DAkkS Deutsche Akkreditierungsstelle D-PL-21375-01-03 D-PL-21375-01-04

INGENIEURBÜRO LENHARDT

Bundesnetzagentur

BNetzA-CAB-21/21-21

Partial Test Report

Test report no.: 21086129-23010-1
Date of issue: 2021-12-08

Test result: The test item **- passed -** and complies with the listed standards.

Applicant

Mitsubishi Electric Corporation Sanda Works

Manufacturer

Mitsubishi Electric Corporation

Test Item

R1LOW-R-SBM

RF-Spectrum Testing according to:

FCC 47 CFR Part 15
Radio Frequency Devices (Subpart E)

RSS-247 Issue 2
Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

RSS-Gen Issue 5
General Requirements for Compliance of Radio Apparatus

Tested by (name, function, signature)	*Piotr Sardyko* *Deputy Head of Laboratory RF*	signature
Approved by (name, function, signature)	*Dr.-Ing. Harald Ansorge* *Managing Director*	signature

Applicant and Test item details	
Applicant	Mitsubishi Electric Corporation Sanda Works 2-3-33, Miwa, Sanda-City, Hyogo 669-1513 Japan DESIGN-A SECTION, CAR MULTIMEDIA DESIGN DEPT. Fon: +81 79 559 4813 E-Mail: Yoshinaga.Ryuji@db.MitsubishiElectric.co.jp
Manufacturer	Mitsubishi Electric Corporation 2-3-33, Miwa, Sanda-City, Hyogo 669-1513 Japan DESIGN-A SECTION, CAR MULTIMEDIA DESIGN DEPT. Fon: +81 79 559 4813 E-Mail: Yoshinaga.Ryuji@db.MitsubishiElectric.co.jp
Test item description	Automotive Display Audio
Model/Type reference	R1LOW-R-SBM
Standard specific information	
FCC ID	UJH-R1LOW-R-SBM
IC	662K-R1LOWRSB
PMN	R1LOW-R-SBM
HVIN variant ID#28 **HVIN variant ID#33** **HVIN variant ID#39** **HVIN variant ID#43** **HVIN variant ID#48**	28 33 39 43 48
FVIN	N/A
HMN	N/A
Frequency	UNII bands 5150 MHz to 5850 MHz)
Technology	Type of radio transmission: OFDM Type of modulation: BPSK, QPSK, 16QAM, 64QAM, 256QAM
Number of channels	25 (20 MHz), 12 (40 MHz), 6 (80 MHz)
Antenna	external PCB antenna
Power supply	9 – 16.5V DC Battery
Temperature range	-40 °C to +75 °C

Disclaimer and Notes

The content of this rest report relates to the mentioned test sample(s) only.
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The last valid version is available at TAMSys®.

Within this test report, a ☒ point / ☐ comma is used as a decimal separator.
If otherwise, a detailed note is added adjected to its use.

IBL-Lab GmbH does not take test samples. The sample used for testing is provided by the applicant.

Decision rule: Binary Statement for Simple Acceptance Rule according ILAC-G8:09/2019

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2 GENERAL INFORMATION

2.1 Administrative details

Testing laboratory	**IBL-Lab GmbH** Heinrich-Hertz-Allee 7 66386 Sankt Ingbert / Germany Fon: +49 6894 38938-0 Fax: +49 6894 38938-99 URL: www.ib-lenhardt.de E-Mail: info@ib-lenhardt.de
Accreditation	The testing laboratory is accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025:2018. Scope of testing and registration number: • Electronics D-PL-21375-01-01 • Electromagnetic Compatibility D-PL-21375-01-02 • Electromagnetic Compatibility and Telecommunication (FCC requirements) D-PL-21375-01-03 • Telecommunication (TC) and Electromagnetic Compatibility (EMC) for Canadian Standards D-PL-21375-01-04 • ISED Company Number 27156 • Testing Laboratory CAB Identifier DE0020 • Telekommunikation (TK) D-PL-21375-01-05 Website DAkkS: https://www.dakks.de/ The Deutsche Akkreditierungsstelle GmbH (DAkkS) is also a signatory to ILAC Mutual Recognition Arrangement
Testing location	**IBL-Lab GmbH** Heinrich-Hertz-Allee 7 66386 St. Ingbert / Germany
Date of receipt of test samples	2021-09-30
Start – End of tests	2021-10-04 – 2021-11-18

2.2 Possible test case verdicts

Test sample meets the requirements	P (PASS)
Test sample does not meet the requirements	F (FAIL)
Test case does not apply to the test sample	N/A (Not applicable)
Test case not performed	N/P (Not performed)

2.3 Observations

No additional observations other than the reported observations within this test report have been made.

2.4 Opinions and Interpretations

No appropriate opinions or interpretations according ISO/IEC 17025:2017 clause 7.8.7 are within this test report.

2.5 Revision History

-0 Initial Version

-1 Revision: administrative modification/correction

Change of HVIN

This test report 21086129-23010-1 replaces the previous test report 21086129-23010-0.
Utilisation, publication and control of previous report editions is under responsibility of the applicant.

2.6 Further documents

List of further applicable documents belonging to the present test report:

- TR-21086129-23010-1 (test report).pdf (latest available version)
- TR-21086129-23010-1_AnnexA (test results EUT).pdf
- TR-21086129-23010-1_AnnexB (external photos EUT).pdf
- TR-21086129-23010-1_AnnexC (internal photos EUT).pdf
- TR-21086129-23010-1_AnnexD (test setup FCC - IC).pdf

3 ENVIRONMENTAL & TEST CONDITIONS

3.1 Environmental conditions

Temperature	20°C ± 5°C
Relative humidity	25-75 % r.H.
Barometric Pressure	860-1060 mbar
Power supply	230 V / 50 Hz

3.2 Normal and extreme test conditions

	minimum	nominal	maximum
Temperature	-/-	+25 °C	-/-
Relative humidity	-/-	50 % r.h.	-/-
Power supply	-/-	12.6 V DC	-/-

4 TEST STANDARDS AND REFERENCES

Test standard (accredited)	Description
FCC 47 CFR Part 15	Radio Frequency Devices (Subpart E)
RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus

Test standard (not accredited)	Description
none	---

Reference	Description
ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
789033 D02 General U-NII Test Procedures New Rules v02r01	Guidelines for Compliance Testing of Unlicensed National Information Infrastructur (U-NII) Devices Part 15, Subpart E
905462 D02 UNII DFS Compliance Procedures New Rules v02	Compliance Measurement Procedures for Unlicensed-National Information Infrastructure Devices Operating in the 5250-5350 MHz and 5470-5725 MHz Bands Incorporating Dynamic Frequency Selection

5 EQUIPMENT UNDER TEST (EUT)

5.1 Product Description

Automotive Display Audio

*: as declared by applicant

5.2 Test Item Description

Model name*	R1LOW-R-SBM
EUT status*	PrePV
Serial number*	ID#28: mechanical variant SBX, electrical variant 30 (lead model) ID#33: mechanical variant SBX, electrical variant 31 ID#39: mechanical variant SBX, electrical variant 60 ID#43: mechanical variant SBX, electrical variant 40 ID#48: mechanical variant SBX, electrical variant 41
Serial number of EUT test samples*	ID#28: radiated EUT: 65108 conducted EUT: 65112 ID#33: radiated EUT: 66605 conducted EUT: - ID#39: radiated EUT: 65334 conducted EUT: 65332 ID#43: radiated EUT: 66704 conducted EUT: - ID#48: radiated EUT: 66804, 66805 conducted EUT: -
PCB identifier*	NJ00193612
Hardware status*	NR-0C-R-PrePV
Software status*	Android 10

*: as declared by applicant; please see TR-21086129-23010-1_AnnexB , TR-21086129-23010-1_AnnexC for EUT photographs.

5.3 Technical Data of Equipment	
Operational frequency band*	UNII bands 5150 MHz to 5850 MHz)
Transmitter*	Chip QCA6574AU with 48 MHz TCXO (Module UGKZ5A3006A)
Technology*	802.11 a/n/ac, OFDM
Modulation type*	802.11 a/n: BPSK, QPSK, 16QAM, 64QAM 802.11 ac: BPSK, QPSK, 16QAM, 64QAM, 256 QAM
Data rate*	802.11 a: 6 Mbps – 54 Mbps 802.11 n: 6.5 Mbps – 300 Mbps 802.11 ac: 6.5 Mbps – 866.7 Mbps
Number of channels*	25 (20 MHz bandwidth) 12 (40 MHz bandwidth) 6 (80 MHz bandwidth)
Channel bandwidth*	20/40/80 MHz
Channel spacing*	20/40/80 MHz
Guard Interval*	802.11n, 802.11ac: GI=800 ns, GI=400 ns
Rated RF Output Power*	Maximum rated RF output power is maximum measured RF output power value (see section 7.1) plus 2dB: 802.11 a: 8.6 dBm 802.11 n: 7.5 – 8.0 dBm (depending on channel bandwidth) 802.11 ac: 6.2 – 7.9 dBm (depending on channel bandwidth)
Transmit Power Control*	yes (follows attenuation – power constraint IE - from access point)
DFS capability*	yes
DFS mode*	Secondary (Slave) without radar detection
Antenna R1LOW-R-SBM model* Part name Antenna 0 Part name Antenna 1	external PCB antenna, P68306857AA/00534042660 #0 P68306857AA/00534042660 #1
Antenna gain R1LOW-R-SBM model *	Antenna 0: 0.15 dBi, Antenna 1: 1.61 dBi
Antenna R1LOW-R model* Part name Antenna 0 Part name Antenna 1	Sheet metal antenna, 2342059-2 2342059-1
Antenna gain R1LOW-R model*	Antenna 0: -2.29 dBi, Antenna 1: -2.81 dBi
Number of Spatial Streams*	NSS=1, NSS=2
Power supply*	9 – 16.5V DC Battery, V_{nom}=12.6 V
Temperature range*	-40 °C to +75 °C, T_{nom}=+25°C

*: as declared by applicant

Channels with **20 MHz** channel bandwidth:

U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz) channel number & center frequency								
channel	**36**	40	44	**48**	**52**	56	60	**64**
f_c / MHz	**5180**	5200	5220	**5240**	**5260**	5280	5300	**5320**

U-NII-2C (5470 MHz to 5725 MHz) channel number & center frequency												
channel	**100**	104	108	112	116	**120**	124	128	132	136	**140**	**144**
f_c / MHz	**5500**	5520	5540	5560	5580	**5600**	5620	5640	5660	5680	**5700**	**5720**

U-NII-3 (5725 MHz to 5850 MHz) channel number & center frequency					
channel	**149**	153	**157**	161	**165**
f_c / MHz	**5745**	5765	**5785**	5805	**5825**

Channels with **40 MHz** channel bandwidth:

U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz) channel number & center frequency				
channel	**38**	**46**	**54**	**62**
f_c / MHz	**5190**	**5230**	**5270**	**5310**

U-NII-2C (5470 MHz to 5725 MHz) channel number & center frequency						
channel	**102**	110	118	**126**	134	**142**
f_c / MHz	**5510**	5550	5590	**5630**	5670	**5710**

U-NII-3 (5725 MHz to 5850 MHz) channel number & center frequency		
channel	**151**	**159**
f_c / MHz	**5755**	**5795**

Channels with **80 MHz** channel bandwidth:

U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz) channel number & center frequency		
channel	**42**	**58**
f_c / MHz	**5210**	**5290**

U-NII-2C (5470 MHz to 5725 MHz) channel number & center frequency			
channel	**106**	**122**	**138**
f_c / MHz	**5530**	**5610**	**5690**

U-NII-3 (5725 MHz to 5850 MHz) channel number & center frequency	
channel	**155**
f_c / MHz	**5775**

5.4 Additional Information

Model variant differences*	• R1LOW-R DV model with integrated sheet metal antenna and associated display, PCB ID NJ00193611 • R1LOW-R-SBM DV model with external antenna and disassociated display, PCB ID NJ00193611 • R1LOW-R-SBM PrePV model with external antenna and disassociated display, PCB ID NJ00193612 **Applicant declares that transmitter module with chip and external antenna are identical in R1LOW-R-SBM DV model (see IBL-Lab test report TR-21086129-23010-1) and R1LOW-R-SBM PrePV model.** **Electrical variants of R1LOW-R-SBM PrePV model listed in section 5.2 refer to different memory chipsets and multmedia chipsets and interfaces.** Test results of R1LOW-R-SBM DV model are used for following test cases (see IBL-Lab test report TR-21086129-23010-1): • 6 dB emission bandwidth • 26 dB emission bandwidth • Occupied Channel Bandwidth (99%) • Peak power spectral density (PSD) • Band edge compliance (BEC), conducted • Conducted spurious emissions (CSE) • Dynamic Frequency Selection (DFS) Conducted R1LOW-R PrePV test samples of model variants #28, #39 are used for following test cases: • RF output power (conducted peak power) Radiated R1LOW-R PrePV test samples of model variants #28, #39 are used for following test cases: • Antenna gain (calculated) Radiated R1LOW-R PrePV test samples of all model variants are used for following test cases: • Band edge compliance (BEC), radiated • Radiated spurious emissions (RSE) – worst case from R1LOW-R-SBM DV tests (see IBL-Lab test report TR-21086129-23010-1)
Ancillaries tested with	None
Additional equipment used for testing	Notebook with test tool

*: as declared by applicant

5.5 Test modes	
Mode 1, a-mode	20 MHz bandwidth, Modulation type: BPSK 6.0 Mbps*
Mode 2, n-HT20 mode	20 MHz bandwidth, Modulation type: BPSK 13.0 Mbps, NSS=2*
Mode 3, n-HT40 mode	40 MHz bandwidth, Modulation type: BPSK 27.0 Mbps, NSS=2*
Mode 4, ac-HT20-mode	20 MHz bandwidth, Modulation type: BPSK, 13.0 Mbps, NSS=2*
Mode 5, ac-HT40-mode	40 MHz bandwidth, Modulation type: BPSK, 27.0 Mbps, NSS=2*
Mode 6, ac-HT80-mode	80 MHz bandwidth, Modulation type: BPSK, 58.5 Mbps, NSS=2*
Channel	Channels used for testing are marked in bold in 20 MHz, 40 MHz, 80 MHz channel lists (see secion 5.3)
Antennas and transmit operating mode	Equipment with 2 antennas/transmit chains are used simultaneously but without beamforming

Worst case configuration with respect to RF output power	Conducted RF output power of R1LOW-R DV model has been measured for following modulation types, spatial streams and data rates for following channels (respective channel frequencies and bandwidth see channel lists in section 5.3):
	– 802.11a, all modulation types and data rates, NSS=2 (antenna 0 + 1) for
	  o 20 MHz channel 44, 60, 120, 157
	– 802.11n, all modulation types and data rates, NSS=2 (antenna 0 + 1) for
	  o 20 MHz channel 44, 60, 120, 157 and
	  o 40 MHz channel 46, 62, 126, 159
	– 802.11ac, all modulation types and data rates, NSS=2 (antenna 0 + 1) for
	  o 20 MHz channel 44, 60, 120, 157 and
	  o 40 MHz channel 46, 62, 126, 159 and
	  o 80 MHz channel 42, 58, 122, 155
	– 802.11a, BPSK, NSS=2, antenna 0 + 1 for channel frequencies marked in bold in 20 MHz channel list (see section 5.3)
	– 802.11n, BPSK, NSS=2, antenna 0 + 1 for channel frequencies marked in bold in 20, 40 MHz channel list (see section 5.3)
	– 802.11ac, BPSK, NSS=2, antenna 0 + 1 for channel frequencies marked in bold in 20, 40, 80 MHz channel list (see section 5.3)
	
	* From conducted RF output measurements of R1LOW-R DV model test modes have been selected based on measured maximum conducted output power
	• Test mode 1, 2, 3, 4, 5, 6 for RF output power (conducted peak power)
	• Test mode 1 for peak EIRP to get Antenna gain (calculated)
	• Test mode 1 for Band edge compliance (BEC), radiated
	• Test mode 1 for Radiated spurious emissions (RSE)

6 SUMMARY OF TEST RESULTS

Test specification
FCC 47 CFR Part 15 **RSS-247 Issue 2 / RSS-Gen Issue 5**

Clause	Requirement / Test Case	Guideline - Remark	Verdict
§15.407(e) RSS-247, 6.2.4.1	6 dB emission bandwidth	KDB 789033, section C	- N/P - *)
§15.407(a) RSS-247, 6.2.1.2	26 dB emission bandwidth	KDB 789033, section C	- N/P - *)
RSS Gen, 6.7	Occupied bandwidth (99%)	KDB 789033, section D	- N/P - *)
§15.407(a) RSS-247, 6.2	RF output power (conducted peak power)	KDB 789033, section E	- PASS -
§15.407(a) RSS-247, 6.2	Antenna gain (calculated)	-/-	- PASS -
§15.407(a) RSS-247, 6.2	Peak power spectral density (PSD)	KDB 789033, section F	- N/P - *)
§15.407(b) RSS-247, 6.2	Band edge compliance (BEC), conducted	KDB 789033, section G	- N/P - *)
§15.407(b) RSS-247, 6.2	Band edge compliance (BEC), radiated	KDB 789033, section G	- PASS -
§15.407(b) RSS-247, 6.2	Conducted spurious emissions (CSE)	KDB 789033, section G	- N/P - *)
§15.407(b) / §15.209 RSS-247, 6.2 / RSS-Gen, 8.9	Radiated spurious emissions (RSE)	KDB 789033, section G	- PASS -
§15.407(h)(1) RSS-247, 6.2	Transmit Power Control	A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW	- N/A -
§15.407(h)(2) RSS-247, 6.3	Dynamic Frequency Selection (DFS) - channel availibiltiy check - channel move time - non occupancy period	KDB 905462	- N/P - *)
§15.207 RSS-Gen, 8.8	AC conducted emissions	EUT is battery powered	- N/A -

*) see IBL-Lab test report TR-21086129-23010-1

Comments and observations
Following pages show requirements and references of FCC Part 15.407, ANSI C63.10, KDB 789033 and KDB 905462 only. Same tests are also applicable and valid for RSS-247, with clauses given in table above.

7 TEST RESULTS

7.1 RF Output Power (Conducted Peak Power)

Applicability
This requirement applies to unlicensed National Information Infrastructure (U–NII) devices operating in the 5.15–5.35 GHz, 5.47–5.725 GHz and 5.725–5.85 GHz bands

Description
The RF Output Power is defined as the conducted peak output power.

Limit
§15.407 (a)

- For client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW
- For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.
- For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W

RSS 247 section 6.2:

- Frequency band 5150-5250 MHz and 5250-5350 MHz:
  - For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or 1.76 + 10 log10B, dBm, whichever is less.
  - Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW
- Frequency band 5470-5600 and 5650-5725 MHz:
  - The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less.
- Frequency band 5725-5850 MHz:
  - The maximum conducted output power shall not exceed 1 W

B is the 99% emission bandwidth in megahertz.

Test procedure
KDB 789033 D02, E.

ANSI C63.10, 11.9.2.3.2
Method AVGPM-G is a measurement using a gated RF average power meter.
Alternatively, measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.
Gate triggering can be implemented in such a way that the sweep of the instrument is only active during the burst period of the device. Any Gate triggering shall be performed on the full power portion of the pulses and care must be taken to ensure that static portions of the pulse are not included in the measurement (ensuring that the trace is averaged over the entire symbol range). All Gate triggered measurements shall be accompanied by a Gate setup plot in the test report.

Test setup: 8.4 with conducted test sample (see section 5.2); test setup photographs see TR-21086129-23010-1_AnnexD

Test Results 20 MHz				
EUT ID, Test Mode	**Maximum output power conducted**			**Limit Max [dBm]**
	U-NII-1 (5150 MHz to 5250 MHz)			
	low channel (36) [dBm]	**mid channel (44) [dBm]**	**high channel (48) [dBm]**	
EUT ID#28, Mode 1	4.3	5.0	5.1	24.0
EUT ID#39, Mode 1	4.6	5.0	5.1	24.0
EUT ID#28, Mode 2	4.3	4.8	5.3	24.0
EUT ID#39, Mode 2	4.2	4.6	4.9	24.0
EUT ID#28, Mode 4	4.3	4.8	5.3	24.0
EUT ID#39, Mode 4	4.1	4.6	4.8	24.0

Test Results 20 MHz				
EUT ID, Test Mode	**Maximum output power conducted**			**Limit Max [dBm]**
	U-NII-2A (5250 MHz to 5350 MHz)			
	low channel (52) [dBm]	**mid channel (60) [dBm]**	**high channel (64) [dBm]**	
EUT ID#28, Mode 1	5.2	5.3	5.4	24.0
EUT ID#39, Mode 1	4.8	4.9	5.2	24.0
EUT ID#28, Mode 2	5.2	5.5	5.7	24.0
EUT ID#39, Mode 2	4.6	4.8	4.9	24.0
EUT ID#28, Mode 4	5.3	5.5	5.6	24.0
EUT ID#39, Mode 4	4.6	4.7	4.9	24.0

Test Results 20 MHz					
EUT ID, Test Mode	**Maximum output power conducted**				**Limit Max [dBm]**
	U-NII-2C (5470 MHz to 5725 MHz)				
	low channel (100) [dBm]	**mid channel (120) [dBm]**	**high channel (140) [dBm]**	**Channel 144 [dBm]**	
EUT ID#28, Mode 1	5.3	6.2	6.0	6.6	24.0
EUT ID#39, Mode 1	4.4	5.0	5.0	5.3	24.0
EUT ID#28, Mode 2	4.9	5.5	5.7	6.0	24.0
EUT ID#39, Mode 2	4.2	4.8	4.8	5.0	24.0
EUT ID#28, Mode 4	4.9	5.6	5.7	5.9	24.0
EUT ID#39, Mode 4	4.2	4.7	4.8	5.0	24.0

Test Results 20 MHz				
EUT ID, Test Mode	**Maximum output power conducted**			**Limit Max [dBm]**
	U-NII-3 (5725 MHz to 5850 MHz)			
	low channel (149) [dBm]	**mid channel (157) [dBm]**	**high channel (165) [dBm]**	
EUT ID#28, Mode 1	6.6	6.1	6.1	30.0
EUT ID#39, Mode 1	5.1	5.2	4.9	30.0
EUT ID#28, Mode 2	5.8	5.3	4.7	30.0
EUT ID#39, Mode 2	4.9	4.8	4.5	30.0
EUT ID#28, Mode 4	5.7	5.3	4.7	30.0
EUT ID#39, Mode 4	4.9	4.8	4.5	30.0

Test Results 40 MHz				
EUT ID, Test Mode	Maximum output power conducted			Limit Max [dBm]
	U-NII-1 (5150 MHz to 5250 MHz)			
	low channel (38) [dBm]	mid channel [dBm]	high channel (46) [dBm]	
EUT ID#28, Mode 3	4.6	--	5.1	24.0
EUT ID#39, Mode 3	4.1	--	4.6	24.0
EUT ID#28, Mode 5	4.6	--	5.1	24.0
EUT ID#39, Mode 5	4.0	--	4.1	24.0

Test Results 40 MHz				
EUT ID, Test Mode	Maximum output power conducted			Limit Max [dBm]
	U-NII-2A (5250 MHz to 5350 MHz)			
	low channel (54) [dBm]	mid channel [dBm]	high channel (62) [dBm]	
EUT ID#28, Mode 3	5.0	--	5.1	24.0
EUT ID#39, Mode 3	4.3	--	4.7	24.0
EUT ID#28, Mode 5	5.0	--	5.1	24.0
EUT ID#39, Mode 5	4.3	--	4.6	24.0

Test Results 40 MHz				
EUT ID, Test Mode	Maximum output power conducted			Limit Max [dBm]
	U-NII-2C (5470 MHz to 5725 MHz)			
	low channel (102) [dBm]	mid channel (126) [dBm]	high channel (142) [dBm]	
EUT ID#28, Mode 3	4.7	5.3	5.3	24.0
EUT ID#39, Mode 3	4.1	4.5	4.7	24.0
EUT ID#28, Mode 5	4.7	5.3	5.3	24.0
EUT ID#39, Mode 5	4.0	4.5	4.6	24.0

Test Results 40 MHz				
EUT ID, Test Mode	Maximum output power conducted			Limit Max [dBm]
	U-NII-3 (5725 MHz to 5850 MHz)			
	low channel (151) [dBm]	mid channel [dBm]	high channel (159) [dBm]	
EUT ID#28, Mode 3	5.2	--	5.5	30.0
EUT ID#39, Mode 3	4.7	--	4.4	30.0
EUT ID#28, Mode 5	5.2	--	5.4	30.0
EUT ID#39, Mode 5	4.6	--	4.4	30.0

Test Results 80 MHz				
EUT ID, Test Mode	**Maximum output power conducted**			**Limit Max [dBm]**
	U-NII-1 (5150 MHz to 5250 MHz)			
	low channel [dBm]	**mid channel (42) [dBm]**	**high channel [dBm]**	
EUT ID#28, Mode 6	--	3.7	--	24.0
EUT ID#39, Mode 6	--	3.3	--	24.0

Test Results 80 MHz				
EUT ID, Test Mode	**Maximum output power conducted**			**Limit Max [dBm]**
	U-NII-2A (5250 MHz to 5350 MHz)			
	low channel [dBm]	**mid channel (58) [dBm]**	**high channel [dBm]**	
EUT ID#28, Mode 6	--	4.0	--	24.0
EUT ID#39, Mode 6	--	3.6	--	24.0

Test Results 80 MHz				
EUT ID, Test Mode	**Maximum output power conducted**			**Limit Max [dBm]**
	U-NII-2C (5470 MHz to 5725 MHz)			
	low channel (106) [dBm]	**mid channel (122) [dBm]**	**high channel (138) [dBm]**	
EUT ID#28, Mode 6	3.9	4.0	4.2	24.0
EUT ID#39, Mode 6	3.5	3.6	3.7	24.0

Test Results 80 MHz				
EUT ID, Test Mode	**Maximum output power conducted**			**Limit Max [dBm]**
	U-NII-3 (5725 MHz to 5850 MHz)			
	low channel [dBm]	**mid channel (155) [dBm]**	**high channel [dBm]**	
EUT ID#28, Mode 6	--	4.1	--	30.0
EUT ID#39, Mode 6	--	3.7	--	30.0

Comment:	---

Verdict	**- PASS -**	plots (Mode 1) see TR-21086129-23010-1_AnnexA

7.2 Antenna Gain (calculated)

Applicability
This requirement applies to unlicensed National Information Infrastructure (U–NII) devices operating in the 5.15–5.35 GHz, 5.47–5.725 GHz and 5.725–5.85 GHz bands

Description
The antenna gain is defined as the difference between radiated peak power (Peak EIRP) substracted by the conducted peak power of the module, given in dBi.

Limit
§15.407 (a), RSS-247 section 6.2:
If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi

Test setup: 8.2 with radiated test sample (see section 5.2), 8.4 with conducted test sample (see section 5.2); test setup photographs see TR-21086129-23010-1_AnnexD

Test Results: 20 MHz Bandwidth, a-mode

Test Results 5.150 – 5.350 GHz			
EUT ID #28, Mode 1	**channel 36**	**channel 64**	**Limit**
Radiated peak power [dBm]	5.5	5.6	≤ 36
Conducted peak power [dBm]	4.3	5.4	≤ 30
Calculated antenna gain [dBi]	1.2	0.2	≤ 6

Test Results 5.470 – 5.725 GHz			
EUT ID #28, Mode 1	**channel 100**	**channel 140**	**Limit**
Radiated peak power [dBm]	5.4	5.2	≤ 36
Conducted peak power [dBm]	5.3	6.0	≤ 30
Calculated antenna gain [dBi]	0.1	-0.8	≤ 6

Test Results 5.725 – 5.850 GHz		
EUT ID #28, Mode 1	**channel 165**	**Limit**
Radiated peak power [dBm]	3.8	≤ 36
Conducted peak power [dBm]	6.1	≤ 30
Calculated antenna gain [dBi]	-2.3	≤ 6

Test Results 5.150 – 5.350 GHz			
EUT ID #39, Mode 1	**channel 36**	**channel 64**	**Limit**
Radiated peak power [dBm]	3.9	4.8	≤ 36
Conducted peak power [dBm]	4.6	5.2	≤ 30
Calculated antenna gain [dBi]	-0.7	-0.4	≤ 6

Test Results 5.470 – 5.725 GHz			
EUT ID #39, Mode 1	**channel 100**	**channel 140**	**Limit**
Radiated peak power [dBm]	4.8	4.6	≤ 36
Conducted peak power [dBm]	4.4	5.0	≤ 30
Calculated antenna gain [dBi]	0.4	-0.4	≤ 6

Test Results 5.725 – 5.850 GHz		
EUT ID #39, Mode 1	**channel 165**	**Limit**
Radiated peak power [dBm]	3.0	≤ 36
Conducted peak power [dBm]	4.9	≤ 30
Calculated antenna gain [dBi]	-1.9	≤ 6

Comment:	---

Verdict	**- PASS -**	plots see TR-21086129-23010-1_AnnexA

7.3 Band Edge Compliance (BEC), radiated

Applicability
This requirement applies to unlicensed National Information Infrastructure (U–NII) devices operating in the 5.15–5.35 GHz, 5.47–5.725 GHz and 5.725–5.85 GHz bands.

