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DATE: 21 June 2018

I.T.L. (PRODUCT TESTING) LTD.

FCC/IC Radio Test Report

For

Magos Systems Ltd.

Equipment under test:

SR1000 SURVEILLANCE SENSOR

MS1231A

Tested by:

M. Zohar

Approved by:

D. Shidlow

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This report relates only to items tested.



MS1231A

FCC ID: 2AFHU-SR1000

IC: 22587-SR1000

This report concerns:	Original Grant:	X
	Class I Change:	
	Class II Change:	

Equipment type: FCC: DSS Part 15 Spread Spectrum Transmitter
IC: Low Power Device (5725-5875MHz)
Radar Device
Security Device/Alarm System

Limits used: 47CFR15 Section 15.247
RSS 247, Issue 2, February 2017, Section 5
RSS-Gen, Issue 4, November 2014

Measurement procedures used are FCC Public Notice DA-00-705 and ANSI C63.10: 2013.

Application for Certification
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1. General Information

1.1 Administrative Information

Manufacturer:	Magos Systems Ltd.
Manufacturer's Address:	13 Gad Feinstein St., Rehovot, 7638517 Israel Tel: +972-77-414-0155 Fax: +972-77-414-0165
Manufacturer's Representative:	Amit Isserof
Equipment Under Test (E.U.T):	SR1000 SURVEILLANCE SENSOR
Equipment Part No.:	MS1231A
HVIN:	SR1000
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	February 12, 2018
Start of Test:	February 12, 2018
End of Test:	February 15, 2018
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St., Lod ISRAEL 7120101
Test Specifications:	FCC, Subpart C, Section 15.247 RSS 247, Issue 2, February 2017, Section 5 RSS-Gen, Issue 4, November 2014



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**

High Resolution Short-Range Ground Surveillance Sensor:

The SR-1000 (Scepter) is the most cost effective perimeter protection solution for both rural and more saturated environments, without compromising detection performance.

By utilizing state of the art MIMO & Digital beam forming technology it covers an area of more than 750,000m²(>180acres) with a detection range of over 800m for walker and 1100m for vehicle/boat, and yet consumes extremely low power (<5W) and small form factor.

It boasts an ultra-high range resolution of less than 1m giving it excellent performance in cluttered environments. Its small size, low power consumption and low weight make it simple to install and renders it ideal as a deployable system.

Model Name	SR1000
Working voltage	48VDC via POE
Mode of operation	Transceiver
Modulation	N/A
Assigned Frequency Range	5725.0-5850.0MHz
Operating Frequency Range	5726.0-5849.0MHz
Transmit power	~ 17.0dBm
Antenna Gain	+9dBi integral Patch antenna

1.4 **Test Methodology**

Radiated testing was performed according to the procedures in FCC Public Notice DA 00-705 and ANSI C63.10: 2013. 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**

Conducted Emission

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)
0.15 – 30 MHz:

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

± 3.6 dB



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 transceiver in the 5.8GHz band, transmit CW in 175 channels.
2. The evaluation was performed while the E.U.T was in the operation orientation.
3. Some evaluations were performed in hopping mode and some in non-hopping mode in the low channel (5726MHz), mid channel (5787MHz) and high channel (5849MHz).

2.2 *EUT Exercise Software*

No special exercise software was used.

2.3 *Special Accessories*

No special accessories were needed in order to achieve compliance.

2.4 *Equipment Modifications*

No modifications were needed in order to achieve compliance.

