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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 5 / RSS-247 Issue 2
FCC Part 15 Subpart C

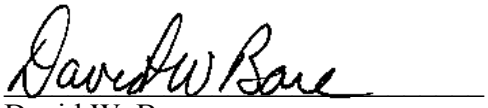
Model: Airplane AccessPoint

IC CERTIFICATION #:	20826-CWAP
FCC ID:	2AGGYCWAP
APPLICANT:	Thales Avionics, Inc. 700 South Babcock Road Melbourne, FL 32901
TEST SITE(S):	National Technical Systems 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-4 and 2845B-7
PROJECT NUMBER:	PR048459 / JD101779
REPORT DATE:	May 18, 2018
FINAL TEST DATES:	March 28, 29, April 3, 4, 5, November 9, 2017, March 5, 2018
TOTAL NUMBER OF PAGES:	109

A2LA ACCREDITED
Testing Cert #0214.26

VALIDATING SIGNATORIES

PROGRAM MGR



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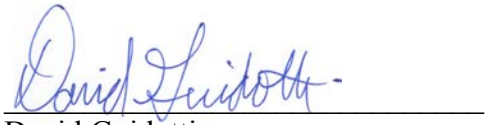

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	May 18, 2018	First release	

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SCOPE

An electromagnetic emissions test has been performed on the Thales Avionics, Inc. model Airplane AccessPoint, 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 Thales Avionics, Inc. model Airplane AccessPoint 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 Thales Avionics, Inc. model Airplane AccessPoint and therefore apply only to the tested sample. The sample was selected and prepared by John Steigerwald of Thales Avionics, Inc..

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 OFDM / DSSS techniques	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	RSS 247 5.2 (1)	6dB Bandwidth	11b - 9.0 MHz 11g – 16.4 MHz 11n20 – 17.6 MHz 11n40 – 36.4 MHz	>500kHz	Complies
15.247 (b) (3)	RSS 247 5.4 (4)	Output Power (multipoint systems)	1Tx Modes 11b – 18.5 dBm (0.071 Watts) 11g - 18.2 dBm (0.066 Watts) EIRP = 0.183 W Note 1 3Tx Modes 11n20 – 22.7 dBm (0.188 Watts) 11n40 - 22.9 dBm (0.194 Watts) EIRP = 0.502 W Note 1	1Watt, EIRP limited to 4 Watts.	Complies
15.247(e)	RSS 247 5.2 (2)	Power Spectral Density	1Tx Modes 11b -2.3 dBm/3kHz 11g -4.5 dBm/3kHz 3Tx Modes 11n20 -0.8 dBm/3kHz 11n40 -2.9 dBm/3kHz	8dBm/3kHz	Complies
15.247(d)	RSS 247 5.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	All emissions below the -30dBc limit	< -30dBc Note 2	Complies
15.247(d) / 15.209	RSS 247 5.5	Radiated Spurious Emissions 30MHz – 25 GHz	54.0 dBµV/m @ 2389.0 MHz (0.0 dB)	Refer to the limits section (p20) for restricted bands, all others <-30dBc Note 2	Complies

Note 1: EIRP calculated using antenna gains of 4.1 dBi for the highest EIRP system.
Note 2: Limit of -30dBc used because the power was measured using the UNII test procedure (maximum power averaged over a transmission burst).
Note 3: the device is operating under the smart antenna rules as detailed in FCC 15.247(c) (2) / RSS 247 5.4 (6). Refer to the operational description for additional justification.

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 antennas	Unique or integral antenna required	Complies
15.31 (m)	RSS-Gen 6.9	Channel Selection	Emissions tested at outermost and middle channels in each band	Device was tested on the top, bottom and center channels in each band	N/A
15.407 (b) (6)	RSS-Gen Table 4	AC Conducted Emissions	Does not connect to a public utility	Refer to page 19	N/A
15.247 (i)	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	No detachable antennas	Statement for products with detachable antenna	Complies
-	RSS-Gen 8.4	User Manual	Statement in user manual	Statement for all products	Complies
-	RSP-100 RSS-Gen 6.7	Occupied Bandwidth	11b – 12.0 MHz 11g – 17.5 MHz 11n20 – 18.3 MHz 11n40 - 37.5 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)	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 Thales Avionics, Inc. model Airplane AccessPoint is a wireless access point that is designed for use in aircraft. 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 115 Volts, 400 Hz, 0.2 Amps.

The sample was received on March 28, 2017 and tested on March 28, 29, April 3, 4, 5, November 9, 2017, March 5, 2018. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Thales Avionics Inc.	186140-102	Access Point	LT17000S	2AGGYCWAP

ANTENNA SYSTEM

The antenna system consists of 3 integral antennas.

ENCLOSURE

The EUT enclosure is primarily constructed of metal with a plastic radome It measures approximately 22.5 cm wide by 17 cm deep by 7 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 for testing:

Company	Model	Description	Serial Number	FCC ID
Hp	ProBook 450 G3	Laptop	5CD61522JT	-

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
J1	Switches, Power, Laptop Ethernet	Multiple wires	Shielded and Unshielded	6.1
J2	Switches and unterminated	Multiple wires	Shielded and Unshielded	6.1
J3	Switches and unterminated	Multiple wires	Shielded and Unshielded	6.1

EUT OPERATION

During emissions testing the EUT was configured so that both radios were transmitting continuously at the highest duty cycle in the selected mode at the selected power setting. Legacy modes (11a, b and g) operate only in 1x1 (SISO).

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 Fremont, CA 94538-2435
Chamber 7	US0027	2845B-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. 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.

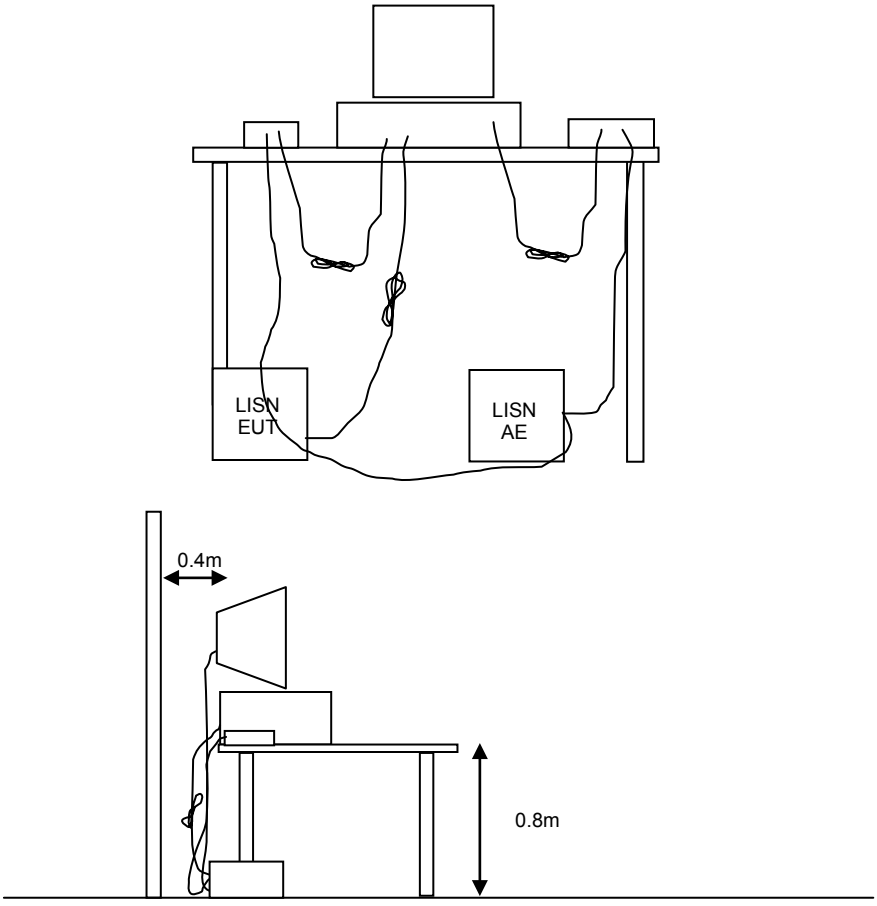


Figure 1 Typical Conducted Emissions Test Configuration

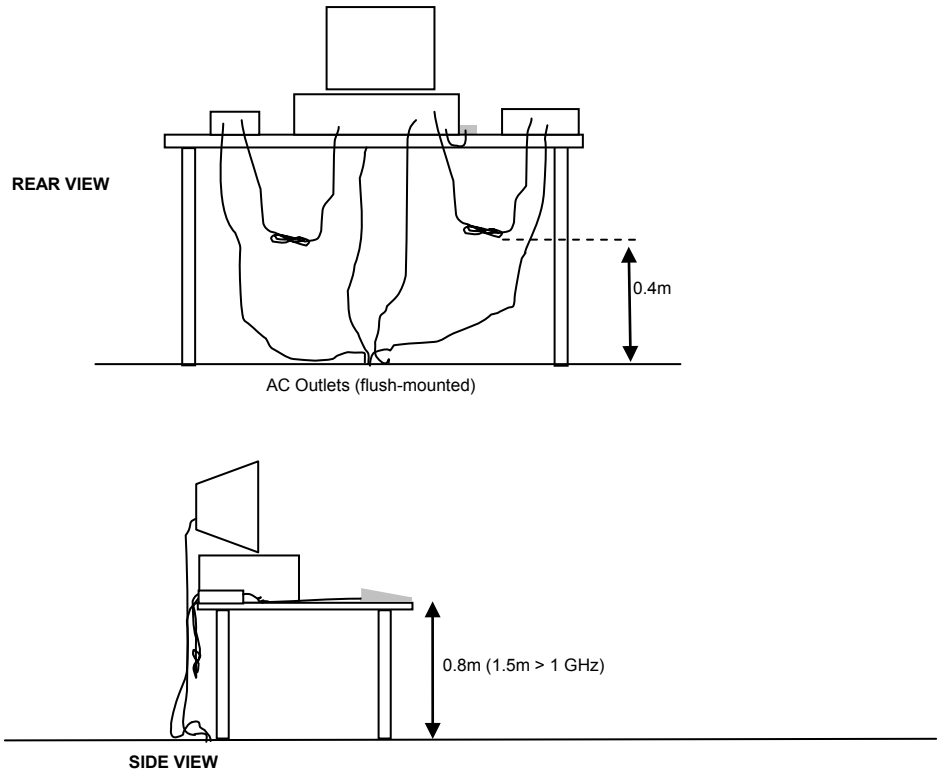
RADIATED EMISSIONS

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.

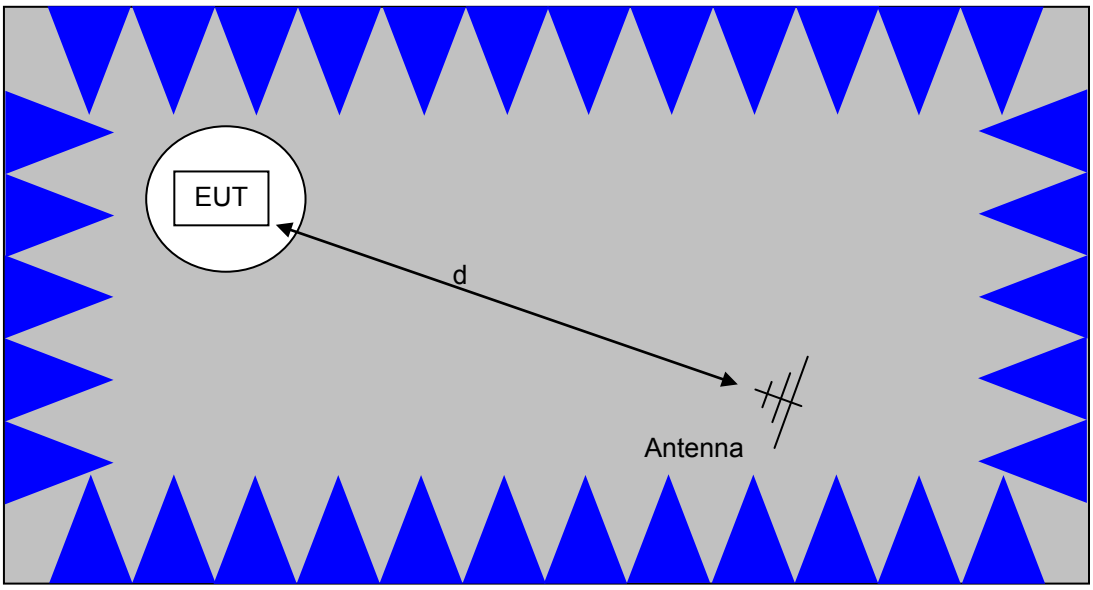
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

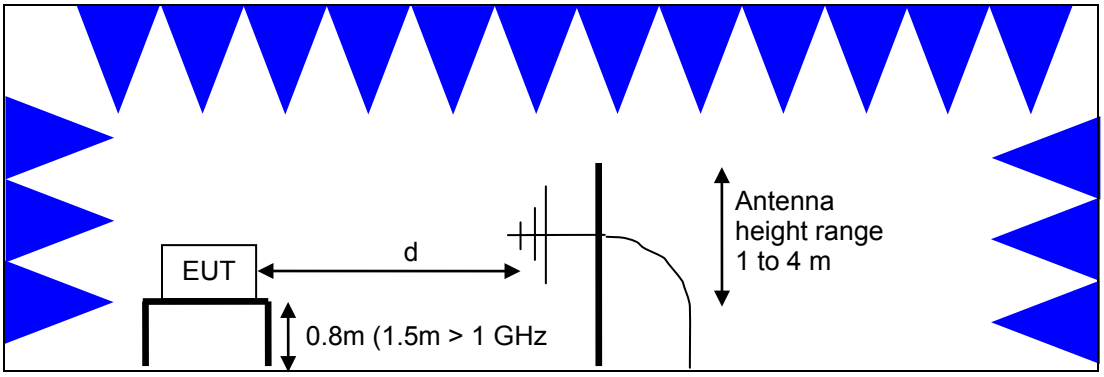


Typical Test Configuration for Radiated Field Strength Measurements



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.

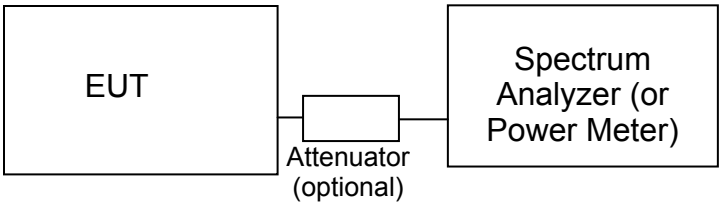
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



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; 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 (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 bands[1].

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

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 (uV/m @ 3m)	Limit (dBuV/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 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. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

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 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:

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

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:

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

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

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Radiated Emissions, 1000 - 6,000 MHz, 28-Mar-17					
EMCO	Antenna, Horn, 1-18 GHz	3115	786	12/21/2015	12/21/2017
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB 7	1538	2/11/2017	2/11/2018
Radiated Emissions, 1000 - 6,000 MHz, 29-Mar-17					
EMCO	Antenna, Horn, 1-18 GHz	3115	786	12/21/2015	12/21/2017
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB 7	1538	2/11/2017	2/11/2018
Radiated Emissions, 1000 - 40,000 MHz, 03, 04, 05-Apr-17					
Hewlett Packard	Spectrum Analyzer (SA40) Red 30 Hz -40 GHz	8564E (84125C)	1148	10/31/2016	11/1/2017
Hewlett Packard	High Pass filter, 8.2 GHz	P/N 84300-80039	1156	5/5/2016	5/5/2017
Hewlett Packard	High Pass filter, 3.5 GHz	P/N 84300-80038	1157	6/28/2016	6/28/2017
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	7/8/2016	7/8/2018
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	9/30/2016	9/30/2017
HP / Miteq	SA40 R Head HF preAmplifier, 18-40 GHz (w/1148)	TTA1840-45-5P-HG-S	1145	8/24/2016	8/24/2017
A. H. Systems	Purple System Horn, 18-40GHz	SAS-574, p/n: 2581	2160	8/28/2014	8/28/2017
Radiated Emissions, 30 - 1,000 MHz, 09-Nov-17					
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	7/27/2016	7/27/2018
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESI 40	2493	3/17/2017	3/17/2018
Hewlett Packard	9KHz-1300MHz pre-amp	8447F	2777	1/27/2017	1/27/2018
Radio Antenna Port (Power and Spurious Emissions), 05-Mar-18					
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	7/31/2017	7/31/2018
Radiated Bandedge 2.4GHz, 05-Mar-18					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/30/2016	6/30/2018
Hewlett Packard	Spectrum Analyzer (SA40) Red 30 Hz -40 GHz	8564E (84125C)	1148	10/14/2017	10/14/2018
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	8/30/2017	8/30/2018
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	7/31/2017	7/31/2018
Hewlett Packard	Spectrum Analyzer (SA40) Red 30 Hz -40 GHz	8564E (84125C)	1148	10/31/2016	11/1/2017
Hewlett Packard	High Pass filter, 8.2 GHz	P/N 84300-80039	1156	5/5/2016	5/5/2017

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Hewlett Packard	High Pass filter, 3.5 GHz	P/N 84300-80038	1157	6/28/2016	6/28/2017
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	7/8/2016	7/8/2018
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	9/30/2016	9/30/2017
HP / Miteq	SA40 R Head HF preAmplifier, 18-40 GHz (w/1148)	TTA1840-45-5P-HG-S	1145	8/24/2016	8/24/2017
A. H. Systems	Purple System Horn, 18-40GHz	SAS-574, p/n: 2581	2160	8/28/2014	8/28/2017

Appendix B Test Data

T103414 Pages 27 – 108

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Product	CWAP	T-Log Number:	T103414
System Configuration:	-	Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Emissions Standard(s):	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	-
Immunity Standard(s):	-	Environment:	Radio

EMC Test Data

For The

Thales Avionics, Inc.

Product

CWAP

Date of Last Test: 4/13/2018

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	-

Radiated 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: 11/9/2017
Test Engineer: David Bare
Test Location: FT Chamber #7
Config. Used: 1
Config Change: None
EUT Voltage: 115,V, 400Hz

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing. Any remote support equipment was located outside the semi-anechoic chamber. Any cables running to remote support equipment were routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.

The test distance and extrapolation factor (if applicable) are detailed under each run description.

Note, preliminary testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. Maximized testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 22.4 °C
Rel. Humidity: 39 %

Summary of Results

Run #	Mode	Channel	Target Power	Passing Power Setting	Test Performed	Limit	Result / Margin
2	11b a	11 36	20 20	20 20	Radiated Emissions, 30 - 1000MHz	FCC 15.209	29.3 dBµV/m @ 41.07 MHz (-10.7 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.

Test Notes

Based on preliminary tests, no emsisions from the 2.4 GHz or 5 GHz radios were observed below 1 GHz.

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	-

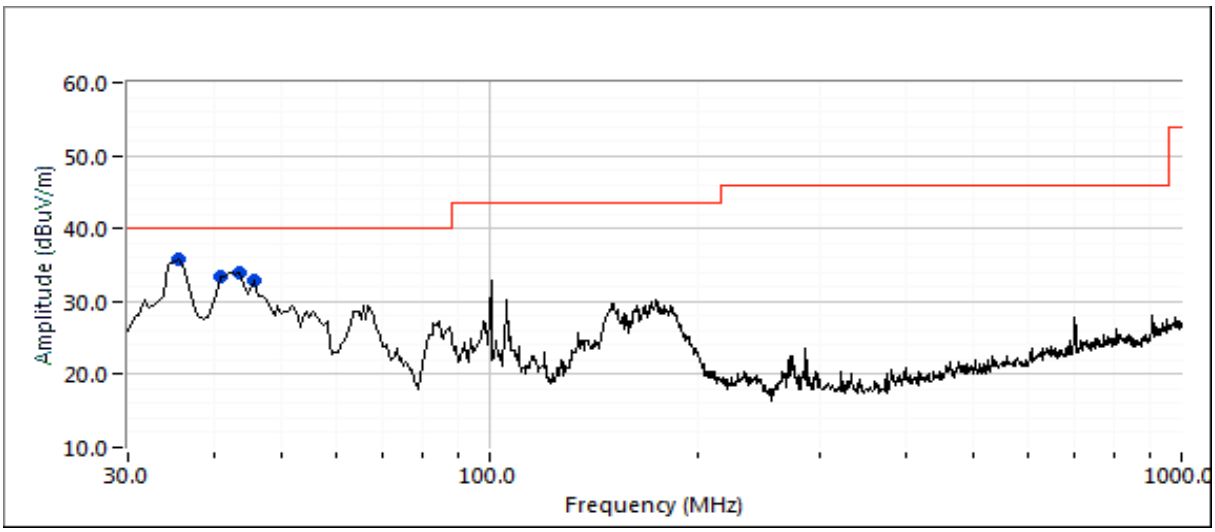
Sample Notes

Sample S/N: LT17000S
Driver: -
Antenna: Integral 4.13 dBi and 5.92 dBi

Run #1: Preliminary Radiated Emissions, 30 - 1000 MHz

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0

Channel:	2462	Mode:	11b	5180	Mode:	11a
Tx Chain:	1Tx	Data Rate:	1	1Tx	Data Rate:	6



Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
35.250	35.9	V	40.0	-4.1	Peak	258	1.0	
41.065	33.5	V	40.0	-6.5	Peak	360	2.0	
43.346	33.9	V	40.0	-6.1	Peak	135	1.5	
45.577	32.8	V	40.0	-7.2	Peak	320	1.5	
100.300	33.1	V	43.5	-10.4	Peak	320	1.5	

Note 1:	No emisisons were observed that are related to the radio transmission frequencies.

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	-

Run #2: Maximized Readings From Run #1

Test Parameters for Maximized Reading(s)			
Frequency Range (MHz)	Test Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0

Maximized quasi-peak readings (includes manipulation of EUT interface cables)

Frequency	Level	Pol	FCC 15.209/15.247/15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
41.065	29.3	V	40.0	-10.7	QP	360	2.0	QP (1.00s)
35.250	28.9	V	40.0	-11.1	QP	262	1.0	QP (1.00s)
100.300	32.4	V	43.5	-11.1	QP	320	1.0	QP (1.00s)
45.577	28.2	V	40.0	-11.8	QP	320	1.0	QP (1.00s)
43.346	27.7	V	40.0	-12.3	QP	135	1.0	QP (1.00s)

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

RSS-247 and FCC 15.247 (DTS) Antenna Port Measurements
MIMO and Smart Antenna Systems
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: 3/5/2018
Test Engineer: Jude Semana / R. Varelas
Test Location: FT Lab #4A

Config. Used: 1
Config Change: None
EUT Voltage: 115V, 400Hz

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: 21.6 °C
Rel. Humidity: 39 %

Summary of Results

Run #			Test Performed	Limit	Pass / Fail	Result / Margin
1Tx Modes (11b, g)						
1			Output Power	15.247(b)	Pass	18.5 dBm
2			Power spectral Density (PSD)	15.247(d)	Pass	-2.5 dBm/3kHz
3Tx Modes (11n)						
1			Output Power	15.247(b)	Pass	22.9 dBm
2			Power spectral Density (PSD)	15.247(d)	Pass	-0.8 dBm/3kHz
MIMO Modes						
3			Minimum 6dB Bandwidth	15.247(a)	Pass	9.0 MHz
3			99% Bandwidth	RSS GEN	Pass	37.5 MHz
4			Spurious emissions	15.247(b)	Pass	All emissions below the -30dBc limit

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

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 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)	IFS
11b	1 Mb/s	0.98	Yes	12.43	0	0	10	200
11g	6 Mb/s	0.99	Yes	2.06	0	0	10	30
n20	MCS0	0.99	Yes	1.922	0	0	10	20
n40	MCS0	0.98	Yes	0.944	0	0	10	20

Sample Notes

Sample S/N: LT17000S

Driver: -

Antenna Gain Information

Freq	Antenna Gain (dBi) / Chain				BF	MultiChain Legacy	CDD	Sectorized / Xpol	Dir G (PWR)	Dir G (PSD)
	1	2	3	4						
2.4 GHz	4.13	4.13	4.13		-	-	X	-	4.1	8.9

For devices that support CDD modes

Min # of spatial streams: 1

Max # of spatial streams: 3

Notes:	BF = beamforming mode supported, Multichain Legacy = 802.11 legacy data rates supported for multichain transmissions, CDD = Cyclic Delay Diversity (or Cyclic Shift Diversity) modes supported, Sectorized / Xpol = antennas are sectorized or cross polarized
Notes:	Dir G (PWR) = total gain (Gant + Array Gain) for power calculations; Dir G (PSD) = total gain for PSD calculations based on FCC KDB 662911. Depending on the modes supported, the Array Gain value for power could be different from the PSD value.
Notes:	Array gain for power/psd calculated per KDB 662911 D01, v01r02.

