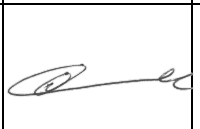
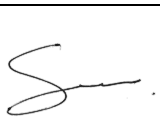
360241

HFE3500

EMISSIONS DATA

Template	260585 iss 1		
Doc No.	360241 iss 1		
	APPD	CHK	DWG
Sign			
Name	Alex Knill	Nick Heighington	Stuart Nottage
Date	28/10/2025	16/10/2025	24/09/2025

I N D E X

Test results are reference data based on our standard measurement condition.

1. Summary of Emissions Test Result

MODELS : HFE3500-24/FSD and HFE3500-48/TSD[1]

Item	Standard	Test Class	Result	Page	Notes & Conditions
Input Current Harmonics	IEC61000-3-12	N/A	PASS	4	
Voltage Flicker	IEC61000-3-11	N/A	N/A	5	$Z_{sys1} < 0.333\ \Omega$[2]
Conducted Emissions	CISPR 11 / 32	B	PASS	6	
	FCC 47-15-B	B	PASS	6	
Radiated Emissions	CISPR 11 / 32	A	PASS	9	
	FCC 47-15-B	A	PASS	12	

[1] HFE3500-24/FSD results given as representative of the range, comprehensive results including HFE3500-48/TSD are given in 360230 HFE3500 Electromagnetic Compatibility Report.

[2] HFE3500 does not meet limits of EN IEC 61000-3-3 when tested with reference impedance supply, Z_{ref}. The final equipment manufacturer shall determine Z_{max} in accordance with 6.3 in the standard and declare it in the equipment instruction manual. The maximum impedance for Z_{sys1} for HFE3500 is 0.333 Ω.

2. Input Current Harmonics (IEC61000-3-12)

M O D E L : H F E 3 5 0 0 - 2 4 / T S E

(1) Equipment Used

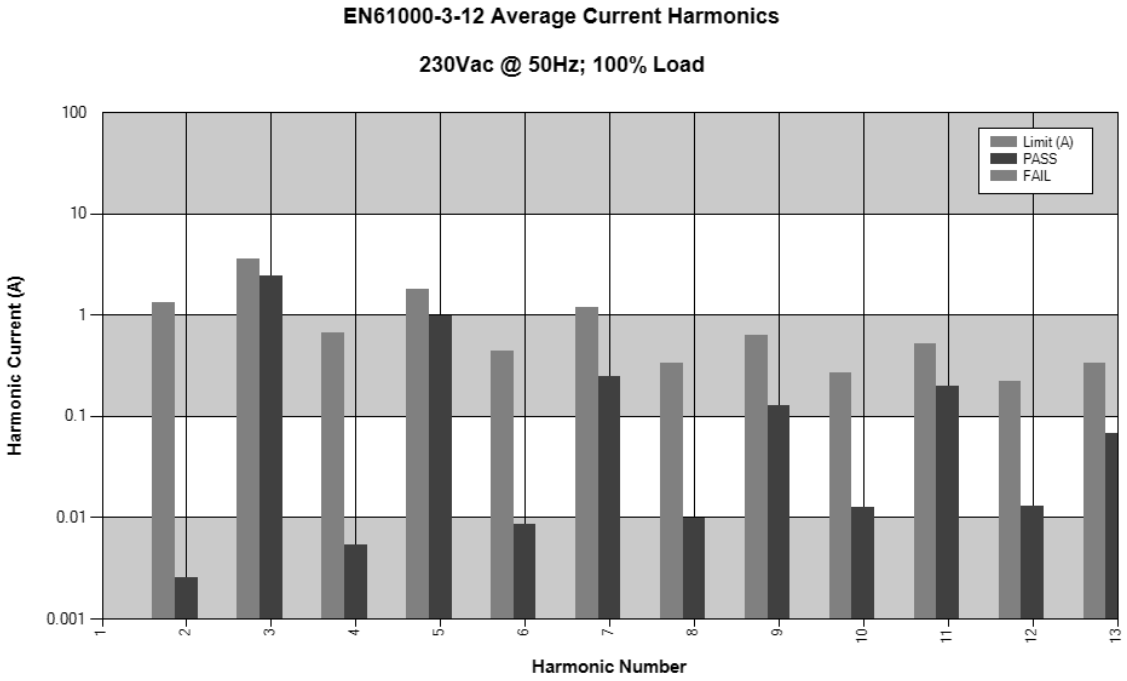
AC Power Source	:Chroma 61511
Power Analyser	:Vitrek PA900

