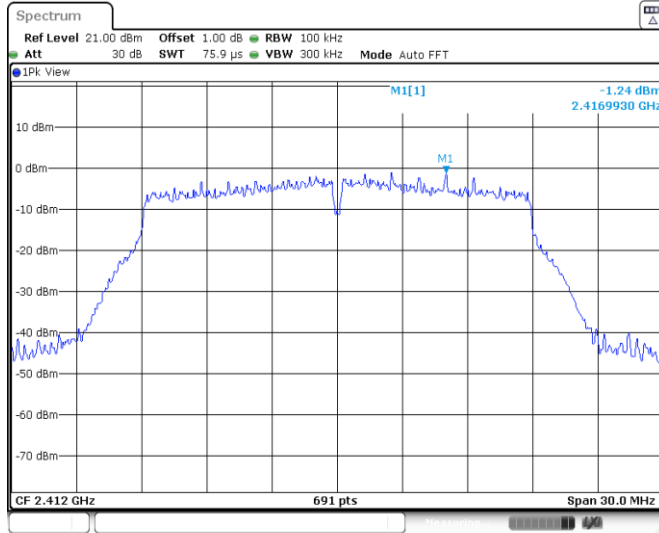
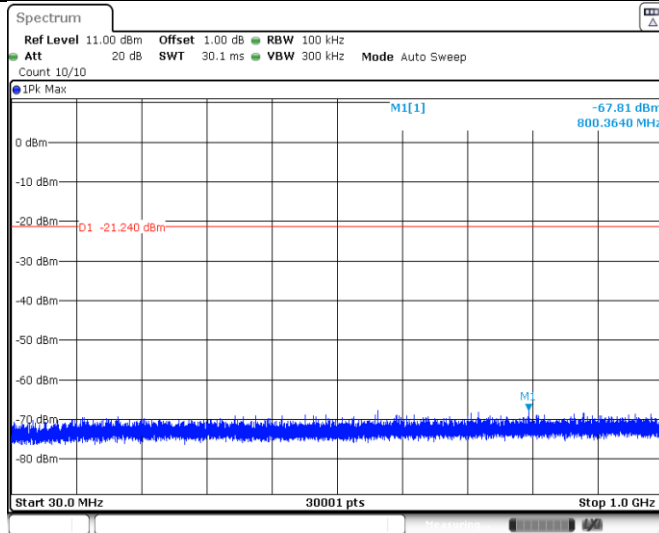


11N20SISO_Ant1_2412_0~Reference



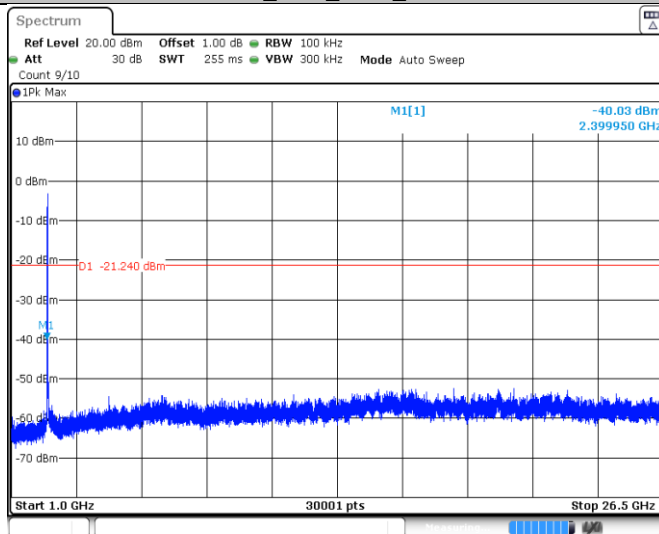
Date: 30 JUL 2022 12:46:32

11N20SISO_Ant1_2412_30~1000

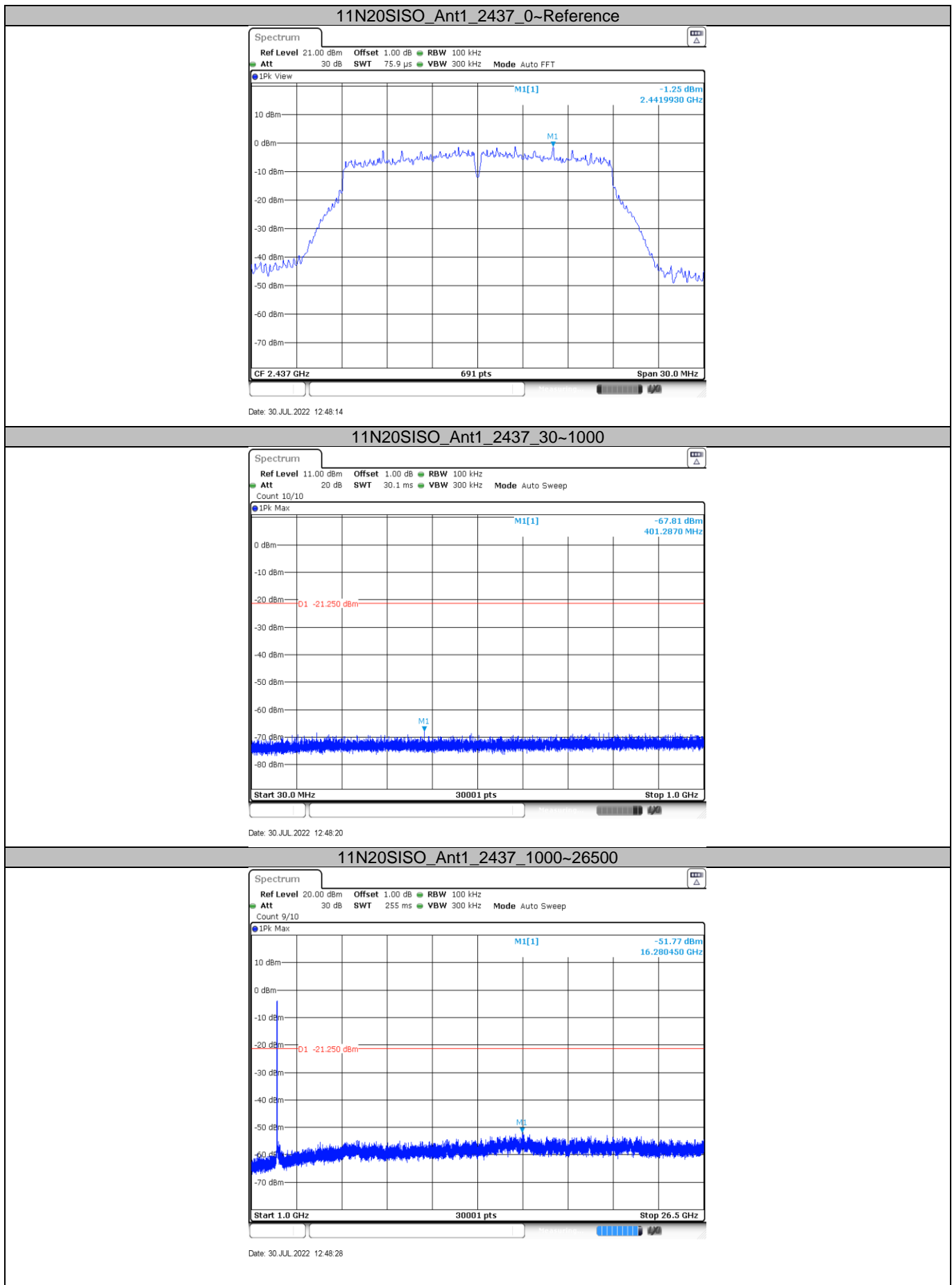


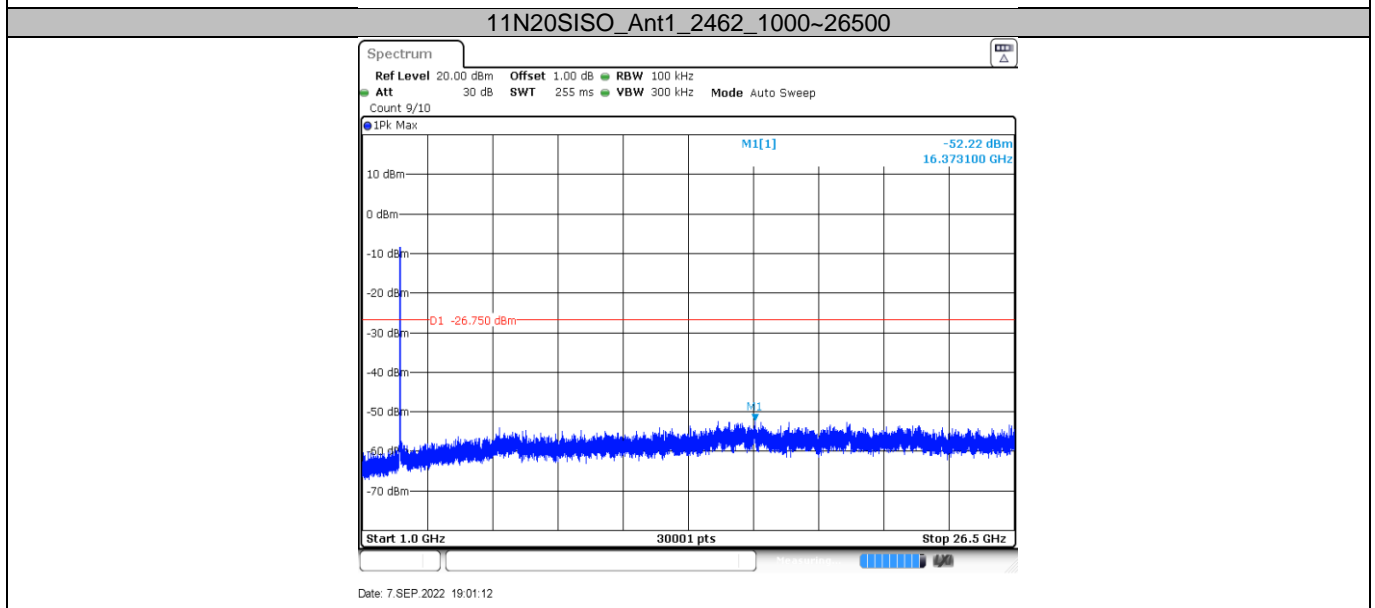
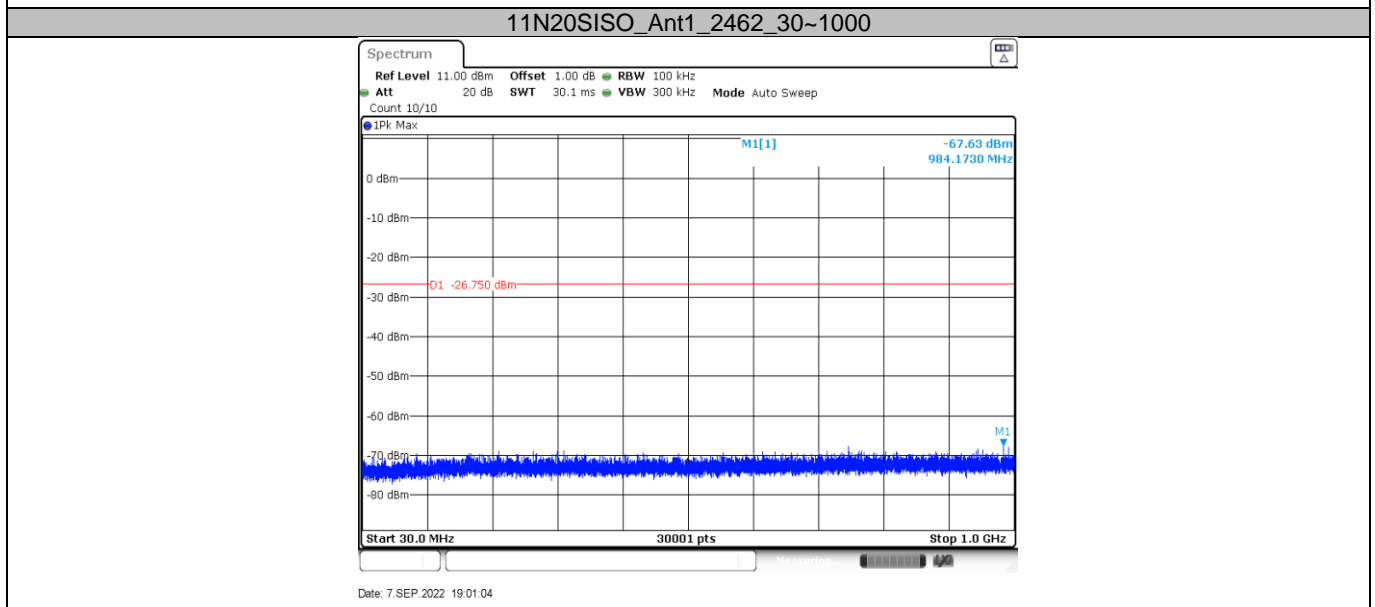
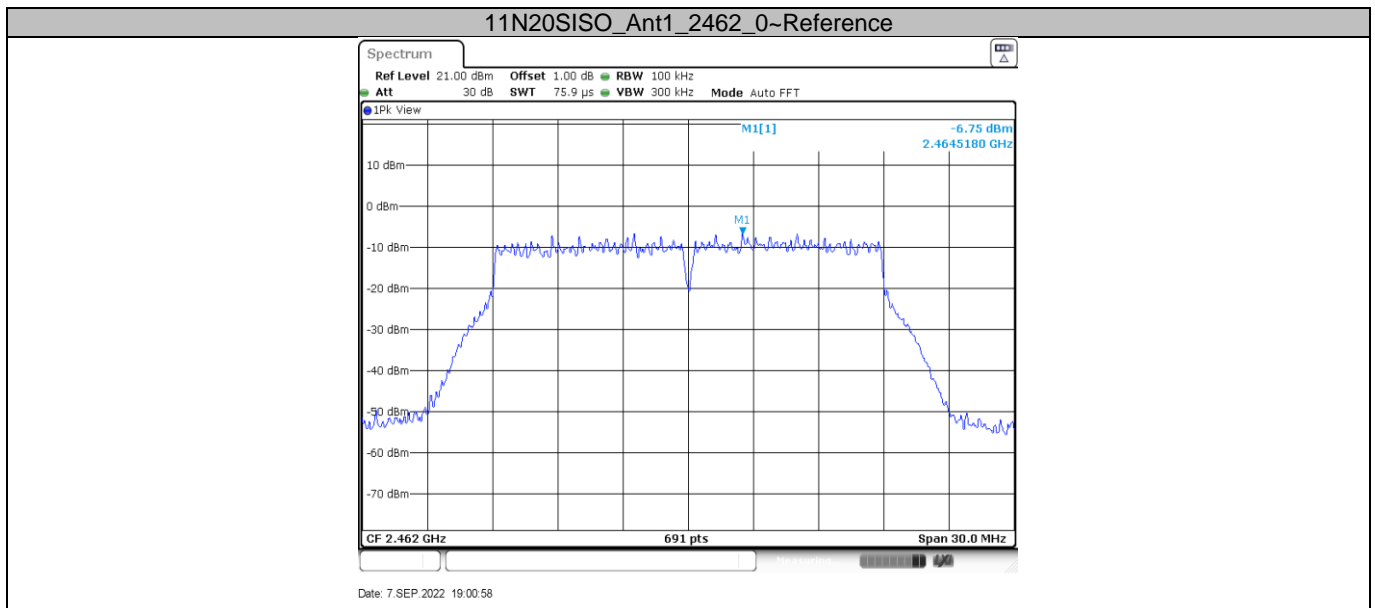
Date: 30 JUL 2022 12:46:38

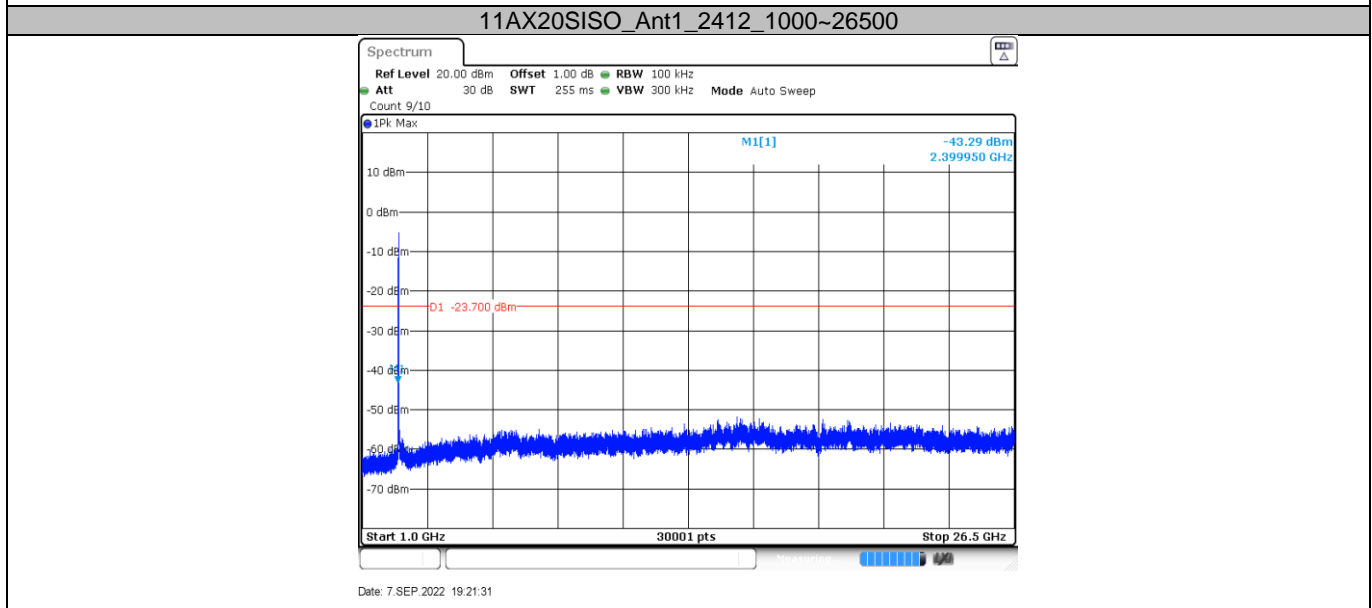
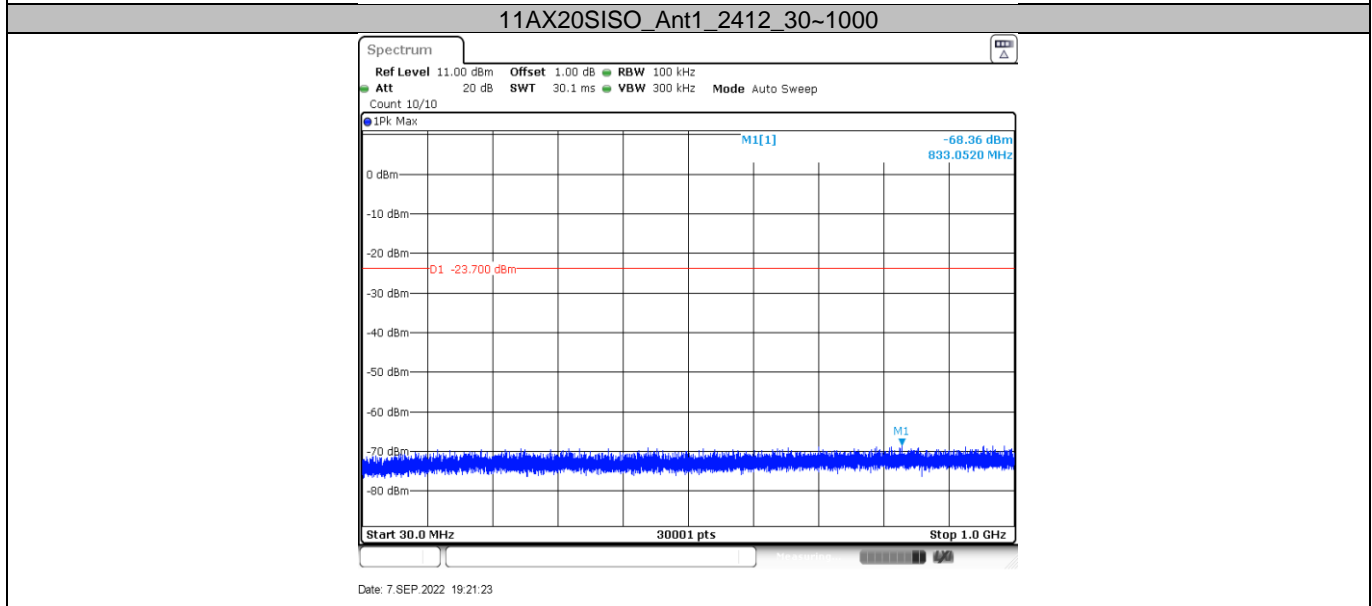
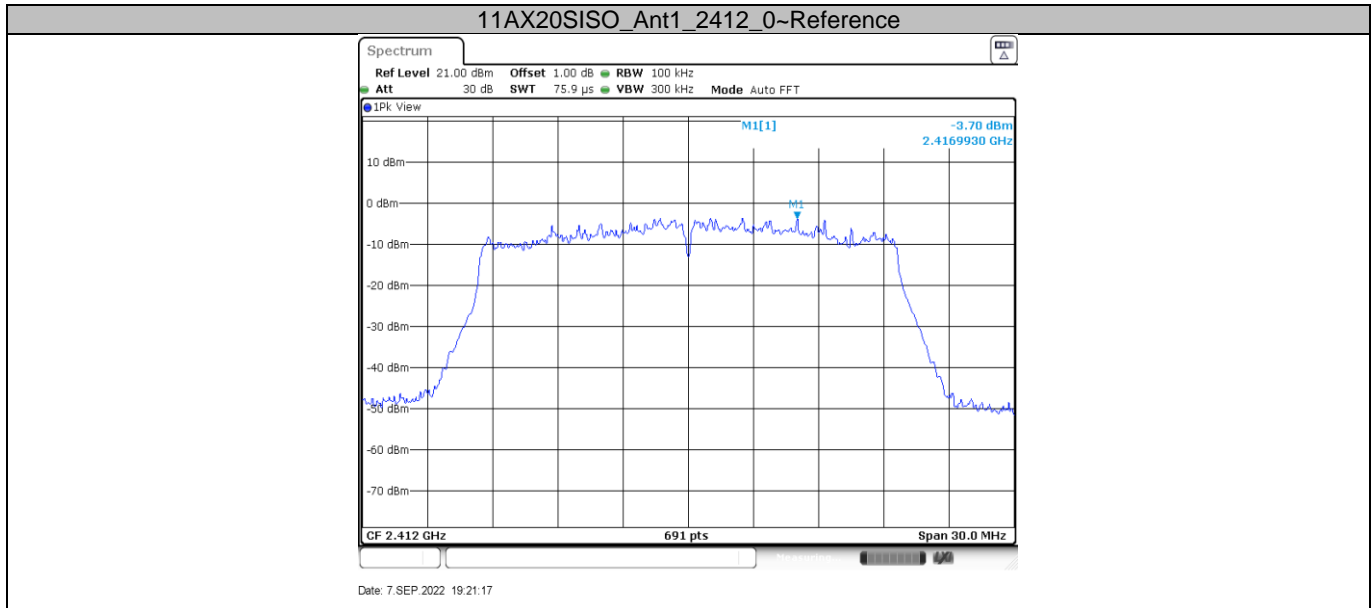
11N20SISO_Ant1_2412_1000~26500

