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FCC LISTED, REGISTRATION NUMBER: 720267

IC LISTED REGISTRATION NUMBER IC 4621A-1

Nº 51/LE147

Informe de ensayo nº:
Test report No:

NIE: 48503RRF.001

Test report

USA FCC Part 15.247, 15.209
CANADA RSS-247, RSS-Gen

Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz.
Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network(LE-LAN) Devices
General Requirements and Information for the Certification of Radio Apparatus.

Identificación del objeto ensayado.....: Identification of item tested	FLUSH Parking Magnetic Sensor
Marca .....: Trade	Fastprk
Modelo y/o referencia tipo .....: Model and /or type reference	FP-GFLL
Other identification of the product .....:	FCC ID: 2AHN4FPGFLL IC: 21260-FPGFLL
Final HW version .....:	04 02
Final SW version .....:	7.3 LF
Características .....: Features	Data not supplied
Fabricante .....: Manufacturer	WORLDSENSING S.L. Aragó, 383 4t, 08013 Barcelona (SPAIN)
Método de ensayo solicitado, norma.....: Test method requested, standard	USA FCC Part 15.247 10-1-15 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 10-1-15 Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 1 (May 2015). CANADA RSS-Gen Issue 4 (November 2014). ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Resultado.....: Summary	IN COMPLIANCE
Aprobado por (nombre / cargo y firma) .....: Approved by (name / position & signature)	A. Llamas RF Lab. Manager Firmado digitalmente por ALEJANDRO LLAMAS RODRIGUEZ Fecha: 2016.04.05 17:00:25 +02'00'

Fecha de realización .....: Date of issue	2016-04-04
Formato de informe No. .....: Report template No	FDT08_18

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Competences and guarantees

AT4 wireless is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

AT4 wireless is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjuction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

AT4 wireless is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: IC 4621A-1.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

1. This report is only referred to the tem that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
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4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the AT4 wireless internal document PODT000.

Usage of samples

Samples undergoing test have been selected by: **the client**

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
48993/002	Test Board	FP-GFLL	---	2016-03-16
48993/016	Sensor	FP-GFLL	---	2016-03-16

1. Sample S/01 has undergone the following test(s).

   All radiated tests indicated in appendix A.

Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
48993/004	Test Board	FP-GFLL	---	2016-03-16
48993/011	Connection cable	---	---	2016-03-16

2. Sample S/02 has undergone following test(s).

   All conducted tests indicated in appendix A.

Test sample description

The test sample consists of a sensor. The Fastprk sensor uses magnetic sensors to precisely detects the presence of vehicles. It houses advanced signal processing, meaning that it can differentiate between the various magnetic fields in its surroundings to achieve highly reliable detection. The Fastprk sensor uses radio communication protocols based on standard certified technology.

Identification of the client

WORLDSENSING S.L.

Aragó, 383 4t, 08013 Barcelona (SPAIN)

Testing period

The performed test started on 2016-03-17 and finished on 2016-03-18.

The tests have been performed at AT4 wireless.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

Remarks and comments

1: Used instrumentation:

Conducted Measurements

		Last Cal. date	Cal. due date
1.	Spectrum analyser Agilent PSA E4440A	2015/10	2017/10
2.	DC power supply R&S NGPE 40/40	2014/11	2017/11

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber ETS FACT3 200STP	N.A.	N.A.
2.	BiconicalLog antenna ETS LINDGREN 3142E	2014/03	2017/03
3.	Multi Device Controller EMCO 2090	N.A.	N.A.
4.	Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2013/11	2016/11
5.	Spectrum analyser Rohde & Schwarz FSW50	2015/12	2017/12
6.	EMI Test Receiver R&S ESU 26	2015/11	2017/11
7.	RF pre-amplifier 10 MHz-6 GHz SCHWARZBECK BBV9743	2015/03	2016/03
8.	RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-3A	2015/05	2016/05

Testing verdicts

Not applicable ..... :	N/A
Pass ..... :	P
Fail ..... :	F
Not measured ..... :	N/M

FCC PART 15 PARAGRAPH / RSS-247		VERDICT			
		NA	P	F	NM
FCC 15.247 Subclause (a) (1) / RSS-247 Clause 5.1 (2)	20 dB Bandwidth and Carrier frequency separation		P		
FCC 15.247 Subclause (a)(1)(i) / RSS-247 Clause 5.1 (3)	Number of hopping channels		P		
FCC 15.247 Subclause (a)(1)(i) / RSS-247 Clause 5.1 (3)	Time of occupancy (Dwell Time)		P		
FCC 15.247 Subclause (b) (2) / RSS-247, Clause 5.4 (1)	Maximum peak output power and antenna gain		P		
FCC 15.247 Subclause (d) / RSS-247 Clause 5.5	Emission limitations conducted (Transmitter)		P		
FCC 15.247 Subclause (d) / RSS-247 Clause 5.5	Emission limitations radiated (Transmitter)		P		

Appendix A – Test results

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TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 3.6 Vdc

Type of power supply = DC voltage from battery

Type of antenna = Integral antenna

Declared Gain for antenna (maximum) = -0.36 dBi

TEST FREQUENCIES:

Lowest channel: 902.20 MHz

Middle channel: 915.20 MHz

Highest channel: 927.36 MHz

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyzer using a low loss RF cable. The reading in the spectrum analyzer is corrected taking into account the cable loss**.**

RADIATED MEASUREMENTS

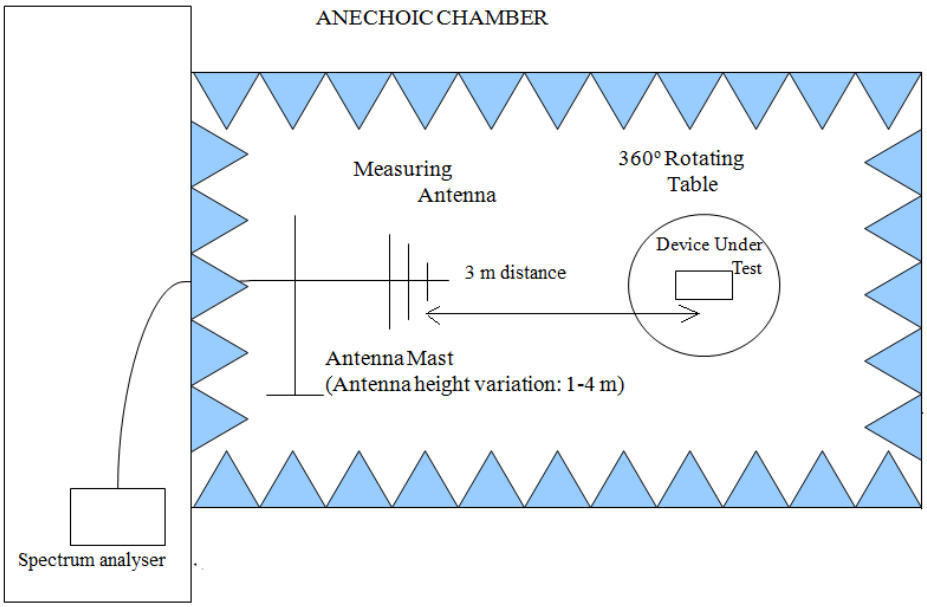
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-10 GHz (1 GHz-18 GHz Double ridge horn antenna).

For radiated emissions in the range 1 GHz-10 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

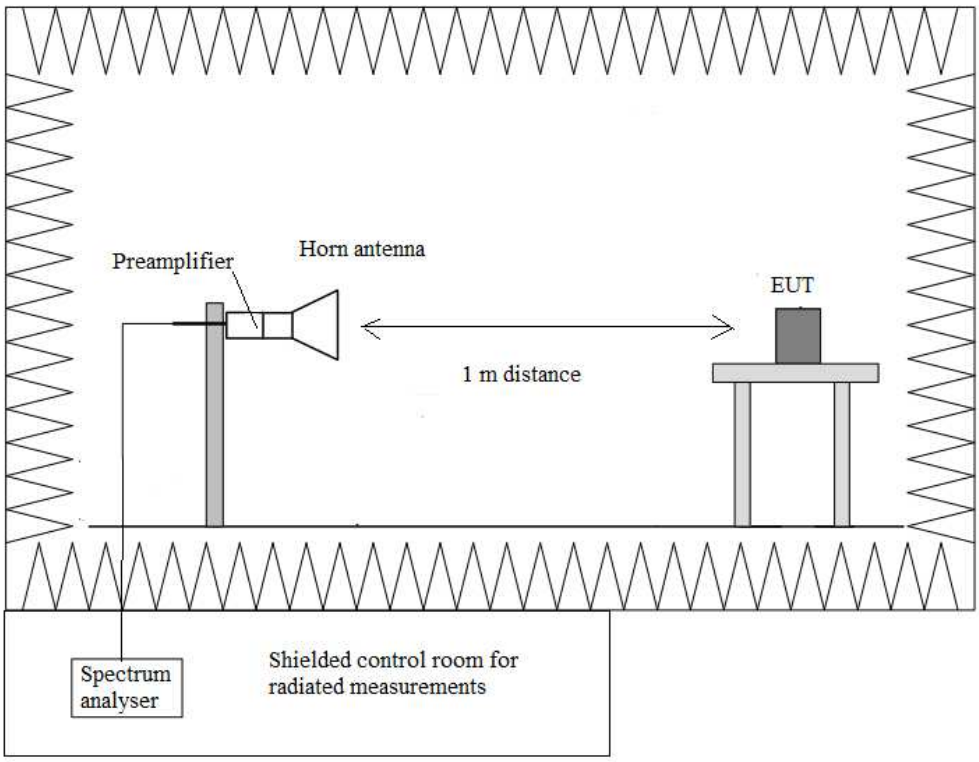
The equipment under test was set up on a non-conductive (wooden) platform 1.5 meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

Radiated measurements setup f < 1 GHz



Radiated measurements setup f > 1 GHz



FCC Section 15.247 Subclause (a) (1) / RSS-247 Clause 5.1 (2). 20 dB Bandwidth and Carrier frequency separation

SPECIFICATION

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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

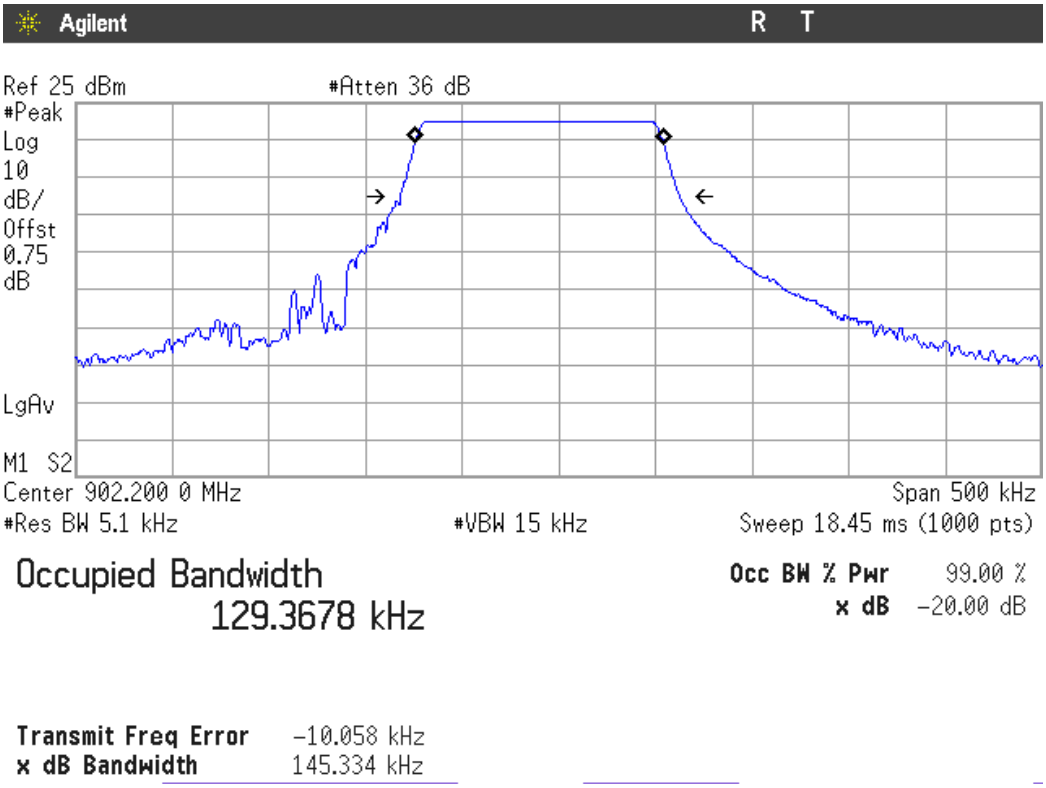
For frequency hopping systems operating in the 902–928 MHz band the maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