2.5 *Configuration of Tested System*

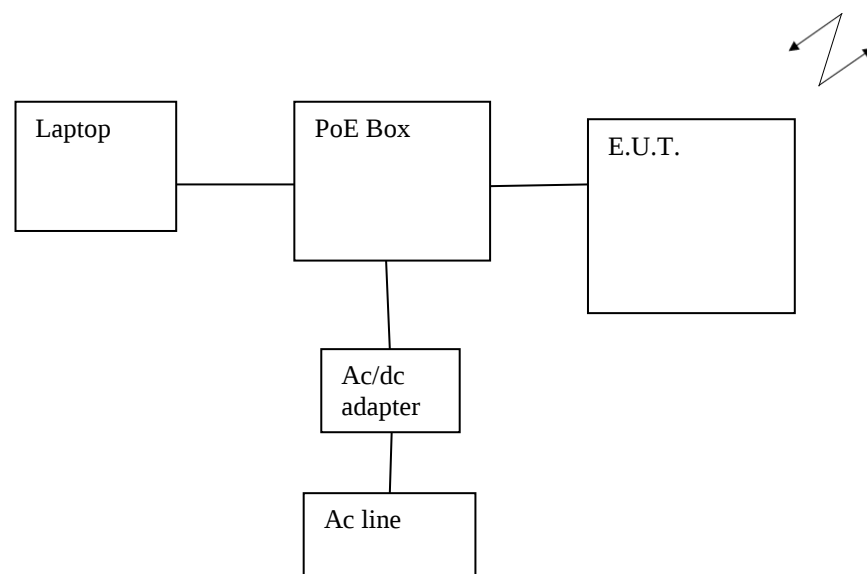


Figure 1. Configuration of Tested System

3. Conducted & Radiated Measurement Test Set-Up Photos



Figure 2. Conducted Emission From AC Mains

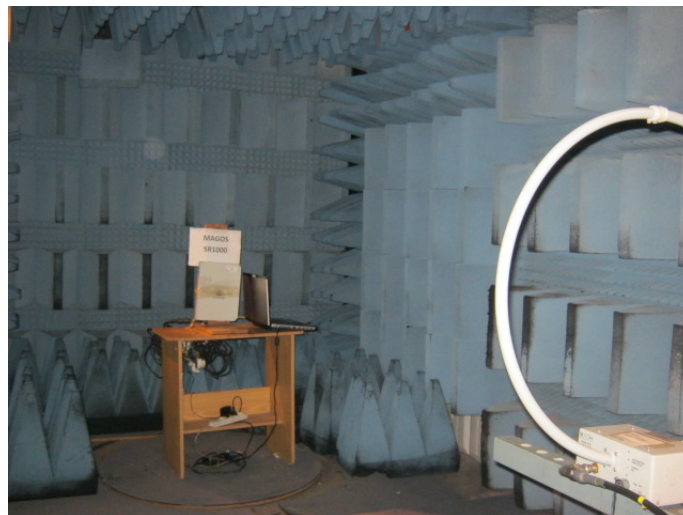


Figure 3. Radiated Emission Test, 0.009-30MHz band

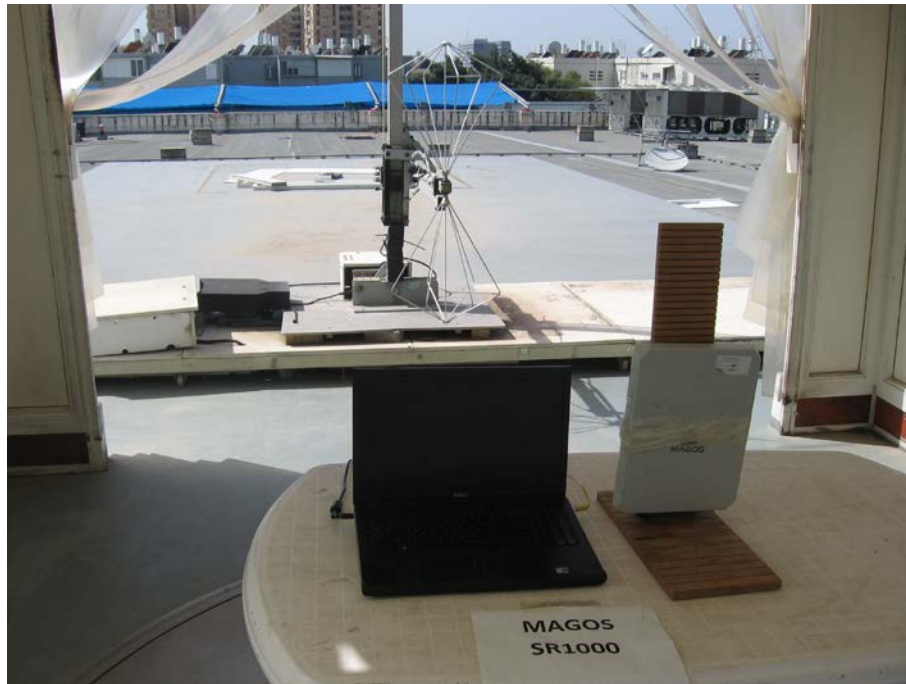


Figure 4. Radiated Emission Test, 30-200MHz band



Figure 5. Radiated Emission Test, 200-1000MHz band

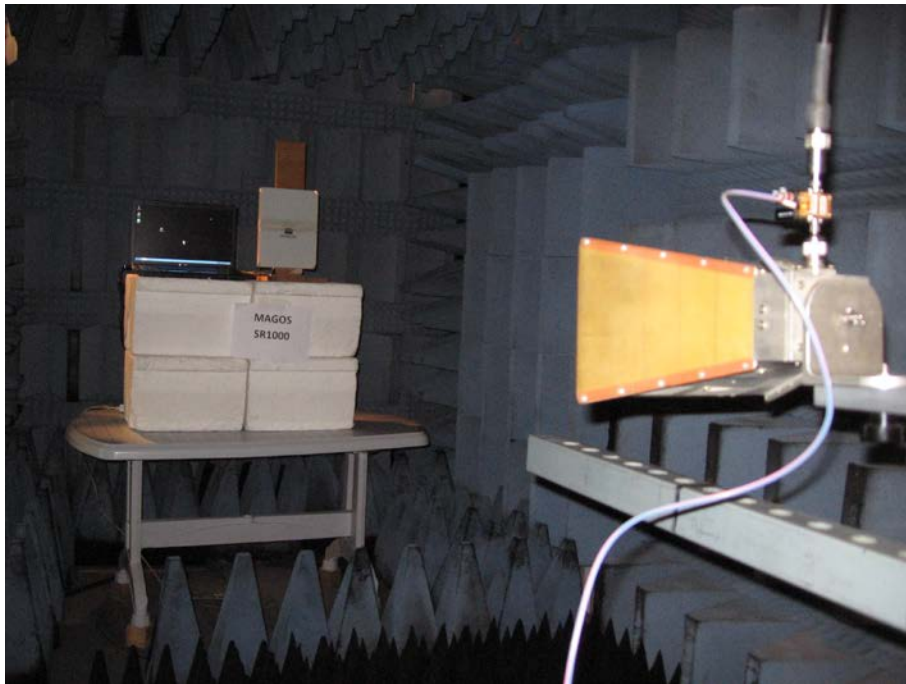


Figure 6. Radiated Emission Test, 1000-18,000MHz band



Figure 7. Radiated Emission Test, 18,000-26,500MHz band

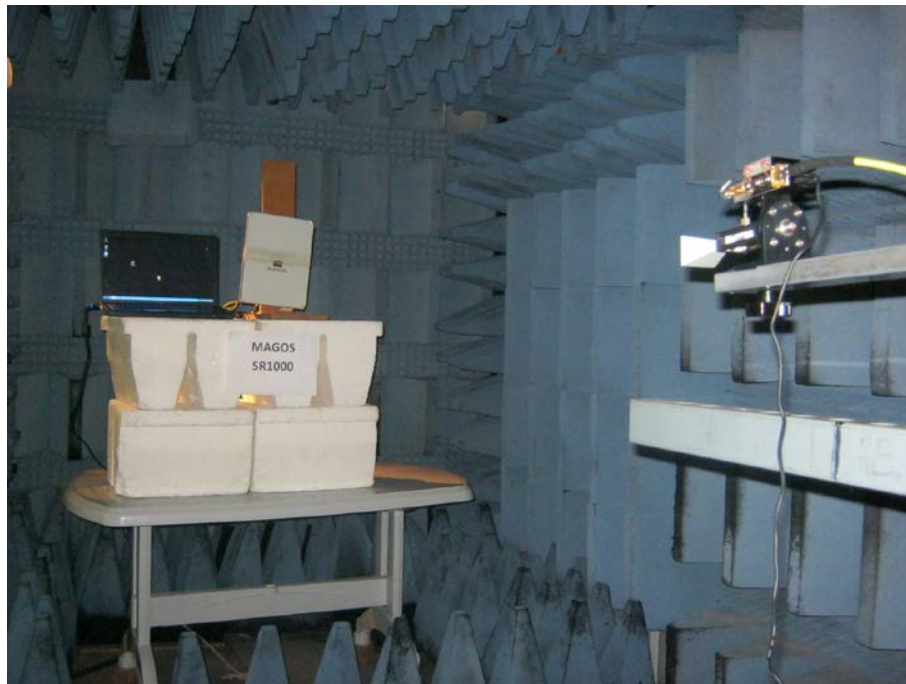


Figure 8. Radiated Emission Test, 26,500-40,000MHz band

4. Conducted Emission From AC Mains

4.1 Test Specification

FCC Part 15, Subpart C, Section 15.207
RSS Gen, Issue 4, Clause 8.8

4.2 Test Procedure

(Temperature (22°C)/ Humidity (51%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 μ 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 configuration tested is shown in the photograph, *Figure 2. Conducted Emission From AC Mains*.

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 μ 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 3.8 dB

The margin between the emission levels and the specification limit is, in the worst case, 4.0 dB for the phase line at 0.47 MHz and 3.8 dB at 0.47 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C and RSS-Gen, Issue 4, clause 8.8 specification requirements.

The details of the highest emissions are given in *Figure 9* to *Figure 12*.



Conducted Emission

E.U.T Description SR1000 SURVEILLANCE SENSOR
Type MS1231A
Serial Number: Not designated

Specification: FCC Part 15, Subpart C;
RSS-Gen, Issue 4, clause 8.8

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	
1 Quasi Peak	190 kHz	54.01	-10.02	
2 Average	190 kHz	43.92	-10.11	
2 Average	282 kHz	43.03	-7.71	
1 Quasi Peak	286 kHz	49.83	-10.80	
2 Average	474 kHz	42.45	-3.98	
1 Quasi Peak	482 kHz	49.61	-6.69	
2 Average	746 kHz	27.84	-18.15	
1 Quasi Peak	754 kHz	34.49	-21.51	
2 Average	1.274 MHz	18.55	-27.44	
1 Quasi Peak	1.422 MHz	27.79	-28.20	
1 Quasi Peak	3.462 MHz	30.17	-25.82	
2 Average	3.602 MHz	23.57	-22.42	
2 Average	4.442 MHz	25.30	-20.69	
1 Quasi Peak	4.926 MHz	29.85	-26.14	
2 Average	10.058 MHz	35.06	-14.93	
1 Quasi Peak	10.126 MHz	40.54	-19.45	
1 Quasi Peak	12.914 MHz	43.80	-16.19	
2 Average	13.006 MHz	38.50	-11.49	
2 Average	17.786 MHz	30.62	-19.37	
1 Quasi Peak	18.034 MHz	36.14	-23.85	

Date: 15.FEB.2018 10:54:49

Figure 9. 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

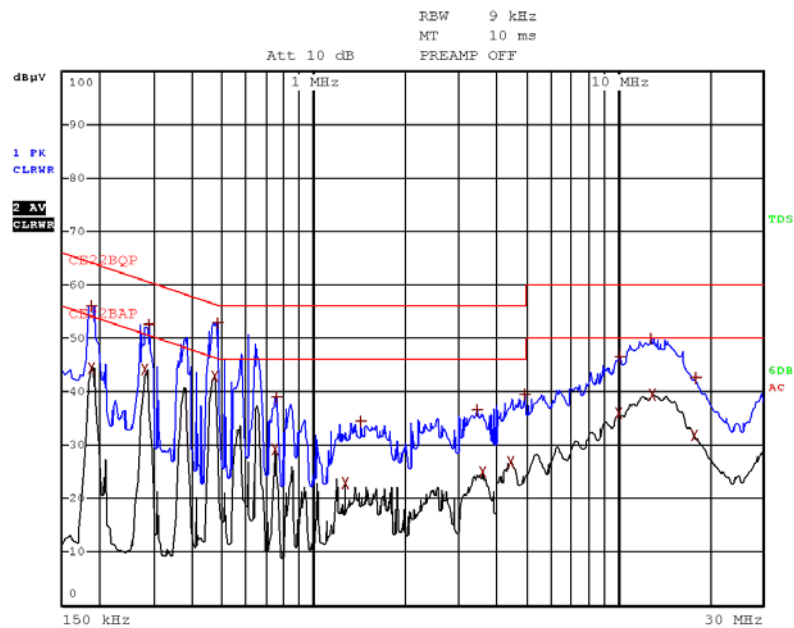
E.U.T Description SR1000 SURVEILLANCE
SENSOR
Type MS1231A
Serial Number: Not designated

Specification: FCC Part 15, Subpart C
RSS-Gen, Issue 4, clause 8.8

Lead: Phase

Detectors: Peak, Quasi-peak, Average

Power Operation POE



Date: 15.FEB.2018 10:52:57

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



Conducted Emission

E.U.T Description SR1000 SURVEILLANCE
SENSOR
Type MS1231A
Serial Number: Not designated

Specification: FCC Part 15, Subpart C
RSS-Gen, Issue 4, clause 8.8
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	186 kHz	43.94	-10.26	
1 Quasi Peak	194 kHz	52.33	-11.52	
2 Average	282 kHz	43.25	-7.50	
1 Quasi Peak	390 kHz	45.67	-12.39	
2 Average	470 kHz	42.67	-3.83	
1 Quasi Peak	474 kHz	50.56	-5.88	
1 Quasi Peak	750 kHz	35.61	-20.38	
2 Average	750 kHz	28.78	-17.21	
2 Average	1.286 MHz	24.08	-21.91	
1 Quasi Peak	1.37 MHz	29.62	-26.37	
1 Quasi Peak	3.154 MHz	28.61	-27.38	
2 Average	3.514 MHz	24.09	-21.90	
2 Average	4.466 MHz	25.57	-20.42	
1 Quasi Peak	4.826 MHz	29.78	-26.21	
1 Quasi Peak	9.99 MHz	40.54	-19.45	
2 Average	10.194 MHz	35.03	-14.96	
1 Quasi Peak	13.406 MHz	43.91	-16.08	
2 Average	14.39 MHz	38.44	-11.55	
1 Quasi Peak	18.006 MHz	36.11	-23.89	
2 Average	18.006 MHz	30.29	-19.70	

Date: 15.FEB.2018 11:01:30

Figure 11. 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 SR1000 SURVEILLANCE
SENSOR
Type MS1231A
Serial Number: Not designated

Specification: FCC Part 15, Subpart C
RSS-Gen, Issue 4, clause 8.8

Lead: Neutral

Detectors: Peak, Quasi-peak, Average

Power Operation POE

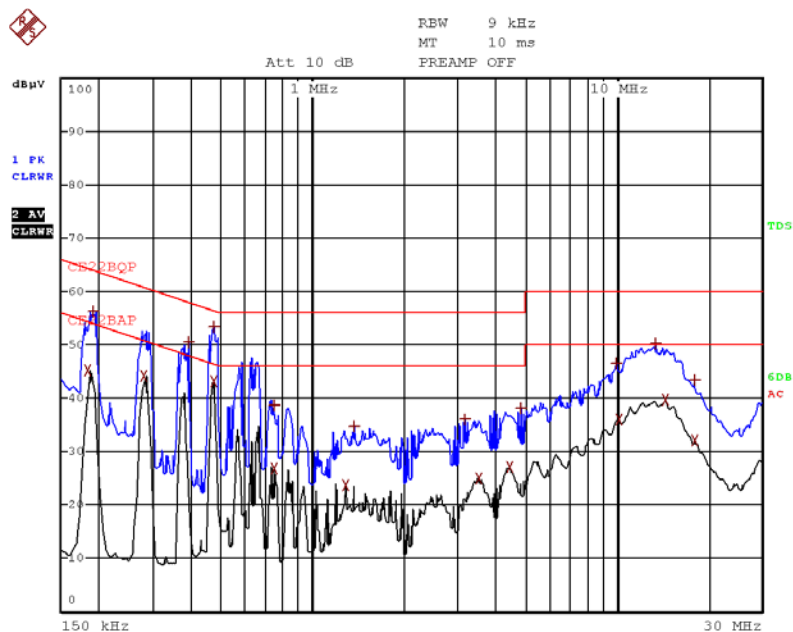


Figure 12 Detectors: Peak, Quasi-peak, Average



4.5 Test Equipment Used; Conducted Emission

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
LISN	Fischer	FCC-LISN-25A	127	July 20, 2017	July 20, 2018
Transient Limiter	HP	11947A	3107A03041	June 29, 2018	June 29, 2018
EMI Receiver	Rohde & Schwarz	ESCI7	100724	February 28, 2017	February 28, 2018
Cable CE Chamber 3M + 3M	Testline 18 + RJ214	11556	-	March 21, 2017	March 21, 2018

Figure 13 Test Equipment Used

5. 20dB Minimum Bandwidth

5.1 Test Specification

F.C.C. Part 15, Subpart C, section 15.247(a)(1)
RSS 247, Issue 2, Section 5.1(a)

5.2 Test Procedure

(Temperature (22°C)/ Humidity (53%RH))

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

The E.U.T was tested in the chamber, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground and 3 meter distance from testing antenna. The spectrum analyzer was set to the following parameters:

Span = ~ 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW $\geq$ 1% of the 20 dB bandwidth

Detector Function: Peak, Trace: Maximum Hold.

5.3 Test Limit

The maximum 20 dB bandwidth of the hopping channel is 1 MHz.

