



Test report No:
NIE: 60237RRF.001

Partial test report

USA FCC Part 15.209, 15.225, 15.247
CANADA RSS-Gen, RSS-210, RSS-247

USA FCC Part 15 - Radio Frequency Devices:

15.209 Radiated emission limits; general requirements.

15.225 Operation within the band 13.110-14.010 MHz.

15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

CANADA - Radio Standards Specifications:

RSS-Gen General Requirements for Compliance of Radio Apparatus.

RSS-210 Licence-Exempt Radio Apparatus: Category I Equipment.

RSS-247 Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices.

(*) Identification of item tested	USB/Ethernet RFID encoder
(*) Trademark	NCoder Fingerprint
(*) Model and/or type reference	EC0BF (type reference: A1928)
Other identification of the product	Hardware version: 1.0 Software version: 0164 (Control Firmware) + 0172 (Reader Firmware) + 0136 (BGM111 Firmware) FCC ID: UKCEC0B IC: 10088A-EC0B
(*) Features	USB, Ethernet Finger print and a certified Bluetooth module (BGM111)
Applicant	SALTO Systems, S.L. Arkotz 9, Polígono Lanbarren 20180, Oiartzun, Gipuzkoa, SPAIN
Test method requested, standard	USA FCC Part 15.209 (10-1-18 Edition): Radiated emission limits; general requirements. USA FCC Part 15.225 (10-1-18 Edition): Operation within the band 13.110 -14.010 MHz. USA FCC Part 15.247 (10-1-18 Edition): Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz. CANADA RSS-Gen Issue 5 (April 2018). CANADA RSS-210 Issue 9 (August 2016). CANADA RSS-247 Issue 2 (February 2017).

	- Transmitter out of band radiated emissions with simultaneous transmissions. Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	J. Carlos Luque RF Lab. Supervisor
Date of issue	2019-11-26
Report template No	FDT08_22 (*) "Data provided by the client"

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Competences and guarantees

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Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification internal document PODT000.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample consists of a SALTO NCoder with Fingerprint and with USB/Ethernet RFID Mifare (ISO14443A & ISO15693 standard based) and Bluetooth Smart (BGM111 module) technology.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

- Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
60237/003	USB/Ethernet RFID encoder	EC0BF	---	2019-04-17

Auxiliary elements used with sample S/01:

Control N°	Description	Model	Serial N°	Date of reception
60237/006	AC/DC adapter	6A-054WP05B	---	2019-04-17
60237/008	USB cable	---	---	2019-04-17

Sample S/01 has undergone the following test(s): All tests indicated in Appendix A.

Test sample description

Ports..... :	Port name and description		Cable				
			Specified length [m]	Attached during test	Shielded		
	Ethernet		100m	☐	☐		
	USB			☒	☐		
Supplementary information to the ports.....:							
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 5 Vdc					
	☐	DC:					
Rated Power	2.5 W (max.)						
Clock frequencies.....	25 MHz, 27.12 MHz						
Other parameters	--						
Software version	0164 (Control Firmware) + 0172 (Reader Firmware) + 0136 (BGM111 Firmware)						
Hardware version	1.0						
Dimensions in cm (W x H x D) :	9.55 x 4.15 x 14.1						
Mounting position	☒	Table top equipment					
	☐	Wall/Ceiling mounted equipment					

	☐	Floor standing equipment	
	☐	Hand-held equipment	
	☐	Other:	
Modules/parts.....:	Module/parts of test item	Type	Manufacturer
	BGM111	BLE Module	Silicon Labs
Accessories (not part of the test item).....:	Description	Type	Manufacturer
	--		
Documents as provided by the applicant	Description	File name	Issue date
	User manual		
	FW explanation document		

Identification of the client

SALTO Systems, S.L.
Arkotz 9, Polígono Lanbarren
20180, Oiartzun, Gipuzkoa, SPAIN

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2019-04-22
Date (finish)	2019-04-22

Document history

Report number	Date	Description
60237RRF.001	2019-11-26	First release

Environmental conditions

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Miguel Ángel Torres.

Used instrumentation:

Radiated Measurements

	Last Calibration	Due Calibration
1. Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N.A.	N.A.
2. Shielded Room ETS LINDGREN S101	N.A.	N.A.
3. EMI Test Receiver 9kHz-7GHz ROHDE AND SCHWARZ ESR7	2018/10	2020/10
4. Active Loop Antenna HEWLETT PACKARD 11966A	2018/06	2020/06
5. RF Pre-amplifier, 40 dB, 10MHz - 6GHz BONN ELEKTRONIK BLNA 0160-01N	2019/02	2020/02
6. Biconical/Log Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2017/09	2020/09
7. Broadband Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2018/01	2021/01
8. Broadband Horn antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2018/07	2021/07
9. Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2018/02	2020/02
10. RF Pre-amplifier, 30 dB, 1GHz - 18GHz BONN ELEKTRONIK BLMA 0118-3A	2019/04	2020/04
11. RF Pre-amplifier, 48 dB, 18GHz - 40GHz NARDA JS44-18004000-33-8P	2019/02	2020/02

Testing verdicts

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

Summary

FCC PART 15 PARAGRAPH / RSS-Gen, RSS-210, RSS-247		
Requirement – Test case	Verdict	Remark
FCC 15.209 (a), FCC 15.225 (d), FCC 15.247 (d) / RSS-Gen 8.9, RSS-210 B.6 (d), RSS-247 5.5. - Transmitter out of band radiated emissions with simultaneous transmissions	P	(1)
<u>Supplementary information and remarks:</u> (1) Only co-location radiated spurious emission test was requested.		

Appendix A: Test results.

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TEST CONDITIONS11

FCC 15.209 (a), FCC 15.225 (d), FCC 15.247 (d) / RSS-Gen 8.9, RSS-210 B.6 (d), RSS-247 5.5. Transmitter
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TEST CONDITIONS

POWER SUPPLY (V):

V nominal: 5 Vdc.
Type of Power Supply: External power supply.

ANTENNA:

Type of NFC Antenna: Internal (PCB).
Maximum Declared Gain for NFC Antenna: Not Applicable.

Type of Bluetooth Antenna: Internal (Chip).
Maximum Declared Gain for Bluetooth Antenna: 1 dBi

The test set-up was made in accordance to the general provisions of FCC DTS Measurement 558074 D01 DTS Meas Guidance v05r02 dated April 2, 2019.

The EUT was tested in the following operating mode:

- Continuous transmission with a modulated carrier at maximum power in all required channels selecting the supported data rates/modulations types.

