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EMC Test Report

Application for FCC Grant of Equipment Authorization

FCC Part 15, Subpart E

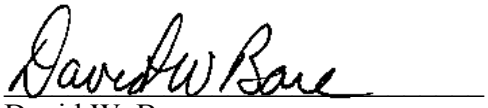
Model: Airplane AccessPoint

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
PROJECT NUMBER:	PR048459 / JD101779
REPORT DATE:	May 23, 2018
FINAL TEST DATES:	March 29, 30, 31, April 3, 4, 5, 6, 7, 10, November 9, 2107, March 6, 7 and 8, 2018
TOTAL NUMBER OF PAGES:	116

A2LA ACCREDITED
Testing Cert #0214.26

VALIDATING SIGNATORIES

PROGRAM MGR



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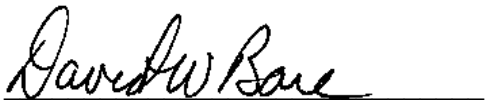

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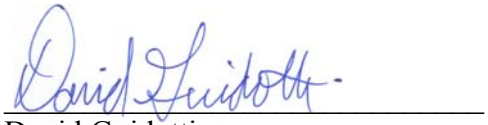

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	May 23, 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:

FCC Part 15, Subpart E requirements for UNII Devices

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 General UNII Test Procedures KDB789033

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:

FCC Part 15, Subpart E requirements for UNII Devices

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

UNII DEVICES

OPERATION IN THE 5.15 – 5.25 GHZ BAND – ACCESS POINTS

FCC Rule Part		Description	Measured Value / Comments	Limit / Requirement	Result
15.407 (a) (1) (i) or (ii)		Output Power	a: 9.1 mW n20: 9.2 mW n40: 15.2 mW ac80: 16.2 mW	30 dBm EIRP <= 4W	Complies
15.407 (a) (1) (i), (ii) or (iii)		Power Spectral Density	a: 0.8 mW/MHz n20: 0.8 mW/MHz n40: 0.7 mW/MHz ac80: 0.4 mW/MHz	17 dBm/MHz	Complies
15.407 (a) (1) (i)		EIRP 30° Above Horizon	Not applicable to indoor APs	21 dBm (125 mW)	N/A
15.407(b) (1) / 15.209		Spurious Emissions above 1GHz	54.0 dBµV/m @ 5149.76 MHz (0.0 dB)	Refer to the limits section (p23) for restricted bands, all others -27 dBm/MHz EIRP	Complies

OPERATION IN THE 5.725 – 5.85 GHZ BAND

FCC Rule Part		Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.407(e)		6dB Bandwidth		<= 500 kHz	Complies
		99% Bandwidth	a: 16.8 MHz n20: 18.1 MHz n40: 36.739 MHz ac80: 76.073 MHz	N/A – limits EIRP if < 20MHz	N/A
15.407(a) (3)		Output Power (multipoint systems)	a: 74.1 mW n20: 233.2 mW n40: 240.5 mW ac80: 225.1 mW (Max eirp: 2.820 W)	30 dBm (1 W) EIRP <= 4W	Complies
15.407(a) (3)		Power Spectral Density	a: 7.5 mW/MHz n20: 7.9 mW/MHz n40: 5.3 mW/MHz ac80: 1.6 mW/MHz	30 dBm / 500 kHz	Complies
15.407(b) (4) / 15.209		Spurious Emissions above 1GHz	66.8 dBµV/m @ 5628.6 MHz (-1.5 dB)	Refer to the limits section (p23) for restricted bands, all others -17 dBm/MHz EIRP bandedge and -27 dBm/MHz EIRP	Complies

REQUIREMENTS FOR ALL U-NII/LELAN BANDS

FCC Rule Part		Description	Measured Value / Comments	Limit / Requirement	Result
15.407		Modulation	Device uses OFDM and DSSS modulations	Digital modulation is required	Complies
15.407(b) (6) / 15.209		Spurious Emissions below 1GHz	29.9 dBµV/m @ 37.18 MHz (-0.1 dB)	Refer to page 24	Complies
15.31 (m)		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 (c)		Operation in the absence of information to transmit	Operation is discontinued in the absence of information (Operational Description page 16 of 19)	Device shall automatically discontinue operation in the absence of information to transmit	Complies
15.407 (g)		Frequency Stability	16 ppm	Signal shall remain within the allocated band	Complies
15.407 (h1)		Transmit Power Control	TPC mechanism is discussed in the Operational Description	The U-NII device shall have the capability to operate with a mean EIRP value lower than 24dBm (250mW)	Complies
15.407 (h2)		Dynamic frequency Selection (device with radar detection)	Refer to separate test report, reference FR-048459.03-FCC DFS Rev 0	Threshold -62dBm (-64dBm if eirp > 200mW) Channel Availability Check > 60s Channel closing transmission time < 260ms Channel move time < 10s Non occupancy period > 30minutes	Complies
		User manual information	Refer to manual for details	Warning regarding Tilt angle for EIRP compliance, Indoor use for 5150-5250 MHz band and Radar are primary user of some bands	Complies

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part		Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203		RF Connector	Integral antennas	Unique or integral antenna required	Complies
15.407 (b) (6)		AC Conducted Emissions	Does not connect to a public utility	Refer to page 22	N/A
15.407 (f)		RF Exposure Requirements	Refer to MPE calculations in separate exhibit and User Manual statements.	Refer to OET 65, FCC Part 1	Complies
-		Occupied Bandwidth	See above for each band	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 an 802.11a/b/g/n/ac 3x3 MIMO dual radio 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 29, 30, 31, April 3, 4, 5, 6, 7, 10, November 9, 2107, March 6, 7 and 8, 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 for each radio.

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.

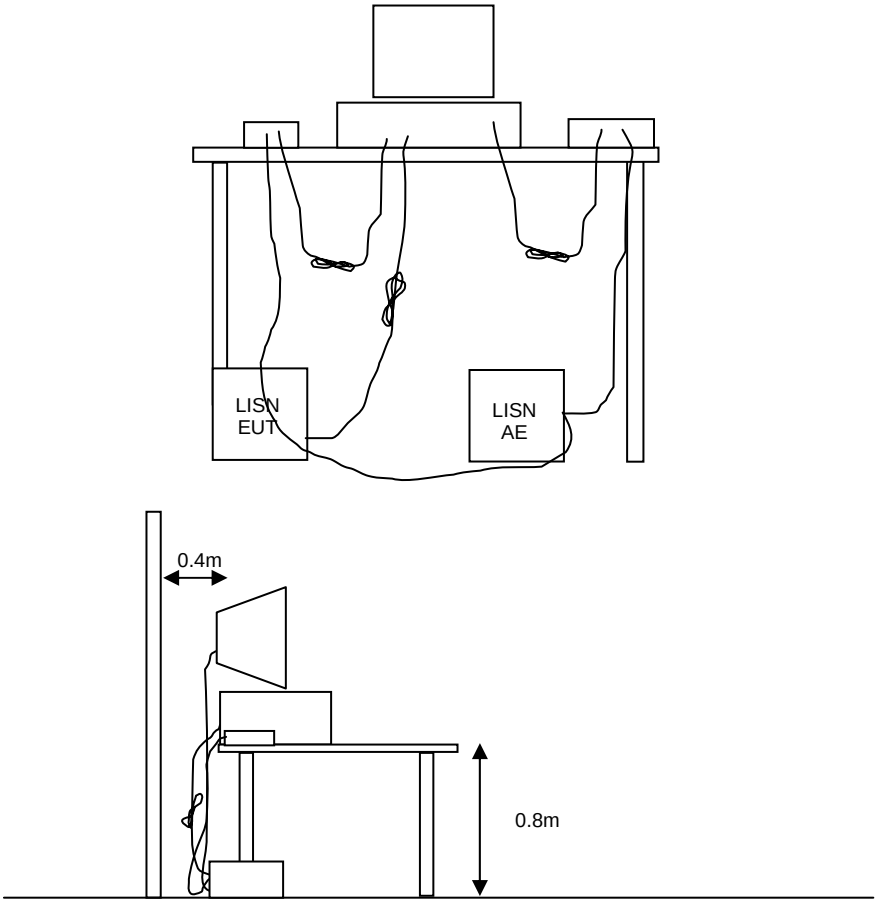


Figure 1 Typical Conducted Emissions Test Configuration

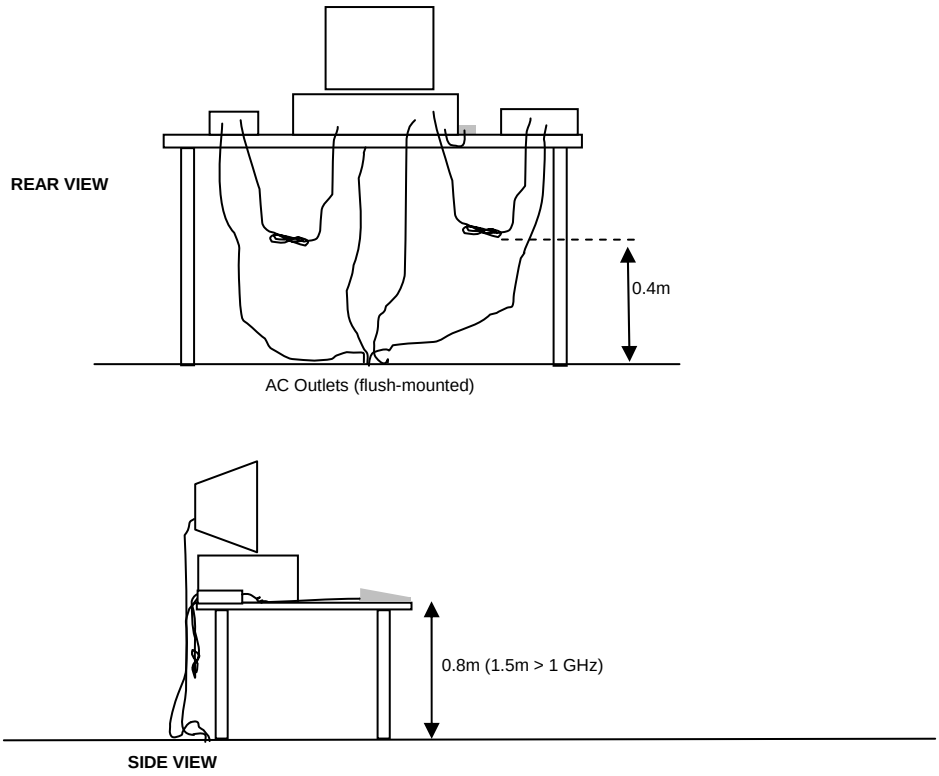
RADIATED EMISSIONS

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.

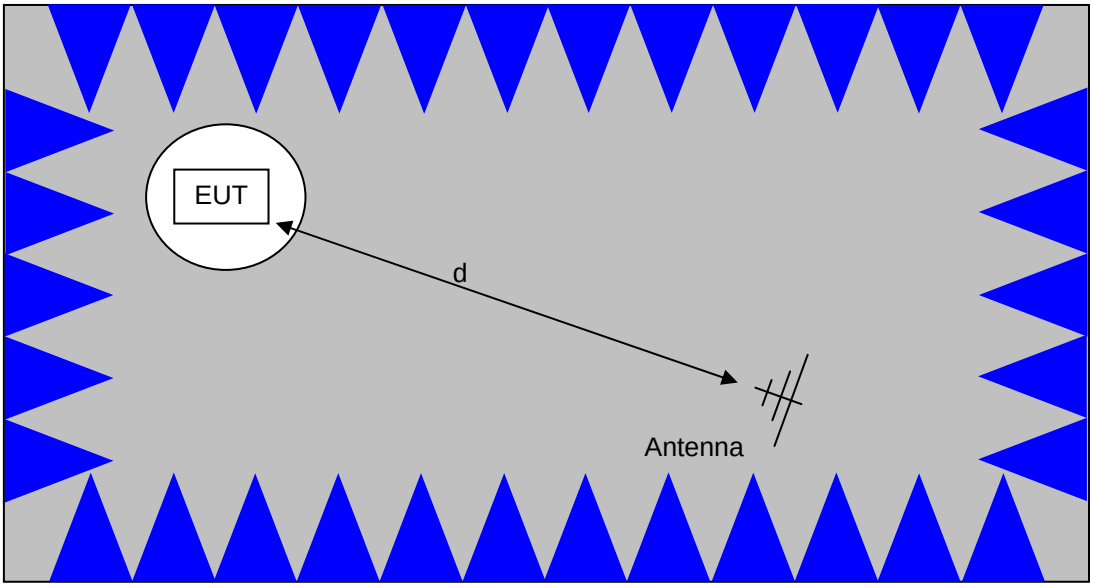
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

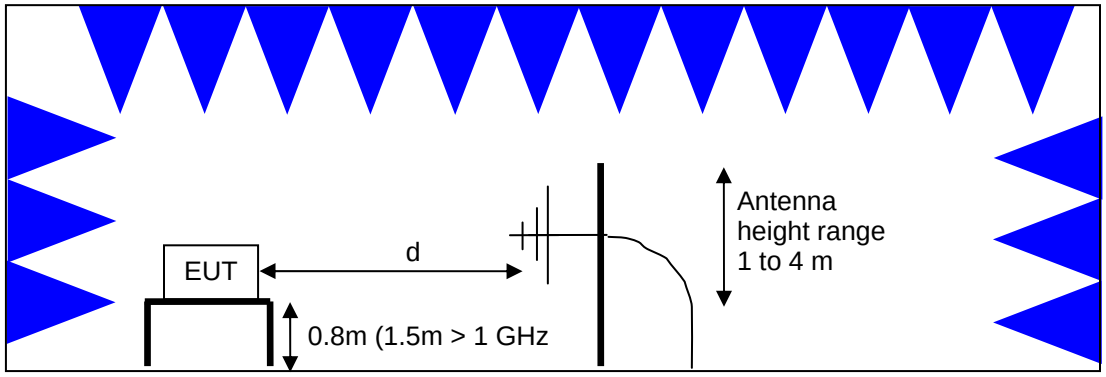


Typical Test Configuration for Radiated Field Strength Measurements



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.

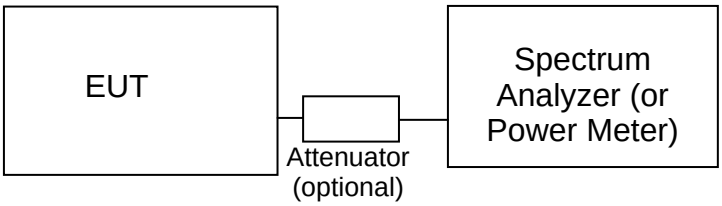
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



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

FCC 15.407 (a) OUTPUT POWER LIMITS

The table below shows the limits for output power and output power density. For the 5250-5350 and 5470-5725 MHz bands, 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
5150 – 5250	1Watt (30 dBm)	17 dBm/MHz
5250 – 5350 and 5470-5725	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watt (30 dBm)	30 dBm/500kHz

For system using antennas with gains exceeding 6dBi, the output power and power spectral density limits are reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

OUTPUT POWER LIMITS –LELAN DEVICES

The table below shows the limits for output power and output power density defined by RSS 247. 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
5150 – 5250	200mW (23 dBm) eirp	10 dBm/MHz eirp
5250 – 5350 and 5470 - 5725	250 mW (24 dBm)2 1W (30dBm) eirp	11 dBm/MHz
5725 – 5825	1 Watt (30 dBm) 4W eirp	30 dBm/500kHz

Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

SPURIOUS EMISSIONS LIMITS –UNII and LELAN DEVICES

The spurious emissions limits for signals below 1GHz are the FCC/RSS-Gen general limits. For emissions above 1GHz, signals in restricted bands are subject to the FCC/RSS-Gen general limits. All other signals have a limit of –27dBm/MHz, which is field strength of 68.3dBuV/m/MHz at a distance of 3m. For devices operating in the 5725-5850 MHz bands under the LELAN/UNII rules, the limit within 10MHz of the allocated band is increased to –17dBm/MHz.

[2] If EIRP exceeds 500mW the device must employ TPC

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, 29, 30, 31-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, 06, 07, 10-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), 06, 07-Mar-18					
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	7/31/2017	7/31/2018
Frequency Stability, 08-Mar-18					
Watlow	Temp Chamber (w/ F4 watlow Controller)	96A0	2171	7/7/2017	7/7/2018
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	7/31/2017	7/31/2018

Appendix B Test Data

T103414 Pages 29 – 115

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:	-

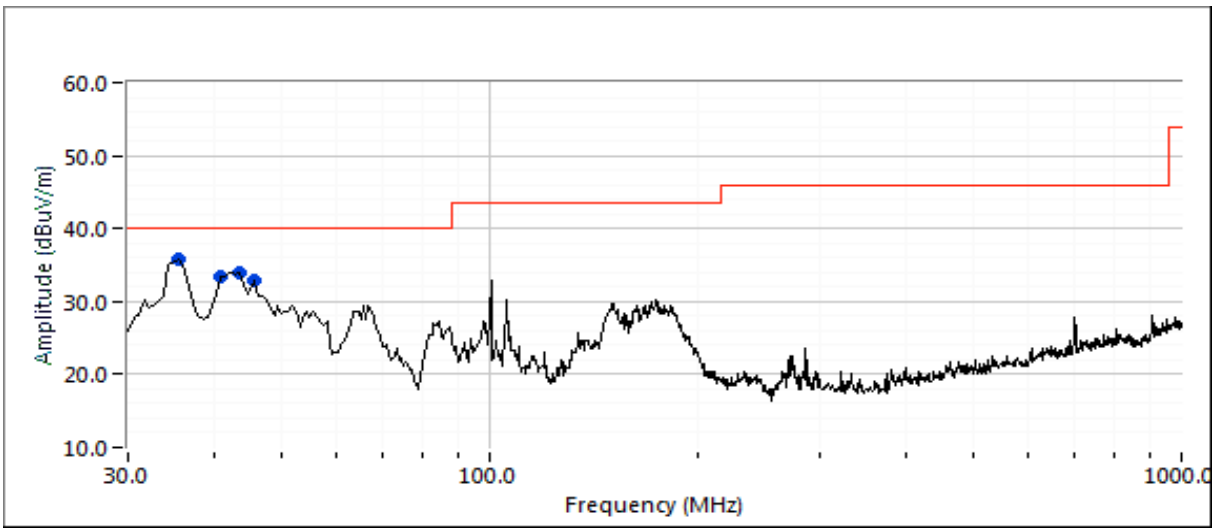
Sample Notes

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 15.407 (UNII) 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

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
Scans on "center" channel in all four OFDM modes to determine the worst case mode.							
1	a	40 - 5200MHz	20	20	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	47.3 dBµV/m @ 5078.3 MHz (-6.7 dB)
	n20	40 - 5200MHz		20	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	52.8 dBµV/m @ 6933.3 MHz (-1.2 dB)
	n40	38 - 5190MHz		20	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	49.2 dBµV/m @ 5035.4 MHz (-4.8 dB)
	ac80	42 - 5210MHz		20	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	42.2 dBµV/m @ 5383.4 MHz (-11.8 dB)
Measurements on low and high channels in worst-case OFDM mode.							
2	n20	36 - 5180MHz	20	20	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	48.4 dBµV/m @ 5060.6 MHz (-5.6 dB)
	n20	48 - 5240MHz		20	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	48.9 dBµV/m @ 5122.1 MHz (-5.1 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

Scans on "center" channel in all four OFDM modes to determine the worst case mode.							
7	a	157 - 5785MHz	20	20	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	65.2 dBµV/m @ 5908.1 MHz (-3.1 dB)
	n20	157 - 5785MHz		20	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	64.8 dBµV/m @ 5906.0 MHz (-3.5 dB)
	n40	159 - 5795MHz		20	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	54.3 dBµV/m @ 6277.9 MHz (-14.0 dB)
	ac80	155 - 5755MHz		20	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	48.6 dBµV/m @ 5133.4 MHz (-5.4 dB)
Measurements on low and high channels in worst-case OFDM mode.							
8	a	149 - 5745MHz	20	20	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	61.5 dBµV/m @ 5902.7 MHz (-6.8 dB)
	a	165- 5825MHz		20	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15 E	64.9 dBµV/m @ 5943.5 MHz (-3.4 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	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 789033
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 50 traces. (method VB of KDB 789033)
5 GHz band reject filters used

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11a	6MB/s	97.0	No	2	0	0	500
11n20	MCS	96.2	No	2	0	0	500
11n40	MCS	96.8	No	2	0	0	500
ac80	MCS	89.4	No	2	0	0	500

Commands to use for the following modes:
11a - data-rates custom basic-6
n20 - data-rates custom basic-mcs-1s
n40 - data-rates custom basic-mcs-1s
ac80 - data-rates custom basic-mcs-1s

Sample Notes

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

Measurement Specific Notes:

Note 1	For emissions in restricted bands, the limit of 15.209 was used which requires average and peak measurements.
Note 2	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB≥3MHz, peak detector). Per KDB 789033 2) c) (i), compliance can be demonstrated by meeting the average and peak limits of 15.209, as an alternative.
Note 3	Emission has non constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW>1/T but not less than 10Hz, peak detector, linear averaging, auto sweep,max hold 50*1/DC traces (method VB of KDB 789033)

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 - 40,000 MHz. Operation in the 5150-5250 MHz Band

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: Center Channel

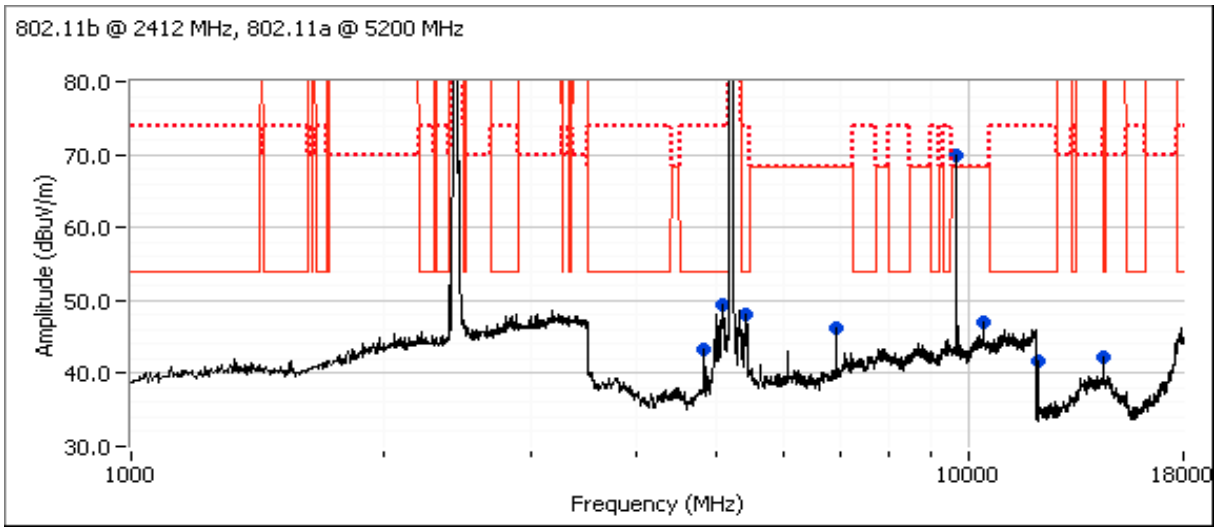
Channel: 40 Mode: a

Tx Chain: 1 Data Rate: 6MB/s

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
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	1 kHz;Peak, 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 3
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 3
5080.630	59.4	H	74.0	-14.6	PK	292	2.1	
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
10401.320	57.1	V	68.3	-11.2	PK	14	1.6	RB 1 MHz;VB 3 MHz;Peak
14471.710	51.7	H	54.0	-2.3	Avg	328	1.5	*2.4GHz radio signal*
14471.900	61.2	H	74.0	-12.8	PK	328	1.5	*2.4GHz radio signal*
12059.160	51.7	H	54.0	-2.3	Avg	68	1.5	*2.4GHz radio signal*
12059.910	57.9	H	74.0	-16.1	PK	61	1.5	*2.4GHz radio signal*

