



FCC/ISED Canada

CERTIFICATION TEST REPORT

For the

Applicant	: Sindoh Co., Ltd.
Product	: 3D Printer
FCC ID	: 2AB83-TYPEA530
Model	: type A530
Multiple Model	: type A530s
FCC Rule	: CFR 47 Part 15 Subpart B Section 15.101
ISED Canada Rule	: ICES-003 Issue 7 October 2020

We hereby certify that the above product has been tested by us with the listed rules and found in compliance with the regulation. The test data and results are issued on the test report no. **TR-W2109-003**

Signature


Choi, Young-min / Technical Manager

Date: 2021-09-10

Test Laboratory: ENG Co., Ltd.

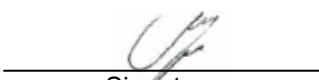
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FCC & ISED Canada TEST REPORT

Project Number : EA2109C-002
Test Report Number : TR-W2109-003
Type of Equipment : 3D Printer
FCC ID : 2AB83-TYPEA530
Model Name : type A530
Multiple Model Name : type A530s
Applicant : Sindoh Co., Ltd.
Address : 3, Seongsuiro24(isipsa)-gil, Seongdong-gu, Seoul 04797,
Republic of Korea
Manufacturer : Sindoh Co., Ltd.
Address : 3, Seongsuiro24(isipsa)-gil, Seongdong-gu, Seoul 04797,
Republic of Korea
FCC Rule : FCC CFR 47 Part 15 Subpart B §15.101 Class A
ISED Canada Rule : ICES-003 7 October 2020
Total page of Report : 77 pages
Date of Receipt : 2021-09-01
Date of Issue : 2021-09-10
Test Result : Pass

This test report only contains the result of a single test of the sample supplied for the examination.
It is not a generally valid assessment of the features of the respective products of the mass-production.

Prepared by Chu, Woo-sik / Senior Engineer



Signature

2021-09-10

Date

Reviewed by Choi, Young-min / Technical Manager



Signature

2021-09-10

Date

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Release Control Record

Issue Report No.	Issued Date	Details/Revisions
TR-W2109-003	2021-09-10	Initial Release

1. TEST SUMMARY

1.1 Test standards and results

The sample submitted for evaluation (Hereafter refer to as the EUT) has been tested in accordance with the following regulations or standards:

Agency	APPLICABLE SECTION	TEST DESCRIPTION	RESULTS
FCC	Part 15 Subpart B Section 15.107 (b)	AC Power Line Conducted Emission	PASS
	Part 15 Subpart B Section 15.109 (b)	Radiated Emission	PASS
ISED	ICES-003 Section 3.2.1 Table 1	AC Power Line Conducted Emission	PASS
	ICES-003 Section 3.2.2 Table 2, Table 4	Radiated Emission	PASS

1.2 Test Methodology

FCC: ANSI C 63.4:2014, FCC CFR 47 Part 2, and Part 15

ISED Canada: CAN/CSA-CISPR 32: 17, ANSI C63.4-2014 amended as per ANSI C63.4a-2017, ICES-Gen

1.3 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

1.4 Purpose of the test

To determine whether the equipment under test fulfills the FCC and ISED Canada Rules, Regulation and standards stated in section 1.1 and 1.2.

1.5 Test Facility

The measurement facilities are located at 135-60 Gyeongchung-daero, Gonjam-eup, Gwangju-si, Gyeonggi-do 12813, Korea. Our test facilities are accredited as a Conformity Assessment Body (CAB) by the FCC and ISED Canada, designated by the RRA (National Radio Research Agency), and accredited by KOLAS (Korea Laboratory Accreditation Scheme) in Korea and approved by TUV Rheinland, TUV SÜD and Korean Register of Shipping according to the requirement of ISO/IEC 17025.

Laboratory Qualification	Registration No.	Mark
FCC	KR0160	
ISED Canada	12721A	
RRA	KR0160	
TUV Rheinland	UA 50314109-0002	
TUV SÜD	CARAT 094465 0004 Rev.00	
Korean Agency for Technology and Standards	KT733	
KOREAN REGISTER OF SHIPPING	PCT40841-TL001	

Remark. This report is not related to KOLAS accreditation and relevant regulation.

2. EUT (Equipment Under Test) Description

The Sindoh Co., Ltd., Model type A530 (referred to as the EUT in this report) is a 3D Printer, which has certified WLAN Module. The product specification described herein was obtained from product data sheet or user's manual.

Main Body	
Input Power Rating	120 V~, 60 Hz, 9.7 A
Power	Max. 1050W
Dimension (mm)	747 x 810 x 784 (W x D x H)
Weight	97 kg (Machine only)
Port	USB devices, USB hosts, Wi-Fi, Ethernet
Contained RF Module	Model No: S904-SD-WF FCC ID: OZ5-S904-SD-WF IC: 21703-S904SDWF Manufacturer: Ohsung Electronics Co., Ltd.
Printing	
Printing Method	Fused Filament Fabrication (FFF)
Max. Print Length (mm)	W (max): 320, D (max): 320, H (max): 313
Print Layer Thickness Setting	0.05–0.4 mm
Default (Optional) Nozzle Diameter	0.4 mm
Filament Diameter	1.75 mm
Printable Material	ABS, ASA, ARS, PLA
Bed Leveling	Auto adjustment + Manual leveling
Print Head	2-nozzle
Temperature/Speed	
Max. Nozzle Temperature	290 °C
Max. Bed Temperature	110 °C
Max. Printing Temperature	200 mm/s
smartStation	
Dimension (mm)	747 x 810 x 888 (W x D x H)
1st Table	Table for simple operations
2nd Drawer	Extension of filament box (2 boxes by default, up to 4 boxes)
3rd Drawer	Simple storage

2.1 Additional Model

Model Name	Model Difference
type A530	Basic Model
type A530s	Identical to the basic model except for the model designation and optional part. This model is combined with the machine, basic model and optional table.
Note: The manufacturer has declared to all the additional model names into basic model name without any further evaluation by ENG Co., Ltd.	

3. TEST CONDITION

3.1 Equipment Used During Test

The following peripheral devices and/or interface cables were connected during the measurement:

Description	Model No.	FCC ID	Serial No.	Manufacturer.
3D Printer (EUT)	type A530	2AB83- TYPEA530	N/A	Sindoh Co., Ltd.
Option Table (EUT)	smartStation		N/A	Sindoh Co., Ltd.
Filament Box 1,2 (EUT)	N/A		N/A	Sindoh Co., Ltd.
Notebook PC	TRN-C125	DoC	N/A	HP
Adapter for Notebook PC	HSTNN-CA40	DoC	N/A	CHICONY POWER TECHNOLOGY
Access Point	AW-A1	-	ABRE400675NT	Unicorn Information System
Adapter for Access Point	KA02-1201000	DoC	N/A	Shenzhen Keyu Power Supply Technology Co., Ltd.
USB Memory Stick	32GB-MB032	2AB83- 32GBMB032	N/A	Shenzhen Chenge Electronics Co., Ltd.

3.2 Cable Description

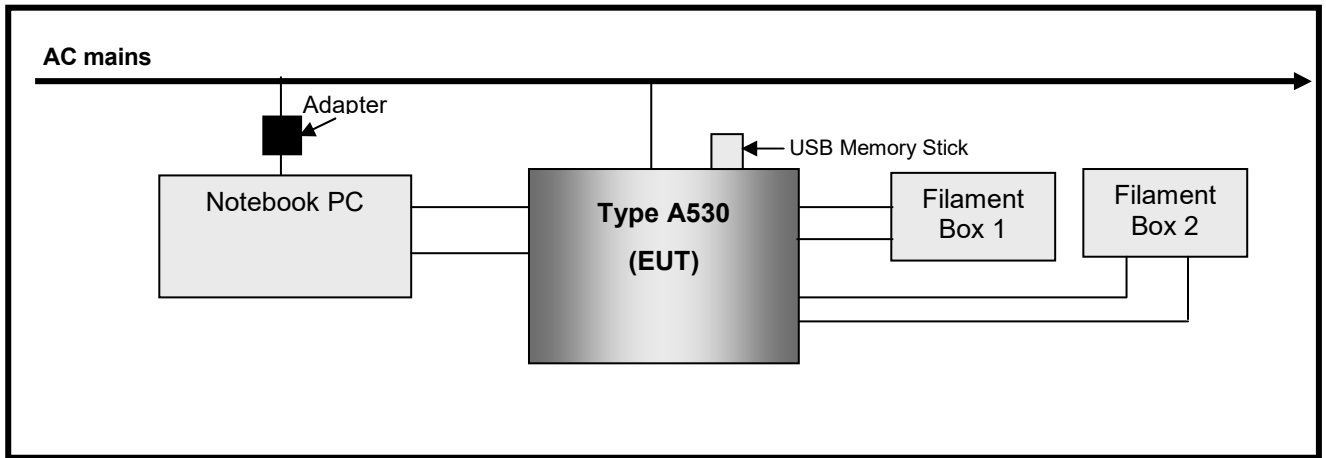
Test Mode	Description	Ports Name	Shielded (Y/N)	Ferrite Bead (Y/N)	Length (m)	Connected to
Mode #1 ~ Mode #3	3D Printer (EUT)	AC IN	N	N	1.5	AC Mains
		USB	-	-	-	USB Memory Stick
		USB	Y	N	1.5	Notebook PC
		LAN	N	N	3.0	Notebook PC
		Motor cable	N	N	1.5	Filament Box 1,2
		Sensor cable	N	N	1.5	Filament Box 1,2
Mode #4 ~ Mode #5	3D Printer (EUT)	AC IN	N	N	1.5	AC Mains
		USB	-	-	-	USB Memory Stick
		USB	Y	N	1.5	Notebook PC
		LAN	N	N	3.0	Notebook PC
		-	-	-	-	Option Table (EUT)
Mode #6 ~ Mode #9	3D Printer (EUT)	AC IN	N	N	1.5	AC Mains
		USB	-	-	-	USB Memory Stick
		USB	Y	N	1.5	Notebook PC
		LAN	N	N	3.0	Line terminated
		-	-	-	-	Option Table (EUT)
	Access Point	-	-	-	-	-

3.3 Mode of operation during the test

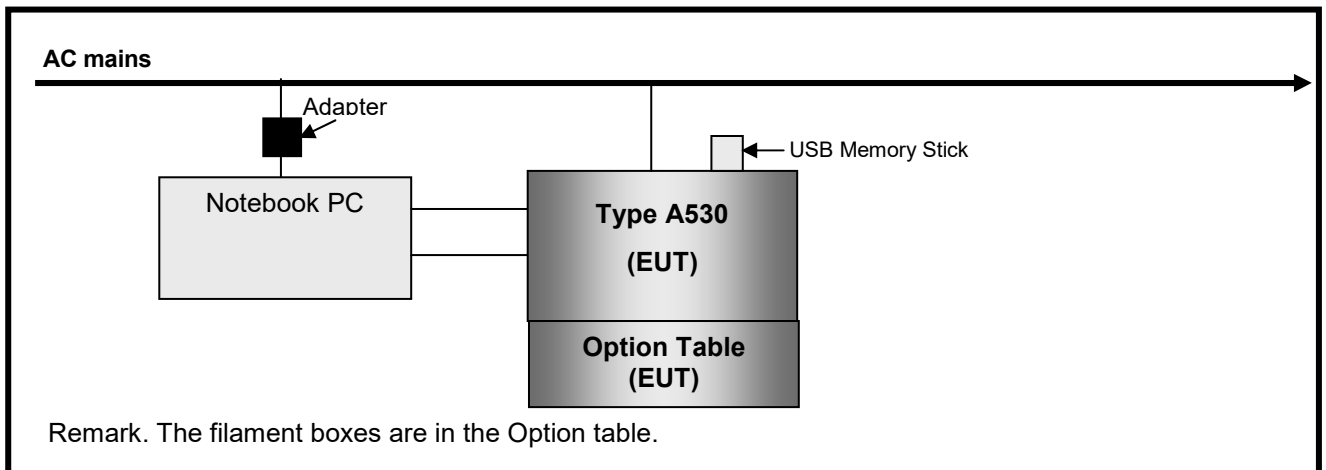
Test Mode	Description
# 1	The EUT was operated in standby mode without option table.
# 2	Printing mode using USB cable between the EUT and a Notebook PC without option table.
# 3	Printing mode using USB memory stick without option table.
# 4	Printing mode using Ethernet speed, 100 Mbps with option table.
# 5	Printing mode using Ethernet speed, 1 Gbps with option table.
# 6	Printing mode using Wi-Fi function, 802.11b with option table.
# 7	Printing mode using Wi-Fi function, 802.11g with option table.
# 8	Printing mode using Wi-Fi function, 802.11n HT20 with option table.
# 9	Printing mode using Wi-Fi function, 802.11n HT40 with option table.

3.4 Test Setup Drawing

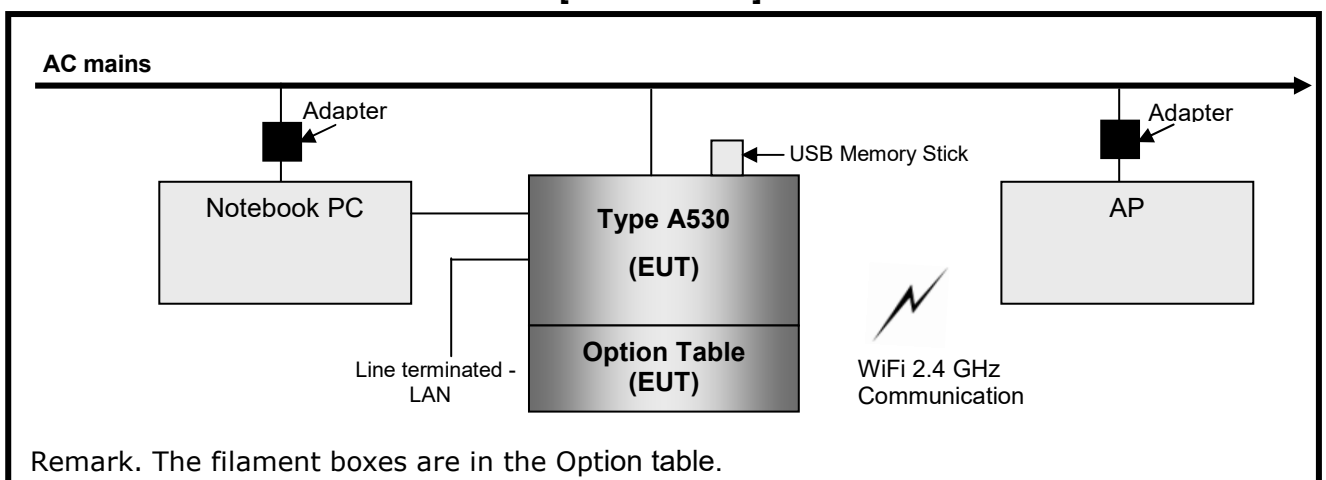
[Mode #1 ~ #3]



[Mode #4 ~ #5]



[Mode #6 ~ #9]



4. EUT Modifications

- No EMC Relevant Modifications were performed by this test laboratory.

5. EMISSION TESTS

5.1 AC Power Line Conducted Emission

5.1.1 Test setup

The EUT and all supporting equipments were placed on a non-metallic table approximately 0.8 m above the ground plane.

Power was fed to the EUT through a $50\ \Omega/50\ \mu\text{H} + 5\ \Omega$ Line Impedance Stabilization Network (LISN) and all supporting equipments were connected to another LISN. The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient noise. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.4:2014 7.3.3 to determine the worse operating conditions.

The test set-up photos are included in appendix I.

Used Software for measurement is EMC 32 supplied by Rohde&Schwarz.

5.1.2 Measurement uncertainty

Frequency range	Uncertainty
150 kHz ~ 30 MHz	2.17 dB

The measurement uncertainties are given with 95 % confidence.

5.1.3 Test Result

Date of Test	2021-09-03		
Temperature	$(22.45 \pm 0.35)\ ^\circ\text{C}$	Relative humidity	$(47.9 \pm 0.3)\ \%\ \text{R.H.}$
Operating Input Voltage	120 Vac	Input Frequency	60 Hz
Frequency range	RBW	VBW	Detector Mode
0.15 MHz ~ 30 MHz	9 kHz	30 kHz	Peak , Q.P and/or Average
Test Mode	Mode #1 ~ Mode #9		
Test Result	Pass	Tested By	Im, Jin-young 

5.1.4 Sample Calculated Example

At 5.31 MHz

QP Limit = 73.0 dB μ V

Correction Factor (C. Factor) of LISN, Pulse Limiter and cable loss at 5.31 MHz = 9.7 dB

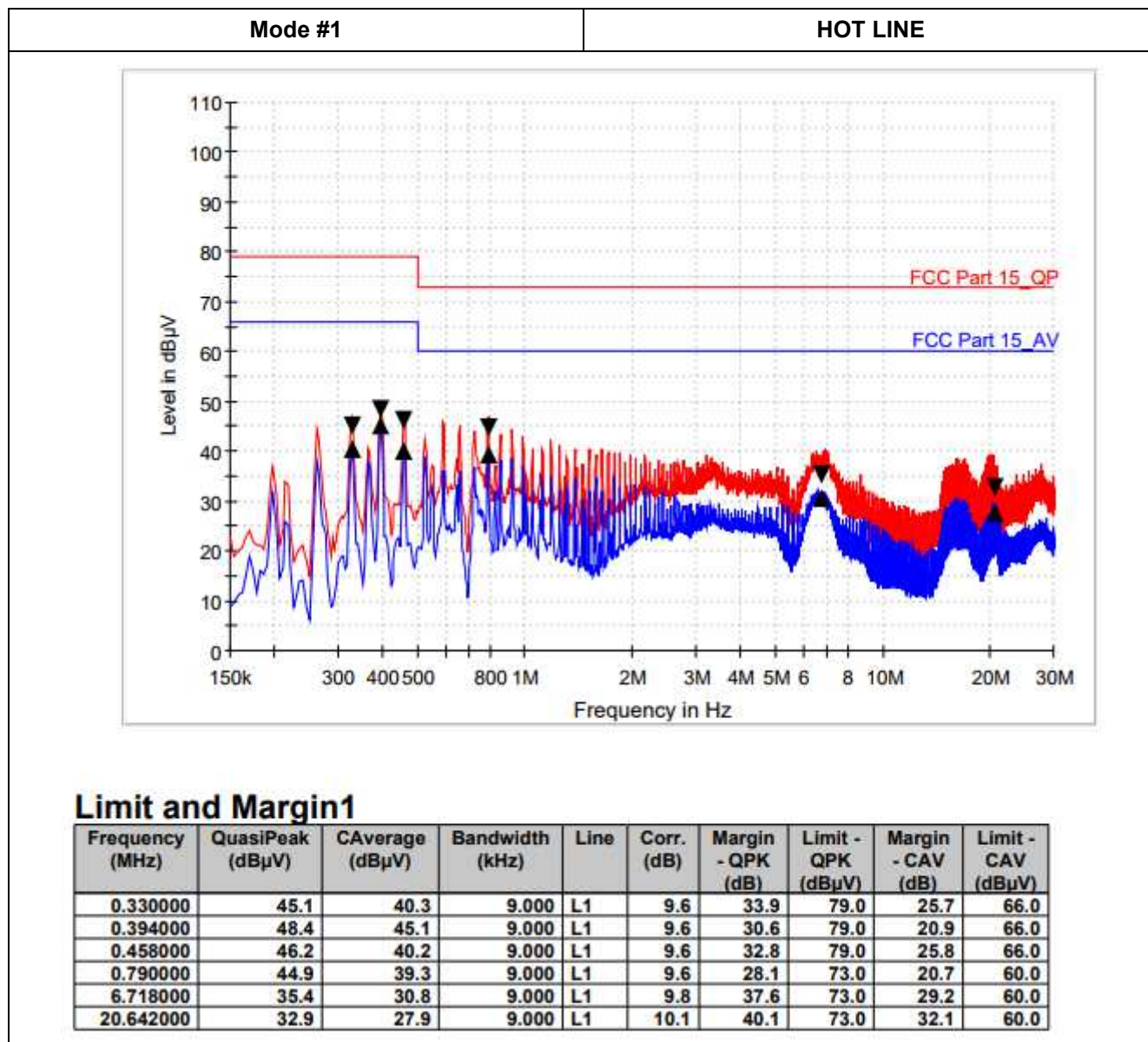
Q.P Reading from the Test receiver = 40.8 dB μ V

