

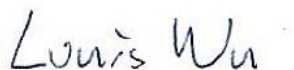


FCC RADIO TEST REPORT

FCC ID : 2AMK2-RM05CA
Equipment : Marker Plus
Brand Name : reMarkable
Model Name : RM05C
Applicant : reMarkable AS
Fridtjof Nansens Vei 12
0369 Oslo
Norway
Manufacturer : reMarkable AS
Fridtjof Nansens Vei 12
0369 Oslo
Norway
Standard : FCC Part 15 Subpart C §15.209

The product was received on Jan. 30, 2024 and testing was performed from Mar. 12, 2024 to Jun. 11, 2024. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.



Approved by: Louis Wu

Sporton International Inc. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)



Table of Contents

History of this test report.....	3
Summary of Test Result.....	4
1. General Description	5
1.1 Product Feature of Equipment Under Test	5
1.2 Modification of EUT	5
1.3 Testing Location	5
1.4 Applicable Standards.....	5
2. Test Configuration of Equipment Under Test.....	6
2.1 Descriptions of Test Mode	6
2.2 Connection Diagram of Test System	6
2.3 Support Unit used in test configuration and system	6
2.4 EUT Operation Test Setup	6
3. Test Results	7
3.1 20dB and 99% OBW Spectrum Bandwidth Measurement.....	7
3.2 Radiated Emissions Measurement.....	8
3.3 Antenna Requirements.....	12
4. List of Measuring Equipment	13
5. Measurement Uncertainty.....	14
Appendix A. Test Results of RF Near Field Test Items	
Appendix B. Test Results of Radiated Test Items	
B2. Results of Radiated Emissions (9 kHz~30MHz)	
B3. Results of Radiated Emissions (30MHz~1GHz)	
Appendix C. Setup Photographs	



History of this test report

Report No.	Version	Description	Issue Date
FR413019	01	Initial issue of report	Apr. 24, 2024
FR413019	02	1. Revise Appendix A, B and C 2. Revise List of Measuring Equipment This report is an updated version, replacing the report issued on Apr. 24, 2024.	Jun. 12, 2024

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	15.207	AC Power Line Conducted Emissions	Not Required	-
3.1	15.215(c)	20dB Spectrum Bandwidth	Reporting only	-
	2.1049	99% OBW Spectrum Bandwidth	Reporting only	-
3.2	15.209	Field Strength of Fundamental Emissions	Pass	Max level -68.40 dB μ V/m at 0.12 MHz
		Radiated Spurious Emissions	Pass	9.23 dB under the limit at 30.00MHz
3.3	15.203	Antenna Requirements	Pass	-

Note: Not required means after assessing, test items are not necessary to carry out.

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacture who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty".

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Keven Cheng

Report Producer: Ming Chen

1. General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Sample 1	With Battery 1
Sample 2	With Battery 2
General Specs	Pen tip & Pen tail Wireless Tx and NFC Rx only
Antenna Type	Integral antenna

Remark: The above EUT's information was declared by manufacturer. Please refer to Disclaimer in report summary.

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Location

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory	
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	
	TH03-HY	03CH07-HY
Test Engineer	Eric Wu	Stan Hsieh
Temperature (°C)	19.4~21.4	22.6~23.8
Relative Humidity (%)	44.4~46.4	48.9~54.7

FCC designation No.: TW1190

1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart C §15.209
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01
- ♦ ANSI C63.10-2013

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2. Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

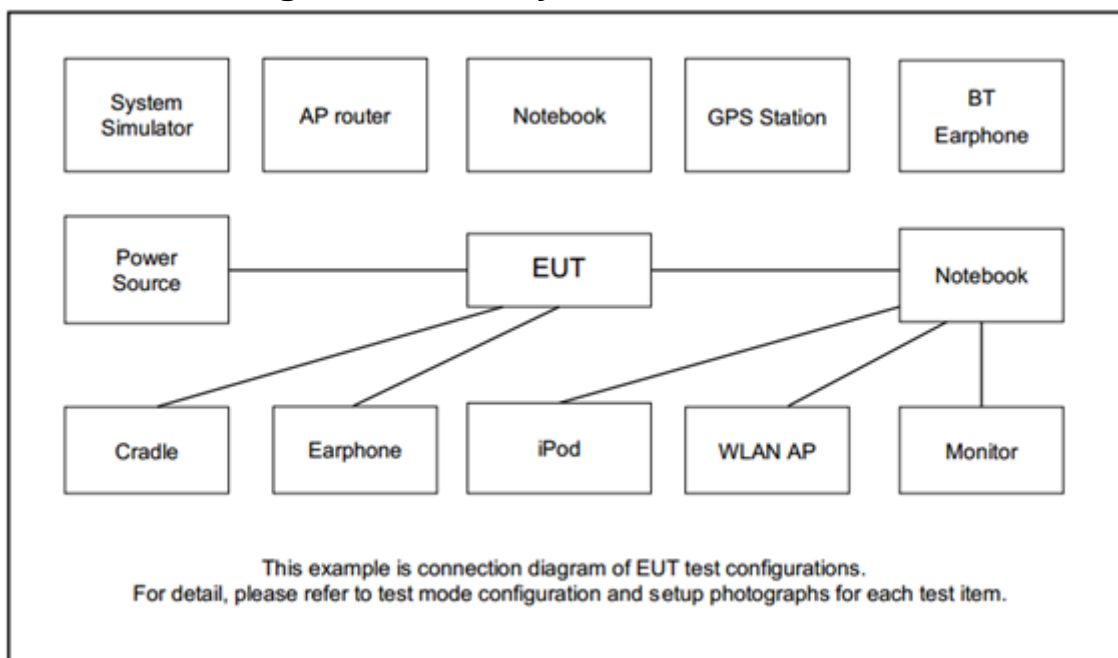
Investigation has been done on all the possible configurations.

The following table is a list of the test modes shown in this test report.

Test Items	
20dB Spectrum Bandwidth / 99OB	Field Strength of Fundamental Emissions
Radiated Emissions 9kHz~30MHz	Radiated Emissions 30MHz~1GHz

Remark: For Radiated Test Cases, the tests were performed with Battery 1 and Sample 1

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	E-book	reMarkable	Ferrari	N/A	N/A	N/A

2.4 EUT Operation Test Setup

EUT Wireless Tx with E-book via wireless transfer function.

3. Test Results

3.1 20dB and 99% OBW Spectrum Bandwidth Measurement

3.1.1 Limit

Reporting only

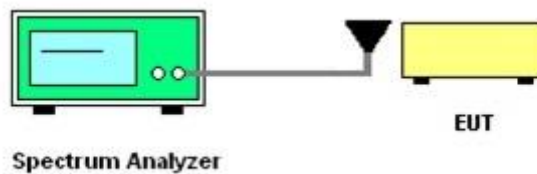
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT in peak Max hold mode.
2. The resolution bandwidth of 1 kHz and the video bandwidth of 3 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.
4. Measured the 99% OBW.

3.1.4 Test Setup



3.1.5 Test Result of RF Near Field Test Items

Please refer to Appendix A.

3.2 Radiated Emissions Measurement

3.2.1 Limit

The field strength of any emissions which appear band shall not exceed the general radiated emissions limits.

