Test Report for the EMC Testing of the Wolf Convection Glass Variant Microwave oven for Sharp Manufacturing Company of UK

Test Report number 13116TR1

Project number C4344/1

Author: .....
Steve Seller, Senior EMC Test Engineer

Checked: .....
Mr. Martin Nicholson, BEng (Hons), Technical Manager

Approved: .....
Mr. Colin Greenfield, BEng (Hons), Laboratory Business Manager

Issue	Description			Issue by	Date
1	First Issue	PDF	x	SAS	20th March 2019

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Test Report Change History

Issue	Date	Modification Details
1	20th March 2019	Original issue of test report
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Section 1Test Location

All testing was performed at;

Eurofins York Ltd	Unit 5
	Speedwell Road
	Castleford
	WF10 5PY
Tel:	01977 731173
Website	https://www.yorkemc.com
UKAS Testing No.	1574

1.1 UKAS Accreditation

Tests marked "Not UKAS Accredited" in this report are not included in the UKAS Accreditation Schedule for our laboratory.

Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

Eurofins York latest accreditation schedule can be found at:

http://www.ukas.org/testing/lab_detail.asp?lab_id=989&location_id=&vMenuOption=3

Eurofins York, listed as York EMC Services Ltd, is a recognised test facility with the Federal Communications Commission (FCC). The appropriate FCC recognition number is UK0022, recognition date 5th September 2017.

Section 2 Customer Information

Company name	Sharp Manufacturing Ltd
Address	Davy Way
	Llay
	Wrexham
	Clwyd
	LL12 0PG
Tel:	01978 857706
Contact	Ms Kelly Jones
Email	Kelly.Jones@sharp.eu
Customer Representative(s) present during testing	None – Unwitnessed testing

Section 3 Equipment Details

3.1 Equipment Under Test (EUT)

Date received:	9th October 2018						
EUT name:	Wolf Convection Glass Variant Microwave Oven						
Serial no/s:	A3RO8OURKO RJ85LOZ						
EUT description:	The EUT is a microwave oven designed for use in a domestic environment.						
No of units tested:	One						
EUT power:	220	V	60	Hz	Single phase	20	A
Highest internal frequency:	The operating frequency of the EUT was declared as 2.45GHz; therefore, as per FCC MP-5, section 2.3(a), measurements were made to the tenth harmonic, which is 24.5GHz.						
Cables:	Cable 1		1.5	m	Unscreened	AC Mains cable	
Size of EUT (mm)	L: -	615	W: -		755	H: -	455
Tested as	Table top						
Mode/s of operation	100% microwave power. The cavity was loaded with 700 millilitres of water in a 190mm external diameter borosilicate glass container with a height of 90mm. The container was placed in the centre of the turntable and the water was changed periodically to prevent boiling.						
Client modification statement:	None						
Modifications incorporated during testing:	None required						

Configuration of EUT

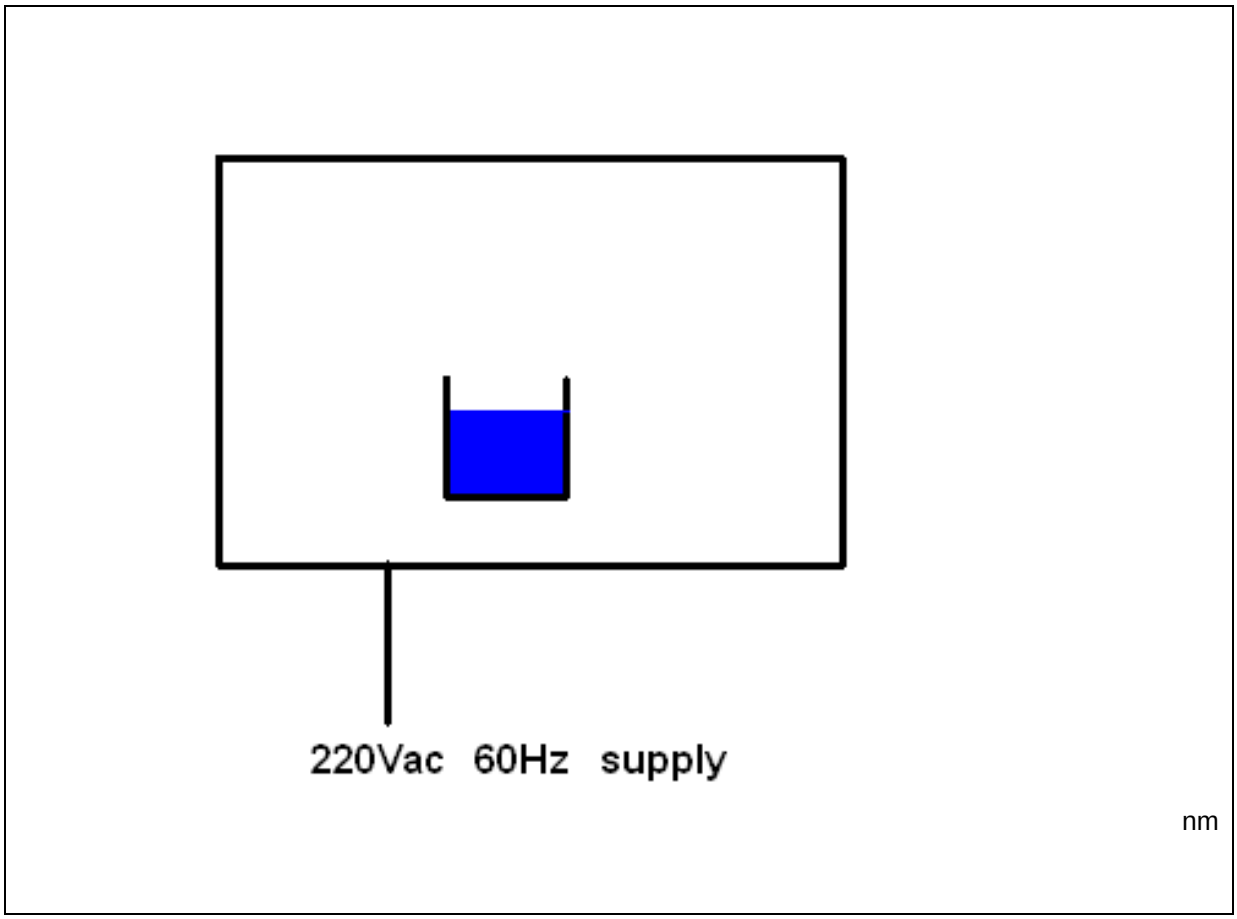


Figure 1: Diagram of EUT

Section 4 Test Specifications

The tests were performed in accordance with Eurofins York Services Quotation C4344/1.

Test	Method	Levels
Conducted Emissions (0.15 – 30MHz)	Method based on MP5 1986 section 7.1.	Part 18 Clause 18.307 Class B
Radiated Emissions Electric Field Measurements (30 – 24500MHz)	Method based on MP5 1986 section 4.	Part 18 Clause 18.305 Class B
Power output Measurements	Method based on MP5 1986 section 4.3 and EN60705:1999 section 8 (Calorimetric method)	Used to calculate limits as described in Part 18 Clause 18.305
Frequency variation Measurements	Methods based on MP5 1986 section 4.5 and	Part 18 Clause 18.301

Note 1: The testing was carried out in accordance to the test methods contained within 'FCC methods of measurements of Radio Noise emissions from Industrial, Scientific and medical equipment'
February 1986 - FCC/OST MP5 (1986)

4.1 Knowledge Database References

The following KDBs were referenced during the testing of the Wolf Convection Glass Variant

The latest knowledge database references are available via the FCC KDB website at:

https://apps.**fcc**.gov/kdb

4.1.1 Conducted Emissions

Publication Number	Keyword	Publication Date
174176	Section 15.107, 15.207,18.307, C63.4, C63.10, Suitable Dummy Load, AC Power Line Conducted Measurement	03/06/2015

4.1.2 Radiated Emissions (30MHz to 1000MHz)

Publication Number	Keyword	Publication Date
746324	CE Mark and use of CISPR 22 limits	06/12/2015
414788	Test sites for radiated emissions	18/04/2017
822428	Antenna calibration	16/12/2015

4.1.3 Radiated Emissions (1GHz to 40GHz)

Publication Number	Keyword	Publication Date
746324	CE Mark and use of CISPR 22 limits	12/06/2015
714737	15B, Average Detector for Unintentional Radiator	30/11/2010
704992	Test Site Validation Requirements above 1 GHZ.	12/06/2015
822428	Antenna calibration	16/12/2015

4.2 Compliance Statement

The Wolf Convection Glass Variant Microwave Oven, as tested, was shown to meet requirements of the standards listed in Section 4 of this report.