RESULTS

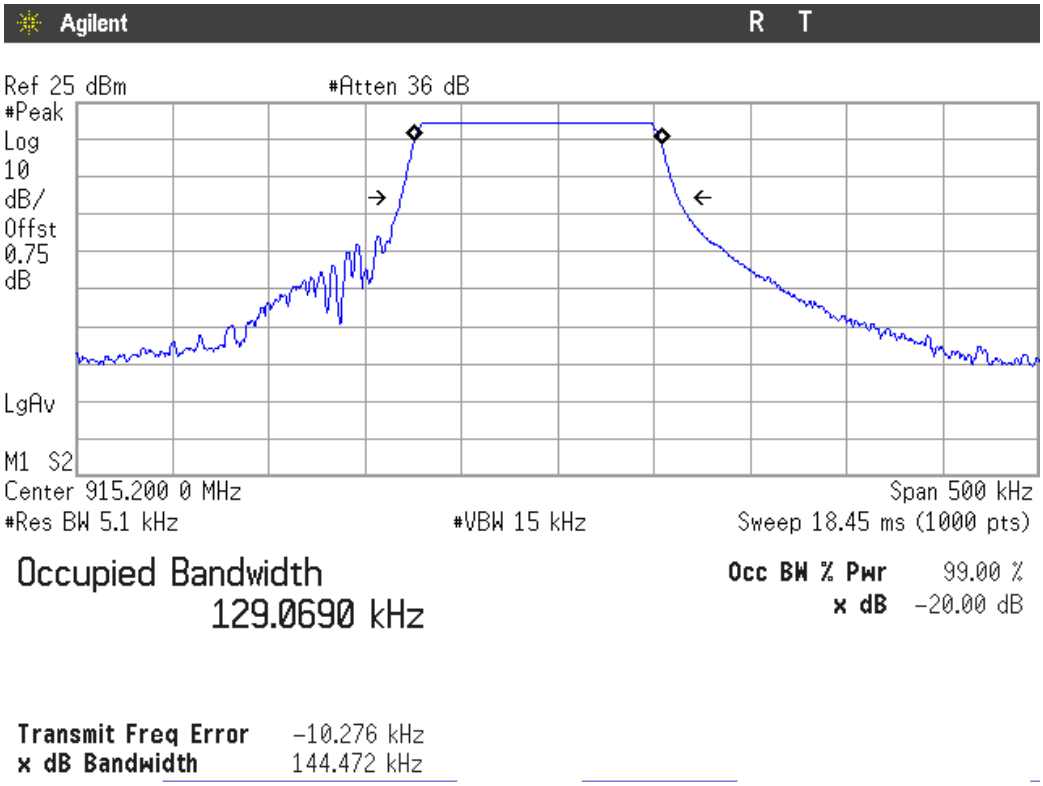
(See next plots)

	Lowest frequency 902.20 MHz	Middle frequency 915.20 MHz	Highest frequency 927.36 MHz
20 dB Spectrum bandwidth (kHz)	145.335	144.472	146.218
Measurement uncertainty (kHz)	< ±0.67		

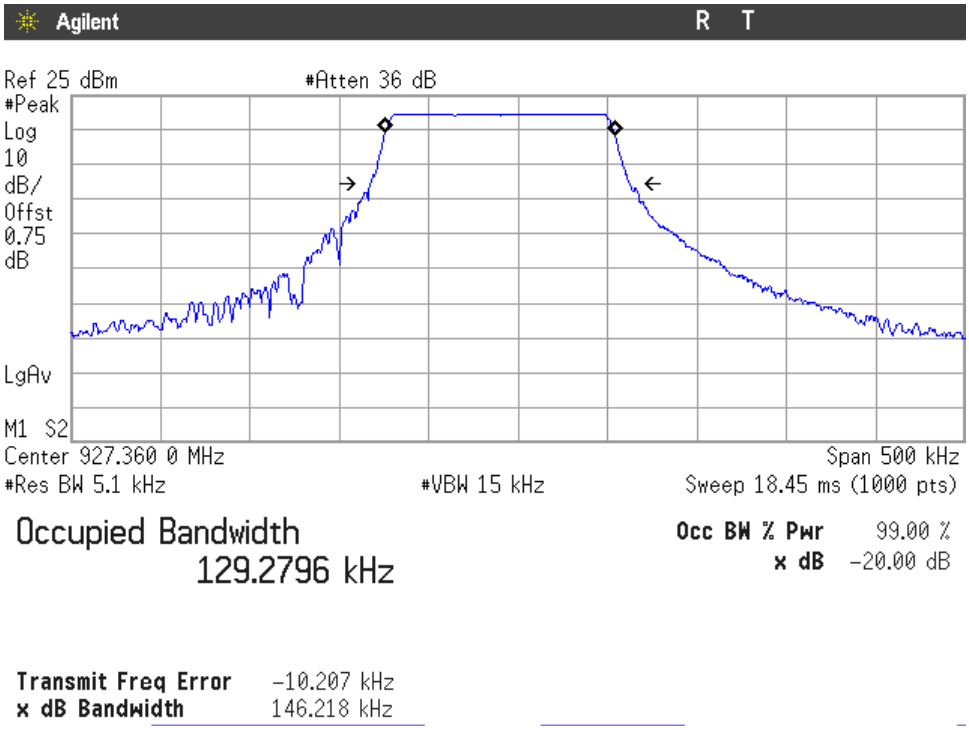
20 dB BANDWIDTH. Lowest Channel: 902.2 MHz



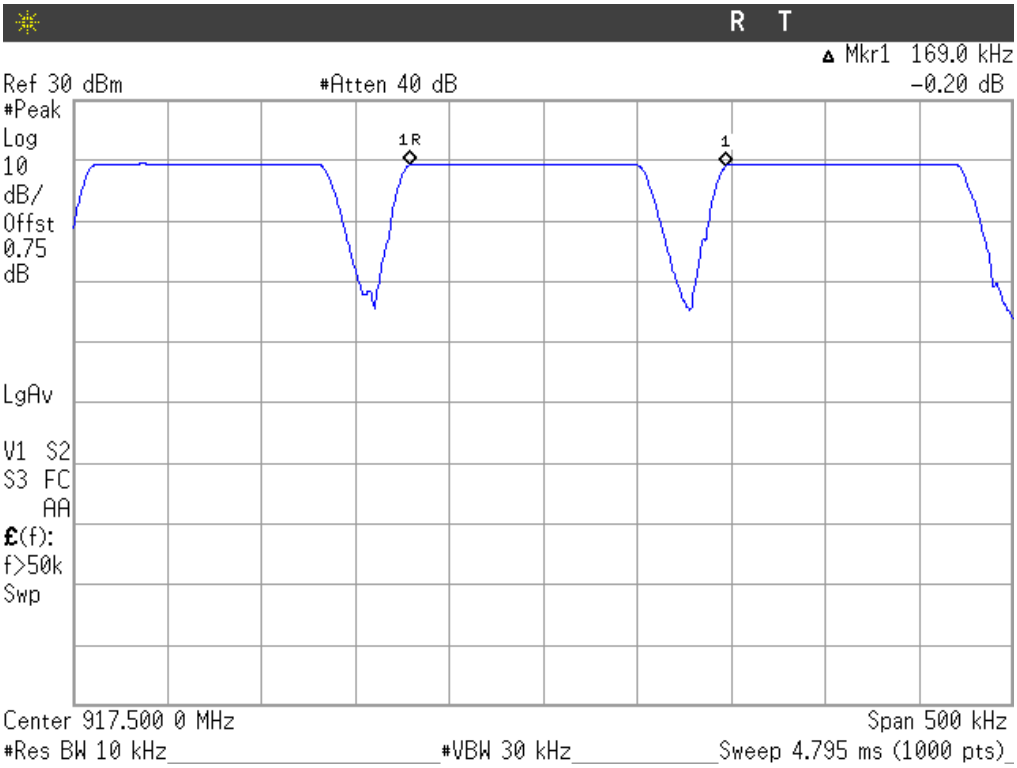
Middle Channel: 915.2 MHz



Highest Channel: 927.36 MHz.



Carrier frequency separation



Measurement uncertainty (kHz)	< ±2.20

The hopping channel carrier frequencies are separated by a minimum of the 20 dB bandwidth of the hopping channel.

Verdict: PASS

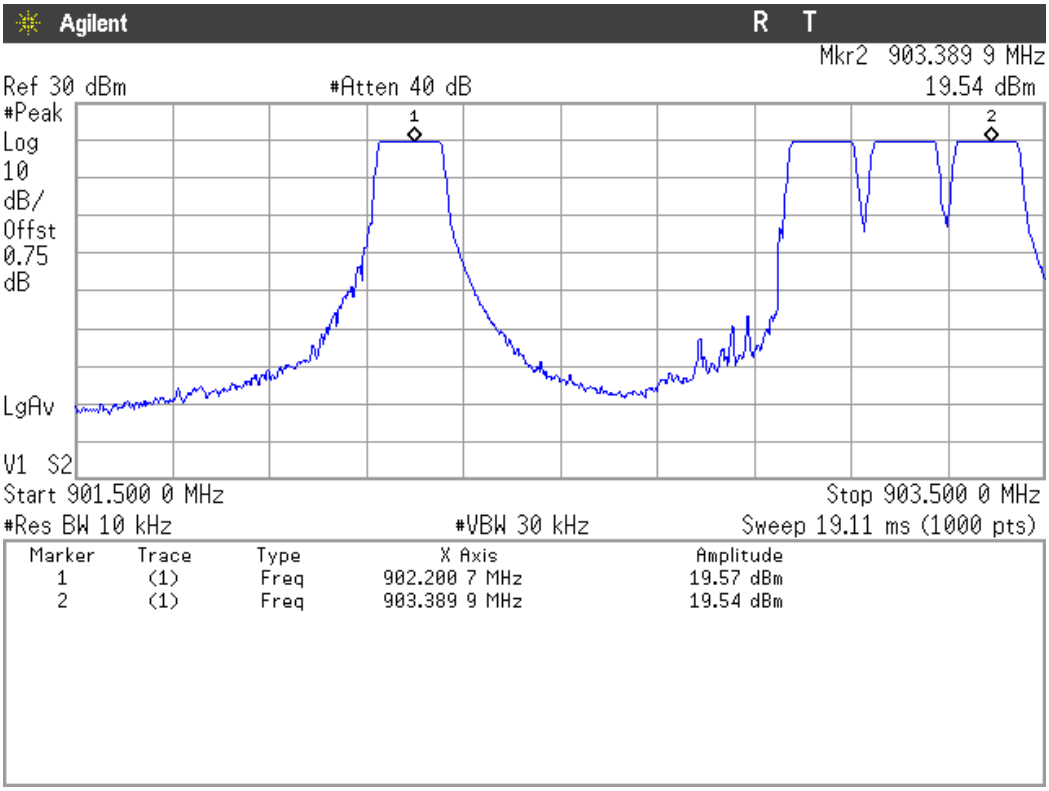
FCC Section 15.247 Subclause (a) (1) (i) / RSS-247 Clause 5.1 (3). Number of hopping channels

SPECIFICATION

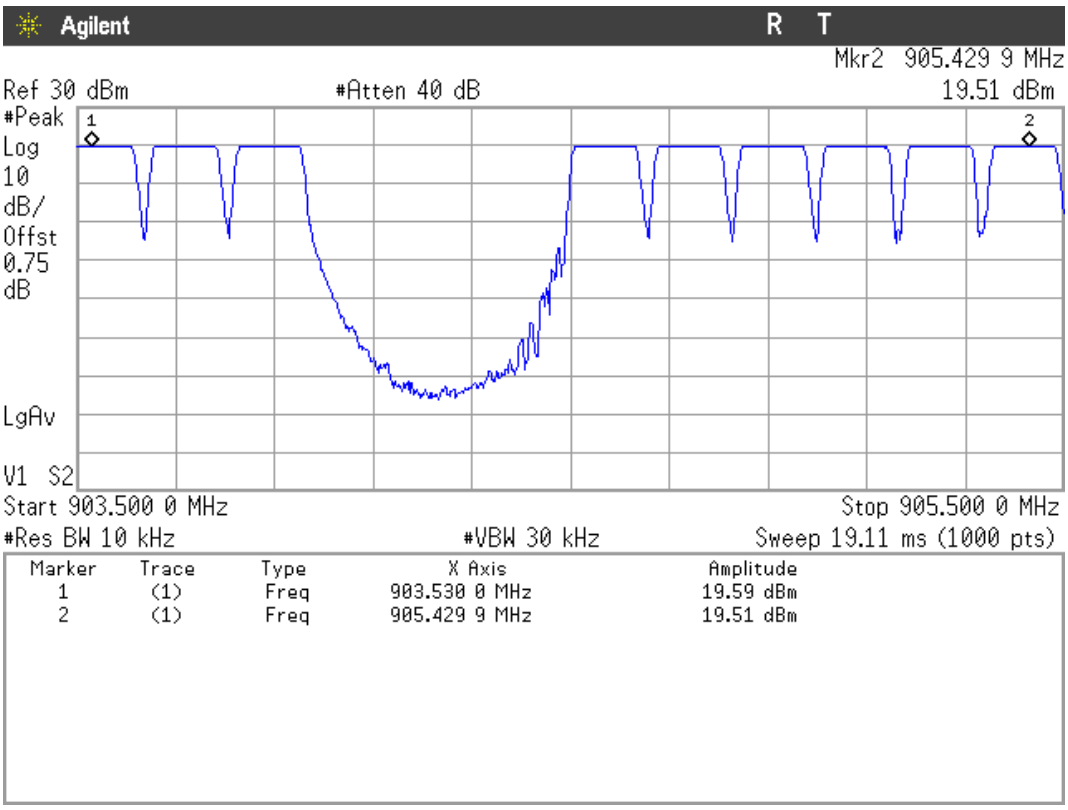
For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

RESULTS

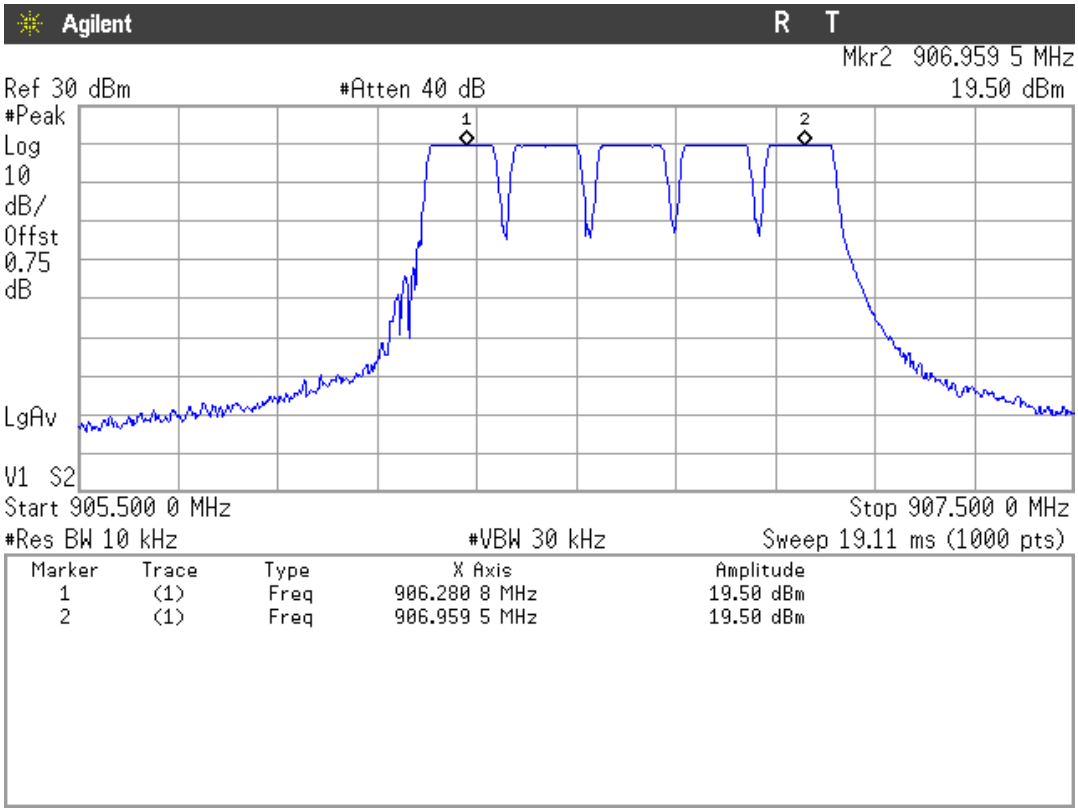
The number of hopping channels is 94 (see next plots).