Frequencies (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Measuring Instrument Setting

The following table is the setting of receiver:

Receiver Parameter	Setting
Attenuation	Auto
Frequency Range: 9kHz~150kHz	RBW 200Hz for QP
Frequency Range: 150kHz~30MHz	RBW 9kHz for QP
Frequency Range: 30MHz~1000MHz	RBW 120kHz for Peak

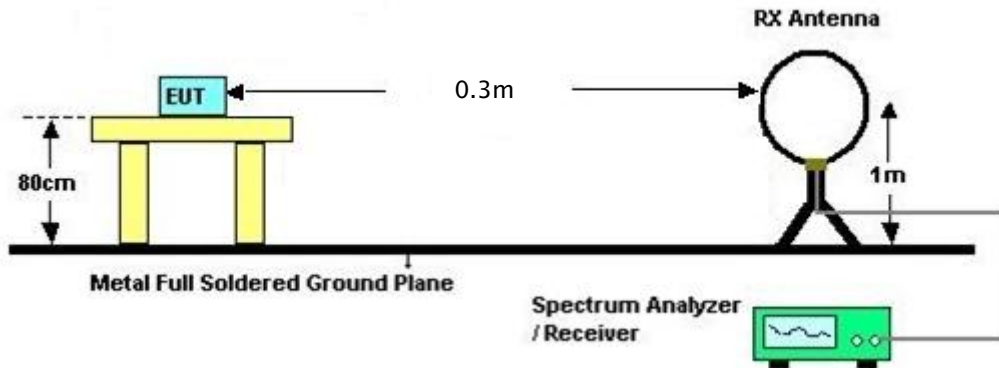
Note: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz and 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

3.2.4 Test Procedures

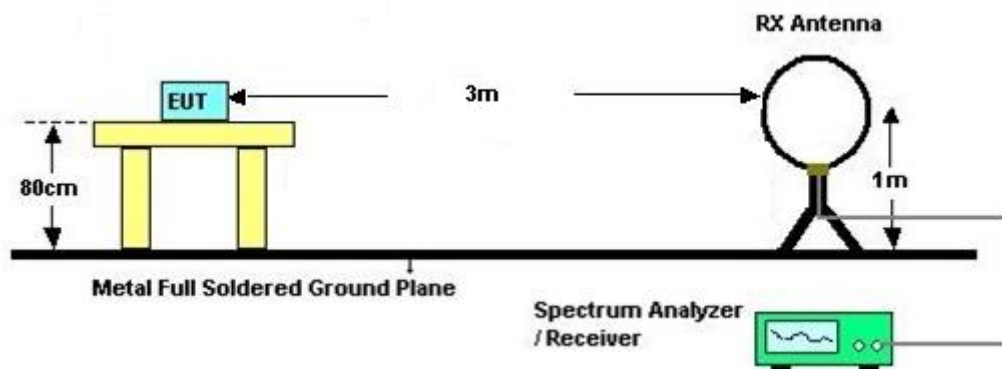
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
7. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver.
8. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as “-”.

3.2.5 Test Setup

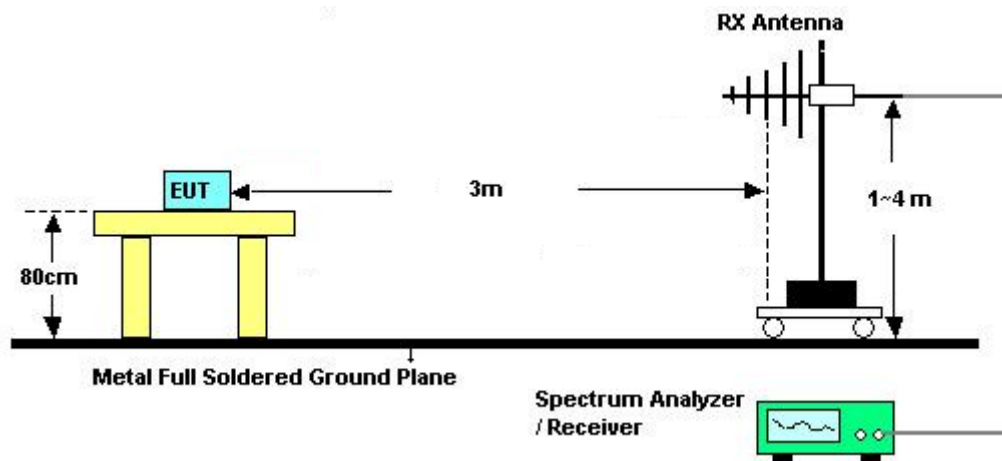
Field Strength of Fundamental Emissions



For radiated emissions below 30MHz



For radiated emissions above 30MHz





3.2.6 Test Result of Radiated Emissions Measurement

Please refer to Appendix B.

Remark:

1. There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.
2. According to C63.10 radiated test, the EUT pre-scanned horizontal, vertical, and ground-parallel three polarization's, the worst case is horizontal & vertical polarization, test data of two mode was reported.

3.3 Antenna Requirements

3.3.1 Standard Applicable

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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 the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

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 rule.

3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.



4. List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 07, 2023	Mar. 12, 2024~ Jun. 11, 2024	Nov. 06, 2024	Near Field (TH03-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV3044	101104	10Hz~44GHz	Feb. 20, 2024	Mar. 12, 2024~ Jun. 11, 2024	Feb. 19, 2025	Near Field (TH03-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Feb. 01, 2024	Apr. 01, 2024~ Jun. 07, 2024	Jan. 31, 2025	Radiation (03CH07-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	35419 & 03	30MHz~1GHz	Apr. 23, 2023	Apr. 01, 2024~ Apr. 02, 2024	Apr. 22, 2024	Radiation (03CH07-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	35419 & 03	30MHz~1GHz	Apr. 22, 2024	Jun. 07, 2024	Apr. 21, 2025	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Feb. 23, 2024	Apr. 01, 2024~ Jun. 07, 2024	Feb. 22, 2025	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	Oct. 02, 2023	Apr. 01, 2024~ Jun. 07, 2024	Oct. 01, 2024	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4 MY24971/4 MY15682/4	30MHz to 18GHz	Feb. 21, 2024	Apr. 01, 2024~ Jun. 07, 2024	Feb. 20, 2025	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4 MY24971/4	9kHz to 30MHz	Feb. 21, 2024	Apr. 01, 2024~ Jun. 07, 2024	Feb. 20, 2025	Radiation (03CH07-HY)
Controller	EMEC	EM1000	N/A	Control Ant Mast	N/A	Apr. 01, 2024~ Jun. 07, 2024	N/A	Radiation (03CH07-HY)
Controller	MF	MF-7802	N/A	Control Turn table	N/A	Apr. 01, 2024~ Jun. 07, 2024	N/A	Radiation (03CH07-HY)
Antenna Mast	EMEC	AM-BS-4500E	N/A	Boresight mast 1M~4M	N/A	Apr. 01, 2024~ Jun. 07, 2024	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Apr. 01, 2024~ Jun. 07, 2024	N/A	Radiation (03CH07-HY)
Software	Audix	E3	N/A	N/A	N/A	Apr. 01, 2024~ Jun. 07, 2024	N/A	Radiation (03CH07-HY)
USB Data Logger	TECPEL	TR-32	HE17XB2495	N/A	Mar. 01, 2024	Apr. 01, 2024~ Jun. 07, 2024	Feb. 28, 2025	Radiation (03CH07-HY)



5. Measurement Uncertainty

Uncertainty of Radiated Emission Measurement (9 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.8 dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	6.3 dB
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Appendix A. Test Results of RF Near Field Test Items

Test mode		Pen tip Wireless Tx with E-book	
20dB Bandwidth (kHz)	9.97	99% Occupied BW(kHz)	10.243

