Wireless test report

Type of assessment:

Final product testing

Report Reference No.:

REP103002

Applicant:

IDS GeoRadar s.r.l.
Via A. Righi 6, 6A, 8
56121 Pisa (PI) – Italy

Product name:

Interferometric radar sensor

Model:

IBIS3D

FCC ID:

UFW-IBIS3D

Specifications:

- FCC 47 CFR Part 90 Subpart F
  Radiolocation Service

Date of issue: June 27, 2025

Tested by	P. Barbieri	Signature:	Firmato digitalmente da Barbieri Paolo
Reviewed by	R. Giampaglia	Signature:	Firmato digitalmente da Giampaglia Roberto

Test location(s)

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	682159

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.

Copyright notification

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	IDS GeoRadar s.r.l.
Address	Via A. Righi 6, 6A, 8 56121 Pisa (PI) – Italy

1.2 Test specifications

FCC 47 CFR Part 90, Subpart F	Radiolocation Service

1.3 Test methods

ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.5 below. 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 #	Date of issue	Details of changes made to test report
REP103002	June 27, 2025	Original report issued

Section 2. Summary of test results

2.1 FCC Part 90 Subpart F test results

Table 2.1-1: *FCC Part 90 requirements results*

Part	Test description	Verdict
§90.205(r)	RF output power	Pass
§90.209	Occupied Bandwidth	Pass
§90.210(b)	Emission mask	Pass
§90.210(b)	Spurious emissions at antenna terminals	Pass
§90.210(b)	Field strength of spurious radiation	Pass
§90.213	Frequency stability	Pass

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	June 19, 2025
Testing start date	June 19, 2025
Testing termination date	June 26, 2025
Nemko sample ID number	PRJ0079739001

3.2 EUT information

Product name	Interferometric radar sensor
Model	IBIS3D

3.3 Technical information

Frequency	17.0 to 17.3 GHz
RF power Max (dBm)	21 dBm
Measured BW (MHz) (99%)	298.5 MHZ
Type of modulation	FMCW
Emission classification (F1D, G1D, D1D)	N0N
Power requirements	24 V DC
Antenna information	The EUT uses two patch antennas for the TX module and twelve patch antennas for the RX module. The two TX antennas work in time division, so no simultaneous transmission occurs.

3.4 EUT setup diagram

3.5 Product description and theory of operation

The EUT is a Frequency Modulated Continuous Wave (FMCW) coherent radar sensor and is composed by the following main functional blocks:

- A waveform generator giving as output the FMCW signal at low frequencies, configurable from 1GHz to 1.3GHz or 1.1GHz to 1.2GHz. The waveform generator start from a master clock at 250MHz and by a configurable DDS (driven by a 3.5 GHz clock derived from the master clock) generates the signal at low frequencies;
- An up conversion block converts the FMCW signal direct to RF frequencies;
- An amplification block amplifies the FMCW and a RF switch send the RF signals to two possible transmitting patch antenna (with a multiplexing time division);
- 12 receiving antennas are connected to 4 RF-RX switches that select 4 receiving parallel antennas (12 receiving antennas are selected with a multiplexing time division). All receiving RF parallel channel amplifies by a LNA (Low Noise Amplifier) the radio frequency signal detect by the receiving antenna;

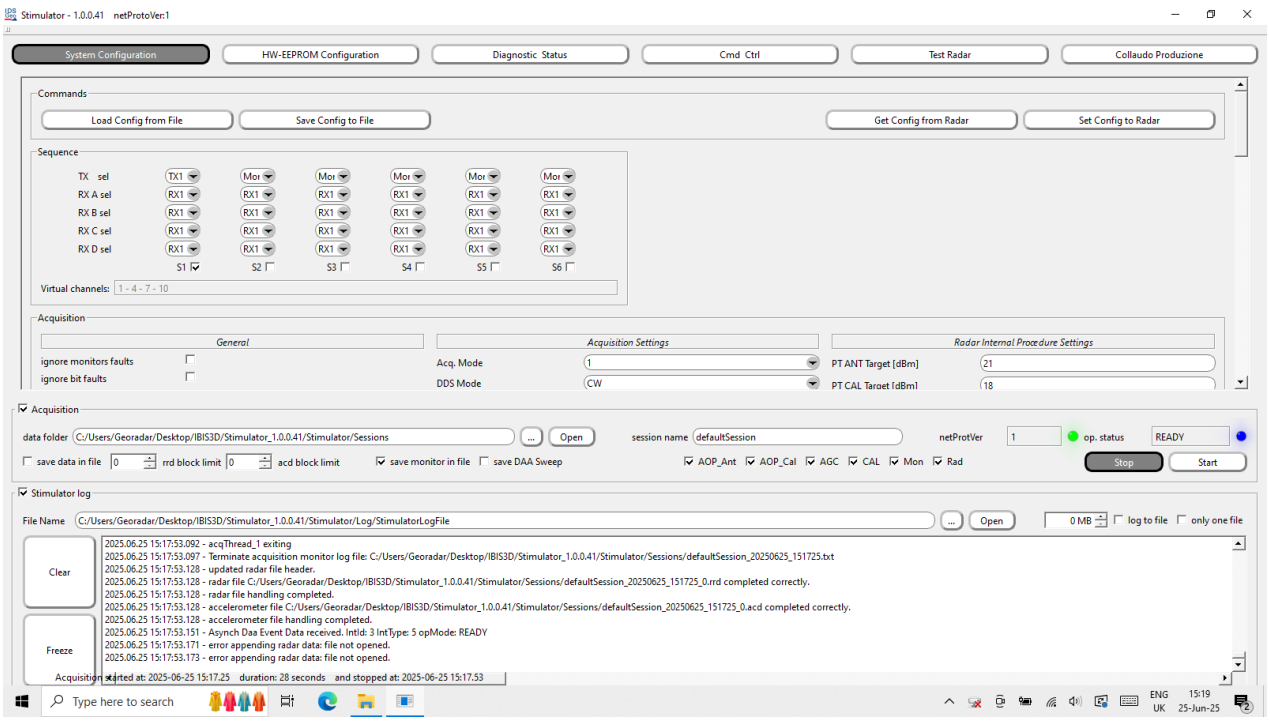
- A demodulation and down conversion block allows each channel to down-converts by direct conversion (real demodulator) the radio frequency signals. The base band signal is amplified, filtered and sent to the A/D conversion block;
- The A/D conversion block converts the received signal in digital;
- The digitized signal is then elaborated and transmitted to the personal computer through an Ethernet link;
- An accelerometer is used to detect the radar orientation (pitch and roll);
- A GPS is used to detect the UTC time of the radar and position;
- A magnetometer help to determine a rough radar yaw orientation;
- An encoder can be used to synchronize the acquisition to the encoder position.

It's consists of the following modules:

- RF Module: deals with the synthesis, amplification and transceiver of the radar signal. On transmitter it is equipped with an antenna selector to transmit the signal in time division on two antennas. On receiver it is equipped with 4 receivers in parallel and each has an antenna selector on top of three receiving antennas for MIMO acquisition.
- DIG Module: deals with external communication, configuration and management of the Radar Unit. It is equipped with a GPS, an accelerometer and a magnetometer. It also includes mounting via the connector of the EXP Module additional board
- EXP Module: Conditions and converts the video signal received by the RF module into digital. The converted video signal is sent to the DIG for primary processing of the radar data
- ANT TX and RX Module: Radar Unit board antennas (patch technology)

3.6 EUT exercise details

The following software has been used to set the EUT in continuous transmission mode:



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

No technical judgment

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	2025-01	2027-01
Thermo-hygrometer data loggers	Testo	175-H2	20013013/305	2025-01	2027-01
Barometer	Castle	GPB 3300	072015	2025-03	2026-03

5.2 Power supply range

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

EUT Power requirements:	☐ AC	☒ DC	☐ Battery
If EUT is an AC or a DC powered, was the noticeable output power variation observed?	☐ YES	☒ NO	☐ N/A
If EUT is battery operated, was the testing performed using fresh batteries?	☐ YES	☐ NO	☒ N/A
If EUT is rechargeable battery operated, was the testing performed using fully charged batteries?	☐ YES	☐ NO	☒ N/A

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, ETSI TR 100 028-1, ETSI TR 100 028-2 and other specific test standards and is documented in Nemko Spa working manuals WML1002 and WML0078.

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)

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. Testing data

7.1 RF power output

7.1.1 Definitions and limits

FCC § 90.205

Applicants for licenses must request and use no more power than the actual power necessary for satisfactory operation. Except where otherwise specifically provided for, the maximum power that will be authorized to applicants whose license applications for new stations are filed after August 18, 1995 is as follows:

(r) All other frequency bands. Requested transmitter power will be considered and authorized on a case by case basis.

7.1.2 Test date

Start date	June 26, 2025

7.1.3 Observations, settings and special notes

EUT tested at its maximum power output

7.1.4 Test equipment list

Table 7.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Spectrum Analyzer	Rohde & Schwarz	FSW43	101767	2025-01	2026-01
Coaxial cable	Rosenberger	ST.ALO-02	1.650	2024-12	2025-12

7.1.5 Test data

Table 7.1-2: *RF power output*

Frequency	Conducted output power TX1	Conducted output power TX2
17.00 GHz	20.8 dBm	20.6 dBm
17.15 GHz	21.0 dBm	21.0 dBm
17.30 GHz	20.7 dBm	20.7 dBm

