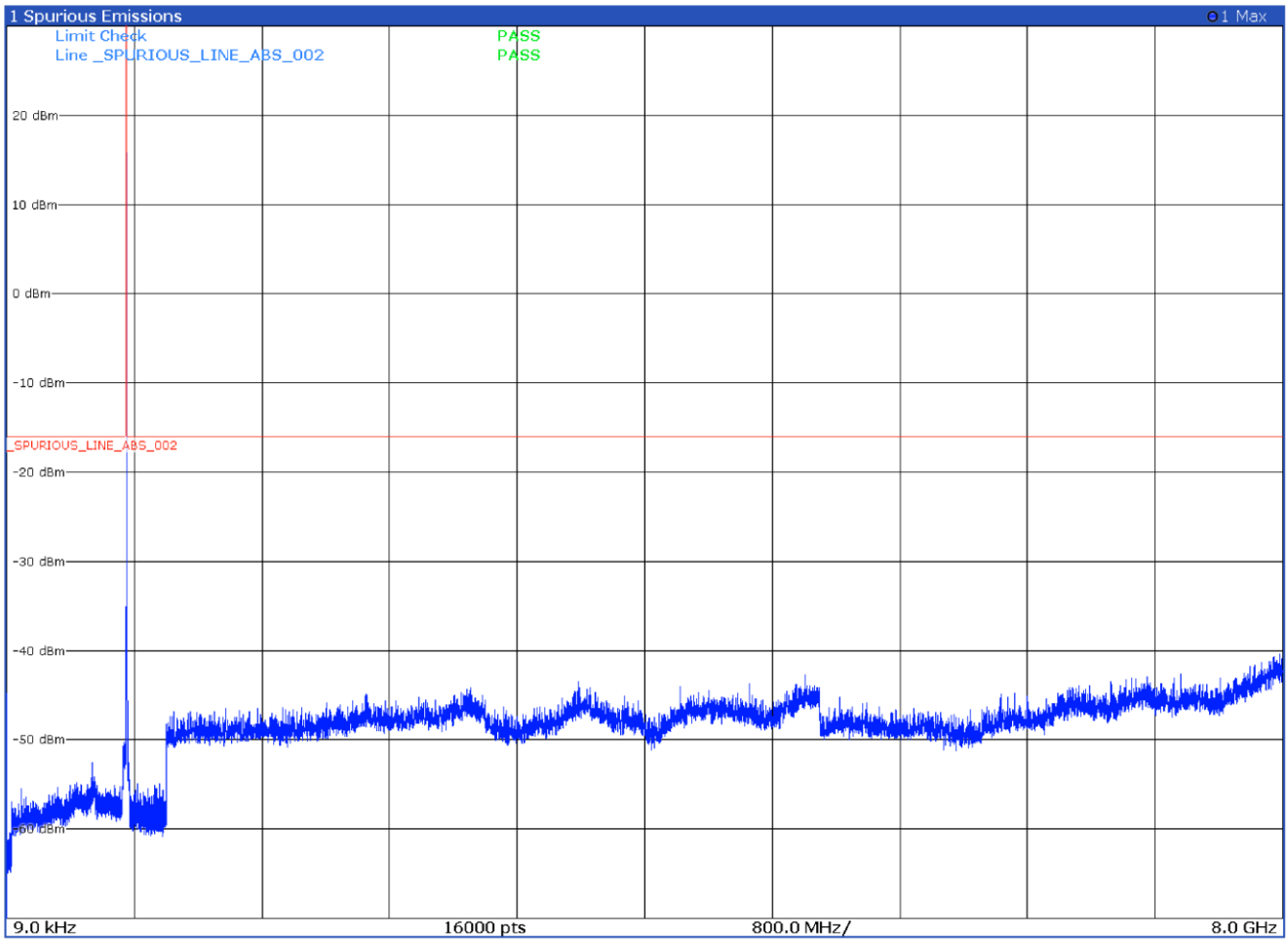
Test data, continued

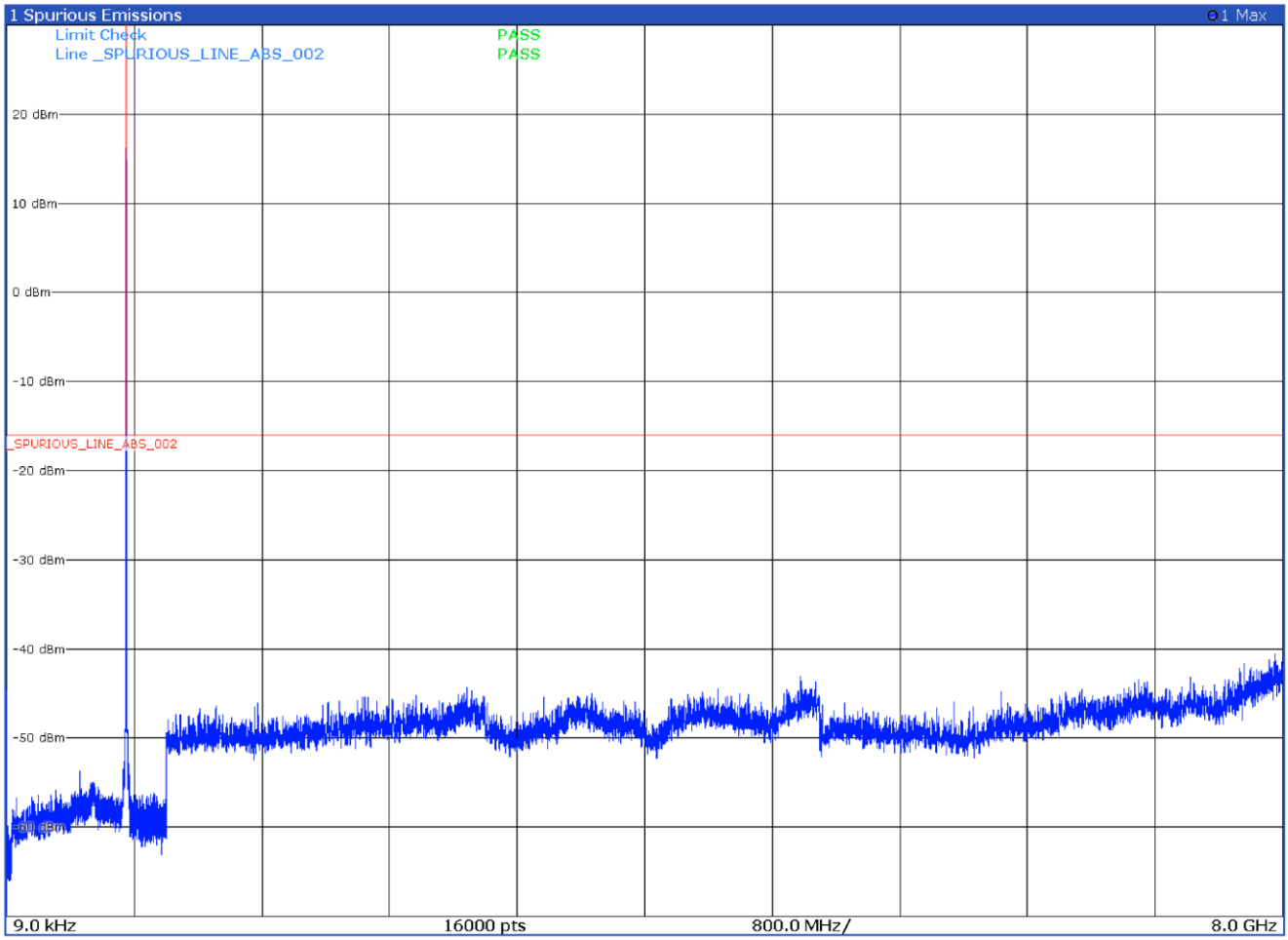


2 Result Summary

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 kHz	150.000 kHz	1.000 kHz	**10.762 50 kHz**	**-65.26 dBm**	**-49.26 dB**
150.000 kHz	30.000 MHz	10.000 kHz	**702.225 00 kHz**	**-44.83 dBm**	**-28.83 dB**
30.000 MHz	746.000 MHz	100.000 kHz	**745.821 00 MHz**	**-46.64 dBm**	**-30.64 dB**
746.000 MHz	756.000 MHz	100.000 kHz	**754.152 50 MHz**	**15.72 dBm**	**-34.28 dB**
756.000 MHz	1.000 GHz	100.000 kHz	**756.061 00 MHz**	**-39.70 dBm**	**-23.70 dB**
1.000 GHz	8.000 GHz	1.000 MHz	**7.980 31 GHz**	**-40.35 dBm**	**-24.35 dB**

Figure 8.6-3: *Conducted spurious emissions of high channel, antenna port 1*

Test data, continued

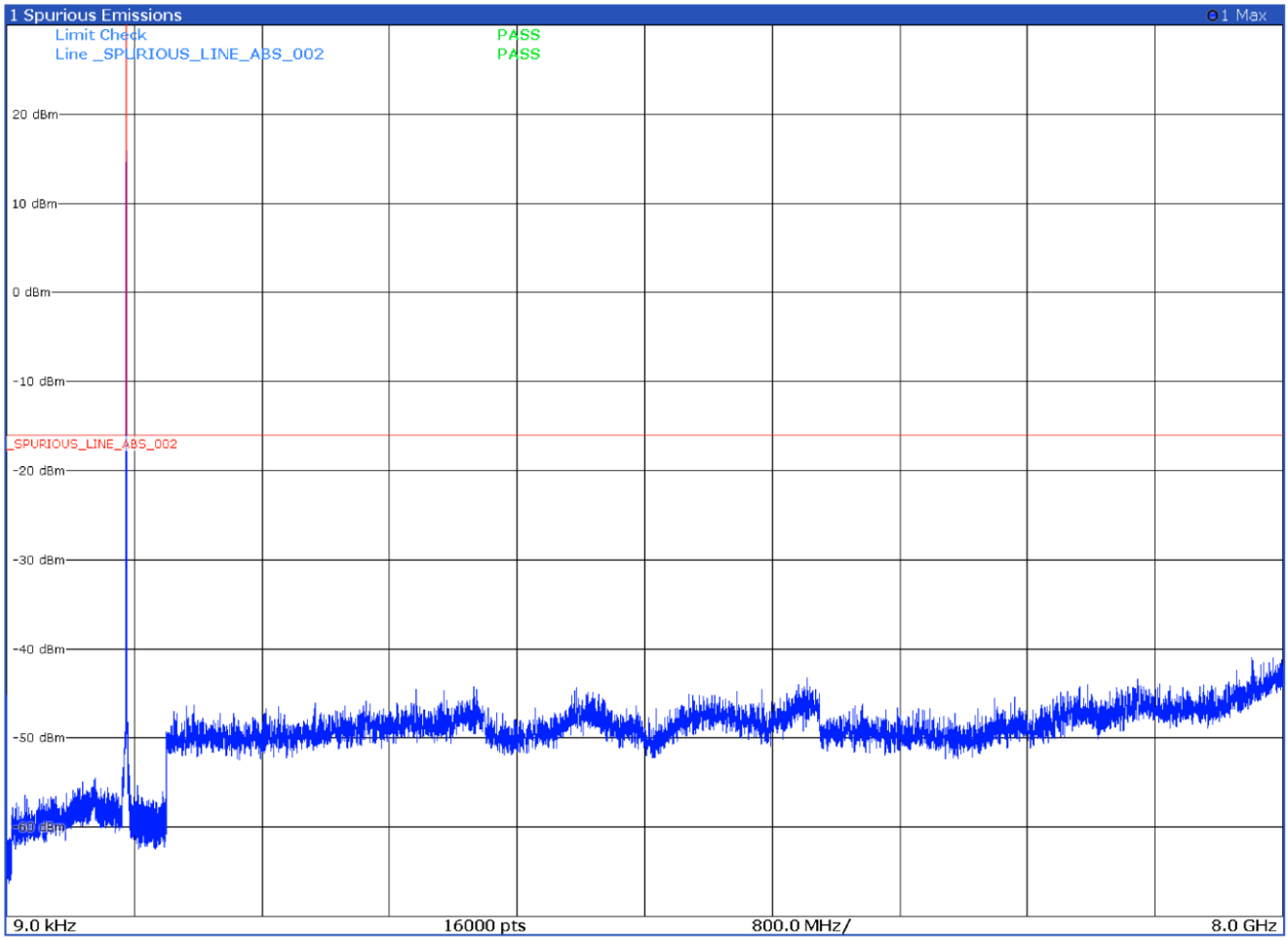


2 Result Summary

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 kHz	150.000 kHz	1.000 kHz	**15.274 50 kHz**	**-65.83 dBm**	**-49.83 dB**
150.000 kHz	30.000 MHz	10.000 kHz	**702.225 00 kHz**	**-44.68 dBm**	**-28.68 dB**
30.000 MHz	746.000 MHz	100.000 kHz	**745.821 00 MHz**	**-42.40 dBm**	**-26.40 dB**
746.000 MHz	756.000 MHz	100.000 kHz	**748.212 50 MHz**	**16.20 dBm**	**-33.80 dB**
756.000 MHz	1.000 GHz	100.000 kHz	**756.061 00 MHz**	**-46.51 dBm**	**-30.51 dB**
1.000 GHz	8.000 GHz	1.000 MHz	**7.949 69 GHz**	**-40.57 dBm**	**-24.57 dB**

Figure 8.6-4: *Conducted spurious emissions of low channel, antenna port 2*

Test data, continued

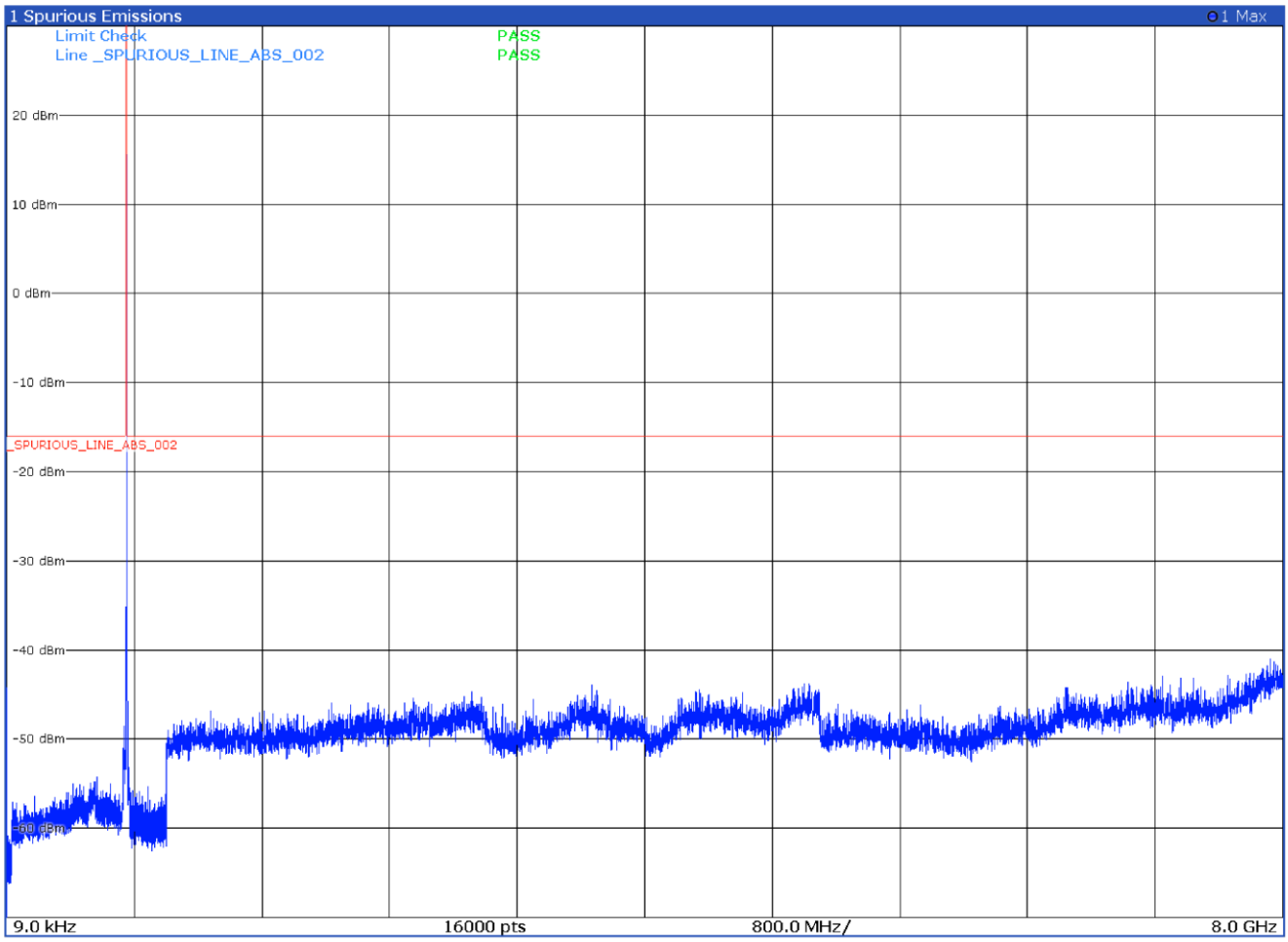


2 Result Summary

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 kHz	150.000 kHz	1.000 kHz	**13.441 50 kHz**	**-65.70 dBm**	**-49.70 dB**
150.000 kHz	30.000 MHz	10.000 kHz	**702.225 00 kHz**	**-45.21 dBm**	**-29.21 dB**
30.000 MHz	746.000 MHz	100.000 kHz	**745.821 00 MHz**	**-45.64 dBm**	**-29.64 dB**
746.000 MHz	756.000 MHz	100.000 kHz	**751.667 50 MHz**	**15.90 dBm**	**-34.10 dB**
756.000 MHz	1.000 GHz	100.000 kHz	**756.061 00 MHz**	**-47.72 dBm**	**-31.72 dB**
1.000 GHz	8.000 GHz	1.000 MHz	**7.941 81 GHz**	**-40.96 dBm**	**-24.96 dB**

Figure 8.6-5: *Conducted spurious emissions of mid channel, antenna port 2*

Test data, continued



2 Result Summary

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 kHz	150.000 kHz	1.000 kHz	**126.241 50 kHz**	**-65.84 dBm**	**-49.84 dB**
150.000 kHz	30.000 MHz	10.000 kHz	**702.225 00 kHz**	**-44.27 dBm**	**-28.27 dB**
30.000 MHz	746.000 MHz	100.000 kHz	**745.821 00 MHz**	**-48.08 dBm**	**-32.08 dB**
746.000 MHz	756.000 MHz	100.000 kHz	**753.227 50 MHz**	**15.53 dBm**	**-34.47 dB**
756.000 MHz	1.000 GHz	100.000 kHz	**756.061 00 MHz**	**-41.63 dBm**	**-25.63 dB**
1.000 GHz	8.000 GHz	1.000 MHz	**7.922 56 GHz**	**-41.02 dBm**	**-25.02 dB**