Note:	*Scans made between 18 - 40 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

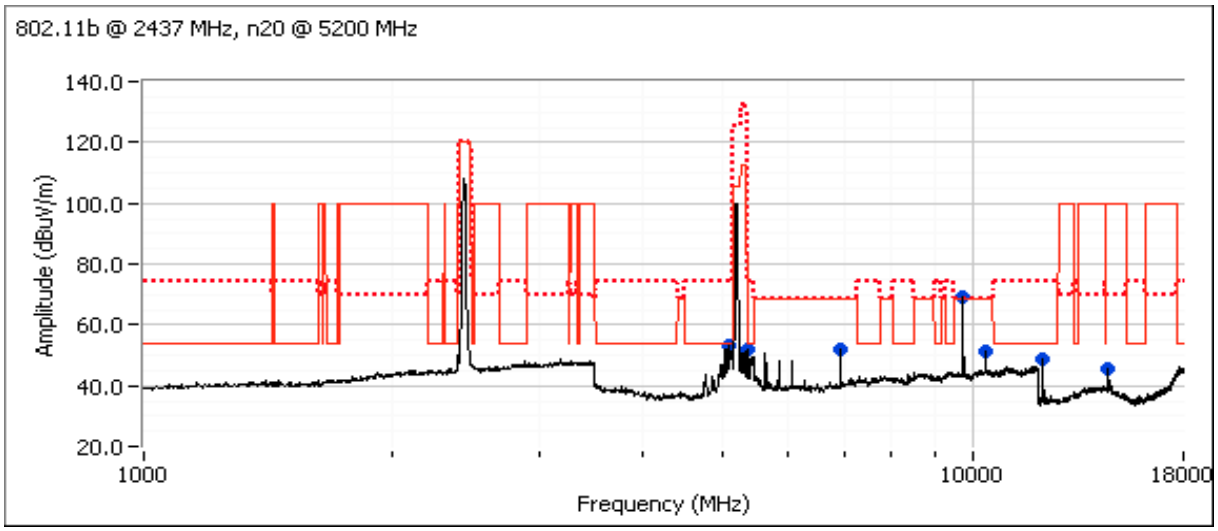
Run #1b: Center Channel

Channel: 40 Mode: 11n20
Tx Chain: 1, 2 and 3 Data Rate: MCS

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
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)								
5352.210	47.2	H	54.0	-6.8	Avg	302	1.8	VB: 1 kHz, note 3
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 3
5076.230	63.3	H	74.0	-10.7	PK	304	1.3	
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
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
10398.820	58.0	H	68.3	-10.3	PK	57	1.3	RB 1 MHz;VB 3 MHz;Peak
12185.560	51.9	H	54.0	-2.1	Avg	66	1.5	VB 1 kHz, Note 3
12185.690	48.5	H	54.0	-5.5	Peak	65	1.5	
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	VB 1 kHz, Note 3

Note:	*Scans made between 18 - 40 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



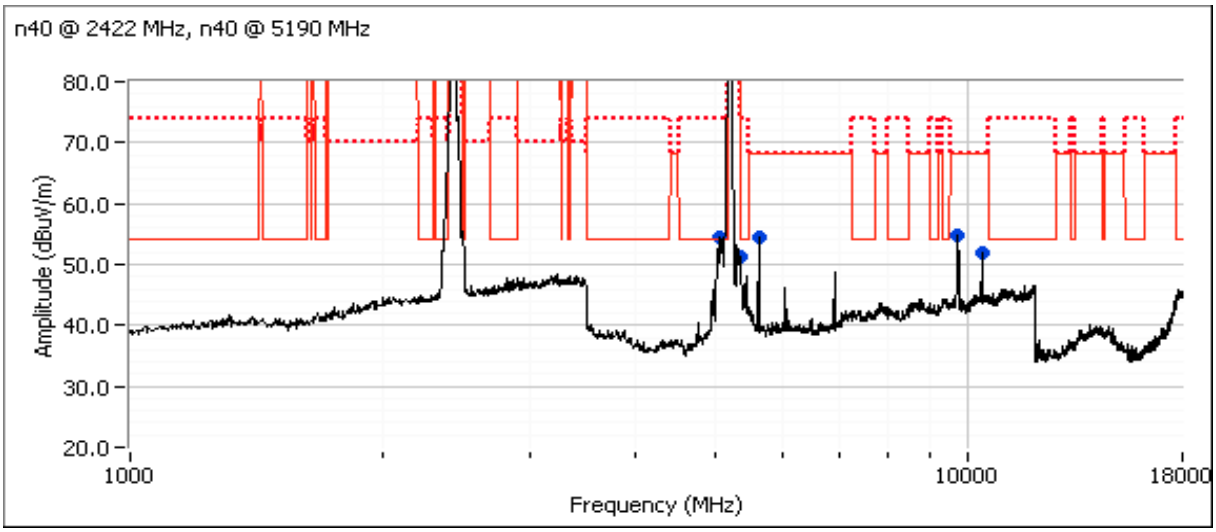
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #1c: Center Channel

Channel: 38 Mode: 11n40
Tx Chain: 1, 2 and 3 Data Rate: MCS

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
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)								
5622.500	58.0	H	68.3	-10.3	PK	57	1.92	
5352.070	44.8	H	54.0	-9.2	Avg	290	1.94	VB: 1 kHz, note 6.
5354.000	61.5	H	74.0	-12.5	PK	290	1.94	
5035.400	49.2	H	54.0	-4.8	Avg	298	1.05	VB: 1 kHz, note 6.
5035.600	61.0	H	74.0	-13.0	PK	298	1.05	
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-12GHz)								
9707.500	*54.7*	*H*	*68.3*	*-13.6*	*Peak*	*55*	*1.5*	*4 th harmonic of DTS signal.*
10383.170	57.0	H	68.3	-11.3	PK	62	1.48	

Note:	*Scans made between 18 - 40 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*



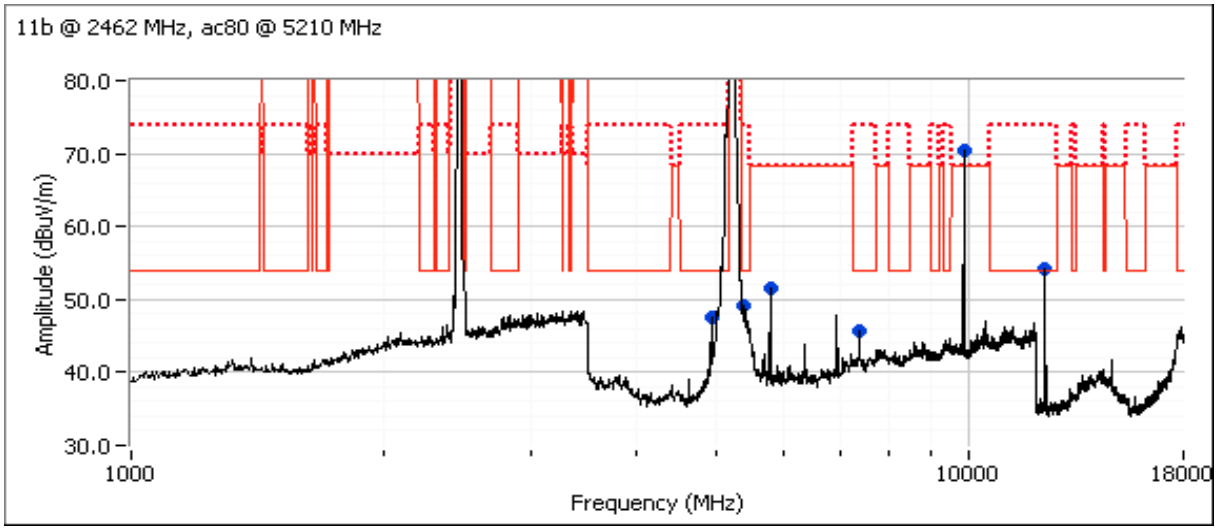
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #1d: Center Channel

Channel: 42 Mode: ac80
Tx Chain: 1, 2 and 3 Data Rate: MCS

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
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)								
5383.400	42.2	H	54.0	-11.8	Avg	304	1.4	VB: 1 kHz, note 6.
5385.550	57.8	H	74.0	-16.2	PK	304	1.4	
7386.750	45.7	H	54.0	-8.3	Avg	47	1.2	*2.4GHz radio signal*
7385.770	54.9	H	74.0	-19.1	PK	47	1.2	*2.4GHz radio signal*
5773.890	49.5	H	68.3	-18.8	PK	53	2.2	RB 1 MHz;VB 3 MHz;Peak
4923.910	*47.6*	*V*	*54.0*	*-6.4*	*Peak*	*30*	*2.0*	*2.4GHz radio signal*
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
9853.330	*70.4*	*H*	*68.3*	*2.1*	*Peak*	*48*	*2.5*	*2.4GHz radio signal*
12300.000	*54.3*	*H*	*54.0*	*0.3*	*Peak*	*66*	*1.5*	*2.4GHz radio signal*

Note:	*Scans made between 18 - 40 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 #2: Radiated Spurious Emissions, 1,000 - 40000 MHz. Operating Mode: worst case from Run #1

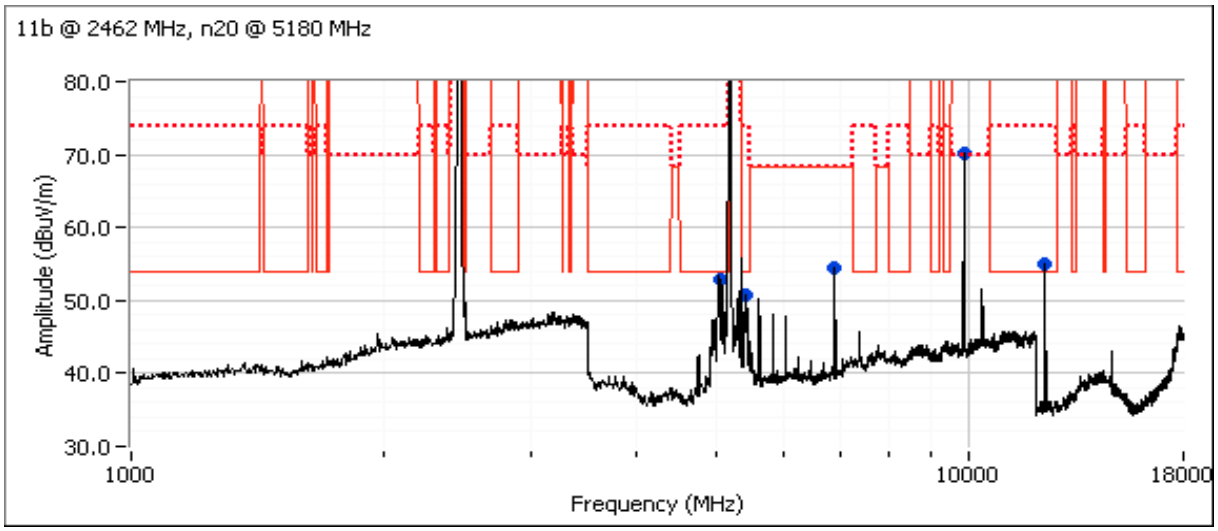
Date of Test: 4/5/2017 0:00 Config. Used: 1
Test Engineer: Rafael Varelas/ Joseph Cadigal Config Change: None
Test Location: Chamber 7 EUT Voltage: 115V / 400Hz

Run #2a: Low Channel

Channel: 36 Mode: 11n20
Tx Chain: 1, 2 and 3 Data Rate: MCS

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
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)								
6906.560	57.5	H	68.3	-10.8	PK	58	1.6	RB 1 MHz;VB 3 MHz;Peak
5412.640	47.1	H	54.0	-6.9	Avg	302	2.2	VB: 1 kHz, note 6.
5414.100	57.2	H	74.0	-16.8	PK	302	2.2	
5060.550	48.4	H	54.0	-5.6	Avg	284	1.6	VB: 1 kHz, note 6.
5063.350	60.5	H	74.0	-13.5	PK	284	1.6	
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
12310.000	*54.9*	*H*	*54.0*	*0.9*	*Peak*	*65*	*1.5*	*2.4GHz radio signal*
9847.500	*70.2*	*H*	*70.0*	*0.2*	*Peak*	*46*	*2.5*	*2.4GHz radio signal*

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



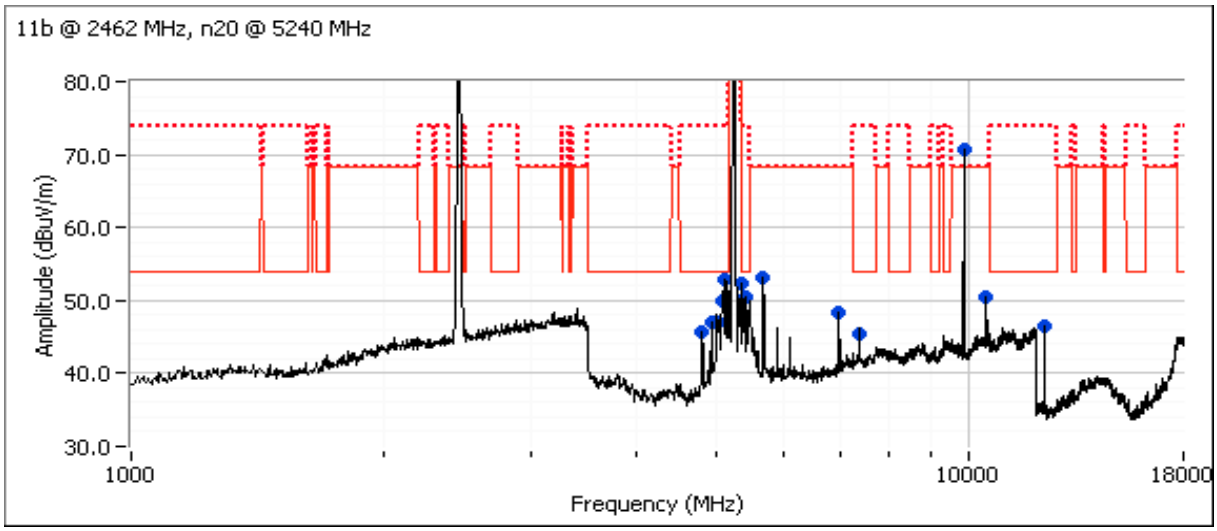
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #2b: High Channel

Channel: 48 Mode: 11n20
Tx Chain: 1, 2 and 3 Data Rate: MCS

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
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)								
5122.120	48.9	H	54.0	-5.1	Avg	300	2.0	VB: 1 kHz, note 6.
5122.910	60.6	H	74.0	-13.4	PK	300	2.0	
4924.140	46.1	V	54.0	-7.9	Avg	15	2.0	VB: 1 kHz, note 6.
4923.820	52.5	V	74.0	-21.5	Pk	15	2.0	
4811.060	41.7	H	54.0	-12.3	Avg	74	2.0	VB: 1 kHz, note 6.
4807.700	52.6	H	74.0	-21.4	PK	74	2.0	
7386.850	45.1	V	54.0	-8.9	Avg	71	1.0	VB: 1 kHz, note 6.
7386.860	54.2	V	74.0	-19.8	PK	71	1.0	
5360.260	45.5	H	54.0	-8.5	Avg	288	1.5	VB: 1 kHz, note 6.
5358.100	61.6	H	74.0	-12.4	PK	288	1.5	
5363.810	48.3	H	54.0	-5.7	Avg	290	2.0	VB: 1 kHz, note 6.
5364.120	61.5	H	74.0	-12.5	PK	290	2.0	
5081.190	44.9	H	54.0	-9.1	Avg	300	2.0	VB: 1 kHz, note 6.
5083.010	58.6	H	74.0	-15.4	PK	300	2.0	
5026.590	45.3	H	54.0	-8.7	Avg	300	2.0	VB: 1 kHz, note 6.
5026.710	56.9	H	74.0	-17.1	PK	300	2.0	
6986.860	54.7	H	68.3	-13.6	PK	52	1.5	RB 1 MHz;VB 3 MHz;Peak
5679.230	58.4	H	68.3	-9.9	PK	52	2.5	RB 1 MHz;VB 3 MHz;Peak
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
9847.920	67.7	H	68.3	-0.6	Peak	40	2.5	*2.4GHz radio signal*
10473.850	55.8	H	68.3	-12.5	Peak	64	1.5	
12311.230	46.4	H	54.0	-7.6	Peak	59	1.5	*2.4GHz radio signal*

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 #7, Radiated Spurious Emissions, 1,000 - 40,000 MHz. Operation in the 5725-5850 MHz Band

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

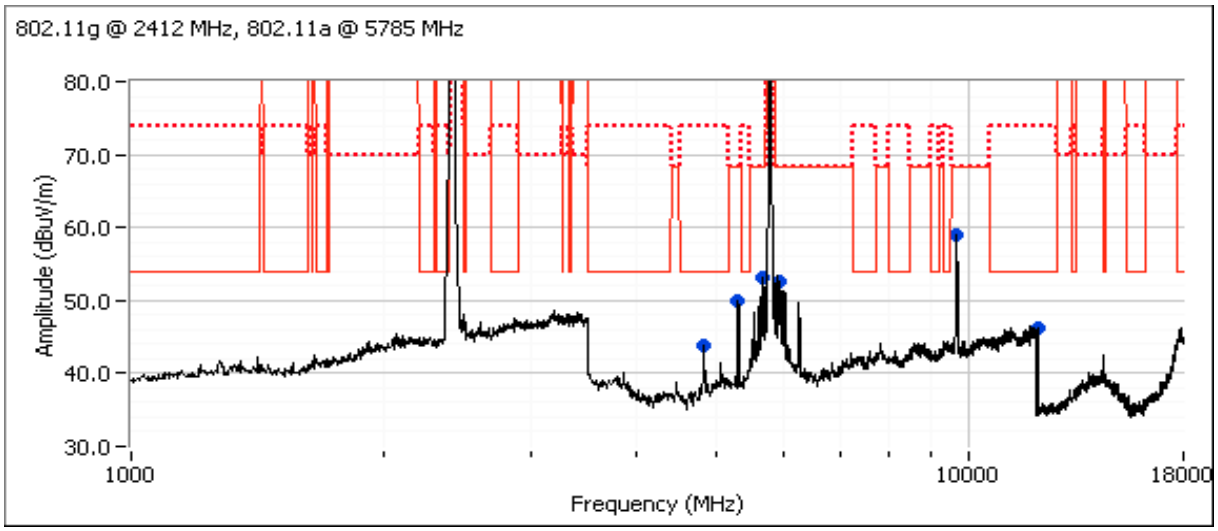
Run #7a: Center Channel

Channel: 157 Mode: a
Tx Chain: 1 Data Rate: 6MB/s

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
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	*2.4GHz radio signal*
12053.570	61.6	H	74.0	-12.4	PK	72	1.4	*2.4GHz radio signal*
9650.580	58.9	H	76.1	-17.2	PK	57	1.5	*2.4GHz radio signal*

Note:	*Scans made between 18 - 40 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



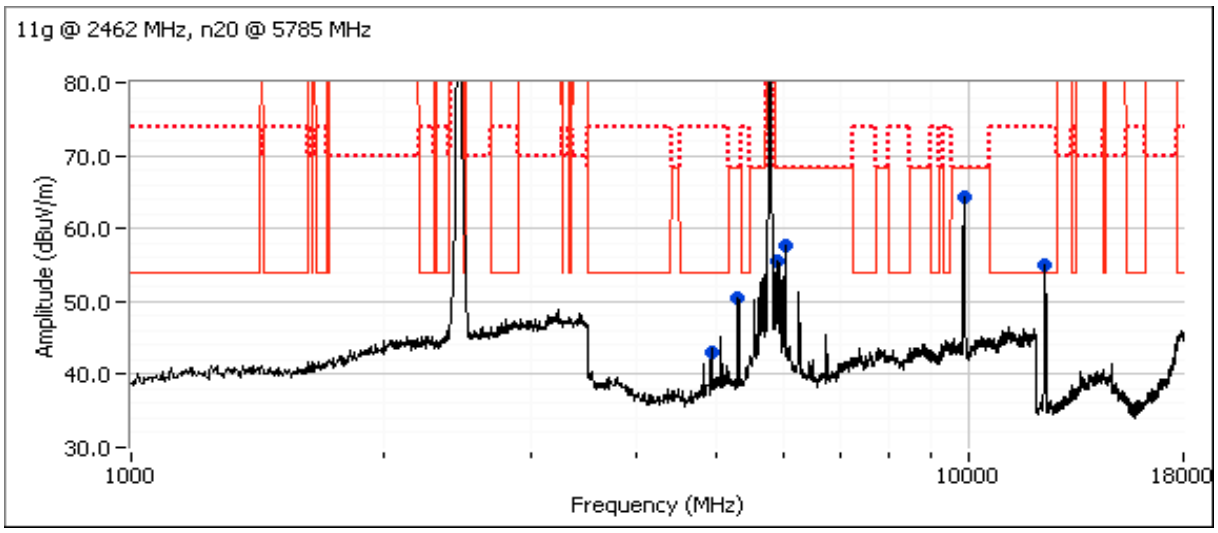
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #7b: Center Channel

Channel: 157 Mode: 11n20
Tx Chain: 1,2, and 3 Data Rate: MCS

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
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	*2.4GHz radio signal*
12329.870	65.6	H	74.0	-8.4	PK	82	1.2	*2.4GHz radio signal*
9848.040	62.7	H	77.8	-15.1	PK	59	1.1	*2.4GHz radio signal*

Note:	*Scans made between 18 - 40 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*