During transmitter test the EUT was being controlled by the SW tool to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

The following configurations were selected based on preliminary testing that identified those corresponding to the worst cases:

Transmission modes selected with each radio:

* NFC: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in NFC ISO 14443A (106 Kbps) and NFC ISO 15693 (106 Kbps) because both modulations can transmit simultaneously with the other radio.

* Bluetooth Low Energy: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in Low Energy mode.

Simultaneous transmission modes selected:

* **NFC ISO 14443A, Bluetooth Low Energy co-location**, with the EUT configured to simultaneously transmit two signals at maximum output power, NFC ISO 14443A (106 Kbps), Bluetooth Low Energy.

* **NFC ISO 15693, Bluetooth Low Energy co-location**, with the EUT configured to simultaneously transmit two signals at maximum output power, NFC ISO 15693 (106 Kbps), Bluetooth Low Energy.

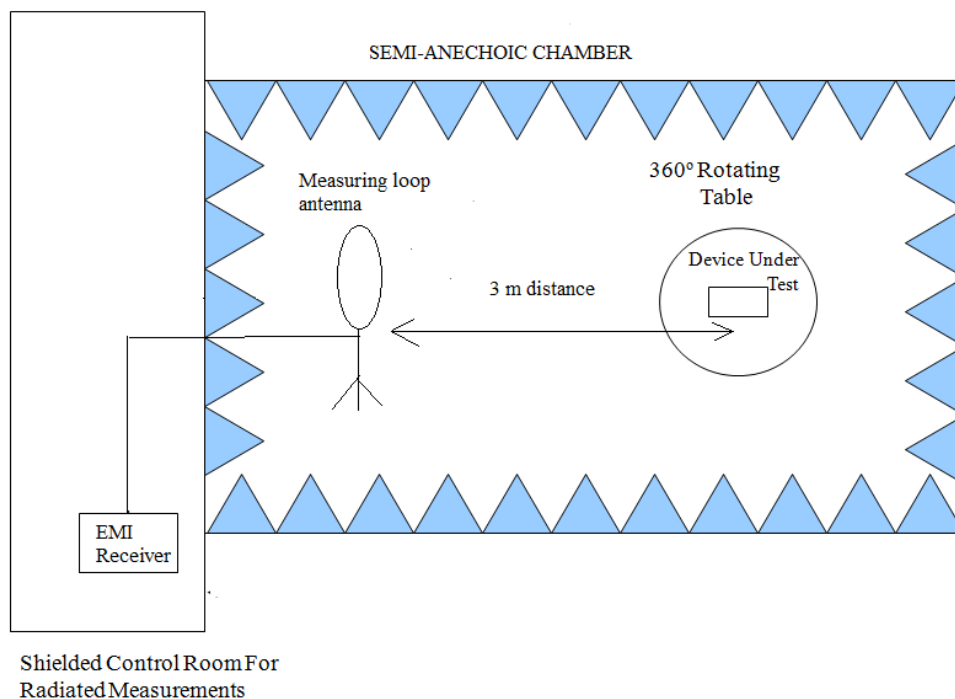
RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m. The EUT was placed at a height of 80 cm above the reference ground plane in the center of the chamber turntable to perform the measurements below 1GHz and The EUT was placed at a height of 1.5 meters above the test chamber floor in the center of the chamber turntable to perform the measurements above 1GHz. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

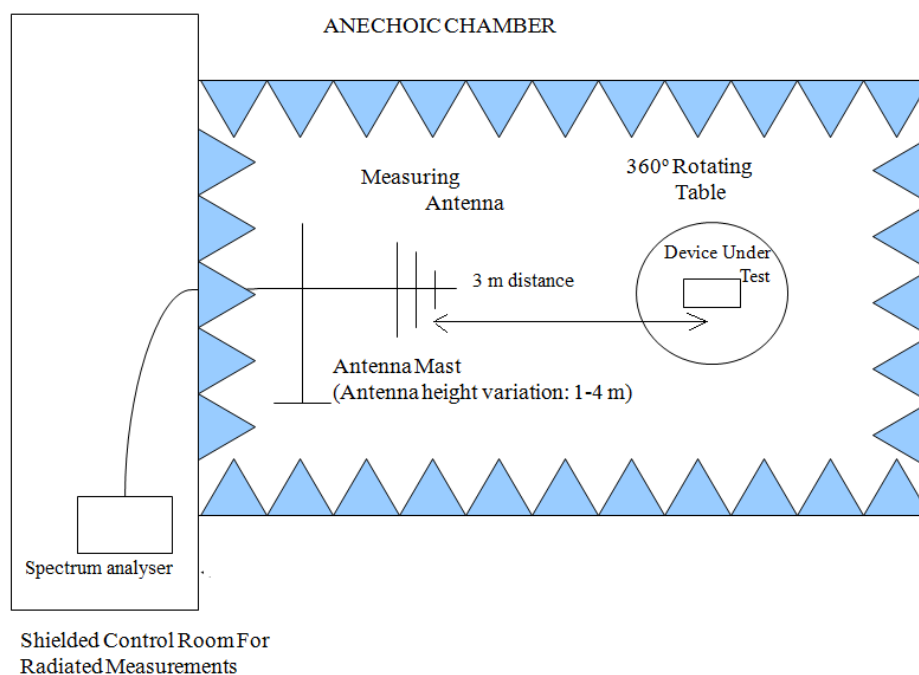
Measurements were made in both horizontal and vertical planes of polarization.

The final measured value, for the given emission, in the tables below incorporates the calibrated antenna factor, preamplifier gain (if used) and cable losses.

