

TEST REPORT

CSA Group Korea Ltd.
155, Osan-Ro, Mohyeon-eup, Cheoin-Gu, Yongin-Si,
Gyeonggi-Do 16885 Republic of Korea
www.csagroup.org

Report No.:
CSA-26-R-0033-R1
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1. Report No. : CSA-26-R-0033-R1

2. Customer

◦ Name : HYOLIM XE CO., LTD.

◦ Address : 89, Seongseo4chacheomdan-ro, Dalseo-gu, Daegu, 704-801, Korea

3. Use of Report : FCC Original Grant

4. Product Name / Model Name : Car AVN / DGU-12T5-J150SA-2

FCC ID : 2AE77DGU12T5J150SA2

5. FCC Regulation(s): FCC Part 15 Subpart E 15.407

Test Method used: ANSI C63.4:2014, ANSI C63.10:2020

KDB 789033 D02 v02r01

6. Date of Test : 2026-06-17 to 2026-07-01

7. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing
(Address: 155, Osan-Ro, Mohyeon-eup, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 16885 Republic of Korea)

8. Testing Environment : See appended test report.

9. Test Result : Refer to the test result in the test report

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

Affirmation	Tested by	Technical Manager
	Name : Sungjung Kim (Signature)	Name : Changwon Lee (Signature)

2026-07-09

CSA Group Korea Ltd.

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality.
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REPORT REVISION HISTORY

Date	Revision	Page No
2026-07-06	Originally issued	-
2026-07-09	Rev.01 (Radiated Emissions plot update)	67 ~ 102

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General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ Statement not required by the standard or client used for type testing

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1. General Information

1.1. Description of EUT

Equipment Class	Unlicensed National Information Infrastructure TX(NII)
Product Name	Car AVN
Model Name	DGU-12T5-J150SA-2
Add Model Name	DGU-12T5-J150SA-1, DGU-12T5-J150SA-9, DGU-12T5-J150SA-10, DGU-12T5-U110SA-1, DGU-12T5-U110SA-2
Firmware Version Identification Number	R5.01.01
Power Supply	DC 12 V
Modulation Technique	OFDM
Antenna Specification(Antenna 1)	Antenna Type: PCB Antenna Antenna Gain NII-1: -0.56 dBi, NII-2A: -0.94 dBi, NII-2C: 0.00 dBi, NII-3: -0.55 dBi

Band	Mode	Tx. frequency(MHz)	Max. conducted power(dBm)
U-NII-1	802.11a	5 180 ~ 5 240	5.37
	802.11n(HT20)	5 180 ~ 5 240	5.16
	802.11n(HT40)	5 190 ~ 5 230	1.68
	802.11ac(VHT80)	5 210	-0.18
U-NII-2A	802.11a	5 260 ~ 5 320	5.04
	802.11n(HT20)	5 260 ~ 5 320	4.05
	802.11n(HT40)	5 270 ~ 5 310	1.51
	802.11ac(VHT80)	5 290	0.28
U-NII-2C	802.11a	5 550 ~ 5 700	5.00
	802.11n(HT20)	5 550 ~ 5 700	4.77
	802.11n(HT40)	5 510 ~ 5 670	0.34
	802.11ac(VHT80)	5 530	-3.46
U-NII-3	802.11a	5 745 ~ 5 825	6.00
	802.11n(HT20)	5 745 ~ 5 825	5.74
	802.11n(HT40)	5 755 ~ 5 795	1.83
	802.11ac(VHT80)	5 775	0.01

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1.2. Declaration by the applicant / manufacturer

N/A

1.3. Testing Laboratory

CSA Group Korea Ltd. (Yongin Lab.)		
155, Osan-Ro, Mohyeon-eup, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 16885 Republic of Korea		
Telephone Number: +82-2-6371-6600		
- FCC&IC MRA Accredited Test Designation No. : KR0175		
Telephone	:	+82-2-6371-6600

1.4. Testing Environment

Ambient Condition	
▪ Temperature	+22 °C ~ +27 °C
▪ Relative Humidity	+35 % ~ +47 %

1.5. Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C63.4-2014 and ANSI C63.10-2020. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence.

Parameter	Measurement uncertainty
Antenna-port conducted emission	1.04 dB (The confidence level is about 95 %, $k = 2$)
Output Power	1.04 dB (The confidence level is about 95 %, $k = 2$)
Bandwidth	1.4×10^4 Hz (The confidence level is about 95 %, $k = 2$)
Radiated emission (1 GHz Below)	5.82 dB (The confidence level is about 95 %, $k = 2$)
Radiated emission (1 GHz Above)	5.02 dB (The confidence level is about 95 %, $k = 2$)

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1.6. Test Equipment List

Type	Manufacturer	Model	S/N	Spec	Next.Cal.Date (yy/mm/dd)
Spectrum Analyzer	ROHDE & SCHWARZ	FSV40	101404	10 Hz ~ 40GHz	2026-10-02
Signal Generator	ROHDE & SCHWARZ	SMB100B	105988	8 kHz ~ 40 GHz	2026-10-02
Vector Signal Generator	ROHDE & SCHWARZ	SMM100A	102150	100 kHz ~ 7.5 GHz	2026-10-02
Temp & Humid Chamber	ESPEC	SH-241	92004648	-40 °C ~ 100 °C	2026-10-01
DC Power Supply	ROHDE & SCHWARZ	NGL201	100791	0 V ~ 20 V / 0 A ~ 6 A	2027-04-24
Digital Multimeter	HIOKI	3280-10F	2310B9354	-	2026-04-23
Digital thermometer	SATO	PC-5410TRH	545509	0.0 °C ~ 50.0 °C	2026-12-06
AP Router	ASUS	GT-AXE16000	S6IG5D2000449Y4	2.4GHz BW Max 40MHz 5GHz BW Max 160MHz 6GHz BW Max 160MHz	-
Power Splitter	HP	11667B	09436	DC to 26.5 GHz	2027-04-27
Power Splitter	HP	11667B	02365	DC to 26.5 GHz	2027-07-09
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW44	103091	1 Hz - 44 GHz	2027-04-22
Active Loop Antenna	ROHDE & SCHWARZ	HFH2-Z2E	101198	Frequency range : 8.3 kHz to 30 MHz, Nominal impedance : 50 Ω	2028-04-23
Signal Conditioning Unit	ROHDE & SCHWARZ	SCU 01	10029	9 kHz - 1 GHz, 40 dB	2027-04-22
TRILOG Broadband Antenna	SCHWARZBECK	VULB 9168	01755	30 MHz - 1 GHz, 10 W	2026-12-05
DOUBLE RIDGED HORN ANTENNA	ROHDE & SCHWARZ	HF907	100197	1-18GHz	2027-04-23
Amplifier	TESTEK	TK-PA18H	240132-L	1 GHz - 18 GHz, 45 dB	2027-04-22
HORN ANTENNA	SCHWARZBECK	BBHA 9170	1392	14 GHz - 40 GHz, 10 W	2026-10-10
Amplifier	PASTERNAK	PE7390-6	240143-L	50 dB, 18 GHz-40 GHz	2026-10-13
Highpass Filter	Wainwright Instruments	WHKX6-6320-8000-26500-40CC	7	-	2026-10-13

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2. Test Methodology

The measurement procedures described in the ANSI C63.10-2020 and the guidance provided in KDB789033 D02v02r01 were used in measurement of the EUT.

The EUT was tested per the guidance of KDB789033 D02v02r01. And ANSI C63.10-2020 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the test mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E.

2.3. General Test Procedures

Conducted Emissions

The power-line conducted emission test procedure is not described on the KDB789033 D02v02r01.

So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10-2020.

The EUT is placed on the wooden table, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and Average detector.

Radiated Emissions

Basically the radiated tests were performed with KDB789033 D02v02r01. But some requirements and procedures like test site requirements, EUT setup and maximizing procedure were fulfilled with the requirements in Section 5 and 6 of the ANSI C63.10-2020 as stated on KDB789033 D02v02r01.

The EUT is placed on a non-conductive table, which is 0.8 m above ground plane. For emission measurements above 1 GHz, the table height is 1.5 m. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 1 m or 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the highest emission, the relative positions of the EUT were rotated through three orthogonal axis.

2.4. Instrument Calibration

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

2.5. Description of Test Modes

The EUT has been tested with the operating condition for maximizing the emission characteristics. A test program is used to control the EUT for staying in continuous transmitting.

Transmitting Configuration of EUT

Mode	SISO
	Ant 1
	Data rate
802.11a	6 ~ 54 Mbps
802.11n(HT20)	MCS 0 ~ 7
802.11ac(VHT20)	MCS 0 ~ 8
802.11n(HT40)	MCS 0 ~ 7
802.11ac(VHT40)	MCS 0 ~ 9
802.11ac(VHT80)	MCS 0 ~ 9

Tested Mode

Test Mode		ANT configuration	Worst data rate
TM 1	802.11a	CDD Multiple transmitting	6 Mbps
TM 2	802.11n(HT20)	CDD Multiple transmitting	MCS 0
TM 3	802.11n(HT40)	CDD Multiple transmitting	MCS 0
TM 4	802.11ac(VHT80)	CDD Multiple transmitting	MCS 0

Note 1: The worst case data rate is determined as above test mode according to the power measurements.

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3. Antenna Requirements

■ **According to Part 15.203**

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

Uses a unique connector type. Connector type: U.FL terminal (Refer to Internal Photo file.)

Therefore this E.U.T complies with the requirement of Part 15.203

4. Summary of Test Result

FCC Part Section(s)	Test Description	Limit	Test Condition	Status Note 1
15.407(a)	Emission Bandwidth (26 dB Bandwidth)	N/A	Conducted	C
15.407(e)	Minimum Emission Bandwidth (6 dB Bandwidth)	> 500 kHz in 5 725 ~ 5 850 MHz		C
15.407(a)	Maximum Conducted Output Power	Part 15.407(a) (Refer to section 5.3)		C
15.407(a)	Maximum Power Spectral Density	Part 15.407(a) (Refer to section 5.4)		C
15.407(h)	Dynamic Frequency Selection	Part 15.407(h)		C Note 3
15.205 15.209 15.407(b)	Unwanted Emissions	Part 15.209, 15.407(b) (Refer to section 5.5)	Radiated	C
15.207	AC Conducted Emissions	Part 15.207 (Refer to section 5.6)	AC Line Conducted	NA Note 2
15.203	Antenna Requirements	Part 15.203 (Refer to section 3)	-	C
Note 1: C = Comply NC = Not Comply NT = Not Tested NA = Not Applicable Note 2: This device is installed in a car. Therefore the power source is a battery of car. Note 3: Please refer to the DFS Report for the relevant item. (Report No. CSA-26-R-0034)				

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5. TEST RESULT

5.1. Emission Bandwidth (26 dB Bandwidth)

■ Test Requirements

- Emission Bandwidth (26 dB Bandwidth)

The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

■ Test Configuration

Refer to the APPENDIX I.