Figure 8.6-6: *Conducted spurious emissions of high channel, antenna port 2*

Test data, continued

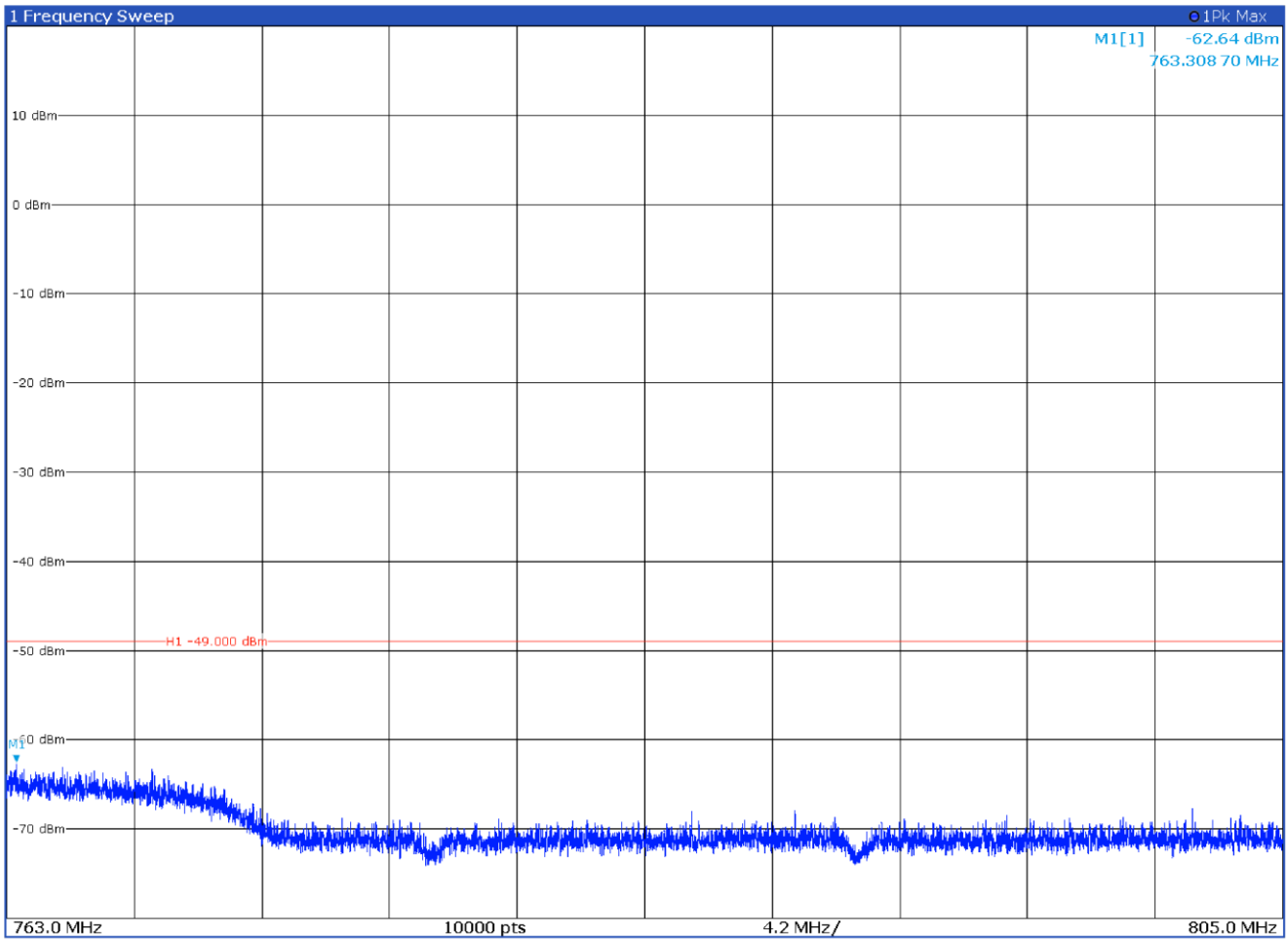


Figure 8.6-7: *Conducted spurious emissions of low channel, antenna port 1*

Test data, continued

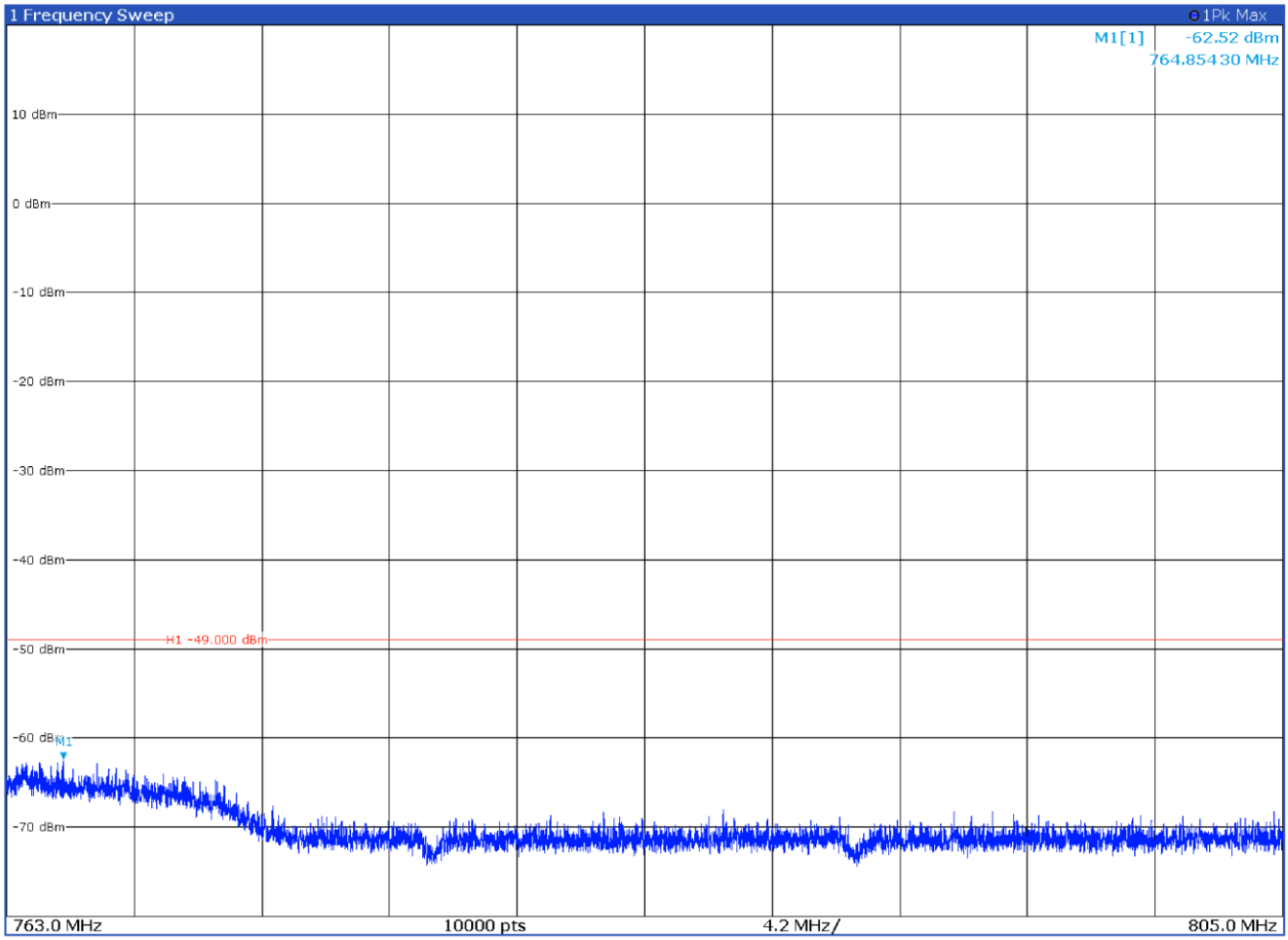


Figure 8.6-8: *Conducted spurious emissions of mid channel, antenna port 1*

Test data, continued

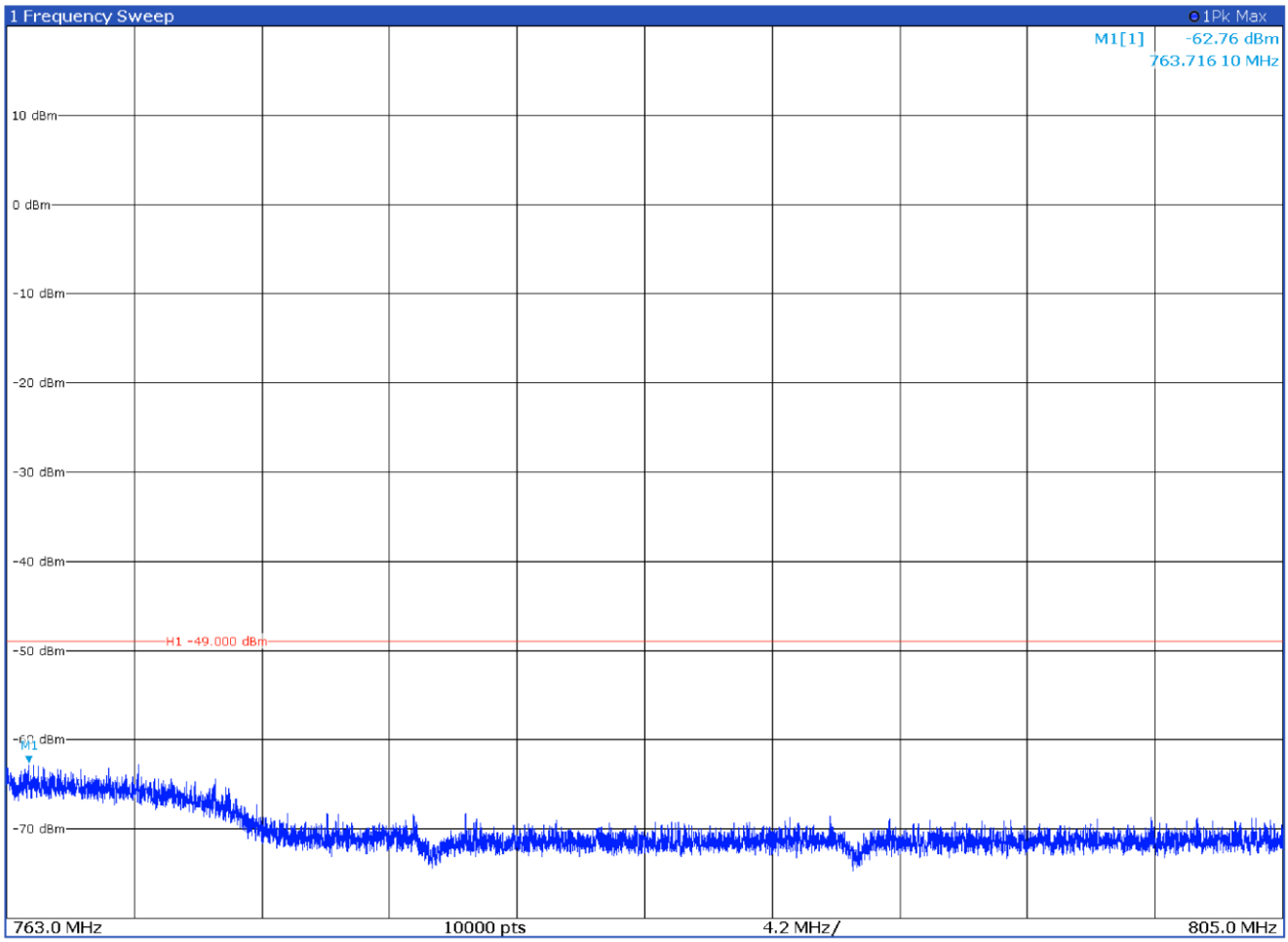


Figure 8.6-9: *Conducted spurious emissions of high channel, antenna port 1*

Test data, continued

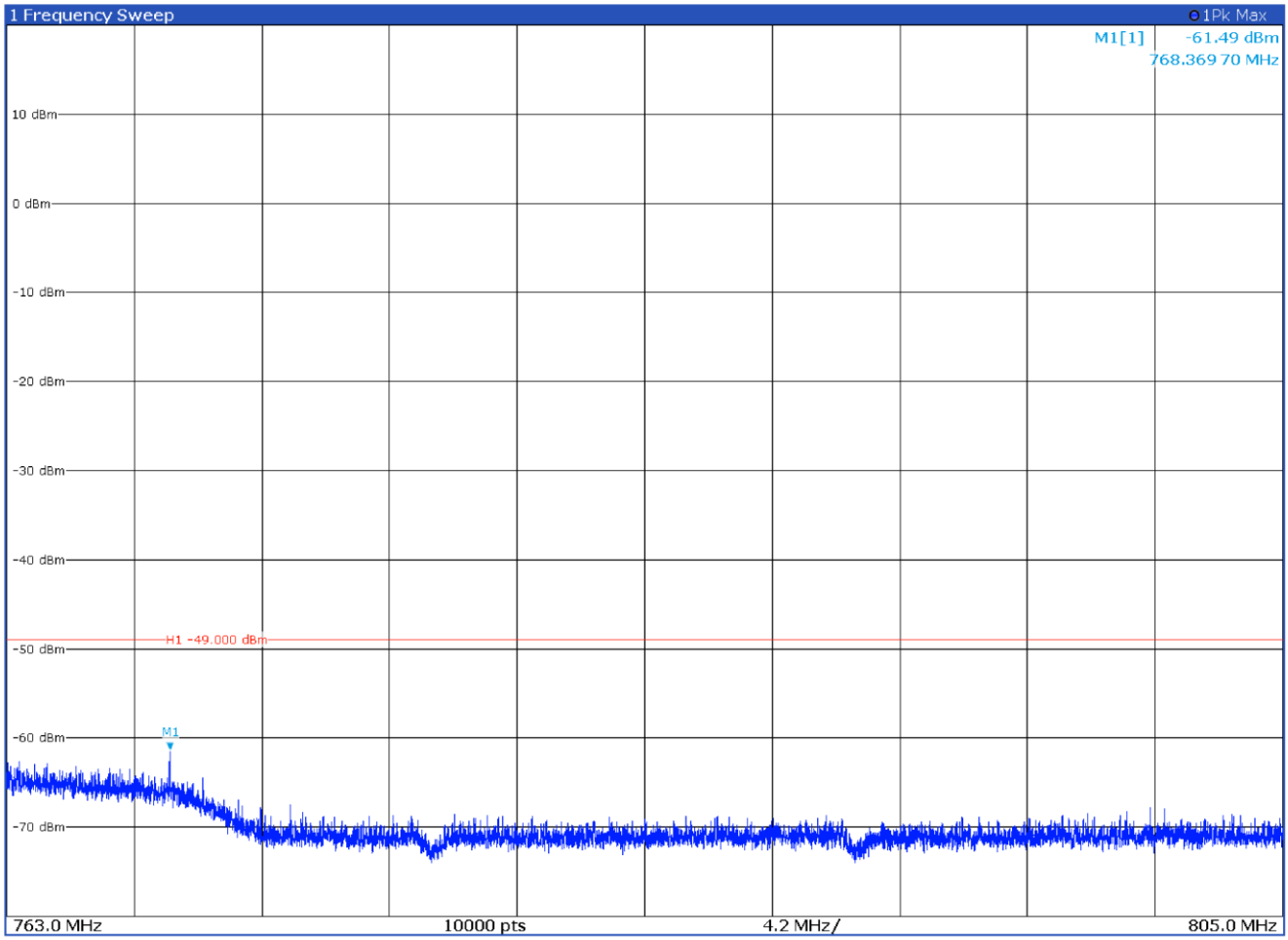


Figure 8.6-10: *Conducted spurious emissions of low channel, antenna port 2*

Test data, continued

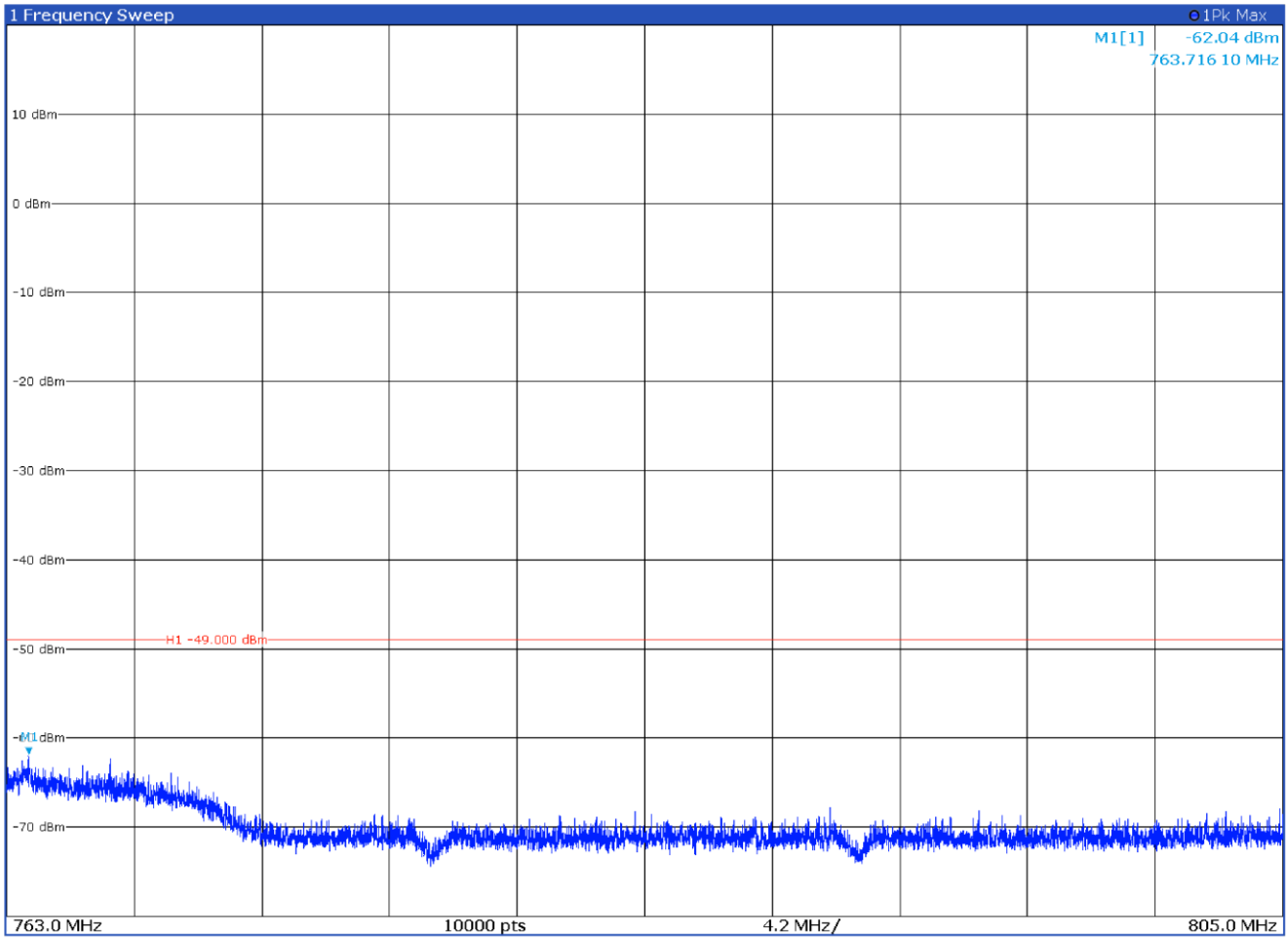


Figure 8.6-11: *Conducted spurious emissions of mid channel, antenna port 2*

Test data, continued

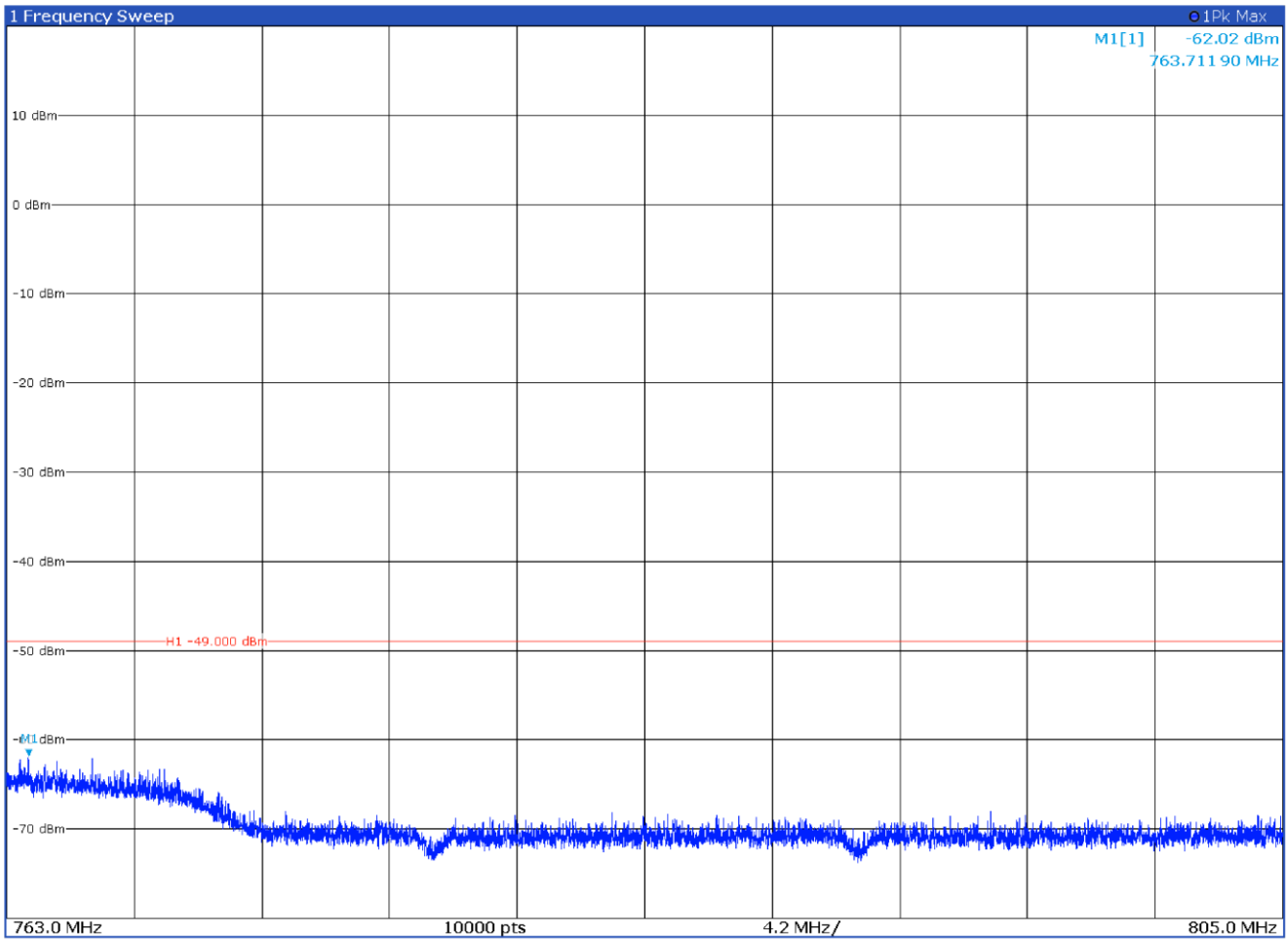


Figure 8.6-12: *Conducted spurious emissions of high channel, antenna port 2*

Test data, continued

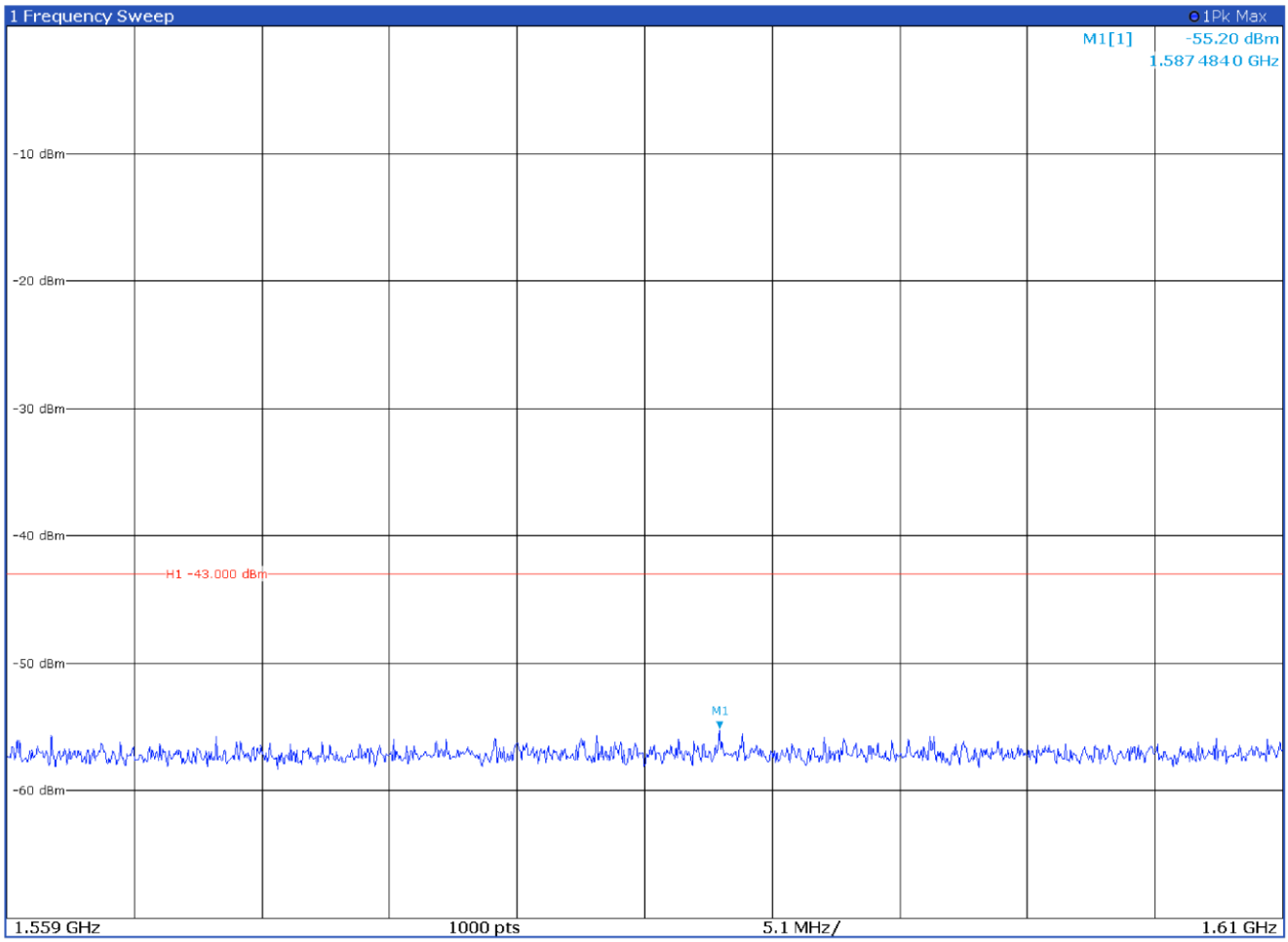


Figure 8.6-13: *Conducted spurious emissions of low channel, antenna port 1 – broad band*

Test data, continued

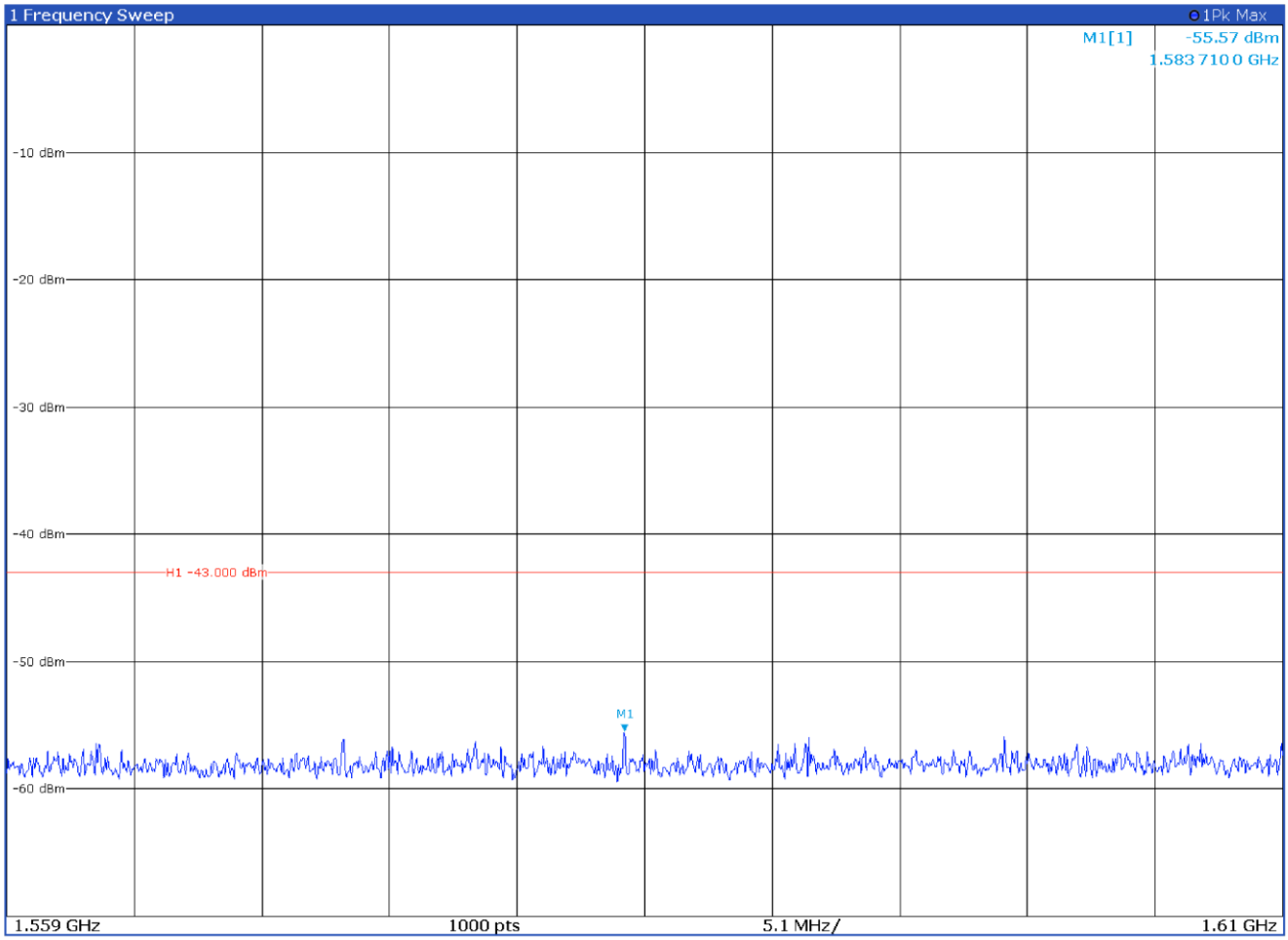


Figure 8.6-14: *Conducted spurious emissions of mid channel, antenna port 1 – broad band*

Test data, continued

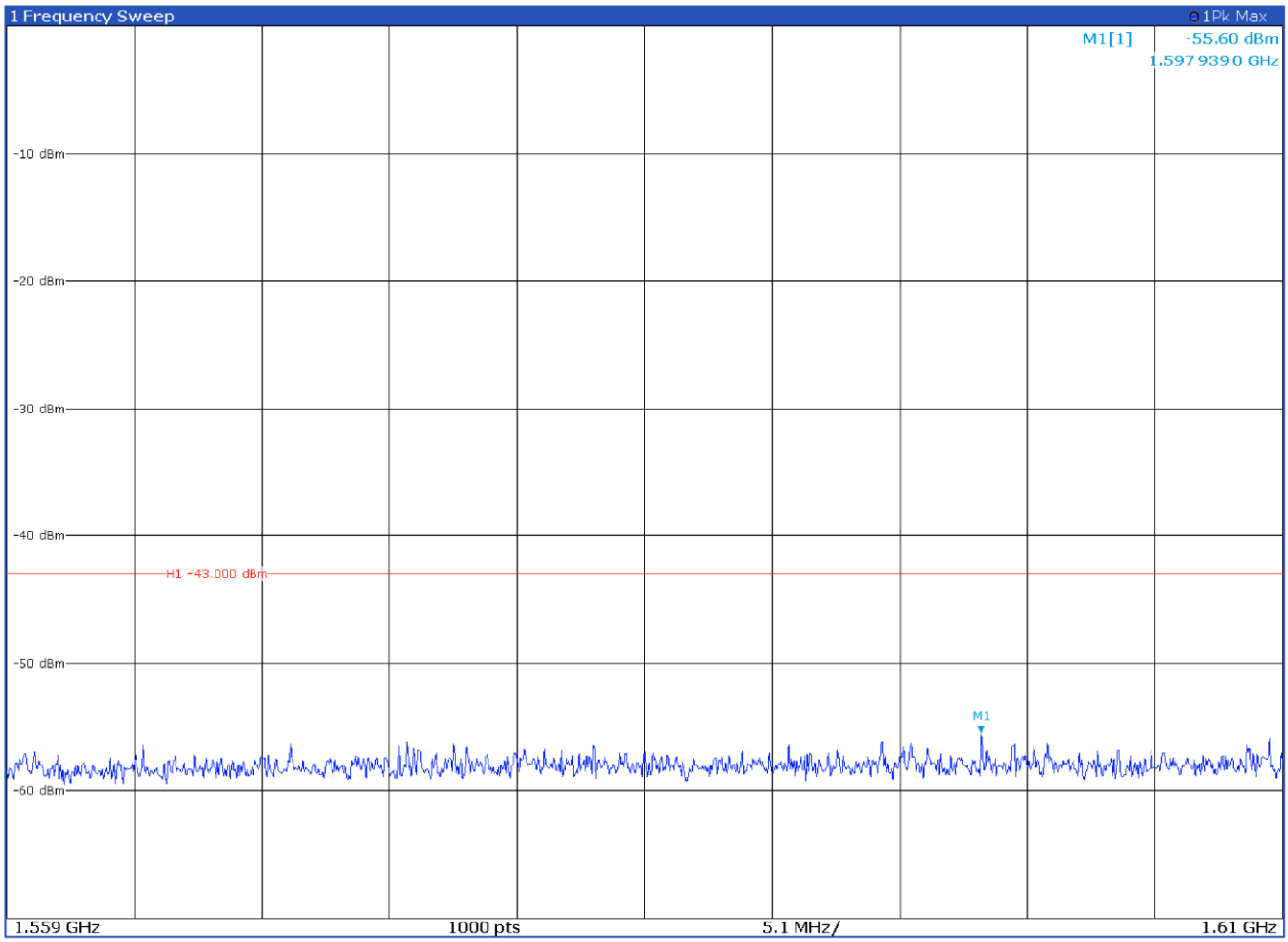


Figure 8.6-15: *Conducted spurious emissions of high channel, antenna port 1 – broad band*