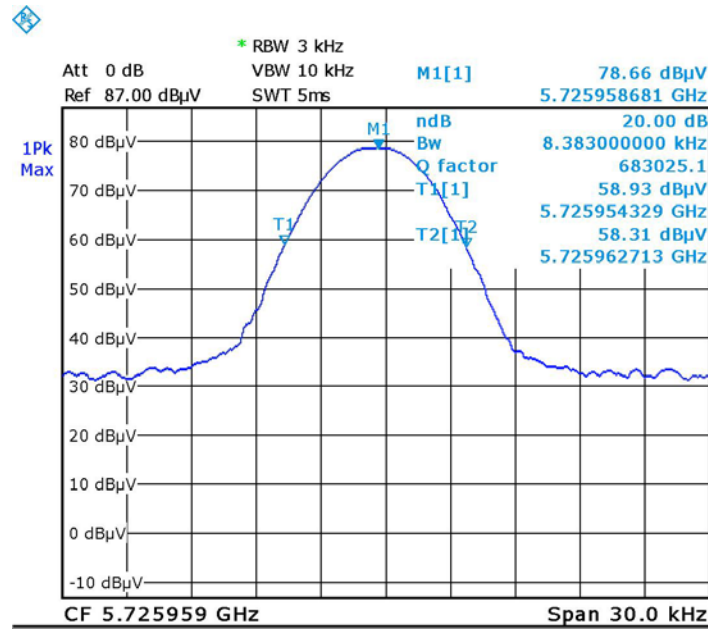
5.4 Test Results

Operation Frequency (MHz)	Bandwidth Reading (kHz)
5,725.9	8.38
5,786.9	8.02
5,848.9	8.14

Figure 14 — Test Results

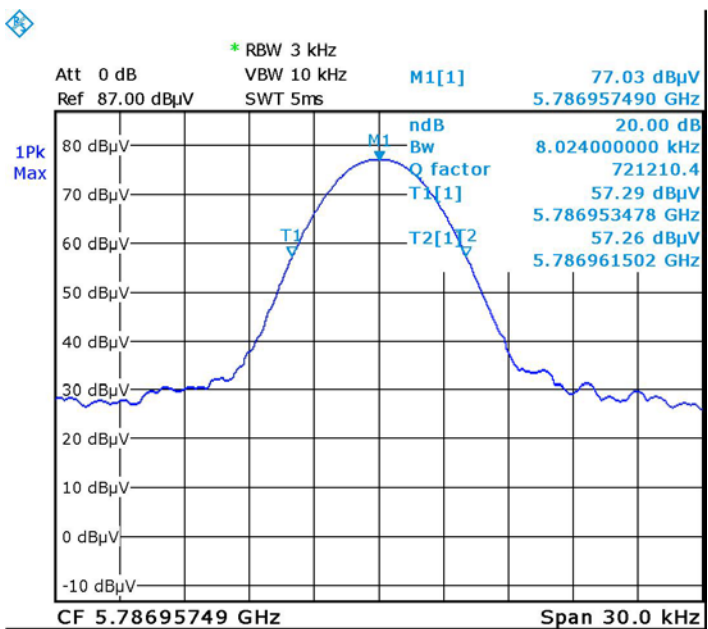
JUDGEMENT: Passed

For additional information see *Figure 15* to *Figure 17*.



Date: 12.FEB.2018 10:25:52

Figure 15. Low Channel



Date: 12.FEB.2018 10:35:07

Figure 16. Mid Channel

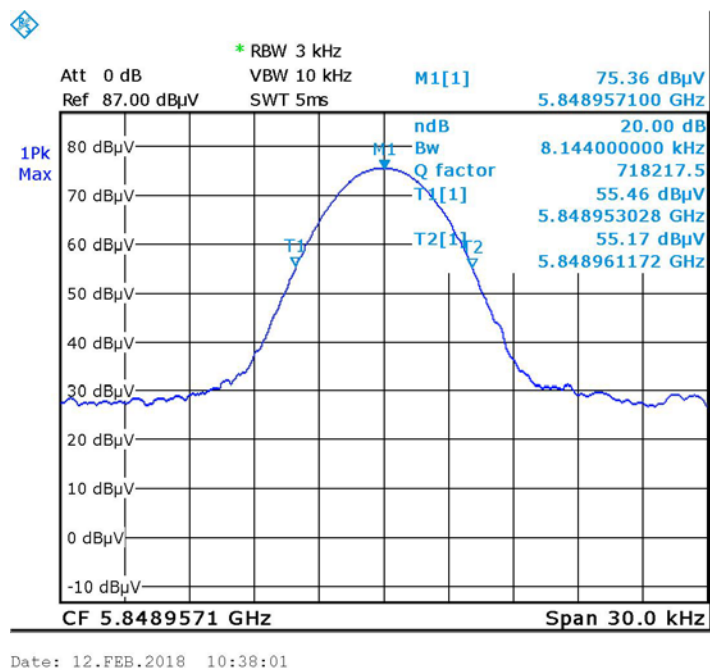


Figure 17. High Channel

5.5 Test Equipment Used, 20 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 28, 2017	February 28, 2018
Horn Antenna	ETS	3115	6142	May 19, 2015	May 19, 2018
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 18 Test Equipment Used

6. Occupied Bandwidth

6.1 Test Specification

F.C.C. Part 15, Subpart C: section 2.1048
RSS Gen, Section 6.6

6.2 Test Procedure

(Temperature (22°C)/ Humidity (53%RH))

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

The E.U.T was tested in the chamber, and placed on a remote-controlled turntable.

The E.U.T was placed on a non-metallic table, 1.5 meters above the ground and a 3 meter distance from testing antenna. The spectrum analyzer was set to the following parameters:

Span = ~ 2 to 3 times the occupied bandwidth, centered on a hopping channel

RBW $\geq$ 1% of the occupied bandwidth

Detector Function: Peak, Trace: Maximum Hold.

99% Occupied bandwidth function was turn on.

6.3 Test Limit

N/A

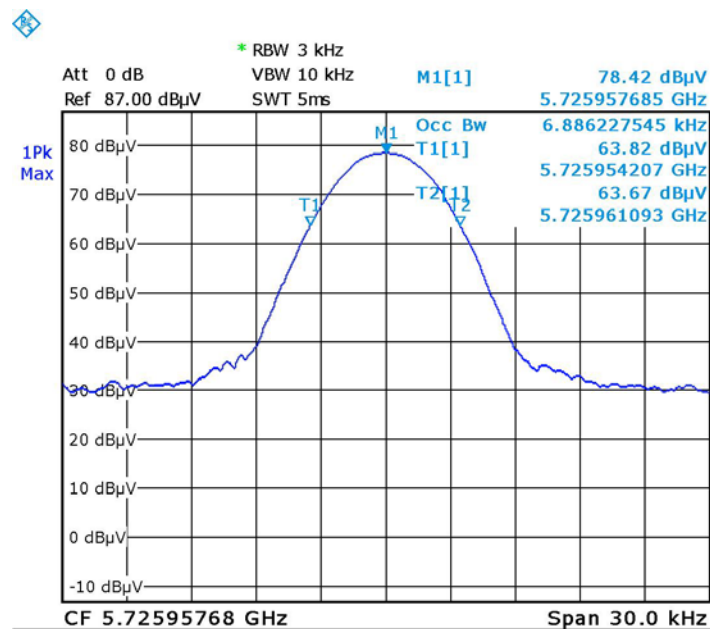
6.4 Test Results

Operation Frequency (MHz)	Bandwidth Reading (kHz)
5,725.9	6.89
5,786.9	6.83
5,848.9	7.07

Figure 19 Test Results

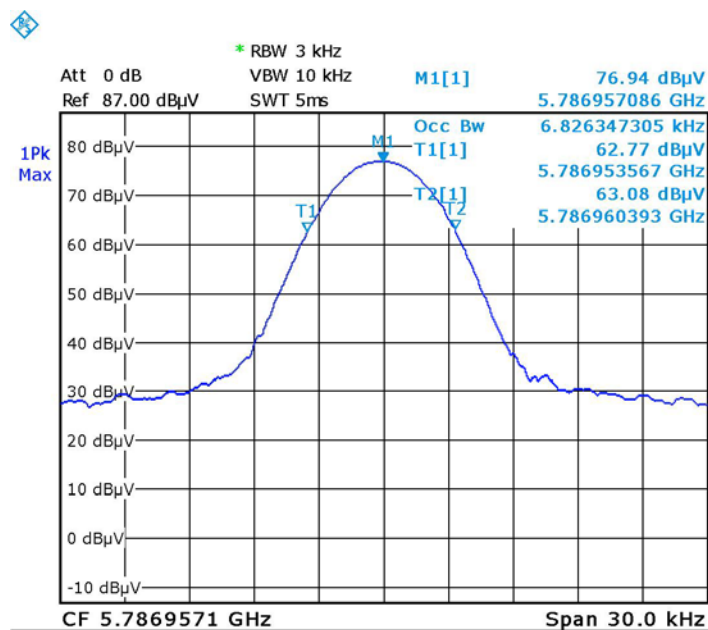
JUDGEMENT: Passed

For additional information see *Figure 15 to Figure 17*.



Date: 12.FEB.2018 10:54:03

Figure 20. Low Channel



Date: 12.FEB.2018 10:52:14

Figure 21. Mid Channel

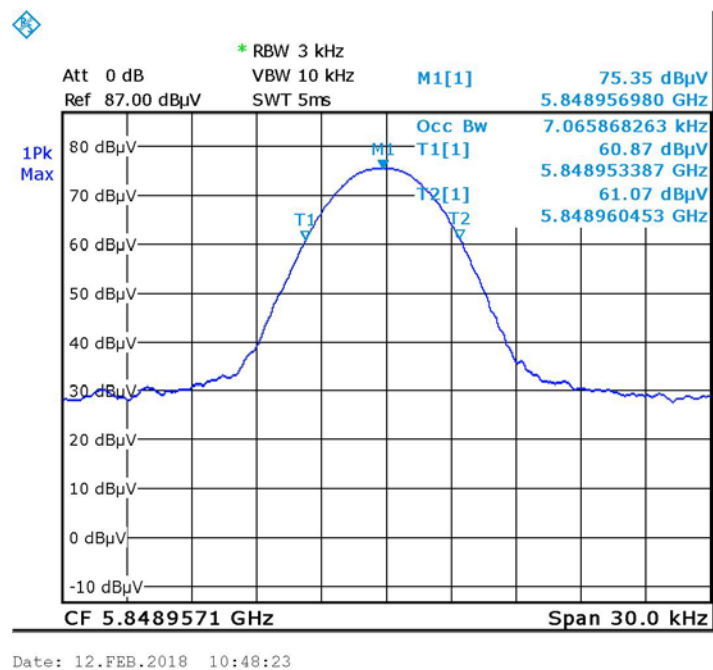


Figure 22. High Channel

6.5 Test Equipment Used, Occupied Bandwidth

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	FSL6	100194	March 2, 2017	March 2, 2018
Horn Antenna	ETS	3115	6142	May 19, 2015	May 19, 2018
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 23 Test Equipment Used

7. Number of Hopping Frequencies

7.1 Test Specification

F.C.C., Part 15, Subpart C Section 15.247(a)(1)(ii)
RSS 247, Issue 2, February 2017, clause 5.1(e)

7.2 Test Procedure

(Temperature (22°C)/ Humidity (52%RH))

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

The E.U.T was tested in the chamber, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground and a 3 meter distance from testing antenna.

