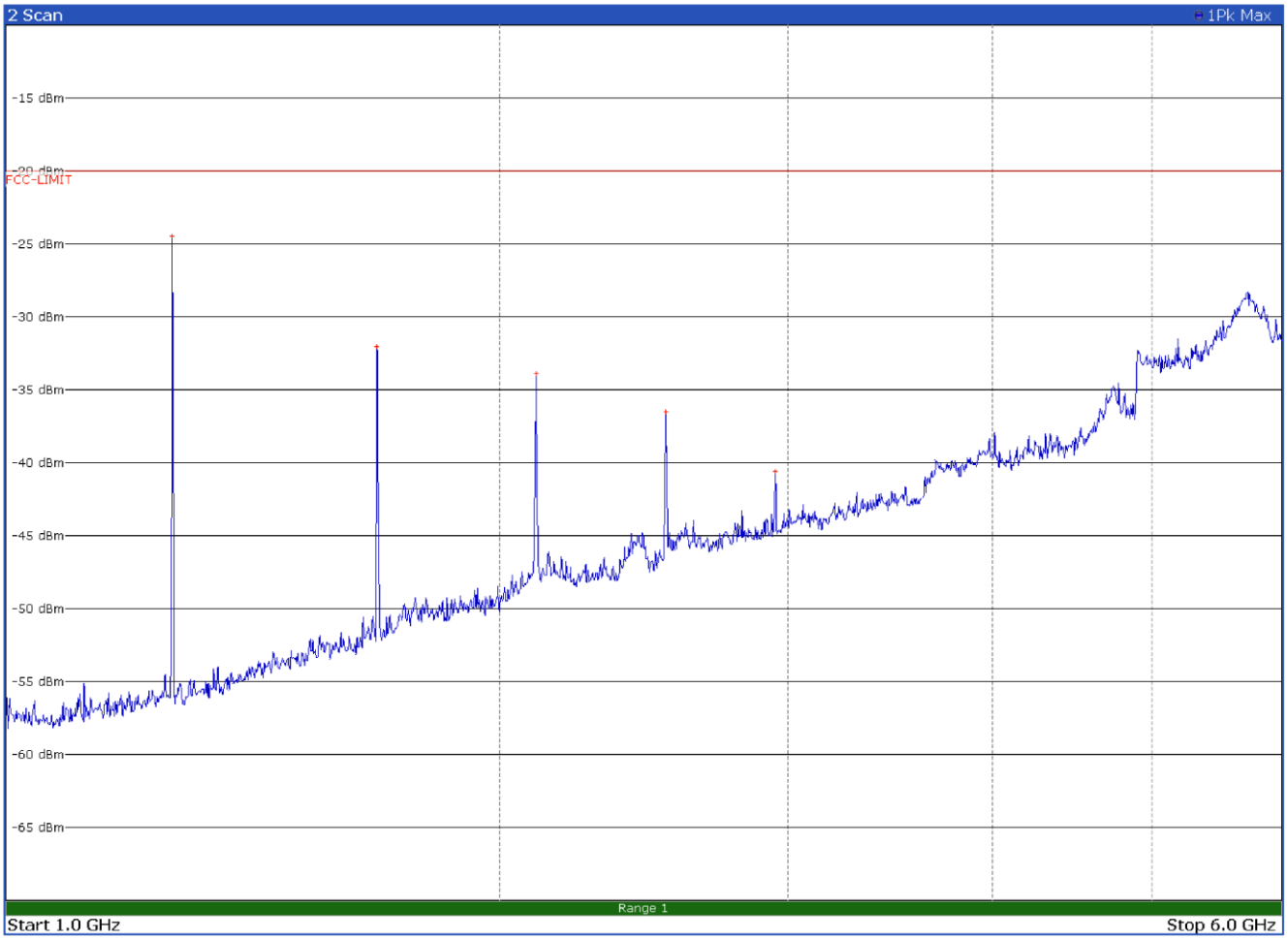
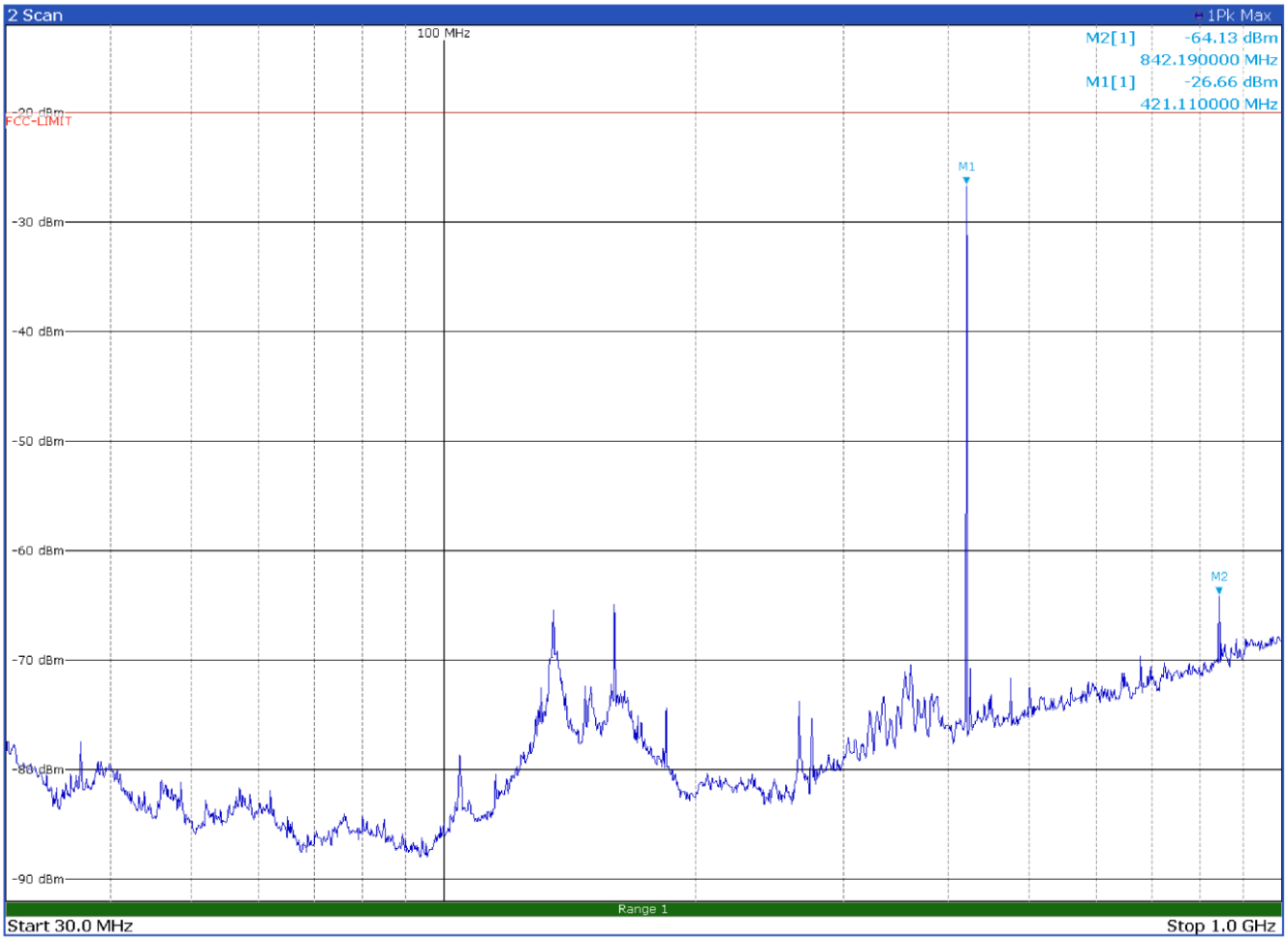
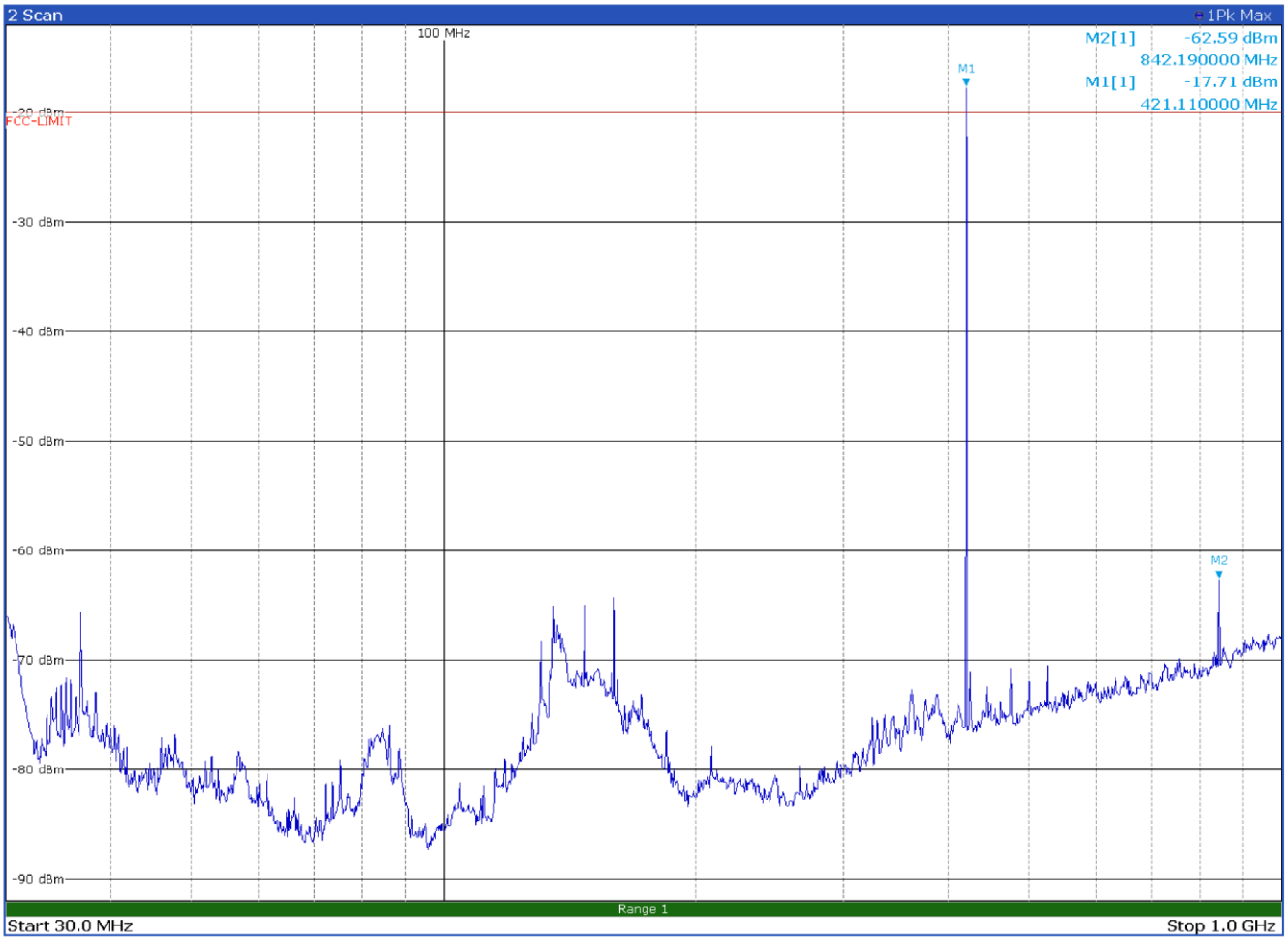


Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1263.2500	-24.5	-20.0	-4.5	Pk
1684.5000	-32.1	-20.0	-12.1	Pk
2105.5000	-33.9	-20.0	-13.9	Pk
2526.5000	-36.5	-20.0	-16.5	Pk
2947.7500	-40.6	-20.0	-20.6	Pk

Radiated spurious emissions with modulation FM 12.5 kHz at 421.1 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

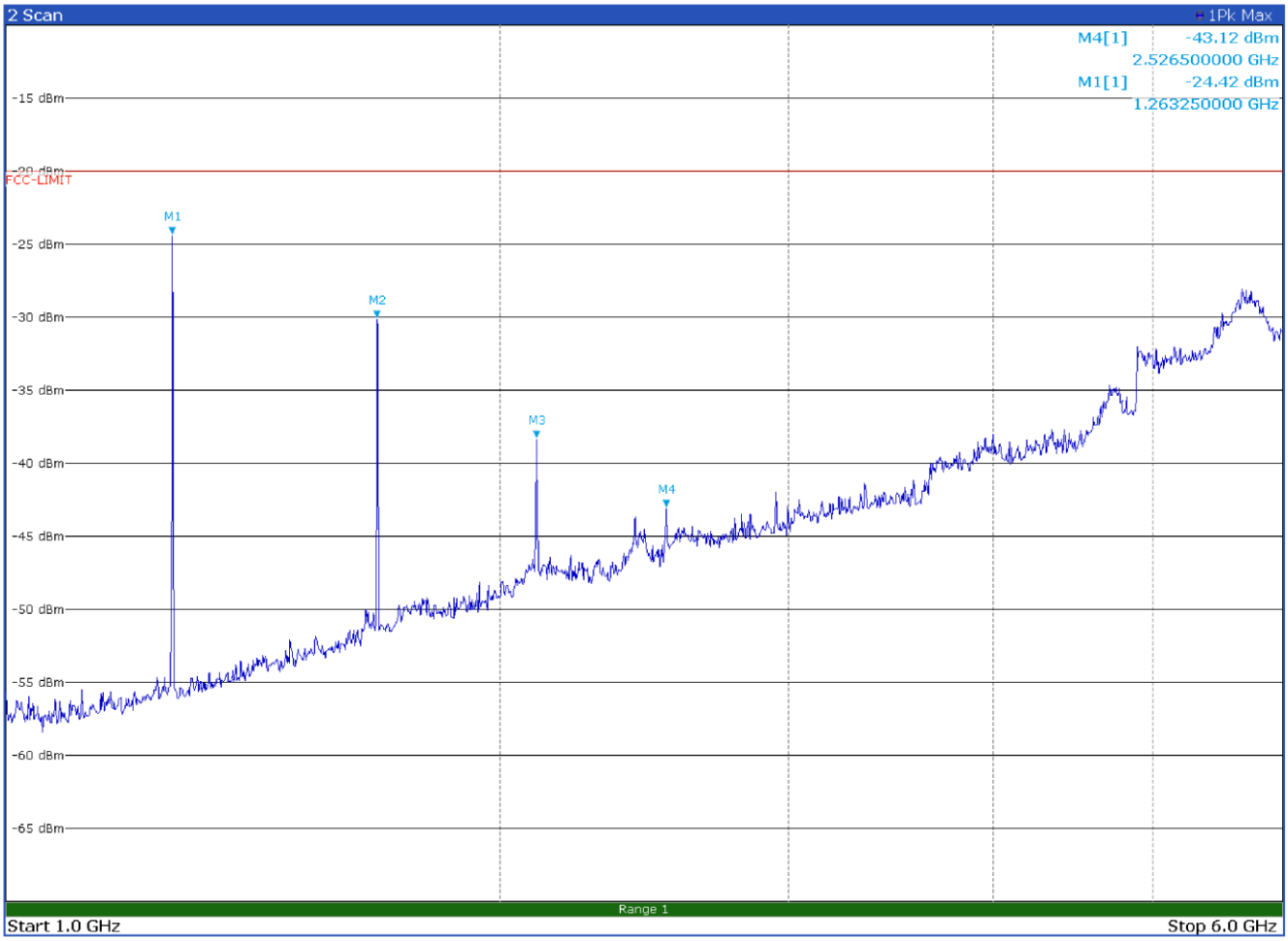


Radiated spurious emissions with modulation FM 25.0 kHz at 421.1 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)



Radiated spurious emissions with modulation FM 25.0 kHz at 421.1 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

