

9. ANTENNA REQUIREMENT

REQUIREMENT

Please refer to FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)

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

Standard	Requirement
RSS-Gen issue 5 6.8.	The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list. For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below). When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer. The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested. For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location: This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

	Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.
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DESCRIPTION

Pass

10. AC POWER LINE CONDUCTED EMISSION

LIMITS

Please refer to CFR 47 FCC §15.207 (a) and ISED RSS-Gen Clause 8.8

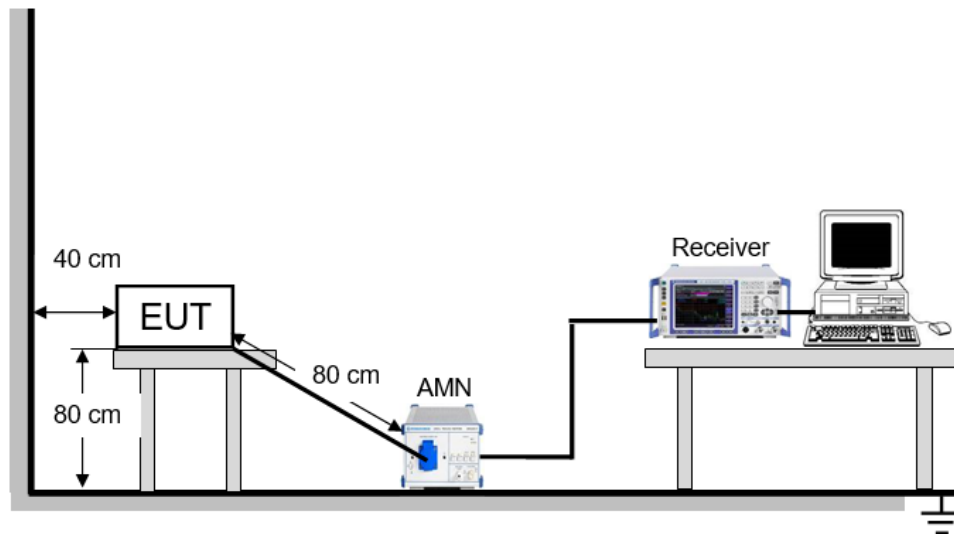
FREQUENCY (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

TEST PROCEDURE

The EUT is put on a table of non-conducting material that is 80 cm high. The vertical conducting wall of shielding is located 40 cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

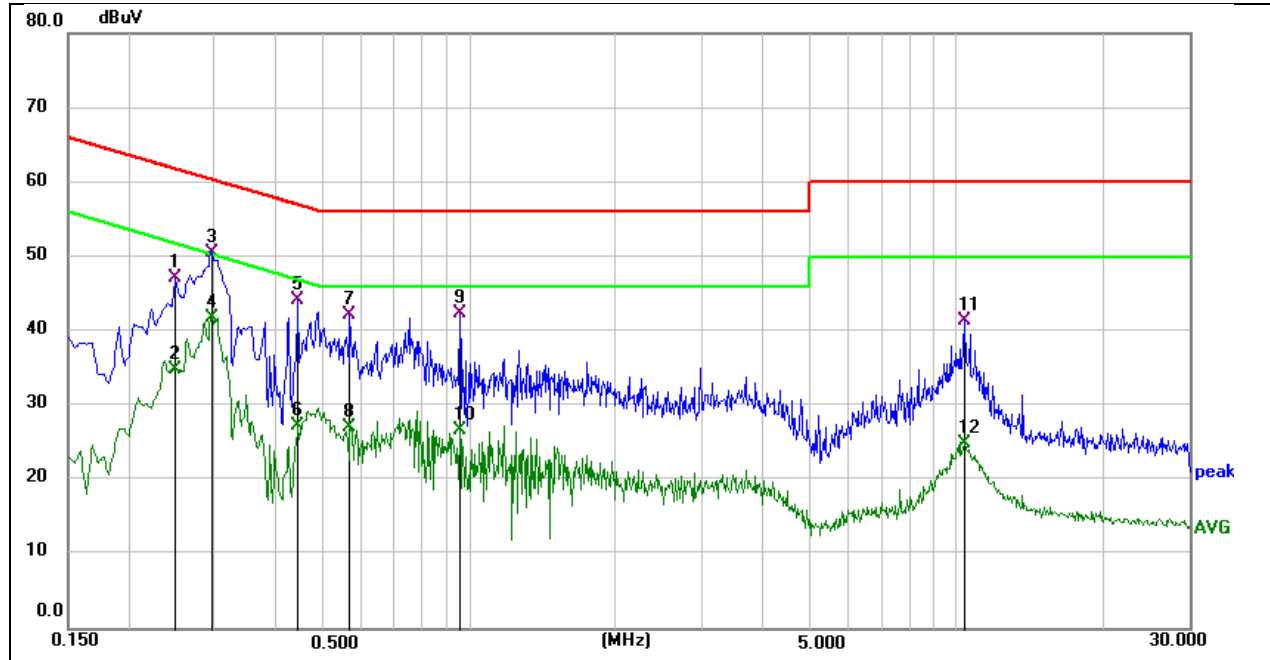
The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST SETUP



TEST ENVIRONMENT

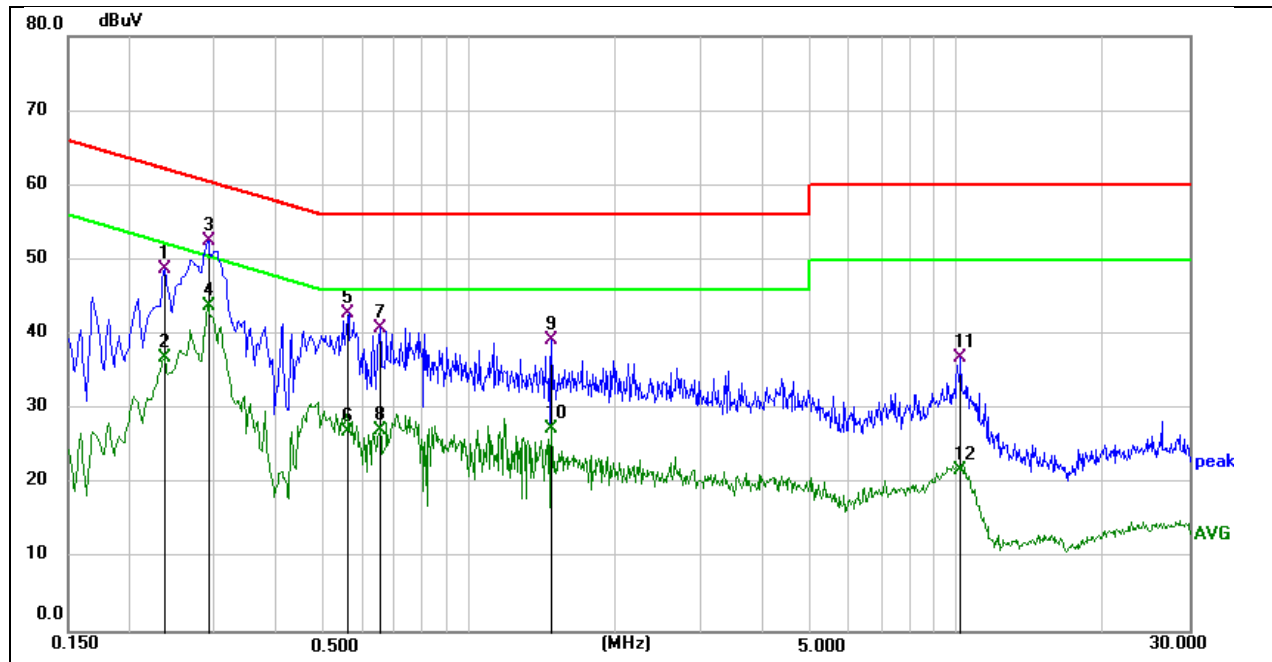
Temperature	26°C	Relative Humidity	54%
Atmosphere Pressure	101kPa		

TEST RESULTS

Phase: L1

Mode: 802.11ax HE20 2437MHz

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.2495	37.58	9.62	47.20	61.77	-14.57	QP
2	0.2495	25.24	9.62	34.86	51.77	-16.91	AVG
3	0.2955	40.71	9.88	50.59	60.37	-9.78	QP
4	0.2955	31.93	9.88	41.81	50.37	-8.56	AVG
5	0.4444	34.26	9.92	44.18	56.98	-12.80	QP
6	0.4444	17.28	9.92	27.20	46.98	-19.78	AVG
7	0.5670	32.41	9.81	42.22	56.00	-13.78	QP
8	0.5670	17.28	9.81	27.09	46.00	-18.91	AVG
9	0.9531	32.53	9.86	42.39	56.00	-13.61	QP
10	0.9531	16.92	9.86	26.78	46.00	-19.22	AVG
11	10.3422	31.33	10.03	41.36	60.00	-18.64	QP
12	10.3422	14.94	10.03	24.97	50.00	-25.03	AVG



Phase: N

Mode: 802.11ax HE20 2437MHz

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.2354	38.88	9.82	48.70	62.26	-13.56	QP
2	0.2354	26.92	9.82	36.74	52.26	-15.52	AVG
3	0.2894	42.87	9.72	52.59	60.54	-7.95	QP
4	0.2894	34.11	9.72	43.83	50.54	-6.71	AVG
5	0.5639	32.91	9.93	42.84	56.00	-13.16	QP
6	0.5639	16.96	9.93	26.89	46.00	-19.11	AVG
7	0.6540	30.88	9.92	40.80	56.00	-15.20	QP
8	0.6540	17.13	9.92	27.05	46.00	-18.95	AVG
9	1.4730	29.41	9.89	39.30	56.00	-16.70	QP
10	1.4730	17.42	9.89	27.31	46.00	-18.69	AVG
11	10.1805	26.74	10.02	36.76	60.00	-23.24	QP
12	10.1805	11.68	10.02	21.70	50.00	-28.30	AVG

Note: 1. Result = Reading + Correct Factor.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).

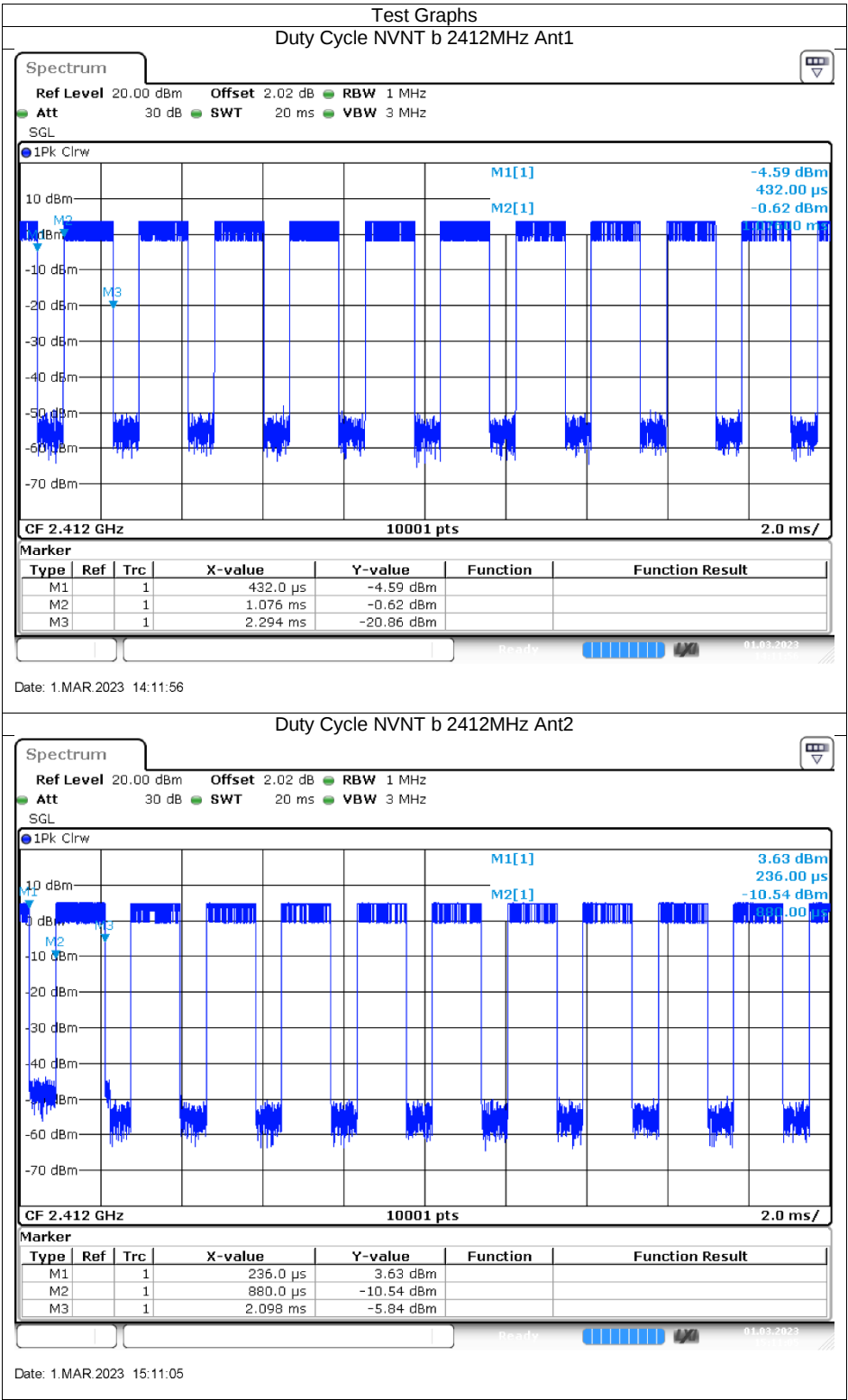
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

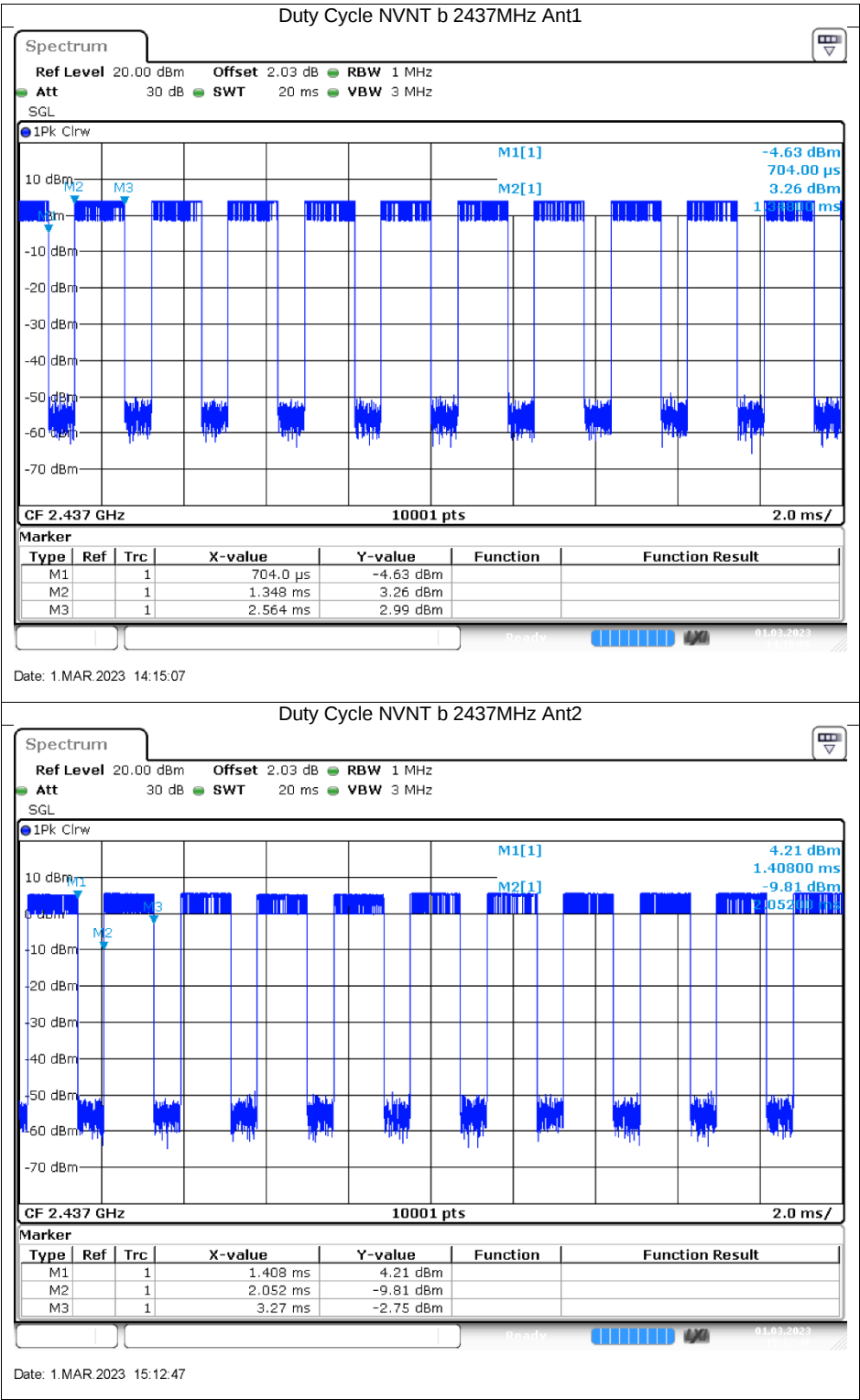
Note: All the modes have been tested, only the worst data was recorded in the report.

