

Peak Output Power

E.U.T Description	Radar-Based, Outdoor Perimeter Security Sensor
Type	SR150F
Serial Number:	Not designated

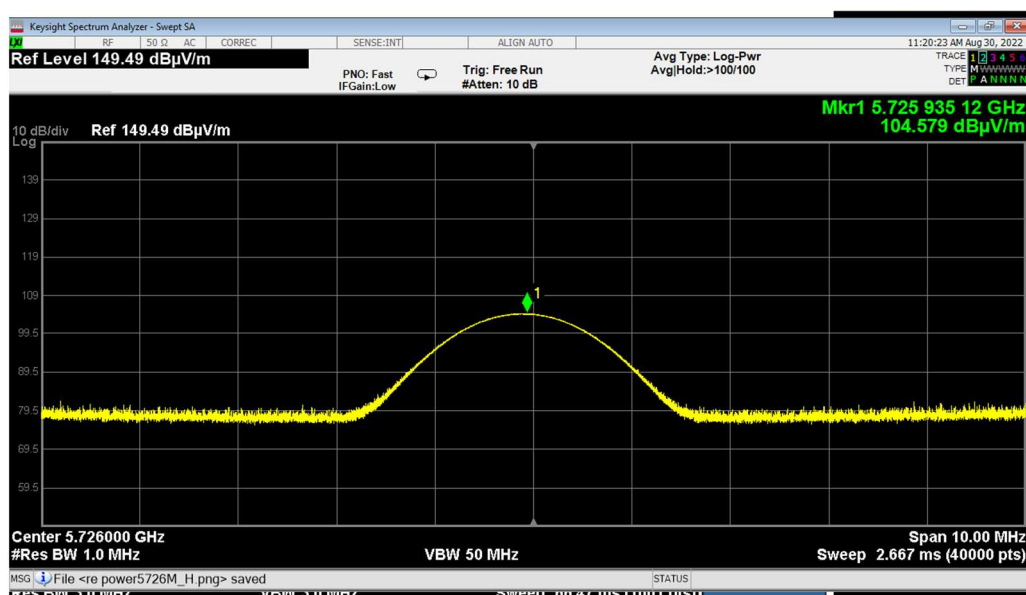


Figure 29 Low, Vertical

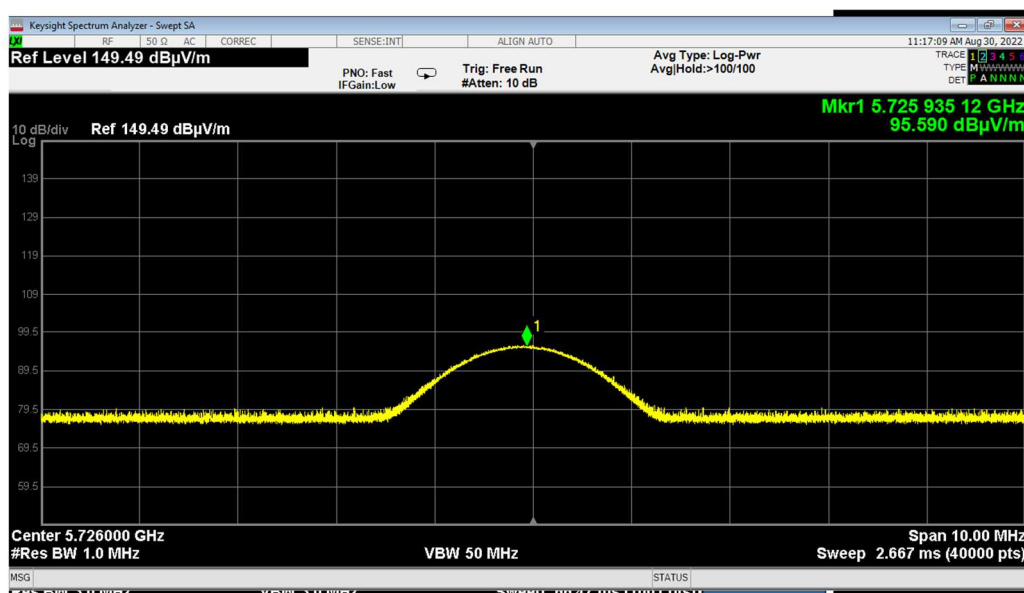


Figure 30 Low, Horizontal

Peak Output Power

E.U.T Description	Radar-Based, Outdoor Perimeter Security Sensor
Type	SR150F
Serial Number:	Not designated