The E.U.T. was set to hopping mode.

The spectrum analyzer was set to the following parameters:

RBW: 30 kHz, VBW: 100 kHz

Detector Function: Peak, Trace: Maximum Hold.

7.3 Test Limit

Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies.

7.4 Test Results

Number of Hopping Frequencies	Specification
247	≥ 75

Figure 24 Test Results

JUDGEMENT: Passed

For additional information see

Figure 25 to Figure 28.

Number of Hopping Frequencies

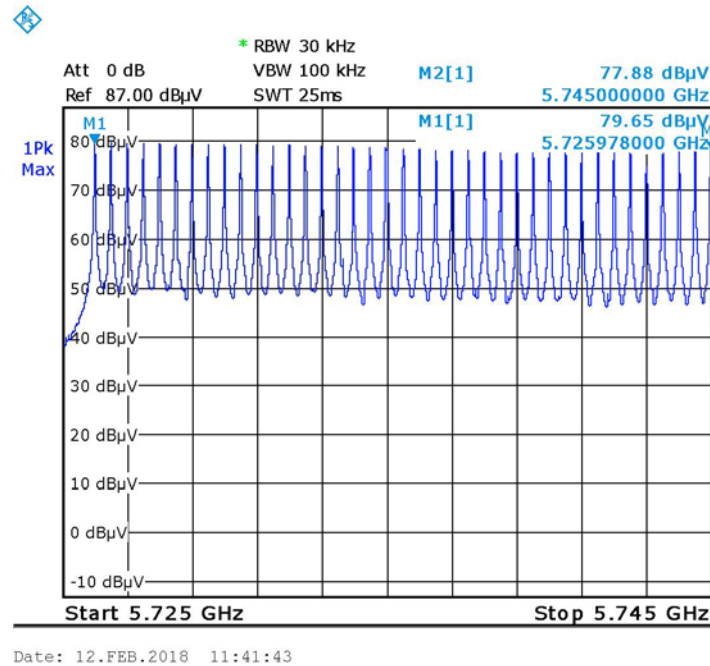


Figure 25. Number of Channels 5725-5745MHz band

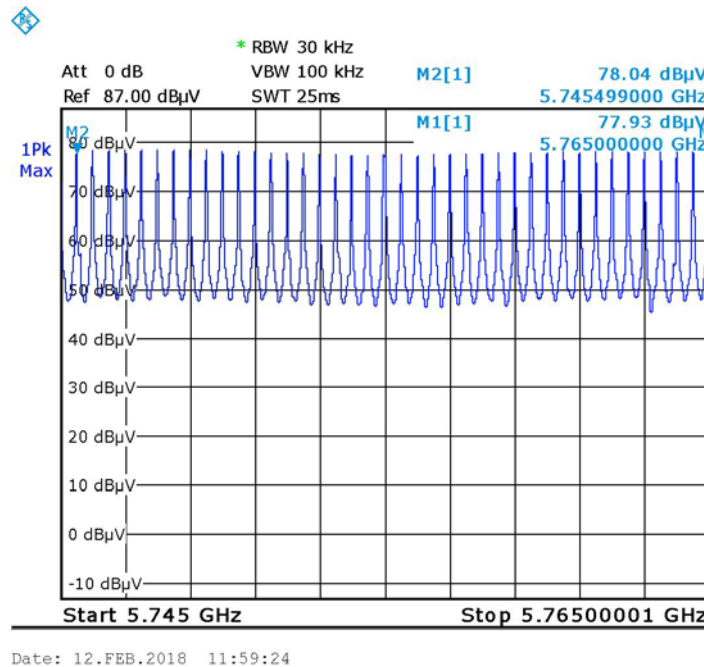
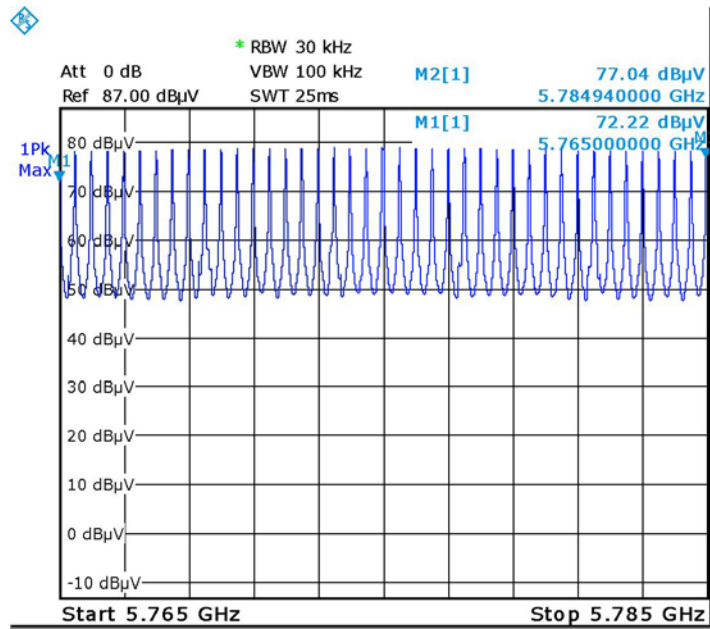
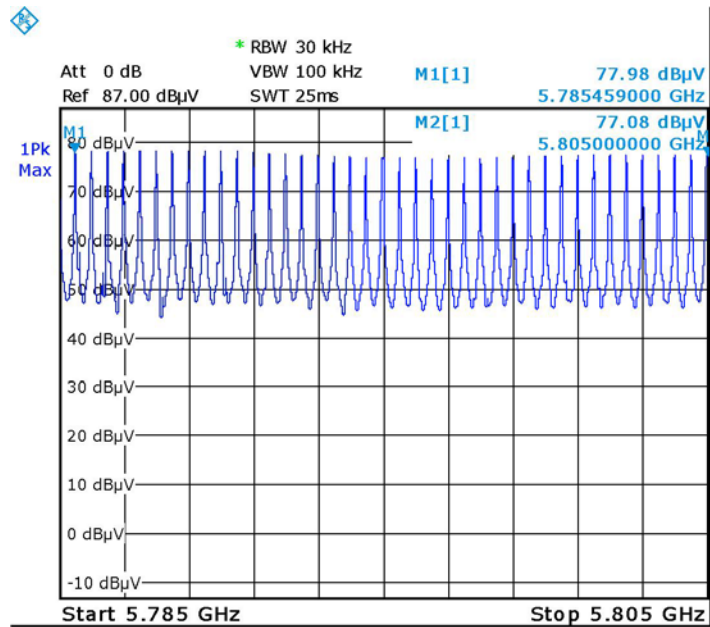


Figure 26. Number of Channels 5745-5765MHz band



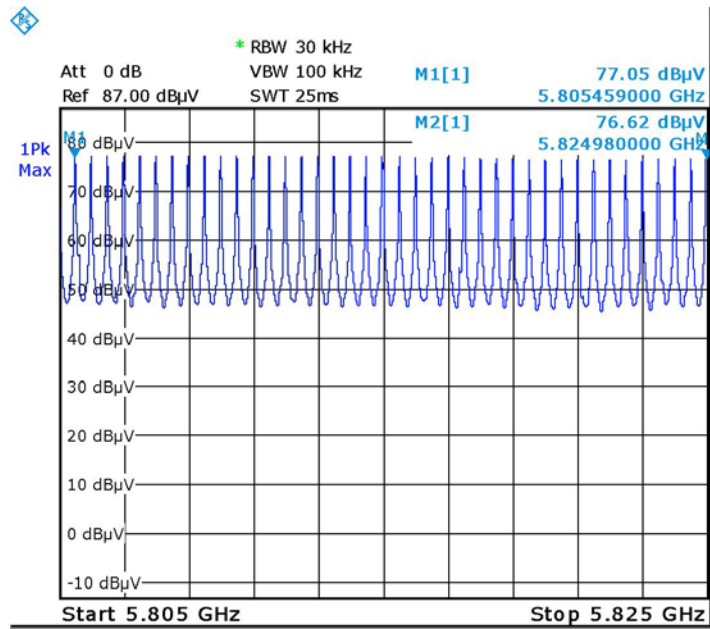
Date: 12.FEB.2018 12:49:07

Figure 27. Number of Channels 5765-5785MHz band



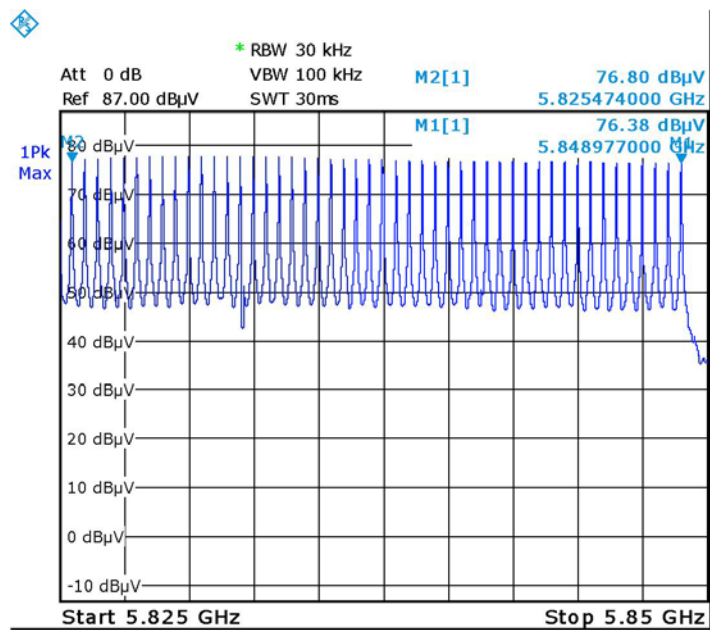
Date: 12.FEB.2018 13:10:07

Figure 28. Number of Channels 5785-5805MHz band



Date: 12.FEB.2018 13:28:11

Figure 29. Number of Channels 5805-5825MHz band



Date: 12.FEB.2018 14:04:19

Figure 30. Number of Channels 5825-5850MHz band



7.5 Test Equipment Used, Number of Hopping Frequencies

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	FSL6	100194	March 2, 2017	March 2, 2018
Horn Antenna	ETS	3115	6142	May 19, 2015	May 19, 2018
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 31 Test Equipment Used

8. Channel Frequency Separation

8.1 Test Specification

FCC Part 15, Subpart C, 15.247(a) (1)

RSS 247. Issue 2, Clause 5.1(b)

8.2 Test Procedure

(Temperature (22°C)/ Humidity (52%RH))

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

The E.U.T was tested in the chamber, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground and a 3 meter distance from testing antenna.

The E.U.T. was set to hopping mode.