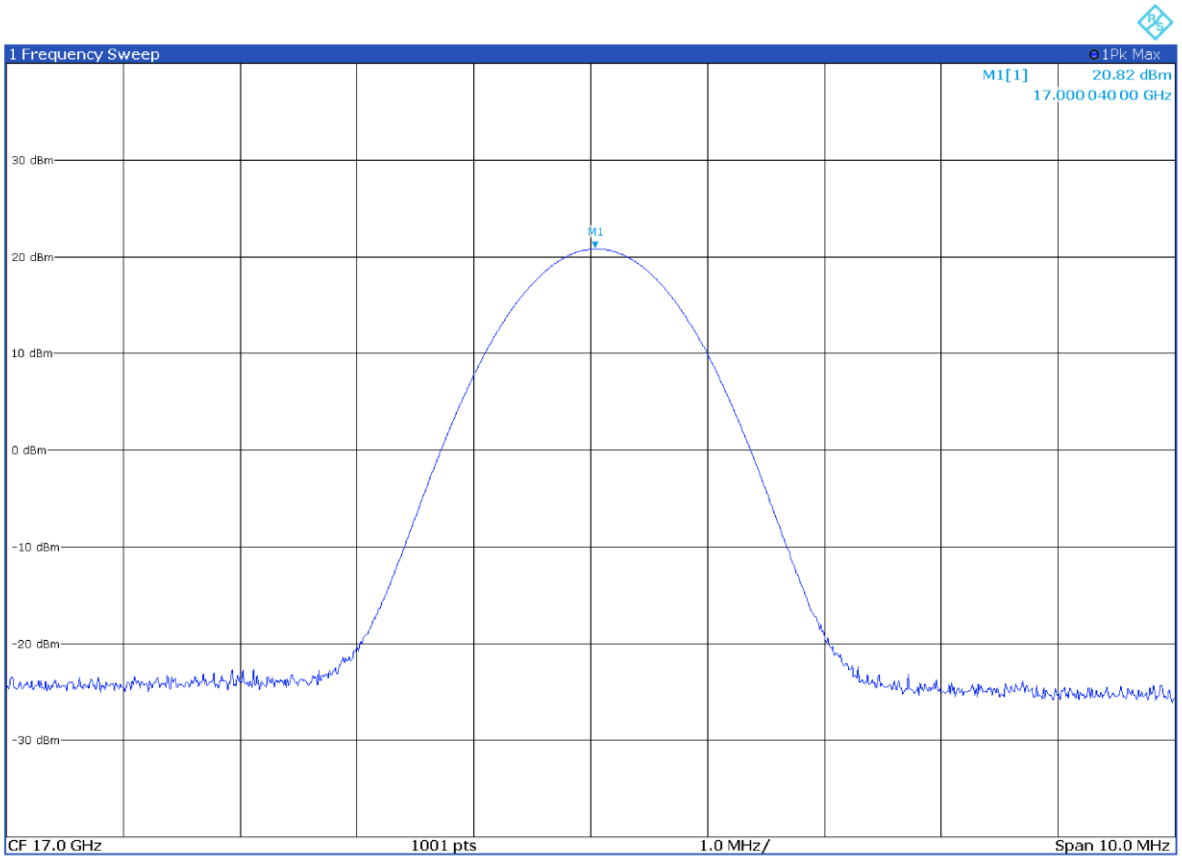


Figure 7.1-1: *RF power output @ low channel (TX1)*

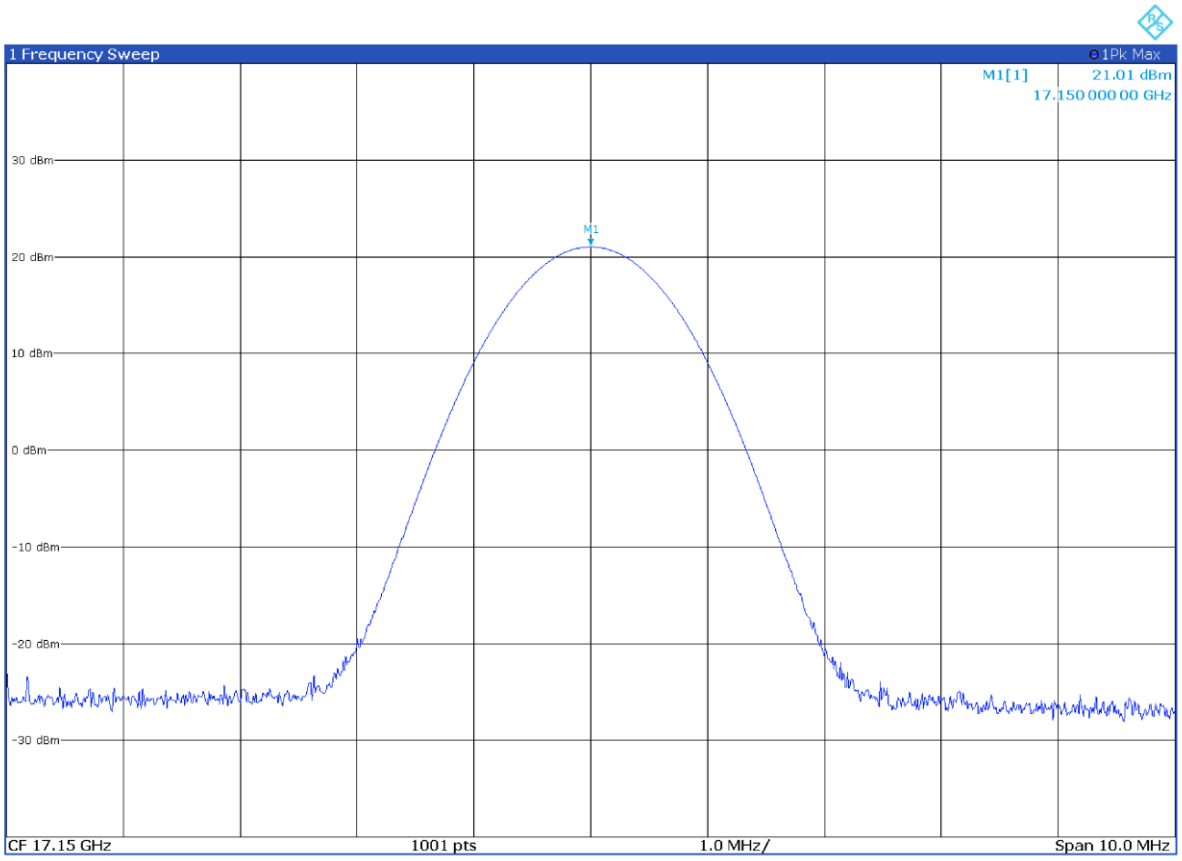


Figure 7.1-2: *RF power output @ mid channel (TX1)*

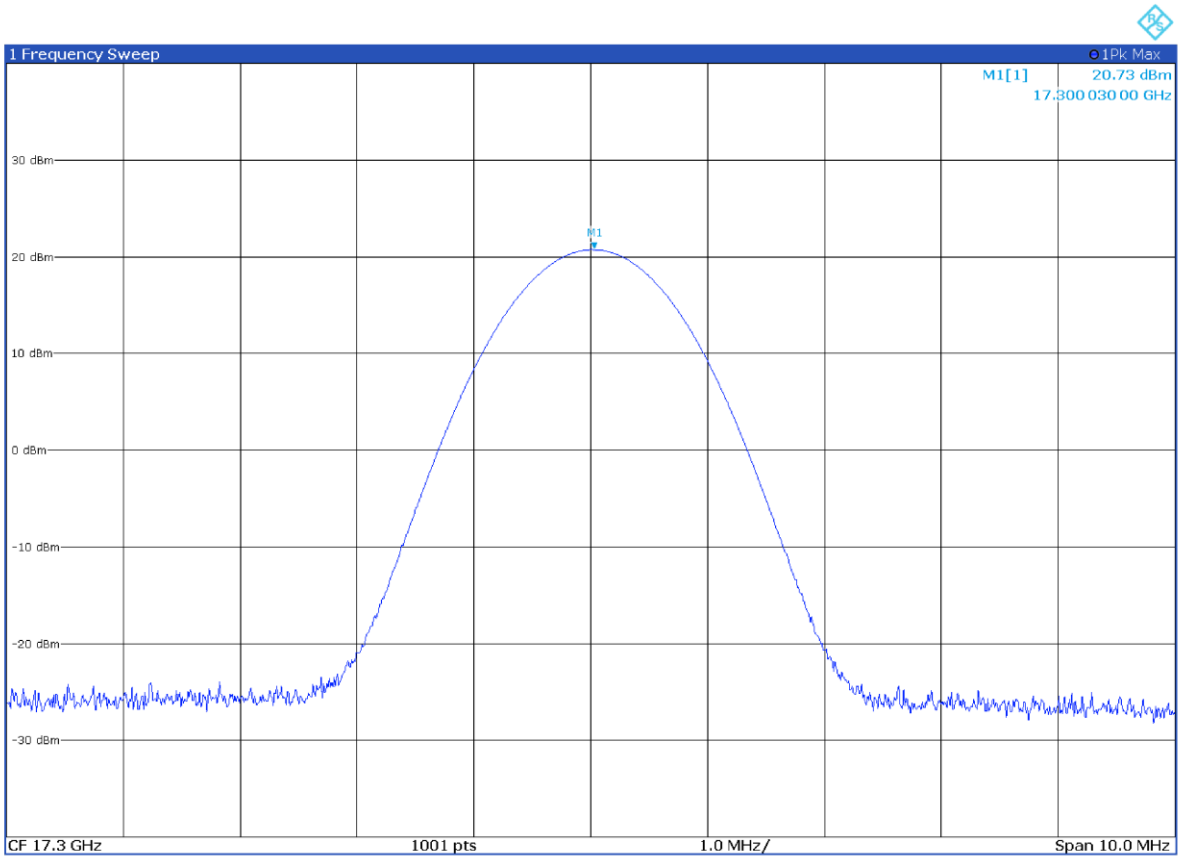


Figure 7.1-3: *RF power output @ high channel (TX1)*

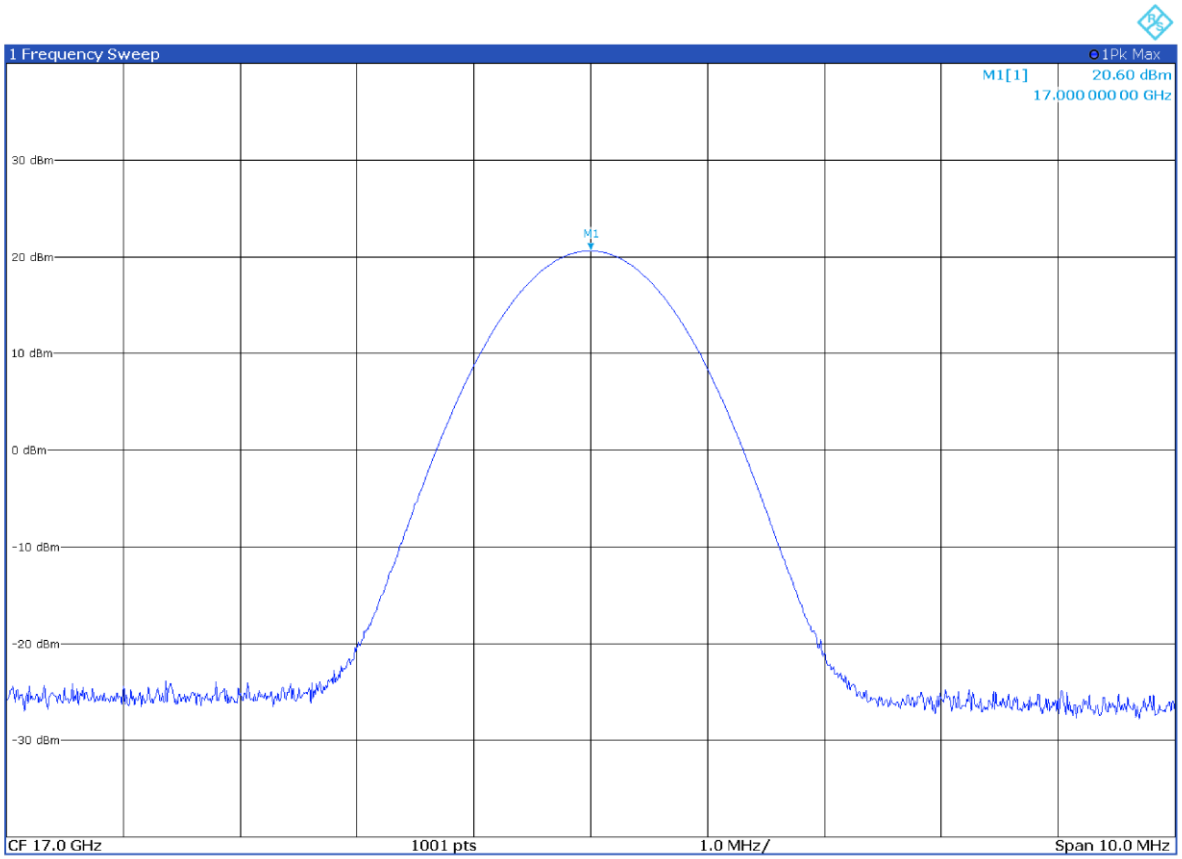


Figure 7.1-4: *RF power output @ low channel (TX2)*

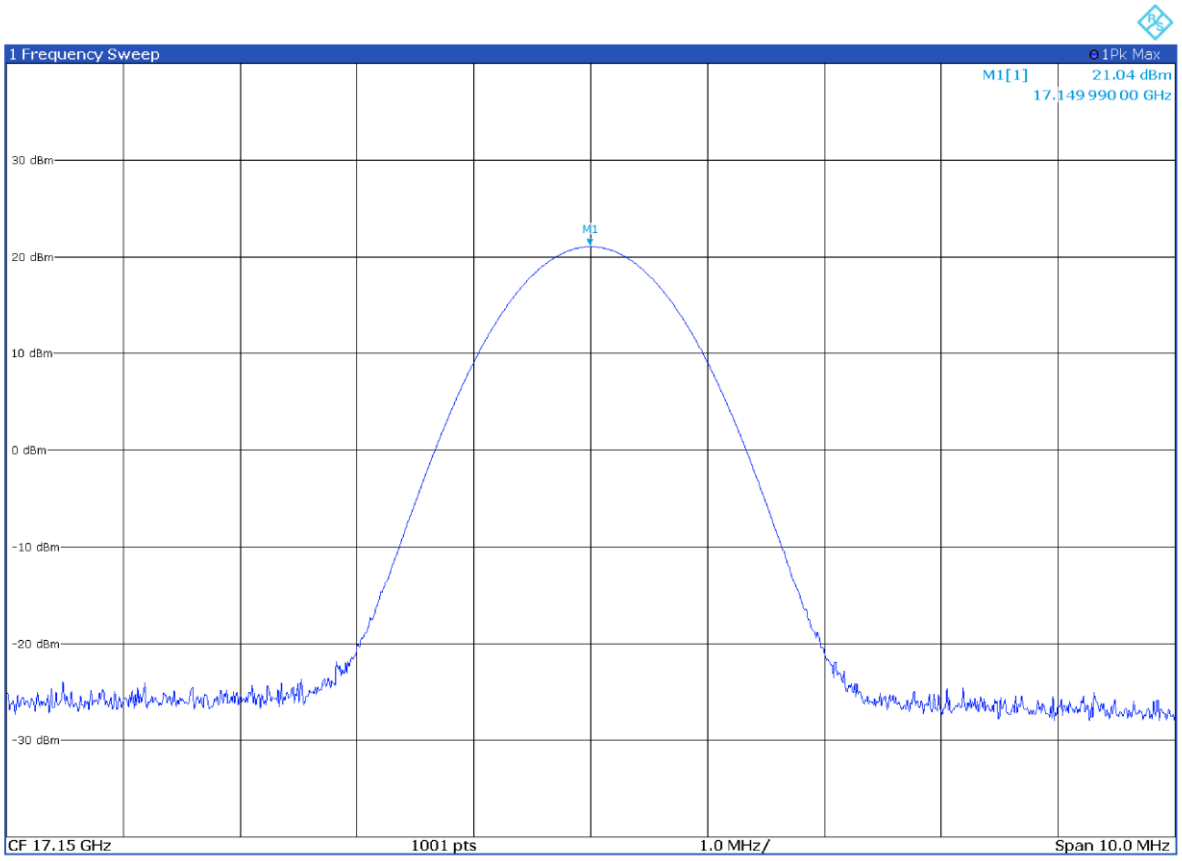


Figure 7.1-5: *RF power output @ mid channel (TX2)*

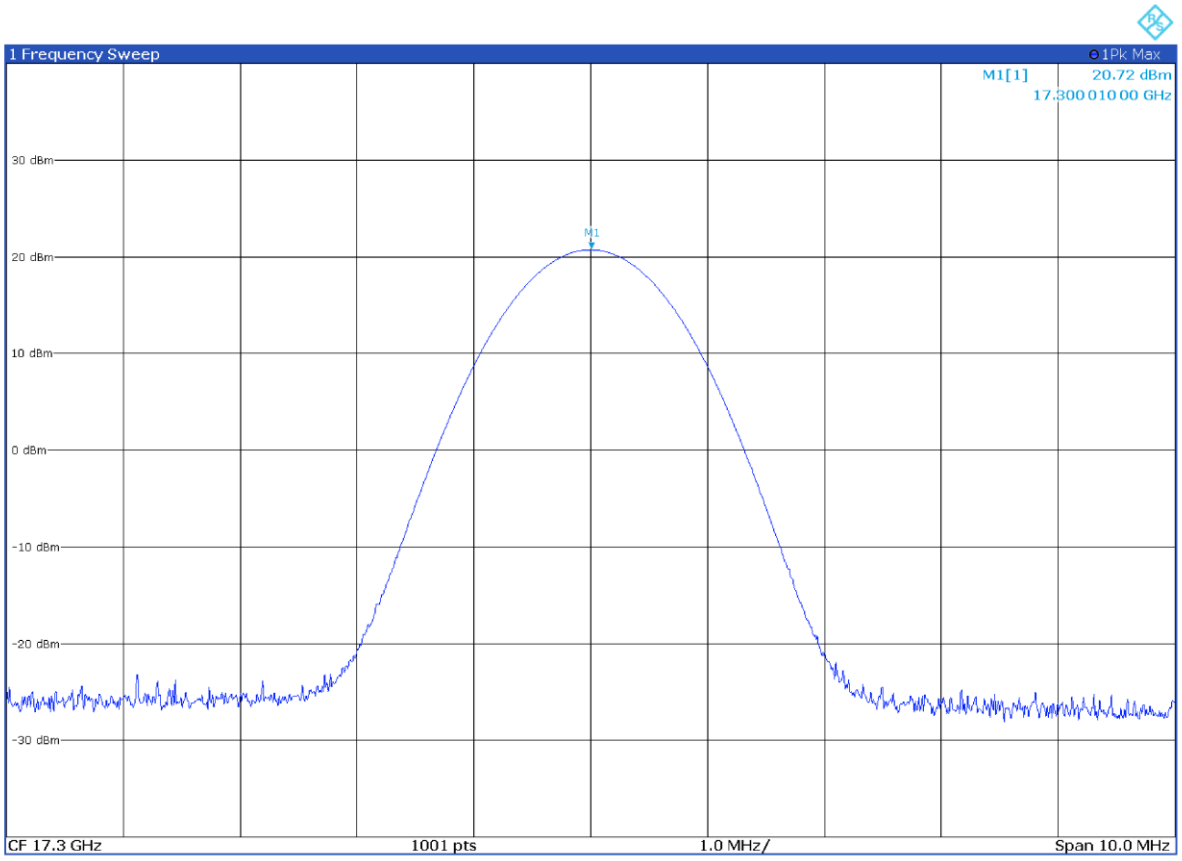


Figure 7.1-6: *RF power output @ high channel (TX2)*

7.2 Occupied bandwidth

7.2.1 Definitions and limits

FCC §90.209:

(a) Each authorization issued to a station licensed under this part will show an emission designator representing the class of emission authorized. The designator will be prefixed by a specified necessary bandwidth. This number does not necessarily indicate the bandwidth occupied by the emission at any instant. In those cases where § 2.202 of this chapter does not provide a formula for the computation of necessary bandwidth, the occupied bandwidth, as defined in part 2 of this chapter, may be used in lieu of the necessary bandwidth.

(b) The maximum authorized single channel bandwidth of emission corresponding to the type of emission specified in § 90.207 is as follows:

(1) For A1A or A1B emissions, the maximum authorized bandwidth is 0.25 kHz. The maximum authorized bandwidth for type A3E emission is 8 kHz.

(2) For operations below 25 MHz utilizing J3E emission, the bandwidth occupied by the emission shall not exceed 3000 Hz. The assigned frequency will be specified in the authorization. The authorized carrier frequency will be 1400 Hz lower in frequency than the assigned frequency. Only upper sideband emission may be used. In the case of regularly available double sideband radiotelephone channels, an assigned frequency for J3E emissions is available either 1600 Hz below or 1400 Hz above the double sideband radiotelephone assigned frequency.

(3) For all other types of emissions, the maximum authorized bandwidth shall not be more than that normally authorized for voice operations.

(4) Where a frequency is assigned exclusively to a single licensee, more than a single emission may be used within the authorized bandwidth. In such cases, the frequency stability requirements of § 90.213 must be met for each emission.

(5) Unless specified elsewhere, channel spacings and bandwidths that will be authorized in the following frequency bands are given in the following table.

TABLE 1 TO § 90.209(b)(5)—STANDARD CHANNEL SPACING/BANDWIDTH

Frequency band (MHz)	Channel spacing (kHz)	Authorized bandwidth (kHz)
Below 25 [2]		
25-50	20	20
72-76	20	20
150-174	[1] 7.5	[1 3] 20/11.25/6
216-220 [5]	6.25	20/11.25/6
220-222	5	4
406-512 [2]	[1] 6.25	[1 3 6] 20/11.25/6
806-809/851-854	12.5	20
809-817/854-862	12.5	[6] 20/11.25
817-824/862-869	25	[6] 20
896-901/935-940	12.5	13.6
902-928 [4]		
929-930	25	20
1427-1432 [5]	12.5	12.5
[3] 2450-2483.5 [2]		
Above 2500 [2]		

[1] For stations authorized on or after August 18, 1995.

[2] Bandwidths for radiolocation stations in the 420-450 MHz band and for stations operating in bands subject to this footnote will be reviewed and authorized on a case-by-case basis.

[3] Operations using equipment designed to operate with a 25 kHz channel bandwidth will be authorized a 20 kHz bandwidth. Operations using equipment designed to operate with a 12.5 kHz channel bandwidth will be authorized a 11.25 kHz bandwidth. Operations using equipment designed to operate with a 6.25 kHz channel bandwidth will be authorized a 6 kHz bandwidth. All stations must operate on channels with a bandwidth of 12.5 kHz or less beginning January 1, 2013, unless the operations meet the efficiency standard of § 90.203(j)(3).

[4] The maximum authorized bandwidth shall be 12 MHz for non-multilateration LMS operations in the band 909.75-921.75 MHz and 2 MHz in the band 902.00-904.00 MHz. The maximum authorized bandwidth for multilateration LMS operations shall be 5.75 MHz in the 904.00-909.75 MHz band; 2 MHz in the 919.75-921.75 MHz band; 5.75 MHz in the 921.75-927.25 MHz band and its associated 927.25-927.50 MHz narrowband forward link; and 8.00 MHz if the 919.75-921.75 MHz and 921.75-927.25 MHz bands and their associated 927.25-927.50 MHz and 927.50-927.75 MHz narrowband forward links are aggregated.

[5] See § 90.259.

[6] Operations using equipment designed to operate with a 25 kilohertz channel bandwidth may be authorized up to a 20 kilohertz bandwidth unless the equipment meets the Adjacent Channel Power limits of § 90.221 in which case operations may be authorized up to a 22 kilohertz bandwidth. Operations using equipment designed to operate with a 12.5 kilohertz channel bandwidth may be authorized up to an 11.25 kilohertz bandwidth.

(6)(i) Beginning January 1, 2011, no new applications for the 150-174 MHz and/or 421-512 MHz bands will be acceptable for filing if the applicant utilizes channels with an authorized bandwidth exceeding 11.25 kHz, unless specified elsewhere or the operations meet the efficiency standards of § 90.203(j)(3).

(6)(ii) Beginning January 1, 2011, no modification applications for stations in the 150-174 MHz and/or 421-512 MHz bands that increase the station's authorized interference contour, will be acceptable for filing if the applicant utilizes channels with an authorized bandwidth exceeding 11.25 kHz, unless specified elsewhere or the operations meet the efficiency standards of § 90.203(j)(3). See § 90.187(b)(2)(iii) and (iv) for interference contour designations and calculations. Applications submitted pursuant to this paragraph must comply with frequency coordination requirements of § 90.175.

(7) Economic Area (EA)-based licensees in frequencies 817-824/862-869 MHz (813.5-824/858.5-869 MHz in the counties listed in § 90.614(c)) may exceed the standard channel spacing and authorized bandwidth listed in paragraph (b)(5) of this section in any National Public Safety Planning Advisory Committee Region when all 800 MHz public safety licensees in the Region have completed band reconfiguration consistent with this part. In any National Public Safety Planning Advisory Committee Region where the 800 MHz band reconfiguration is incomplete, EA-based licensees in frequencies 817-821/862-866 MHz (813.5-821/858.5-866 MHz in the counties listed in § 90.614(c)) may exceed the standard channel spacing and authorized bandwidth listed in paragraph (b)(5) of this section. Upon all 800 MHz public safety licensees in a National Public Safety Planning Advisory Committee Region completing band reconfiguration, EA-based 800 MHz SMR licensees in the 821-824/866-869 MHz band may exceed the channel spacing and authorized bandwidth in paragraph (b)(5) of this section. Licensees authorized to exceed the standard channel spacing and authorized bandwidth under this paragraph must provide at least 30 days written notice prior to initiating such service in the bands listed herein to every 800 MHz public safety licensee with a base station in an affected National Public Safety Planning Advisory Committee Region, and every 800 MHz public safety licensee with a base station within 113 kilometers (70 miles) of an affected National Public Safety Planning Advisory Committee Region. Such notice shall include the estimated date upon which the EA-based 800 MHz SMR licensee intends to begin operations that exceed the channel spacing and authorized bandwidth in paragraph (b)(5) of this section.

(8) Applicants may begin to license 12.5 kilohertz bandwidth channels in the 809-817/854-862 MHz band segment only after the Wireless Telecommunications Bureau and the Public Safety and Homeland Security Bureau jointly release a public notice announcing the availability of those channels for licensing in a National Public Safety Planning Advisory Committee region.

7.2.2 Test date

Start date	June 24, 2025

7.2.3 Observations, settings and special notes

Spectrum analyser settings:

Resolution bandwidth	≥ 1 % of emission bandwidth
Video bandwidth	≥ 3 × RBW
Frequency span	Wider than emission bandwidth
Detector mode	Peak

7.2.4 Test equipment list

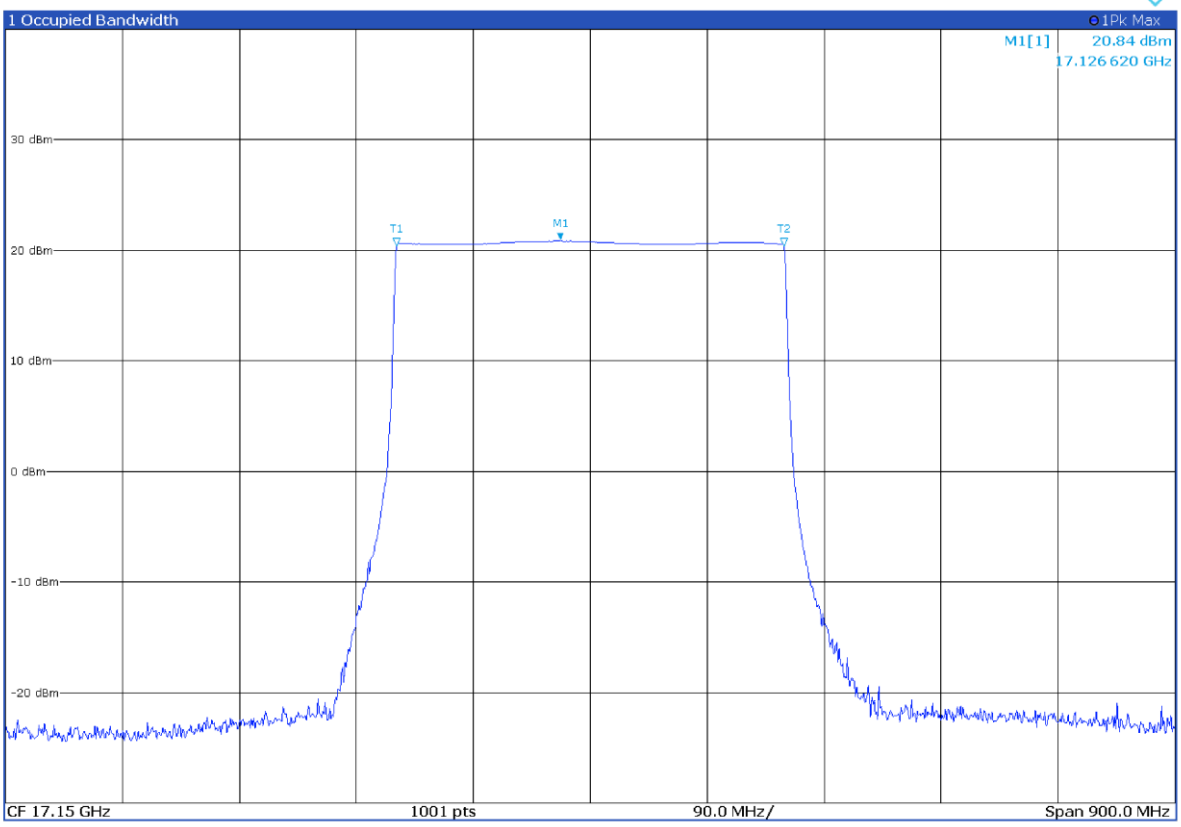
Table 7.2-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Spectrum Analyzer	Rohde & Schwarz	FSW43	101767	2025-01	2026-01
Coaxial cable	Rosenberger	ST.ALO-02	1.650	2024-12	2025-12

7.2.5 Test data

Table 7.2-2: *Occupied bandwidth*

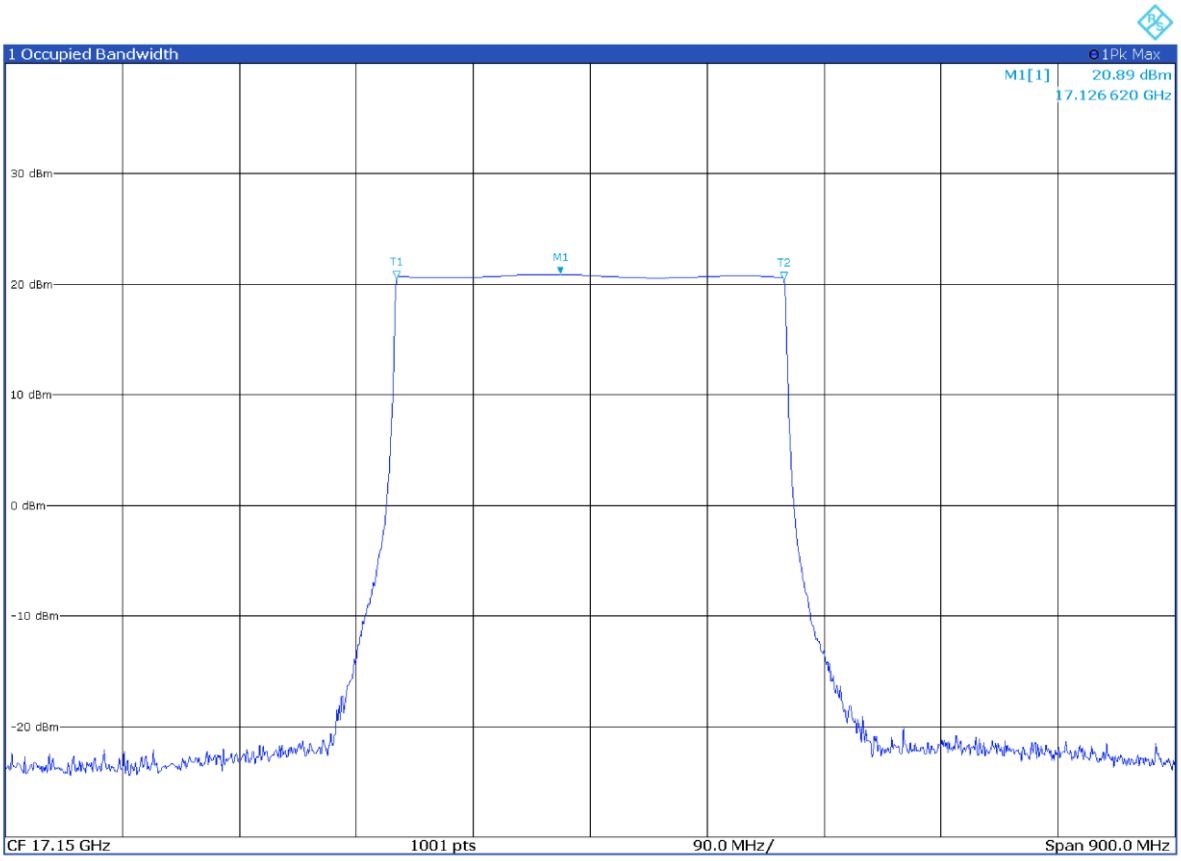
Frequency	Occupied bandwidth TX1	Occupied bandwidth TX2
17.0 to 17.3 GHz	298.5 MHz	298.4 MHz



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**17.126 62 GHz**	**20.84 dBm**	Occ Bw	**298.527 776 56 MHz**
T1		1	17.000 791 GHz	20.41 dBm	Occ Bw Centroid	17.150 055 355 GHz
T2		1	17.299 319 GHz	20.41 dBm	Occ Bw Freq Offset	55.354 995 615 kHz

Figure 7.2-1: *Occupied bandwidth (TX1)*



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**17.126 62 GHz**	**20.89 dBm**	Occ Bw	**298.426 943 66 MHz**
T1		1	17.000 864 GHz	20.47 dBm	Occ Bw Centroid	17.150 077 089 GHz
T2		1	17.299 291 GHz	20.39 dBm	Occ Bw Freq Offset	77.089 176 832 kHz

Figure 7.2-2: *Occupied bandwidth (TX2)*

7.3 Spurious emissions at antenna terminals and emission mask

7.3.1 Definitions and limits

FCC §90.210 (b):

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (o) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating under this part.

