FCC / ISED Test Report

FOR:

Astronautics

Model Name:

AFS6460

Product Description:

Connectivity Module

FCC ID: 2AVRR-AGCS-AFS6460
ISED ID: 25923-AFS6460

Applied Rules and Standards:
47 CFR Part 15.247 (DTS)
RSS-247 Issue 2 (DTSs) & RSS-Gen Issue 5

REPORT #: EMC_ASTRO-001-20001_15.247_DTS

DATE: 2020-04-02

A2LA Accredited

IC recognized # 3462B-1

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1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-247.

No deviations were ascertained.

Company	Description	Model #
Astronautics	Connectivity Module	AFS6460

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2020-03-19	Compliance	Cindy Li (EMC Lab Manager)	Cindy Li Digitally signed by cindy.li@cetecom.com DN: CN=cindy.li@cetecom.com Reason: I am approving this document Location: Date: 2020-04-02 14:49:56

Responsible for the Report:

Date	Section	Name	Signature
2020-03-19	Compliance	Kris Lazarov (Senior EMC Engineer)	Kris Lazarov Digitally signed by Kris Lazarov Date: 2020.04.02 14:38:11 -07'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
EMC Lab Manager:	Cindy Li
Responsible Project Leader:	Kris Lazarov

2.2 Identification of the Client

Applicant's Name:	Astronautics
Street Address:	135 W Forest Hill Avenue
City/Zip Code	Oak Creek, WI 53154-0121
Country	United States

2.3 Identification of the Manufacturer

Manufacturer's Name:	Astronautics
Manufacturers Address:	1426 W National Ave
City/Zip Code	Milwaukee, WI 53204
Country	United States

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No:	AFS6460
HW Version :	278830-1
SW Version :	282306-0002
FCC-ID :	2AVRR-AGCS-AFS6460
ISED ID:	25923-AFS6460
FWIN:	N/A
HVIN:	AFS6460
PMN:	Connectivity Module
Product Description:	Connectivity Module
Radio Module:	Contains two Sparklan WPEQ-256ACNI; FCC ID: RYK-WPEQ256ACNI
Frequency Range / number of channels:	Nominal band: 2400 – 2483.5MHz / 11 channels
Type(s) of Modulation:	WiFi 802.11b,g,n / BPSK
Modes of Operation:	WLAN and WAP See Note 1
Antenna Information as declared:	WAP Max Gain 2.1dBi WLAN Max Gain 4dBi
Max. Peak Output Power:	Conducted 18 dBm
Power Supply/ Rated Operating Voltage Range:	- 37V to - 57V – Nominal - 48V
Operating Temperature Range	-40 ºC to 65 ºC
Other Radios included in the device:	UMTS / LTE / 802.11a/b/g/n/ac
Sample Revision	☐Prototype Unit; ■Production Unit; ☐Pre-Production

Note 1: This device incorporates two identical Sparklan certified modules model number: WPEQ-256ACNI. One module is configured to operate as access point, and the other operates as WLAN station.

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	112190984	278830-1	282306-0002	-

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
1	Remote Media Device	AFS6480	Astronautics	110191019
2	Airborne Communication Server	AFS6400	Astronautics	110190246

3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#1 + AE#1 +AE#2	----------

3.5 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
1	WAP	The device was configured to operate as a wireless access point, and linked to a laptop PC in 802.11b mode. Iperf3 traffic was established between the AP and the laptop PC.
2	WLAN	The device was configured to operate as a station, and linked to an access point in 802.11b mode. Iperf3 traffic was established between the AP and the device.

3.6 Justification for Worst Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on low, mid and high channels, and highest power in 802.11b mode. For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 of ISED Canada.

This test report is to support a request for new equipment authorization under the FCC ID: 2AVRR-AGCS-AFS6460, and ISED ID: 25923-AFS6460

Testing procedures are based on 558074 D01 DTS Meas Guidance v04 – "GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER SECTION 15.247" - April 5, 2017, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.

5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.247(a)(1) RSS-247 5.2(a)	Emission Bandwidth	Nominal	BTLE	☐	☐	■	Complies See Note 2
§15.247(e) RSS-247 5.2(b)	Power Spectral Density	Nominal	BTLE	☐	☐	■	Complies See Note 2
§15.247(b)(1) RSS-247 5.4(d)	Maximum Conducted Output Power and EIRP	Nominal	BTLE	☐	☐	■	Complies See Note 2
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal	BTLE	☐	☐	■	Complies See Note 2
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal	BTLE	☐	☐	■	Complies See Note 2
§15.247(d); §15.209 RSS-Gen 6.13	TX Spurious emissions-Radiated	Nominal	BTLE	■	☐	☐	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	BTLE	☐	■	☐	Complies See Note 3

Note 1: NA= Not Applicable; NP= Not Performed.
Note 2: This device incorporates two identical Sparklan certified modules model number: WPEQ-256ACNI. One module is configured to operate as access point, and the other operates as a station. Only radiated spurious emissions were tested for both modules
Note 3: This devise does not connect to AC mains network

6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=1.

Radiated measurement

9 kHz to 30 MHz	±2.5 dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	±2.0 dB (Biconilog Antenna)
1 GHz to 40 GHz	±2.3 dB (Horn Antenna)

Conducted measurement

150 kHz to 30 MHz	±0.7 dB (LISN)

RF conducted measurement	±0.5 dB

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: http://physics.nist.gov/cuu/Uncertainty/typeb.html. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3 dB to the limit.

6.1 Environmental Conditions During Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25° C
- Relative humidity: 40-60%