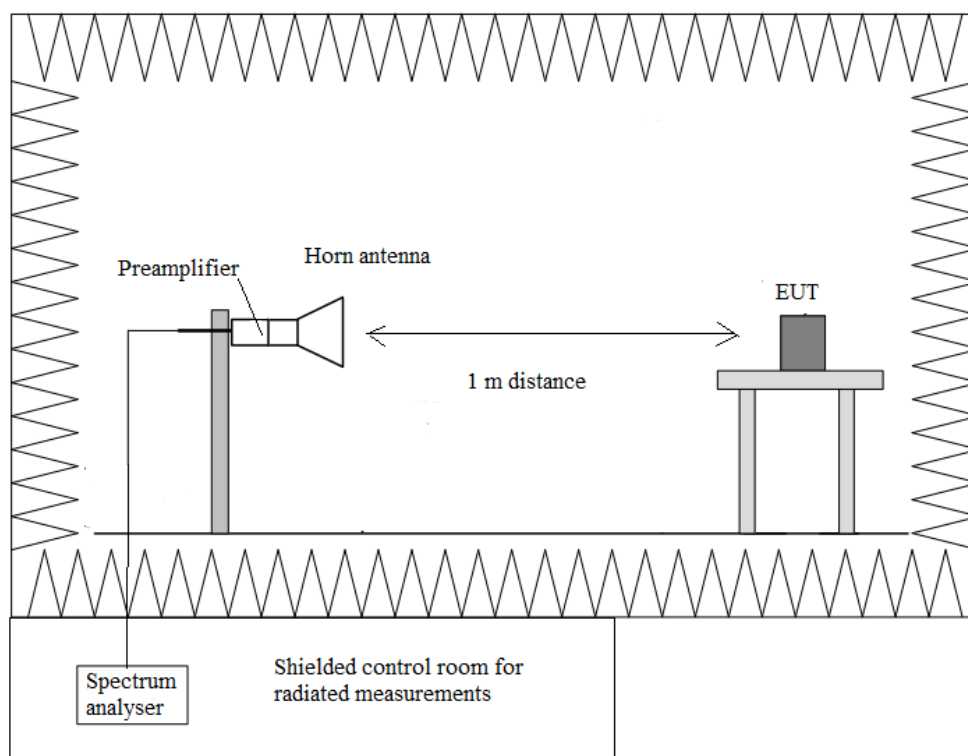
Radiated measurements setup $9\text{ kHz} < f < 30\text{ MHz}$:



Radiated measurements setup $30 \text{ MHz} < f < 1 \text{ GHz}$



Radiated measurements setup $f > 1 \text{ GHz}$



FCC 15.209 (a), FCC 15.225 (d), FCC 15.247 (d) / RSS-Gen 8.9, RSS-210 B.6 (d), RSS-247 5.5. Transmitter out of band radiated emissions with simultaneous transmissions

SPECIFICATION:

Radiated emissions which fall in the restricted bands, as defined in §15.205 (a), appearing outside of the band 13.110 MHz - 14.010 MHz must also comply with the radiated emission limits specified in §15.209 (a) (see §15.205 (c) / RSS-Gen):

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	29.54	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 40000	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.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° 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-40 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.

Test performed on the following worst cases in all relevant tests channels.

- **Mode NFC A and Bluetooth Low Energy.**

NFC ISO 14443A: 106Kbps (13.56 MHz).

Bluetooth Low Energy: 1Mbps (2440 MHz).

Frequency range 9 KHz - 30 MHz

The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode selected in the EUT.

No spurious frequencies detected at less than 20 dB below the limit.

Frequency range 30 MHz - 1 GHz

The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode selected in the EUT.

Spurious frequencies at less than 20 dB below the limit:

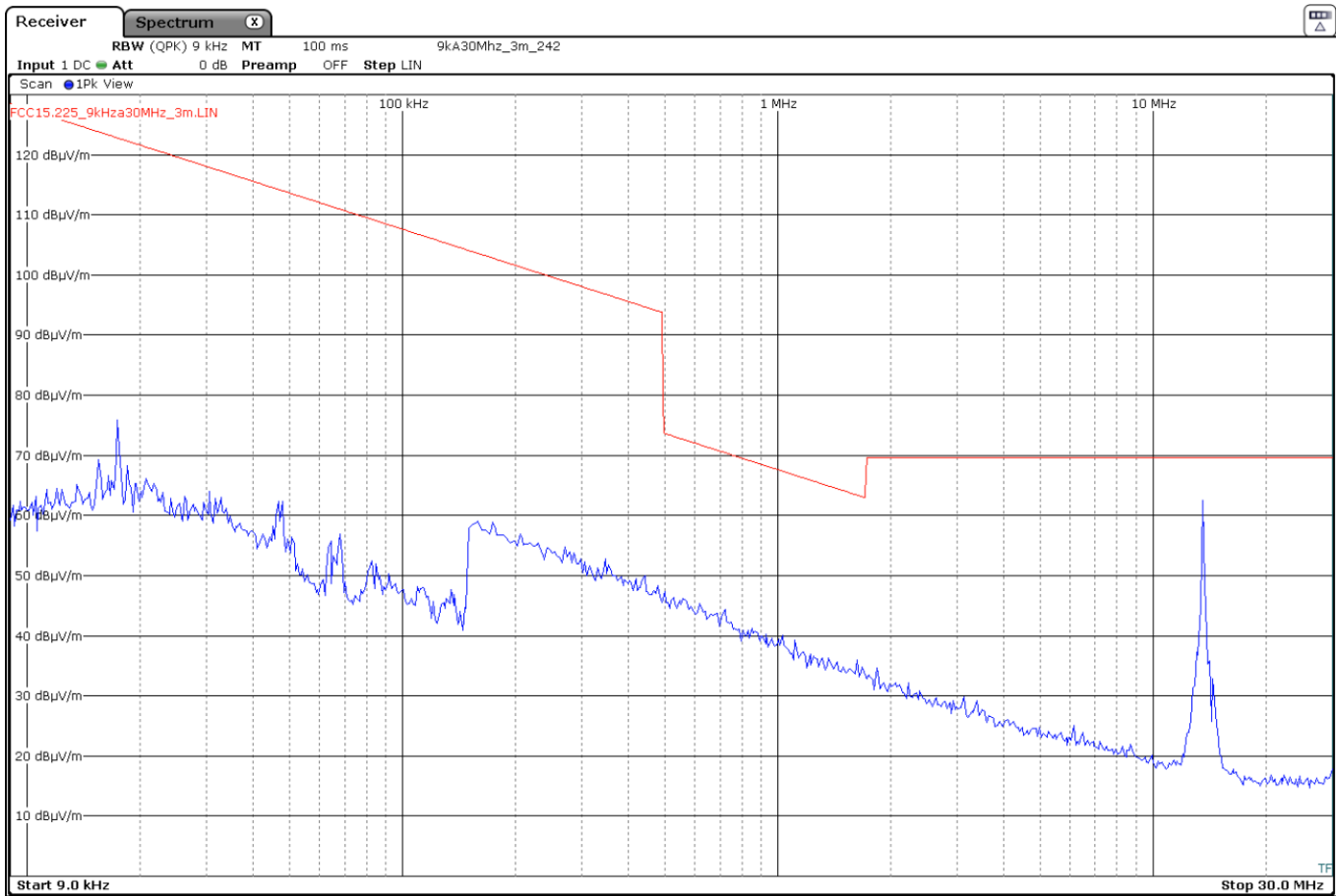
Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Limit (dBμV/m)	Measurement Uncertainty (dB)
49.675	V	Quasi-Peak	36.7	40	± 3.88
104.965	V	Quasi-Peak	26.7	43.5	± 3.88
288.651	H	Quasi-Peak	39.8	46	± 3.88
375.013	V	Quasi-Peak	37.8	46	± 3.88
393.249	V	Quasi-Peak	33.9	46	± 3.88
400.007	H	Quasi-Peak	27.7	46	± 3.88