(b) Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

7.3.2 Test date

Start date	June 24, 2025

7.3.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to 90 GHz (5th harmonic)

Spectrum analyzer settings for peak radiated measurements below 1000 MHz

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

Spectrum analyzer settings for peak radiated measurements above 1000 MHz

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

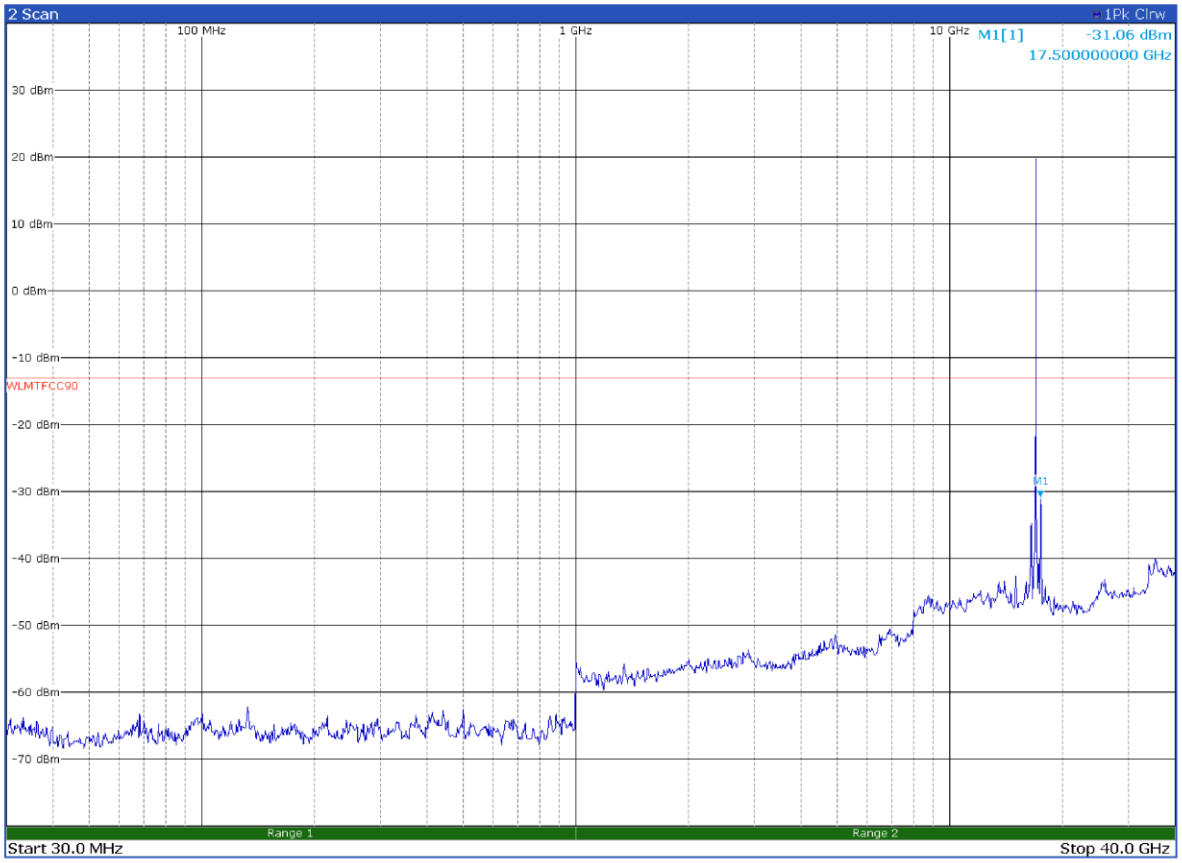
7.3.4 Test equipment list

Table 7.3-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI Receiver	Rohde & Schwarz	ESW44	101620	2024-09	2025-09
Coaxial cable	Rosenberger	ST.ALO-02	1.650	2024-12	2025-12

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

7.3.5 Test data



Limit exceeded by the carrier

Figure 7.3-1: *Conducted emission on low channel (TX1)*

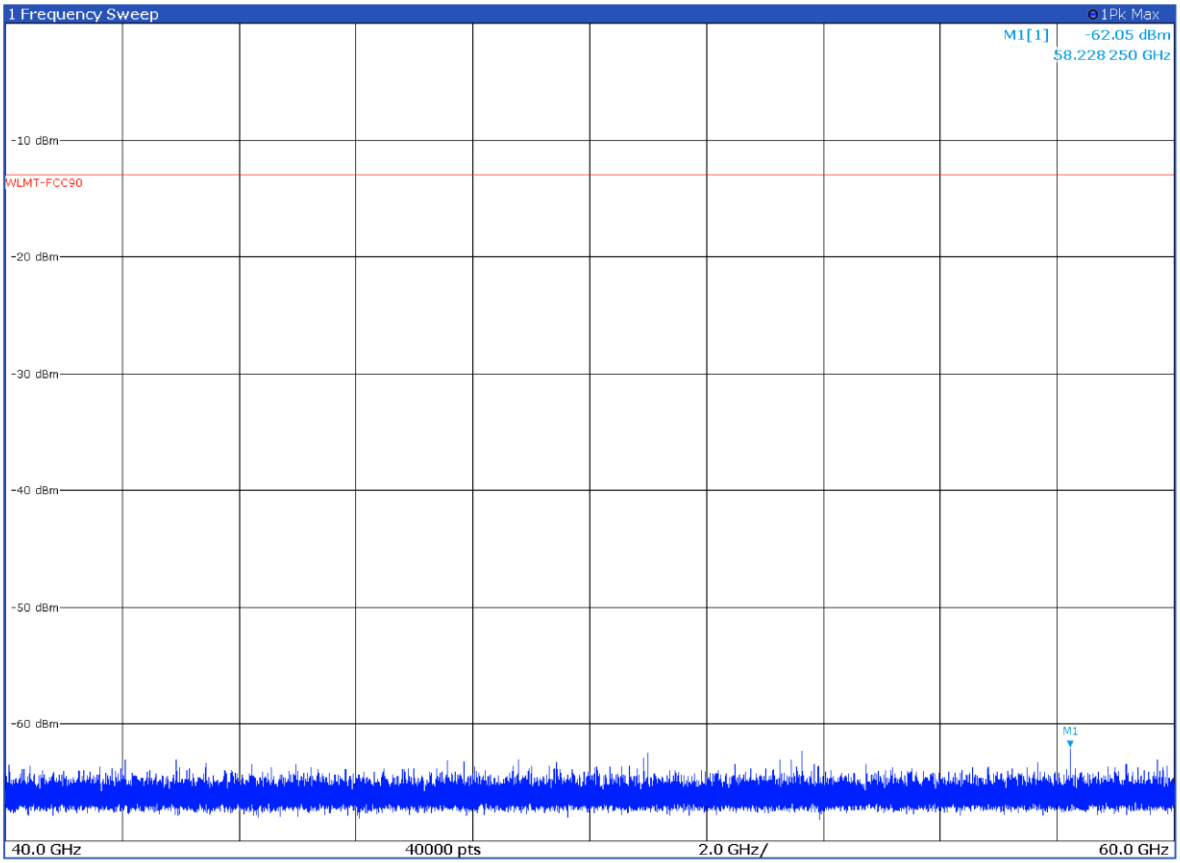


Figure 7.3-2: *Conducted emission on low channel (TX1)*

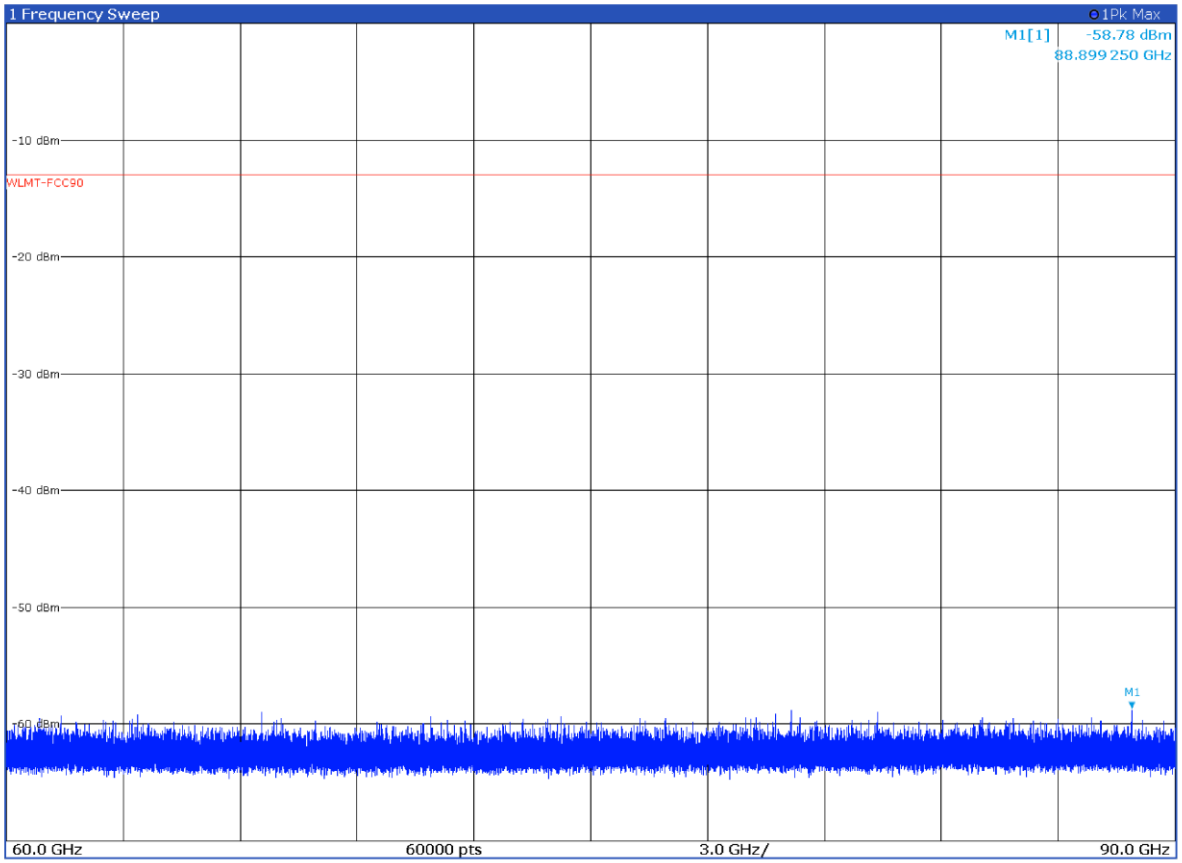
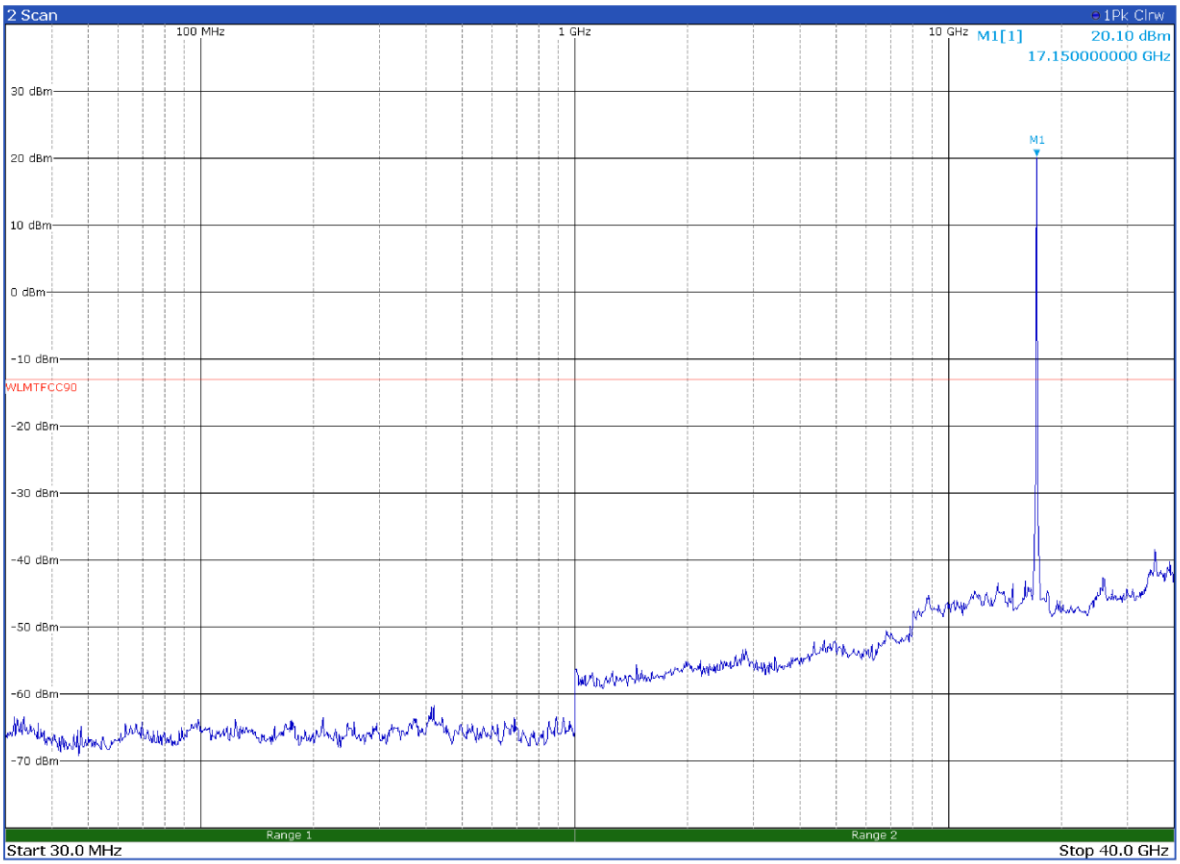


Figure 7.3-3: *Conducted emission on low channel (TX1)*



Limit exceeded by the carrier

Figure 7.3-4: *Conducted emission on mid channel (TX1)*

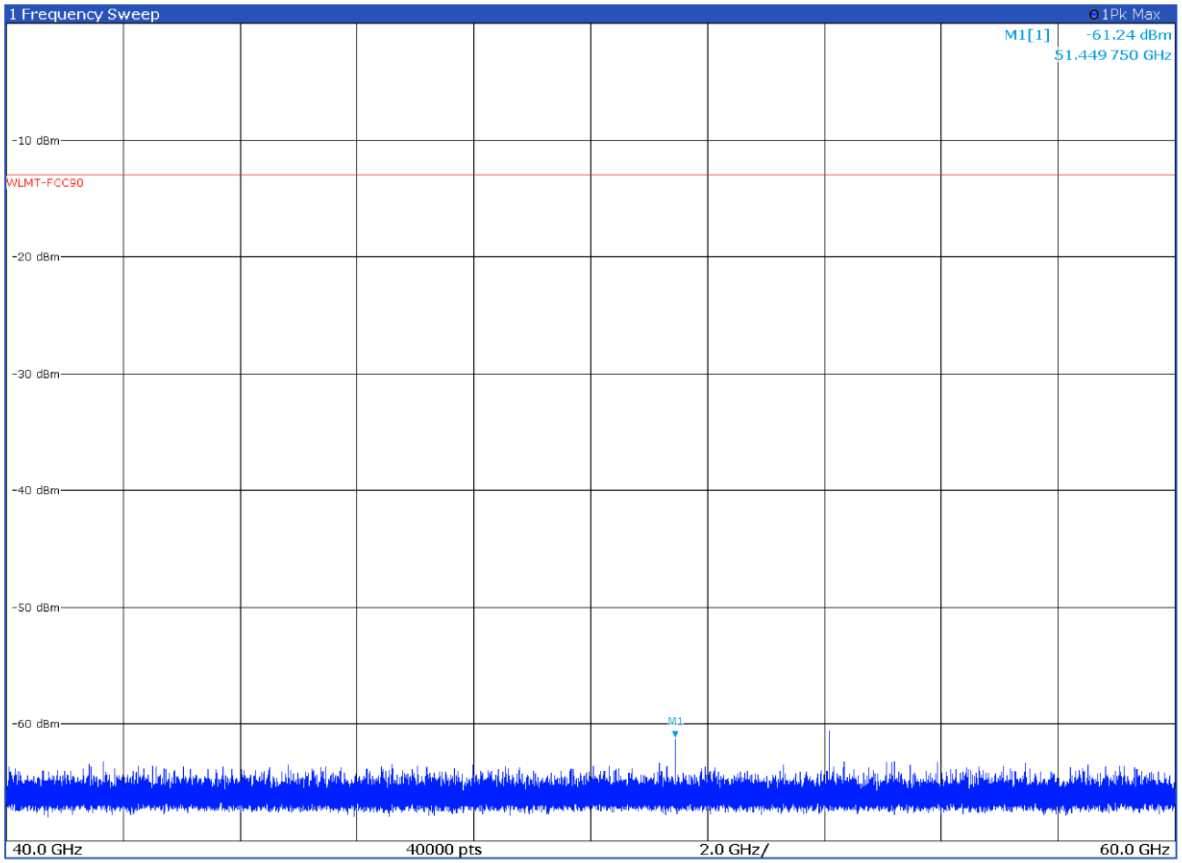


Figure 7.3-5: *Conducted emission on mid channel (TX1)*

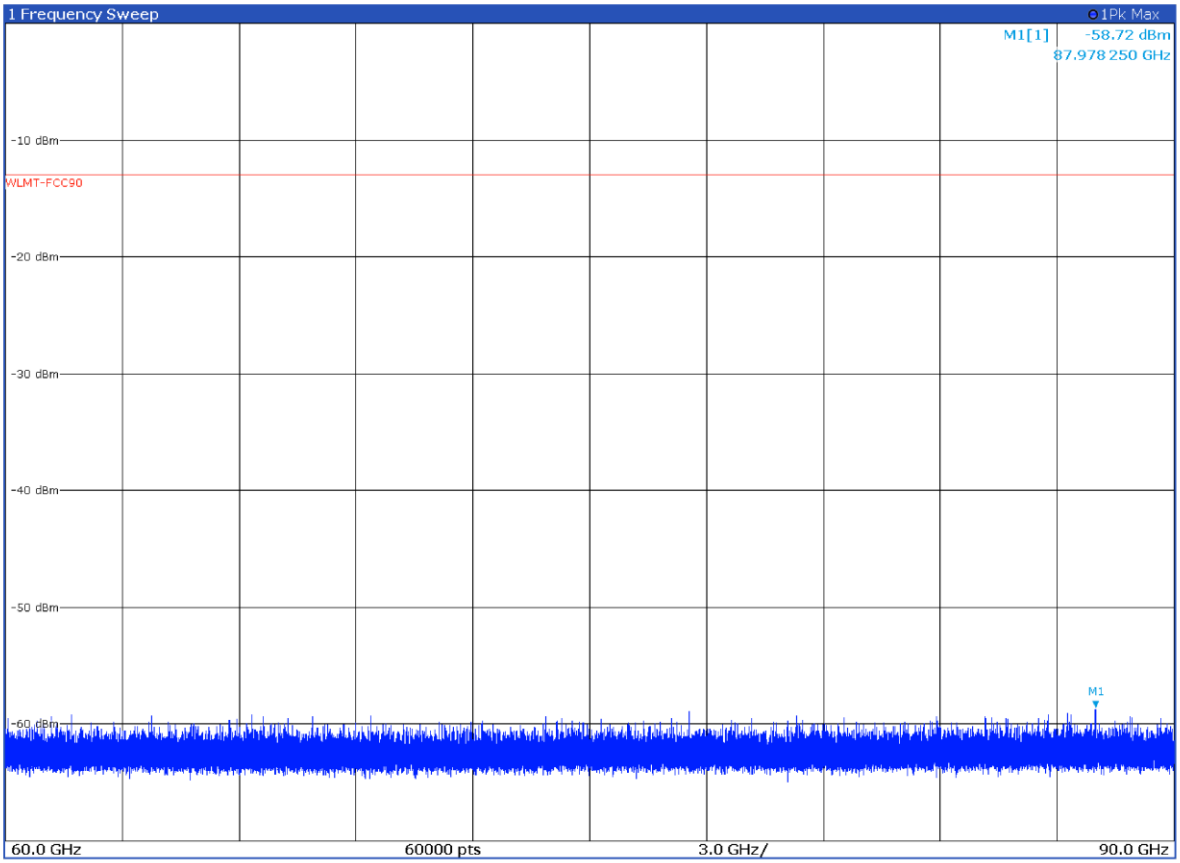
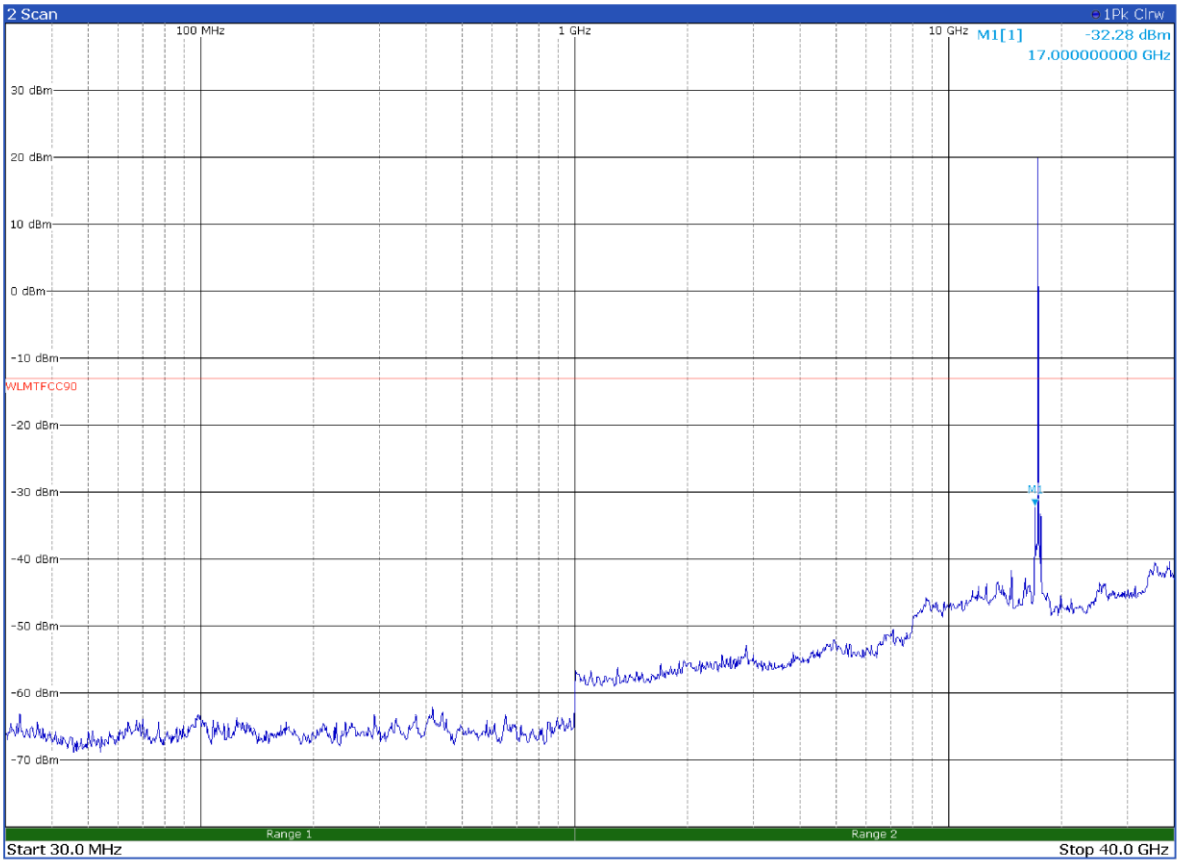