Section 5 Conducted Emission Results

5.1 Test Specification

Standard	Method based on MP5 1986
Measurement Uncertainty	The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 % is +/- 3.31dB

5.2 Power Line Emission Limits

Frequency (MHz)	Class B (dBµV)	
	Quasi Peak	Average
0.15 – 0.5	66 – 56*	56 – 46*
0.5 – 5.0	56.0	46.0
5.0 - 30	60.0	50.0

Note: * The limit decreases linearly with the logarithm of the frequency in the range

5.3 Receiver Settings

Receiver Parameters	Setting
Detector Function	Quasi Peak and Average
Start Frequency	150kHz
Stop Frequency	30MHz
Resolution Bandwidth	10kHz
Video Bandwidth	Auto

5.4 Procedure and Test Software Version

Eurofins York test procedure	CEP19 Issue 5
Test software	RadiMation Version 2016.1.6

5.4.1 Date of Test

19th October 2018

5.4.2 Test Area

LAB 4

5.4.3 Tested by

Bryan
Renton

5.4.4 Test Setup

This test was applied to the EUT's Live and Neutral lines. The EUT was configured in the screened room on an 80cm high table and was positioned 40cm from the room wall.

The EUT was powered from the mains supply via a Line Impedance Stabilisation Network (LISN).

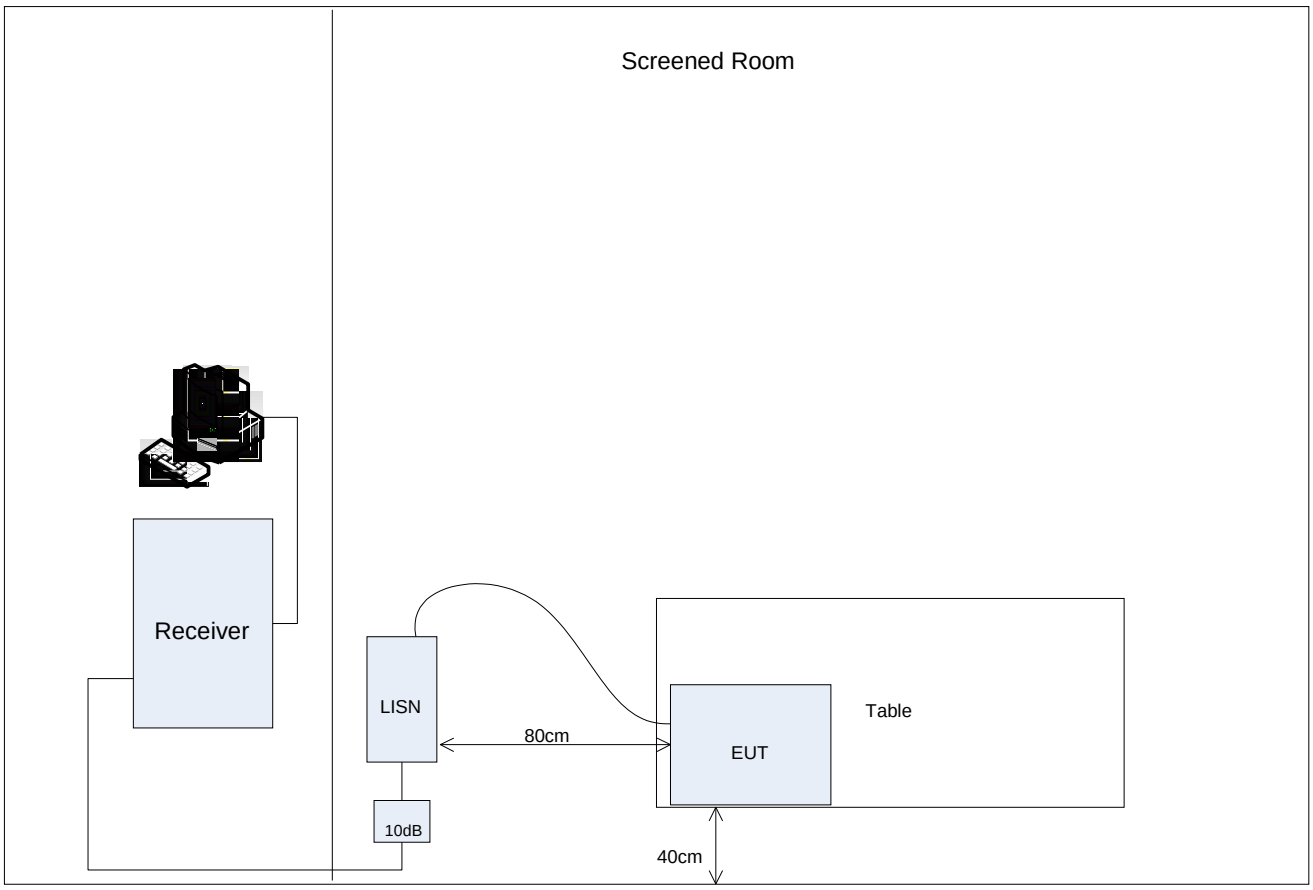


Figure 2: Test setup for Conducted Emissions on the AC power port

The screened room provides an environment that ensures valid, repeatable measurement results that meet the requirements of Clause 5.2 of ANSI C63.4-2014.

5.4.5 Plots

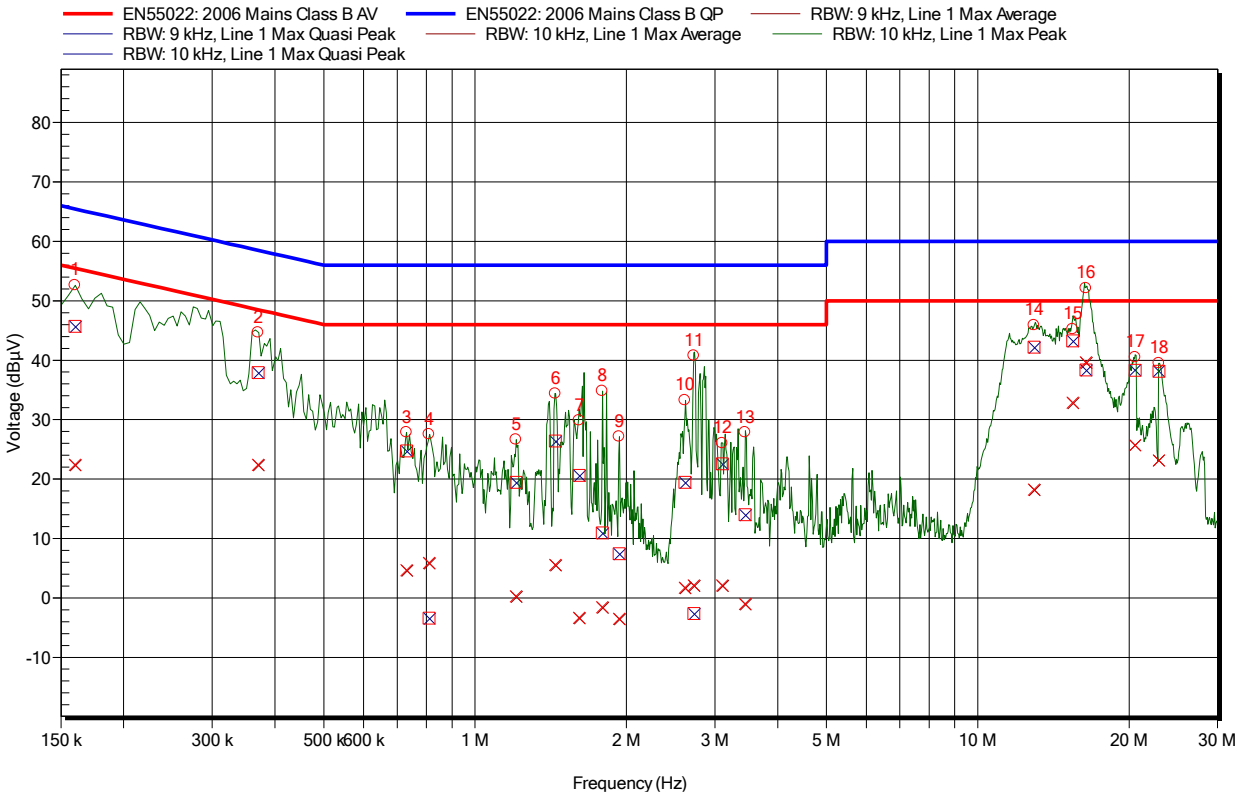


Figure 3: Conducted Emissions Plot - Input Power 220V 60Hz Live

Frequency	Peak dBµV	Average dBµV	Average Limit dBµV	Average Difference dB	Average Correction dB	Average Status dB	Quasi-Peak dBµV	Quasi-Peak Limit dBµV	Quasi-Peak Difference dB	Quasi-Peak Correction dB	Quasi-Peak Status	Overall Status
370kHz	44.7	22.4	48.5	-26.1	10.1	Pass	37.9	58.5	-20.61	10.1	Pass	Pass
20.57MHz	40.5	25.7	50	-24.32	11.6	Pass	38.3	60	-21.68	11.6	Pass	Pass
16.42MHz	52.1	39.6	50	-10.37	11.3	Pass	38.4	60	-21.62	11.3	Pass	Pass
15.44MHz	45.2	32.9	50	-17.12	11.3	Pass	43.2	60	-16.76	11.3	Pass	Pass
12.935MHz	45.9	18.2	50	-31.76	11.2	Pass	42.2	60	-17.83	11.3	Pass	Pass
160kHz	52.6	22.4	55.5	-33.07	10	Pass	45.7	65.5	-19.75	10	Pass	Pass