Test data, continued

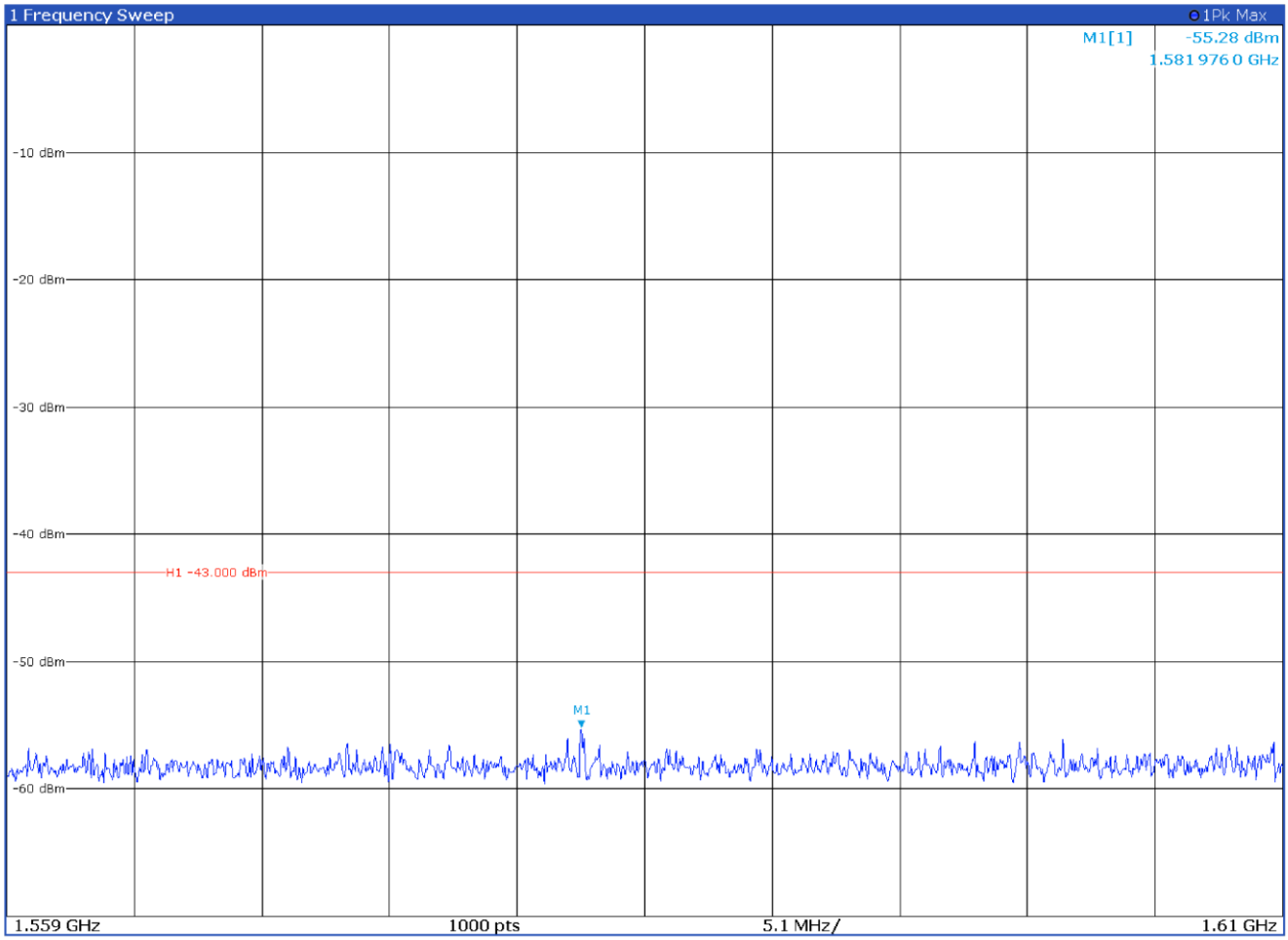


Figure 8.6-16: *Conducted spurious emissions of low channel, antenna port 2 – broad band*

Test data, continued

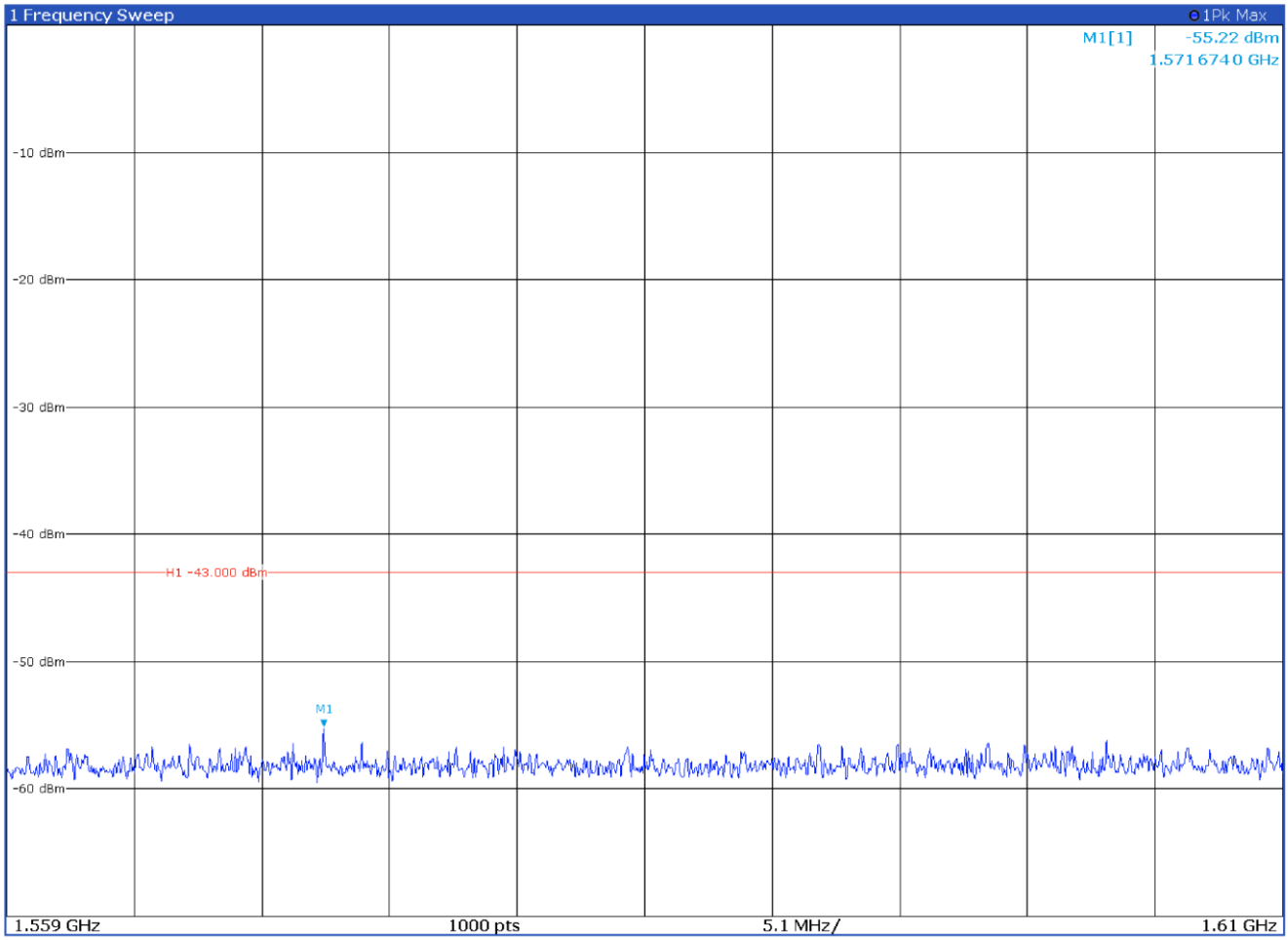


Figure 8.6-17: *Conducted spurious emissions of mid channel, antenna port 2 – broad band*

Test data, continued

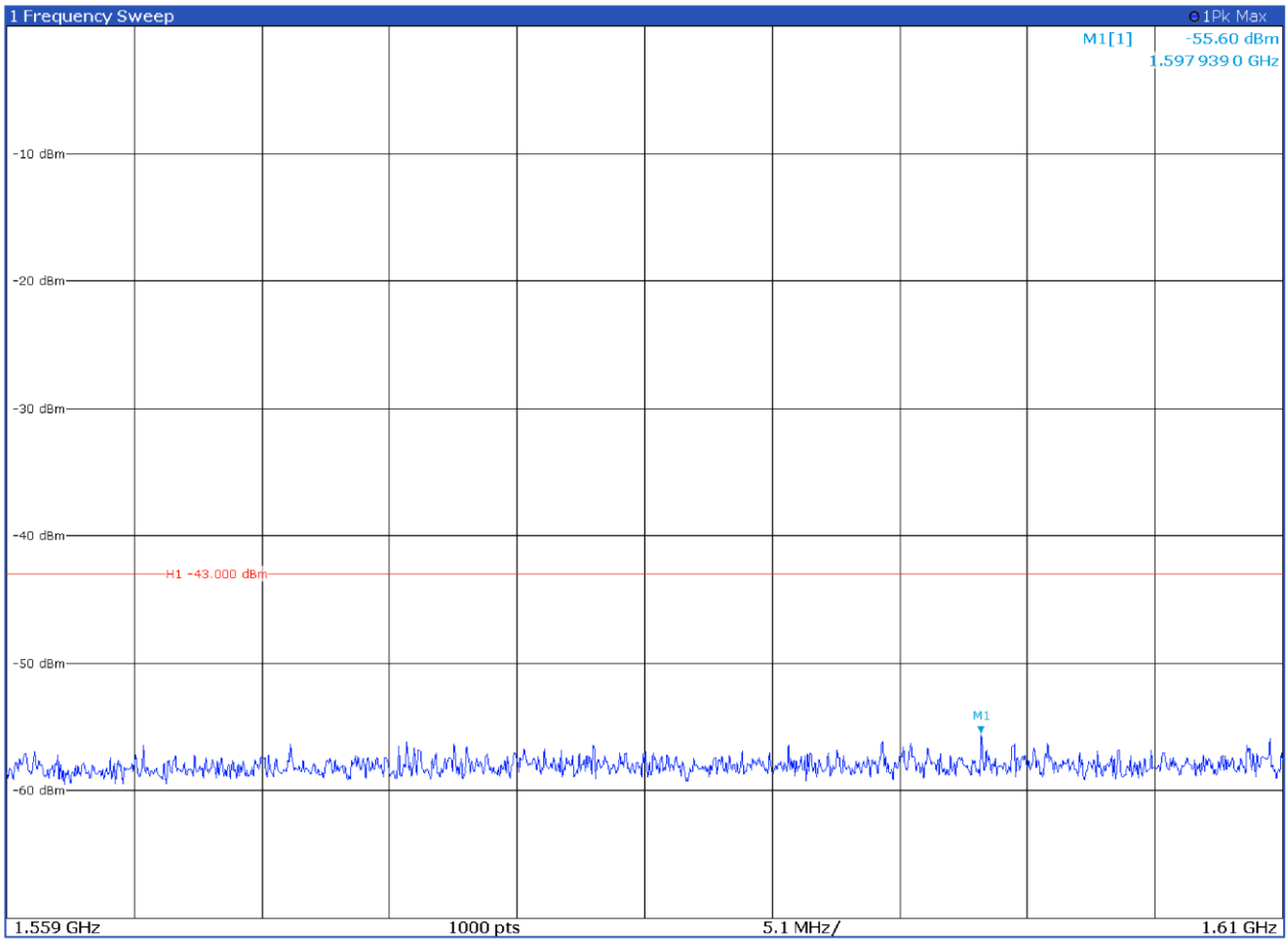


Figure 8.6-18: *Conducted spurious emissions of high channel, antenna port 2 – broad band*

Test data, continued

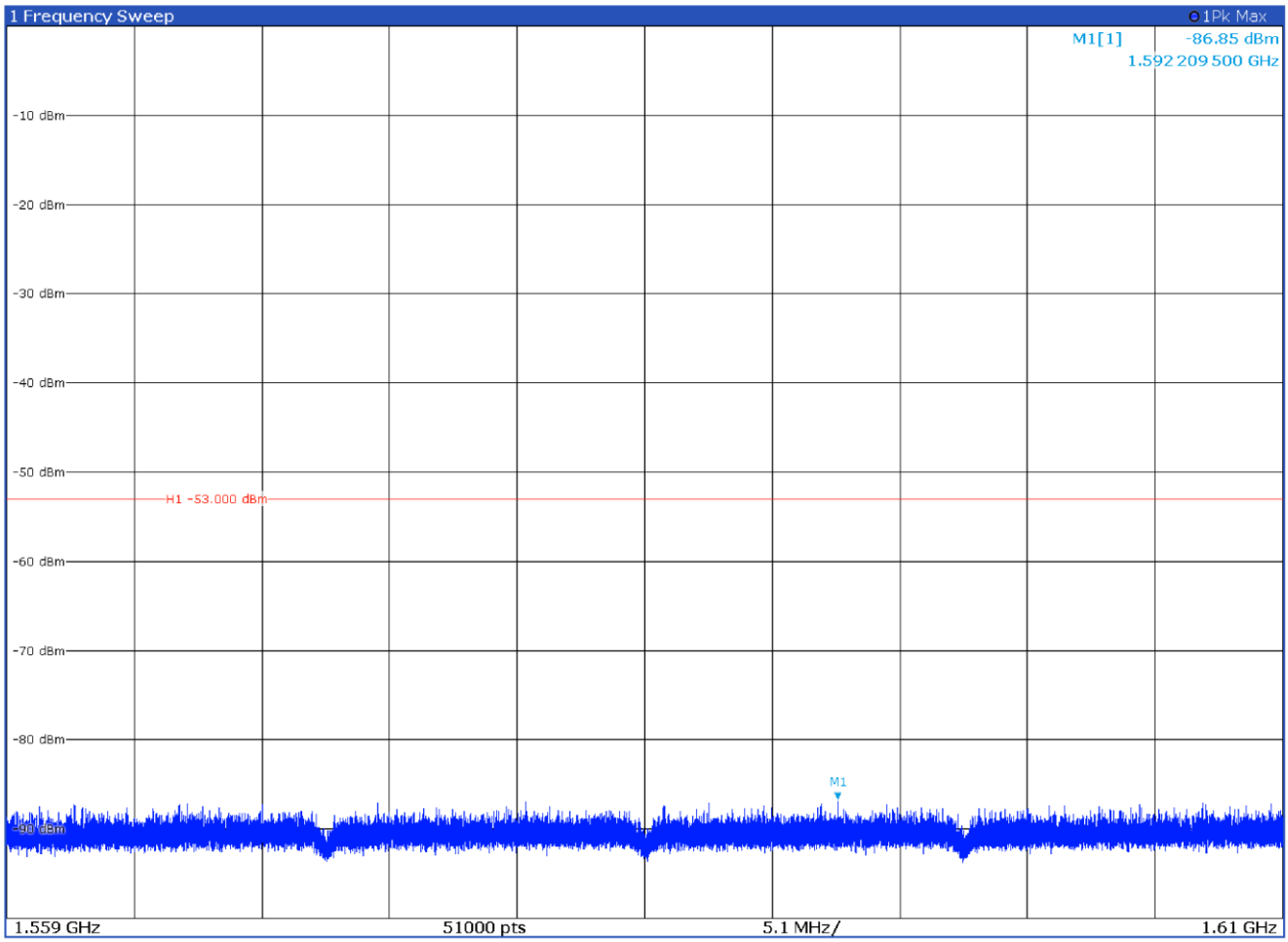


Figure 8.6-19: *Conducted spurious emissions of low channel, antenna port 1 – narrow band*

Test data, continued

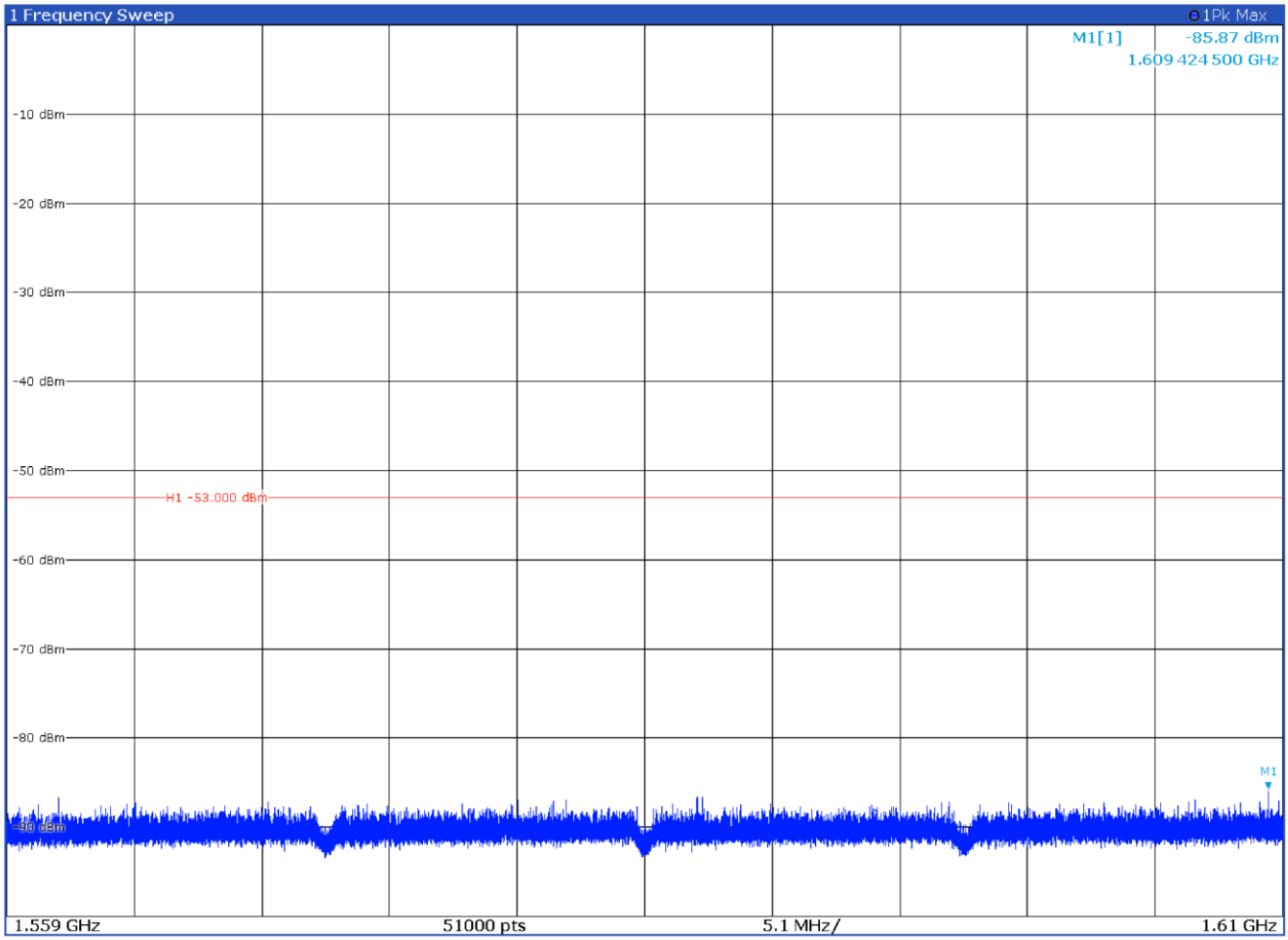


Figure 8.6-20: *Conducted spurious emissions of mid channel, antenna port 1 – narrow band*

Test data, continued

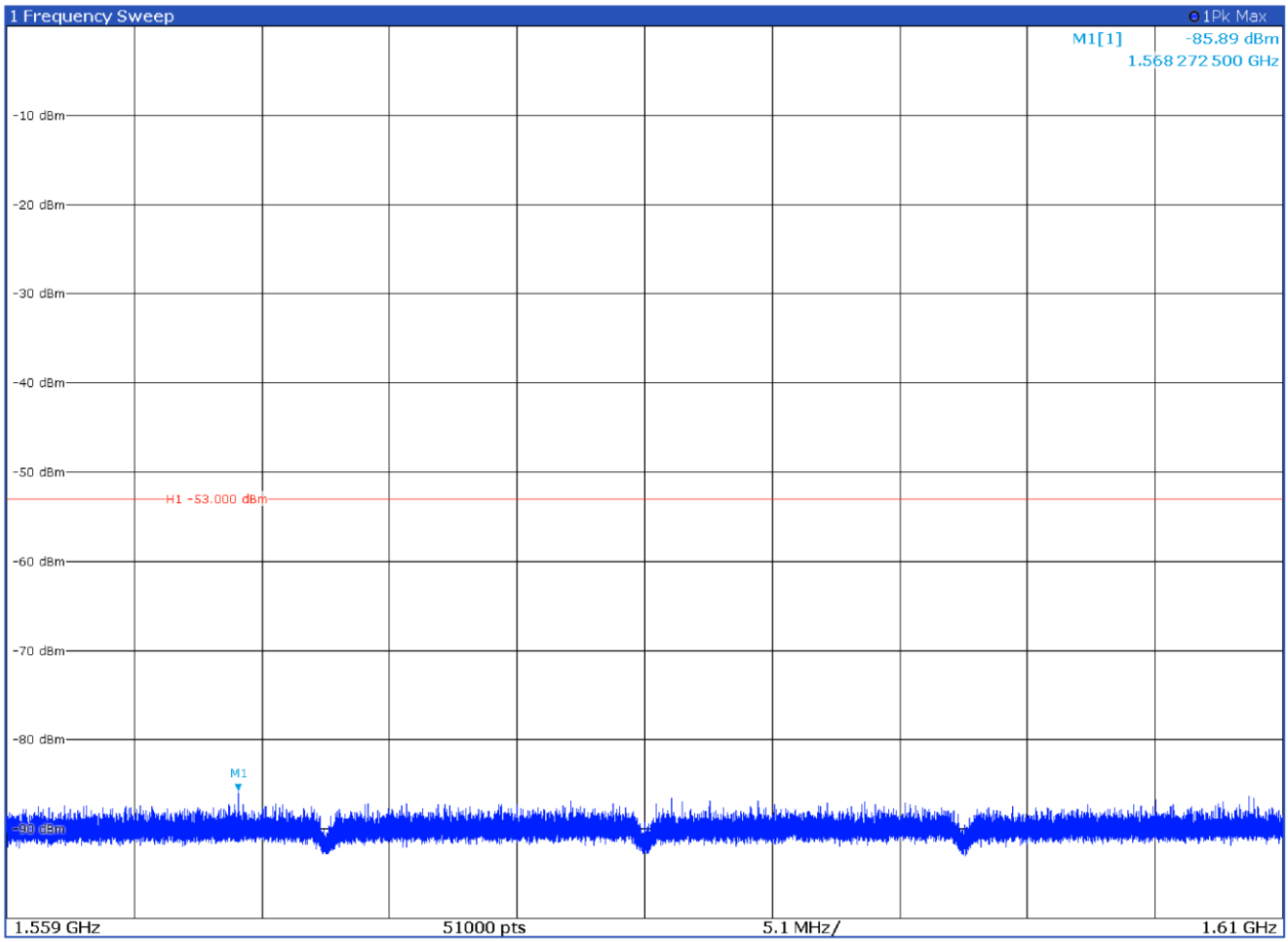


Figure 8.6-21: *Conducted spurious emissions of high channel, antenna port 1 – narrow band*

Test data, continued

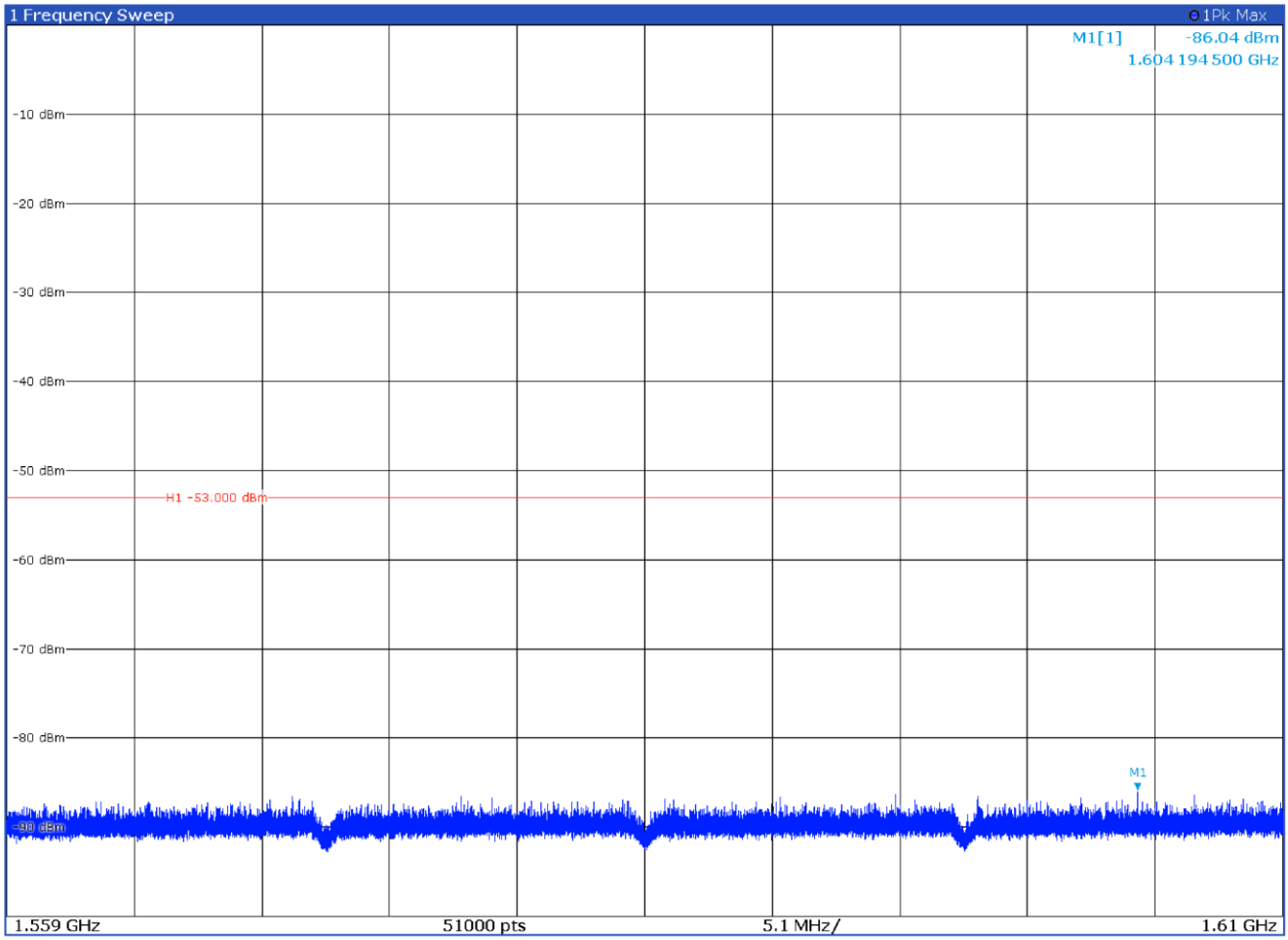


Figure 8.6-22: *Conducted spurious emissions of low channel, antenna port 2 – narrow band*