■ Test Procedure

- Emission Bandwidth (26 dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of **KDB789033 D02v02r01**.

1. Set resolution bandwidth (RBW) = approximately **1 %** of the EBW.
2. Set the video bandwidth (**VBW**) > **RBW**.
3. Detector = **Peak**.
4. Trace mode = **max hold**.

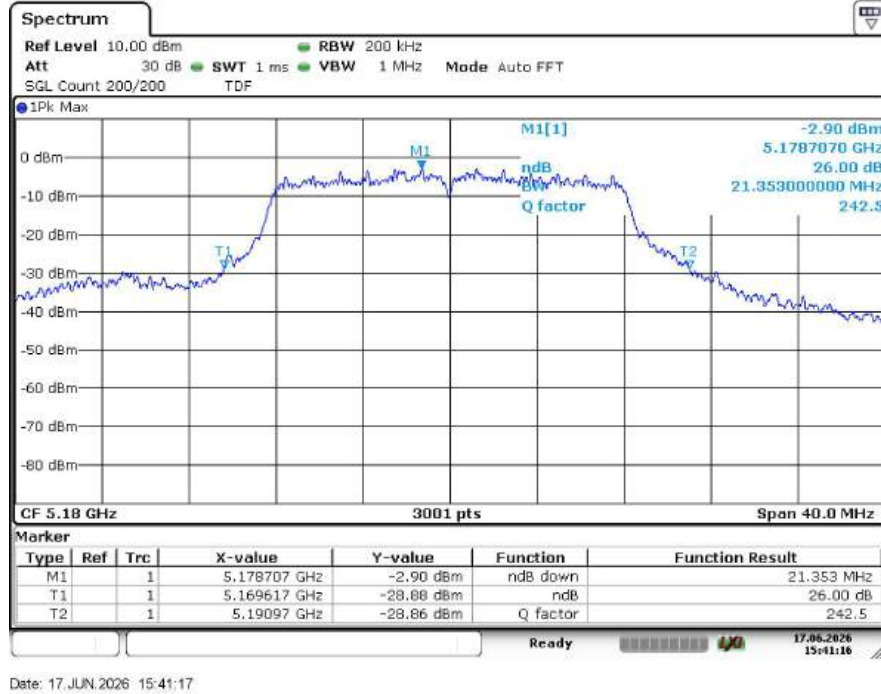
Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %.

■ Test Results: **Comply**

Test Mode	Band	Channel	Frequency(MHz)	26 dB BW(MHz)
TM 1	U-NII-1	36	5 180	21.35
		40	5 200	21.31
		48	5 240	21.45
	U-NII-2A	52	5 260	21.33
		60	5 280	21.06
		64	5 320	21.11
	U-NII-2C	100	5 500	20.97
		116	5 580	21.23
		140	5 700	20.90
TM 2	U-NII-1	36	5 180	21.77
		40	5 200	21.90
		48	5 240	21.90
	U-NII-2A	52	5 260	21.58
		60	5 280	21.27
		64	5 320	21.26
	U-NII-2C	100	5 500	21.23
		116	5 580	21.27
		140	5 700	21.27
TM 3	U-NII-1	38	5 190	42.36
		46	5 230	42.07
	U-NII-2A	54	5 270	41.80
		62	5 310	41.61
	U-NII-2C	102	5 510	41.69
		110	5 550	41.56
		134	5 670	41.69
TM 4	U-NII-1	42	5 210	85.95
	U-NII-2A	58	5 290	83.23
	U-NII-2C	106	5 530	84.35

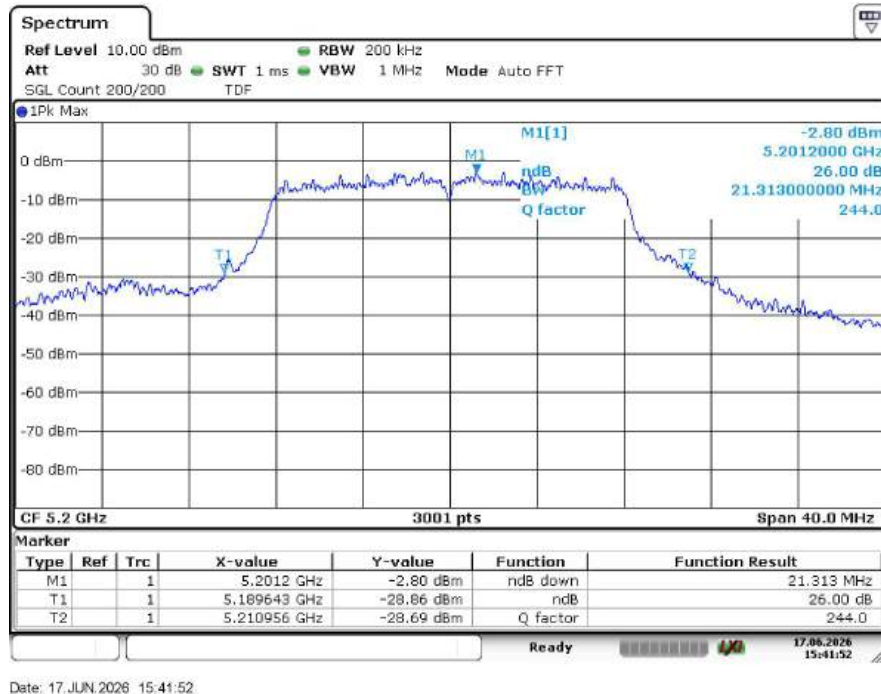
26 dB Bandwidth

Test Mode: TM 1 & Ch.36



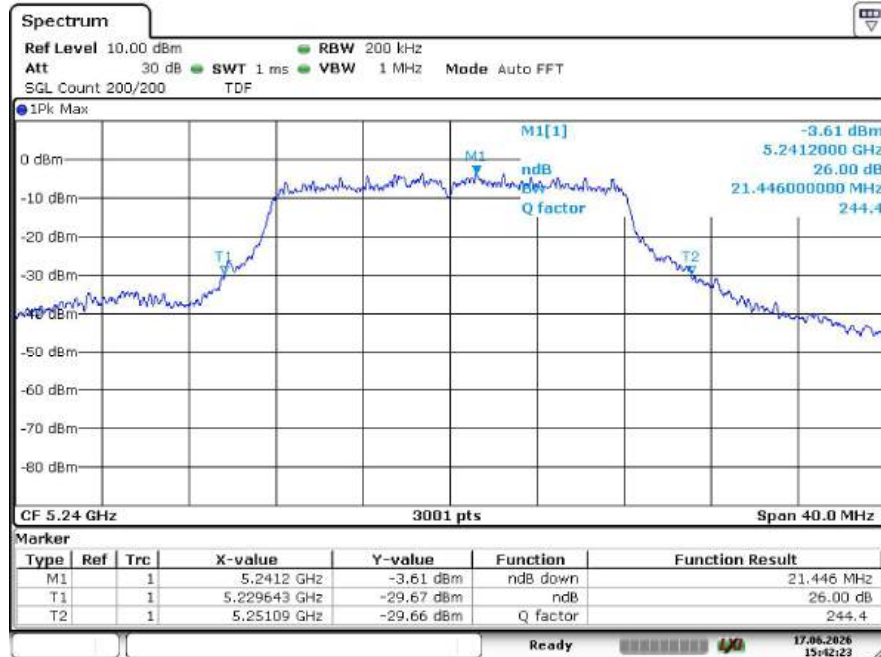
26 dB Bandwidth

Test Mode: TM 1 & Ch.40



26 dB Bandwidth

Test Mode: TM 1 & Ch.48



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26 dB Bandwidth

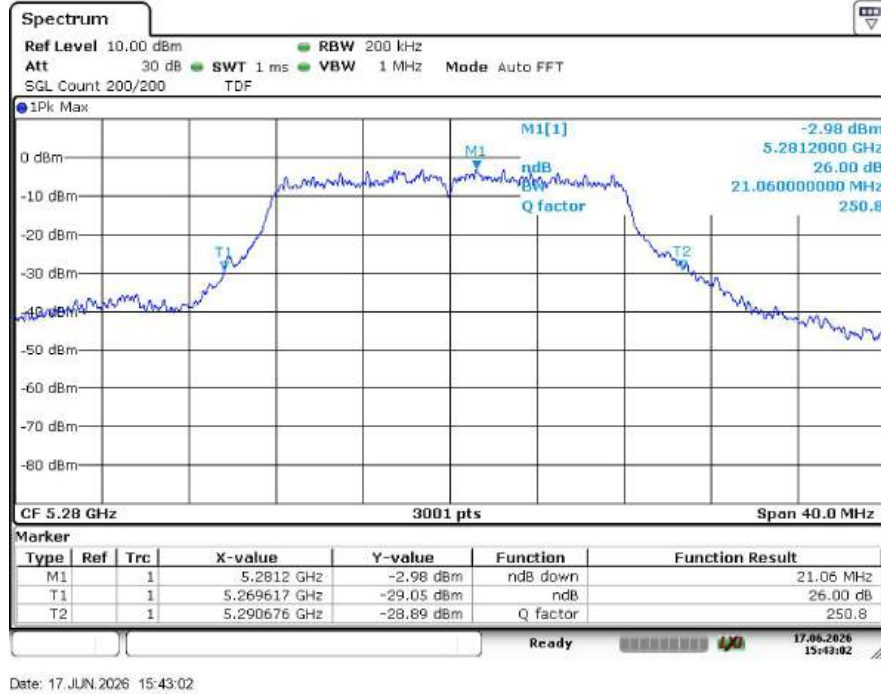
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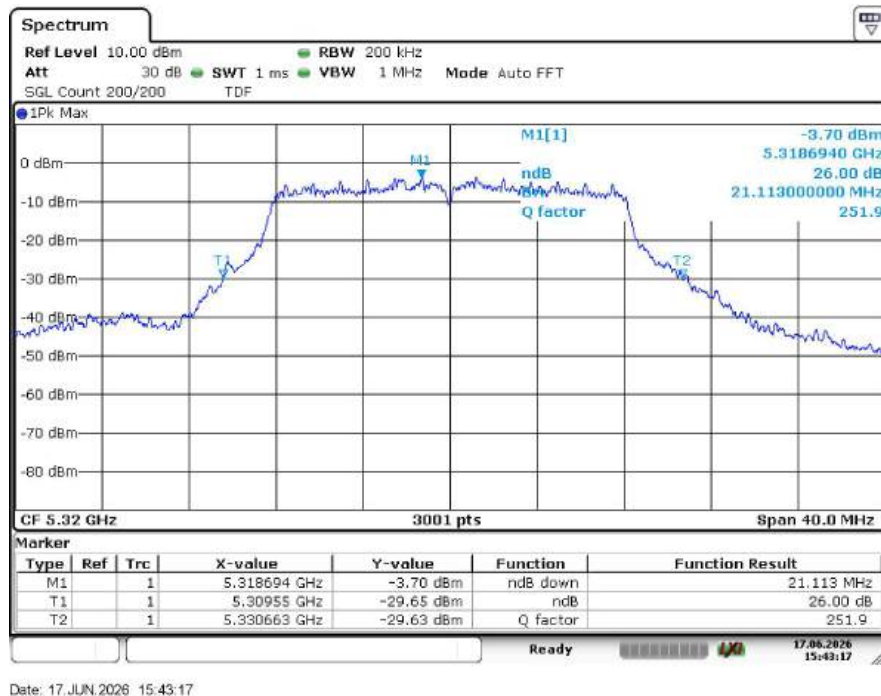
26 dB Bandwidth