Figure 7.3-6: *Conducted emission on mid channel (TX1)*



Limit exceeded by the carrier

Figure 7.3-7: *Conducted emission on high channel (TX1)*

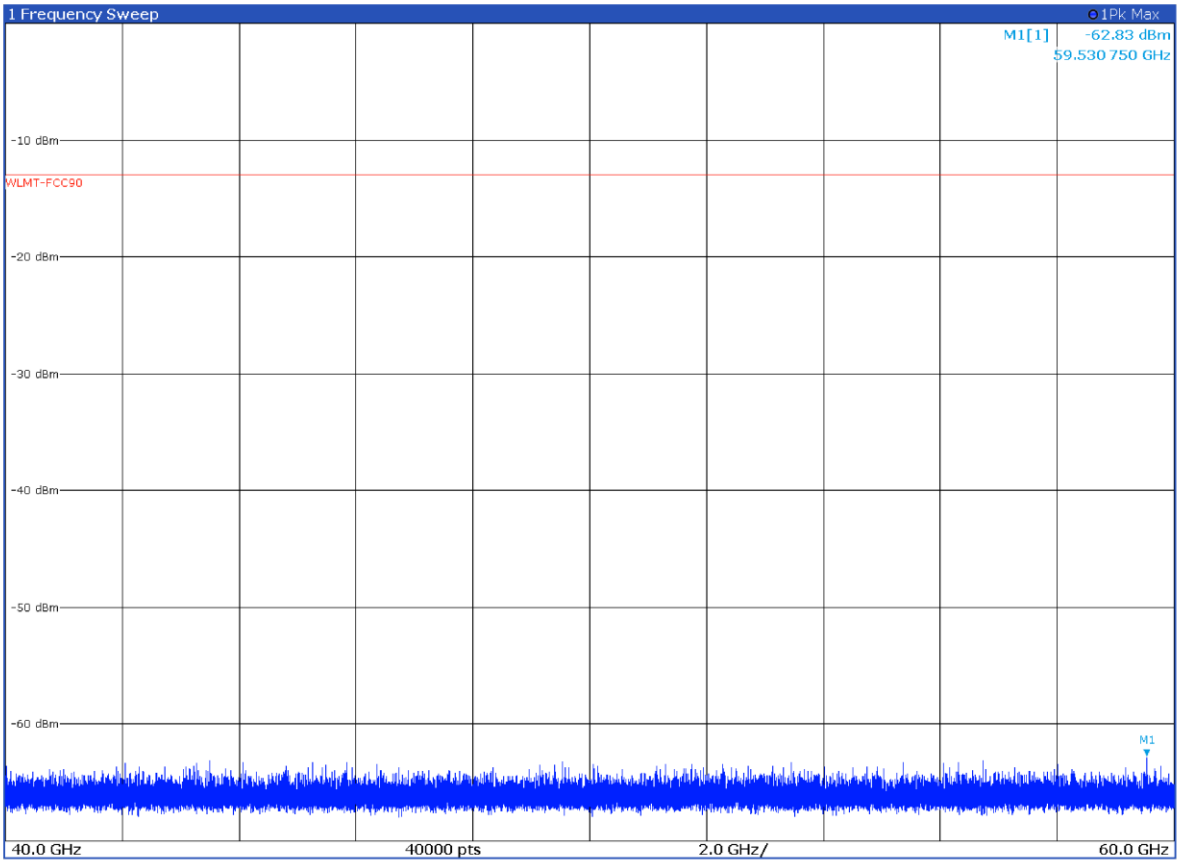


Figure 7.3-8: *Conducted emission on high channel (TX1)*

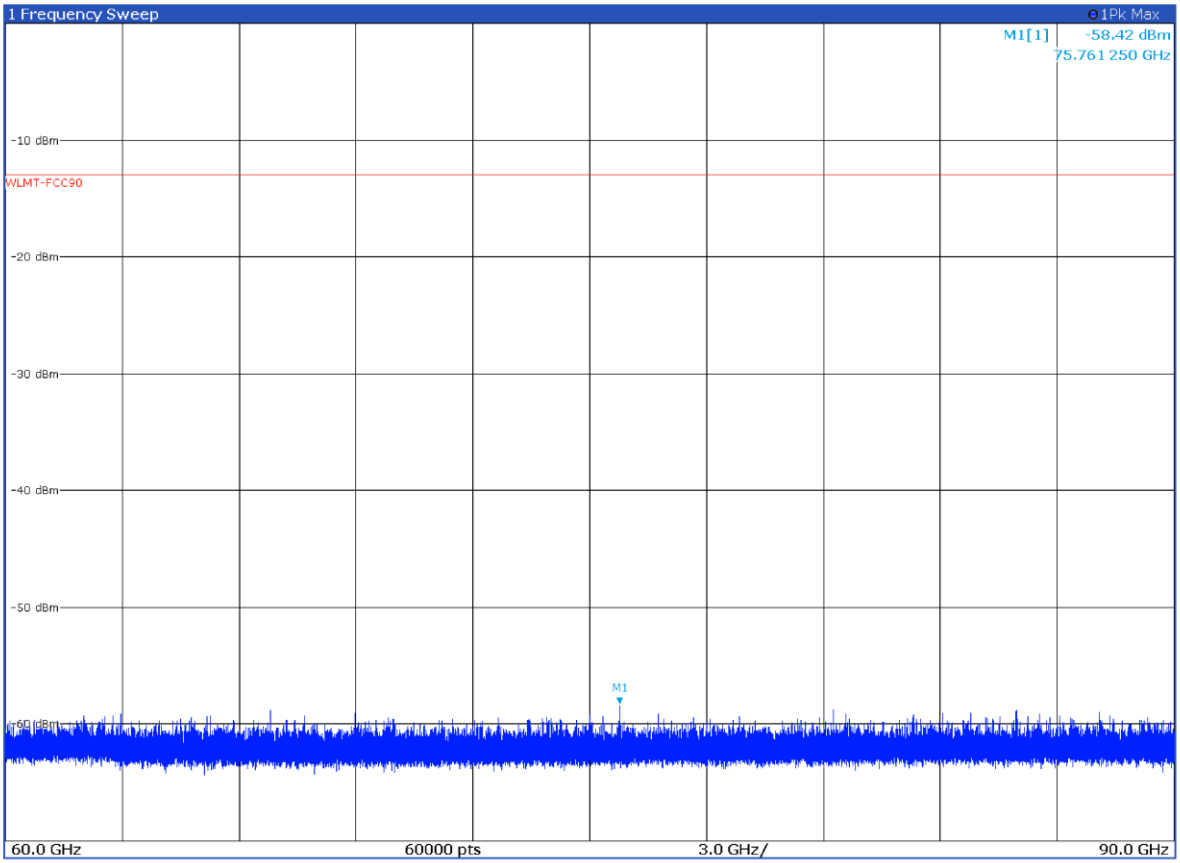


Figure 7.3-9: *Conducted emission on high channel (TX1)*

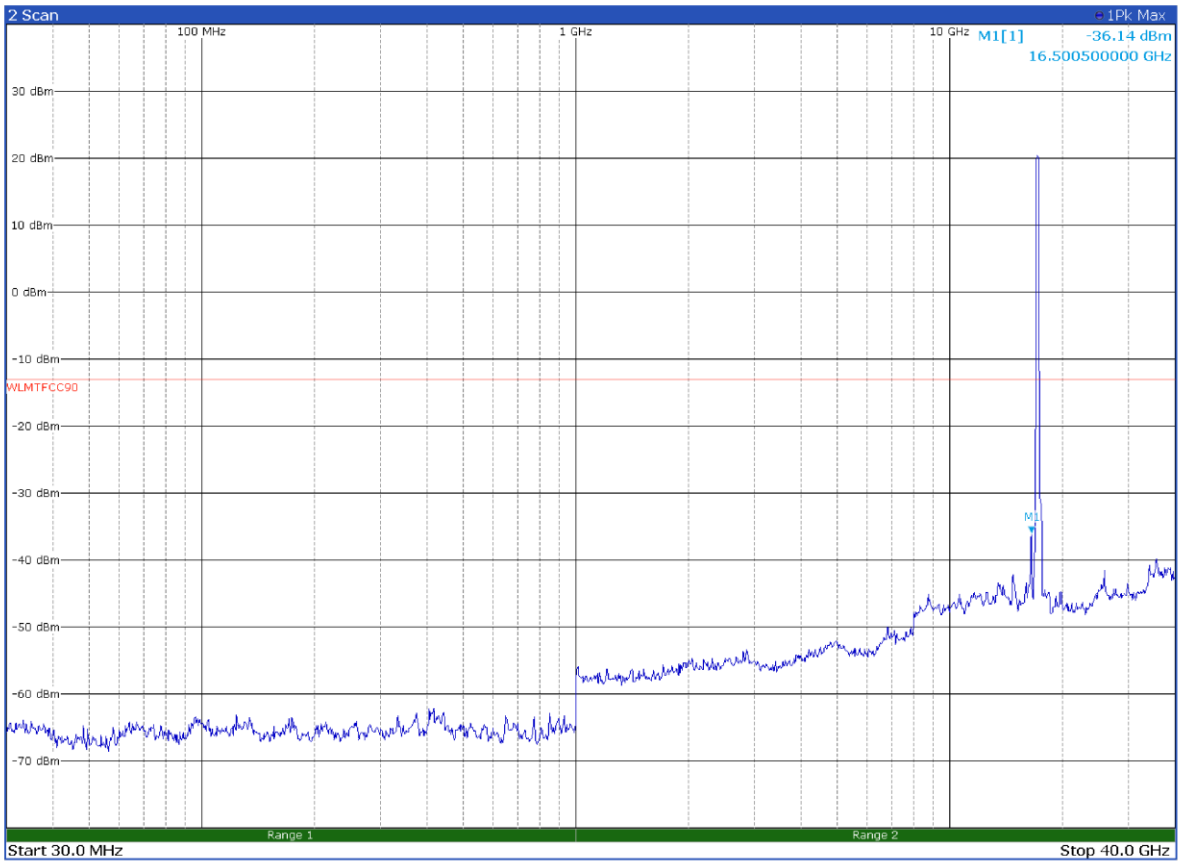


Figure 7.3-10: *Conducted emission in FMCW (TX1)*

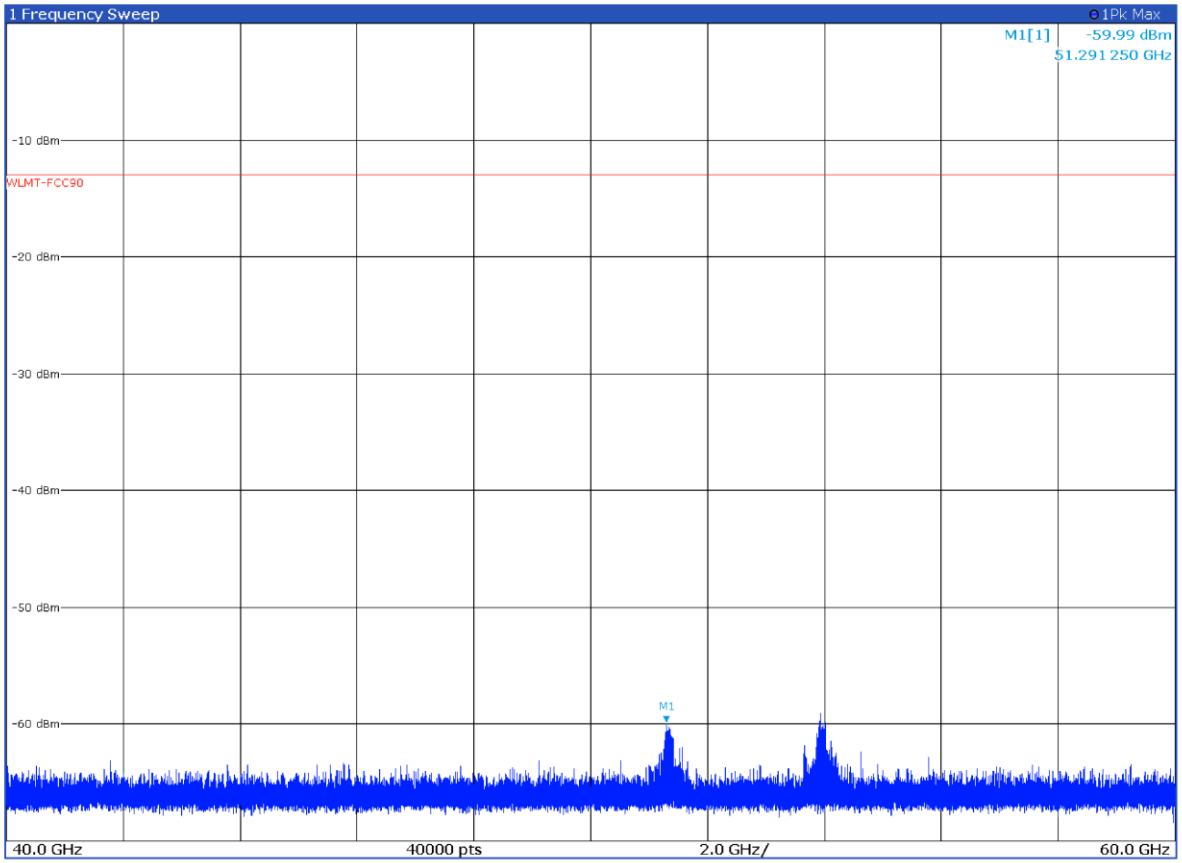


Figure 7.3-11: *Conducted emission in FMCW (TX1)*

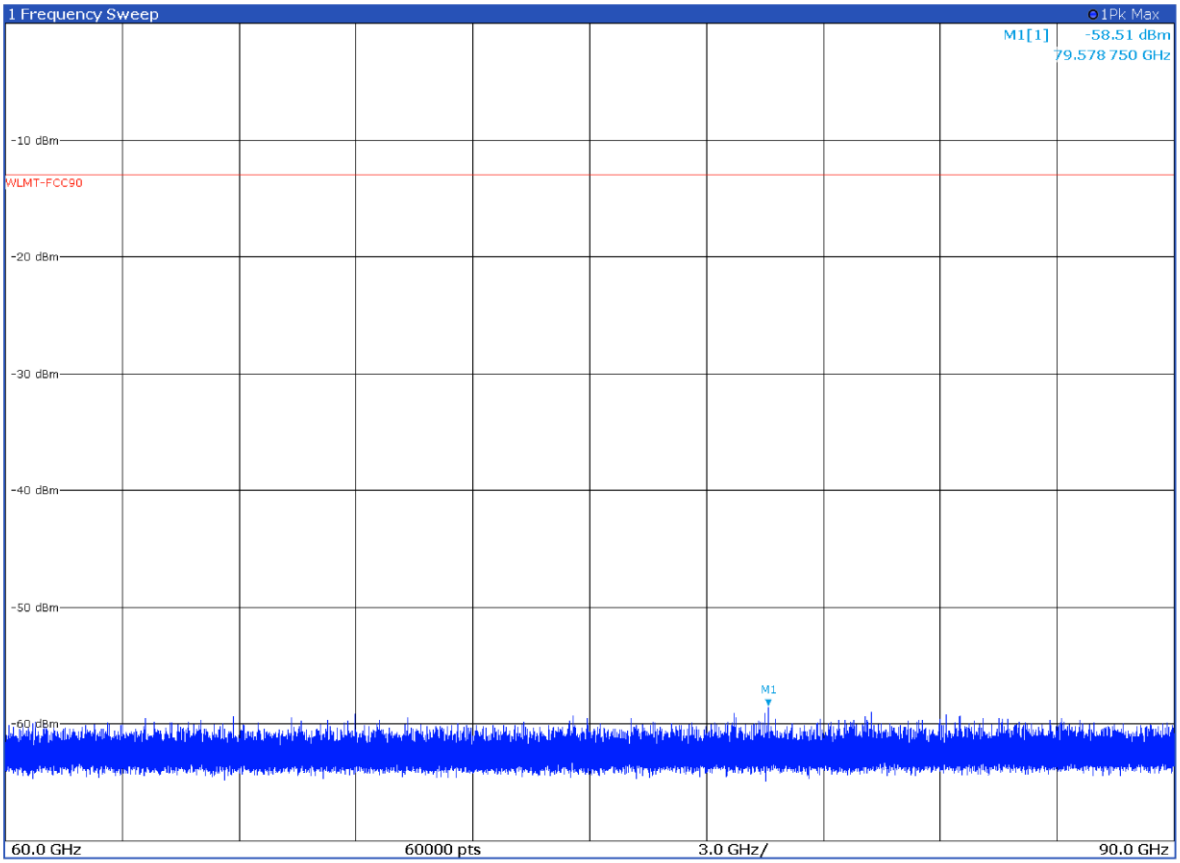


Figure 7.3-12: *Conducted emission in FMCW (TX1)*

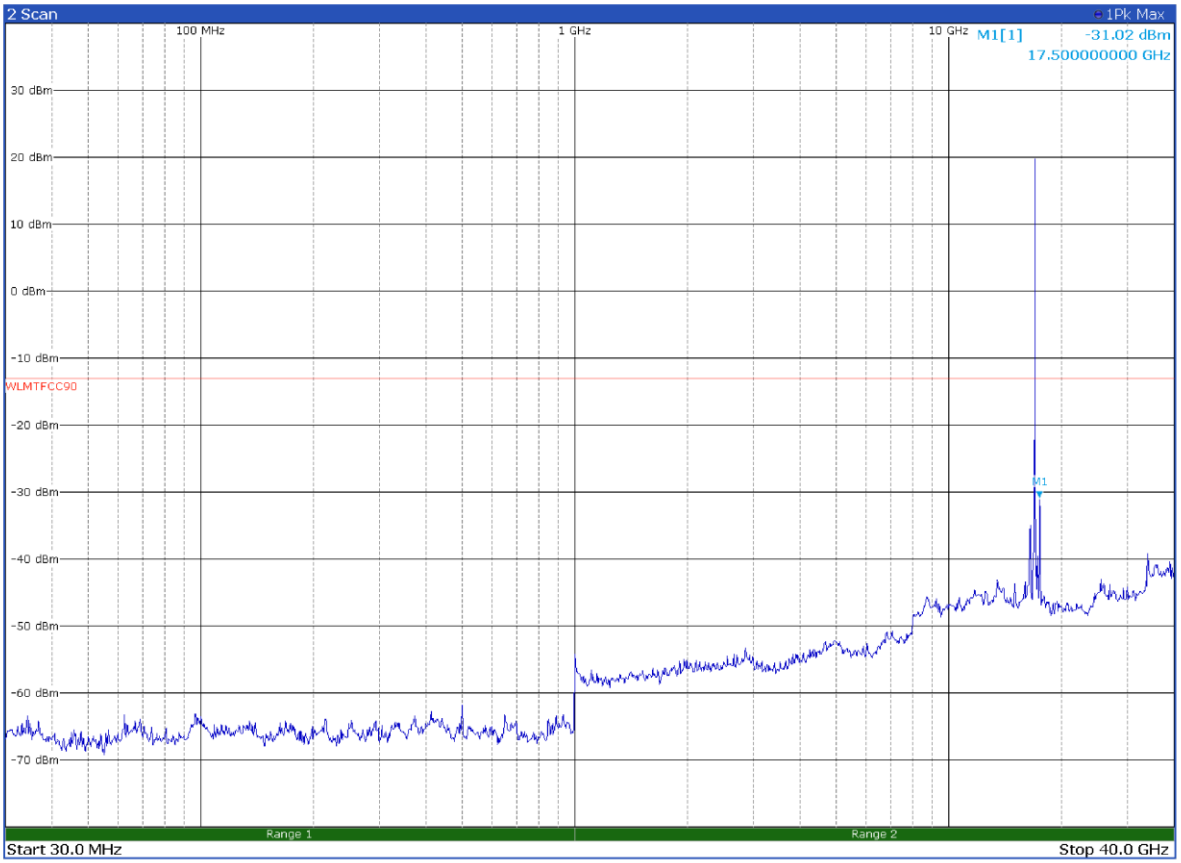


Figure 7.3-13: *Conducted emission on low channel (TX2)*

