



**DATE: 21 January 2019**

**I.T.L. (PRODUCT TESTING) LTD.  
FCC/IC Radio Test Report**

**for**

**AeroScout**

**Equipment under test:**

**Gateway**

**model: GW-1000**

**SKU: GW-1200**

Tested by:

M. Zohar

Approved by:

D. Shidlowsky

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This report relates only to items tested.



**Measurement/Technical Report for**  
**AeroScout**  
**Gateway**

**model: GW-1000**

**SKU: GW-1200**

**FCC ID: Q3HGW1000**  
**IC: 5115A-GW1000**

This report concerns:	Original Grant:	X
	Class I Change:	
	Class II Change:	
Equipment type:	FCC: DTS - Digital Transmission System IC: Spread Spectrum/Digital Device (2400–2483.5 MHz)	
Limits used:	47CFR15 Section 15.247 RSS 247, Issue 2, February 2017, Section 5 RSS-Gen, Issue 5, May 2018	

Measurement procedure used is KDB 558074 D01 v03r05, ANSI C63.4-2014 and RSS Gen, Issue 5, 2018

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Applicant for this device:  
(different from "prepared by")

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# 1. General Information

## 1.1 Administrative Information

Manufacturer:	AeroScout
Manufacturer's Address:	2 Ilan Ramon St., Science Park Ness-Ziona, 7403635, Israel Tel: +972-8-936-9393 Fax: +972-8-936-5977
Manufacturer's Representative:	Eli Aharon
Equipment Under Test (E.U.T):	Gateway
Equipment Info:	model: GW-1000 SKU: GW-1200
HVIN:	GW-1000
PMN:	GW1200 Gateway
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	August 26, 2018
Start of Test:	August 27, 2018
End of Test:	August 28, 2018
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St., Lod ISRAEL 7120101
Test Specifications:	FCC Part 15, Subpart C, Section 15.247 RSS 247, Issue 2, February 2017, Section 5 RSS-Gen, Issue 5, May 2018



## **1.2 List of Accreditations**

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), FCC Designation No. IL1005.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. Industry Canada (Canada), IC File No.: 46405-4025; Site Nos. IC 4025A-1, IC 4025A-2.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

### 1.3 **Product Description**

The GW-1000 Gateway is a component of STANLEY Healthcare's suite of enterprise visibility solutions for location-based applications. The GW-1000 receives transmission messages from Wi-Fi transmitting devices, such as Wi-Fi Call Stations and P10 Resident Pendants and relays the messages to the Location Engine.

PMN:	GW-1200
Working voltage	48VDC via POE unit
Mode of operation	Transceiver
Modulations	CCK
Assigned Frequency Range	2400.0-2483.5MHz
Operating Frequency Range	2412.0-2462.0MHz
Transmit power(conducted)	~4.0dBm
Antenna Gain	2.5dBi PIFA antenna
Modulation BW	20MHz
Bit rate (Mbit/s)	1Mbps

### 1.4 **Test Methodology**

Both conducted and radiated testing was performed according to the procedures in KDB 558074 D01 v03r05, ANSI C63.10: 2013 and RSS Gen Issue 5. Radiated testing was performed at an antenna to EUT distance of 3 meters.

### 1.5 **Test Facility**

Emissions tests were performed at I.T.L.'s testing facility in Lod, Israel. I.T.L.'s EMC Laboratory is accredited by A2LA, certificate No. 1152.01 and its FCC Designation Number is IL1005.

### 1.6 **Measurement Uncertainty**

#### **Radiated Emission**

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site:

30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):  
± 4.96 dB

1 GHz to 6 GHz

Expanded Uncertainty (95% Confidence, K=2):  
±5.19 dB

>6 GHz

Expanded Uncertainty (95% Confidence, K=2):  
±5.51 dB

## 2. System Test Configuration

### 2.1 Justification

1. The E.U.T contains 2 identical transceivers supporting only IEEE 802.11/b standard (Wi-Fi/b) technique with 20MHz CBW and 1Mbps bit rate. The transceivers don't transmit simultaneously (see customer declaration on page10).
2. The unit was evaluated while transmitting at the low channel (2412MHz), the mid channel (2437MHz) and the high channel (2462MHz).
3. Conducted emission tests were performed with the E.U.T. antenna terminal connected by a RF cable to the Spectrum Analyzer through a 30dB external attenuator.
4. Final radiated emission tests were performed after exploratory emission testing was performed in 2 optional installation positions to determine the "worst case" radiation.
6. According to the below results the worst case was the wall mounted orientation.

Orientation	Frequency	2 <sup>nd</sup> Harmonic	3 <sup>rd</sup> Harmonic	Band edge
	(MHz)	(dBuV/m)	(dBuV/m)	(dBuV/m)
Wall Mounted	2412.0	43.9	47.3	53.3
	2437.0	44.1	48.0	-
	2462.0	43.8	47.6	53.2
Ceiling Mounted	2412.0	43.7	47.2	53.0
	2437.0	44.0	47.6	-
	2462.0	43.8	47.5	52.9

Figure 1. Screening Results

### 2.2 EUT Exercise Software

No special exercise software was used.

### 2.3 Special Accessories

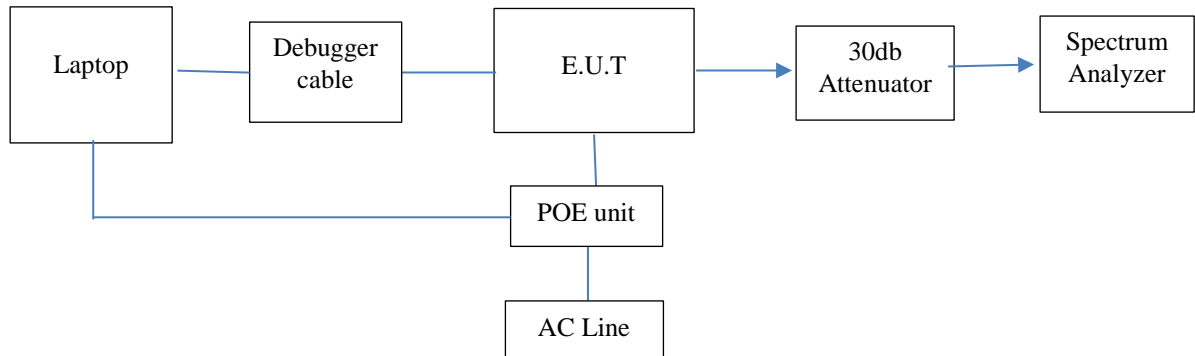
Equipment	Manufacturer	Model Number	Serial Number
POE Unit	CISCO	SB-PWR-INJ1	C1214657500
Laptop	Lenovo	T430	1451

### 2.4 Equipment Modifications

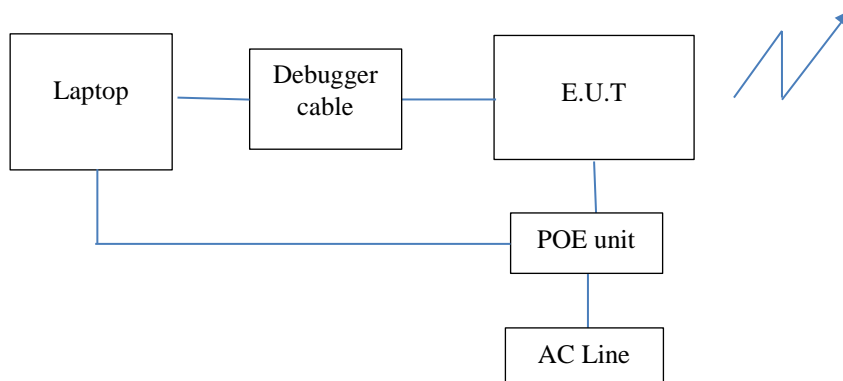
No modifications were necessary in order to achieve compliance.



