

Test data, continued

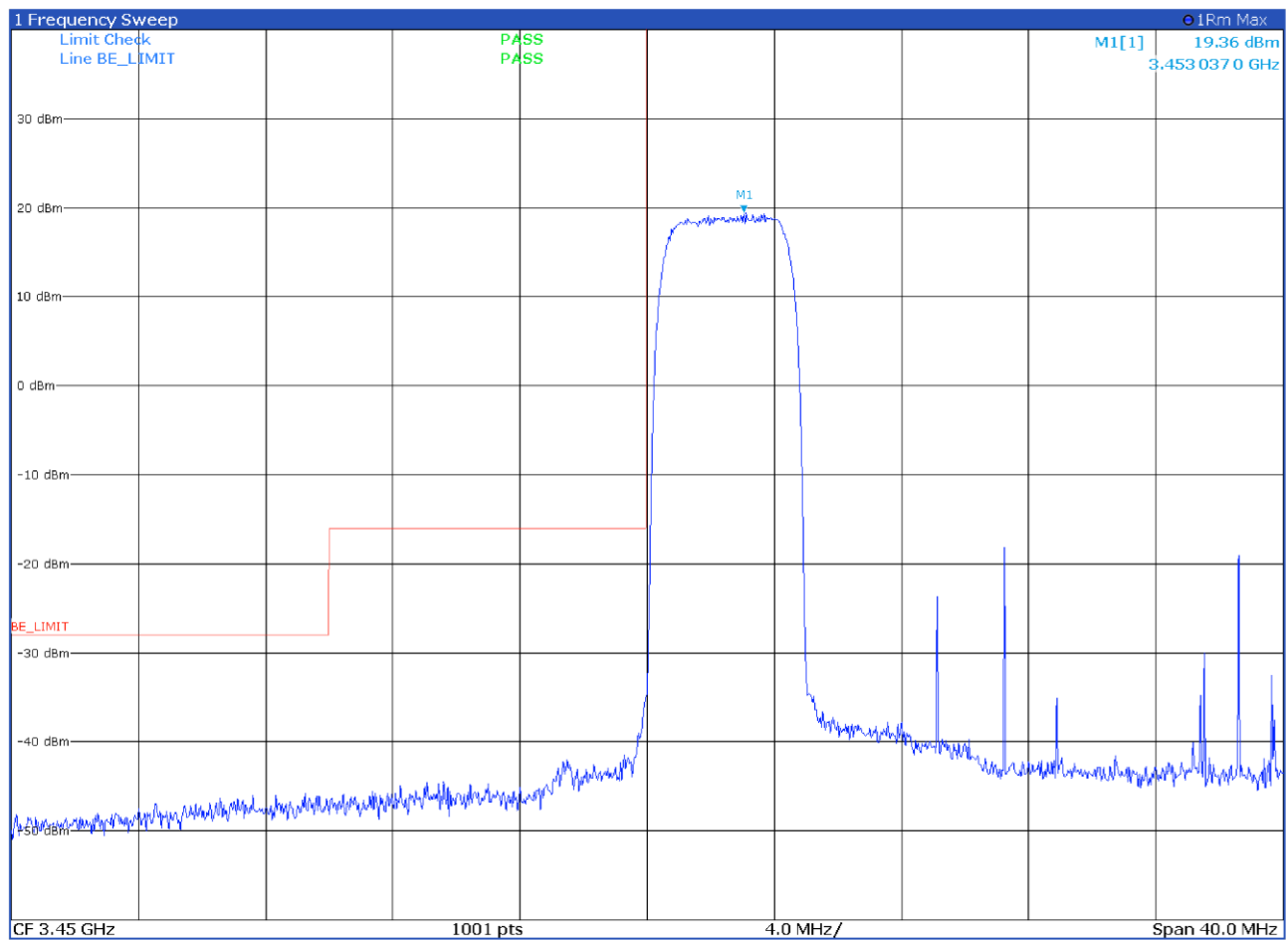


Figure 8.5-15: Antenna port 2 single carrier lower block edge with input signal at AGC threshold

Test data, continued

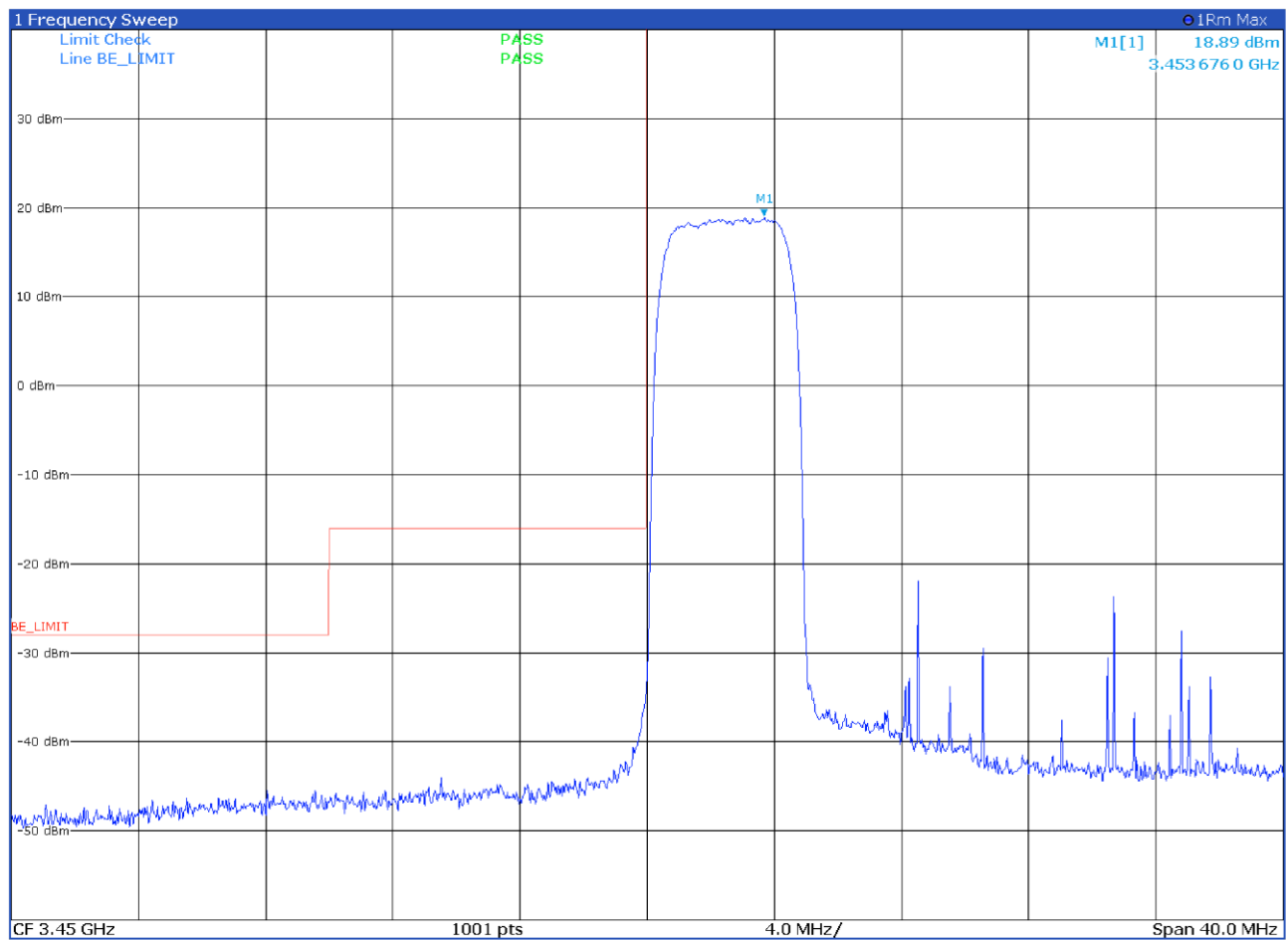


Figure 8.5-16: Antenna port 2 single carrier lower block edge with input signal at AGC threshold +3 dB

8.6 Spurious emissions conducted measurements

8.6.1 References, definitions and limits

FCC §27.53(n):

3.45 GHz Service. The following emission limits apply to stations transmitting in the 3450–3550 MHz band:

For base station operations in the 3450–3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed –13 dBm/MHz. Compliance with the provisions of this paragraph (n)(1) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, but limited to a maximum of 200 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. Notwithstanding the channel edge requirement of –13 dBm per megahertz, for base station operations in the 3450–3550 MHz band, the conducted power of any emission below 3440 MHz or above 3560 MHz shall not exceed –25 dBm/MHz, and the conducted power of emissions below 3430 MHz or above 3570 MHz shall not exceed –40 dBm/MHz.

For mobile operations in the 3450–3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed –13 dBm/MHz. Compliance with this paragraph (n)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, but limited to a maximum of 200 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

8.6.2 Test summary

Verdict	Pass		
Tested by	P. Barbieri	Test date	July 18, 2023

8.6.3 Observations, settings and special notes

The spectrum was searched from 9 kHz 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.

Limit line ($43 + 10 \log_{10}(P)$ or –13 dBm) was adjusted for MIMO operation by 3 dB*: –13 dBm – 3 dB = –16 dBm

*MIMO correction factor for 2 antenna ports: $10 \times \log_{10}(2) = 3.01$ dB

Spectrum analyser settings:

Resolution bandwidth:	Reference bandwidth in the applicable rule section for the supported frequency band
Video bandwidth:	VBW $\geq 3 \times$ RBW
Detector mode:	Peak
Trace mode:	Max Hold

Input signal frequency

Low channel	3452.5 MHz
Middle channel	3500.0 MHz
High channel	3547.5 MHz

8.6.4 Test equipment used

Equipment	Manufacturer	Model no.	Asset no.
Spectrum Analyzer	Rohde & Schwarz	FSW43	101767
RF Vector Signal Generator	Rohde & Schwarz	SMBV100A	263254
RF Vector Signal Generator	Rohde & Schwarz	SMBV100A	263397

Notes: --

8.6.5 Test data

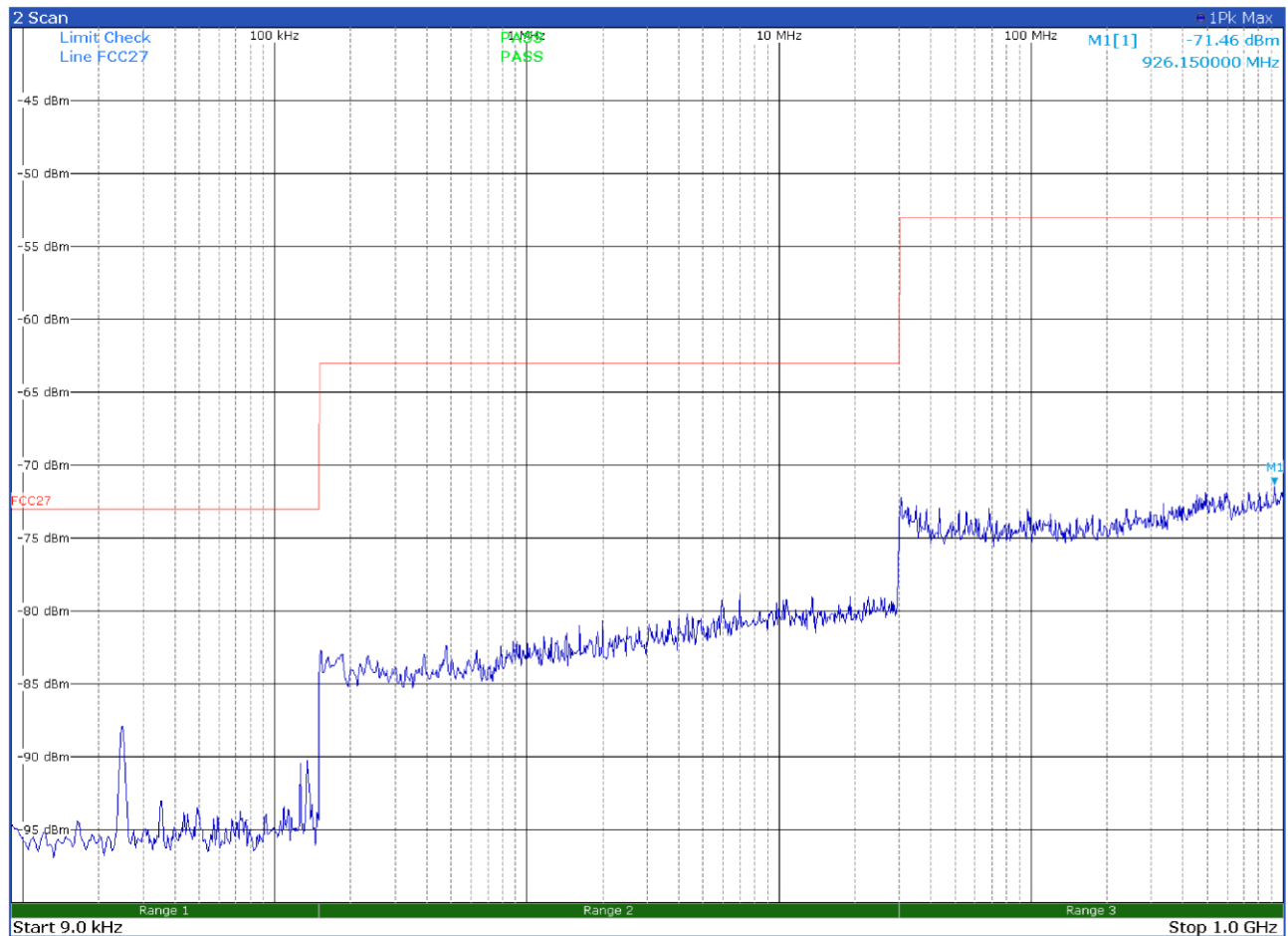


Figure 8.6-1: Conducted spurious emissions of low channel, antenna port 1 – Range 9 kHz to 1000 MHz

Test data, continued

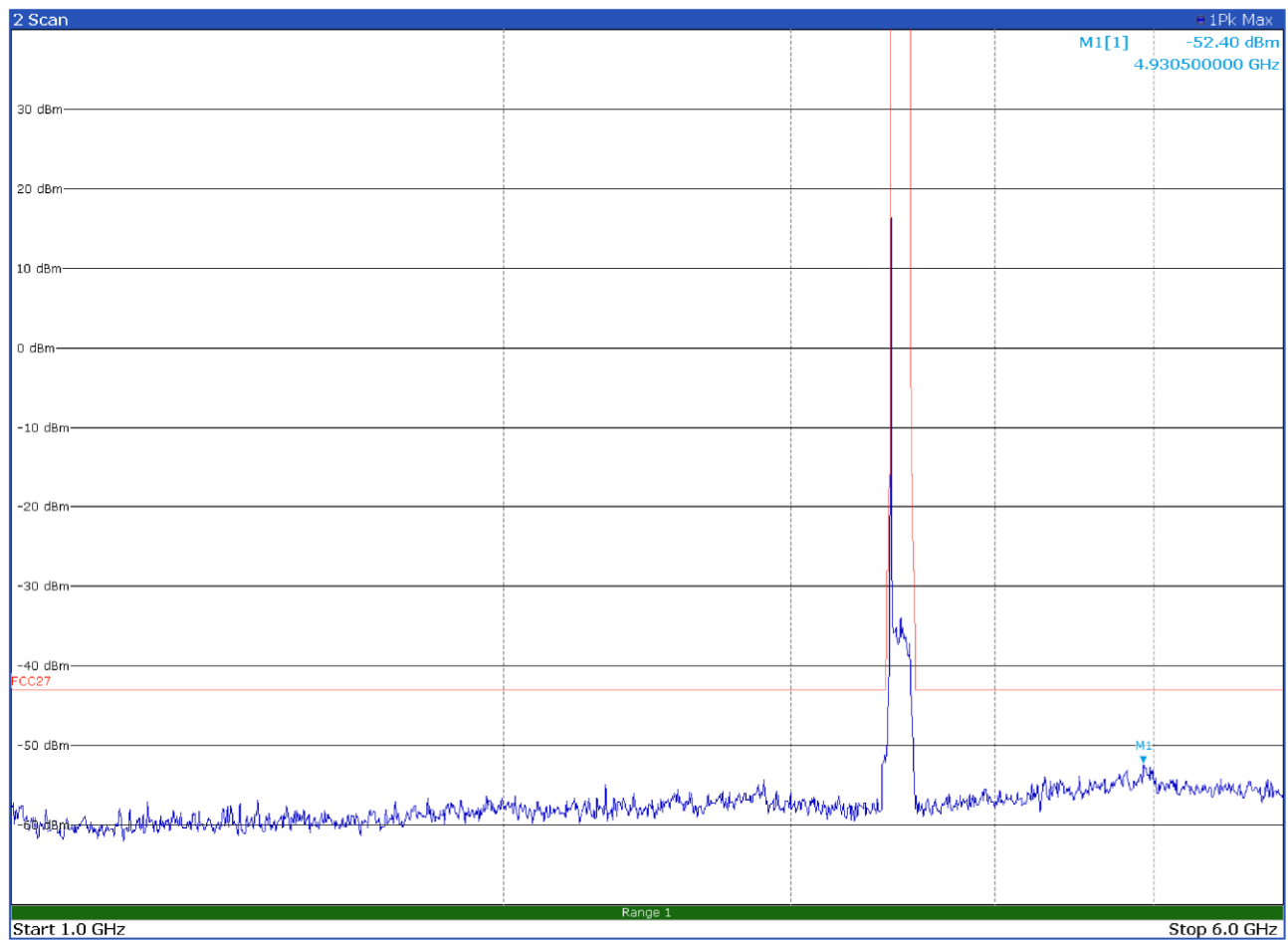


Figure 8.6-2: Conducted spurious emissions of low channel, antenna port 1 – Range 1000 MHz to 6000 MHz

Test data, continued

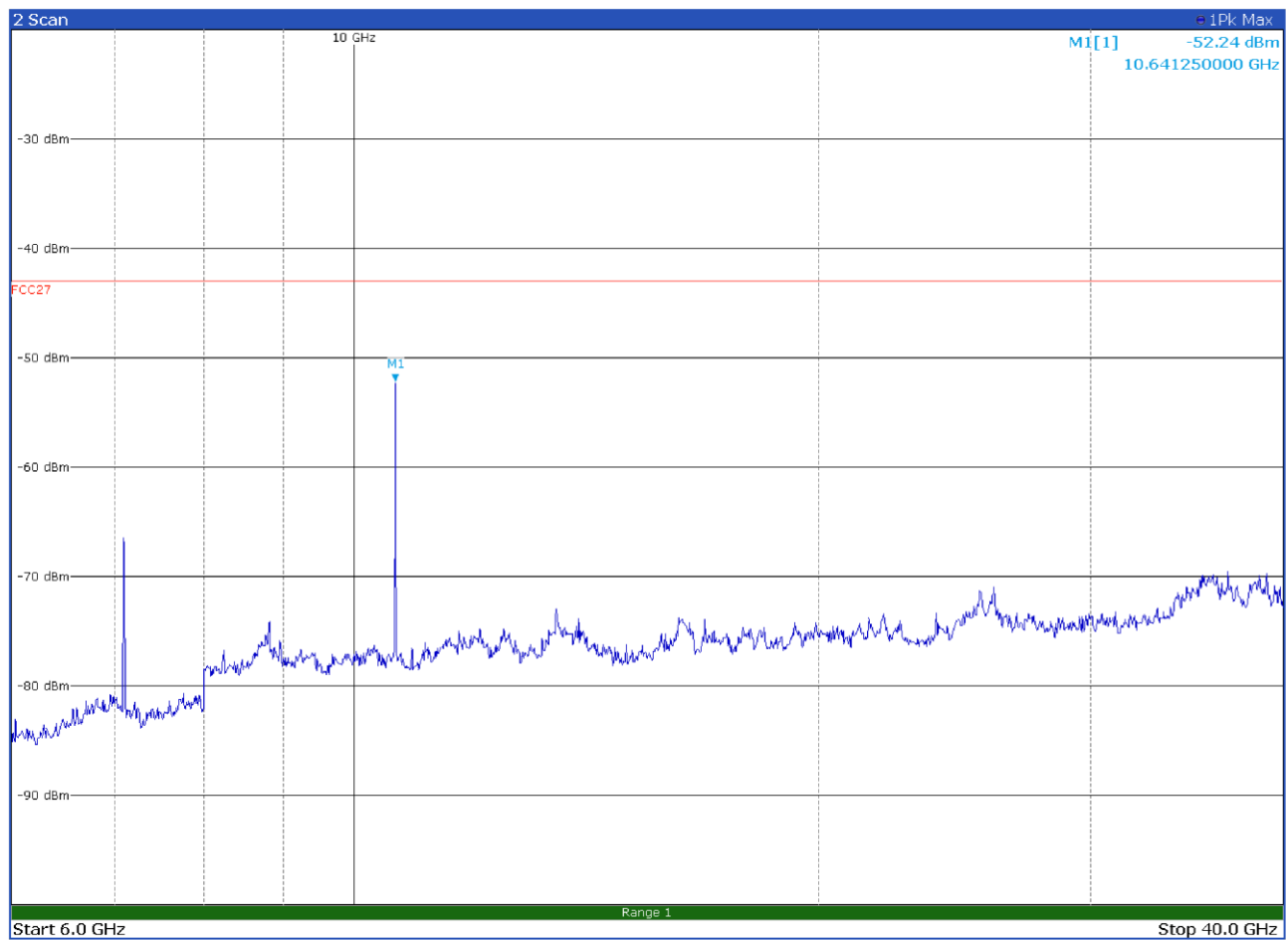


Figure 8.6-3: Conducted spurious emissions of low channel, antenna port 1 – Range 6000 MHz to 10th harmonic