Frequency range 1 - 26 GHz

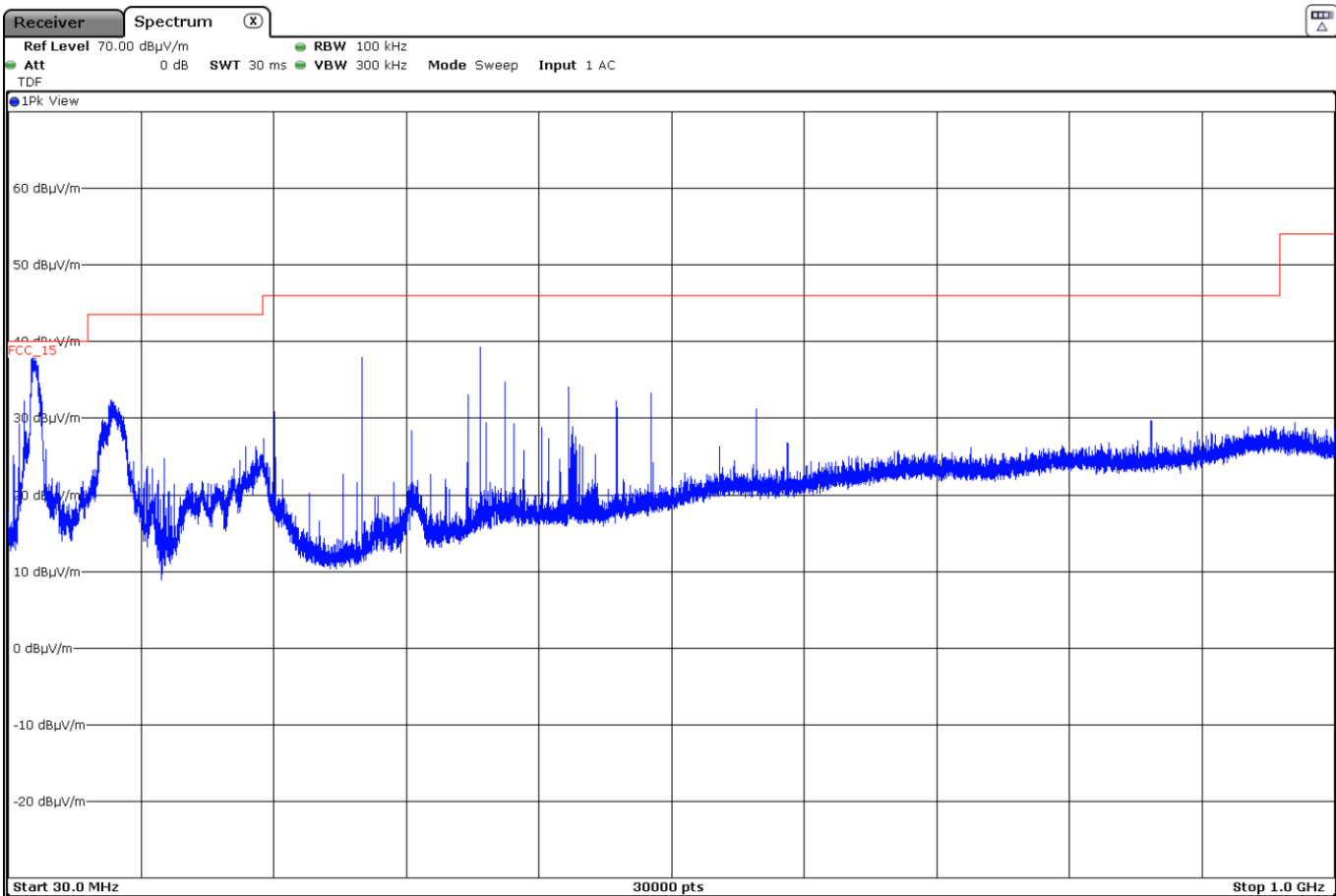
No spurious frequencies detected at less than 20 dB below the limit for all the channels.