6.2 Dates of Testing:

03/09/2020 - 03/20/2020

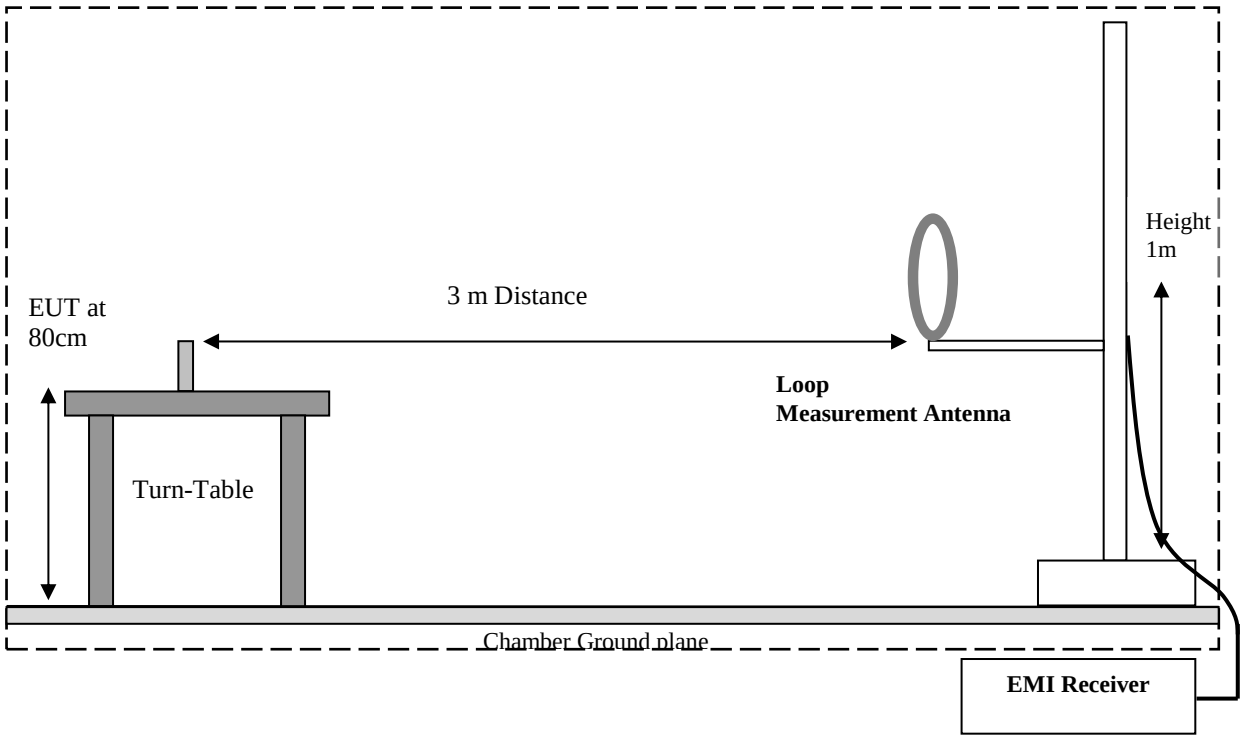
7 Measurement Procedures

7.1 Radiated Measurement

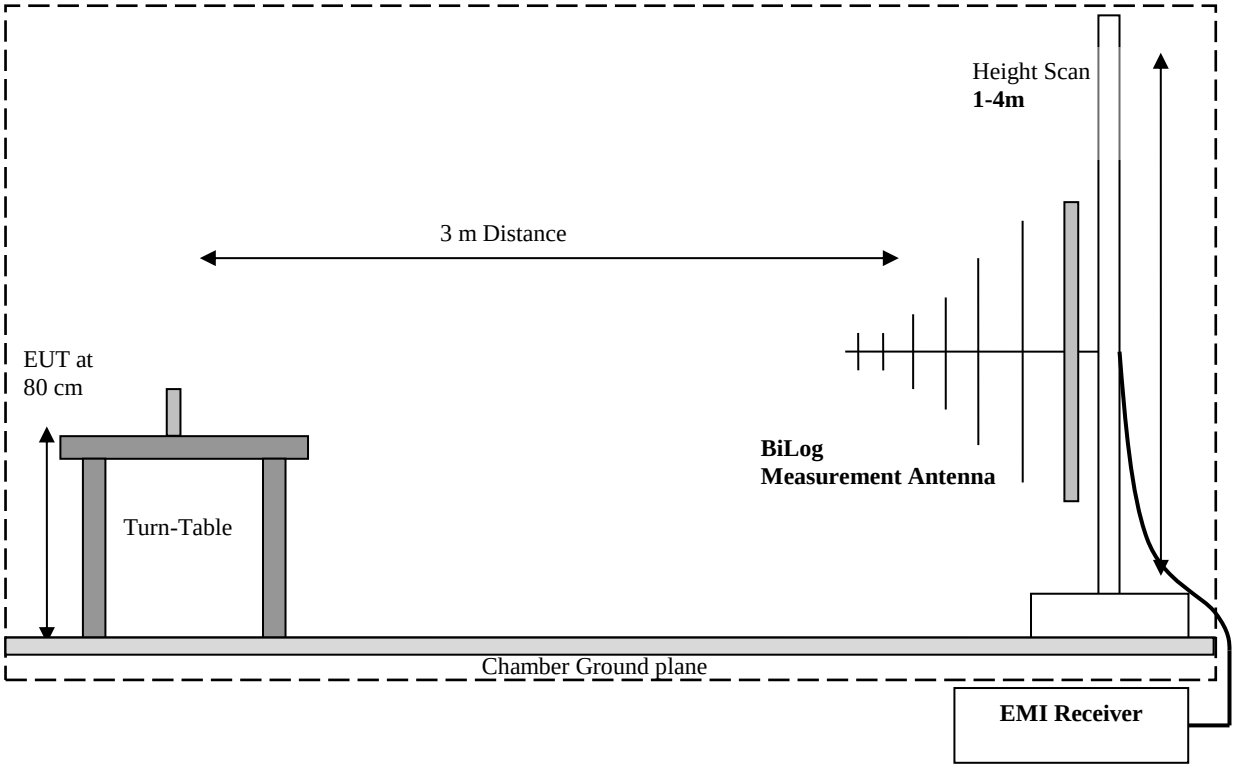
The radiated measurement is performed according to ANSI C63.10 (2013)

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.

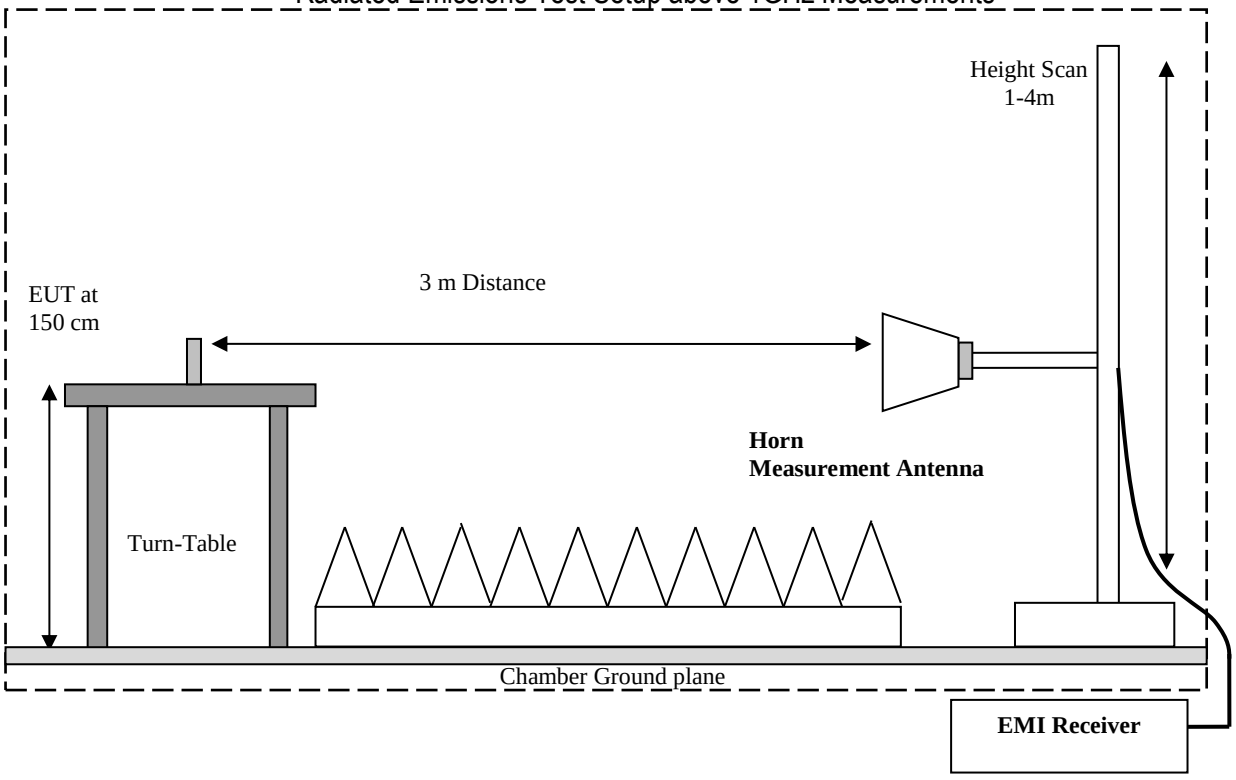
Radiated Emissions Test Setup below 30MHz Measurements



