

EMC Test Report**Application for FCC Grant of Equipment Authorization
Canada Certification****Innovation, Science and Economic Development Canada
RSS-Gen Issue 5 / RSS-247 Issue 2
FCC Part 15 Subpart C****Model: ARCN9004LTE**IC CERTIFICATION #: 4675A-ARCN9004LTE
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SCOPE

An electromagnetic emissions test has been performed on the Aruba, a Hewlett Packard Enterprise Company model ARCN9004LTE, pursuant to the following rules:

RSS-GEN Issue 5 “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 test procedures:

ANSI C63.10-2013
FCC DTS Measurement Guidance KDB558074

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.

National Technical Systems is accredited by the A2LA, certificate number 0214.26, to perform the test(s) listed in this report, except where noted otherwise.

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 Aruba, a Hewlett Packard Enterprise Company model ARCN9004LTE complied with the requirements of the following regulations:

RSS-GEN Issue 5 “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 Aruba, a Hewlett Packard Enterprise Company model ARCN9004LTE and therefore apply only to the tested sample. The sample was selected and prepared by Mark Hill of Aruba, a Hewlett Packard Enterprise Company.

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 (2400 – 2483.5MHz)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247(a)	RSS 247 5.2	Digital Modulation	Systems uses GFSK modulation	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	RSS 247 5.2 (1)	Min 6dB Bandwidth	701 kHz	>500kHz	Complies
15.247 (b) (3)	RSS 247 5.4 (4)	Output Power (multipoint systems)	7.1 dBm (0.005 Watts) EIRP = 0.002 W <small>Note 1</small>	1Watt, EIRP limited to 4 Watts.	Complies
15.247(e)	RSS 247 5.2 (2)	Power Spectral Density	Total power is less than 8 dBm	8dBm/3kHz	Complies
15.247(d)	RSS 247 5.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	All < -20 dBc	< -20dBc	Complies
15.247(d) / 15.209	RSS 247 5.5	Radiated Spurious Emissions 30MHz – 25 GHz	52.3 dBμV/m @ 12011.0 MHz (-1.7 dB)	Refer to the limits section (p19) for restricted bands, all others < -20dBc	Complies

Note 1: EIRP calculated using antenna gains of -4.0 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 4	AC Conducted Emissions	52.3 dBμV @ 0.152 MHz (margin: -13.6 dB)	Refer to page 19	Complies
15.247 (i) / 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in separate exhibit, RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
-	RSS-Gen 6.8	User Manual	Detachable antennas are only used for the Licensed cellular radio module	Statement for products with detachable antenna	Complies
-	RSS-Gen 8.4	User Manual	In Installaion Guide	Statement for all products	Complies
-	RSP-100 RSS-Gen 6.7	Occupied Bandwidth	1.07 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	± 0.52 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
Conducted emission of receiver	dBm	25 to 26500 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 26500 MHz	± 2.5 dB
Radiated emission (field strength)	dB μ V/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dB μ V	0.15 to 30 MHz	± 2.4 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Aruba, a Hewlett Packard Enterprise Company model ARCN9004LTE is a gateway that supports both SD-WAN and wireless LAN capabilities that is designed to control access points. It incorporates a BLE radio and a passive NFC tag feature. Since the EUT could be placed in any position during operation, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 12 Volts DC, 2.5 Amps. It is supplied with an AC adapter rated 100-240V, 50-60 Hz, 1.5 Amp.

The sample was received on November 12, 2019 and tested on November 12, 13, 14, 18 and December 26, 2019. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Aruba	ARCN9004LTE	Gateway	TWJ9KSP00D	Q9DARCN9004LTE
Aruba	DB-48A12	Power Supply	-	-

ANTENNA SYSTEM

The BLE antenna system consists of an integral PCB antenna.

OTHER EUT DETAILS

The EUT incorporates a Cellular transceiver module, Quectel EG25-G that uses three antennas connected to ports on the EUT.

ENCLOSURE

The EUT enclosure is primarily constructed of metal. It measures approximately 20 cm wide by 15 cm deep by 4 cm high.

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 during testing:

Company	Model	Description	Serial Number	FCC ID
Unknown	Unknown	USB Memory Stick	-	-
HP	Elitebook 745 G4	Laptop	5CG7296JK5	-
EMCO	3115	Horn Antenna	9504-4486	-

The following was used as remote support equipment during testing.

Company	Model	Description	Serial Number	FCC ID
Anritsu	MT8820C	Call Box	6201341856	-

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

EUT

Port	Connected To	Description	Cable(s)	
			Shielded or Unshielded	Length(m)
DC power	AC Adapter	Two wire	Unshielded	1.0
RJ45 Console	Laptop	Multiwire with USB adapter	Shielded and Unshielded	2.5
Eth0	Eth1	Cat 5	Unshielded	1.5
Eth2	Eth3	Cat 5	Unshielded	1.0
USB	Memory Stick	Multiwire	Shielded	1.0
μUSB console	Not connected	-	-	-
AC Adapter Power	Mains	Three wire	Unshielded	1.6

EUT OPERATION

During emissions testing the EUT was set to transmit a continuous modulated signal at the selected power and frequency. The LTE module was communicating with the call box at maximum RF power. LAN ports were passing traffic using internal diagnostics.

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 6.2 of RSS-GEN, NTS has been recognized as an accredited test laboratory by the Commission and Innovation, Science and Economic Development Canada. A description of the facilities employed for testing is maintained by NTS.

Site	Company / Registration Numbers		Location
	FCC	Canada	
Chamber 3	US1031	2845B (Wireless Test Lab #US0027)	41039 Boyce Road Fremont, CA 94538-2435
Chamber 4			
Chamber 5			
Chamber 7			

ANSI C63.4 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. Results from testing performed in this chamber have been correlated with results from an open area test site. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.10. 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 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4.

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 1000MHz 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 fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH 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 specifies that the test height above ground for table mounted devices shall be 80 centimeters for testing below 1 GHz and 1.5m for testing above 1 GHz. 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. 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, 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.

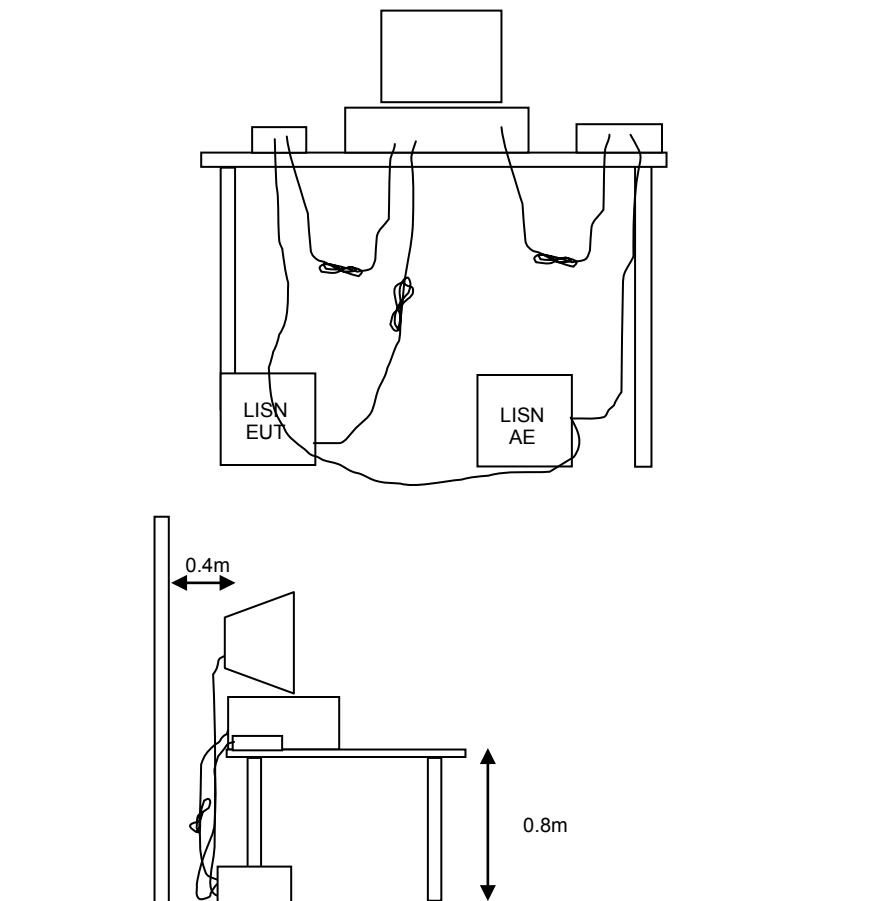


Figure 1 Typical Conducted Emissions Test Configuration

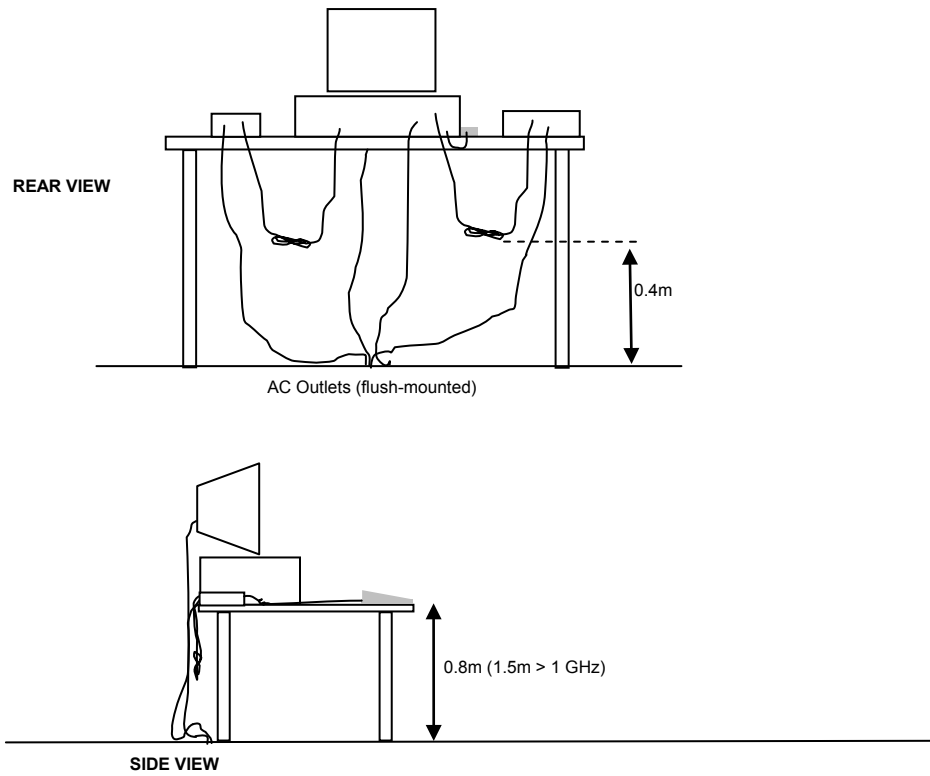
RADIATED EMISSIONS

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.

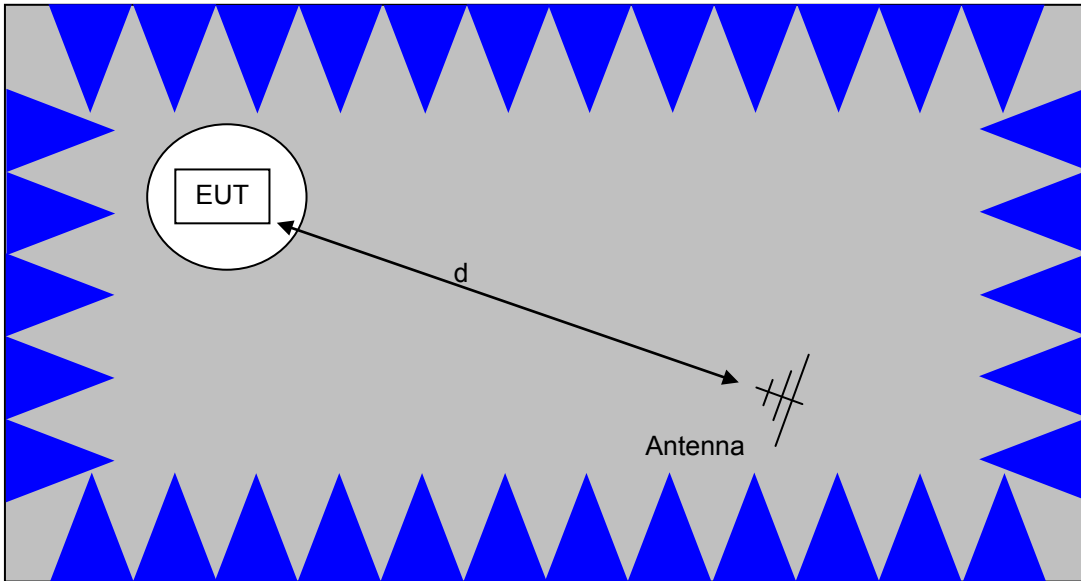
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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 1m). 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.

When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

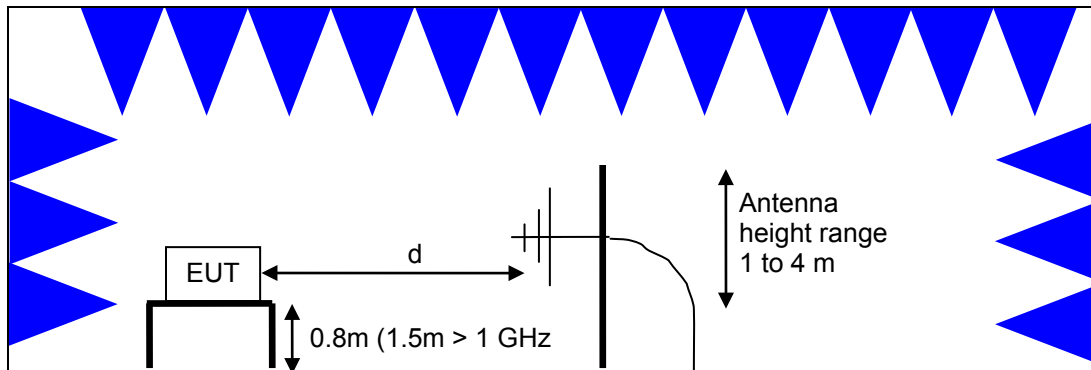


Typical Test Configuration for Radiated Field Strength Measurements



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.

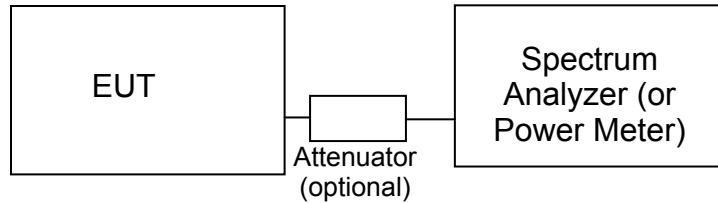
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



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

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 (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/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; 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 (dBuV)	Quasi Peak Limit (dBuV)
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 bands¹.

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/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

¹ The restricted bands are detailed in FCC 15.205 and RSS-Gen Table 7

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/3kHz
2400 – 2483.5	1 Watt (30 dBm)	8 dBm/3kHz
5725 – 5850	1 Watt (30 dBm)	8 dBm/3kHz

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. For FCC, fixed point to point applications using the 2400-2483.5 MHz band may use antennas with more than 6 dBi gain but output power is reduced by 1 dB for every 3dB that the antenna gain exceeds 6 dBi. For Canada, fixed point-to-point applications using the 2400-2483.5 MHz band are not subject to this restriction. Fixed point-to-point applications using the 5725 – 5850 MHz band are also not subject to this restriction. Certification of DTS systems operating in the 5725-5850 MHz band is no longer allowed under FCC Rules per §15.37(h).

