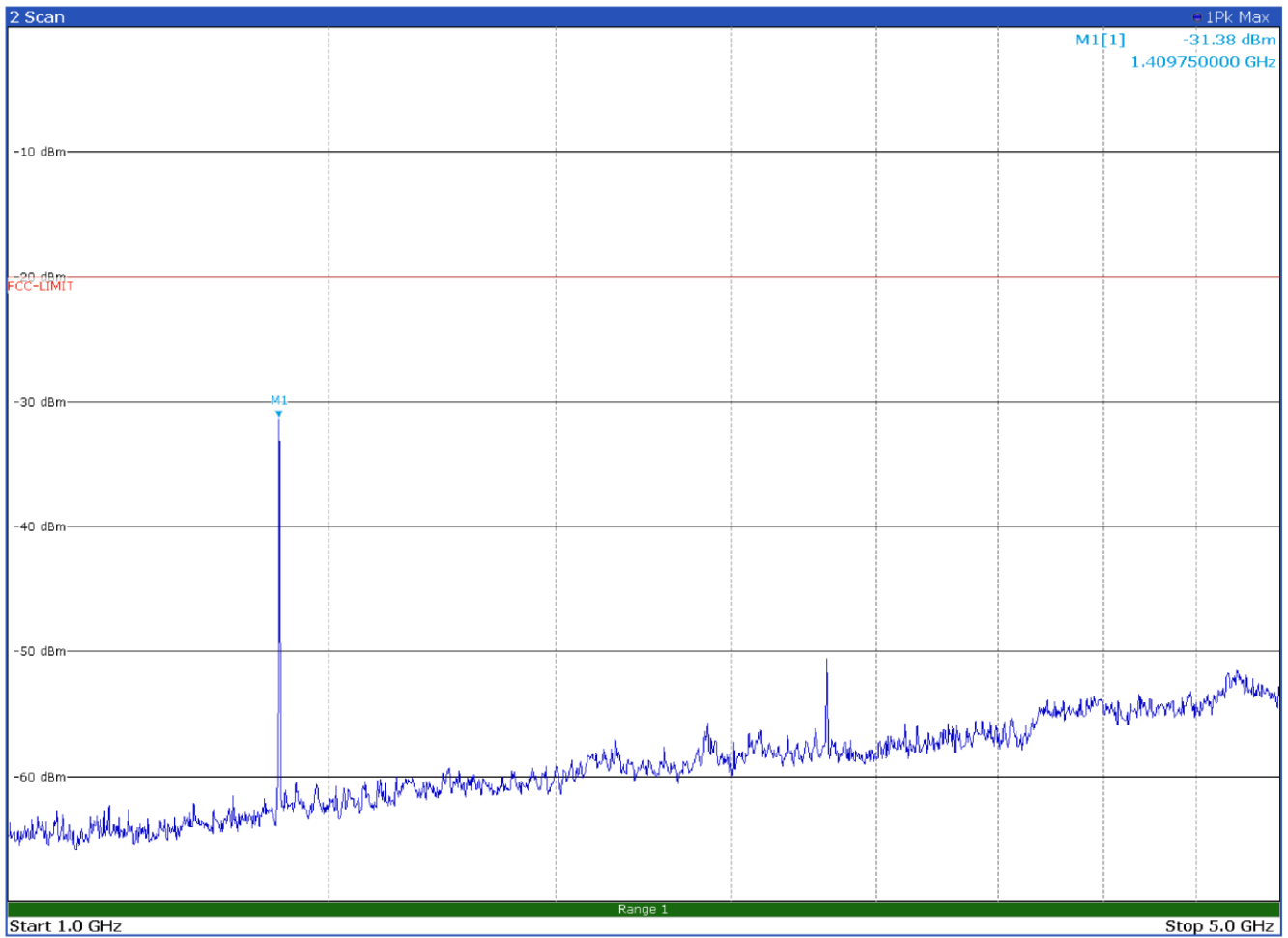
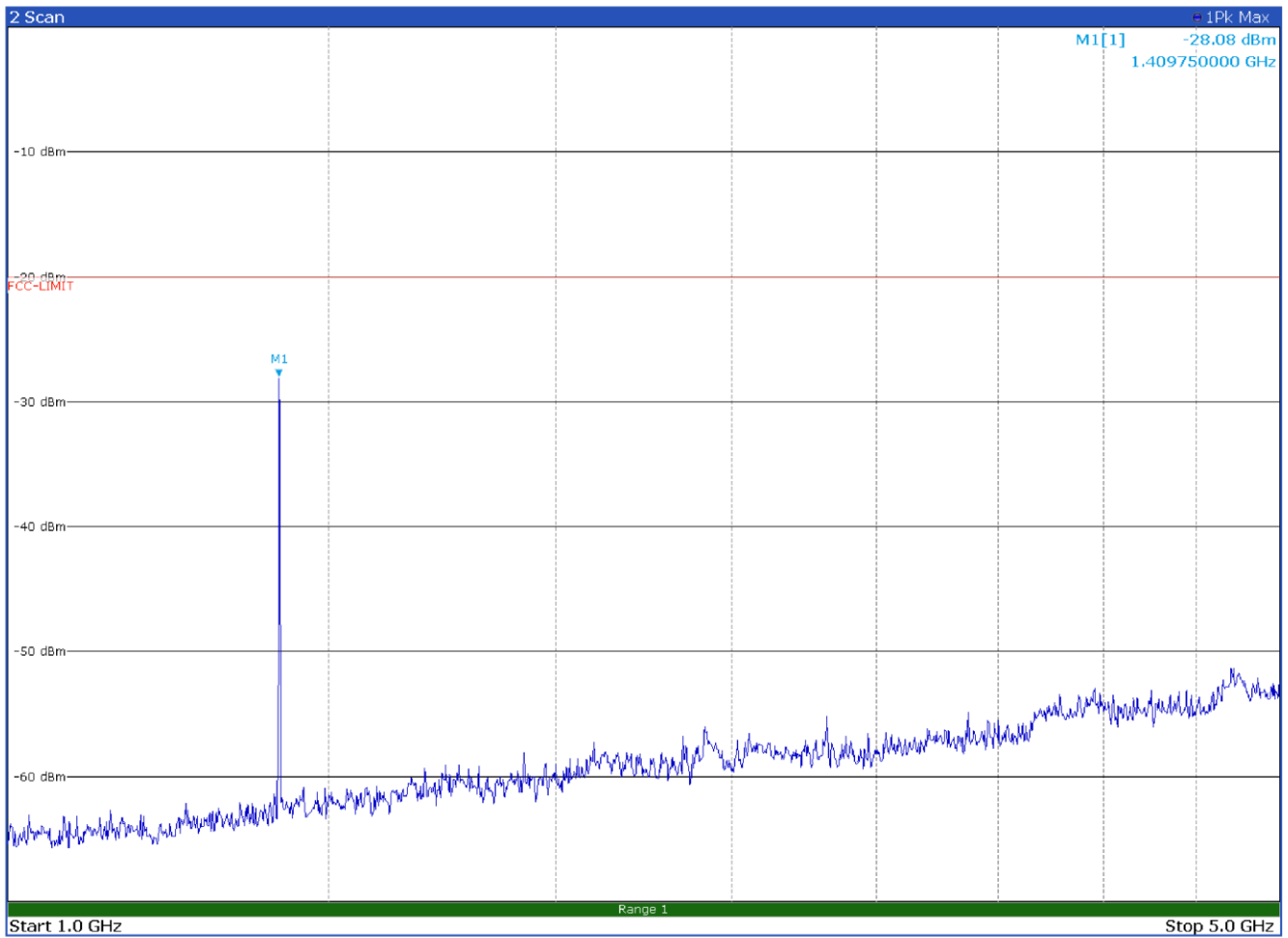


Test data, continued



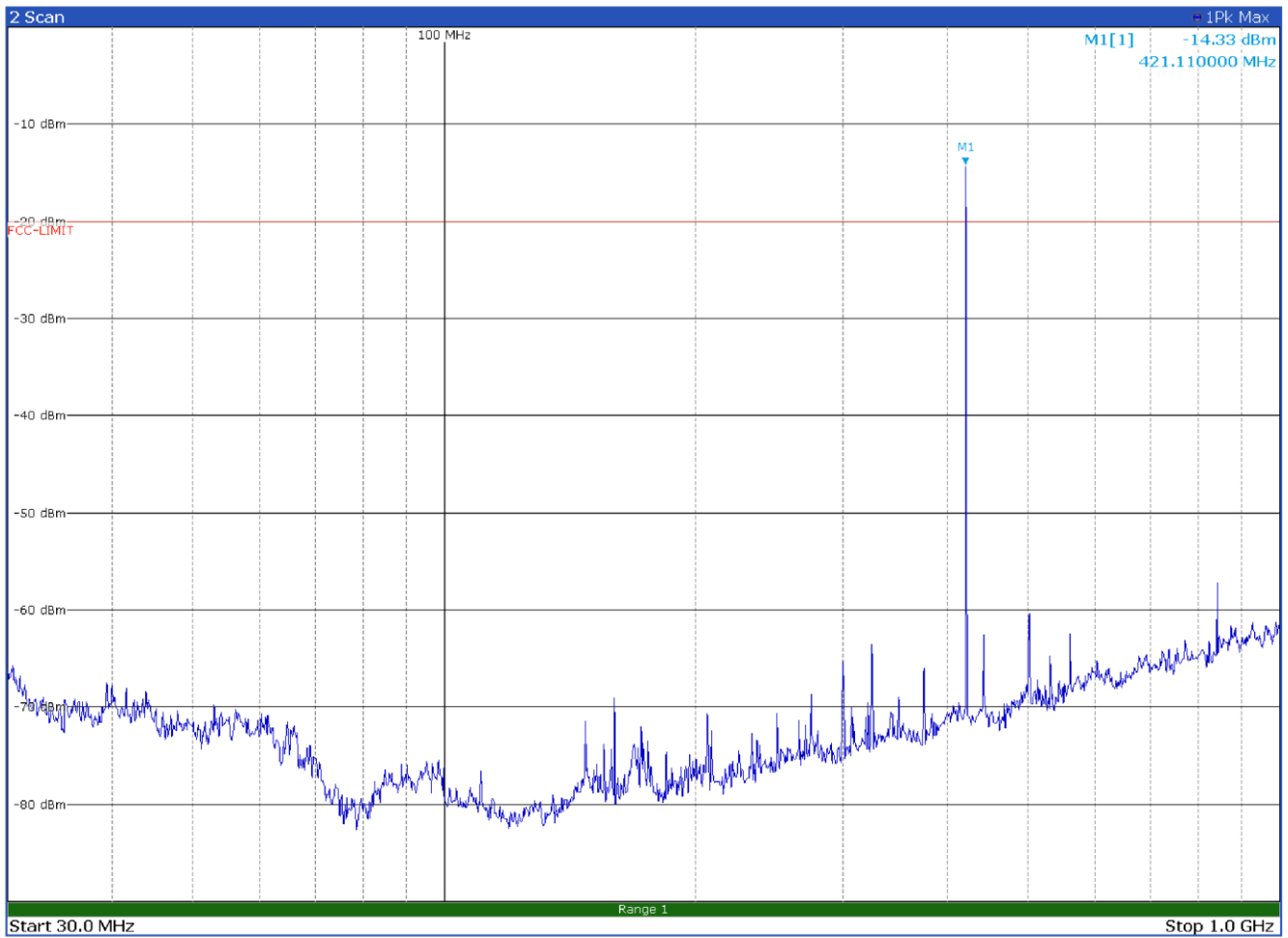
Radiated spurious emissions with modulation FM 25.0 kHz at 469.9 MHz – Antenna in horizontal polarization

Test data, continued



Radiated spurious emissions with modulation FM 25.0 kHz at 469.9 MHz – Antenna in vertical polarization

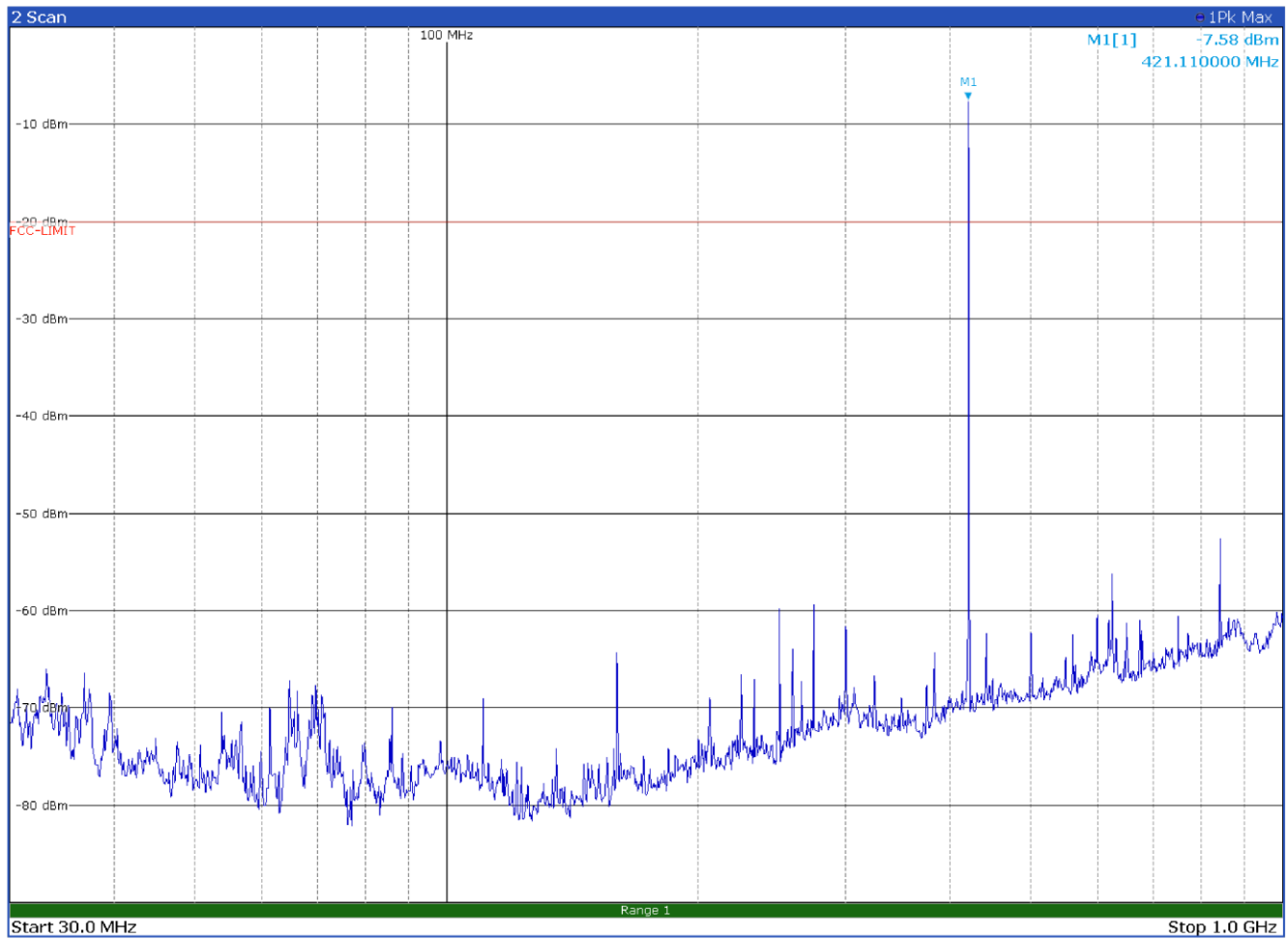
Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 421.1 MHz – Antenna in horizontal polarization

Limit exceeded by the carrier

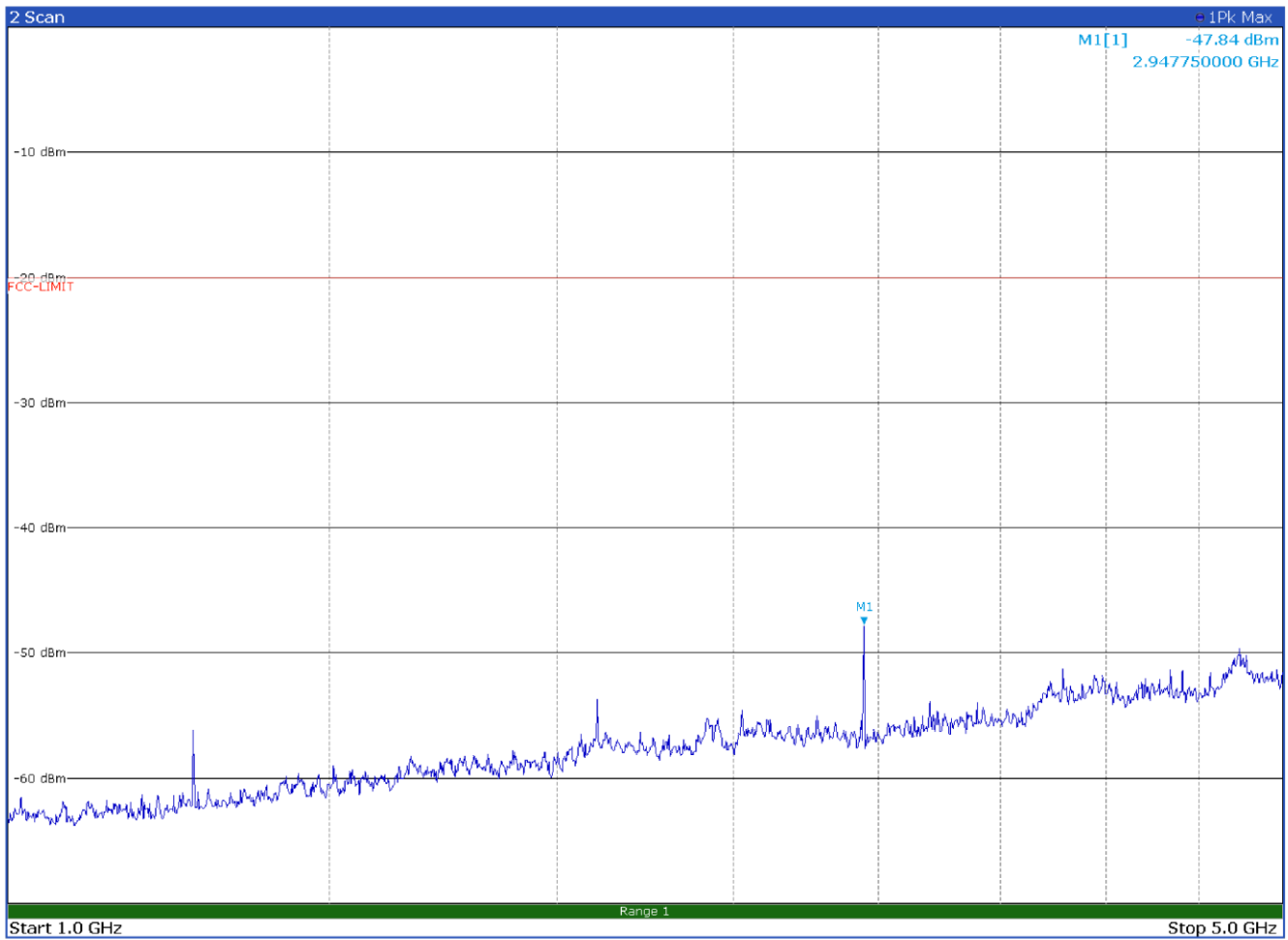
Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 421.1 MHz – Antenna in vertical polarization

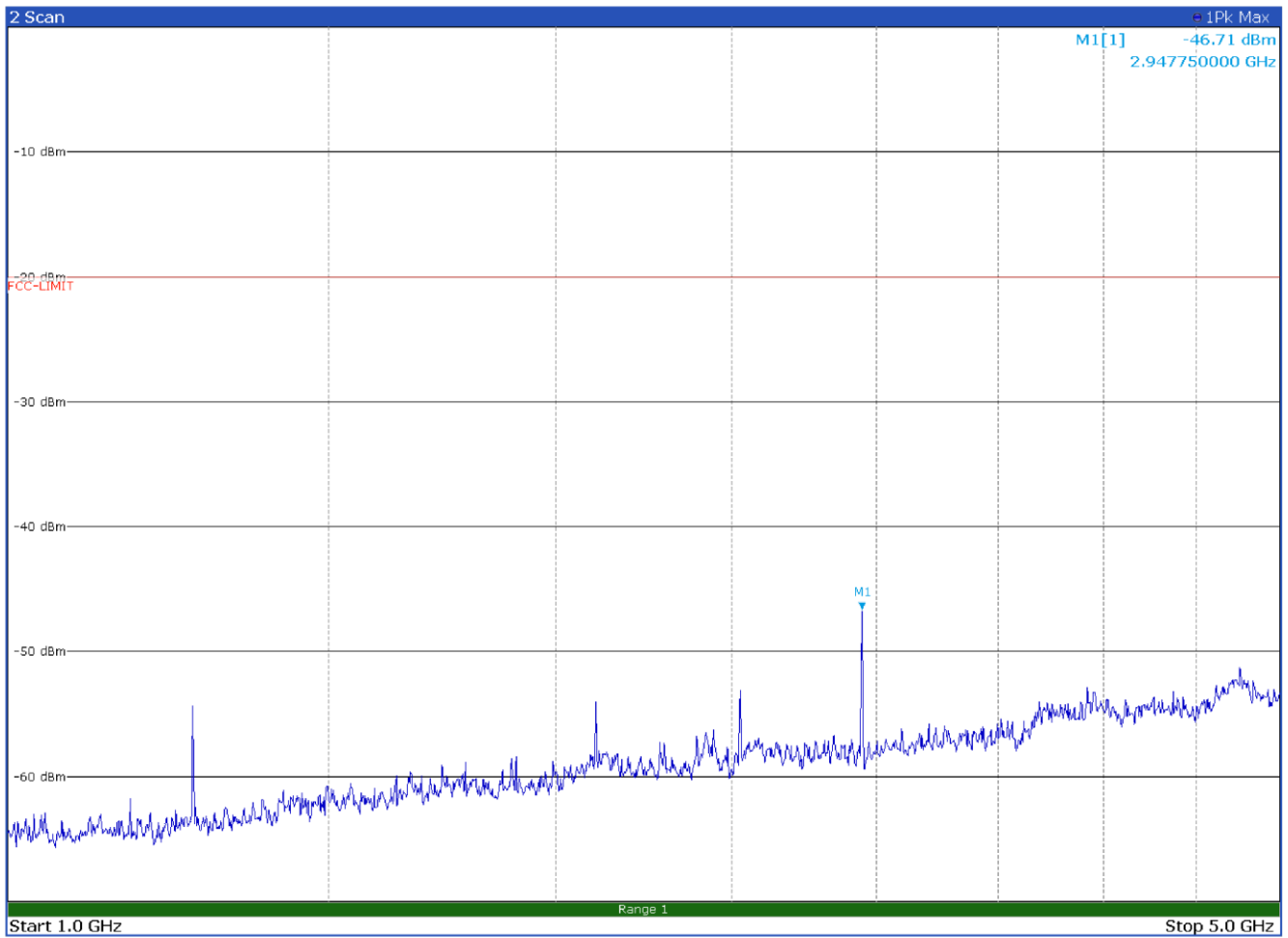
Limit exceeded by the carrier

Test data, continued



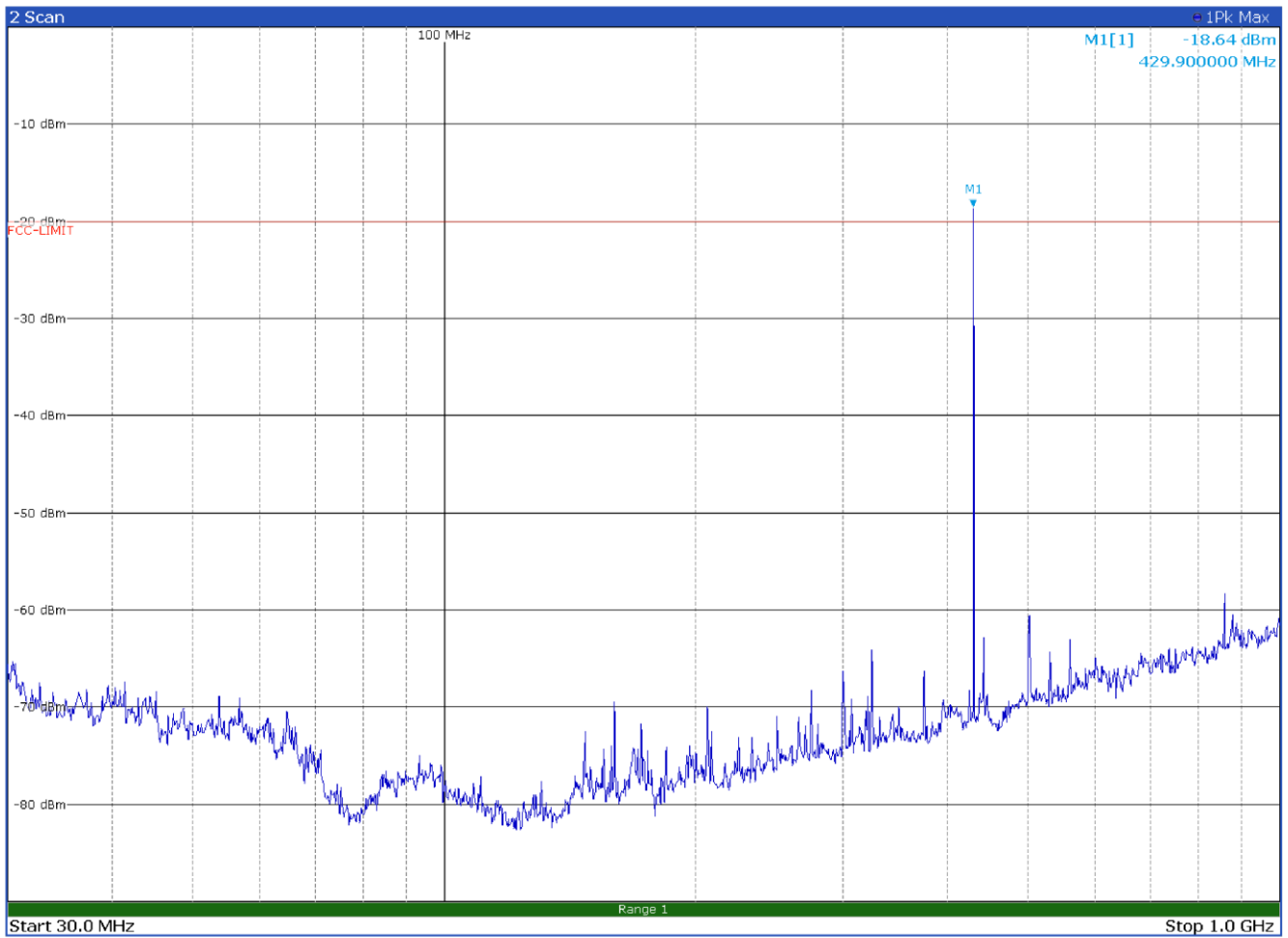
Radiated spurious emissions with modulation CST 4FSK at 421.1 MHz – Antenna in horizontal polarization

Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 421.1 MHz – Antenna in vertical polarization

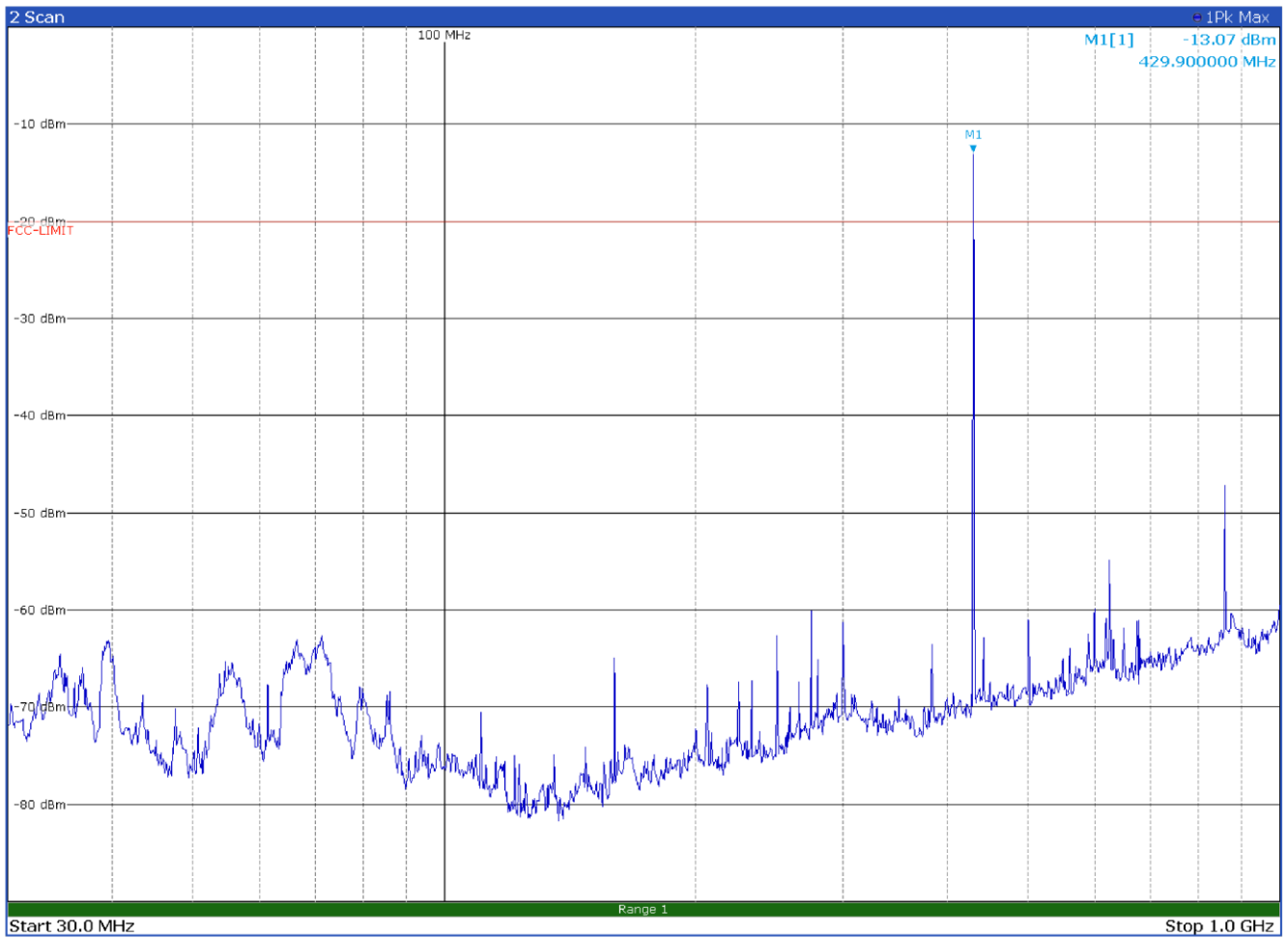
Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 429.9 MHz – Antenna in horizontal polarization

Limit exceeded by the carrier

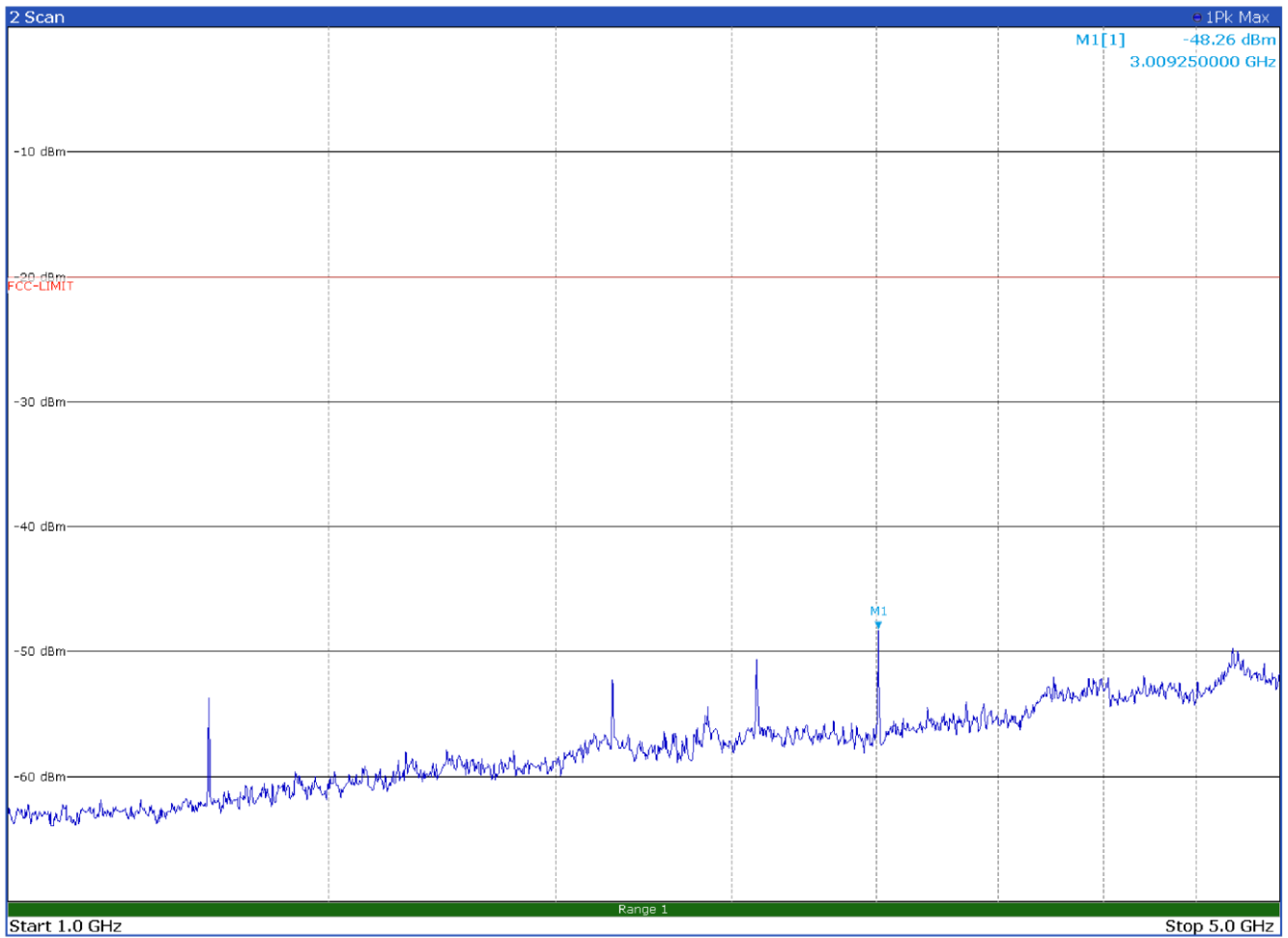
Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 429.9 MHz – Antenna in vertical polarization

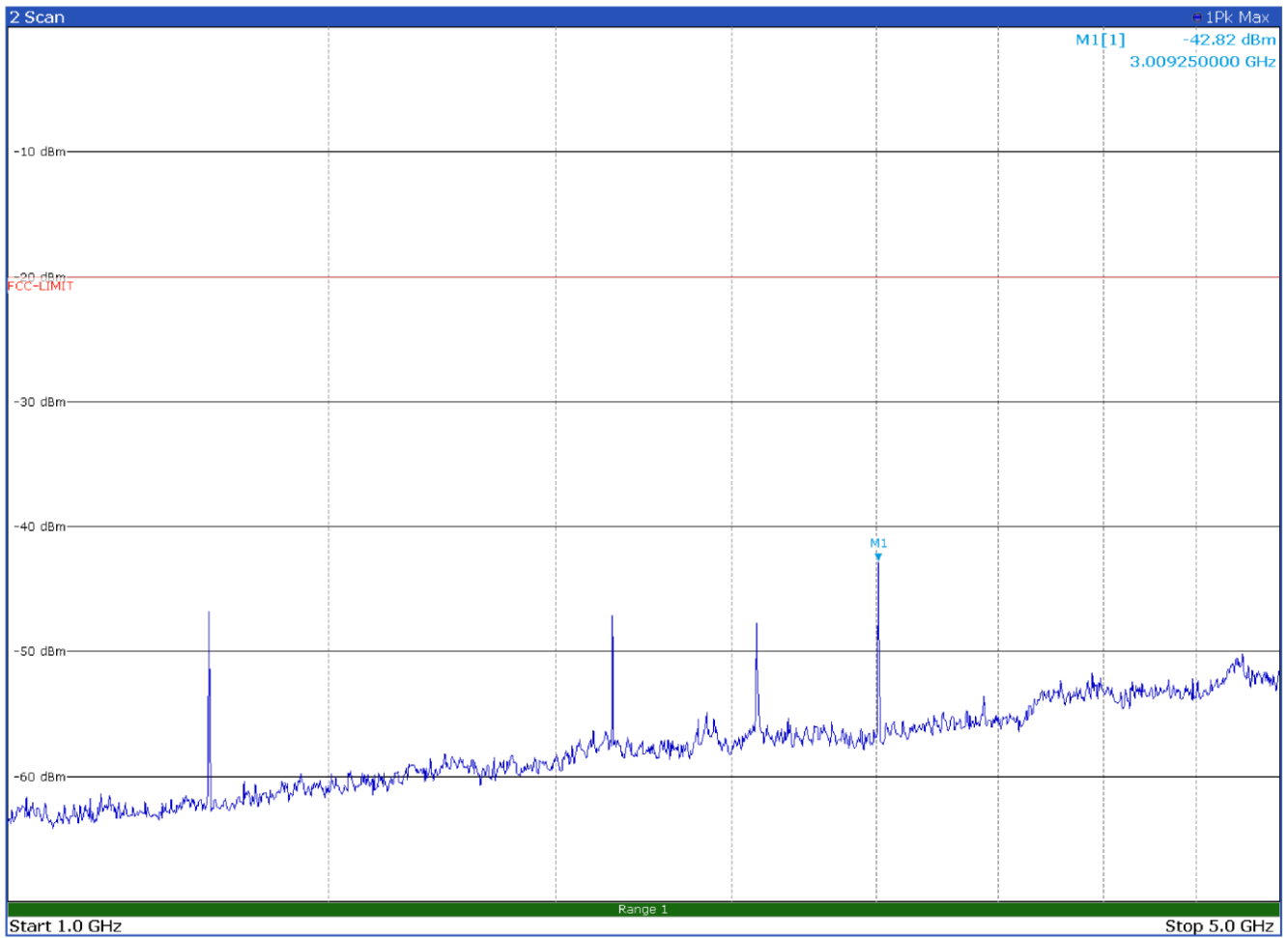
Limit exceeded by the carrier

Test data, continued



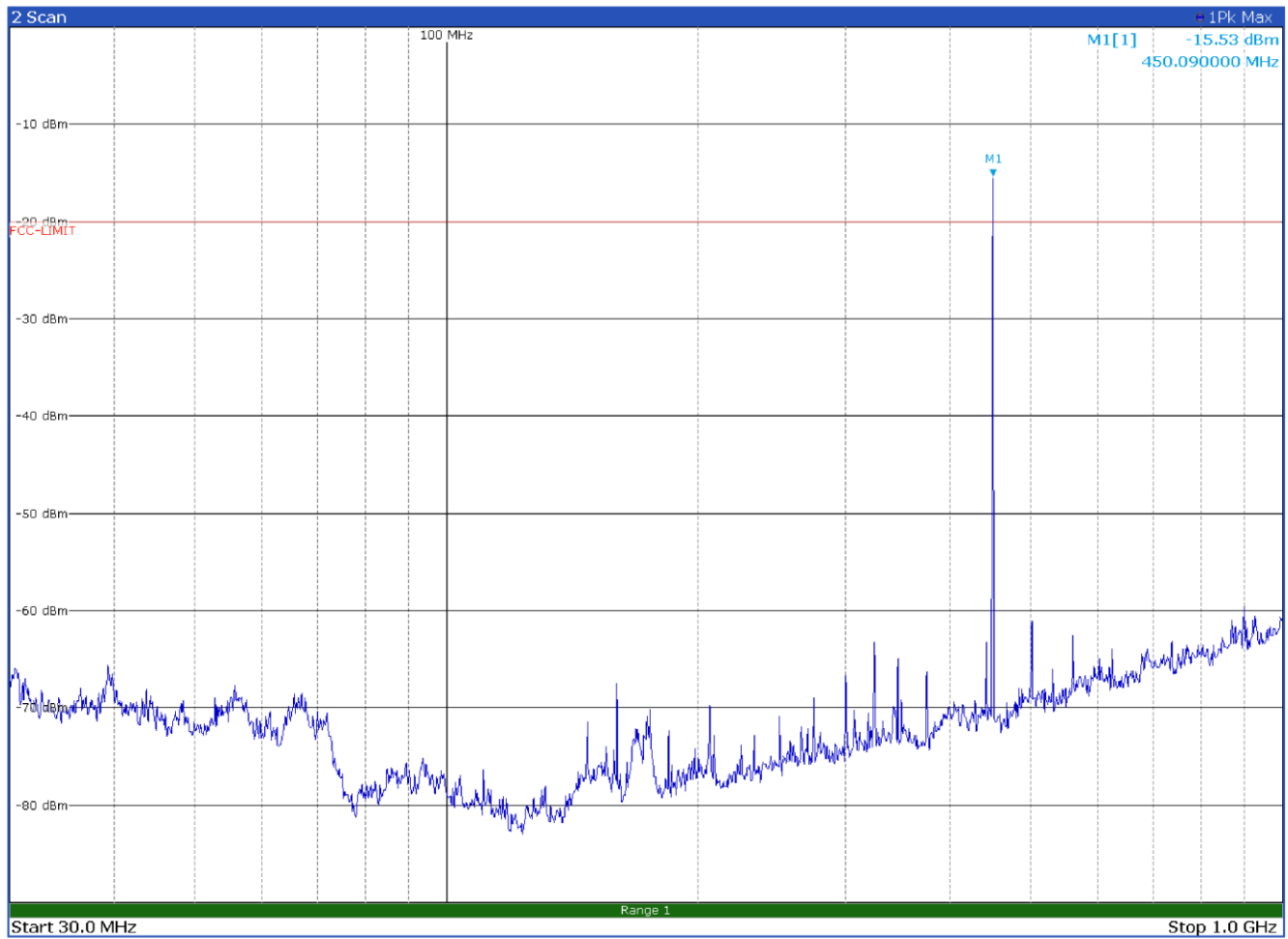
Radiated spurious emissions with modulation CST 4FSK at 429.9 MHz – Antenna in horizontal polarization

Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 429.9 MHz – Antenna in vertical polarization

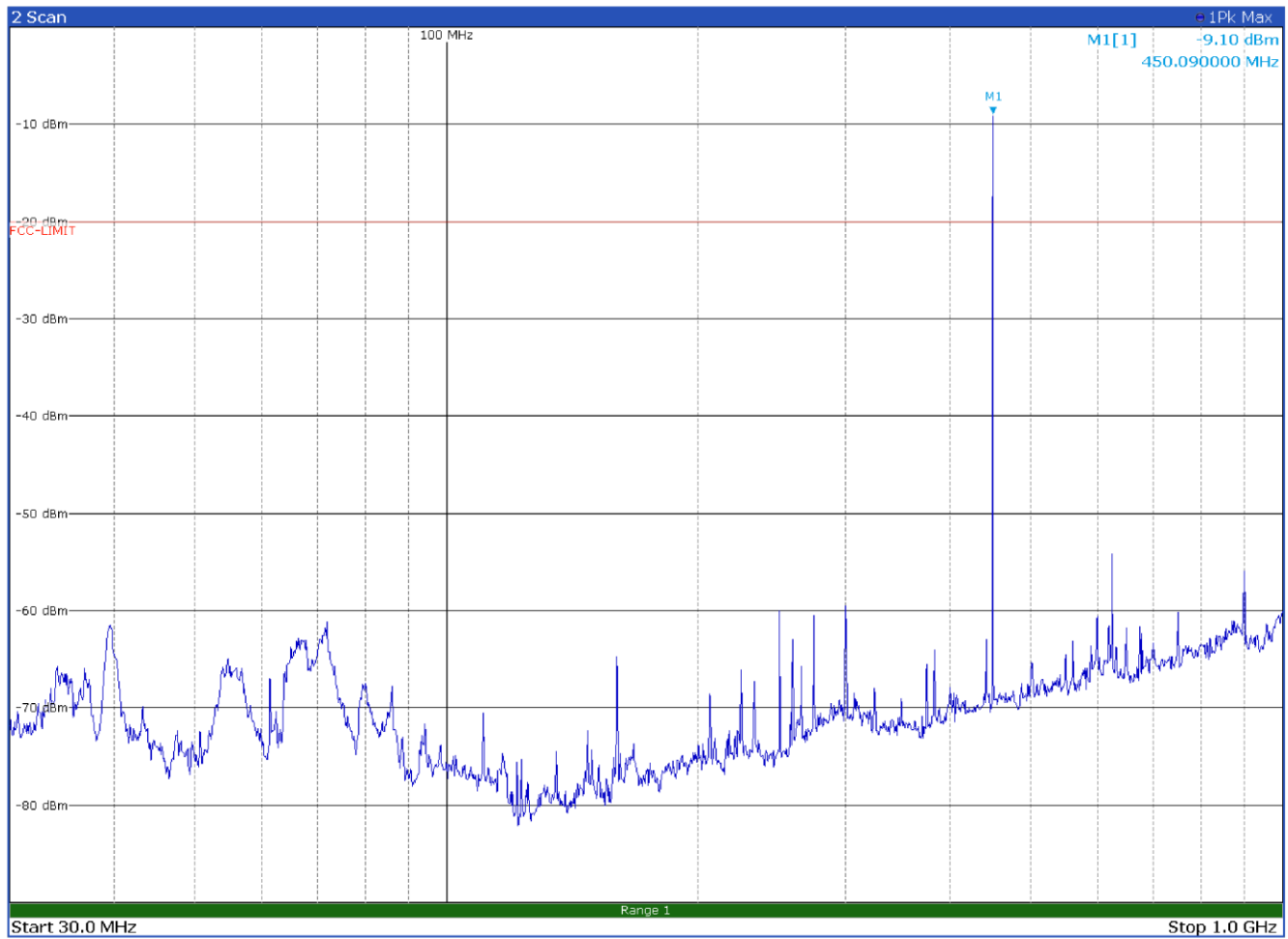
Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 450.1 MHz – Antenna in horizontal polarization

