Test report

381371-4TRFWL

Date of issue: 2020-03-19

Applicant:

Inventis SRL

Corso Stati Uniti, 1/3 – 35127 Padova (PD) – Italia

Product:

Real ear measurement system + Audiometer

Model:

Trumpet REM & AUD Wireless; Trumpet REM & AUD

Trumpet REM Wireless; Trumpet REM; Trumpet AUD

FCC ID:

2AVOO-RE1RA

IC Registration number:

25857-RE1RA

Specifications:

- FCC 47 CFR Part 15 Subpart C, §15.247

  Operation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz

- RSS-247, Issue 2, Feb 2017, Section 5

  Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices. Standard specifications for frequency hopping systems and digital transmission systems operating in the bands 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz

Test location

Company name:	Nemko Spa
Address:	Via del Carroccio, 4
City:	Biassono
Province:	MB
Postal code:	20853
Country:	Italy
Telephone:	+39 039 220 12 01
Facsimile:	+39 039 220 12 21
Website:	www.nemko.com
Site number:	FCC: 682159; IC: 9109A (10 m semi anechoic chamber)

Tested by (name, function and signature)	P. Barbieri	(project handler)	Barbieri
Reviewed by (name, function and signature)	D. Guarnone	(verifier)	Daniele Guarnone
Date:	2020-03-19		

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report. This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Spa ISO/IEC 17025 accreditation.

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Inventis SRL
Address	Corso Stati Uniti, 1/3
City	Padova
Province/State	PD
Postal/Zip code	35127
Country	Italy

1.2 Test specifications

FCC 47 CFR Part 15, Subpart C, Clause 15.247	Operation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–585 MHz
RSS-247, Issue 2, Feb 2017, Section 5	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

1.3 Test methods

558074 D01 DTS Meas Guidance v05r02	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
662911 D01 Multiple Transmitter Output v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band
DA 00-705, Released March 30, 2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.5 Exclusions

None

1.6 Test report revision history

Revision #	Details of changes made to test report
381371-4TRFWLFAIL	Original report issued.
381371-4TRFWL	Second release. EUT tested with a reduced power that reproduce the power in normal working mode.

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, general requirements test results

Part	Test description	Verdict
§15.207(a)	Conducted limits	Pass
§15.31(e)	Variation of power source	Pass[1]
§15.203	Antenna requirement	Pass[2]

Notes: [1] Measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, was performed with the supply voltage varied between 85 % and 115 % of the nominal rated supply voltage. No noticeable output power variation was observed

[2] The Antennas are located within the enclosure of EUT and not user accessible.

2.2 FCC Part 15 Subpart C, intentional radiators test results

Part	Test description	Verdict
§15.247(a)(1)(i)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
§15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725–5850 MHz band	Not applicable
§15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Pass
§15.247(a)(2)	Minimum 6 dB bandwidth for systems using digital modulation techniques	Not applicable
§15.247(b)(1)	Maximum peak output power of frequency hopping systems operating in the 2400–2483.5 MHz band and 5725–5850 MHz band	Pass
§15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902–928 MHz band	Not applicable
§15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands	Not applicable
§15.247(c)(1)	Fixed point-to-point operation with directional antenna gains greater than 6 dBi	Not applicable
§15.247(c)(2)	Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams	Not applicable
§15.247(d)	Spurious emissions	Pass
§15.247(e)	Power spectral density for digitally modulated devices	Not applicable
§15.247(f)	Time of occupancy for hybrid systems	Not applicable

2.3 ISED RSS-GEN, Issue 5, test results

Part	Test description	Verdict
6.7	Occupied bandwidth	Pass
6.9	Operating bands and selection of test frequencies	Pass
6.11	Transmitter frequency stability	Not applicable
7.3	Receiver radiated emissions limits	Not applicable
7.4	Receiver conducted emissions limits	Not applicable
8.8	AC power lines conducted emission limits	Pass

Notes: The EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.

2.4 ISED RSS-247, Issue 2, test results

Part	Test description	Verdict
5.1	Frequency Hopping Systems (FHSs)	
5.1 (a)	Bandwidth of a frequency hopping channel	Pass
5.1 (b)	Minimum channel spacing for frequency hopping systems	Pass
5.1 (c)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
5.1 (d)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Pass
5.1 (e)	Frequency hopping systems operating in the 5725–5850 MHz band	Not applicable
5.2	Digital Transmission Systems (DTSs)	
5.2 (a)	Minimum 6 dB bandwidth	Not applicable
5.2 (b)	Maximum power spectral density	Not applicable
5.3	Hybrid Systems	
5.3 (a)	Digital modulation turned off	Not applicable
5.3 (b)	Frequency hopping turned off	Not applicable
5.4	Transmitter output power and e.i.r.p. requirements	
5.4 (a)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
5.4 (b)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Pass
5.4 (c)	Frequency hopping systems operating in the 5725–5850 MHz	Not applicable
5.4 (d)	Systems employing digital modulation techniques	Not applicable
5.4 (e)	Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band	Not applicable
5.4 (f)	Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams	Not applicable
5.5	Unwanted emissions	Pass

Notes: None

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	2020-01-24
Nemko sample ID number	381371

3.2 EUT information

Product name	Real ear measurement system + Audiometer
Model	TRUMPET REM & AUD Wireless
Model variant	Trumpet REM & AUD; Trumpet REM Wireless; Trumpet REM; Trumpet AUD
Serial number	RE1RA20100004

3.3 Technical information

Frequency band	2400–2483.5 MHz
Frequency Min (MHz)	2402
Frequency Max (MHz)	2480
Channels	74
Channel separation	1 MHz
RF power Min (W), EIRP	0.24 mW (-6.5 dBm)
RF power Max (W), EIRP	0.34 mW (-4.7 dBm)
Field strength, Units @ distance	N/A
Measured BW (kHz) (20 dB)	806.2
Occupied bandwidth (kHz) (99 %)	885.1 kHz
Calculated BW (kHz), as per TRC-43	N/A
Type of modulation	FHSS
Emission classification (F1D, G1D, D1D)	885KFXD
Transmitter spurious, dBµV/m @3m	35.2 dBuV/m (@ 121.3500 MHz)
Equipment Class	DSS - Part 15 Spread Spectrum Transmitter
Power requirements	15 V DC from an external 100 – 240 V ~ 47 – 63 Hz adapter
Antenna information	The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator. The EUT use a 2.4 GHz Mini Antenna SMT P/N 2450AT18B100 manufactured by Johanson Technology with a peak gain 0.5 dBi.

3.4 Product description and theory of operation

Trumpet is a real ear measurement system. A real ear measurement system allows the determination of the intensity of sounds reaching the tympanic membrane of the patient. To this end it uses a couple of microphones, one located at the level of the patient's earlobe (the reference microphone), and one inserted in the patient ear canal through a silicon tube (the probe microphone). The operator, using the system, delivers to the patient sound stimuli different in intensity and in frequency content, and measures the intensity of the sound received by the two microphones. A real ear measurement system is generally used to quantify the gain provided by a hearing aid, when this is worn by the patient. Trumpet can be also an audiometer. An audiometer is a device that helps the operator in defining the patient's auditory sensitivity by generating and delivering to the patient sound stimuli of different types and intensities for diagnostic purposes.

The EUT is the main unit of Trumpet system, provided with two Bluetooth radio modules, that are uncorrelated to each other and with separate antennas; this main unit also integrates a wireless charging circuit for the recharge operation of the Wireless REM probes, part of the Trumpet system but separately approved.

3.5 EUT exercise details

The software used in normal working is Maestro version 1.11.1. The following software (Blue Suit 2.6.6 / FW version 3.0.2) and USB adapter has been used to force the EUT in transmission mode:

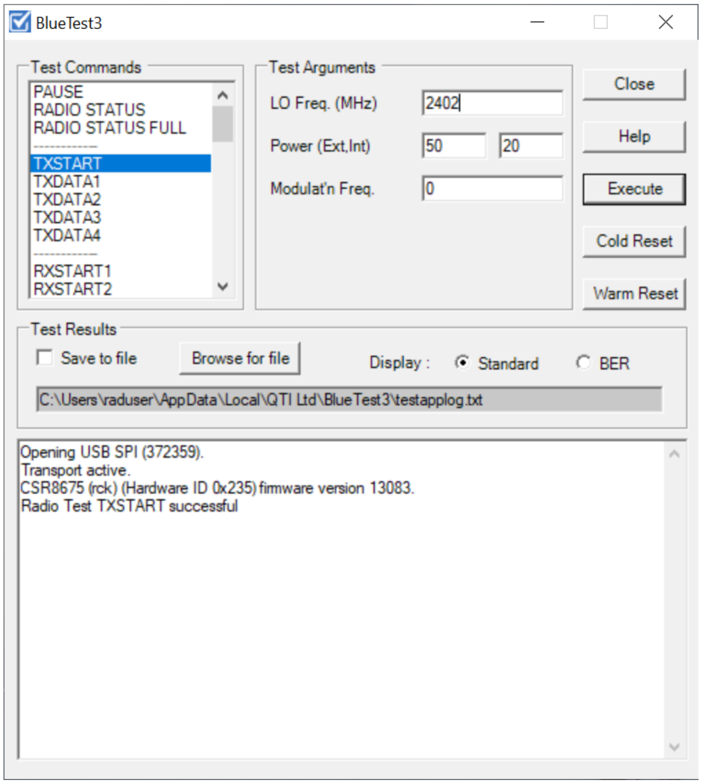


Figure 3.5-1: *USB adapter*

The EUT has been modified as following:

Figure 3.5-2: *EUT connected to the USB adapter*

3.6 EUT setup diagram

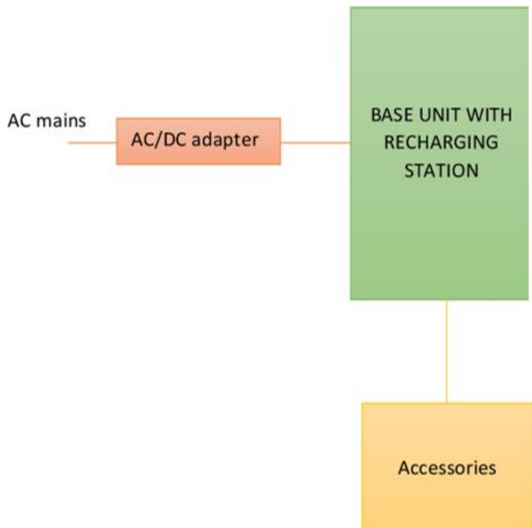


Figure 3.6-1: *Setup diagram*

3.7 EUT sub assemblies

Table 3.7-1: *EUT sub assemblies*

Description	Brand name	Model/Part number	Serial number
Main unit	Inventis srl	TRUMPET REM & AUD Wireless REF 11725	RE1RA20100004
AC/DC adapter	Sinpro	MPU31-106	--
Supra-aural headphones transducers	RadioEar	DD45	--
Supra-aural headphones transducers	RadioEar	TDH39	--
Insert earphones transducer	RadioEar	ER-3C	--
Bone vibrator transducer	RadioEar	B71	--
Monitor headset with boom microphone	Sennheiser	PC3	--
Talk back microphone	--	--	--
Patient response switch	Inventis srl	--	--
RECD loudspeaker	--	--	--

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

Co-location of the two uncorrelated Bluetooth transmitters of the Trumpet main unit (EUT) has been evaluated (see Spurious emissions test results). The higher value measured was 58.18 dBµV/m (peak) @ 17.841500 GHz (peak limit is 74 dBuV/m).

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

In the laboratory, the following ambient conditions are respected for each test reported below:

Temperature	18 – 33 °C
Relative humidity	25 – 70 %
Air pressure	860 – 1060 mbar

The following instruments are used to monitor the environmental conditions:

Equipment	Manufacturer	Model no.	Asset no.	Cal date	Next cal.
Thermo-hygrometer data loggers	Testo	175-H2	20012380/305	2019-01	2021-01
Thermo-hygrometer data loggers	Testo	175-H2	38203337/703	2019-01	2021-01
Barometer	Castle	GPB 3300	072015	2019-12	2020-12

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

The measurement uncertainty was calculated for each test and quantity listed in this test report, according to CISPR 16-4-2 and other specific test standard and is documented in Nemko Spa working manual WML1002.

The assessment of conformity for each test performed on the equipment is performed not taking into account the measurement uncertainty. The two following possible verdicts are stated in the report:

P (Pass) - The measured values of the equipment respect the specification limit at the points tested. The specific risk of false accept is up to 50% when the measured result is close to the limit.

F (Fail) - One or more measured values of the equipment do not respect the specification limit at the points tested. The specific risk of false reject is up to 50% when the measured result is close to the limit.

Hereafter Nemko's measurement uncertainties are reported:

EUT	Type	Test	Range	Measurement Uncertainty	Notes
Transmitter	Conducted	Frequency error	0.001 MHz ÷ 40 GHz	0.08 ppm	(1)
		Carrier power RF Output Power	0.009 MHz ÷ 30 MHz	1.1 dB	(1)
			30 MHz ÷ 18 GHz	1.5 dB	(1)
			18 MHz ÷ 40 GHz	3.0 dB	(1)
			40 MHz ÷ 140 GHz	5.0 dB	(1)
		Adjacent channel power	1 MHz ÷ 18 GHz	1.4 dB	(1)
		Conducted spurious emissions	0.009 MHz ÷ 18 GHz	3.0 dB	(1)
			18 GHz ÷ 40 GHz	4.2 dB	(1)
			40 GHz ÷ 220 GHz	6.0 dB	(1)
		Intermodulation attenuation	1 MHz ÷ 18 GHz	2.2 dB	(1)
		Attack time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Attack time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Release time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Release time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Transient behaviour of the transmitter– Transient frequency behaviour	1 MHz ÷ 18 GHz	0.2 kHz	(1)
		Transient behaviour of the transmitter – Power level slope	1 MHz ÷ 18 GHz	9%	(1)
		Frequency deviation - Maximum permissible frequency deviation	0.001 MHz ÷ 18 GHz	1.3%	(1)
		Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz	0.001 MHz ÷ 18 GHz	0.5 dB	(1)
		Dwell time	-	3%	(1)
		Hopping Frequency Separation	0.01 MHz ÷ 18 GHz	1%	(1)
		Occupied Channel Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
		Modulation Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
	Radiated	Radiated spurious emissions	0.009 MHz ÷ 26.5 GHz	6.0 dB	(1)
			26.5 GHz ÷ 66 GHz	8.0 dB	(1)
			66 GHz ÷ 220 GHz	10 dB	(1)
		Effective radiated power transmitter	10 kHz ÷ 26.5 GHz	6.0 dB	(1)
			26.5 GHz ÷ 66 GHz	8.0 dB	(1)
			66 GHz ÷ 220 GHz	10 dB	(1)

EUT	Type	Test	Range	Measurement Uncertainty	Notes
Receiver	Radiated	Radiated spurious emissions	0.009 MHz ÷ 26.5 GHz	6.0 dB	(1)
			26.5 GHz ÷ 66 GHz	8.0 dB	(1)
			66 GHz ÷ 220 GHz	10 dB	(1)
		Sensitivity measurement	1 MHz ÷ 18 GHz	6.0 dB	(1)
	Conducted	Conducted spurious emissions	0.009 MHz ÷ 18 GHz	3.0 dB	(1)
			18 GHz ÷ 40 GHz	4.2 dB	(1)
			40 GHz ÷ 220 GHz	6.0 dB	(1)

NOTES:
(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 %

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI receiver (20 Hz ÷ 8 GHz)	Rohde & Schwarz	ESU8	100202	2020-01	2021-01
EMI receiver (20 Hz ÷ 8 GHz)	Rohde & Schwarz	ESW44	101620	2019-08	2020-08
Trilog Antenna (30 MHz ÷ 7 GHz)	Schwarzbeck	VULB 9162	9162-025	2018-07	2021-07
Bilog antenna (1 ÷ 18 GHz)	Schwarzbeck	STLP 9148	9148-123	2018-07	2021-07
Preamplifier (1 ÷ 18 GHz)	Schwarzbeck	BBV 9718	9718-137	2019-09	2020-09
Horn antenna (4 ÷ 40 GHz)	RFSpin	DRH40	061106A40	2017-02	2020-03
Preamplifier (18 ÷ 40 GHz)	Miteq	JS44-18004000-35-8P-R	1.627	2019-09	2020-09
Controller	Maturo	FCU3.0	10041	NCR	NCR
Tilt antenna mast	Maturo	TAM4.0-E	10042	NCR	NCR
Turntable	Maturo	TT4.0-5T	2.527	NCR	NCR
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	2019-09	2021-09
Shielded room	Siemens	10m control room	1947	NCR	NCR
LISN three phase (9 kHz ÷30 MHz)	Rohde & Schwarz	ESH2-Z5	872 460/041	2019-09	2020-09
Shielded room	Siemens	Conducted emission test room	1862	NCR	NCR

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

Section 8. Testing data

8.1 FCC 15.31(m) and RSS-Gen 6.9 Number of frequencies

8.1.1 Definitions and limits

Measurements on intentional radiators or receivers shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table.

Table 8.1-1: *Frequency Range of Operation*

Frequency range over which the device operates (in each band)	Number of test frequencies required	Location of measurement frequency inside the operating frequency range
1 MHz or less	1	Center (middle of the band)
1–10 MHz	2	1 near high end, 1 near low end
Greater than 10 MHz	3	1 near high end, 1 near center and 1 near low end

Note: "near" means as close as possible to or at the centre / low end / high end of the frequency range over which the device operates.

8.1.2 Test summary

Test date	2020-01-30
Test engineer	P. Barbieri
Verdict	Pass

8.1.3 Observations, settings and special notes

None

8.1.4 Test data

Table 8.1-2: *Test channels selection*

Start of Frequency range, MHz	End of Frequency range, MHz	Frequency range bandwidth, MHz	Low channel, MHz	Mid channel, MHz	High channel, MHz
2402	2480	78	2402	2440	2480

8.2 FCC 15.207(a) and RSS-Gen 8.8 AC power line conducted emissions limits

8.2.1 Definitions and limits

FCC:
Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

IC:
A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz, shall not exceed the limits in table below.

Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in table below. The more stringent limit applies at the frequency range boundaries.

Table 8.2-1: *Conducted emissions limit*

Frequency of emission, MHz	Conducted limit, dBµV	
	Quasi-peak	Average**
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

Note: * - The level decreases linearly with the logarithm of the frequency.
** - A linear average detector is required.

8.2.2 Test summary

Test date	2020-02-06
Test engineer	P. Barbieri
Verdict	Pass

8.2.3 Observations, settings and special notes

The EUT was set up as tabletop configuration.

The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

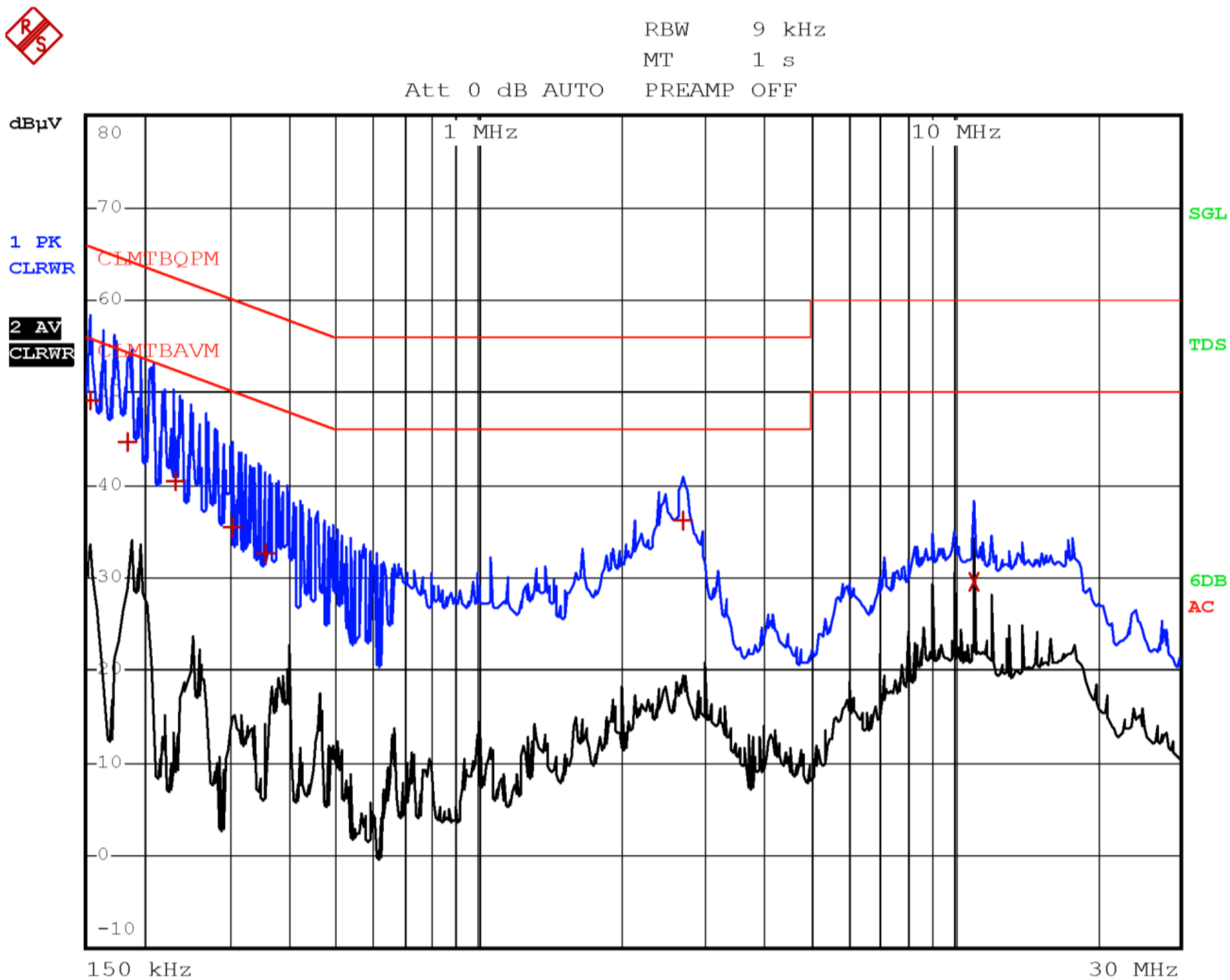
Receiver settings for preview measurements:

Resolution bandwidth:	9 kHz
Detector mode:	Peak and Average
Trace mode:	Max Hold
Measurement time:	10 ms

Receiver settings for final measurements:

Resolution bandwidth:	9 kHz
Detector mode:	Quasi-Peak and Average
Trace mode:	Max Hold
Measurement time:	1000 ms

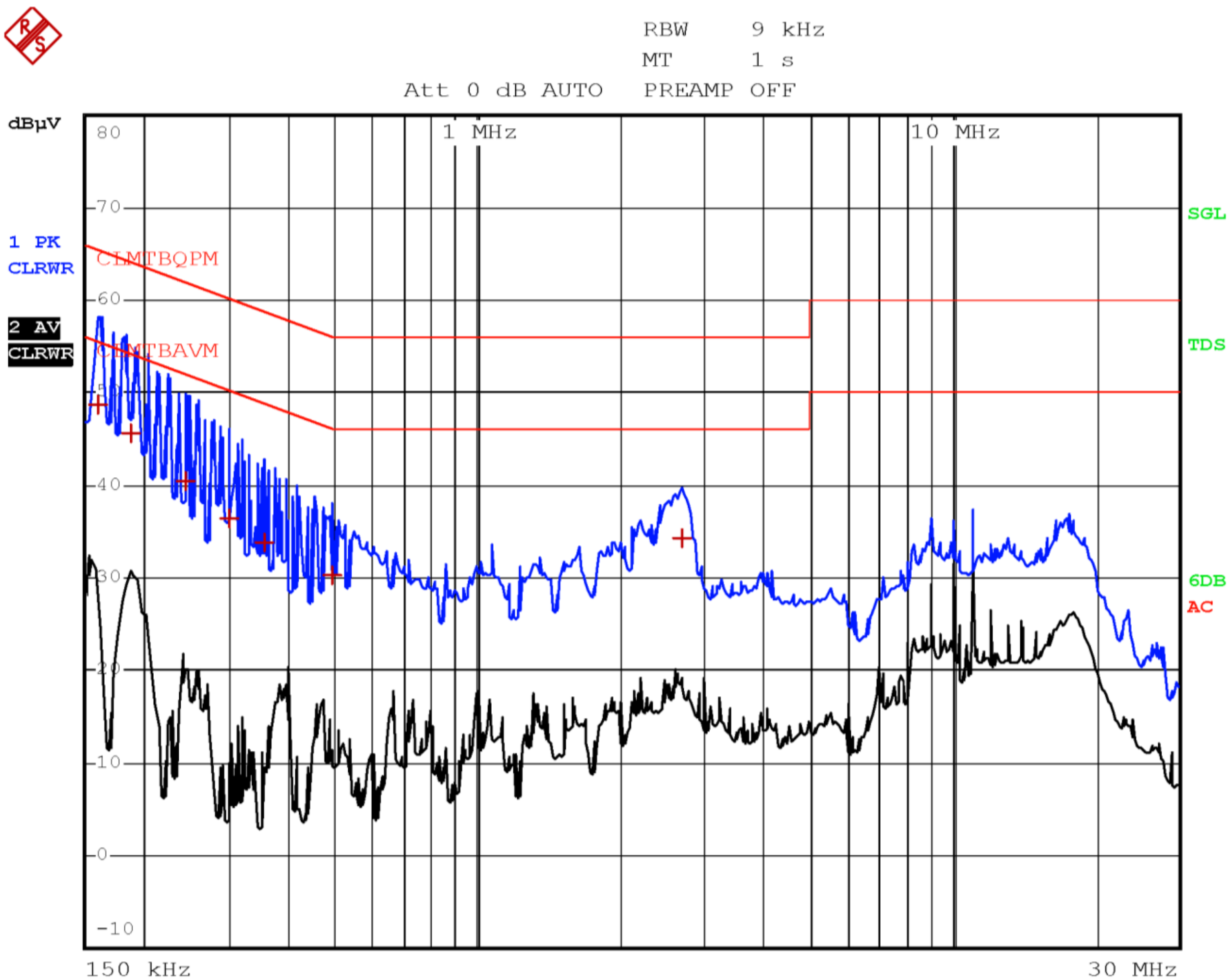
8.2.4 Test data



Plot 8.2-1: *Conducted emissions on phase line*

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.1540	49.1	65.8	-16.6	QP
0.1860	44.7	64.2	-19.5	QP
0.2340	40.5	62.3	-21.8	QP
0.3020	35.5	60.2	-24.7	QP
0.3540	32.7	58.9	-26.2	QP
2.7140	36.2	56.0	-19.8	QP
11.0420	29.7	50.0	-20.3	Av

8.2.4 Test data, continued



Plot 8.2-2: *Conducted emissions on neutral line*

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.1620	48.7	65.4	-16.6	QP
0.1900	45.7	64.0	-18.3	QP
0.2420	40.4	62.0	-21.6	QP
0.2980	36.5	60.3	-23.8	QP
0.3540	33.9	58.9	-25.0	QP
0.4940	30.4	56.1	-25.7	QP
2.7020	34.2	56.0	-21.8	QP

8.3 FCC 15.247(a)(1) and RSS-247 5.1 Frequency Hopping Systems requirements

8.3.1 Definitions and limits

FCC:

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(iii) Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

ISED:

a) The bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The system's radio frequency (RF) bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

b) FHSs shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400–2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided that the systems operate with an output power no greater than 0.125 W.

d) FHSs operating in the band 2400–2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

8.3.2 Test summary

Test date	2020-02-14
Test engineer	P. Barbieri
Verdict	Pass

8.3.3 Observations, settings and special notes

Spectrum analyser settings for carrier frequency separation:

Resolution bandwidth	≥ 1 % of the span
Video bandwidth	≥ RBW
Frequency span	wide enough to capture the peaks of two adjacent channels
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for number of hopping frequencies:

Resolution bandwidth	≥ 1 % of the span
Video bandwidth	≥ RBW
Frequency span	the frequency band of operation
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for time of occupancy (dwell time):

Resolution bandwidth	1 MHz
Video bandwidth	≥ RBW
Frequency span	Zero span
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for 20 dB bandwidth:

Resolution bandwidth	≥ 1% of the 20 dB bandwidth
Video bandwidth	≥ RBW
Frequency span	approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
Detector mode	Peak
Trace mode	Max Hold

8.3.4 Test data

Table 8.3-1: *20 dB bandwidth and 99% bandwidth results*

EUT	Frequency, MHz	20 dB bandwidth, kHz	99% bandwidth, kHz (1)
BASE UNIT - LEFT	2402	806.2	885.1
BASE UNIT – LEFT	2440	764.2	864.9
BASE UNIT - LEFT	2480	764.2	870.2
BASE UNIT - RIGHT	2402	761.2	861.7
BASE UNIT – RIGHT	2440	764.2	862.4
BASE UNIT - RIGHT	2480	764.2	860.7

(1) RSS-247 § 6.7 Occupied bandwidth

Table 8.3-2: *Carrier frequency separation results*

Carrier frequency separation, kHz	Minimum limit, kHz	Margin, kHz
995	806.2	188.2

Table 8.3-3: *Number of hopping frequencies results*

Number of hopping frequencies	Minimum limit	Margin
74	15	59

Table 8.3-4: *Average time of occupancy results*

Dwell time of each pulse, ms	Number of pulses within period	Total dwell time within period, ms	Limit, ms	Margin, ms
1.34	150	201	400	199

Measurement Period is 20 s

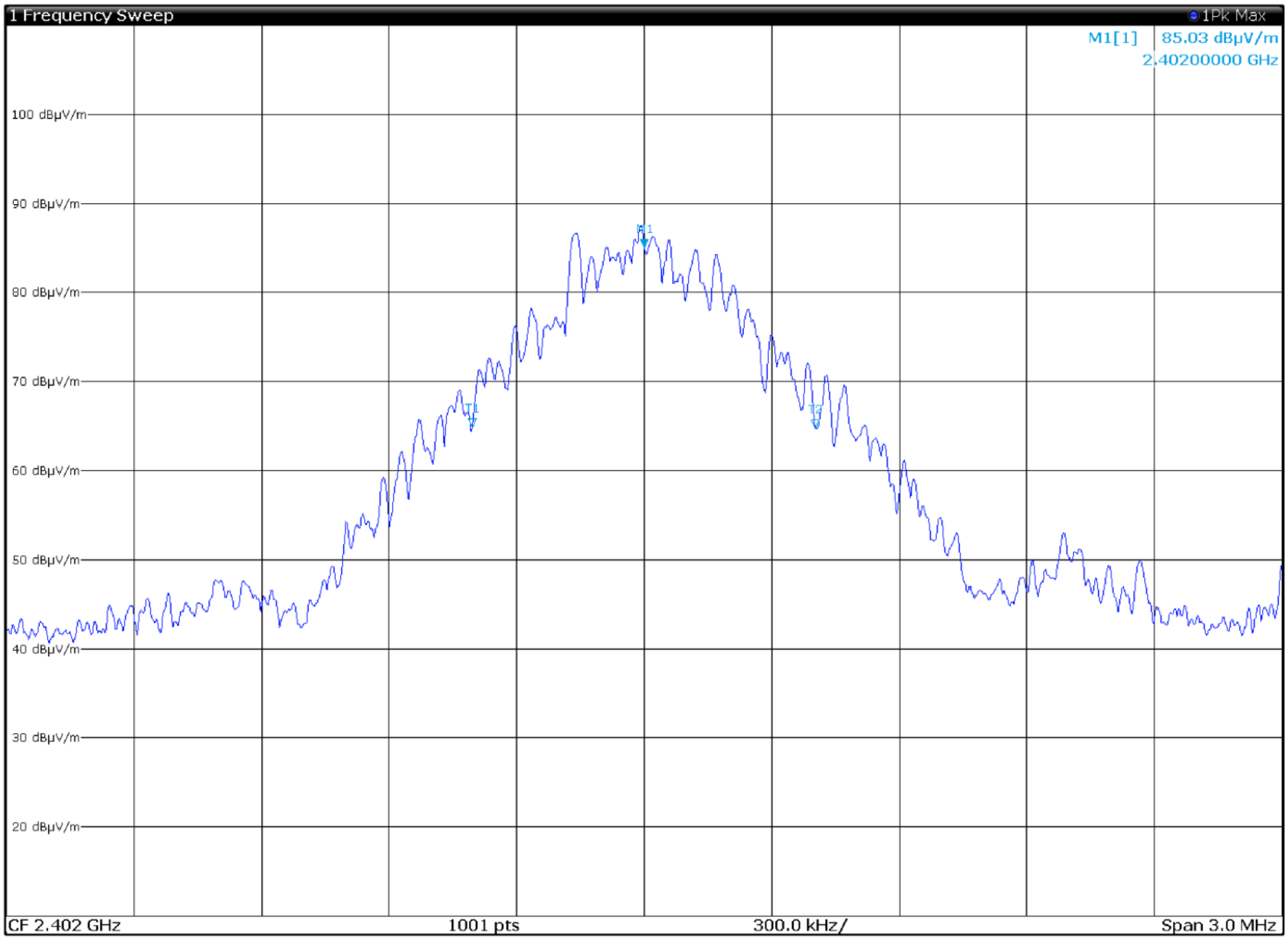


Figure 8.3-1: **20 dB bandwidth on low channel - BASE UNIT – LEFT**

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.402 GHz**	**85.03 dBµV/m**	ndB	20.0 dB
T1		1	2.4015954 GHz	64.88 dBµV/m	ndB down BW	**806.20 kHz**
T2		1	2.4024016 GHz	64.75 dBµV/m	Q Factor	2979.4

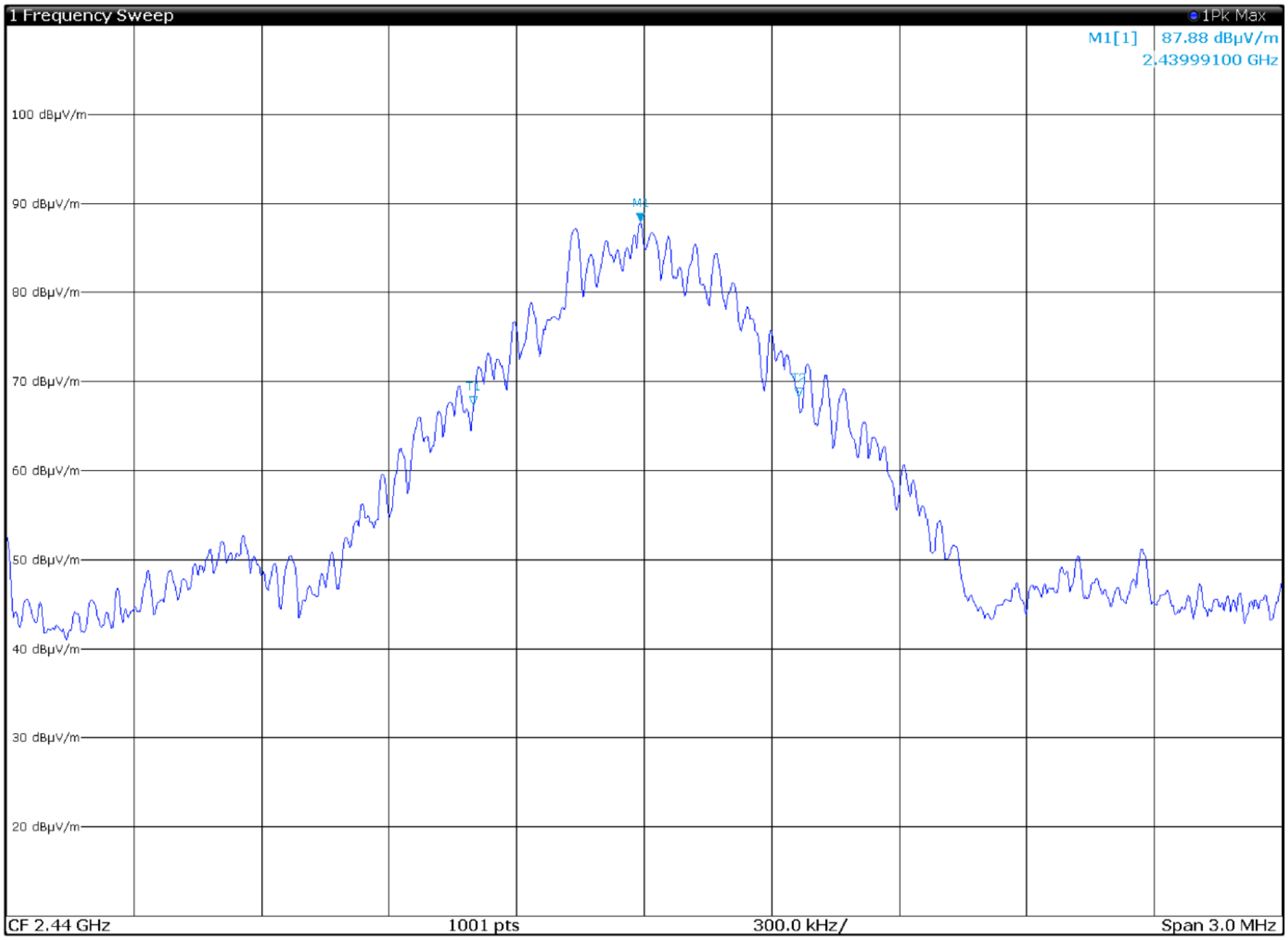


Figure 8.3-2: **20 dB bandwidth on mid channel- BASE UNIT - LEFT**

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.439991 GHz**	**87.88 dBµV/m**	ndB	20.0 dB
T1		1	2.4395984 GHz	67.35 dBµV/m	ndB down BW	**764.20 kHz**
T2		1	2.4403626 GHz	68.32 dBµV/m	Q Factor	3192.7

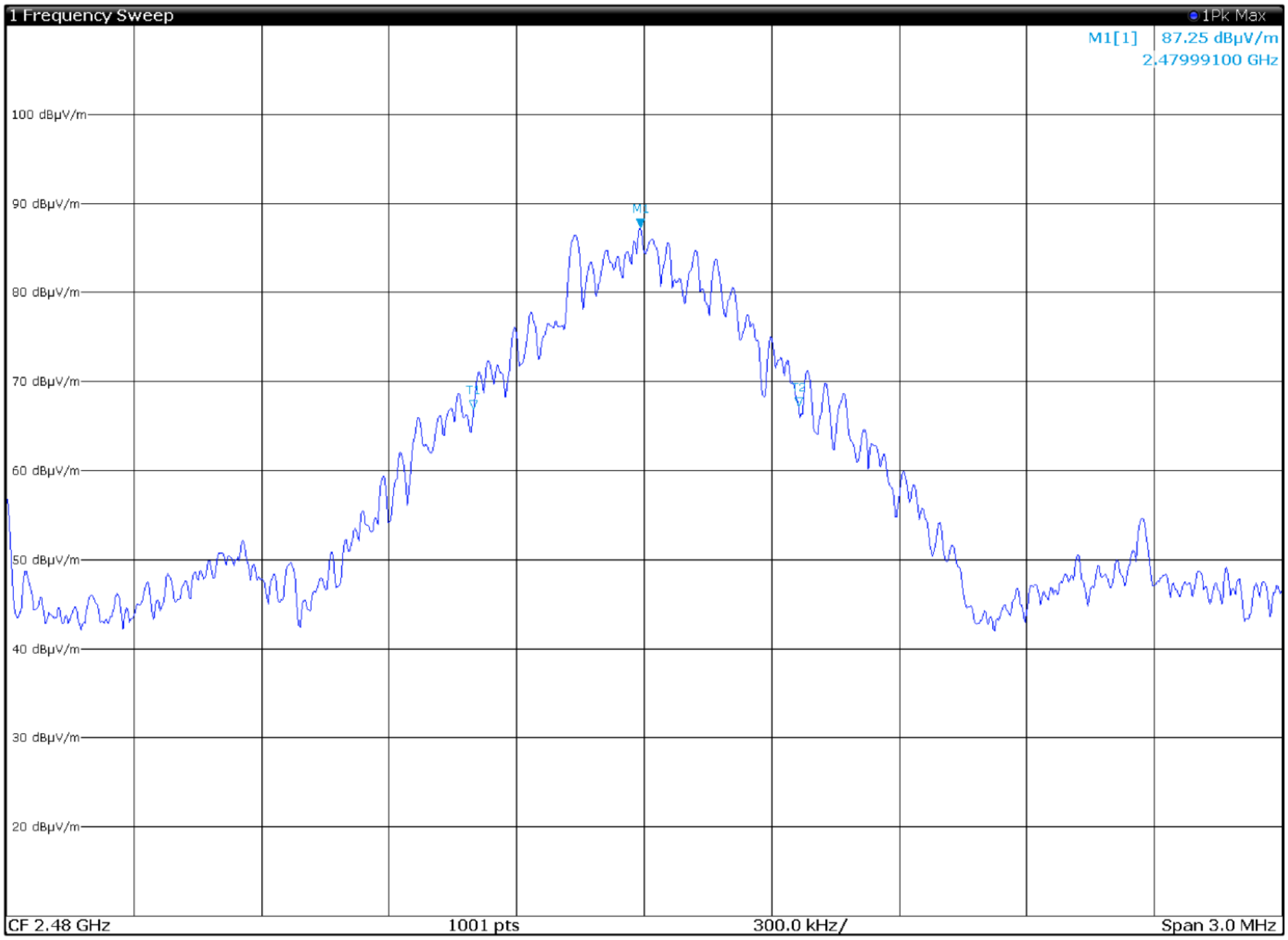


Figure 8.3-3: **20 dB bandwidth on high channel- BASE UNIT – LEFT**

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.479991 GHz**	**87.25 dBµV/m**	ndB	20.0 dB
T1		1	2.4795984 GHz	66.85 dBµV/m	ndB down BW	**764.20 kHz**
T2		1	2.4803626 GHz	67.26 dBµV/m	Q Factor	3245.1

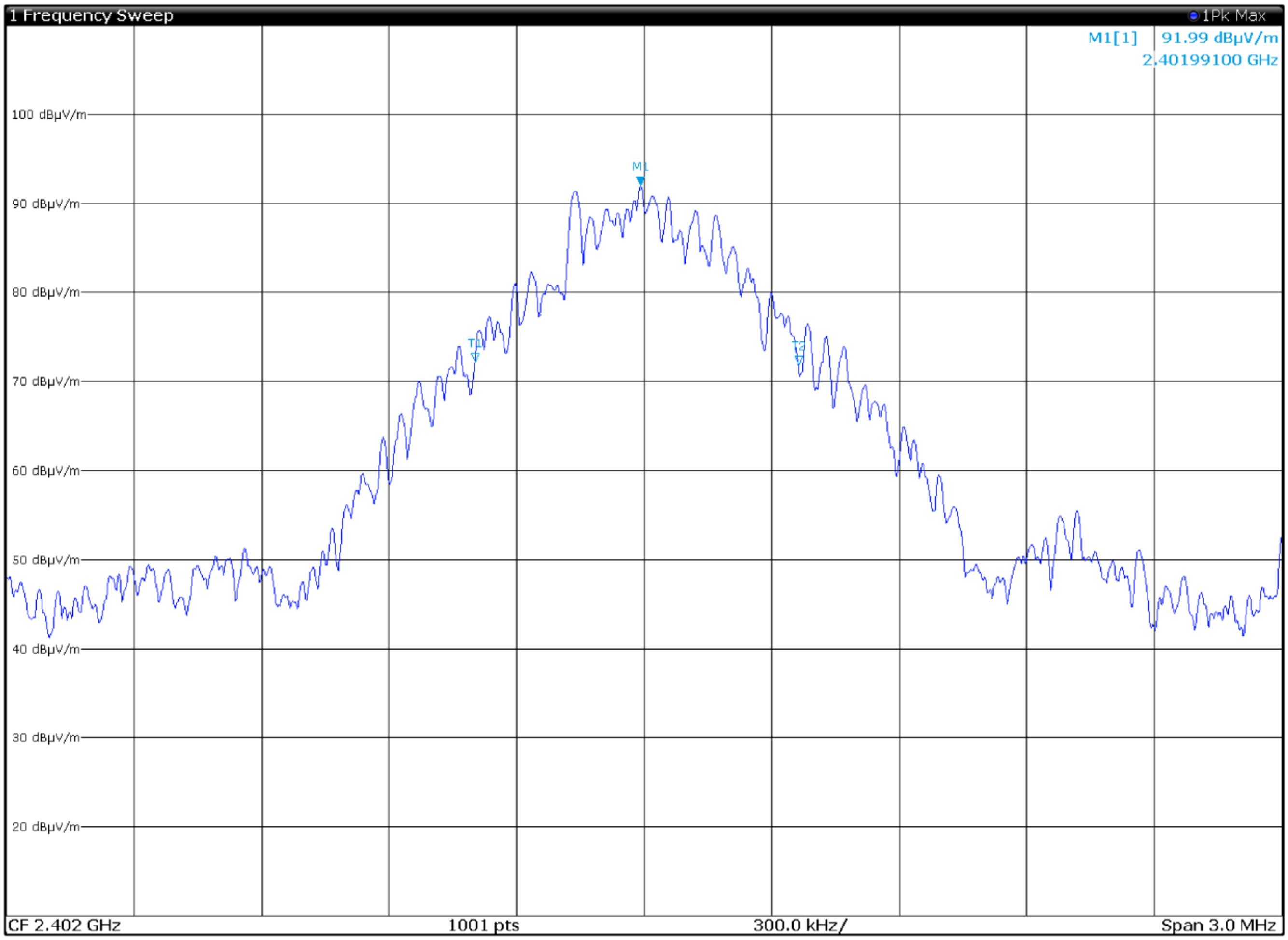


Figure 8.3-4: **20 dB bandwidth on low channel - BASE UNIT - RIGHT**

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.401991 GHz**	**91.99 dBµV/m**	ndB	20.0 dB
T1		1	2.4016014 GHz	72.20 dBµV/m	ndB down BW	**761.20 kHz**
T2		1	2.4023626 GHz	71.81 dBµV/m	Q Factor	3155.4

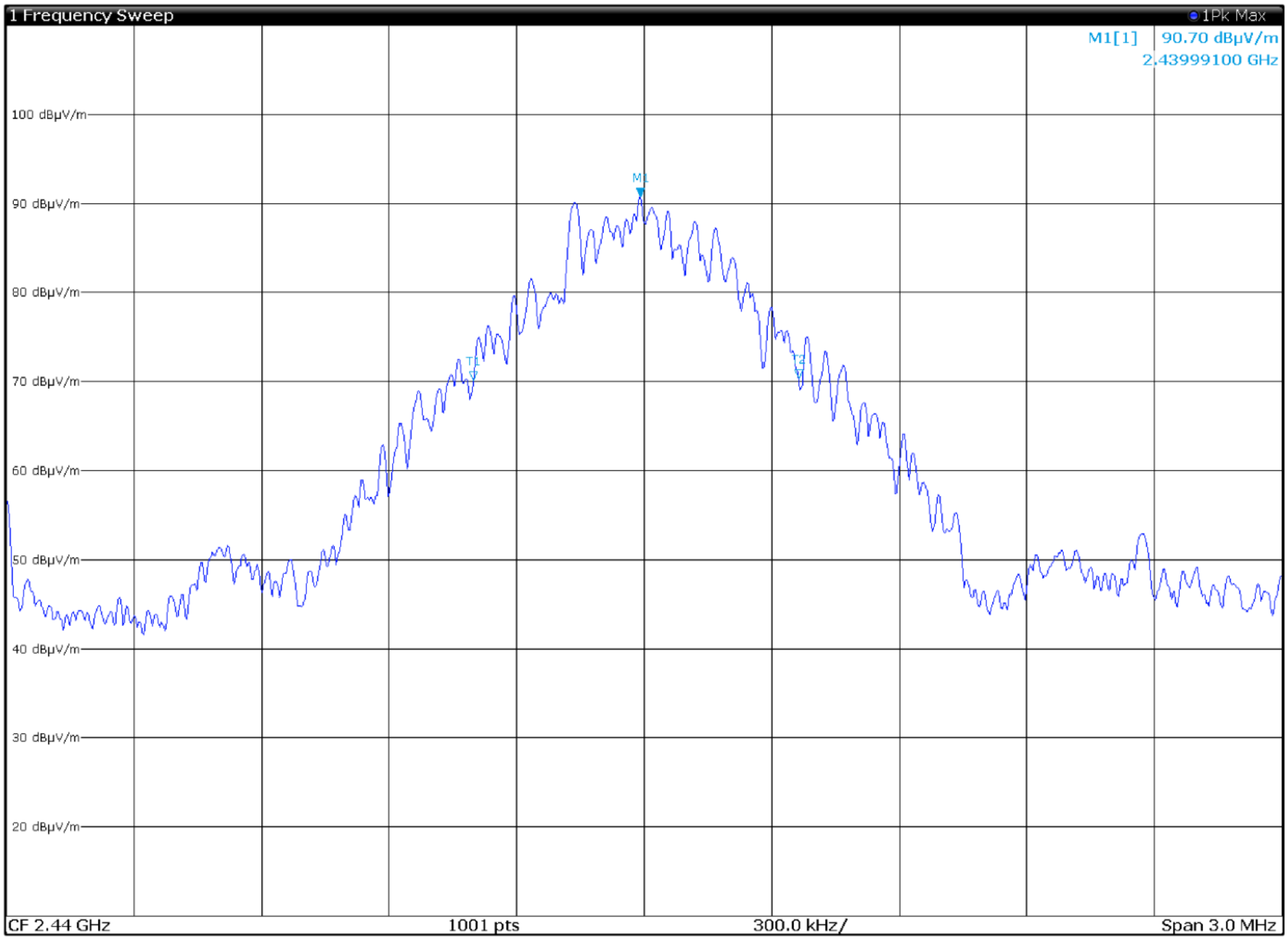


Figure 8.3-5: **20 dB bandwidth on mid channel- BASE UNIT - RIGHT**

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.439991 GHz**	**90.70 dBμV/m**	ndB	20.0 dB
T1		1	2.4395984 GHz	70.15 dBμV/m	ndB down BW	**764.20 kHz**
T2		1	2.4403626 GHz	70.37 dBμV/m	Q Factor	3192.7

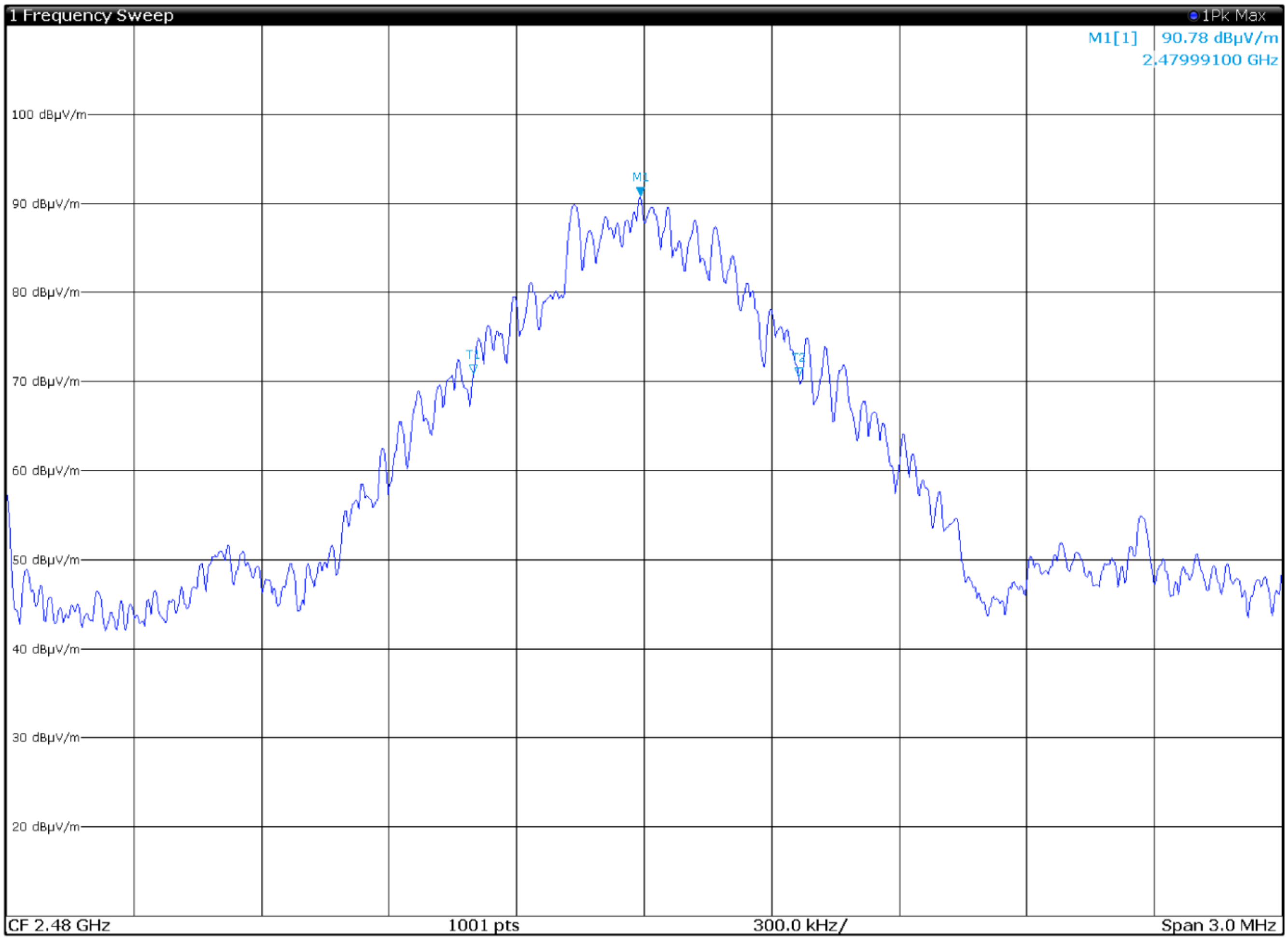


Figure 8.3-6: **20 dB bandwidth on high channel- BASE UNIT – RIGHT**

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.479991 GHz**	**90.78 dBµV/m**	ndB	20.0 dB
T1		1	2.4795984 GHz	70.93 dBµV/m	ndB down BW	**764.20 kHz**
T2		1	2.4803626 GHz	70.58 dBµV/m	Q Factor	3245.1

