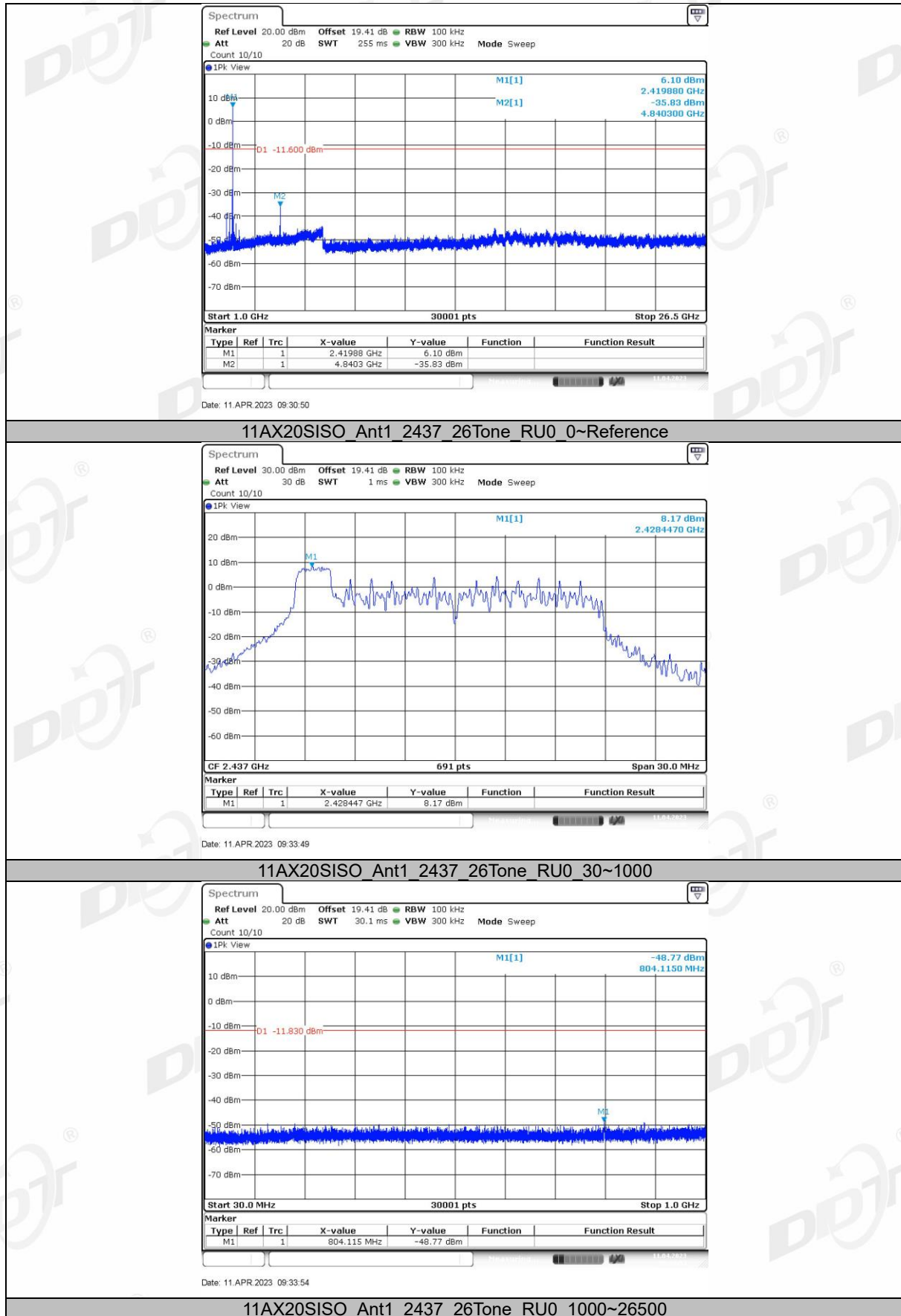
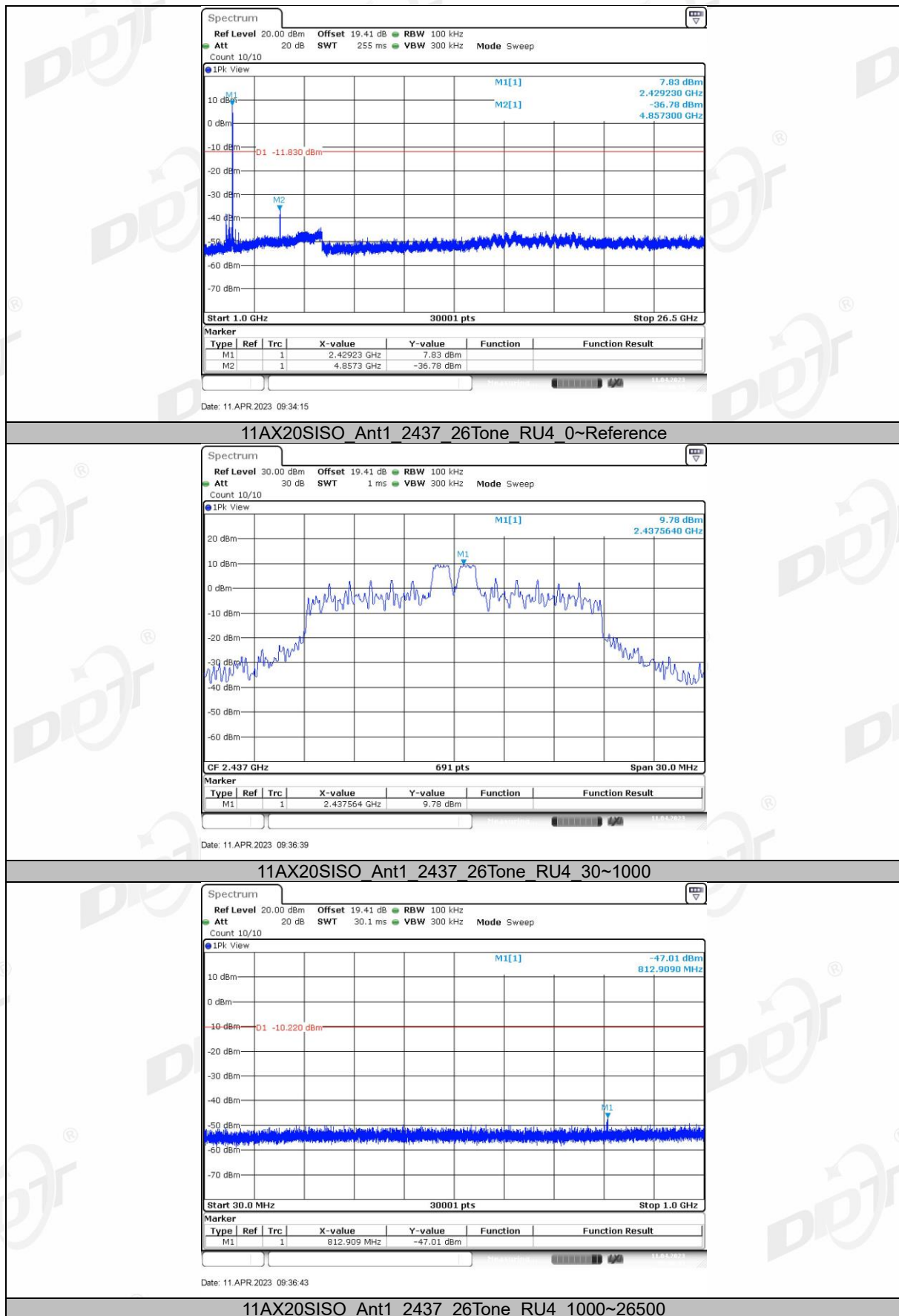
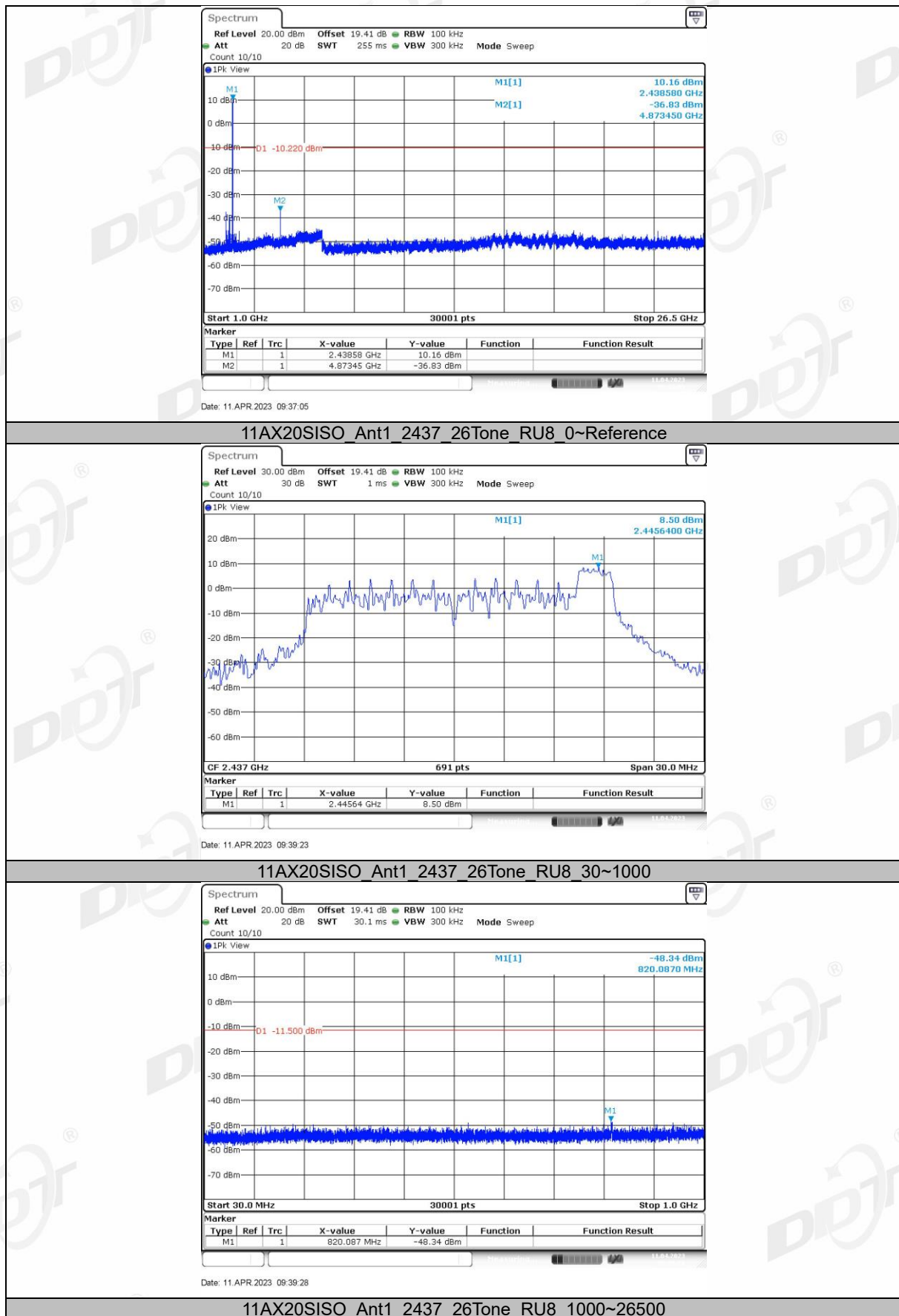