(Calculated value for system losses by software EMC32 manufactured by Rohde & Schwarz)

Therefore Q.P Margin = 73 - 40.8 = 32.2

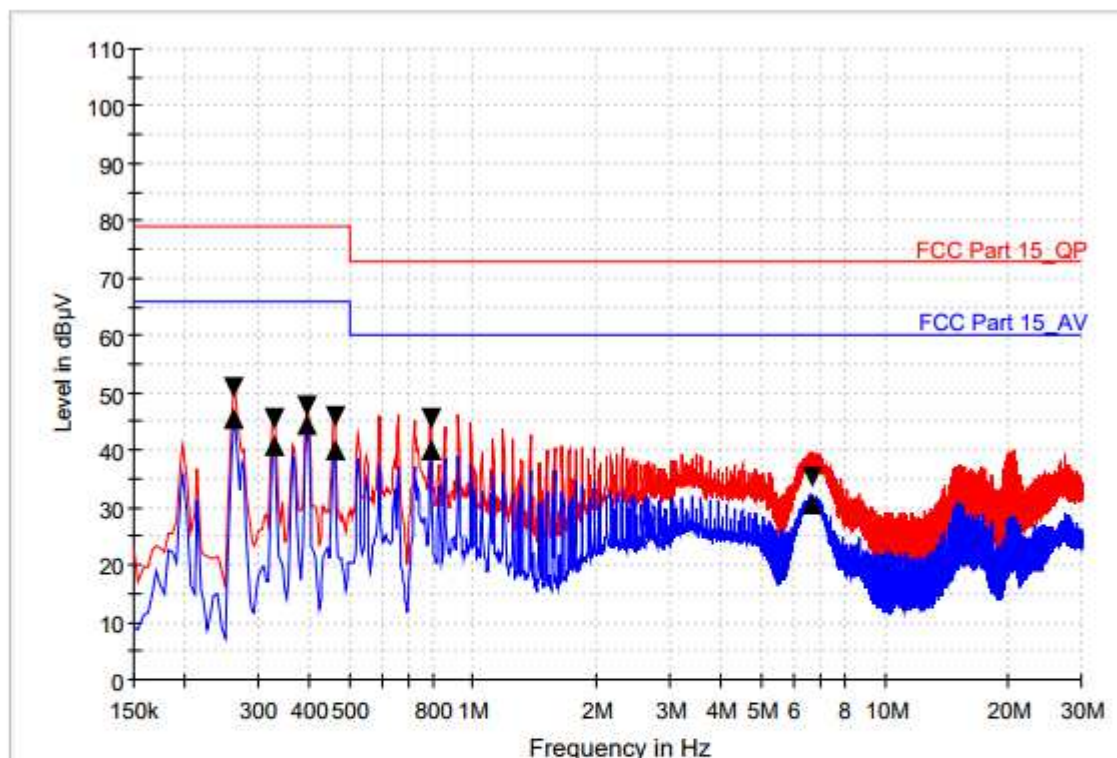
so the EUT has 32.2 dB margin at 5.31 MHz

5.1.5 Test Data



Mode #1

NEUTRAL LINE

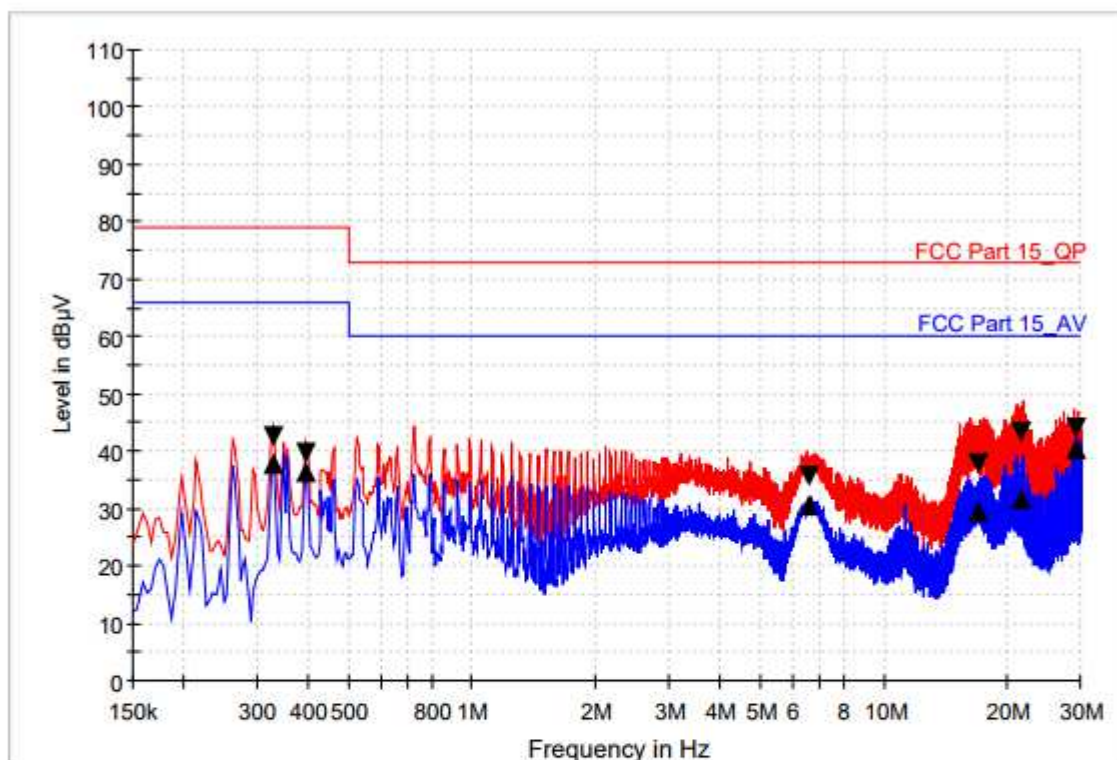


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.262000	50.8	45.4	9.000	N	9.6	28.2	79.0	20.6	66.0
0.330000	45.5	40.7	9.000	N	9.6	33.5	79.0	25.3	66.0
0.394000	47.7	44.5	9.000	N	9.6	31.3	79.0	21.5	66.0
0.462000	46.0	40.0	9.000	N	9.6	33.0	79.0	26.0	66.0
0.790000	45.6	40.0	9.000	N	9.6	27.4	73.0	20.0	60.0
6.662000	35.4	30.6	9.000	N	9.8	37.6	73.0	29.4	60.0

Mode #2

HOT LINE

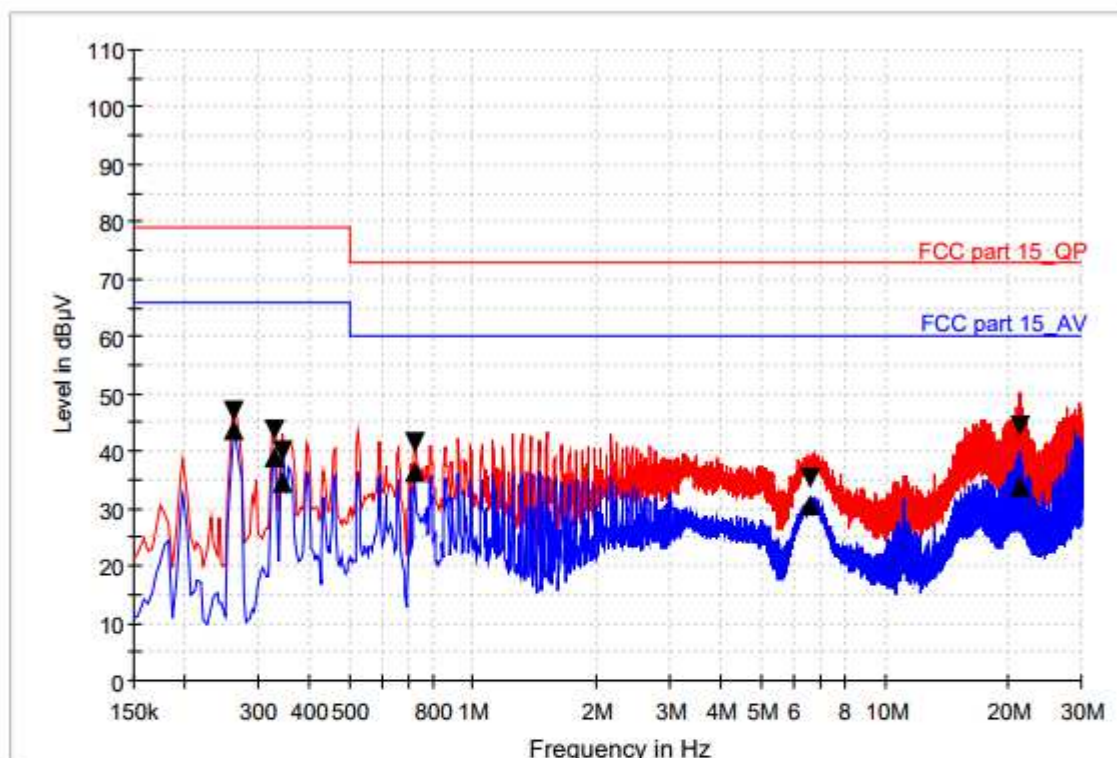


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.330000	42.7	38.0	9.000	L1	9.6	36.3	79.0	28.0	66.0
0.394000	39.7	36.6	9.000	L1	9.6	39.3	79.0	29.4	66.0
6.570000	35.6	30.6	9.000	L1	9.8	37.4	73.0	29.4	60.0
17.054000	37.9	29.6	9.000	L1	10.0	35.1	73.0	30.4	60.0
21.478000	43.5	31.7	9.000	L1	10.1	29.5	73.0	28.3	60.0
29.342000	44.1	40.3	9.000	L1	10.2	28.9	73.0	19.7	60.0

Mode #2

NEUTRAL LINE

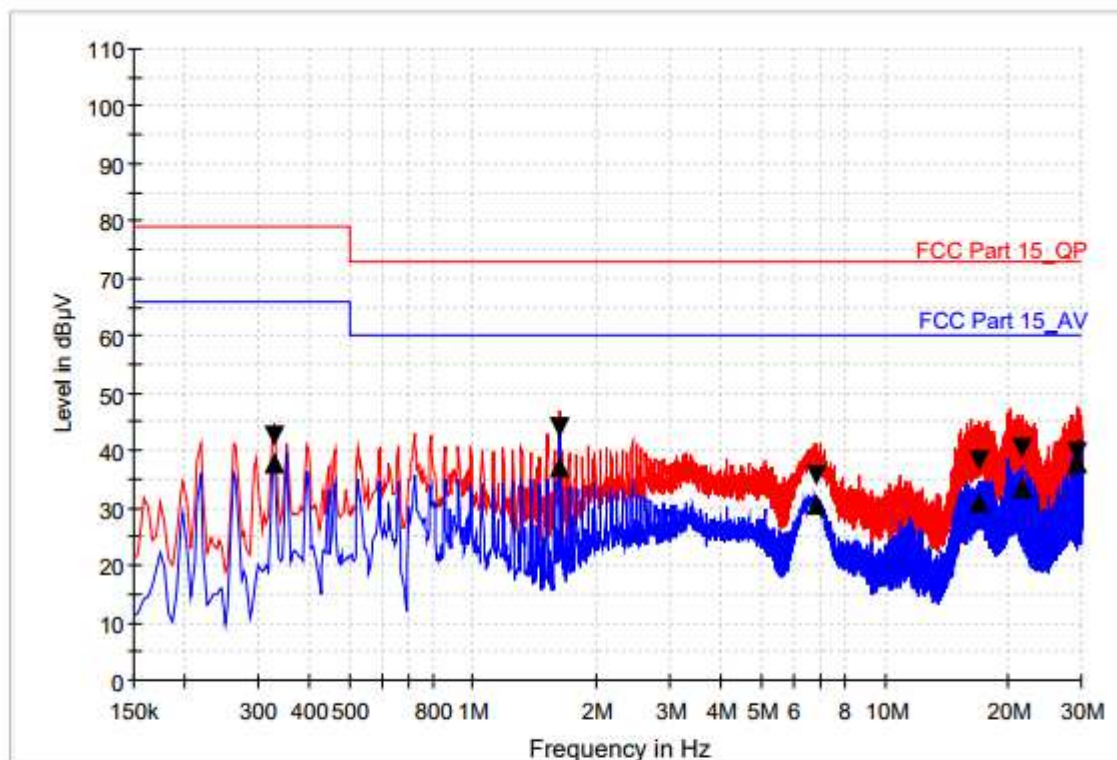


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.262000	47.0	43.8	9.000	N	9.6	32.0	79.0	22.2	66.0
0.330000	43.7	39.1	9.000	N	9.6	35.3	79.0	26.9	66.0
0.346000	40.2	34.7	9.000	N	9.6	38.8	79.0	31.3	66.0
0.722000	41.7	36.3	9.000	N	9.6	31.3	73.0	23.7	60.0
6.602000	35.4	30.6	9.000	N	9.8	37.6	73.0	29.4	60.0
21.250000	44.3	33.8	9.000	N	10.1	28.7	73.0	26.2	60.0

Mode #3

HOT LINE

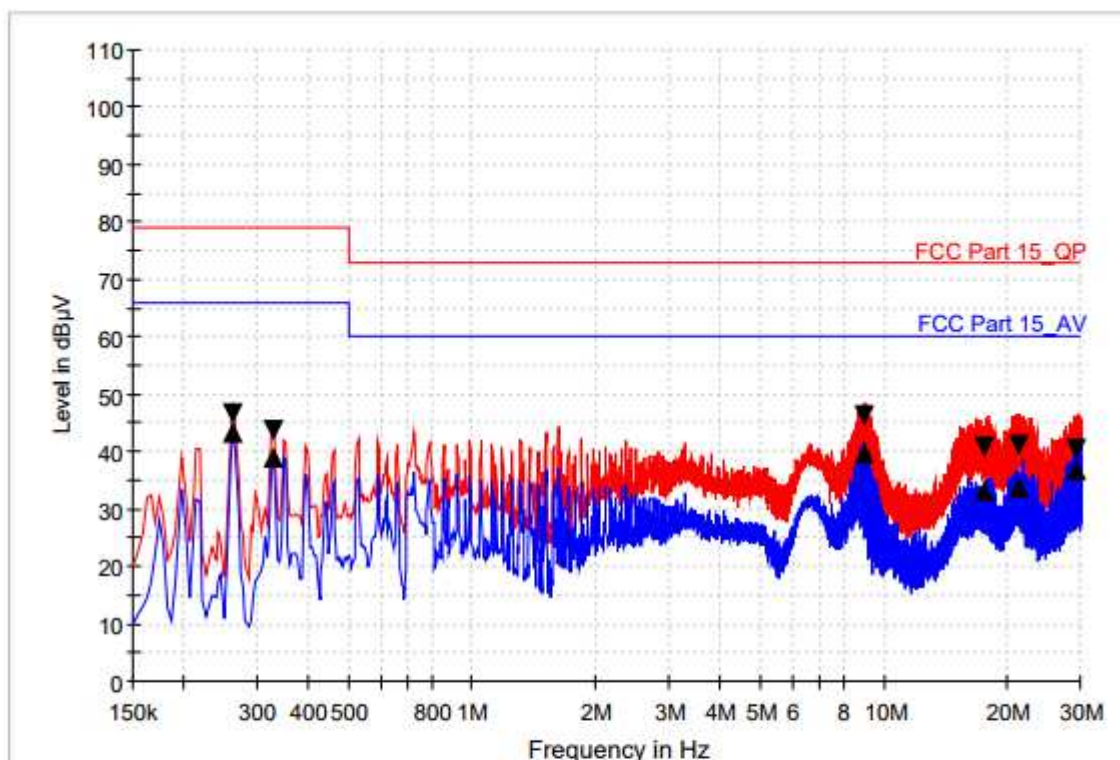


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.330000	42.6	37.8	9.000	L1	9.6	36.4	79.0	28.2	66.0
1.622000	44.2	37.3	9.000	L1	9.7	28.8	73.0	22.7	60.0
6.798000	35.8	30.7	9.000	L1	9.8	37.2	73.0	29.3	60.0
16.974000	38.2	30.8	9.000	L1	10.0	34.8	73.0	29.2	60.0
21.642000	40.3	33.5	9.000	L1	10.1	32.7	73.0	26.5	60.0
29.298000	39.7	37.9	9.000	L1	10.2	33.3	73.0	22.1	60.0

