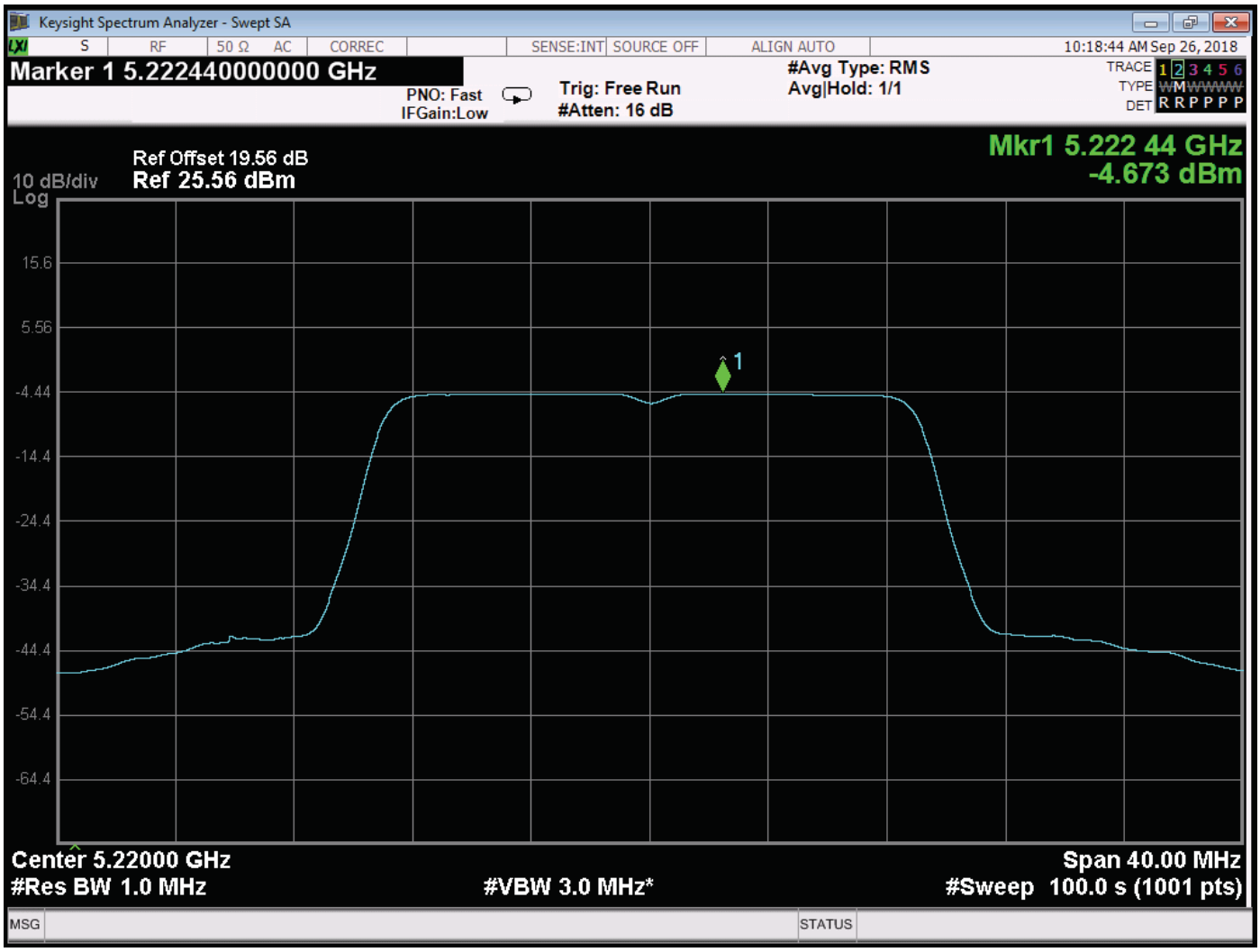

EBW Bandwidth – 5240 MHz – Port #3



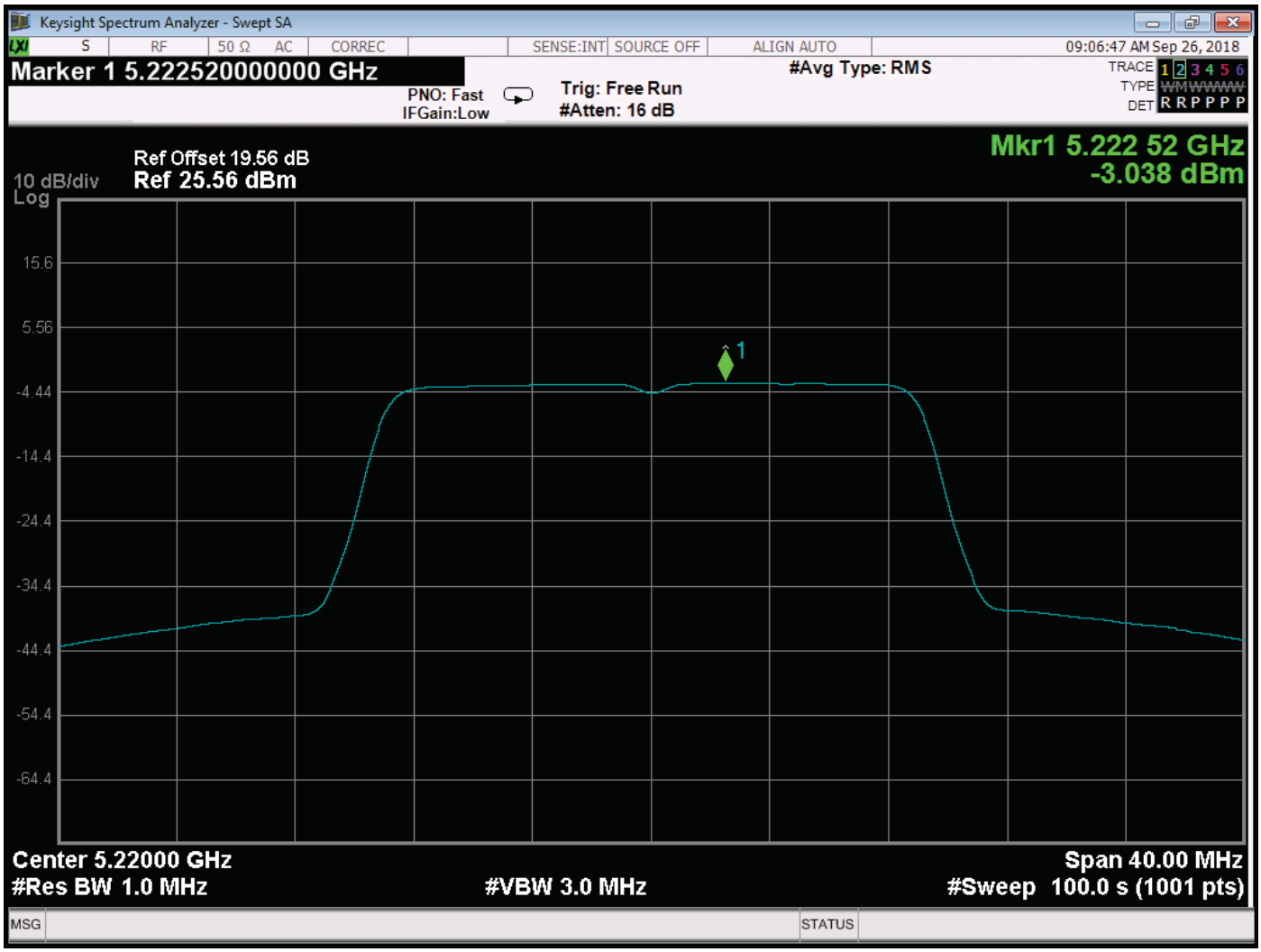

EBW Bandwidth – 5240 MHz – Port #4

# *SPECTRAL DENSITY OUTPUT*

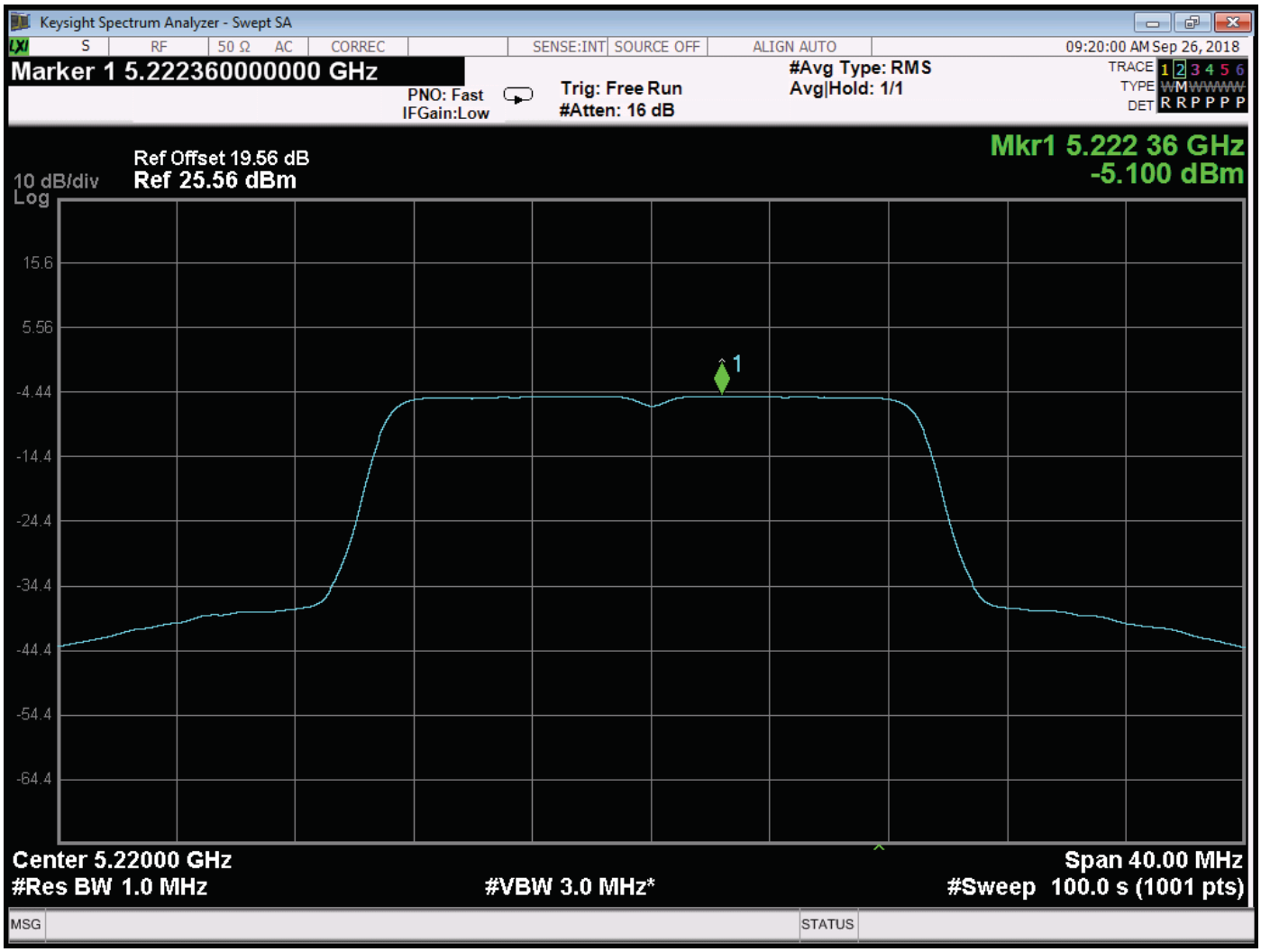
# *DATA SHEETS*



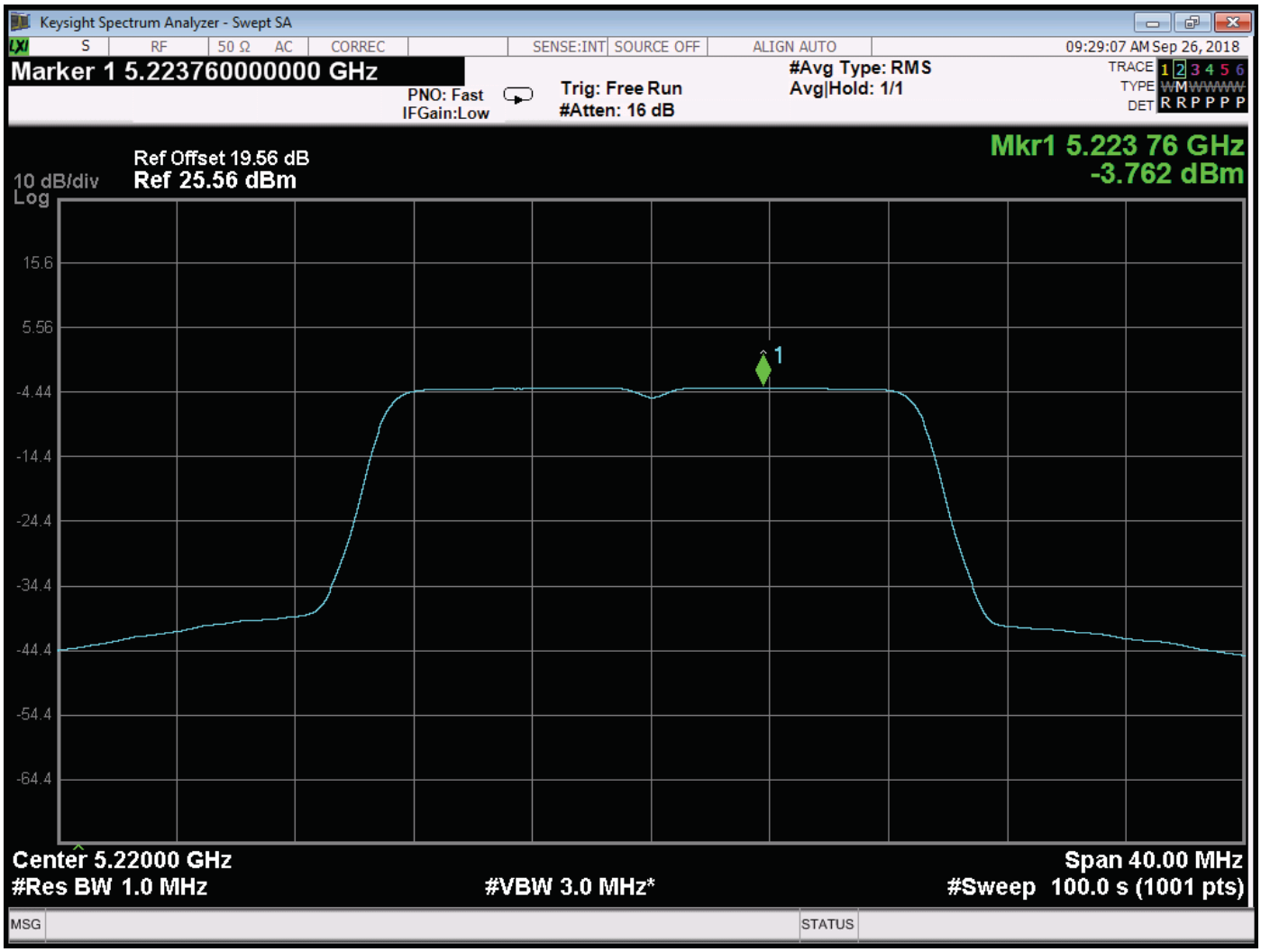

Spectral Density – 5220 MHz – Port #1



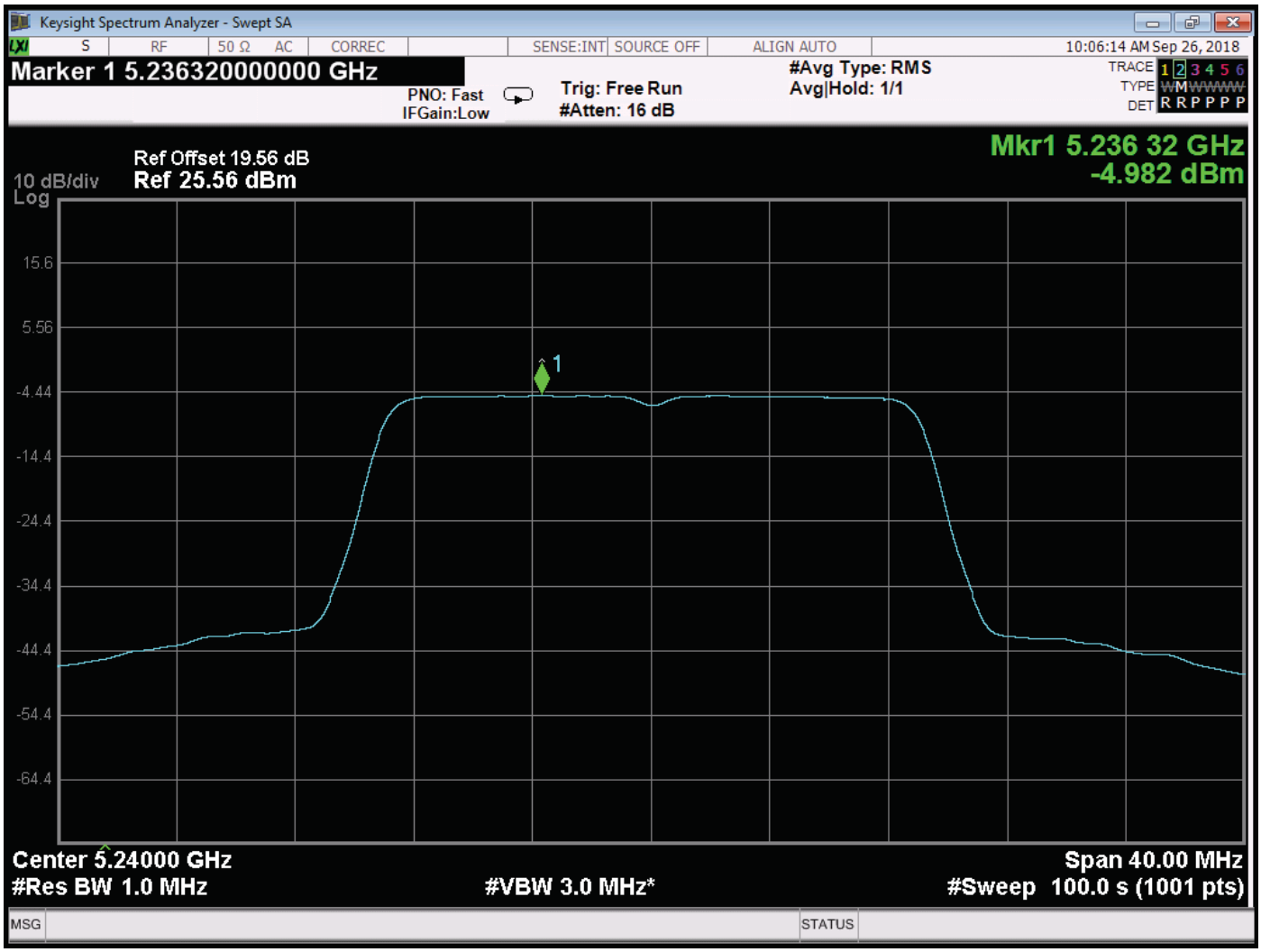

Spectral Density – 5220 MHz – Port #2



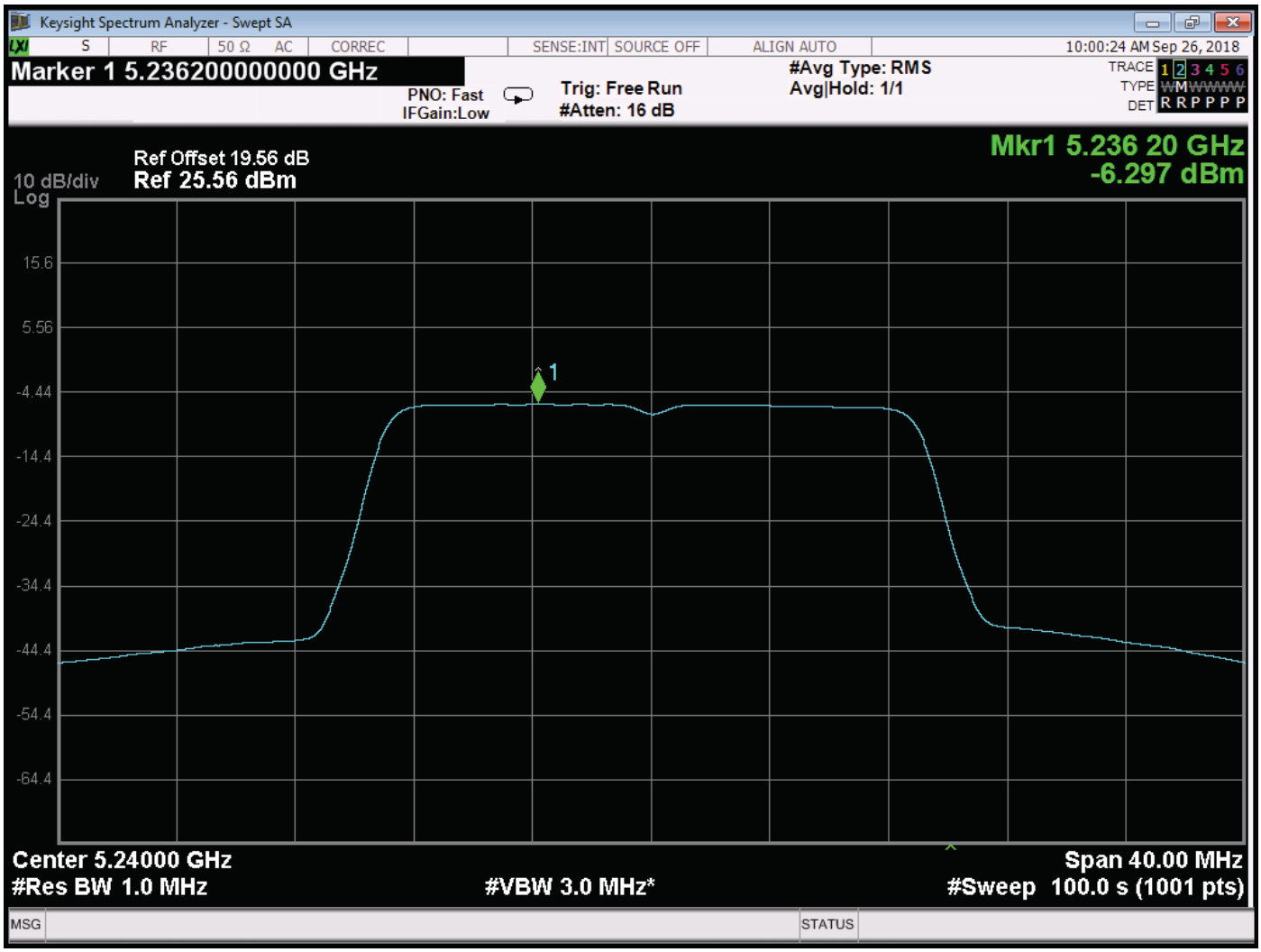