## 2.5 Configuration of Tested System



**Figure 2. Configuration of Tested System - Conducted**



**Figure 3. Configuration of Tested System - Radiated**



## Declaration

Date: November 13, 2018

RE: model GW-1000, SKU: GW-1200

I hereby declare that the 2 WiFi transmitters contained in model GW-1000, SKU: GW-1200 do not transmit at the same time.

Reuven Amsalem  
VP HW R&D

### 3. Conducted & Radiated Measurement Test Set-Up Photos



Figure 4. Conducted Emission from AC Line Test



Figure 5. Radiated Emission Test, 0.009-30MHz



**Figure 6. Radiated Emission Test, 30-200MHz**

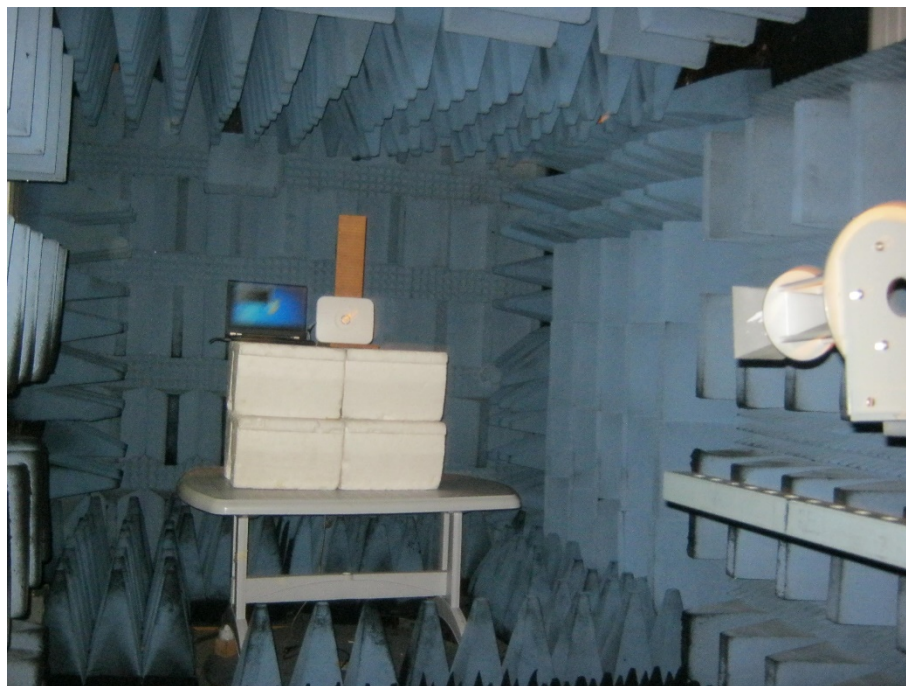


**Figure 7. Radiated Emission Test, 200-1000MHz**





**Figure 8. Radiated Emission Test, 1-18GHz**



**Figure 9. Radiated Emission Test, 18-26.5GHz**

## 4. Conducted Emission From AC Mains

### 4.1 Test Specification

FCC Part 15, Subpart C, Section 15.207  
RSS Gen, Issue 5, Clause 8.8

### 4.2 Test Procedure

(Temperature (22°C)/ Humidity (60%RH))

The E.U.T operation mode and test setup are as described in Section 2 of this report. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on a 0.8 meter high wooden table, 0.4 meter from the room's vertical wall. In the case of a floor-standing E.U.T., it was placed on the horizontal ground plane.

The E.U.T was powered from 115 V AC / 60 Hz via 50 Ohm / 50  $\mu$ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T.'s AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver and are displayed on the receiver's spectrum display.

The E.U.T was evaluated in TX operation mode.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

### 4.3 Test Limit

Frequency of emission (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.



#### **4.4 Test Results**

JUDGEMENT: Passed by 9.72 dB

The margin between the emission levels and the specification limit is, in the worst case, 9.72 dB for the phase line at 0.502 MHz and 9.73 dB at 0.502 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 10* to *Figure 13*.

## Conducted Emission

E.U.T Description      Gateway  
Type                      model: GW-1000  
                              SKU: GW-1200  
Serial Number:        Not designated

Specification:          FCC Part 15, Subpart C  
Lead:                    Phase  
Detectors: :            Peak, Quasi-peak, Average  
Power Operation        POE

EDIT PEAK LIST (Final Measurement Results)			
Trace1:	CE22BQP		
Trace2:	CE22BAP		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
2 Average	170 kHz	37.99	-16.96
1 Quasi Peak	174 kHz	45.58	-19.18
1 Quasi Peak	270 kHz	39.27	-21.84
2 Average	402 kHz	25.42	-22.38
2 Average	502 kHz	36.27	-9.72
1 Quasi Peak	534 kHz	38.25	-17.74
1 Quasi Peak	974 kHz	27.71	-28.28
2 Average	974 kHz	23.02	-22.97
1 Quasi Peak	1.406 MHz	26.94	-29.05
2 Average	1.438 MHz	22.74	-23.25
1 Quasi Peak	3.418 MHz	29.03	-26.96
2 Average	3.418 MHz	23.98	-22.01
1 Quasi Peak	4.15 MHz	29.65	-26.34
2 Average	4.882 MHz	29.36	-16.63
1 Quasi Peak	8.786 MHz	41.83	-18.16
2 Average	8.79 MHz	39.43	-10.56
1 Quasi Peak	14.89 MHz	37.36	-22.63
2 Average	15.866 MHz	37.51	-12.48
2 Average	17.818 MHz	33.26	-16.73
1 Quasi Peak	21.482 MHz	36.04	-23.95

Date: 23.AUG.2018 09:51:45

**Figure 10. Detectors: Peak, Quasi-peak, Average**

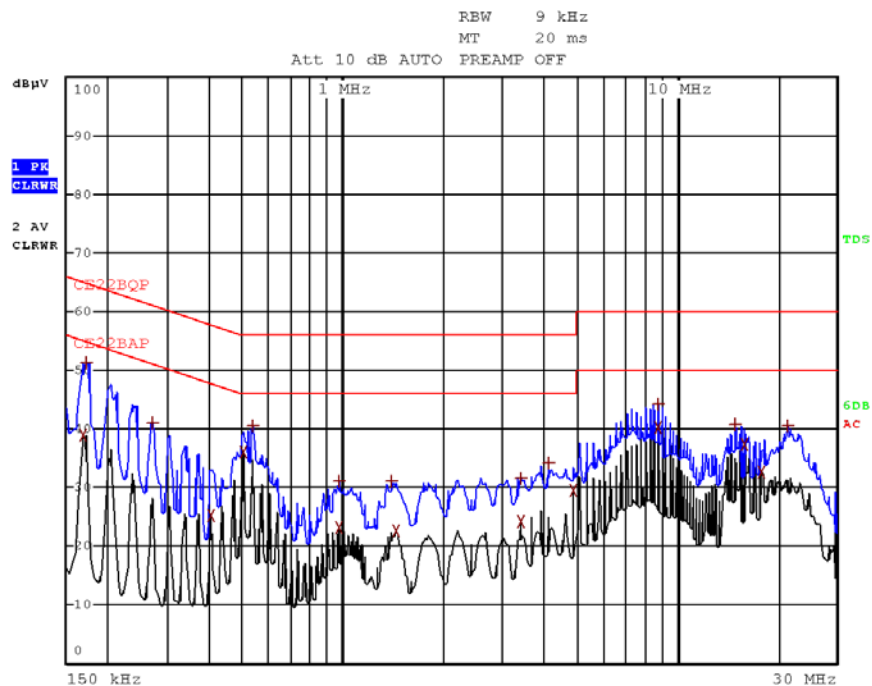
*Note: QP Delta/Av Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.*



