

Global EMC Inc. Labs EMC & RF Test Report

As per

RSS 247 Issue 1

&

FCC Part 15 Subpart C

Unlicensed Intentional Radiators

on the

Wireless Gate Sensor Module



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Testing produced for



See Appendix A for full customer & EUT details.





Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

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Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Report Scope

This report addresses the EMC verification testing and test results of the Wireless Gate Sensor Receiver, herein referred to as EUT (Equipment Under Test) performed at Global EMC Labs.

The EUT was tested for compliance against the following standards:


RSS 247 Issue 1 / FCC Part 15 Subpart C 15

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

The results contained in this report relate only to the item(s) tested.

This report does not imply product endorsement by A2LA or any other accreditation agency, any government, or Global EMC Inc.


Opinions/interpretations expressed in this report, if any, are outside the scope of Global EMC Inc accreditation. Any opinions expressed do not necessarily reflect the opinions of Global EMC Inc, unless otherwise stated.

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Summary

The results contained in this report relate only to the item(s) tested.


EUT FCC Certification #, FCC ID:	I5TE7EM0201
EUT Industry Canada Certification #, IC:	1454B-E7EM0201
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Scott Drysdale

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS 247 (Table 1)	Restricted Bands for intentional operation	None	Pass
FCC 15.207	Power line conducted emissions	QuasiPeak Average	Pass See Justifications
FCC 15.209 RSS-247 5.5	Spurious Radiated emissions	QuasiPeak Average	Pass
FCC 15.247(a)2 RSS-247 5.2.1	6 dB Bandwidth	> 500 kHz	Pass
FCC 15.247(b)2 RSS-247 5.4	Max output power	< 1 Watt	Pass
FCC 15.247(b)(4) RSS-247 5.4.4	Antenna Gain	< 6 dBi	Pass See Justifications
FCC 15.247(d) RSS-247 5.5	Antenna conducted spurious	< 20 dBc	Pass
FCC 15.247(e) RSS-247 5.2.2	Spectral Density	< 8 dBm (3 kHz BW)	Pass
FCC 15.247(i) IC Safety code 6	Maximum Permissible Exposure	> 20 cm separation.	Pass See justification and calculations
Overall Result			PASS

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued. Note that 'PASS' / 'FAIL' grade is independent of any measurement uncertainties. A 'PASS' / 'FAIL' grade within measurement uncertainty is marked with a '*'.

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Justifications, Descriptions, or Deviations

The following justifications for tests not performed or deviations from the above listed specifications apply:

For the Antenna requirement specified in FCC 15.203 , this device has external antenna(s) connected with a U.fl connector type.

For the Restricted Bands of operation, the EUT is designed to only operate between 915.4 to 920.5 MHz.

For the power line conducted emissions requirements, the EUT is DC powered, with no provisions to connect to the mains and this test does not apply.


For the scope of this testing the EUT was pre-scanned in three orthogonal axis to maximize emissions. Maximum emissions were found in the vertical EUT polarization. This setup was used for all testing in this report. Additionally, normally the EUT would be operated in this orientation.

For the Antenna gain, this device is designed to use an antenna with a rated gain of 1.6 dBi, however marginally more gain was observed by comparing the conducted emissions with the radiated emissions, but within measurement uncertainty and significantly less than 6 dBi.

The EUT was tested in both transmit and standby (receive) mode. No difference in emissions below 900 MHz were observed, and the worst case (transmit) mode is presented as representative for both modes.


This device was scanned with both solar powered and battery powered, no differences were observed, and the worst case results are presented.

For maximum permissible exposure, as per 447498 D01 General RF Exposure Guidance v05r02, section 4.3.1 this device operates at less than 25 mW (20.9 mW) at 915 MHz and is designed to operate at or greater than 20 cm or more from personnel during normal operation. No testing is required.

Client	Senstar Corporation	
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Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Applicable Standards, Specifications and Methods

- ANSI C63.4:2014 - Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
- ANSI C63.10:2013 - American national standard for testing unlicensed wireless devices
- CFR 47 FCC 15 - Code of Federal Regulations – Radio Frequency Devices
- CISPR 22:2008 - Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
- ICES-003:2012 - Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
- ISO 17025:2005 - General Requirements for the competence of testing and calibration laboratories
- RSS-247:2015 - Issue 1: Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

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Sample calculation(s)


Margin = limit – (received signal + antenna factor + cable loss – pre-amp gain)

Margin = 50.5dBuV/m – (50dBuV + 10dB + 2.5dB – 20dB)

Margin = 8.5 dB

Document Revision Status

Revision 1 – Jan 24, 2016

Client	Senstar Corporation	
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Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

AE – Auxiliary Equipment.

BW – Bandwidth. Unless otherwise stated, this refers to the 6 dB bandwidth.

EMC – Electro-Magnetic Compatibility

EMI – Electro-Magnetic Immunity


EUT – Equipment Under Test

ITE – Information Technology Equipment with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

LISN – Line impedance stabilization network

NCR – No Calibration Required

RF – Radio Frequency


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Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Testing Facility

Testing for EMC on the EUT was carried out at Global EMC labs in Montréal, Québec, Canada. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on an EUT with a maximum width or length of up to 2m and height up to 3m. The chamber is equipped with a turn table that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120 Vac and 240Vac single phase, or 208 Vac 3 phase input. DC capability is also available. The chamber is equipped with an antenna mast that controls polarization and height from the control room adjoining the shielded chamber. Radiated emissions measurements are performed using a Bilog, and Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN.

Calibrations and Accreditations


The measurement site used is registered with Federal Communications Commission (FCC) and Industry Canada (IC). This site is calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”. The semi-anechoic chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

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Testing Environmental Conditions and Dates

Following were the environmental conditions in the facility during time of testing –

Date	Test	Init.	Temperature (°C)	Humidity (%)	Pressure (kPa)
Nov 15, 2015	Radiated	SD	22.5°C	30-45%	98 -103kPa
Nov 16, 2015	Antenna Conducted	SD	21°C	30-45%	98 -103kPa

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Detailed Test Results Section

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Radiated Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limit(s) and Method

The method is as defined in ANSI C63.4

The limits are as defined in FCC Part 15, Section 15.209:


0.009 MHz – 0.490 MHz, 2400/F(kHz) uV/m at 300 m⁴
0.490 MHz – 1.705 MHz, 24000/F(kHz) uV/m at 30 m⁴
1.705 MHz – 30 MHz, 30 uV/m at 30 m⁴
30 MHz – 88 MHz, 100 uV/m (40.0 dBuV/m¹) at 3 m
88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m¹) at 3 m
216 MHz – 960 MHz, 200 uV/m (46.0 dBuV/m¹) at 3 m
Above 960 MHz, 500 uV/m (54.0 dBuV/m¹) at 3 m
Above 1000 MHz, 500 uV/m (54 dBuV/m²) at 3m
Above 1000 MHz, 5000 uV/m (74 dBuV/m³) at 3m

¹Limit is with 120 kHz measurement bandwidth and a using a Quasi Peak detector.

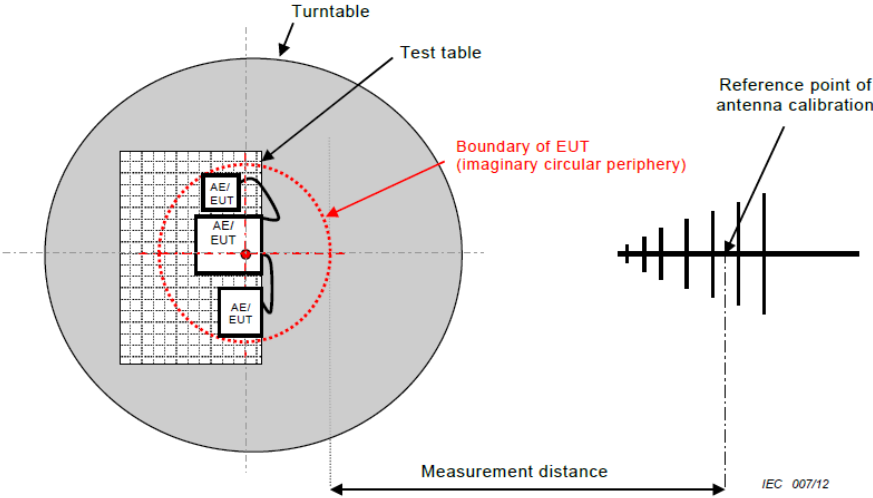
²Limit is with 1 MHz measurement bandwidth and using an Average detector


³Limit is with 1 MHz measurement bandwidth and using an Peak detector

⁴Limit is with using a Quasi-peak detector with a bandwidth as defined in CISPR 16-1-1

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Typical Radiated Emissions Setup



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Measurement Uncertainty


The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-4.4 dB with a 'k=2' coverage factor and a 95% confidence level.

Preliminary Graphs

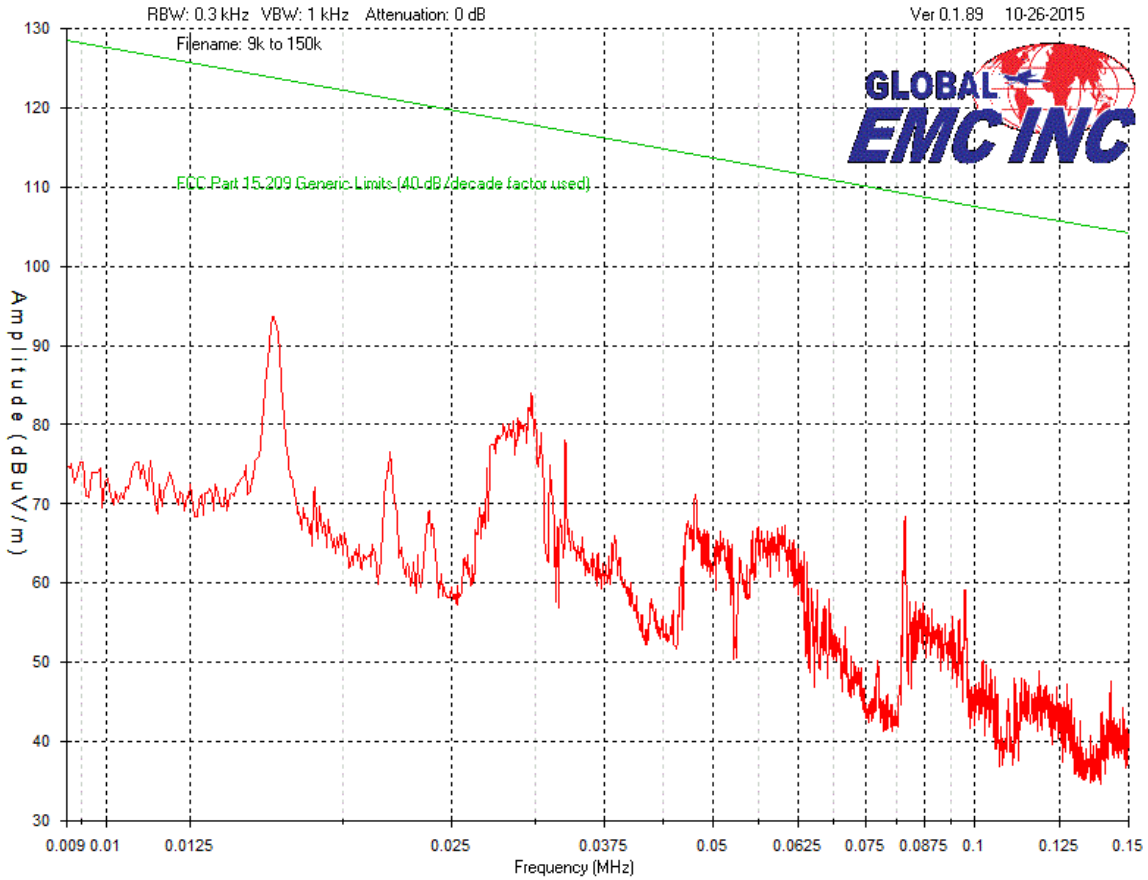
Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurement table where applicable. The graph shown below is a maximized peak measurement graph, measured with a resolution bandwidth greater than the final required detector and over a full 0-360 rotation. This peaking process is done as a worst case measurement. This process enables the detection of frequencies of concern for final measurement, and provides considerable time savings. Final measurements are performed over a full 0-360 degrees rotation and 1 – 4 meter height of measurement antenna.

In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to the 10th harmonic (a minimum of a 1 GHz).