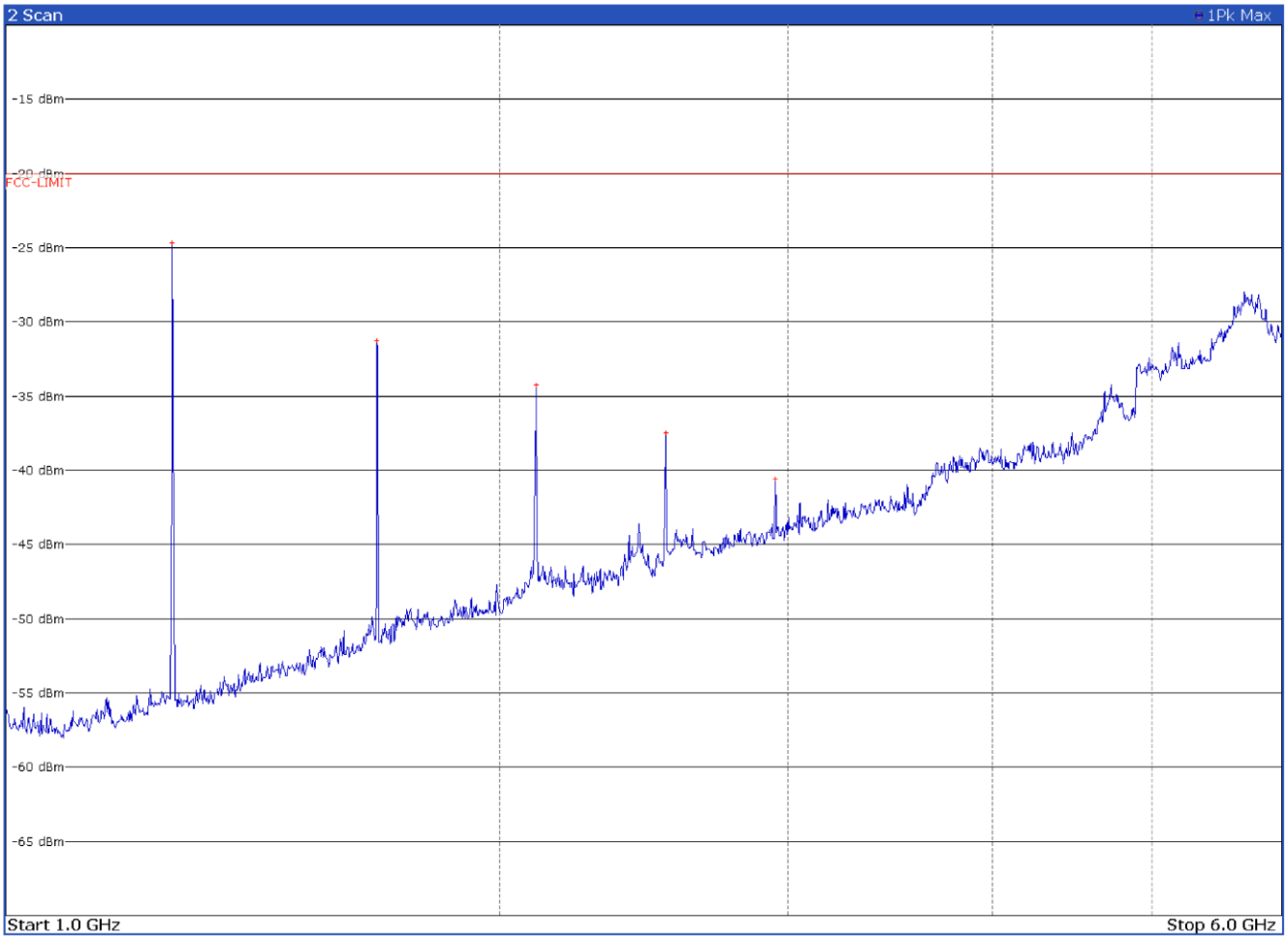
Limit exceeded by the carrier



3 Marker Table

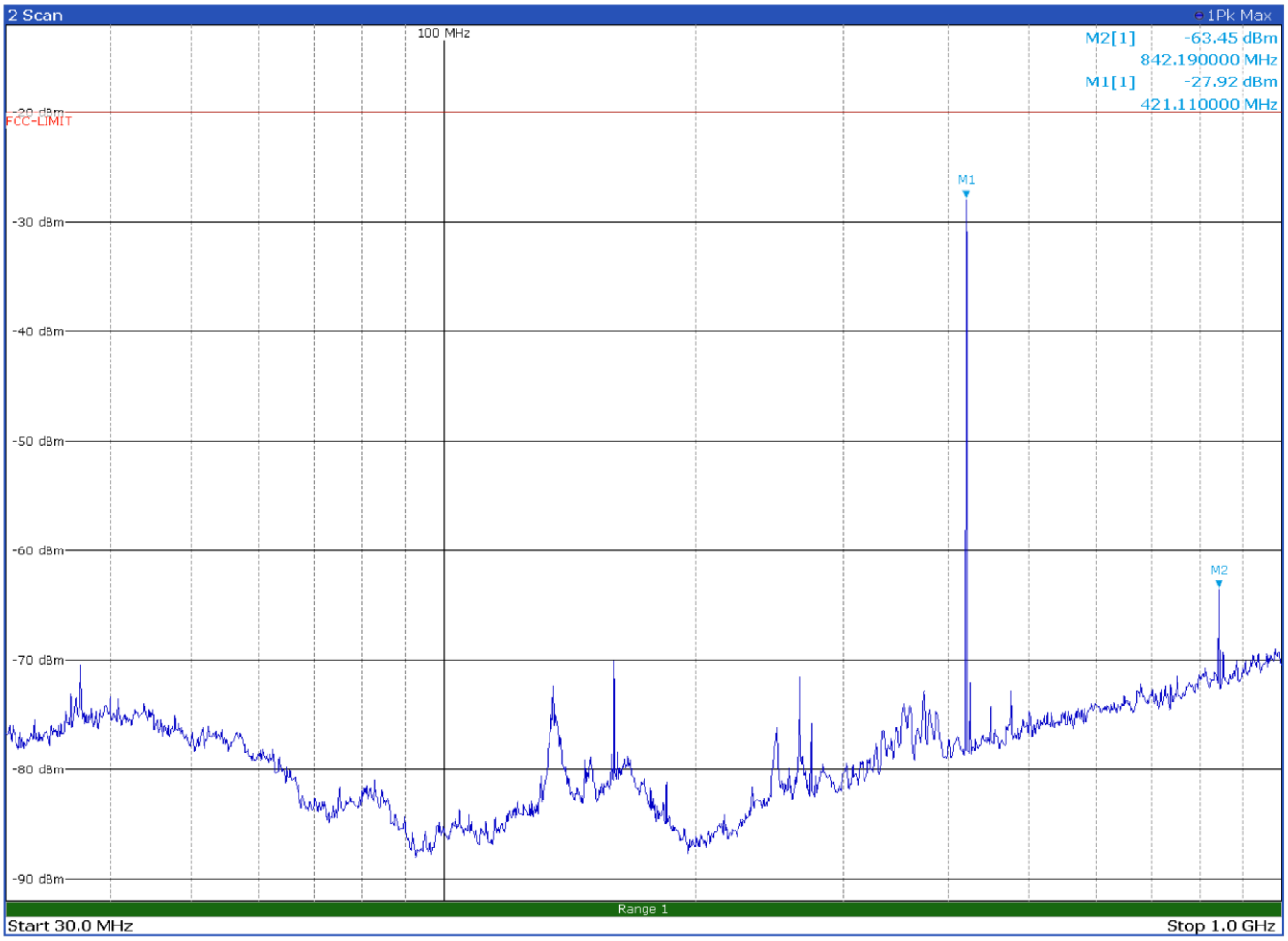
Wnd	Type	Ref	Trc	X-value	Y-value
Scan	M1		1	**1.26325 GHz**	**-24.42 dBm**
Scan	M2		1	**1.6845 GHz**	**-30.13 dBm**
Scan	M3		1	**2.1055 GHz**	**-38.34 dBm**
Scan	M4		1	**2.5265 GHz**	**-43.12 dBm**

Radiated spurious emissions with modulation FM 25.0 kHz at 421.1 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)

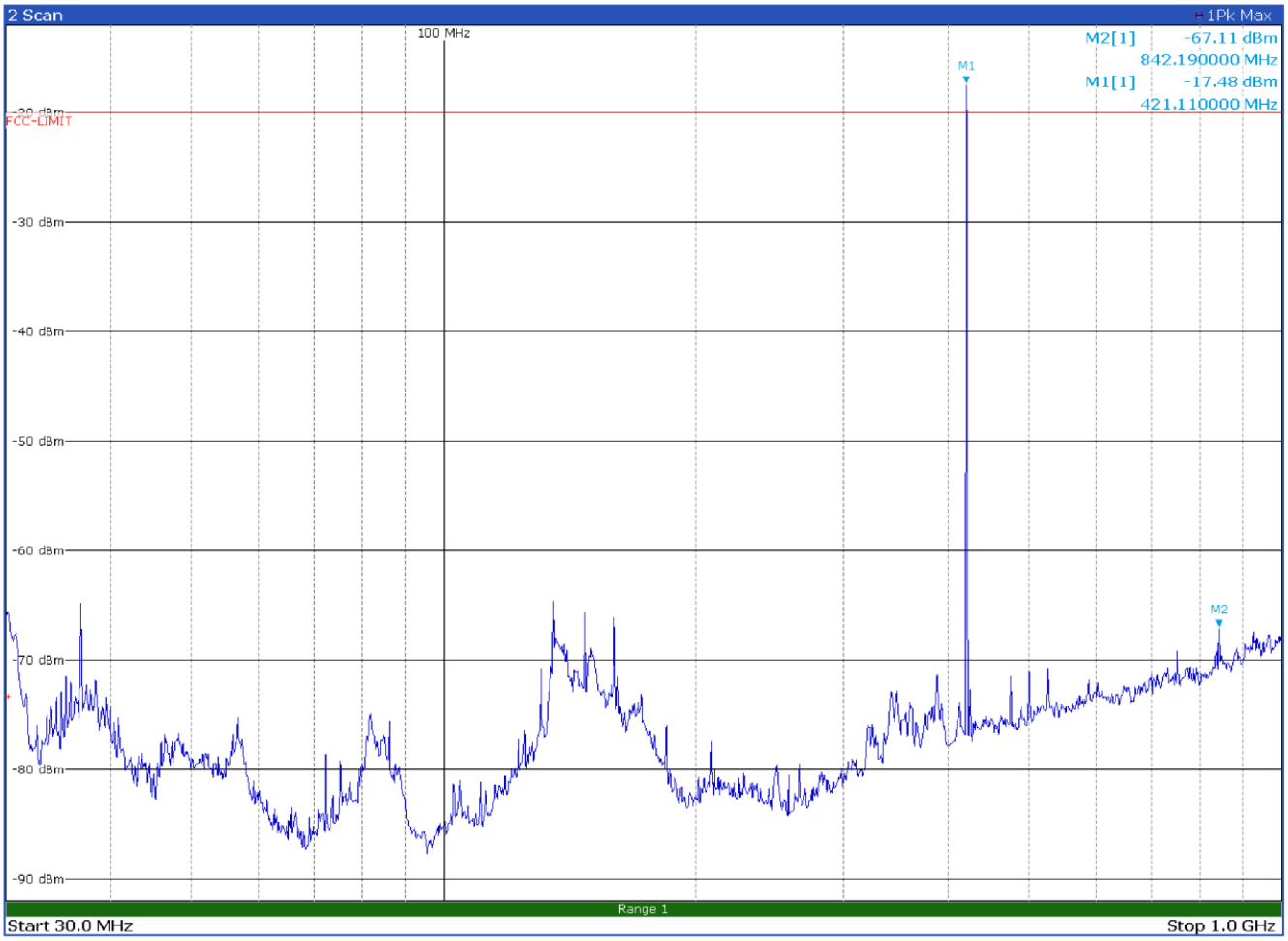


Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1263.2500	-24.7	-20.0	-4.7	Pk
1684.5000	-31.3	-20.0	-11.3	Pk
2105.5000	-34.3	-20.0	-14.3	Pk
2526.5000	-37.5	-20.0	-17.5	Pk
2947.7500	-40.6	-20.0	-20.6	Pk

Radiated spurious emissions with modulation FM 25.0 kHz at 421.1 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

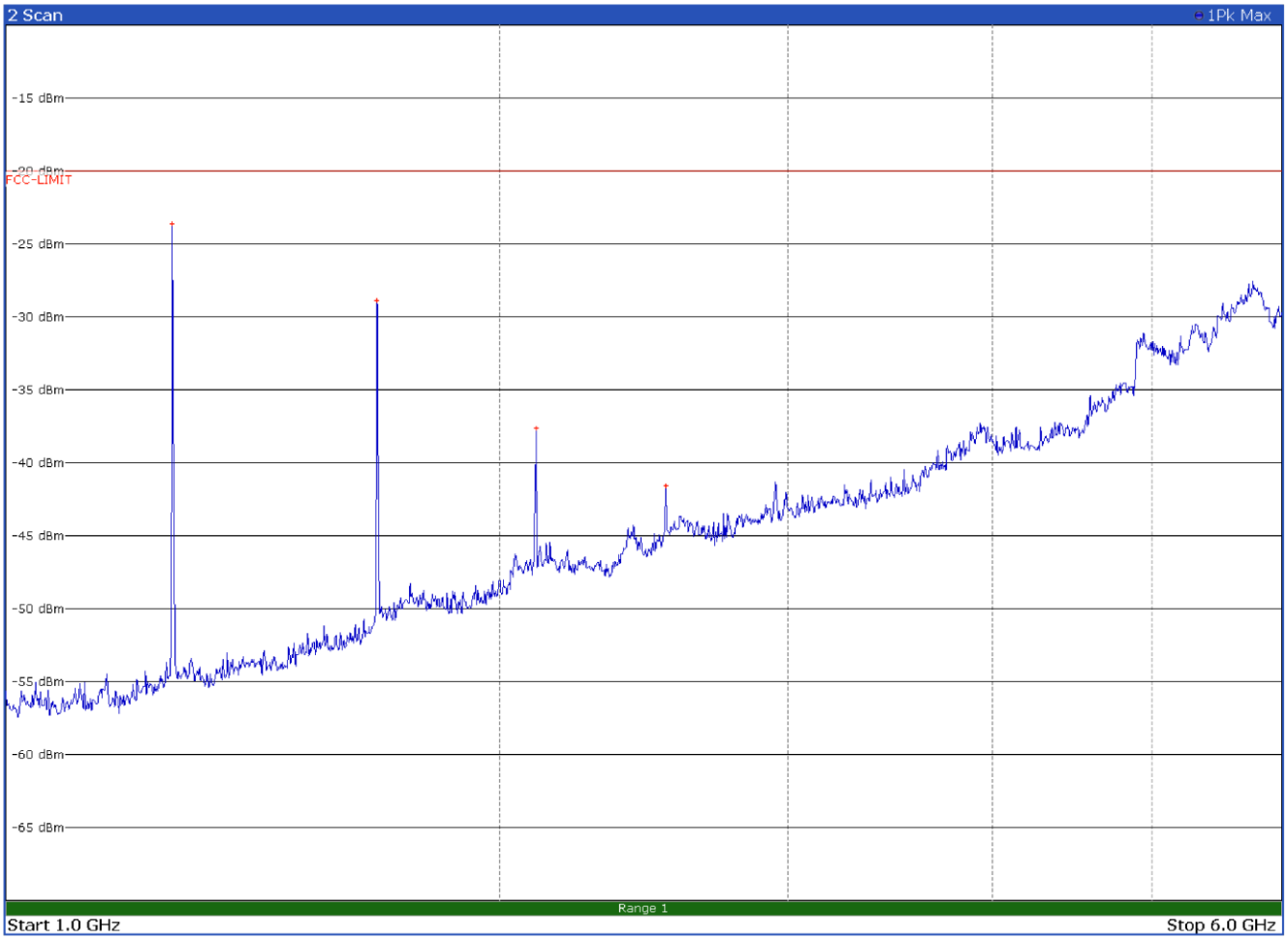


Radiated spurious emissions with modulation DMR 4FSK at 421.1 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)