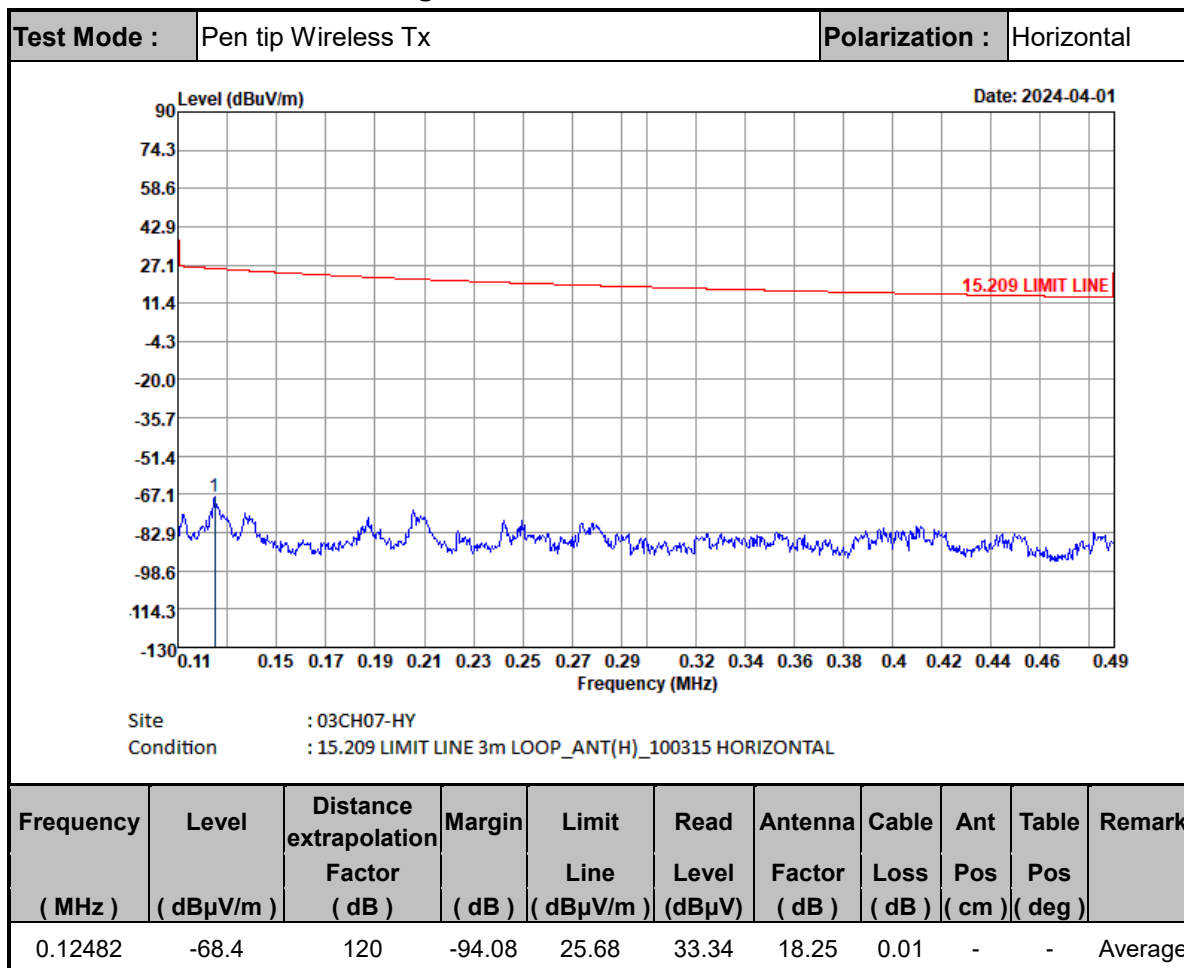
Test mode		Pen tail Wireless Tx with E-book	
20dB Bandwidth (kHz)	11.668	99% Occupied BW(kHz)	15.116

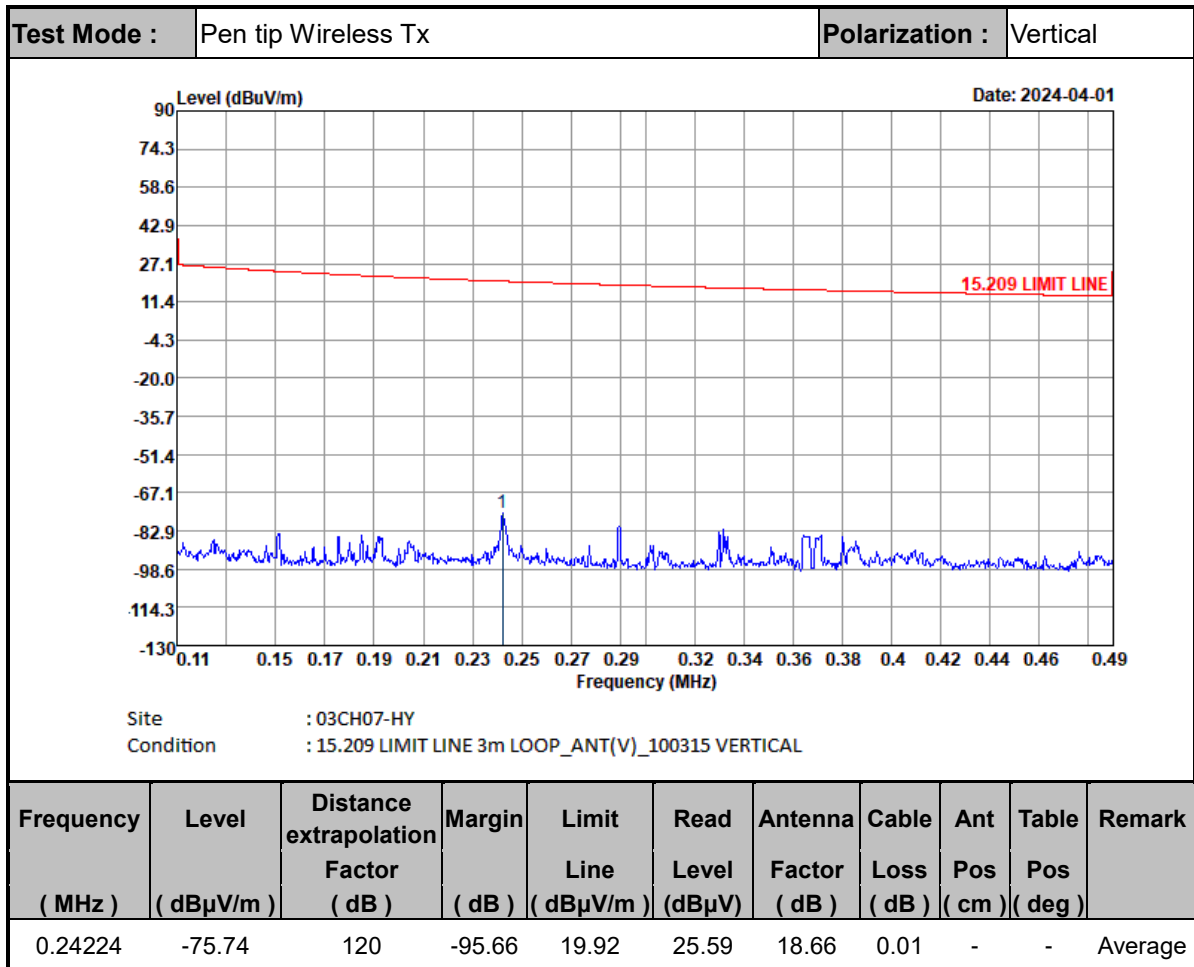
Remark: Because the measured signal is CW adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.