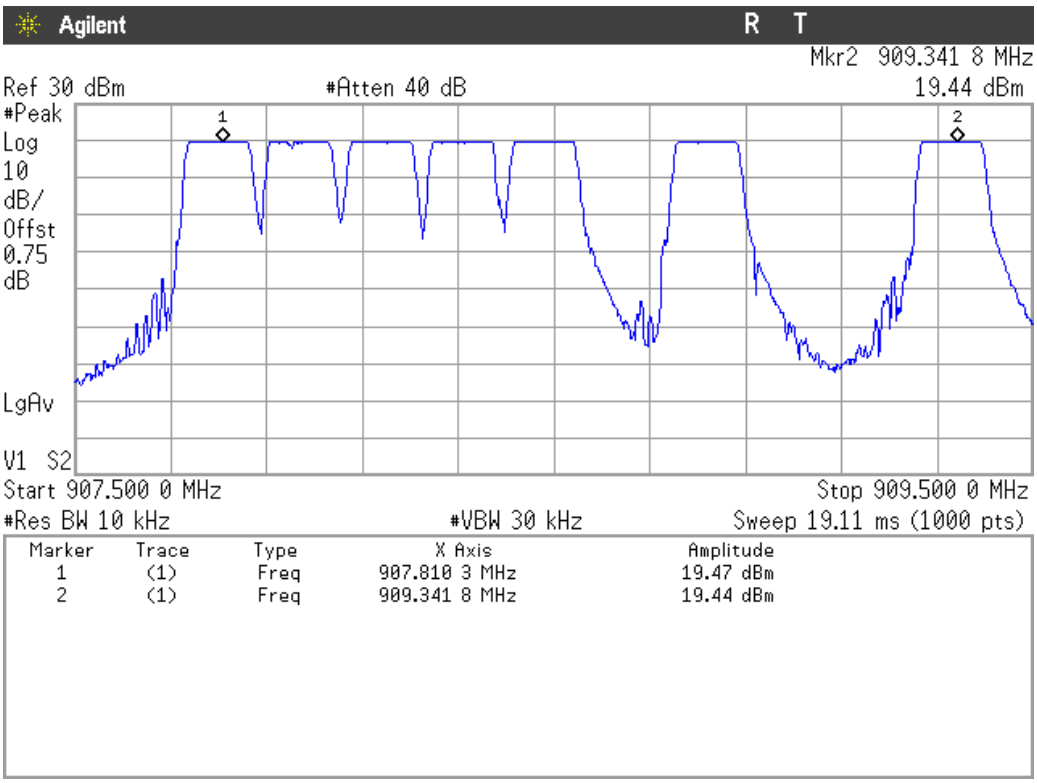
Number of hopping frequencies: 4



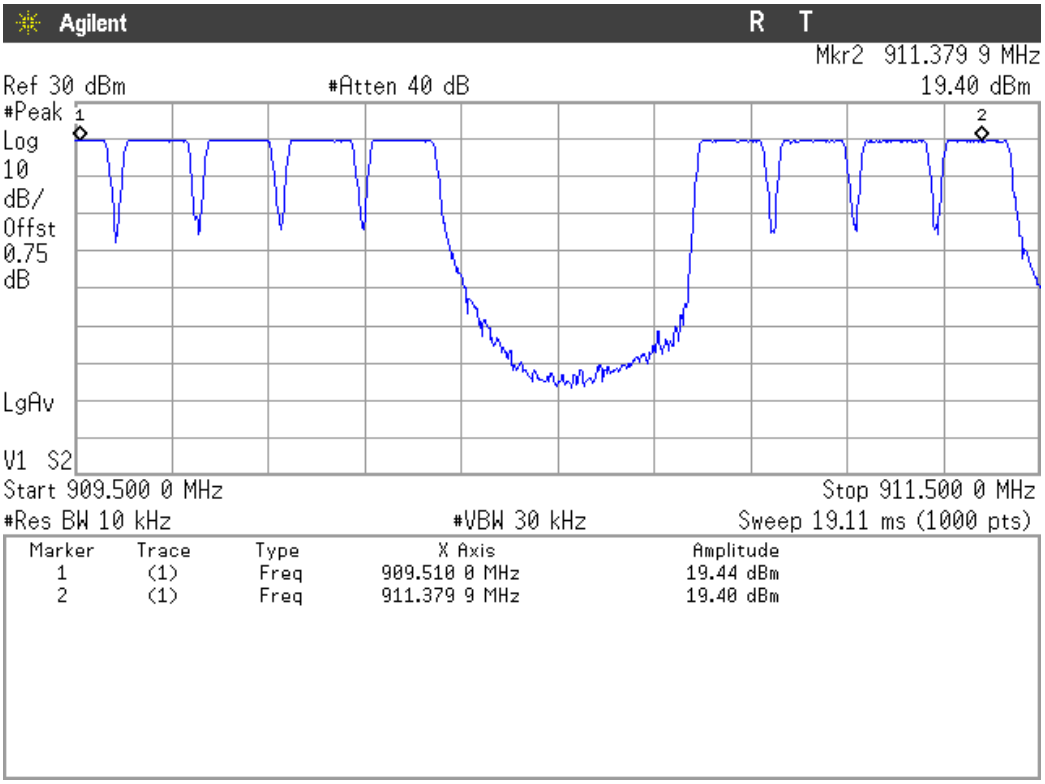
Number of hopping frequencies: 9



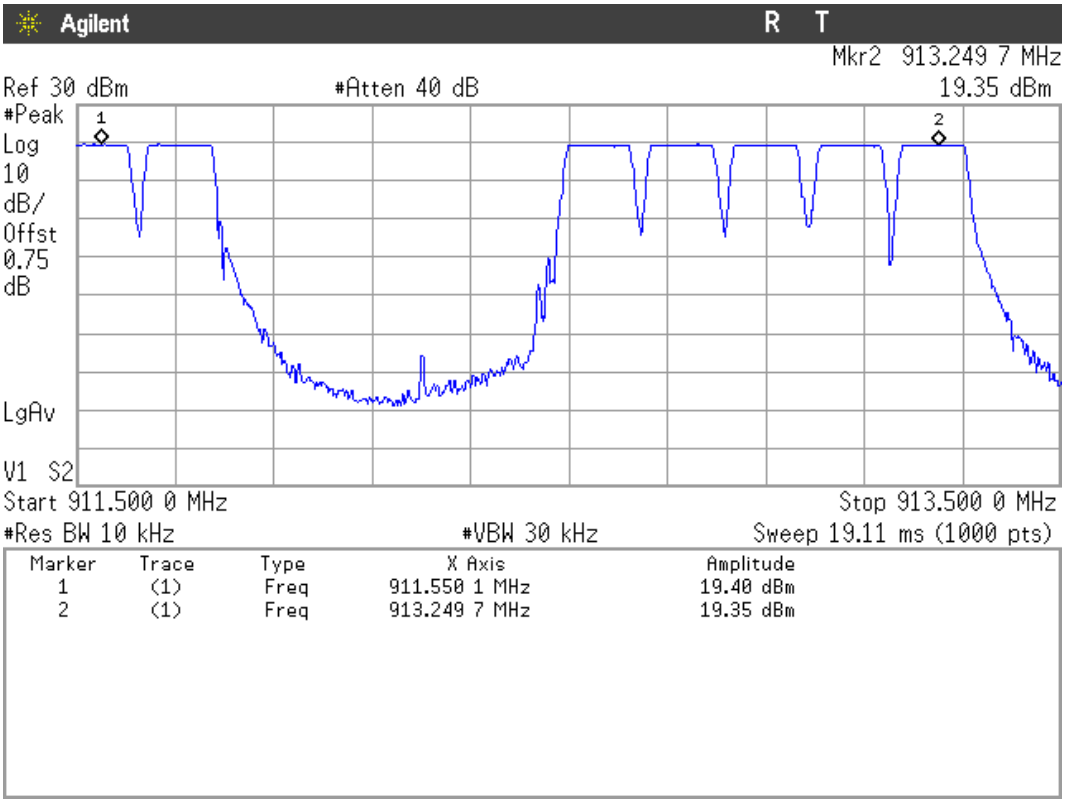
Number of hopping frequencies: 5



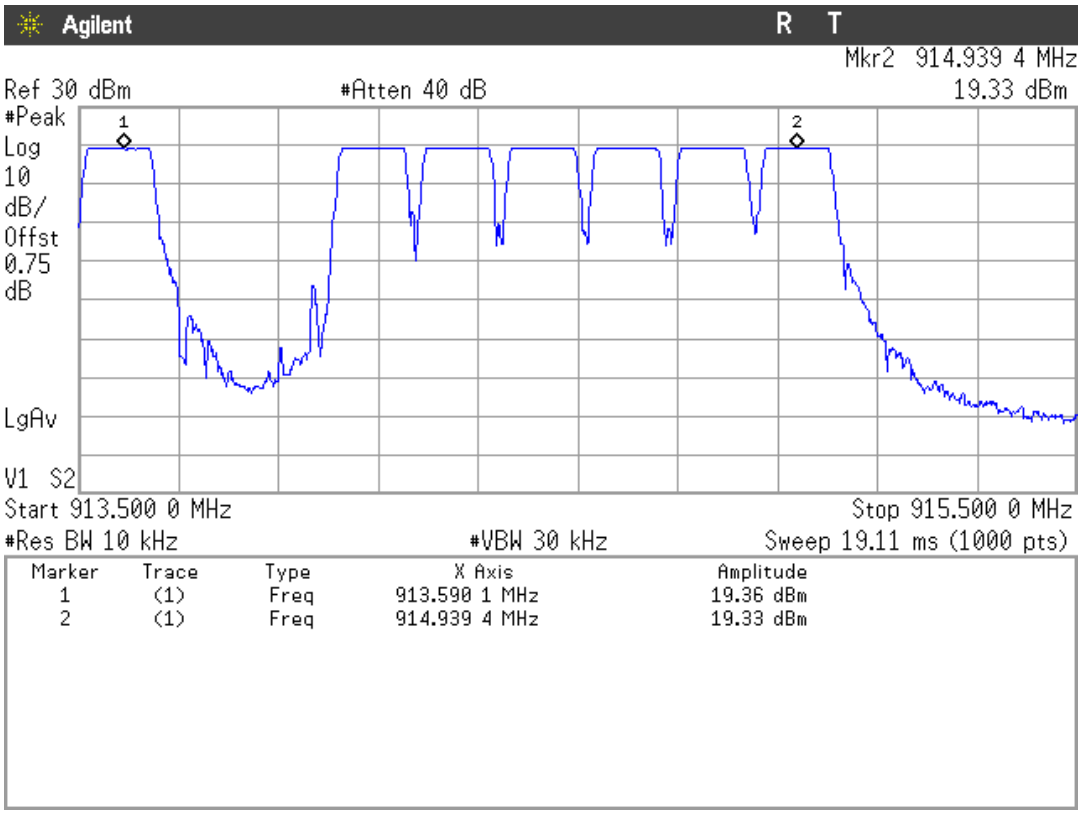
Number of hopping frequencies: 7



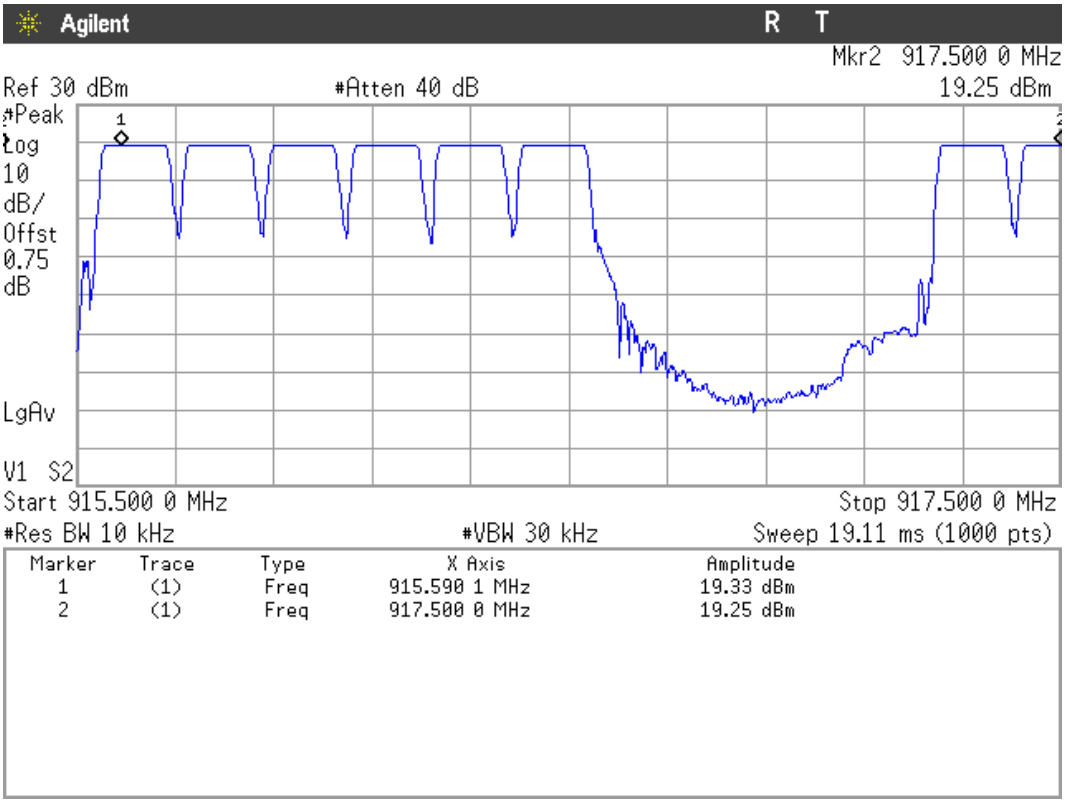
Number of hopping frequencies: 9



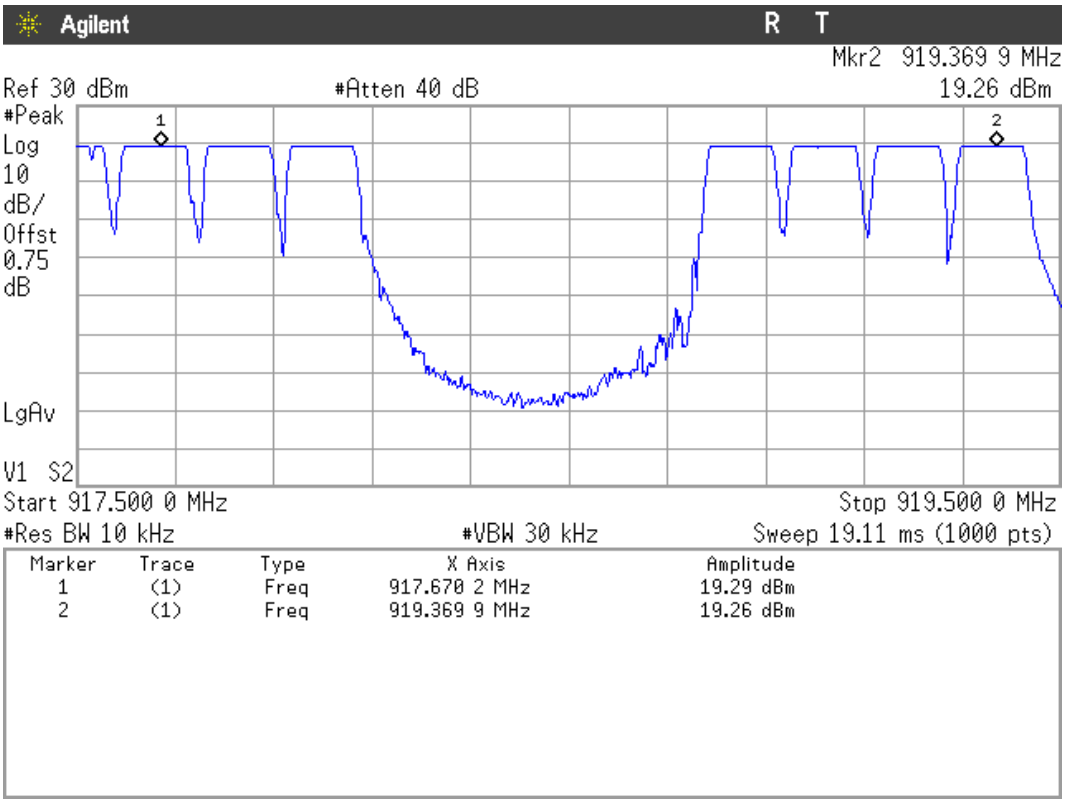
Number of hopping frequencies: 7



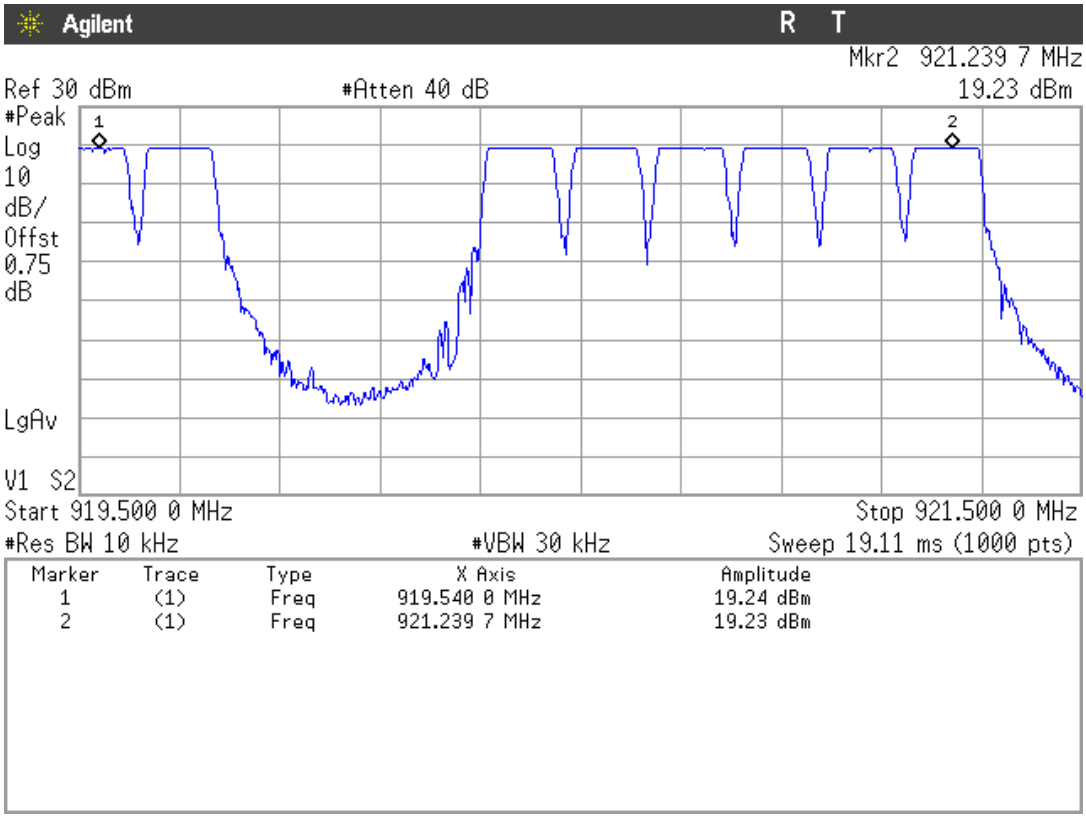
Number of hopping frequencies: 7



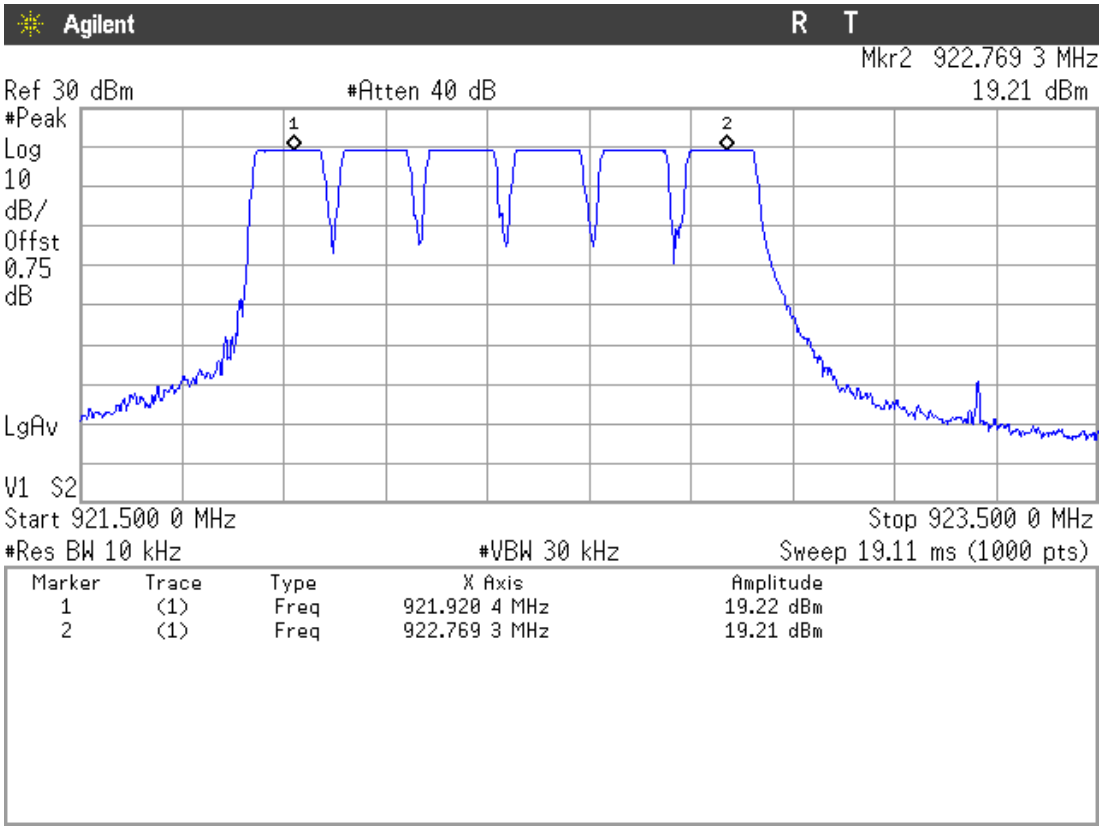
Number of hopping frequencies: 8



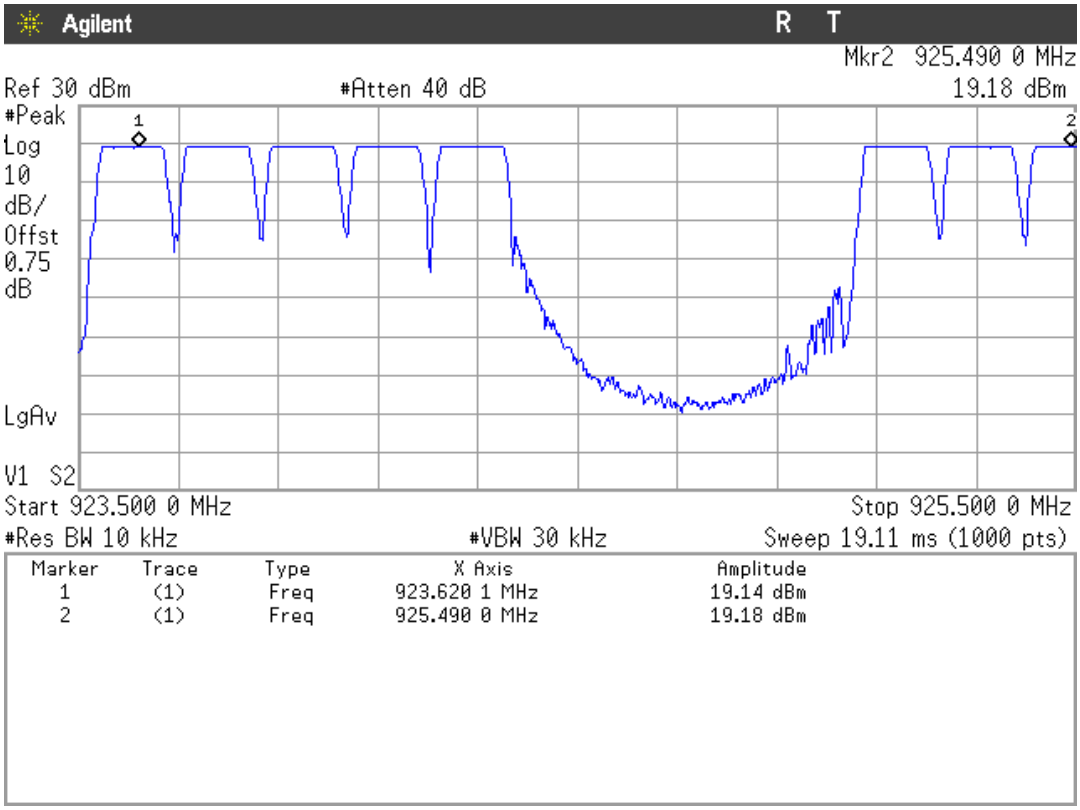
Number of hopping frequencies: 7



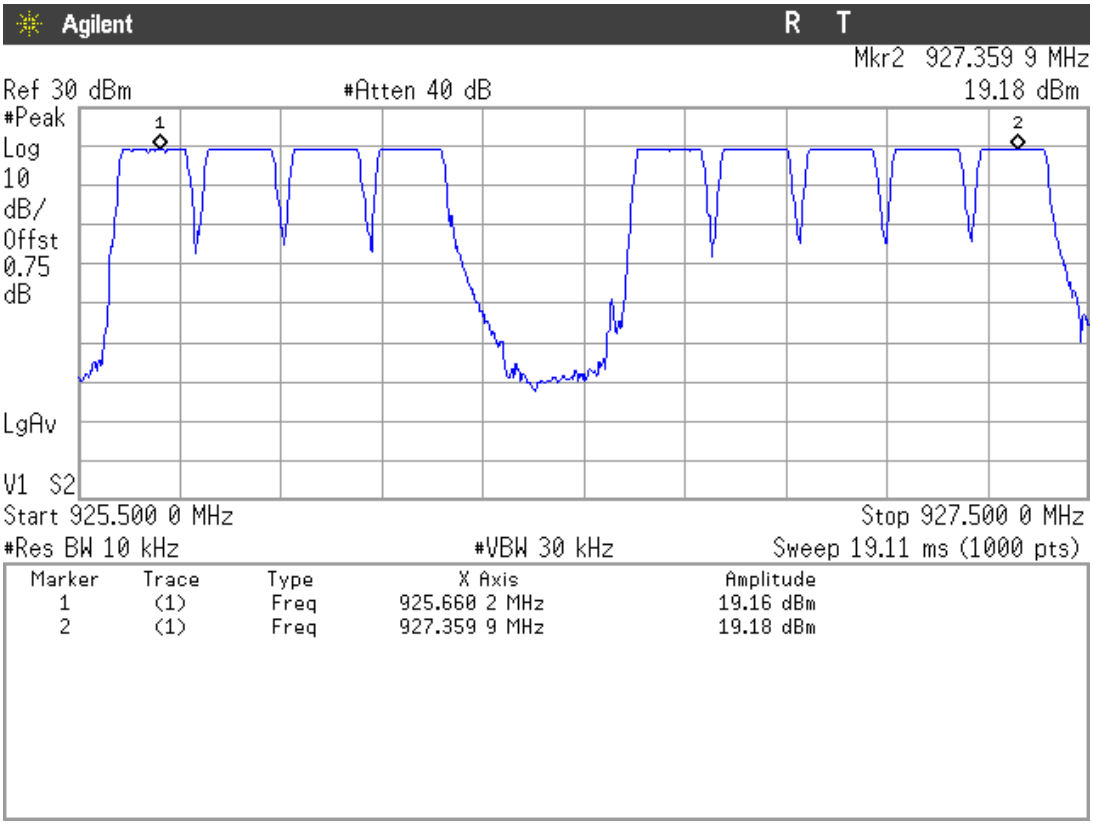
Number of hopping frequencies: 8



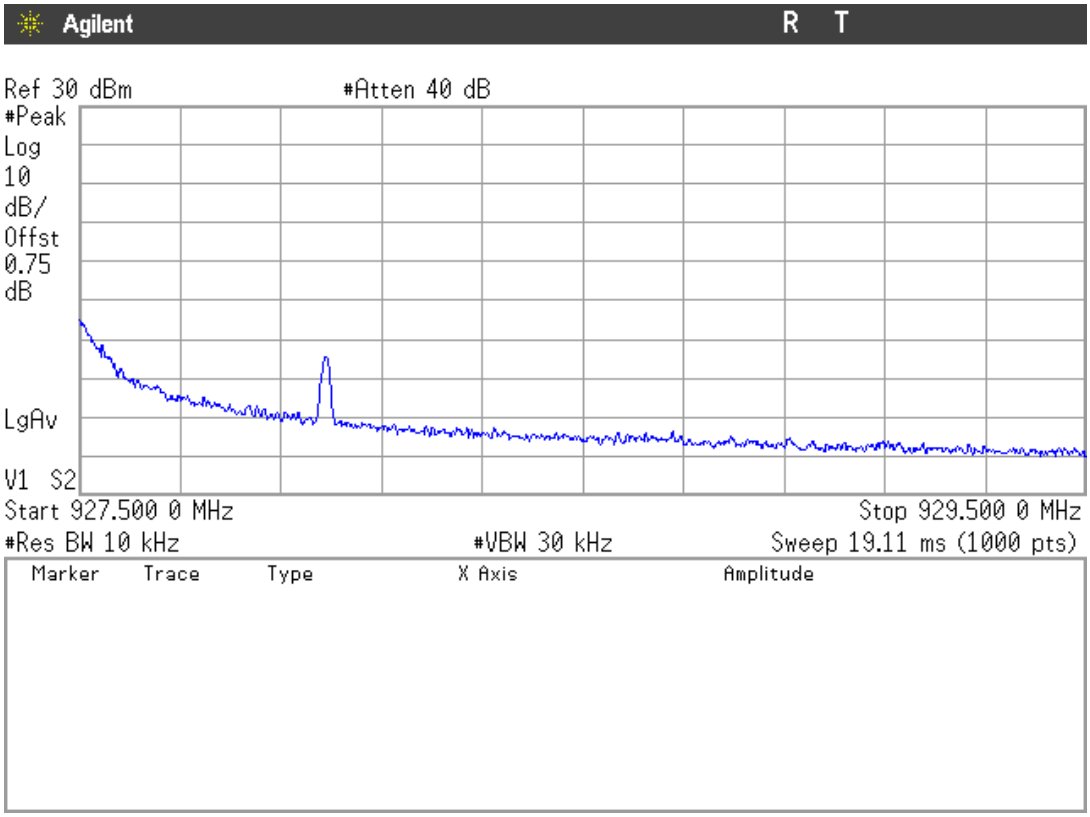