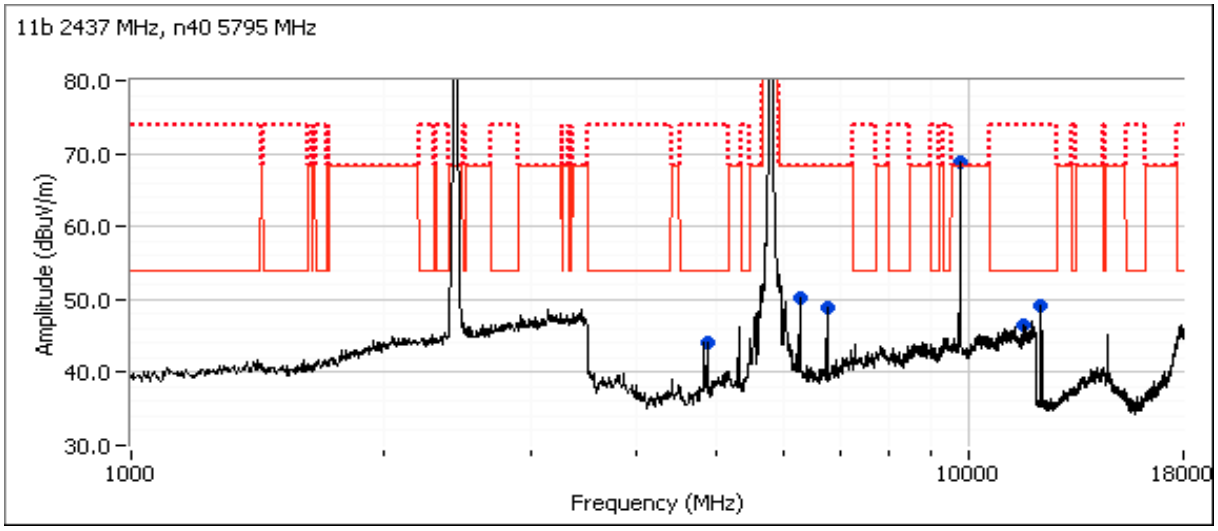
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #7c: Center Channel

Channel: 159 Mode: 11n40
Tx Chain: 1,2, and 3 Data Rate: MCS

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
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)								
4866.670	*44.0*	*V*	*54.0*	*-10.0*	*Peak*	*21*	*2.5*	*2nd harmonic of 2.4G carrier*
6277.880	54.3	H	68.3	-14.0	PK	67	2.0	
6760.890	54.1	H	68.3	-14.2	PK	67	2.4	
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
9748.330	*68.9*	*H*	*68.3*	*0.6*	*Peak*	*69*	*1.5*	*4th harmonic of 2.4G carrier*
11585.830	*46.5*	*H*	*54.0*	*-7.5*	*Peak*	*33*	*1.5*	*Could not find signal.*
12180.000	*49.1*	*H*	*54.0*	*-4.9*	*Peak*	*87*	*1.5*	*5h harmonic of 2.4G carrier*

Note:	*Scans made between 18 - 40 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*



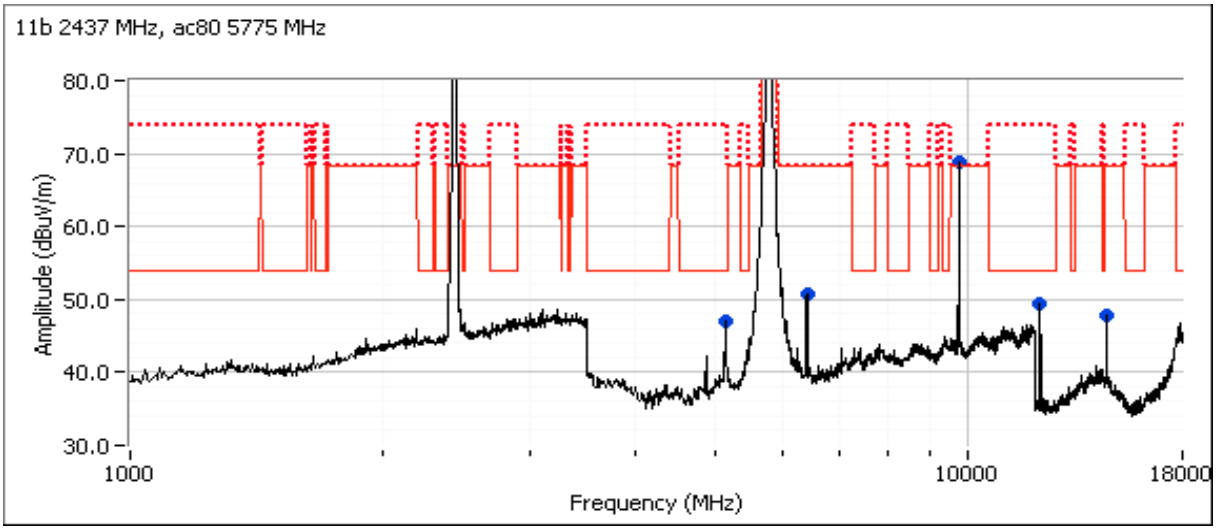
Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #7d: Center Channel

Channel: 155 Mode: ac80
Tx Chain: 1, 2, & 3 Data Rate: MCS

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
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)								
5133.430	48.6	H	54.0	-5.4	Avg	328	1.9	VB 1 kHz, note 3.
5134.170	53.2	H	74.0	-20.8	PK	328	1.9	
6416.990	56.8	H	68.3	-11.5	PK	45	2.5	RB 1 MHz;VB 3 MHz;Peak
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
9748.330	*68.8*	*H*	*NA*	*NA*	*Peak*	*61*	*1.5*	*4th harmonic of 2.4G carrier*
12180.000	*49.5*	*H*	*54.0*	*-4.5*	*Peak*	*87*	*1.5*	*5th harmonic of 2.4G carrier*
14620.000	*47.7*	*H*	*NA*	*NA*	*Peak*	*334*	*1.5*	*6th harmonic of 2.4G carrier*

Note:	*Scans made between 18 - 40 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 #8: Radiated Spurious Emissions, 1,000 - 40000 MHz. Operating Mode: worst case from Run #7

Date of Test: 4/10/2017 0:00
Test Engineer: Rafael Varelas
Test Location: FT Chamber#7

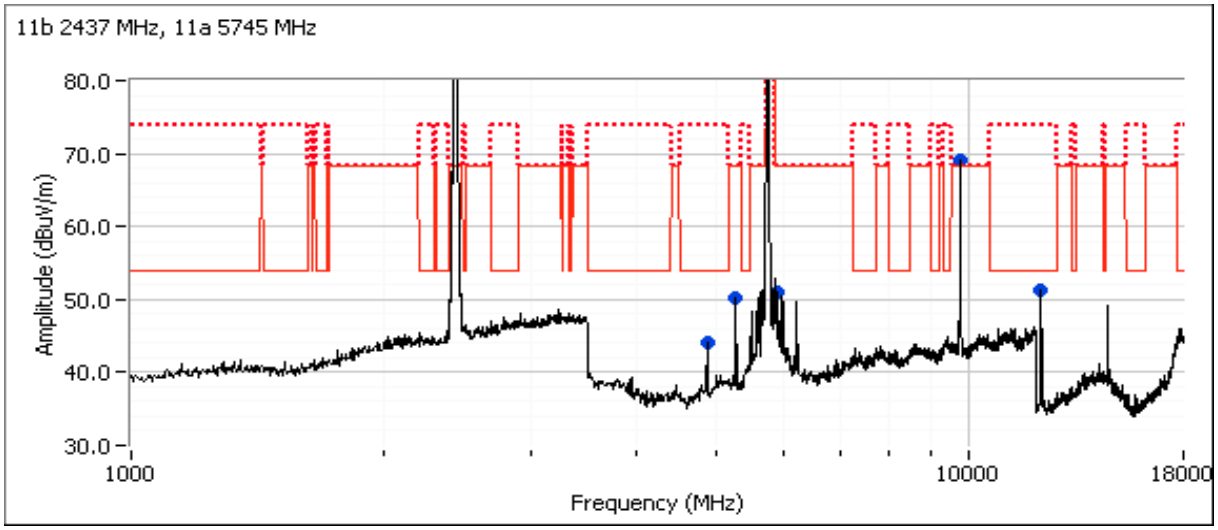
Config. Used: 1
Config Change: none
EUT Voltage: 115V / 400Hz

Run #8a: Low Channel

Channel: 149
Tx Chain: 1

Mode: a
Data Rate: 6MB/s

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
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)								
5266.680	60.3	H	68.3	-8.0	PK	285	2.2	RB 1 MHz;VB 3 MHz;Peak
5902.670	61.5	H	68.3	-6.8	PK	301	1.6	RB 1 MHz;VB 3 MHz;Peak
4866.670	*44.2*	*V*	*54.0*	*-9.8*	*Peak*	*21*	*2.5*	*2.4GHz radio signal*
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
12180.000	*51.3*	*H*	*54.0*	*-2.7*	*Peak*	*84*	*1.5*	*2.4GHz radio signal*
9748.330	*69.1*	*H*	*68.3*	*0.8*	*Peak*	*65*	*1.5*	*2.4GHz radio signal*

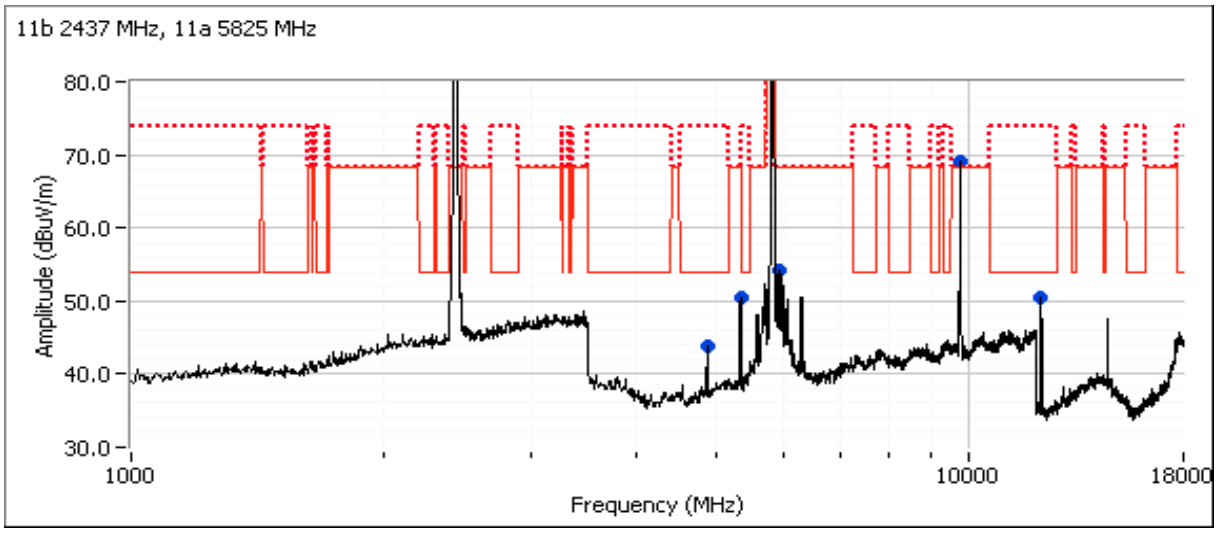


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Run #8b: High Channel

Channel: 165 Mode: a
Tx Chain: 1 Data Rate: 6MB/s

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
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)								
5342.700	61.3	H	68.3	-7.0	PK	286	2.1	RB 1 MHz;VB 3 MHz;Peak
5943.480	64.9	H	68.3	-3.4	PK	40	1.5	RB 1 MHz;VB 3 MHz;Peak
4866.670	*43.7*	*V*	*54.0*	*-10.3*	*Peak*	*8*	*2.5*	*2.4GHz radio signal*
SA40 @ 3m distance w/ Preamp and 8.2GHz HPF (8.5-18GHz)								
9748.330	*69.1*	*H*	*68.3*	*0.8*	*Peak*	*71*	*1.5*	*2.4GHz radio signal*
12180.000	*51.3*	*H*	*54.0*	*-2.7*	*Peak*	*84*	*1.5*	*2.4GHz radio signal*



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 (LELAN) and FCC 15.407(UNII)
Antenna Port Measurements
Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

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

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Power, 5150 - 5250MHz	15.407(a) (1), (2), (3) RSS-247 6.2	Pass	a: 9.1 mW n20: 9.2 mW n40: 15.2 mW ac80: 16.2 mW
1	PSD, 5150 - 5250MHz	15.407(a) (1), (2), (3) RSS-247 6.2	Pass	a: 0.8 mW/MHz n20: 0.8 mW/MHz n40: 0.7 mW/MHz ac80: 0.4 mW/MHz
1	99% Bandwidth	RSS-247 (Information only)	N/A	a: 16.8 MHz n20: 17.8 MHz n40: 36.4 MHz ac80: 75.8 MHz
2	Antenna Conducted - Out of Band Spurious	15.407(b) -27dBm/MHz	N/A	N/A - all spurious emissions evaluated using radiated methods

General Test Configuration

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators and cables used.

Ambient Conditions:

Temperature: 21.8 °C
Rel. Humidity: 39 %

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 789033 D01

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)	IFS
11a	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
ac80	MCS0	0.96	Yes	0.463	0.2	0.3	2160	20

Sample Notes

Sample S/N: LT17000S

Driver: -

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: Bandwidth, Output Power and Power Spectral Density - MIMO Systems

Date of Test: 3/6/2018 0:00 Config. Used: 1

Test Engineer: Jude Semana / Rafael Varelas Config Change: None

Test Location: FT Lab #4A EUT Voltage: 115V/400Hz

Note 1a:	For a, n20 and n40 modes Duty Cycle ≥ 98%. Output power measured using a spectrum analyzer (see plots below). RBW=1MHz, VB=3 MHz, Span > OBW, # of points in sweep ≥ 2*span/RBW, auto sweep, RMS detector, power averaging on (transmitted signal was continuous, duty cycle ≥ 98%) and power integration over the OBW (method SA-1 of ANSI C63.10).
Note 1b:	For ac80 mode only Constant Duty Cycle < 98%. Output power measured using a spectrum analyzer (see plots below). RBW=1MHz, VB=3 MHz, Span > OBW, # of points in sweep ≥ 2*span/RBW, RMS detector, trace average 100 traces (at least 100 traces, increase the number to get true average), power averaging on and power integration over the OBW. Tthe measurements were adjusted by adding 0.2 dB. This is based on 10log(1/x), where x is the duty cycle. (method SA-2 of ANSI C63.10)
Note 2:	PSD measured using the same analyzer settings used for output power.
Note 3:	For RSS-247 the PSD limit for the 5150 - 5250 MHz band accounts for the antenna gain as the maximum eirp allowed is 10dBm/MHz. The limits are also corrected for instances where the highest measured value of the PSD exceeds the average PSD (calculated from the measured power divided by the measured 99% bandwidth) by more than 3dB by the amount that the measured value exceeds the average by more than 3dB.
Note 4:	99% Bandwidth measured in accordance with C63.10 - RB between 1-5 % of OBW and VB ≥ 3*RB, Span between 1.5 and 5 times OBW.
Note 5:	For MIMO systems the total output power and total PSD are calculated from the sum of the powers of the individual chains (in linear terms). The antenna gain used to determine the EIRP and limits for PSD/Output power depends on the operating mode of the MIMO device. If the signals on the non-coherent between the transmit chains then the gain used to determine the limits is the highest gain of the individual chains and the EIRP is the sum of the products of gain and power on each chain. If the signals are coherent then the effective antenna gain is the sum (in linear terms) of the gains for each chain and the EIRP is the product of the effective gain and total power.

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

Antenna Gain Information

Freq	Antenna Gain (dBi) / Chain				BF	MultiChain Legacy	CDD	Sectorized / Xpol	Dir G (PWR)	Dir G (PSD)
	1	2	3	4						
5150-5250	5.92	5.92	5.92		-	-	X	-	5.9	10.7
5250-5350										
5470-5725										
5725-5825										

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; GA (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.
Notes:	For systems with Beamforming and CDD, choose one the following options: Option 1: Delays are optimized for beamforming, rather than being selected from cyclic delay table of 802.11; Array gains calculated based on beamforming criteria. Option 2: Antennas are paired for beamforming, and the pairs are configured to use the cyclic delay diversity of 802.11; the array gain associated with beamforming with 2 antennas (3dB), and the array gain associated with CDD with two antennas (3dB for PSD and 0 dB for power)

FCC UNII-1 Limits		Pwr	PSD
	Outdoor AP	30	17
X	Indoor AP	30	17
	Station (e.g. Client)	24	11
	Outdoor AP (>30° Elv.)	21	-

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

MIMO Device - 5150-5250 MHz Band - FCC

Mode: 11a — Max EIRP (mW): 35.6

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power[1] dBm	Total Power mW	Total Power dBm	FCC Limit dBm	Max Power (W)	Result
5180	0	12		99	9.6	9.1	9.6	30.0		Pass
5200	0	12		99	9.4	8.7	9.4	30.0	0.009	Pass
5240	0	12		99	9.5	8.9	9.5	30.0		Pass

MIMO Device - 5150-5250 MHz Band - Industry Canada

Mode: 11a — Max EIRP (mW): 35.6

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power[1] dBm	Total Power dBm	Total Power dBm (eirp)	IC limit dBm (eirp)	Max Power (W)	Result
5180	0	12	16.8	99	9.6	9.6	15.5	22.3		Pass
5200	0	12	16.8	99	9.4	9.4	15.3	22.3	0.009	Pass
5240	0	12	16.8	99	9.5	9.5	15.4	22.3		Pass

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

5150-5250 PSD - FCC

Mode: 11a

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	FCC Limit dBm/MHz	Result
5180	0	12		99	-1.0	0.8	-1.0	17.0	Pass
5200	0	12		99	-1.4	0.7	-1.5	17.0	Pass
5240	0	12		99	-1.2	0.8	-1.0	17.0	Pass

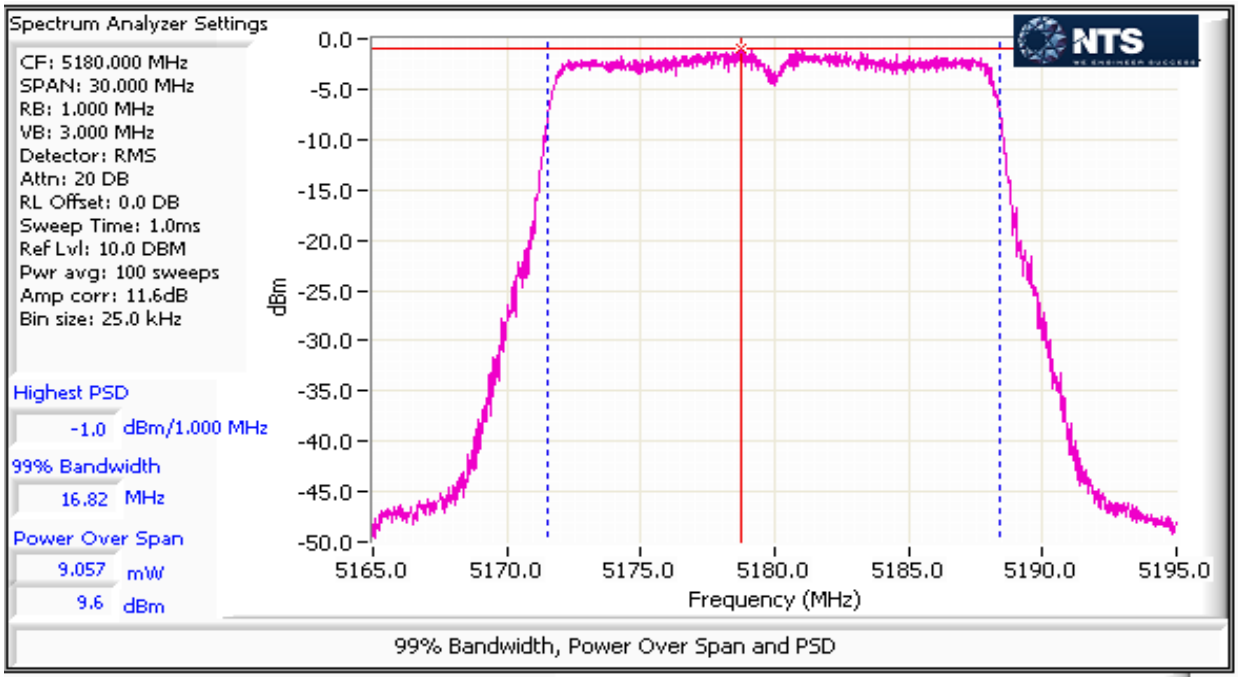
5150-5250 PSD - IC

Mode: 11a

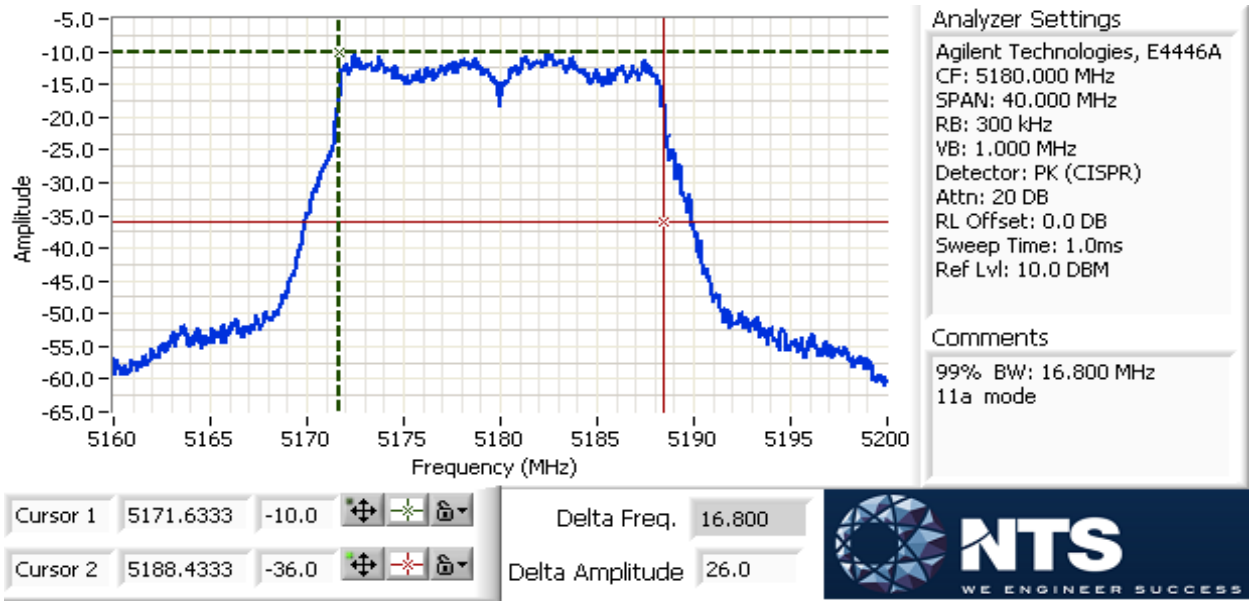
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	IC Limit dBm/MHz	Result
5180	0	12		99	-1.0	0.8	-1.0	4.1	Pass
5200	0	12		99	-1.4	0.7	-1.4	4.1	Pass
5240	0	12		99	-1.2	0.8	-1.2	4.1	Pass

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

Pwr/PSD Plot: 11a



99% BW Plot: 11a



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

MIMO Device - 5150-5250 MHz Band - FCC

Mode: n20 Max EIRP (mW): 36.0

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power[1] dBm	Total Power mW	Total Power dBm	FCC Limit dBm	Max Power (W)	Result
5180	0	7		98	4.6	9.0	9.5	30.0	0.009	Pass
	1				4.7					
	2				5.0					
5200	0	7		98	4.7	9.1	9.6	30.0		Pass
	1				4.9					
	2				4.9					
5240	0	7		98	4.3	9.2	9.6	30.0		Pass
	1				4.8					
	2				5.4					