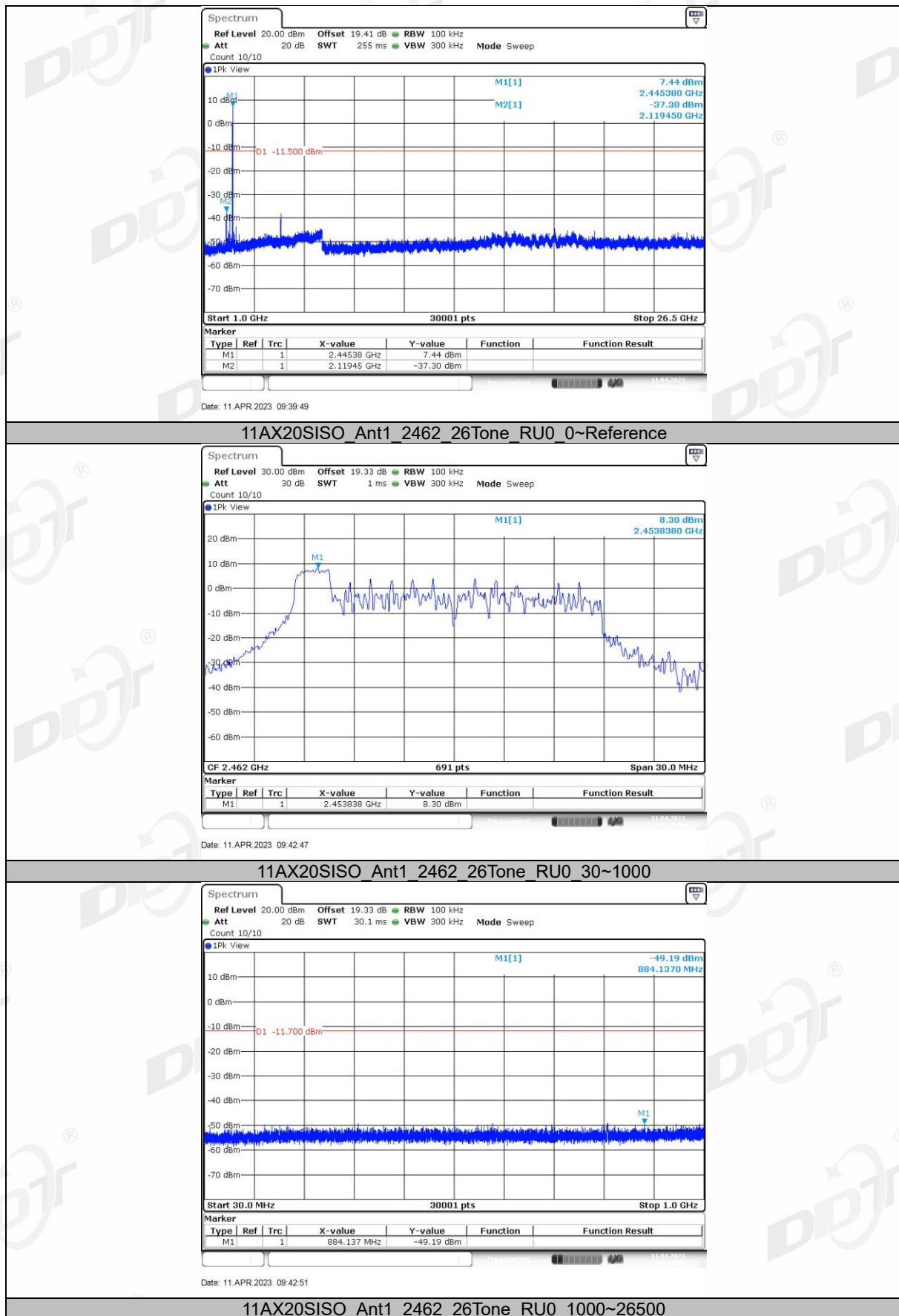
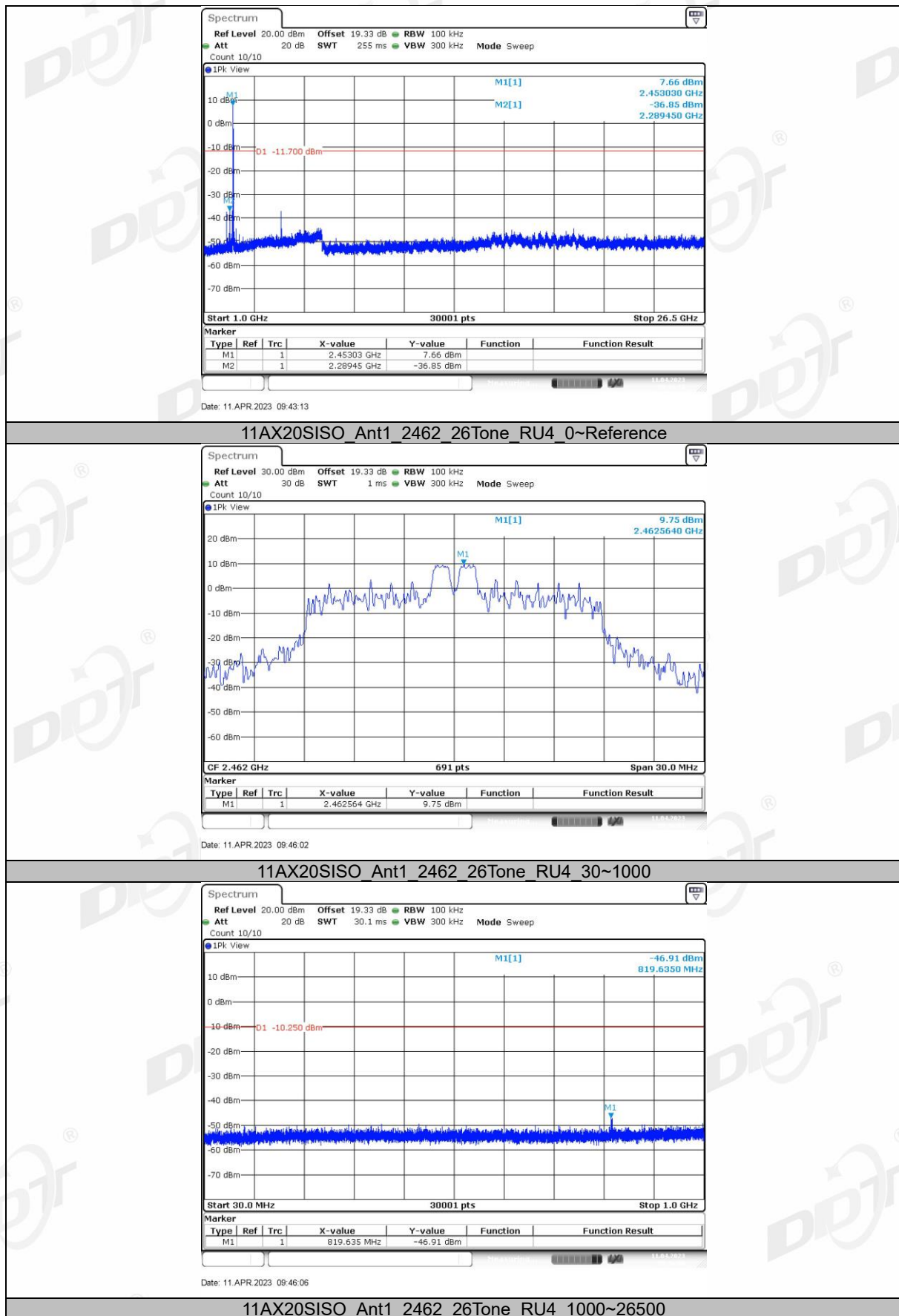