Spectral Density – 5220 MHz – Port #3



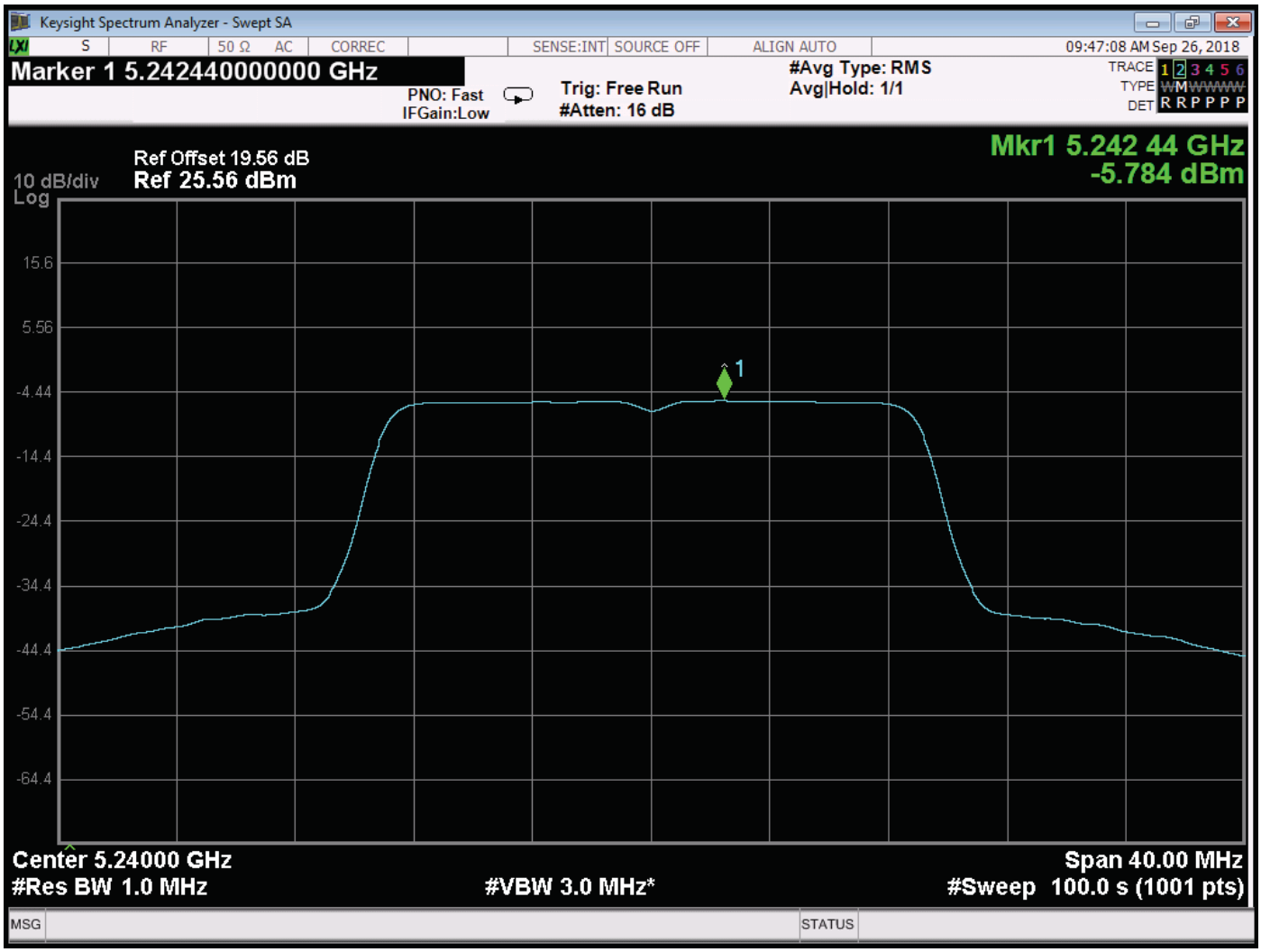

Spectral Density – 5220 MHz – Port #4



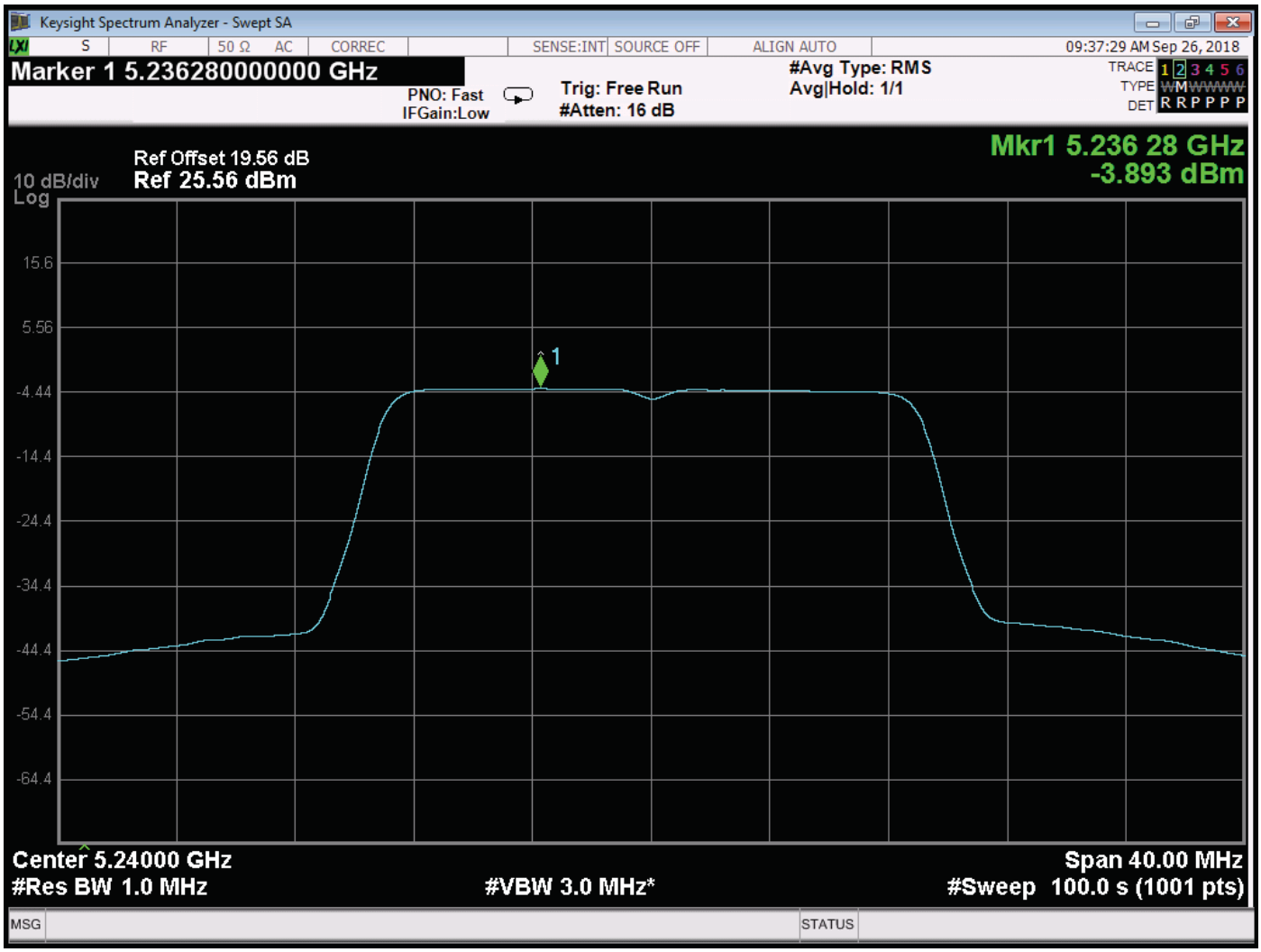

Spectral Density – 5240 MHz – Port #1




Spectral Density – 5240 MHz – Port #2




Spectral Density – 5240 MHz – Port #3




Spectral Density – 5240 MHz – Port #4

# PEAK POWER SPECTRAL DENSITY

## SC4480 MIMO Radio
## Model: SC4480E-520-SBST

Limit = 10.98 dBm

**5220 MHz**
**Port 1 Gain Setting = 41**
**Port 2 Gain Setting =39**
**Port 3 Gain Setting = 43**
**Port 4 Gain Setting = 40**

| ANTENNA PORT | DIRECT PPSD (dBm) | 10 Log (N) | CORRECTED PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| 1 | -4.673 | 6.02 | 1.348 | 10.98 | -9.632 |
| 2 | -3.038 | 6.02 | 2.982 | 10.98 | -7.998 |
| 3 | -5.100 | 6.02 | 0.92 | 10.98 | -10.06 |
| 4 | -3.762 | 6.02 | 2.258 | 10.98 | -8.722 |