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #1: Output Power

Operating Mode: 11b
Directional Gain (dBi): 4.1

Max EIRP (mW): 183.2

Frequency (MHz)	Chain	Software Setting	Power[1] dBm	Power[1] mW	Total mW	Total dBm	Max Power (W)	Limit dBm	Result	Power (dBm)[3]
2412	0	20	18.5	70.8	70.8	18.5	0.071	30.0	Pass	
				0.0						
				0.0						
				0.0						
2437	0	20	18.5	70.8	70.8	18.5				
				0.0						
				0.0						
				0.0						
2462	0	19	17.0	50.1	50.1	17.0				
				0.0						
				0.0						
				0.0						

Operating Mode: 11g
Directional Gain (dBi): 4.1

Max EIRP (mW): 171.0

Frequency (MHz)	Chain	Software Setting	Power[1] dBm	Power[1] mW	Total mW	Total dBm	Max Power (W)	Limit dBm	Result	Power (dBm)[3]
2412	0	15	13.1	20.4	20.4	13.1	0.066	30.0	Pass	
				0.0						
				0.0						
				0.0						
2437	0	20	18.2	66.1	66.1	18.2				
				0.0						
				0.0						
				0.0						
2462	0	13	10.8	12.0	12.0	10.8				
				0.0						
				0.0						
				0.0						

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Operating Mode: n20 Non-beamforming
Directional Gain (dBi): 4.1
Max EIRP (mW): 486.7

Frequency (MHz)	Chain	Software Setting	Power[1] dBm	Power[1] mW	Total mW	Total dBm	Max Power (W)	Limit dBm	Result	Power (dBm)[3]
2412	0	15	13.0	20.0	62.2	17.9	0.188	30.0	Pass	
	1		13.2	20.9						
				0.0						
	2		13.3	21.4						
2437	0	20	18.2	66.1	188.0	22.7				
	1		17.7	58.9						
				0.0						
	2		18.0	63.1						
2462	0	13	10.8	12.0	35.8	15.5				
	1		10.7	11.7						
				0.0						
	2		10.8	12.0						

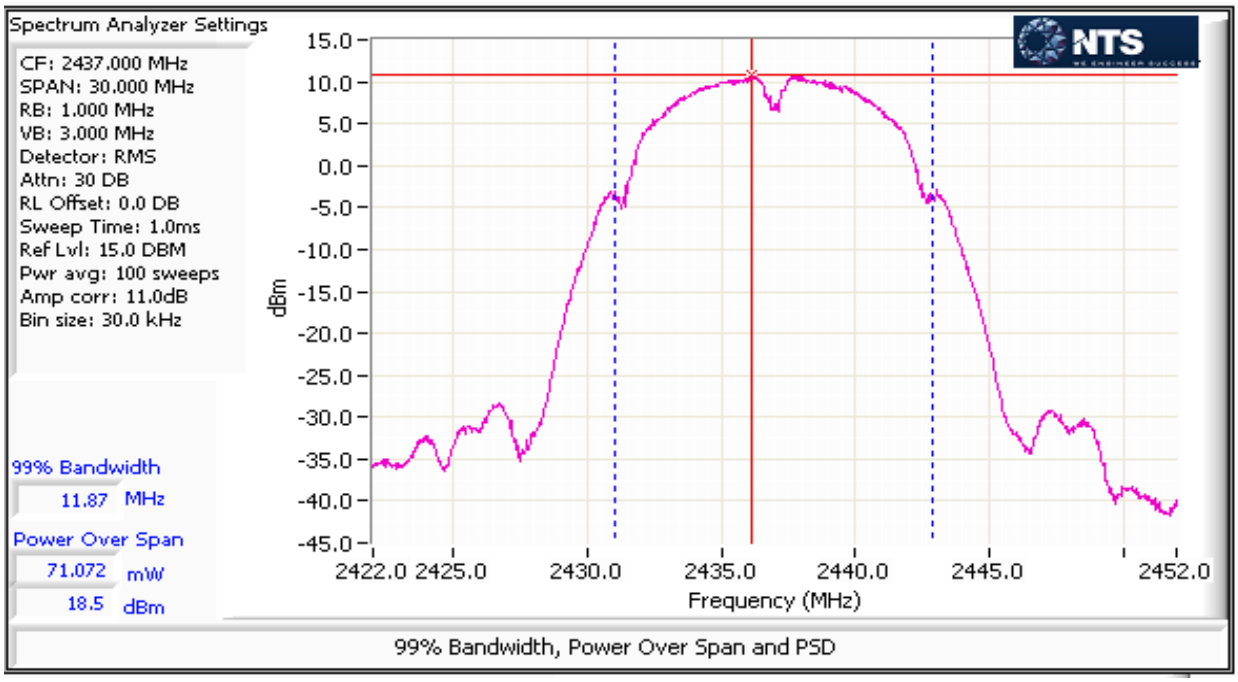
Operating Mode: n40 Non-beamforming
Directional Gain (dBi): 4.1
Max EIRP (mW): 502.0

Frequency (MHz)	Chain	Software Setting	Power[1] dBm	Power[1] mW	Total mW	Total dBm	Max Power (W)	Limit dBm	Result	Power (dBm)[3]
2422	0	11	10.0	10.0	28.5	14.5	0.194	30.0	Pass	
	1		9.5	8.9						
				0.0						
	2		9.8	9.5						
2437	0	20	18.4	69.2	193.9	22.9				
	1		17.9	61.7						
				0.0						
	2		18.0	63.1						
2452	0	11	9.7	9.3	26.2	14.2				
	1		9.0	7.9						
				0.0						
	2		9.5	8.9						

Note 1:	Duty Cycle ≥ 98%. Output power measured using a spectrum analyzer (see plots below) with RBW= 1-5% of OBW and ≤ 1 MHz, VB≥3* RBW, Span ≥ 1.5 of OBW, auto sweep time, RMS detector, power averaging on, and power integration over the OBW, trace average 100 traces (option AVGSA-1 in ANSI C63.10). Spurious limit becomes -30dBc.
Note 2:	Power setting - the software power setting used during testing, included for reference only.

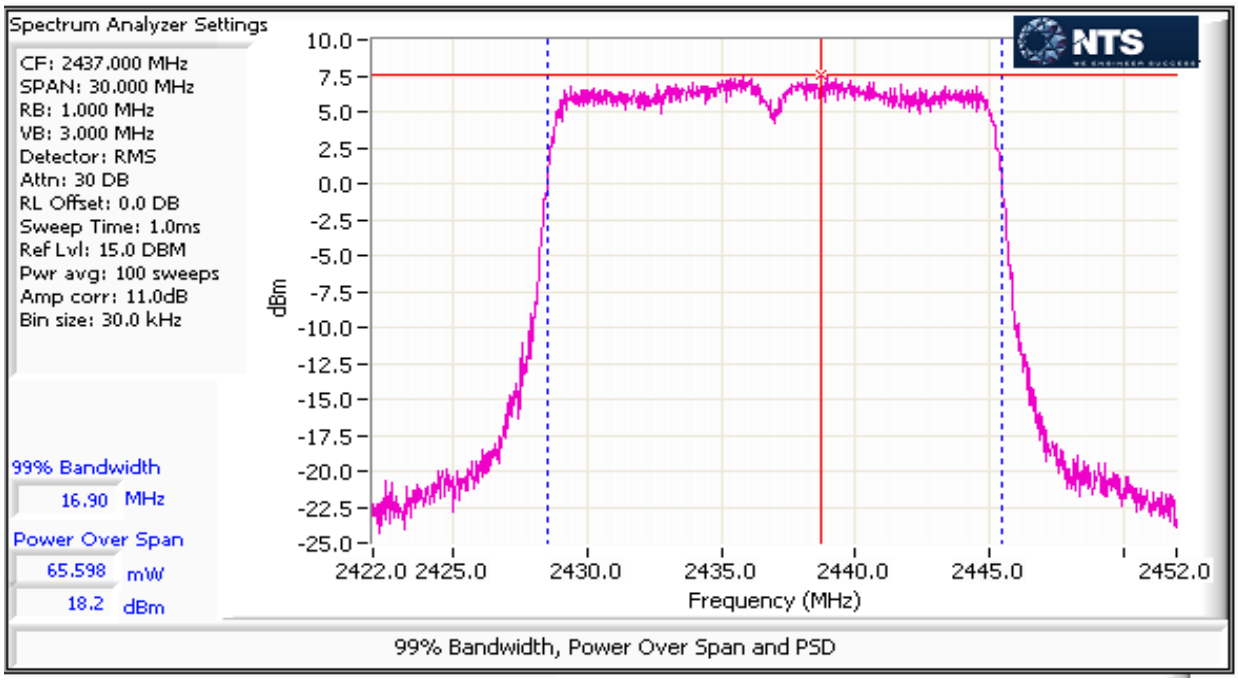
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Power plot : 802.11b



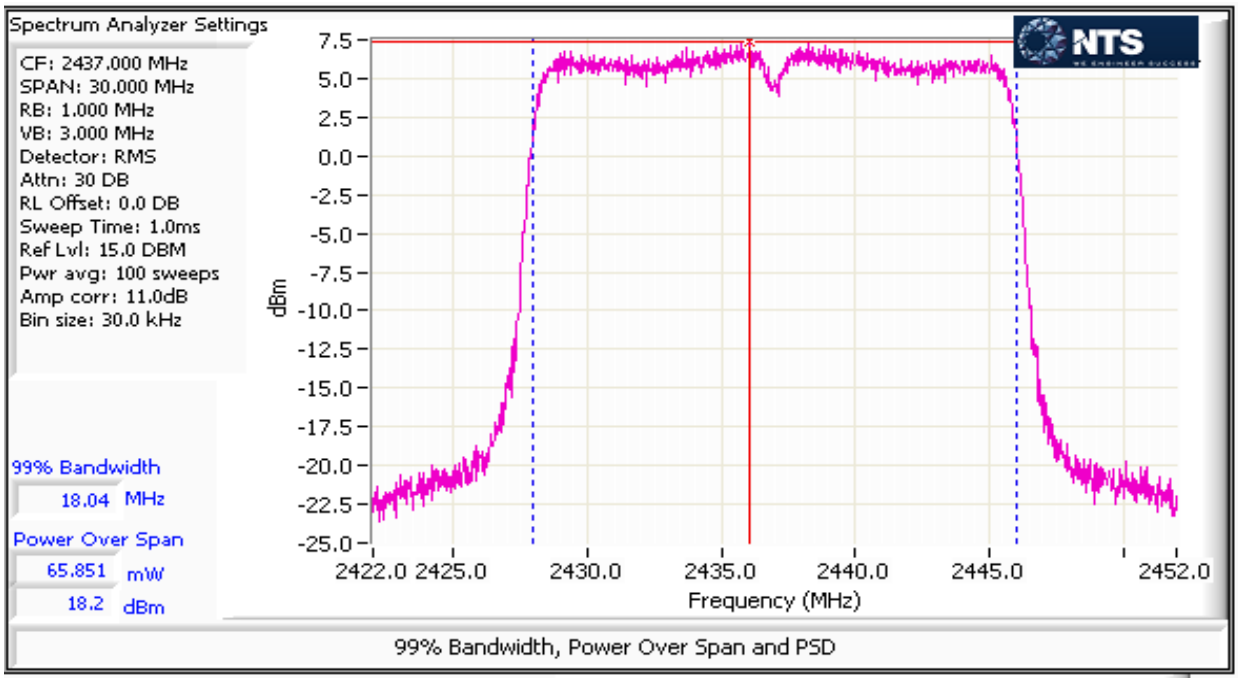
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Power plot : 802.11g



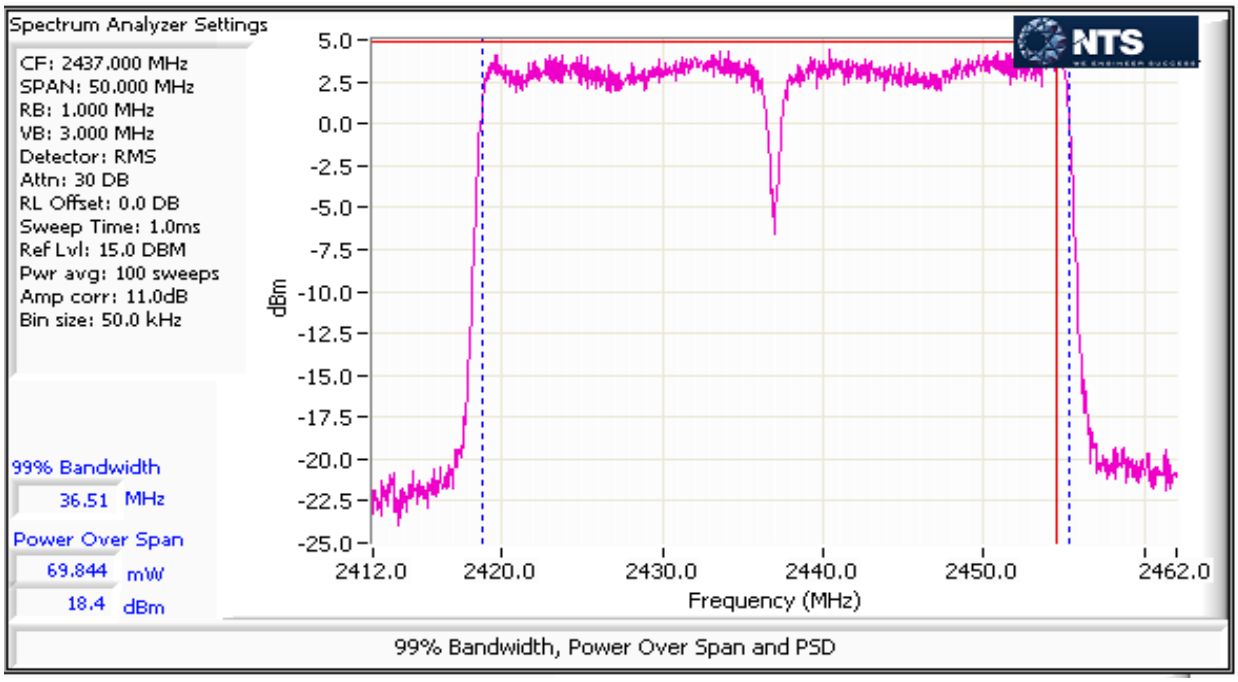
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Power plot : 802.11n20



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Power plot : 802.11n40



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #2: Power spectral Density

Mode: 11b

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1					Limit dBm/3kHz	Result
		Chain 0	Chain 1	Chain 2	Chain 4	Total		
20	2412	-2.3				-2.3	8.0	Pass
20	2437	-2.5				-2.5	8.0	Pass
19	2462	-3.0				-3.0	8.0	Pass

Mode: 11g

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1					Limit dBm/3kHz	Result
		Chain 0	Chain 1	Chain 2	Chain 4	Total		
15	2412	-9.4				-9.4	8.0	Pass
20	2437	-4.5				-4.5	8.0	Pass
13	2462	-11.5				-11.5	8.0	Pass

Mode: n20

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1					Limit dBm/3kHz	Result
		Chain 0	Chain 1	Chain 2	Chain 4	Total		
15	2412	-9.8	-10.0	-10.7		-5.4	8.0	Pass
20	2437	-4.7	-5.5	-6.6		-0.8	8.0	Pass
13	2462	-11.9	-12.3	-12.6		-7.5	8.0	Pass

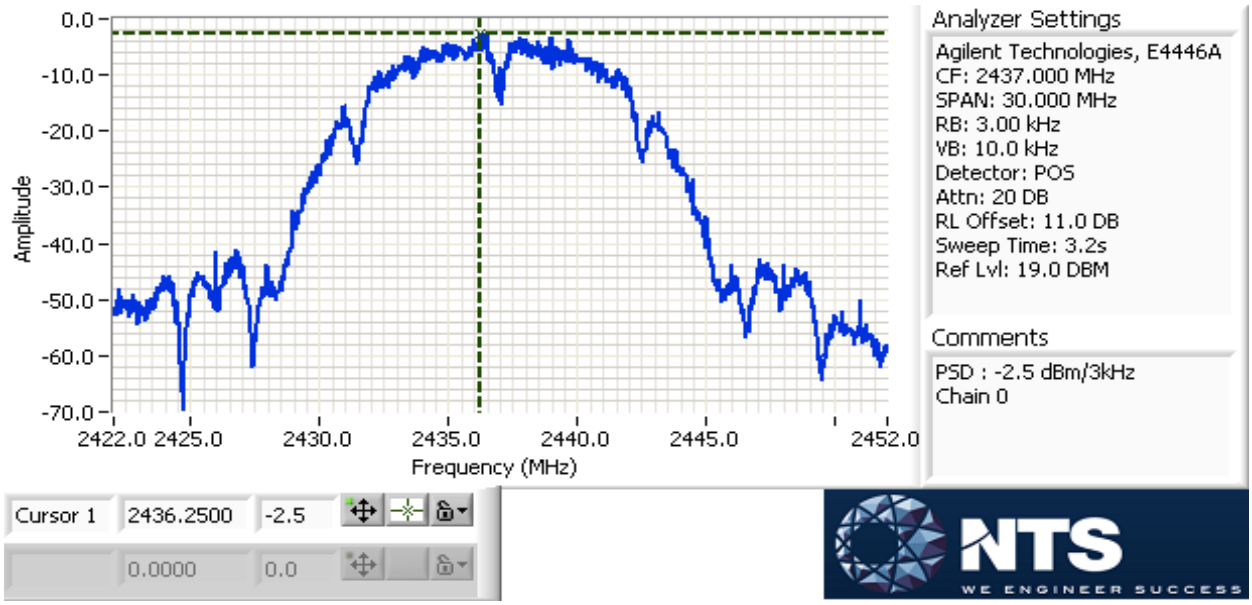
Mode: n40

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1					Limit dBm/3kHz	Result
		Chain 0	Chain 1	Chain 2	Chain 4	Total		
11	2422	-13.8	-15.8	-14.2		-9.7	8.0	Pass
20	2437	-7.5	-7.0	-8.5		-2.9	8.0	Pass
11	2452	-14.9	-17.3	-16.9		-11.5	8.0	Pass

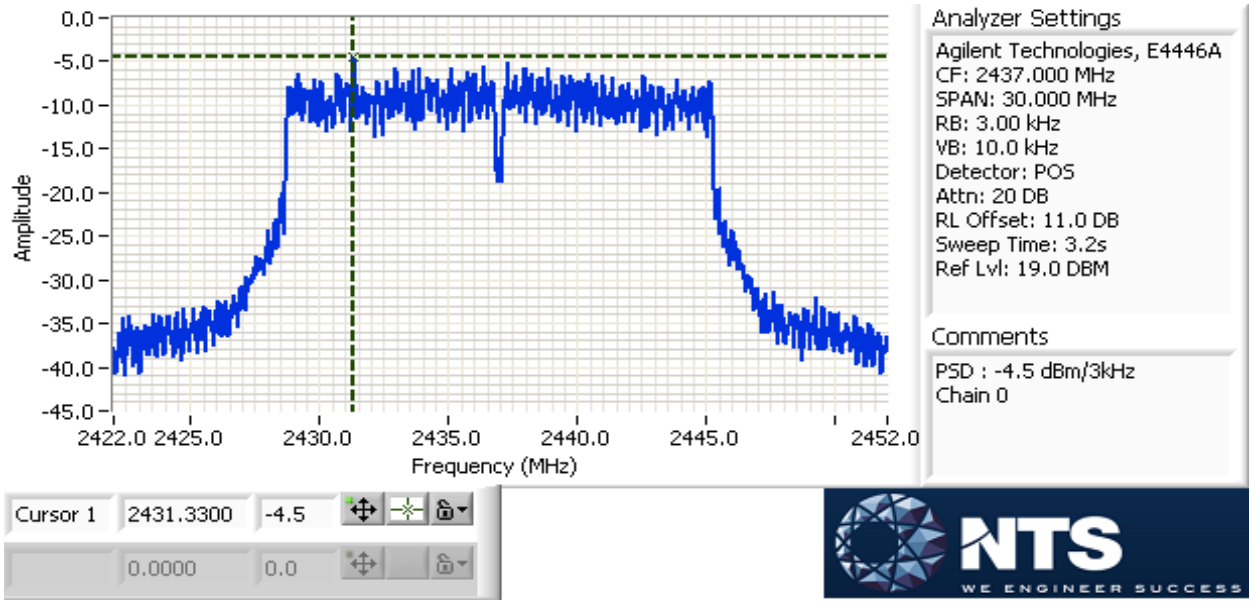
Note 1:	Test performed per method PKSPD, in KDB 558074. Power spectral density measured using: 3kHz ≤ RBW ≤ 100kHz, VBW=3*RBW, peak detector, span = 1.5*DTS BW, auto sweep time, max hold.

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

PSD plot : 802.11b

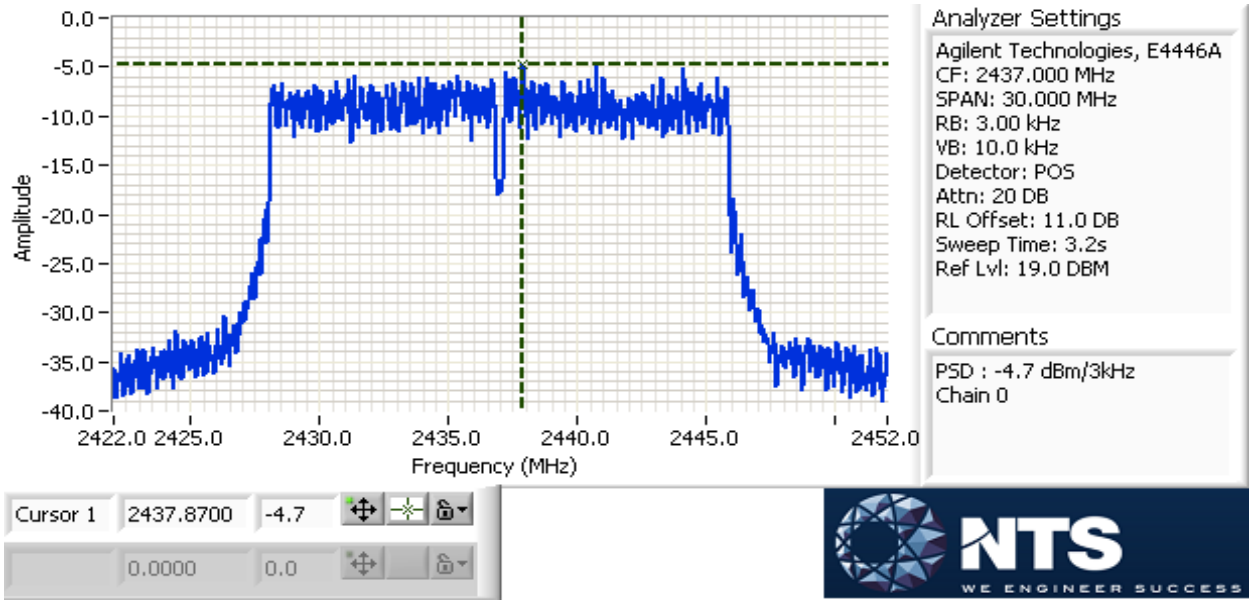


PSD plot : 802.11g

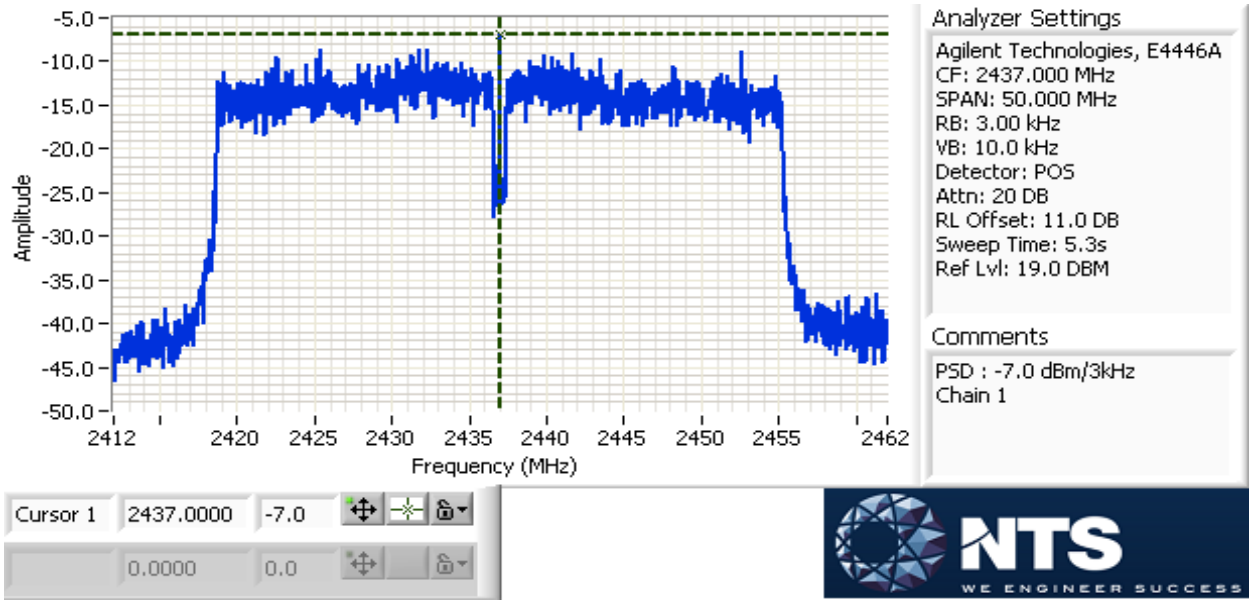


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

PSD plot : 802.11n20



PSD plot : 802.11n40



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #3: Signal Bandwidth

Mode: 11b

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (kHz)	
		6dB	99%	6dB	99%
20	2437	9.0	12.0	100	300

Mode: 11g

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (kHz)	
		6dB	99%	6dB	99%
20	2437	16.4	17.5	100	300

Mode: n20

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (kHz)	
		6dB	99%	6dB	99%
20	2437	17.6	18.3	100	300

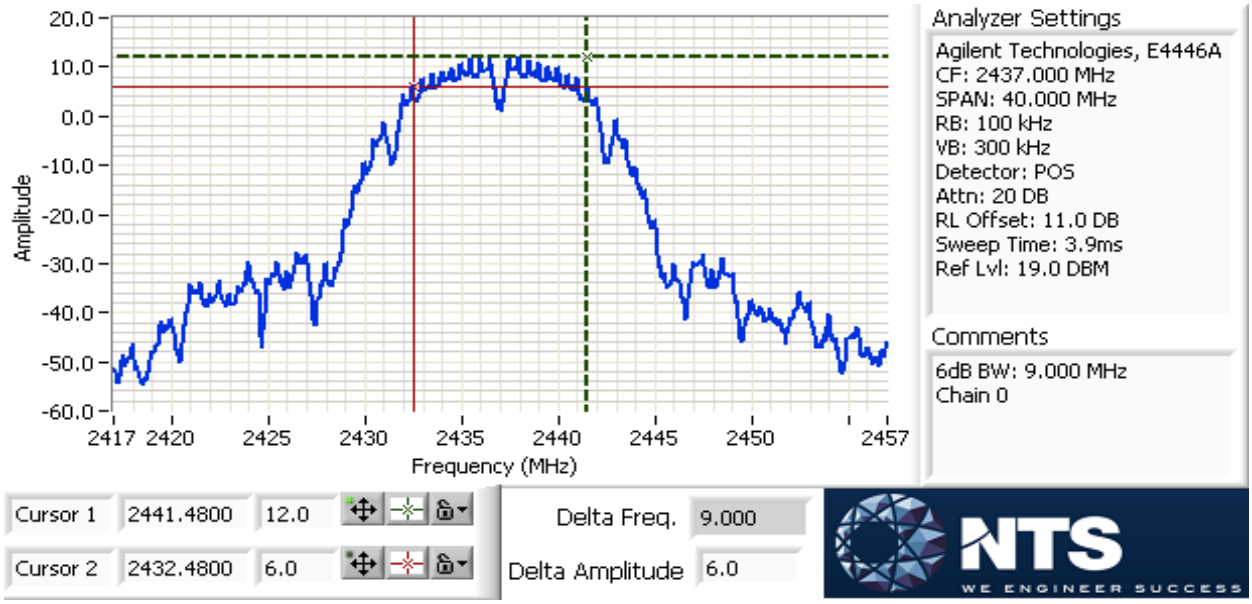
Mode: n40

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (kHz)	
		6dB	99%	6dB	99%
20	2437	36.4	37.5	100	500