## Conducted Emission

E.U.T Description	Gateway
Type	model: GW-1000 SKU: GW-1200
Serial Number:	Not designated

Specification:	FCC Part 15, Subpart C
Lead:	Phase
Detectors:	Peak, Quasi-peak, Average
Power Operation	POE



Date: 23.AUG.2018 09:50:26

Figure 11. Detectors: Peak, Quasi-peak, Average



## Conducted Emission

E.U.T Description    Gateway  
Type                    model: GW-1000  
                             SKU: GW-1200  
Serial Number:       Not designated

Specification:        FCC Part 15, Subpart C  
Lead:                   Neutral  
Detectors:            Peak, Quasi-peak, Average  
Power Operation      POE

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CE22BQP			
Trace2:	CE22BAP			
Trace3:	---			
	TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
2	Average	170 kHz	37.60	-17.35
1	Quasi Peak	174 kHz	45.20	-19.56
1	Quasi Peak	266 kHz	39.28	-21.95
2	Average	402 kHz	26.68	-21.13
2	Average	502 kHz	36.26	-9.73
1	Quasi Peak	534 kHz	38.56	-17.43
1	Quasi Peak	946 kHz	26.50	-29.49
2	Average	1.002 MHz	24.85	-21.15
2	Average	1.438 MHz	24.35	-21.65
1	Quasi Peak	1.466 MHz	28.97	-27.02
1	Quasi Peak	3.418 MHz	30.20	-25.79
2	Average	3.418 MHz	24.81	-21.18
1	Quasi Peak	3.906 MHz	31.75	-24.24
2	Average	4.882 MHz	29.49	-16.50
1	Quasi Peak	8.542 MHz	41.74	-18.25
2	Average	9.03 MHz	39.78	-10.21
1	Quasi Peak	15.622 MHz	37.66	-22.33
2	Average	15.866 MHz	37.18	-12.81
2	Average	17.818 MHz	32.58	-17.41
1	Quasi Peak	21.97 MHz	35.24	-24.75

Date: 23.AUG.2018 09:59:43

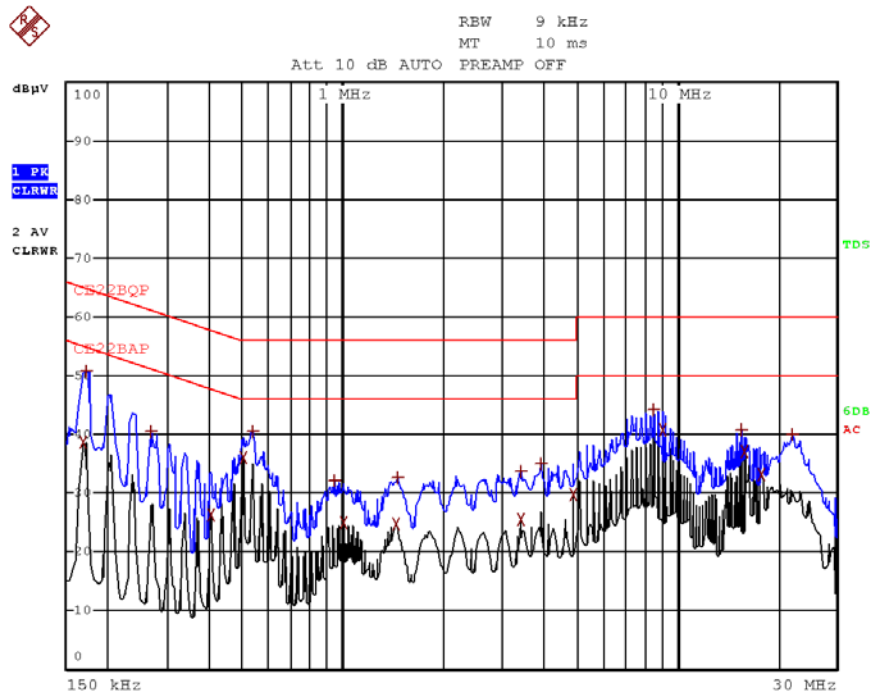
**Figure 12. Detectors: Peak, Quasi-peak, Average**

*Note: QP Delta/Av Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.*

## Conducted Emission

E.U.T Description    Gateway  
Type                    model: GW-1000  
                             SKU: GW-1200  
Serial Number:       Not designated

Specification:        FCC Part 15, Subpart C  
Lead:                   Neutral  
Detectors:            Peak, Quasi-peak, Average  
Power Operation      POE



Date: 23.AUG.2018 09:58:37

Figure 13 Detectors: Peak, Quasi-peak, Average



#### 4.5 *Test Equipment Used; Conducted Emission*

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Last Calibration Date</b>	<b>Next Calibration Due</b>
LISN	Fischer	FCC-LISN-25A	127	July 20, 2018	July 31, 2019
Transient Limiter	HP	11947A	3107A03041	June 25, 2018	June 25, 2019
EMI Receiver	Rohde & Schwarz	ESCI7	100724	February 19, 2018	February 19, 2019
Low Loss Cable	Testline 18 + RJ214	11556	-	March 31, 2018	March 31, 2019

**Figure 14 Test Equipment Used**

## 5. 6 dB Minimum Bandwidth

### 5.1 Test Specification

FCC Part 15, Subpart C, Section 247(a)(2)

RSS 247, Issue 2, section 5.2(a)

### 5.2 Test Procedure

(Temperature (22°C)/ Humidity (61%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss=31.0 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

The spectrum bandwidth of the E.U.T. at the point of 6 dB below maximum peak power was measured and recorded. The RBW was set to 100 kHz.

### 5.3 Test Limit

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 5.4 Test Results

Protocol Type	Operation Frequency	Reading	Limit
	(MHz)	(kHz)	(kHz)
Wi-fi/b(1Mbit/s)	2412.0	10,000.0	>500.0
	2437.0	9,966.0	>500.0
	2462.0	9,900.0	>500.0

Figure 15 6 dB Minimum Bandwidth

JUDGEMENT: Passed

For additional information see *Figure 16 to Figure 18*.

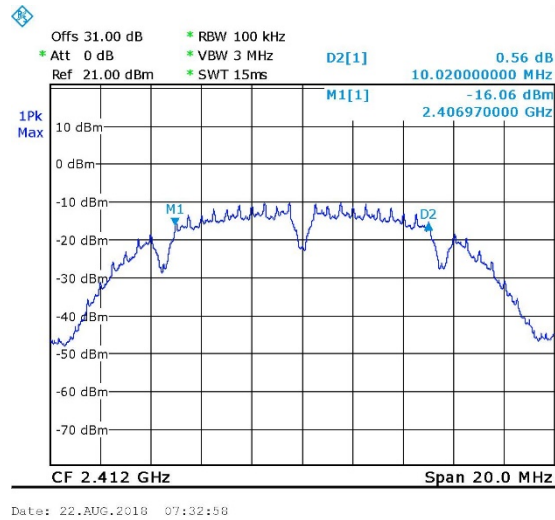


Figure 16. 2412.0 MHz, Wi-fi/b(1Mbit/s)

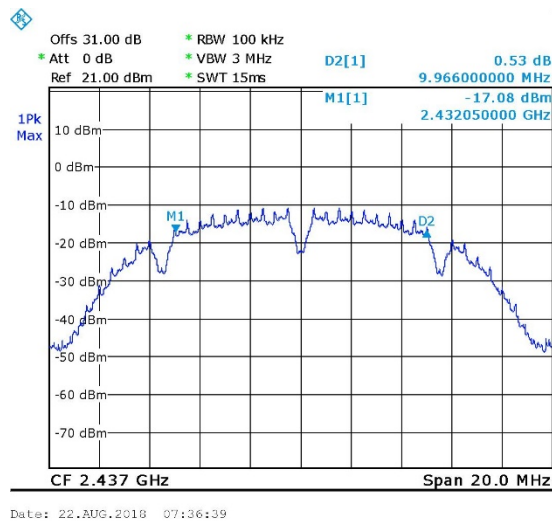


Figure 17. 2437.0 MHz, Wi-fi/b(1Mbit/s)