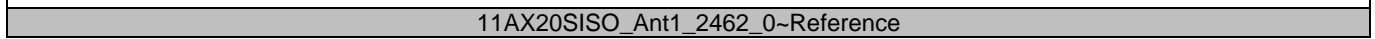
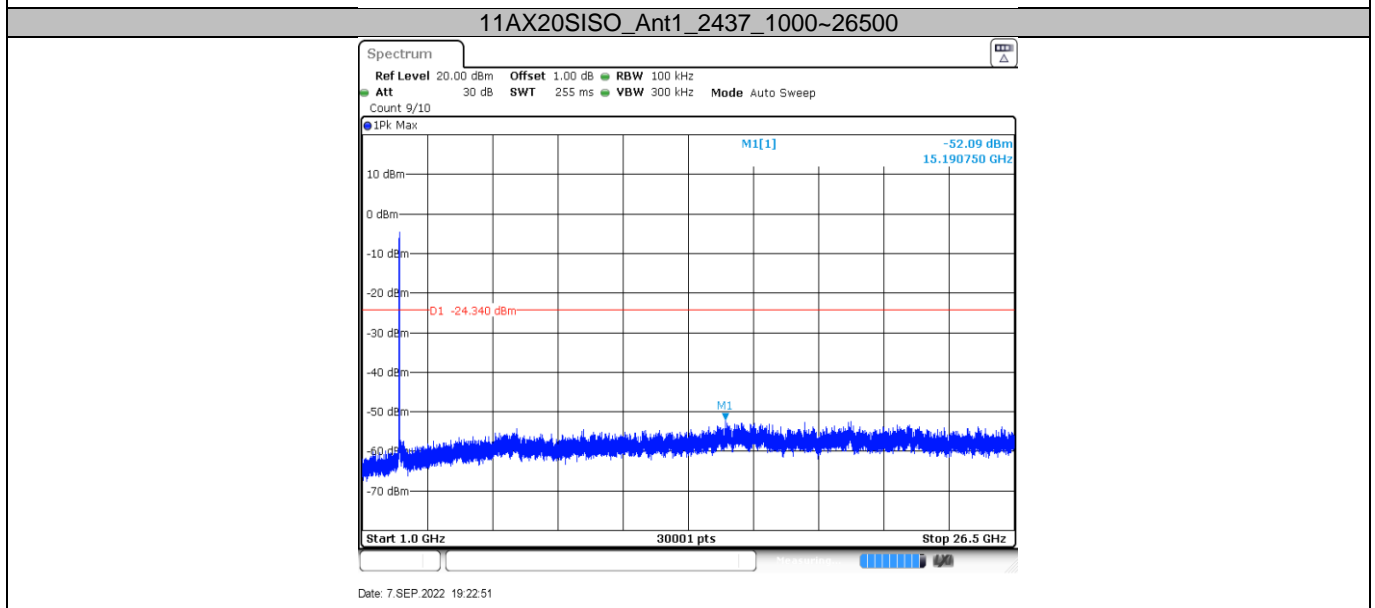
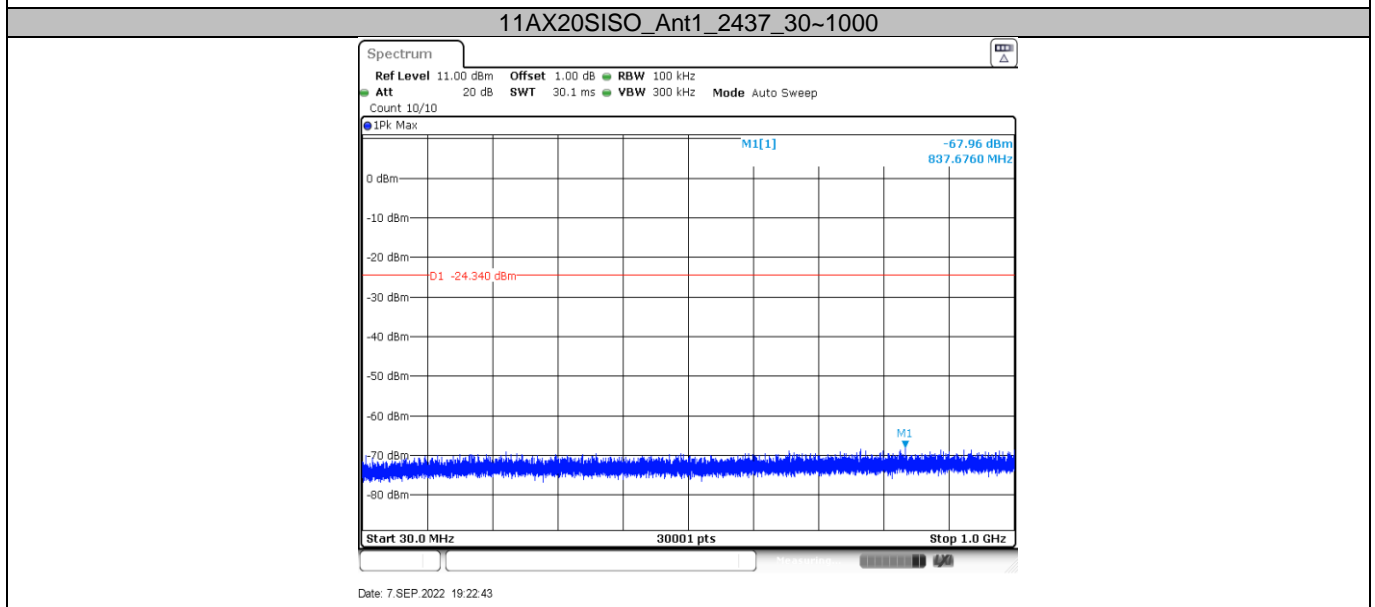
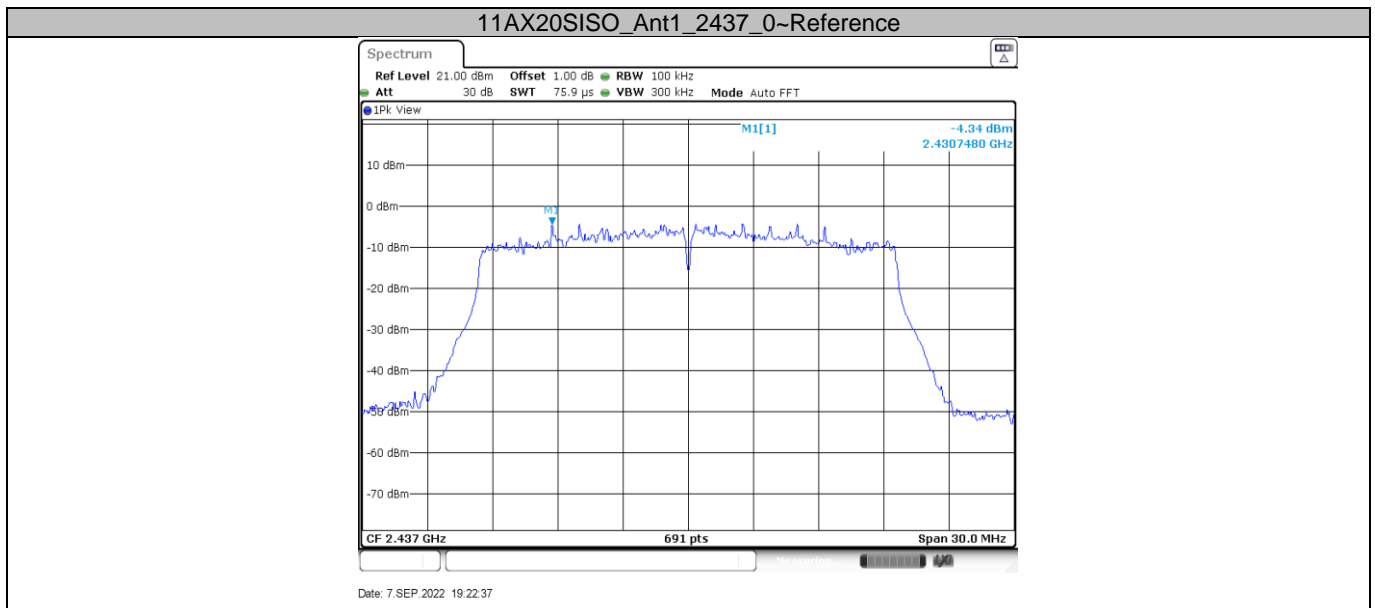


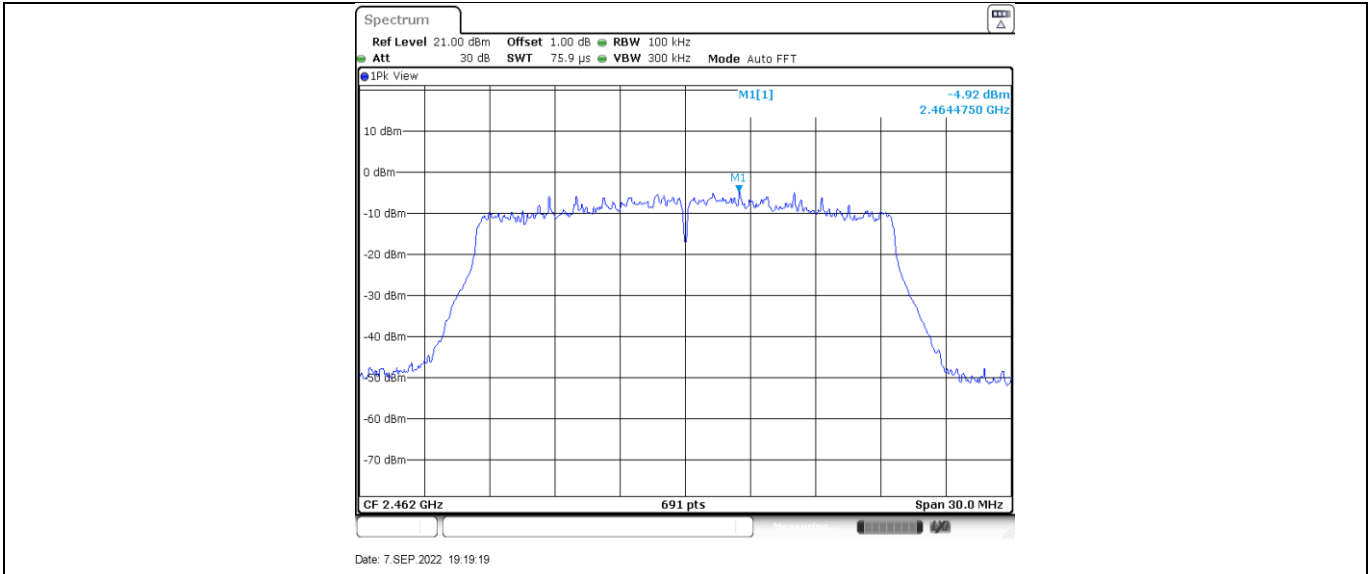
Date: 30 JUL 2022 12:46:46



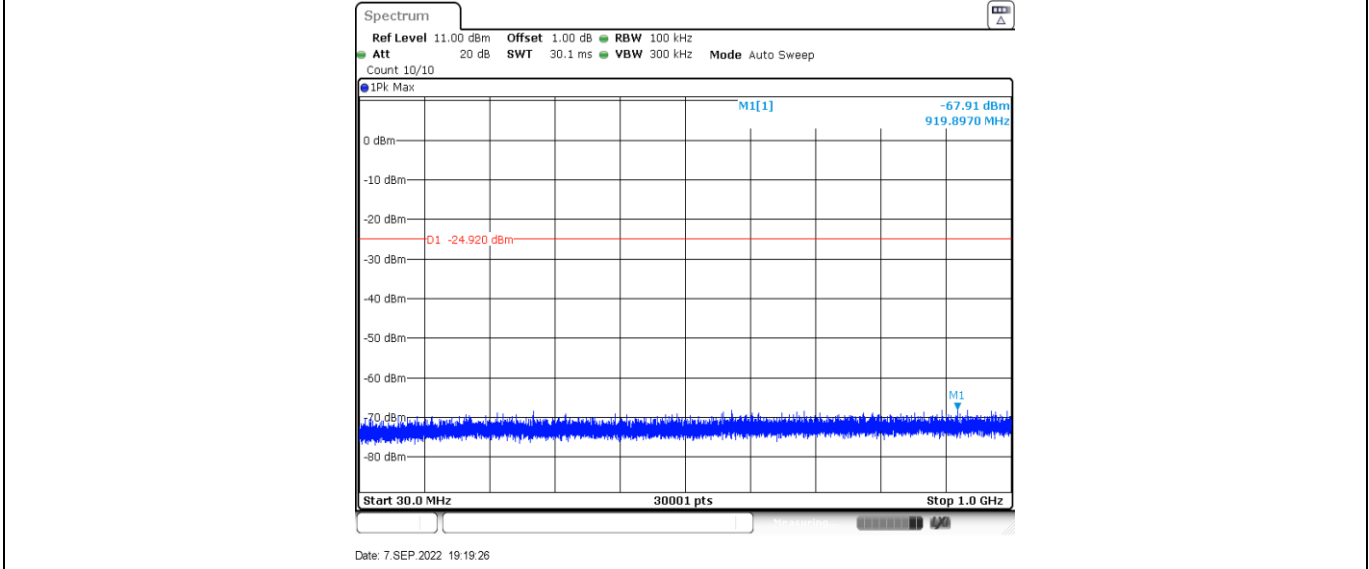




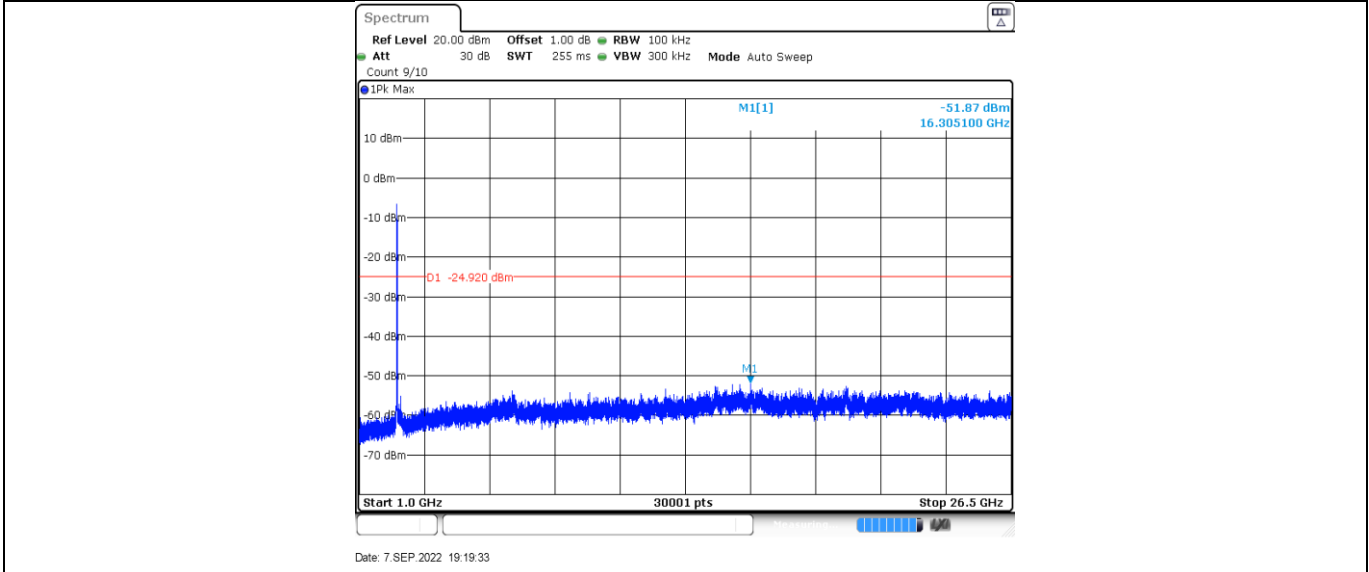


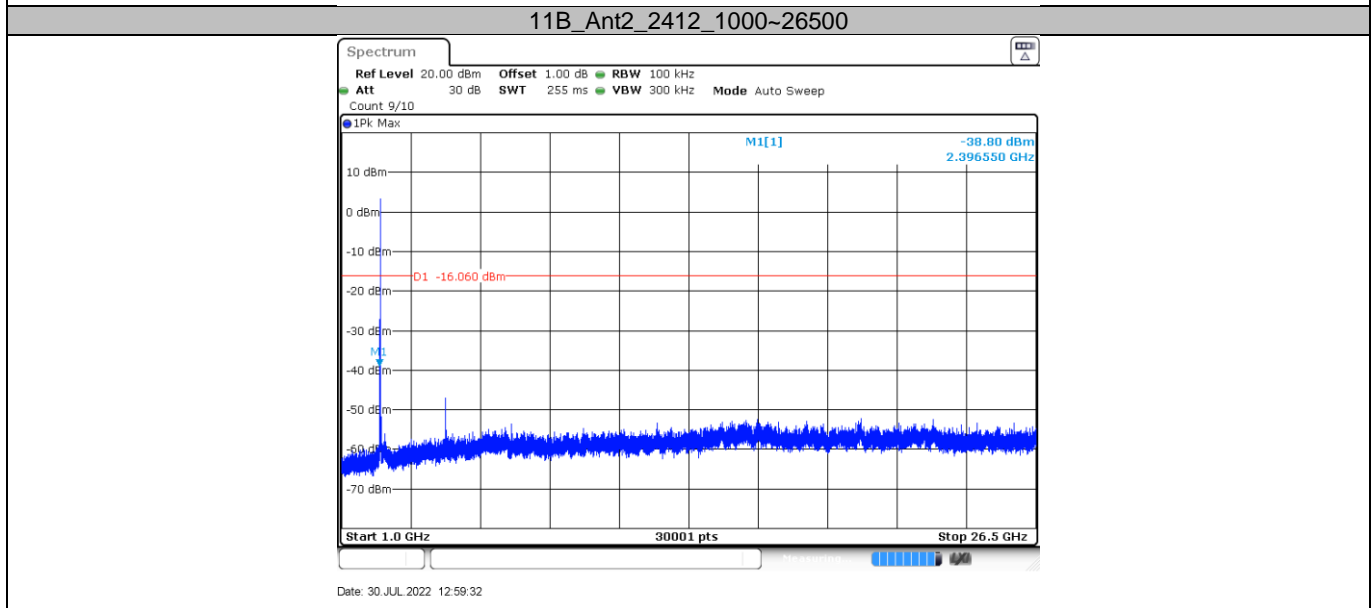
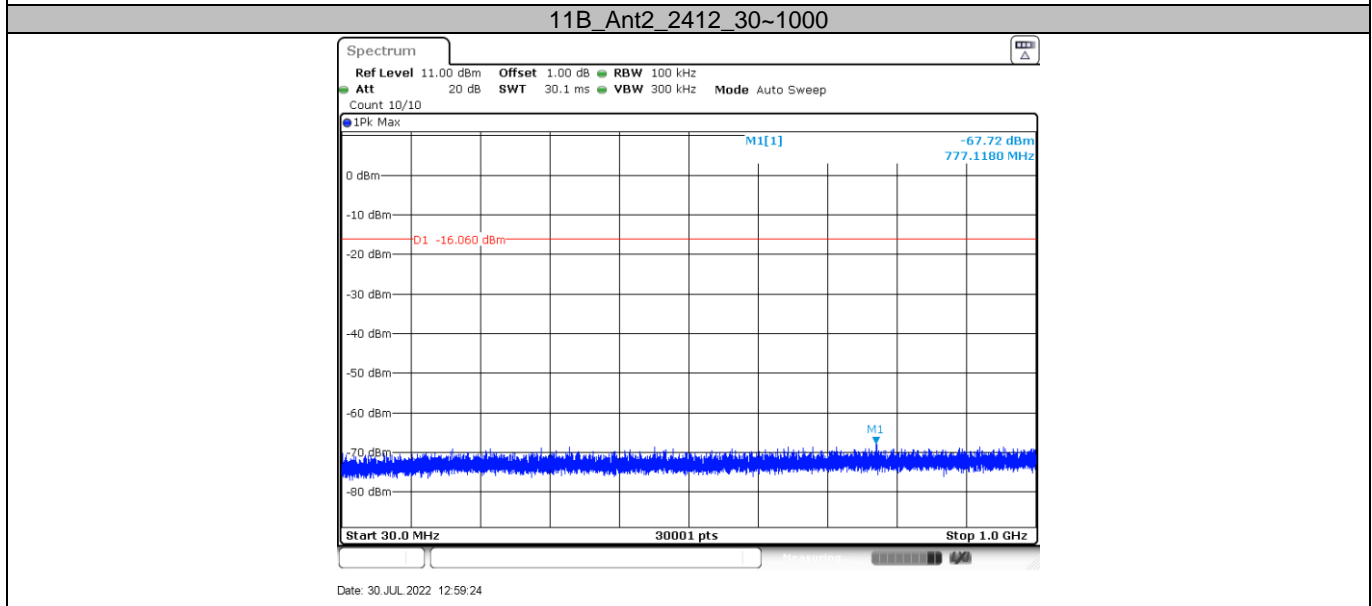
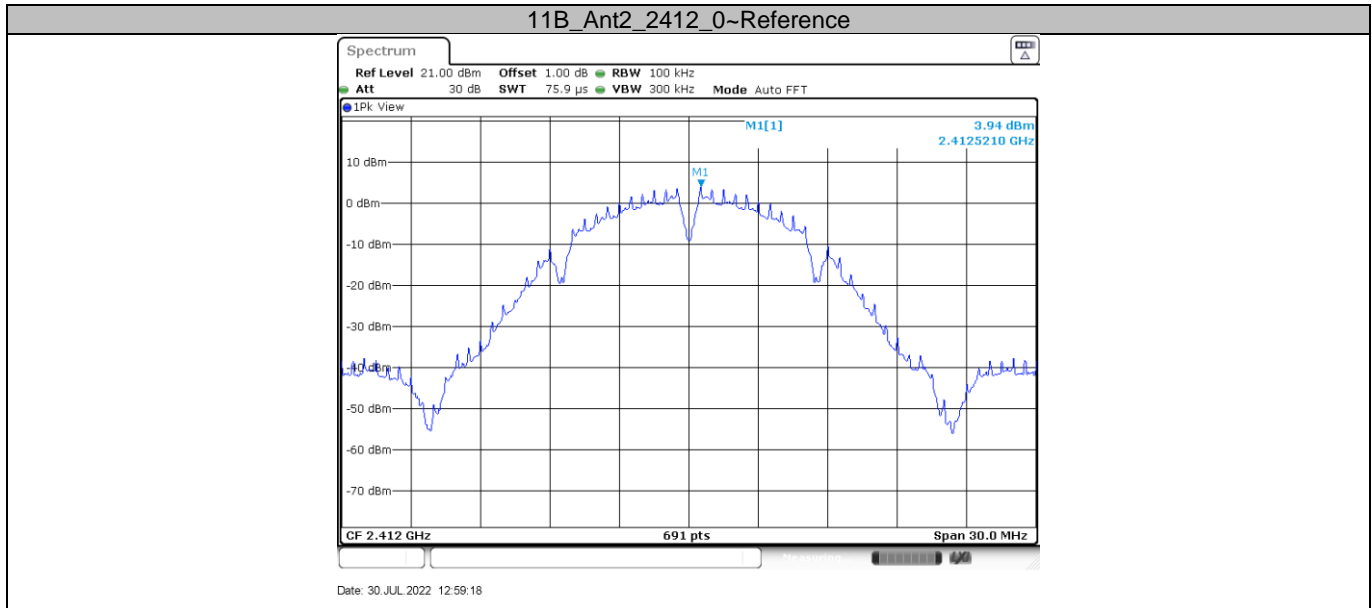