The spectrum analyzer was set to the following parameters:

Span = wide enough to capture two adjacent channels, RBW $\geq$ 1% of the span

Detector Function: Peak, Trace: Maximum Hold.

8.3 Test Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

8.4 Test Results

Channel Frequency Separation	Limit – at least
(kHz)	(kHz)
499.0	25.0

Figure 32 Test Results

JUDGEMENT: Passed

For additional information see *Figure 33*.

Channel Frequency Separation

E.U.T Description SR1000 SURVEILLANCE
SENSOR
Type MS1231A
Serial Number: Not designated

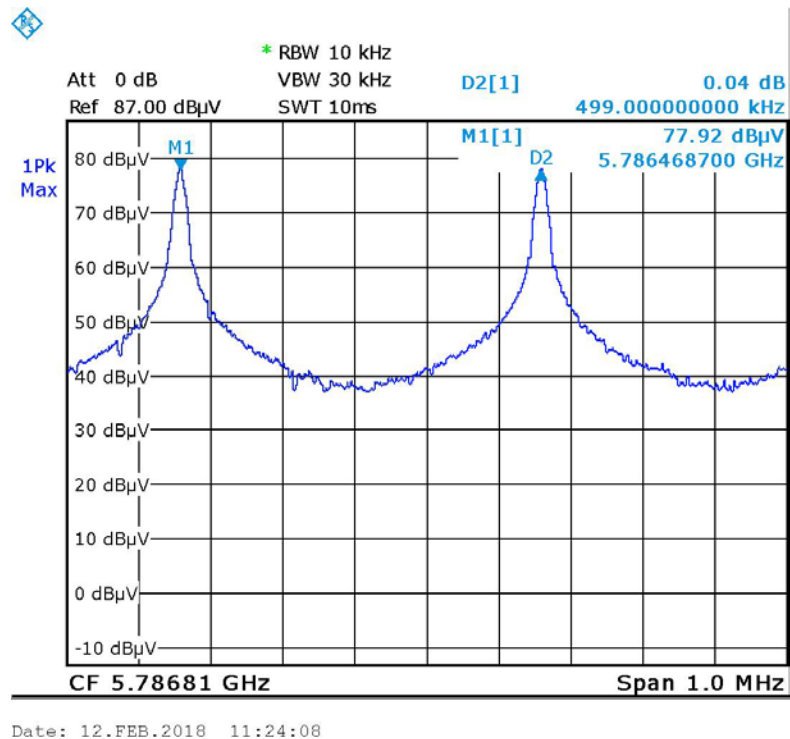


Figure 33. Channel Frequency Separation



8.5 Test Equipment Used, Channel Frequency Separation Test

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 28, 2017	February 28, 2018
Horn Antenna	ETS	3115	6142	May 19, 2015	May 19, 2018
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 34 Test Equipment Used

9. Peak Output Power

9.1 Test Specification

F.C.C. Part 15, Subpart C: section 15.247(b)(1)
RSS 247, Issue 2, Clause 5.4(c)

9.2 Test Procedure

(Temperature (22°C)/ Humidity (54%RH))

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

The E.U.T was tested in the chamber, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground and a 3 meter distance from testing antenna.

The spectrum analyzer was set to the following parameters:

Span = ~5 times the 20 dB bandwidth, centered on a hopping channel RBW $\geq$ of the 20 dB bandwidth of the emission being measured.

Detector Function: Peak, Trace: Maximum Hold.

Radiated output power levels were measured at selected operation frequencies and the results were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} \text{ [W]}$$

E - Field Strength (V/m)

d – Distance from transmitter (m)

G – Antenna gain

P – Peak power (W)

9.3 Test Limit

For all frequency hopping systems in the 5725-5850 MHz band: 1 watt.

9.4 Test Results

Operation Frequency (MHz)	Polarization (V/H)	Field Strength (dBuV/m)	EIRP (dBm)	Antenna Gain (dBi)	Conducted Power (dBm)	Conducted Power (mW)	Limit* (mW)	Margin (mW)
5726.0	V	121.2	26.0	9.0	17.0	50.1	500.0	-449.9
	H	107.8	12.6	9.0	3.6	2.3	500.0	-497.7
5787.0	V	119.9	24.7	9.0	15.7	37.2	500.0	-462.8
	H	108.2	13.0	9.0	4.0	2.5	500.0	-497.5
5849.0	V	120.7	25.5	9.0	16.5	44.7	500.0	-455.3
	H	107.0	11.8	9.0	2.8	1.9	500.0	-498.1

*Note – Limit value reduced by 3dBi because antenna gain exceeds 6dBi by 3dB.

Figure 35 Radiated Power Output Test Results

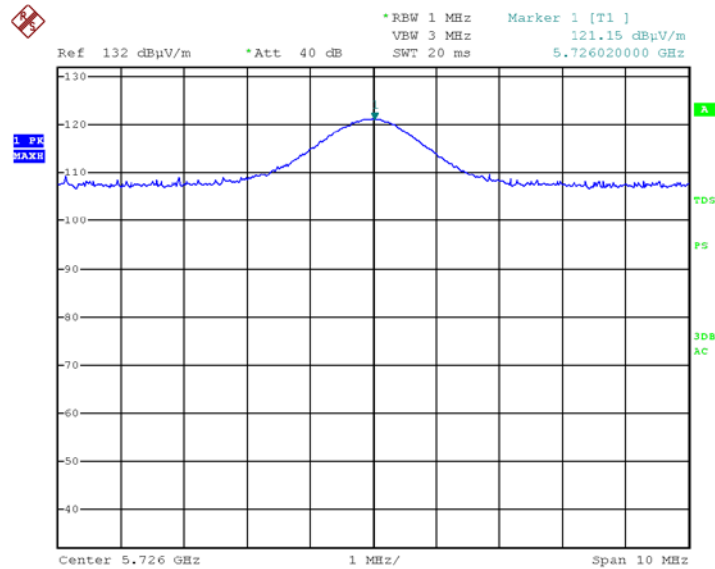
JUDGEMENT: Passed by 449.9 mW

For additional information see *Figure 36 to Figure 41*.



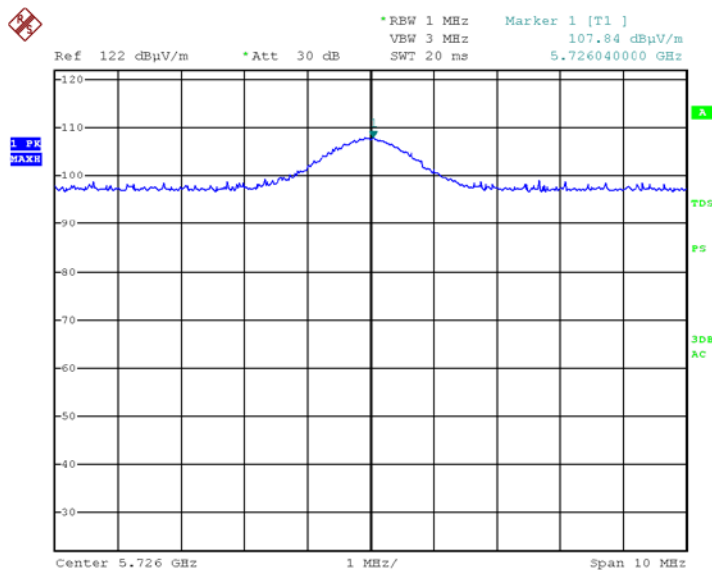
Peak Output Power

E.U.T Description SR1000 SURVEILLANCE
 SENSOR
Type MS1231A
Serial Number: Not designated



Date: 12.FEB.2018 09:11:37

Figure 36 —Low Vertical



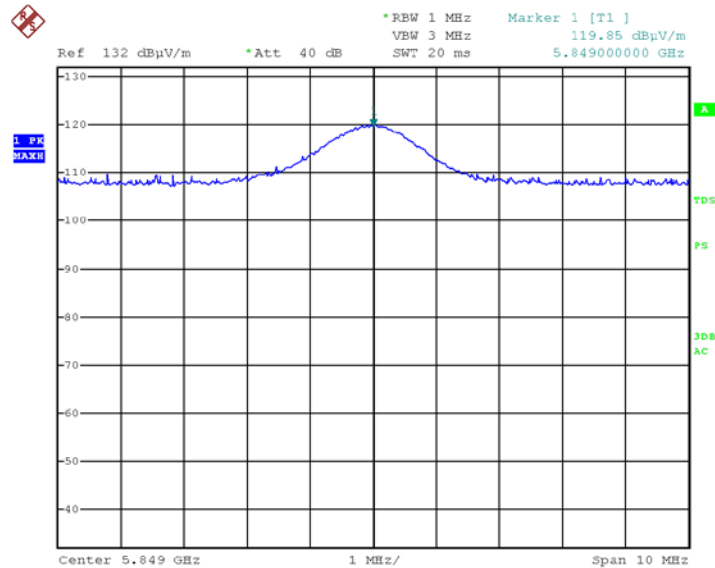
Date: 12.FEB.2018 09:23:49

Figure 37 —Low Horizontal



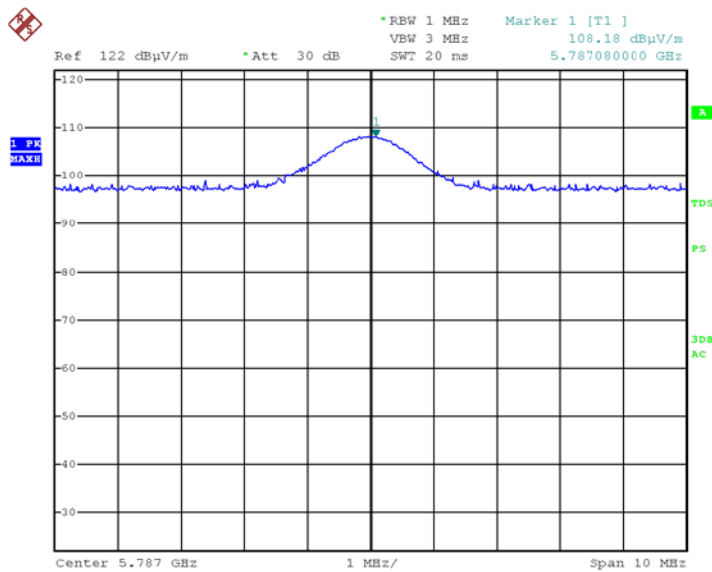
Peak Output Power

E.U.T Description SR1000 SURVEILLANCE
 SENSOR
Type MS1231A
Serial Number: Not designated