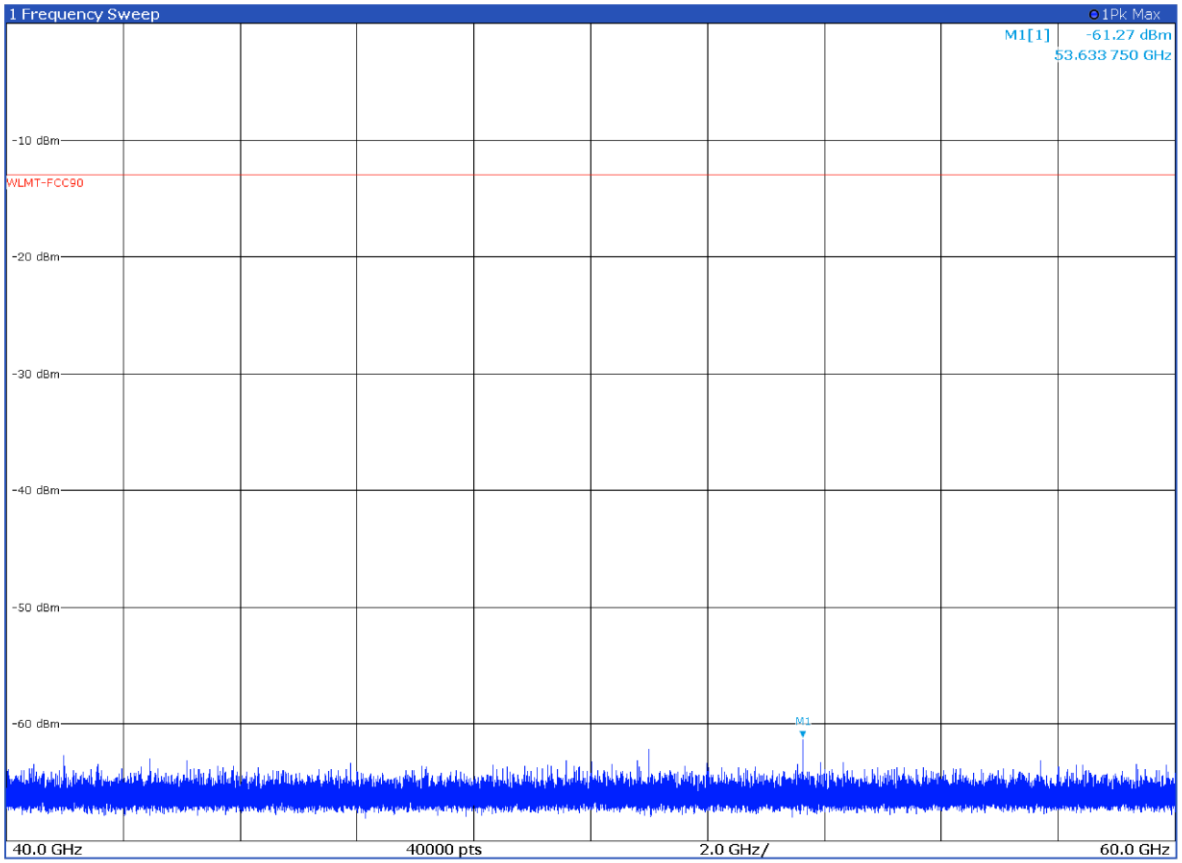


Figure 7.3-14: *Conducted emission on low channel (TX2)*

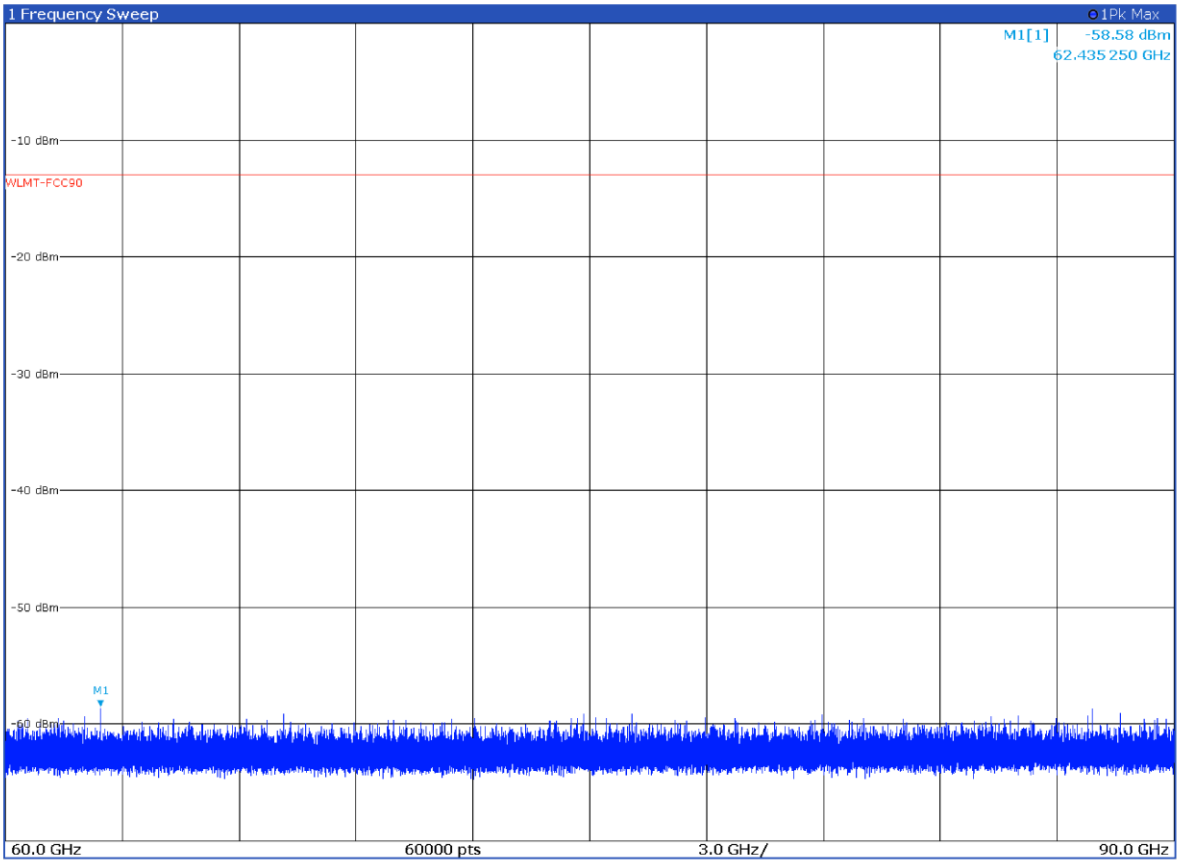


Figure 7.3-15: *Conducted emission on low channel (TX2)*

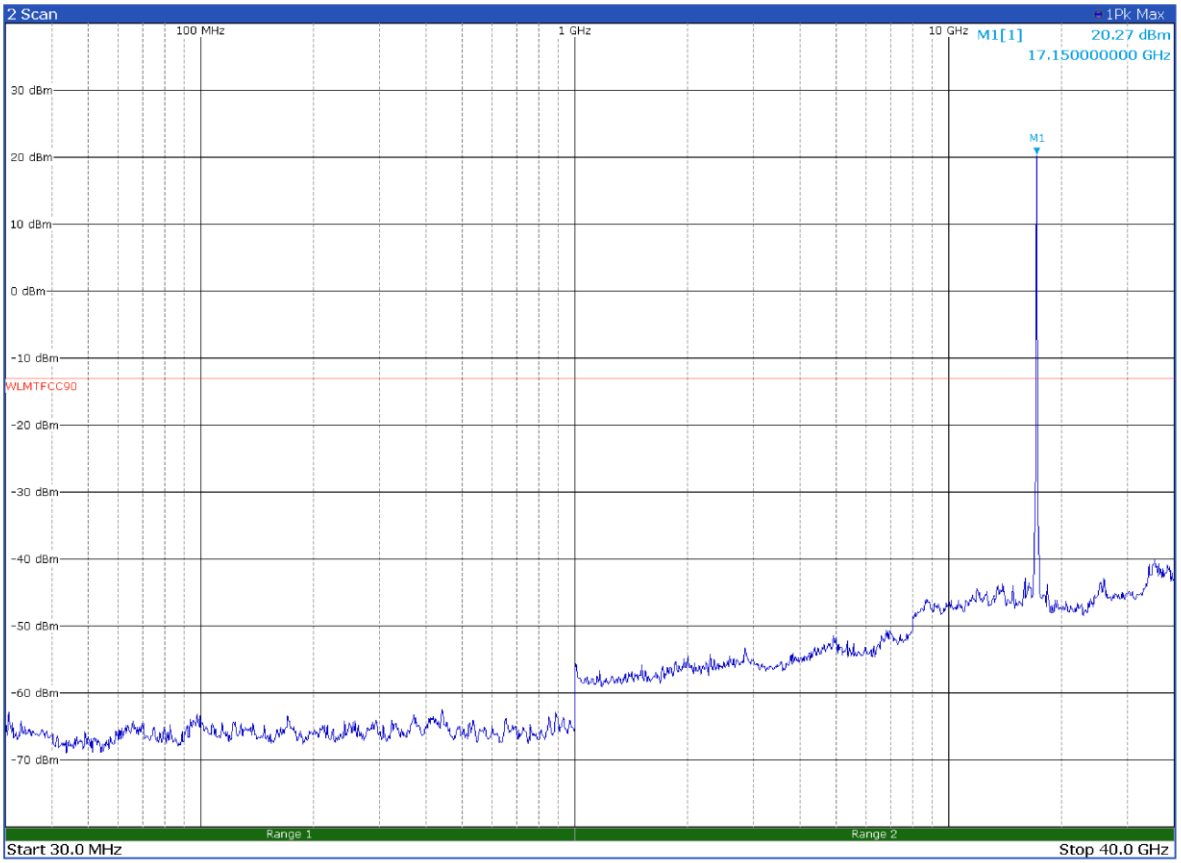


Figure 7.3-16: *Conducted emission on mid channel (TX2)*

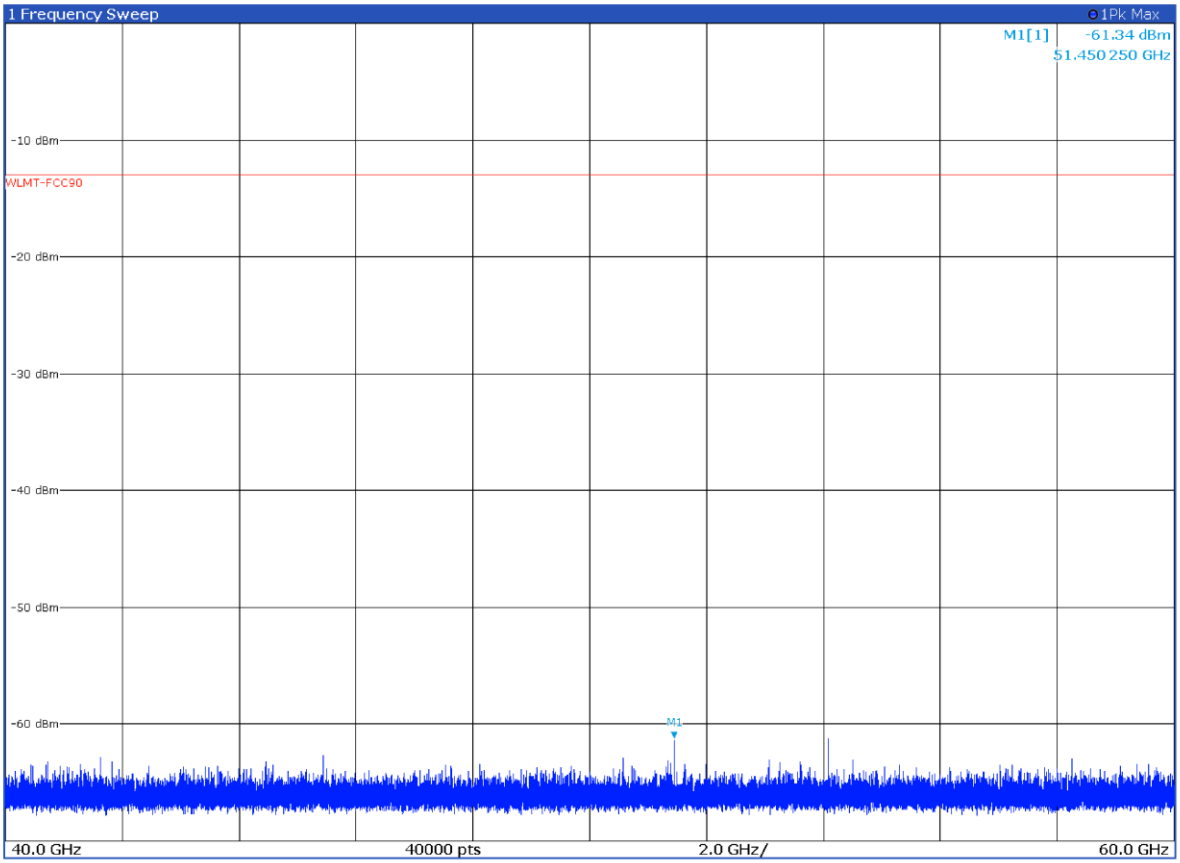


Figure 7.3-17: *Conducted emission on mid channel (TX2)*

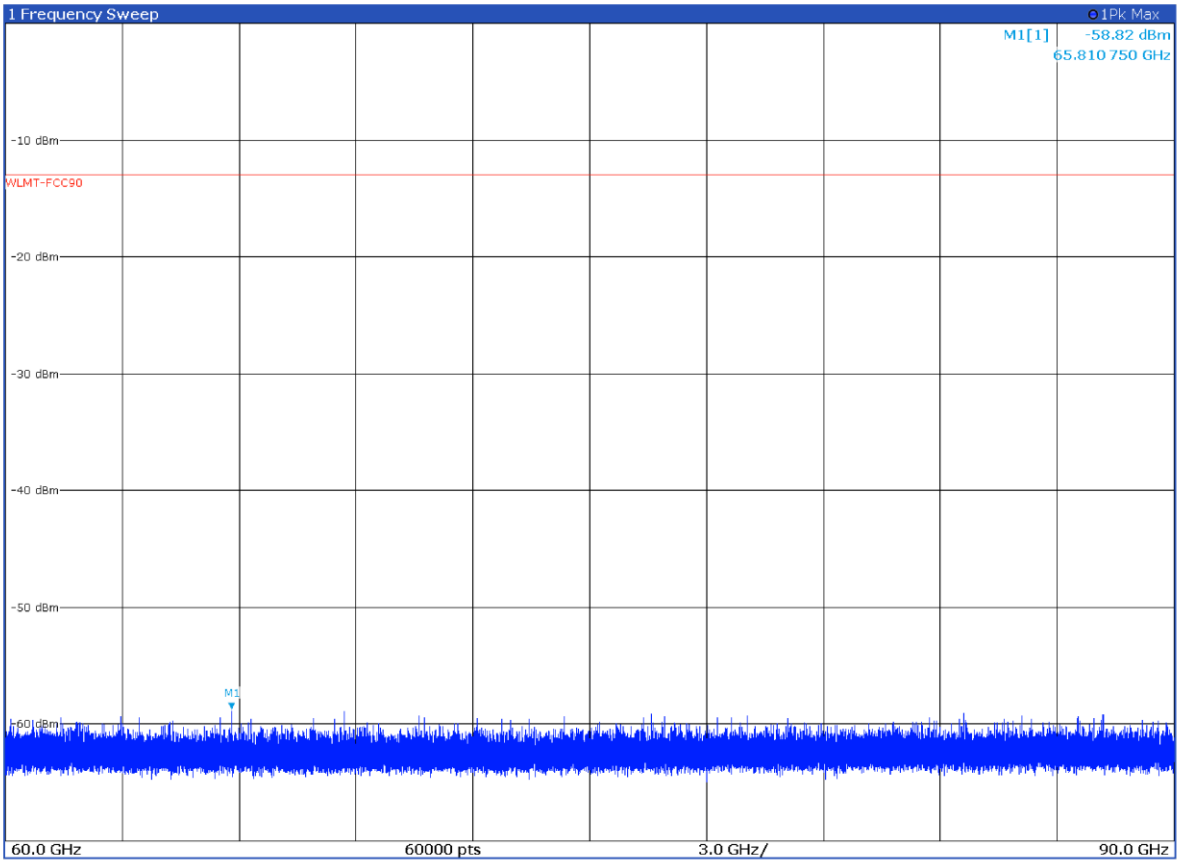


Figure 7.3-18: *Conducted emission on mid channel (TX2)*

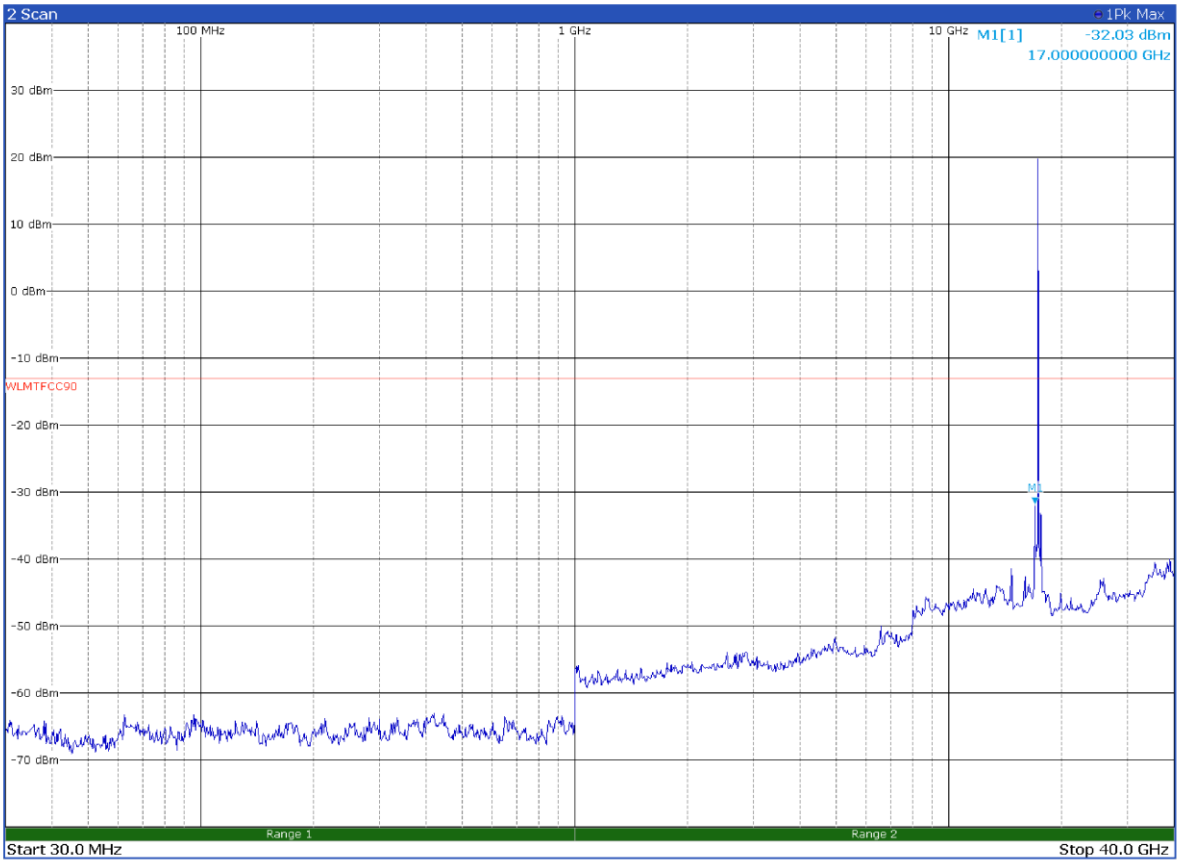


Figure 7.3-19: *Conducted emission on high channel (TX2)*

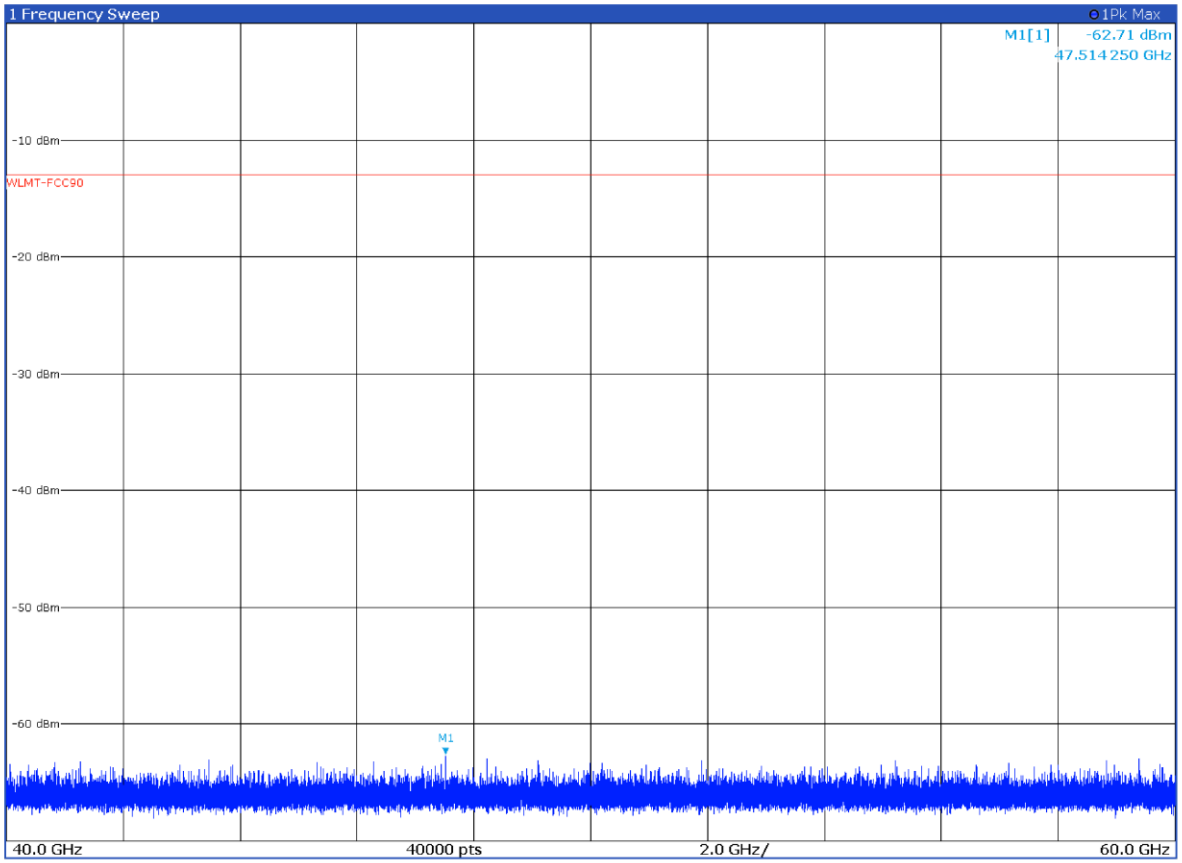


Figure 7.3-20: *Conducted emission on high channel (TX2)*

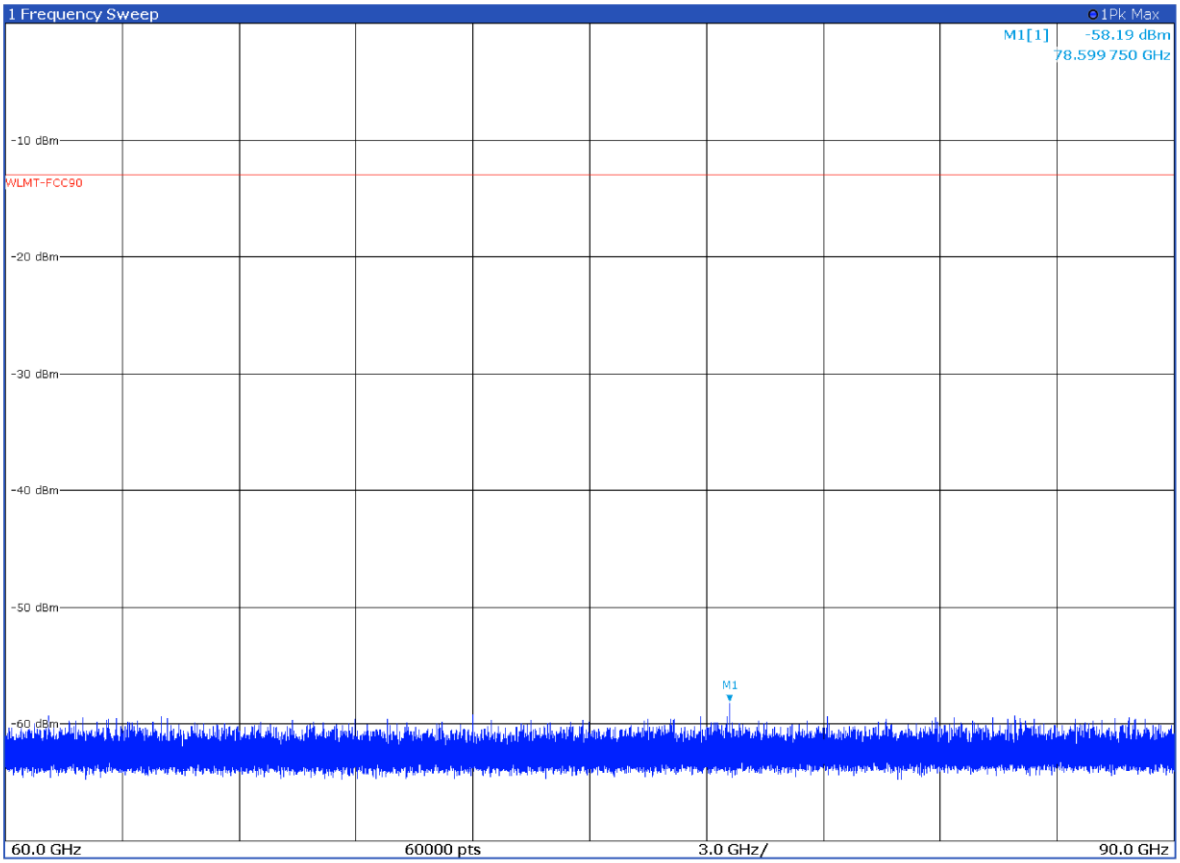