Test Mode: TM 1 & Ch.60



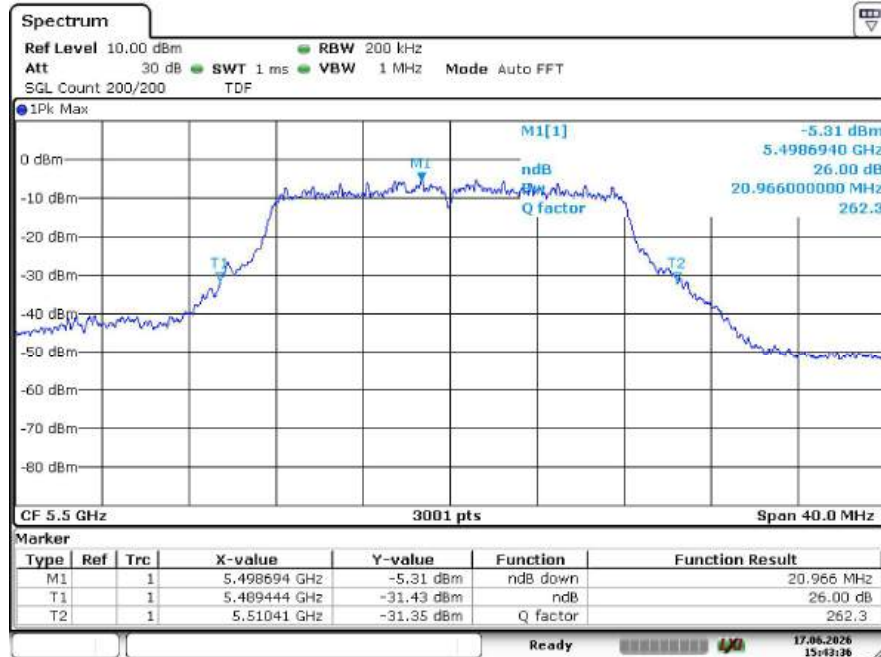
26 dB Bandwidth

Test Mode: TM 1 & Ch.64



26 dB Bandwidth

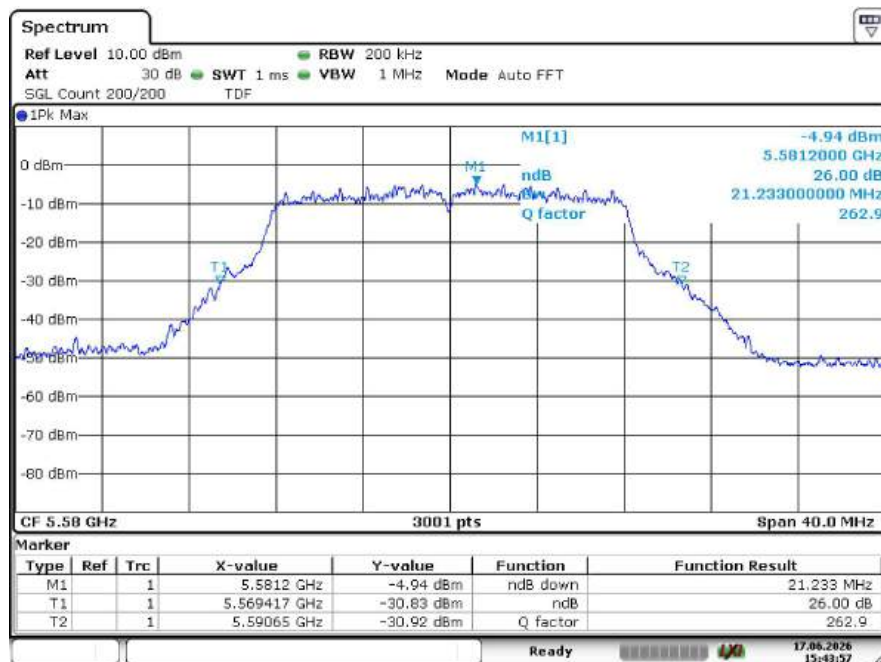
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26 dB Bandwidth

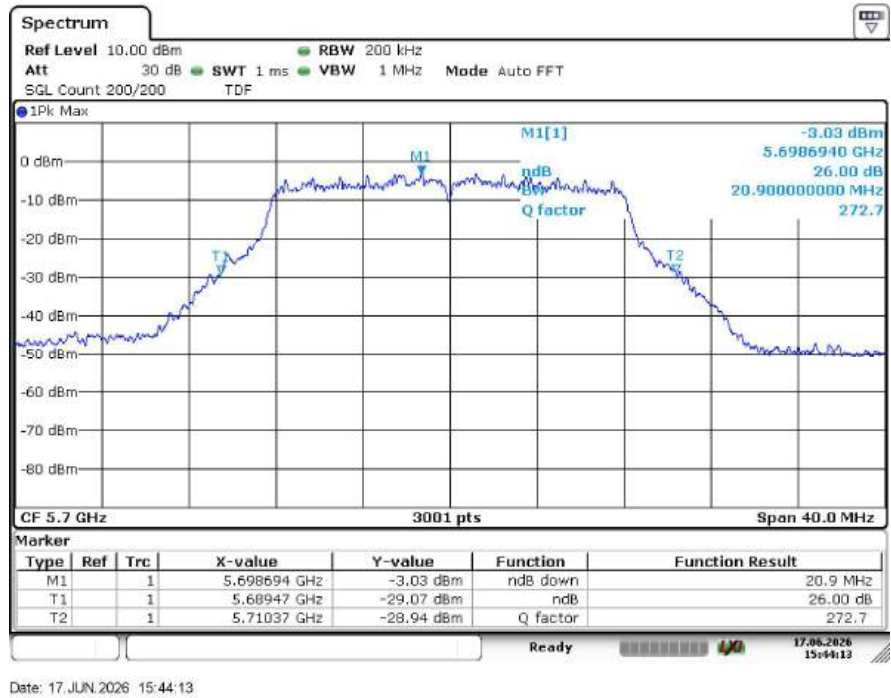
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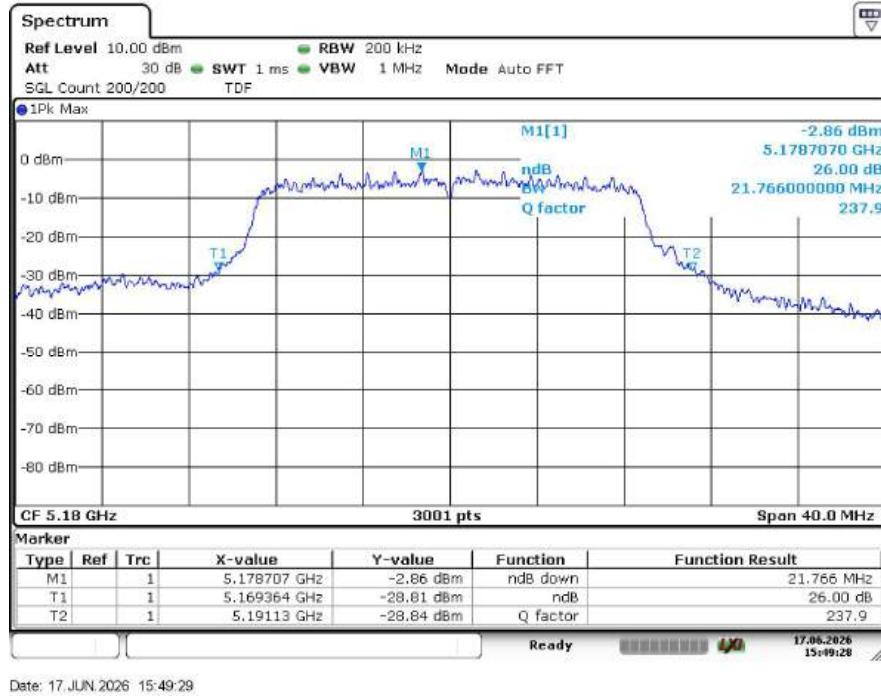
26 dB Bandwidth