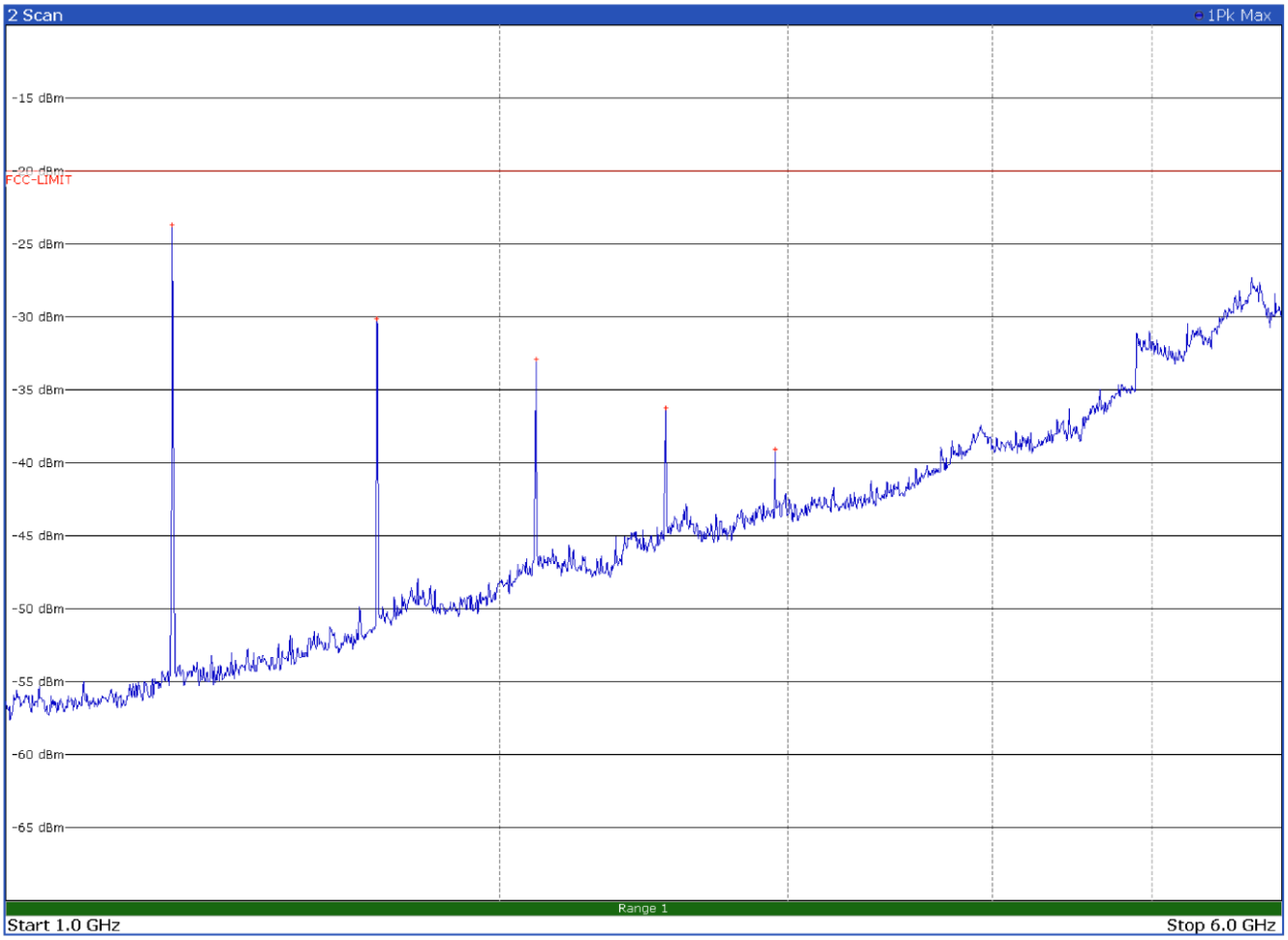
Radiated spurious emissions with modulation DMR 4FSK at 421.1 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

Limit exceeded by the carrier



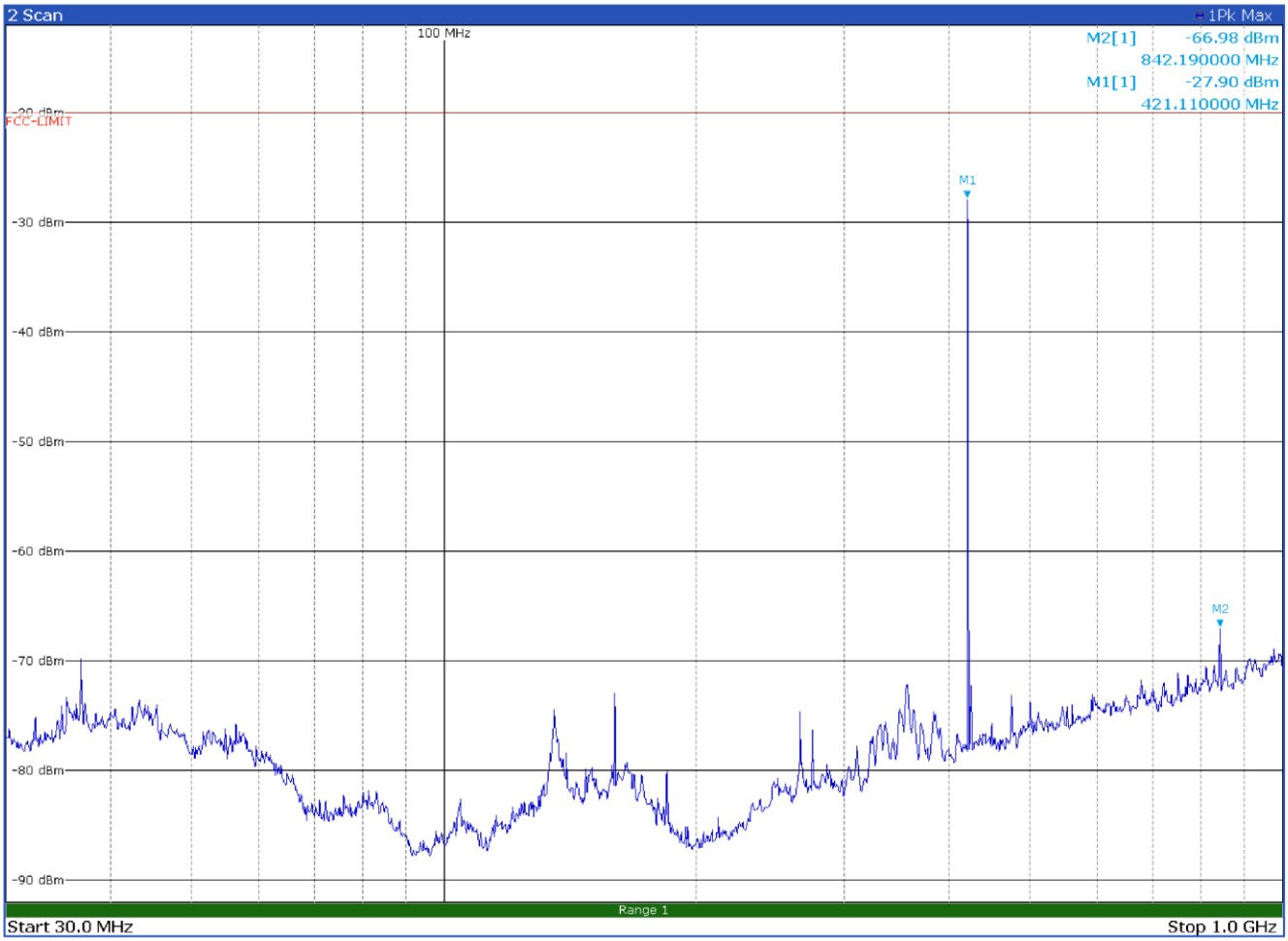
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1263.2500	-23.7	-20.0	-3.7	Pk
1684.5000	-28.9	-20.0	-8.9	Pk
2105.5000	-37.7	-20.0	-17.7	Pk
2526.7500	-41.6	-20.0	-21.6	Pk

Radiated spurious emissions with modulation DMR 4FSK at 421.1 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)

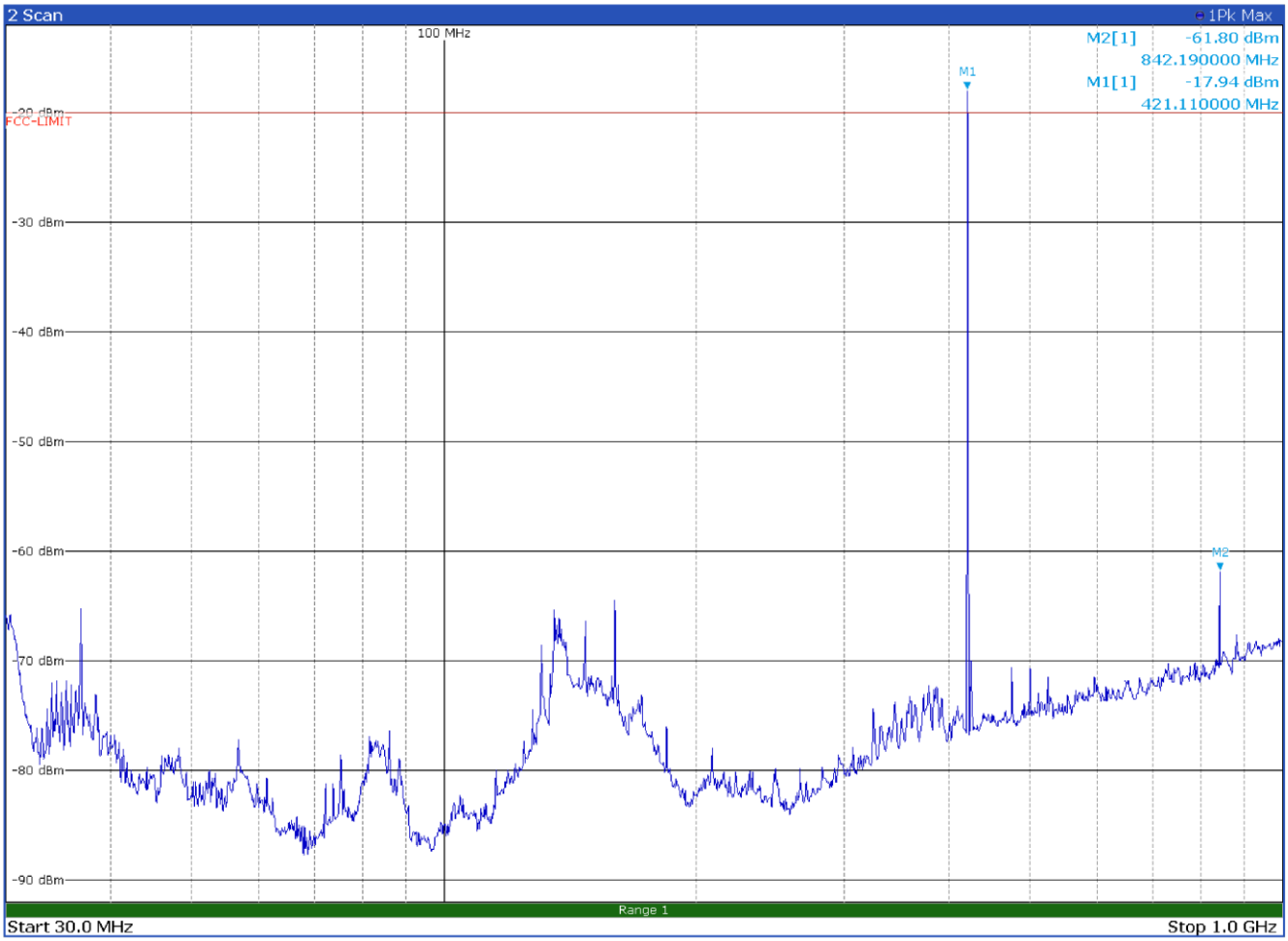


Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1263.2500	-23.7	-20.0	-3.7	Pk
1684.5000	-30.2	-20.0	-10.2	Pk
2105.5000	-32.9	-20.0	-12.9	Pk
2526.5000	-36.3	-20.0	-16.3	Pk
2947.7500	-39.1	-20.0	-19.1	Pk

Radiated spurious emissions with modulation DMR 4FSK at 421.1 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

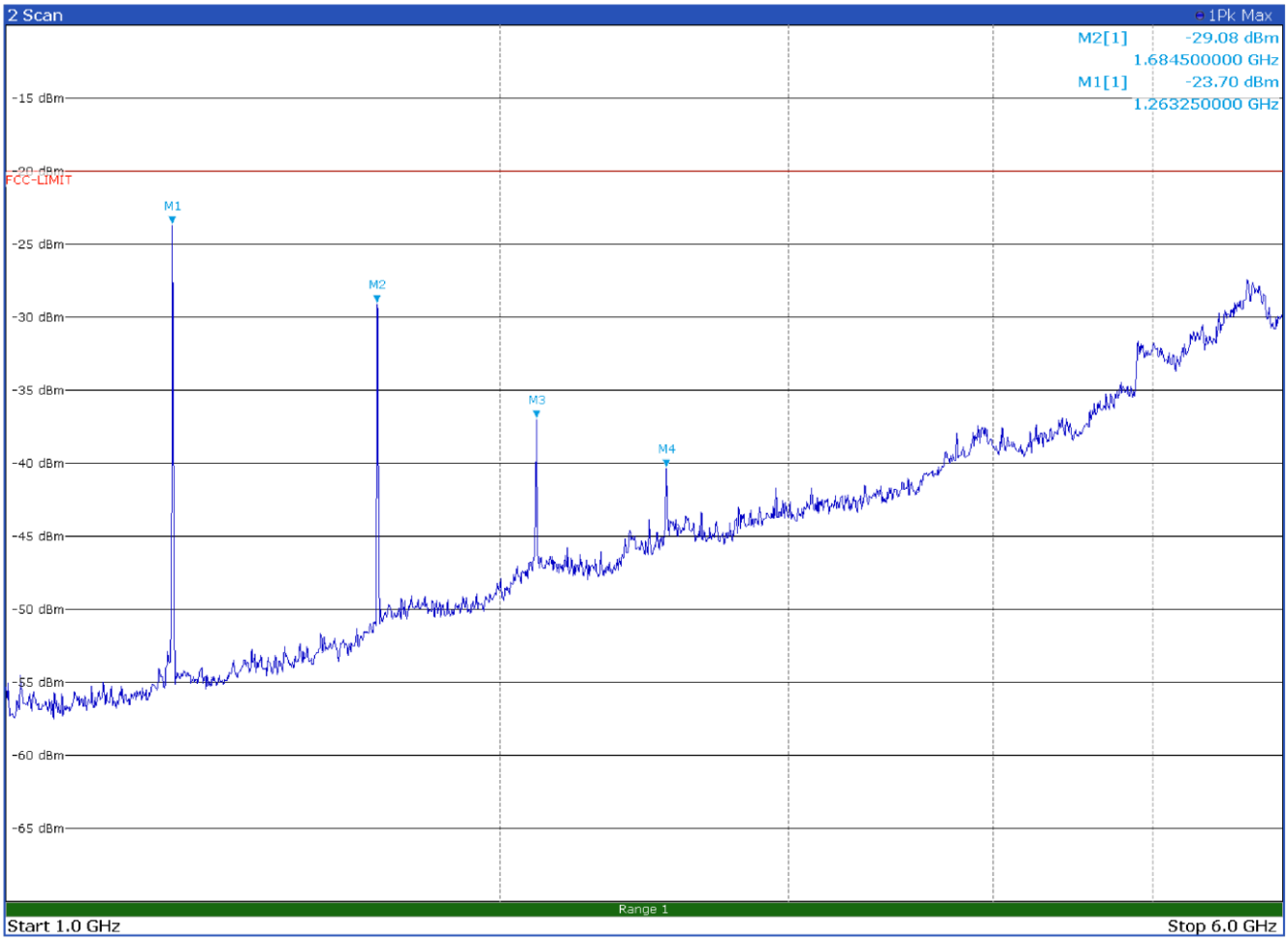


Radiated spurious emissions with modulation P25 C4FM at 421.1 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)



Radiated spurious emissions with modulation P25 C4FM at 421.1 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