Table 1: Input Power Live Conducted Emissions Peaks

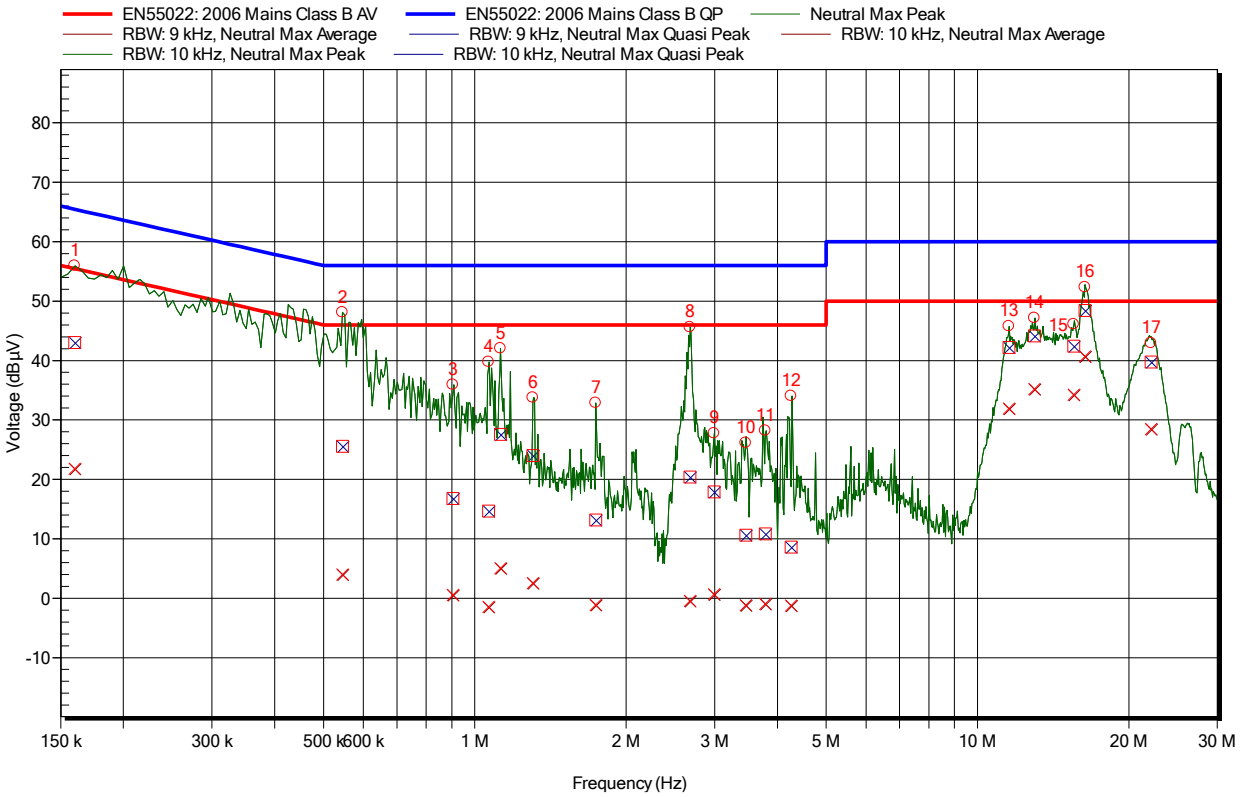


Figure 4: Conducted Emissions Plot - Input Power 220V 60Hz Neutral

Frequency	Peak dBµV	Average dBµV	Average Limit dBµV	Average Difference dB	Average Correction dB	Average Status dB	Quasi-Peak dBµV	Quasi-Peak Limit dBµV	Quasi-Peak Difference dB	Quasi-Peak Correction dB	Quasi-Peak Status	Overall Status
22.14MHz	42.9	28.5	50	-21.53	11.7	Pass	39.8	60	-20.22	11.7	Pass	Pass
16.37MHz	53.2	40.7	50	-9.33	11.3	Pass	48.4	60	-11.55	11.3	Pass	Pass
15.54MHz	46.1	34.3	50	-15.73	11.3	Pass	42.4	60	-17.59	11.3	Pass	Pass
12.97MHz	47.2	35.2	50	-14.8	11.2	Pass	44.1	60	-15.85	11.2	Pass	Pass
11.55MHz	45.7	31.9	50	-18.1	11.1	Pass	42.2	60	-17.79	11.1	Pass	Pass
160kHz	55.9	21.8	55.5	-33.68	10	Pass	43.1	65.5	-22.41	10	Pass	Pass

Table 2: Input Power Neutral Conducted Emissions Peaks

5.4.6 Correction factors

The quasi-peak correction and average correction are shown in the above table. This correction figure consists of LISN Insertion loss (IL), Cable loss (CL) and Transient Limiter Loss (TL)

The Actual Signal Level (ASL) is calculated as follows:

ASL (dBµV) = Indicated Signal Level (dBµV) + IL (dB) + CL (dB) + TL (dB)

5.4.7 Sample Data

The Quasi-Peak level at 11.55 MHz

ASL (dBµV) = 43.1dBµV = 32dBµV + 0.5dB + 0.6dB + 10dB

Section 6 Radiated Emission Results

6.1 Test Specification

Standard	Method based on MP5 1986
Measurement Uncertainty	The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95% is +/- 5.81dB for the frequency range 30MHz to 1GHz +/- 4.82dB for the frequency range from 1GHz to 6GHz +/- 5.16dB for the frequency range from 6GHz to 18GHz +/- 4.81dB for the frequency range from 18GHz to 40GHz

6.2 Procedure and Test Software Version

Eurofins York test procedure (30MHz to 1GHz)	CEP23 Issue 4
Eurofins York test procedure (1GHz to 40GHz)	CEP64 Issue 5
Test software	RadiMation Version 2016.2.8

6.3 Radiated Emissions (30MHz to 1GHz)

6.3.1 Limits at 3m

Frequency (MHz)	(dBµV/m)
	Quasi Peak
30 - 1000	65.8

6.3.2 Receiver Settings

Receiver Parameters	Setting
Detector Function	Quasi Peak
Start Frequency	30MHz
Stop Frequency	1000MHz
Resolution Bandwidth	120kHz
Video Bandwidth	Auto

6.3.3 Emissions measurements

6.3.4 Date of Test

18th October 2018

6.3.5 Test Area

LAB 1 (SAC)

6.3.6 Tested by

Bryan Renton

6.3.7 Test Setup

The EUT was configured in the SAC on an 80cm high table.

The measurement was performed with an antenna to EUT separation distance of 3m. The Quasi peak limits are therefore increased by 10dB (from the 10m values), to allow for the reduction in the measurement distance.

The results were maximised in orientation 0-360 degrees and height 1-4m.