(2) Test Conditions

Input Voltage	:230VAC	Mains Frequency	:50Hz
Output Voltage	:Rated	Output Current	:145.8A
Test Observation Period	:1.5 seconds	Ambient Temperature	:25°C

(3) Test Result

230Vac



Test	Class	HFE3500-24/TSE
EN61000-3-12	N/A	PASS

3. Voltage Flicker (IEC61000-3-11)

MODEL: HFE3500-24/TSE

(1) Equipment Used

AC Power Source :Chroma 61511

Oscilloscope : Rohde & Schwarz RTM3004

(2) Test Conditions

Input Voltage	: 230VAC	Mains Frequency	:50Hz
Output Voltage	:Rated	Output Current	:145.8A
Test	:d_{max}	Ambient Temperature	:25°C

(3) Test Result

Number	Voltage (V)	Percentage (%)	RMS Current (A)
1	17.59	7.6%	27.06
2	17.06	7.4%	26.25
3	15.69	6.8%	24.14
4	17.51	7.6%	26.94
5	17.35	7.5%	26.69
6	18.33	8.0%	28.20
7	17.61	7.7%	27.09
8	18.47	8.0%	28.42
9	18.27	7.9%	28.11
10	18.50	8.0%	28.46
11	18.35	8.0%	28.23
12	17.96	7.8%	27.63
13	18.31	8.0%	28.17
14	17.87	7.8%	27.49
15	18.36	8.0%	28.25
16	17.24	7.5%	26.52
17	18.75	8.2%	28.85
18	18.23	7.9%	28.05
19	17.95	7.8%	27.62
20	18.10	7.9%	27.85
21	17.69	7.7%	27.22
22	18.43	8.0%	28.35
23	18.73	8.1%	28.82
24	18.10	7.9%	27.85
Maximum	18.75	8.2%	28.85
Minimum	15.69	6.8%	24.14
Average	**18.00**	**7.8%**	27.69

As the maximum voltage change with the reference impedance is greater than 4.0% the HFE3500 emissions cannot meet the technical requirements of EN 61000-3-3 in accordance with 6.3.1 of EN 61000-3-11. Therefore the equipment shall only be connected to a supply having a system impedance lower than Z_{ref}. The maximum permissible system impedance needs to be determined.

$$Z_{sys1} = Z_{ref} \cdot \frac{d_{max}\ limit}{d_{max}}$$

$$Z_{sys1} = 0.651 \cdot \frac{4.00}{7.83} = 0.333\ \Omega$$

The final equipment manufacturer must calculate Z_{sys2}, Z_{sys3} and Z_{sys4} in accordance with 6.3.2 in EN 61000-3-11. The minimum of the four calculated values of Z_{sys} is the maximum permissible system impedance, Z_{max}, which the manufacturer shall declare in accordance with Clause 4 of the standard.