Date: 12.FEB.2018 09:05:18

Figure 38 —Mid Vertical



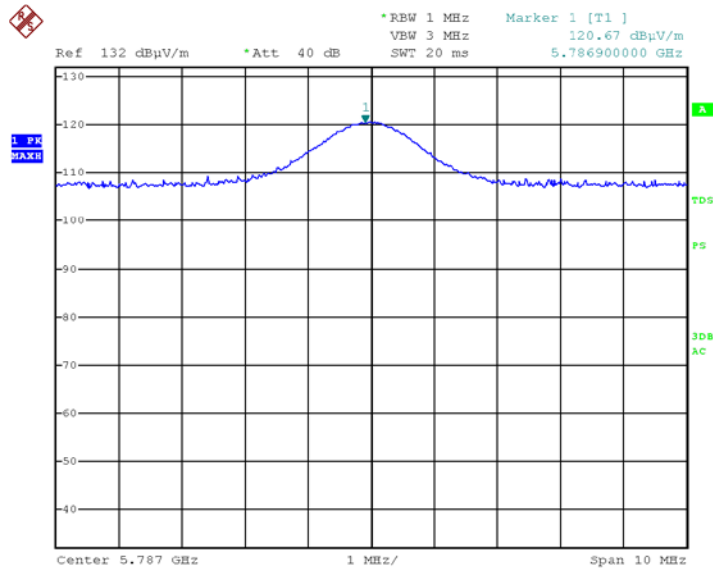
Date: 12.FEB.2018 09:28:48

Figure 39 —Mid Horizontal



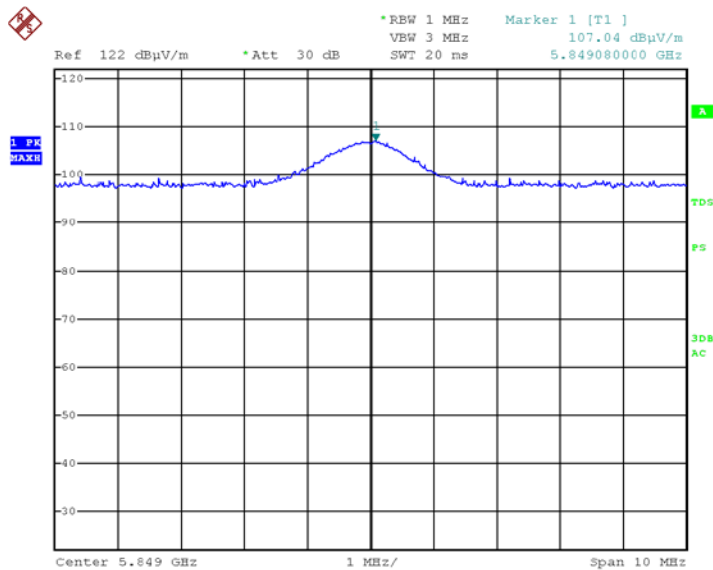
Peak Output Power

E.U.T Description SR1000 SURVEILLANCE
 SENSOR
Type MS1231A
Serial Number: Not designated



Date: 12.FEB.2018 09:00:45

Figure 40 —High Vertical



Date: 12.FEB.2018 09:34:43

Figure 41 —High Horizontal



9.5 Test Equipment Used, Radiated Maximum Power Output

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 28, 2017	February 28, 2018
Horn Antenna	ETS	3115	6142	May 19, 2015	May 19, 2018
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 42 Test Equipment Used



10. Dwell Time on Each Channel

10.1 Test Specification

FCC Part 15, sub part C, Section 15.247(a)(1)(ii)

RSS 247, Issue 2, clause 5.1(e)

10.2 Test Procedure

(Temperature (22°C)/ Humidity (54%RH))

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

The E.U.T was tested in the chamber, and placed on a remote-controlled turntable.

The E.U.T was placed on a non-metallic table, 1.5 meters above the ground and 3 meter distance from testing antenna.

The spectrum analyzer was set to the following parameters:

Span = zero span, centered on a hopping channel, $RBW \geq 1\text{MHz}$

Detector Function: Peak, Trace: Maximum Hold

10.3 Test Limit

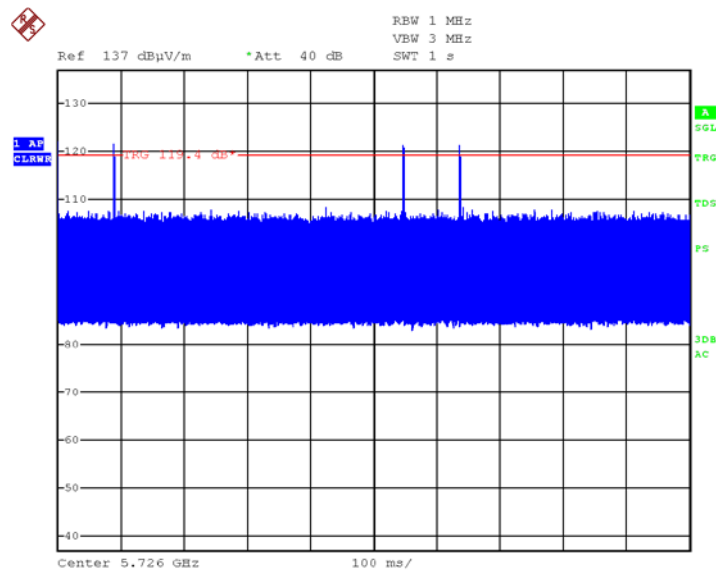
The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

10.4 Test Results

JUDGEMENT: Passed

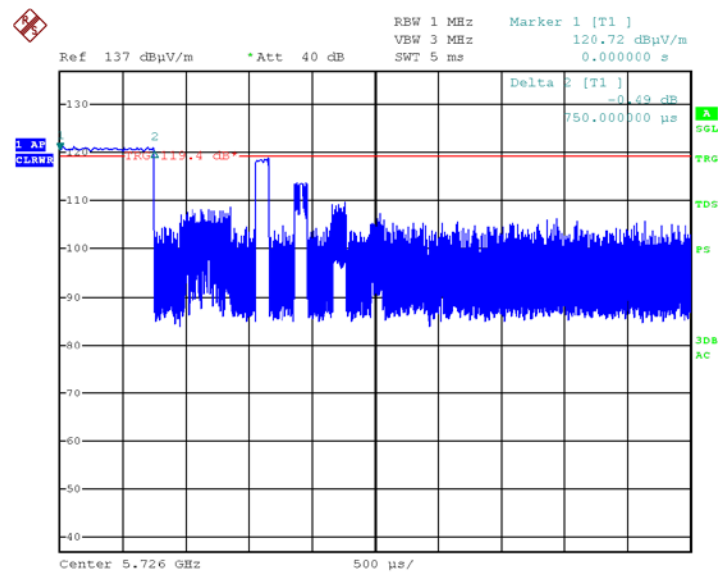
The E.U.T met the requirements of the FCC Part 15, Section 15.247(a)(1)(i) and RSS 247, Issue 2, clause 5.1(e).

Additional information of the results is given in *Figure 43* to *Figure 45*.



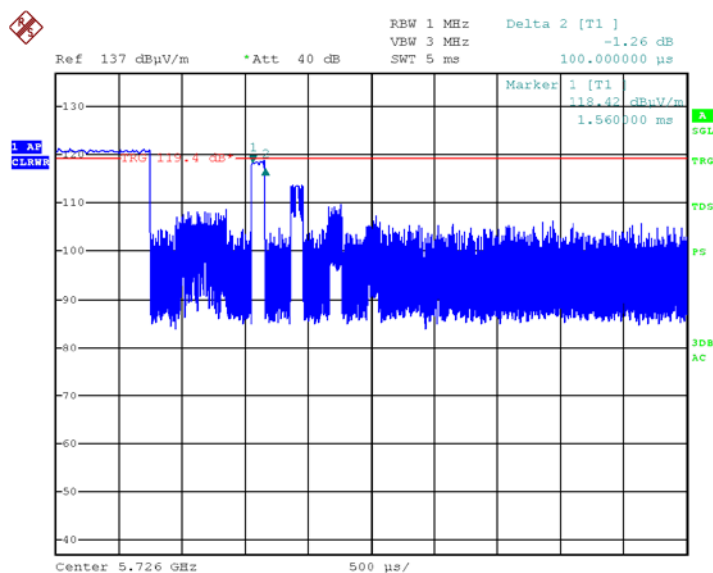
Date: 12.FEB.2018 10:43:01

Figure 43 — Number of Bursts in 1sec=4, in 30sec=120



Date: 12.FEB.2018 10:40:29

Figure 44 — Burst Duration1 =0.75ms



Date: 12.FEB.2018 10:41:19

Figure 45 — Burst Duration2 =0.1ms
DWELL TIME = 0.85m*120= 102msec<0.4s

10.5 Test Equipment Used, Dwell Time on Each Channel

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 28, 2017	February 28, 2018
Horn Antenna	ETS	3115	6142	May 19, 2015	May 19, 2018
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 46 Test Equipment Used

11. Band Edge

11.1 Test Specification

FCC Part 15, Section 15.247(d)

RSS 247, Issue 2, clause 5.5

11.2 Test Procedure

(Temperature (22°C)/ Humidity (54%RH))

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

The E.U.T was tested in the chamber, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground and a 3 meter distance from testing antenna.

The transmitter unit operated in 2 modes: hopping enabled and hopping disabled. The RBW was set to 100 kHz. The EMI receiver was adjusted to the transmission channel at the maximum level. The display line was set to 20 dBc and the EMC analyzer was set to the band edge frequencies.

The E.U.T. was tested at the lower and the upper channels.

11.3 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 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

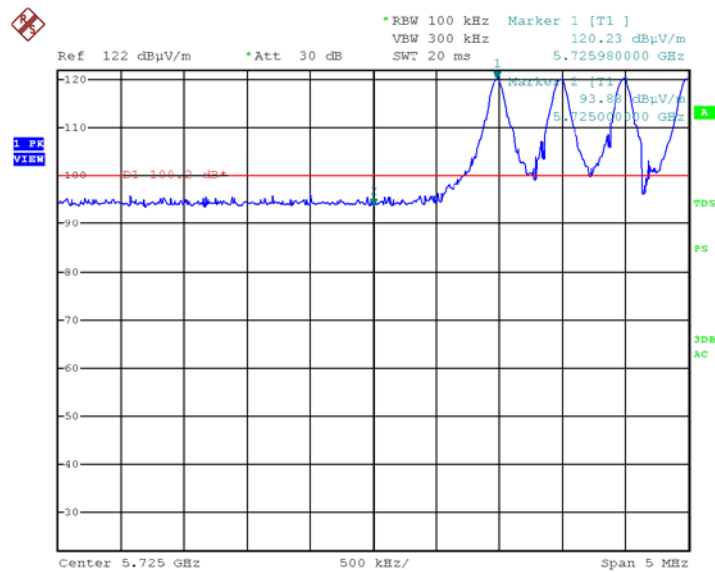
11.4 Test Results

Mode	Operation Frequency	Band Edge Frequency	Spectrum Level	Limit	Margin
	(MHz)	(MHz)	(dBuV/m)	(dBuV/m)	(dB)
Hopping	Low	5725.0	93.88	100.2	-6.3
	High	5850.0	95.09	97.7	-2.6
Non- Hopping	Low	5725.0	94.49	99.5	-5.0
	High	5850.0	94.60	97.9	-3.3

Figure 47 Band Edge Test Results

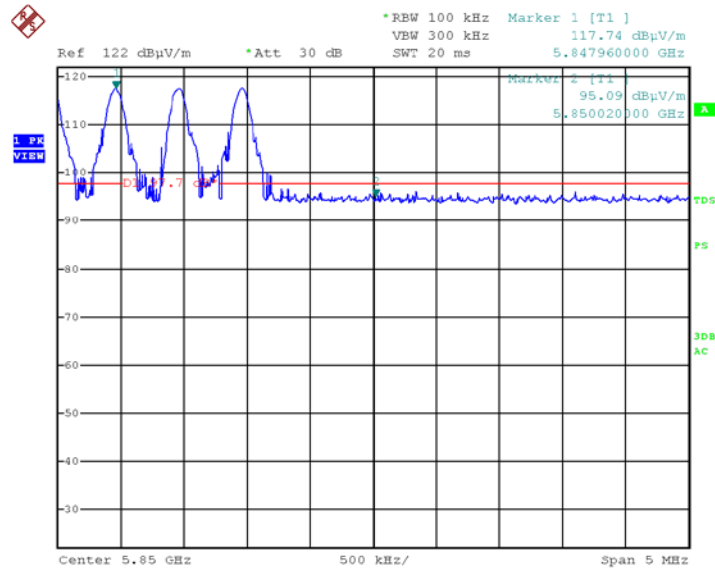
JUDGEMENT: Passed by 2.6 dB

For additional information see *Figure 48 to Figure 51*.