Description
KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 II.G.3.d ii
Unwanted band-edge emissions may be measured using either of the special band-edge measurement techniques (the marker-delta or integration methods). Note that the marker-delta method is primarily a radiated measurement technique that requires the 99% occupied bandwidth edge to be within 2 MHz of the authorized band edge, whereas the integration method can be used in either a radiated or conducted measurement without any special requirement with regards to the displacement of the unwanted emission(s) relative to the authorized bandwidth.

Limits
§15.407(b)
The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(1) For transmitters operating in the 5.15–5.25 GHz band: All emissions out- side of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
(2) For transmitters operating in the 5.25–5.35 GHz band: All emissions out- side of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
(3) For transmitters operating in the 5.47–5.725 GHz band: All emissions out- side of the 5.47–5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
(4) For transmitters operating in the 5.725–5.85 GHz band:
(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Test procedure
The marker-delta method as described in ANSI C63.10, 6.10.6 or the integration methode as described in ANSI C63.10, 11.13.3 can be used to perform measurements of the unwanted emissions level at the band edges.

Test setup: 8.2 with radiated sample (see section 5.2)

Test results 20 MHz				
EUT ID, testing mode, frequency band	**low channel [dBµV/m @3m]**	**high channel [dBµV/m @3m]**	**Limit AVG / Peak [dBµV/m @3m]**	**Verdict**
EUT ID#28, Mode 1, U-NII-1 & U-NII-2A	≤ 50 AVG / ≤ 60 PK	≤ 50 AVG / ≤ 60 PK	≤ 54 AVG / ≤ 74 PK	- PASS -
EUT ID#28, Mode 1, U-NII-2C & U-NII-3	≤ 50 AVG / ≤ 60 PK	≤ 50 AVG / ≤ 60 PK	≤ 54 AVG / ≤ 74 PK	- PASS -
EUT ID#33, Mode 1, U-NII-1 & U-NII-2A	≤ 50 AVG / ≤ 60 PK	≤ 50 AVG / ≤ 60 PK	≤ 54 AVG / ≤ 74 PK	- PASS -
EUT ID#33, Mode 1, U-NII-2C & U-NII-3	≤ 50 AVG / ≤ 60 PK	≤ 50 AVG / ≤ 60 PK	≤ 54 AVG / ≤ 74 PK	- PASS -
EUT ID#39, Mode 1, U-NII-1 & U-NII-2A	≤ 50 AVG / ≤ 60 PK	≤ 50 AVG / ≤ 60 PK	≤ 54 AVG / ≤ 74 PK	- PASS -
EUT ID#39, Mode 1, U-NII-2C & U-NII-3	≤ 50 AVG / ≤ 60 PK	≤ 50 AVG / ≤ 60 PK	≤ 54 AVG / ≤ 74 PK	- PASS -
EUT ID#43, Mode 1, U-NII-1 & U-NII-2A	≤ 50 AVG / ≤ 60 PK	≤ 50 AVG / ≤ 60 PK	≤ 54 AVG / ≤ 74 PK	- PASS -
EUT ID#43, Mode 1, U-NII-2C & U-NII-3	≤ 50 AVG / ≤ 60 PK	≤ 50 AVG / ≤ 60 PK	≤ 54 AVG / ≤ 74 PK	- PASS -
EUT ID#48, Mode 1, U-NII-1 & U-NII-2A	≤ 50 AVG / ≤ 60 PK	≤ 50 AVG / ≤ 60 PK	≤ 54 AVG / ≤ 74 PK	- PASS -
EUT ID#48, Mode 1, U-NII-2C & U-NII-3	≤ 50 AVG / ≤ 60 PK	≤ 50 AVG / ≤ 60 PK	≤ 54 AVG / ≤ 74 PK	- PASS -

Comment:	---

Verdict	**- PASS -**	plots see TR-21086129-23010-1_AnnexA

7.4 Radiated Spurious Emissions (RSE)

Applicability
This requirement applies to unlicensed National Information Infrastructure (U–NII) devices operating in the 5.15–5.35 GHz, 5.47–5.725 GHz and 5.725–5.85 GHz bands.

Description
Spurious emission / unwanted emissions are emission on a frequency or frequencies which are outside the authorized band and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products. Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation.

Limits
§15.407(b)
All emissions out- side of the operational frequency band shall not exceed an e.i.r.p. of -27 dBm/MHz.
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

Frequency [MHz]	Field Strength [µV/m] / [dBµV/m]	Measurement distance [m]
0.009 – 0.490	2400/F[kHz]	300
0.490 – 1.705	24000/F[kHz]	30
1.705 – 30.0	30.0 / 29.5	30
30 – 88	100 / 40.0	3
88 – 216	150 / 43.5	3
216 – 960	200 / 46.0	3
960 – 40 000	500 / 54.0	3

Note:
Measurements are performed as field strength measurement in dBµV. -27 dBm/MHz limit value corresponds to a limit of 67.9 dBµV measured in a distance of 3.

Test procedure
Test according to FCC title 47 part 15 §15.407(b), KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 II.G.4&5 and ANSI C63.10-2013

Test setup: 8.1, 8.2, 8.3 with radiated test sample (see section 5.2)

Test results: Test Mode 1, a-mode, 20 MHz bandwidth, Modulation type: BPSK 6.0 Mbps					
EUT ID / Channel	**Frequency [MHz]**	**Peak/RMS Detector**	**Level [dBm]**	**Limit [dBm]**	**Verdict**
EUT ID#28, 36	see plots	MaxPeak	see plots	see plots	- passed -
EUT ID#28, 165	see plots	MaxPeak	see plots	see plots	- passed -
EUT ID#33, 36	see plots	MaxPeak	see plots	see plots	- passed -
EUT ID#33, 165	see plots	MaxPeak	see plots	see plots	- passed -
EUT ID#39, 36	see plots	MaxPeak	see plots	see plots	- passed -
EUT ID#39, 165	see plots	MaxPeak	see plots	see plots	- passed -
EUT ID#43, 36	see plots	MaxPeak	see plots	see plots	- passed -
EUT ID#43, 165	see plots	MaxPeak	see plots	see plots	- passed -
EUT ID#48, 36	see plots	MaxPeak	see plots	see plots	- passed -
EUT ID#48, 165	see plots	MaxPeak	see plots	see plots	- passed -

Comment:	Radiated Spurious Emissions (RSE) are performed for - mode 1 (20 MHz channel bandwidth), for low channel of U-NII-1 frequency band and high channel of U-NII-3 frequency band.

Verdict	**- PASS -**	plots see TR-21086129-23010-1_AnnexA *

* description of line and marker for all radiated spurious emission (RSE) measurements:

positive Peak (Max Hold) trace during pre-scan

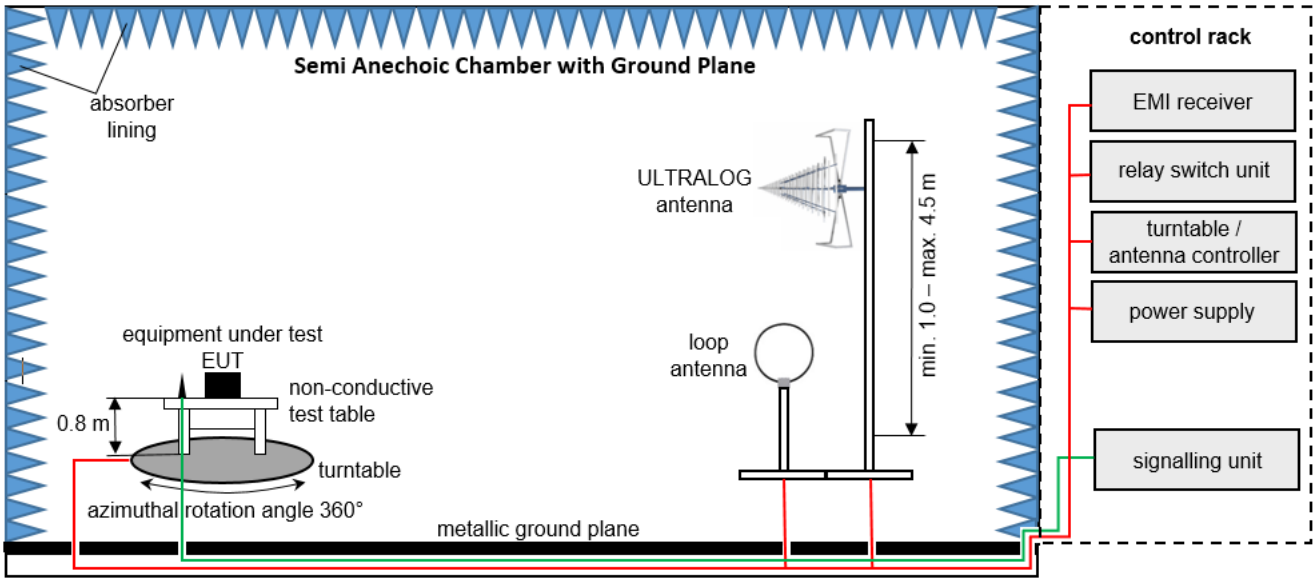
Max Peak value

final Quasi Peak value

8 TEST SETUP DESCRIPTION

8.1 Semi Anechoic Chamber with Ground Plane

Radiated measurements are performed in vertical and horizontal plane in the frequency range 30 MHz to 1 GHz in a Semi Anechoic Chamber with a metallic ground plane. The EUT is positioned on a non-conductive test table with a height of 0.80 m above the metallic ground plane that covers the whole chamber. The receiving antennas conform to specification ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices. These antennas can be moved over the height range between 1.0 m and 4.5 m in order to search for maximum field strength emitted from the EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by a spectrum analyzer where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: loop antenna 3 m, ULTRALOG antenna 3 m
EMC32 software version: 11.10.00

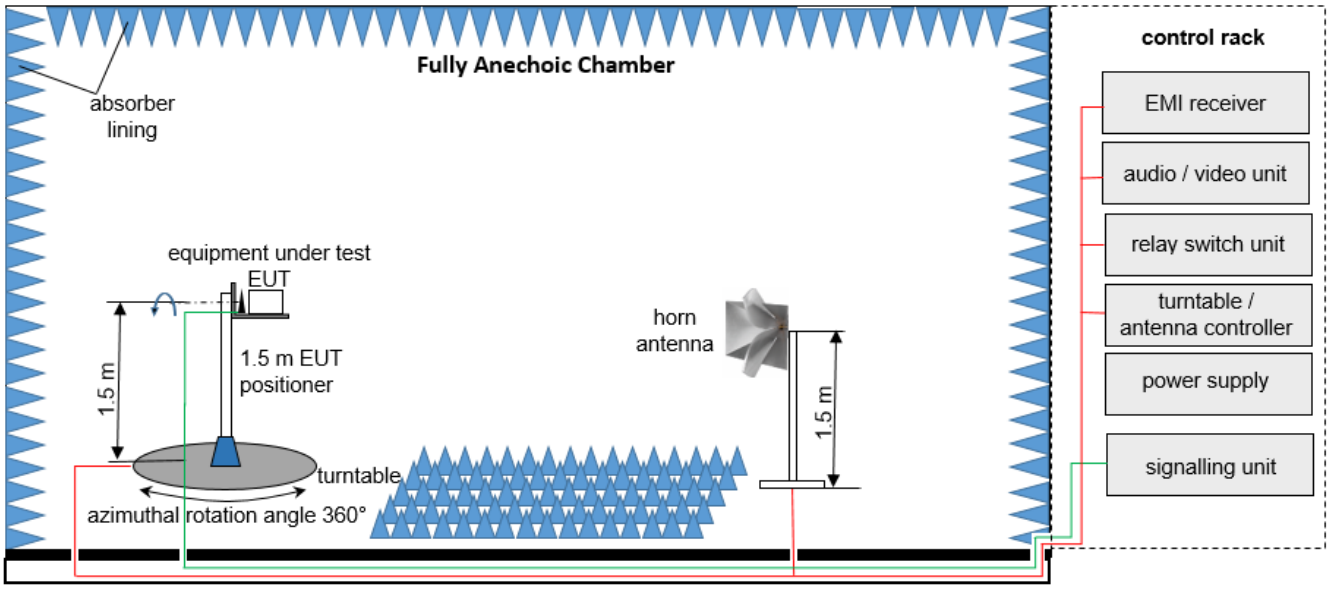
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

List of test equipment used:

No.	Equipment	Manufacturer	Type	Serial No.	INV. No.	Last / Next Calibration
1	Power Supply	Elektro-Automatik GmbH & Co. KG	EA-PSI 9080-40 T	2000230001	LAB000313	–
2	Test table	innco systems GmbH	PT1208-080-RH	-	LAB000306	–
3	Power Supply	Chroma	61604	616040005416	LAB000285	–
4	Positioner	maturo GmbH	TD 1.5-10KG		LAB000258	–
5	Compressed Air	Implotex	1-850-30	-	LAB000256	–
6	EMI Test Receiver	Rohde & Schwarz	ESW26	101517	LAB000363	2021-02-05 → 2022-02-05
7	Semi-Anechoic Chamber (SAC)	Albatross Projects GmbH	SAC 5 (Babylon 5)	20168.PRB	LAB000235	2020-08-24 → 2021-08-24
8	Measurement Software	Rohde & Schwarz	EMC32 V11.00.10		LAB000226	–
9	Turntable	maturo GmbH	TT2.0-2t	TT2.0-2t/921	LAB000225	–
10	Antenna Mast	maturo GmbH	CAM4.0-P	CAM4.0-P/316	LAB000224	–
11	Antenna Mast	maturo GmbH	BAM4.5-P	BAM4.5-P/272	LAB000223	–
12	Controller	maturo GmbH	FCU 3.0	10082	LAB000222	–
13	Power Supply	Elektro-Automatik GmbH & Co. KG	PS 2042-10 B	2878350292	LAB000191	–
14	Pre-Amplifier	Schwarzbeck Mess-Elektronik OHG	BBV 9718 C	84	LAB000169	–
15	Open Switch and Control Platform	Rohde & Schwarz	OSP200 Base Unit 2HU	101748	LAB000149	–
16	Antenna	Rohde & Schwarz	HL562E	102001	LAB000123	2020-07-05 → 2023-07-05
17	Antenna	Rohde & Schwarz	HFH2-Z2E - Active Loop Antenna	100954	LAB000108	2020-03-25 → 2023-03-25

8.2 Fully Anechoic Chamber



Measurement distance: horn antenna 3 meter
EMC32 software version: 11.10.00

FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

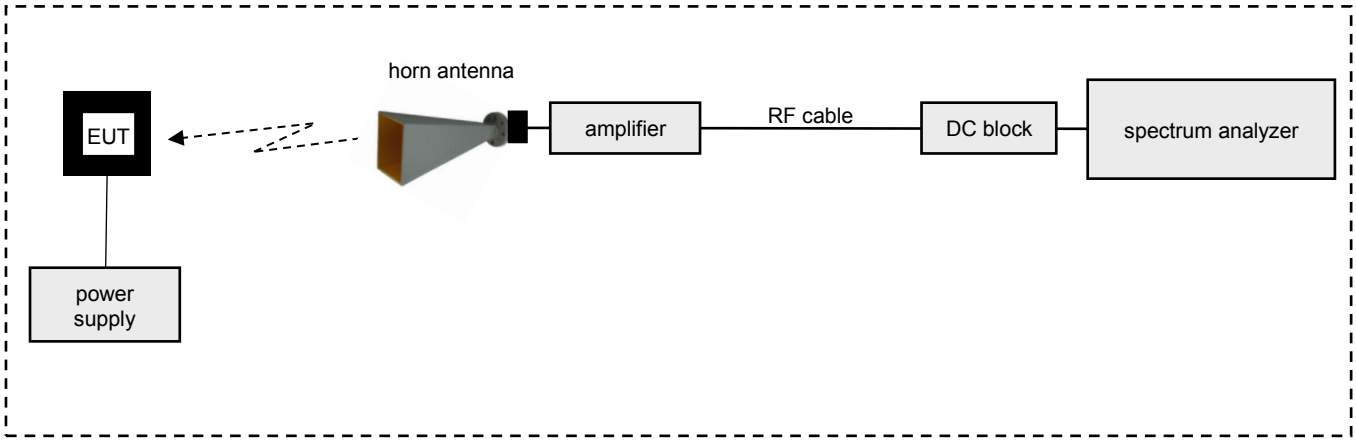
OP = AV + D - G + CA
(OP-radiated output power; AV-analyzer value; D-free field attenuation of measurement distance; G-antenna gain+amplifier gain; CA-loss signal path)

Example calculation:
OP [dBm] = -65.0 [dBm] + 50 [dB] - 20 [dBi] + 5 [dB] = -30 [dBm] (1 µW)

List of test equipment used:

No.	Equipment	Manufacturer	Type	Serial No.	INV. No.	Last / Next Calibration
1	Power Supply	Elektro-Automatik GmbH & Co. KG	EA-PSI 9080-40 T	2000230001	LAB000313	–
2	Test table	innco systems GmbH	PT1208-080-RH	-	LAB000306	–
3	Power Supply	Chroma	61604	616040005416	LAB000285	–
4	Positioner	maturo GmbH	TD 1.5-10KG	–	LAB000258	–
5	Compressed Air	Implotex	1-850-30	-	LAB000256	–
6	EMI Test Receiver	Rohde & Schwarz	ESW26	101517	LAB000363	2021-02-05 → 2022-02-05
7	Semi-Anechoic Chamber (SAC)	Albatross Projects GmbH	SAC 5 (Babylon 5)	20168.PRB	LAB000235	2020-08-24 → 2021-08-24
8	Measurement Software	Rohde & Schwarz	EMC32 V11.00.10	–	LAB000226	–
9	Turntable	maturo GmbH	TT2.0-2t	TT2.0-2t/921	LAB000225	–
10	Antenna Mast	maturo GmbH	BAM4.5-P	BAM4.5-P/272	LAB000223	–
11	Controller	maturo GmbH	FCU 3.0	10082	LAB000222	–
12	Power Supply	Elektro-Automatik GmbH & Co. KG	PS 2042-10 B	2878350292	LAB000191	–
13	Pre-Amplifier	Schwarzbeck Mess-Elektronik OHG	BBV 9718 C	84	LAB000169	–
14	Open Switch and Control Platform	Rohde & Schwarz	OSP200 Base Unit 2HU	101748	LAB000149	–
15	Antenna	Rohde & Schwarz	HF907	102898	LAB000124	2020-04-23 → 2023-04-23
16	HP-filter	AtlantRF	–	–	LAB000382	–

8.3 Radiated measurements > 18 GHz

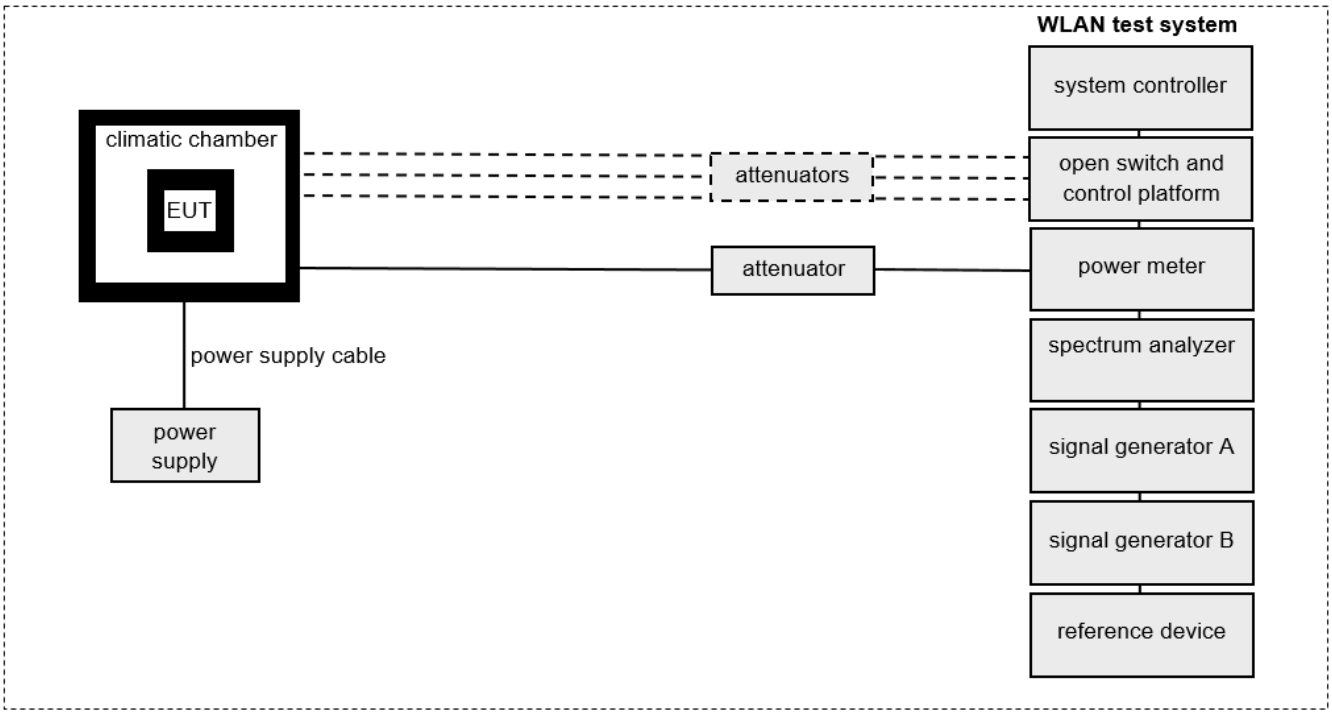


List of test equipment used:

No.	Equipment	Manufacturer	Type	Serial No.	INV. No.	Last / Next Calibration
1	Test table	innco systems GmbH	PT0707-RH light	-	LAB000303	–
2	WG-Coax-Adapter	Flann Microwave Ltd	20093-TF30 UBR220	273374	LAB000181	–
3	Coaxial Cable	Huber & Suhner	SF101/1.5m	503987/1	LAB000165	–
4	Antenna	Flann Microwave Ltd	20240-20	266403	LAB000128	2020-06-29 → 2023-06-29
5	Spectrum Analyser	Rohde & Schwarz	FSW43	101391	LAB000289	2021-07-02 → 2022-07-02

8.4 Conducted measurements WLAN test system R&S TS 8997

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The losses for all signal paths are first checked within a calibration. The measurement readings on the signalling unit/spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, signalling unit and the spectrum analyzer are impedance matched on 50 Ohm.



EMC32/WMS32 software version: 11.00.00

List of test equipment used:

No.	Equipment	Manufacturer	Type	Serial No.	INV. No.	Last / Next Calibration
1	TS8997-Rack	Rohde & Schwarz	TS8997-Rack	100829	LAB000322	–
2	Open Switch and Control Platform	Rohde & Schwarz	OSP-B157WX	101247	LAB000280	–
3	Open Switch and Control Platform	Rohde & Schwarz	OSP-B157W8	100982	LAB000279	–
4	Spectrum Analyser	Rohde & Schwarz	FSV40	101403	LAB000278	2021-06-15 → 2022-06-15
5	Signal Generator	Rohde & Schwarz	SMBV100A	258240	LAB000277	2021-06-02 → 2022-06-02
6	Signal Generator	Rohde & Schwarz	SMB100A-20	178175	LAB000276	2021-05-27 → 2022-05-27
7	Radio Communication Tester	Rohde & Schwarz	CMW270	101479	LAB000275	–
8	Controller	Hewlett Packard	ATS-Z230	101379	LAB000274	–
9	Power Supply	EA	PS 2042-10 B	2878350263	LAB000190	–

9 MEASUREMENT UNCERTAINTIES

Radio frequency	≤ ± 1 x 10^{-7}
RF power, conducted	≤ ± 0.75 dB
Power spectral density	≤ ± 3 dB
Maximum frequency deviation	≤ ± 5 %
Deviation limitation Duty Cycle, Tx-sequence, Tx-gap	≤ ± 5 %
Occupied channel bandwidth	≤ ± 5 %
Conducted spurious emission of transmitter	≤ ± 4 dB
Conducted emission of receivers	≤ ± 4 dB
Radiated emission of transmitter	≤ ± 6 dB
Radiated emission of receiver	≤ ± 6 dB
Temperature	≤ ± 2.5 °C
Humidity	≤ ± 10 %

The indicated expanded measurement uncertainty corresponds to the standard measurement uncertainty for the measurement results multiplied by the coverage factor k = 2. It was determined in accordance with EA-4/02 M:2013. The true value is located in the corresponding interval with a probability of 95 %.