Limit exceeded by the carrier

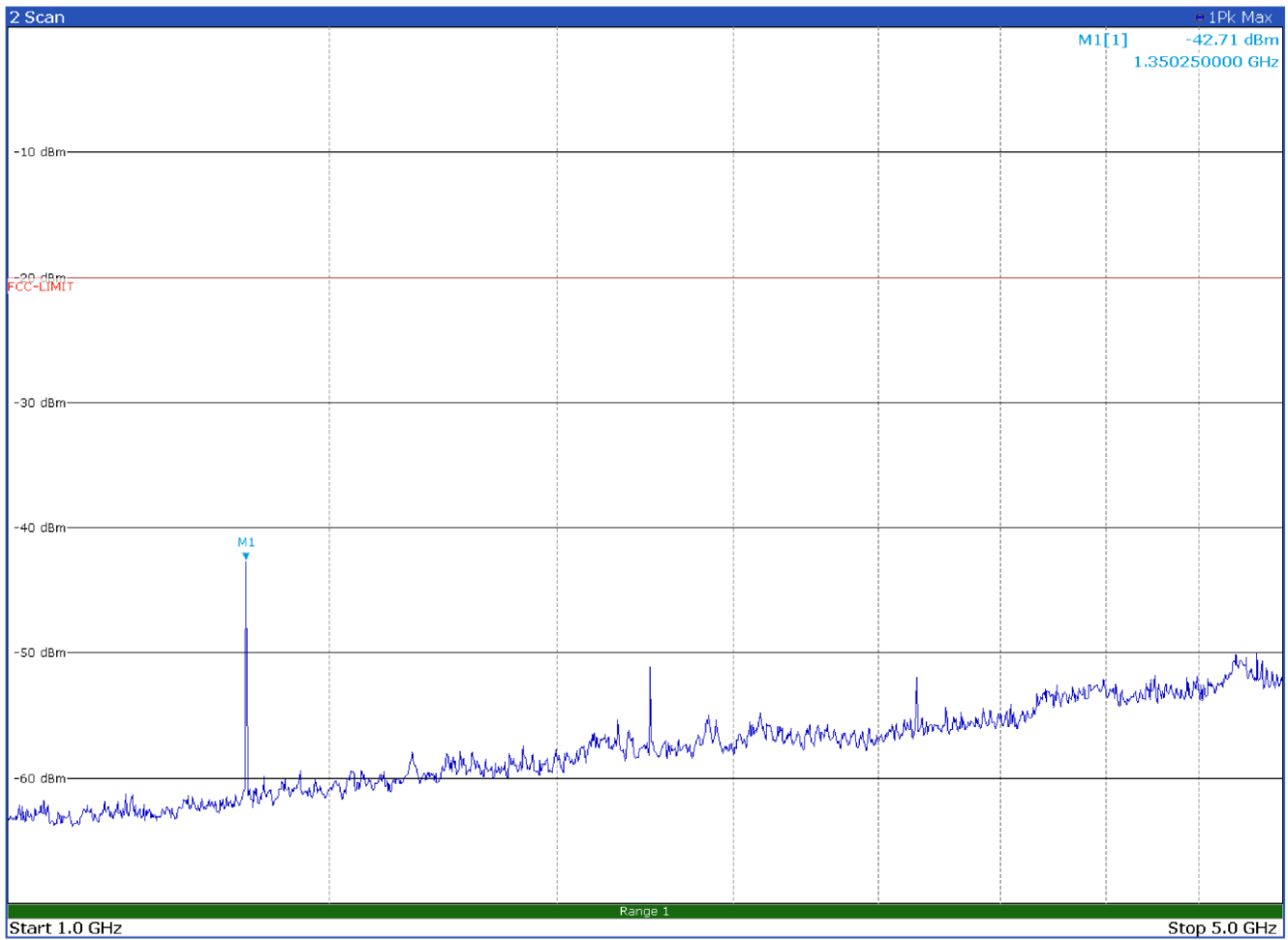
Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 450.1 MHz – Antenna in vertical polarization

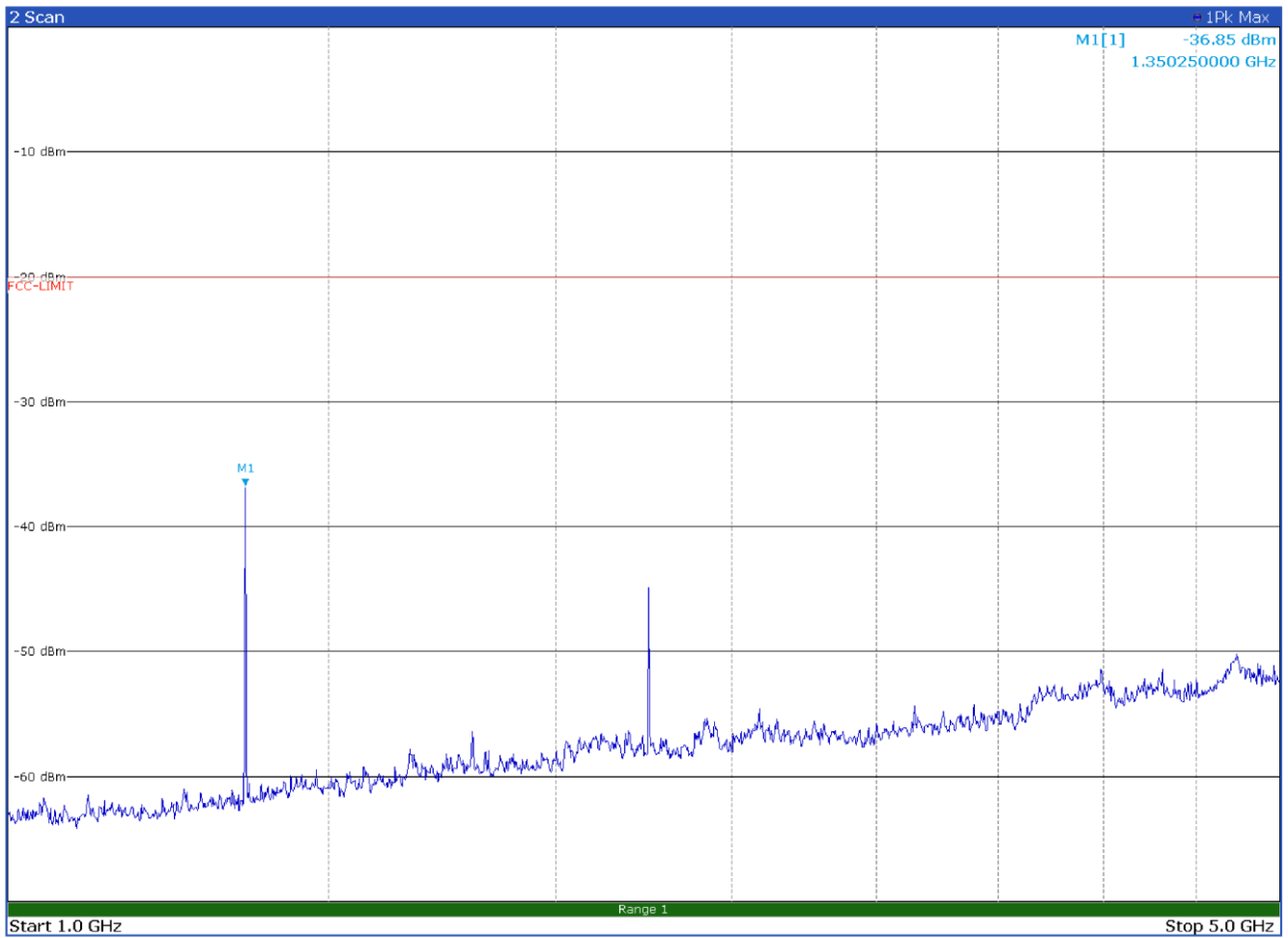
Limit exceeded by the carrier

Test data, continued



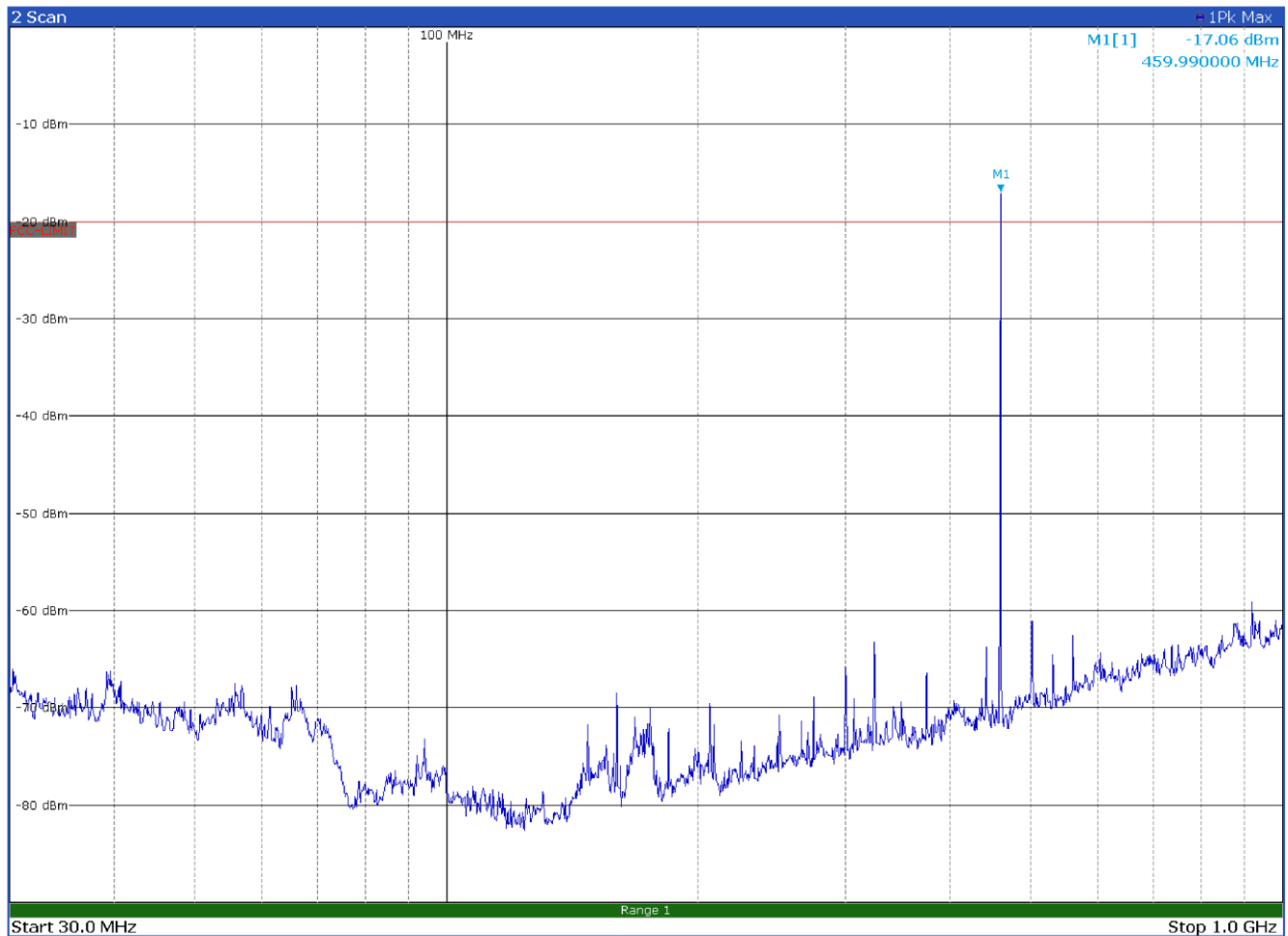
Radiated spurious emissions with modulation CST 4FSK at 450.1 MHz – Antenna in horizontal polarization

Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 450.1 MHz – Antenna in vertical polarization

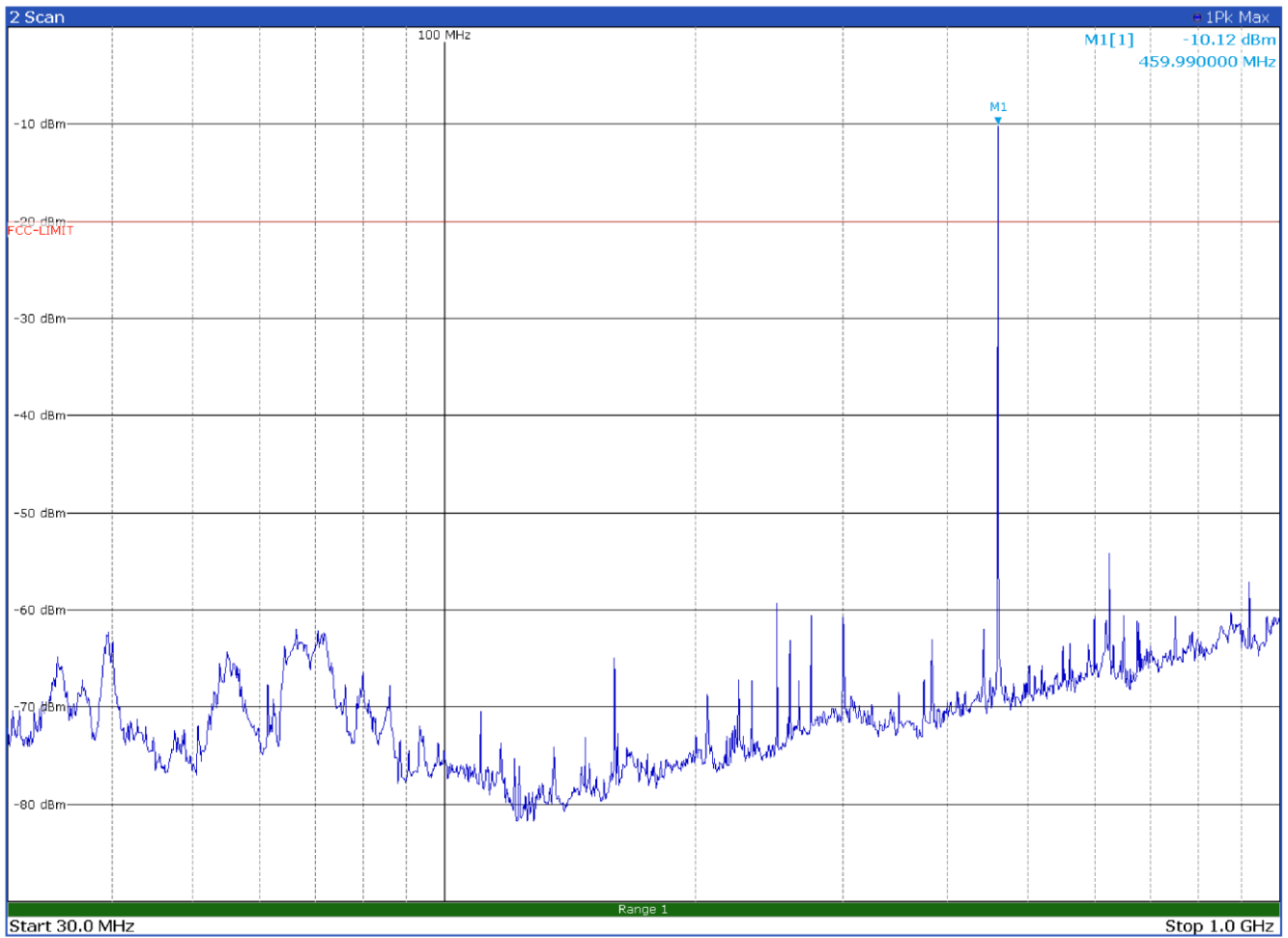
Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 460.0 MHz – Antenna in horizontal polarization

Limit exceeded by the carrier

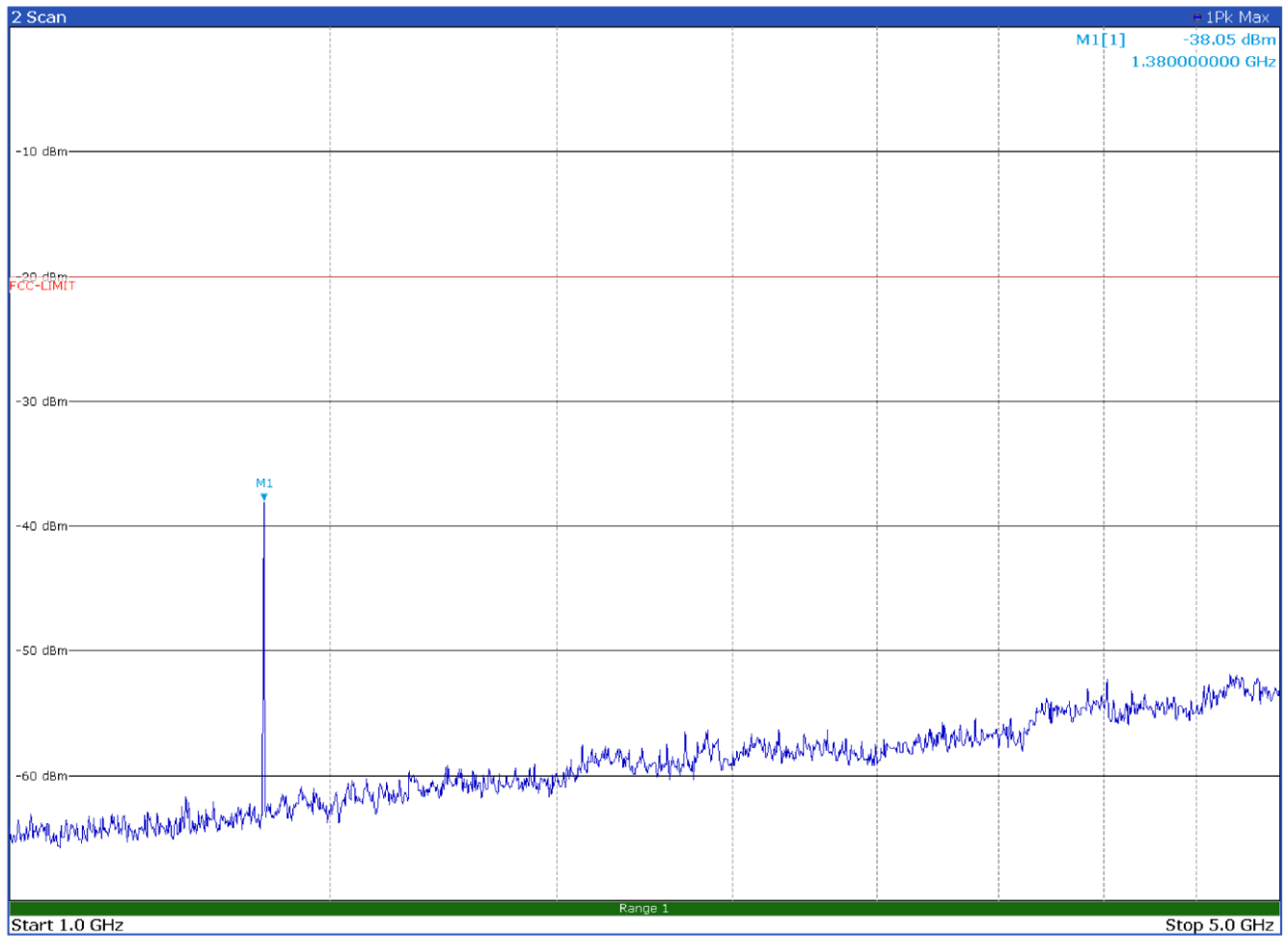
Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 460.0 MHz – Antenna in vertical polarization

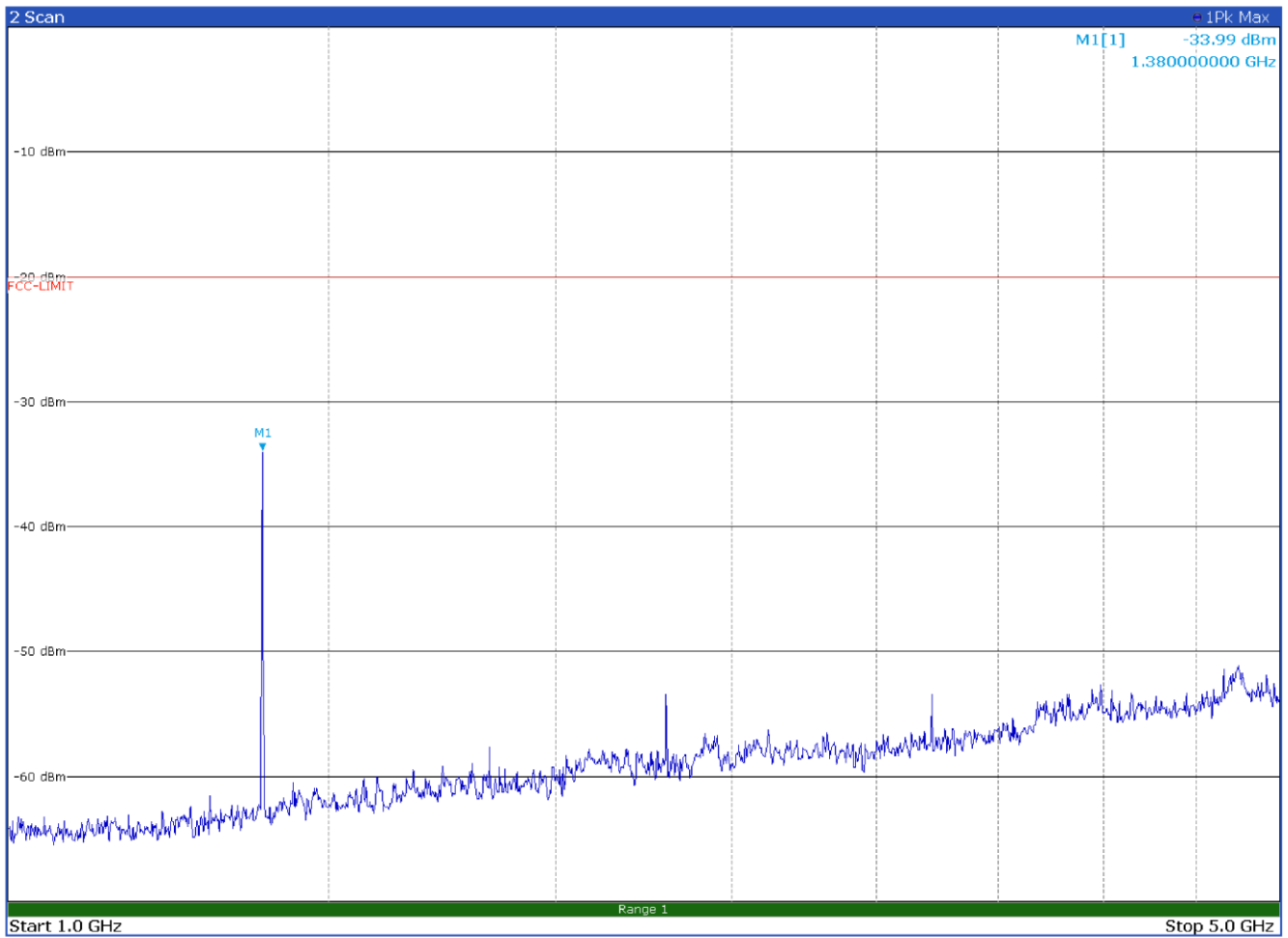
Limit exceeded by the carrier

Test data, continued



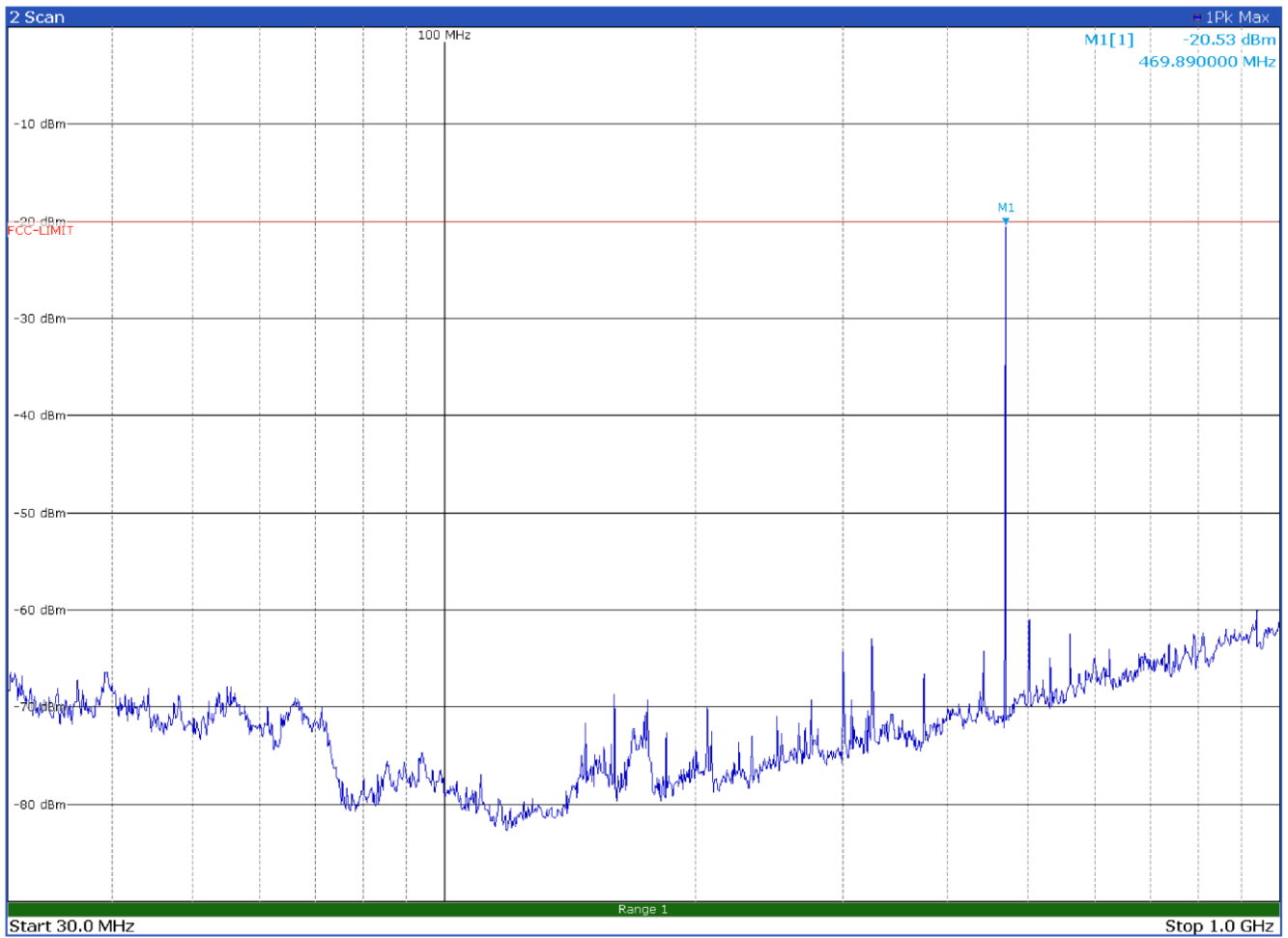
Radiated spurious emissions with modulation CST 4FSK at 460.0 MHz – Antenna in horizontal polarization

Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 460.0 MHz – Antenna in vertical polarization

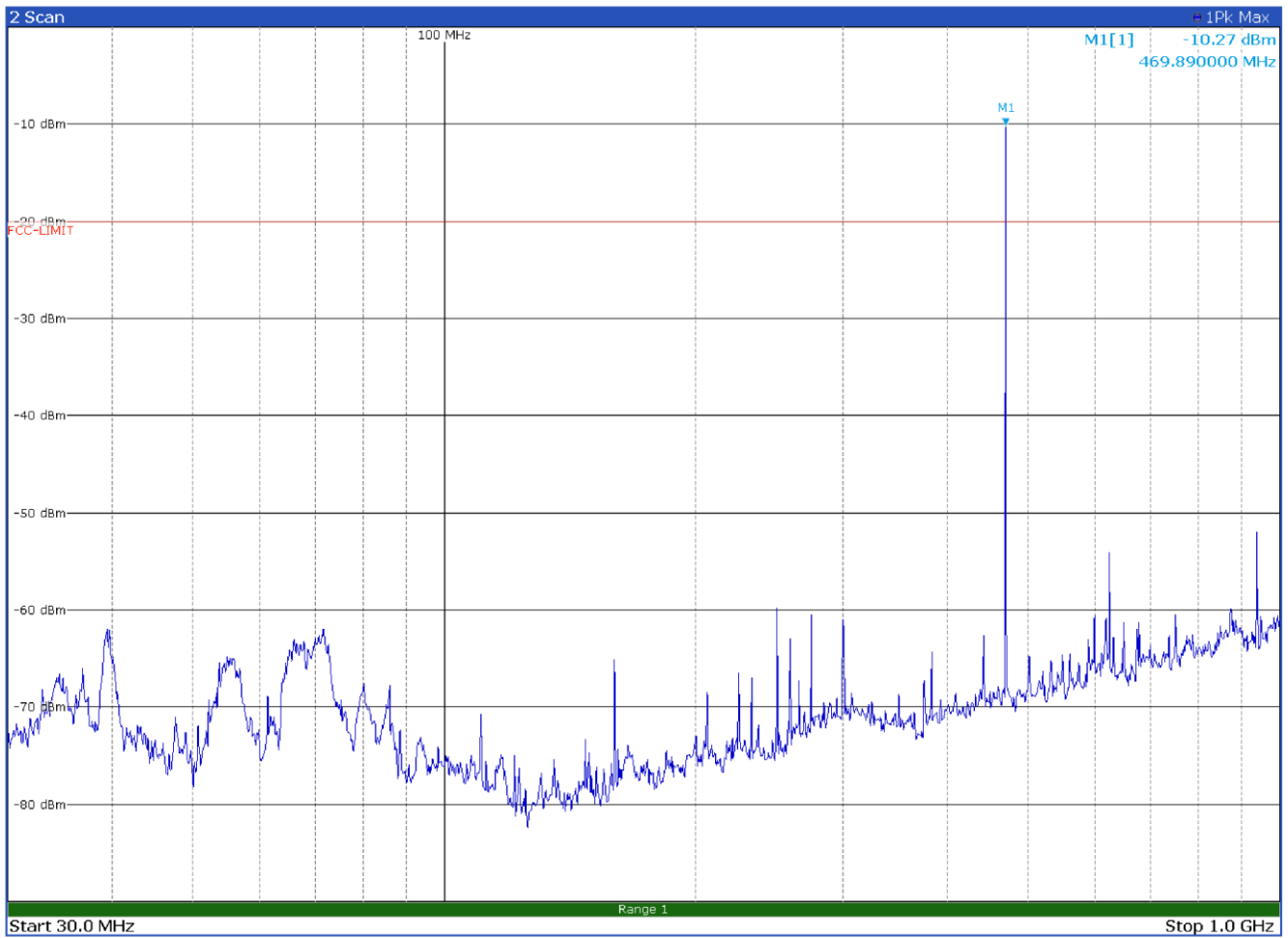
Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 469.9 MHz – Antenna in horizontal polarization

Limit exceeded by the carrier

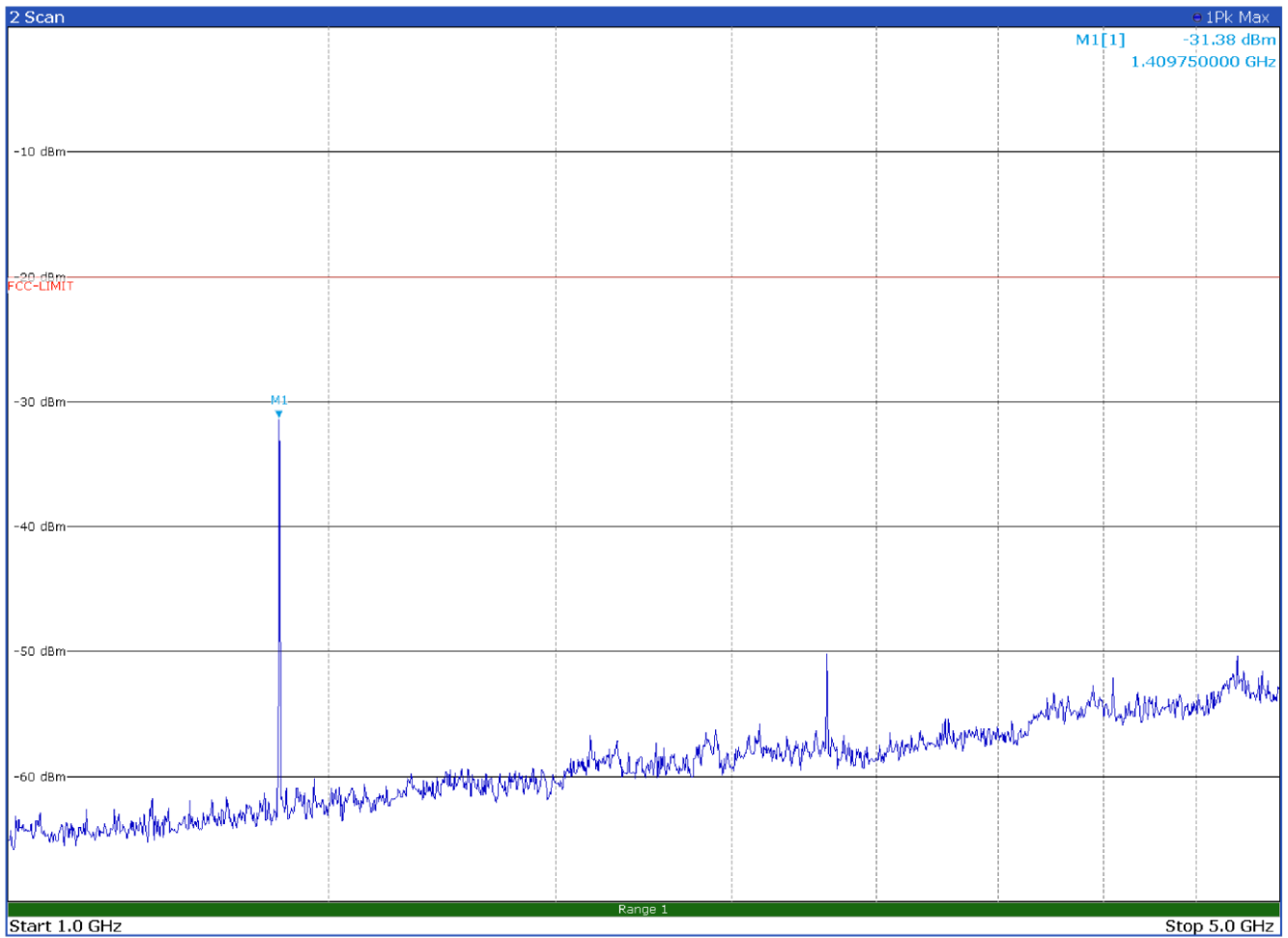
Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 469.9 MHz – Antenna in vertical polarization

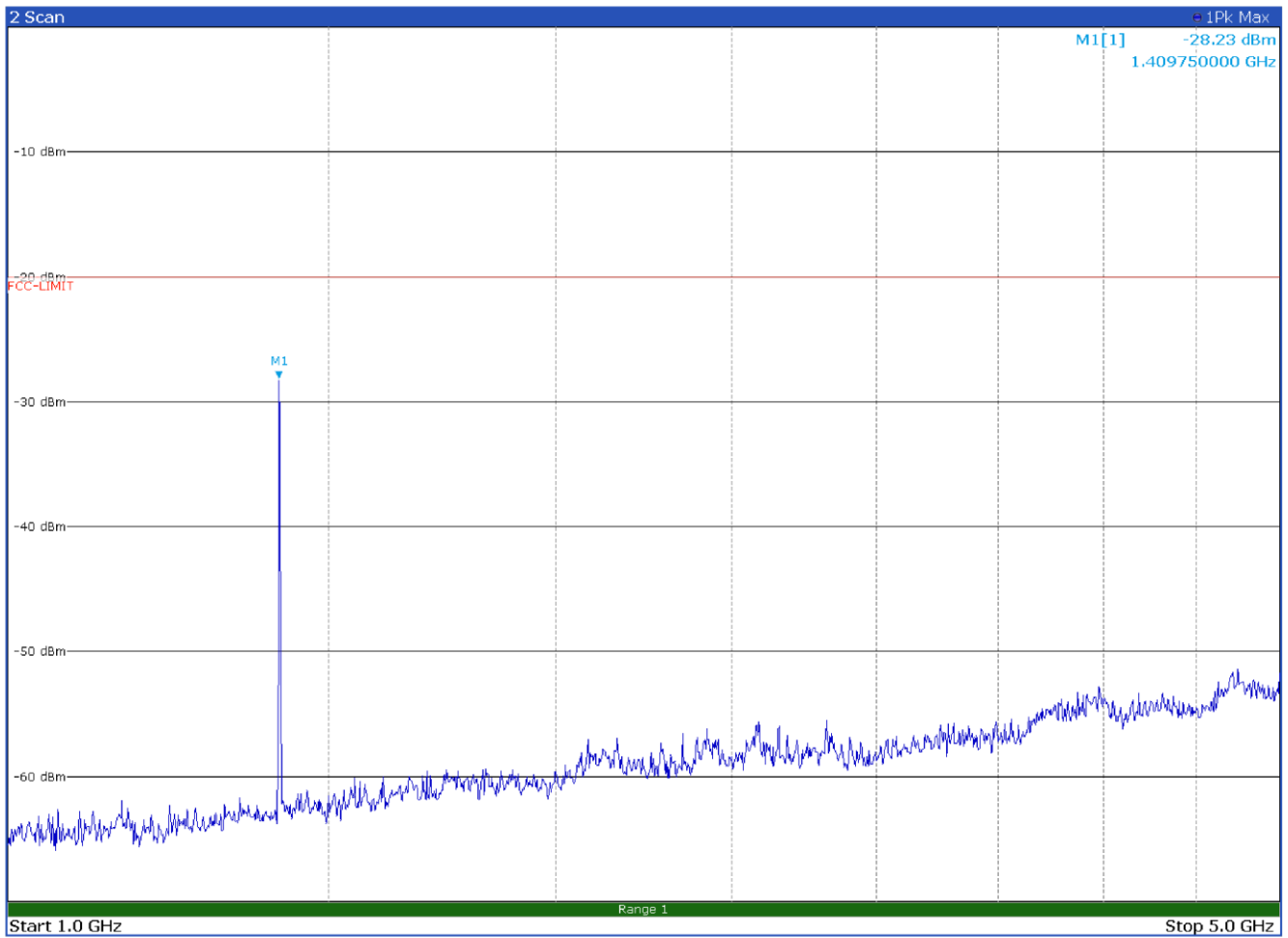
Limit exceeded by the carrier

Test data, continued



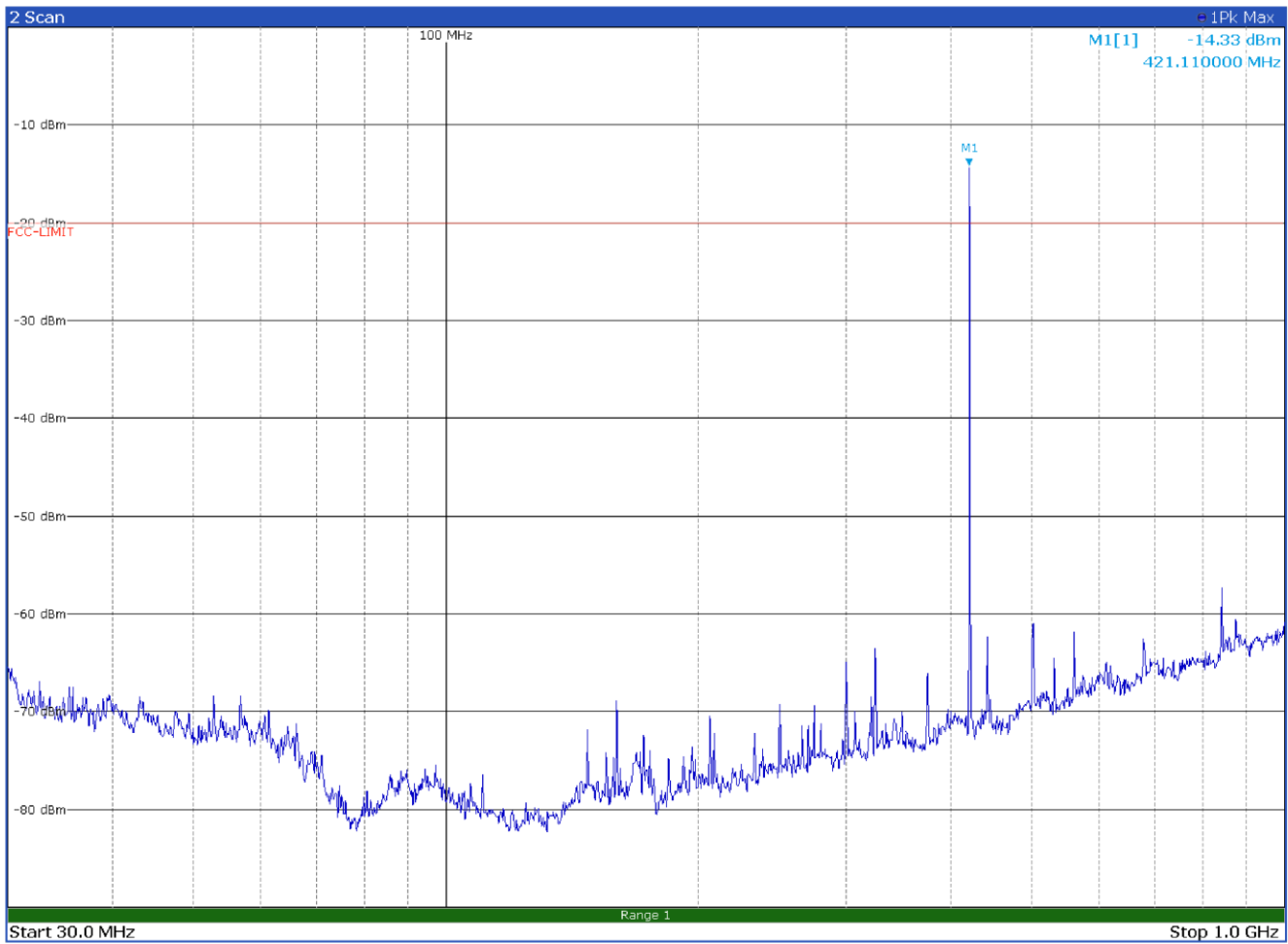
Radiated spurious emissions with modulation CST 4FSK at 469.9 MHz – Antenna in horizontal polarization

Test data, continued



Radiated spurious emissions with modulation CST 4FSK at 469.9 MHz – Antenna in vertical polarization

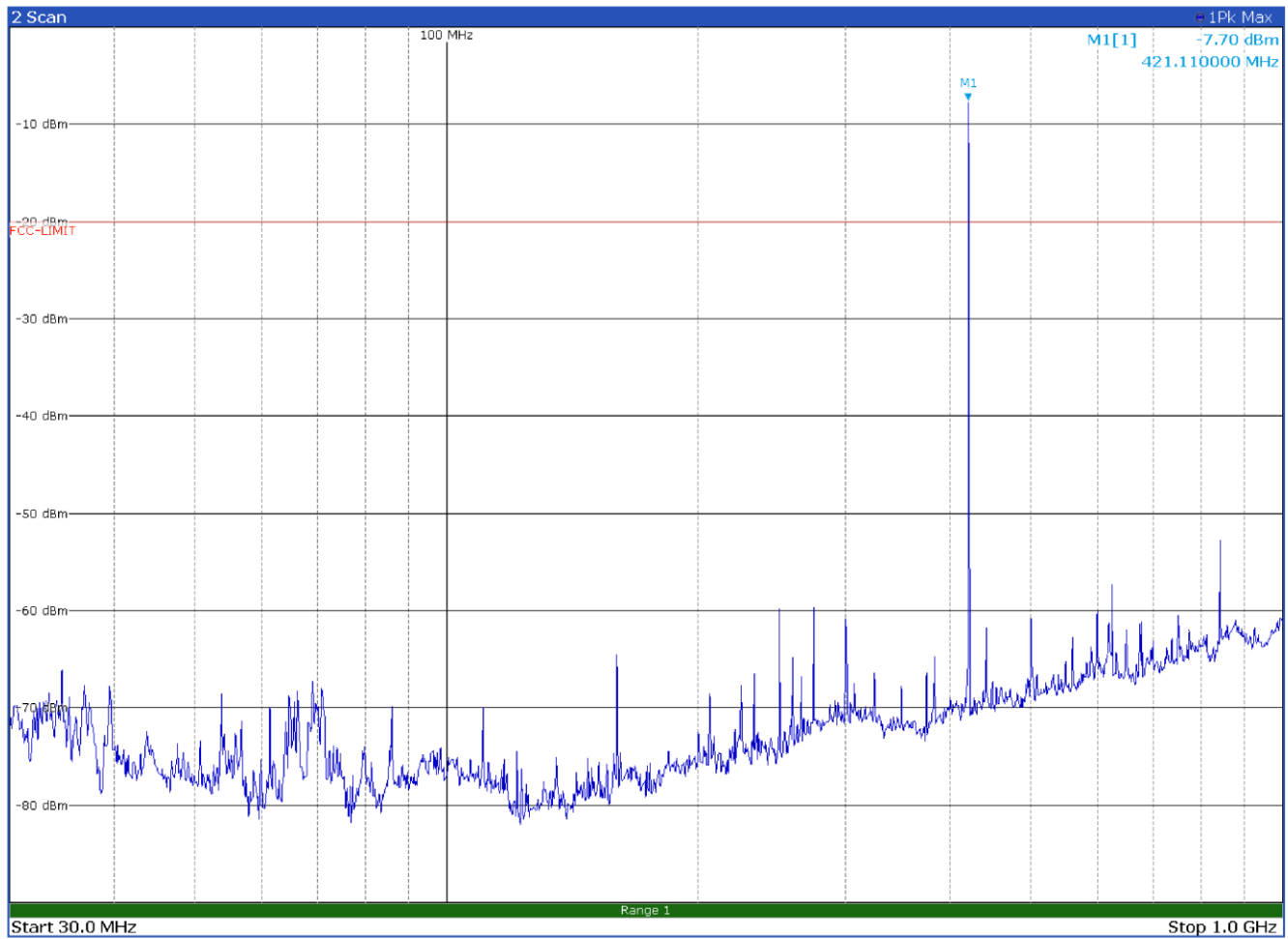
Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 421.1 MHz – Antenna in horizontal polarization

Limit exceeded by the carrier

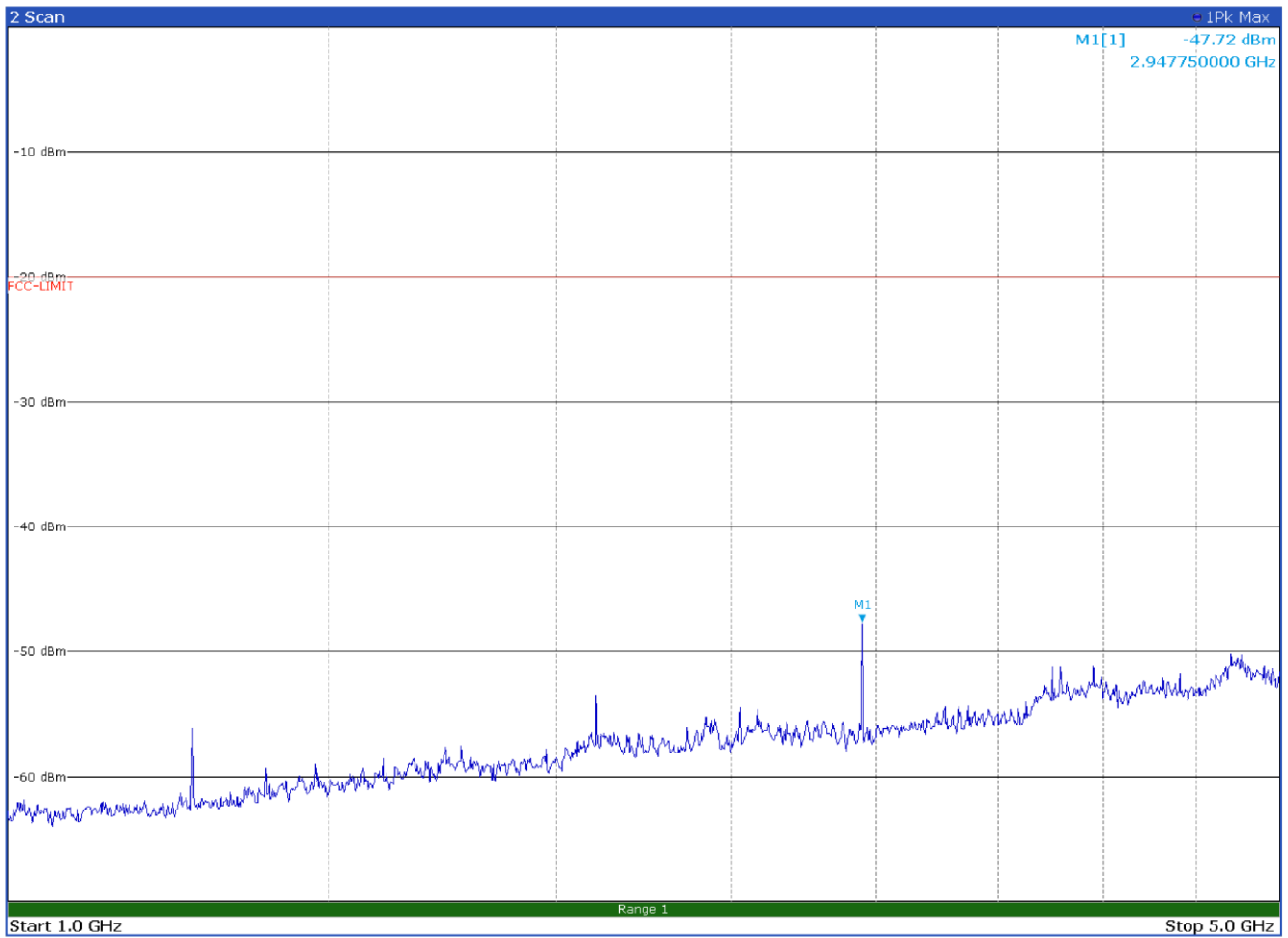
Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 421.1 MHz – Antenna in vertical polarization