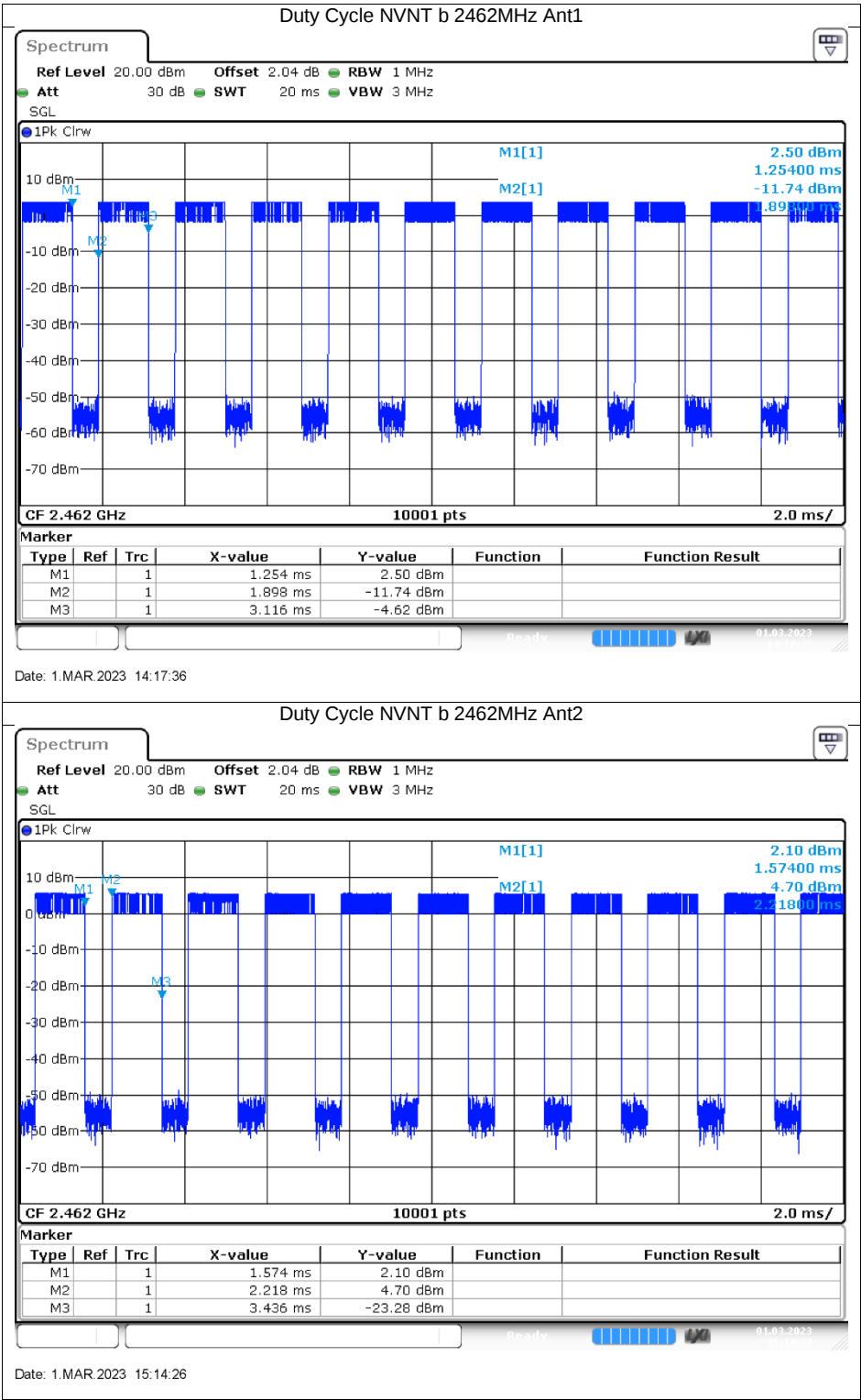
11. TEST DATA - Appendix A

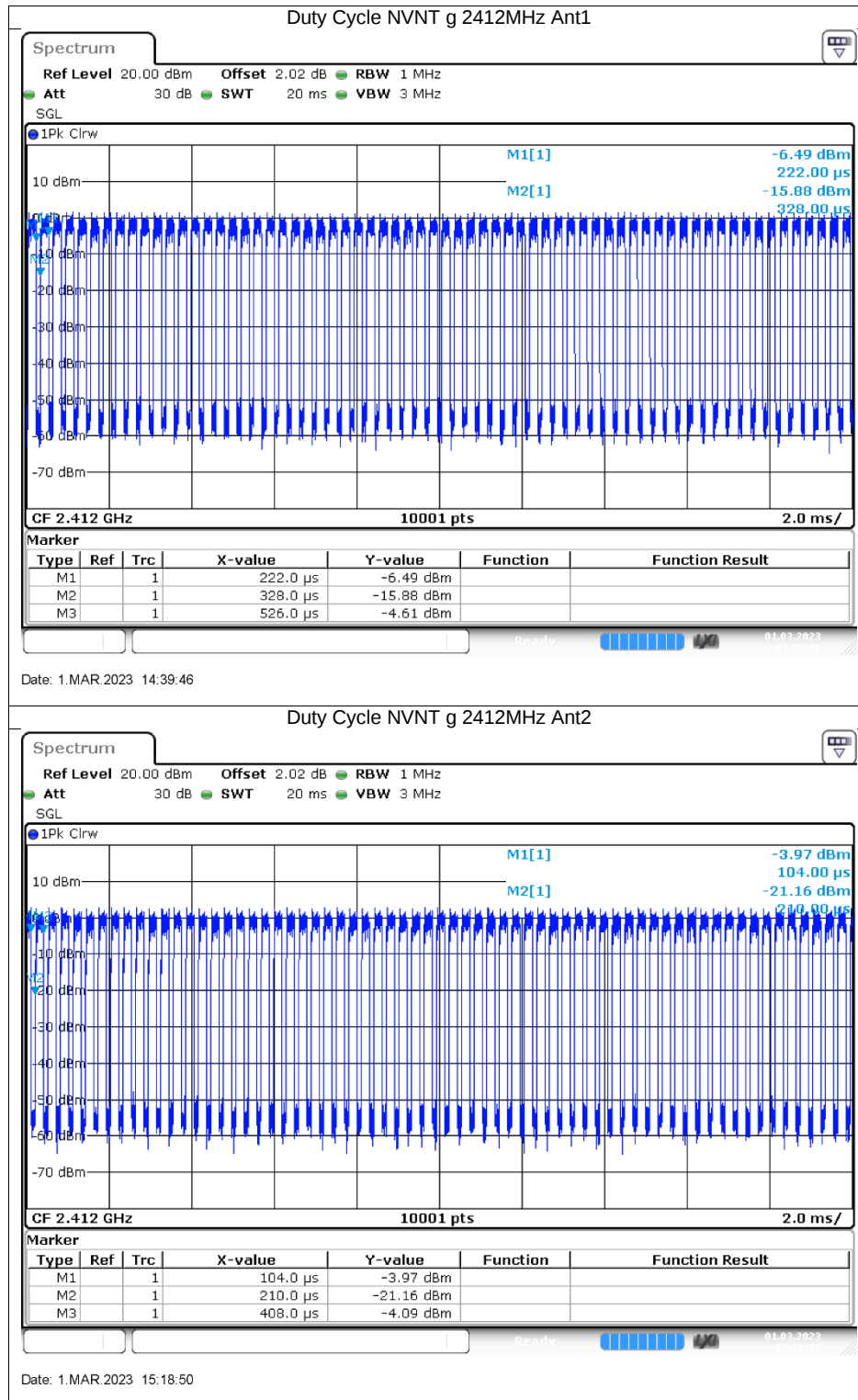
Duty Cycle

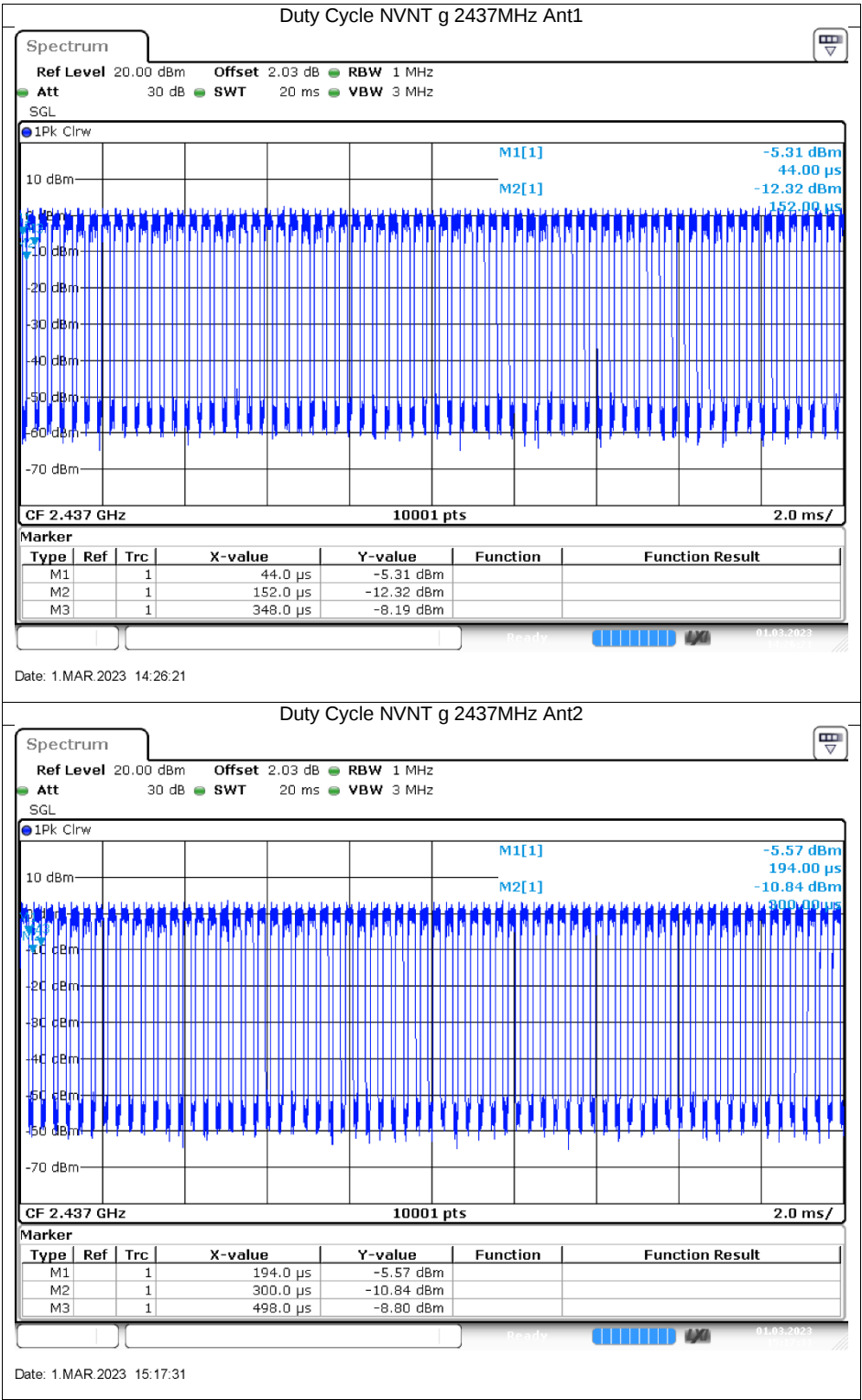
Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	b	2412	Ant1	65.41	1.84	0.82
NVNT	b	2412	Ant2	65.41	1.84	0.82
NVNT	b	2437	Ant1	65.38	1.85	0.82
NVNT	b	2437	Ant2	65.41	1.84	0.82
NVNT	b	2462	Ant1	65.41	1.84	0.82
NVNT	b	2462	Ant2	65.41	1.84	0.82
NVNT	g	2412	Ant1	65.13	1.86	5.05
NVNT	g	2412	Ant2	65.13	1.86	5.05
NVNT	g	2437	Ant1	64.47	1.91	5.1
NVNT	g	2437	Ant2	65.13	1.86	5.05
NVNT	g	2462	Ant1	64.47	1.91	5.1
NVNT	g	2462	Ant2	65.13	1.86	5.05
NVNT	n20	2412	Ant1	67.11	1.73	4.9
NVNT	n20	2412	Ant2	67.76	1.69	4.85
NVNT	n20	2437	Ant1	67.76	1.69	4.85
NVNT	n20	2437	Ant2	67.11	1.73	4.9
NVNT	n20	2462	Ant1	67.55	1.7	4.9
NVNT	n20	2462	Ant2	67.11	1.73	4.9
NVNT	n40	2422	Ant1	55.45	2.56	8.2
NVNT	n40	2422	Ant2	55.45	2.56	8.2
NVNT	n40	2437	Ant1	56.36	2.49	8.06
NVNT	n40	2437	Ant2	55.45	2.56	8.2
NVNT	n40	2452	Ant1	55.45	2.56	8.2
NVNT	n40	2452	Ant2	2.44	16.13	500
NVNT	ax20	2412	Ant1	86.73	0.62	5.1
NVNT	ax20	2412	Ant2	86.73	0.62	5.1
NVNT	ax20	2437	Ant1	86.73	0.62	5.1
NVNT	ax20	2437	Ant2	86.73	0.62	5.1
NVNT	ax20	2462	Ant1	86.73	0.62	5.1
NVNT	ax20	2462	Ant2	86.73	0.62	5.1
NVNT	ax40	2422	Ant1	81.25	0.9	7.69
NVNT	ax40	2422	Ant2	80	0.97	7.81
NVNT	ax40	2437	Ant1	81.25	0.9	7.69
NVNT	ax40	2437	Ant2	82.28	0.85	7.69
NVNT	ax40	2452	Ant1	81.25	0.9	7.69
NVNT	ax40	2452	Ant2	81.01	0.91	7.81