Mode #3

NEUTRAL LINE

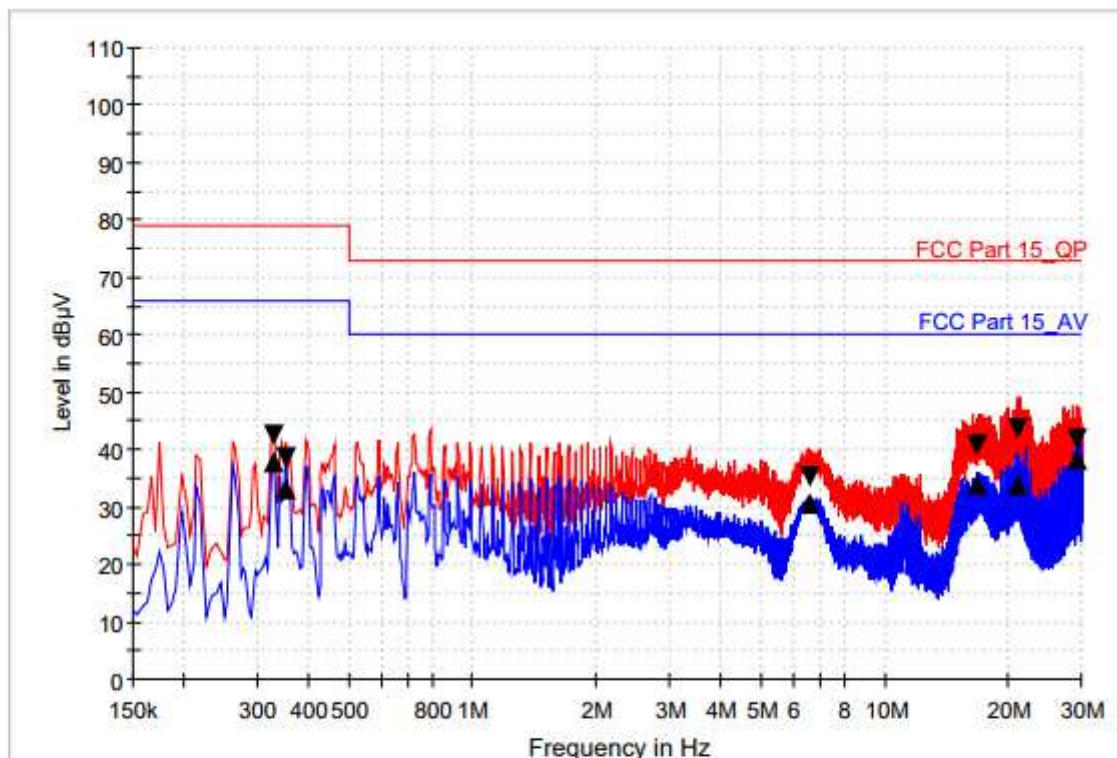


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.262000	46.4	43.3	9.000	N	9.6	32.6	79.0	22.7	66.0
0.330000	43.6	38.8	9.000	N	9.6	35.4	79.0	27.2	66.0
8.918000	46.3	39.9	9.000	N	9.8	26.7	73.0	20.1	60.0
17.494000	40.8	33.2	9.000	N	10.0	32.2	73.0	26.8	60.0
21.306000	41.2	33.8	9.000	N	10.1	31.8	73.0	26.2	60.0
29.362000	40.5	36.9	9.000	N	10.2	32.5	73.0	23.1	60.0

Mode #4

HOT LINE

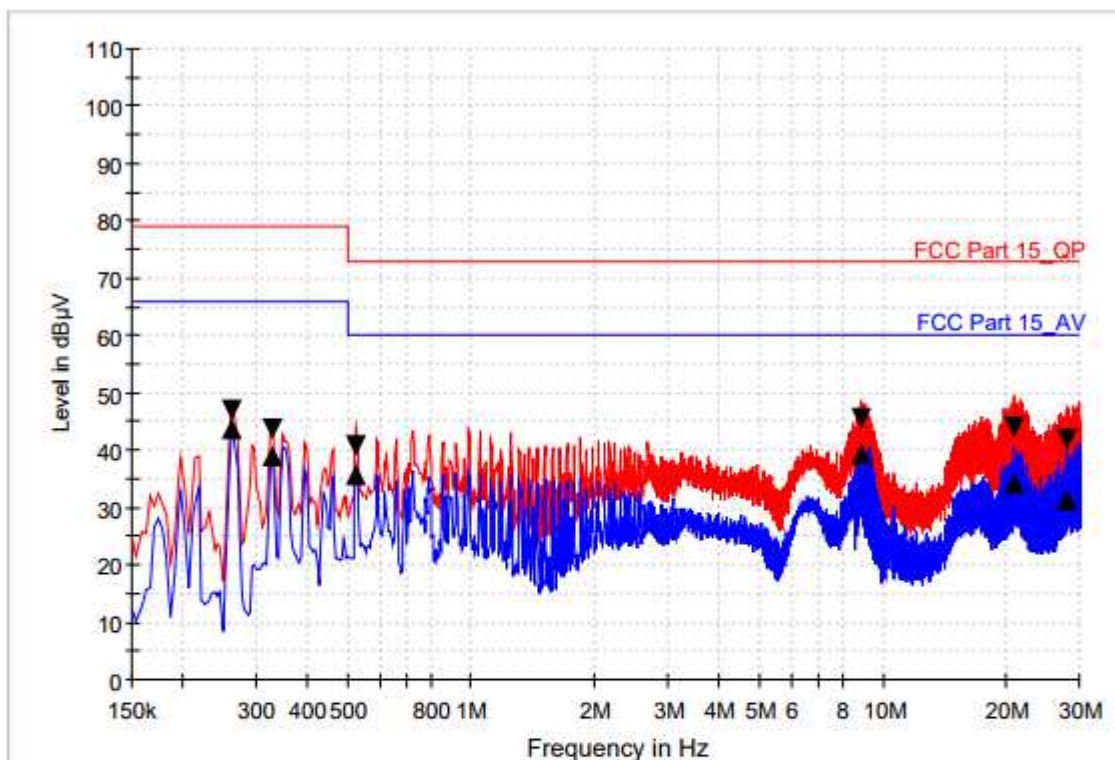


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.330000	42.7	37.9	9.000	L1	9.6	36.3	79.0	28.1	66.0
0.354000	38.5	33.3	9.000	L1	9.6	40.5	79.0	32.7	66.0
6.622000	35.2	30.6	9.000	L1	9.8	37.8	73.0	29.4	60.0
16.770000	41.0	34.0	9.000	L1	10.0	32.0	73.0	26.0	60.0
21.054000	43.9	33.7	9.000	L1	10.1	29.1	73.0	26.3	60.0
29.394000	41.7	38.4	9.000	L1	10.2	31.3	73.0	21.6	60.0

Mode #4

NEUTRAL LINE

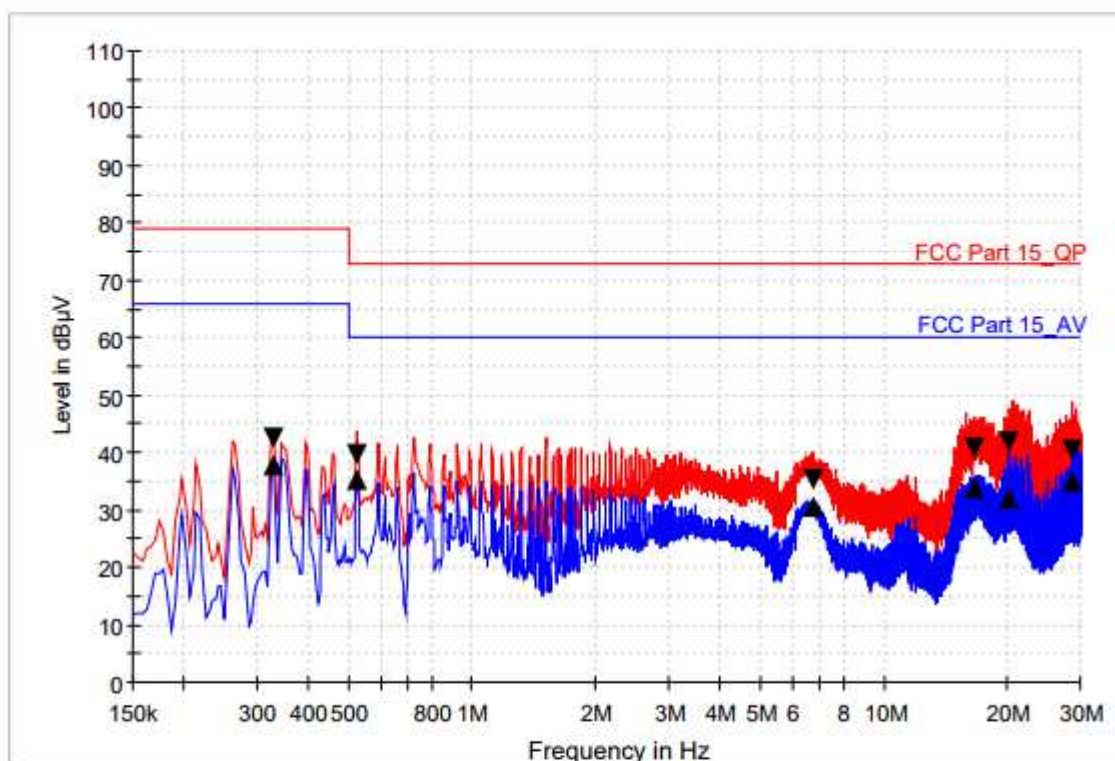


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.262000	46.9	43.7	9.000	N	9.6	32.1	79.0	22.3	66.0
0.330000	43.7	39.1	9.000	N	9.6	35.3	79.0	26.9	66.0
0.526000	40.7	35.8	9.000	N	9.6	32.3	73.0	24.2	60.0
8.846000	45.6	39.4	9.000	N	9.8	27.4	73.0	20.6	60.0
20.842000	44.0	34.4	9.000	N	10.1	29.0	73.0	25.6	60.0
27.862000	41.8	31.3	9.000	N	10.2	31.2	73.0	28.7	60.0

Mode #5

HOT LINE

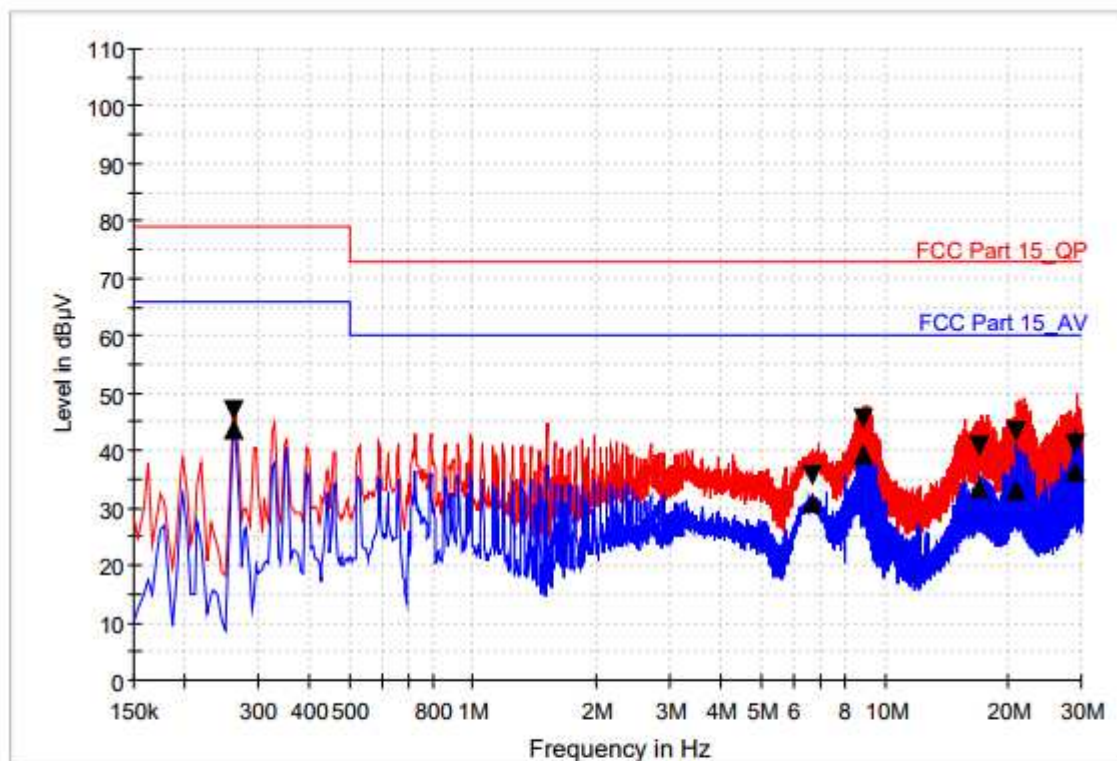


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.330000	42.7	37.9	9.000	L1	9.6	36.3	79.0	28.1	66.0
0.526000	39.8	35.3	9.000	L1	9.6	33.2	73.0	24.7	60.0
6.726000	35.4	30.4	9.000	L1	9.8	37.6	73.0	29.6	60.0
16.642000	40.6	33.8	9.000	L1	10.0	32.4	73.0	26.2	60.0
20.094000	42.0	32.0	9.000	L1	10.0	31.0	73.0	28.0	60.0
28.734000	40.5	35.1	9.000	L1	10.2	32.5	73.0	24.9	60.0

Mode #5

NEUTRAL LINE

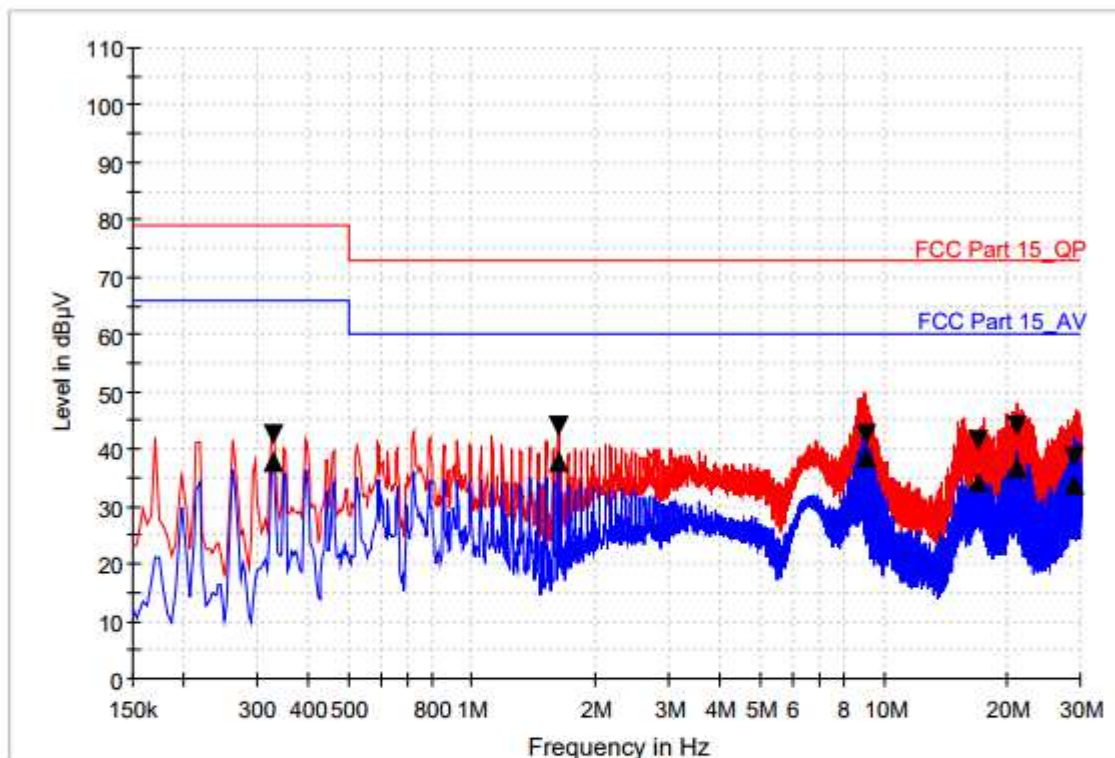


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.262000	46.8	43.6	9.000	N	9.6	32.2	79.0	22.4	66.0
6.650000	35.8	31.0	9.000	N	9.8	37.2	73.0	29.0	60.0
8.846000	45.6	39.4	9.000	N	9.8	27.4	73.0	20.6	60.0
17.034000	40.7	33.6	9.000	N	10.0	32.3	73.0	26.4	60.0
20.950000	43.3	33.1	9.000	N	10.1	29.7	73.0	26.9	60.0
29.094000	41.1	36.5	9.000	N	10.2	31.9	73.0	23.5	60.0

Mode #6

HOT LINE

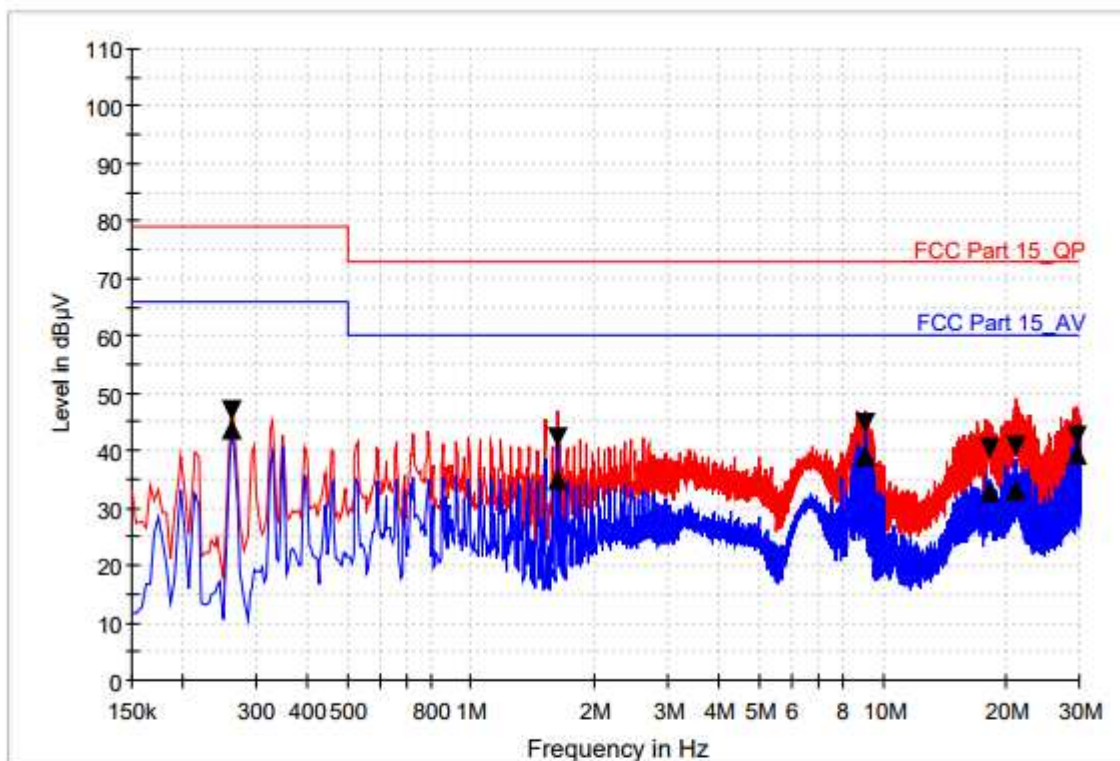


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.330000	42.8	37.9	9.000	L1	9.6	36.2	79.0	28.1	66.0
1.622000	44.0	37.9	9.000	L1	9.7	29.0	73.0	22.1	60.0
9.058000	42.6	38.6	9.000	L1	9.8	30.4	73.0	21.4	60.0
17.034000	41.6	34.3	9.000	L1	10.0	31.4	73.0	25.7	60.0
21.182000	44.2	36.7	9.000	L1	10.1	28.8	73.0	23.3	60.0
29.010000	38.8	33.9	9.000	L1	10.2	34.2	73.0	26.1	60.0