End of Test Report

Annex A

Test results of EUT

part of / in addition to

Test report no.: 21086129-23010-1

Tested by (name, function, signature)	*Piotr Sardyko* *Deputy Head of Laboratory RF*	signature
Approved by (name, function, signature)	*Dr.-Ing. Harald Ansorge* *Managing Director*	signature

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2 TEST RESULTS

2.1 Variant ID #28

DUT Information

DUT Name: prePV 28
Manufacturer: Mitsubishi Electric Corporation
Serial Number: 65112 (conducted)
65108 (radiated)

2.1.1 RF Output Power (Conducted Peak Power)

Test according to FCC title 47 part 15 §15.407(a), KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 II.E and ANSI C63.10-2013

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Combined Uncertainty of absolute Level Measurement (K=2) < 1 dB

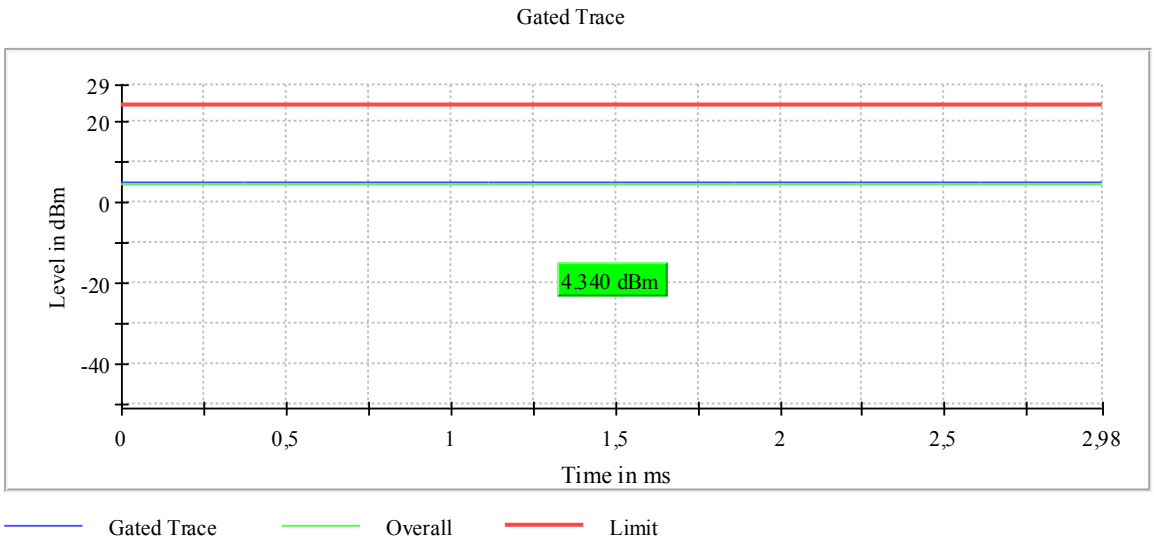
DUT Information

DUT Name: prePV 28
Manufacturer: Mitsubishi Electric Corporation
Serial Number: 65112 (conducted)

Plot 1: Mode 1, U-NII-1, AVGPM-G Gated Average Power Measurement, low channel

Result

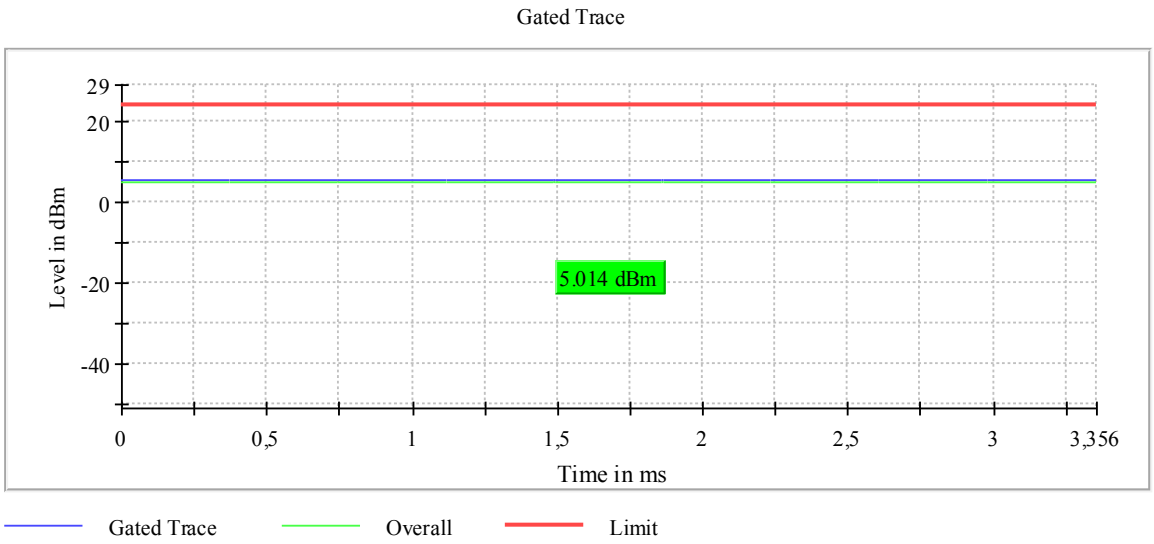
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5180.000000	4.3	24.0	4.3	0.365	PASS



Plot 2: Mode 1, U-NII-1, AVGPM-G Gated Average Power Measurement, mid channel

Result

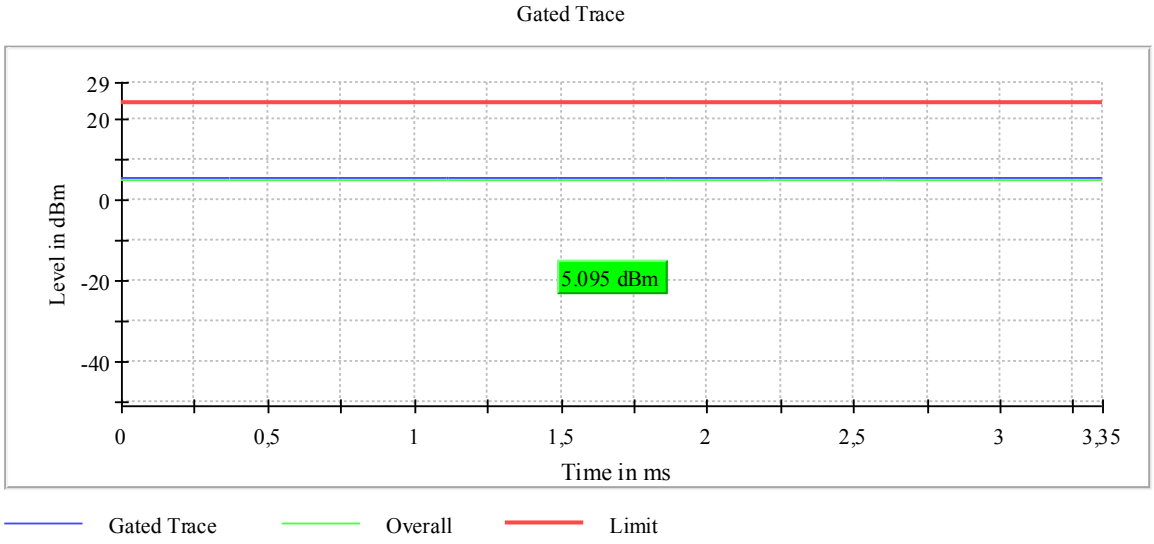
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5220.000000	5.0	24.0	5.0	0.365	PASS



Plot 3: Mode 1, U-NII-1, AVGPM-G Gated Average Power Measurement, high channel

Result

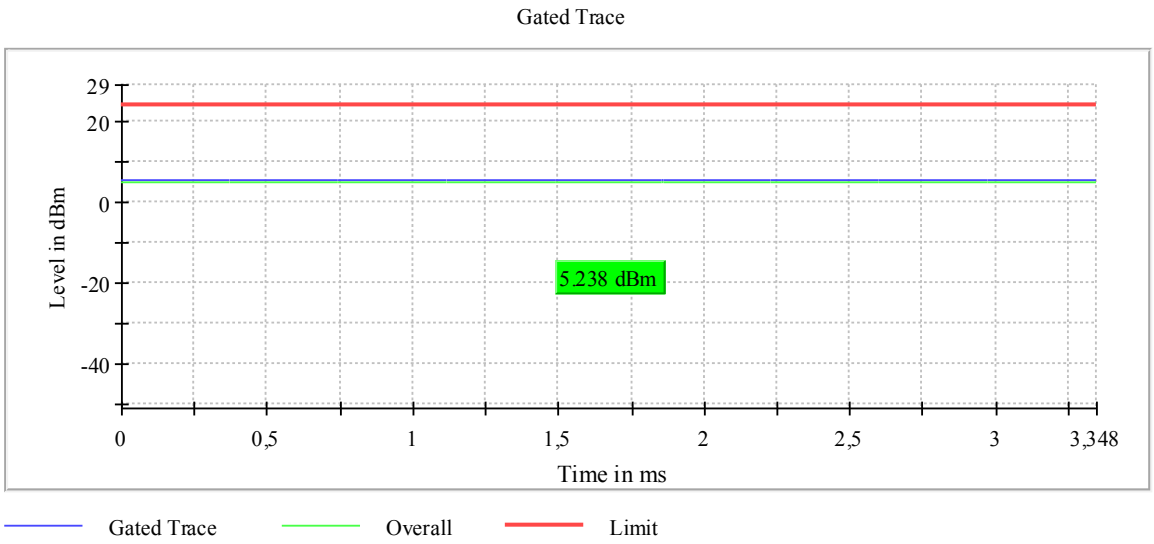
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5240.000000	5.1	24.0	5.1	0.365	PASS



Plot 4: Mode 1, U-NII-2A, AVGPM-G Gated Average Power Measurement, low channel

Result

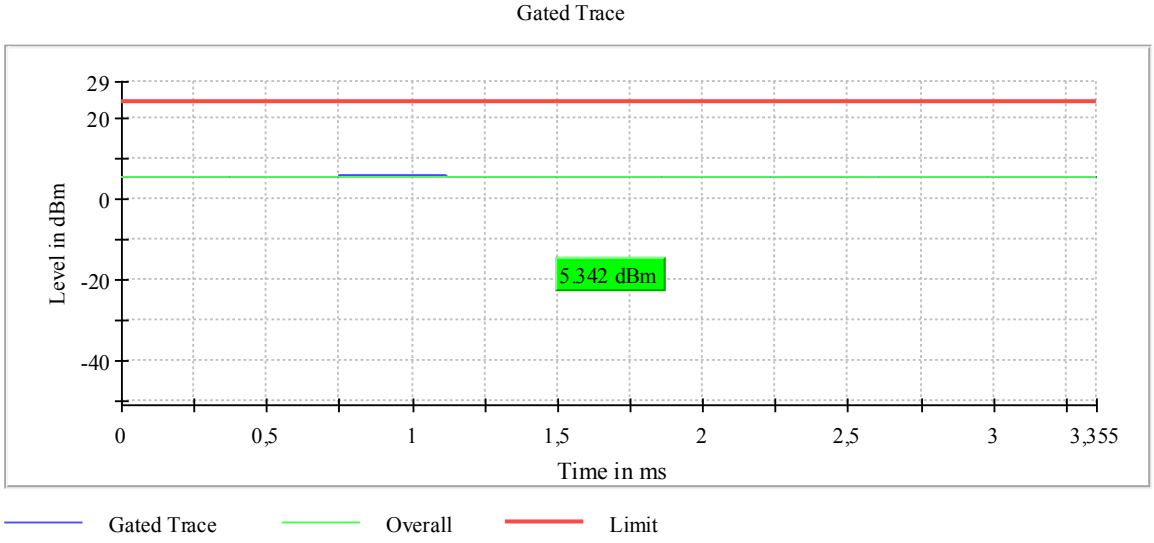
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5260.000000	5.2	24.0	5.2	0.364	PASS



Plot 5: Mode 1, U-NII-2A, AVGPM-G Gated Average Power Measurement, mid channel

Result

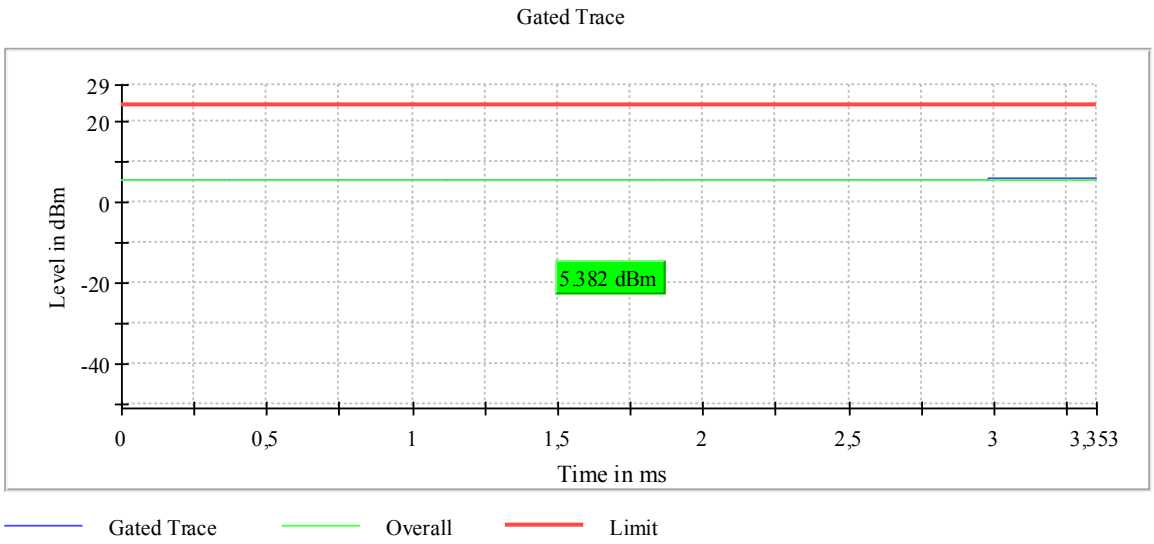
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5300.000000	5.3	24.0	5.3	0.365	PASS



Plot 6: Mode 1, U-NII-2A, AVGPM-G Gated Average Power Measurement, high channel

Result

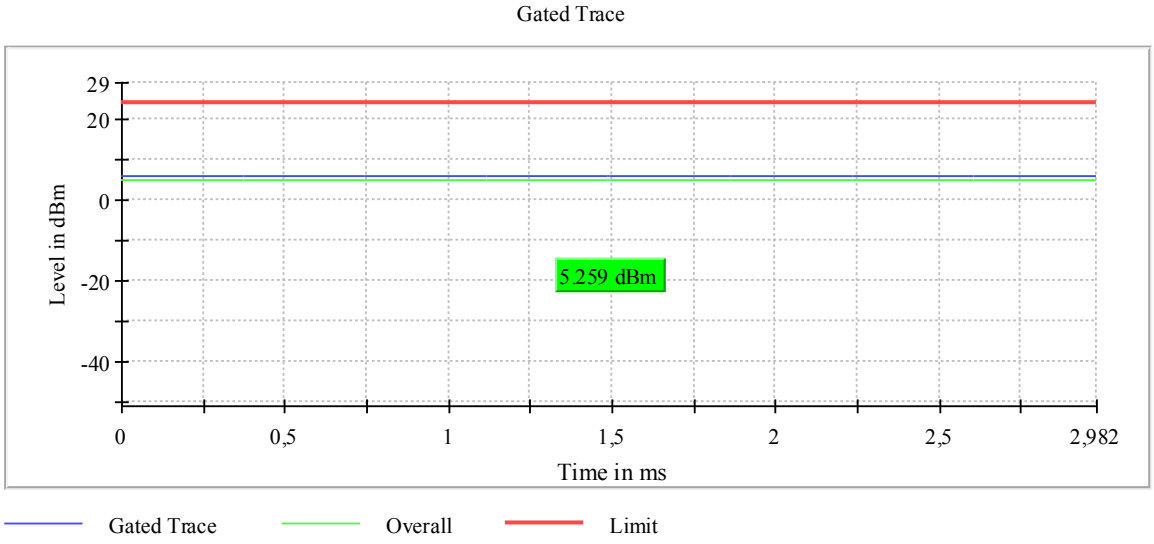
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5320.000000	5.4	24.0	5.4	0.365	PASS



Plot 7: Mode 1, U-NII-2C, AVGPM-G Gated Average Power Measurement, low channel

Result

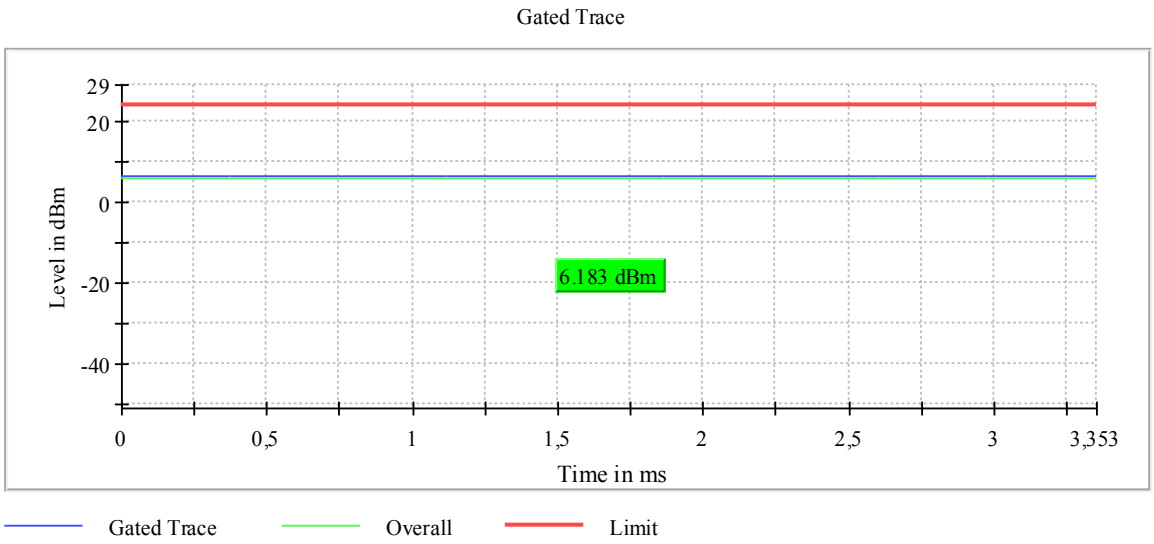
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5500.000000	5.3	24.0	5.3	0.365	PASS



Plot 8: Mode 1, U-NII-2C, AVGPM-G Gated Average Power Measurement, mid channel

Result

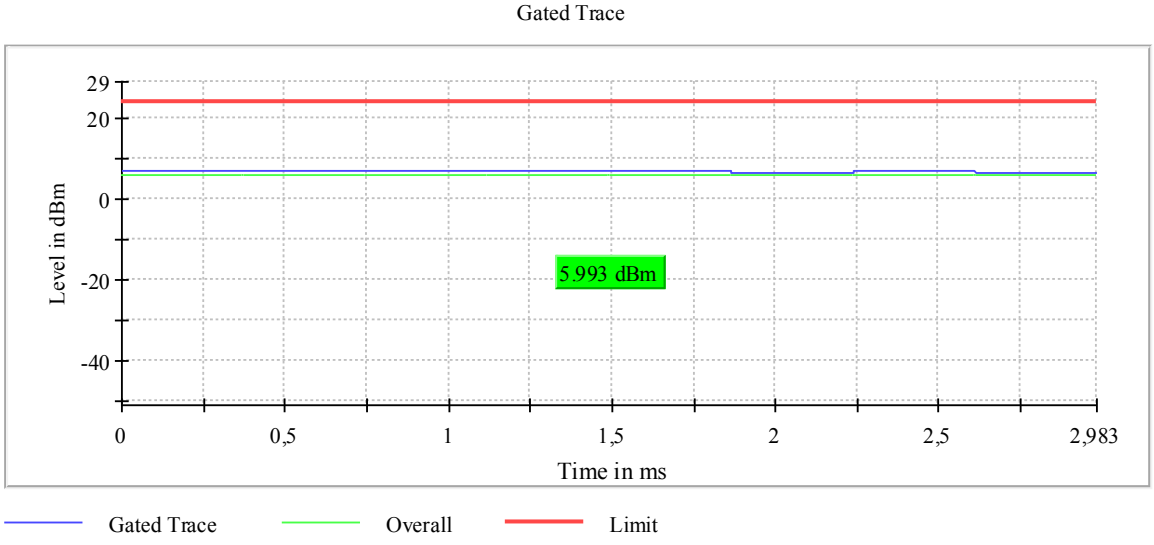
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5600.000000	6.2	24.0	6.2	0.365	PASS



Plot 9: Mode 1, U-NII-2C, AVGPM-G Gated Average Power Measurement, high channel

Result

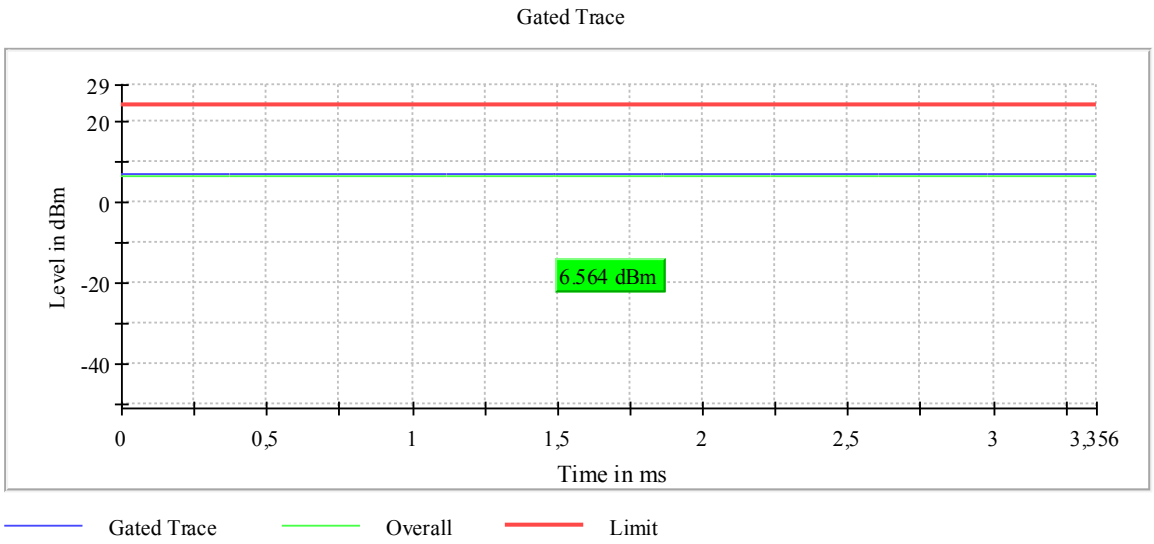
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5700.000000	6.0	24.0	6.0	0.365	PASS



Plot 10: Mode 1, U-NII-2C, AVGPM-G Gated Average Power Measurement, channel 144

Result

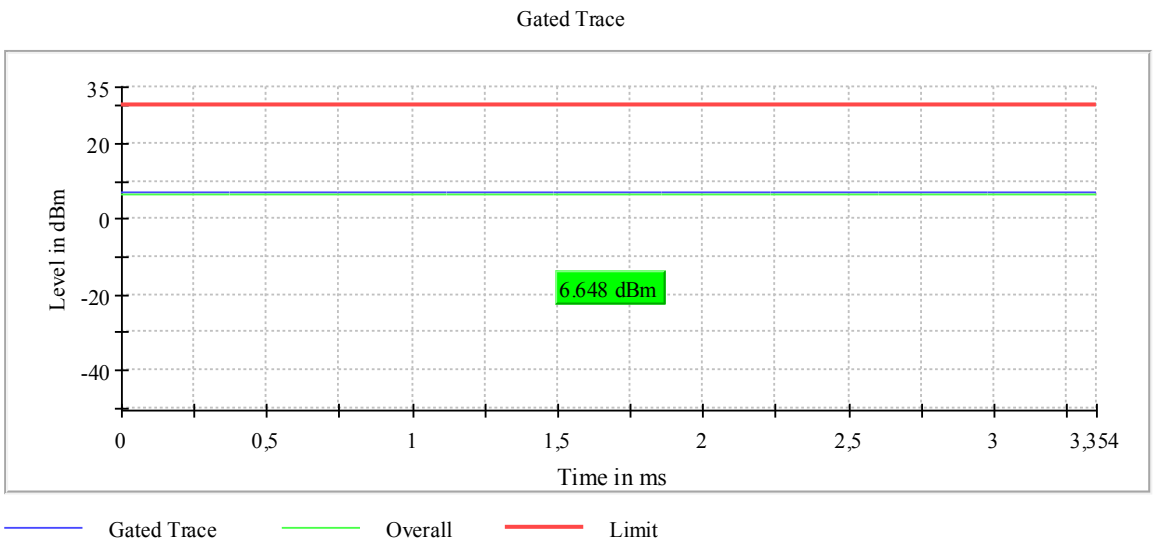
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5720.000000	6.6	24.0	6.6	0.365	PASS



Plot 11: Mode 1, U-NII-3, AVGPM-G Gated Average Power Measurement, low channel

Result

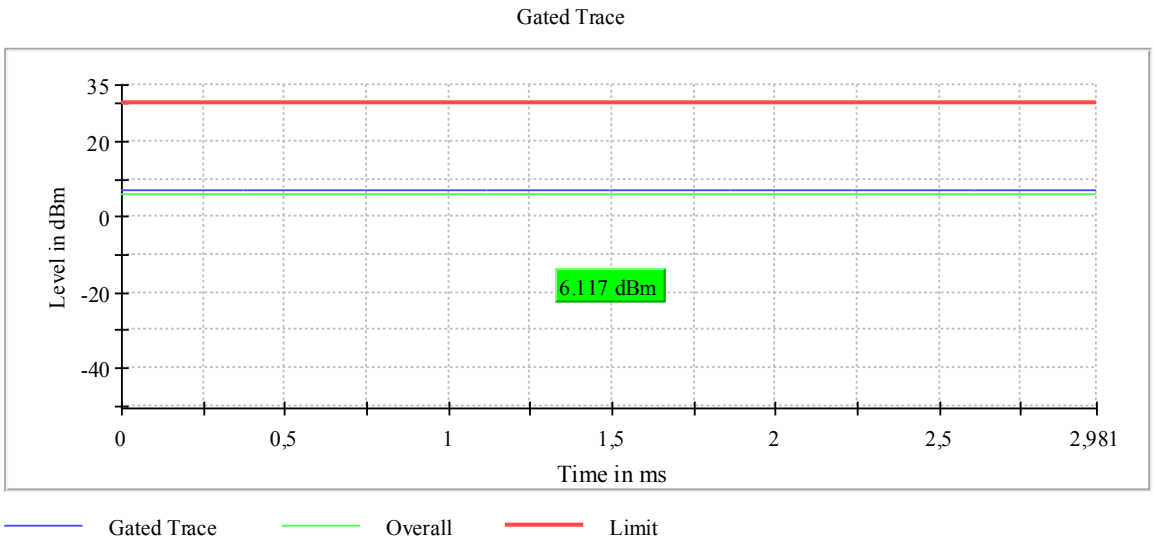
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5745.000000	6.6	30.0	6.6	0.365	PASS



Plot 12: Mode 1, U-NII-3, AVGPM-G Gated Average Power Measurement, mid channel

Result

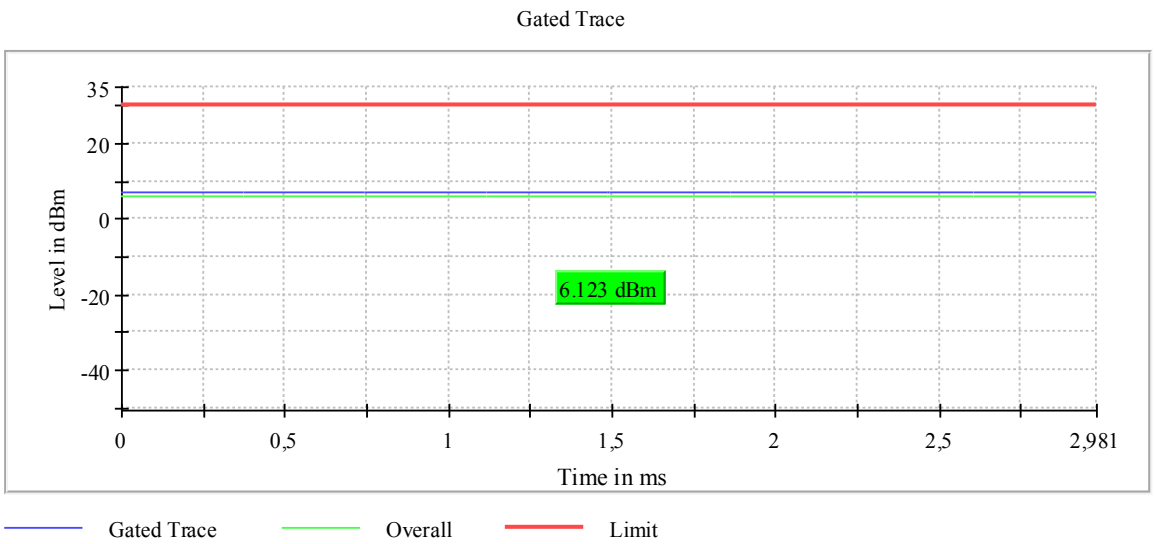
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5785.000000	6.1	30.0	6.1	0.365	PASS



Plot 13: Mode 1, U-NII-3, AVGPM-G Gated Average Power Measurement, high channel

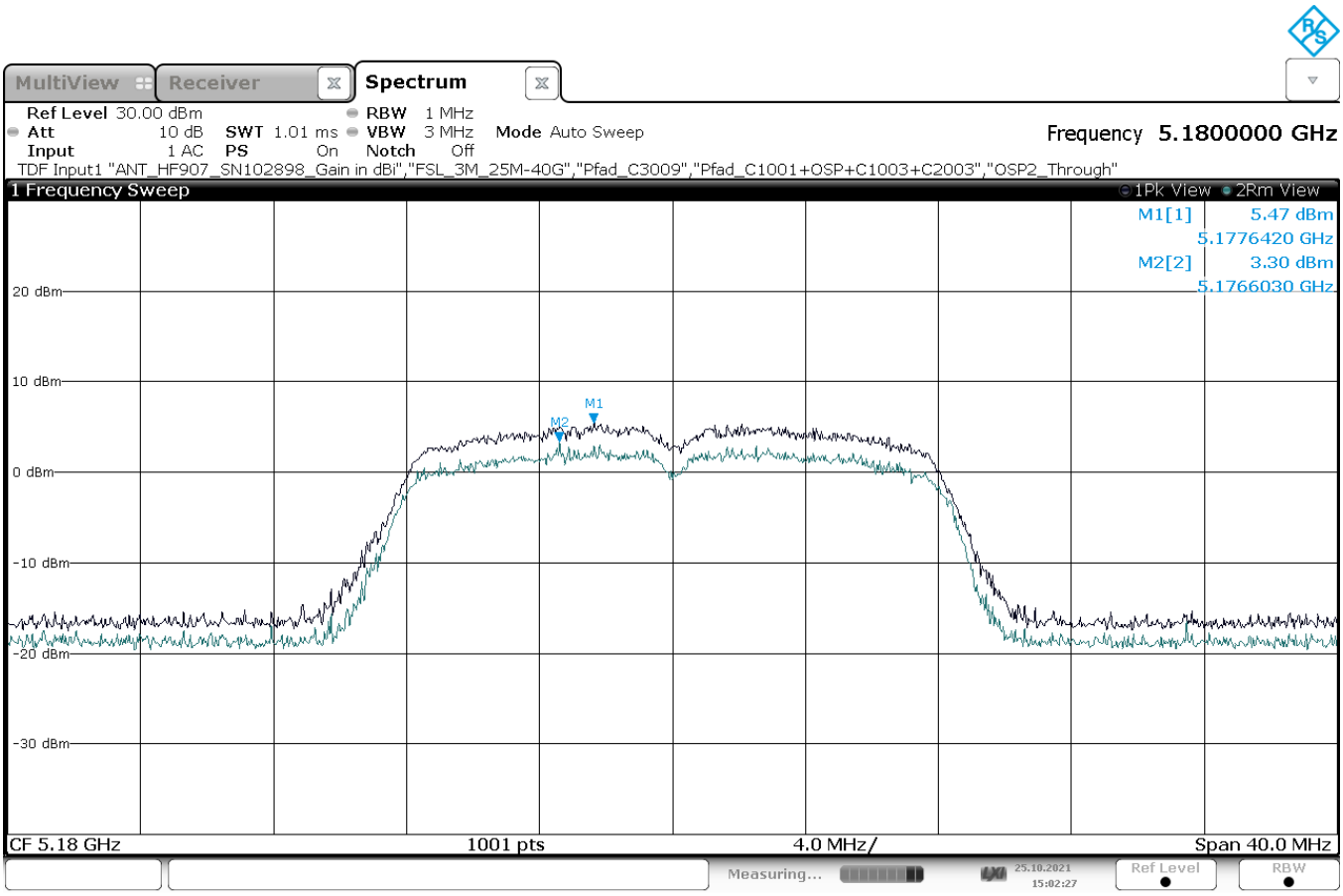
Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5825.000000	6.1	30.0	6.1	0.365	PASS