Test data, continued

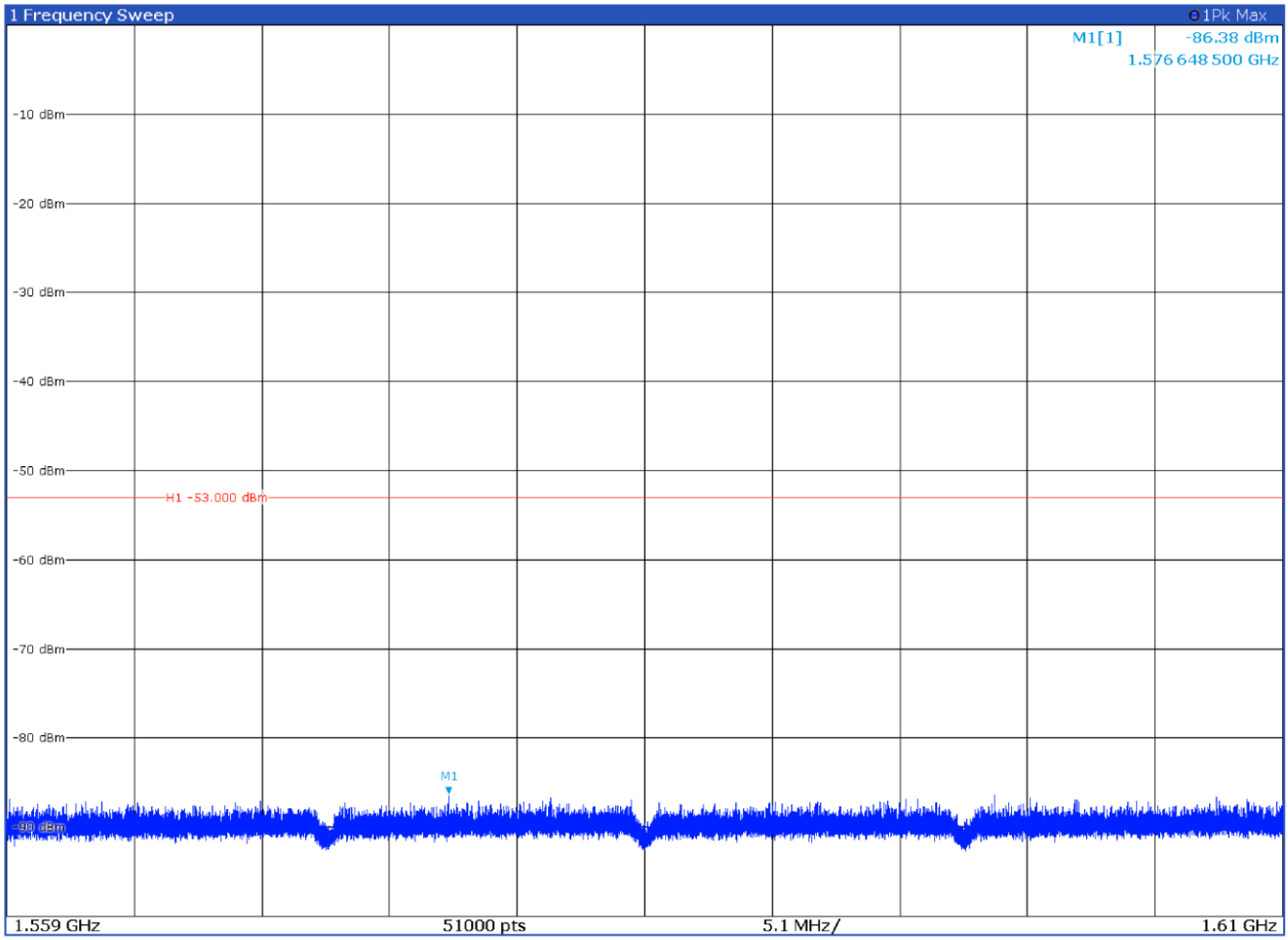


Figure 8.6-23: *Conducted spurious emissions of mid channel, antenna port 2 – narrow band*

Test data, continued

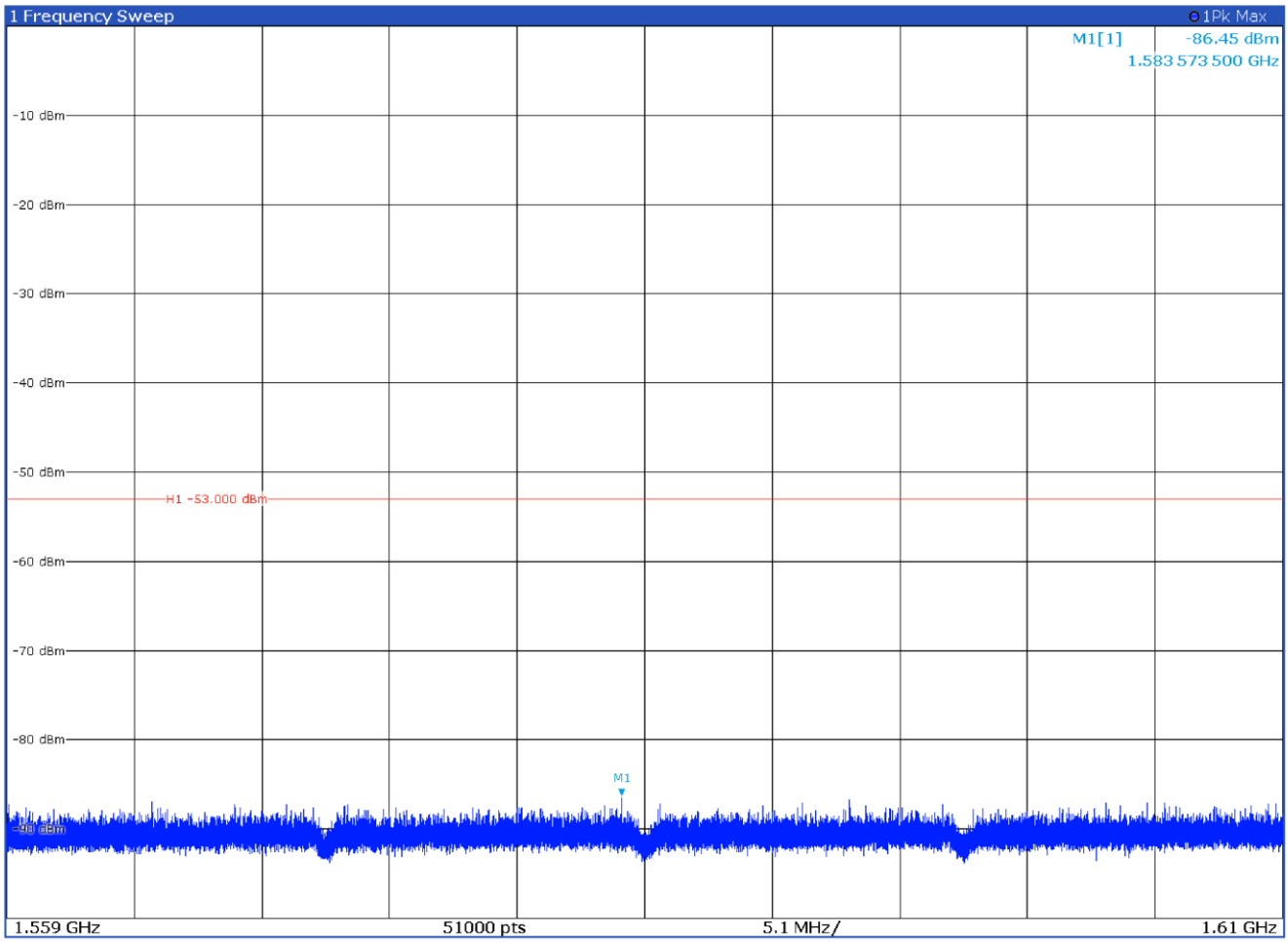


Figure 8.6-24: *Conducted spurious emissions of high channel, antenna port 2 – narrow band*

8.7 Spurious emissions radiated measurements

8.7.1 References, definitions and limits

FCC §27.53(c)

For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

FCC §27.53(f)

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

RSS-131, Clause 5.2

Industrial Zone Enhancers, including DASs, shall employ a gain control feature and shall comply with all the requirements in the RSS which applies to the equipment with which the zone enhancer is to be used. In addition, the equipment shall comply with the requirements specified in this section.

RSS-130, Clause 4.7.1

General unwanted emissions limits

The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment’s frequency block range, a resolution bandwidth of 30 kHz may be employed.

RSS-130, Clause 4.7.2

Additional unwanted emissions limits

In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:

(a) the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:
76 + 10 log10 p (watts), dB, for base and fixed equipment and
65 + 10 log10 p (watts), dB, for mobile and portable equipment

(b) the e.i.r.p. in the band 1559-1610 MHz shall not exceed −70 dBW/MHz for wideband signal and −80 dBW for discrete emission with bandwidth less than 700 Hz.

8.7.2 Test summary

Verdict	Pass		
Tested by	P. Barbieri	Test date	February 8, 2022

8.7.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10th harmonic.
All measurements were performed using peak detector according to note 4 of 935210 D05 Indus Booster Basic Meas v01r04 paragraph 3.6.3.
Testing was performed with RF ports terminated with 50 Ohm load.
In the graphics below, no radiated spurious emission found and the limit is exceeded only by the carrier.

Spectrum analyser settings:

Resolution bandwidth:	100 kHz and 1 MHz
Video bandwidth:	VBW ≥ 3 × RBW
Detector mode:	Peak
Trace mode:	Max Hold

Input signal frequency

Low channel	748.5 MHz
Middle channel	751.0 MHz
High channel	753.5 MHz

8.7.4 Test equipment used

Equipment	Manufacturer	Model no.	Asset no.
Spectrum Analyzer	Rohde & Schwarz	FSW43	101767
EMI Receiver	Rohde & Schwarz	ESW44	101620
RF Vector Signal Generator	Rohde & Schwarz	SMBV100A	263254
RF Vector Signal Generator	Rohde & Schwarz	SMBV100A	263397
Antenna Trilog 25MHz - 8GHz	Schwarzbeck Mess-Elektronik	VULB9162	9162-025
Antenna 1 - 18 GHz	Schwarzbeck Mess-Elektronik	STLP9148	STLP 9148-152
Double Ridge Horn Antenna	RFSpin	DRH40	061106A40
Broadband Amplifier	Schwarzbeck Mess-Elektronik	BBV9718C	00121
Broadband Bench Top Amplifier	Sage	STB-1834034030-KFKF-L1	18490-01
Controller	Maturo	FCU3.0	10041
Tilt antenna mast	Maturo	TAM4.0-E	10042
Turntable	Maturo	TT4.0-5T	2.527
Semi-anechoic chamber	Nemko S.p.a.	10m semi-anechoic chamber	530

Notes: NCR - no calibration required, VOU - verify on use

8.7.5 Test data

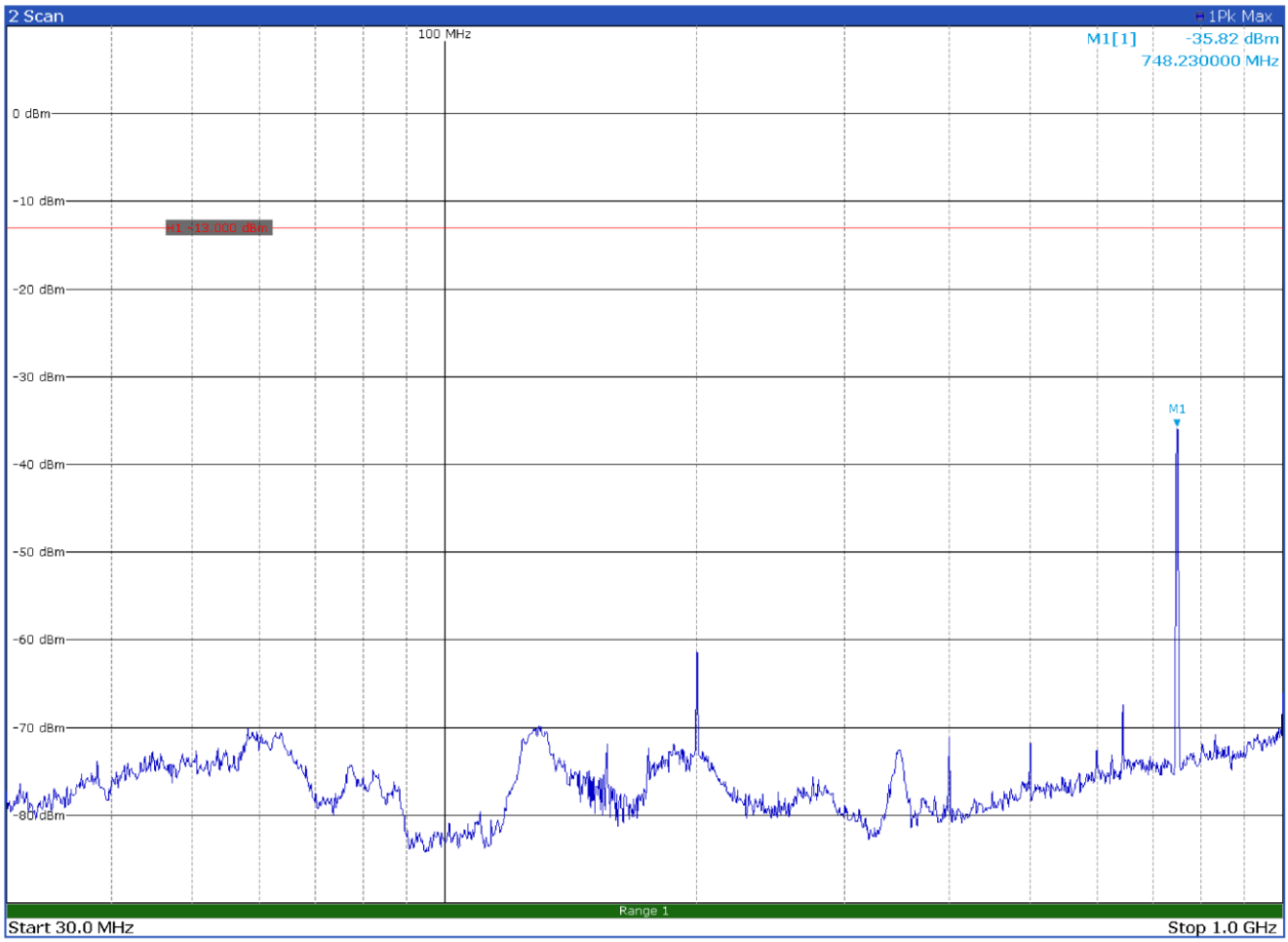


Figure 8.7-1: *Radiated spurious emissions below 1 GHz, low channel with antenna in horizontal polarization*

Test data, continued

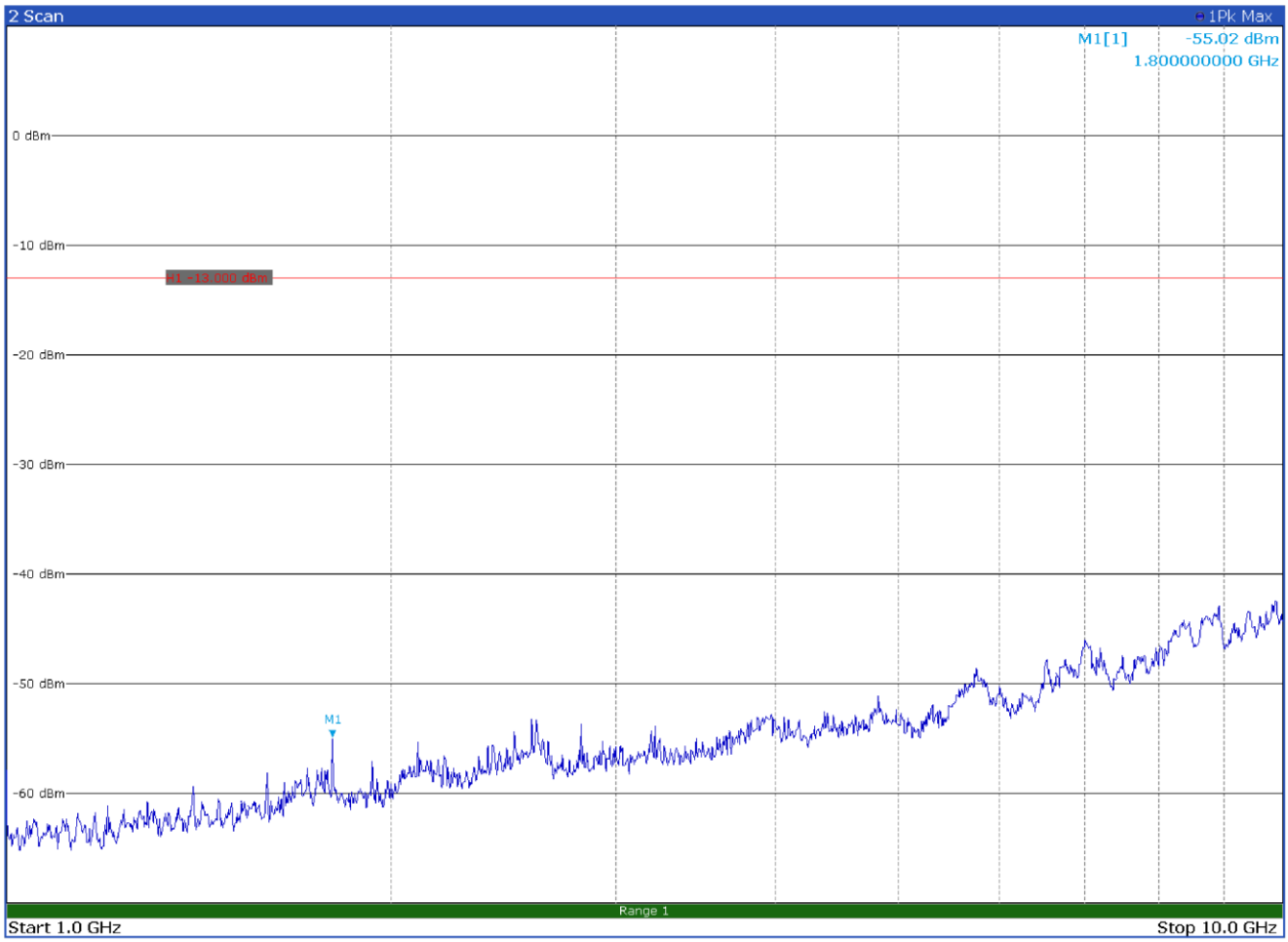


Figure 8.7-2: *Radiated spurious emissions from 1 GHz to 10 GHz, low channel with antenna in horizontal polarization*

Test data, continued

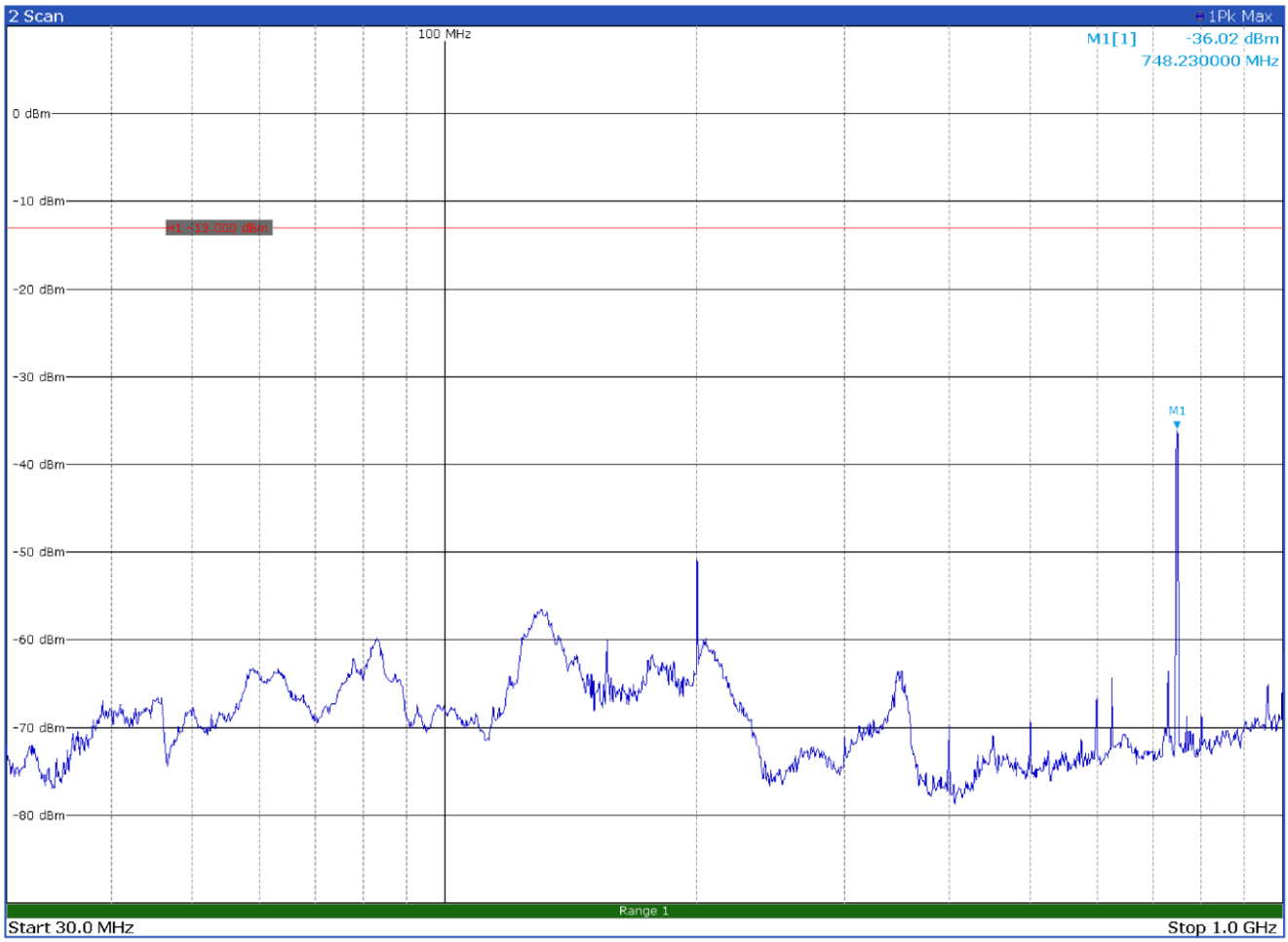


Figure 8.7-3: *Radiated spurious emissions below 1 GHz, low channel with antenna in vertical polarization*

Test data, continued

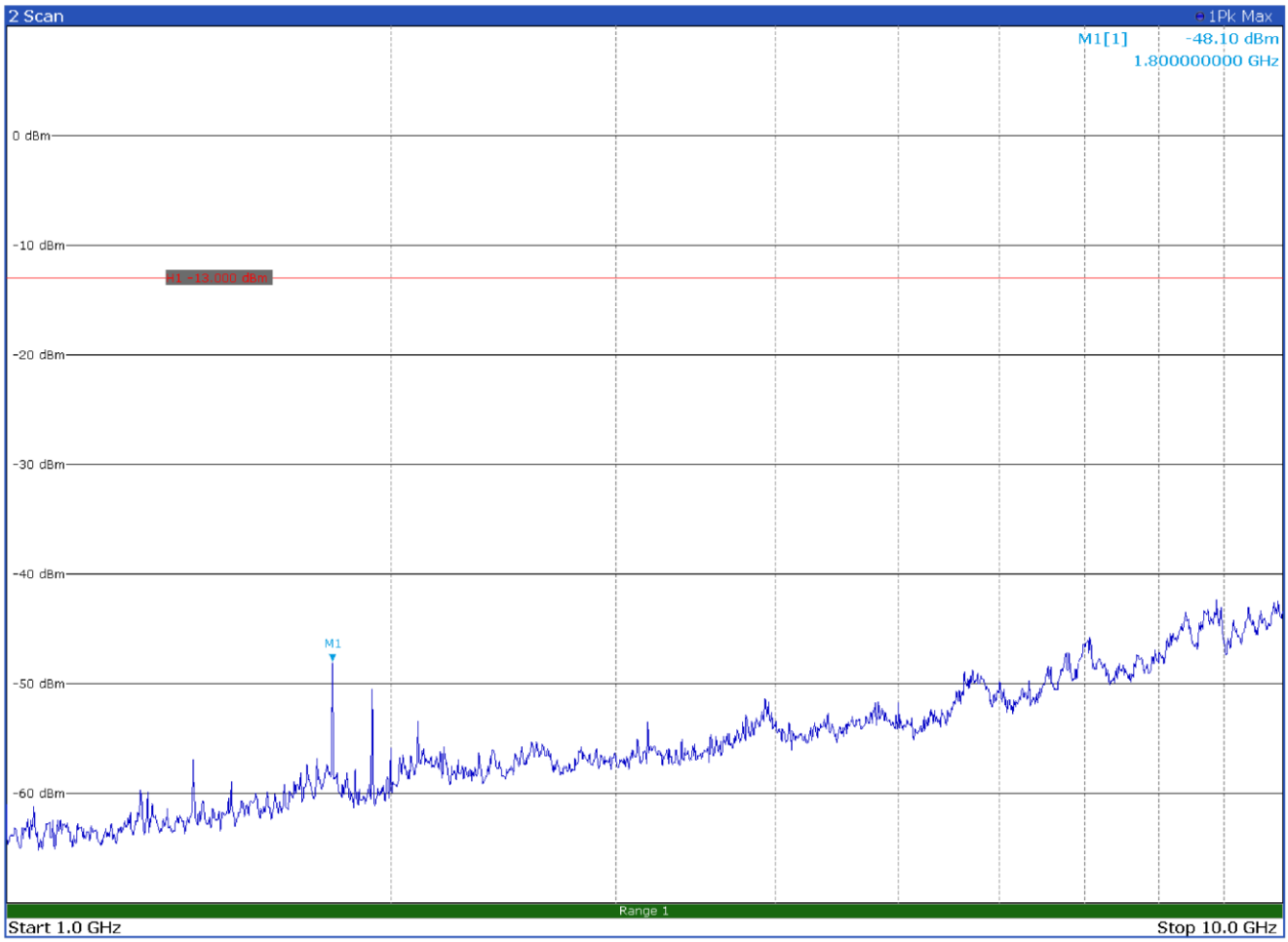


Figure 8.7-4: *Radiated spurious emissions from 1 GHz to 10 GHz, low channel with antenna in vertical polarization*