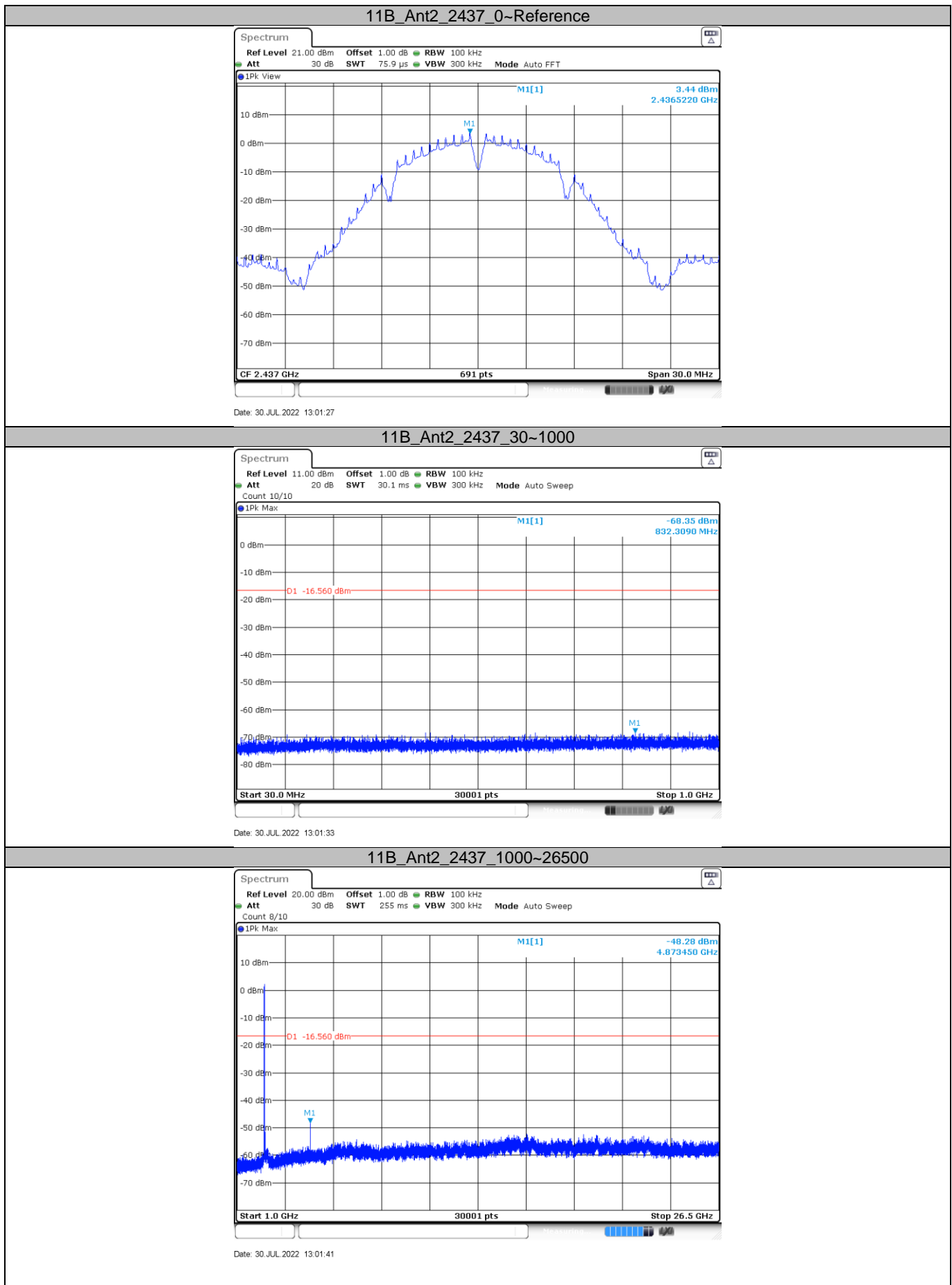
11AX20SISO_Ant1_2462_30~1000

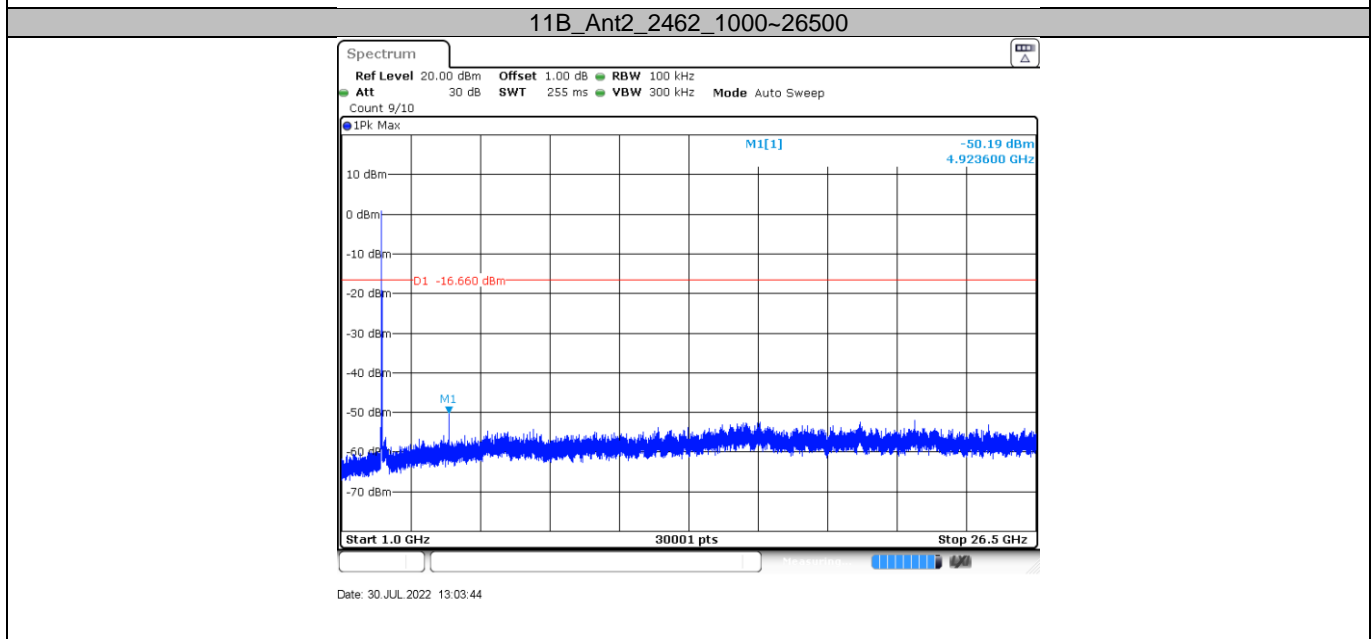
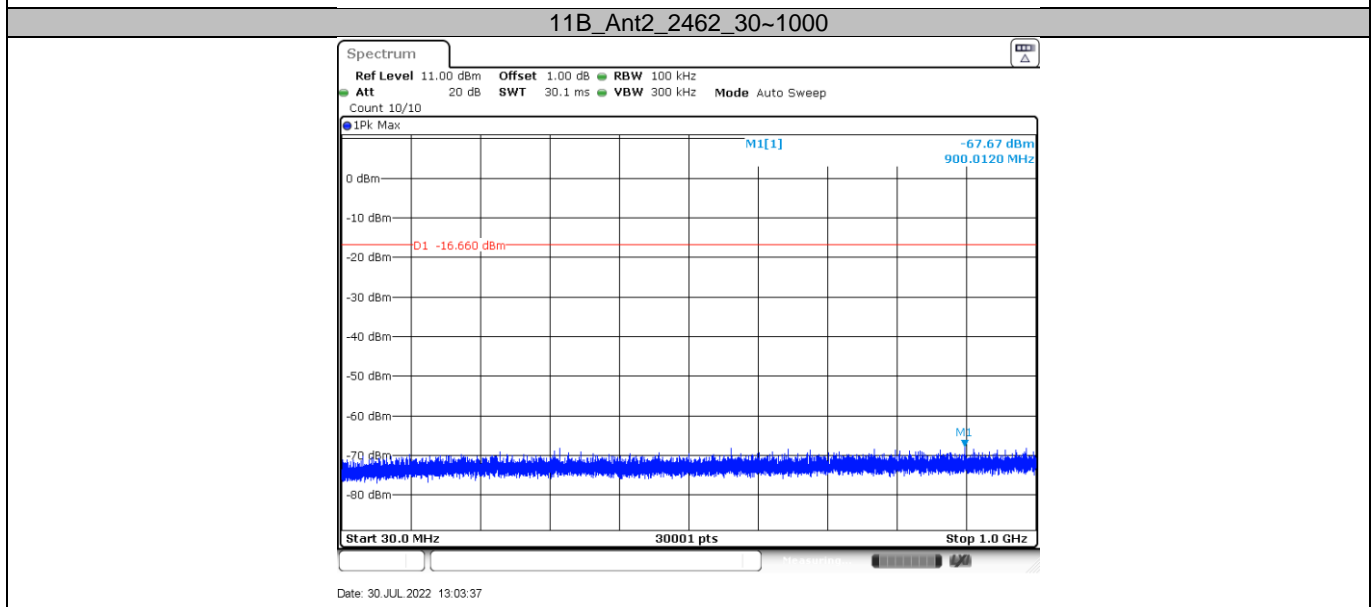
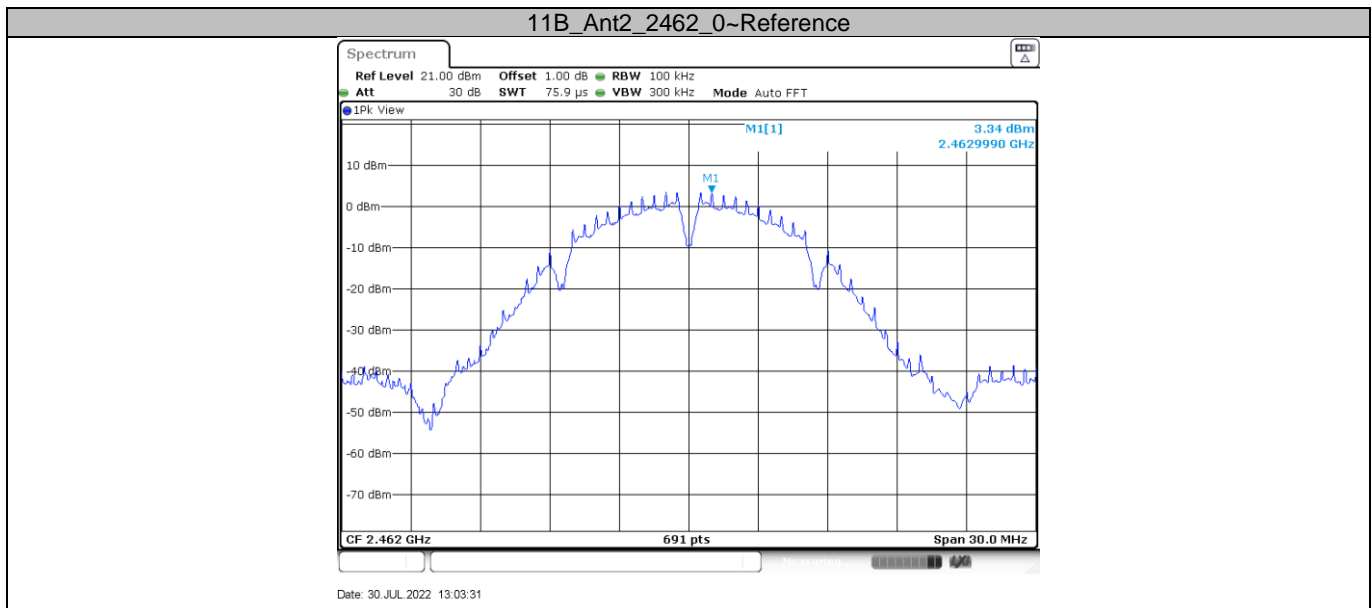


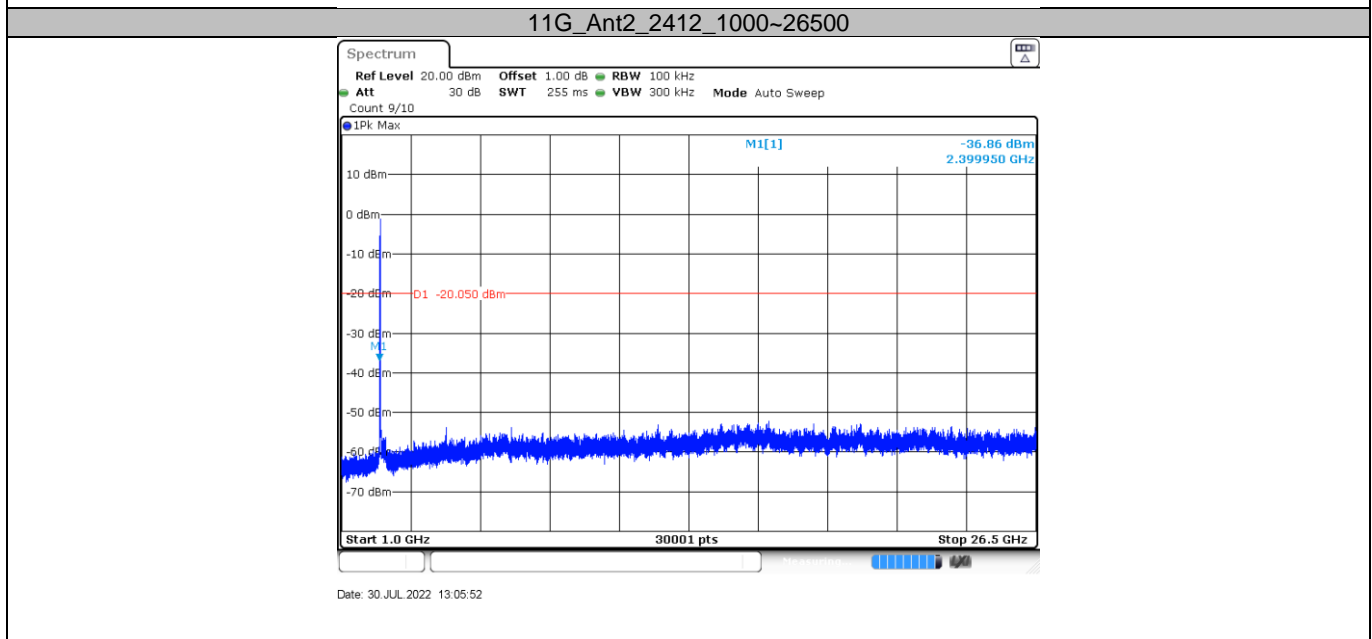
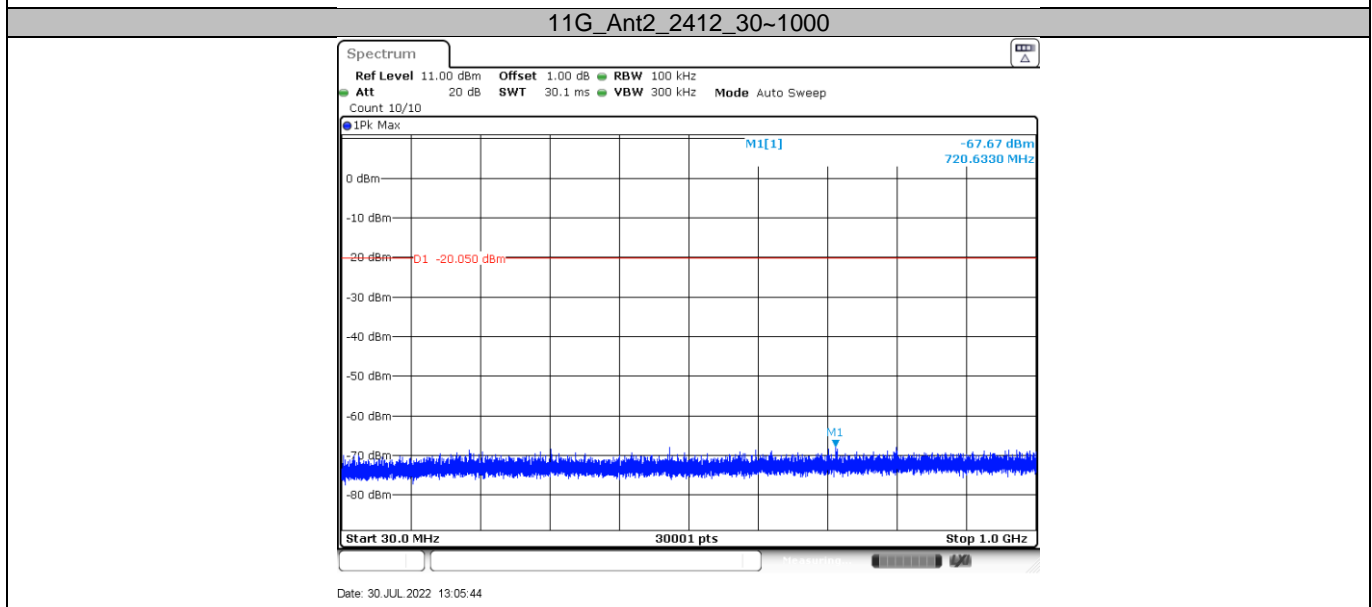
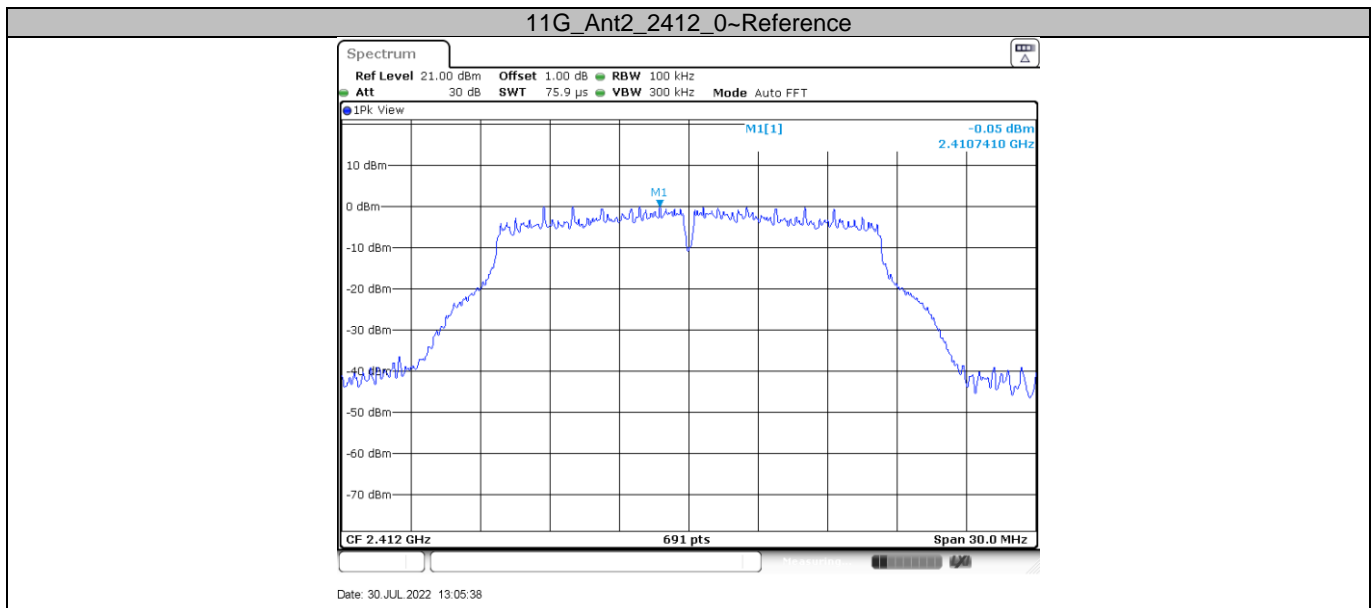
11AX20SISO_Ant1_2462_1000~26500