Number of hopping frequencies: 6



Number of hopping frequencies: 8



Number of hopping frequencies: 9



Number of hopping frequencies: 0

Total number of hopping frequencies: 94

Verdict: PASS

FCC Section 15.247 Subclause (a) (1) (i) / RSS-247 Clause 5.1 (3). Time of occupancy (Dwell Time)

SPECIFICATION

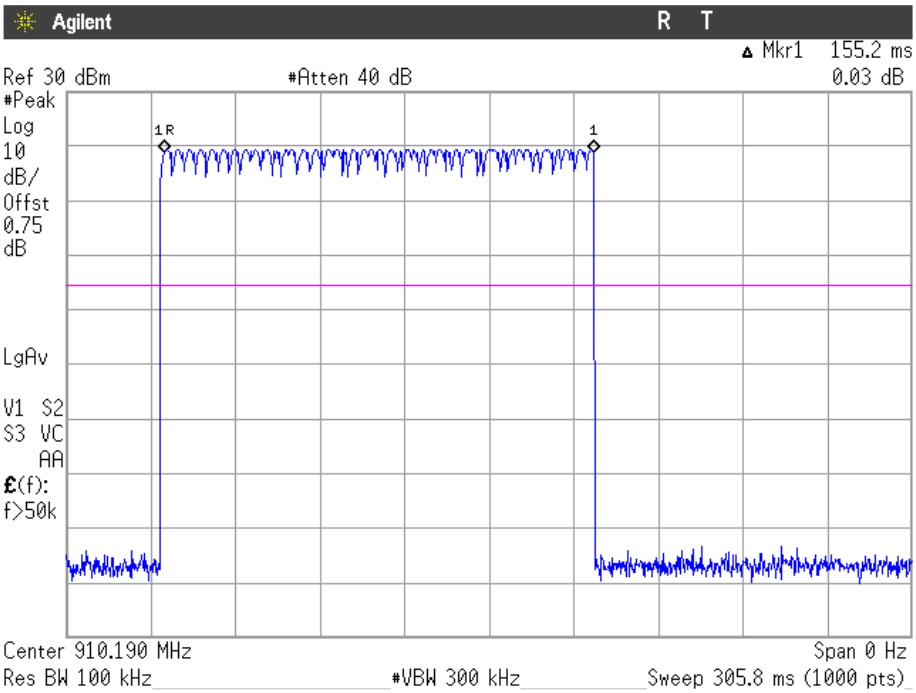
For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

RESULTS

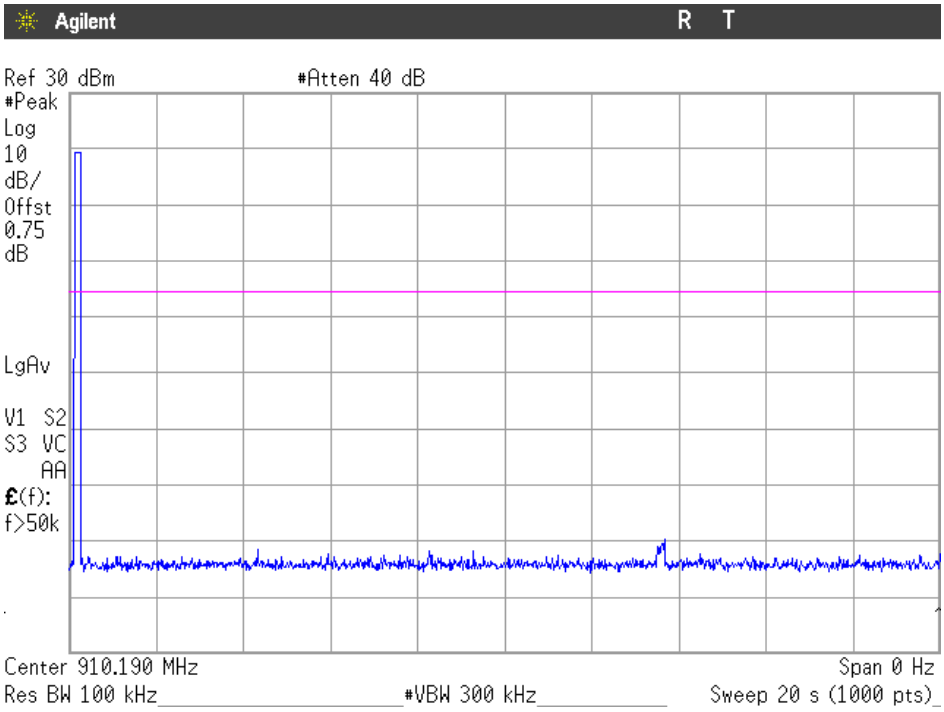
The equipment has one operation mode.

The 20 dB bandwidth of the hopping channel is less than 250 kHz.

1. Tx-time per hop = 155.2 ms (see next plot).



2. Number of hops over a period of 20 seconds = 1 (see next plot).



Averaging time of occupancy = 1 hop per 20 seconds x 155.2 ms = 155.2 ms per 20 seconds.

Measurement uncertainty (%)	<±0.01