Mode #6

NEUTRAL LINE

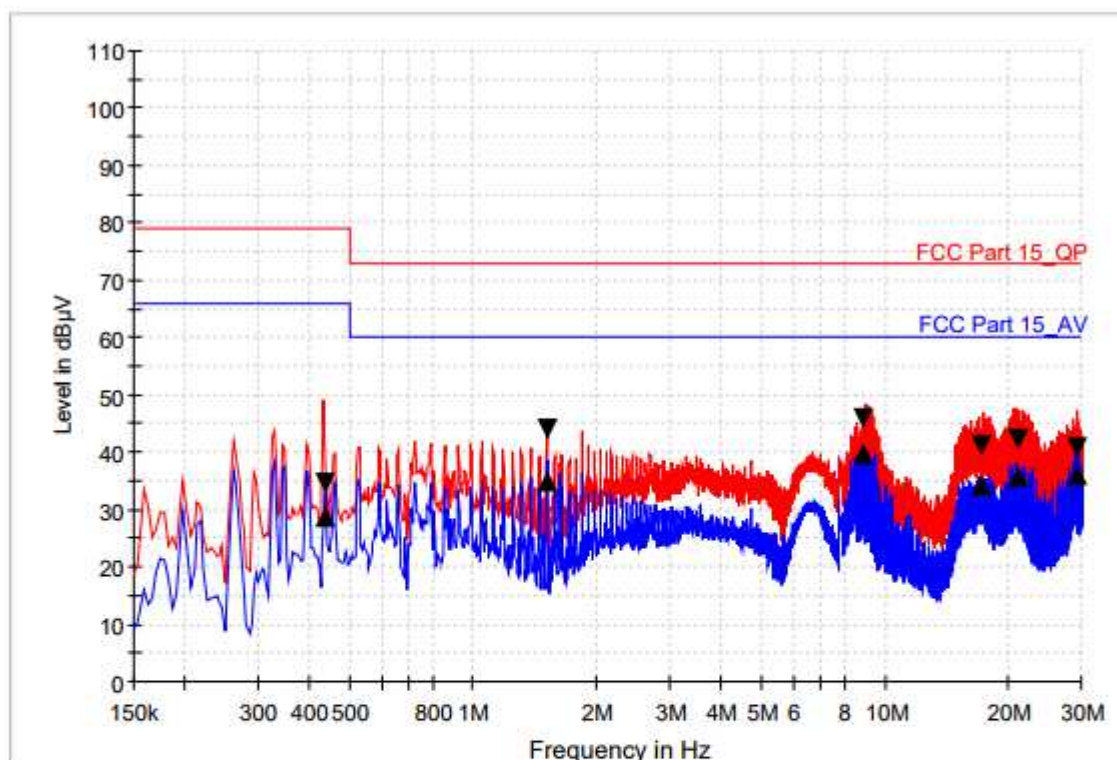


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.262000	46.9	43.6	9.000	N	9.6	32.1	79.0	22.4	66.0
1.618000	42.1	34.9	9.000	N	9.7	30.9	73.0	25.1	60.0
9.094000	44.9	39.0	9.000	N	9.8	28.1	73.0	21.0	60.0
18.218000	40.4	32.7	9.000	N	10.0	32.6	73.0	27.3	60.0
21.110000	40.9	33.1	9.000	N	10.1	32.1	73.0	26.9	60.0
29.638000	42.7	39.2	9.000	N	10.2	30.3	73.0	20.8	60.0

Mode #7

HOT LINE

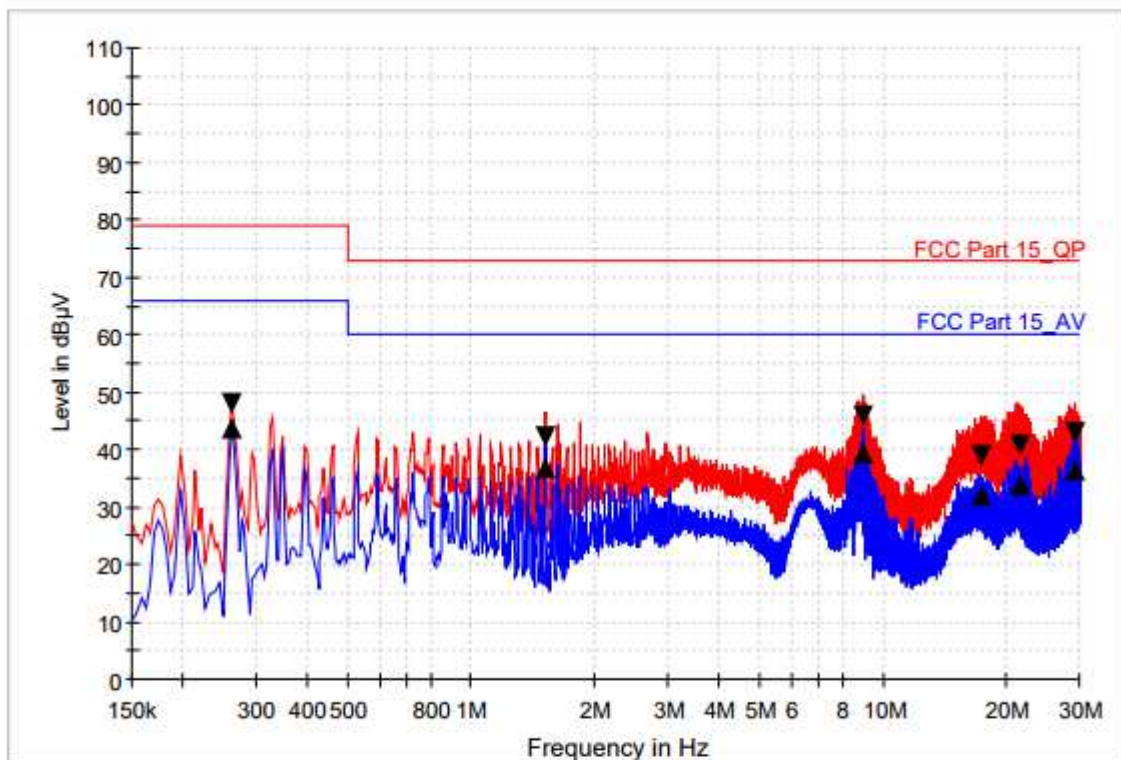


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.438000	34.6	28.6	9.000	L1	9.6	44.4	79.0	37.4	66.0
1.510000	44.2	35.1	9.000	L1	9.7	28.8	73.0	24.9	60.0
8.846000	45.8	39.7	9.000	L1	9.8	27.2	73.0	20.3	60.0
17.102000	41.2	34.2	9.000	L1	10.0	31.8	73.0	25.8	60.0
21.182000	42.1	35.8	9.000	L1	10.1	30.9	73.0	24.2	60.0
29.382000	40.9	36.0	9.000	L1	10.2	32.1	73.0	24.0	60.0

Mode #7

NEUTRAL LINE

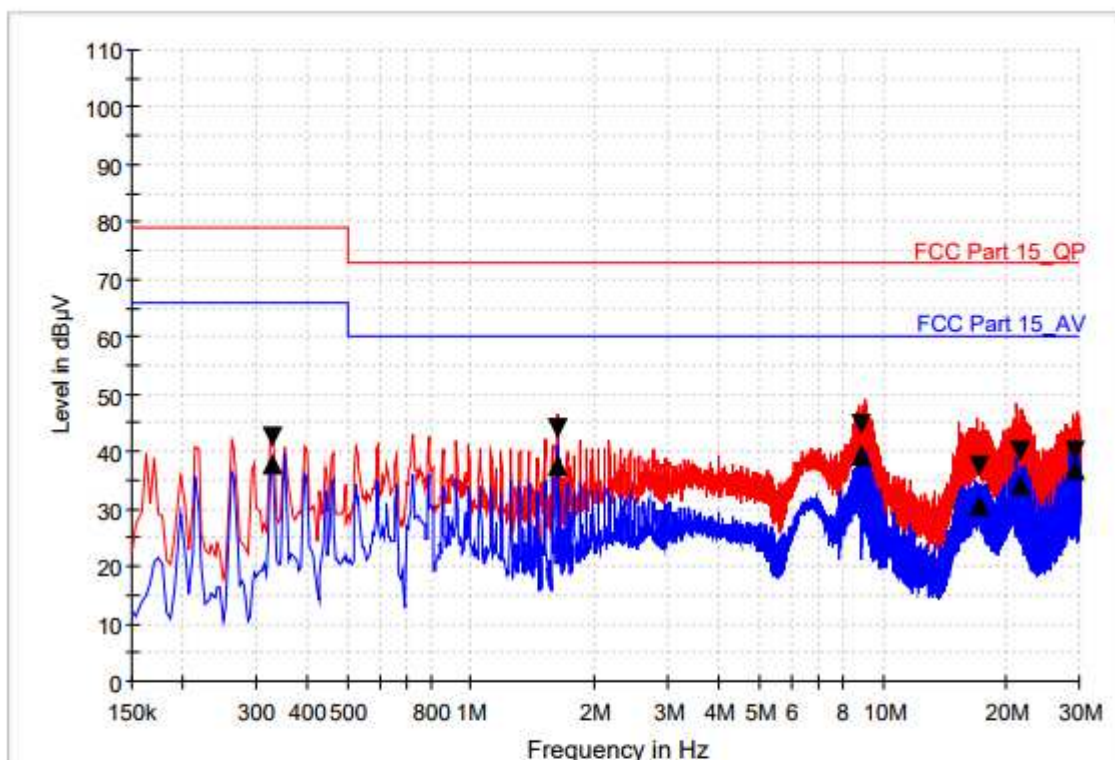


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Margin - CAV (dB)	Limit - CAV (dBµV)
0.262000	48.1	43.7	9.000	N	9.6	30.9	79.0	22.3	66.0
1.514000	42.4	36.9	9.000	N	9.7	30.6	73.0	23.1	60.0
8.986000	45.9	39.5	9.000	N	9.8	27.1	73.0	20.5	60.0
17.366000	38.8	31.9	9.000	N	10.0	34.2	73.0	28.1	60.0
21.438000	40.8	34.0	9.000	N	10.1	32.2	73.0	26.0	60.0
29.390000	43.0	36.5	9.000	N	10.2	30.0	73.0	23.5	60.0

Mode #8

HOT LINE

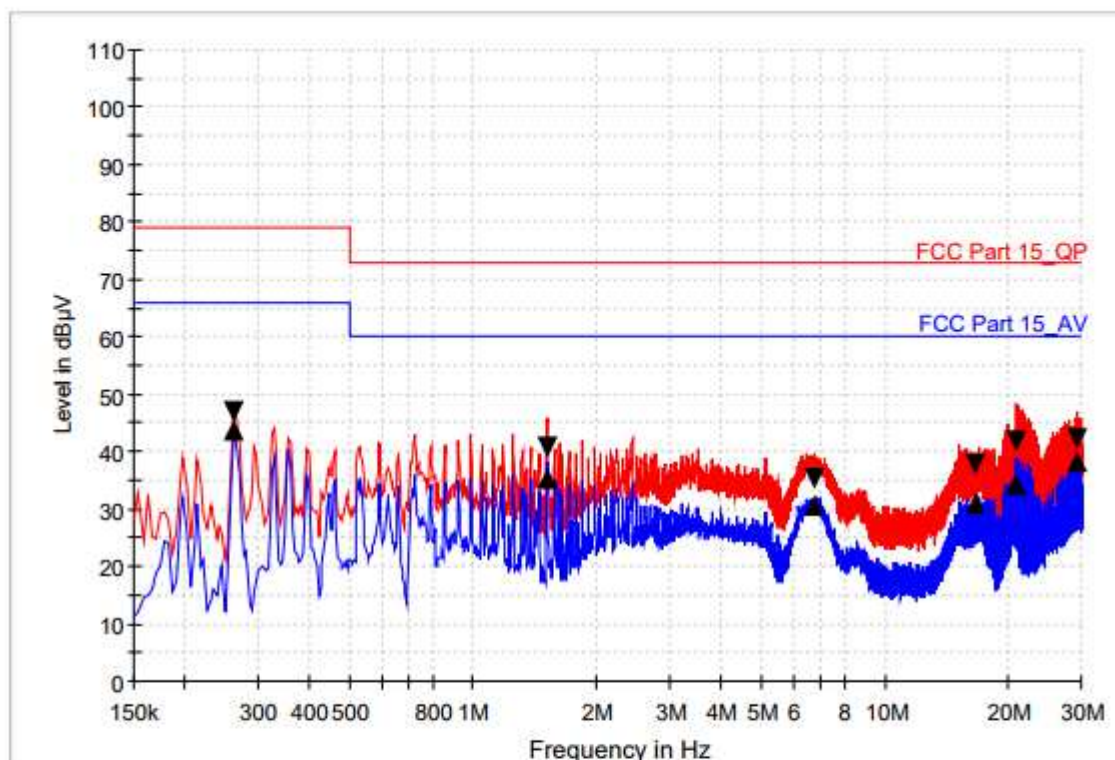


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.330000	42.7	38.0	9.000	L1	9.6	36.3	79.0	28.0	66.0
1.622000	44.2	37.5	9.000	L1	9.7	28.8	73.0	22.5	60.0
8.814000	44.6	39.3	9.000	L1	9.8	28.4	73.0	20.7	60.0
17.170000	37.7	30.7	9.000	L1	10.0	35.3	73.0	29.3	60.0
21.438000	40.1	34.3	9.000	L1	10.1	32.9	73.0	25.7	60.0
29.242000	39.9	36.7	9.000	L1	10.2	33.1	73.0	23.3	60.0

Mode #8

NEUTRAL LINE

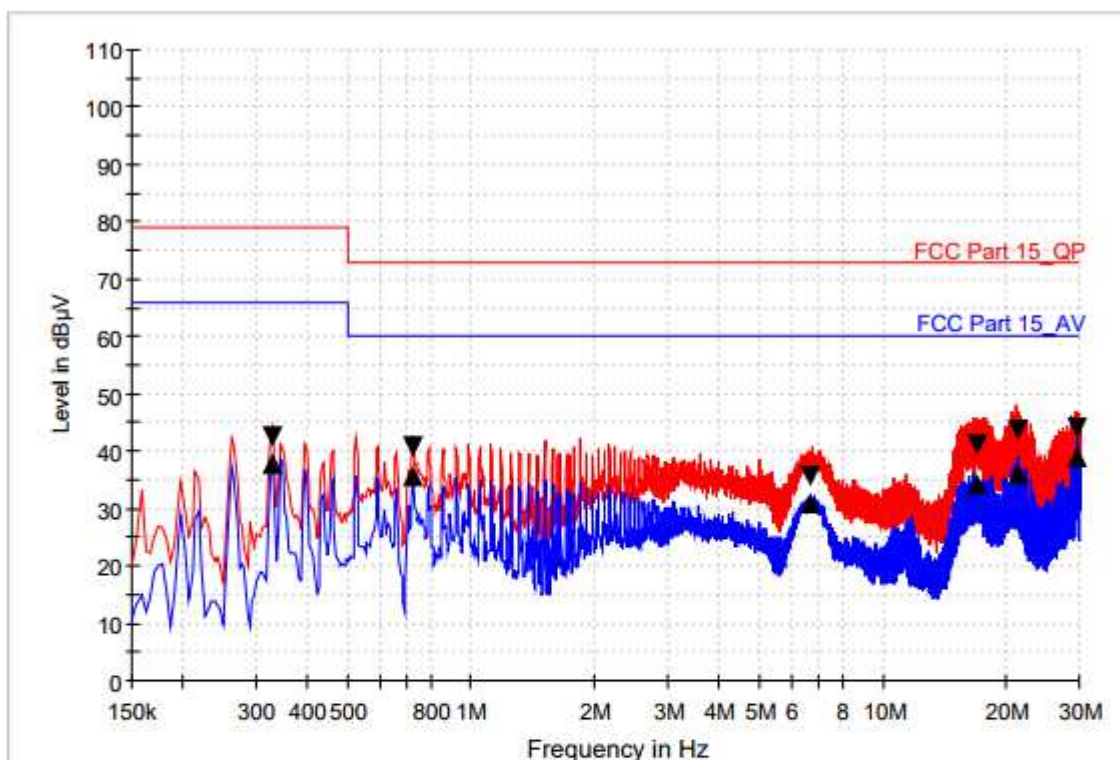


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.262000	47.0	43.5	9.000	N	9.6	32.0	79.0	22.5	66.0
1.510000	40.7	35.2	9.000	N	9.7	32.3	73.0	24.8	60.0
6.718000	35.4	30.7	9.000	N	9.8	37.6	73.0	29.3	60.0
16.514000	38.0	31.0	9.000	N	10.0	35.0	73.0	29.0	60.0
20.854000	41.9	34.2	9.000	N	10.1	31.1	73.0	25.8	60.0
29.270000	42.3	38.2	9.000	N	10.2	30.7	73.0	21.8	60.0