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 GEN. All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level (30dB 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 dBuV

S = Specification Limit in dBuV

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 30MHz, is calculated by using the following formula:

$$F_d = 20 * \text{LOG}_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

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

$$F_d = 40 * \text{LOG}_{10} (D_m/D_s)$$

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 dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of d (meters) from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{d} \quad \text{microvolts per meter}$$

where P is the eirp (Watts)

For a measurement at 3m the conversion from a logarithmic value for field strength (dBuV/m) to an eirp power (dBm) is -95.3dB.

Appendix A Test Equipment Calibration Data

Radiated Emissions, - 30 - 25,000 MHz, 12,13, and 14-Nov-19

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Calibrated</u>	<u>Cal Due</u>
Hewlett Packard	Spectrum Analyzer (Blue)	8564E (84125C)	WC055592	12/8/2018	12/8/2019
Hewlett Packard	Microwave Preamplifier Head, 18-40 GHz (Blue)	84125C EMI Test Head	WC055663	1/9/2019	1/9/2020
EMCO	Antenna, Horn, 1-18 GHz (SA40-Blu)	3115	WC064442	10/8/2018	10/8/2020
Hewlett Packard	High Pass filter, 3.5 GHz	84300-80038	WC064495	7/25/2019	7/25/2020
Hewlett Packard	Microwave Preamplifier, 1- 26.5GHz	8449B	WC064498	7/18/2019	7/18/2020
A. H. Systems	Antenna, Horn, 18-40GHz	SAS-574	WC064553	9/5/2017	8/8/2020
Rohde & Schwarz	EMI test receiver	ESI 40	WC068000	3/15/2019	3/15/2020
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	WC064454	3/11/2019	3/11/2021

Radio Antenna Port (Power and Spurious Emissions), 18-Nov-19

Rohde & Schwarz	Spectrum Analyzer	FSQ26	WC055662	7/4/2019	7/4/2020
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Conducted Emissions - Telecom and AC Power Ports, 18-Nov-19

National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
EMCO	LISN, 10 kHz-100 MHz	3825/2	WC064399	7/24/2019	7/24/2020
Rohde & Schwarz	EMI test receiver	ESI 40	WC068000	3/15/2019	3/15/2020
Teseq	ISN T8	ISN T8-Cat6	WC068004	4/23/2019	4/23/2020
Rohde & Schwarz	Pulse Limiter	ESH3-Z2	WC072357	6/24/2019	6/24/2020

Conducted Emissions - AC Power Ports, 26-Dec-19

National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
Anritsu Wiltron	LTE radio communications analyzer generator OTA	MT8820C	WC062407	9/10/2019	9/10/2020
EMCO	LISN, 10 kHz-100 MHz	3825/2	WC064407	6/13/2019	6/13/2020
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	WC064432	9/18/2018	9/18/2020
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	WC064445	12/2/2019	12/2/2020
Rohde & Schwarz	EMI Test Receiver, 20 Hz- 7 GHz	ESIB 7	WC064989	11/4/2019	11/4/2020



Appendix B Test Data

TL107760-RA NA Pages 25 – 64



EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	PR Number:	PR107760
Product:	ARC9004LTE	T-Log Number:	TL107760-RA
System Configuration:		Project Manager:	Christine Krebill
Contact:	Mark Hill	Project Engineer:	David Bare
Emissions Standard(s):	FCC 15.247, RSS-247	Class:	-
Immunity Standard(s):	-	Environment:	Radio

EMC Test Data

For The

Aruba, a Hewlett Packard Enterprise company

Product

ARC9004LTE

Date of Last Test: 11/18/2019



EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	PR Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
		Project Manager:	Christine Krebill
Contact:	Mark Hill	Project Engineer:	David Bare
Standard:	FCC 15.247, RSS-247	Class:	-

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: 12/26/2019
 Test Engineer: Mehran Birgani
 Test Location: Fremont Chamber #5

Config. Used: 1
 Config Change: Communication test set was local
 EUT Voltage: 120V/ 60Hz

General Test Configuration

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

Ambient Conditions: Temperature: 20-22 °C
 Rel. Humidity: 36-40 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 120V/60Hz (LTE LINK)	Class B	Pass	52.3 dBµV @ 0.152 MHz (margin: -13.6 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

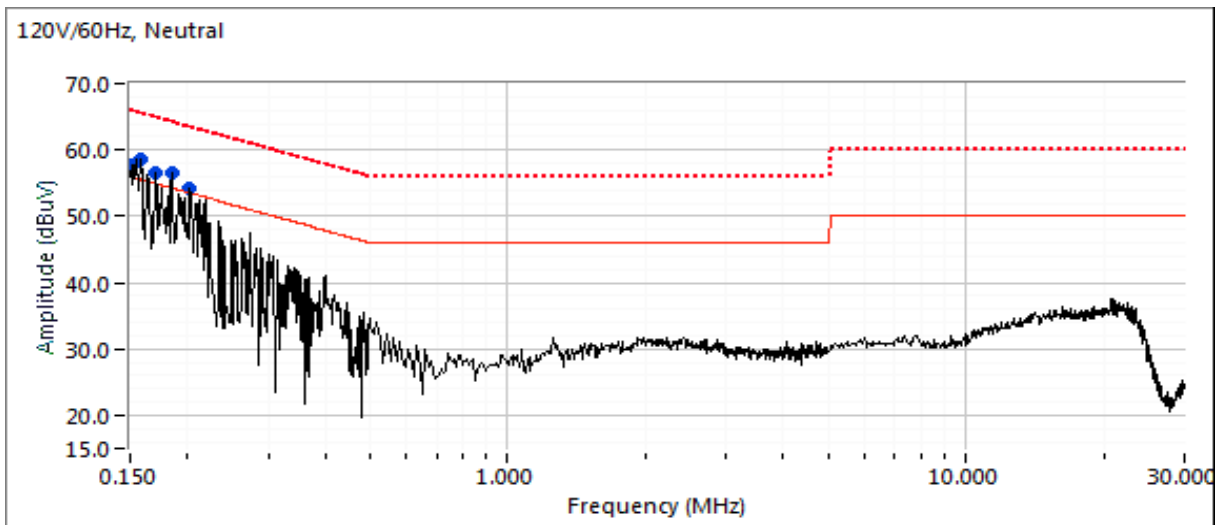
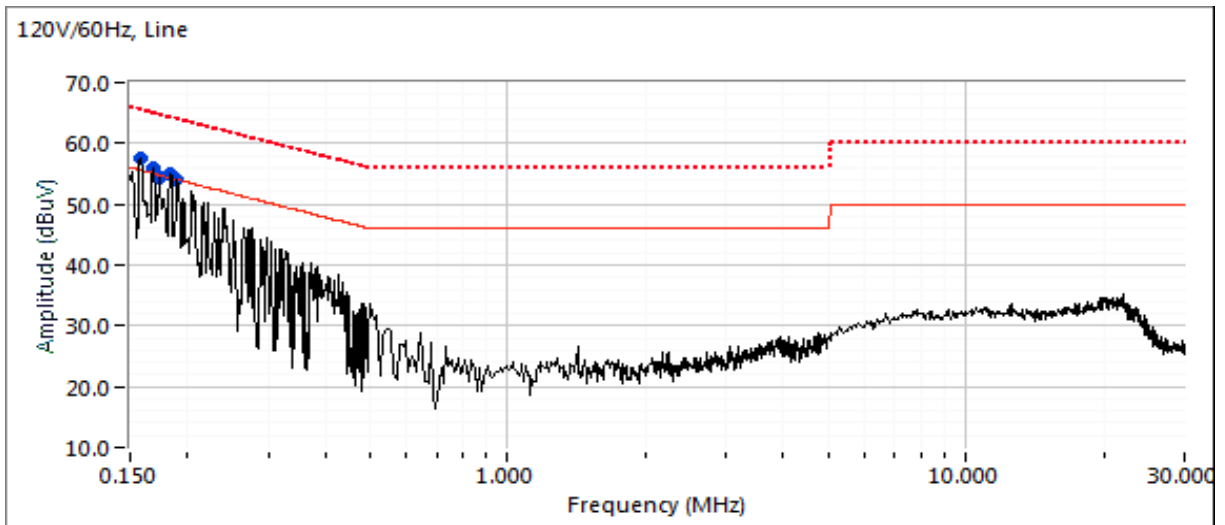
No deviations were made from the requirements of the standard.



EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	PR Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Engineer:	David Bare
		Class:	-

Run #1: AC Power Port Conducted Emissions, 0.15 - 30 MHz, 120V/60Hz (LTE LINK, Bluetooth, GNSS and LAN Active)





EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	PR Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Engineer:	David Bare
		Class:	-

Run #1: AC Power Port Conducted Emissions, 0.15 - 30 MHz, 120 V/60 Hz (LTE LINK, Bluetooth, GNSS and LAN Active)

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

Frequency MHz	Level dB μ V	AC Line	Class B		Detector QP/Ave	Comments
			Limit	Margin		
0.158	57.7	Line	55.6	2.1	Peak	
0.168	56.1	Line	55.0	1.1	Peak	
0.184	55.0	Line	54.3	0.7	Peak	
0.174	54.3	Line	54.8	-0.5	Peak	
0.190	53.9	Line	54.0	-0.1	Peak	
0.152	57.7	Neutral	55.9	1.8	Peak	
0.158	58.5	Neutral	55.5	3.0	Peak	
0.170	56.6	Neutral	54.9	1.7	Peak	
0.184	56.4	Neutral	54.3	2.1	Peak	
0.203	54.1	Neutral	53.5	0.6	Peak	

Final quasi-peak and average readings

Frequency MHz	Level dB μ V	AC Line	Class B		Detector QP/Ave	Comments
			Limit	Margin		
0.152	52.3	Neutral	65.9	-13.6	QP	QP (1.00s)
0.159	51.6	Neutral	65.5	-13.9	QP	QP (1.00s)
0.157	51.5	Line	65.6	-14.1	QP	QP (1.00s)
0.170	50.3	Neutral	65.0	-14.7	QP	QP (1.00s)
0.174	49.9	Line	64.8	-14.9	QP	QP (1.00s)
0.168	50.0	Line	65.1	-15.1	QP	QP (1.00s)
0.185	48.0	Line	64.3	-16.3	QP	QP (1.00s)
0.185	48.0	Neutral	64.3	-16.3	QP	QP (1.00s)
0.190	47.3	Line	64.0	-16.7	QP	QP (1.00s)
0.203	46.2	Neutral	63.5	-17.3	QP	QP (1.00s)
0.152	33.4	Neutral	55.9	-22.5	AVG	AVG (0.10s)
0.159	32.4	Neutral	55.5	-23.1	AVG	AVG (0.10s)
0.157	31.7	Line	55.6	-23.9	AVG	AVG (0.10s)
0.170	31.1	Neutral	55.0	-23.9	AVG	AVG (0.10s)
0.168	30.1	Line	55.1	-25.0	AVG	AVG (0.10s)
0.174	29.8	Line	54.8	-25.0	AVG	AVG (0.10s)
0.185	27.4	Neutral	54.3	-26.9	AVG	AVG (0.10s)
0.185	26.9	Line	54.3	-27.4	AVG	AVG (0.10s)
0.190	25.9	Line	54.0	-28.1	AVG	AVG (0.10s)
0.203	25.3	Neutral	53.5	-28.2	AVG	AVG (0.10s)



EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
		Project Manager:	Christine Krebill
Contact:	Mark Hill	Project Coordinator:	David Bare
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: 11/18/2019
 Test Engineer: Rafael Varelas
 Test Location: FT Lab #3

Config. Used: 1
 Config Change: None
 EUT Voltage: 110V/60Hz

General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator.
 All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 23.8 °C
 Rel. Humidity: 42 %

Summary of Results

Run #	Pwr setting	Test Performed	Limit	Pass / Fail	Result / Margin
1	8	Output Power	15.247(b)	Pass	7.1 dBm
2	8	Power spectral Density (PSD)	15.247(d)	Pass	> 8 dBm
3	8	Minimum 6dB Bandwidth	15.247(a)	Pass	701 kHz
3	8	99% Bandwidth	RSS GEN	-	1.07 MHz
4	8	Spurious emissions	15.247(b)	Pass	All < -20 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.

Procedure Comments:

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

Sample Notes

Sample S/N: TWJ9KSP00D
 EUT Software Build: ArubaOS_90xx_8.7.0.0-mm-dev.new_mm-dev_9004lte_compliance and radio_test_pca10056-Aruba
 Antenna: Maglayer



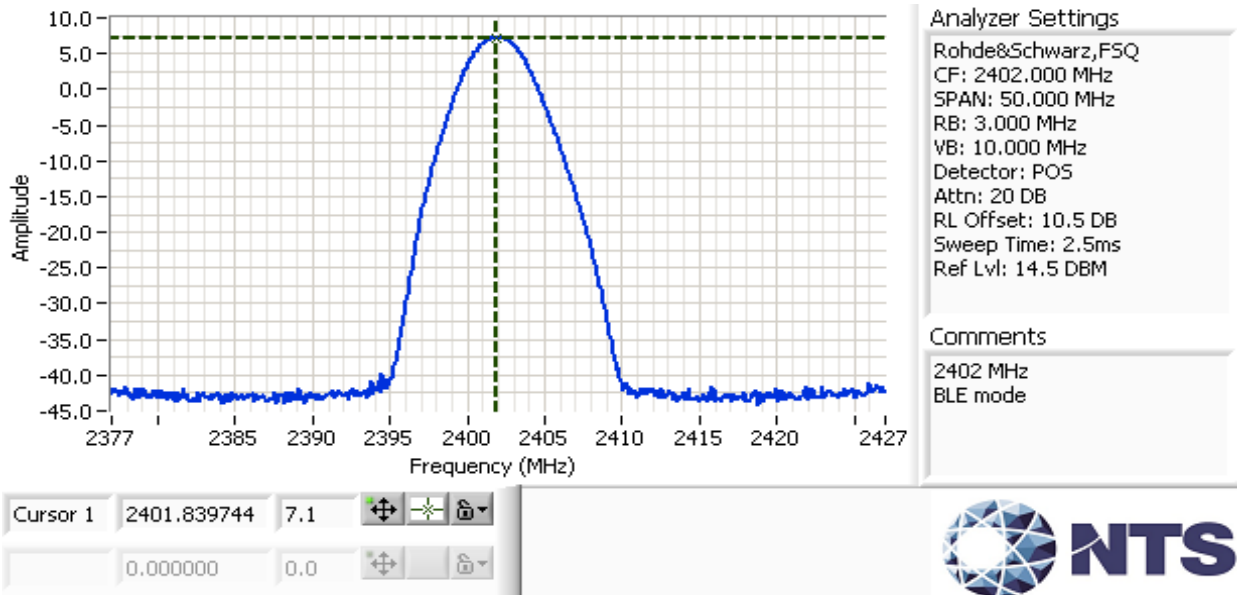
EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Run #1: Output Power

Power Setting ²	Frequency (MHz)	Output Power		Antenna Gain (dBi)	Result	EIRP		Output Power	
		(dBm) ¹	mW			dBm	W	(dBm) ³	mW
8	2402	7.1	5.1	-6.2	Pass	0.9	0.00123		
8	2450	7.1	5.1	-4.0	Pass	3.1	0.00204		
8	2480	6.9	4.9	-4.4	Pass	2.5	0.00178		

- Note 1: Duty Cycle ≥ 98%. Output power measured using a spectrum analyzer (see plots below) with RBW > OBW, VBW ≥ 3* RBW, Span ≥ 1.5 of OBW, auto sweep time, Peak detector.
- Note 2: Power setting - the software power setting used during testing, included for reference only.
- Note 3: Power measured using average power meter (non-gated), if requested and is included for reference only.