Devices scanned above 1GHz may be scanned at a closer test distance, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used above 30 MHz, and 40 dB/decade below 30 MHz.

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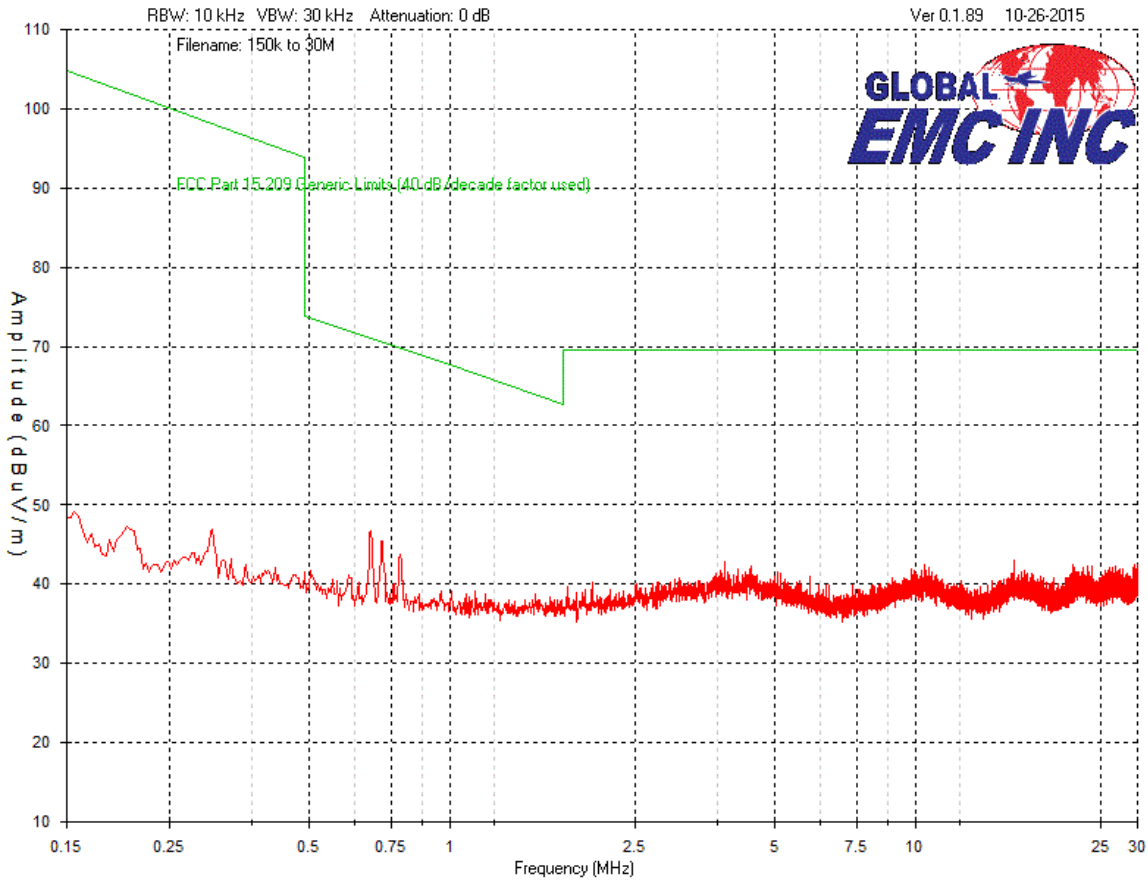
9 kHz to 150 kHz -




For this frequency band, all spurious emissions were greater than 20 dB below the limit. EUT was scanned 0-360 degrees in each of the three orthogonal axis, for each receive loop antenna alignment. When the loop was in vertical orientation, the receive loop was also rotated 0-360 degrees. Exploratory emissions were scanned with the receive loop in vertical and horizontal orientations, worst case emissions are shown above.

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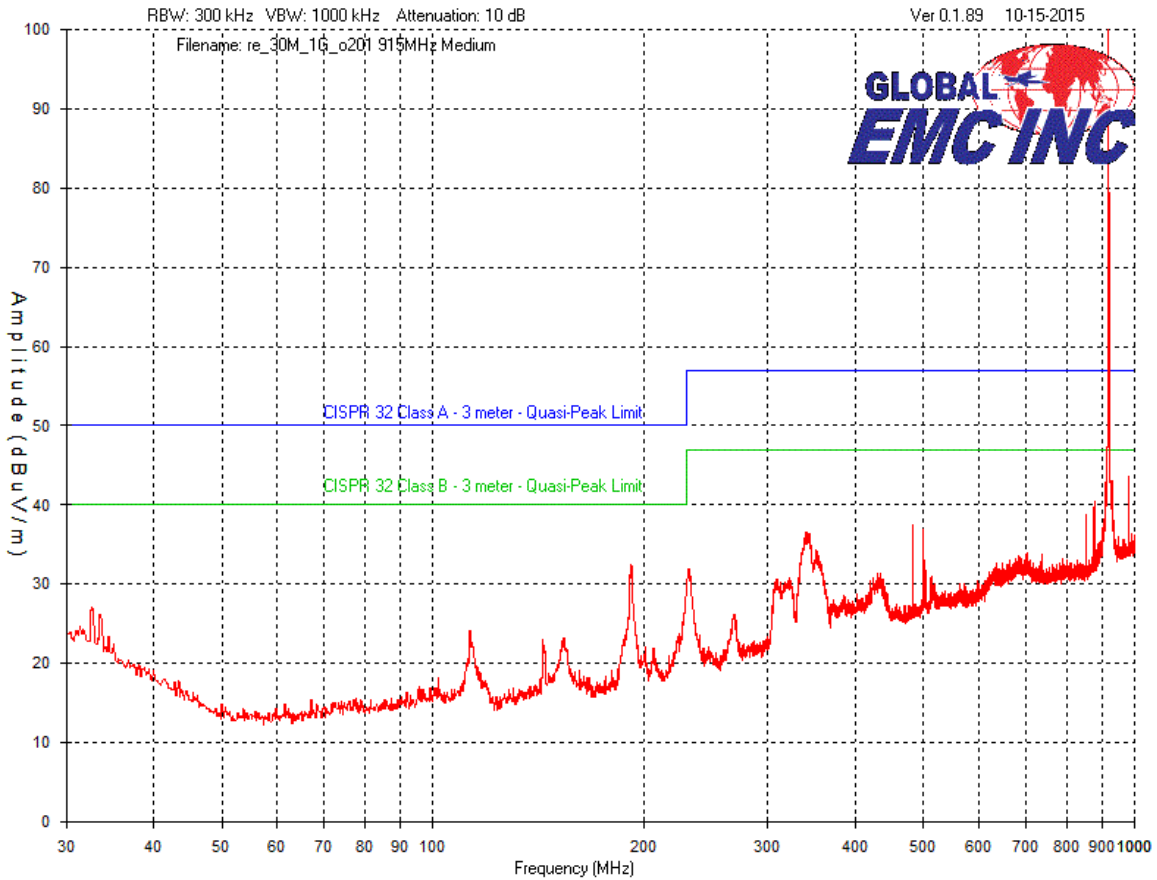
150 kHz to 30 MHz




The EUT was scanned 0-360 degrees in each of the three orthogonal axis, for each receive loop antenna alignment. When the loop was in vertical orientation, the receive loop was also rotated 0-360 degrees. Exploratory emissions were scanned with the receive loop in vertical and horizontal orientations, worst case emissions are shown above.

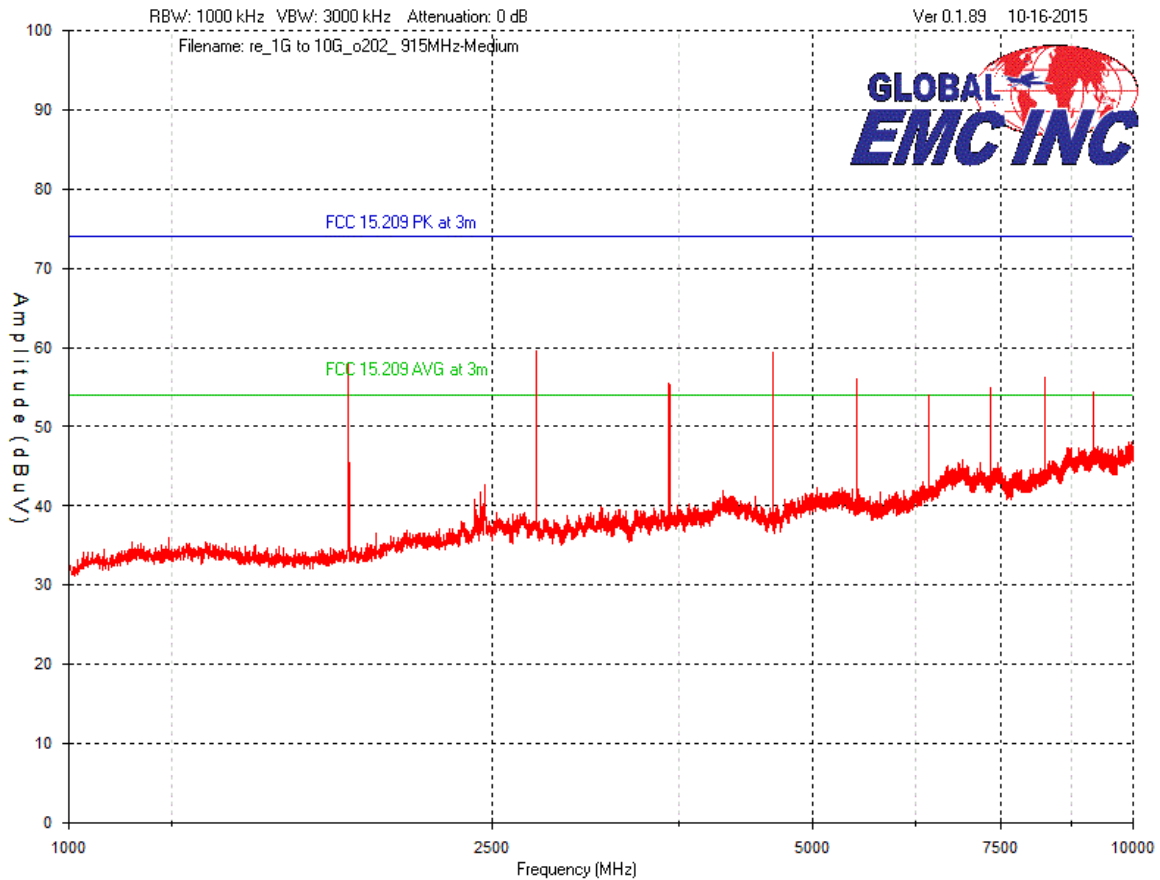
Client	Senstar Corporation	
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Vertical – Peak Emissions Graph



Note: In accordance with RSS-247 and 15.247, the requirement outside of restricted bands as listed in 15.205 is 20 dBc. In restricted bands, the requirements of the limit shown above apply.

Client	Senstar Corporation	
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Note 1: Worst case, middle, shown above. All emissions shown are harmonics of the fundamental. No emissions exceeded the 20 dBc requirement. The following harmonics fall in restricted bands

3rd harmonic, 2706 to 2784 MHz

4th harmonic, 3608 to 3712 MHz

5th harmonic, 4510 to 4640 MHz

8th harmonic, 7216 to 7424 MHz (partial restricted band)

9th harmonic, 8115 to 8352 MHz

10th harmonic 9020 to 9280 MHz (partial restricted band)


Note 2:

The follow harmonics do not fall in restricted bands.