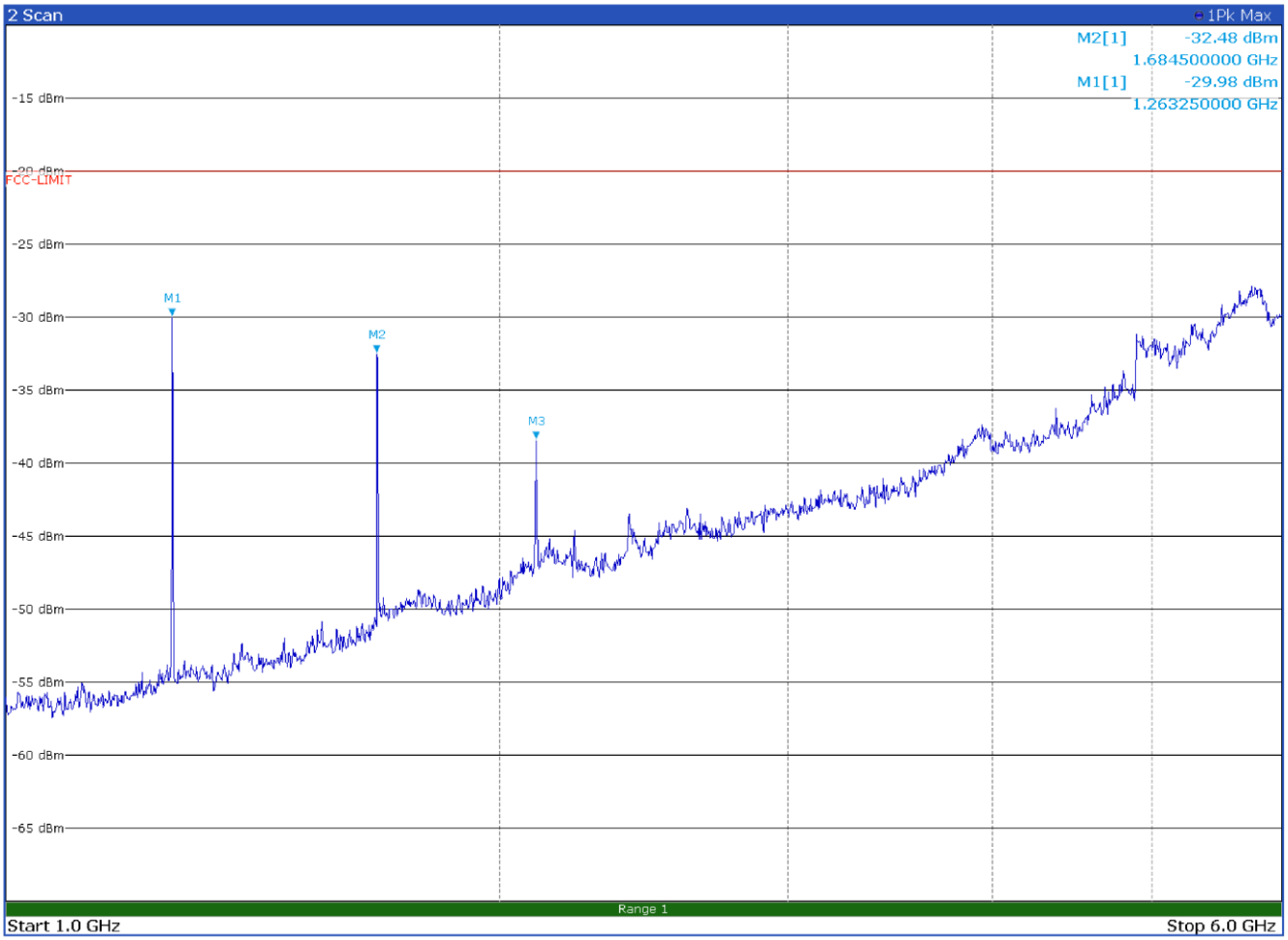
Limit exceeded by the carrier



3 Marker Table

Wnd	Type	Ref	Trc	X-value	Y-value
Scan	M1		1	**1.26325 GHz**	**-23.7 dBm**
Scan	M2		1	**1.6845 GHz**	**-29.08 dBm**
Scan	M3		1	**2.1055 GHz**	**-36.96 dBm**
Scan	M4		1	**2.5265 GHz**	**-40.32 dBm**

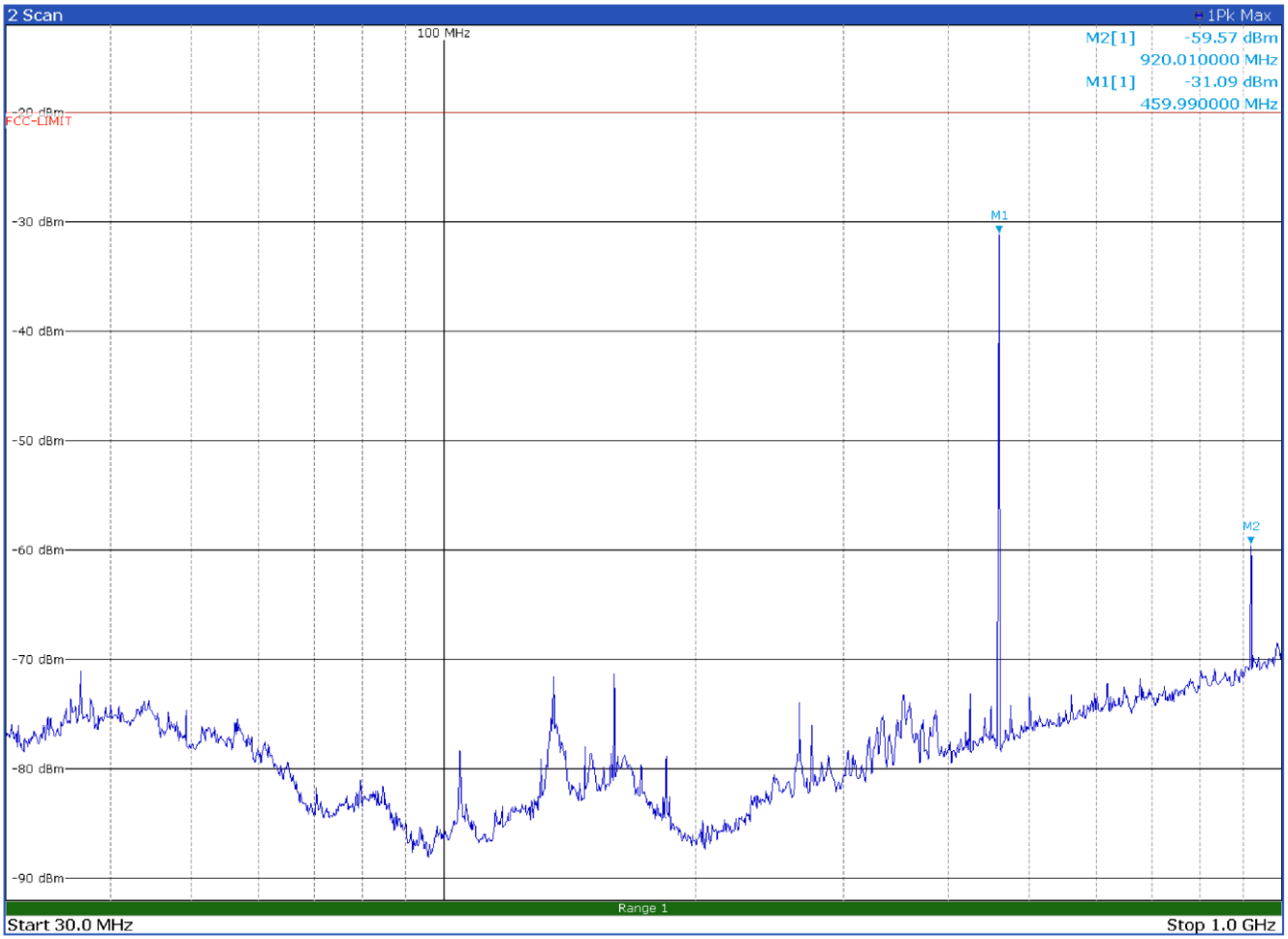
Radiated spurious emissions with modulation P25 C4FM at 421.1 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)



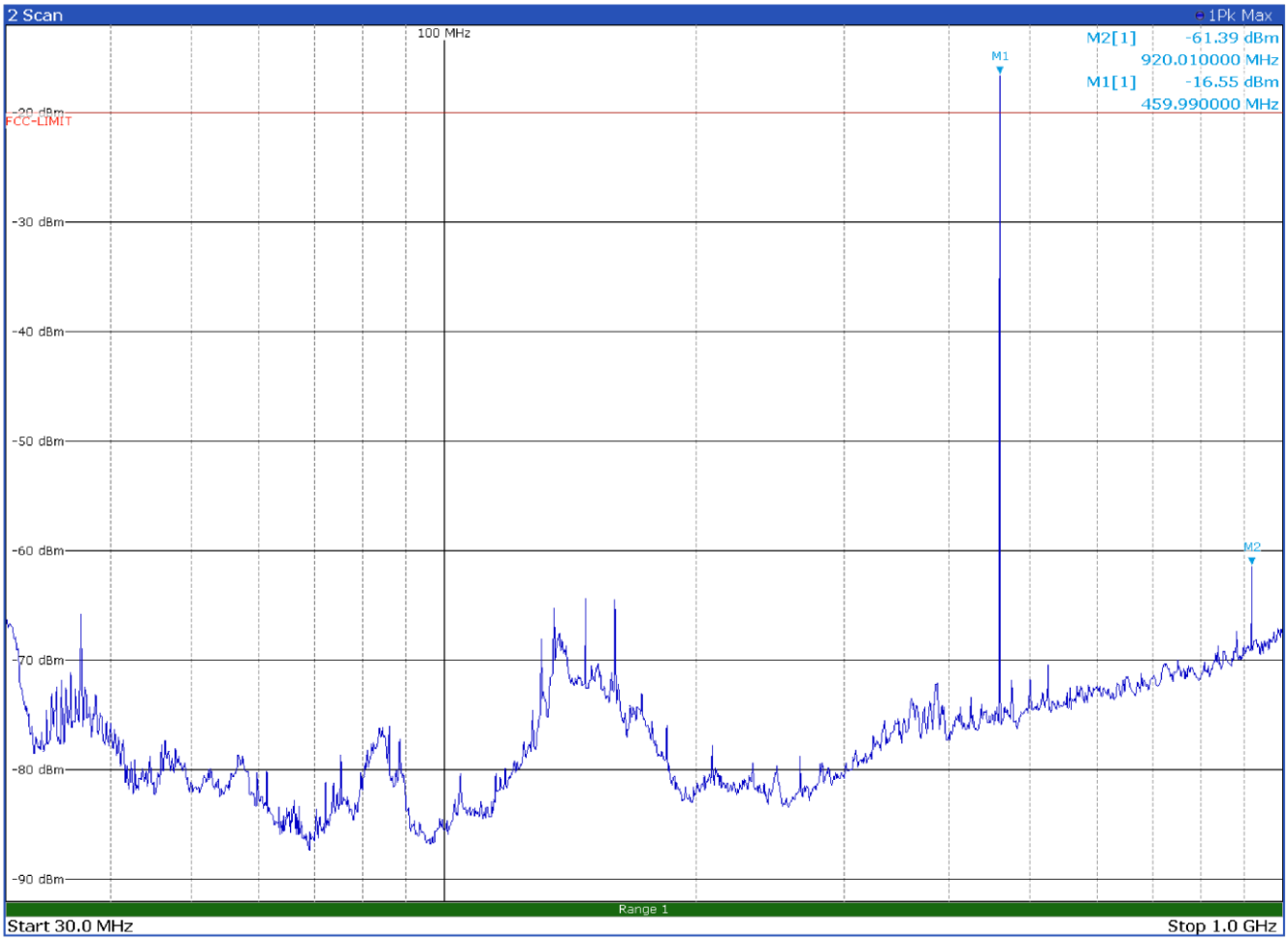
3 Marker Table

Wnd	Type	Ref	Trc	X-value	Y-value
Scan	M1		1	**1.26325 GHz**	**-29.98 dBm**
Scan	M2		1	**1.6845 GHz**	**-32.48 dBm**
Scan	M3		1	**2.1055 GHz**	**-38.45 dBm**

Radiated spurious emissions with modulation P25 C4FM at 421.1 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

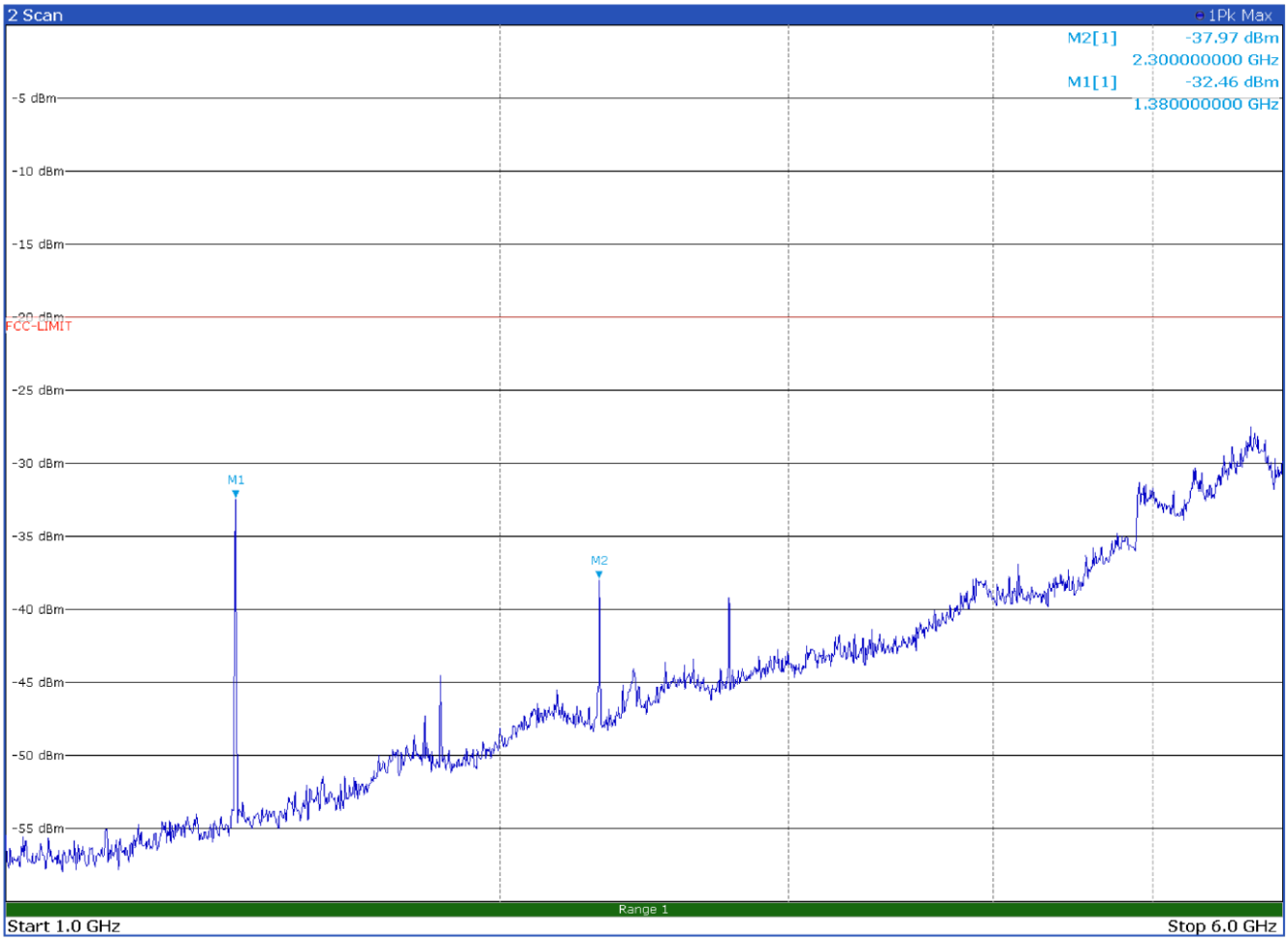


Radiated spurious emissions with modulation FM 12.5 kHz at 460.0 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)

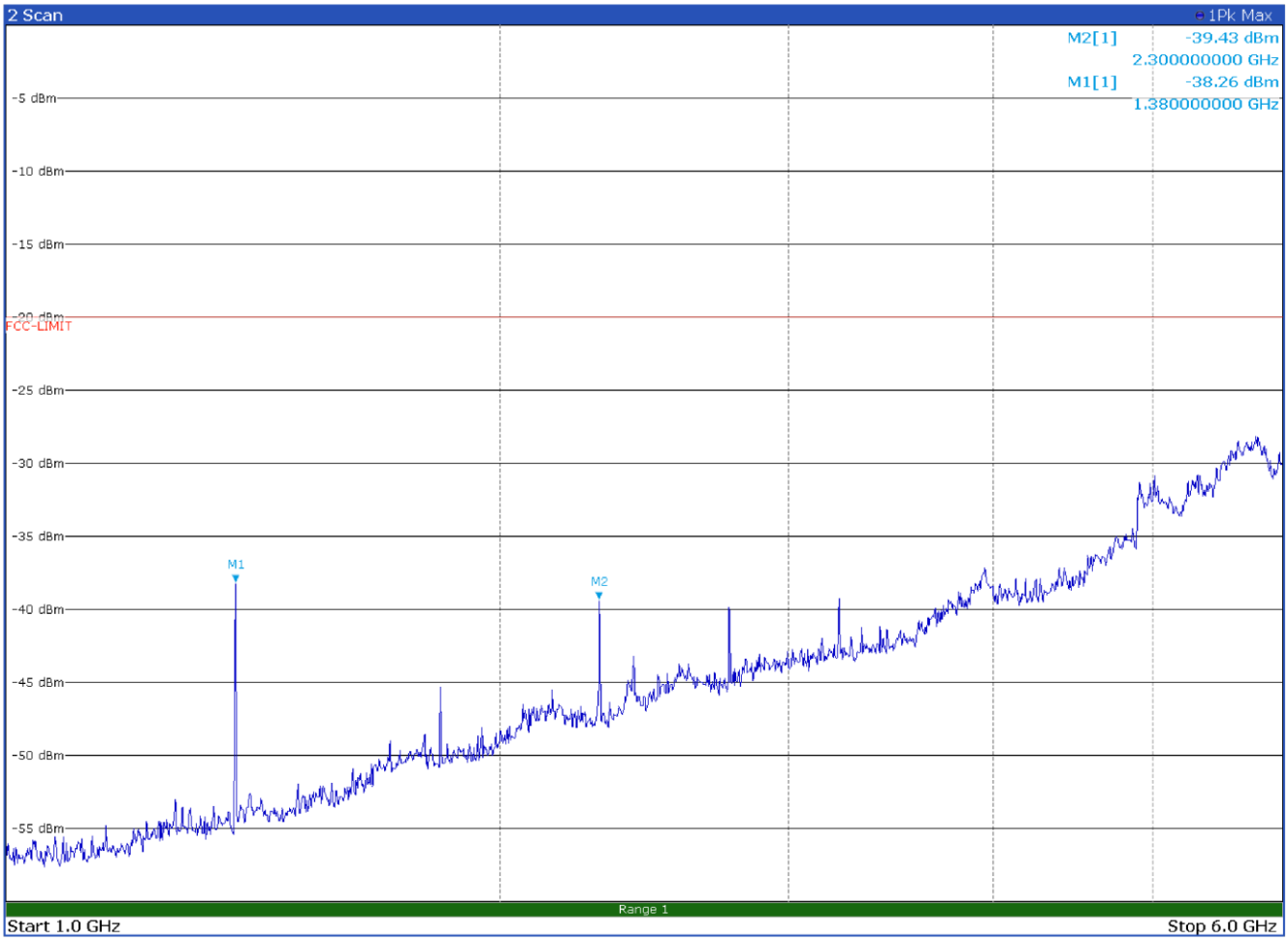


Radiated spurious emissions with modulation FM 12.5 kHz at 460.0 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

