Test report

REP057319-1R2TRFWL

Date of issue: February 27, 2025

Applicant:

Echodyne Corporation

Product:

Ku Band Radar

Model:

EchoShield

Model Number(s):

700025-300-100
700025-300-200
700025-300-300
700025-300-400
700025-350-100
700025-350-200
700025-350-300
700025-350-400

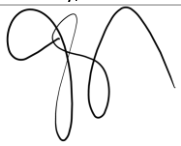
FCC ID: 2ANLB-MESA00055

Specifications:

- FCC CFR 47 Part 87
  Aviation Services
- FCC CFR 47 Part 2
  Frequency Allocations and Radio Treaty Matters, General Rules and Regulations

Lab and test locations

Company name	Nemko USA Inc.
Address	2210 Faraday Ave, Suite 150
City	Carlsbad
State	California
Postal code	92008
Country	USA
Telephone	+1 760 444 3500
Website	www.nemko.com
FCC Site Number	Test Firm Registration Number: 392943; Designation Number: US5058
ISED Test Site	2040B-3

Tested by	Chenhao Ma, Wireless Test technician
Reviewed by	James Cunningham, EMC/WL Manager
Review date	27 February, 2025
Reviewer signature	

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 USA's ISO/IEC 17025 accreditation.

Copyright notification

Table of Contents

Section 1 Report summary

1.1 Test specifications

FCC CFR 47 Part 2	Frequency Allocations and Radio Treaty Matters General Rules and Regulations
FCC CFR 47 Part 87	Aviation Services

1.2 Test methods

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

1.3 Exclusions

None.

1.4 Statement of compliance

Testing was performed against all relevant requirements of the test standard(s).

Results obtained indicate that the product under test complies in full with the tested requirements.

The test results relate only to the item(s) tested.

See “Section 2 Summary of test results” for full details.

1.5 Test report revision history

Table 1.5-1: Test report revision history

Revision #	Issue Date	Details of changes made to test report
REP057319-1TRFEMC	October 8, 2024	Original report issued
REP057319-1R2TRFEMC	October 31, 2024	Update some plots and data
REP057319-1R3TRFEMC	February 27, 2025	Updated model numbers

Section 2 Summary of test results

2.1 FCC Part 2 and Part 87 test results

Part	Test description	Verdict
§2.1049 and Part 87.135 (a)	Bandwidth of emission	Pass
§2.1046 (a) and §87.131	Power and emissions	Pass
§87.139 (a)	Emission limitations	Pass
§2.1055 and §87.133 (a)	Frequency stability	Pass
§2.1051 and §87.139 (a)	Spurious emissions at antenna port	Not applicable[1]
§2.1053 and §87.139 (a)	Emission limitations	Pass

[1] Note: Conducted port not available.

Section 3 Equipment under test (EUT) details

3.1 Disclaimer

This section contains information provided by the applicant and has been utilized to support the test plan. Inaccurate information provided by the applicant can affect the validity of the results within this test report. Nemko accepts no responsibility for the information contained within this section and the impact it may have on the test plan and resulting measurements.

3.2 Sample information

Receipt date	05-Sep-24
Nemko sample ID number	REP057319

3.3 Testing period

Test start date	05-Sep-24
Test end date	13-Sep-24

3.4 Applicant

Company name	Echodyne Corporation
Address	12112 115th Ave NE
City	Kirkland
State	WA
Postal/Zip code	98034
Country	United States of America

3.5 Manufacturer

Company name	Echodyne Corporation
Address	12112 115th Ave NE
City	Kirkland
State	WA
Postal/Zip code	98034
Country	United States of America

3.6 EUT information

Product name	Ku Band Radar
Model	EchoShield
Model Number(s)	700025-300-100 700025-300-200 700025-300-300 700025-300-400 700025-350-100 700025-350-200 700025-350-300 700025-350-400
Serial number	N/A
Part number	N/A
Power requirements	28 VDC
Description/theory of operation	Ground-based location and navigation radar
Software details	N/A
Operating band	Ku Band: 15.4 GHz – 15.7 GHz
Operational frequencies	15.45 GHz – 15.55 GHz – 15.65 GHz (25 MHz BW); 15.50 GHz – 15.55 GHz – 15.60 GHz (50 MHz BW); 15.55 GHz (100 MHz BW); 15.55 GHz (200 MHz BW).
Antenna type	AESA (Active Electronically Scanned Array)
Antenna gain (declared)	27 dBi

3.7 EUT exercise and monitoring details

EUT description of the methods used to exercise the EUT and all relevant ports:

- EUT was configured with a channel frequency and bandwidth fixed via ethernet port using a computer (via client's software).

EUT setup/configuration rationale:

- The EUT setup in a configuration that was expected to produce the highest amplitude emissions.

3.8 EUT setup details

Table 3.8-1: EUT sub assemblies

Description	Brand name	Model/Part number	Serial number	Rev.
N/A	N/A	N/A	N/A	N/A

Table 3.8-2: EUT interface ports

Description	Qty.
1G Base-T Ethernet.	1

Table 3.8-3: Support equipment

Description	Brand name	Model/Part number	Serial number	Rev.
Control PC	ThinkPad	N/A	N/A	N/A
Universal AC/DC Power supply	Echodyne	N/A	N/A	N/A
Junction Box (1 Channel)	Echodyne	N/A	N/A	N/A

Table 3.8-4: Inter-connection cables

Cable description	From	To	Length (m)
Primary radar cable	EUT	Junction Box (1 CH)	2
CAT5e 1G Ethernet cable	Junction Box (1 CH)	Control PC	5
DC Power cable	Junction Box (1 CH)	Universal AC/DC Power supply	2
NEMA 5-15P Cable	AC Outlet	Universal AC/DC Power supply	1

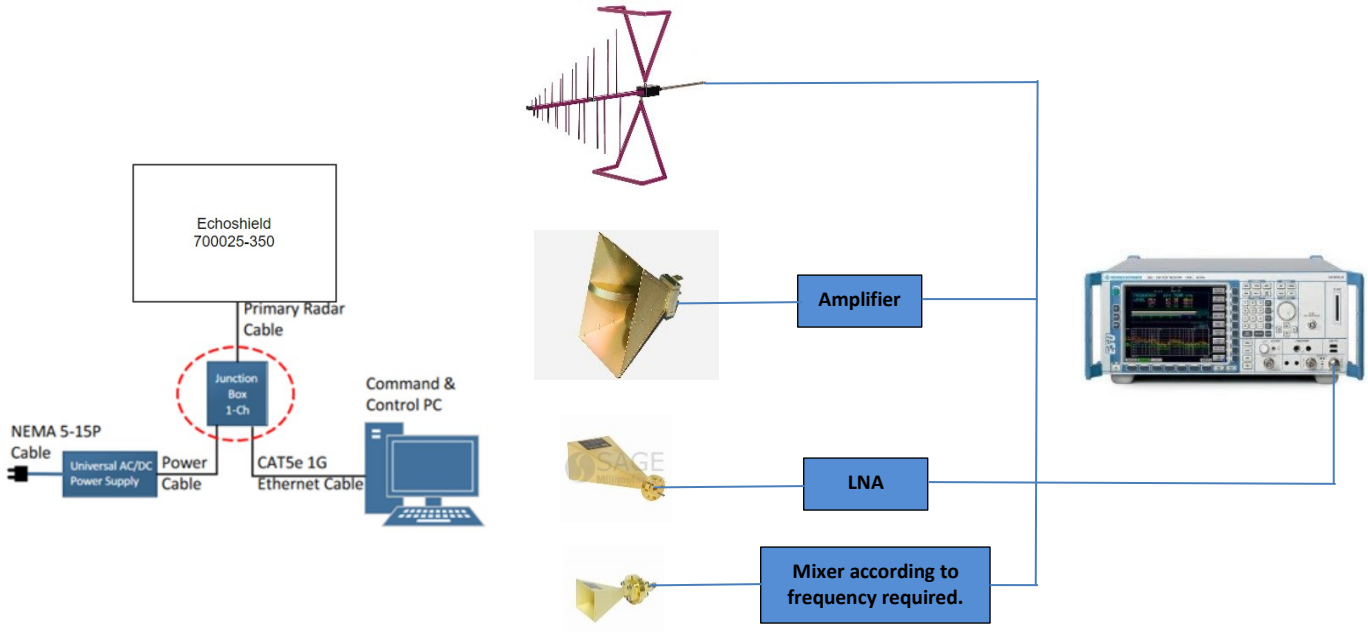


Figure 3.8-1: Test setup diagram

Section 4 Engineering considerations

4.1 Modifications incorporated in the EUT

None.

4.2 Technical judgement

None.

4.3 Deviations from laboratory test procedures

None.

Section 5 Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	86–106 kPa

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

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

Nemko USA Inc. has calculated measurement uncertainty and is documented in EMC/MUC/001 “Uncertainty in EMC measurements.” Measurement uncertainty was calculated using the methods described in CISPR 16-4-2 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics, and limit modelling – Measurement instrumentation uncertainty. The expression of Uncertainty in EMC testing. Measurement uncertainty calculations assume a coverage factor of K=2 with 95% certainty.

Table 6.1-1: Measurement uncertainty calculations

Measurement		**U_{cispr} dB**	**U_{lab} dB**
Conducted disturbance at AC mains and other port power using a V-AMN	9 kHz to 150 kHz	3.8	2.9
	150 kHz to 30 MHz	3.4	2.3
Conducted disturbance at telecommunication port using AAN	150 kHz to 30 MHz	5.0	4.3
Conducted disturbance at telecommunication port using CVP	150 kHz to 30 MHz	3.9	2.9
Conducted disturbance at telecommunication port using CP	150 kHz to 30 MHz	2.9	1.4
Conducted disturbance at telecommunication port using CP and CVP	150 kHz to 30 MHz	4.0	3.1
Radiated disturbance (electric field strength in a SAC)	30 MHz to 1 GHz	6.3	5.5
Radiated disturbance (electric field strength in a FAR)	1 GHz to 6 GHz	5.2	4.7
Radiated disturbance (electric field strength in a FAR)	6 GHz to 18 GHz	5.5	5.0

Notes: Compliance assessment:

If U_{lab} is less than or equal to U_{cispr} then:

- compliance is deemed to occur is no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit

If U_{lab} is greater than U_{cispr} then:

- compliance is deemed to occur is no measured disturbance level, increased by (U_{lab} - U_{cispr}), exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by (U_{lab} - U_{cispr}), exceeds the disturbance limit

V-AMN: V type artificial mains network
AAN: Asymmetric artificial network
CP: Current probe
CVP: Capacitive voltage probe
SAC: Semi-anechoic chamber
FAR: Fully anechoic room

Section 7 Test equipment

7.1 Test equipment list

Table 7.1-1: Test equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Signal & Spectrum Analyzer 2Hz / 43.5 GHz	Rohde & Schwarz	FSW43	E1302	1 year	Jan-22-2025
Antenna Horn	EMCO	3115	1033	2 years	Nov-02-2024
EMC Test Receiver	Rohde & Schwarz	ESU 40	E1121	1 year	Dec-14-2025
Antenna, Bilog	Schaffner-Chase	CBL6111C	1480	2 year	June-28-2026
Antenna, Horn	ETS-Lingren	3117-PA	E1160	2 years	Feb-13-2025
Standard Gain Horn Antenna	Eravant	SAZ-2410-42-S1	EW107	1 year	Dec-05-2024
Standard Gain Horn Antenna	Eravant	SAZ-2410-2-S1	EW108	1 year	Dec-05-2024
Low Noise Amplifier	Sage Millimeter	SBL-1834034030-KFKF-SI	E1228	NCR	NCR
Antenna, Horn	Sage Millimeter	SAR-2309-19-S2	E1144	NCR	NCR
Mixer	Rohde & Schwarz	FS-Z60	E1138	VOU	VOU
Antenna, Horn	Sage Millimeter	SAR-2408-15-S2	E1152	NCR	NCR
Mixer	Rohde & Schwarz	FS-Z75	E1149	VOU	VOU
Antenna, Horn	Sage Millimeter	SAR-2507-10-S2	E1146	NCR	NCR
Mixer	Rohde & Schwarz	FS-Z110	E1154	VOU	VOU
Low pass filter	RF-Lambda	RLPF13G14	PBC	VOU	VOU
High pass filter	Anatech Electronics	AE18000SSH6616	PBC	VOU	VOU
High pass filter	Anatech Electronics	AE18000SSH6615	PBC	VOU	VOU

Notes: N/A – not applicable
NCR – no calibration required
VOU – verify on use
PBC – provided by client

Table 7.1-2: Test software details

Manufacturer of Software	Details
Rohde & Schwarz	EMC 32 V10.60.15

Notes: None

Section 8 Testing data

8.1 Bandwidth of emission (99%)

8.1.1 References and limits

- FCC 47 CFR Part 87: §87.135
- Test method: ANSI C63.26-2014 (5.4.4)

(a) Occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0.5 percent of the total mean power of a given emission.
(b) The authorized bandwidth is the maximum occupied bandwidth authorized to be used by a station.
(c) The necessary bandwidth for a given class of emission is the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions.

8.1.2 Test summary

Verdict	Pass		
Test date	September 5, 2024; September 6, 2024;	Temperature	22°C 21°C
Test engineer	Chenhao Ma, Wireless Test Technician	Air pressure	1003mbar 1002mbar
Test location	☐ Wireless bench ☒ Other: 3M Chamber	Relative humidity	58% 53%

8.1.3 Notes

Testing was performed with the transmitter operating on a fixed channel at full power.
Two modes related to the width of the radar pulse were tested and the summary of the time duration of each pulse is described in the following table:

Frequency	Bandwidth declared	Type of pulse	Time duration
15.45 GHz	25 MHz	Longest pulse	30 µs
15.55 GHz	25 MHz	Longest pulse	30 µs
15.65 GHz	25 MHz	Longest pulse	30 µs
15.50 GHz	50 MHz	Longest pulse	30 µs
15.55 GHz	50 MHz	Longest pulse	30 µs
15.60 GHz	50 MHz	Longest pulse	30 µs
15.55 GHz	100 MHz	Longest pulse	30 µs
15.55 GHz	200 MHz	Longest pulse	28.494 µs
15.45 GHz	25 MHz	Shortest pulse	2 µs
15.55 GHz	25 MHz	Shortest pulse	1 µs
15.65 GHz	25 MHz	Shortest pulse	2 µs
15.50 GHz	50 MHz	Shortest pulse	5 µs
15.55 GHz	50 MHz	Shortest pulse	500 ns
15.60 GHz	50 MHz	Shortest pulse	5 µs
15.55 GHz	100 MHz	Shortest pulse	5 µs
15.55 GHz	200 MHz	Shortest pulse	10 µs

Table 8.1-1: Pulse description table.

Testing was done at 3 meters with the antenna and turntable fixed. A maximization of the signal was done to define the position of the max power

8.1.4 Setup details

EUT power input during test	28 V DC
EUT setup configuration	☐ Table-top ☐ Floor standing ☒ Other: Tripod mounted (1.5 m)

Receiver settings:

Resolution bandwidth	Approximately 1-5 % of the emission bandwidth
Video bandwidth	Approximately 3 x resolution bandwidth
Detector mode	Peak
Trace mode	Max Hold
Measurement time	Long enough for trace to stabilize

8.1.5 Test data

Frequency	99% Bandwidth	Type of pulse	Time duration
15.45 GHz	25.137MHz	Longest pulse	30 µs
15.55 GHz	25.122MHz	Longest pulse	30 µs
15.65 GHz	25.092MHz	Longest pulse	30 µs
15.50 GHz	48.826MHz	Longest pulse	30 µs
15.55 GHz	48.826MHz	Longest pulse	30 µs
15.60 GHz	48.826MHz	Longest pulse	30 µs
15.55 GHz	97.652MHz	Longest pulse	30 µs
15.55 GHz	192.807MHz	Longest pulse	28.494 µs
15.45 GHz	27.67MHz	Shortest pulse	2 µs
15.55 GHz	31.16MHz	Shortest pulse	1 µs
15.65 GHz	27.27MHz	Shortest pulse	2 µs
15.50 GHz	49.45MHz	Shortest pulse	5 µs
15.55 GHz	62.037MHz	Shortest pulse	500 ns
15.60 GHz	49.3MHz	Shortest pulse	5 µs
15.55 GHz	97.702MHz	Shortest pulse	5 µs
15.55 GHz	192.807MHz	Shortest pulse	10 µs

Table 8.1-2: 99% OBW results.