Verdict: PASS

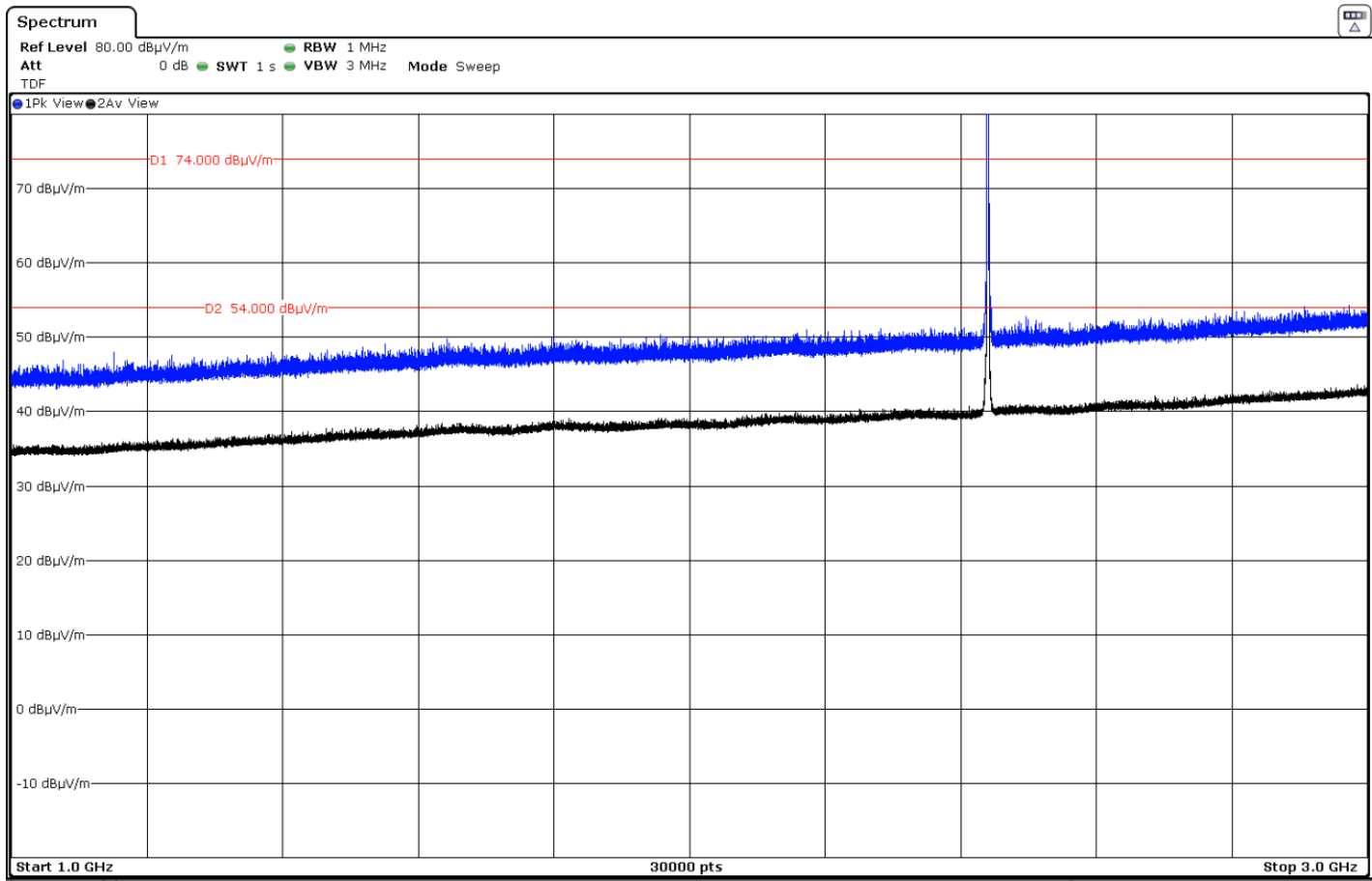
FREQUENCY RANGE 9 kHz - 30 MHz



FREQUENCY RANGE 30 MHz - 1 GHz

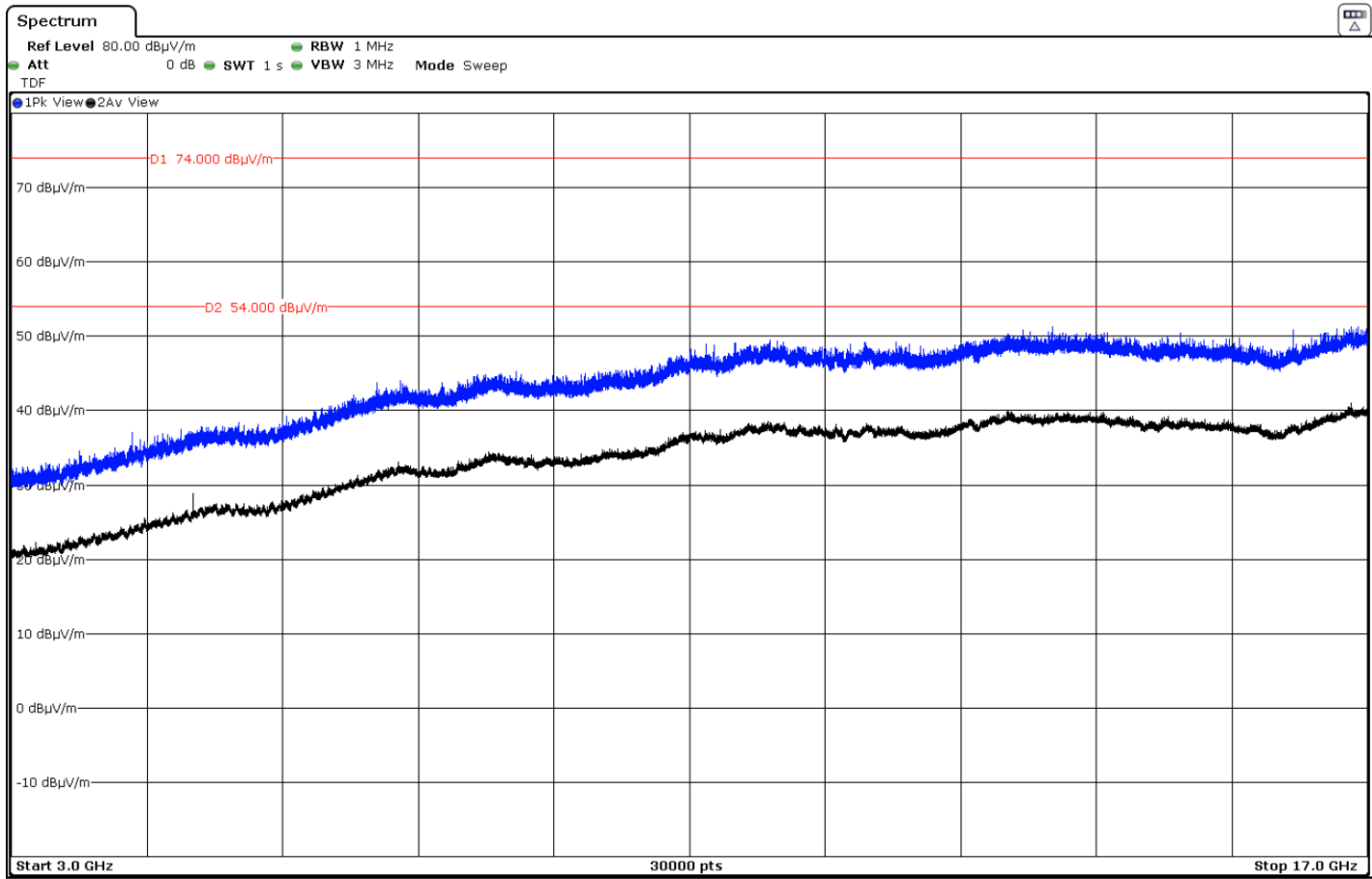


FREQUENCY RANGE 1 - 3 GHz

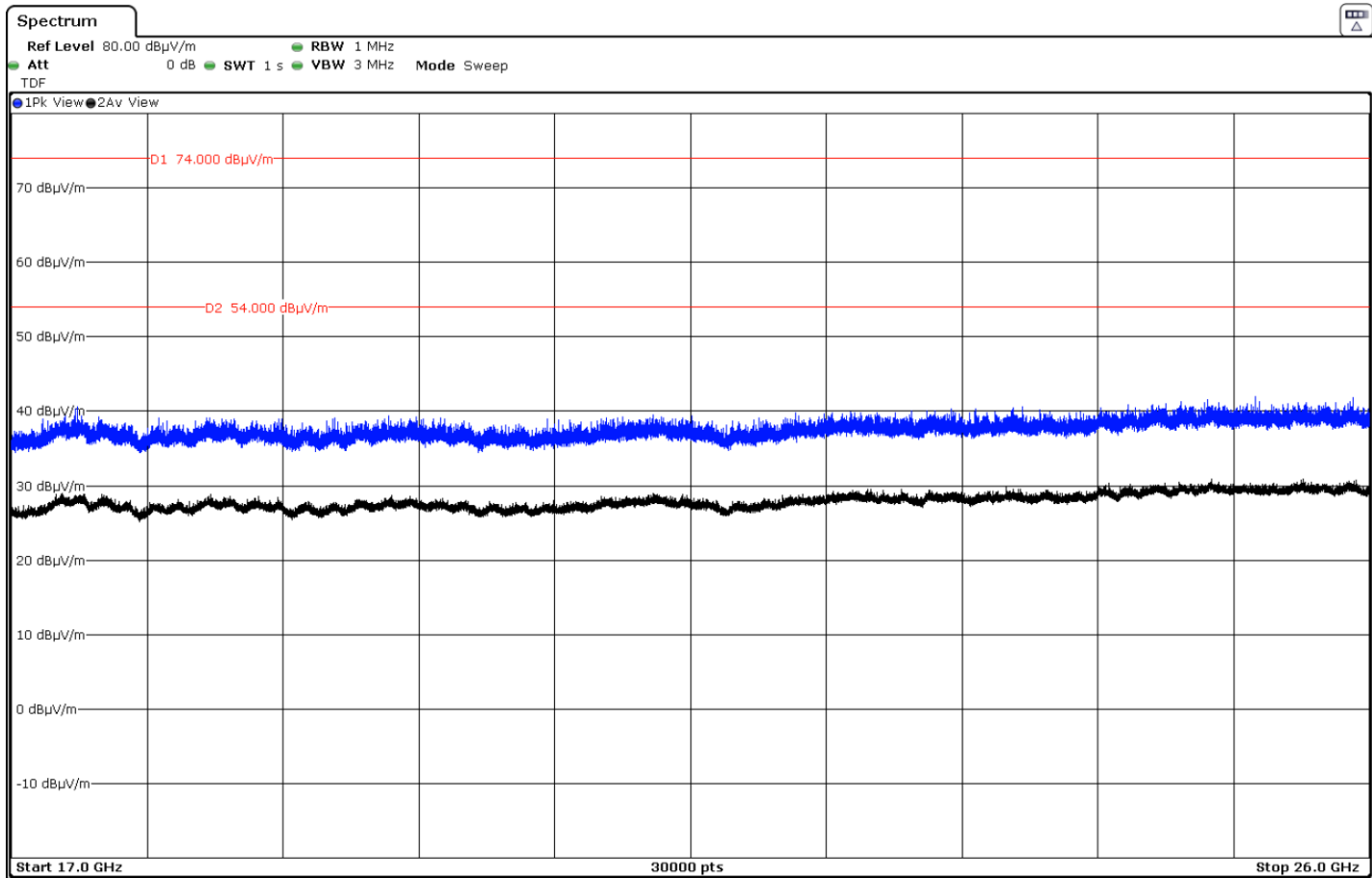


Note: The peaks shown in the plot above the limit are the carrier frequencies.

FREQUENCY RANGE 3 - 17 GHz



FREQUENCY RANGE 17 - 26 GHz



- **Mode NFC V and Bluetooth Low Energy.**

NFC ISO 15693: 106Kbps (13.56 MHz).
Bluetooth Low Energy: 1Mbps (2440 MHz).

Frequency range 9 KHz - 30 MHz

The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode selected in the EUT.