Mode #9

HOT LINE

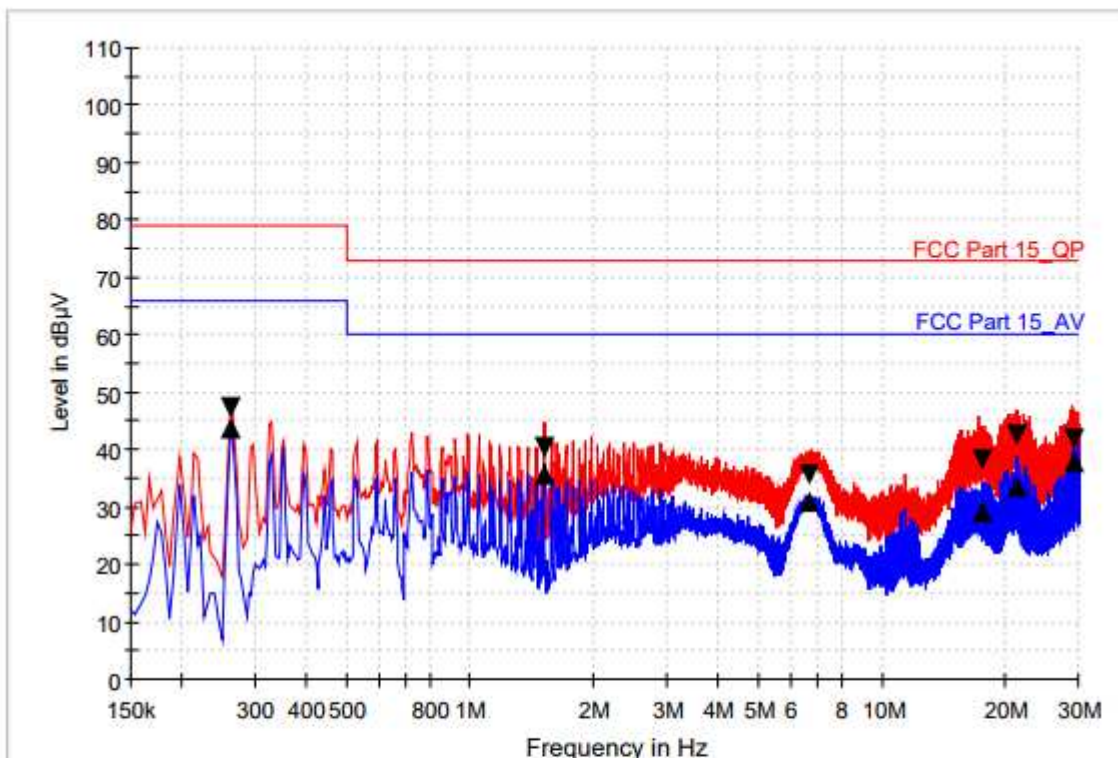


Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.330000	42.6	37.9	9.000	L1	9.6	36.4	79.0	28.1	66.0
0.722000	40.7	35.8	9.000	L1	9.6	32.3	73.0	24.2	60.0
6.654000	35.8	30.9	9.000	L1	9.8	37.2	73.0	29.1	60.0
16.906000	41.1	34.1	9.000	L1	10.0	31.9	73.0	25.9	60.0
21.314000	43.6	35.9	9.000	L1	10.1	29.4	73.0	24.1	60.0
29.730000	44.0	39.0	9.000	L1	10.2	29.0	73.0	21.0	60.0

Mode #9

NEUTRAL LINE



Limit and Margin1

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Margin - CAV (dB)	Limit - CAV (dBμV)
0.262000	47.2	43.8	9.000	N	9.6	31.8	79.0	22.2	66.0
1.514000	40.4	35.7	9.000	N	9.7	32.6	73.0	24.3	60.0
6.654000	35.6	30.8	9.000	N	9.8	37.4	73.0	29.2	60.0
17.610000	38.3	29.0	9.000	N	10.0	34.7	73.0	31.0	60.0
21.202000	42.5	33.3	9.000	N	10.1	30.5	73.0	26.7	60.0
29.350000	42.0	38.0	9.000	N	10.2	31.0	73.0	22.0	60.0

5.2 Radiated Emission

5.2.1 Test setup

The radiated emissions measurements were in the 3/10 m, Semi Anechoic Chamber. The EUT and all local supporting equipments were placed on a non-conductive table approximately 0.8 m above the ground plane.

The frequency spectrum from 30 MHz to the maximum frequency as specified in CFR 47 Part 15 section 15.33 was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

Preliminary radiated emission test was conducted using the procedure in ANSI C63.4: 2014 8.3.1.1 below 1 000 MHz, 8.3.1.2 above 1 GHz to determine the worse operating conditions

Measurement distance between the EUT and an antenna was as below table.

Frequency range (MHz)	Measurement Distance	
	Class B Device	Class A Device
Below 1 000 MHz	3 m	10 m
Above 1 000 MHz	3 m	3 m

The test set-up photos are included in appendix II.

Used Software for measurement is manufactured by TSJ.

5.2.2 Measurement frequency range

Highest frequency generated or used in the device or on which the device operates or tunes	Upper Frequency of Measurement range (MHz)
Below 1.705 MHz	30
(1.705 ~ 108) MHz	1 000
(108 ~ 500) MHz	2 000
(500 ~ 1 000) MHz	5 000
Above 1 000 MHz	5th harmonic of the highest freq. or 40 GHz, whichever is lower

The measurement uncertainties are given with 95 % confidence.

5.2.3 Measurement uncertainty

Frequency range	Uncertainty
Below 1 000 MHz	4.30 dB
Above 1 000 MHz	4.67 dB

The measurement uncertainties are given with 95 % confidence.

5.2.4 Test result

Date of Test	2021-09-02			
Temperature	(22.85 ± 0.35) °C		Relative humidity	(48.85 ± 0.35) % R.H.
Operating Input Voltage	120 Vac		Input Frequency	60 Hz
Frequency range	RBW	VBW	Detector Mode	Measurement distance
Below 1 000 MHz	120 kHz	300 kHz	Peak or Q.P.	10 m
Date of Test	2021-09-02			
Temperature	(23.35 ± 0.15) °C		Relative humidity	(49.3 ± 0.2) % R.H.
Frequency range	RBW	VBW	Detector Mode	Measurement distance
Above 1 000 MHz	1 MHz	1 MHz or 10 Hz	Peak or Average	3 m
Test Mode	Mode #1 ~ Mode #9			
Test Result	Pass	Tested By	Im, Jin-young 	

5.2.5 Sample Calculated Example

At 80 MHz

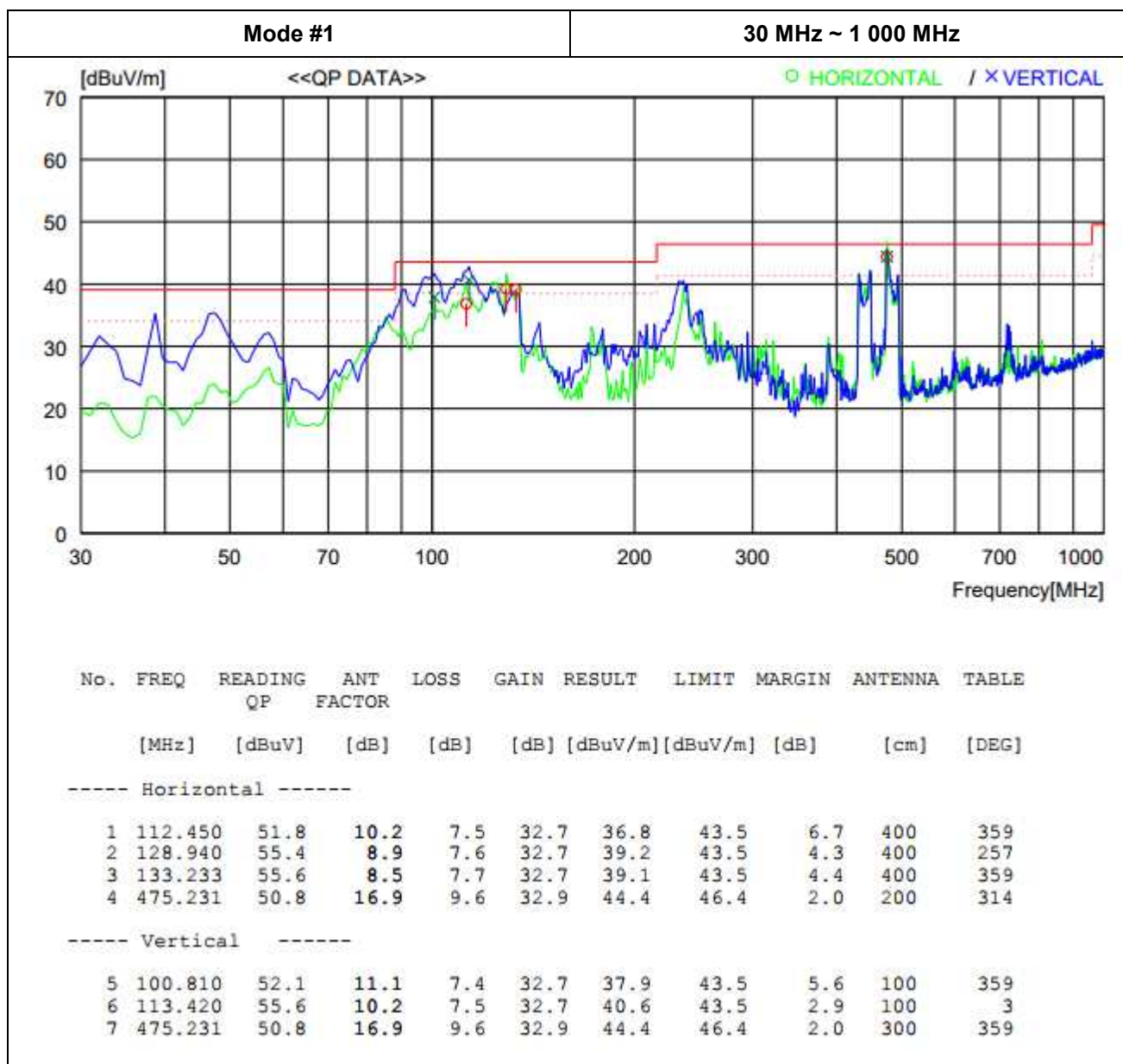
Limit = 40.0dB μ V/m

Result = Receiver reading value + Antenna Factor + Cable Loss - Pre-amplifier gain = 30.0 dB μ V/m

Margin = Limit - Result = 40.0 – 30.0 = 10.0

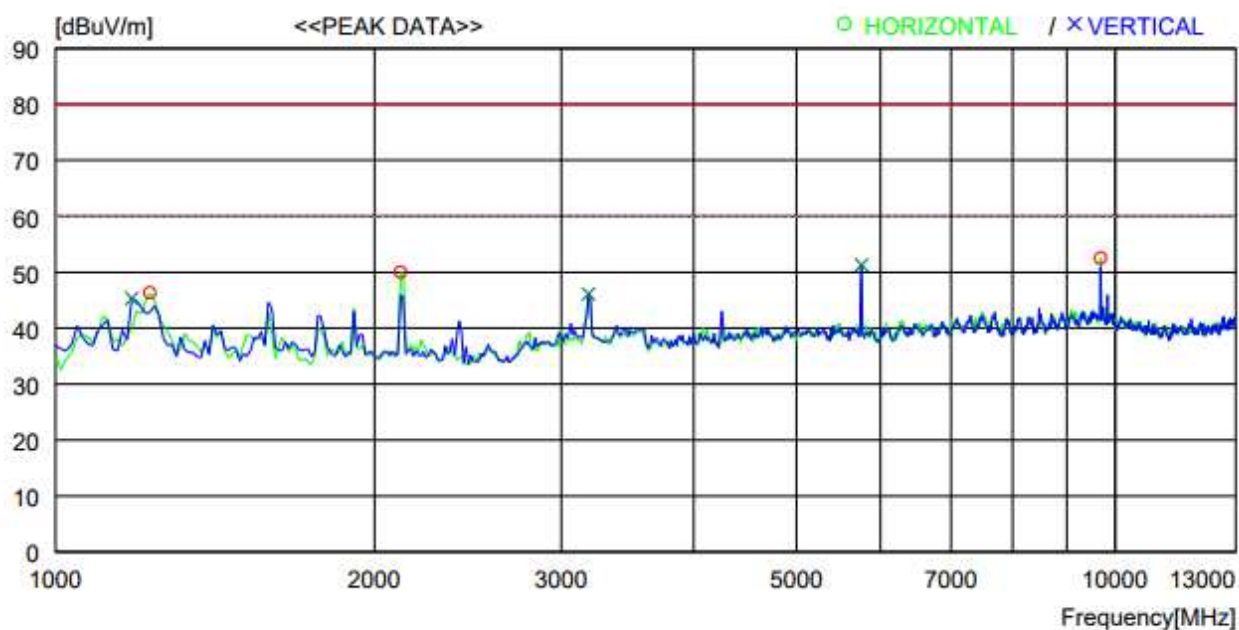
so the EUT has 10.0 dB margin at 80 MHz

5.2.6 Test Data



Mode #1

Above 1 000 MHz (Peak Measurement)

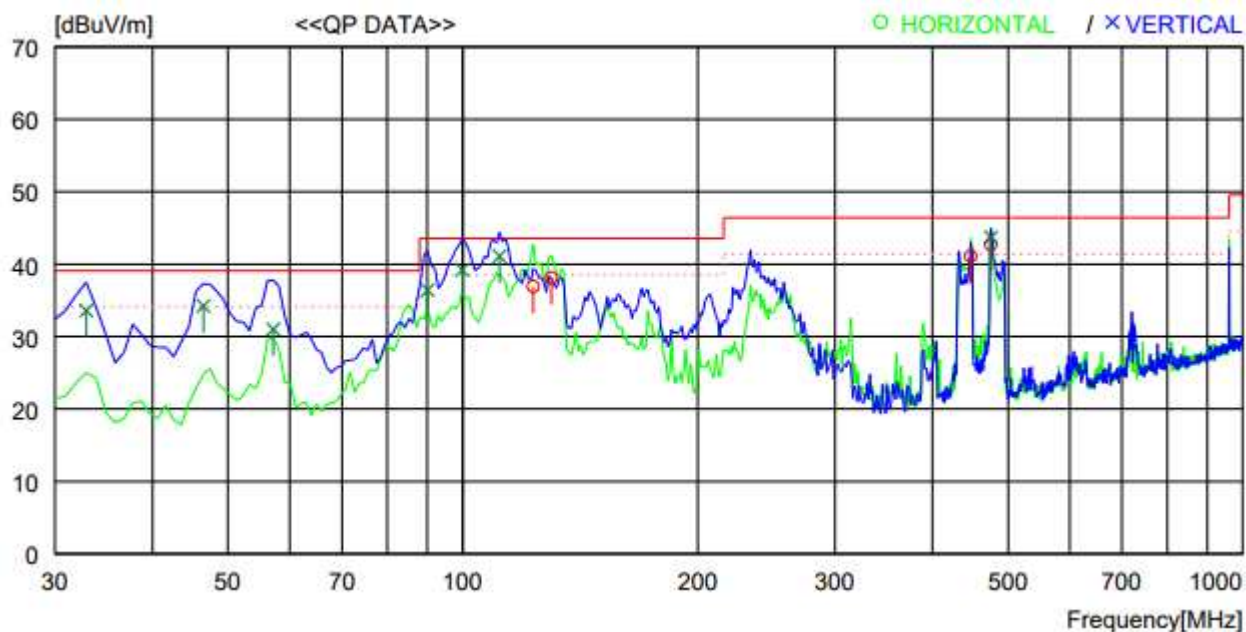


No.	FREQ [MHz]	READING [dBuV]	ANT PEAK FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1228.000	55.4	25.1	5.7	39.9	46.3	80.0	33.7	200	227
2	2116.000	53.6	28.6	7.5	39.7	50.0	80.0	30	300	359
3	9688.000	40.0	37.3	15.7	40.5	52.5	80.0	27.5	100	359
----- Vertical -----										
4	1180.000	54.7	24.9	5.6	39.9	45.3	80.0	34.7	300	0
5	3184.000	45.6	31.2	9.2	39.9	46.1	80.0	33.9	200	359
6	5764.000	44.4	34.6	12.4	40.1	51.3	80.0	28.7	300	0

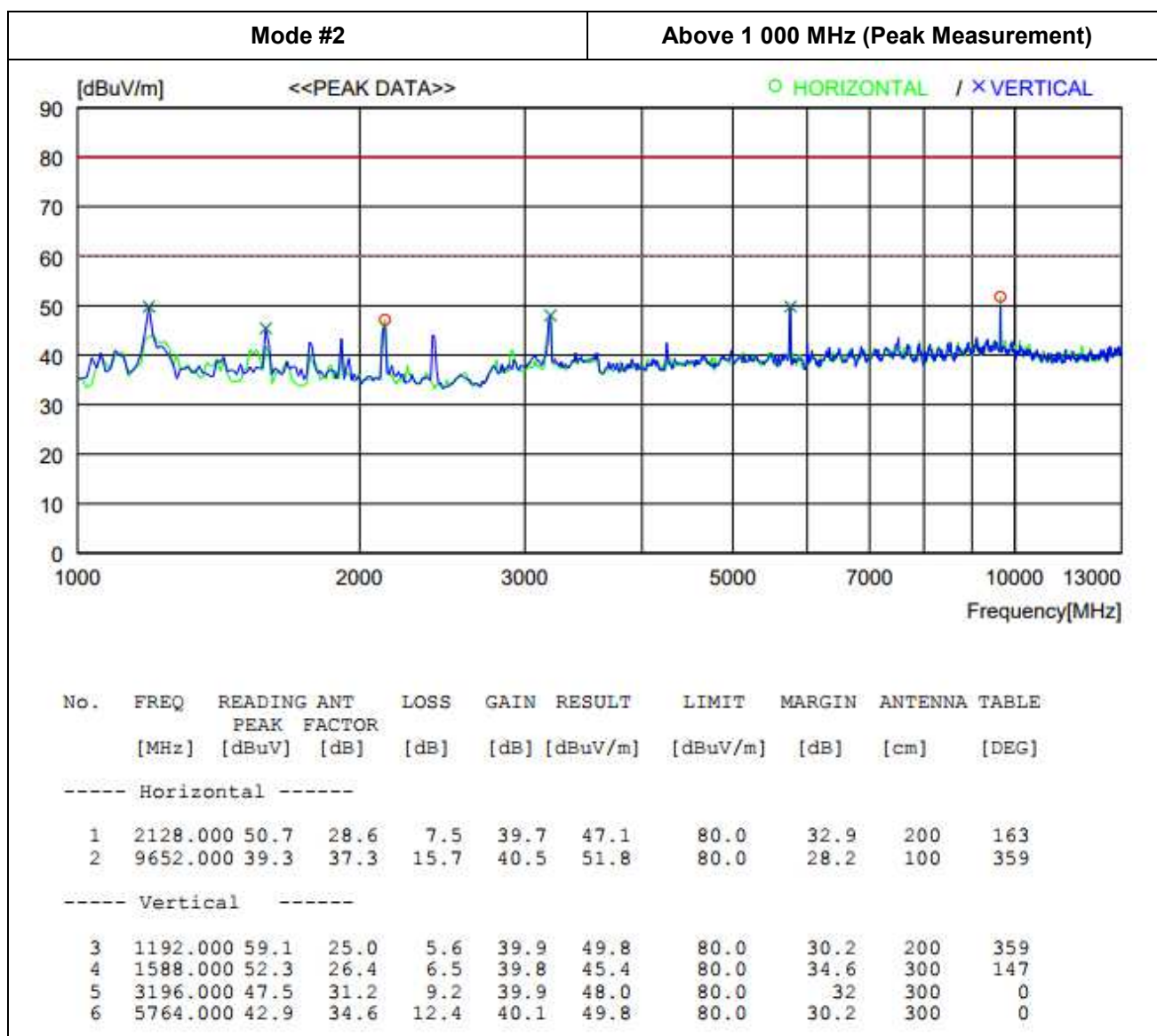
NOTE: Average mode was not measured, because peak values were under the average limit.