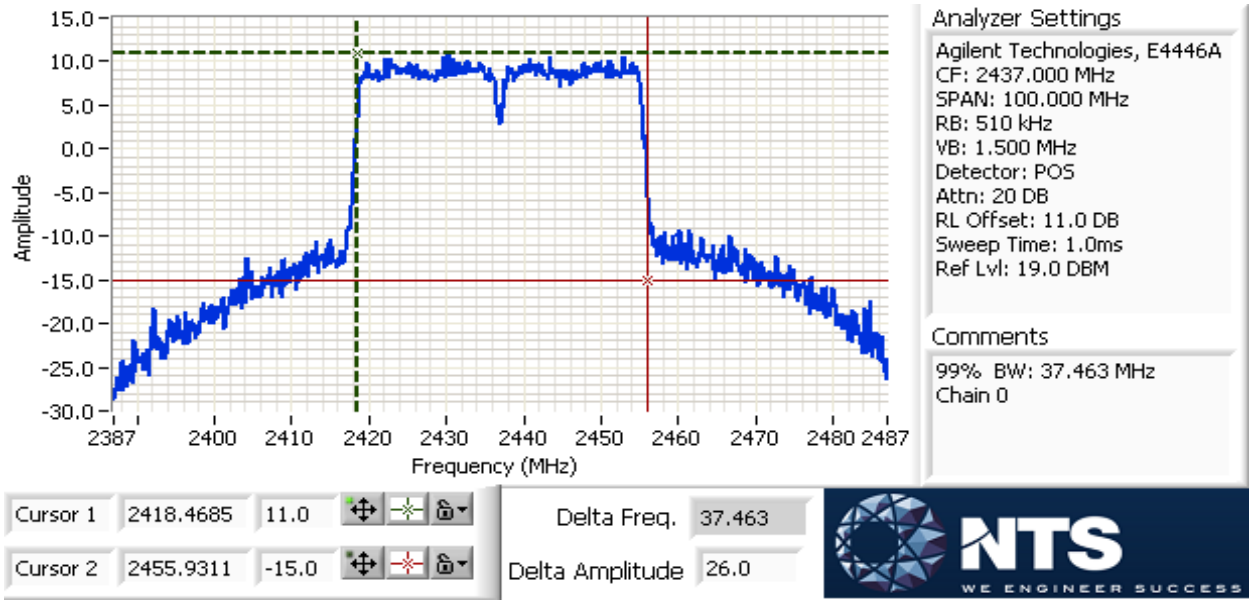
Note 1:	DTS BW: RBW=100kHz, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time, Span 2-5 times measured BW. 99% BW: RBW=1-5% of 99%BW, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time. Span 1.5-5 times OBW.
Note 2:	Measurements performed on chain 0

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

6dB BW plot : 802.11b



99% BW plot : 802.11n40



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

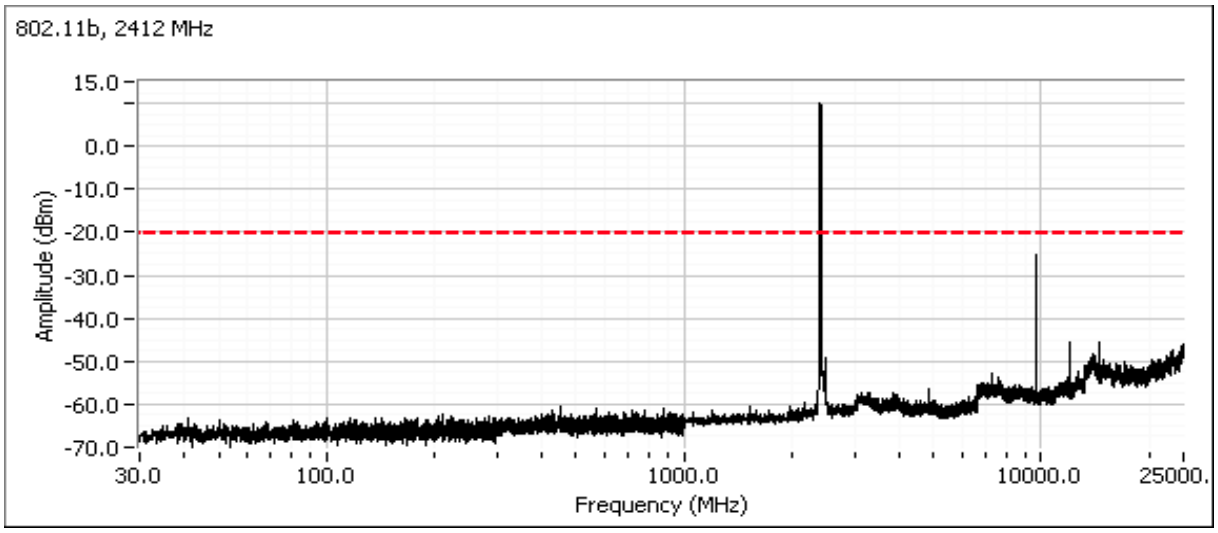
Run #4a: Out of Band Spurious Emissions

Power Setting Per Chain #0	#1	#2	#4	Mode	Frequency (MHz)	Limit	Result
20				11b	2412	-30dBc	Pass
20				11b	2437	-30dBc	Pass
19				11b	2462	-30dBc	Pass
15				11g	2412	-30dBc	Pass
20				11g	2437	-30dBc	Pass
13				11g	2462	-30dBc	Pass
15				11n20	2412	-30dBc	Pass
20				11n20	2437	-30dBc	Pass
13				11n20	2462	-30dBc	Pass
11				11n40	2422	-30dBc	Pass
20				11n40	2437	-30dBc	Pass
11				11n40	2452	-30dBc	Pass

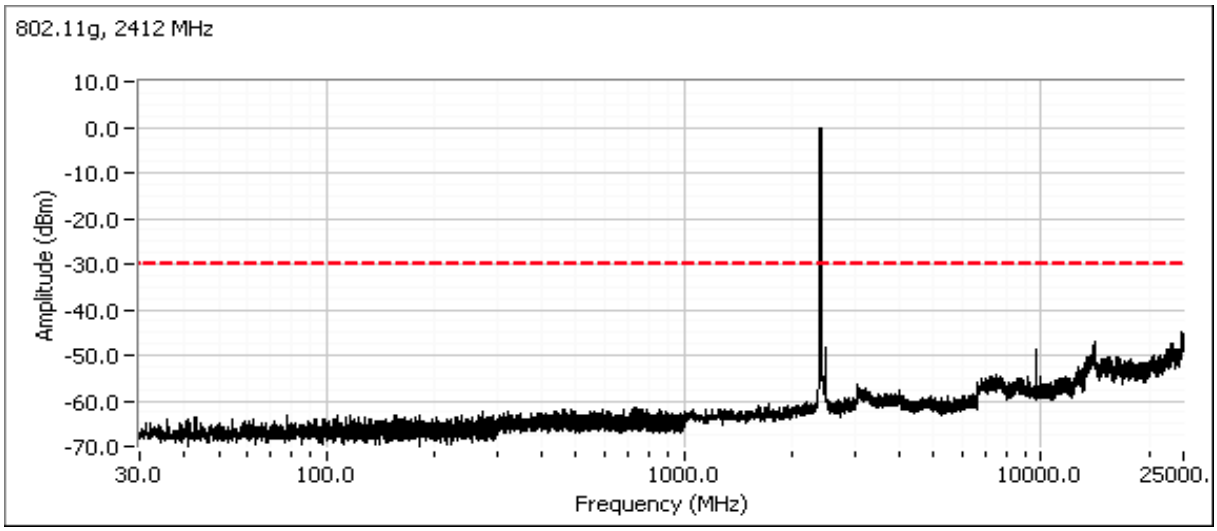
Note 1:	Measured on each chain individually and for single chain operation on the chain with the highest power

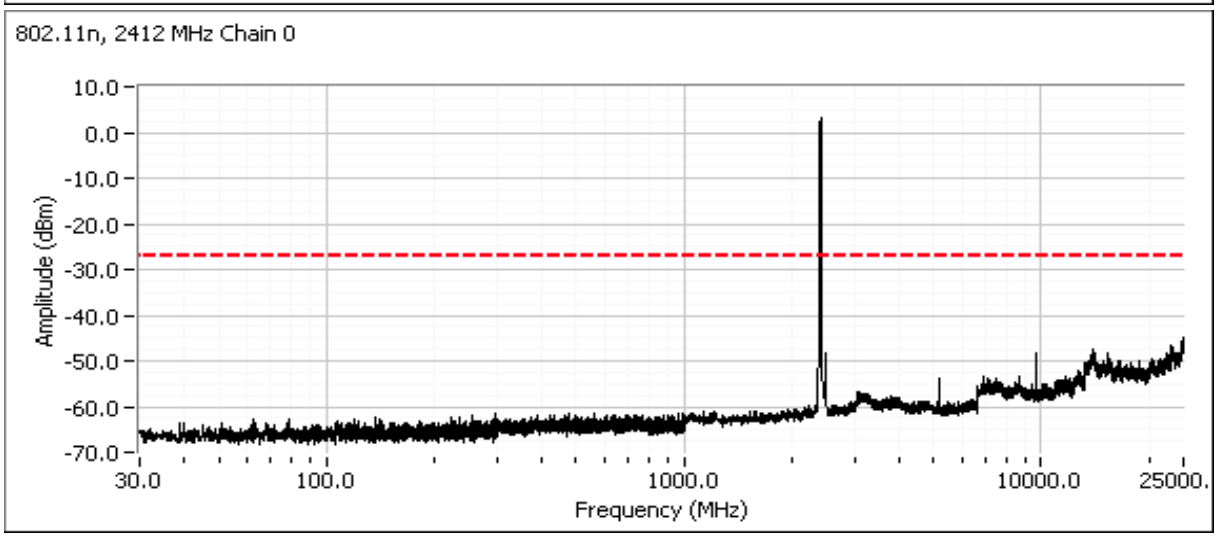
RBW = 100 kHz and VBW = 300 kHz for all plots.

Plots for low channel

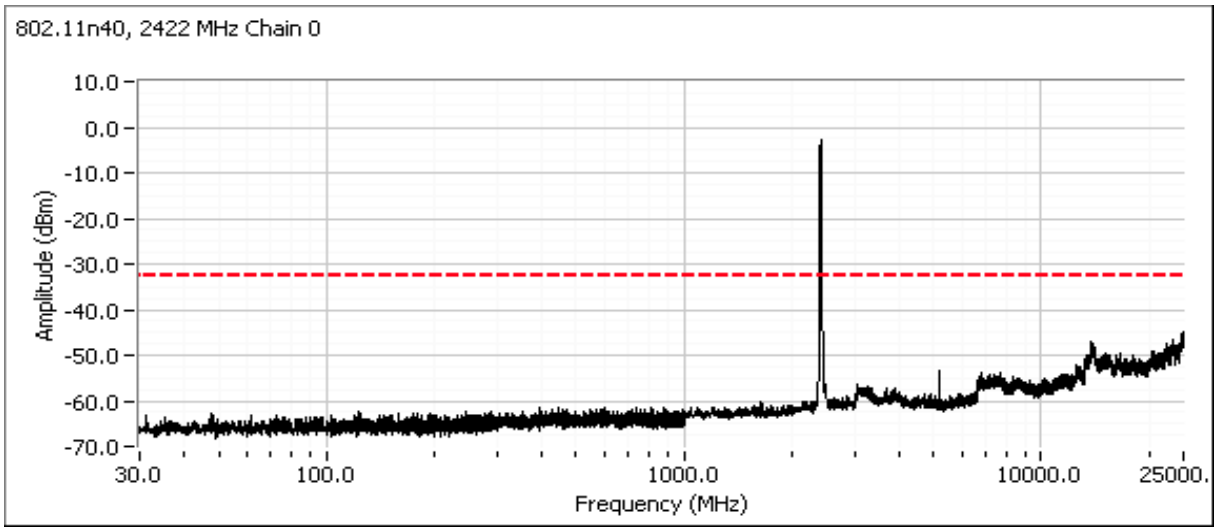


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A



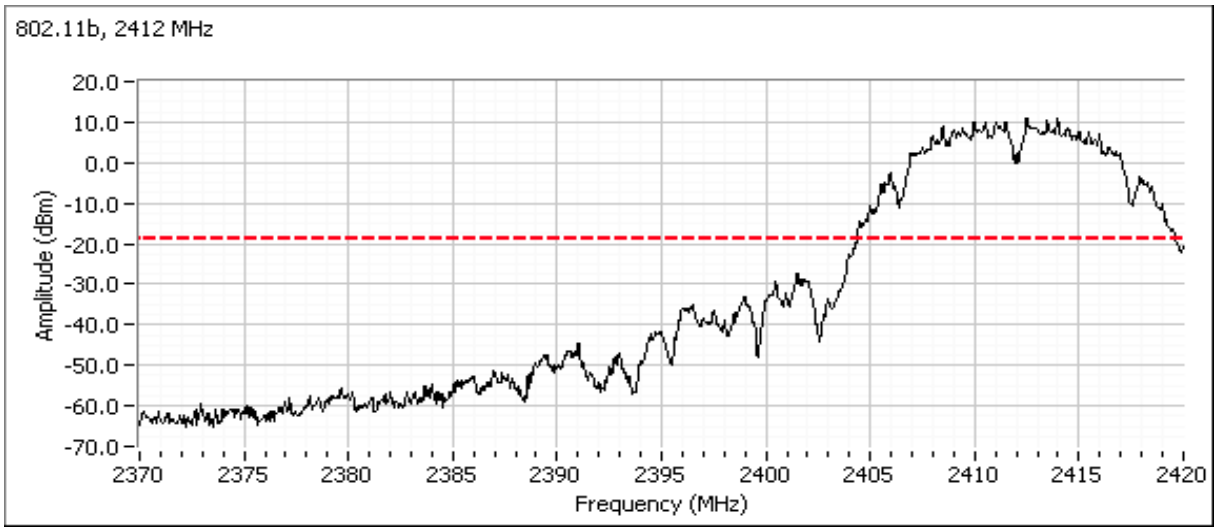


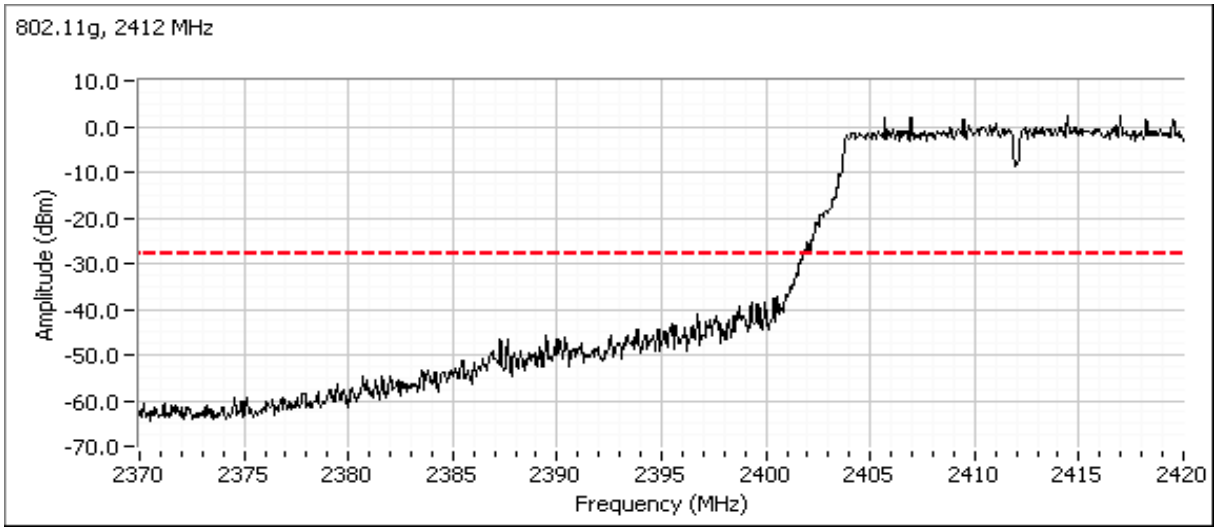
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A



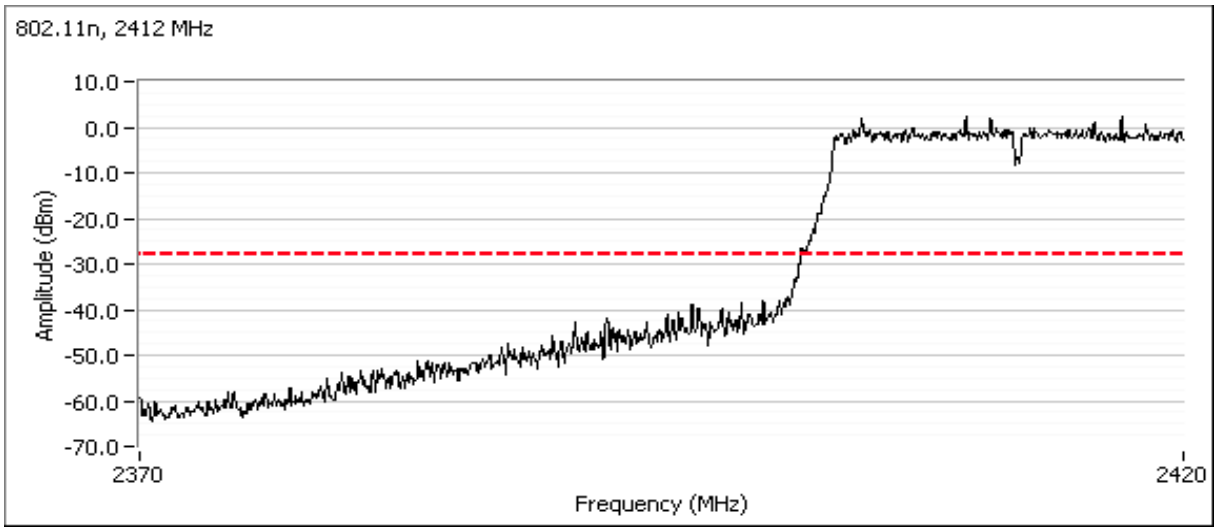
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

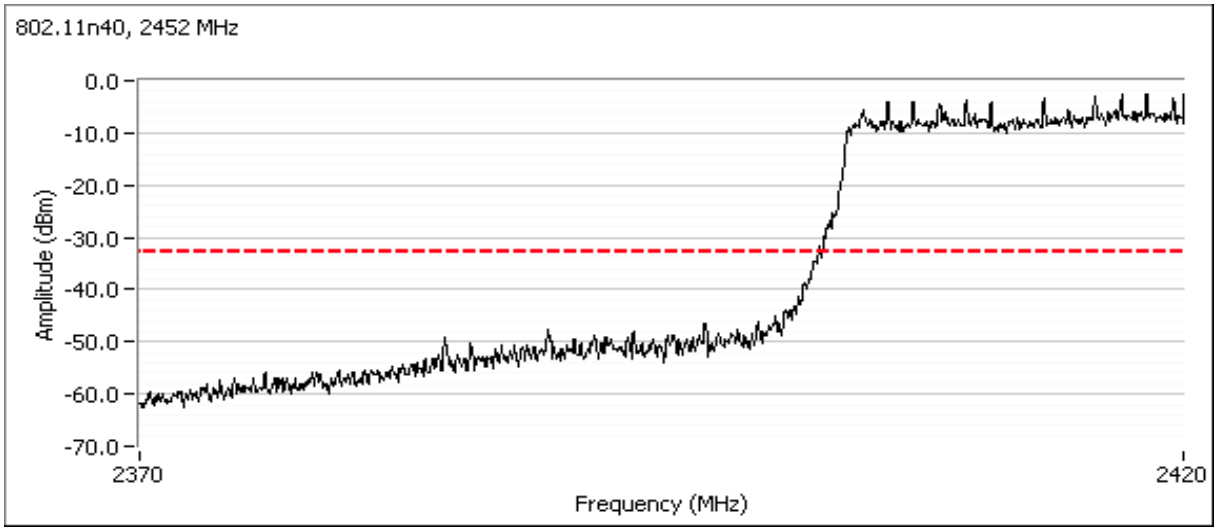
Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted bands below 2390 MHz and above 2483.5 MHz.





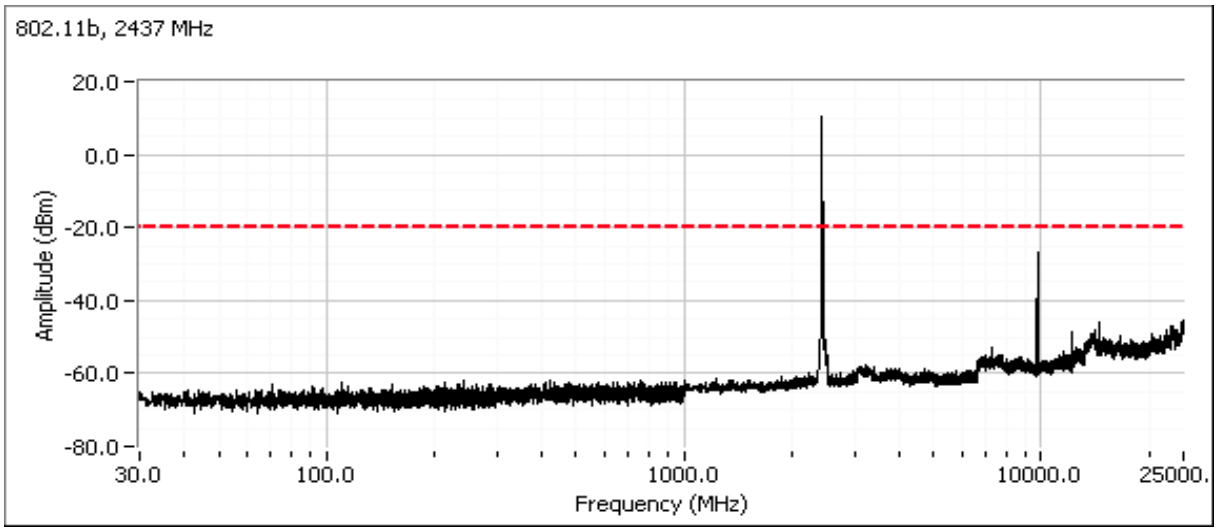
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

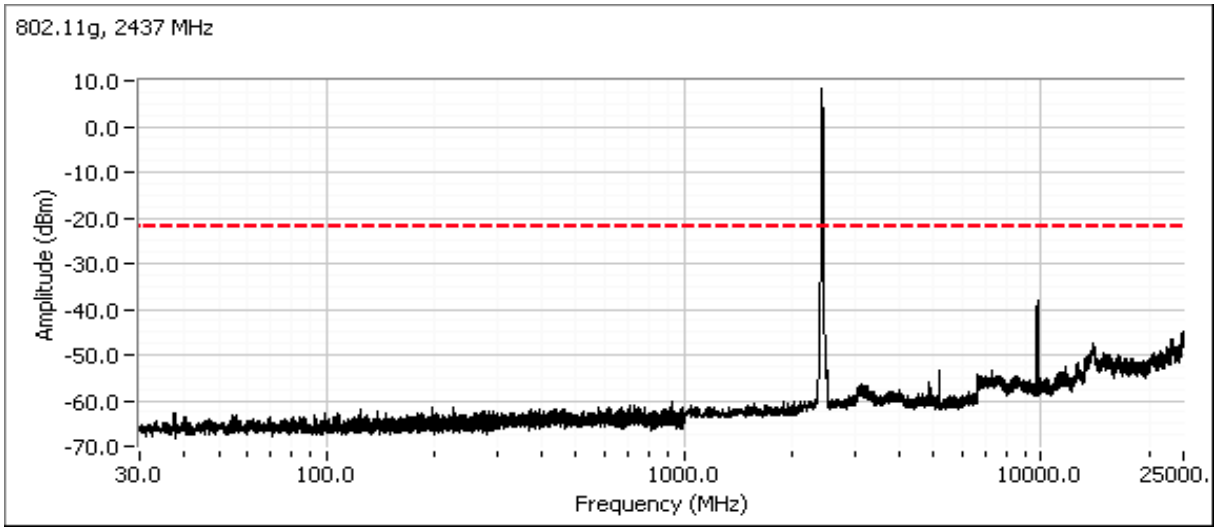




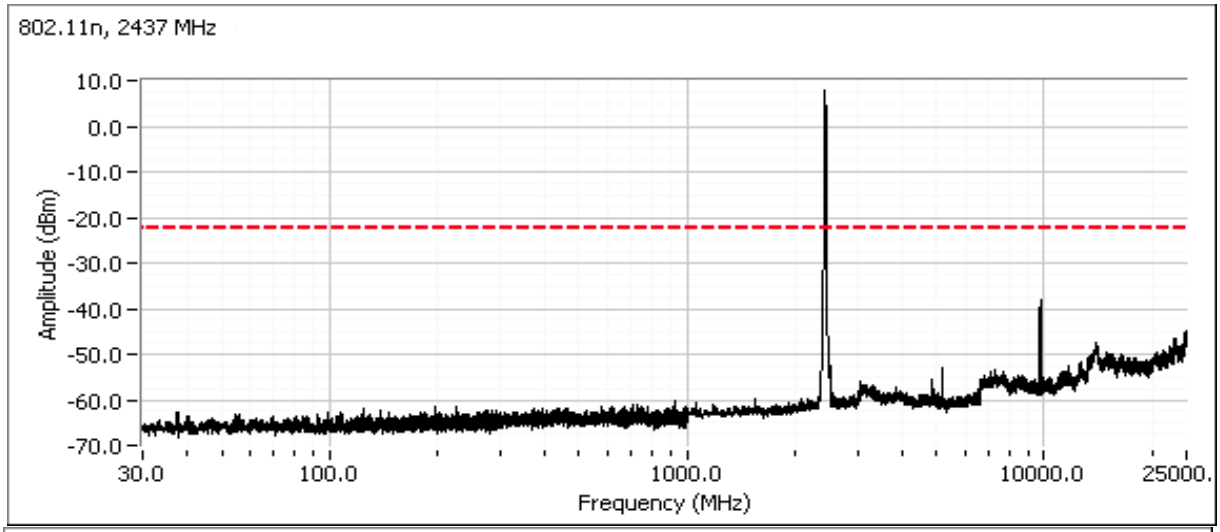
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