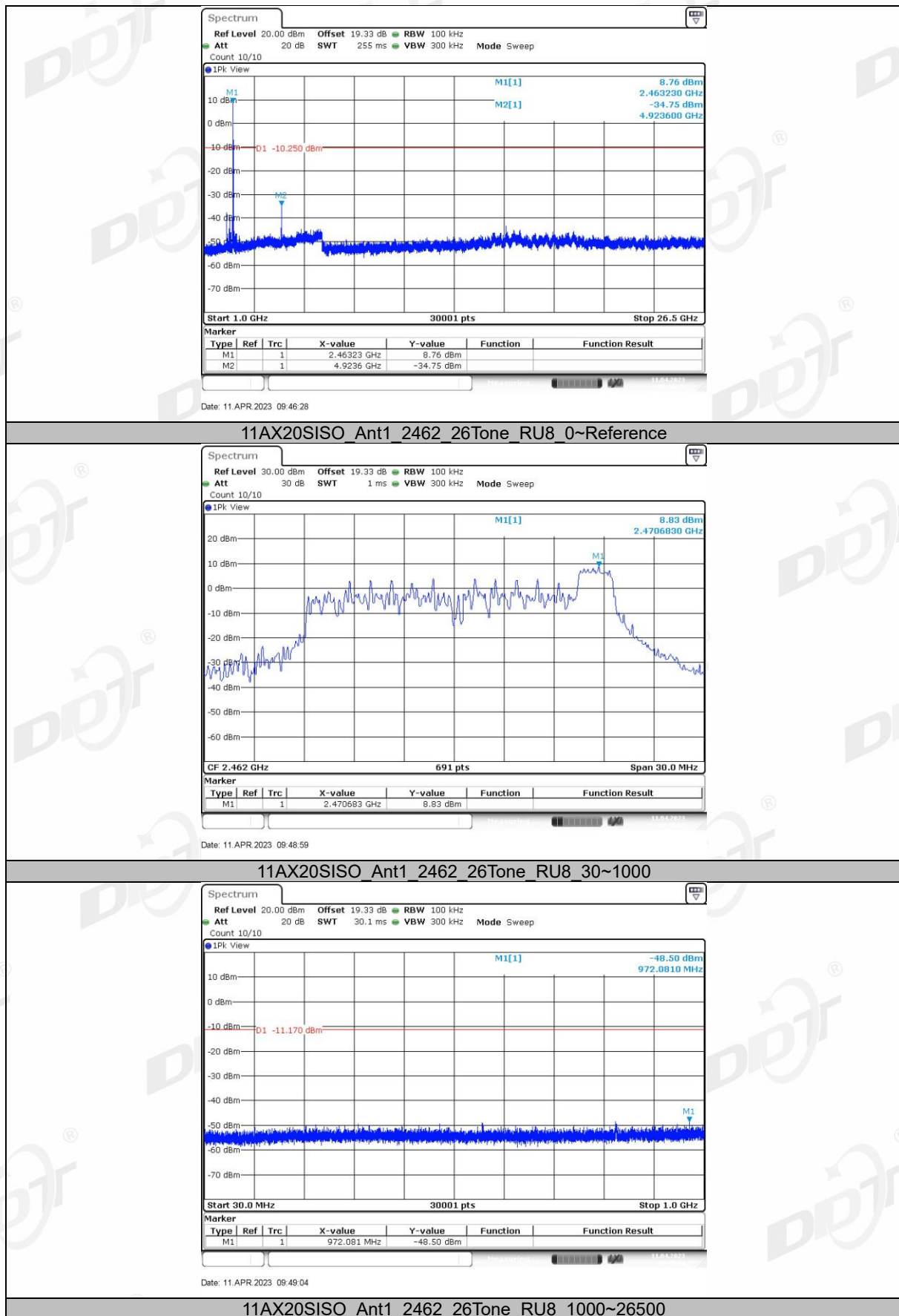


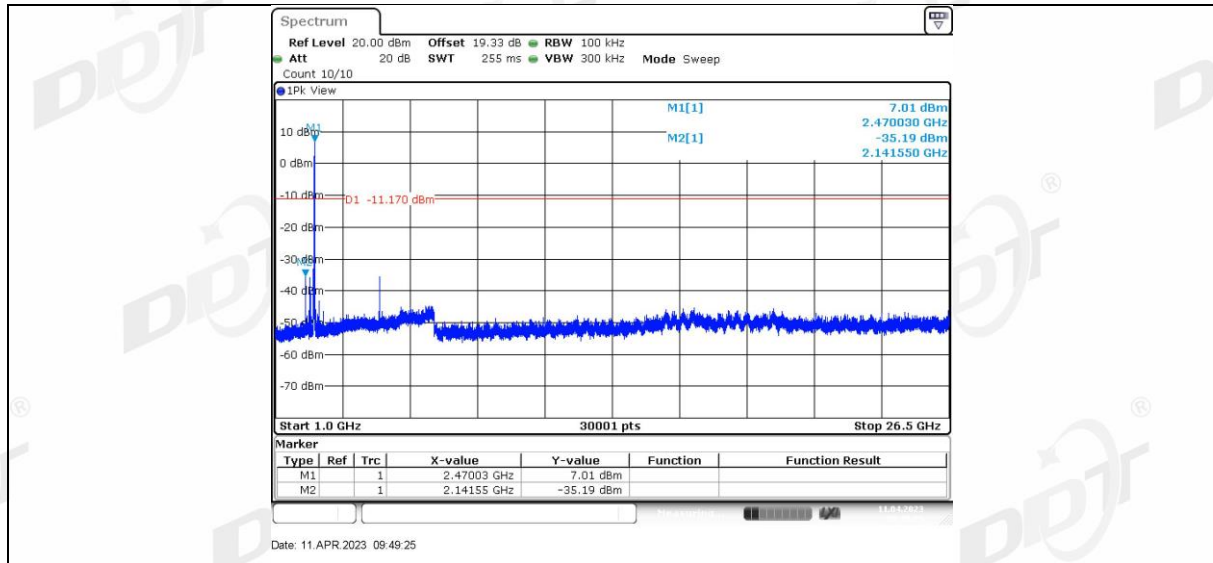






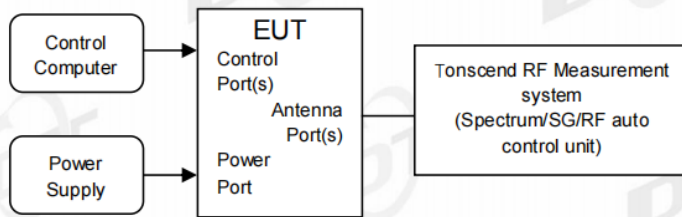






9. Duty Cycle

9.1. Block diagram of test setup



9.2. Limit

Just for Report.