Radiated Emissions Test Setup 30MHz-1GHz Measurements



Radiated Emissions Test Setup above 1GHz Measurements



7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dBµV
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

FS (dBµV/m) = Measured Value on SA (dBµV)+ Cable Loss (dB)+ Antenna Factor (dB/m)

Example:

Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

8 Test Result Data

8.1 Radiated Transmitter Spurious Emissions and Restricted Bands

8.1.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak

- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)

- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz

- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing at distance other than the specified in the standard, the limit conversion is calculated by using 40 dB/decade extrapolation factor as follow: Conversion factor (CF) = 40 log (D/d) = 40 log (300m / 3m) = 80dB

8.1.2 Limits:

FCC §15.247

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

FCC §15.209 & RSS-Gen 8.9

- Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)	Field strength @ 3m (dBµV/m)
0.009–0.490	2400/F(kHz) / ---------	300	-
0.490–1.705	24000/F(kHz) / --------	30	-
1.705–30.0	30 / (29.5)	30	-
30–88	100	3	40 dBµV/m
88–216	150	3	43.5 dBµV/m
216–960	200	3	46 dBµV/m
Above 960	500	3	54 dBµV/m

FCC §15.205 & RSS-Gen 8.10

- Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

- Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
  *PEAK LIMIT= 74 dBµV/m
  *AVG. LIMIT= 54 dBµV/m

8.1.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
22° C	1	1 and 2	29 VDC

8.1.4 Testing notes:

In order to exercise the EUT the support equipment needed to be placed in close proximity on top of the turn table. The emissions from the support equipment were evaluated with a base line scan where the EUT was powered off. This base line scan identified the following frequencies, which were excluded from the evaluation of the EUT performance:

Frequency (MHz)
31.067
133.208
212.457
249.996
315.115
499.997
687.531
750.031
875.064
1000.000
1250.000
5000.000

8.1.5 Measurement result:

EUT operating mode 1 (WAP)				
Plot #	**Channel #**	**Scan Frequency**	**Limit**	**Result**
1-3	Low	30 MHz – 18 GHz	See section 8.1.2	Pass
4-8	Mid	9 kHz – 26 GHz	See section 8.1.2	Pass
9-11	High	30 MHz – 18 GHz	See section 8.1.2	Pass

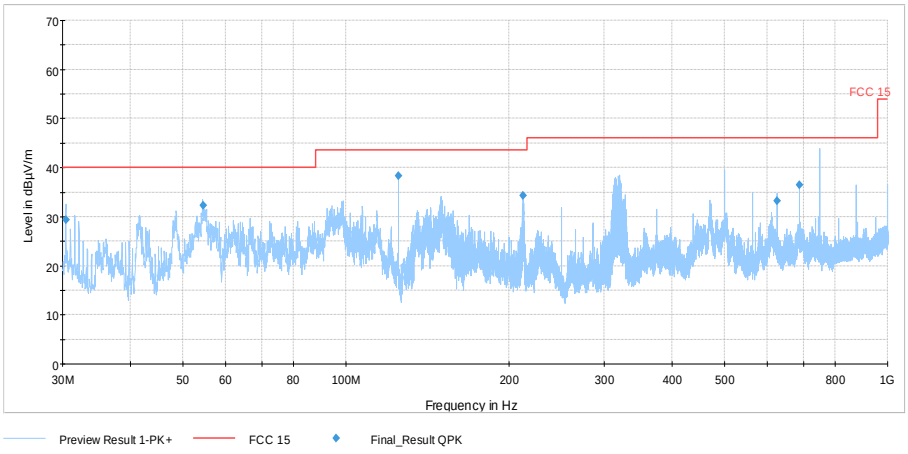
EUT operating mode 2 (WLAN)				
Plot #	**Channel #**	**Scan Frequency**	**Limit**	**Result**
12-14	Low	30 MHz – 18 GHz	See section 8.1.2	Pass
15-19	Mid	9 kHz – 26 GHz	See section 8.1.2	Pass
20-22	High	30 MHz – 18 GHz	See section 8.1.2	Pass

8.1.6 Measurement Plots:

Plot #1 Radiated Emissions: 30 MHz – 1GHz

Mode: WAP 802.11/b | **Channel: Low**

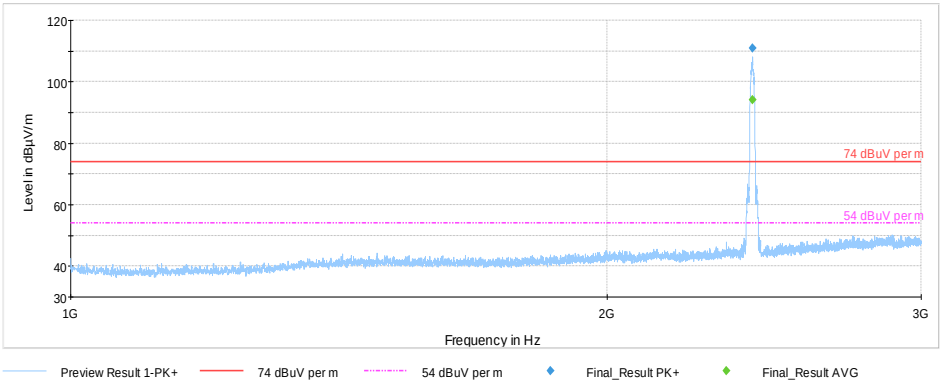
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
30.466	29.37	40.00	10.63	200.0	120.000	174.0	V	323.0
54.487	32.36	40.00	7.64	200.0	120.000	172.0	V	280.0
125.003	38.39	43.52	5.13	200.0	120.000	140.0	V	27.0
212.636	34.28	43.52	9.25	200.0	120.000	157.0	V	118.0
625.025	33.17	46.02	12.85	200.0	120.000	151.0	H	51.0
687.492	36.49	46.02	9.53	200.0	120.000	179.0	V	351.0



