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# *EMC Test Report*

## *Application for FCC Grant of Equipment Authorization*
## *Canada Certification*

## *Innovation, Science and Economic Development Canada*
## *RSS-Gen Issue 4 / RSS 247 Issue 2*
## *FCC Part 15 Subpart C*

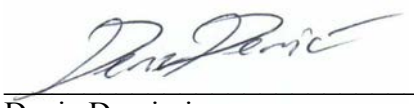
## *Model: WH300-XD1 and WH350-XD1*

| | |
|---|---|
| IC CERTIFICATION #: | AL8-WH3X0XD1 |
| FCC ID: | 457A-WH3X0XD1 |
| APPLICANT: | Plantronics Inc.<br>P.O. Box 635<br>Santa Cruz, CA 95061-0635 |
| TEST SITE(S): | National Technical Systems - Silicon Valley<br>41039 Boyce Road.<br>Fremont, CA. 94538-2435 |
| IC SITE REGISTRATION #: | 2845B-4 |
| REPORT DATE: | September 13, 2017 |
| REISSUE DATE: | December 5, 2017 |
| FINAL TEST DATES: | August 4, 9, 10 and 16, 2017 |
| TOTAL NUMBER OF PAGES: | 51 |

A2LA ACCREDITED
Testing Cert #0214.26

## *VALIDATING SIGNATORIES*

PROGRAM MGR



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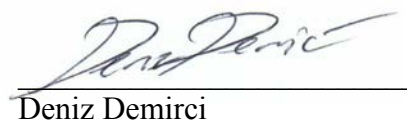

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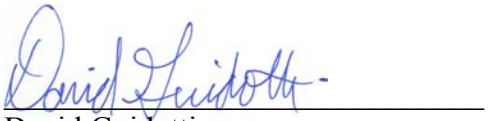

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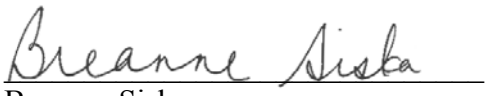
QUALITY ASSURANCE DELEGATE



Breanne Siska
Technical Writer

## REVISION HISTORY

| Rev# | Date | Comments | Modified By |
|---|---|---|---|
| - | September 13, 2017 | First release | - |
| 1 | September 15, 2017 | Typos corrected. | Deniz Demirci |
| 2 | September 26, 2017 | Dates and version numbers added to undated reference standards.<br>Revised to clarify below 30 MHz measurements.<br>Clarified the EUT height above 1 GHz radiated emission measurements. | Deniz Demirci |
| 3 | December 5, 2017 | Revised to update model name | David Guidotti |

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## SCOPE

An electromagnetic emissions test has been performed on the Plantronics Inc. model WH300-XD1 and WH350-XD1, pursuant to the following rules:

RSS-Gen Issue 4 "General Requirements for Compliance of Radio Apparatus"
RSS 247 Issue 2 "Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices"
FCC Part 15 Subpart C

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in National Technical Systems - Silicon Valley test procedures:

ANSI C63.10-2013
FCC DTS Measurement Guidance KDB558074 D01 v04 (April 5, 2017)

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

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

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

## OBJECTIVE

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

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

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

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

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

## *STATEMENT OF COMPLIANCE*

The tested sample of Plantronics Inc. model WH300-XD1 and WH350-XD1 complied with the requirements of the following regulations:

RSS-Gen Issue 4 "General Requirements for Compliance of Radio Apparatus"
RSS 247 Issue 2 "Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices"
FCC Part 15 Subpart C

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

The test results recorded herein are based on a single type test of Plantronics Inc. model WH300-XD1 and WH350-XD1 and therefore apply only to the tested sample. The samples were selected and prepared by Bill Jones of Plantronics Inc.

WH300-XD and WH350-XD are electrically identical except WH300-XD is monaural and WH350-XD is binaural. The radiated and AC conducted emission tests were performed for both samples and the results are presented for WH350-XD (Binaural) as worst case.

## *DEVIATIONS FROM THE STANDARDS*

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

## TEST RESULTS SUMMARY

### DIGITAL TRANSMISSION SYSTEMS (902 – 928 MHz)

| FCC Rule Part | RSS Rule Part | Description | Measured Value / Comments | Limit / Requirement | Result |
|---|---|---|---|---|---|
| 15.247(a) | RSS 247 5.2 | Digital Modulation | Systems uses DSSS techniques | System must utilize a digital transmission technology | Complies |
| 15.247 (a) (2) | RSS 247 5.2 (1) | 6 dB Bandwidth | 0.890 MHz | > 500 kHz | Complies |
| 15.247 (b) (3) | RSS 247 5.4 (4) | Output Power, 902 – 928 MHz | 16.4 dBm (0.044 Watts) EIRP = 0.072 W Note 1 | 1 Watt, EIRP limited to 4 Watts. | Complies |
| 15.247(e) | RSS 210 5.2 (2) | Power Spectral Density | 1.9 dBm/3 kHz | 8 dBm/3 kHz | Complies |
| 15.247(d) | RSS 247 5.5 | Antenna Port Spurious Emissions 890 MHz – 940 MHz | -29.7 dBc | < -20 dBc | Complies |
| 15.247(d) / 15.209 | RSS 247 5.5 | Radiated Spurious Emissions 9 kHz – 10 GHz | 56.8 dBµV/m @ 3773.3 MHz (-17.2 dB) | Refer to the limits section (p18) for restricted bands, all others < -20 dBc | Complies |
| Note 1: EIRP calculated using antenna gain of 2.2 dBi for the highest EIRP system. | | | | | |

### GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

| FCC Rule Part | RSS Rule part | Description | Measured Value / Comments | Limit / Requirement | Result (margin) |
|---|---|---|---|---|---|
| 15.203 | - | RF Connector | Integral antenna | Unique or integral antenna required | Complies |
| 15.407 (b) (6) | RSS-Gen Table 3 | AC Conducted Emissions | 34.6 dBµV @ 2.283 MHz (-21.4 dB) | Refer to page 17 | Complies |
| 15.247 (i) 15.407 (f) | RSS 102 | RF Exposure Requirements | Refer to SAR exclusion calculation in separate exhibit and RSS 102 declaration. | Refer to OET 65, FCC Part 1 and RSS 102 | Complies |
| - | RSS-Gen 8.3 | User Manual | Integral antenna | Statement for products with detachable antenna | Complies |
| - | RSS-Gen 8.4 | User Manual | Refer to the User Manual | Statement for all products | Complies |
| - | RSP-100 RSS-Gen 6.6 | Occupied Bandwidth | 1.225 MHz | Information only | N/A |

***MEASUREMENT UNCERTAINTIES***

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

| Measurement Type | Measurement Unit | Frequency Range | Expanded Uncertainty |
|---|---|---|---|
| RF power, conducted (power meter) | dBm | 25 to 7000 MHz | ± 0.5 dB |
| RF power, conducted (Spectrum analyzer) | dBm | 25 to 7000 MHz | ± 0.7 dB |
| Conducted emission of transmitter | dBm | 25 to 26500 MHz | ± 0.7 dB |
| Radiated emission (field strength) | dBµV/m | 25 to 1000 MHz | ± 3.6 dB |
| | | 1000 to 40000 MHz | ± 6.0 dB |
| Conducted Emissions (AC Power) | dBµV | 0.15 to 30 MHz | ± 2.4 dB |

## EQUIPMENT UNDER TEST (EUT) DETAILS

### GENERAL

The Plantronics Inc. model WH300-XD1 and WH350-XD1 are the headsets for Plantronics C052-XD base units.
The samples were received on August 1, 2017 and tested on August 4, 9, 10 and 16, 2017. The EUT consisted of the following component(s):

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Plantronics | WH300-XD1<br>WH350-XD1 | Monaural headset<br>Binaural headset | HLS02<br>HLS01 | AL8-WH3X0XD1 |

### OTHER EUT DETAILS

The EUT has TDD air interface protocol with maximum of 7 % source based duty cycle.

### ANTENNA SYSTEM

Integral antenna.

### ENCLOSURE

The EUT enclosure measures approximately 20 x 20 x 5 cm. It is primarily constructed of plastic.

### MODIFICATIONS

No modifications were made to the EUT during the time the product was at NTS Silicon Valley.

### SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:
AC powerline spurious emissions:

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Plantronics | - | Call indication | - | - |
| Lucent | - | Phone | 0821 | - |
| Plantronics | C052-XD | Base unit | MBZ | - |

Radiated emissions:

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Plantronics | C052-XD | Base unit (Remote) | MBZ | - |

### EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:
AC powerline spurious emissions:

| Port | Connected To | Cable(s) | | |
|---|---|---|---|---|
| | | Description | Shielded or Unshielded | Length(m) |
| Charging port | Base unit | Direct connection | N/A | N/A |

### EUT OPERATION

During testing, the EUT was transmitting with full power for each test cases detailed in the test report.

## TEST SITE

### GENERAL INFORMATION

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

| Site | Designation / Registration Numbers | | Location |
|---|---|---|---|
| | FCC | Canada | |
| Chamber 4 | US0027 | 2845B-4 | 41039 Boyce Road<br>Fremont, CA 94538-2435 |

ANSI C63.4-2014 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement. The test site(s) contain separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4-2014.

### CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.10-2013. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

### RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4-2014 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4-2014.

## MEASUREMENT INSTRUMENTATION

### RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000 MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

### INSTRUMENT CONTROL COMPUTER

Software is used to view and convert receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers. The software used for radiated and conducted emissions measurements is NTS EMI Test Software (rev 2.10)

### LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a 50 µH Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 µH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

### FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

### ANTENNAS

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

### ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.10-2013 specifies that the test height above ground for table mounted devices shall be 0.8 m for below 1 GHz measurements and 1.5 m for above 1 GHz measurements. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor as specified in ANSI C63.4-2014. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

### INSTRUMENT CALIBRATION

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

## TEST PROCEDURES

### EUT AND CABLE PLACEMENT

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.10-2013, and the worst-case orientation is used for final measurements.

### CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

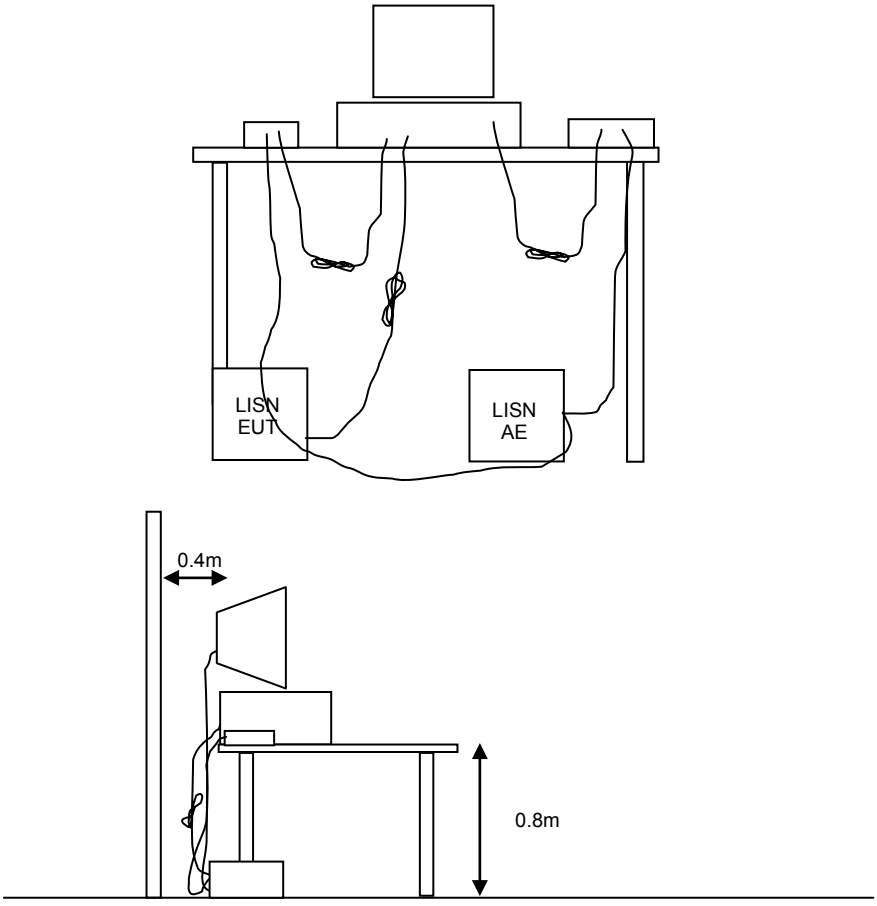


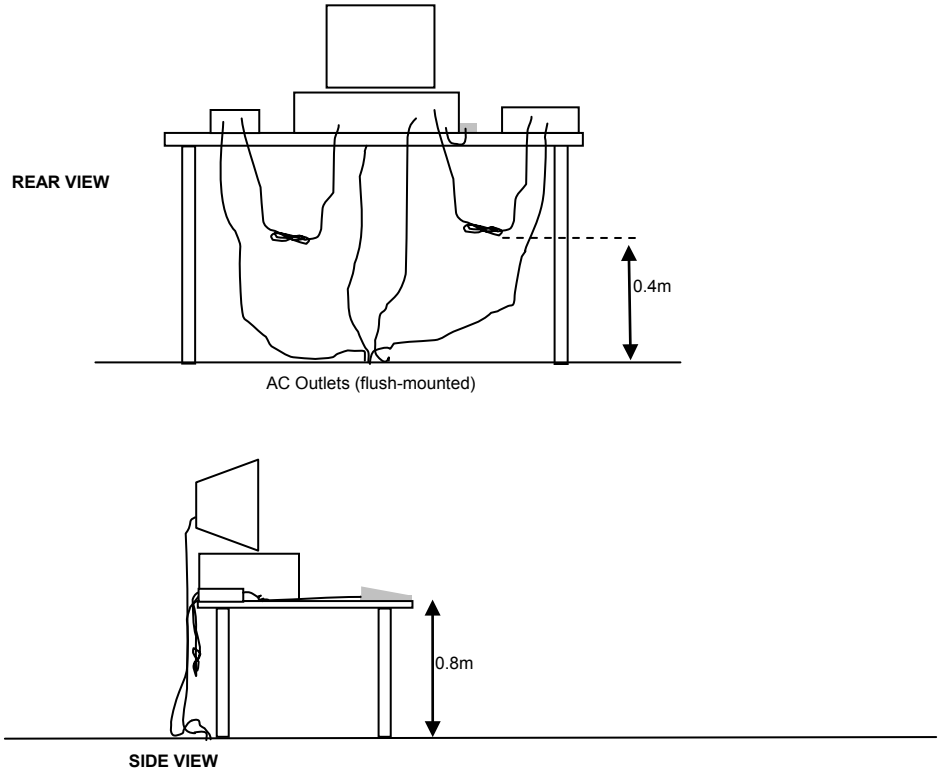

**Figure 1 Typical Conducted Emissions Test Configuration**

***RADIATED EMISSIONS***

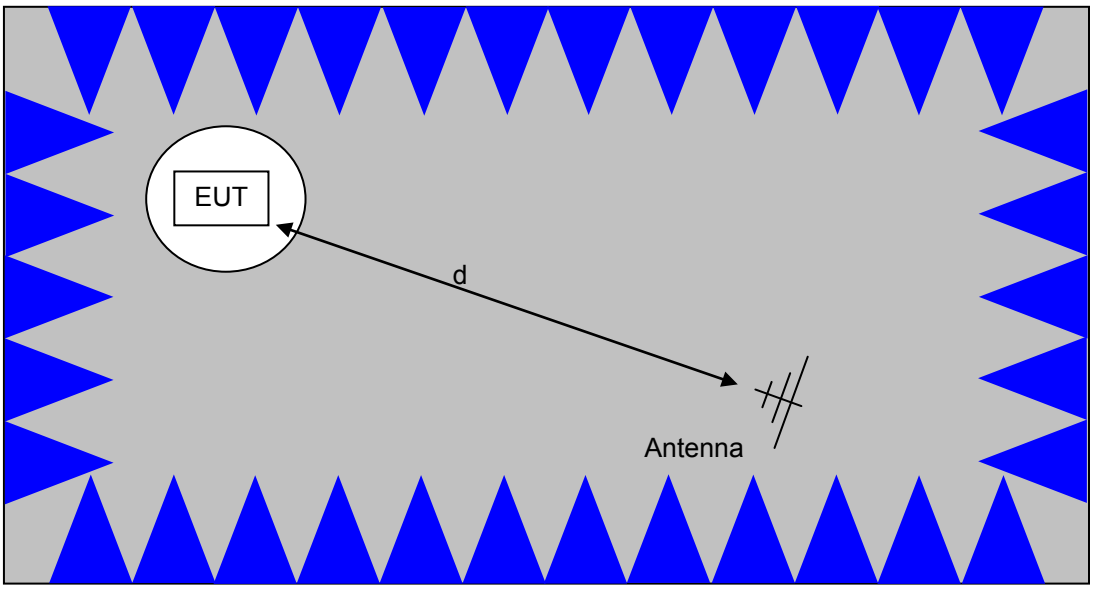
A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT).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

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

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

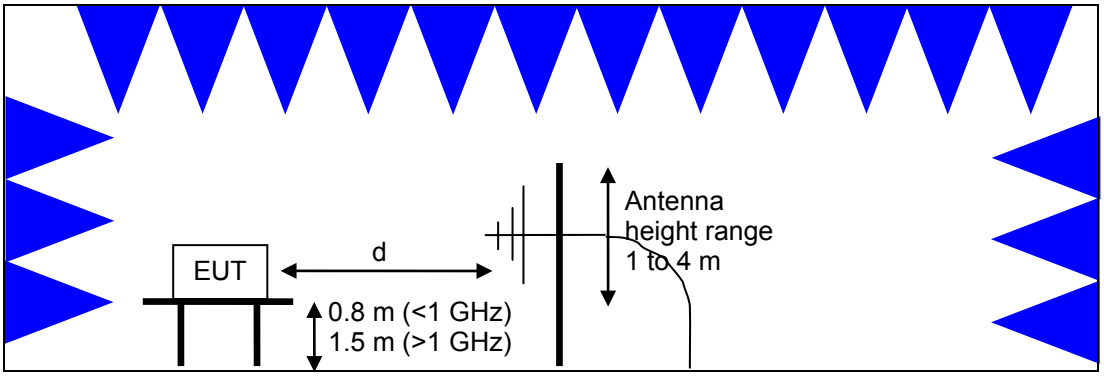



Typical Test Configuration for Radiated Field Strength Measurements




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

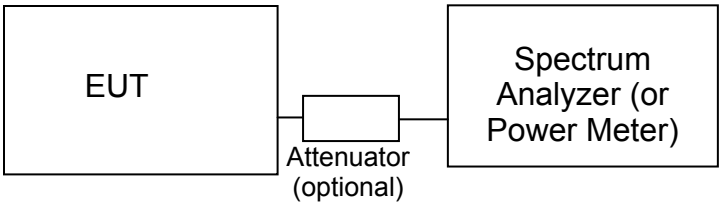
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.




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

***CONDUCTED EMISSIONS FROM ANTENNA PORT***

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




Test Configuration for Antenna Port Measurements

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

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

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

***BANDWIDTH MEASUREMENTS***

The 6 dB, 20 dB, 26 dB and/or 99% signal bandwidth are measured using the bandwidths recommended by ANSI C63.10-2013 and RSS GEN Issue 4.

***SPECIFICATION LIMITS AND SAMPLE CALCULATIONS***

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

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

***CONDUCTED EMISSIONS SPECIFICATION LIMITS: FCC 15.207; FCC 15.107(a), RSS GEN***

The table below shows the limits for the emissions on the AC power line from an intentional radiator and a receiver.

| Frequency (MHz) | Average Limit (dBµV) | Quasi Peak Limit (dBµV) |
|---|---|---|
| 0.150 to 0.500 | Linear decrease on logarithmic frequency axis between 56.0 and 46.0 | Linear decrease on logarithmic frequency axis between 66.0 and 56.0 |
| 0.500 to 5.000 | 46.0 | 56.0 |
| 5.000 to 30.000 | 50.0 | 60.0 |

***GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS***

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1].

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

***RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS***

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109 and RSS GEN Table 2. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109 and receivers that are not stand-alone are exempt from the ISED Canada requirements per RSS-GEN.

| Frequency Range (MHz) | Limit (µV/m @ 3m) | Limit (dBµV/m @ 3m) |
|---|---|---|
| 30 to 88 | 100 | 40 |
| 88 to 216 | 150 | 43.5 |
| 216 to 960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

[1] The restricted bands are detailed in FCC 15.205 and RSS-Gen Table 6

### *OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS*

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

| Operating Frequency (MHz) | Output Power | Power Spectral Density |
|---|---|---|
| 902 – 928 | 1 Watt (30 dBm) | 8 dBm/3 kHz |
| 2400 – 2483.5 | 1 Watt (30 dBm) | 8 dBm/3 kHz |
| 5725 – 5850 | 1 Watt (30 dBm) | 8 dBm/3 kHz |

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6 dBi.

### *TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS*

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS 210. All other unwanted (spurious) emissions shall be at least 20 dB below the level of the highest in-band signal level (30 dB if the power is measured using the sample detector/power averaging method).

***SAMPLE CALCULATIONS - CONDUCTED EMISSIONS***

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

$$R_r - S = M$$

where:
$R_r$ = Receiver Reading in dBµV
S = Specification Limit in dBµV
M = Margin to Specification in +/- dB

***SAMPLE CALCULATIONS - RADIATED EMISSIONS***

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

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

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

where:
$F_d$ = Distance Factor in dB
$D_m$ = Measurement Distance in meters
$D_s$ = Specification Distance in meters

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

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

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

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

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:
$R_r$ = Receiver Reading in dBµV/m
$F_d$ = Distance Factor in dB
$R_c$ = Corrected Reading in dBµV/m
$L_s$ = Specification Limit in dBµV/m
M = Margin in dB Relative to Spec

# Appendix A Test Equipment Calibration Data

| Manufacturer | Description | Model | Asset # | Calibrated | Cal Due |
|---|---|---|---|---|---|
| **Radiated Emissions, 9 kHz - 10,000 MHz, 04-Aug-17** | | | | | |
| National Technical Systems | NTS EMI Software (rev 2.10) | N/A | 0 | | N/A |
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 785 | 10/5/2016 | 10/5/2017 |
| EMCO | Antenna, Horn, 1-18 GHz | 3115 | 786 | 12/21/2015 | 12/21/2017 |
| Hewlett Packard | Spectrum Analyzer (SA40) Red 30 Hz -40 GHz | 8564E (84125C) | 1148 | 10/31/2016 | 11/1/2017 |
| Hewlett Packard | High Pass filter, 1.5 GHz (Blu System) | P/N 84300-80037 (84125C) | 1389 | 9/9/2016 | 9/9/2017 |
| Sunol Sciences | Biconilog, 30-3000 MHz | JB3 | 1548 | 10/12/2016 | 10/12/2018 |
| Com-Power | Preamplifier, 30-1000 MHz | PA-103 | 1632 | 3/8/2017 | 3/8/2018 |
| Rohde & Schwarz | EMI Test Receiver, 20 Hz-7 GHz | ESIB 7 | 1756 | 7/8/2017 | 7/8/2018 |
| EMCO | Magnetic Loop Antenna, 9 kHz-30 MHz | AL-130 | 3003 | 8/9/2016 | 8/9/2018 |
| **Radiated Emissions, 30 - 10,000 MHz, 09-Aug-17** | | | | | |
| National Technical Systems | NTS EMI Software (rev 2.10) | N/A | 0 | | N/A |
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 785 | 10/5/2016 | 10/5/2017 |
| EMCO | Antenna, Horn, 1-18 GHz | 3115 | 786 | 12/21/2015 | 12/21/2017 |
| Hewlett Packard | Spectrum Analyzer (SA40) Red 30 Hz -40 GHz | 8564E (84125C) | 1148 | 10/31/2016 | 11/1/2017 |
| Hewlett Packard | High Pass filter, 1.5 GHz (Blu System) | P/N 84300-80037 (84125C) | 1389 | 9/9/2016 | 9/9/2017 |
| Sunol Sciences | Biconilog, 30-3000 MHz | JB3 | 1548 | 10/12/2016 | 10/12/2018 |
| Com-Power | Preamplifier, 30-1000 MHz | PA-103 | 1632 | 3/8/2017 | 3/8/2018 |
| Rohde & Schwarz | EMI Test Receiver, 20 Hz-7 GHz | ESIB 7 | 1756 | 7/8/2017 | 7/8/2018 |
| **AC Power line Conducted Emissions, 10-Aug-17** | | | | | |
| National Technical Systems | NTS EMI Software (rev 2.10) | N/A | 0 | | N/A |
| Rohde & Schwarz | Pulse Limiter | ESH3 Z2 | 1401 | 2/3/2017 | 2/3/2018 |
| Rohde & Schwarz | EMI Test Receiver, 20 Hz-7 GHz | ESIB 7 | 1756 | 7/8/2017 | 7/8/2018 |
| Fischer Custom Comm | LISN, 25A, 150kHz to 30MHz, 25 Amp, | FCC-LISN-50-25-2-09 | 2000 | 9/26/2016 | 9/26/2017 |
| **Radiated Emissions, 30 - 10,000 MHz, 16-Aug-17** | | | | | |
| National Technical Systems | NTS EMI Software (rev 2.10) | N/A | 0 | | N/A |
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 785 | 10/5/2016 | 10/5/2017 |
| EMCO | Antenna, Horn, 1-18 GHz | 3115 | 786 | 12/21/2015 | 12/21/2017 |
| Hewlett Packard | Spectrum Analyzer (SA40) Red 30 Hz -40 GHz | 8564E (84125C) | 1148 | 10/31/2016 | 11/1/2017 |
| Sunol Sciences | Biconilog, 30-3000 MHz | JB3 | 1548 | 10/12/2016 | 10/12/2018 |
| Com-Power | Preamplifier, 30-1000 MHz | PA-103 | 1632 | 3/8/2017 | 3/8/2018 |
| Rohde & Schwarz | EMI Test Receiver, 20 Hz-7 GHz | ESIB 7 | 1756 | 7/8/2017 | 7/8/2018 |

| Manufacturer | Description | Model | Asset # | Calibrated | Cal Due |
|---|---|---|---|---|---|
| **Antenna port measurements, 16-Aug-17** | | | | | |
| National Technical Systems | NTS Capture Analyzer Software (rev 3.8) | N/A | 0 | | N/A |
| Rohde & Schwarz | Power Meter, Single Channel | NRVS | 1422 | 3/10/2017 | 3/10/2018 |
| Rohde & Schwarz | Peak Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155) | NRV-Z32 | 1536 | 4/19/2017 | 4/21/2018 |
| Agilent Technologies | USB Average Power Sensor | U2001A | 2442 | 1/5/2017 | 1/5/2018 |
| Agilent Technologies | 3Hz -44GHz PSA Spectrum Analyzer | E4446A | 2796 | 5/22/2017 | 5/22/2018 |

# Appendix B Test Data

T105584 Pages 24 – 45
T105585 Pages 46 – 50

| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Product | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) | T-Log Number: | T105584 |
| System Configuration: | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | |
| Emissions Standard(s): | FCC 15.247 / RSS-247 | Class: | B |
| Immunity Standard(s): | | Environment: | |

# EMC Test Data

For The

# Plantronics Inc.

Product

WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets.