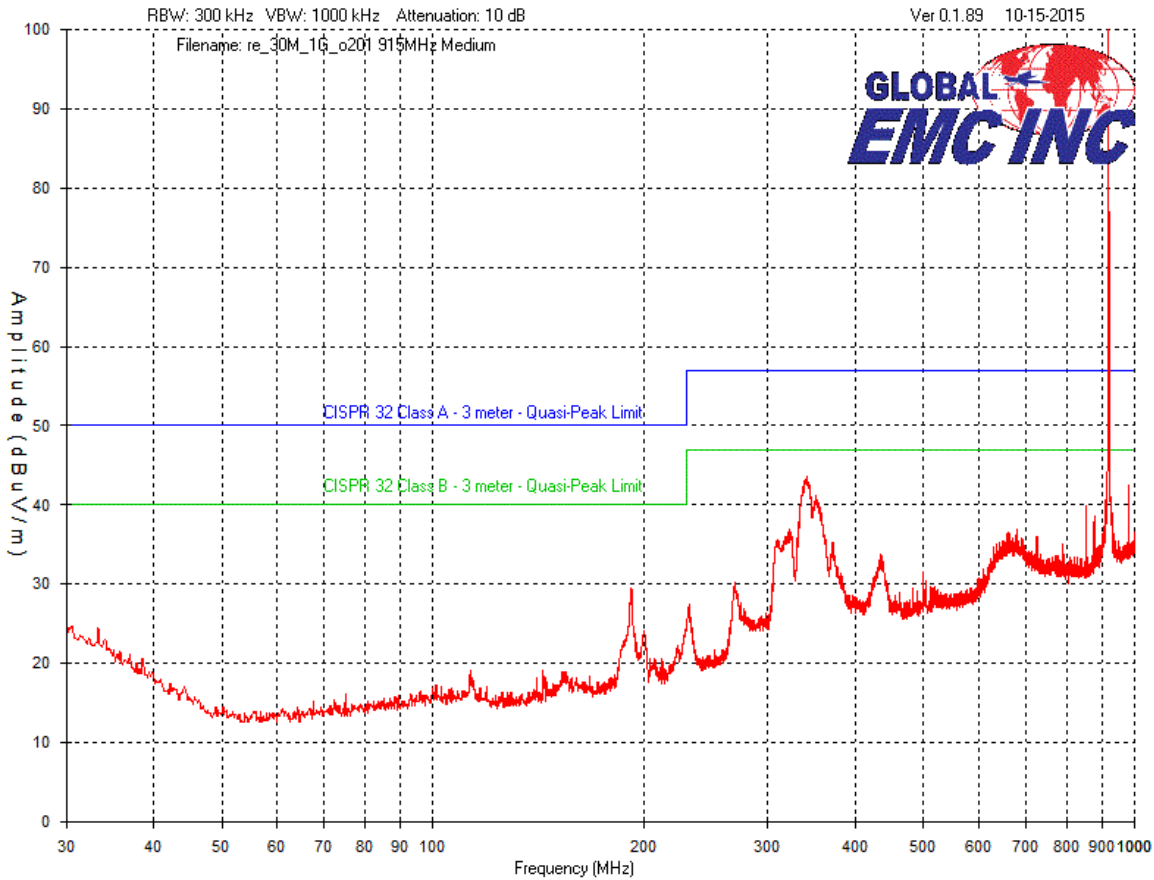
2nd harmonic falls 1830 to 1850 MHz

6th harmonic falls 5490 MHz to 5520 MHz


7th harmonic falls 6405 MHz to 6440 MHz

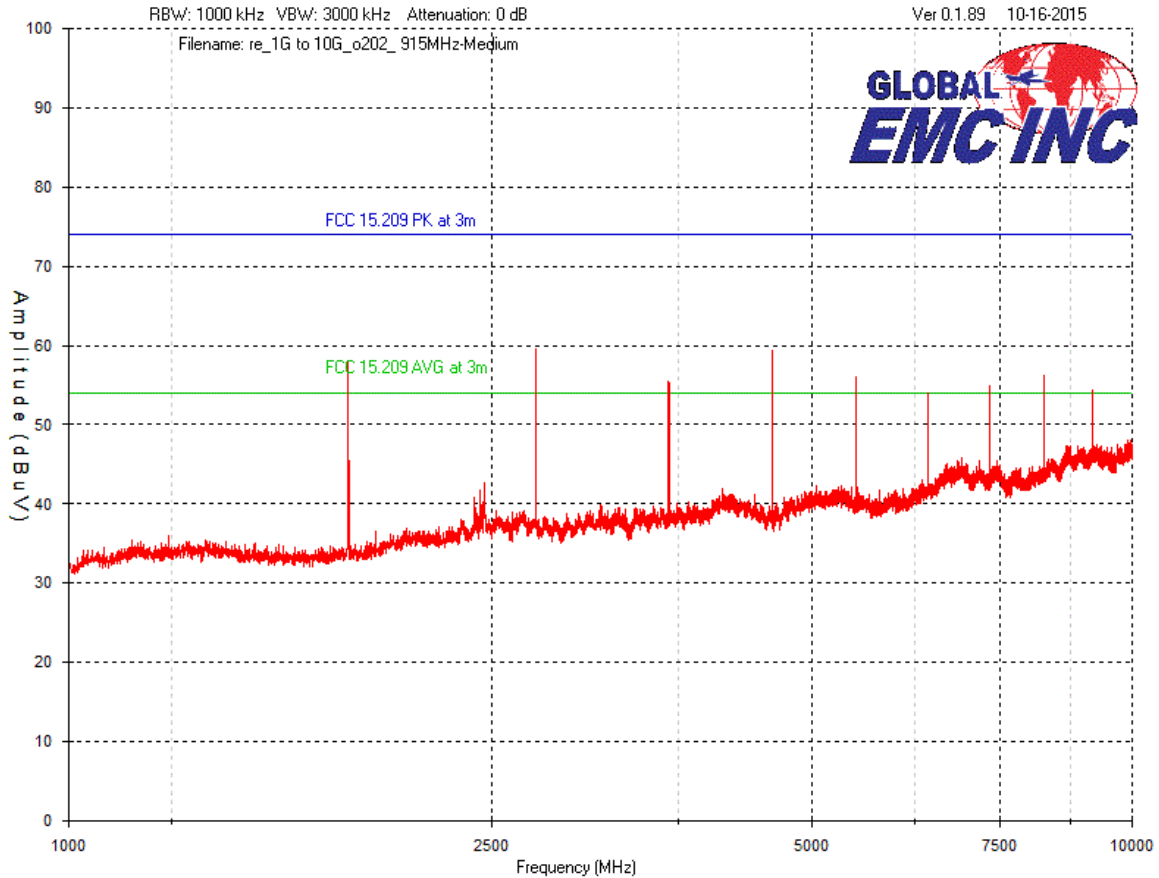
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Horizontal – Peak Emissions Graph



Note: In accordance with RSS-247 and 15.247, the requirement outside of restricted bands as listed in 15.205 is 20 dBc. In restricted bands, the requirements of the limit shown above apply.

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10th harmonic 9020 to 9280 MHz (partial restricted band)


Note 2:

The follow harmonics do not fall in restricted bands.

2nd harmonic falls 1830 to 1850 MHz

6th harmonic falls 5490 MHz to 5520 MHz

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Final Measurements

Vertical – Below 1 GHz

Frequency (MHz)	Detector Peak/QP	Received Signal (dB μ V)	Antenna Factor (dB/m)	Atten Factor (dB)	Cable Factor (dB)	Pre-Amp (dB)	Level (dB μ V/m)	QP Limit	QP Margin (dB)	Pass/Fail
917.513	Peak	109.3	24	3	2.8	-32.3	106.8			Pass
875.549	Peak	47.5	23.1	3	2.7	-32.5	43.8	46	2.2	Pass
977.787	Peak	44.3	24.2	3	2.9	-31.9	42.5	54	11.5	Pass
191.505	Peak	52.2	9.9	3	1.3	-33.3	33.1	43.5	10.4	Pass
478.043	Peak	49.1	17.9	3	2	-33.3	38.7	46	7.3	Pass
850.717	Peak	42.5	22.4	3	2.7	-32.6	38	46	8	Pass
499.577	Peak	46.7	18.5	3	2.1	-33.3	37	46	9	Pass

Horizontal – Below 1 GHz

Frequency (MHz)	Detector Peak/QP	Received Signal (dB μ V)	Antenna Factor (dB/m)	Atten Factor (dB)	Cable Factor (dB)	Pre-Amp (dB)	Level (dB μ V/m)	QP Limit	Margin (dB)	Pass/Fail
917.453	Peak	109.3	24	3	2.8	-32.3	106.8			Pass
341.079	Peak	57	15.2	3	1.8	-33.3	43.7	46	2.3	Pass
980.309	Peak	44.2	24.2	3	2.9	-31.9	42.4	54	11.6	Pass
852.269	Peak	44.3	22.5	3	2.7	-32.6	39.9	46	6.1	Pass
875.355	Peak	42.2	23.1	3	2.7	-32.5	38.5	46	7.5	Pass
678.639	Peak	42.6	22	3	2.4	-33.1	36.9	46	9.1	Pass
322.067	Peak	51	14.4	3	1.7	-33.3	36.8	46	9.2	Pass


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Vertical – Above 1 GHz

Frequency (MHz)	Detector Peak/ AV	Received Signal (dBμV)	Antenna Factor (dB/m)	Pre-Amp (dB)	Level (dBμV/m)	AV Limit	AV Margin (dB)	Pass/Fail
1835	AV	60.2	25.5	-33.1	52.6	54	1.4	Pass
2453	AV	40.4	29.2	-33.1	36.5	54	17.5	Pass
2752.2	AV	56	29.5	-33.1	52.4	54	1.6	Pass
3666.67	AV	50.7	30.9	-32.9	48.7	54	5.3	Pass
3670.67	AV	50.9	31	-32.9	49	54	5	Pass
4587	AV	50.7	32.8	-32.9	50.6	54	3.4	Pass
5505.33	AV	50.2	33.8	-32.7	51.3	54	2.7	Pass
6422.33	AV	47	36.1	-32.8	50.3	54	3.7	Pass
7340.33	AV	44.9	38.1	-33	50	54	4	Pass
8257.5	AV	45.6	38.7	-33.2	51.1	54	2.9	Pass
9175.67	AV	42	39.5	-33.5	48	54	6	Pass

Horizontal – Above 1 GHz


Frequency (MHz)	Detector Peak/ AV	Received Signal (dBμV)	Antenna Factor (dB/m)	Pre-Amp (dB)	Level (dBμV/m)	AV Limit	AV Margin (dB)	Pass/Fail
1834.87	AV	58.6	25.5	-33.1	51	54	3	Pass
2461	AV	46.5	29.2	-33.1	42.6	54	11.4	Pass
2752.67	AV	56.1	29.5	-33.1	52.5	54	1.5	Pass
3666.67	AV	51.4	30.9	-32.9	49.4	54	4.6	Pass
3670.67	AV	50.2	31	-32.9	48.3	54	5.7	Pass
4587.67	AV	52.4	32.8	-32.9	52.3	54	1.7	Pass
5505.33	AV	46.8	33.9	-32.7	48	54	6	Pass
6422.33	AV	46.6	36.1	-32.8	49.9	54	4.1	Pass
7340.33	AV	42.8	38.1	-33	47.9	54	6.1	Pass
8257.33	AV	41.7	38.7	-33.2	47.2	54	6.8	Pass
9175.67	AV	40.3	39.5	-33.5	46.3	54	7.7	Pass

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Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date ¹	Next Calibration Date ¹	Asset #
Spectrum Analyzer Display	8566B	HP	1-28-15	1-28-17	4168
Spectrum Analyzer	8566B	HP	1-28-15	1-28-17	4169
Quasi Peak Adapter	85650A	HP	1-28-15	1-28-17	4170
BiLog Antenna	3142-C	ETS	9-8-14	9-8-16	8
Horn Antenna	ATH1G18G	AR	4-23-15	4-23-17	4003
Biconical Antenna	EM-6913	Electro-Metrics	4/28/15	4/28/17	4060
Log Periodic Antenna	LPA-25	Electro-Metrics	4/14/15	4/14/17	4087
Attenuator 3 dB	FP-50-3	Trilithic	1-28-15	1-28-17	4028
LNA pre-amp	LNA-1450	RF Bay Inc.	7/22/15	7/22/16	4089
1-26.5GHz preamp	8449B	Agilent	9-9-14	9-9-16	6351
RF Cable 10m	LMR-400-10M-50OHM-MN-MN	LexTec	1-28-15	1-28-17	4025
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	1-28-15	1-28-17	4026
Emission software	0.1.87	Global EMC	1-28-15	1-28-17	58

¹: For cables and attenuators, verification dates apply.

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6dB Bandwidth of Digitally Modulated Systems

Purpose

The purpose of this test is to ensure that the bandwidth occupied exceeds a stated minimum. This helps ensure the utilization of the frequency allocation is sufficiently wide. This also helps prevent corruption of data by ensuring adequate data separation to distinguish the reception of the intended information.


Limits

The Limit is as specified in FCC Part 15 and RSS 247.

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. This should be measured with a 100 kHz RBW and a 300 kHz VBW.