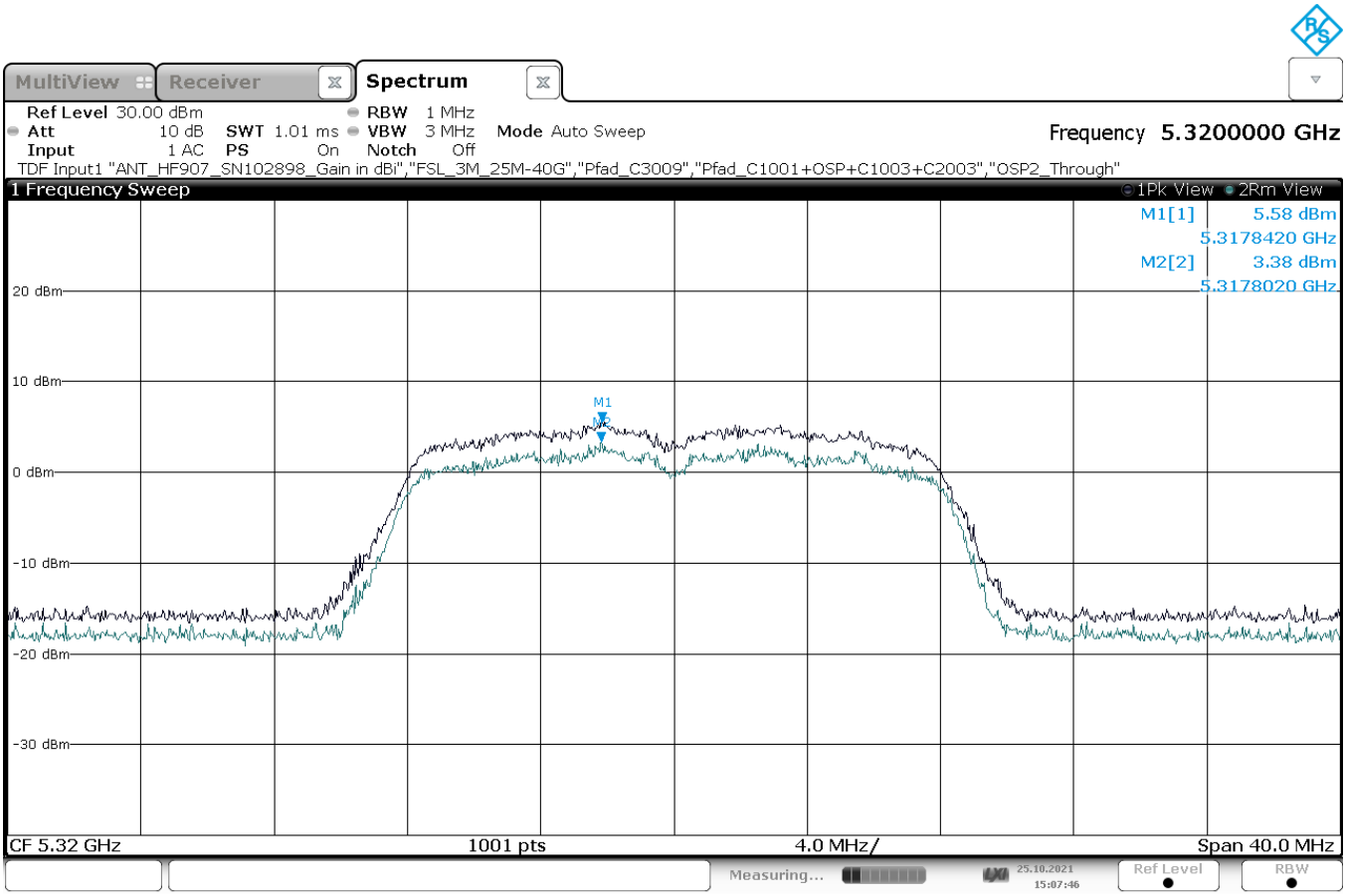


2.1.2 Radiated Peak Power (Peak EIRP)

Plot 14: Test Mode 1, a-mode, BPSK, 6 Mbit/s, Peak EIRP, channel 36, 5180 MHz

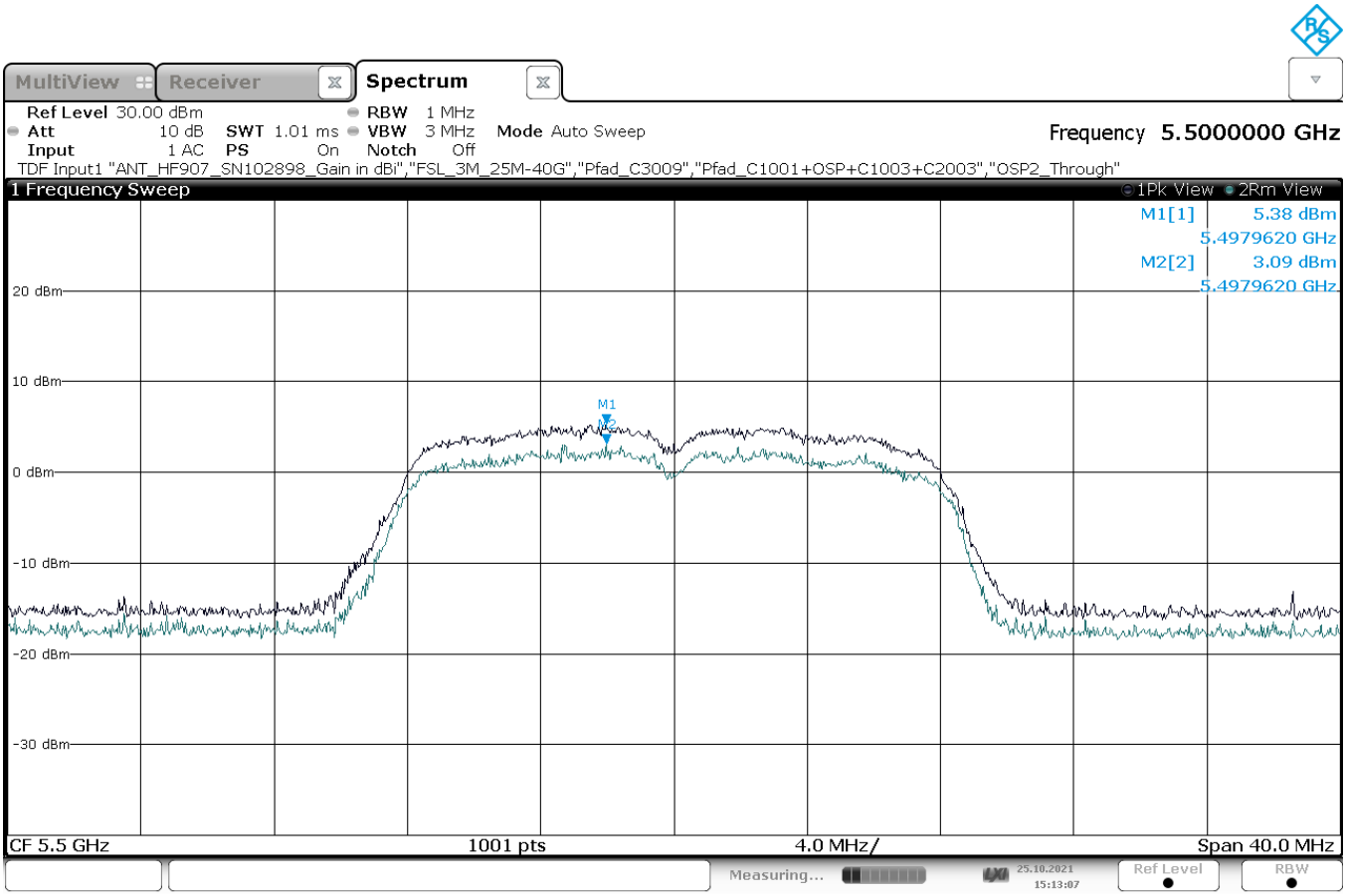


Plot 15: Test Mode 1, a-mode, BPSK, 6 Mbit/s, Peak EIRP, channel 64, 5320 MHz



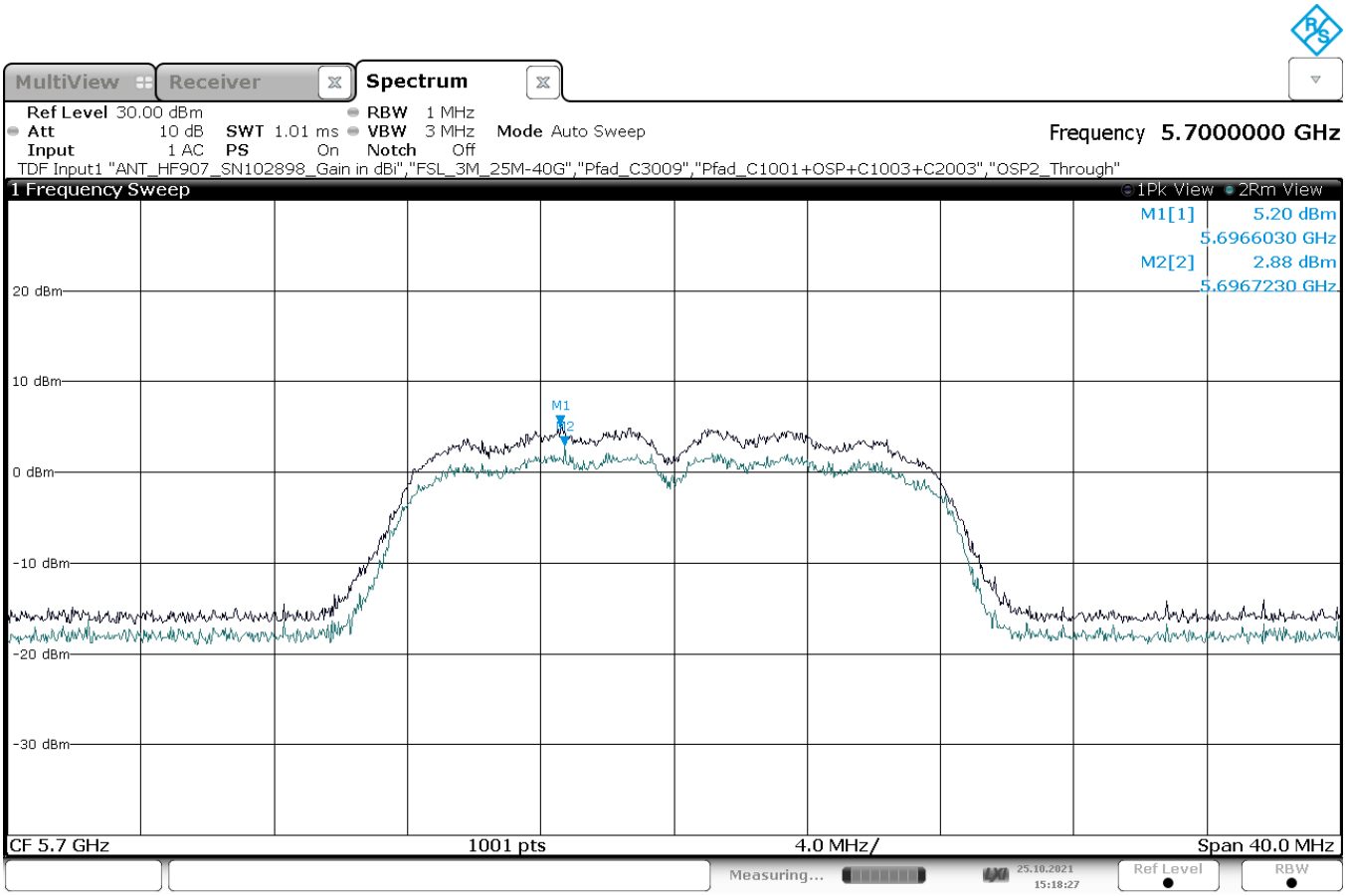
15:07:47 25.10.2021

Plot 16: Test Mode 1, a-mode, BPSK, 6 Mbit/s, Peak EIRP, channel 100, 5500 MHz



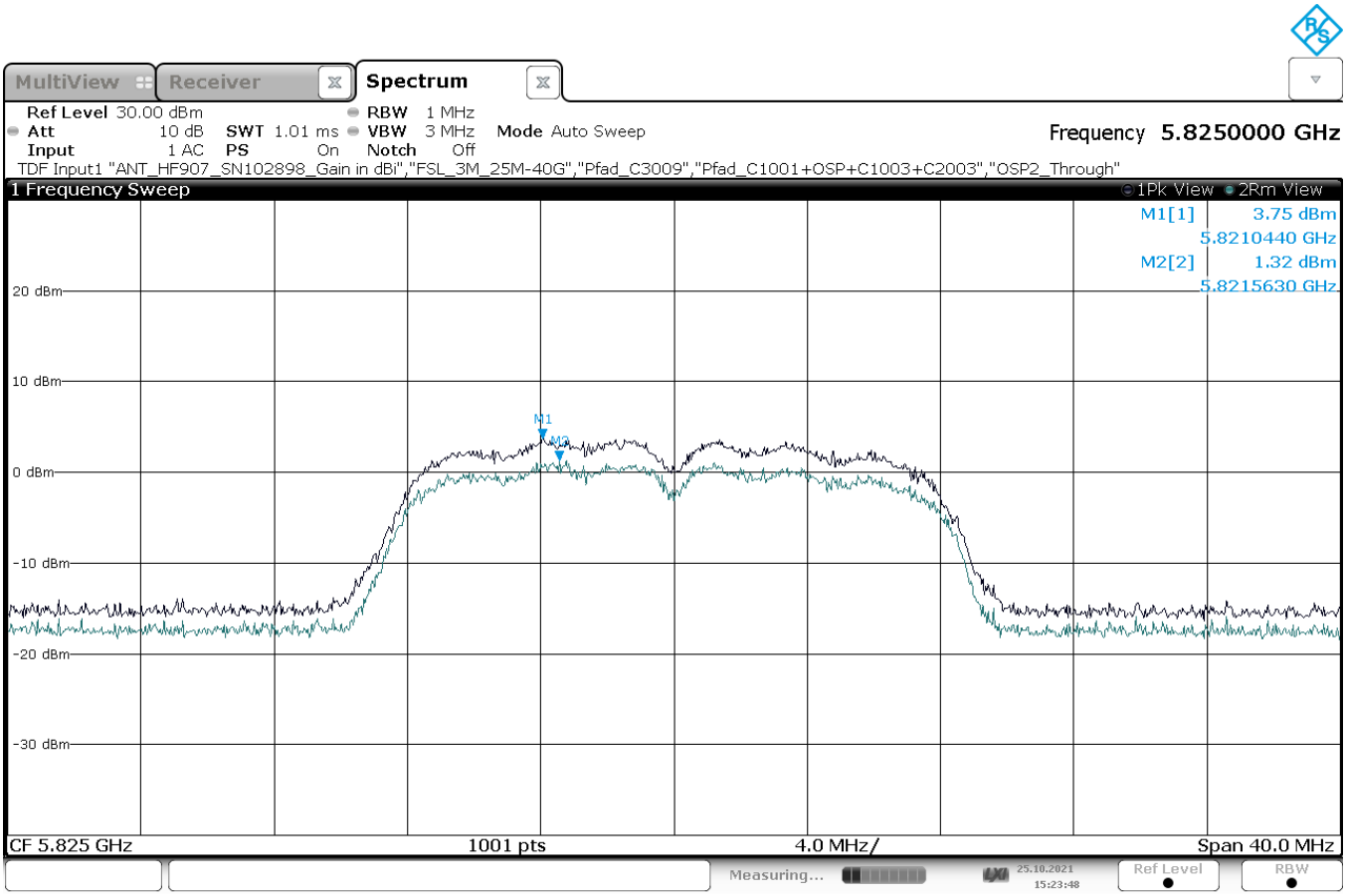
15:13:07 25.10.2021

Plot 17: Test Mode 1, a-mode, BPSK, 6 Mbit/s, Peak EIRP, channel 140, 5700 MHz



15:18:28 25.10.2021

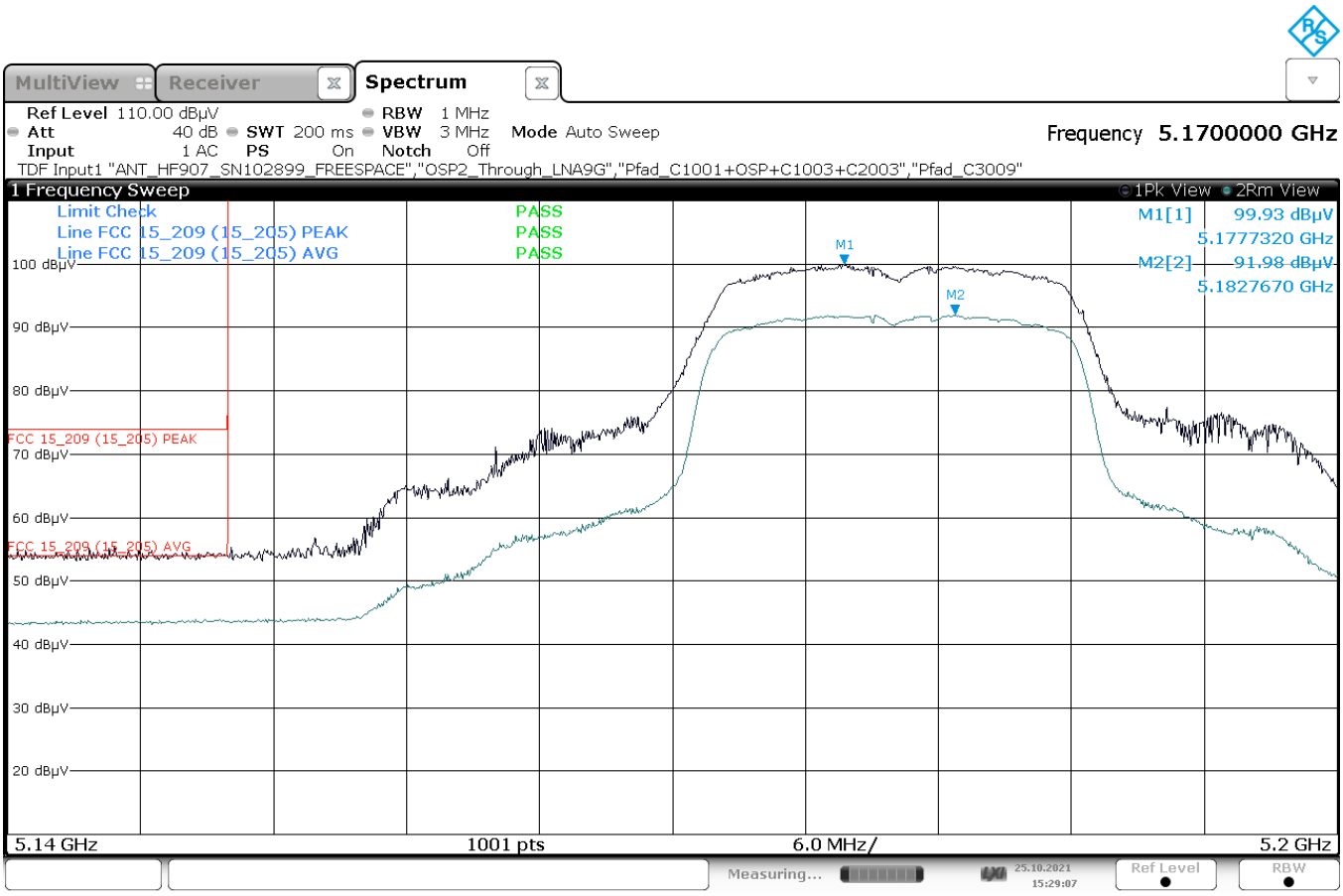
Plot 18: Test Mode 1, a-mode, BPSK, 6 Mbit/s, Peak EIRP, channel 165, 5825 MHz



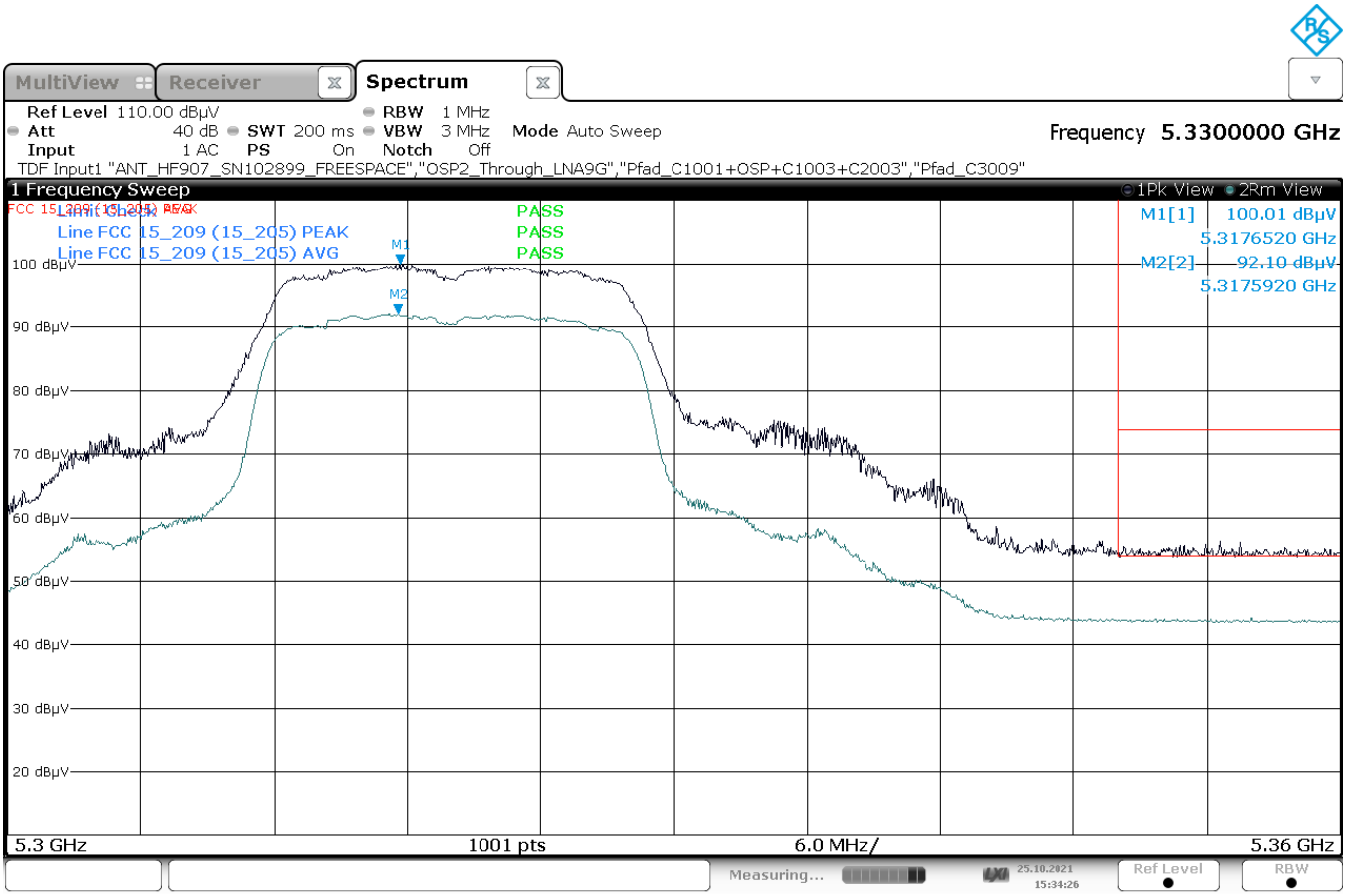
15:23:49 25.10.2021

2.1.3 Band Edge Compliance (BEC), radiated

Plot 19: Mode 1, a-mode, BEC low, channel 36, 5180 MHz

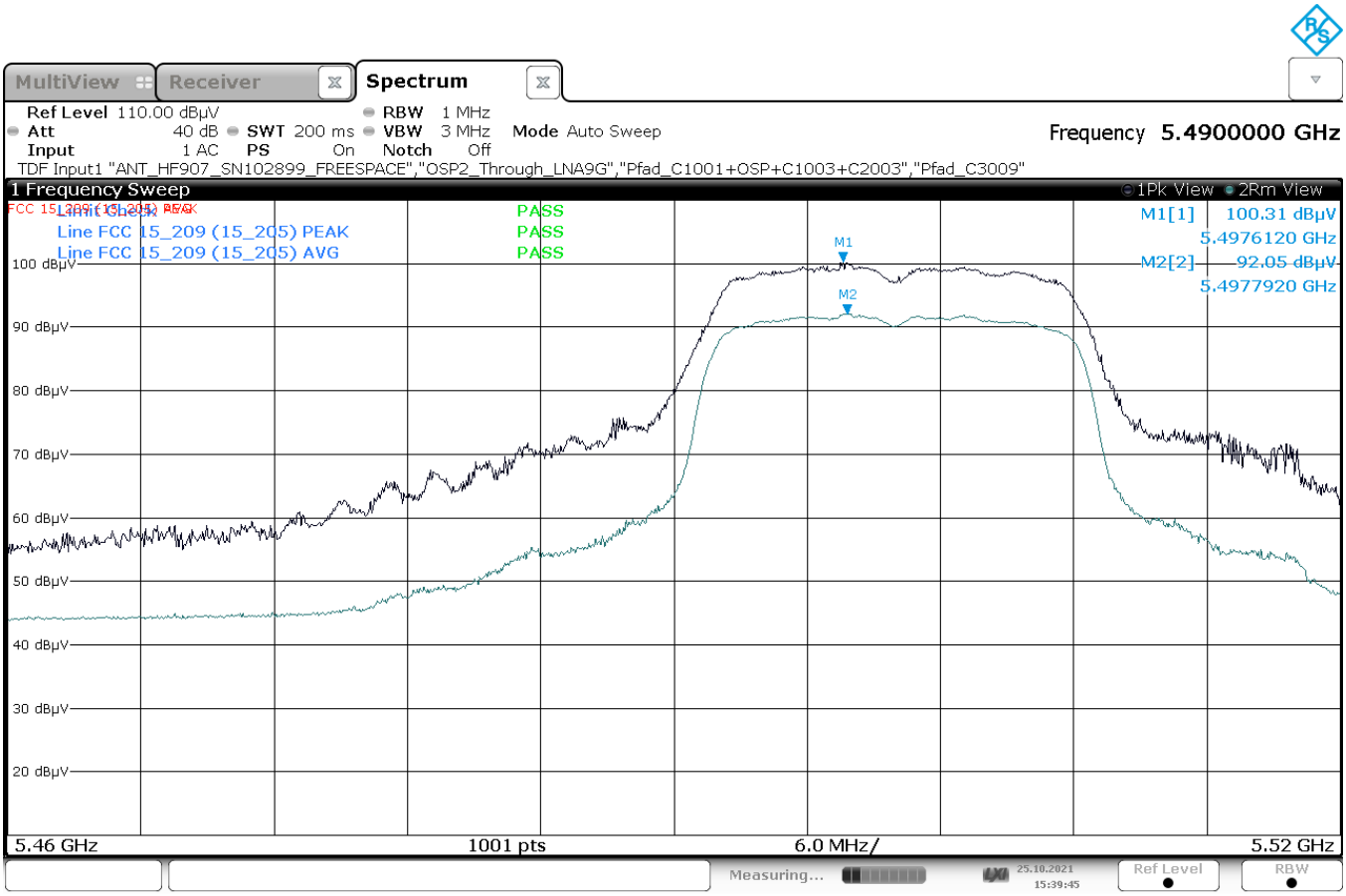


Plot 20: Mode 1, a-mode, BEC high, channel 64, 5320 MHz, 20 MHz channel bandwidth