Run #2: Power spectral Density
 Power less than 8 dBm, no separate PSD test required



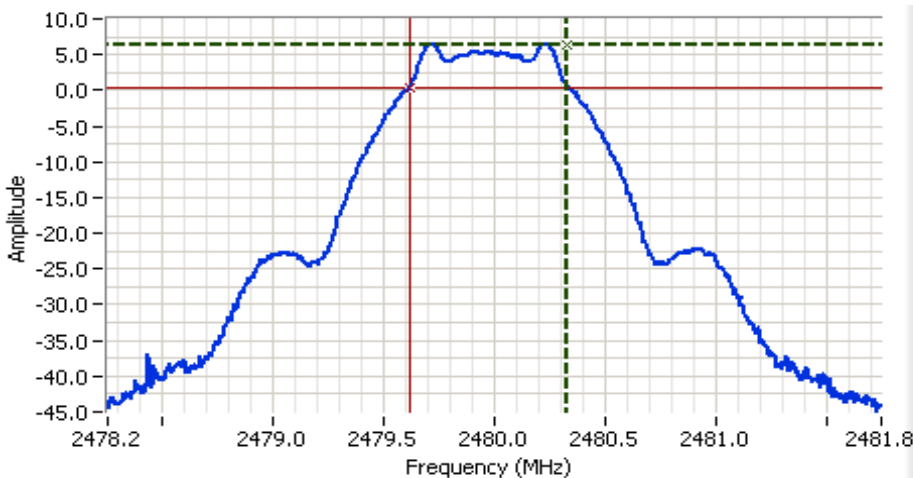
EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Run #3: Signal Bandwidth

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (MHz)	
		6dB	99%	6dB	99%
8	2402	0.707	1.06	0.1	0.05
8	2440	0.712	1.06	0.1	0.05
8	2480	0.701	1.07	0.1	0.05

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



Analyzer Settings

Rohde&Schwarz,FSQ
 CF: 2480.000 MHz
 SPAN: 3.500 MHz
 RB: 100 kHz
 VB: 300 kHz
 Detector: POS
 Attn: 20 DB
 RL Offset: 10.5 DB
 Sweep Time: 2.5ms
 Ref Lvl: 14.5 DBM

Comments

6dB BW: 707 kHz

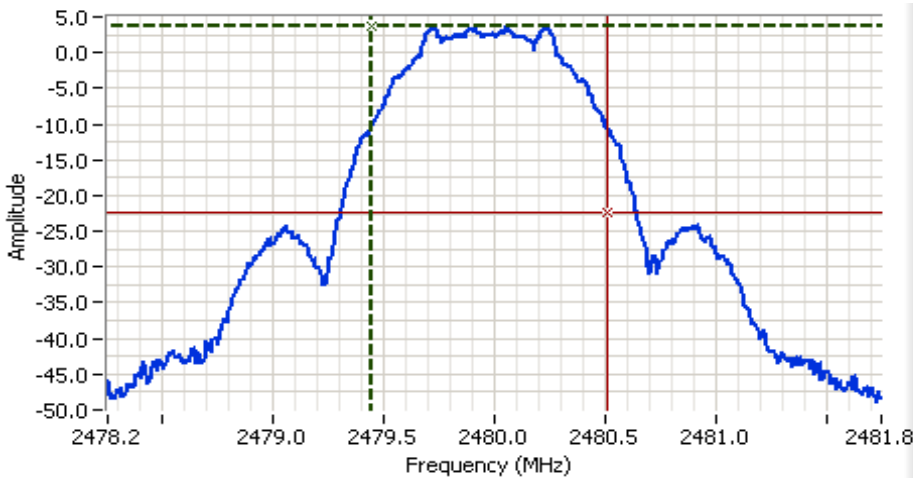
Cursor 1	2480.325321	6.5		Delta Freq.	707 kHz
Cursor 2	2479.618590	0.5		Delta Amplitude	6.0





EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A



Analyzer Settings
Rohde&Schwarz,FSQ
CF: 2480.000 MHz
SPAN: 3.500 MHz
RB: 50.0 kHz
VB: 200 kHz
Detector: POS
Attn: 20 DB
RL Offset: 10.5 DB
Sweep Time: 2.5ms
Ref Lvl: 14.5 DBM

Comments
99% BW: 1.070 MHz

Cursor 1	2479.442800	3.7		Delta Freq.	1.070
Cursor 2	2480.512400	-22.3		Delta Amplitude	26.0





EMC Test Data

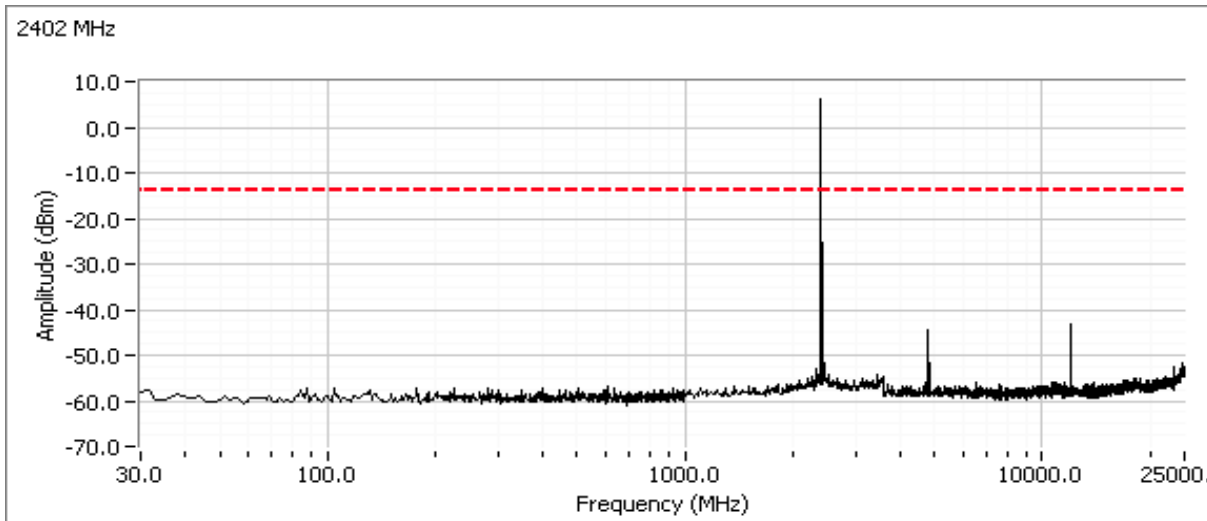
Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Run #4: Out of Band Spurious Emissions

Frequency (MHz)	Power Setting		Limit	Result
2402	8		-20dBc	Pass
2450	8		-20dBc	Pass
2480	8		-20dBc	Pass

RBW = 100 kHz and VBW = 300 kHz for all plots.

Plots for low channel

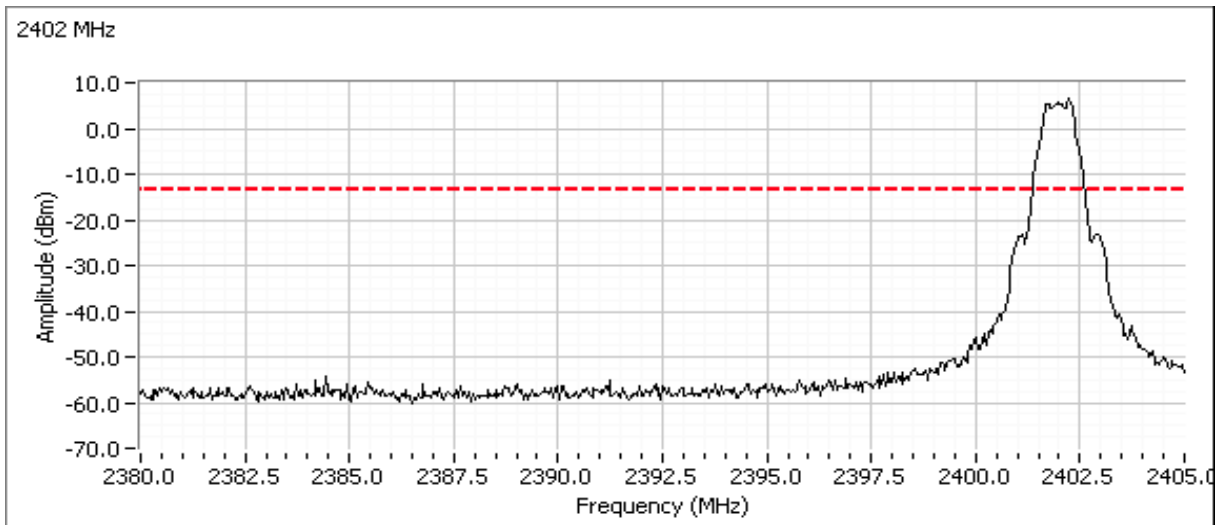




EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Additional plot showing compliance with -20dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.

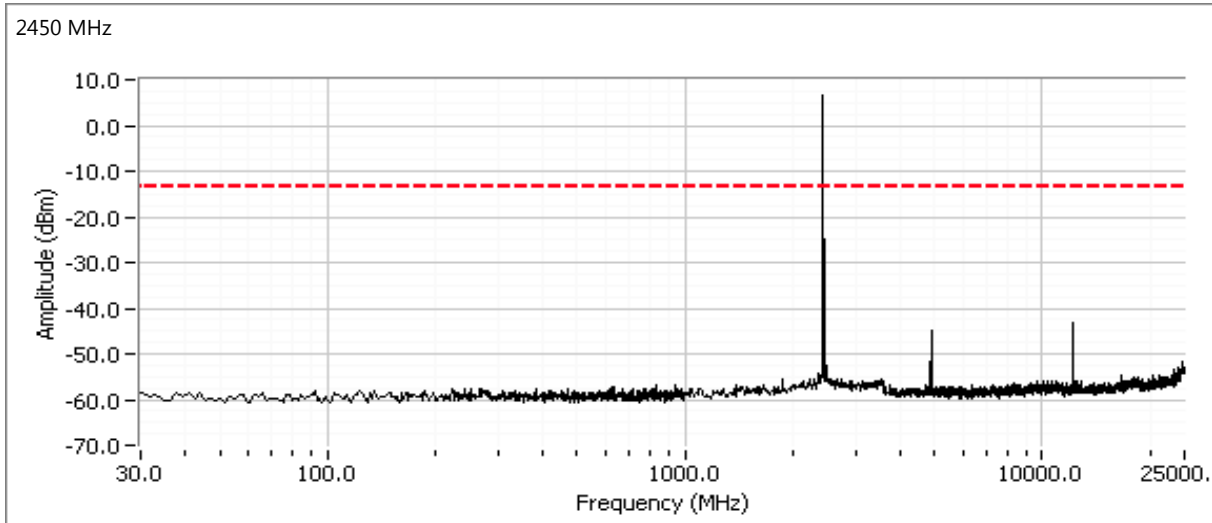




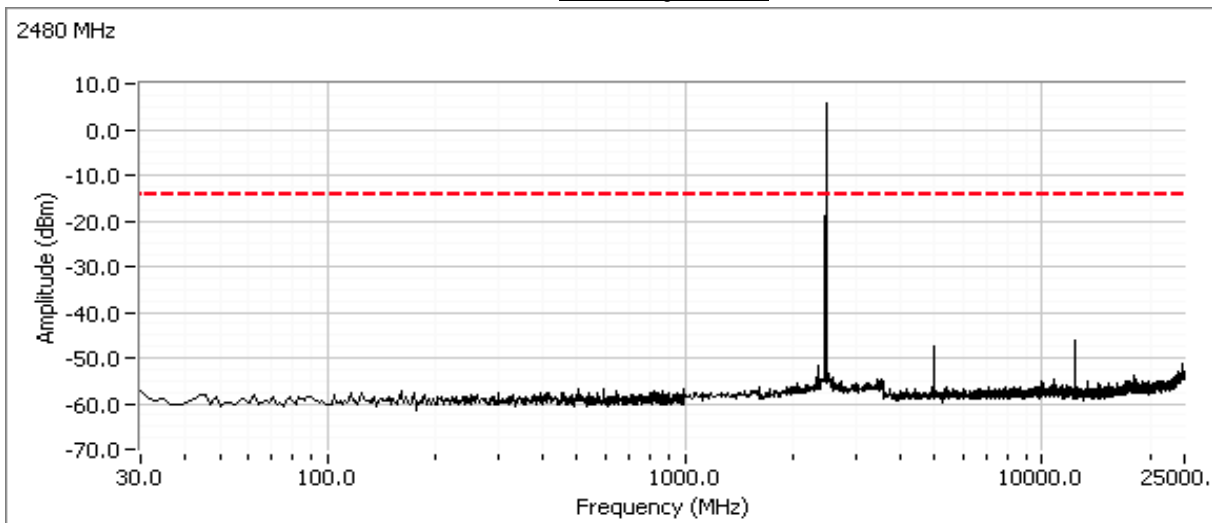
EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Plots for center channel



Plots for high channel





EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		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: 22.3 °C
Rel. Humidity: 38 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	Power Setting	Test Performed	Limit	Result / Margin
1	BLE	37 - 2402MHz	8	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	40.0 dBµV/m @ 2388.7 MHz (-14.0 dB)
	BLE	39 - 2480MHz	8	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	40.8 dBµV/m @ 2500.0 MHz (-13.2 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.