MIMO Device - 5150-5250 MHz Band - Industry Canada

Mode: n20 Max EIRP (mW): 35.9

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power[1] dBm	Total Power dBm	Total Power dBm (eirp)	IC limit dBm (eirp)	Max Power (W)	Result
5180	0	7	17.8	98	4.6	9.5	15.5	22.5	0.009	Pass
	1				4.7					
	2				5.0					
5200	0	7	17.8	98	4.7	9.6	15.5	22.5		Pass
	1				4.9					
	2				4.9					
5240	0	7	17.8	98	4.3	9.6	15.5	22.5		Pass
	1				4.8					
	2				5.4					

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

5150-5250 PSD - FCC

Mode: n20

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	FCC Limit dBm/MHz	Result
5180	0	7		98	-6.3	0.8	-1.0	12.3	Pass
	1				-5.2				
	2				-5.4				
5200	0	7		98	-6.0	0.8	-1.0	12.3	Pass
	1				-5.5				
	2				-5.7				
5240	0	7		98	-6.5	0.8	-1.0	12.3	Pass
	1				-5.4				
	2				-5.6				

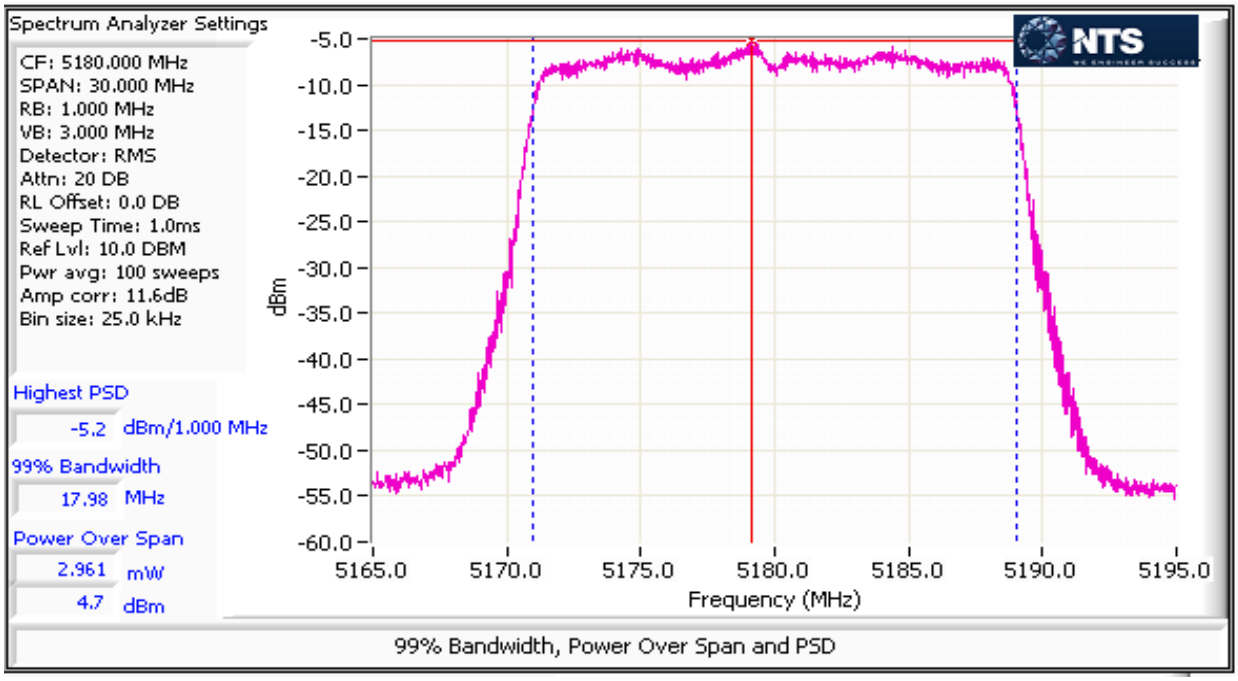
5150-5250 PSD - IC

Mode: n20

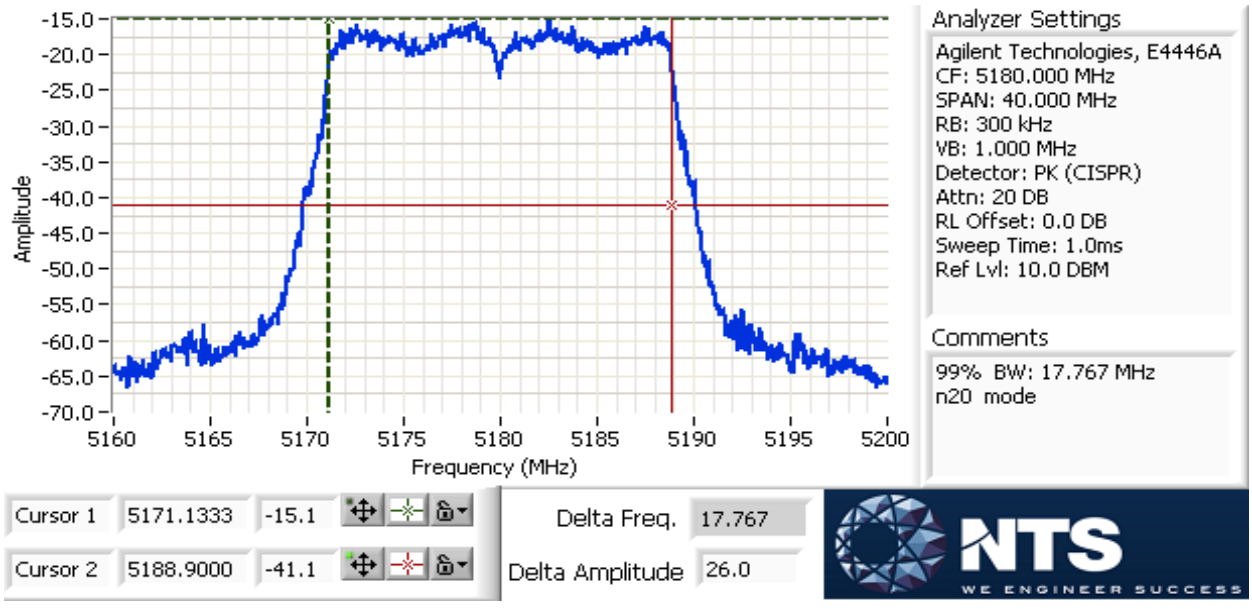
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	IC Limit dBm/MHz	Result
5180	0	7		98	-6.3	0.8	-1.0	-0.7	Pass
	1				-5.2				
	2				-5.4				
5200	0	7		98	-6.0	0.8	-1.0	-0.7	Pass
	1				-5.5				
	2				-5.7				
5240	0	7		98	-6.5	0.8	-1.0	-0.7	Pass
	1				-5.4				
	2				-5.6				

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

Pwr Plot: n20



99% BW Plot: n20



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

MIMO Device - 5150-5250 MHz Band - FCC

Mode: n40 Max EIRP (mW): 59.4

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	FCC Limit dBm	Max Power (W)	Result
5190	0	9		98	6.6	14.6	11.6	30.0	0.015	Pass
	1				7.3					
	2				6.7					
5230	0	9		98	6.9	15.2	11.8	30.0		Pass
	1				7.2					
	2				7.0					

MIMO Device - 5150-5250 MHz Band - Industry Canada

Mode: n40 Max EIRP (mW): 59.2

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power[1] dBm	Total Power dBm	Total Power dBm (eirp)	IC limit dBm (eirp)	Max Power (W)	Result
5190	0	9	36.4	98	6.6	11.6	17.6	23.0	0.015	Pass
	1				7.3					
	2				6.7					
5230	0	9	36.4	98	6.9	11.8	17.7	23.0		Pass
	1				7.2					
	2				7.0					

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

5150-5250 PSD - FCC

Mode: n40

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	FCC Limit dBm/MHz	Result
5190	0	9		98	-6.8	0.7	-1.5	12.3	Pass
	1				-5.8				
	2				-6.8				
5230	0	9		98	-7.1	0.7	-1.5	12.3	Pass
	1				-5.8				
	2				-6.9				

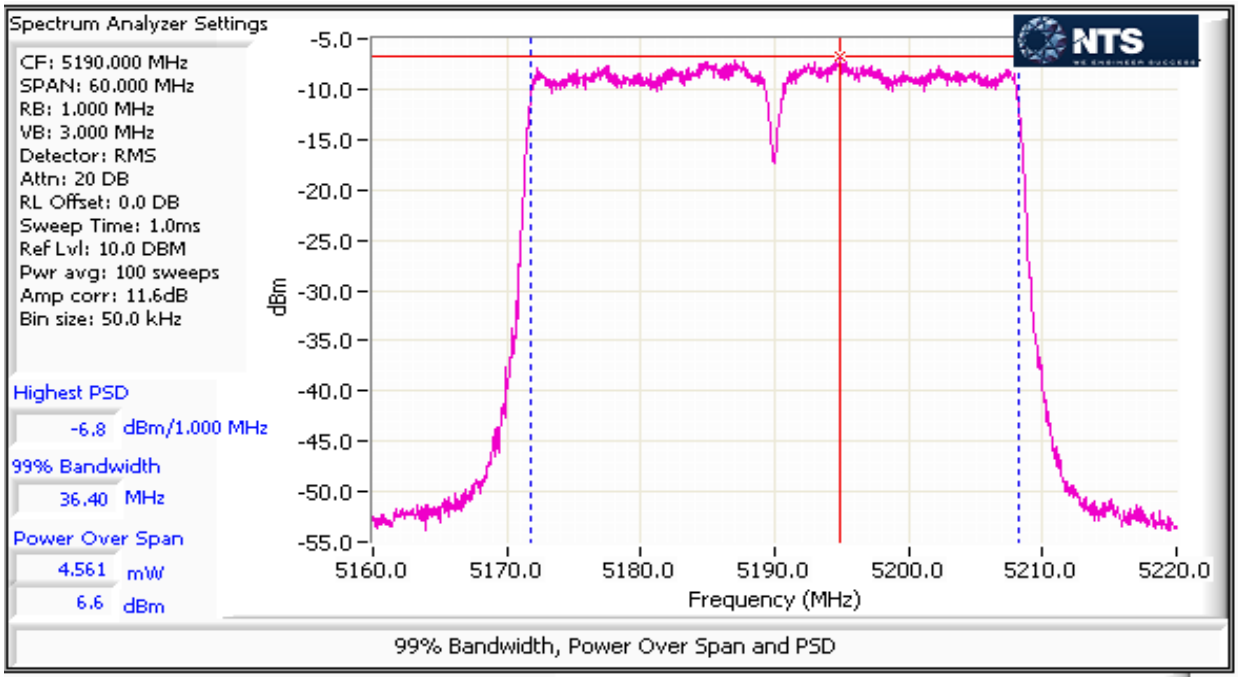
5150-5250 PSD - IC

Mode: n40

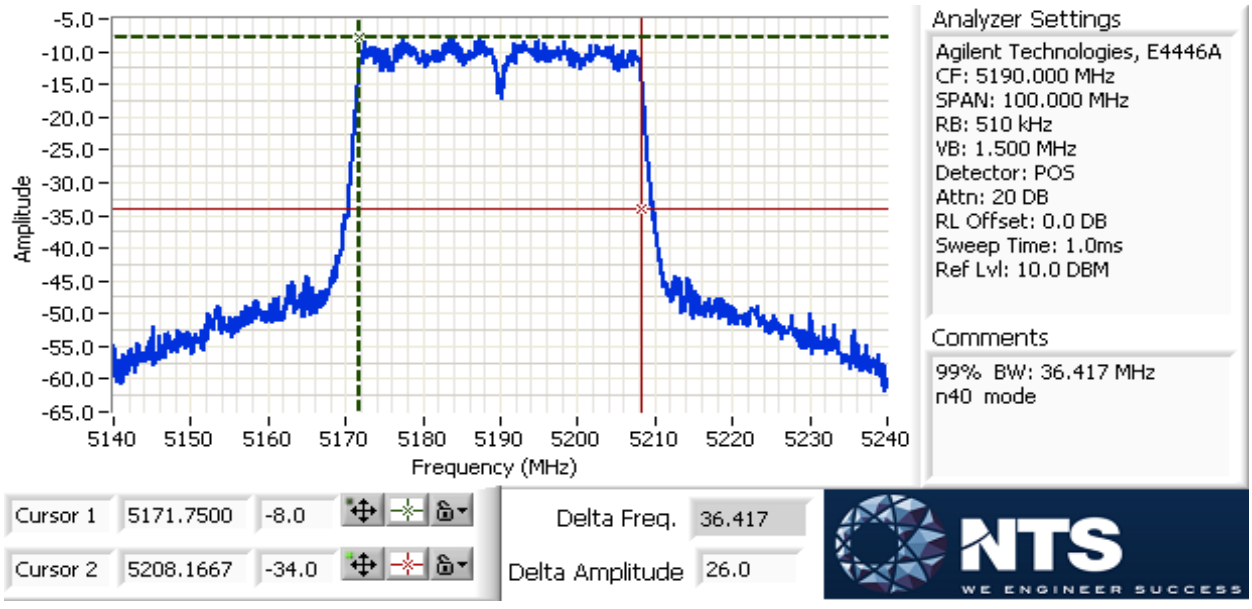
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	IC Limit dBm/MHz	Result
5190	0	9		98	-6.8	0.7	-1.5	-0.7	Pass
	1				-5.8				
	2				-6.8				
5230	0	9		98	-7.1	0.7	-1.5	-0.7	Pass
	1				-5.8				
	2				-6.9				

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

Pwr Plot: n40



99% BW Plot: n40



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

MIMO Device - 5150-5250 MHz Band - FCC

Mode: ac80 Max EIRP (mW): 63.3

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	FCC Limit dBm	Max Power (W)	Result
5210	1	9		96	6.5	16.2	12.1	30.0	0.016	Pass
	3				7.5					
	4									
	2				7.4					

MIMO Device - 5150-5250 MHz Band - Industry Canada

Mode: ac80 Max EIRP (mW): 63.5

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power[1] dBm	Total Power dBm	Total Power dBm (eirp)	IC limit dBm (eirp)	Max Power (W)	Result
5210	0	9	75.8	96	6.5	12.1	18.0	23.0	0.016	Pass
	1				7.5					
	2				7.4					

5150-5250 PSD - FCC

Mode: ac80

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	FCC Limit dBm/MHz	Result
5210	0	9		96	-10.1	0.4	-4.0	12.3	Pass
	1				-8.9				
	2				-9.3				

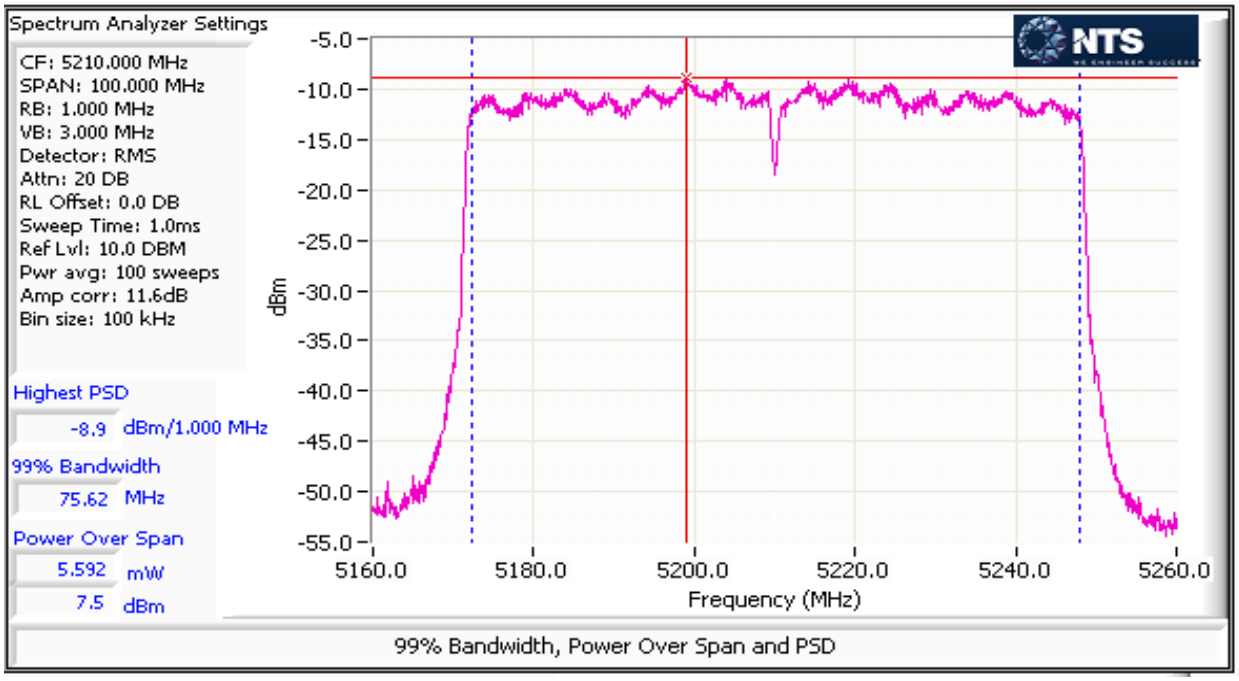
5150-5250 PSD - IC

Mode: ac80

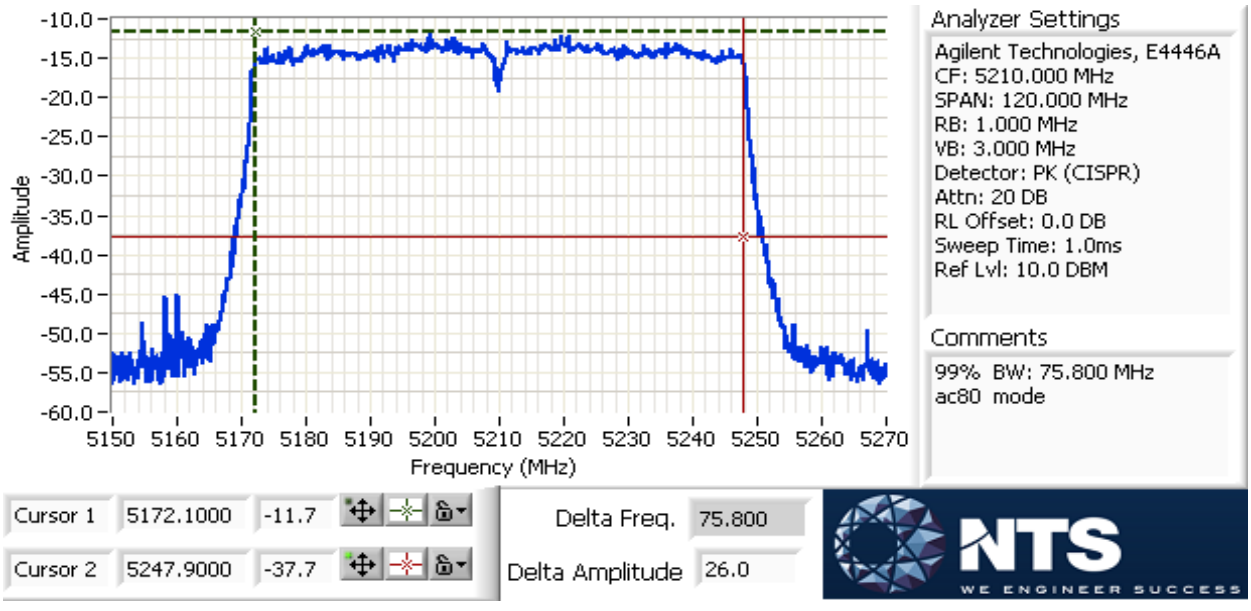
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	IC Limit dBm/MHz	Result
5210	0	9		96	-10.1	0.4	-4.0	-0.7	Pass
	1				-8.9				
	2				-9.3				

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

Pwr Plot: n80



99% BW Plot: n80



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 (LELAN) and FCC 15.407(UNII)
Antenna Port Measurements
Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

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

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Power, 5150 - 5250MHz	15.407(a) (1), (2), (3) RSS-247 6.2		n20: 9.2 mW n40: 15.2 mW ac80: 16.2 mW

General Test Configuration

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators and cables used.

Ambient Conditions:

Temperature:	21.8 °C
Rel. Humidity:	39 %

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 789033 D01

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
ac80	MCS0	0.96	Yes	0.463	0.2	0.3	2160	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						
5150-5250	5.92	5.92	5.92		X	-	X	-	10.7	10.7
5250-5350										
5470-5725										
5725-5825										

For devices that support CDD modes

Min # of spatial streams: 1

Max # of spatial streams: 3

FCC UNII-1 Limits		Pwr	PSD
	Outdoor AP	30	17
X	Indoor AP	30	17
	Station (e.g. Client)	24	11
	Outdoor AP (>30° Elv.)	21	-

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: Bandwidth, Output Power and Power Spectral Density - MIMO Systems

Date of Test: 3/6/2018 0:00 Config. Used: 1

Test Engineer: Jude Semana / Rafael Varelas Config Change: None

Test Location: FT Lab #4A EUT Voltage: 115V/400Hz

Note 1:	For a, n20 and n40 modes Duty Cycle ≥ 98%. Output power measured using a spectrum analyzer (see plots below). RBW=1MHz, VB=3 MHz, Span > OBW, # of points in sweep ≥ 2*span/RBW, auto sweep, RMS detector, power averaging on (transmitted signal was continuous, duty cycle ≥ 98%) and power integration over the OBW (method SA-1 of ANSI C63.10).
Note 1b:	For ac80 mode only Constant Duty Cycle < 98%. Output power measured using a spectrum analyzer (see plots below). RBW=1MHz, VB=3 MHz, Span > OBW, # of points in sweep ≥ 2*span/RBW, RMS detector, trace average 100 traces (at least 100 traces, increase the number to get true average), power averaging on and power integration over the OBW. Tthe measurements were adjusted by adding 0.2 dB. This is based on 10log(1/x), where x is the duty cycle. (method SA-2 of ANSI C63.10)
Note 2:	For MIMO systems the total output power and total PSD are calculated from the sum of the powers of the individual chains (in linear terms). The antenna gain used to determine the EIRP and limits for PSD/Output power depends on the operating mode of the MIMO device. If the signals on the non-coherent between the transmit chains then the gain used to determine the limits is the highest gain of the individual chains and the EIRP is the sum of the products of gain and power on each chain. If the signals are coherent then the effective antenna gain is the sum (in linear terms) of the gains for each chain and the EIRP is the product of the effective gain and total power.
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; GA (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.
Notes:	For systems with Beamforming and CDD, choose one the following options: Option 1: Delays are optimized for beamforming, rather than being selected from cyclic delay table of 802.11; Array gains calculated based on beamforming criteria. Option 2: Antennas are paired for beamforming, and the pairs are configured to use the cyclic delay diversity of 802.11; the array gain associated with beamforming with 2 antennas (3dB), and the array gain associated with CDD with two antennas (3dB for PSD and 0 dB for power)

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

MIMO Device - 5150-5250 MHz Band - FCC

Mode: n20 Max EIRP (mW): 107.9

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power[1] dBm	Total Power mW	Total Power dBm	FCC Limit dBm	Max Power (W)	Result
5180	1	7		98	4.6	9.0	9.5	25.3	0.009	Pass
	3				4.7					
	4									
	2				5.0					
5200	1	7		98	4.7	9.1	9.6	25.3		Pass
	3				4.9					
	4									
	2				4.9					
5240	1	7		98	4.3	9.2	9.6	25.3		Pass
	3				4.8					
	4									
	2				5.4					

MIMO Device - 5150-5250 MHz Band - Industry Canada

Mode: n20 Max EIRP (mW): 107.6

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power[1] dBm	Total Power dBm	Total Power dBm (eirp)	IC limit dBm (eirp)	Max Power (W)	Result
5180	1	7	17.8	98	4.6	9.5	20.2	22.5	0.009	Pass
	3				4.7					
	4									
	2				5.0					
5200	1	7	17.8	98	4.7	9.6	20.3	22.5		Pass
	3				4.9					
	4									
	2				4.9					
5240	1	7	17.8	98	4.3	9.6	20.3	22.5		Pass
	3				4.8					
	4									
	2				5.4					

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

MIMO Device - 5150-5250 MHz Band - FCC

Mode: n40 Max EIRP (mW): 178.2

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	FCC Limit dBm	Max Power (W)	Result
5190	1	9		98	6.6	14.6	11.6	25.3	0.015	Pass
	3				7.3					
	4									
	2				6.7					
5230	1	9		98	6.9	15.2	11.8	25.3		Pass
	3				7.2					
	4									
	2				7.0					

MIMO Device - 5150-5250 MHz Band - Industry Canada

Mode: n40 Max EIRP (mW): 177.7

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power[1] dBm	Total Power dBm	Total Power dBm (eirp)	IC limit dBm (eirp)	Max Power (W)	Result
5190	1	9	36.4	98	6.6	11.6	22.3	23.0	0.015	Pass
	3				7.3					
	4									
	2				6.7					
5230	1	9	36.4	98	6.9	11.8	22.5	23.0		Pass
	3				7.2					
	4									
	2				7.0					

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

MIMO Device - 5150-5250 MHz Band - FCC

Mode: ac80 Max EIRP (mW): 189.9

Frequency (MHz)	Chain	Software Setting	26dB BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	FCC Limit dBm	Max Power (W)	Result
5210	1	9		96	6.5	16.2	12.1	25.3	0.016	Pass
	3				7.5					
	4									
	2				7.4					

MIMO Device - 5150-5250 MHz Band - Industry Canada

Mode: ac80 Max EIRP (mW): 190.2

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power[1] dBm	Total Power dBm	Total Power dBm (eirp)	IC limit dBm (eirp)	Max Power (W)	Result
5210	1	9	75.8	96	6.5	12.1	22.8	23.0	0.016	Pass
	3				7.5					
	4									
	2				7.4					

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 (LELAN) and FCC 15.407(UNII)
Antenna Port Measurements
Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

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

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Power, 5725 - 5850MHz	15.407(a) (1), (2), (3) RSS-247 6.2	Pass	a: 74.1 mW n20: 233.2 mW n40: 240.5 mW ac80: 225.1 mW
1	PSD, 5725 - 5850MHz	15.407(a) (1), (2), (3) RSS-247 6.2	Pass	a: 7.5 mW/MHz n20: 7.9 mW/MHz n40: 5.3 mW/MHz ac80: 1.6 mW/MHz
1	99% Bandwidth	RSS-GEN (Information only)	N/A	a: 16.8 MHz n20: 18.1 MHz n40: 36.739 MHz ac80: 76.073 MHz
2	Antenna Conducted - Out of Band Spurious	15.407(b) -27dBm/MHz	N/A	N/A - all spurious emissions evaluated using radiated methods

General Test Configuration

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators and cables used.