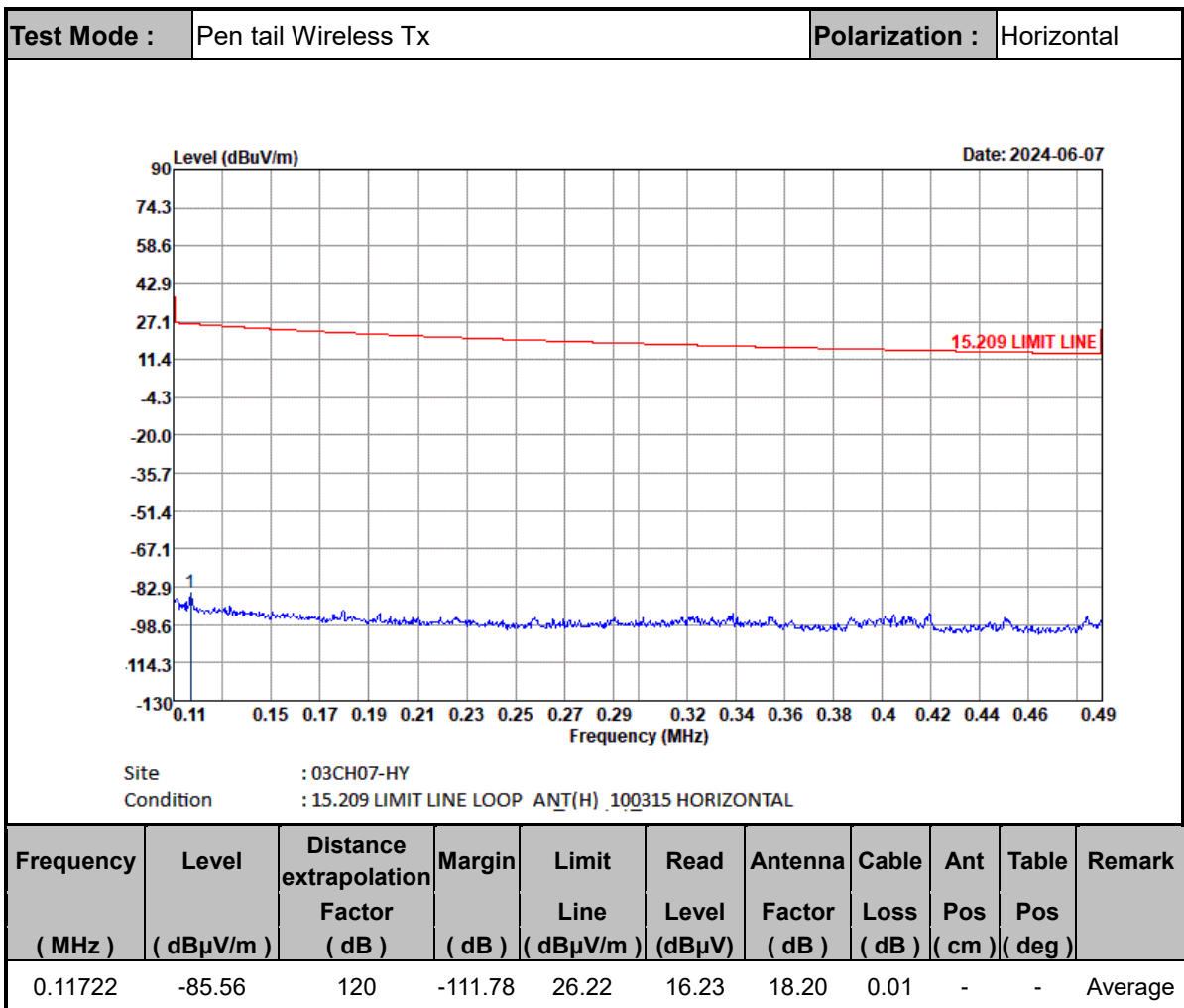
Appendix B. Test Results of Radiated Test Items

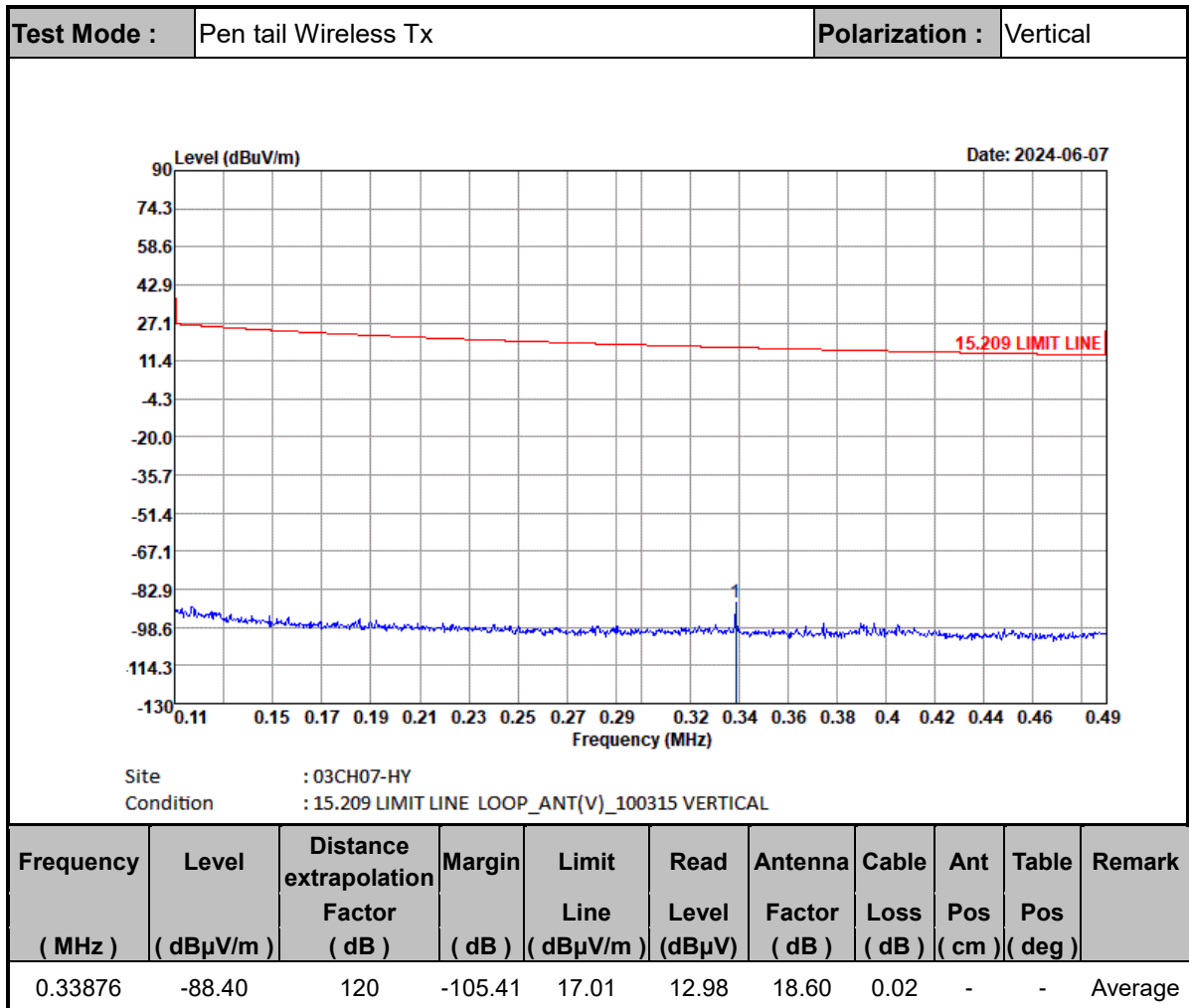
B1. Test Result of Field Strength of Fundamental Emissions