Test data, continued

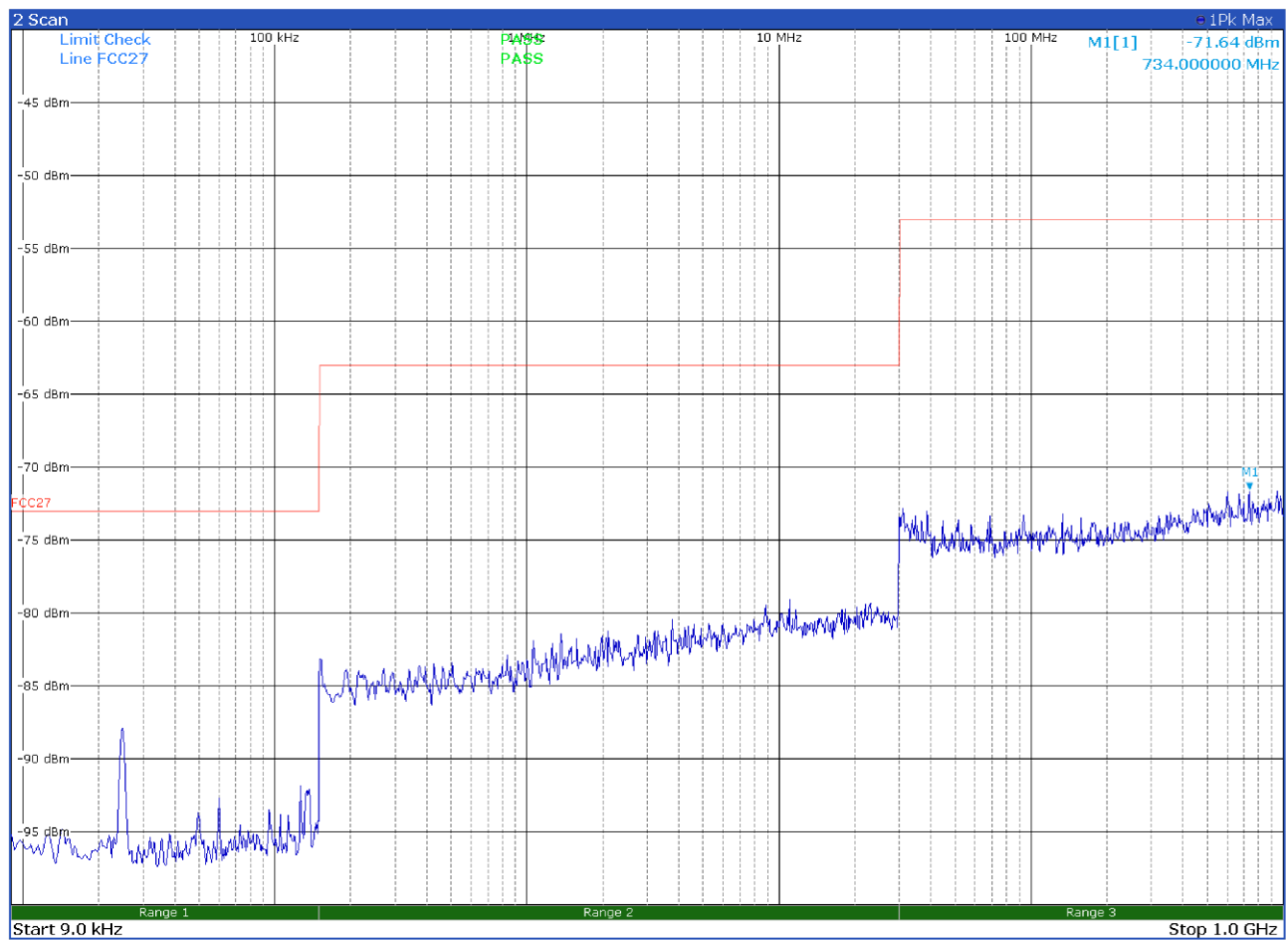


Figure 8.6-4: Conducted spurious emissions of middle channel, antenna port 1 – Range 9 kHz to 1000 MHz

Test data, continued

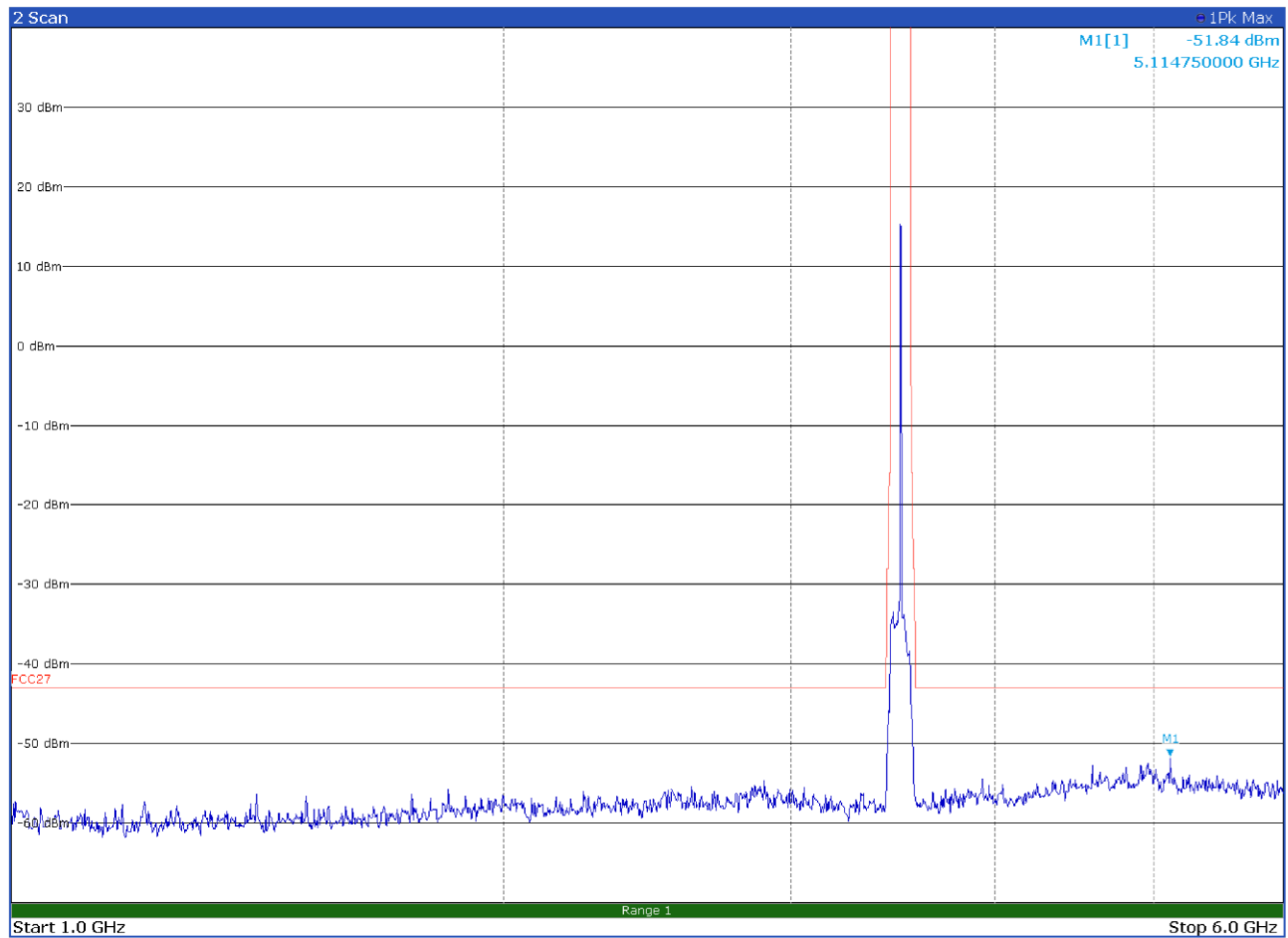


Figure 8.6-5: Conducted spurious emissions of middle channel, antenna port 1 – Range 1000 MHz to 6000 MHz

Test data, continued

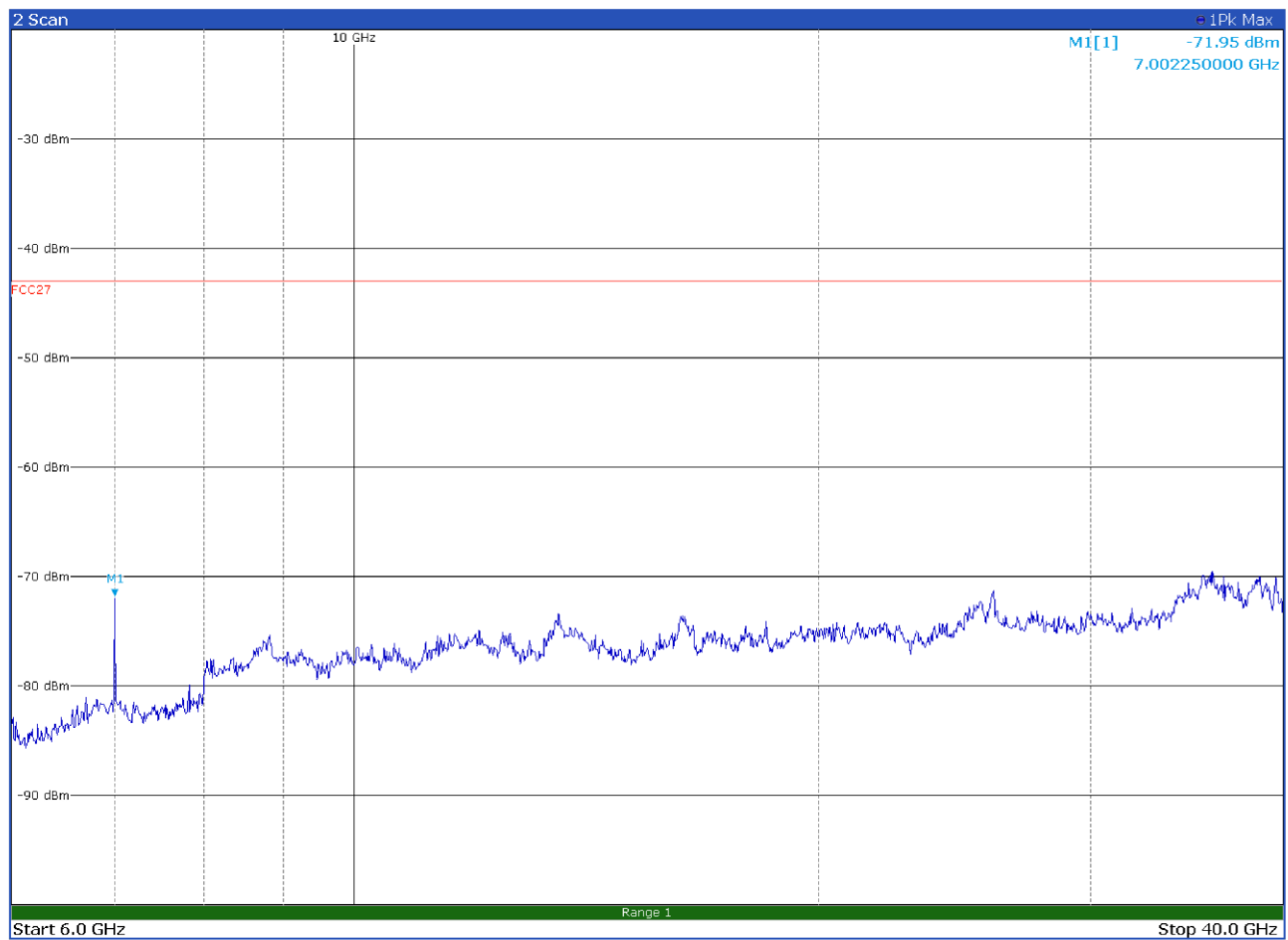


Figure 8.6-6: Conducted spurious emissions of middle channel, antenna port 1 – Range 6000 MHz to 10th harmonic

Test data, continued

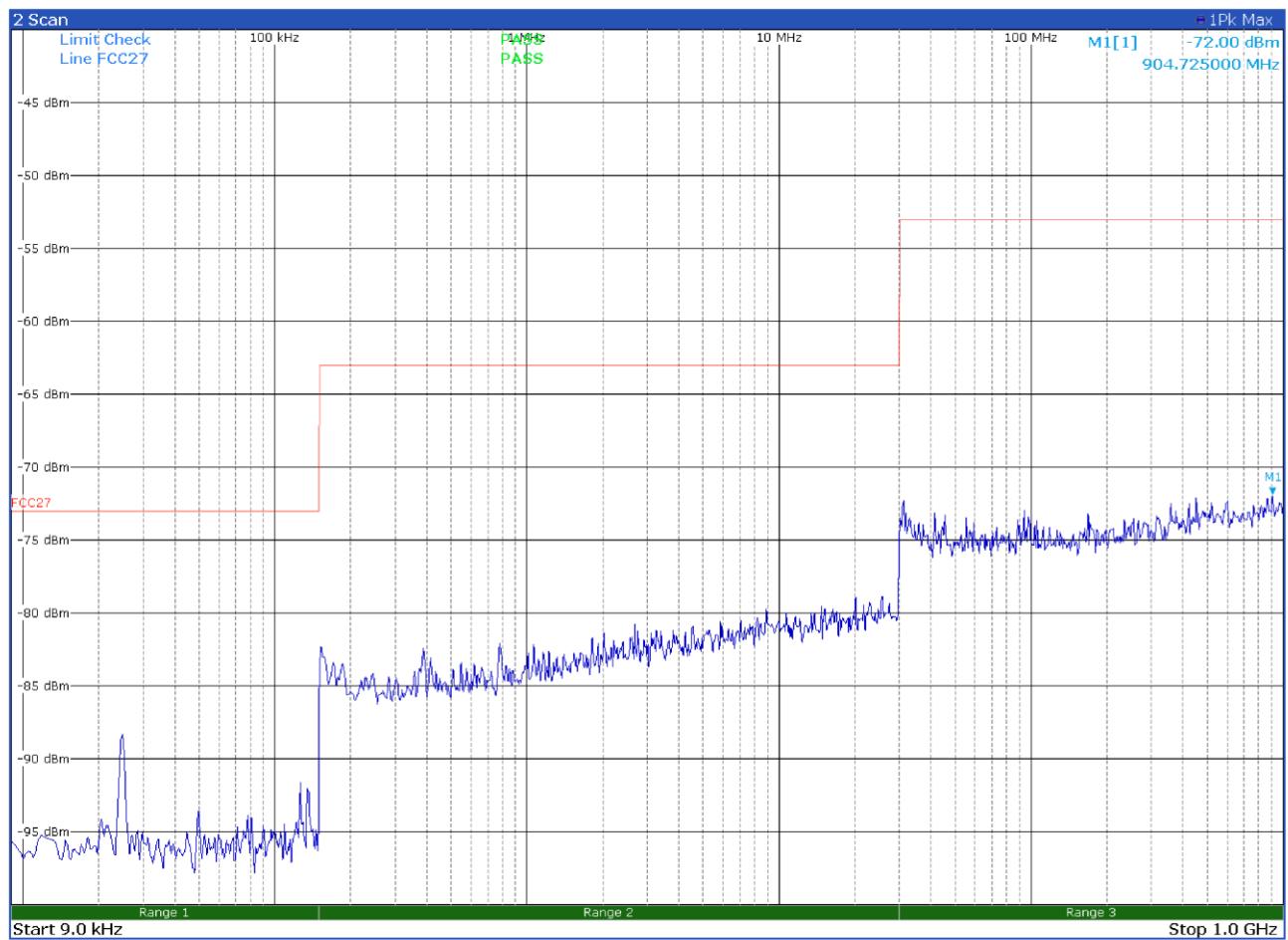


Figure 8.6-7: Conducted spurious emissions of high channel, antenna port 1 – Range 9 kHz to 1000 MHz

Test data, continued

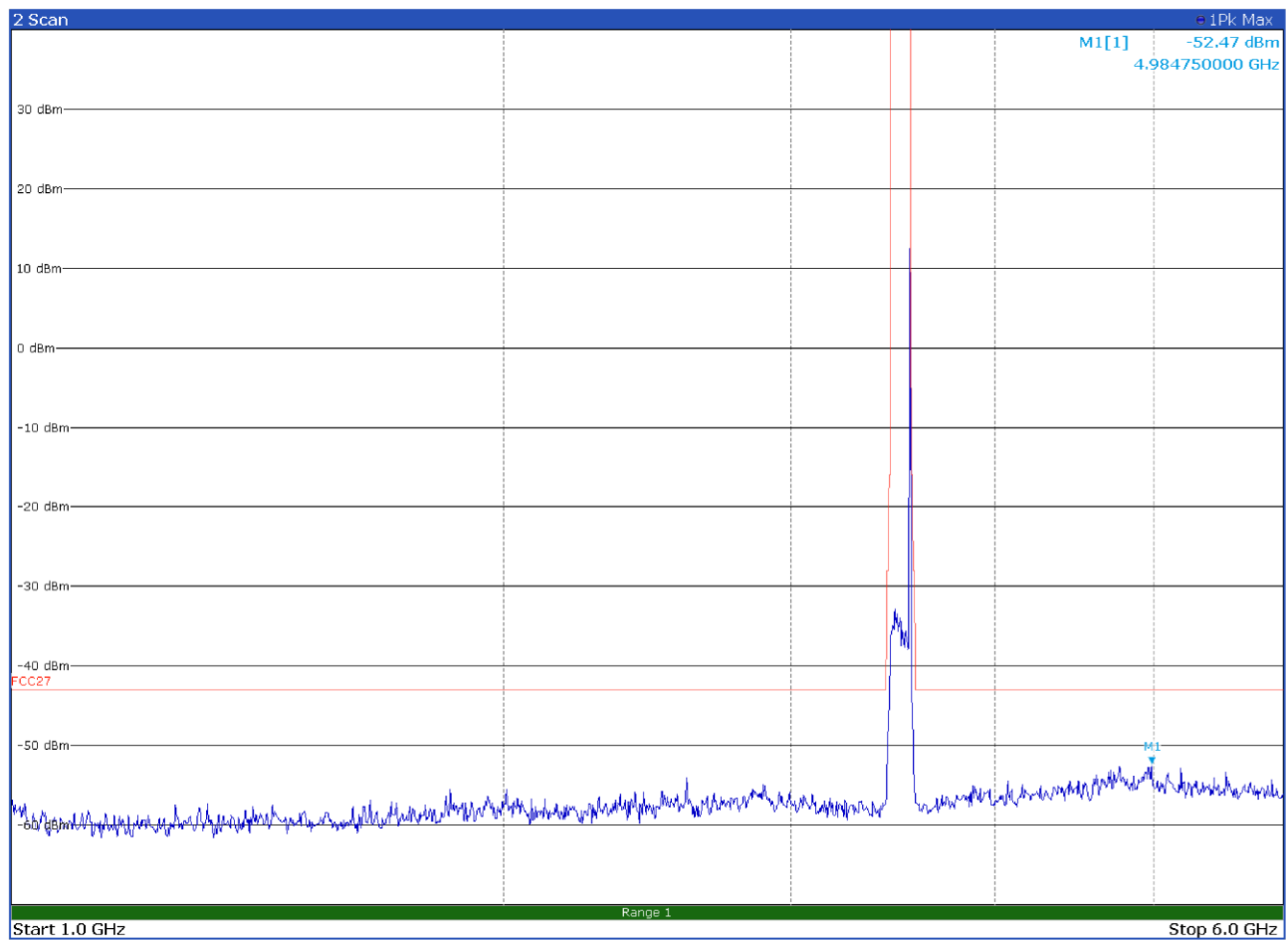


Figure 8.6-8: Conducted spurious emissions of high channel, antenna port 1 – Range 1000 MHz to 6000 MHz

Test data, continued

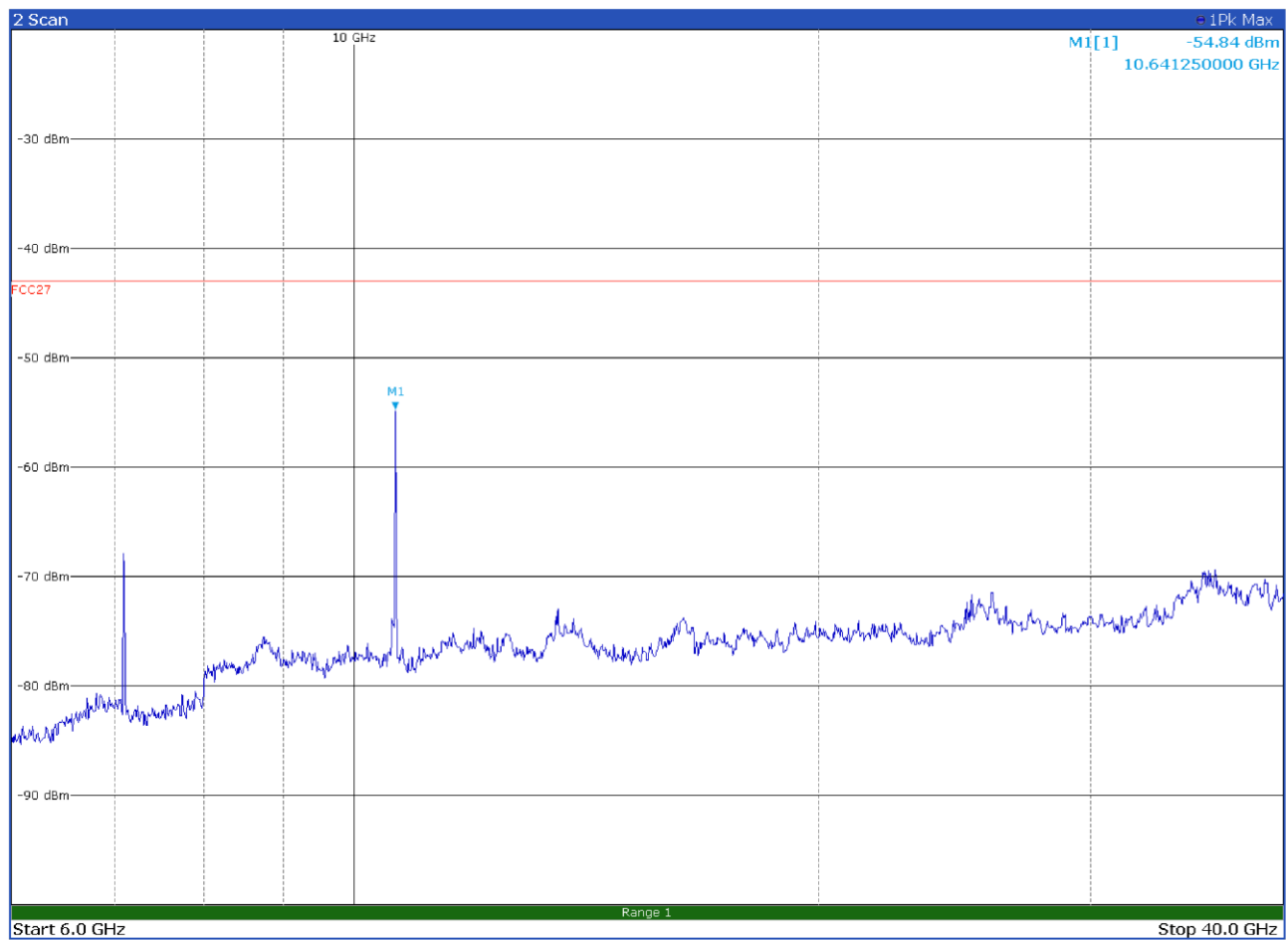


Figure 8.6-9: Conducted spurious emissions of high channel, antenna port 1 – Range 6000 MHz to 10th harmonic