Ambient Conditions:

Temperature: 20.9 °C
Rel. Humidity: 37 %

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 789033 D01

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)	
11a	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
ac80	MCS0	0.96	Yes	0.463	0.2	0.3	2160	20

Sample Notes

Sample S/N: LT17000S

Driver: -

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: Bandwidth, Output Power and Power Spectral Density - MIMO Systems

Date of Test: 3/7/2018 0:00 Config. Used: 1

Test Engineer: Jude Semana / Rafael Varelas Config Change: None

Test Location: FT Lab #4B EUT Voltage: 115V/400Hz

Note 1a:	For a, n20 and n40 modes Duty Cycle ≥ 98%. Output power measured using a spectrum analyzer (see plots below). RBW=1MHz, VB=3 MHz, Span > OBW, # of points in sweep ≥ 2*span/RBW, auto sweep, RMS detector, power averaging on (transmitted signal was continuous, duty cycle ≥ 98%) and power integration over the OBW (method SA-1 of ANSI C63.10).
Note 1b:	For ac80 mode only Constant Duty Cycle < 98%. Output power measured using a spectrum analyzer (see plots below). RBW=1MHz, VB=3 MHz, Span > OBW, # of points in sweep ≥ 2*span/RBW, RMS detector, trace average 100 traces (at least 100 traces, increase the number to get true average), power averaging on and power integration over the OBW. Tthe measurements were adjusted by adding 0.2 dB. This is based on 10log(1/x), where x is the duty cycle. (method SA-2 of ANSI C63.10)
Note 2:	PSD measured using the same analyzer settings used for output power.
Note 3:	99% Bandwidth measured in accordance with C63.10 - RB between 1-5 % of OBW and VB ≥ 3*RB, Span between 1.5 and 5 times OBW.
Note 4:	For MIMO systems the total output power and total PSD are calculated from the sum of the powers of the individual chains (in linear terms). The antenna gain used to determine the EIRP and limits for PSD/Output power depends on the operating mode of the MIMO device. If the signals on the non-coherent between the transmit chains then the gain used to determine the limits is the highest gain of the individual chains and the EIRP is the sum of the products of gain and power on each chain. If the signals are coherent then the effective antenna gain is the sum (in linear terms) of the gains for each chain and the EIRP is the product of the effective gain and total power.

Antenna Gain Information

Freq	Antenna Gain (dBi) / Chain				BF	MultiChain Legacy	CDD	Sectorized / Xpol	Dir G (PWR)	Dir G (PSD)
	1	2	3	4						
5150-5250										
5250-5350										
5470-5725										
5725-5825	5.92	5.92	5.92		-	-	X	-	5.9	10.7

For devices that support CDD modes

Min # of spatial streams: 1

Max # of spatial streams: 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

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; GA (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.
Notes:	For systems with Beamforming and CDD, choose one the following options: Option 1: Delays are optimized for beamforming, rather than being selected from cyclic delay table of 802.11; Array gains calculated based on beamforming criteria. Option 2: Antennas are paired for beamforming, and the pairs are configured to use the cyclic delay diversity of 802.11; the array gain associated with beamforming with 2 antennas (3dB), and the array gain associated with CDD with two antennas (3dB for PSD and 0 dB for power)

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

MIMO Device - 5725-5850 MHz Band - FCC/IC

Mode: 11a Max EIRP (mW): 289.6

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	Limit dBm	Max Power (W)	Result
5745	0	20	16.8	99	18.6	72.4	18.6	30.0	0.074	Pass
5785	0	20	16.8	99	18.7	74.1	18.7	30.0		Pass
5825	0	20	16.8	99	18.3	67.6	18.3	30.0		Pass

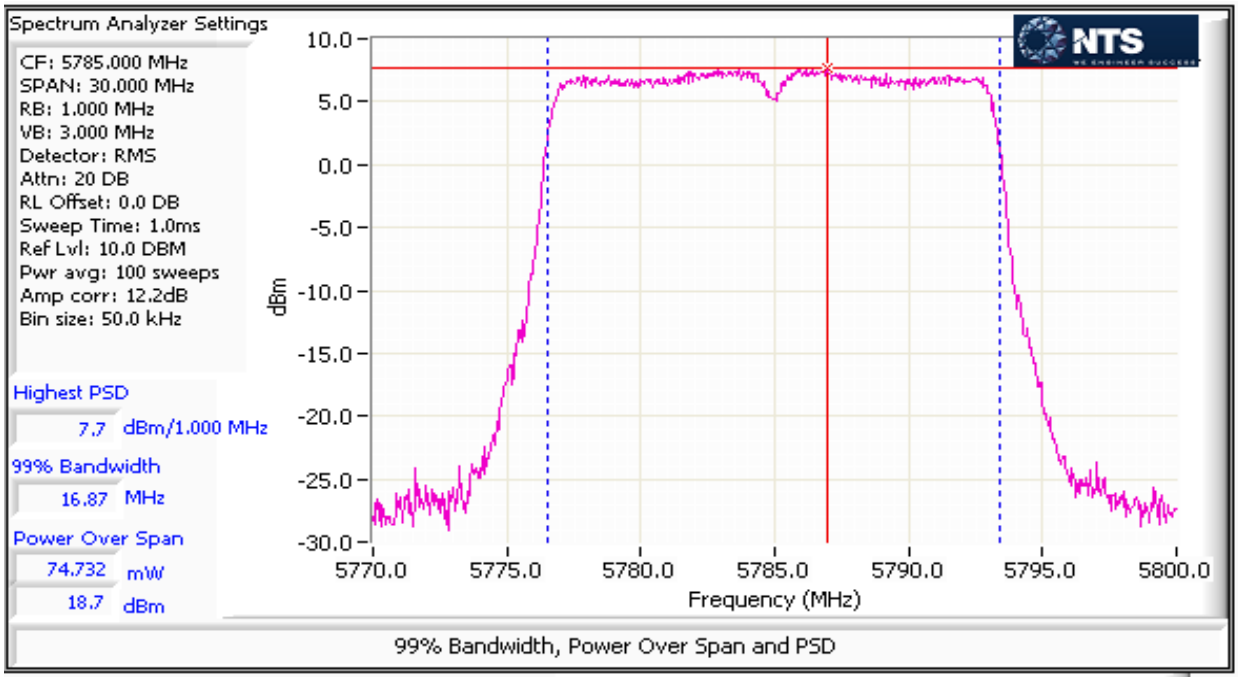
5725-5850 PSD - FCC/IC

Mode: 11a

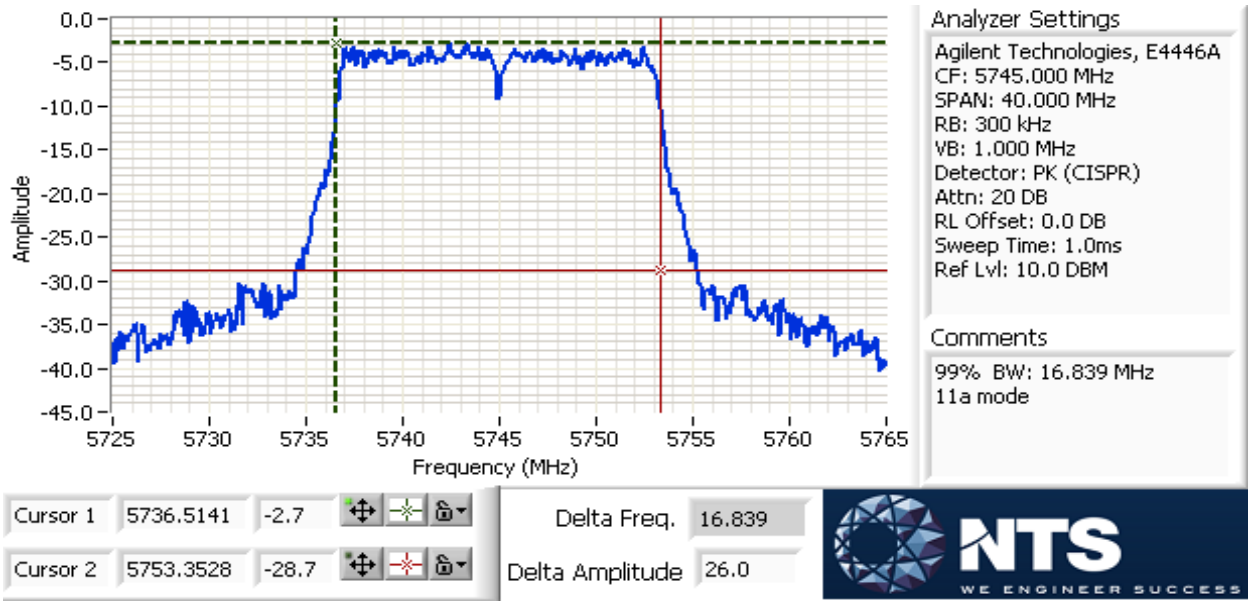
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	FCC Limit dBm/500kHz	IC Limit dBm/500kHz	Result
5745	0	20		99	7.5	5.6	7.5	25.3	25.3	Pass
5785	0	20		99	7.7	5.9	7.7	25.3	25.3	Pass
5825	0	20		99	7.3	5.4	7.3	25.3	25.3	Pass

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

Pwr Plot: 11a



99% BW Plot: 11a



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

MIMO Device - 5725-5850 MHz Band - FCC/IC

Mode: n20 Max EIRP (mW): 911.4

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	FCC Limit dBm	Max Power (W)	Result
5745	0	20	18.1	99	18.6	229.6	23.6	30.0	0.233	Pass
	1				19.1					
	2				18.8					
5785	0	20	18.1	99	18.6	233.2	23.7	30.0		Pass
	1				19.1					
	2				19.0					
5825	0	20	18.1	99	18.4	212.4	23.3	30.0		Pass
	1				18.6					
	2				18.5					

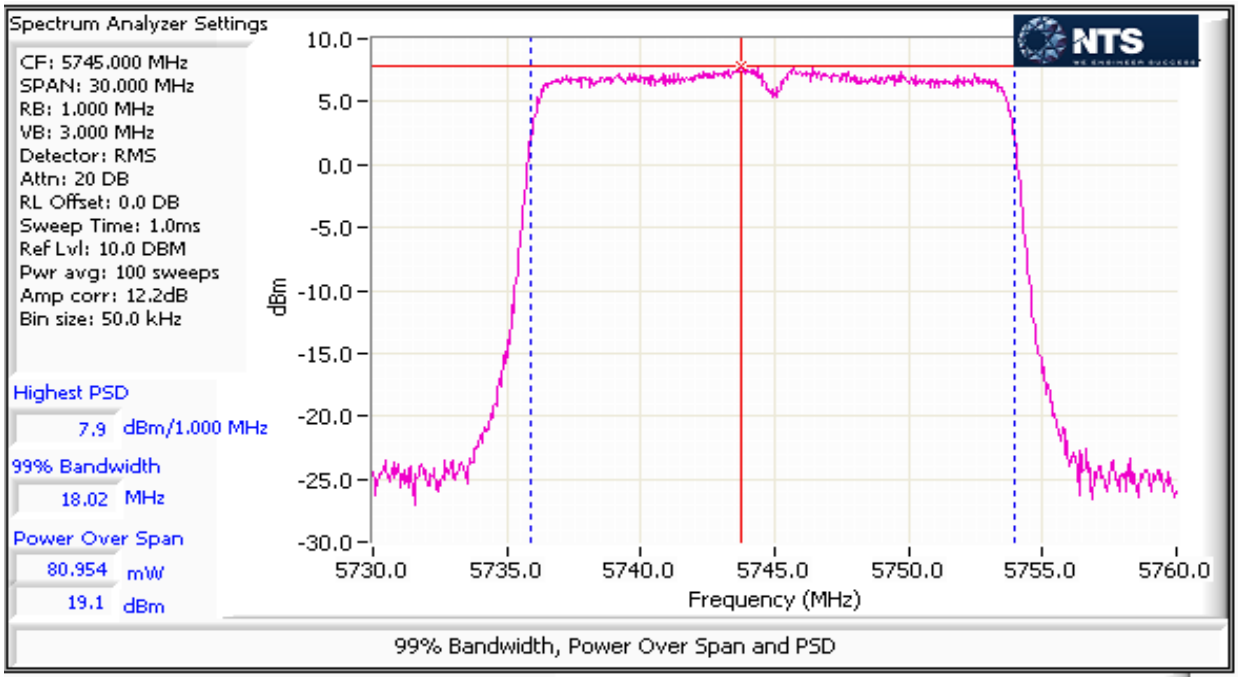
5250-5350 PSD - FCC/IC

Mode: n20

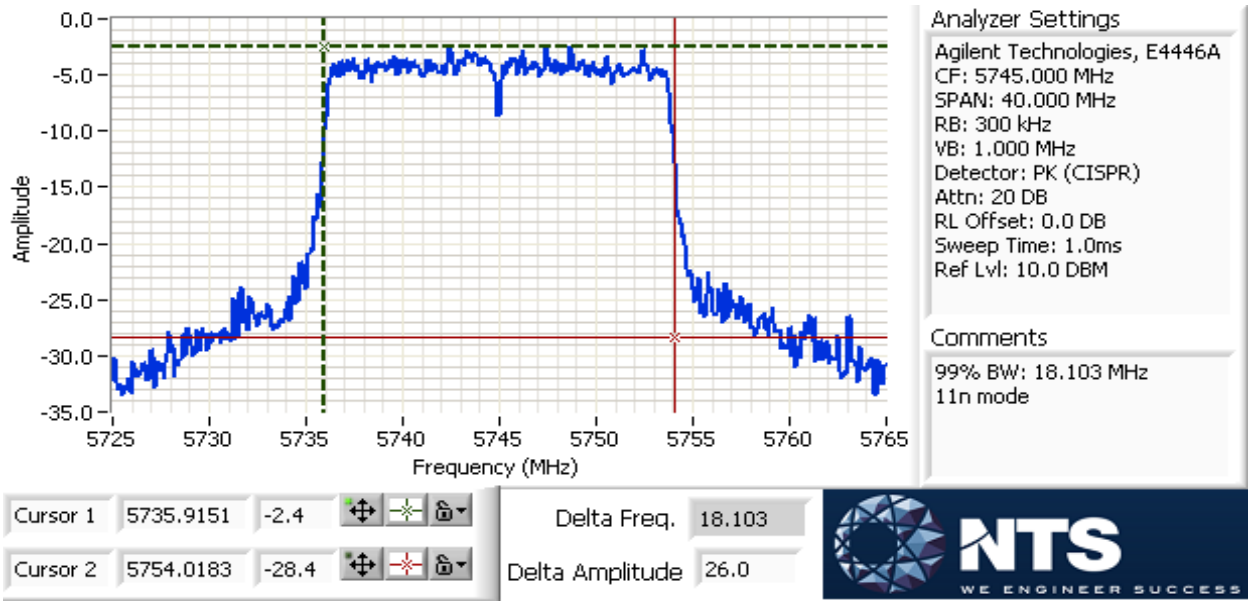
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result
5745	0	20		99	7.5	17.7	12.5	25.3	25.3	Pass
	1				7.9					
	2				7.7					
5785	0	20		99	7.2	17.3	12.4	25.3	25.3	Pass
	1				7.8					
	2				7.8					
5825	0	20		99	7.1	15.9	12.0	25.3	25.3	Pass
	1				7.5					
	2				7.1					

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

Pwr Plot: n20



99% BW Plot: n20



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

MIMO Device - 5725-5850 MHz Band - FCC/IC

Mode: n40 Max EIRP (mW): 940.0

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	FCC Limit dBm	Max Power (W)	Result
5755	0	20	36.739	98	18.7	236.7	23.7	30.0	0.241	Pass
	1				19.1					
	2				19.1					
5795	0	20	36.739	98	18.7	240.5	23.8	30.0		Pass
	1				19.2					
	2				19.2					

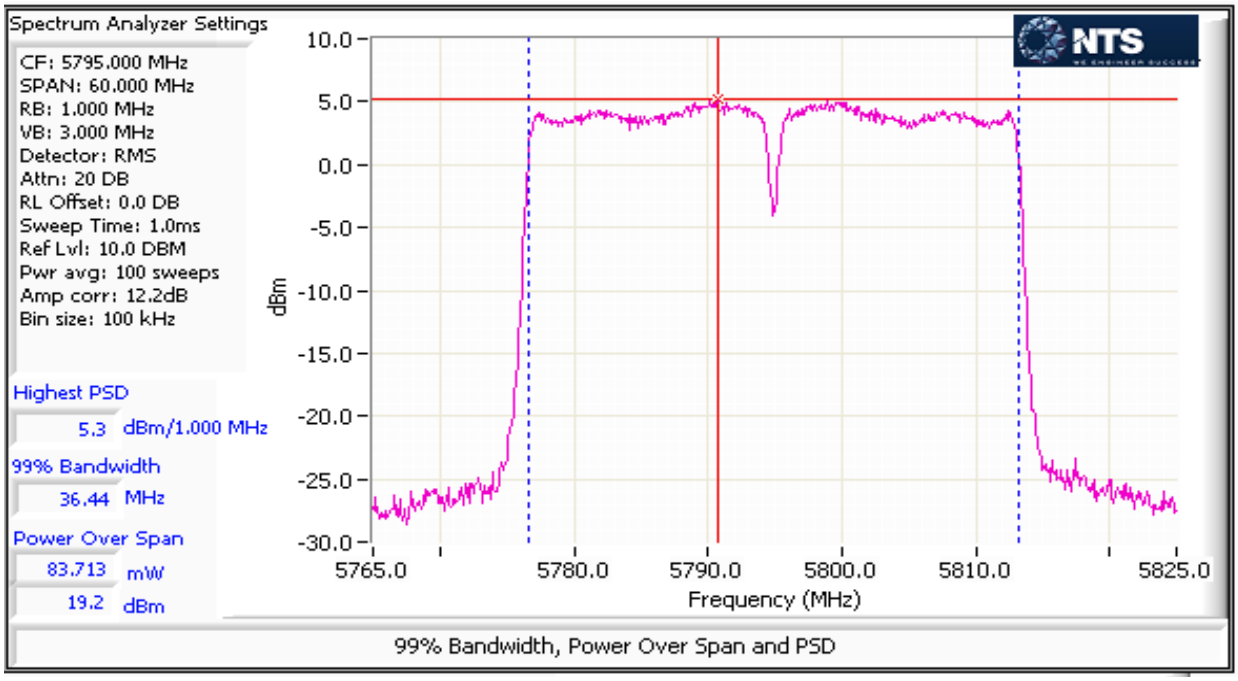
MIMO Device 5250-5350 PSD - FCC/IC

Mode: n40

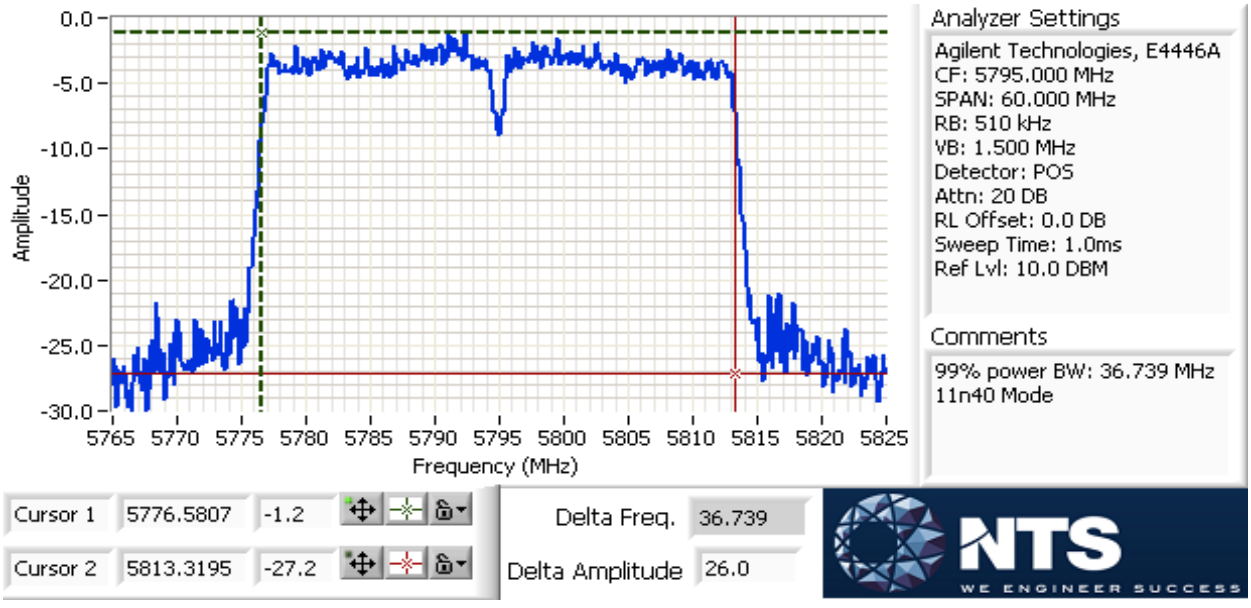
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result
5755	0	20		98	4.5	9.0	9.5	25.3	25.3	Pass
	1				4.9					
	2				4.9					
5795	0	20		98	4.5	9.2	9.6	25.3	25.3	Pass
	1				5.3					
	2				4.8					