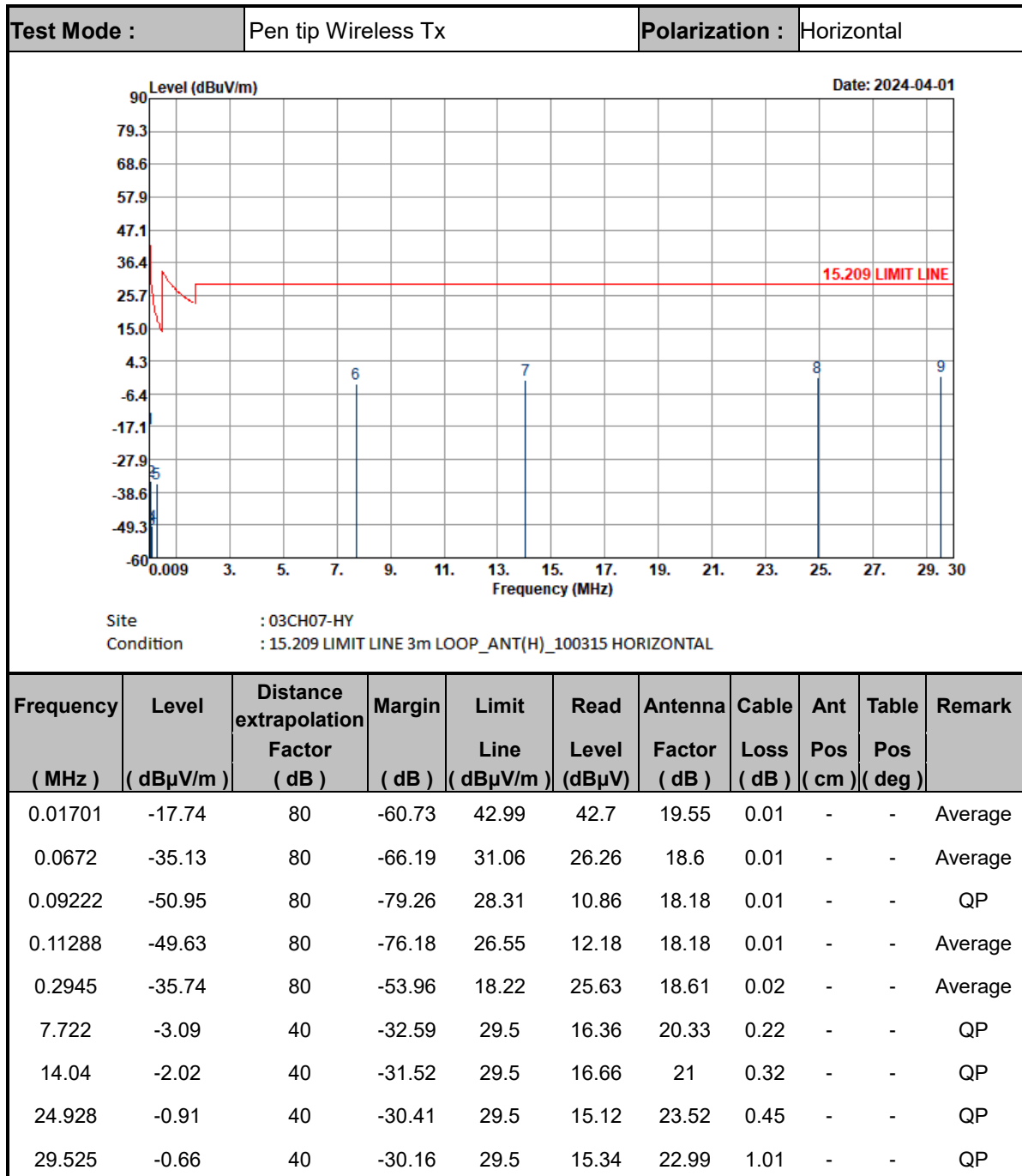

Note:

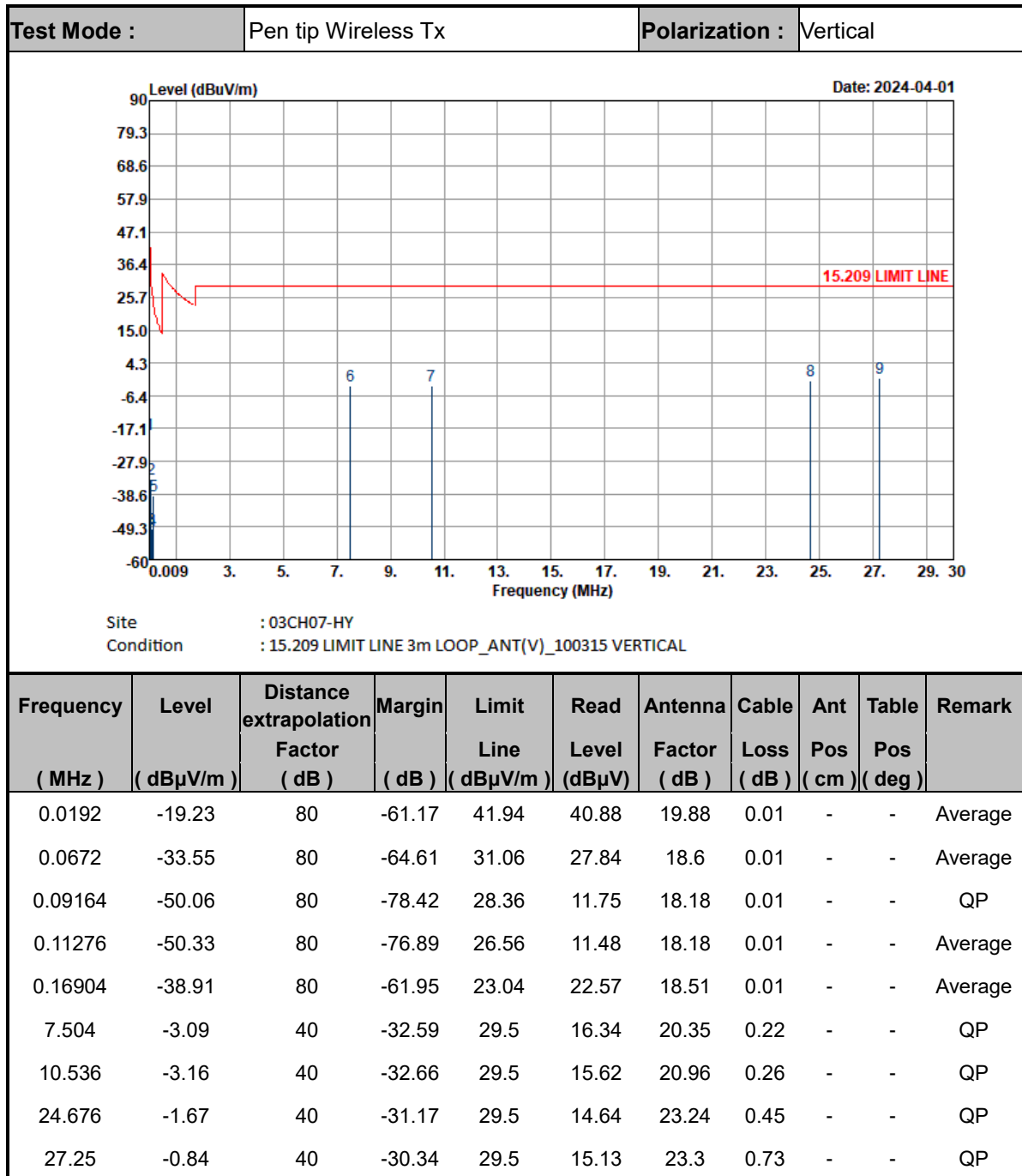
1. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);
2. Level= Read Level + Antenna Factor + Cable loss - distance extrapolation factor.