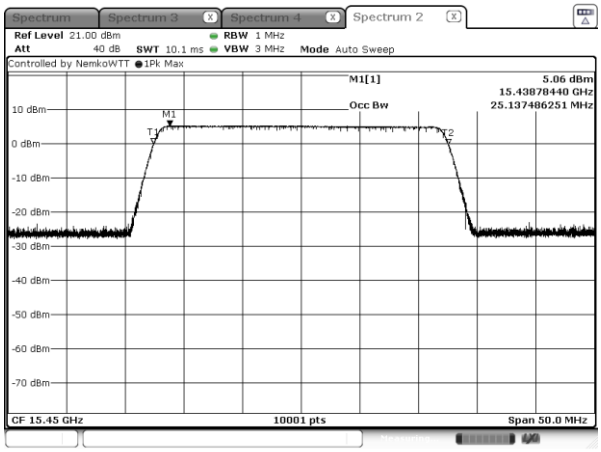


Figure 8.1-1: *99% OBW Low channel: 15.45 GHz, longest pulse (25 MHz BW)*

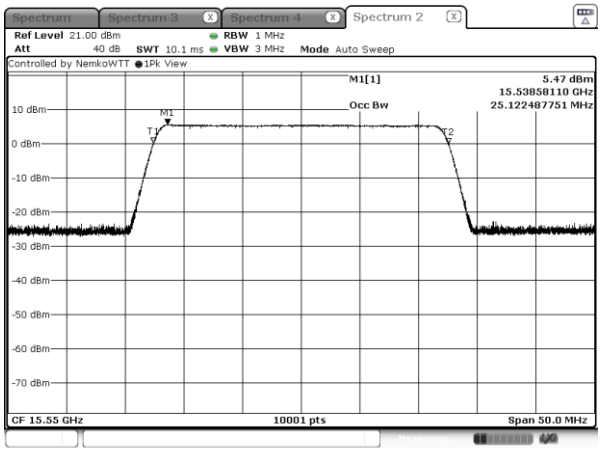


Figure 8.1-2: *99% OBW Middle channel: 15.55 GHz, longest pulse (25 MHz BW)*

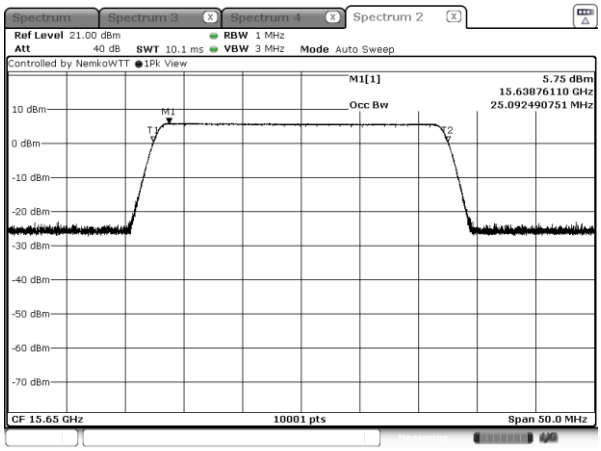


Figure 8.1-3: *99% OBW High channel: 15.65 GHz, longest pulse (25 MHz BW)*

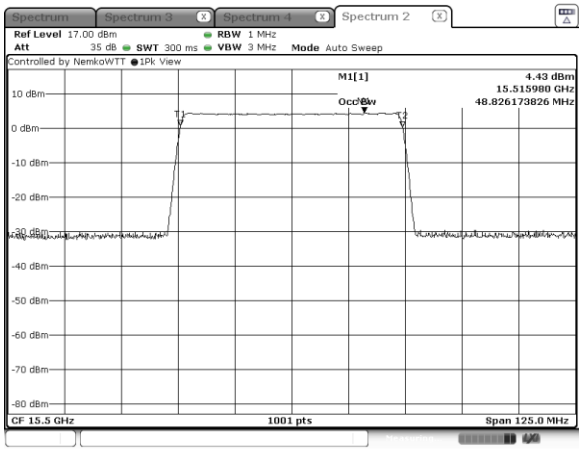


Figure 8.1-4: *99% OBW Low channel: 15.50 GHz, longest pulse (50 MHz BW)*

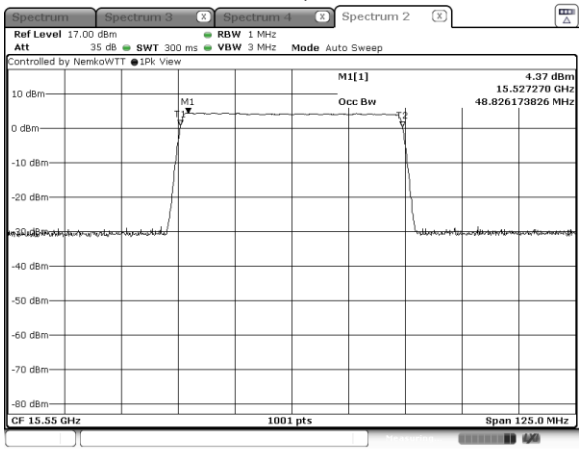


Figure 8.1-5: *99% OBW Middle channel: 15.55 GHz, longest pulse (50 MHz BW)*

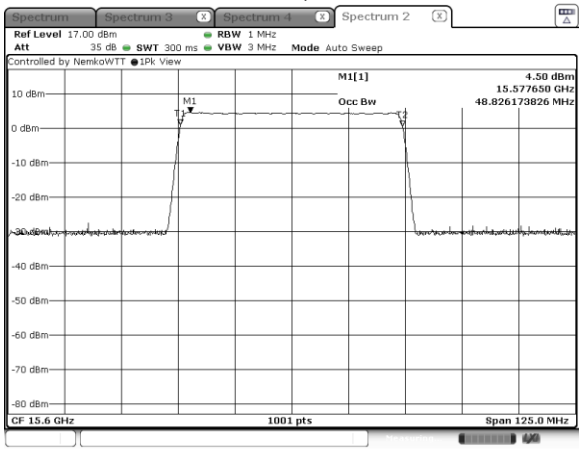


Figure 8.1-6: *99% OBW High channel: 15.60 GHz, longest pulse (50 MHz BW)*

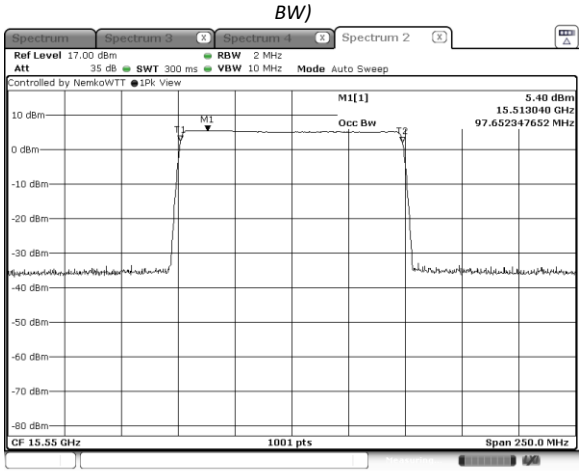


Figure 8.1-7: *99% OBW Middle channel: 15.55 GHz, longest pulse (100 MHz BW)*

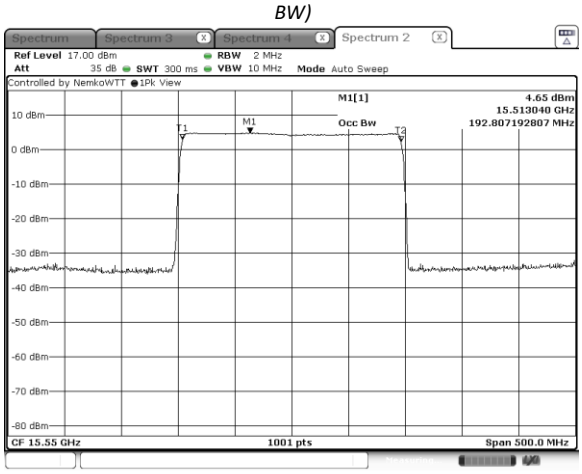


Figure 8.1-8: *99% OBW Middle channel: 15.55 GHz, longest pulse (200 MHz BW)*

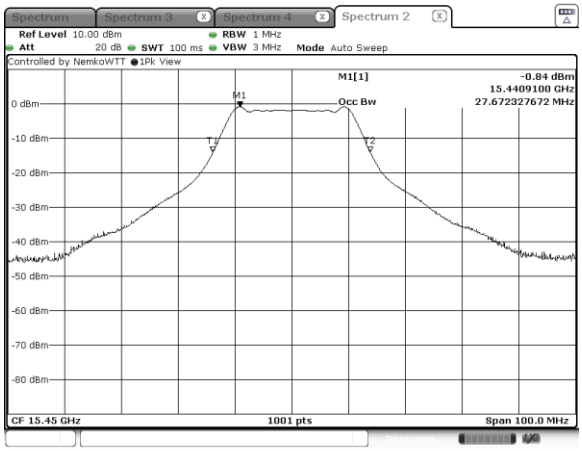


Figure 8.1-9: *99% OBW Low channel: 15.45 GHz, shortest pulse (25 MHz BW)*

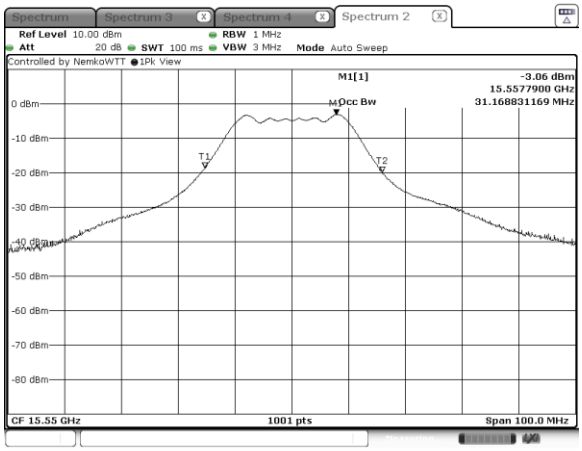


Figure 8.1-10: *99% OBW Middle channel: 15.55 GHz, shortest pulse (25 MHz BW)*

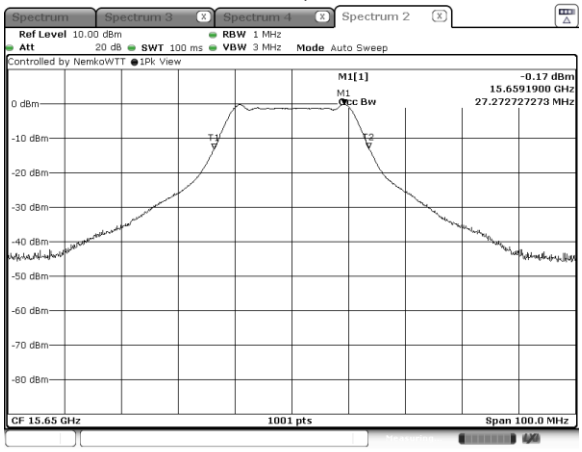


Figure 8.1-11: *99% OBW High channel: 15.65 GHz, shortest pulse (25 MHz BW)*

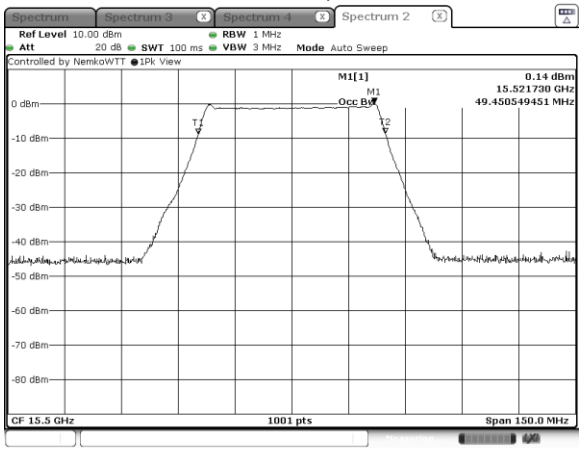


Figure 8.1-12: *99% OBW Low channel: 15.50 GHz, shortest pulse (50 MHz BW)*

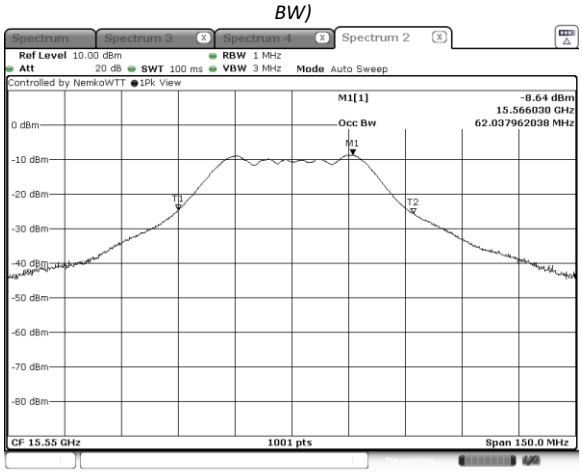


Figure 8.1-13: *99% OBW Middle channel: 15.55 GHz, shortest pulse (50 MHz BW)*

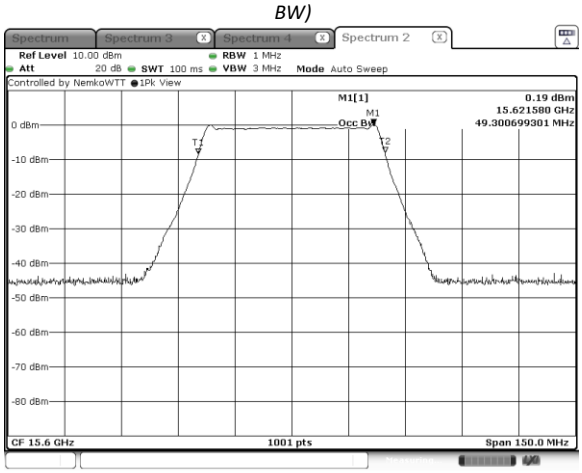


Figure 8.1-14: *99% OBW High channel: 15.60 GHz, shortest pulse (50 MHz BW)*

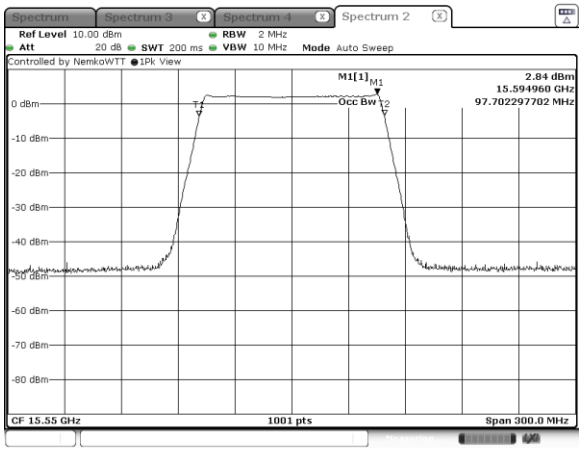


Figure 8.1-15: *99% OBW Middle channel: 15.55 GHz, shortest pulse (100 MHz BW)*

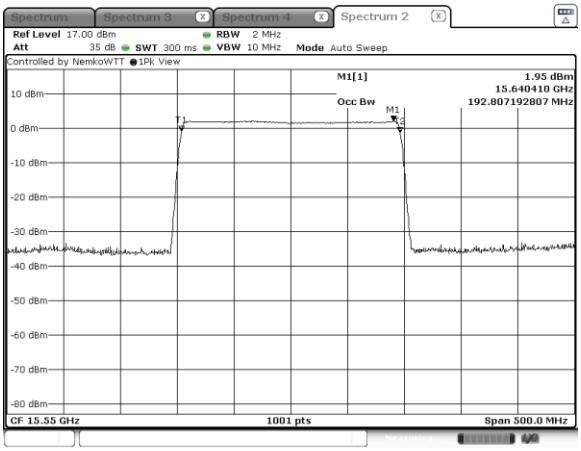


Figure 8.1-16: *99% OBW Middle channel: 15.55 GHz, shortest pulse (200 MHz BW)*

8.2 Bandwidth of emission (26 dB)

8.2.1 References and limits

- Test method: ANSI C63.26-2014 (5.4.3)

8.2.2 Test summary

Verdict	Pass		
Test date	September 5, 2024; September 6, 2024;	Temperature	22°C 21°C
Test engineer	Chenhao Ma, Wireless Test Technician	Air pressure	1003mbar 1002mbar
Test location	☐ Wireless bench ☒ Other: 3M Chamber	Relative humidity	58% 53%

8.2.3 Notes

Testing was performed with the transmitter operating on a fixed channel at full power following the cases shown on table 8.1-1 from section 8.1.3 of this document. This measurement is not a requirement, but it is used for the mask calculation in section 8.4 of this document.

Testing was done at 3 meters with the antenna and turntable fixed. A maximization of the signal was done to define the position of the max power:

8.2.4 Setup details

EUT power input during test	28 V DC
EUT setup configuration	☐ Table-top ☐ Floor standing ☒ Other: Tripod mounted (1.5 m)

Receiver settings:

Resolution bandwidth	Approximately 1-5 % of the emission bandwidth
Video bandwidth	Approximately 3 x resolution bandwidth
Detector mode	Peak
Trace mode	Max Hold
Measurement time	Long enough for trace to stabilize

8.2.5 Test data

Frequency	26dB Bandwidth	Type of pulse	Time duration
15.45 GHz	28.172MHz	Longest pulse	30 µs
15.55 GHz	29.016MHz	Longest pulse	30 µs
15.65 GHz	28.57MHz	Longest pulse	30 µs
15.50 GHz	52.45MHz	Longest pulse	30 µs
15.55 GHz	52.9MHz	Longest pulse	30 µs
15.60 GHz	52.9MHz	Longest pulse	30 µs
15.55 GHz	102.3MHz	Longest pulse	30 µs
15.55 GHz	201.3MHz	Longest pulse	28.494 µs
15.45 GHz	42.06MHz	Shortest pulse	2 µs
15.55 GHz	47.2MHz	Shortest pulse	1 µs
15.65 GHz	40.86MHz	Shortest pulse	2 µs
15.50 GHz	60.69MHz	Shortest pulse	5 µs
15.55 GHz	88.71MHz	Shortest pulse	500 ns
15.60 GHz	61.14MHz	Shortest pulse	5 µs
15.55 GHz	113.59MHz	Shortest pulse	5 µs
15.55 GHz	206.29MHz	Shortest pulse	10 µs

Table 8.2-1: 26 dB OBW results.