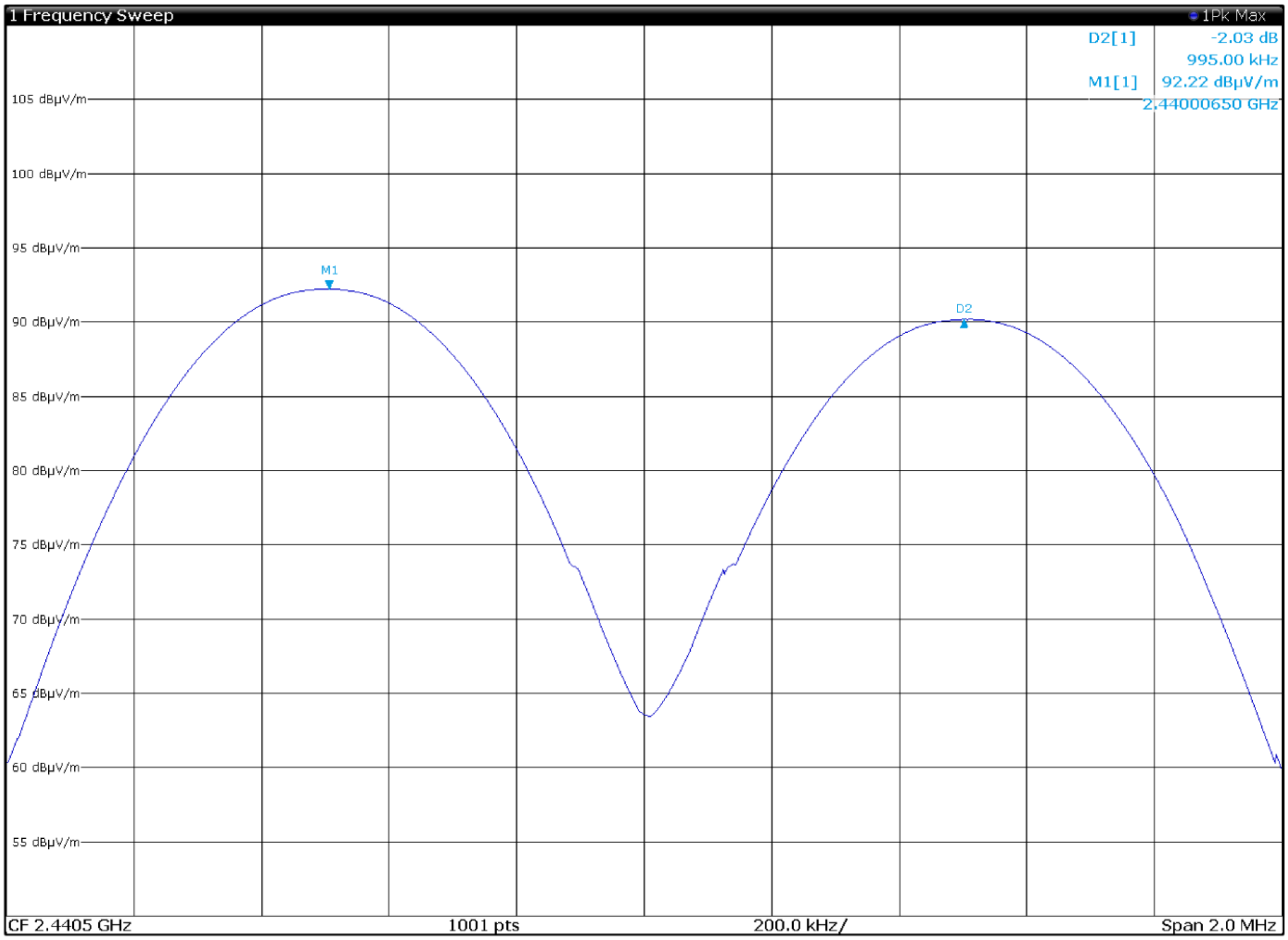


Figure 8.3-7: **Carrier frequency separation**

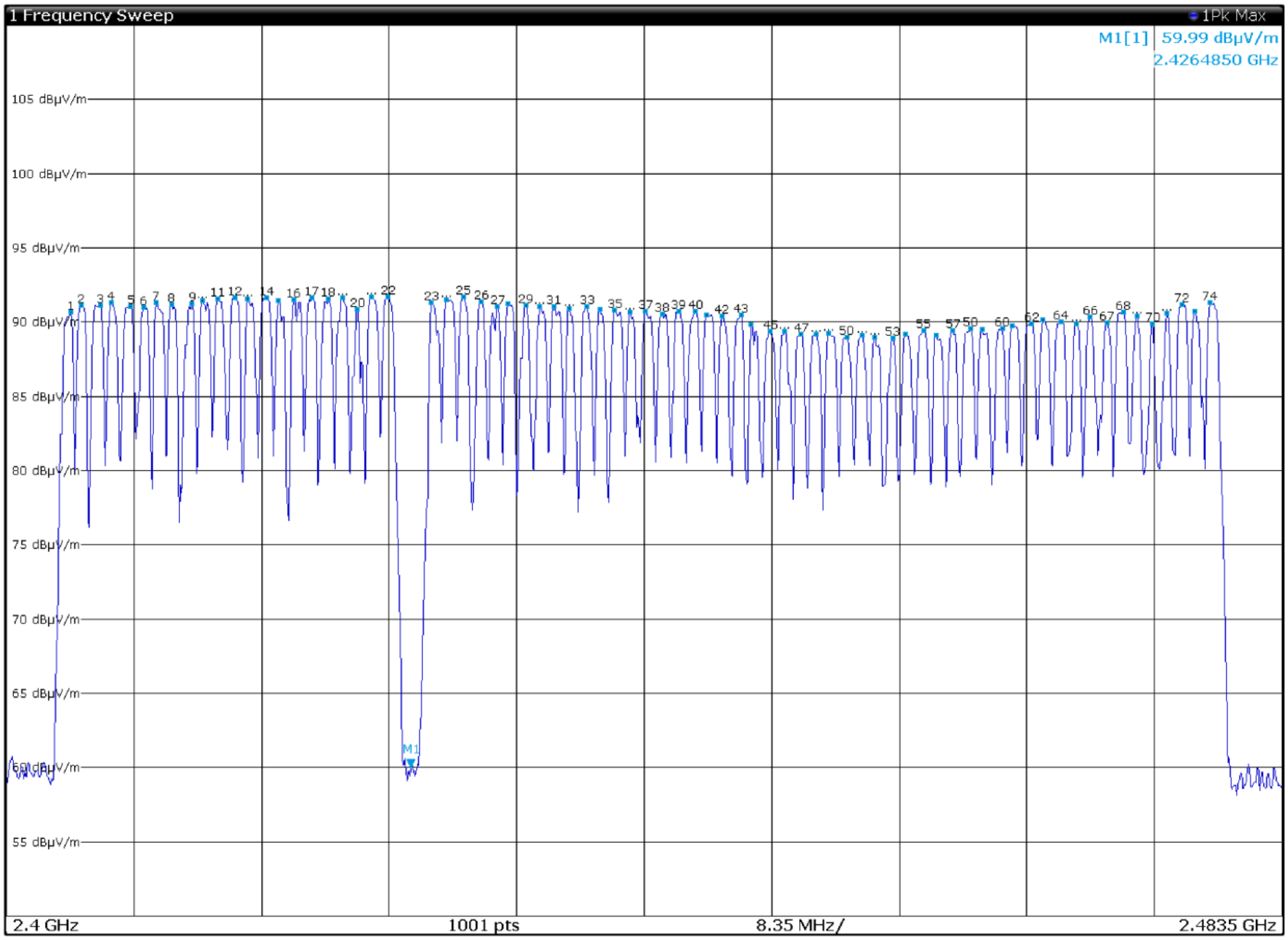


Figure 8.3-8: **Number of hopping channels**

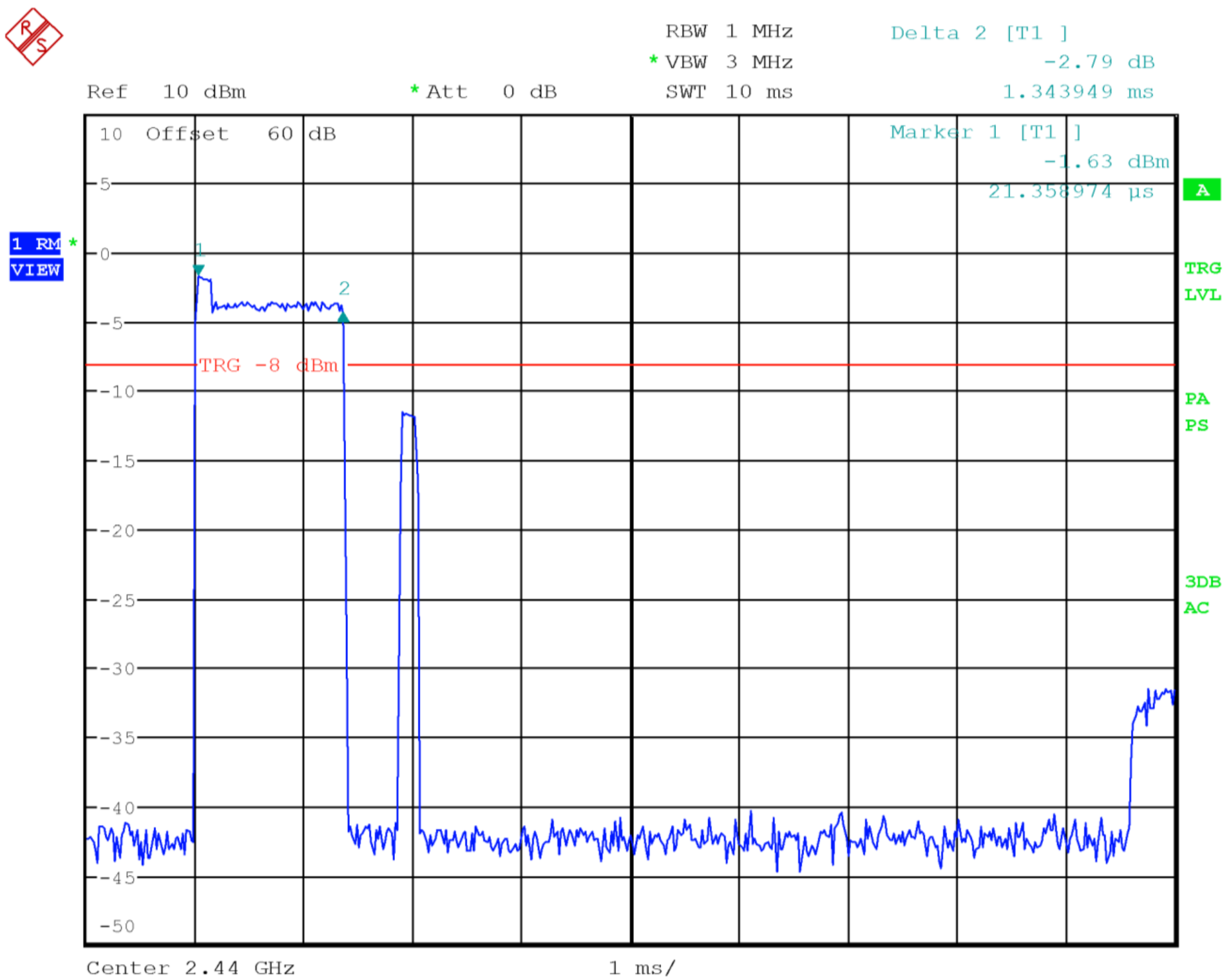


Figure 8.3-9: **Dwell time**

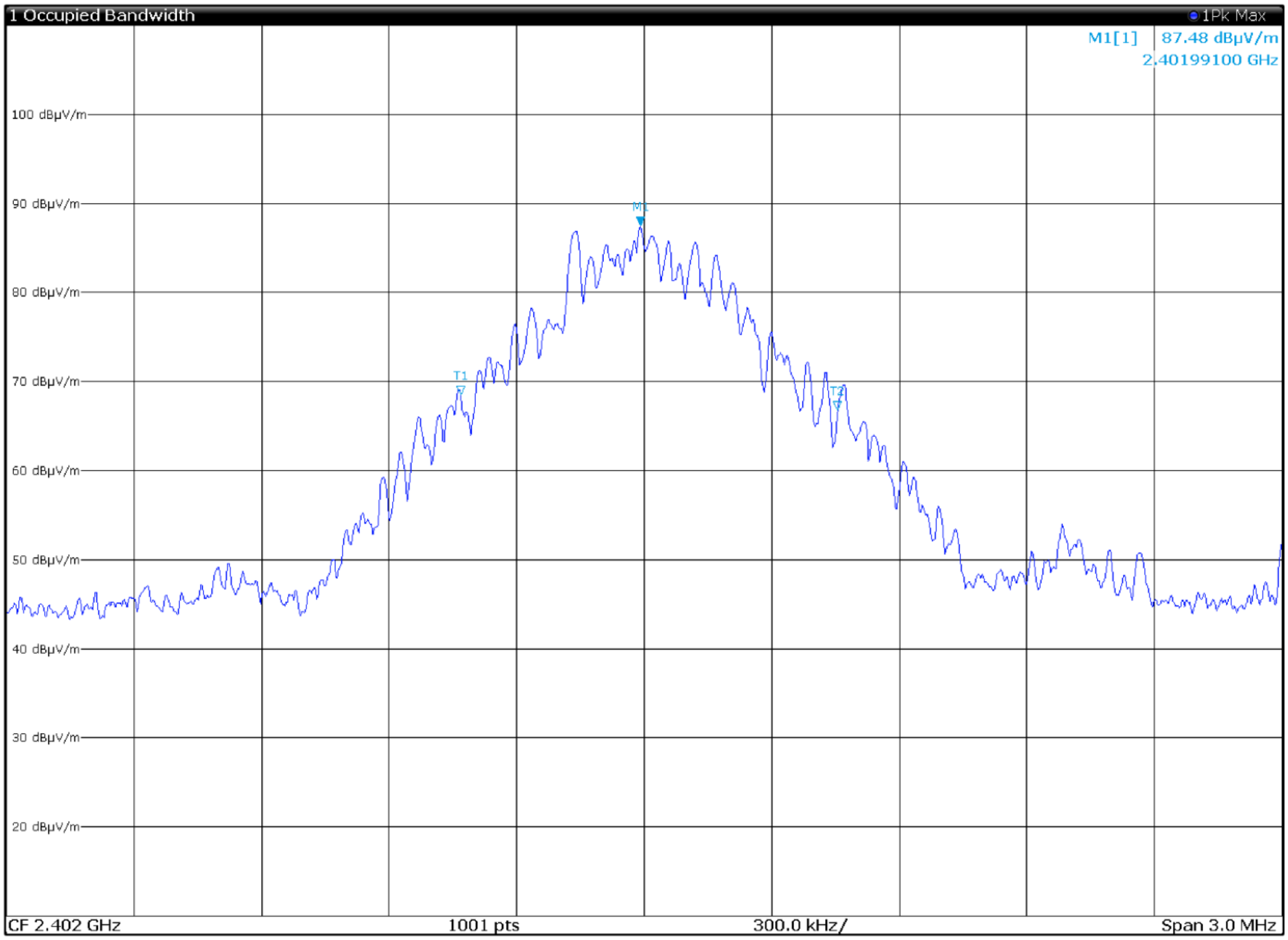


Figure 8.3-10: **99% bandwidth on low channel - BASE UNIT - LEFT**

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.401991 GHz**	**87.48 dBµV/m**	Occ Bw	**885.050988208 kHz**
T1		1	2.40156928 GHz	68.53 dBµV/m	Occ Bw Centroid	2.402011801 GHz
T2		1	2.40245433 GHz	66.77 dBµV/m	Occ Bw Freq Offset	11.800506315 kHz

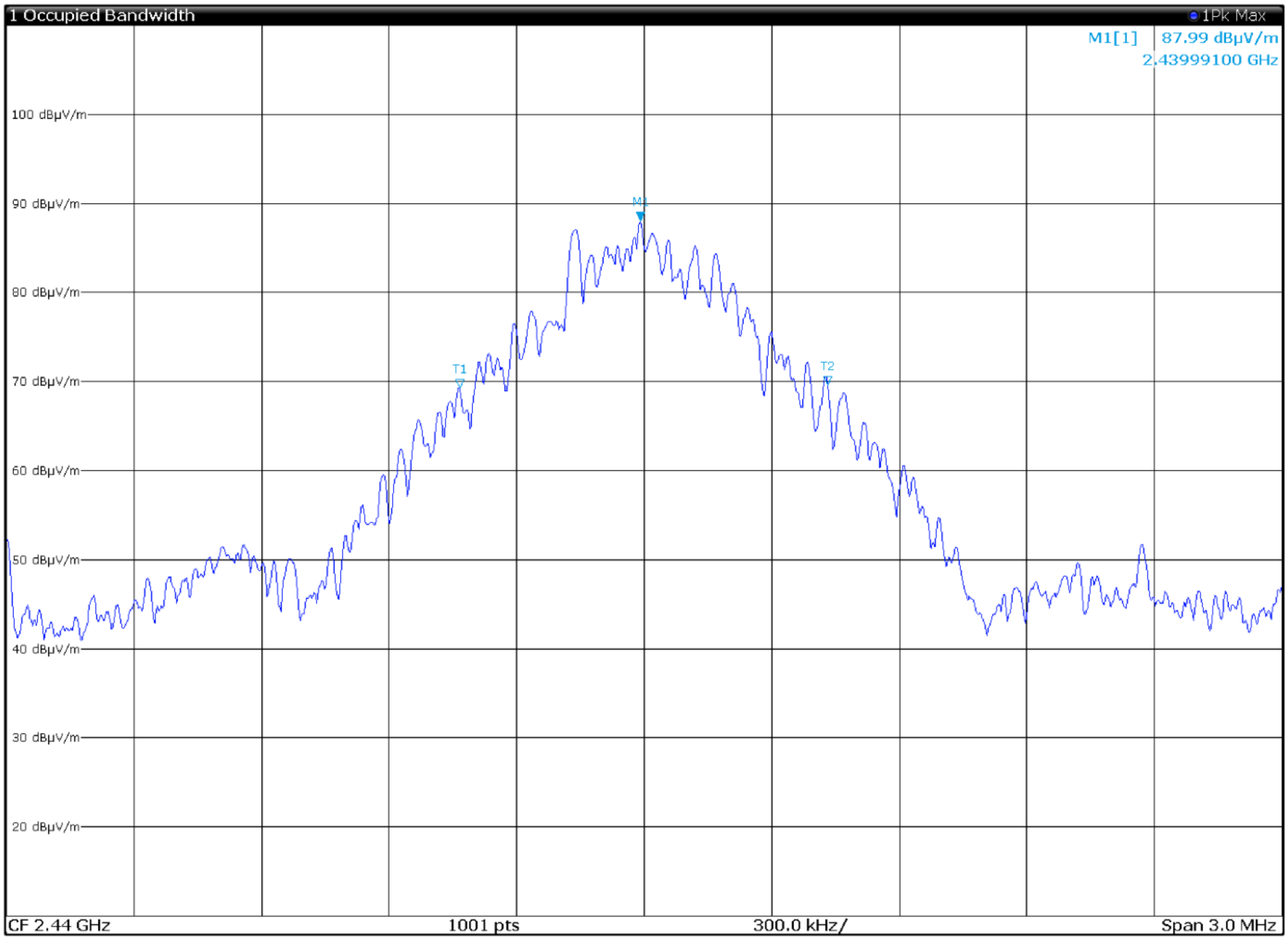


Figure 8.3-11: **99% bandwidth on mid channel- BASE UNIT - LEFT**

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.439991 GHz**	**87.99 dBµV/m**	Occ Bw	**864.949332293 kHz**
T1		1	2.43956572 GHz	69.22 dBµV/m	Occ Bw Centroid	2.439998197 GHz
T2		1	2.44043067 GHz	69.64 dBµV/m	Occ Bw Freq Offset	-1.802920721 kHz

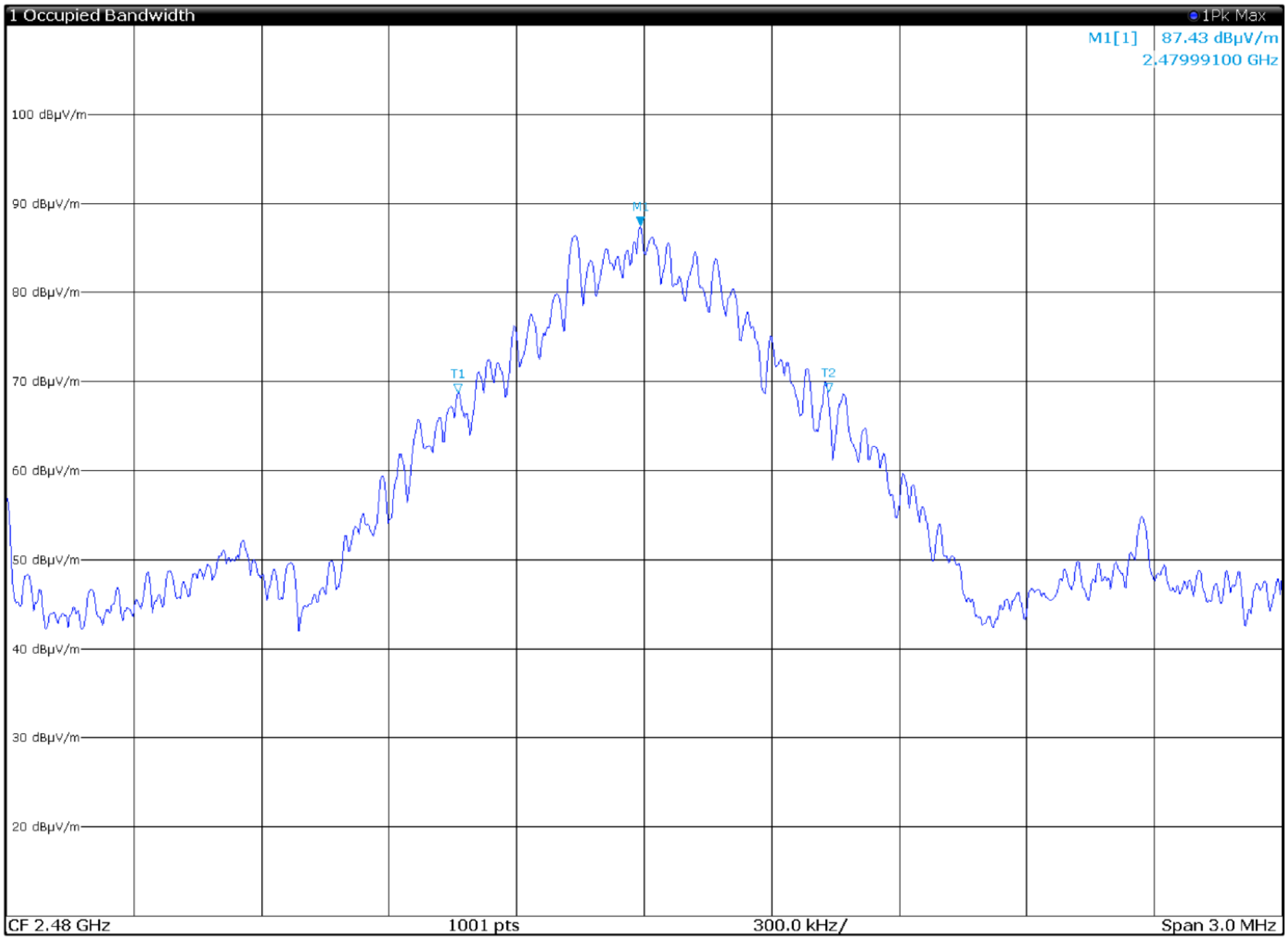


Figure 8.3-12: **99% bandwidth on high channel- BASE UNIT – LEFT**

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.479991 GHz**	**87.43 dBµV/m**	Occ Bw	**870.176279908 kHz**
T1		1	2.47956259 GHz	68.73 dBµV/m	Occ Bw Centroid	2.479997679 GHz
T2		1	2.48043277 GHz	68.79 dBµV/m	Occ Bw Freq Offset	-2.321384528 kHz

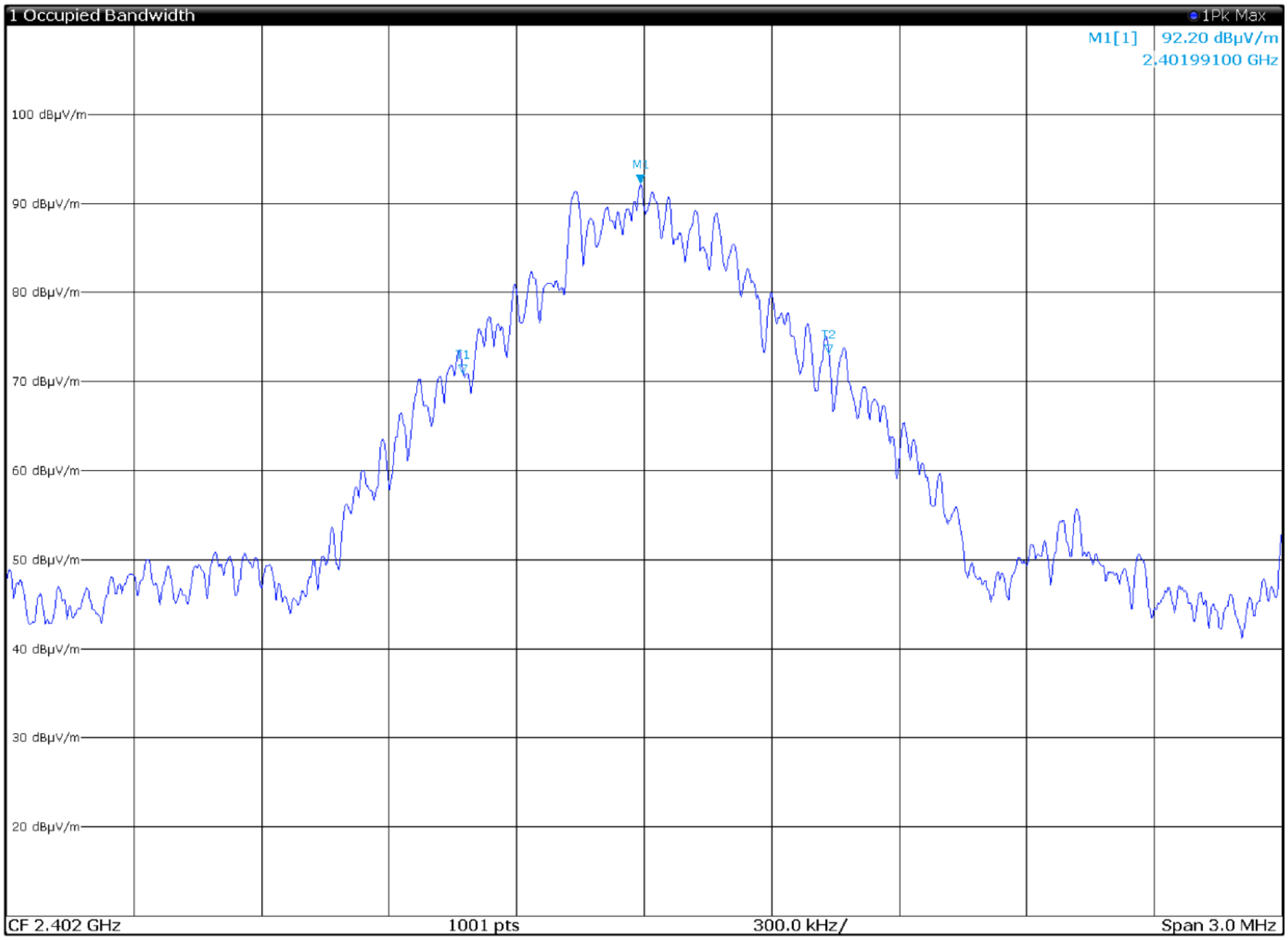


Figure 8.3-13: **99% bandwidth on low channel - BASE UNIT - RIGHT**

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.401991 GHz**	**92.20 dBµV/m**	Occ Bw	**861.69909178 kHz**
T1		1	2.40157302 GHz	70.85 dBµV/m	Occ Bw Centroid	2.402003872 GHz
T2		1	2.40243472 GHz	73.10 dBµV/m	Occ Bw Freq Offset	3.87183256 kHz