# PEAK POWER SPECTRAL DENSITY

## SC4480 MIMO Radio
## Model: SC4480E-520-SBST

Limit = 10.98 dBm

**5240 MHz**
**Port 1 Gain Setting = 41**
**Port 2 Gain Setting =39**
**Port 3 Gain Setting = 43**
**Port 4 Gain Setting = 40**

| ANTENNA PORT | DIRECT PPSD (dBm) | 10 Log (N) | CORRECTED PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| 1 | -4.982 | 6.02 | 1.038 | 10.98 | -9.942 |
| 2 | -6.297 | 6.02 | -0.277 | 10.98 | -11.257 |
| 3 | -5.784 | 6.02 | 0.236 | 10.98 | -10.744 |
| 4 | -3.893 | 6.02 | 2.127 | 10.98 | -8.853 |

# *MAXIMUM CONDUCTED OUTPUT POWER*

# *DATA SHEETS*

# MAXIMUM CONDUCTED OUTPUT POWER

## SC4480 MIMO Radio
## Model: SC4480E-520-SBST

Limit = 23.98 dBm

**5220 MHz**
**Port 1 Gain Setting = 41**
**Port 2 Gain Setting =39**
**Port 3 Gain Setting = 43**
**Port 4 Gain Setting = 40**

| ANTENNA PORT | PEAK POWER (dBm) | AVERAGE POWER (dBm) | PEAK POWER (mW) | AVERAGE POWER (mW) |
|---|---|---|---|---|
| 1 | 17.59 | 17.01 | 57.41 | 50.23 |
| 2 | 17.53 | 17.33 | 56.62 | 54.08 |
| 3 | 18.12 | 17.90 | 64.86 | 61.66 |
| 4 | 18.99 | 18.78 | 79.25 | 75.51 |
| Total Power: | 24.12 | 23.83 | 258.14 | 241.48 |

# MAXIMUM CONDUCTED OUTPUT POWER

SC4480 MIMO Radio
Model: SC4480E-520-SBST

Limit = 23.98 dBm

**5240 MHz**
**Port 1 Gain Setting = 41**
**Port 2 Gain Setting =39**
**Port 3 Gain Setting = 43**
**Port 4 Gain Setting = 40**

| ANTENNA PORT | PEAK POWER (dBm) | AVERAGE POWER (dBm) | PEAK POWER (mW) | AVERAGE POWER (mW) |
|---|---|---|---|---|
| 1 | 17.69 | 17.47 | 58.75 | 55.85 |
| 2 | 17.54 | 17.34 | 56.75 | 54.20 |
| 3 | 18.19 | 17.96 | 65.92 | 62.52 |
| 4 | 18.86 | 18.69 | 76.91 | 73.96 |
| Total Power: | 24.12 | 23.92 | 258.33 | 246.52 |

# MAXIMUM EIRP ELEVATION ANGLE

## SC4480 MIMO Radio
## Model: SC4480E-520-SBST

## Limit = 20.97 dBm

**5220 MHz**
**Port 1 Gain Setting = 41**
**Port 2 Gain Setting =39**
**Port 3 Gain Setting = 43**
**Port 4 Gain Setting = 40**

| ANTENNA PORT | PEAK POWER (dBm) | AVERAGE POWER (dBm) | PEAK POWER (mW) | AVERAGE POWER (mW) |
|---|---|---|---|---|
| 1 | 17.59 | 17.01 | 57.41 | 50.23 |
| 2 | 17.53 | 17.33 | 56.62 | 54.08 |
| 3 | 18.12 | 17.90 | 64.86 | 61.66 |
| 4 | 18.99 | 18.78 | 79.25 | 75.51 |
| Total Power: | 24.12 | 23.83 | 258.14 | 241.48 |

| TOTAL PEAK POWER (dBm) | GAIN (dBi) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 24.12 | -3.98* | 20.14 | 20.97 | -0.83 |

*Worst Case Directional Gain that is 30 degrees above the Horizon – Model: CO520-6-LS, S/N: 004
Note: The worst case gain is -10 dBi at 35 degrees above the Horizon. There are a total of four antennas.

# MAXIMUM EIRP ELEVATION ANGLE

## SC4480 MIMO Radio
## Model: SC4480E-520-SBST

## Limit = 20.97 dBm

**5240 MHz**
**Port 1 Gain Setting = 41**
**Port 2 Gain Setting =39**
**Port 3 Gain Setting = 43**
**Port 4 Gain Setting = 40**

| ANTENNA PORT | PEAK POWER (dBm) | AVERAGE POWER (dBm) | PEAK POWER (mW) | AVERAGE POWER (mW) |
|---|---|---|---|---|
| 1 | 17.69 | 17.47 | 58.75 | 55.85 |
| 2 | 17.54 | 17.34 | 56.75 | 54.20 |
| 3 | 18.19 | 17.96 | 65.92 | 62.52 |
| 4 | 18.86 | 18.69 | 76.91 | 73.96 |
| Total Power: | 24.12 | 23.92 | 258.33 | 246.52 |

| TOTAL PEAK POWER (dBm) | GAIN (dBi) | EIRP (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 24.12 | -3.98* | 20.14 | 20.97 | -0.83 |

*Worst Case Directional Gain that is 30 degrees above the Horizon – Model: CO520-6-LS, S/N: 004
Note: The worst case gain is -10 dBi at 35 degrees above the Horizon. There are a total of four antennas.

# *BAND EDGES*

# *DATA SHEETS*

**FCC 15.247**
Silvus Technologies, Inc.
SC4480 MIMO Radio
Model: SC440E-520-SBST

Date: 09/26/2018
Lab: D
Tested By: Kyle Fujimoto

**Band Edges - 5220 MHz**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| 5220.00 | 107.77 | H | -- | -- | Peak | 47.25 | 183.50 | **Fundamental** |
| 5220.00 | 100.24 | H | -- | -- | Avg | 47.25 | 183.50 | **5220 MHz** |
| | | | | | | | | |
| 5120.45 | 52.43 | H | 73.97 | -21.54 | Peak | 47.25 | 183.50 | **Lower Band Edge** |
| 5120.45 | 44.60 | H | 53.97 | -9.37 | Avg | 47.25 | 183.50 | **5220 MHz** |
| | | | | | | | | |
| 5150.00 | 50.35 | H | 73.97 | -23.62 | Peak | 47.25 | 183.50 | **Lower Band Edge** |
| 5150.00 | 42.71 | H | 53.97 | -11.26 | Avg | 47.25 | 183.50 | **5220 MHz** |
| | | | | | | | | |
| 5220.00 | 112.56 | V | -- | -- | Peak | 213.75 | 175.56 | **Fundamental** |
| 5220.00 | 103.93 | V | -- | -- | Avg | 213.75 | 175.56 | **5220 MHz** |
| | | | | | | | | |
| 5120.45 | 53.77 | V | 73.97 | -20.20 | Peak | 213.75 | 175.56 | **Lower Band Edge** |
| 5120.45 | 44.23 | V | 53.97 | -9.74 | Avg | 213.75 | 175.56 | **5220 MHz** |
| | | | | | | | | |
| 5150.00 | 52.36 | V | 73.97 | -21.61 | Peak | 213.75 | 175.56 | **Lower Band Edge** |
| 5150.00 | 43.71 | V | 53.97 | -10.26 | Avg | 213.75 | 175.56 | **5220 MHz** |
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**FCC 15.247**
Silvus Technologies, Inc.
SC4480 MIMO Radio
Model: SC440E-520-SBST