8.6.1 Test data

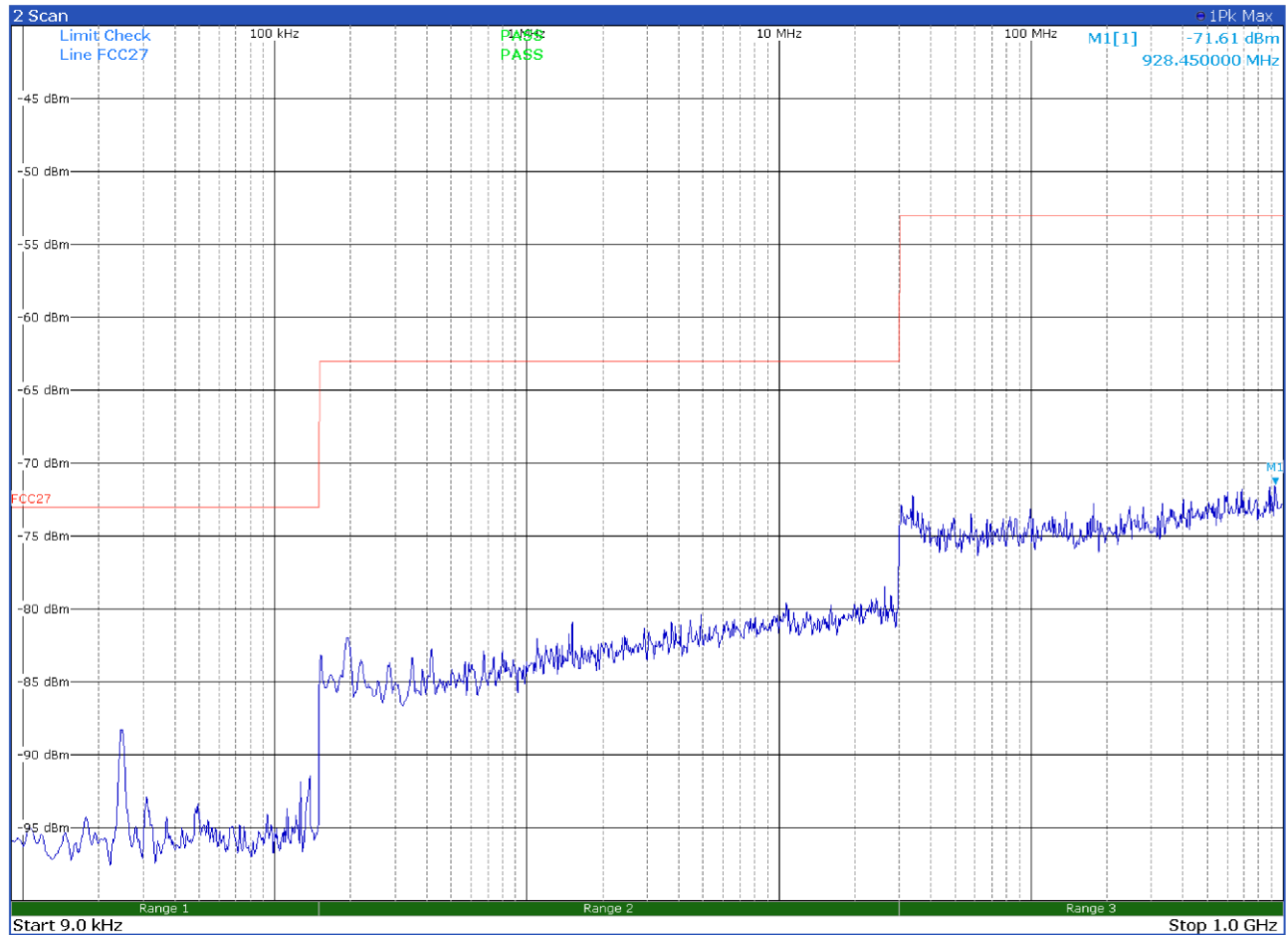


Figure 8.6-10: Conducted spurious emissions of low channel, antenna port 2 – Range 9 kHz to 1000 MHz

Test data, continued

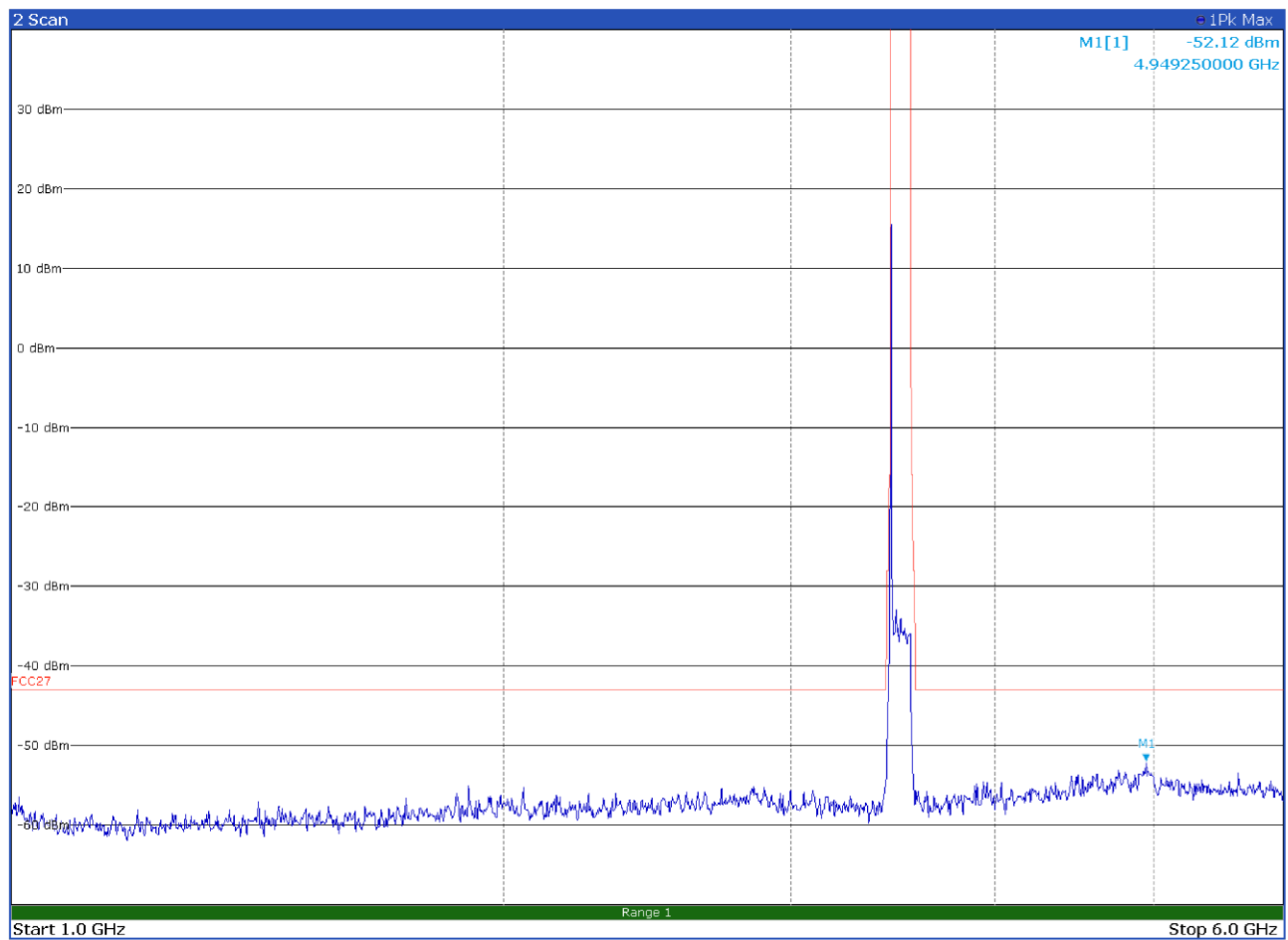


Figure 8.6-11: Conducted spurious emissions of low channel, antenna port 2 – Range 1000 MHz to 6000 MHz

Test data, continued

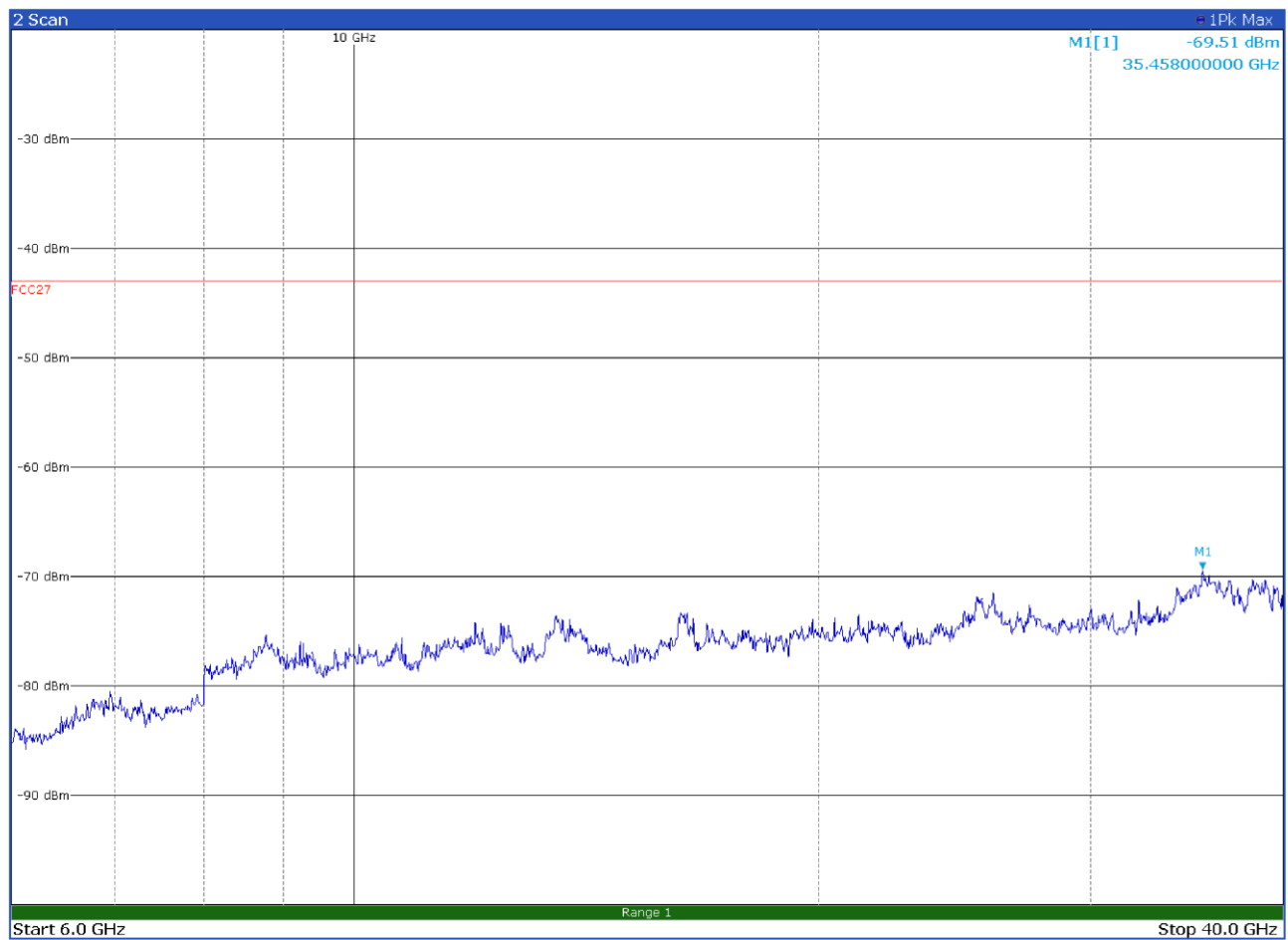


Figure 8.6-12: Conducted spurious emissions of low channel, antenna port 2 – Range 6000 MHz to 10th harmonic

Test data, continued

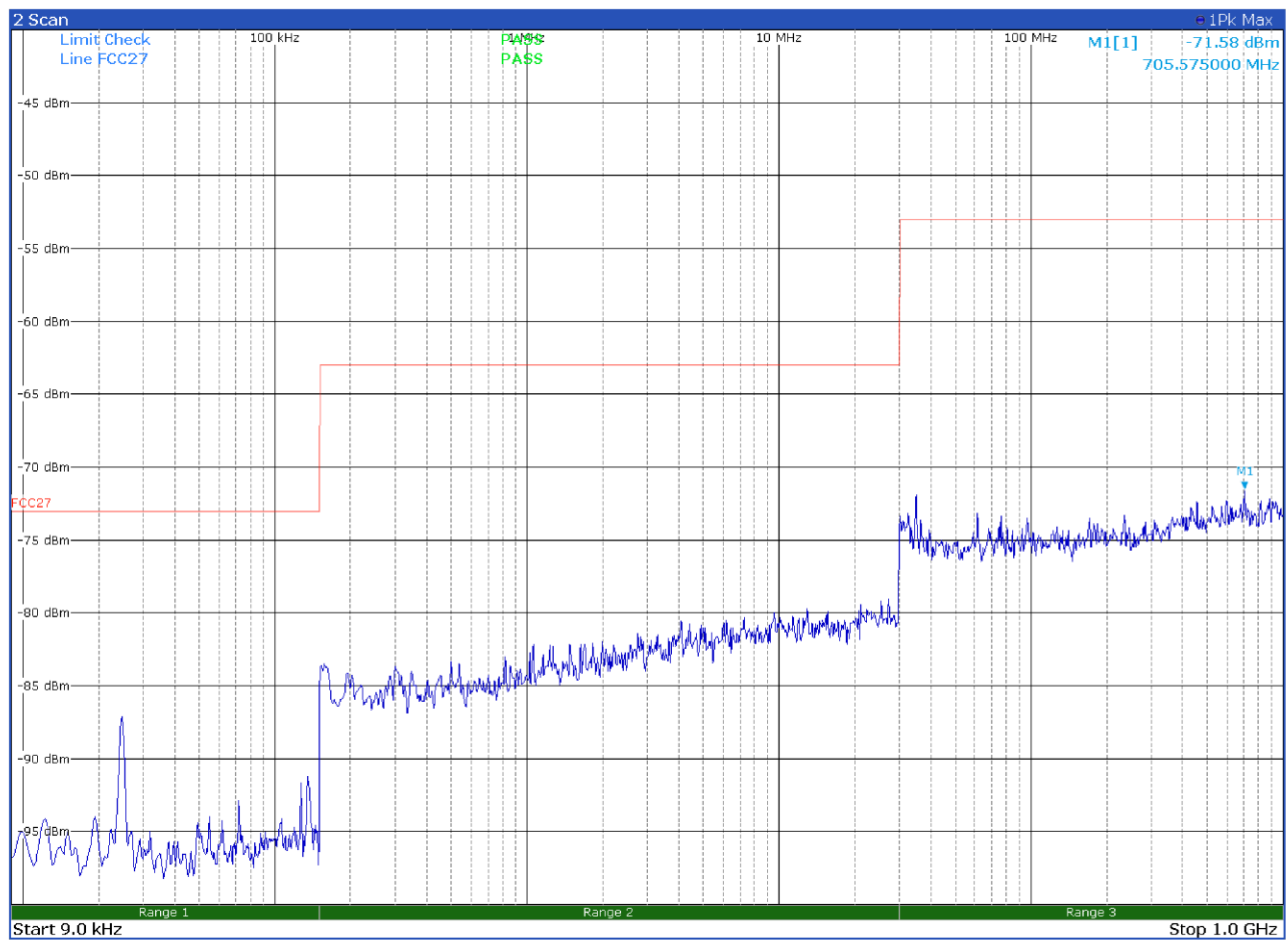


Figure 8.6-13: Conducted spurious emissions of middle channel, antenna port 2 – Range 9 kHz to 1000 MHz

Test data, continued

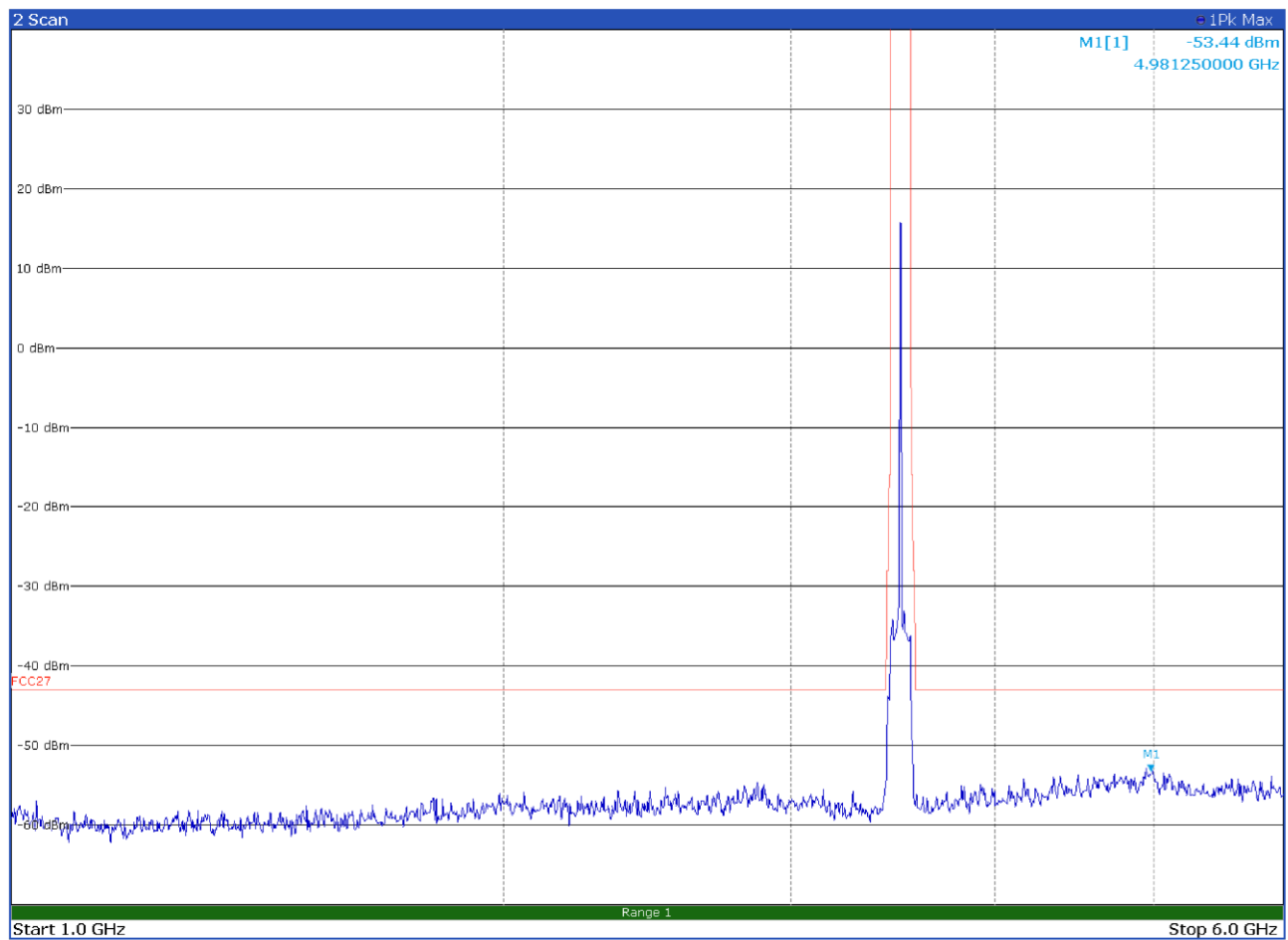


Figure 8.6-14: Conducted spurious emissions of middle channel, antenna port 2 – Range 1000 MHz to 6000 MHz

Test data, continued

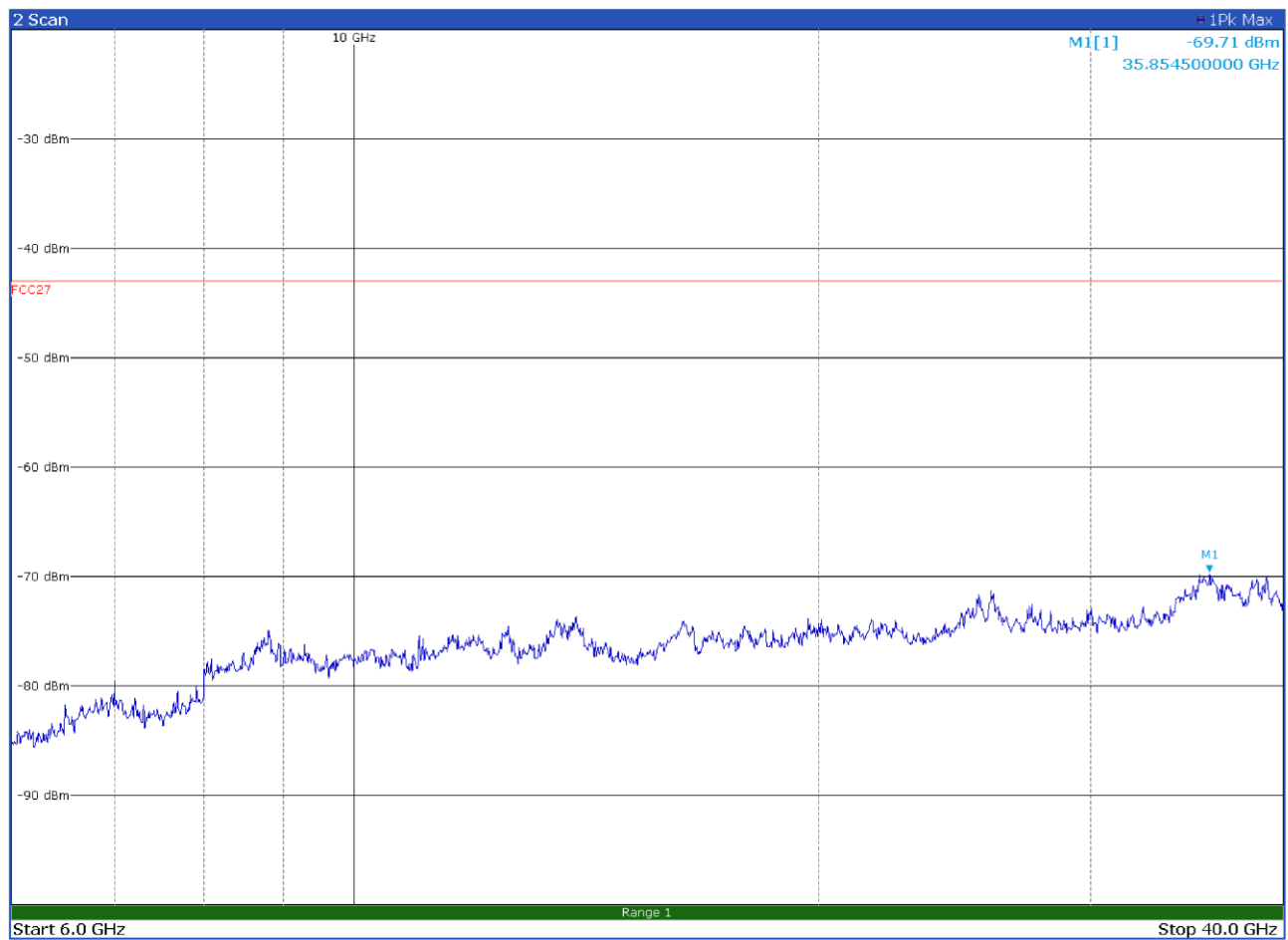


Figure 8.6-15: Conducted spurious emissions of middle channel, antenna port 2 – Range 6000 MHz to 10th harmonic