Test Mode: TM 1 & Ch.140



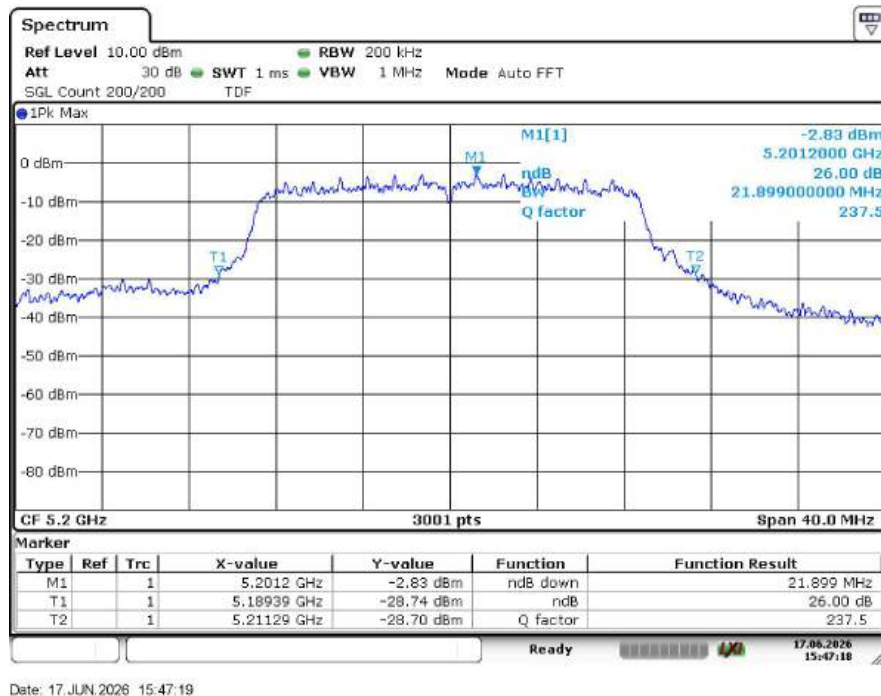
26 dB Bandwidth

Test Mode: TM 2 & Ch.36



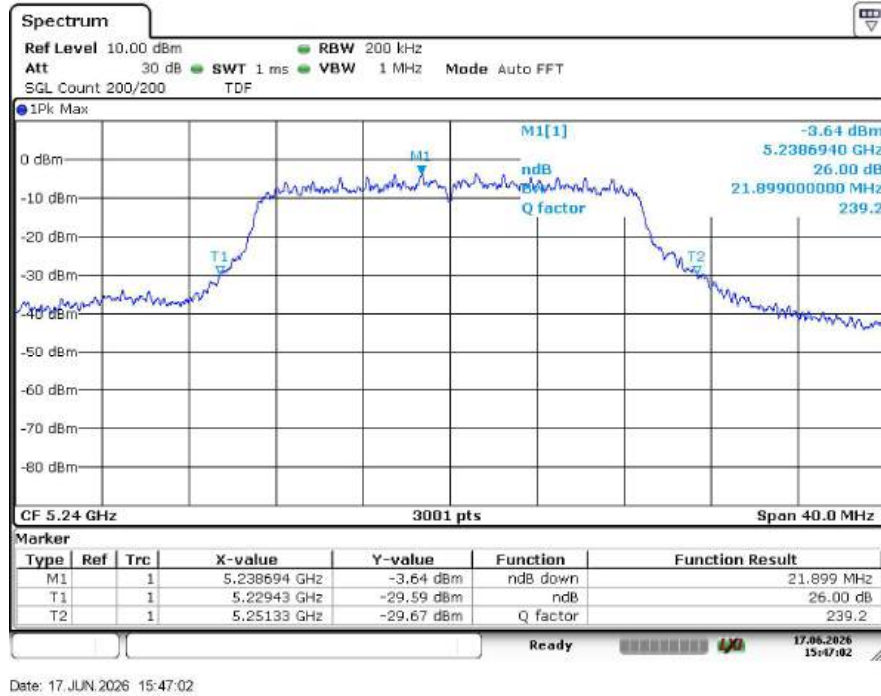
26 dB Bandwidth

Test Mode: TM 2 & Ch.40



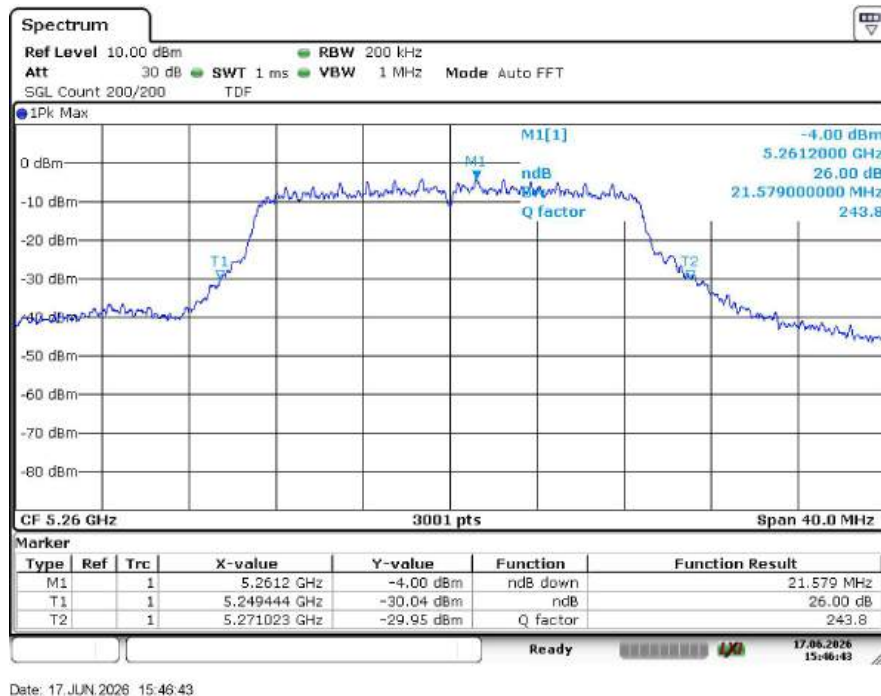
26 dB Bandwidth

Test Mode: TM 2 & Ch.48



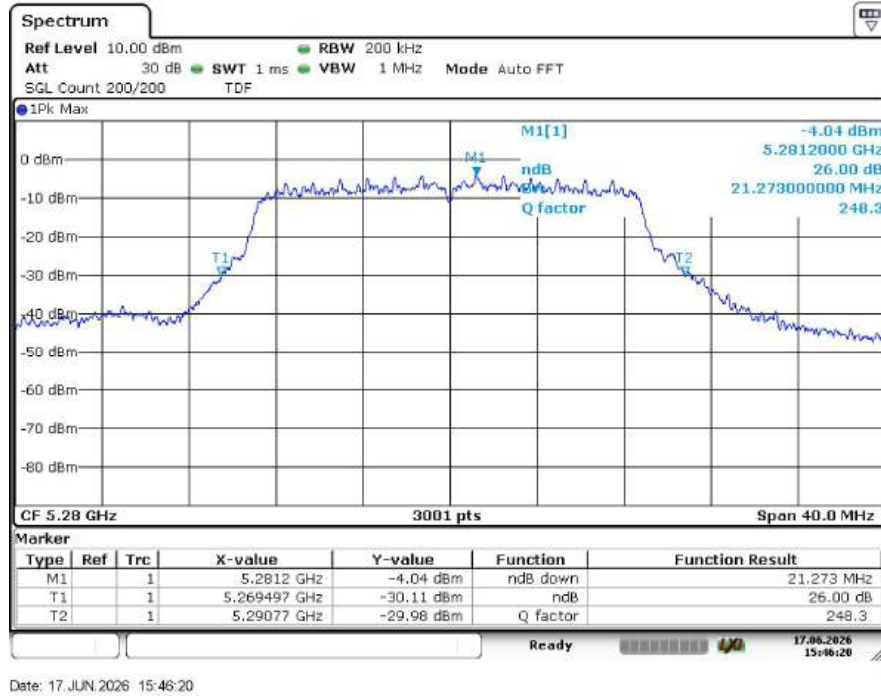
26 dB Bandwidth

Test Mode: TM 2 & Ch.52



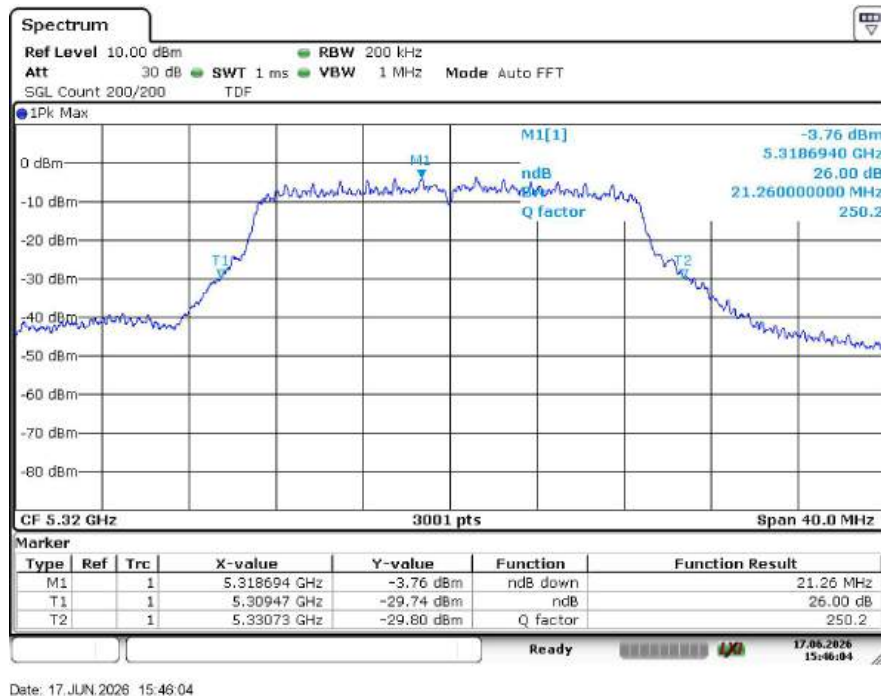
26 dB Bandwidth

Test Mode: TM 2 & Ch.60



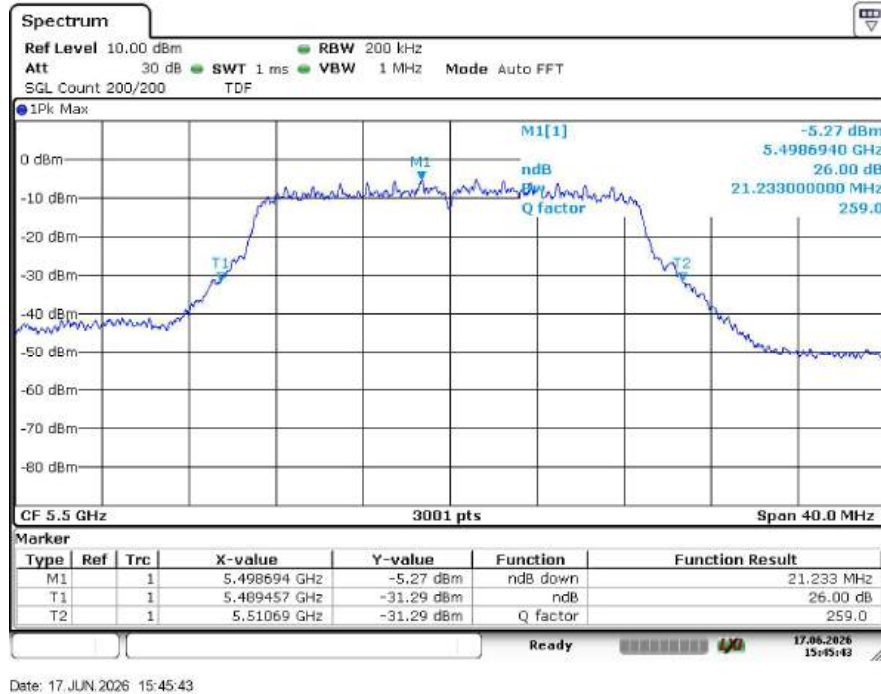
26 dB Bandwidth

Test Mode: TM 2 & Ch.64