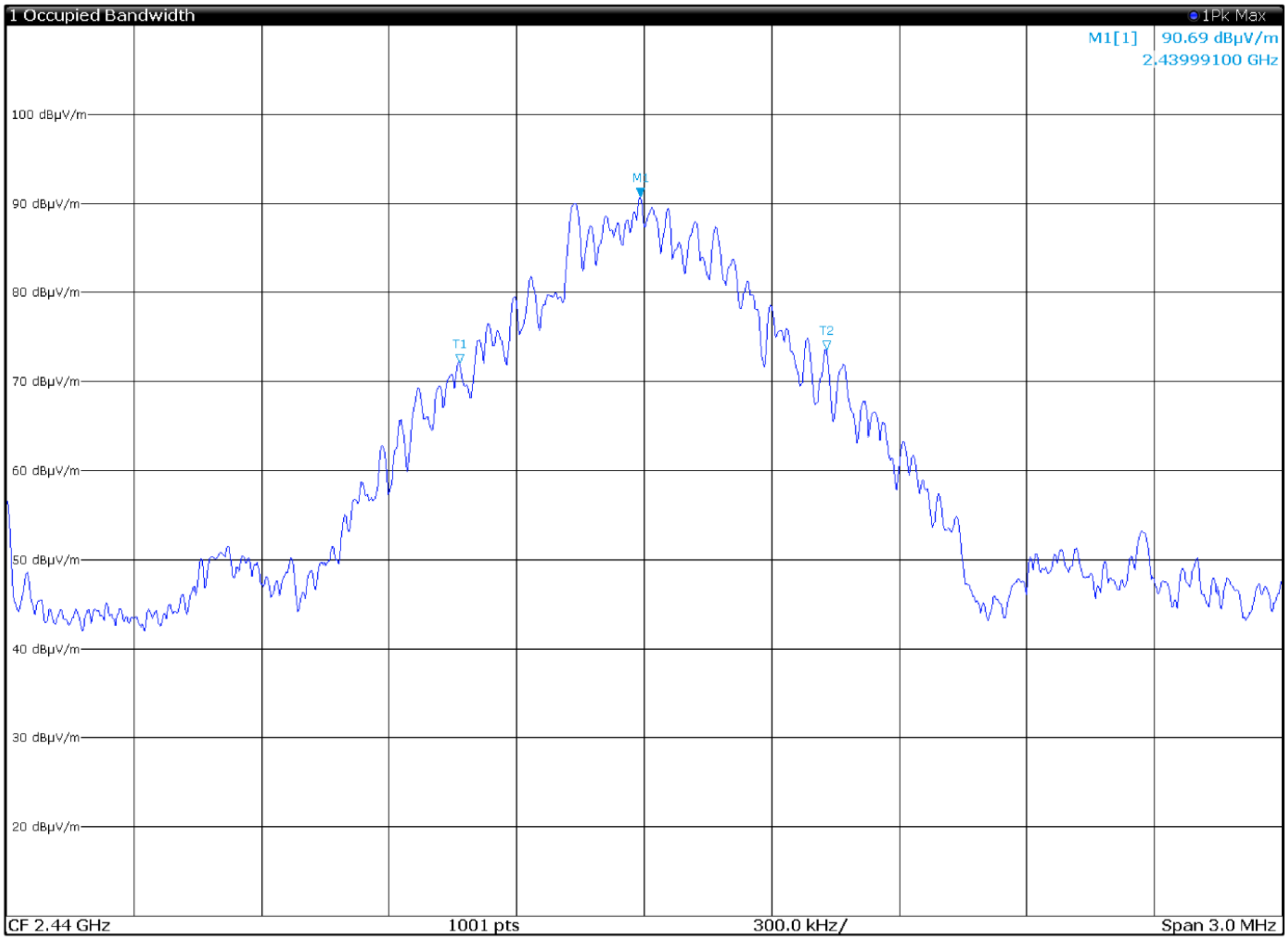


Figure 8.3-14: **99% bandwidth on mid channel- BASE UNIT - RIGHT**

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.439991 GHz**	**90.69 dBµV/m**	Occ Bw	**862.409007843 kHz**
T1		1	2.43956666 GHz	72.11 dBµV/m	Occ Bw Centroid	2.439997866 GHz
T2		1	2.44042907 GHz	73.55 dBµV/m	Occ Bw Freq Offset	-2.134077562 kHz

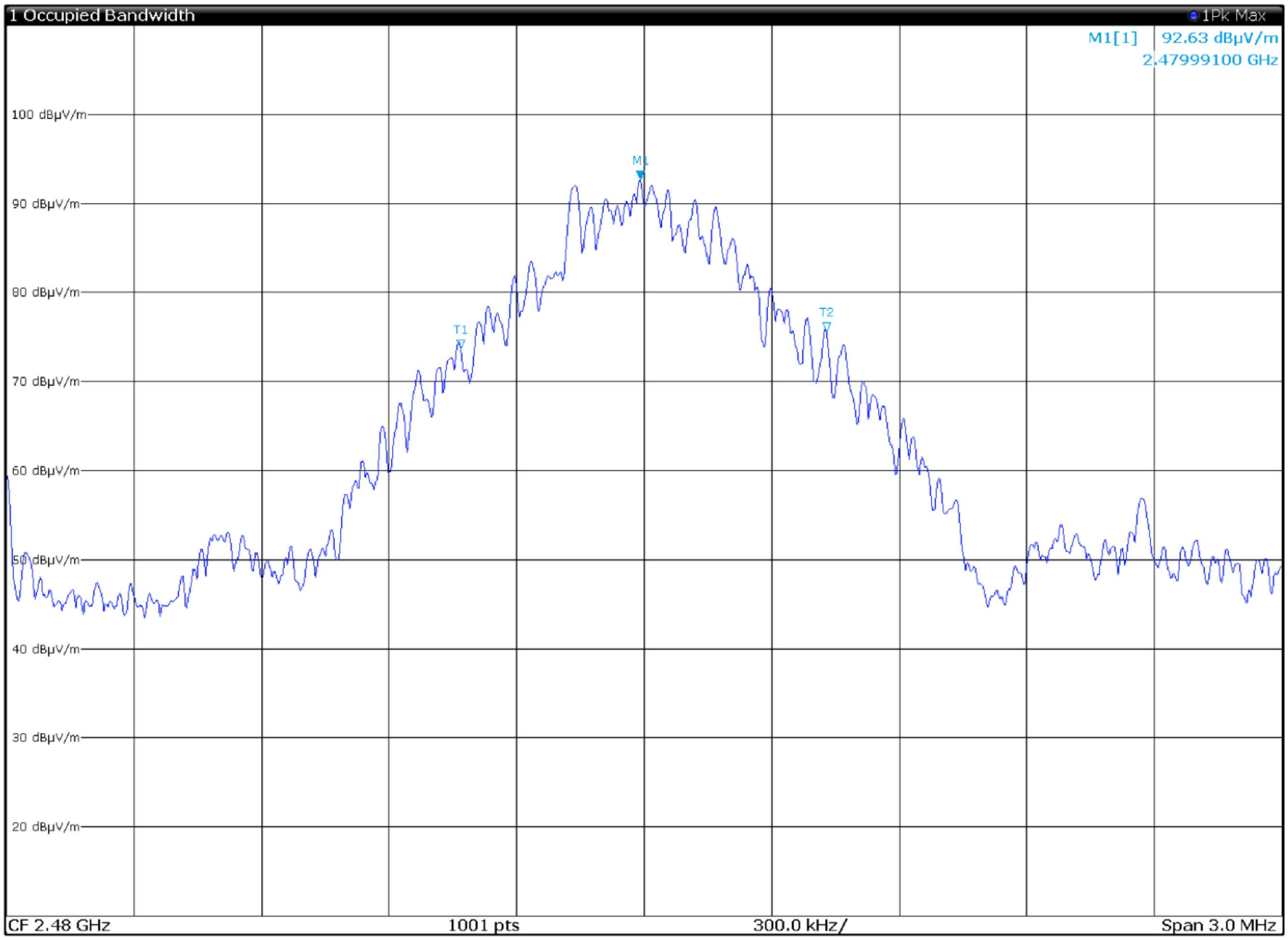


Figure 8.3-15: **99% bandwidth on high channel- BASE UNIT – RIGHT**

2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.479991 GHz**	**92.63 dBµV/m**	Occ Bw	**860.701626357 kHz**
T1		1	2.4795677 GHz	73.71 dBµV/m	Occ Bw Centroid	2.47999805 GHz
T2		1	2.4804284 GHz	75.63 dBµV/m	Occ Bw Freq Offset	-1.950279757 kHz

8.4 FCC 15.247(b) and RSS-247 5.4 (b) Transmitter output power and e.i.r.p. requirements

8.4.1 Definitions and limits

FCC:

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

(1) For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt (30 dBm). For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts (21 dBm).

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

ISED:

For FHSs operating in the band 2400–2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W (30 dBm) if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W (21 dBm) if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W (36 dBm), except as provided in section 5.4(e).

Section 5.4(e)

Fixed point-to-point systems in the bands 2400–2483.5 MHz and 5725–5850 MHz are permitted to have an e.i.r.p. higher than 4 W provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited from exceeding an e.i.r.p. of 4 W.

8.4.2 Test summary

Test date	2020-03-19
Test engineer	P. Barbieri
Verdict	Pass

8.4.3 Observations, settings and special notes

Spectrum analyser settings for output power:

Resolution bandwidth	> the 20 dB bandwidth of the emission being measured
Video bandwidth	≥ RBW
Frequency span	approximately 5 times the 20 dB bandwidth, centered on a hopping channel
Detector mode	Peak
Trace mode	Max Hold

8.4.4 Test data

Table 8.4-1: *Output power and EIRP results for BASE UNIT LEFT*

Frequency, MHz	Output power, dBm	Output power limit, dBm	Margin, dB	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
2402	-8.5	30.00	-38.5	0.5	-8.0	36.00	-44.0
2440	-8.0	30.00	-38.0	0.5	-7.5	36.00	-43.5
2480	-10.0	30.00	-40.0	0.5	-9.5	36.00	-45.5

Output power = EIRP - Antenna gain

The EIRP is calculated from the field strength measured at 3 m with the formula EIRP (dBm) = Field Strength (dBµV/m) – 95.23 dB

Table 8.4-2: *Output power and EIRP results for BASE UNIT RIGHT*

Frequency, MHz	Output power, dBm	Output power limit, dBm	Margin, dB	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
2402	-9.0	30.00	-39.0	0.5	-8.5	36.00	-44.5
2440	-8.9	30.00	-38.9	0.5	-8.4	36.00	-44.4
2480	-7.5	30.00	-37.5	0.5	-7.0	36.00	-43.0

Output power = EIRP - Antenna gain

The EIRP is calculated from the field strength measured at 3 m with the formula EIRP (dBm) = Field Strength (dBµV/m) – 95.23 dB

Table 8.4-3: *Combined Output power and combined EIRP results for simultaneous transmission of BASE UNIT LEFT and RIGHT*

BASE UNIT RIGHT / BASE UNIT LEFT, Frequency, MHz	Calculated Output power, dBm	Output power limit, dBm	Margin, dB	Antenna gain, dBi	Calculated EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
2402 / 2402	-5.7	30.00	-35.7	0.5	-5.2	36.00	-41.2
2402 / 2440	-5.5	30.00	-35.5	0.5	-5.0	36.00	-41.0
2402 / 2480	-6.5	30.00	-36.5	0.5	-6.0	36.00	-42.0
2440 / 2402	-5,7	30.00	-35.7	0.5	-5.2	36.00	-41.2
2440 / 2440	-5,4	30.00	-35.4	0.5	-4.9	36.00	-40.9
2440 / 2480	-6,4	30.00	-36.4	0.5	-5.9	36.00	-41.9
2480 / 2402	-5.0	30.00	-35.0	0.5	-4.5	36.00	-40.5
2480 / 2440	**-4.7**	30.00	-34.7	0.5	**-4.2**	36.00	-40.2
2480 /2480	-5.6	30.00	-35.6	0.5	-5.1	36.00	-41.1

Calculated Output power (dBm) = 10 ∗ LOG (Output power BASE UNIT LEFT (mW) + Output power BASE UNIT RIGHT (mW))

Example of calculation (@ 2440 MHz): 10^(-8.0/10) + 10^(-8.9/10) = 0.158 + 0.129 = 0.287 mW = -5.4 dBm

The EIRP is calculated in the same way of the Calculated Output power (sum of the EIRP converted in linear power unit)

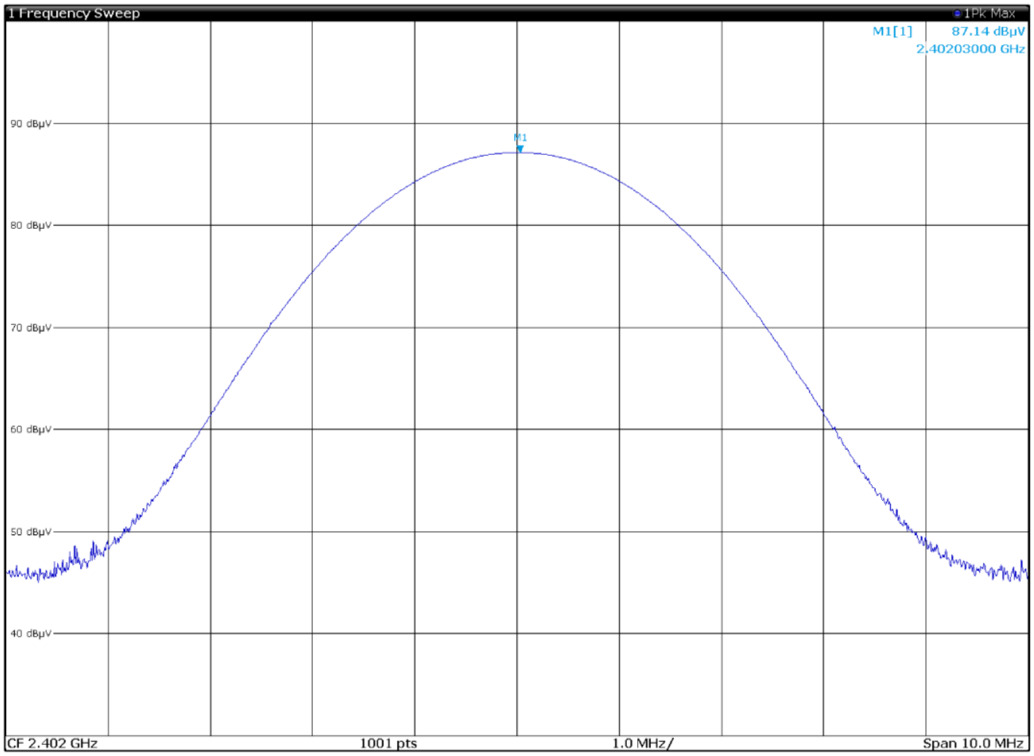


Figure 8.4-1: **Field strength measured at 3 m with antenna in horizontal polarization on low channel – BASE UNIT LEFT**

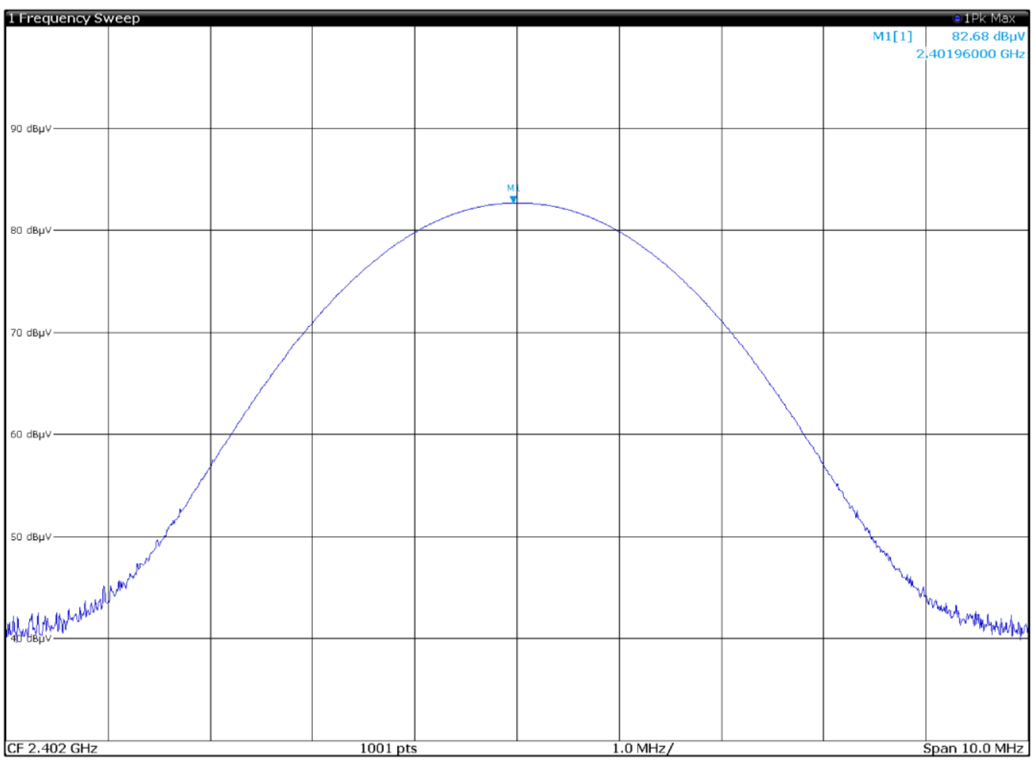


Figure 8.4-2: **Field strength measured at 3 m with antenna in vertical polarization on low channel – BASE UNIT LEFT**

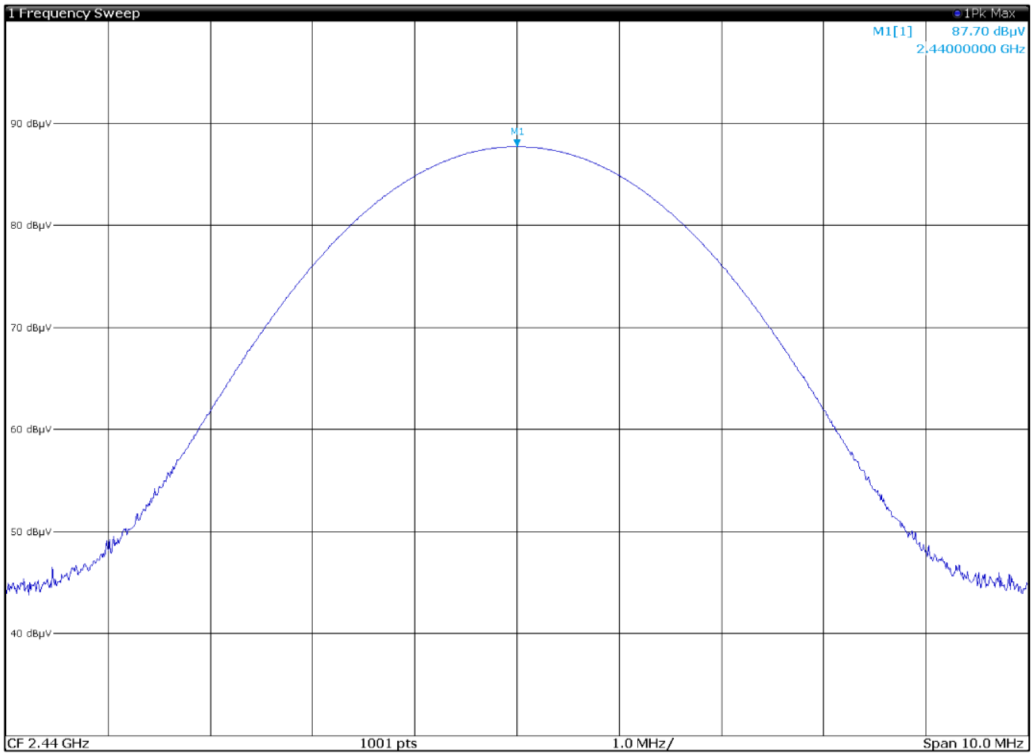


Figure 8.4-3: **Field strength measured at 3 m with antenna in horizontal polarization on mid channel – BASE UNIT LEFT**

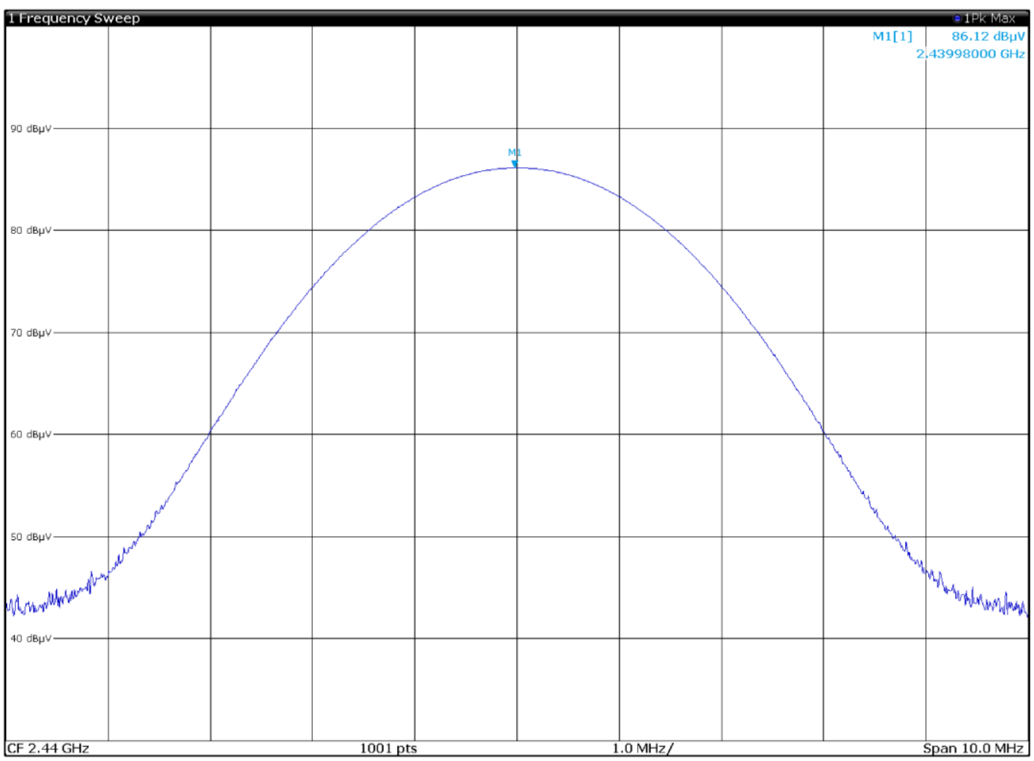


Figure 8.4-4: **Field strength measured at 3 m with antenna in vertical polarization on mid channel – BASE UNIT LEFT**

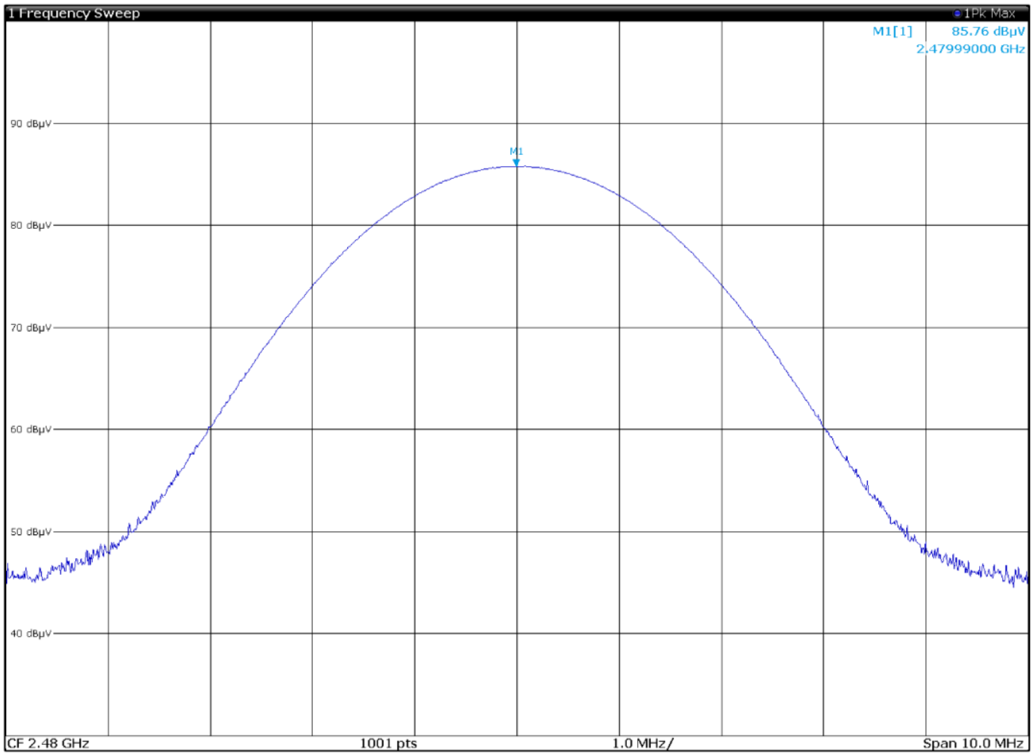


Figure 8.4-5: **Field strength measured at 3 m with antenna in horizontal polarization on high channel – BASE UNIT LEFT**