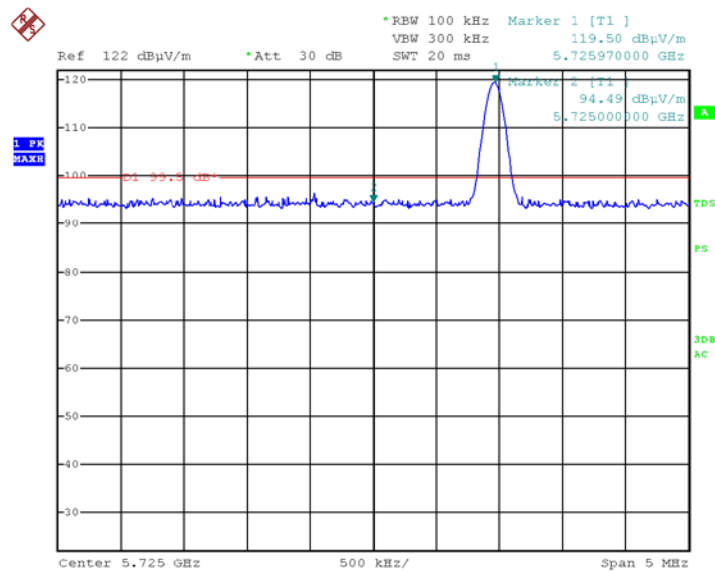
Date: 12.FEB.2018 10:14:42

Figure 48 — Hopping - Low



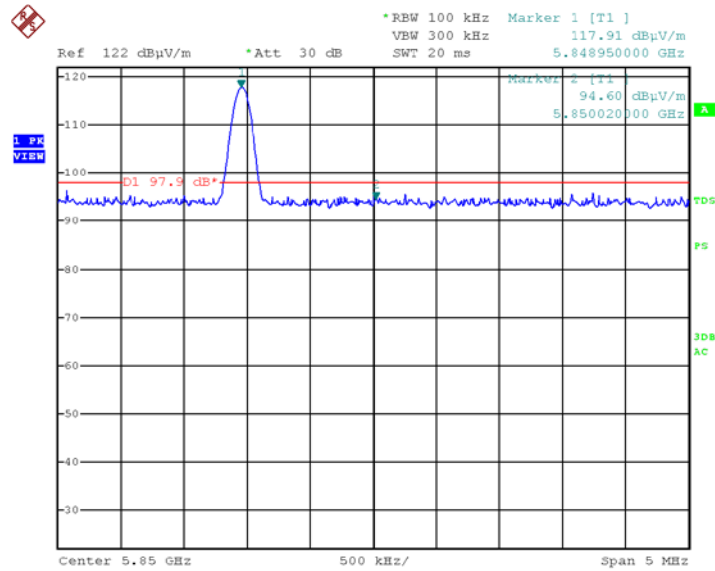
Date: 12.FEB.2018 09:57:24

Figure 49 — Hopping - High



Date: 12.FEB.2018 10:19:33

Figure 50 — Non-Hopping - Low



Date: 12.FEB.2018 09:48:56

Figure 51 — Non-Hopping - High



11.5 Test Equipment Used, Band Edge Spectrum

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	FSL6	February 28, 2018
Horn Antenna	ETS	3115	6142	May 19, 2015	May 19, 2018
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 52 Test Equipment Used

12. Emissions in Non-Restricted Frequency Bands

12.1 Test Specification

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

RSS 247, Issue 2, Section 5.5

12.2 Test Procedure

(Temperature (21°C)/ Humidity (51%RH))

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

For measurements between 0.009MHz-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 30.0MHz-1.0GHz:

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 30.0MHz -1.0GHz was scanned and the list of the highest emissions was verified and updated accordingly.

For measurements between 1.0GHz-40.0GHz:

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 1.0GHz -40.0GHz was scanned.

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

12.3 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.



12.4 Test Results

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 247 (d) and RSS 247, Issue 2, Section 5.5 specification.

All detected emissions were greater than 20dBc below the fundamental level.



12.5 Test Equipment Used, Emissions in Non-Restricted Frequency Bands

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 28, 2017	February 28, 2018
Spectrum Analyzer	HP	8592L	3826A01204	March 1, 2017	March 1, 2018
EMI Receiver	HP	8542E	3906A00276	March 1, 2017	March 1, 2018
RF Filter Section	HP	85420E	3705A00248	March 1, 2017	March 1, 2018
Spectrum Analyzer	HP	8564E	3442A00275	March 19, 2017	March 19, 2018
Biconical Antenna	EMCO	3110B	9912-3337	May 15, 2017	May 15, 2019
Log Periodic Antenna	EMCO	3146	9505-4081	May 15, 2017	May 15, 2018
Horn Antenna	ETS	3115	29845	May 19, 2015	May 19, 2018
Horn Antenna	ARA	SWH-28	1007	December 31, 2017	December 31, 2020
Horn Antenna Ka Band	OSR Electronics	PE9850R-20	J202021732	February 1, 2015	February 28, 2018
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
Spectrum Analyzer	HP	8593EM	3536A00120A DI	February 28, 2017	February 28, 2018
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
RF Cable (OATS)	EIM	RG214-11N(X2)		August 13, 2017	August 13, 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 53 Test Equipment Used

13. Emissions in Restricted Frequency Bands

13.1 Test Specification

FCC, Part 15, Subpart C, Sections 247(d), 15.205, 15.209
RSS Gen, Issue 4, Section 8.10

13.2 Test Procedure

(Temperature (22°C)/ Humidity (54%RH))

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-40GHz:

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 -40GHz was scanned.

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.

13.3 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.

13.4 Test Results

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C 209 and RSS Gen, Issue 4, Section 8.10 specification.

For additional information see Figure 54.



Radiated Emission

E.U.T Description SR1000 SURVEILLANCE
SENSOR
Type MS1231A
Serial Number: Not designated

Specification: FCC, Part 15, Subpart C, Sections 15.209, 15.205, 15.247(d);
RSS Gen, Issue 4, Section 8.10

Antenna Polarization: Horizontal/Vertical Frequency Range: 9kHz to 40.0 GHz
Protocol type: CW 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)
5726.0	11,452.0	V	69.0	74.0	-5.0	33.6	54.0	-20.4
	11,452.0	H	72.8	74.0	-1.2	37.4	54.0	-16.6
	22,904.0	V	65.0	74.0	-9.0	29.6	54.0	-24.4
	22,904.0	H	65.6	74.0	-8.4	30.2	54.0	-23.8
5787.0	11,574.0	V	69.3	74.0	-4.7	33.9	54.0	-20.1
	11,574.0	H	73.8	74.0	-0.2	38.4	54.0	-15.6
5849.0	11,698.0	V	72.0	74.0	-2.0	36.6	54.0	-17.4
	11,698.0	H	73.0	74.0	-1.0	37.6	54.0	-16.4

Figure 54. 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



13.5 Test Equipment Used, Emissions in Restricted Frequency Bands

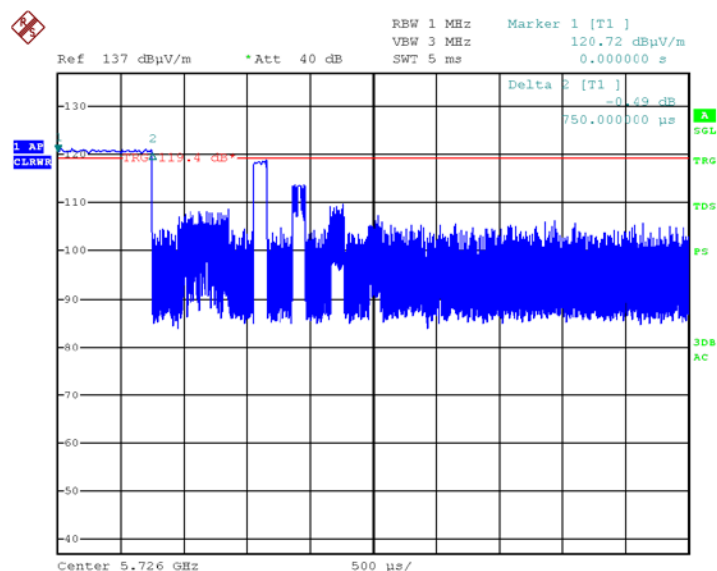
Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 28, 2017	February 28, 2018
Spectrum Analyzer	HP	8592L	3826A01204	March 1, 2017	March 1, 2018
EMI Receiver	HP	8542E	3906A00276	March 1, 2017	March 1, 2018
RF Filter Section	HP	85420E	3705A00248	March 1, 2017	March 1, 2018
Spectrum Analyzer	HP	8564E	3442A00275	March 19, 2017	March 19, 2018
Biconical Antenna	EMCO	3110B	9912-3337	May 15, 2017	May 15, 2019
Log Periodic Antenna	EMCO	3146	9505-4081	May 15, 2017	May 15, 2018
Horn Antenna	ETS	3115	29845	May 19, 2015	May 19, 2018
Horn Antenna	ARA	SWH-28	1007	December 31, 2017	December 31, 2020
Horn Antenna Ka Band	OSR Electronics	PE9850R-20	J202021732	February 1, 2015	February 28, 2018
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
Spectrum Analyzer	HP	8593EM	3536A00120 ADI	February 28, 2017	February 28, 2018
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
RF Cable (OATS)	EIM	RG214-11N(X2)		August 13, 2017	August 13, 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 55 Test Equipment Used