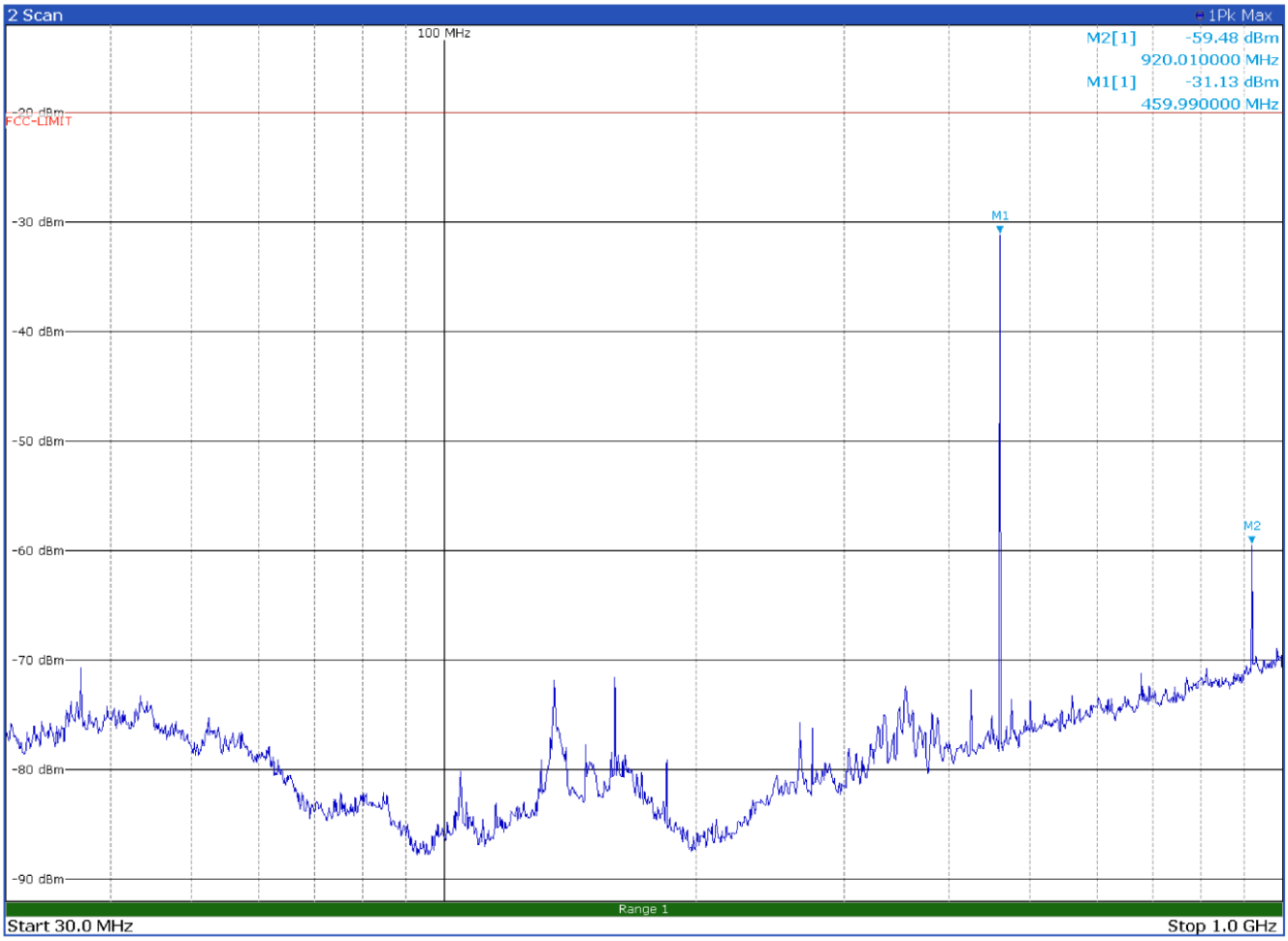
Limit exceeded by the carrier



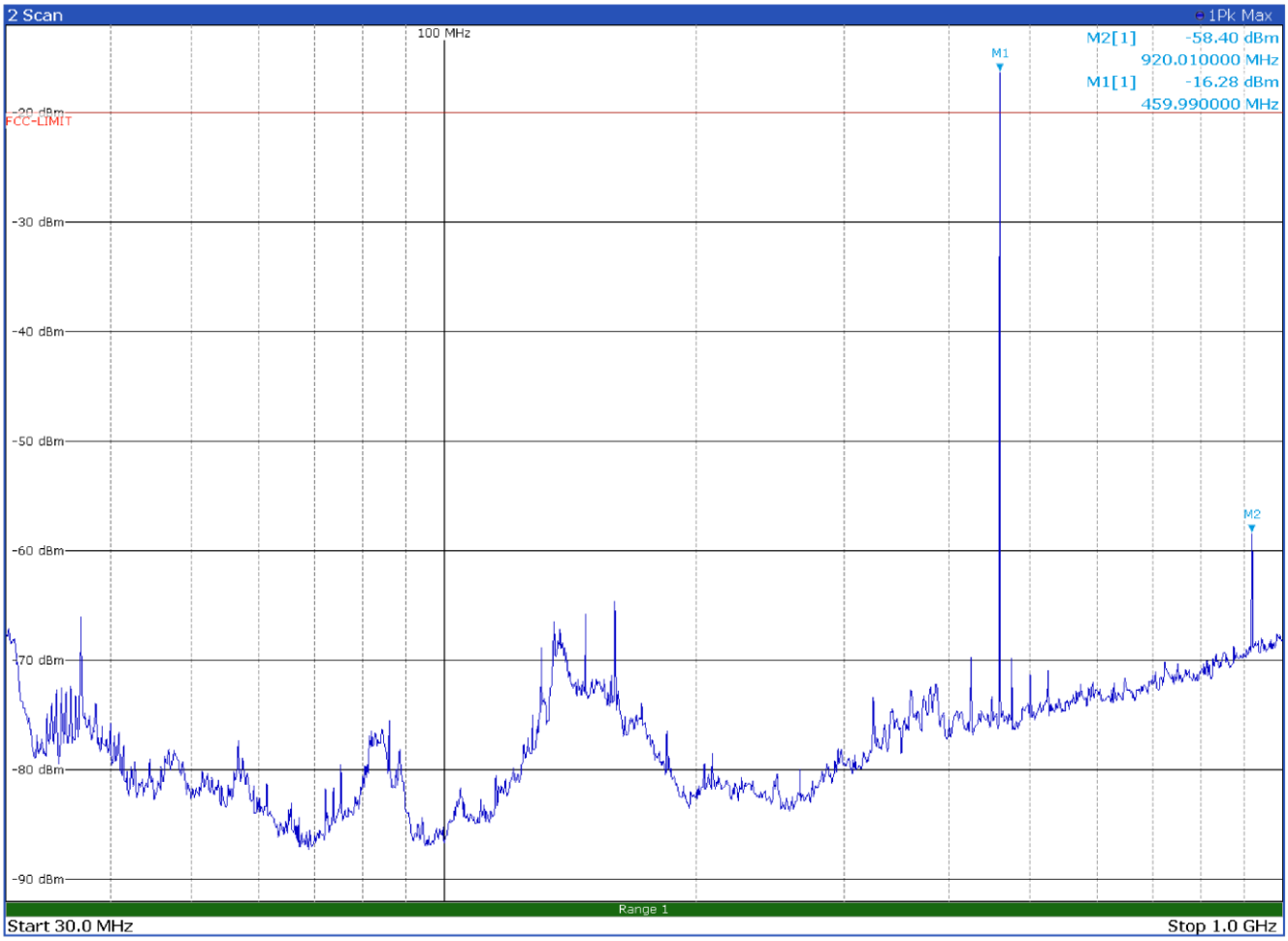
Radiated spurious emissions with modulation FM 12.5 kHz at 460.0 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)



Radiated spurious emissions with modulation FM 12.5 kHz at 460.0 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

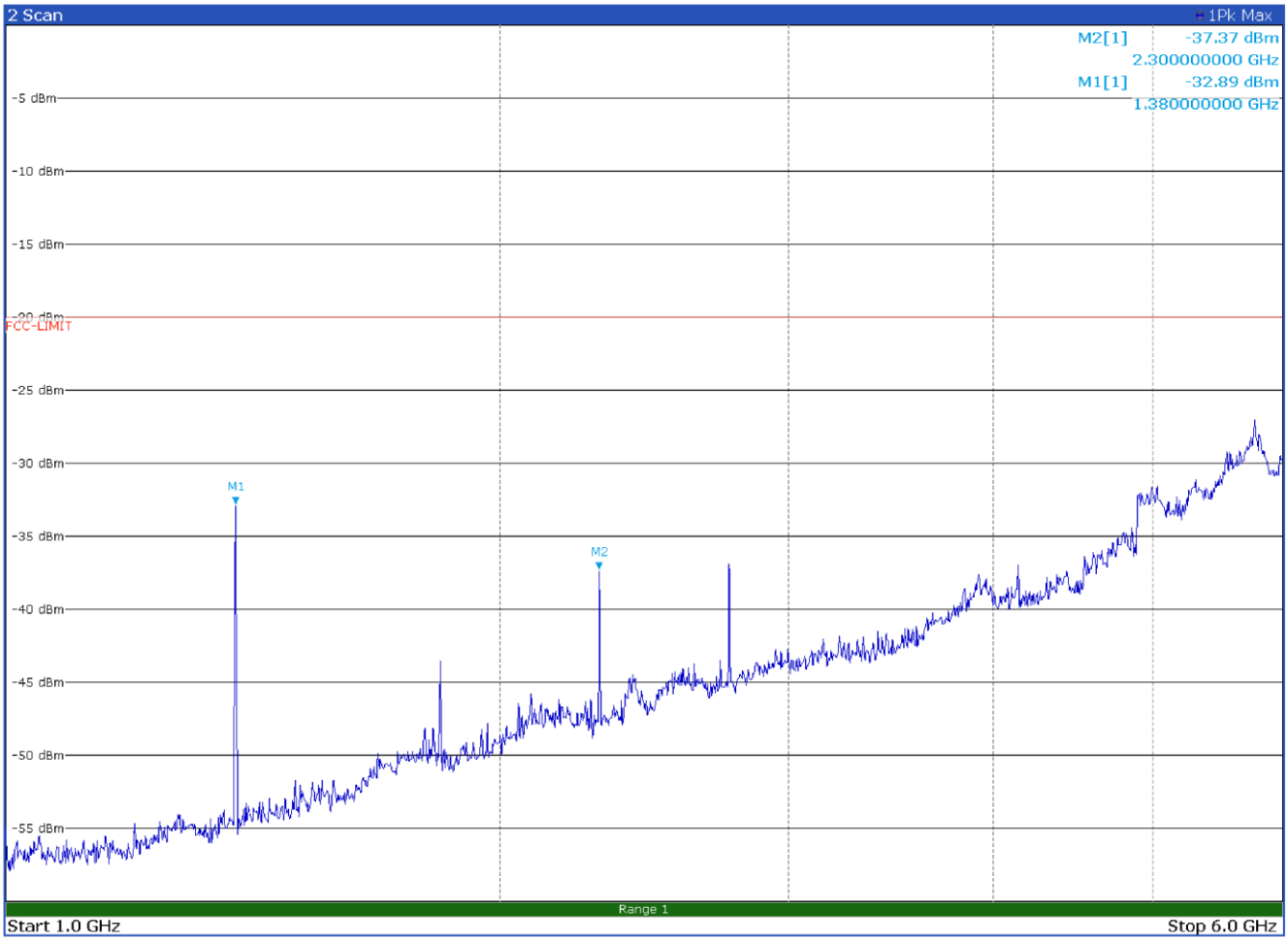


Radiated spurious emissions with modulation FM 25.0 kHz at 460.0 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)

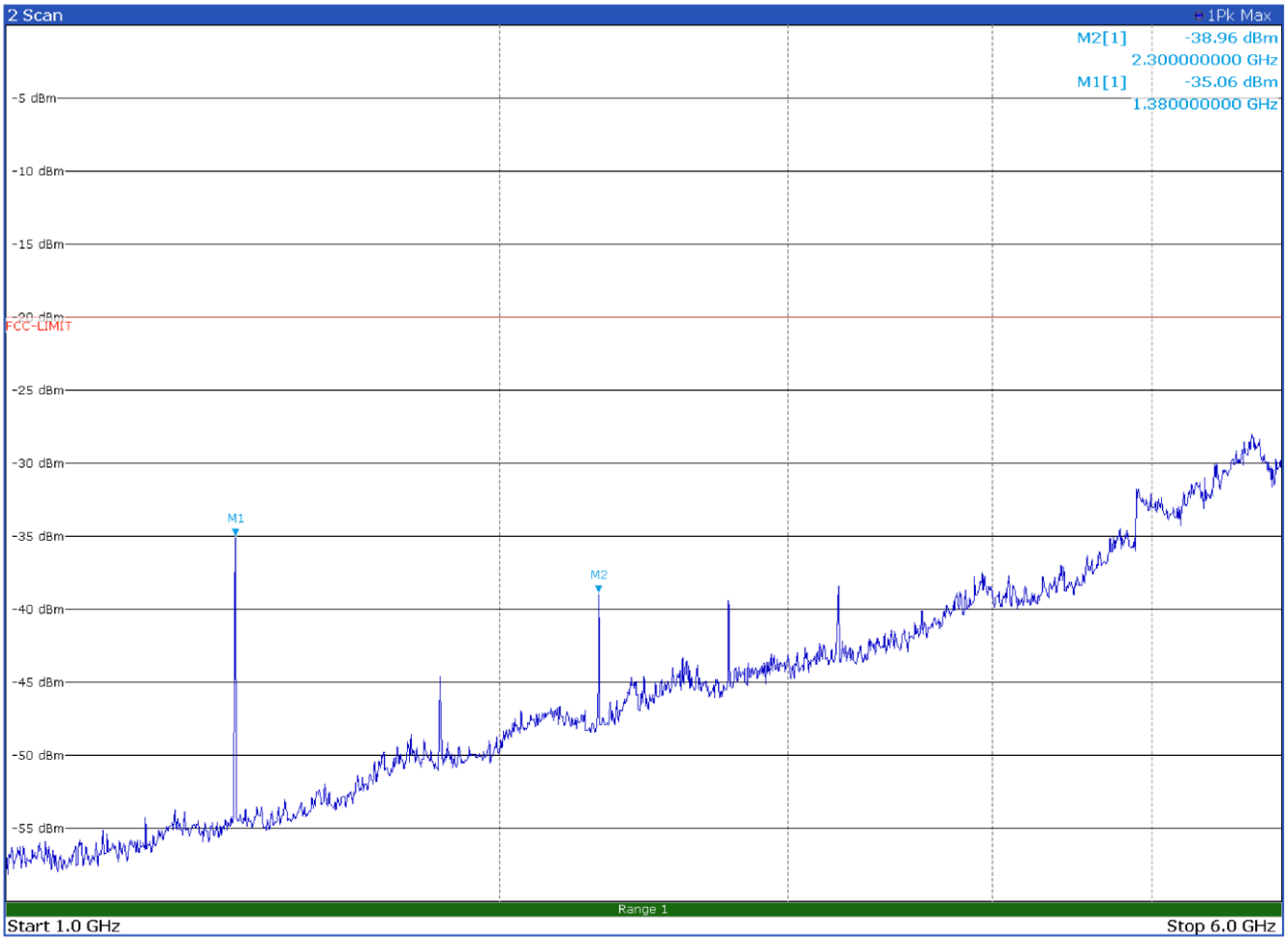


Radiated spurious emissions with modulation FM 25.0 kHz at 460.0 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