Plot # 2 Radiated Emissions: 1-3 GHz

Mode: WAP 802.11/b | **Channel: Low**

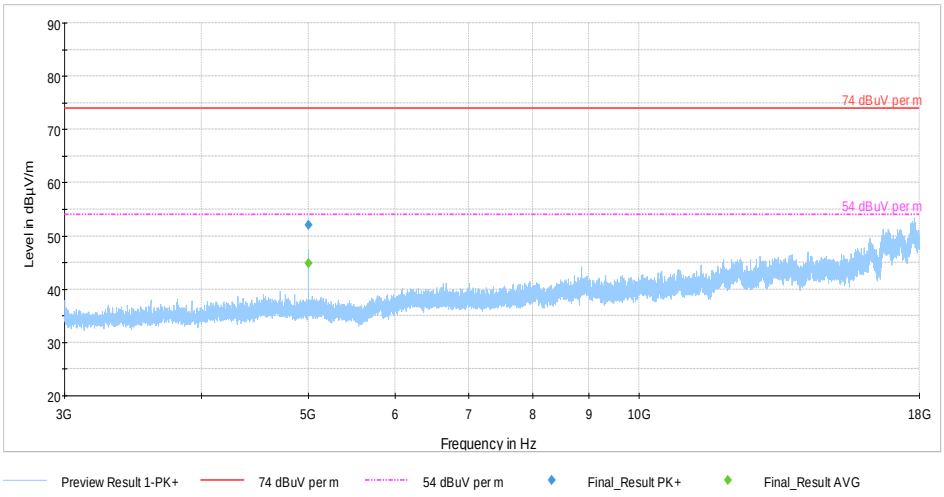
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2412.796	---	94.13	54.00	-40.13	200.0	1000.000	165.0	H	210.0
2412.796	110.98	---	74.00	-36.98	200.0	1000.000	165.0	H	210.0



Plot # 3 Radiated Emissions: 3-18 GHz

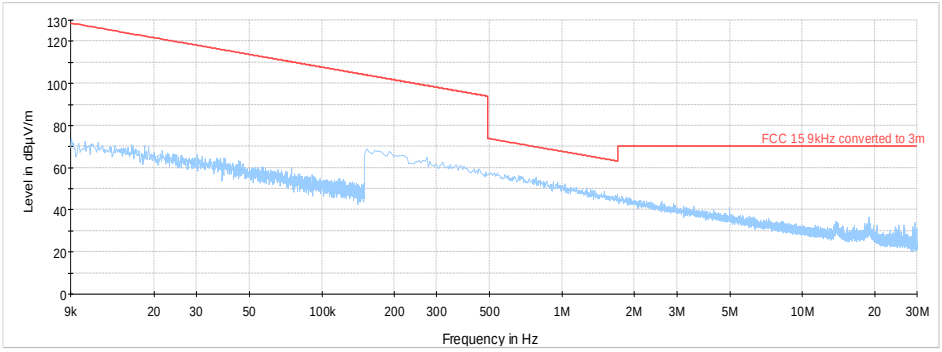
Mode: WAP 802.11/b | **Channel: Low**

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
4999.987	---	44.83	54.00	9.17	200.0	1000.000	154.0	H	6.0
4999.987	52.01	---	74.00	21.99	200.0	1000.000	154.0	H	6.0



Plot # 4 Radiated Emissions: 9 KHz – 30 MHz

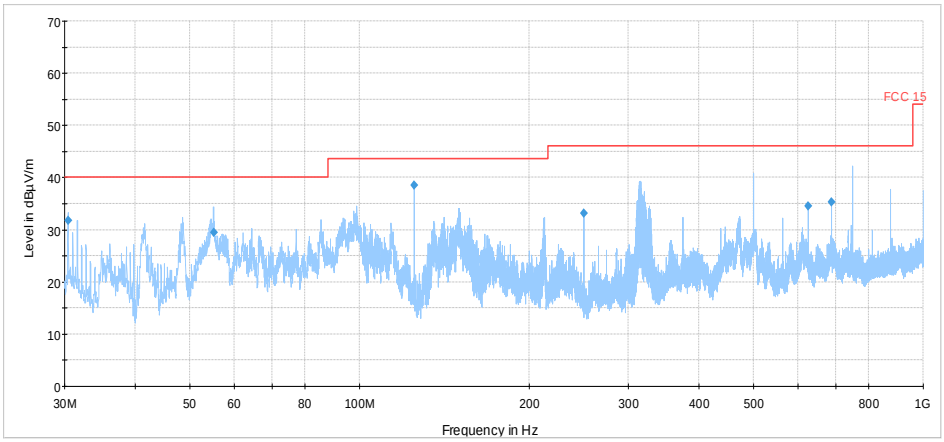
Mode: WAP 802.11/b | **Channel: Mid**



Plot #5 Radiated Emissions: 30 MHz – 1GHz

Mode: WAP 802.11/b | **Channel: Mid**

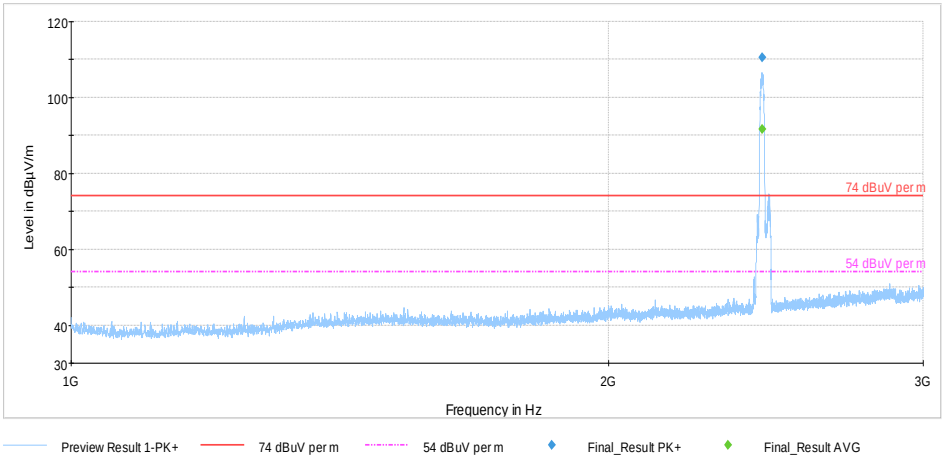
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
30.461	31.82	40.00	8.18	200.0	120.000	187.0	V	-31.0
55.172	29.49	40.00	10.51	200.0	120.000	204.0	V	287.0
124.997	38.49	43.52	5.03	200.0	120.000	140.0	V	23.0
250.006	33.16	46.02	12.86	200.0	120.000	169.0	V	15.0
624.990	34.56	46.02	11.46	200.0	120.000	140.0	V	345.0
687.510	35.31	46.02	10.71	200.0	120.000	170.0	V	315.0