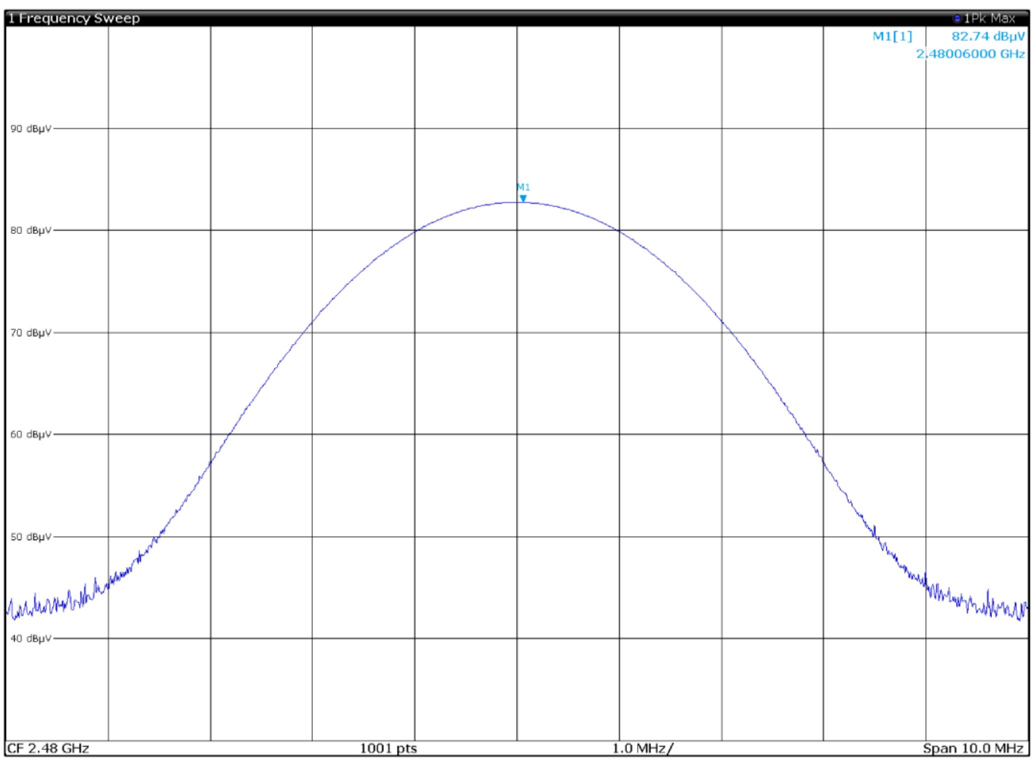


Figure 8.4-6: **Field strength measured at 3 m with antenna in vertical polarization on high channel – BASE UNIT LEFT**

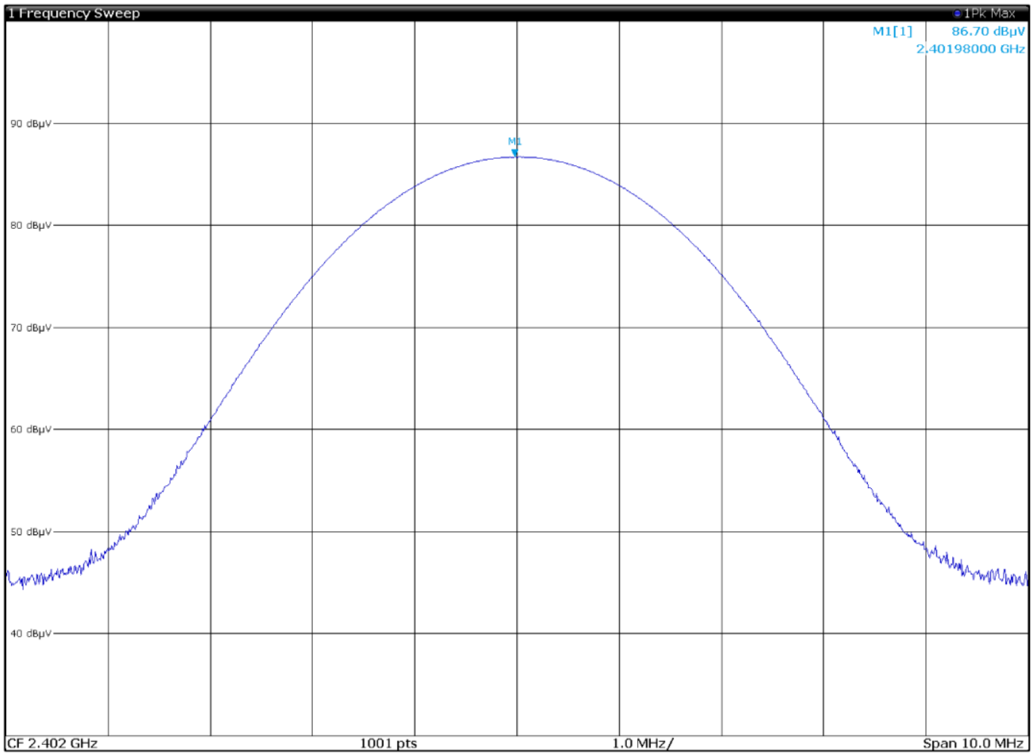


Figure 8.4-7: **Field strength measured at 3 m with antenna in horizontal polarization on low channel – BASE UNIT RIGHT**

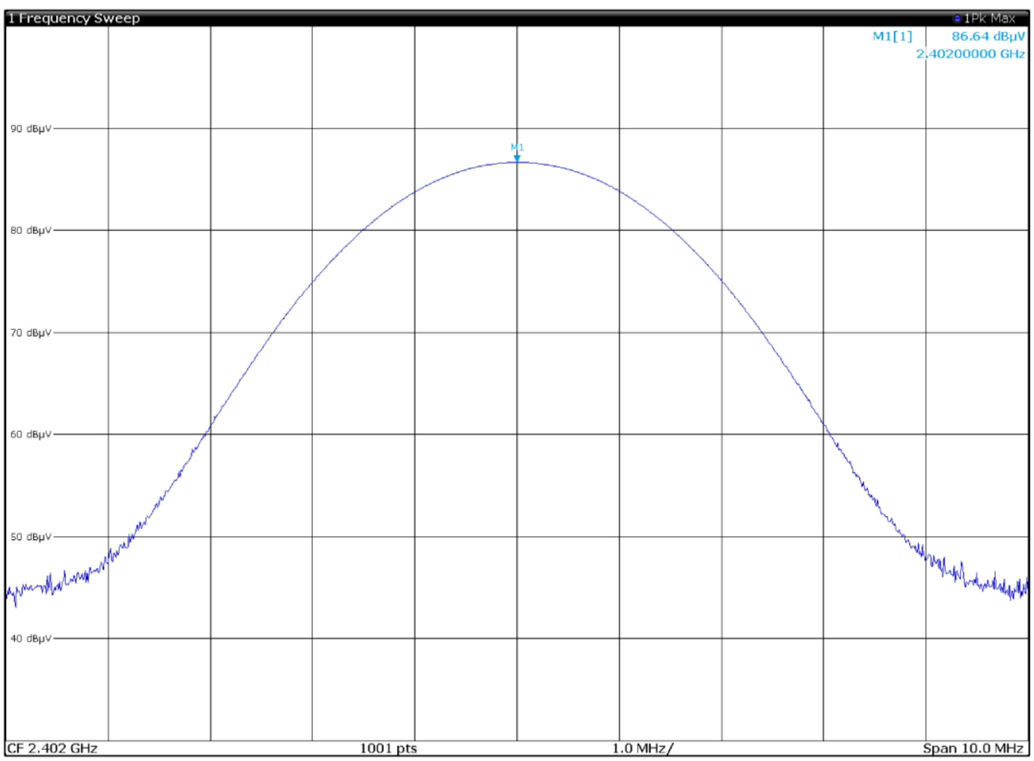


Figure 8.4-8: **Field strength measured at 3 m with antenna in vertical polarization on low channel – BASE UNIT RIGHT**

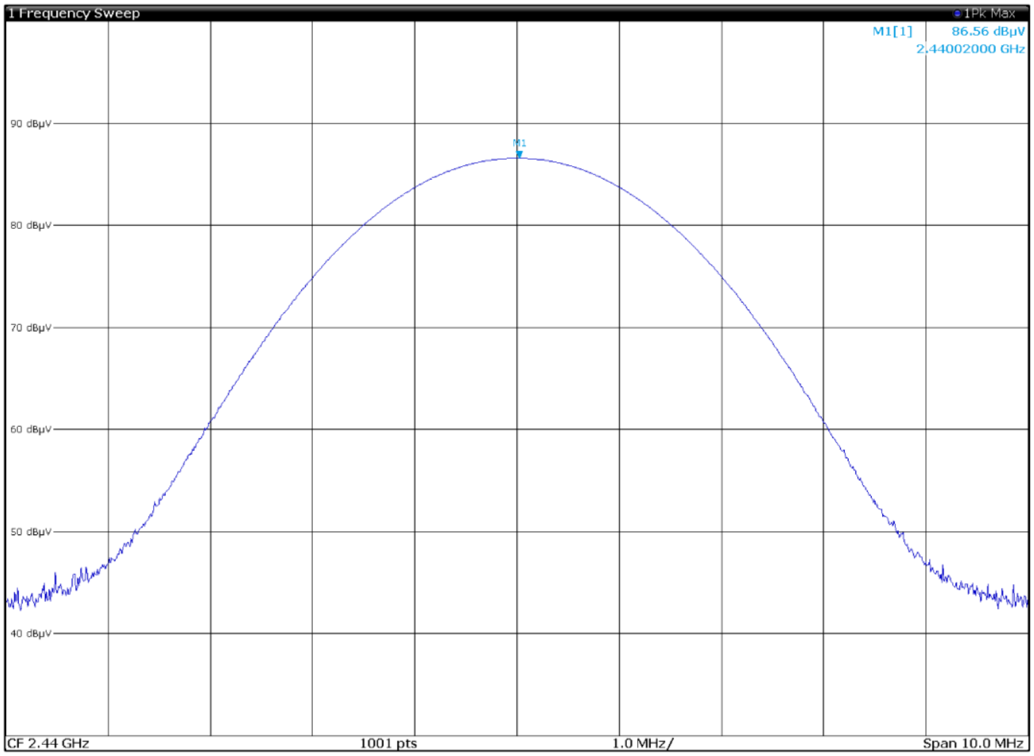


Figure 8.4-9: **Field strength measured at 3 m with antenna in horizontal polarization on mid channel – BASE UNIT RIGHT**

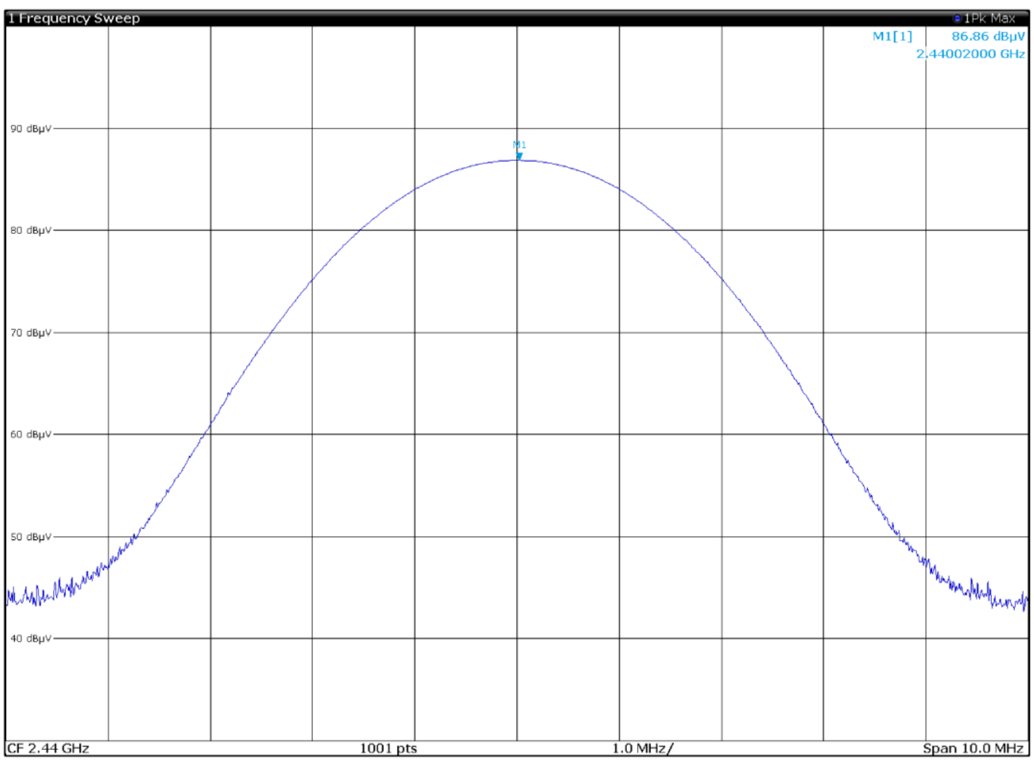


Figure 8.4-10: **Field strength measured at 3 m with antenna in vertical polarization on mid channel – BASE UNIT RIGHT**

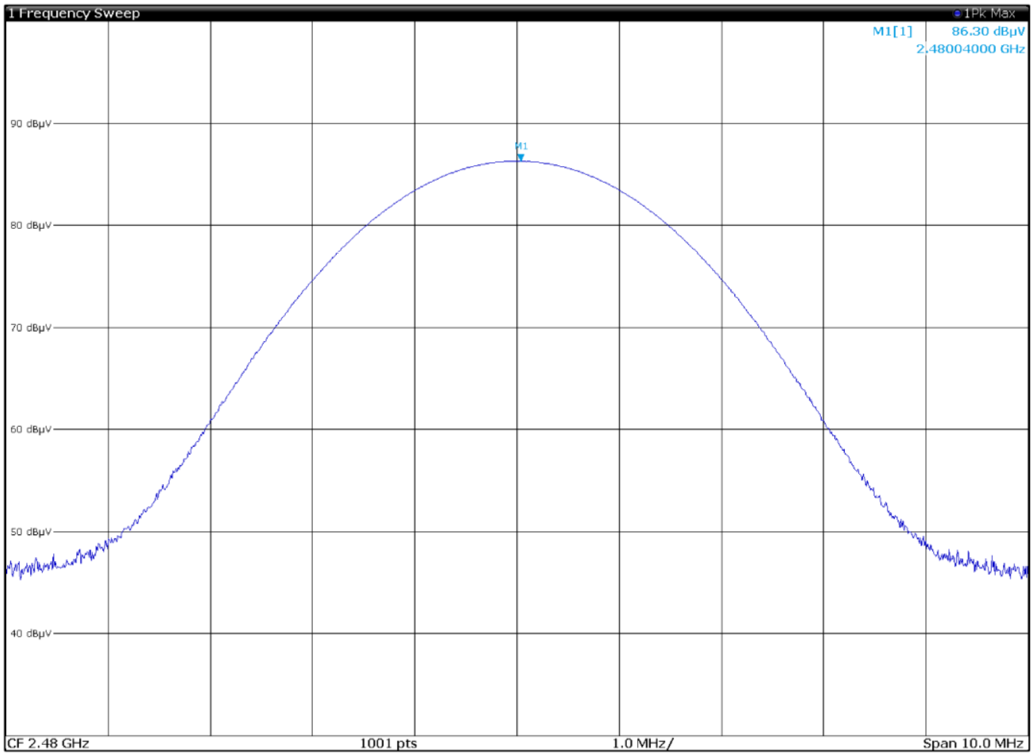


Figure 8.4-11: **Field strength measured at 3 m with antenna in horizontal polarization on high channel – BASE UNIT RIGHT**

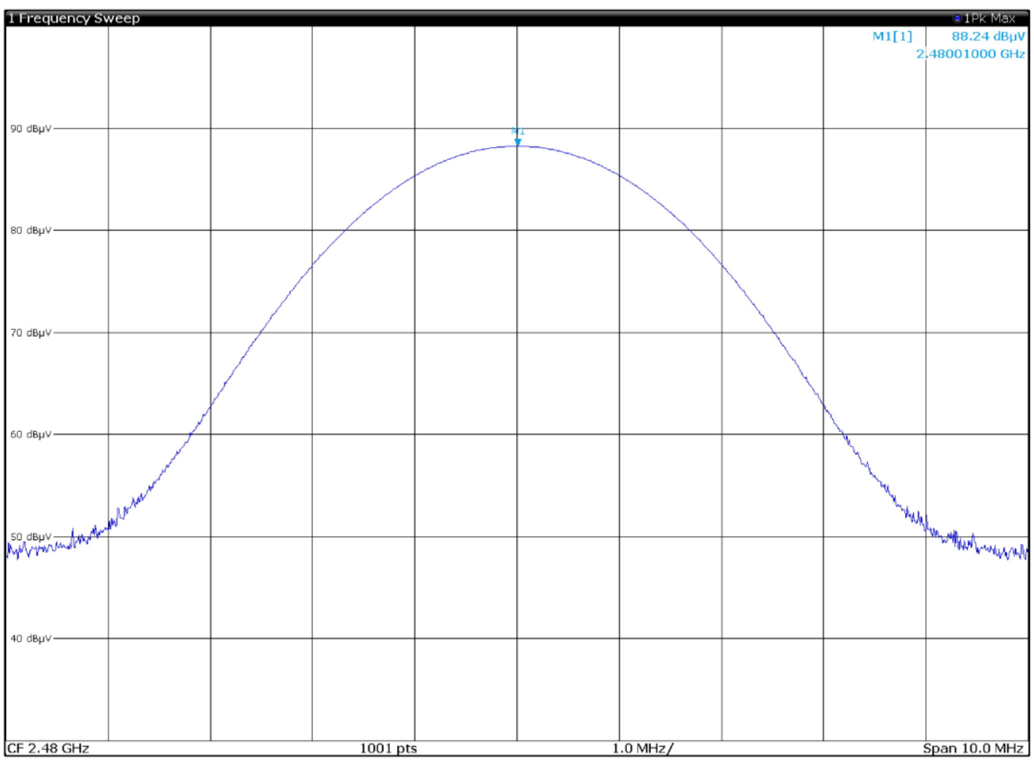


Figure 8.4-12: **Field strength measured at 3 m with antenna in vertical polarization on high channel – BASE UNIT RIGHT**

8.5 FCC 15.247(d) and RSS-247 5.5 Spurious (out-of-band) unwanted emissions

8.5.1 Definitions and limits

FCC:
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

ISED:
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Table 8.5-1: *FCC §15.209 and RSS-Gen – Radiated emission limits*

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/m	
0.009–0.490	2400/F	$67.6 - 20 \times \log_{10}(F)$	300
0.490–1.705	24000/F	$87.6 - 20 \times \log_{10}(F)$	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes: In the emission table above, the tighter limit applies at the band edges.
For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

Table 8.5-2: *ISED restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	12.57675–12.57725	399.9–410	7.25–7.75
0.498-0.505	13.36–13.41	608–614	8.025–8.5
2.1735–2.1905	16.42–16.423	960–1427	9.0–9.2
3.020–3.026	16.69475–16.69525	1435–1626.5	9.3–9.5
4.125–4.128	16.80425–16.80475	1645.5–1646.5	10.6–12.7
4.17725–4.17775	25.5–25.67	1660–1710	13.25–13.4
4.20725–4.20775	37.5–38.25	1718.8–1722.2	14.47–14.5
5.677-5.683	73–74.6	2200–2300	15.35–16.2
6.215–6.218	74.8–75.2	2310–2390	17.7–21.4
6.26775–6.26825	108–138	2483.5 - 2500	22.01–23.12
6.31175–6.31225	149.9-150.05	2655–2900	23.6–24.0
8.291–8.294	156.52475–156.52525	3260–3267	31.2–31.8
8.362–8.366	156.7–156.9	3332–3339	36.43–36.5
8.37625–8.38675	162.0125 - 167.17	3345.8–3358	Above 38.6
8.41425–8.41475	167.72 - 173.2	3500–4400	
12.29–12.293	240–285	4500–5150	
12.51975–12.52025	322–335.4	5.35–5.46	

Note: Certain frequency bands listed in Table 8.5-2 and above 38.6 GHz are designated for low-power licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in this Standard

Table 8.5-3: *FCC restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

8.5.2 Test summary

Test date	2020-02-07 to 2020-03-19
Test engineer	P. Barbieri
Verdict	Pass

8.5.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10th harmonic.
EUT was set to transmit with 100 % duty cycle.
Radiated measurements were performed at a distance of 3 m.
Since fundamental power was tested using peak method, the spurious emissions limit is −20 dBc/100 kHz
Radiated emissions test from 30 MHz to 1000 MHz have been performed only with complete system (all the four-module transmitting contemporary). Same result found for all the configuration modes of the radio modules.

Spectrum analyser settings for radiated measurements within restricted bands below 1 GHz:

Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for peak radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for average radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	10 Hz
Detector mode:	Peak
Trace mode:	Max Hold

8.5.4 Test data

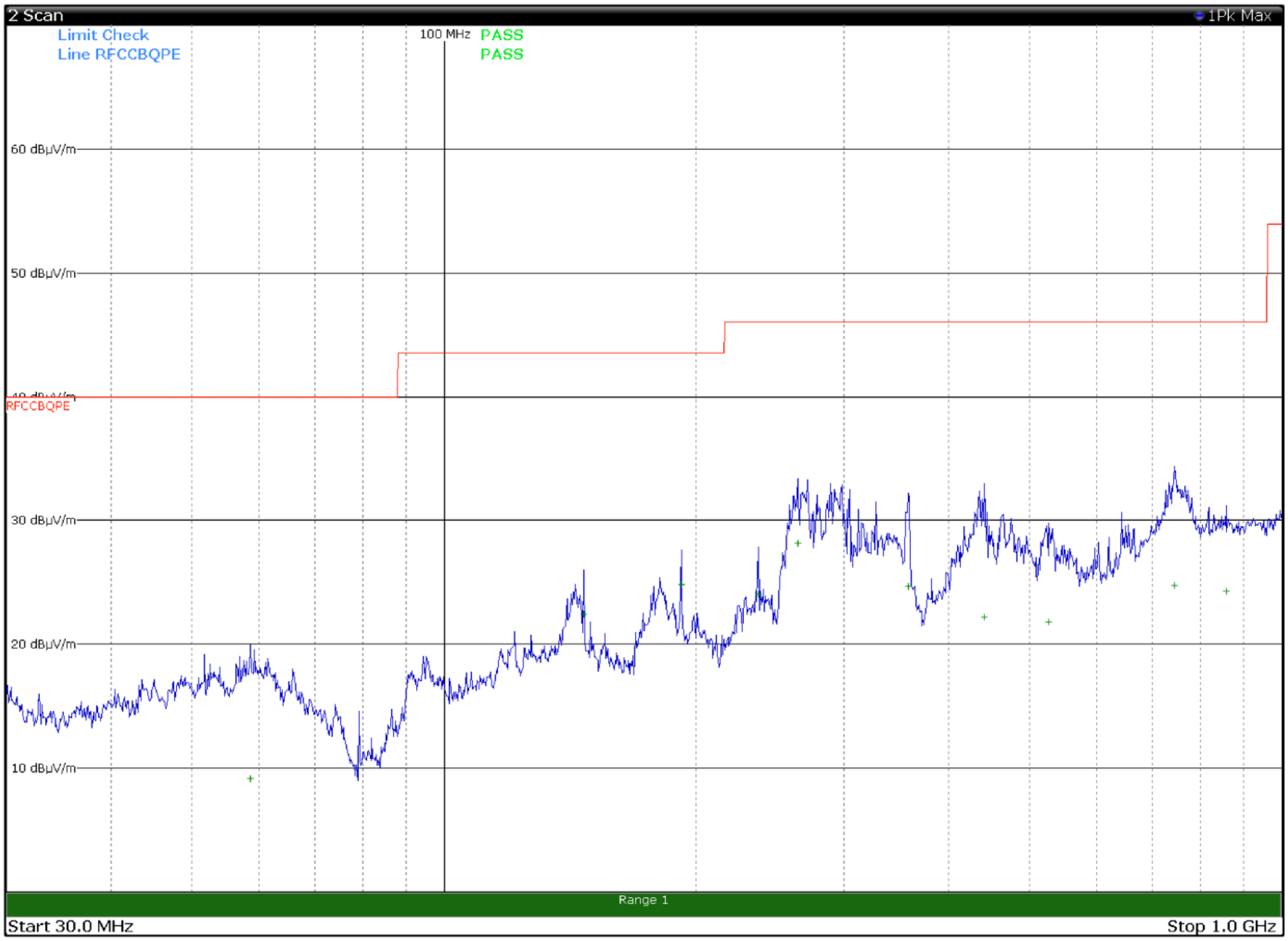


Figure 8.5-1: **Radiated spurious emissions for the BASE UNIT LEFT, low channel with antenna in horizontal polarization**

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
58.6800	9.2	40.0	-30.8	QP
146.7900	22.5	43.5	-21.0	QP
191.9100	24.9	43.5	-18.6	QP
237.0900	24.1	46.0	-21.9	QP
264.0000	28.2	46.0	-17.8	QP
357.8400	24.7	46.0	-21.3	QP
441.3600	22.3	46.0	-23.7	QP
526.4700	21.9	46.0	-24.1	QP
743.5500	24.8	46.0	-21.2	QP
858.0000	24.3	46.0	-21.7	QP

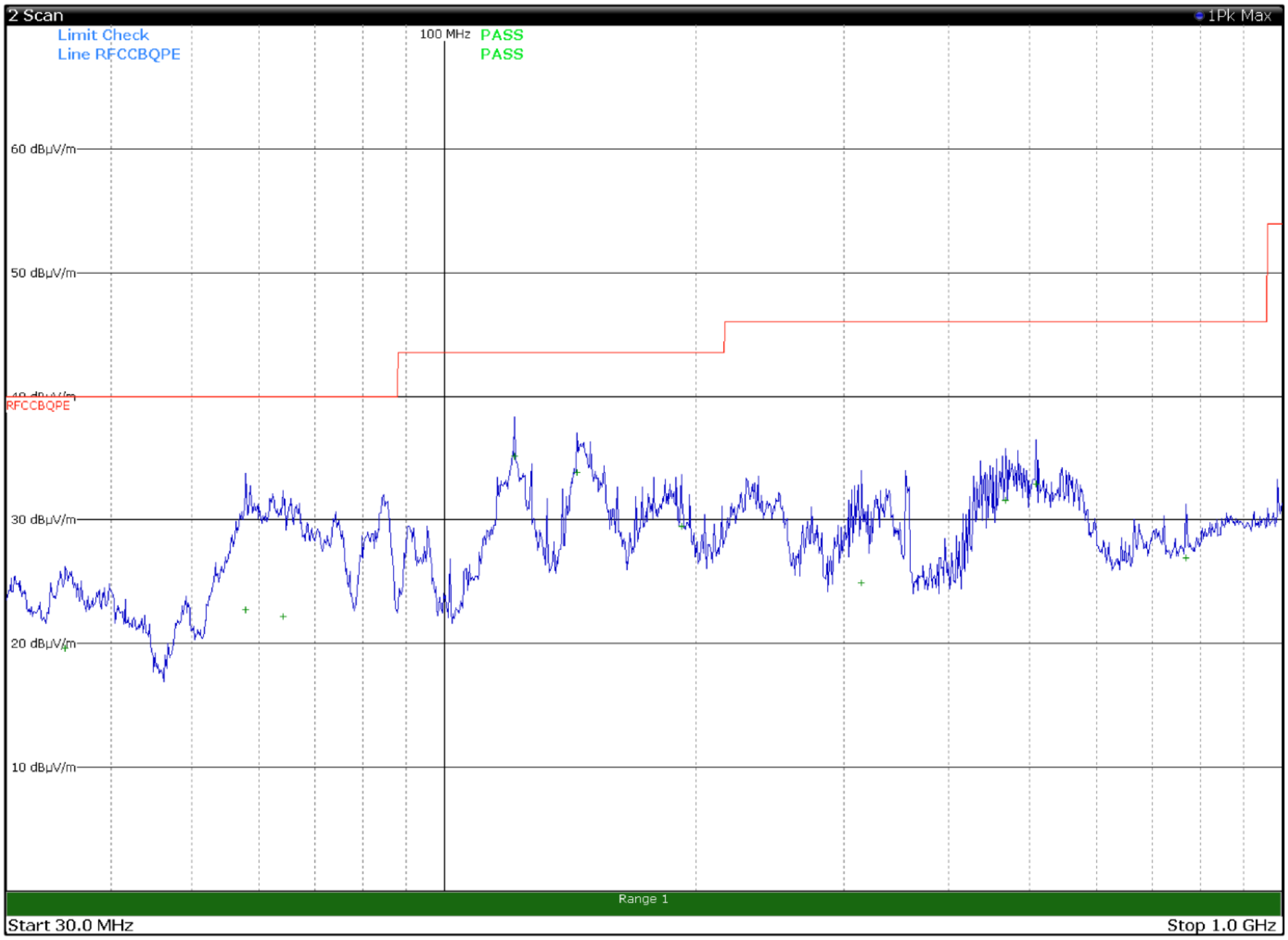


Figure 8.5-2: **Radiated spurious emissions for the BASE UNIT LEFT, low channel with antenna in vertical polarization**