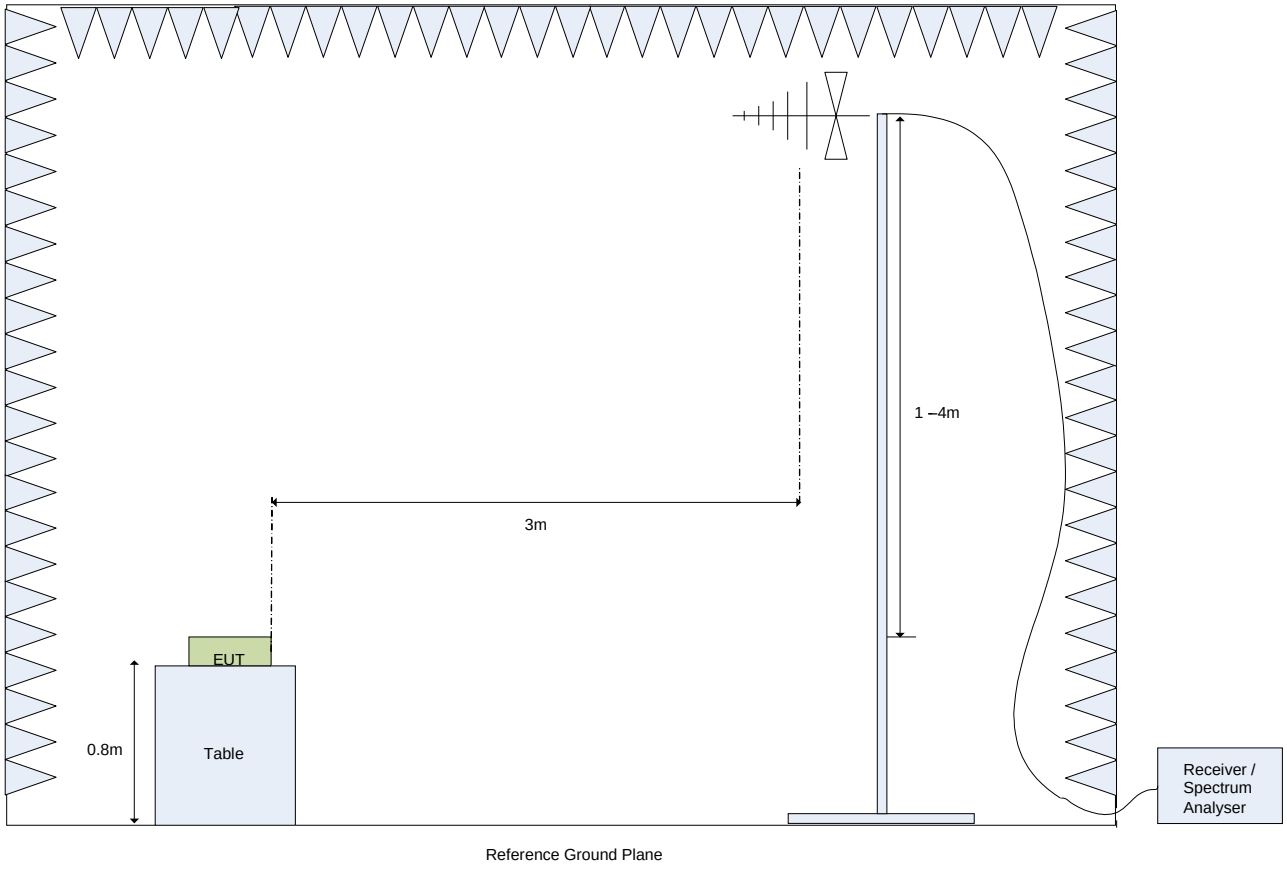


Figure 5: Test Setup for E-Field Measurements from 30MHz to 1GHz

Note 1 : With the EUT de-energized the ambient radio noise and signals met the 6dB peak detection requirement of ANSI C63.4-2014 Clause 5.1.3.

Note 2 : There were no significant environmental temperature changes during the test duration and hence it was not considered necessary to consider any variation in cable loss.

6.3.8 Electric field emissions, 30MHz to 1GHz

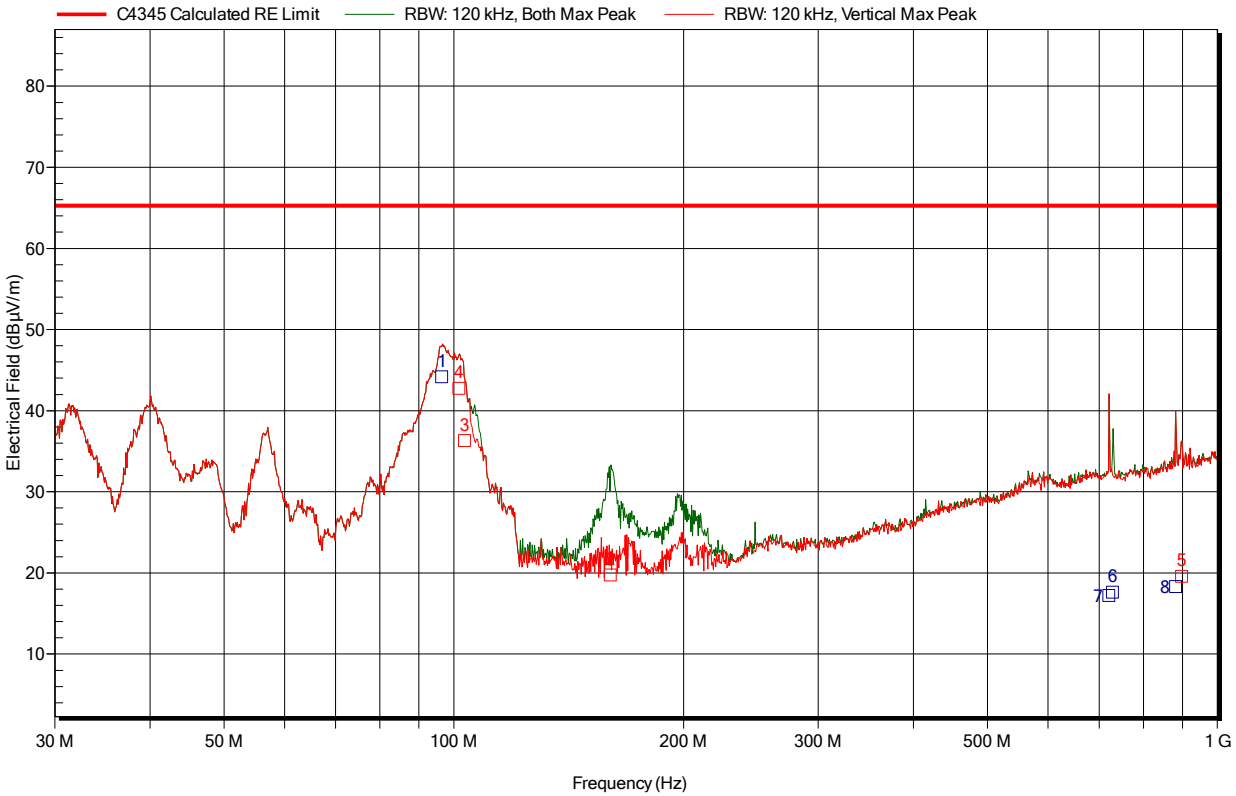


Figure 6: Electric field emissions Plot, 30MHz to 1GHz

Frequency MHz	Peak dBµV/m	Quasi-Peak dBµV/m	Quasi Peak Limit dBµV/m	Quasi-Peak Difference dB	Quasi-Peak Correction dB	Quasi-Peak Status	Angle degrees	Height m	Polarization
96.42	48.1	44.2	65.8	-21.6	17	Pass	310	1	Vertical
160.2	32.6	19.8	65.8	-46	17.2	Pass	355	1.5	Horizontal
103.2	43.5	36.3	65.8	-29.5	17.9	Pass	25	3.1	Horizontal
101.52	47.1	42.7	65.8	-23	17.7	Pass	320	1.1	Vertical
897.78	35.7	19.6	65.8	-46.2	29.3	Pass	34	2.1	Vertical
729	38.7	17.6	65.8	-48.1	27.7	Pass	45	3	Horizontal
720.48	42	17.2	65.8	-48.6	27.6	Pass	10	2.8	Vertical
881.88	39.9	18.3	65.8	-47.4	28.9	Pass	150	1.2	Vertical

Table 3: Electric Field Emissions Peaks, 30MHz to 1GHz

6.3.9 Quasi Peak correction factors

The quasi peak correction is shown in the above table. This correction figure consists of Antenna factor (AF); and Cable loss (CL).

Field strength (FS) is calculated as follows:

FS (dBµV/m) = Indicated Signal Level (dBµV) + AF (dB) + CL (dB)

6.3.10 Sample Data

The Quasi-Peak level at 96.42MHz

FS (dBµV/m) = 44.2.6dB = 27.2dBµV + 1.1dB + 15.9dB

6.4 Radiated Emissions (1GHz to 24.5GHz)

6.4.1 Limits

Frequency (GHz)	(dBµV/m)
	Average
1-24.5	65.8

6.4.2 Receiver Settings

Receiver Parameters	Setting
Detector Function	Average
Start Frequency	1GHz
Stop Frequency	24.5GHz
Resolution Bandwidth	1MHz
Video Bandwidth	Auto

6.4.3 Emissions measurements

6.4.4 Date of Test

18th October 2018 and 16th February 2019

6.4.5 Test Area

LAB 1 (SAC)

6.4.6 Tested by

Bryan Renton
Colin Greenfield

6.4.7 Test Setup

The EUT was configured in the SAC on an 80cm high table.
The measurement was then performed with an antenna to EUT separation distance of 3m.
The results were maximised in orientation 0-360 degrees and height 1-4m.