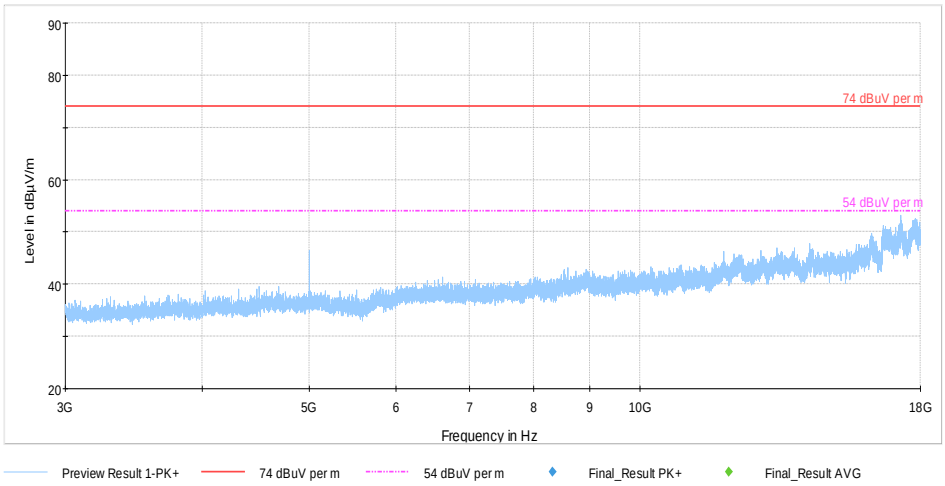
Plot #6 Radiated Emissions: 1-3 GHz

Mode: WAP 802.11/b | **Channel: Mid**

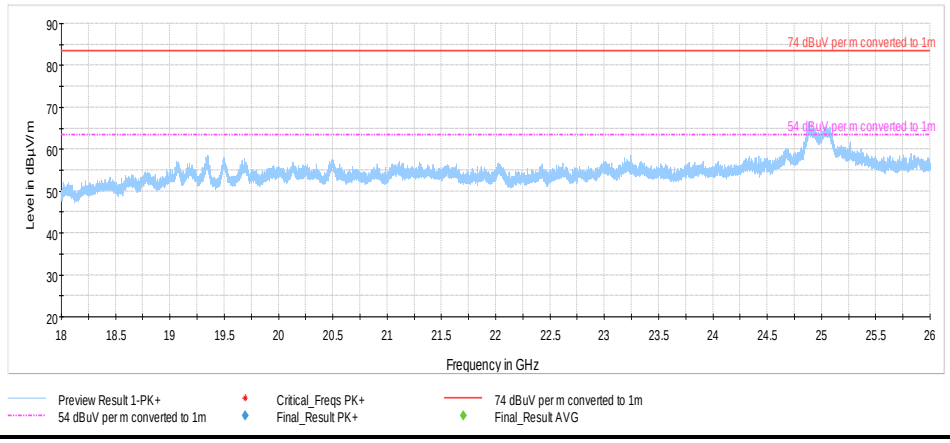
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2437.070	---	91.59	54.00	-37.59	200.0	1000.000	140.0	H	205.0
2437.070	110.45	---	74.00	-36.45	200.0	1000.000	140.0	H	205.0



Plot #7 Radiated Emissions: 3-18 GHz		
Mode: WAP 802.11/b	**Channel: Mid**	



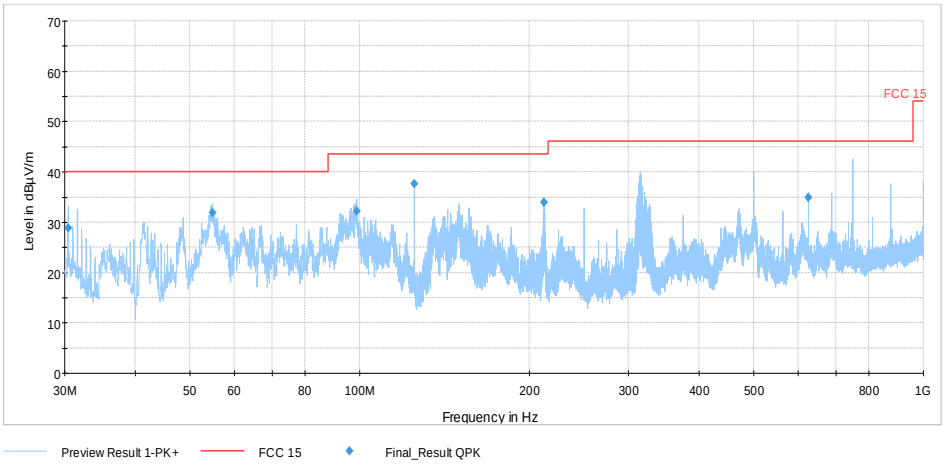
Plot #8 Radiated Emissions: 18-26 GHz		
Mode: WAP 802.11/b	**Channel: Mid**	



Plot # 9 Radiated Emissions: 30 MHz – 1GHz

Mode: WAP 802.11/b | **Channel: High**

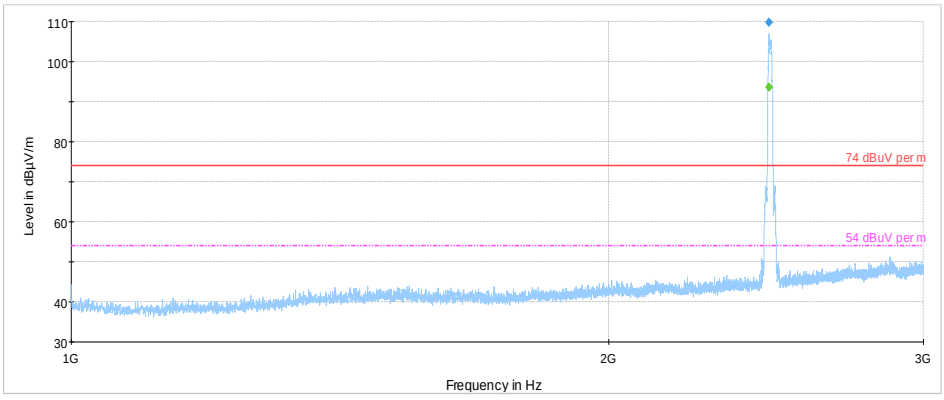
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
30.459	28.79	40.00	11.21	200.0	120.000	159.0	V	342.0
54.847	31.95	40.00	8.05	200.0	120.000	238.0	V	359.0
98.991	32.21	43.52	11.31	200.0	120.000	151.0	V	39.0
125.010	37.62	43.52	5.91	200.0	120.000	152.0	V	257.0
212.624	33.88	43.52	9.64	200.0	120.000	193.0	V	108.0
624.999	34.97	46.02	11.05	200.0	120.000	152.0	V	340.0