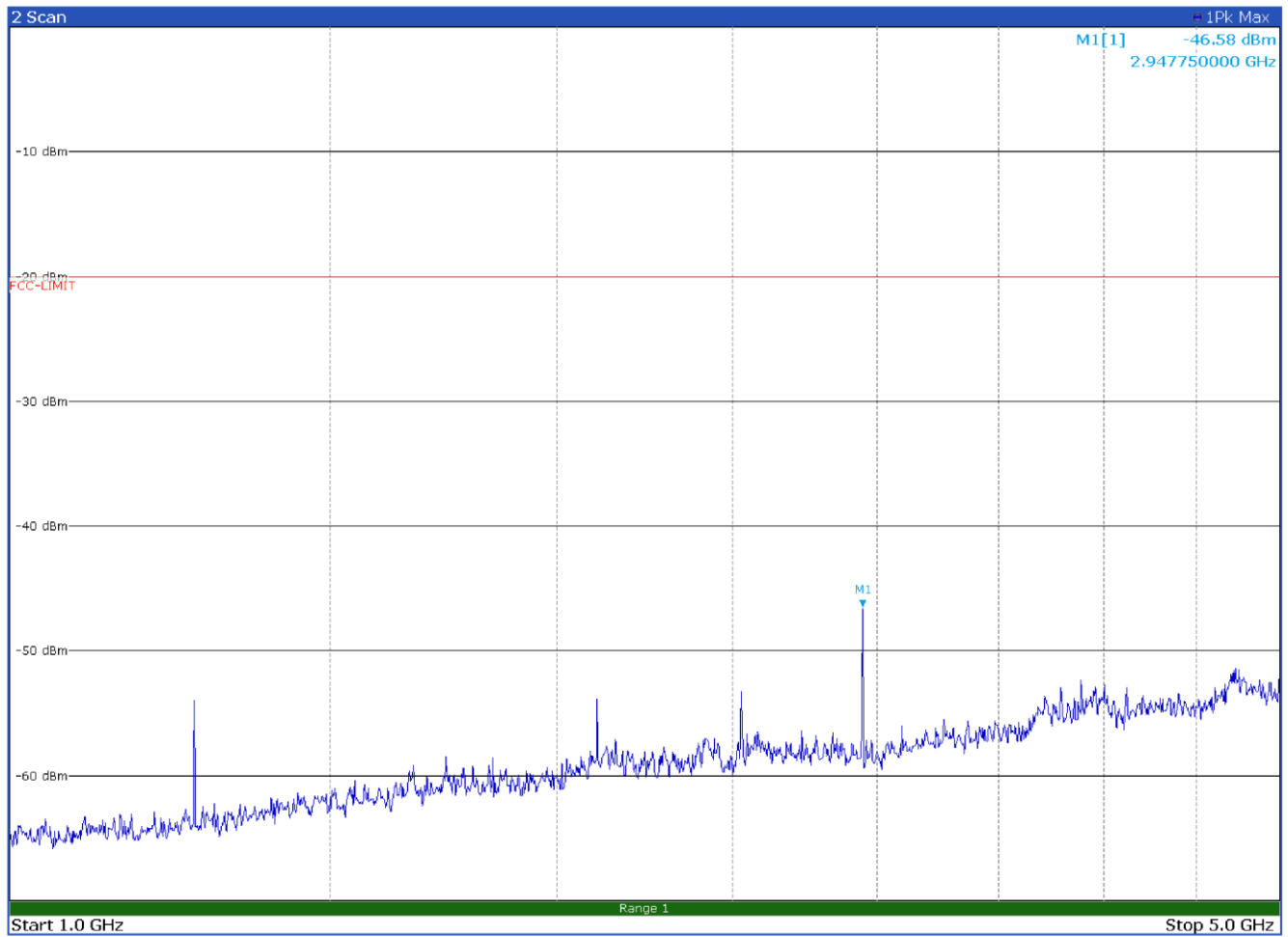
Limit exceeded by the carrier

Test data, continued



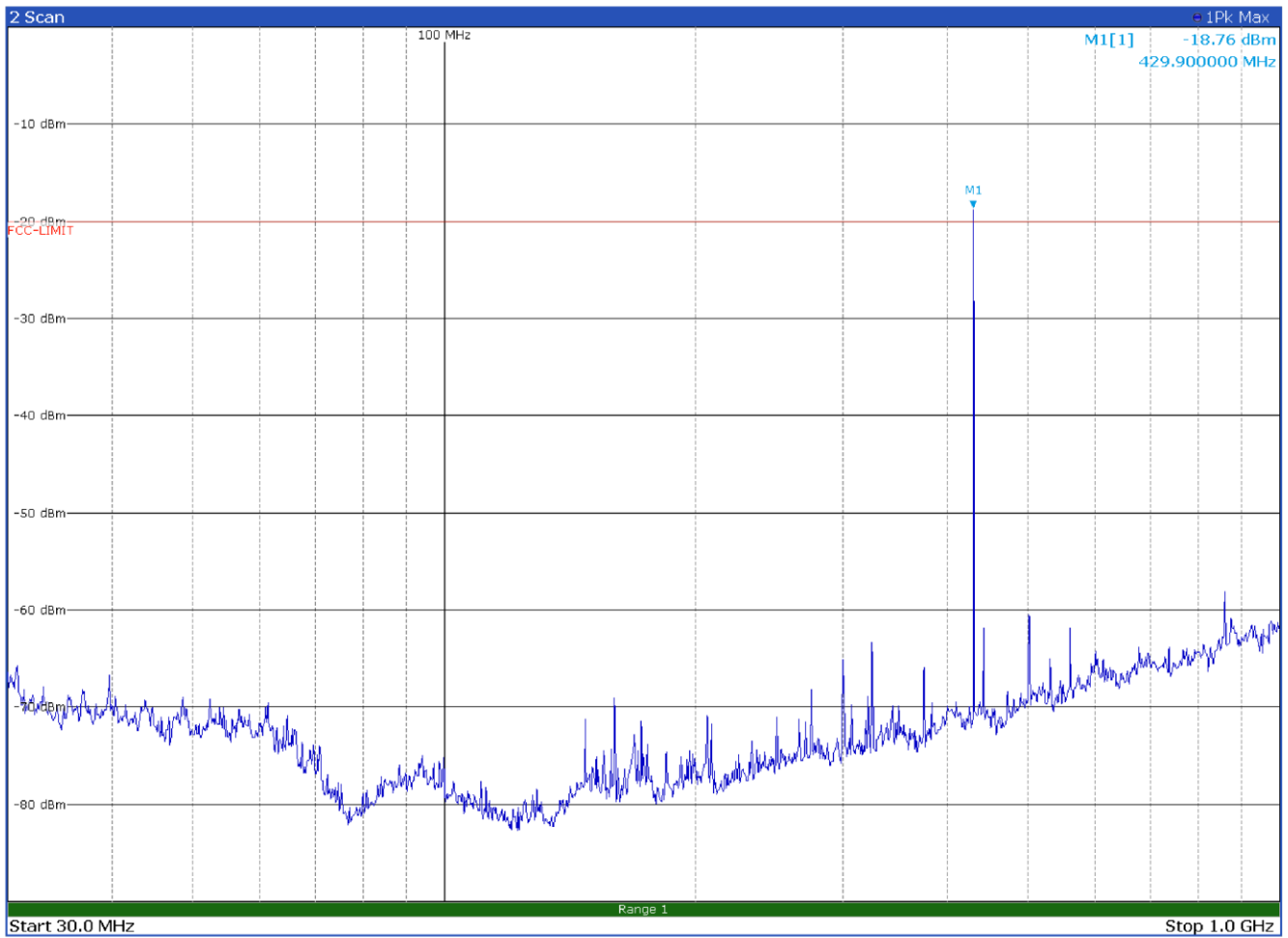
Radiated spurious emissions with modulation P25 C4FM at 421.1 MHz – Antenna in horizontal polarization

Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 421.1 MHz – Antenna in vertical polarization

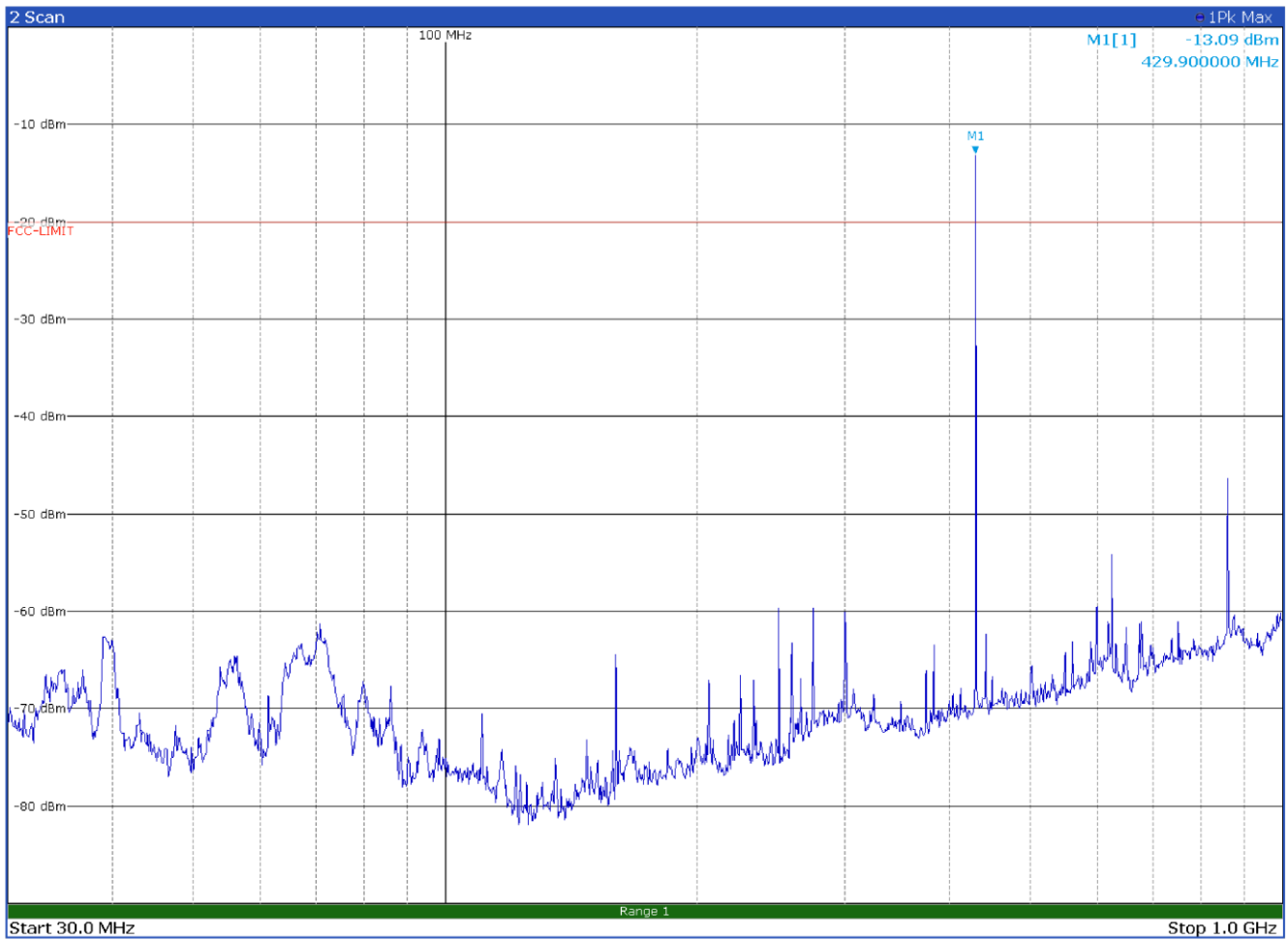
Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 429.9 MHz – Antenna in horizontal polarization

Limit exceeded by the carrier

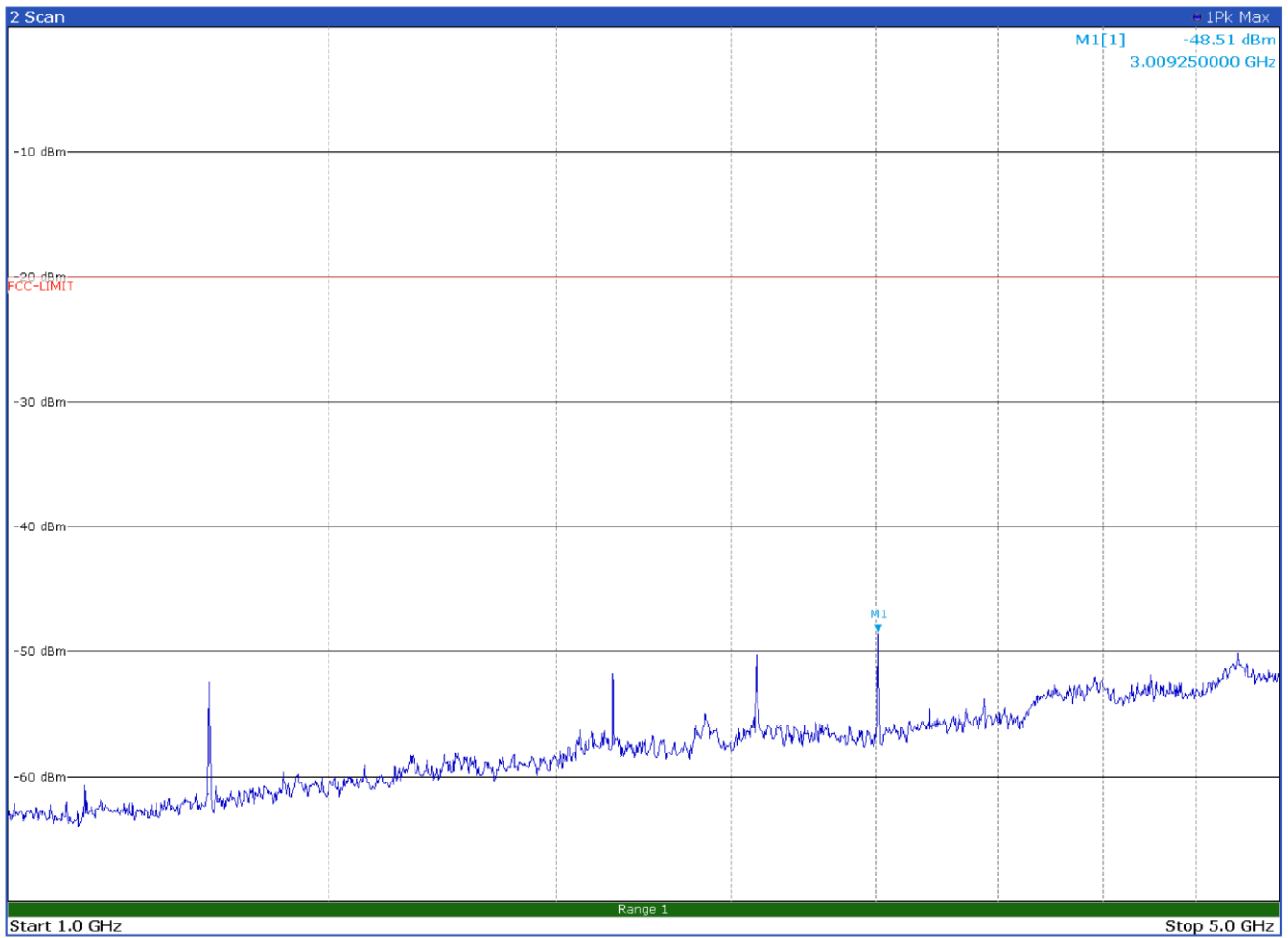
Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 429.9 MHz – Antenna in vertical polarization

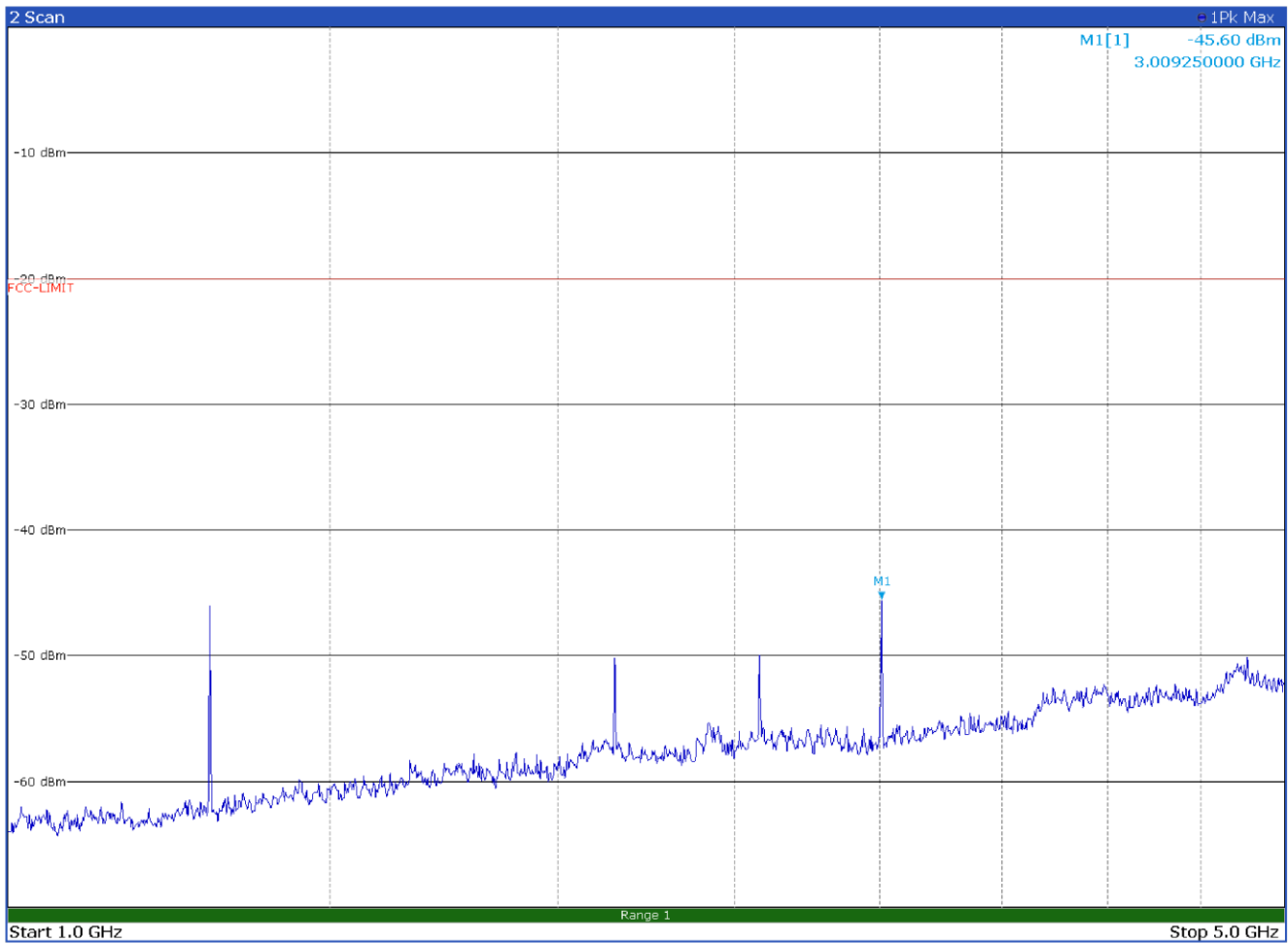
Limit exceeded by the carrier

Test data, continued



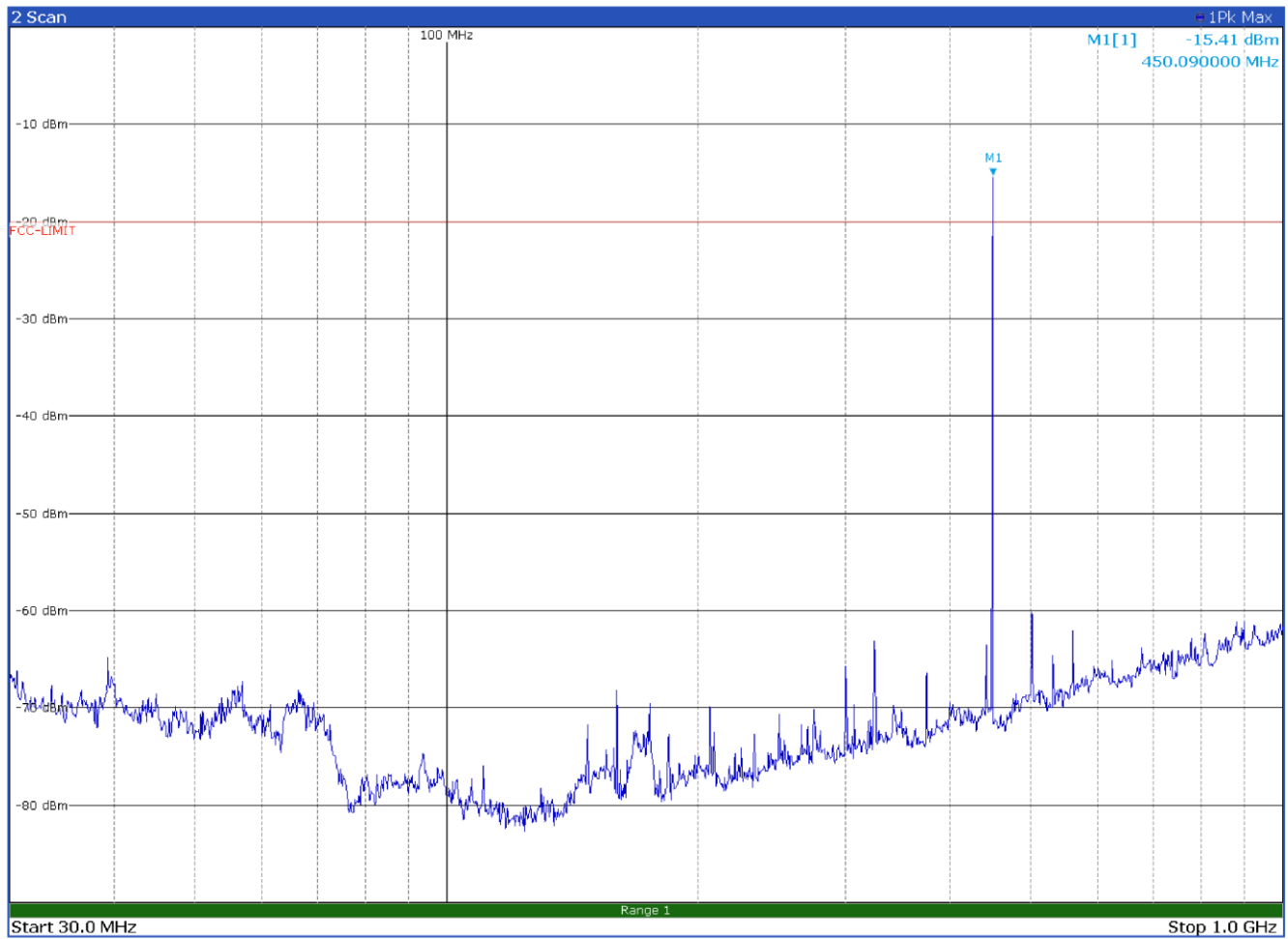
Radiated spurious emissions with modulation P25 C4FM at 429.9 MHz – Antenna in horizontal polarization

Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 429.9 MHz – Antenna in vertical polarization