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
35.2800	19.7	40.0	-20.3	QP
57.9600	22.8	40.0	-17.2	QP
64.1400	22.3	40.0	-17.7	QP
121.3500	35.2	43.5	-8.3	QP
143.9400	33.9	43.5	-9.6	QP
191.9100	29.5	43.5	-14.0	QP
314.8500	25.0	46.0	-21.0	QP
468.0000	31.7	46.0	-14.3	QP
508.0200	32.9	46.0	-13.1	QP
767.7000	27.0	46.0	-19.0	QP

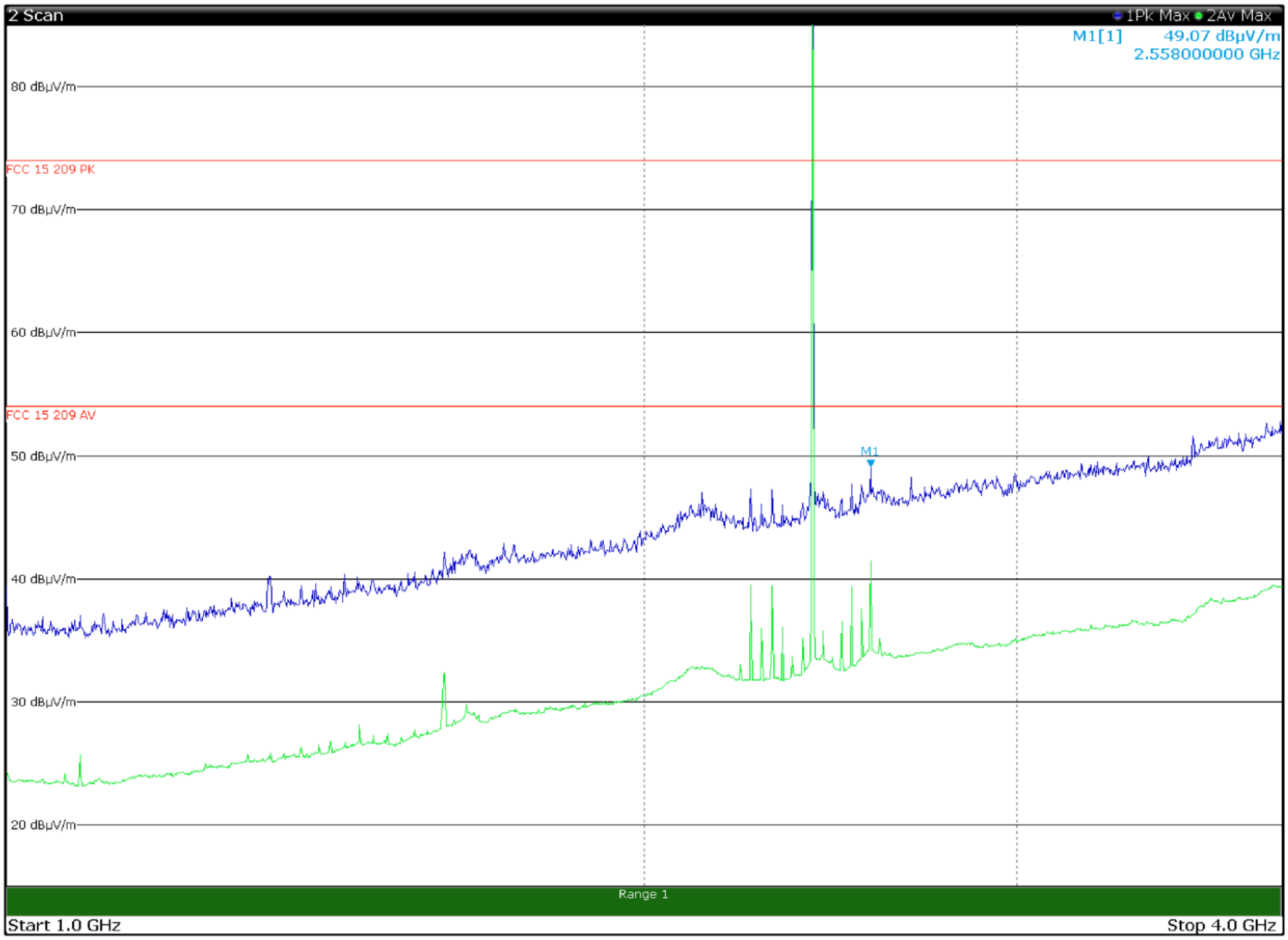


Figure 8.5-3: **Radiated spurious emissions for the BASE UNIT LEFT, low channel with antenna in horizontal polarization**

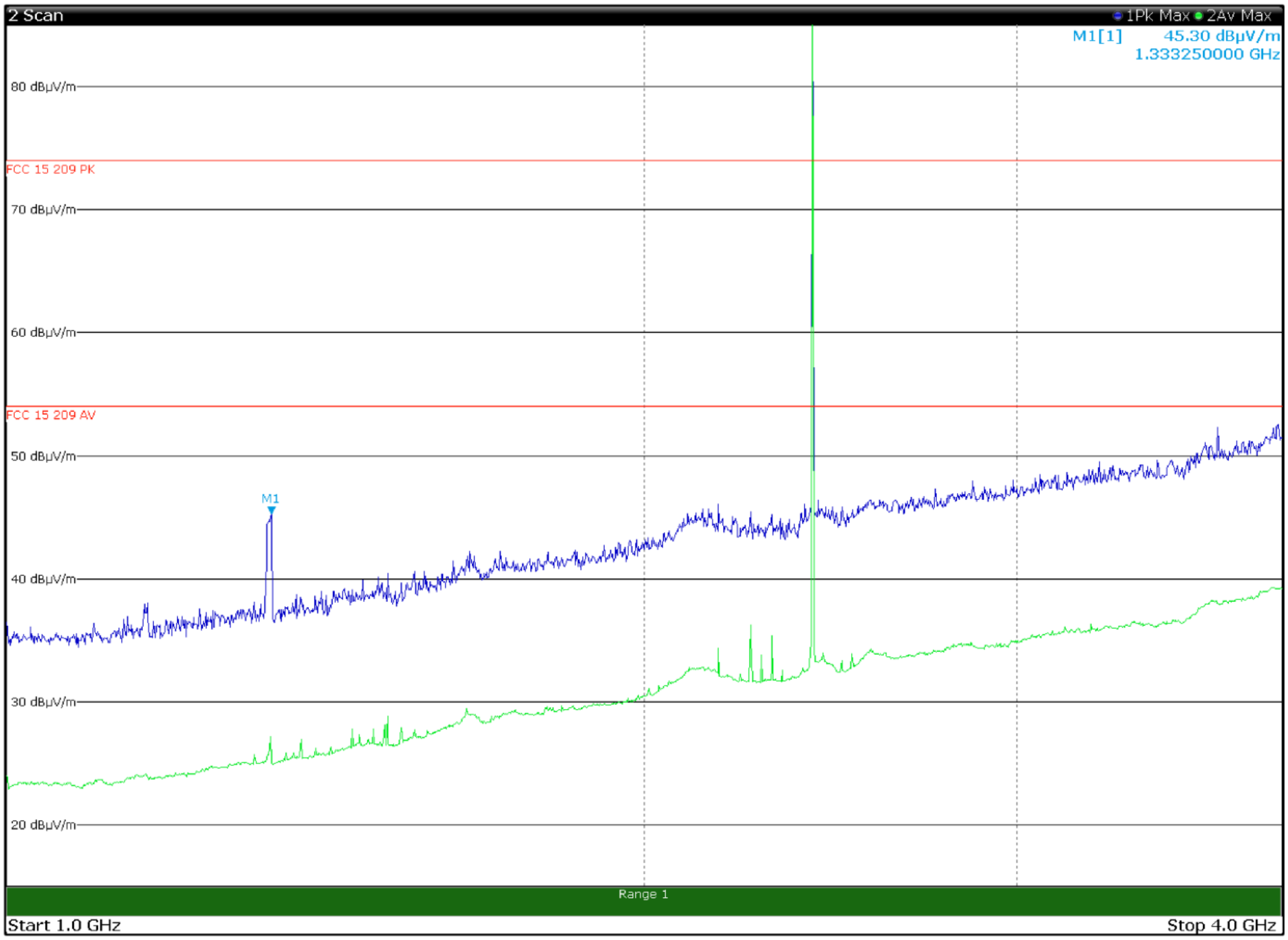


Figure 8.5-4: **Radiated spurious emissions for the BASE UNIT LEFT, low channel with antenna in vertical polarization**

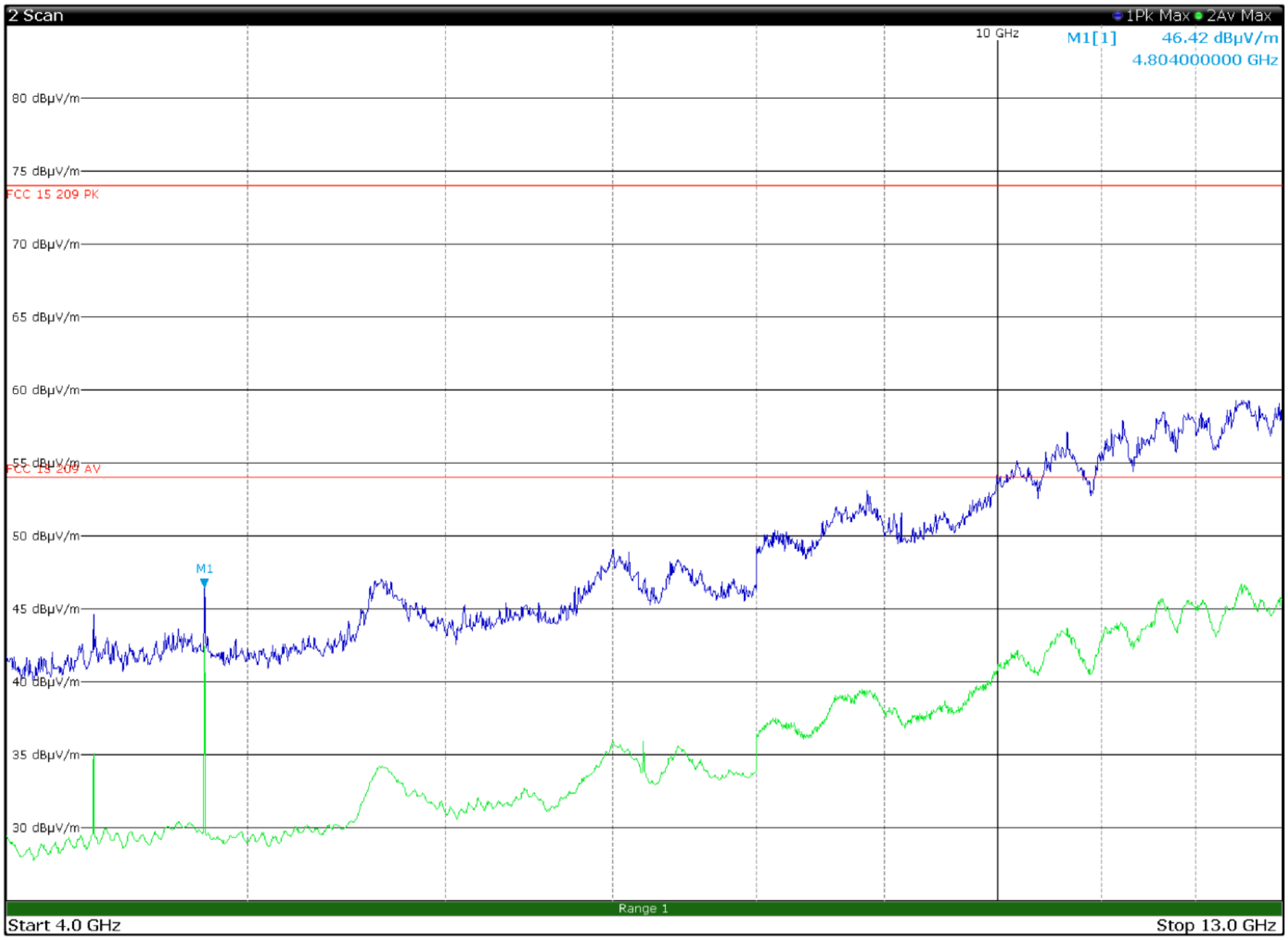


Figure 8.5-5: **Radiated spurious emissions for the BASE UNIT LEFT, low channel with antenna in horizontal polarization**

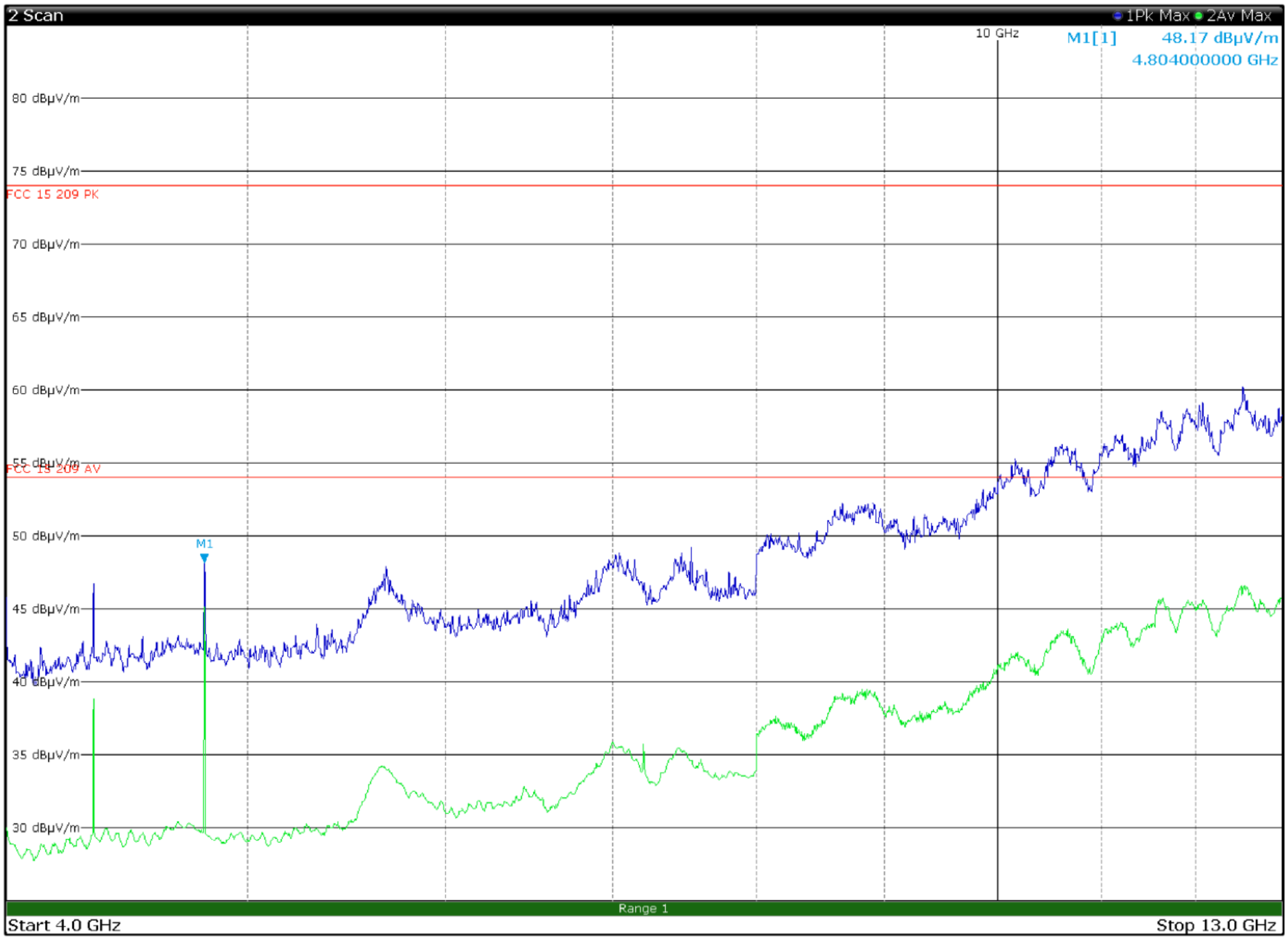


Figure 8.5-6: **Radiated spurious emissions for the BASE UNIT LEFT, low channel with antenna in vertical polarization**

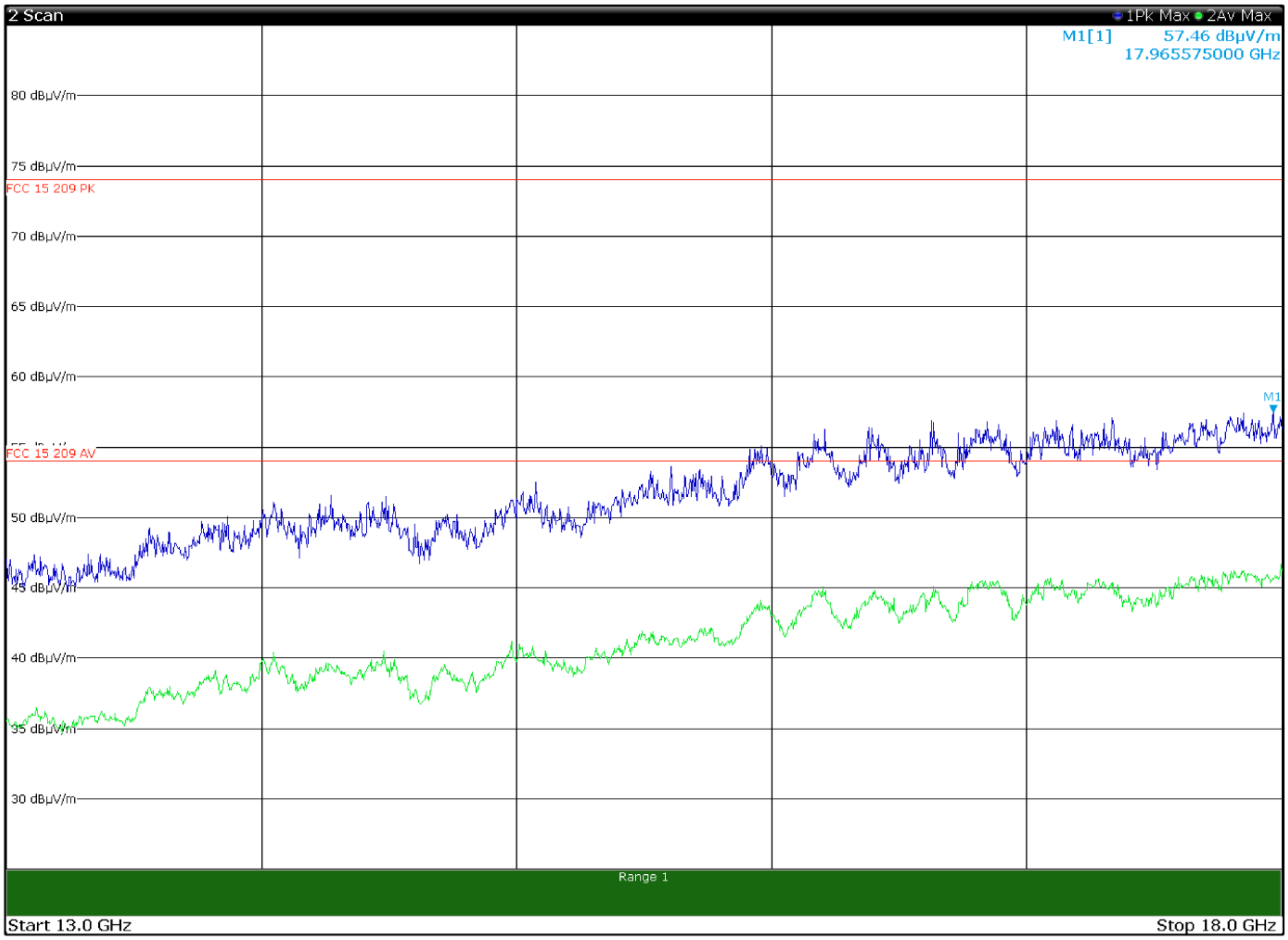


Figure 8.5-7: **Radiated spurious emissions for the BASE UNIT LEFT, low channel with antenna in horizontal polarization**

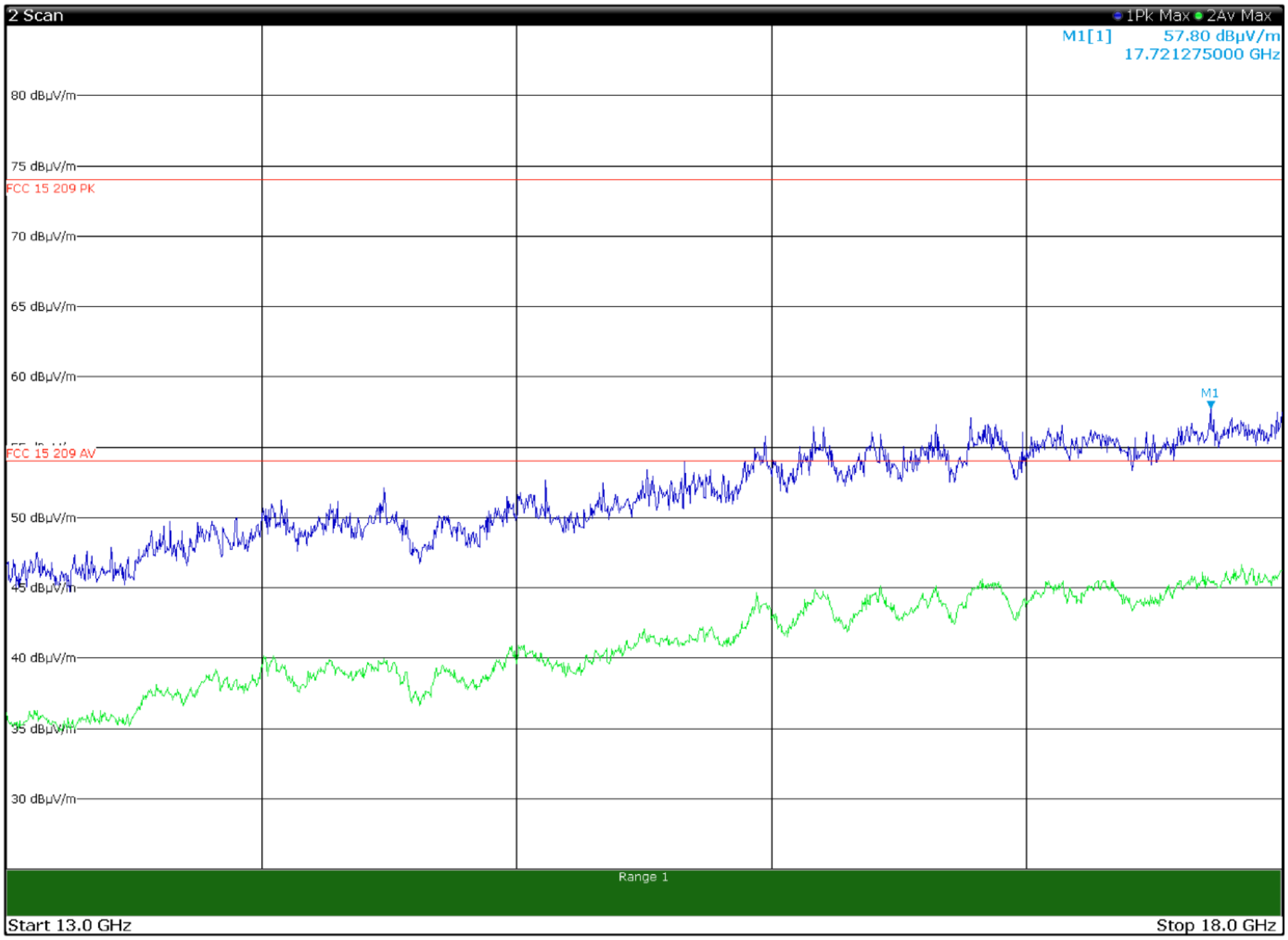


Figure 8.5-8: **Radiated spurious emissions for the BASE UNIT LEFT, low channel with antenna in vertical polarization**

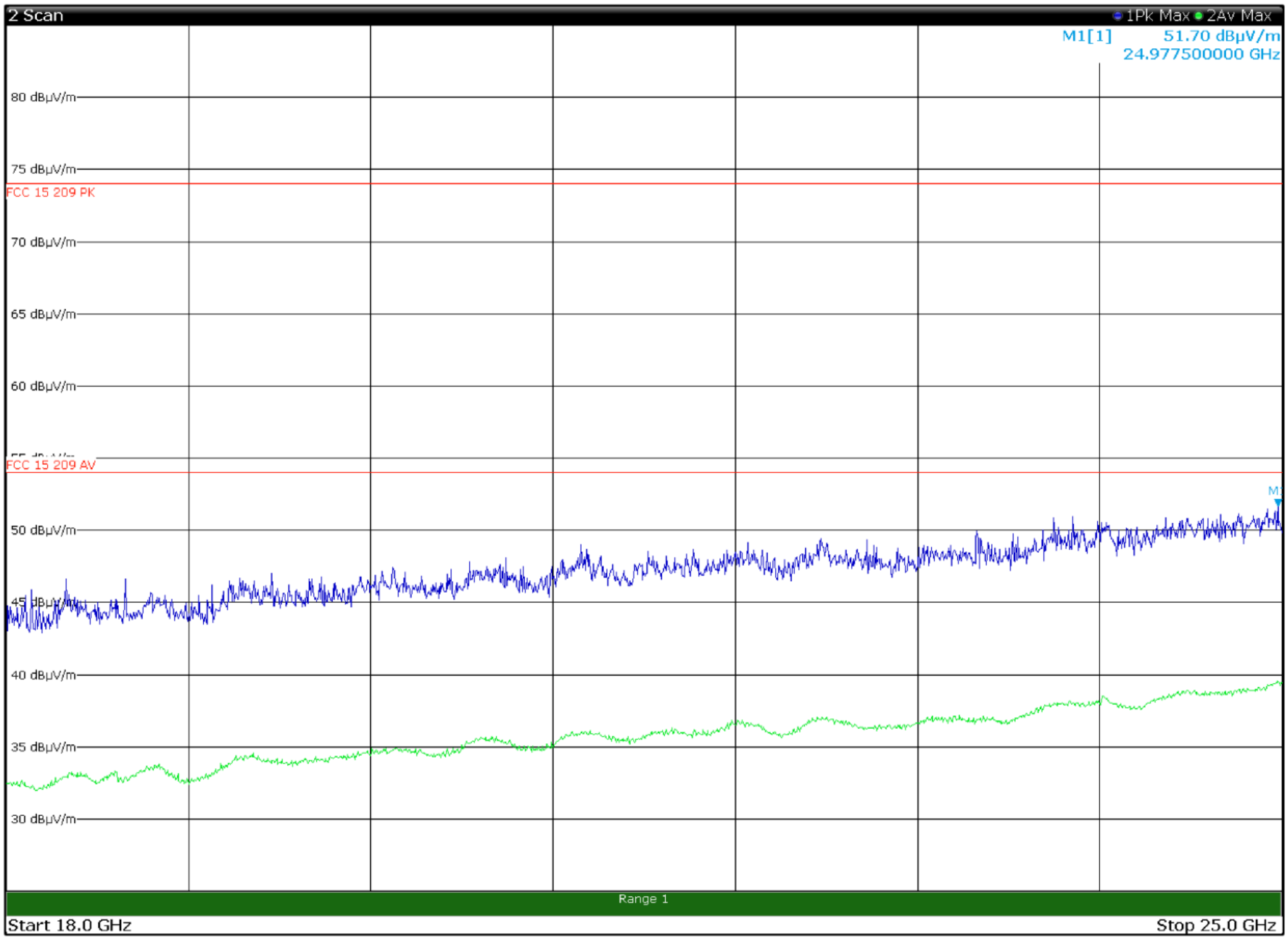


Figure 8.5-9: **Radiated spurious emissions for the BASE UNIT LEFT, low channel with antenna in horizontal polarization**