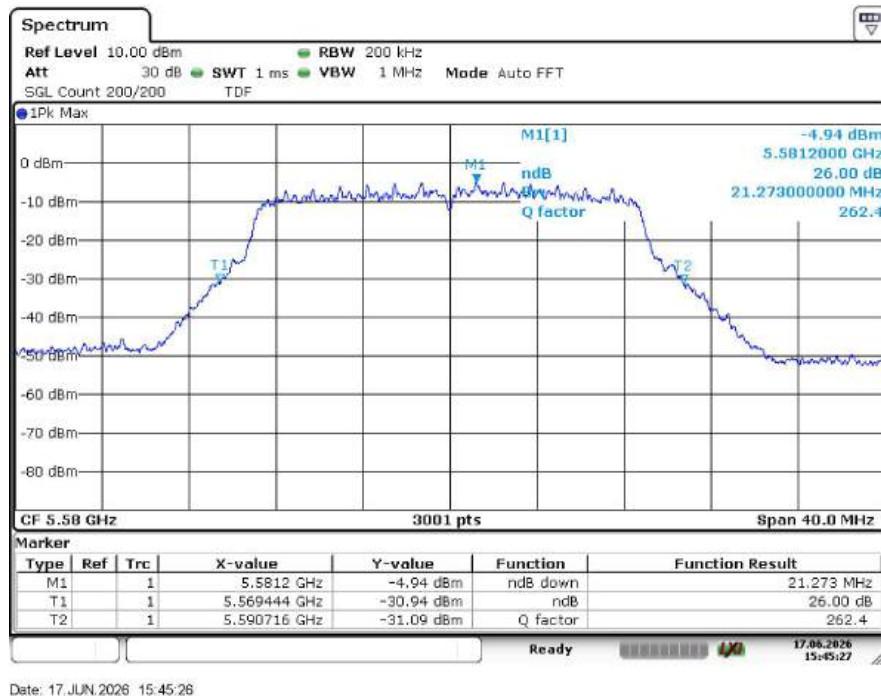
26 dB Bandwidth

Test Mode: TM 2 & Ch.100



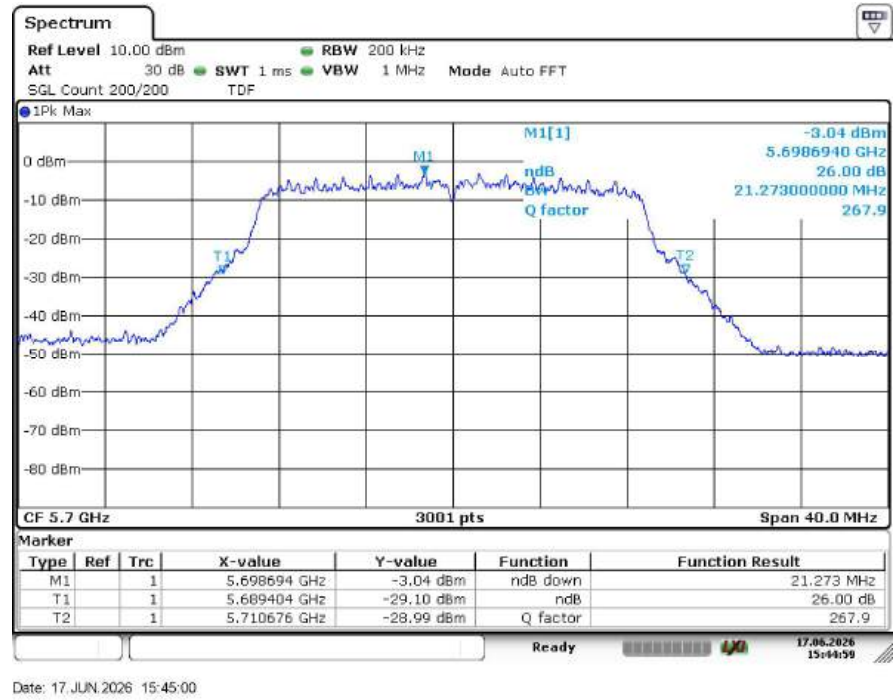
26 dB Bandwidth

Test Mode: TM 2 & Ch.116



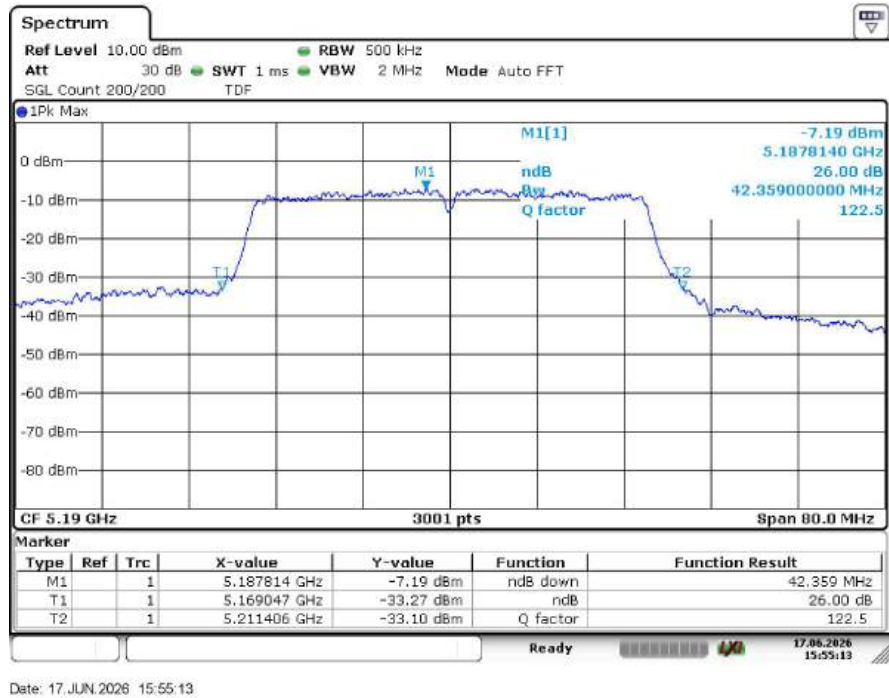
26 dB Bandwidth

Test Mode: TM 2 & Ch.140



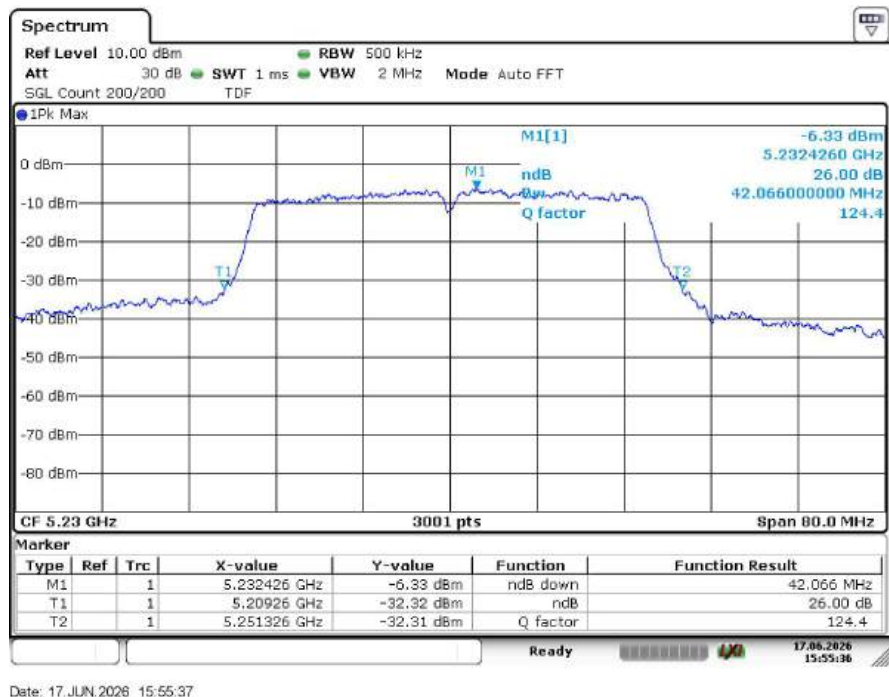
6 dB Bandwidth

Test Mode: TM 3 & Ch.38



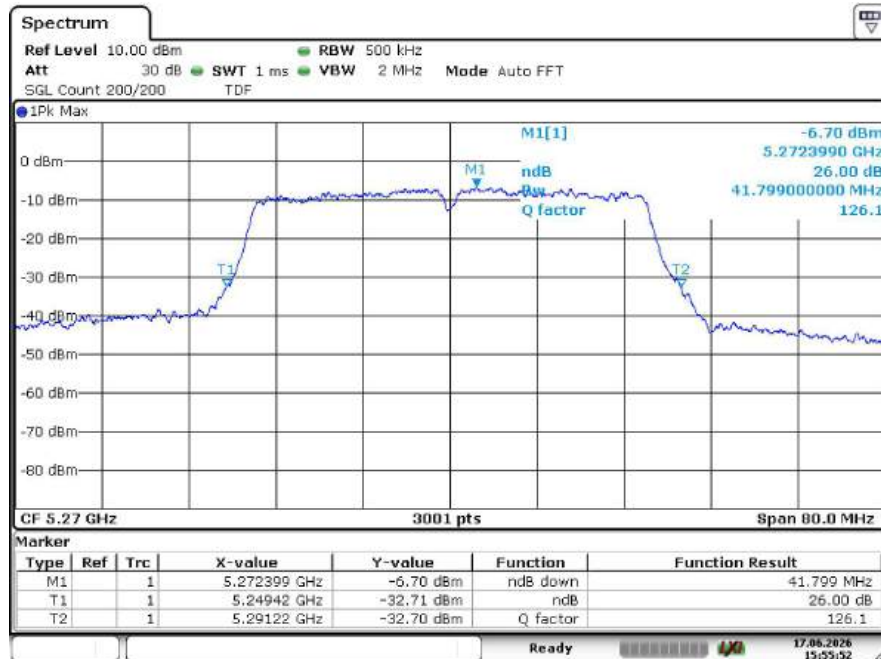
6 dB Bandwidth

Test Mode: TM 3 & Ch.46



6 dB Bandwidth

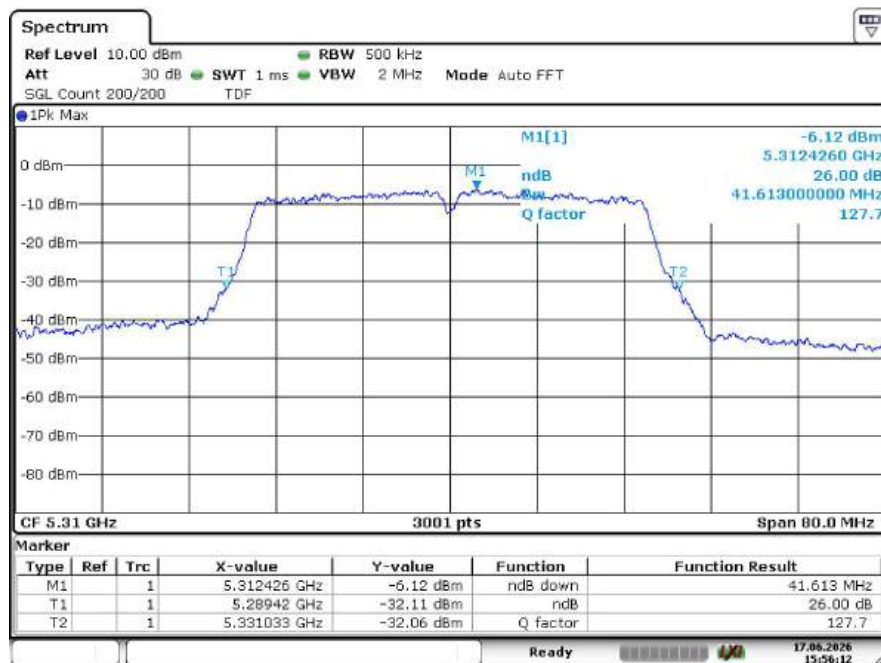
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6 dB Bandwidth