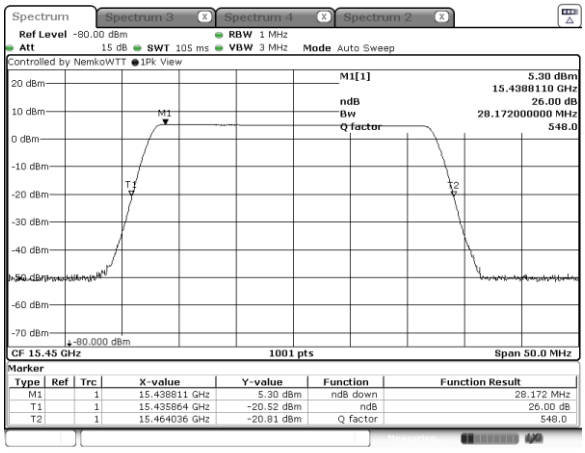


Figure 8.2-1: *26 dB OBW Low channel: 15.45 GHz, longest pulse (25 MHz BW)*

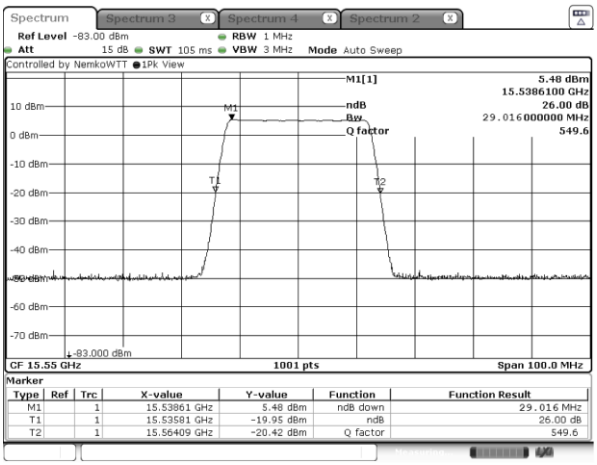


Figure 8.2-2: *26 dB OBW Middle channel: 15.55 GHz, longest pulse (25 MHz BW)*

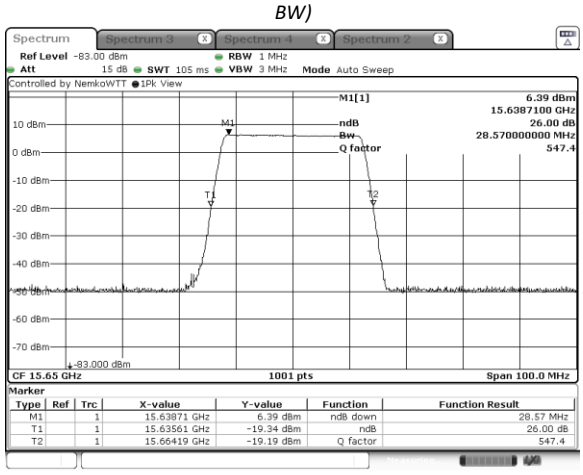


Figure 8.2-3: *26 dB OBW High channel: 15.65 GHz, longest pulse (25 MHz BW)*

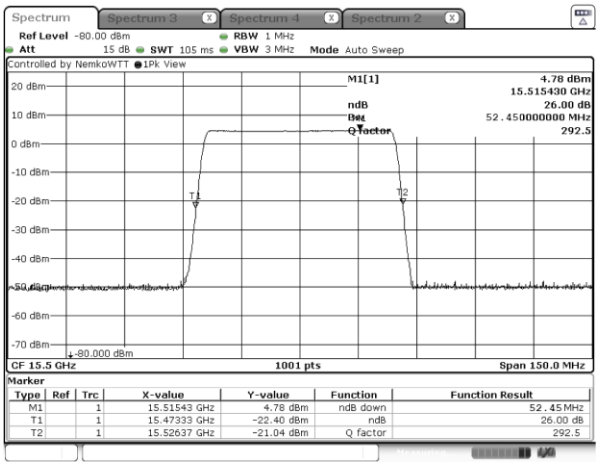


Figure 8.2-4: *26 dB OBW Low channel: 15.50 GHz, longest pulse (50 MHz BW)*

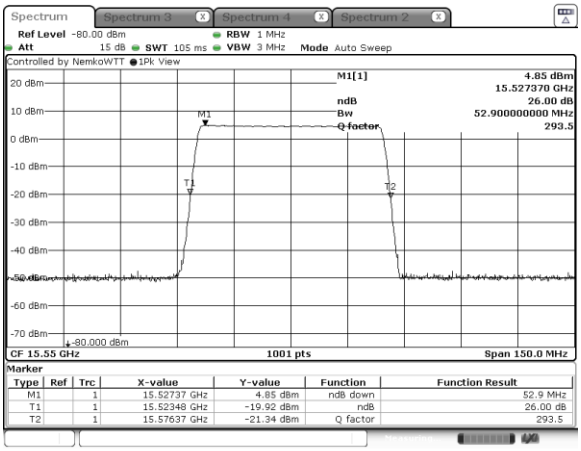


Figure 8.2-5: *26 dB OBW Middle channel: 15.55 GHz, longest pulse (50 MHz BW)*

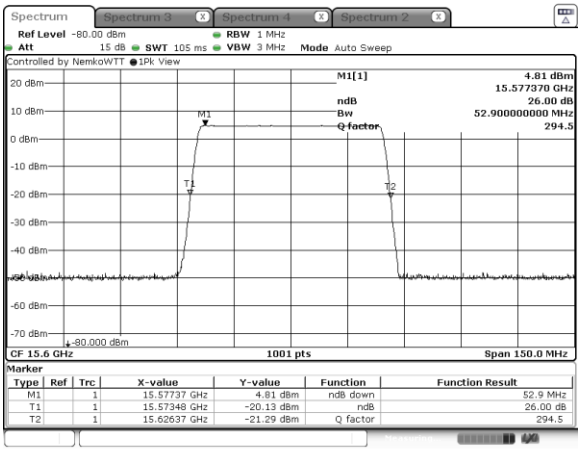


Figure 8.2-6: *26 dB OBW High channel: 15.60 GHz, longest pulse (50 MHz BW)*

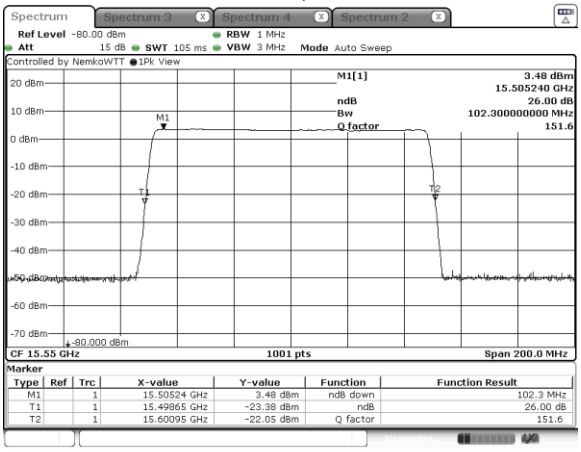


Figure 8.2-7: *26 dB OBW Middle channel: 15.55 GHz, longest pulse (100 MHz BW)*

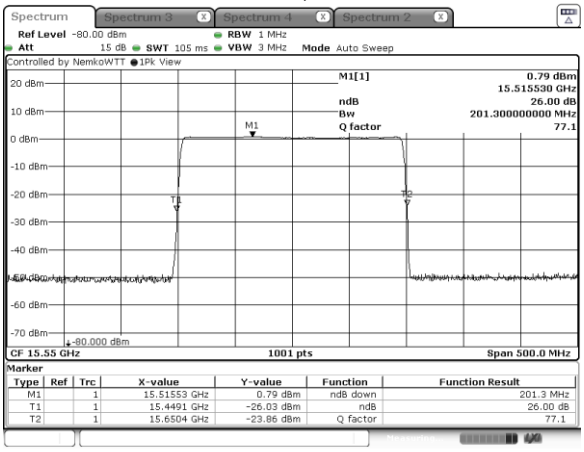


Figure 8.2-8: *26 dB OBW Middle channel: 15.55 GHz, longest pulse (200 MHz BW)*

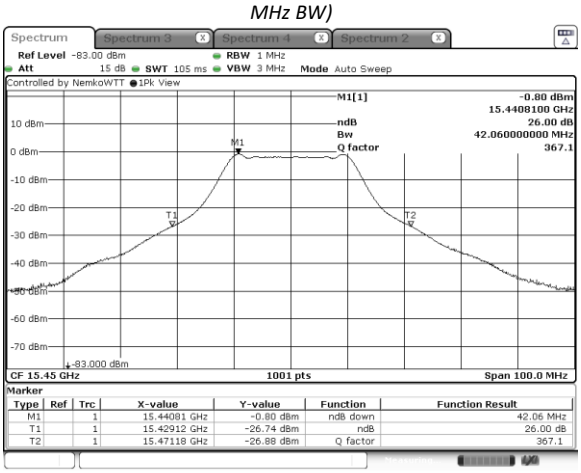


Figure 8.2-9: *26 dB OBW Low channel: 15.45 GHz, shortest pulse (25 MHz BW)*

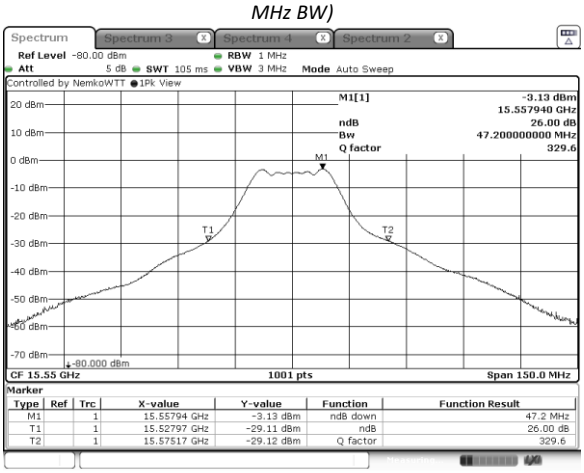


Figure 8.2-10: *26 dB OBW Middle channel: 15.55 GHz, shortest pulse (25 MHz BW)*

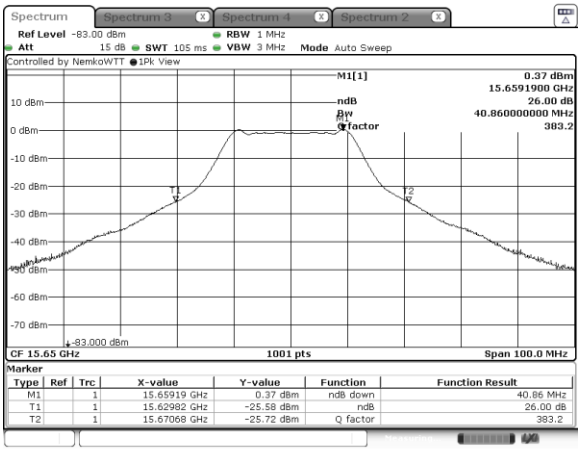


Figure 8.2-11: *26 dB OBW High channel: 15.65 GHz, shortest pulse (25 MHz BW)*

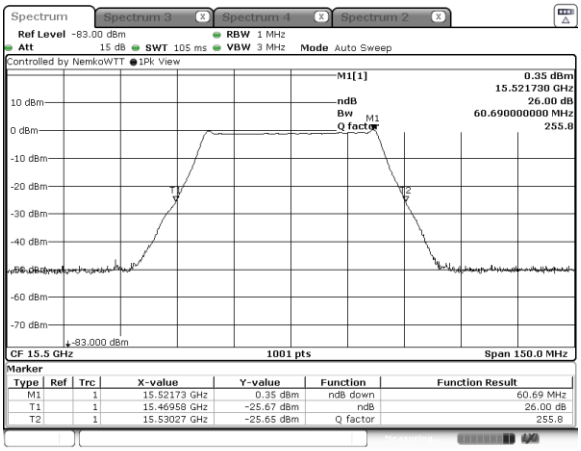


Figure 8.2-12: *26 dB OBW Low channel: 15.50 GHz, shortest pulse (50 MHz BW)*

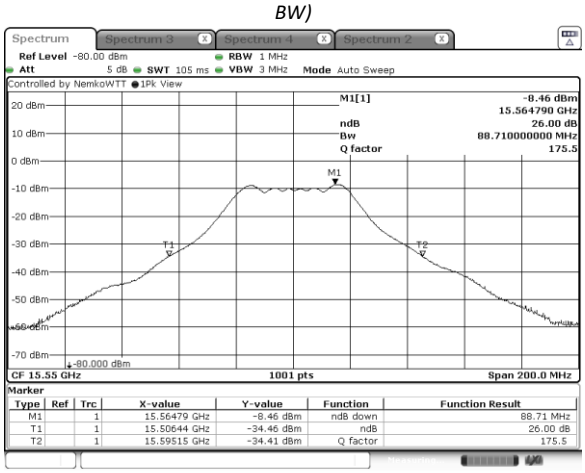


Figure 8.2-13: *26 dB OBW Middle channel: 15.55 GHz, shortest pulse (50 MHz BW)*

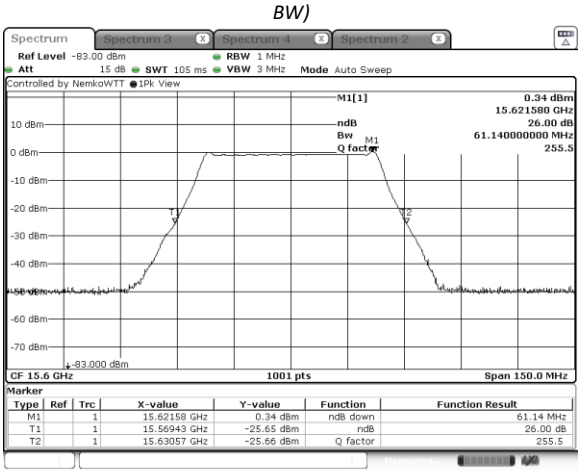


Figure 8.2-14: *26 dB OBW High channel: 15.60 GHz, shortest pulse (50 MHz BW)*

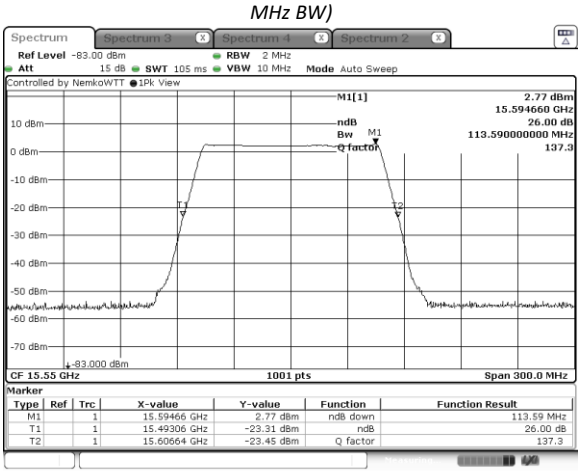


Figure 8.2-15: *26 dB OBW Middle channel: 15.55 GHz, shortest pulse (100 MHz BW)*

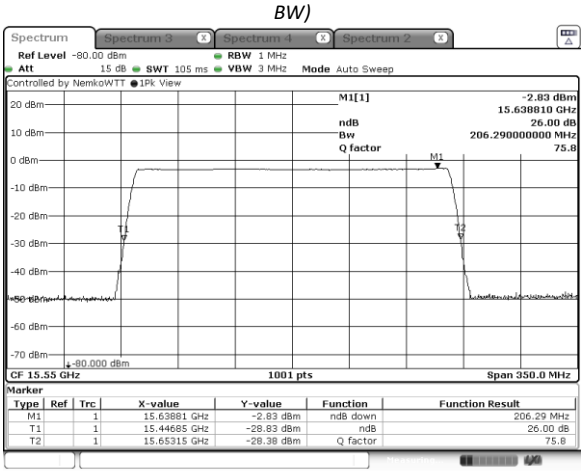


Figure 8.2-16: *26 dB OBW Middle channel: 15.55 GHz, shortest pulse (200 MHz BW)*

8.3 Power and emissions

8.3.1 References and limits

- FCC 47 CFR Part 87: §87.131
- Test method: ANSI C63.26-2014 (5.2.4.4.2)

The following table lists authorized emissions and maximum power. Power must be determined by direct measurement.

Class of station	Frequency band/frequency	Authorized emission(s)[9]	Maximum power[1]
(Radionavigation)	Various[7]	Various[7]	Various.[7]

[7] Frequency, emission, and maximum power will be determined by appropriate standards during the certification process.

8.3.2 Test summary

Verdict	Pass		
Test date	September 5, 2024; September 6, 2024;	Temperature	22°C 21°C
Test engineer	Chenhao Ma, Wireless Test Technician	Air pressure	1003mbar 1002mbar
Test location	☐ Wireless bench ☒ Other: 3M Chamber	Relative humidity	58% 53%

8.3.3 Notes

Testing was performed with the transmitter operating on a fixed channel at full power following the cases shown on table 8.1-1 from section 8.1.3 of this document. All correction factors corresponding cables losses, receiving antenna gain, and air path losses were compensated to get the real EIRP value of the product. Both polarizations were evaluated, horizontal and vertical (linear polarization per client declaration) and only the worst case (max power) was taken for the testing purposes: horizontal polarization. The duty cycle correction factor was added according to each frequency channel tested. Table 8.3-1 shows the constant duty cycle corresponding to each case.
The equation to calculate the total correction factor corresponding to each frequency tested is given by the following expression as well as the table with the corresponding duty cycle to each case:

$$E.I.R.P = P_r - G_r - 20\log_{10}\left(\frac{\lambda}{4\pi d}\right)$$

Adding cable losses and duty cycle correction factors (absolute values):

$$E.I.R.P = P_r - G_r - 20\log_{10}\left(\frac{\lambda}{4\pi d}\right) + L_{cable} + 10\log_{10}\left(\frac{1}{Duty\ cycle}\right)$$

Where:
P_r = Power received in the spectrum analyzer
λ = Wavelength of the signal
L_{cable} = Losses corresponding to interconnexion cables
d = Measuring distance (3 meters)
G_r = Receiving antenna gain
DC = Duty cycle declared

Example:

$$E.I.R.P = P_r - 15.555 - 20\log_{10}\left(\frac{\frac{299792458}{15450000000}}{4\pi(3)}\right) + 19.96 + 10\log_{10}\left(\frac{1}{0.15}\right)$$

$$E.I.R.P = P_r - 15.555 - (-65.768) + 19.96 + 8.239 = P_r + 77.745 \text{ (offset)}$$

Frequency	Type of pulse	Time duration	Constant duty cycle
15.45 GHz	Longest pulse	30 µs	15%
15.55 GHz	Longest pulse	30 µs	15%
15.65 GHz	Longest pulse	30 µs	15%
15.50 GHz	Longest pulse	30 µs	15%
15.55 GHz	Longest pulse	30 µs	15%
15.60 GHz	Longest pulse	30 µs	15%
15.55 GHz	Longest pulse	30 µs	15%
15.55 GHz	Longest pulse	28.494 µs	15%
15.45 GHz	Shortest pulse	2 µs	10%
15.55 GHz	Shortest pulse	1 µs	10%
15.65 GHz	Shortest pulse	2 µs	10%
15.50 GHz	Shortest pulse	5 µs	10%
15.55 GHz	Shortest pulse	500 ns	10%
15.60 GHz	Shortest pulse	5 µs	10%
15.55 GHz	Shortest pulse	5 µs	10%
15.55 GHz	Shortest pulse	10 µs	10%

Table 8.3-1: Duty cycle table.