Test data, continued

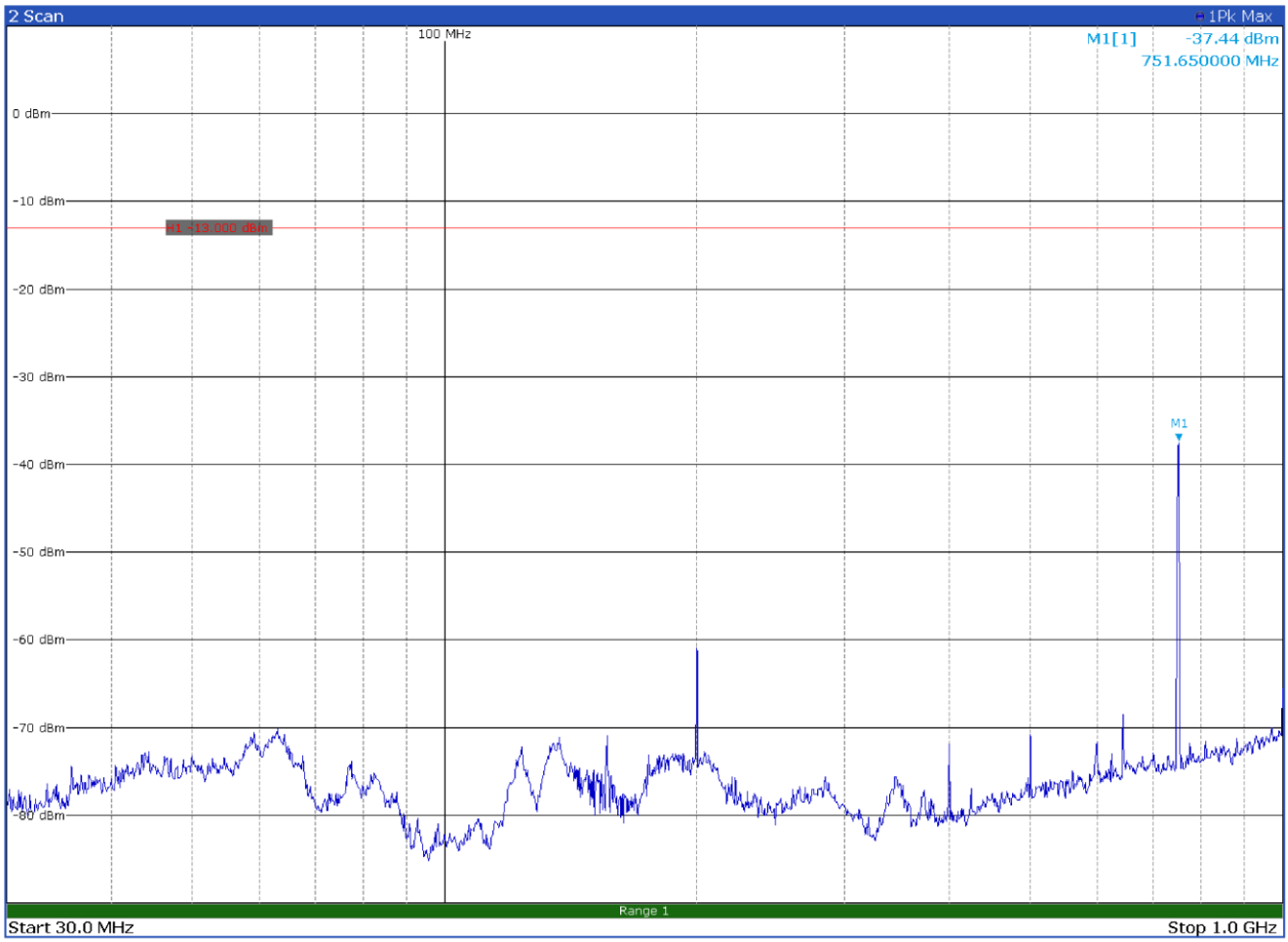


Figure 8.7-5: *Radiated spurious emissions below 1 GHz, mid channel with antenna in horizontal polarization*

Test data, continued

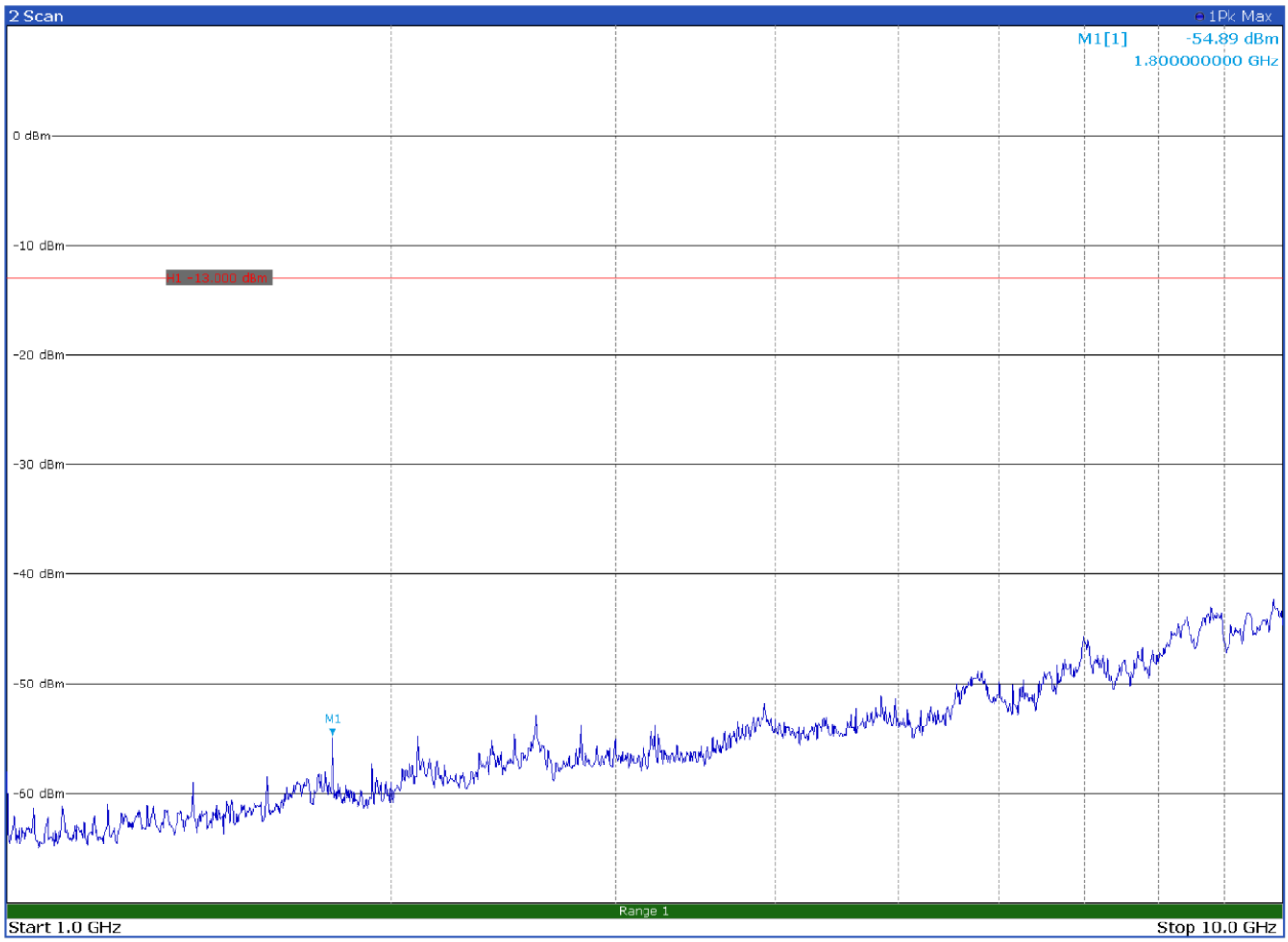


Figure 8.7-6: *Radiated spurious emissions from 1 GHz to 10 GHz, mid channel with antenna in horizontal polarization*

Test data, continued

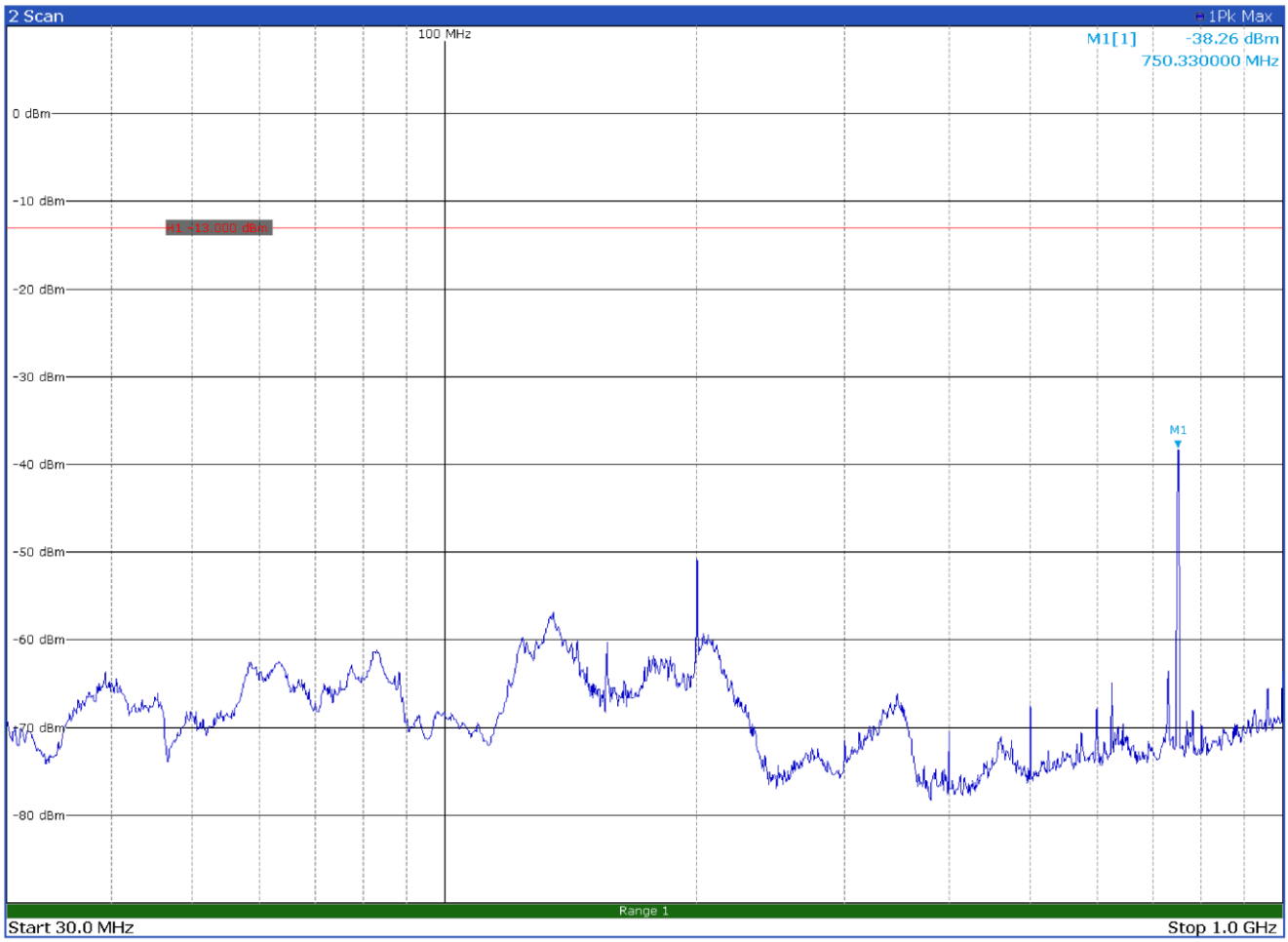


Figure 8.7-7: *Radiated spurious emissions below 1 GHz, mid channel with antenna in vertical polarization*

Test data, continued

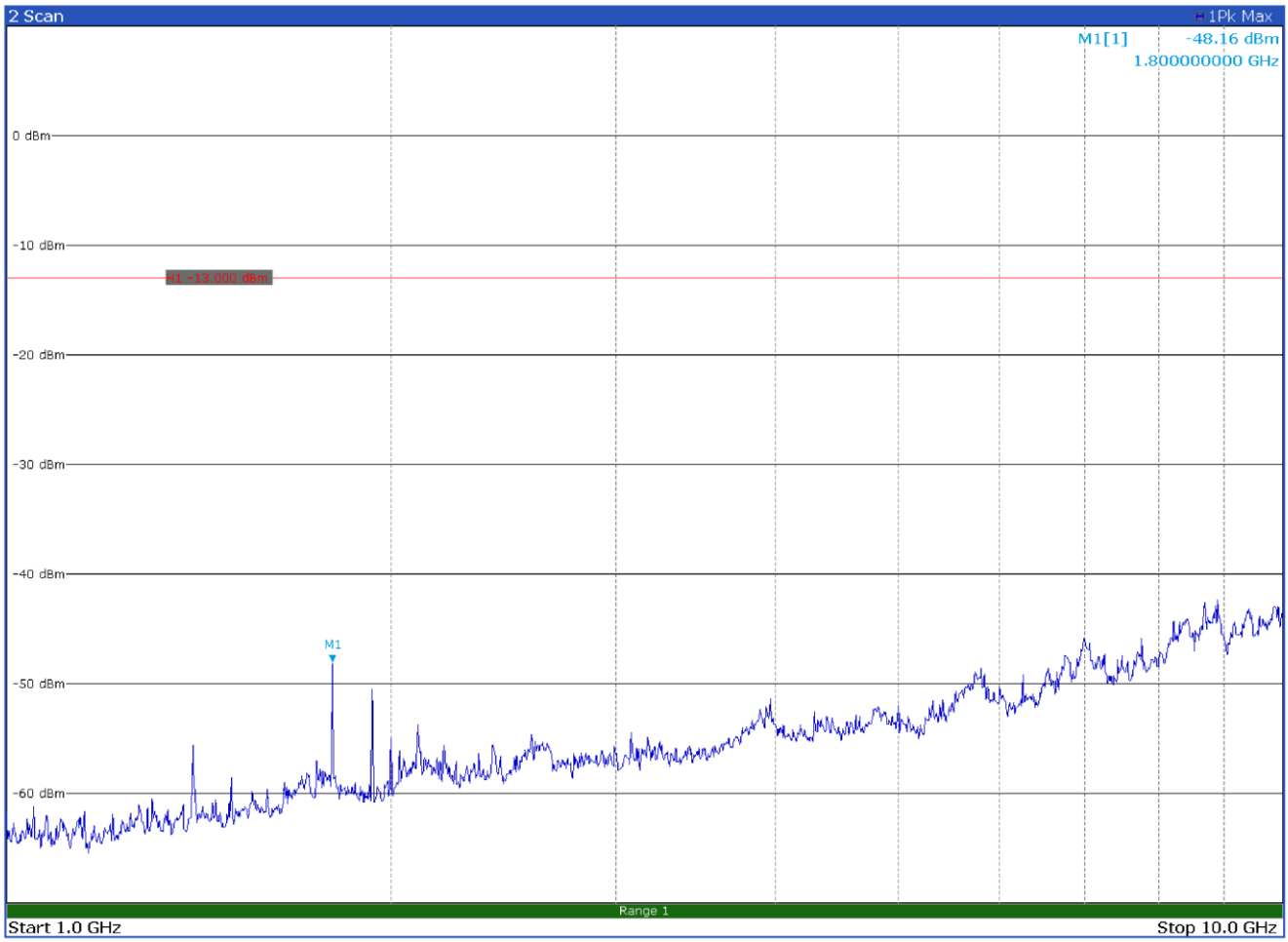


Figure 8.7-8: *Radiated spurious emissions from 1 GHz to 10 GHz, mid channel with antenna in vertical polarization*

Test data, continued

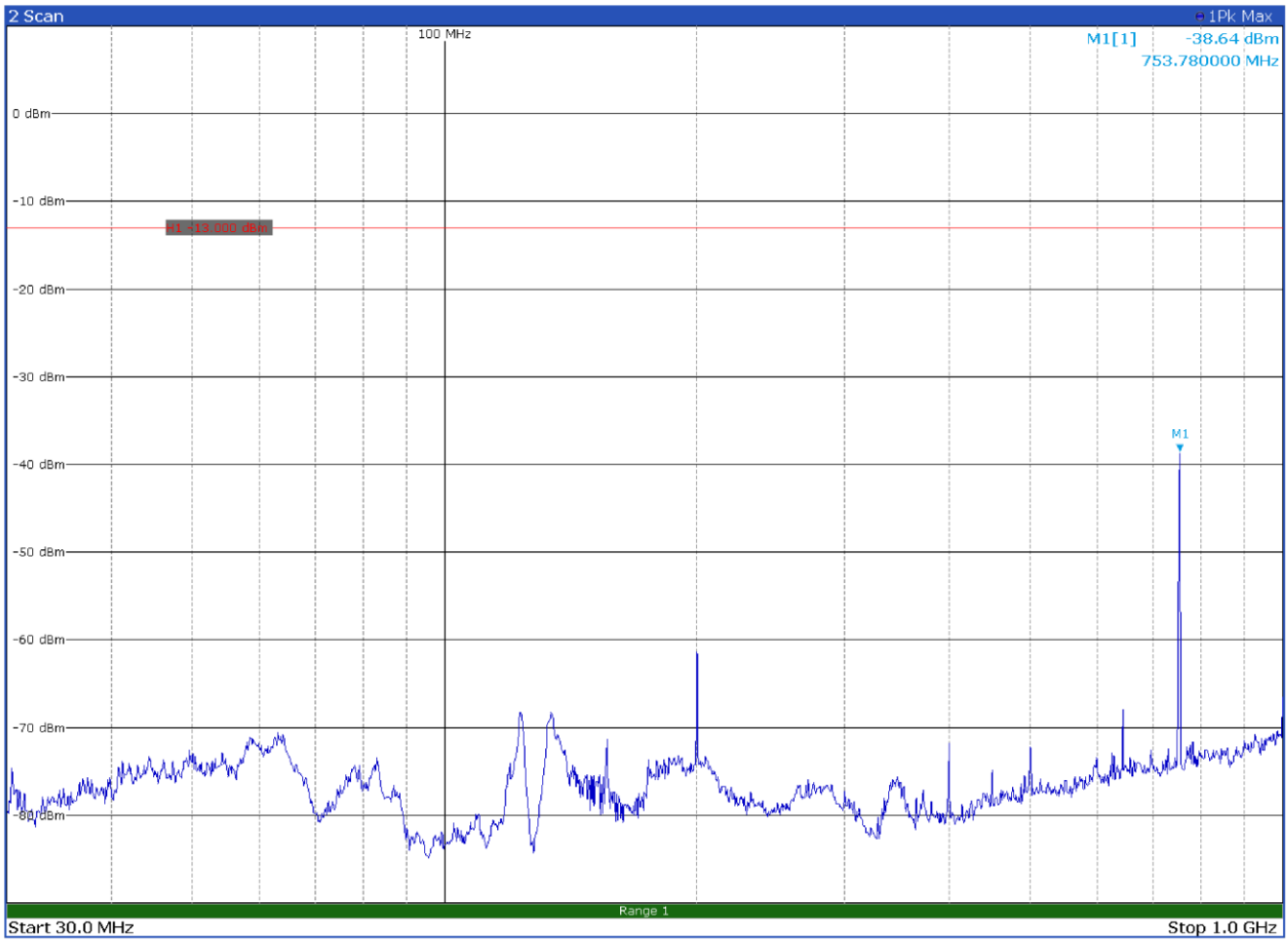


Figure 8.7-9: *Radiated spurious emissions below 1 GHz, high channel with antenna in horizontal polarization*

Test data, continued

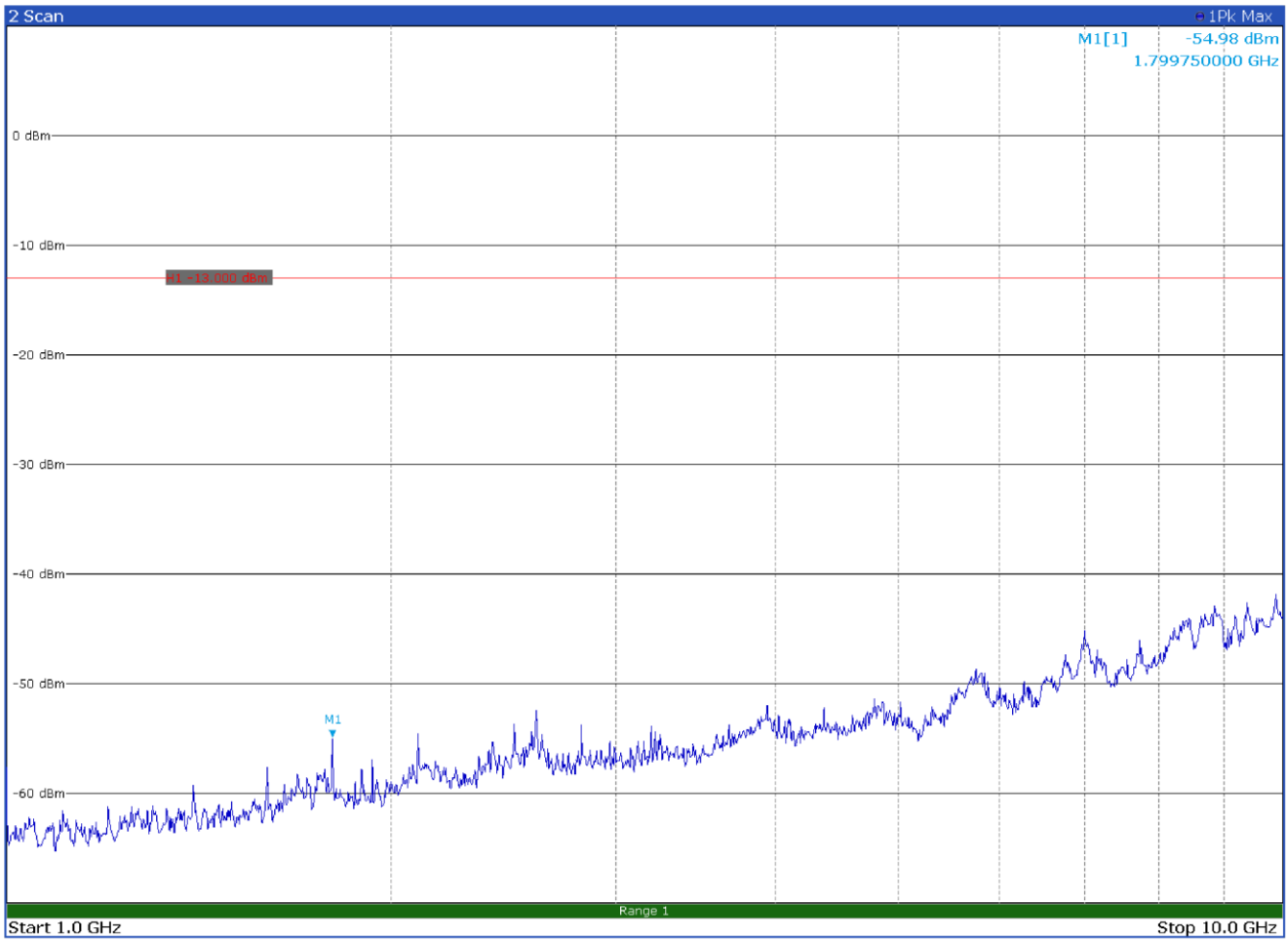


Figure 8.7-10: *Radiated spurious emissions from 1 GHz to 10 GHz, high channel with antenna in horizontal polarization*

Test data, continued

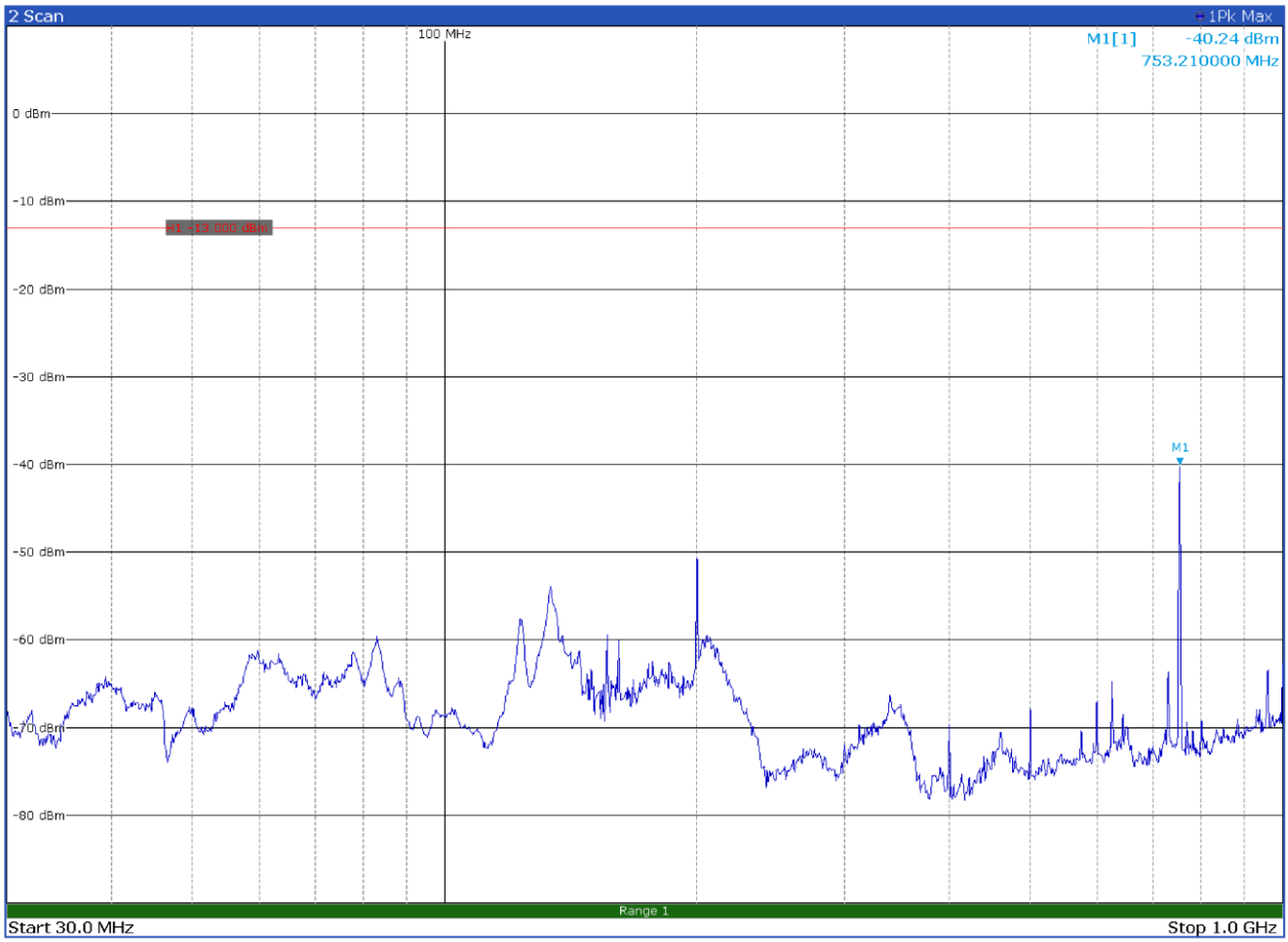


Figure 8.7-11: *Radiated spurious emissions below 1 GHz, high channel with antenna in vertical polarization*