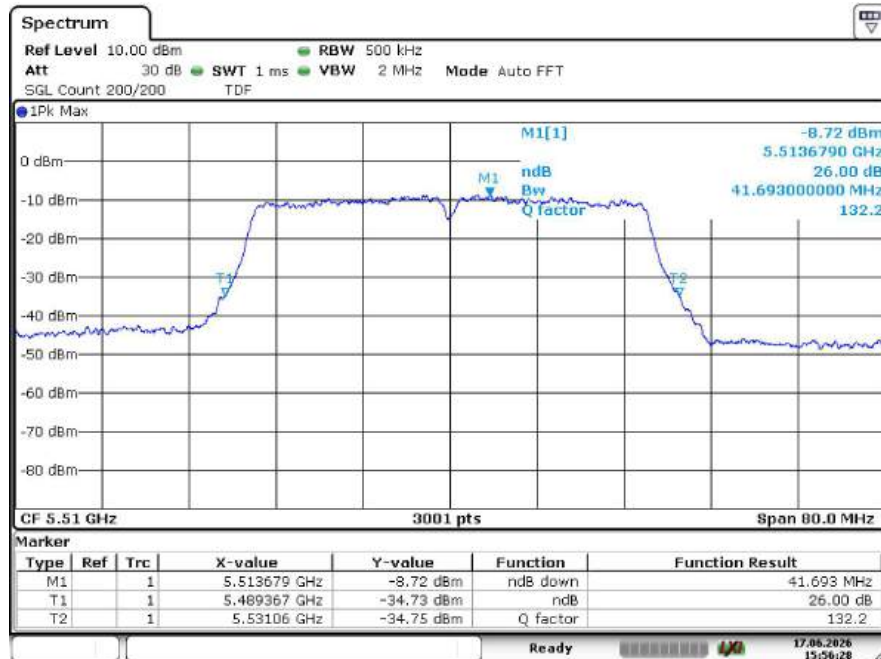
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6 dB Bandwidth

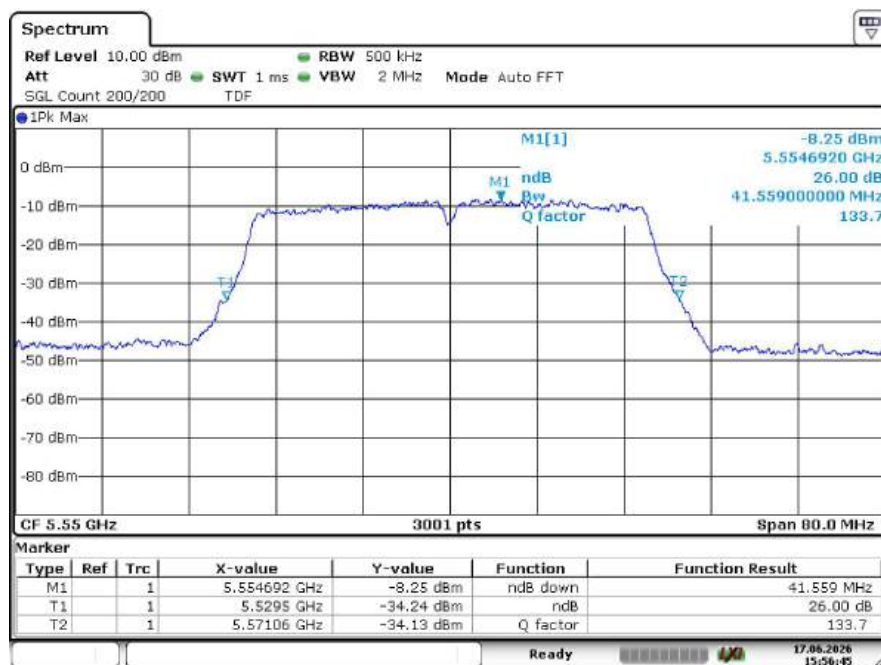
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6 dB Bandwidth

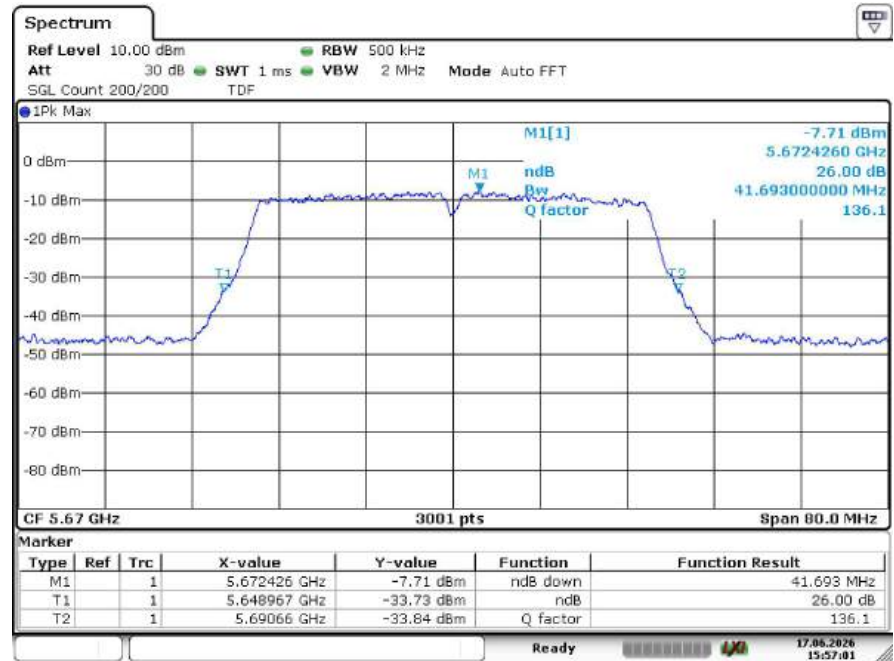
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6 dB Bandwidth

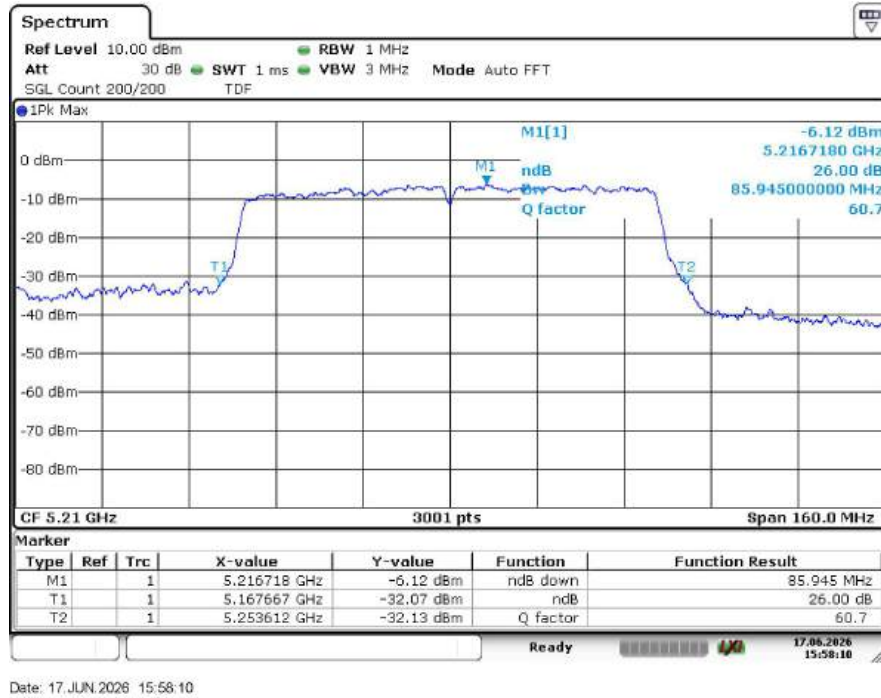
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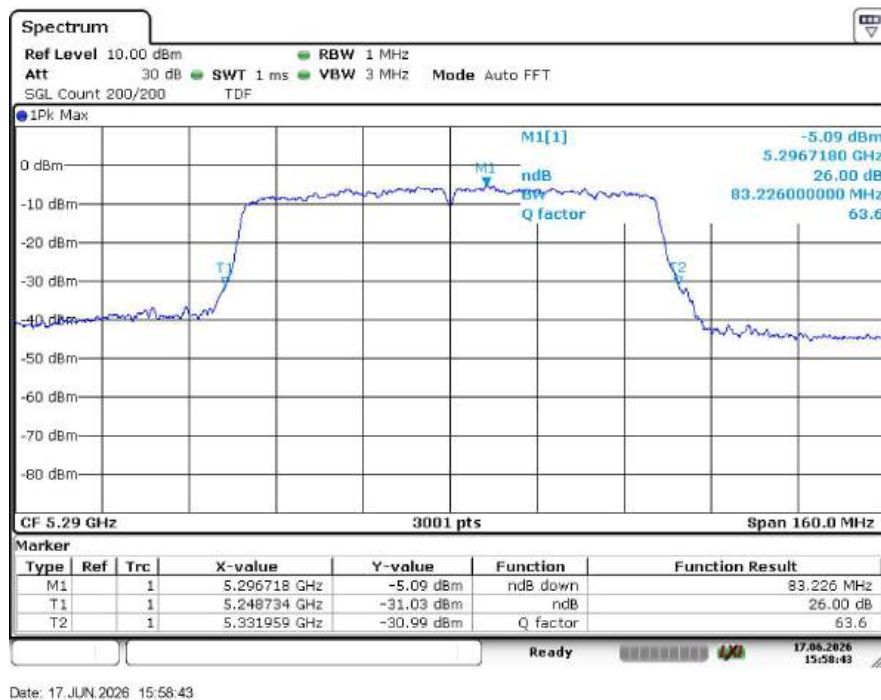
6 dB Bandwidth