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

Pwr Plot: n40



99% BW Plot: n40



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

MIMO Device - 5725-5850 MHz Band - FCC/IC

Mode: ac80 Max EIRP (mW): 879.8

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	FCC Limit dBm	Max Power (W)	Result
5775	0	20	76.073	96	18.2	225.1	23.5	30.0	0.225	Pass
	1				18.7					
	2				18.8					

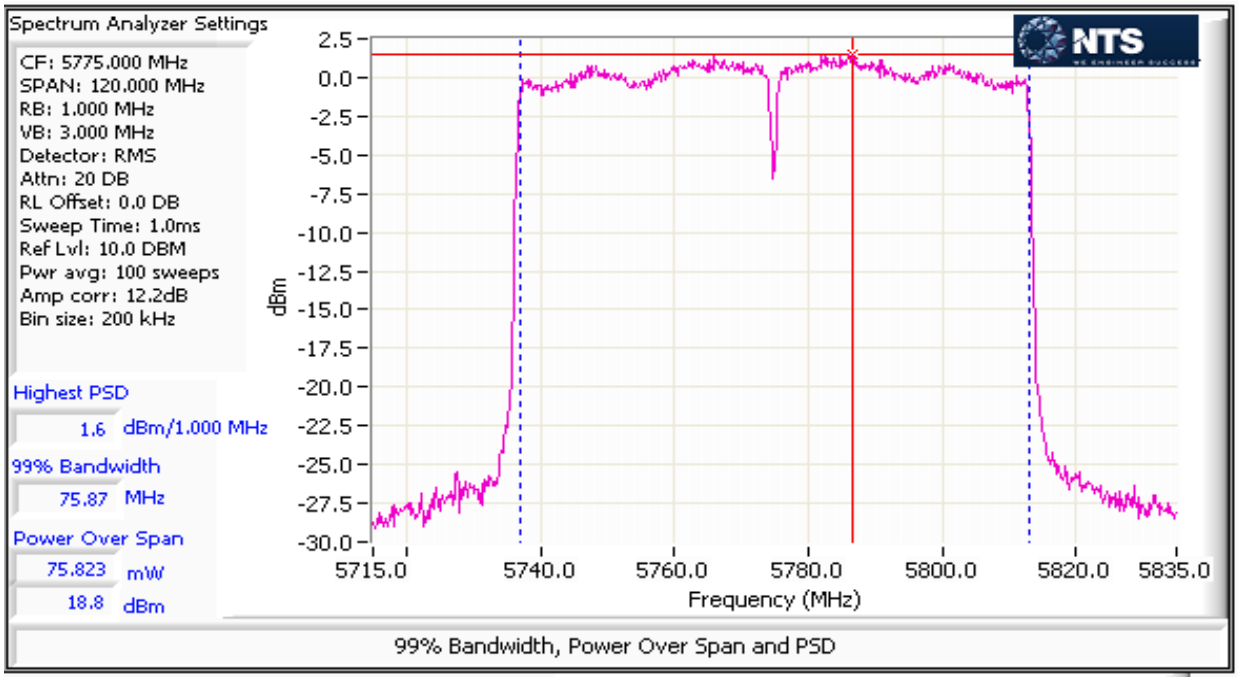
MIMO Device 5250-5350 PSD - FCC/IC

Mode: ac80

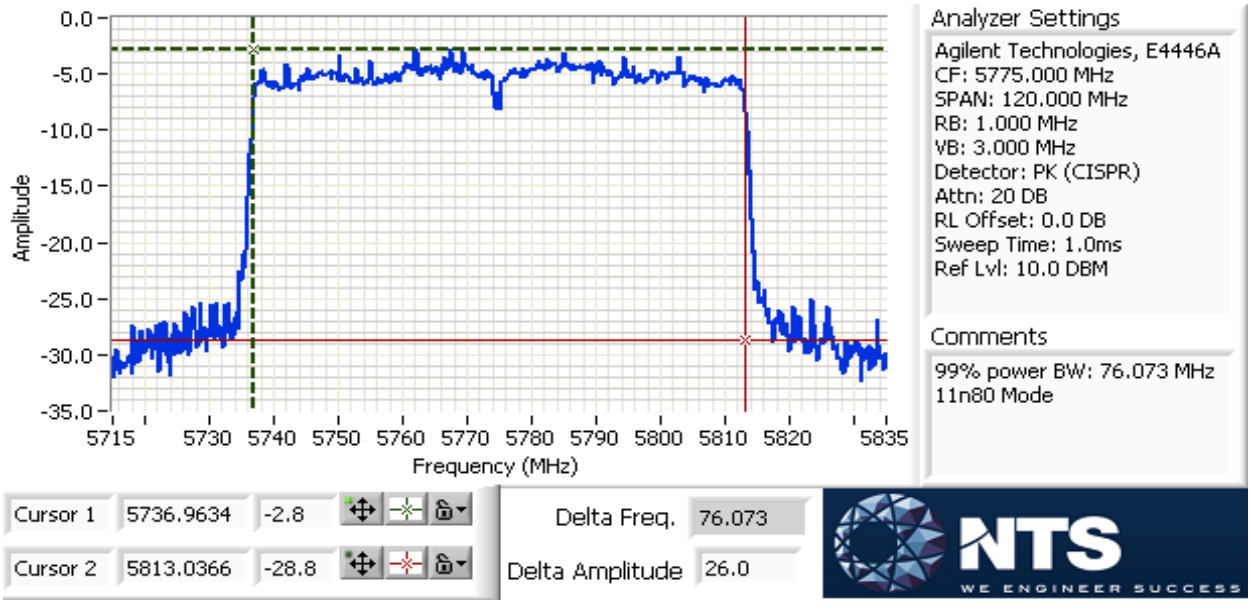
Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	PSD dBm/MHz	Total PSD[1] mW/MHz	Total PSD[1] dBm/MHz	FCC Limit dBm/MHz	IC Limit dBm/MHz	Result
5775	0	20		96	0.8	4.2	6.2	25.3	25.3	Pass
	1				1.4					
	2				1.6					

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

Pwr Plot: n80



99% BW Plot: n80



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 (LELAN) and FCC 15.407(UNII)
Antenna Port Measurements
Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

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

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Power, 5725 - 5850MHz	15.407(a) (1), (2), (3) RSS-247 6.2	Pass	n20: 233.2 mW n40: 240.5 mW ac80: 225.1 mW

General Test Configuration

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators and cables used.

Ambient Conditions:

Temperature:	20.9 °C
Rel. Humidity:	37 %

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 789033 D01

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
ac80	MCS0	0.96	Yes	0.463	0.2	0.3	2160	20

Sample Notes

Sample S/N: LT17000S

Driver: -

Run #1: Bandwidth, Output Power and Power Spectral Density - MIMO Systems

Date of Test: 3/7/2018 0:00 Config. Used: 1

Test Engineer: Jude Semana / Rafael Varelas Config Change: None

Test Location: FT Lab #4B EUT Voltage: 115V/400Hz

Note 1a:	For a, n20 and n40 modes Duty Cycle ≥ 98%. Output power measured using a spectrum analyzer (see plots below). RBW=1MHz, VB=3 MHz, Span > OBW, # of points in sweep ≥ 2*span/RBW, auto sweep, RMS detector, power averaging on (transmitted signal was continuous, duty cycle ≥ 98%) and power integration over the OBW (method SA-1 of ANSI C63.10).
Note 1b:	For ac80 mode only Constant Duty Cycle < 98%. Output power measured using a spectrum analyzer (see plots below). RBW=1MHz, VB=3 MHz, Span > OBW, # of points in sweep ≥ 2*span/RBW, RMS detector, trace average 100 traces (at least 100 traces, increase the number to get true average), power averaging on and power integration over the OBW. Tthe measurements were adjusted by adding 0.2 dB. This is based on 10log(1/x), where x is the duty cycle. (method SA-2 of ANSI C63.10)
Note 2:	For MIMO systems the total output power and total PSD are calculated from the sum of the powers of the individual chains (in linear terms). The antenna gain used to determine the EIRP and limits for PSD/Output power depends on the operating mode of the MIMO device. If the signals on the non-coherent between the transmit chains then the gain used to determine the limits is the highest gain of the individual chains and the EIRP is the sum of the products of gain and power on each chain. If the signals are coherent then the effective antenna gain is the sum (in linear terms) of the gains for each chain and the EIRP is the product of the effective gain and total power.

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

Antenna Gain Information

Freq	Antenna Gain (dBi) / Chain				BF	MultiChain Legacy	CDD	Sectorized / Xpol	Dir G (PWR)	Dir G (PSD)
	1	2	3	4						
5150-5250										
5250-5350										
5470-5725										
5725-5825	5.92	5.92	5.92		X	-	X	-	10.7	10.7

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; GA (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.
Notes:	For systems with Beamforming and CDD, choose one the following options: Option 1: Delays are optimized for beamforming, rather than being selected from cyclic delay table of 802.11; Array gains calculated based on beamforming criteria. Option 2: Antennas are paired for beamforming, and the pairs are configured to use the cyclic delay diversity of 802.11; the array gain associated with beamforming with 2 antennas (3dB), and the array gain associated with CDD with two antennas (3dB for PSD and 0 dB for power)

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

MIMO Device - 5725-5850 MHz Band - FCC/IC

Mode: n20 Max EIRP (mW): 2734.3

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	FCC Limit dBm	Max Power (W)	Result
5745	1	20	18.1	99	18.6	229.6	23.6	25.3	0.233	Pass
	3				19.1					
	4									
	2				18.8					
5785	1	20	18.1	99	18.6	233.2	23.7	25.3		Pass
	3				19.1					
	4									
	2				19.0					
5825	1	20	18.1	99	18.4	212.4	23.3	25.3		Pass
	3				18.6					
	4									
	2				18.5					

MIMO Device - 5725-5850 MHz Band - FCC/IC

Mode: n40 Max EIRP (mW): 2819.9

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	FCC Limit dBm	Max Power (W)	Result
5755	1	20	36.739	98	18.7	236.7	23.7	25.3	0.241	Pass
	3				19.1					
	4									
	2				19.1					
5795	1	20	36.739	98	18.7	240.5	23.8	25.3		Pass
	3				19.2					
	4									
	2				19.2					

MIMO Device - 5725-5850 MHz Band - FCC/IC

Mode: ac80 Max EIRP (mW): 2639.3

Frequency (MHz)	Chain	Software Setting	99% BW (MHz)	Duty Cycle %	Power dBm	Total Power[1] mW	Total Power[1] dBm	FCC Limit dBm	Max Power (W)	Result
5775	1	20	76.073	96	18.2	225.1	23.5	25.3	0.225	Pass
	3				18.7					
	4									
	2				18.8					

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 15.407 (UNII) Radiated Spurious Emissions

Test Specific Details

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

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

Ambient Conditions:

Temperature: 22.3 °C
Rel. Humidity: 41 %

Summary of Results

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
20MHz Bandwith Modes							
1	a	36 - 5180MHz	20	20	Restricted Band Edge at 5150 MHz	15.209	49.0 dBµV/m @ 5149.1 MHz (-5.0 dB)
4		149 - 5745MHz		20	Band Edge 5725 MHz	15.E	58.5 dBµV/m @ 5625.1 MHz (-9.8 dB)
		165 - 5825MHz		20	Band Edge 5850MHz		58.8 dBµV/m @ 5942.4 MHz (-9.5 dB)
5	n20	36 - 5180MHz		20	Restricted Band Edge at 5150 MHz	15.209	50.8 dBµV/m @ 5149.8 MHz (-3.2 dB)
8		149 - 5745MHz		20	Band Edge 5725 MHz	15.E	65.7 dBµV/m @ 5943.2 MHz (-2.6 dB)
		165 - 5825MHz		20	Band Edge 5850MHz		59.4 dBµV/m @ 5943.6 MHz (-8.9 dB)
40MHz Bandwith Modes							
9	n40	38 - 5190MHz	20	13	Restricted Band Edge at 5150 MHz	15.209	53.8 dBµV/m @ 5149.7 MHz (-0.2 dB)
12		151 - 5755MHz		20	Band Edge 5725 MHz	15.E	60.1 dBµV/m @ 5631.7 MHz (-8.2 dB)
		159 - 5795MHz		20	Band Edge 5850MHz		59.9 dBµV/m @ 5944.3 MHz (-8.4 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

80MHz Bandwith Modes

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
13	ac80	42 - 5210MHz	20	12	Restricted Band Edge at 5150 MHz	15.209	52.0 dBµV/m @ 5148.4 MHz (-2.0 dB)
16		155 - 5775MHz		20	Band Edge 5725 MHz	15.E	64.5 dBµV/m @ 5639.7 MHz (-3.8 dB)
		155 - 5775MHz		20	Band Edge 5850MHz		66.0 dBµV/m @ 5929.8 MHz (-2.3 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.

Procedure Comments:

Measurements performed in accordance with FCC KDB 789033
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 50 traces. (method VB of KDB 789033)

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11a	6MB/s	97.0	NO	1	0	0	1000
11n20	MCS	96.2	NO	1	0	0	1000
11n40	MCS	96.8	NO	1	0	0	1000
ac80	MCS	89.4	NO	1	0	0	1000

Measurement Specific Notes:

Note 1:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB≥3MHz, peak detector). Per KDB 789033 2) c) (i), compliance can be demonstrated by meeting the average and peak limits of 15.209, as an alternative.
Note 3:	Emission has non constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW>1/T but not less than 10Hz, peak detector, linear averaging, auto sweep,max hold 50*1/DC traces (method VB of KDB 789033)
Note 4:	Emission has a duty cycle < 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100*1/DC traces, measurement corrected by Pwr correction factor (method AD of KDB 789033)

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

The EUT was evaluated for worst case orientation: Worst case orientation EUT Upright

Sample Notes

Sample S/N: LT17000S
Driver: -
Antenna: Integral 5.92 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

Run #1: Radiated Bandedge Measurements, 5150-5250MHz

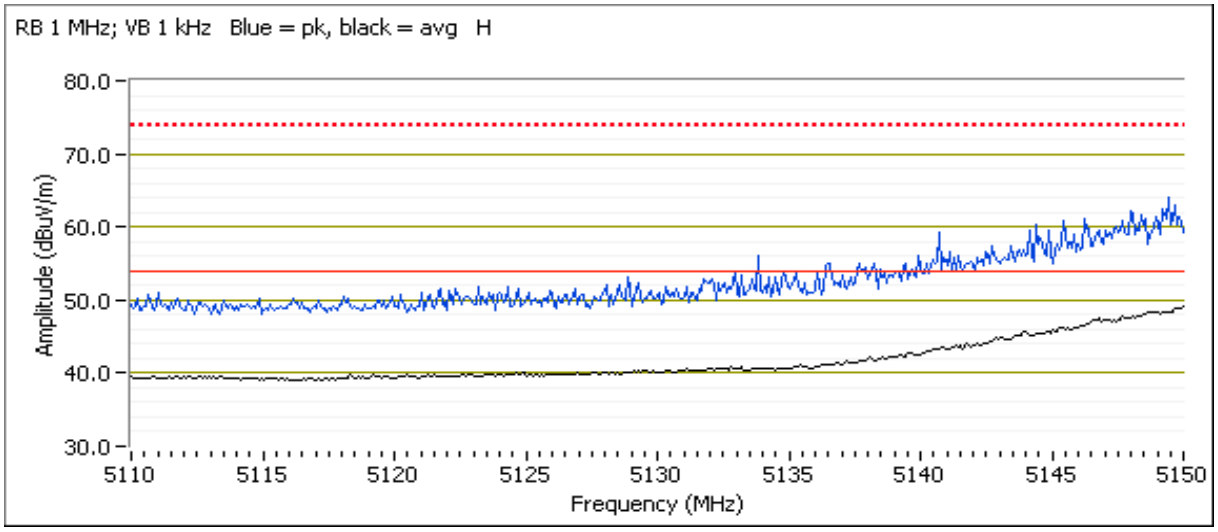
Date of Test: 3/29/2017 0:00
Test Engineer: Rafael Varelas
Test Location: Chamber 7

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

Channel: 36 - 5180 MHz
Tx Chain: 1
Mode: a
Data Rate: 6MB/s

5150 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5149.080	49.0	H	54.0	-5.0	Avg	128	1.3	VB: 1 kHz, Note 3
5149.440	64.9	H	74.0	-9.1	PK	128	1.3	
5150.000	43.9	V	54.0	-10.1	Avg	181	1.0	VB: 1 kHz, Note 3
5148.160	63.1	V	74.0	-10.9	PK	181	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, 5725-5850MHz

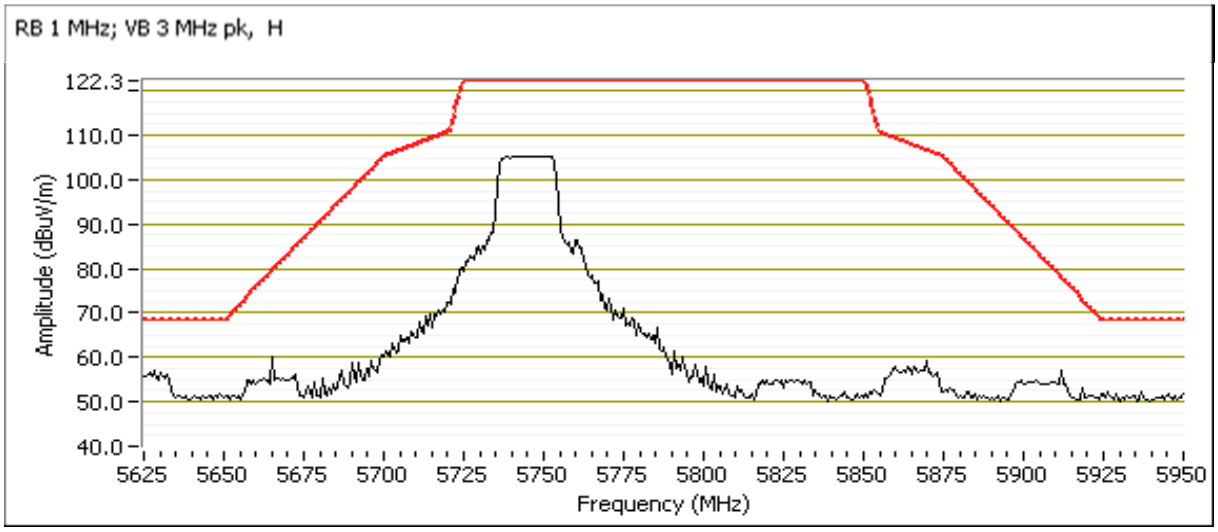
Date of Test: 3/29/2017 0:00
Test Engineer: Rafael Varelas
Test Location: Chamber 7

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

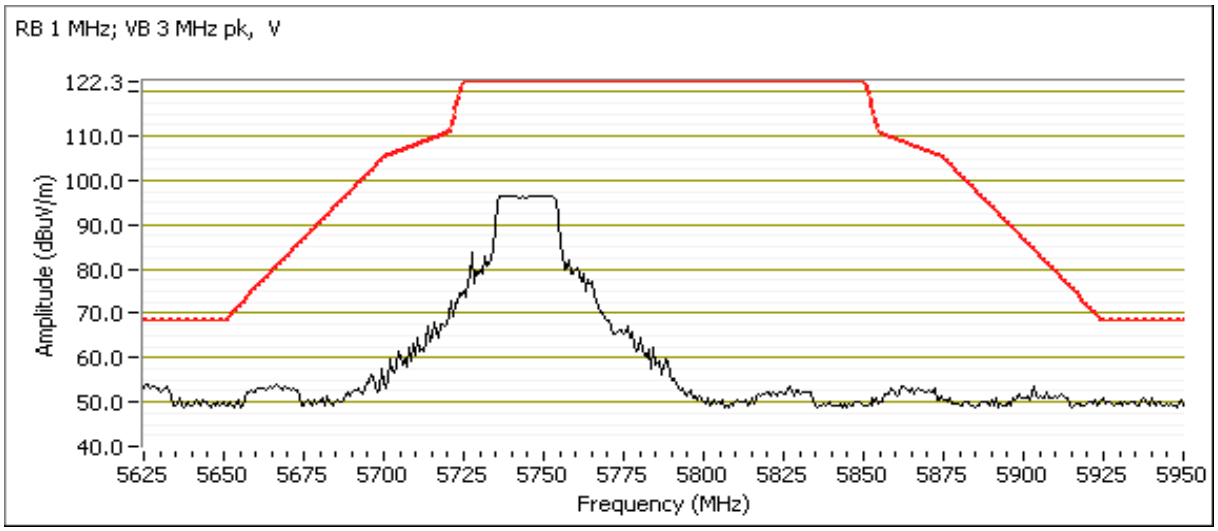
Channel: 149 - 5745MHz
Tx Chain: 1
Mode: a
Data Rate: 6MB/s

5725 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5625.100	58.5	H	68.3	-9.8	PK	258	1.9	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

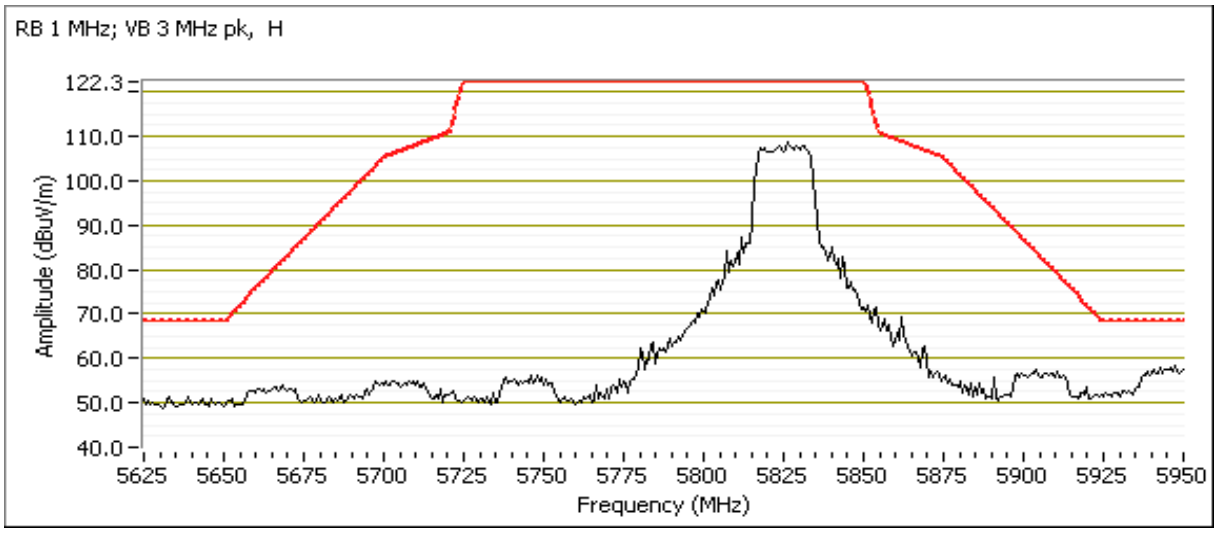


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 165 - 5825MHz
Tx Chain: 1
Mode: a
Data Rate: 6MB/s