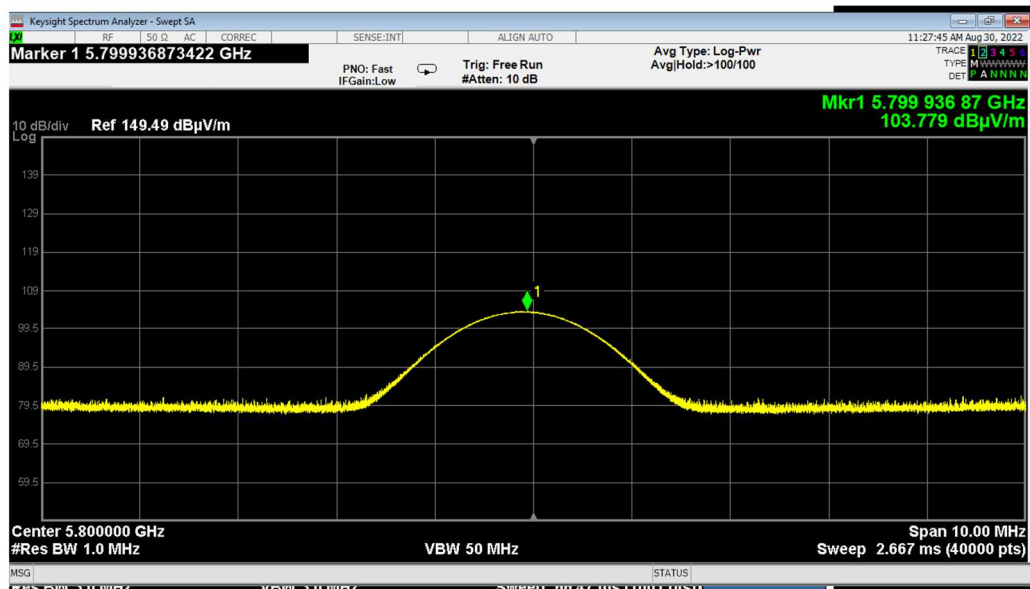


Figure 31 Mid, Vertical

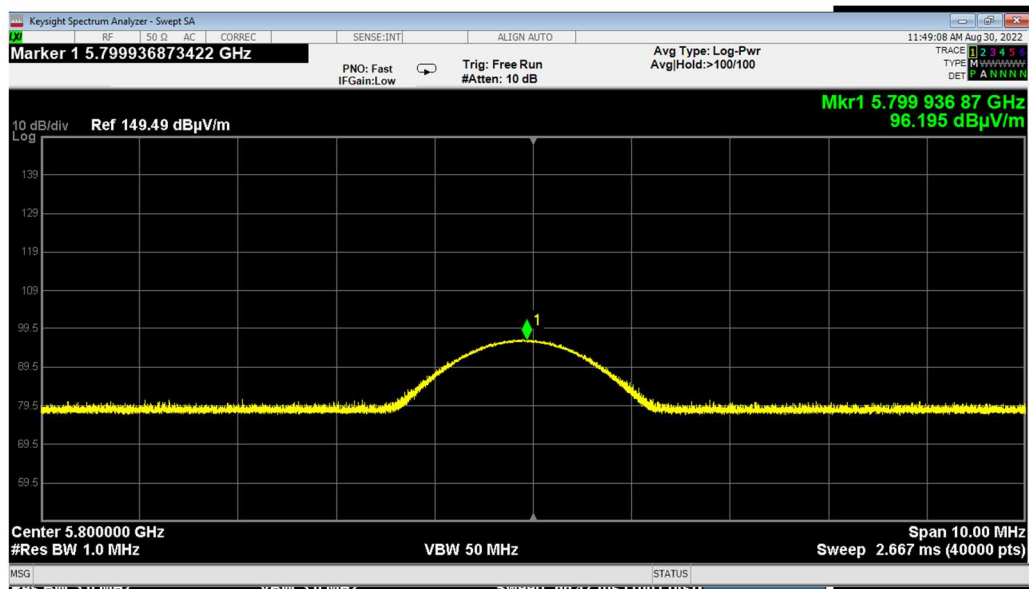


Figure 32 Mid, Horizontal

Peak Output Power

E.U.T Description Radar-Based, Outdoor
Perimeter Security Sensor
Type SR150F
Serial Number: Not designated