Test data, continued

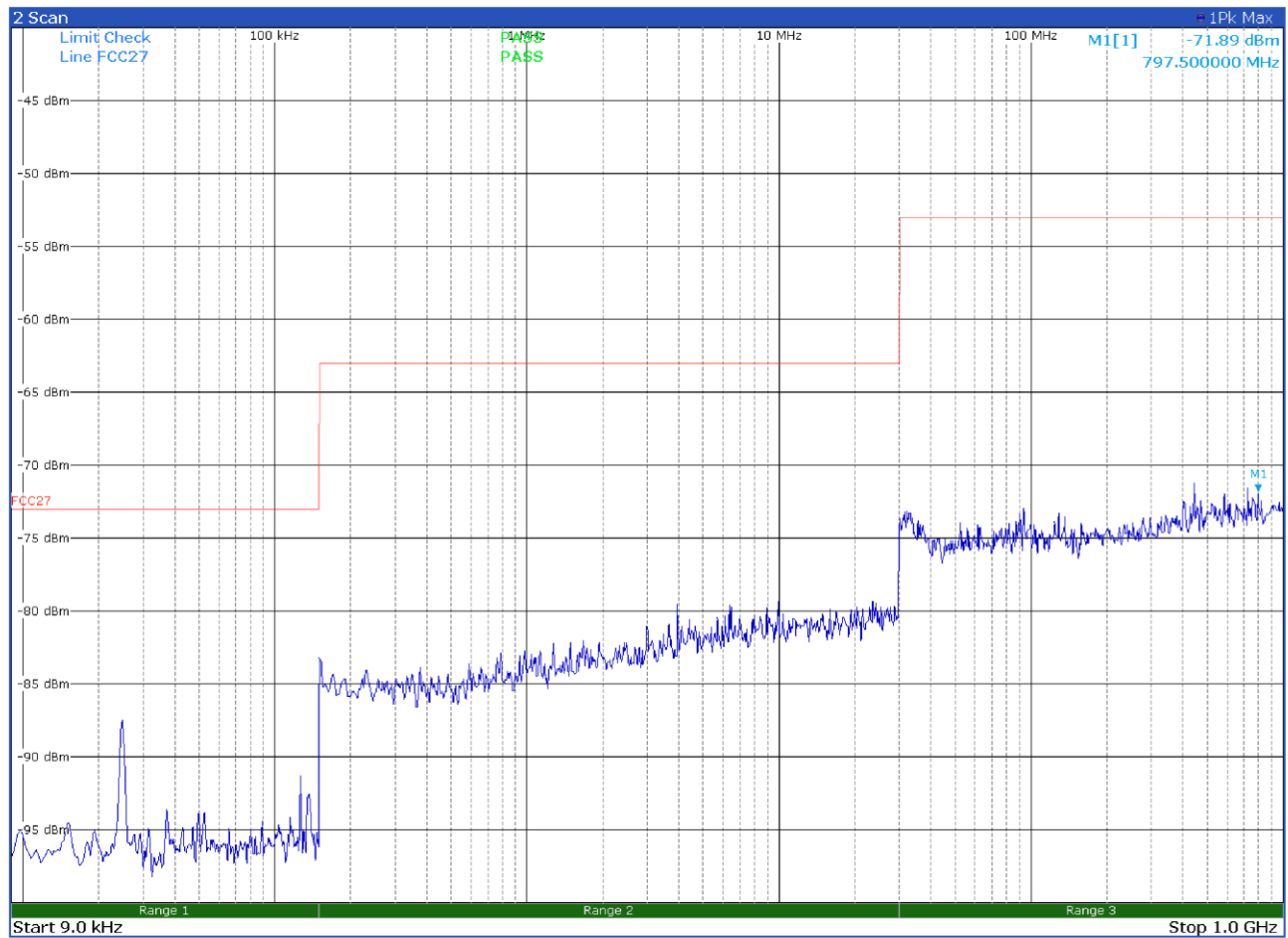


Figure 8.6-16: Conducted spurious emissions of high channel, antenna port 2 – Range 9 kHz to 1000 MHz

Test data, continued

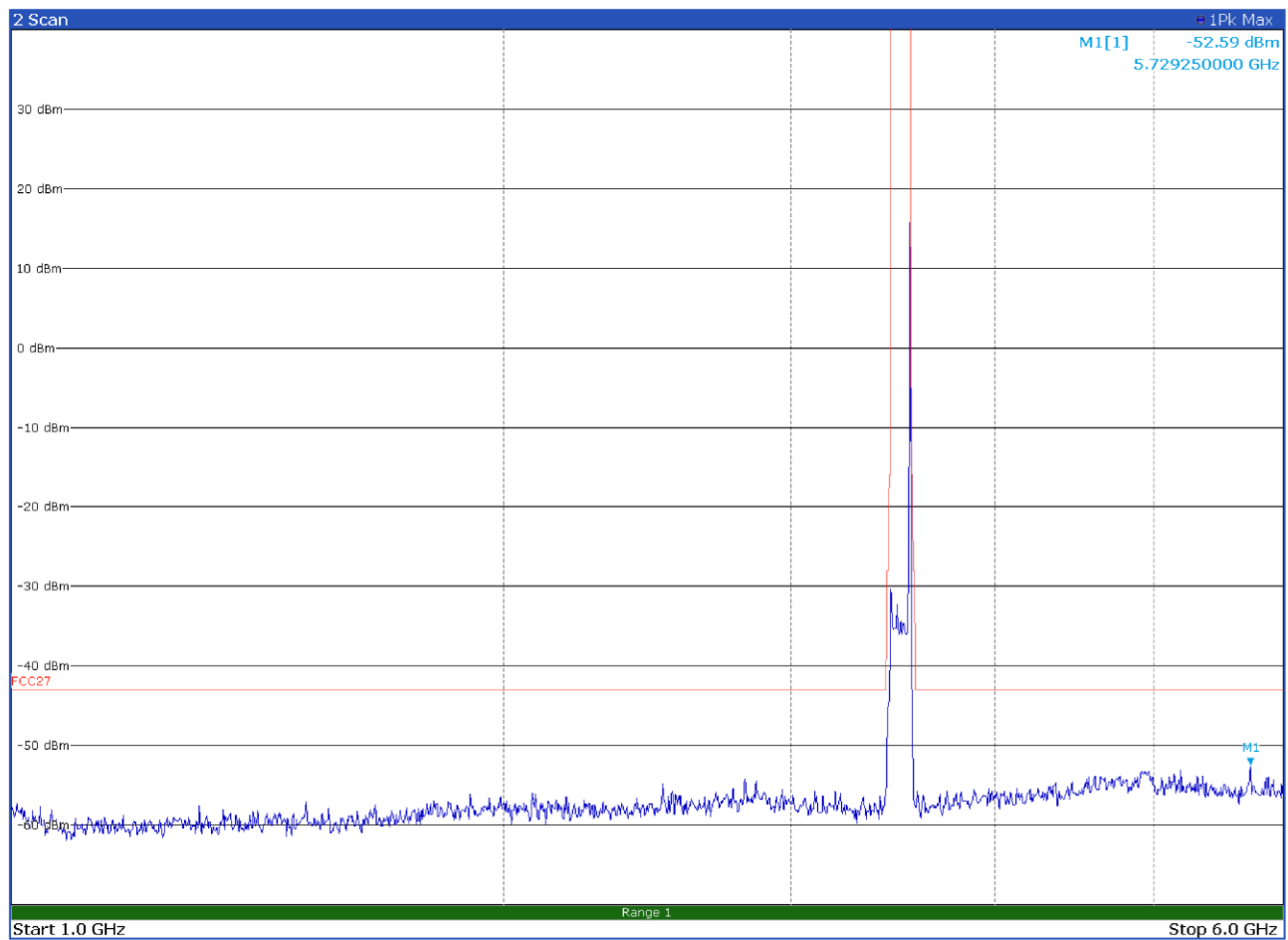


Figure 8.6-17: Conducted spurious emissions of high channel, antenna port 2 – Range 1000 MHz to 6000 MHz

Test data, continued

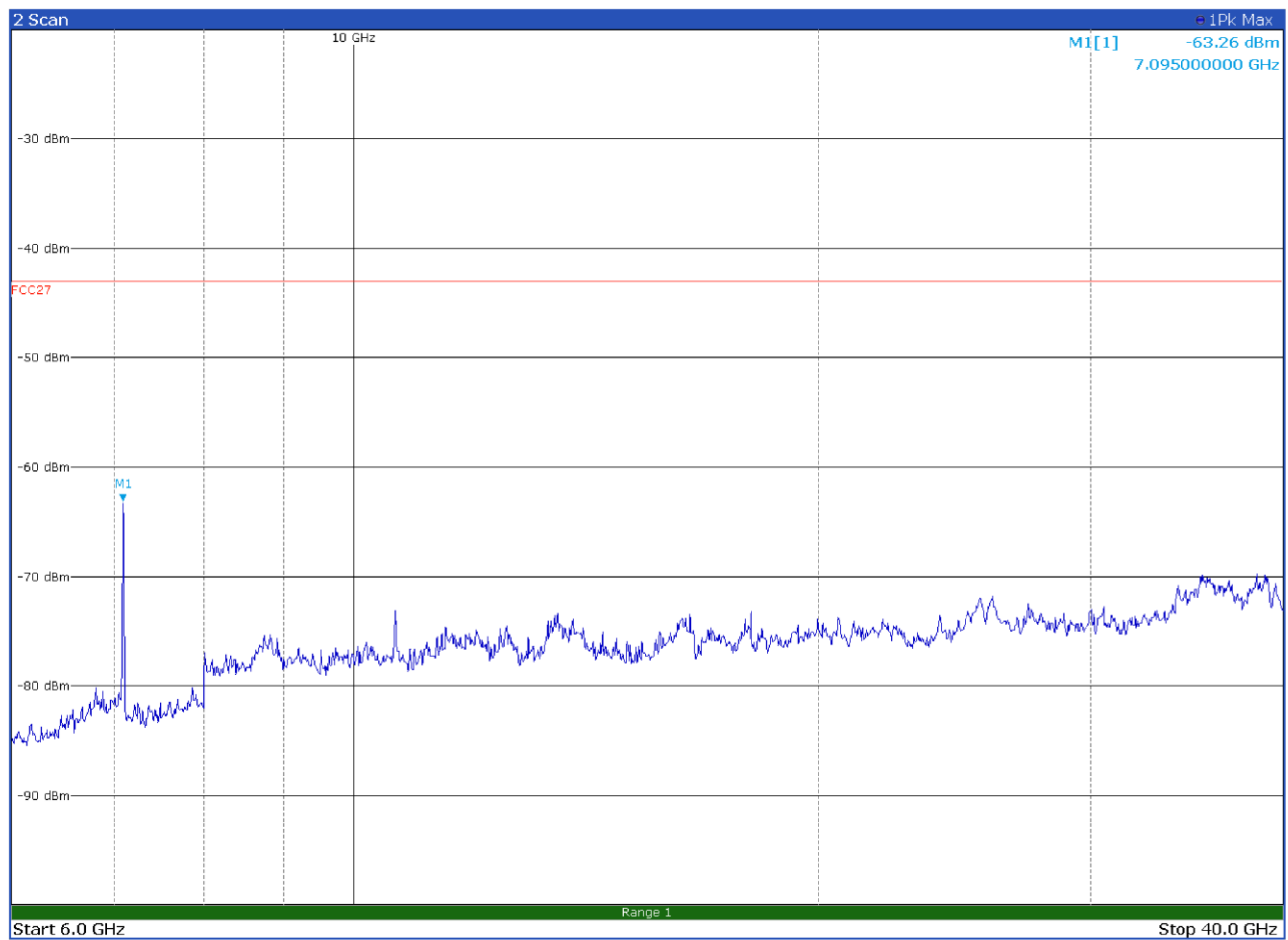


Figure 8.6-18: Conducted spurious emissions of high channel, antenna port 2 – Range 6000 MHz to 10th harmonic

8.7 Spurious emissions radiated measurements

8.7.1 References, definitions and limits

FCC §27.53(n):

3.45 GHz Service. The following emission limits apply to stations transmitting in the 3450–3550 MHz band:

For base station operations in the 3450–3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed –13 dBm/MHz. Compliance with the provisions of this paragraph (n)(1) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, but limited to a maximum of 200 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. Notwithstanding the channel edge requirement of –13 dBm per megahertz, for base station operations in the 3450–3550 MHz band, the conducted power of any emission below 3440 MHz or above 3560 MHz shall not exceed –25 dBm/MHz, and the conducted power of emissions below 3430 MHz or above 3570 MHz shall not exceed –40 dBm/MHz.

For mobile operations in the 3450–3550 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed –13 dBm/MHz. Compliance with this paragraph (n)(2) is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed, but limited to a maximum of 200 kHz. In the bands between 1 and 5 MHz removed from the licensee's frequency block, the minimum resolution bandwidth for the measurement shall be 500 kHz. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

8.7.2 Test summary

Verdict	Pass		
Tested by	P. Barbieri	Test date	July 5, 2023

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 $\geq 3 \times$ RBW
Detector mode:	Peak
Trace mode:	Max Hold

Input signal frequency

Low channel	3452.5 MHz
Middle channel	3500.0 MHz
High channel	3547.5 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
3m Semi anechoic chamber	Comtest	SAC-3	1711-150

Notes: --

8.7.5 Test data

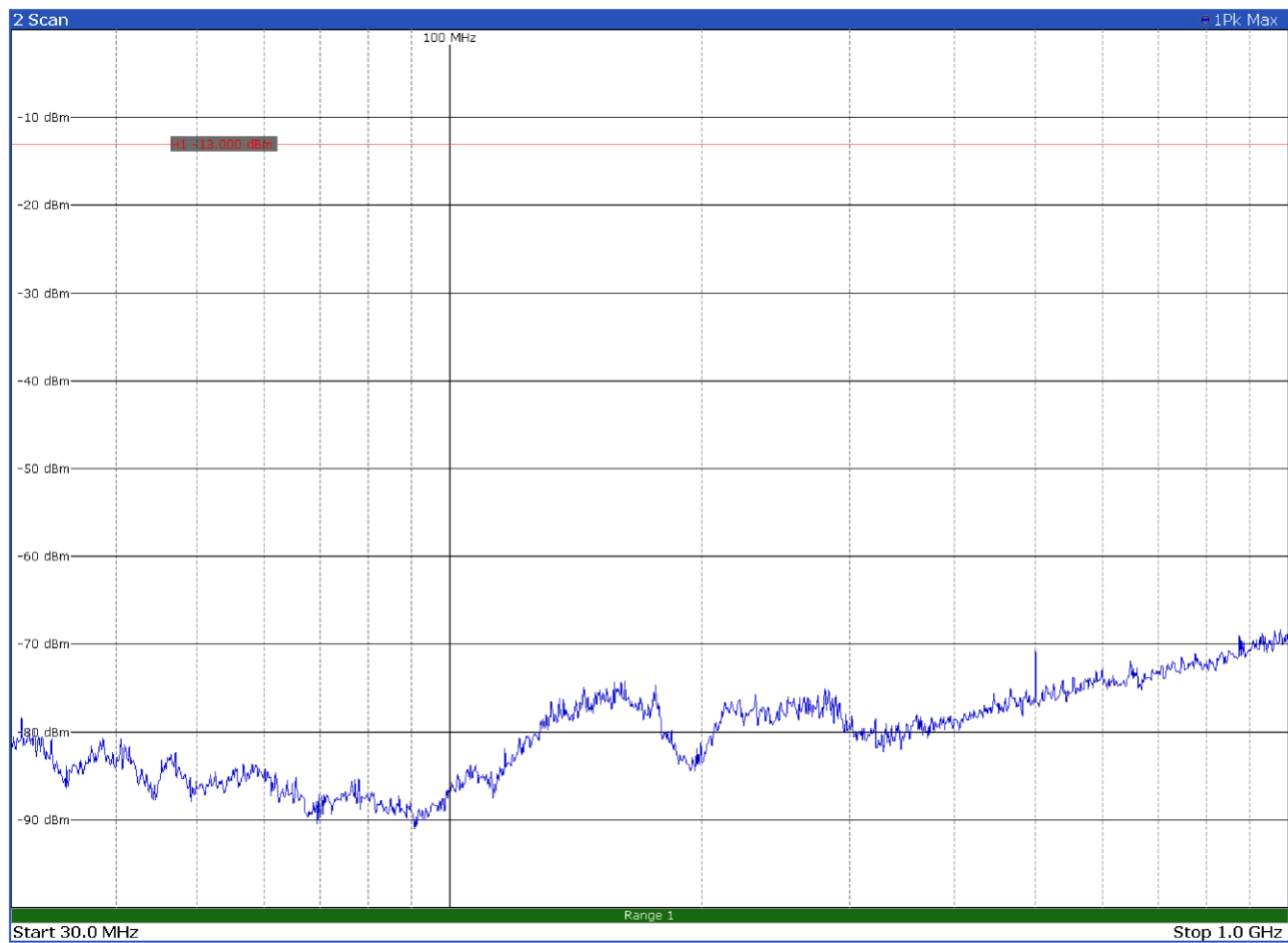


Figure 8.7-1: Radiated spurious emissions from 30 MHz to 1 GHz, low channel with antenna in horizontal polarization

Test data, continued

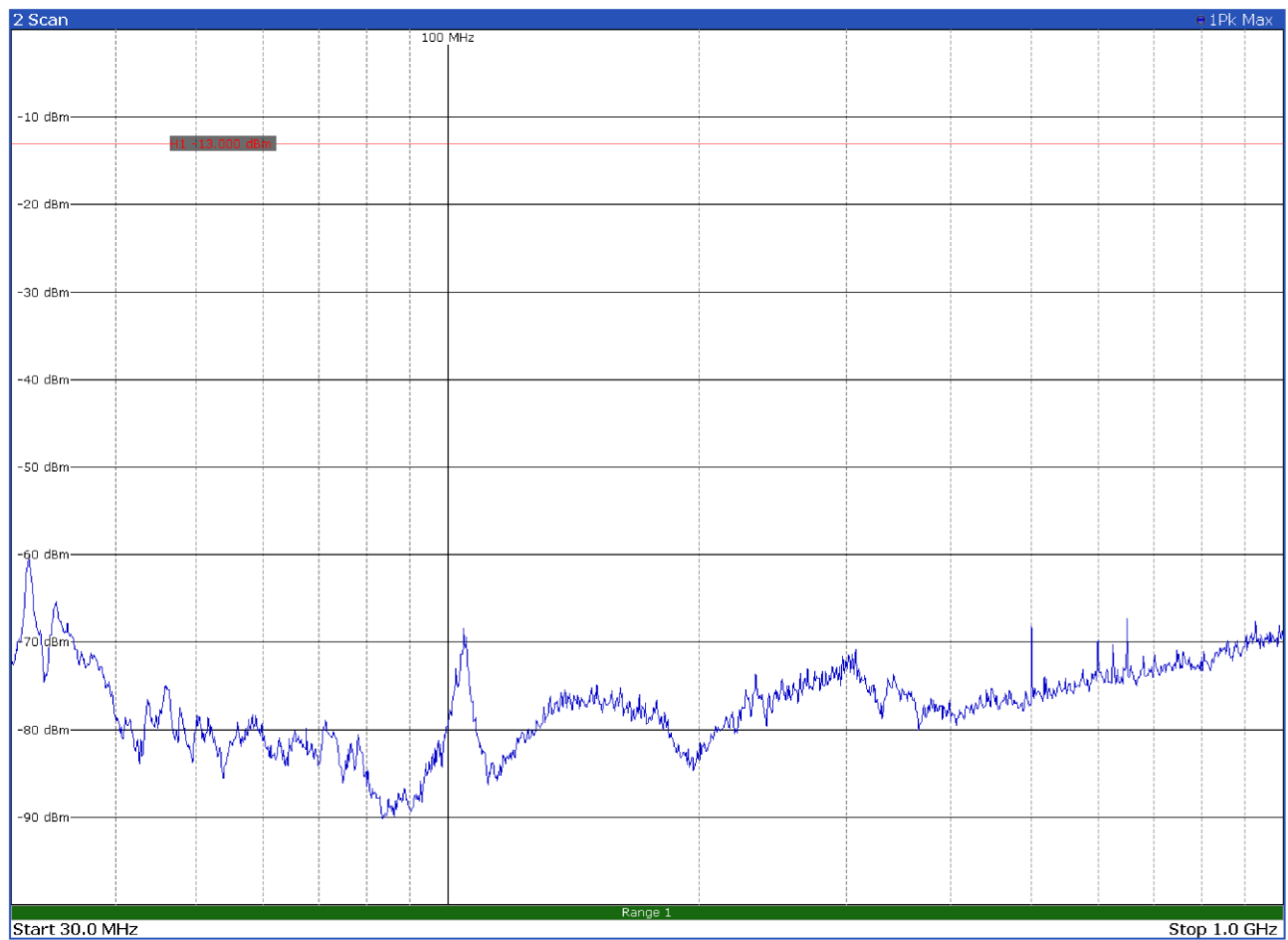


Figure 8.7-2: Radiated spurious emissions from 30 MHz to 1 GHz, low channel with antenna in vertical polarization