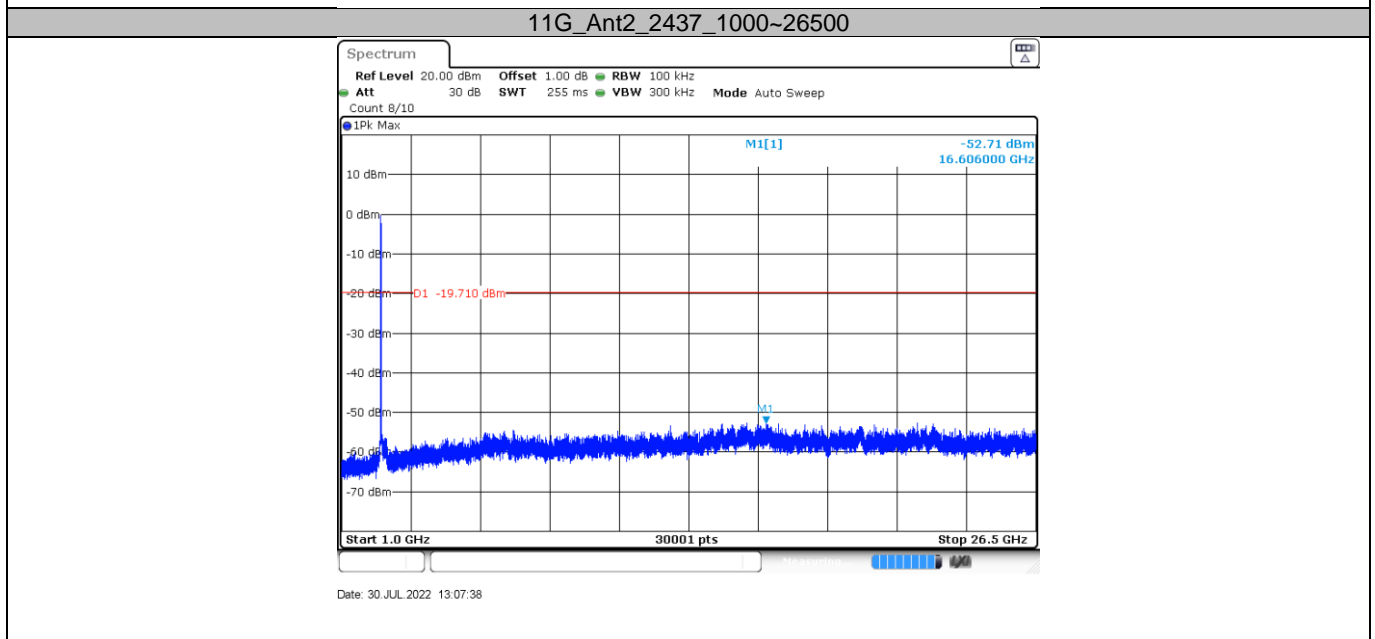
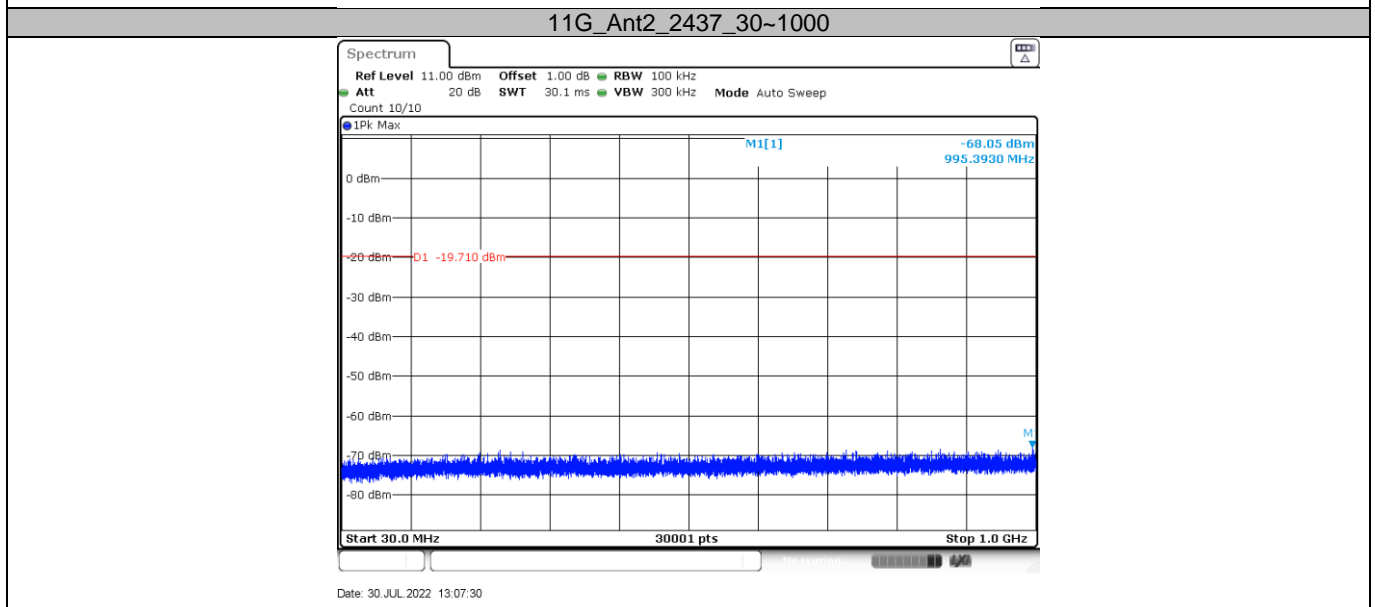
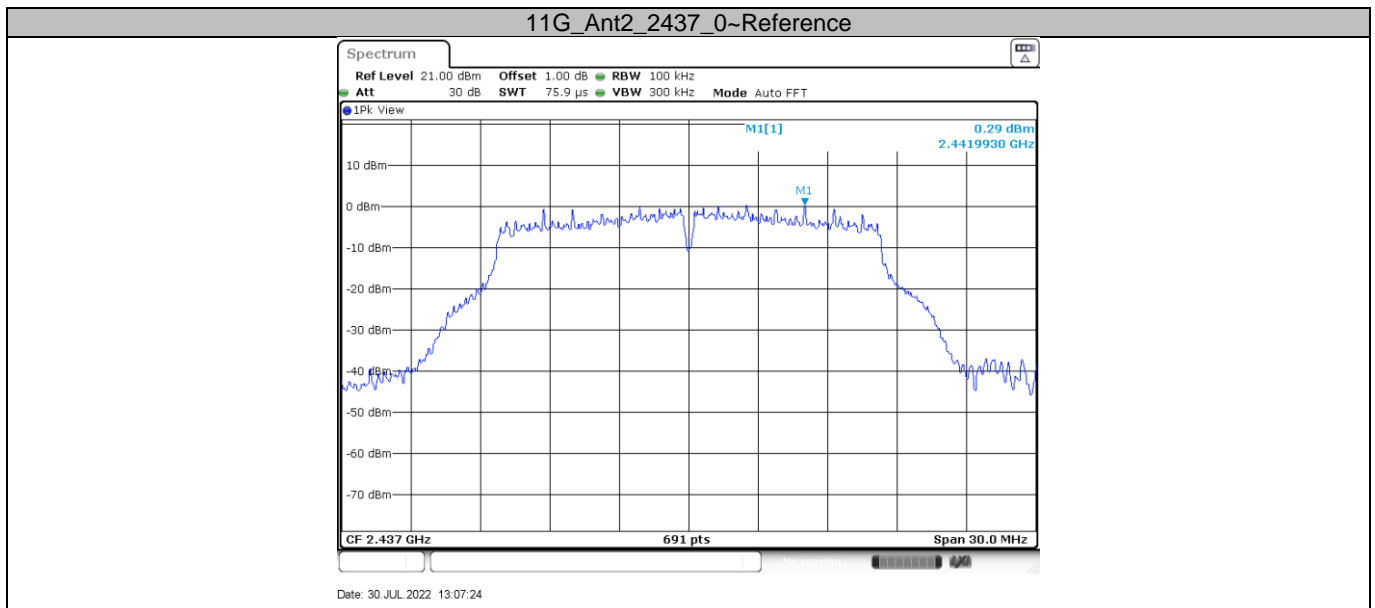


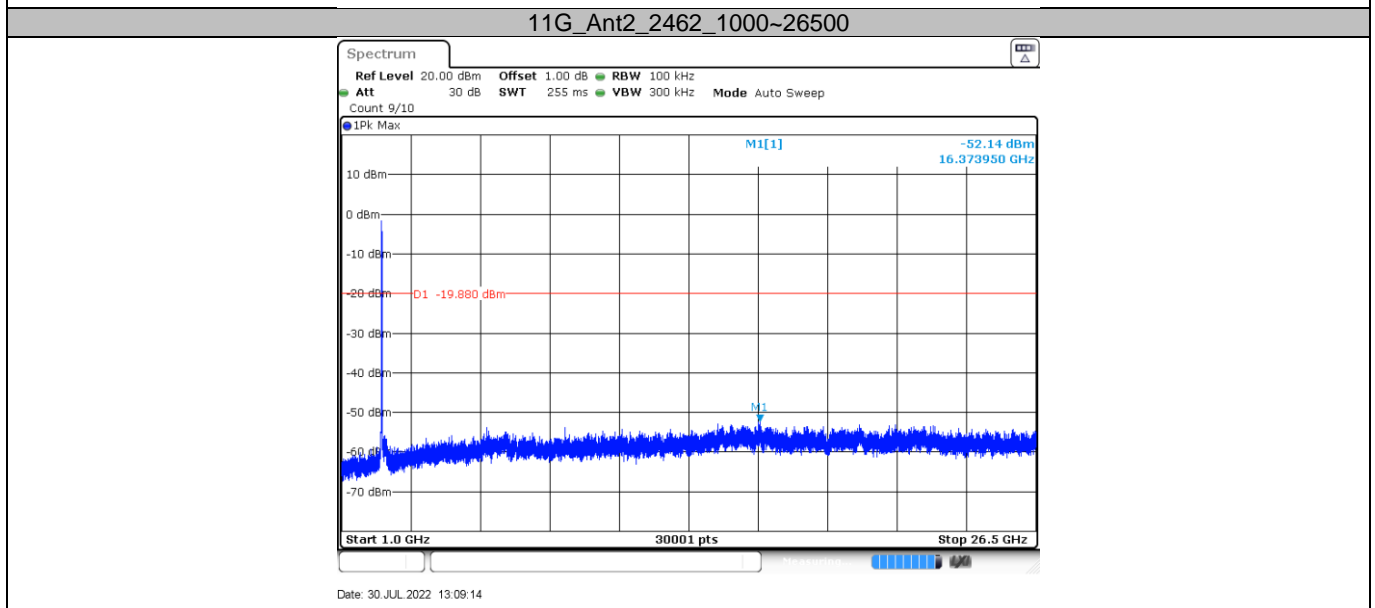
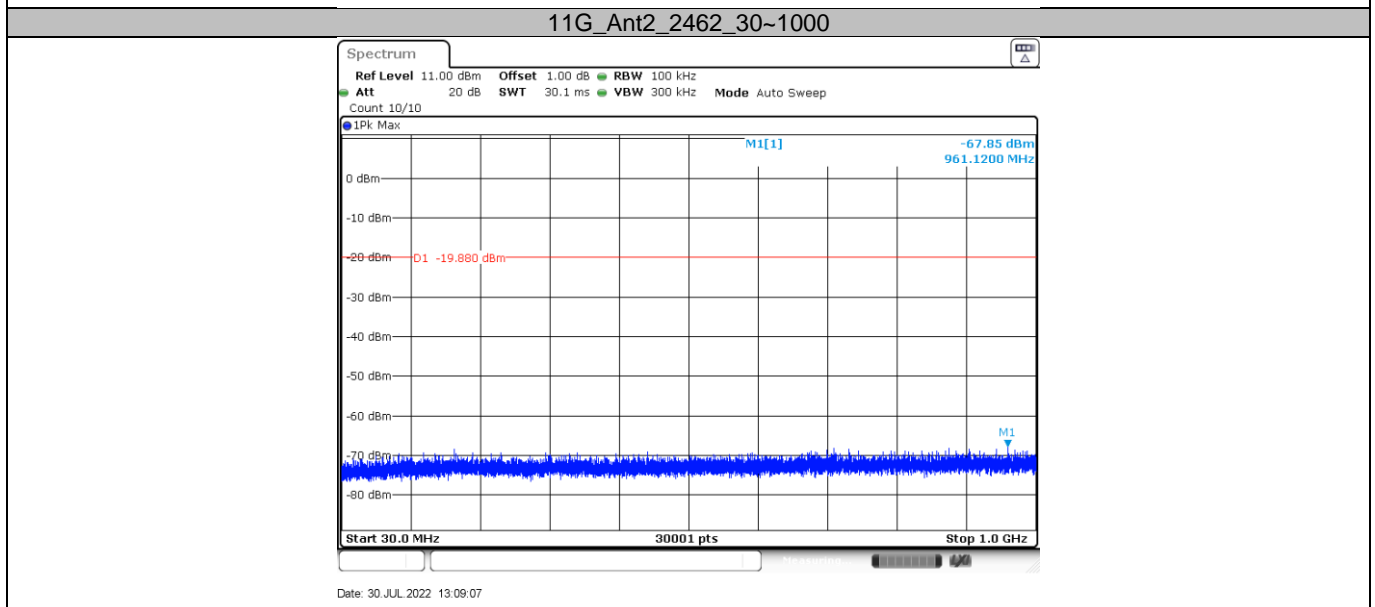
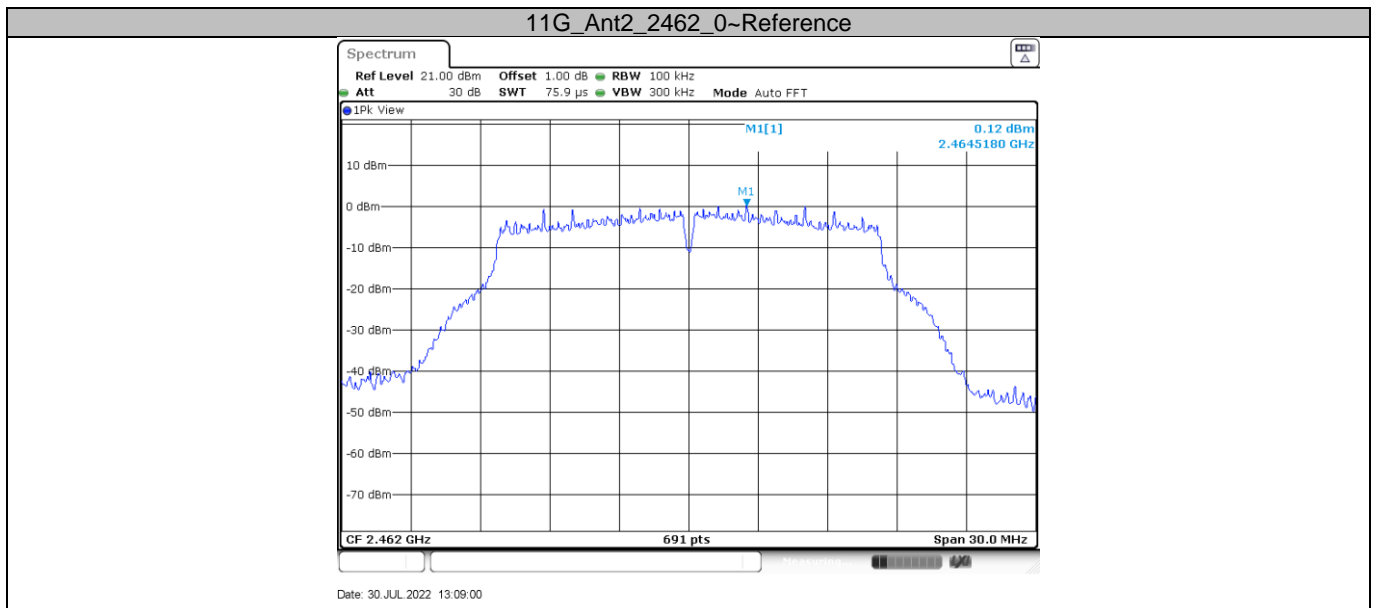


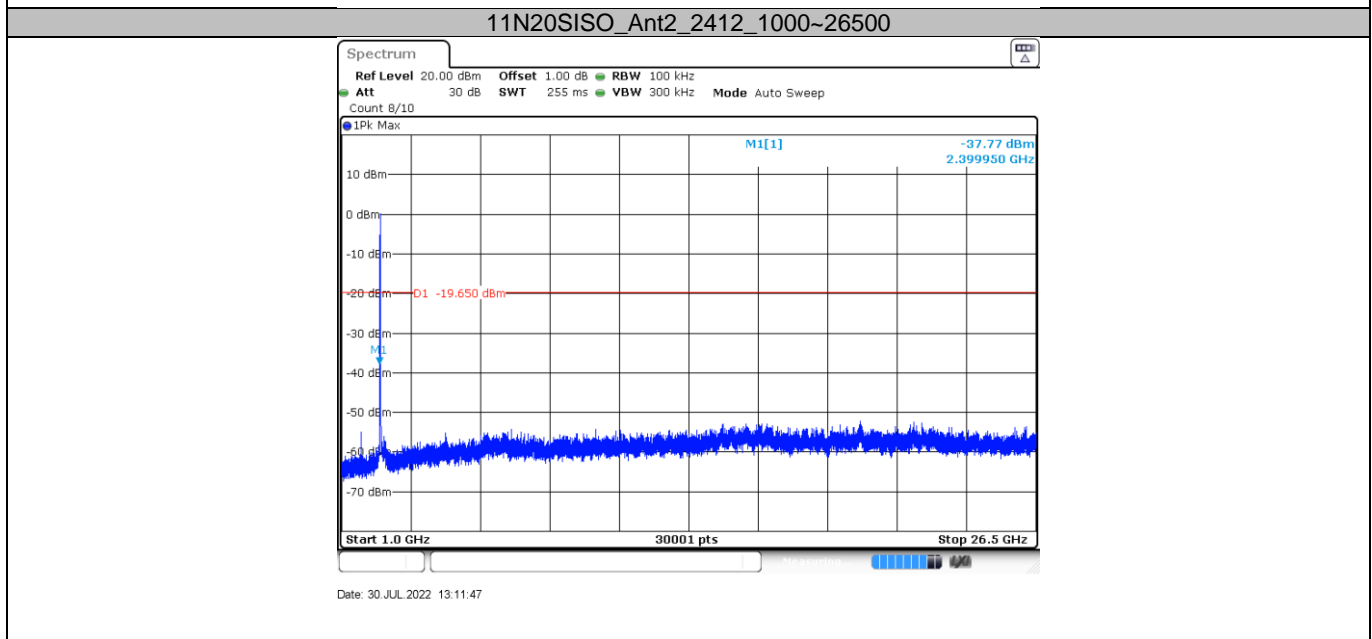
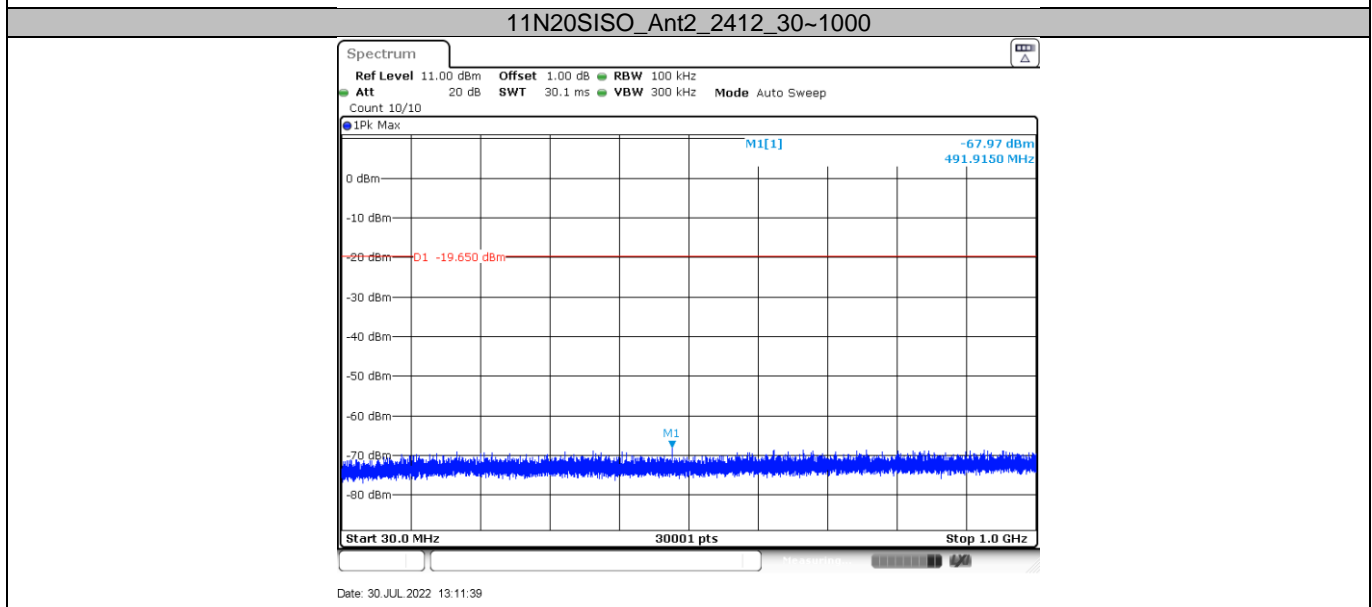
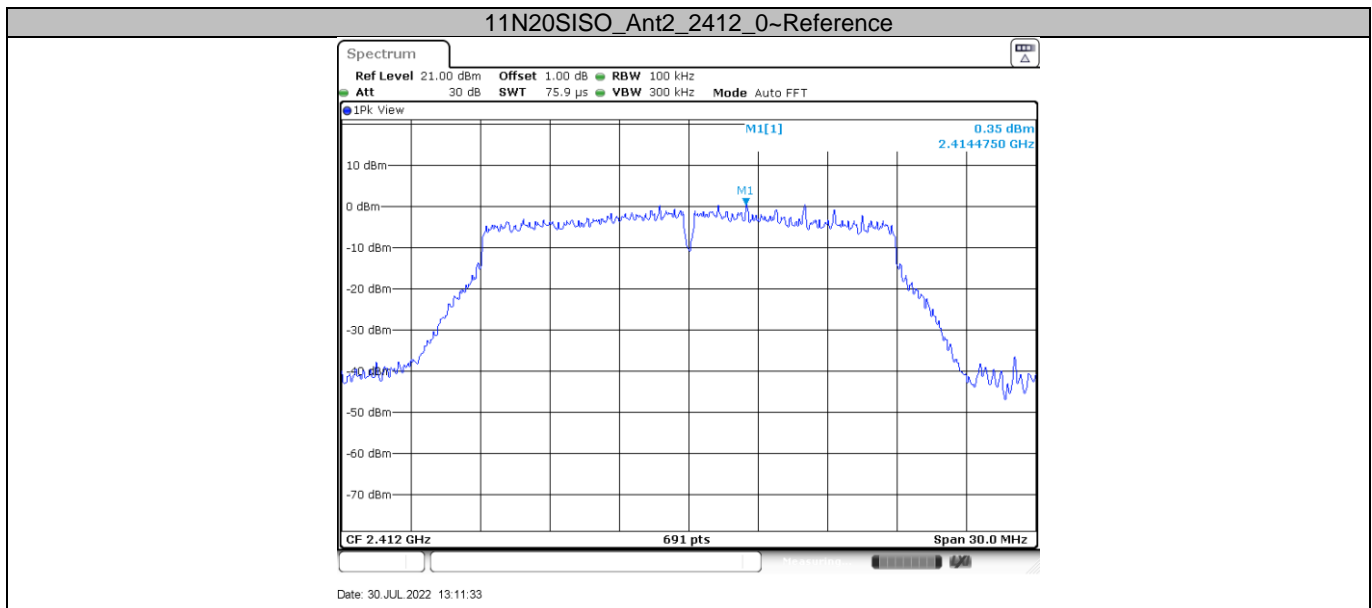