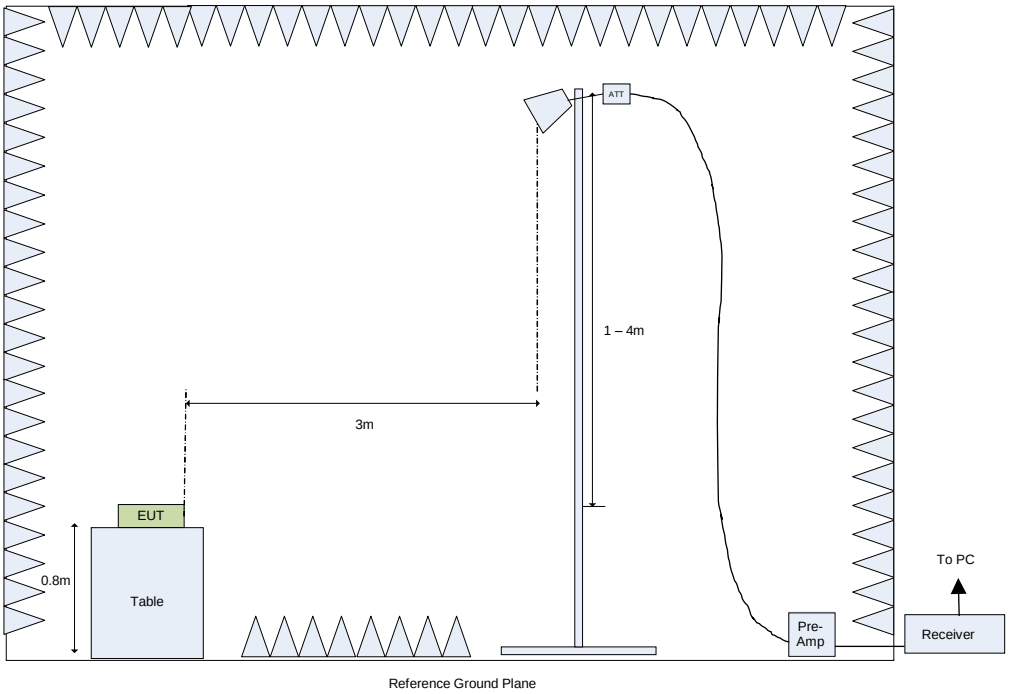


Figure 7: Test Setup for Final E-Field Measurements from 1GHz to 18GHz

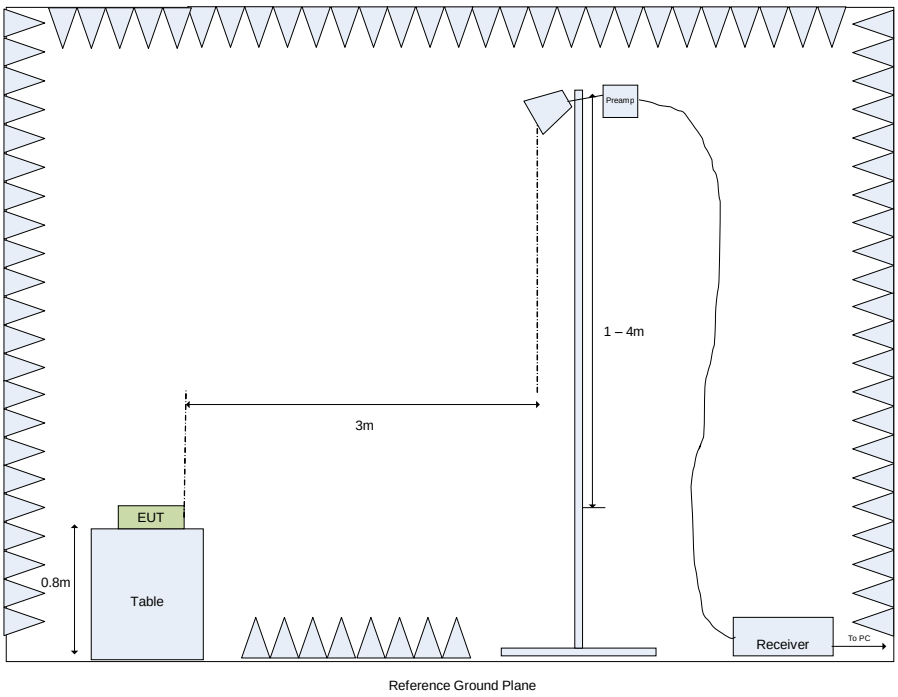


Figure 8: Test Setup for Final E-Field Measurements from 18GHz to 40GHz

Note 1 : With the EUT de-energized the ambient radio noise and signals met the 6dB peak detection requirement of ANSI C63.4-2014 Clause 5.1.3.

Note 2 : There were no significant environmental temperature changes during the test duration and hence it was not considered necessary to consider any variation in cable loss.

6.4.8 Calculation of electric field strength limit

Output power

The output power of the unit was first determined by the calorimetric method based on the procedure described in EN60705:1999 Section 8, and FCC document MP5 :1986 Sections 4.1 and 4.3. The test was performed using 1000g ±5g of tap water heated in a 150mm diameter cylindrical glass vessel placed in the centre of the oven. Start Temp is that of the water before it was poured into the glass vessel. Final temperature of the water was taken within 60sec of the microwave cycle finishing, after it had been stirred.

$$\text{Output power (in Watts)} = \frac{1000 \times (\text{Final temp} - \text{Start temp}) \times 4.1868}{\text{Time}}$$

Where temperatures are measured in degree Celsius, Time in seconds, and 4.1868 J/gram degC is the specific heat capacity of water.

Values obtained were as follows:

Start temp (degC)	Finish temp (degC)	Temp difference (degC)	Time (s)	Calculated power (Watts)
19.1	33.8	14.7	74	832
19.1	32.6	13.5	70	808
19	31	12	60	837

Electric field limit

ISM equipment operating on a frequency specified in Section 18.301 of the FCC Rules is permitted unlimited radiated energy in the band specified for that frequency.

The limit of field strength levels of emissions that lie outside the ISM bands is specified in Section 18.305 of the FCC rules as follows:

Where the operating frequency is within an ISM frequency band and where the output power is greater than 500W at a measurement distance of 300m the limit for radiated field strength outside of the ISM bands is:

$$\text{Limit } (\mu\text{V/m}) \text{ at } 300\text{m} = 15\sqrt{\frac{P}{500}}$$

Where P is the measured output power of the oven in w (refer to section 3.1 of this test report).
In units of dBµV/m, and at a measurement distance of 3m the limit is calculated as:

$$\text{Limit } (\text{dB}\mu\text{V/m}) \text{ at } 3\text{m} = 20\log_{10}\left(15\sqrt{\frac{P}{500}}\right) + 20\log_{10}\left(\frac{300}{3}\right)$$

The measured oven power P, was 837W. Using this measured value of P in above formula this gives a field strength limit of 65.8dBµV/m at a measurement distance of 3m.
The electric field strength between 100MHz and 24.5GHz was measured at 3m and compared to this limit calculated at 3m.

Note: Section 4.6.1 of FCC Document MP5 dated 1986 states that a conservative value of the field strength limit at closer distances than 300m may be calculated using inverse linear variation of field with distance.