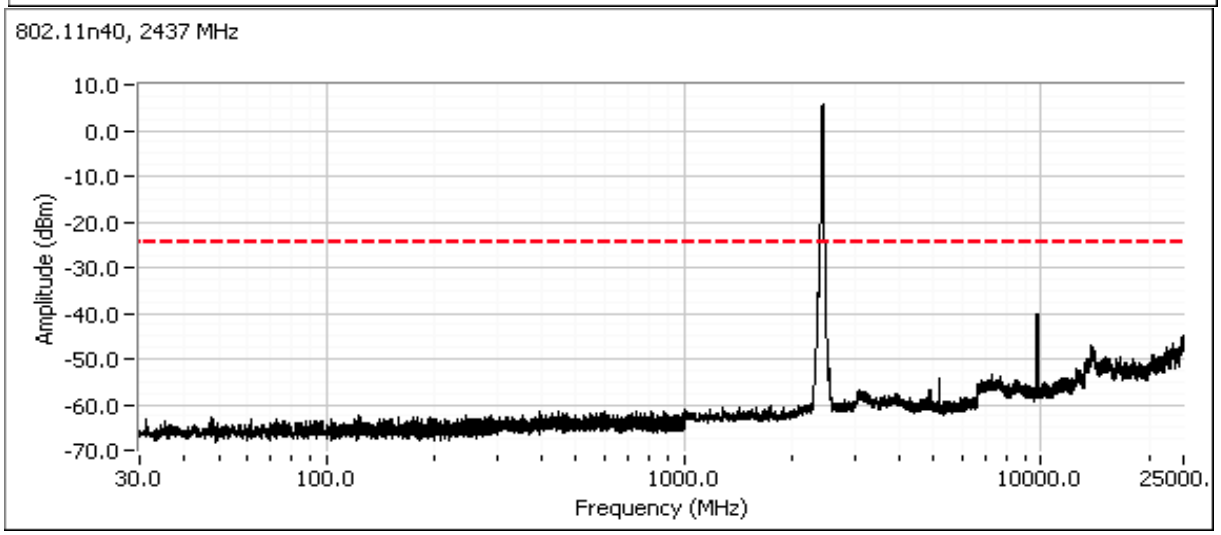
Plots for center channel





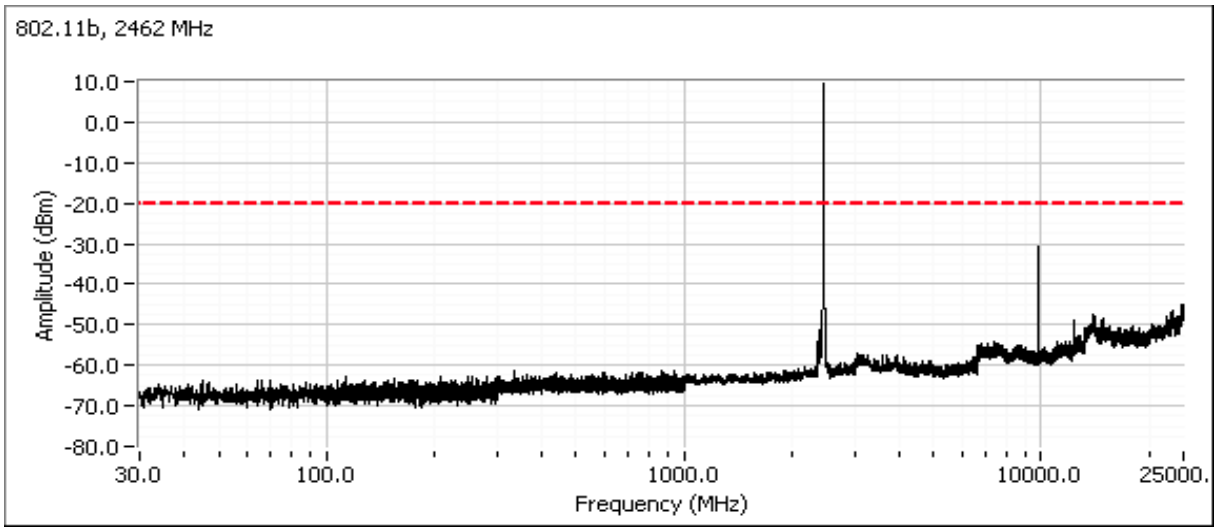
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

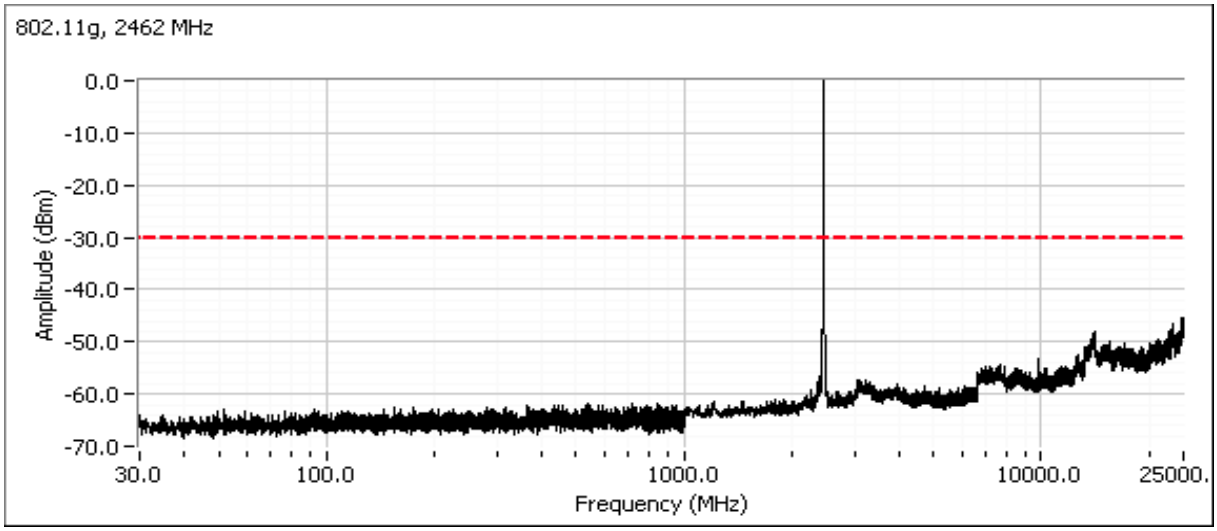




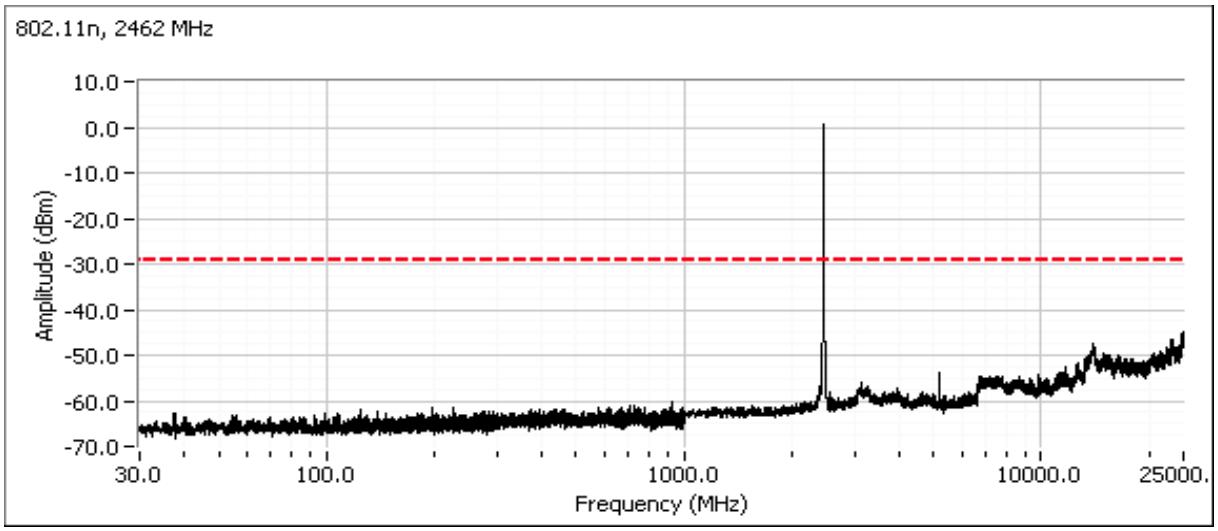
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

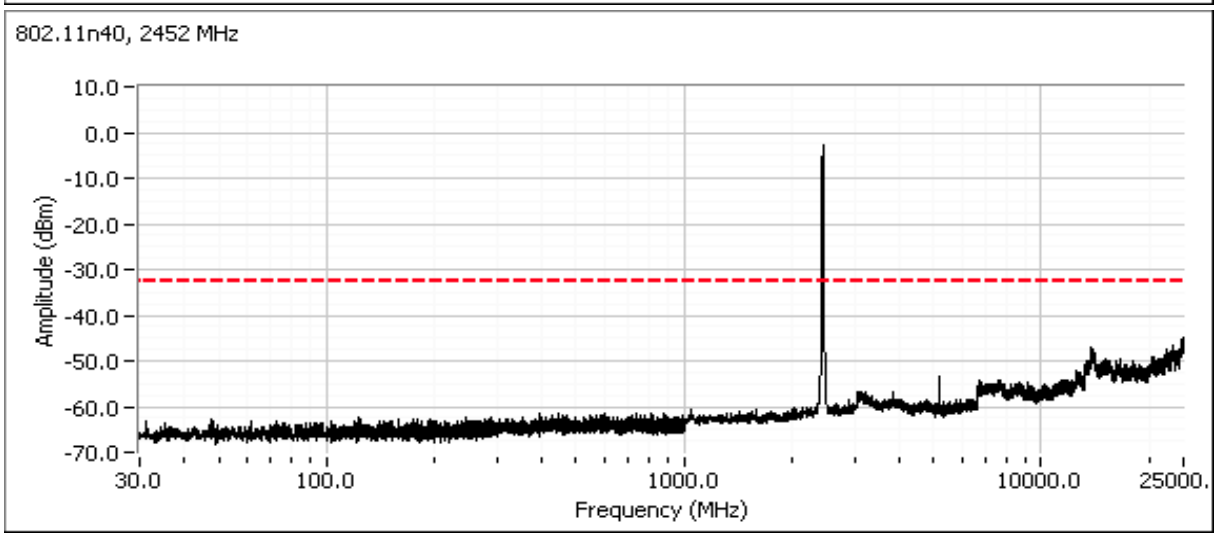
Plots for high channel





Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A





Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

RSS-247 and FCC 15.247 (DTS) Antenna Port Measurements
MIMO and Smart Antenna Systems
Power

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: 3/5/2018
Test Engineer: Jude Semana / R. Varelas
Test Location: FT Lab #4A

Config. Used: 1
Config Change: None
EUT Voltage: 115V, 400Hz

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: 21.6 °C
Rel. Humidity: 39 %

Summary of Results

Run #			Test Performed	Limit	Pass / Fail	Result / Margin
3Tx Modes (11n)						
1			Output Power	15.247(b)	Pass	22.9 dBm

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:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, 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)	
n20	MCS0	0.99	Yes	1.922	0	0	10	20
n40	MCS0	0.98	Yes	0.944	0	0	10	20

Sample Notes

Sample S/N: LT17000S

Driver: -

Antenna Gain Information

Freq	Antenna Gain (dBi) / Chain				BF	MultiChain Legacy	CDD	Sectorized / Xpol	Dir G (PWR)	Dir G (PSD)
	1	2	3	4						
2.4 GHz	4.13	4.13	4.13		X	-	X	-	8.9	8.9

For devices that support CDD modes

Min # of spatial streams: 1

Max # of spatial streams: 3

Notes:	BF = beamforming mode supported, Multichain Legacy = 802.11 legacy data rates supported for multichain transmissions, CDD = Cyclic Delay Diversity (or Cyclic Shift Diversity) modes supported, Sectorized / Xpol = antennas are sectorized or cross polarized
Notes:	Dir G (PWR) = total gain (Gant + Array Gain) for power calculations; Dir G (PSD) = total gain for PSD calculations based on FCC KDB 662911. Depending on the modes supported, the Array Gain value for power could be different from the PSD value.
Notes:	Array gain for power/psd calculated per KDB 662911 D01, v01r02.

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #1: Output Power

Operating Mode: n20
Directional Gain (dBi): 8.9

Max EIRP (mW): 1460.136

Frequency (MHz)	Chain	Software Setting	Power[1] dBm	Power[1] mW	Total mW	Total dBm	Max Power (W)	Limit dBm	Result	Power (dBm)[3]
2412	0	15	13.0	20.0	62.2	17.9	0.188	27.1	Pass	
	1		13.2	20.9						
				0.0						
	2		13.3	21.4						
2437	0	20	18.2	66.1	188.0	22.7				
	1		17.7	58.9						
				0.0						
	2		18.0	63.1						
2462	0	13	10.8	12.0	35.8	15.5				
	1		10.7	11.7						
				0.0						
	2		10.8	12.0						

Operating Mode: n40
Directional Gain (dBi): 8.9

Max EIRP (mW): 1505.8611

Frequency (MHz)	Chain	Software Setting[2]	Power[1] dBm	Power[1] mW	Total mW	Total dBm	Max Power (W)	Limit dBm	Result	Power (dBm)[3]
2422	0	11	10.0	10.0	28.5	14.5	0.194	27.1	Pass	
	1		9.5	8.9						
				0.0						
	2		9.8	9.5						
2437	0	20	18.4	69.2	193.9	22.9				
	1		17.9	61.7						
				0.0						
	2		18.0	63.1						
2452	0	11	9.7	9.3	26.2	14.2				
	1		9.0	7.9						
				0.0						
	2		9.5	8.9						

Note 1:	Duty Cycle ≥ 98%. Output power measured using a spectrum analyzer (see plots below) with RBW= 1-5% of OBW and ≤ 1 MHz, VB≥3* RBW, Span ≥ 1.5 of OBW, auto sweep time, RMS detector, power averaging on, and power integration over the OBW, trace average 100 traces (option AVGSA-1 in ANSI C63.10). Spurious limit becomes -30dBc.

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, 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: 22.4 °C
Rel. Humidity: 41 %

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

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
1	b	1 - 2412MHz	20	20	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	49.9 dBµV/m @ 2389.8 MHz (-4.1 dB)
		11 - 2462MHz		19	Restricted Band Edge (2483.5 MHz)		52.3 dBµV/m @ 2483.5 MHz (-1.7 dB)
2	g	1 - 2412MHz		15	Restricted Band Edge (2390 MHz)		51.0 dBµV/m @ 2483.9 MHz (-3.0 dB)
		2 - 2417MHz		17			53.9 dBµV/m @ 2388.8 MHz (-0.1 dB)
		8 - 2447MHz		17	Restricted Band Edge (2483.5 MHz)		50.8 dBµV/m @ 2483.5 MHz (-3.2 dB)
		9 - 2452MHz		16			50.7 dBµV/m @ 2483.7 MHz (-3.3 dB)
		10 - 2457MHz		15			51.5 dBµV/m @ 2484.3 MHz (-2.5 dB)
		11 - 2462MHz		13			52.0 dBµV/m @ 2389.8 MHz (-2.0 dB)

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

3	n20	1 - 2412MHz	20	15	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	53.7 dBµV/m @ 2389.5 MHz (-0.3 dB)
		2 - 2417MHz		20			52.5 dBµV/m @ 2390.0 MHz (-1.5 dB)
		10 - 2457MHz		20	Restricted Band Edge (2483.5 MHz)		50.8 dBµV/m @ 2487.1 MHz (-3.2 dB)
		11 - 2462MHz		13			53.0 dBµV/m @ 2483.8 MHz (-1.0 dB)
4	n40	3 - 2422MHz		11	Restricted Band Edge (2390 MHz)		51.4 dBµV/m @ 2386.2 MHz (-2.6 dB)
	n40	4 - 2427MHz		12	Restricted Band Edge (2390 MHz)		53.5 dBµV/m @ 2389.7 MHz (-0.5 dB)
	n40	5 - 2432MHz		14	Restricted Band Edge (2390 MHz)		53.5 dBµV/m @ 2388.9 MHz (-0.5 dB)
	n40	6 - 2432MHz		q57 / 14.25	Restricted Band Edge (2390 MHz)		53.1 dBµV/m @ 2389.9 MHz (-0.9 dB)
	n40	6 - 2437MHz		q59 / 14.75	Restricted Band Edge (2483.5 MHz)		53.3 dBµV/m @ 2483.8 MHz (-0.7 dB)
	n40	7 - 2442MHz		q55 / 13.75	Restricted Band Edge (2483.5 MHz)		53.6 dBµV/m @ 2483.9 MHz (-0.4 dB)
	n40	8 - 2447MHz		q53 / 13.25	Restricted Band Edge (2483.5 MHz)		53.8 dBµV/m @ 2483.6 MHz (-0.2 dB)
	n40	9 - 2452MHz		11	Restricted Band Edge (2483.5 MHz)		70.7 dBµV/m @ 2492.8 MHz (-3.3 dB)

Modifications Made During Testing

Modifications are detailed under each run description.

Deviations From The Standard

No deviations were made from the requirements of the standard.

Sample Notes

Sample S/N: LT17000S
Driver: -
Antenna: Internal 4.13 dBi

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, 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 a duty cycle ≥ 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)
11b	2 Mb/s	95.7	No	7	0	0	143
11g	6 Mb/s	97.6	No	2	0	0	500
n20	MCS1	96.2	No	2	0	0	500
n40	MCS1	96.8	No	2	0	0	500

Commands to use for the following modes:
11b - data-rates custom basic-2
11g - data-rates custom basic-6
n20 - data-rates custom basic-mcs-1s
n40 - data-rates custom basic-mcs-1s

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 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
Note 8:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabular results for final measurements.

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #1: Radiated Bandedge Measurements

Date of Test: 3/28/2017 0:00
Test Engineer: John Caizzi
Test Location: Chamber 7

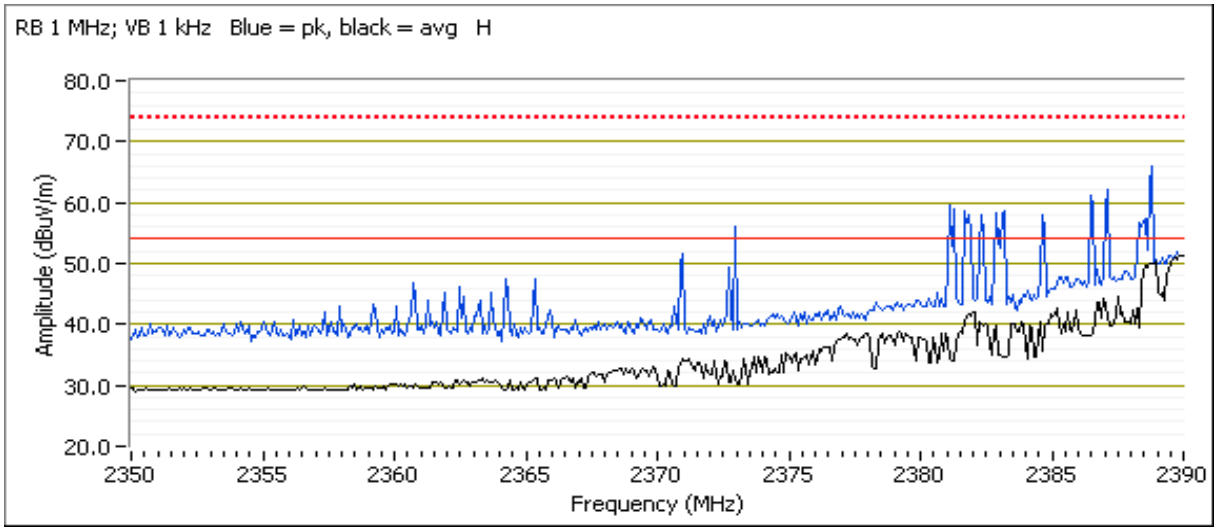
Config. Used: 1
Config Change: none
EUT Voltage: 115V / 400Hz

Channel: 1
Tx Chain: 1

Mode: b
Data Rate: 2 Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.440	43.7	V	54.0	-10.3	Avg	260	1.58	VB: 1 kHz, note 6.
2386.230	48.2	V	74.0	-25.8	PK	260	1.58	
2389.760	49.9	H	54.0	-4.1	Avg	240	1.00	VB: 1 kHz, note 6.
2388.960	62.4	H	74.0	-11.6	PK	240	1.00	

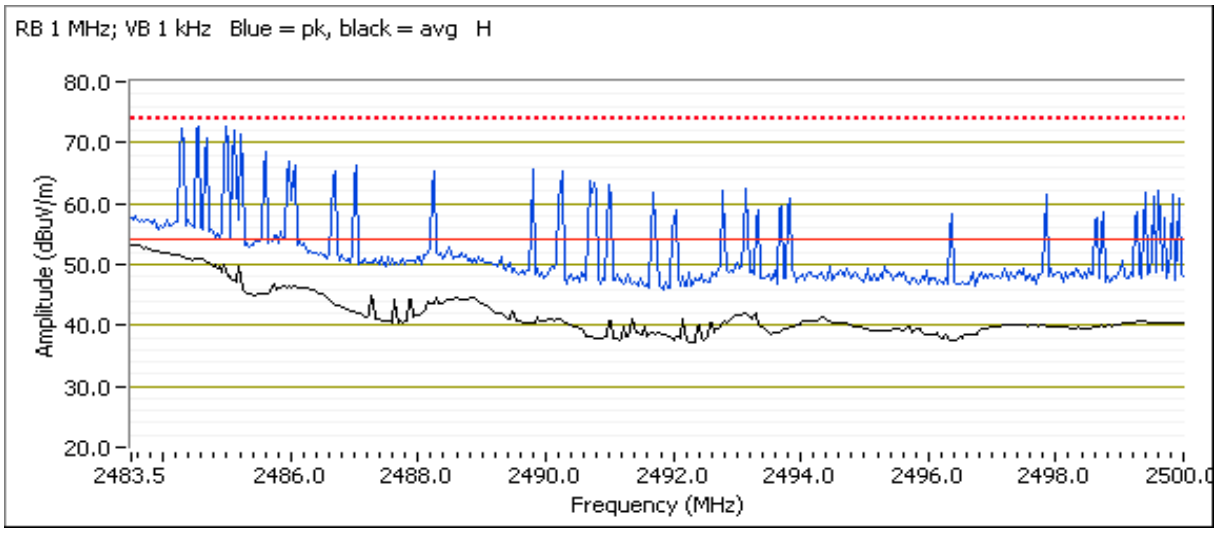


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 11 Mode: b
Tx Chain: 1 Data Rate: 2 Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2483.530	52.8	H	54.0	-1.2	Avg	129	1.57	VB: 1 kHz, note 6.
2493.450	74.3	H	74.0	0.3	PK	129	1.57	
Pwr setting = 19								
2483.500	52.3	H	54.0	-1.7	Avg	129	1.6	VB: 1 kHz, note 6.
2483.600	67.1	H	74.0	-6.9	PK	129	1.6	



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #2: Radiated Bandedge Measurements

Date of Test: 3/28/2017 0:00
Test Engineer: John Caizzi
Test Location: Chamber 7

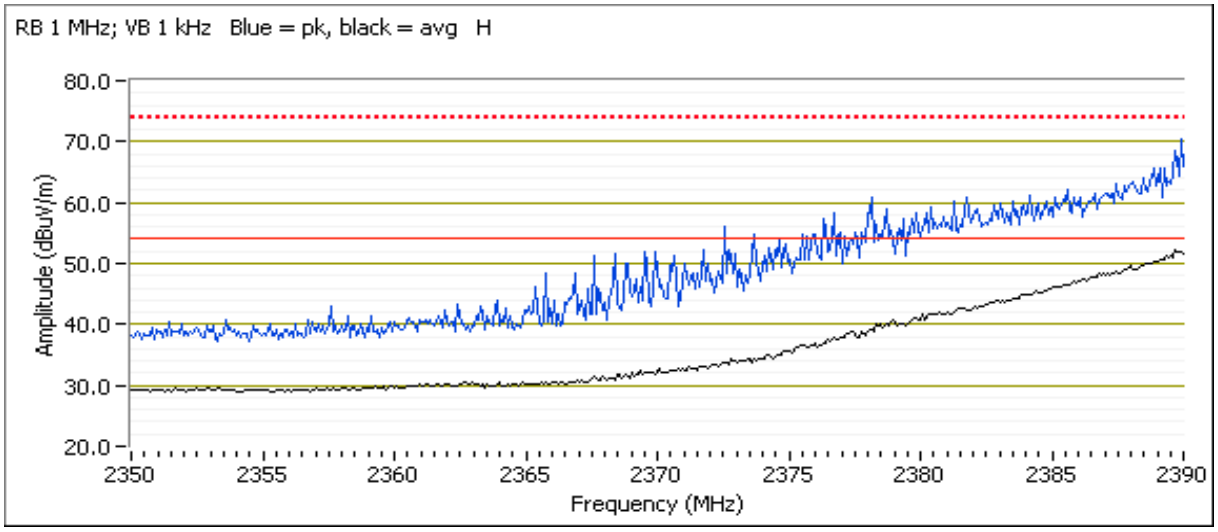
Config. Used: 1
Config Change: none
EUT Voltage: 115V / 400Hz

Channel: 1
Tx Chain: 1

Mode: g
Data Rate: 6 Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 15								
2389.840	52.0	H	54.0	-2.0	Avg	239	1.28	VB: 1 kHz, note 6.
2390.000	67.2	H	74.0	-6.8	PK	239	1.28	

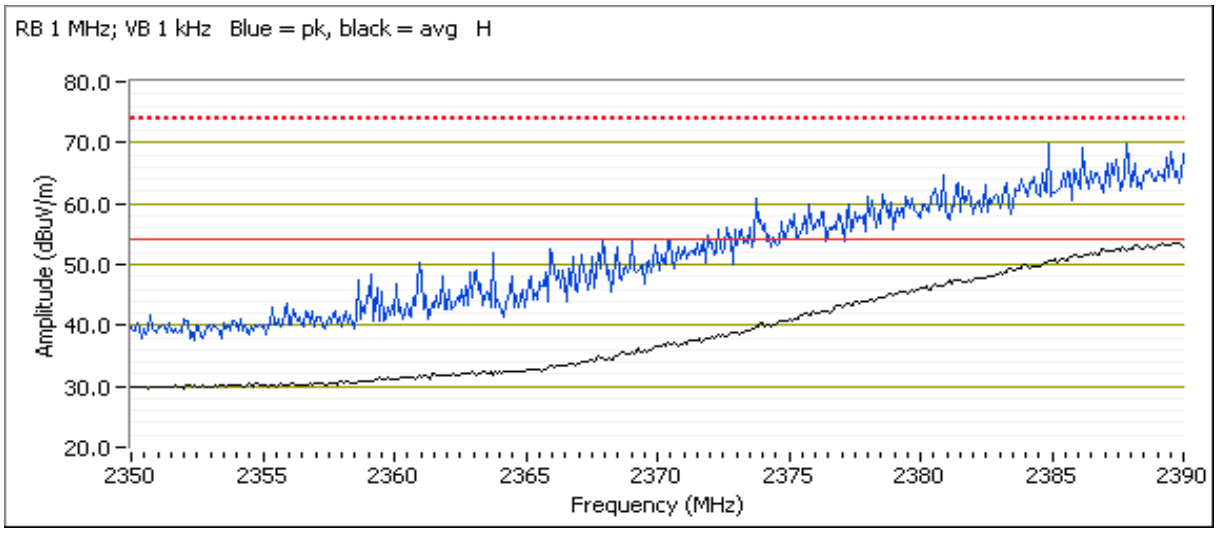


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 2 Mode: g
Tx Chain: 1 Data Rate: 6 Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 17								
2388.800	53.9	H	54.0	-0.1	Avg	236	1.12	VB: 1 kHz, note 6.
2389.120	70.2	H	74.0	-3.8	PK	236	1.12	