Sample Notes

Sample S/N: TWJ9KSP00D
EUT Software Build: ArubaOS_90xx_8.7.0.0-mm-dev.new_mm-dev_9004lte_compliance and radio_test_pca10056-Aruba
Antenna: Maglayer

Test Notes

BLE and LTE Band 30



EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074

Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time

Unless otherwise stated/noted, emission has a duty cycle $\geq 98\%$ and average was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
BLE	1 Mb/s	1.00	Yes	0	0	0	10



EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Run #1: Radiated Bandedge Measurements

Date of Test: 11/14/2019

Config. Used: 1

Test Engineer: Rafael Varelas

Config Change: None

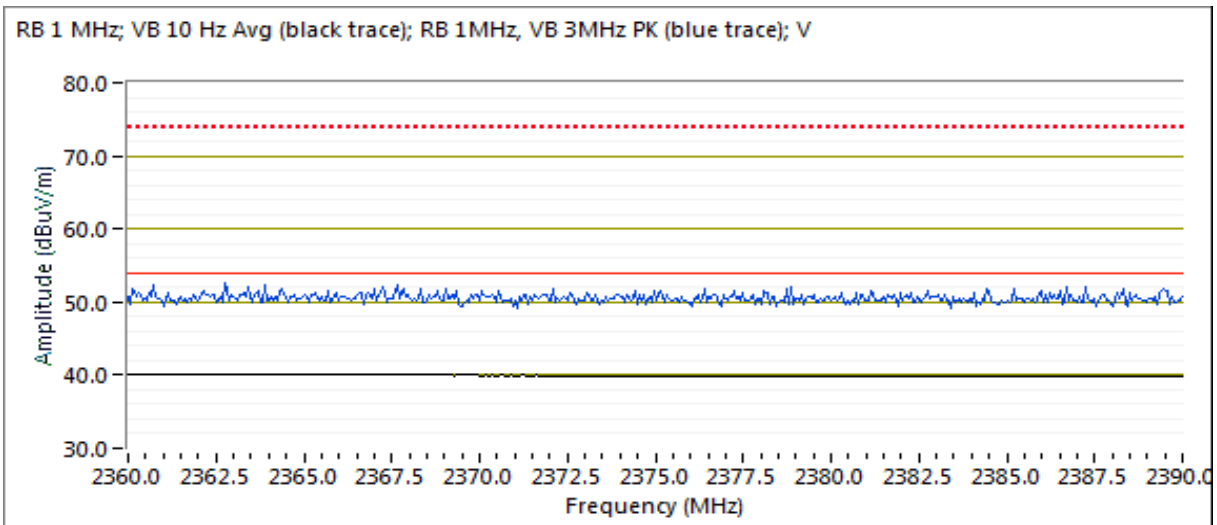
Test Location: Fremont Chamber #7

EUT Voltage: 110V/60Hz

Channel: 37 Mode: BLE
 Channel: 27735 (Uplink) Mode: LTE (Band 30)

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2388.660	40.0	V	54.0	-14.0	AVG	336	1.0	POS; RB 1 MHz; VB: 10 Hz
2389.900	53.5	V	74.0	-20.5	PK	336	1.0	POS; RB 1 MHz; VB: 3 MHz





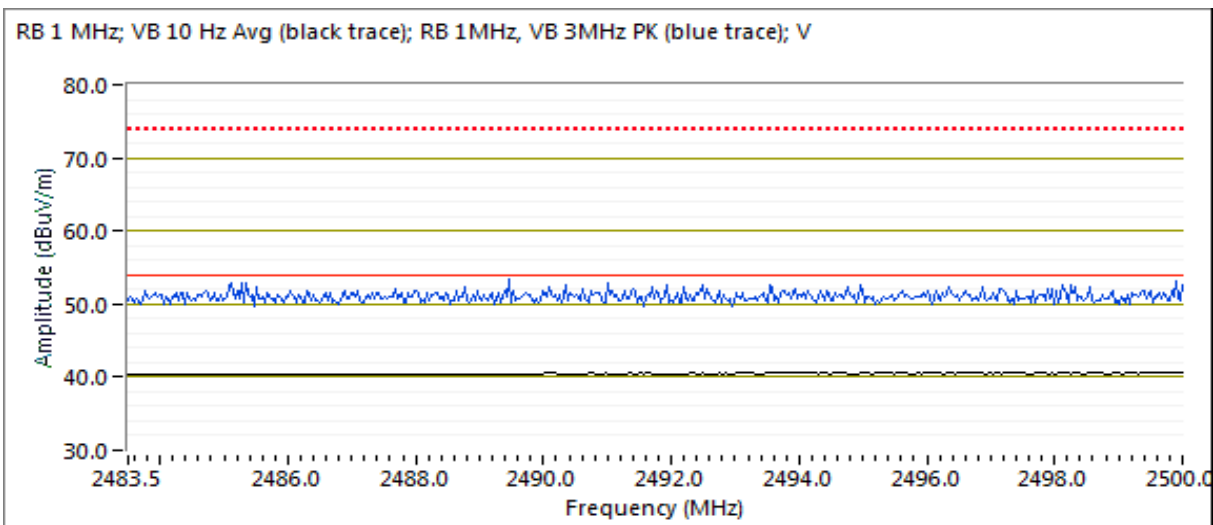
EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Channel: 39 Mode: BLE
 Channel: 27735 (Uplink) Mode: LTE (Band 30)

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2500.000	40.8	V	54.0	-13.2	AVG	27	1.0	POS; RB 1 MHz; VB: 10 Hz
2497.490	53.2	V	74.0	-20.8	PK	27	1.0	POS; RB 1 MHz; VB: 3 MHz





EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		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: 23.4 °C
Rel. Humidity: 41 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	Power Setting	Test Performed	Limit	Result / Margin
1	BLE	37 - 2402MHz	8	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	34.0 dBµV/m @ 2389.7 MHz (-20.0 dB)
	BLE	39 - 2480MHz	8	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	35.6 dBµV/m @ 2500.0 MHz (-18.4 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.

Sample Notes

Sample S/N: TWJ9KSP00D
EUT Software Build: ArubaOS_90xx_8.7.0.0-mm-dev.new_mm-dev_9004lte_compliance and radio_test_pca10056-Aruba
Antenna: Maglayer

Test Notes

BLE and LTE Band 4



EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074

Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time

Unless otherwise stated/noted, emission has a duty cycle $\geq 98\%$ and average was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
BLE	1 Mb/s	1.00	Yes	0	0	0	10



EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Run #1: Radiated Bandedge Measurements

Date of Test: 11/12/2019

Test Engineer: Rafael Varelas

Test Location: Fremont Chamber #7

Config. Used: 1

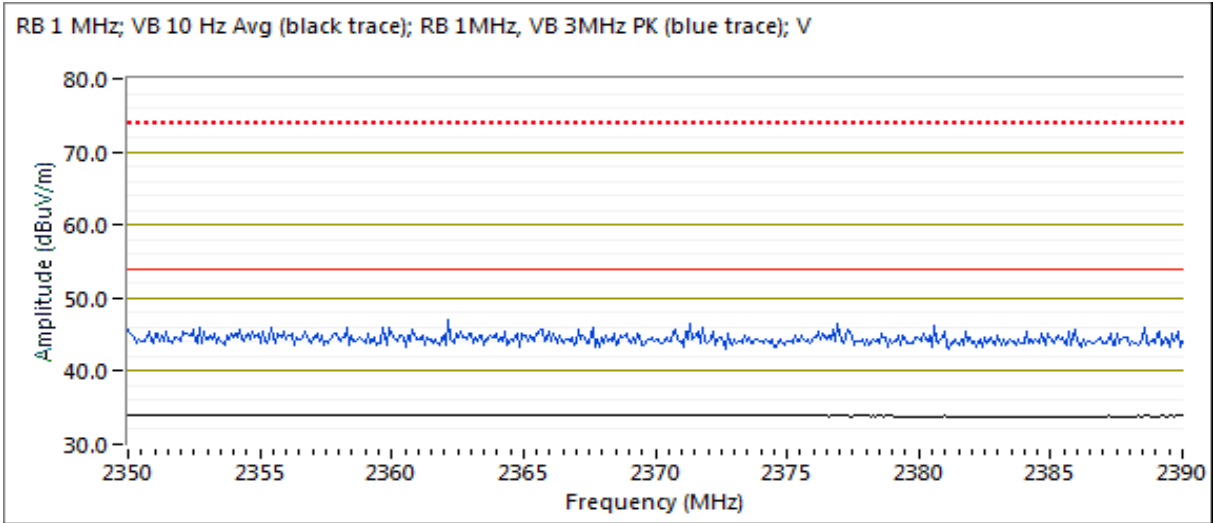
Config Change: None

EUT Voltage: 110V/60Hz

Channel: 37 Mode: BLE
 Channel: 20175 (Uplink) Mode: LTE (Band 4)

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.720	34.0	V	54.0	-20.0	AVG	129	1.9	POS; RB 1 MHz; VB: 10 Hz
2389.380	34.0	H	54.0	-20.0	AVG	326	1.0	POS; RB 1 MHz; VB: 10 Hz
2388.380	47.5	V	74.0	-26.5	PK	129	1.9	POS; RB 1 MHz; VB: 3 MHz
2389.380	47.1	H	74.0	-26.9	PK	326	1.0	POS; RB 1 MHz; VB: 3 MHz





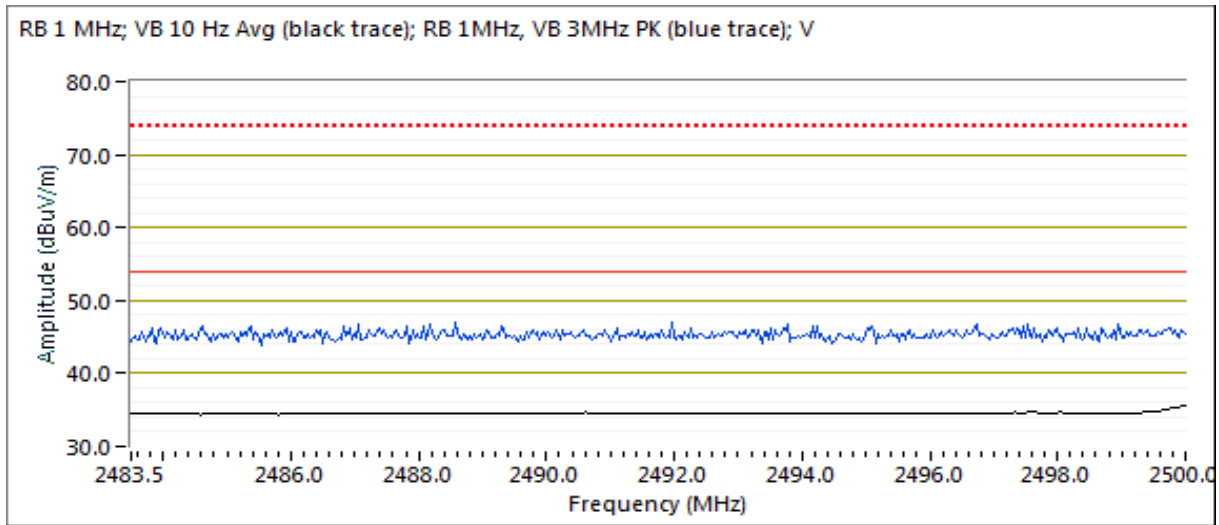
EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Channel: 39 Mode: BLE
 Channel: 20175 (Uplink) Mode: LTE (Band 4)

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
2500.000	35.6	V	54.0	-18.4	AVG	15	1.0	POS; RB 1 MHz; VB: 10 Hz
2483.500	35.1	H	54.0	-18.9	AVG	347	1.0	POS; RB 1 MHz; VB: 10 Hz
2490.340	48.4	H	74.0	-25.6	PK	347	1.0	POS; RB 1 MHz; VB: 3 MHz
2499.980	48.2	V	74.0	-25.8	PK	15	1.0	POS; RB 1 MHz; VB: 3 MHz





EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		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:	23.4 °C
Rel. Humidity:	41 %

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.



EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	LTE Band Uplink	Power Setting	Test Performed	Limit	Result / Margin
1	BLE	37 2402MHz	4 20175	8	Radiated Emissions, 30 MHz - 25 GHz	FCC Part 15.209 / 15.247(c)	52.3 dBµV/m @ 12011.0 MHz (-1.7 dB)
	BLE	17 2440MHz	5 20525	8	Radiated Emissions, 30 MHz - 25 GHz	FCC Part 15.209 / 15.247(c)	50.0 dBµV/m @ 4879.8 MHz (-4.0 dB)
	BLE	39 2480MHz	4 20175	8	Radiated Emissions, 30 MHz - 25 GHz	FCC Part 15.209 / 15.247(c)	44.4 dBµV/m @ 12398.7 MHz (-9.6 dB)
	BLE	37 2402MHz	30 27710	8	Radiated Emissions, 30 MHz - 25 GHz	FCC Part 15.209 / 15.247(c)	43.6 dBµV/m @ 960.13 MHz (-10.4 dB)
	BLE	37 2402MHz	30 27735	8	Radiated Emissions, 30 MHz - 25 GHz	FCC Part 15.209 / 15.247(c)	36.0 dBµV/m @ 247.72 MHz (-10.0 dB)

Sample Notes

Sample S/N: TWJ9KSP00D

EUT Software Build: ArubaOS_90xx_8.7.0.0-mm-dev.new_mm-dev_9004lte_compliance and radio_test_pca10056-Aruba

Antenna: Maglayer



EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
		Project Manager:	Christine Krebill
Contact:	Mark Hill	Project Coordinator:	David Bare
Standard:	FCC 15.247, RSS-247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074

Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time

Unless otherwise stated/noted, emission has duty cycle $\geq 98\%$ and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
BLE	1 Mb/s	1.00	Yes	0	0	0	10

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 3:	Emission has a duty cycle $\geq 98\%$, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 4:	Emission has constant duty cycle $< 98\%$, average measurement performed: RBW=1MHz, VBW $> 1/T$ but not less than 10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear voltage correction factor
Note 5:	Emission has constant duty cycle $< 98\%$, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Emission has non constant duty cycle $< 98\%$, average measurement performed: RBW=1MHz, VBW $> 1/T$, peak detector, linear average mode, sweep time auto, max hold. Max hold for $50*(1/DC)$ traces
Note 7:	Emission has non constant duty cycle $< 98\%$, average measurement performed: RBW=1MHz, VBW $> 1/T$, RMS detector, sweep time auto, max hold. Max hold for $50*(1/DC)$ traces



EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Run #1: Radiated Spurious Emissions, 30 - 25,000 MHz.

Date of Test: 11/12-14/2019

Config. Used: 1

Test Engineer: Rafael Varelas; M. Birgani

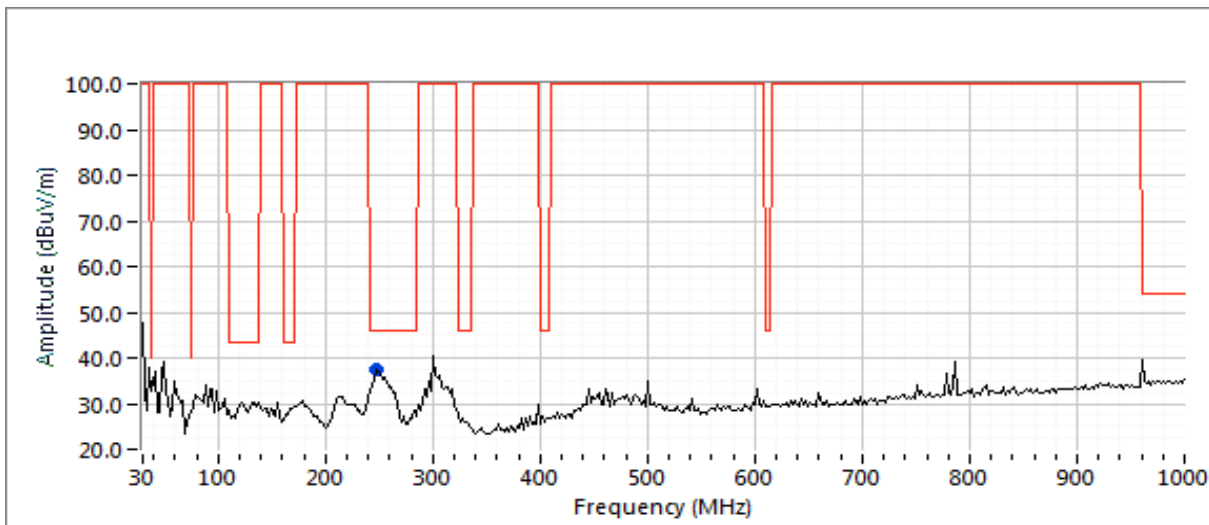
Config Change: -

Test Location: Fremont Chamber #7

EUT Voltage: 110V/60Hz

Run #1a: Channel: 37 Mode: BLE
 Channel: 20175 (Uplink) Mode: LTE (Band 4)