6.4.9 Electric field emissions, 1GHz to 18GHz

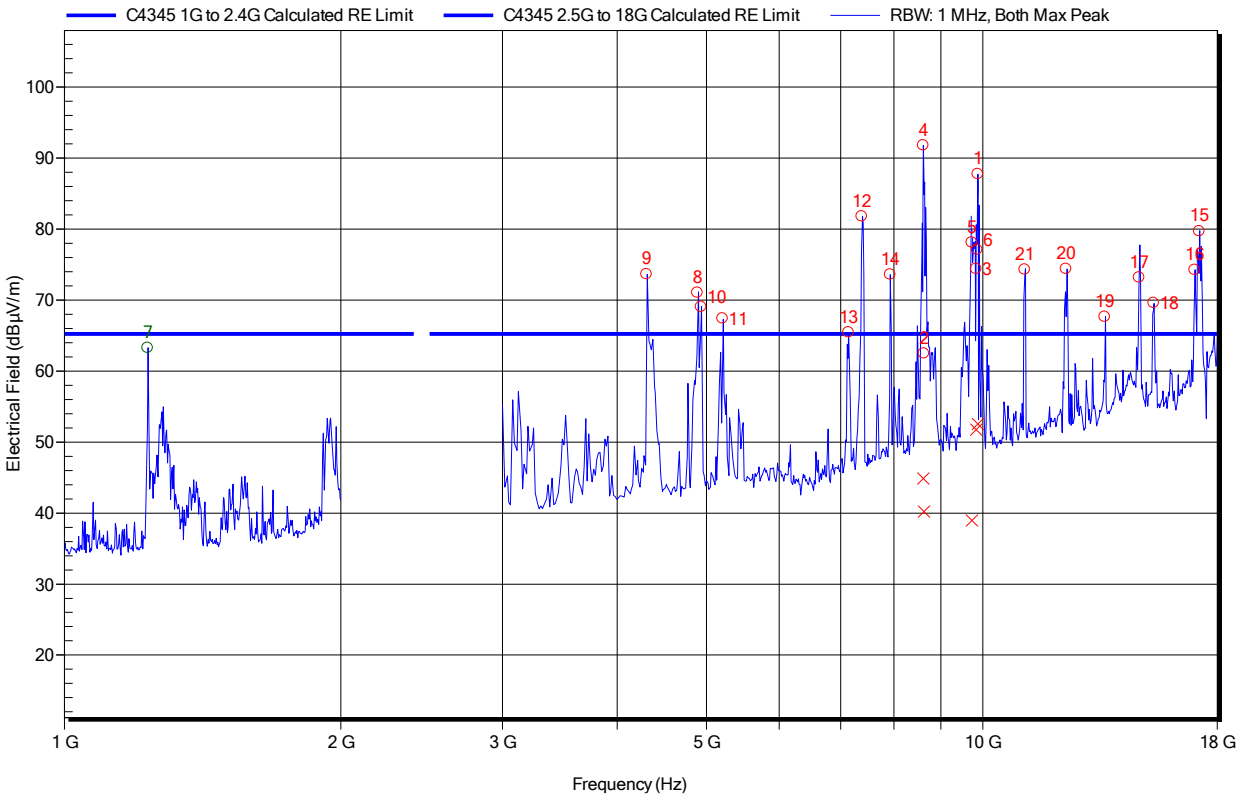


Figure 9: Electric field emissions Plot, 1GHz to 18GHz

Frequency GHz	Peak dBµV/m	Average dBµV/m	Average Limit dBµV/m	Average Difference dB	Average Correction dB	Average Status	Angle degrees	Height m	Polarization
9.877	87.72	52.55	65.8	-13.25	-0.9	Pass	60	1.7	Horizontal
8.631	62.44	40.24	65.8	-25.56	-3.2	Pass	70	3	Horizontal
9.832	74.36	51.77	65.8	-14.03	-0.9	Pass	120	2.6	Vertical
8.616	91.79	44.87	65.8	-20.93	-3.2	Pass	200	1.2	Horizontal
9.727	78.12	38.96	65.8	-26.84	-1	Pass	250	1.1	Horizontal

Table 4: Electric Field Emissions Peaks, 1GHz to 18GHz

6.4.10 Electric field emissions, 2GHz to 3GHz

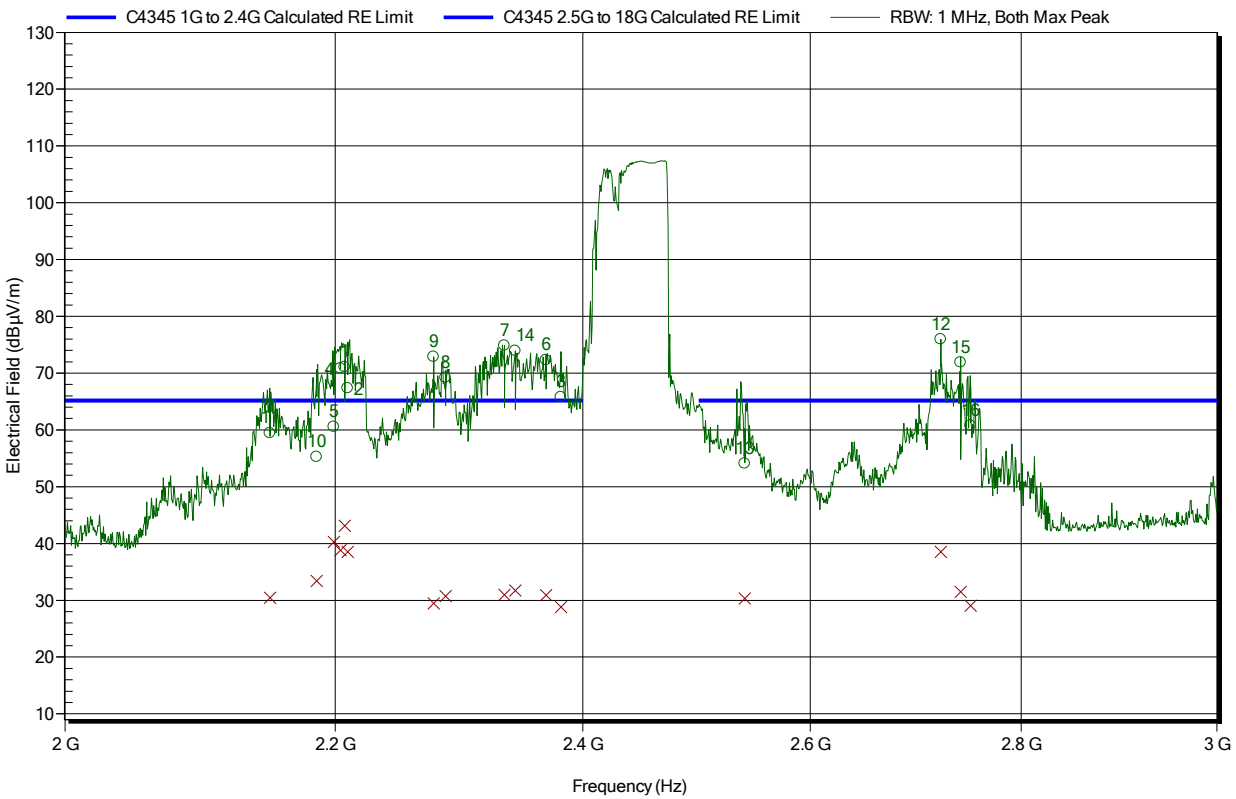


Figure 10: Electric field emissions Plot, 2GHz to 3GHz

Frequency GHz	Peak dBµV/m	Average dBµV/m	Average Limit dBµV/m	Average Difference dB	Average Correction dB	Average Status	Angle degrees	Height m	Polarization
2.207	71.04	43.12	65.8	-22.68	-17.8	Pass	20	1.1	Vertical
2.21	67.3	38.52	65.8	-27.28	-17.8	Pass	20	1.1	Horizontal
2.382	65.75	28.82	65.8	-36.98	-17.5	Pass	60	1.7	Horizontal
20204	70.81	38.81	65.8	-26.99	-17.8	Pass	280	2.8	Horizontal
2.199	60.48	40.24	65.8	-25.56	-17.8	Pass	280	2.9	Vertical
2.369	72.27	30.88	65.8	-34.92	-17.5	Pass	340	1	Vertical
2.335	74.81	30.98	65.8	-34.82	-17.6	Pass	60	2.8	Vertical
2.287	69.19	30.73	65.8	-35.07	-17.7	Pass	40	1.6	Vertical
2.277	72.85	29.45	65.8	-36.35	-17.7	Pass	320	1	Vertical
2.186	55.24	33.38	65.8	-32.42	-17.9	Pass	280	1.5	Vertical
2.15	59.43	30.46	65.8	-35.347	-17.9	Pass	360	1.9	Vertical
2.722	75.93	38.54	65.8	-27.26	-16.1	Pass	20	2.6	Vertical
2.541	54.03	30.32	65.8	-35.48	-17	Pass	0	1.2	Vertical
2.344	73.87	31.7	65.8	-34.1	-17.6	Pass	340	2.4	Vertical
2.741	71.86	31.47	65.8	-34.33	-16	Pass	20	2.2	Horizontal
2.751	60.73	29.02	65.8	-36.78	-15.9	Pass	300	1.3	Vertical