Figure 7.3-21: *Conducted emission on high channel (TX2)*

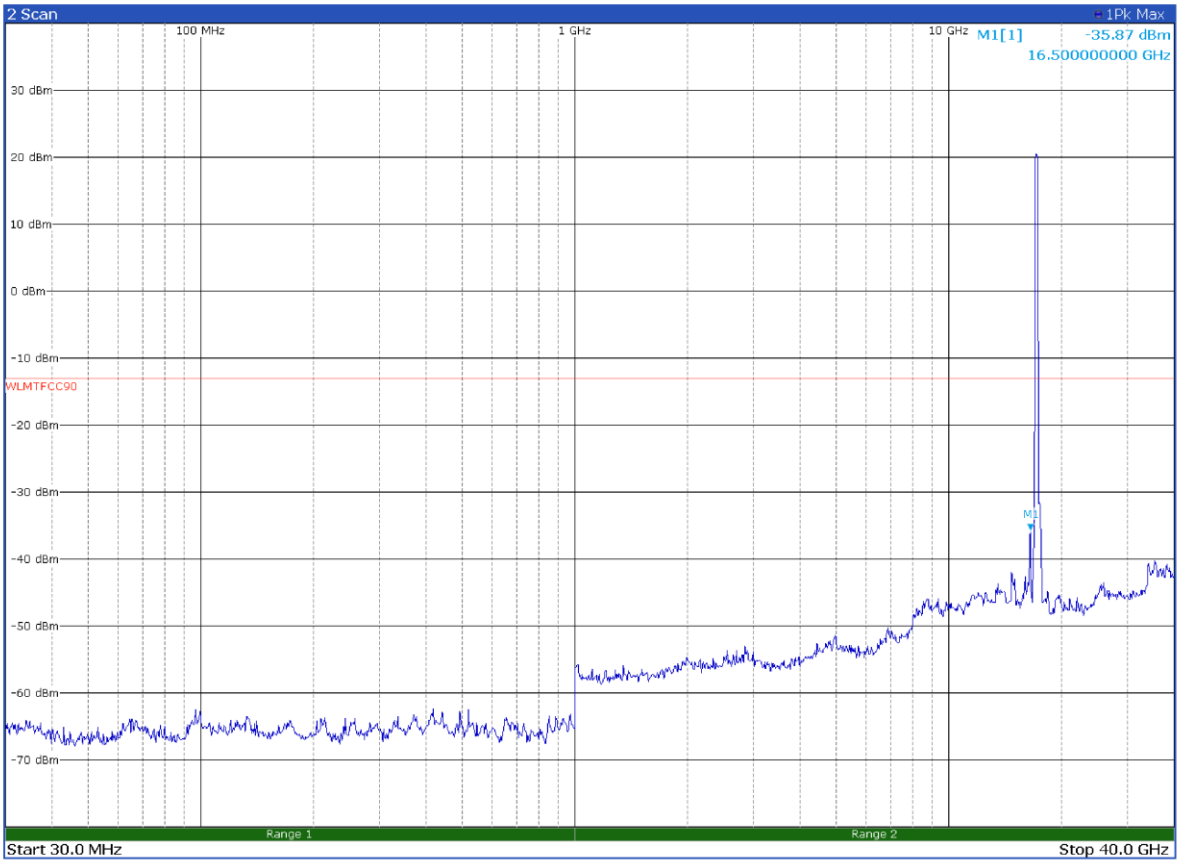


Figure 7.3-22: *Conducted emission on FMCW (TX2)*

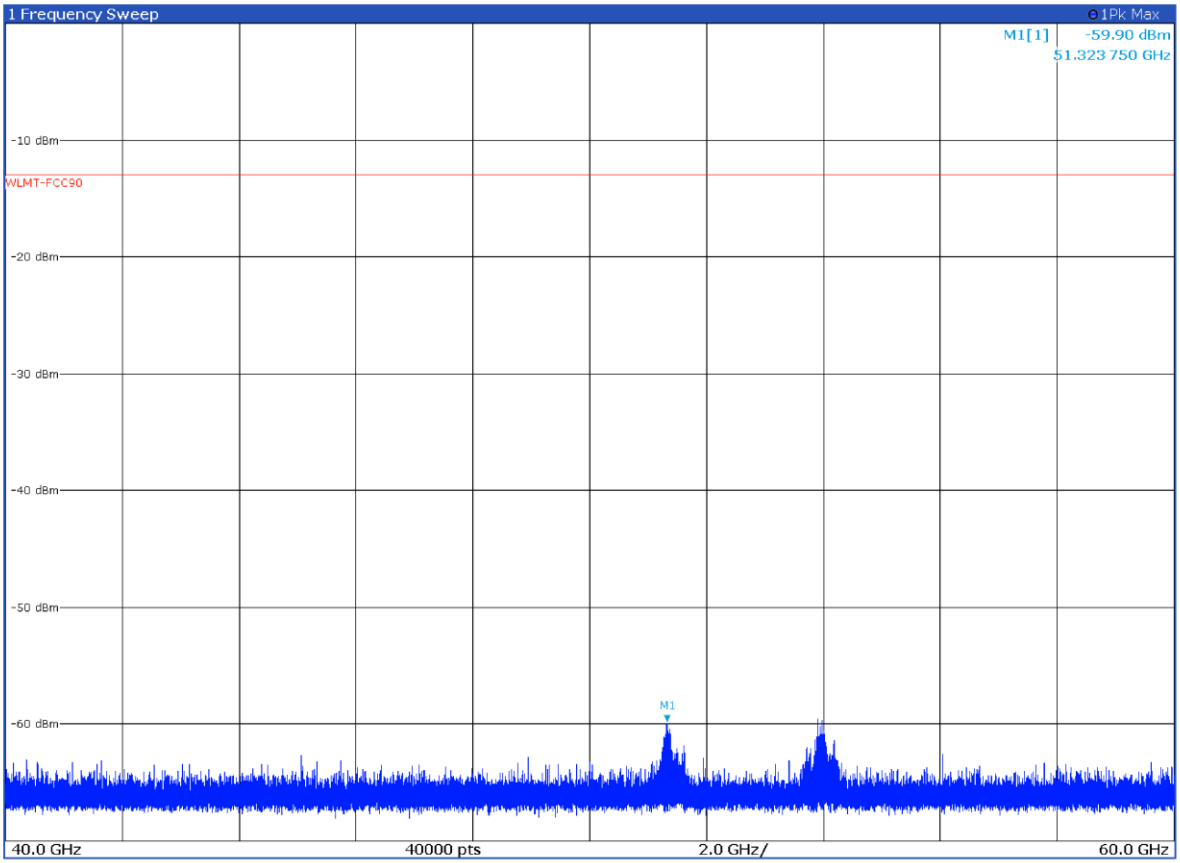


Figure 7.3-23: *Conducted emission on FMCW (TX2)*

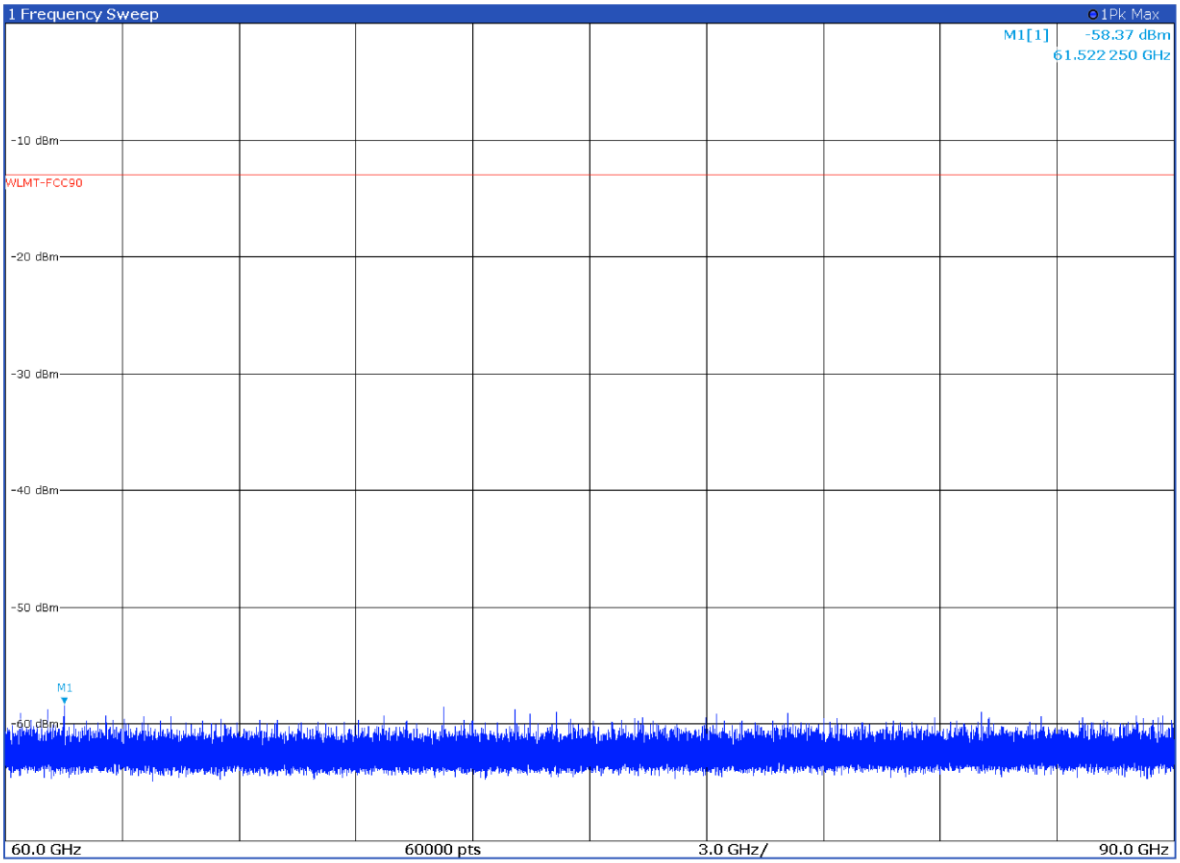


Figure 7.3-24: *Conducted emission on FMCW (TX2)*

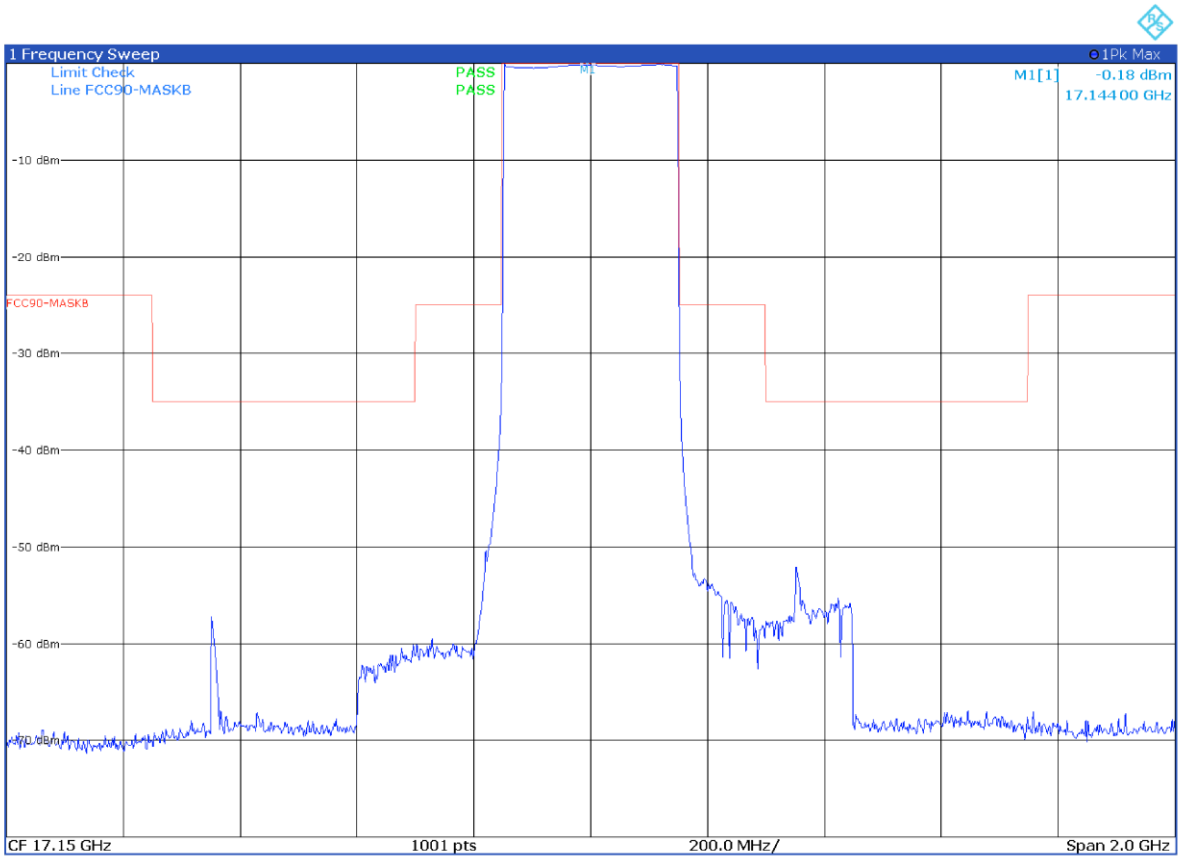


Figure 7.3-25: *Emission mask in FMCW (TX1)*

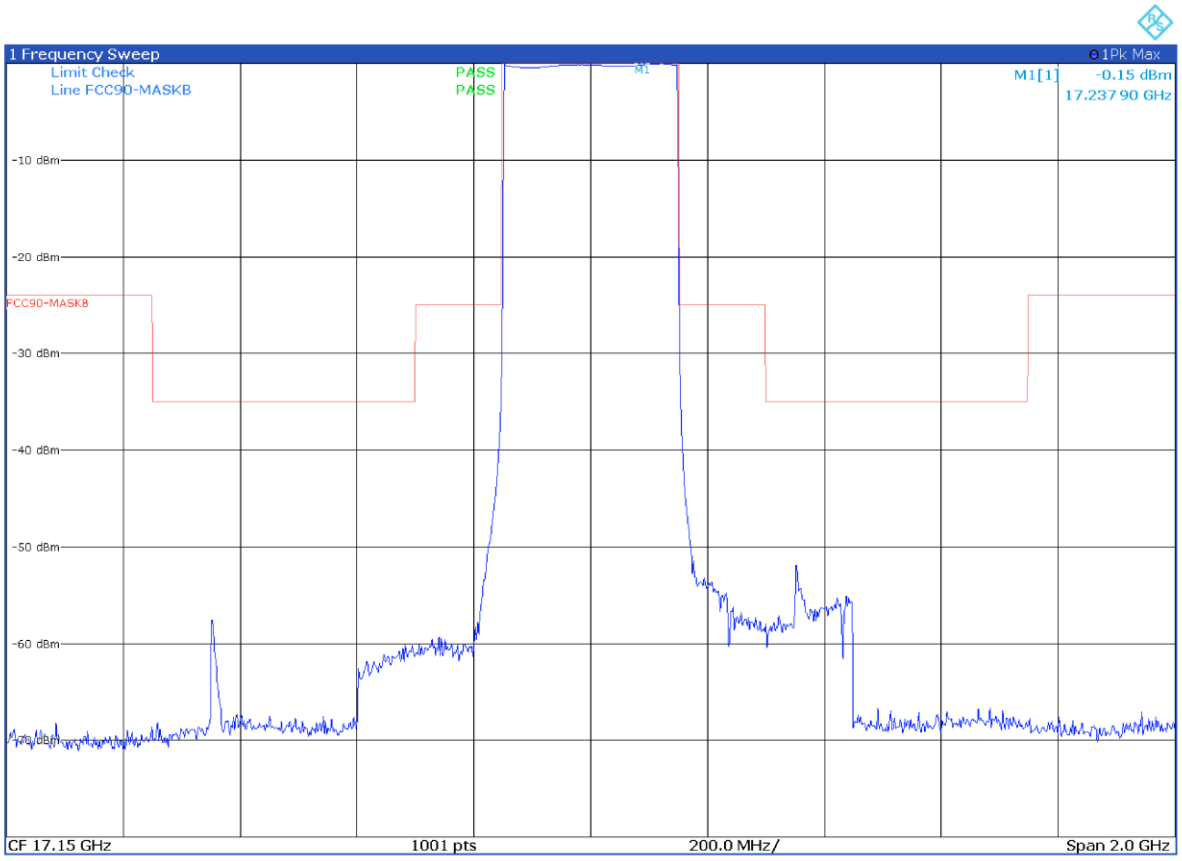


Figure 7.3-26: *Emission mask in FMCW (TX2)*

7.4 Field strength of spurious radiation

7.4.1 Definitions and limits

FCC §90.210 (b):
Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (o) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating under this part.