Date: 09/25/2018
Lab: D
Tested By: Kyle Fujimoto

**Band Edges - 5240 MHz**

| Freq. (MHz) | Level (dBuV/m) | Pol (v/h) | Limit | Margin | Peak / QP / Avg | Table Angle (deg) | Ant. Height (cm) | Comments |
|---|---|---|---|---|---|---|---|---|
| 5240.00 | 107.05 | H | -- | -- | Peak | 286.75 | 181.59 | **Fundamental** |
| 5240.00 | 98.37 | H | -- | -- | Avg | 286.75 | 181.59 | **5240 MHz** |
| | | | | | | | | |
| 5350.00 | 50.45 | H | 73.97 | -23.52 | Peak | 286.75 | 181.59 | **Upper Band Edge** |
| 5350.00 | 41.36 | H | 53.97 | -12.61 | Avg | 286.75 | 181.59 | **5240 MHz** |
| | | | | | | | | |
| 5240.00 | 110.12 | V | -- | -- | Peak | 262.50 | 186.25 | **Fundamental** |
| 5240.00 | 100.99 | V | -- | -- | Avg | 262.50 | 186.25 | **5240 MHz** |
| | | | | | | | | |
| 5350.00 | 51.32 | V | 73.97 | -22.65 | Peak | 262.50 | 186.25 | **Upper Band Edge** |
| 5350.00 | 41.49 | V | 53.97 | -12.48 | Avg | 262.50 | 186.25 | **5240 MHz** |
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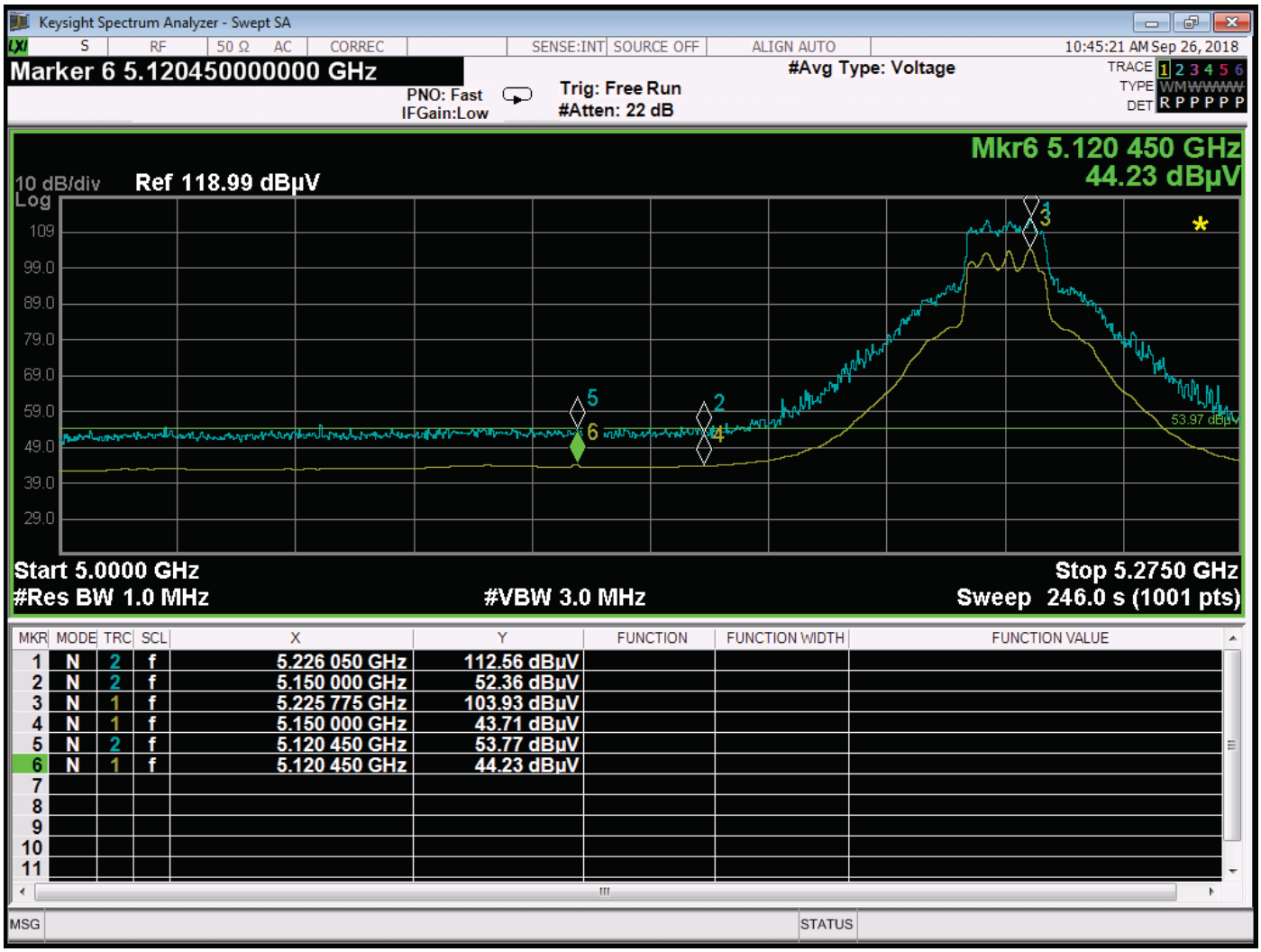
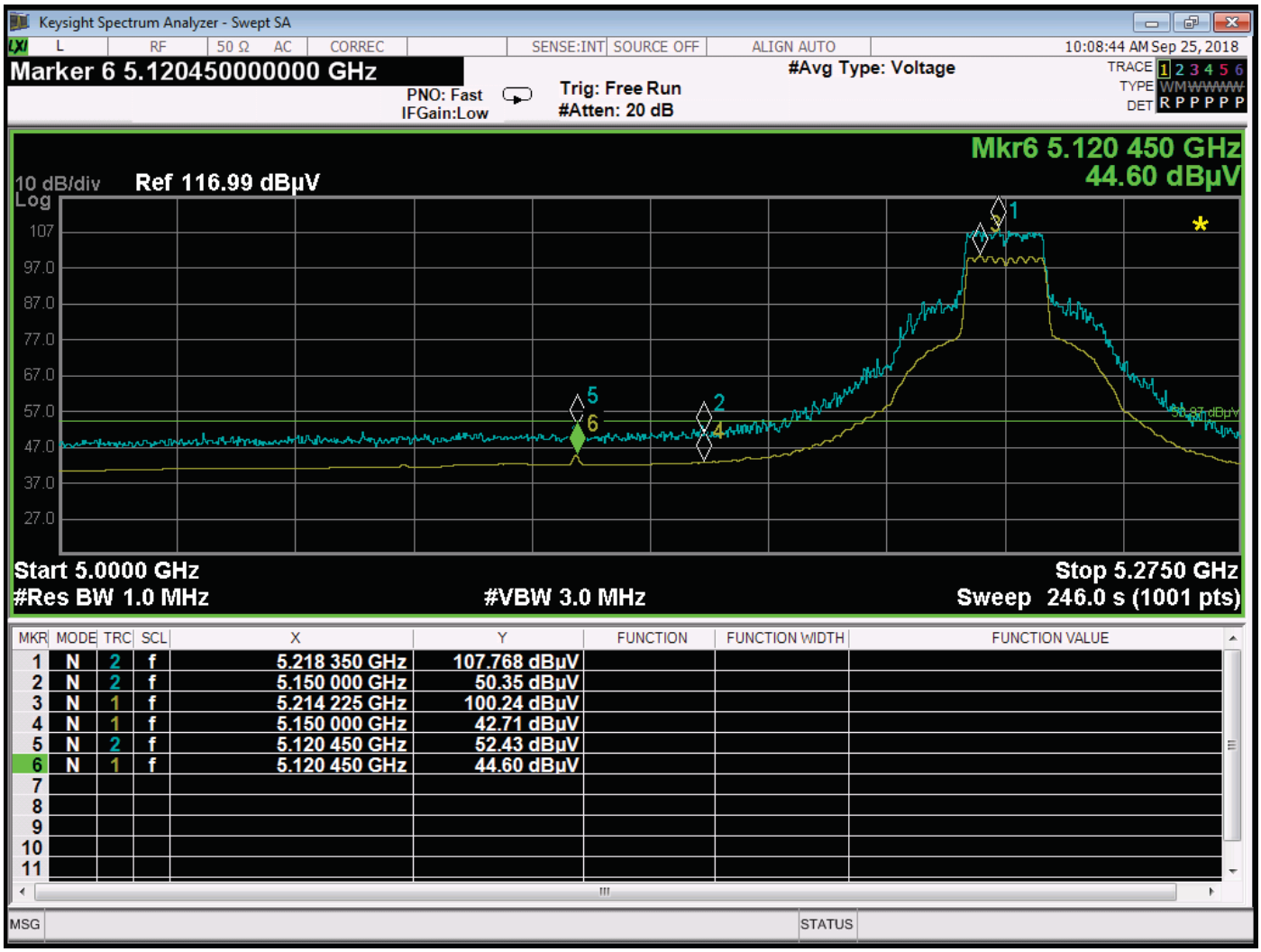
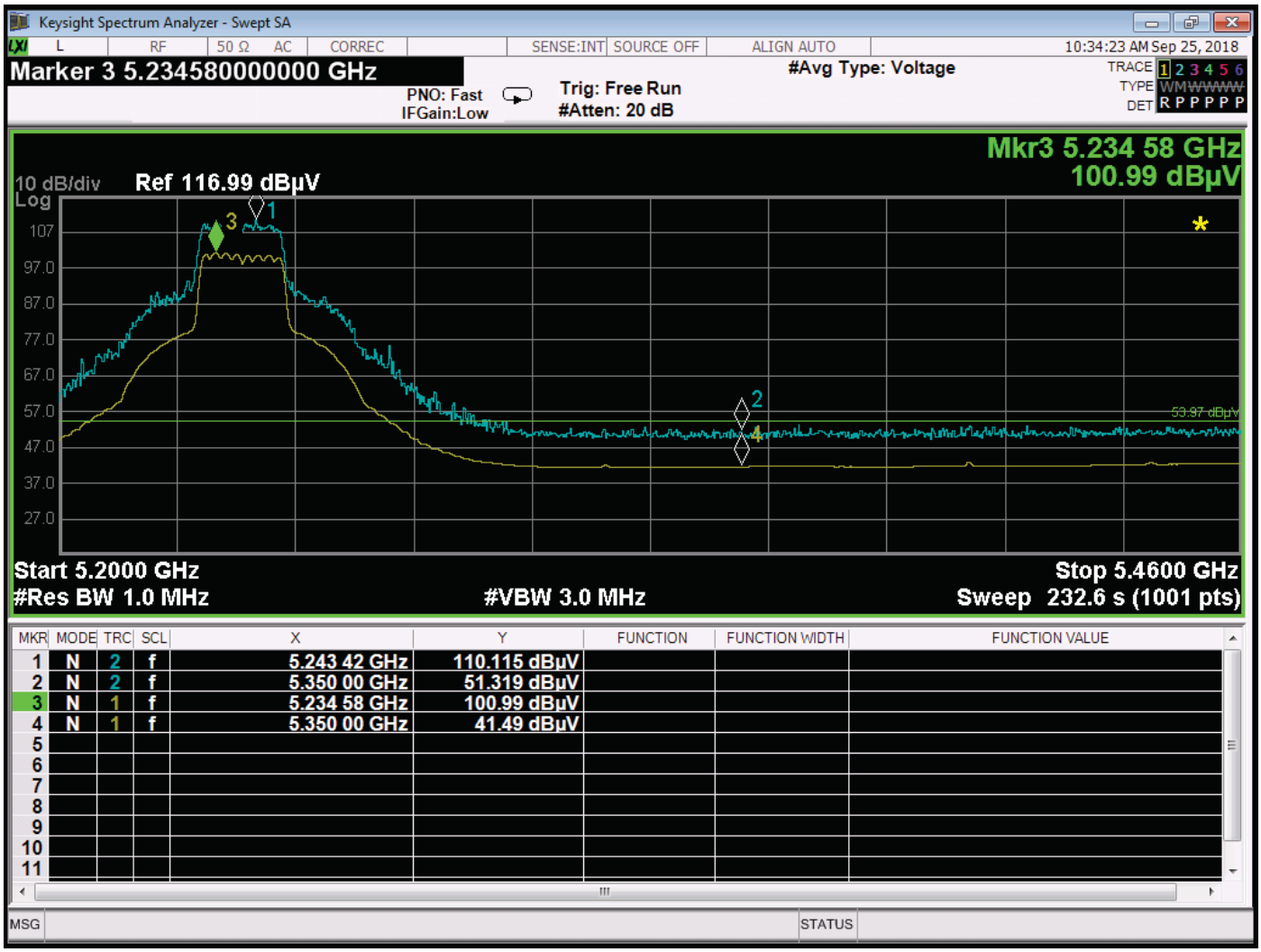