Table 5: Electric Field Emissions Peaks, 2GHz to 3GHz

6.4.11 Electric field emissions, 2nd and 3rd harmonics

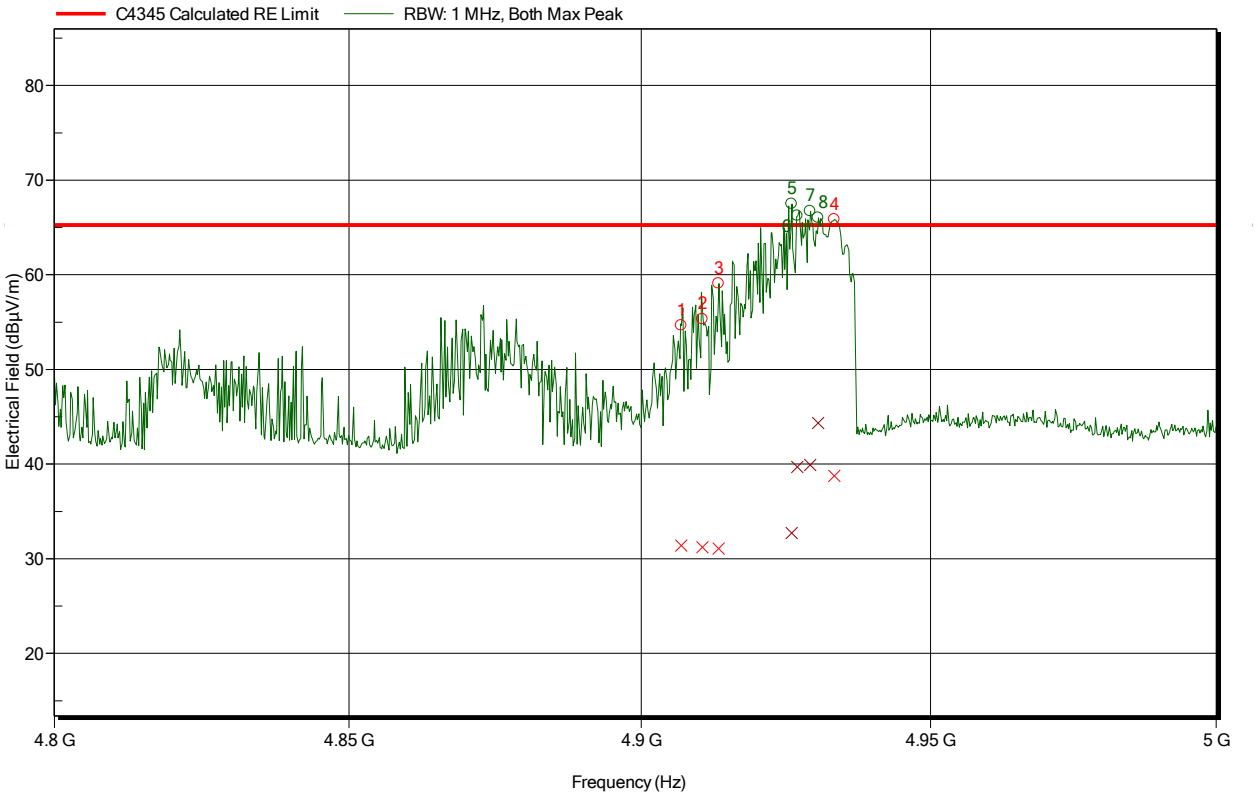


Figure 11: Electric field emissions, 2nd harmonic, 700ml in centre of oven

Frequency GHz	Peak dBµV/m	Average dBµV/m	Average Limit dBµV/m	Average Difference dB	Average Correction dB	Average Status	Angle degrees	Height m	Polarization
4.907	54.6	31.4	65.8	-34.4	-9.6	Pass	0	1.5	Vertical
4.911	55.3	31.2	65.8	-34.6	-9.5	Pass	0	1.5	Vertical
4.913	59.1	31.1	65.8	-34.7	-9.5	Pass	0	1.5	Vertical
4.933	65.8	38.8	65.8	-27	-8.9	Pass	0	1.5	Vertical
4.926	67.5	32.7	65.8	-33.1	-9.1	Pass	0	1.5	Vertical
4.927	66.2	39.7	65.8	-26.1	-9.1	Pass	0	1.5	Vertical
4.929	66.7	39.9	65.8	-25.9	-9	Pass	0	1.5	Vertical
4.931	66	44.3	65.8	-21.5	-9	Pass	0	1.5	Vertical

Table 6: Electric Field Emissions, 2nd harmonic, 700ml in centre of oven

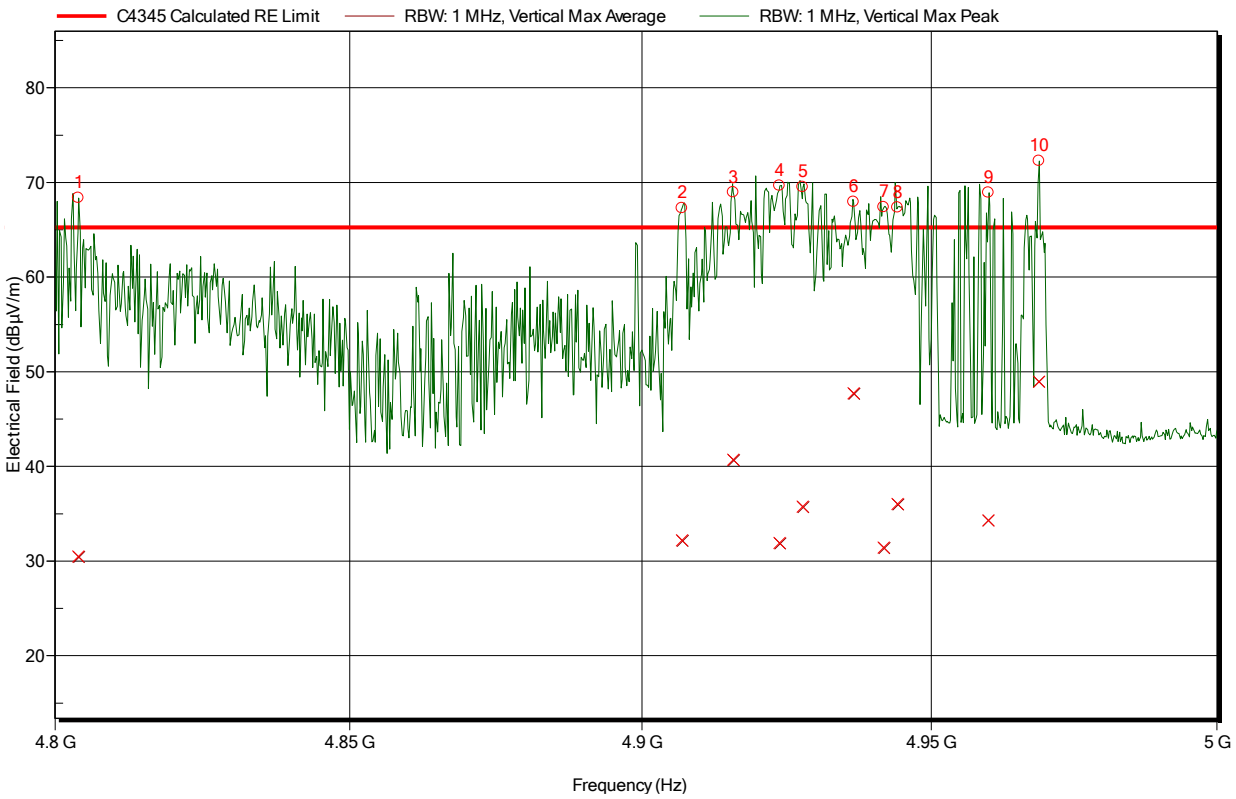


Figure 12: Electric field emissions, 2nd harmonic, 700ml in front right of oven

Frequency GHz	Peak dBµV/m	Average dBµV/m	Average Limit dBµV/m	Average Difference dB	Average Correction dB	Average Status	Angle degrees	Height m	Polarization
4.804	68.4	30.5	65.8	-35.3	-10.3	Pass	0	1	Vertical
4.907	67.3	32.2	65.8	-33.6	-9.6	Pass	0	1	Vertical
4.916	69	40.7	65.8	-25.1	-9.4	Pass	0	1	Vertical
4.924	69.6	31.9	65.8	-33.9	-9.2	Pass	0	1	Vertical
4.928	69.5	35.8	65.8	-30	-9.1	Pass	0	1	Vertical
4.937	68	47.7	65.8	-18.1	-8.8	Pass	0	1	Vertical
4.942	67.4	31.4	65.8	-34.4	-8.7	Pass	0	1	Vertical
4.944	67.4	36.1	65.8	-29.7	-8.6	Pass	0	1	Vertical
4.96	68.9	34.3	65.8	-31.5	-8.1	Pass	0	1	Vertical
4.969	72.3	49	65.8	-16.8	-8.2	Pass	0	1	Vertical