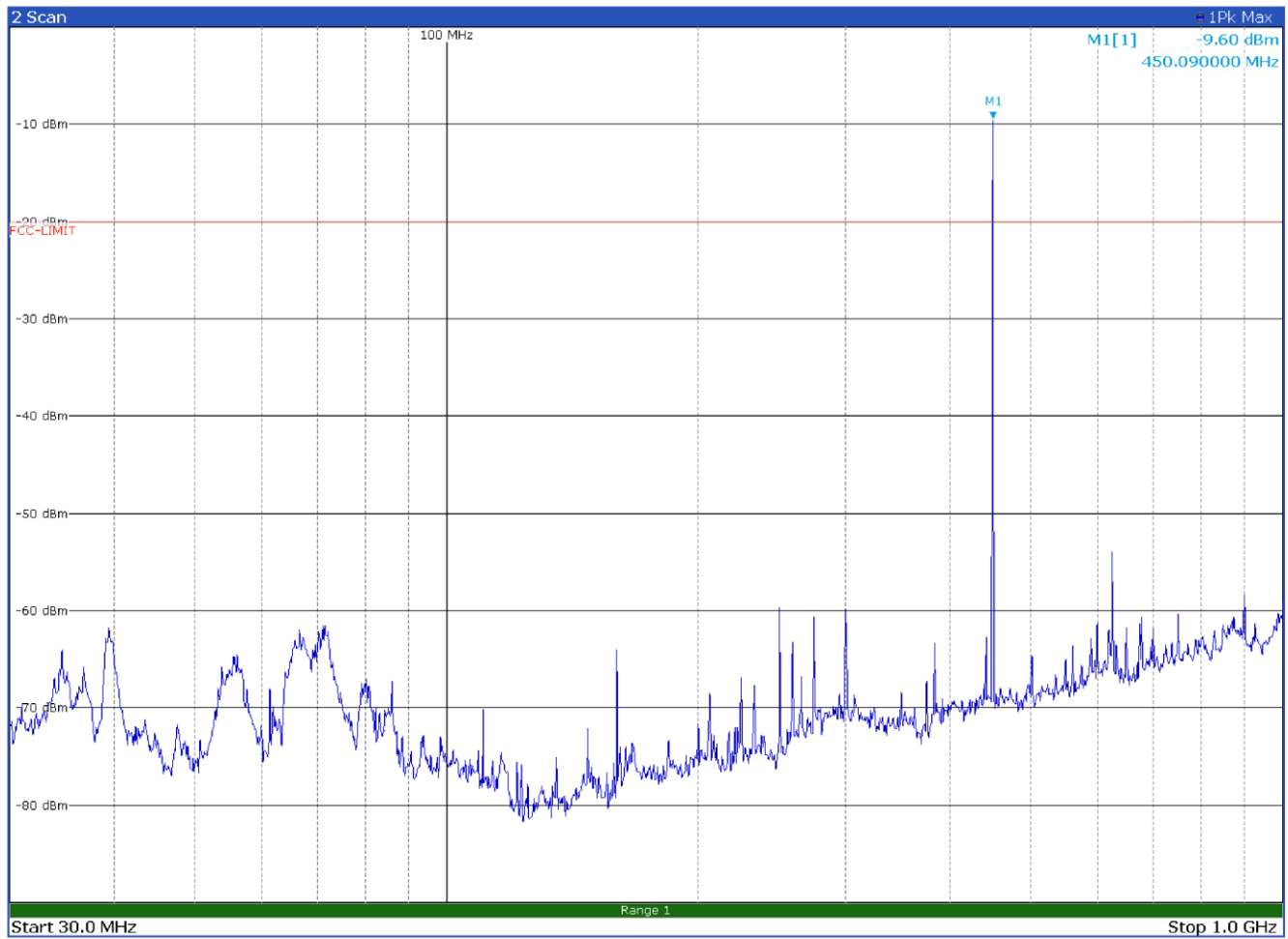
Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 450.1 MHz – Antenna in horizontal polarization

Limit exceeded by the carrier

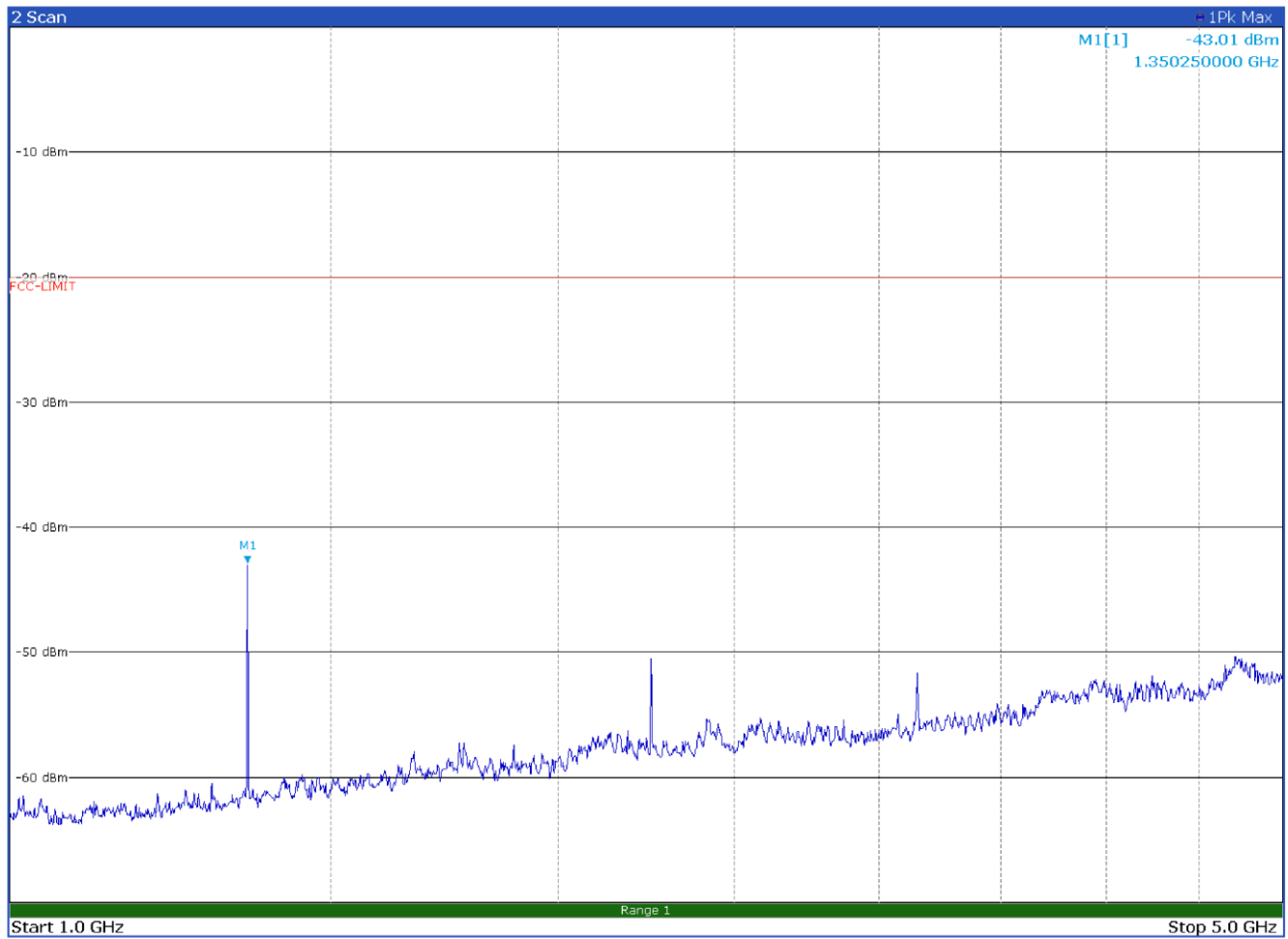
Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 450.1 MHz – Antenna in vertical polarization

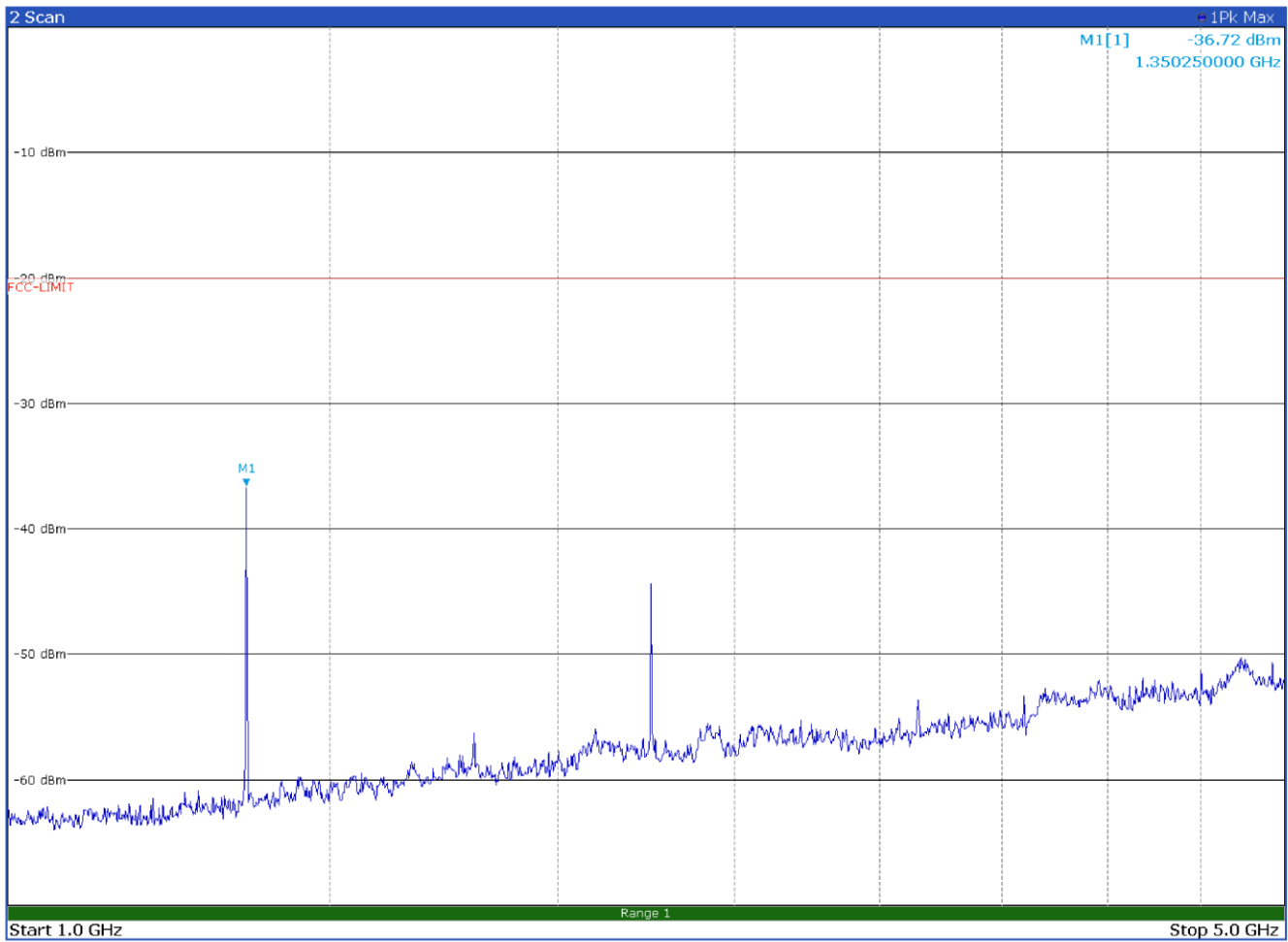
Limit exceeded by the carrier

Test data, continued



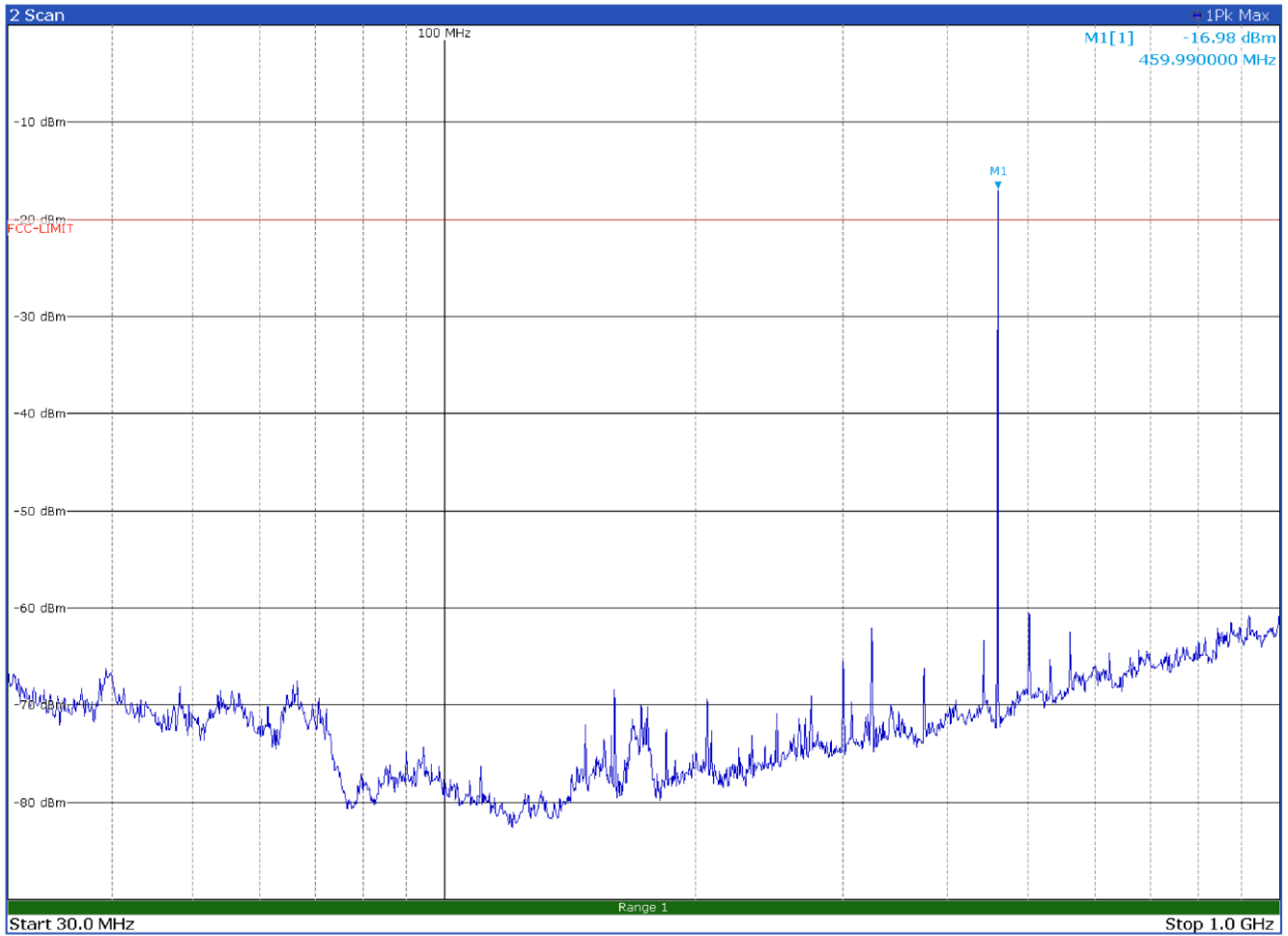
Radiated spurious emissions with modulation P25 C4FM at 450.1 MHz – Antenna in horizontal polarization

Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 450.1 MHz – Antenna in vertical polarization

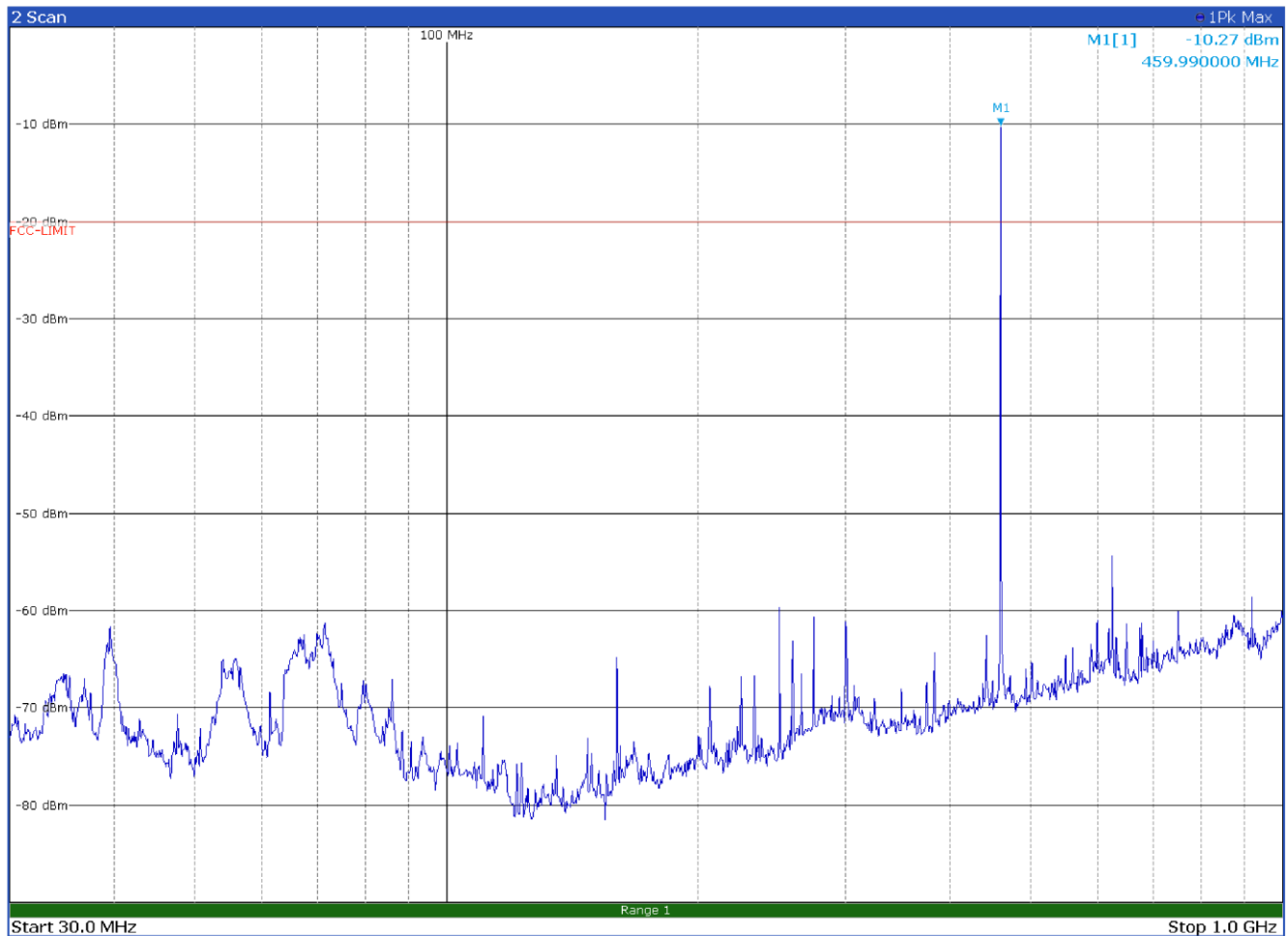
Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 460.0 MHz – Antenna in horizontal polarization

Limit exceeded by the carrier

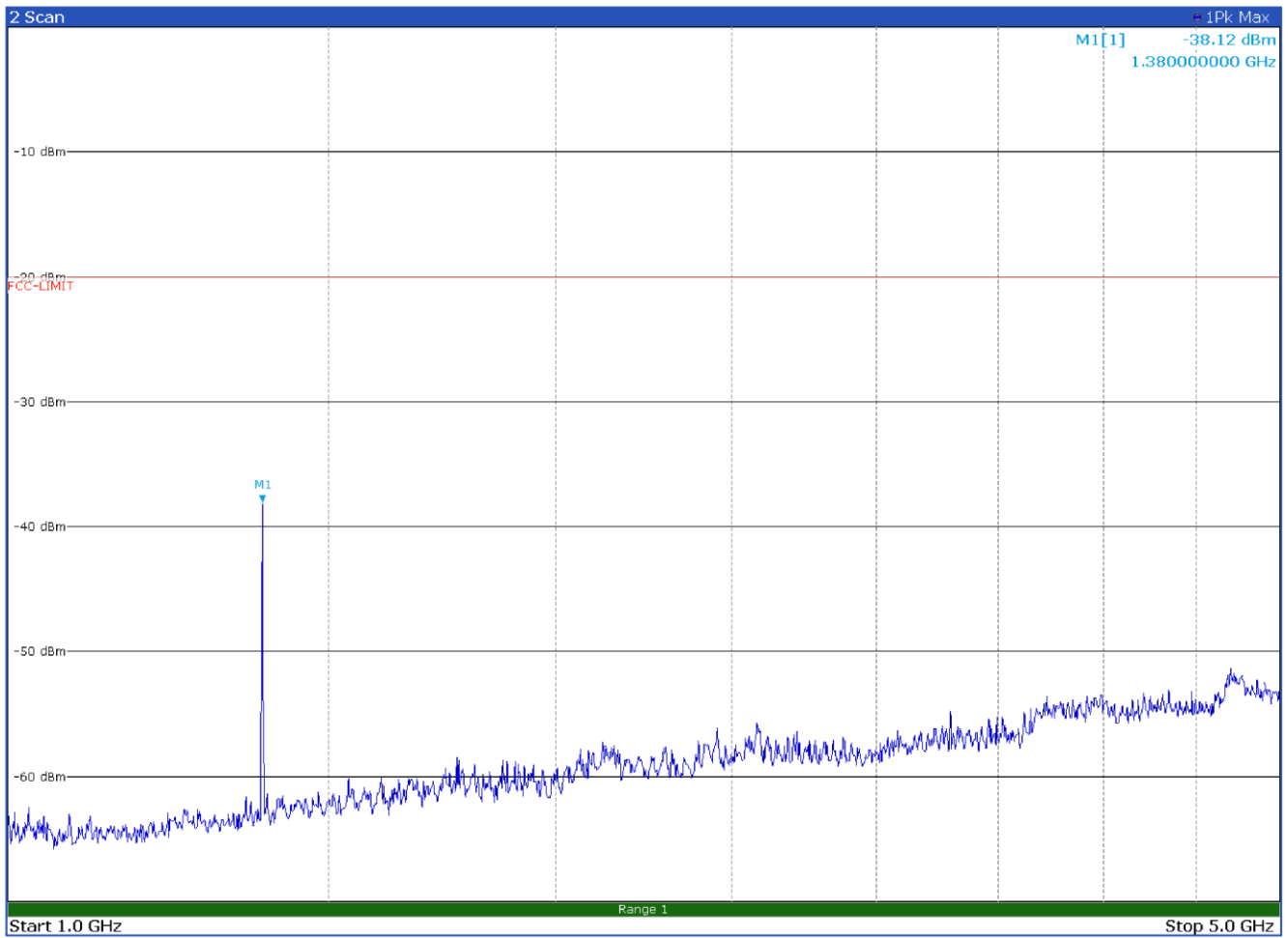
Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 460.0 MHz – Antenna in vertical polarization