14. Avg. Factor Calculation

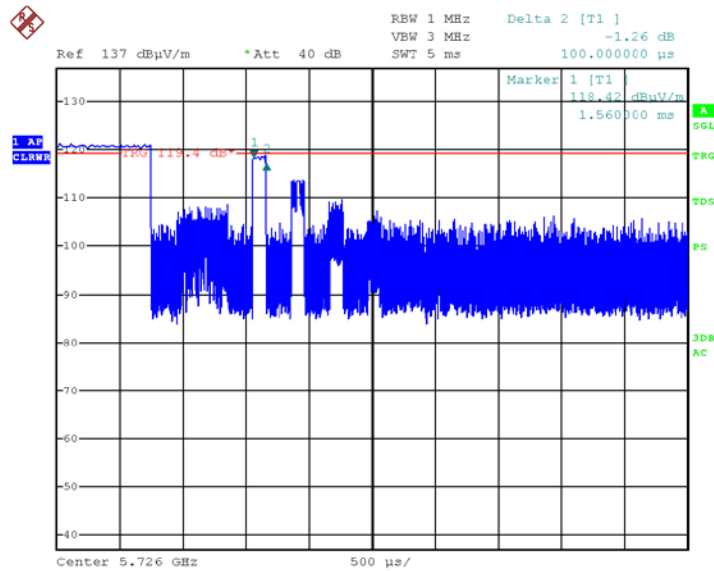
1. Pulse period = 1 (worst scenario)
2. Pulse duration = 1 (worst scenario)
3. Burst duration = 0.85msec
4. Average Factor = $20 \log \left[\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{burst duration}}{100\text{msec}} \times \text{Num of burst within 100msec} \right]$

$$\text{Average Factor} = 20 \log [1 * 0.85 / 100 * 2] = -35.4$$



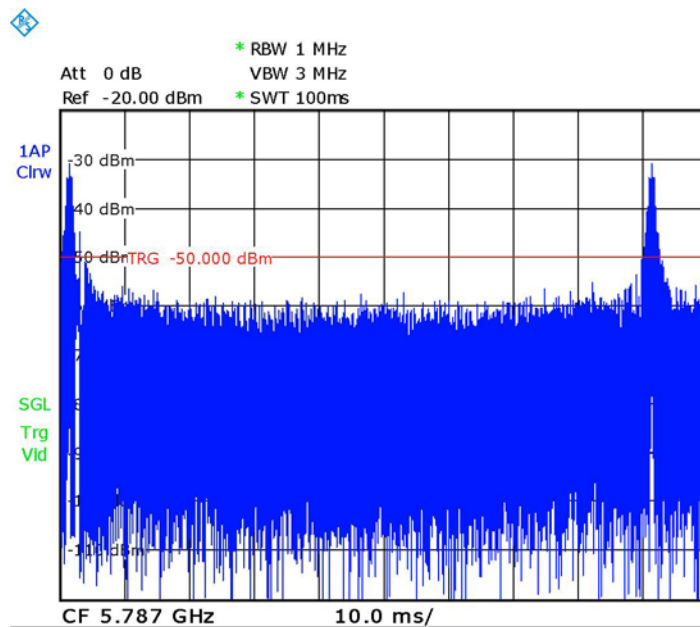
Date: 12.FEB.2018 10:40:29

Figure 56 — Burst Duration1 =0.75ms



Date: 12.FEB.2018 10:41:19

Figure 57 — Burst Duration2 =0.1ms



Date: 14.FEB.2018 11:10:59

Figure 58. Number of Bursts in 100msec=2



14.1 Test Equipment Used, Average Factor

Instrument	Manufacturer	Model	Serial Number	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	Rodhe & Schwarz	FSL6	100194	March 2, 2017	March 2, 2018
Low Loss Cable	Huber Suner	Sucofelex	27502/4PEA	October 1, 2017	October 1, 2018
-30dB Attenuator	Bird	8304-N30DB	-	June 29, 2017	June 29, 2018

Figure 59 Test Equipment Used



15. Antenna Gain/Information

The antenna gain is 9 dBi, patch.



16. R.F Exposure/Safety

The typical placement of the E.U.T. is wall mounted. The typical distance between the E.U.T. and the user is at least 20cm.

Calculation of Maximum Permissible Exposure (MPE)

Based on 47CFR1 Section 1.1307(b)(1) and RSS 102 Issue 5, Table 4 Requirements

- (a) FCC Limit at 5726 MHz is: 1 mW/cm²

Using Table 1 of 47CFR1 Section 1.1310 limit for general population/uncontrolled exposures, the above levels are an average over 30 minutes.

- (b) ISED Limit: 300-6000MHz = $0.02619f^{0.6834} \text{ W/m}^2 =$
 $0.02619 \times 5726^{0.6834} = 0.02619 \times 369.93 = 9.69 \text{ W/m}^2 = 0.969 \text{ mW/cm}^2$

- (c) The power density produced by the E.U.T. is:

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

P_t = Conducted Transmitted Power 17.0 dBm = 50.1 mW

G_t = Antenna Gain 9dBi = 7.9 numeric

R = Distance From Transmitter 20 cm

- (d) The peak power density produced by the E.U.T. is:

$$S = 50.1 * 7.9 \div 4\pi(20)^2 = 0.08$$

- (e) This is below the FCC/ISED limit.



17. APPENDIX A - CORRECTION FACTORS

17.1 *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



17.2 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



17.3 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



17.4 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



17.5 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



**17.6 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



17.7 Correction factors for

Horn Antenna

Model: SWH-28
at 3 meter range.
ITL #:1353

CALIBRATION DATA

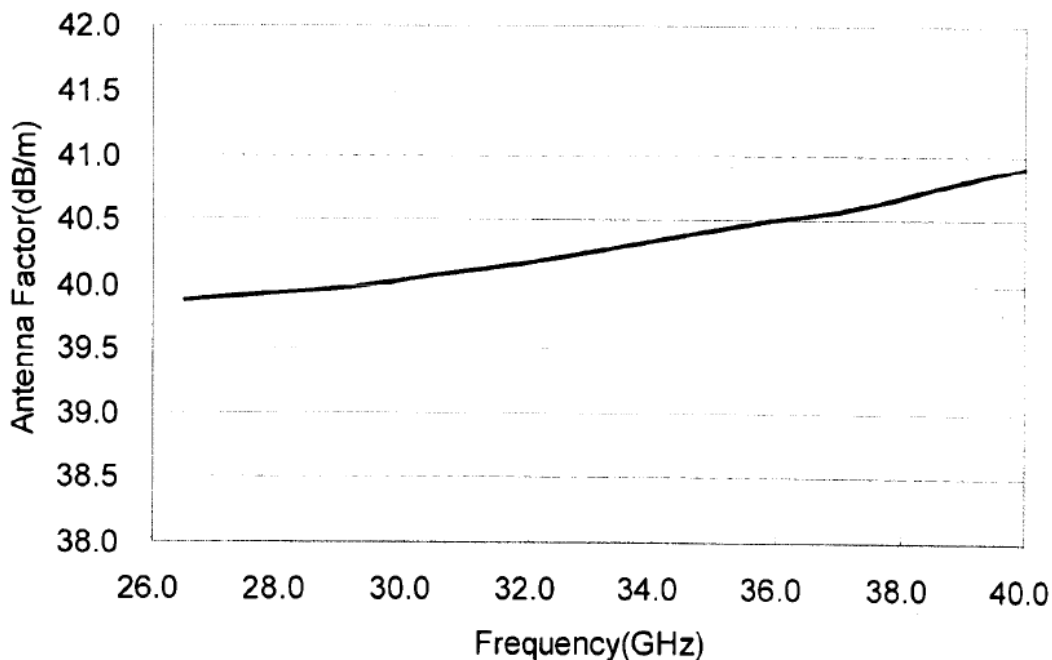
3 m distance

Frequency, MHz	Measured antenna factor, dB/m ¹⁾
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

¹⁾ The antenna factor shall be added to receiver reading in dB μ V to obtain field strength in dB μ V/m.



17.8 Correction factors for Horn Antenna Ka Band
Model: PE9850R-20
Serial No: J202021732; ITL #:1777



Frequency(GHz)	Gain(dB)	Antenna Factor(dB/m)
26.50	18.80	39.87
27.85	19.18	39.93
29.20	19.53	39.99
30.55	19.83	40.08
31.90	20.12	40.17
33.25	20.37	40.28
34.60	20.60	40.39
35.95	20.82	40.50
37.30	21.05	40.59
38.65	21.20	40.75
40.00	21.34	40.91



Frequency	Low Signal Gain (dB)	Noise Figure	Supply Current
20.0 GHz	47.7	2.9 dB	0.37A
20.5 GHz	50.1	2.9 dB	0.37A
21.0 GHz	50.5	2.9 dB	0.37A
21.5 GHz	51.2	2.9 dB	0.37A
22.0 GHz	50.8	2.9 dB	0.37A
22.5 GHz	50.4	2.9 dB	0.37A
23.0 GHz	50.0	2.9 dB	0.37A
23.5 GHz	50.0	2.9 dB	0.37A
24.0 GHz	50.0	2.9 dB	0.37A
24.5 GHz	50.6	2.9 dB	0.37A
25.0 GHz	51.3	2.9 dB	0.37A
25.5 GHz	51.5	2.9 dB	0.37A
26.0 GHz	52.0	2.9 dB	0.37A
26.5 GHz	51.5	2.9 dB	0.37A
27.0 GHz	52.2	2.9 dB	0.37A
27.5 GHz	52.5	2.9 dB	0.37A
28.0 GHz	52.1	2.9 dB	0.37A
28.5 GHz	51.8	2.9 dB	0.37A
29.0 GHz	52.0	2.9 dB	0.37A
29.5 GHz	52.2	2.9 dB	0.37A
30.0 GHz	52.0	2.9 dB	0.37A
30.5 GHz	51.5	2.9 dB	0.37A
31.0 GHz	51.3	2.9 dB	0.37A
31.5 GHz	50.5	2.9 dB	0.37A
32.0 GHz	49.3	2.9 dB	0.37A
32.5 GHz	49.2	2.9 dB	0.37A
33.0 GHz	48.2	2.9 dB	0.37A
33.5 GHz	48.5	2.9 dB	0.37A
34.0 GHz	47.7	2.9 dB	0.37A
34.5 GHz	48.1	2.9 dB	0.37A
35.0 GHz	47.9	2.9 dB	0.37A
35.5 GHz	48.2	2.9 dB	0.37A
36.0 GHz	47.8	2.9 dB	0.37A
36.5 GHz	48.4	2.9 dB	0.37A
37.0 GHz	48.3	2.9 dB	0.37A
37.5 GHz	48.6	2.9 dB	0.37A
38.0 GHz	47.8	2.9 dB	0.37A
38.5 GHz	47.0	2.9 dB	0.37A
39.0 GHz	47.1	2.9 dB	0.37A
39.5 GHz	47.1	2.9 dB	0.37A
40.0 GHz	48.3	2.9 dB	0.37A