Date of Last Test: 8/16/2017

| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |

# RSS-247 and FCC 15.247 (DTS) Antenna Port Measurements

## Power, PSD, Bandwidth and Spurious Emissions

## Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 8/16/2017
Test Engineer: Deniz Demirci
Test Location: Fremont EMC Lab #4A

Config. Used: 1
Config Change: None
EUT Voltage: 4 Vdc

## General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

## Ambient Conditions:

Temperature: 20-22 °C
Rel. Humidity: 38-40 %

## Summary of Results

| Run # | Pwr setting | Avg Pwr | Test Performed | Limit | Pass / Fail | Result / Margin |
|---|---|---|---|---|---|---|
| 1 | Max | | Output Power | 15.247(b) | Pass | 16.4 dBm |
| 2 | Max | | Power spectral Density (PSD) | 15.247(d) | Pass | 1.9 dBm/3 kHz |
| 3 | Max | | Minimum 6 dB Bandwidth | 15.247(a) | Pass | 0.890 MHz |
| 3 | Max | | 99% Bandwidth | RSS GEN | - | 1.225 MHz |
| 4 | Max | | Spurious emissions | 15.247(b) | Pass | -29.7 dBc |

## Modifications Made During Testing

No modifications were made to the EUT during testing

## Deviations From The Standard

No deviations were made from the requirements of the standard.

## Sample Notes

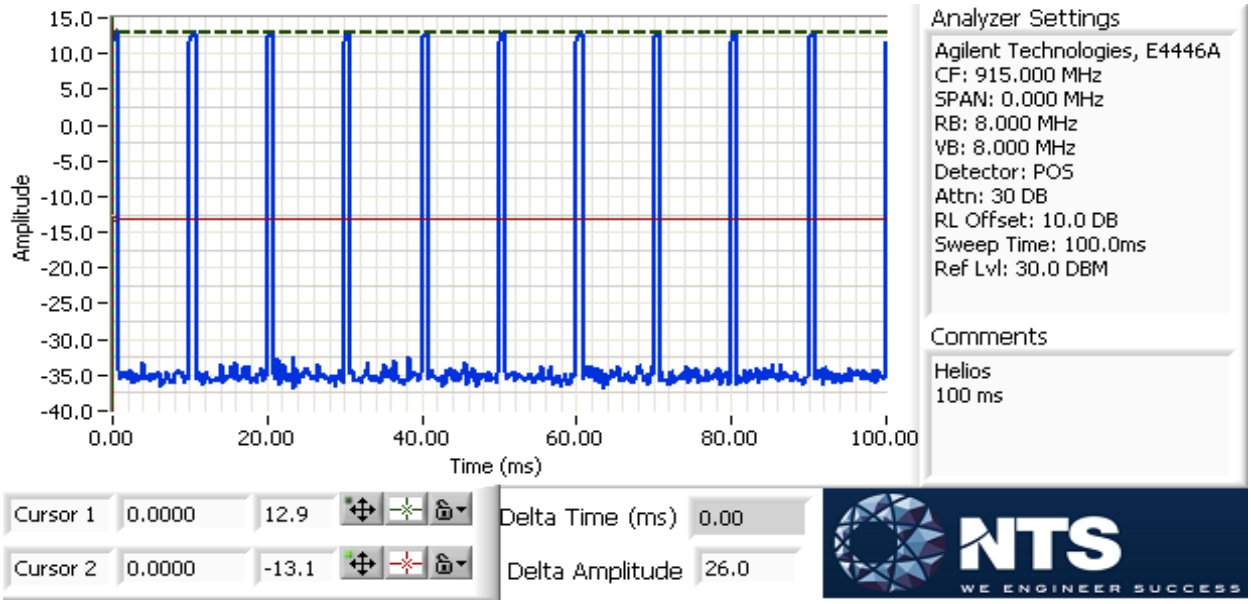
Sample S/N: HLS 2
Driver: -

| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |

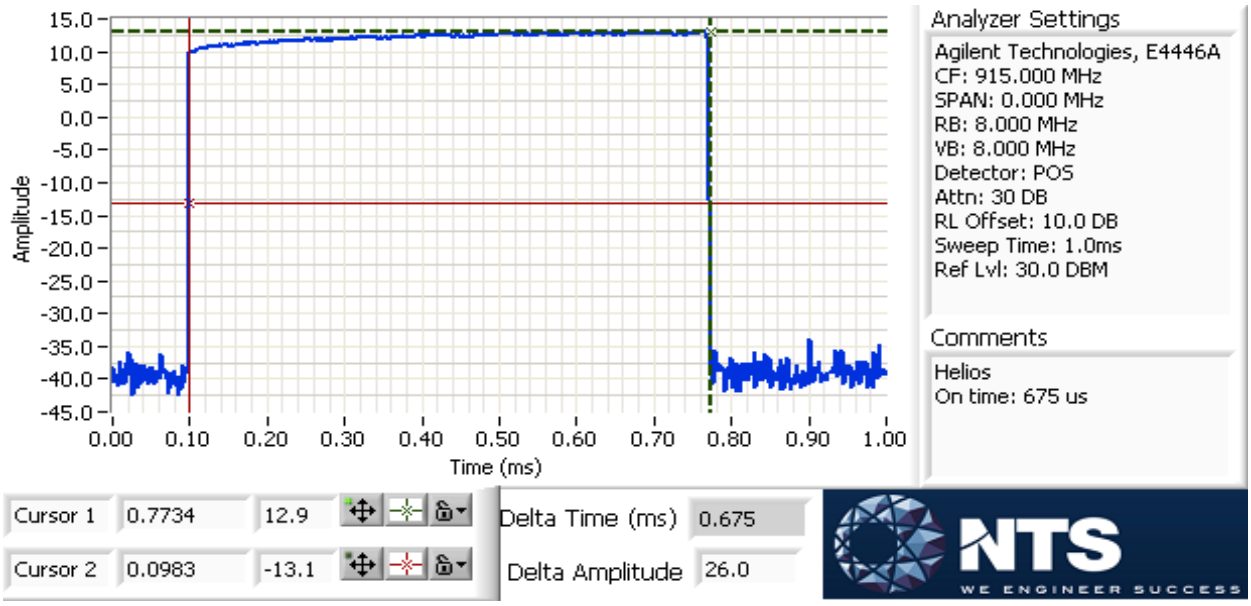
## Procedure Comments:

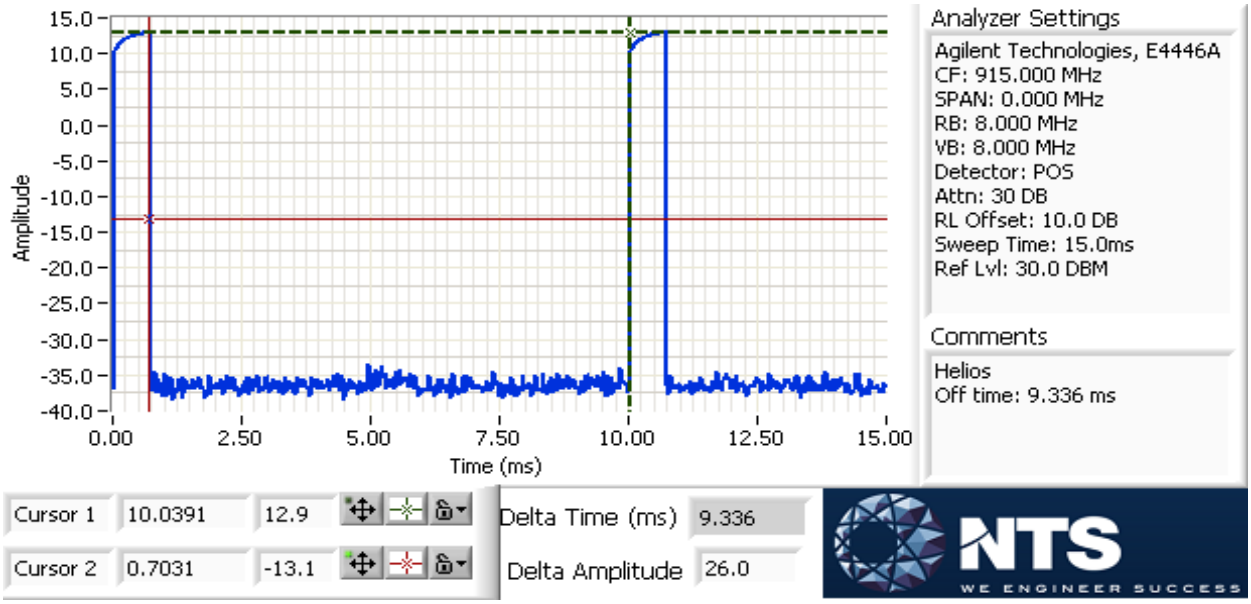
Measurements performed in accordance with FCC KDB 558074

| Mode | Data Rate | Duty Cycle (x) | Constant DC? | T (ms) | Pwr Cor Factor* | Lin Volt Cor Factor** | Min VBW for FS (Hz) |
|---|---|---|---|---|---|---|---|
| Tx | - | 0.07 | Yes | 0.675 | - | - | - |



| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |



| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |

Run #1: Output Power

Peak power

| Power Setting[2] | Frequency (MHz) | Output Power (dBm) [1] | Output Power mW | Antenna Gain (dBi) | Result | EIRP dBm | EIRP W | Output Power (dBm) [3] | Output Power mW |
|---|---|---|---|---|---|---|---|---|---|
| Max | 902.850 | 16.4 | 43.7 | 2.2 | Pass | 18.6 | 0.072 | | |
| Max | 915.000 | 13.0 | 20.0 | 2.2 | Pass | 15.2 | 0.033 | | |
| Max | 927.125 | 11.7 | 14.8 | 2.2 | Pass | 13.9 | 0.025 | | |

| | |
|---|---|
| Note 1: | Output power measured using a peak power meter, spurious limit is -20dBc. |

Average power (On time) - For information only

| Power Setting[2] | Frequency (MHz) | Output Power (dBm) [1] | Output Power mW | Antenna Gain (dBi) | Result | EIRP dBm | EIRP W | Output Power (dBm) [3] | Output Power mW |
|---|---|---|---|---|---|---|---|---|---|
| Max | 902.850 | 14.8 | 30.20 | 2.2 | Pass | 17.0 | 0.050 | | |
| Max | 915.000 | 11.8 | 15.14 | 2.2 | Pass | 14.0 | 0.025 | | |
| Max | 927.125 | 10.4 | 10.96 | 2.2 | Pass | 12.6 | 0.018 | | |

| | |
|---|---|
| Note 1: | Output power measured using a gated average power meter. |

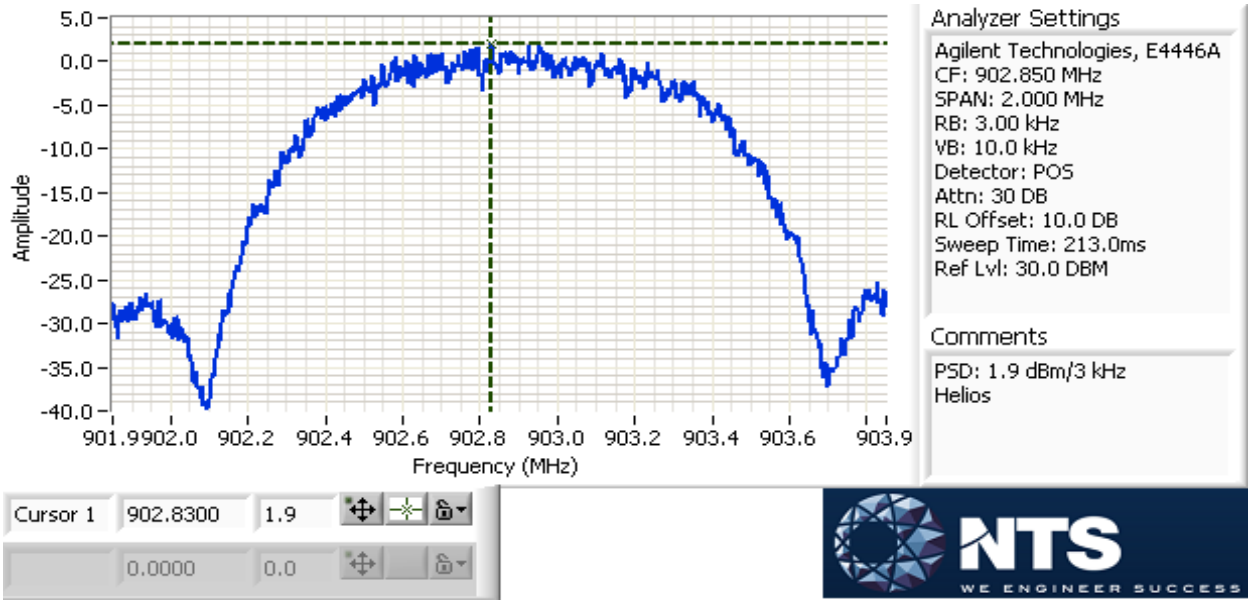
| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |

Run #2: Power spectral Density

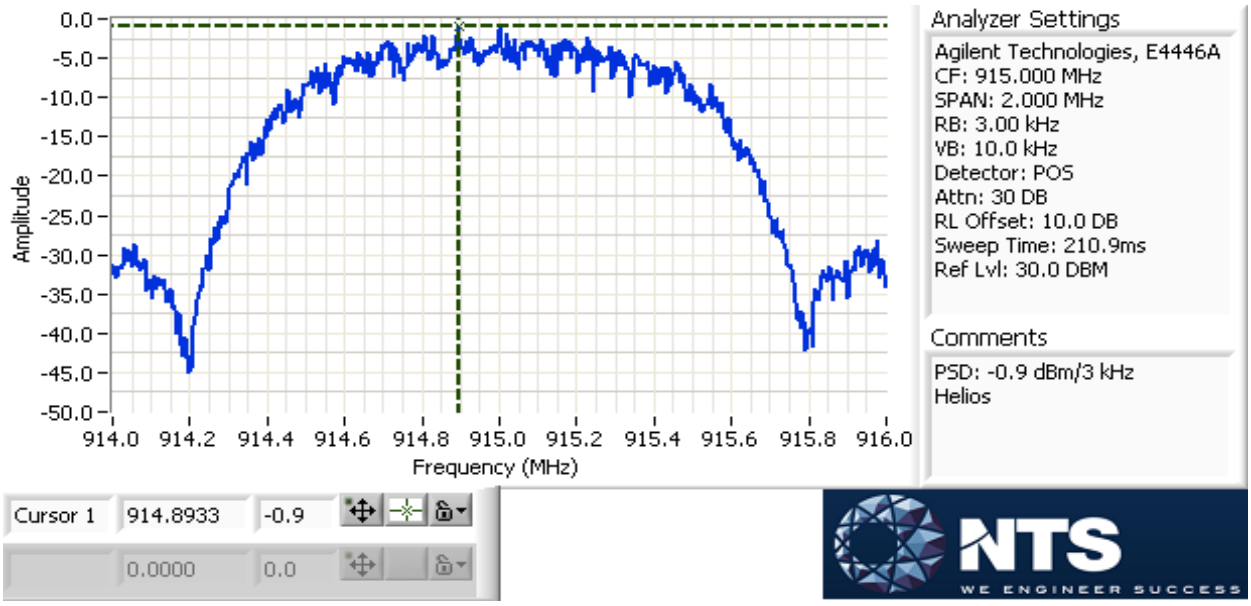
Mode: Tx

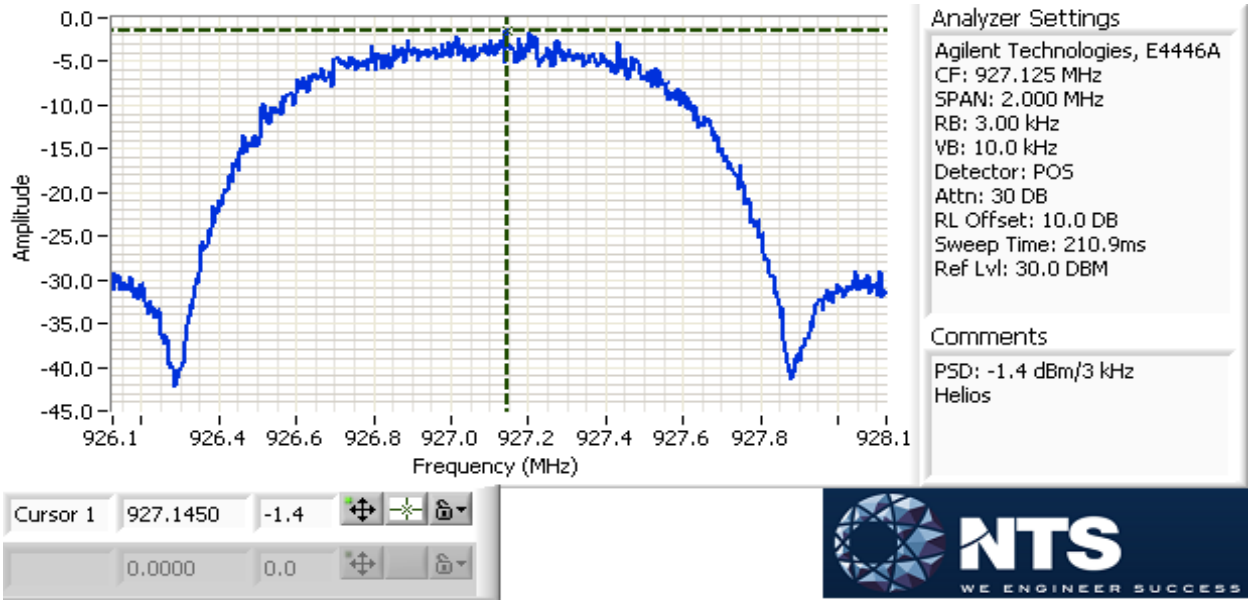
| Power Setting | Frequency (MHz) | PSD (dBm/3 kHz) Note 1 | Limit dBm/3 kHz | Result |
|---|---|---|---|---|
| Max | 902.850 | 1.9 | 8.0 | Pass |
| Max | 915.000 | -0.9 | 8.0 | Pass |
| Max | 927.125 | -1.4 | 8.0 | Pass |

| | |
|---|---|
| Note 1: | Test performed per method PKSPD, in KDB 558074. Power spectral density measured using: 3kHz ≤ RBW ≤ 100kHz, VBW=3*RBW, peak detector, span = 1.5*EBW, auto sweep time, max hold. |



| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |



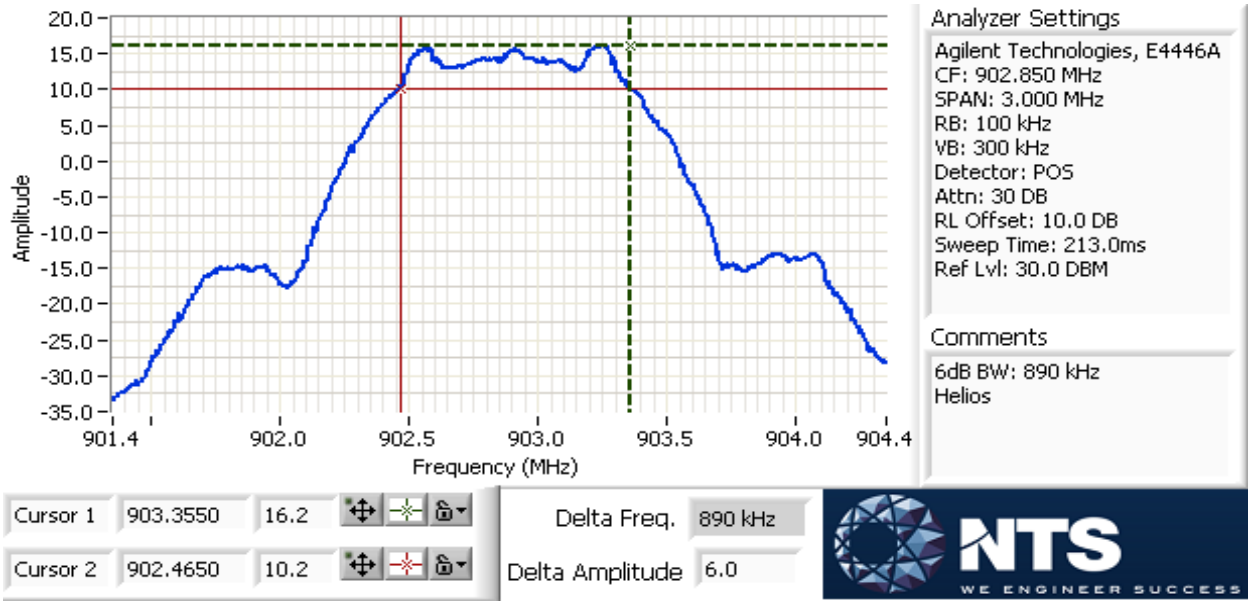
| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |

Run #3: Signal Bandwidth

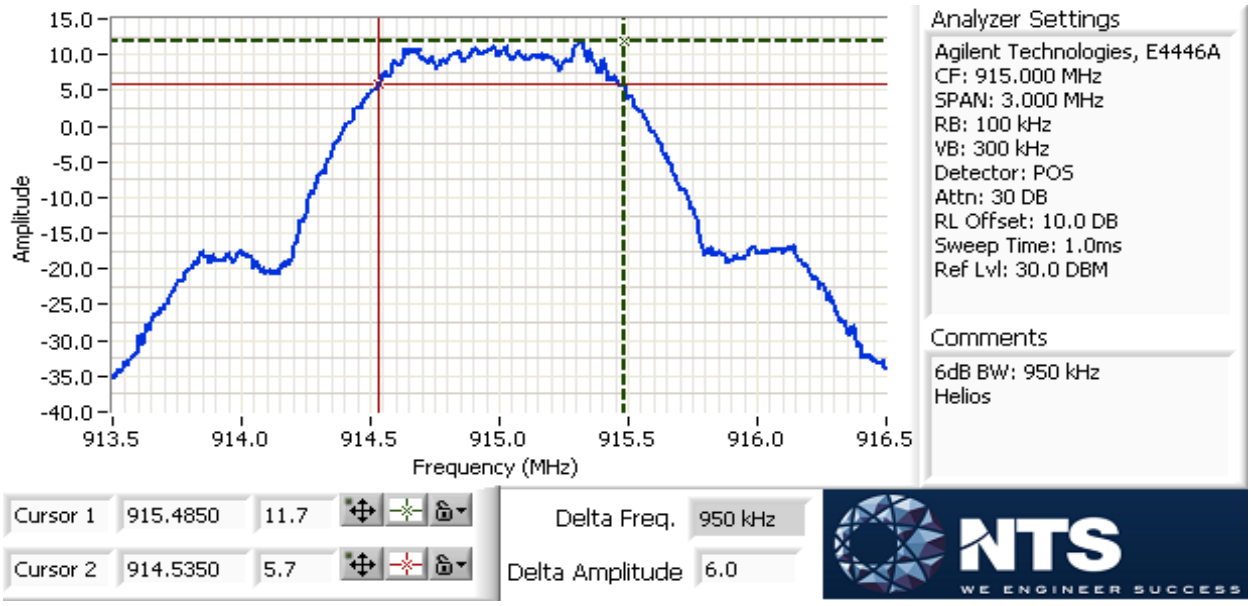
Mode: TX

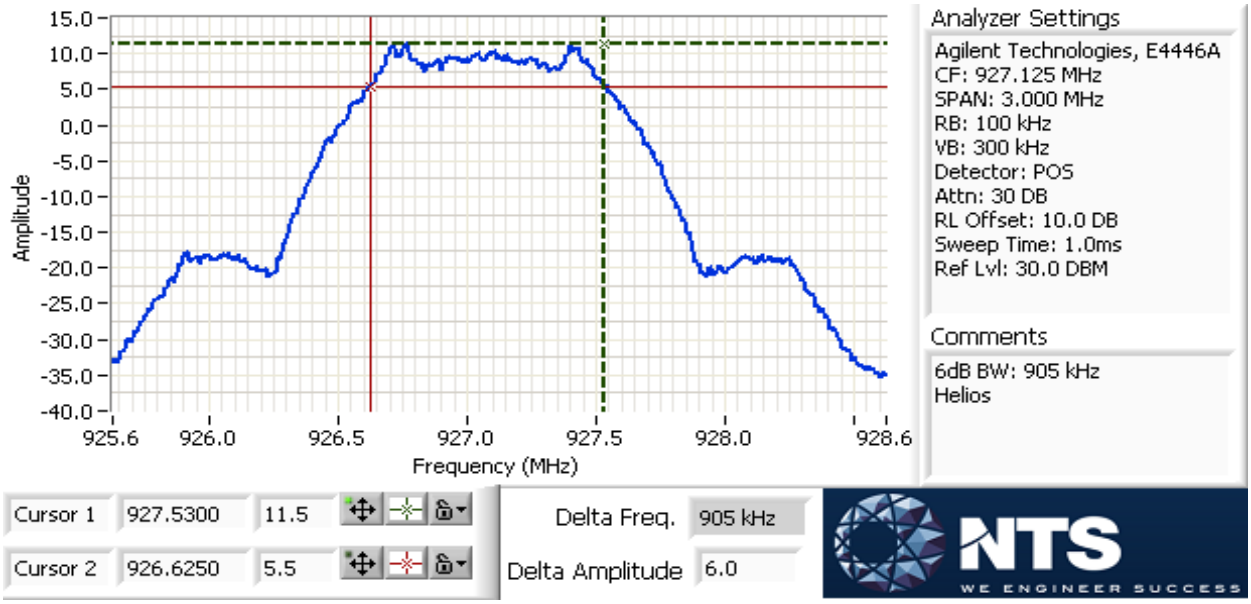
| Power Setting | Frequency (MHz) | Bandwidth (MHz) | | RBW Setting (kHz) | |
|---|---|---|---|---|---|
| | | 6dB | 99% | 6dB | 99% |
| Max | 902.850 | 0.890 | 1.198 | 100 | 51 |
| Max | 915.000 | 0.950 | 1.211 | 100 | 51 |
| Max | 927.125 | 0.905 | 1.225 | 100 | 51 |

| | |
|---|---|
| Note 1: | DTS BW: RBW=100 kHz, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time, Span 2-5 times measured BW.<br>99% BW: RBW=1-5% of 99%BW, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time. Span 1.5-5 times OBW. |