Test data, continued

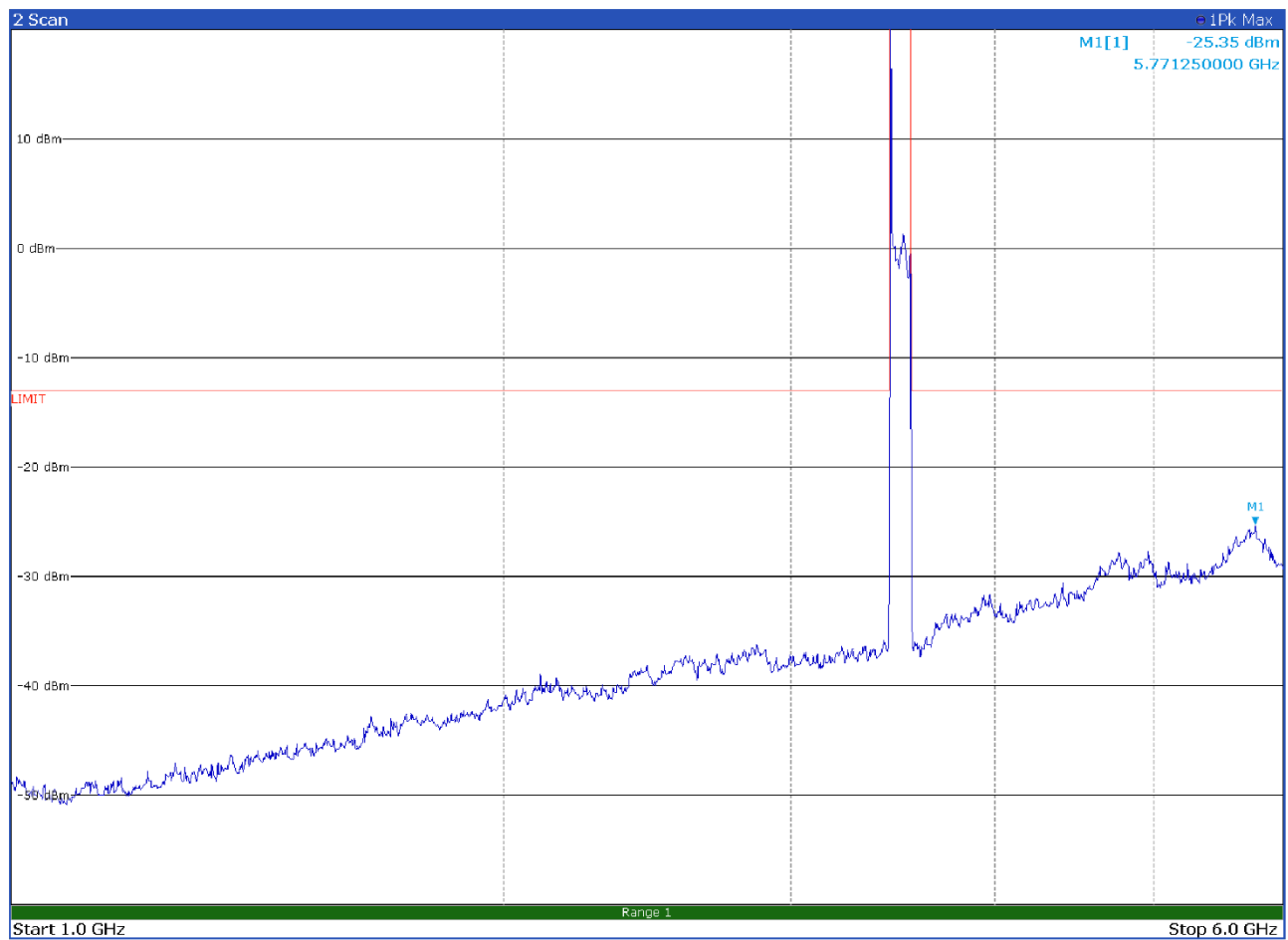


Figure 8.7-3: Radiated spurious emissions from 1 GHz to 6 GHz, low channel with antenna in horizontal polarization

Test data, continued

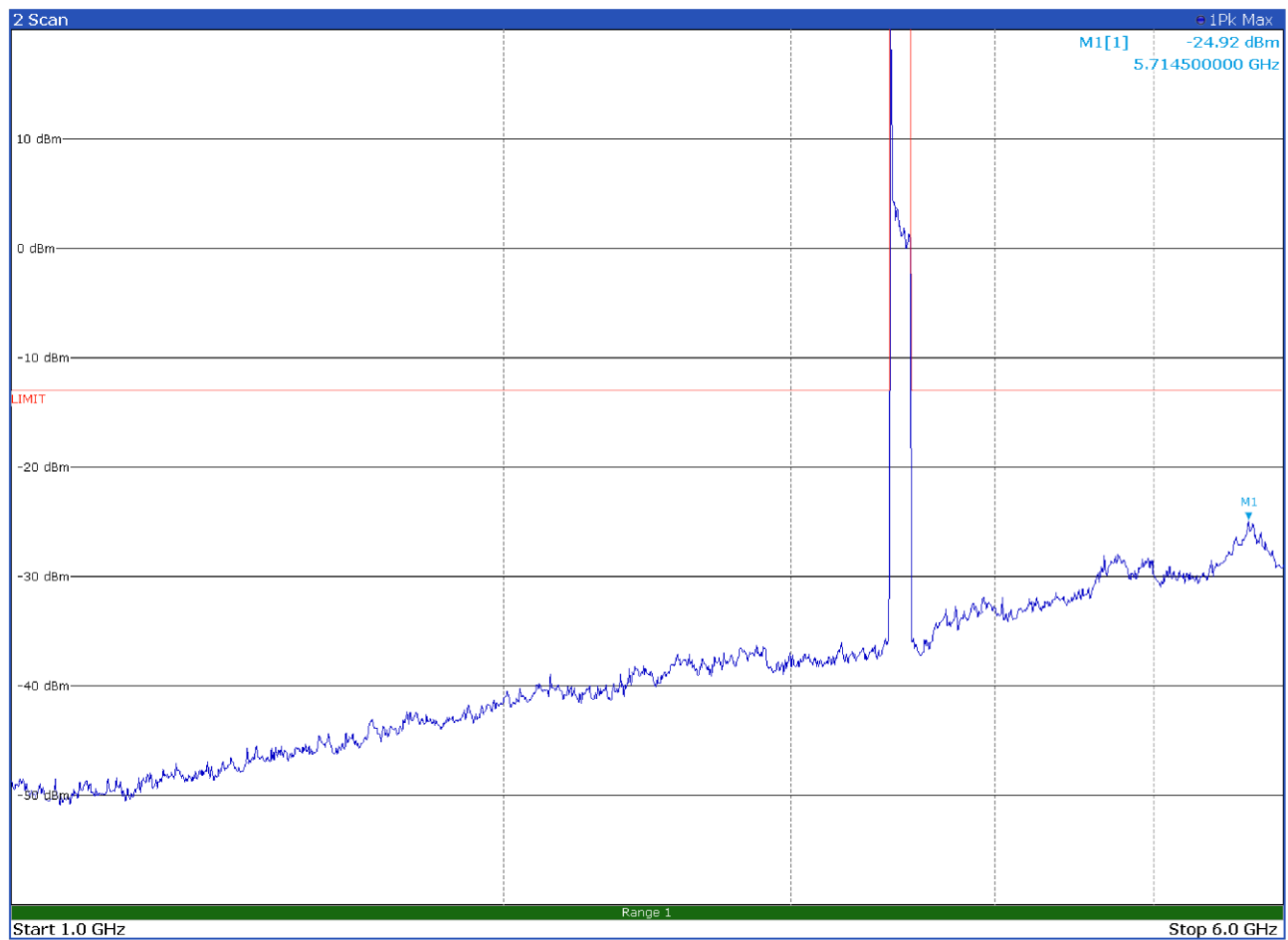


Figure 8.7-4: Radiated spurious emissions from 1 GHz to 6 GHz, low channel with antenna in vertical polarization

Test data, continued

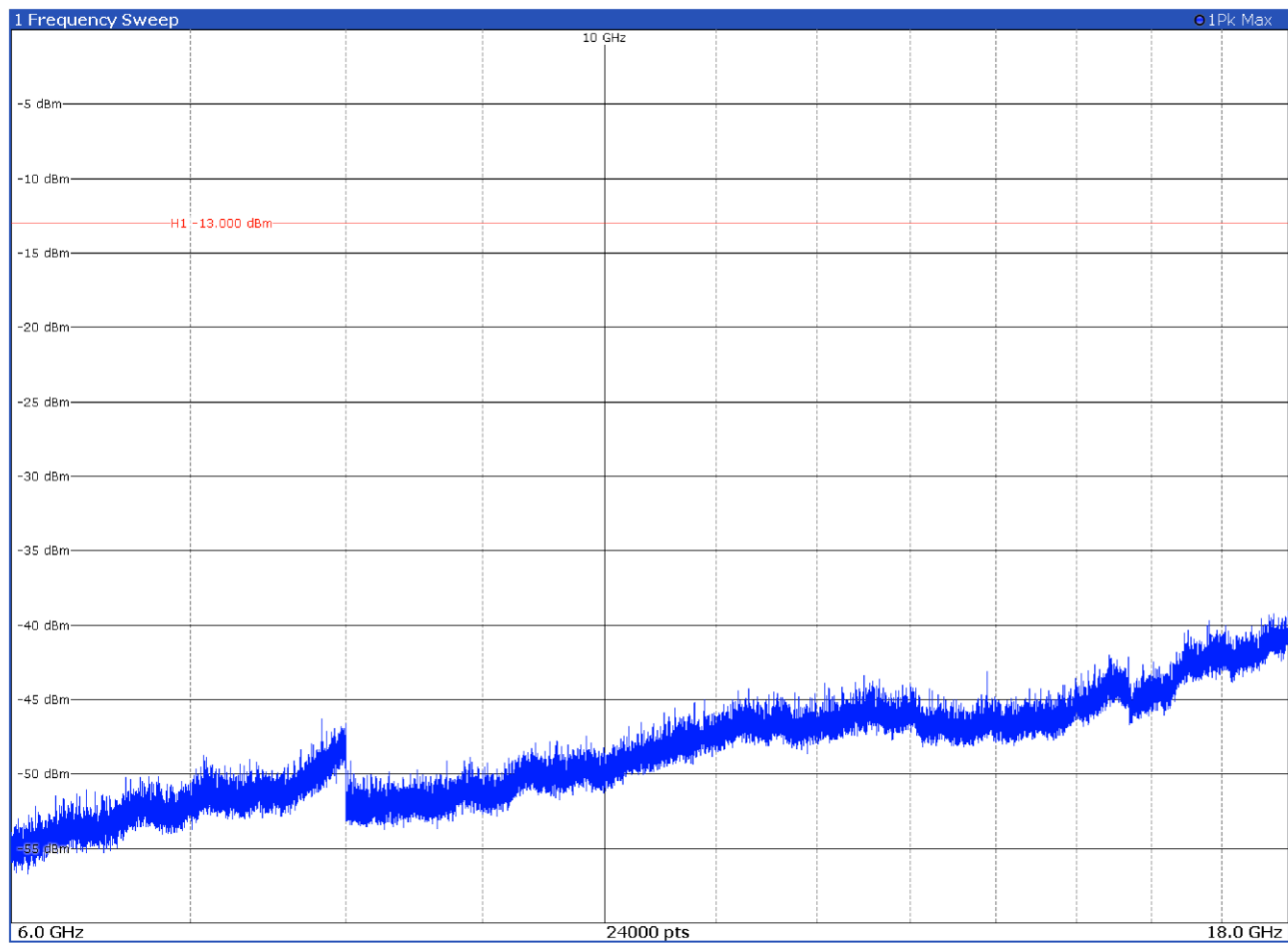


Figure 8.7-5: Radiated spurious emissions from 6 GHz to 18 GHz, low channel with antenna in horizontal polarization

Test data, continued

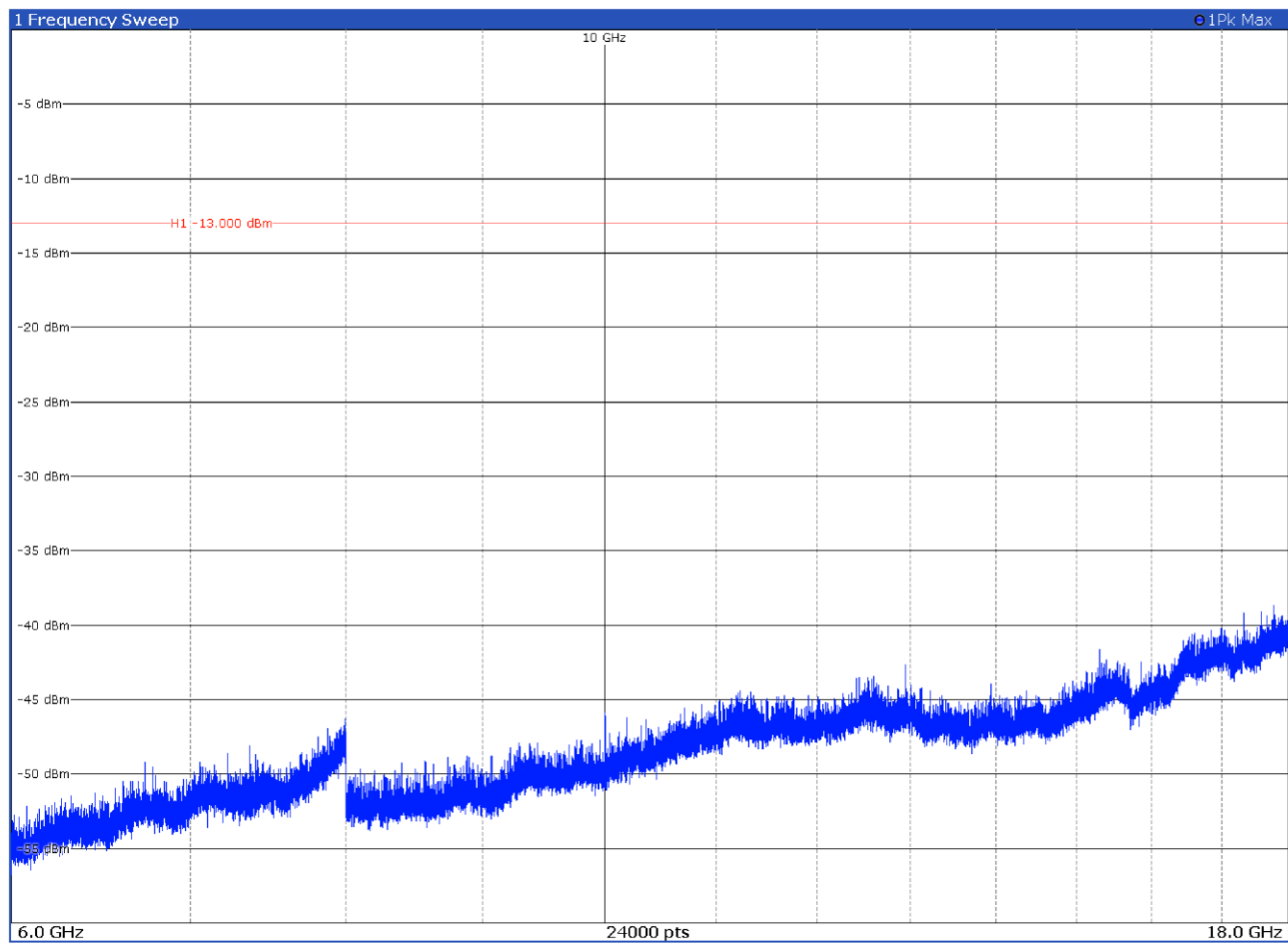


Figure 8.7-6: Radiated spurious emissions from 6 GHz to 18 GHz, low channel with antenna in vertical polarization

Test data, continued

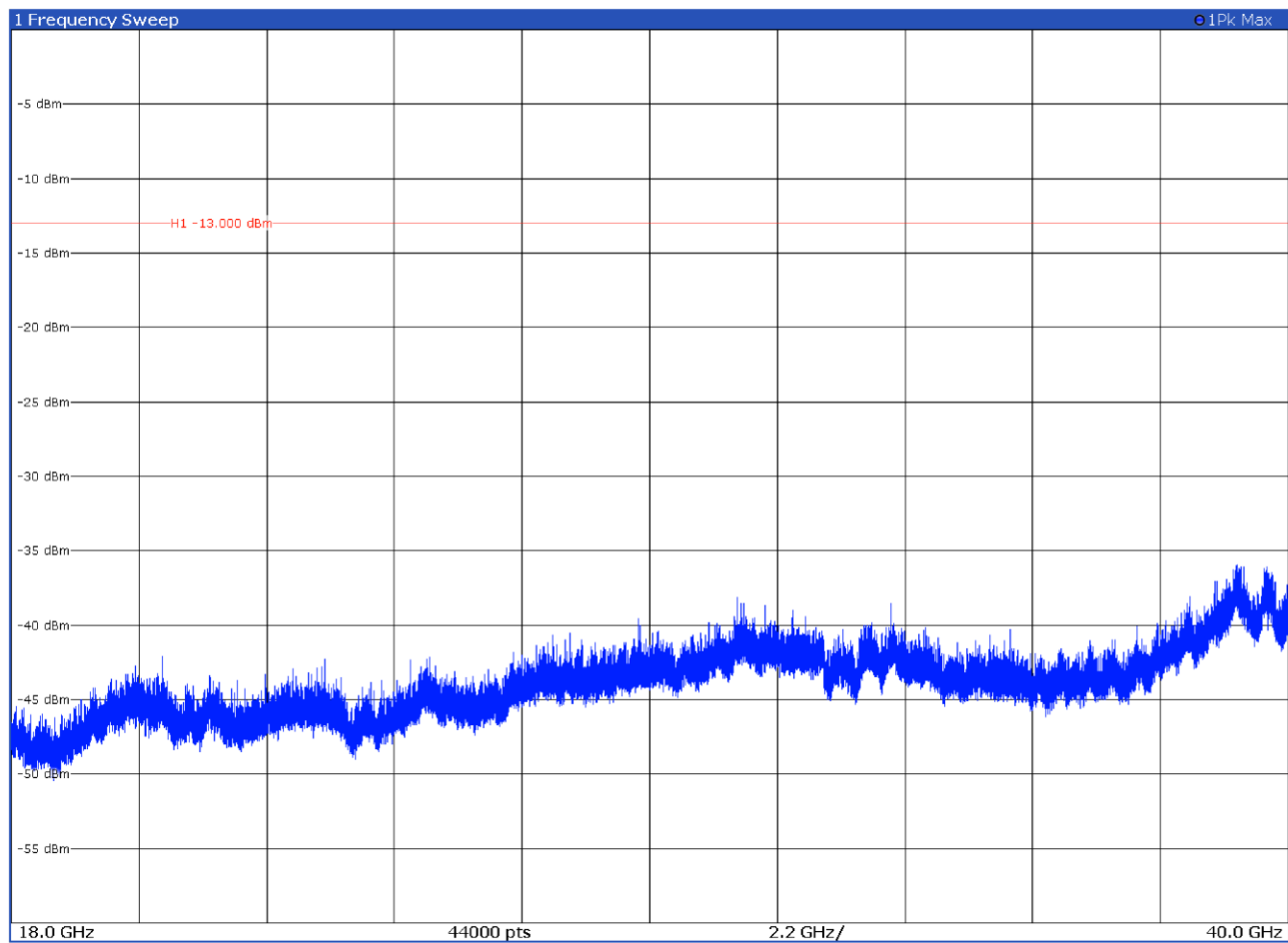


Figure 8.7-7: Radiated spurious emissions from 18 GHz to 40 GHz, low channel with antenna in horizontal polarization

Test data, continued

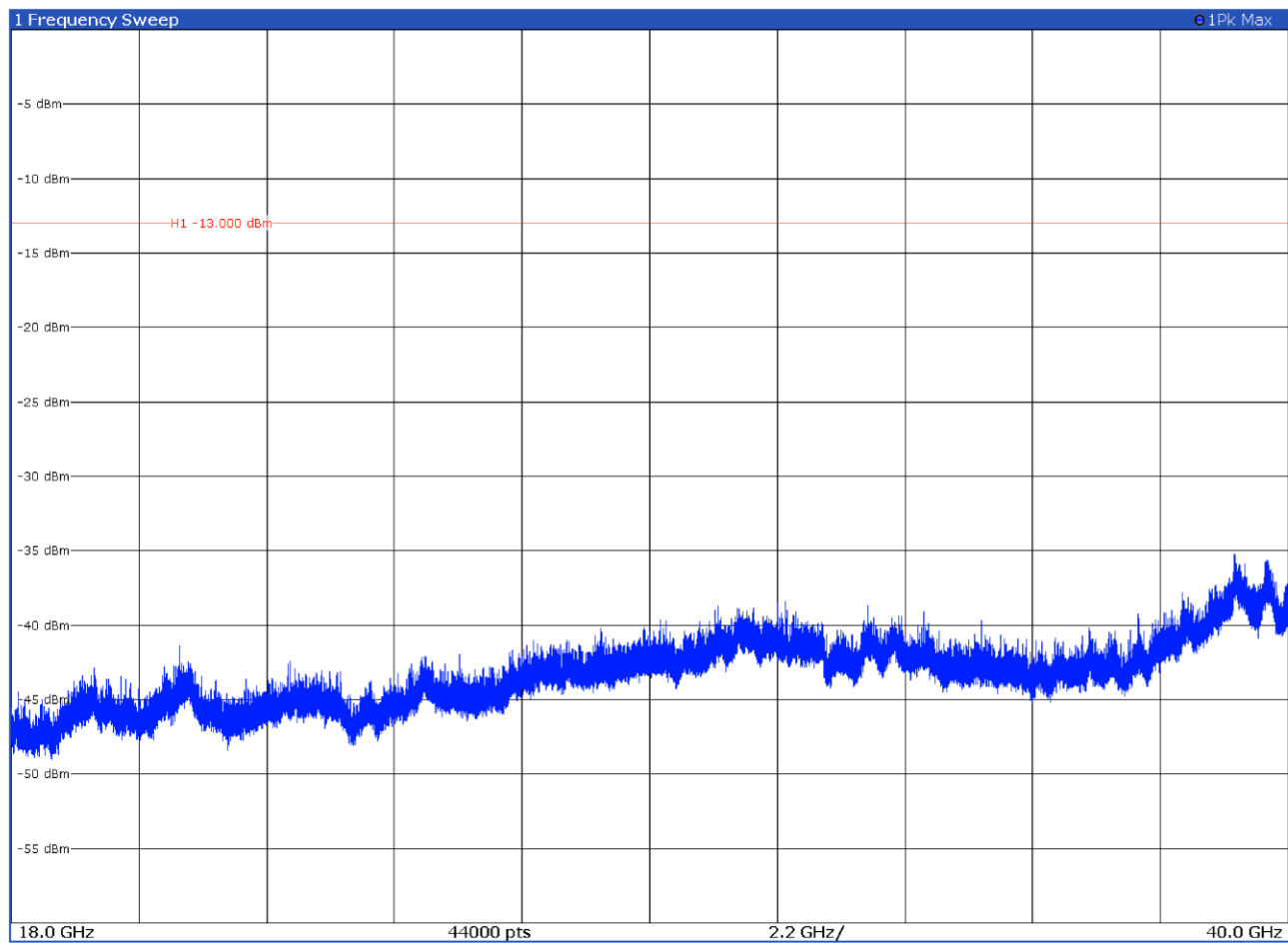


Figure 8.7-8: Radiated spurious emissions from 18 GHz to 40 GHz, low channel with antenna in vertical polarization