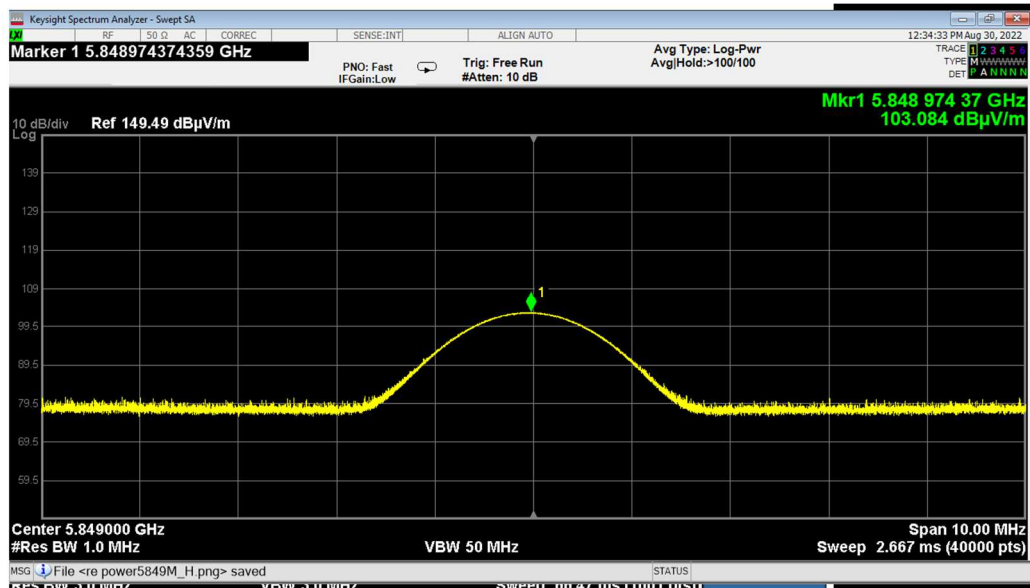


Figure 33 High, Vertical

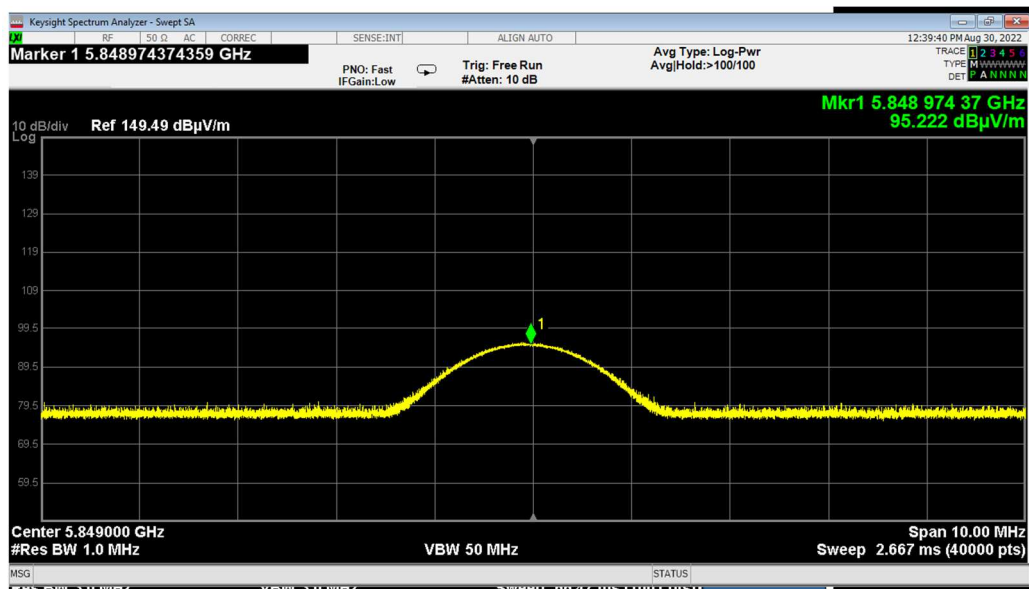


Figure 34 High, Horizontal



9.5 Test Equipment Used, Peak Output Power

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 20, 2022	February 20, 2023
Horn Antenna	ETS	3115	6142	May 25, 2021	May 25, 2024
RF Cable	Commscope ORS	0623 WBC-400	G020133	May 16, 2022	May 16, 2023
full Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 35 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)

10.2 Test Procedure

(Temperature (22°C)/ Humidity (55%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 $\geq$ 1MHz
- 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)(ii) and RSS 247, Issue 2, clause 5.1(e).

Additional information of the results is given in *Figure 36* to *Figure 37*.

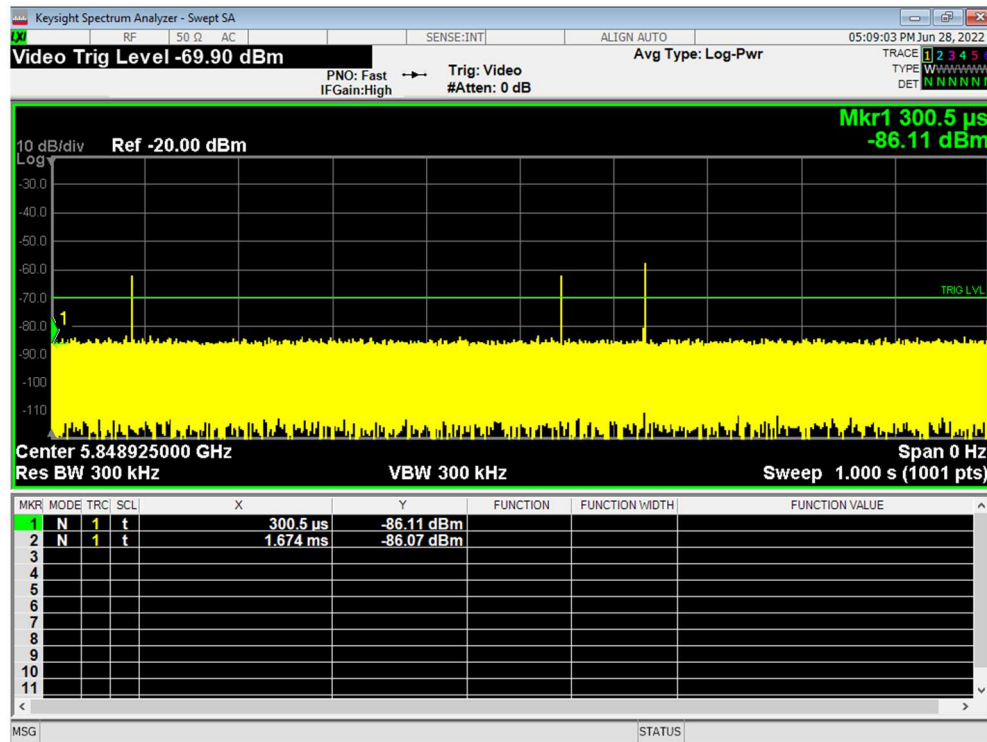


Figure 36 Number of Bursts in 1sec=4, in 30sec=120

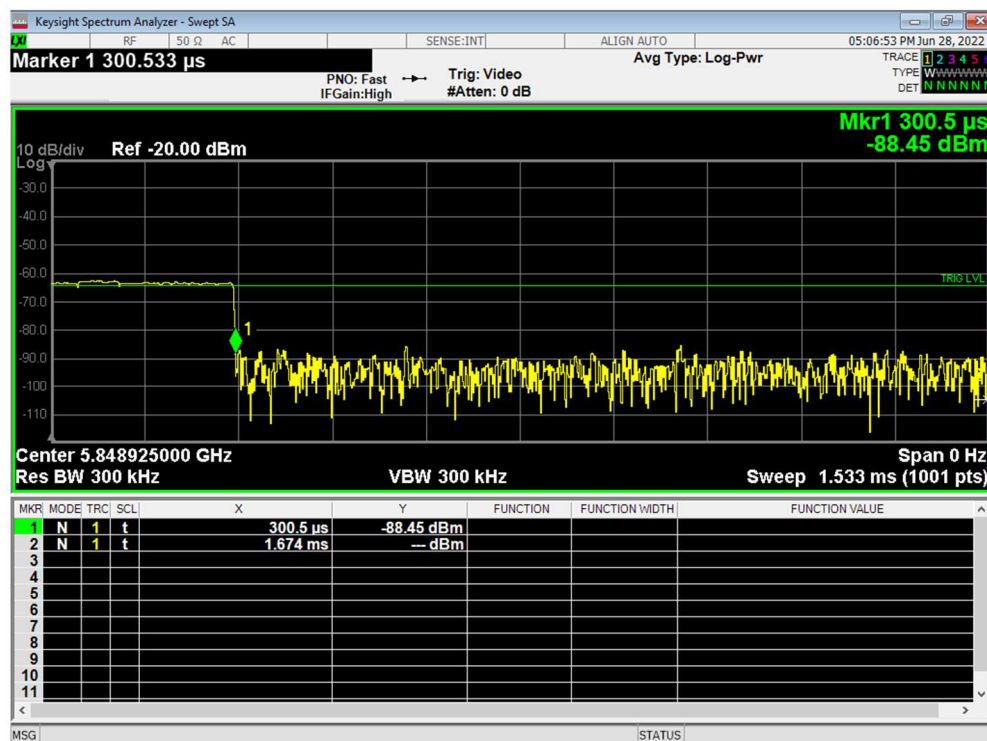


Figure 37 Burst Duration1 =0.3ms
Dwell Time = 0.3msec*120= 36msec<0.4s



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 20, 2022	February 20, 2023
Horn Antenna	ETS	3115	6142	May 25, 2021	May 25, 2024
RF Cable	Commscope ORS	0623 WBC-400	G020133	May 16, 2022	May 16, 2023
Full Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 38 Test Equipment Used