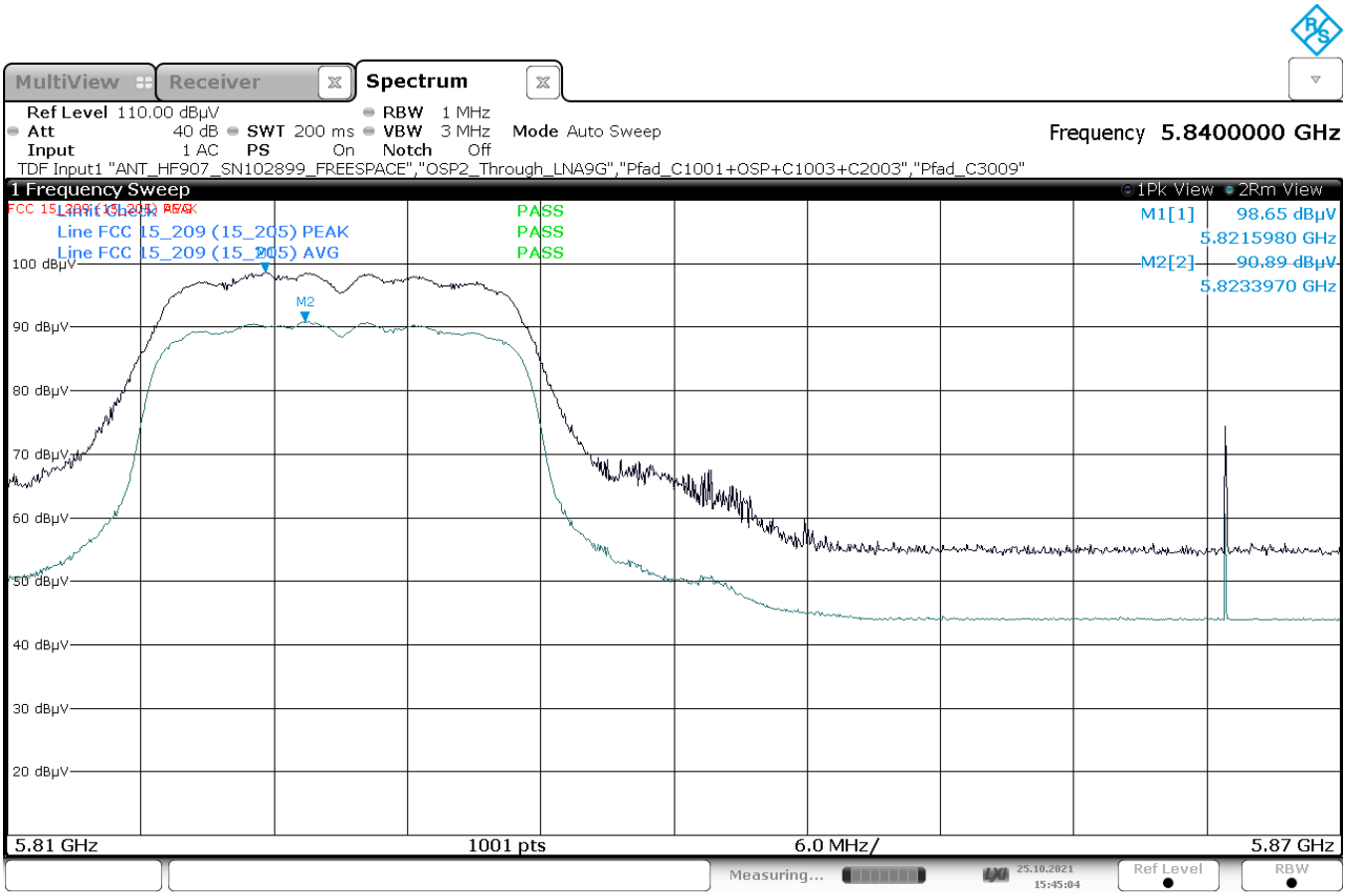
15:34:26 25.10.2021

Plot 21: Mode 1, a-mode, BEC low, channel 100, 5500 MHz, 20 MHz channel bandwidth



15:39:45 25.10.2021

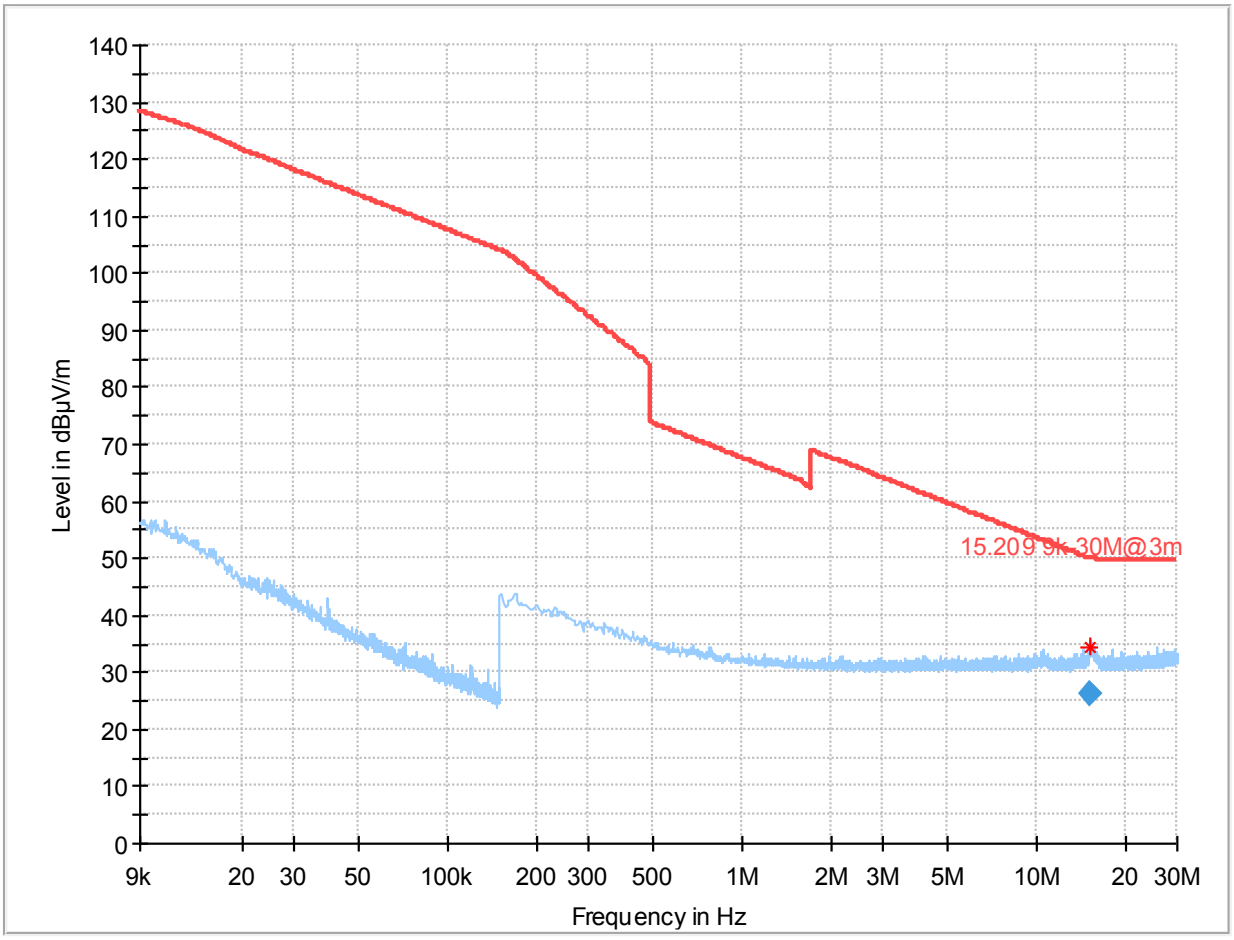
Plot 22: Mode 1, a-mode, BEC high, channel 165, 5825 MHz, 20 MHz channel bandwidth



15:45:04 25.10.2021

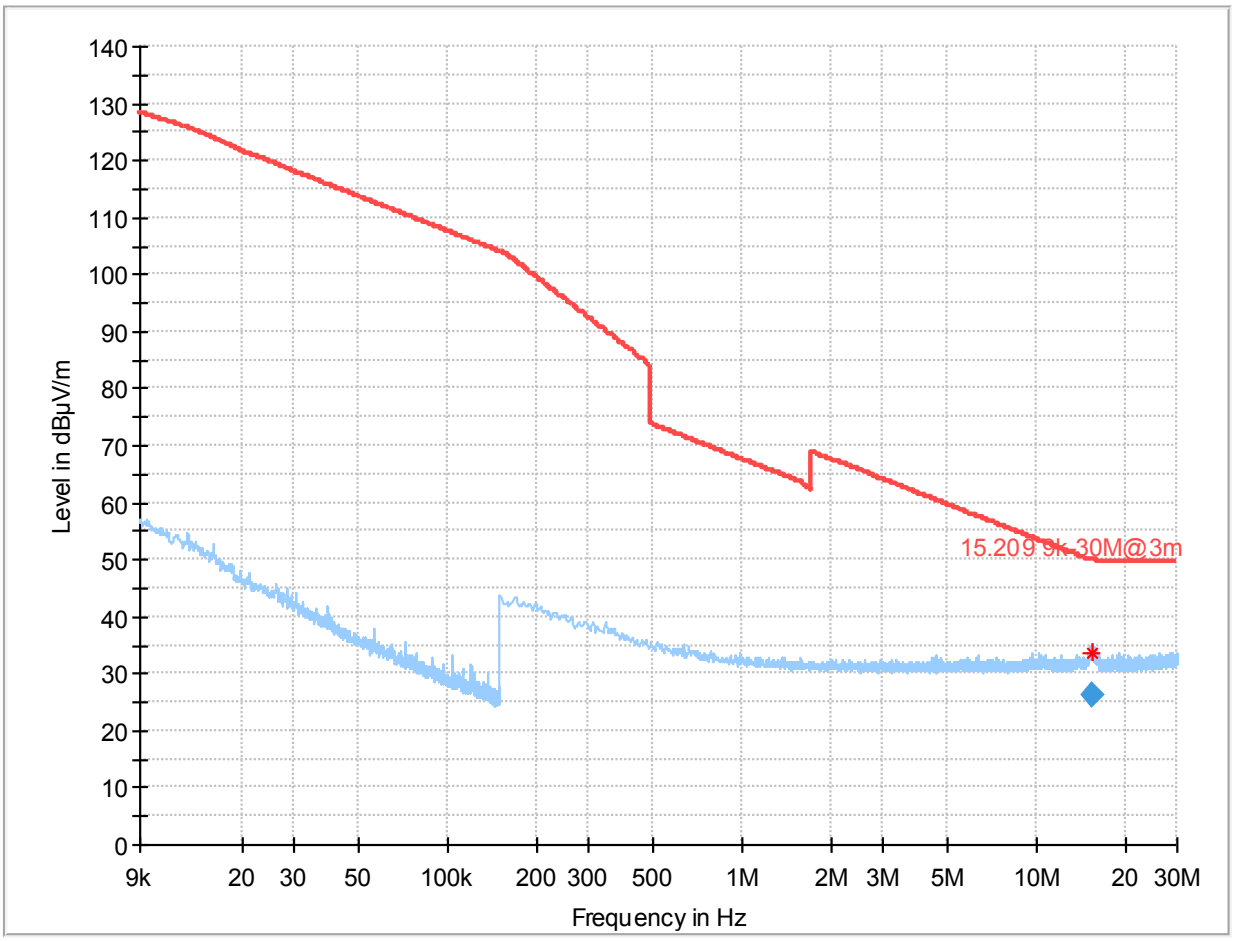
2.1.4 Radiated Spurious Emissions (RSE)

Plot 23: Mode 1, RSE 9 kHz – 30 MHz, channel 36, loop antenna



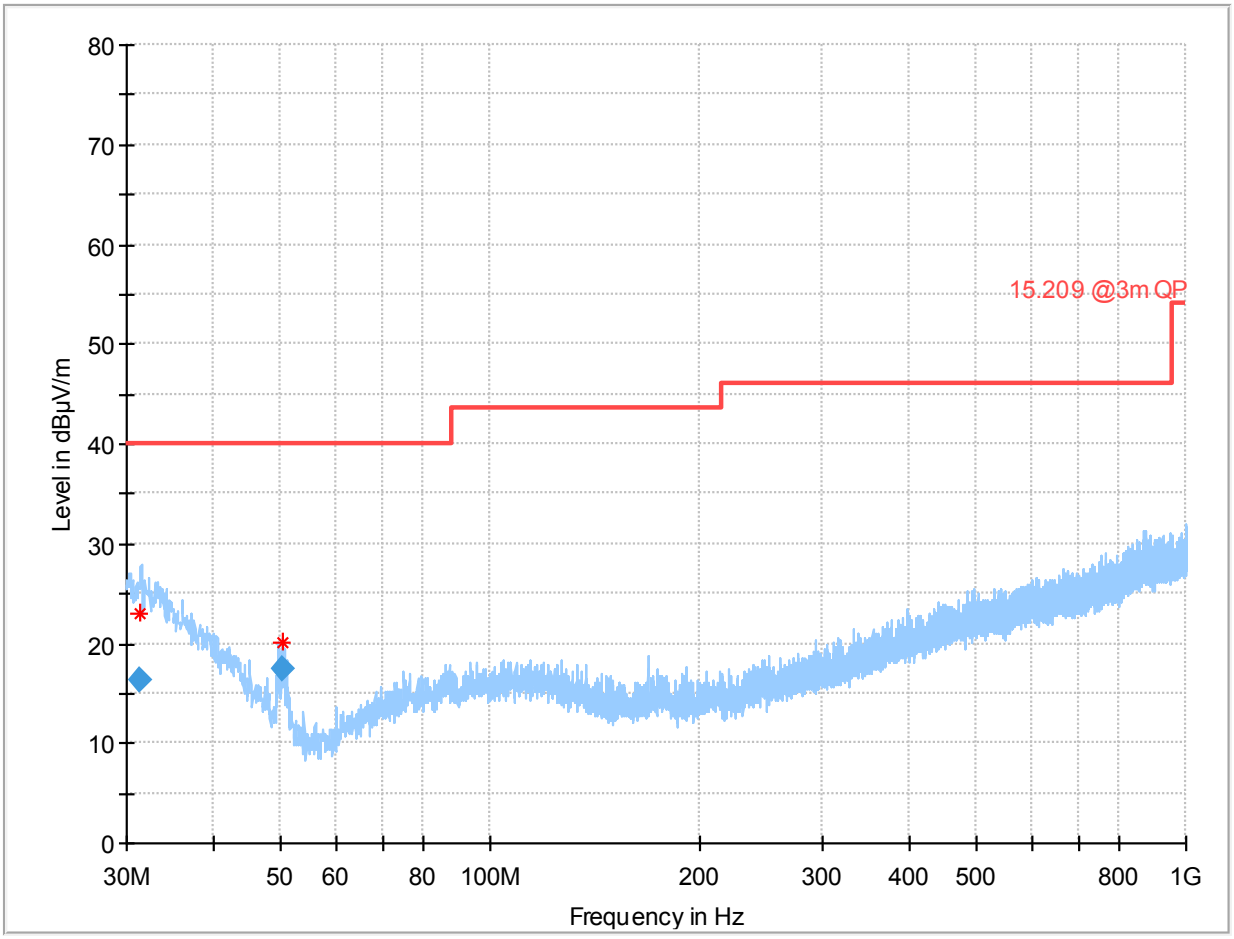
Frequency	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB/m)
15.247500	26.17	50.05	23.88	100.0	9.000	H	30.0	20.5

Plot 24: Mode 1, RSE 9 kHz – 30 MHz, channel 165, loop antenna



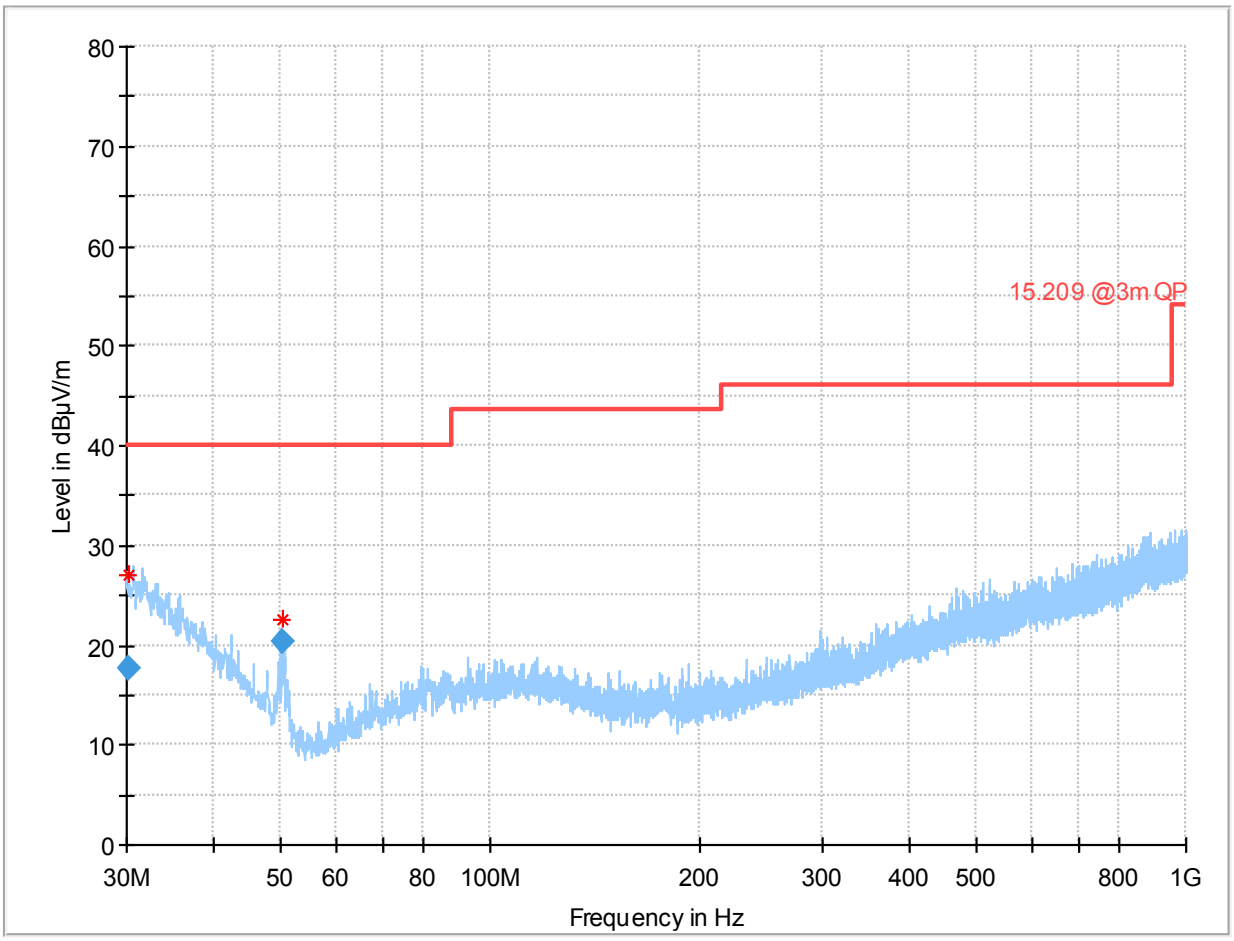
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB/m)
15.371250	26.37	50.04	23.67	100.0	9.000	H	210.0	20.5

Plot 25: Mode 1, RSE 30 MHz – 1 GHz, channel 36, horizontal / vertical polarisation



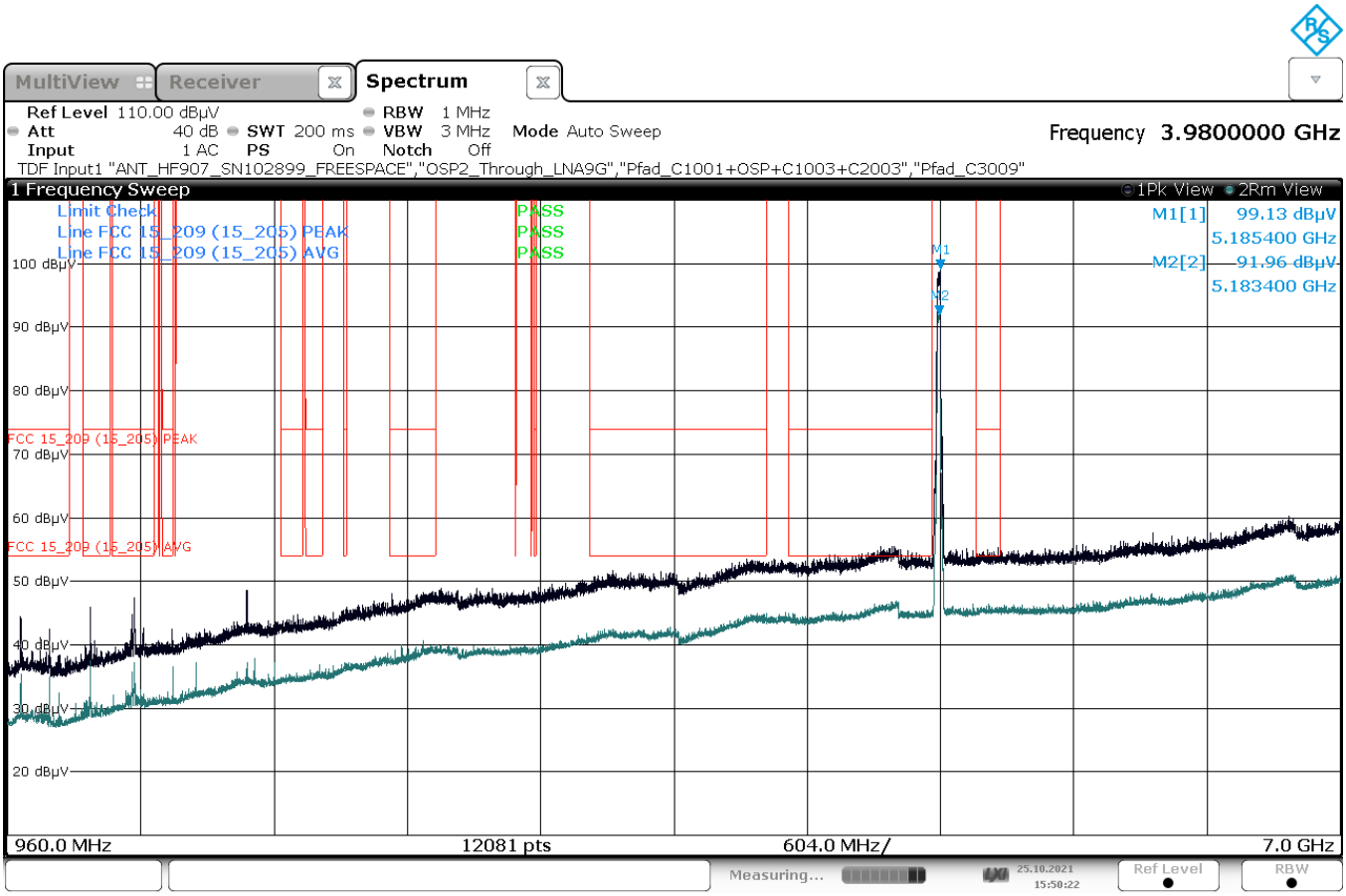
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
31.353500	16.35	40.00	23.65	100.0	120.000	103.0	V	279.0
50.224500	17.47	40.00	22.53	100.0	120.000	100.0	V	254.0

Plot 26: Mode 1, RSE 30 MHz – 1 GHz, channel 165, horizontal / vertical polarisation

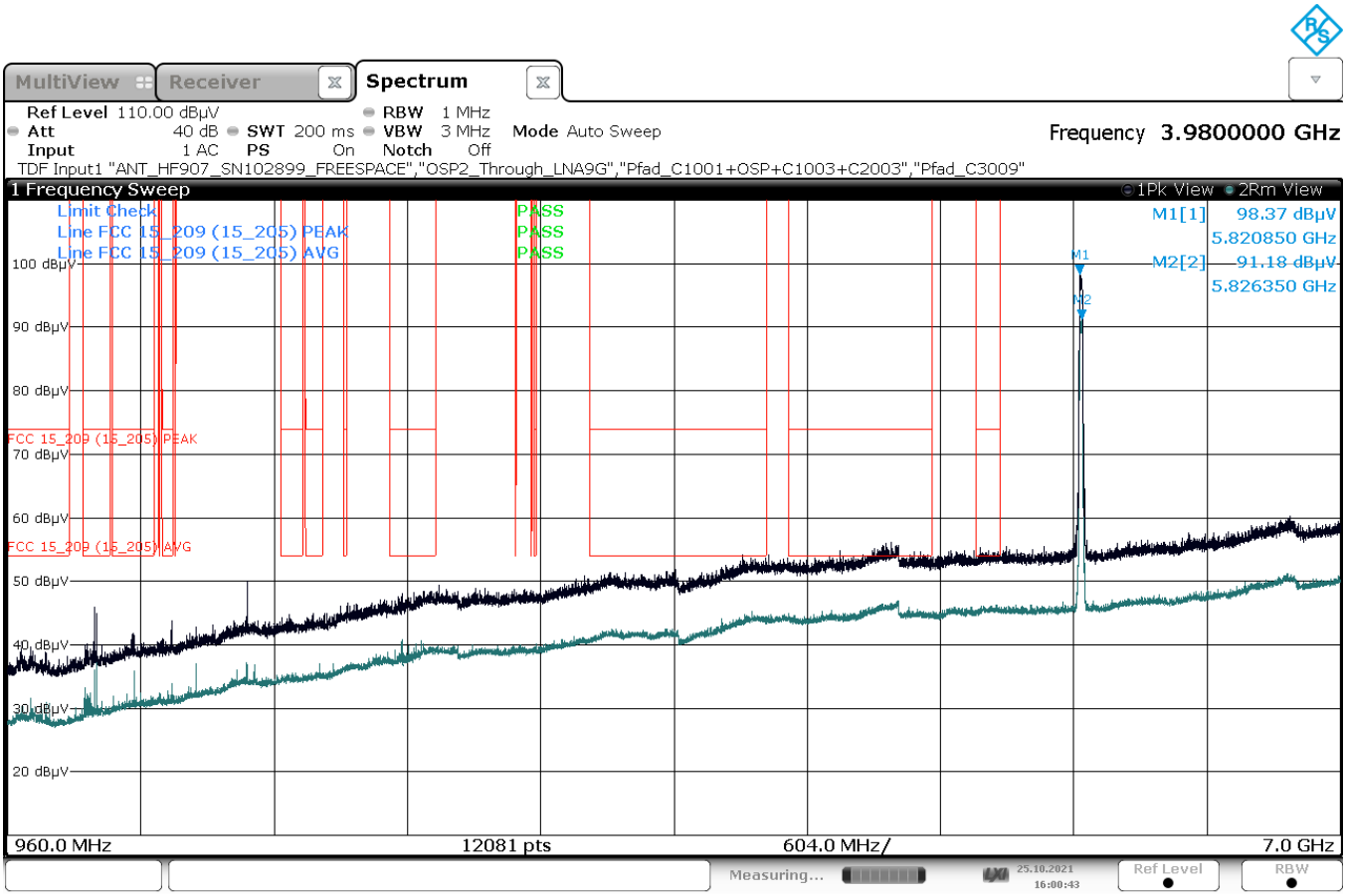


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
30.254000	17.70	40.00	22.30	100.0	120.000	103.0	V	346.0
50.467000	20.38	40.00	19.62	100.0	120.000	100.0	V	207.0