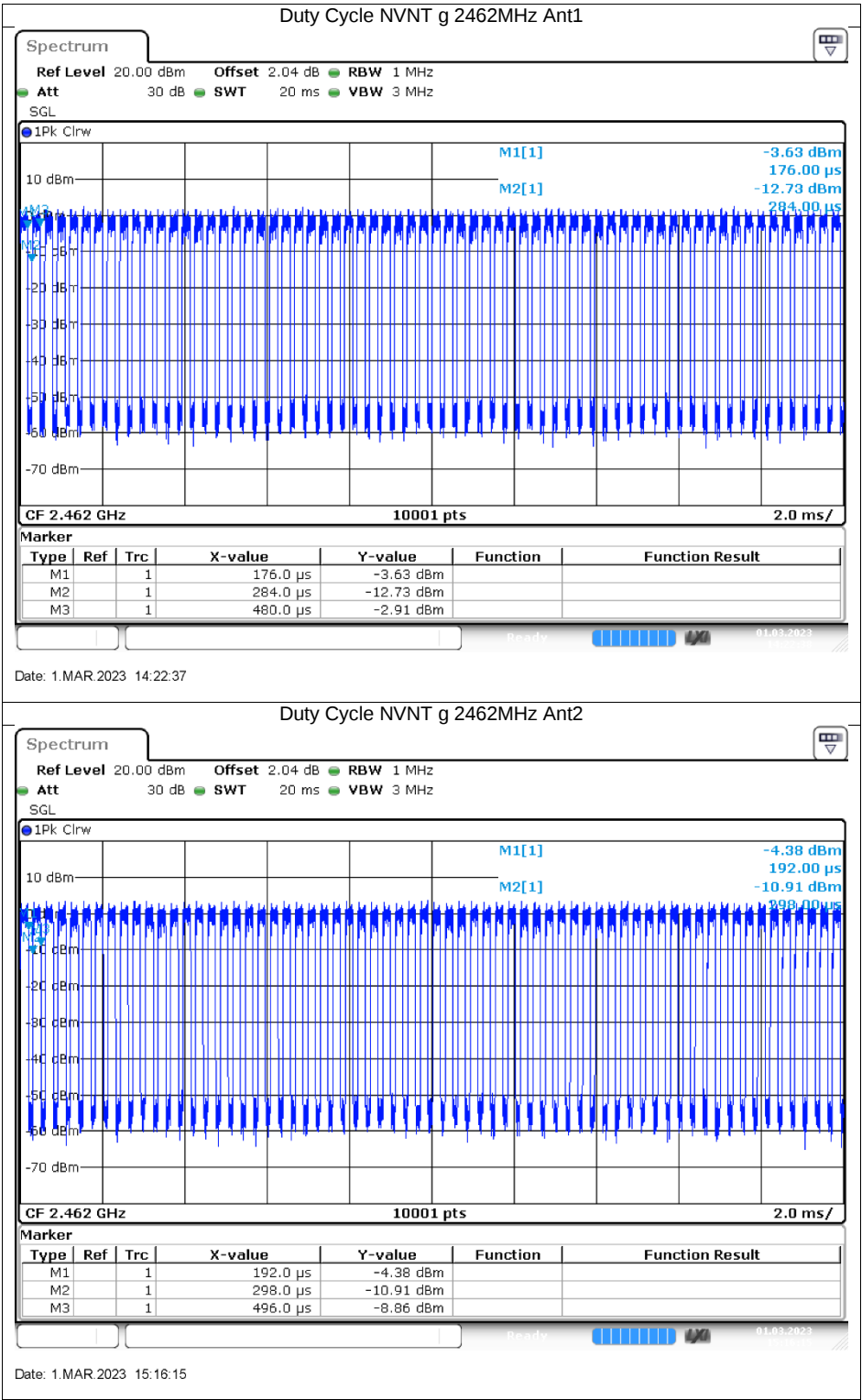


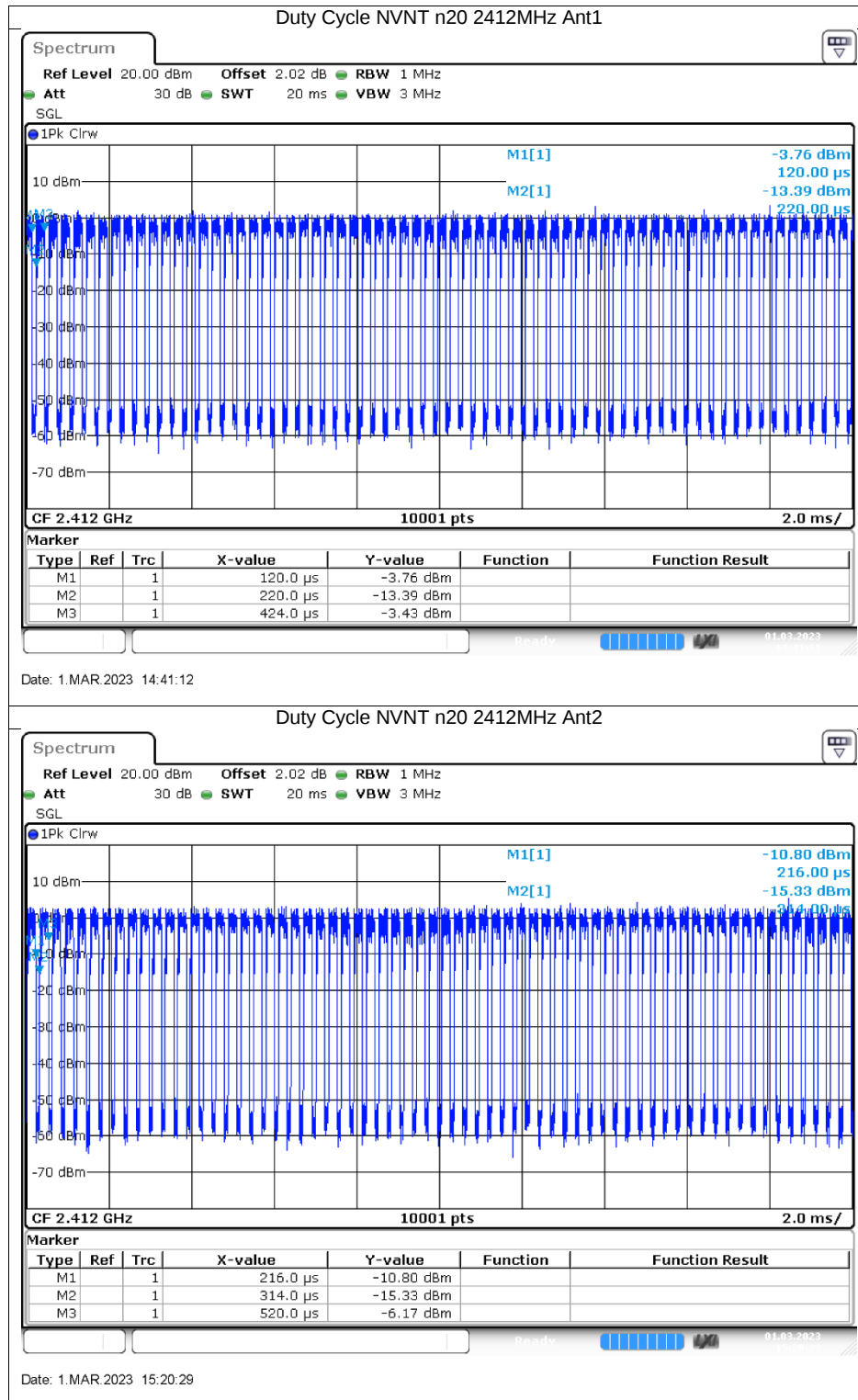


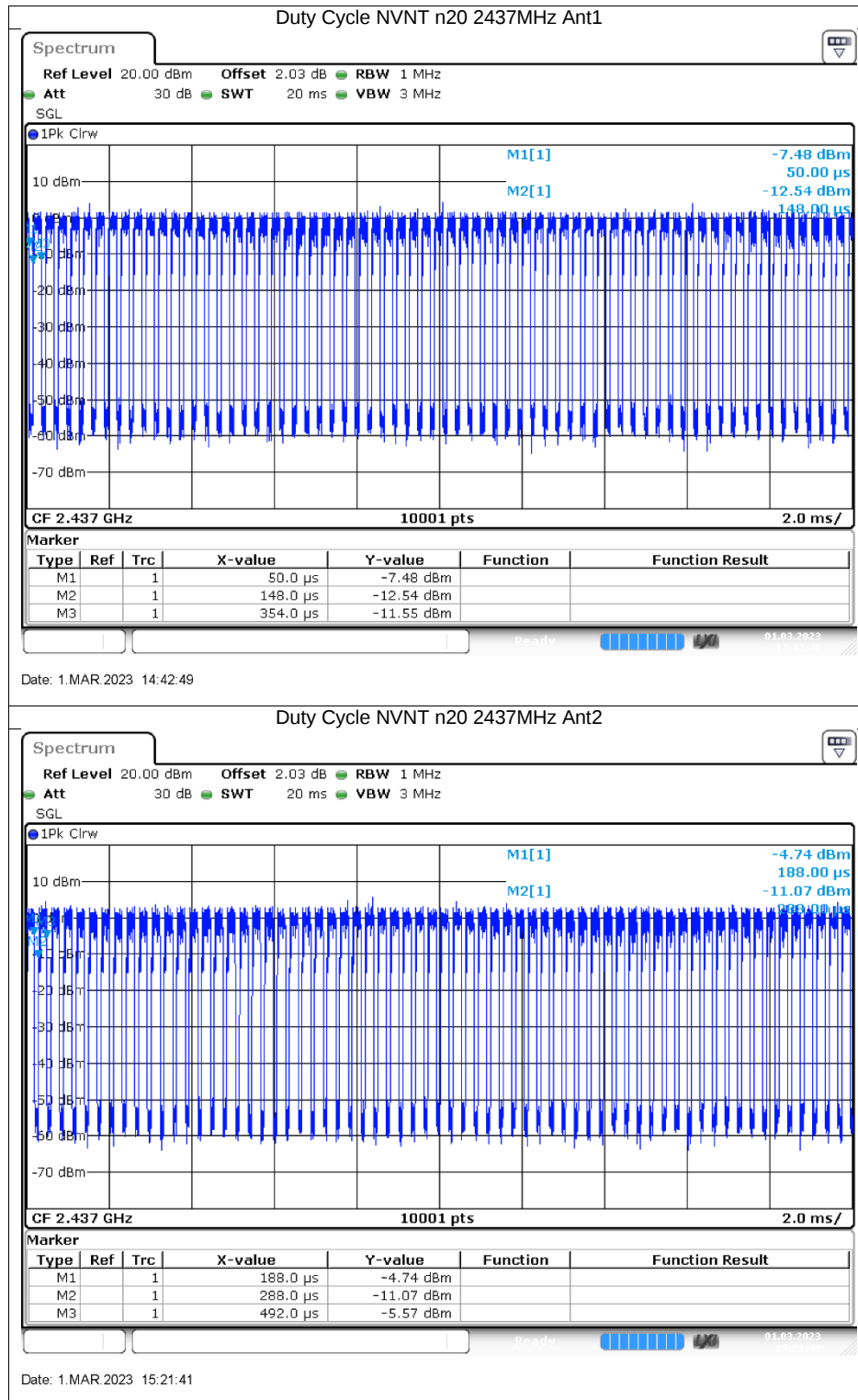


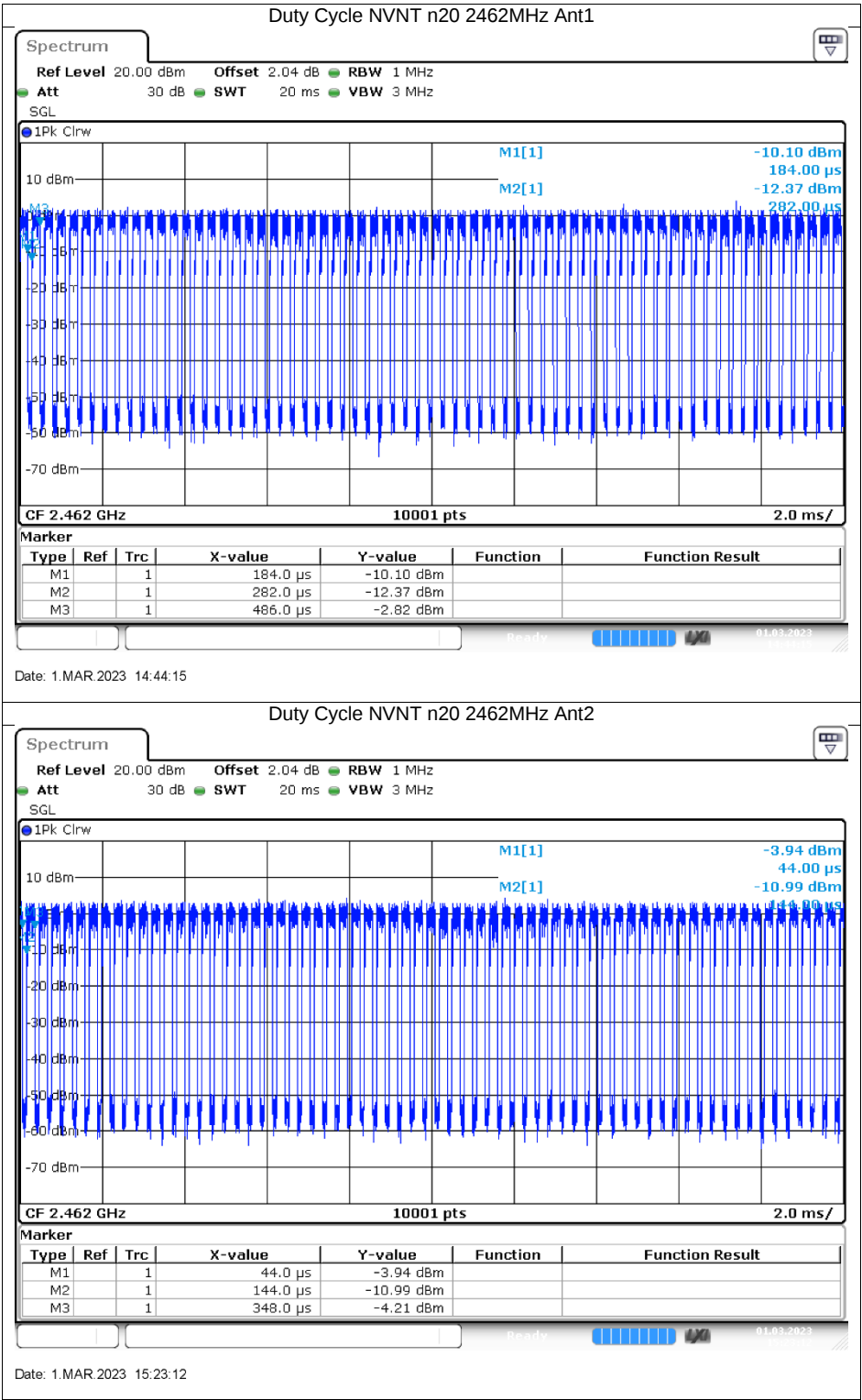


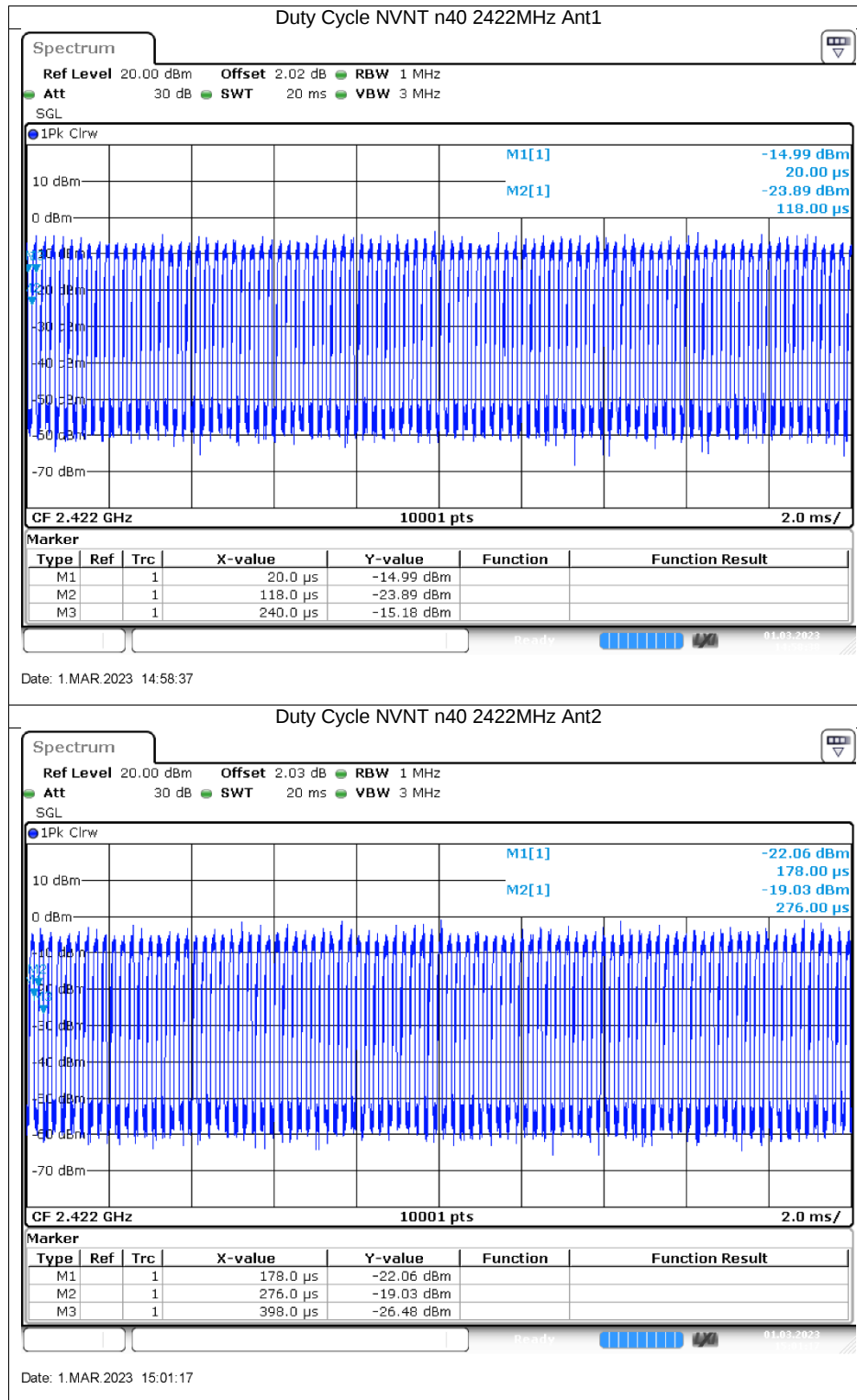


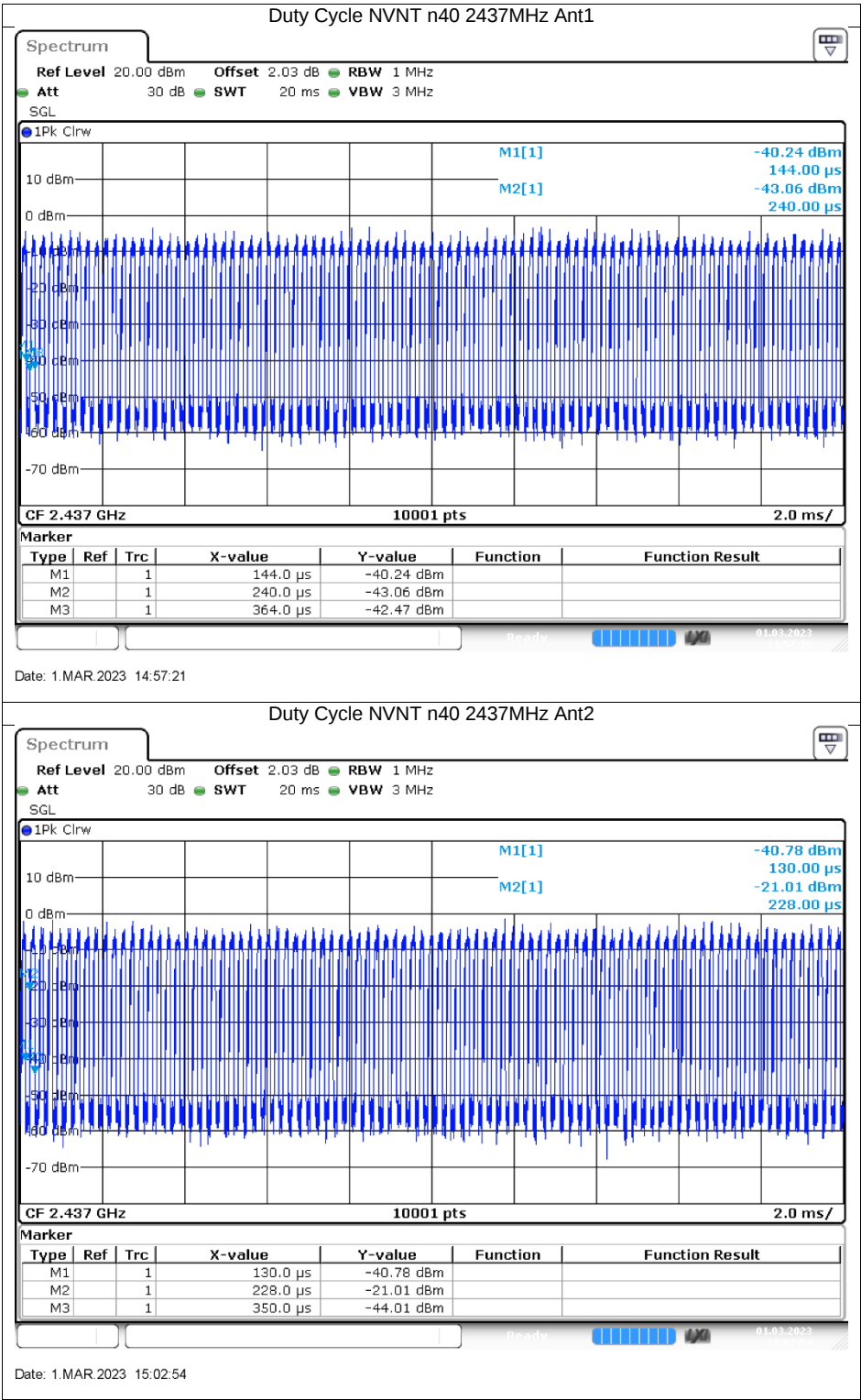




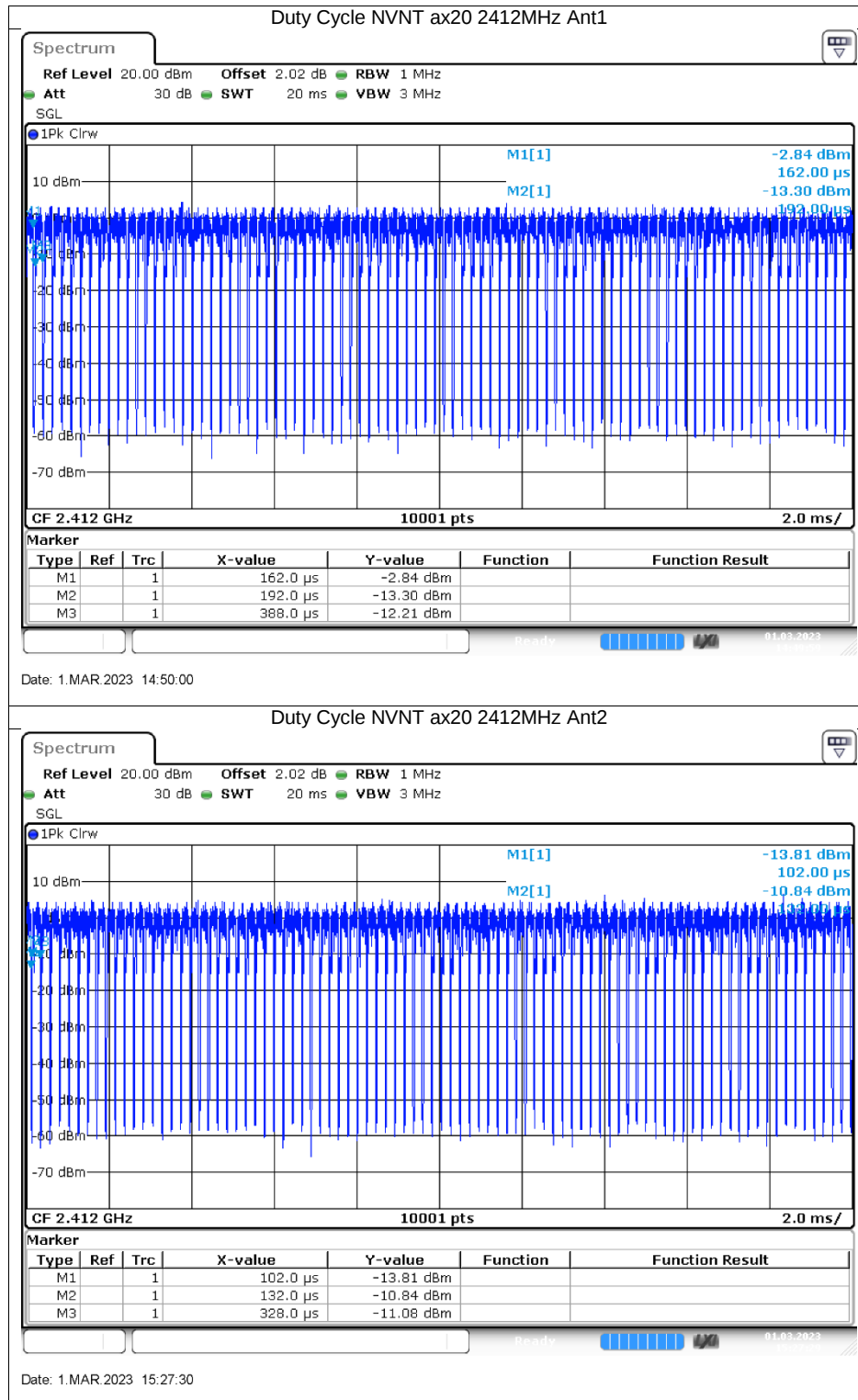


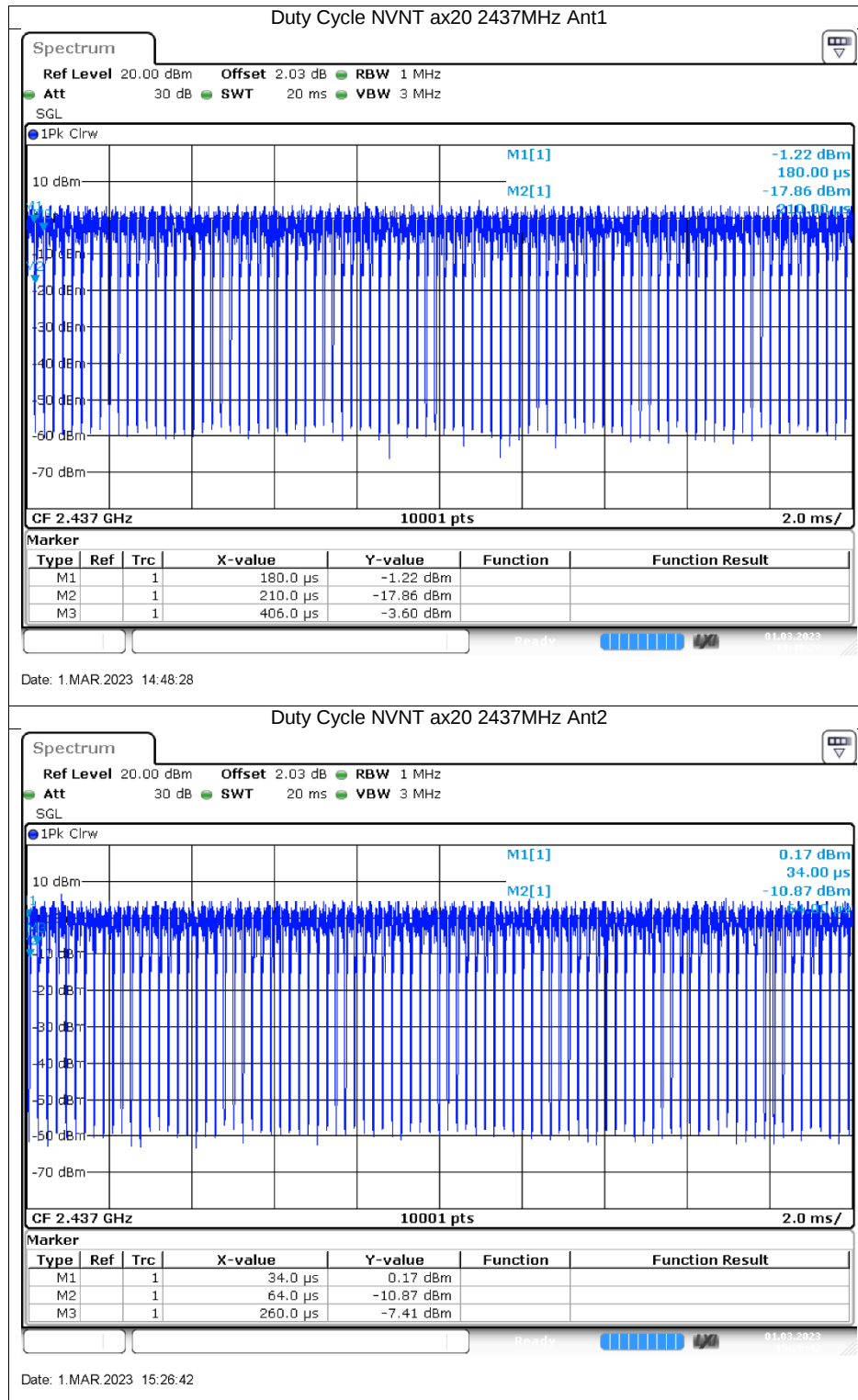


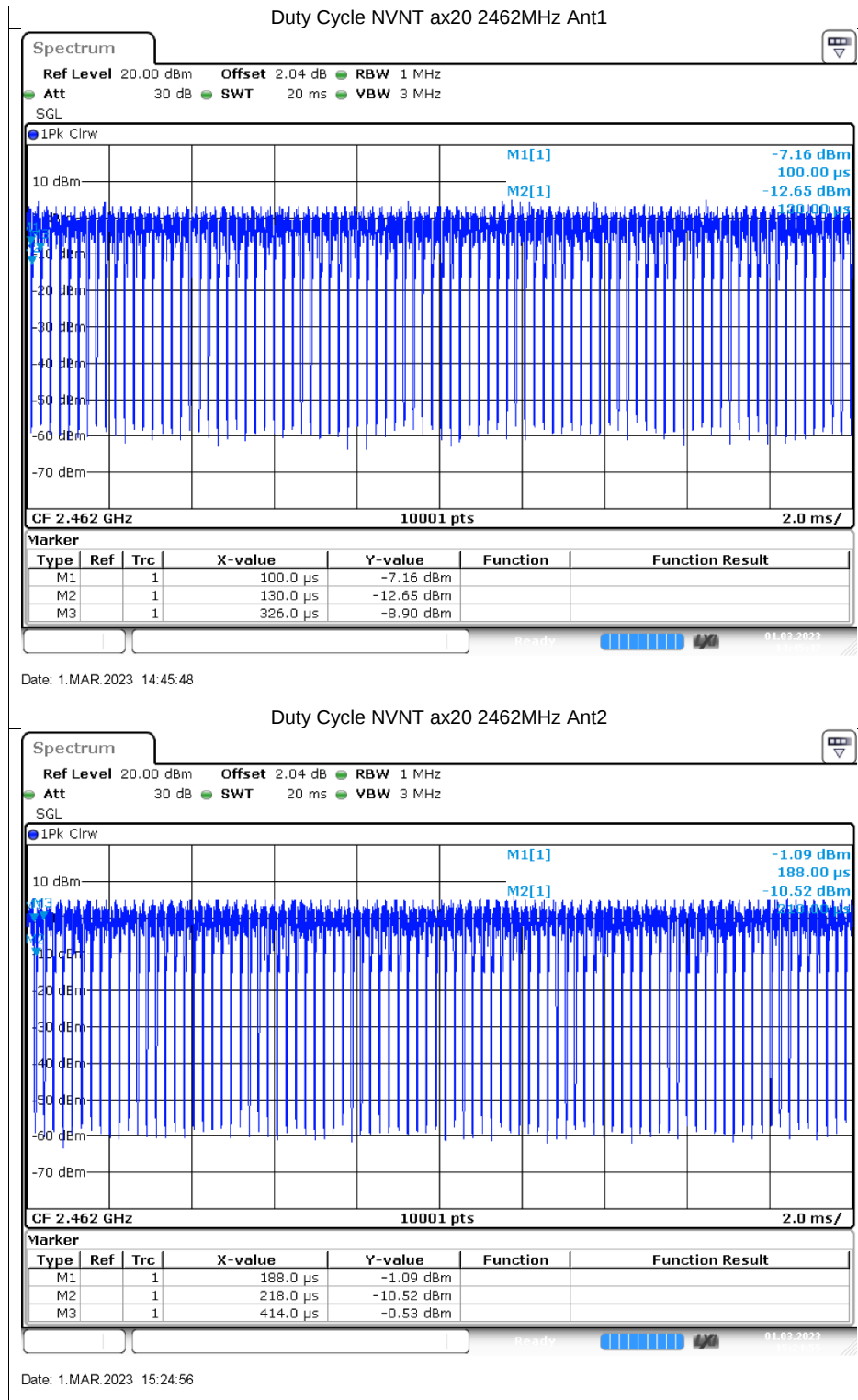


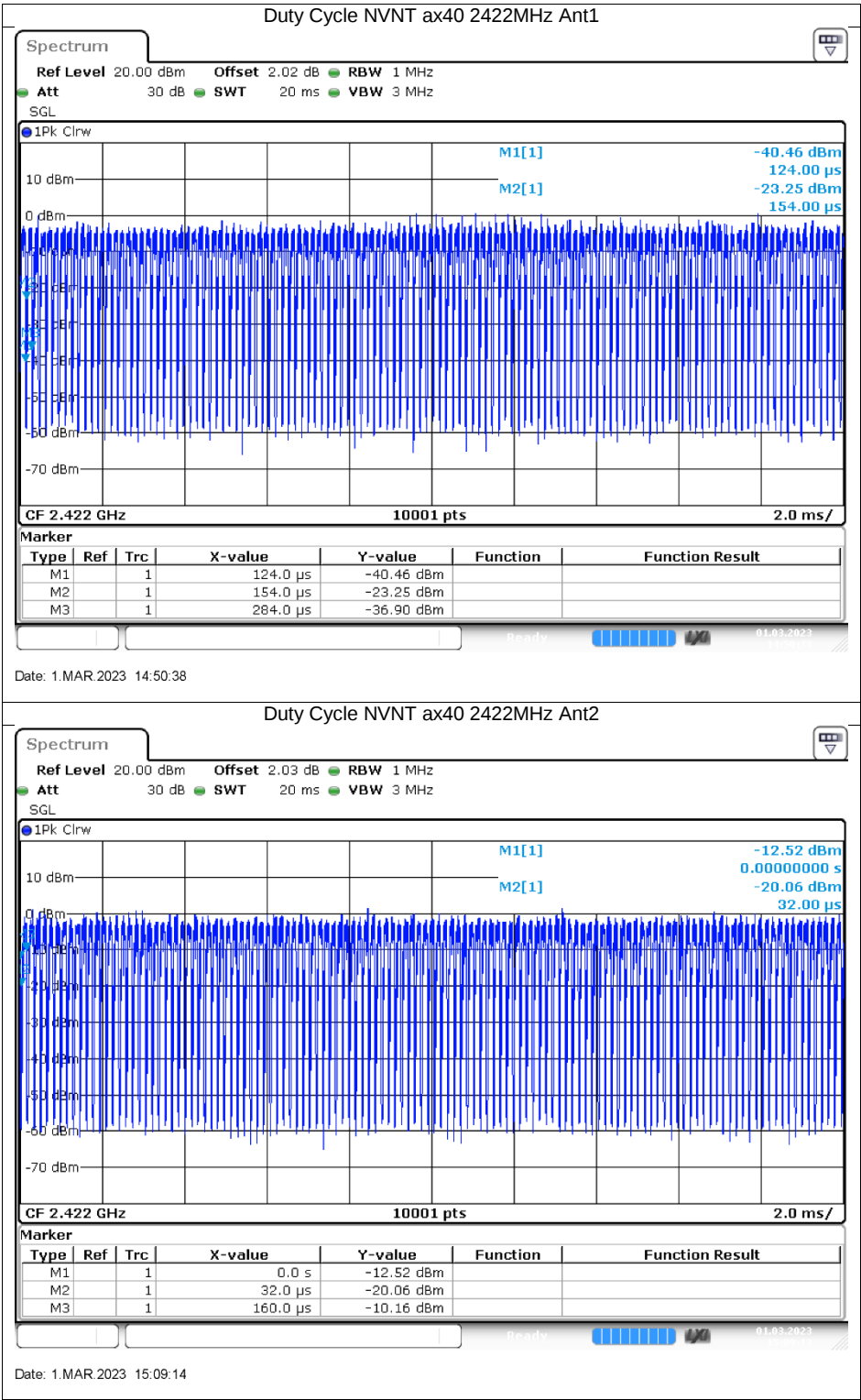


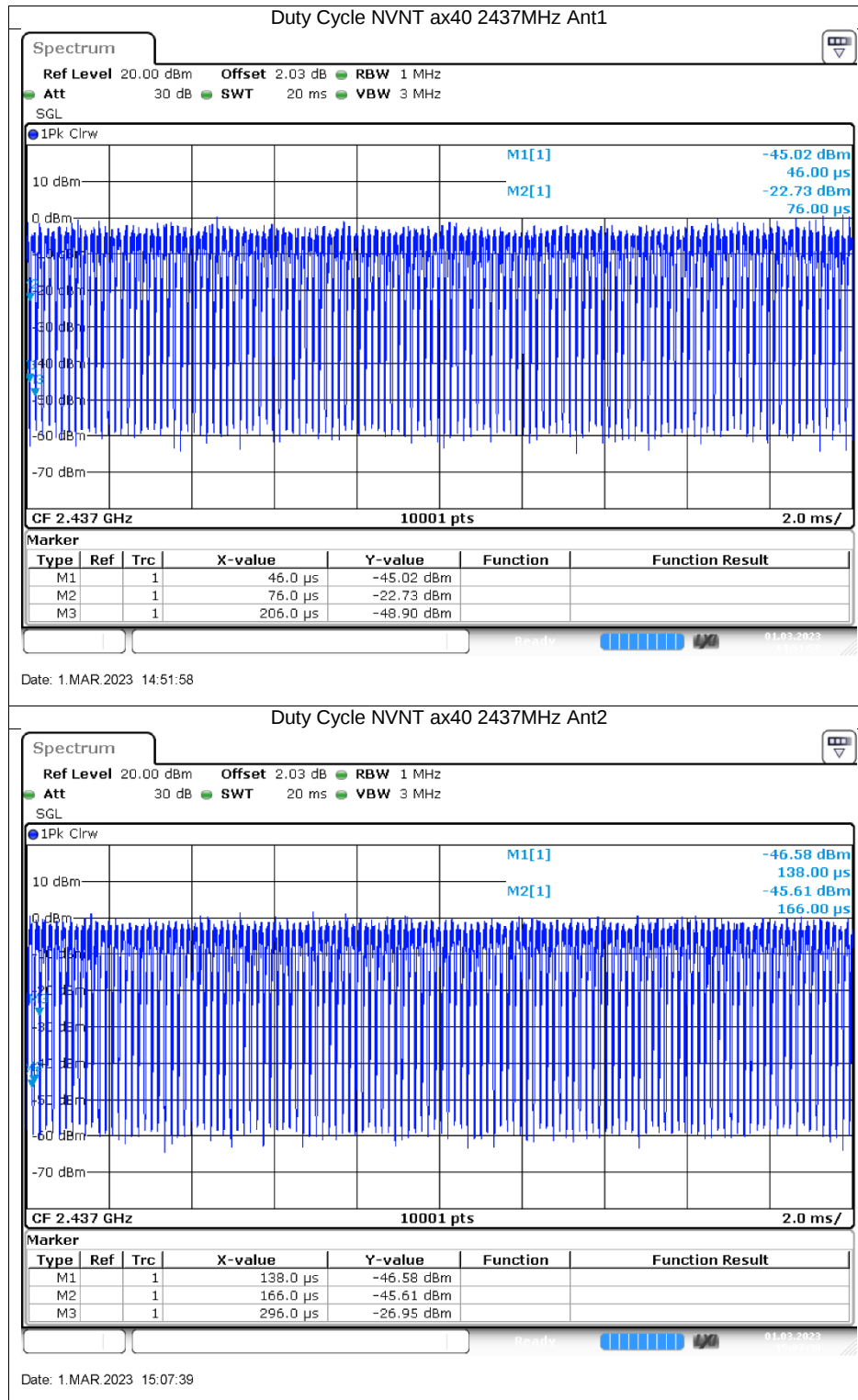


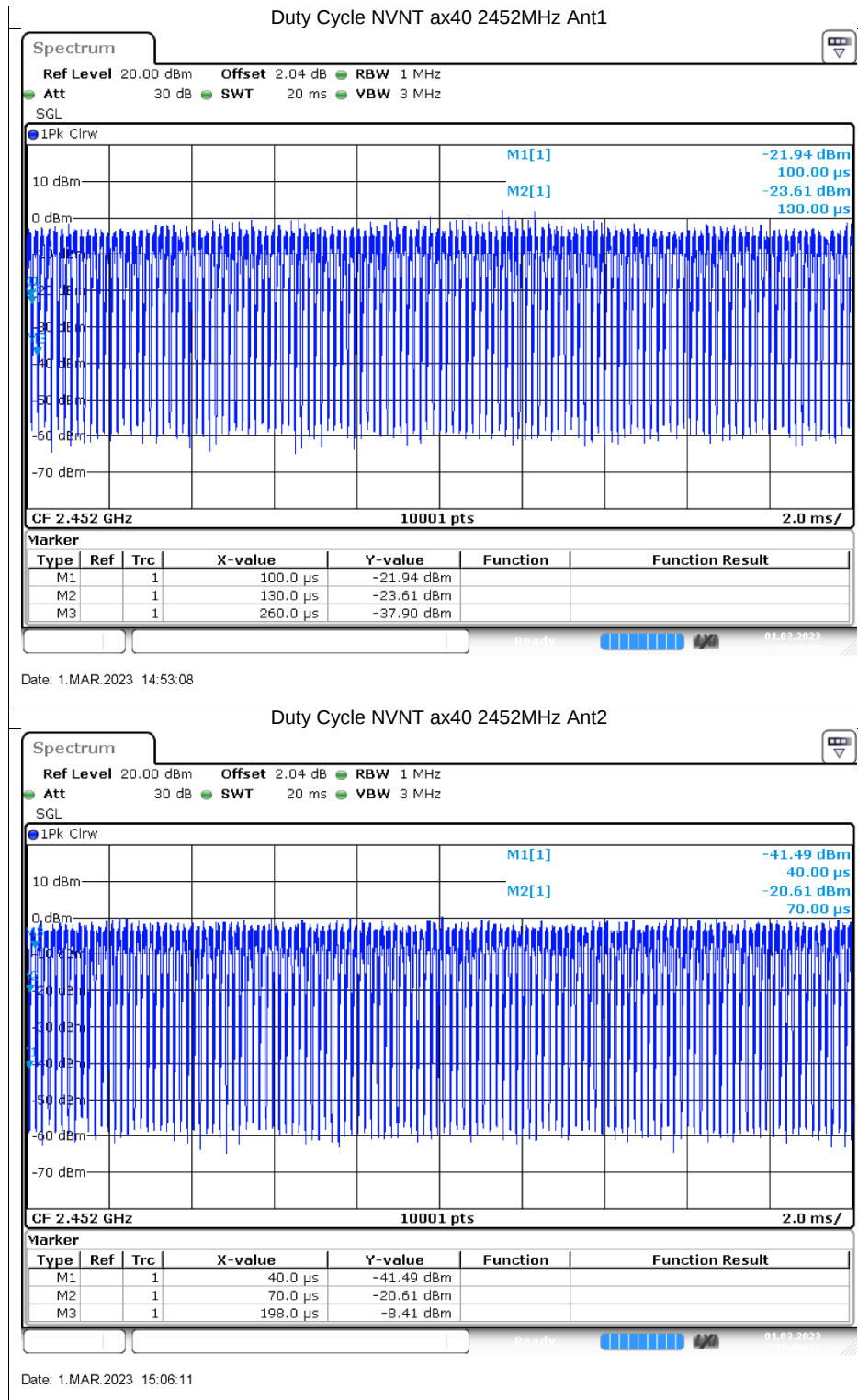












Maximum Conducted Output Power

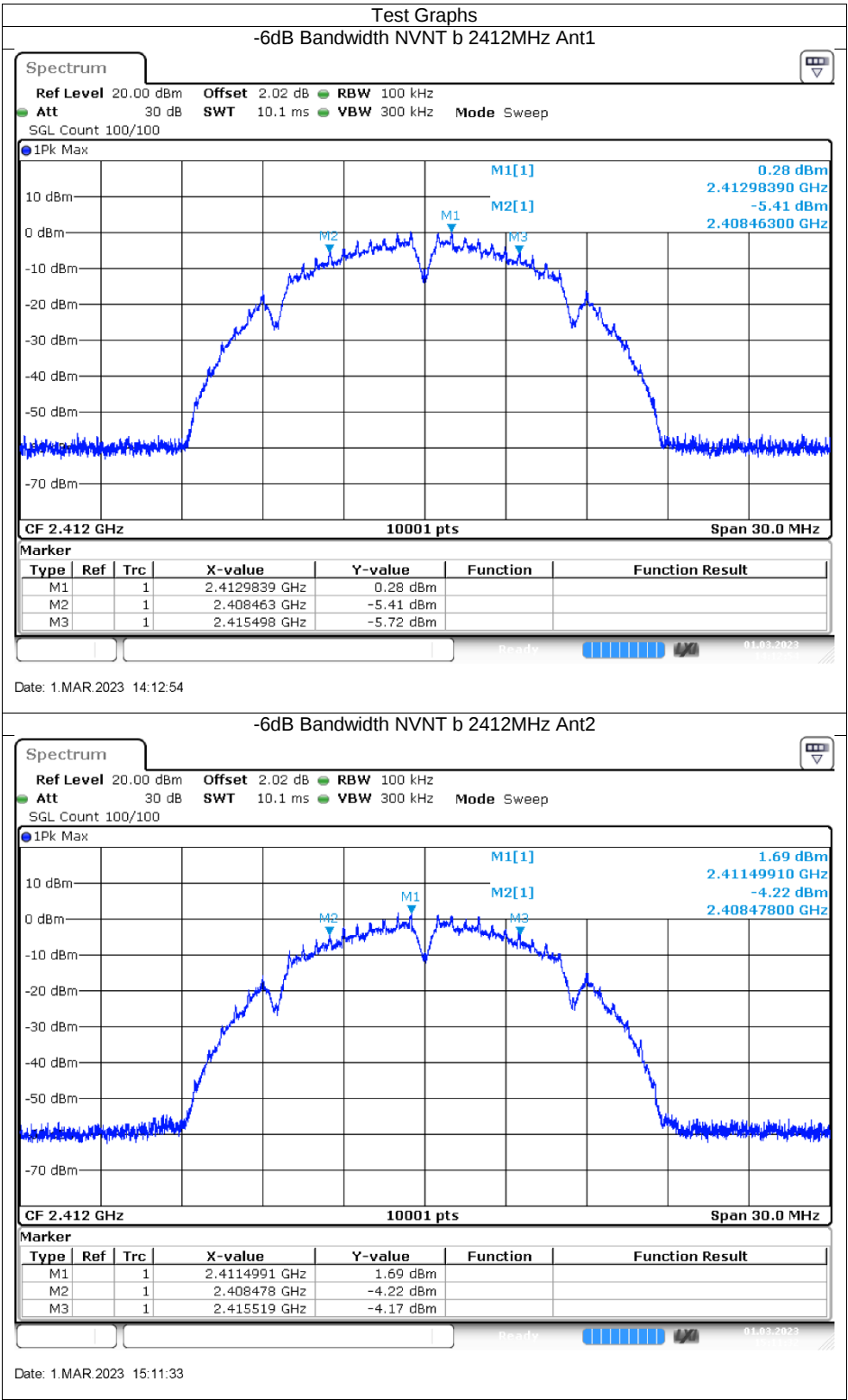
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant1	8.47	30	Pass
NVNT	b	2412	Ant2	10.13	30	Pass
NVNT	b	2437	Ant1	8.71	30	Pass
NVNT	b	2437	Ant2	10.61	30	Pass