Test data, continued

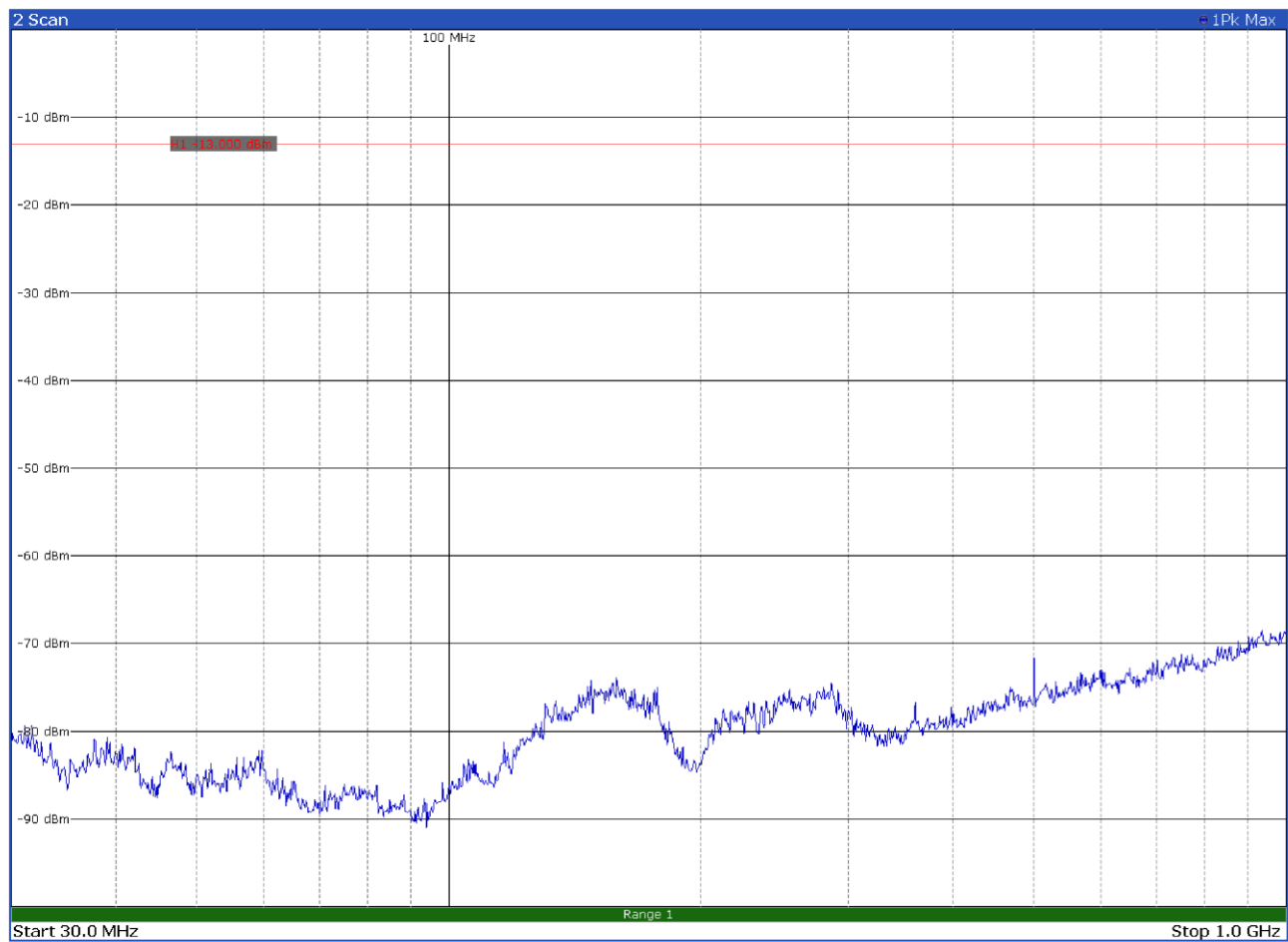


Figure 8.7-9: Radiated spurious emissions from 30 MHz to 1 GHz, middle channel with antenna in horizontal polarization

Test data, continued

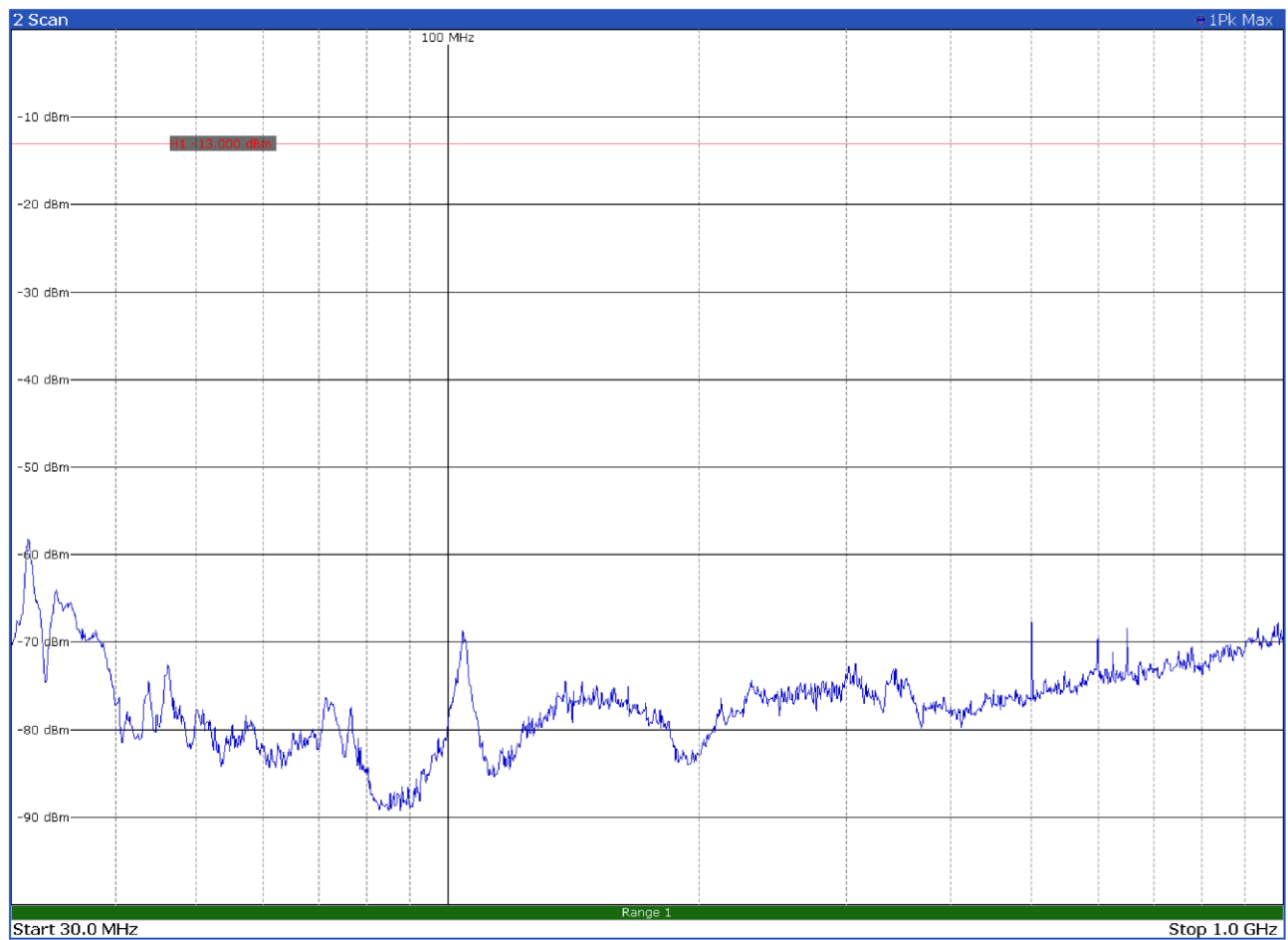


Figure 8.7-10: Radiated spurious emissions from 30 MHz to 1 GHz, middle channel with antenna in vertical polarization

Test data, continued

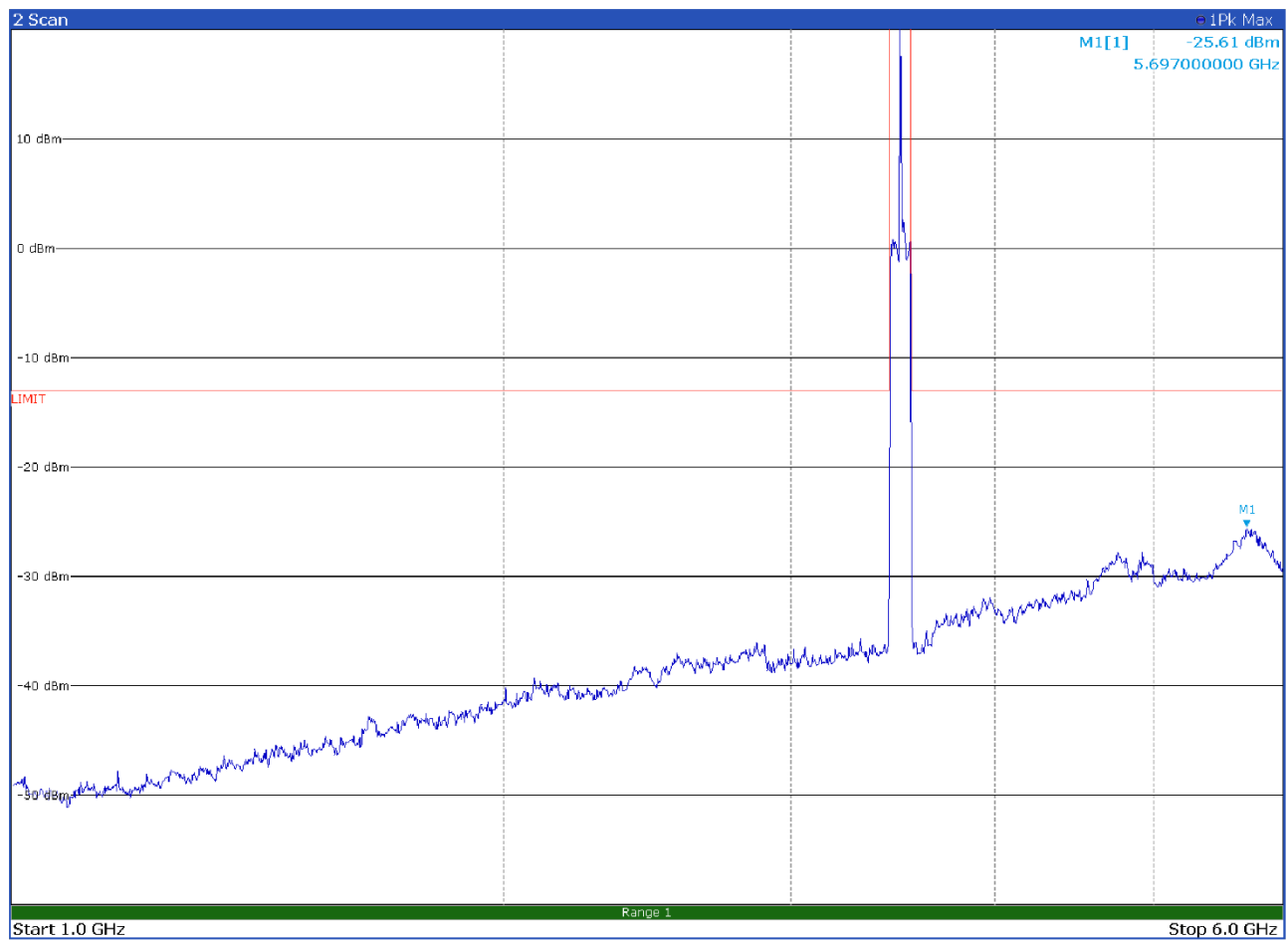


Figure 8.7-11: Radiated spurious emissions from 1 GHz to 6 GHz, middle channel with antenna in horizontal polarization

Test data, continued

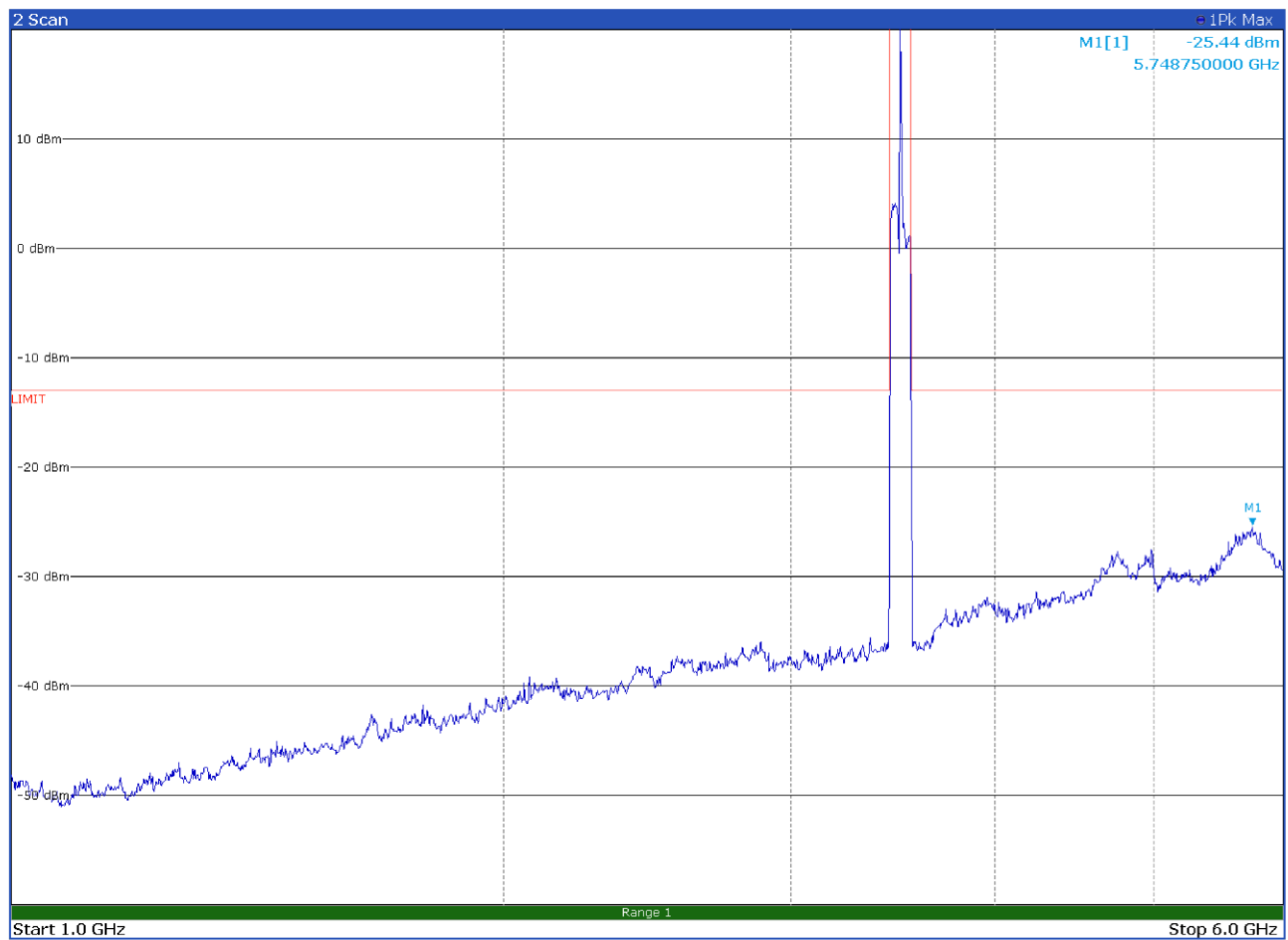


Figure 8.7-12: Radiated spurious emissions from 1 GHz to 6 GHz, middle channel with antenna in vertical polarization

Test data, continued

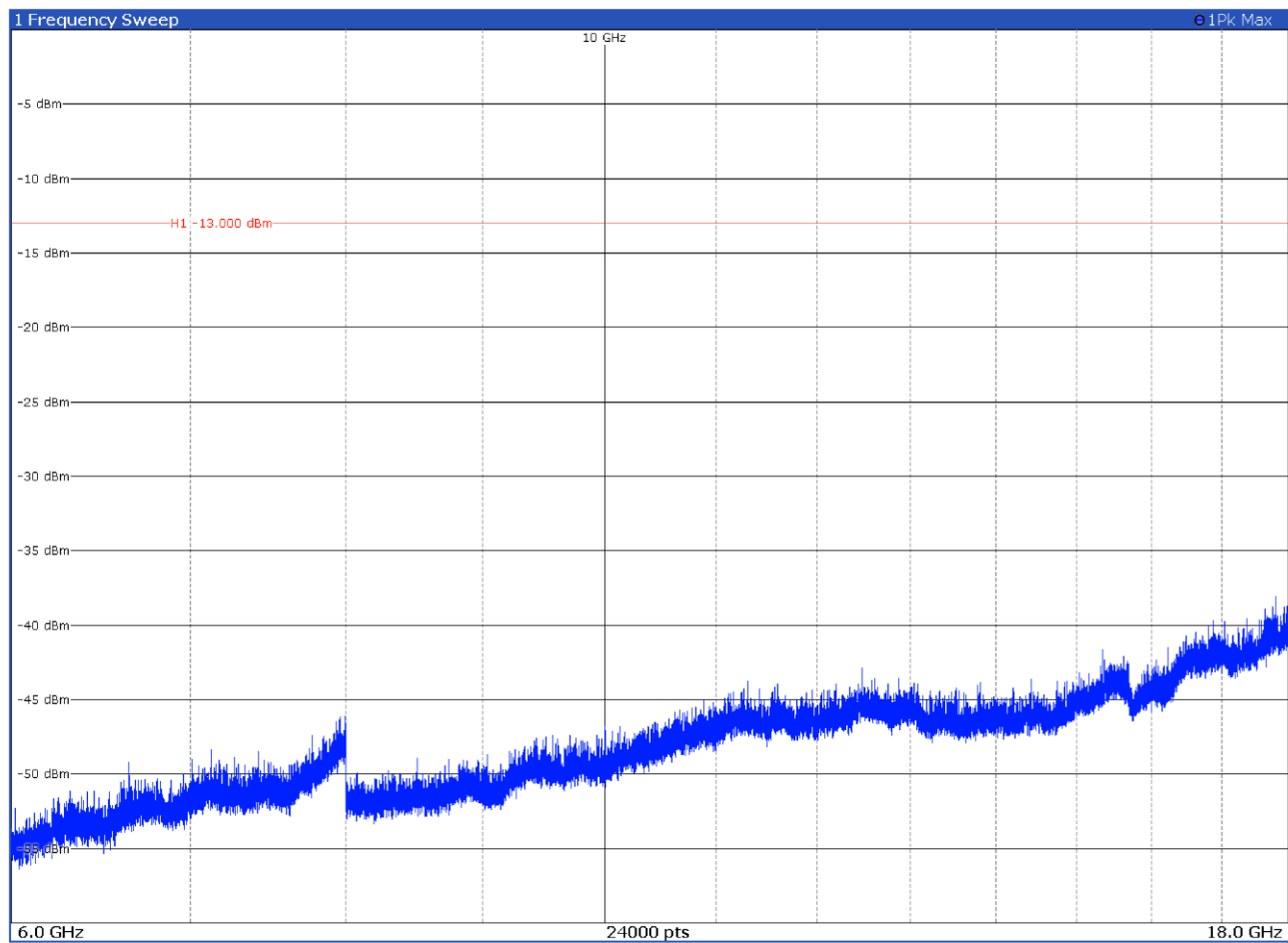


Figure 8.7-13: Radiated spurious emissions from 6 GHz to 18 GHz, middle channel with antenna in horizontal polarization

Test data, continued

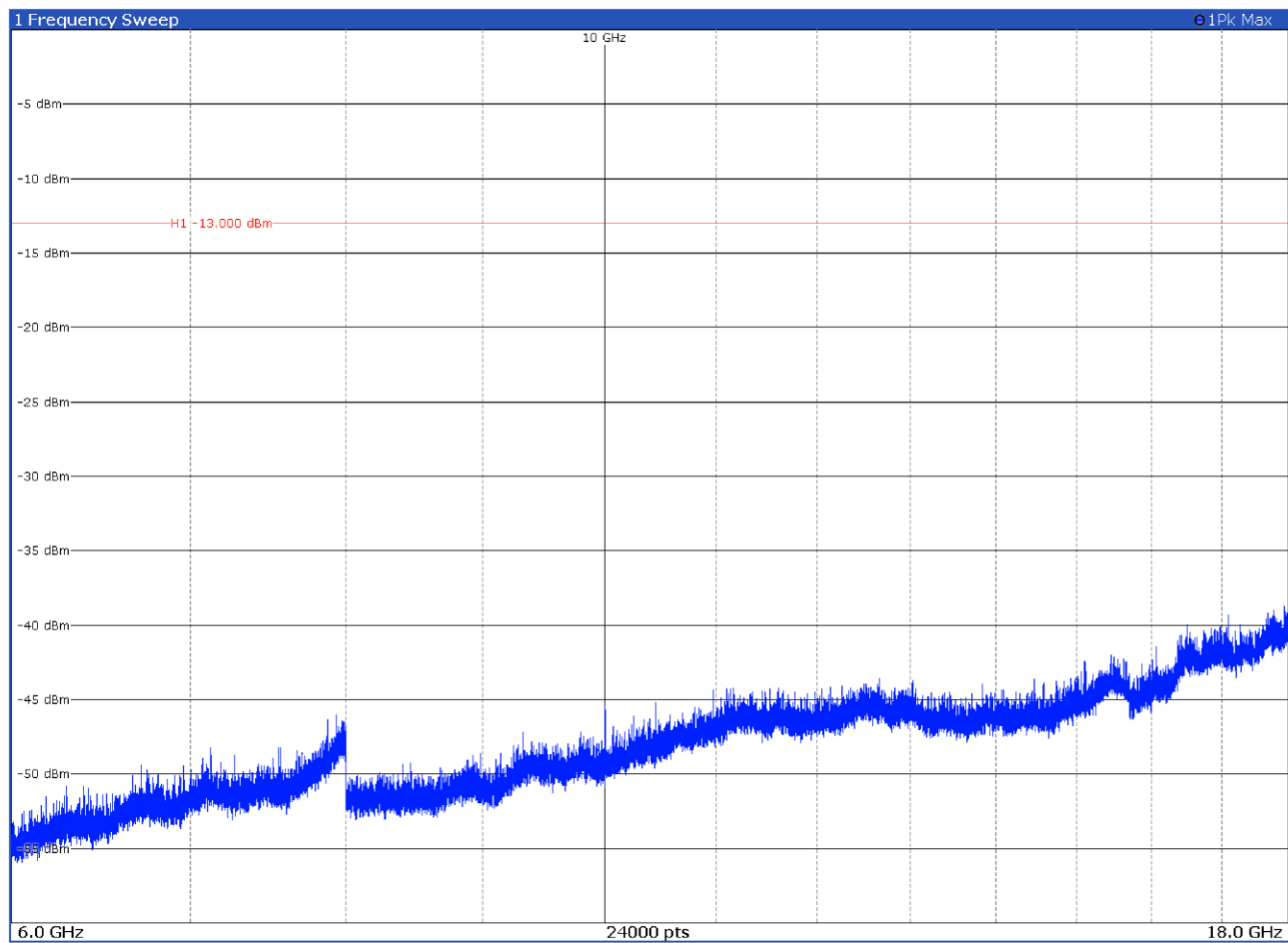


Figure 8.7-14: Radiated spurious emissions from 6 GHz to 18 GHz, middle channel with antenna in vertical polarization