Results

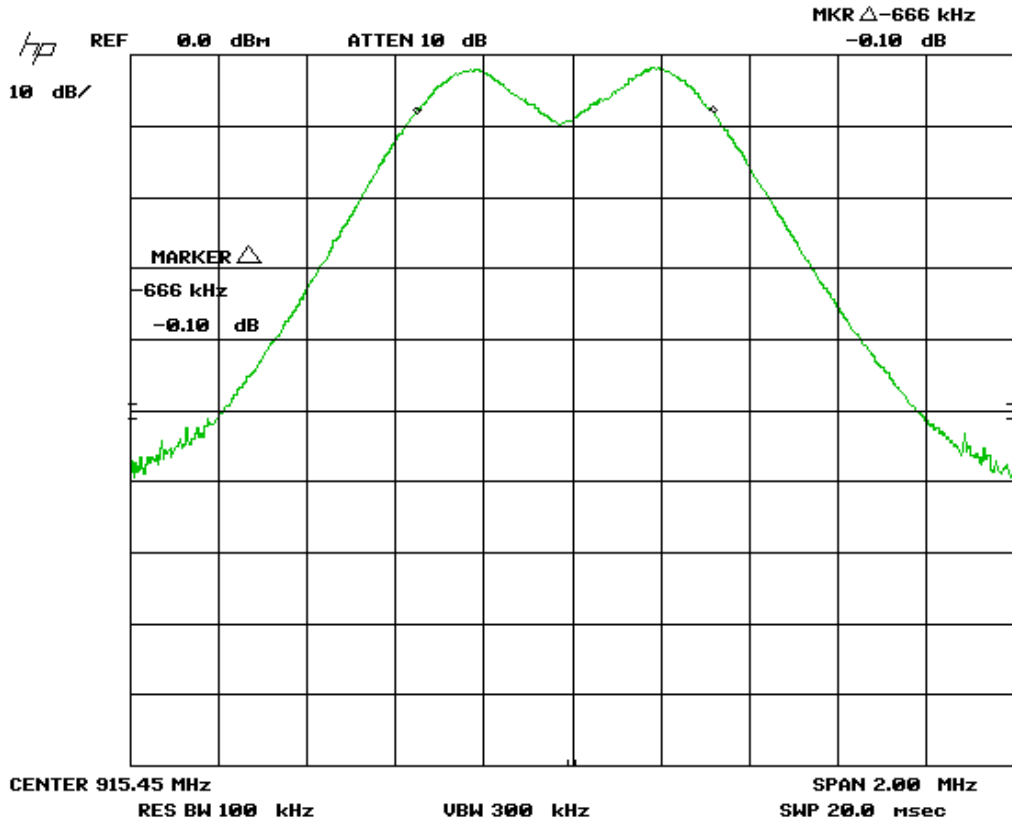
The EUT passed. The least 6 dB BW measured was 646 kHz.


Client	Senstar Corporation	
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Graph(s)

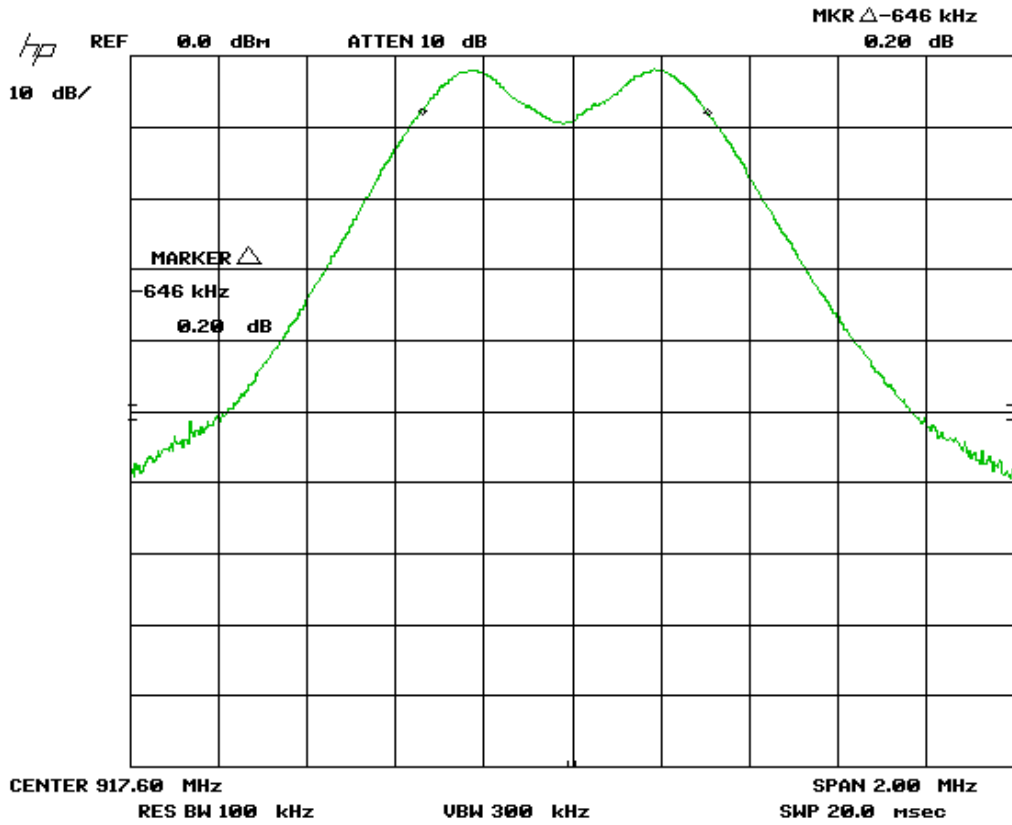
The graphs shown below shows the channel spacing during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the 6 dB bandwidth of a channel during operation of the EUT. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute.


Low



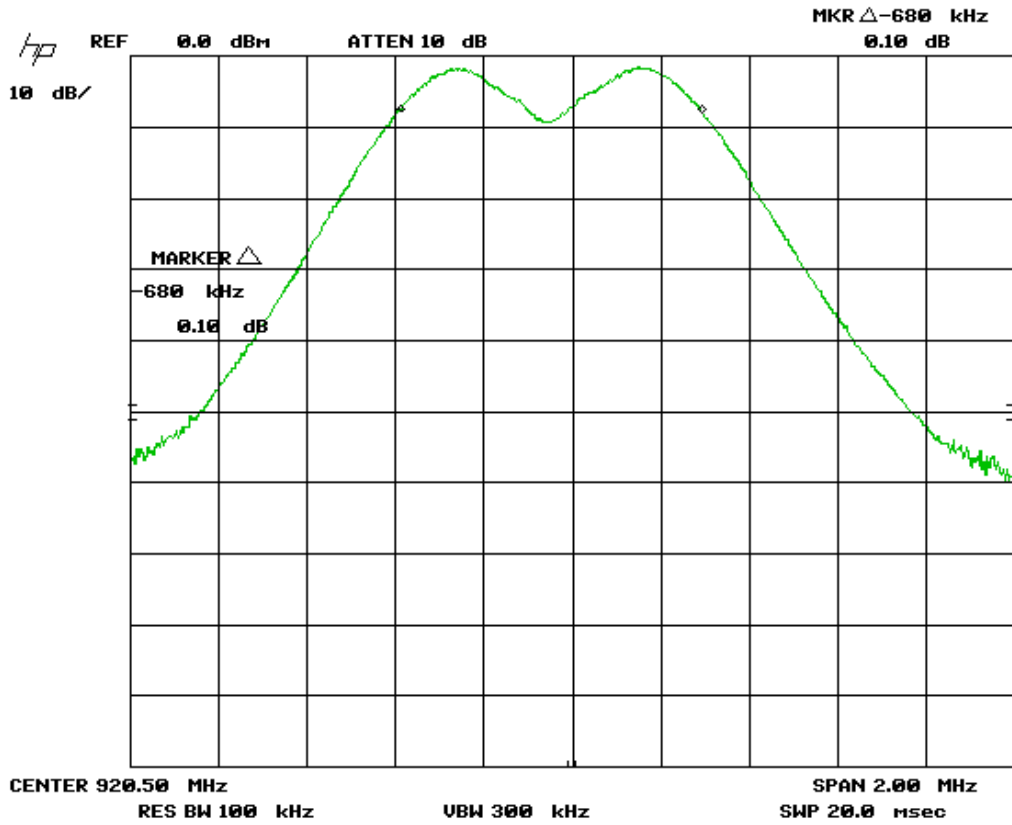
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Middle




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High




Note: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up.

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Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer Display	8566B	HP	1-28-15	1-28-17	4168
Spectrum Analyzer	8566B	HP	1-28-15	1-28-17	4169
RF Cable 10m	LMR-400-10M-50OHM-MN-MN	LexTec	1-28-15	1-28-17	4025
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	1-28-15	1-28-17	4026

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	Senstar Corporation	
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Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Maximum Peak Envelope Conducted Power

Purpose


The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified. This ensures that if the end-user replaces the antenna, that the maximum power does not exceed an amount which may create an excessive power level.

Limits

The limits are defined in FCC Part 15.247(b) and RSS 247. For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands, the peak limit is 1 watt.

Results

The EUT passed. The peak power measured was 13.2 dBm (20.9 mW)


Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Table(s)

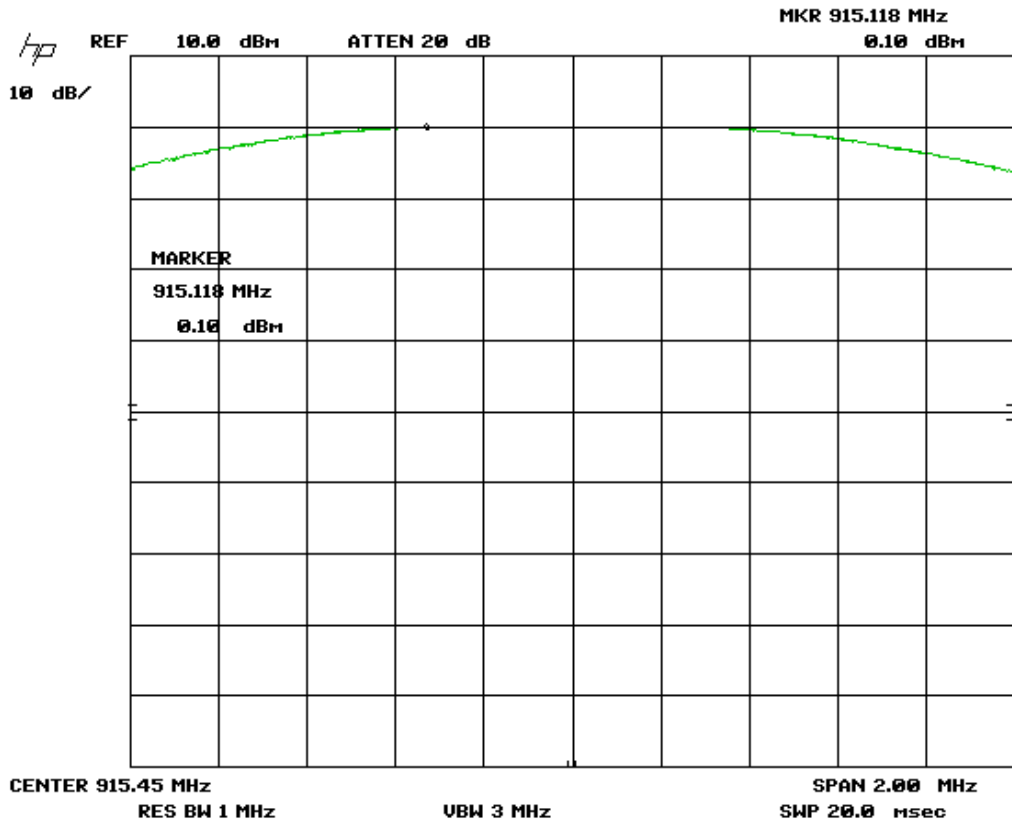
The tables shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT. Note there was 20 dB of external attenuation taken during this measurement.