No spurious frequencies detected at less than 20 dB below the limit.

Frequency range 30 MHz - 1 GHz

The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode selected in the EUT.

Spurious frequencies at less than 20 dB below the limit:

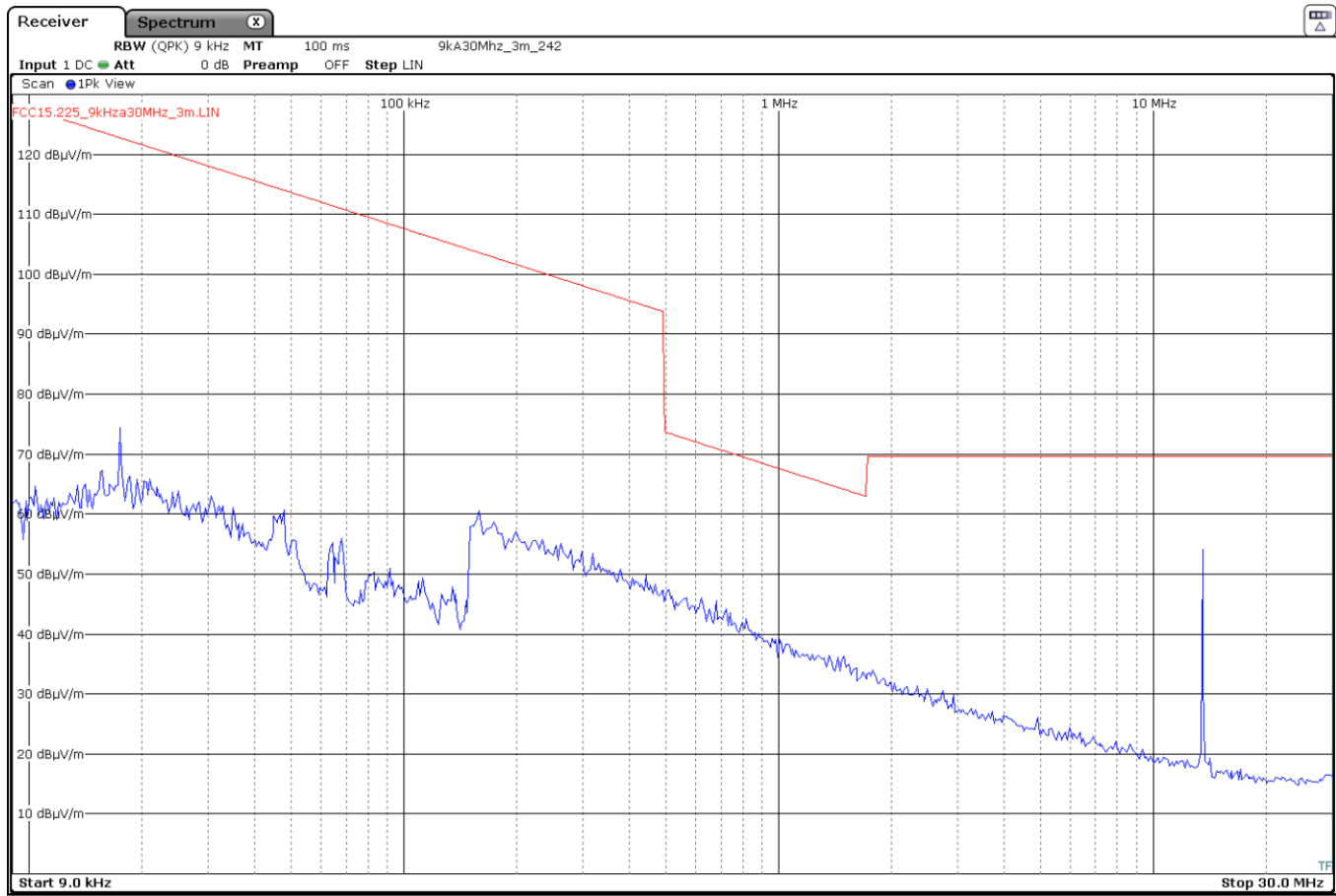
Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Limit (dBμV/m)	Measurement Uncertainty (dB)
50.580	V	Quasi-Peak	22.4	40	± 3.88
105.482	V	Quasi-Peak	28.2	43.5	± 3.88
275.006	H	Quasi-Peak	29.2	46	± 3.88
288.651	H	Quasi-Peak	41.7	46	± 3.88
350.019	H	Quasi-Peak	26.2	46	± 3.88
366.121	V	Quasi-Peak	35.3	46	± 3.88
375.013	V	Quasi-Peak	37.2	46	± 3.88
400.007	V	Quasi-Peak	33.8	46	± 3.88