9.3. Test procedure

- (1) Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, The cable loss and attenuator loss have been put into spectrum analyzer as amplitude offset.
set the Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the middle hopping channel.

Resolution BW: 10 MHz.

Video BW: 10 MHz.

Span: Zero span.

Detector: Peak.

Trace Mode: Max Hold.

Sweep: Video Trigger

- (2) When the trace is complete, measure the sending time of 1 burst and the duty cycle of 1 burst cycle.
- (3) Calculate dwell time follow below formula:

$$\text{Duty cycle} = \text{Pulse's on time} / \text{Burst cycle}$$

9.4. Test result

Test Mode	Antenna	Frequency [MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11B	Ant1	2412	0.32	0.35	91.43
		2437	0.32	0.34	94.12
		2462	0.32	0.34	94.12
11G	Ant1	2412	1.36	1.39	97.84
		2437	1.36	1.39	97.84
		2462	1.36	1.39	97.84
11N20SISO	Ant1	2412	5.09	5.11	99.61
		2437	5.09	5.11	99.61
		2462	5.09	5.11	99.61
11N40SISO	Ant1	2422	2.47	2.49	99.20
		2437	2.48	2.50	99.20
		2452	2.47	2.50	98.80
11AX20SISO	Ant1	2412	3.88	3.90	99.49
		2437	3.87	3.90	99.23
		2462	3.87	3.90	99.23

Test Mode	Antenna	Frequency [MHz]	Ru Size	Ru Index	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11AX20SISO	Ant1	2412	26Tone	RU0	0.86	0.90	95.56
				RU4	0.86	0.90	95.56
				RU8	0.86	0.89	96.63
		2437	26Tone	RU0	0.86	0.90	95.56
				RU4	0.86	0.89	96.63
				RU8	0.86	0.90	95.56
		2462	26Tone	RU0	0.86	0.90	95.56
				RU4	0.86	0.90	95.56
				RU8	0.86	0.89	96.63