Mode #2

30 MHz ~ 1 000 MHz



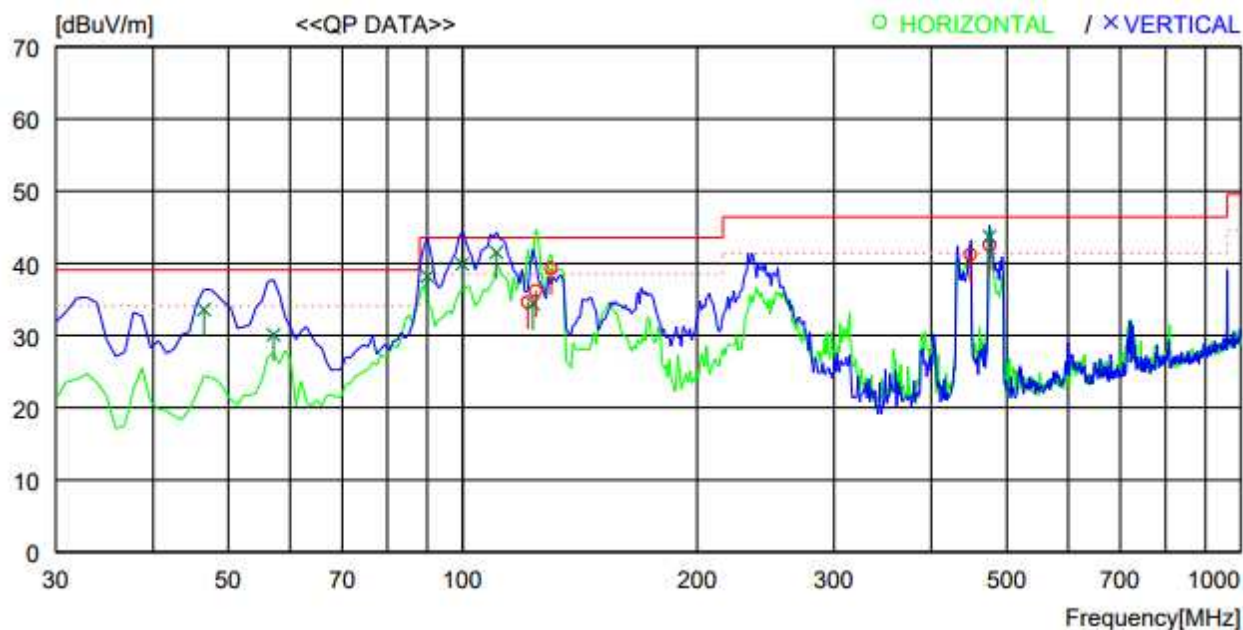
No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	123.120	52.6	9.4	7.6	32.7	36.9	43.5	6.6	400	0
2	129.910	54.4	8.8	7.6	32.7	38.1	43.5	5.4	400	0
3	448.071	48.0	16.5	9.4	32.8	41.1	46.4	5.3	200	24
4	475.231	49.1	16.9	9.6	32.9	42.7	46.4	3.7	200	16
----- Vertical -----										
5	46.490	45.9	14.2	6.8	32.7	34.2	39.1	4.9	200	359
6	57.160	43.3	13.4	7.0	32.7	31.0	39.1	8.1	100	0
7	90.140	51.9	9.9	7.3	32.7	36.4	43.5	7.1	300	108
8	99.840	53.4	11.2	7.3	32.7	39.2	43.5	4.3	100	0
9	111.480	56.0	10.3	7.5	32.7	41.1	43.5	2.4	100	0
10	475.231	50.1	16.9	9.6	32.9	43.7	46.4	2.7	300	288
11	32.910	48.8	10.8	6.7	32.7	33.6	39.1	5.5	100	319



NOTE: Average mode was not measured, because peak values were under the average limit.

Mode #3

30 MHz ~ 1 000 MHz



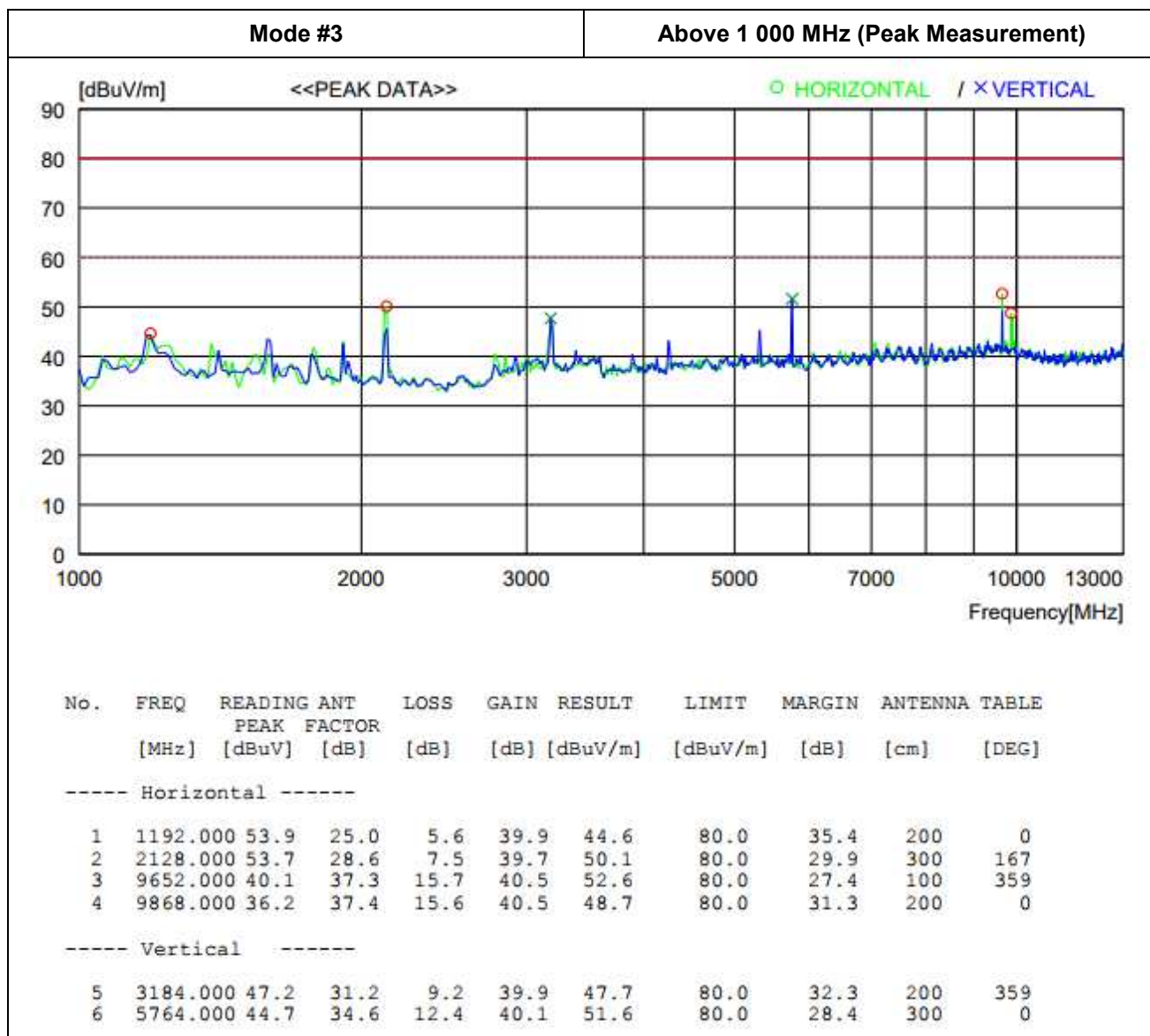
No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
-----	---------------	-------------------------	-----------------------	--------------	--------------	--------------------	-------------------	----------------	-----------------	----------------

----- Horizontal -----

1	121.180	50.2	9.6	7.5	32.7	34.6	43.5	8.9	300	359
2	124.090	52.0	9.3	7.6	32.7	36.2	43.5	7.3	400	0
3	129.910	55.6	8.8	7.6	32.7	39.3	43.5	4.2	400	260
4	449.041	48.1	16.5	9.4	32.8	41.2	46.4	5.2	200	32
5	475.231	48.9	16.9	9.6	32.9	42.5	46.4	3.9	200	0

----- Vertical -----

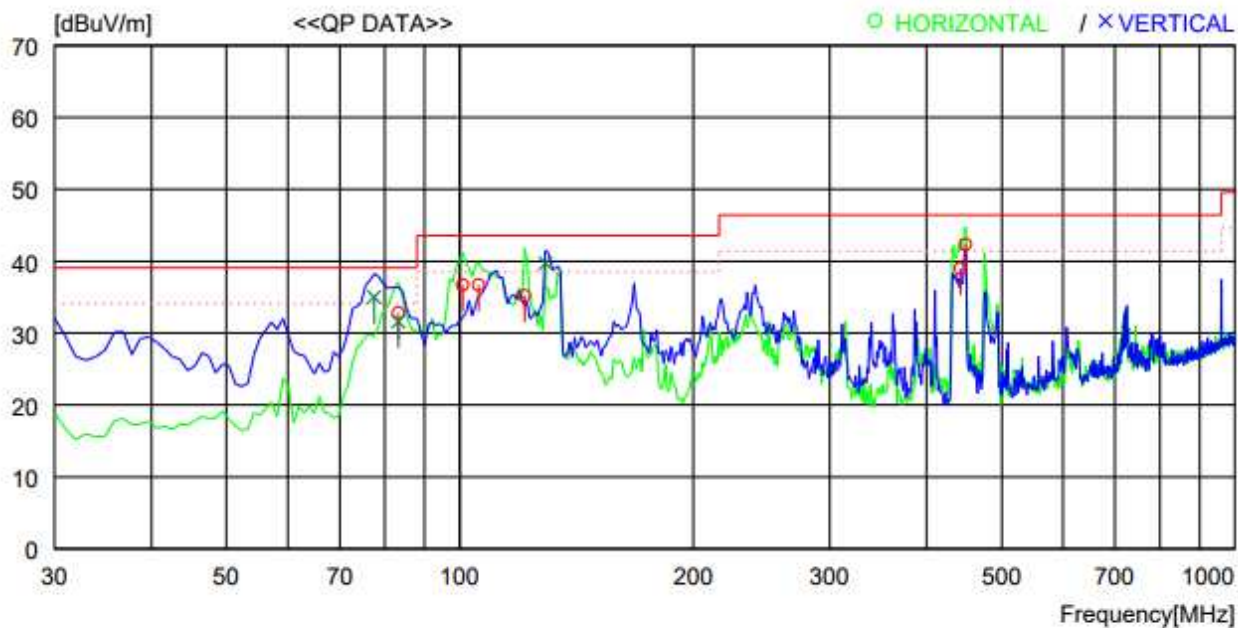
6	46.490	45.3	14.2	6.8	32.7	33.6	39.1	5.5	200	359
7	57.160	42.4	13.4	7.0	32.7	30.1	39.1	9.0	100	0
8	90.140	53.7	9.9	7.3	32.7	38.2	43.5	5.3	200	359
9	99.840	54.1	11.2	7.3	32.7	39.9	43.5	3.6	100	0
10	110.510	56.3	10.4	7.5	32.7	41.5	43.5	2.0	100	0
11	123.120	50.1	9.4	7.6	32.7	34.4	43.5	9.1	100	0
12	475.231	50.1	16.9	9.6	32.9	43.7	46.4	2.7	300	0



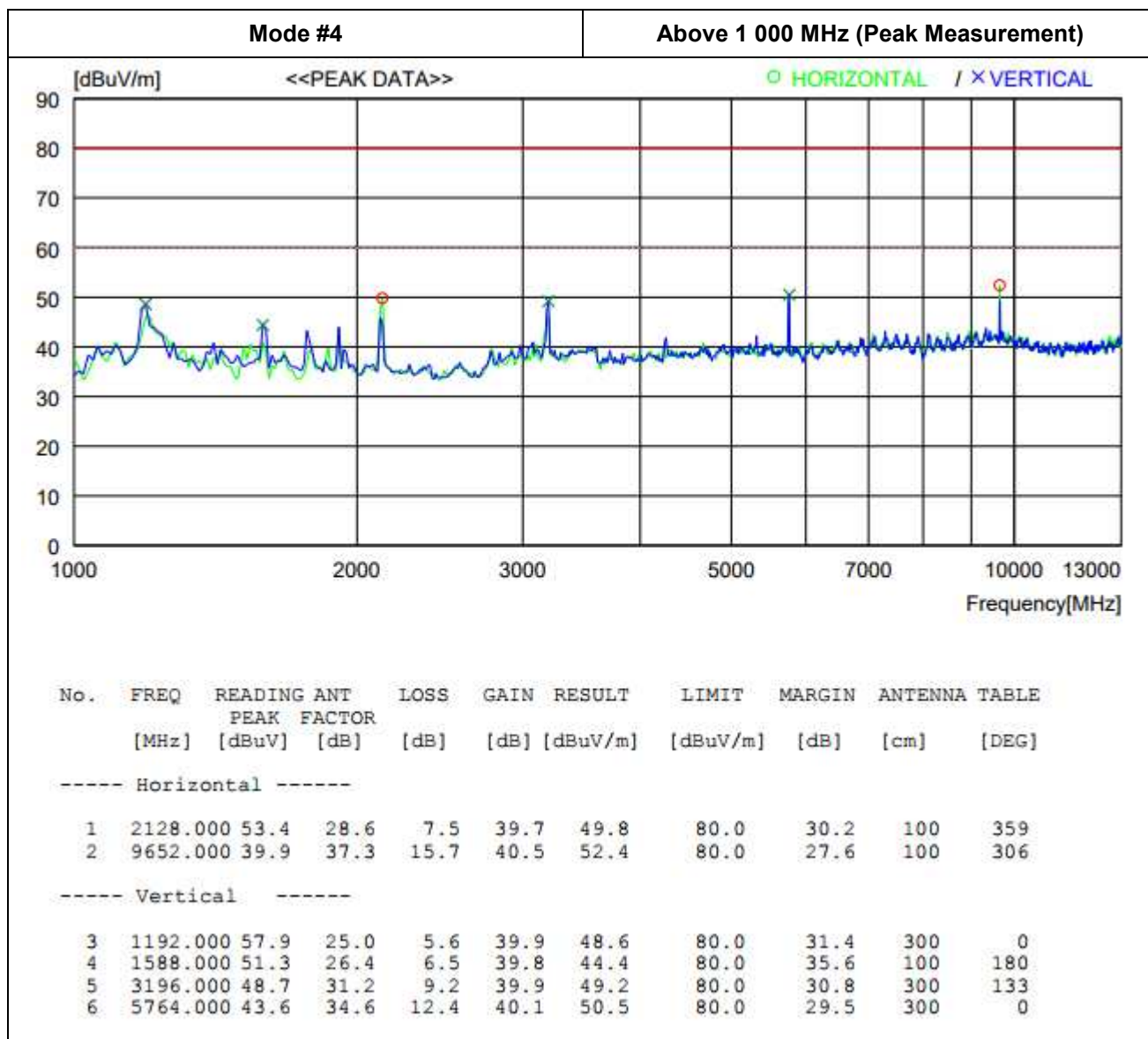
NOTE: Average mode was not measured, because peak values were under the average limit.

Mode #4

30 MHz ~ 1 000 MHz



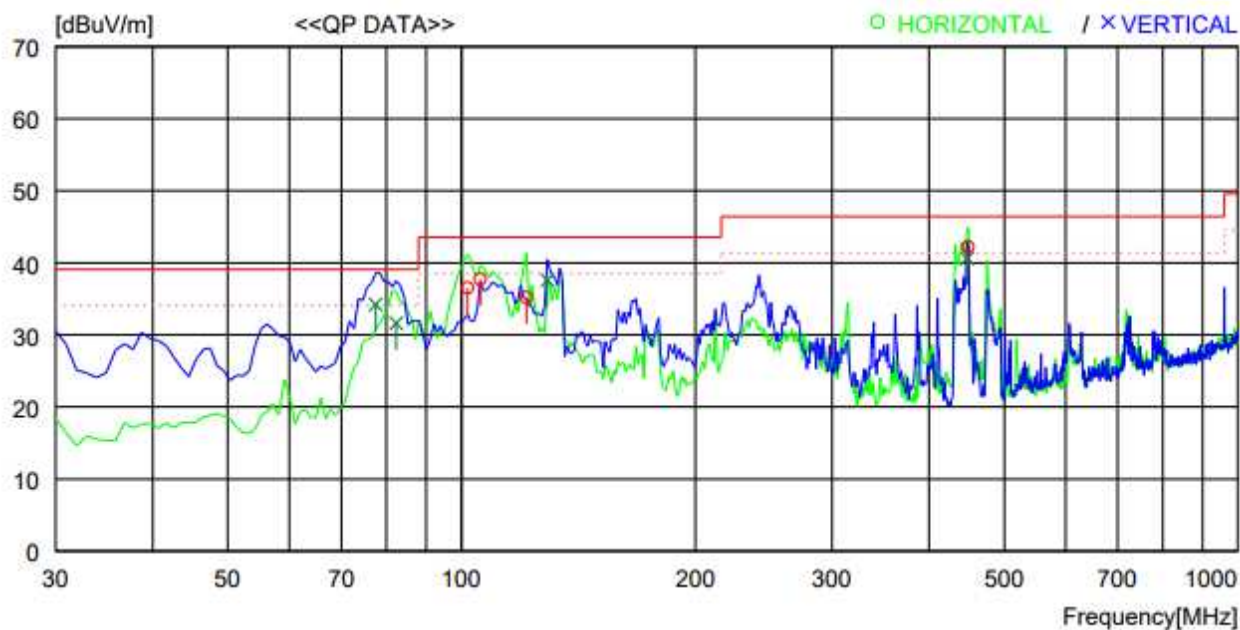
No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	83.350	50.3	8.0	7.2	32.7	32.8	39.1	6.3	400	2
2	100.810	50.9	11.1	7.4	32.7	36.7	43.5	6.8	400	0
3	105.660	51.2	10.8	7.4	32.7	36.7	43.5	6.8	400	30
4	121.180	50.8	9.6	7.5	32.7	35.2	43.5	8.3	300	113
5	442.251	46.0	16.4	9.4	32.8	39.0	46.4	7.4	100	359
6	449.041	49.2	16.5	9.4	32.8	42.3	46.4	4.1	100	359
----- Vertical -----										
7	77.530	52.8	7.7	7.2	32.7	35.0	39.1	4.1	200	359
8	83.350	49.1	8.0	7.2	32.7	31.6	39.1	7.5	200	359
9	128.940	55.9	8.9	7.6	32.7	39.7	43.5	3.8	100	0