Testing was done at 3 meters with the antenna and turntable fixed. A maximization of the signal was done to define the position of the max power

8.3.4 Setup details

EUT power input during test	28 VDC
EUT setup configuration	☐ Table-top ☐ Floor standing ☒ Other: Tripod mounted (1.5 m)

Receiver settings:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	RMS
Trace mode	Average (at least 100 traces)
Measurement points	≥ (2xspan)/RBW
Span	2 times or 3 times the 99% OBW

8.3.5 Test data

Frequency	Power (EIRP)	Type of pulse	Time duration
15.45 GHz	74.07 dBm	Longest pulse	30 µs
15.55 GHz	73.96 dBm	Longest pulse	30 µs
15.65 GHz	**74.46 dBm[1]**	**Longest pulse**	**30 µs**
15.50 GHz	73.97 dBm	Longest pulse	30 µs
15.55 GHz	73.69 dBm	Longest pulse	30 µs
15.60 GHz	74.1 dBm	Longest pulse	30 µs
15.55 GHz[1]	74.02 dBm	Longest pulse	30 µs
15.55 GHz	74.23 dBm	Longest pulse	28.494 µs
15.45 GHz	73.13 dBm	Shortest pulse	2 µs
15.55 GHz	72.24 dBm	Shortest pulse	1 µs
15.65 GHz	73.13 dBm	Shortest pulse	2 µs
15.50 GHz	73.87 dBm	Shortest pulse	5 µs
15.55 GHz	71.69 dBm	Shortest pulse	500 ns
15.60 GHz	73.86 dBm	Shortest pulse	5 µs
15.55 GHz	73.94 dBm	Shortest pulse	5 µs
15.55 GHz	73.88 dBm	Shortest pulse	15 µs

Note 1: Max power measured (worst case)

Table 8.3-2: Power results (EIRP)

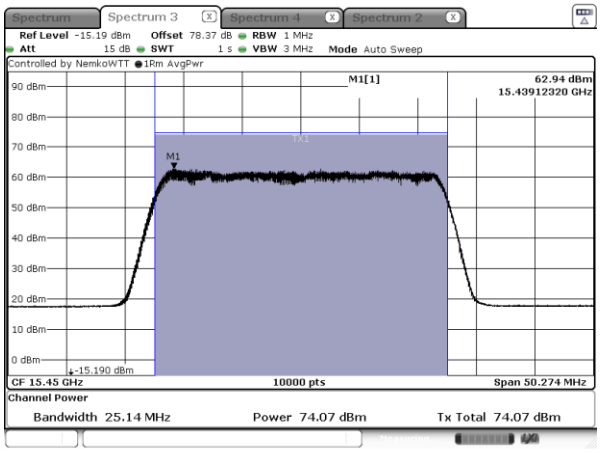


Figure 8.3-1: *EIRP Power, Low channel: 15.45 GHz, longest pulse (25 MHz BW)*

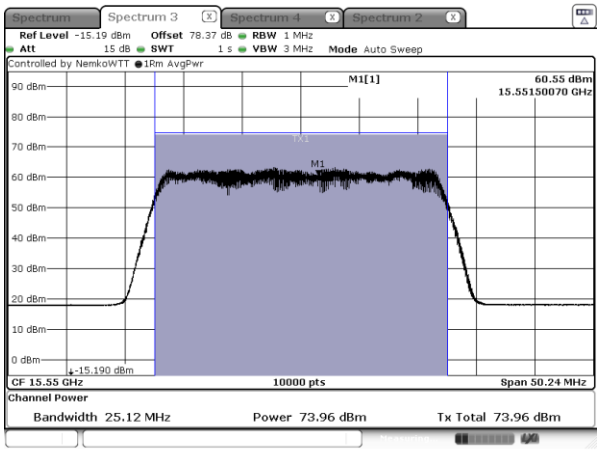


Figure 8.3-2: *EIRP Power, Middle channel: 15.55 GHz, longest pulse (25 MHz BW)*

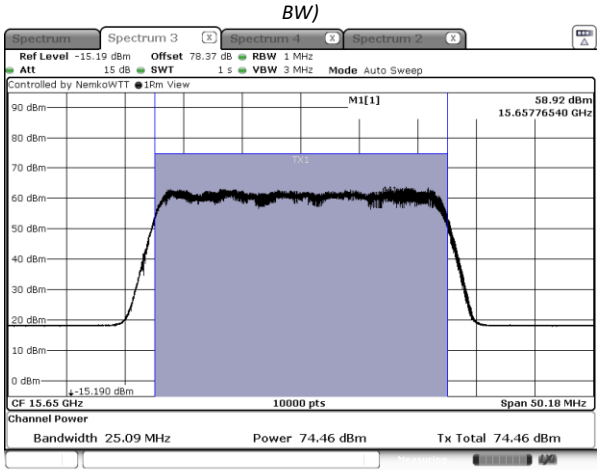


Figure 8.3-3: *EIRP Power, High channel: 15.65 GHz, longest pulse (25 MHz BW)*

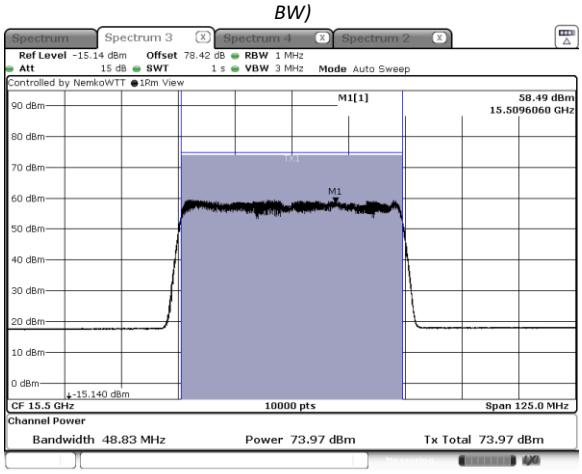


Figure 8.3-4: *EIRP Power, Low channel: 15.50 GHz, longest pulse (50 MHz BW)*

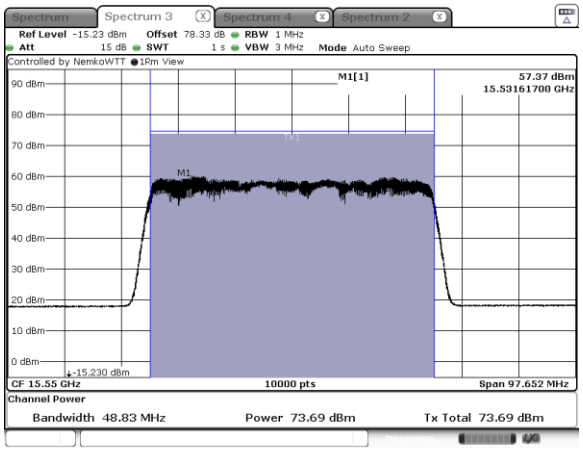


Figure 8.3-5: *EIRP Power, Middle channel: 15.55 GHz, longest pulse (50 MHz BW)*

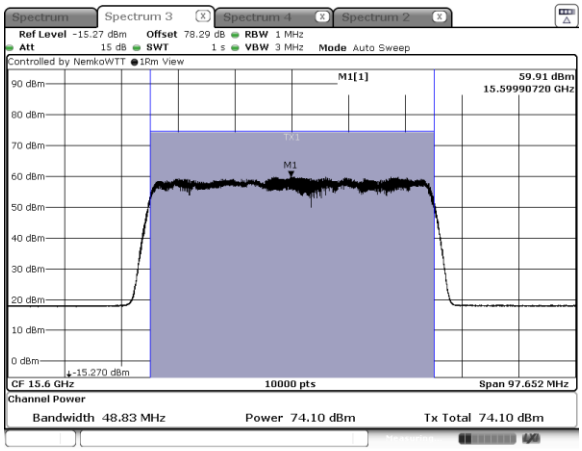


Figure 8.3-6: *EIRP Power, High channel: 15.60 GHz, longest pulse (50 MHz BW)*

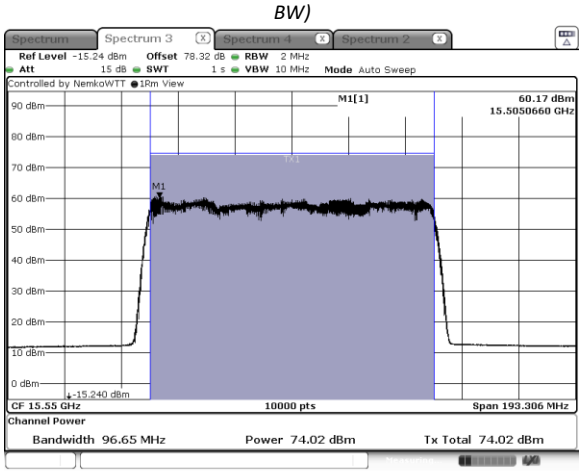


Figure 8.3-7: *EIRP Power, Middle channel: 15.55 GHz, longest pulse (100 MHz BW)*

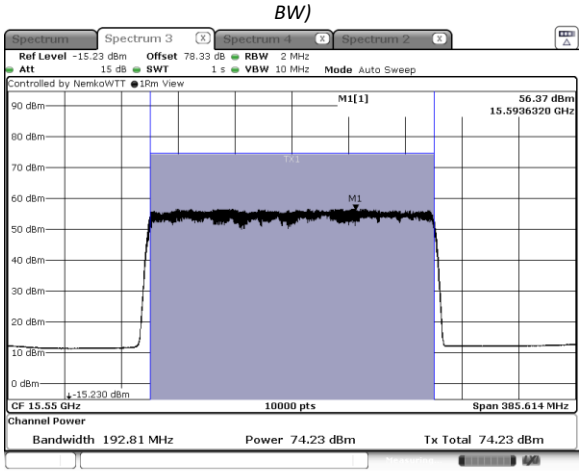


Figure 8.3-8: *EIRP Power, Middle channel: 15.55 GHz, longest pulse (200 MHz BW)*

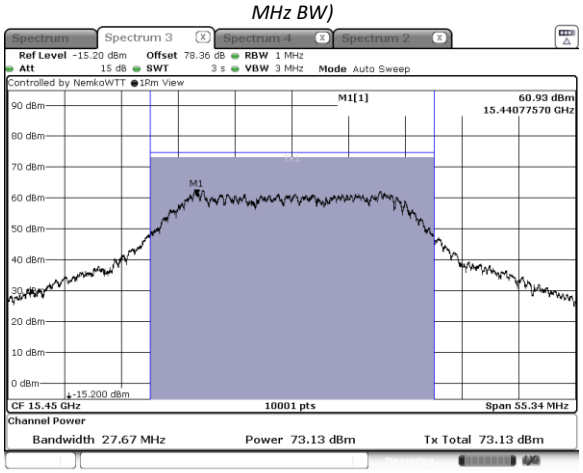


Figure 8.3-9: *EIRP Power, Low channel: 15.45 GHz, shortest pulse (25 MHz BW)*

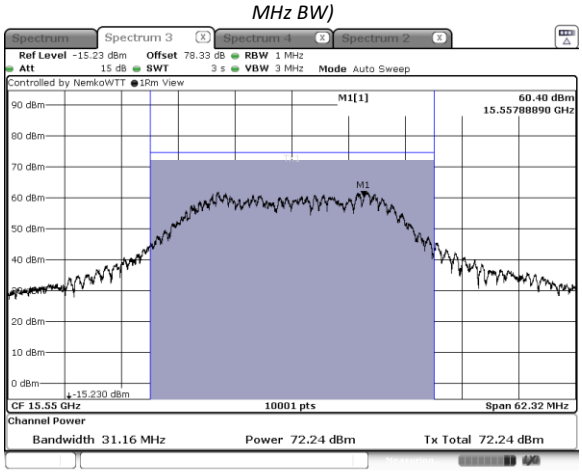


Figure 8.3-10: *EIRP Power, Middle channel: 15.55 GHz, shortest pulse (25 MHz BW)*

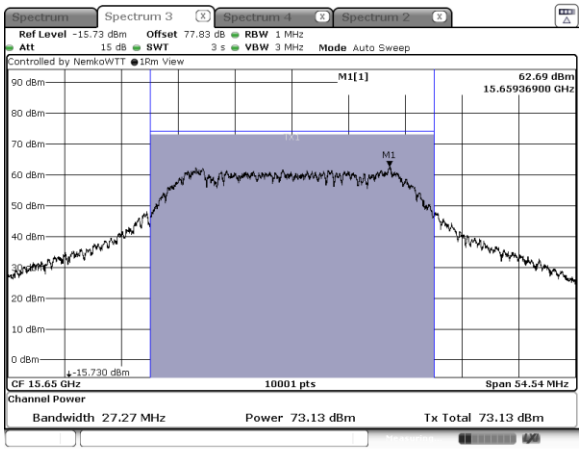


Figure 8.3-11: *EIRP Power, High channel: 15.65 GHz, shortest pulse (25 MHz BW)*

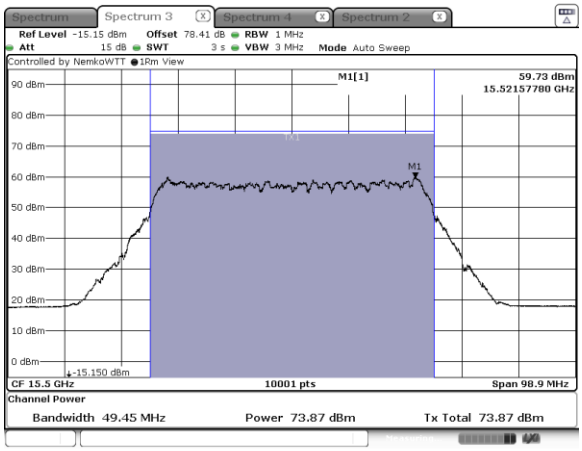


Figure 8.3-12: *EIRP Power, Low channel: 15.50 GHz, shortest pulse (50 MHz BW)*

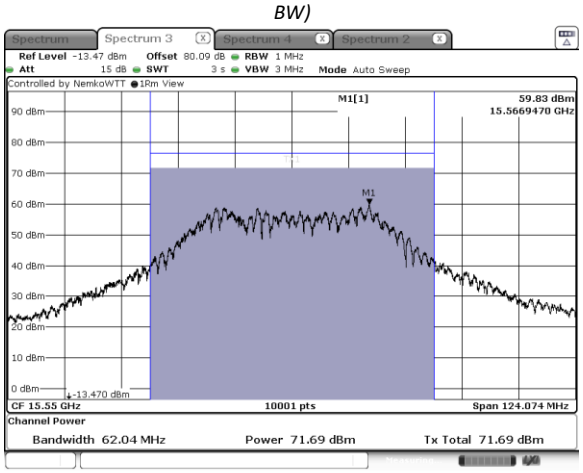


Figure 8.3-13: *EIRP Power, Middle channel: 15.55 GHz, shortest pulse (50 MHz BW)*

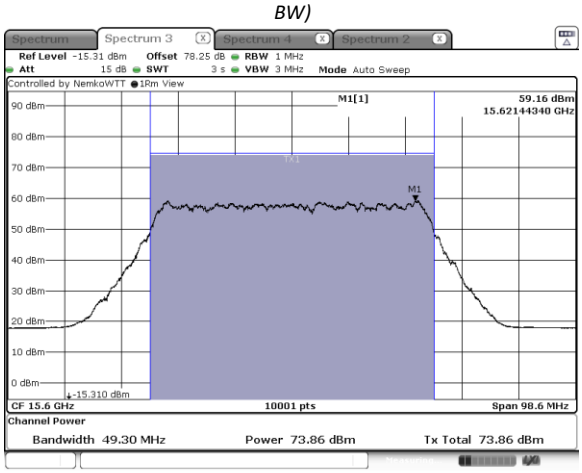


Figure 8.3-14: *EIRP Power, High channel: 15.60 GHz, shortest pulse (50 MHz BW)*

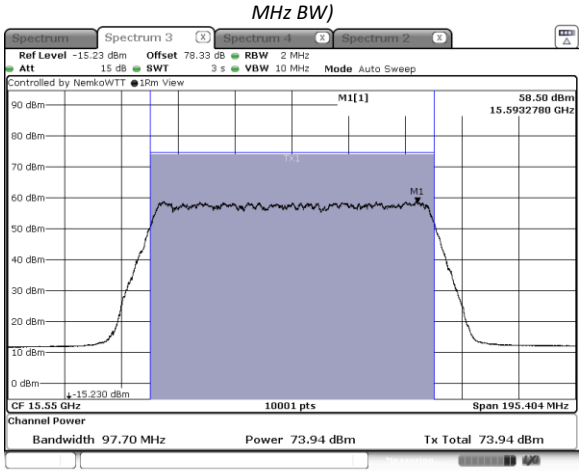


Figure 8.3-15: *EIRP Power, Middle channel: 15.55 GHz, shortest pulse (100 MHz BW)*

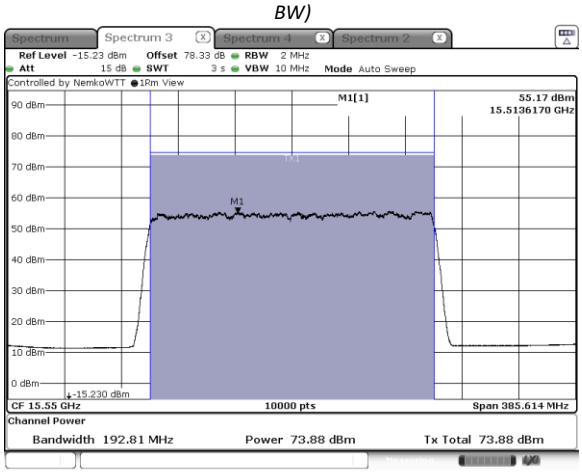


Figure 8.3-16: *EIRP Power, Middle channel: 15.55 GHz, shortest pulse (200 MHz BW)*

8.4 Emission limitations

8.4.1 References and limits

- FCC 47 CFR Part 87: §87.139
- Test method: ANSI C63.26-2014 (5.5)

(a) Except for ELTs and when using single sideband (R3E, H3E, J3E), or frequency modulation (F9) or digital modulation (F9Y) for telemetry or telecommand in the 1435–1525 MHz, 2345–2395 MHz, or 5091–5150 MHz band or digital modulation (G7D) for differential GPS, the mean power of any emissions must be attenuated below the mean power of the transmitter (pY) as follows:

(1) When the frequency is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth the attenuation must be at least 25 dB;

(2) When the frequency is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth the attenuation must be at least 35 dB.

(3) When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth the attenuation for aircraft station transmitters must be at least 40 dB; and the attenuation for aeronautical station transmitters must be at least 43 + 10 log10 pY dB.

8.4.2 Test summary

Verdict	Pass		
Test date	September 5, 2024; September 6, 2024;	Temperature	22°C 21°C
Test engineer	Chenhao Ma, Wireless Test Technician	Air pressure	1003mbar 1002mbar
Test location	☐ Wireless bench ☒ Other: 3M Chamber	Relative humidity	58% 53%

8.4.3 Notes

Testing was performed with the transmitter operating on a fixed channel at full power following the cases shown on table 8.1-1 from section 8.1.3 of this document. The width of the mask was defined according to the 26 dB bandwidth results (one measured bandwidth selected for each declared bandwidth and each pulse width) shown in table 8.2-1 from section 8.2.5 of this document.

The range between the ±250% is a relative limit, therefore, no correction factors were added. For the frequency range beyond ±250% the limit is an absolute value (-13 dBm), which means the corrections factors corresponding to air path losses and interconnection cables were added as an offset in the spectrum analyzer.

In this section, offset equivalent to RBW/2 in the edges of frequency can be applied, according to the basic guidelines described on C63.26 (5.7.2).