NVNT	b	2462	Ant1	8.88	30	Pass
NVNT	b	2462	Ant2	10.46	30	Pass
NVNT	g	2412	Ant1	7.5	30	Pass
NVNT	g	2412	Ant2	8.97	30	Pass
NVNT	g	2437	Ant1	8.1	30	Pass
NVNT	g	2437	Ant2	9.47	30	Pass
NVNT	g	2462	Ant1	7.82	30	Pass
NVNT	g	2462	Ant2	9.45	30	Pass
NVNT	n20	2412	Ant1	7.24	30	Pass
NVNT	n20	2412	Ant2	8.9	30	Pass
NVNT	n20	2412	Sum	11.16	27	Pass
NVNT	n20	2437	Ant1	7.75	30	Pass
NVNT	n20	2437	Ant2	9.43	30	Pass
NVNT	n20	2437	Sum	11.68	27	Pass
NVNT	n20	2462	Ant1	7.61	30	Pass
NVNT	n20	2462	Ant2	9.23	30	Pass
NVNT	n20	2462	Sum	11.51	27	Pass
NVNT	n40	2422	Ant1	6.75	30	Pass
NVNT	n40	2422	Ant2	8.35	30	Pass
NVNT	n40	2422	Sum	10.63	27	Pass
NVNT	n40	2437	Ant1	6.97	30	Pass
NVNT	n40	2437	Ant2	8.5	30	Pass
NVNT	n40	2437	Sum	10.81	27	Pass
NVNT	n40	2452	Ant1	6.99	30	Pass
NVNT	n40	2452	Ant2	8.57	30	Pass