Test data, continued

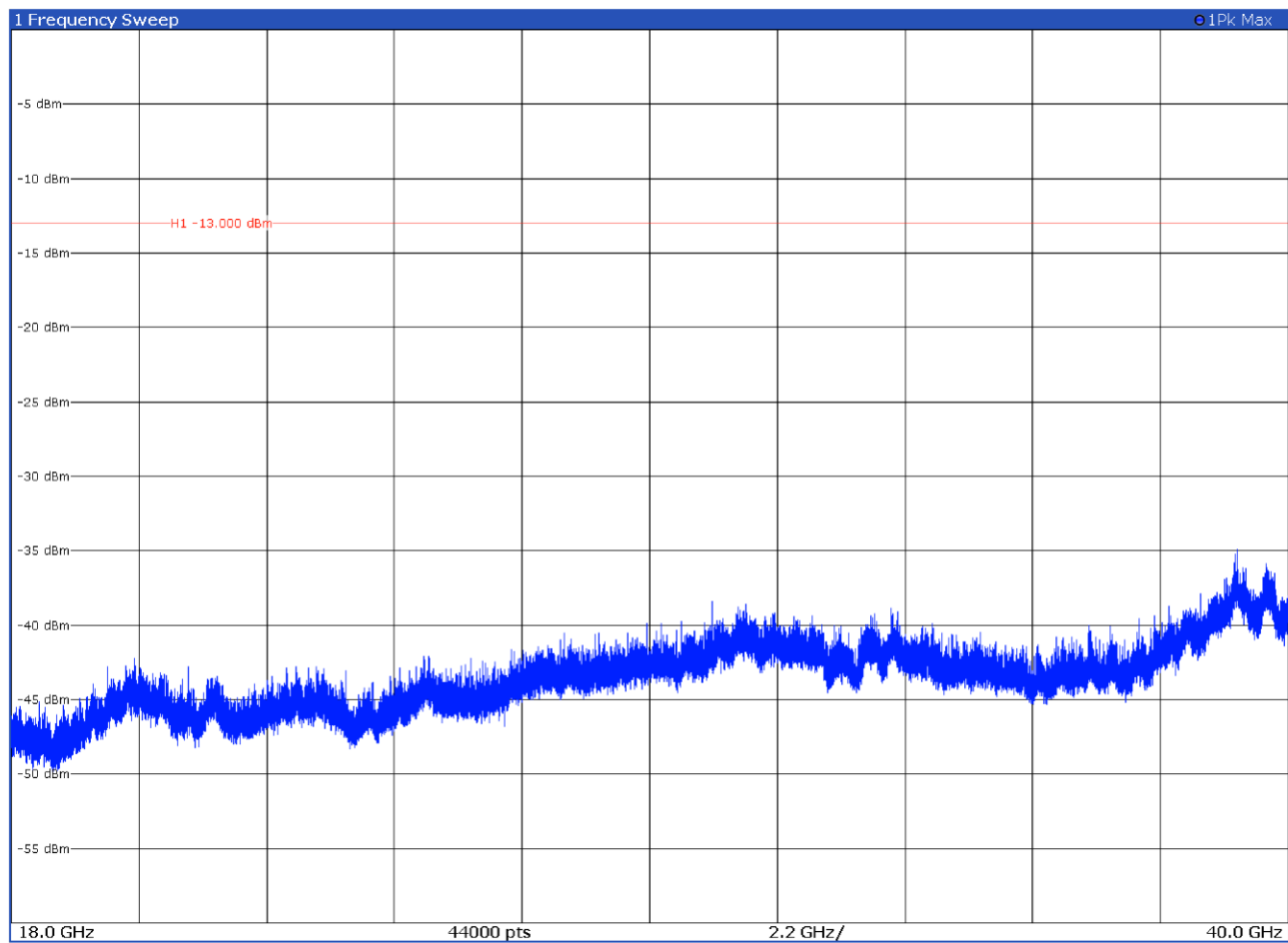


Figure 8.7-15: Radiated spurious emissions from 18 GHz to 40 GHz, middle channel with antenna in horizontal polarization

Test data, continued

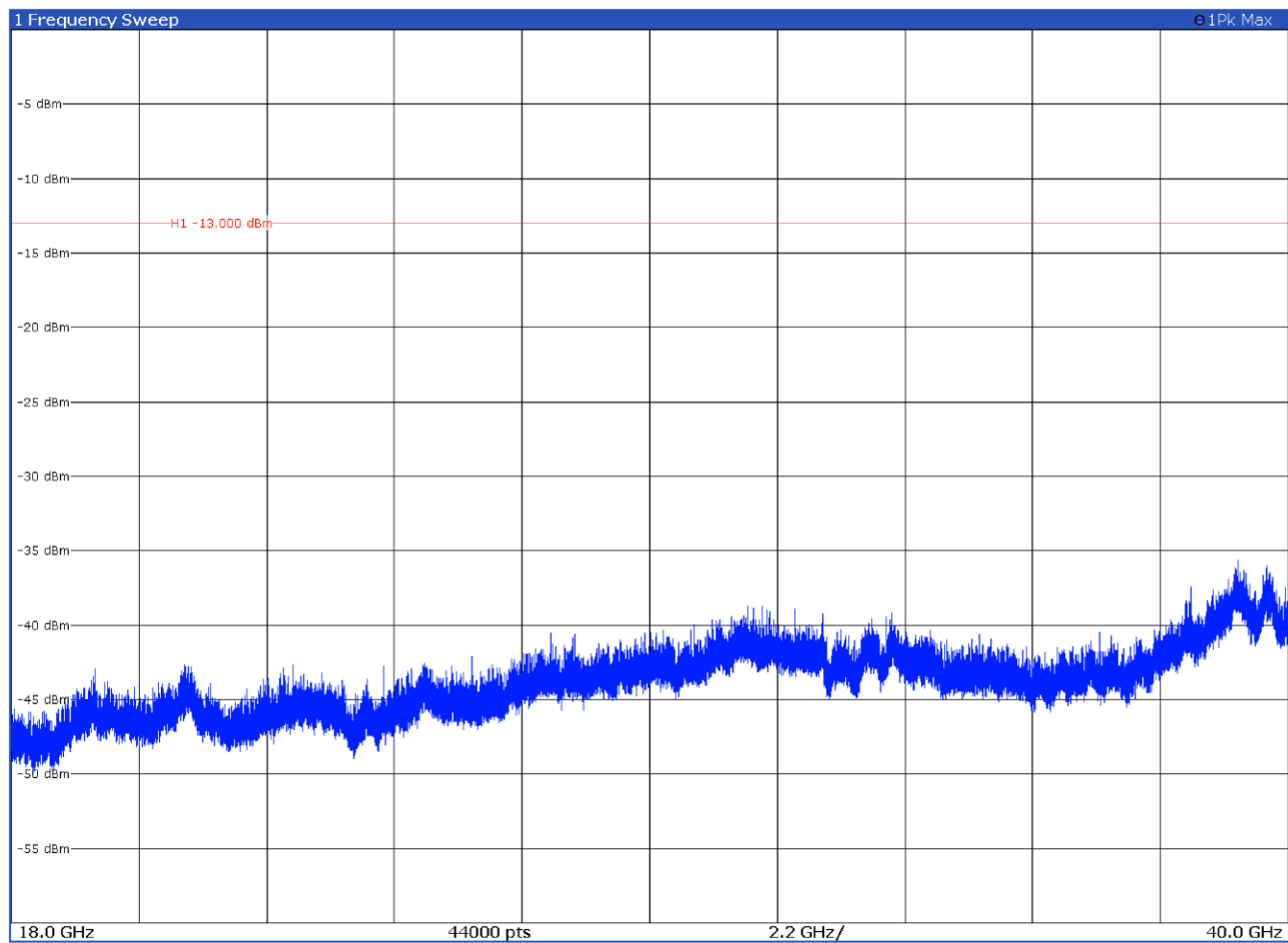


Figure 8.7-16: Radiated spurious emissions from 18 GHz to 40 GHz, middle channel with antenna in vertical polarization

Test data, continued

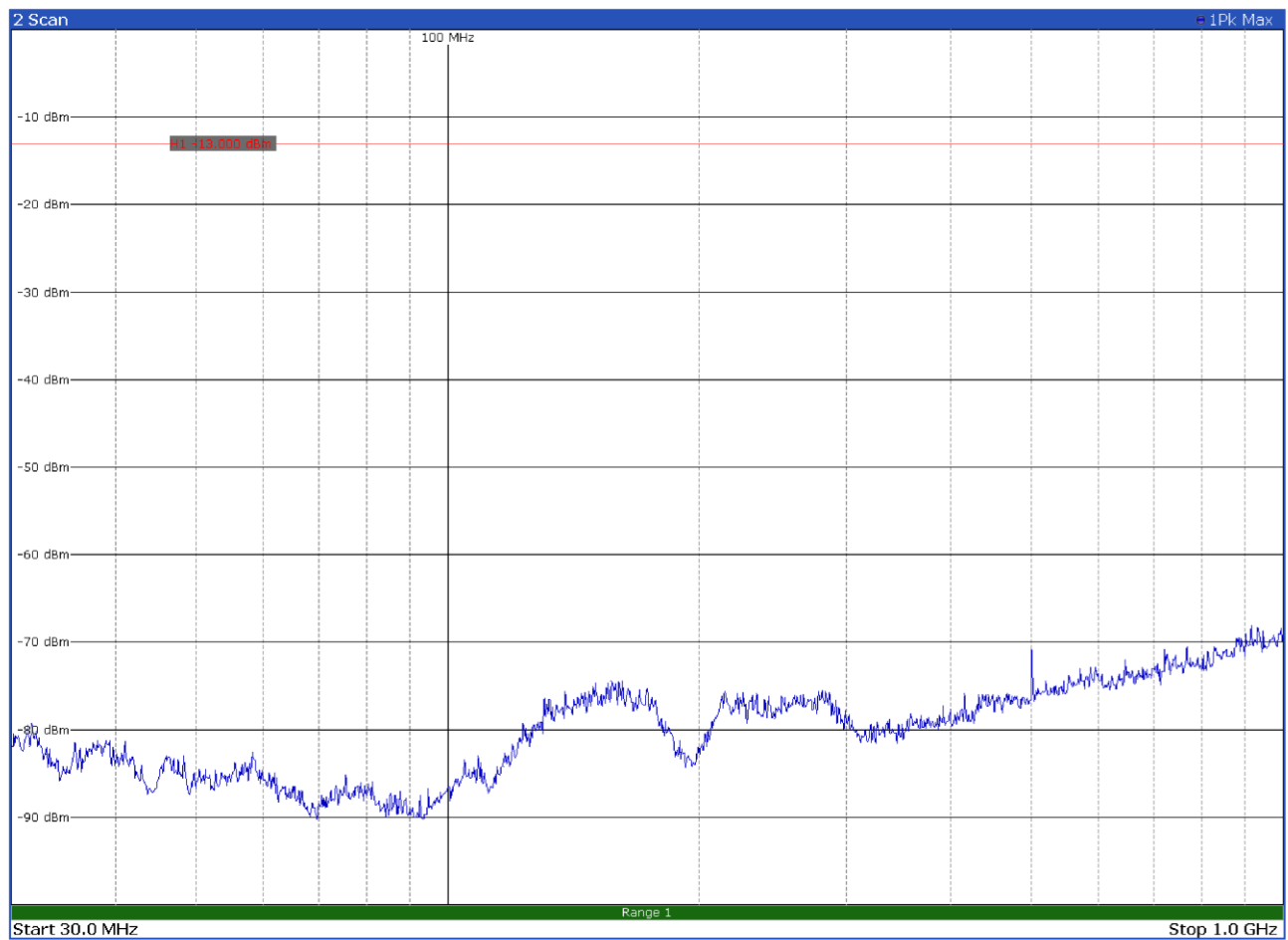


Figure 8.7-17: Radiated spurious emissions from 30 MHz to 1 GHz, high channel with antenna in horizontal polarization

Test data, continued

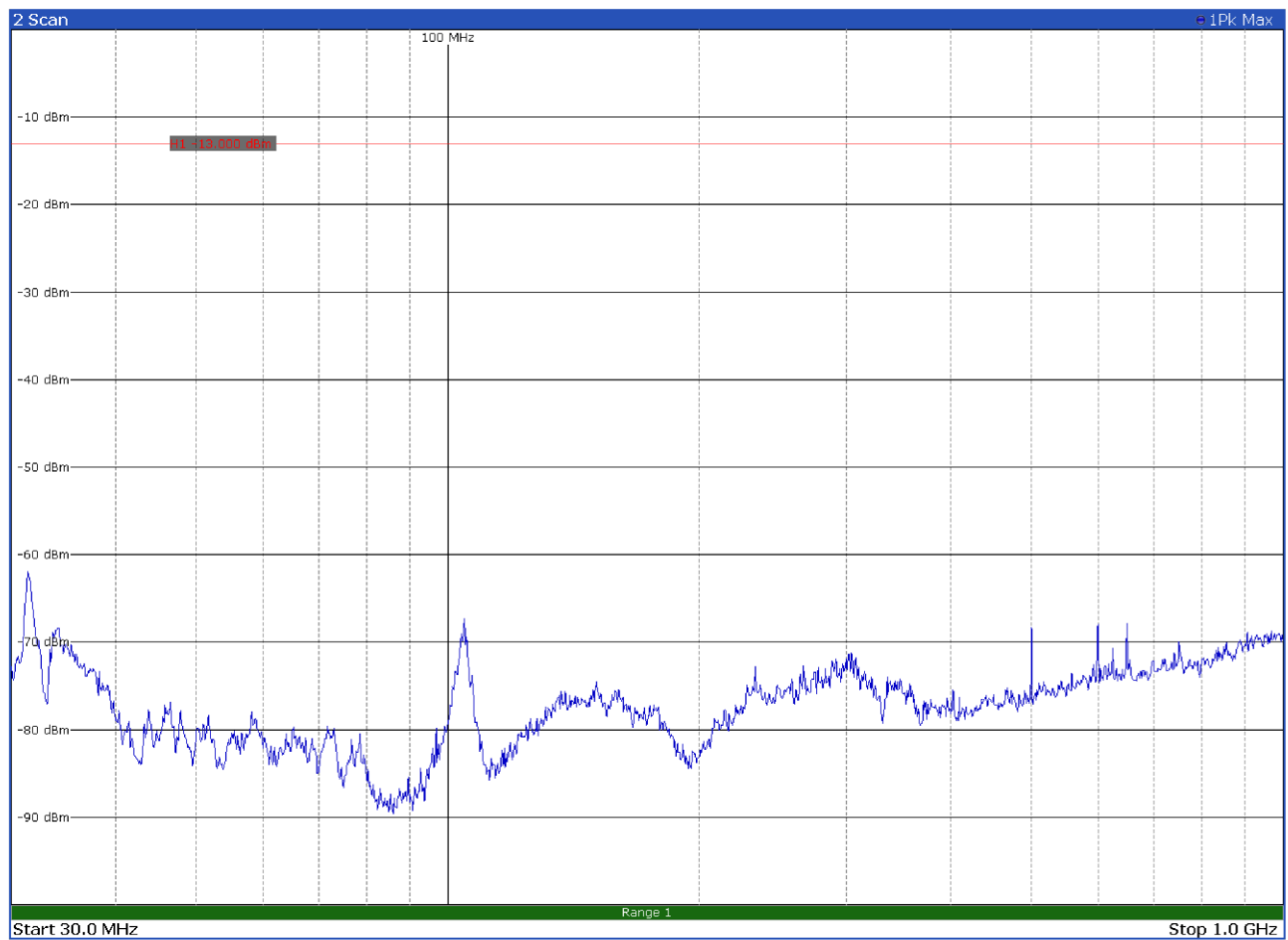


Figure 8.7-18: Radiated spurious emissions from 30 MHz to 1 GHz, high channel with antenna in vertical polarization

Test data, continued

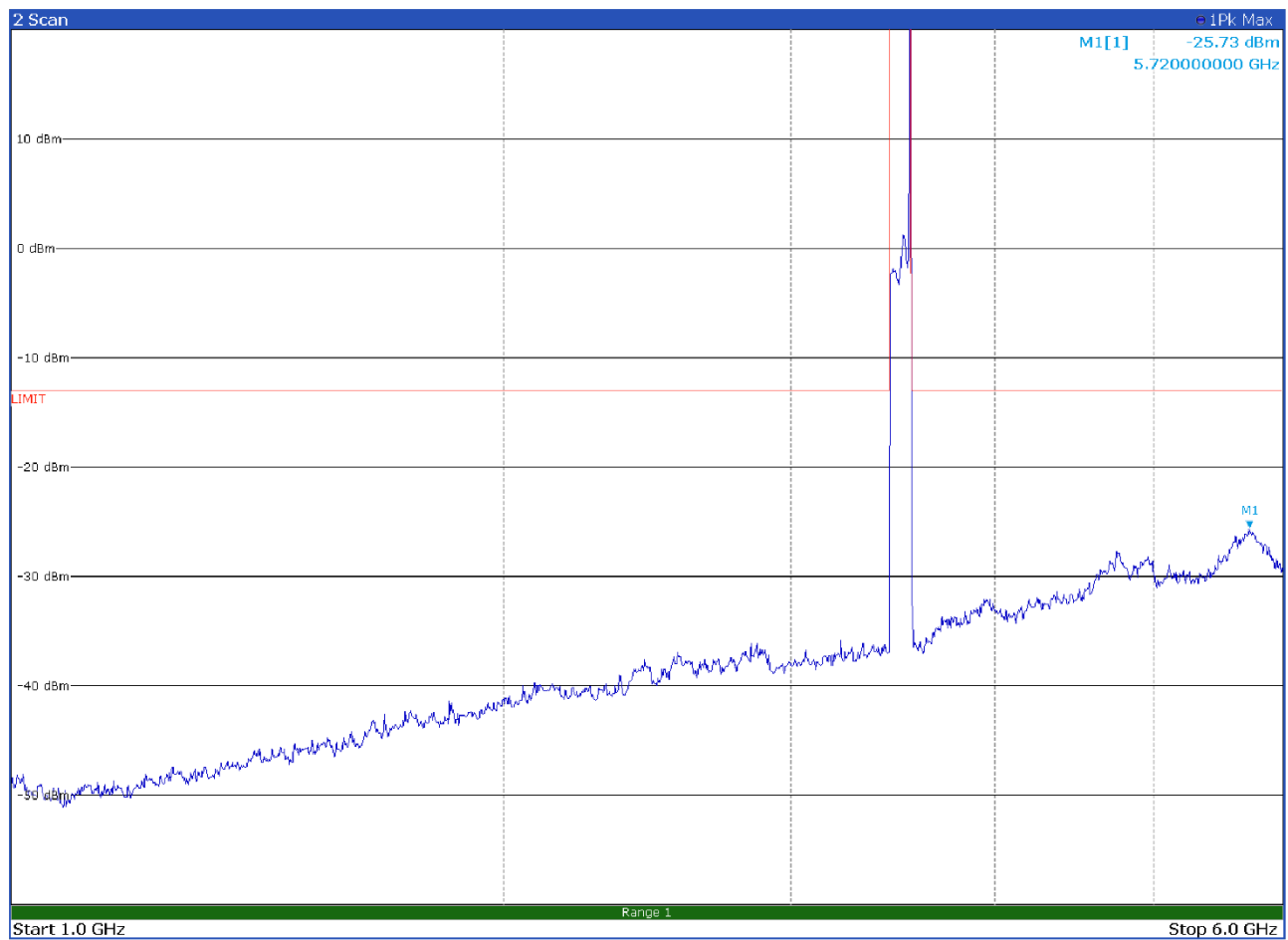


Figure 8.7-19: Radiated spurious emissions from 1 GHz to 6 GHz, high channel with antenna in horizontal polarization

Test data, continued

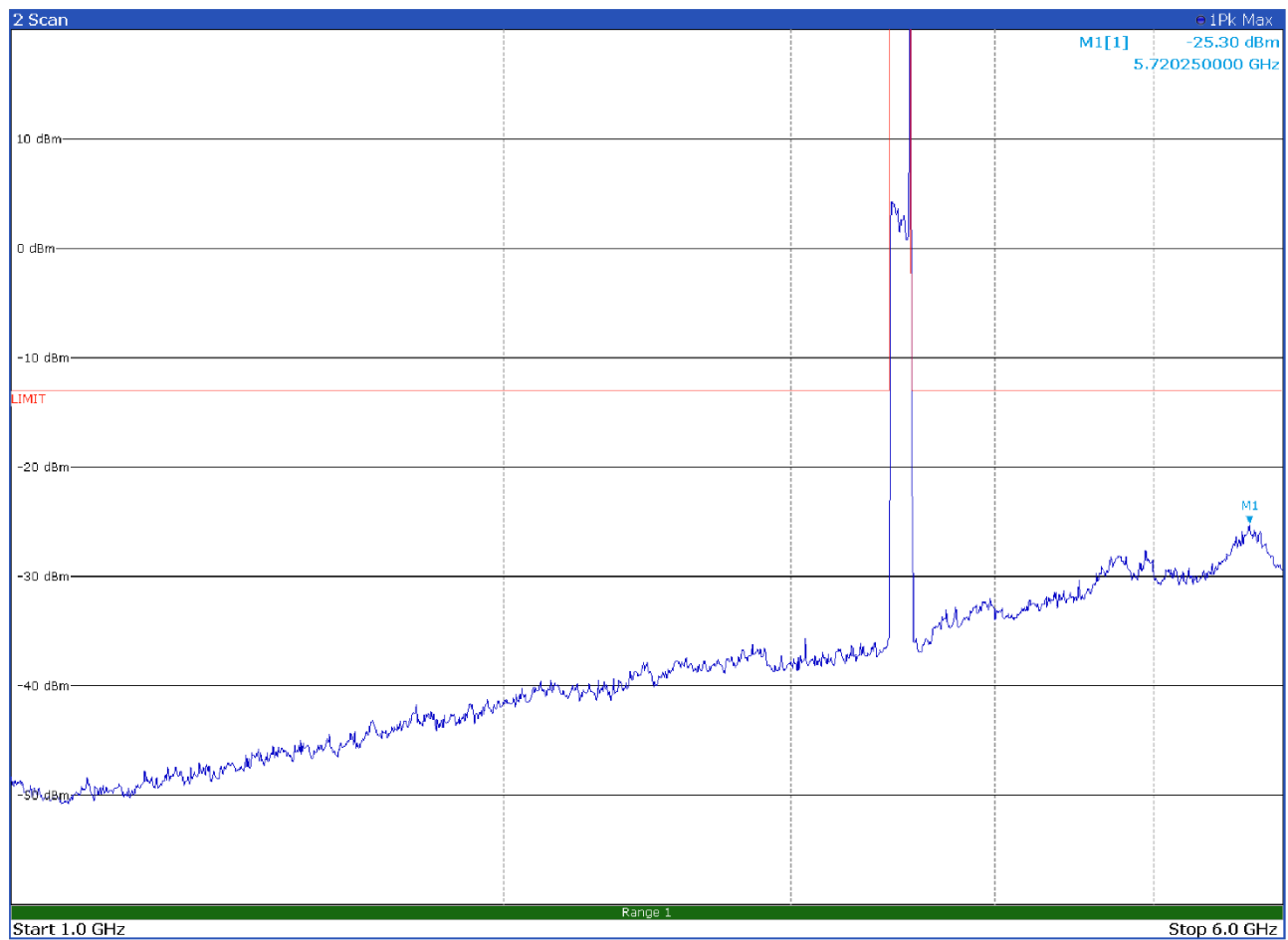


Figure 8.7-20: Radiated spurious emissions from 1 GHz to 6 GHz, high channel with antenna in vertical polarization