Frequency range 1 - 26 GHz

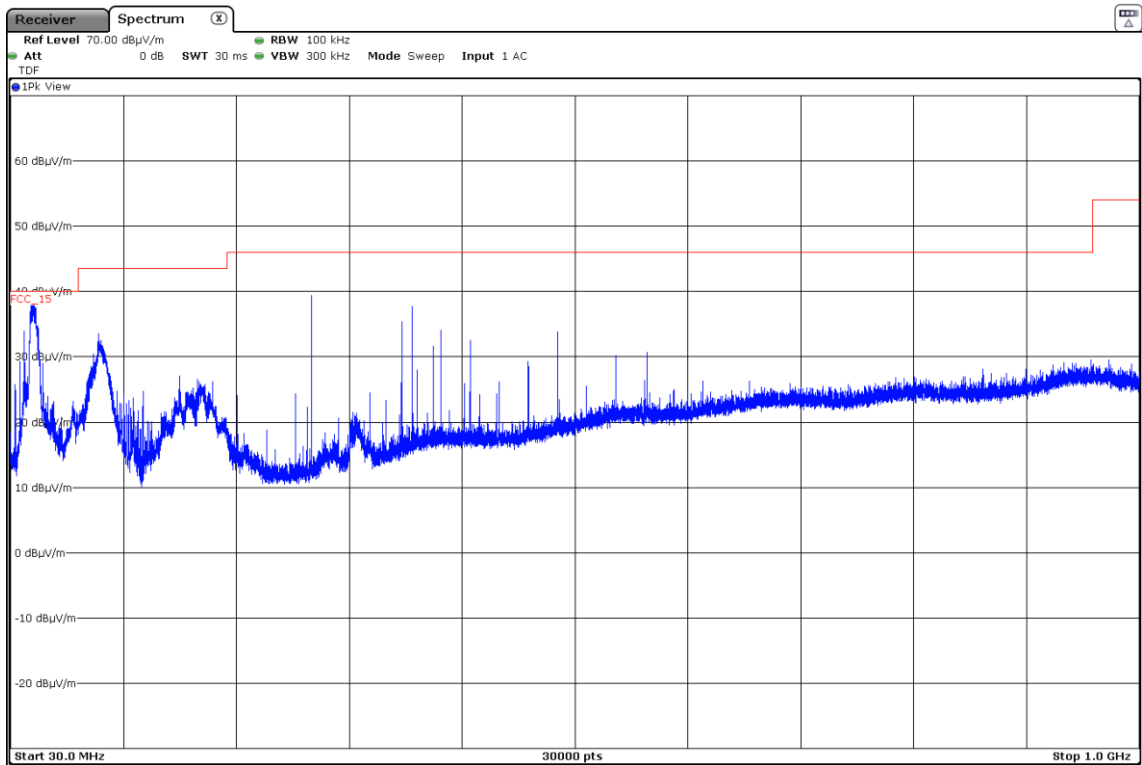
No spurious frequencies detected at less than 20 dB below the limit.