NVNT	n40	2452	Sum	10.86	27	Pass
NVNT	ax20	2412	Ant1	7.78	30	Pass
NVNT	ax20	2412	Ant2	9.22	30	Pass
NVNT	ax20	2412	Sum	11.57	27	Pass
NVNT	ax20	2437	Ant1	8.07	30	Pass
NVNT	ax20	2437	Ant2	9.77	30	Pass
NVNT	ax20	2437	Sum	12.01	27	Pass
NVNT	ax20	2462	Ant1	8.11	30	Pass
NVNT	ax20	2462	Ant2	9.71	30	Pass
NVNT	ax20	2462	Sum	11.99	27	Pass
NVNT	ax40	2422	Ant1	7.09	30	Pass
NVNT	ax40	2422	Ant2	8.72	30	Pass
NVNT	ax40	2422	Sum	10.99	27	Pass
NVNT	ax40	2437	Ant1	7.3	30	Pass
NVNT	ax40	2437	Ant2	9.05	30	Pass
NVNT	ax40	2437	Sum	11.27	27	Pass
NVNT	ax40	2452	Ant1	7.21	30	Pass
NVNT	ax40	2452	Ant2	9.16	30	Pass
NVNT	ax40	2452	Sum	11.3	27	Pass

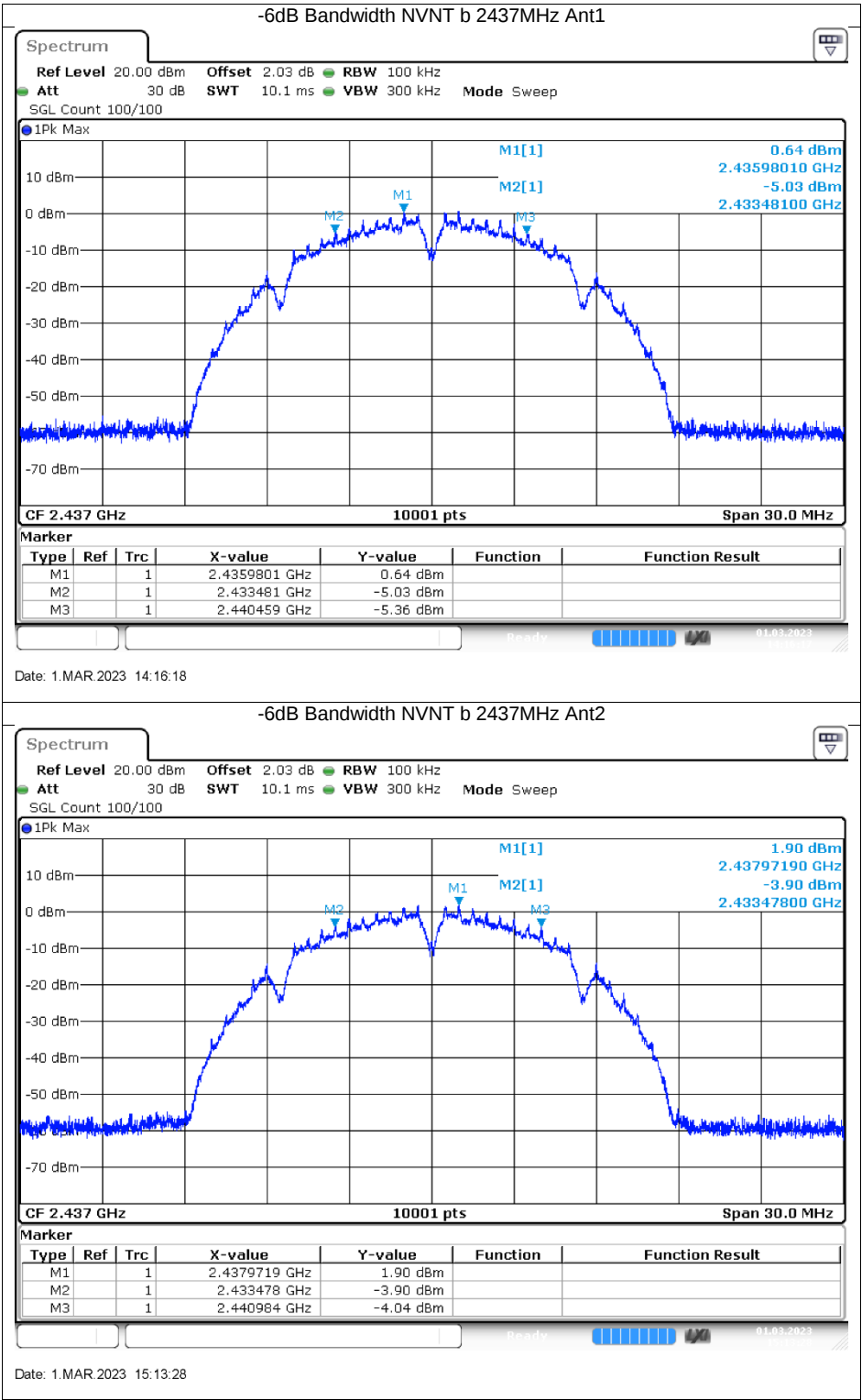
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Antenna Gain (dBi)	E.i.r.p. (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant1	8.47	9	17.47	36.02	Pass