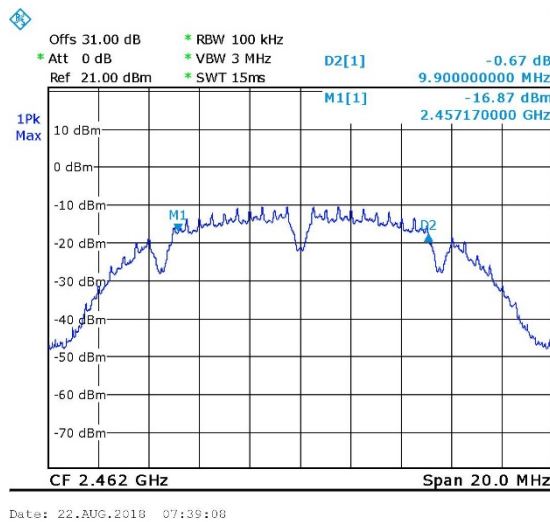


Figure 18. 2462.0 MHz, Wi-fi/b(1Mbit/s)



### 5.5 *Test Equipment Used; 6dB Bandwidth*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	February 19, 2018	February 19, 2019
30dB Attenuator	MCL	BW-S30W5	533	October 1, 2017	October 1, 2018
RF cable	Huber Suner	Sucofelex	27502/4PEA	October 1, 2017	October 1, 2018

**Figure 19 Test Equipment Used**

## 6. Maximum Conducted Output Power

### 6.1 Test Specification

FCC, Part 15, Subpart C, Section 247(b)(3)

RSS 247, Issue 2, section 5.4(d)

### 6.2 Test Procedure

(Temperature (22°C)/ Humidity (61%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss=31.0 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

### 6.3 Test Limit

The maximum peak conducted output power of the intentional radiator for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

### 6.4 Test Results

Protocol Type	Operation Frequency	Power	Power	Limit	Margin
	(MHz)	(dBm)	(mW)	(mW)	(mW)
Wi-fi/b (1Mbit/s)	2412.0	3.6	2.29	1000.0	-997.71
	2437.0	3.1	2.04	1000.0	-997.96
	2462.0	3.4	2.19	1000.0	-997.81

Figure 20 Maximum Peak Power Output

JUDGEMENT: Passed by 997.71 mW

For additional information see *Figure 21* to *Figure 23*.



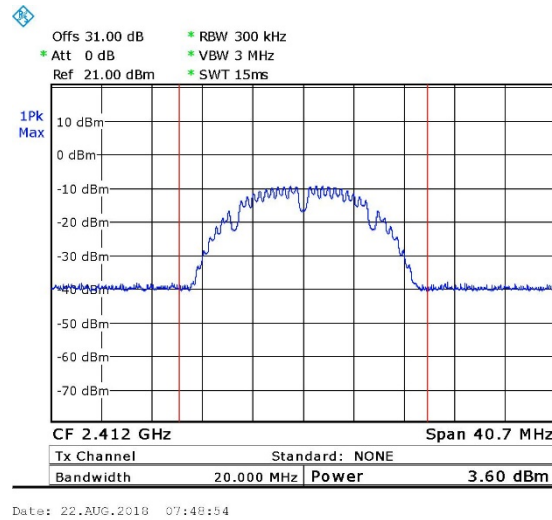


Figure 21. 2412.0 MHz, Wi-fi/b(1Mbit/s)

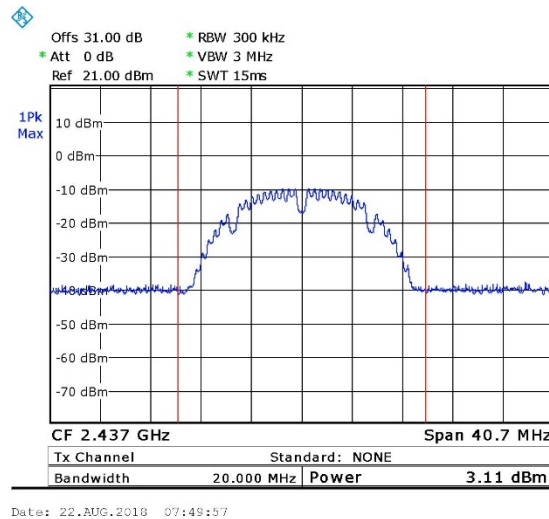


Figure 22. 2437.0 MHz, Wi-fi/b(1Mbit/s)

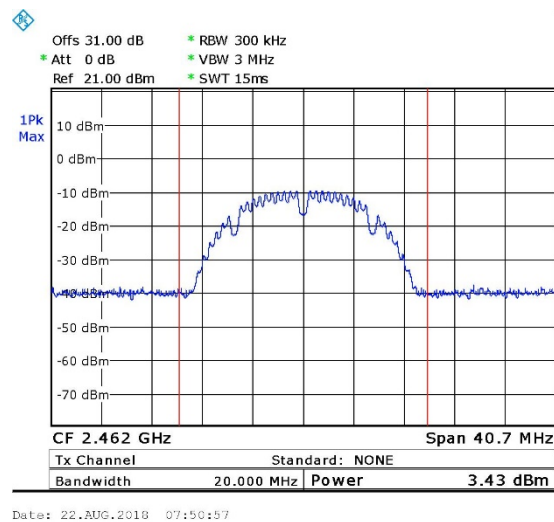


Figure 23. 2462.0 MHz, Wi-fi/b(1Mbit/s)



## 6.5 Test Equipment Used; Maximum Peak Power Output

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	February 19, 2018	February 19, 2019
30dB Attenuator	MCL	BW-S30W5	533	October 1, 2017	October 1, 2018
RF cable	Huber Suner	Sucofelex	27502/4PEA	October 1, 2017	October 1, 2018

Figure 24 Test Equipment Used

## 7. Band Edge Spectrum

### 7.1 Test Specification

FCC, Part 15, Subpart C, Section 247(d)

RSS 247, Issue 2, section 5.5

### 7.2 Test Procedure

(Temperature (22°C)/ Humidity (61%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (loss=31.0 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

The RBW was set to 100 kHz.

### 7.3 Test Limit

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.

### 7.4 Test Results

Protocol Type	Operation Frequency	Band Edge Frequency	Spectrum Level	Limit	Margin
	(MHz)	(MHz)	(dBm)	(dBm)	(dB)
Wi-fi/b(1Mbit/s)	2412.0	2400.0	-47.4	-30.9	-16.5
	2462.0	2483.5	-47.5	-31.0	-16.5

Figure 25 Band Edge Spectrum

JUDGEMENT: Passed by 16.5dB

For additional information see *Figure 26* and *Figure 27*.