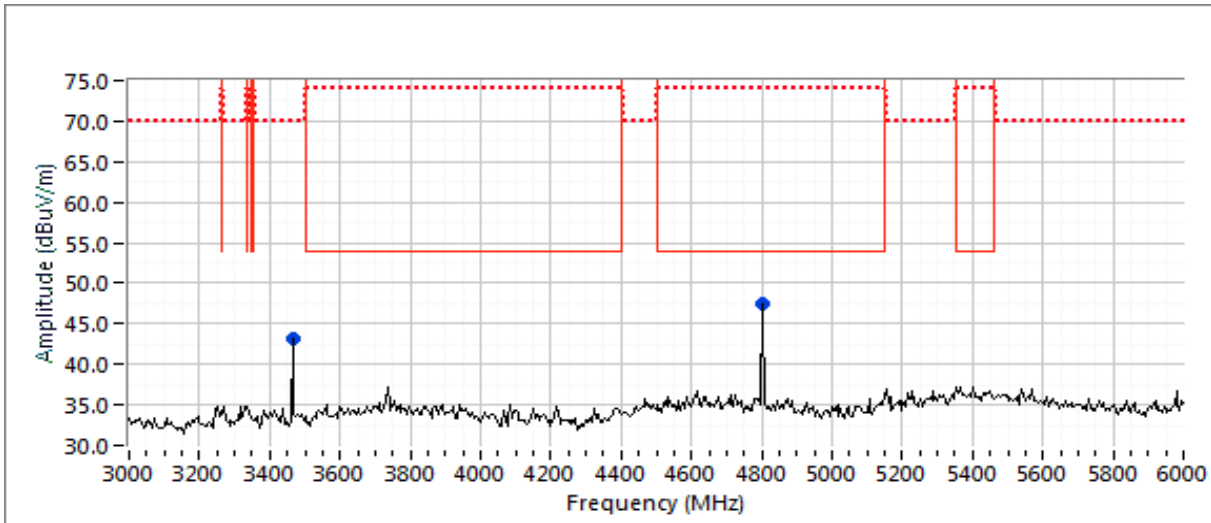
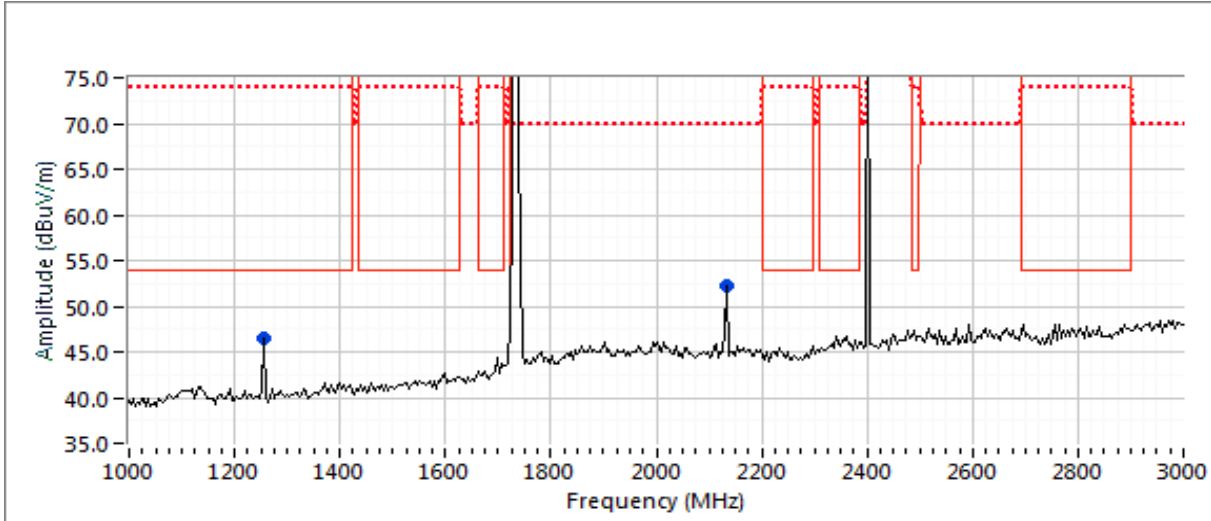
Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
248.448	34.3	H	46.0	-11.7	QP	3	1.0	QP (1.00s)
1256.950	64.2	V	74.0	-9.8	PK	319	1.0	POS; RB 1 MHz; VB: 3 MHz
1257.160	33.5	V	54.0	-20.5	AVG	319	1.0	POS; RB 1 MHz; VB: 10 Hz
1732.500	115.5	V	-	-	Peak	170	1.0	LTE Uplink (Band 4)
2132.500	52.3	V	-	-	Peak	73	1.5	LTE Downlink (Band 4)
2402.000	86.7	H	-	-	Peak	13	1.0	BLE Fundamental
3464.800	41.2	V	54.0	-12.8	AVG	17	1.0	RB 1 MHz;VB 10 Hz;Peak
3464.810	50.1	V	74.0	-23.9	PK	17	1.0	RB 1 MHz;VB 3 MHz;Peak
4803.450	50.4	V	74.0	-23.6	PK	336	1.7	RB 1 MHz;VB 3 MHz;Peak
4804.000	44.0	V	54.0	-10.0	AVG	336	1.7	RB 1 MHz;VB 10 Hz;Peak
12008.650	46.3	V	54.0	-7.7	AVG	339	1.0	RB 1 MHz;VB 10 Hz;Peak
12009.320	57.5	V	74.0	-16.5	PK	339	1.0	RB 1 MHz;VB 3 MHz;Peak
12011.010	52.3	H	54.0	-1.7	AVG	355	1.0	RB 1 MHz;VB 10 Hz;Peak
12011.060	61.2	H	74.0	-12.8	PK	355	1.0	RB 1 MHz;VB 3 MHz;Peak





EMC Test Data

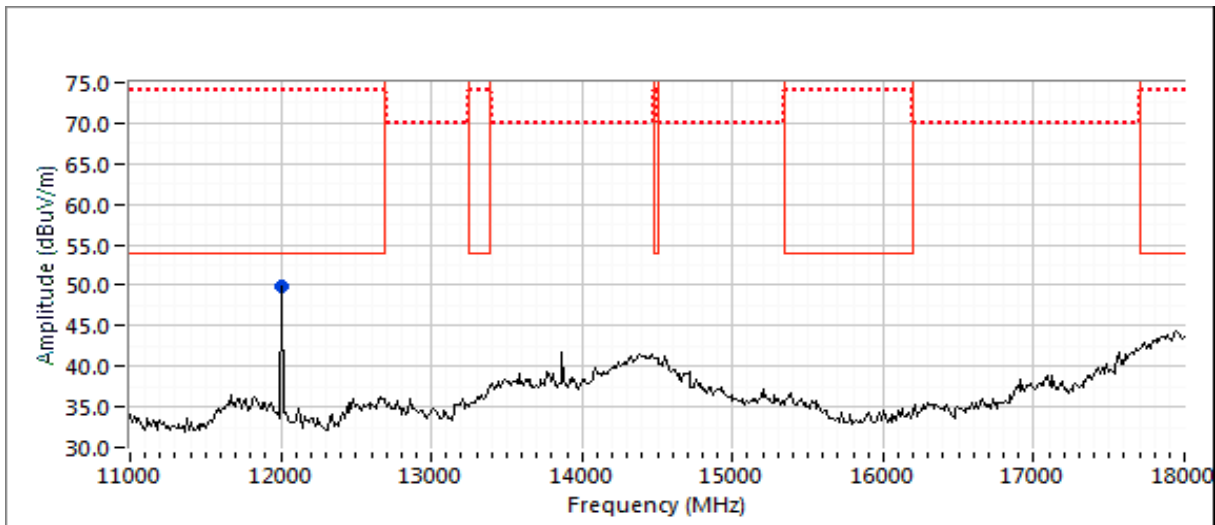
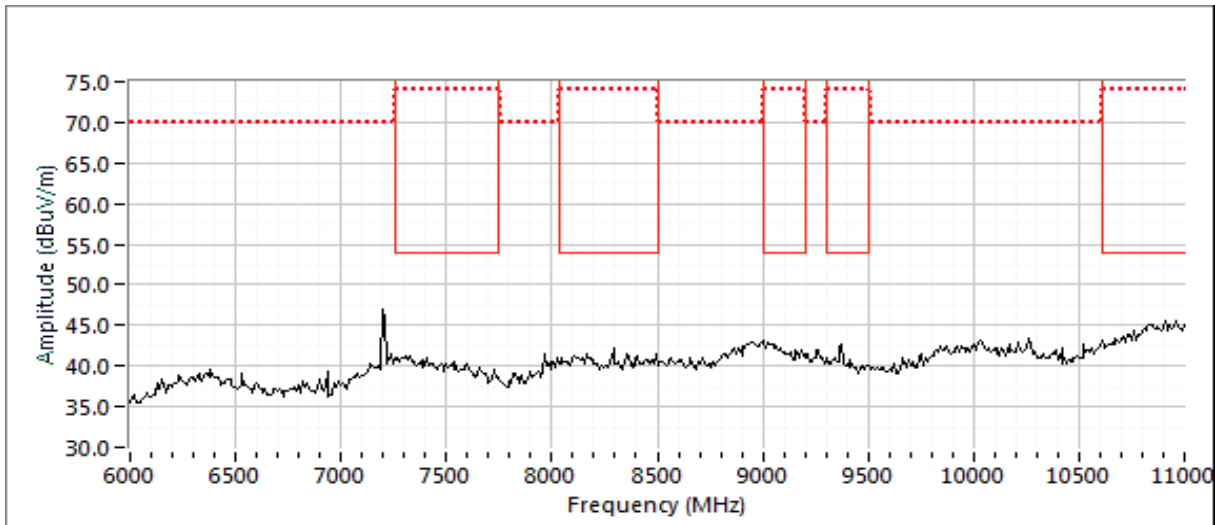
Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A





EMC Test Data

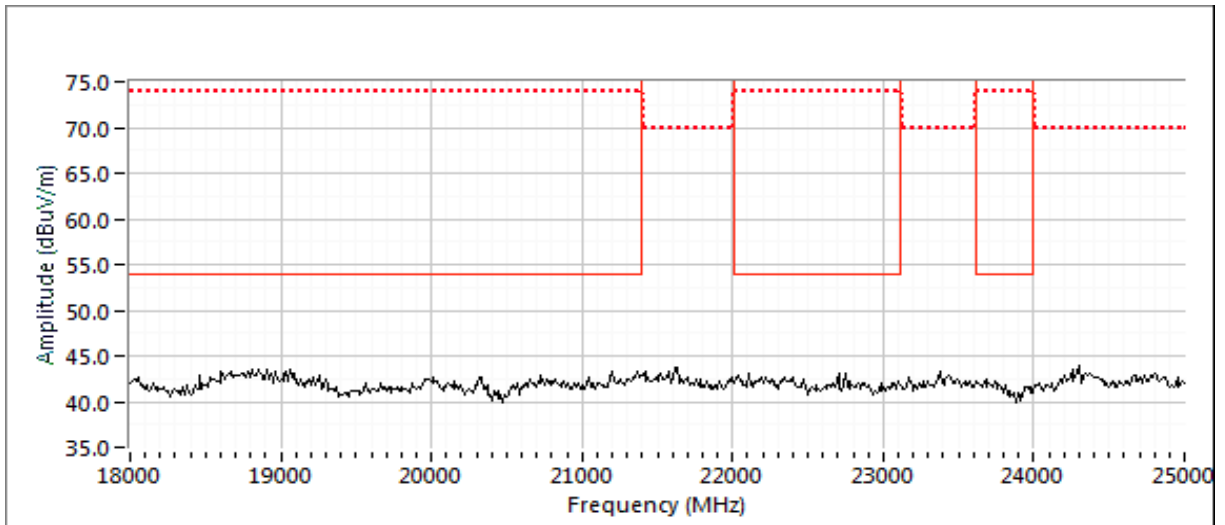
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Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A





EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A



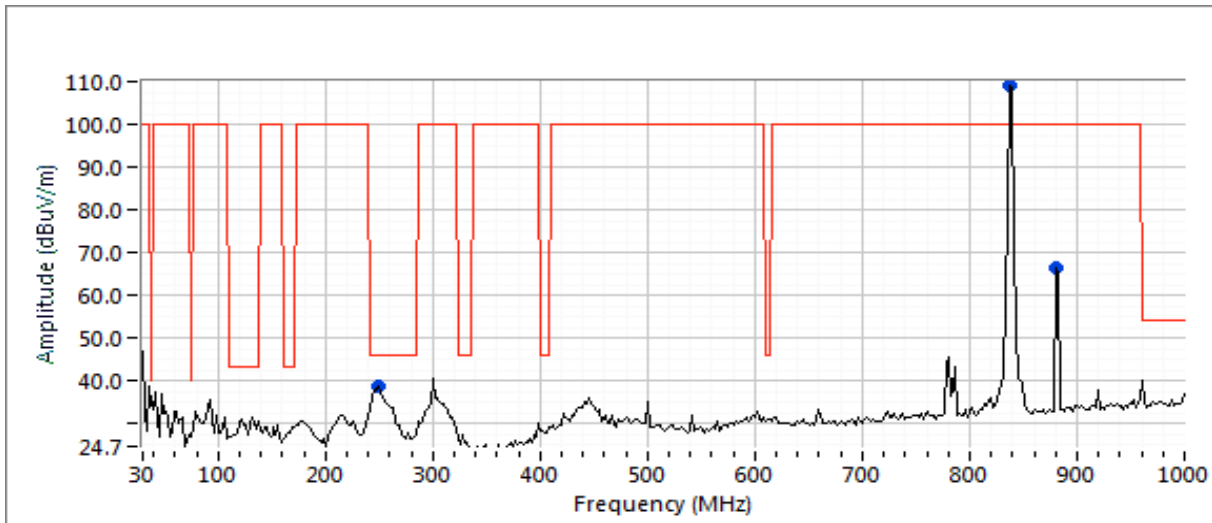


EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Run #1b:	Channel: 17	Mode: BLE
	Channel: 20525 (Uplink)	Mode: LTE (Band 5)