| MKR | MODE | TRC | SCL | X | Y | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 2 | f | 5.226 050 GHz | 112.56 dBµV | | | |
| 2 | N | 2 | f | 5.150 000 GHz | 52.36 dBµV | | | |
| 3 | N | 1 | f | 5.225 775 GHz | 103.93 dBµV | | | |
| 4 | N | 1 | f | 5.150 000 GHz | 43.71 dBµV | | | |
| 5 | N | 2 | f | 5.120 450 GHz | 53.77 dBµV | | | |
| 6 | N | 1 | f | 5.120 450 GHz | 44.23 dBµV | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| 11 | | | | | | | | |

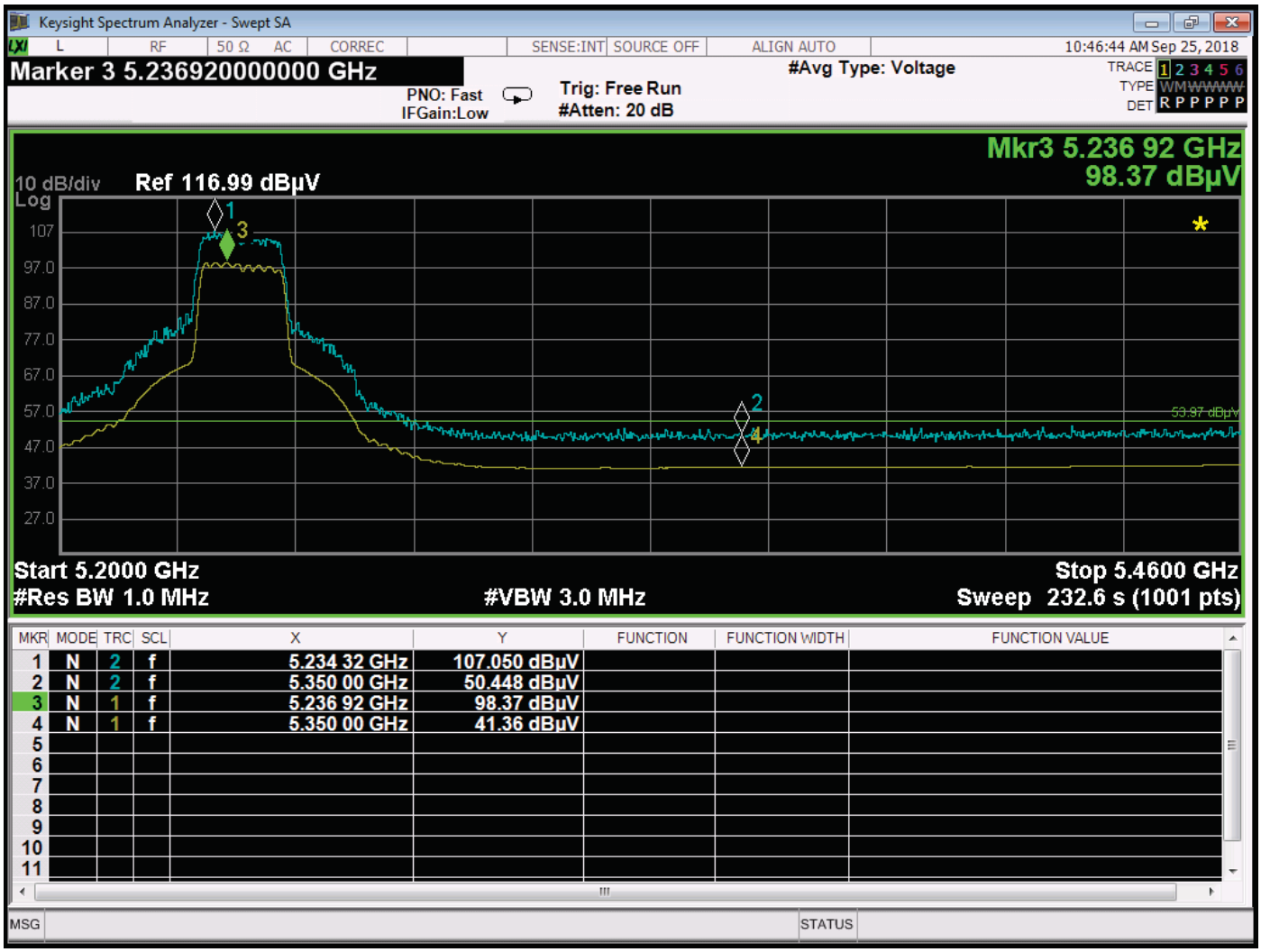
Band Edge – Low Channel – Vertical Polarization




Band Edge – Low Channel – Horizontal Polarization




Band Edge – High Channel – Vertical Polarization



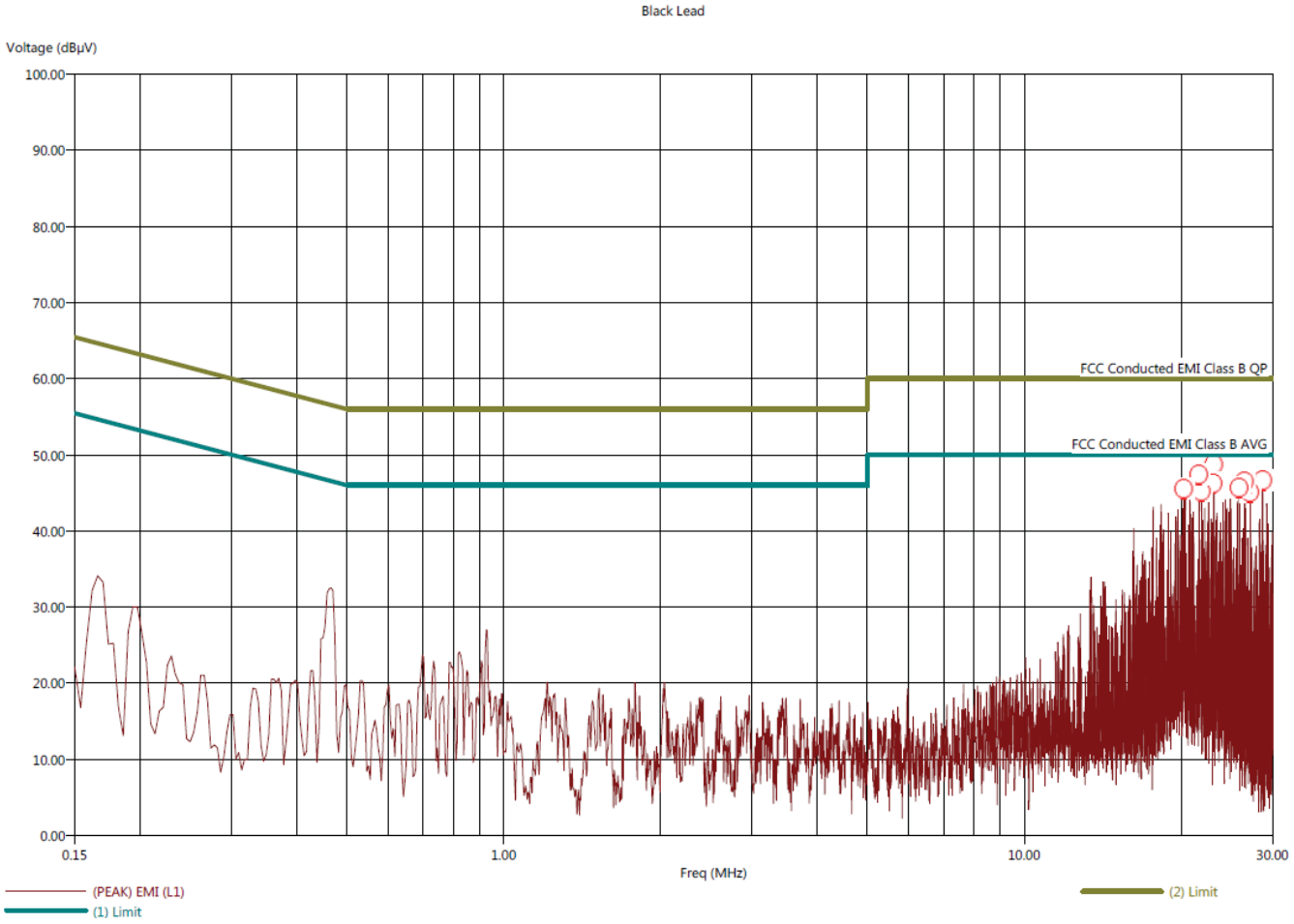

Band Edge – High Channel – Horizontal Polarization

# *CONDUCTED EMISSIONS*

# *DATA SHEETS*

Title: FCC Class B - Black Lead
File: Keysight - CE - Pre-Scan - 5220 MHz - Black Lead - FCC Class B.set
Operator: Kyle Fujimoto
EUT Type: SC4480 MIMO Radio
EUT Condition: The EUT is continuously transmitting at 5220 MHz on all four antennas
Company: Silvus Technologies
Model: SC4480E-520-SBST

9/28/2018 2:18:06 PM
Sequence: Preliminary Scan



Title: FCC Class B - Black Lead
File: Keysight - CE - Final Scan - 5220 MHz - Black Lead - FCC Class B.set
Operator: Kyle Fujimoto
EUT Type: SC4480 MIMO Radio
EUT Condition: The EUT is continuously transmitting at 5220 MHz on all four antennas
Company: Silvus Technologies
Model: SC4480E-520-SBST