9.5. Test graphs













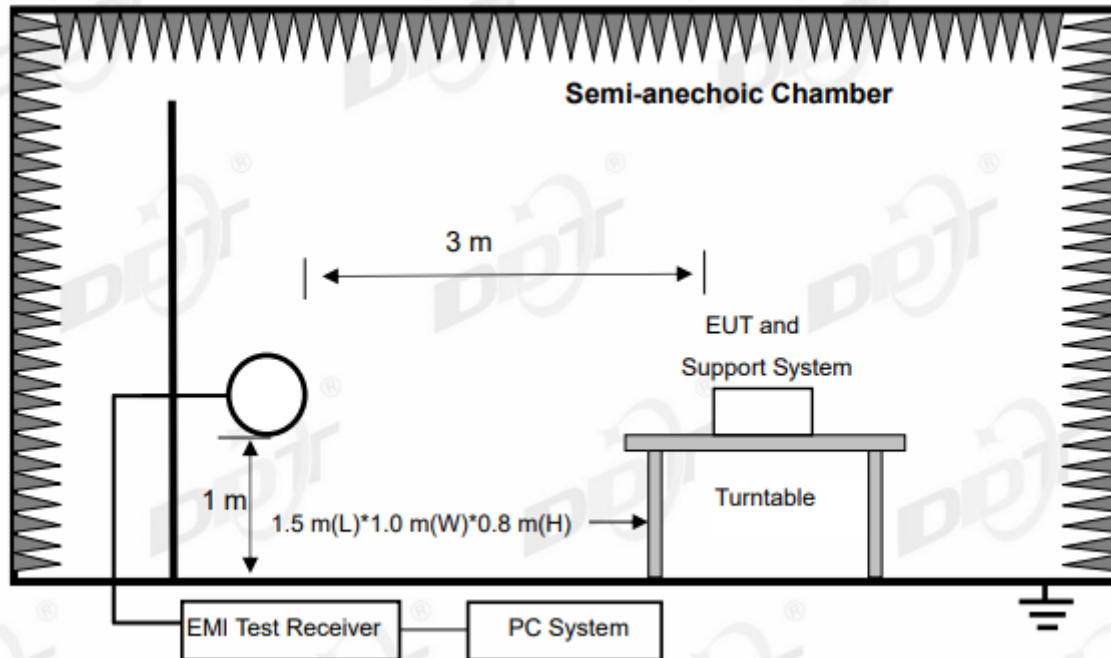




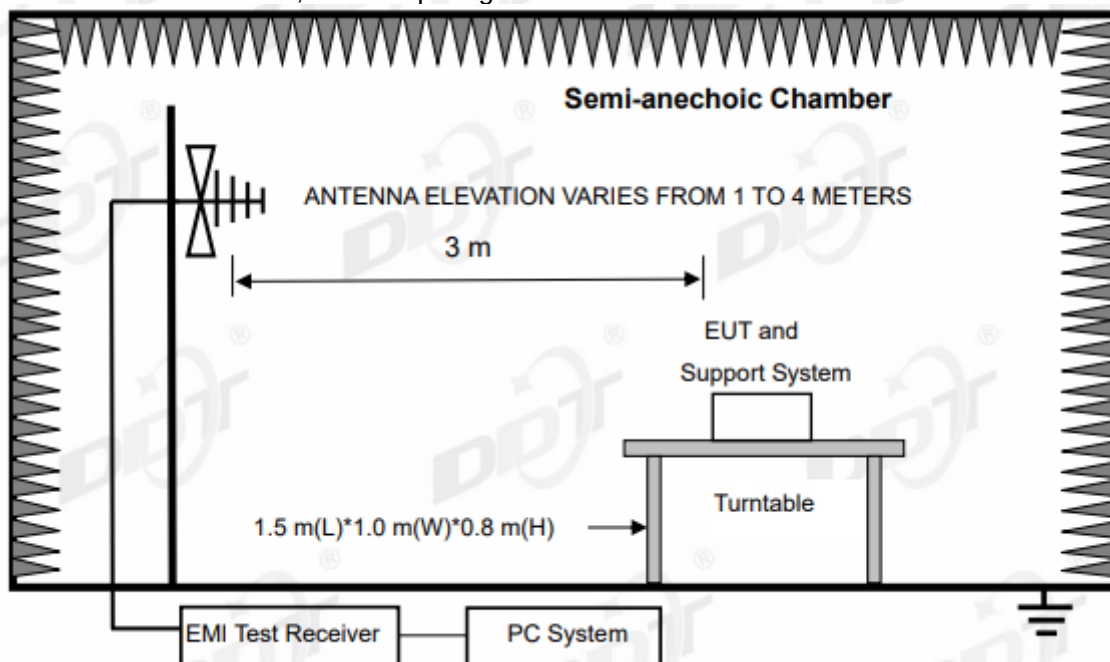
10. Radiated Spurious Emissions

10.1. Block diagram of test setup

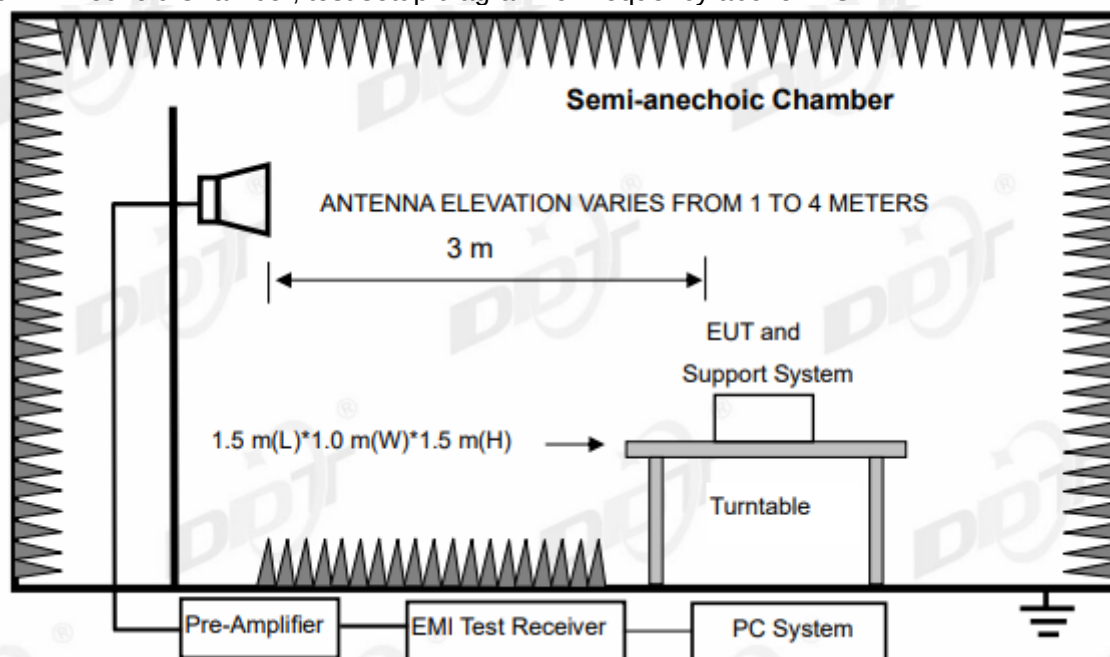
In 3 m Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:



In 3 m Anechoic Chamber, test setup diagram for 30 MHz - 1 GHz:



In 3 m Anechoic Chamber, test setup diagram for frequency above 1 GHz:



Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

10.2. Limit

(1) FCC 15.205 Restricted frequency band:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.1772&4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.2072&4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6

(2) FCC 15.209 Limit.

Frequency (MHz)	Measurement distance (meters)	Field strength limit	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009 ~ 0.490	300	$2400/F(\text{kHz})$	$67.6-20\log(F)$
0.490 ~ 1.705	30	$24000/F(\text{kHz})$	$87.6-20\log(F)$
1.705 ~ 30.0	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak), 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

Note:

(1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000MHz, radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3\text{m}}(\text{dB}\mu\text{V}/\text{m}) = \text{Limit}_{30\text{m}}(\text{dB}\mu\text{V}/\text{m}) + 40\log(30\text{m}/3\text{m})$$

(3) Limit for this EUT

The emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20 dB below the fundamental emissions or comply with 15.209 limits.

10.3. Test procedure

(1) EUT height should be 0.8 m for below 1 GHz at a semi - anechoic chamber while EUT height should be 1.5 m for above 1 GHz at full chamber or semi - anechoic chamber ground with absorbers.

(2) The antenna used as below table.

Test frequency range	Test antenna used	Test antenna distance
9kHz-30MHz	Active Loop antenna	3m
30MHz-1GHz	Trilog Broadband Antenna	3m
1GHz-18GHz	Double Ridged Horn Antenna (1GHz-18GHz)	3m
18GHz-40GHz	Horn Antenna (18GHz-40GHz)	1m

According ANSI C63.10:2013 clause 6.4.6 and 6.5.3, for measurements below 30 MHz, Antenna was located 3 m from EUT, the loop antenna was positioned in three antenna orientations (parallel, perpendicular, and round-parallel), for each measurement antenna alignment, the EUT shall be rotated through 0° to 360° on a turntable, and the lowest height of the magnetic antenna

shall be 1 m above the ground. For measurement above 30MHz, the trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

(3) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9 kHz to 25 GHz:

(a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1 m to 4 m (Except loop antenna, it's fixed 1m above ground.)

(b) Change work frequency or channel of device if practicable.

(c) Change modulation type of device if practicable.

(d) Change power supply range from 85% to 115% of the rated supply voltage

(e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9 kHz to 25 GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 18GHz to 25GHz, so below final test was performed with frequency range from 9kHz to 18GHz.

(4) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission.

Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 2013 on Radiated Emission test.

(5) The emissions from 9 kHz to 1 GHz were measured based on CISPR QP detector except for the frequency bands 9-90 kHz, 110-490 kHz, for emissions from 9 kHz-90 kHz,110 kHz-490 kHz and above 1 GHz were measured based on average detector, for emissions above 1 GHz, peak emissions also be measured and need comply with Peak limit.

(6) The emissions from 9 kHz to 1 GHz, QP or average values were measured with EMI receiver with below RBW

Frequency band	RBW
9 kHz-150 kHz	200 Hz
150 kHz-30 MHz	9 kHz
30 MHz-1 GHz	120 kHz

(7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1 MHz, VBW is set at 3 MHz for Peak measure; RMS detector RBW 1 MHz VBW 10 Hz for Average measure (according ANSI C63.10:2013 clause

4.2.3.2.3 procedure for average measure).

10.4. Test result

Pass. (See below detailed test result)

All the emissions except fundamental emission from 9 kHz to 25 GHz were comply with 15.209 limits.

Note 1: According exploratory test, the emission levels are 20 dB below the limit detected from 9 kHz to 30 MHz and 18 GHz to 25 GHz, so the final test was performed with frequency range from 30 MHz to 18 GHz and recorded in below.

Note 2: 30 MHz ~ 25 GHz: (Scan with all mode, the worst case is 802.11b mode)

Note 3: For emissions below 1 GHz, according exploratory explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions below 1 GHz, the final test was only performed with EUT working in 802.11b, Tx 2462MHz mode.

Note 4: For emissions above 1 GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit, only recorded the worst case in this report.

Note5: BT+2.4GWIFI is the worst simultaneous case and was recorded.

Radiated Emission test (below 1GHz)

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-04-14

Tested By: Bairong

EUT: Smart Light Switch

Model Number: 50367

Test Mode: Tx mode

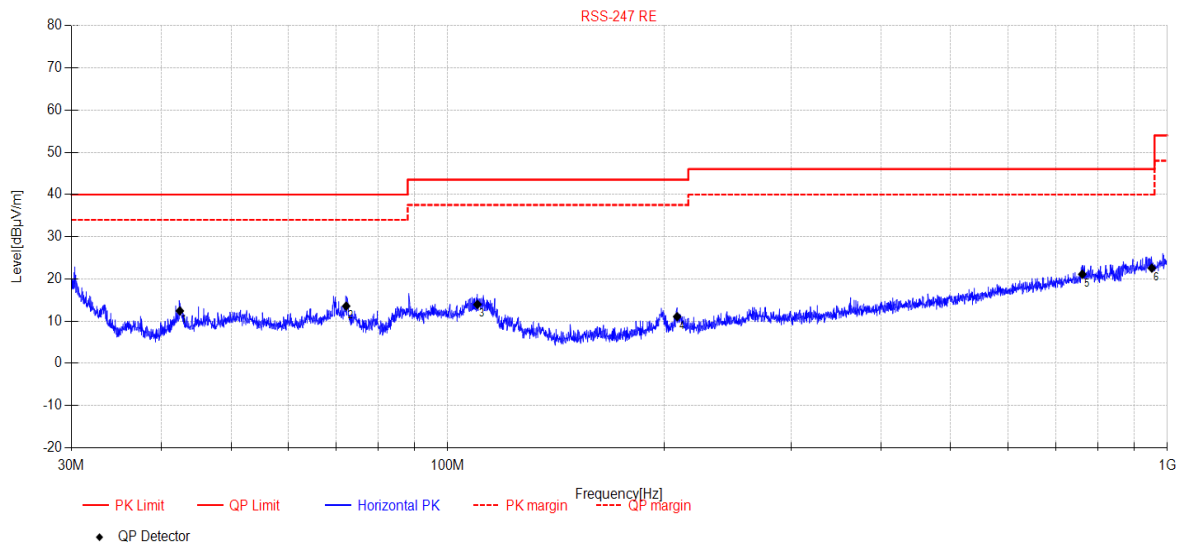
Power Supply: AC 120V/60Hz

Condition: Temp:22.2°C;Humi:54.0%

Test Site: DDT 3# Chamber

File Path: d:\ts\2023 report data\Q23030729-2E 50367\IC BELOW 1G\20230414-180917_H