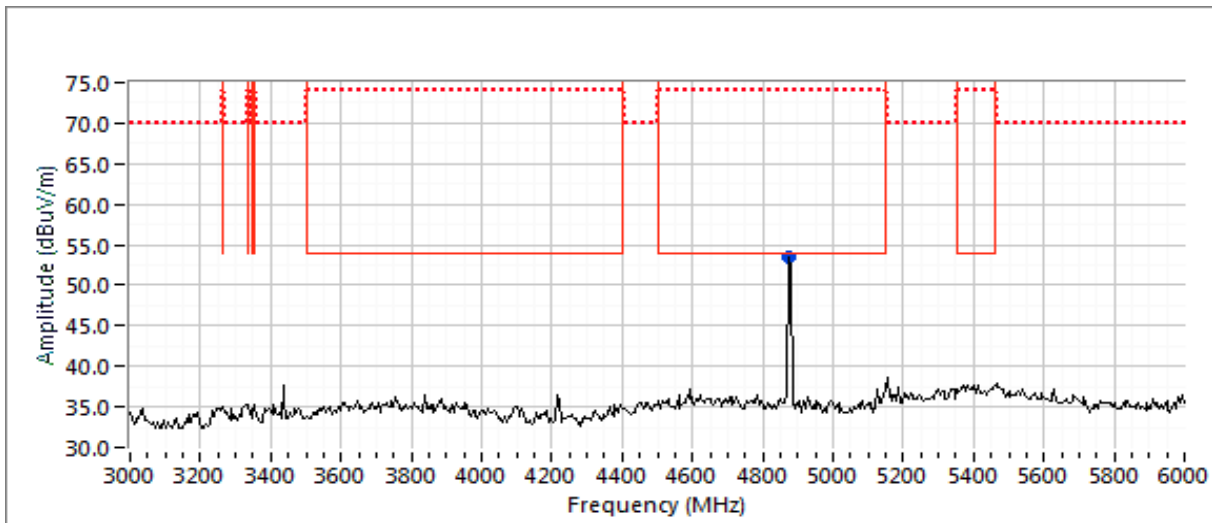
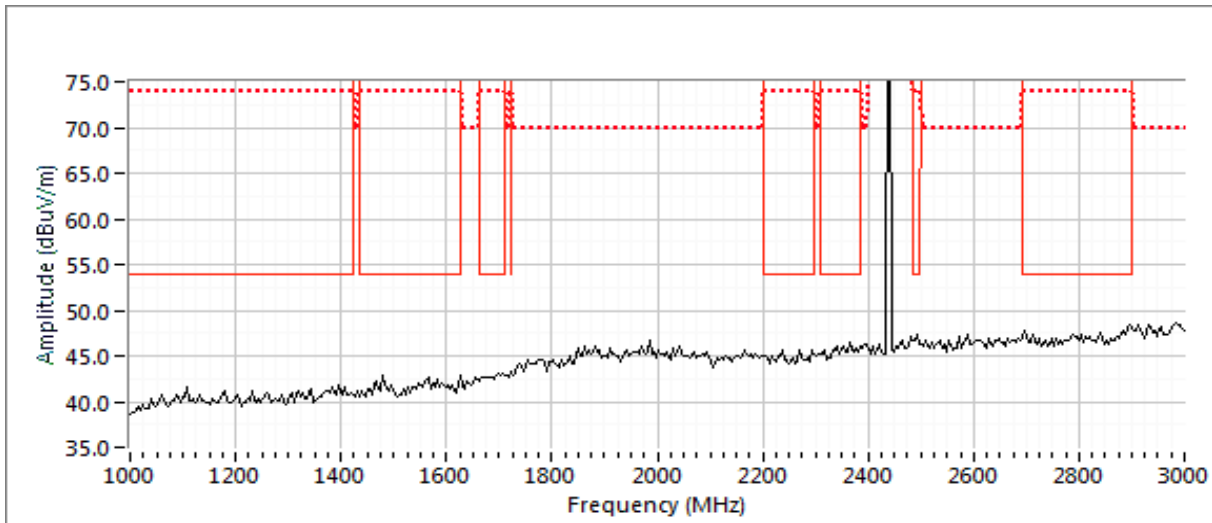
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
248.290	36.0	H	46.0	-10.0	QP	177	1.0	QP (1.00s)
836.613	109.0	H	-	-	Peak	122	3.0	LTE Uplink (Band 5)
881.423	66.3	V	-	-	Peak	79	1.0	LTE Downlink (Band 5)
2440.020	84.7	H	-	-	Peak	19	1.0	BLE Fundamental
4879.390	55.7	V	74.0	-18.3	PK	333	1.7	RB 1 MHz;VB 3 MHz;Peak
4879.770	50.0	V	54.0	-4.0	AVG	333	1.7	RB 1 MHz;VB 10 Hz;Peak
7319.020	54.5	V	74.0	-19.5	PK	184	1.9	RB 1 MHz;VB 3 MHz;Peak
7319.320	44.8	V	54.0	-9.2	AVG	184	1.9	RB 1 MHz;VB 10 Hz;Peak
12188.620	46.4	V	54.0	-7.6	AVG	340	1.0	RB 1 MHz;VB 10 Hz;Peak
12188.880	56.1	V	74.0	-17.9	PK	340	1.0	RB 1 MHz;VB 3 MHz;Peak





EMC Test Data

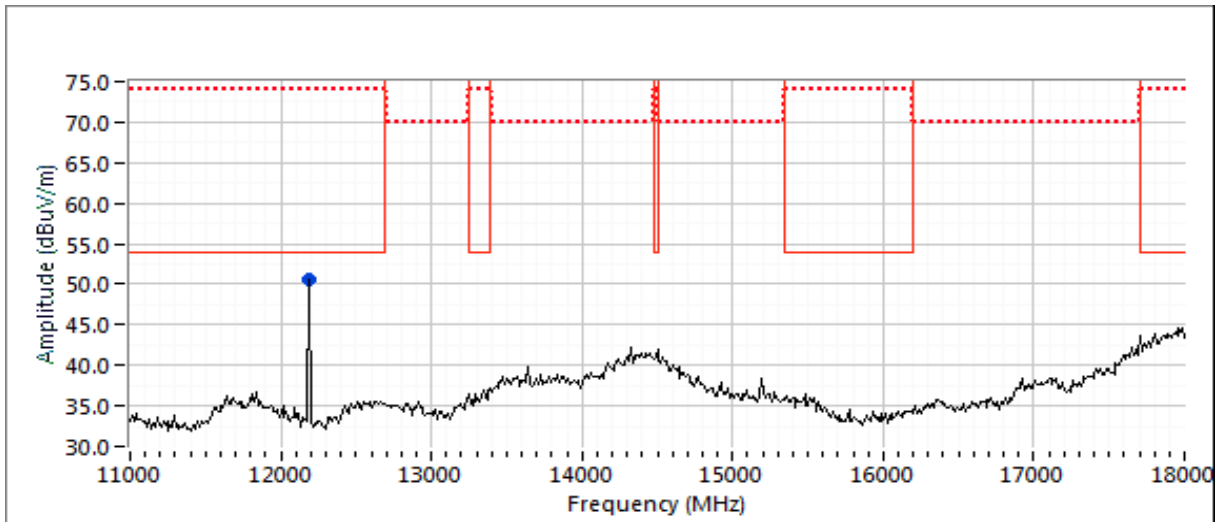
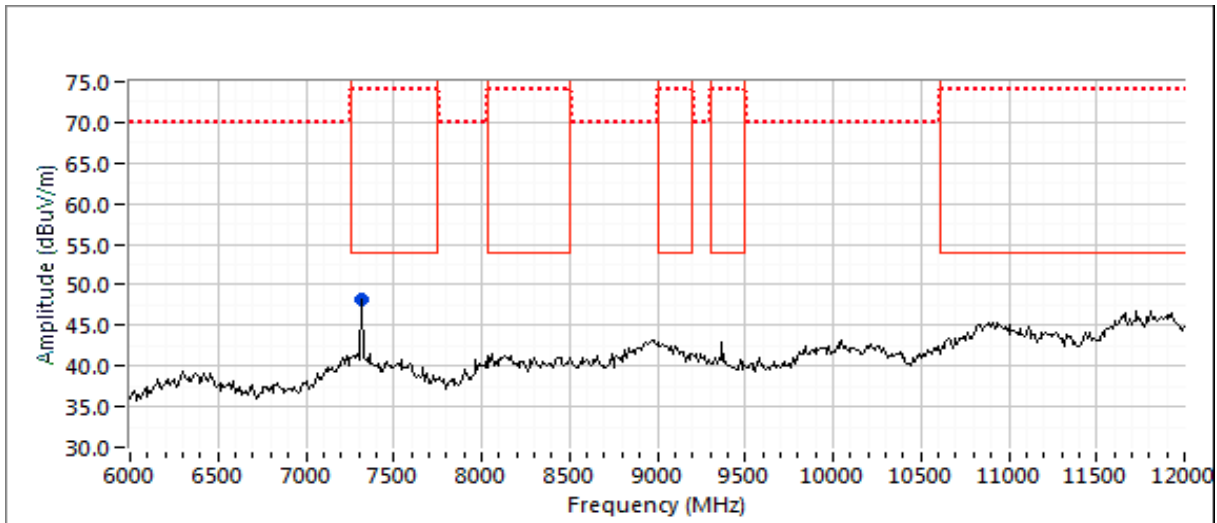
Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A





EMC Test Data

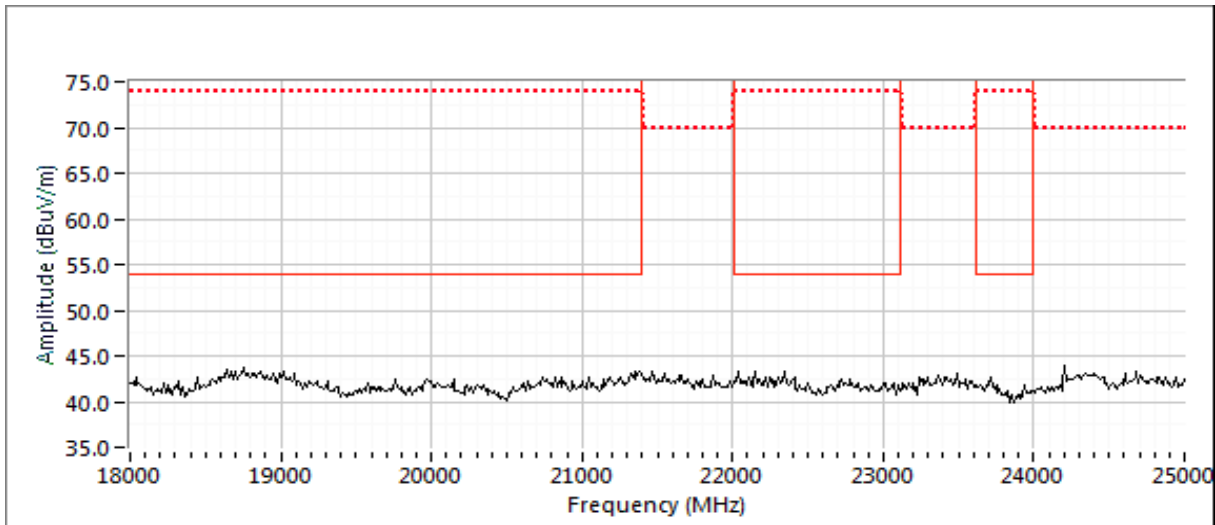
Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A





EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A



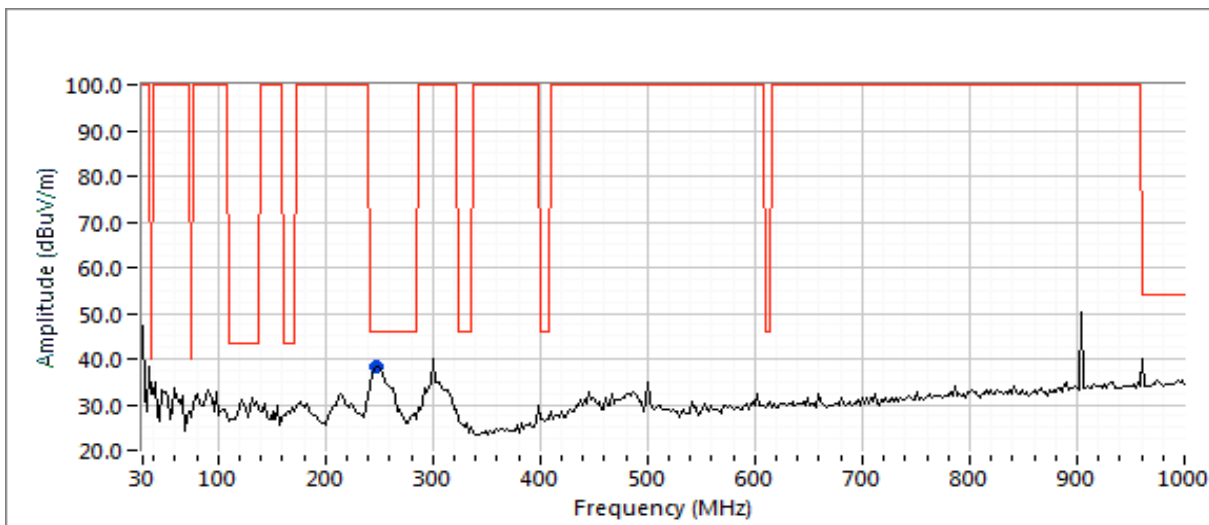


EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Run #1c:	Channel: 39	Mode: BLE
	Channel: 20175 (Uplink)	Mode: LTE (Band 4)

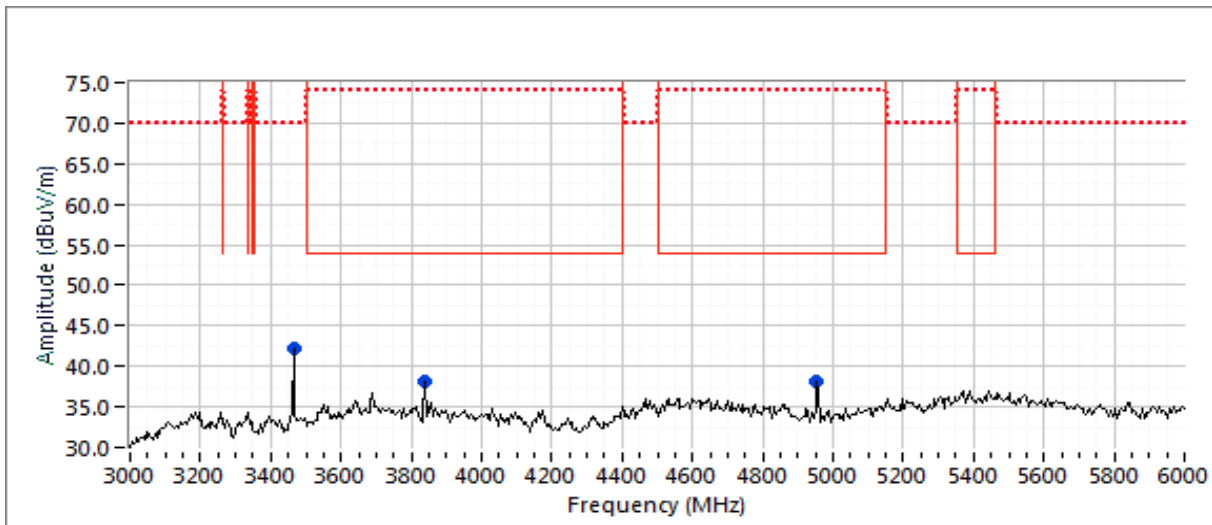
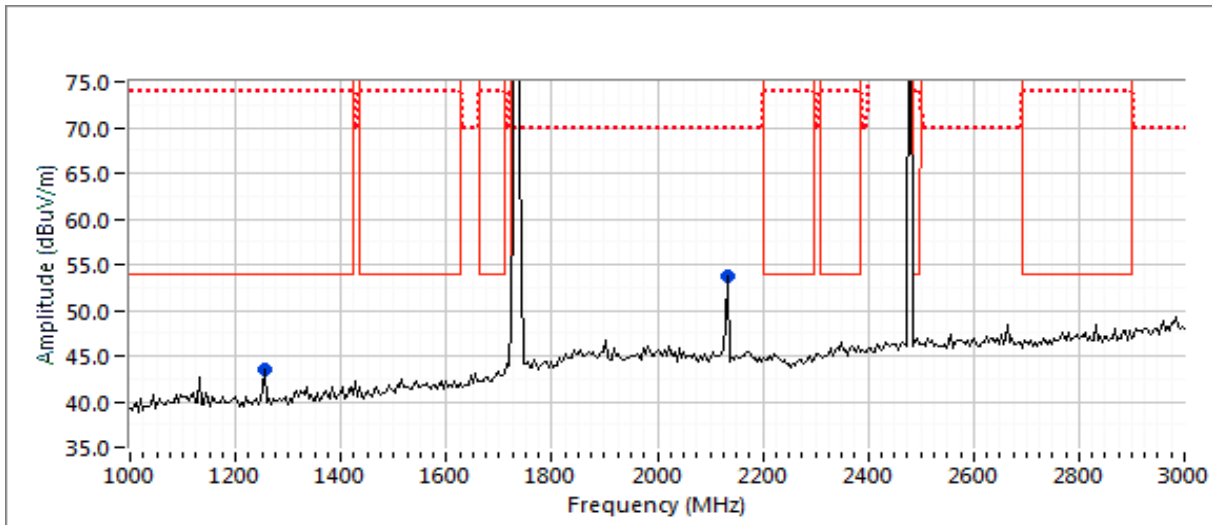
Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
248.290	36.0	H	46.0	-10.0	QP	177	1.0	Same as run 1B
1255.070	54.5	V	74.0	-19.5	PK	330	2.5	POS; RB 1 MHz; VB: 3 MHz
1255.350	33.5	V	54.0	-20.5	AVG	330	2.5	POS; RB 1 MHz; VB: 10 Hz
1732.500	115.7	V	-	-	Peak	162	1.0	LTE Uplink (Band 4)
2132.500	53.8	V	-	-	Peak	92	2.0	LTE Downlink (Band 4)
2480.000	88.1	H	-	-	Peak	340	1.0	BLE Fundamental
3465.050	42.3	V	74.0	-31.7	PK	72	1.3	2nd Harmonic of Cell
3840.450	36.4	H	54.0	-17.6	AVG	258	1.7	RB 1 MHz;VB 10 Hz;Peak
3840.720	45.0	H	74.0	-29.0	PK	258	1.7	RB 1 MHz;VB 3 MHz;Peak
4959.690	45.6	V	74.0	-28.4	PK	331	1.6	RB 1 MHz;VB 3 MHz;Peak
4959.820	37.6	V	54.0	-16.4	AVG	331	1.6	RB 1 MHz;VB 10 Hz;Peak
7439.230	51.6	V	74.0	-22.4	PK	351	2.4	RB 1 MHz;VB 3 MHz;Peak
7439.290	43.3	V	54.0	-10.7	AVG	351	2.4	RB 1 MHz;VB 10 Hz;Peak
12398.610	54.4	V	74.0	-19.6	PK	345	1.0	RB 1 MHz;VB 3 MHz;Peak
12398.710	44.4	V	54.0	-9.6	AVG	345	1.0	RB 1 MHz;VB 10 Hz;Peak