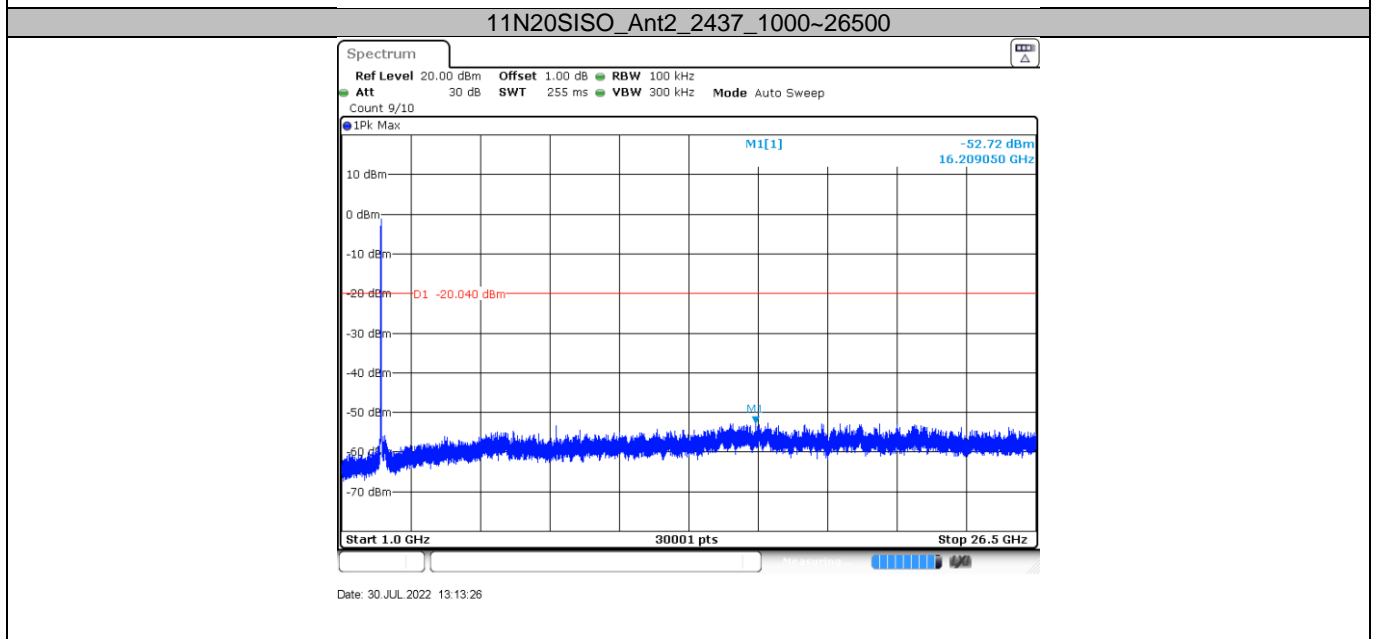
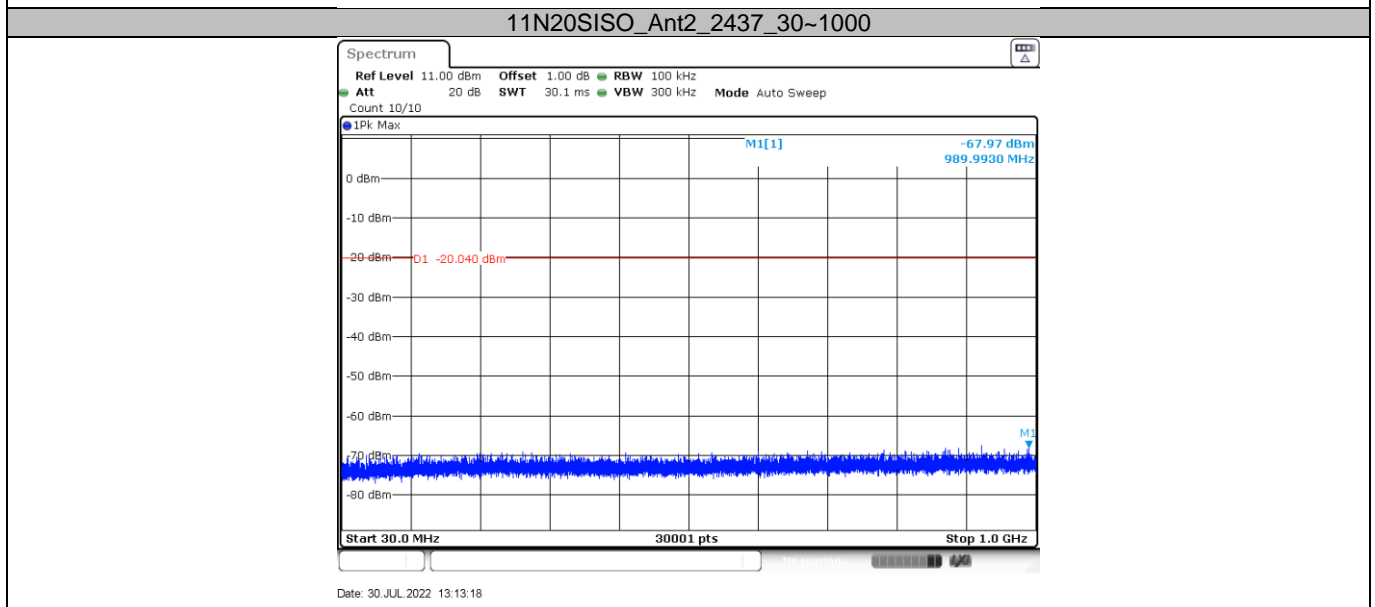
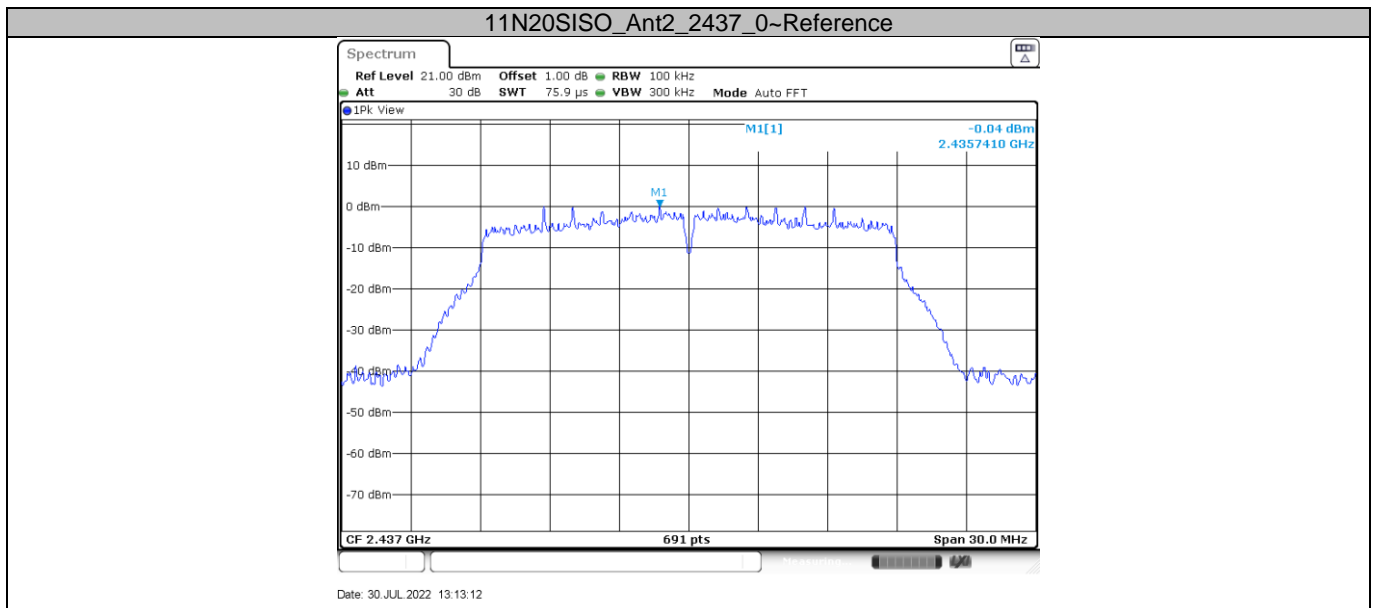


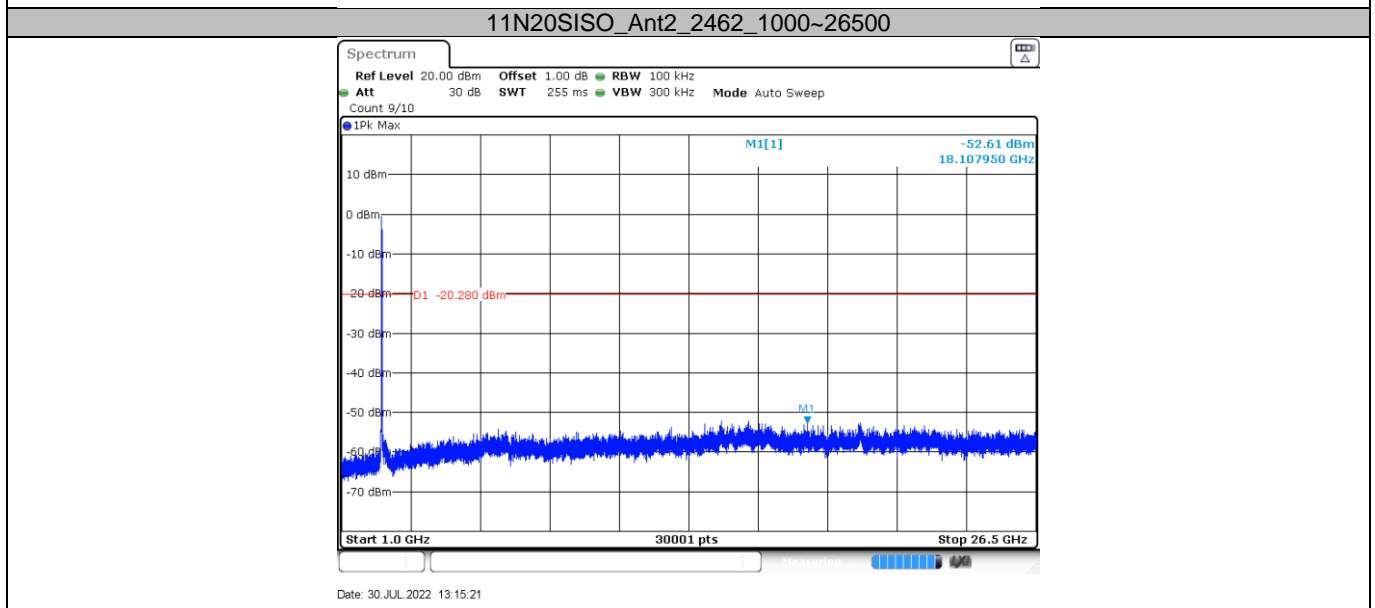
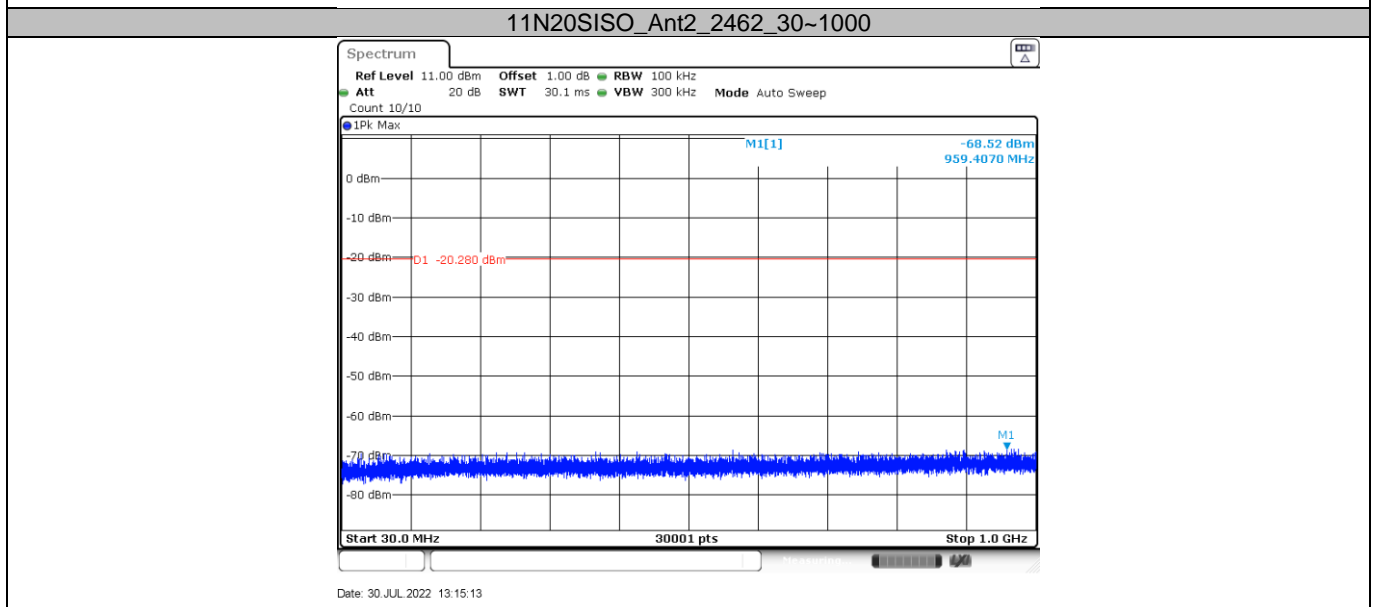
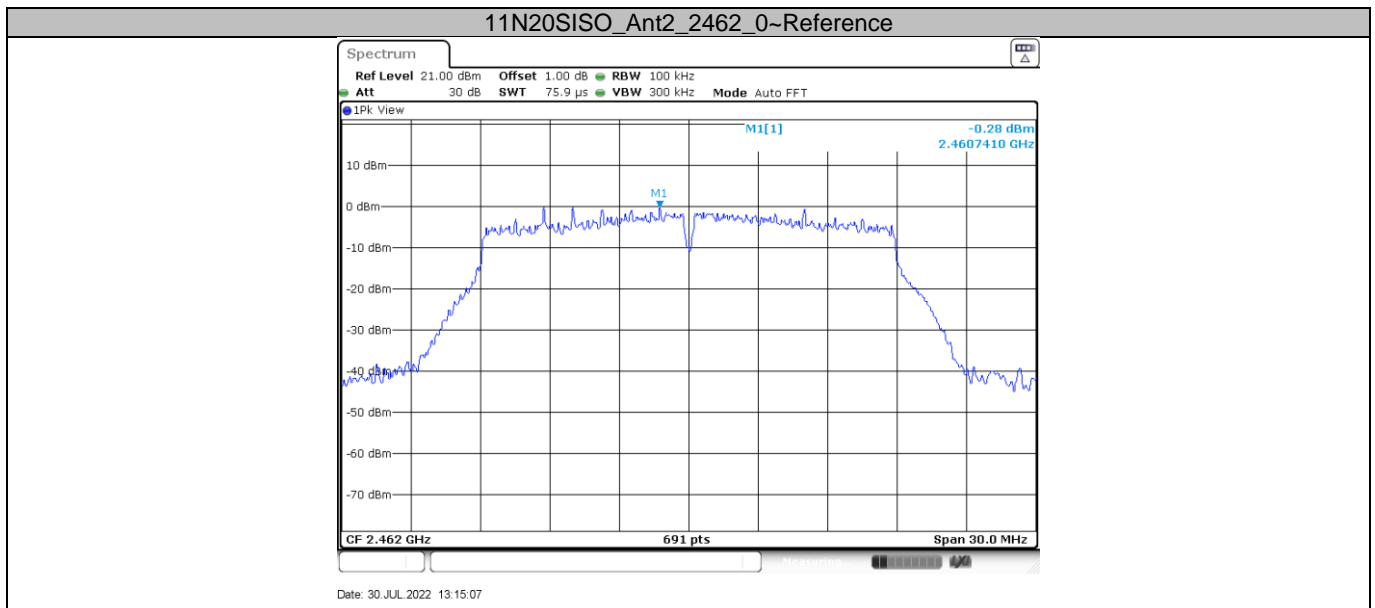


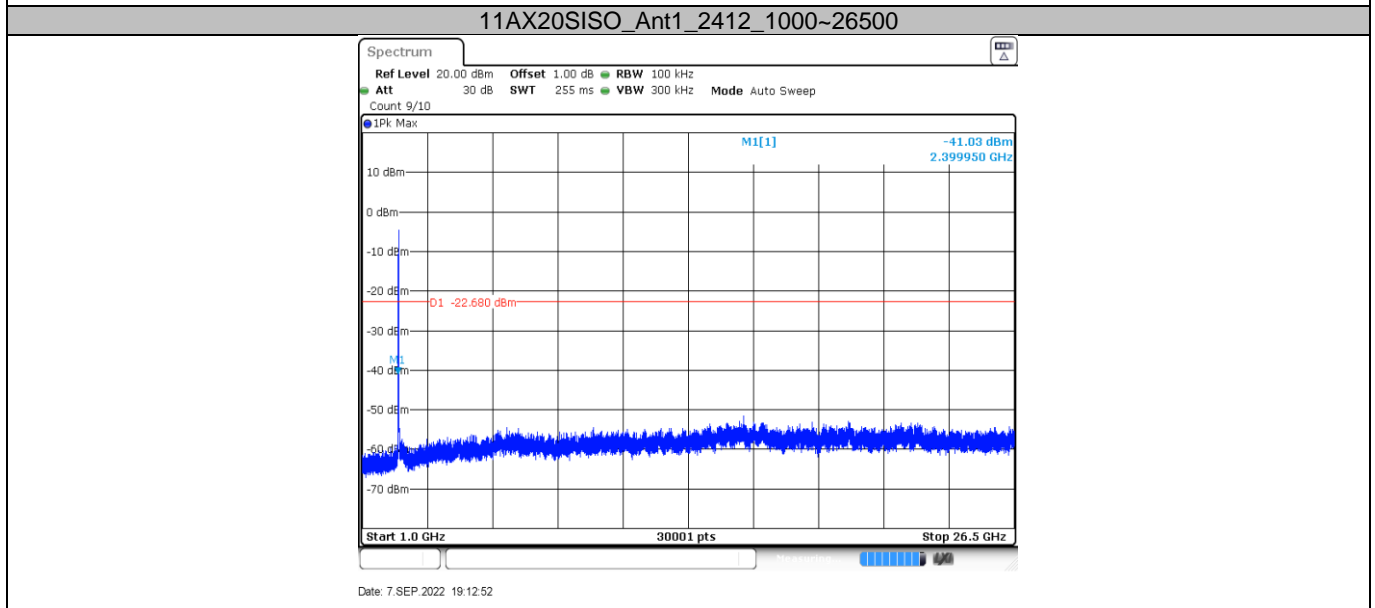
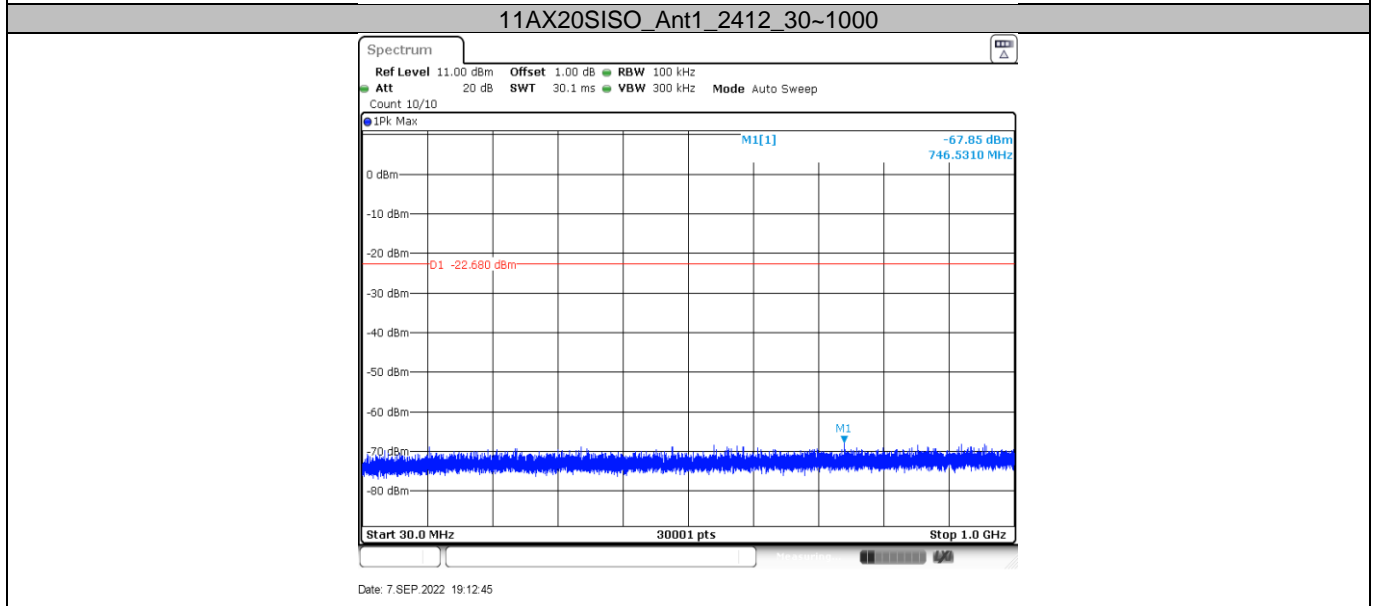
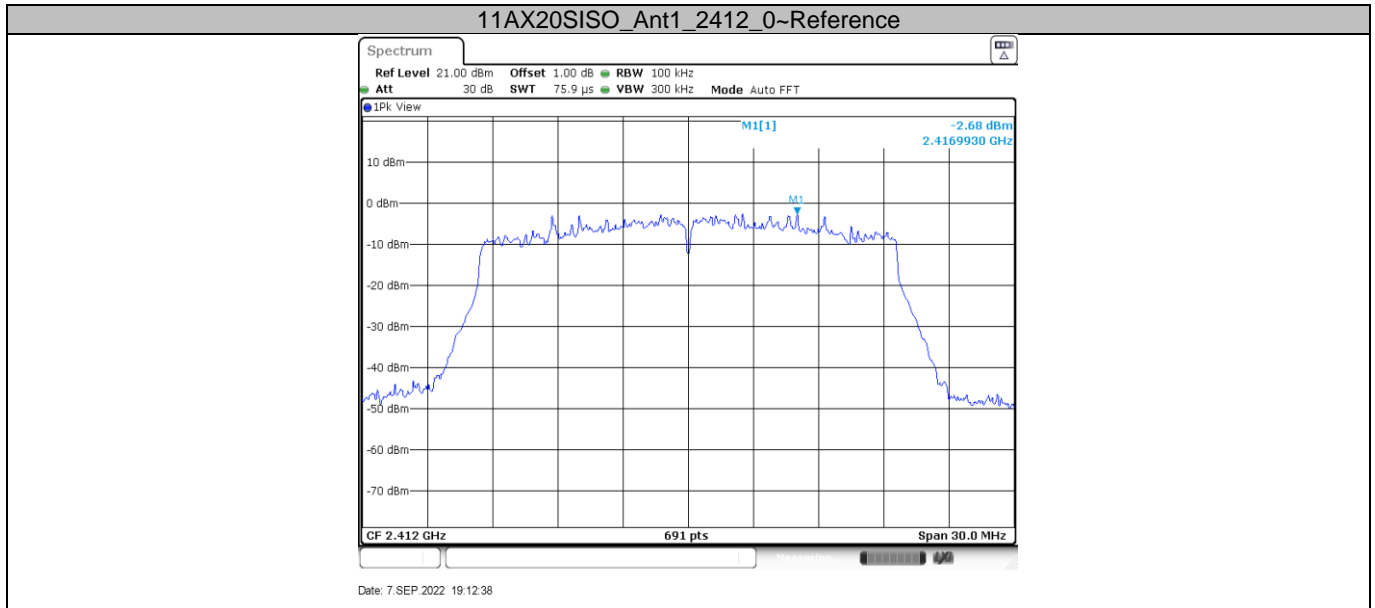