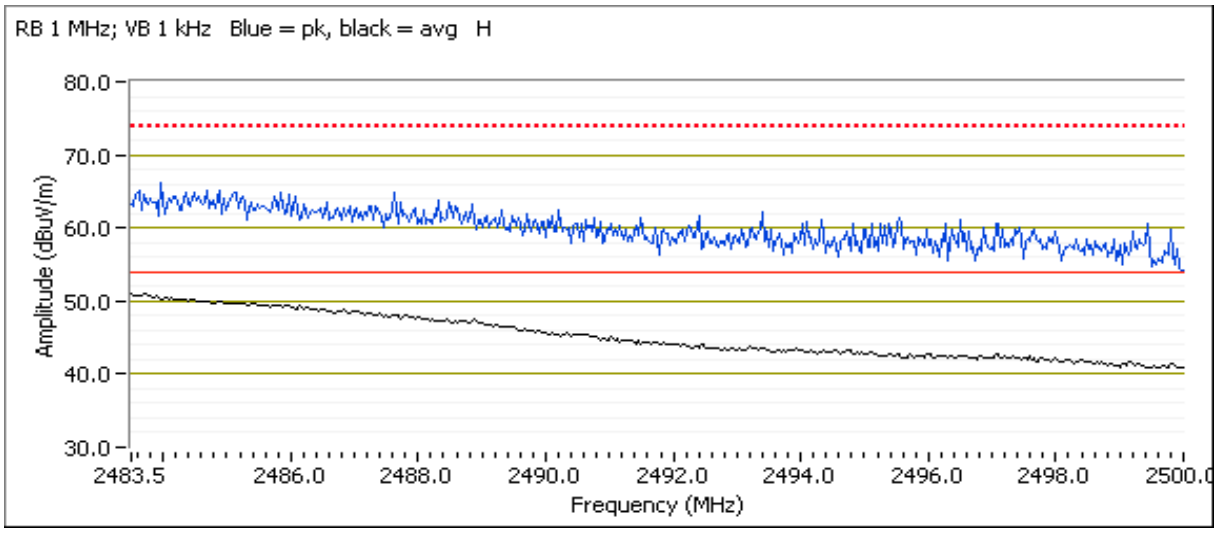


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 8 Mode: g
Tx Chain: 1 Data Rate: 6 Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 17								
2483.500	50.8	H	54.0	-3.2	Avg	132	1.2	VB: 1 kHz, note 6.
2484.190	65.3	H	74.0	-8.7	PK	132	1.2	

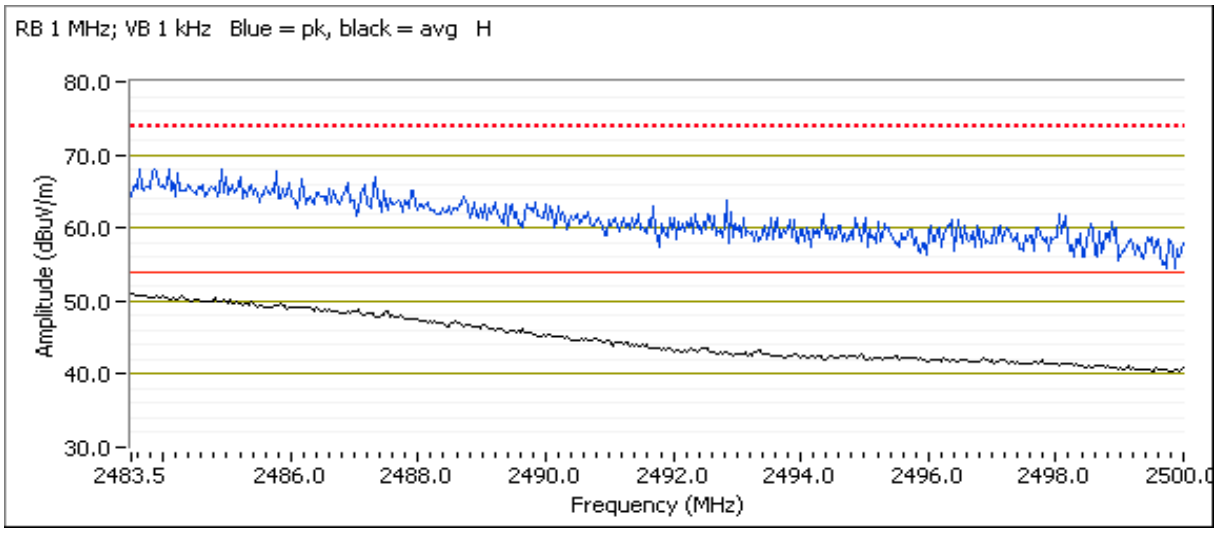


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 9 Mode: g
Tx Chain: 1 Data Rate: 6 Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 17								
2483.570	54.9	H	54.0	0.9	Avg	132	1.2	VB: 1 kHz, note 6.
2484.820	78.2	H	74.0	4.2	PK	132	1.2	
Pwr setting = 16								
2483.670	50.7	H	54.0	-3.3	Avg	132	1.2	VB: 1 kHz, note 6.
2486.910	70.2	H	74.0	-3.8	PK	132	1.2	

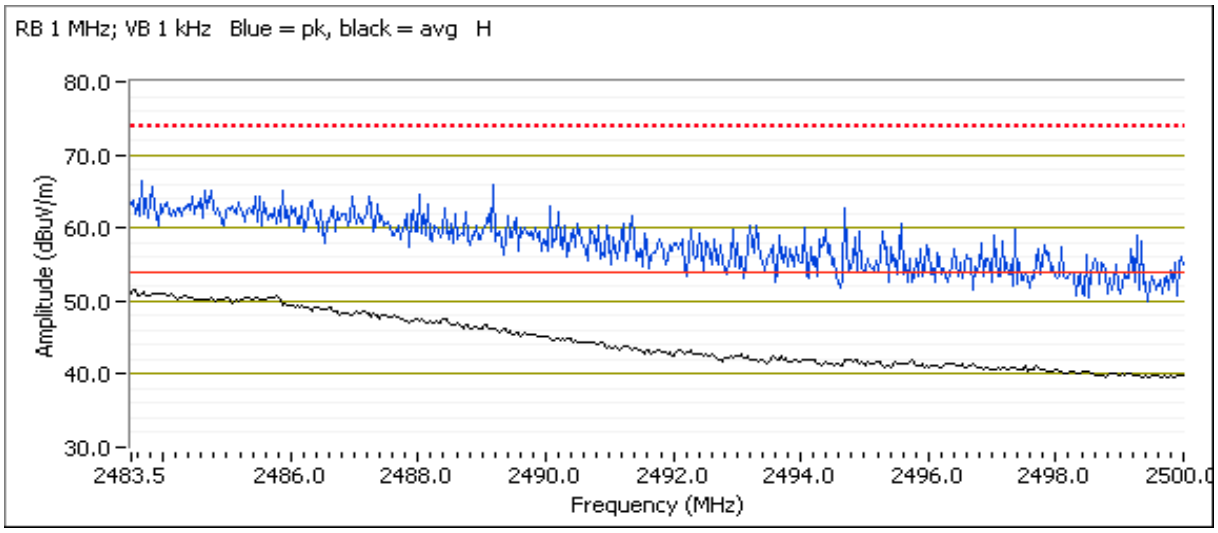


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 10 Mode: g
Tx Chain: 1 Data Rate: 6 Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 16								
2483.570	54.5	H	54.0	0.5	Avg	128	1.23	VB: 1 kHz, note 6.
2485.450	70.8	H	74.0	-3.2	PK	128	1.23	
Pwr setting = 15								
2484.260	51.5	H	54.0	-2.5	Avg	128	1.23	VB: 1 kHz, note 6.
2486.150	68.3	H	74.0	-5.7	PK	128	1.23	

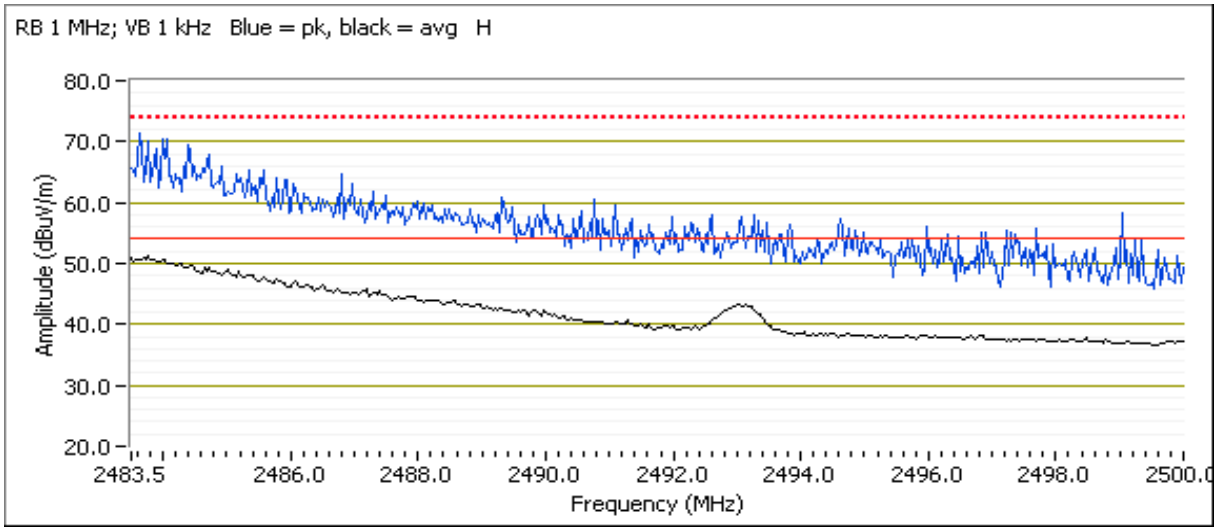


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 11 Mode: g
Tx Chain: 1 Data Rate: 6 Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 19								
2483.600	67.6	H	54.0	13.6	Avg	130	1.24	VB: 1 kHz, note 6.
2483.570	85.7	H	74.0	11.7	PK	130	1.24	
Pwr setting = 14								
2483.630	55.3	H	54.0	1.3	Avg	130	1.24	VB: 1 kHz, note 6.
2483.600	73.2	H	74.0	-0.8	PK	130	1.24	
Pwr setting = 13								
2483.860	51.0	H	54.0	-3.0	Avg	130	1.24	VB: 1 kHz, note 6.
2484.000	69.8	H	74.0	-4.2	PK	130	1.24	



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

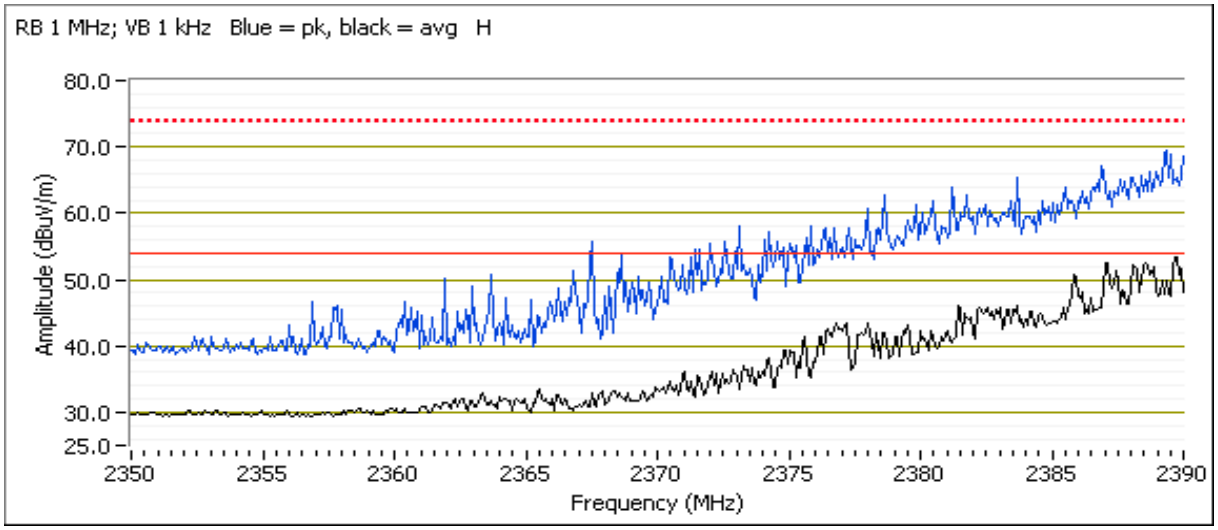
Run #3: Radiated Bandedge Measurements

Date of Test: 3/28/2017 0:00 Config. Used: 1
Test Engineer: Rafael Varelas Config Change: none
Test Location: Chamber 7 EUT Voltage: 115V / 400Hz

Channel: 1 Mode: n20 Non-Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 17								
2385.990	55.6	H	54.0	1.6	Avg	239	1.0	VB: 1 kHz, note 6.
2385.270	74.3	H	74.0	0.3	PK	239	1.0	
Pwr setting = 16								
2388.780	54.9	H	54.0	0.9	Avg	239	1.0	VB: 1 kHz, note 6.
2389.060	71.3	H	74.0	-2.7	PK	239	1.0	
Pwr setting = 15								
2389.540	53.7	H	54.0	-0.3	Avg	239	1.0	VB: 1 kHz, note 6.
2389.940	70.2	H	74.0	-3.8	PK	239	1.0	
2388.340	49.4	V	54.0	-4.6	Avg	176	1.0	VB: 1 kHz, note 6.
2388.600	67.2	V	74.0	-6.8	PK	176	1.0	

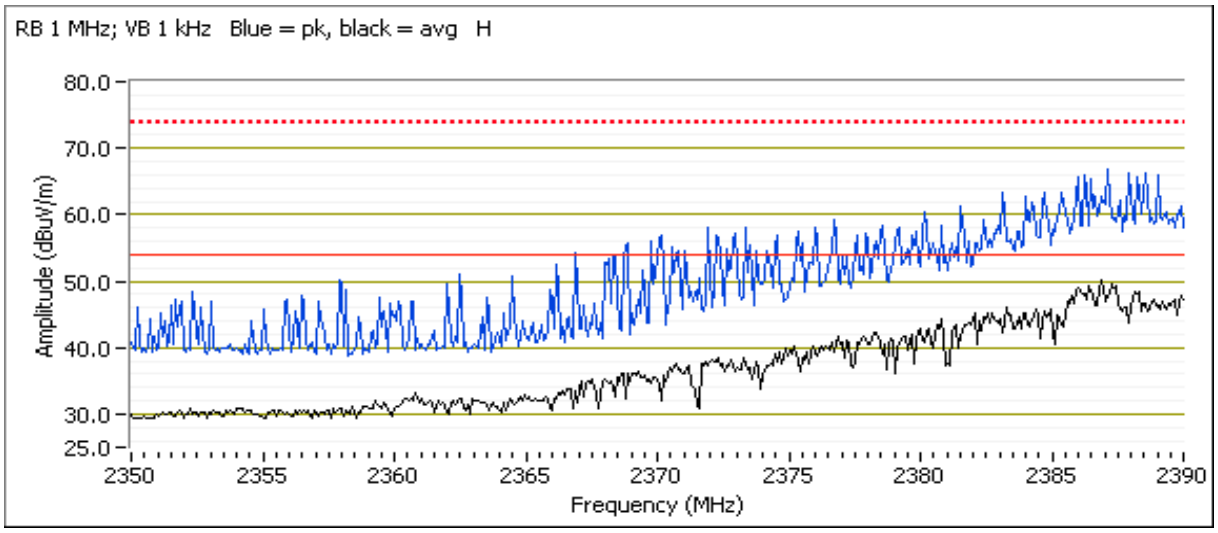


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 2 Mode: n20 Non-Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2390.000	52.5	H	54.0	-1.5	Avg	236	1.0	VB: 1 kHz, note 6.
2384.610	68.1	H	74.0	-5.9	PK	236	1.0	

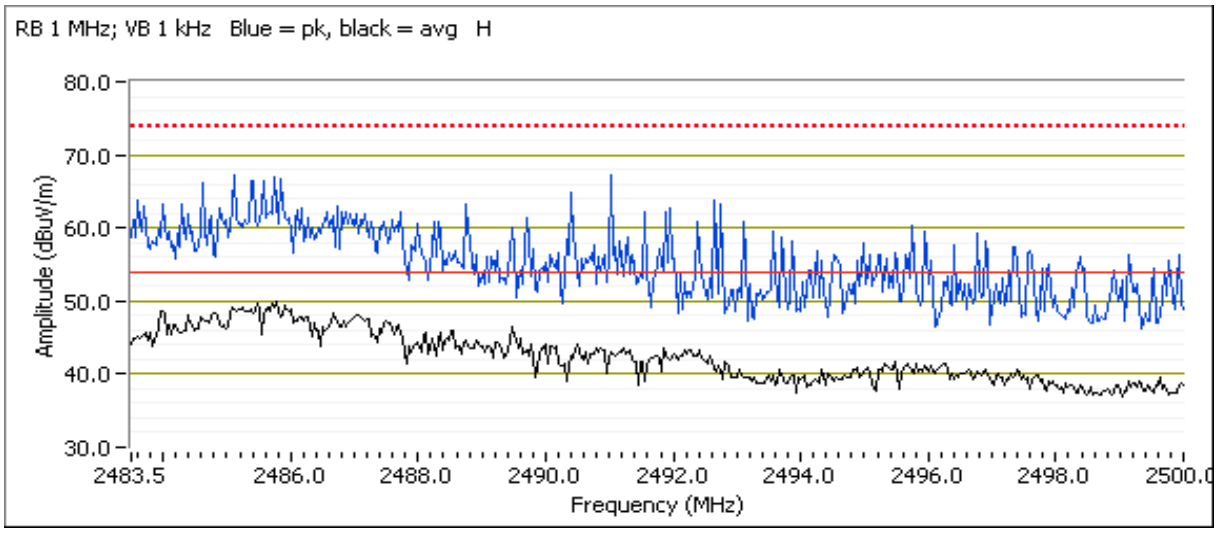


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 10 Mode: n20 Non-Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2487.070	50.8	H	54.0	-3.2	Avg	230	1.0	VB: 1 kHz, note 6.
2485.950	70.3	H	74.0	-3.7	PK	230	1.0	

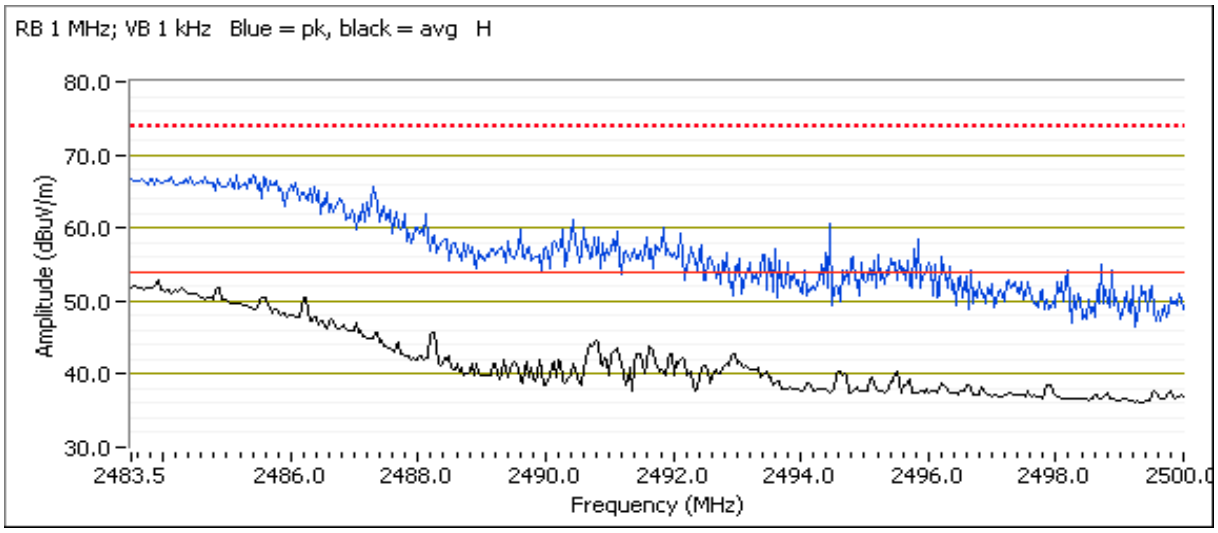


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 11 Mode: n20 Non-Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2485.570	56.3	H	54.0	2.3	Avg	237	1.0	VB: 1 kHz, note 6.
2483.730	78.4	H	74.0	4.4	PK	237	1.0	
Pwr setting = 13								
2483.830	53.0	H	54.0	-1.0	Avg	238	1.0	VB: 1 kHz, note 6.
2484.030	69.3	H	74.0	-4.7	PK	238	1.0	



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #4: Radiated Bandedge Measurements

Date of Test: 3/28/2017 0:00 Config. Used: 1

Test Engineer: Rafael Varelas Config Change: none

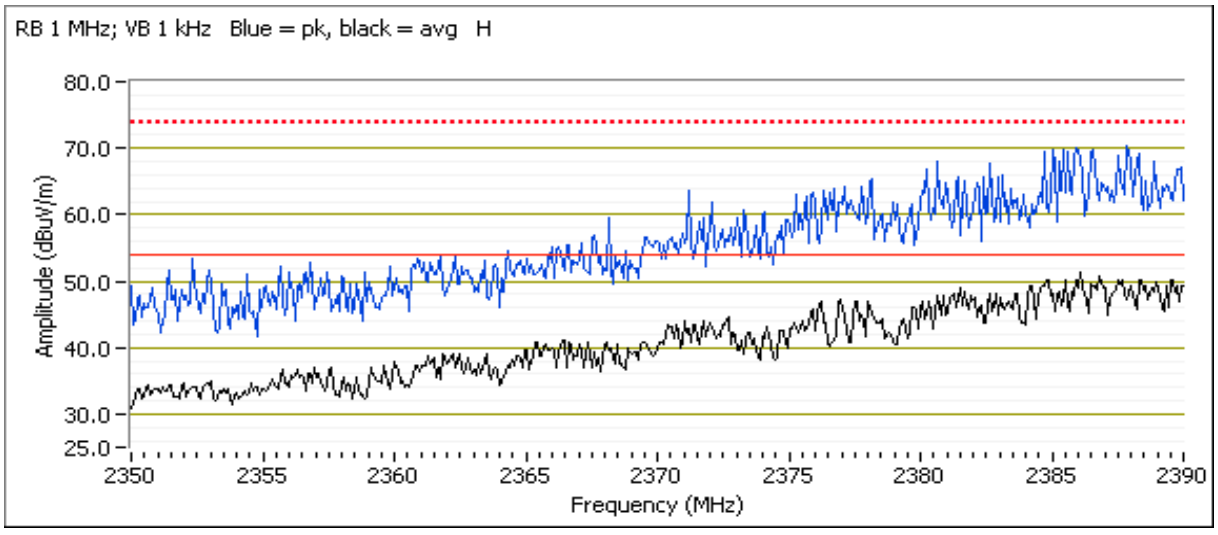
Test Location: Chamber 7 EUT Voltage: 115V / 400Hz

Channel: 3 Mode: n40 Non-Beamforming

Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2384.870	63.6	H	54.0	9.6	Avg	237	1.0	VB: 1 kHz, note 6.
2386.470	85.8	H	74.0	11.8	PK	237	1.0	
Pwr setting = 11								
2386.150	51.4	H	54.0	-2.6	Avg	237	1.0	VB: 1 kHz, note 6.
2387.430	70.5	H	74.0	-3.5	PK	237	1.0	

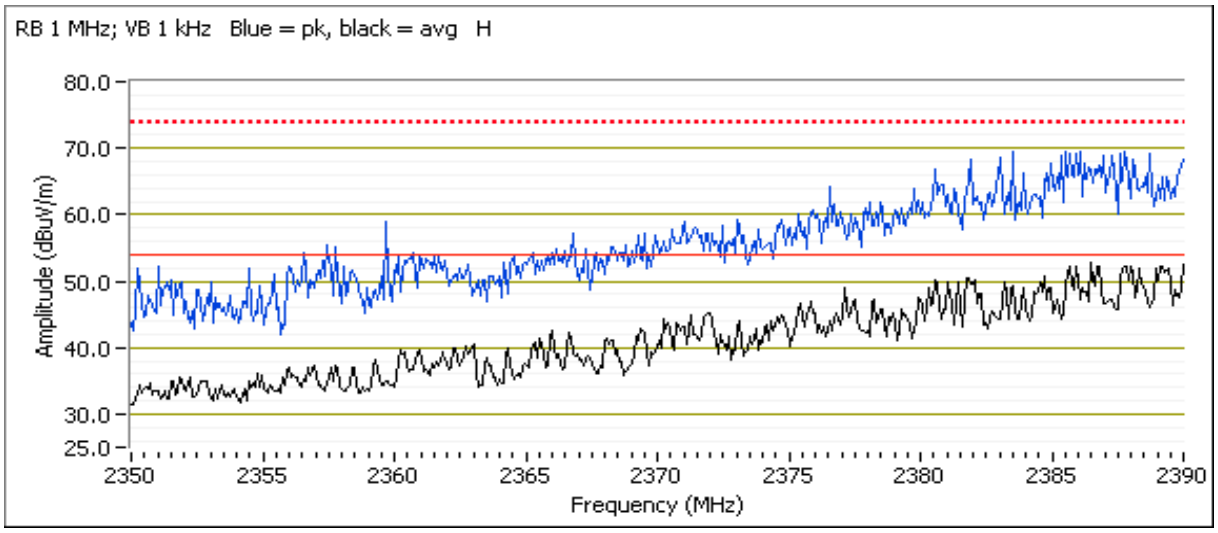


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 4 Mode: n40 Non-Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2388.400	61.5	H	54.0	7.5	Avg	240	1.0	VB: 1 kHz, note 6.
2386.010	82.6	H	74.0	8.6	PK	240	1.0	
Pwr setting = 12								
2389.680	53.5	H	54.0	-0.5	Avg	240	1.0	VB: 1 kHz, note 6.
2380.940	71.0	H	74.0	-3.0	PK	240	1.0	