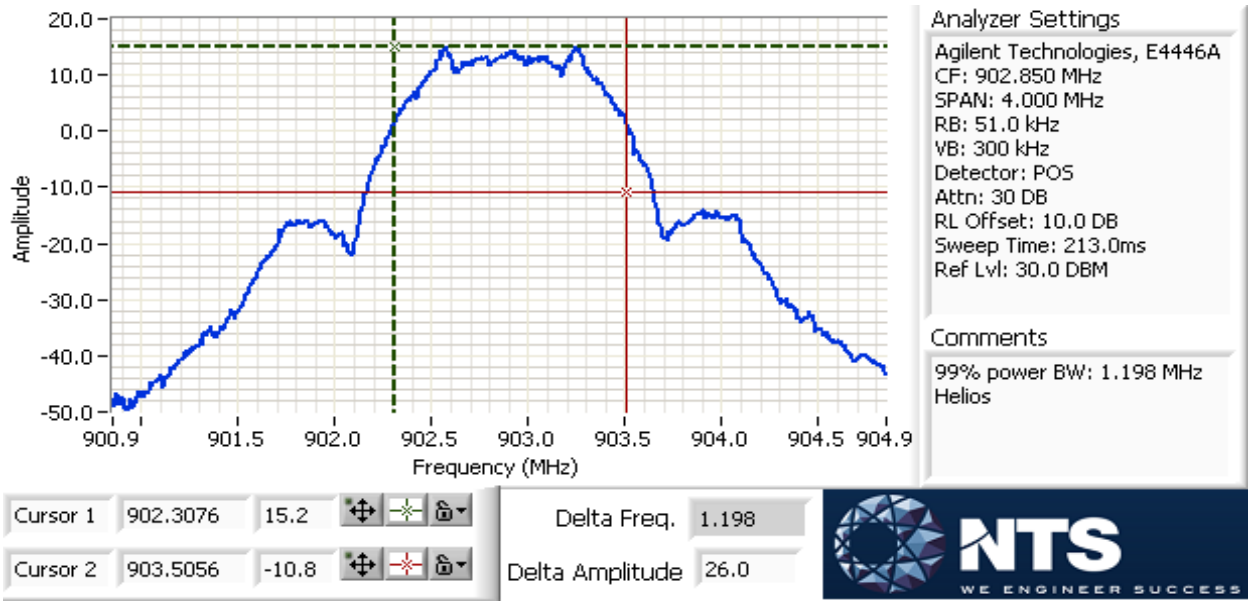


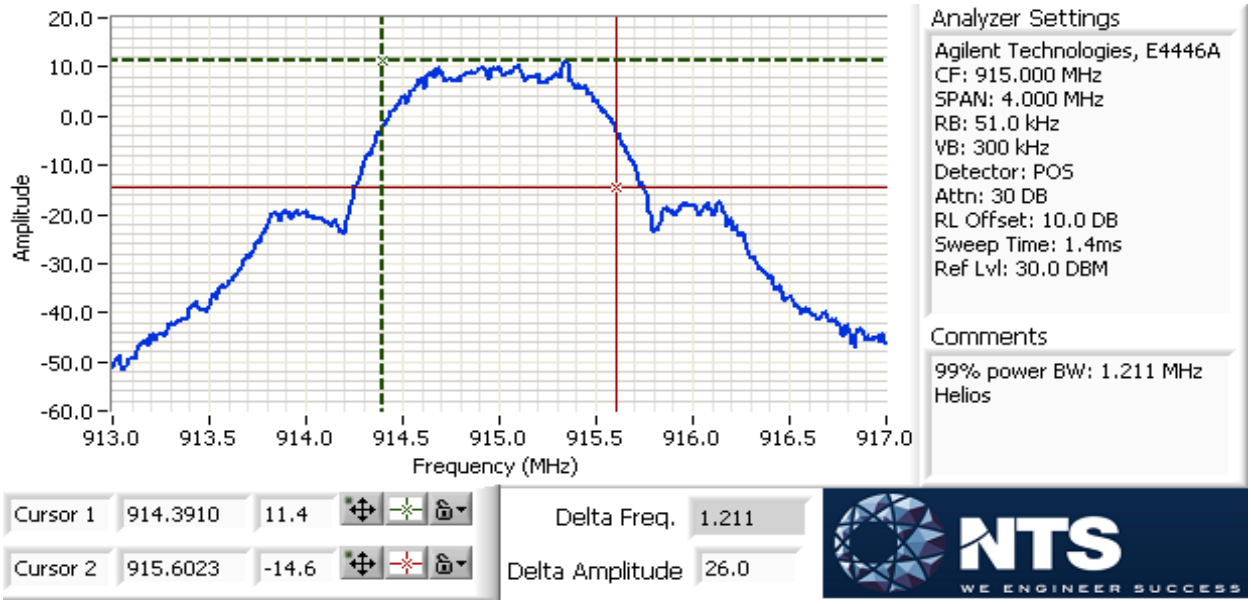
| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |



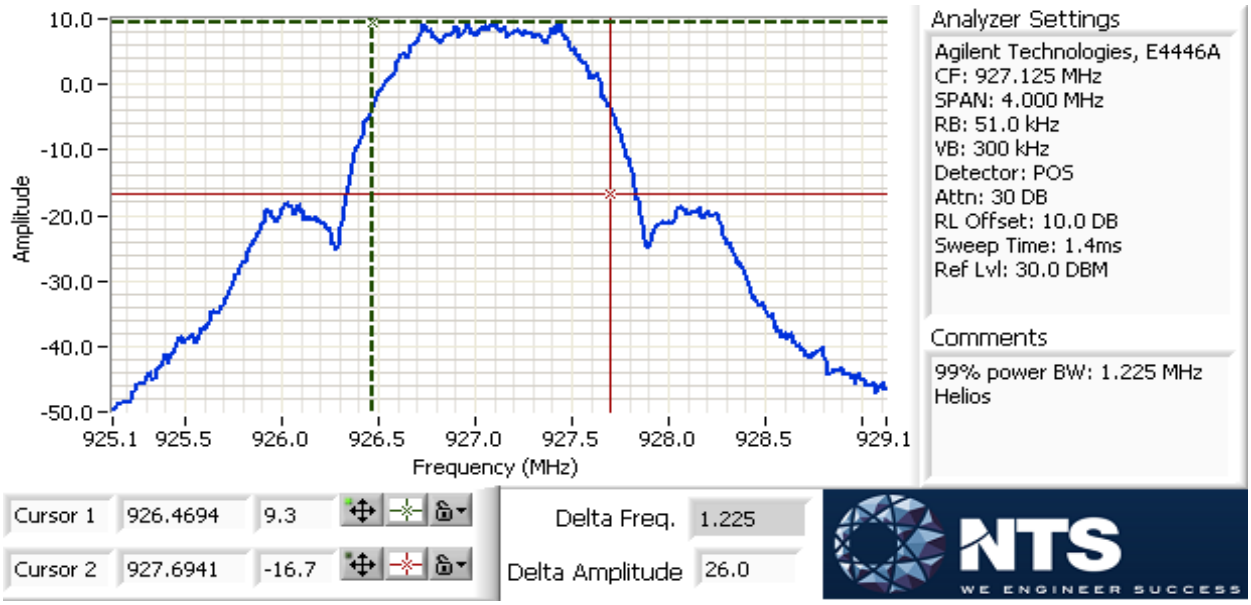



| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |



| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |



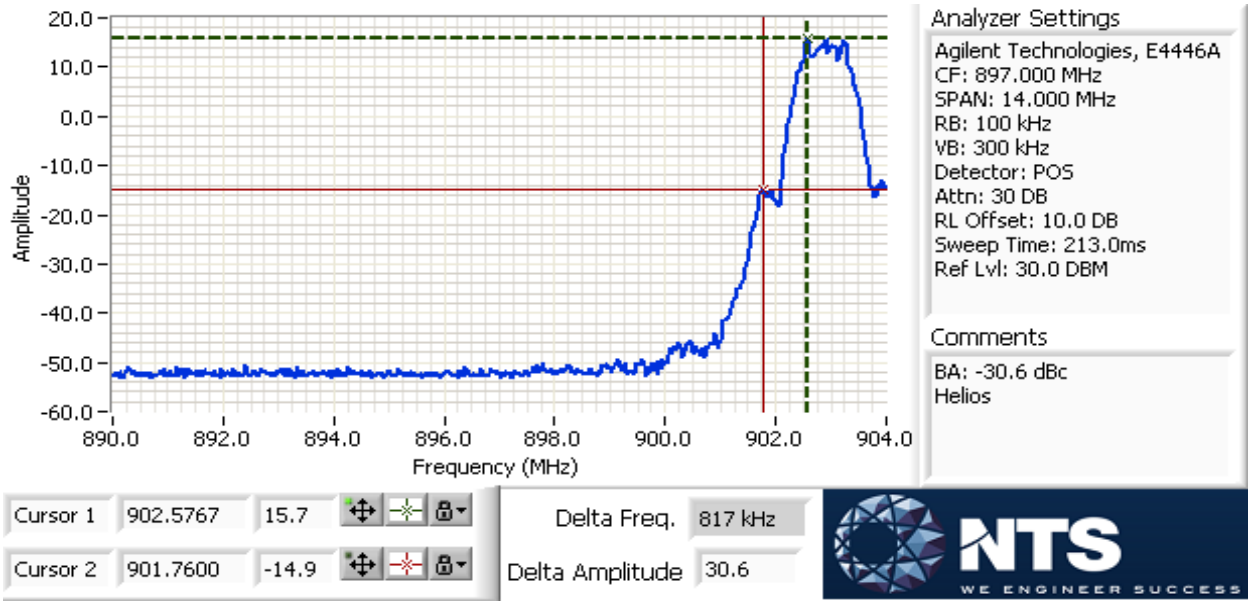
| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |

Run #4a: Out of Band Spurious Emissions

| Frequency (MHz) | Power Setting | Mode | Limit | Result |
|---|---|---|---|---|
| 902.850 | Max | Tx | -20 dBc | Pass<br>-30.6 dBc |
| 927.125 | Max | Tx | -20 dBc | Pass<br>-29.7 dBc |

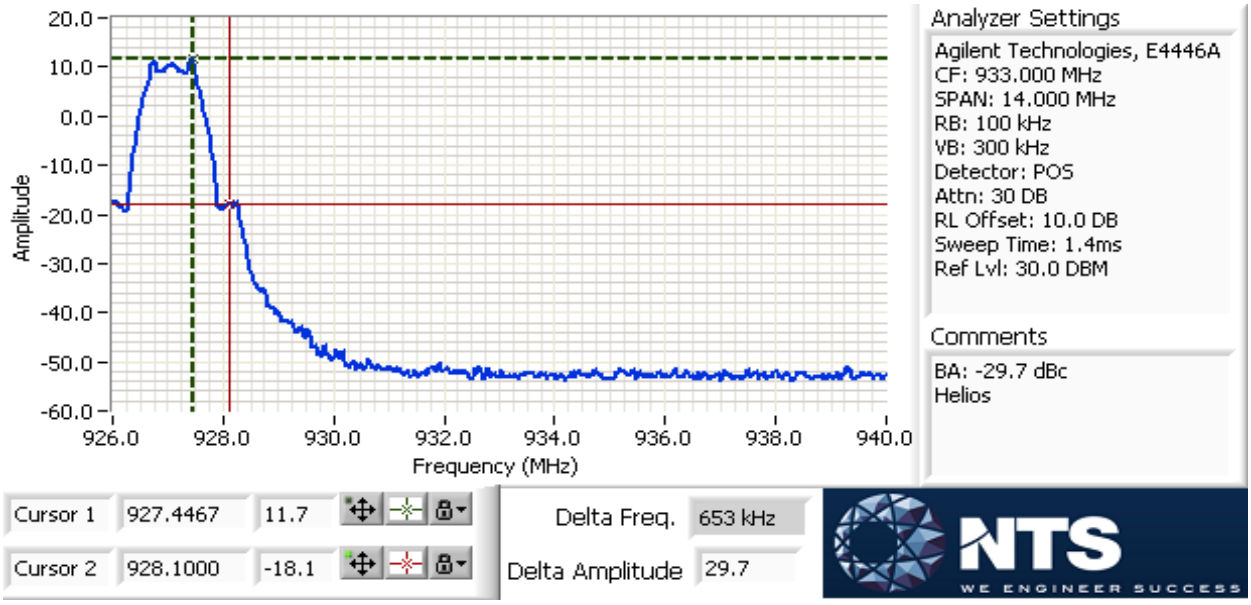
RBW = 100 kHz and VBW = 300 kHz for all plots.
Plots showing compliance with -20 dBc limit for 902 and 928 MHz band edges