8.4.4 Setup details

EUT power input during test	28 V DC
EUT setup configuration	☐ Table-top ☐ Floor standing ☒ Other: Tripod mounted (1.5 m)

Receiver settings:

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	RMS
Trace mode	Average (at least 100 traces)
Span	Enough to see the spectrum under investigation

8.4.5 Test data

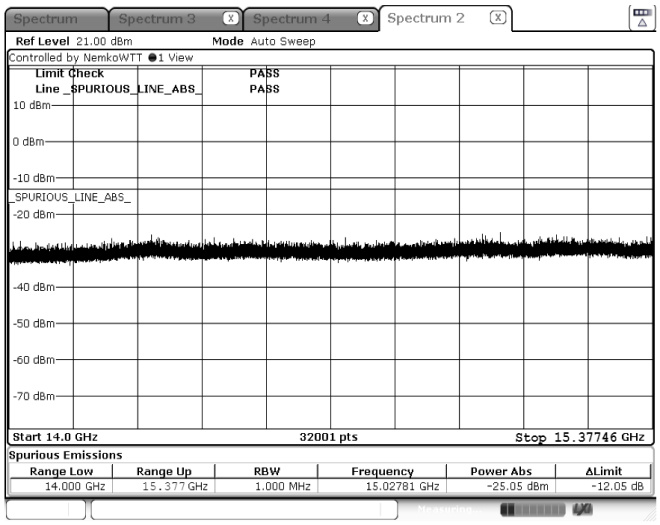


Figure 8.4-1: *Emission mask, beyond ±250% of BW (low frequency range), Low channel: 15.45 GHz, longest pulse. (25 MHz BW)*

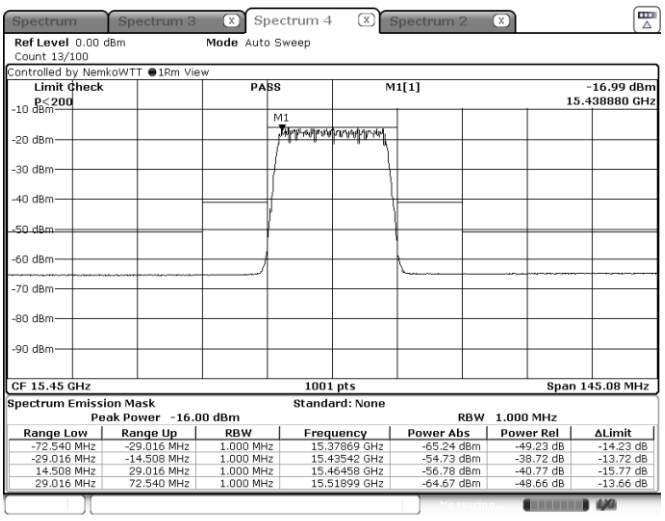


Figure 8.4-2: *Emission mask, Low channel: 15.45 GHz, longest pulse. (25 MHz BW)*

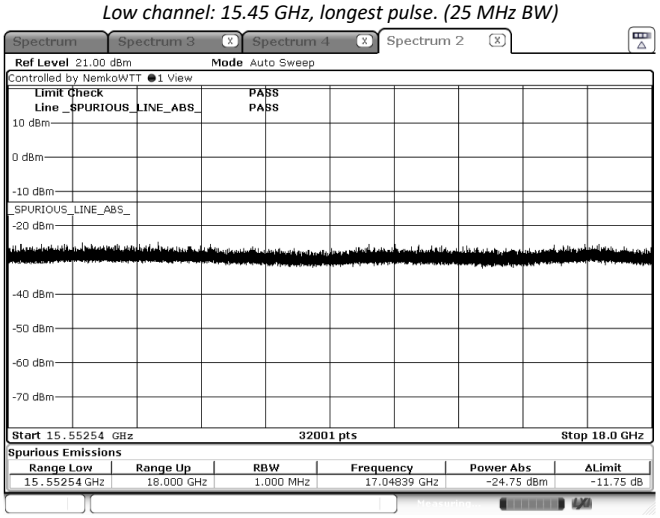


Figure 8.4-3: *Emission mask, beyond ±250% of BW (high frequency range), Low channel: 15.45 GHz, longest pulse. (25 MHz BW)*

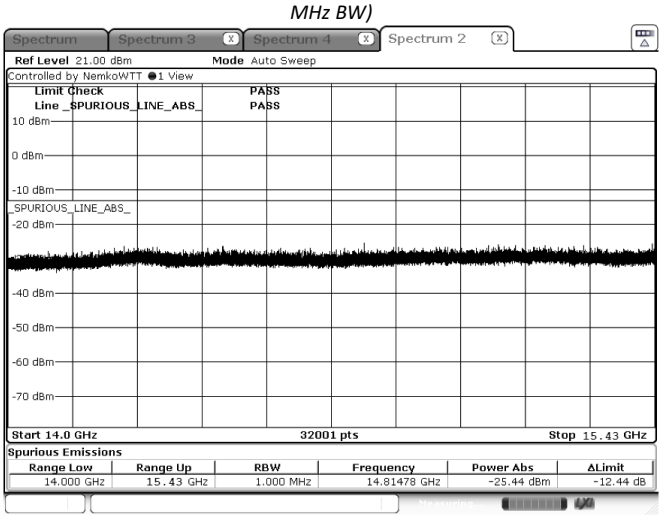


Figure 8.4-4: *Emission mask, beyond ±250% of BW (low frequency range), Middle channel: 15.55 GHz, longest pulse. (25 MHz BW)*

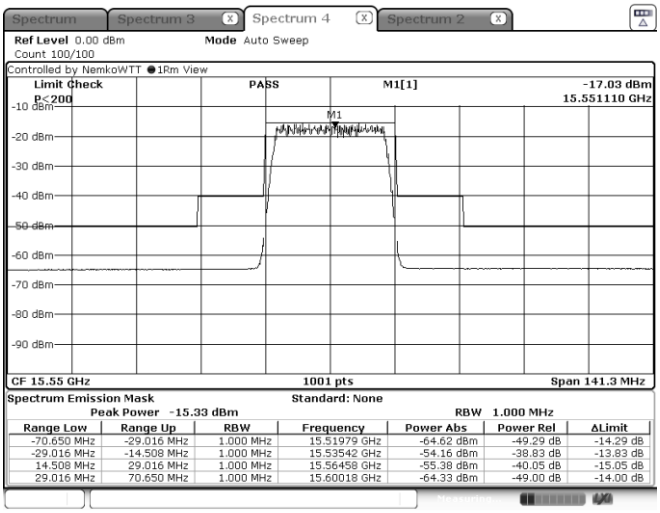


Figure 8.4-5: *Emission mask, Middle channel: 15.55 GHz, longest pulse. (25 MHz BW)*

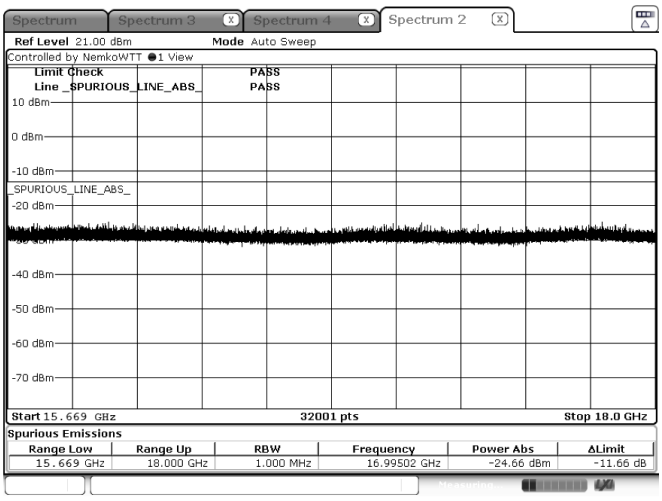


Figure 8.4-6: *Emission mask, beyond ±250% of BW (high frequency range), Middle channel: 15.55 GHz, longest pulse. (25 MHz BW)*

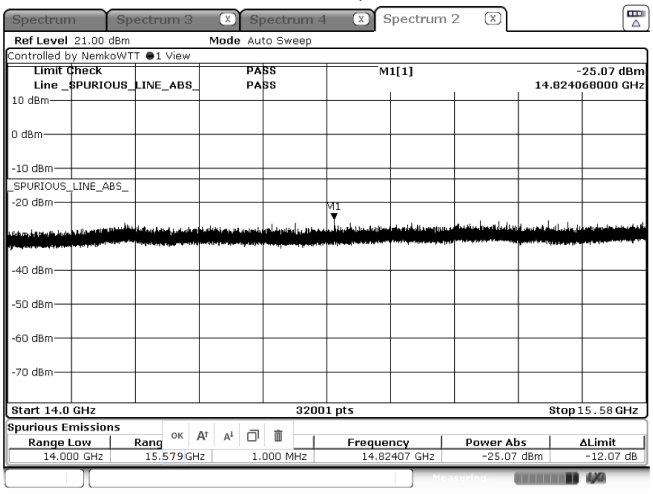


Figure 8.4-7: *Emission mask, beyond ±250% of BW (low frequency range), High channel: 15.65 GHz, longest pulse. (25 MHz BW)*

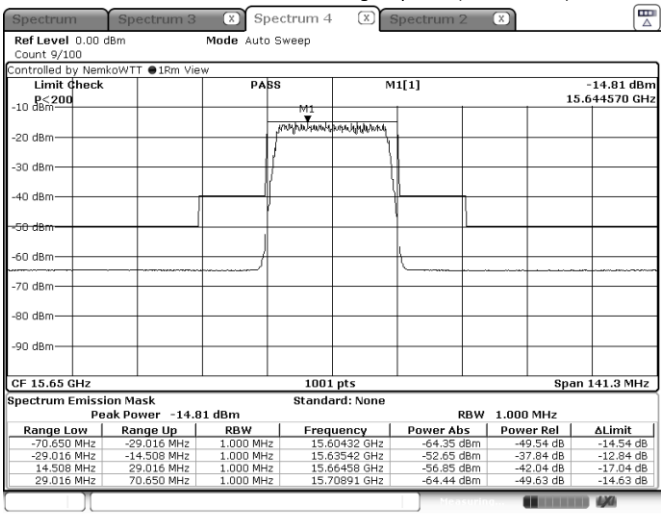


Figure 8.4-8: *Emission mask, High channel: 15.65 GHz, longest pulse. (25 MHz BW)*

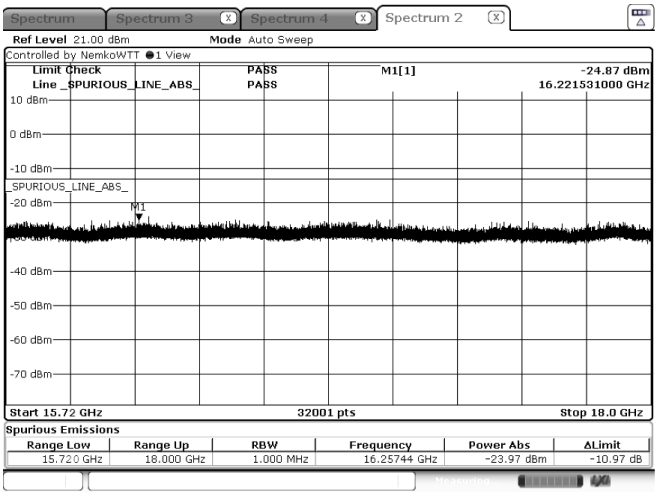


Figure 8.4-9: *Emission mask, beyond ±250% of BW (high frequency range), High channel: 15.65 GHz, longest pulse. (25 MHz BW)*

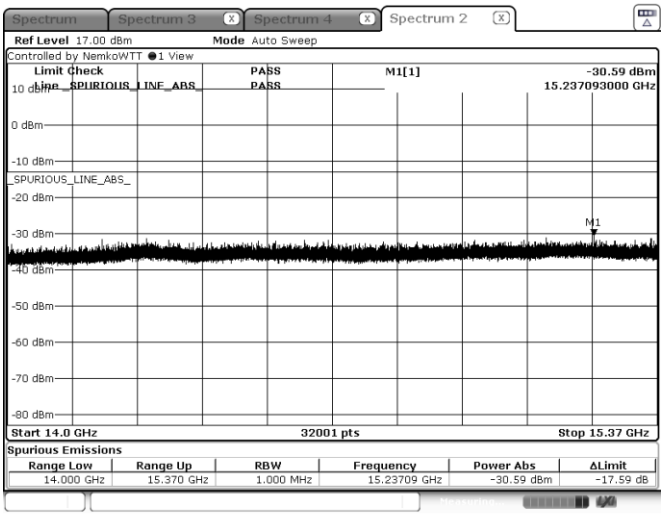


Figure 8.4-10: *Emission mask, beyond ±250% of BW (low frequency range), Low channel: 15.50 GHz, longest pulse. (50 MHz BW)*

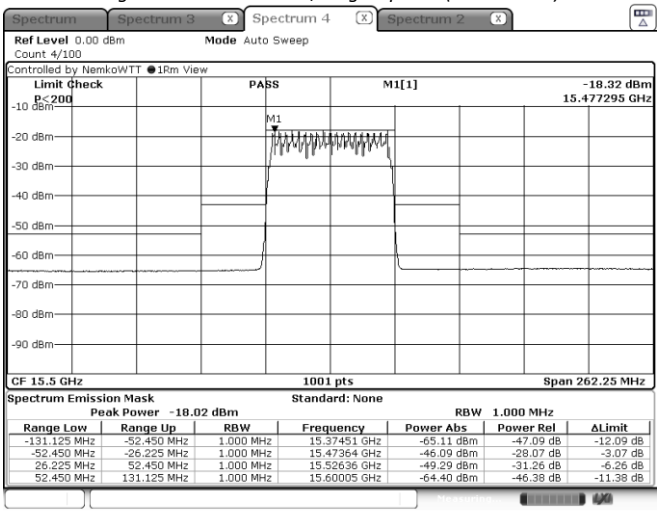


Figure 8.4-11: *Emission mask, Low channel: 15.50 GHz, longest pulse. (50 MHz BW)*

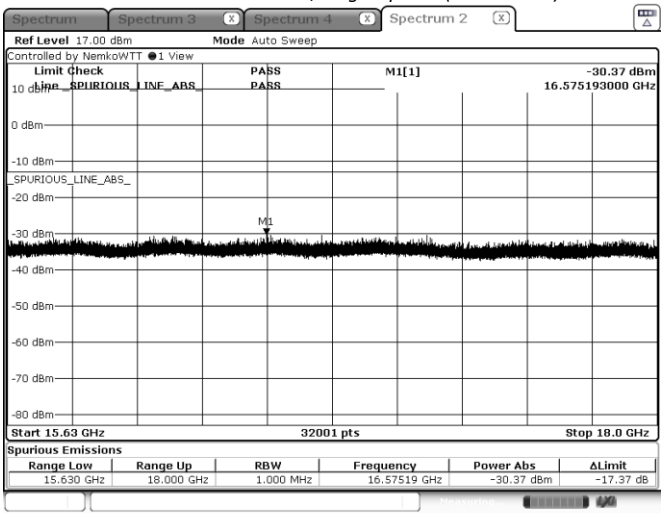


Figure 8.4-12: *Emission mask, beyond ±250% of BW (high frequency range), Low channel: 15.50 GHz, longest pulse. (50 MHz BW)*

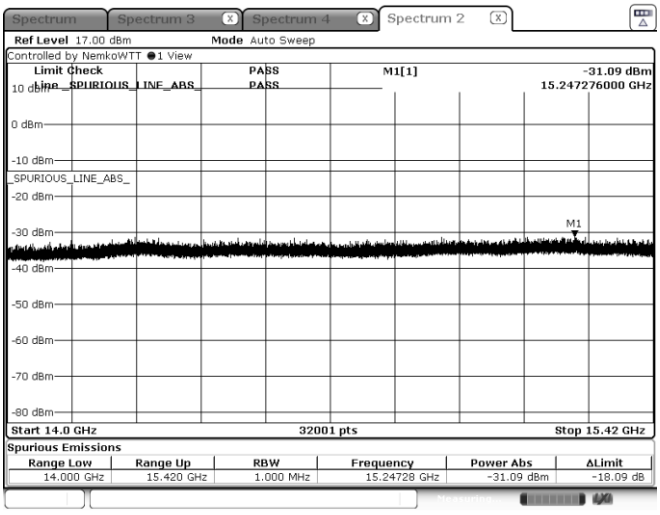


Figure 8.4-13: *Emission mask, beyond ±250% of BW (low frequency range), Middle channel: 15.55 GHz, longest pulse. (50 MHz BW)*

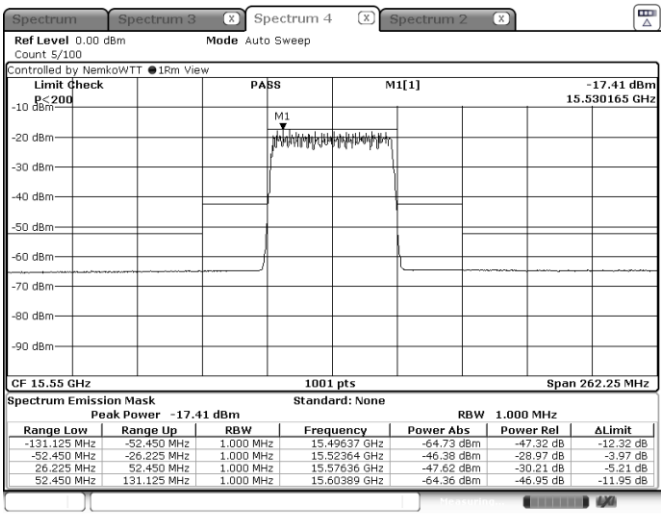


Figure 8.4-14: *Emission mask, Middle channel: 15.55 GHz, longest pulse. (50 MHz BW)*

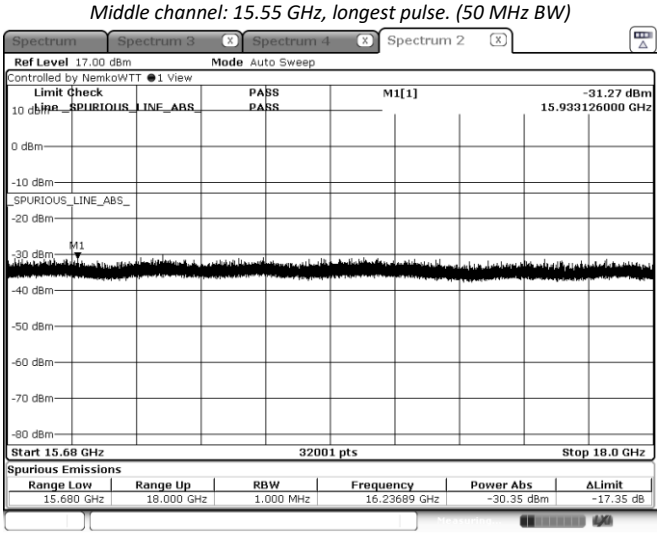


Figure 8.4-15: *Emission mask, beyond ±250% of BW (high frequency range), Middle channel: 15.55 GHz, longest pulse. (50 MHz BW)*

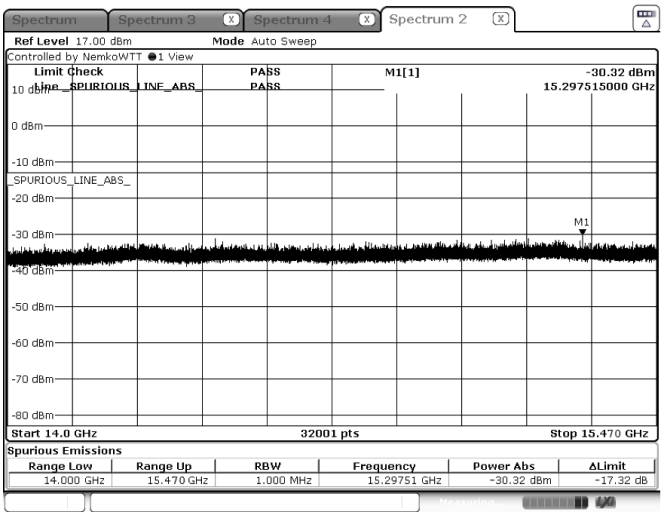


Figure 8.4-16: *Emission mask, beyond ±250% of BW (low frequency range), High channel: 15.60 GHz, longest pulse. (50 MHz BW)*

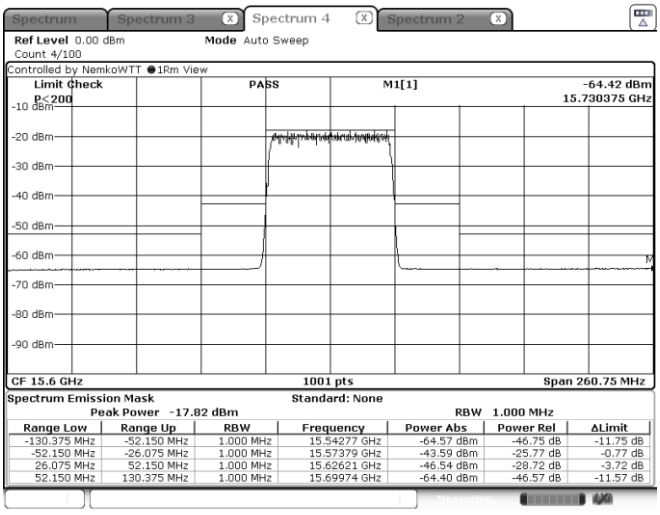


Figure 8.4-17: *Emission mask, High channel: 15.60 GHz, longest pulse. (50 MHz BW)*