Test	Test	HFE3500-24/TSE
EN61000-3-11	d_{max} < 4%	Z_{sys1} < 0.333 Ω

4. Conducted Emissions (CISPR11)

MODEL:HFE3500-24/FSD

(1) Equipment Used

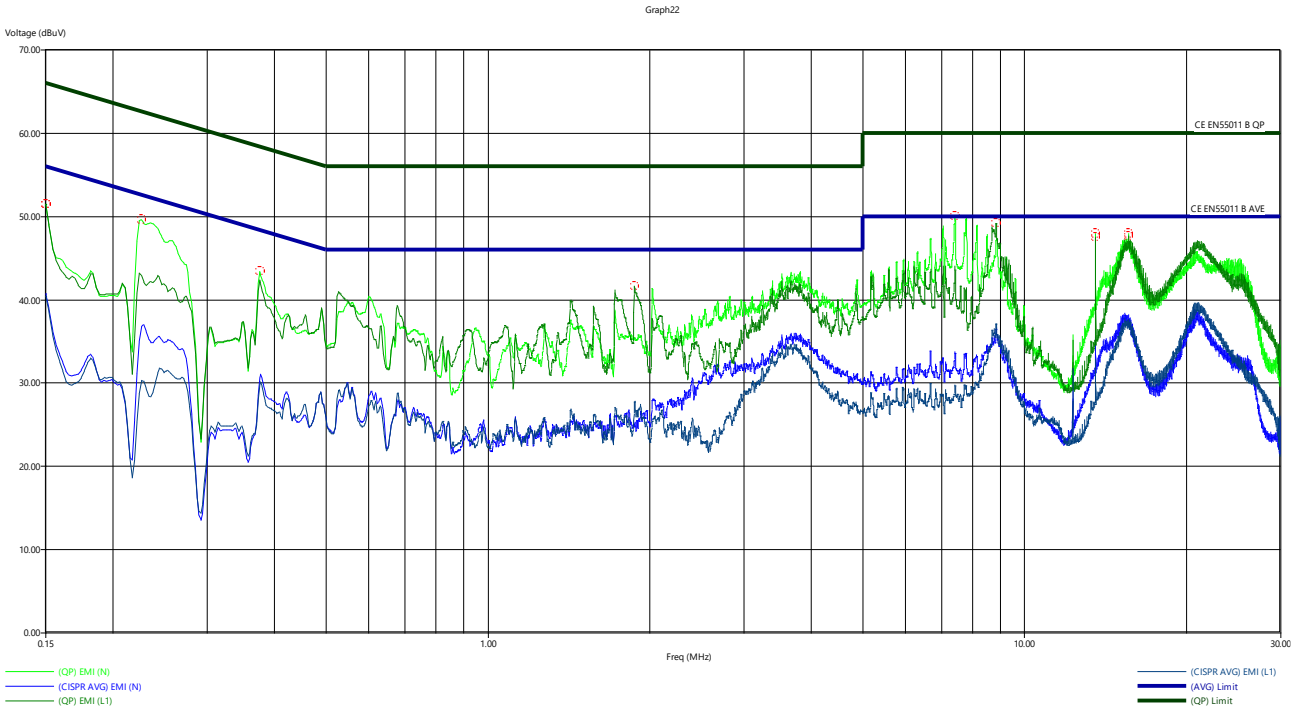
Receiver	:Rohde & Schwarz ESPI
4 Line V-Network	:Rohde & Schwarz ENV 432

(2) Test Conditions

Input Voltage	: 230VAC	Mains Frequency	:50Hz
Output Voltage	:Rated	Output Load	:100%, 50% and 0%
Class	:B	Ambient Temperature	:20°C