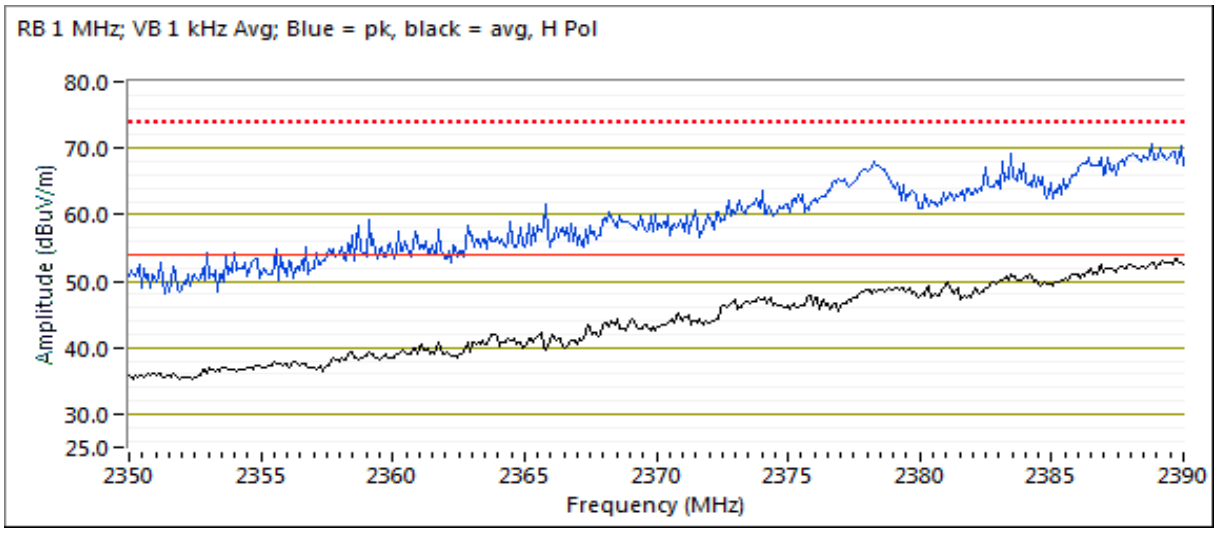


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 5 Mode: n40 Non-Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = q56								
2388.920	53.5	H	54.0	-0.5	Avg	310	1.6	POS; RB 1 MHz; VB: 1 kHz
2388.680	69.9	H	74.0	-4.1	PK	310	1.6	POS; RB 1 MHz; VB: 3 MHz

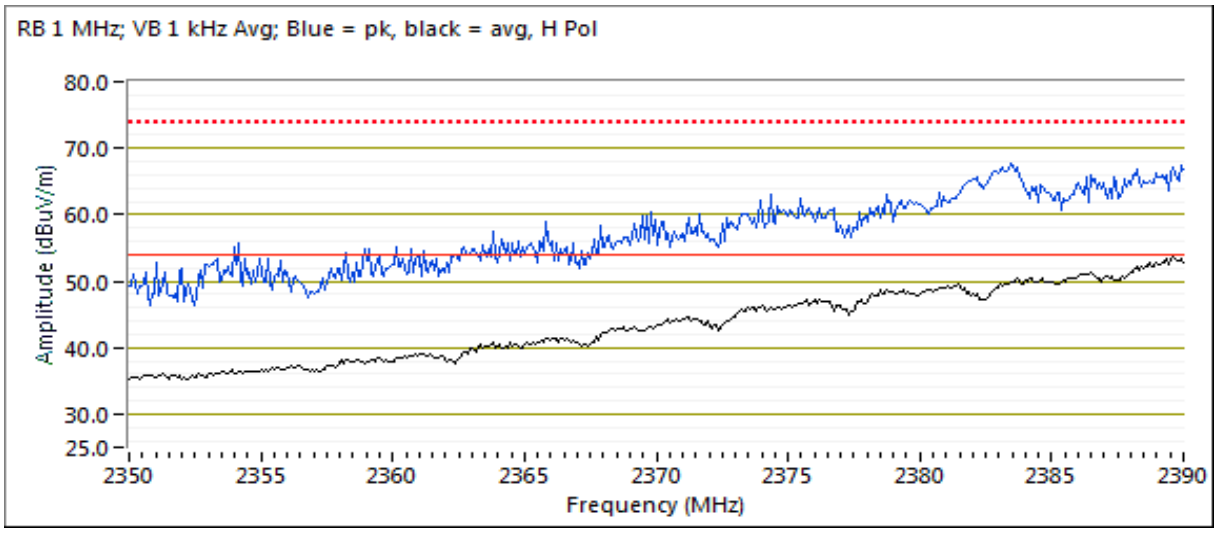


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 6 Mode: n40 Non-Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

2390 MHz - Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = q57								
2389.920	53.1	H	54.0	-0.9	Avg	314	1.7	POS; RB 1 MHz; VB: 1 kHz
2389.520	67.6	H	74.0	-6.4	PK	314	1.7	POS; RB 1 MHz; VB: 3 MHz

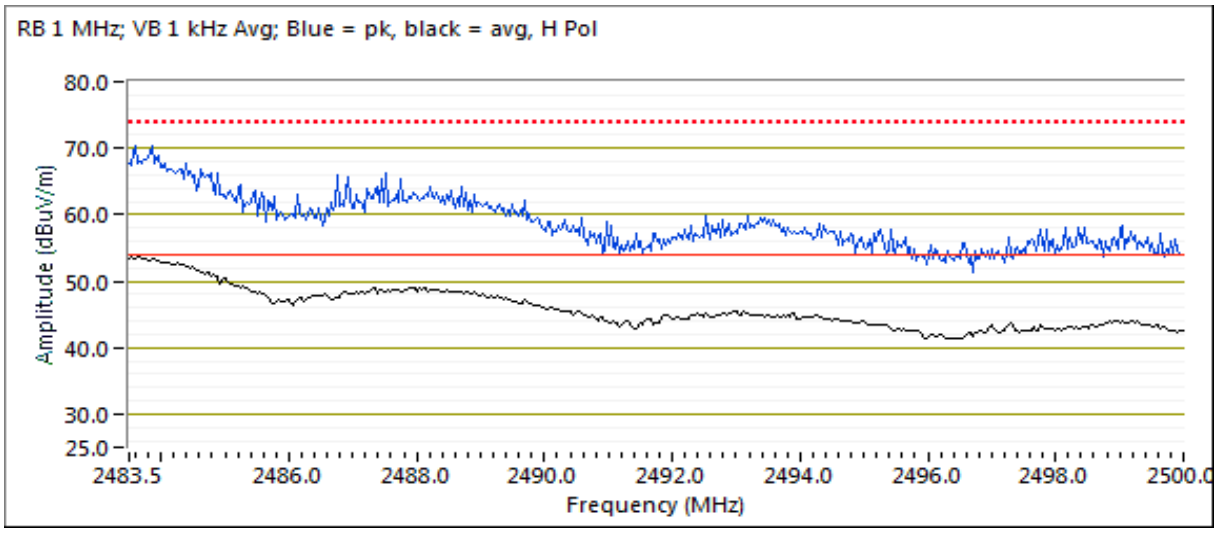


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 6 Mode: n40 Non-Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

2483.5 MHz - Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = q59								
2483.800	53.3	H	54.0	-0.7	Avg	194	1.0	POS; RB 1 MHz; VB: 1 kHz
2483.530	70.4	H	74.0	-3.6	PK	194	1.0	POS; RB 1 MHz; VB: 3 MHz

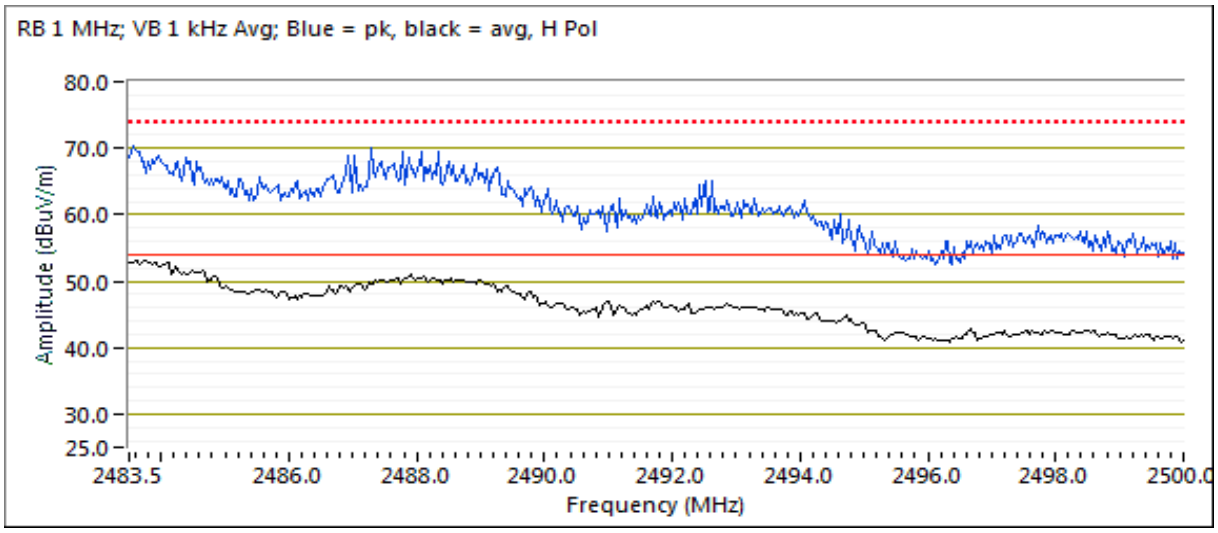


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 7 Mode: n40 Non-Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = q55								
2483.860	53.6	H	54.0	-0.4	Avg	188	1.0	POS; RB 1 MHz; VB: 1 kHz
2483.530	69.9	H	74.0	-4.1	PK	188	1.0	POS; RB 1 MHz; VB: 3 MHz

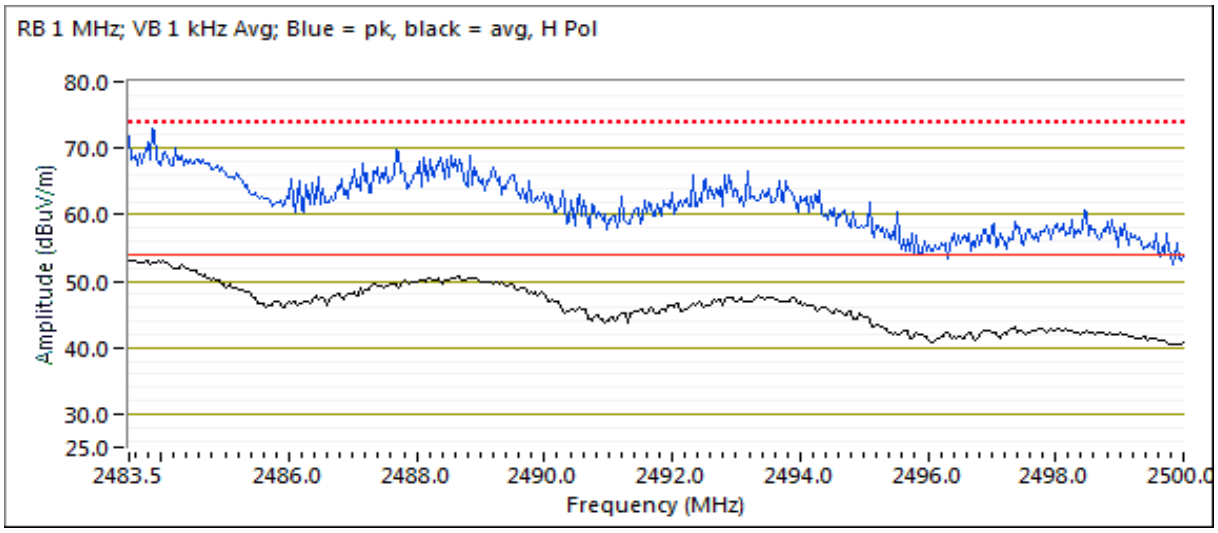


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 8 Mode: n40 Non-Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = q53								
2483.570	53.8	H	54.0	-0.2	Avg	196	1.0	POS; RB 1 MHz; VB: 1 kHz
2484.030	72.0	H	74.0	-2.0	PK	196	1.0	POS; RB 1 MHz; VB: 3 MHz

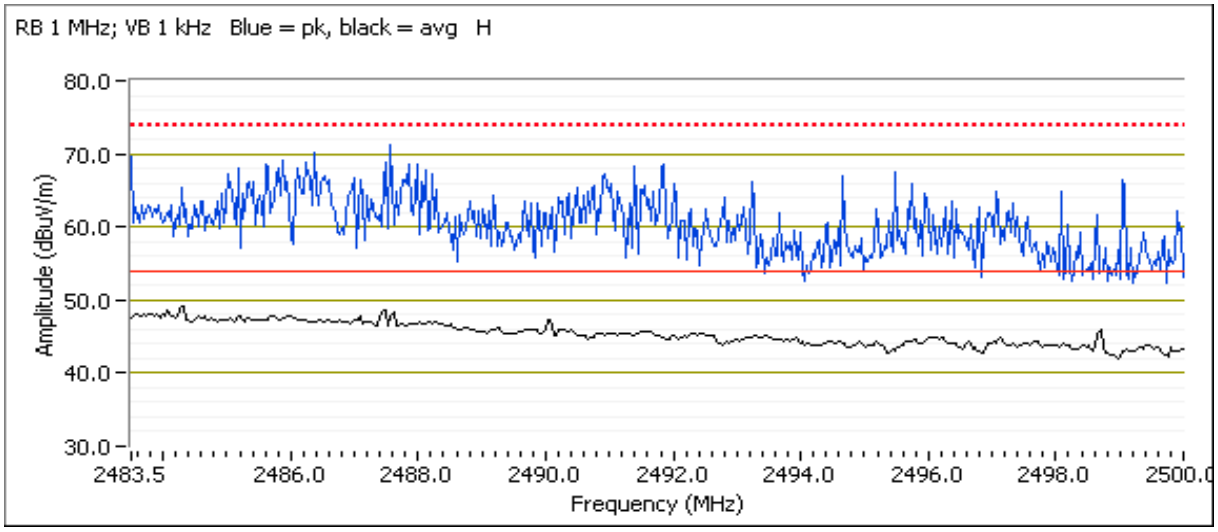


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 9 Mode: n40 Non-Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 13								
2486.180	55.3	H	54.0	1.3	Avg	239	1.34	VB: 1 kHz, note 6.
2486.710	77.3	H	74.0	3.3	PK	239	1.34	
Pwr setting = 12								
2484.160	50.2	H	54.0	-3.8	Avg	239	1.34	VB: 1 kHz, note 6.
2486.150	76.9	H	74.0	2.9	PK	239	1.34	
Pwr setting = 11								
2483.860	50.3	H	54.0	-3.7	Avg	239	1.34	VB: 1 kHz, note 6.
2492.760	70.7	H	74.0	-3.3	PK	239	1.34	



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, 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: 22.4 °C
Rel. Humidity: 41 %

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

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
1	n20	1 - 2412MHz	20	15	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	54.0 dBµV/m @ 2389.0 MHz (0.0 dB)
		2 - 2417MHz		19			51.2 dBµV/m @ 2389.8 MHz (-2.8 dB)
		10 - 2457MHz		17	Restricted Band Edge (2483.5 MHz)		52.5 dBµV/m @ 2483.6 MHz (-1.5 dB)
		11 - 2462MHz		14			53.9 dBµV/m @ 2484.2 MHz (-0.1 dB)
2	n40	3 - 2422MHz	20	12	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	51.7 dBµV/m @ 2386.4 MHz (-2.3 dB)
	n40	4 - 2427MHz	20	12		FCC Part 15.209 / 15.247(c)	53.7 dBµV/m @ 2384.7 MHz (-0.3 dB)
	n40	5 - 2432MHz	20	16		FCC Part 15.209 / 15.247(c)	73.5 dBµV/m @ 2387.7 MHz (-0.5 dB)
	n40	6 - 2437MHz	20	16		FCC Part 15.209 / 15.247(c)	50.0 dBµV/m @ 2389.9 MHz (-4.0 dB)
	n40	6 - 2437MHz	20	15	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	72.0 dBµV/m @ 2484.7 MHz (-2.0 dB)
	n40	7 - 2442MHz	20	14		FCC Part 15.209 / 15.247(c)	73.3 dBµV/m @ 2485.6 MHz (-0.7 dB)
	n40	8 - 2447MHz	20	13		FCC Part 15.209 / 15.247(c)	71.3 dBµV/m @ 2485.2 MHz (-2.7 dB)
	n40	9 - 2452MHz	20	12		FCC Part 15.209 / 15.247(c)	73.9 dBµV/m @ 2486.8 MHz (-0.1 dB)

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

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: LT17000S
Driver: -
Antenna: Internal 4.13 dBi

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 ≥ 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)
n20	MCS1	98.0	No	2	0	0	500
n40	MCS1	94.0	No	2	0	0	500

n20 - data-rates custom basic-mcs-1s
n40 - data-rates custom basic-mcs-1s

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 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

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #1: Radiated Bandedge Measurements

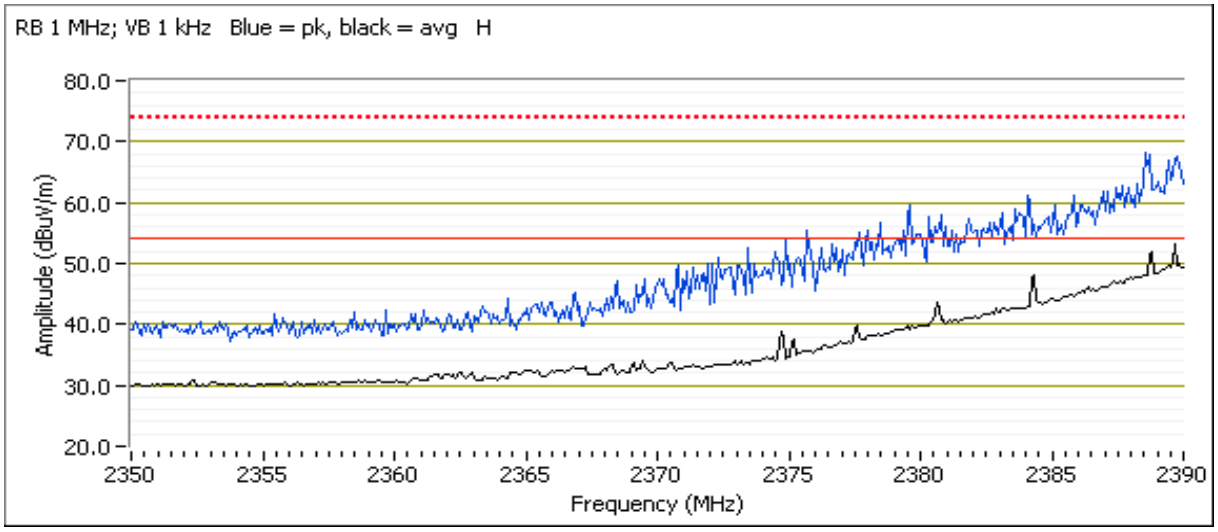
Date of Test: 3/29/2017 0:00
Test Engineer: John Caizzi
Test Location: Chamber 7

Config. Used: 1
Config Change: None
EUT Voltage: 115V / 400Hz

Channel: 1 Mode: n20 Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 15								
2389.040	54.0	H	54.0	0.0	Avg	142	1.35	VB: 1 kHz, note 6.
2389.200	68.1	H	74.0	-5.9	PK	142	1.35	

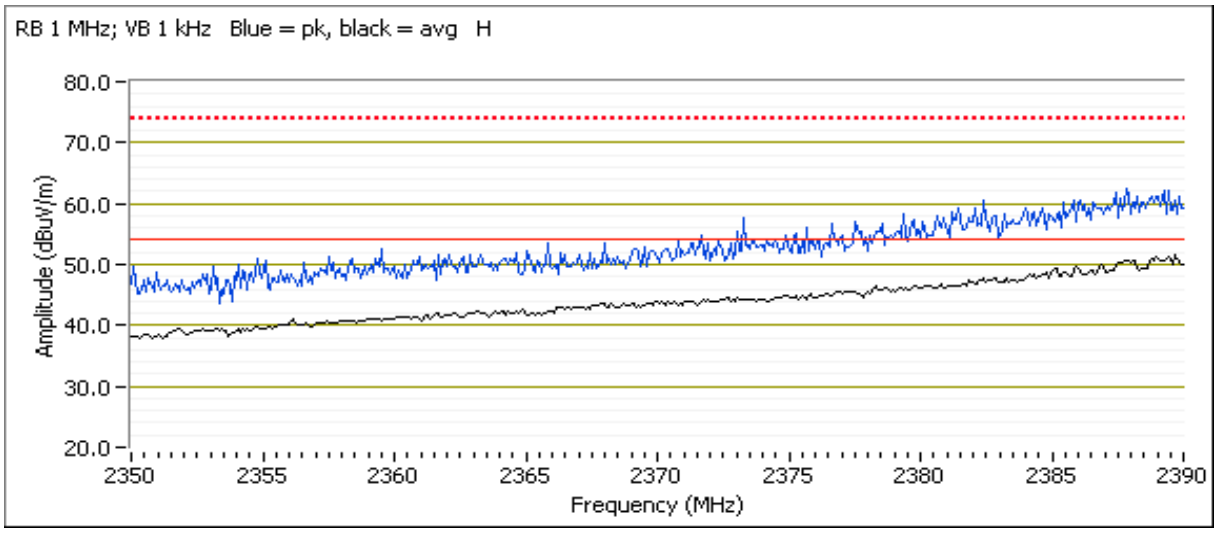


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 2 Mode: n20 Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 19								
2389.840	51.2	H	54.0	-2.8	Avg	244	1.55	VB: 1 kHz, note 6.
2386.470	62.0	H	74.0	-12.0	PK	244	1.55	

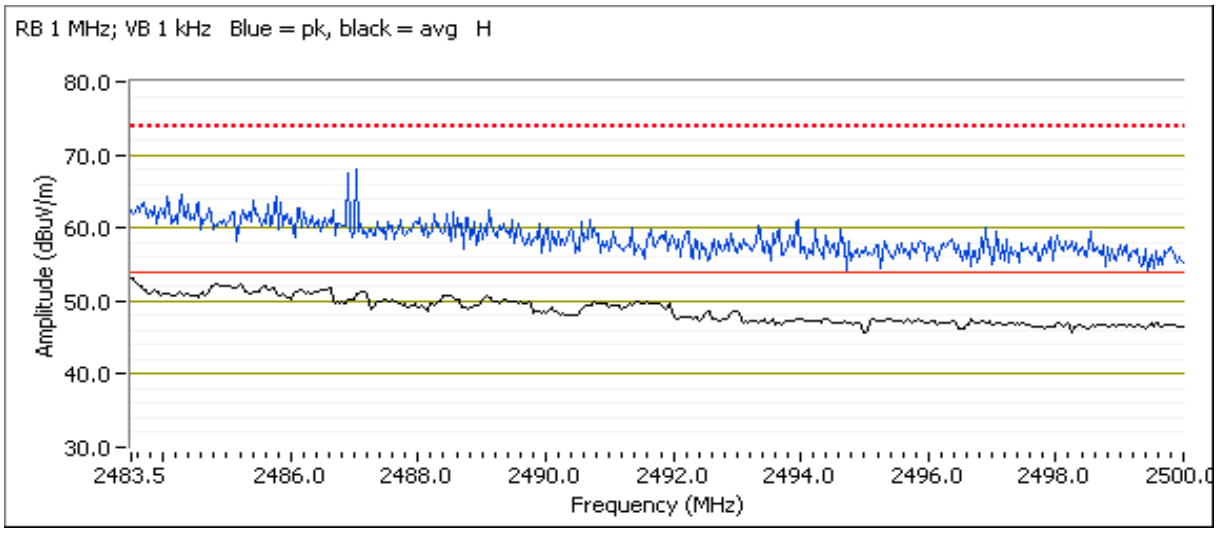


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 10 Mode: n20 Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 17								
2483.630	52.5	H	54.0	-1.5	Avg	246	1.30	VB: 1 kHz, note 6.
2484.160	66.3	H	74.0	-7.7	PK	246	1.30	

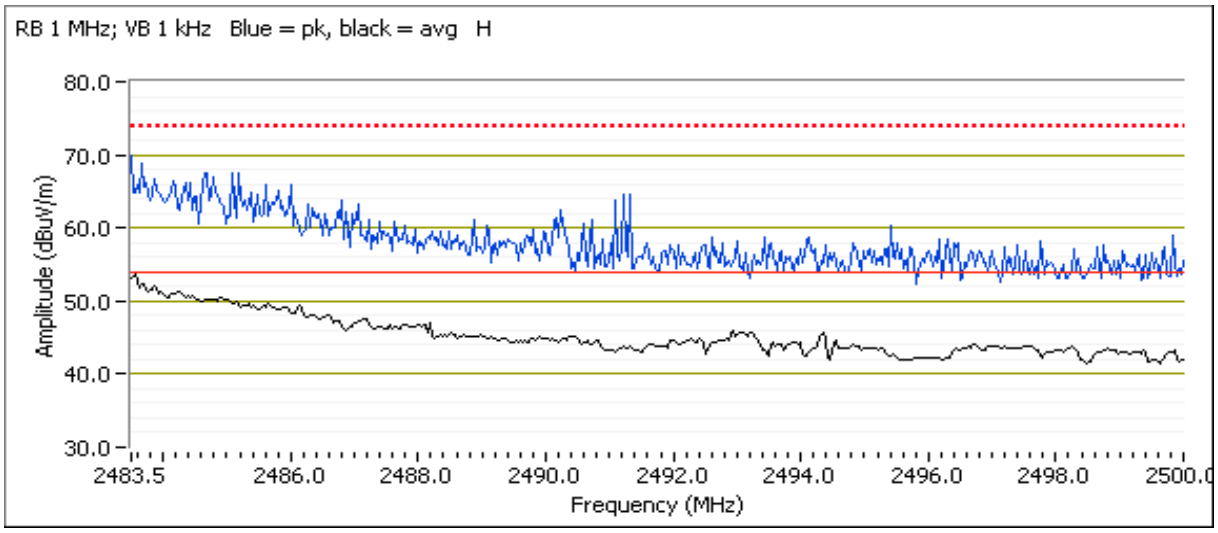


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 11 Mode: n20 Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 15								
2483.500	56.7	H	54.0	2.7	Avg	239	1.29	VB: 1 kHz, note 6.
2485.320	72.7	H	74.0	-1.3	PK	239	1.29	
Pwr setting = 14								
2484.160	53.9	H	54.0	-0.1	PK	239	1.3	VB: 1 kHz, note 6.
2485.420	70.5	H	74.0	-3.5	PK	239	1.3	