11 Band Edge

11.1 Test Specification

FCC Part 15, Section 15.247(d)

11.2 Test Procedure

(Temperature (22°C)/ Humidity (55%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, 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 display line was set to 20 dBc

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)	(dBm)	(dBm)	(dB)
Hopping	5726.0	5725.0	-89.2	-74.9	
	5849.0	5850.0	-89.0	-76.2	
Non-Hopping	5726.0	5725.0	-70.0	-49.0	
	5849.0	5850.0	-73.0	-49.0	

Figure 39 Band Edge Test Results

JUDGEMENT: Passed by 3.4 dB

For additional information see *Figure 40 to Figure 43*.

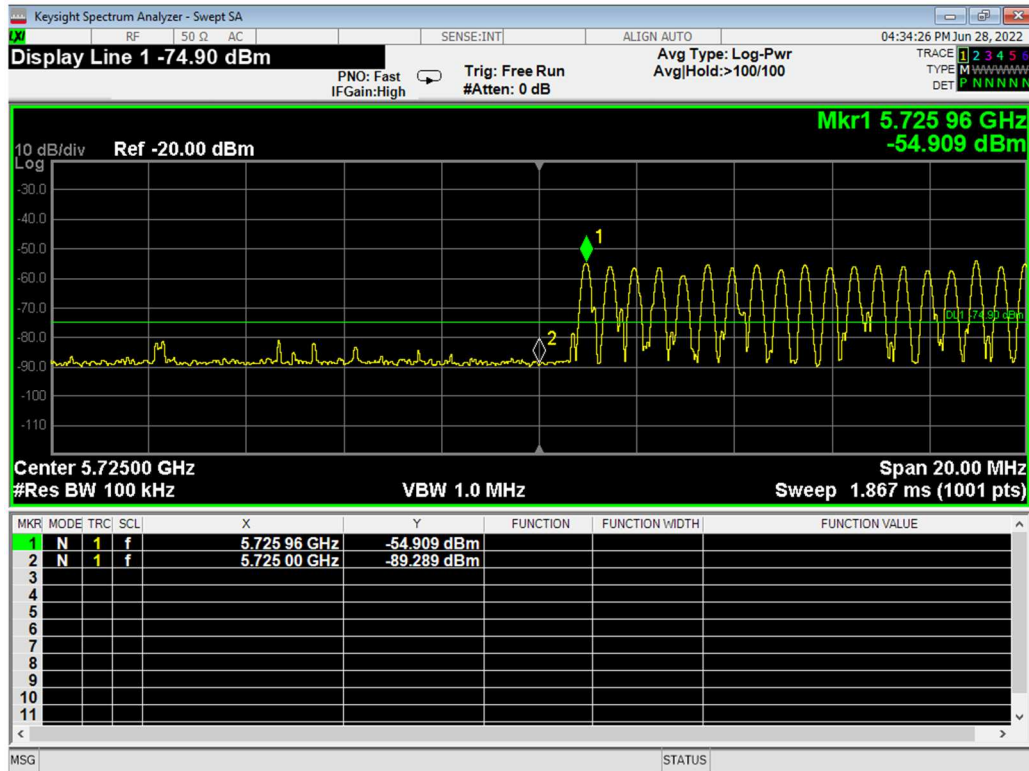


Figure 40 Hopping, Lower Band Edge

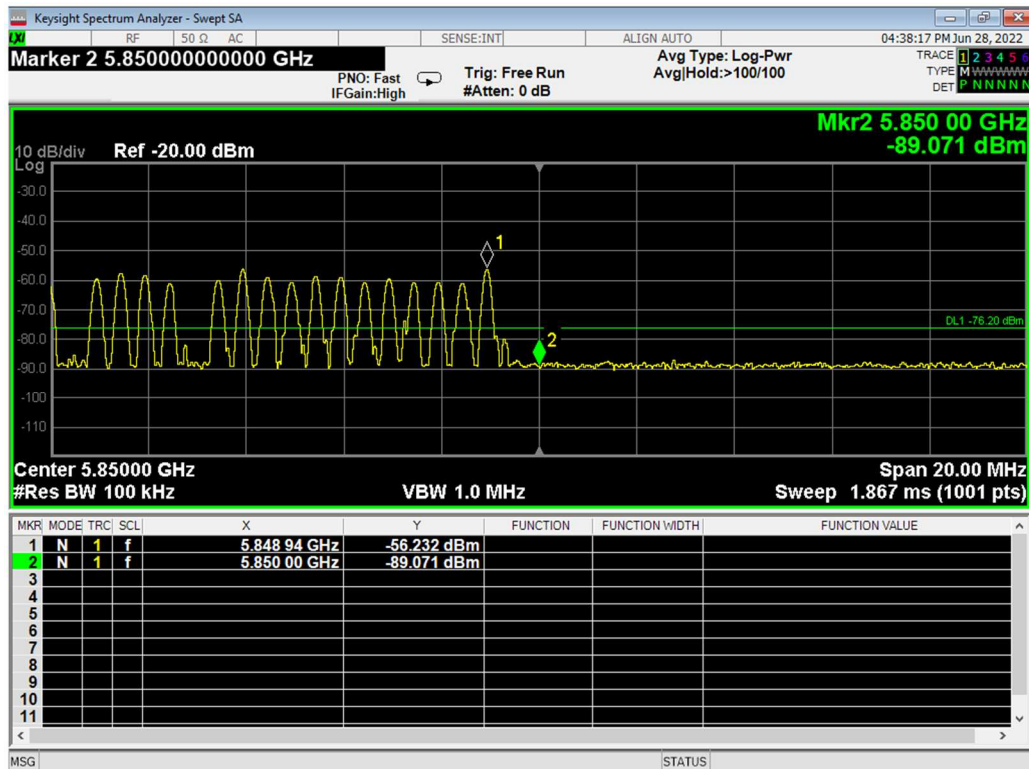


Figure 41 Hopping, Higher Band Edge

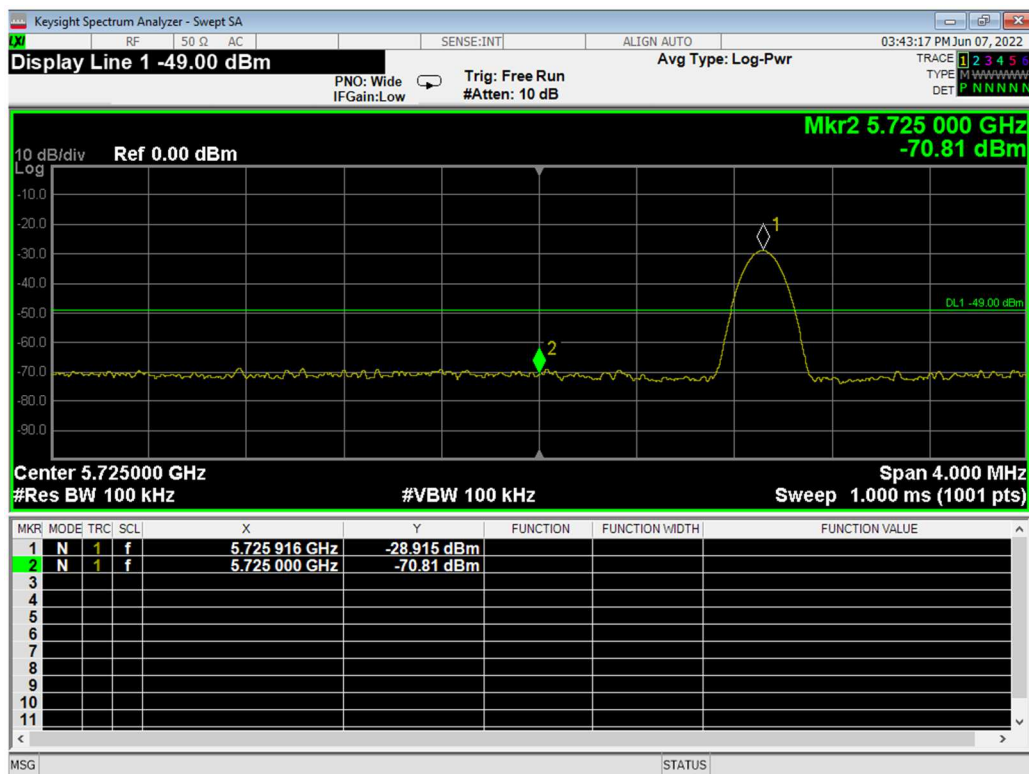