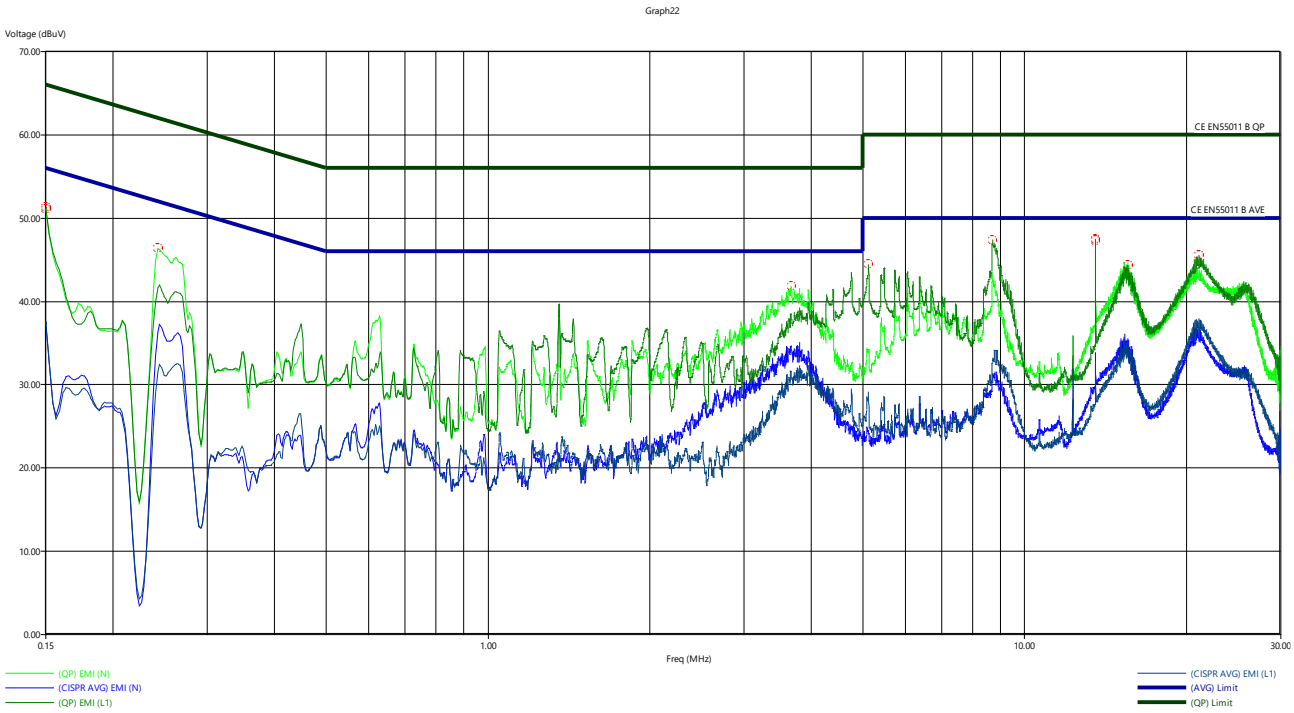
(3) Test Results

100% Load



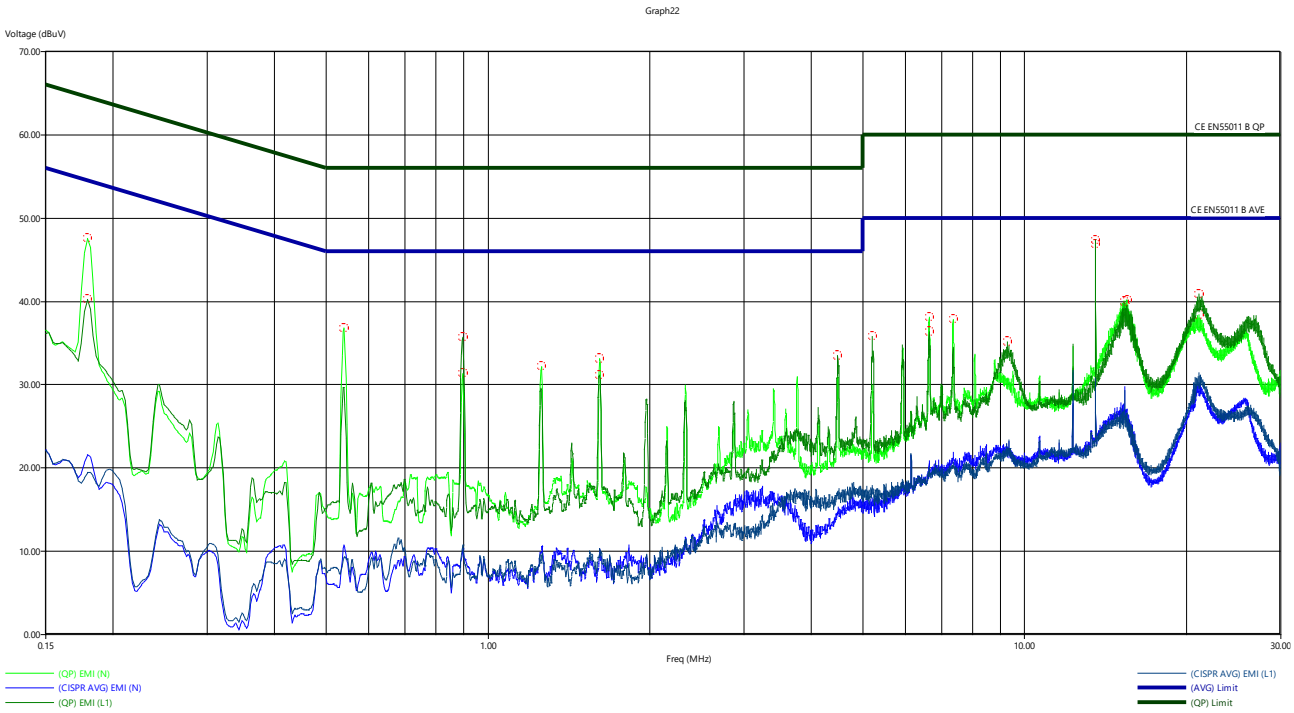
Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Quasi-Peak (dBµV)	Limit (dBµV)	Margin (dB)
0.226	36.80	52.58	15.78	49.56	62.58	13.02
1.873	27.15	46.00	18.85	41.59	56.00	14.41
7.415	33.73	50.00	16.27	50.07	60.00	**9.93**
8.846	37.10	50.00	12.90	49.17	60.00	10.83
13.560	35.47	50.00	14.53	47.96	60.00	12.04
15.616	38.21	50.00	11.79	47.92	60.00	12.08