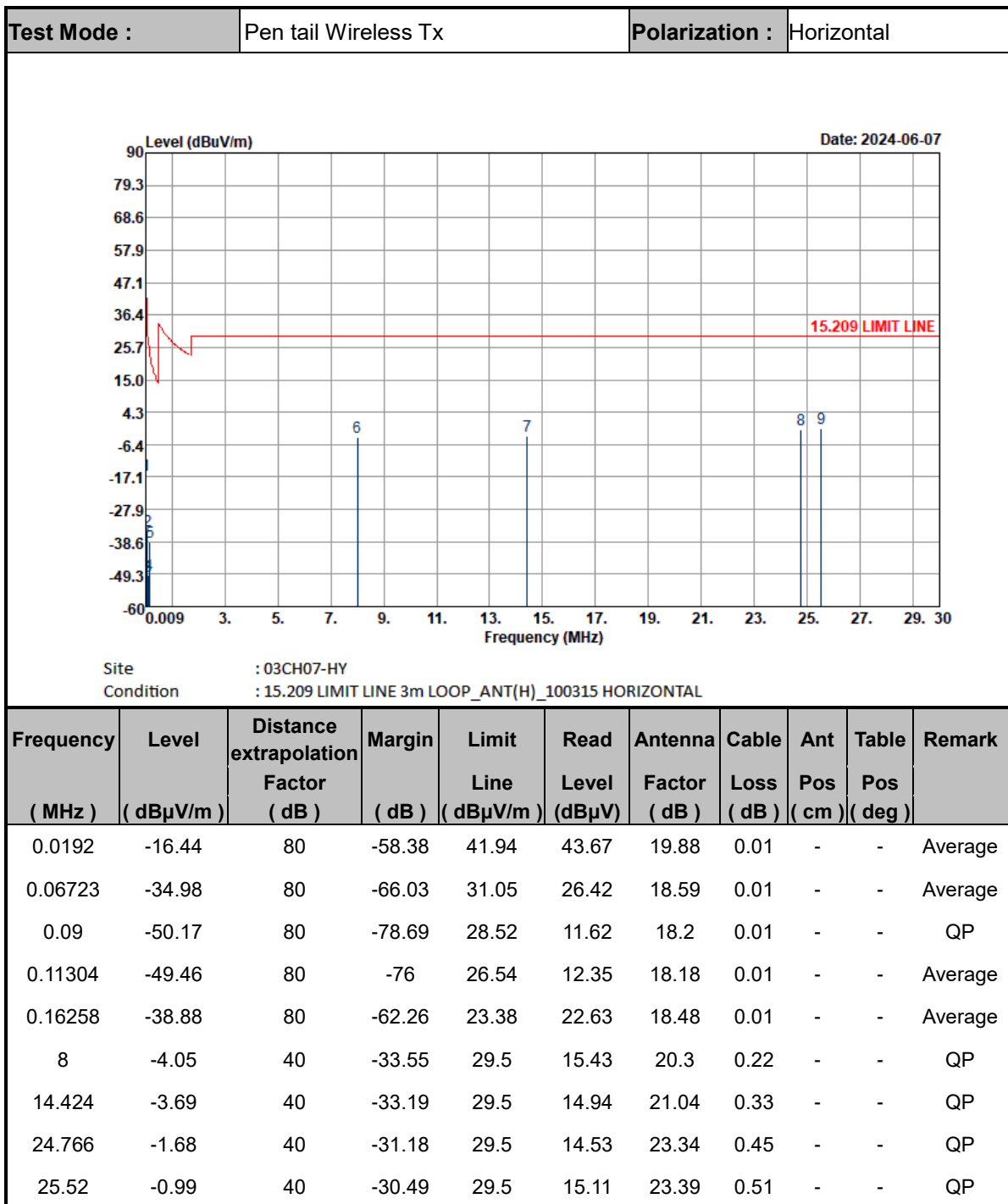

Note:

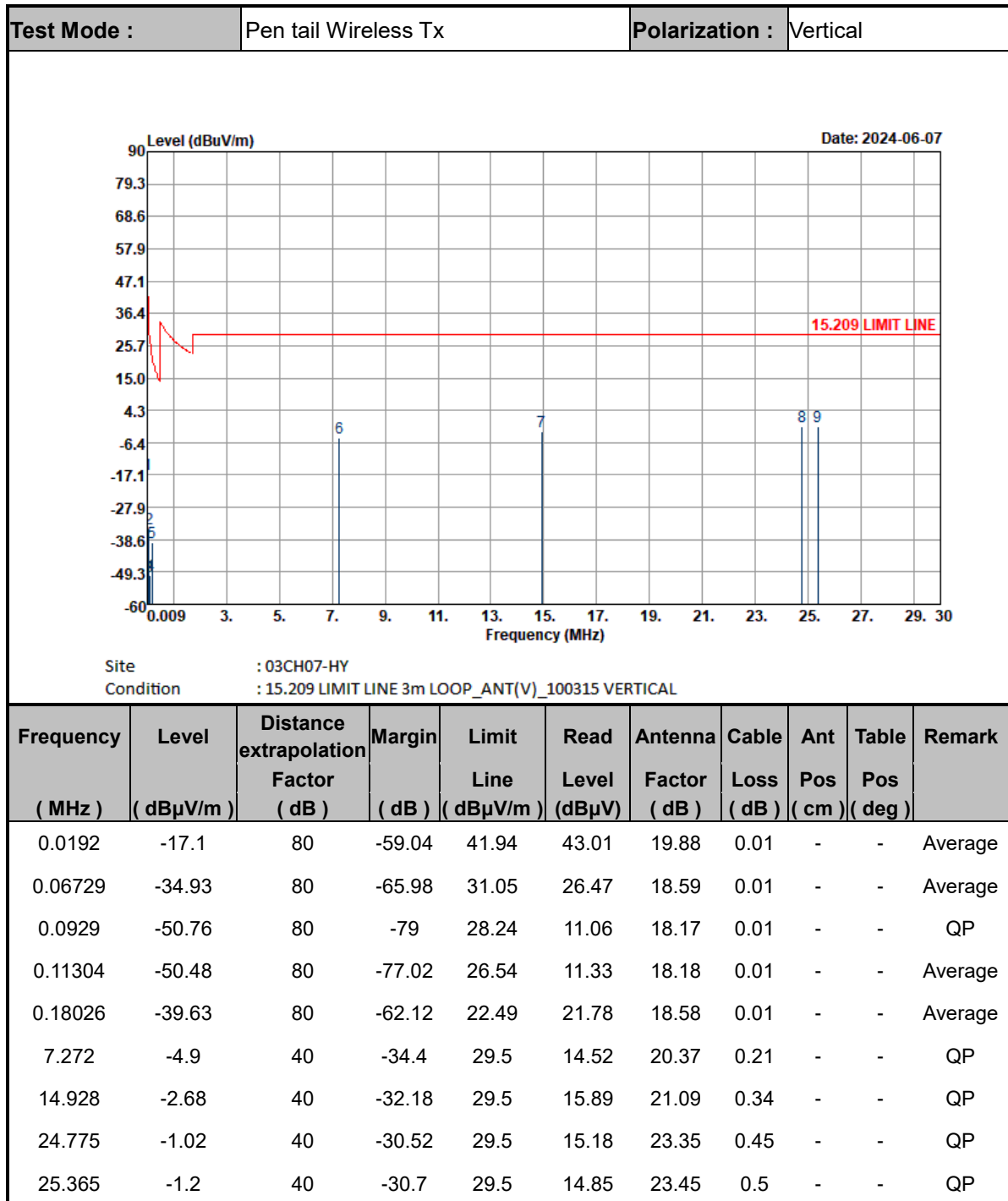
1. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);
2. Level= Read Level + Antenna Factor + Cable loss - distance extrapolation factor.