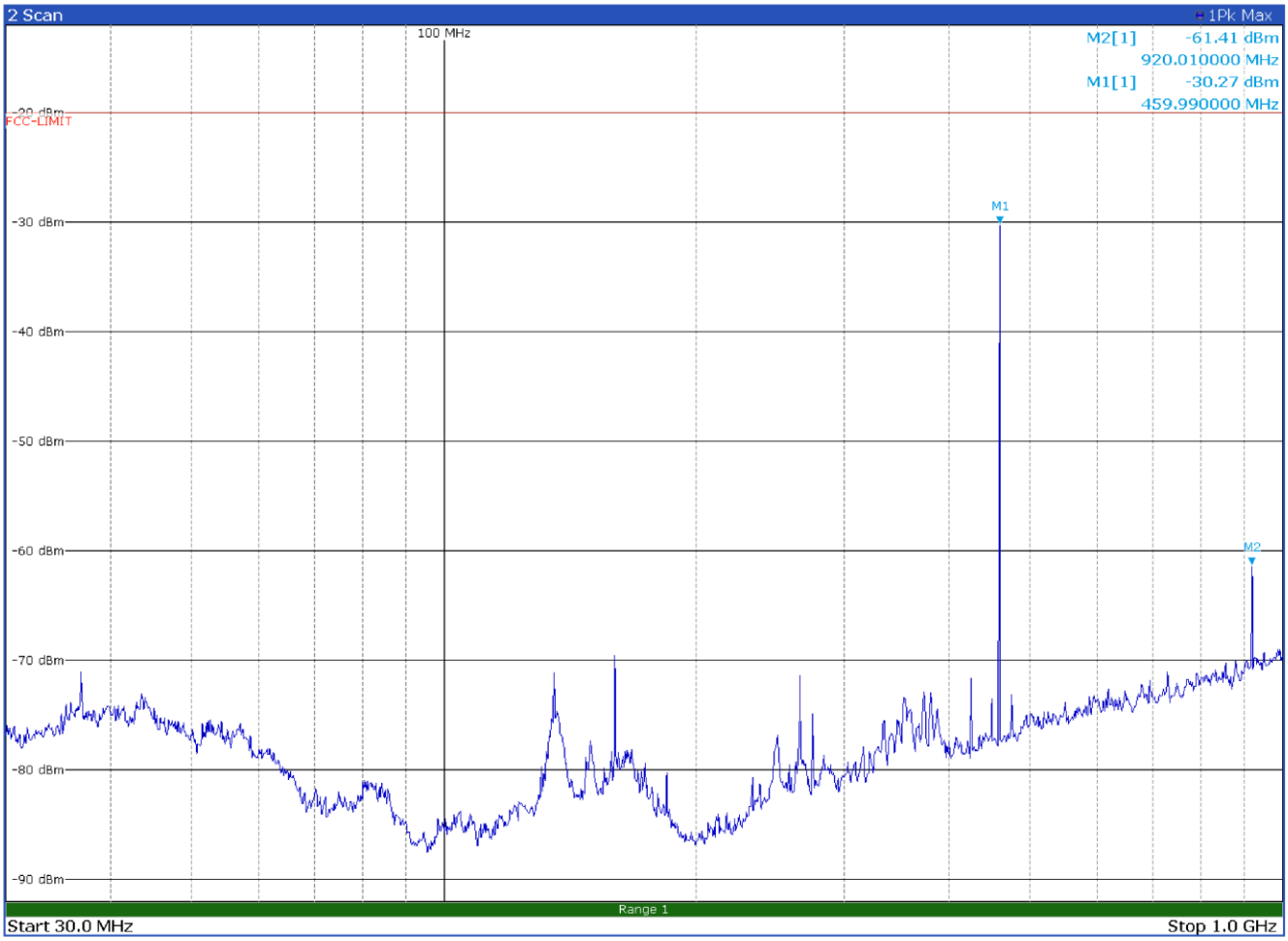
Limit exceeded by the carrier



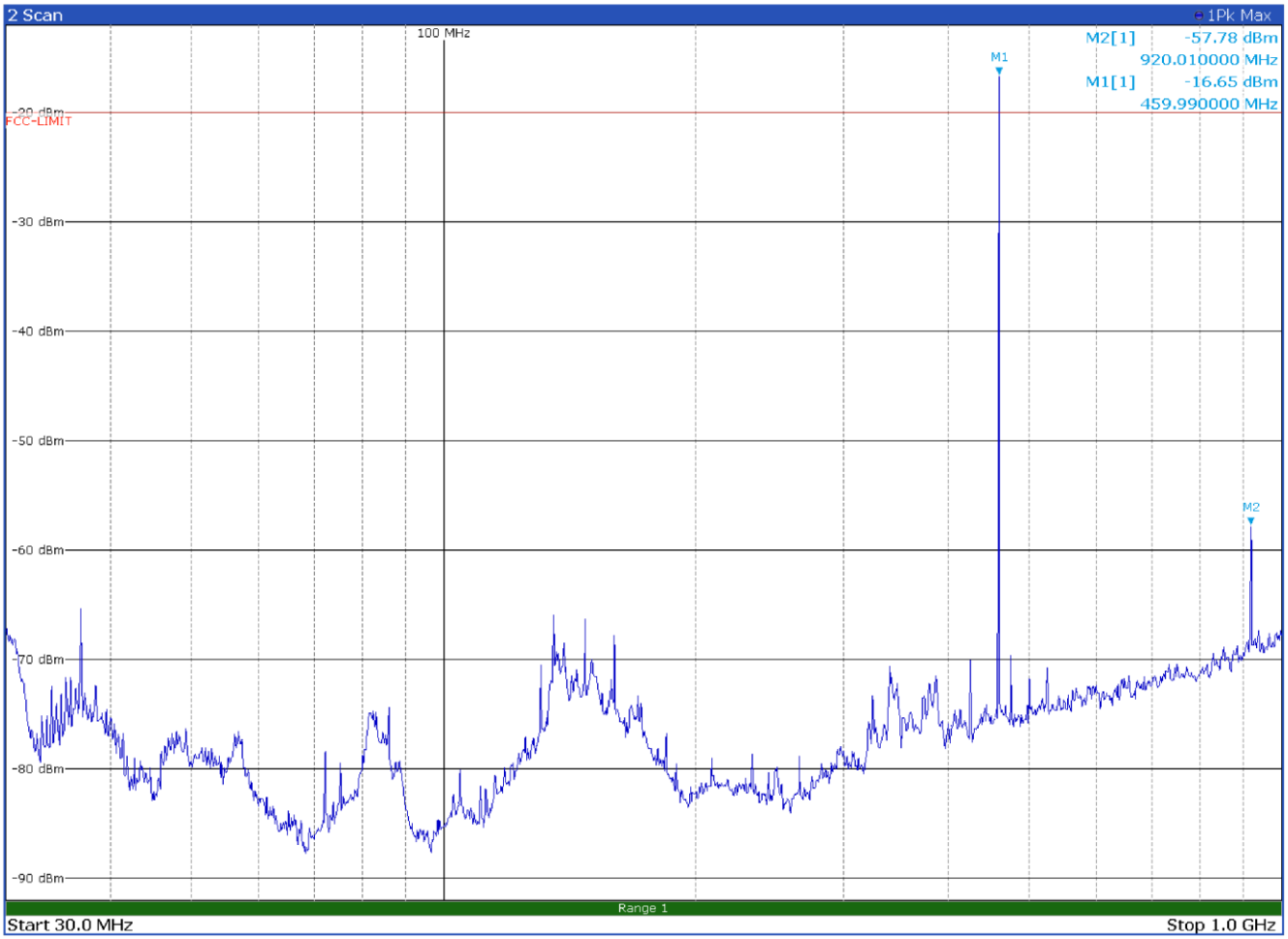
Radiated spurious emissions with modulation FM 25.0 kHz at 460.0 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)



Radiated spurious emissions with modulation FM 25.0 kHz at 460.0 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

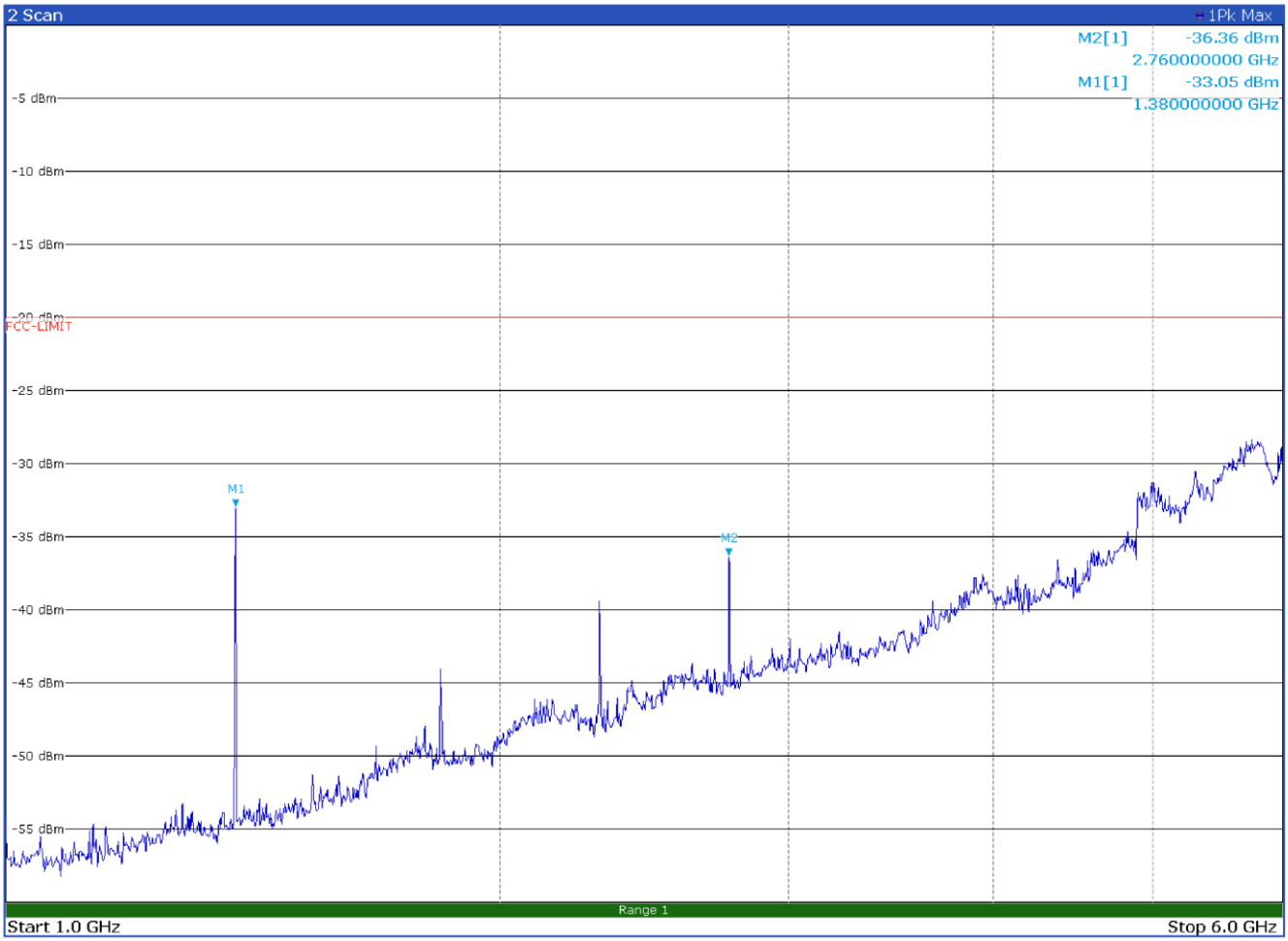


Radiated spurious emissions with modulation DMR 4FSK at 460.0 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)

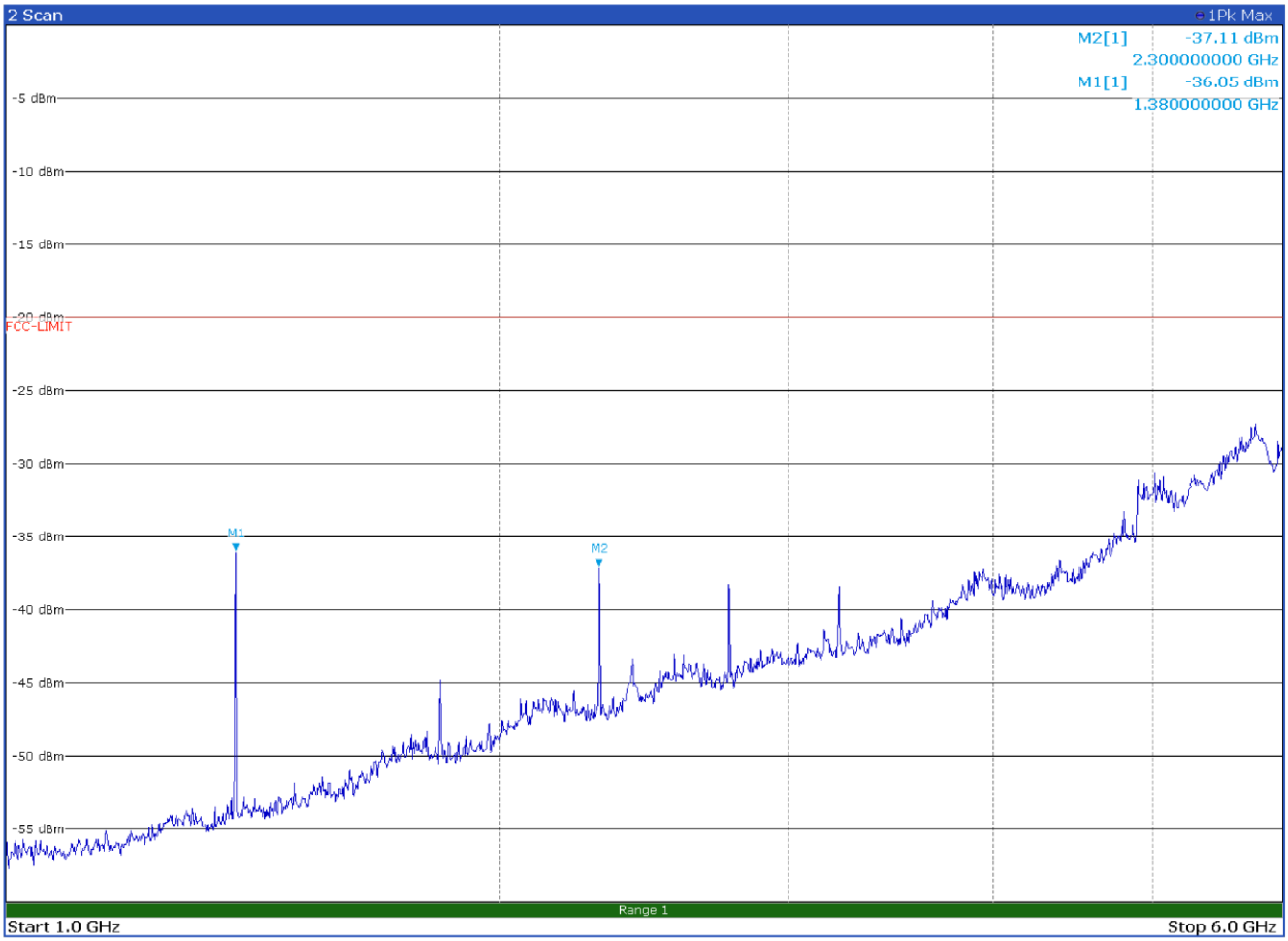


Radiated spurious emissions with modulation DMR 4FSK at 460.0 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