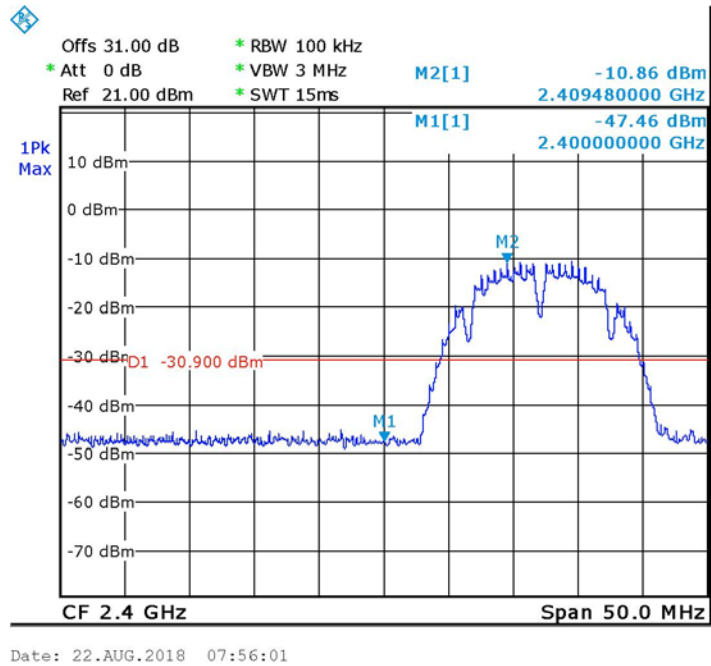


Figure 26 Band Edge Low, Wi-fi/b(1Mbit/s)

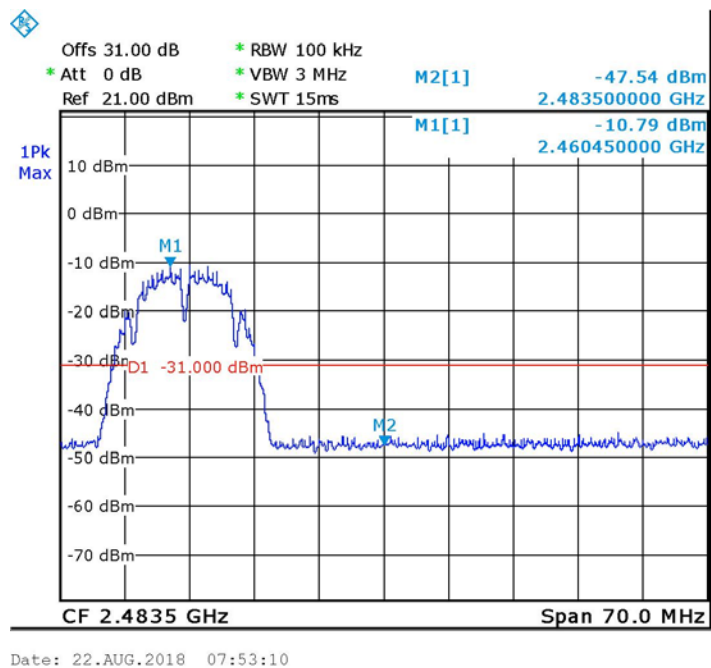


Figure 27 Band Edge High, Wi-fi/b(1Mbit/s)



### 7.5 *Test Equipment Used; Band Edge*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	February 19, 2018	February 19, 2019
30dB Attenuator	MCL	BW-S30W5	533	October 1, 2017	October 1, 2018
RF Cable	Huber Suner	Sucofelex	27502/4PEA	October 1, 2017	October 1, 2018

**Figure 28 Test Equipment Used**

## 8. Emissions in Non-Restricted Frequency Bands

### 8.1 Test Specification

FCC, Part 15, Subpart C, Section 247(d)

RSS 247, Issue 2, section 5.5

### 8.2 Test Procedure

(Temperature (22°C)/ Humidity (60%RH))

The E.U.T. operation mode and test set-up are as described in Section 2 of this report.

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (max total loss=34.0 dB).

Special attention was taken to prevent Spectrum Analyzer RF input overload.

RBW was set to 100kHz, detector set to max peak and trace to “max hold”.

### 8.3 Test Limit

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.

### 8.4 Test Results

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 247(d) specification.

For additional information see *Figure 29* to *Figure 31*.

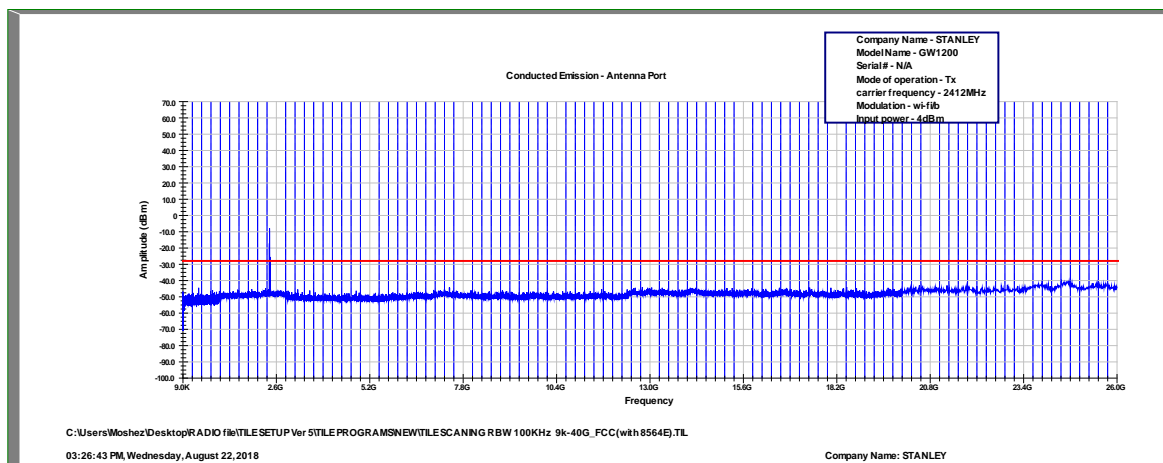


Figure 29 2412.0 MHz, WI-FI/b(1Mbit/s)

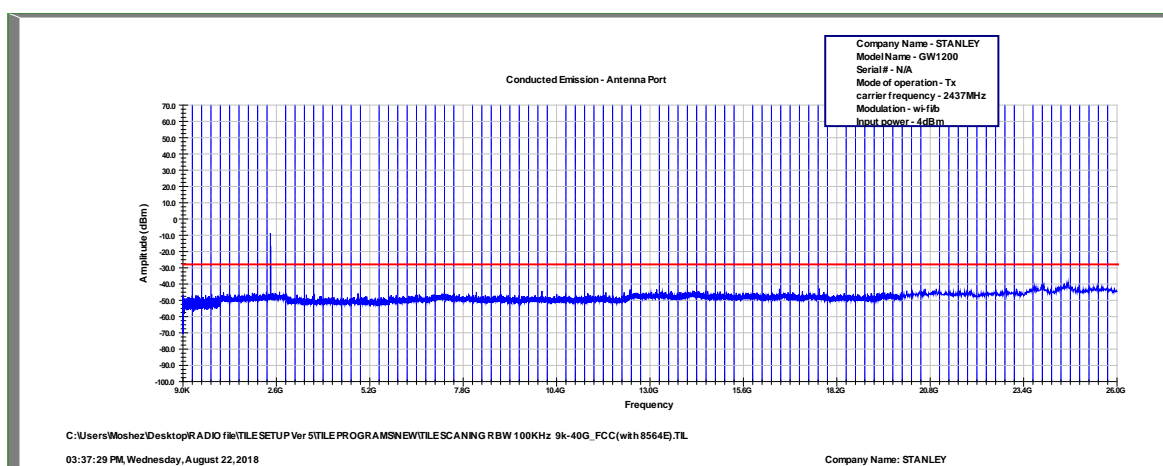


Figure 30 2437.0 MHz, WI-FI/b(1Mbit/s)