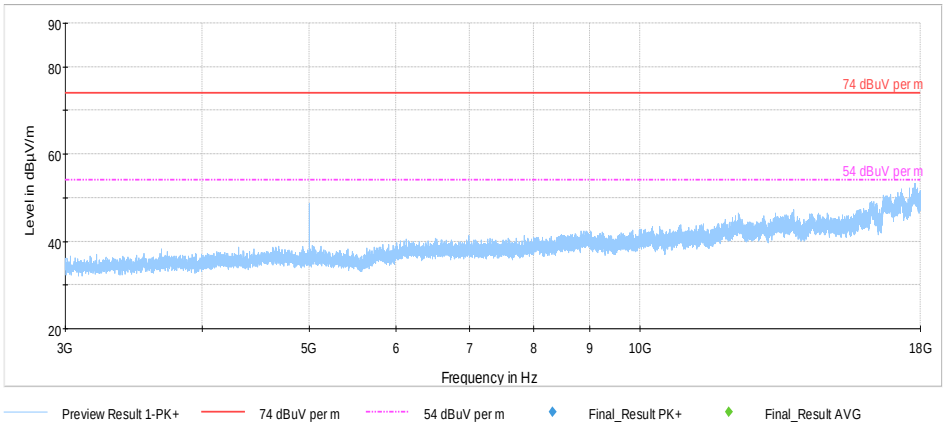
Plot #10 Radiated Emissions: 1-3 GHz

Mode: WAP 802.11/b | **Channel: Low**

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2459.365	---	93.67	54.00	-39.67	200.0	1000.000	140.0	H	235.0
2459.365	109.71	---	74.00	-35.71	200.0	1000.000	140.0	H	235.0

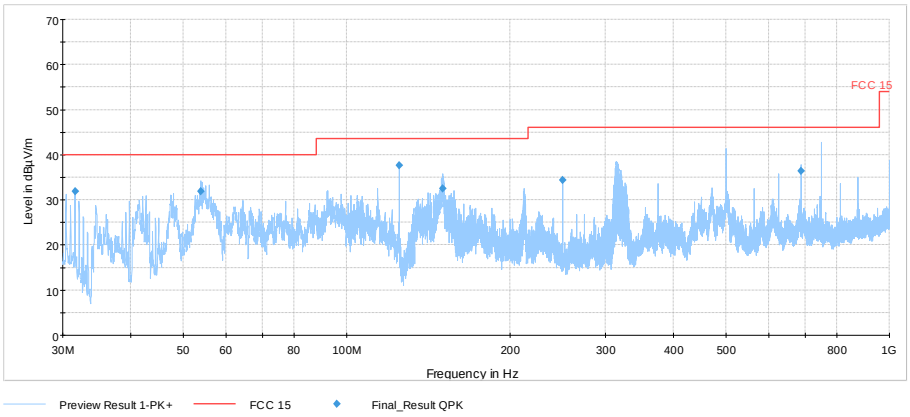


Plot #11 Radiated Emissions: 3-18 GHz		
Mode: WAP 802.11/b	**Channel: Low**	



Plot #12 Radiated Emissions: 30 MHz – 1GHz		
Mode: WLAN 802.11/b	**Channel: Low**	

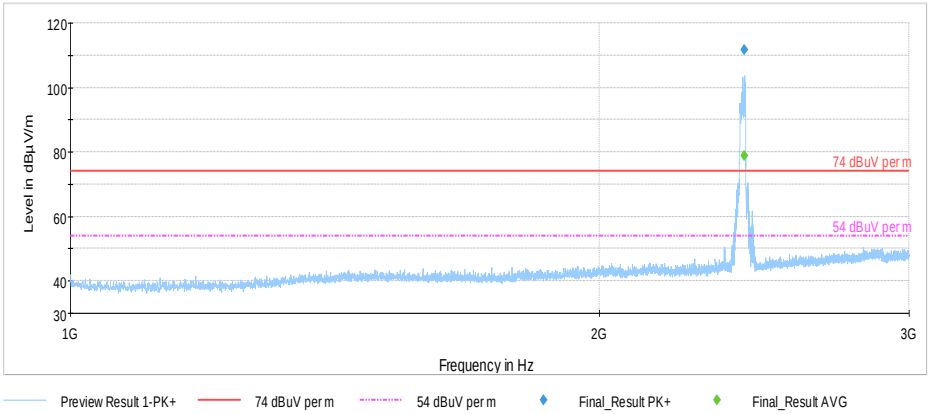
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
31.629	31.81	40.00	8.19	200.0	120.000	152.0	V	282.0
53.885	31.81	40.00	8.19	200.0	120.000	170.0	V	247.0
125.004	37.66	43.52	5.86	200.0	120.000	155.0	V	35.0
150.390	32.50	43.52	11.02	200.0	120.000	152.0	V	245.0
249.992	34.31	46.02	11.71	200.0	120.000	166.0	H	213.0
687.501	36.33	46.02	9.69	200.0	120.000	171.0	V	349.0



Plot # 13 Radiated Emissions: 1-3 GHz

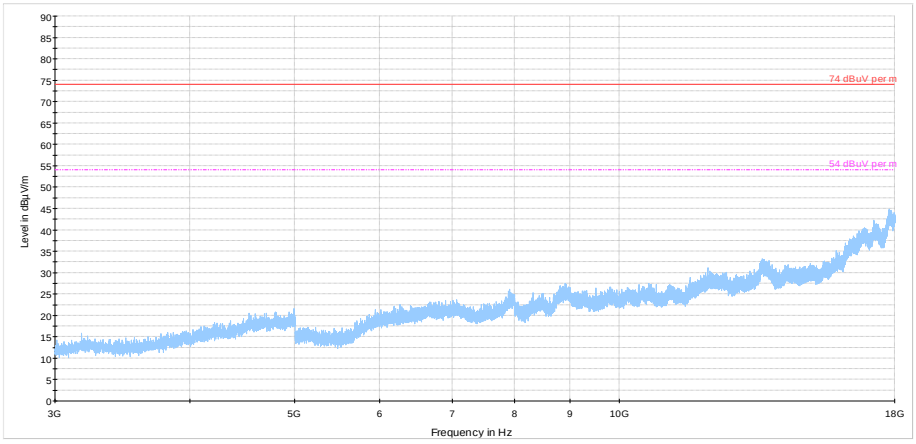
Mode: WLAN 802.11/b | **Channel: Low**

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2417.652	---	78.87	54.00	-24.87	200.0	1000.000	188.0	H	334.0
2417.652	111.57	---	74.00	-37.57	200.0	1000.000	188.0	H	334.0