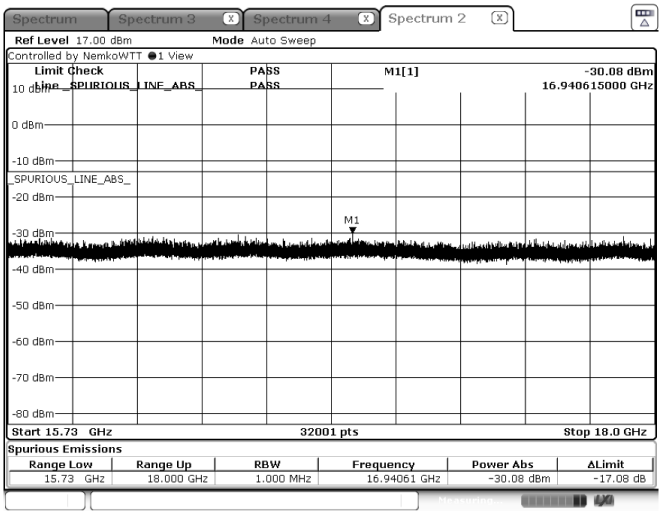


Figure 8.4-18: *Emission mask, beyond ±250% of BW (high frequency range), High channel: 15.60 GHz, longest pulse. (50 MHz BW)*

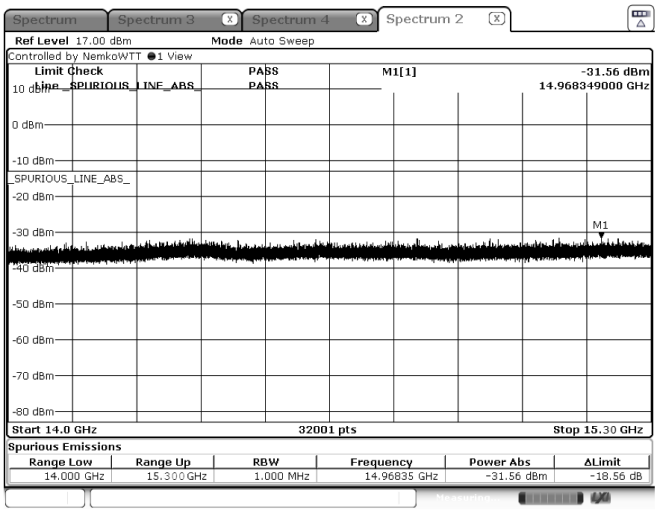


Figure 8.4-19: *Emission mask, beyond ±250% of BW (low frequency range), Middle channel: 15.55 GHz, longest pulse. (100 MHz BW)*

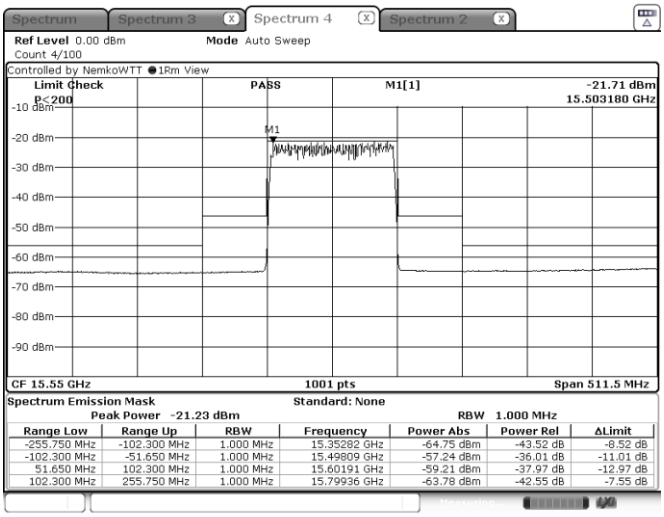


Figure 8.4-20: *Emission mask, Middle channel: 15.55 GHz, longest pulse. (100 MHz BW)*

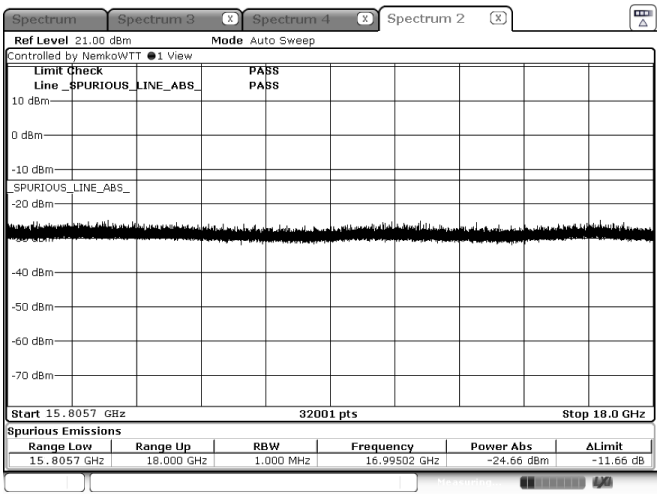


Figure 8.4-21: *Emission mask, beyond ±250% of BW (high frequency range), Middle channel: 15.55 GHz, longest pulse. (100 MHz BW)*

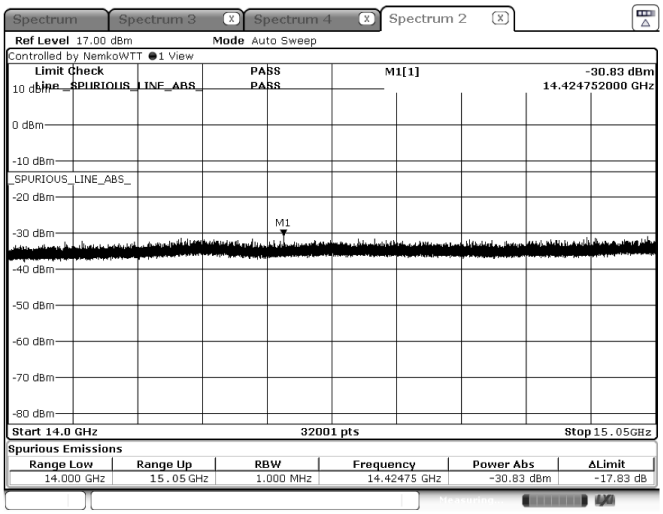


Figure 8.4-22: *Emission mask, beyond ±250% of BW (low frequency range), Middle channel: 15.55 GHz, longest pulse. (200 MHz BW)*

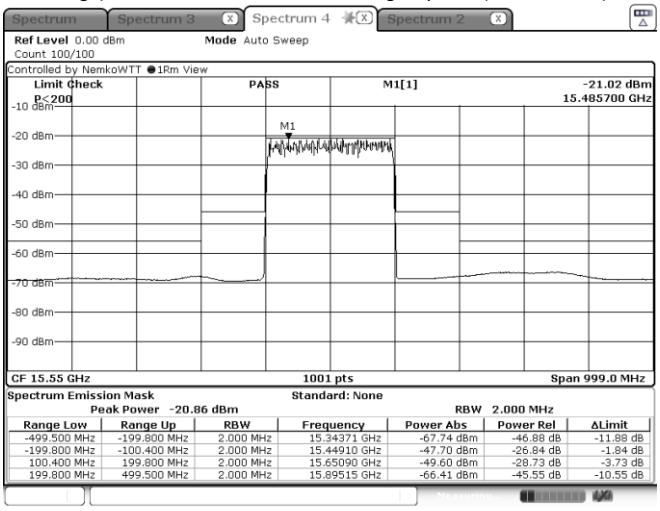


Figure 8.4-23: *Emission mask, Middle channel: 15.55 GHz, longest pulse. (200 MHz BW)*

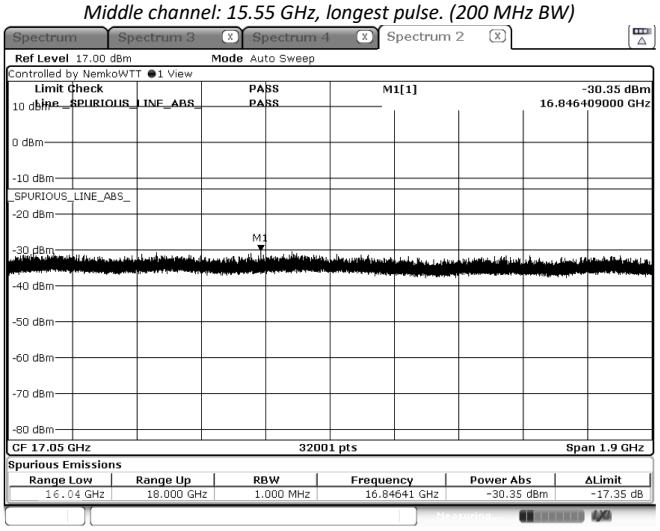


Figure 8.4-24: *Emission mask, beyond ±250% of BW (high frequency range), Middle channel: 15.55 GHz, longest pulse. (200 MHz BW)*

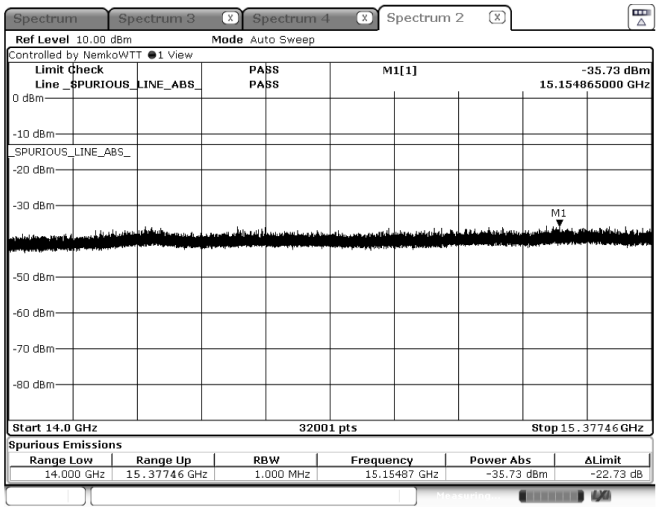


Figure 8.4-25: *Emission mask, beyond ±250% of BW (low frequency range), Low channel: 15.45 GHz, shortest pulse. (25 MHz BW)*

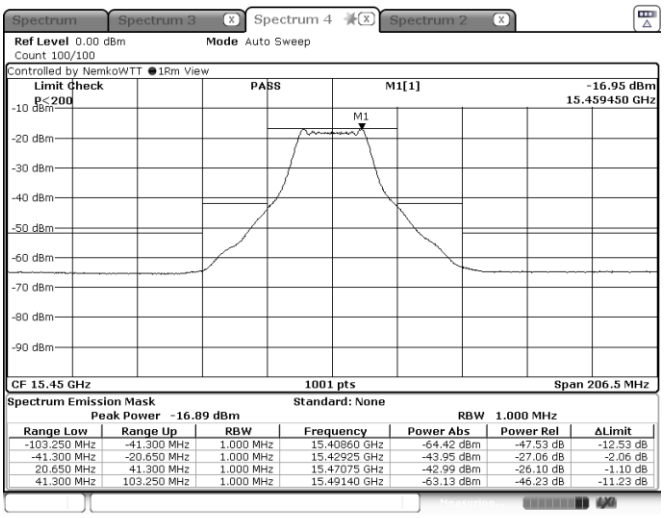


Figure 8.4-26: *Emission mask, Low channel: 15.45 GHz, shortest pulse. (25 MHz BW)*

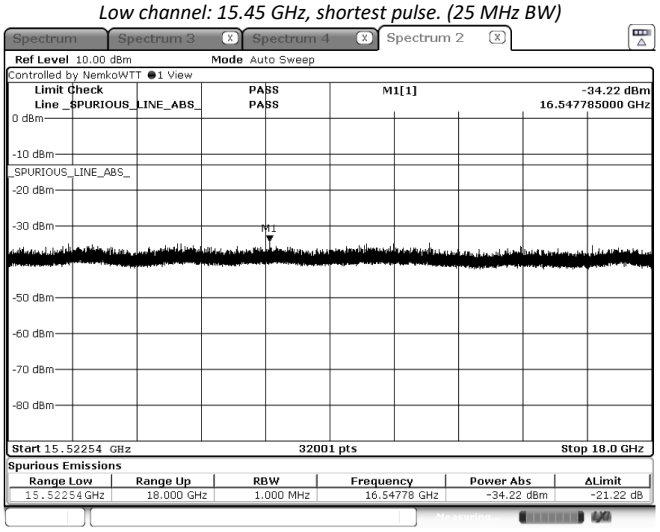


Figure 8.4-27: *Emission mask, beyond ±250% of BW (high frequency range), Low channel: 15.45 GHz, shortest pulse. (25 MHz BW)*

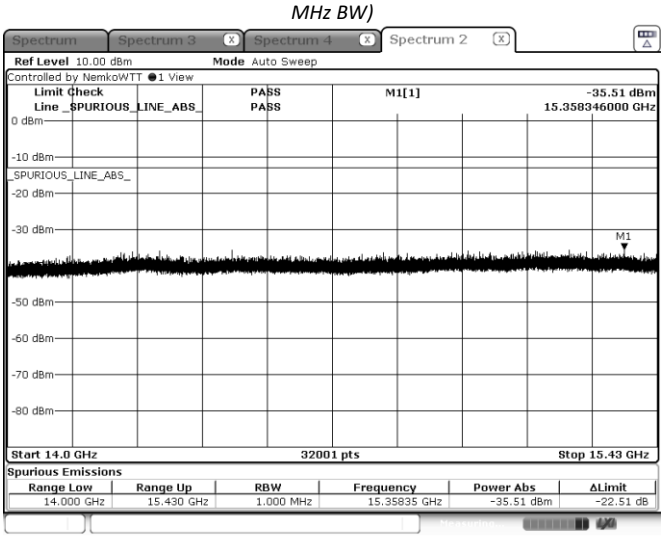


Figure 8.4-28: *Emission mask, beyond ±250% of BW (low frequency range), Middle channel: 15.55 GHz, shortest pulse. (25 MHz BW)*

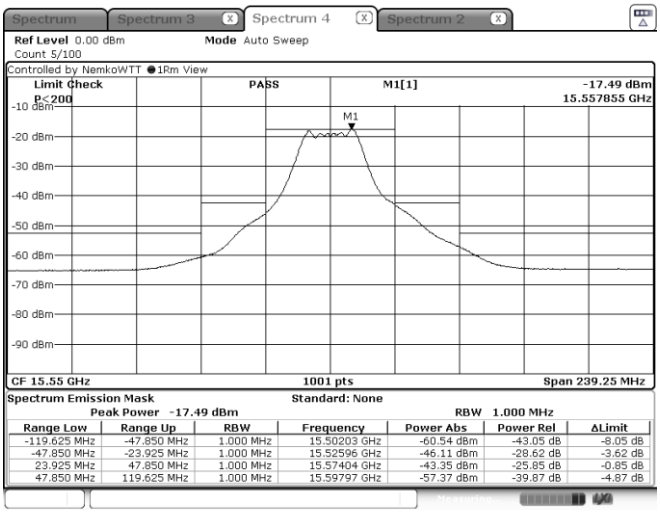


Figure 8.4-29: *Emission mask, Middle channel: 15.55 GHz, shortest pulse. (25 MHz BW).*

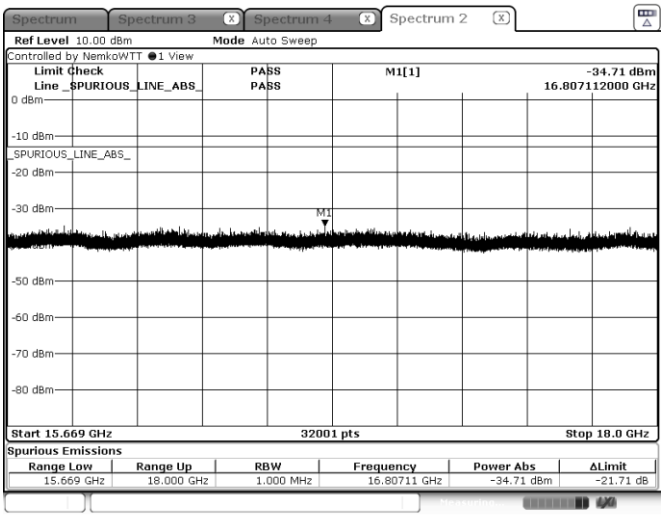


Figure 8.4-30: *Emission mask, beyond ±250% of BW (high frequency range), Middle channel: 15.55 GHz, shortest pulse. (25 MHz BW)*

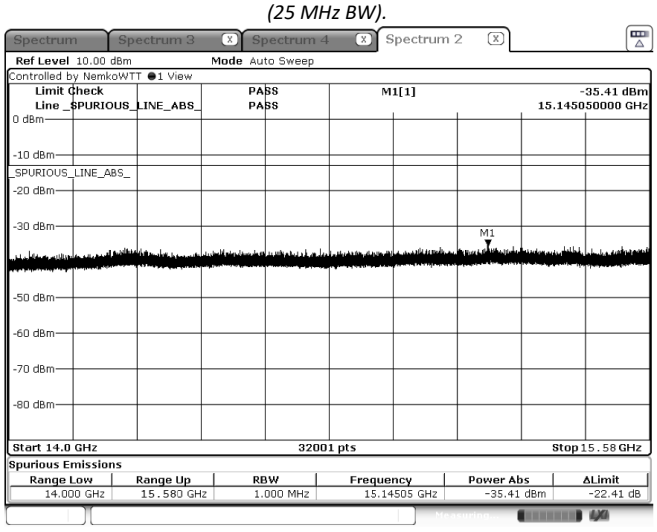


Figure 8.4-31: *Emission mask, beyond ±250% of BW (low frequency range), High channel: 15.65 GHz, shortest pulse. (25 MHz BW)*

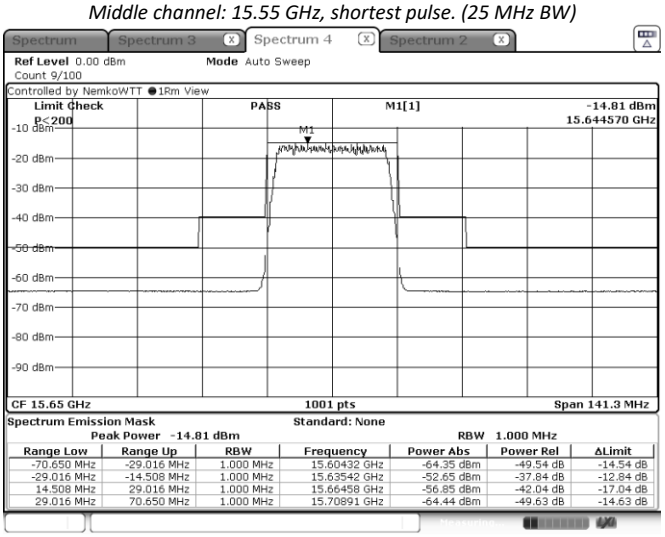


Figure 8.4-32: *Emission mask, High channel: 15.65 GHz, shortest pulse. (25 MHz BW)*