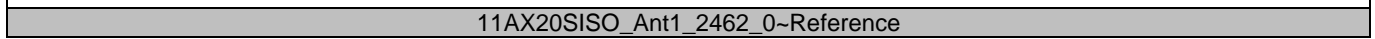
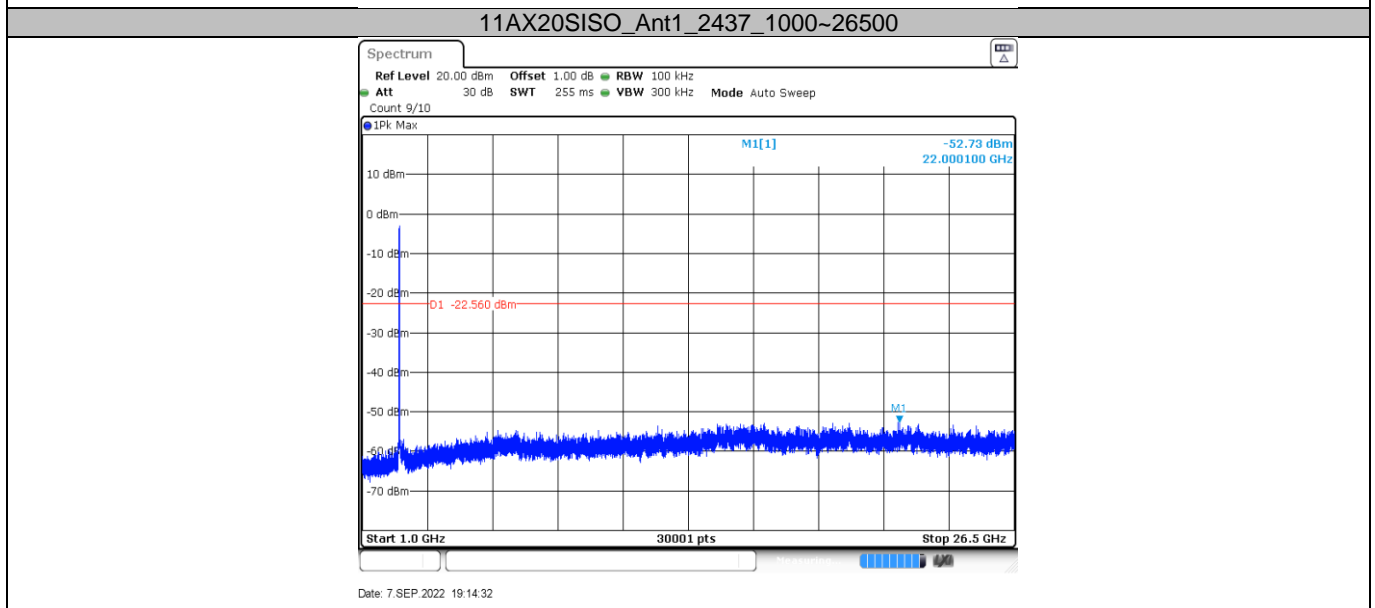
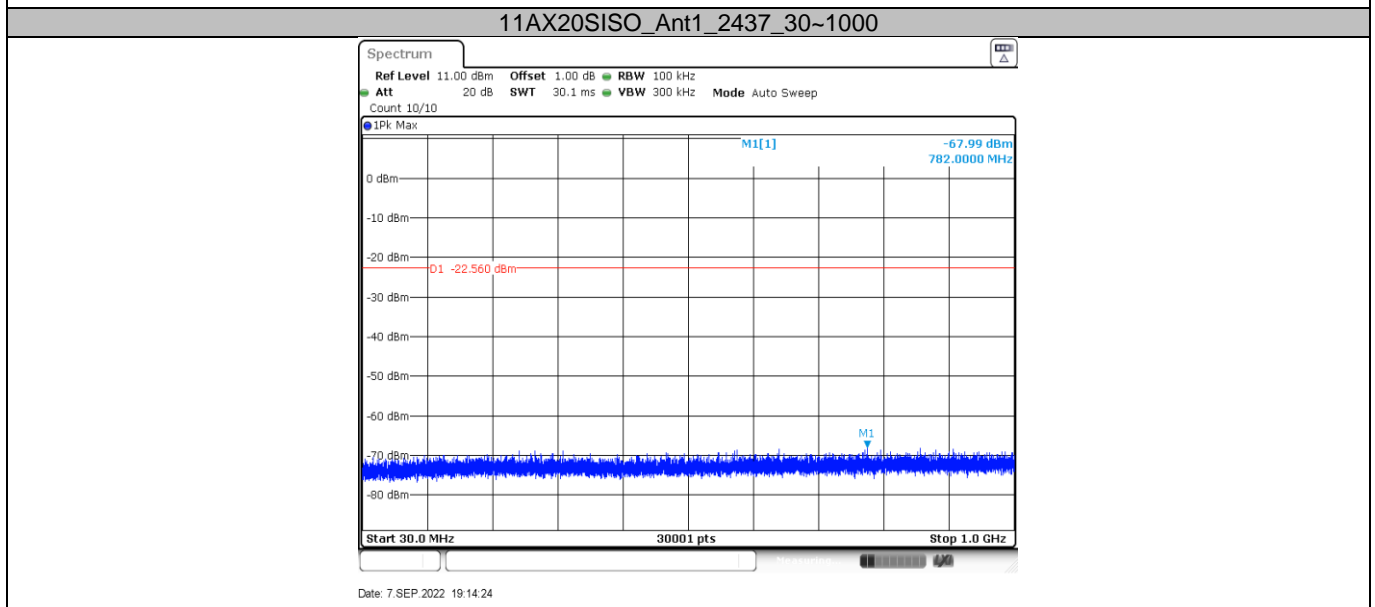
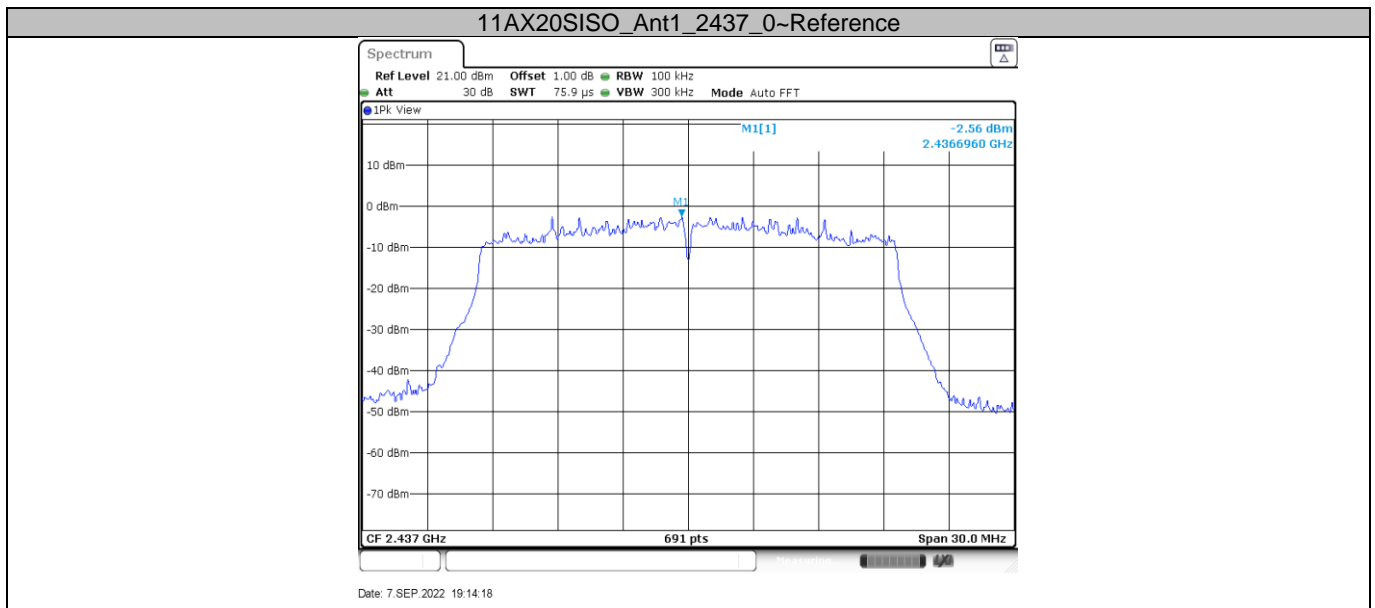


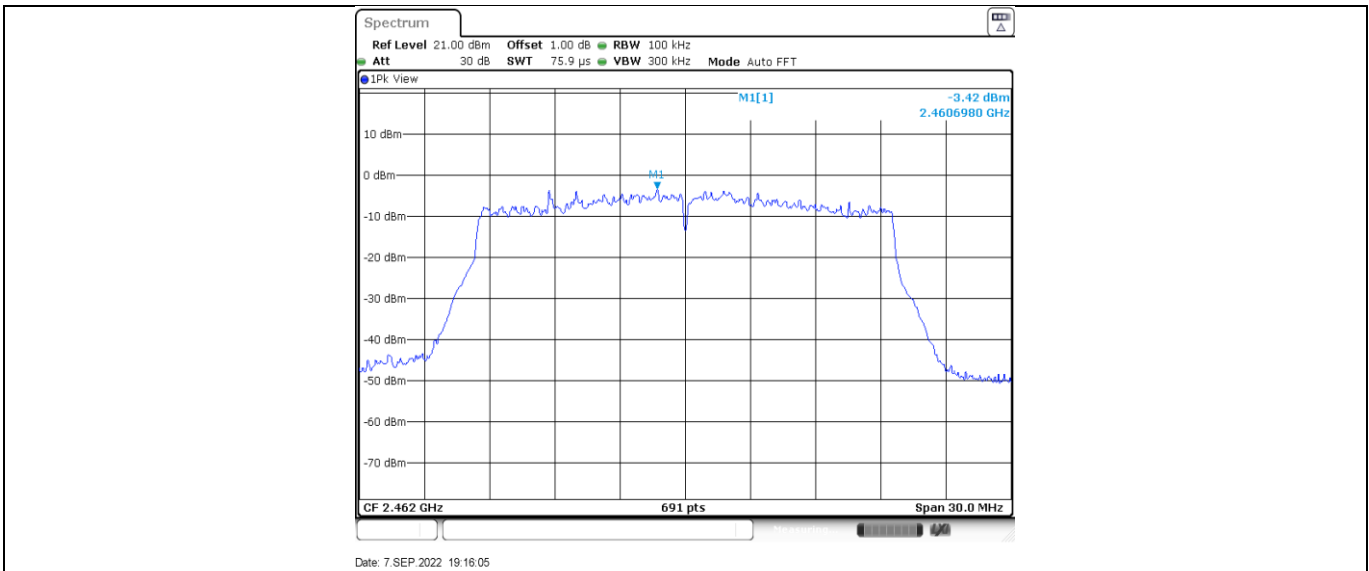




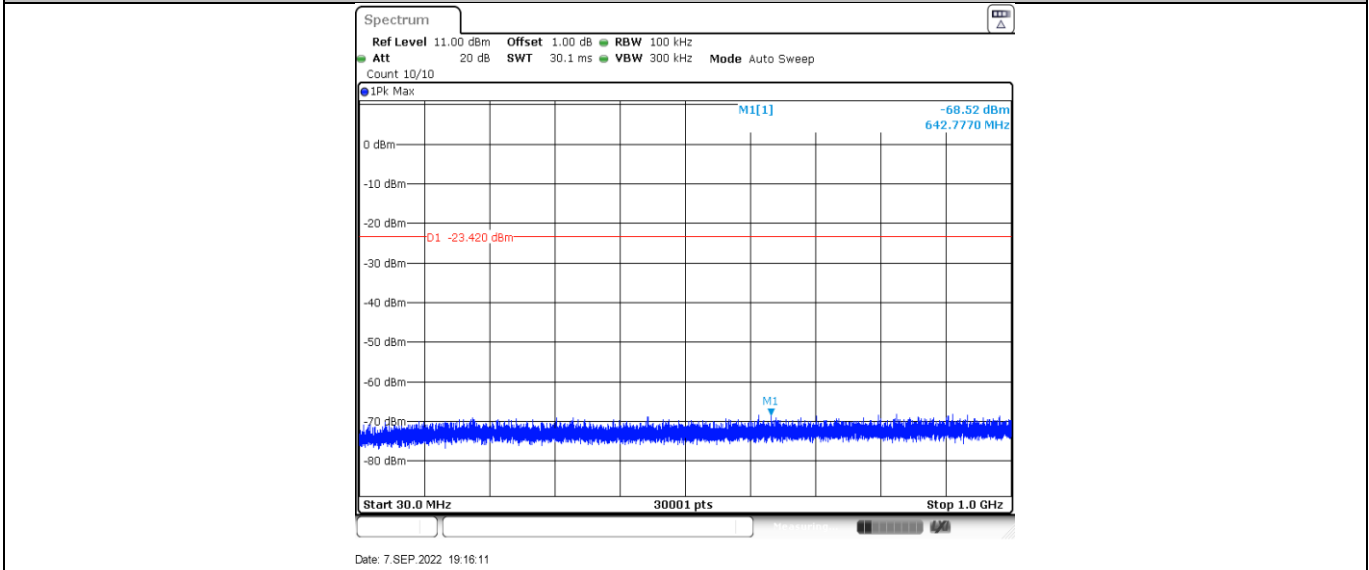




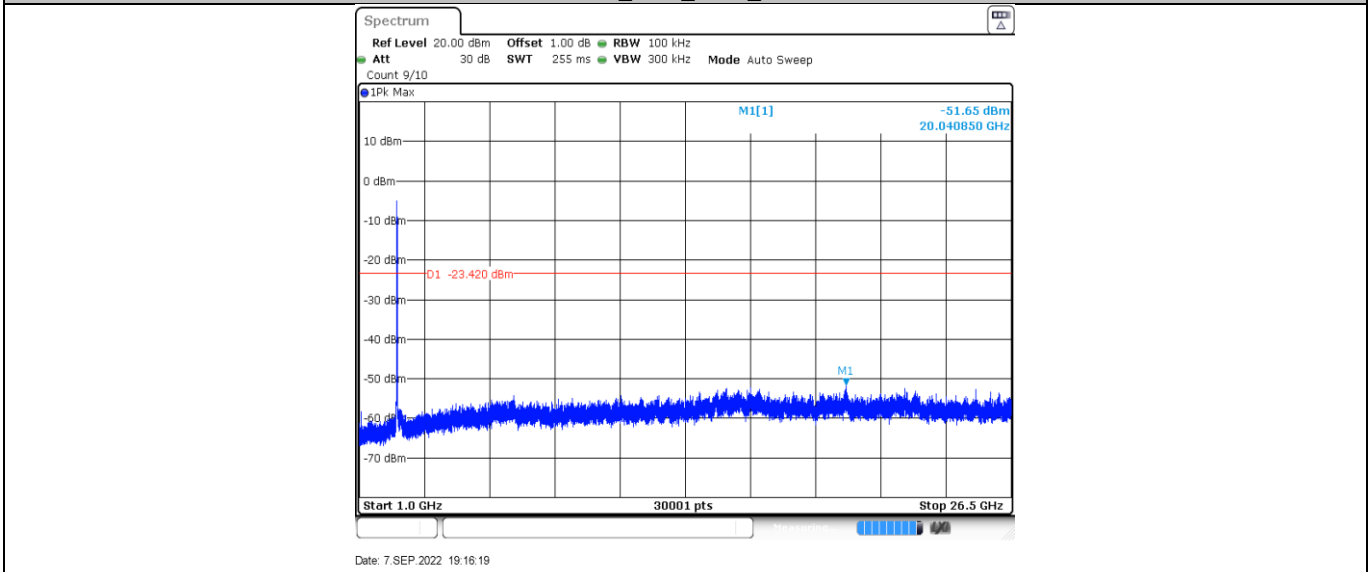




11AX20SISO_Ant1_2462_30~1000



11AX20SISO_Ant1_2462_1000~26500



9.6 Band edge testing

Test Method

- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section. .
- 4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under § 15.247(b)(3) and RSS 247 section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB.

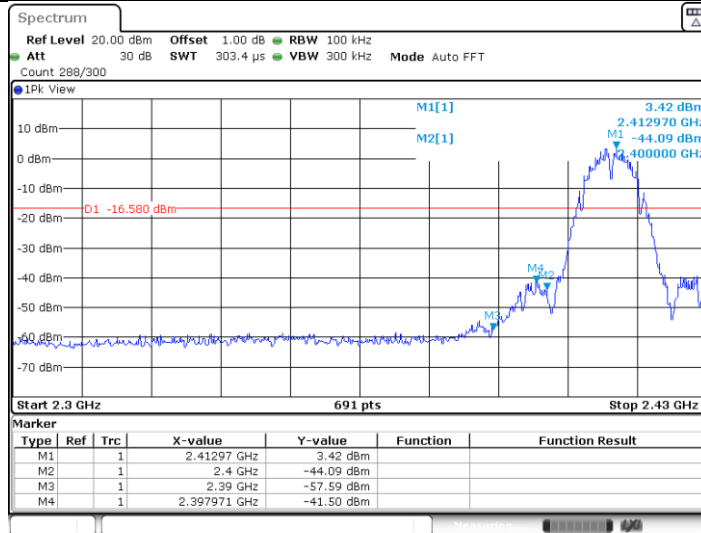
Frequency Range MHz	Limit (dBc)
30-25000	-20

Test result

Test Mode	Antenna	Ch Name	Channel	RefLevel	Result	Limit	Verdict
11B	Ant1	Low	2412	3.42	-41.5	≤ -16.58	PASS
	Ant1	High	2462	2.72	-53.19	≤ -17.28	PASS
11G	Ant1	Low	2412	-1.34	-41.02	≤ -21.34	PASS
	Ant1	High	2462	-1.44	-52.98	≤ -21.44	PASS
11N20SISO	Ant1	Low	2412	-1.71	-41	≤ -21.71	PASS
	Ant1	High	2462	-1.42	-51.83	≤ -21.42	PASS
11AX20SISO	Ant1	Low	2412	-3.77	-46.97	≤ -23.77	PASS
	Ant1	High	2462	-5.12	-55.16	≤ -25.12	PASS

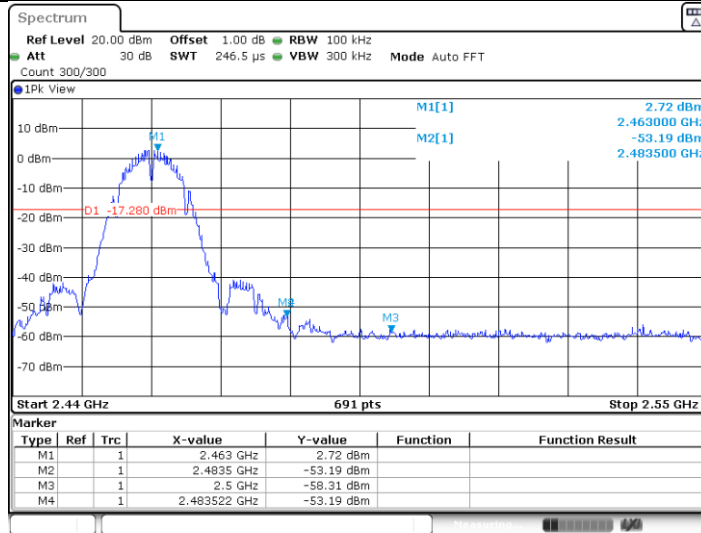
Test Mode	Antenna	Ch Name	Channel	RefLevel	Result	Limit	Verdict
11B	Ant2	Low	2412	3.58	-38.23	≤ -16.42	PASS
	Ant2	High	2462	2.73	-52.1	≤ -17.27	PASS
11G	Ant2	Low	2412	-0.40	-37.34	≤ -20.4	PASS
	Ant2	High	2462	-0.02	-50.58	≤ -20.02	PASS
11N20SISO	Ant2	Low	2412	0.17	-36.48	≤ -19.83	PASS
	Ant2	High	2462	-0.89	-49.38	≤ -20.89	PASS
11AX20SISO	Ant2	Low	2412	-2.65	-42.59	≤ -22.65	PASS
	Ant2	High	2462	-3.51	-52.59	≤ -23.51	PASS

11B_Ant1_Low_2412



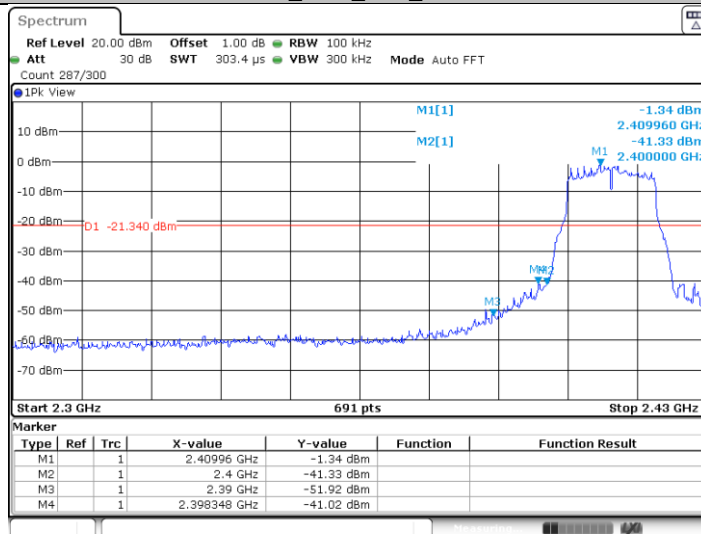
Date: 30 JUL 2022 10:52:05

11B_Ant1_High_2462



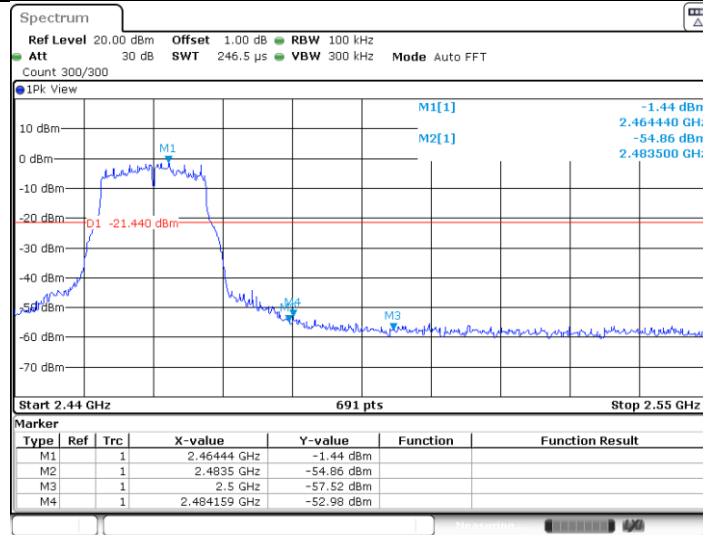
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11G_Ant1_Low_2412



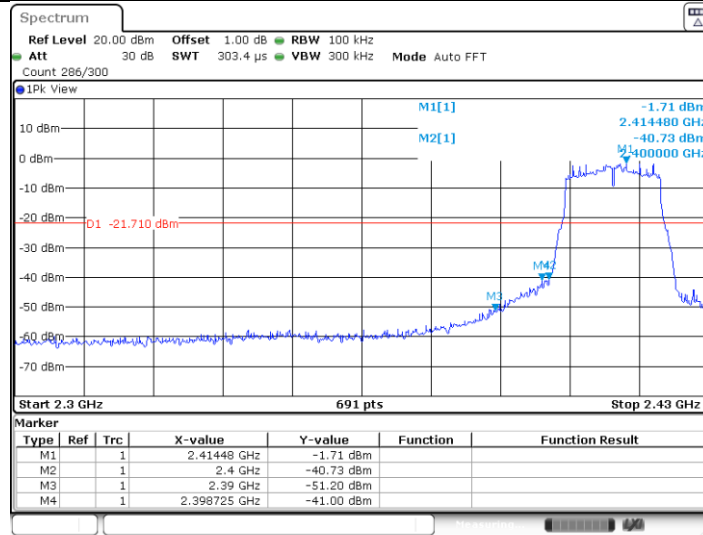
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11G_Ant1_High_2462