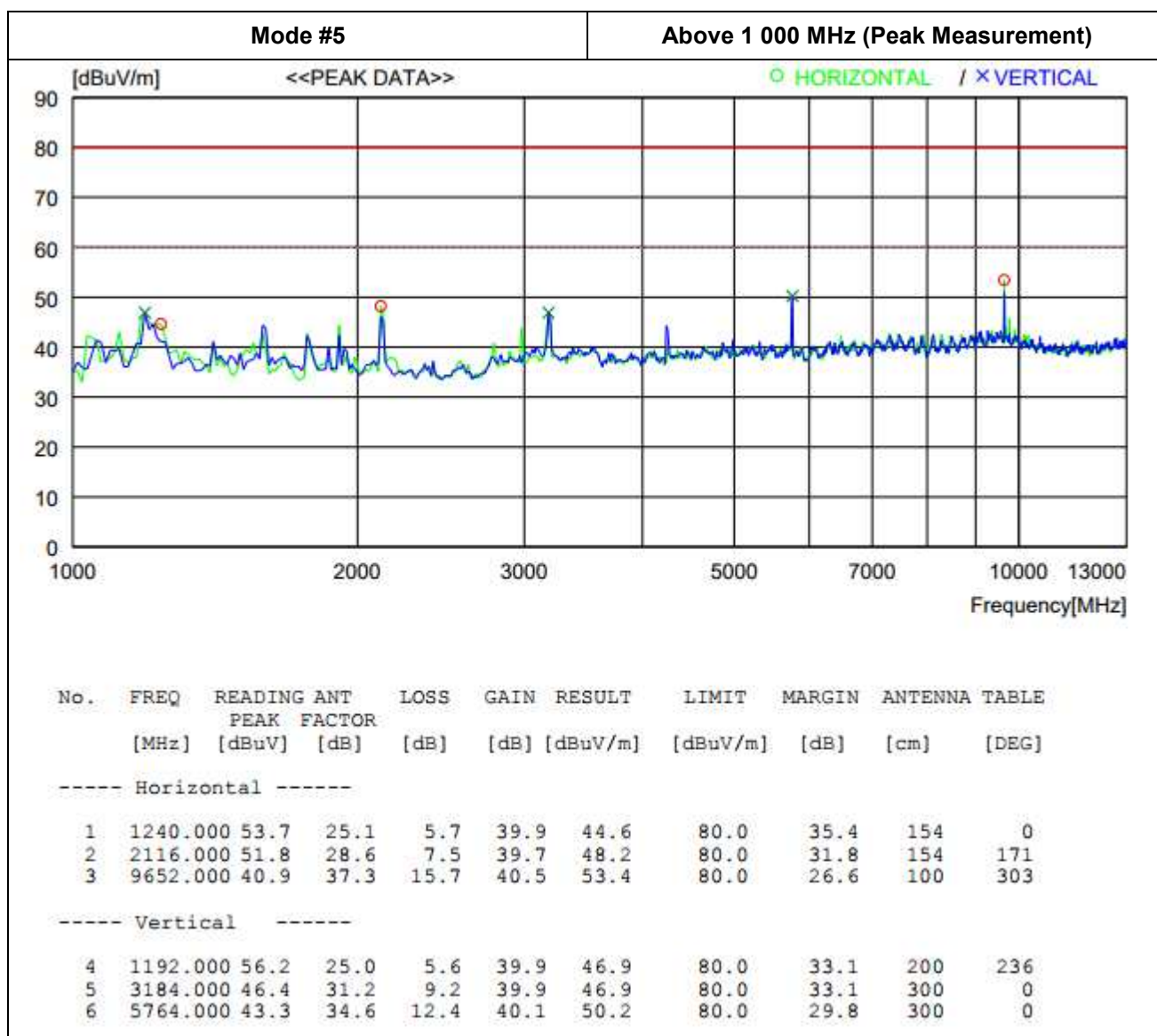
NOTE: Average mode was not measured, because peak values were under the average limit.

Mode #5

30 MHz ~ 1 000 MHz



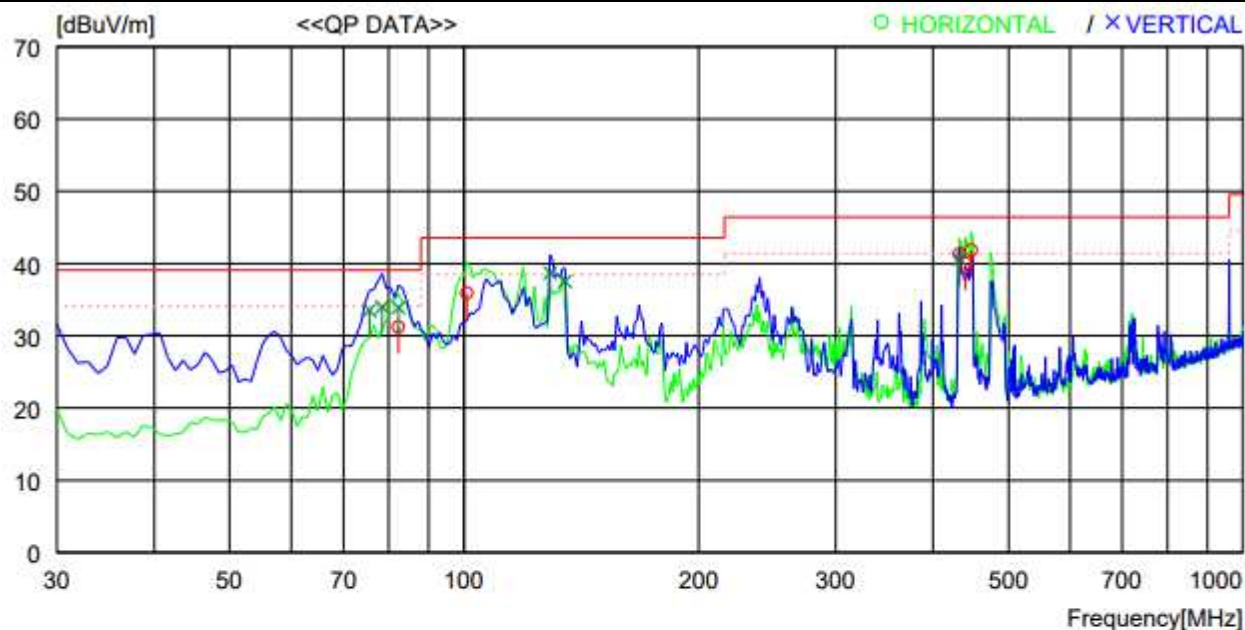
No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
		QP	FACTOR							
	[MHz]	[dBuV]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	101.780	50.7	11.1	7.4	32.7	36.5	43.5	7.0	400	359
2	105.660	52.2	10.8	7.4	32.7	37.7	43.5	5.8	400	359
3	121.180	50.8	9.6	7.5	32.7	35.2	43.5	8.3	300	110
4	449.041	49.1	16.5	9.4	32.8	42.2	46.4	4.2	100	358
----- Vertical -----										
5	77.530	52.0	7.7	7.2	32.7	34.2	39.1	4.9	200	0
6	82.380	49.4	7.7	7.2	32.7	31.6	39.1	7.5	200	218
7	128.940	53.8	8.9	7.6	32.7	37.6	43.5	5.9	100	2
8	448.071	47.5	16.5	9.4	32.8	40.6	46.4	5.8	300	359



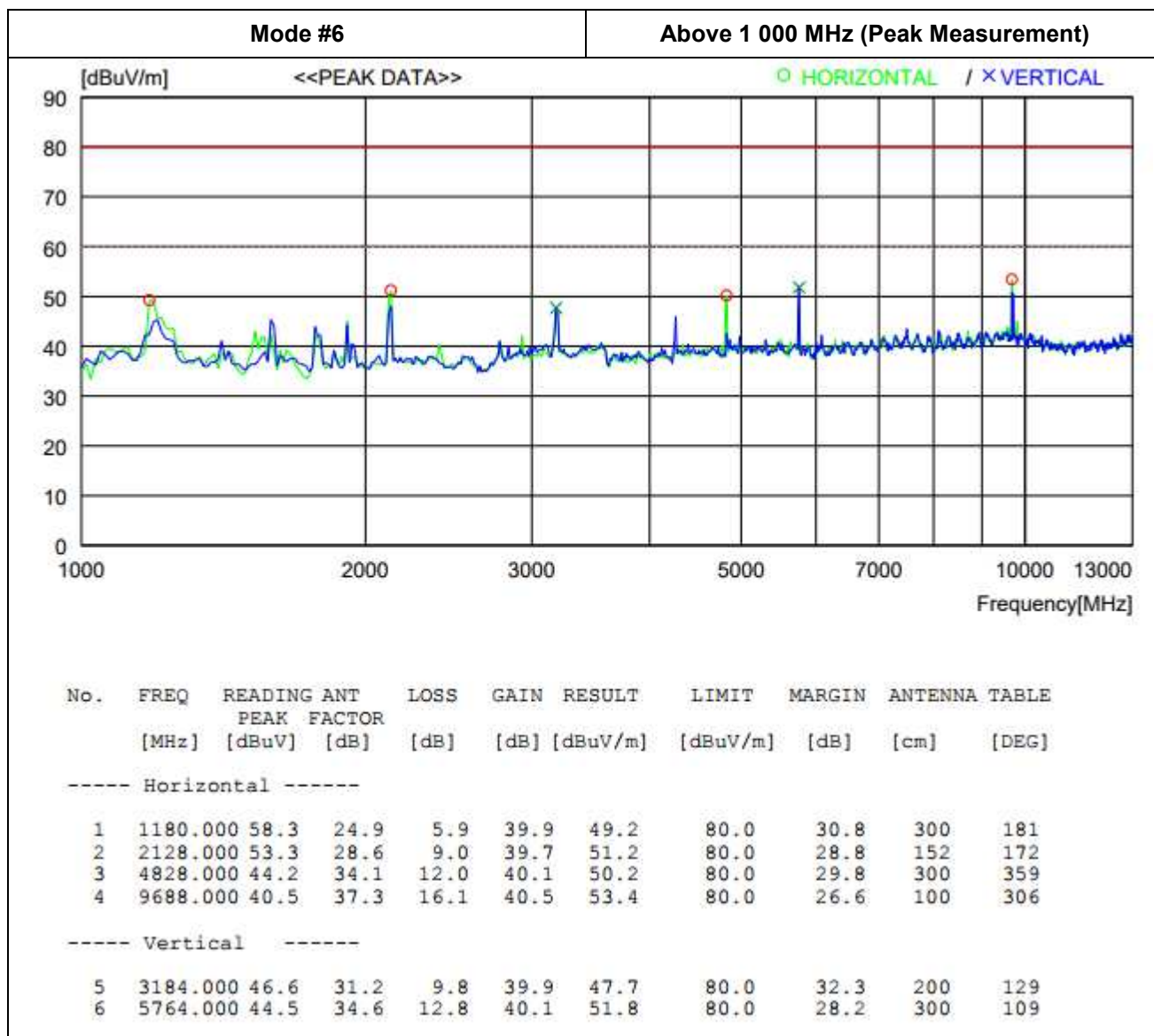
NOTE: Average mode was not measured, because peak values were under the average limit.

Mode #6

30 MHz ~ 1 000 MHz



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	82.380	49.0	7.7	7.2	32.7	31.2	39.1	7.9	400	0
2	100.810	50.1	11.1	7.4	32.7	35.9	43.5	7.6	400	358
3	432.551	48.5	16.2	9.4	32.8	41.3	46.4	5.1	100	337
4	440.311	47.1	16.3	9.4	32.8	40.0	46.4	6.4	100	359
5	448.071	48.7	16.5	9.4	32.8	41.8	46.4	4.6	100	3
----- Vertical -----										
6	75.590	50.8	8.2	7.2	32.7	33.5	39.1	5.6	200	359
7	78.500	52.1	7.4	7.2	32.7	34.0	39.1	5.1	200	167
8	82.380	51.7	7.7	7.2	32.7	33.9	39.1	5.2	300	232
9	128.940	54.9	8.9	7.6	32.7	38.7	43.5	4.8	100	23
10	134.760	54.2	8.3	7.7	32.7	37.5	43.5	6.0	100	0
11	432.551	47.8	16.2	9.4	32.8	40.6	46.4	5.8	300	294

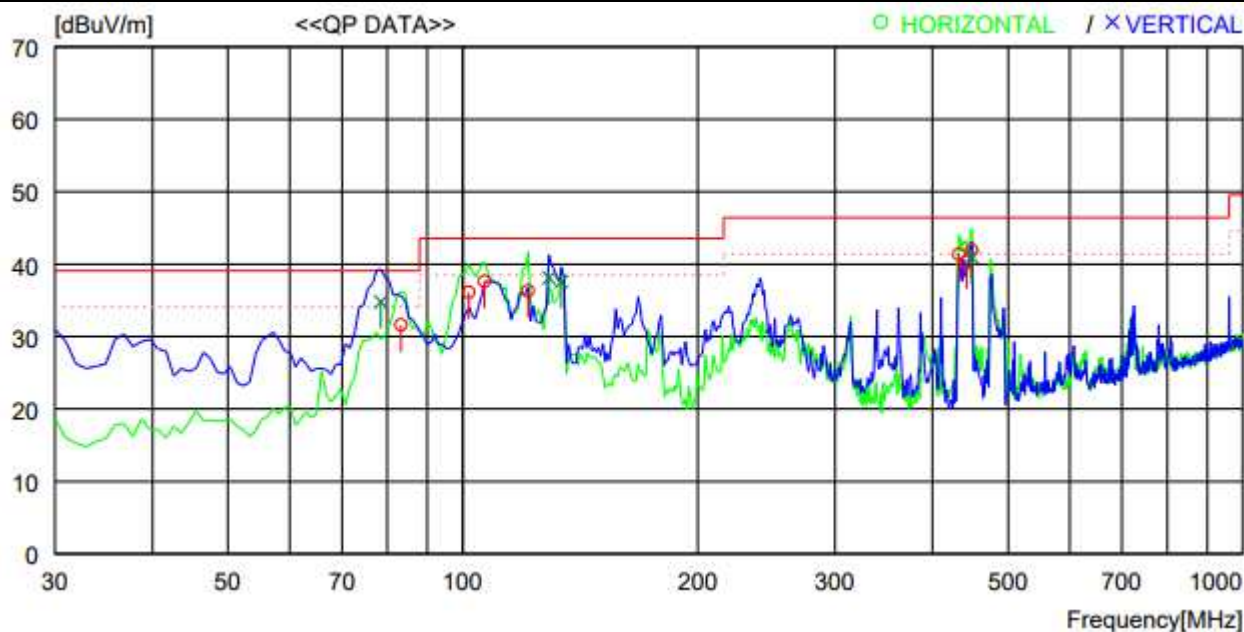


NOTE: Average mode was not measured, because peak values were under the average limit.

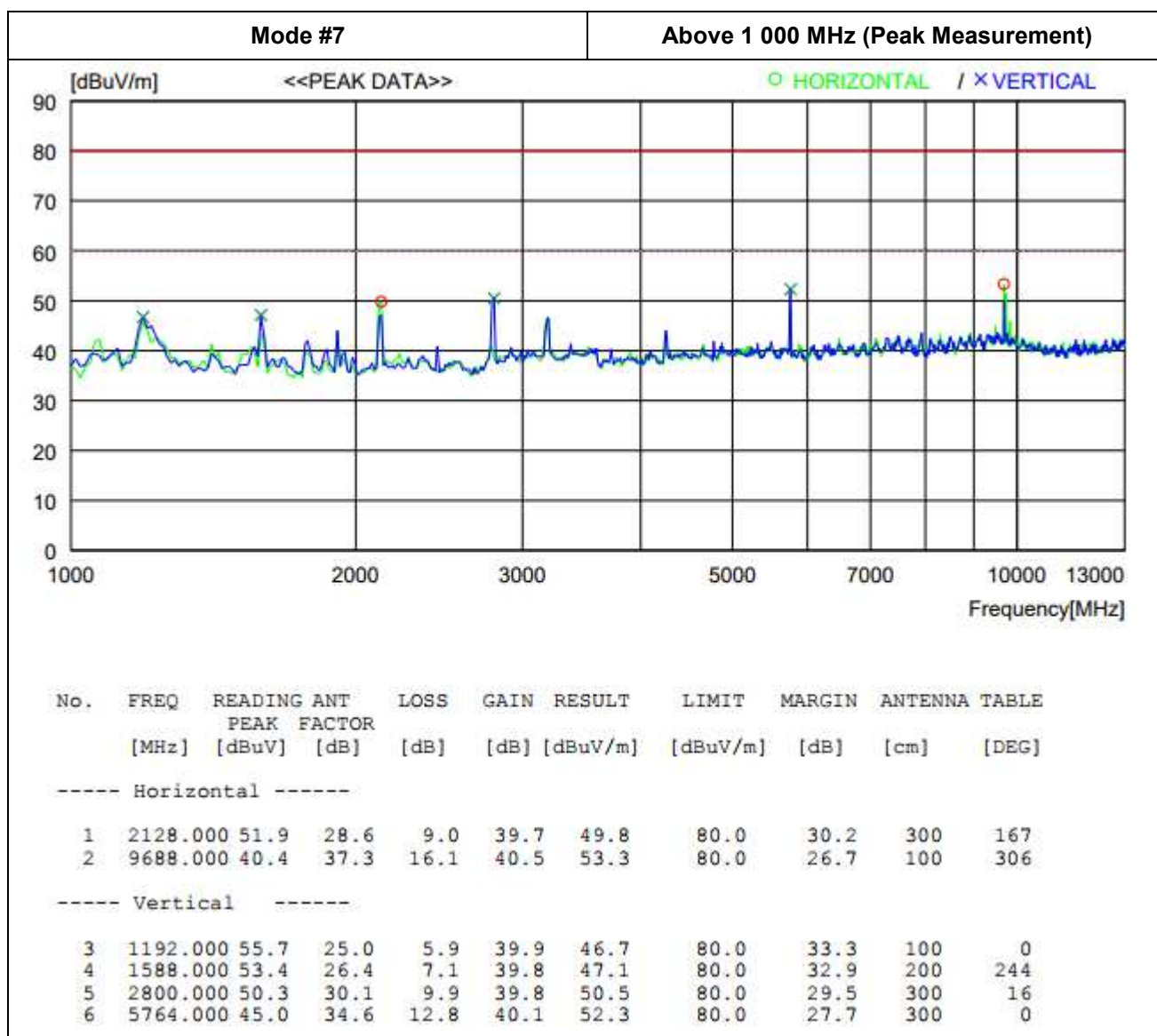
Notch Filter was used during the test.