Band	Frequency (MHz)	Reading (dBm)	Factor (dB)	Output Power (dBm)
Low	915.42	0.1	12	12.1
Medium	917.5	0.2	12	12.2
High	920.15	0.3	12	12.3


Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

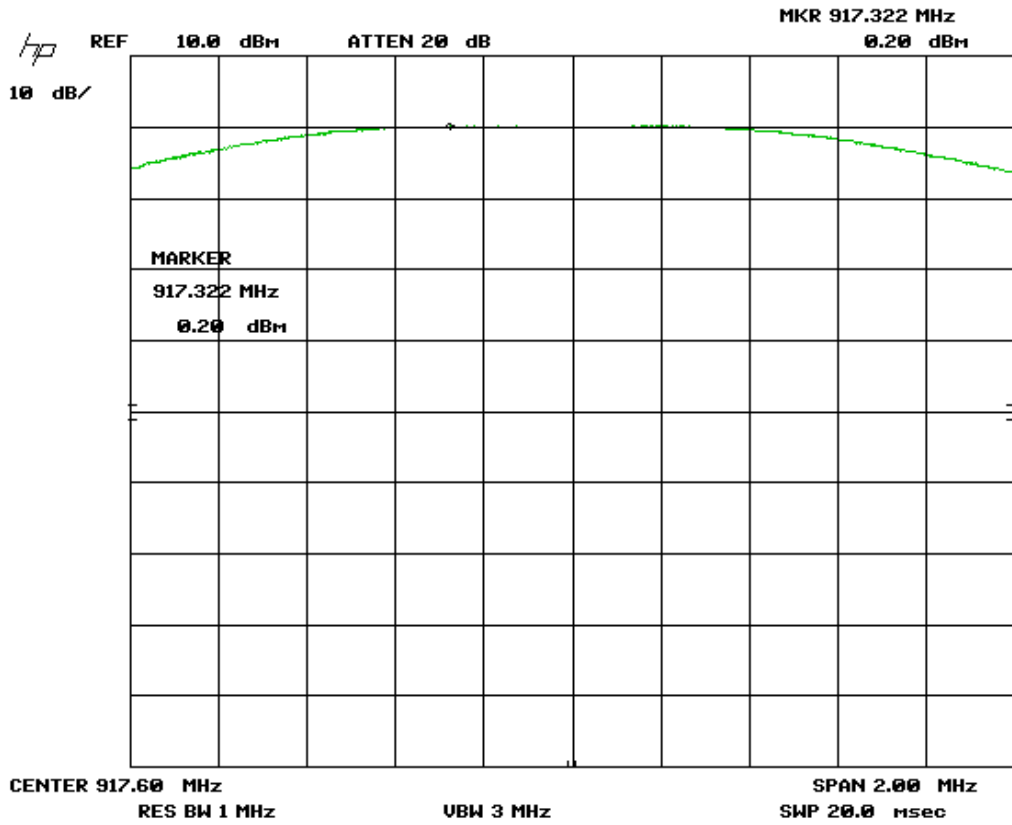
Low




12 dB external

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

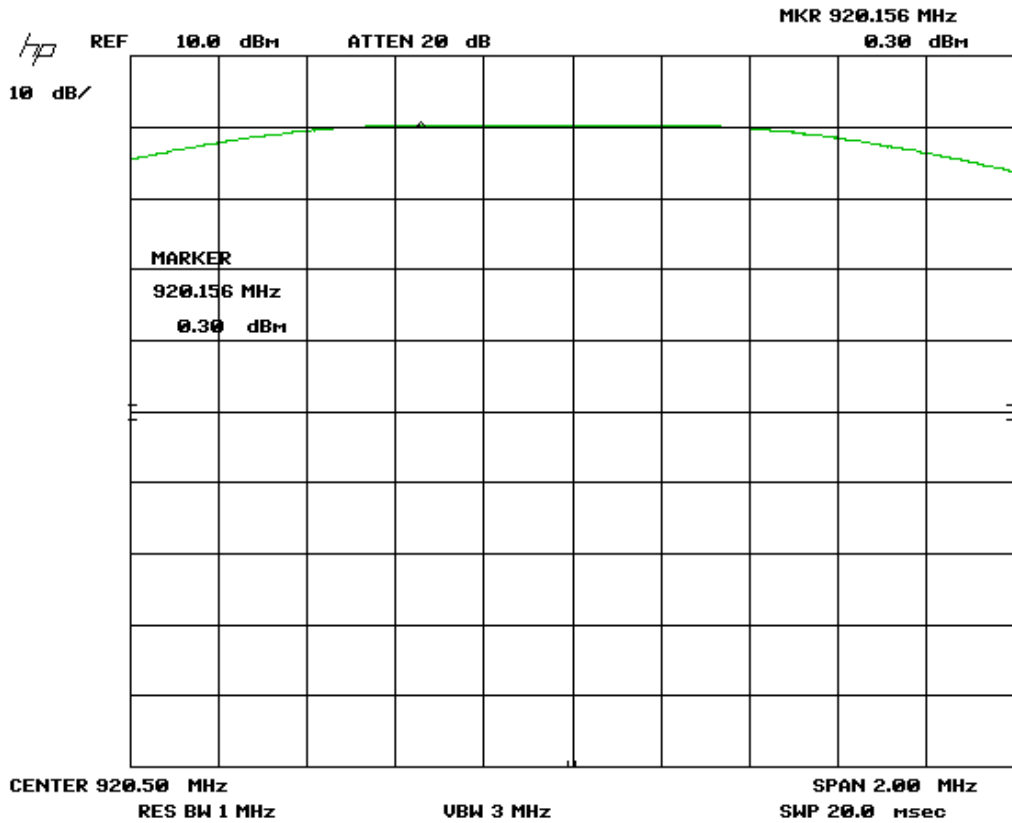
Middle




12 dB external

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

High




12 external

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer Display	8566B	HP	1-28-15	1-28-17	4168
Spectrum Analyzer	8566B	HP	1-28-15	1-28-17	4169
RF Cable 1M	LMR-400-1M-50OHM-MN-MN	LexTec	1-28-15	1-28-17	4039
Attenuator 10 dB	FP-50-10	Trilithic	1-28-15	1-28-17	4027

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Spurious Conducted Emissions

Purpose


The purpose of this test is to ensure that the maximum power conducted to the radiating element at frequencies outside of the authorized spectrum does not exceed the limits specified. This ensures that the only the intended signal is delivered to the radiating element.

Limits

The limits are defined in 15.247(d). In any 100 kHz band, the peak spurious harmonics emissions must be at least 20 dB below the fundamental. Spurious Conducted emissions are to be evaluated up to the 10th harmonic. This -20 dBc requirement also applies at the 'band edge' or 902 MHz and 928 MHz.

Results

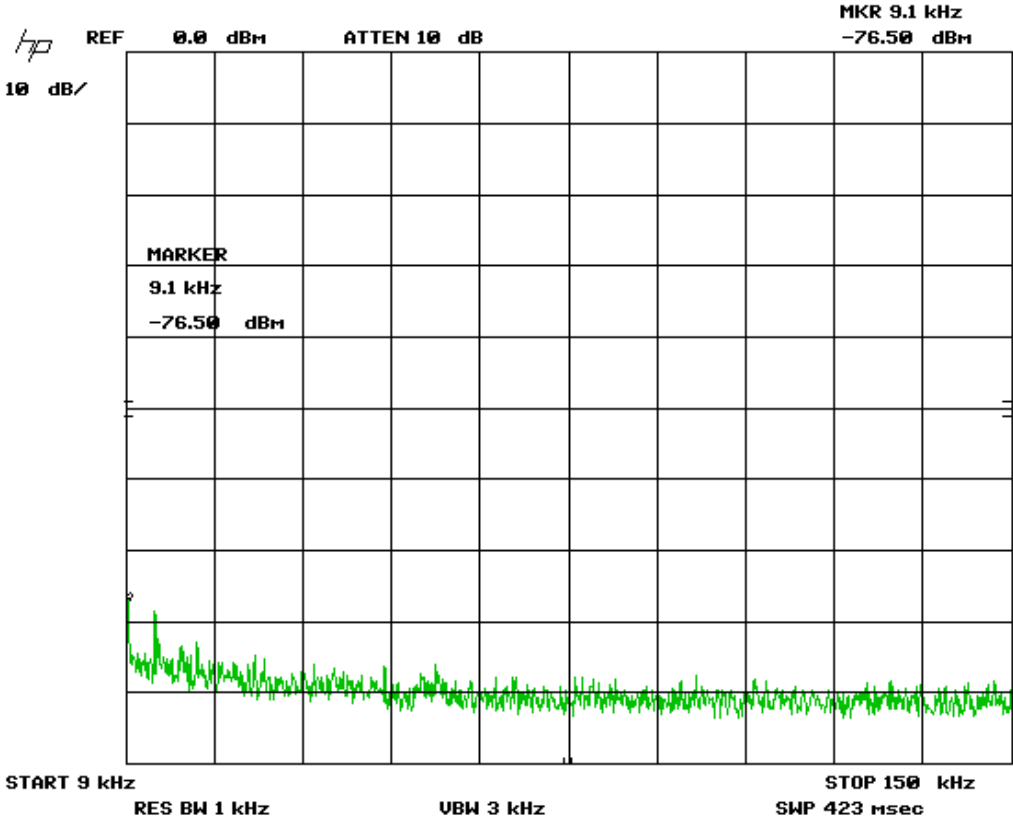
The EUT pass. Low, middle and high band was measured.


Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

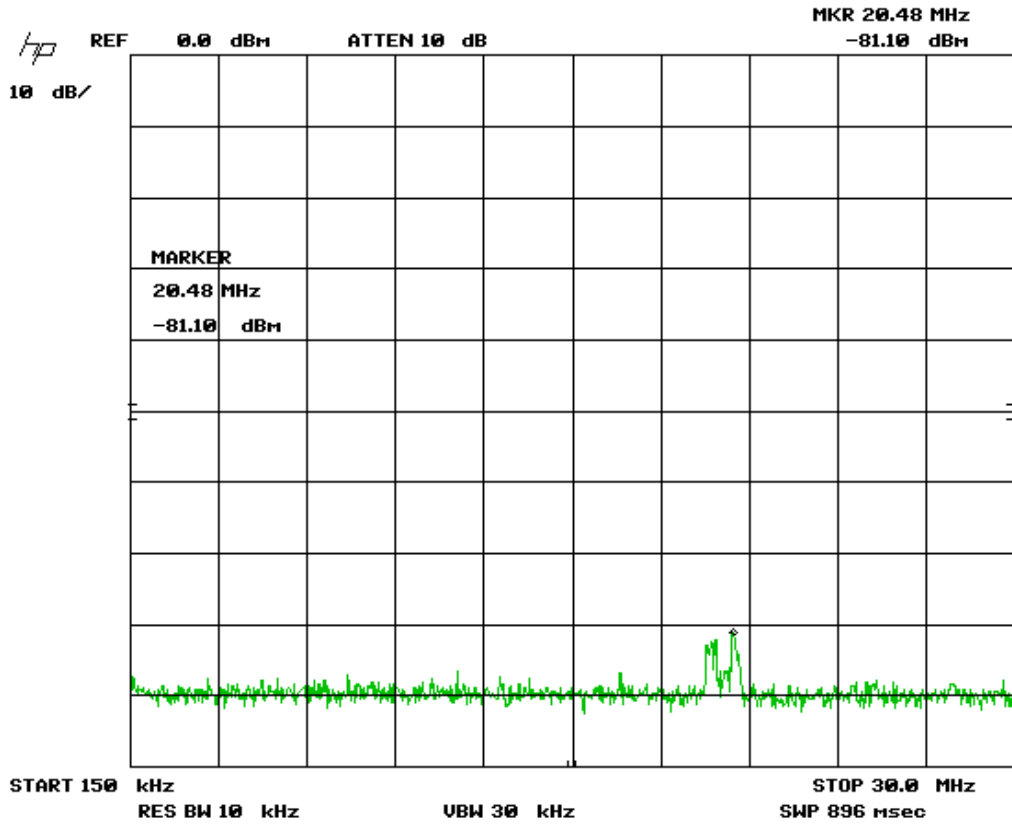
Graph(s)


The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT. Note there was 20 dB of external attenuation taken during this measurement.