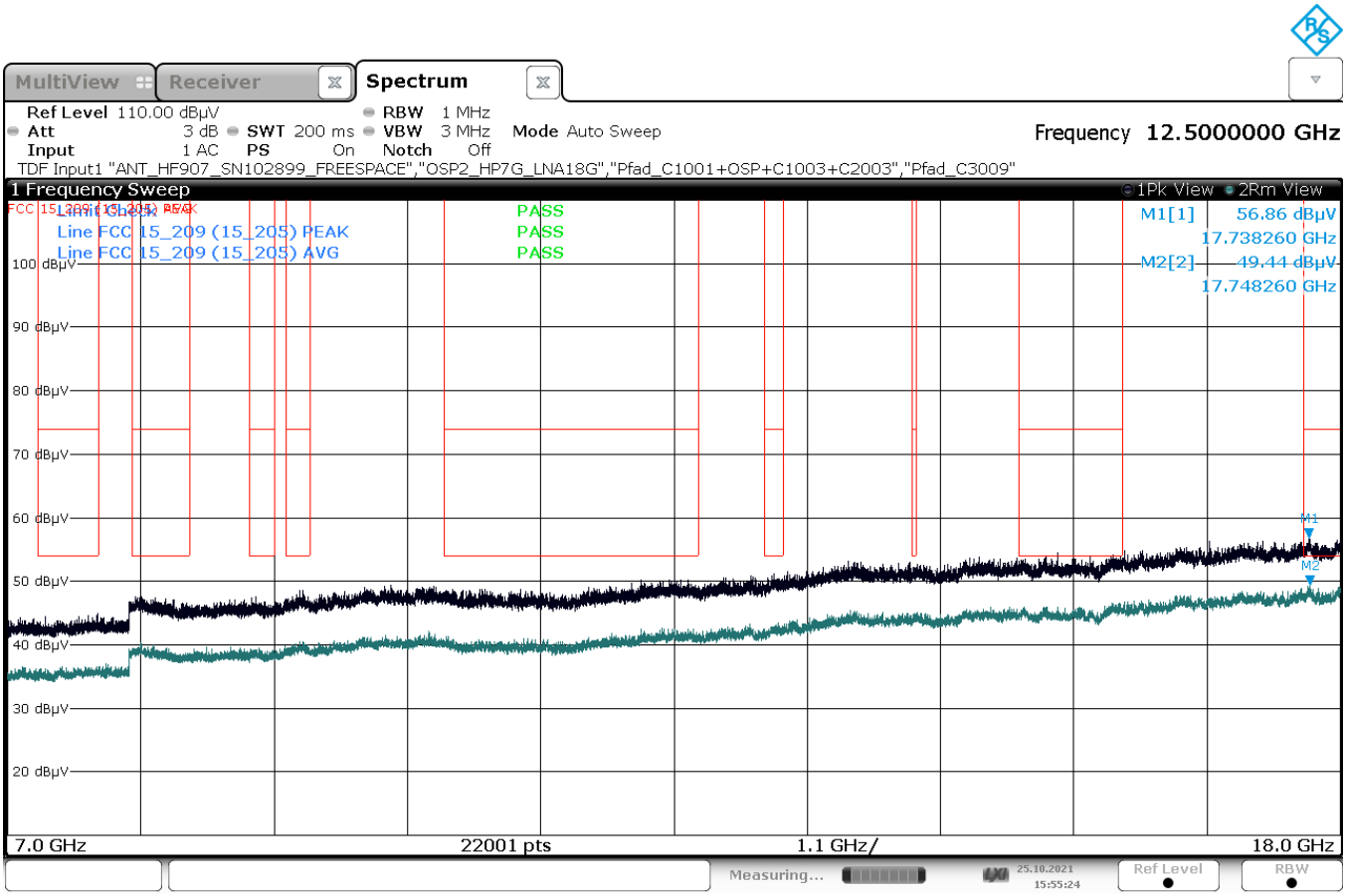
Plot 27: Mode 1, RSE 1 GHz – 7 GHz, channel 36, horizontal / vertical polarisation



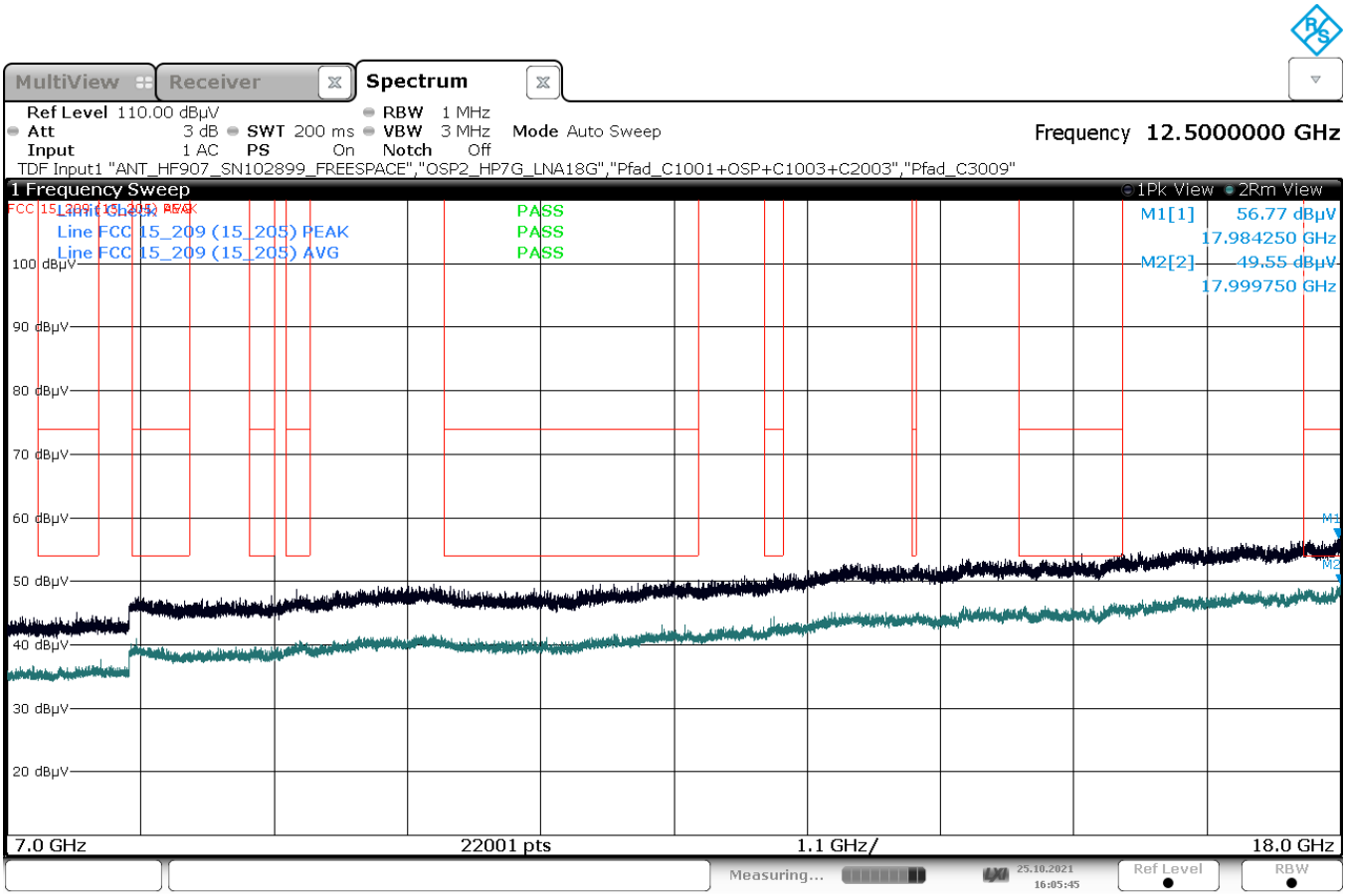
Plot 28: Mode 1, RSE 1 GHz – 7 GHz, channel 165, horizontal / vertical polarisation



Plot 29: Mode 1, RSE 7 GHz – 18 GHz, channel 36, horizontal / vertical polarisation



Plot 30: Mode 1, RSE 7 GHz – 18 GHz, channel 165, horizontal / vertical polarisation



2.2 Variant ID #33

DUT Information

DUT Name:	prePV 33
Manufacturer:	Mitsubishi Electric Corporation
Serial Number:	66605 (radiated)

2.2.1 RF Output Power (Conducted Peak Power)

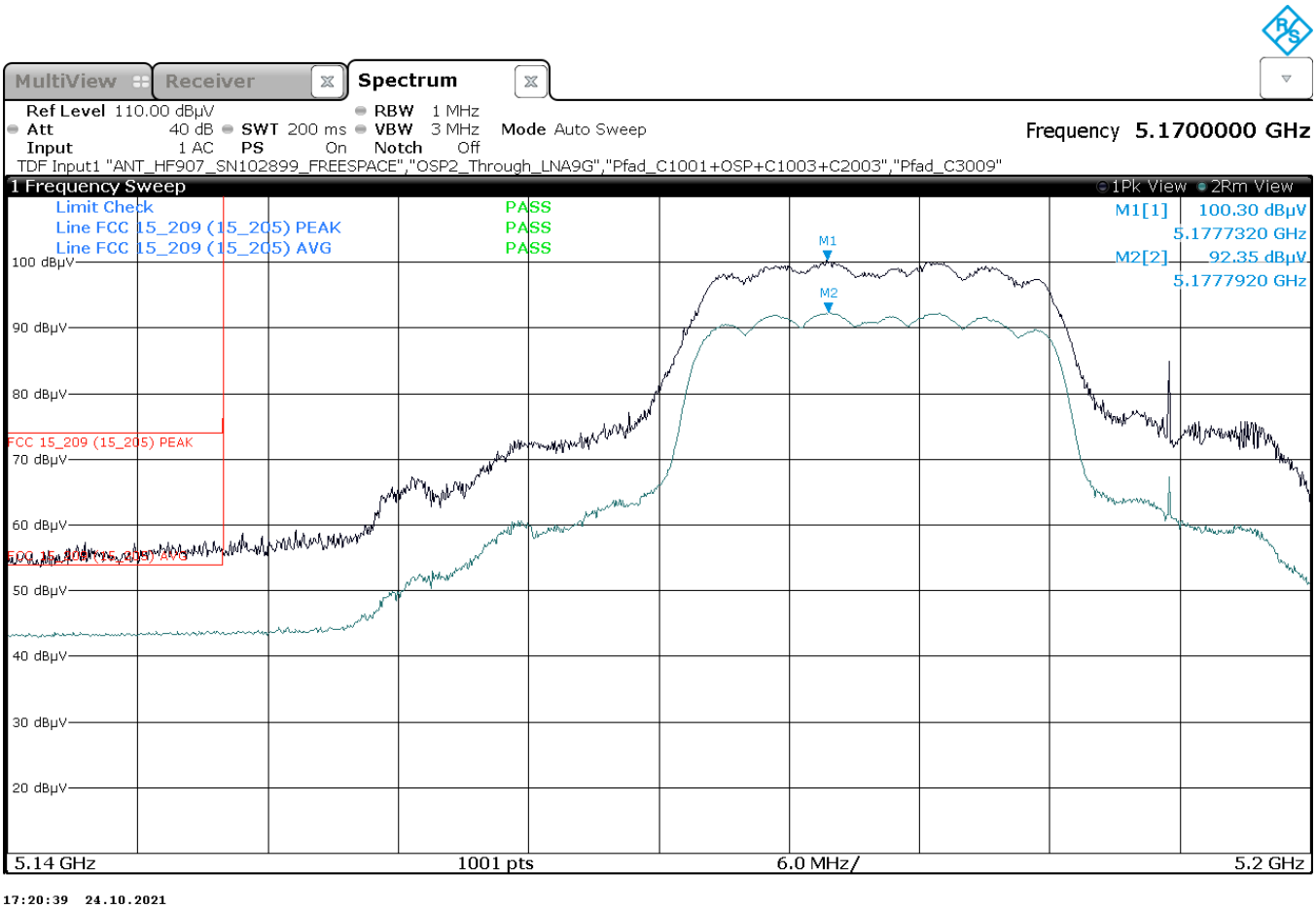
See test results of R1LOW-R-SBM DV model (see IBL-Lab test report TR-21065785-21222)

2.2.2 Radiated Peak Power (Peak EIRP)

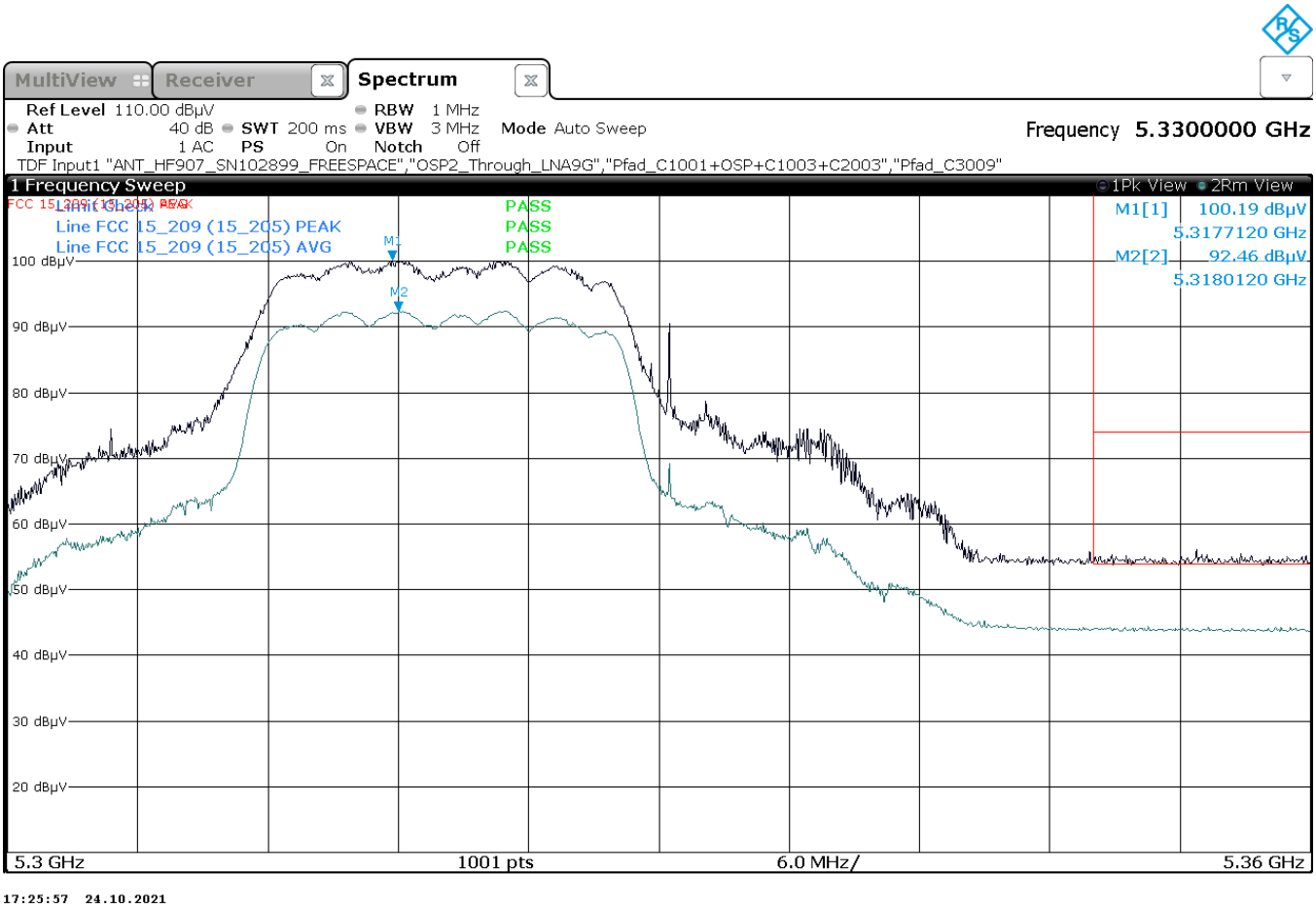
See test results of R1LOW-R-SBM DV model (see IBL-Lab test report TR-21065785-21222)

2.2.3 Band Edge Compliance (BEC), radiated

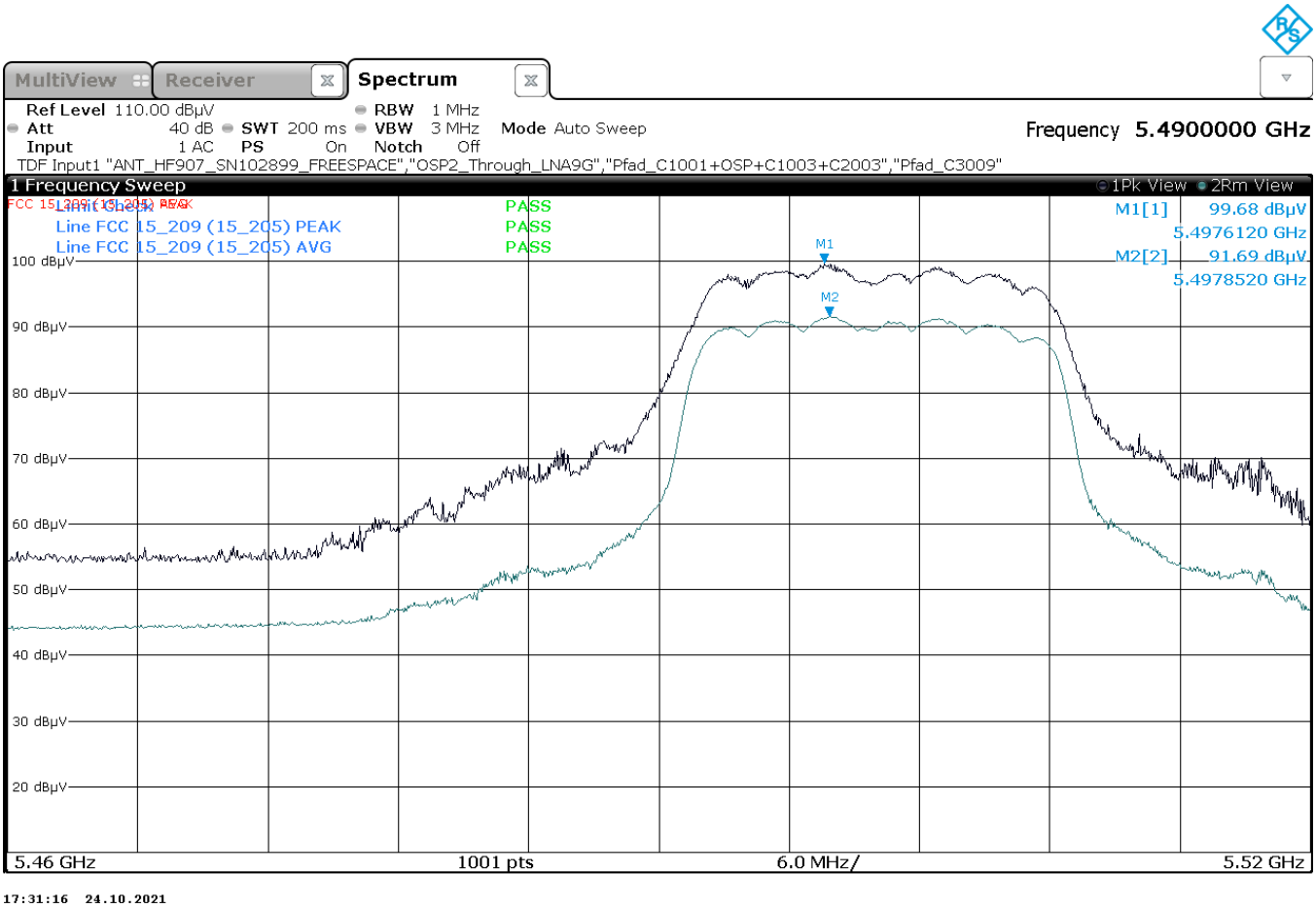
Plot 31: Mode 1, a-mode, BEC low, channel 36, 5180 MHz



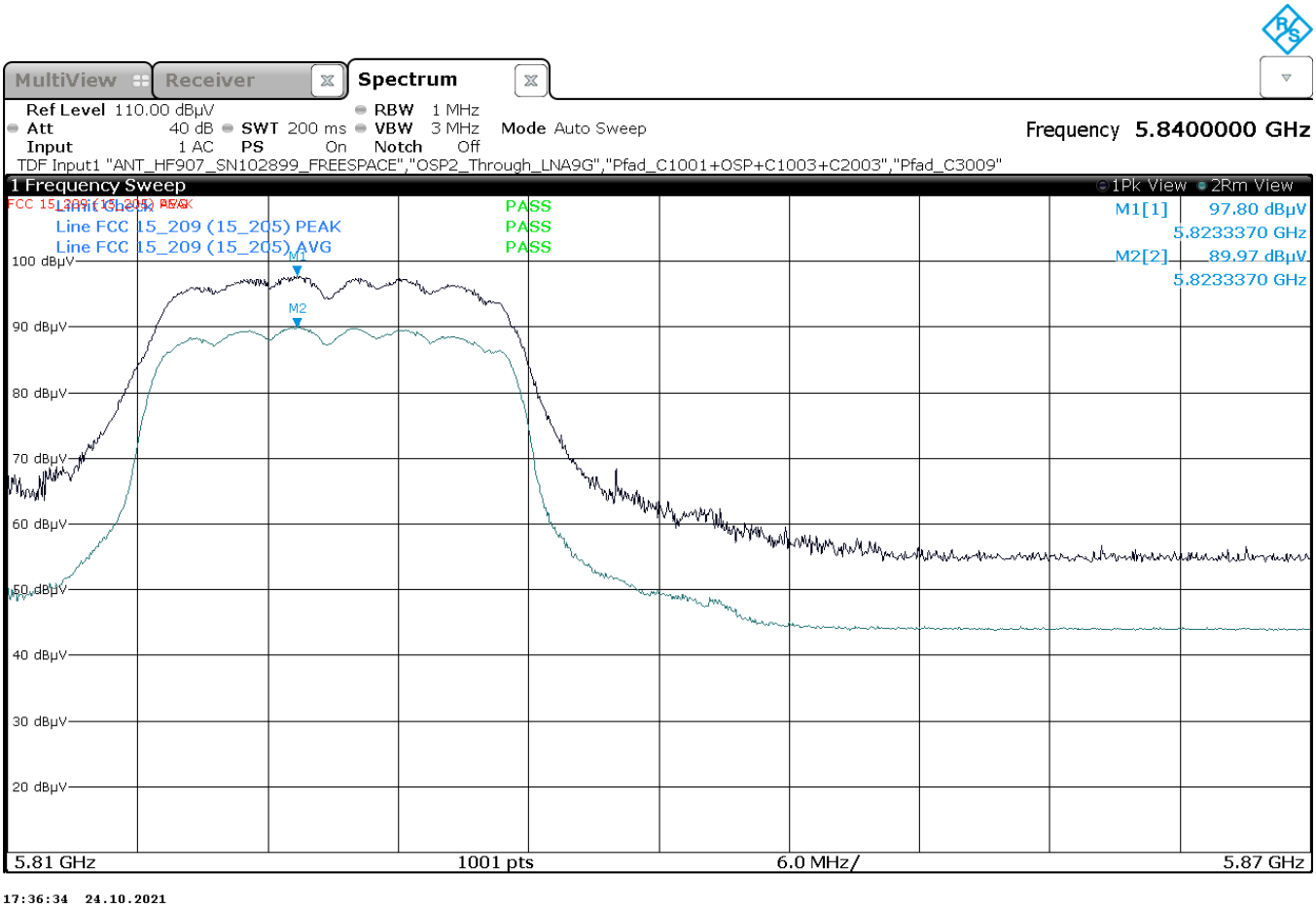
Plot 32: Mode 1, a-mode, BEC high, channel 64, 5320 MHz, 20 MHz channel bandwidth



Plot 33: Mode 1, a-mode, BEC low, channel 100, 5500 MHz, 20 MHz channel bandwidth

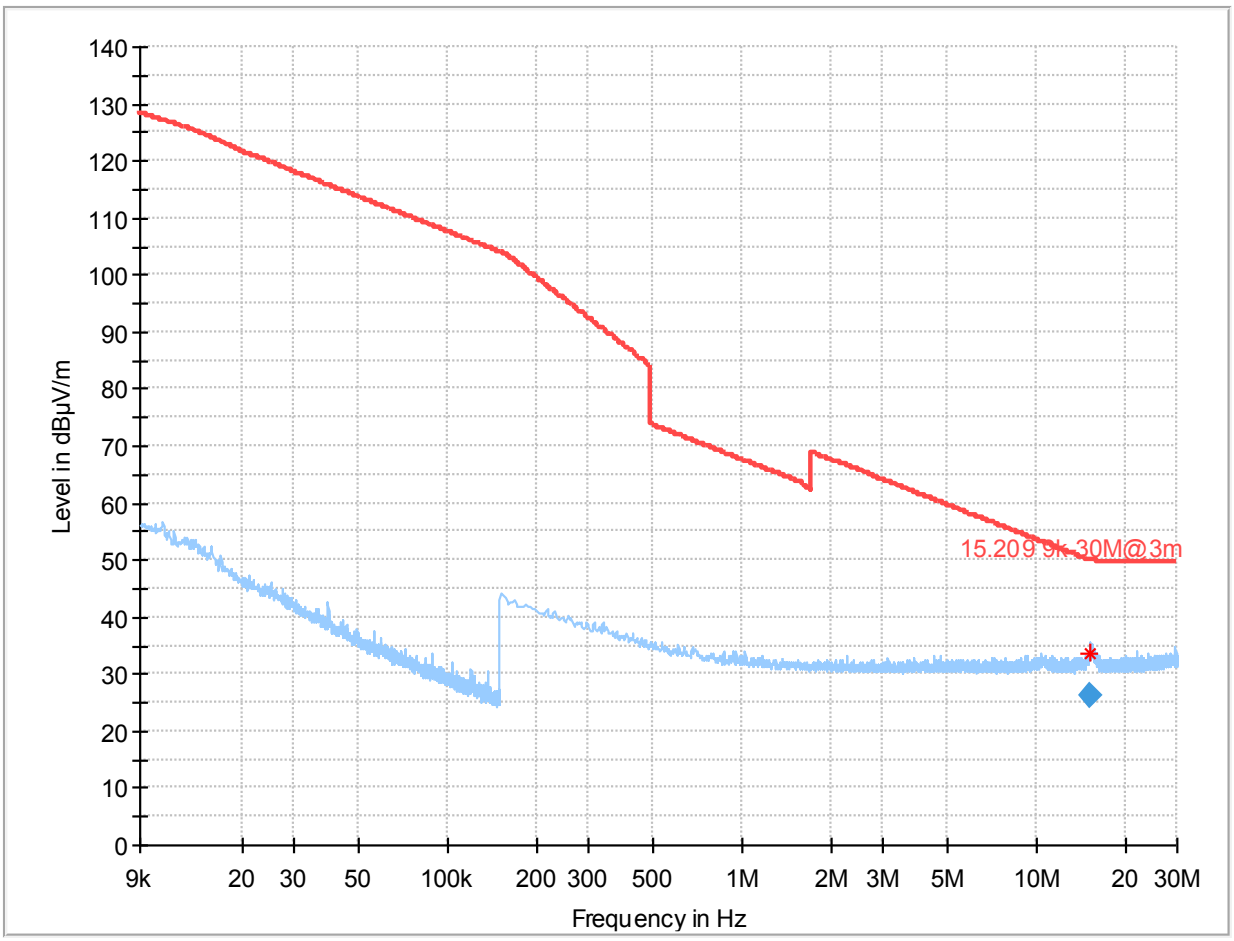


Plot 34: Mode 1, a-mode, BEC high, channel 165, 5825 MHz, 20 MHz channel bandwidth