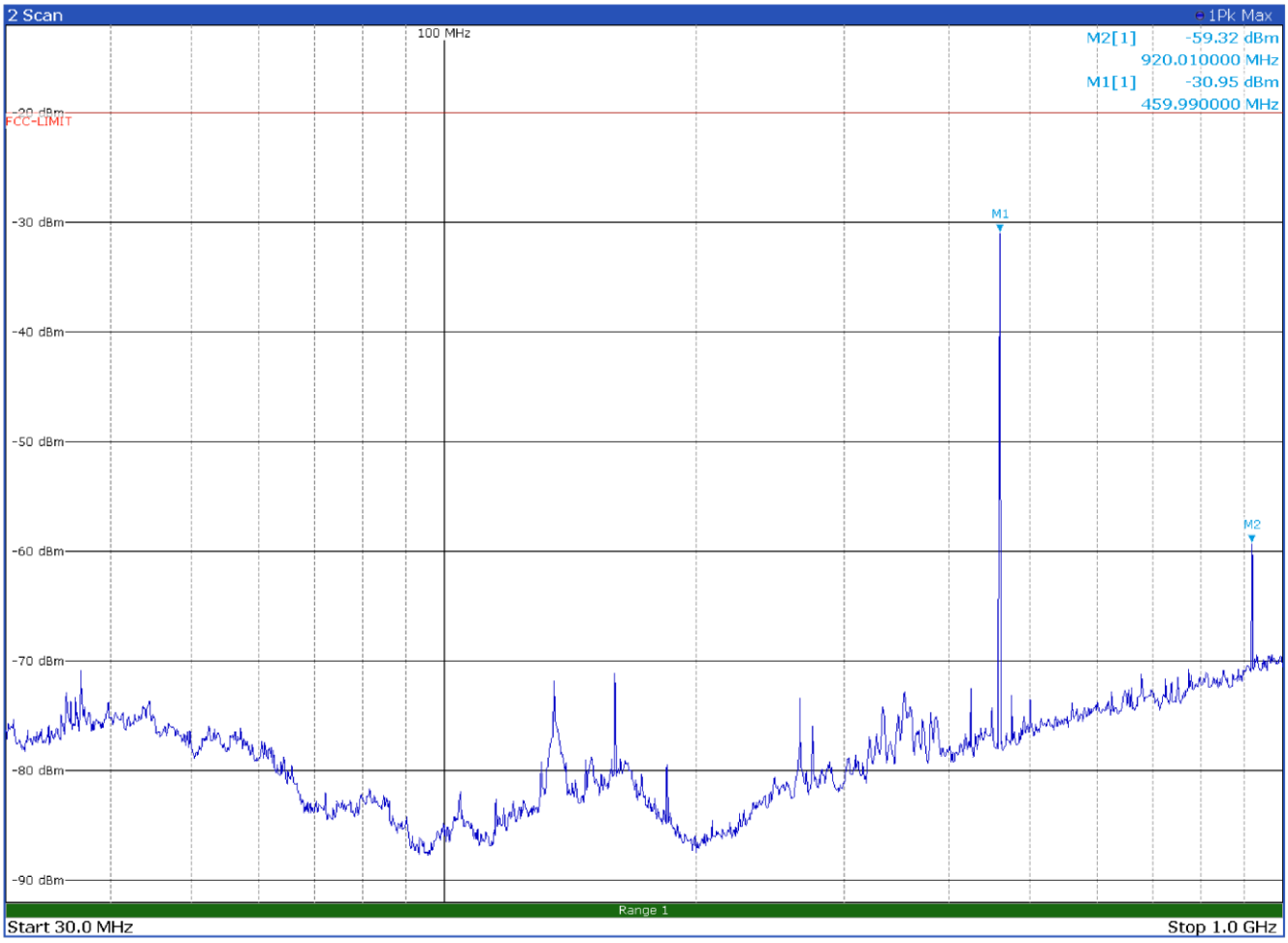
Limit exceeded by the carrier



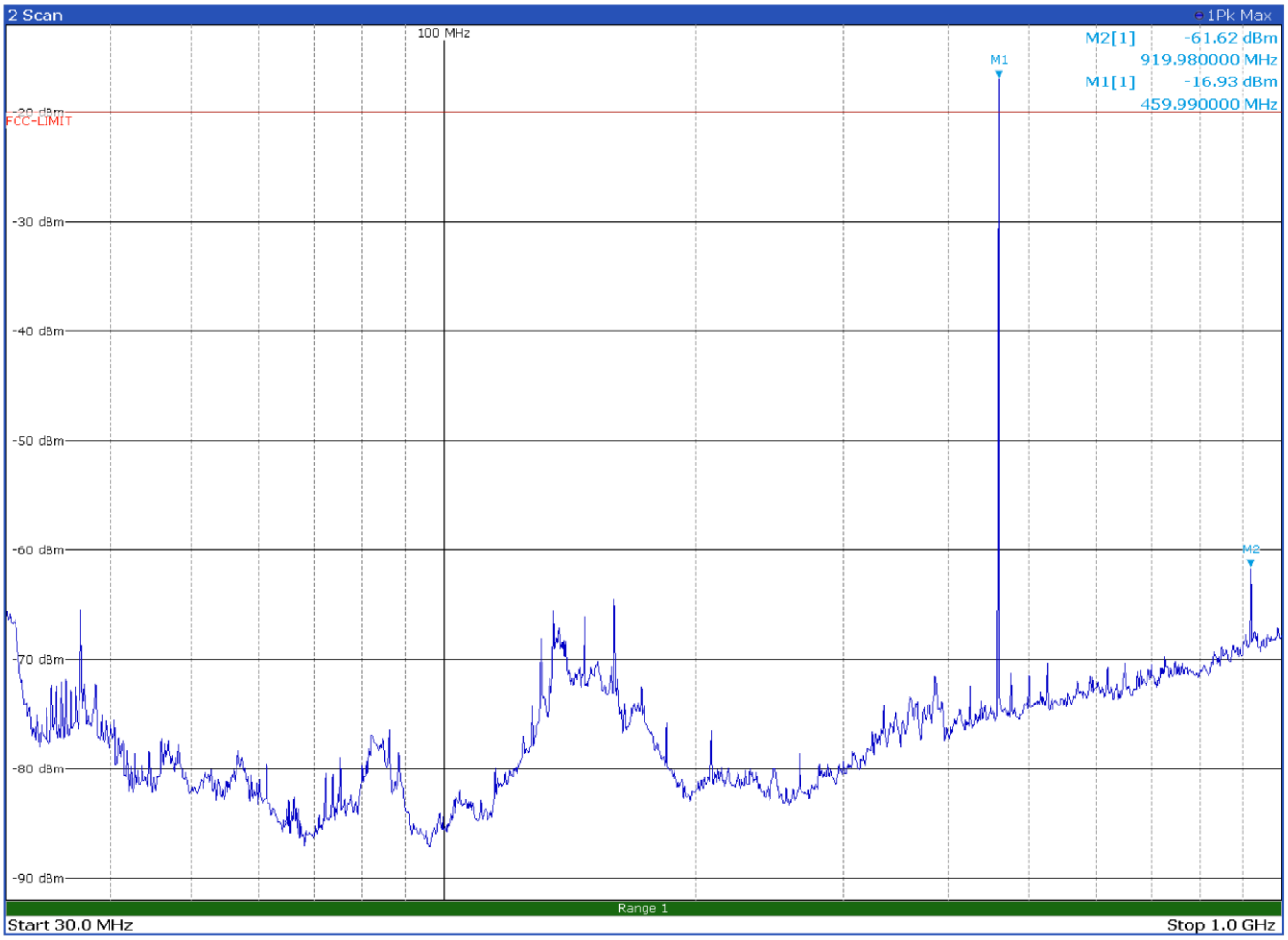
Radiated spurious emissions with modulation DMR 4FSK at 460.0 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)



Radiated spurious emissions with modulation DMR 4FSK at 460.0 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

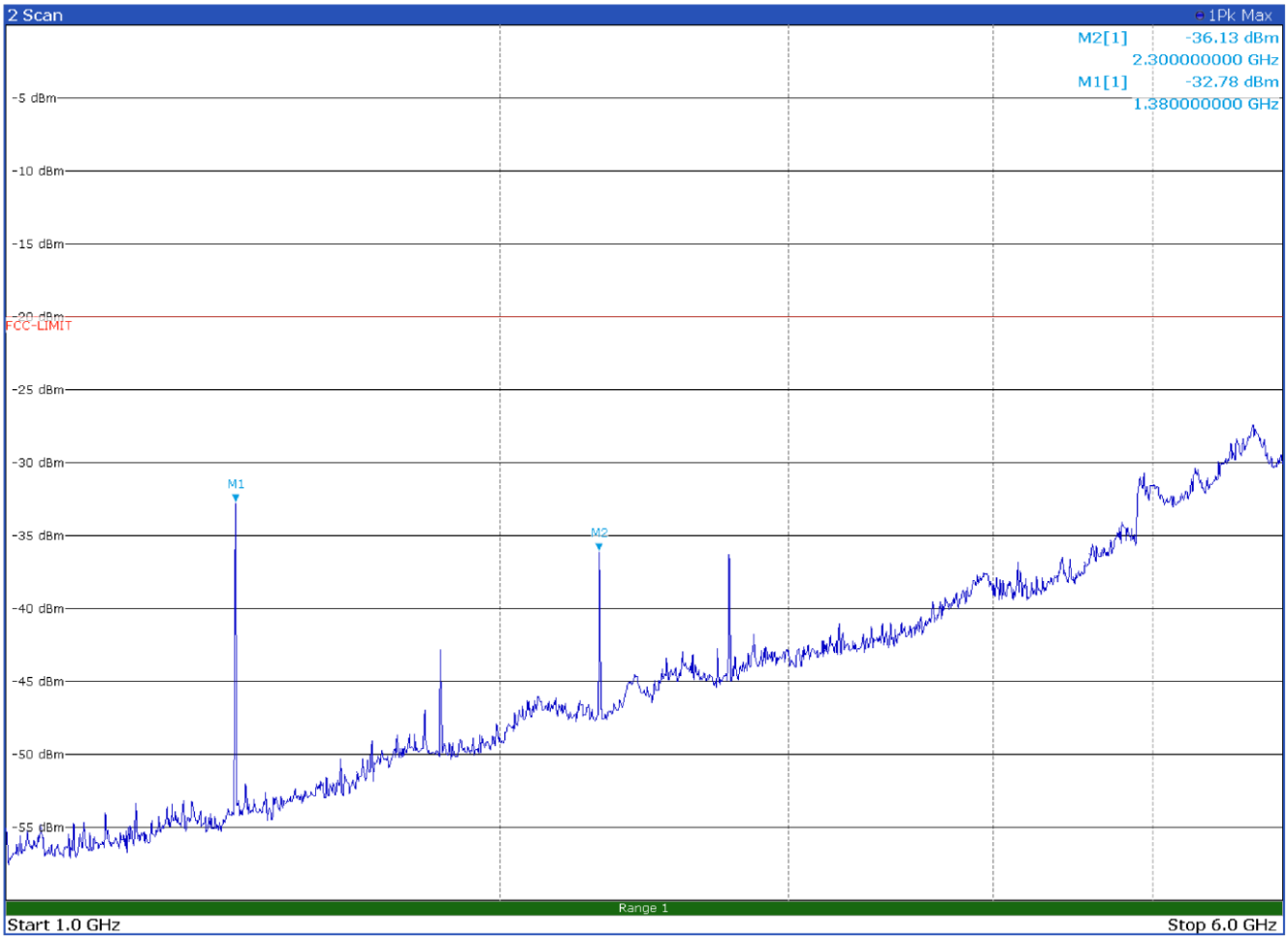


Radiated spurious emissions with modulation P25 C4FM at 460.0 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)

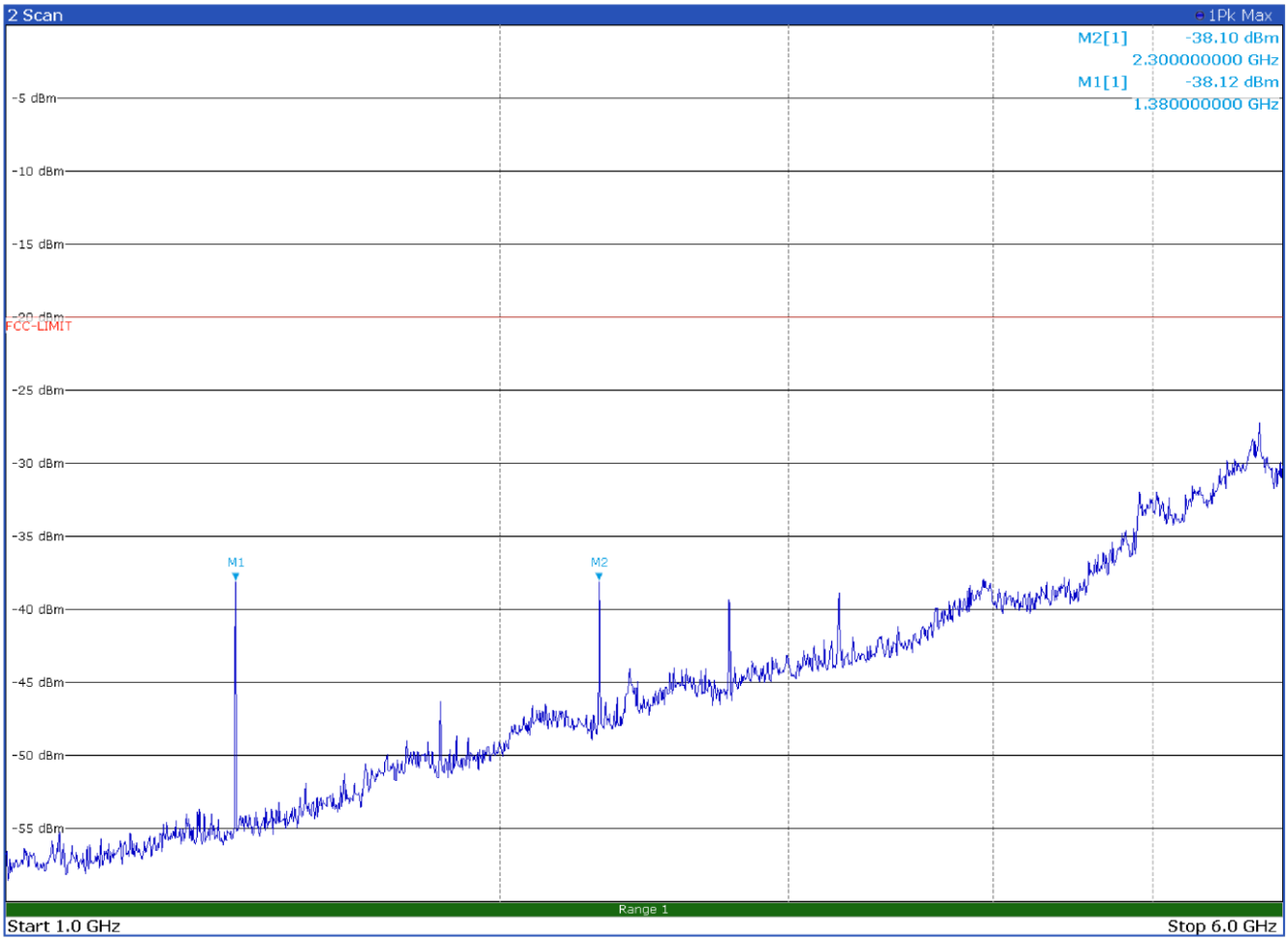


Radiated spurious emissions with modulation P25 C4FM at 460.0 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

Limit exceeded by the carrier



Radiated spurious emissions with modulation P25 C4FM at 460.0 MHz – Antenna in horizontal polarization
(worst frequency case from conducted emissions)



Radiated spurious emissions with modulation P25 C4FM at 460.0 MHz – Antenna in vertical polarization
(worst frequency case from conducted emissions)

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: [1]t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.
t_1 is the time period immediately following t_{on}.
t_2 is the time period immediately following t_1.
t_3 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.
[2]During the time from the end of t_2 to the beginning of t_3, the frequency difference must not exceed the limits specified in §90.213.
[3]Difference between the actual transmitter frequency and the assigned transmitter frequency.
[4]If 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	O. Frau	Test date	April 02, 2024