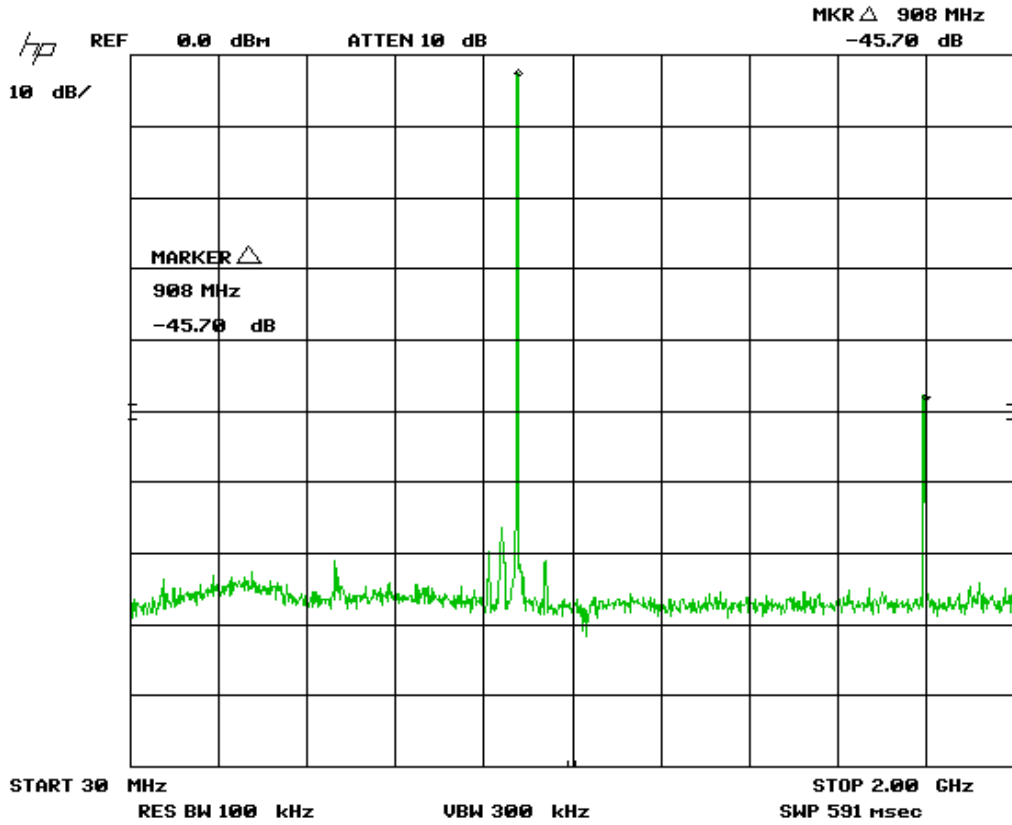
Frequencies below fundamental




Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

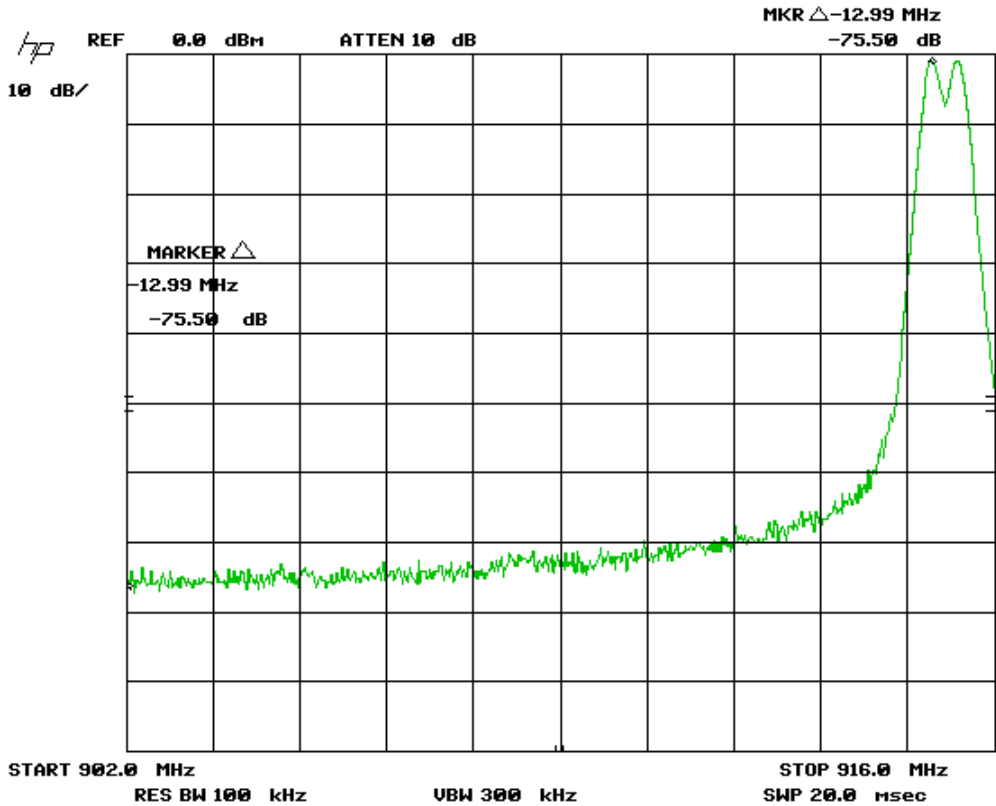



Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	



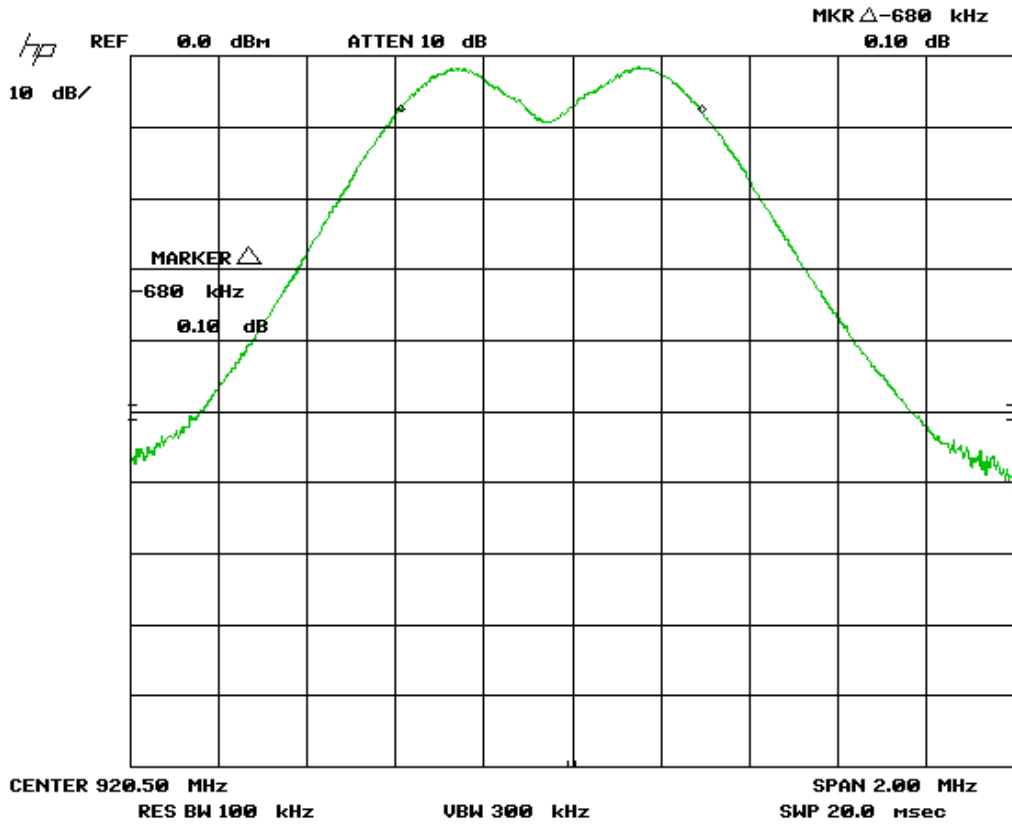
Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Low Channel, Lower Band Edge




Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

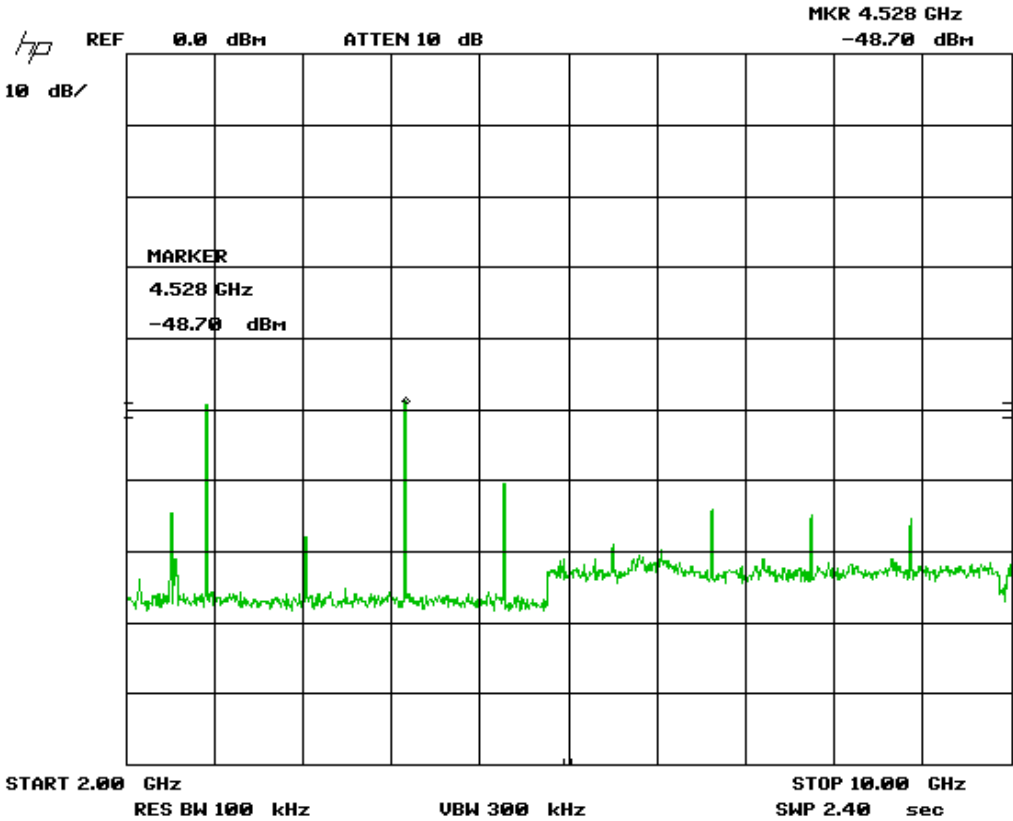
High channel




No emissions between 921.4 and 928 MHz were observed

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Frequencies above Fundamental (2GHz to 10 GHz)




Note: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up.

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date ¹	Next Calibration Date ¹	Asset #
Spectrum Analyzer Display	8566B	HP	1-28-15	1-28-17	4168
Spectrum Analyzer	8566B	HP	1-28-15	1-28-17	4169
Attenuator 3 dB	FP-50-3	Trilithic	1-28-15	1-28-17	4028
RF Cable 10m	LMR-400-10M-50OHM-MN-MN	LexTec	1-28-15	1-28-17	4025
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	1-28-15	1-28-17	4026
Emission software	0.1.87	Global EMC	1-28-15	1-28-17	58

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Power Spectral Density

Purpose

The purpose of this test is to ensure that the maximum power spectral density to the radiating element does not exceed the limits specified. This ensures that the modulation is significantly wide enough, or low enough in power that it will allow for co-operation of other wireless devices operating within this frequency allocation.

Limits

The limits are defined in 15.247(e).


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.