Figure 42 Non-Hopping, Lower Band Edge

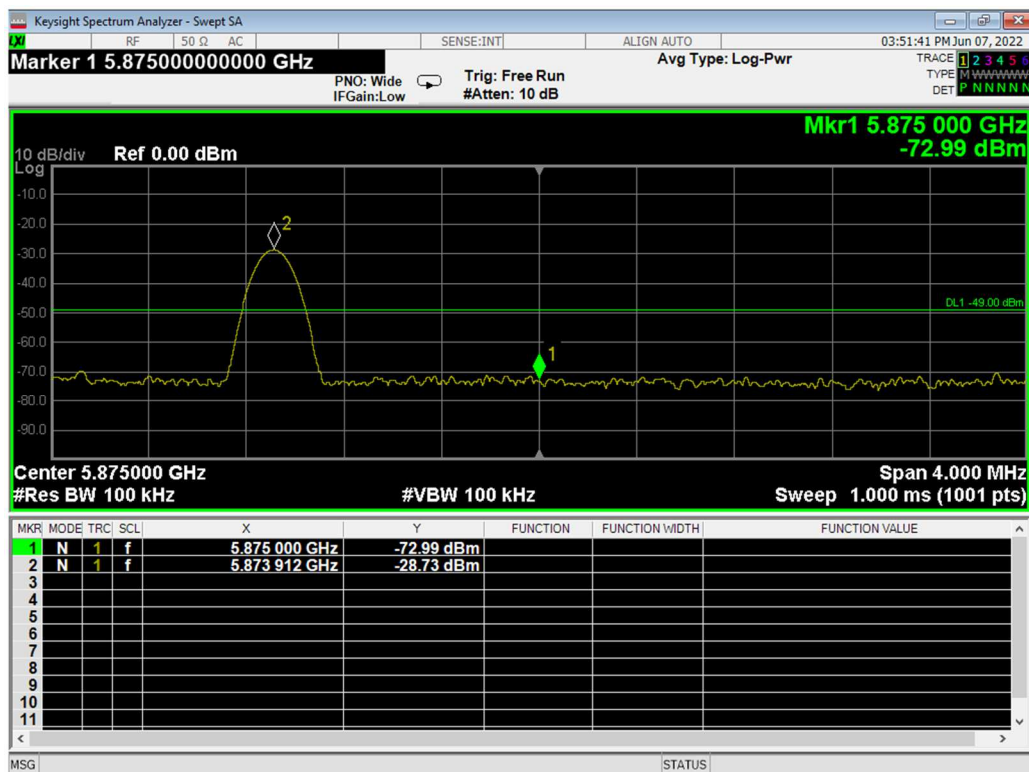


Figure 43 Non-Hopping, Higher Band Edge



11.5 Test Equipment Used, Band Edge

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 20, 2022	February 20, 2023
Horn Antenna	ETS	3115	6142	May 25, 2021	May 25, 2024
RF Cable	Commscope ORS	0623 WBC-400	G020133	May 16, 2022	May 16, 2023
Full Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 44 Test Equipment Used

12 Emissions in non-Restricted Frequency Bands

12.1 Test Specification

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

12.2 Test Procedure

(Temperature (22°C)/ Humidity (55%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, 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 FCC Part 15, Subpart C, Section 247 (d) specification –