Plot for low channel



| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |

Plot for high channel



| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |

# RSS-247 and FCC 15.247 (DTS) Radiated Spurious Emissions

## Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

## General Test Configuration

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

For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

## Ambient Conditions:

Temperature: 22-24 °C
Rel. Humidity: 35-40 %

## Summary of Results - Device Operating in the 902-928 MHz Band

| Run # | Mode | Channel | Target Power | Power Setting | Test Performed | Limit | Result / Margin |
|---|---|---|---|---|---|---|---|
| 1 | TX | 902.850 MHz | - | Max | Radiated Emissions, 9 kHz - 10 GHz | FCC Part 15.209 / 15.247( c) | 56.8 dBµV/m @ 3773.3 MHz (-17.2 dB) |
| | TX | 915.000 MHz | - | Max | Radiated Emissions, 9 kHz - 10 GHz | FCC Part 15.209 / 15.247( c) | 26.9 dBµV/m @ 2883.0 MHz (-27.1 dB) |
| | TX | 927.125 MHz | - | Max | Radiated Emissions, 9 kHz - 10 GHz | FCC Part 15.209 / 15.247( c) | 56.3 dBµV/m @ 3821.9 MHz (-17.7 dB) |

## Modifications Made During Testing

No modifications were made to the EUT during testing

## Deviations From The Standard

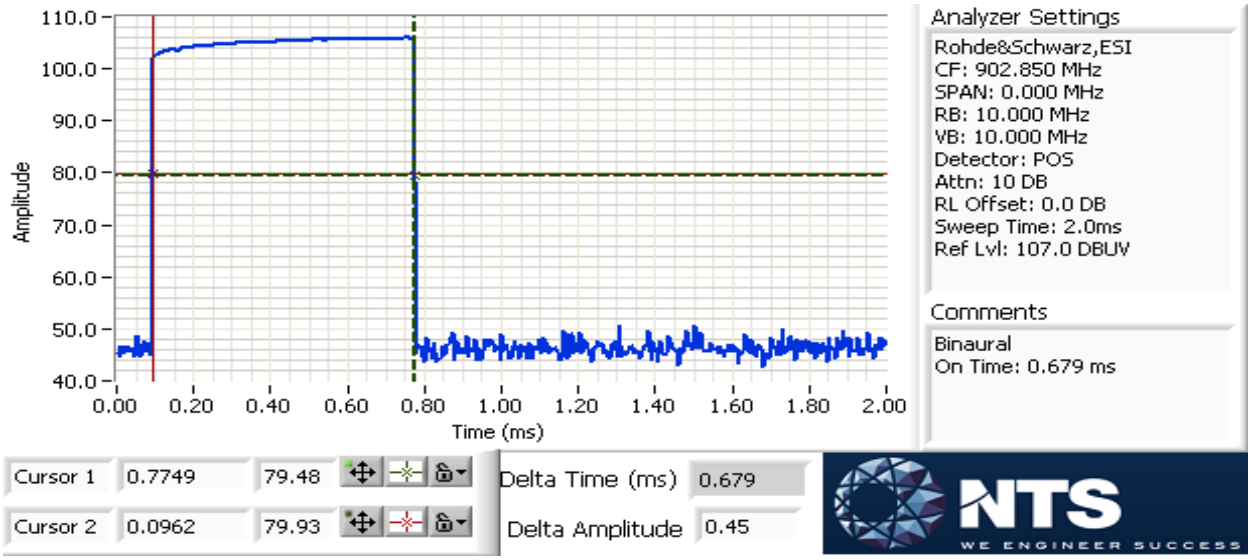
No deviations were made from the requirements of the standard.

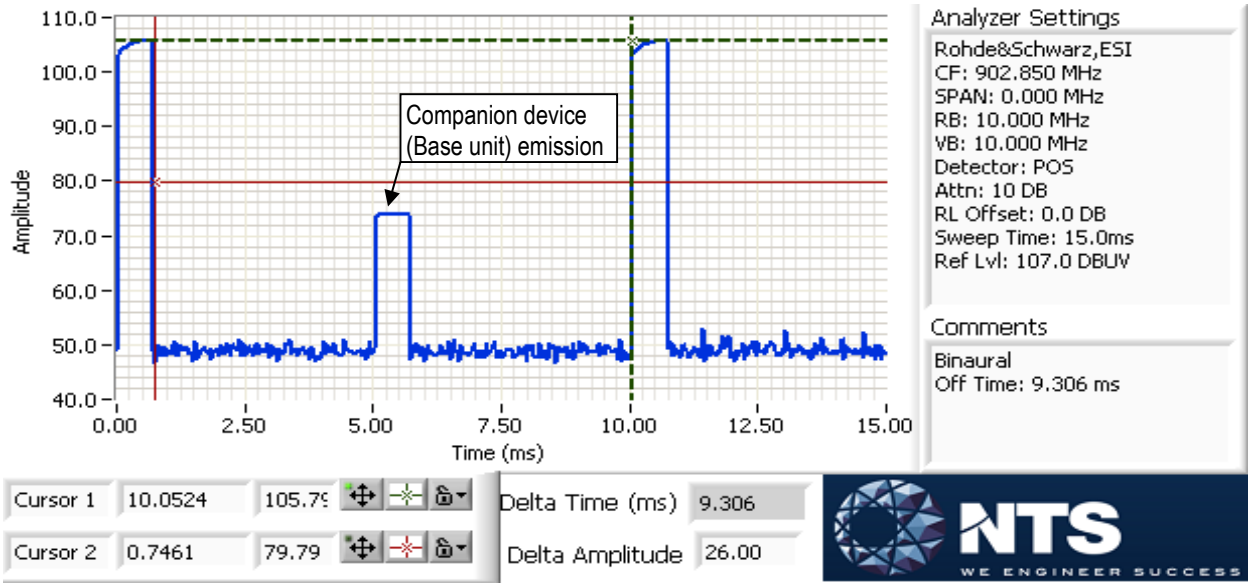
| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |

## Procedure Comments:

Measurements performed in accordance with FCC KDB 558074, ANSI C63.10 and ANSI C63.4

| Mode | Data Rate | Duty Cycle (x) | Constant DC? | T (ms) | Pwr Cor | Lin Volt Cor | Min VBW for FS (Hz) |
|---|---|---|---|---|---|---|---|
| - | - | 0.07 | Yes | 0.679 | 11.7 | 23.4 | 1473 |



| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |

Run #1: Radiated Spurious Emissions, 30 MHz - 10 GHz.

Date of Test: 8/9/2017, 8/10/2017 Config. Used: 1
Test Engineer: Deniz Demirci Config Change: None
Test Location: FT Ch #4 EUT Voltage: Battery powered

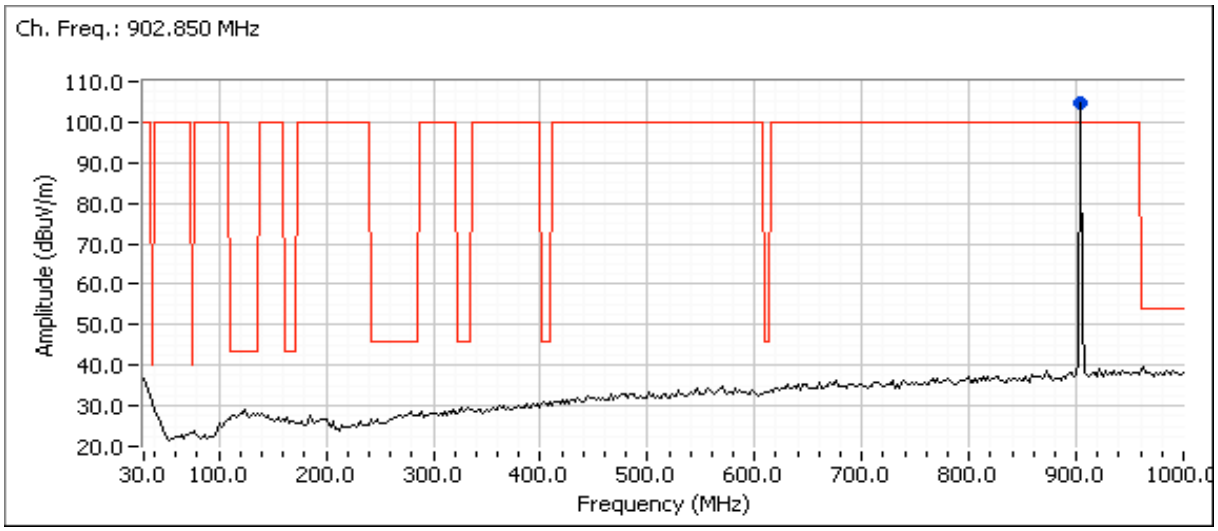
Run #1a: Low Channel

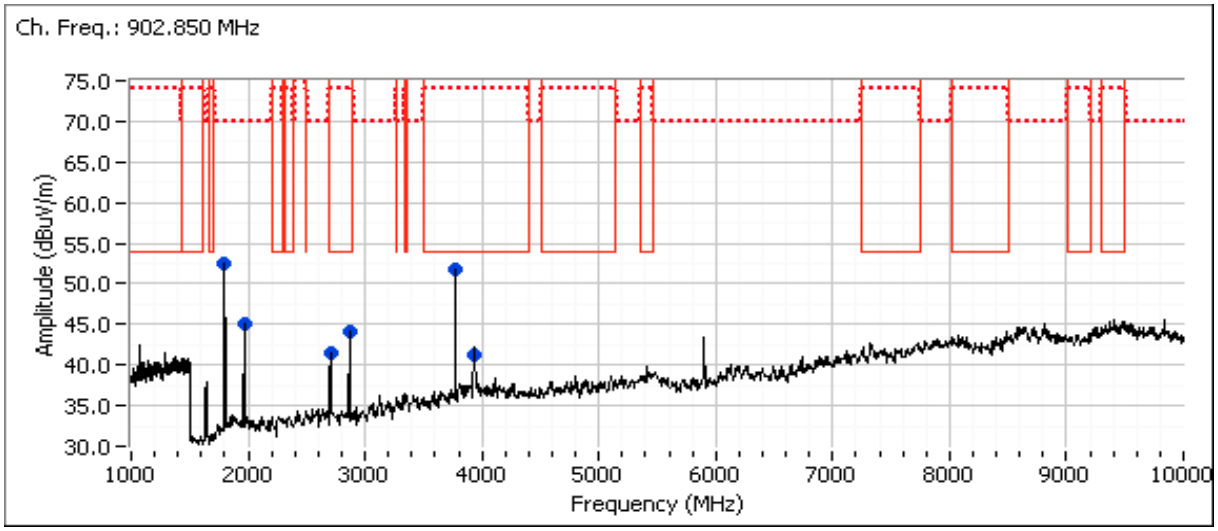
Channel: 902.850 MHz Mode: Tx
Tx Chain: - Data Rate: -

| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 902.856 | 106.7 | H | - | - | PK | 359 | 1.5 | Fundamental - RB 100 kHz;VB 300 k |
| 1806.530 | 52.4 | V | 86.7 | -34.3 | PK | 151 | 1.0 | RB 100 kHz;VB 300 kHz;Peak |
| 1968.110 | 49.2 | V | 86.7 | -37.5 | PK | 67 | 1.2 | RB 100 kHz;VB 300 kHz;Peak |
| 2709.880 | 46.3 | V | 74.0 | -27.7 | PK | 99 | 1.9 | RB 1 MHz;VB 3 MHz;Peak |
| 2709.880 | 26.3 | V | 54.0 | -27.7 | AVG | 99 | 1.9 | Note 2 |
| 2871.290 | 48.5 | V | 74.0 | -25.5 | PK | 236 | 1.9 | RB 1 MHz;VB 3 MHz;Peak |
| 2871.290 | 28.5 | V | 54.0 | -25.5 | AVG | 236 | 1.9 | Note 2 |
| 3773.280 | 56.8 | H | 74.0 | -17.2 | PK | 100 | 1.0 | RB 1 MHz;VB 3 MHz;Peak |
| 3773.280 | 36.8 | H | 54.0 | -17.2 | AVG | 100 | 1.0 | Note 2 |
| 3936.410 | 48.7 | H | 74.0 | -25.3 | PK | 293 | 1.7 | RB 1 MHz;VB 3 MHz;Peak |
| 3936.410 | 28.7 | H | 54.0 | -25.3 | AVG | 293 | 1.7 | Note 2 |

| | |
|---|---|
| Note: | The preliminary measurements were performed with the EUT positioned in three orientations (Upright, Side and Flat). The upright orientation of the EUT has the wost case fundamental power and spurious emission results. Final measurements were presented with upright orinetation. |
| Note 2: | Duty cycle correction factor of -20 dB (20*Log(0.68/9.99)) was used to calculate average value from peak measurement per the rule part FCC 15.35( c ) and RSS-Gen 6.10 |
| Note 3: | Pre-scan measurements were performed between 9 kHz and 30 MHz with the fixed measurement antenna height of 1 m. There were no significant emissions observed in this frequency range. |

| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |



| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |

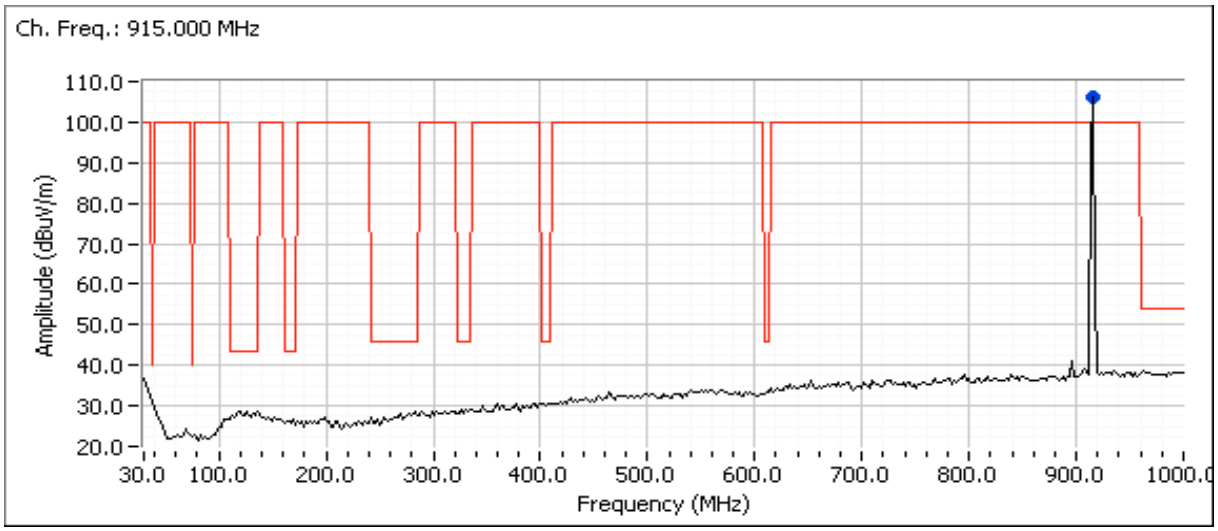
Run #1b: Center Channel

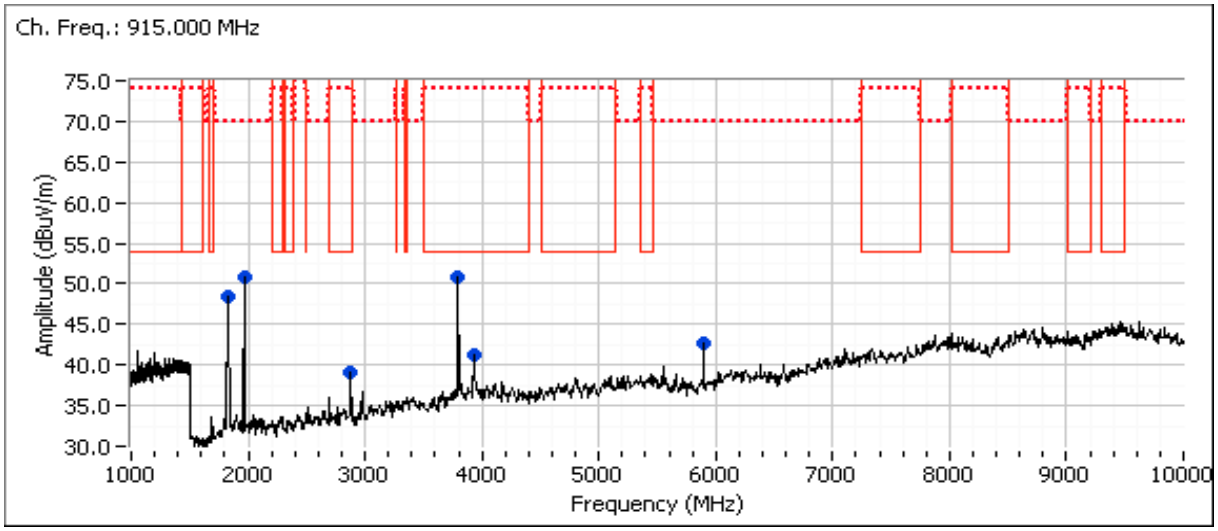
Channel: 915.000 MHz Mode: Tx
Tx Chain: - Data Rate: -

| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 915.002 | 106.4 | H | - | - | PK | 88 | 1.5 | Fundamental - RB 100 kHz;VB 300 k |
| 1830.350 | 43.9 | V | 86.4 | -42.5 | PK | 107 | 1.1 | RB 100 kHz;VB 300 kHz;Peak |
| 1968.180 | 47.5 | V | 86.4 | -38.9 | PK | 85 | 1.5 | RB 100 kHz;VB 300 kHz;Peak |
| 2883.010 | 46.9 | H | 74.0 | -27.1 | PK | 251 | 1.8 | RB 1 MHz;VB 3 MHz;Peak |
| 2883.010 | 26.9 | H | 54.0 | -27.1 | AVG | 251 | 1.8 | Note 2 |
| 3797.480 | 56.6 | H | 74.0 | -17.4 | PK | 33 | 1.0 | RB 1 MHz;VB 3 MHz;Peak |
| 3797.480 | 36.6 | H | 54.0 | -17.4 | AVG | 33 | 1.0 | Note 2 |
| 3936.580 | 48.6 | H | 74.0 | -25.4 | PK | 265 | 1.7 | RB 1 MHz;VB 3 MHz;Peak |
| 3936.580 | 28.6 | H | 54.0 | -25.4 | AVG | 265 | 1.7 | Note 2 |
| 5904.460 | 45.2 | H | 86.4 | -41.2 | PK | 252 | 1.8 | RB 100 kHz;VB 300 kHz;Peak |

| | |
|---|---|
| Note: | The preliminary measurements were performed with the EUT positioned in three orientations (Upright, Side and Flat). The upright orientation of the EUT has the wost case fundamental power and spurious emission results. Final measurements were presented with upright orinetation. |
| Note 2: | Duty cycle correction factor of -20 dB (20*Log(0.68/9.99)) was used to calculate average value from peak measurement per the rule part FCC 15.35( c ) and RSS-Gen 6.10 |
| Note 3: | Pre-scan measurements were performed between 9 kHz and 30 MHz with the fixed measurement antenna height of 1 m. There were no significant emissions observed in this frequency range. |

| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |



| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |

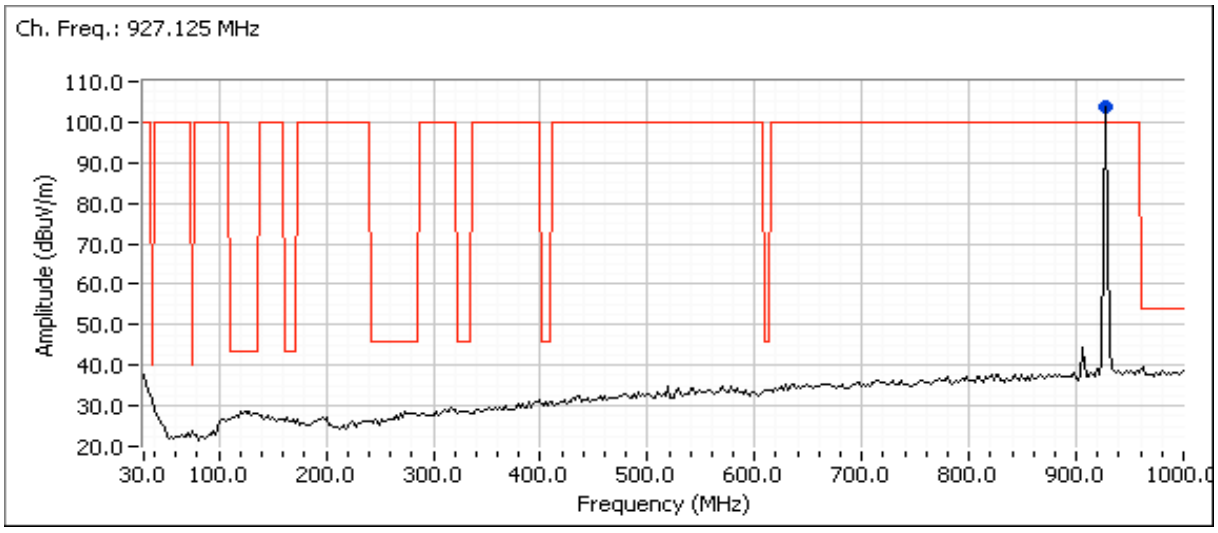
Run #1c: High Channel

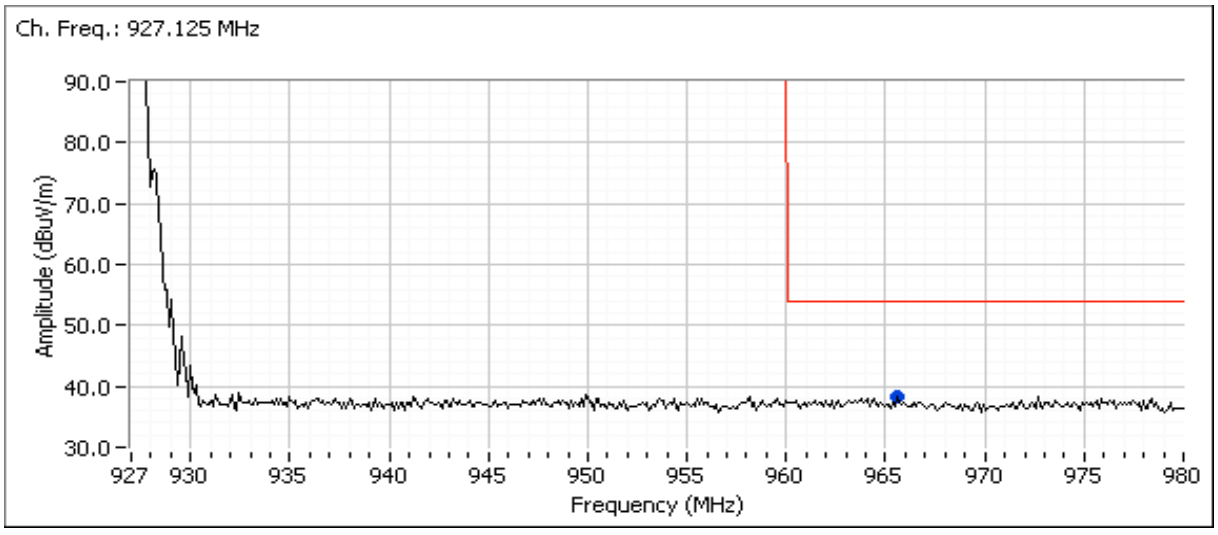
Channel: 927.125 MHz Mode: Tx
Tx Chain: - Data Rate: -

| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 927.136 | 103.8 | H | - | - | PK | 83 | 1.5 | Fundamental - RB 100 kHz;VB 300 k |
| 965.555 | 38.4 | V | 54.0 | -15.6 | PK | 48 | 1.3 | Restricted band edge noise floor. |
| 1853.550 | 54.0 | V | 83.8 | -29.8 | PK | 67 | 1.6 | RB 100 kHz;VB 300 kHz;Peak |
| 1968.130 | 47.7 | V | 83.8 | -36.1 | PK | 290 | 1.0 | RB 100 kHz;VB 300 kHz;Peak |
| 2895.270 | 47.9 | V | 74.0 | -26.1 | PK | 7 | 1.4 | RB 1 MHz;VB 3 MHz;Peak |
| 2895.270 | 27.9 | V | 54.0 | -26.1 | AVG | 7 | 1.4 | Note 2 |
| 3821.860 | 56.3 | H | 74.0 | -17.7 | PK | 65 | 1.2 | RB 1 MHz;VB 3 MHz;Peak |
| 3821.860 | 36.3 | H | 54.0 | -17.7 | AVG | 65 | 1.2 | Note 2 |
| 3936.400 | 49.3 | H | 74.0 | -24.7 | PK | 65 | 1.0 | RB 1 MHz;VB 3 MHz;Peak |
| 3936.400 | 29.3 | H | 54.0 | -24.7 | AVG | 65 | 1.0 | Note 2 |
| 7644.060 | 53.4 | V | 74.0 | -20.6 | PK | 351 | 1.5 | RB 1 MHz;VB 3 MHz;Peak |
| 7644.060 | 33.4 | V | 54.0 | -20.6 | AVG | 351 | 1.5 | Note 2 |