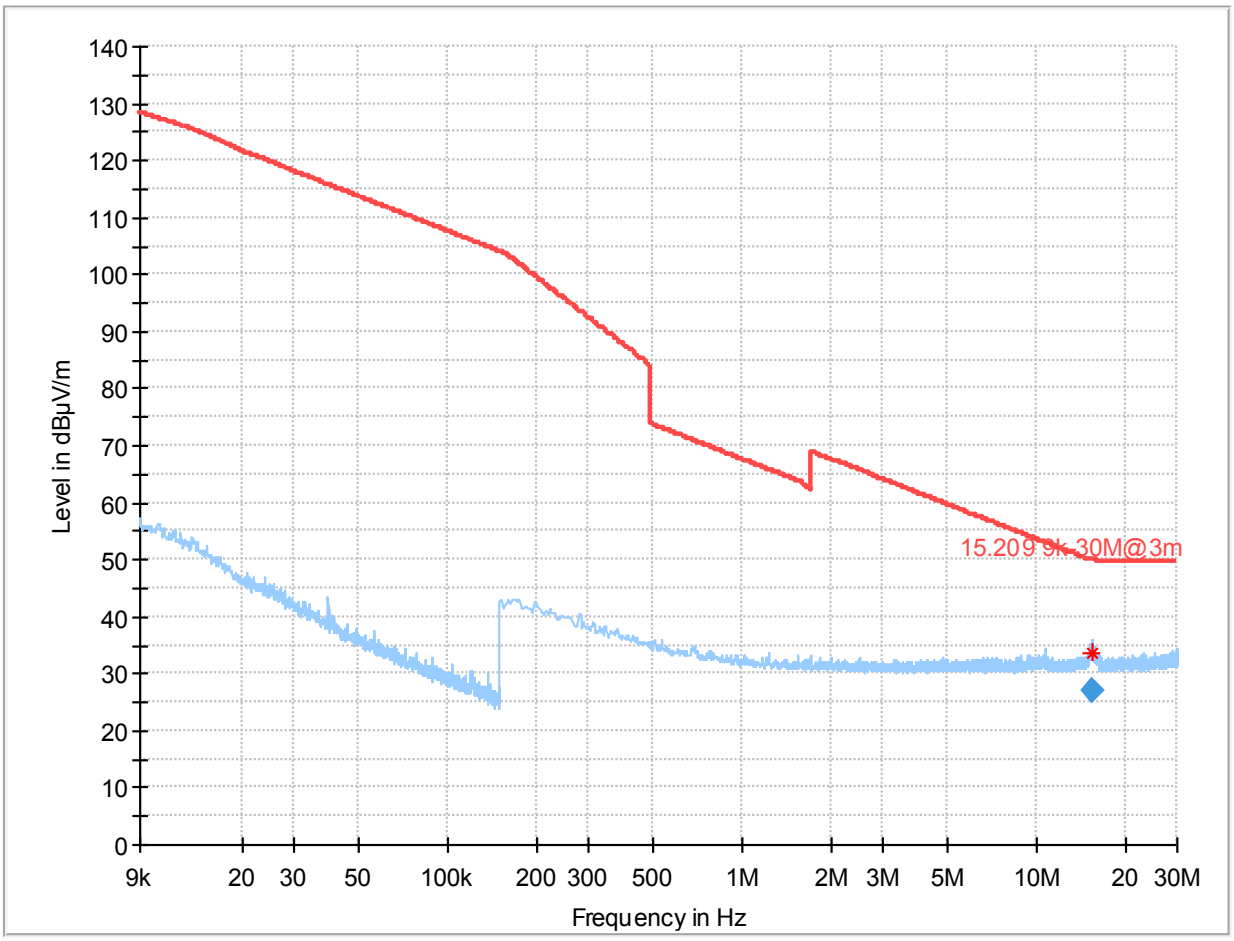
2.2.4 Radiated Spurious Emissions (RSE)

Plot 35: Mode 1, RSE 9 kHz – 30 MHz, channel 36, loop antenna



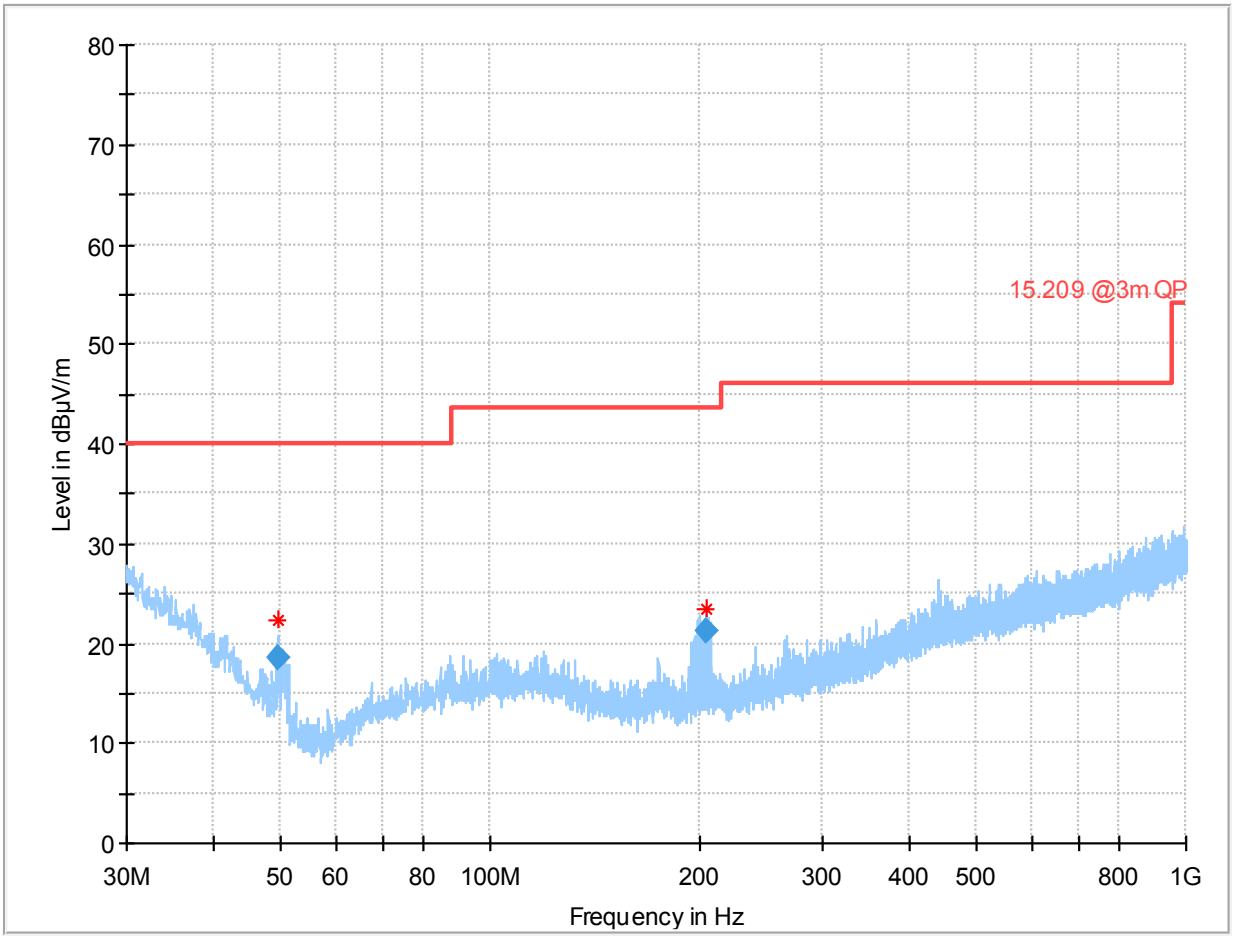
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB/m)
15.274500	26.26	50.04	23.78	100.0	9.000	V	300.0	20.5

Plot 36: Mode 1, RSE 9 kHz – 30 MHz, channel 165, loop antenna



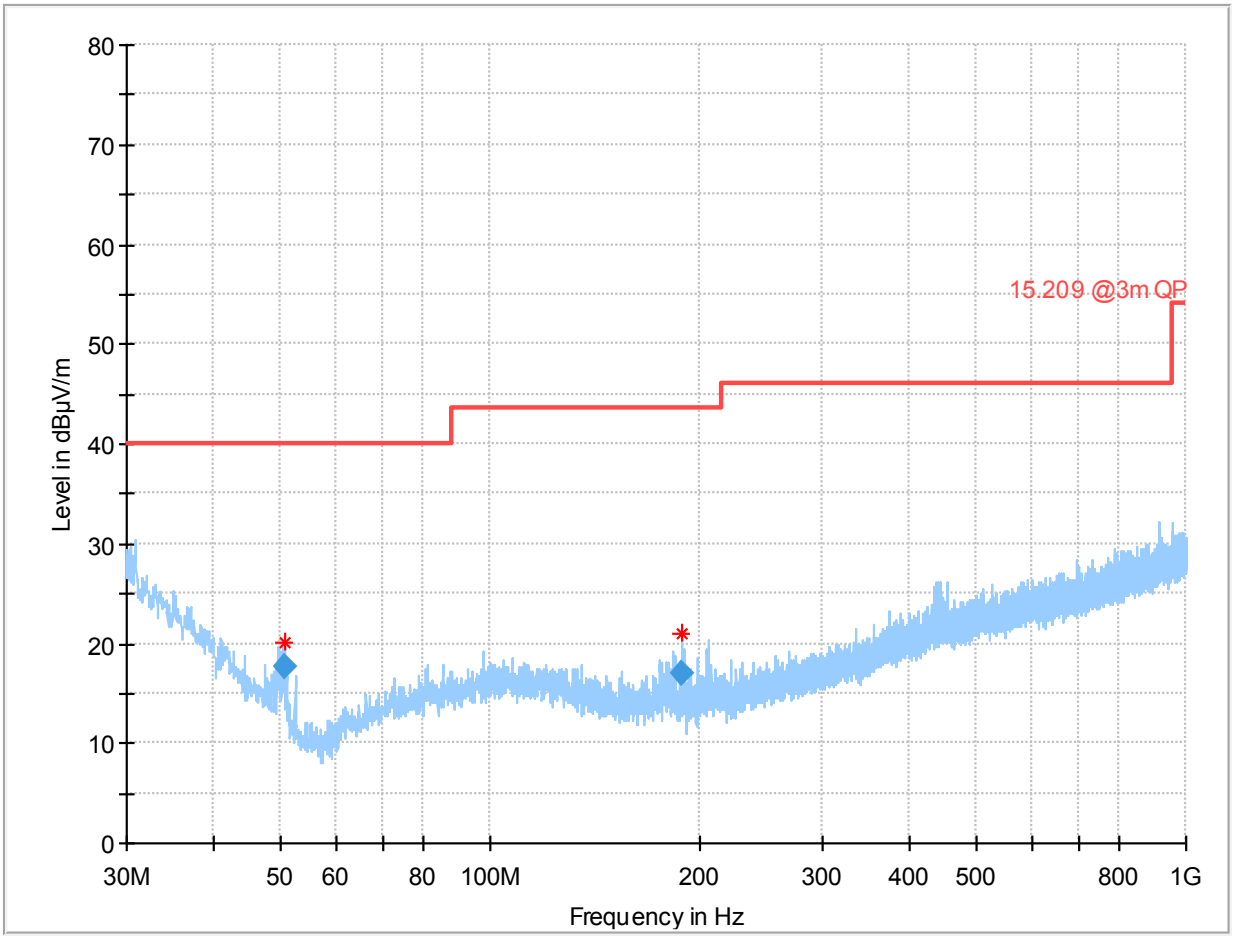
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Azimuth (deg)	Corr. (dB/m)
15.362250	26.79	50.04	23.25	100.0	9.000	H	276.0	20.5

Plot 37: Mode 1, RSE 30 MHz – 1 GHz, channel 36, horizontal / vertical polarisation



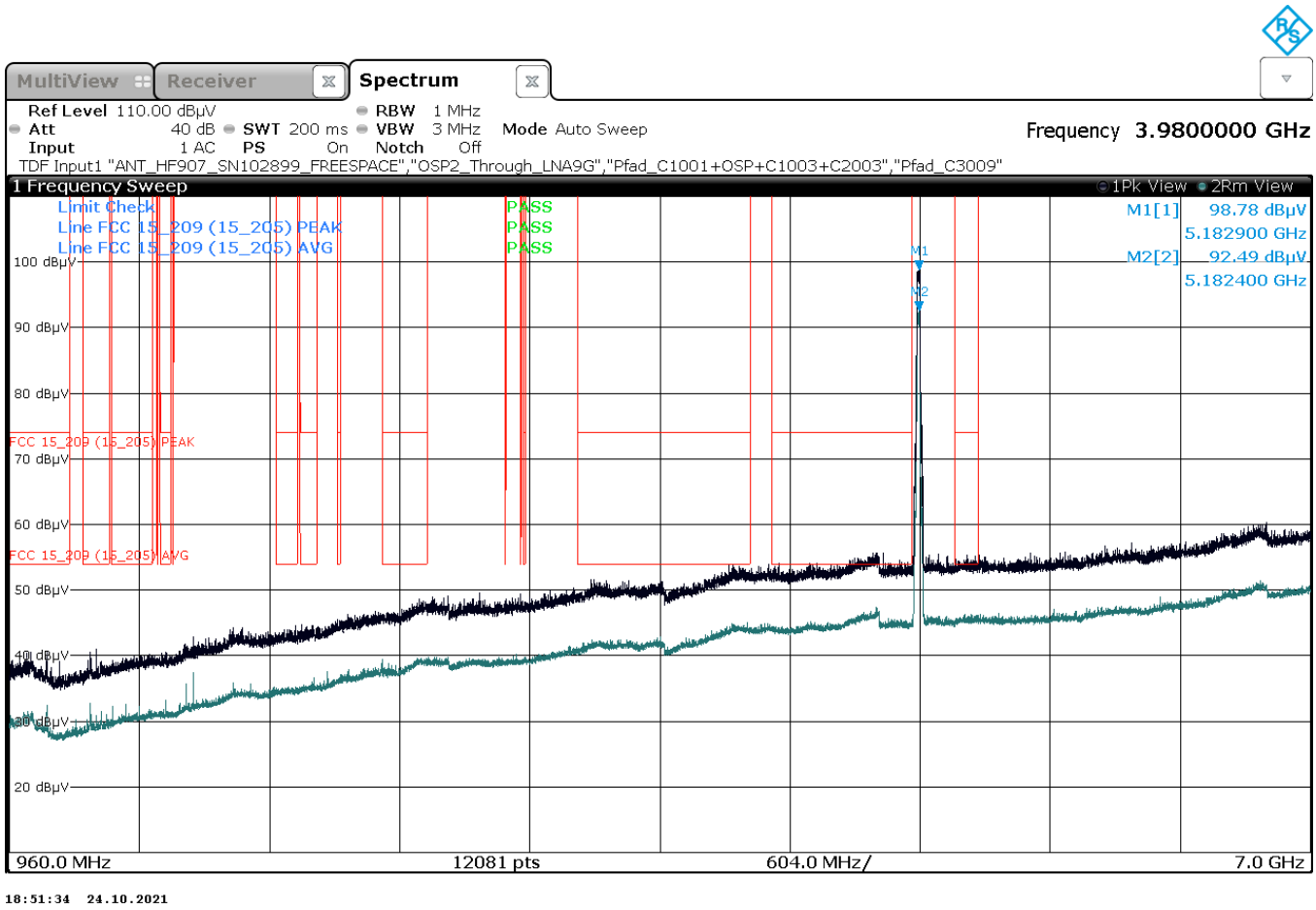
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
49.716000	18.62	40.00	21.38	100.0	120.000	100.0	V	215.0
204.140000	21.16	43.50	22.34	100.0	120.000	100.0	V	93.0

Plot 38: Mode 1, RSE 30 MHz – 1 GHz, channel 165, horizontal / vertical polarisation

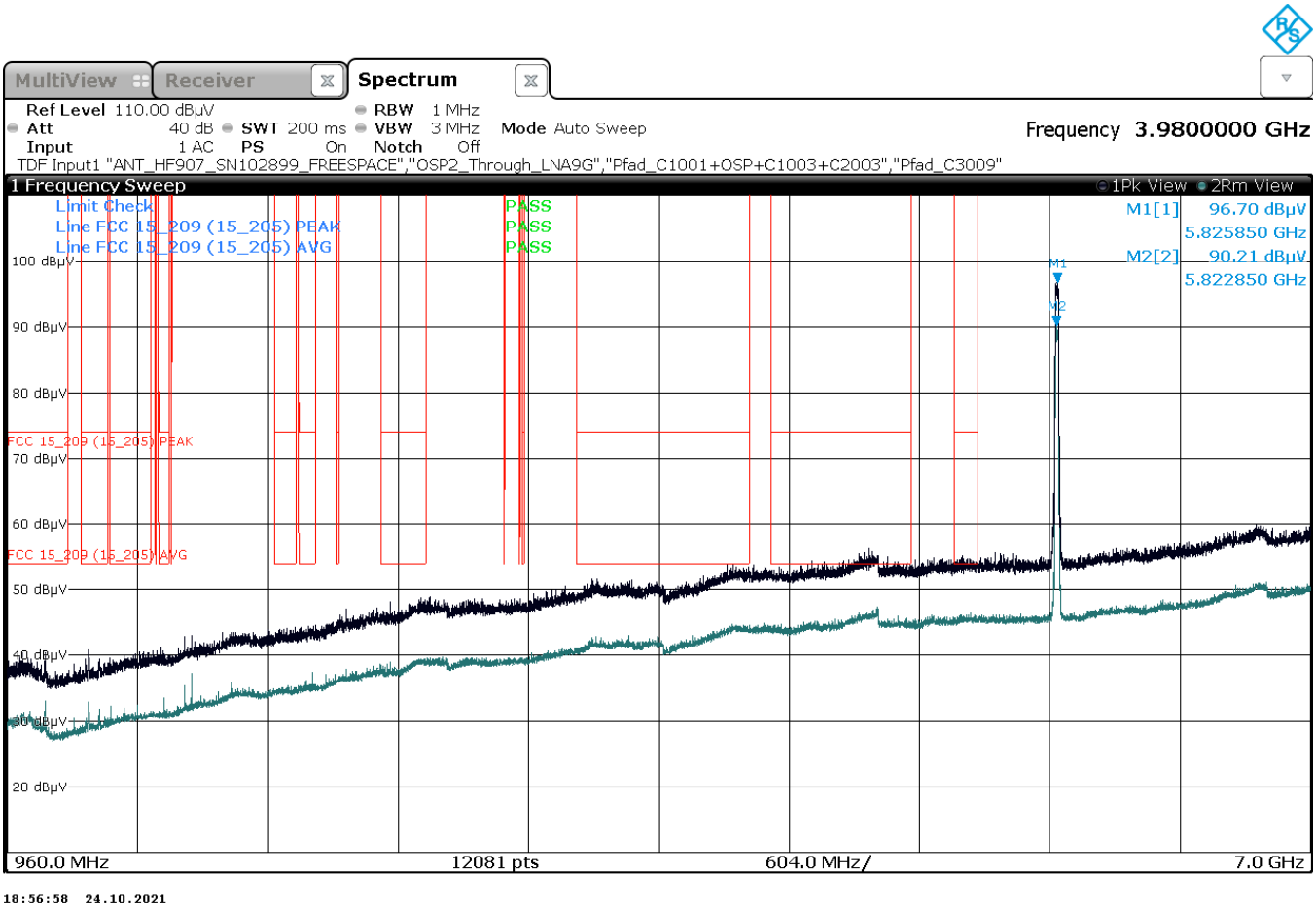


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
50.515500	17.57	40.00	22.43	100.0	120.000	100.0	V	214.0
188.617000	16.97	43.50	26.53	100.0	120.000	100.0	V	33.0

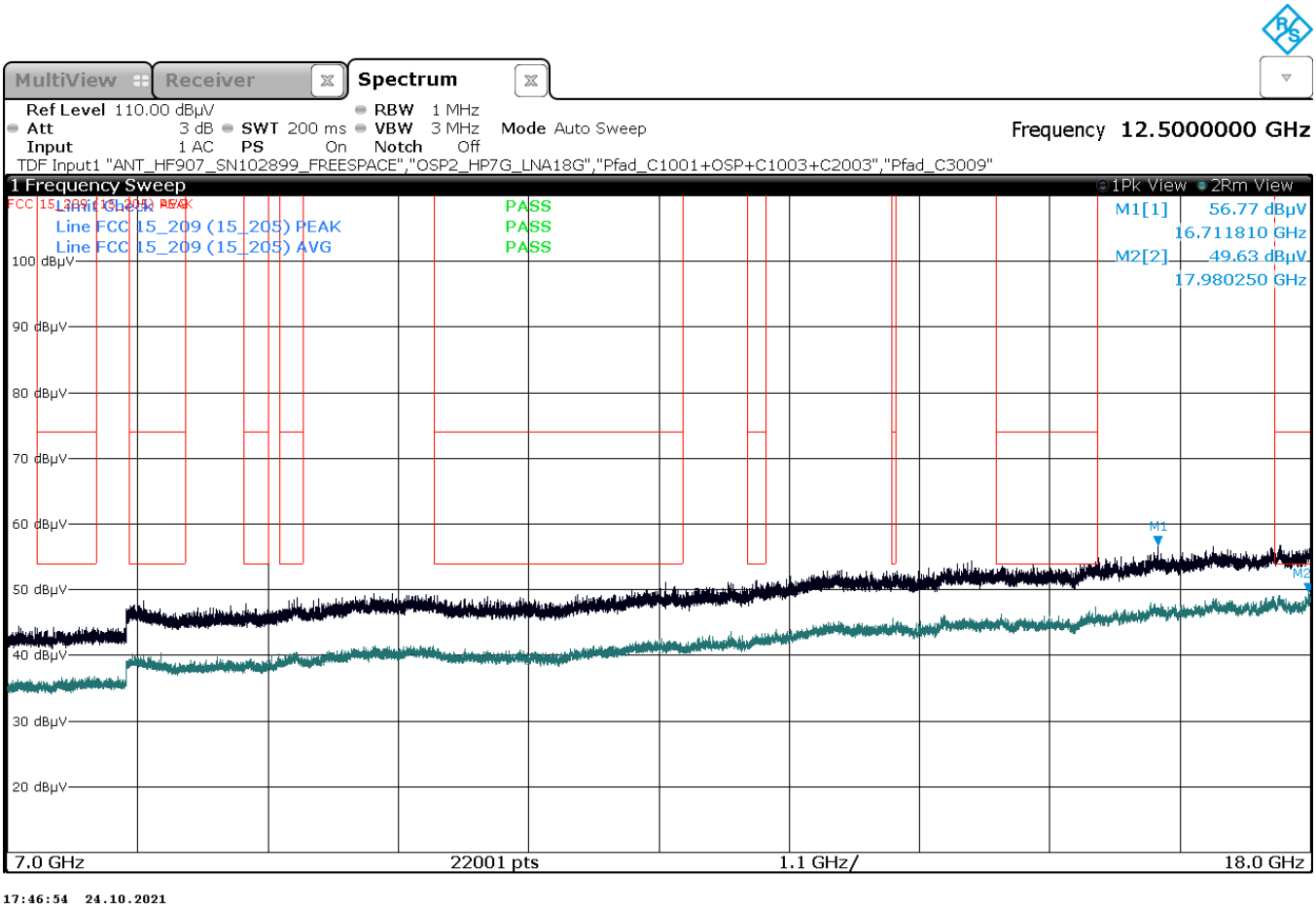
Plot 39: Mode 1, RSE 1 GHz – 7 GHz, channel 36, horizontal / vertical polarisation



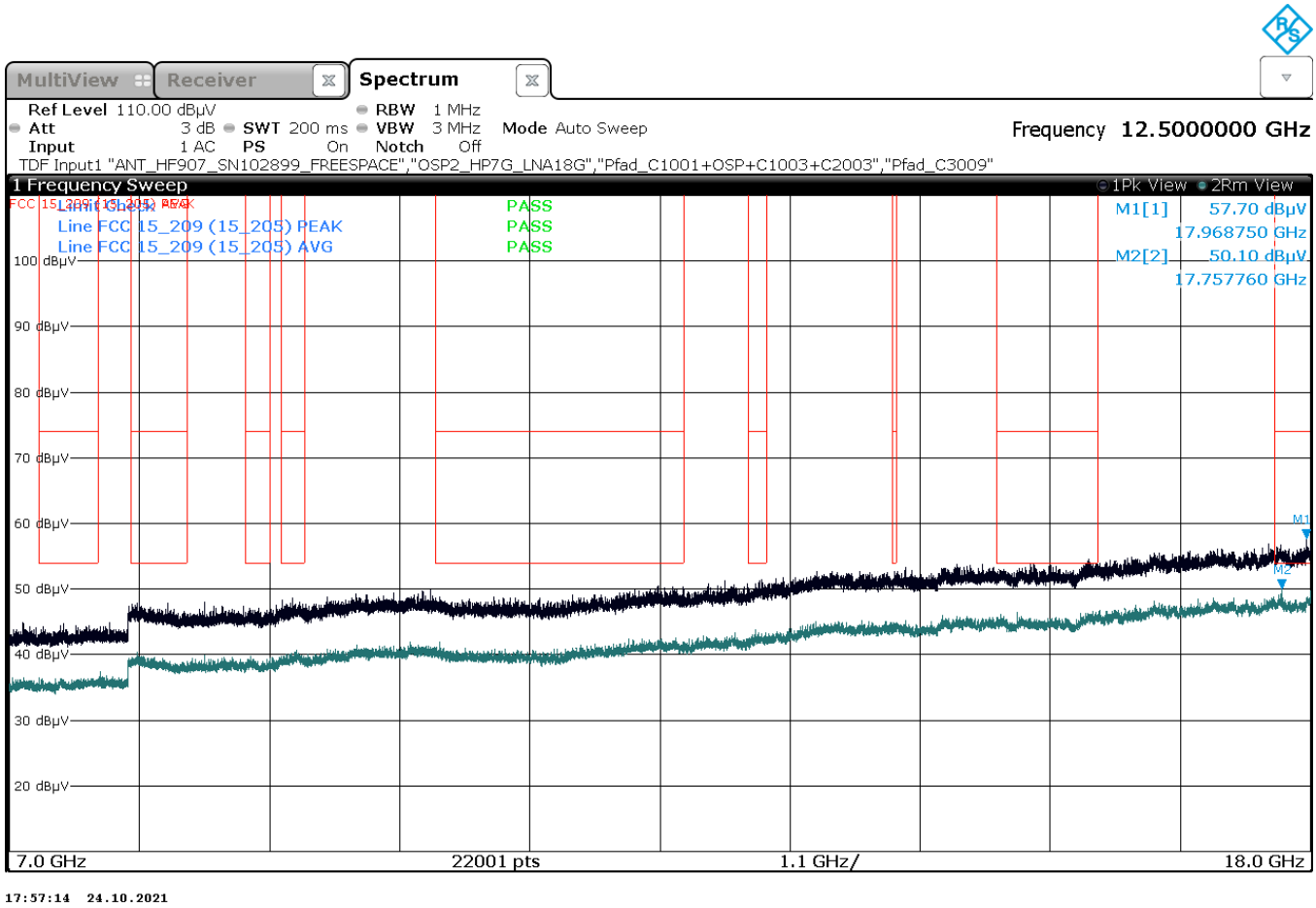
Plot 40: Mode 1, RSE 1 GHz – 7 GHz, channel 165, horizontal / vertical polarisation



Plot 41: Mode 1, RSE 7 GHz – 18 GHz, channel 36, horizontal / vertical polarisation



Plot 42: Mode 1, RSE 7 GHz – 18 GHz, channel 165, horizontal / vertical polarisation



2.3 Variant ID #39

DUT Information

DUT Name:	prePV 39
Manufacturer:	Mitsubishi Electric Corporation
Serial Number:	65332 (conducted) 65334 (radiated)

2.3.1 RF Output Power (Conducted Peak Power)

Test according to FCC title 47 part 15 §15.407(a), KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 II.E and ANSI C63.10-2013

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1.
Expanded Combined Uncertainty of absolute Level Measurement (K=2) < 1 dB