(b) Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

7.4.2 Test date

Start date	June 24, 2025

7.4.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to 90 GHz (5th harmonic)

Spectrum analyzer settings for peak radiated measurements below 1000 MHz

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

Spectrum analyzer settings for peak radiated measurements above 1000 MHz

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

7.4.4 Test equipment list

Table 7.4-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI Receiver	Rohde & Schwarz	ESW44	101620	2024-09	2025-09
Antenna Trilog 25MHz - 8GHz	Schwarzbeck Mess-Elektronik	VULB9162	9162-025	2024-08	2027-08
Antenna 1 - 18 GHz	Schwarzbeck Mess-Elektronik	STLP9148	STPL 9148-123	2024-08	2027-08
Double Ridge Horn Antenna	RFSpin	DRH40	061106A40	2023-05	2026-05
Preamplifier (1 ÷ 18 GHz)	Schwarzbeck	BBV9718C	00121	2025-01	2026-01
Broadband Bench Top Amplifier	Sage	STB-1834034030-KFKF-L1	18490-01	2024-07	2025-07
Harmonic Mixer	Radiometer Physics	FS-Z90	101670	2024-02	2027-02
Harmonic Mixer	Radiometer Physics	FS-Z60	100988	2024-02	2027-02
Pyramidal Horn Antenna 40-60 GHz	Sage	SAR-2507-19VF-R2	15715-01	2024-08	2027-08
Pyramidal Horn Antenna 60-90 GHz	Sage	SAR-2013-121F-E2	17383.01	2024-08	2027-08
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
Software turntable and mast	Maturo	mcApp	8.1.0.5410	NCR	NCR
3m Semi anechoic chamber	Comtest	SAC-3	1711-150	2024-09	2026-09
Semi-anechoic chamber	Nemko Spa	10m SAC	530	2023-09	2025-09
Cable set	Rosenberger and Huber + Suhner	RE01+RE02	1.654+1.655	2025-01	2026-01
Coaxial cable	Rosenberger	ST.ALO-05	1.669	2025-03	2026-03
Coaxial cable	Rosenberger	ST.ALO-02	1.650	2024-12	2025-12

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

7.4.5 Test data

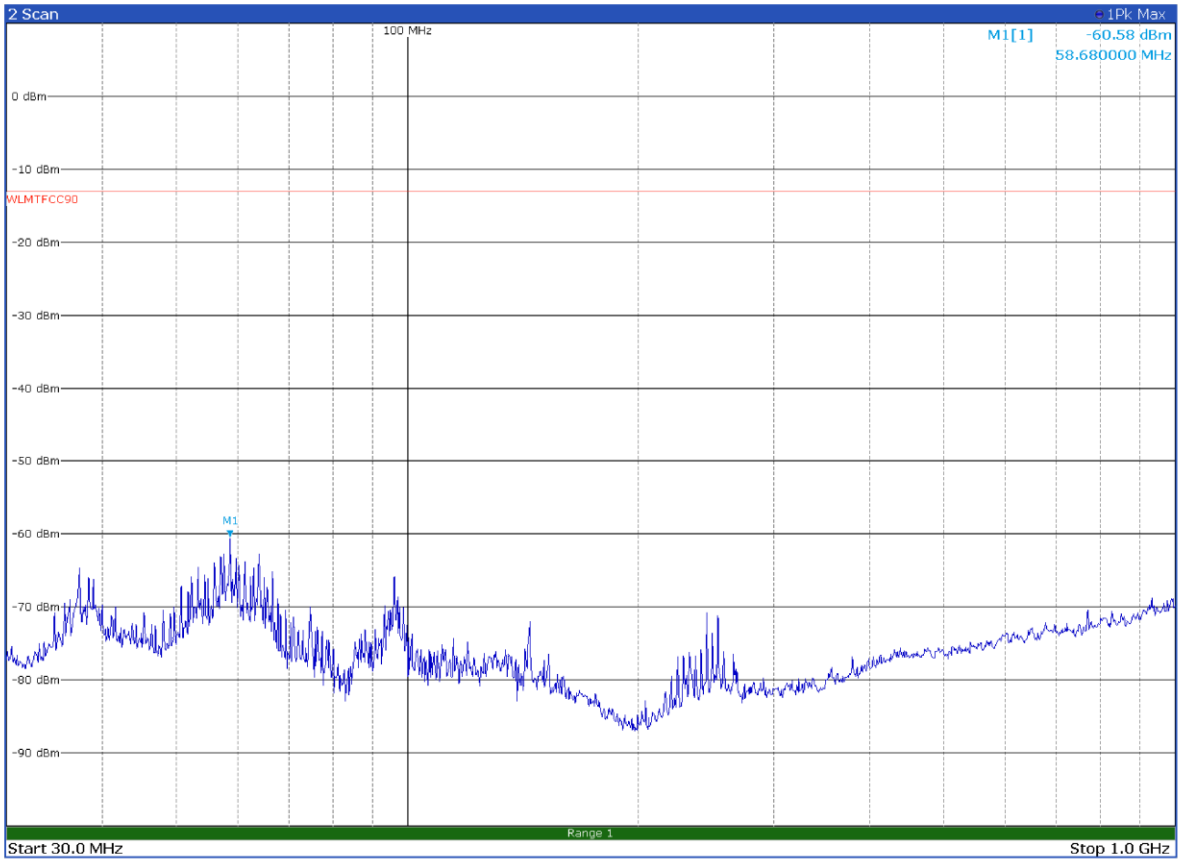


Figure 7.4-1: *Radiated emission with antenna in horizontal polarization on low channel (TX1)*

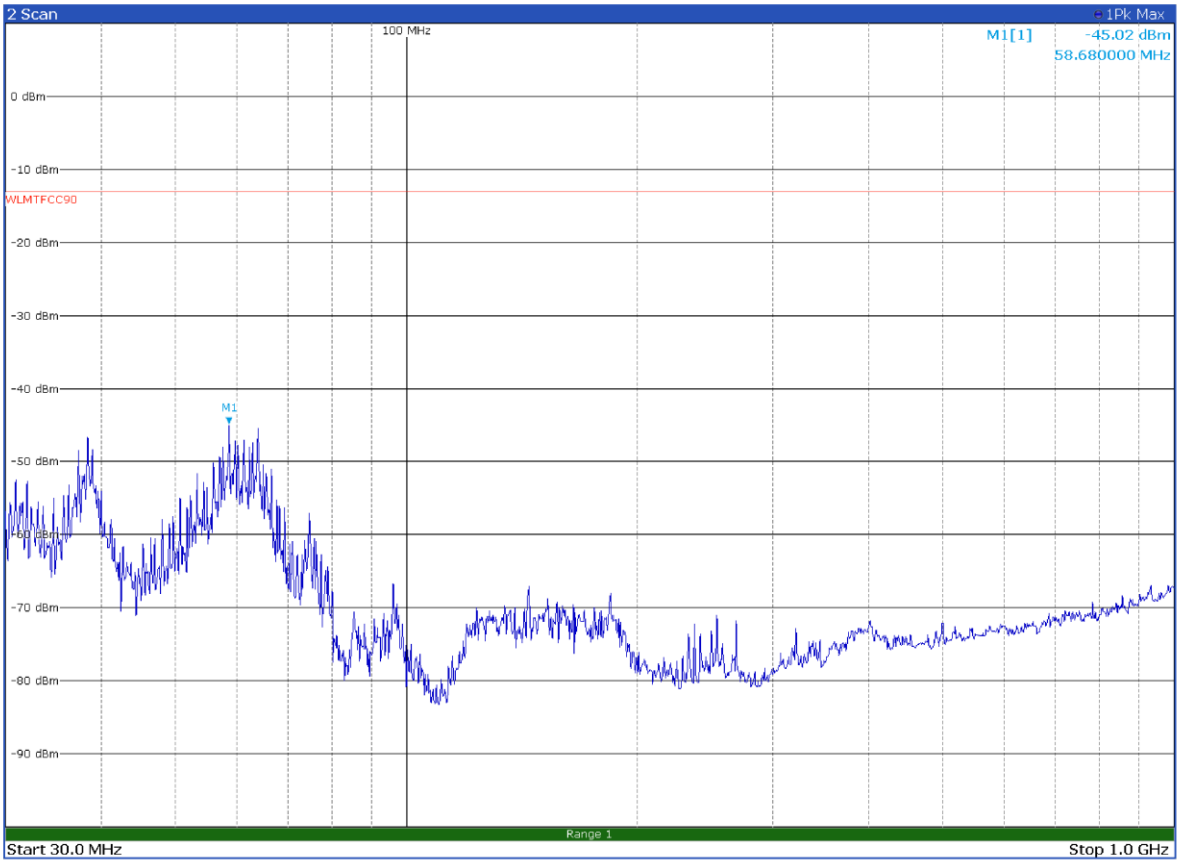


Figure 7.4-2: *Radiated emission with antenna in vertical polarization on low channel (TX1)*

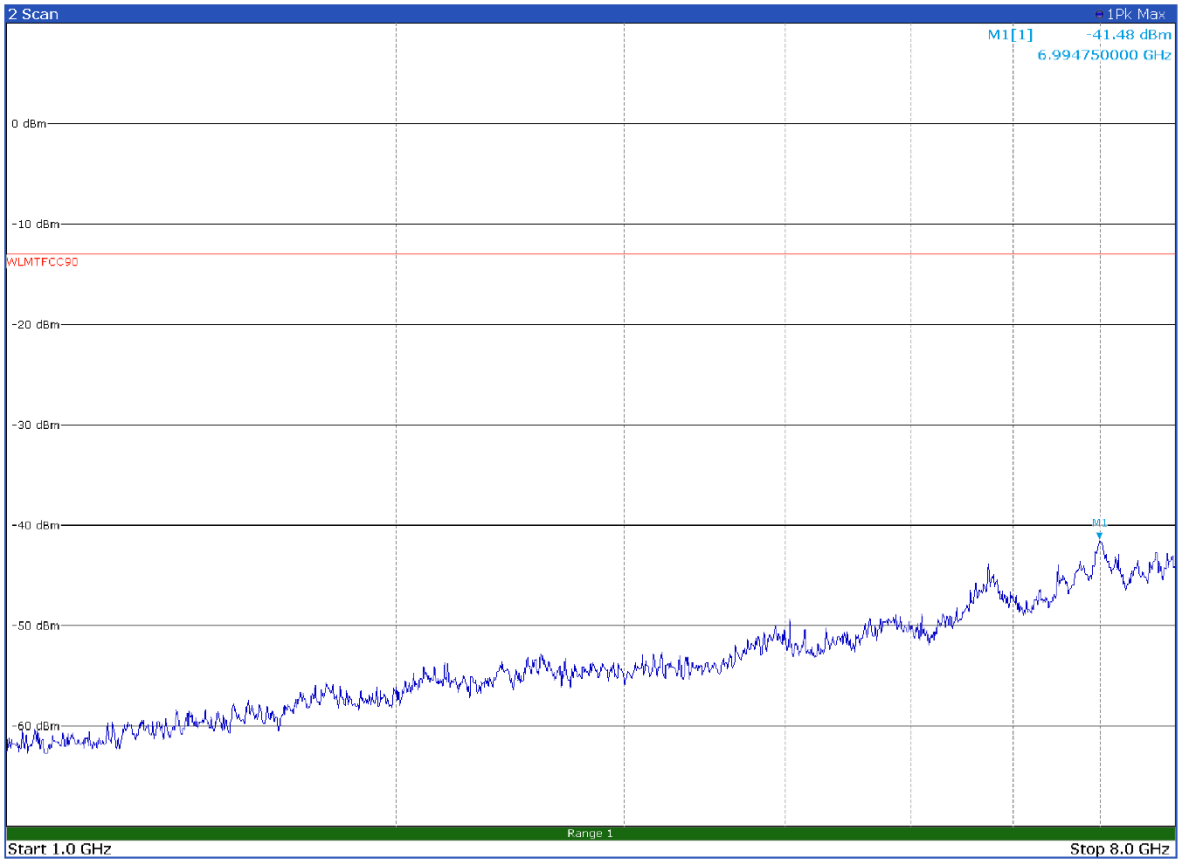


Figure 7.4-3: *Radiated emission with antenna in horizontal polarization on low channel (TX1)*

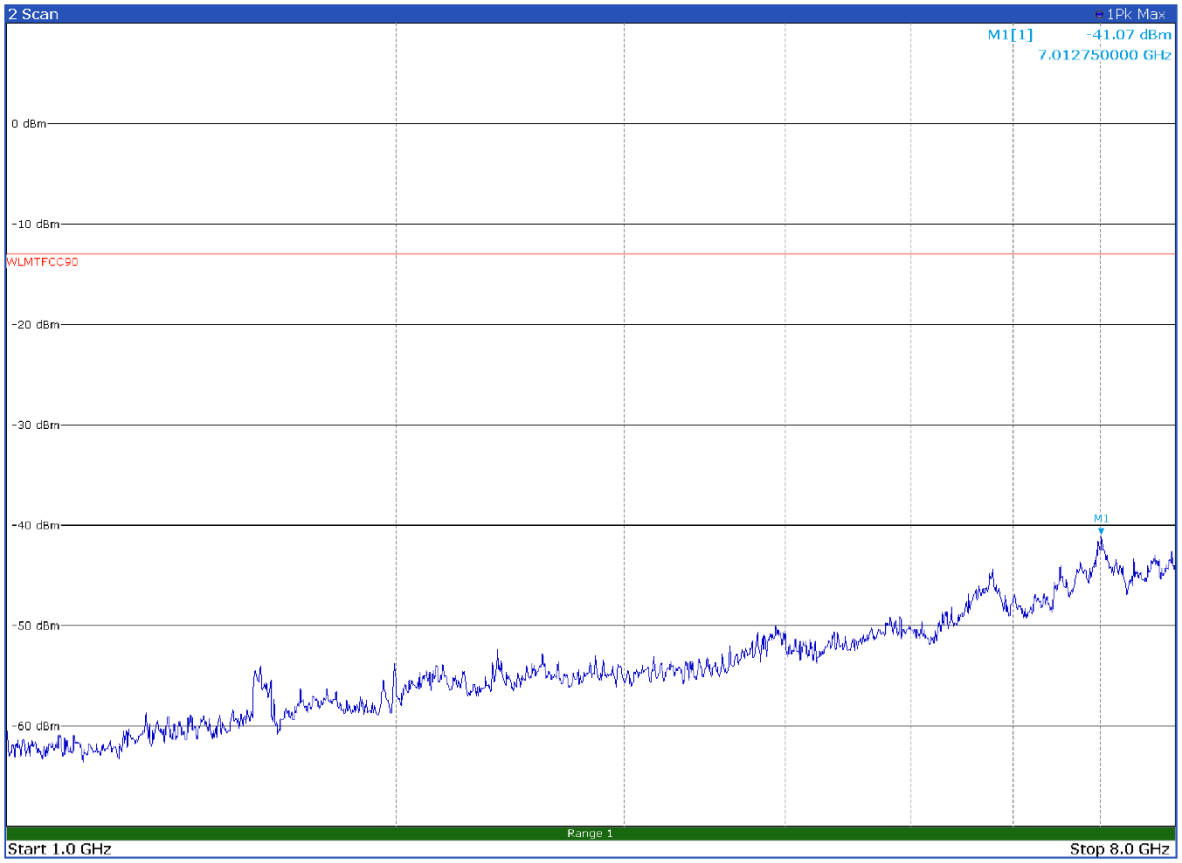
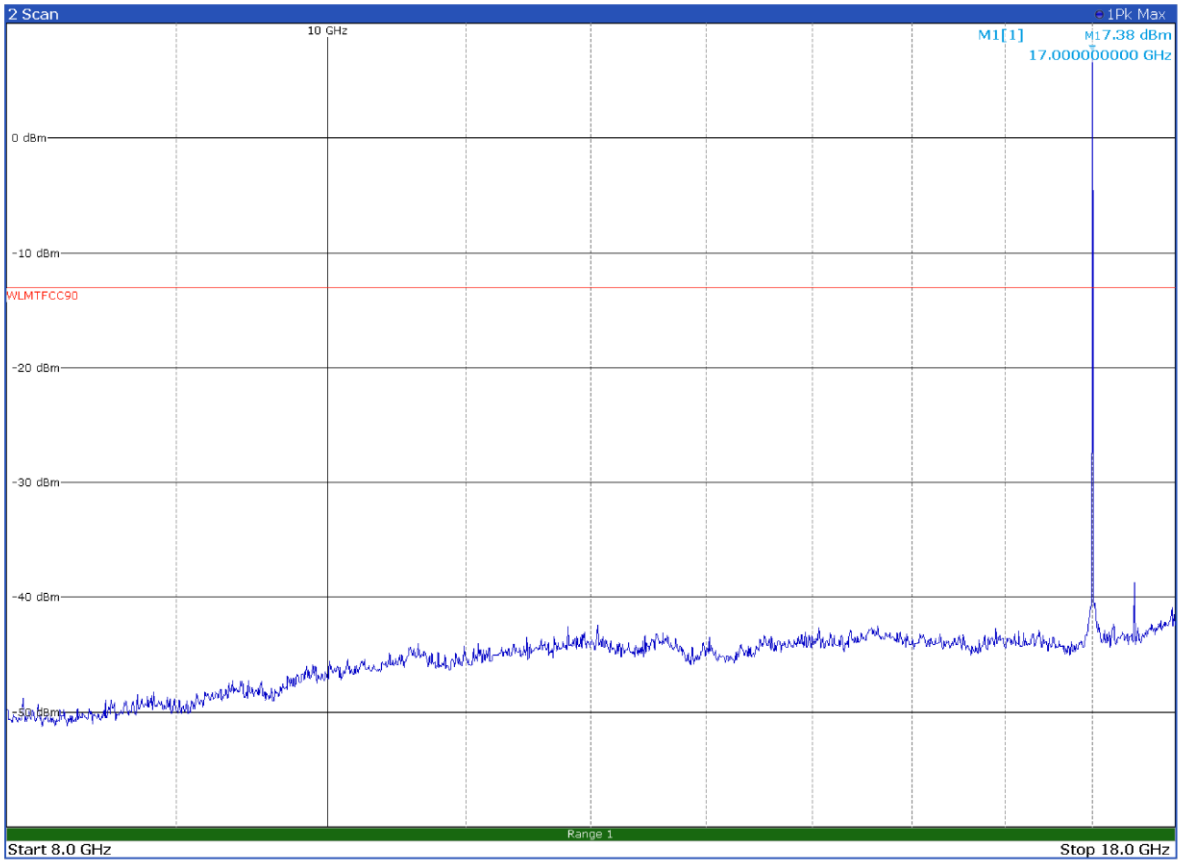
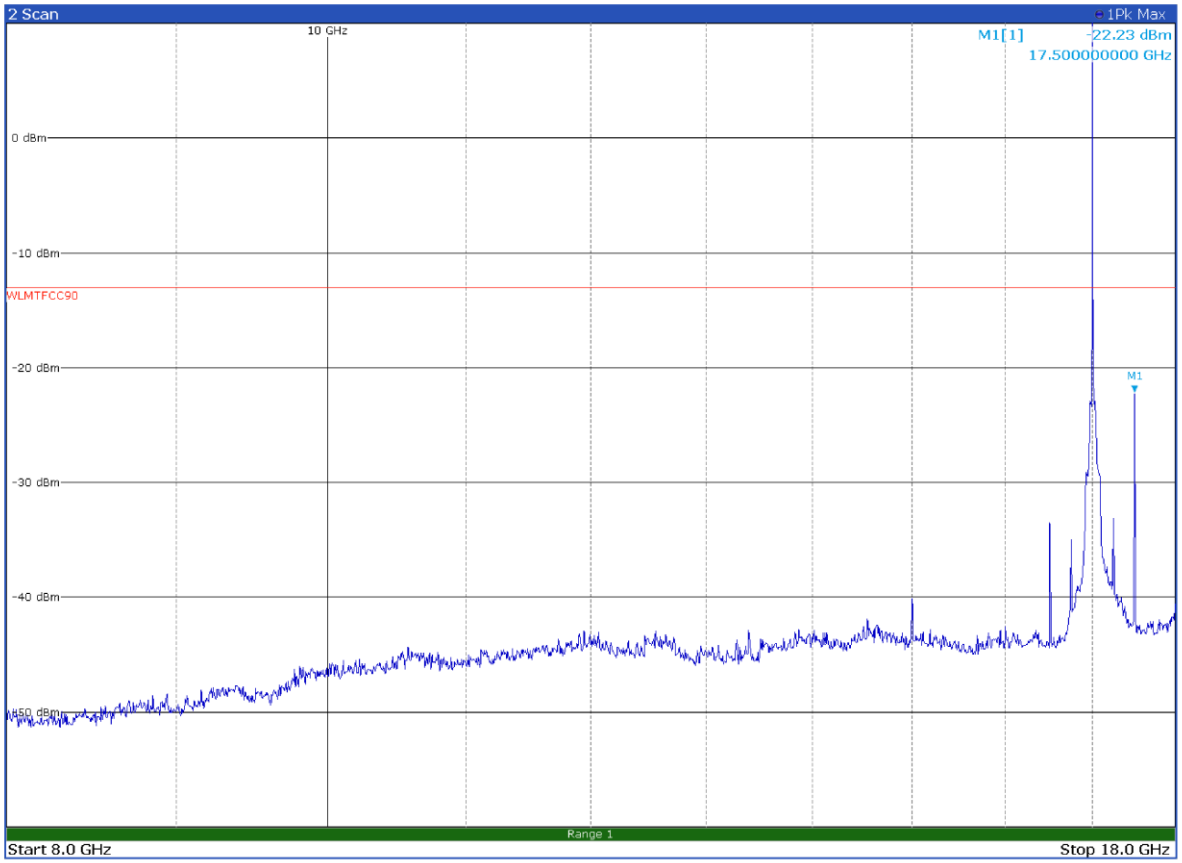