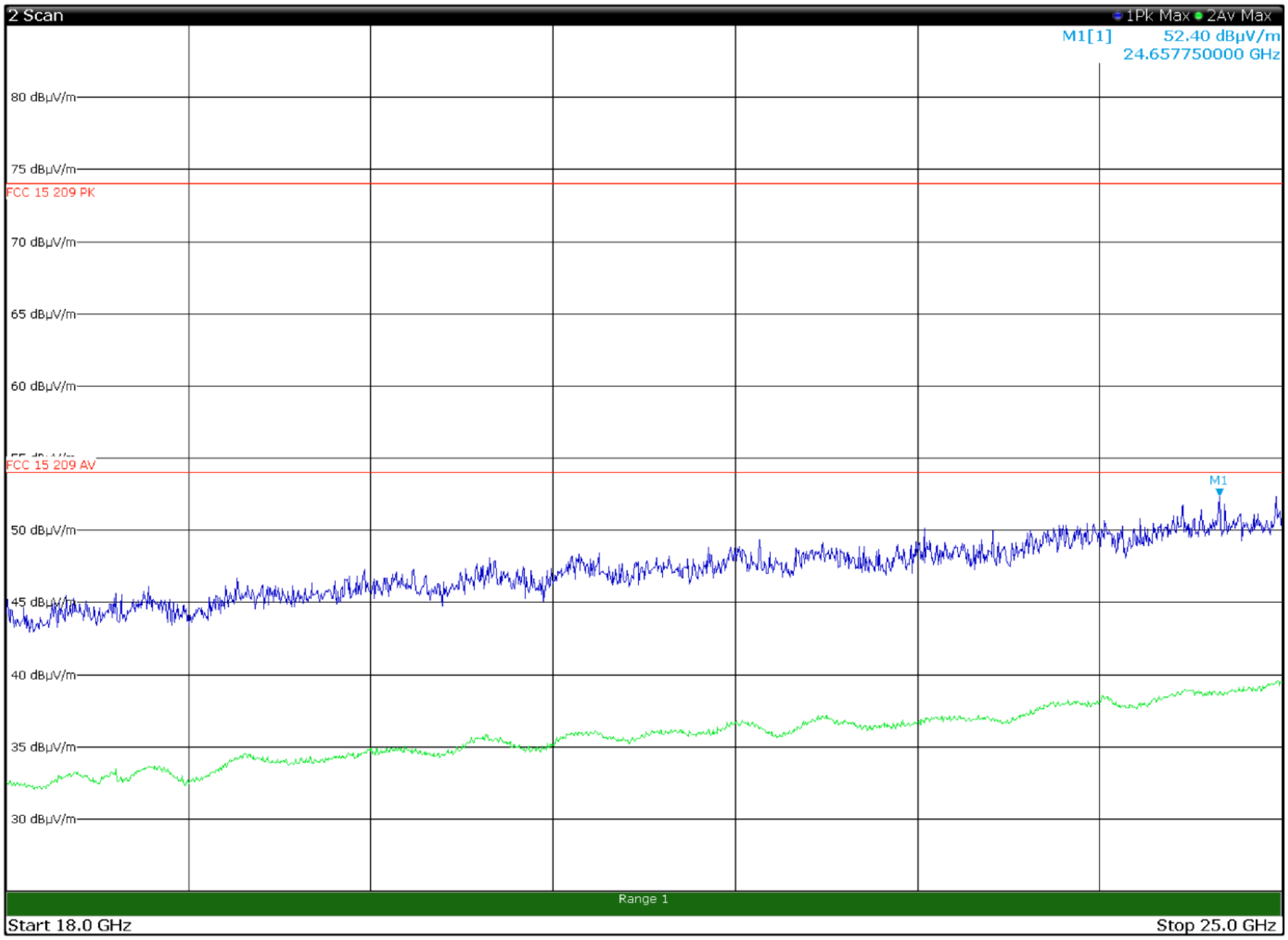


Figure 8.5-10: **Radiated spurious emissions for the BASE UNIT LEFT, low channel with antenna in vertical polarization**

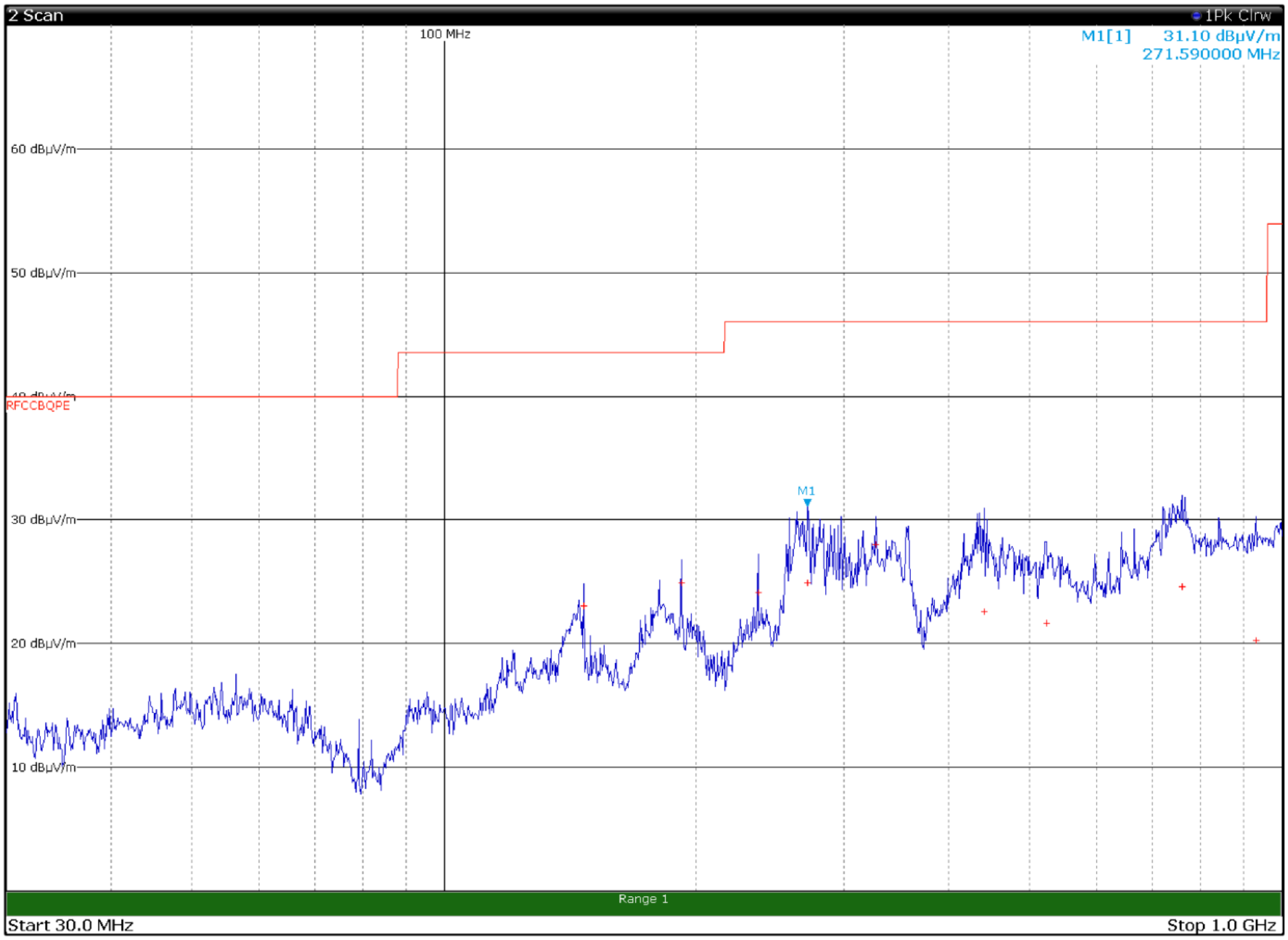


Figure 8.5-11: **Radiated spurious emissions for the BASE UNIT LEFT, mid channel with antenna in horizontal polarization**

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
146.7600	23.1	43.5	-20.4	QP
191.9100	24.9	43.5	-18.6	QP
237.0900	24.2	46.0	-21.8	QP
271.5900	25.0	46.0	-21.0	QP
327.4200	28.1	46.0	-17.9	QP
441.5100	22.6	46.0	-23.4	QP
523.4700	21.7	46.0	-24.3	QP
760.4400	24.6	46.0	-21.4	QP
930.9600	20.3	46.0	-25.7	QP

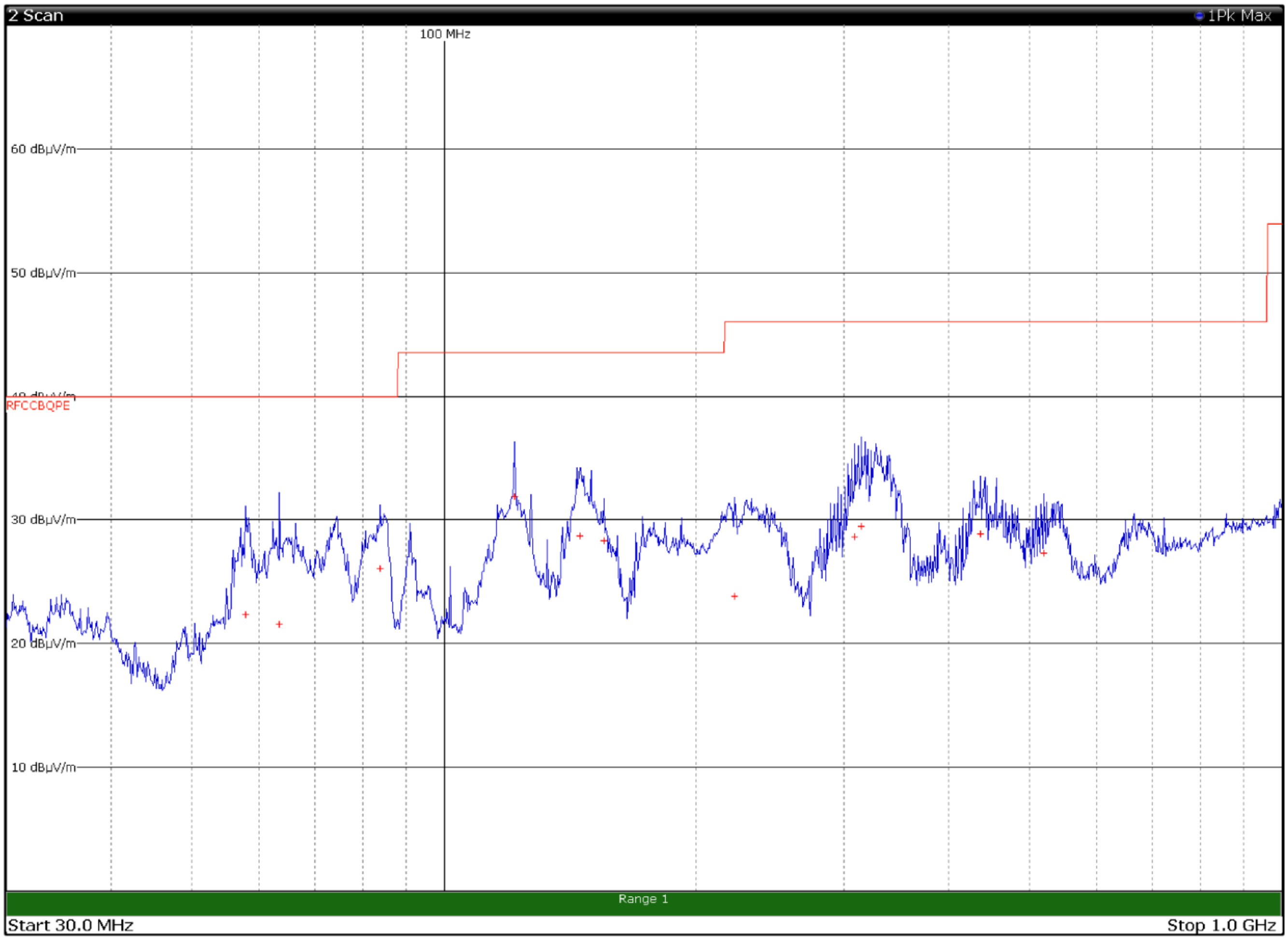


Figure 8.5-12: **Radiated spurious emissions for the BASE UNIT LEFT, mid channel with antenna in vertical polarization**

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
57.9300	22.4	40.0	-17.6	QP
63.5100	21.7	40.0	-18.3	QP
83.8800	26.1	40.0	-13.9	QP
121.3500	32.0	43.5	-11.5	QP
145.0800	28.8	43.5	-14.7	QP
155.2200	28.4	43.5	-15.1	QP
222.1200	23.9	46.0	-22.1	QP
309.0600	28.7	46.0	-17.3	QP
314.7600	29.5	46.0	-16.5	QP
435.9900	28.9	46.0	-17.1	QP
519.9900	27.3	46.0	-18.7	QP

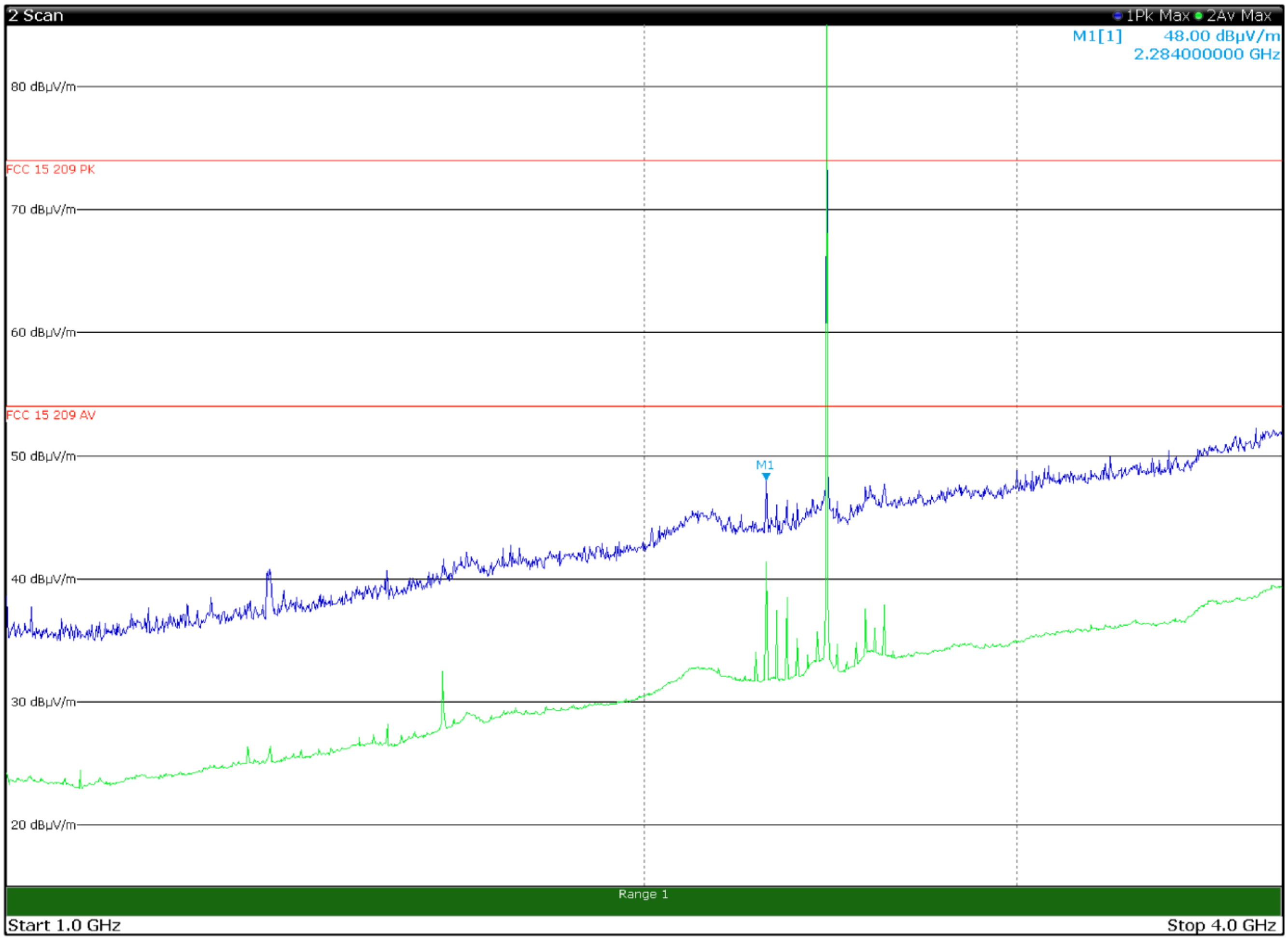


Figure 8.5-13: **Radiated spurious emissions for the BASE UNIT LEFT, mid channel with antenna in horizontal polarization**

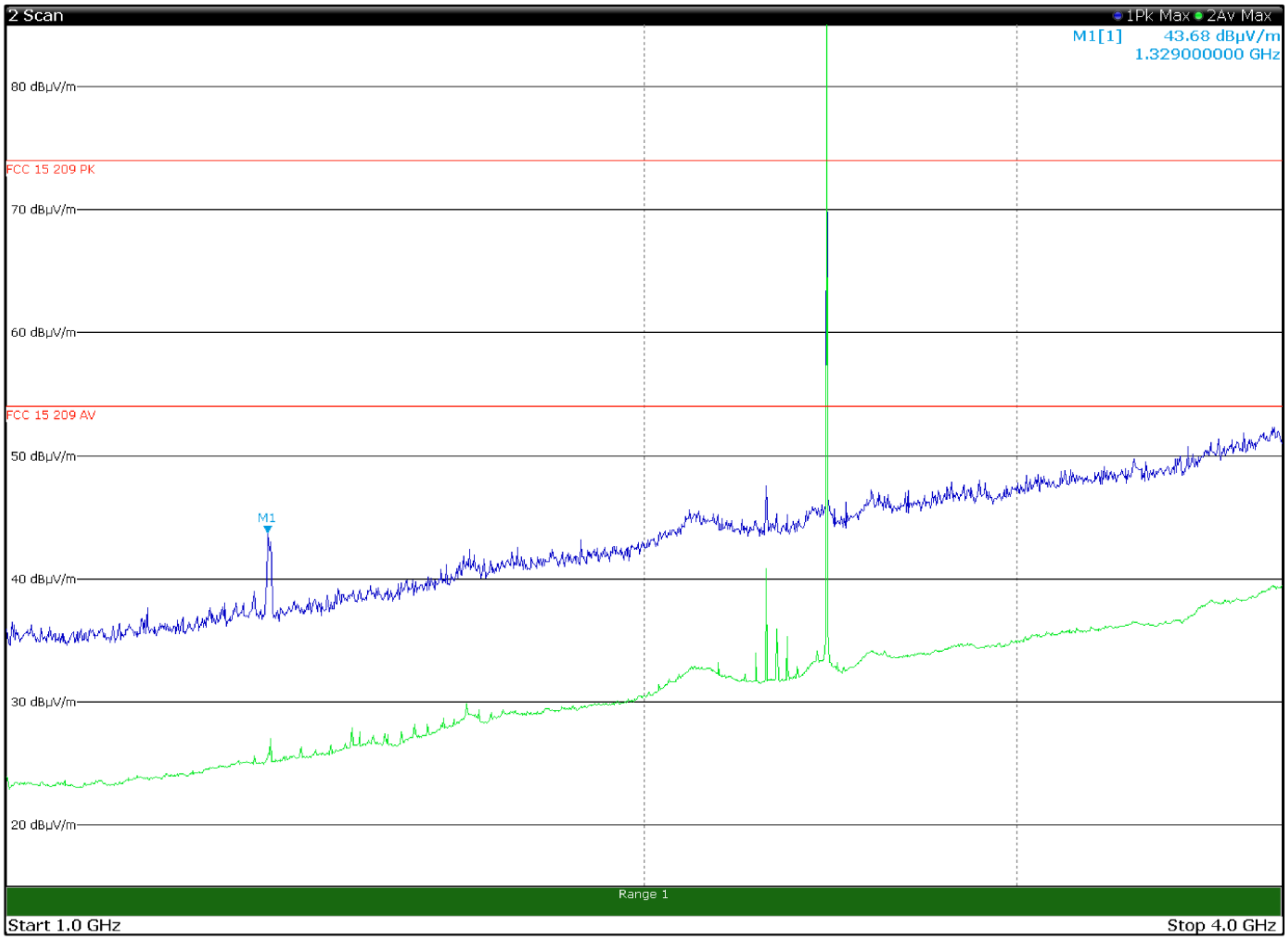


Figure 8.5-14: **Radiated spurious emissions for the BASE UNIT LEFT, mid channel with antenna in vertical polarization**

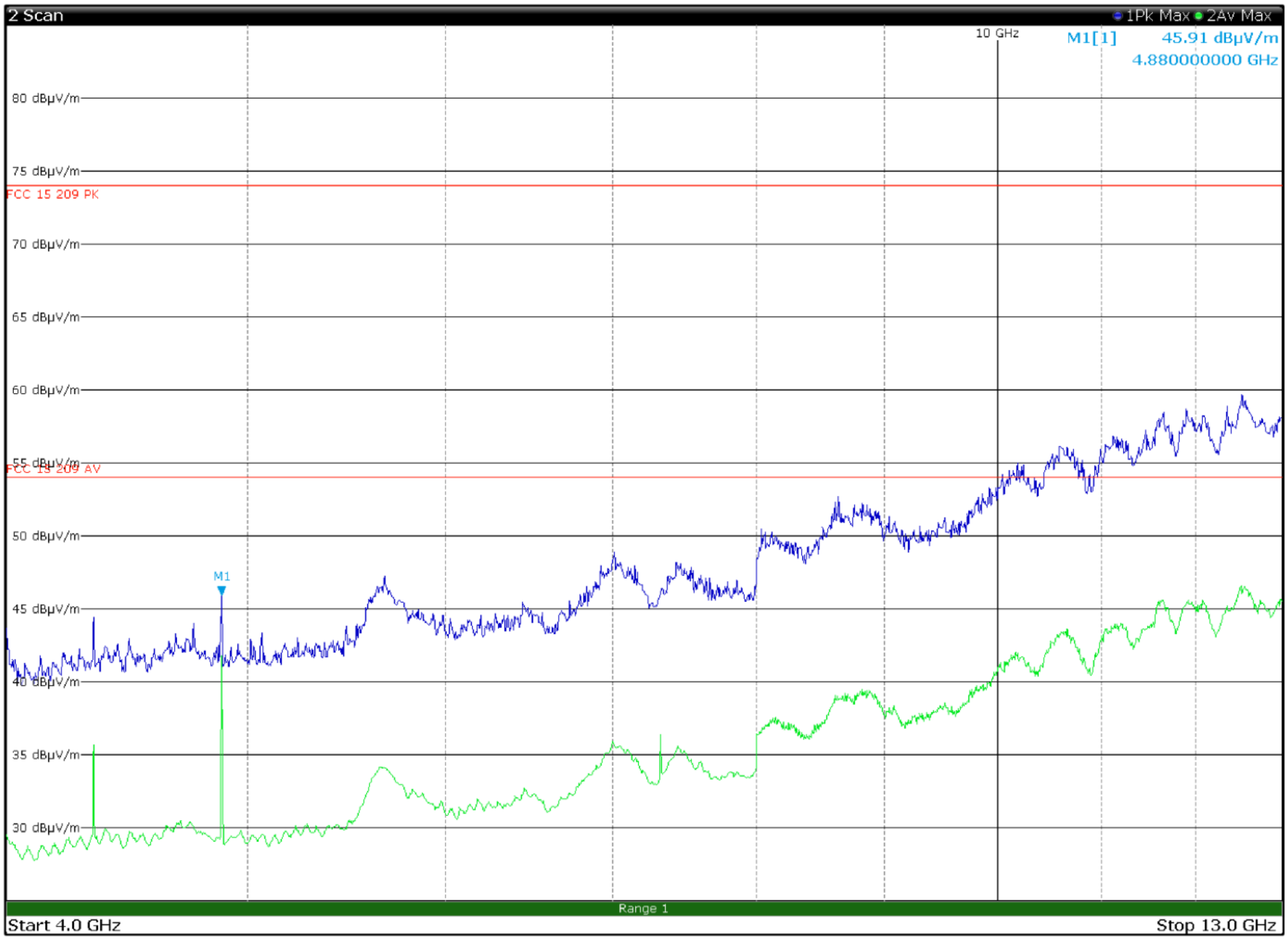


Figure 8.5-15: **Radiated spurious emissions for the BASE UNIT LEFT, mid channel with antenna in horizontal polarization**