Verdict: PASS

FCC Section 15.247 Subclause (b) (2) / RSS-247 Clause 5.4 (1). Maximum peak output power and antenna gain

SPECIFICATION

For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

The e.i.r.p. shall not exceed 4 W (36 dBm) if the hopset uses 50 or more hopping channels (Canada).

RESULTS

MAXIMUM OUTPUT POWER. See next plots.

Declared maximum antenna gain: -0.36 dBi.

The EIRP power (dBm) is calculated by subtracting the antenna cable loss and adding the declared maximum antenna gain to the measured conducted power.

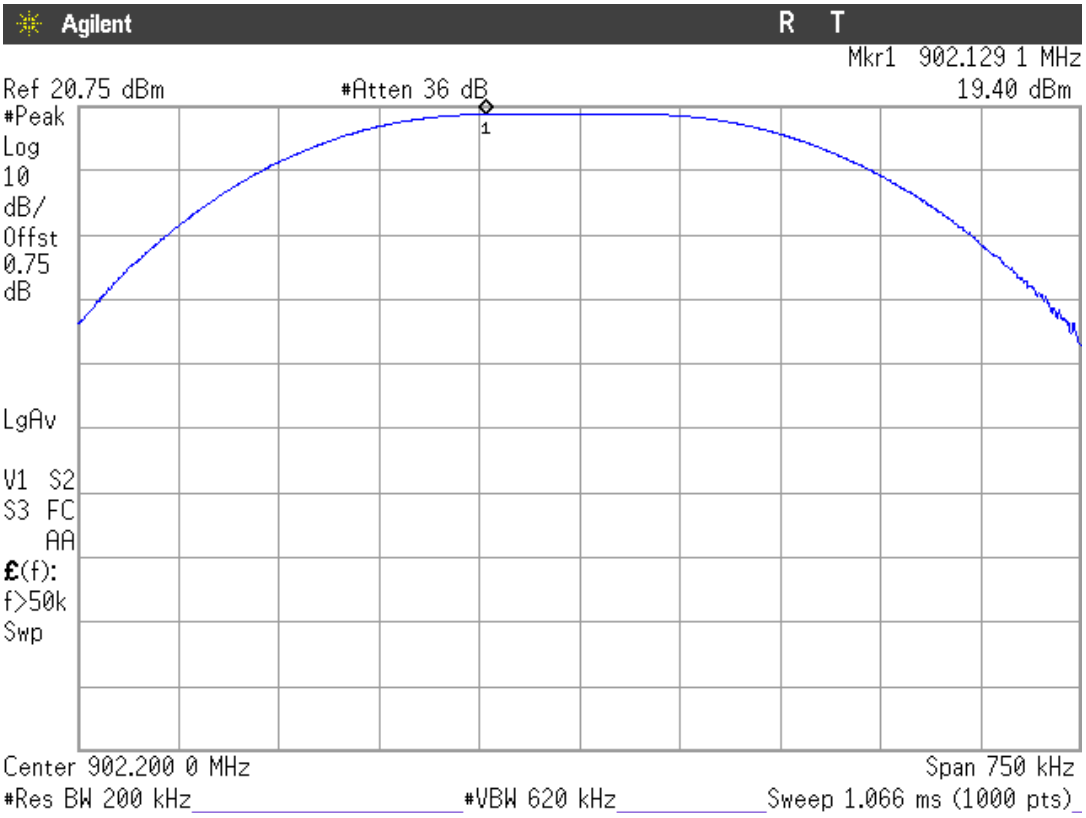
	Lowest frequency 915.3 MHz	Middle frequency 921.1 MHz	Highest frequency 927.6 MHz
Maximum peak power (dBm)	19.40	19.21	19.05
Maximum EIRP power (dBm)	19.04	18.85	18.69
Measurement uncertainty (dB)	<±0.78		