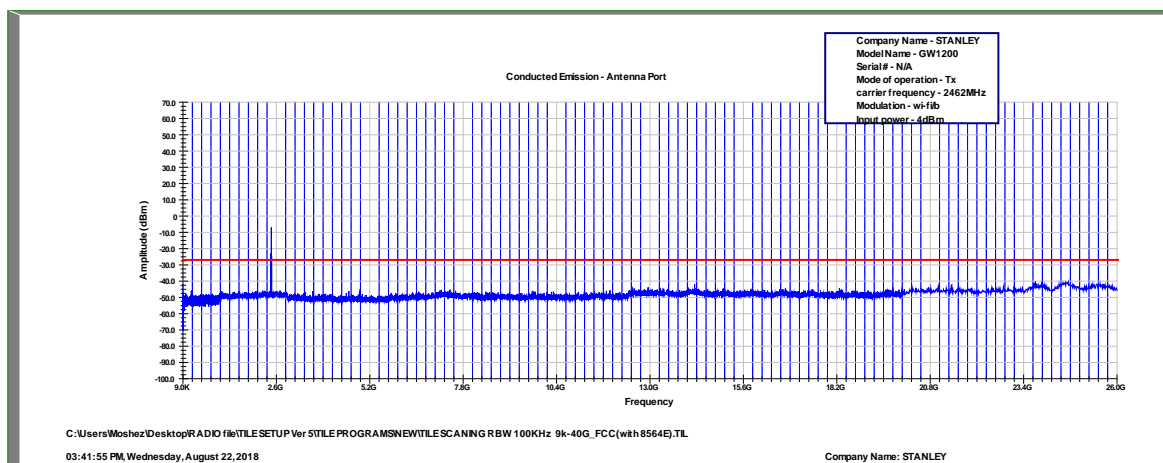


Figure 31 2462.0 MHz, WI-FI/b(1Mbit/s)

Note: All peaks in plots are the fundamental transmission frequency.



**8.1 Test Instrumentation Used, Emission in Non Restricted Frequency Bands**

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Last Calibration Date</b>	<b>Next Calibration Due</b>
Spectrum Analyzer	HP	8564E	3442A00275	February 28, 2018	February 28, 2019
30dB Attenuator	MCL	BW-S30W5	533	October 1, 2017	October 1, 2018
RF Cable	Huber Suner	Sucofelex	27502/4PEA	October 1, 2017	October 1, 2018

**Figure 32 Test Equipment Used**



## 9. Emissions in Restricted Frequency Bands

### 9.1 Test Specification

FCC Part 15, Subpart C, Sections 15.209, 15.205, 15.247(d)

RSS 247, Issue 2, section 3.3

RSS Gen, Issue 5, section 8.10

### 9.2 Test Procedure

(Temperature (23°C)/ Humidity (65%RH))

The E.U.T. operation mode and test set-up are as described in Section 2 of this report.

#### **For measurements between 0.009-30MHz:**

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 0.8 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.

The frequency range 0.009MHz-30MHz was scanned.

#### **For measurements between 30-1000MHz:**

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. The frequency range 30MHz -1000MHz was scanned and the list of the highest emissions was verified and updated accordingly.

#### **For measurements between 1GHz-25GHz:**

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 1.5 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.

The frequency range 1GHz -25GHz was scanned.

Tests were performed for all “worst case” of each protocol type. The highest radiations are described in the tables below.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

### 9.3 Test Limit

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)).

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	Field strength* (dBµV/m)	Field strength* (dBµV/m)@3m
0.009-0.490	2400/F(kHz)	300	48.5-13.8	128.5-73.8
0.490-1.705	24000/F(kHz)	30	33.8-23.0	73.8-63.0
1.705-30.0	30	30	29.5	69.5
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

\*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

**Figure 33 Table of Limits**

### 9.4 Test Results

JUDGEMENT: Passed by 10.0 dB

For the operation frequency of 2412 MHz, the margin between the emission level and the specification limit is in the worst case 10.1 dB at the frequency of 2390.0 MHz, horizontal polarization.

For the operation frequency of 2437 MHz, the margin between the emission level and the specification limit is in the worst case 25.8 dB at the frequency of 7311.0 MHz, vertical polarization.

For the operation frequency of 2462 MHz, the margin between the emission level and the specification limit is in the worst case 10.0 dB at the frequency of 2483.5 MHz, vertical polarization.

The EUT met the requirements of the F.C.C. Part 15, Subpart C Sections 15.209, 15.205, 15.247(d) specifications.

The details of the highest emissions are given in *Figure 34*.

## Radiated Emission

E.U.T Description Gateway  
Type model: GW-1000  
SKU: GW-1200  
Serial Number: Not designated

Specifications: FCC, Part 15, Subpart C, Sections 15.209, 15.205, 15.247(d)  
RSS 247, Issue 2, section 3.3 RSS Gen, Issue 5, section 8.10

Antenna Polarization: Horizontal/Vertical Frequency Range: 9KHz to 25.0 GHz  
Protocol type: WI-FI/b(1Mbps) Detector: Peak, Average

Operation Frequency	Freq.	Pol	Peak Reading	Peak Limit	Peak Margin	Average Reading	Average Limit	Average Margin
(MHz)	(MHz)	(H/V)	(dBμV/m)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
2412.0	2390.0	V	53.5	74.0	-20.5	43.5	54.0	-10.5
	2390.0	H	53.4	74.0	-20.6	43.9	54.0	-10.1
	4824.0	V	44.2	74.0	-29.8	-	54.0	-
	4824.0	H	44.0	74.0	-30.0	-	54.0	-
2437.0	4874.0	V	44.5	74.0	-29.5	-	54.0	-
	4874.0	H	44.3	74.0	-29.7	-	54.0	-
	7311.0	V	48.2	74.0	-25.8	-	54.0	-
	7311.0	H	48.0	74.0	-26.0	-	54.0	-
2462.0	4924.0	V	43.9	74.0	-30.1	-	54.0	-
	4924.0	H	44.1	74.0	-29.9	-	54.0	-
	2483.5	V	53.1	74.0	-20.9	44.0	54.0	-10.0
	2483.5	H	53.4	74.0	-20.6	43.8	54.0	-10.2

**Figure 34. Radiated Emission Results**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Amp” includes correction factor.

\* “Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

## 9.5 Test Instrumentation Used; Emissions in Restricted Frequency Bands

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 19, 2018	February 19, 2019
EMI Receiver	HP	8542E	3906A00276	February 19, 2018	February 19, 2019
RF Filter Section	HP	85420E	3705A00248	February 19, 2018	February 19, 2019
Spectrum Analyzer	HP	8593EM	3536A00120 ADI	February 20, 2018	February 20, 2019
Biconical Antenna	EMCO	3110B	9912-3337	May 15, 2017	May 15, 2019
Log Periodic Antenna	EMCO	3146	9505-4081	May 31, 2018	May 31, 2019
Horn Antenna	ETS	3115	29845	May 31, 2018	May 31, 2021
Horn Antenna	ARA	SWH-28	1007	December 13, 2017	December 13, 2020
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2017	October 19, 2018
MicroWave System Amplifier	HP	83006A	3104A00589	October 1, 2017	October 1, 2018
Low noise amplifier 1GHz-18GHz	Miteq	AFSX4-02001800-50-8P	-	October 1, 2017	October 1, 2018
RF cable chamber	Commscope ORS (Serge)	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
RF Cable OATS	EIM	RG214-11N(X2)	-	August 13, 2017	August 30, 2018
Pass Band Filter	Meuro	MFL040120H50	902252	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR
Antenna Mast	ETS	2070-2	9608-1497	NCR	NCR
Turntable	ETS	2087	-	NCR	NCR
Mast & Table Controller	ETS/EMCO	2090	9608-1456	NCR	NCR

**Figure 35 Test Equipment Used**

## 11. Transmitted Power Density

### 11.1 Test Specification

FCC, Part 15, Subpart C, Section 247(e)

RSS 247, Issue 2, section 5.2(b)

### 11.2 Test Procedure

(Temperature (22°C)/ Humidity (61%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss= 31.0dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

The spectrum analyzer was set to 3 kHz RBW.

### 11.3 Test Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 11.4 Test Results

Protocol Type	Operation Frequency	PSD reading	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Wi-fi/b(1Mbit/s)	2412.0	-25.9	8.0	-33.9
	2437.0	-26.4	8.0	-34.4
	2462.0	-25.8	8.0	-33.8

Figure 36 Test Results

JUDGEMENT: Passed by 33.8dB

For additional information see *Figure 37 to Figure 39*.