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #2: Radiated Bandedge Measurements

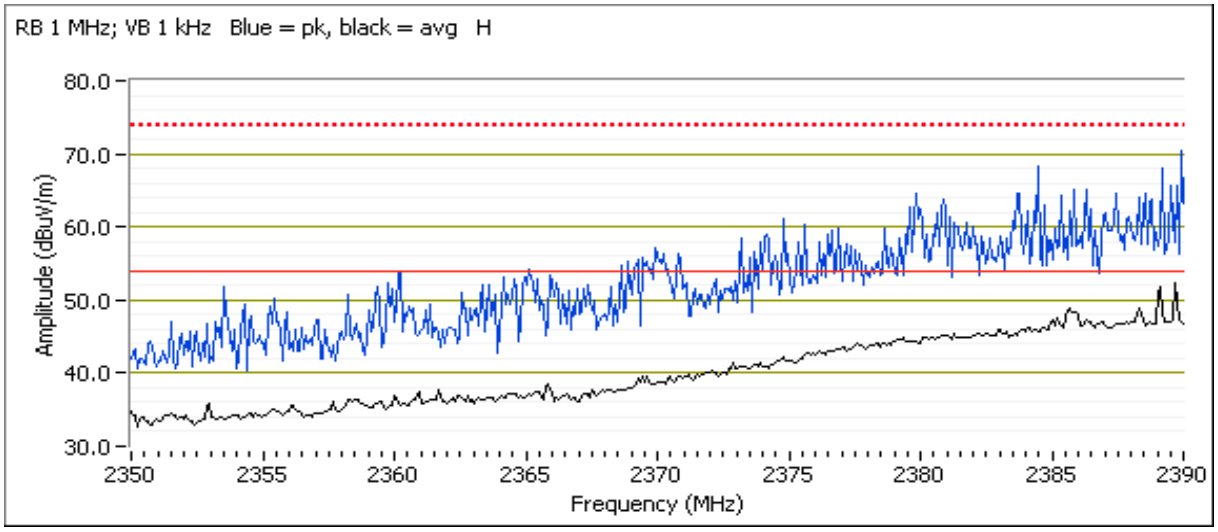
Date of Test: 3/29/2017 0:00
Test Engineer: John Caizzi
Test Location: Chamber 7

Config. Used: 1
Config Change: None
EUT Voltage: 115V / 400Hz

Channel: 3 Mode: n40 Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 12								
2386.390	51.7	H	54.0	-2.3	Avg	134	2.19	VB: 1 kHz, note 6.
2380.780	71.3	H	74.0	-2.7	PK	134	2.19	

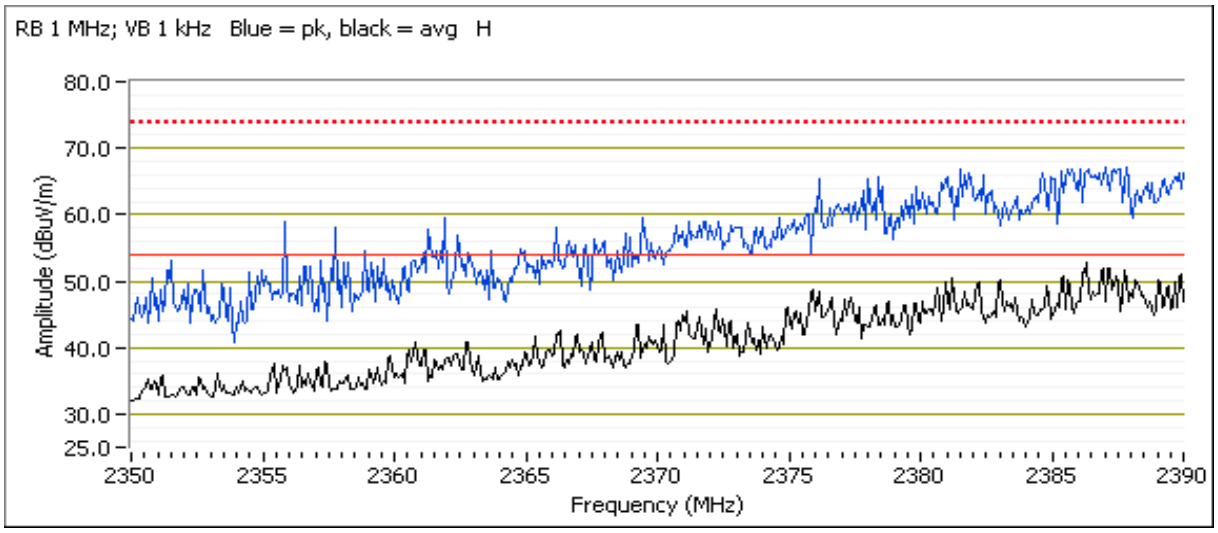


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 4 Mode: n40 Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 17								
2387.350	61.4	H	54.0	7.4	Avg	235	1.0	VB: 1 kHz, note 6.
2386.230	86.1	H	74.0	12.1	PK	235	1.0	
Pwr setting = 12								
2384.710	53.7	H	54.0	-0.3	Avg	235	1.0	VB: 1 kHz, note 6.
2350.560	70.5	H	74.0	-3.5	PK	235	1.0	

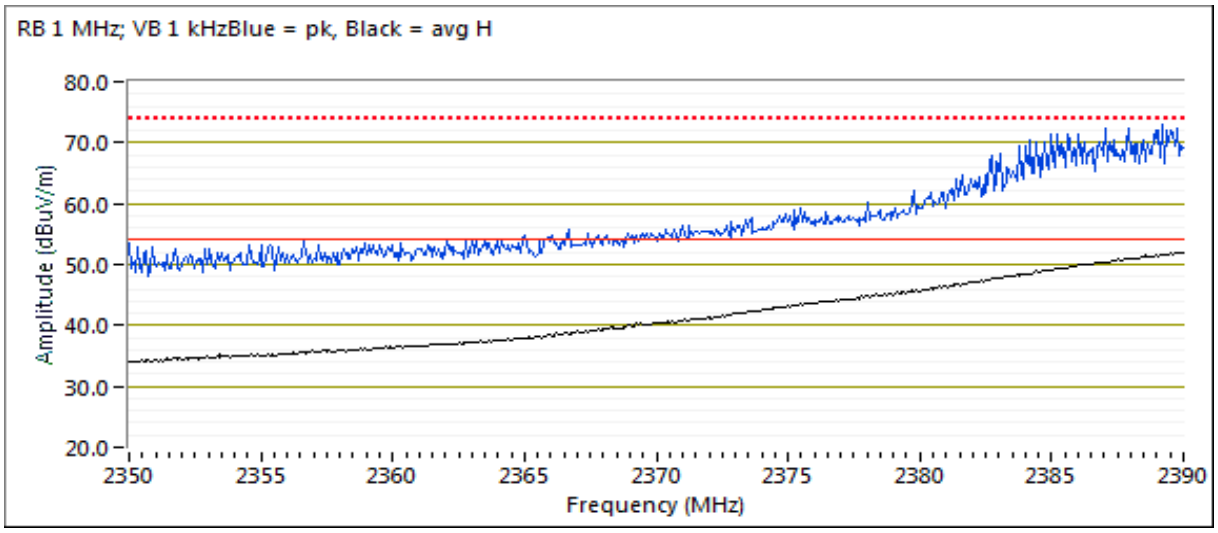


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 5 Mode: n40 Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 16								
2387.720	73.5	H	74.0	-0.5	PK	252	1.51	RB 1 MHz;VB 3 MHz;Peak
2389.830	51.8	H	54.0	-2.2	AVG	252	1.51	RB 1 MHz;VB 1 kHz;Peak

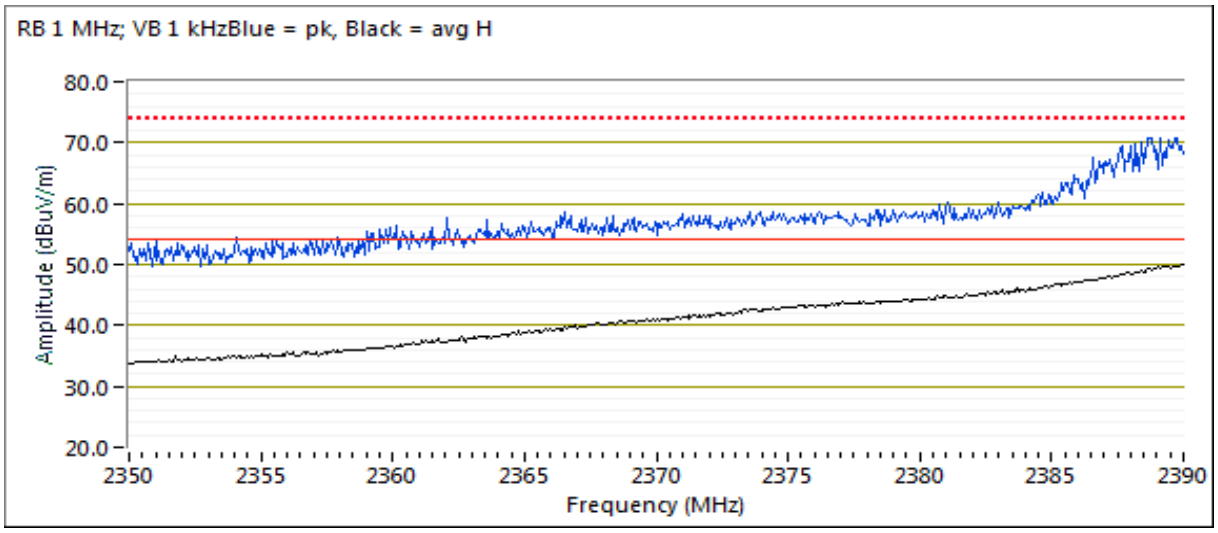


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 6 Mode: n40 Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 16								
2389.870	50.0	H	54.0	-4.0	AVG	357	1.55	RB 1 MHz;VB 1 kHz;Peak
2389.800	67.8	H	74.0	-6.2	PK	357	1.55	RB 1 MHz;VB 3 MHz;Peak

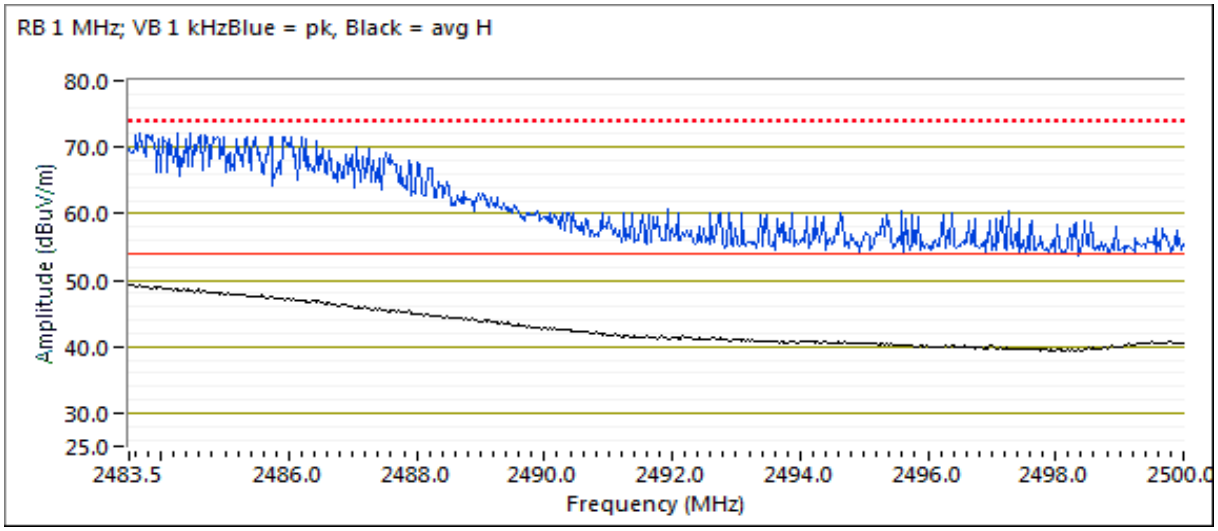


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 6 Mode: n40 Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 15								
2484.740	72.0	H	74.0	-2.0	PK	351	1.52	RB 1 MHz;VB 3 MHz;Peak
2483.730	48.9	H	54.0	-5.1	AVG	351	1.52	RB 1 MHz;VB 1 kHz;Peak
			0.0	0.0				
			0.0	0.0				

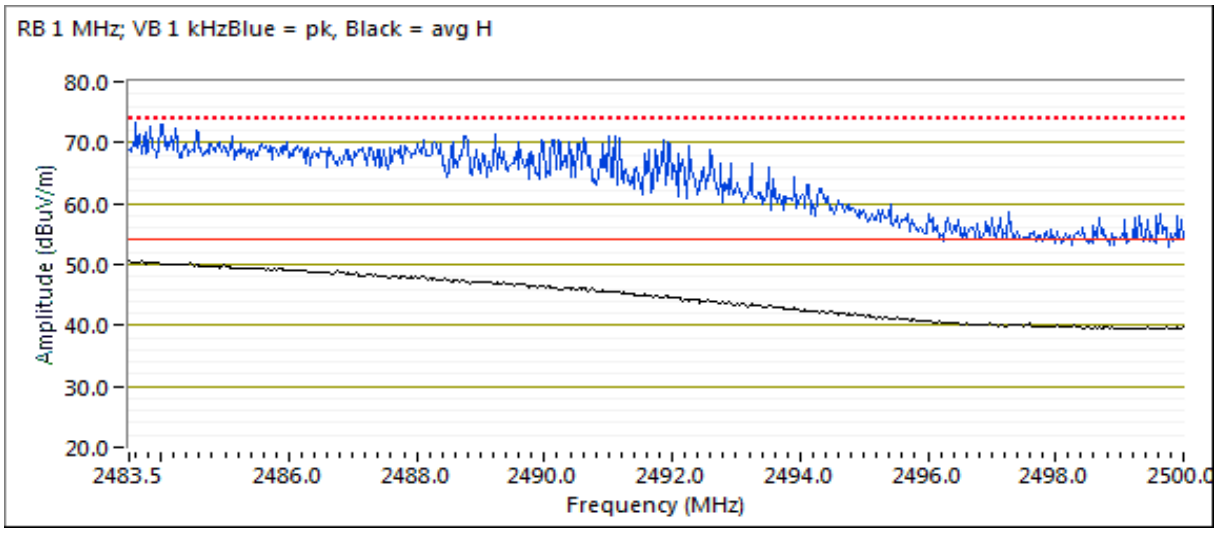


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 7 Mode: n40 Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 14								
2485.620	73.3	H	74.0	-0.7	PK	354	1.52	RB 1 MHz;VB 3 MHz;Peak
2483.690	50.3	H	54.0	-3.7	AVG	354	1.52	RB 1 MHz;VB 1 kHz;Peak

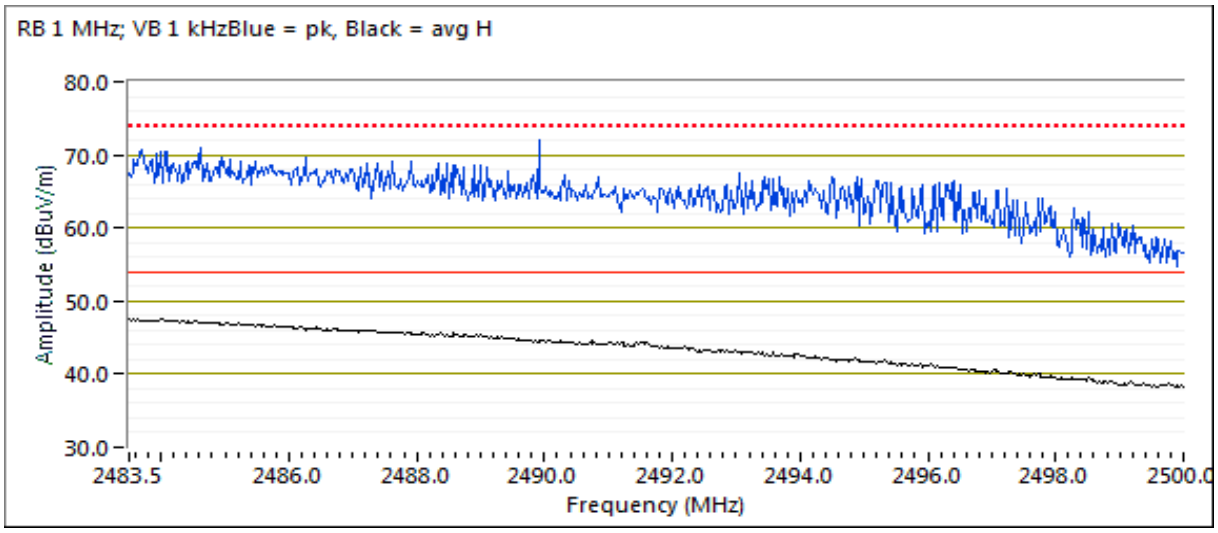


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 8 Mode: n40 Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 13								
2485.210	71.3	H	74.0	-2.7	PK	355	1.55	RB 1 MHz;VB 3 MHz;Peak
2483.740	47.9	H	54.0	-6.1	AVG	355	1.55	RB 1 MHz;VB 1 kHz;Peak

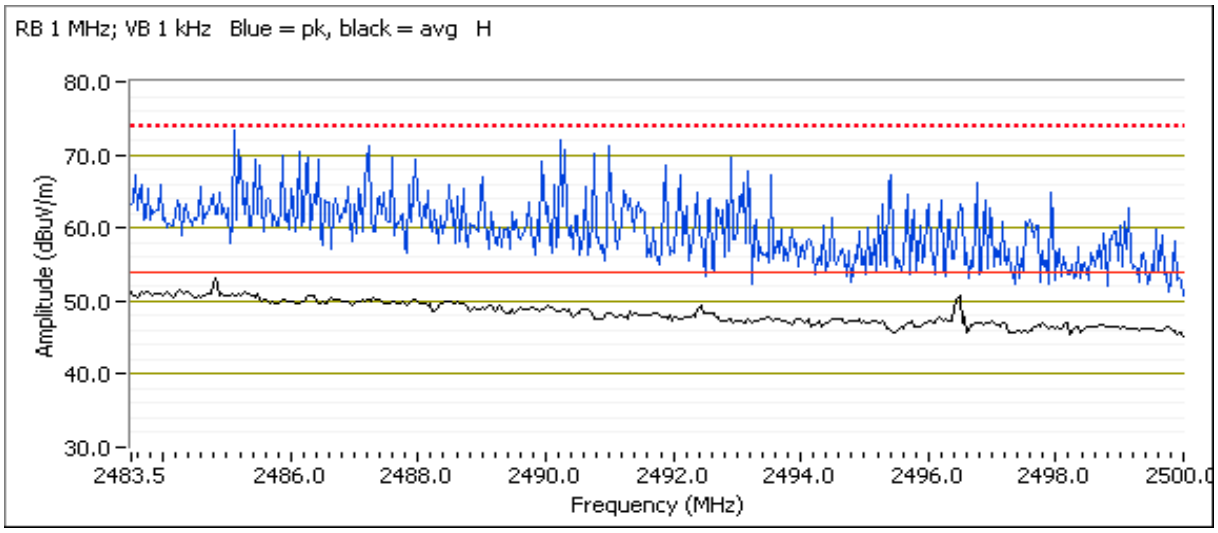


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 9 Mode: n40 Beamforming
Tx Chain: 1, 2 & 3 Data Rate: MCS1

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 12								
2483.800	53.4	H	54.0	-0.6	Avg	244	1.52	VB: 1 kHz, note 6.
2486.810	73.9	H	74.0	-0.1	PK	244	1.52	



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, 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: 21.6 °C
Rel. Humidity: 40 %

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

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
1	b	1 - 2412MHz	20	20	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	51.7 dBµV/m @ 12059.2 MHz (-2.3 dB)
	b	6 - 2437MHz		20	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	52.8 dBµV/m @ 6933.3 MHz (-1.2 dB)
	b	11 - 2462MHz		20	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	53.9 dBµV/m @ 12310.7 MHz (-0.1 dB)
Scans on center channel in all three OFDM modes to determine the worst case mode.							
2	g	6 - 2437MHz	20	20	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	50.2 dBµV/m @ 12186.0 MHz (-3.8 dB)
	n20	6 - 2437MHz		20	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	51.3 dBµV/m @ 7084.6 MHz (-17.0 dB)
	n40	4 - 2427MHz		20	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	53.1 dBµV/m @ 9693.1 MHz (-19.7 dB)
Measurements on low and high channels in worst-case OFDM mode - use for g or n20 if worst case from run 2							
3	g	1 - 2412MHz	20	20	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	47.5 dBµV/m @ 12056.6 MHz (-6.5 dB)
	g	11 - 2462MHz	20	20	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	51.5 dBµV/m @ 12311.7 MHz (-2.5 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Deviations From The Standard

No deviations were made from the requirements of the standard.

Sample Notes

Sample S/N: LT17000S
Driver: -
Antenna: Internal

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 ≥ 98% and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.
2.4GHz band reject filter used

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	2 Mb/s	95.7	Yes	7	0	0	143
11g	6 Mb/s	97.6	No	2	0	0	500
n20	MCS1	96.2	No	2	0	0	500
n40	MCS1	96.8	No	2	0	0	500

Commands to use for the following modes:
11b - data-rates custom basic-2
11g - data-rates custom basic-6
n20 - data-rates custom basic-mcs-1s
n40 - data-rates custom basic-mcs-1s

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 6:	Emission has non constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW> 1/T, peak detector, linear mode, sweep time auto, max hold. Max hold for 50*(1/DC) traces

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #1: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: 802.11b

Date of Test: 4/3/2017 0:00 Config. Used: 1

Test Engineer: Rafael Varelas/ Joseph Cadigal Config Change: None

Test Location: Chamber 7 EUT Voltage: 115V / 400Hz

Run #1a: Low Channel

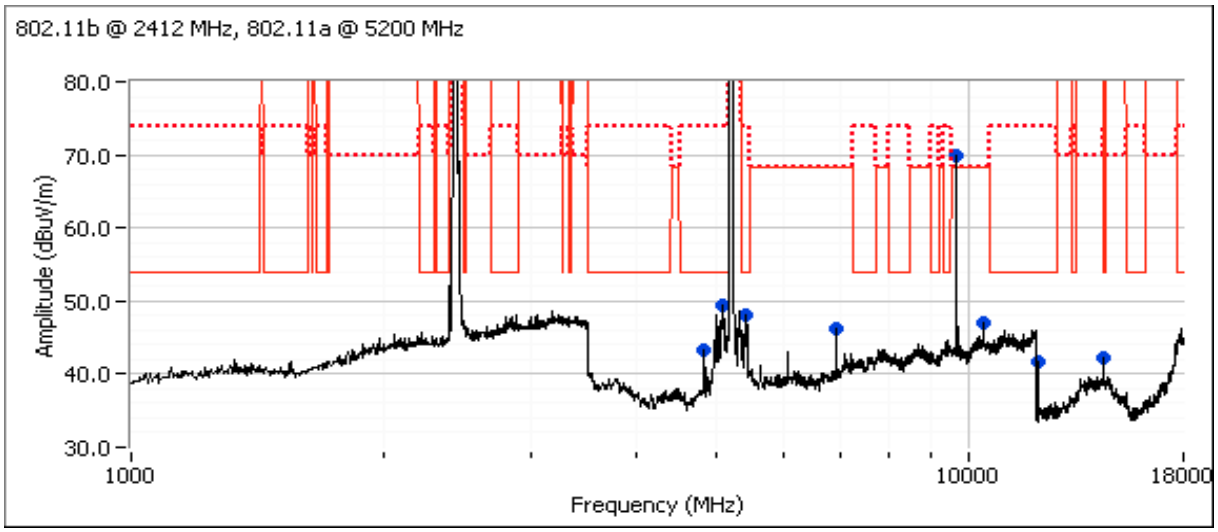
Channel: 1 Mode: b Channel: 40 Mode: a

Tx Chain: 1 Data Rate: 2 Mb/s Tx Chain: 1 Data Rate: 6 Mb/s

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2412.930	101.8	V	-	-	PK	313	1.6	RB 100 kHz;VB 300 kHz;Peak
2412.870	107.6	H	-	-	PK	60	1.0	RB 100 kHz;VB 300 kHz;Peak
SA40 at 1m distance and extrapolate to 3m - no preamp (1-3.5GHz)								
refer to plot - no significant emissions observed for this scan								
SA40 @ 3m distance w/ Preamp and 3.5GHz HPF (3.5-8.5GHz)								
6933.290	46.6	H	54.0	-7.4	Avg	51	1.7	VB 1 kHz, Note 1
6933.120	53.6	H	74.0	-20.4	PK	51	1.7	Note 1
5415.930	46.6	H	54.0	-7.4	Avg	285	1.9	VB: 1 kHz, note 6.
5414.130	57.2	H	74.0	-16.8	PK	285	1.9	
5078.270	47.3	H	54.0	-6.7	Avg	292	2.1	VB: 1 kHz, note 6.
5080.630	59.4	H	74.0	-14.6	PK	292	2.1	
4823.850	39.0	V	54.0	-15.0	Avg	312	2.3	VB: 1 kHz, note 6.
4825.010	48.2	V	74.0	-25.8	PK	312	2.3	
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
12059.160	51.7	H	54.0	-2.3	Avg	68	1.5	VB 1 kHz, Note 1
14471.710	51.7	H	54.0	-2.3	Avg	328	1.5	VB 1 kHz, Note 1
9647.880	68.8	H	77.6	-8.8	PK	56	1.6	RB 100 kHz;VB 300 kHz;Peak
14471.900	61.2	H	74.0	-12.8	PK	328	1.5	
12059.910	57.9	H	74.0	-16.1	PK	61	1.5	