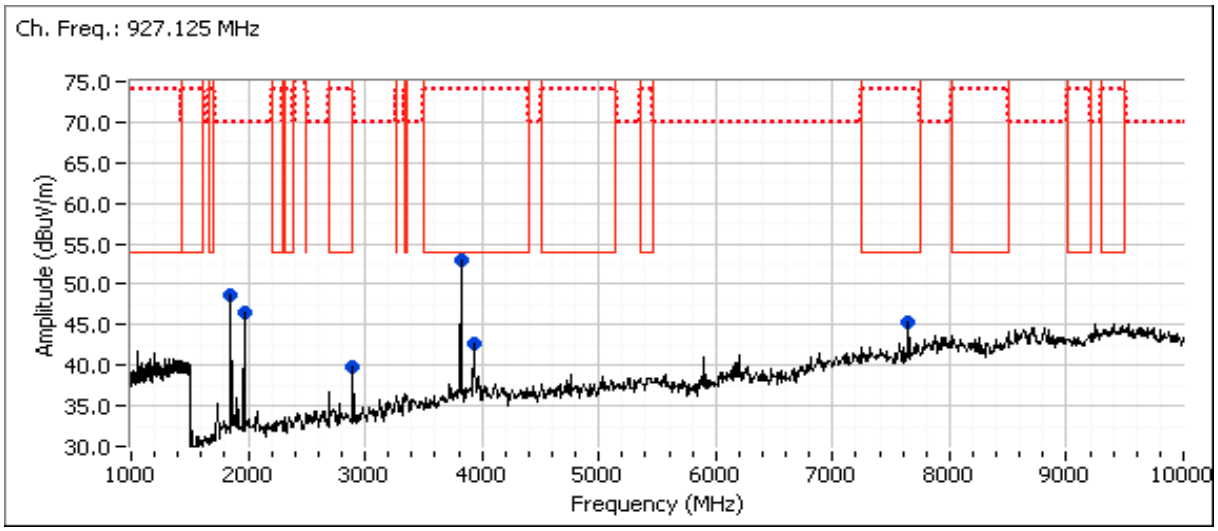
| | |
|---|---|
| Note: | The preliminary measurements were performed with the EUT positioned in three orientations (Upright, Side and Flat). The upright orientation of the EUT has the wost case fundamental power and spurious emission results. Final measurements were presented with upright orinetation. |
| Note 2: | Duty cycle correction factor of -20 dB (20*Log(0.68/9.99)) was used to calculate average value from peak measurement per the rule part FCC 15.35( c ) and RSS-Gen 6.10 |
| Note 3: | Pre-scan measurements were performed between 9 kHz and 30 MHz with the fixed measurement antenna height of 1 m. There were no significant emissions observed in this frequency range. |

| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |



| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | WH300-XD1 (Monaural) and WH350-XD1 (Binaural) Headsets. | T-Log Number: | T105584 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | N/A |



| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Product | C052-XD1 and C054-XD1, 900 MHz Cordless Base | T-Log Number: | T105585 |
| System Configuration: | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | |
| Emissions Standard(s): | FCC 15.247 / RSS-247 | Class: | B |
| Immunity Standard(s): | | Environment: | |

# EMC Test Data

For The

# Plantronics Inc.

Product

C052-XD1 and C054-XD1, 900 MHz Cordless Base Units

Date of Last Test: 9/15/2017

| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | C052-XD1 and C054-XD1, 900 MHz Cordless Base Units | T-Log Number: | T105585 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | B |

# Conducted Emissions

*(NTS Silicon Valley, Fremont Facility, Semi-Anechoic Chamber)*

## Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 8/10/2017
Test Engineer: Deniz Demirci
Test Location: Fremont Chamber #4
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

## General Test Configuration

For tabletop equipment, the EUT and support equipment were located on a table inside the semi-anechoic chamber, 40 cm from a vertical coupling plane and 80 cm from the LISN.

## Ambient Conditions:

Temperature: 20-22 °C
Rel. Humidity: 38-40 %

## Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|---|---|---|---|---|
| 1 | CE, AC Power, 120 V/60 Hz | Class B | Pass | 34.6 dBµV @ 2.283 MHz (-21.4 dB) |

## Modifications Made During Testing

No modifications were made to the EUT during testing

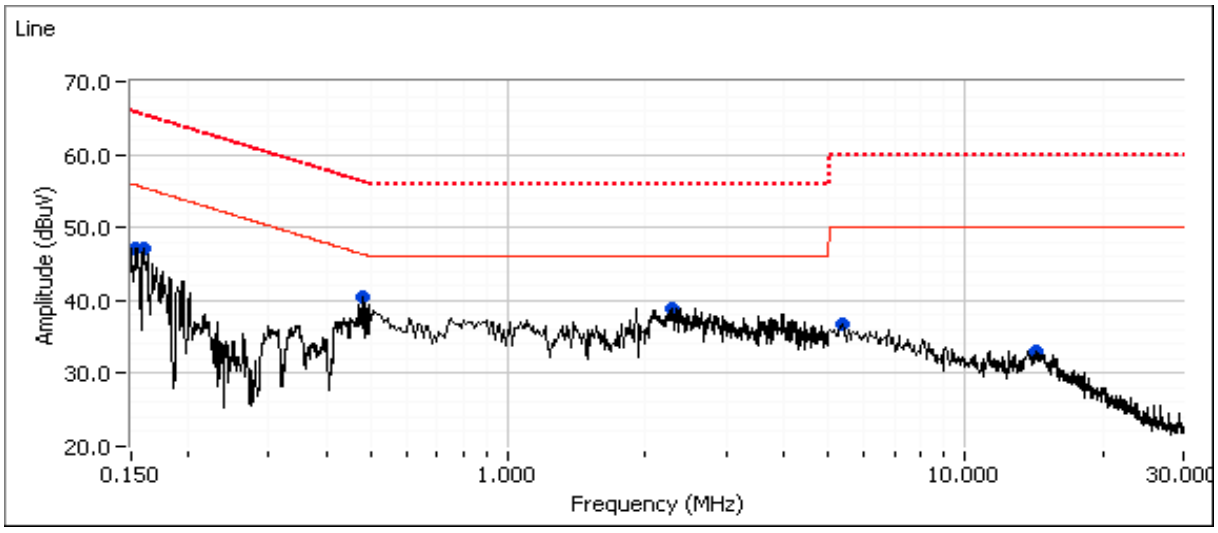
## Deviations From The Standard

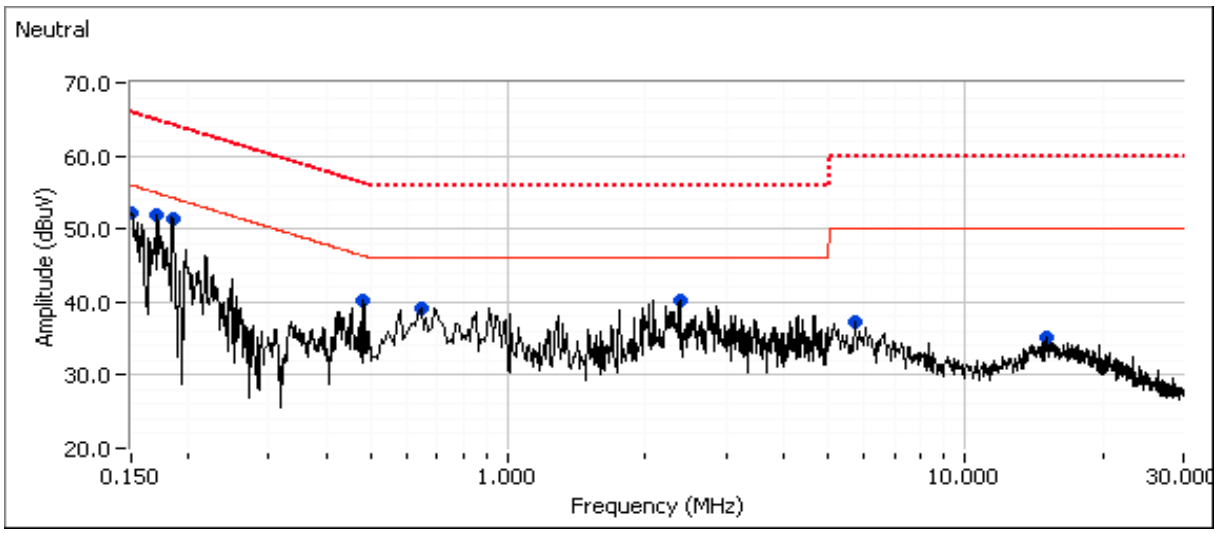
No deviations were made from the requirements of the standard.

| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | C052-XD1 and C054-XD1, 900 MHz Cordless Base Units | T-Log Number: | T105585 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | B |

Run #1: AC Power Port Conducted Emissions, 0.15 - 30 MHz, 120 V/60 Hz

EUT and Test Configuration Details:
Binaural headset and Base set to transmit at high channel. Headset is charging. Call indicator attached and active. Phone line is connected.



| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | C052-XD1 and C054-XD1, 900 MHz Cordless Base Units | T-Log Number: | T105585 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | B |

Preliminary peak readings captured during pre-scan (peak readings vs. average limit)

| Frequency | Level | AC | Class B | | Detector | Comments |
|---|---|---|---|---|---|---|
| MHz | dBµV | Line | Limit | Margin | QP/Ave | |
| *0.154* | *47.1* | *Line 1* | *55.8* | *-8.7* | *Peak* | |
| *0.159* | *47.2* | *Line 1* | *55.5* | *-8.3* | *Peak* | |
| *0.480* | *40.4* | *Line 1* | *46.3* | *-5.9* | *Peak* | |
| *2.295* | *39.0* | *Line 1* | *46.0* | *-7.0* | *Peak* | |
| *5.401* | *36.7* | *Line 1* | *50.0* | *-13.3* | *Peak* | |
| *5.401* | *36.7* | *Line 1* | *50.0* | *-13.3* | *Peak* | |
| *14.218* | *33.0* | *Line 1* | *50.0* | *-17.0* | *Peak* | |
| *0.151* | *52.3* | *Neutral* | *56.0* | *-3.7* | *Peak* | |
| *0.171* | *52.0* | *Neutral* | *54.9* | *-2.9* | *Peak* | |
| *0.185* | *51.5* | *Neutral* | *54.3* | *-2.8* | *Peak* | |
| *0.483* | *40.2* | *Neutral* | *46.3* | *-6.1* | *Peak* | |
| *0.644* | *39.1* | *Neutral* | *46.0* | *-6.9* | *Peak* | |
| *2.376* | *40.3* | *Neutral* | *46.0* | *-5.7* | *Peak* | |
| *5.752* | *37.4* | *Neutral* | *50.0* | *-12.6* | *Peak* | |
| *15.120* | *35.1* | *Neutral* | *50.0* | *-14.9* | *Peak* | |

Final quasi-peak and average readings

| Frequency | Level | AC | Class B | | Detector | Comments |
|---|---|---|---|---|---|---|
| MHz | dBµV | Line | Limit | Margin | QP/Ave | |
| 2.283 | 34.6 | Line 1 | 56.0 | -21.4 | QP | QP (1.00s) |
| 0.658 | 34.0 | Neutral | 56.0 | -22.0 | QP | QP (1.00s) |
| 0.482 | 32.3 | Line 1 | 56.3 | -24.0 | QP | QP (1.00s) |
| 0.151 | 41.1 | Neutral | 65.9 | -24.8 | QP | QP (1.00s) |
| 0.153 | 40.7 | Line 1 | 65.8 | -25.1 | QP | QP (1.00s) |
| 2.375 | 30.9 | Neutral | 56.0 | -25.1 | QP | QP (1.00s) |
| 2.283 | 20.4 | Line 1 | 46.0 | -25.6 | AVG | AVG (0.10s) |
| 2.375 | 20.1 | Neutral | 46.0 | -25.9 | AVG | AVG (0.10s) |
| 0.658 | 20.0 | Neutral | 46.0 | -26.0 | AVG | AVG (0.10s) |
| 0.161 | 39.2 | Line 1 | 65.4 | -26.2 | QP | QP (1.00s) |
| 15.151 | 23.0 | Neutral | 50.0 | -27.0 | AVG | AVG (0.10s) |
| 0.171 | 37.9 | Neutral | 64.9 | -27.0 | QP | QP (1.00s) |
| 0.483 | 29.3 | Neutral | 56.3 | -27.0 | QP | QP (1.00s) |
| 0.184 | 36.6 | Neutral | 64.3 | -27.7 | QP | QP (1.00s) |
| 0.482 | 18.4 | Line 1 | 46.3 | -27.9 | AVG | AVG (0.10s) |
| 14.189 | 21.0 | Line 1 | 50.0 | -29.0 | AVG | AVG (0.10s) |
| 5.458 | 20.1 | Line 1 | 50.0 | -29.9 | AVG | AVG (0.10s) |

| | | | |
|---|---|---|---|
| Client: | Plantronics Inc. | Job Number: | JD105563 |
| Model: | C052-XD1 and C054-XD1, 900 MHz Cordless Base Units | T-Log Number: | T105585 |
| | | Project Manager: | Christine Krebill |
| Contact: | Bill Jones | Project Coordinator: | - |
| Standard: | FCC 15.247 / RSS-247 | Class: | B |

Cont - Final quasi-peak and average readings

| Frequency | Level | AC | Class B | | Detector | Comments |
|---|---|---|---|---|---|---|
| MHz | dBµV | Line | Limit | Margin | QP/Ave | |
| 5.458 | 29.9 | Line 1 | 60.0 | -30.1 | QP | QP (1.00s) |
| 0.483 | 15.7 | Neutral | 46.3 | -30.6 | AVG | AVG (0.10s) |
| 5.741 | 19.2 | Neutral | 50.0 | -30.8 | AVG | AVG (0.10s) |
| 15.151 | 29.1 | Neutral | 60.0 | -30.9 | QP | QP (1.00s) |
| 5.741 | 28.5 | Neutral | 60.0 | -31.5 | QP | QP (1.00s) |
| 14.189 | 27.5 | Line 1 | 60.0 | -32.5 | QP | QP (1.00s) |
| 0.171 | 19.3 | Neutral | 54.9 | -35.6 | AVG | AVG (0.10s) |
| 0.161 | 18.5 | Line 1 | 55.4 | -36.9 | AVG | AVG (0.10s) |
| 0.184 | 13.3 | Neutral | 54.3 | -41.0 | AVG | AVG (0.10s) |
| 0.153 | 14.7 | Line 1 | 55.8 | -41.1 | AVG | AVG (0.10s) |
| 0.151 | 14.8 | Neutral | 55.9 | -41.1 | AVG | AVG (0.10s) |

***End of Report***

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