NVNT	b	2412	Ant2	10.13	9	19.13	36.02	Pass
NVNT	b	2437	Ant1	8.71	9	17.71	36.02	Pass
NVNT	b	2437	Ant2	10.61	9	19.61	36.02	Pass
NVNT	b	2462	Ant1	8.88	9	17.88	36.02	Pass
NVNT	b	2462	Ant2	10.46	9	19.46	36.02	Pass
NVNT	g	2412	Ant1	7.5	9	16.5	36.02	Pass
NVNT	g	2412	Ant2	8.97	9	17.97	36.02	Pass
NVNT	g	2437	Ant1	8.1	9	17.1	36.02	Pass
NVNT	g	2437	Ant2	9.47	9	18.47	36.02	Pass
NVNT	g	2462	Ant1	7.82	9	16.82	36.02	Pass
NVNT	g	2462	Ant2	9.45	9	18.45	36.02	Pass
NVNT	n20	2412	Ant1	7.24	9	16.24	36.02	Pass
NVNT	n20	2412	Ant2	8.9	9	17.9	36.02	Pass
NVNT	n20	2412	Sum	11.16	-	20.16	33.02	Pass
NVNT	n20	2437	Ant1	7.75	9	16.75	36.02	Pass
NVNT	n20	2437	Ant2	9.43	9	18.43	36.02	Pass
NVNT	n20	2437	Sum	11.68	-	20.68	33.02	Pass