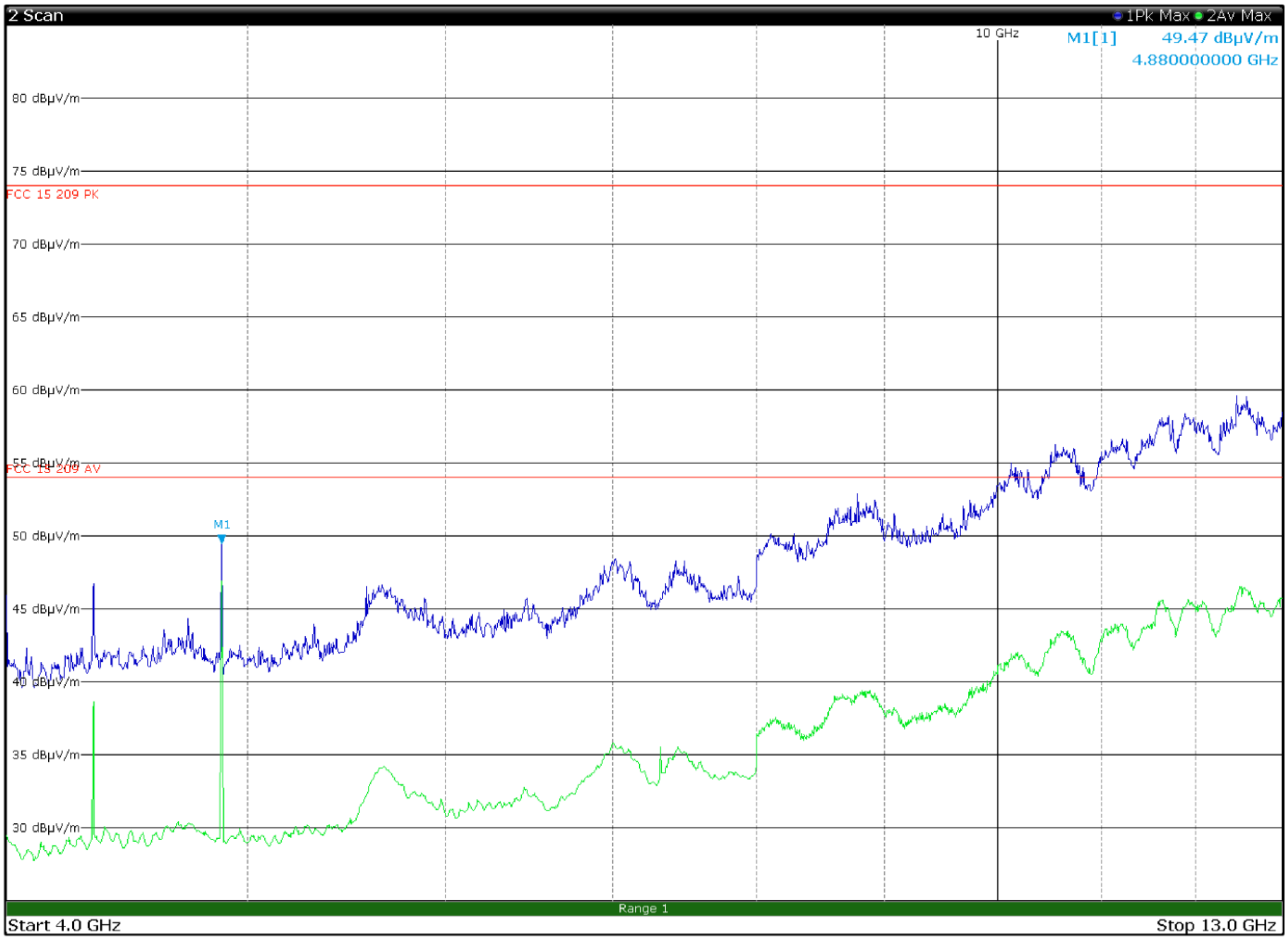


Figure 8.5-16: **Radiated spurious emissions for the BASE UNIT LEFT, mid channel with antenna in vertical polarization**

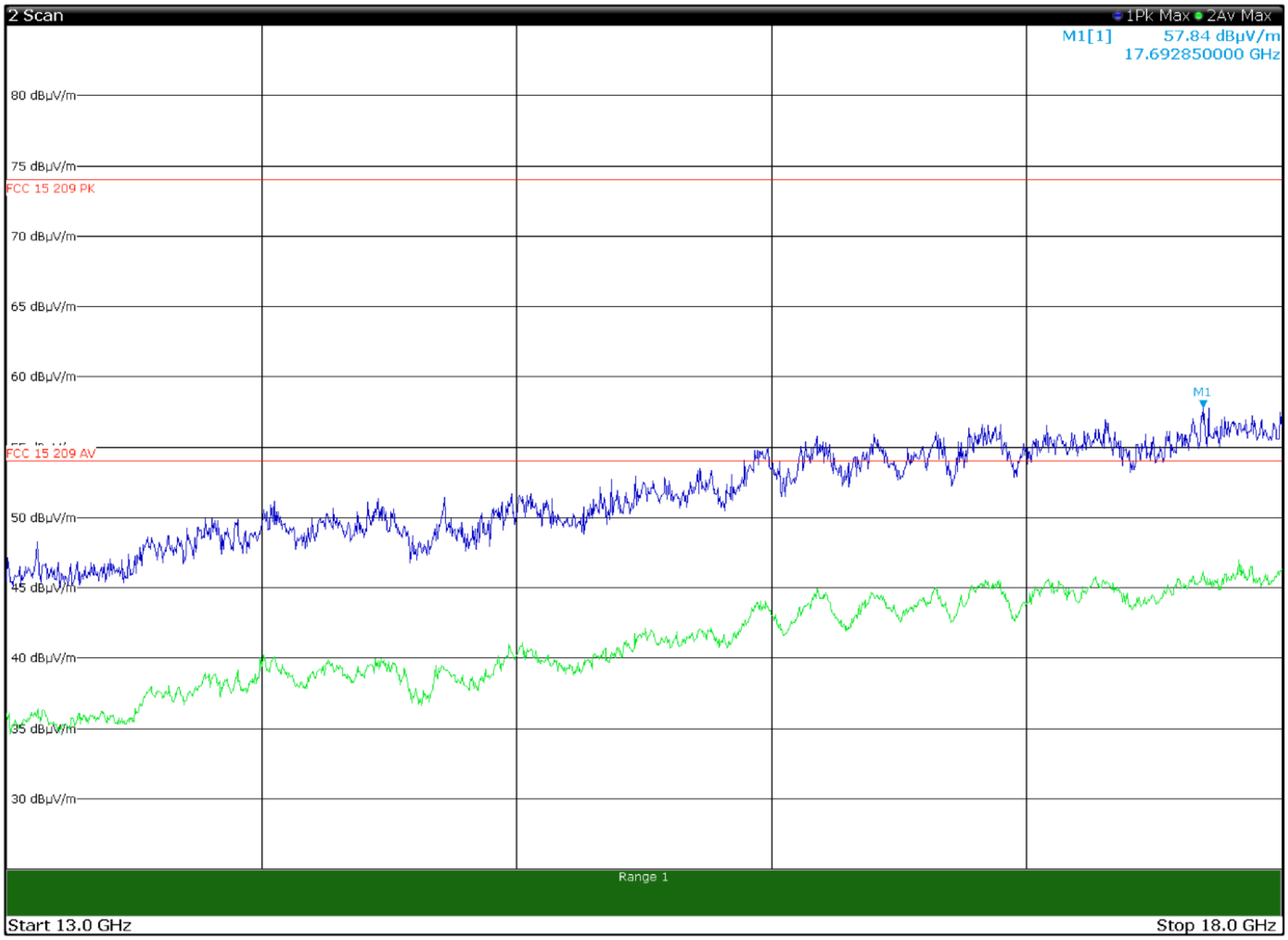


Figure 8.5-17: **Radiated spurious emissions for the BASE UNIT LEFT, mid channel with antenna in horizontal polarization**

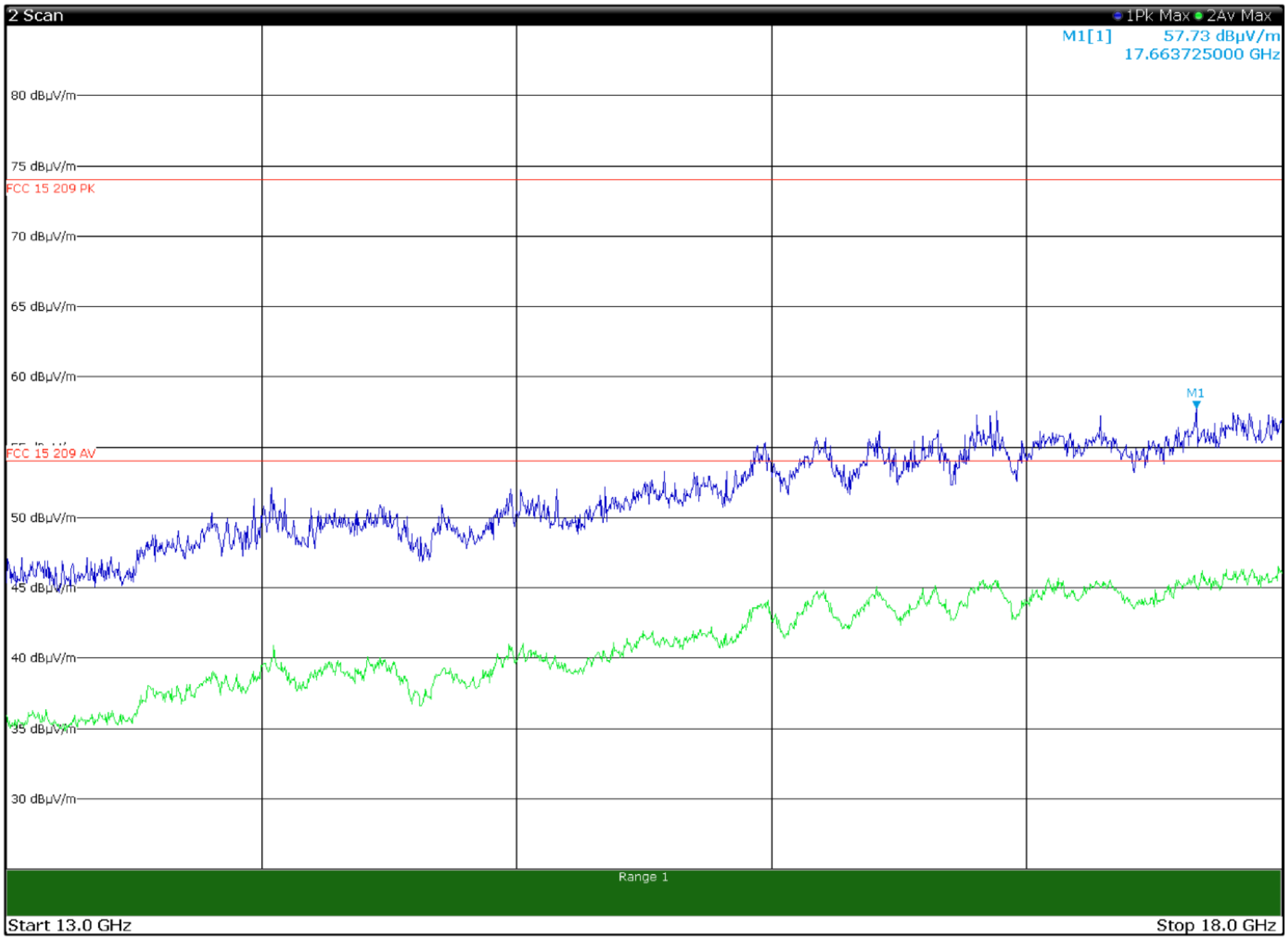


Figure 8.5-18: **Radiated spurious emissions for the BASE UNIT LEFT, mid channel with antenna in vertical polarization**

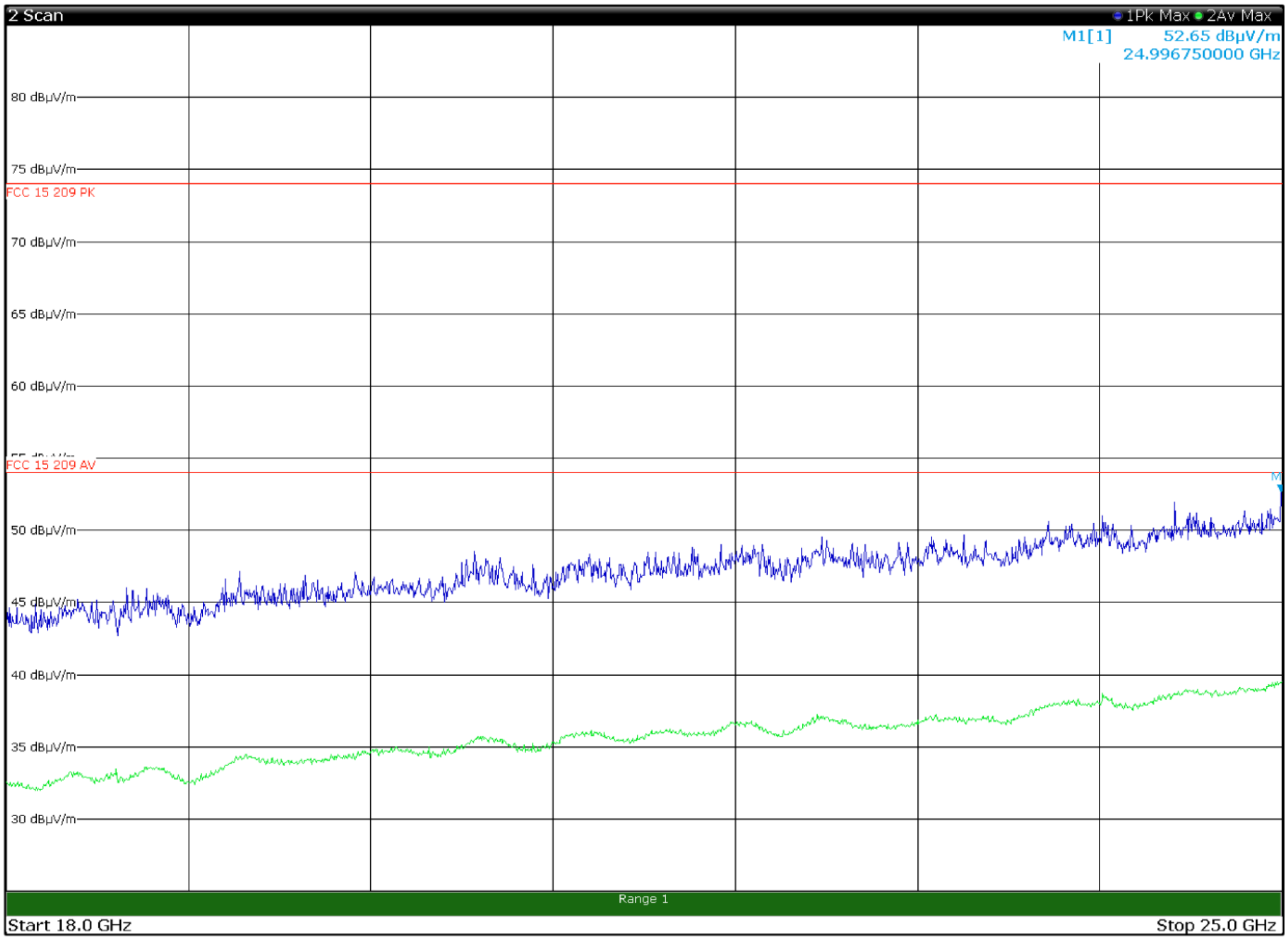


Figure 8.5-19: **Radiated spurious emissions for the BASE UNIT LEFT, mid channel with antenna in horizontal polarization**

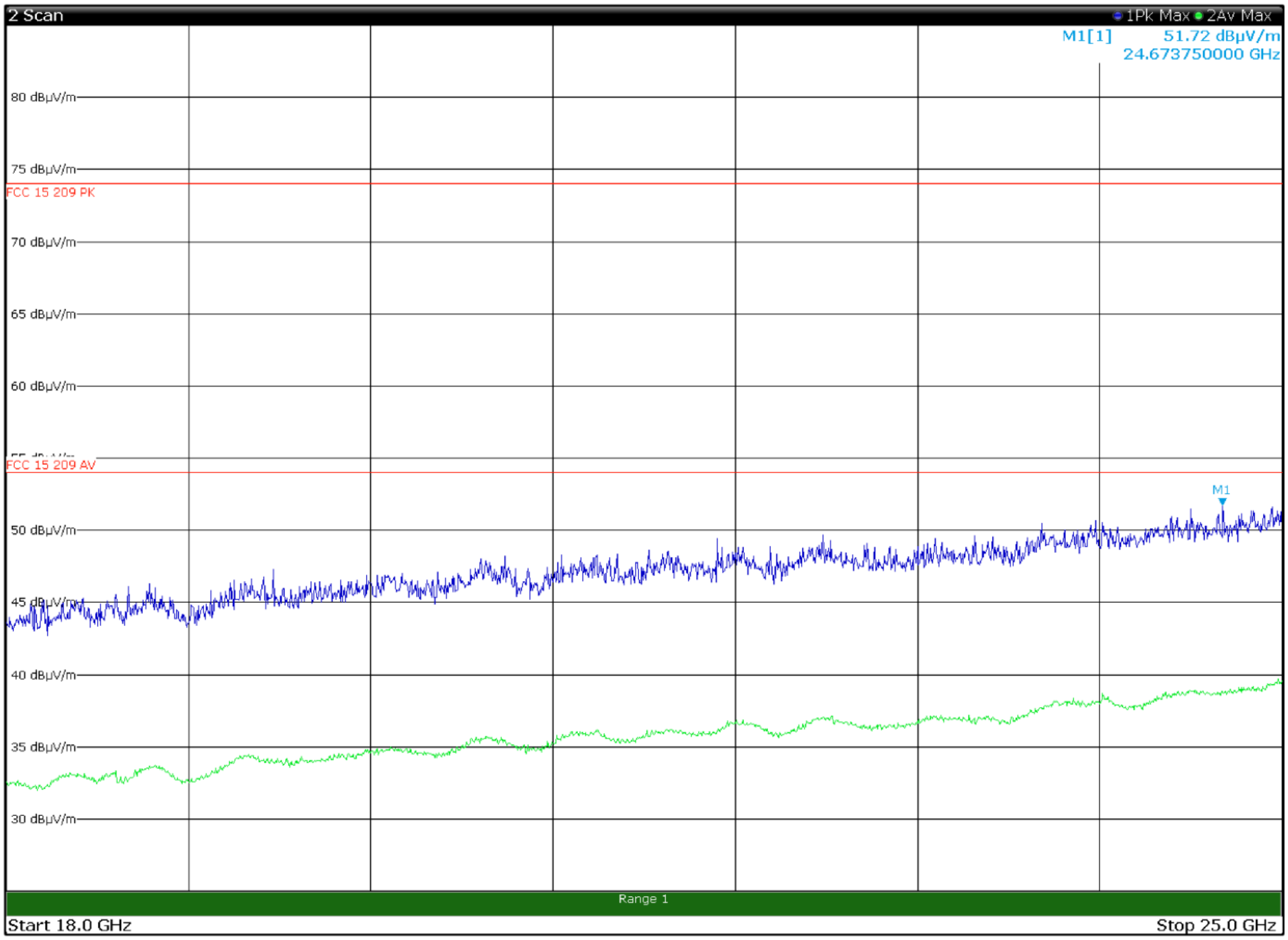


Figure 8.5-20: **Radiated spurious emissions for the BASE UNIT LEFT, mid channel with antenna in vertical polarization**

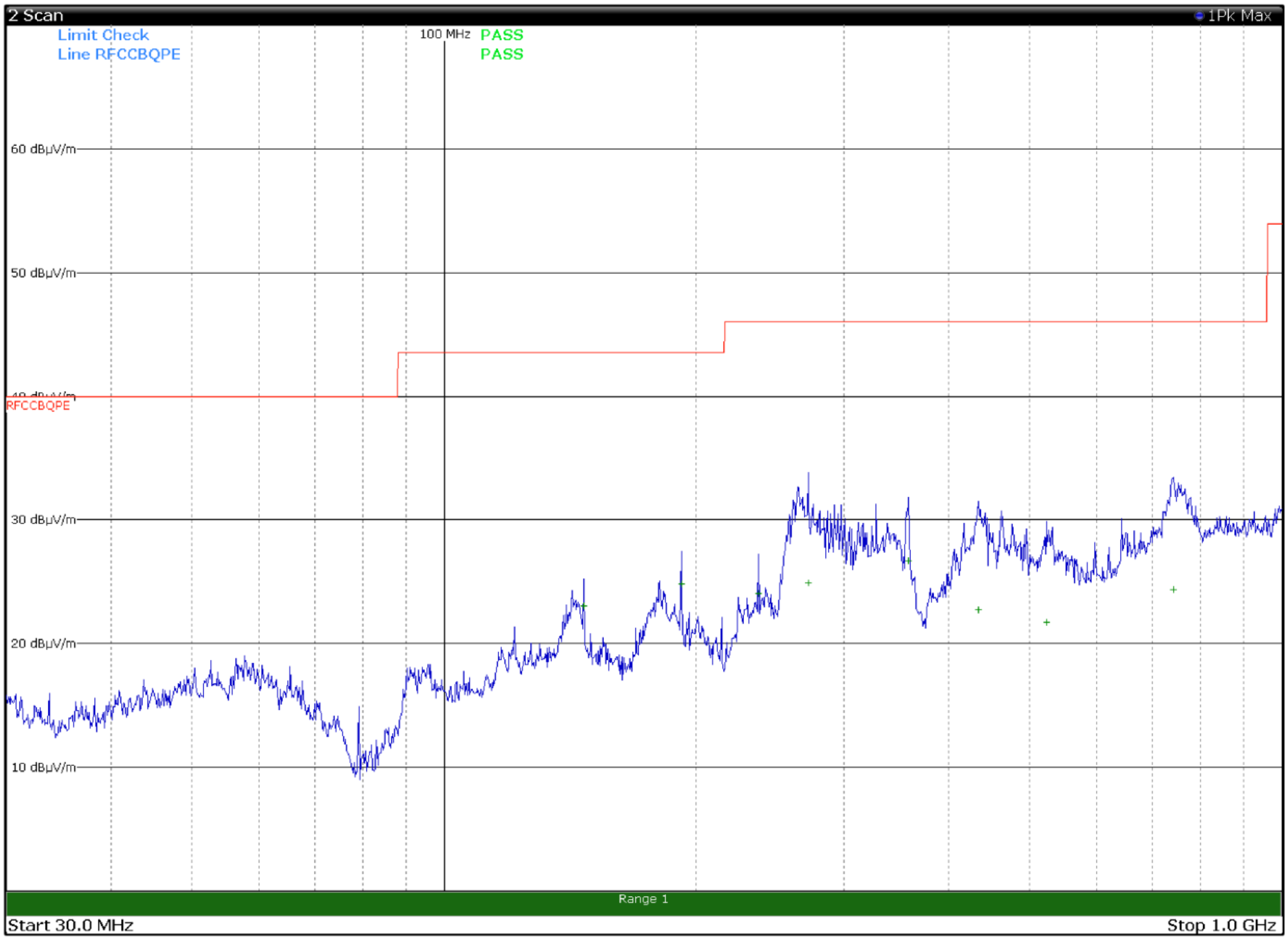


Figure 8.5-21: **Radiated spurious emissions for the BASE UNIT LEFT, high channel with antenna in horizontal polarization**

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
146.7600	23.1	43.5	-20.4	QP
191.9100	24.9	43.5	-18.6	QP
237.0900	24.1	46.0	-21.9	QP
271.7700	25.0	46.0	-21.0	QP
358.4700	26.7	46.0	-19.3	QP
434.0700	22.8	46.0	-23.2	QP
523.4700	21.7	46.0	-24.3	QP
741.1200	24.4	46.0	-21.6	QP

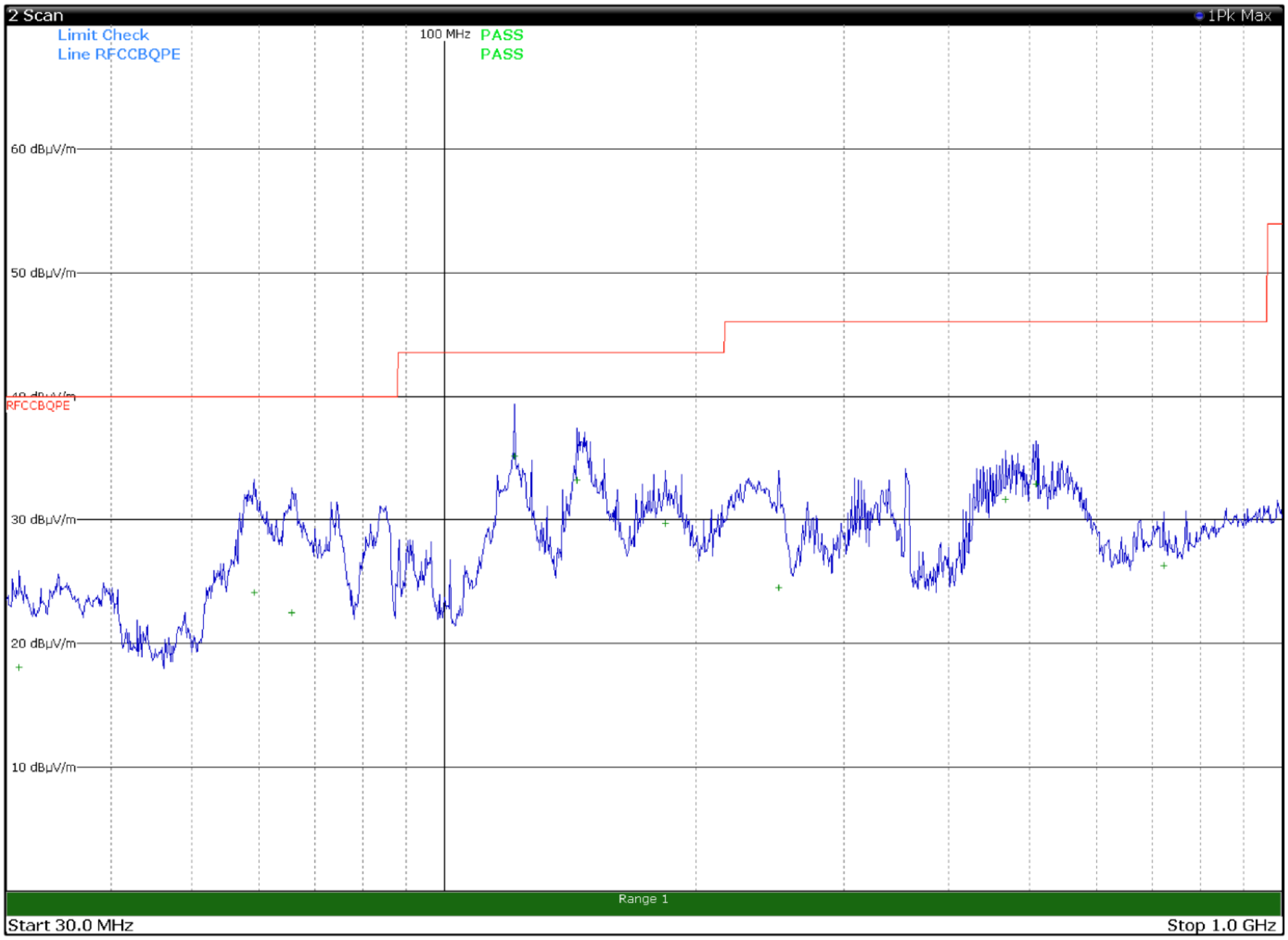


Figure 8.5-22: **Radiated spurious emissions for the BASE UNIT LEFT, high channel with antenna in vertical polarization**

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
31.0800	18.1	40.0	-21.9	QP
59.2800	24.2	40.0	-15.8	QP
65.7300	22.5	40.0	-17.5	QP
121.3500	35.2	43.5	-8.3	QP
143.9700	33.2	43.5	-10.3	QP
183.4800	29.8	43.5	-13.7	QP
250.8300	24.6	46.0	-21.4	QP
468.0000	31.7	46.0	-14.3	QP
508.0200	32.9	46.0	-13.1	QP
722.5500	26.3	46.0	-19.7	QP