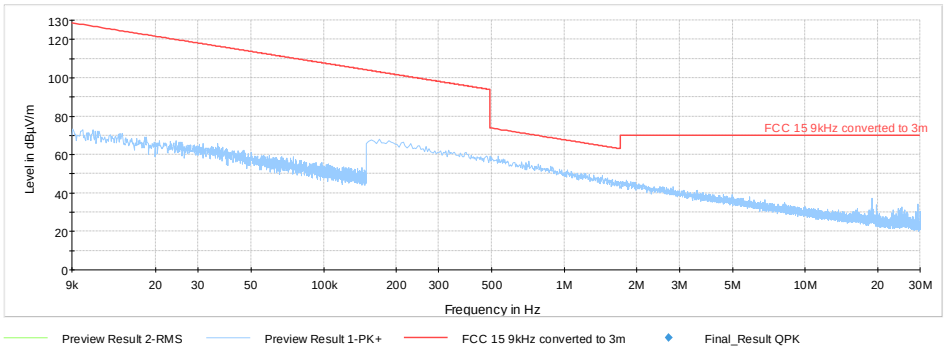


Plot # 14 Radiated Emissions: 3-18 GHz

Mode: WLAN 802.11/b | **Channel: Low**

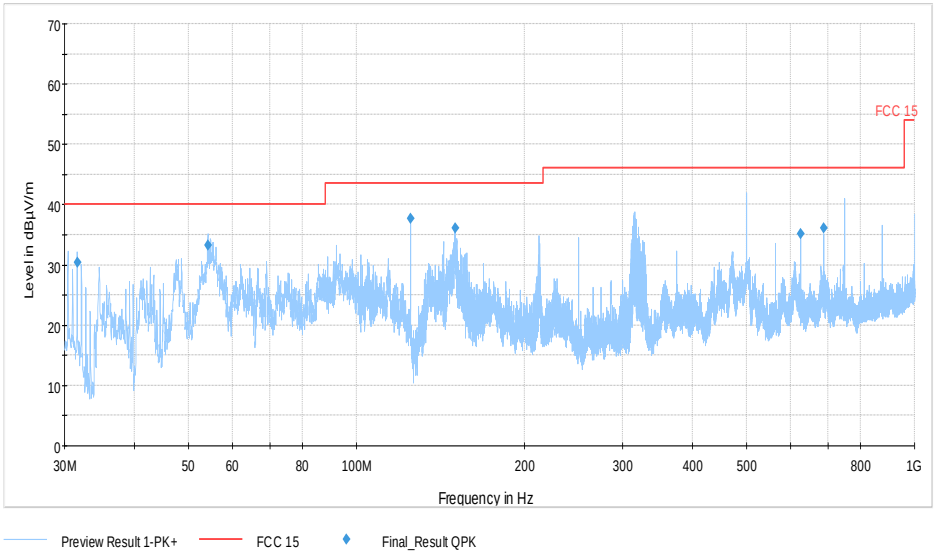


Plot # 15 Radiated Emissions: 9 KHz – 30 MHz		
Mode: WLAN 802.11/b	**Channel: Mid**	



Plot #16 Radiated Emissions: 30 MHz – 1GHz		
Mode: WLAN 802.11/b	**Channel: Mid**	

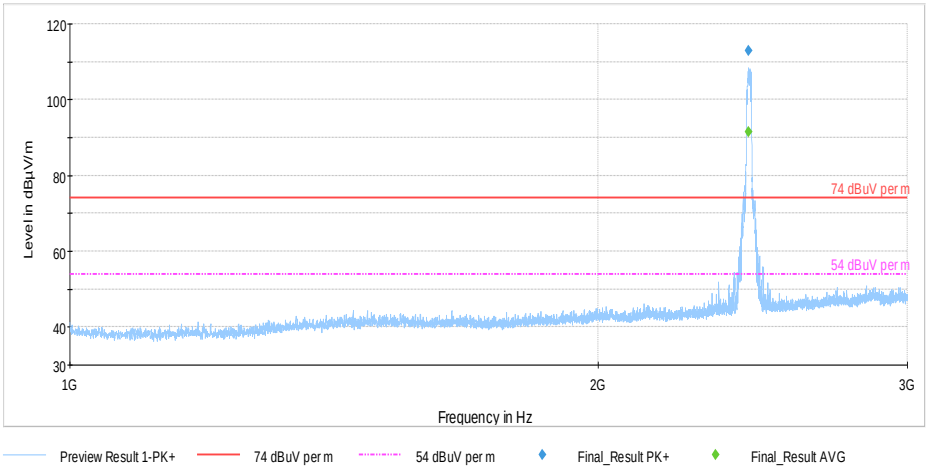
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
31.637	30.43	40.00	9.57	200.0	120.000	140.0	V	291.0
54.193	33.33	40.00	6.67	200.0	120.000	165.0	V	230.0
124.994	37.67	43.52	5.85	200.0	120.000	152.0	V	29.0
150.556	36.04	43.52	7.48	200.0	120.000	152.0	V	258.0
625.000	35.15	46.02	10.87	200.0	120.000	265.0	V	334.0
687.500	36.05	46.02	9.97	200.0	120.000	171.0	V	-27.0



Plot #17 Radiated Emissions: 1-3 GHz

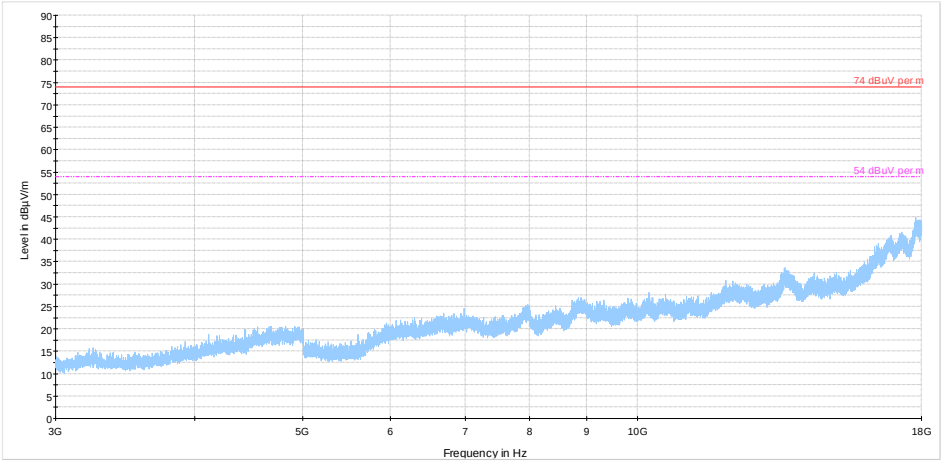
Mode: WLAN 802.11/b | **Channel: Mid**

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2436.424	---	91.61	54.00	-37.61	200.0	1000.000	154.0	H	310.0
2436.424	112.93	---	74.00	-38.93	200.0	1000.000	154.0	H	310.0