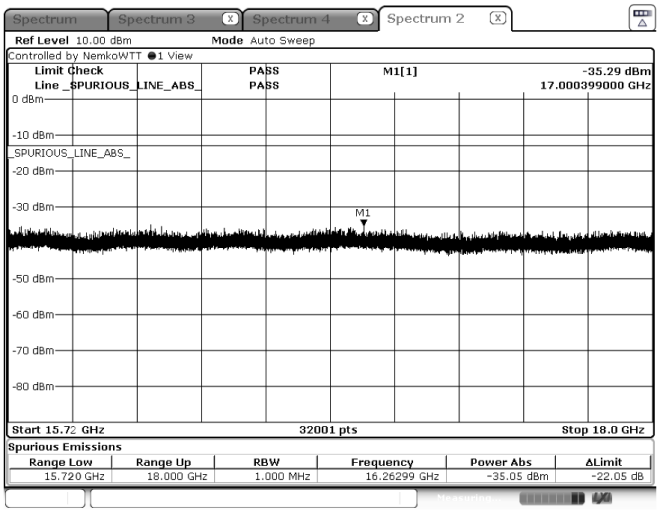


Figure 8.4-33: *Emission mask, beyond ±250% of BW (high frequency range), High channel: 15.65 GHz, shortest pulse. (25 MHz BW)*

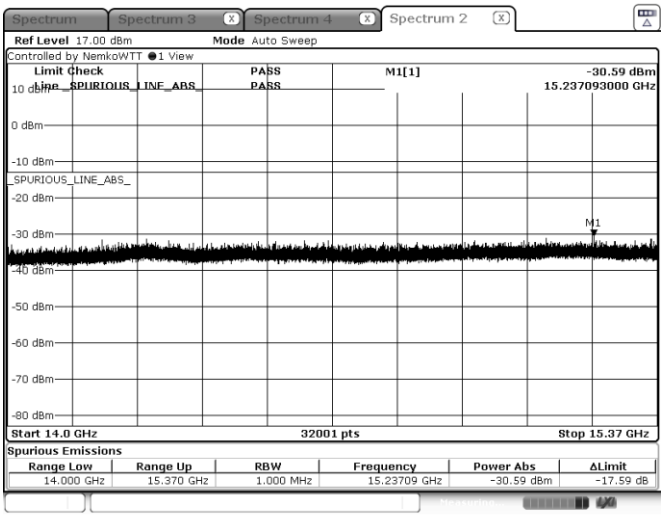


Figure 8.4-34: *Emission mask, beyond ±250% of BW (low frequency range), Low channel: 15.50 GHz, shortest pulse. (50 MHz BW)*

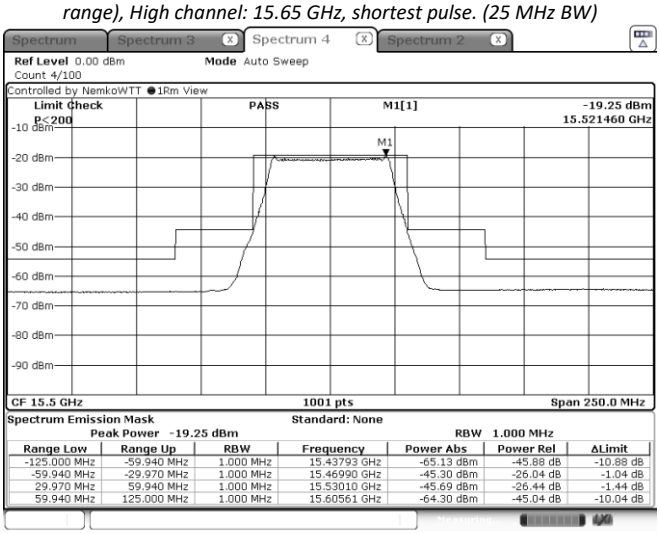


Figure 8.4-35: *Emission mask, Low channel: 15.50 GHz, shortest pulse. (50 MHz BW)*

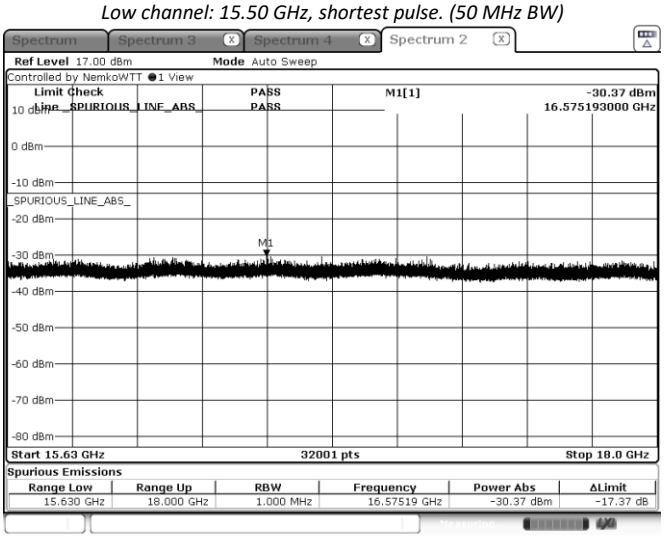


Figure 8.4-36: *Emission mask, beyond ±250% of BW (high frequency range), Low channel: 15.50 GHz, shortest pulse. (50 MHz BW)*

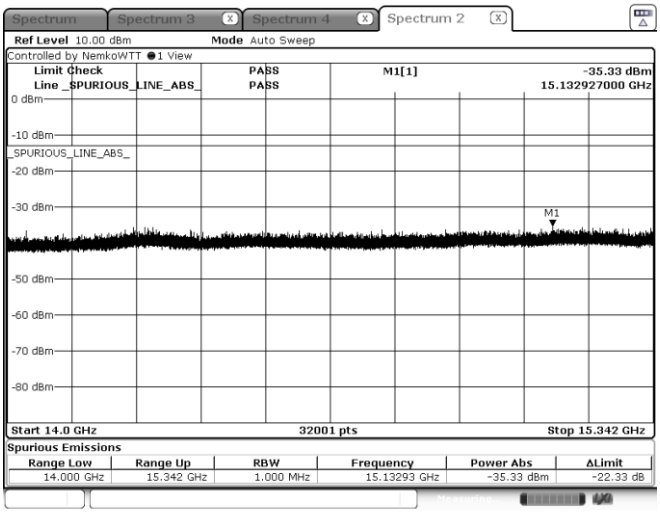


Figure 8.4-37: *Emission mask, beyond ±250% of BW (low frequency range), Middle channel: 15.55 GHz, shortest pulse. (50 MHz BW)*

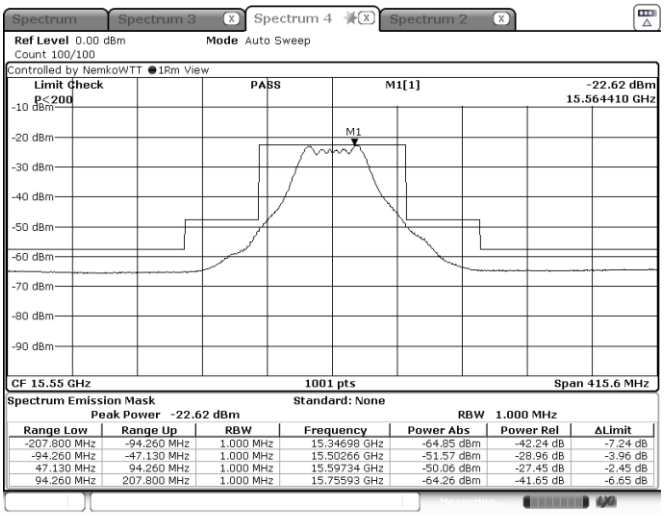


Figure 8.4-38: *Emission mask, Middle channel: 15.55 GHz, shortest pulse. (50 MHz BW)*

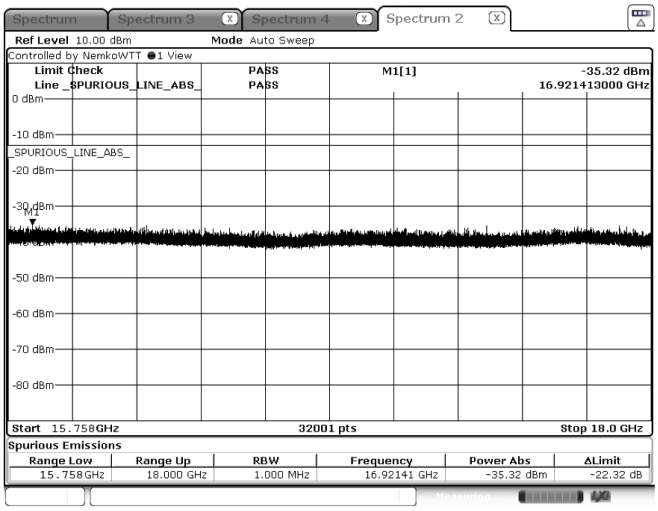


Figure 8.4-39: *Emission mask, beyond ±250% of BW (high frequency range), Middle channel: 15.55 GHz, shortest pulse. (50 MHz BW)*

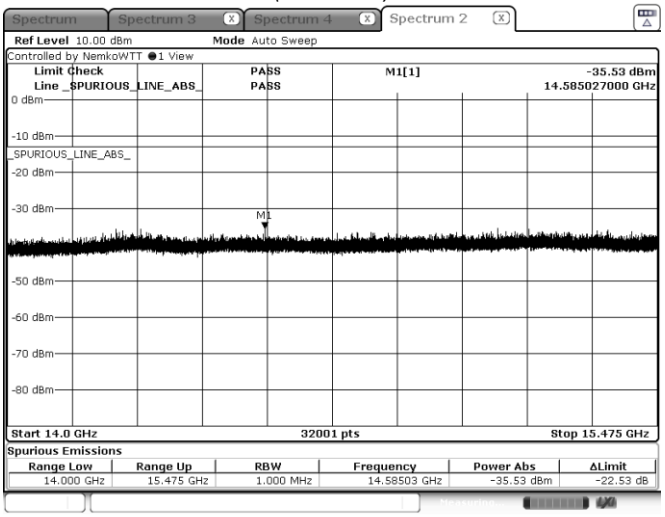


Figure 8.4-40: *Emission mask, beyond ±250% of BW (low frequency range), High channel: 15.60 GHz, shortest pulse. (50 MHz BW)*

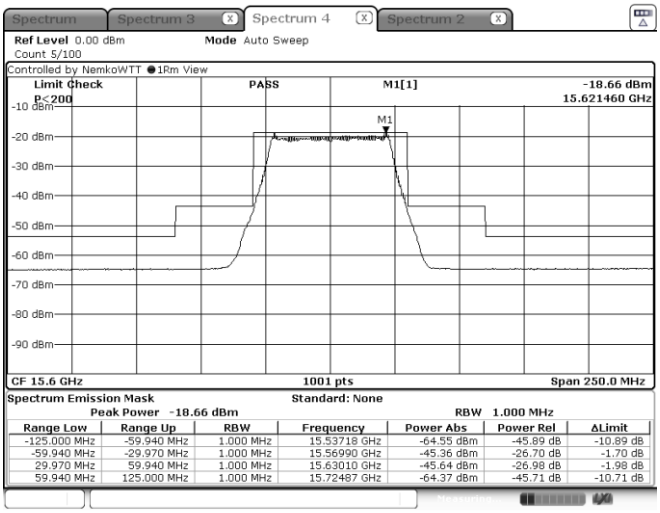


Figure 8.4-41: *Emission mask, High channel: 15.60 GHz, shortest pulse. (50 MHz BW)*

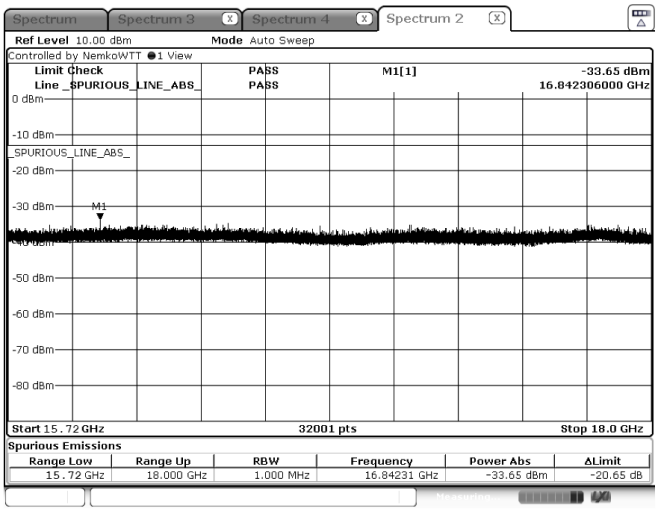


Figure 8.4-42: *Emission mask, beyond ±250% of BW (high frequency range), High channel: 15.60 GHz, shortest pulse. (50 MHz BW)*

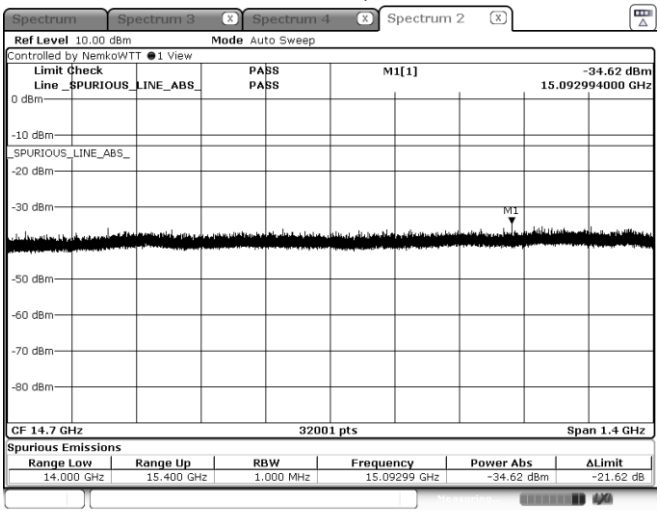


Figure 8.4-43: *Emission mask, beyond ±250% of BW (low frequency range), Middle channel: 15.55 GHz, shortest pulse. (100 MHz BW)*

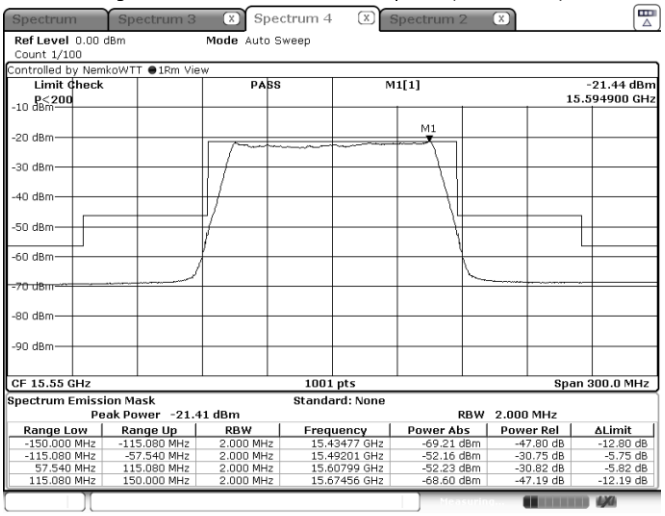


Figure 8.4-44: *Emission mask, Middle channel: 15.55 GHz, shortest pulse. (100 MHz BW)*

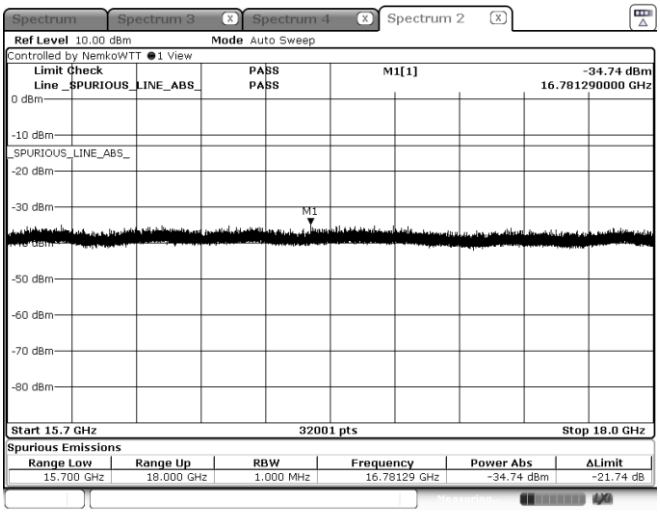


Figure 8.4-45: *Emission mask, beyond ±250% of BW (high frequency range), Middle channel: 15.55 GHz, shortest pulse. (100 MHz BW)*

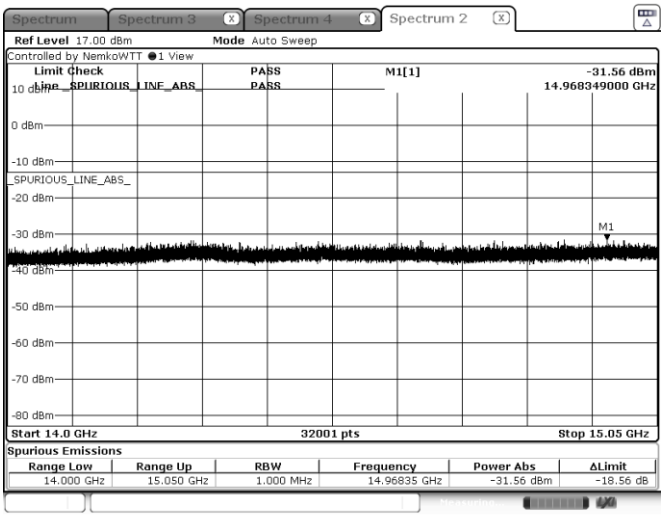


Figure 8.4-46: *Emission mask, beyond ±250% of BW (low frequency range), Middle channel: 15.55 GHz, shortest pulse. (200 MHz BW)*

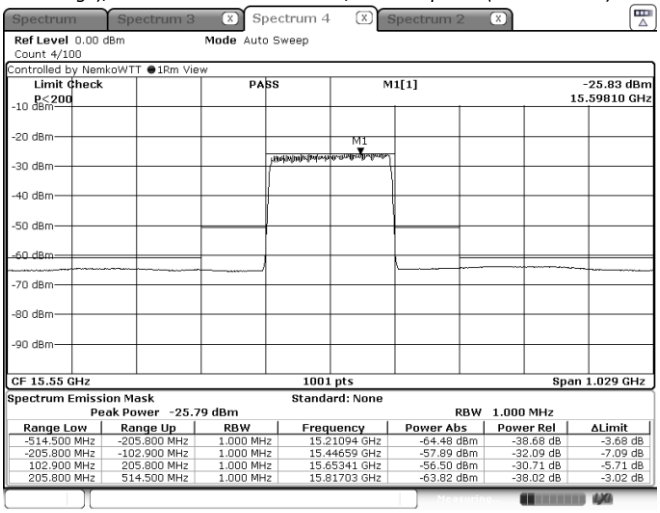


Figure 8.4-47: *Emission mask, Middle channel: 15.55 GHz, shortest pulse. (200 MHz BW)*

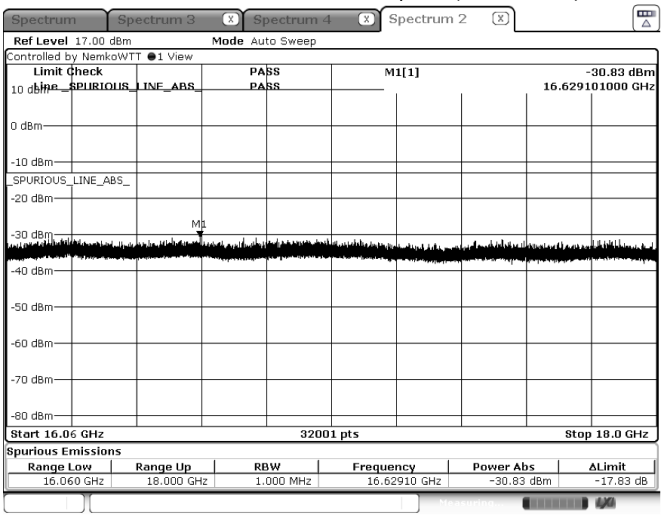


Figure 8.4-48: *Emission mask, beyond ±250% of BW (high frequency range), Middle channel: 15.55 GHz, shortest pulse. (200 MHz BW)*

8.5 Transmitter spurious emissions

8.5.1 References and limits

- FCC 47 CFR Part 87: §87.139
- Test method: ANSI C63.4 (5.5)

(a) Except for ELTs and when using single sideband (R3E, H3E, J3E), or frequency modulation (F9) or digital modulation (F9Y) for telemetry or telecommand in the 1435–1525 MHz, 2345–2395 MHz, or 5091–5150 MHz band or digital modulation (G7D) for differential GPS, the mean power of any emissions must be attenuated below the mean power of the transmitter (pY) as follows:

(3) When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth the attenuation for aircraft station transmitters must be at least 40 dB; and the attenuation for aeronautical station transmitters must be at least 43 + 10 log10 pY dB.