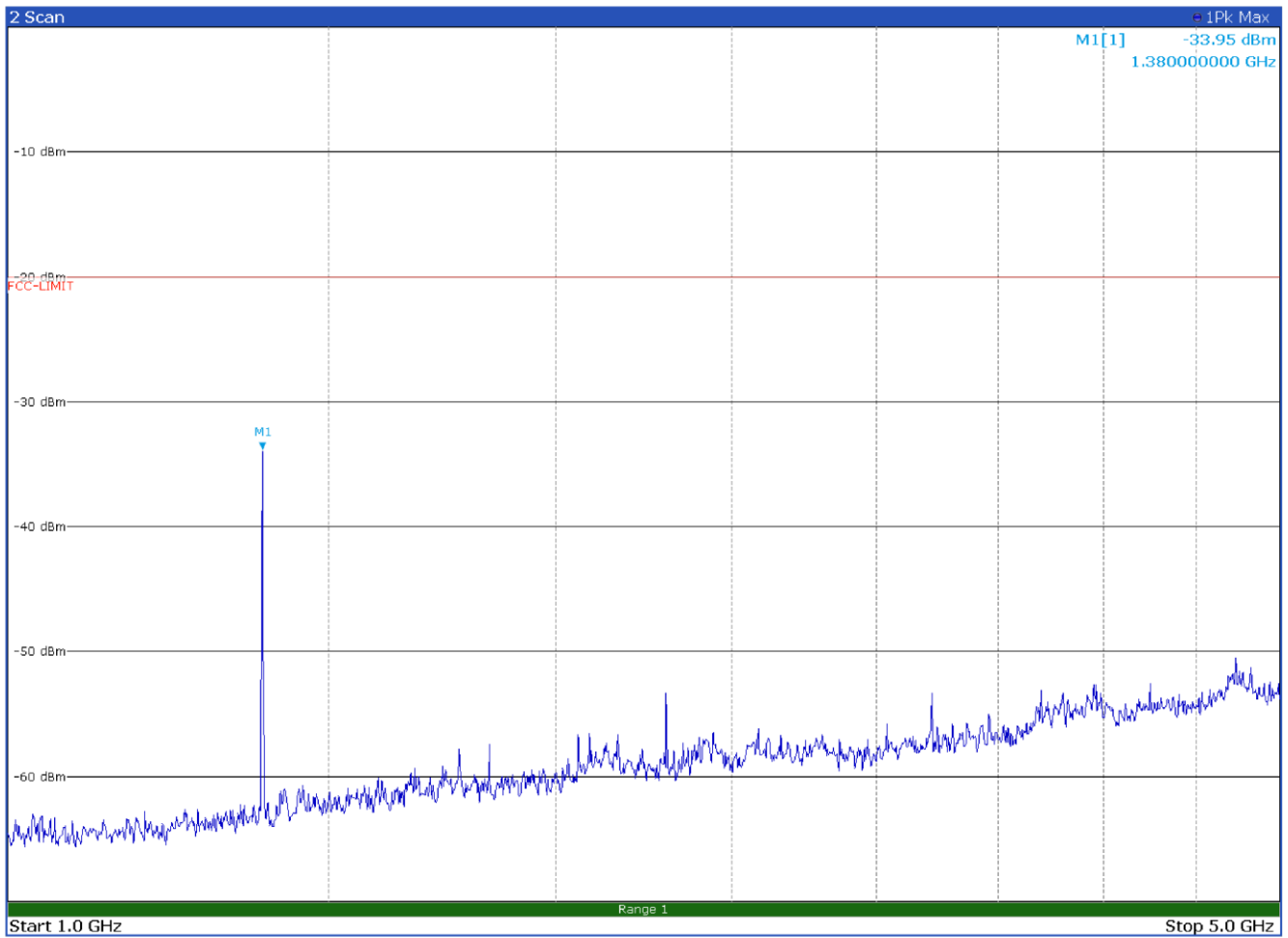
Limit exceeded by the carrier

Test data, continued



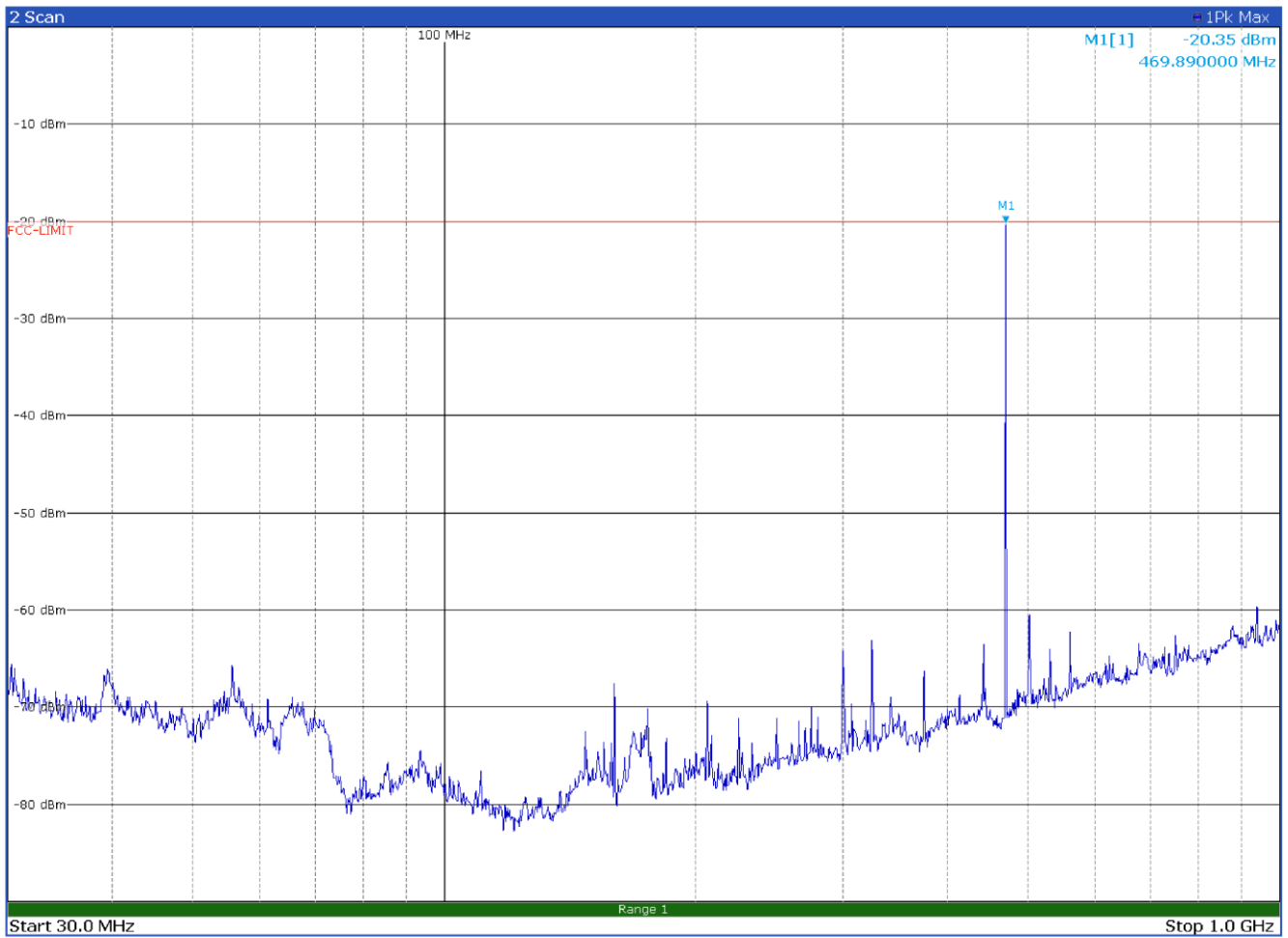
Radiated spurious emissions with modulation P25 C4FM at 460.0 MHz – Antenna in horizontal polarization

Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 460.0 MHz – Antenna in vertical polarization

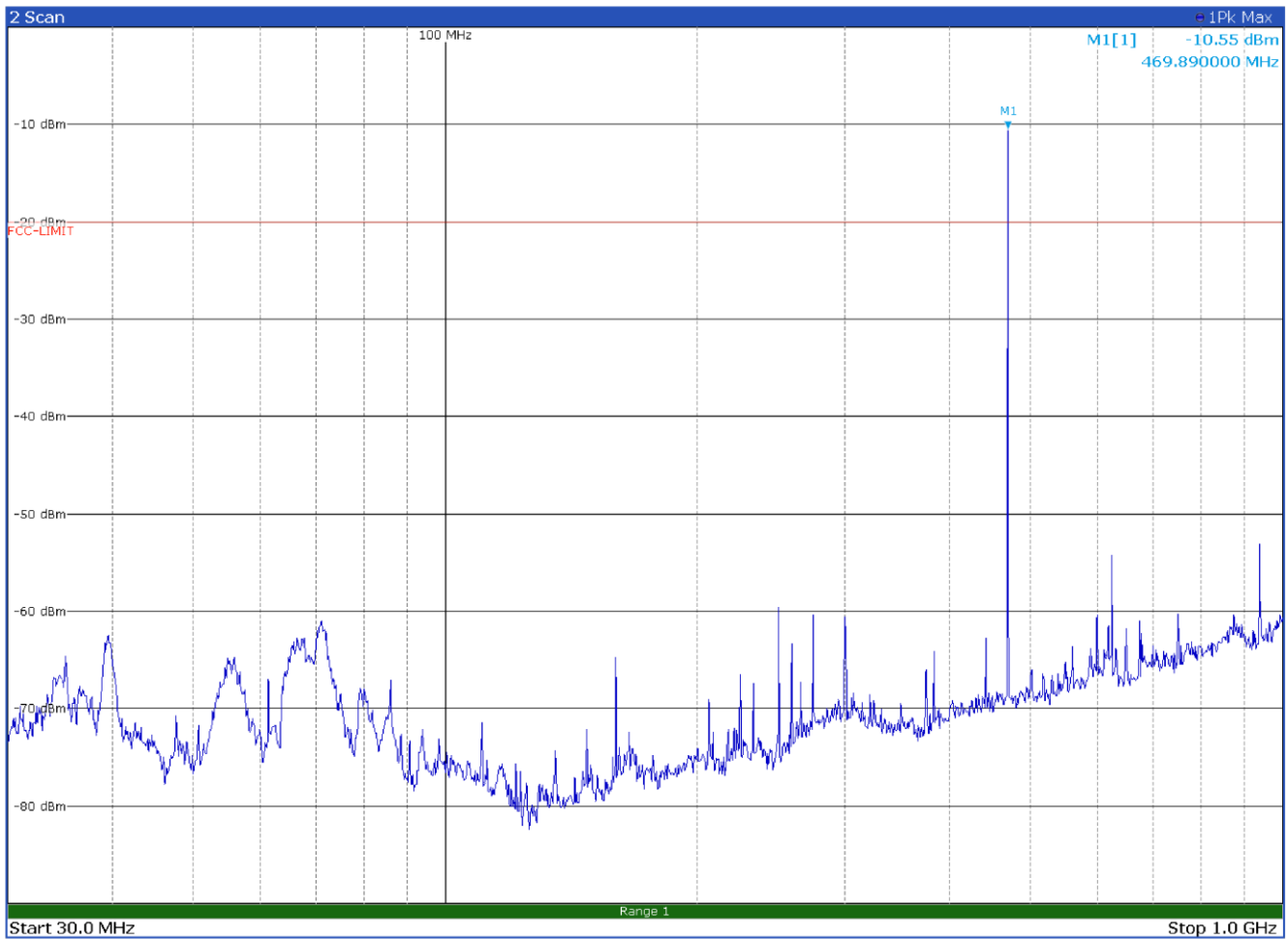
Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 469.9 MHz – Antenna in horizontal polarization

Limit exceeded by the carrier

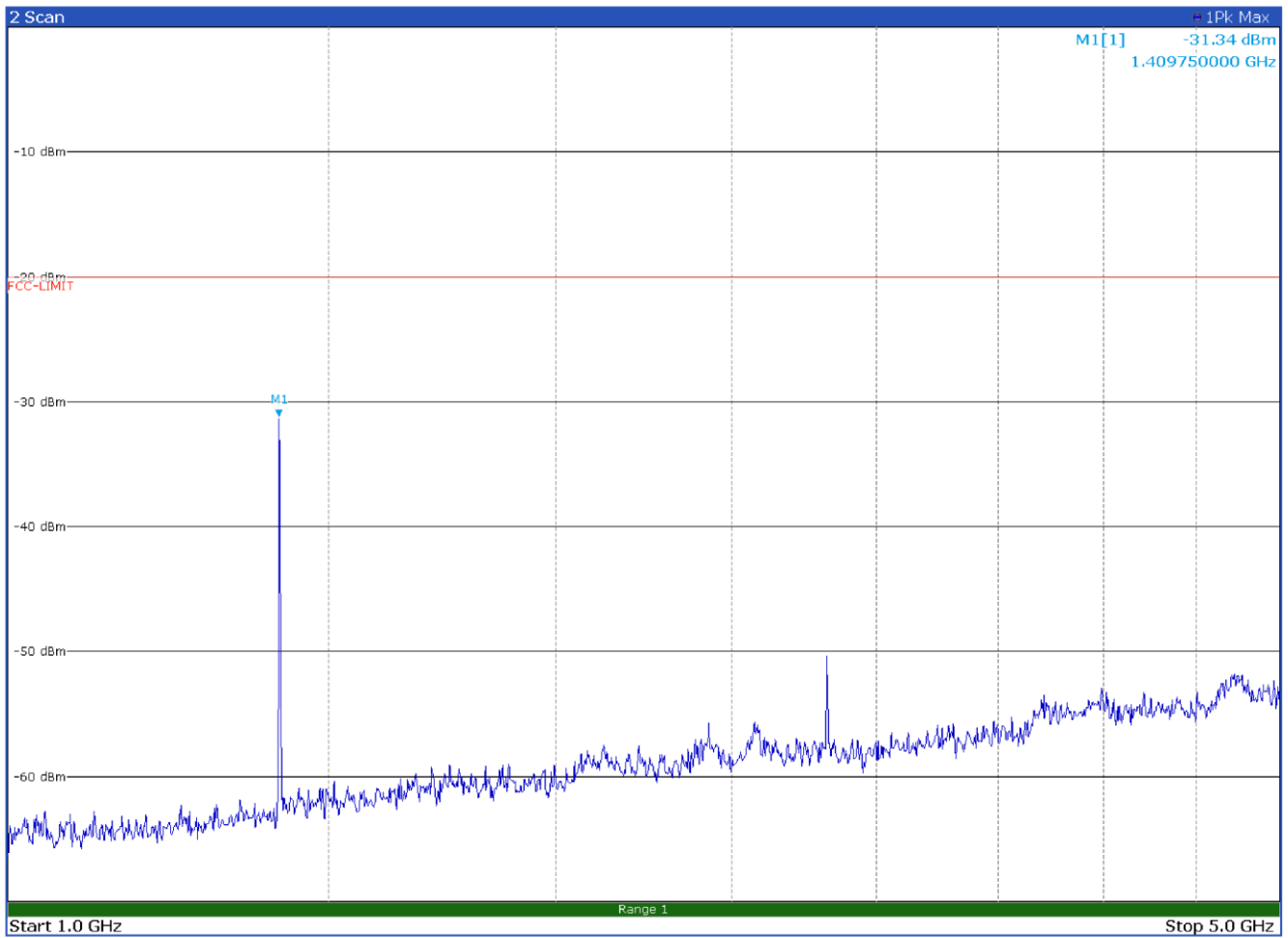
Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 469.9 MHz – Antenna in vertical polarization

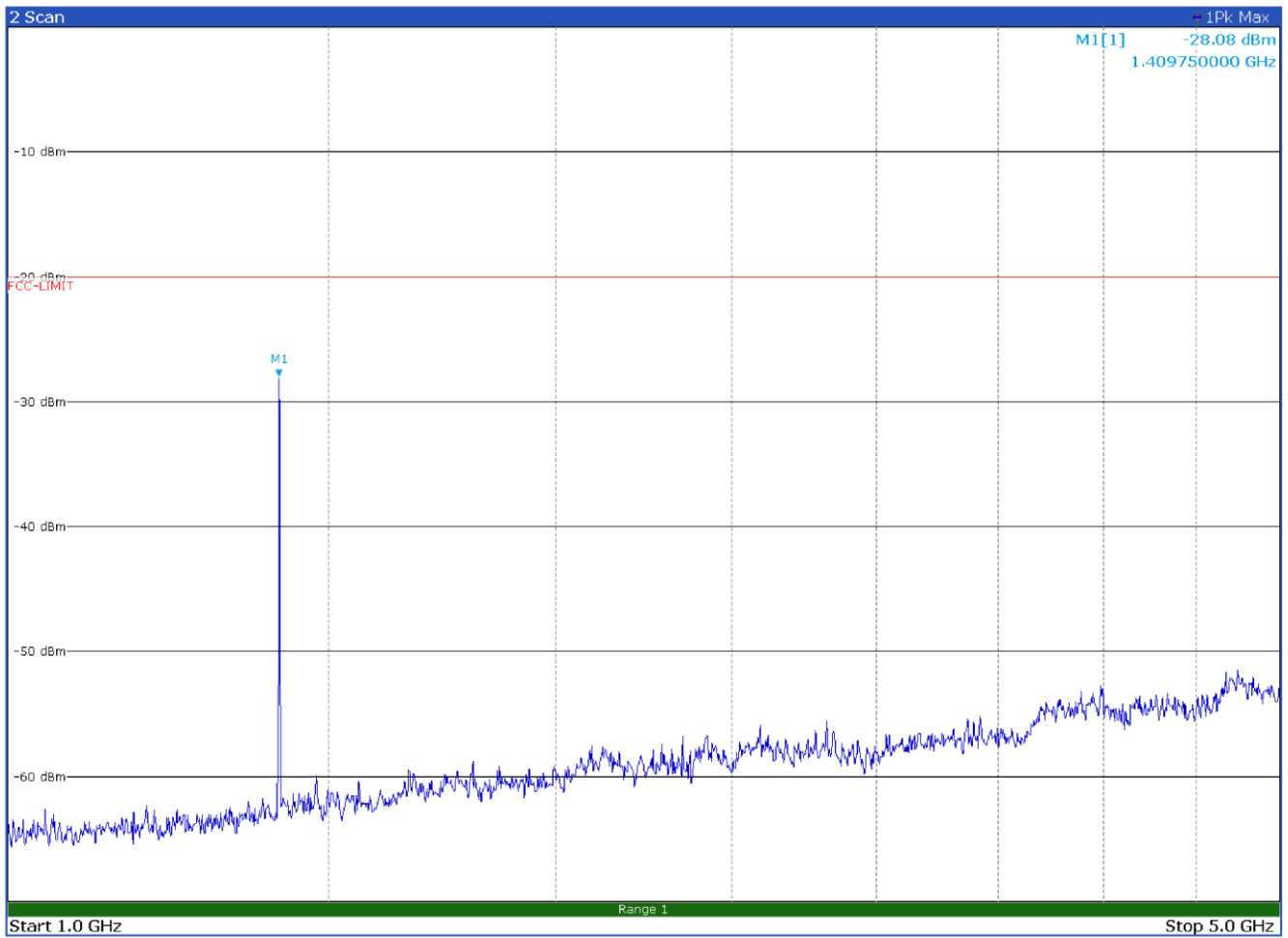
Limit exceeded by the carrier

Test data, continued



Radiated spurious emissions with modulation P25 C4FM at 469.9 MHz – Antenna in horizontal polarization

Test data, continued, continue



Radiated spurious emissions with modulation P25 C4FM at 469.9 MHz – Antenna in vertical polarization

7.6 Transient frequency behavior

7.6.1 References, definitions and limits

FCC §90.214:

Transmitters designed to operate in the 421–512 MHz frequency band must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Table 7.6-1: Transient frequency behavior

Time intervals ^{1,2}	Maximum frequency difference ³	Transient duration limit
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels		
t ₁ ⁴	±25.0 kHz	10.0 ms
t ₂	±12.5 kHz	25.0 ms
t ₃ ⁴	±25.0 kHz	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels		
t ₁ ⁴	±12.5 kHz	10.0 ms
t ₂	±6.25 kHz	25.0 ms
t ₃ ⁴	±12.5 kHz	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels		
t ₁ ⁴	±6.25 kHz	10.0 ms
t ₂	±3.125 kHz	25.0 ms
t ₃ ⁴	±6.25 kHz	10.0 ms

Notes: ¹t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

t₁ is the time period immediately following t_{on}.

t₂ is the time period immediately following t₁.

t₃ is the time period from the instant when the transmitter is turned off until t_{off}.

t_{off} is the instant when the 1 kHz test signal starts to rise.

²During the time from the end of t₂ to the beginning of t₃, the frequency difference must not exceed the limits specified in §90.213.

³Difference between the actual transmitter frequency and the assigned transmitter frequency.

⁴If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

7.6.2 Test summary

Verdict	Pass		
Tested by	P. Barbieri	Test date	June 27, 2023

7.6.3 Observations, settings and special notes

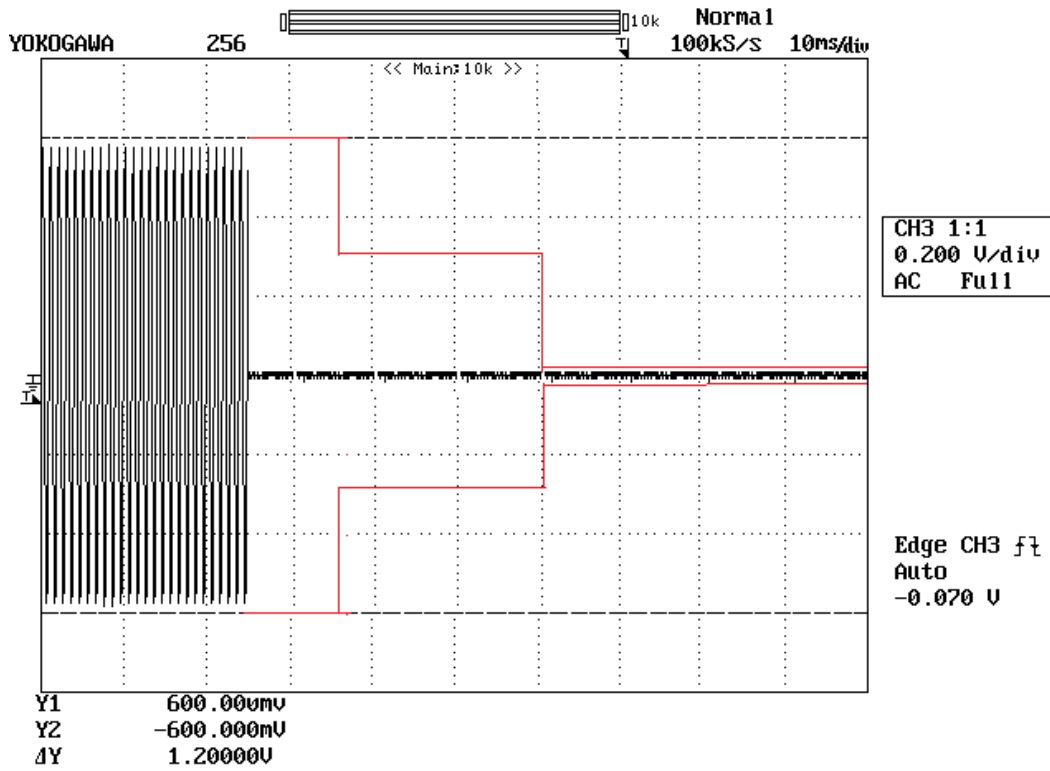
None

7.6.4 Test equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI receiver	Rohde & Schwarz	ESW44	101620	2022-08	2023-08
Shielded room	Siemens	10m control room	1947	NCR	NCR
Radio communication tester	Rohde & Schwarz	CMT	883 152/001	2021-01	2024-01
Oscilloscope	Yokogawa	DL1540	25WY1600L	2023-03	2024-03

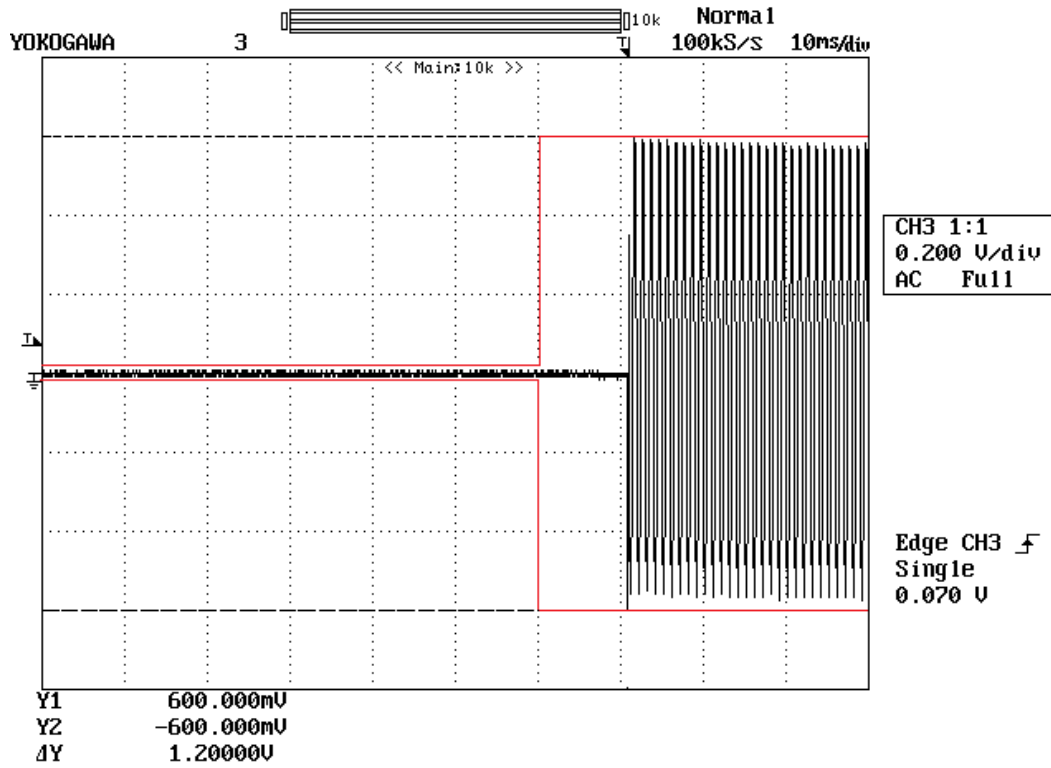
Note: NCR - no calibration required, VOU - verify on use