Memo:

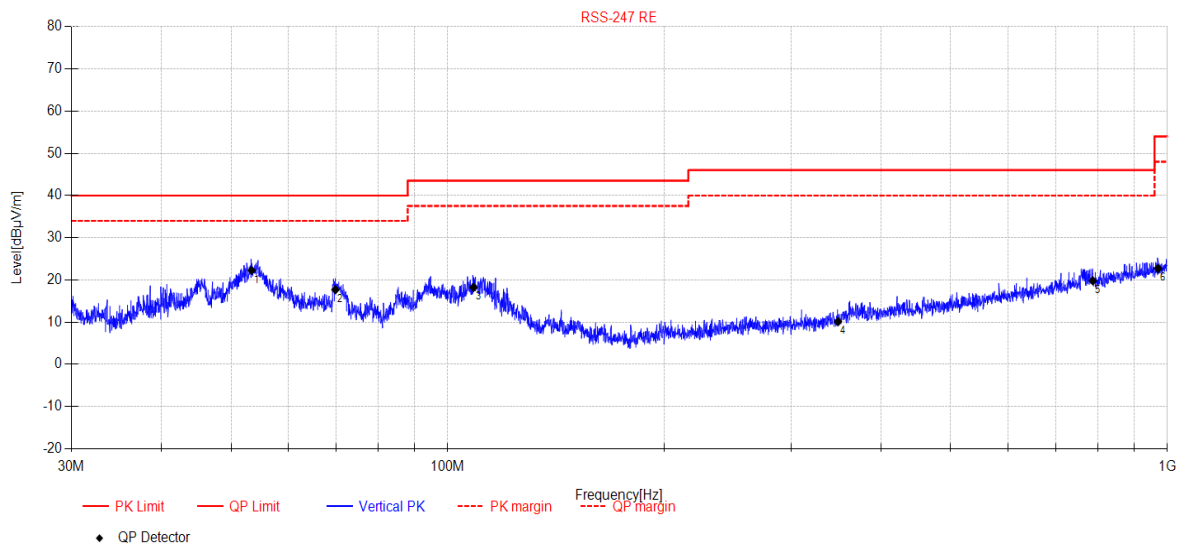


Final Data List										
NO.	Freq. [MHz]	Reading [dBμV/m]	Antenna Factor [dB]	Cable Loss [dB]	AMP [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	42.45	31.25	12.59	0.87	-32.28	12.43	40.00	27.57	QP	Horizontal
2	72.27	36.73	7.82	1.27	-32.26	13.56	40.00	26.44	QP	Horizontal
3	110.00	33.96	10.50	1.72	-32.23	13.95	43.50	29.55	QP	Horizontal
4	208.35	30.06	10.87	2.39	-32.25	11.07	43.50	32.43	QP	Horizontal
5	761.81	28.33	20.84	4.75	-32.81	21.11	46.00	24.89	QP	Horizontal
6	951.44	26.13	22.70	5.36	-31.63	22.56	46.00	23.44	QP	Horizontal

Note:

1. Result Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-04-14**Tested By:** Bairong**EUT:** Smart Light Switch**Model Number:** 50367**Test Mode:** Tx mode**Power Supply:** AC 120V/60Hz**Condition:** Temp:22.2°C;Humi:54.0%**Test Site:** DDT 3# Chamber**File Path:** d:\ts\2023 report data\Q23030729-2E 50367\IC BELOW 1G\20230414-181003_V**Memo:**

Final Data List										
NO.	Freq. [MHz]	Reading [dBμV/m]	Antenna Factor [dB]	Cable Loss [dB]	AMP [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	53.42	40.67	12.86	1.01	-32.28	22.26	40.00	17.74	QP	Vertical
2	69.83	40.16	8.57	1.23	-32.27	17.69	40.00	22.31	QP	Vertical
3	108.62	38.13	10.64	1.71	-32.23	18.25	43.50	25.25	QP	Vertical
4	348.59	24.78	14.57	3.11	-32.34	10.12	46.00	35.88	QP	Vertical
5	787.89	26.67	21.10	4.83	-32.79	19.81	46.00	26.19	QP	Vertical
6	970.98	25.9	22.80	5.41	-31.40	22.71	54.00	31.29	QP	Vertical

Note:

- Result Level = Reading + Cable loss + Antenna Factor + AMP
- If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
- Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

Radiated Emission test (above 1GHz)

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-04-10

Tested By: Bairong

EUT: Smart Light Switch

Model Number: 50367

Test Mode: Tx mode

Power Supply: AC 120V/60Hz

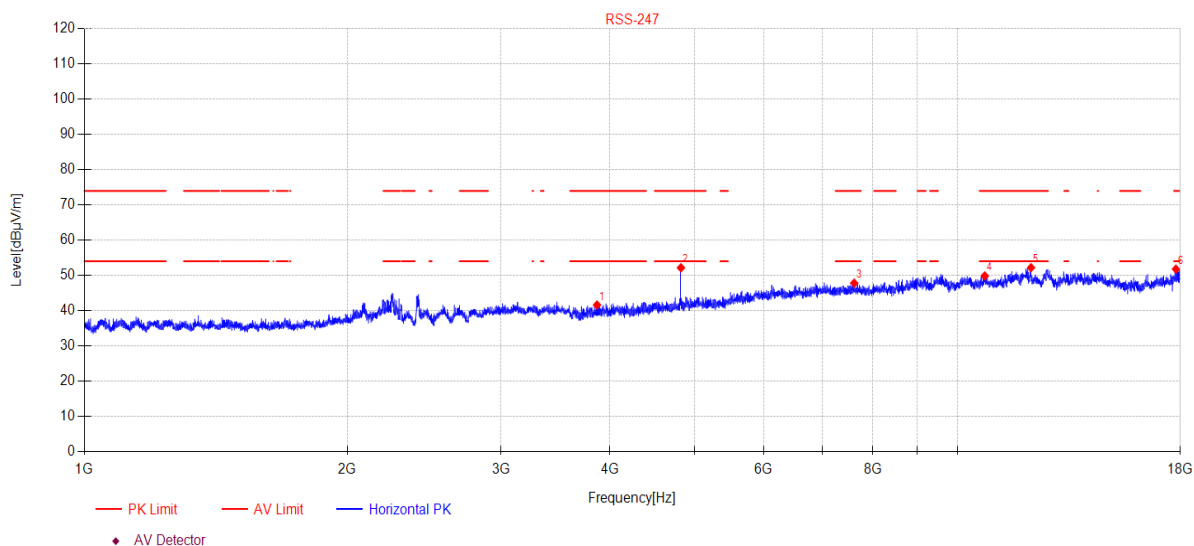
Condition: Temp:22.2°C;Humi:54.0%

Test Site: DDT 3# Chamber

File Path: d:\ts\2023 report data\Q23030729-2E 50367\IC ABOVE 1G 2.4GWIFI\29

Memo: 11B 2412

Test Graph



Suspected Data List

NO	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	3865.07	46.83	5.66	30.43	-41.32	41.60	74.00	32.40	PK	Horizontal
2	4822.83	54.94	5.99	32.39	-41.15	52.17	74.00	21.83	PK	Horizontal
3	7616.24	45.27	7.12	36.43	-41.00	47.82	74.00	26.18	PK	Horizontal
4	10745.55	43.37	7.92	39.10	-40.53	49.86	74.00	24.14	PK	Horizontal
5	12142.87	43.63	8.51	39.10	-39.04	52.20	74.00	21.80	PK	Horizontal
6	17793.11	40.24	11.72	40.45	-40.62	51.79	74.00	22.21	PK	Horizontal