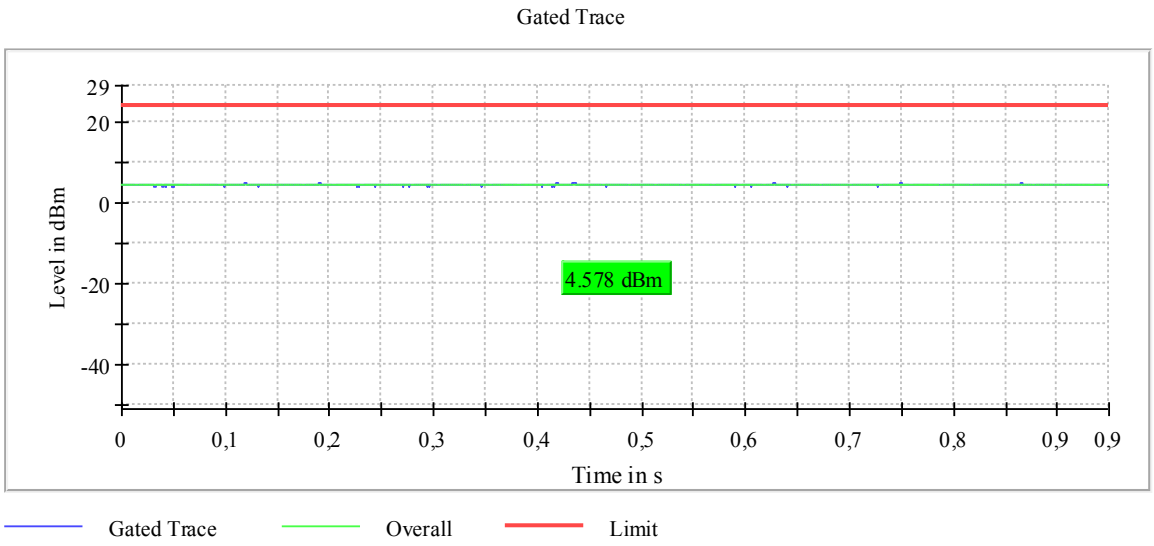
DUT Information

DUT Name:	prePV 39
Manufacturer:	Mitsubishi Electric Corporation
Serial Number:	65332 (conducted)

Plot 43: Mode 1, U-NII-1, AVGPM-G Gated Average Power Measurement, low channel

Result

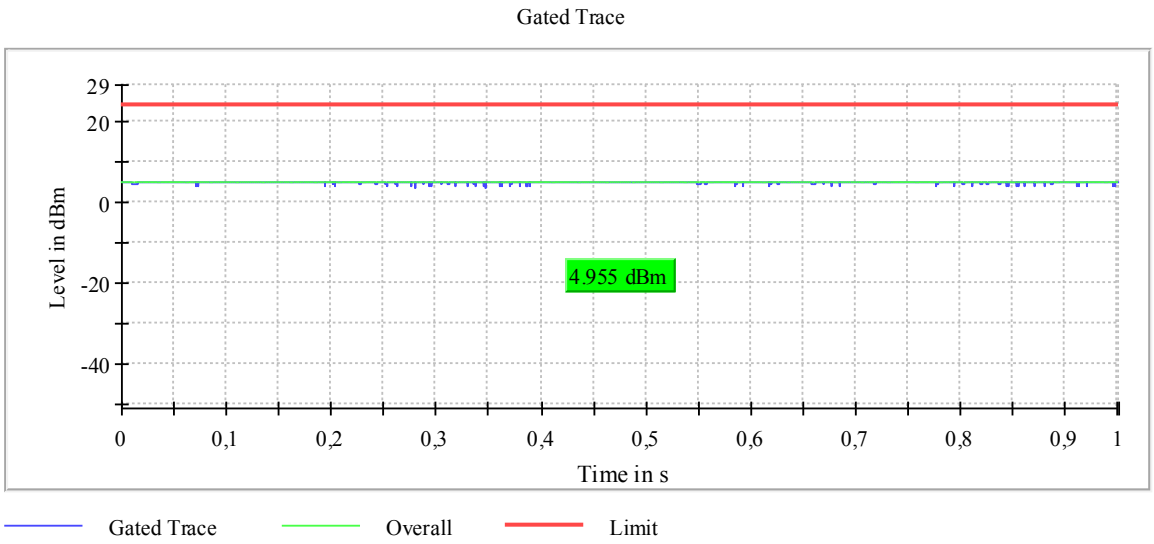
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5180.000000	4.6	24.0	4.6	95.174	PASS



Plot 44: Mode 1, U-NII-1, AVGPM-G Gated Average Power Measurement, mid channel

Result

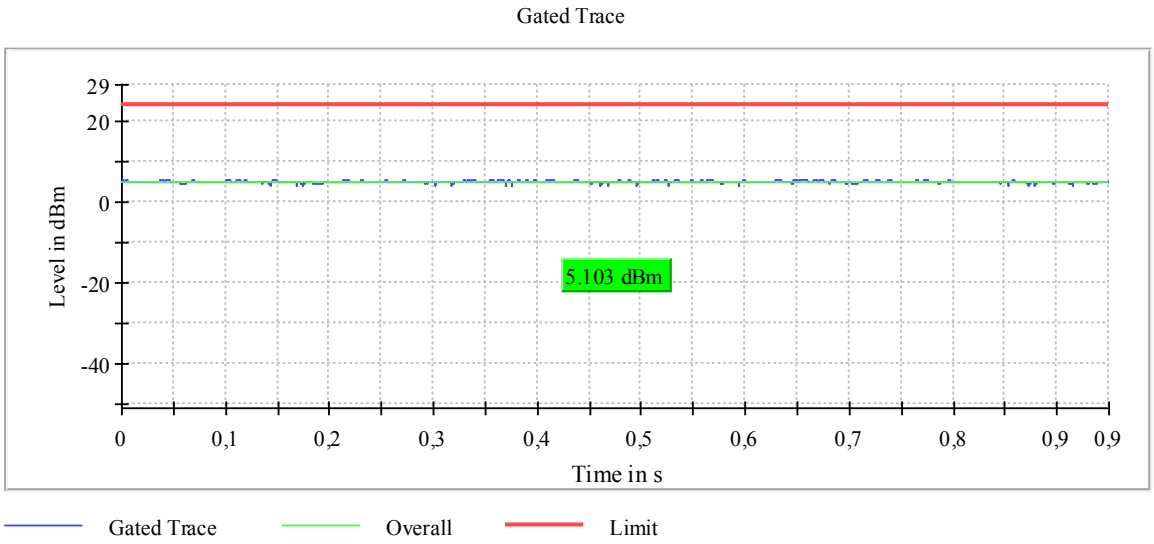
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5220.000000	5.0	24.0	5.0	95.457	PASS



Plot 45: Mode 1, U-NII-1, AVGPM-G Gated Average Power Measurement, high channel

Result

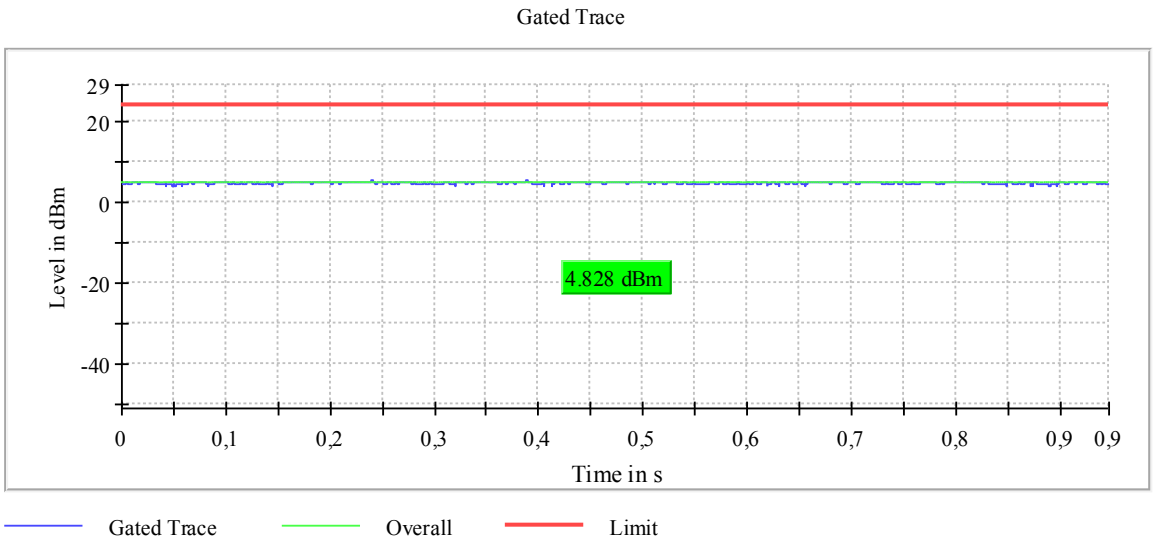
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5240.000000	5.1	24.0	5.1	95.215	PASS



Plot 46: Mode 1, U-NII-2A, AVGPM-G Gated Average Power Measurement, low channel

Result

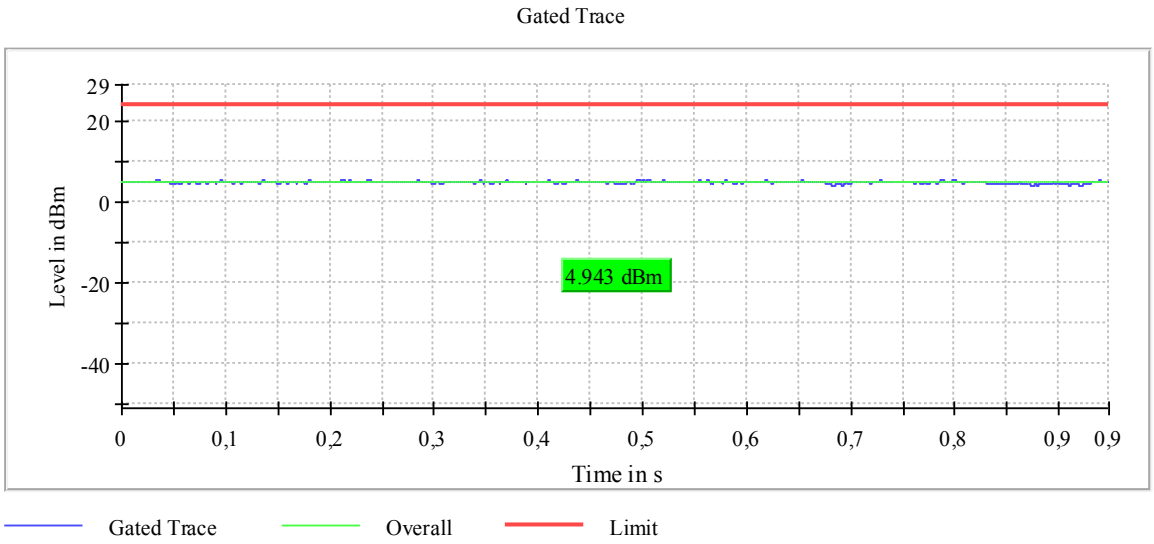
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5260.000000	4.8	24.0	4.8	95.126	PASS



Plot 47: Mode 1, U-NII-2A, AVGPM-G Gated Average Power Measurement, mid channel

Result

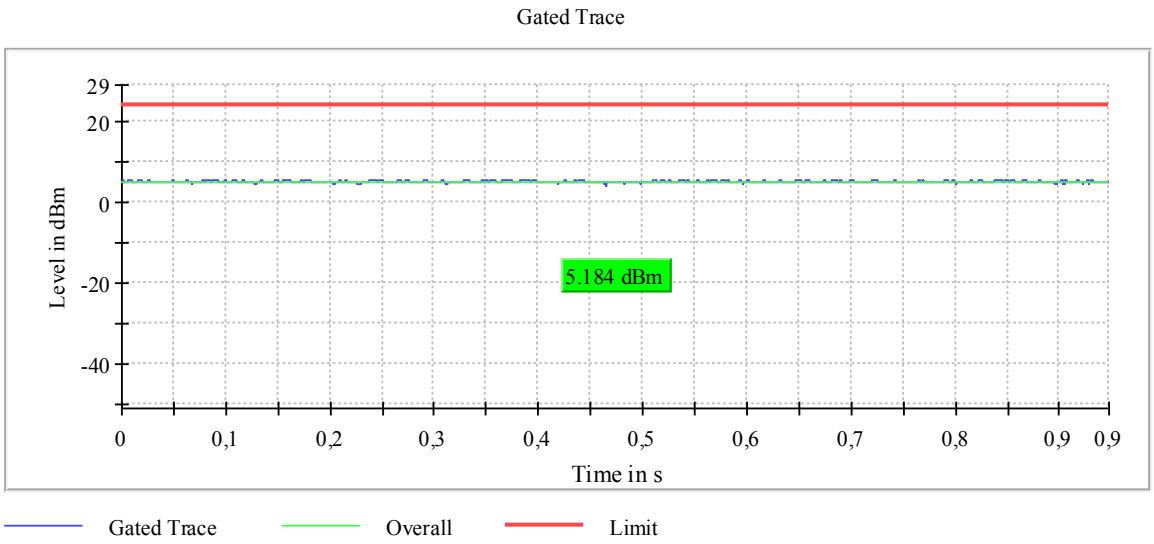
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5300.000000	4.9	24.0	4.9	94.987	PASS



Plot 48: Mode 1, U-NII-2A, AVGPM-G Gated Average Power Measurement, high channel

Result

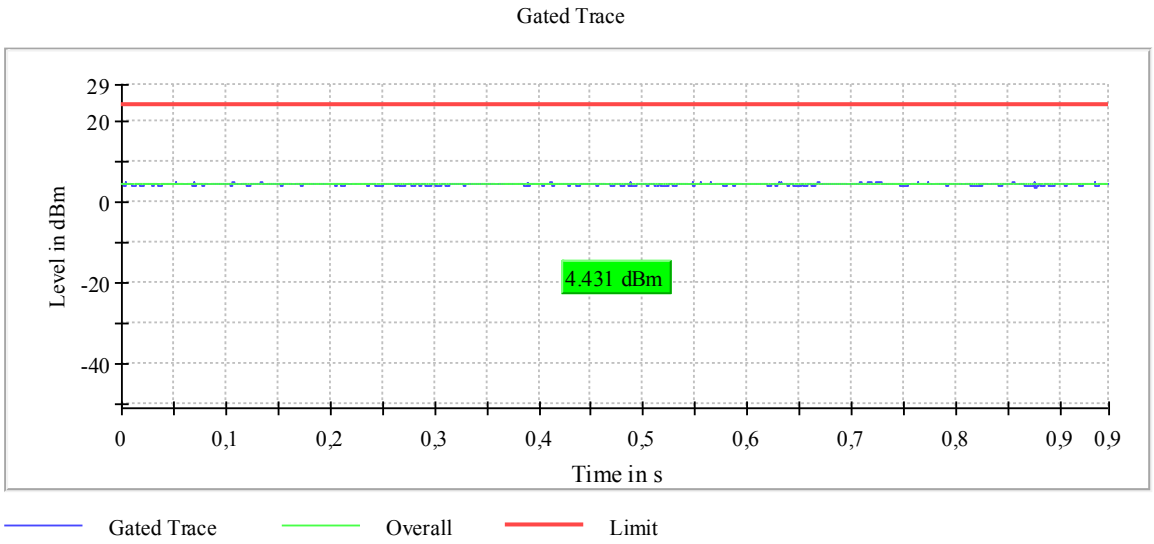
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5320.000000	5.2	24.0	5.2	94.983	PASS



Plot 49: Mode 1, U-NII-2C, AVGPM-G Gated Average Power Measurement, low channel

Result

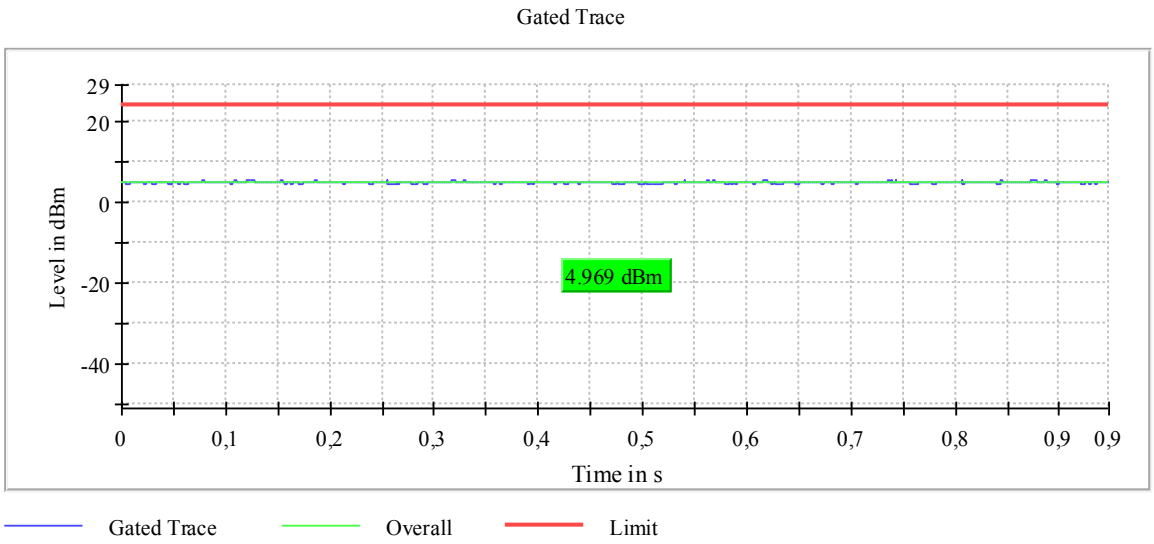
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5500.000000	4.4	24.0	4.4	95.027	PASS



Plot 50: Mode 1, U-NII-2C, AVGPM-G Gated Average Power Measurement, mid channel

Result

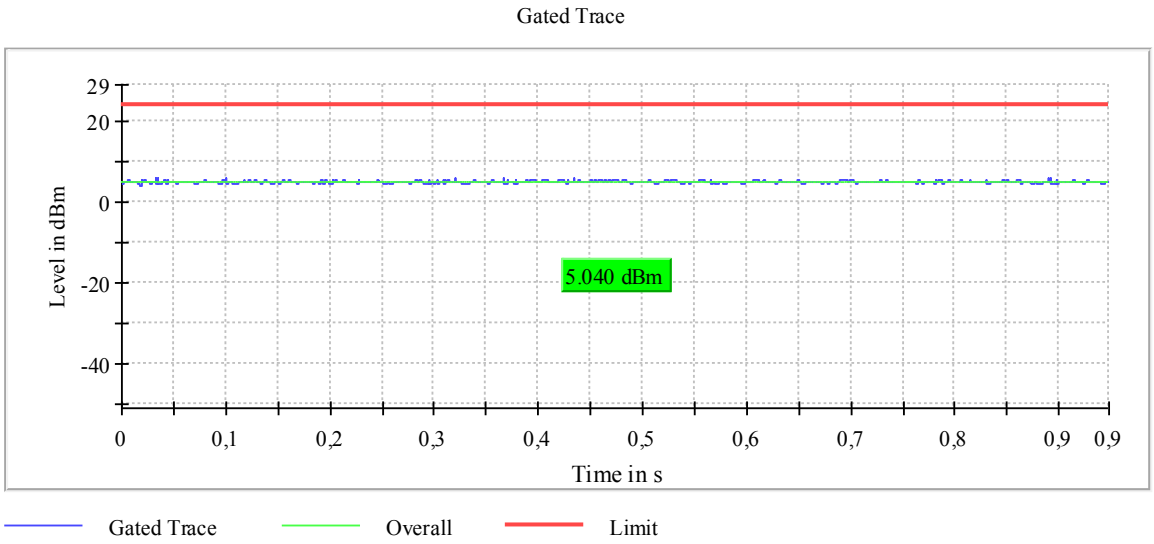
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5600.000000	5.0	24.0	5.0	94.982	PASS



Plot 51: Mode 1, U-NII-2C, AVGPM-G Gated Average Power Measurement, high channel

Result

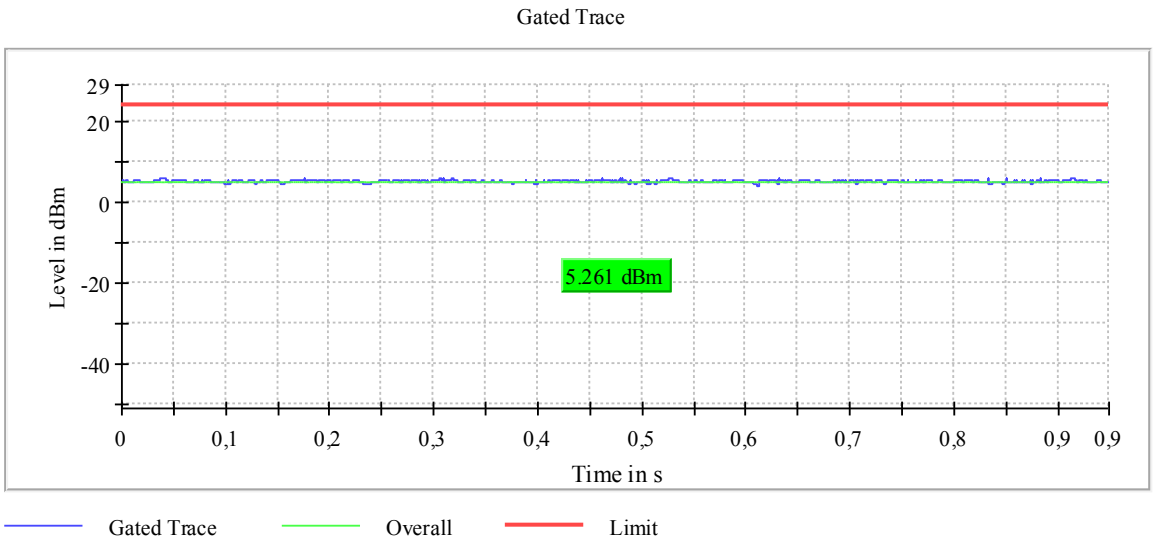
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5700.000000	5.0	24.0	5.0	95.171	PASS



Plot 52: Mode 1, U-NII-2C, AVGPM-G Gated Average Power Measurement, channel 144

Result

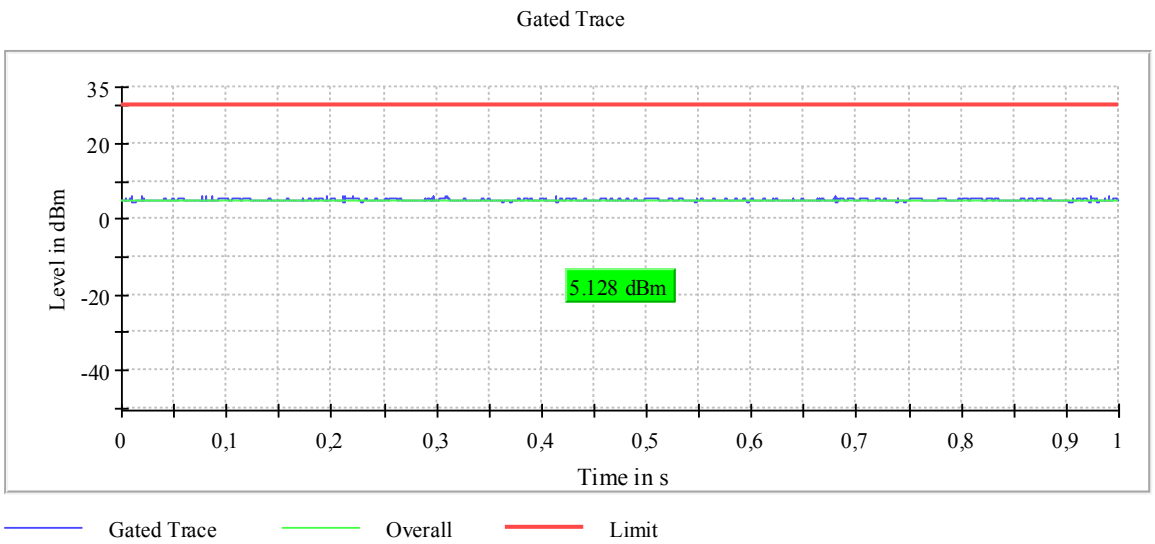
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5720.000000	5.3	24.0	5.3	95.333	PASS



Plot 53: Mode 1, U-NII-3, AVGPM-G Gated Average Power Measurement, low channel

Result

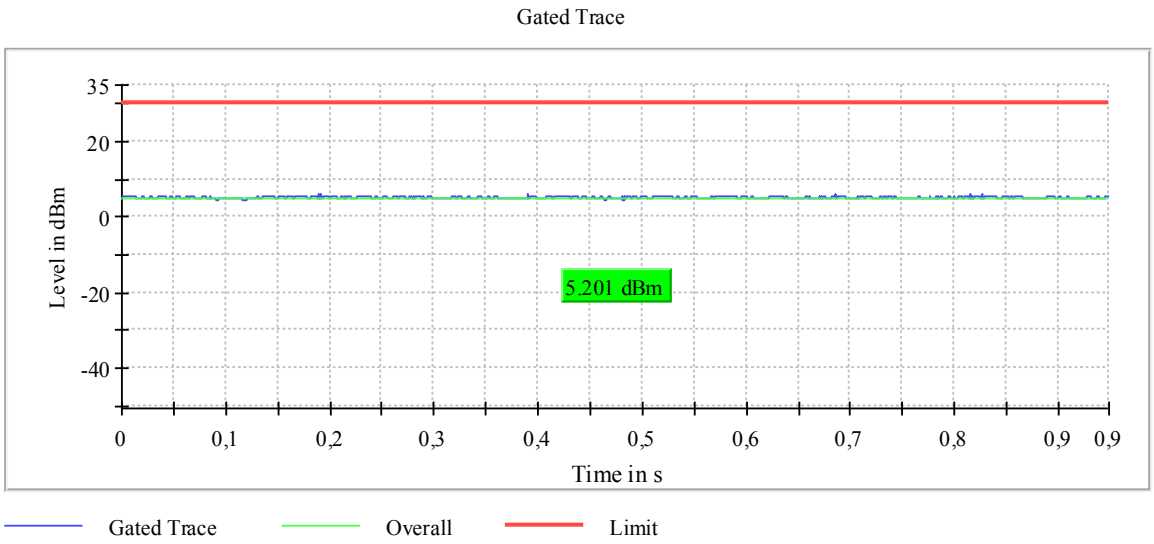
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5745.000000	5.1	30.0	5.1	95.264	PASS



Plot 54: Mode 1, U-NII-3, AVGPM-G Gated Average Power Measurement, mid channel

Result

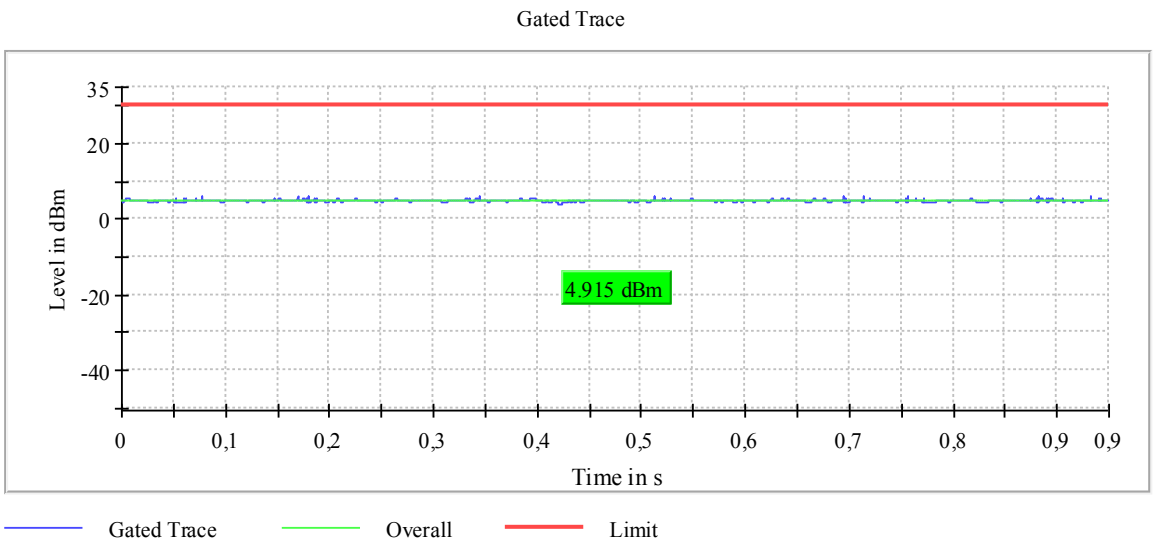
DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5785.000000	5.2	30.0	5.2	95.097	PASS



Plot 55: Mode 1, U-NII-3, AVGPM-G Gated Average Power Measurement, high channel

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
5825.000000	4.9	30.0	4.9	95.193	PASS



2.3.2 Radiated Peak Power (Peak EIRP)

Plot 56: Test Mode 1, a-mode, BPSK, 6 Mbit/s, Peak EIRP, channel 36, 5180 MHz