Verdict: PASS

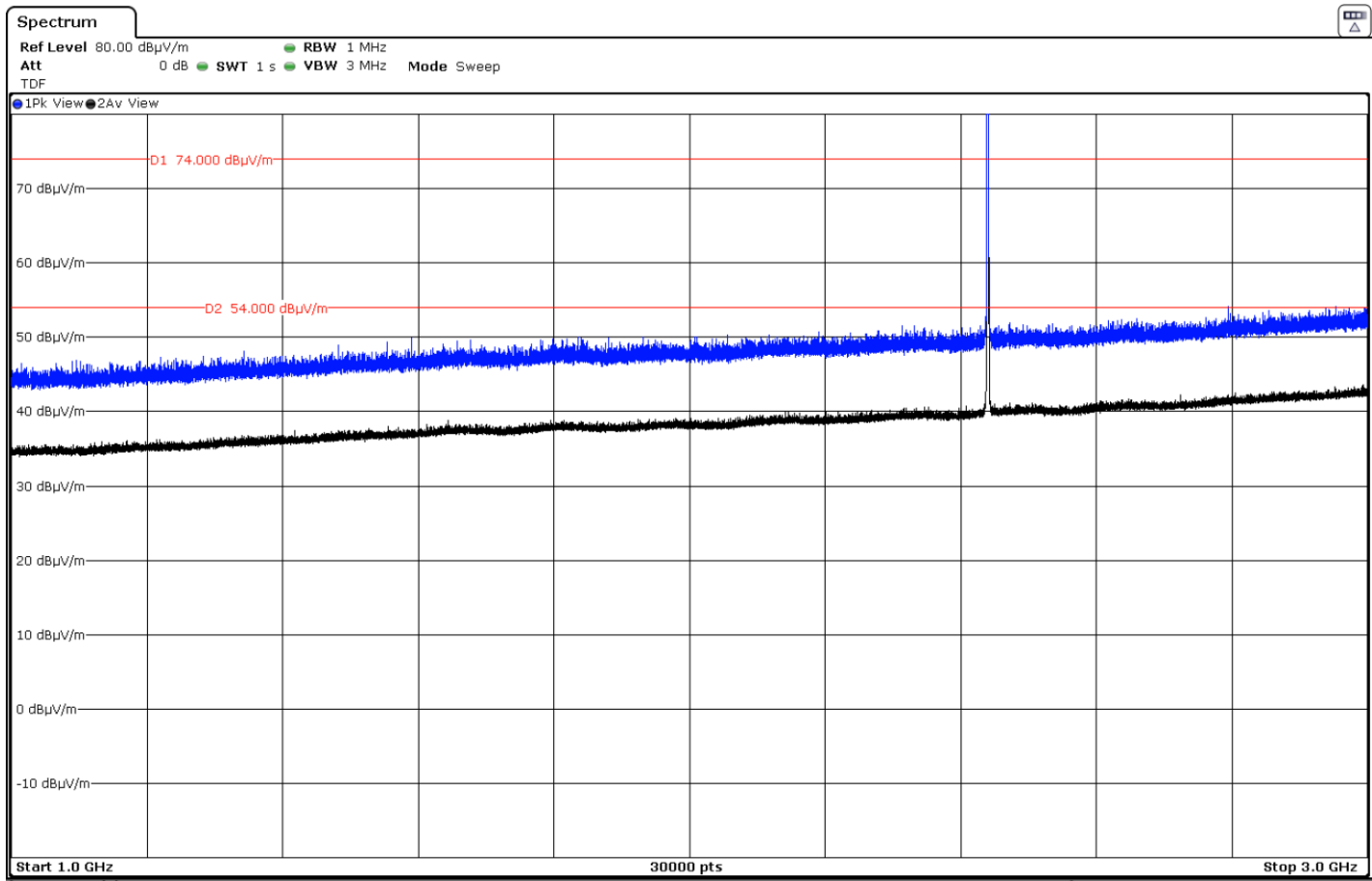
FREQUENCY RANGE 9 kHz - 30 MHz



FREQUENCY RANGE 30 MHz - 1 GHz

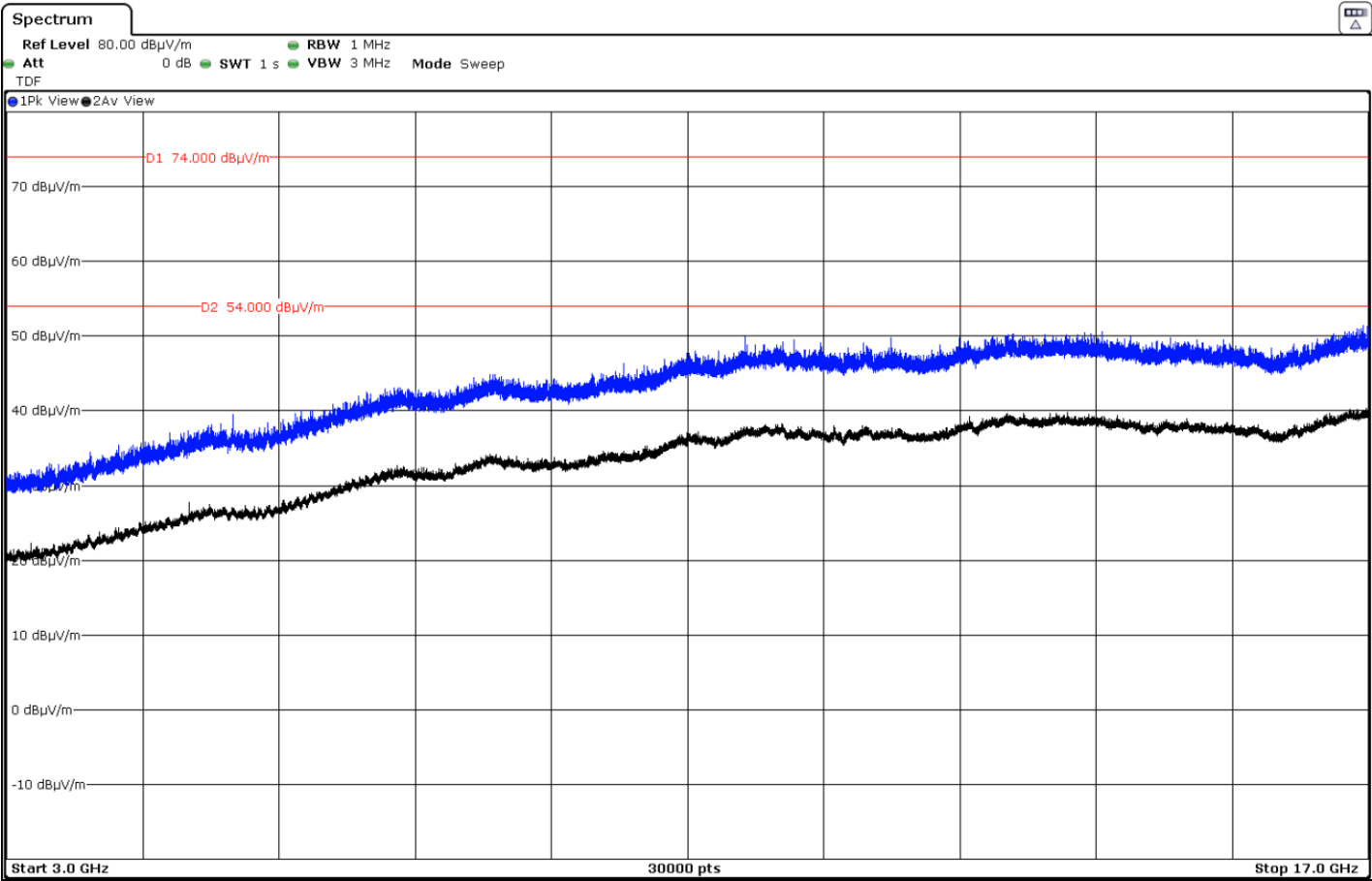


FREQUENCY RANGE 1 - 3 GHz



Note: The peaks shown in the plot above the limit are the carrier frequencies.

FREQUENCY RANGE 3 - 17 GHz



FREQUENCY RANGE 17 - 26 GHz