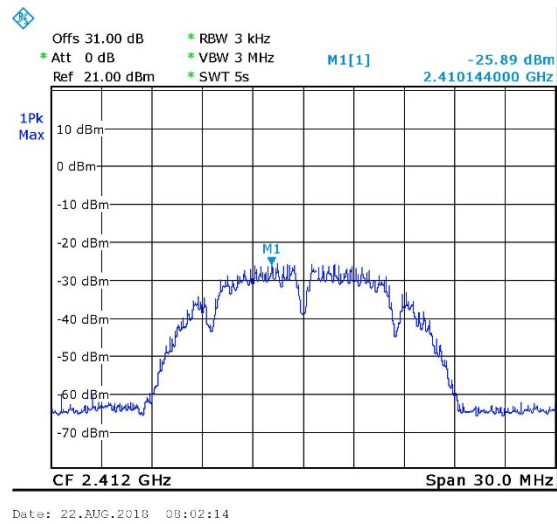


Figure 37. 2412.0 MHz, Wi-fi/b(1Mbit/s)

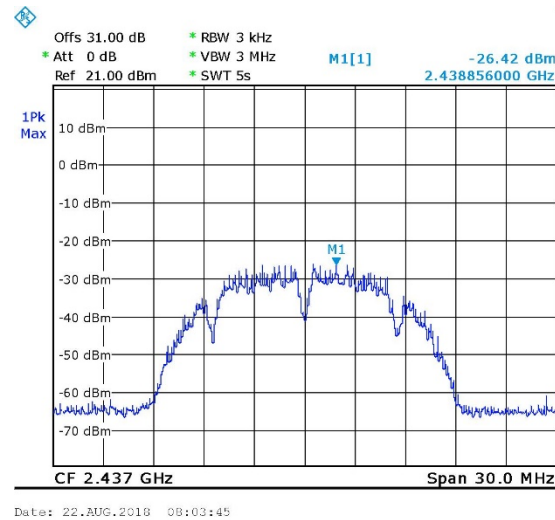


Figure 38. 2437.0 MHz, Wi-fi/b(1Mbit/s)

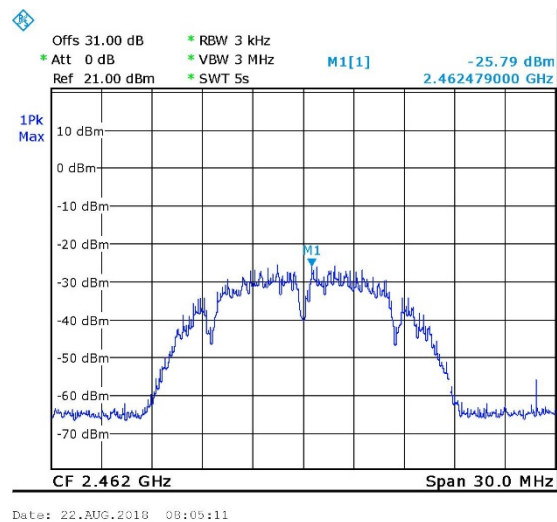


Figure 39. 2462.0 MHz, Wi-fi/b(1Mbit/s)



**11.5 Test Equipment Used; Transmitted Power Density**

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Last Calibration Date</b>	<b>Next Calibration Due</b>
Spectrum Analyzer	R&S	FSL6	100194	February 19, 2018	February 19, 2019
30dB Attenuator	MCL	BW-S30W5	533	October 1, 2017	October 1, 2018
RF Cable	Huber Suner	Sucofelex	27502/4PEA	October 1, 2017	October 1, 2018

**Figure 40 Test Equipment Used**

## 12. Occupied Bandwidth

### 12.1 Test Specification

FCC, Part 2, Sub part J, Section 2.1049

RSS-Gen, Issue 5, 2018, Section 6.6

### 12.2 Test Procedure

(Temperature (22°C)/ Humidity (61%RH))

The E.U.T. operation mode and test set-up are as described in Section 2 of this report.

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss= 31.0dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

The RBW set to the range of 1% to 5% of the OBW. The span was set to ~ 3 times the OBW.

99% occupied bandwidth function was set on.

### 12.3 Test Limit

N/A

### 12.4 Test Results

Protocol Type	Operation Frequency	Reading
	(MHz)	(MHz)
Wi-fi/b(1Mbit/s)	2412.0	14.3
	2437.0	14.3
	2462.0	14.3

Figure 41. Bandwidth Test Results

JUDGEMENT: N/A

See additional information in *Figure 42* to *Figure 44*.



## Occupied Bandwidth

E.U.T Description    Gateway  
Model Number        model: GW-1000  
SKU: GW-1200  
Part Number:        Not designated

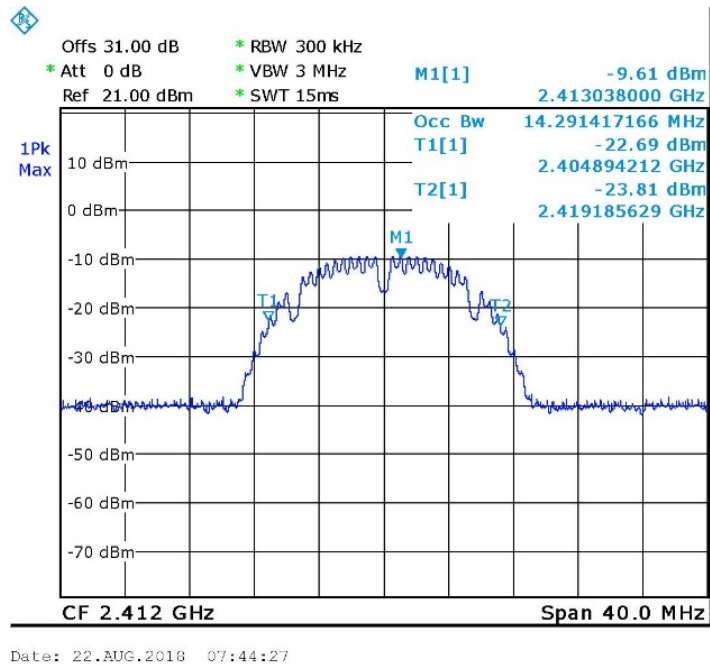


Figure 42. 2412.0 MHz, Wi-fi/b(1Mbit/s)