Test Mode: TM 4 & Ch. 42



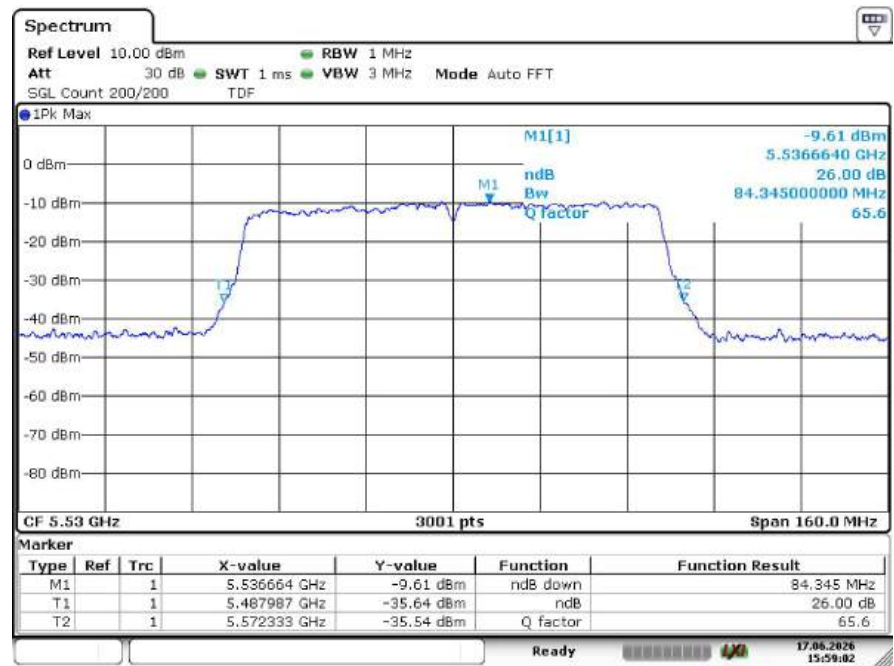
6 dB Bandwidth

Test Mode: TM 3 & Ch.58



6 dB Bandwidth

Test Mode: TM 4 & Ch.106



Date: 17 JUN. 2026 15:59:02

5.2. Minimum Emission Bandwidth (6 dB Bandwidth)

■ Test Requirements

- Emission Bandwidth (6 dB Bandwidth)

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

■ Test Configuration

Refer to the APPENDIX I.

■ Test Procedure

- Emission Bandwidth (6 dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of **KDB789033 D02v02r01**.

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth $\geq 3 \times \text{RBW}$.
3. Detector = **Peak**.
4. Trace mode = **max hold**.

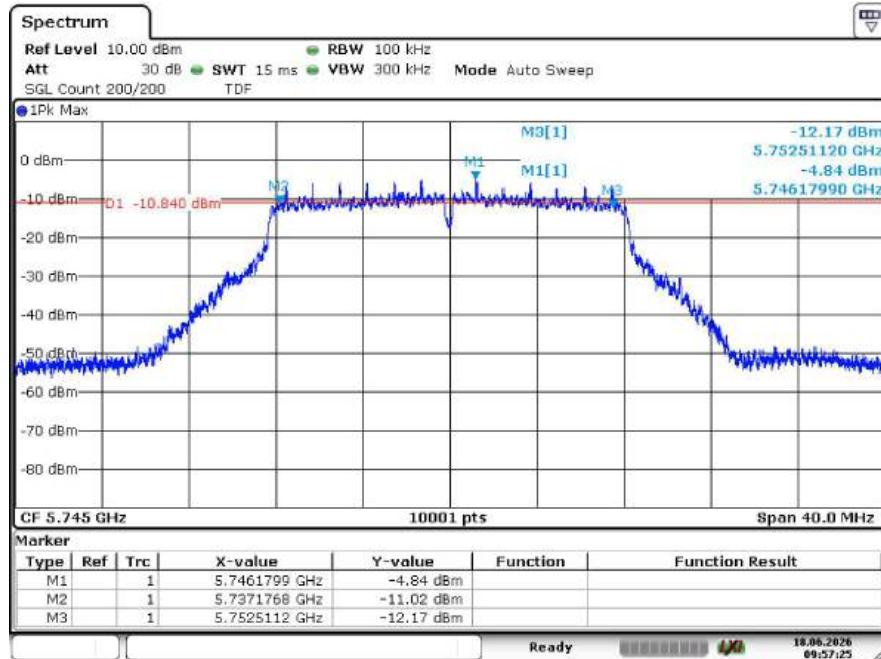
Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

■ Test Results: **Comply**

Test Mode	Band	Channel	Frequency(MHz)	6 dB BW(MHz)
TM 1	U-NII-3	149	5 745	15.33
		157	5 785	15.24
		165	5 825	15.33
TM 2	U-NII-3	149	5 745	16.13
		157	5 785	15.95
		165	5 825	16.79
TM 3	U-NII-3	151	5 755	35.14
		159	5 795	35.70
TM 4	U-NII-3	155	5 775	75.14