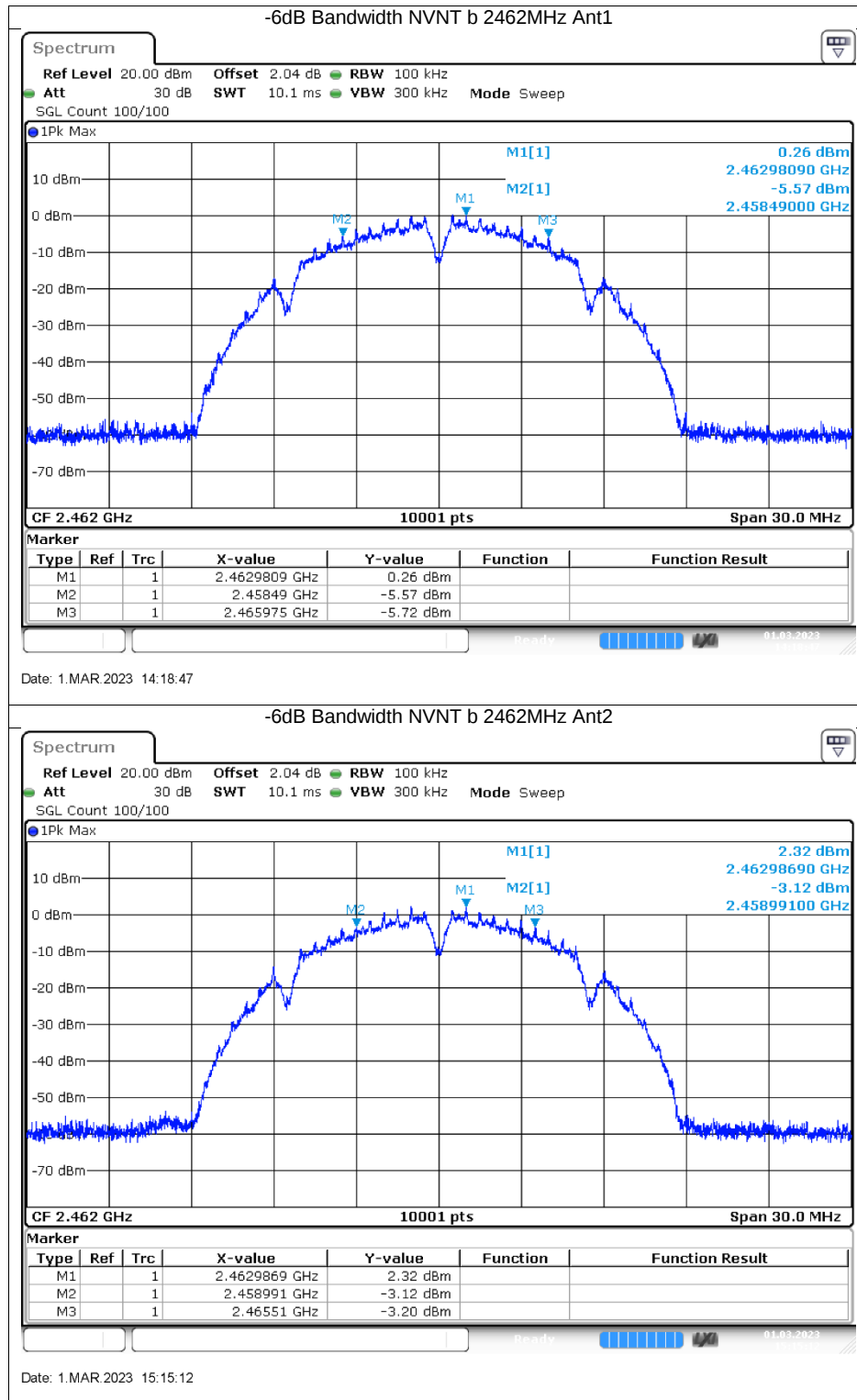
NVNT	n20	2462	Ant1	7.61	9	16.61	36.02	Pass
NVNT	n20	2462	Ant2	9.23	9	18.23	36.02	Pass
NVNT	n20	2462	Sum	11.51	-	20.51	33.02	Pass
NVNT	n40	2422	Ant1	6.75	9	15.75	36.02	Pass
NVNT	n40	2422	Ant2	8.35	9	17.35	36.02	Pass
NVNT	n40	2422	Sum	10.63	-	19.63	33.02	Pass
NVNT	n40	2437	Ant1	6.97	9	15.97	36.02	Pass
NVNT	n40	2437	Ant2	8.5	9	17.5	36.02	Pass
NVNT	n40	2437	Sum	10.81	-	19.81	33.02	Pass
NVNT	n40	2452	Ant1	6.99	9	15.99	36.02	Pass
NVNT	n40	2452	Ant2	8.57	9	17.57	36.02	Pass
NVNT	n40	2452	Sum	10.86	-	19.86	33.02	Pass
NVNT	ax20	2412	Ant1	7.78	9	16.78	36.02	Pass
NVNT	ax20	2412	Ant2	9.22	9	18.22	36.02	Pass
NVNT	ax20	2412	Sum	11.57	-	20.57	33.02	Pass
NVNT	ax20	2437	Ant1	8.07	9	17.07	36.02	Pass
NVNT	ax20	2437	Ant2	9.77	9	18.77	36.02	Pass
NVNT	ax20	2437	Sum	12.01	-	21.01	33.02	Pass
NVNT	ax20	2462	Ant1	8.11	9	17.11	36.02	Pass
NVNT	ax20	2462	Ant2	9.71	9	18.71	36.02	Pass
NVNT	ax20	2462	Sum	11.99	-	20.99	33.02	Pass
NVNT	ax40	2422	Ant1	7.09	9	16.09	36.02	Pass
NVNT	ax40	2422	Ant2	8.72	9	17.72	36.02	Pass
NVNT	ax40	2422	Sum	10.99	-	19.99	33.02	Pass
NVNT	ax40	2437	Ant1	7.3	9	16.3	36.02	Pass
NVNT	ax40	2437	Ant2	9.05	9	18.05	36.02	Pass
NVNT	ax40	2437	Sum	11.27	-	20.27	33.02	Pass
NVNT	ax40	2452	Ant1	7.21	9	16.21	36.02	Pass
NVNT	ax40	2452	Ant2	9.16	9	18.16	36.02	Pass
NVNT	ax40	2452	Sum	11.3	-	20.3	33.02	Pass

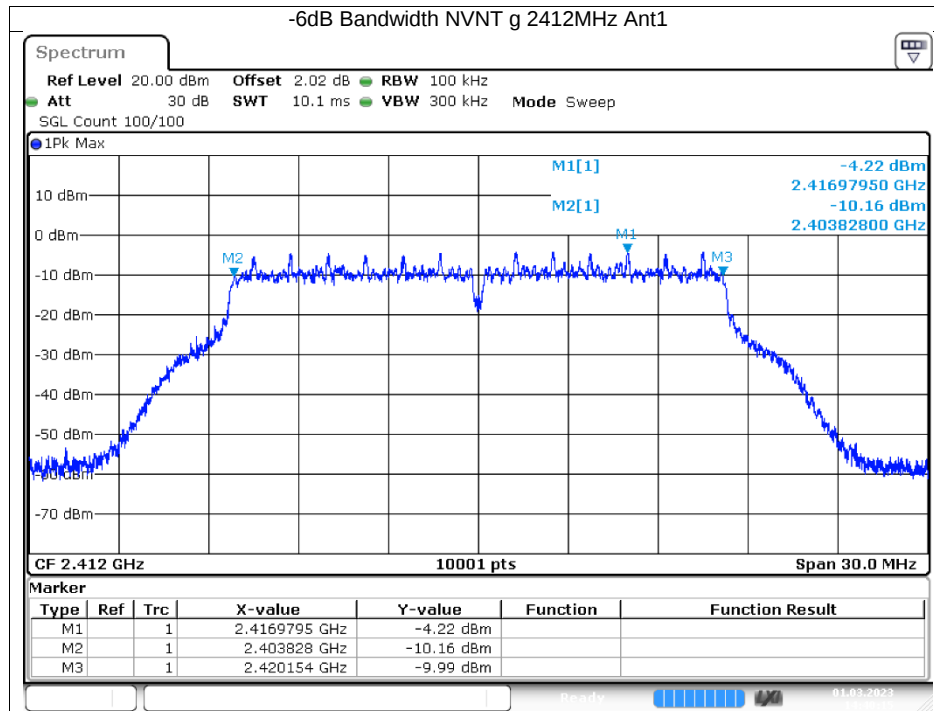
-6dB Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	b	2412	Ant1	7.035	0.5	Pass
NVNT	b	2412	Ant2	7.041	0.5	Pass
NVNT	b	2437	Ant1	6.978	0.5	Pass
NVNT	b	2437	Ant2	7.506	0.5	Pass
NVNT	b	2462	Ant1	7.485	0.5	Pass
NVNT	b	2462	Ant2	6.519	0.5	Pass
NVNT	g	2412	Ant1	16.326	0.5	Pass
NVNT	g	2412	Ant2	16.047	0.5	Pass
NVNT	g	2437	Ant1	16.332	0.5	Pass
NVNT	g	2437	Ant2	16.329	0.5	Pass
NVNT	g	2462	Ant1	16.314	0.5	Pass
NVNT	g	2462	Ant2	16.317	0.5	Pass
NVNT	n20	2412	Ant1	17.514	0.5	Pass
NVNT	n20	2412	Ant2	17.28	0.5	Pass
NVNT	n20	2437	Ant1	17.574	0.5	Pass
NVNT	n20	2437	Ant2	17.55	0.5	Pass
NVNT	n20	2462	Ant1	17.544	0.5	Pass
NVNT	n20	2462	Ant2	17.541	0.5	Pass
NVNT	n40	2422	Ant1	35.658	0.5	Pass
NVNT	n40	2422	Ant2	35.706	0.5	Pass
NVNT	n40	2437	Ant1	35.364	0.5	Pass
NVNT	n40	2437	Ant2	36.018	0.5	Pass
NVNT	n40	2452	Ant1	36.294	0.5	Pass
NVNT	n40	2452	Ant2	35.922	0.5	Pass
NVNT	ax20	2412	Ant1	18.837	0.5	Pass
NVNT	ax20	2412	Ant2	18.564	0.5	Pass
NVNT	ax20	2437	Ant1	18.978	0.5	Pass
NVNT	ax20	2437	Ant2	18.939	0.5	Pass
NVNT	ax20	2462	Ant1	18.825	0.5	Pass
NVNT	ax20	2462	Ant2	18.882	0.5	Pass
NVNT	ax40	2422	Ant1	37.548	0.5	Pass
NVNT	ax40	2422	Ant2	36.348	0.5	Pass
NVNT	ax40	2437	Ant1	37.56	0.5	Pass
NVNT	ax40	2437	Ant2	37.596	0.5	Pass
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NVNT	ax40	2452	Ant2	37.596	0.5	Pass

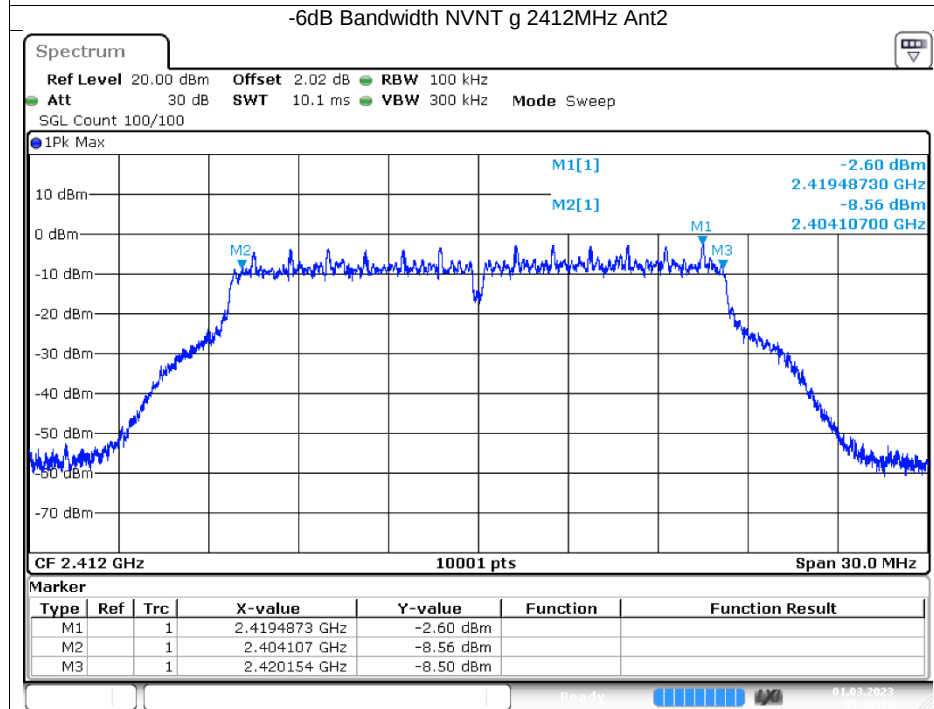




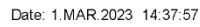


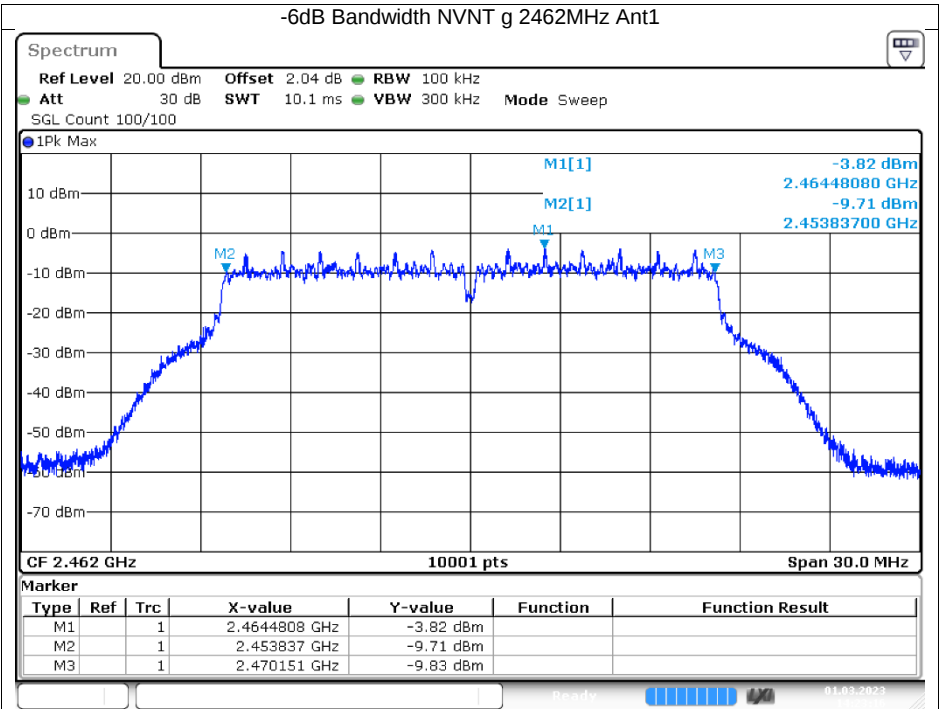


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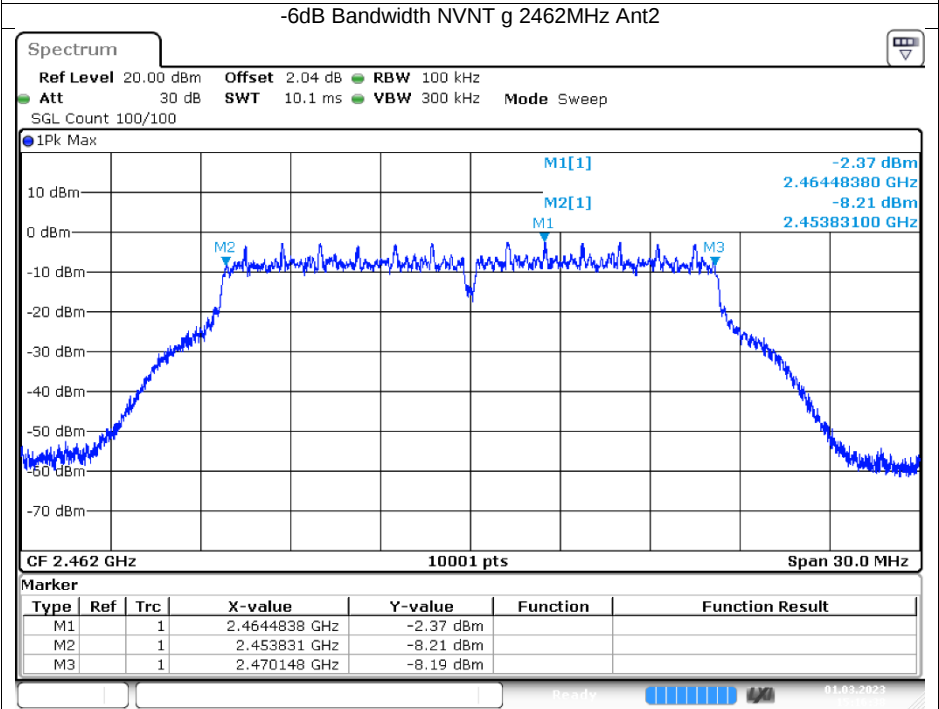