B2. Results of Radiated Spurious Emissions (9 kHz~30MHz)


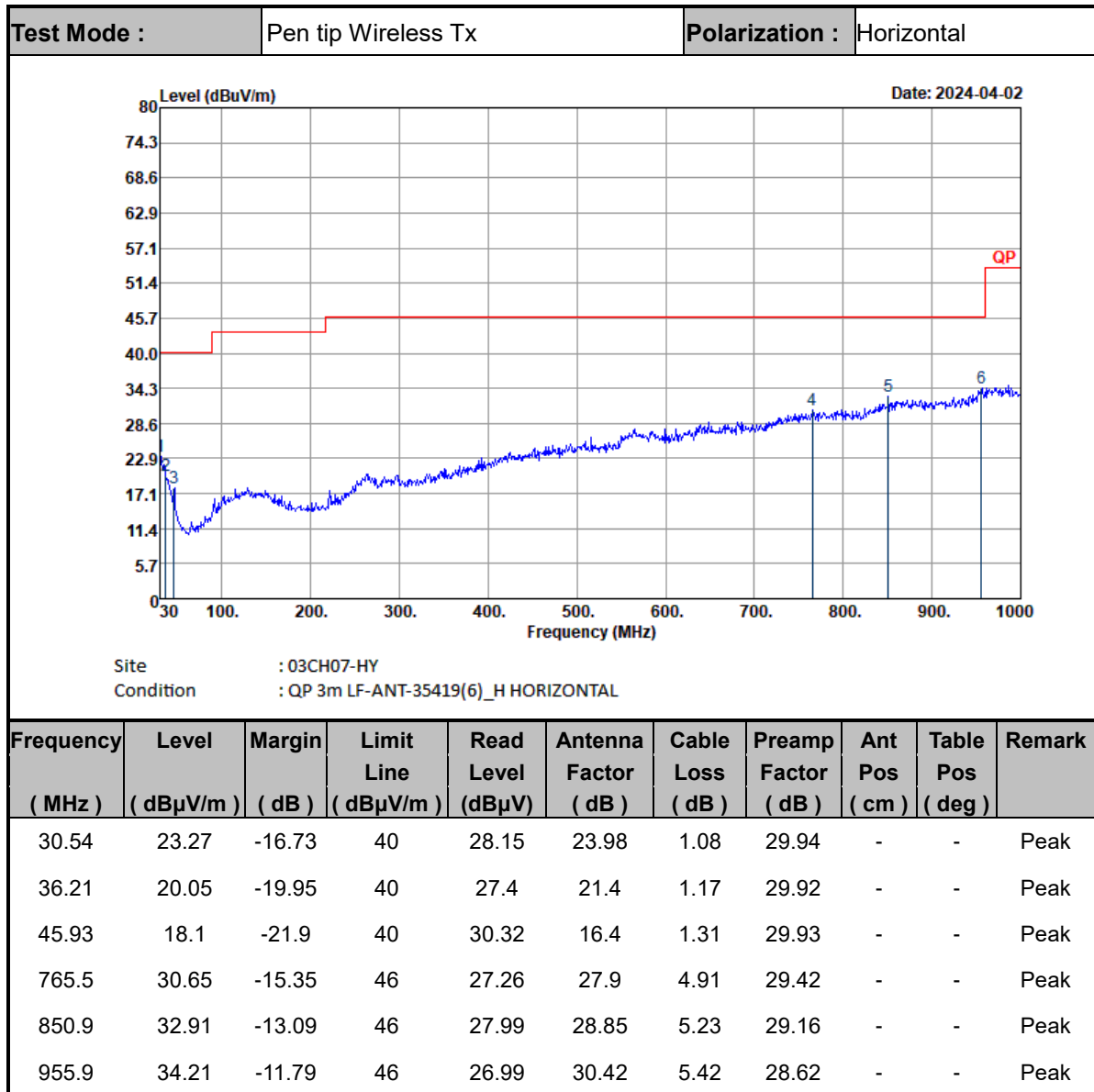

Note:

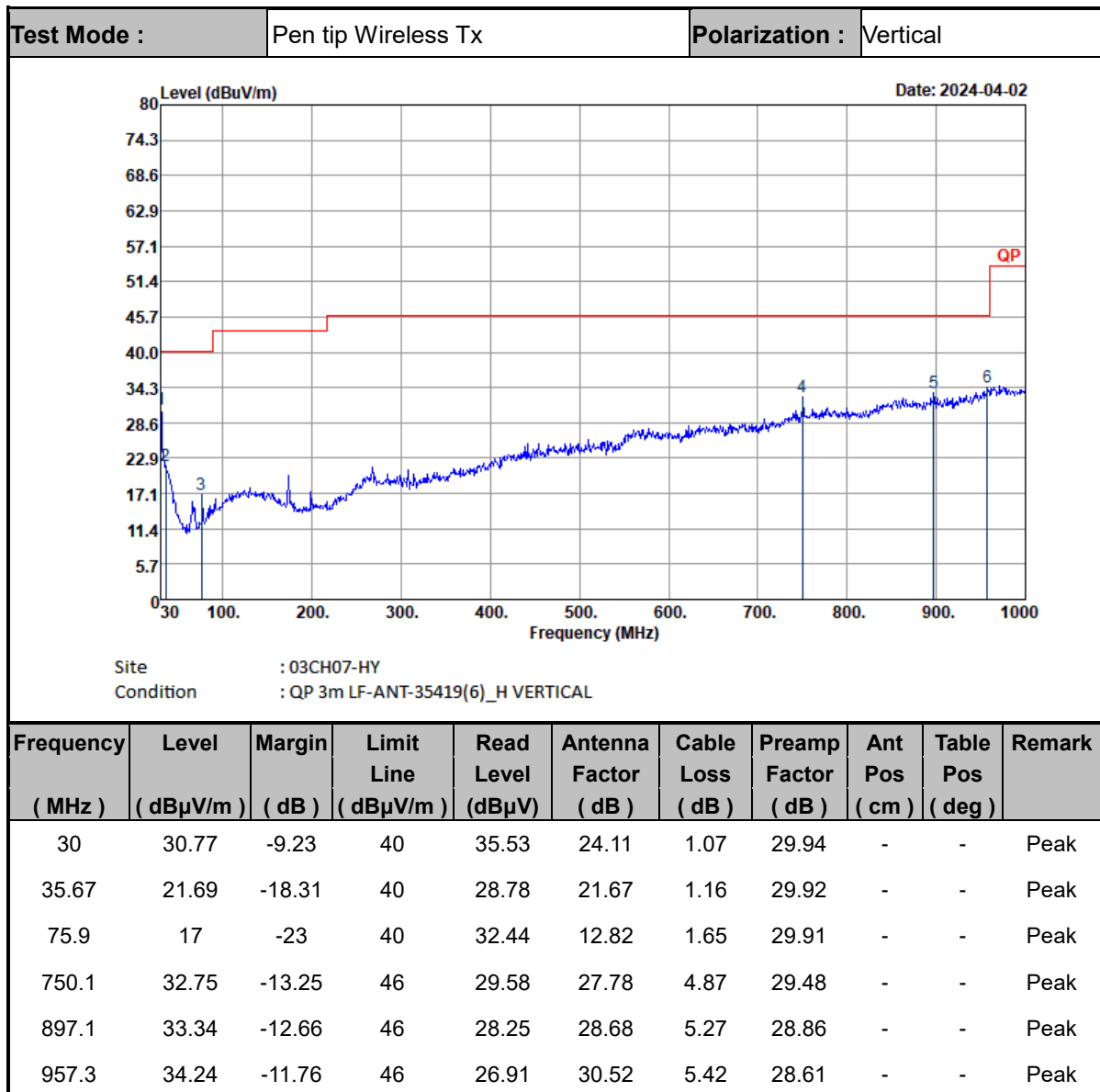
1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
3. Level= Read Level + Antenna Factor + Cable loss - distance extrapolation factor.