Plot #18 Radiated Emissions: 3-18 GHz

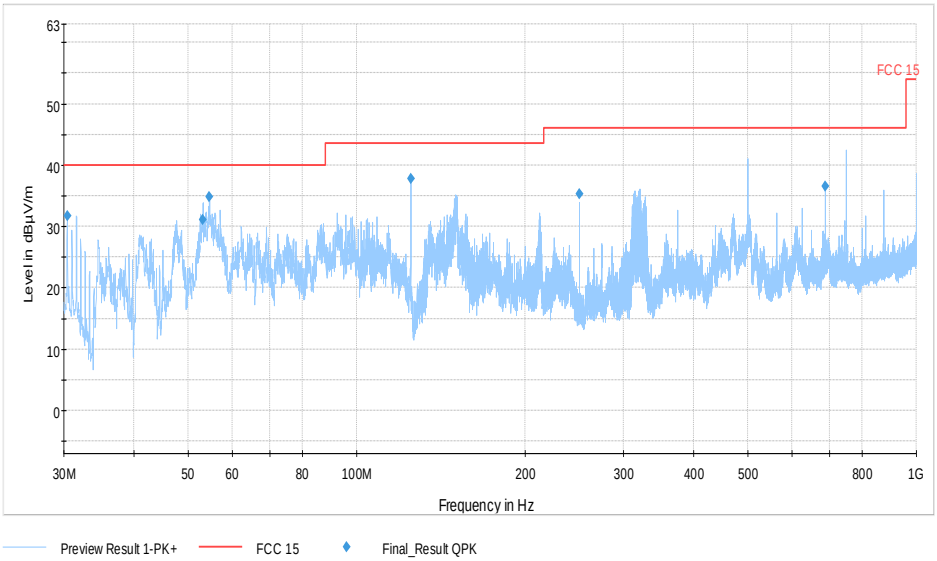
Mode: WLAN 802.11/b | **Channel: Mid**



Plot #19 Radiated Emissions: 18-26 GHz		
Mode: WLAN 802.11/b	**Channel: Mid**	

Plot # 20 Radiated Emissions: 30 MHz – 1GHz		
Mode: WLAN 802.11/b	**Channel: High**	

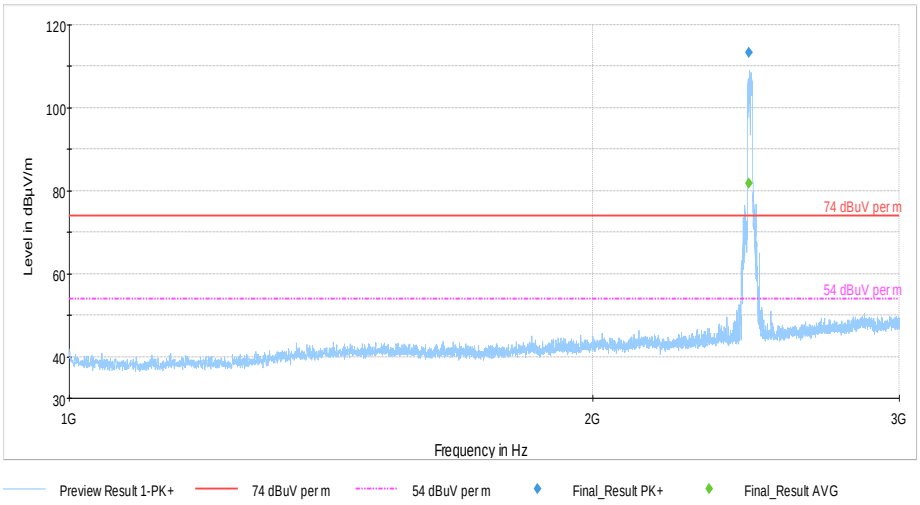
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
30.462	31.73	40.00	8.27	200.0	120.000	140.0	V	341.0
53.133	31.07	40.00	8.93	200.0	120.000	178.0	V	235.0
54.588	34.79	40.00	5.21	200.0	120.000	140.0	V	239.0
124.998	37.80	43.52	5.73	200.0	120.000	151.0	V	32.0
249.994	35.28	46.02	10.74	200.0	120.000	210.0	V	17.0
687.508	36.48	46.02	9.54	200.0	120.000	199.0	V	349.0



Plot #21 Radiated Emissions: 1-3 GHz

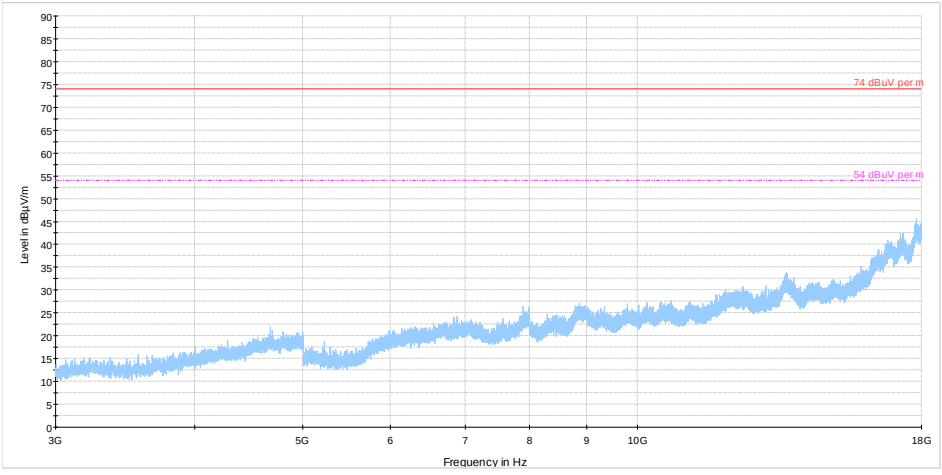
Mode: WLAN 802.11/b | **Channel: Low**

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2459.302	---	81.71	54.00	-27.71	200.0	1000.000	196.0	H	212.0
2459.302	113.23	---	74.00	-39.23	200.0	1000.000	196.0	H	212.0



Plot #22 Radiated Emissions: 3-18 GHz

Mode: WLAN 802.11/b | **Channel: Low**



9 Test setup photos

Setup photos are included in supporting file name: "EMC_ASTRO-001-20001_15.247_DTS_Setup_Photos.pdf"

10 Test Equipment And Ancillaries Used For Testing

Equipment Name/Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
EMI Receiver/Analyzer	Rohde&Schwarz	ESU 40	100251	3 Years	07/16/2019
Biconlog Antenna	EMCO	3142E	166067	3 years	06/27/2017
Horn Antenna	EMCO	3115	35114	3 years	04/17/2019
Horn Antenna	ETS Lindgren	Horn 3117-PA	159547	3 years	8/8/2017
Horn Antenna	ETS Lindgren	Horn 3116	70497	3 years	10/31/2017
Compact Digital Barometer	Control Company	35519-055	91119547	3 Years	6/08/2017

Note: Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels. Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

11 History

Date	Report Name	Changes to report	Report prepared by
2020-04-02	EMC_ASTRO-001-20001_15.247_DTS	Initial Version	Kris Lazarov

<<< The End >>>