9/28/2018 2:20:13 PM
Sequence: Final Measurements

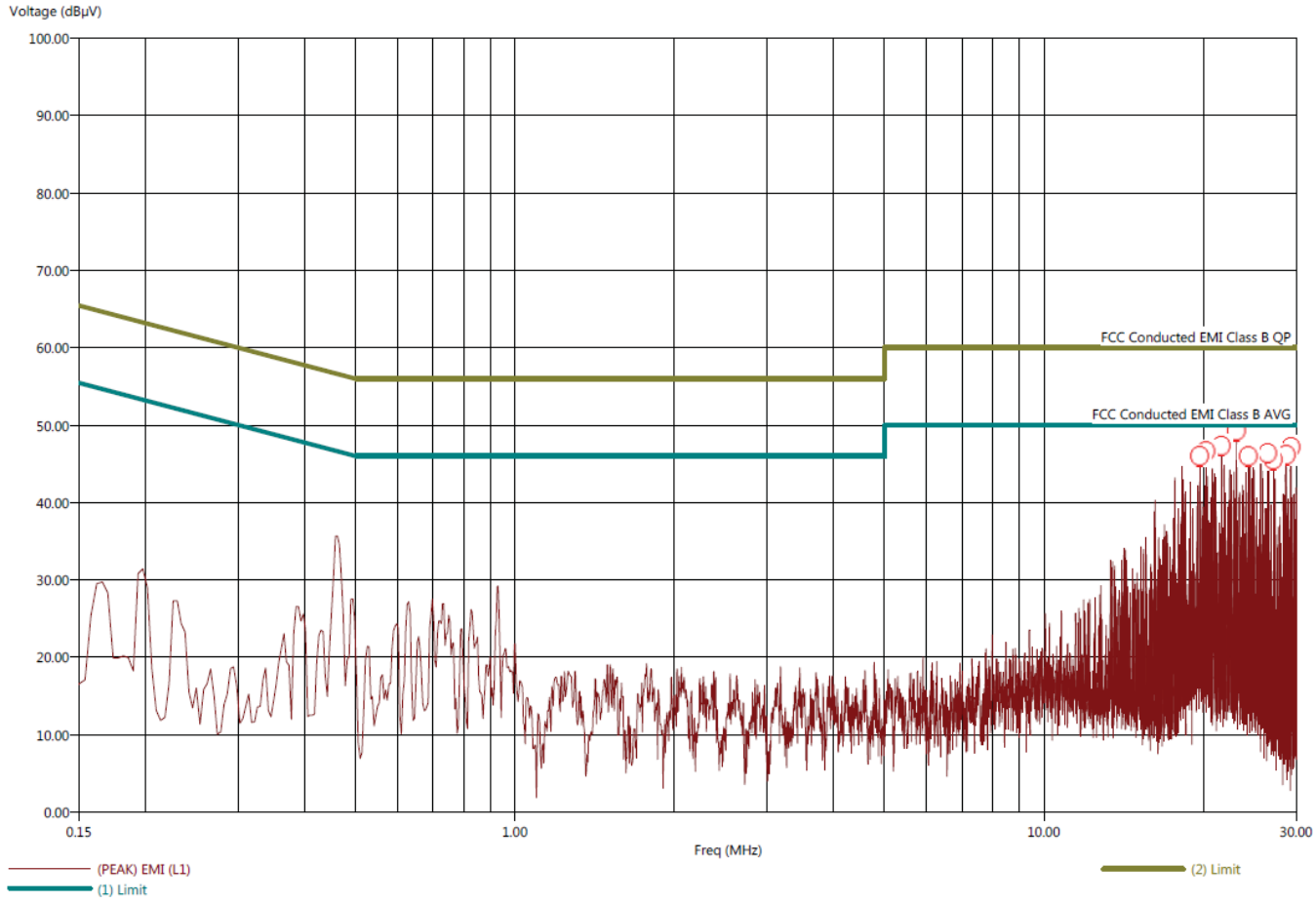
Black Lead

| Freq (MHz) | (PEAK) EMI (dBµV) | (AVG) EMI (dBµV) | (PEAK) Margin (AVG) (dB) | (AVG) Margin (AVG) (dB) | (AVG) Limit (dBµV) | Cable (dB) | Transducer (dB) |
|---|---|---|---|---|---|---|---|
| 20.258 | 46.66 | 41.06 | -3.34 | -8.94 | 50.00 | 0.44 | 0.00 |
| 21.662 | 47.69 | 42.16 | -2.31 | -7.84 | 50.00 | 0.64 | 0.01 |
| 21.906 | 45.46 | 39.57 | -4.54 | -10.43 | 50.00 | 0.67 | 0.01 |
| 23.066 | 46.11 | 40.51 | -3.89 | -9.49 | 50.00 | 0.82 | 0.02 |
| 23.126 | 49.95 | 44.58 | -0.05 | -5.42 | 50.00 | 0.83 | 0.02 |
| 25.874 | 45.89 | 40.49 | -4.11 | -9.51 | 50.00 | 1.16 | 0.03 |
| 26.486 | 46.99 | 41.52 | -3.01 | -8.48 | 50.00 | 1.23 | 0.04 |
| 26.546 | 45.89 | 40.46 | -4.11 | -9.54 | 50.00 | 1.24 | 0.04 |
| 27.158 | 45.83 | 40.44 | -4.17 | -9.56 | 50.00 | 1.31 | 0.04 |
| 28.734 | 38.74 | 33.06 | -11.26 | -16.94 | 50.00 | 1.47 | 0.05 |

Title: FCC Class B - White Lead
File: Keysight - CE - Pre-Scan - 5220 MHz - White Lead - FCC Class B.set
Operator: Kyle Fujimoto
EUT Type: SC4480 MIMO Radio
EUT Condition: The EUT is continuously transmitting at 5220 MHz on all four antennas
Company: Silvus Technologies
Model: SC4480E-520-SBST

9/28/2018 2:31:02 PM
Sequence: Preliminary Scan

White Lead



Title: FCC Class B - White Lead
File: Keysight - CE - Final Scan - 5220 MHz - White Lead - FCC Class B.set
Operator: Kyle Fujimoto
EUT Type: SC4480 MIMO Radio
EUT Condition: The EUT is continuously transmitting at 5220 MHz on all four antennas
Company: Silvus Technologies
Model: SC4480E-520-SBST

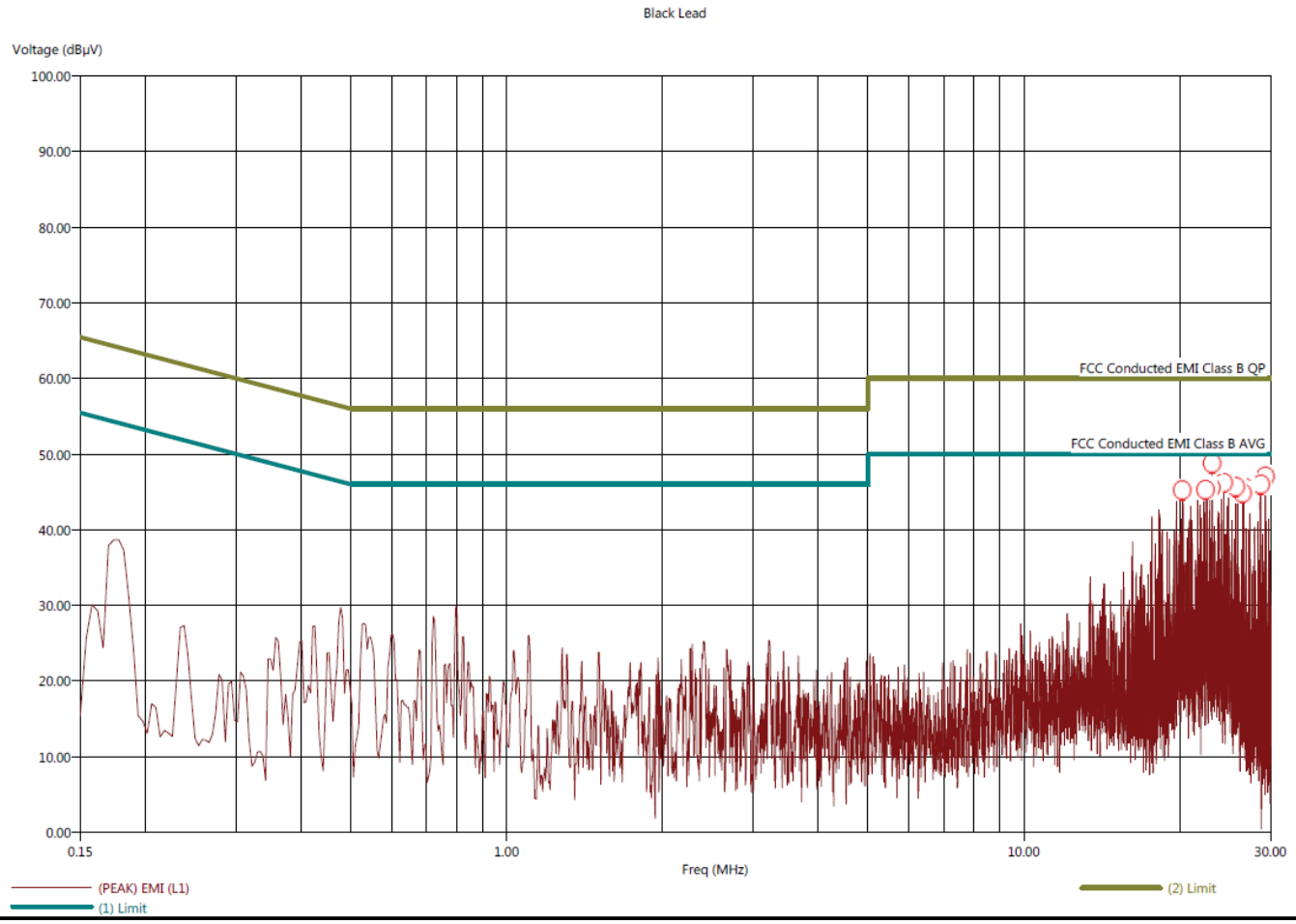
9/28/2018 2:34:04 PM
Sequence: Final Measurements