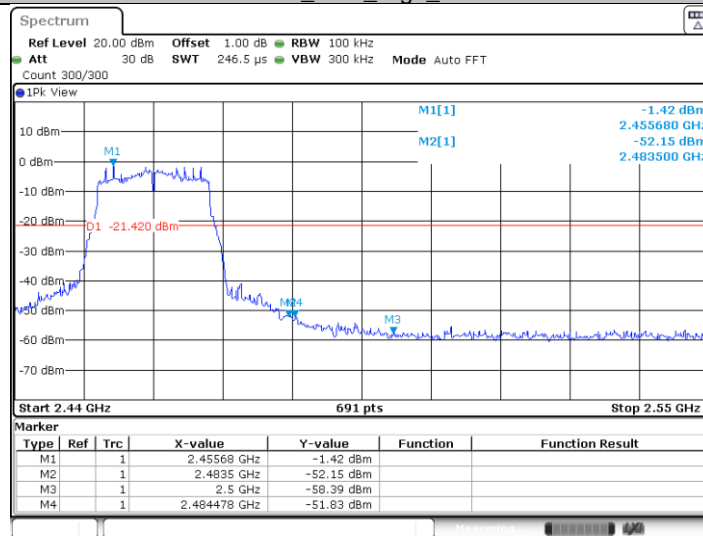
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11N20 Ant1 Low 2412

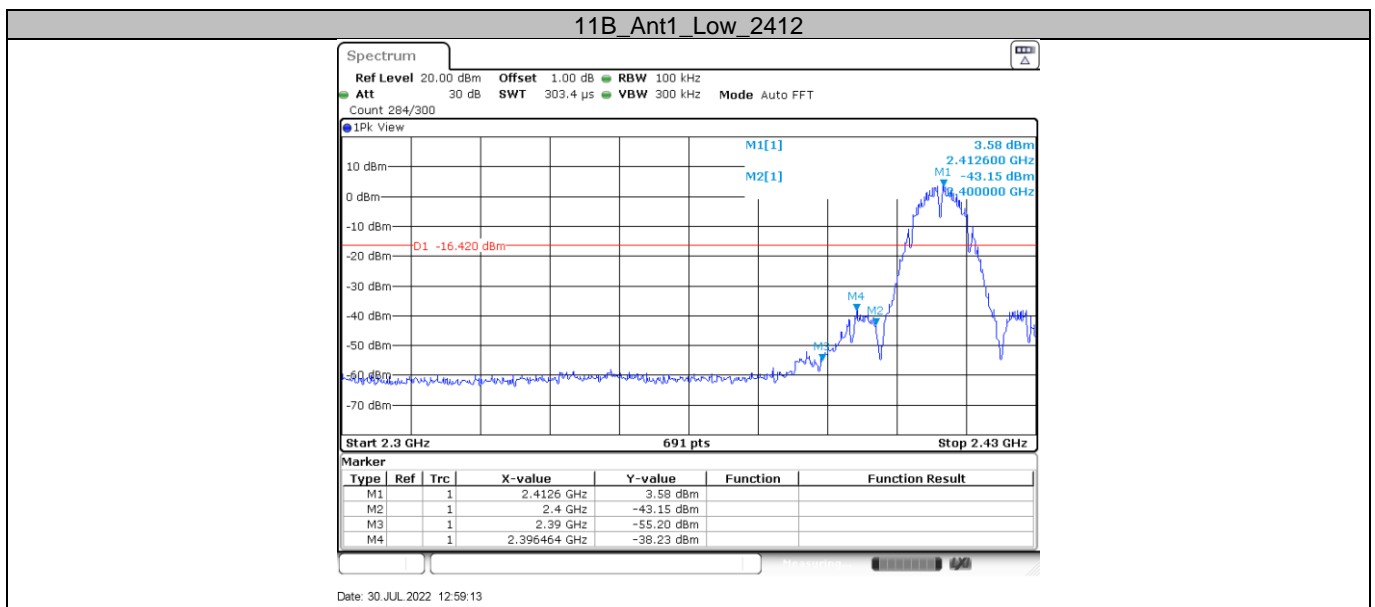
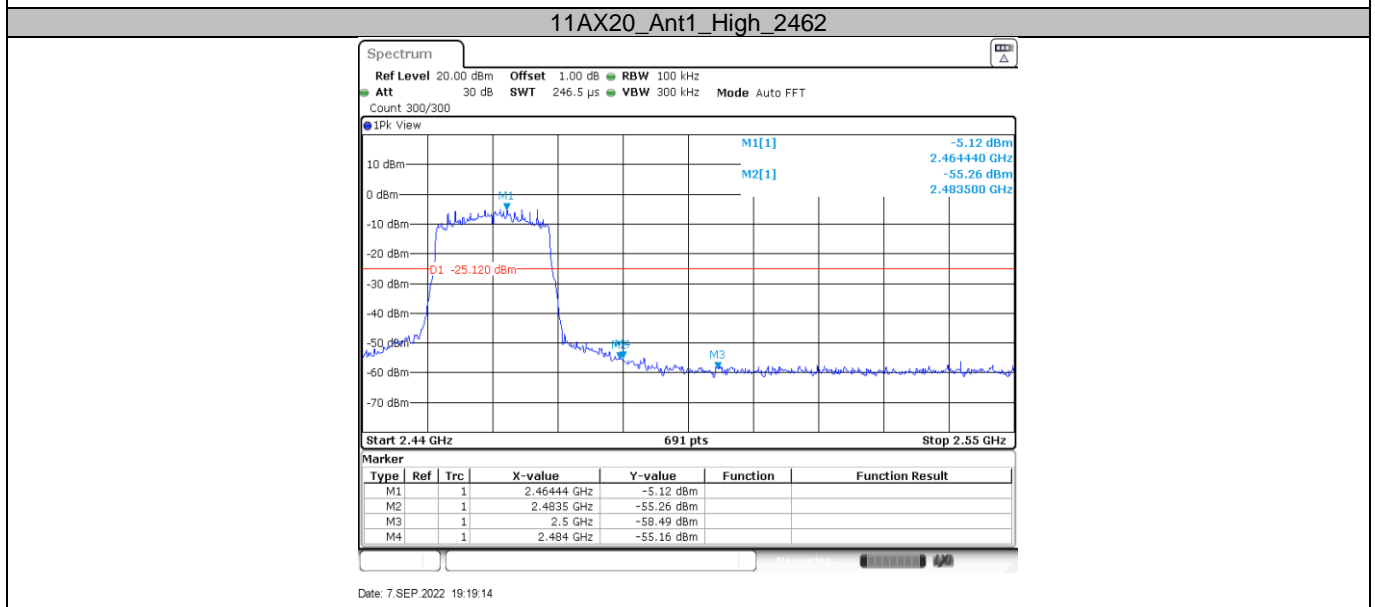
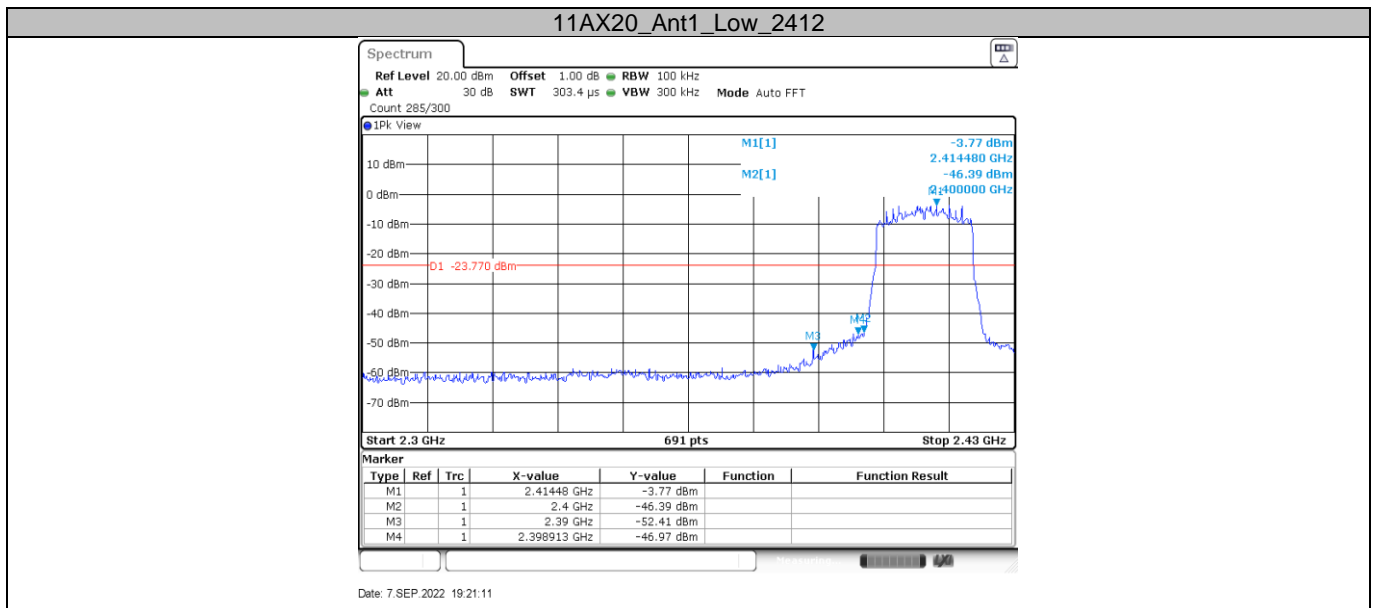


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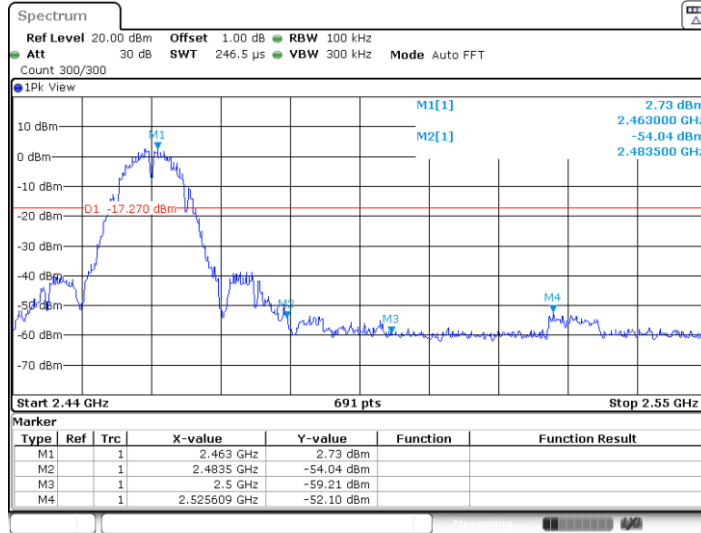
11N20 Ant1 High 2462



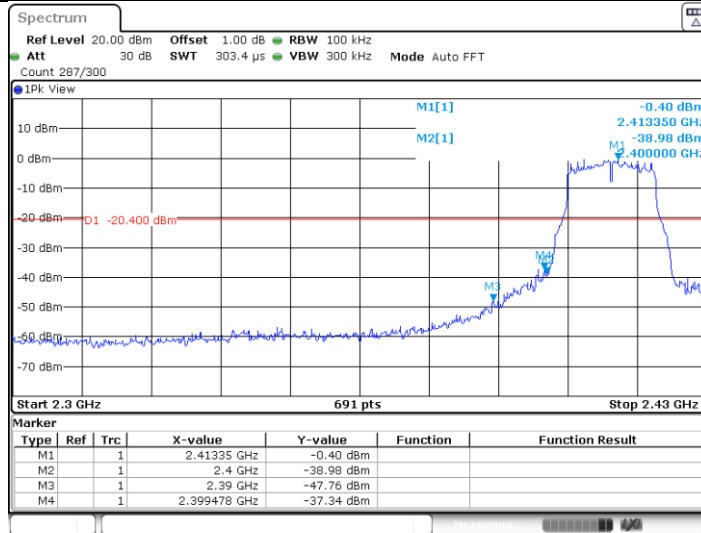
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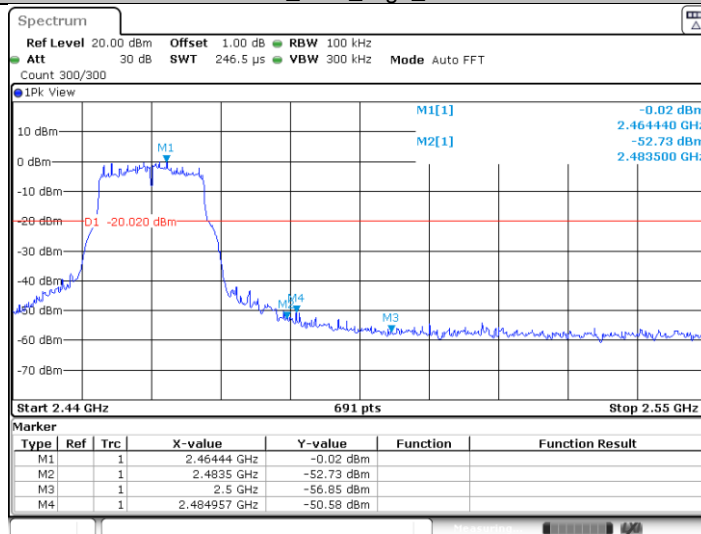
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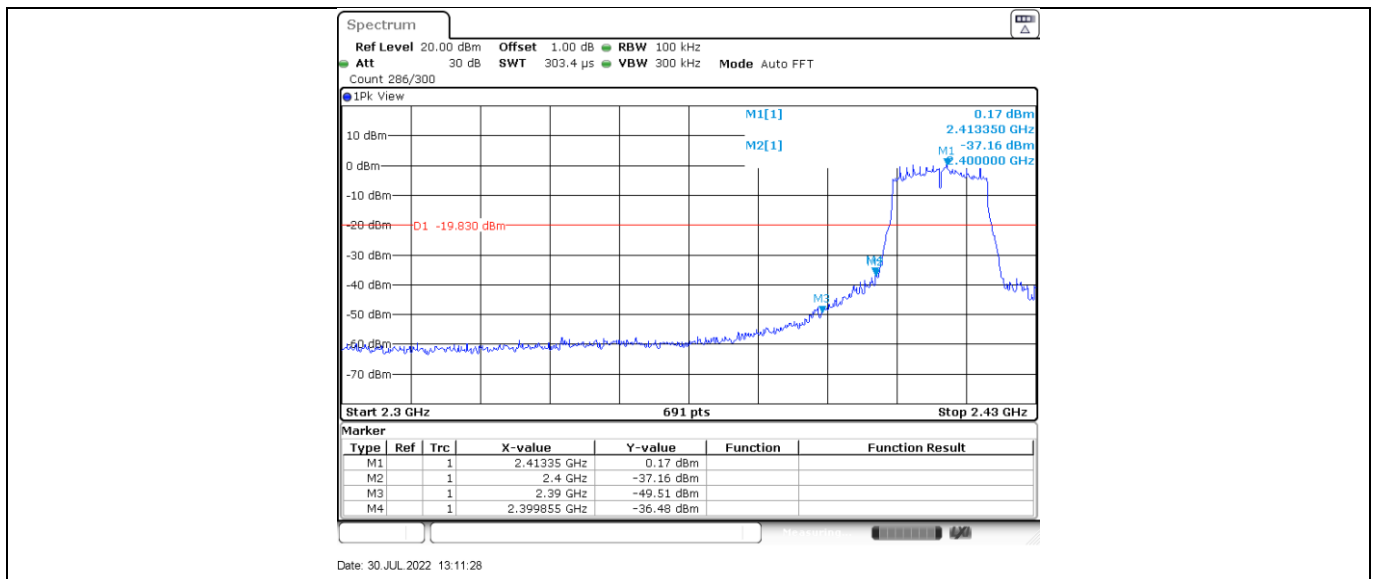
11G_Ant1_Low_2412



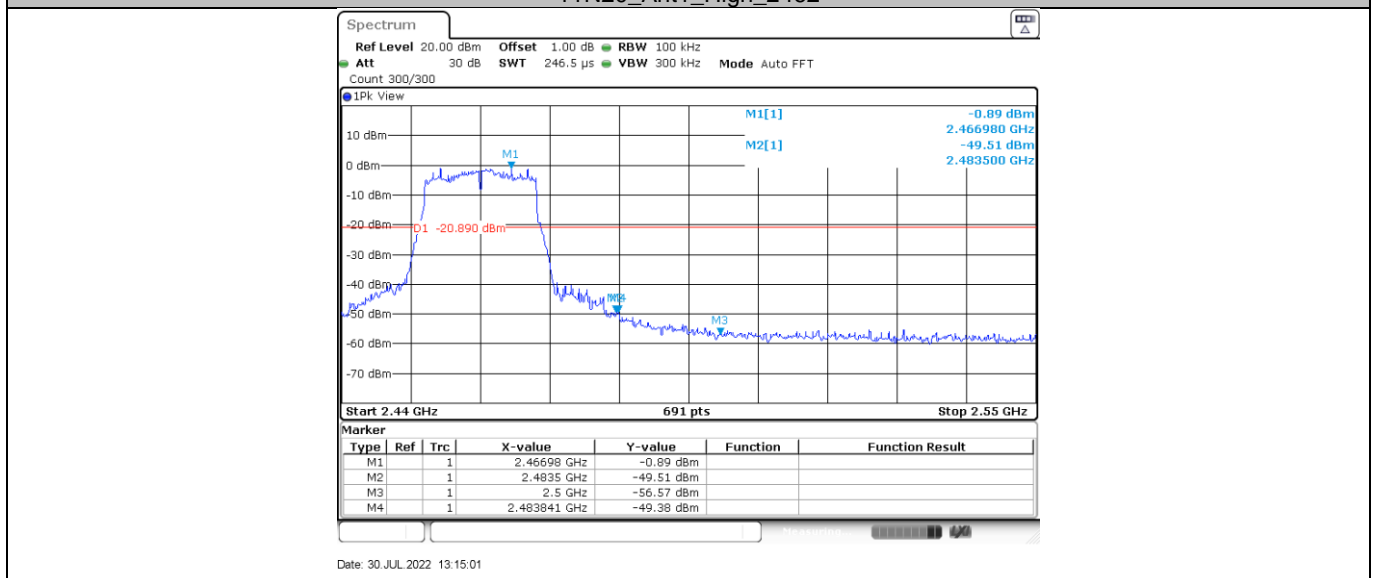
11G_Ant1_High_2462



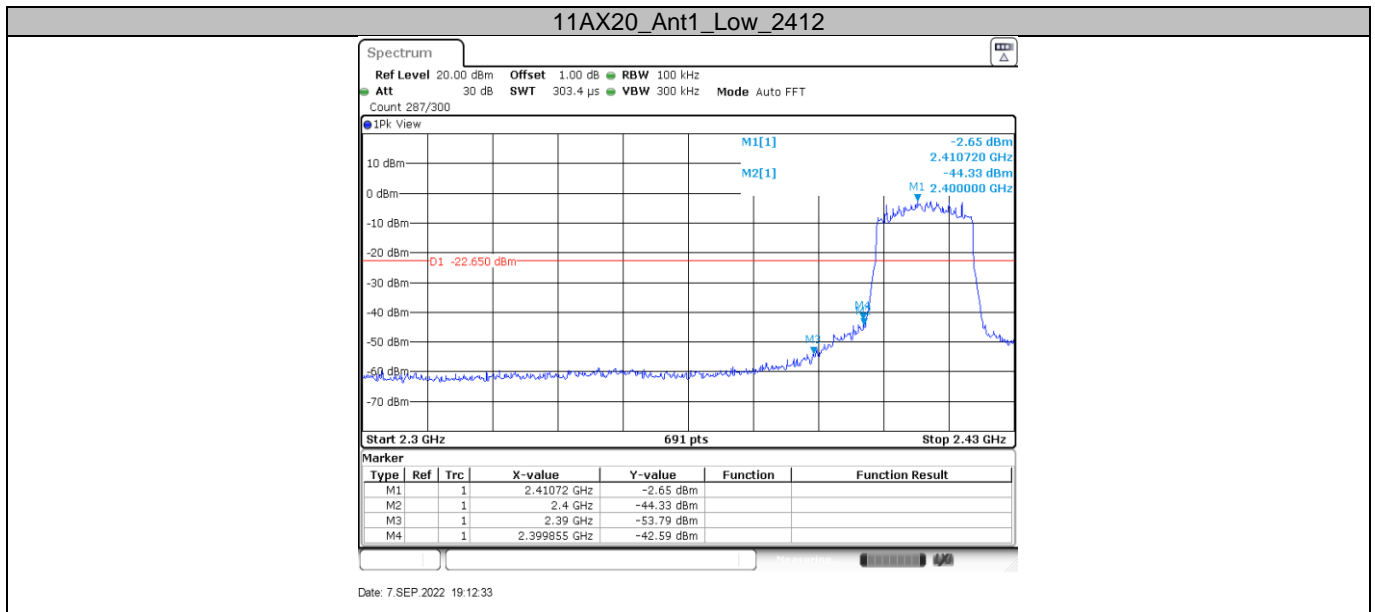
11N20_Ant1_Low_2412



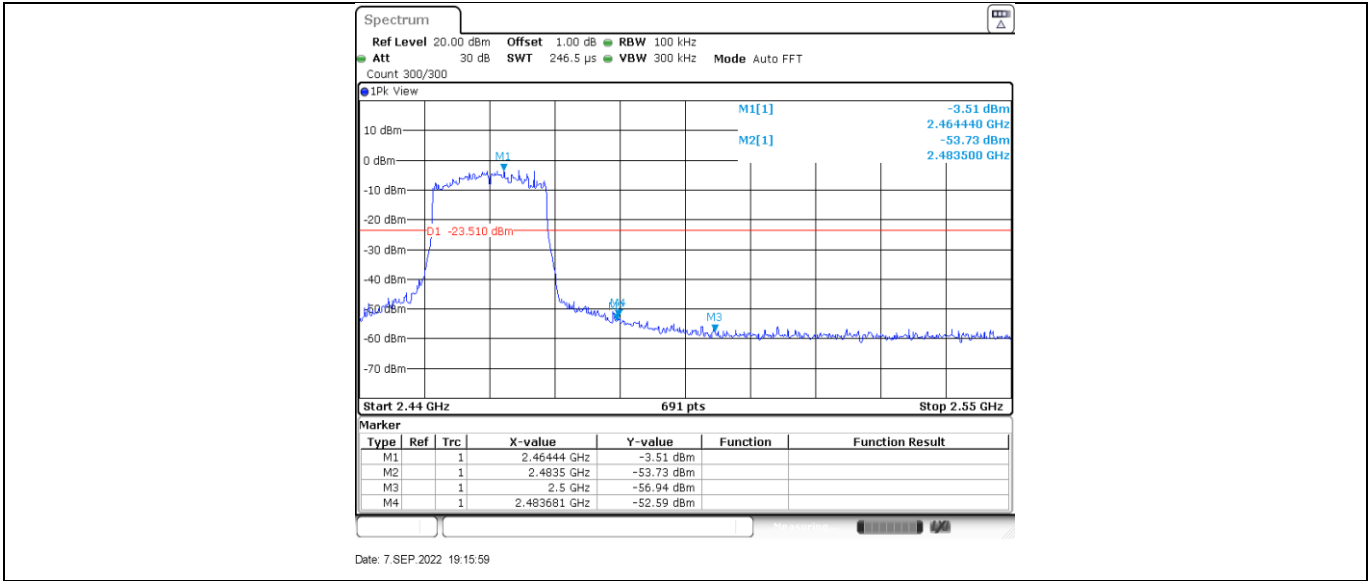
11N20_Ant1_High_2462



11AX20_Ant1_Low_2412



11AX20SISO_Ant1_High_2462



9.7 Radiated spurious emissions for transmitter

Test Method

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 100 KHz to 120KHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 1MHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz

- a) RBW = 1 MHz.
- b) VBW \ [3 × RBW].
- c) Detector = RMS (power averaging), if [span / (# of points in sweep)] \ RBW / 2.
 Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
- d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
- e) Sweep time = auto.
- f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
- g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
 - 1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty

cycle was 50%, then 3 dB shall be added to the measured emission levels.