Mode #7

30 MHz ~ 1 000 MHz



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	83.350	49.1	8.0	7.2	32.7	31.6	39.1	7.5	400	359
2	101.780	50.3	11.1	7.4	32.7	36.1	43.5	7.4	400	359
3	106.630	52.2	10.7	7.4	32.7	37.6	43.5	5.9	400	359
4	121.180	51.9	9.6	7.5	32.7	36.3	43.5	7.2	400	128
5	432.551	48.6	16.2	9.4	32.8	41.4	46.4	5.0	200	328
6	442.251	47.3	16.4	9.4	32.8	40.3	46.4	6.1	100	357
7	449.041	48.8	16.5	9.4	32.8	41.9	46.4	4.5	100	5
----- Vertical -----										
8	78.500	52.9	7.4	7.2	32.7	34.8	39.1	4.3	200	201
9	128.940	54.3	8.9	7.6	32.7	38.1	43.5	5.4	100	359
10	133.790	54.2	8.4	7.7	32.7	37.6	43.5	5.9	100	359
11	449.041	47.9	16.5	9.4	32.8	41.0	46.4	5.4	400	278

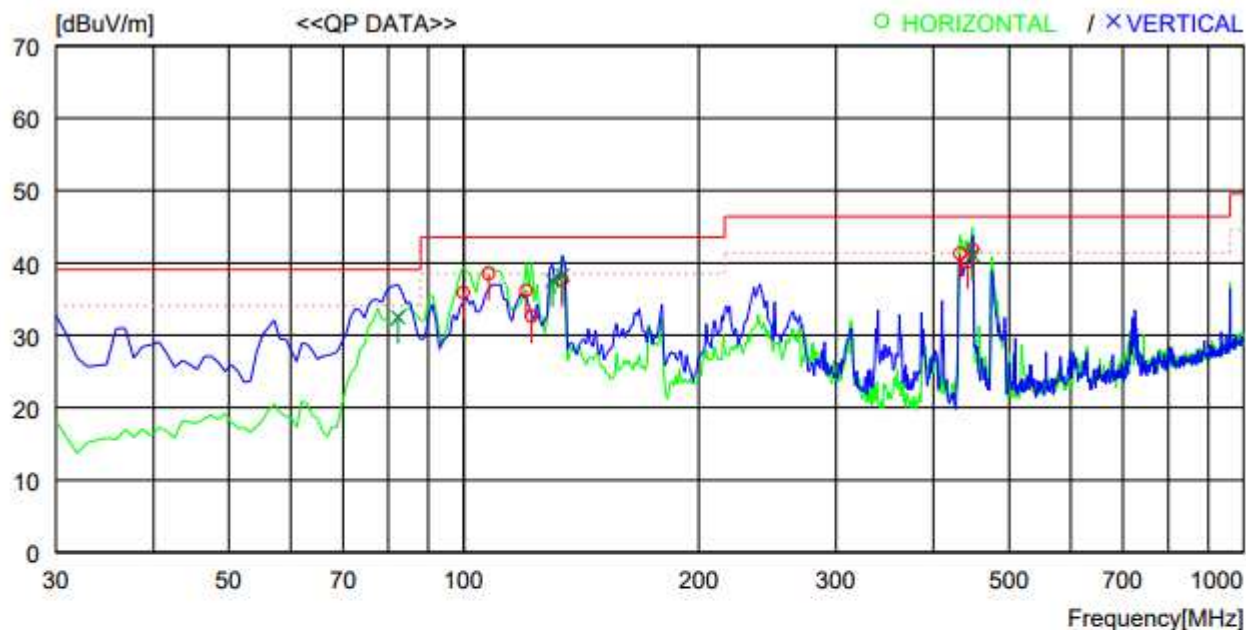


NOTE: Average mode was not measured, because peak values were under the average limit.

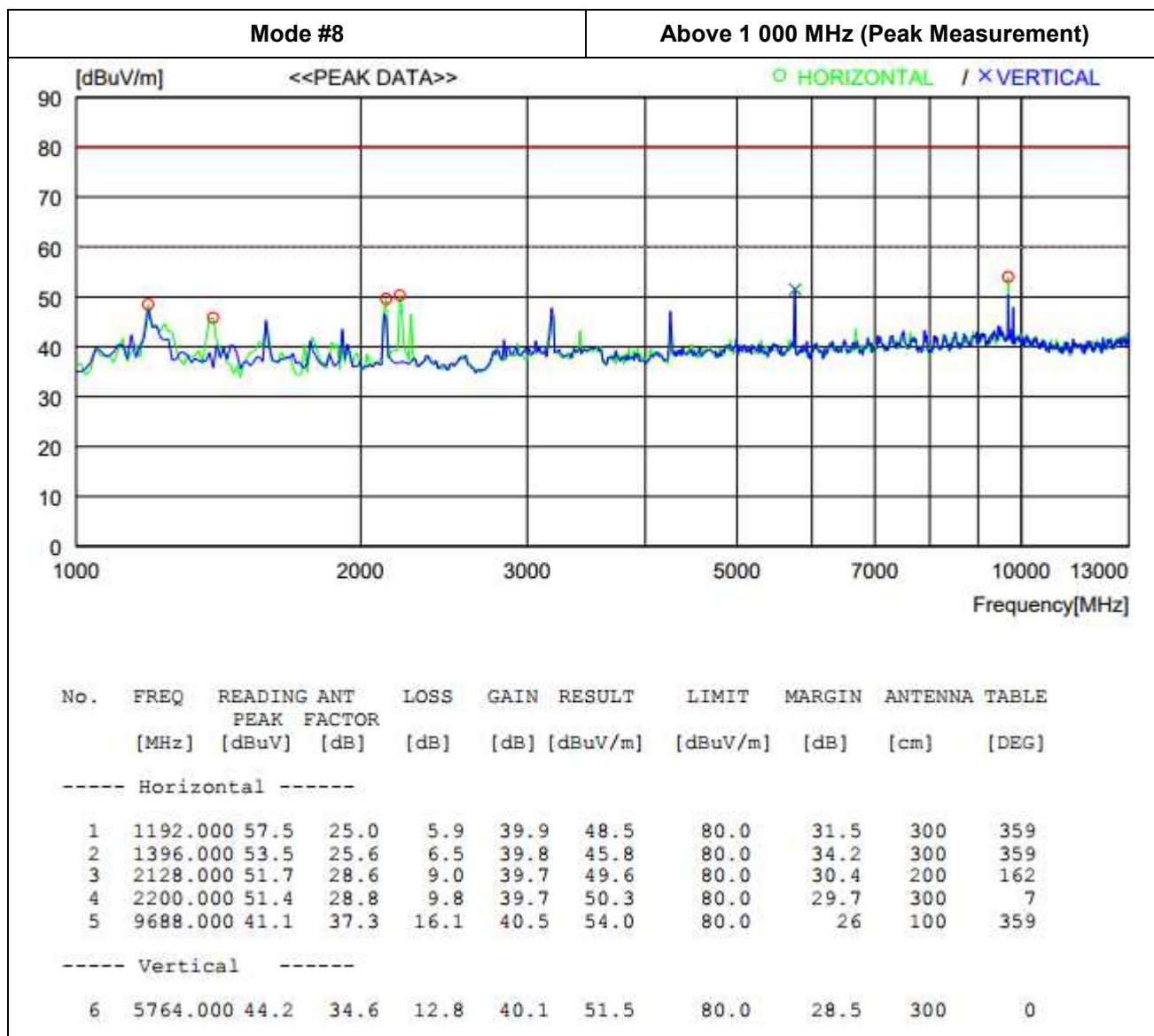
Notch Filter was used during the test.

Mode #8

30 MHz ~ 1 000 MHz



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP [dBuV]	FACTOR [dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	99.840	50.1	11.2	7.3	32.7	35.9	43.5	7.6	400	346
2	107.600	53.1	10.6	7.5	32.7	38.5	43.5	5.0	400	359
3	120.210	51.8	9.6	7.5	32.7	36.2	43.5	7.3	400	359
4	122.150	48.3	9.5	7.5	32.7	32.6	43.5	10.9	400	82
5	133.790	54.2	8.4	7.7	32.7	37.6	43.5	5.9	400	270
6	432.551	48.5	16.2	9.4	32.8	41.3	46.4	5.1	200	359
7	442.251	47.1	16.4	9.4	32.8	40.1	46.4	6.3	100	2
8	449.041	48.7	16.5	9.4	32.8	41.8	46.4	4.6	100	0
----- Vertical -----										
9	82.380	50.3	7.7	7.2	32.7	32.5	39.1	6.6	200	0
10	129.910	53.9	8.8	7.6	32.7	37.6	43.5	5.9	100	359
11	133.790	54.9	8.4	7.7	32.7	38.3	43.5	5.2	100	359
12	449.041	48.0	16.5	9.4	32.8	41.1	46.4	5.3	400	0

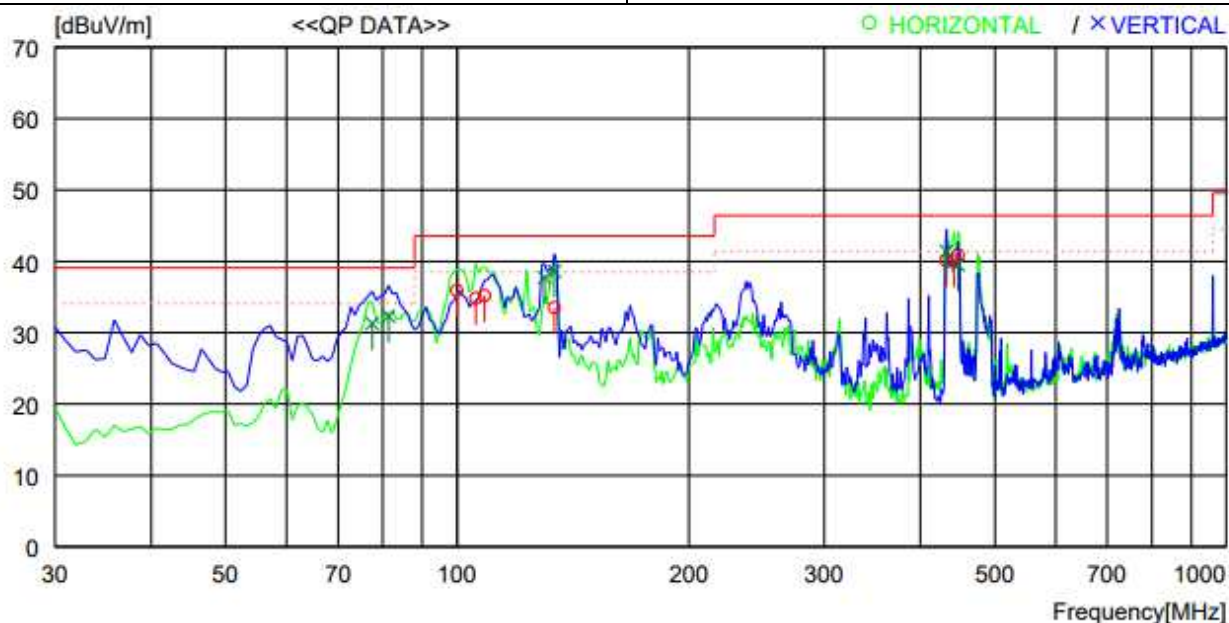


NOTE: Average mode was not measured, because peak values were under the average limit.

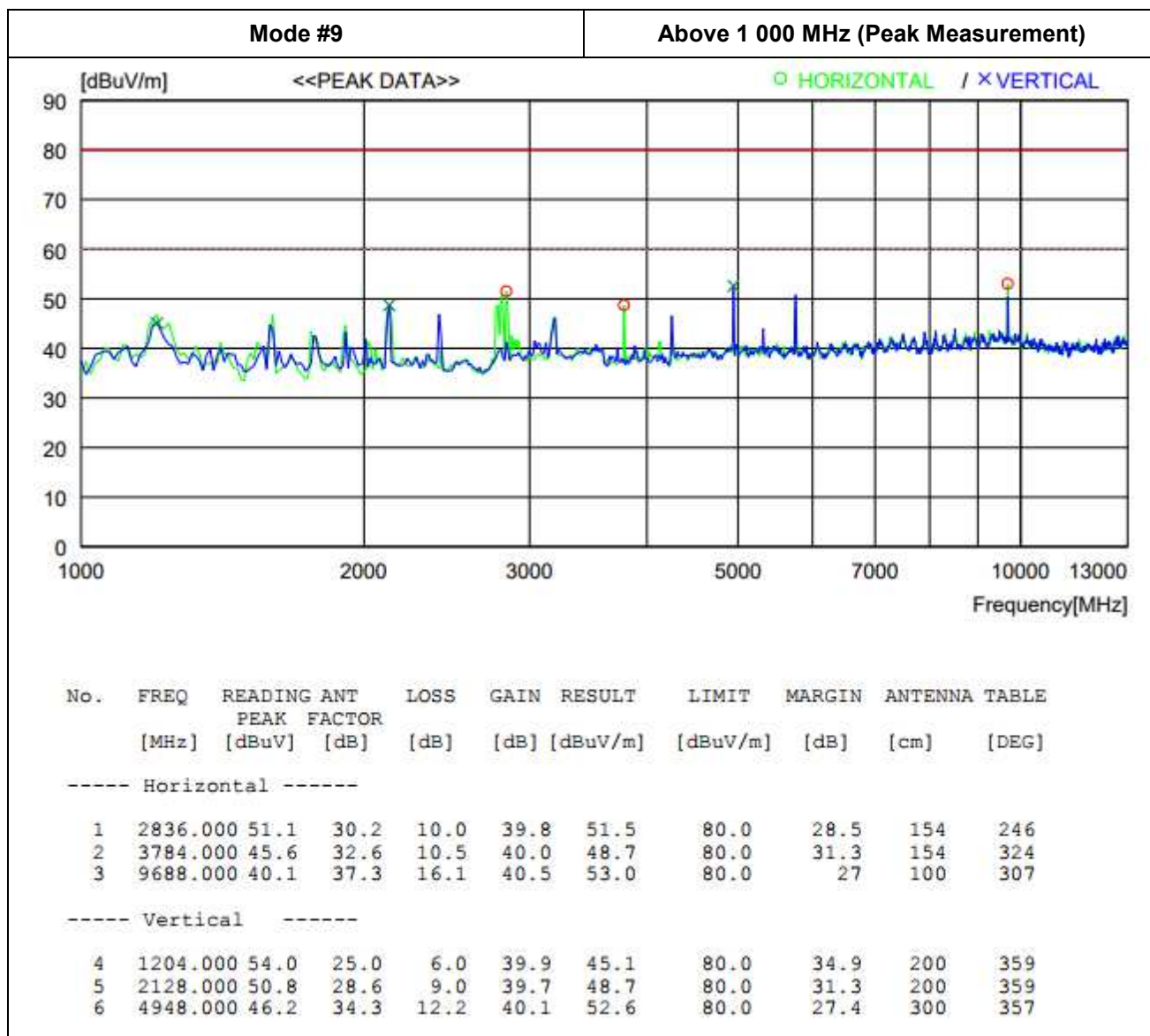
Notch Filter was used during the test.

Mode #9

30 MHz ~ 1 000 MHz



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	99.840	50.1	11.2	7.3	32.7	35.9	43.5	7.6	400	0
2	105.660	49.3	10.8	7.4	32.7	34.8	43.5	8.7	400	0
3	108.570	49.9	10.5	7.5	32.7	35.2	43.5	8.3	400	62
4	133.790	50.1	8.4	7.7	32.7	33.5	43.5	10.0	400	269
5	432.551	47.3	16.2	9.4	32.8	40.1	46.4	6.3	200	327
6	442.251	47.1	16.4	9.4	32.8	40.1	46.4	6.3	100	359
7	448.071	47.8	16.5	9.4	32.8	40.9	46.4	5.5	100	20
----- Vertical -----										
8	77.530	49.1	7.7	7.2	32.7	31.3	39.1	7.8	200	359
9	81.410	50.4	7.4	7.2	32.7	32.3	39.1	6.8	200	166
10	129.910	54.0	8.8	7.6	32.7	37.7	43.5	5.8	100	0
11	133.790	55.2	8.4	7.7	32.7	38.6	43.5	4.9	100	0
12	432.551	48.6	16.2	9.4	32.8	41.4	46.4	5.0	300	296
13	448.071	46.4	16.5	9.4	32.8	39.5	46.4	6.9	300	0



NOTE: Average mode was not measured, because peak values were under the average limit.

Notch Filter was used during the test.

Appendix I - Test Instrumentation

Name of Equipment	Model Number	Manufacturer	Serial Number	Last Cal. (Interval)	USE
For EMISSION					
Test Receiver	ESR 7	Rohde & Schwarz	101543	2021-07-16 (1Y)	■
LISN	ENV4200	Rohde & Schwarz	100203	2021-01-15 (1Y)	□
LISN	ENV216	Rohde & Schwarz	100110	2021-01-14 (1Y)	■
LISN	LS16C	AFJ	16011403310	2021-07-16 (1Y)	■
8-Wire ISN CAT 3	CAT3 8158	Schwarzbeck	CAT3 8158 #70	2021-01-18(1Y)	□
8-Wire ISN CAT 5	CAT5 8158	Schwarzbeck	CAT5 8158 #126	2021-01-18(1Y)	□
8-Wire ISN CAT 6	NTFM 8158	Schwarzbeck	NTFM 8158 #95	2021-01-18(1Y)	□
Test Receiver	ESU	Rohde & Schwarz	100303	2021-01-14 (1Y)	■
TRILog Broadband Antenna	VULB9163	Schwarzbeck	9163-799	2019-11-12(2Y)	■
DOPPEL STEG HORN Antenna	HF 907	Rohde & Schwarz	102426	2020-10-29(1Y)	■
Preamp (1-18) GHz	SCU 18D	Rohde & Schwarz	19006450	2021-04-15(1Y)	■
Preamp 9 kHz-1 GHz	310N	Sonoma Instrument	344015	2021-01-14(1Y)	■
Attenuators	6 dB	Rohde & Schwarz	272.4110.50	2021-01-14(1Y)	■
Antenna Master	MA4000-EP	INNCO SYSTEM	4600814	N/A	■
Antenna Master	MA4000-XP-ET	INNCO SYSTEM	N/A	N/A	■
Turn Table	DT3000-3t	INNCO SYSTEM	1310814	N/A	■
CO3000 Controller	CO3000-4PORT	INNCO SYSTEM	CO3000/806/34130 814/L	N/A	■
CO3000 Controller	CO3000-4PORT	INNCO SYSTEM	CO3000/807/34130 814/L	N/A	■
Notch Filter	BRM50702	MICRO-TRONICS	G318	2020-11-04(1Y)	■
Digital Power Analyzer For Harmonic & Flicker	DPA 500	EM Test	V0713102356	2021-01-19 (1Y)	□
AC Power Source	ACS 500	EM Test	V0713102357	2021-07-16 (1Y)	□

The above measuring equipments have been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.