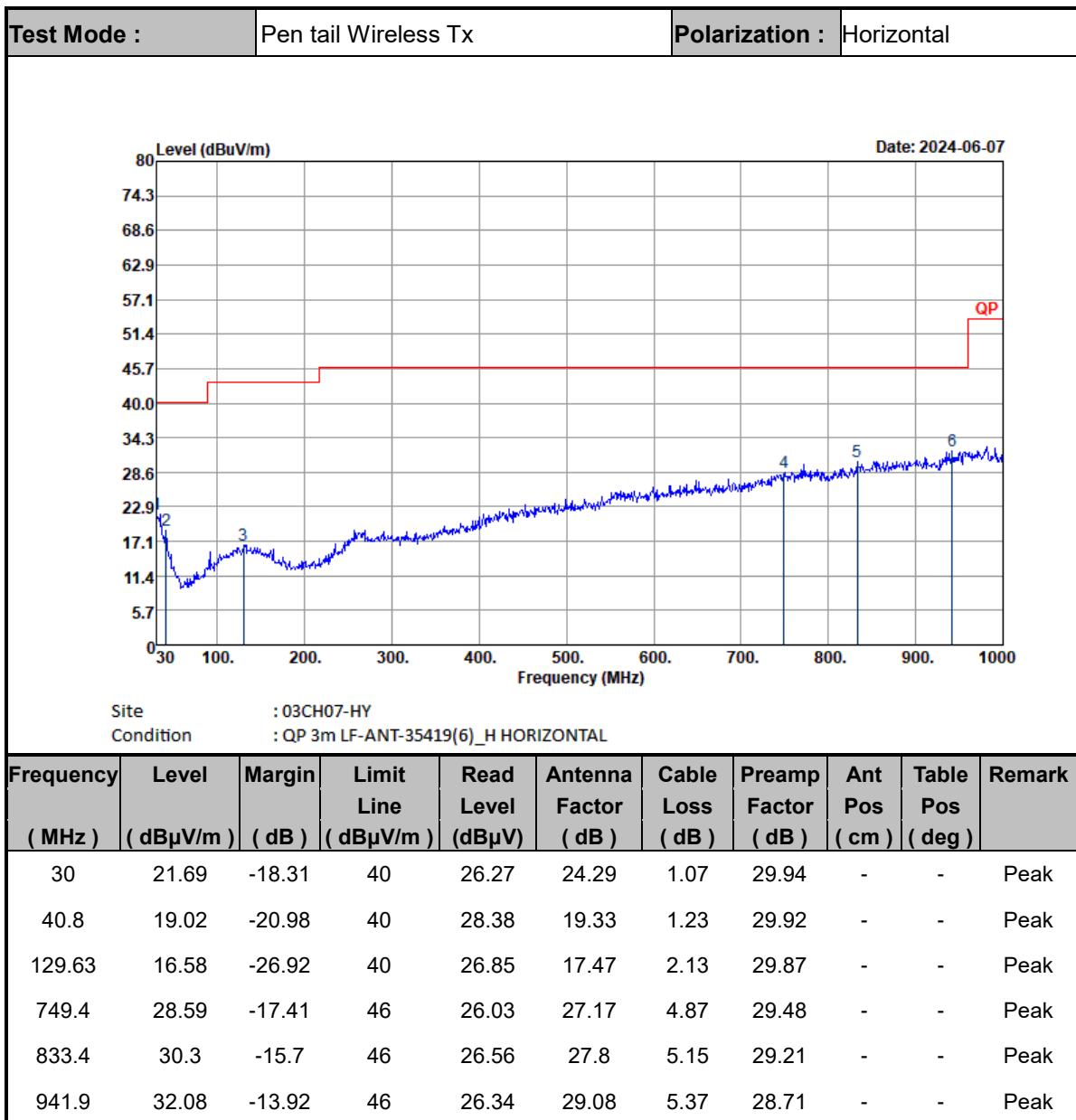

Note:

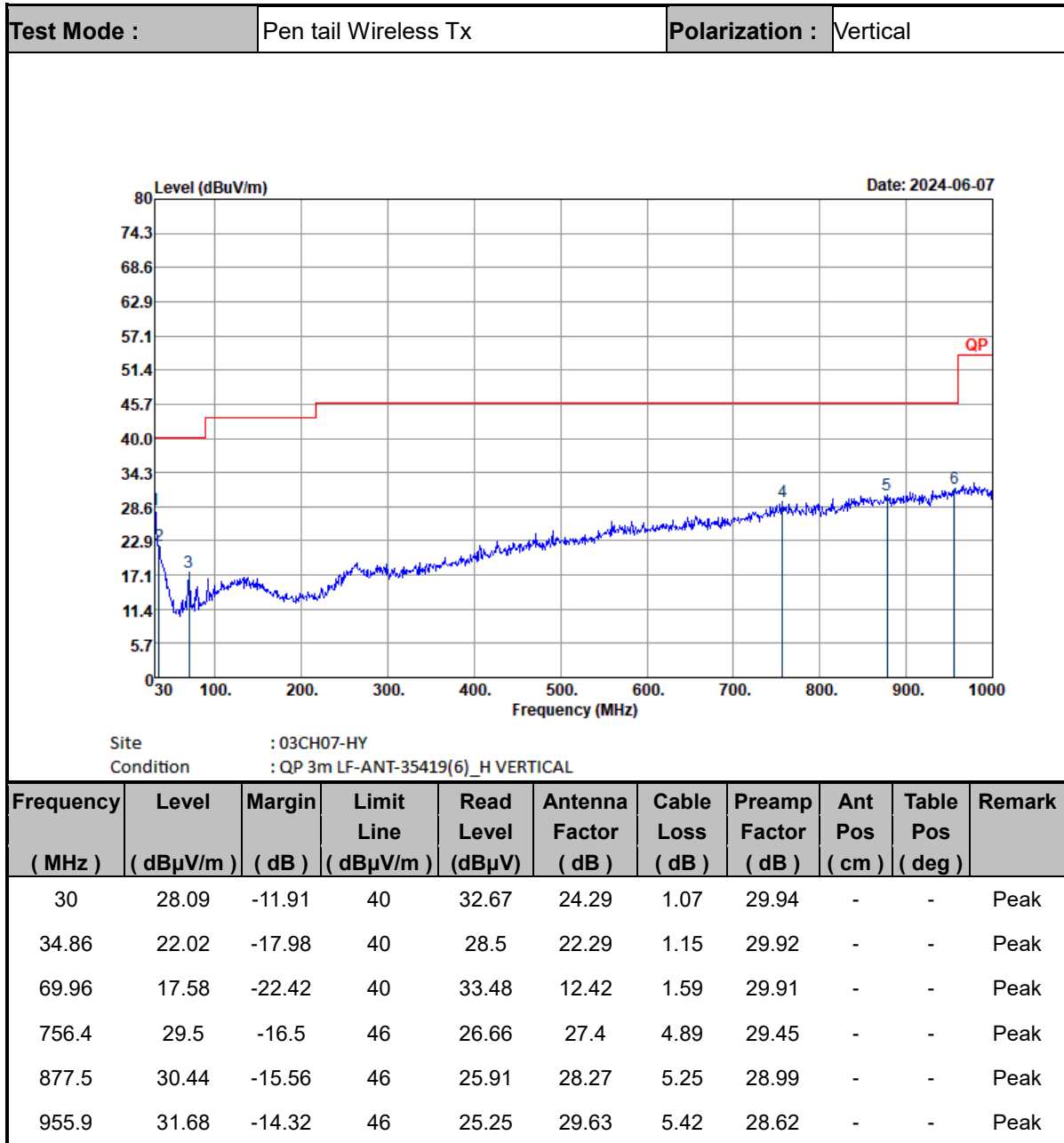
1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
3. Level= Read Level + Antenna Factor + Cable loss - distance extrapolation factor.

B3. Results of Radiated Spurious Emissions (30MHz~1GHz)



Note:

1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Emission level (dBμV/m) = 20 log Emission level (μV/m).
3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor= Level.




Note:

1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Emission level (dBμV/m) = 20 log Emission level (μV/m).
3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor= Level.