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

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

Instrument	Mfr.	Model	Serial No.	Last Calibration	Calibration Due
Active Loop Antenna	EMCO	6502	2950	05-Jul 2022	05-Jul 2023
Low Noise Amplifier	Narda	DBS-0411N313	13	16-May 2022	16-May 2023
Filter Band pass 8-16 GHz	Serno	MFR01341-HI-3816JJ-1	322	16-May 2022	16-May 2023
Spectrum Analyzer	HP	8564E	3442A00275	23-Feb 2022	23-Feb 2023
EMI Receiver	HP (Agilent)	8542E	3906A00276	22-Feb 2022	22-Feb 2023
RF Filter	HP (Agilent)	85420E	3705A00248	22-Feb 2022	22-Feb 2023
Wideband RF Amplifier 100K-26.5GHz	OSR	-	-	May 16, 2022	May 16, 2023
Log-periodic Antenna	EMCO	3146	9505-4081	27-Apr 2021	27-Apr 2024
Horn Antenna	ETS	3115	29845	25-May 2021	25-May 2024
Horn Antenna	ARA	SWH-28	1007	02-Nov 2021	02-Nov 2024
Biconical Antenna	EMCO	3110B	9912-3337	18-Jan 2022	18-Jan 2024
Multi device Controller	EMCO	2090	9908-1456	NCR	NCR
RF Amplifier	MIT	50-8P	AFSX4	NCR	NCR
LOD full anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR
EMI Test Receiver	Rohde & Schwarz	ESCI7	100724	20-Feb 2022	20-Feb 2023



Instrument	Mfr.	Model	Serial No.	Last Calibration	Calibration Due
LNA Horn Antenna amplifier Ka band	OSR Electronics (Serge)	PE9850R-20	J202021732	16-May 2022	16-May 2025
10 m RF cable	Commscope ORS (Serge)	0623 WBC-400	G020132	25-May 2021	25-May 2022
35m coaxial cable for oats	EIM (Huber Suhner)	RG214-11N(X2) RG214/U	0	22-Jun 2022	22-Jun 2023
EMC Analyzer	HP Agilent/Keysight	8593EM	3826A00265	February 20, 2022	February 20, 2023
Antenna Mast	ETS	2070-2	9608-1497	NCR	NCR
Turntable	ETS	2087	-	NCR	NCR

Figure 45 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

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, 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 FCC Part 15, Subpart C 209 specification.

For additional information see Figure 46.

Radiated Emission

E.U.T Description Radar-Based, Outdoor Perimeter Security Sensor
Type SR150F
Serial Number: Not designated

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

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	59.4	74.0	-14.6	15.0	54.0	-39
	11,452.0	H	59.8	74.0	-14.2	15.4	54.0	-38.6
5800.0	11,600.0	V	60.1	74.0	-13.9	15.7	54.0	-38.3
	11,600.0	H	59.4	74.0	-14.6	15.0	54.0	-39.0
5849.0	11,698.0	V	60.5	74.0	-13.5	16.1	54.0	-37.9
	11,698.0	H	61.6	74.0	-12.4	17.2	54.0	-36.8

Figure 46. 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	Mfr.	Model	Serial No.	Last Calibration	Calibration Due
Active Loop Antenna	EMCO	6502	2950	05-Jul 2022	05-Jul 2023
Low Noise Amplifier	Narda	DBS-0411N313	13	16-May 2022	16-May 2023
Filter Band pass 8-16 GHz	Serno	MFR0134 1-HI-3816JJ-1	322	16-May 2022	16-May 2023
Spectrum Analyzer	HP	8564E	3442A00275	23-Feb 2022	23-Feb 2023
EMI Receiver	HP (Agilent)	8542E	3906A00276	22-Feb 2022	22-Feb 2023
RF Filter	HP (Agilent)	85420E	3705A00248	22-Feb 2022	22-Feb 2023
Wideband RF Amplifier 100K-26.5GHz	OSR	-	-	May 16, 2022	May 16, 2023
Log-periodic Antenna	EMCO	3146	9505-4081	27-Apr 2021	27-Apr 2024
Horn Antenna	ETS	3115	29845	25-May 2021	25-May 2024
Horn Antenna	ARA	SWH-28	1007	02-Nov 2021	02-Nov 2024
Biconical Antenna	EMCO	3110B	9912-3337	18-Jan 2022	18-Jan 2024
Multi device Controller	EMCO	2090	9908-1456	NCR	NCR
RF Amplifier	MIT	50-8P	AFSX4	NCR	NCR
LOD Semi anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR
EMI Test Receiver	Rohde & Schwarz	ESCI7	100724	20-Feb 2022	20-Feb 2023
LNA Horn Antenna amplifier Ka band	OSR Electronics (Serge)	PE9850R-20	J202021732	16-May 2022	16-May 2025
10 m RF cable	Commscope ORS (Serge)	0623 WBC-400	G020132	25-May 2021	25-May 2022



Instrument	Mfr.	Model	Serial No.	Last Calibration	Calibration Due
35m coaxial cable for oats	EIM (Huber Suhner)	RG214-11N(X2) RG214/U	0	22-Jun 2022	22-Jun 2023
EMC Analyzer	HPAgilent/Keysight	8593EM	3826A00265	February 20, 2022	February 20, 2023
Antenna Mast	ETS	2070-2	9608-1497	NCR	NCR
Turntable	ETS	2087	-	NCR	NCR

Figure 47 Test Equipment Used

14 Average Factor Calculation

1. Pulse period = 1 (worst scenario)
2. Pulse duration = 1 (worst scenario)
3. Burst duration = 0.3 msec
4. Average Factor = $20 \log \left[\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{burst duration}}{100 \text{ msec}} \right] \times$
 $\text{Num of burst within 100 msec} = 20 \log [1 * (0.3 * 2 / 100)] = -44.4 \text{ dB}$