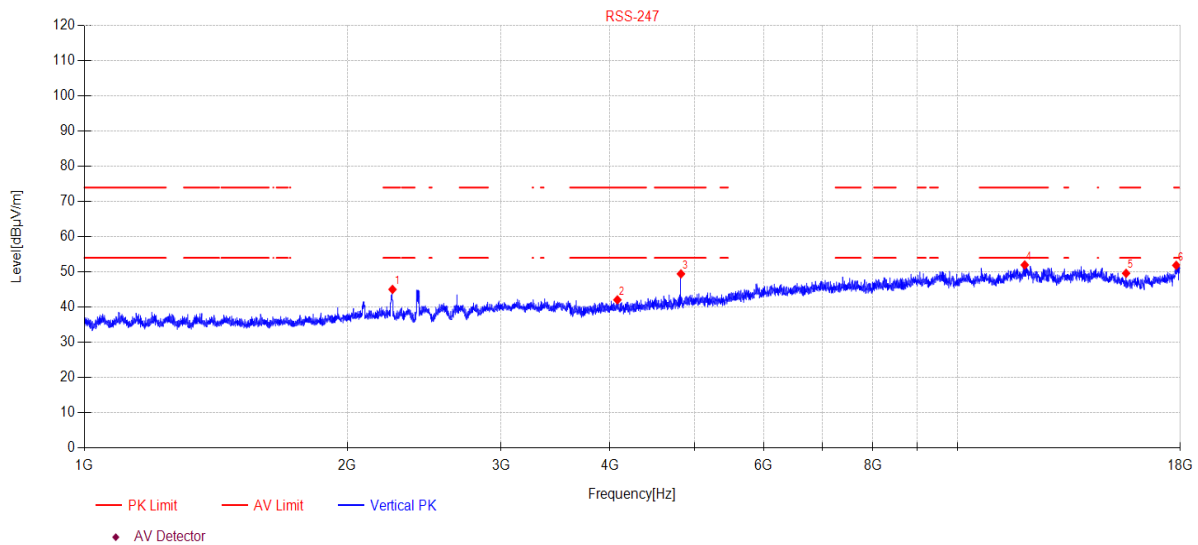
Note:

1. Level = Reading + Cable Loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-04-10 **Tested By:** Bairong
EUT: Smart Light Switch **Model Number:** 50367
Test Mode: Tx mode **Power Supply:** AC 120V/60HZ
Condition: Temp:22.2°C;Humi:54.0% **Test Site:** DDT 3# Chamber
File Path: d:\ts\2023 report data\Q23030729-2E 50367\IC ABOVE 1G 2.4GWIFI\30
Memo: 11B 2412

Test Graph



Suspected Data List

NO	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	2253.97	53.12	4.59	27.30	-39.98	45.03	74.00	28.97	PK	Vertical
2	4078.53	46.81	5.76	30.86	-41.38	42.05	74.00	31.95	PK	Vertical
3	4822.83	52.21	5.99	32.39	-41.15	49.44	74.00	24.56	PK	Vertical
4	11941.03	43.76	8.36	38.84	-38.99	51.97	74.00	22.03	PK	Vertical
5	15600.65	41.24	10.08	38.40	-40.12	49.60	74.00	24.40	PK	Vertical
6	17808.55	40.19	11.74	40.56	-40.62	51.87	74.00	22.13	PK	Vertical

Note:

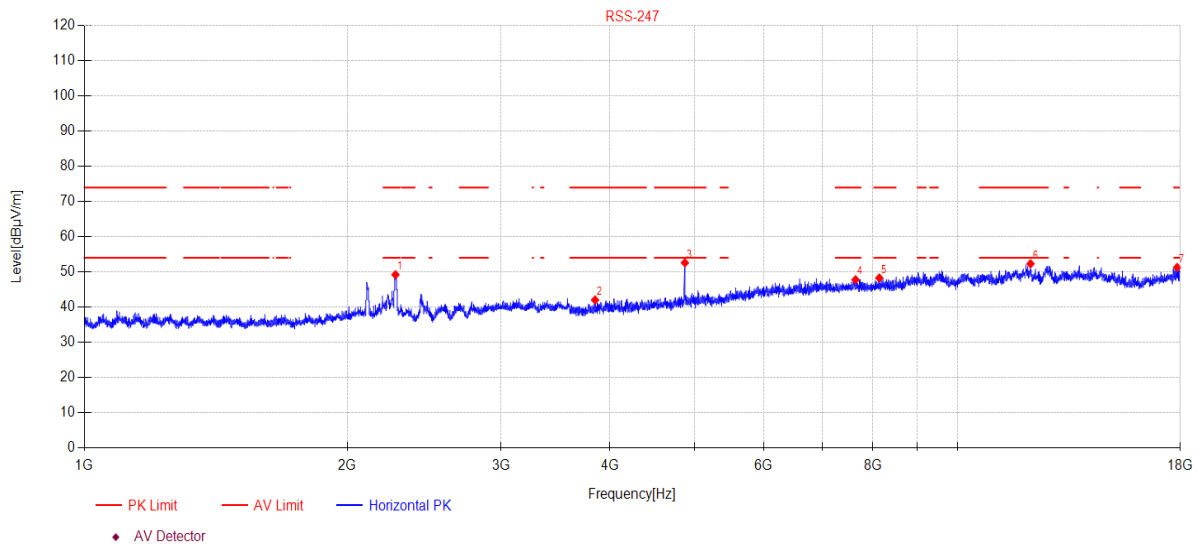
- Level = Reading + Cable Loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-04-10
EUT: Smart Light Switch
Test Mode: Tx mode
Condition: Temp:22.2°C;Humi:54.0%
File Path: d:\ts\2023 report data\Q23030729-2E 50367\IC ABOVE 1G 2.4GWIFI\31
Memo: 11B 2437

Tested By: Bairong
Model Number: 50367
Power Supply: AC 120V/60HZ
Test Site: DDT 3# Chamber

Test Graph



Suspected Data List

NO	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	2271.62	57.30	4.61	27.30	-40.00	49.21	74.00	24.79	PK	Horizontal
2	3845.02	47.29	5.65	30.39	-41.31	42.02	74.00	31.98	PK	Horizontal
3	4873.27	55.18	6.01	32.55	-41.14	52.60	74.00	21.40	PK	Horizontal
4	7642.70	45.16	7.12	36.49	-41.00	47.77	74.00	26.23	PK	Horizontal
5	8137.36	44.98	7.06	37.00	-40.78	48.26	74.00	25.74	PK	Horizontal
6	12125.34	43.74	8.50	39.10	-39.03	52.31	74.00	21.69	PK	Horizontal
7	17849.77	39.26	11.80	40.85	-40.64	51.27	74.00	22.73	PK	Horizontal

Note:

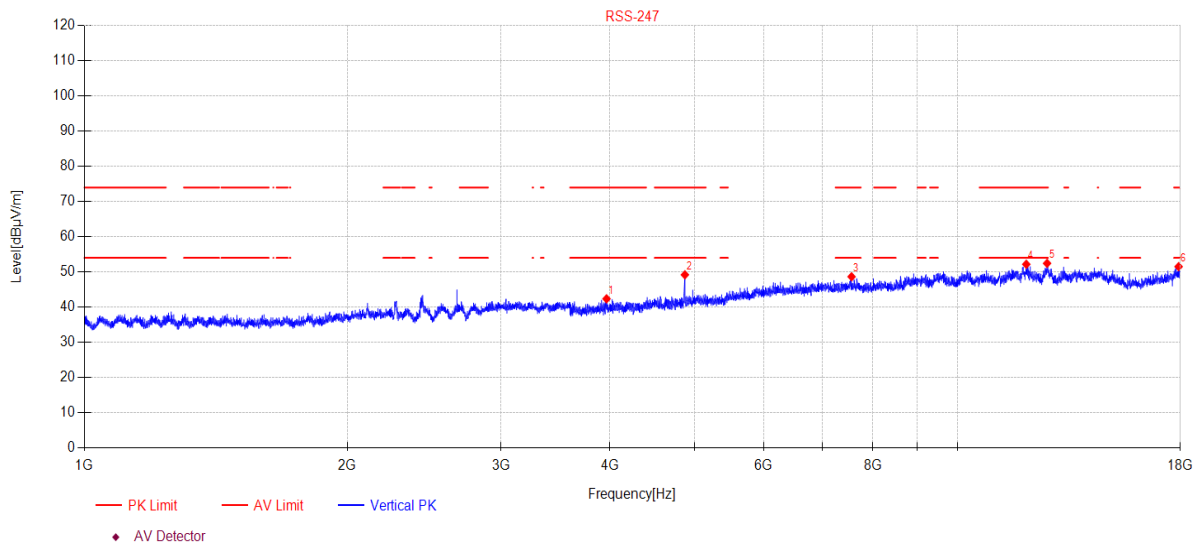
- Level = Reading + Cable Loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-04-10
EUT: Smart Light Switch
Test Mode: Tx mode
Condition: Temp:22.2°C;Humi:54.0%
File Path: d:\ts\2023 report data\Q23030729-2E 50367\IC ABOVE 1G 2.4GWIFI\32
Memo: 11B 2437