Results

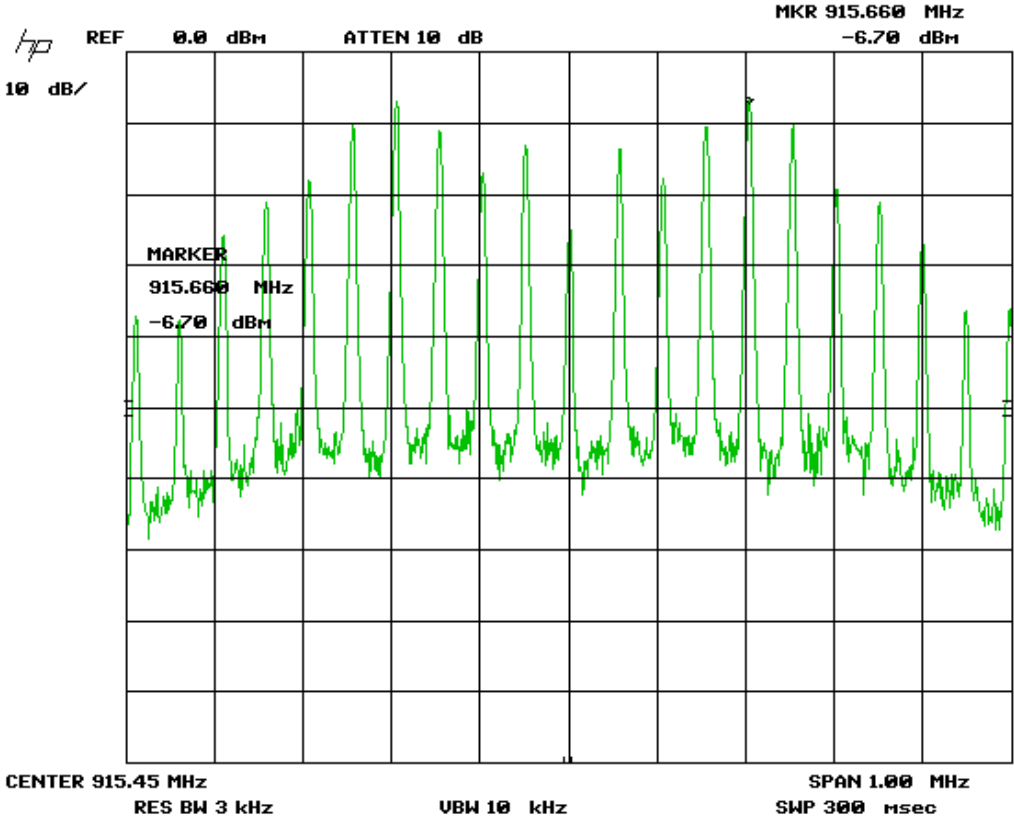
The EUT passed. Each mode was tested at low, medium, and high band. The worst case value is 5.8 dBm as measured with a 3 kHz resolution bandwidth (peak power).

Graph(s)


The graphs shown below show the power spectral density of the device during the conducted measurement operation of the EUT. Low, middle, and high channel was investigated in each mode. Peak readings shown were taken with a 3 kHz Resolution.

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

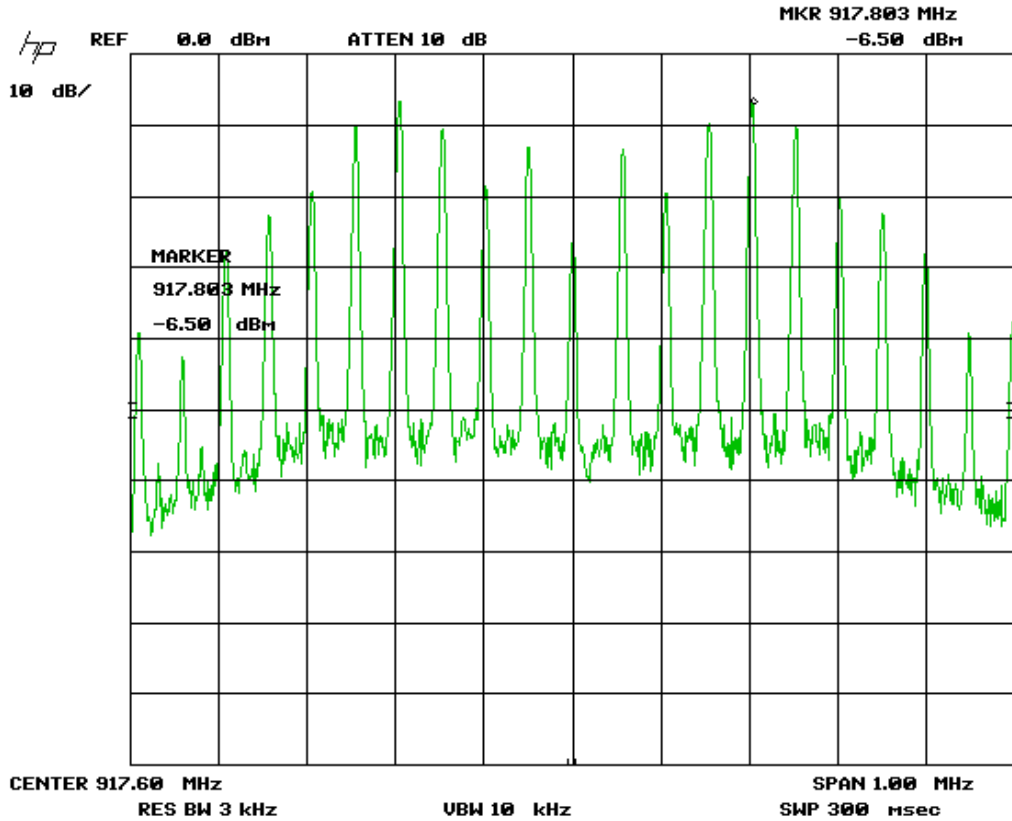
Low channel




Note: There was 12 dB external attenuation, resulting in 5.3 dBm reading.

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

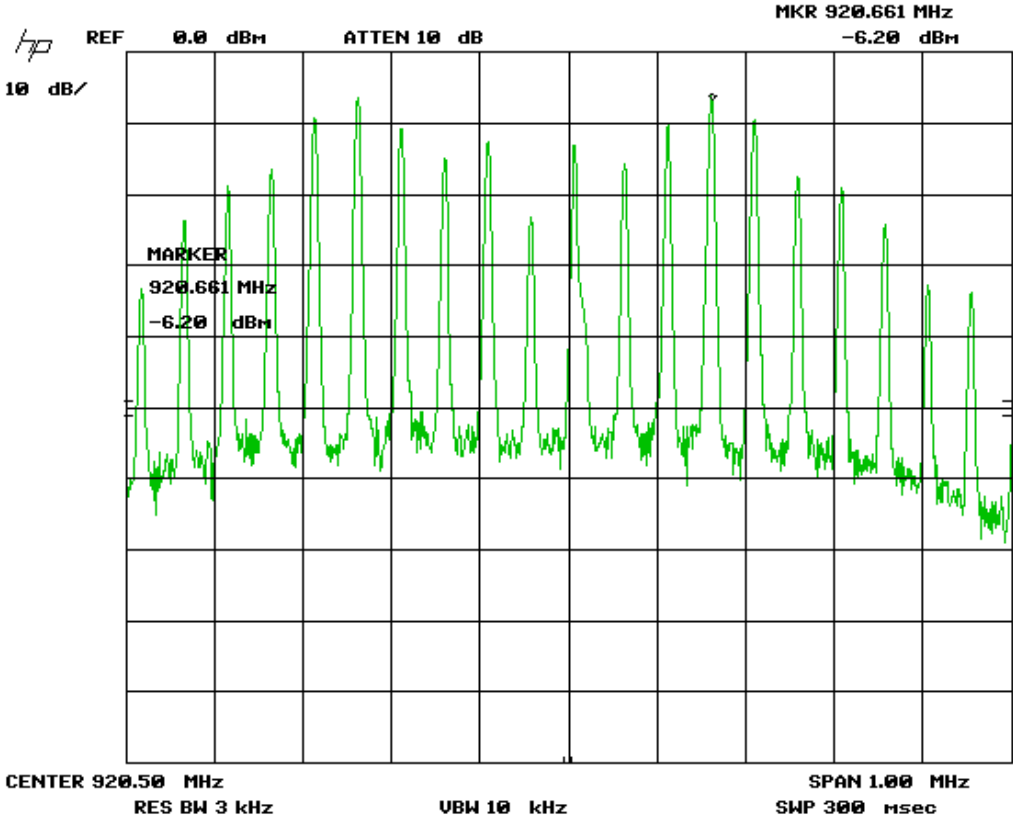
Mid channel



Note: There was 12 dB external attenuation, resulting in 5.5 dBm reading.


Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

High channel



Note: There was 12 dB external attenuation, resulting in 5.8 dBm reading.


Note: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up.

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer Display	8566B	HP	1-28-15	1-28-17	4168
Spectrum Analyzer	8566B	HP	1-28-15	1-28-17	4169
RF Cable 1M	LMR-400-1M-50OHM-MN-MN	LexTec	1-28-15	1-28-17	4039
Attenuator 10 dB	FP-50-10	Trilithic	1-28-15	1-28-17	4027

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

99% Occupied Bandwidth

Purpose


The purpose of this test is to measure the bandwidth of EUT. This also helps prevent corruption of data by ensuring adequate data separation to distinguish the reception of the intended information.

Limits

No limit applies, however this information is to be reported to the FCC and Industry Canada.

Results

The EUT passed. The 99 % occupied bandwidth measured was 818 kHz.

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	


Graph(s)

The graphs shown below shows the channel spacing during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit 99% bandwidth of a channel during operation of the EUT. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute.

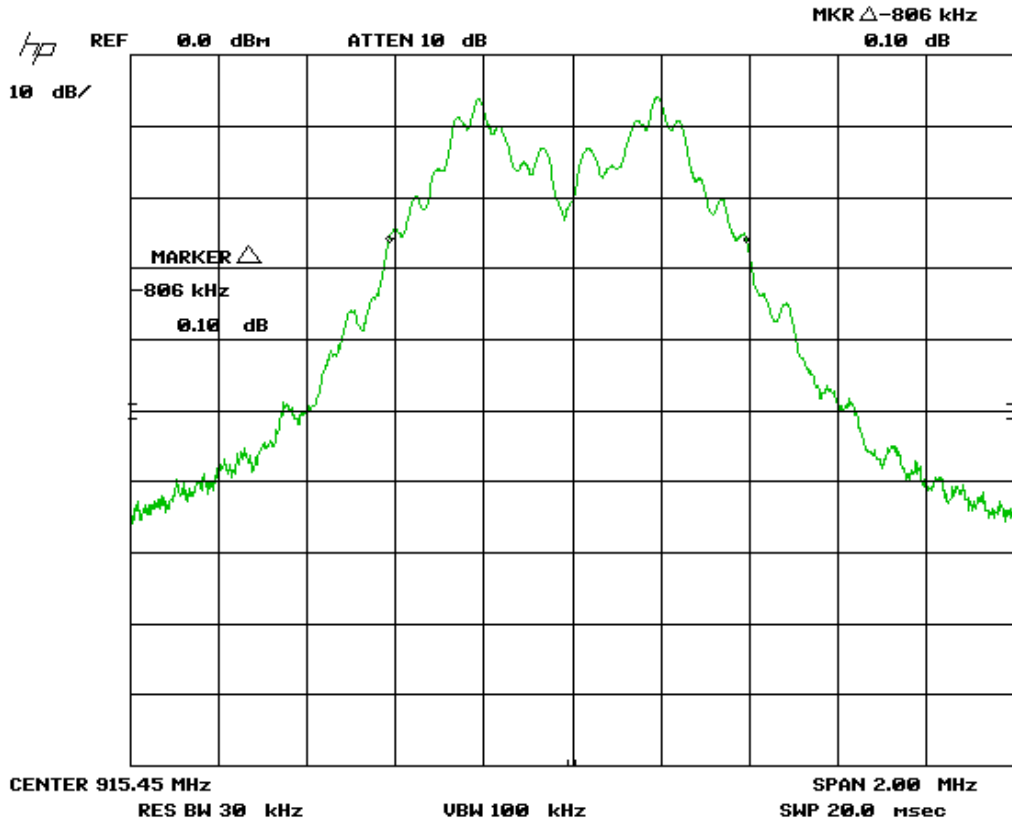
In each case the trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. These points are marked on the graph shown.

The difference between the two recorded frequencies is the 99% occupied bandwidth.

Note: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up.


Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Low

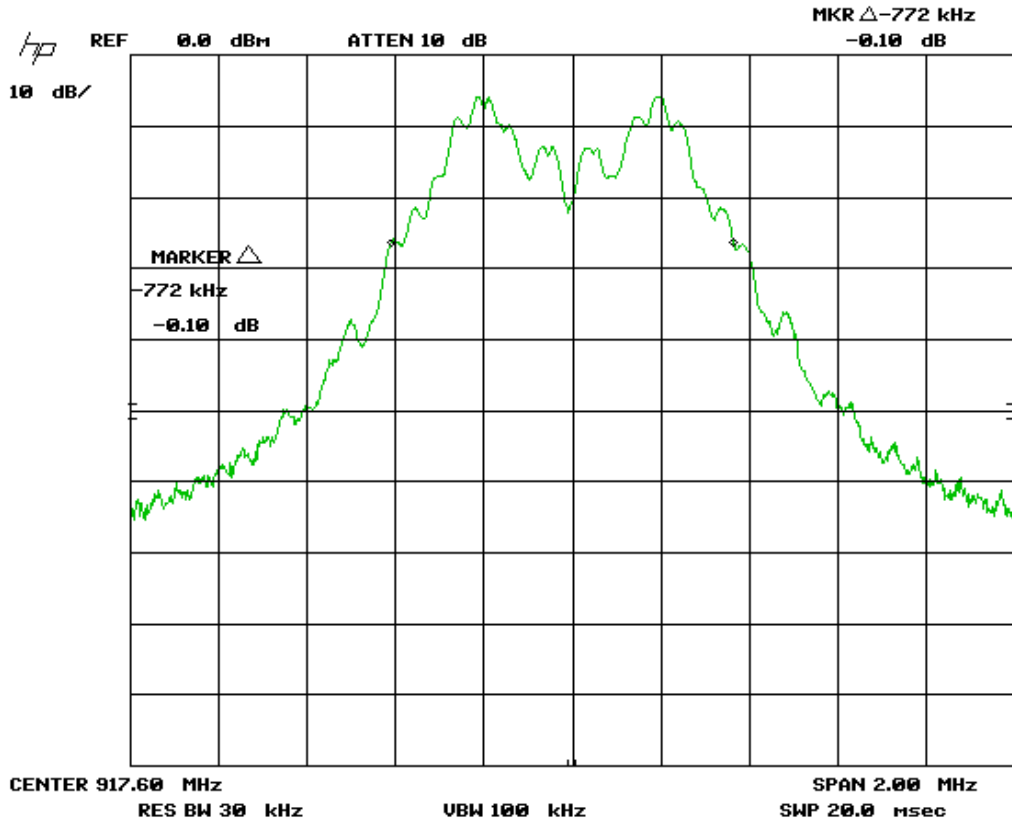


806 kHz

In each case the trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. These points are marked on the graph shown.


Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Middle

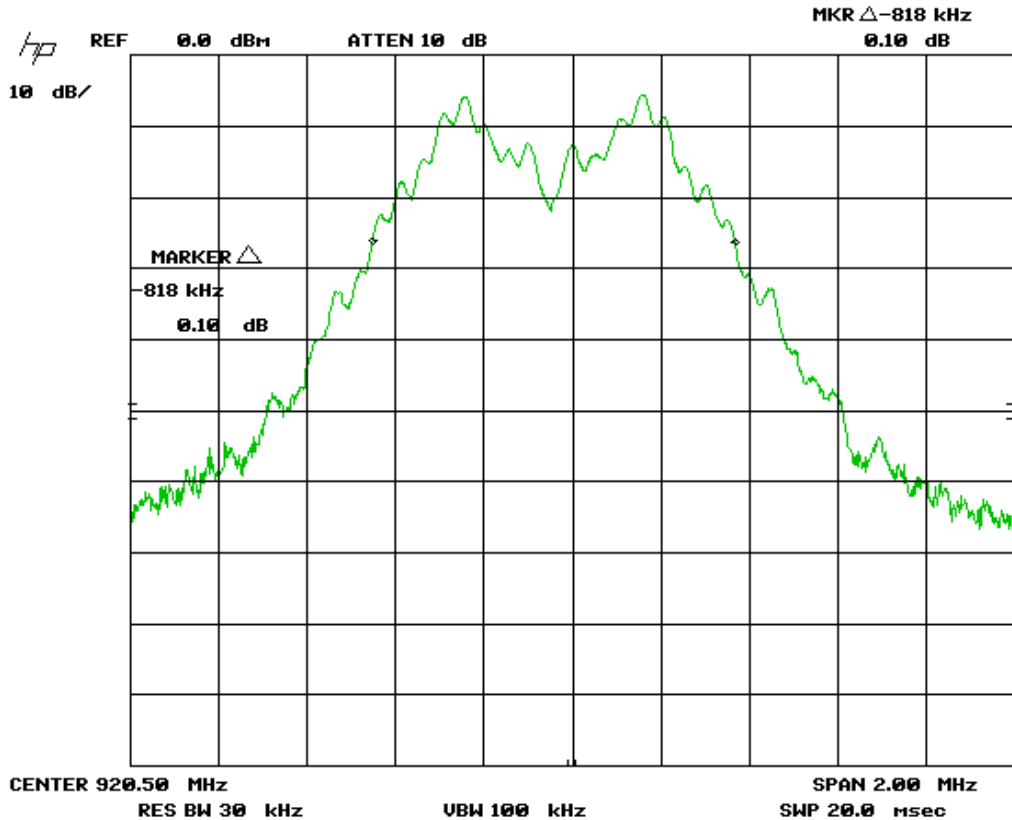


772 kHz

In each case the trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. These points are marked on the graph shown.


Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

High



818 kHz


In each case the trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. These points are marked on the graph shown.

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	1-28-15	1-28-17	4169
Quasi Peak Adapter	85650A	HP	1-28-15	1-28-17	4170
Attenuator 3 dB	FP-50-3	Trilithic	09-02-15	09-02-17	4028
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	09-02-15	09-02-17	4026
RF Cable 1M	LMR-400-1M-50OHM-MN-MN	LexTec	09-02-15	09-02-17	4039
RF Cable 10m	LMR-400-10M-50OHM-MN-MN	LexTec	09-02-15	09-02-17	4025


This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions_Rev5.doc"

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Appendix A – EUT and Test Setup Photographs


Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Note: These photos are for information purposes only. Also refer to PDF files that are separate from this test report.

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	


Radiated Emissions Below 30 MHz



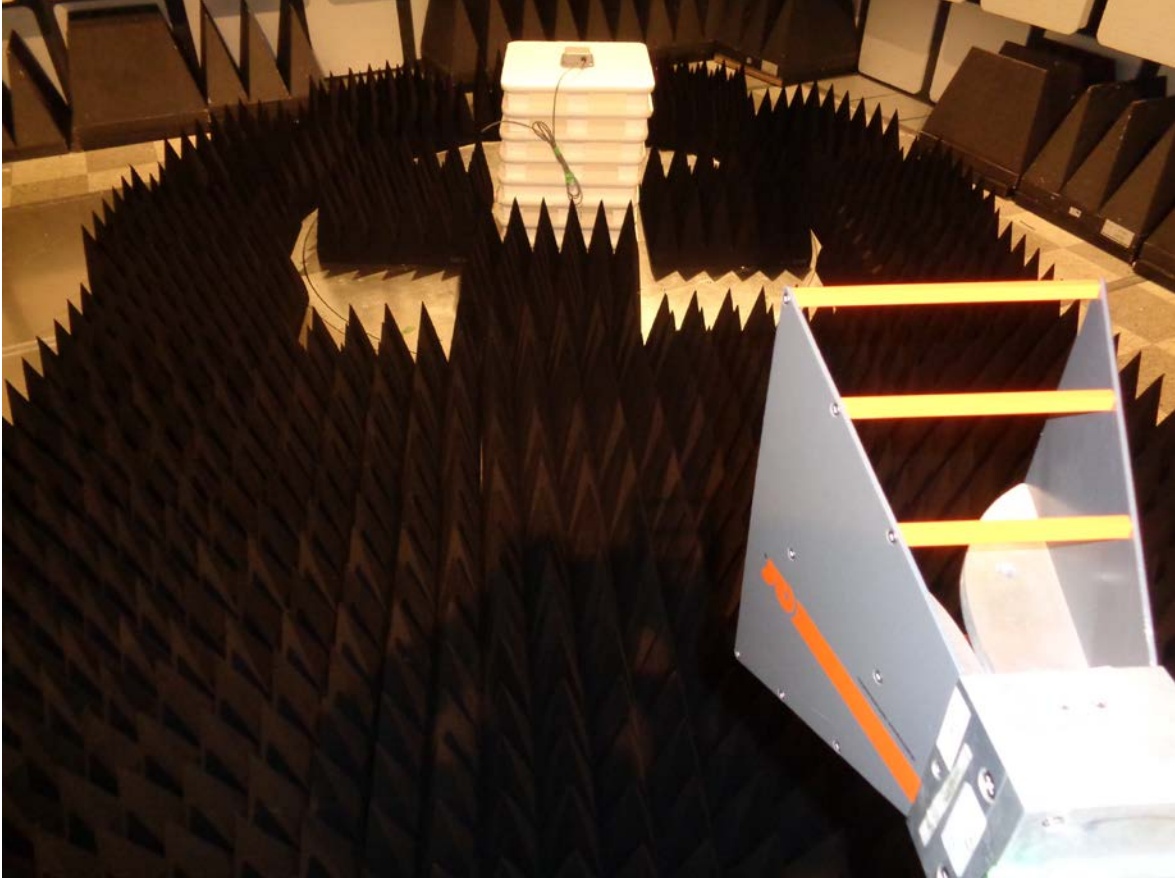
Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Radiated Emissions 30 MHz to 1 GHz




Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

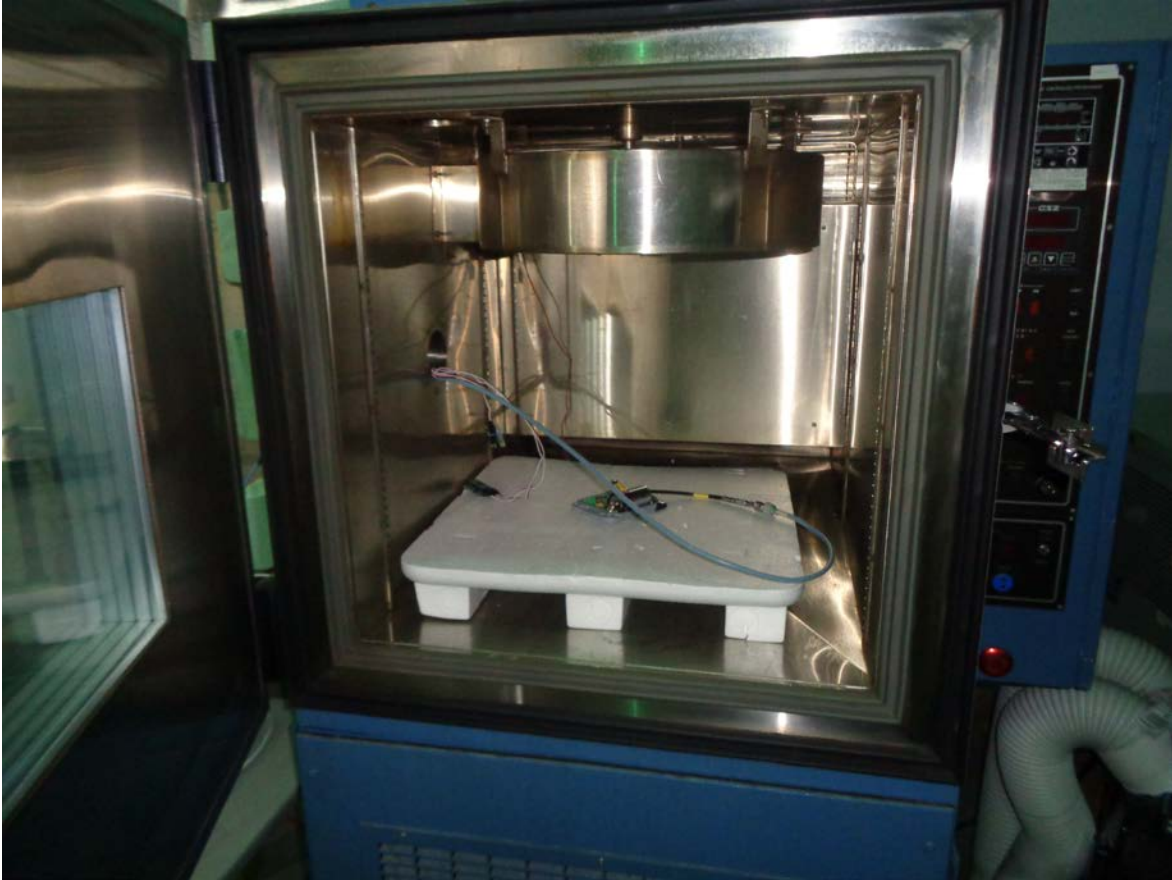
Radiated Emissions above 1 GHz



Note: Additionally the EUT was scanned at 1.5 meter height on top

Client	Senstar Corporation	
Product	Wireless Gate Sensor Module	
Standard(s)	RSS 247 Issue:1 / FCC Part 15 Subpart C 15	

Antenna Conducted Measurements



Note: Direct connection via a 10 dB attenuator to a spectrum analyzer