5850 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5942.380	58.8	H	68.3	-9.5	PK	132	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

Run #5: Radiated Bandedge Measurements, 5150-5250MHz

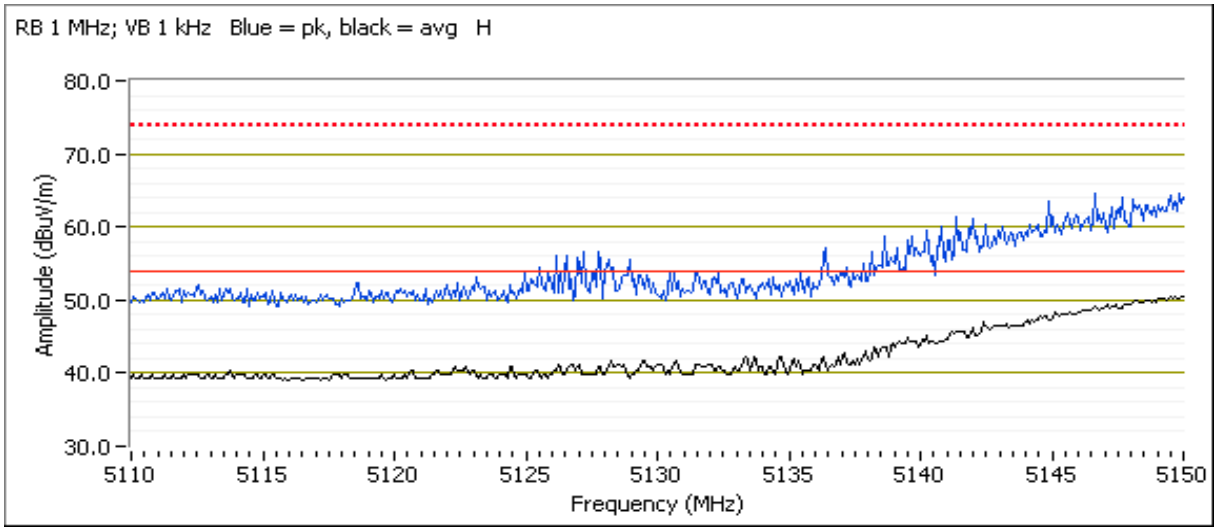
Date of Test: 3/29/2017 0:00
Test Engineer: Rafael Varelas
Test Location: Chamber 7

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

Channel: 36 - 5180 MHz
Tx Chain: 1, 2 and 3
Mode: n20
Data Rate: MCS

5150 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5149.760	50.8	H	54.0	-3.2	Avg	233	1.9	VB: 1 kHz, Note 3
5145.510	63.4	H	74.0	-10.6	PK	233	1.9	



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 #8: Radiated Bandedge Measurements, 5725-5850MHz

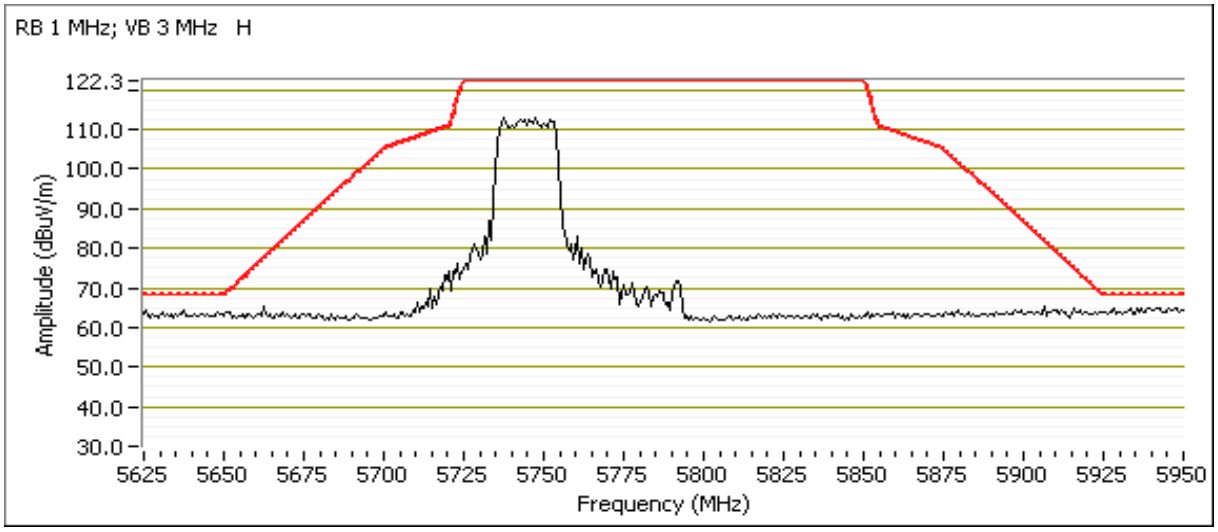
Date of Test: 3/30/2017 0:00
Test Engineer: John Caizzi
Test Location: Chamber 7

Config. Used: ???
Config Change: ???
EUT Voltage: 115V / 400Hz

Channel: 149 - 5745MHz
Tx Chain: 1, 2 and 3
Mode: n20
Data Rate: MCS

5725 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5943.190	65.7	H	68.3	-2.6	PK	162	1.47	

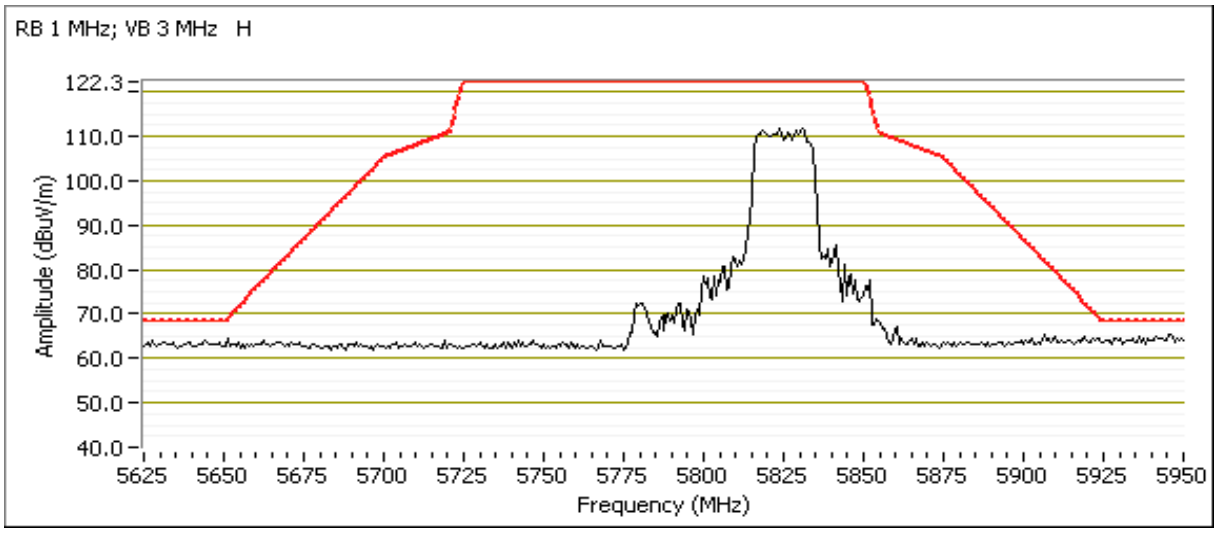


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 165 - 5825MHz
Tx Chain: 1, 2 and 3
Mode: n20
Data Rate: MCS

5850 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5943.590	59.4	H	68.3	-8.9	PK	247	2.18	



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 #9: Radiated Bandedge Measurements, 5150-5250MHz

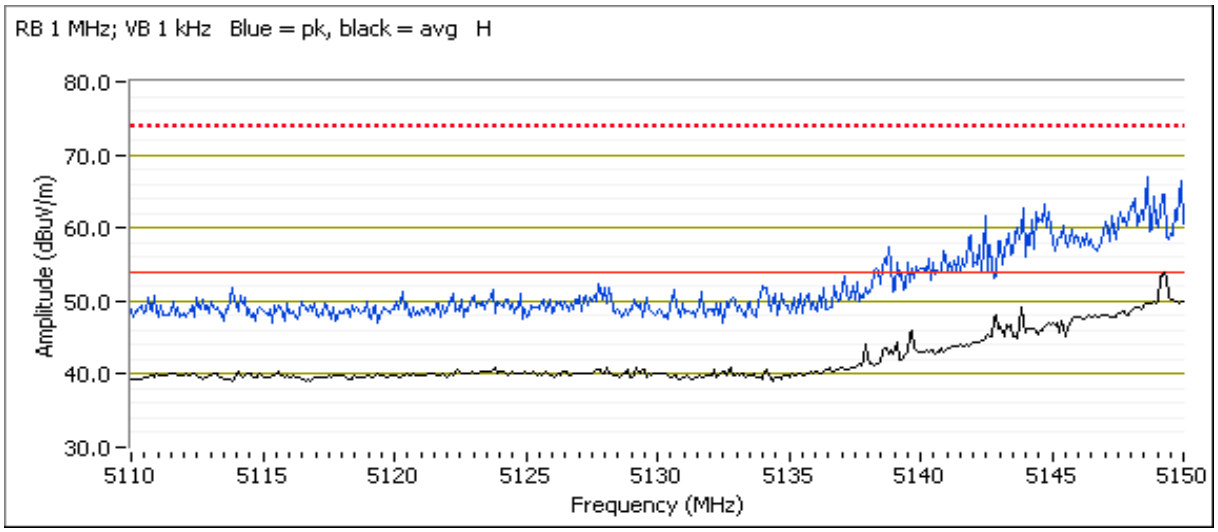
Date of Test: 3/30/2017 0:00
Test Engineer: John Caizzi
Test Location: Chamber 7

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

Channel: 38 - 5190 MHz
Tx Chain: 1, 2 and 3
Mode: n40
Data Rate: MCS

5150 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
5143.590	66.4	H	54.0	12.4	Avg	126	2.05	VB: 1 kHz, note 3
5147.600	78.0	H	74.0	4.0	PK	126	2.05	
Pwr setting = 13								
5149.680	53.8	H	54.0	-0.2	Avg	126	2.05	VB: 1 kHz, note 3
5147.760	67.0	H	74.0	-7.0	PK	126	2.05	



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 #12: Radiated Bandedge Measurements, 5725-5850MHz

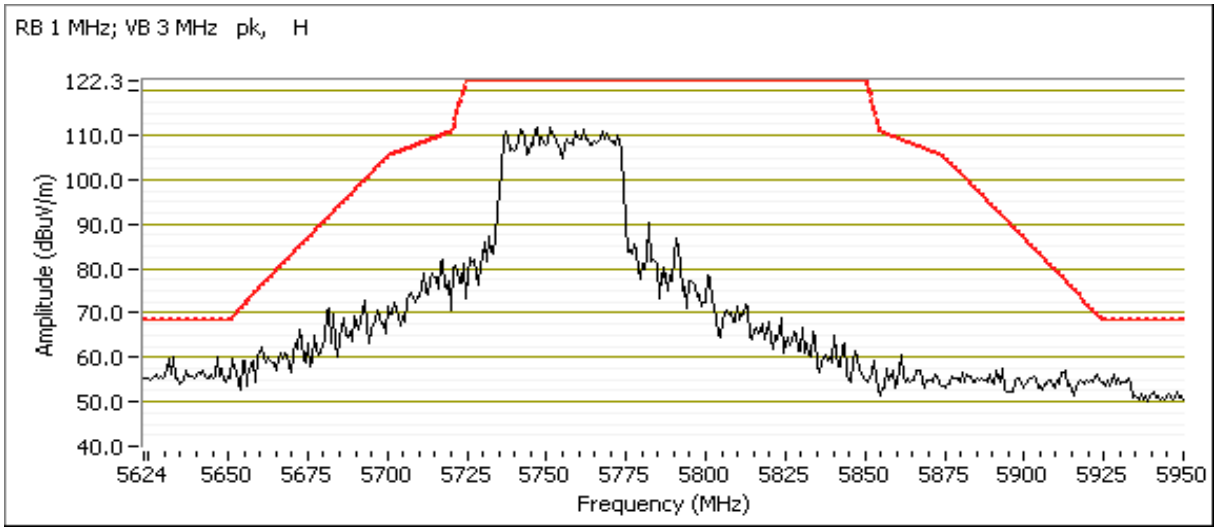
Date of Test: 3/30/2017 0:00
Test Engineer: Rafael Varelas
Test Location: Chamber 7

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

Channel: 151 - 5755MHz
Tx Chain: 1, 2 and 3
Mode: n40
Data Rate: MCS

5725 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5631.730	60.1	H	68.3	-8.2	PK	255	1.6	POS; RB 1 MHz; VB: 3 MHz

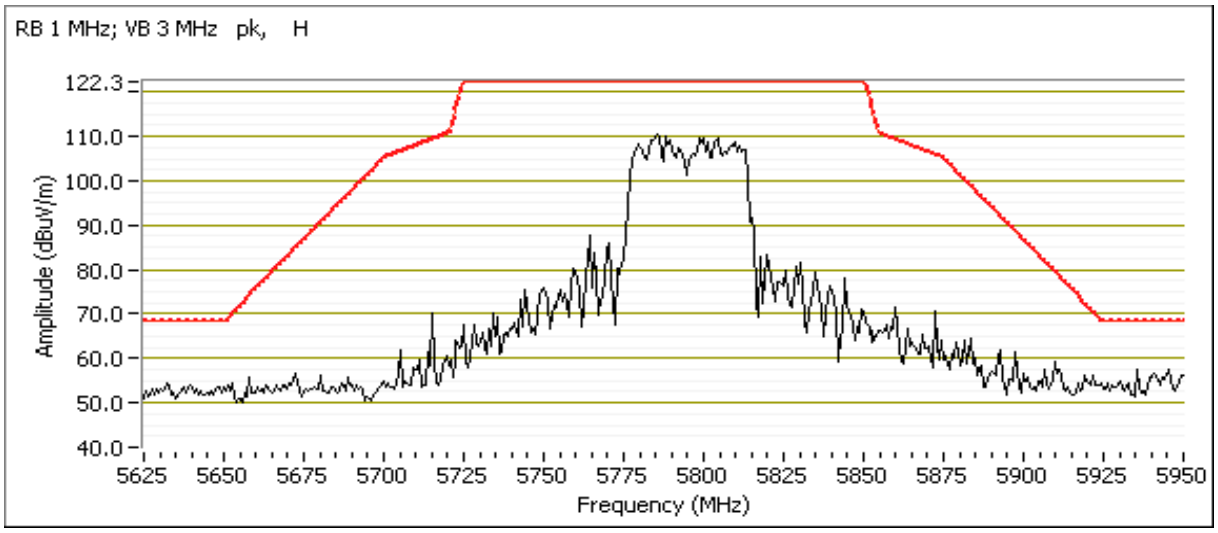


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 159 - 5795MHz
Tx Chain: 1, 2 and 3
Mode: n40
Data Rate: MCS

5850 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5944.290	59.9	H	68.3	-8.4	PK	229	1.9	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

Run #13: Radiated Bandedge Measurements, 5150-5250MHz

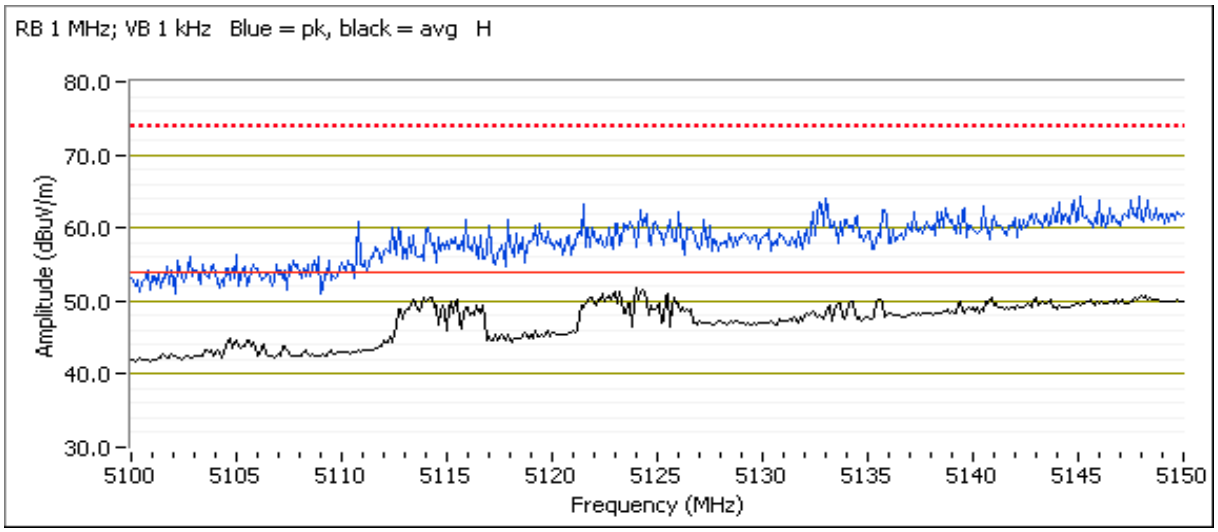
Date of Test: 3/30/2017 0:00
Test Engineer: Rafael Varelas
Test Location: Chamber 7

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

Channel: 42 - 5210MHz
Tx Chain: 1, 2 and 3
Mode: ac80
Data Rate: MCS

5150 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
5135.490	64.3	H	54.0	10.3	Avg	234	1.8	VB: 1 kHz, note 3
5133.010	78.0	H	74.0	4.0	PK	234	1.8	
Pwr setting = 12								
5148.400	52.0	H	54.0	-2.0	Avg	234	1.8	VB: 1 kHz, note 3
5147.920	64.1	H	74.0	-9.9	PK	234	1.8	



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 #16: Radiated Bandedge Measurements, 5725-5850MHz

Date of Test: 3/30/2017 0:00
Test Engineer: Rafael Varelas
Test Location: Chamber 7

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

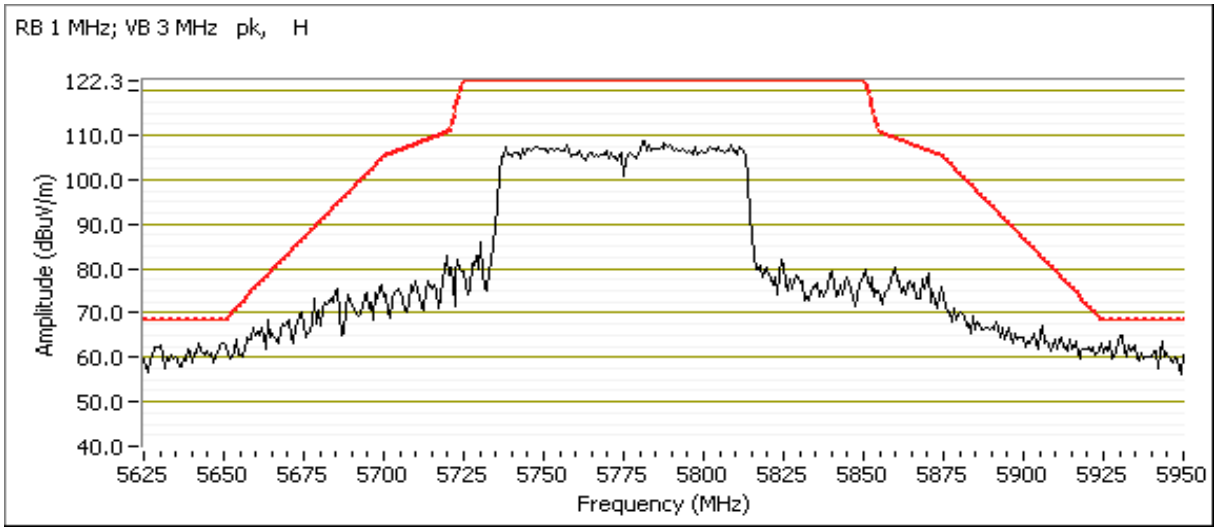
Channel: 155 - 5775MHz
Tx Chain: 1, 2 and 3
Mode: ac80
Data Rate: MCS

5725 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5639.730	64.5	H	68.3	-3.8	PK	225	1.8	POS; RB 1 MHz; VB: 3 MHz

5850 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5929.760	66.0	H	68.3	-2.3	PK	225	1.8	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

RSS-247 and FCC 15.407 (UNII) 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: 40 %

Summary of Results

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
20MHz Bandwith Modes							
5	n20	36 - 5180MHz	20	20	Restricted Band Edge at 5150 MHz	15.209	47.9 dBµV/m @ 5145.2 MHz (-6.1 dB)
8		149 - 5745MHz		20	Band Edge 5725 MHz	15.E	62.4 dBµV/m @ 5626.6 MHz (-5.9 dB)
		165 - 5825MHz		20	Band Edge 5850MHz		62.0 dBµV/m @ 5947.9 MHz (-6.3 dB)
40MHz Bandwith Modes							
9	n40	38 - 5190MHz	20	13	Restricted Band Edge at 5150 MHz	15.209	54.0 dBµV/m @ 5149.76 MHz (0.0 dB)
12	n40	151 - 5755MHz		20	Band Edge 5725 MHz	15E	60.9 dBµV/m @ 5629.5 MHz (-7.4 dB)
	n40	159 - 5795MHz		20	Band Edge 5850MHz	15E	59.4 dBµV/m @ 5949.8 MHz (-8.9 dB)
80MHz Bandwith Modes							
13	ac80	42 - 5210MHz	20	12	Restricted Band Edge at 5150 MHz	15.209	51.8 dBµV/m @ 5145.3 MHz (-2.2 dB)
16	ac80	155 - 5775MHz		20	Band Edge 5725 MHz	15E	66.8 dBµV/m @ 5628.6 MHz (-1.5 dB)
	ac80	155 - 5775MHz		20	Band Edge 5850MHz	15E	66.0 dBµV/m @ 5930.2 MHz (-2.3 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.