Test data, continued

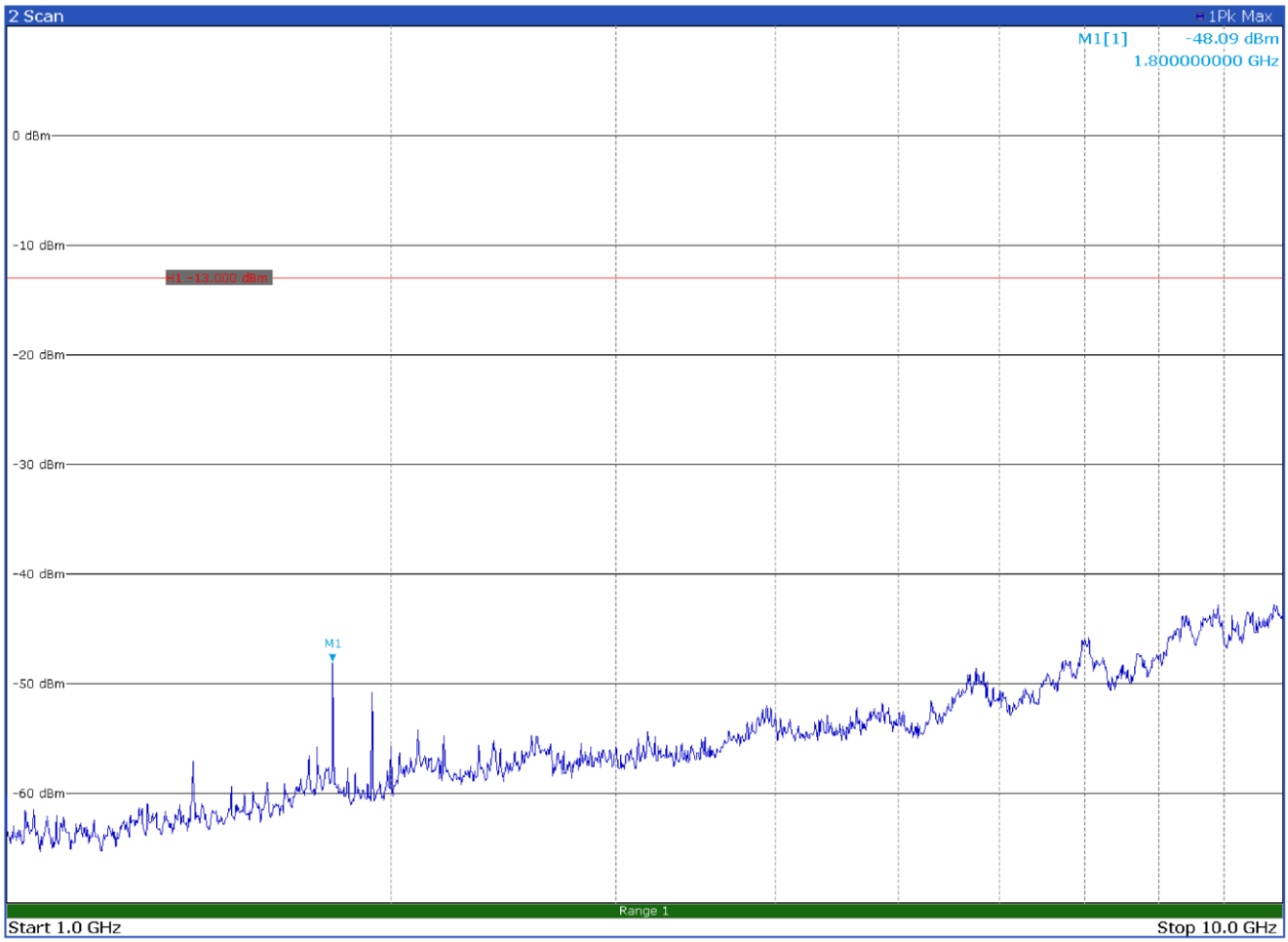


Figure 8.7-12: *Radiated spurious emissions from 1 GHz to 10 GHz, high channel with antenna in vertical polarization*

Test data, continued

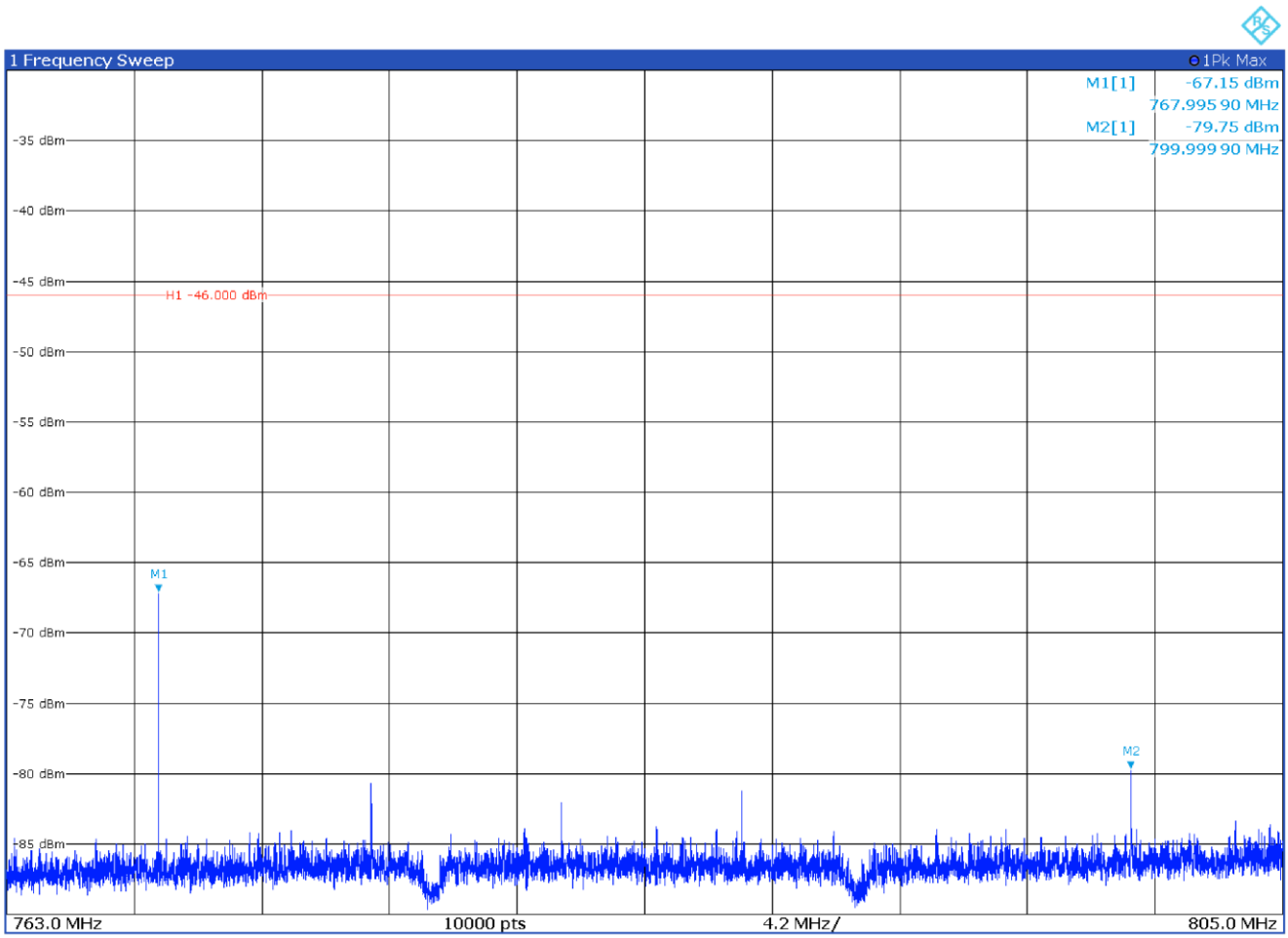


Figure 8.7-13: *Radiated spurious emissions from 763 MHz to 805 MHz, low channel with antenna in horizontal polarization*

Test data, continued

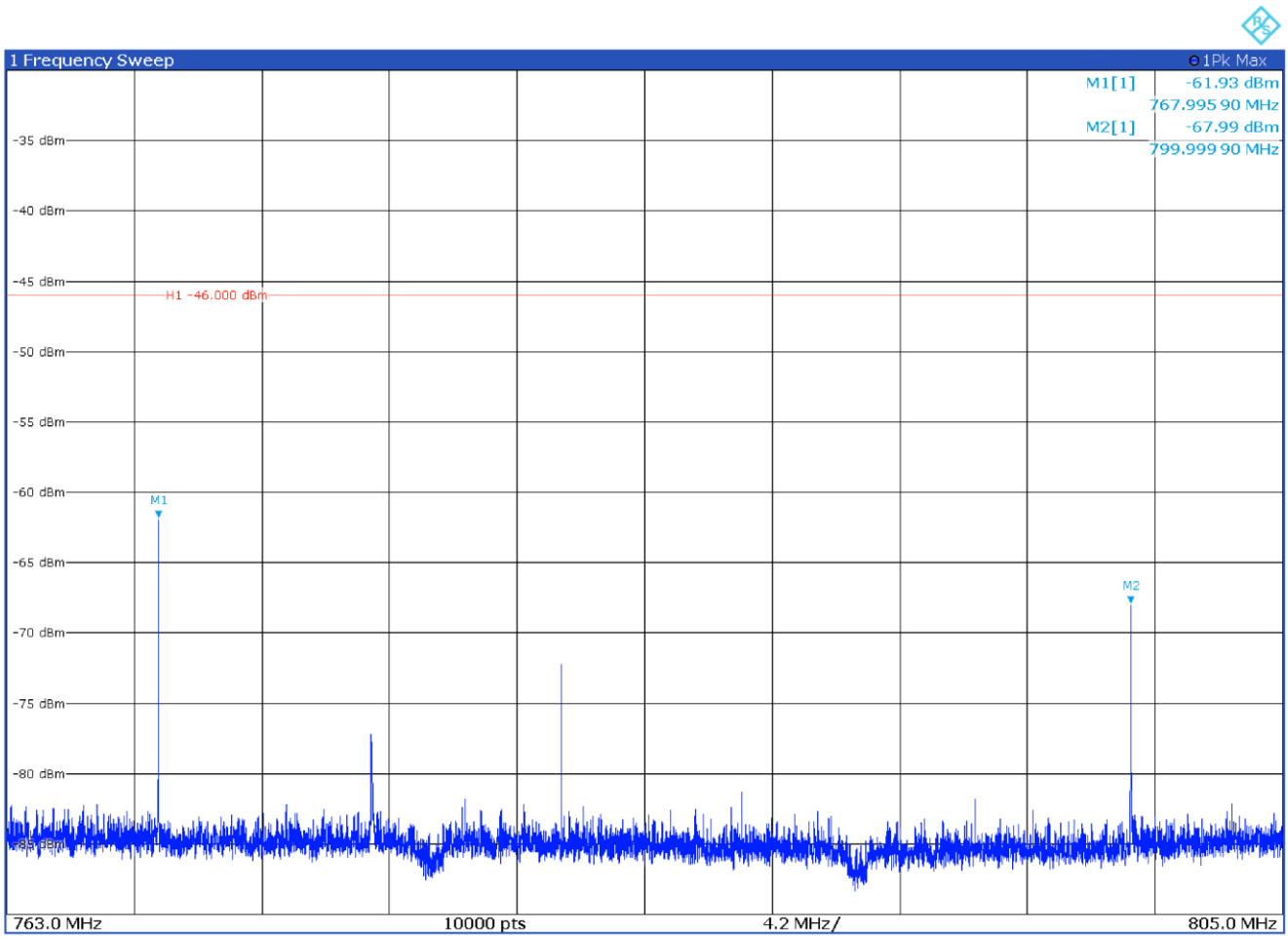


Figure 8.7-14: *Radiated spurious emissions from 763 MHz to 805 MHz, low channel with antenna in vertical polarization*

Test data, continued

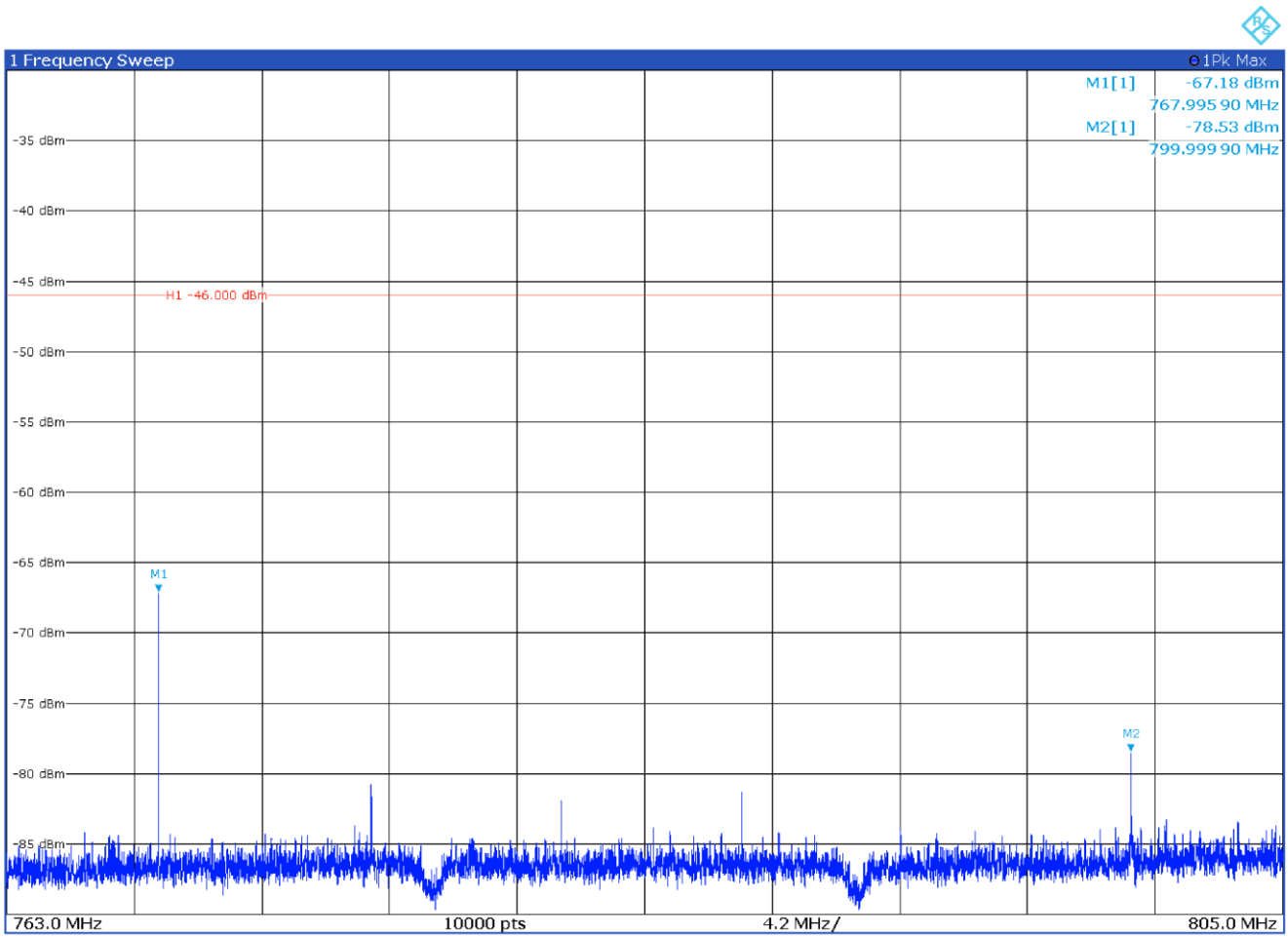


Figure 8.7-15: *Radiated spurious emissions from 763 MHz to 805 MHz, mid channel with antenna in horizontal polarization*

Test data, continued

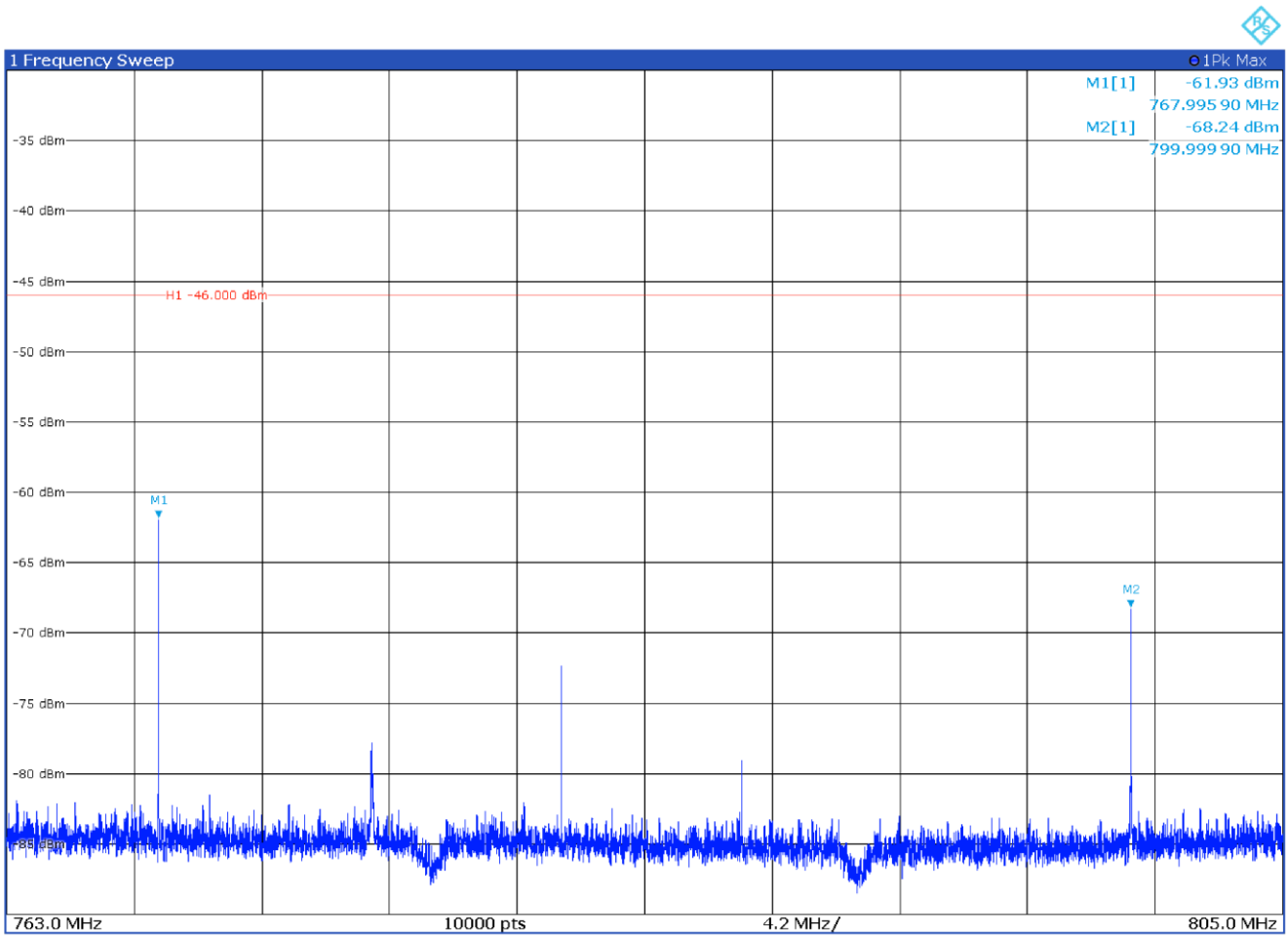


Figure 8.7-16: *Radiated spurious emissions from 763 MHz to 805 MHz, mid channel with antenna in vertical polarization*

Test data, continued

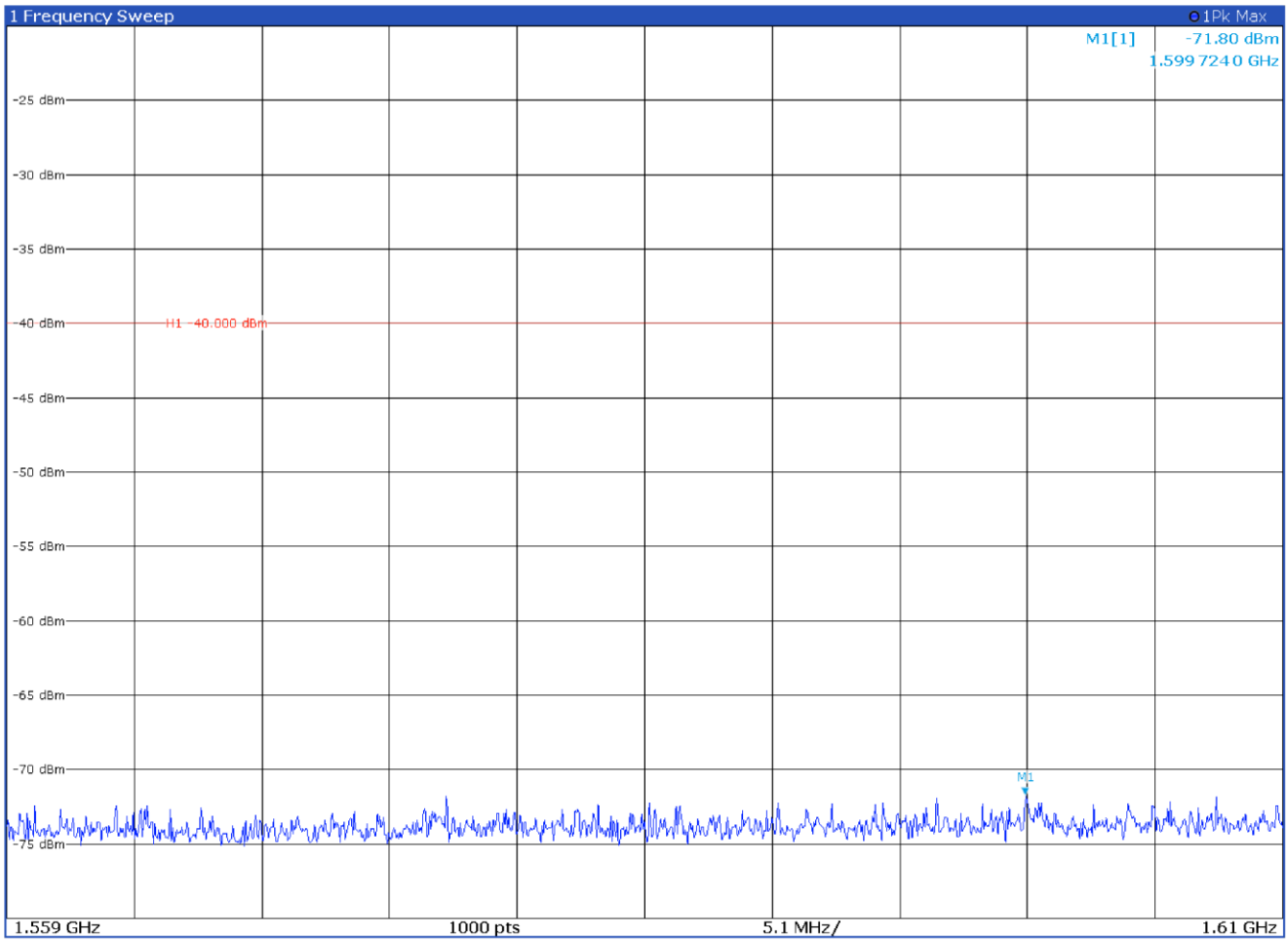


Figure 8.7-17: *Radiated spurious emissions from 763 MHz to 805 MHz, high channel with antenna in horizontal polarization*

Test data, continued

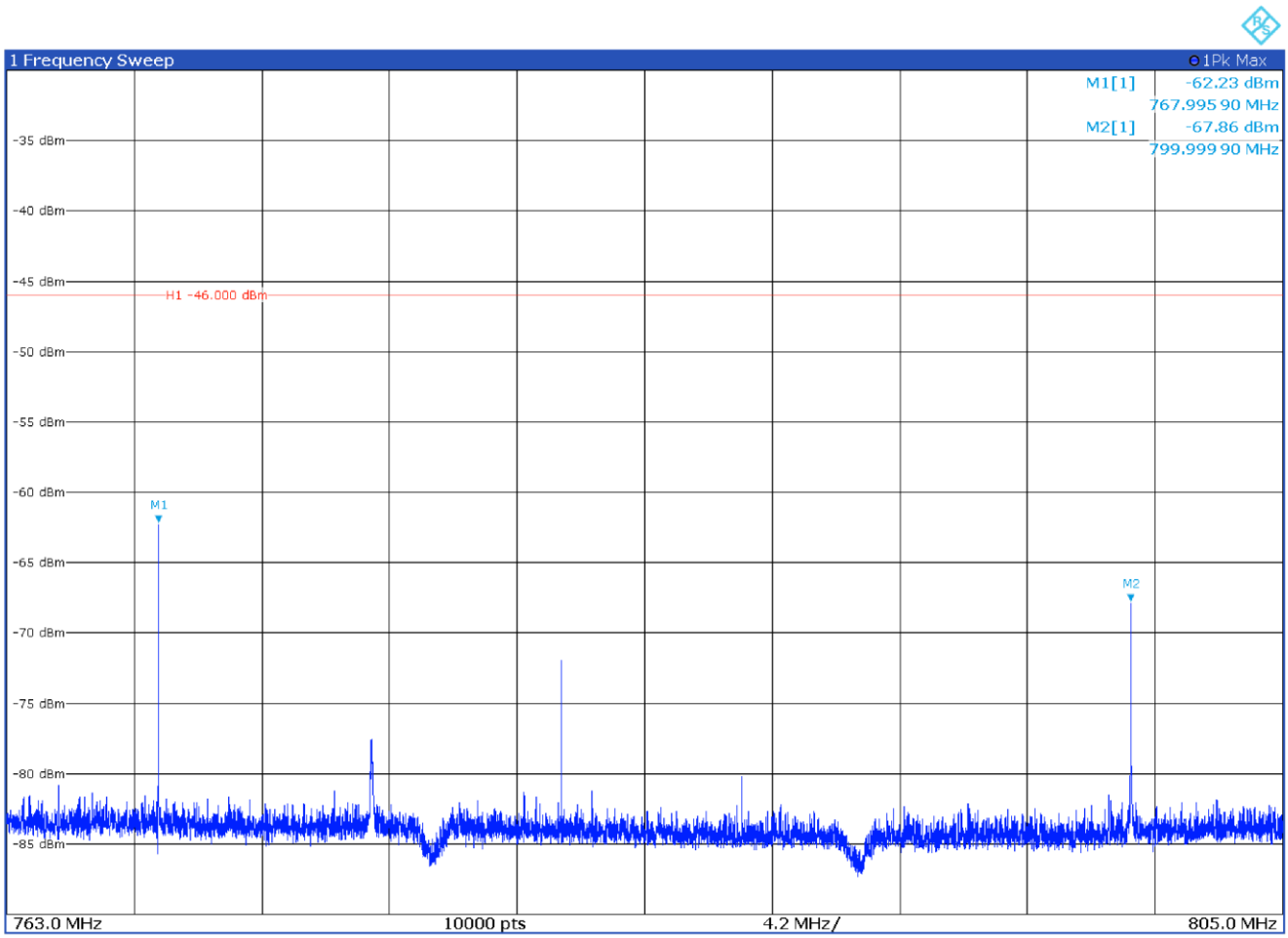


Figure 8.7-18: *Radiated spurious emissions from 763 MHz to 805 MHz, high channel with antenna in vertical polarization*