50% Load



Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Quasi-Peak (dBµV)	Limit (dBµV)	Margin (dB)
0.150	37.57	56.00	18.43	51.30	66.00	14.70
3.671	34.55	46.00	**11.45**	41.80	56.00	14.20
8.720	33.19	50.00	16.81	47.40	60.00	12.60
13.560	33.87	50.00	16.13	47.44	60.00	12.56
15.565	35.50	50.00	14.50	44.54	60.00	15.46
21.098	37.91	50.00	12.09	45.53	60.00	14.47

0% Load



Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Quasi-Peak (dBµV)	Limit (dBµV)	Margin (dB)
0.179	21.64	54.52	32.88	47.56	64.52	16.96
0.539	10.80	46.00	35.20	36.83	56.00	19.17
13.560	30.76	50.00	19.24	47.37	60.00	**12.63**
15.297	27.57	50.00	22.43	40.05	60.00	19.95
15.490	27.05	50.00	22.95	40.18	60.00	19.82
21.098	31.12	50.00	18.88	40.86	60.00	19.14

Note: Limits of CISPR11, EN55011, CISPR32, EN55032, FCC and VCCI Class B are identical.

5. Radiated Emissions (CISPR11)

MODEL: HFE3500-24/FSD

(1) Equipment Used

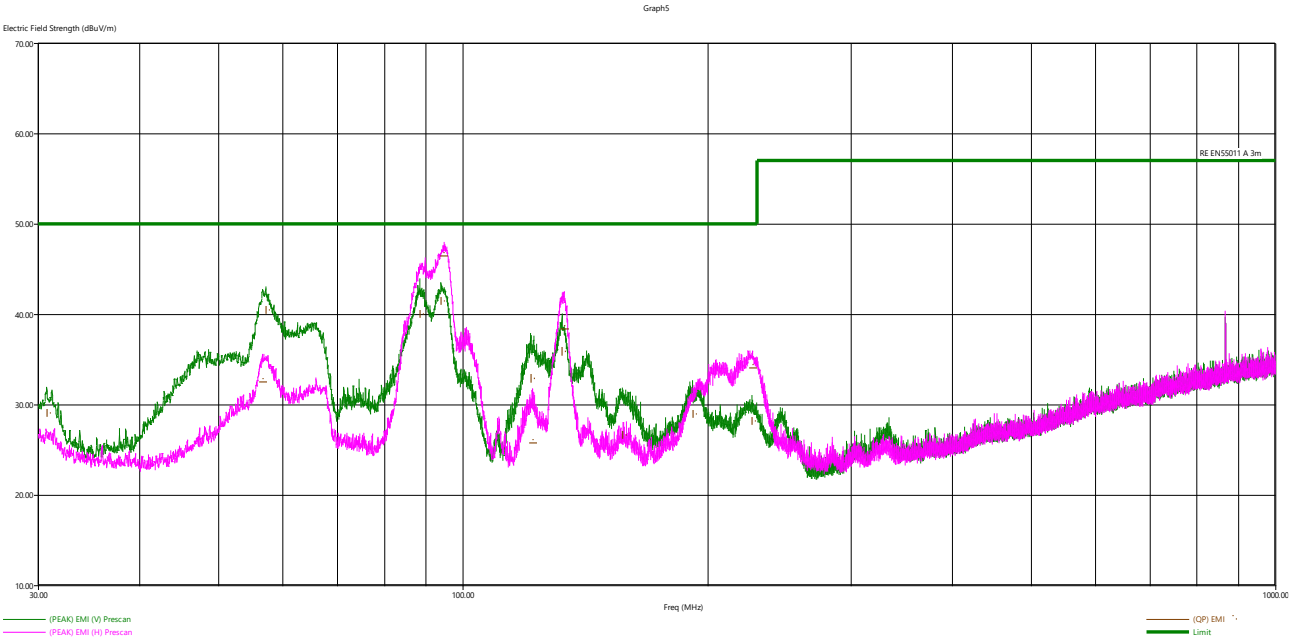
Receiver	:Rohde & Schwarz ESR 3
Antenna	:Schwarzbeck Mess VULB 9168
Controller	:Maturo Control Unit MCU
Antenna Mast	:Maturo Antenna Mast AM 4.0
Turntable	:Maturo Turntable TT 2.0 SI
Semi-Anechoic Chamber	:TRS 3m Semi-Anechoic Chamber