EMC Test Data

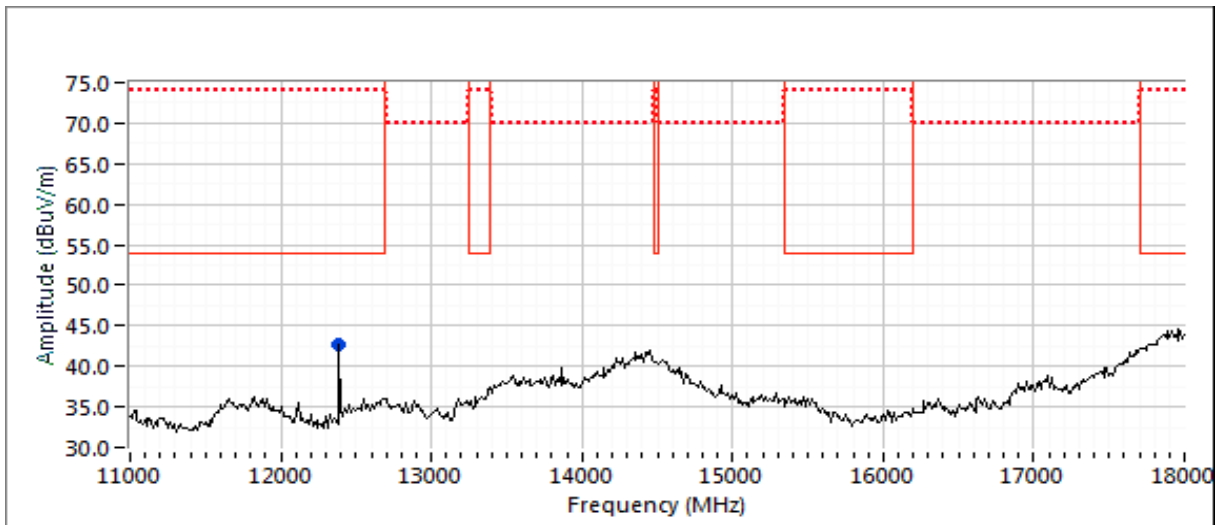
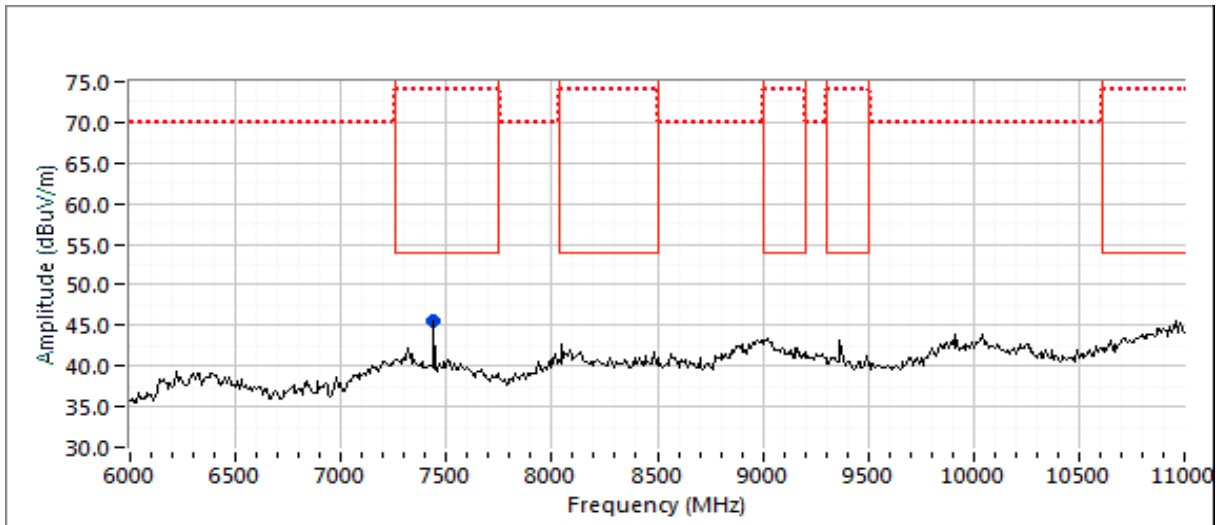
Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A





EMC Test Data

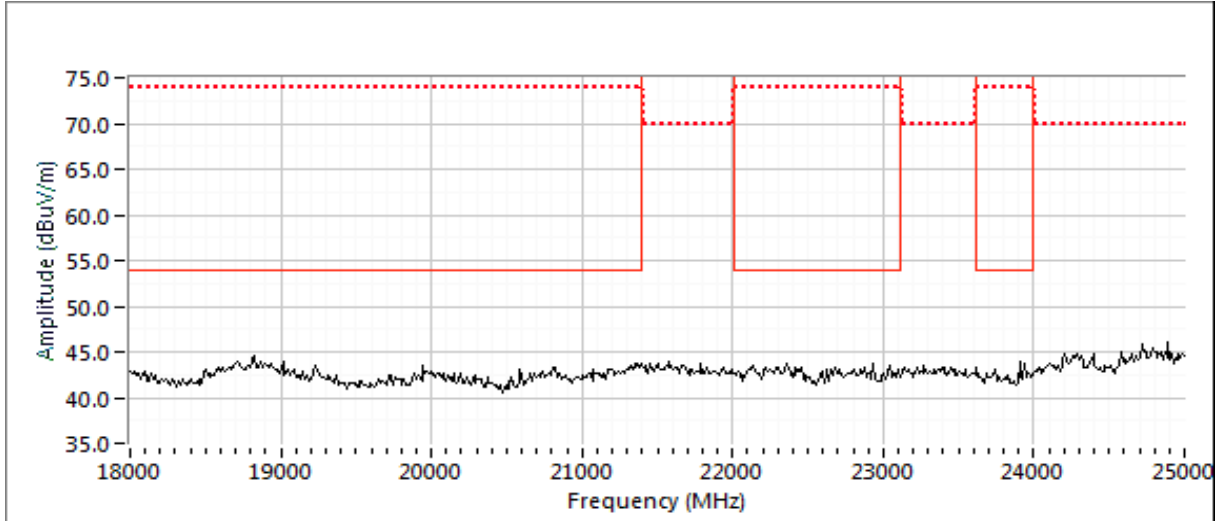
Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A





EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A



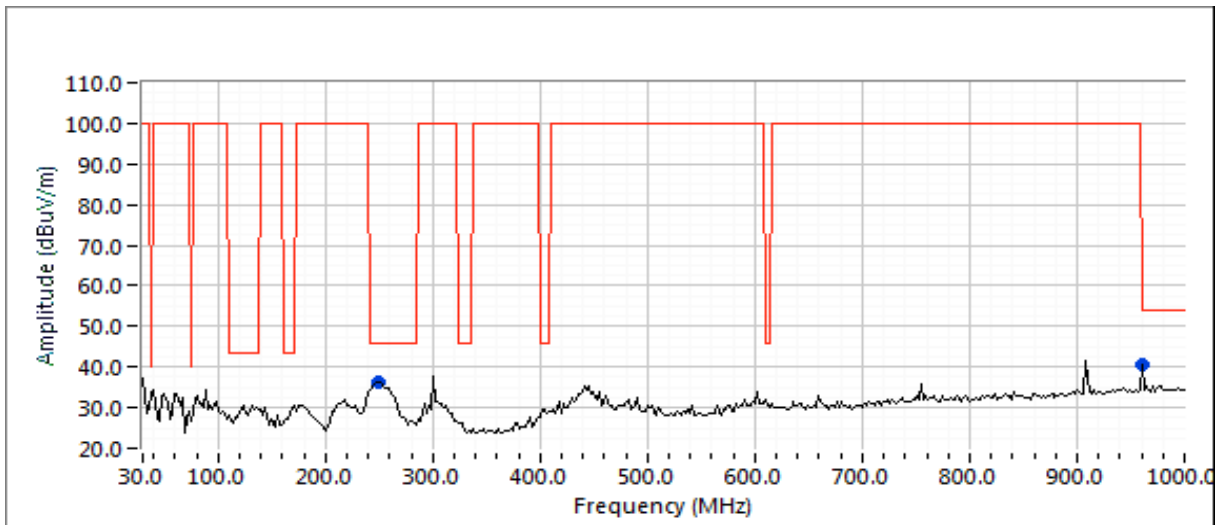


EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Run #1d:	Channel: 37	Mode: BLE
	Channel: 27710 (Uplink)	Mode: LTE (Band 30)

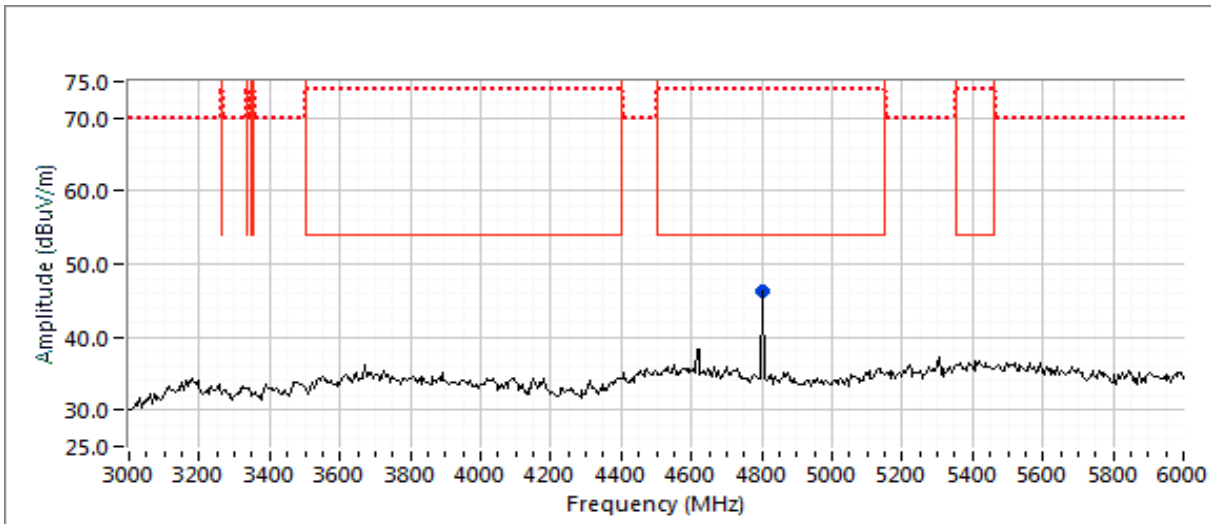
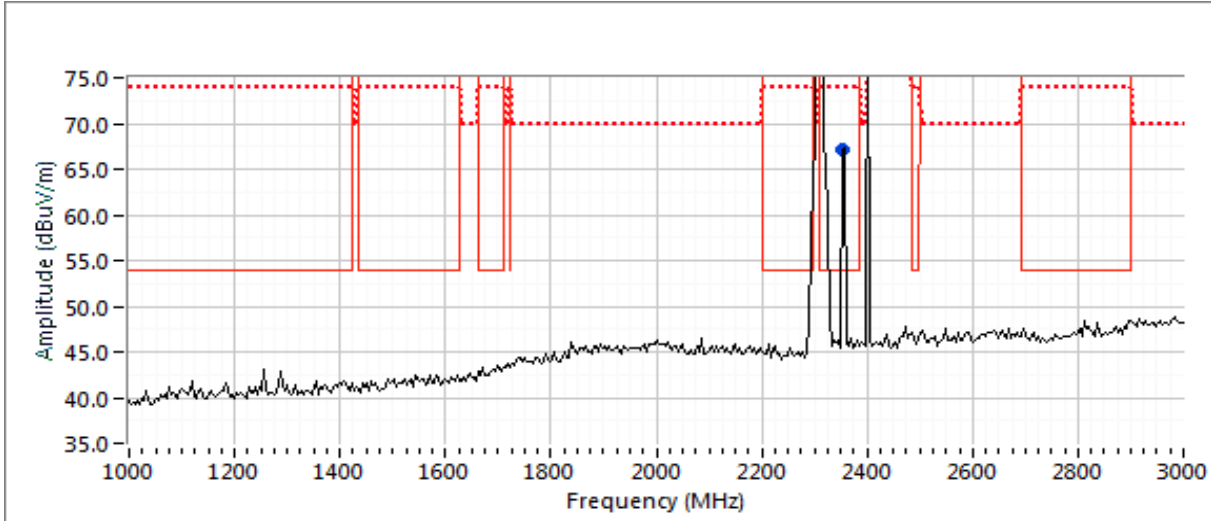
Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
249.286	34.8	H	46.0	-11.2	QP	172	1.0	QP (1.00s)
960.126	43.6	V	54.0	-10.4	QP	206	1.0	QP (1.00s)
2310.000	111.6	V	-	-	Peak	236	1.0	LTE Uplink (Band 30)
2355.000	67.1	V	-	-	Peak	61	1.9	LTE Downlink (Band 30)
2402.000	86.6	V	-	-	Peak	7	1.6	BLE Fundamental
4803.400	49.3	V	74.0	-24.7	PK	327	1.0	RB 1 MHz;VB 3 MHz;Peak
4803.970	42.9	V	54.0	-11.1	AVG	327	1.0	RB 1 MHz;VB 10 Hz;Peak
12008.500	48.9	V	74.0	-25.1	PK	355	1.3	RB 1 MHz;VB 3 MHz;Peak
12010.930	38.4	V	54.0	-15.6	AVG	355	1.3	RB 1 MHz;VB 10 Hz;Peak