6 dB Bandwidth

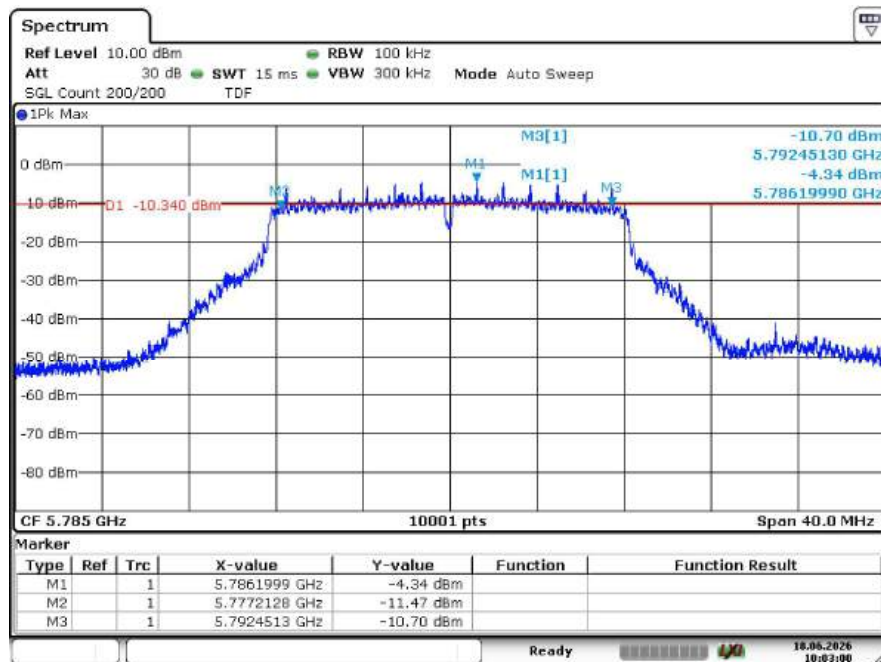
Test Mode: TM 1 & Ch.149



Date: 18 JUN. 2026 09:57:25

6 dB Bandwidth

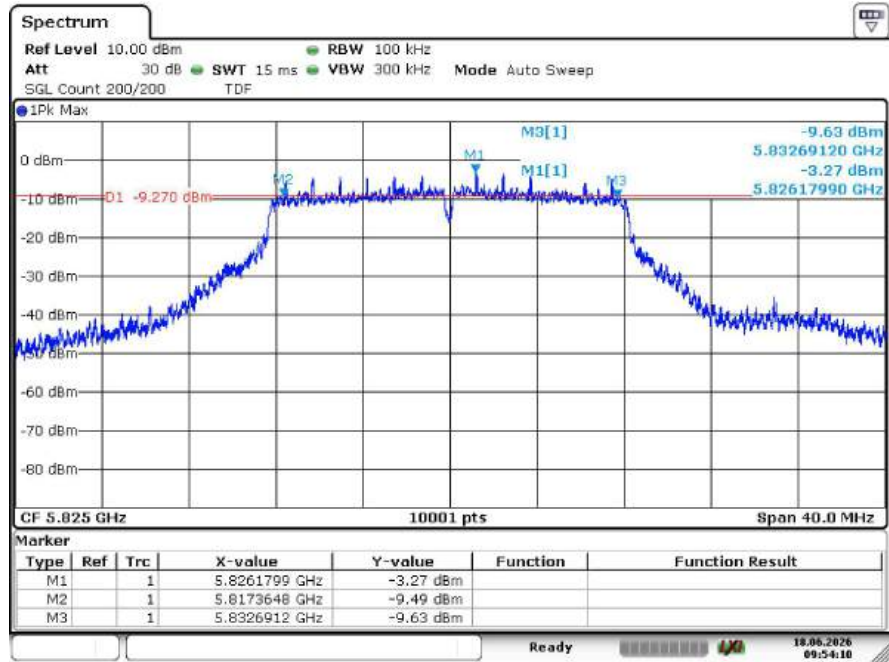
Test Mode: TM 1 & Ch.157



Date: 18 JUN. 2026 10:03:01

6 dB Bandwidth

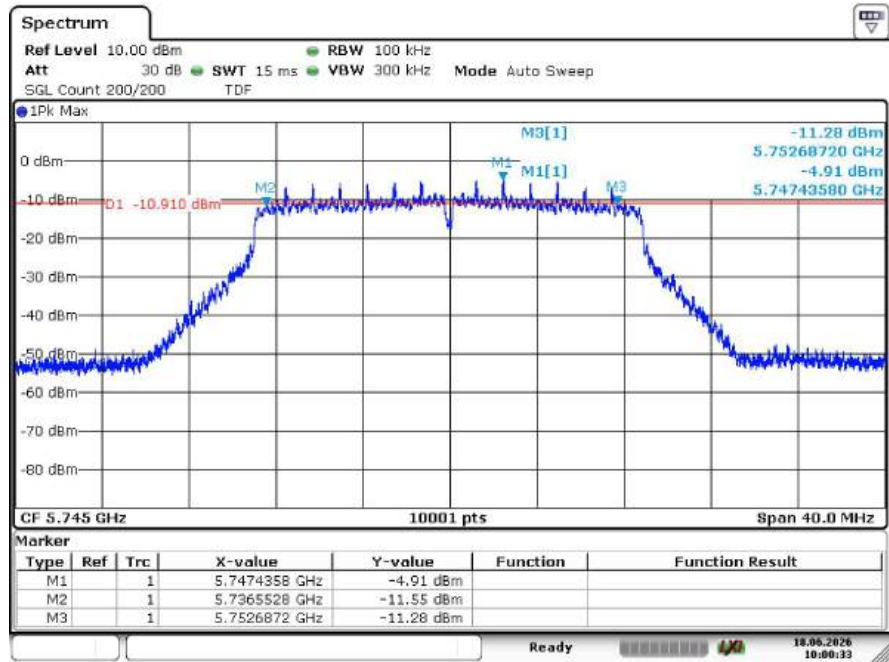
Test Mode: TM 1 & Ch.165



Date: 18 JUN. 2026 09:54:10

6 dB Bandwidth

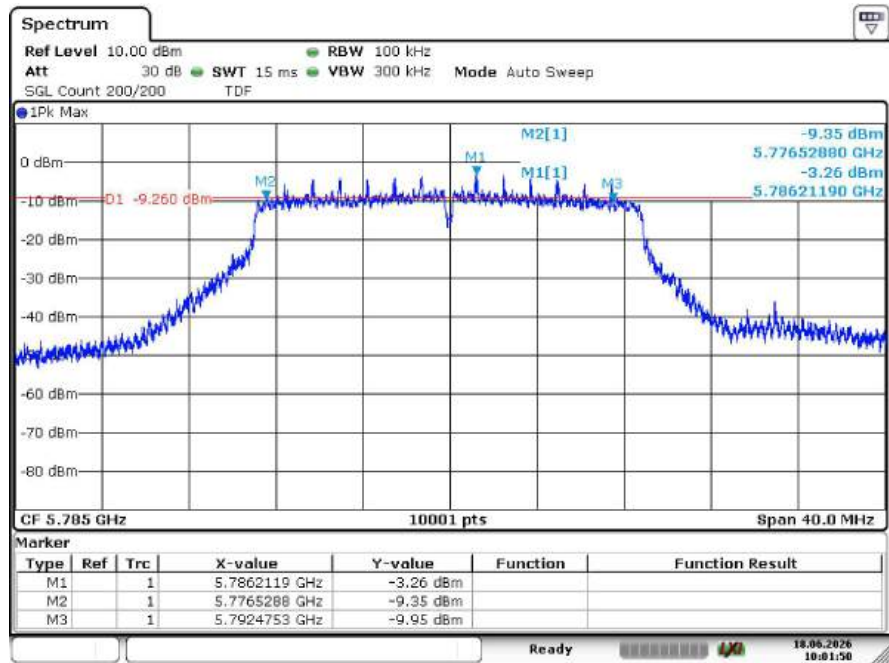
Test Mode: TM 2 & Ch.149



Date: 18 JUN. 2026 10:00:33

6 dB Bandwidth

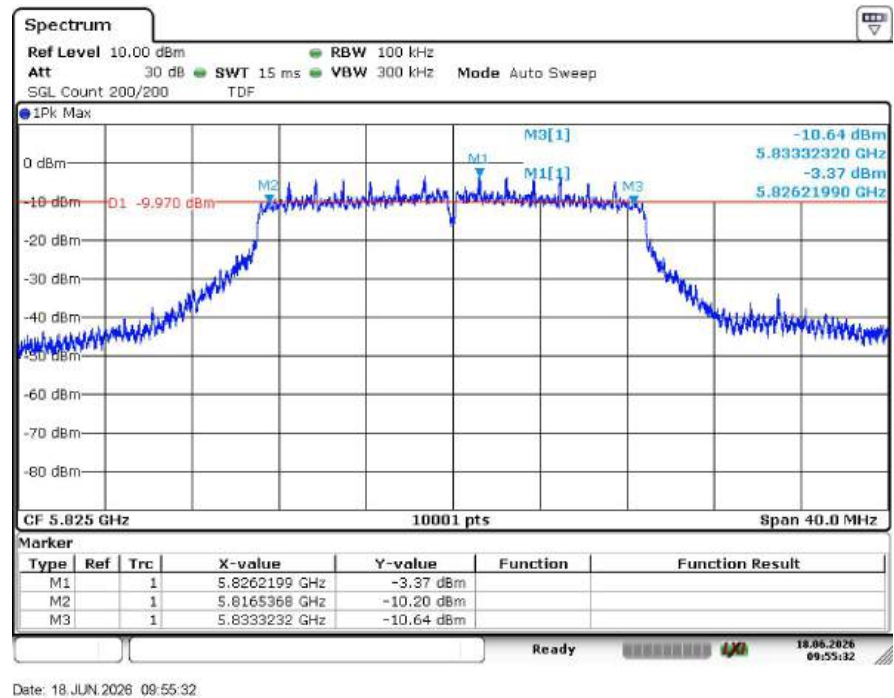
Test Mode: TM 2 & Ch.157



Date: 18 JUN. 2026 10:01:51

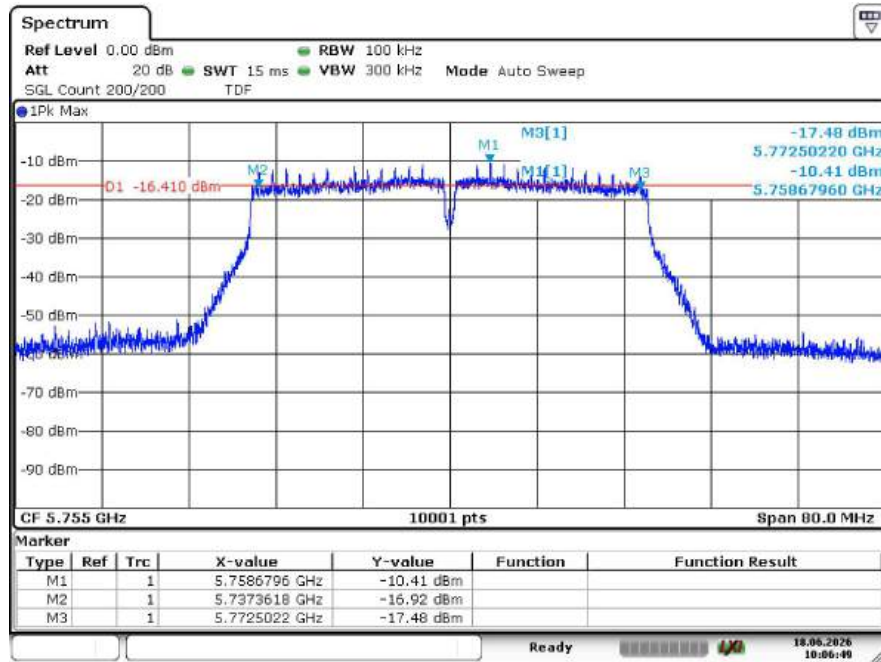
6 dB Bandwidth

Test Mode: TM 2 & Ch.165



6 dB Bandwidth

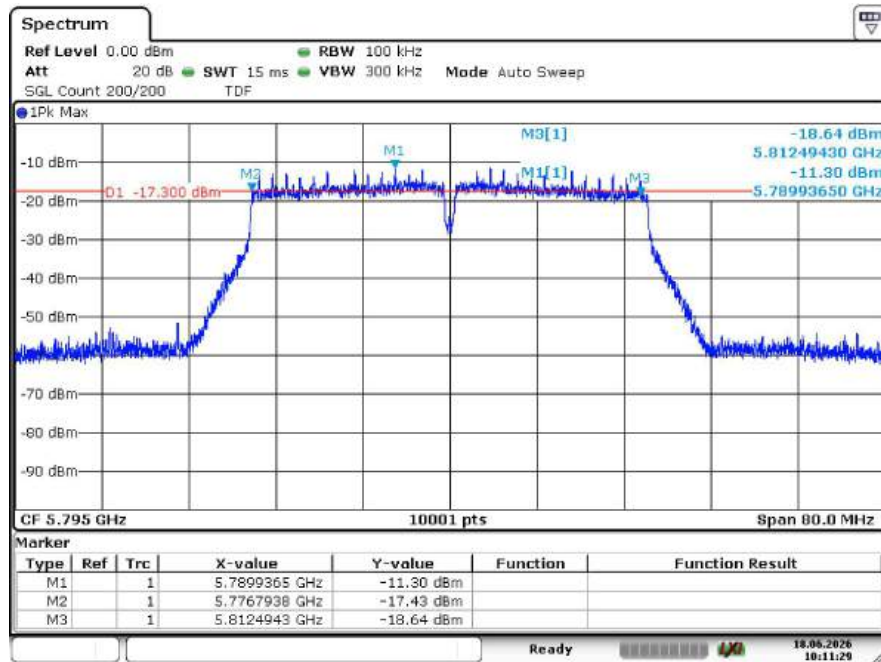
Test Mode: TM 3 & Ch.151



Date: 18 JUN. 2026 10:06:49

6 dB Bandwidth

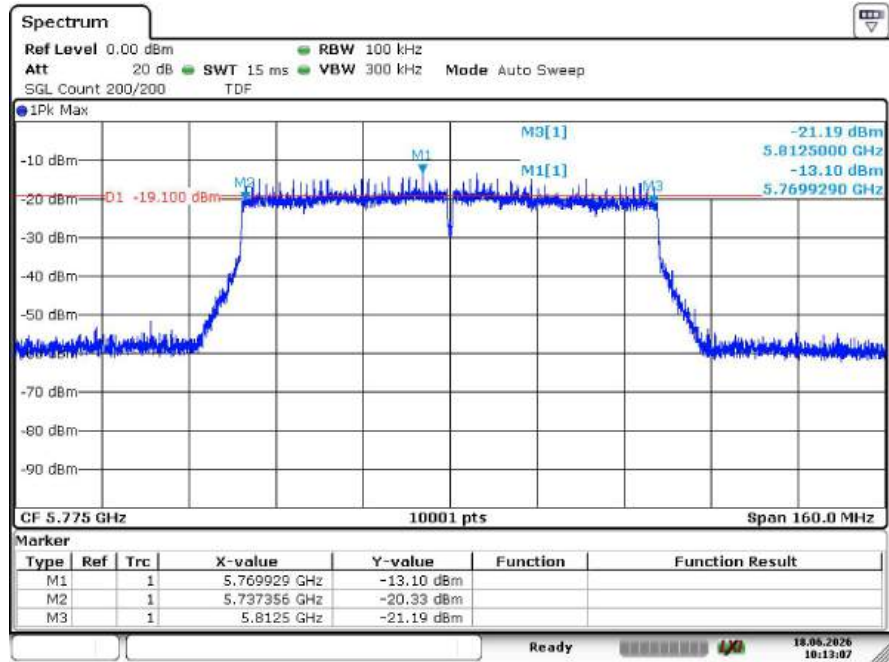
Test Mode: TM 3 & Ch.159



Date: 18 JUN. 2026 10:11:29

6 dB Bandwidth

Test Mode: TM 4 & Ch.155



Date: 18 JUN. 2026 10:13:07