7.6.5 Test data



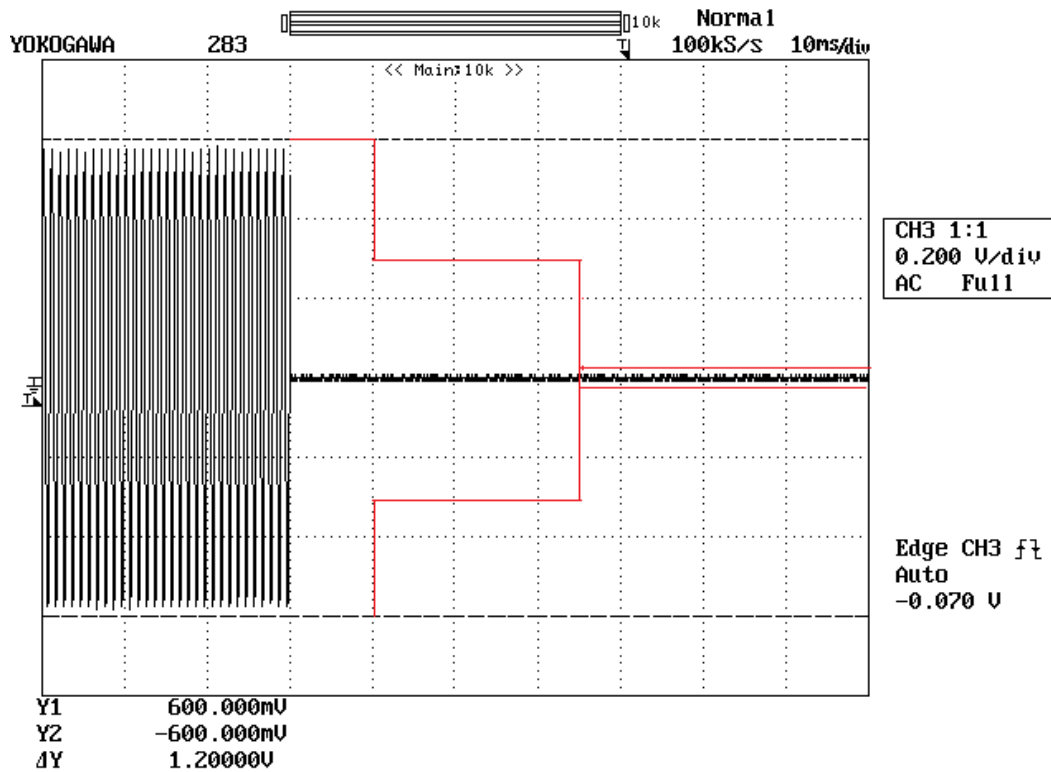
Transient Frequency behavior with modulation FM 12.5 kHz at 421.1 MHz, switch ON

Test data, continued



Transient Frequency behavior with modulation FM 12.5 kHz at 421.1 MHz, switch OFF

Test data, continued



Transient Frequency behavior with modulation FM 12.5 kHz at 450.1 MHz, switch ON

YOKOGAWA 5

Normal 10k

100kS/s 10ns/div

<< Main:10k >>

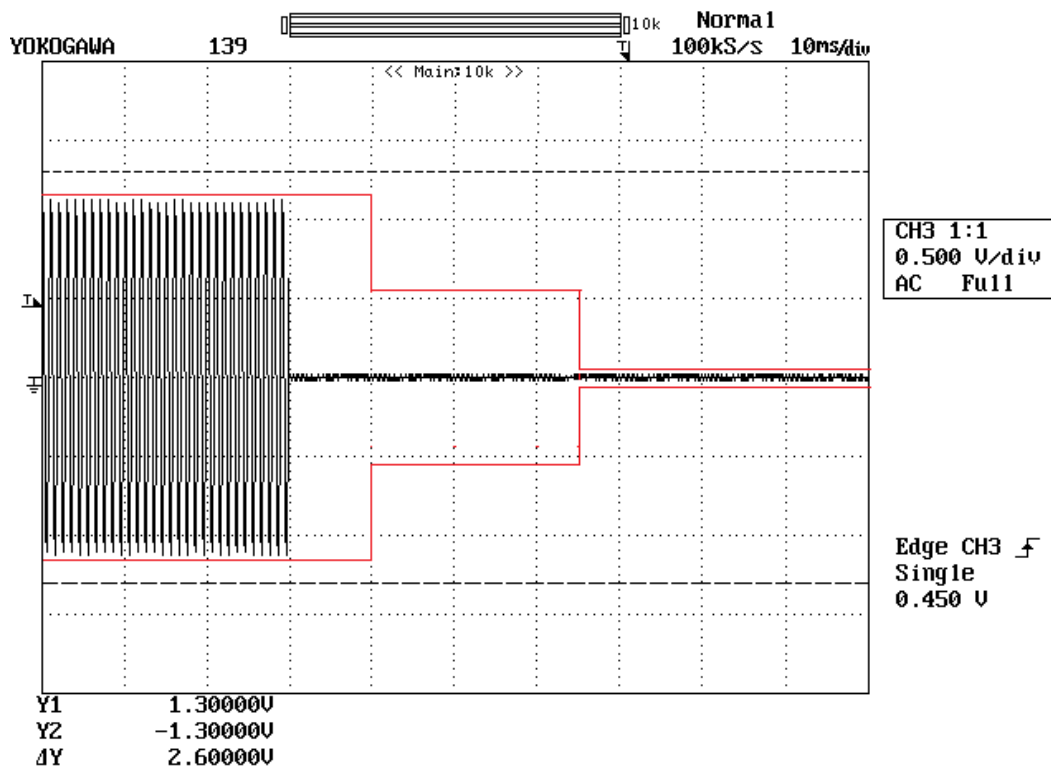
CH1 1:1
0.200 V/div
AC Full

Edge CH3 f
Single
0.070 V

Y1 600.000mV
Y2 -600.000mV
 ΔY 1.20000V

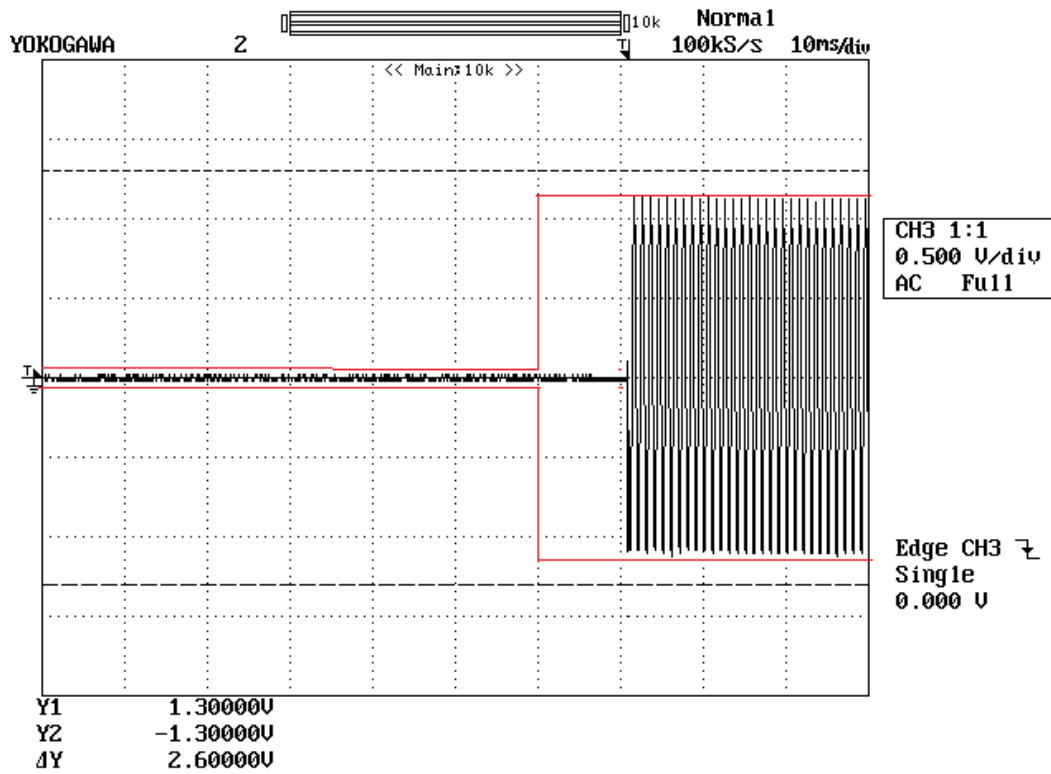
Transient Frequency behavior with modulation FM 12.5 kHz at 450.1 MHz, switch OFF

Test data, continued



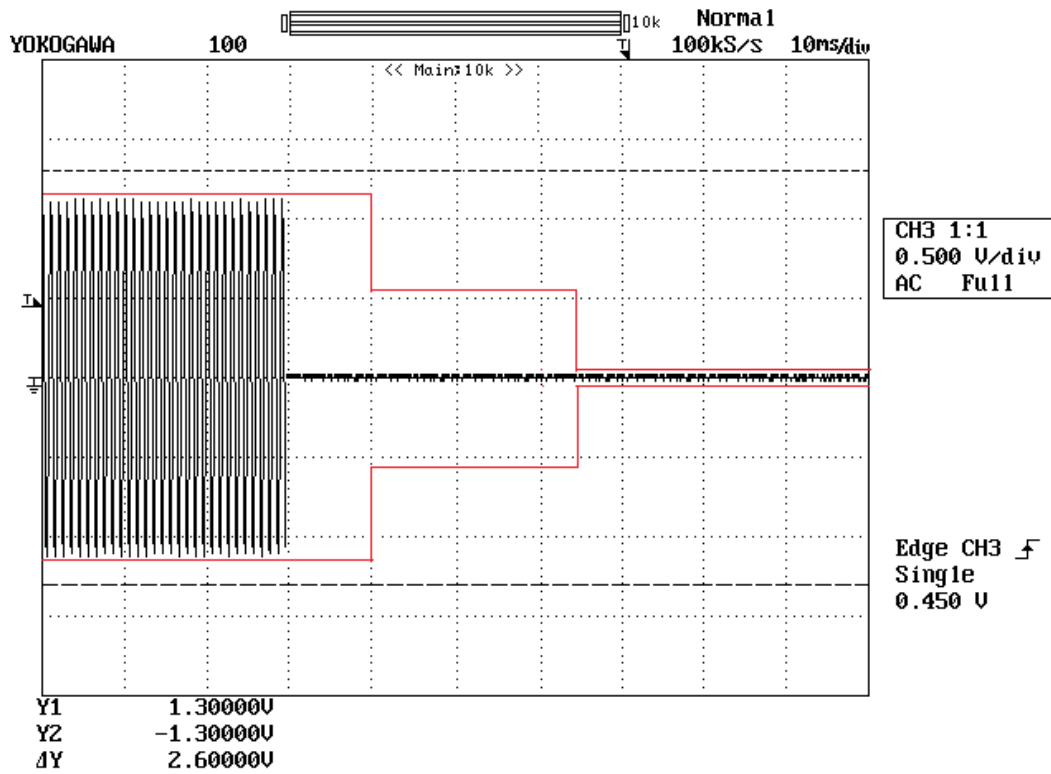
Transient Frequency behavior with modulation FM 25 kHz at 421.1 MHz, switch ON

Test data, continued



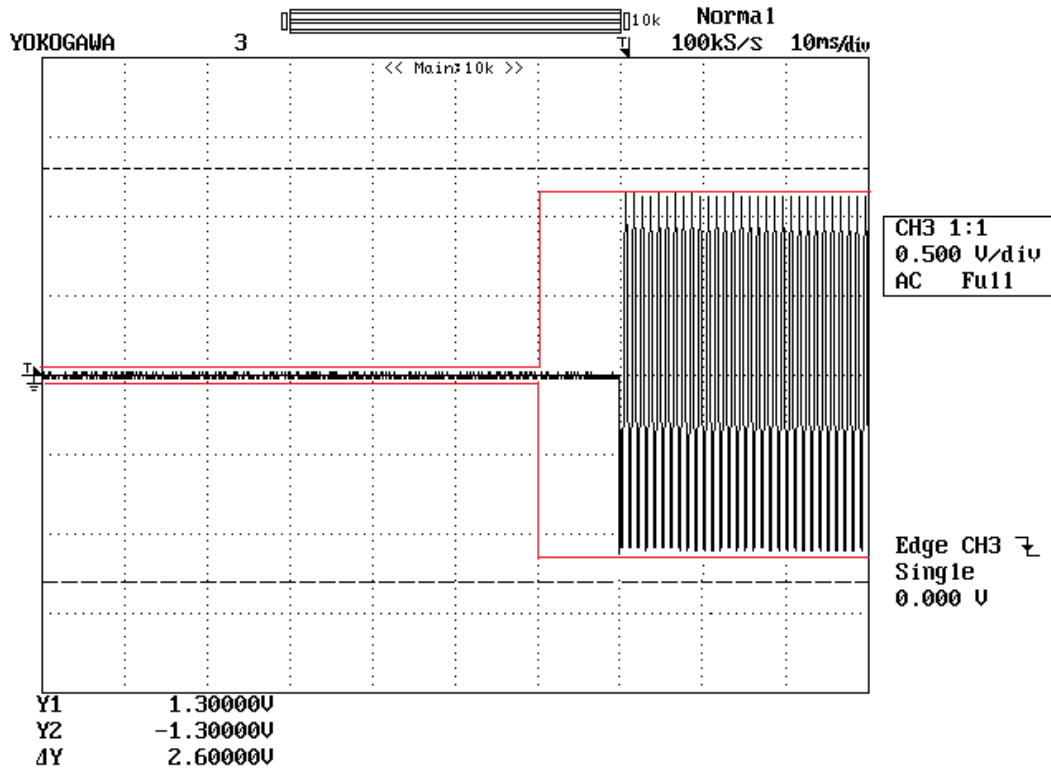
Transient Frequency behavior with modulation FM 25 kHz at 421.1 MHz, switch OFF

Test data, continued



Transient Frequency behavior with modulation FM 25 kHz at 450.1 MHz, switch ON

Test data, continued



Transient Frequency behavior with modulation FM 25 kHz at 450.1 MHz, switch OFF

7.7 Transmitter frequency stability

7.7.1 References, definitions and limits

FCC §22.355:

Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C–1 of this section.

Table 7.7-1: Table C–1—Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Base, fixed (ppm)	Mobile >3 watts (ppm)	Mobile ≤3 watts (ppm)
20 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

FCC §90.213:

- (a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

Table 7.7-2: Minimum frequency stability

Frequency range (MHz)	Fixed and base stations	Mobile stations over 2 watts output power	Mobile stations 2 watts or less output power
421–512	±2.5 ppm ¹	±5 ppm ²	±5 ppm ²

Notes: ¹In the 421–512 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of 1.5 ppm. Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 0.5 ppm.

²In the 421–512 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

7.7.2 Test summary

Verdict	Pass		
Tested by	P. Barbieri	Test date	June 22, 2023

7.7.3 Observations, settings and special notes

Test was performed on supply voltage variations as per client rated, no frequency deviation was observed.

7.7.4 Test equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI Receiver	Rohde & Schwarz	ESU8	100202	2022-09	2023-09
Climatic chamber	espec	ARS-1100	4100000067	2022-12	2023-12

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

7.7.5 Test data

Table 7.7-3: Transmitter frequency stability results

Test conditions	Frequency, Hz	Drift, Hz	Drift, ppm	Limit ±ppm	Margin, ±ppm
+50 °C, Nominal	421099903.5	16.8	0.040	1.5	-1.46
+40 °C, Nominal	421099905.0	15.3	0.037	1.5	-1.46
+30 °C, Nominal	421099915.4	4.9	0.012	1.5	-1.49
+20 °C, +15 %	421099920.3	0.0	0.000	1.5	-1.50
+20 °C, Nominal	421099920.3	Reference	Reference	Reference	Reference
+20 °C, -15 %	421099920.3	0.0	0.000	1.5	-1.50
+10 °C, Nominal	421099919.8	0.5	0.001	1.5	-1.50
0 °C, Nominal	421099912.0	8.3	0.020	1.5	-1.48
-10 °C, Nominal	421099903.3	17.0	0.041	1.5	-1.46
-20 °C, Nominal	421099884.0	36.3	0.087	1.5	-1.41
-30 °C, Nominal	421099865.8	54.5	0.130	1.5	-1.37

Test conditions	Frequency, Hz	Drift, Hz	Drift, ppm	Limit ±ppm	Margin, ±ppm
+50 °C, Nominal	450099893.5	17.0	0.037	1.5	-1.46
+40 °C, Nominal	450099895.3	15.2	0.033	1.5	-1.47
+30 °C, Nominal	450099905.7	4.8	0.010	1.5	-1.49
+20 °C, +15 %	450099910.5	0.0	0.000	1.5	-1.50
+20 °C, Nominal	450099910.5	Reference	Reference	Reference	Reference
+20 °C, -15 %	450099910.5	0.0	0.000	1.5	-1.50
+10 °C, Nominal	450099910.2	0.3	0.001	1.5	-1.50
0 °C, Nominal	450099902.5	8.0	0.017	1.5	-1.48
-10 °C, Nominal	450099893.7	16.8	0.036	1.5	-1.46
-20 °C, Nominal	450099874.5	36.0	0.078	1.5	-1.42
-30 °C, Nominal	450099856.2	54.3	0.118	1.5	-1.38

Section 8 Photos

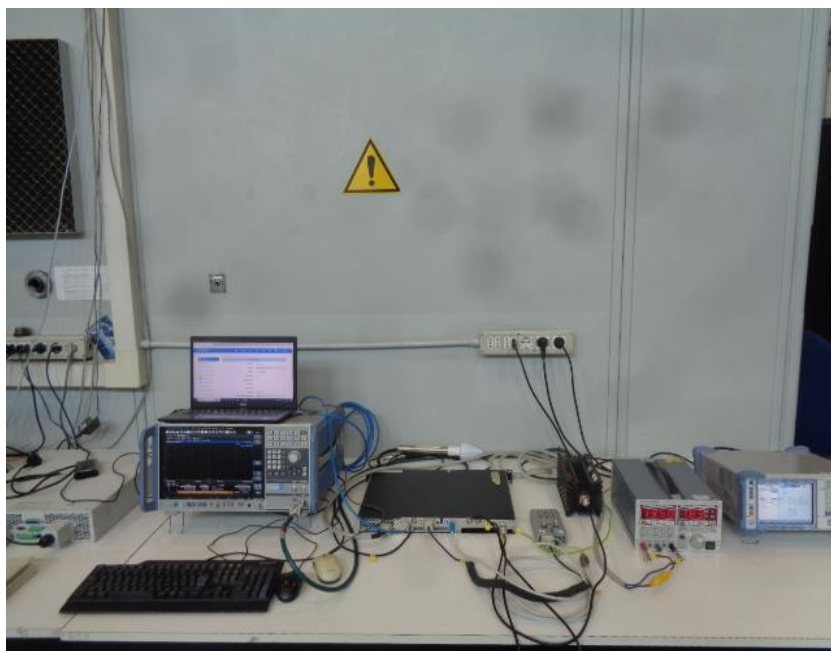
8.1 Photos of the test set-up



Set-up photo for radiated tests below 1 GHz photo



Set-up photo for radiated tests above 1 GHz photo

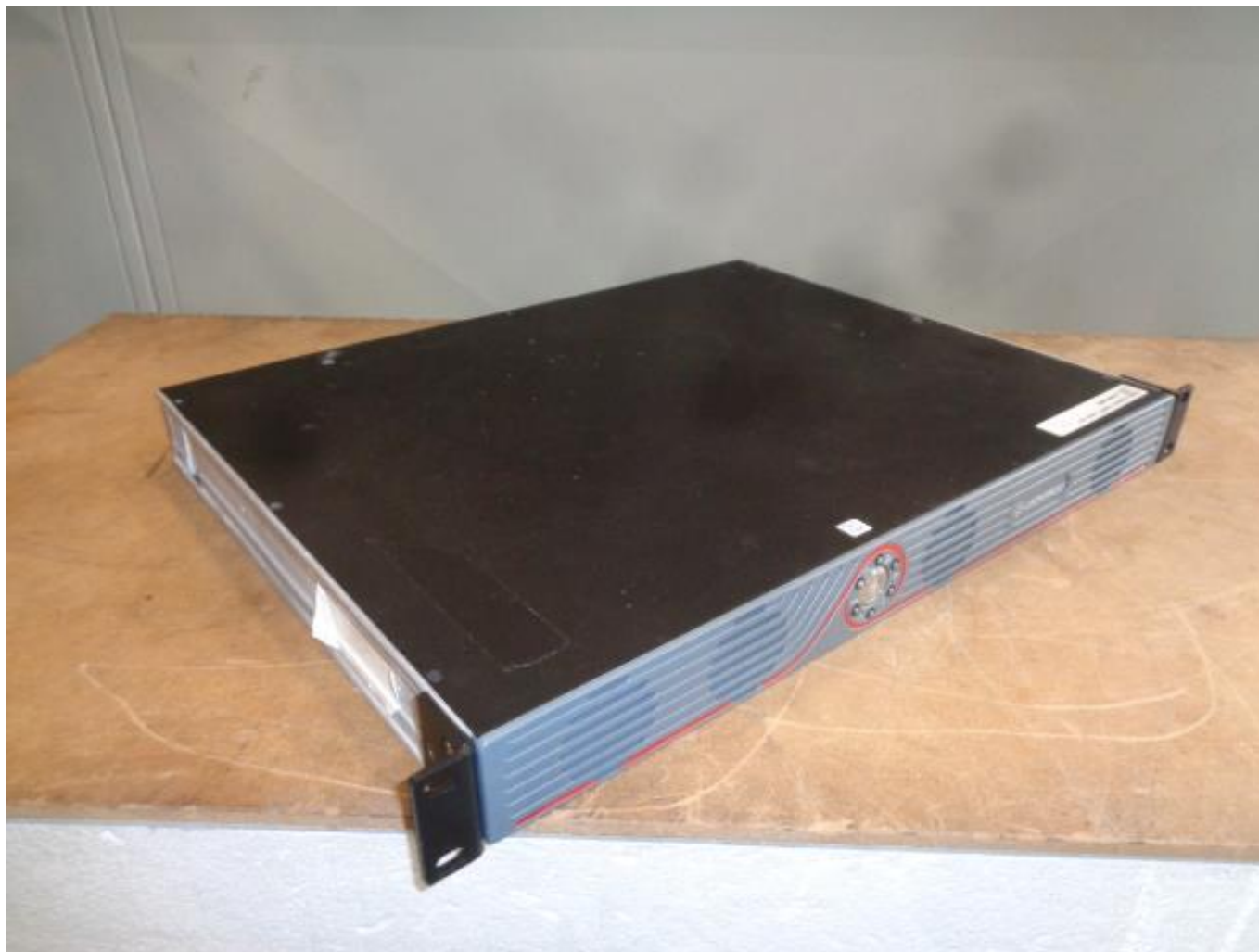


Set-up photo for antenna port tests



Set-up photo for frequency error tests

8.2 Photos of the EUT



Front, left and top side photo



Rear, right and bottom side photo



Copy of marking plate

End of the test report