White Lead

| Freq (MHz) | (PEAK) EMI (dBµV) | (AVG) EMI (dBµV) | (PEAK) Margin (AVG) (dB) | (AVG) Margin (AVG) (dB) | (AVG) Limit (dBµV) | Cable (dB) | Transducer (dB) |
|---|---|---|---|---|---|---|---|
| 19.710 | 46.63 | 43.15 | -3.37 | -6.85 | 50.00 | 0.40 | 0.17 |
| 20.258 | 46.97 | 43.55 | -3.03 | -6.45 | 50.00 | 0.44 | 0.18 |
| 21.662 | 48.25 | 44.45 | -1.75 | -5.55 | 50.00 | 0.64 | 0.21 |
| 23.130 | 50.02 | 46.71 | 0.02 | -3.29 | 50.00 | 0.83 | 0.24 |
| 24.350 | 46.76 | 43.69 | -3.24 | -6.31 | 50.00 | 0.98 | 0.27 |
| 26.486 | 46.96 | 43.84 | -3.04 | -6.16 | 50.00 | 1.23 | 0.31 |
| 26.610 | 47.09 | 43.99 | -2.91 | -6.01 | 50.00 | 1.24 | 0.31 |
| 27.158 | 45.93 | 42.75 | -4.07 | -7.25 | 50.00 | 1.31 | 0.33 |
| 28.734 | 38.97 | 35.52 | -11.03 | -14.48 | 50.00 | 1.47 | 0.36 |
| 29.338 | 38.15 | 34.46 | -11.85 | -15.54 | 50.00 | 1.54 | 0.37 |

Title: FCC Class B - Black Lead
File: Keysight - CE - Pre-Scan - 5240 MHz - Black Lead - FCC Class B.set
Operator: Kyle Fujimoto
EUT Type: SC4480 MIMO Radio
EUT Condition: The EUT is continuously transmitting at 5240 MHz on all four antennas
Company: Silvus Technologies
Model: SC4480E-520-SBST

9/28/2018 2:56:13 PM
Sequence: Preliminary Scan



Title: FCC Class B - Black Lead
File: Keysight - CE - Final Scan - 5240 MHz - Black Lead - FCC Class B.set
Operator: Kyle Fujimoto
EUT Type: SC4480 MIMO Radio
EUT Condition: The EUT is continuously transmitting at 5240 MHz on all four antennas
Company: Silvus Technologies
Model: SC4480E-520-SBST

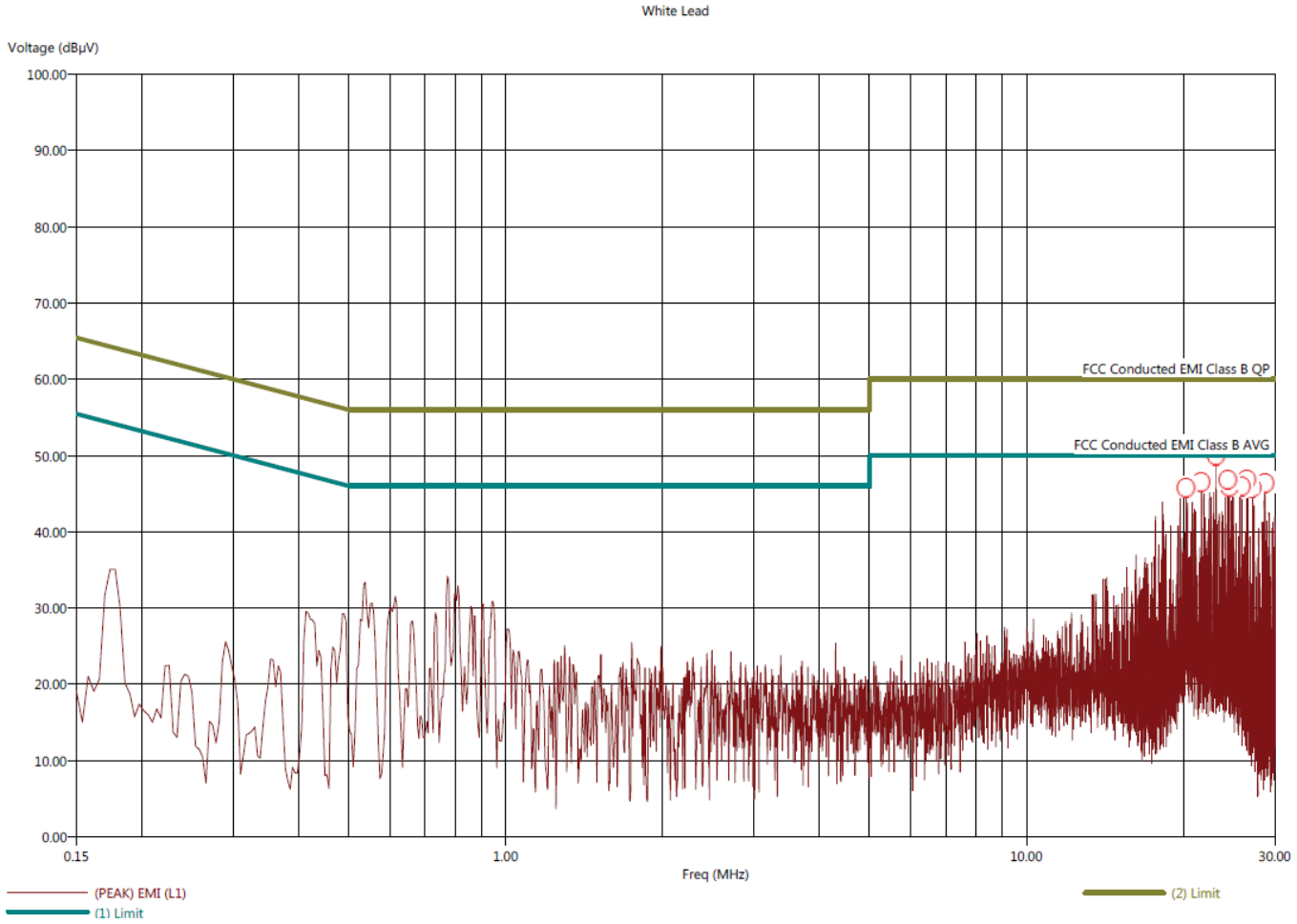
9/28/2018 3:08:19 PM
Sequence: Final Measurements

Black Lead

| Freq (MHz) | (PEAK) EMI (dBµV) | (AVG) EMI (dBµV) | (PEAK) Margin (AVG) (dB) | (AVG) Margin (AVG) (dB) | (AVG) Limit (dBµV) | Cable (dB) | Transducer (dB) |
|---|---|---|---|---|---|---|---|
| 20.258 | 46.38 | 40.52 | -3.62 | -9.48 | 50.00 | 0.44 | 0.00 |
| 22.458 | 46.51 | 40.16 | -3.49 | -9.84 | 50.00 | 0.74 | 0.02 |
| 23.066 | 47.05 | 41.06 | -2.95 | -8.94 | 50.00 | 0.82 | 0.02 |
| 23.126 | 50.72 | 45.14 | 0.72 | -4.86 | 50.00 | 0.83 | 0.02 |
| 24.350 | 47.71 | 41.86 | -2.29 | -8.14 | 50.00 | 0.98 | 0.03 |
| 25.694 | 46.55 | 40.90 | -3.45 | -9.10 | 50.00 | 1.14 | 0.03 |
| 26.486 | 47.46 | 41.95 | -2.54 | -8.05 | 50.00 | 1.23 | 0.04 |
| 26.610 | 47.53 | 42.09 | -2.47 | -7.91 | 50.00 | 1.25 | 0.04 |
| 28.734 | 37.12 | 31.08 | -12.88 | -18.92 | 50.00 | 1.47 | 0.05 |
| 29.338 | 22.07 | 4.37 | -27.93 | -45.63 | 50.00 | 1.53 | 0.05 |

Title: FCC Class B - White Lead
File: Keysight - CE - Pre-Scan - 5240 MHz - White Lead - FCC Class B.set
Operator: Kyle Fujimoto
EUT Type: SC4480 MIMO Radio
EUT Condition: The EUT is continuously transmitting at 5240 MHz on all four antennas
Company: Silvus Technologies
Model: SC4480E-520-SBST

9/28/2018 2:43:58 PM
Sequence: Preliminary Scan



Title: FCC Class B - White Lead
File: Keysight - CE - Final Scan - 5240 MHz - White Lead - FCC Class B.set
Operator: Kyle Fujimoto
EUT Type: SC4480 MIMO Radio
EUT Condition: The EUT is continuously transmitting at 5240 MHz on all four antennas
Company: Silvus Technologies
Model: SC4480E-520-SBST

9/28/2018 2:45:06 PM
Sequence: Final Measurements

White Lead

| Freq (MHz) | (PEAK) EMI (dBµV) | (AVG) EMI (dBµV) | (PEAK) Margin (AVG) (dB) | (AVG) Margin (AVG) (dB) | (AVG) Limit (dBµV) | Cable (dB) | Transducer (dB) |
|---|---|---|---|---|---|---|---|
| 20.258 | 46.14 | 42.55 | -3.86 | -7.45 | 50.00 | 0.44 | 0.18 |
| 21.662 | 47.97 | 44.30 | -2.03 | -5.70 | 50.00 | 0.64 | 0.21 |
| 23.130 | 50.75 | 47.19 | 0.75 | -2.81 | 50.00 | 0.83 | 0.24 |
| 24.350 | 47.82 | 44.08 | -2.18 | -5.92 | 50.00 | 0.98 | 0.27 |
| 24.534 | 46.76 | 43.05 | -3.24 | -6.95 | 50.00 | 1.00 | 0.27 |
| 25.878 | 46.54 | 43.10 | -3.46 | -6.90 | 50.00 | 1.16 | 0.30 |
| 26.486 | 47.44 | 44.14 | -2.56 | -5.86 | 50.00 | 1.23 | 0.31 |
| 26.610 | 47.58 | 44.29 | -2.42 | -5.71 | 50.00 | 1.24 | 0.31 |
| 27.158 | 46.46 | 43.09 | -3.54 | -6.91 | 50.00 | 1.31 | 0.33 |
| 28.734 | 39.35 | 35.75 | -10.65 | -14.25 | 50.00 | 1.47 | 0.36 |