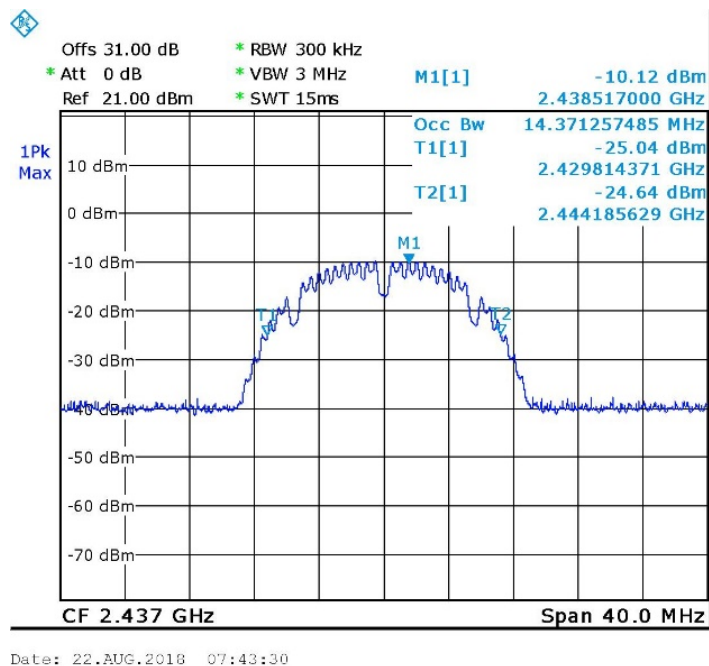
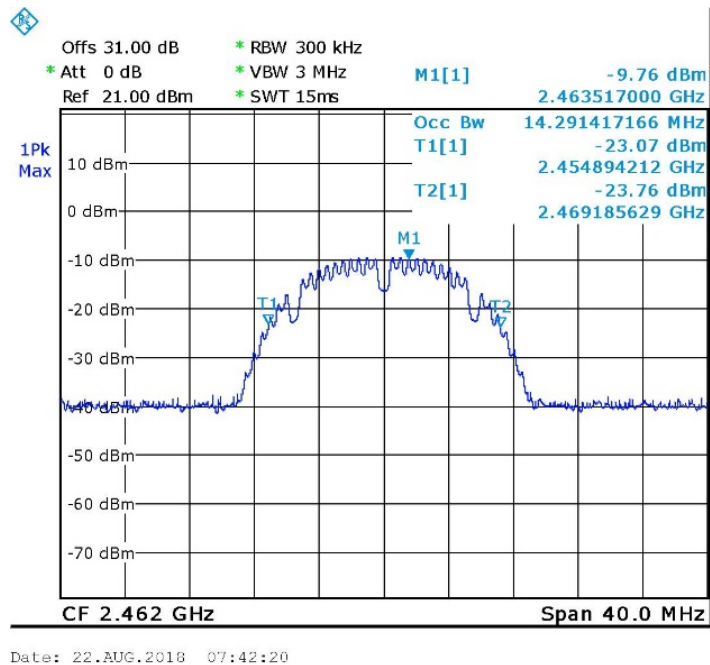


Figure 43. 2437.0 MHz, Wi-fi/b(1Mbit/s)



**Figure 44. 2462.0 MHz, Wi-fi/b(1Mbit/s)**

### 12.5 Test Equipment Used; Bandwidth

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	February 19, 2018	February 19, 2019
30dB Attenuator	MCL	BW-S30W5	533	October 1, 2017	October 1, 2018
RF Cable	Huber Suner	Sucofelex	27502/4PE A	October 1, 2017	October 1, 2018

### Figure 45 Test Equipment Used



## 13. Antenna Gain/Information

The antenna gain is 2.5 dBi.



**D-Puck Antenna**  
**Internal Wireless PIFA Antenna**

## 14. R.F Exposure/Safety

Typical use of the E.U.T. is as a gateway.

The typical placement is in a hospital on wall or ceiling. The typical distance between the E.U.T. and the user is 20 cm.

### Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1310 Requirements

(a) FCC limits at 2412 MHz is:  $1 \frac{mW}{cm^2}$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

P<sub>t</sub>- Transmitted Peak Power =3.6dBm (testing performed conducted; power results do not include antenna gain)

G<sub>T</sub>- Antenna Gain, 2.5 dBi

R- Distance from Transmitter using 20cm worst case

(c) The peak power density is:

$$S = 3.6 + 2.5 = 6.1 \text{ dBm converted to mW} = 4.1$$

$$4.1/4\pi(20)^2 = 8.15 \times 10^{-4} \text{ mw/cm}^2$$

(d) This is below the FCC limit.

## 15. APPENDIX A - CORRECTION FACTORS

### 15.1 Correction factors for

**RF OATS Cable 35m ITL #1879**

Frequency (MHz)	Cable loss (dB)
30.0	1.1
50.0	1.1
100.0	1.7
150.0	2.1
200.0	2.5
250.0	2.7
300.0	2.9
350.0	3.1
400.0	3.5
450.0	3.7
500.0	3.9
550.0	4.0
600.0	4.2
650.0	4.4
700.0	4.9
750.0	5.0
800.0	5.0
850.0	4.9
900.0	5.0
950.0	5.1
1000.0	5.4



**15.2 Correction factor for RF CABLE for Semi Anechoic Chamber**  
**ITL # 1841**

FREQ (MHz)	LOSS (dB)
1000.0	1.5
2000.0	2.1
3000.0	2.7
4000.0	3.1
5000.0	3.5
6000.0	4.1
7000.0	4.6
8000.0	4.9
9000.0	5.7
10000.0	5.7
11000.0	6.1
12000.0	6.1
13000.0	6.2
14000.0	6.7
15000.0	7.4
16000.0	7.5
17000.0	7.9
18000.0	8.1
19000.0	8.8
20000.0	9.1

**NOTES:**

- 1. The cable is manufactured by Commscope*
- 2. The cable type is 0623 WBC-400, serial # G020132 and 10m long*



### 15.3 Correction factors for Active Loop Antenna

**Model 6502 S/N 9506-2950**

**ITL # 1075:**

f(MHz)	MAF(dBs/m)	AF(dB/m)
0.01	-33.1	18.4
0.02	-37.2	14.3
0.03	-38.2	13.3
0.05	-39.8	11.7
0.1	-40.1	11.4
0.2	-40.3	11.2
0.3	-40.3	11.2
0.5	-40.3	11.2
0.7	-40.3	11.2
1	-40.1	11.4
2	-40	11.5
3	-40	11.5
4	-40.1	11.4
5	-40.2	11.3
6	-40.4	11.1
7	-40.4	11.1
8	-40.4	11.1
9	-40.5	11
10	-40.5	11
20	-41.5	10
30	-43.5	8



**15.4 Correction factors for biconical antenna – ITL # 1356**

**Model: EMCO 3110B**

**Serial No.:9912-3337**

Frequency	ITL 1356 AF
[MHz]	[dB/m]
30	13.00
35	10.89
40	10.59
45	10.63
50	10.12
60	9.26
70	7.74
80	6.63
90	8.23
100	11.12
120	13.16
140	13.07
160	14.80
180	16.95
200	17.17





**15.5 Correction factors for log periodic antenna – ITL # 1349**

**Model: EMCO 3146**

**Serial No.:9505-4081**

Frequency	ITL 1349 AF
[MHz]	[dB/m]
200	11.58
250	12.04
300	14.76
400	15.55
500	17.85
600	18.66
700	20.87
800	21.15
900	22.32
1000	24.22



## 15.6 Correction factors for Double –Ridged Waveguide Horn ANTENNA

Model: 3115

Serial number:29845

3 meter range; ITL # 1352

FREQUENCY	AFE	FREQUENCY	AFE
(GHz)	(dB/m)	(GHz)	(dB/m)
0.75	25	9.5	38
1.0	23.5	10.0	38.5
1.5	26.0	10.5	38.5
2.0	29.0	11.0	38.5
2.5	27.5	11.5	38.5
3.0	30.0	12.0	38.0
3.5	31.5	12.5	38.5
4.0	32.5	13.0	40.0
4.5	32.5	13.5	41.0
5.0	33.0	14.0	40.0
5.5	35.0	14.5	39.0
6.0	36.5	15.0	38.0
6.5	36.5	15.5	37.5
7.0	37.5	16.0	37.5
7.5	37.5	16.5	39.0
8.0	37.5	17.0	40.0
8.5	38.0	17.5	42.0
9.0	37.5	18.0	42.5



## 15.7 Correction factors for

## Horn Antenna

Model: SWH-28

at 3 meter range.

ITL #:1353

### CALIBRATION DATA

3 m distance

Frequency, MHz	Measured antenna factor, dB/m <sup>1)</sup>
18000	32.4
18500	32.0
19000	32.3
19500	32.4
20000	32.3
20500	32.8
21000	32.8
21500	32.7
22000	33.1
22500	33.0
23000	33.1
23500	33.8
24000	33.5
24500	33.5
25000	33.8
25500	33.9
26000	34.2
26500	34.7

<sup>1)</sup> The antenna factor shall be added to receiver reading in dB $\mu$ V to obtain field strength in dB $\mu$ V/m.