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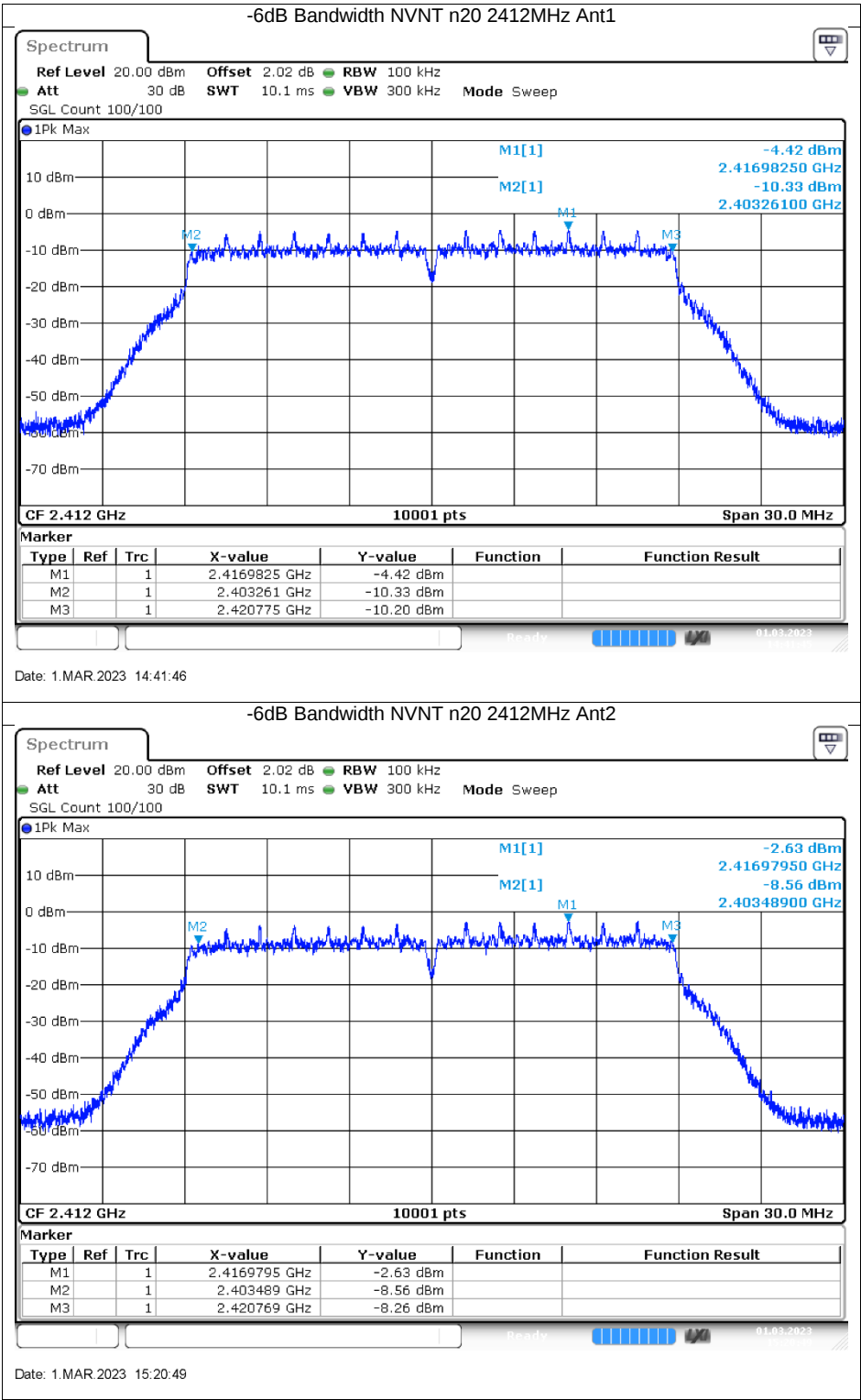


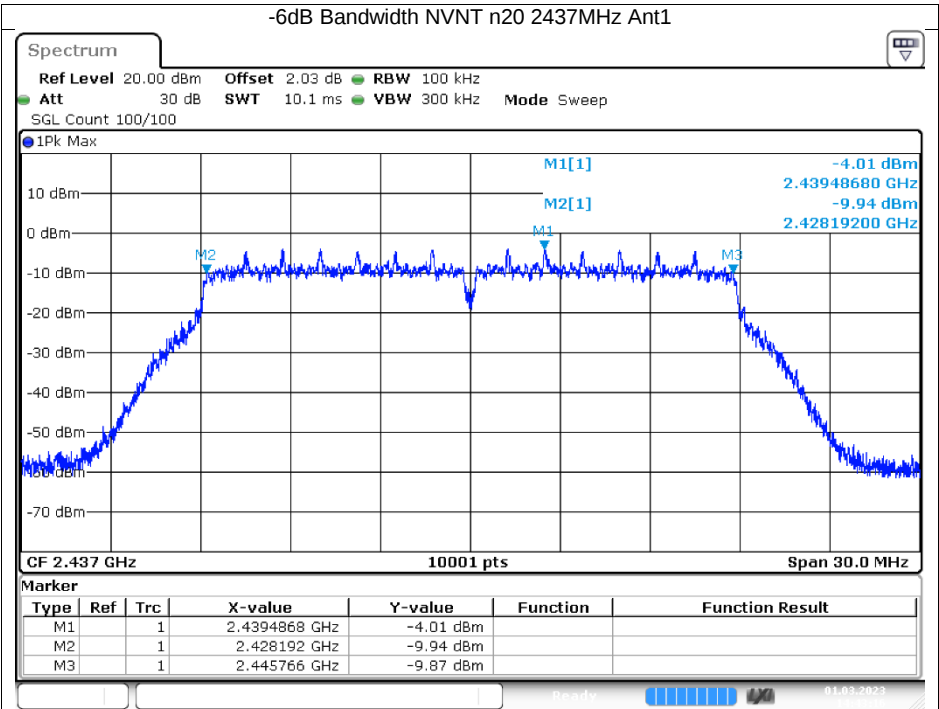


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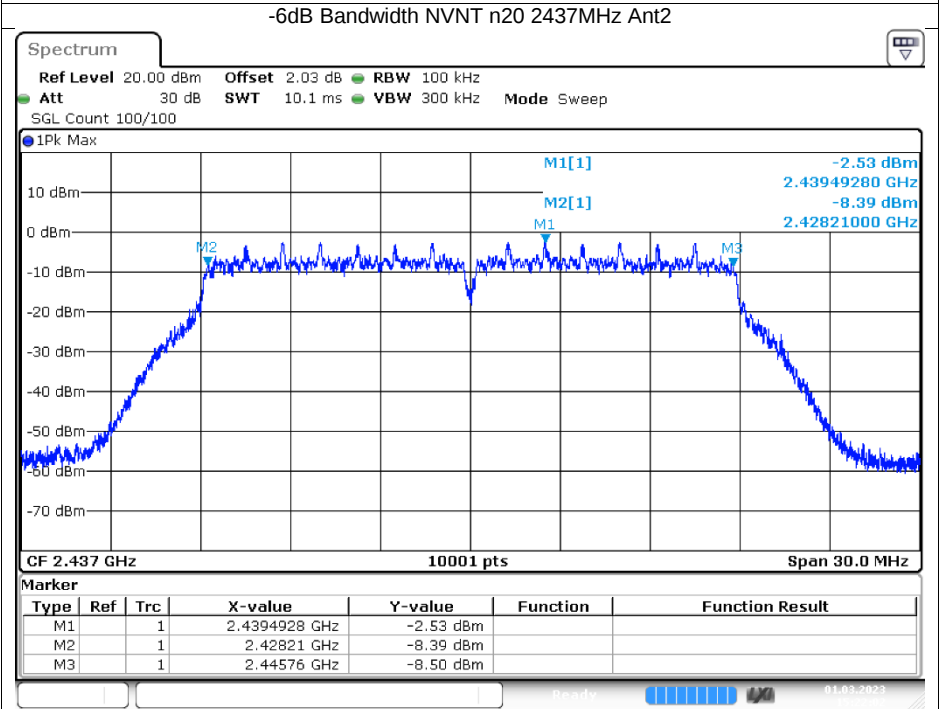


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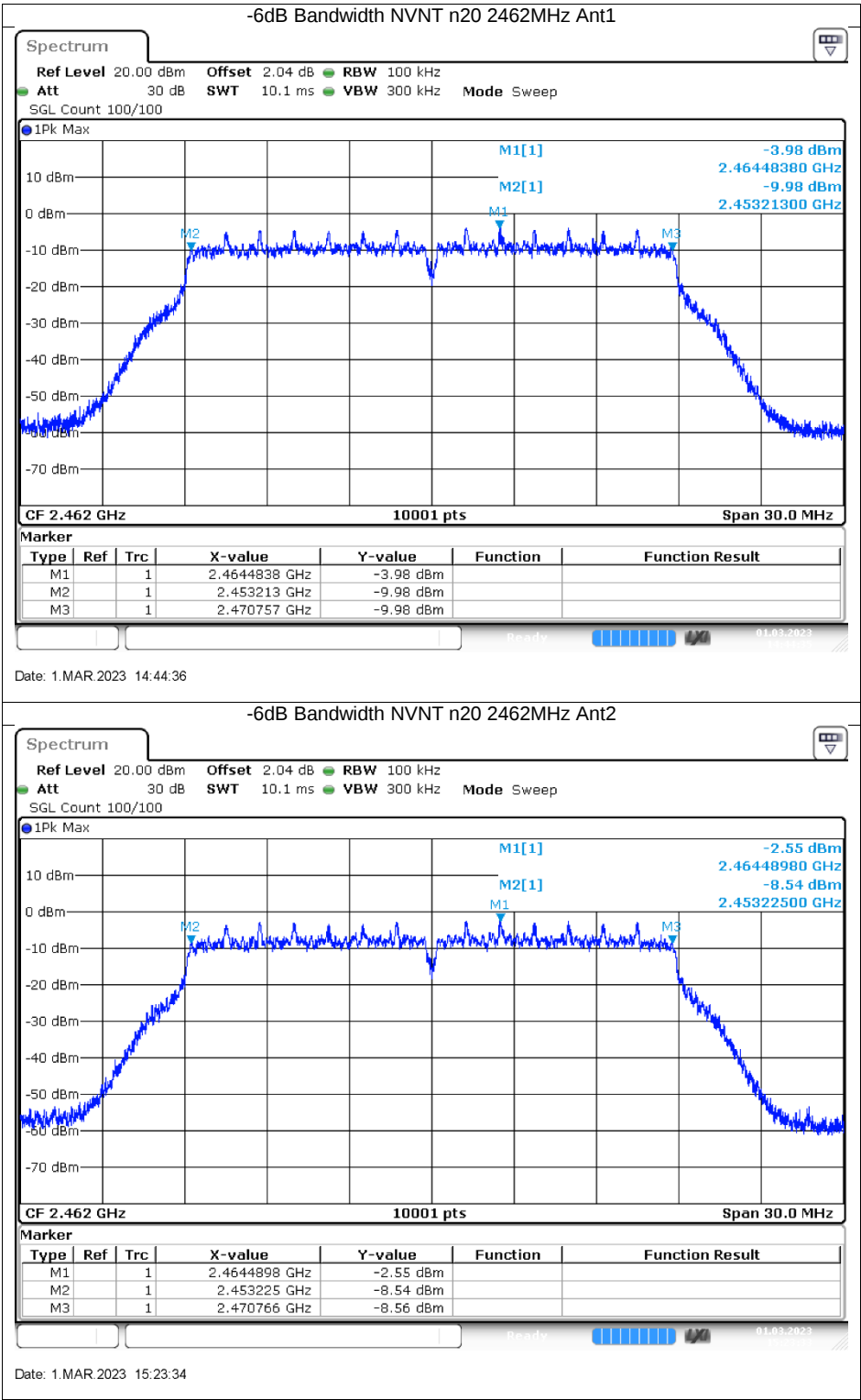


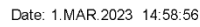


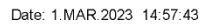
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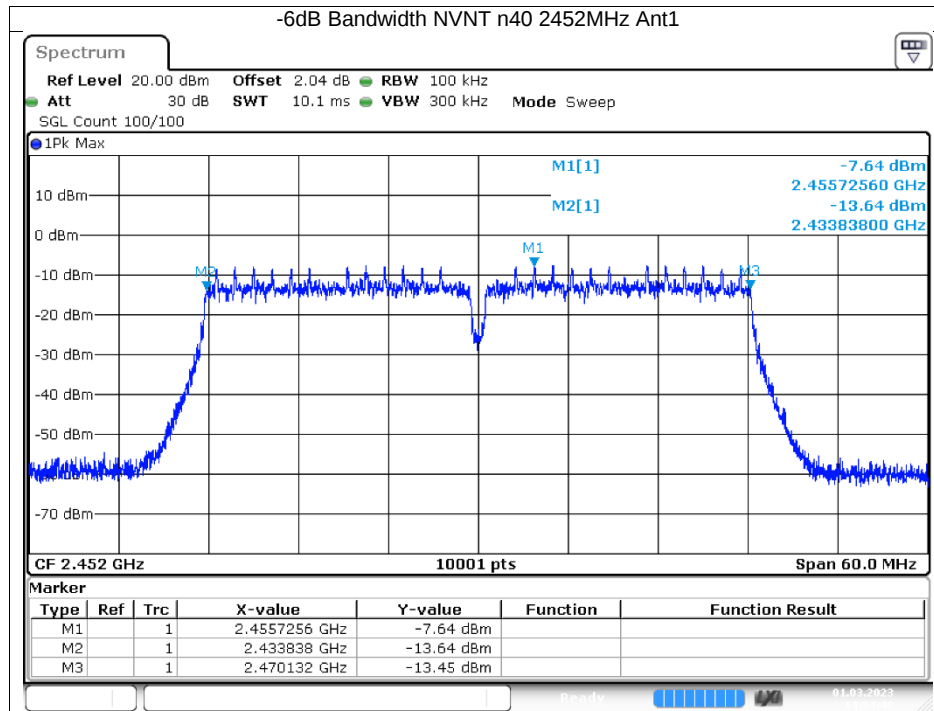


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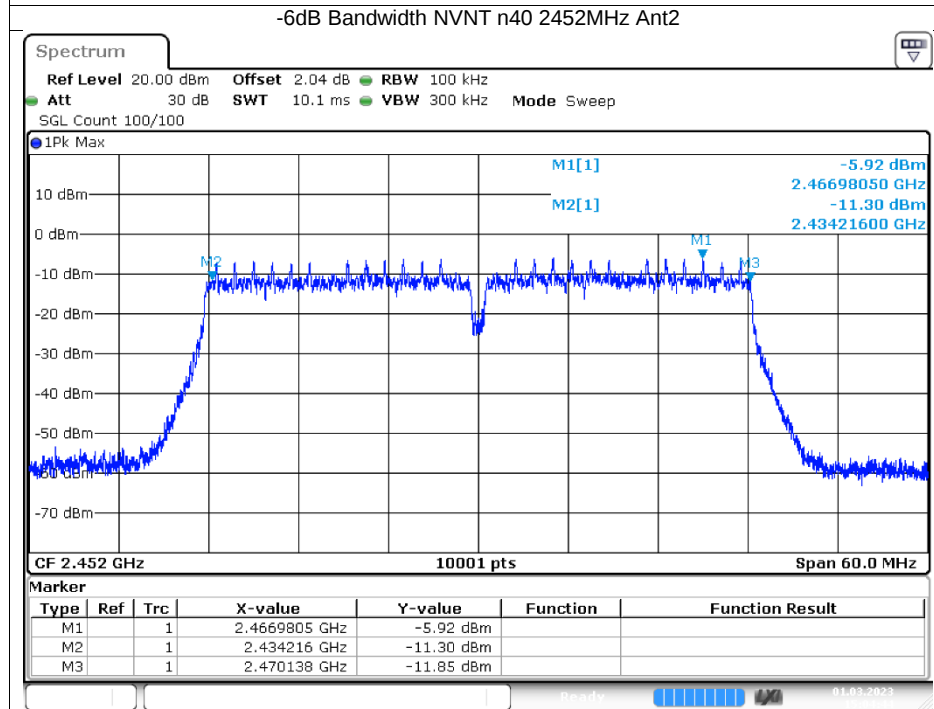








Date: 1.MAR.2023 14:54:49



Date: 1.MAR.2023 15:04:44