The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

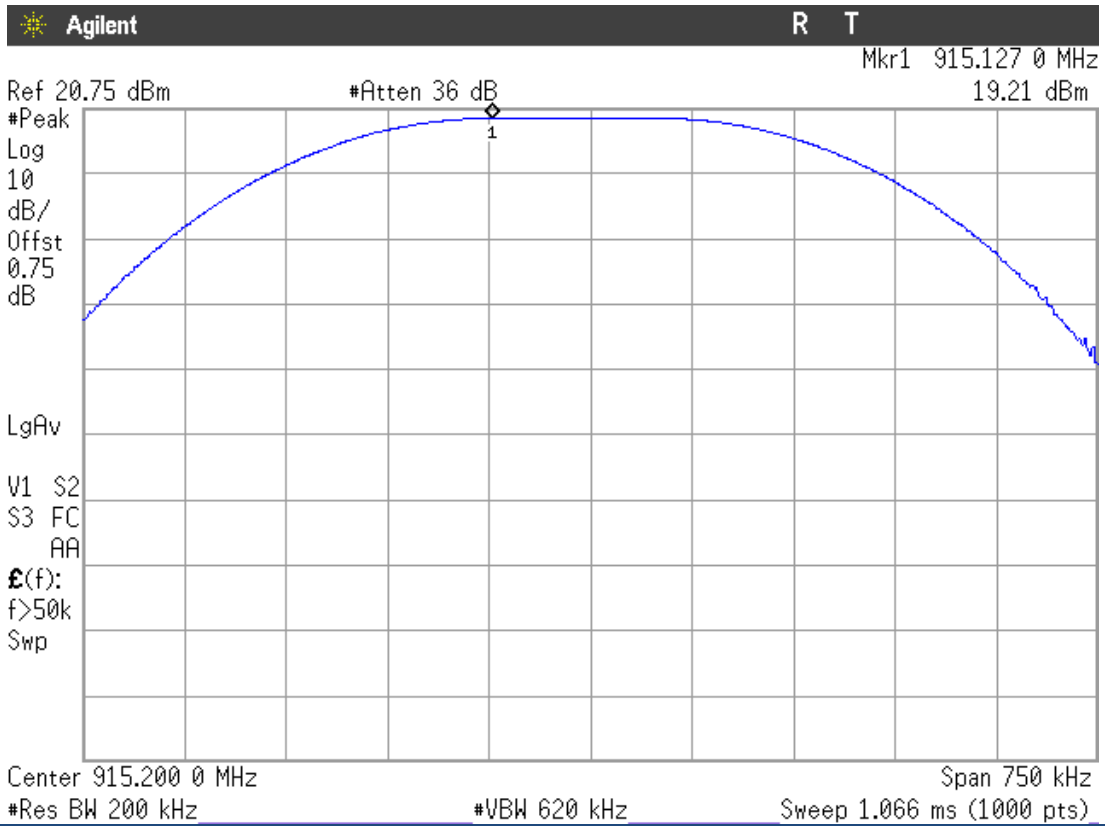
Verdict: PASS

PEAK OUTPUT POWER (CONDUCTED).

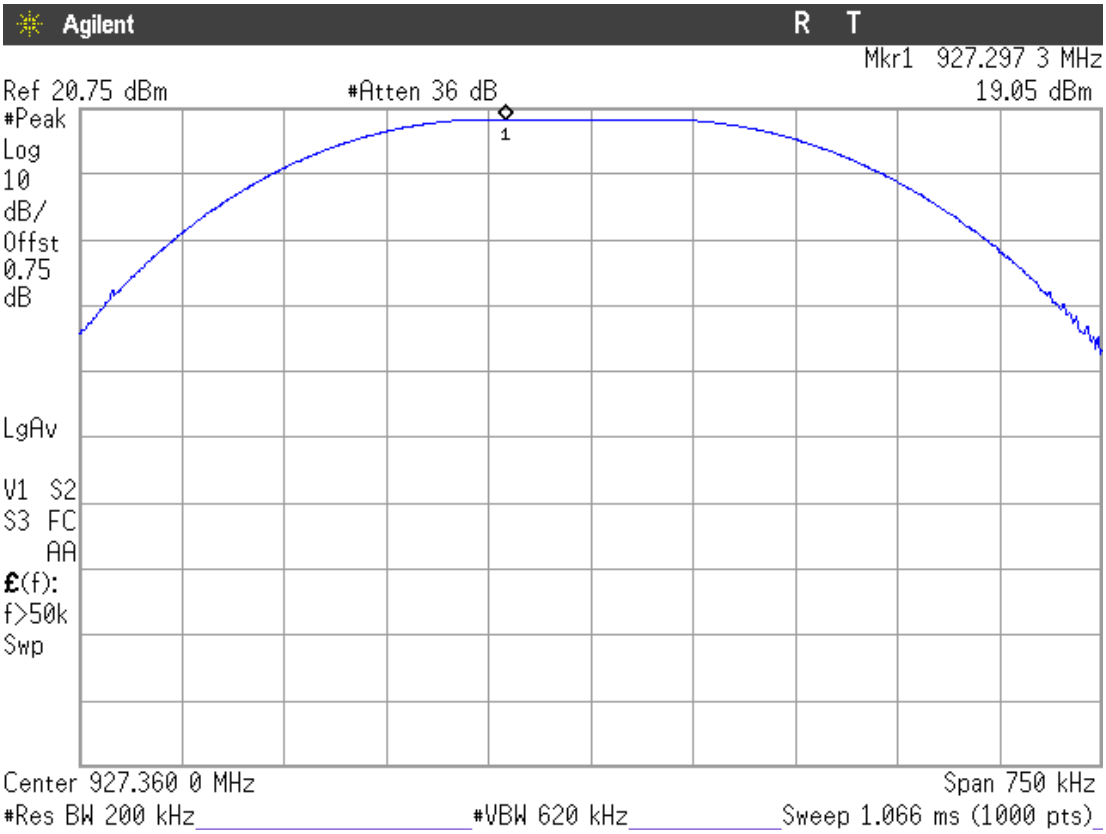
Lowest Channel



Middle Channel



Highest Channel



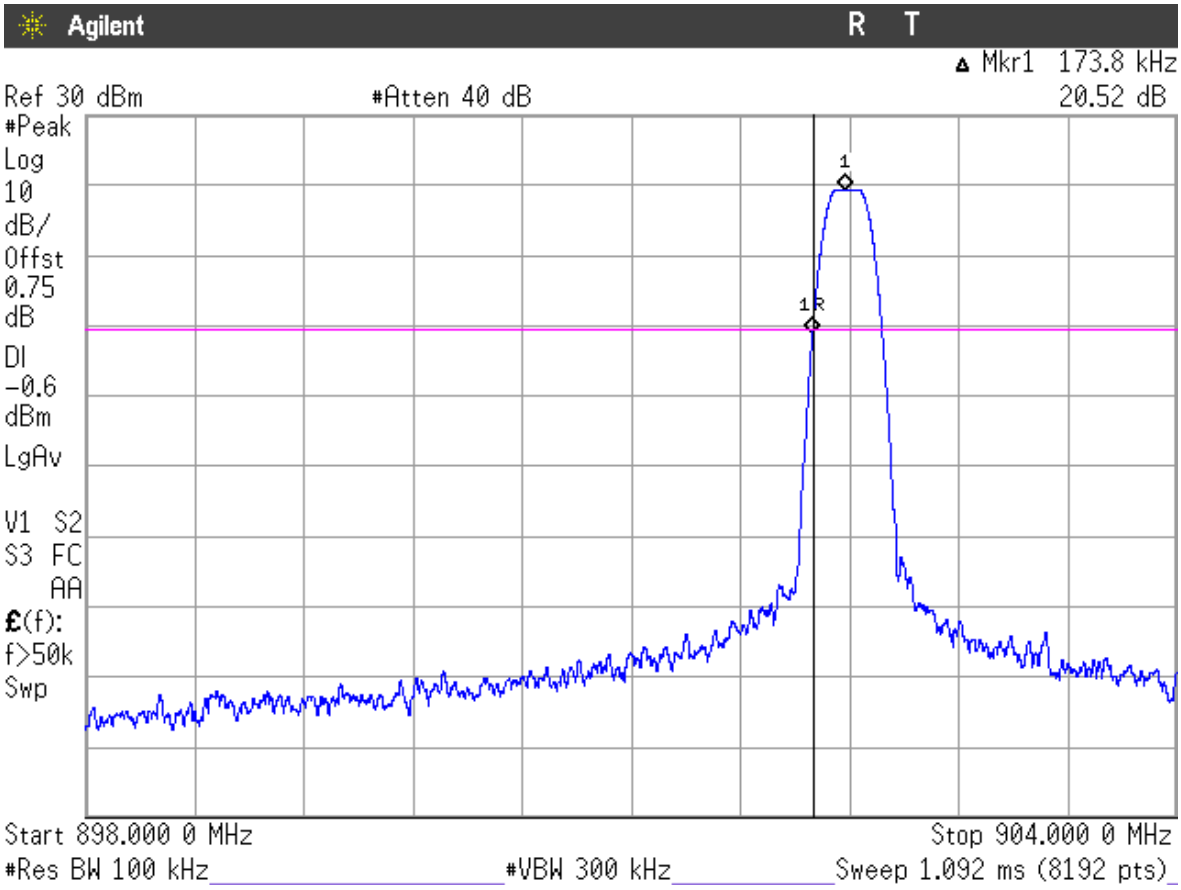
FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Band-edge compliance of conducted emissions (Transmitter)

SPECIFICATION

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

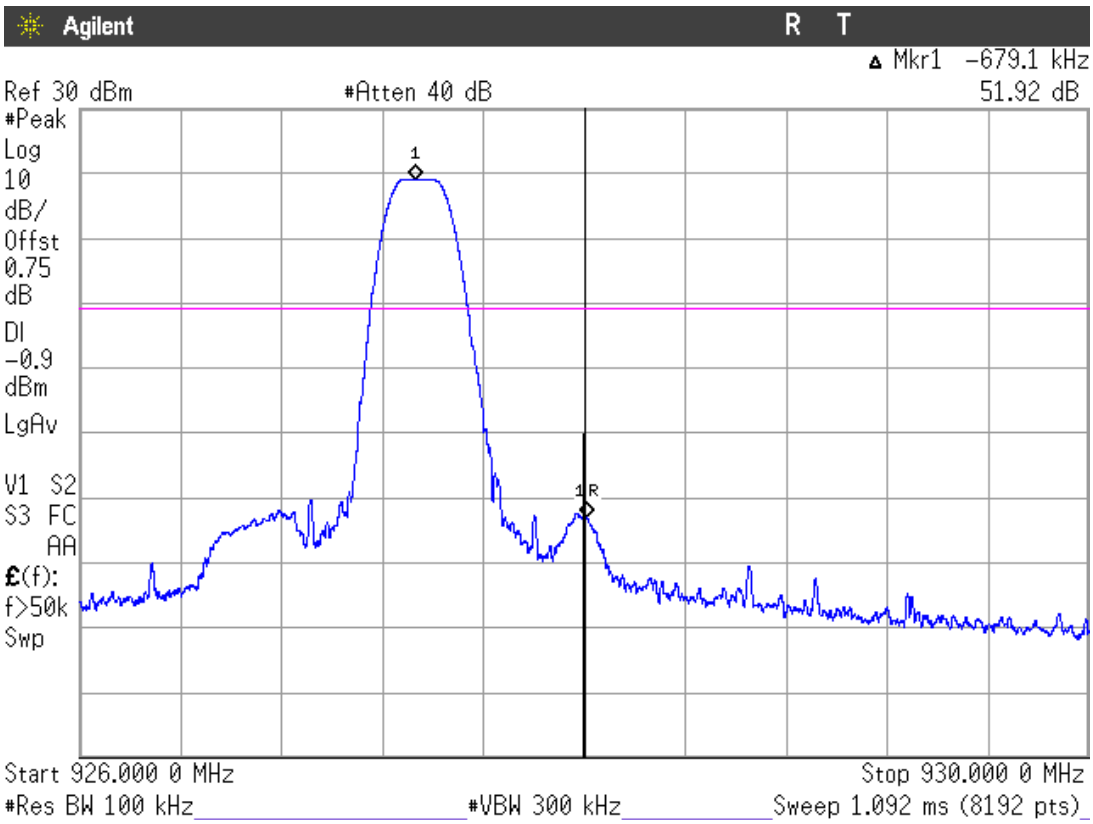
RESULTS:

1. LOW FREQUENCY SECTION (HOPPING OFF). See next plot.



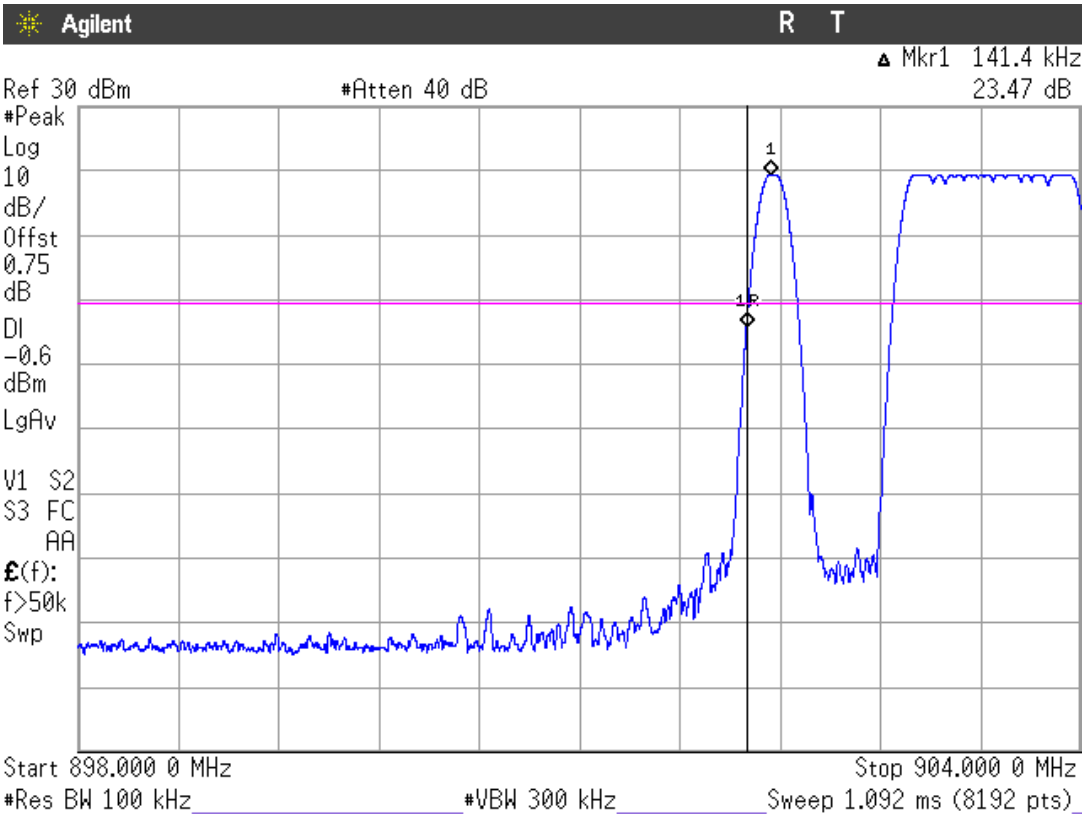
Verdict: PASS

2. HIGH FREQUENCY SECTION (HOPPING OFF). See next plot.



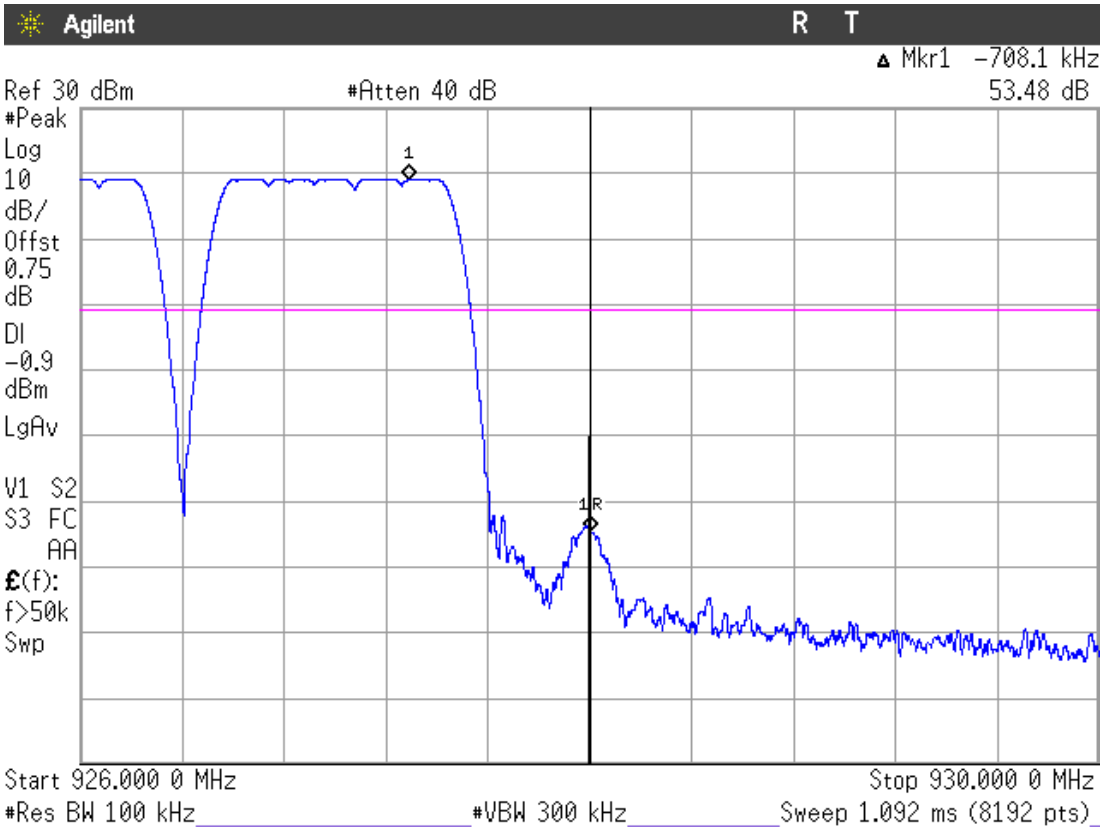
Verdict: PASS

3. LOW FREQUENCY SECTION (HOPPING ON). See next plot.



Verdict: PASS

4. HIGH FREQUENCY SECTION (HOPPING ON). See next plot.



Verdict: PASS

Measurement uncertainty (dB)	<±2.03

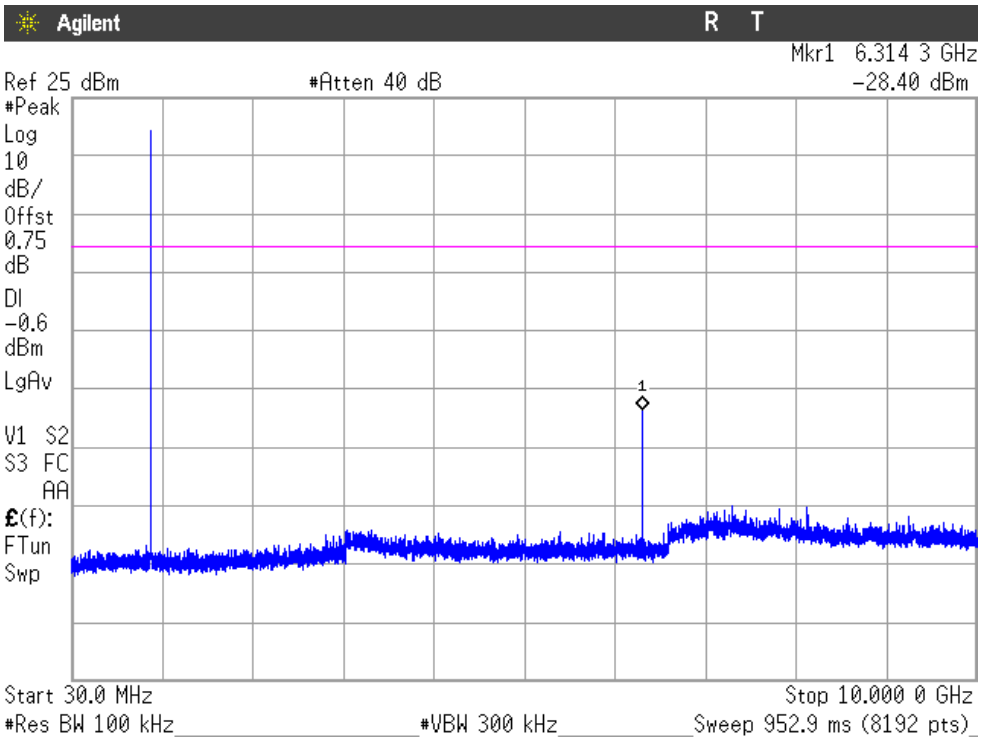
FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Emission limitations conducted (Transmitter)

SPECIFICATION

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

RESULTS:

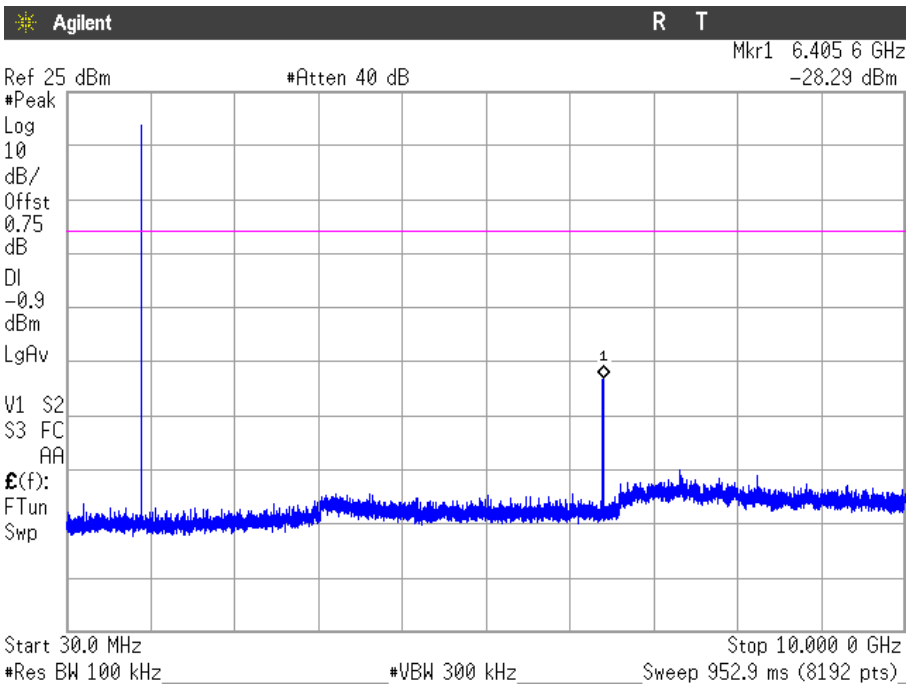
1. LOWEST CHANNEL 30 MHz-10 GHz (see next plot).



Note: The peak above the limit is the carrier frequency.

Verdict: PASS

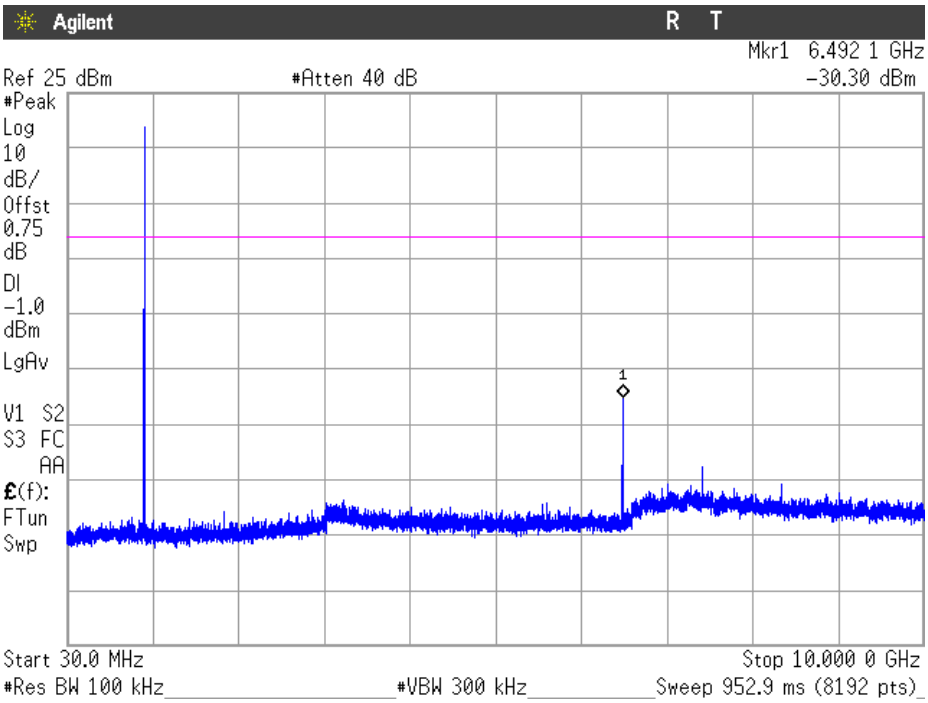
2. MIDDLE CHANNEL 30 MHz-10 GHz (see next plot).



Note: The peak above the limit is the carrier frequency.

Verdict: PASS

3. HIGH CHANNEL 30 MHz-10 GHz (see next plot).



Note: The peak above the limit is the carrier frequency.

Measurement uncertainty (dB)	<±2.03

Verdict: PASS

FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Emission limitations radiated (Transmitter)

SPECIFICATION

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)) / RSS-Gen 8.9:

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing 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.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Frequency range 30 MHz-1000 MHz.

All peaks are more than 20 dB below the limit.

Frequency range 1 GHz-10 GHz

1. CHANNEL: LOWEST

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.70685	V	Peak	36.79	± 4.87
		Average	33.98	± 4.87
6.31525	H	Peak	46.33	± 4.87
		Average	44.38	± 4.87
8.12005	H	Peak	48.81	± 4.87
		Average	45.70	± 4.87

2. CHANNEL: MIDDLE

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.74585	H	Peak	36.61	± 4.87
		Average	34.59	± 4.87
6.40645	H	Peak	46.50	± 4.87
		Average	44.58	± 4.87
7.32115	H	Peak	42.56	± 4.87
		Average	37.50	± 4.87
8.23645	H	Peak	48.78	± 4.87
		Average	45.02	± 4.87

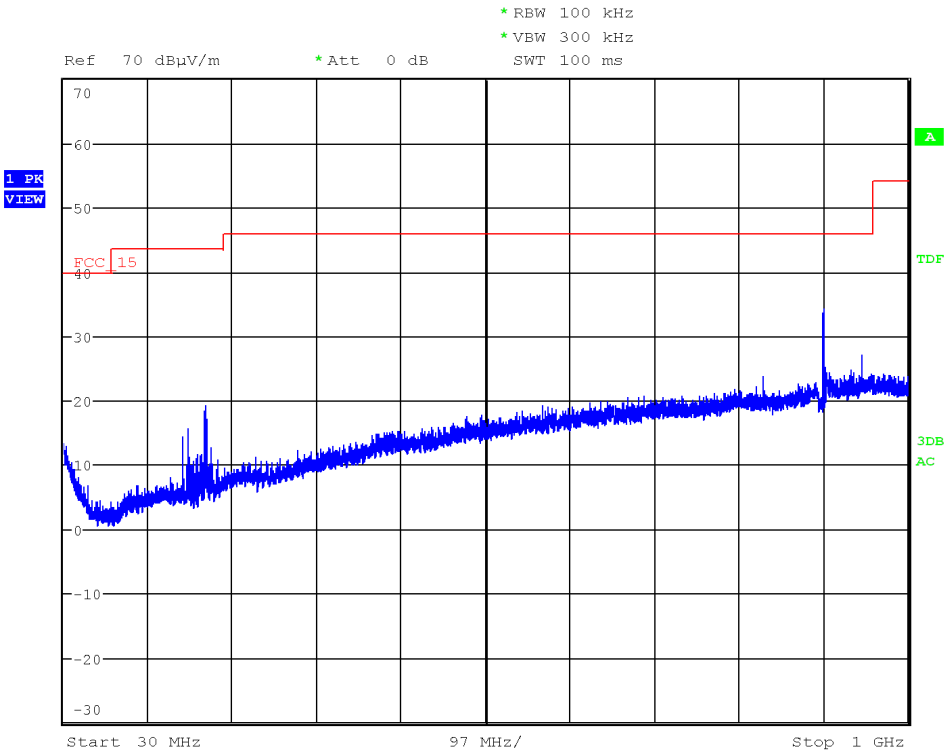
3. CHANNEL: HIGHEST

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1.85486	H	Peak	52.30	± 4.87
		Average	51.92	± 4.87
2.78185	H	Peak	41.39	± 4.87
		Average	39.43	± 4.87
6.49165	H	Peak	46.97	± 4.87
		Average	43.89	± 4.87
7.41835	H	Peak	45.25	± 4.87
		Average	41.56	± 4.87
8.34595	H	Peak	52.18	± 4.87
		Average	50.42	± 4.87