(2) Test Conditions

Input Voltage	: 230VAC	Mains Frequency	:50Hz
Output Voltage	:Rated	Output Load	:100%, 50% and 0%
Class	:B	Ambient Temperature	:20°C

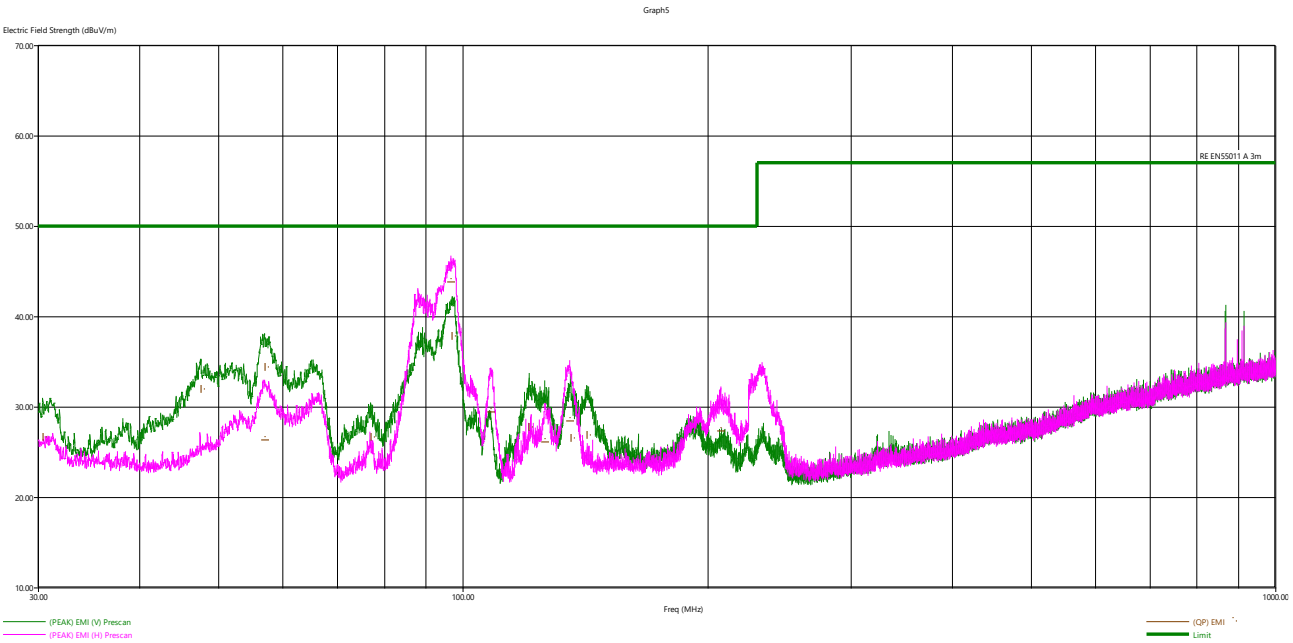
(3) Test Results

100% Load



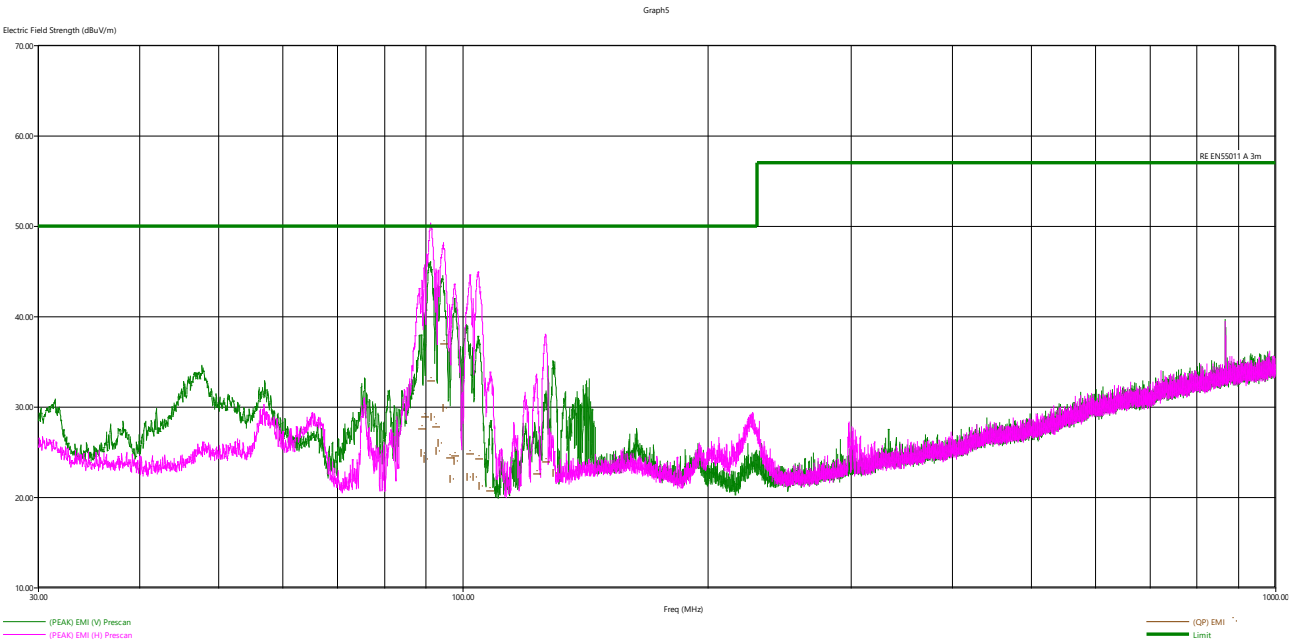
Frequency (MHz)	Polarisation	EUT Angle (Degrees)	Tower Height (cm)	Quasi-Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
94.71	H	199.5	399	46.44	50.00	**3.56**
133.02	H	199.4	349	38.27	50.00	11.73
57.18	V	249.5	101	40.41	50.00	9.59
88.41	V	308.5	399	39.96	50.00	10.04
93.90	V	247.5	101	41.45	50.00	8.55
132.30	V	18.4	101	35.84	50.00	14.16

50% Load



Frequency (MHz)	Polarisation	EUT Angle (Degrees)	Tower Height (cm)	Quasi-Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
96.60	H	215.5	399	43.79	50.00	**6.21**
108.03	H	10.8	399	29.39	50.00	20.61
135.15	H	217.0	349	28.38	50.00	21.62
47.46	V	258.4	101	31.95	50.00	18.05
56.91	V	224.5	149	34.33	50.00	15.67
96.84	V	277.5	149	37.77	50.00	12.23

0% Load



Frequency (MHz)	Polarisation	EUT Angle (Degrees)	Tower Height (cm)	Quasi-Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
89.58	H	328.6	399	28.80	50.00	21.20
91.11	H	143.6	349	32.81	50.00	17.19
92.61	H	330.0	399	27.78	50.00	22.22
94.53	H	70.5	349	36.97	50.00	**13.03**
91.11	V	141.5	399	28.80	50.00	21.20
94.35	V	141.5	399	29.78	50.00	20.22