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*

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

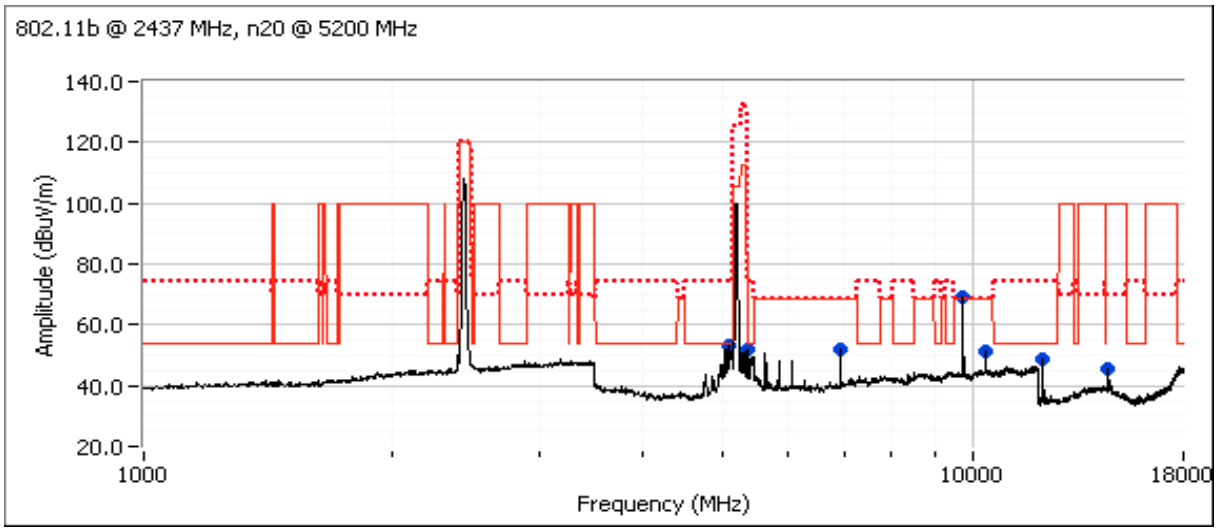
Run #1b: Center Channel

Channel: 6 Mode: b Channel: 40 Mode: n20
Tx Chain: 1 Data Rate: 2 Mb/s Tx Chain: 1, 2, & 3 Data Rate: MCS1

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2436.670	109.4	H	-	-	PK	50	1.2	RB 100 kHz;VB 300 kHz;Peak
2432.930	101.1	V	-	-	PK	311	1.6	RB 100 kHz;VB 300 kHz;Peak
SA40 at 1m distance and extrapolate to 3m - no preamp (1-3.5GHz)								
refer to plot - no significant emissions observed for this scan								
SA40 @ 3m distance w/ Preamp and 3.5GHz HPF (3.5-8.5GHz)								
6933.340	52.8	H	54.0	-1.2	Avg	318	1.9	VB 1 kHz, Note 1
6933.400	57.2	H	74.0	-16.8	PK	318	1.9	Note 1
5352.210	47.2	H	54.0	-6.8	Avg	302	1.8	VB: 1 kHz, note 6.
5353.420	60.1	H	74.0	-13.9	PK	302	1.8	
5074.320	50.6	H	54.0	-3.4	Avg	304	1.3	VB: 1 kHz, note 6.
5076.230	63.3	H	74.0	-10.7	PK	304	1.3	
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
12185.560	51.9	H	54.0	-2.1	Avg	66	1.5	RB 100 kHz;VB 300 kHz;Peak
12185.690	48.5	H	54.0	-5.5	Peak	65	1.5	
9747.870	69.0	H	79.4	-10.4	PK	60	1.6	RB 100 kHz;VB 300 kHz;Peak
14621.950	45.7	H	70.0	-24.3	Peak	319	1.5	
14621.480	49.6	H	79.4	-29.8	PK	327	1.5	RB 100 kHz;VB 300 kHz;Peak

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*

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A



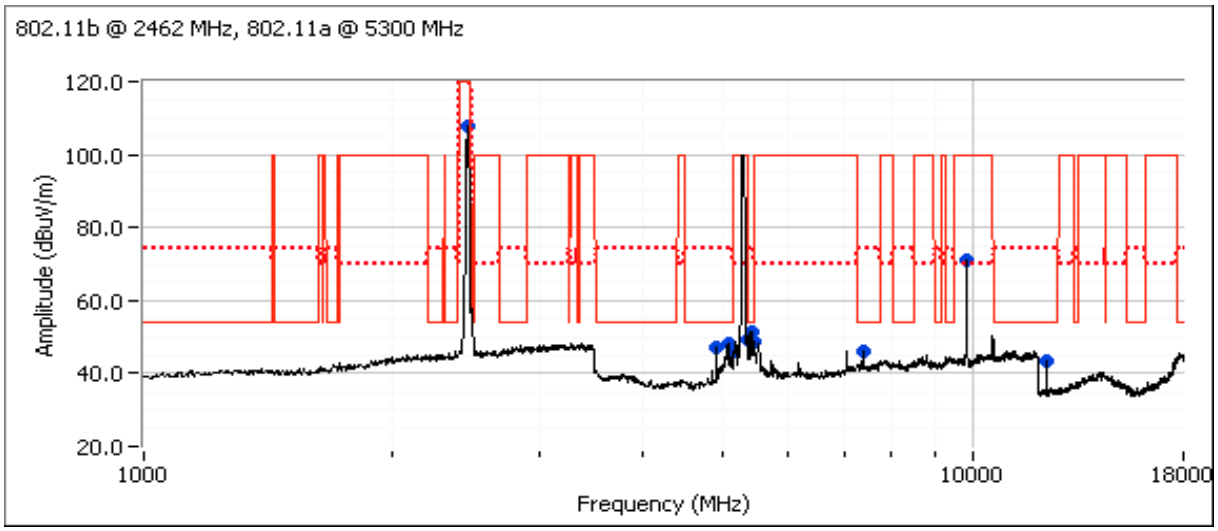
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #1c: High Channel

Channel: 11 Mode: b Channel: 60 Mode: a
Tx Chain: 1 Data Rate: 2 Mb/s Tx Chain: 1 Data Rate: 6 Mb/s

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2461.130	108.7	H	-	-	Pk	56	1.2	RB 100 kHz;VB 300 kHz;Peak
2462.930	102.1	V	-	-	PK	301	1.6	RB 100 kHz;VB 300 kHz;Peak
SA40 at 1m distance and extrapolate to 3m - no preamp (1-3.5GHz)								
refer to plot - no significant emissions observed for this scan								
SA40 @ 3m distance w/ Preamp and 3.5GHz HPF (3.5-8.5GHz)								
5421.070	48.7	H	54.0	-5.3	Avg	295	2.0	VB: 1 kHz, note 6.
5378.190	46.5	H	54.0	-7.5	Avg	300	2.0	VB: 1 kHz, note 6.
5422.710	48.3	H	54.0	-5.7	Avg	295	2.0	VB: 1 kHz, note 6.
5074.060	44.0	H	54.0	-10.0	Avg	280	2.5	VB: 1 kHz, note 6.
4924.200	44.0	V	54.0	-10.0	Avg	11	2.5	VB: 1 kHz, note 6.
5141.390	43.1	H	54.0	-10.9	Avg	305	2.0	VB: 1 kHz, note 6.
7386.800	41.9	V	54.0	-12.1	Avg	10	2.0	VB: 1 kHz, note 6.
5422.070	62.0	H	74.0	-12.0	PK	288	2.0	
5378.190	59.4	H	74.0	-14.6	PK	300	2.0	
5424.680	61.1	H	74.0	-12.9	PK	295	2.0	
5073.620	55.4	H	74.0	-18.6	PK	280	2.5	
4924.000	51.4	V	74.0	-22.6	PK	11	2.5	
5141.870	54.8	H	74.0	-19.2	PK	305	2.0	
7386.070	52.9	V	74.0	-21.1	PK	10	2.0	
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
12310.660	53.9	H	54.0	-0.1	AVG	68	1.5	VB: 1 kHz, note 6.
9847.880	70.2	H	78.7	-8.5	Pk	47	2.5	RB 100 kHz;VB 300 kHz;Peak
12305.660	61.7	H	74.0	-12.3	PK	70	1.5	RB 1 MHz;VB 3 MHz;Peak

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #2: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: OFDM

Date of Test: 4/4/2017 0:00 Config. Used: 1

Test Engineer: Joseph Cadigal/R. Varelas Config Change: none

Test Location: FT Chamber#7 EUT Voltage: 115V / 400Hz

Run #2a: Center Channel

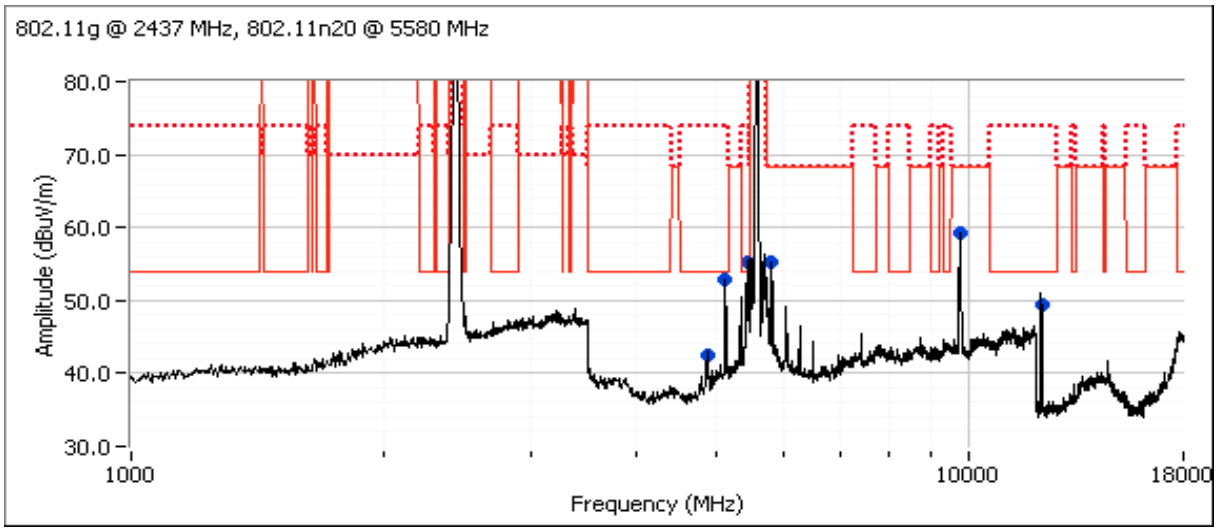
Channel: 6 Mode: g Channel: 116 Mode: n20

Tx Chain: 1 Data Rate: 6 Mb/s Tx Chain: 1, 2, & 3 Data Rate: MCS1

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2444.870	107.0	H	-	-	PK	50	1.1	RB 100 kHz;VB 300 kHz;Peak
SA40 at 1m distance and extrapolate to 3m - no preamp (1-3.5GHz)								
refer to plot - no significant emissions observed for this scan								
SA40 @ 3m distance w/ Preamp and 3.5GHz HPF (3.5-8.5GHz)								
5812.620	59.5	H	68.3	-8.8	PK	44	2.5	
4878.780	36.3	H	54.0	-17.7	Avg	36	1.0	VB: 1 kHz, note 6.
4878.050	49.9	H	74.0	-24.1	PK	36	1.0	
5452.490	53.8	H	54.0	-0.2	Avg	73	2.2	VB: 1 kHz, note 6.
5454.980	65.3	H	74.0	-8.7	PK	73	2.2	
5121.750	51.0	H	54.0	-3.0	Avg	293	1.4	VB: 1 kHz, note 6.
5121.680	61.3	H	74.0	-12.7	PK	293	1.4	
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
9746.150	58.7	H	77.0	-18.3	PK	62	1.5	RB 100 kHz;VB 300 kHz;Peak
12186.000	50.2	H	54.0	-3.8	Avg	74	1.3	VB: 1 kHz, note 6.
12194.870	65.4	H	74.0	-8.6	PK	74	1.3	

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*

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

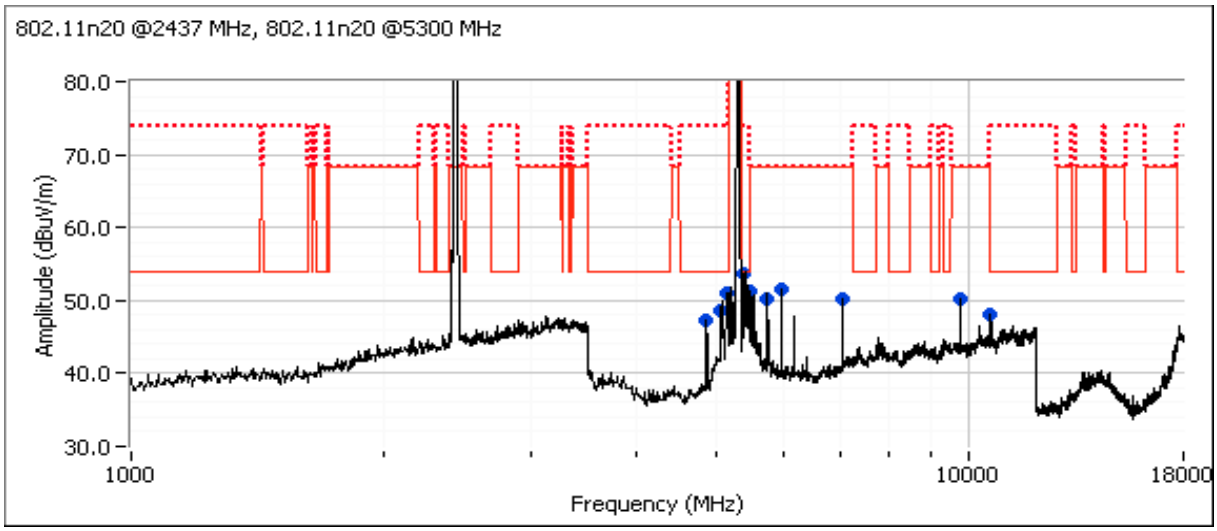
Run #2b: Center Channel
non-beamforming

Channel:	6	Mode:	n20	Channel:	60	Mode:	n20
Tx Chain:	1, 2 & 3	Data Rate:	MCS1	Tx Chain:	1, 2, & 3	Data Rate:	MCS1

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2438.200	107.2	H	-	-	PK	48	2.1	RB 100 kHz;VB 300 kHz;Peak
SA40 @ 1m distance and extrapolate to 3m - no preamp (1-3.5GHz)								
refer to plot - no significant emissions observed for this scan								
SA40 @ 3m distance w/ Preamp and 3.5GHz HPF (3.5-8.5GHz)								
5413.950	50.8	H	54.0	-3.2	Avg	59	2.2	VB: 1 kHz, note 6.
5424.090	63.3	H	74.0	-10.7	PK	59	2.2	
5073.850	44.3	H	54.0	-9.7	Avg	52	2.5	VB: 1 kHz, note 6.
5076.380	54.8	H	74.0	-19.2	PK	52	2.5	
5993.360	49.2	H	68.3	-19.1	PK	51	1.8	
4825.160	35.8	H	54.0	-18.2	Avg	62	2.2	VB: 1 kHz, note 6.
4831.490	47.3	H	74.0	-26.7	PK	62	2.2	
5742.300	59.2	H	68.3	-9.1	PK	52	2.0	
5412.800	49.0	H	54.0	-5.0	Avg	290	1.9	VB: 1 kHz, note 6.
5413.040	64.0	H	74.0	-10.0	PK	290	1.9	
7084.620	51.3	H	68.3	-17.0	PK	310	2.4	
5136.470	48.7	H	54.0	-5.3	Avg	301	2.1	VB: 1 kHz, note 6.
5139.400	60.4	H	74.0	-13.6	PK	301	2.1	
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
10600.070	46.8	H	54.0	-7.2	Avg	62	1.1	VB: 1 kHz, note 6.
10600.070	61.2	H	74.0	-12.8	PK	62	1.1	
9747.460	56.3	H	77.2	-20.9	PK	61	1.3	RB 100 kHz;VB 300 kHz;Peak

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*

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A



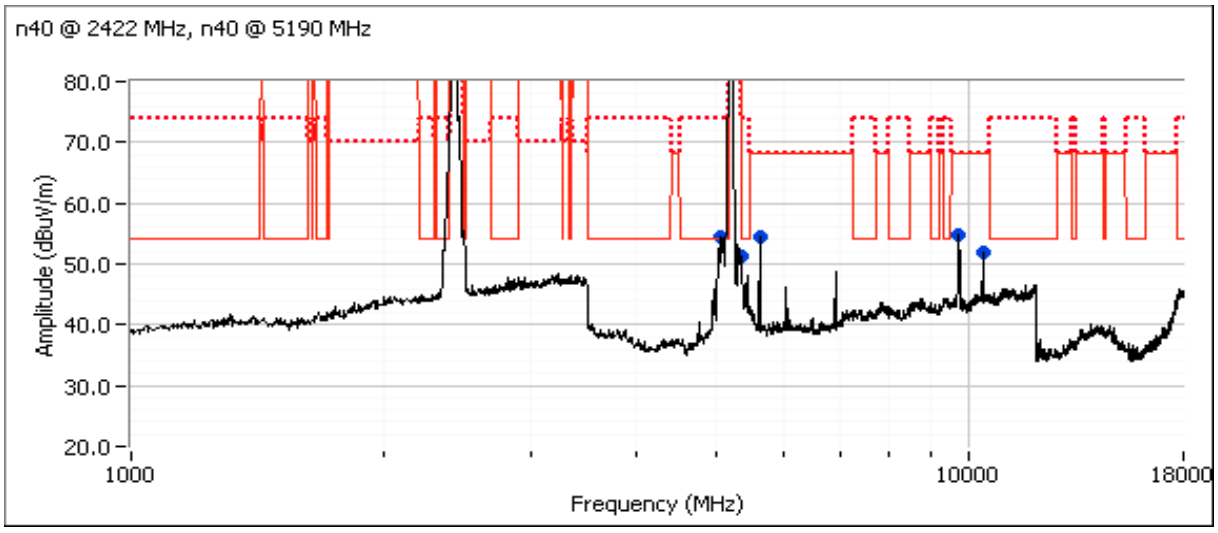
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #2c: Center Channel
non-beamforming

Channel:	4	Mode:	n40	Channel:	38	Mode:	n40
Tx Chain:	1, 2 & 3	Data Rate:	MCS1	Tx Chain:	1, 2, & 3	Data Rate:	MCS1

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2425.060	102.8	H	120.0	-17.2	PK	87	1.5	RB 100 kHz, VB 300 kHz
SA40 @ 1m distance and extrapolate to 3m - no preamp (1-3.5GHz)								
refer to plot - no significant emissions observed for this scan								
SA40 @ 3m distance w/ Preamp and 3.5GHz HPF (3.5-8.5GHz)								
5050.000	*54.4*	*H*	*54.0*	*0.4*	*Peak*	*297*	*1.5*	*From UNII signal.*
5350.000	*51.4*	*H*	*54.0*	*-2.6*	*Peak*	*282*	*1.5*	*From UNII signal.*
5616.670	*54.6*	*H*	*68.3*	*-13.7*	*Peak*	*65*	*2.0*	*From UNII signal.*
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
9693.100	53.1	H	72.8	-19.7	PK	71	1.60	RB 100 kHz, VB 300 kHz
10384.170	*52.0*	*H*	*68.3*	*-16.3*	*Peak*	*76*	*1.5*	*2nd harmonic of UNII signal.*

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*



Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #3: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: Worse case from Run #2

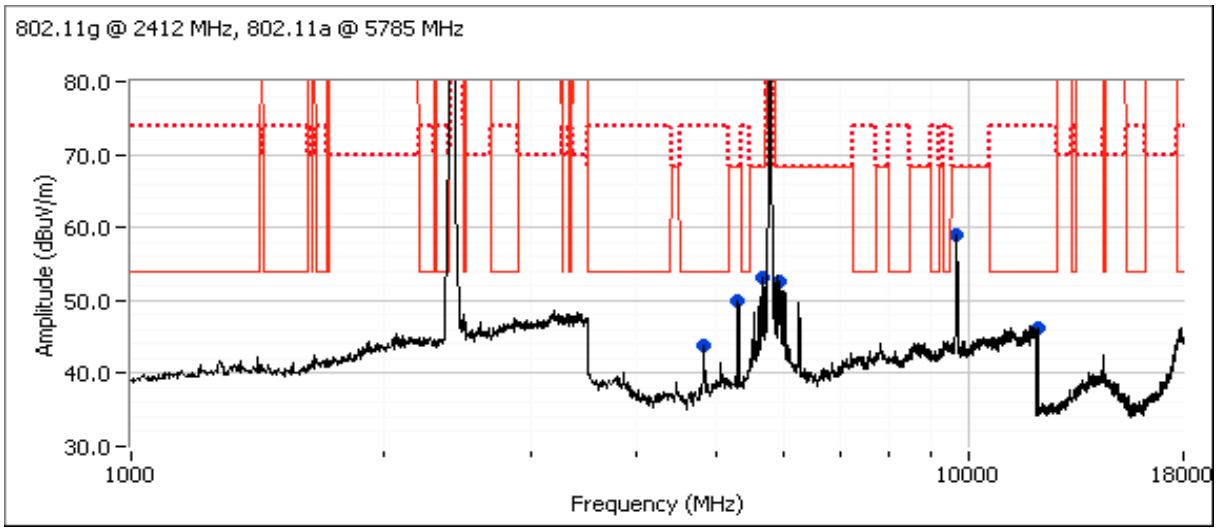
Date of Test: 4/5/2017 0:00 Config. Used: 1
Test Engineer: Rafael Varelas Config Change: none
Test Location: FT Chamber#7 EUT Voltage: 115V / 400Hz

Run #3a: Low Channel

Channel: 1 Mode: g Channel: 116 Mode: n20
Tx Chain: 1 Data Rate: 6 Mb/s Tx Chain: 1, 2, & 3 Data Rate: MCS1

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2412.000	106.1	H	-	-	PK	63	1.1	RB 100 kHz;VB 300 kHz;Peak
SA40 at 1m distance and extrapolate to 3m - no preamp (1-3.5GHz)								
refer to plot - no significant emissions observed for this scan								
SA40 @ 3m distance w/ Preamp and 3.5GHz HPF (3.5-8.5GHz)								
5908.110	65.2	H	68.3	-3.1	PK	44	1.5	
5305.250	60.6	H	68.3	-7.7	PK	284	2.0	
4821.080	39.4	H	54.0	-14.6	Avg	286	2.4	VB: 1 kHz, note 6.
4826.400	54.5	H	74.0	-19.5	PK	286	2.4	
5658.180	62.8	H	68.3	-5.5	PK	309	2.0	
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
12056.640	47.5	H	54.0	-6.5	Avg	72	1.4	VB: 1 kHz, note 6.
12053.570	61.6	H	74.0	-12.4	PK	72	1.4	
9650.580	58.9	H	76.1	-17.2	PK	57	1.5	RB 100 kHz;VB 300 kHz;Peak

Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

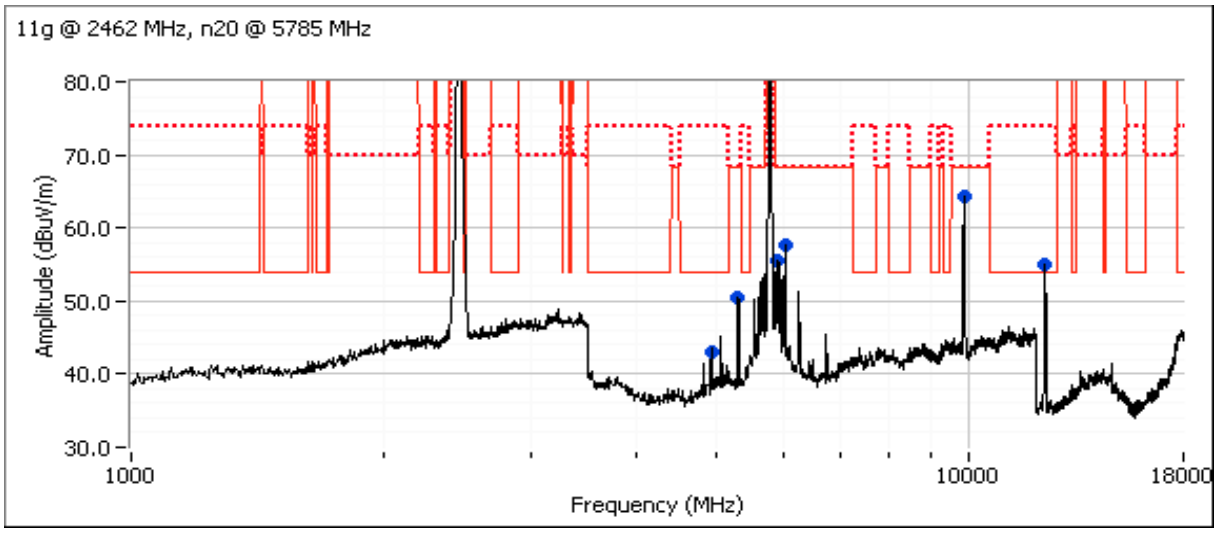


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #3b: High Channel

Channel: 11 Mode: g Channel: 116 Mode: n20
Tx Chain: 1 Data Rate: 6 Mb/s Tx Chain: 1, 2, & 3 Data Rate: MCS1

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
2454.670	107.8	H	-	-	PK	59	1.2	RB 100 kHz;VB 300 kHz;Peak
SA40 at 1m distance and extrapolate to 3m - no preamp (1-3.5GHz)								
refer to plot - no significant emissions observed for this scan								
SA40 @ 3m distance w/ Preamp and 3.5GHz HPF (3.5-8.5GHz)								
4923.980	39.6	V	54.0	-14.4	Avg	18	2.4	RB 1 MHz;VB 1 kHz;Peak
4921.510	54.3	V	74.0	-19.7	PK	18	2.4	RB 1 MHz;VB 3 MHz;Peak
6034.070	61.6	H	68.3	-6.7	PK	54	2.3	RB 1 MHz;VB 3 MHz;Peak
5310.480	61.2	H	68.3	-7.1	PK	299	1.1	RB 1 MHz;VB 3 MHz;Peak
5906.030	64.8	H	68.3	-3.5	PK	312	1.8	RB 1 MHz;VB 3 MHz;Peak
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
12311.670	51.5	H	54.0	-2.5	Avg	82	1.2	RB 1 MHz;VB 1 kHz;Peak
12329.870	65.6	H	74.0	-8.4	PK	82	1.2	RB 1 MHz;VB 3 MHz;Peak
9848.040	62.7	H	77.8	-15.1	PK	59	1.1	RB 100 kHz;VB 300 kHz;Peak



End of Report

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