Test data, continued

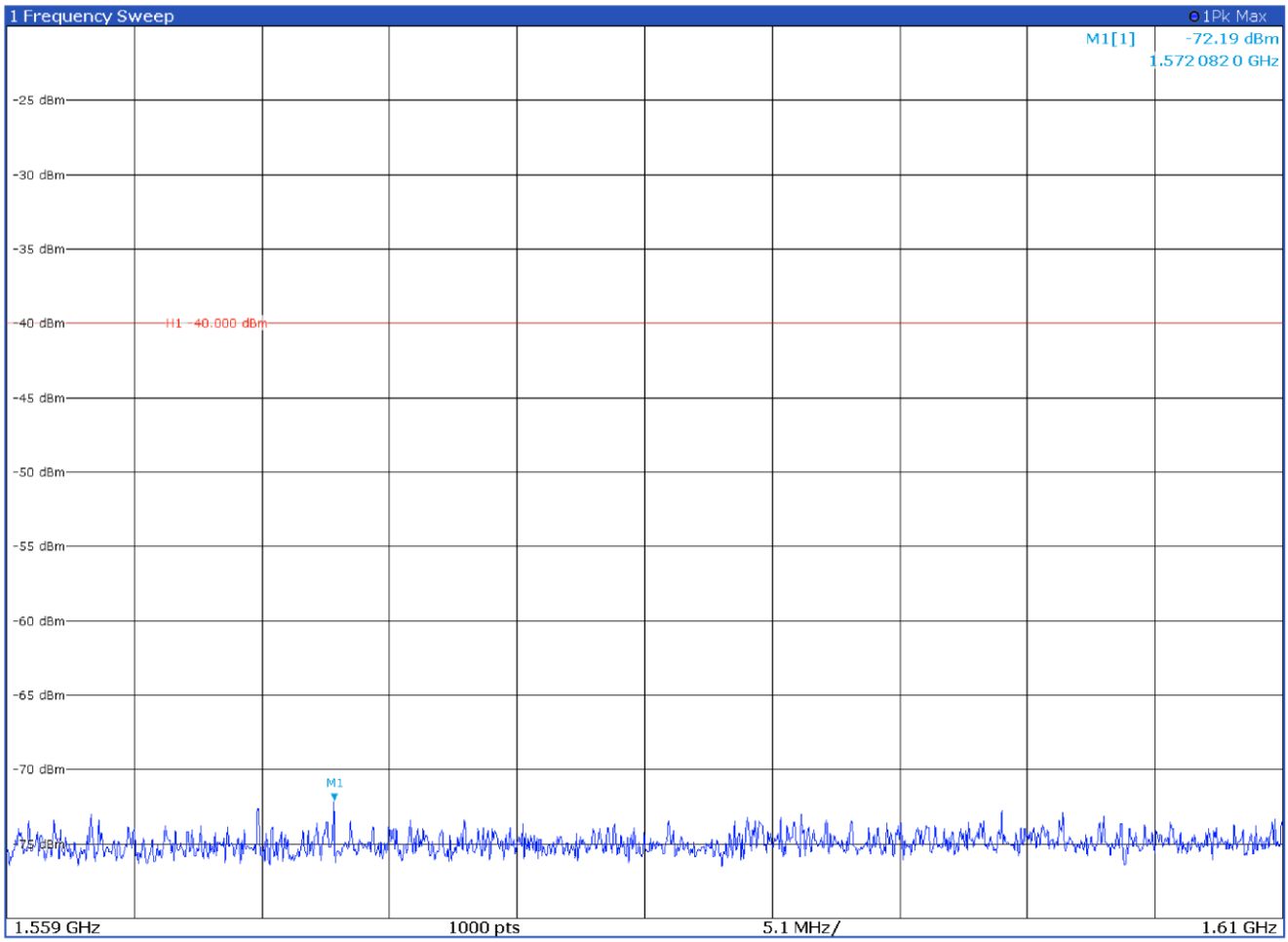


Figure 8.7-19: *Radiated spurious emissions from 1559 MHz to 1610 MHz (broad band), low channel with antenna in horizontal polarization*

Test data, continued

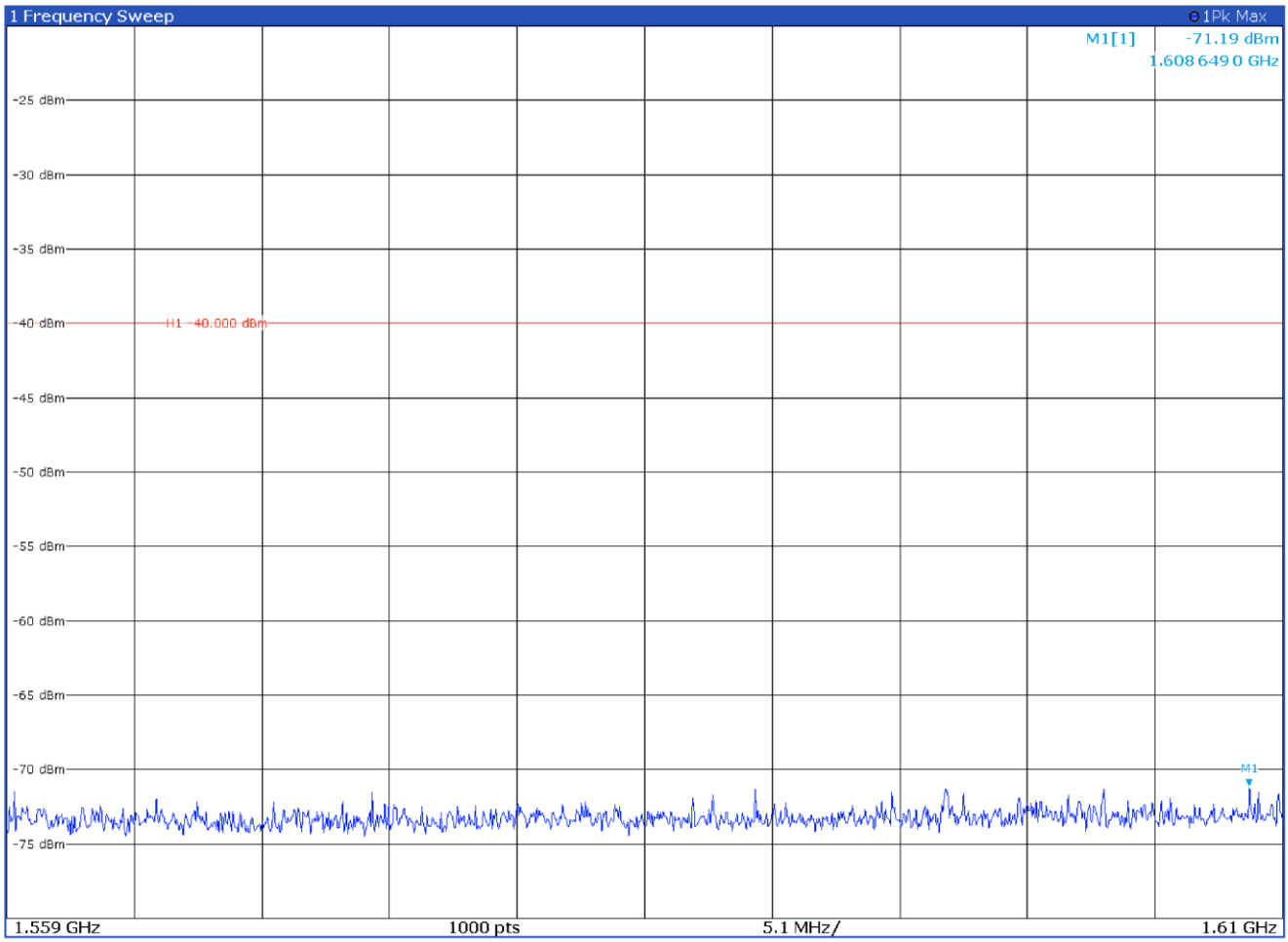


Figure 8.7-20: *Radiated spurious emissions from 1559 MHz to 1610 MHz (broad band), low channel with antenna in vertical polarization*

Test data, continued

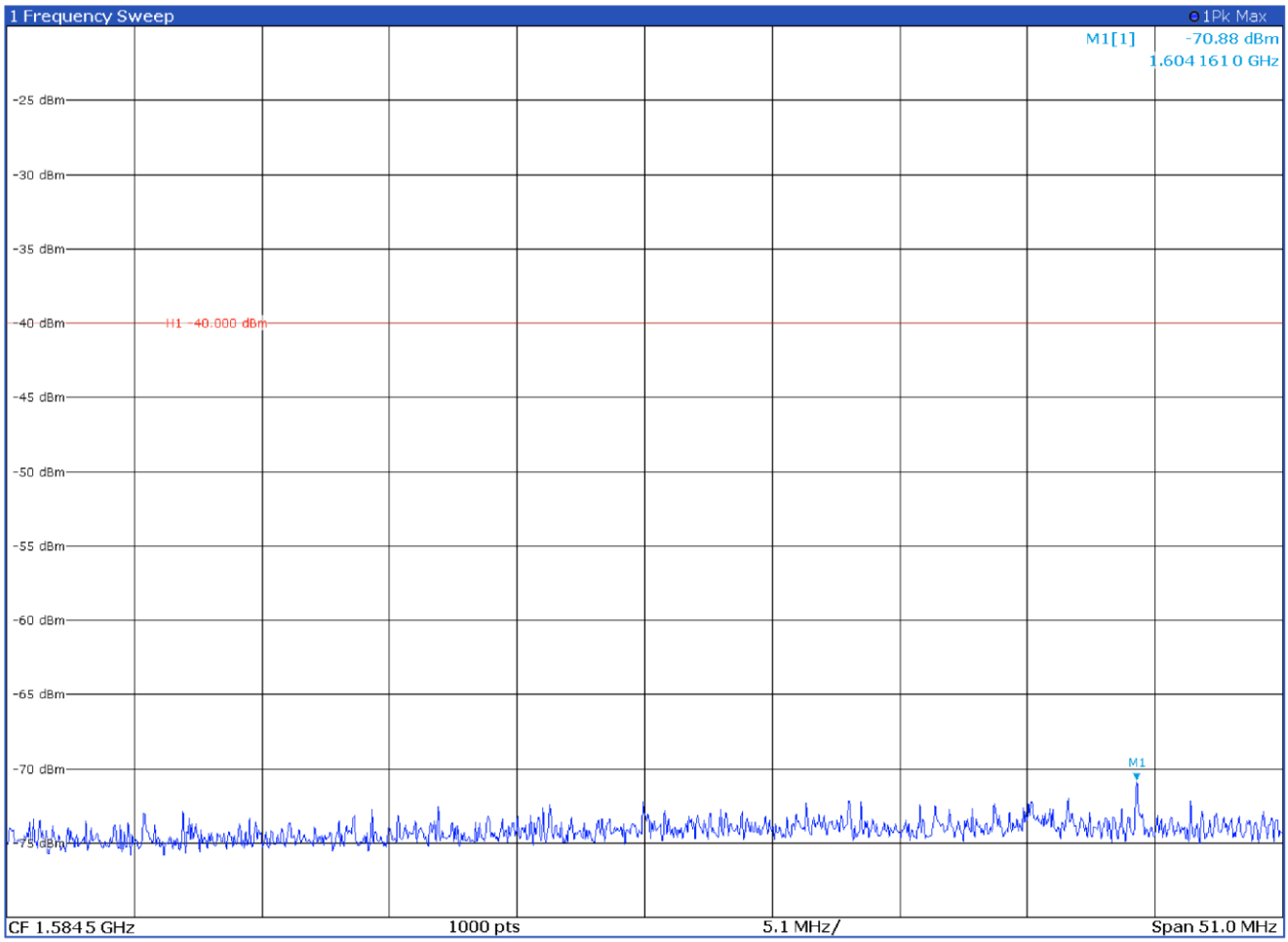


Figure 8.7-21: *Radiated spurious emissions from 1559 MHz to 1610 MHz (broad band), mid channel with antenna in horizontal polarization*

Test data, continued

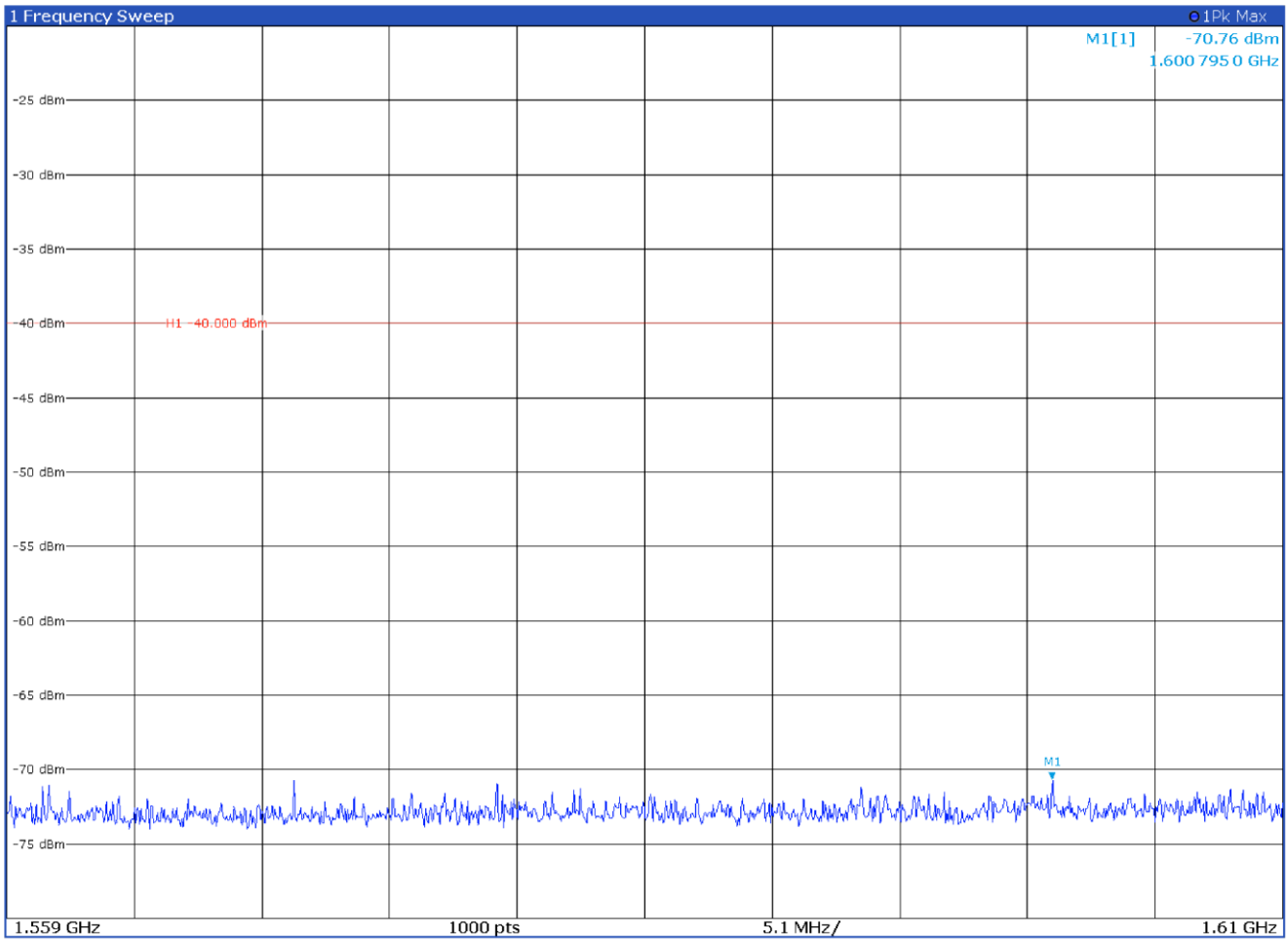


Figure 8.7-22: *Radiated spurious emissions from 1559 MHz to 1610 MHz (broad band), mid channel with antenna in vertical polarization*

Test data, continued

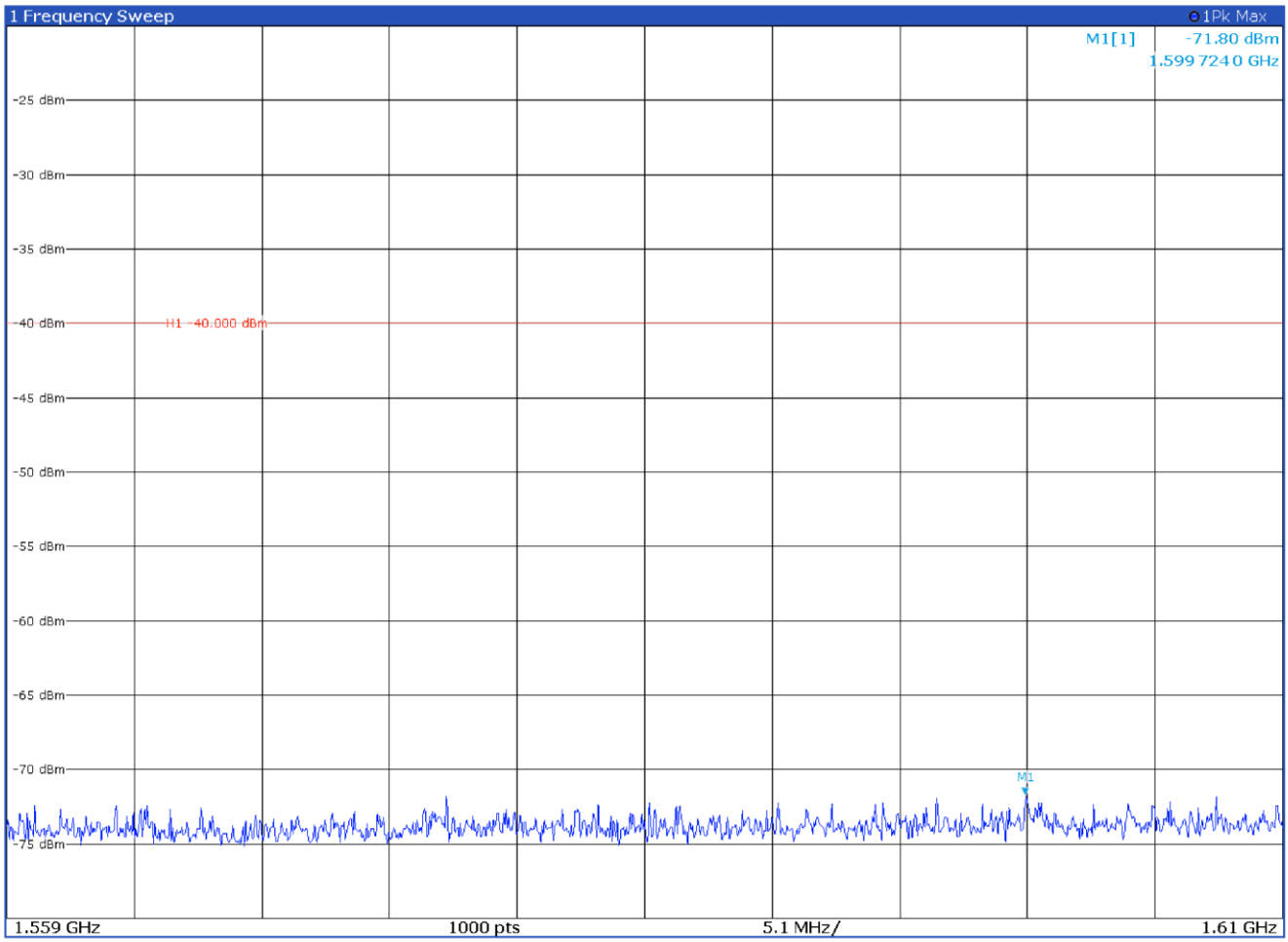


Figure 8.7-23: *Radiated spurious emissions from 1559 MHz to 1610 MHz (broad band), high channel with antenna in horizontal polarization*

Test data, continued

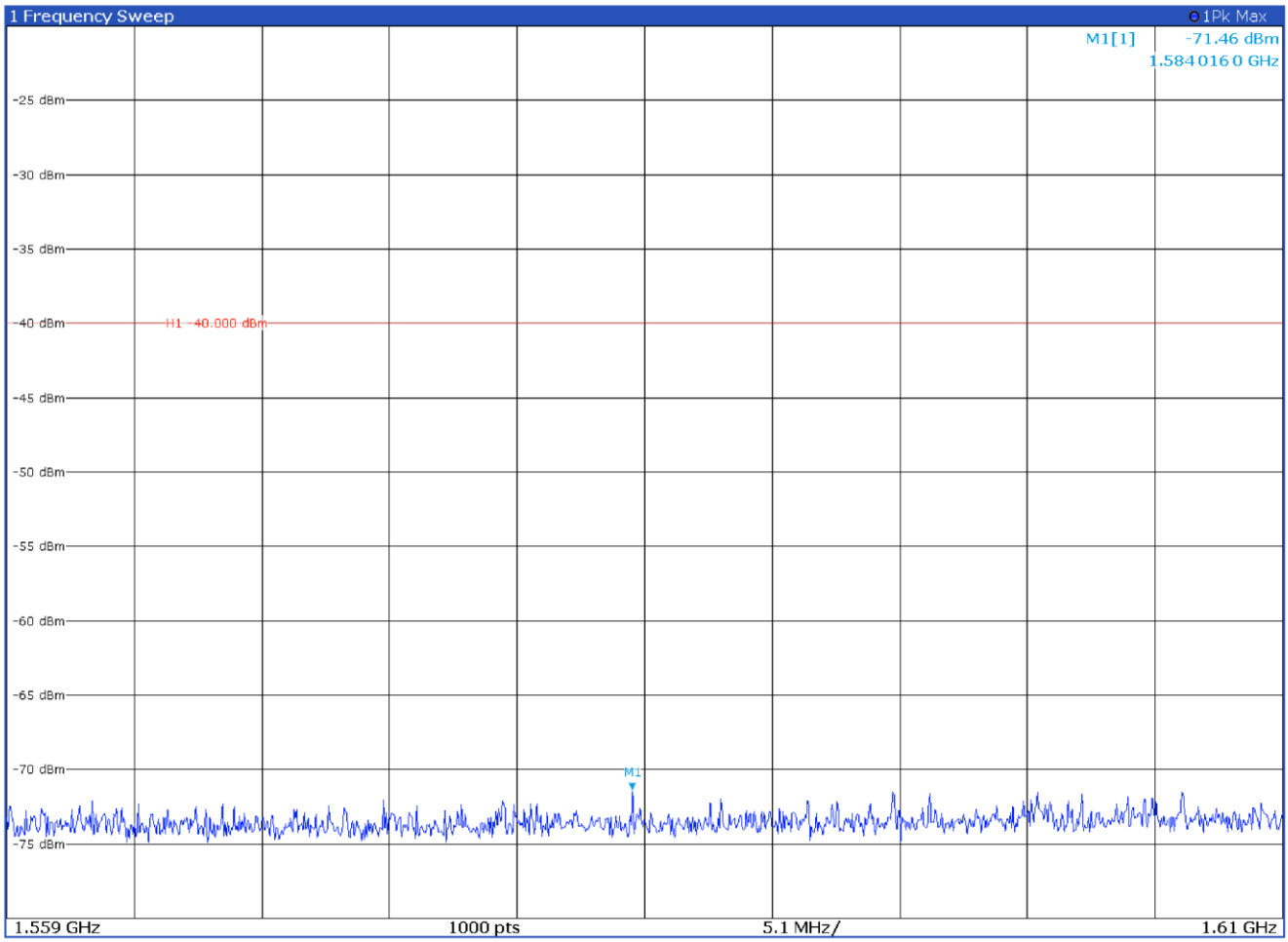


Figure 8.7-24: *Radiated spurious emissions from 1559 MHz to 1610 MHz (broad band), high channel with antenna in vertical polarization*

Test data, continued

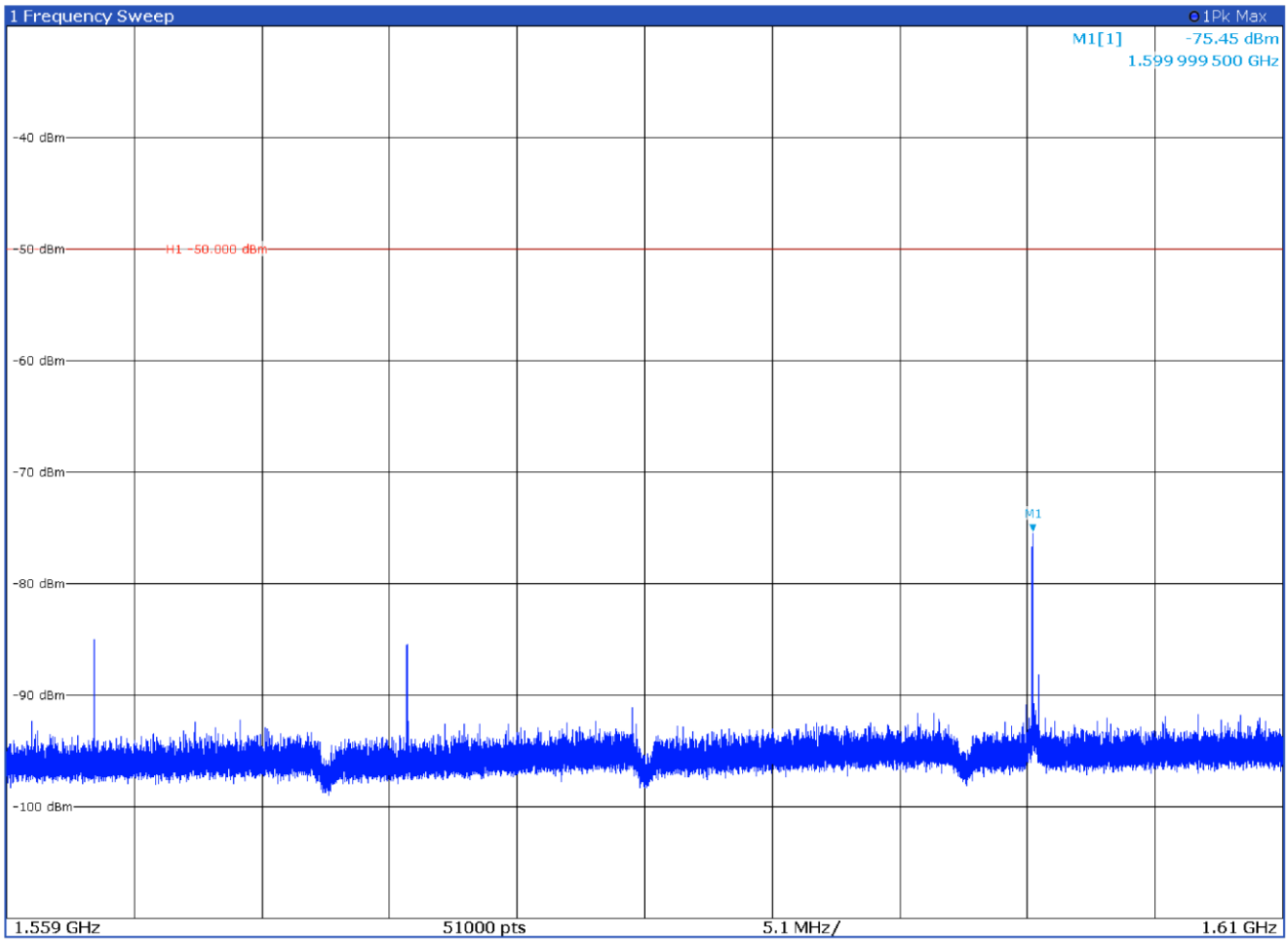


Figure 8.7-25: *Radiated spurious emissions from 1559 MHz to 1610 MHz (narrow band), low channel with antenna in horizontal polarization*