- FCC 47 CFR Part 2: §2.1057

(a) In all of the measurements set forth in §§ 2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:

(2) If the equipment operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

8.5.2 Test summary

Verdict	Pass		
Test date	September 9, 2024; September 10, 2024; September 11, 2024	Temperature	20°C; 18°C 20°C
Test engineer	Chenhao Ma, Wireless Test Technician	Air pressure	1002mbar; 1001mbar; 1001mbar
Test location	☐ Wireless bench ☒ Other: 3M Chamber	Relative humidity	59%; 56%;58%

8.5.3 Notes

Testing was performed with the transmitter operating on a fixed channel at full power. Max power found it in table 8.3-2 was selected as the representative case for this testing (wors case).

Due to the high power emitted by the EUT, several considerations were made to execute accurate testing but avoiding the damage of the receiver system:

1) In the range from 1-18 GHz two low-pass filters in cascade were inserted between the receiving antenna and the power amplifier with the purpose of attenuating the wanted signal and maintaining the linearity of the power amplifier. The 1 dB cut frequency of these filters is at 14 GHz gaining attenuation at the interest frequencies around 100 dB and preserving an insertion loss of 2 dB average in the frequency range under investigation. The suppressed frequencies in this section were investigated previously in section 8.4.5 where the filter was not aggregated (frequency range from 14-18 GHz).
2) In the range from 18-40 GHz two high-pass filters in cascade were inserted between the receiving antenna and the power amplifier with the purpose of attenuating the signal and maintaining the linearity of the power amplifier. The cut frequency of these filters is at 18 GHz, attenuating the interest frequencies signals with around 87 dB (minimum) and preserving an insertion loss of 2.5 dB average in the frequency range under investigation.
3) In the range above 40 GHz ranges no filters or amplifiers were used. Waveguide antennas provide enough wanted signal attenuation.

After calculation -13dBm=84.38dBµV/m below 1GHz
-13dBm=82.23dBµV/m above 1GHz

8.5.4 Setup details

EUT power input during test	28 V DC
EUT setup configuration	☒ Table-top (Above 1 GHz: 1.5m) ☐ Floor standing ☒ Other: Tripod mounted (Below 1 GHz: 80 cm)
Antenna height variation	1–4 m
Turn table position	0–360°
Measurement details	A preview measurement was generated with receiver in continuous scan or sweep mode while the EUT was rotated, and antenna adjusted to maximize radiated emission. 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 (below 1 GHz):

Resolution bandwidth	120 kHz
Video bandwidth	300 kHz
Detector mode	Peak (preview measurements) Quasi-peak (final measurements)
Trace mode	Max Hold
Measurement time	5000 ms (final measurements)

Receiver settings (from 1 -40 GHz):

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Peak (preview measurements) average (final measurements)
Trace mode	Max Hold
Measurement time	5000 ms (final measurements)

Spectrum analyzer settings (above 40 GHz):

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Average
Trace mode	Max Hold

8.5.5 Test data

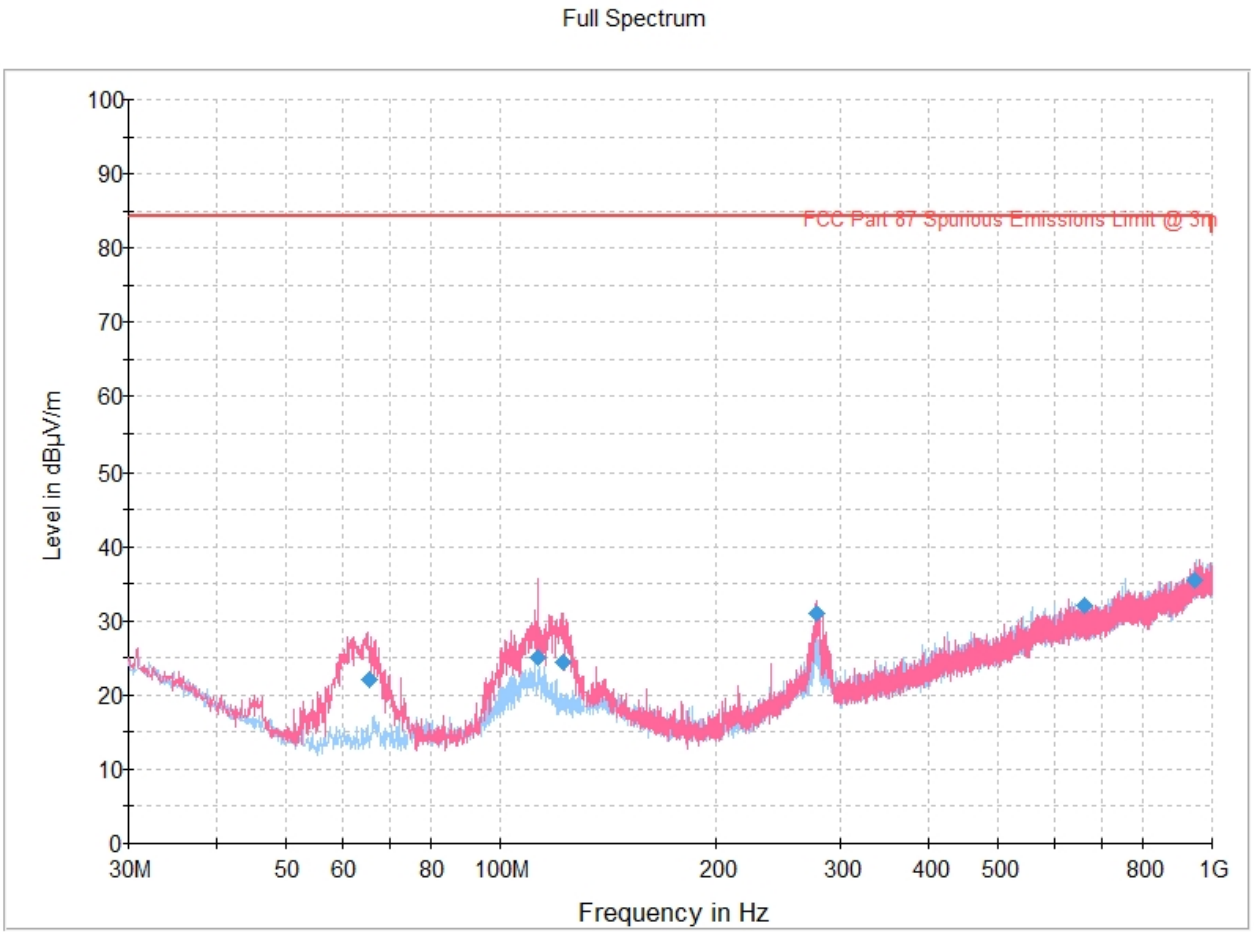


Figure 8.5-1: *Radiated emissions spectral plot (30 MHz - 1 GHz)*

Table 8.5-1*: Radiated emissions results*

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
65.600000	21.99	84.38	62.39	5000.0	120.000	120.0	V	224.0	12.4
113.272000	24.98	84.38	59.40	5000.0	120.000	114.0	V	20.0	18.3
122.675000	24.39	84.38	59.99	5000.0	120.000	161.0	V	52.0	18.4
277.292000	30.90	84.38	53.48	5000.0	120.000	120.0	V	121.0	20.6
660.015000	32.11	84.38	52.27	5000.0	120.000	210.0	V	214.0	30.2
947.705000	35.47	84.38	48.91	5000.0	120.000	110.0	H	20.0	35.6

Notes: [1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factors = antenna factor ACF (dB) + cable loss (dB)
[3] Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

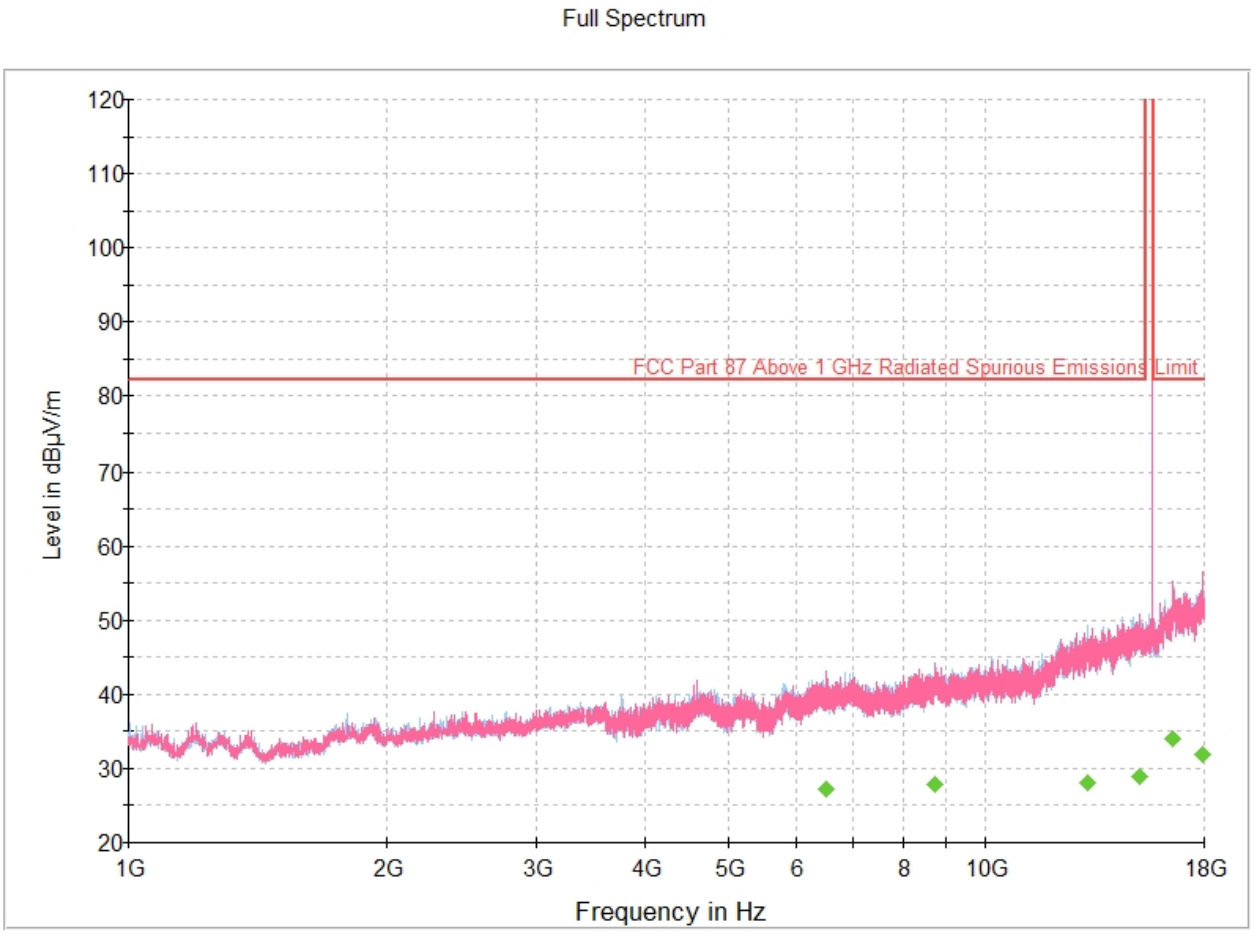


Figure 8.5-2: *Radiated emissions spectral plot (1 GHz - 18 GHz)*

Table 8.5-2*: Radiated emissions results*

Frequency (MHz)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
6519.666667	27.30	82.23	54.93	5000.0	1000.000	273.0	V	31.0	1.3
8730.855556	27.94	82.23	54.29	5000.0	1000.000	378.0	V	173.0	4.0
13158.477778	28.14	82.23	54.09	5000.0	1000.000	107.0	H	88.0	10.5
15157.366667	28.87	82.23	53.36	5000.0	1000.000	116.0	V	352.0	11.9
16559.144444	34.00	82.23	48.23	5000.0	1000.000	214.0	V	110.0	17.1
17897.011111	31.80	82.23	50.43	5000.0	1000.000	146.0	V	64.0	16.9

Notes:
[1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factors = antenna factor ACF (dB) + cable loss (dB)
[3] Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

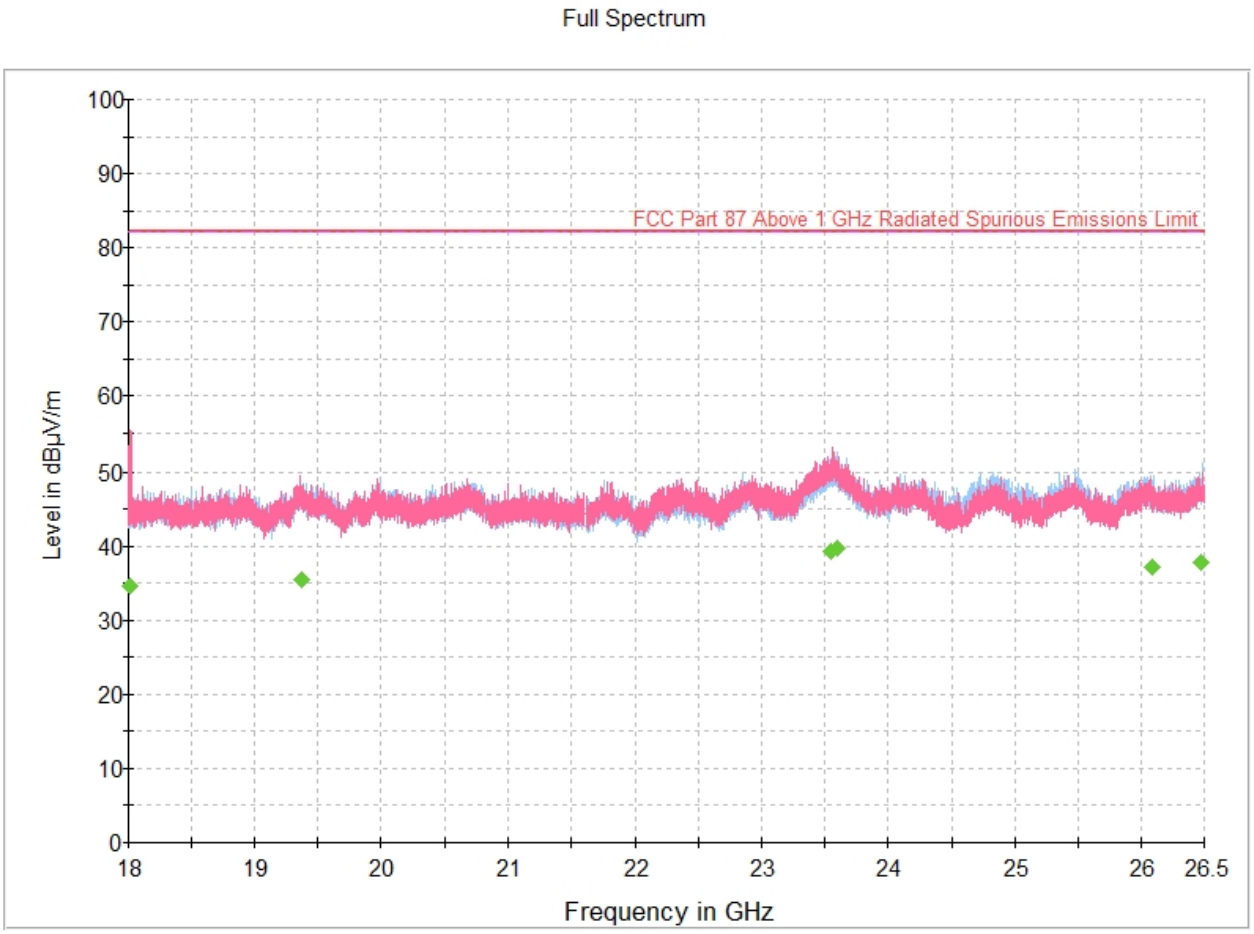


Figure 8.5-3: *Radiated emissions spectral plot (18 GHz - 26.5 GHz)*

Table 8.5-3*: Radiated emissions results*

Frequency (MHz)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18009.718750	34.67	82.23	47.56	5000.0	1000.000	107.0	V	354.0	23.7
19367.118750	35.37	82.23	46.86	5000.0	1000.000	284.0	V	0.0	23.6
23550.681250	39.28	82.23	42.95	5000.0	1000.000	164.0	V	41.0	33.0
23596.868750	39.73	82.23	42.50	5000.0	1000.000	400.0	V	306.0	33.0
26092.237500	37.06	82.23	45.17	5000.0	1000.000	127.0	H	154.0	30.2
26478.537500	37.69	82.23	44.54	5000.0	1000.000	140.0	H	20.0	31.1

Notes:
[1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factors = antenna factor ACF (dB) + cable loss (dB)
[3] Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.