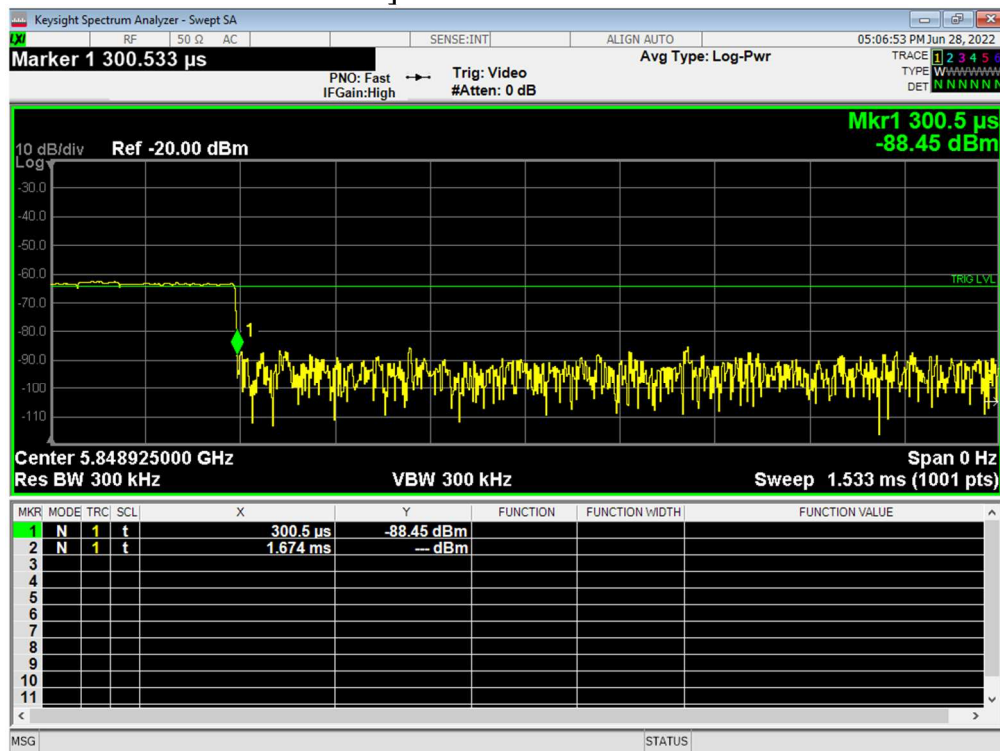


Figure 48 — Burst Duration =0.3ms

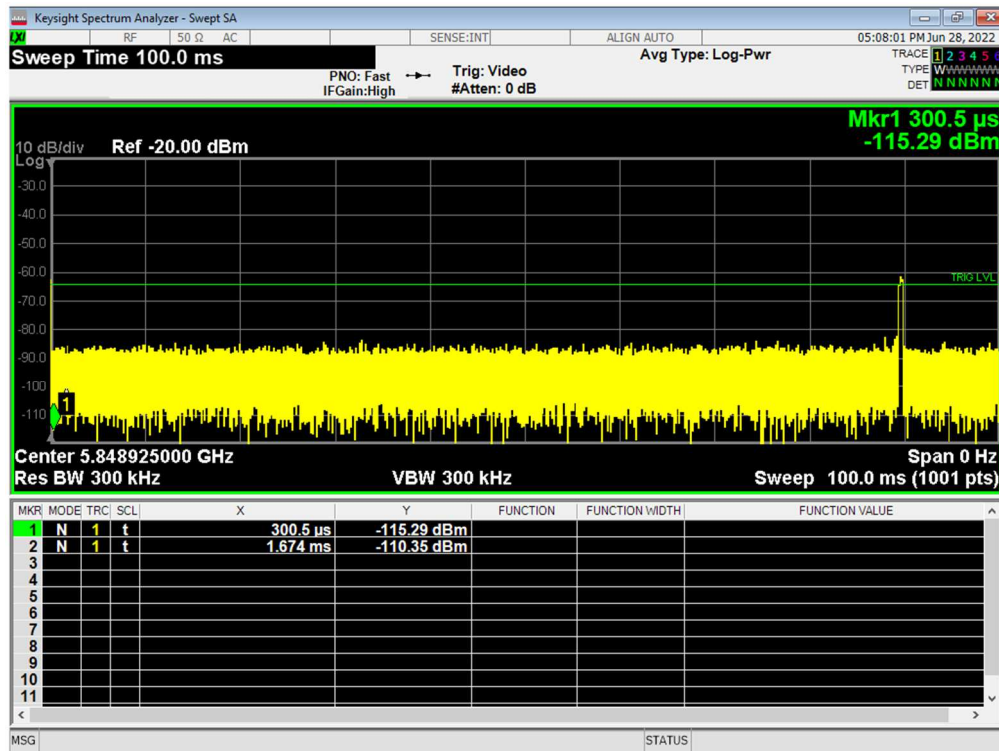


Figure 49. Number of Bursts in 100msec=2

14.1 Test Equipment Used, Average Factor

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 20, 2022	February 20, 2023
Horn Antenna	ETS	3115	6142	May 25, 2021	May 25, 2024
RF Cable	Commscope ORS	0623 WBC-400	G020133	May 16, 2022	May 16, 2023
Full Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 50 Test Equipment Used



15 Antenna Gain/Information

The antenna gain is 9 dBi, patch.

16 R.F Exposure/Safety

See a separate file.