Verdict: PASS

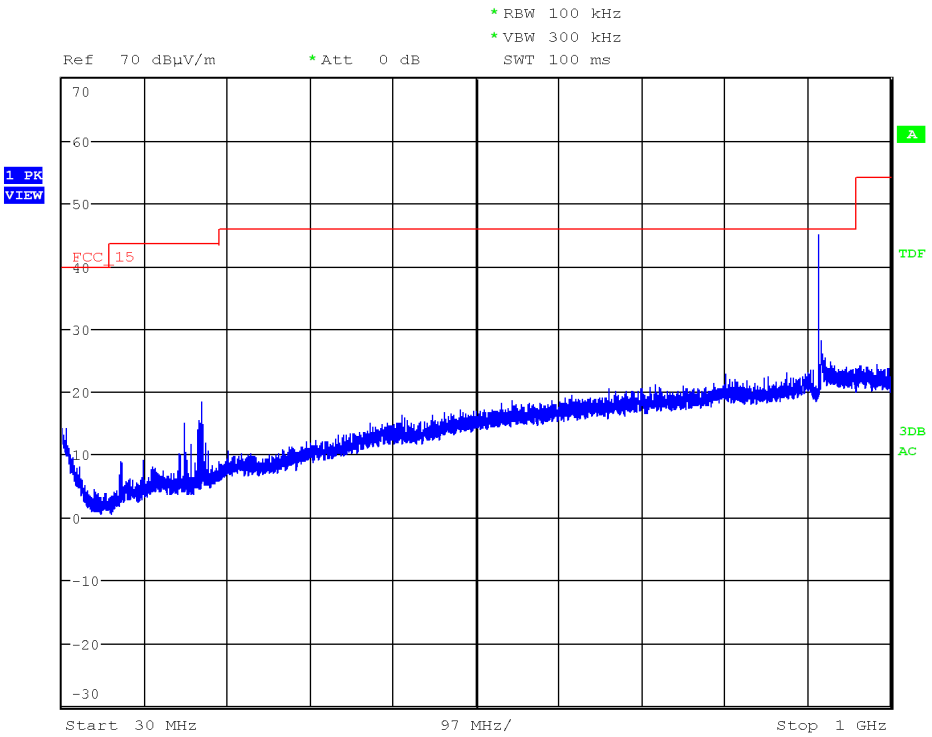
FREQUENCY RANGE 30 MHz-1000 MHz.

CHANNEL: Lowest



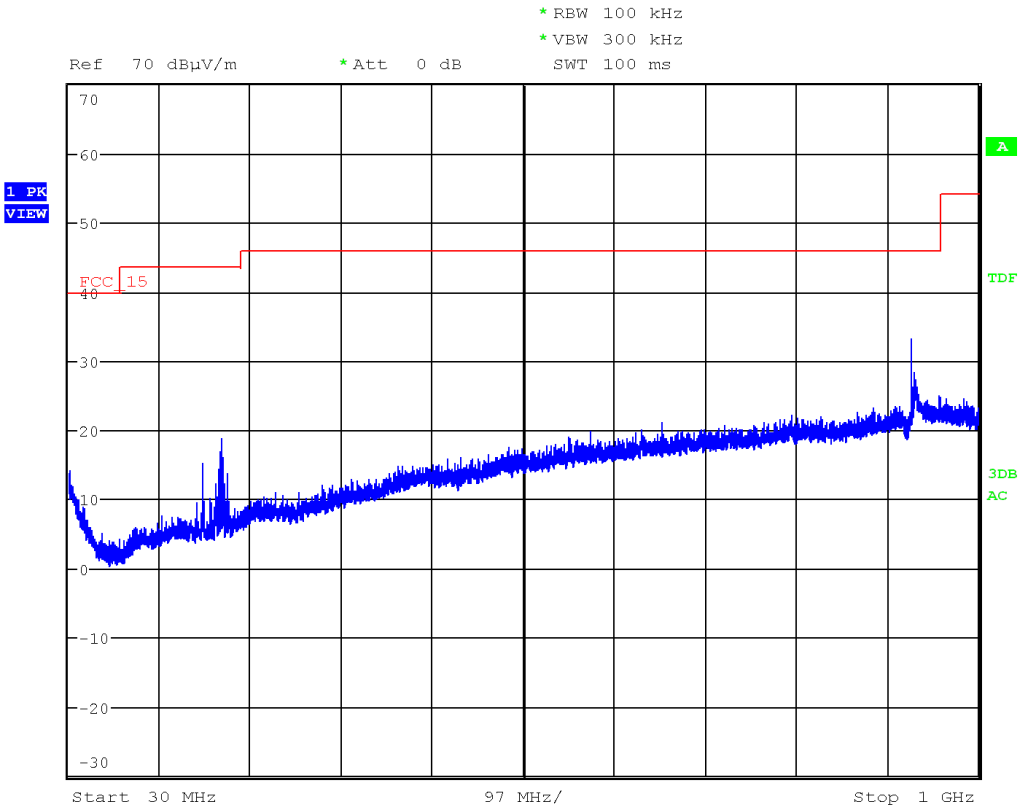
Note: The carrier has been suppressed using a band-stop filter tuned at the carrier frequency.

CHANNEL: Middle



Note: The carrier has been suppressed using a band-stop filter tuned at the carrier frequency.

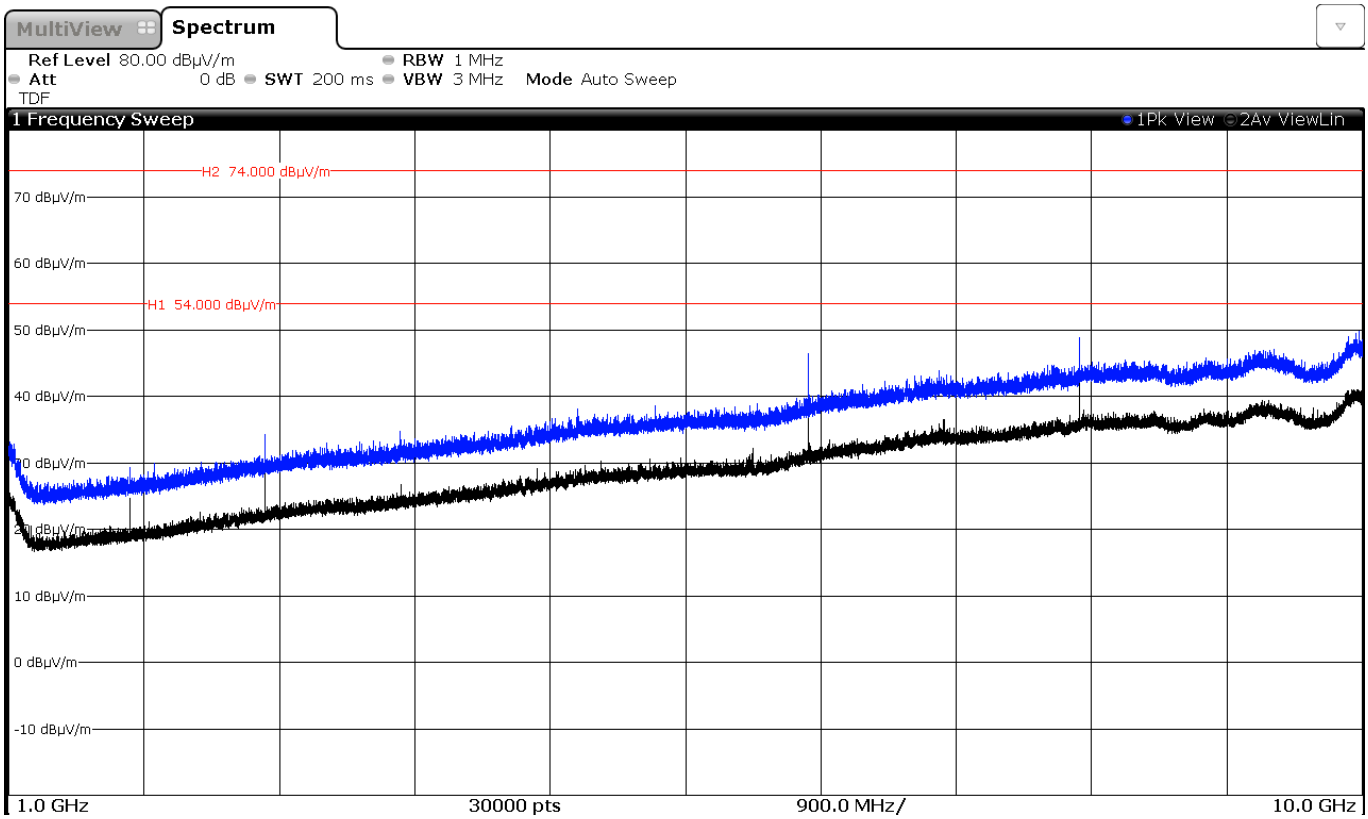
CHANNEL: Highest



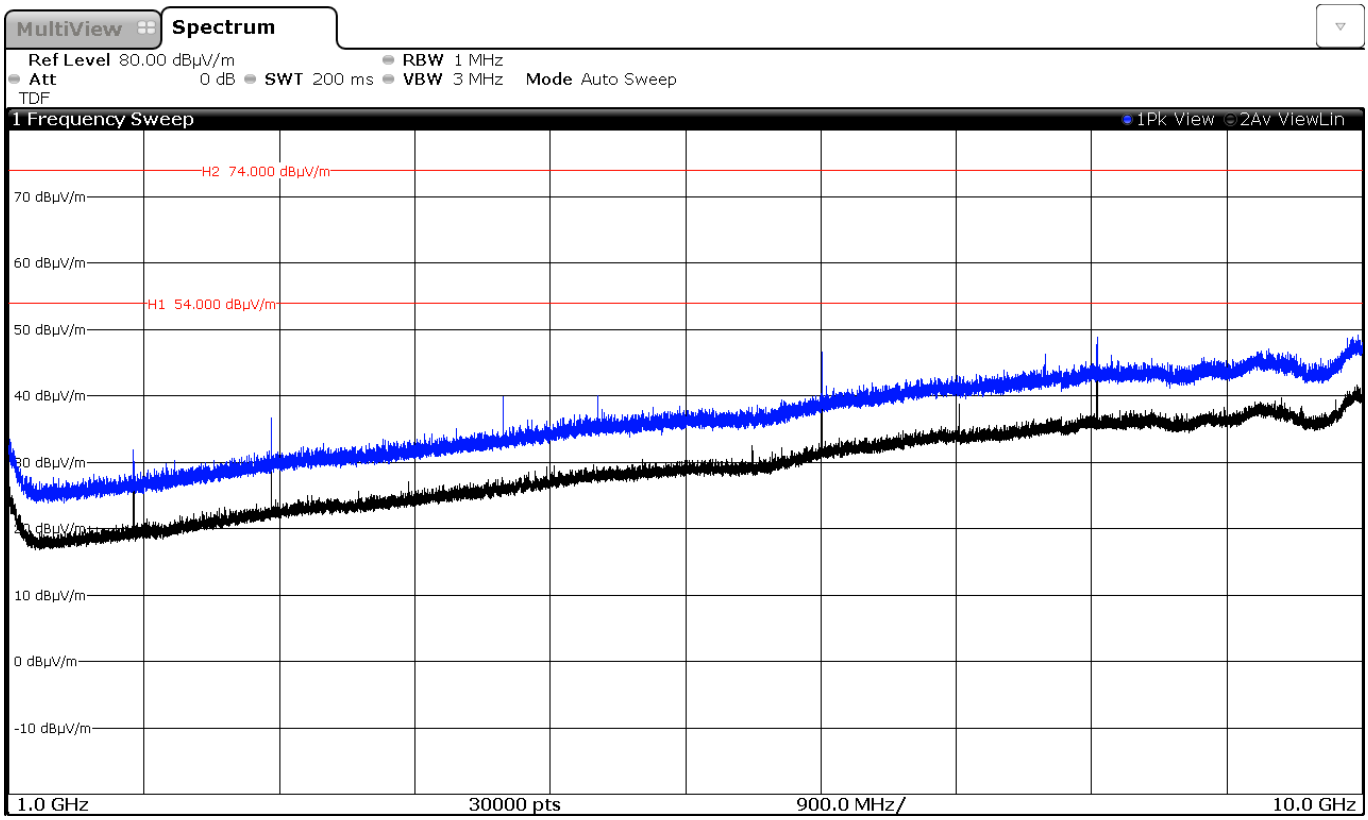
Note: The carrier has been suppressed using a band-stop filter tuned at the carrier frequency.

FREQUENCY RANGE 1 GHz to 10 GHz.

CHANNEL: Lowest



CHANNEL: Middle



CHANNEL: Highest