EMC Test Data

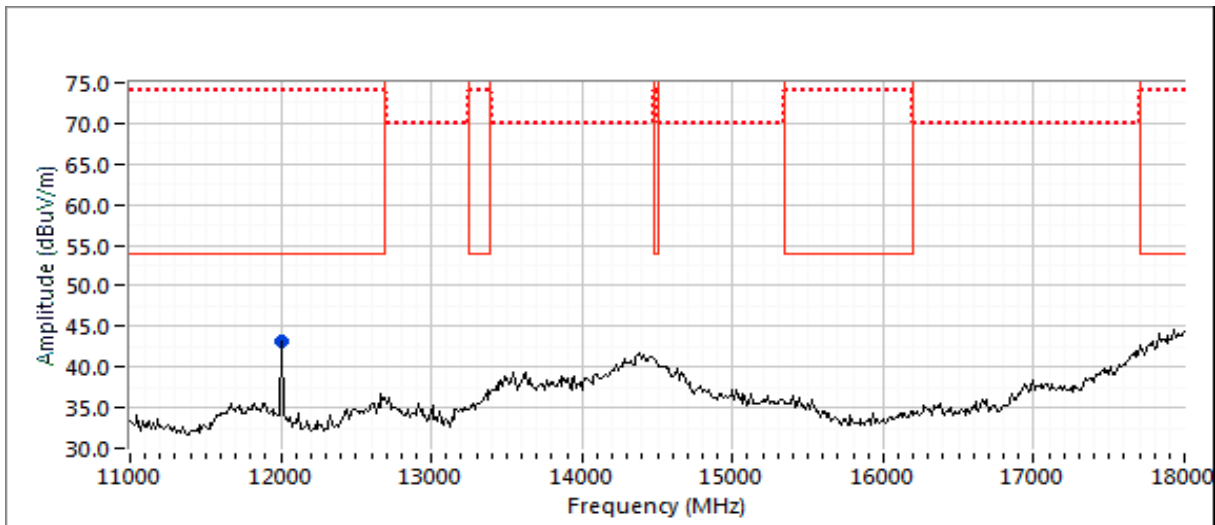
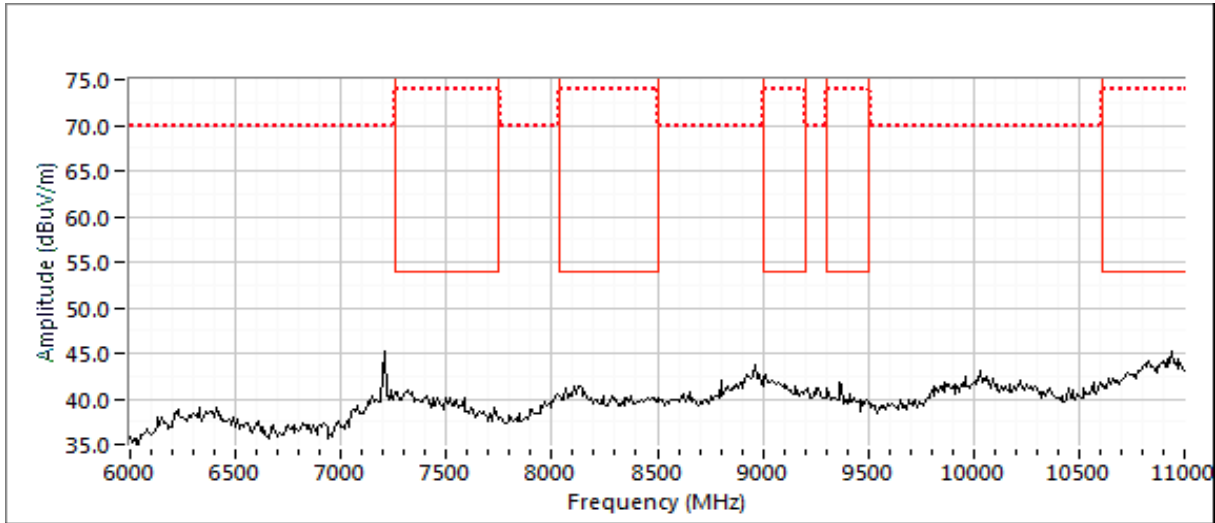
Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A





EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A



Note: Scans made between 18 - 25 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range

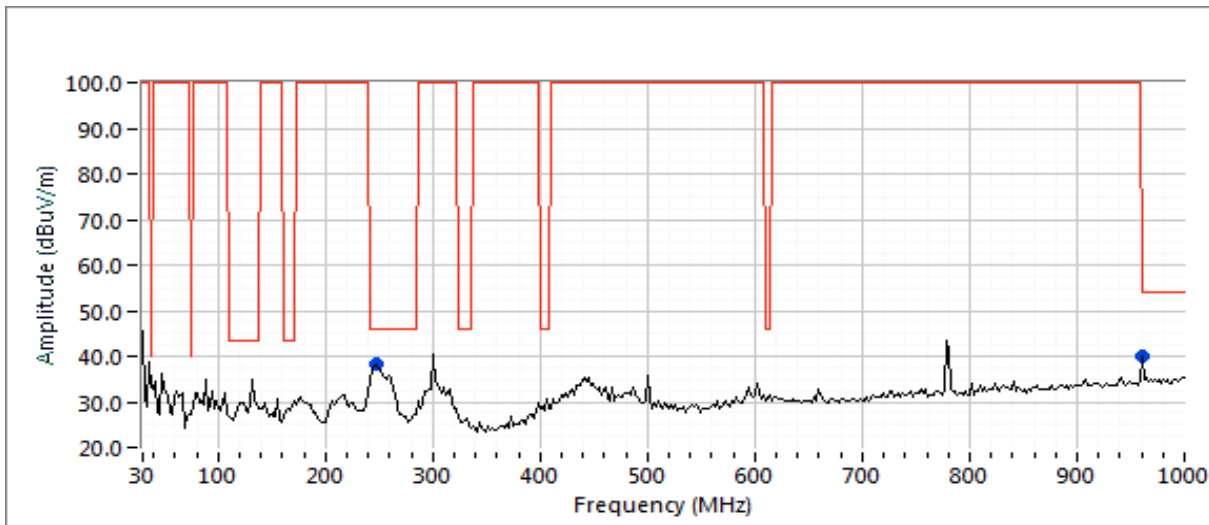


EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A

Run #1e:	Channel: 37	Mode: BLE
	Channel: 27735 (Uplink)	Mode: LTE (Band 30)

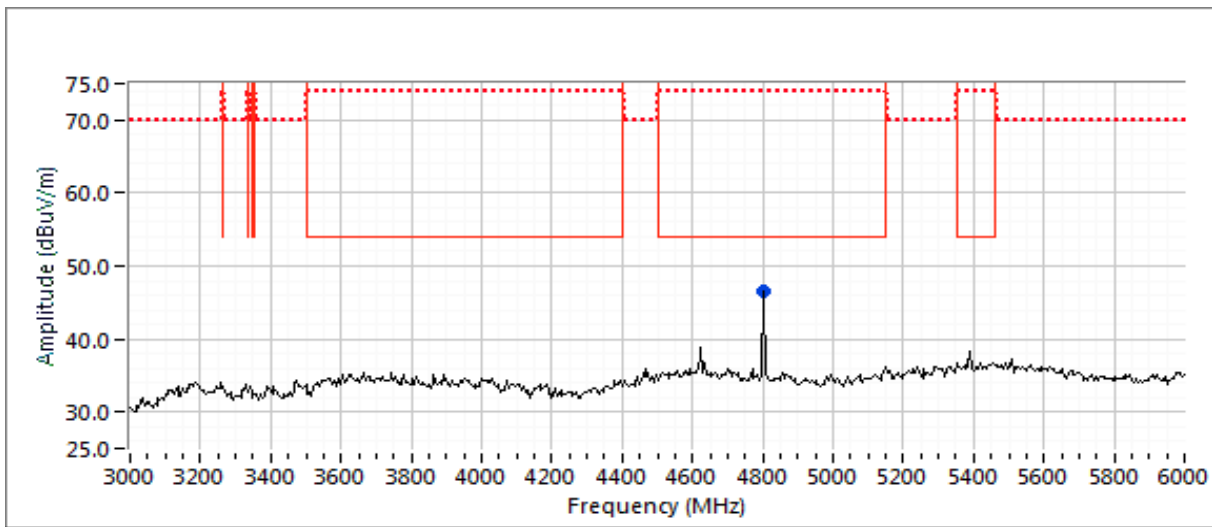
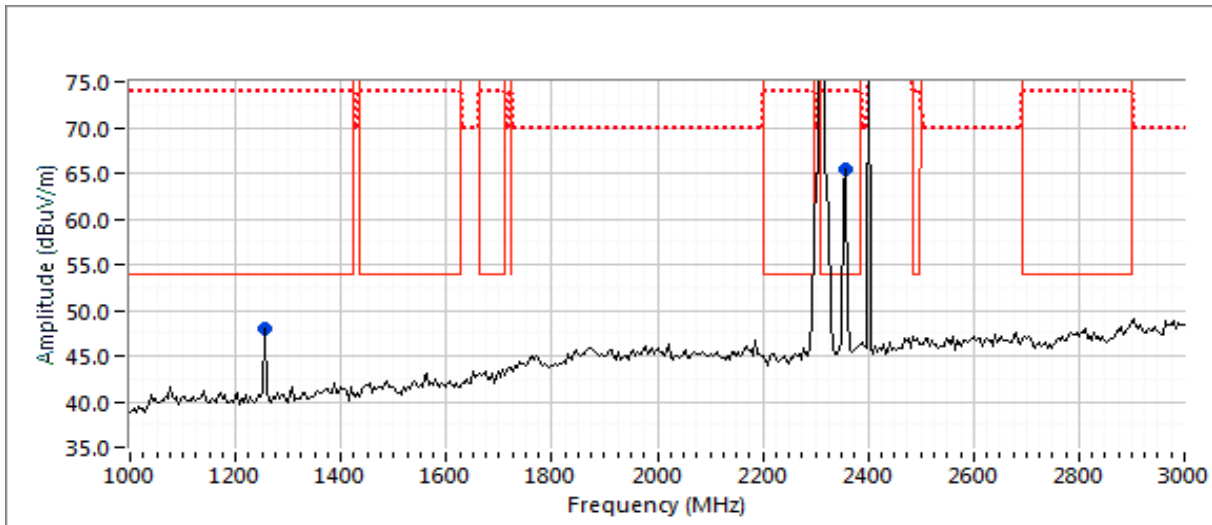
Frequency MHz	Level dB μ V/m	Pol v/h	15.209 / 15.247		Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
			Limit	Margin				
247.715	36.0	H	46.0	-10.0	QP	177	1.0	QP (1.00s)
960.126	43.4	V	54.0	-10.6	QP	208	1.0	QP (1.00s)
1256.450	62.5	V	74.0	-11.5	PK	116	1.3	POS; RB 1 MHz; VB: 3 MHz
1256.920	33.5	V	54.0	-20.5	AVG	116	1.3	POS; RB 1 MHz; VB: 10 Hz
2312.500	109.4	V	-	-	Peak	240	1.0	LTE Uplink (Band 30)
2357.500	65.4	V	-	-	Peak	66	1.3	LTE Downlink (Band 30)
2402.000	86.2	H	-	-	Peak	338	1.0	BLE Fundamental
4803.810	43.8	V	54.0	-10.2	AVG	332	1.3	RB 1 MHz;VB 10 Hz;Peak
4804.400	49.7	V	74.0	-24.3	PK	332	1.3	RB 1 MHz;VB 3 MHz;Peak
12008.570	49.0	V	74.0	-25.0	PK	346	1.1	RB 1 MHz;VB 3 MHz;Peak
12010.970	39.1	V	54.0	-14.9	AVG	346	1.1	RB 1 MHz;VB 10 Hz;Peak





EMC Test Data

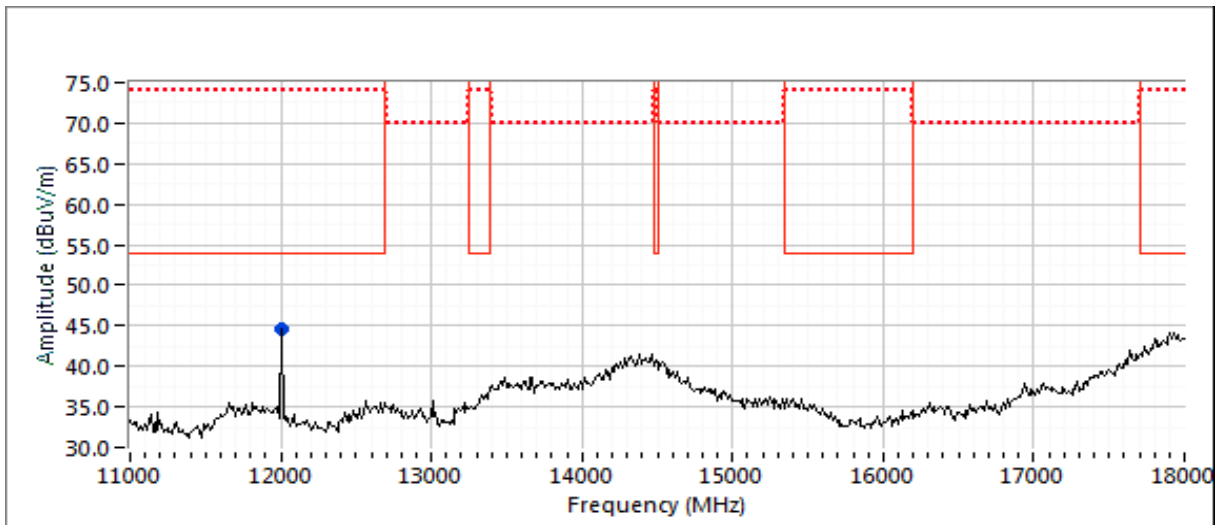
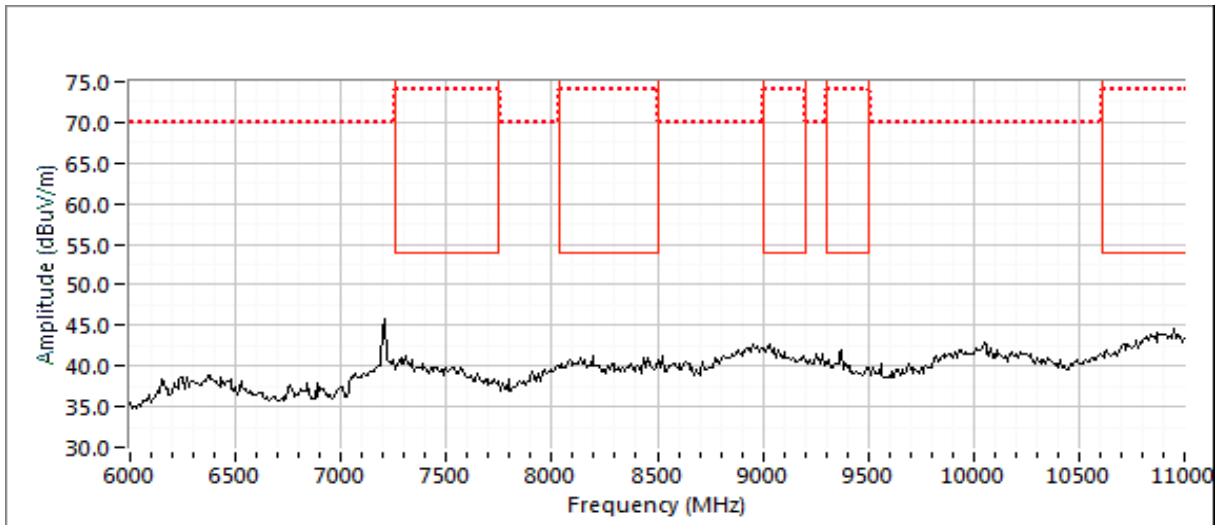
Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A





EMC Test Data

Client:	Aruba, a Hewlett Packard Enterprise company	Job Number:	PR107760
Model:	ARCN9004LTE	T-Log Number:	TL107760-RA
Contact:	Mark Hill	Project Manager:	Christine Krebill
Standard:	FCC 15.247, RSS-247	Project Coordinator:	David Bare
		Class:	N/A



Note: Scans made between 18 - 25 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range

End of Report

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