Procedure Comments:

Measurements performed in accordance with FCC KDB 789033
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 50 traces. (method VB of KDB 789033)

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11n20	MCS	96.0	Yes	1	0	0	1000
11n40	MCS	91.4	Yes	1	0	0	1000
ac80	MCS	54.4	Yes	1	0	0	1000

Sample Notes

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

Measurement Specific Notes:

Note 1:	For emissions outside of the restricted bands the limit is -27dBm/MHz eirp (68.3dBuV/m). The measurement method required is a peak measurement (RB=1MHz, VB≥3MHz, peak detector). Per KDB 789033 2) c) (i), compliance can be demonstrated by meeting the average and peak limits of 15.209, as an alternative.
Note 3:	Emission has constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW>1/T but not less than 10Hz, peak detector, linear averaging, auto sweep,max hold 50*1/DC traces (method VB of KDB 789033)
Note 4:	Emission has a duty cycle < 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100*1/DC traces, measurement corrected by Pwr correction factor (method AD of KDB 789033)

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 #5: Radiated Bandedge Measurements, 5150-5250MHz

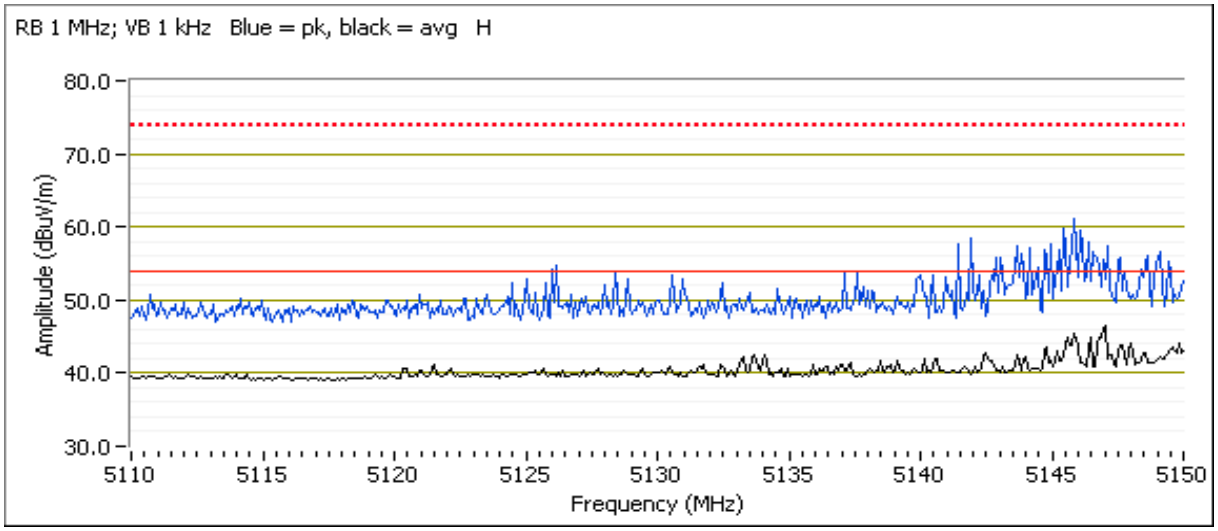
Date of Test: 3/31/2017 0:00
Test Engineer: John Caizzi
Test Location: Chamber 7

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

Channel: 36 - 5180 MHz
Tx Chain: 1, 2 & 3
Mode: n20
Data Rate: MCS

5150 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5145.190	47.9	H	54.0	-6.1	Avg	236	1.00	VB: 1 kHz, note 3.
5138.540	62.1	H	74.0	-11.9	PK	236	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

Run #8: Radiated Bandedge Measurements, 5725-5850MHz

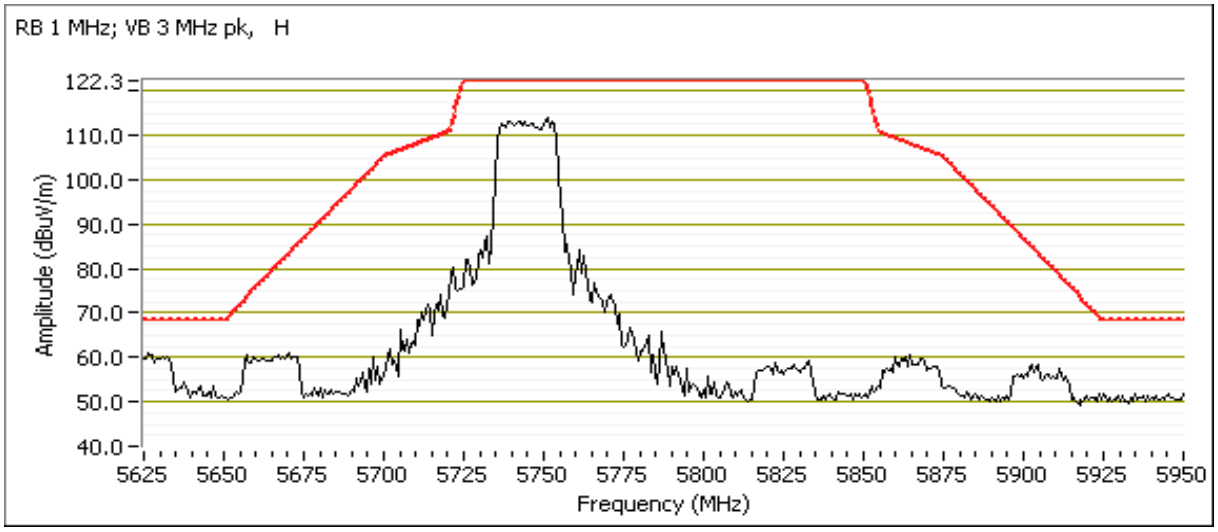
Date of Test: 3/31/2017
Test Engineer: Yew-Kwong Soo
Test Location: Chamber 7

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

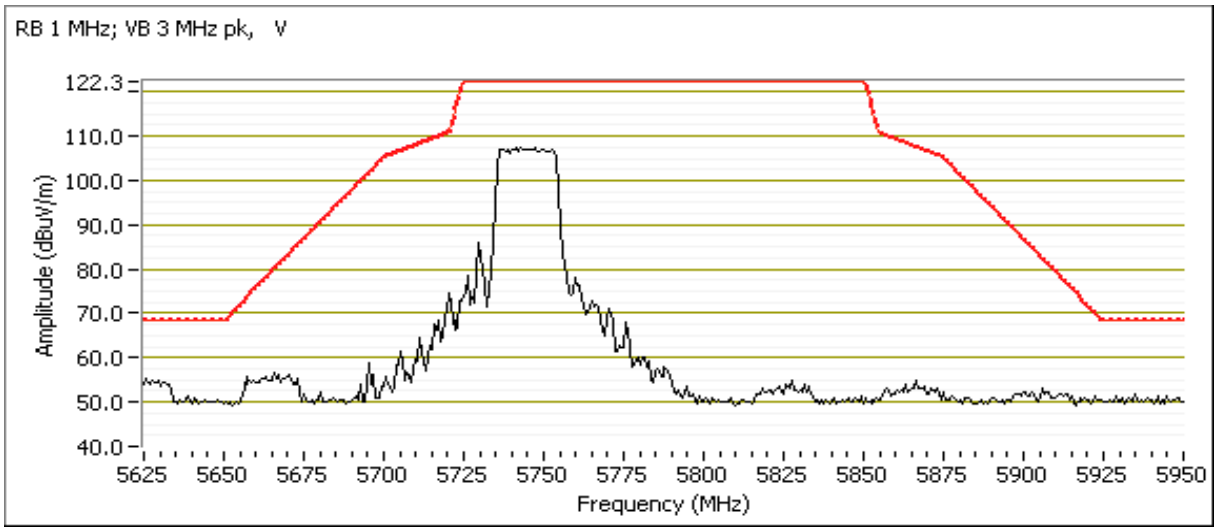
Channel: 149 - 5745MHz
Tx Chain: 1, 2 & 3
Mode: n20
Data Rate: MCS

5725 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5626.560	62.4	H	68.3	-5.9	PK	259	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

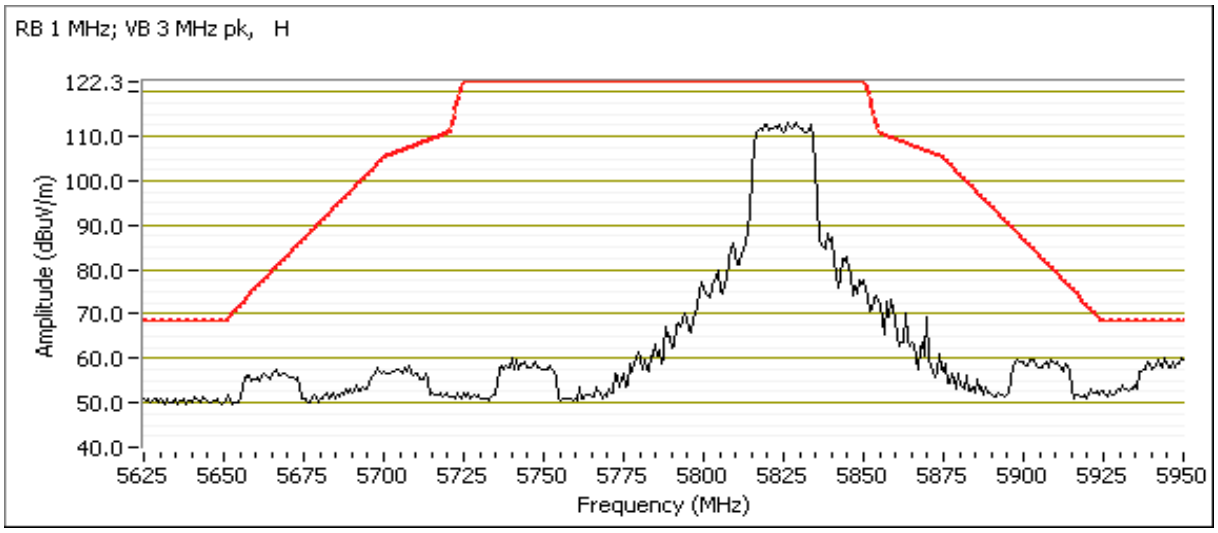


Client:	Thales Avionics, Inc.	Job Number:	JD101779
Model:	CWAP	T-Log Number:	T103414
		Project Manager:	Irene Rademacher
Contact:	Marcus Madray	Project Coordinator:	-
Standard:	FCC 15.207, 15.209, 15.247, 15.407, RSS-247	Class:	N/A

Channel: 165 - 5825MHz
Tx Chain: 1, 2 & 3
Mode: n20
Data Rate: MCS

5850 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5947.900	62.0	H	68.3	-6.3	PK	226	1.5	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

Run #9: Radiated Bandedge Measurements, 5150-5250MHz

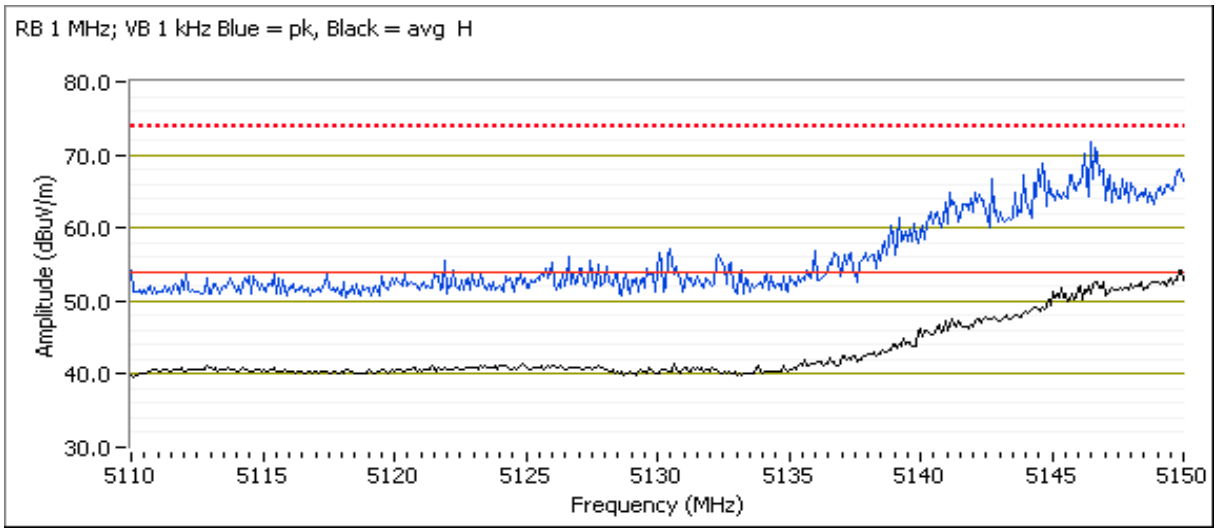
Date of Test: 3/31/2017
Test Engineer: Yew-Kwong Soo
Test Location: Chamber 7

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

Channel: 38 - 5190 MHz
Tx Chain: 1, 2 & 3
Mode: n40
Data Rate: MCS

5150 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 20								
5145.030	65.4	H	54.0	11.4	Avg	252	1.5	VB: 1 kHz, note 3
5149.980	84.6	H	74.0	10.6	PK	252	1.5	
Pwr setting = 13								
5149.760	54.0	H	54.0	0.0	Avg	252	1.5	VB: 1 kHz, note 3
5149.790	71.1	H	74.0	-2.9	PK	252	1.5	



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 #12: Radiated Bandedge Measurements, 5725-5850MHz

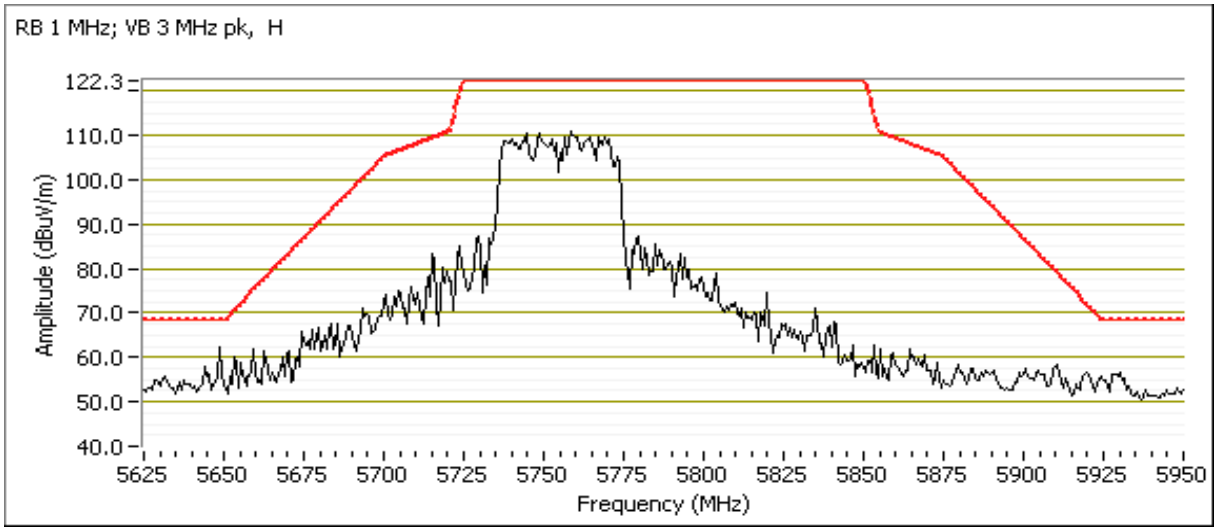
Date of Test: 3/31/2017
Test Engineer: Rafael Varelas
Test Location: Chamber 7

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

Channel: 151 - 5755MHz
Tx Chain: 1, 2 & 3
Mode: n40
Data Rate: MCS

5725 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5629.460	60.9	H	68.3	-7.4	PK	249	1.5	POS; RB 1 MHz; VB: 3 MHz

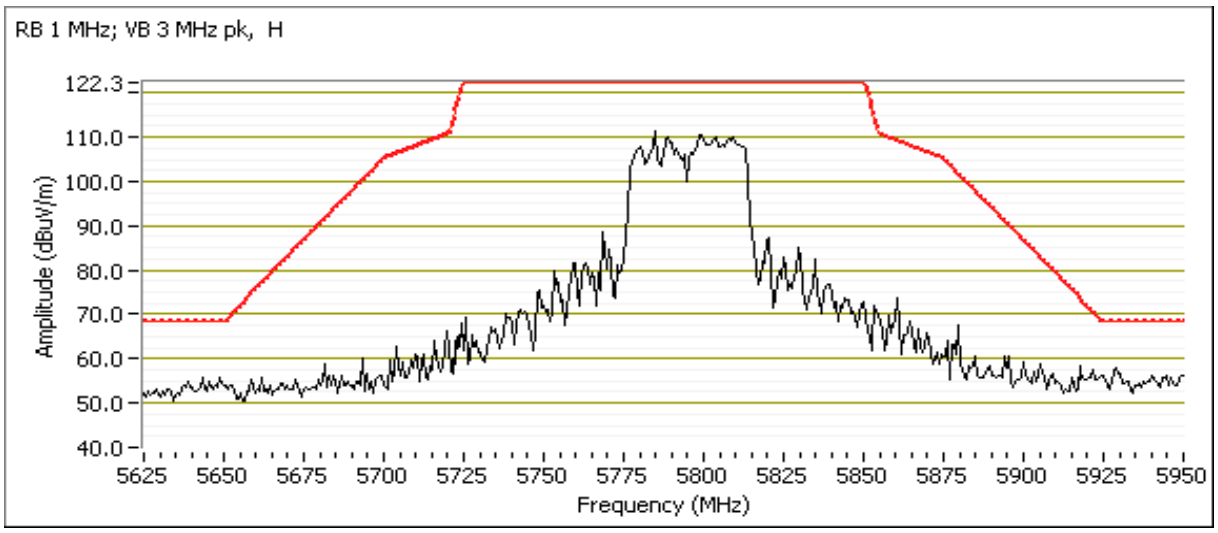


Channel: 159 - 5795MHz
Tx Chain: 1, 2 & 3
Mode: n40
Data Rate: MCS

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

5850 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5949.800	59.4	H	68.3	-8.9	PK	226	1.8	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

Run #13: Radiated Bandedge Measurements, 5150-5250MHz

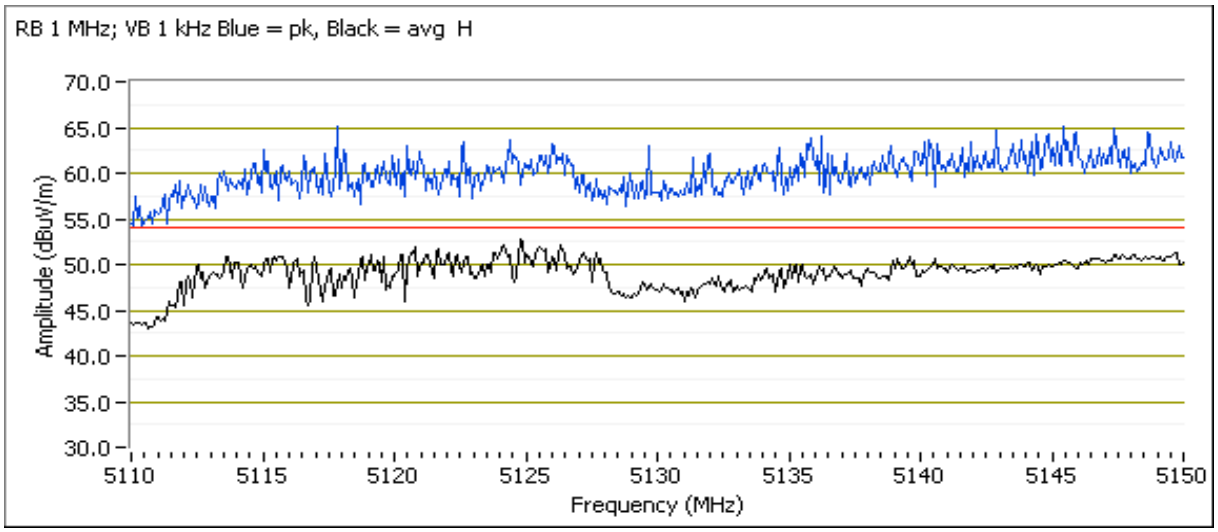
Date of Test: 3/31/2017
Test Engineer: Rafael Varelas
Test Location: Chamber 7

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

Channel: 42 - 5210MHz
Tx Chain: 1, 2 & 3
Mode: ac80
Data Rate: MCS

5150 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Pwr setting = 17								
5134.530	64.5	H	54.0	10.5	Avg	238	1.7	VB: 1 kHz, note 3
5124.670	79.2	H	74.0	5.2	PK	238	1.7	
Pwr setting = 12								
5145.270	51.8	H	54.0	-2.2	Avg	238	1.7	VB: 1 kHz, note 3
5119.220	66.9	H	74.0	-7.1	PK	238	1.7	



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 #16: Radiated Bandedge Measurements, 5725-5850MHz

Date of Test: 3/31/2017
Test Engineer: Rafael Varelas
Test Location: Chamber 7

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

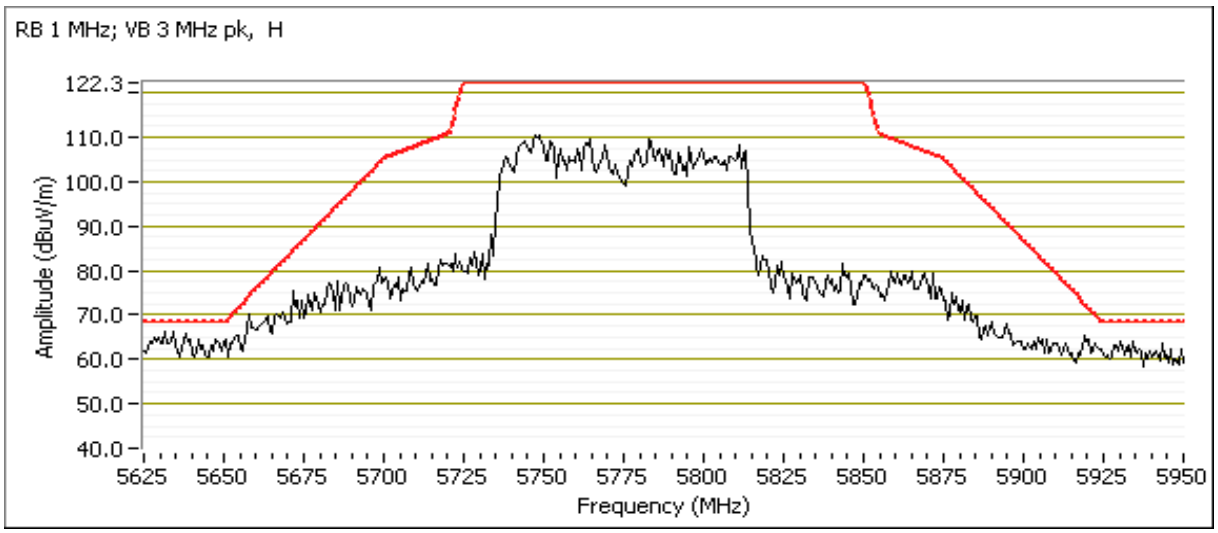
Channel: 155 - 5775MHz
Tx Chain: 1, 2 & 3
Mode: ac80
Data Rate: MCS

5725 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5628.560	66.8	H	68.3	-1.5	PK	238	1.9	POS; RB 1 MHz; VB: 3 MHz

5850 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5930.210	66.0	H	68.3	-2.3	PK	238	1.9	POS; RB 1 MHz; VB: 3 MHz



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