Figure 7.4-4: *Radiated emission with antenna in vertical polarization on low channel (TX1)*



Limit exceeded by the carrier

Figure 7.4-5: *Radiated emission with antenna in horizontal polarization on low channel (TX1)*



Limit exceeded by the carrier

Figure 7.4-6: *Radiated emission with antenna in vertical polarization on low channel (TX1)*

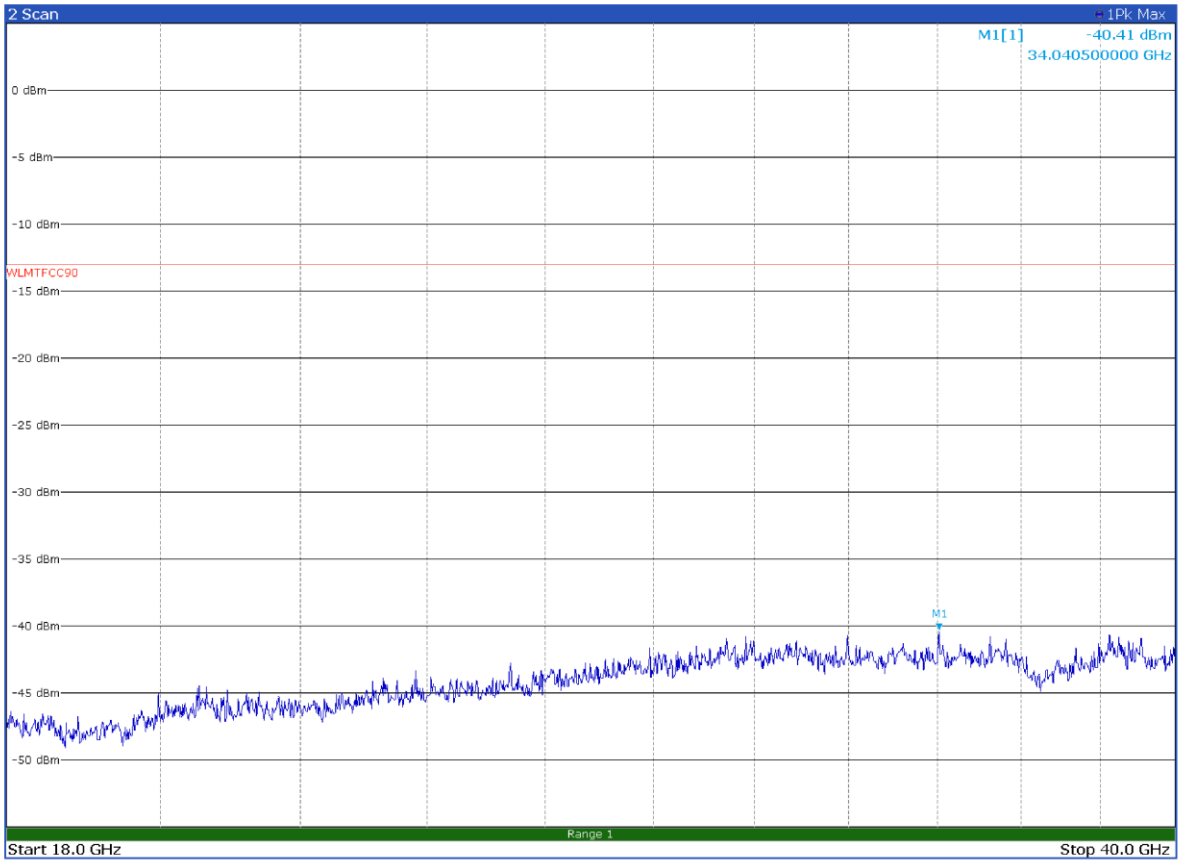


Figure 7.4-7: *Radiated emission with antenna in horizontal polarization on low channel (TX1)*

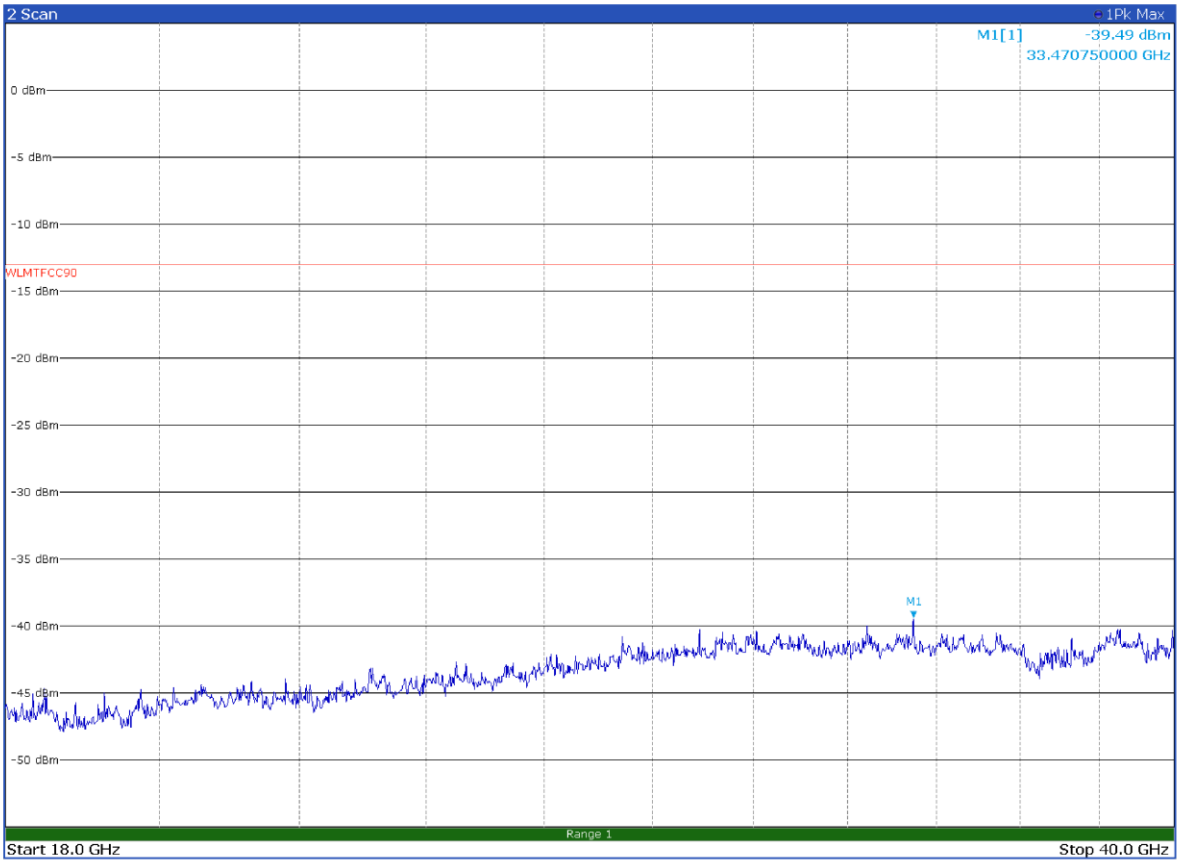


Figure 7.4-8: *Radiated emission with antenna in vertical polarization on low channel (TX1)*

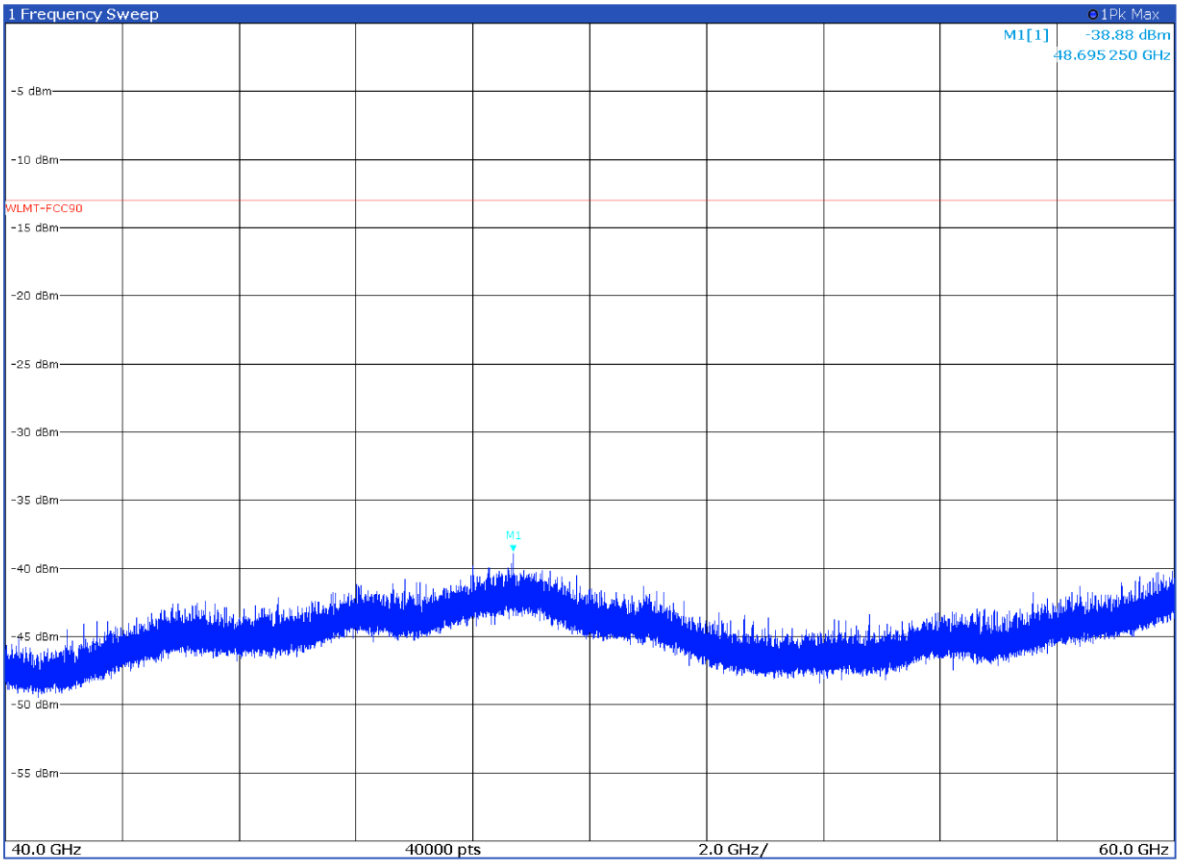


Figure 7.4-9: *Radiated emission with antenna in horizontal polarization on low channel (TX1)*

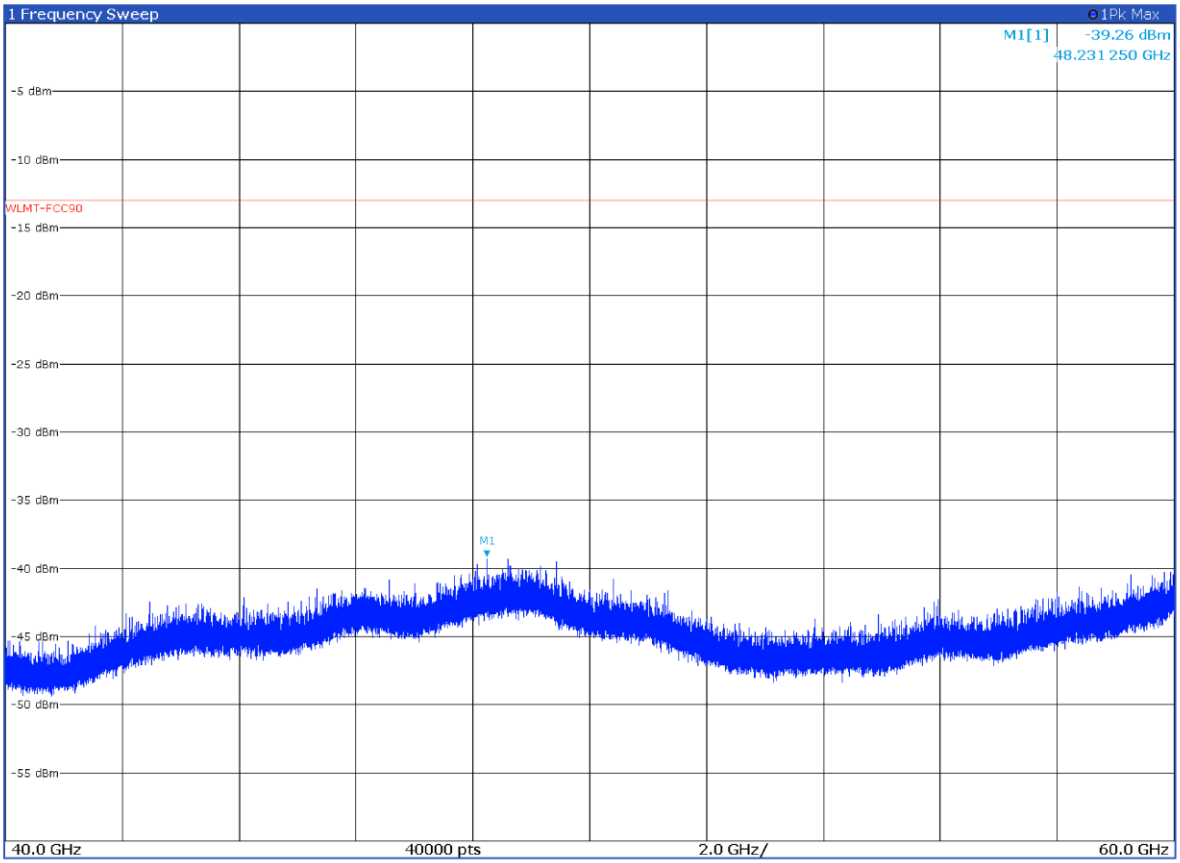


Figure 7.4-10: *Radiated emission with antenna in vertical polarization on low channel (TX1)*

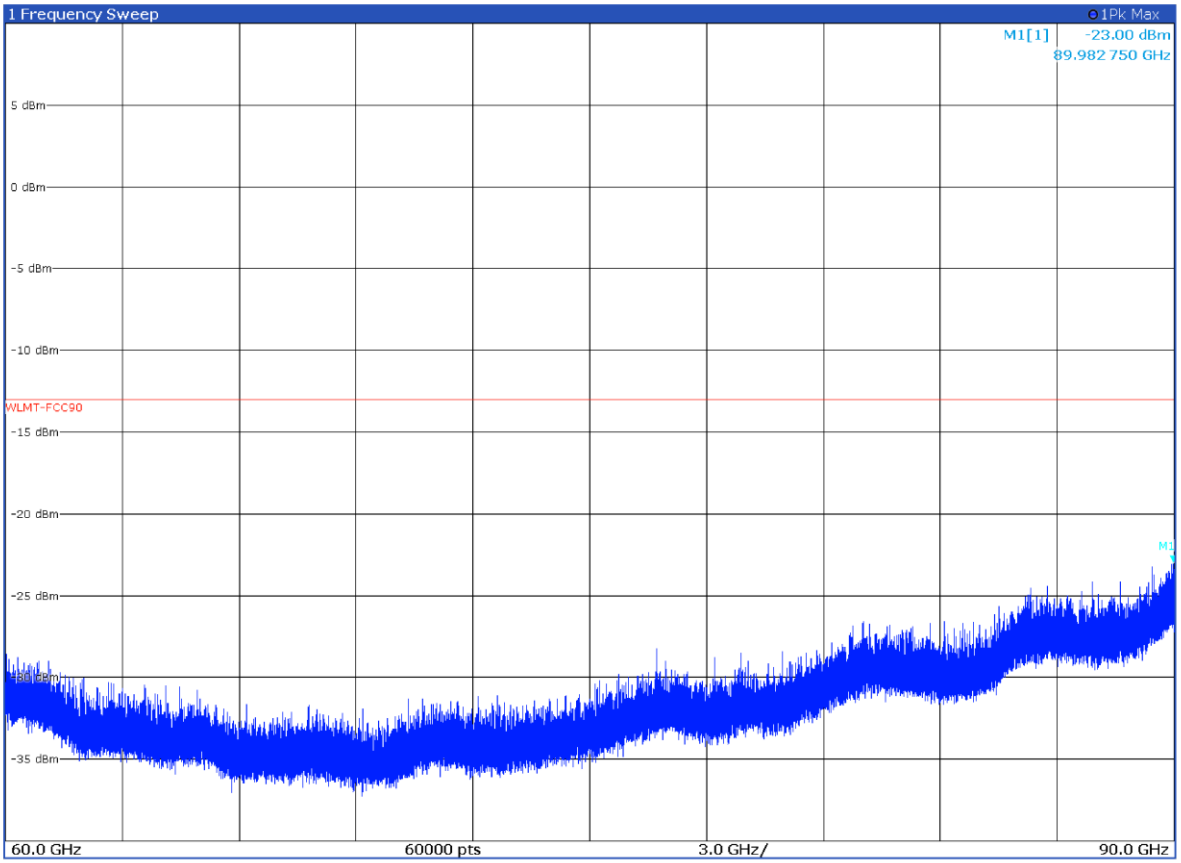


Figure 7.4-11: *Radiated emission with antenna in horizontal polarization on low channel (TX1)*

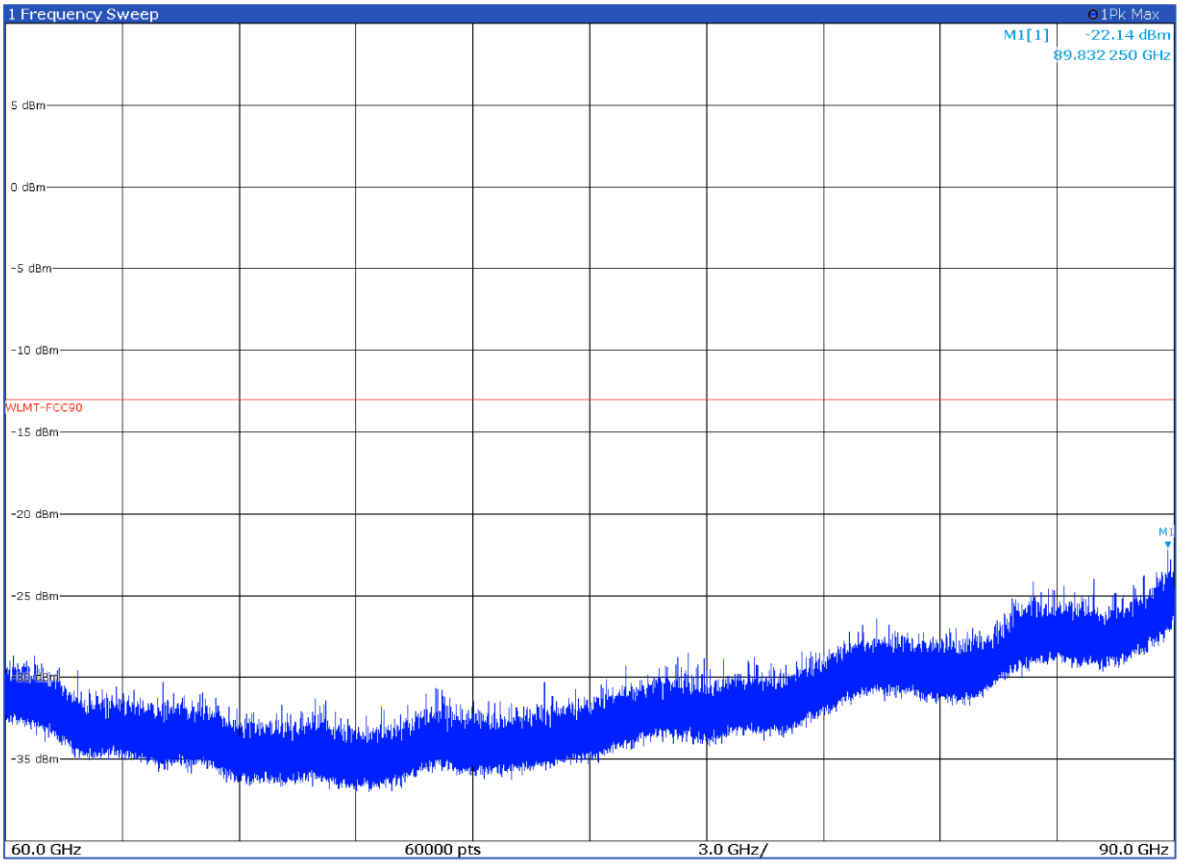


Figure 7.4-12: *Radiated emission with antenna in vertical polarization on low channel (TX1)*