7.6.3 Observations, settings and special notes

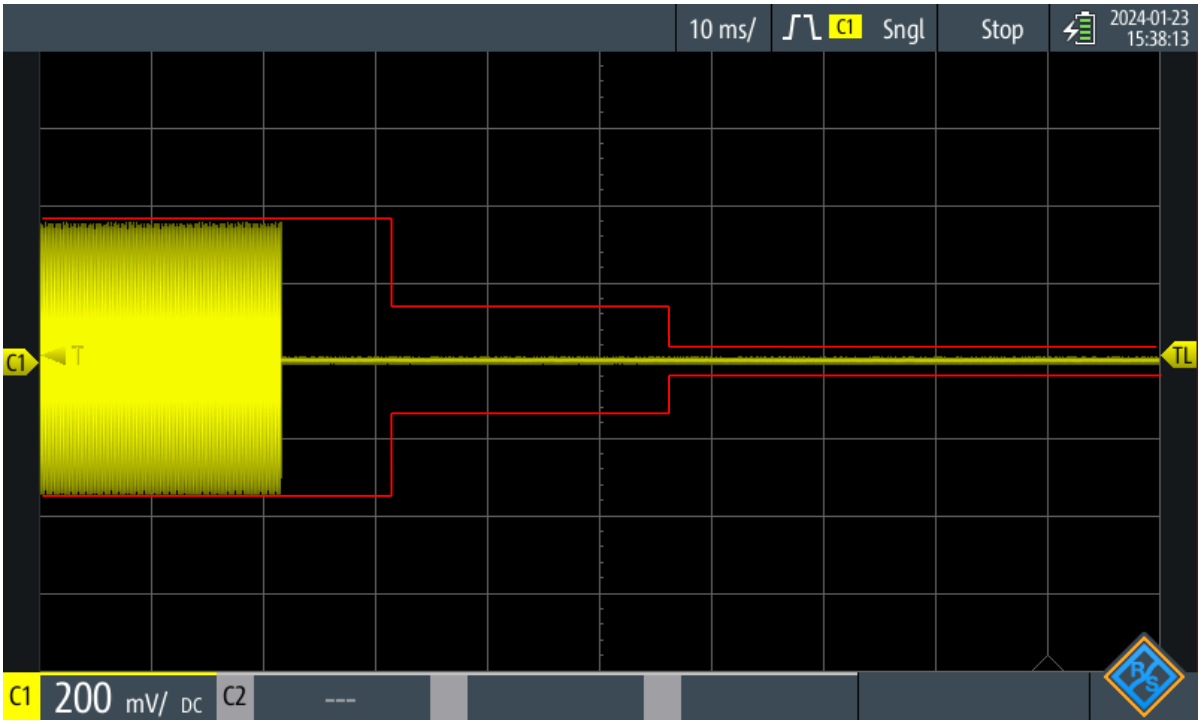
None

7.6.4 Test equipment list

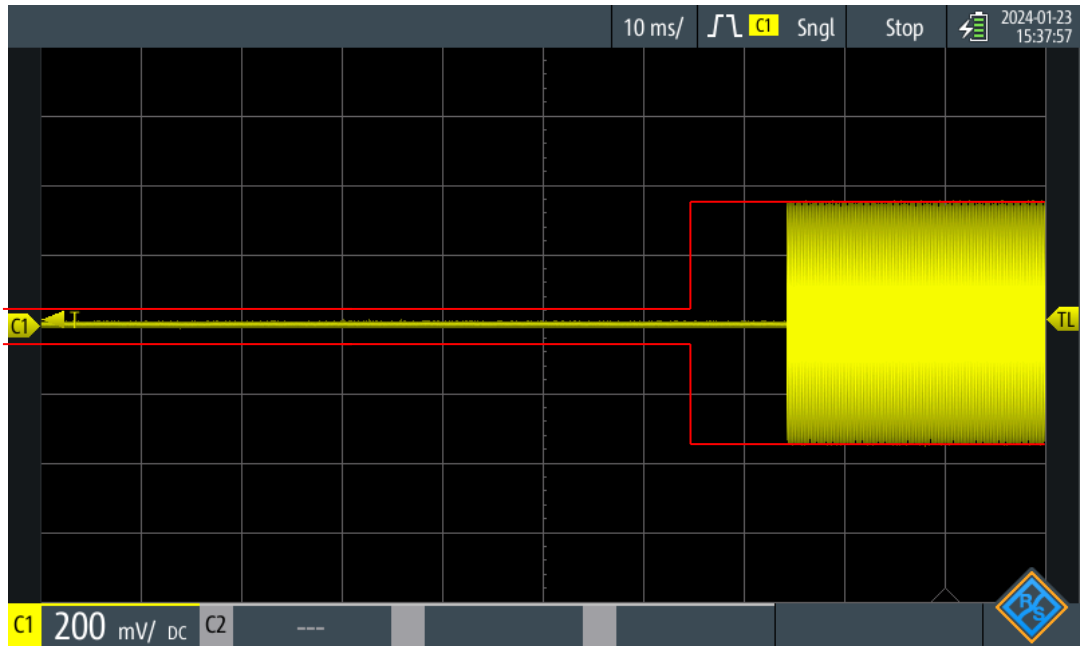
Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI receiver	Rohde & Schwarz	ESW44	101620	2023-08	2024-08
Shielded room	Siemens	10m control room	1947	NCR	NCR
Radio communication tester	Rohde & Schwarz	CMT	883 152/001	2024-01	2027-01
Oscilloscope	Yokogawa	DL1540	25WY1600L	2024-03	2025-03
Cable set	Rosenberger	ST.ALO-02	1.650	2023-10	2024-10

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

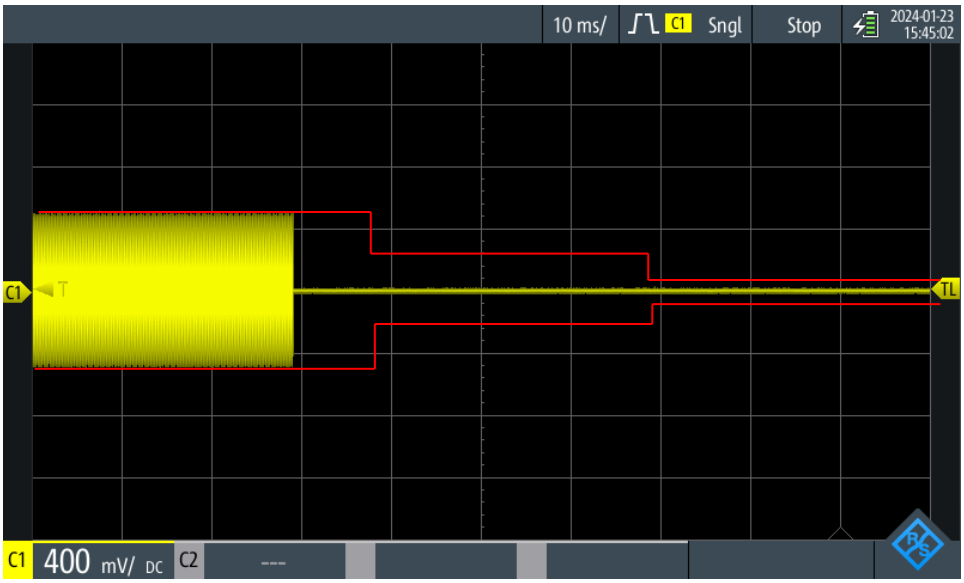
7.6.5 Test data



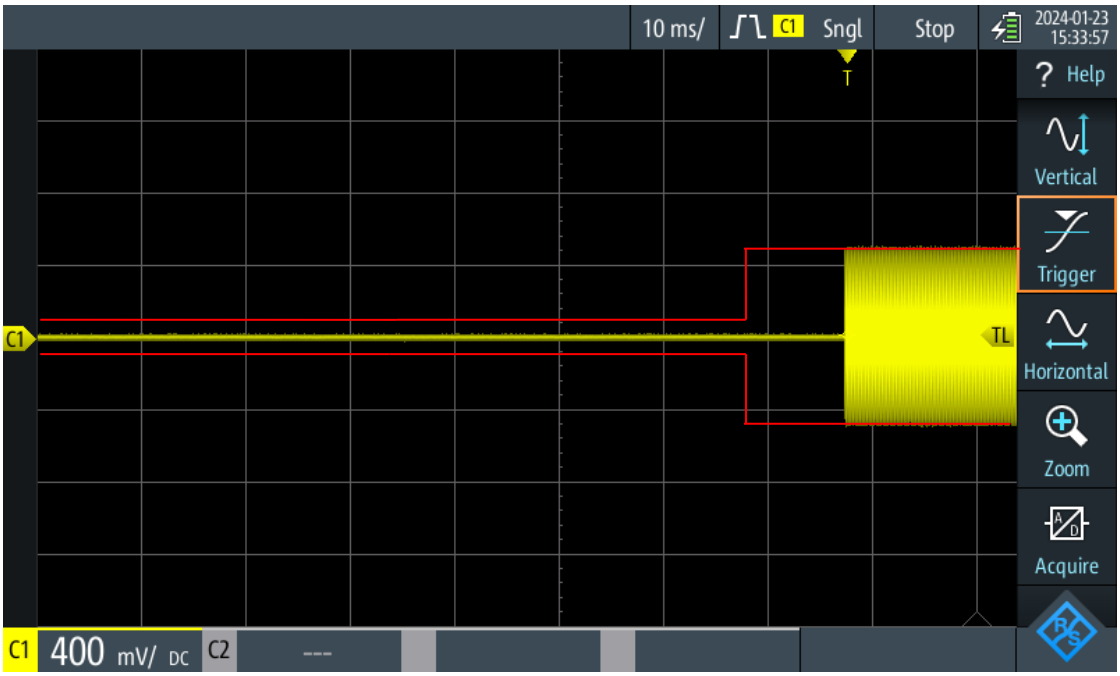
Transient Frequency behavior with modulation FM 12.5 kHz, switch ON



Transient Frequency behavior with modulation FM 12.5 kHz, switch OFF



Transient Frequency behavior with modulation FM 25 kHz, switch ON



Transient Frequency behavior with modulation FM 25 kHz, 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: [1]In 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.

[2]In 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	O. Frau	Test date	April 02, 2024

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	2023-09	2024-09
Climatic chamber	espec	ARS-1100	4100000067	2023-12	2024-12

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	459999690.1	-9.9	-0.022	2.5	-2.52
+40 °C, Nominal	459999691.3	-8.7	-0.019	2.5	-2.52
+30 °C, Nominal	459999695.4	-4.6	-0.010	2.5	-2.51
+20 °C, +15 %	459999699.7	-0.3	-0.001	2.5	-2.50
+20 °C, Nominal	459999700.0	Reference	Reference	Reference	Reference
+20 °C, -15 %	459999699.7	-0.3	-0.001	2.5	-2.50
+10 °C, Nominal	459999697.3	-2.7	-0.006	2.5	-2.51
0 °C, Nominal	459999695.9	-4.1	-0.009	2.5	-2.51
−10 °C, Nominal	459999692.3	-7.7	-0.017	2.5	-2.52
−20 °C, Nominal	459999690.2	-9.8	-0.021	2.5	-2.52
−30 °C, Nominal	459999689.7	-10.3	-0.022	2.5	-2.52

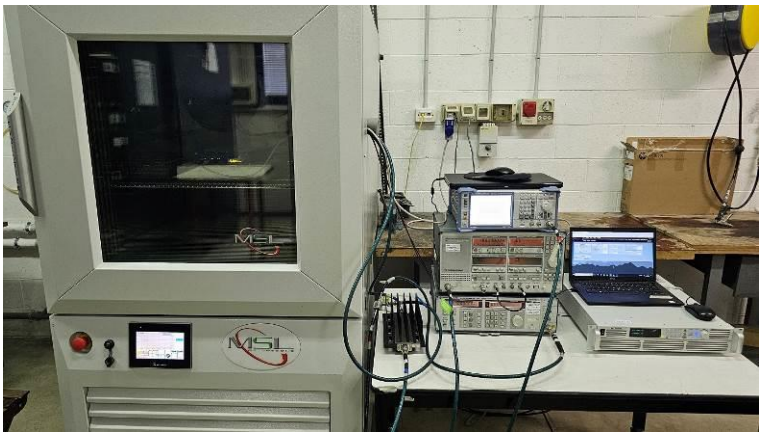
Section 8 Photos

8.1 Photos of the test set-up

Set-up photo for radiated tests below 1 GHz photo

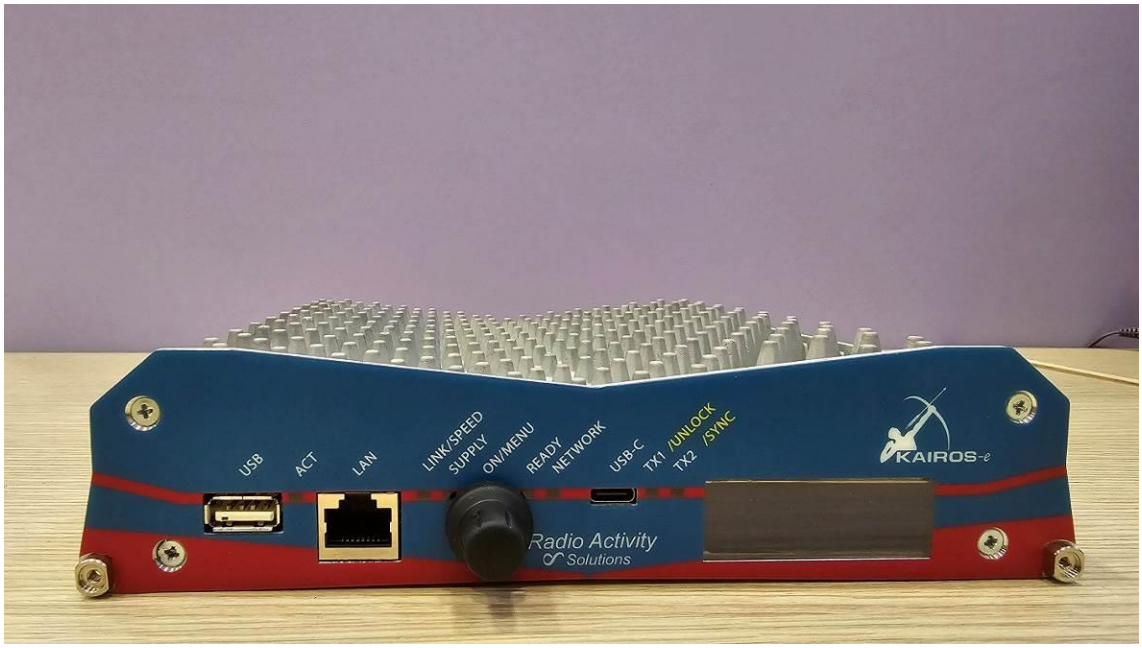
Set-up photo for radiated tests above 1 GHz photo

Set-up photo for antenna port tests



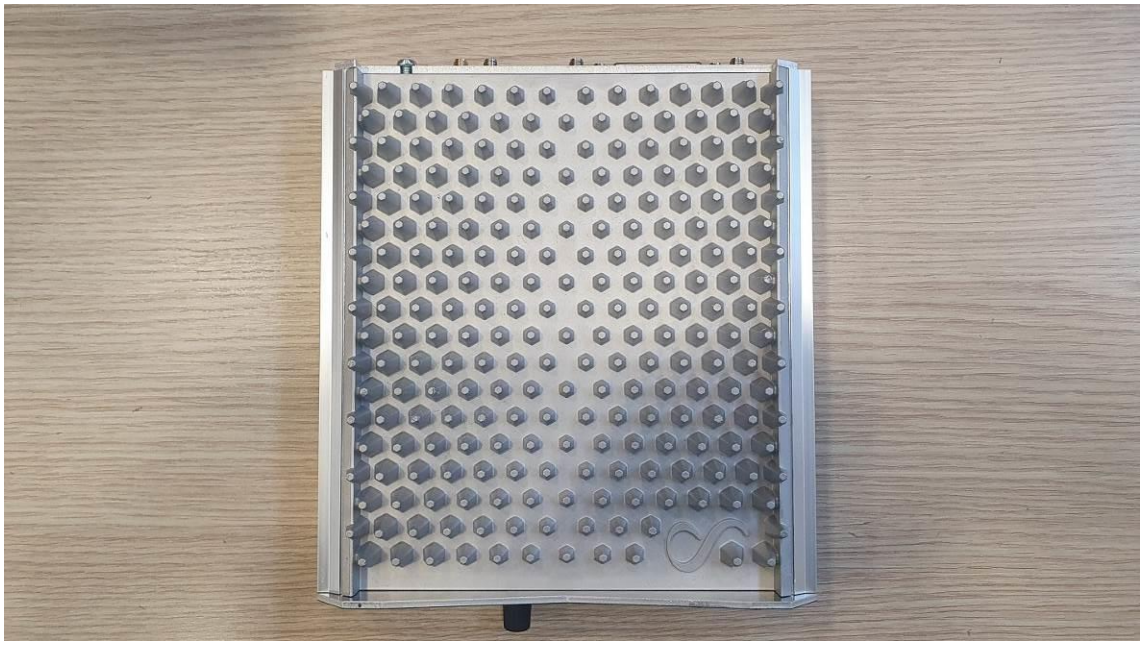
Set-up photo for frequency error tests

8.2 Photos of the EUT



Front side photo

Rear side photo



Top side photo

Bottom side photo

Copy of marking plate

End of the test report