17 Appendix A - Correction Factors

17.1 ITL #1911: OATS RF Cable

Frequency (MHz)	Cable Loss (dB)		Frequency (MHz)	Cable Loss (dB)
1.00	0.50		450.00	5.83
10.00	1.00		500.00	6.33
20.00	1.34		550.00	6.67
30.00	1.50		600.00	6.83
50.00	1.83		650.00	7.17
100.00	2.67		700.00	7.66
150.00	3.17		750.00	7.83
200.00	3.83		800.00	8.16
250.00	4.17		850.00	8.50
300.00	4.50		900.00	8.83
350.00	5.17		950.00	8.84
400.00	5.50		1000.00	9.00

17.2 ITL #1840: Semi-Anechoic Chamber RF Cable

Frequency (MHz)	Cable Loss (dB)		Frequency (MHz)	Cable Loss (dB)
1,000.0	-1.40		10,000.0	-6.00
1,500.0	-1.70		10,500.0	-6.20
2,000.0	-2.00		11,000.0	-6.20
2,500.0	-2.30		11,500.0	-6.00
3,000.0	-2.60		12,000.0	-6.00
3,500.0	-2.80		12,500.0	-6.10
4,000.0	-3.10		13,000.0	-6.30
4,500.0	-3.30		13,500.0	-6.50
5,000.0	-3.60		14,000.0	-6.70
5,500.0	-3.70		14,500.0	-7.00
6,000.0	-4.00		15,000.0	-7.30
6,500.0	-4.40		15,500.0	-7.50
7,000.0	-4.7		16,000.0	-7.60
7,500.0	-4.80		16,500.0	-8.00
8,000.0	-5.00		17,000.0	-8.00
8,500.0	-5.10		17,500.0	-8.10
9,000.0	-5.60		18,000.0	-8.20
9,500.0	-5.80			

17.3 ITL # 1075: Active Loop Antenna

Frequency (MHz)	MAF (dBs/m)	AF (dB/m)	Frequency (MHz)	MAF (dBs/m)	AF (dB/m)
0.01	-33.10	18.40	3.00	-40.00	11.50
0.02	-37.20	14.30	4.00	-40.10	11.40
0.03	-38.20	13.30	5.00	-40.20	11.30
0.05	-39.80	11.70	6.00	-40.40	11.10
0.10	-40.10	11.40	7.00	-40.40	11.10
0.20	-40.30	11.20	8.00	-40.40	11.10
0.30	-40.30	11.20	9.00	-40.50	11.00
0.50	-40.30	11.20	10.00	-40.50	11.00
0.70	-40.30	11.20	20.00	-41.50	10.00
1.00	-40.10	11.40	30.00	-43.50	8.00
2.00	-40.00	11.50			

17.4 ITL #1356: Biconical Antenna

Frequency (MHz)	AF (dB/m)	Frequency (MHz)	AF (dB/m)
30.00	13.00	90.00	8.23
35.00	10.89	100.00	11.12
40.00	10.59	120.00	13.16
45.00	10.63	140.00	13.07
50.00	10.12	160.00	14.80
60.00	9.26	180.00	16.95
70.00	7.74	200.00	17.17
80.00	6.63		

17.5 ITL # 1349: Log Periodic Antenna

Frequency (MHz)	AF (dB/m)
200.00	11.58
250.00	12.04
300.00	14.76
400.00	15.55
500.00	17.85
600.00	18.66
700.00	20.87
800.00	21.15
900.00	22.32
1000.00	24.22

17.6 ITL # 1352: 1-18 GHz Horn Antenna

Frequency (GHz)	AF (dB/m)		Frequency (GHz)	AF (dB/m)
0.75	25.00		9.50	38.00
1.00	23.50		10.00	38.50
1.50	26.00		10.50	38.50
2.00	29.00		11.00	38.50
2.50	27.50		11.50	38.50
3.00	30.00		12.00	38.00
3.50	31.50		12.50	38.50
4.00	32.50		13.00	40.00
4.50	32.50		13.50	41.00
5.00	33.00		14.00	40.00
5.50	35.00		14.50	39.00
6.00	36.50		15.00	38.00
6.50	36.50		15.50	37.50
7.00	37.50		16.00	37.50
7.50	37.50		16.50	39.00
8.00	37.50		17.00	40.00
8.50	38.00		17.50	42.00
9.00	37.50		18.00	42.50

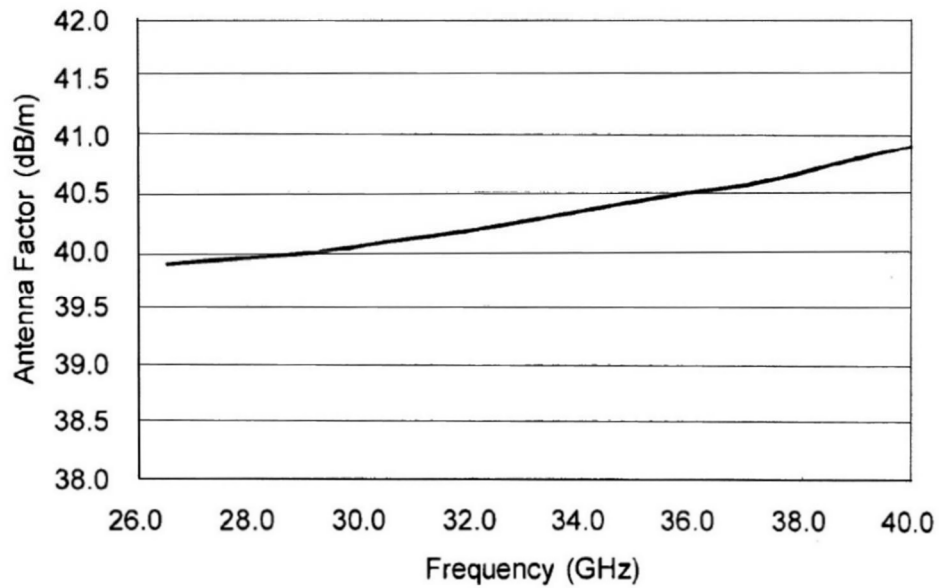
17.7 ITL # 1353: 18-26.5 GHz Horn Antenna

Frequency (MHz)	Measured antenna factor (dB/m) ¹		Frequency (MHz)	Measured antenna factor (dB/m) ¹
18,000.00	32.40		22,500.00	33.00
18,500.00	32.00		23,000.00	33.10
19,000.00	32.30		23,500.00	33.80
19,500.00	32.40		24,000.00	33.50
20,000.00	32.30		24,500.00	33.50
20,500.00	32.80		25,000.00	33.80
21,000.00	32.80		25,500.00	33.90
21,500.00	32.70		26,000.00	34.20
22,000.00	33.10		26,500.00	34.70

¹ The antenna factor shall be added to the receiver's reading in dBμV, to obtain field strength in dBμ V/m



17.1 ITL # 1777: 26.5-40 GHz Horn Antenna



End of Test Report