Test data, continued

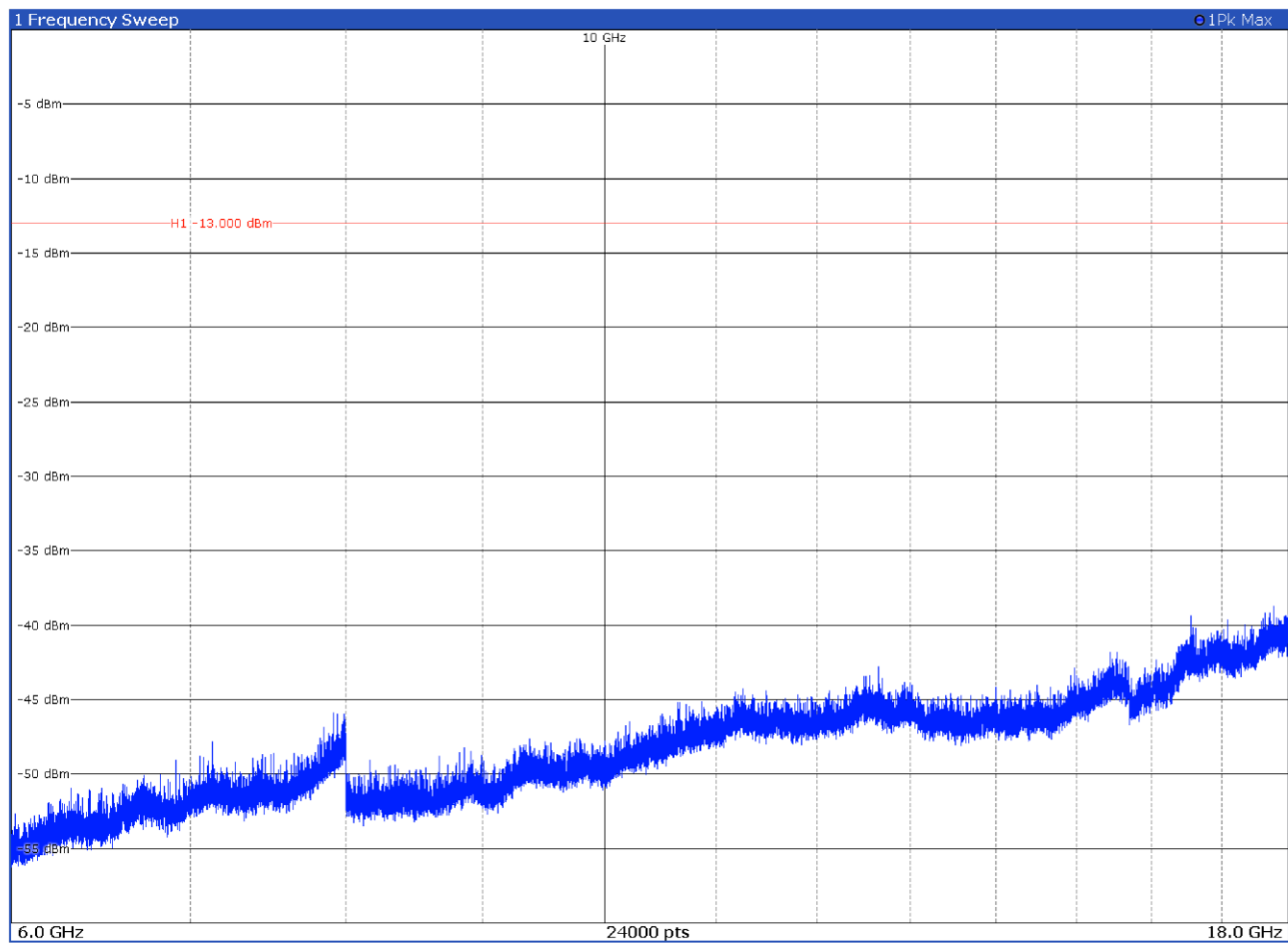


Figure 8.7-21: Radiated spurious emissions from 6 GHz to 18 GHz, high channel with antenna in horizontal polarization

Test data, continued

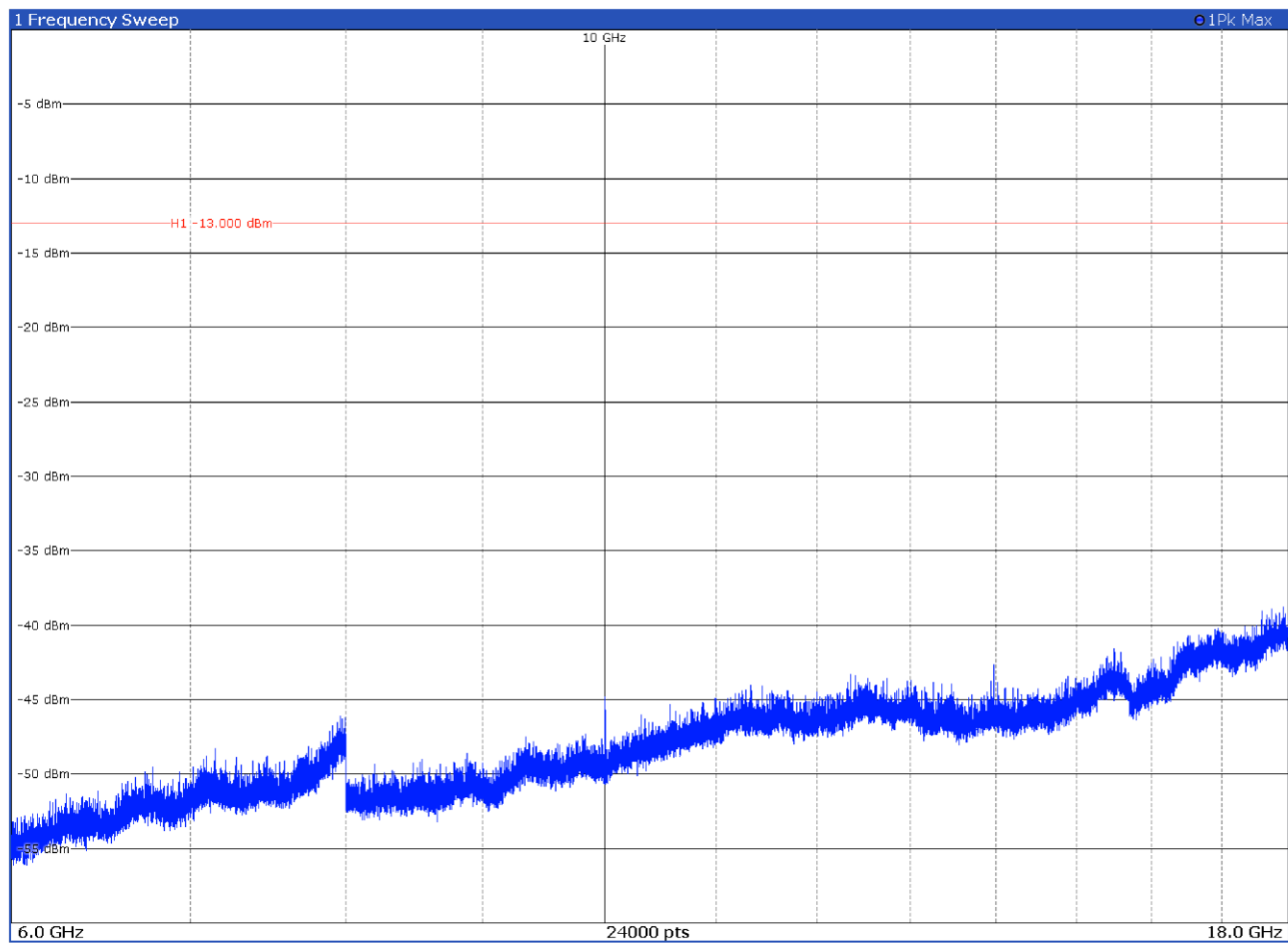


Figure 8.7-22: Radiated spurious emissions from 6 GHz to 18 GHz, high channel with antenna in vertical polarization

Test data, continued

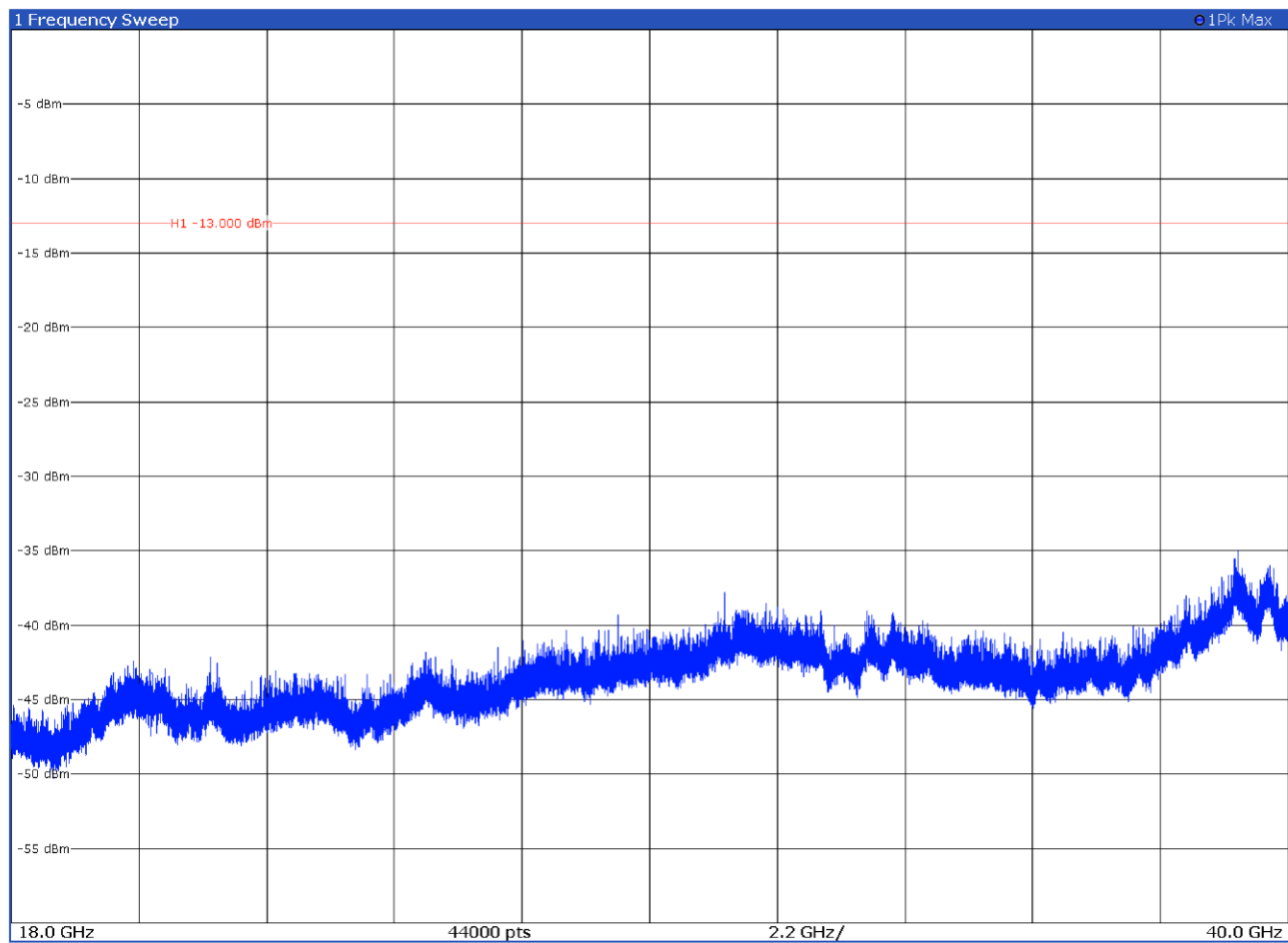


Figure 8.7-23: Radiated spurious emissions from 18 GHz to 40 GHz, high channel with antenna in horizontal polarization

Test data, continued

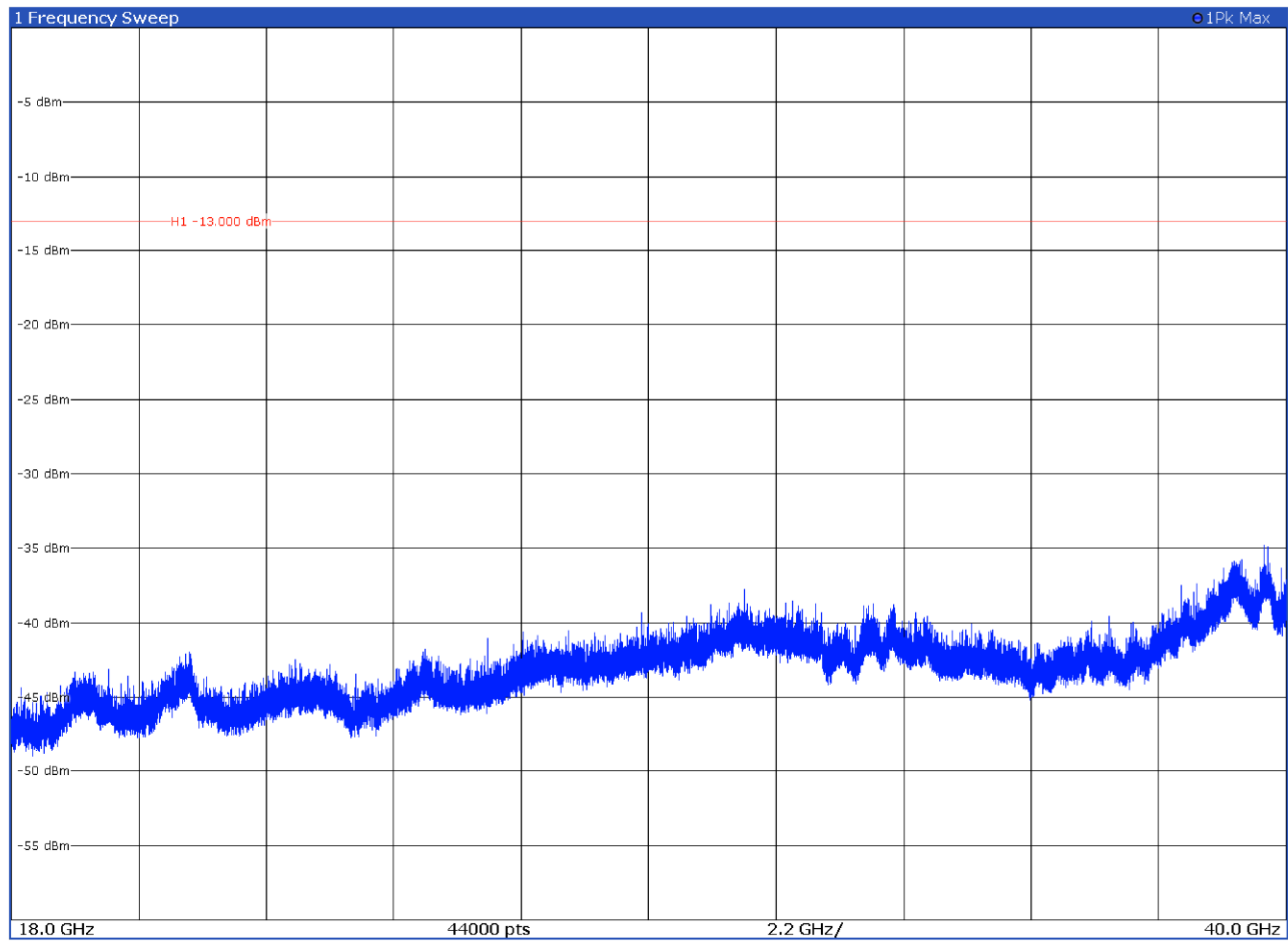


Figure 8.7-24: Radiated spurious emissions from 18 GHz to 40 GHz, high channel with antenna in vertical polarization

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.

8.8.2 Test summary

Verdict	Pass		
Tested by	P. Barbieri	Test date	July 20, 2023

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: --

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
+50 °C, Nominal	3499998121.6	-70.9	0.020
+40 °C, Nominal	3499998083.5	-32.8	0.009
+30 °C, Nominal	3499998059.2	-8.5	0.002
+20 °C, -15% voltage	3499998050.7	0	0.000
+20 °C, Nominal	3499998050.7	Reference	Reference
+20 °C, +15% voltage	3499998050.7	0	0.000
+10 °C, Nominal	3499998007.7	43.0	0.012
0 °C, Nominal	3499997982.3	68.4	0.020
-10 °C, Nominal	3499997937.5	113.2	0.032
-20 °C, Nominal	3499997853.2	197.5	0.056
-30 °C, Nominal	3499997789.8	260.9	0.075



Test data, continued

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

Test conditions	Frequency, Hz	Drift, Hz	Drift, ppm
+50 °C, Nominal	3499998060.7	-71.2	0.020
+40 °C, Nominal	3499998098.4	-33.5	0.010
+30 °C, Nominal	3499998123.0	-8.9	0.003
+20 °C, -15% voltage	3499998131.9	0	0.000
+20 °C, Nominal	3499998131.9	Reference	Reference
+20 °C, +15% voltage	3499998131.9	0	0.000
+10 °C, Nominal	3499998175.4	43.5	0.012
0 °C, Nominal	3499998199.2	67.3	0.019
-10 °C, Nominal	3499998247.1	115.2	0.033
-20 °C, Nominal	3499998325.0	193.1	0.055
-30 °C, Nominal	3499998398.2	266.3	0.076

Section 9 EUT photos

9.1 Set-up photos

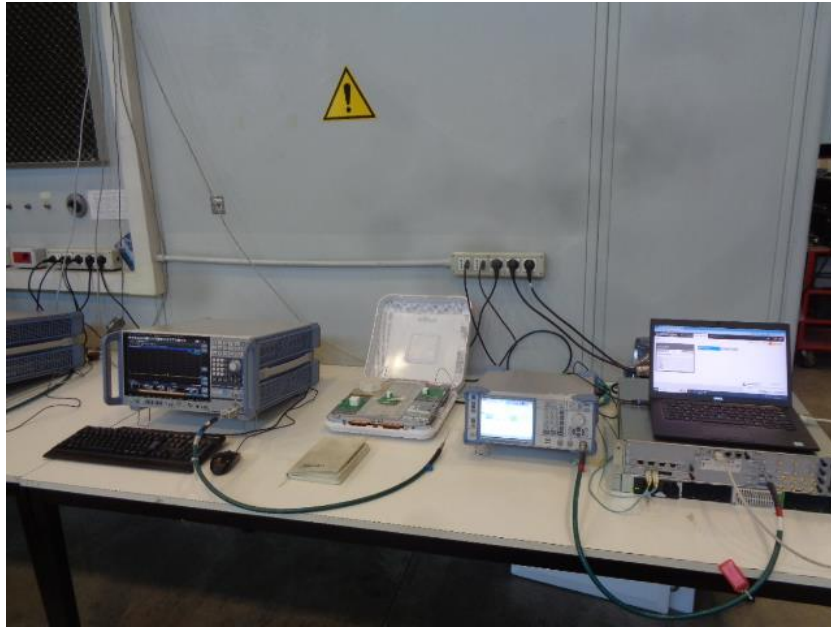


Figure 9.1-1: Antenna port testing set-up



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

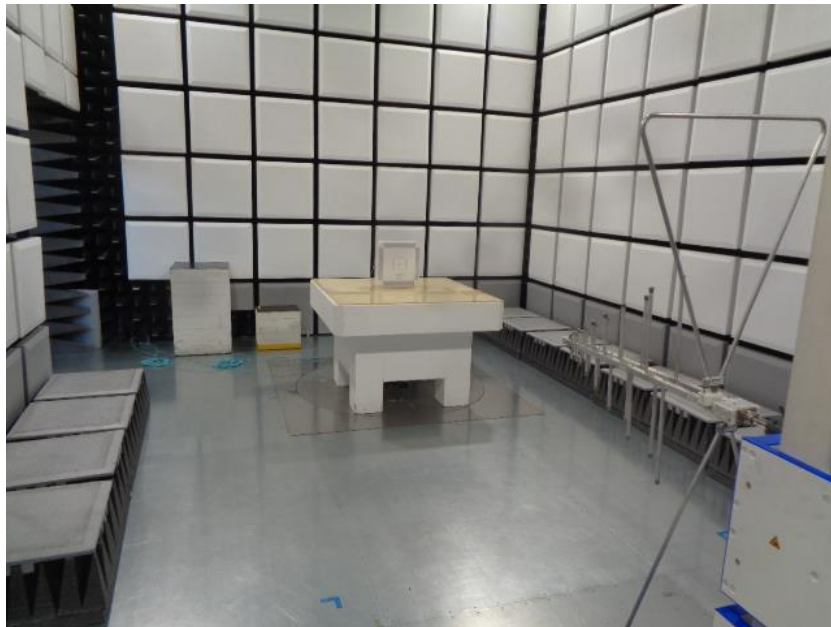


Figure 9.1-3: Radiated emissions set-up for frequencies below 1 GHz



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

9.2 External photos



End of the test report