6. Radiated Emissions (FCC Title 47 – 15 B)

M O D E L : H F E 3 5 0 0 - 2 4 / F S D

(1) Equipment Used

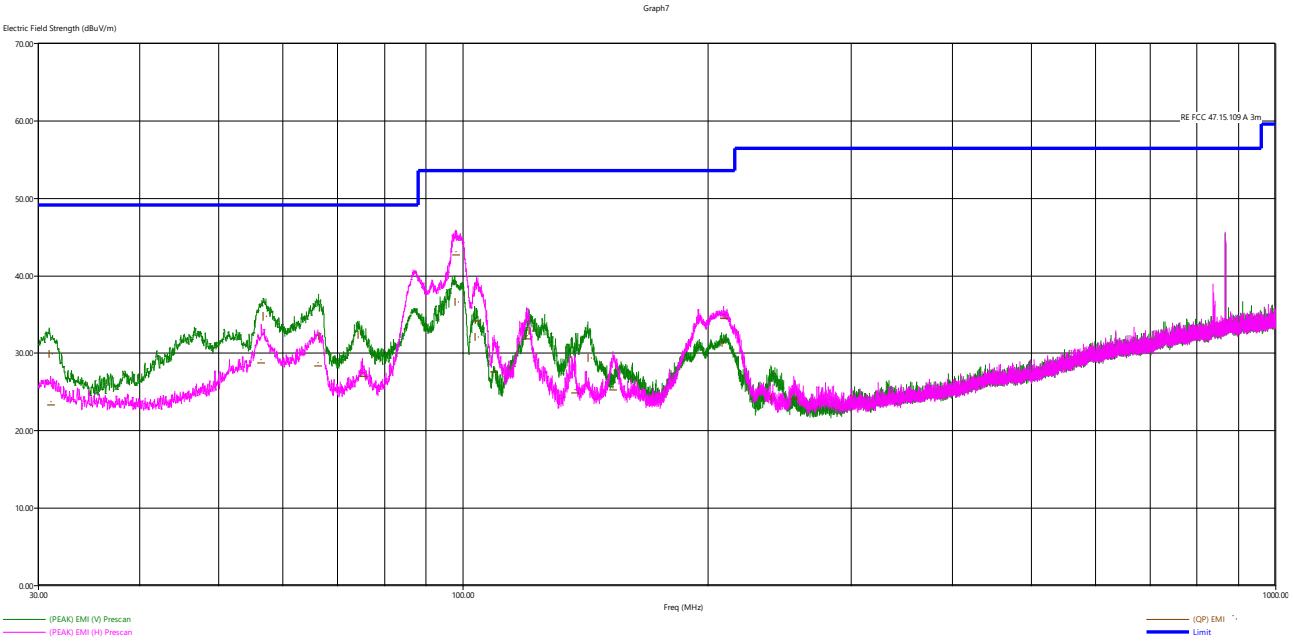
Receiver	:Rohde & Schwarz ESR 3
Antenna	:Schwarzbeck Mess VULB 9168
Controller	:Maturo Control Unit MCU
Antenna Mast	:Maturo Antenna Mast AM 4.0
Turntable	:Maturo Turntable TT 2.0 SI
Semi-Anechoic Chamber	:TRS 3m Semi-Anechoic Chamber

(2) Test Conditions

Input Voltage	: 120VAC	Mains Frequency	:50Hz
Output Voltage	:Rated	Output Load	:100%
Class	:B	Ambient Temperature	:20°C

(3) Test Results

100% Load



Frequency (MHz)	Polarisation	EUT Angle (Degrees)	Tower Height (cm)	Quasi-Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
97.80	H	192.5	399	42.56	53.52	**10.96**
209.19	H	103.5	149	34.41	53.52	19.11
56.76	V	259.5	101	34.64	49.08	14.44
66.36	V	244.5	249	32.14	49.08	16.94
74.16	V	95.5	101	32.30	49.08	16.78
97.68	V	145.5	249	36.51	53.52	17.01