Test data, continued

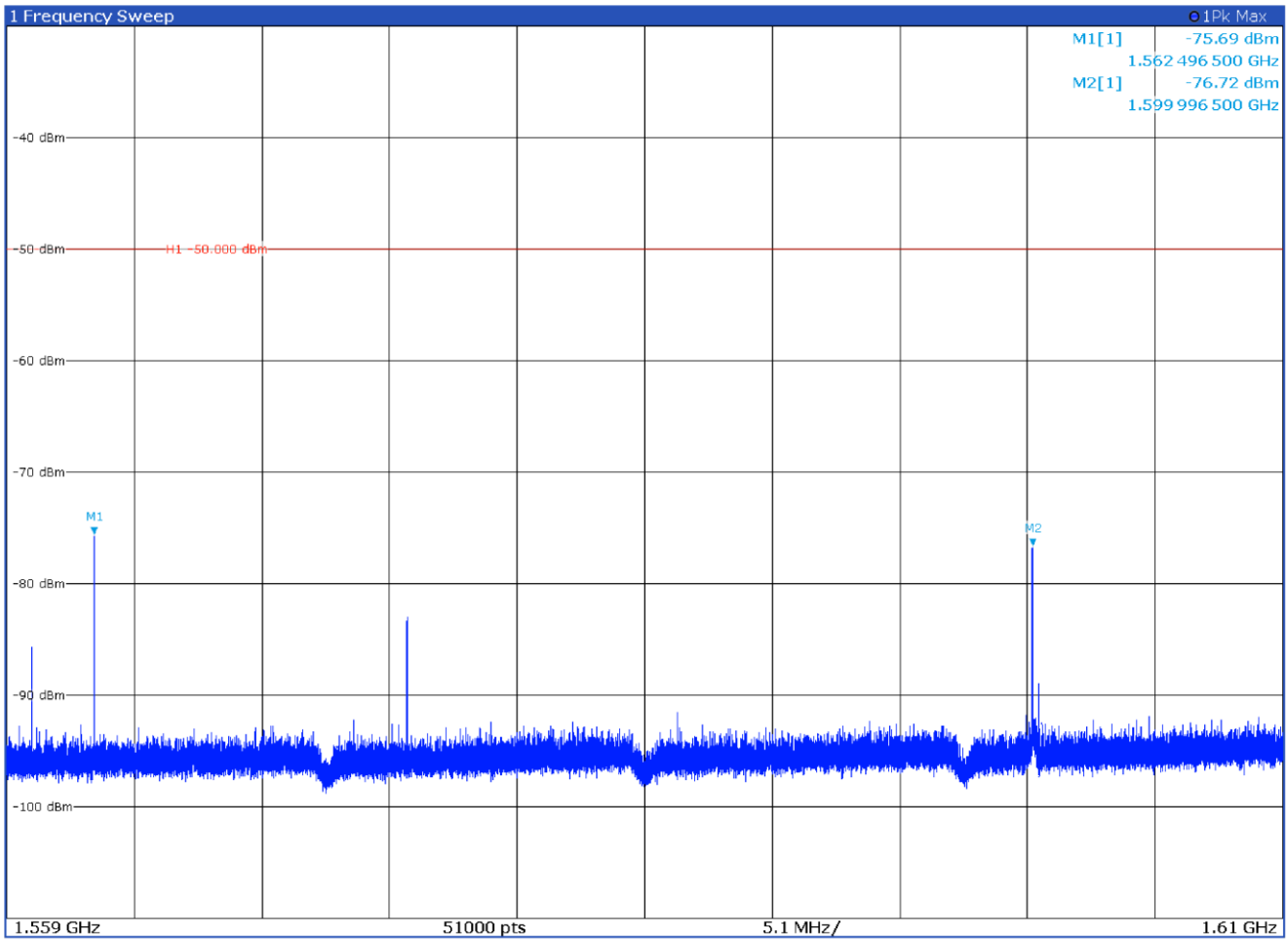


Figure 8.7-26: *Radiated spurious emissions from 1559 MHz to 1610 MHz (narrow band), low channel with antenna in vertical polarization*

Test data, continued

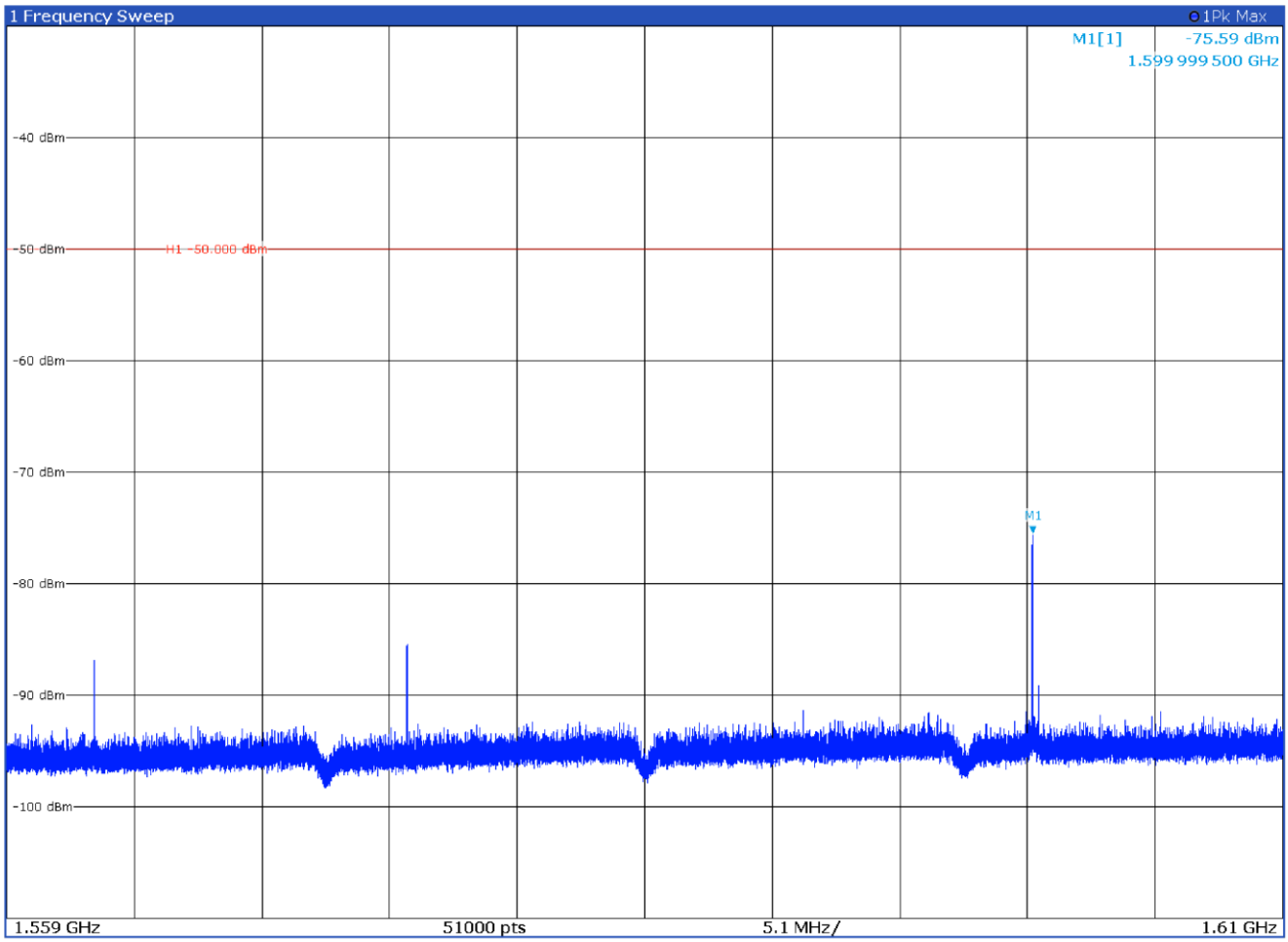


Figure 8.7-27: *Radiated spurious emissions from 1559 MHz to 1610 MHz (narrow band), mid channel with antenna in horizontal polarization*

Test data, continued

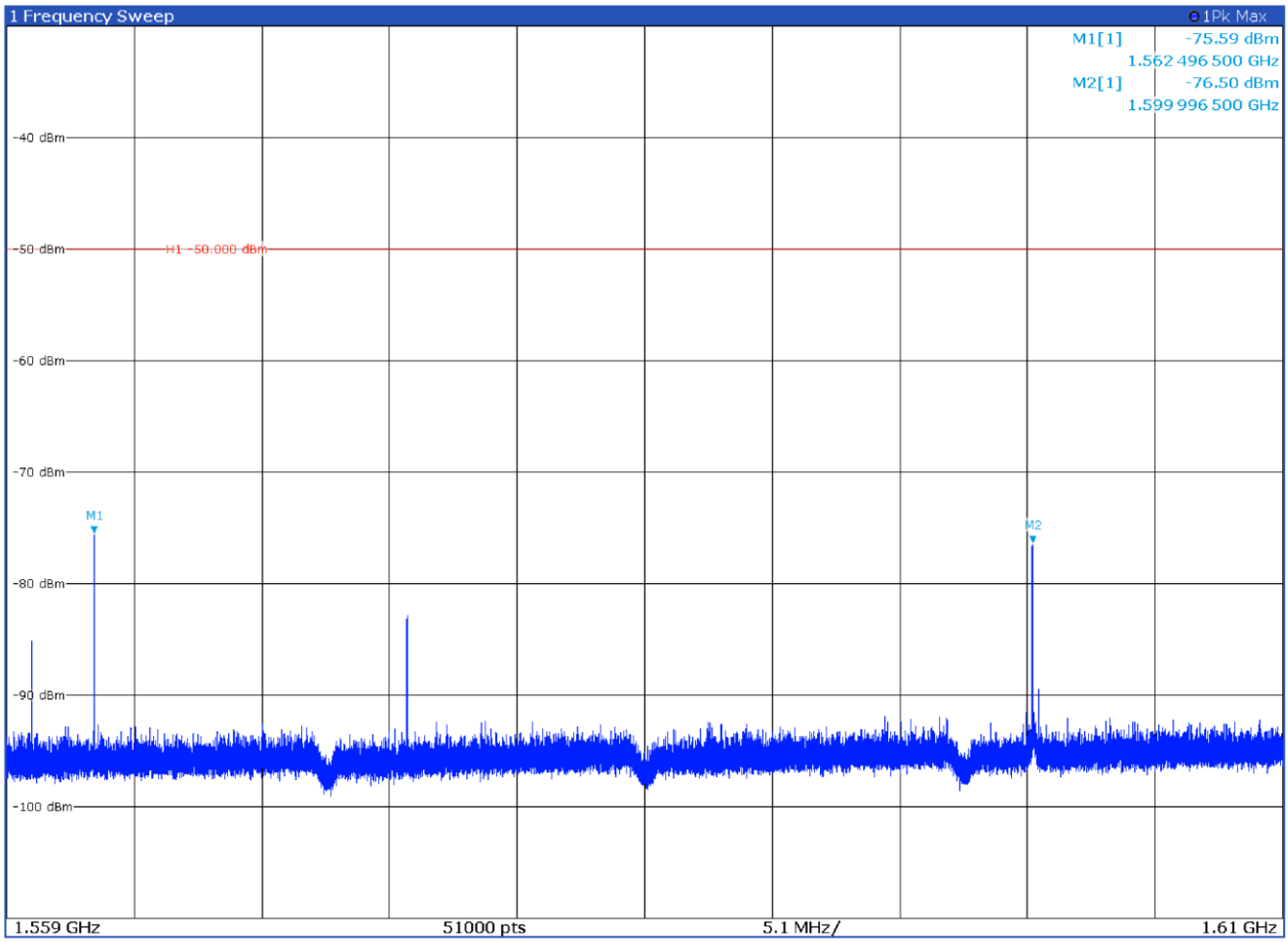


Figure 8.7-28: *Radiated spurious emissions from 1559 MHz to 1610 MHz (narrow band), mid channel with antenna in vertical polarization*

Test data, continued

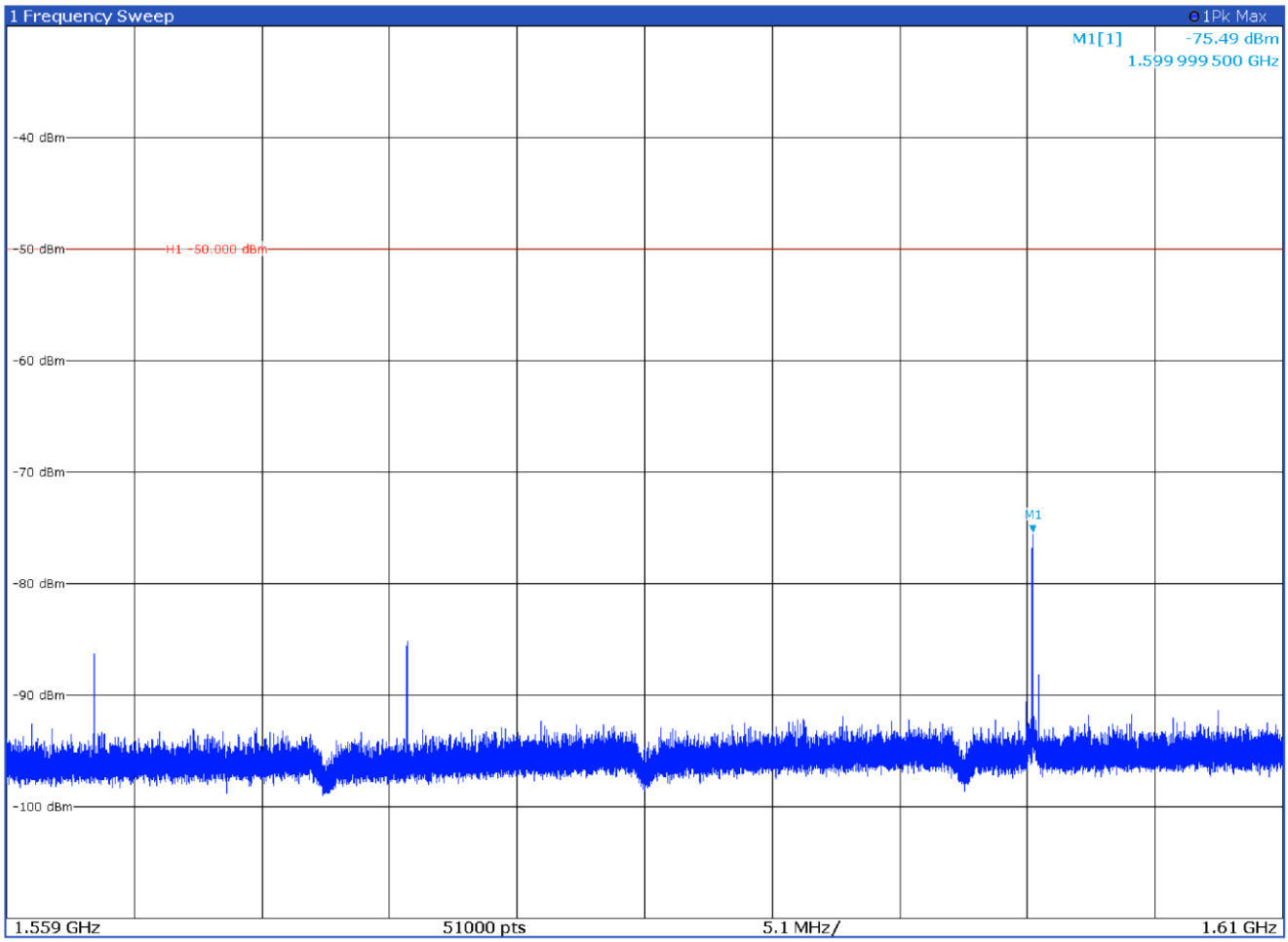


Figure 8.7-29: *Radiated spurious emissions from 1559 MHz to 1610 MHz (narrow band), high channel with antenna in horizontal polarization*

Test data, continued

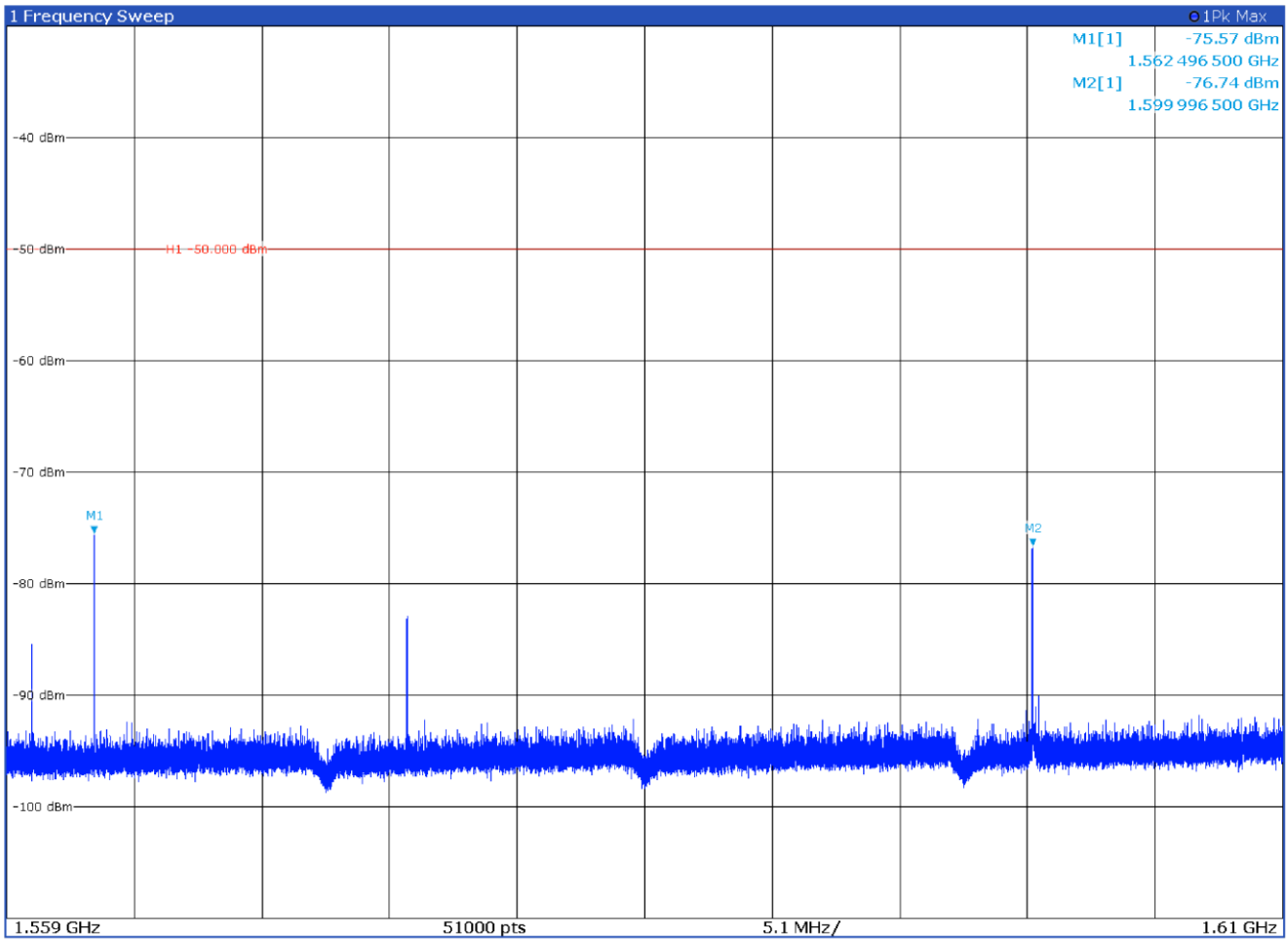


Figure 8.7-30: *Radiated spurious emissions from 1559 MHz to 1610 MHz (narrow band), high channel with antenna in vertical polarization*

8.8 Frequency stability measurements

8.8.1 References, definitions and limits

FCC § 27.54

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

RSS-131, Clause 5.2.4

Industrial zone enhancers shall comply with the frequency stability given in the RSS that applies to the equipment with which the zone enhancer is to be used. In cases where the frequency stability limit is not given in the applicable RSS, the equipment shall comply with a frequency stability of ± 1.5 ppm. For zone enhancers with no input signal processing capability, the frequency stability measurement in this section is not required.

RSS-130, Clause 4.5

For equipment that is capable of transmitting numerous channels simultaneously for different applications (e.g. LTE and narrowband – internet of things (IoT)), the occupied bandwidth shall be the bandwidth representing the sum of the occupied bandwidths of these channels.

The frequency stability shall be sufficient to ensure that the occupied bandwidth remains within each frequency block range when tested at the temperature and supply voltage variations specified in RSSGen

RSS-Gen, Clause 6.11

Transmitter frequency stability

Frequency stability is a measure of frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at an appropriate reference temperature and the rated supply voltage.

When the measurement method of transmitter frequency stability is not stated in the applicable RSS or reference standards, the following conditions apply:

a. The reference temperature for radio transmitters is +20°C (+68°F).
b. A hand-held device that is only capable of operating using internal batteries shall be tested at the battery's nominal voltage, and again at the battery's operating end-point voltage, which shall be specified by the equipment manufacturer. For this test, either a battery or an external power supply can be used.
c. The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency-determining circuit element shall be made subsequent to this initial set-up.

With the transmitter installed in an environmental test chamber, the unmodulated carrier frequency and frequency stability shall be measured under the conditions specified below for licensed and licence-exempt devices, unless specified otherwise in the applicable RSS. A sufficient stabilization period at each temperature shall be used prior to each frequency measurement.

For licensed devices, the following measurement conditions apply:

a. at the temperatures of -30°C (-22°F), +20°C (+68°F) and +50°C (+122°F), and at the manufacturer's rated supply voltage
b. at the temperature of +20°C (+68°F) and at ±15% of the manufacturer's rated supply voltage

8.8.2 Test summary

Verdict	Pass		
Tested by	P. Barbieri	Test date	February 8, 2022

8.8.3 Observations, settings and special notes

Testing was performed per ANSI C63.26 Paragraphs 5.6.3, 5.6.4 and 5.6.5 methods.

8.8.4 Test equipment used

Equipment	Manufacturer	Model no.	Asset no.
EMI Receiver	Rohde & Schwarz	ESU8	100202
RF Vector Signal Generator	Rohde & Schwarz	SMBV100A	263254
RF Vector Signal Generator	Rohde & Schwarz	SMBV100A	263397
Climatic Chamber	MSL	EC500DA	15022

Notes: NCR - no calibration required, VOU - verify on use

8.8.5 Test data

Table 8.8-1: *Transmitter frequency stability results for antenna port 1*

Test conditions	Frequency, Hz	Drift, Hz	Drift, ppm	Limit ±ppm	Margin, ±ppm
+50 °C, Nominal	751000550.4	18.2	0.02423	1.5	1.48
+40 °C, Nominal	751000547.7	15.5	0.02064	1.5	1.48
+30 °C, Nominal	751000544.8	12.6	0.01678	1.5	1.48
+20 °C, -15% voltage	751000533.5	1.3	0.00173	1.5	1.50
+20 °C, Nominal	751000532.2	Reference	Reference	Reference	Reference
+20 °C, +15% voltage	751000531.3	-0.9	-0.00120	1.5	1.50
+10 °C, Nominal	751000514.7	-17.5	-0.02330	1.5	1.48
0 °C, Nominal	751000502.0	-30.2	-0.04021	1.5	1.46
−10 °C, Nominal	751000480.7	-51.5	-0.06858	1.5	1.43
−20 °C, Nominal	751000474.0	-58.2	-0.07750	1.5	1.42
−30 °C, Nominal	751000411.4	-120.8	-0.16085	1.5	1.34

Table 8.8-2: *Transmitter frequency stability results for antenna port 2*

Test conditions	Frequency, Hz	Drift, Hz	Drift, ppm	Limit ±ppm	Margin, ±ppm
+50 °C, Nominal	751000550.7	18.3	0.02437	1.5	1.48
+40 °C, Nominal	751000549.2	16.8	0.02237	1.5	1.48
+30 °C, Nominal	751000545.0	12.6	0.01678	1.5	1.48
+20 °C, -15% voltage	751000534.3	1.9	0.00253	1.5	1.50
+20 °C, Nominal	751000532.4	Reference	Reference	Reference	Reference
+20 °C, +15% voltage	751000531.3	-1.1	-0.00146	1.5	1.50
+10 °C, Nominal	751000515.1	-17.3	-0.02304	1.5	1.48
0 °C, Nominal	751000501.3	-31.1	-0.04141	1.5	1.46
−10 °C, Nominal	751000481.2	-51.2	-0.06818	1.5	1.43
−20 °C, Nominal	751000473.5	-58.9	-0.07843	1.5	1.42
−30 °C, Nominal	751000411.3	-121.1	-0.16125	1.5	1.34

Section 9 EUT photos

9.1 Set-up photos

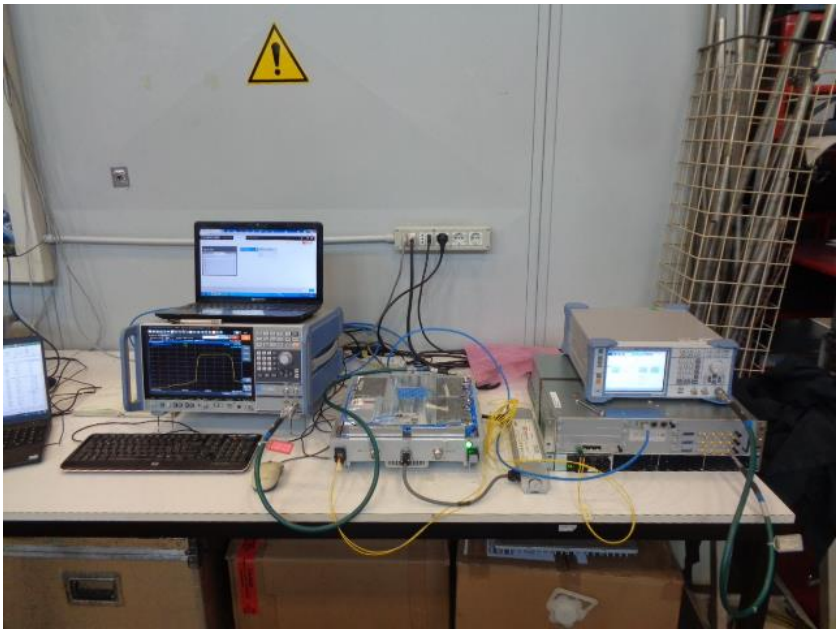


Figure 9.1-1: *Antenna port testing set-up*

Figure 9.1-2: *Antenna port testing set-up in climatic chamber*

Figure 9.1-3: *Radiated emissions set-up for frequencies below 1 GHz*

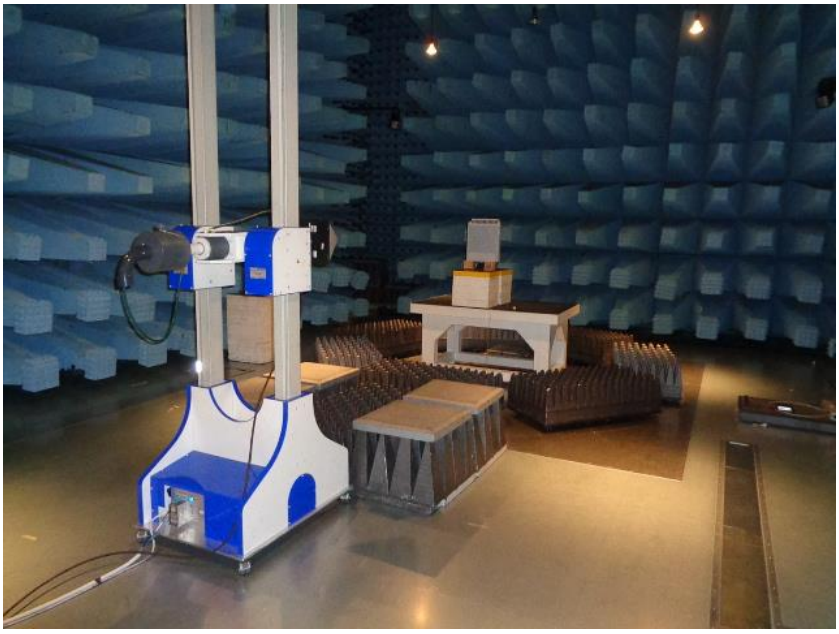


Figure 9.1-4: *Radiated emissions set-up for frequencies above 1 GHz*

9.2 External photos

Figure 9.2-1: *EUT photo*

End of the test report