2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is $[20 \log (1 / D)]$, where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.

3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under § 15.247(b)(3) and RSS 247 section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in § 15.209(a) and RSS-Gen is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a) and RSS-Gen section 8.9, must also comply with the radiated emission limits specified in § 15.209(a) and RSS-Gen section 8.10.

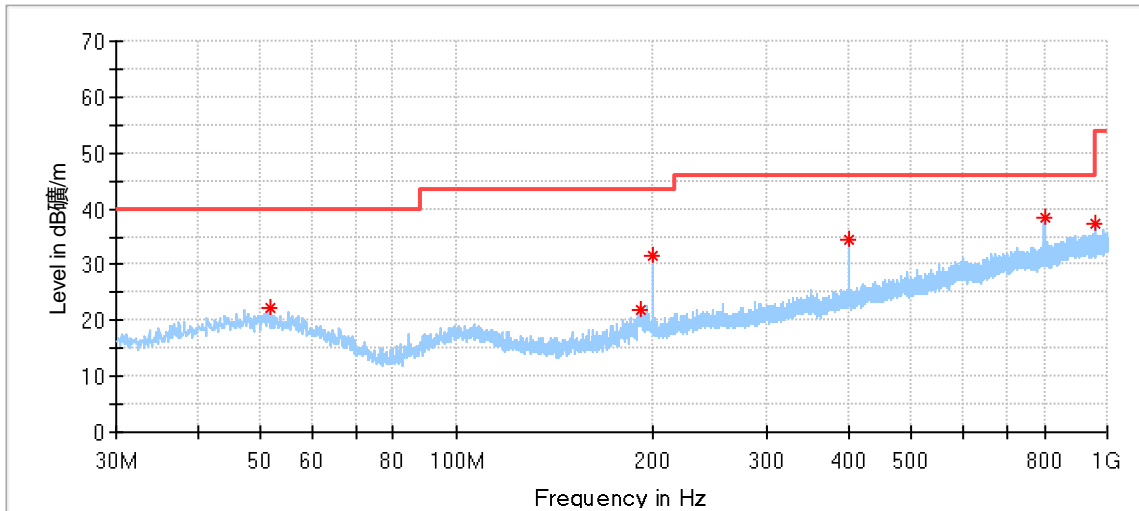
Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

Radiated spurious emissions for transmitter

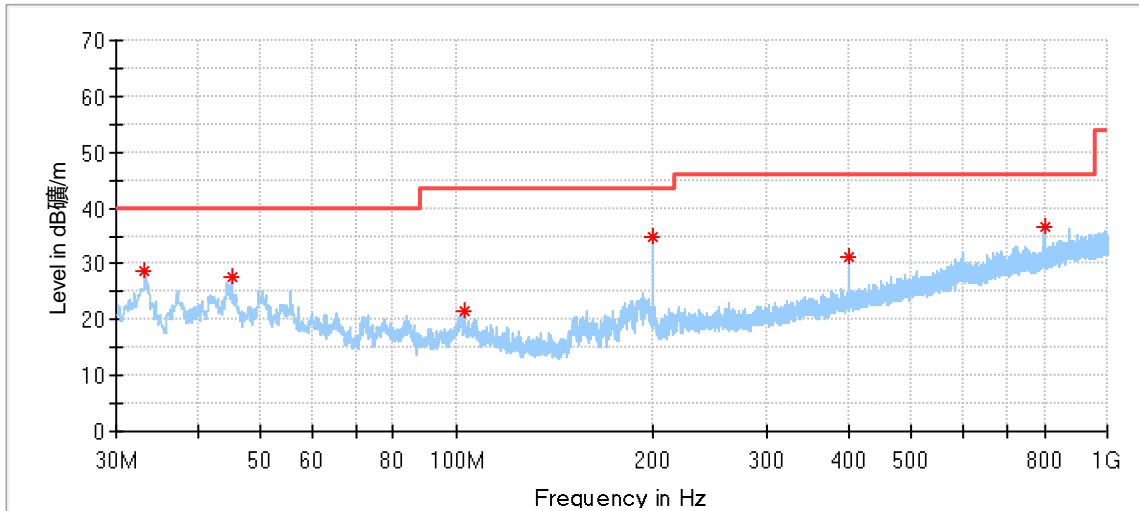
According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Only worst case test data was listed in this report.

Below 1G:



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
51.663333	22.36	40.00	17.64	100.0	H	308.0	20.83
191.343333	22.01	43.50	21.49	200.0	H	74.0	17.99
199.965556	31.67	43.50	11.83	200.0	H	332.0	18.46
400.001111*	34.42	46.00	11.58	100.0	H	123.0	23.56
800.018333	38.42	46.00	7.58	100.0	H	298.0	30.12
960.014444*	37.16	54.00	16.84	100.0	H	342.0	31.98

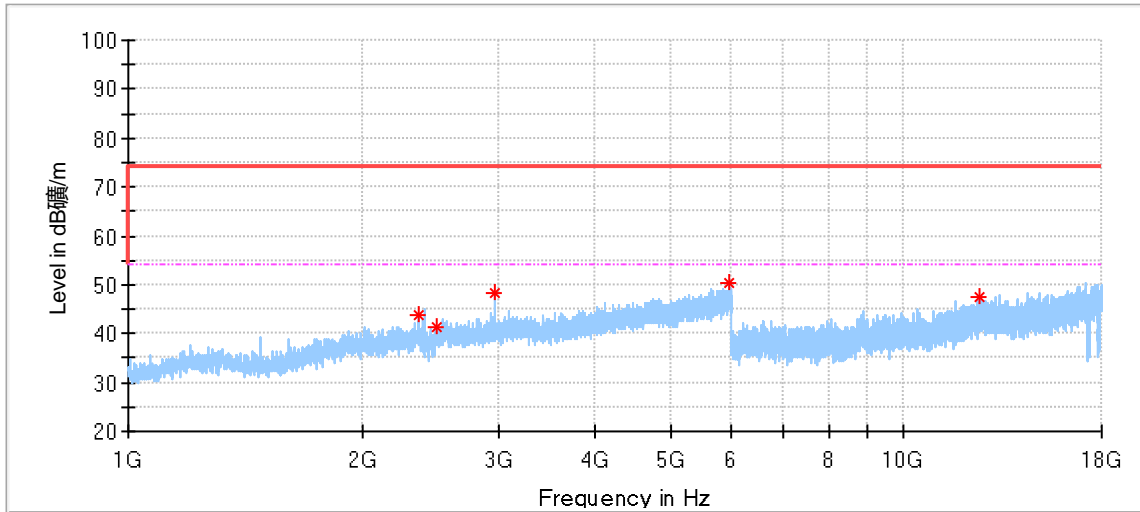


Critical Freqs

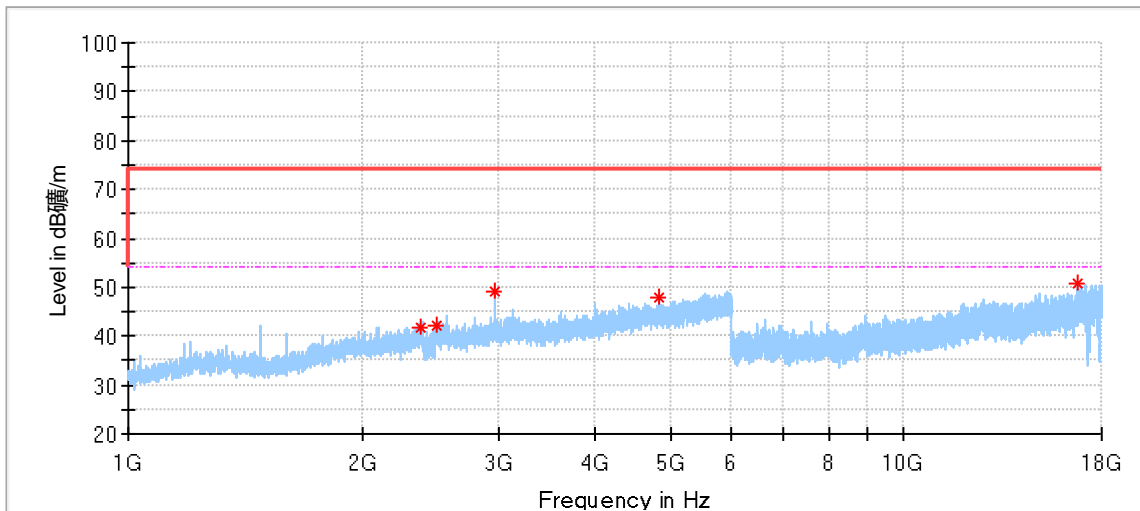
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
33.233333	28.67	40.00	11.33	100.0	V	249.0	16.97
45.088889	27.60	40.00	12.40	100.0	V	104.0	20.69
102.965556	21.65	43.50	21.85	100.0	V	4.0	18.52
199.965556	34.76	43.50	8.74	100.0	V	137.0	18.46
400.001111*	31.08	46.00	14.92	100.0	V	0.0	23.56
800.018333	36.45	46.00	9.55	100.0	V	161.0	30.12

Above 1G:

802.11B Modulation 2412MHz Test Result

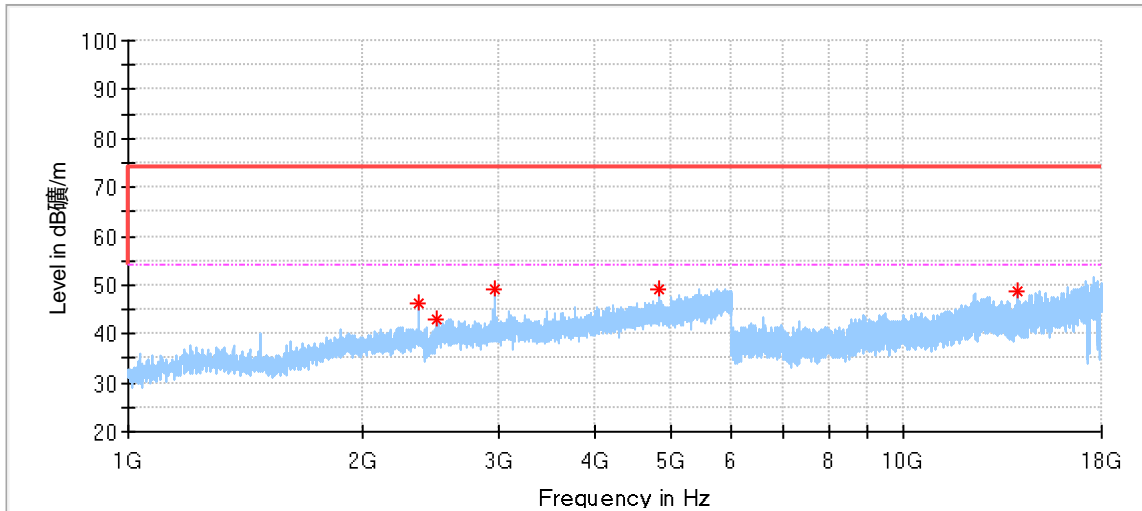


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2374.000000*	43.83	74.00	30.17	150.0	H	317.0	-2.83
2494.000000*	41.27	74.00	32.73	150.0	H	192.0	-2.36
2968.000000	48.21	74.00	25.79	150.0	H	326.0	-0.99
5962.000000	50.30	74.00	23.70	150.0	H	166.0	6.59
12540.500000*	47.60	74.00	26.40	150.0	H	77.0	15.54

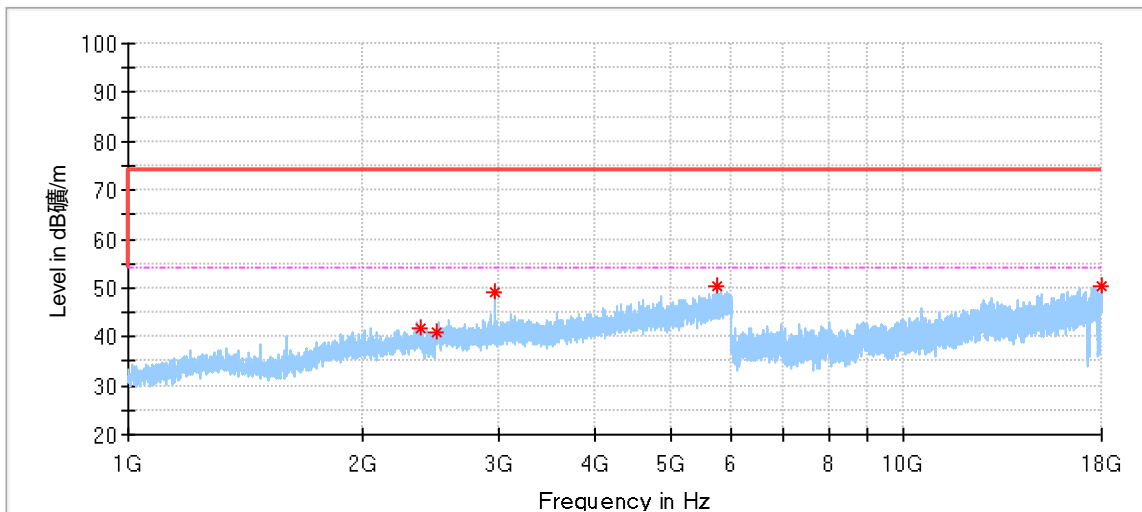


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2384.500000*	41.76	74.00	32.24	150.0	V	287.0	-2.76
2497.000000*	42.11	74.00	31.89	150.0	V	69.0	-2.37
2966.000000	49.08	74.00	24.92	150.0	V	93.0	-0.99
4824.500000*	47.96	74.00	26.04	150.0	V	85.0	3.93
16806.000000	50.89	74.00	23.11	150.0	V	253.0	21.75

802.11B Modulation 2437MHz Test Result

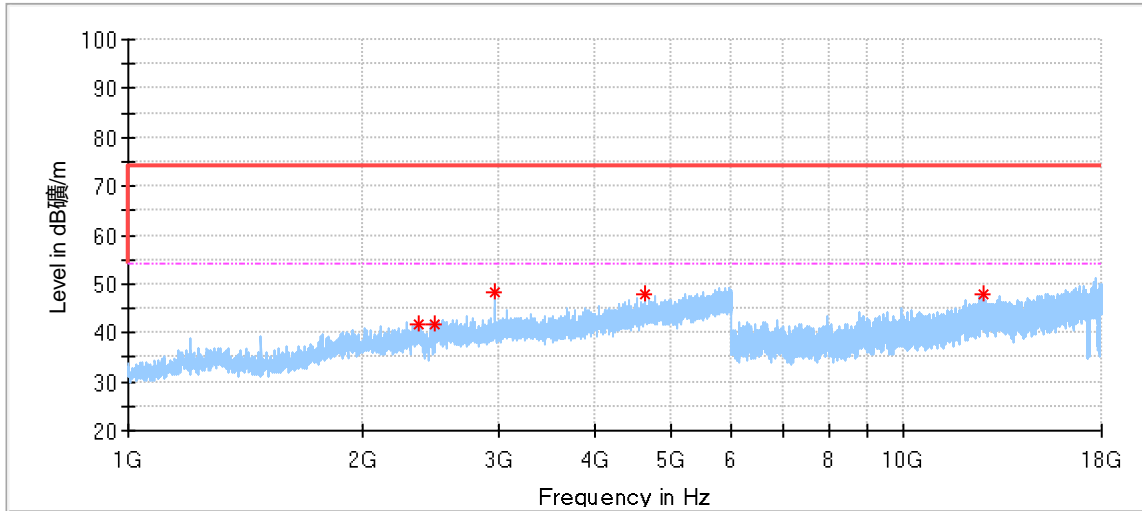


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2366.500000*	46.20	74.00	27.80	150.0	H	59.0	-2.82
2497.000000*	42.79	74.00	31.21	150.0	H	210.0	-2.37
2967.500000	48.94	74.00	25.06	150.0	H	59.0	-0.99
4842.000000*	48.96	74.00	25.04	150.0	H	139.0	3.98
14057.000000	48.78	74.00	25.22	150.0	H	82.0	15.50

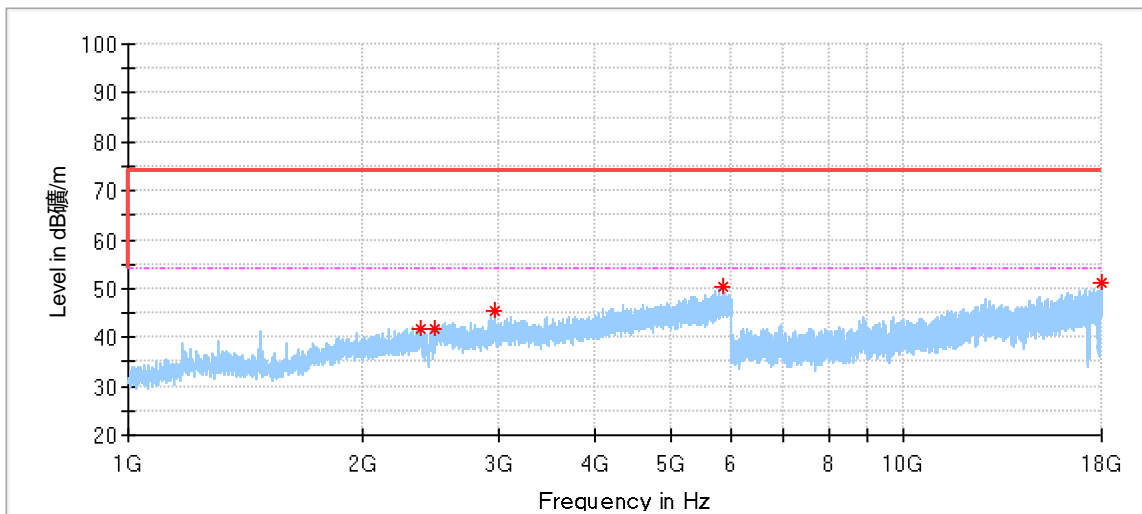


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2384.000000*	41.73	74.00	32.27	150.0	V	30.0	-2.76
2492.000000*	40.77	74.00	33.23	150.0	V	236.0	-2.36
2967.500000	49.11	74.00	24.89	150.0	V	80.0	-0.99
5752.500000	50.22	74.00	23.78	150.0	V	111.0	5.95
17976.500000*	50.36	74.00	23.64	150.0	V	160.0	22.25

802.11B Modulation 2462MHz Test Result



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2364.000000*	41.57	74.00	32.43	150.0	H	23.0	-2.82
2489.500000*	41.60	74.00	32.40	150.0	H	4.0	-2.36
2968.500000	48.42	74.00	25.58	150.0	H	326.0	-0.99
4634.000000*	48.06	74.00	25.95	150.0	H	50.0	3.47
12645.500000*	48.06	74.00	25.94	150.0	H	82.0	16.76



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2384.500000*	41.88	74.00	32.12	150.0	V	132.0	-2.76
2490.500000*	41.94	74.00	32.06	150.0	V	54.0	-2.36
2967.500000	45.51	74.00	28.49	150.0	V	101.0	-0.99
5851.000000	50.25	74.00	23.75	150.0	V	85.0	6.38
17968.500000*	51.04	74.00	22.96	150.0	V	305.0	22.26

Remark:

- (1) The report only shows the worst test data.
- (2) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (3) Data of measurement within frequency range 9kHz-30MHz, 18-26GHz are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so test data does not present in this report.
- (4) Level=Reading Level + Correction Factor
Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
(The Reading Level is recorded by software which is not shown in the sheet)

10 Test Equipment List

Conducted Emission Test

Description	Manufacturer	Model no.	Equipment ID	Serial no.	cal interval (year)	cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-19-002	102590	1	2023-5-27
LISN	Rohde & Schwarz	ENV216	68-4-87-19-001	102472	1	2023-5-27
ISN	Rohde & Schwarz	ENY81	68-4-87-14-003	100177	1	2023-5-27
ISN	Rohde & Schwarz	ENY81-CA6	68-4-87-14-004	101664	1	2023-5-27
High Voltage Probe	Schwarzbeck	TK9420(VT9420)	68-4-27-14-001	9420-584	1	2023-5-27
RF Current Probe	Rohde & Schwarz	EZ-17	68-4-27-14-002	100816	1	2023-5-31
Attenuator	Shanghai Huaxiang	TS2-26-3	68-4-81-16-003	080928189	1	2023-5-27
Test software	Rohde & Schwarz	EMC32	68-4-90-19-005-A01	Version10.35.0 2	N/A	N/A
Shielding Room	TDK	CSR #2	68-4-90-19-005	----	3	2022-11-07

Radiated Emission Test

Description	Manufacturer	Model no.	Equipment ID	Serial no.	cal interval (year)	cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 26	68-4-74-14-002	101269	1	2023-5-28
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9162	68-4-80-19-003	284	1	2023-1-17
Wave Guide Antenna	ETS	3117	68-4-80-19-001	00218954	1	2023-5-9
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-001	100745	1	2023-5-28
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-002	100746	1	2023-5-28
Sideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	68-4-80-14-008	12827	1	2023-7-12
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14-002	100432	1	2023-7-27
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-002	15542	1	2023-5-27
3m Semi-anechoic chamber	TDK	SAC-3 #2	68-4-90-19-006	----	2	2023-5-28
Test software	Rohde & Schwarz	EMC32	68-4-90-19-006-A01	Version10.35.0 2	N/A	N/A

RF conducted test

Description	Manufacturer	Model no.	Equipment ID	Serial no.	cal interval (year)	cal. due date
Signal Analyzer	Rohde & Schwarz	FSV40	68-4-74-14-004	101030	1	2023-5-27
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	68-4-93-14-003	101226/100851	1	2023-5-27
Power Splitter	Weinschel	1580	68-4-85-14-001	SC319	1	2023-5-28
Test software	Tonscend	System for BT/WIFI	68-4-74-14-006-A13	Version 2.6.77.0518	N/A	N/A
Shielding Room	TDK	TS8997	68-4-90-19-003	----	3	2022-11-07

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz	4.70dB
Uncertainty for Conducted Emission 150kHz-30MHz	3.33dB
Uncertainty for Radiated Spurious Emission 25MHz- 1000MHz	Horizontal: 4.59dB; Vertical: 4.75dB;
Uncertainty for Radiated Spurious Emission 1000MHz- 18000MHz	Horizontal: 4.08dB; Vertical: 5.09dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 4.51dB; Vertical: 4.50 dB;
Uncertainty for Conducted RF test with TS 8997	RF Power Conducted: 1.30dB Frequency test involved: 0.6×10^{-8} or 1%