Tested By: Bairong
Model Number: 50367
Power Supply: AC 120V/60HZ
Test Site: DDT 3# Chamber

Test Graph



Suspected Data List

NO	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	3963.49	47.39	5.71	30.63	-41.38	42.35	74.00	31.65	PK	Vertical
2	4873.27	51.76	6.01	32.55	-41.14	49.18	74.00	24.82	PK	Vertical
3	7563.60	46.09	7.14	36.40	-41.00	48.63	74.00	25.37	PK	Vertical
4	11989.44	43.82	8.38	38.89	-38.92	52.17	74.00	21.83	PK	Vertical
5	12666.21	43.67	9.01	39.33	-39.57	52.44	74.00	21.56	PK	Vertical
6	17916.96	38.97	11.89	41.30	-40.67	51.49	74.00	22.51	PK	Vertical

Note:

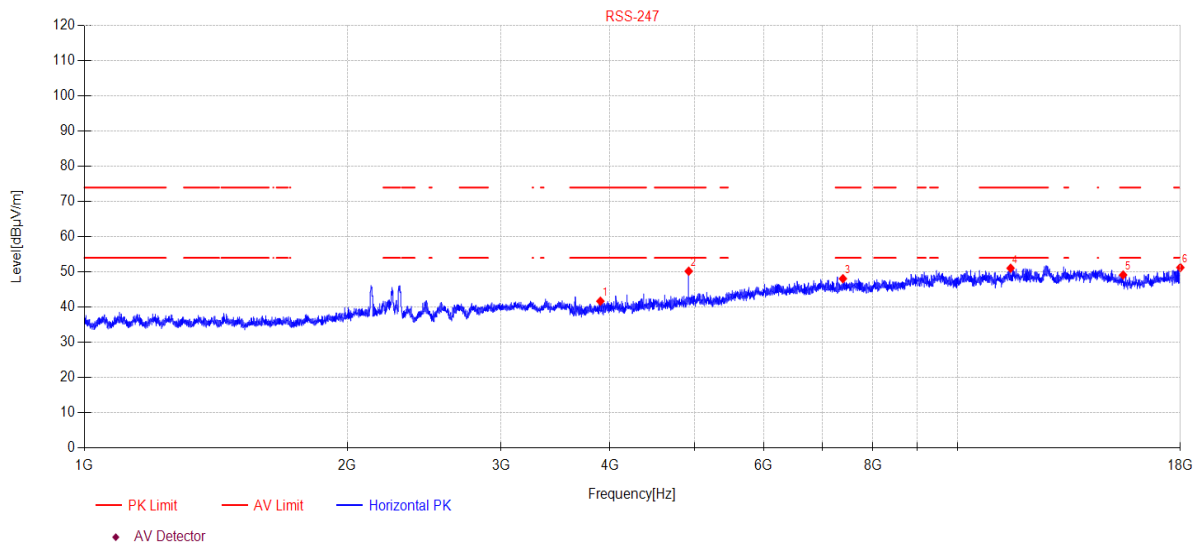
- Level = Reading + Cable Loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-04-10
EUT: Smart Light Switch
Test Mode: Tx mode
Condition: Temp:22.2°C;Humi:54.0%
File Path: d:\ts\2023 report data\Q23030729-2E 50367\IC ABOVE 1G 2.4GWIFI\33
Memo: 11B 2462

Tested By: Bairong
Model Number: 50367
Power Supply: AC 120V/60HZ
Test Site: DDT 3# Chamber

Test Graph



Suspected Data List

NO	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	3899.86	46.84	5.68	30.50	-41.34	41.68	74.00	32.32	PK	Horizontal
2	4922.82	52.60	6.03	32.69	-41.12	50.20	74.00	23.80	PK	Horizontal
3	7392.86	45.40	7.17	36.50	-41.00	48.07	74.00	25.93	PK	Horizontal
4	11504.04	43.54	8.20	39.00	-39.69	51.05	74.00	22.95	PK	Horizontal
5	15479.39	40.52	10.03	38.62	-40.04	49.13	74.00	24.87	PK	Horizontal
6	18000.00	38.14	12.00	41.80	-40.70	51.24	74.00	22.76	PK	Horizontal

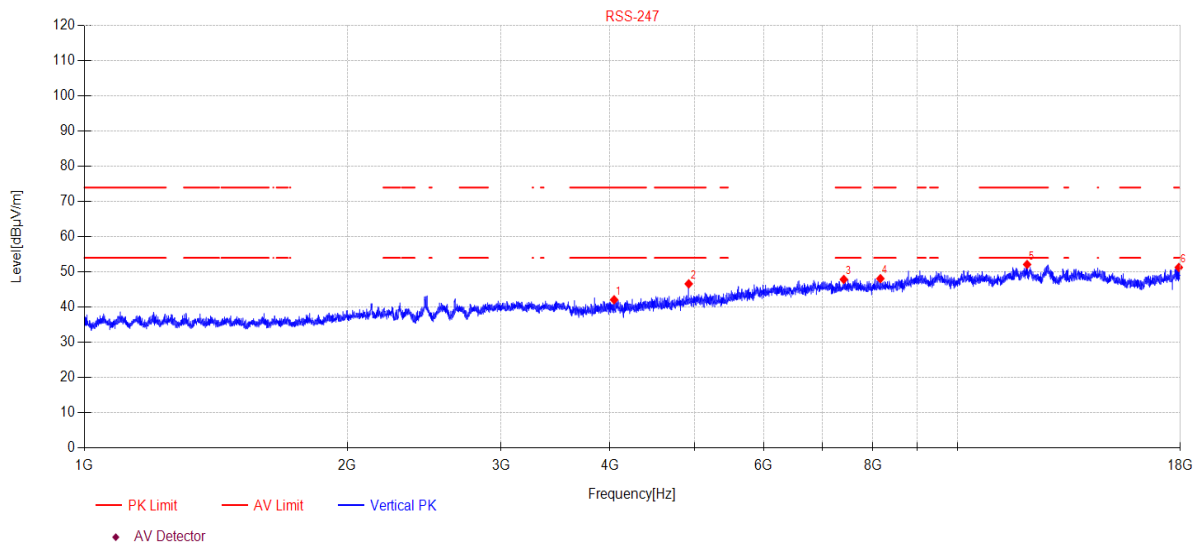
Note:

- Level = Reading + Cable Loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-04-10 **Tested By:** Bairong
EUT: Smart Light Switch **Model Number:** 50367
Test Mode: Tx mode **Power Supply:** AC 120V/60HZ
Condition: Temp:22.2°C;Humi:54.0% **Test Site:** DDT 3# Chamber
File Path: d:\ts\2023 report data\Q23030729-2E 50367\IC ABOVE 1G 2.4GWIFI\34
Memo: 11B 2462

Test Graph



Suspected Data List

NO	Freq. [MHz]	Reading [dBμV]	Cable Loss [dB]	Antenna Factor [dB]	AMP [dB]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	4043.32	46.94	5.74	30.79	-41.39	42.08	74.00	31.92	PK	Vertical
2	4922.82	49.01	6.03	32.69	-41.12	46.61	74.00	27.39	PK	Vertical
3	7409.98	45.19	7.17	36.50	-41.00	47.86	74.00	26.14	PK	Vertical
4	8160.91	44.75	7.06	37.02	-40.74	48.09	74.00	25.91	PK	Vertical
5	12017.19	43.70	8.40	38.93	-38.92	52.11	74.00	21.89	PK	Vertical
6	17927.32	38.68	11.90	41.36	-40.67	51.27	74.00	22.73	PK	Vertical

Note:

- Level = Reading + Cable Loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.