Table 7: Electric Field Emissions, 2nd harmonic, 700ml in front right of oven

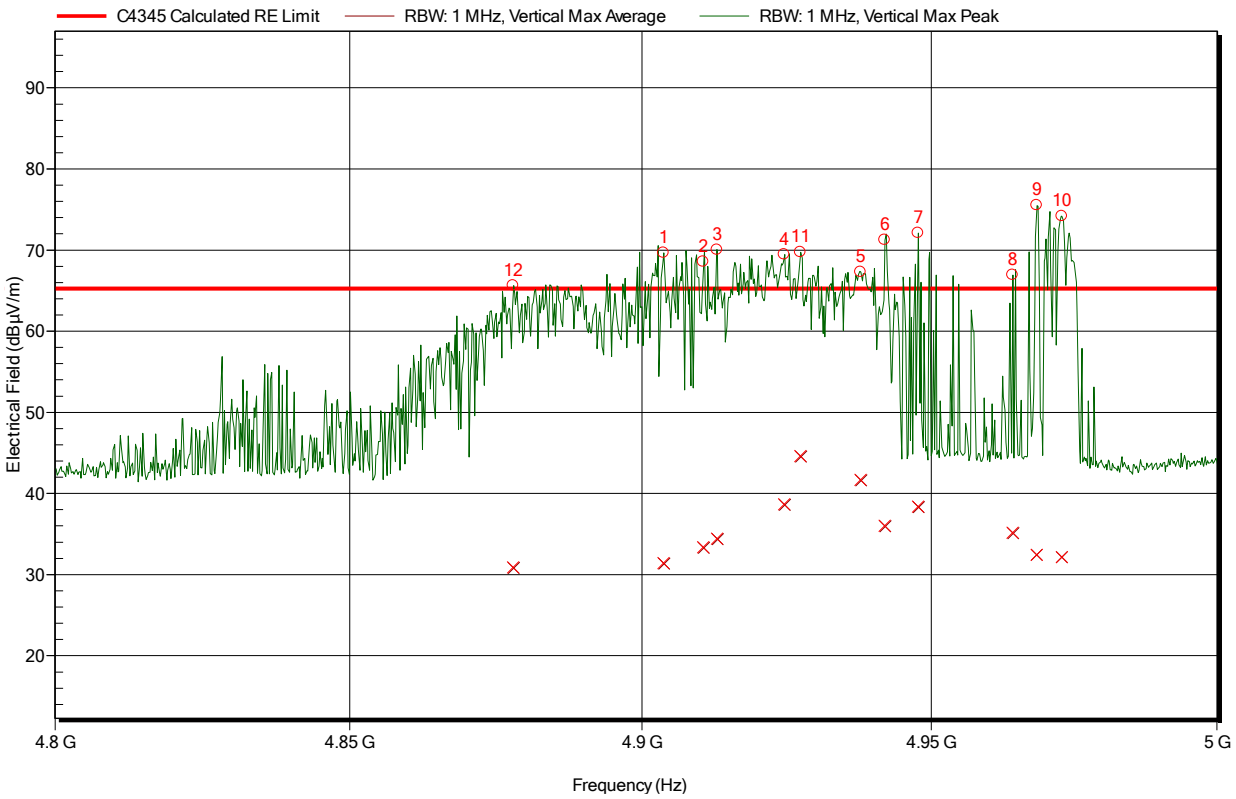


Figure 13: Electric field emissions, 2nd harmonic, 300ml in centre of oven

Frequency GHz	Peak dBµV/m	Average dBµV/m	Average Limit dBµV/m	Average Difference dB	Average Correction dB	Average Status	Angle degrees	Height m	Polarization
4.904	69.7	31.4	65.8	-34.4	-9.6	Pass	0	1	Vertical
4.911	68.5	33.4	65.8	-32.4	-9.5	Pass	0	1	Vertical
4.913	70	34.4	65.8	-31.4	-9.5	Pass	0	1	Vertical
4.925	69.5	38.7	65.8	-27.1	-9.2	Pass	0	1	Vertical
4.938	67.3	41.7	65.8	-24.1	-8.8	Pass	0	1	Vertical
4.942	71.2	36	65.8	-29.8	-8.7	Pass	0	1	Vertical
4.948	72.1	38.4	65.8	-27.4	-8.5	Pass	0	1	Vertical
4.964	66.9	35.2	65.8	-30.60	-8.1	Pass	0	1	Vertical
4.968	75.5	32.4	65.8	-33.4	-8.2	Pass	0	1	Vertical
4.973	74.2	32.1	65.8	-33.7	-8.2	Pass	0	1	Vertical
4.927	69.7	44.6	65.8	-21.2	-9.1	Pass	0	1	Vertical
4.878	65.6	30.9	65.8	-34.9	-10.1	Pass	0	1	Vertical

Table 8: Electric Field Emissions, 2nd harmonic, 300ml in centre of oven

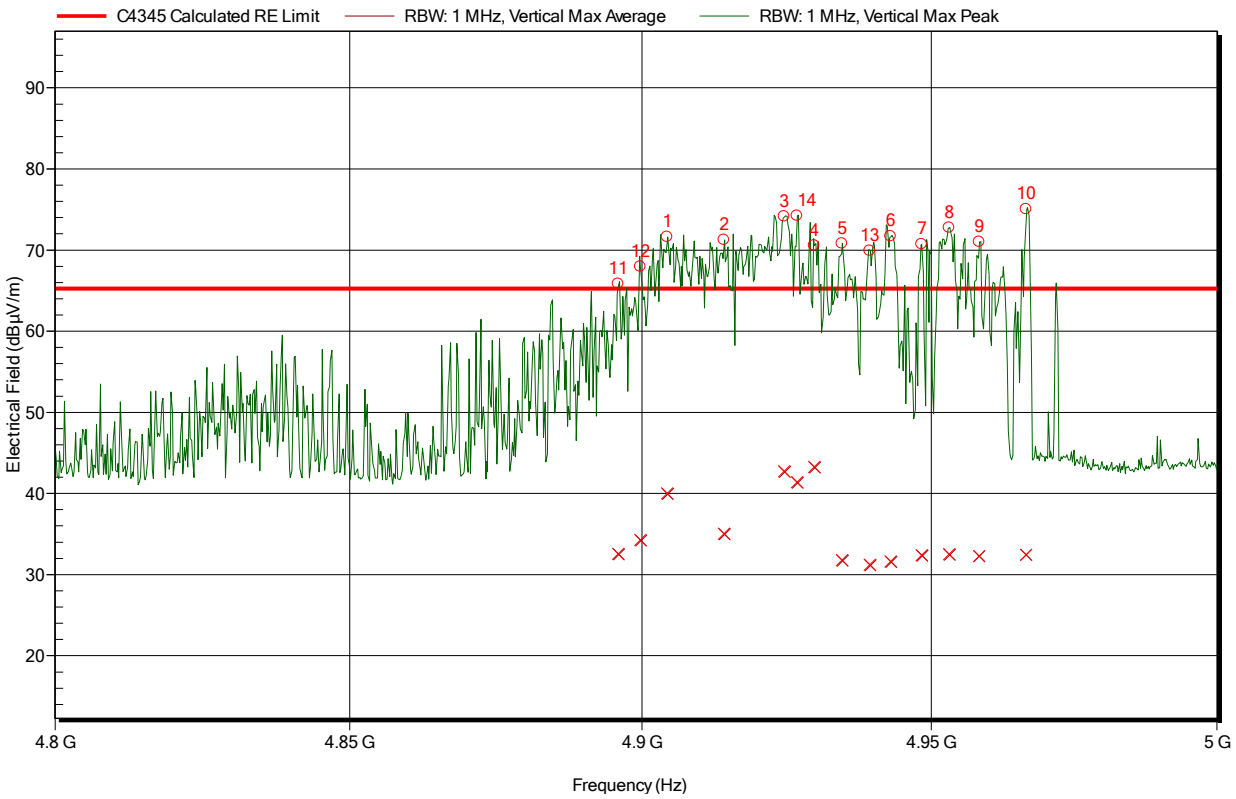


Figure 14: Electric field emissions, 2nd harmonic, 300ml in front right of oven

Frequency GHz	Peak dBµV/m	Average dBµV/m	Average Limit dBµV/m	Average Difference dB	Average Correction dB	Average Status	Angle degrees	Height m	Polarization
4.904	71.6	40	65.8	-25.8	-9.6	Pass	0	1	Vertical
4.914	71.2	35.1	65.8	-30.7	-9.5	Pass	0	1	Vertical
4.925	74.1	42.8	65.8	-23	-9.2	Pass	0	1	Vertical
4.93	70.6	43.3	65.8	-22.5	-9	Pass	0	1	Vertical
4.935	70.8	31.8	65.8	-34	-8.9	Pass	0	1	Vertical
4.943	71.7	31.6	65.8	-34.2	-8.6	Pass	0	1	Vertical
4.948	70.7	32.4	65.8	-33.4	-8.5	Pass	0	1	Vertical
4.953	72.8	32.5	65.8	-33.3	-8.3	Pass	0	1	Vertical
4.958	71	32.3	65.8	-33.5	-8.2	Pass	0	1	Vertical
4.967	75	32.4	65.8	-33.4	-8.1	Pass	0	1	Vertical
4.896	65.8	32.6	65.8	-33.2	-9.8	Pass	0	1	Vertical
4.9	67.9	34.3	65.8	-31.5	-9.7	Pass	0	1	Vertical
4.939	69.9	31.2	65.8	-34.6	-8.7	Pass	0	1	Vertical
4.927	74.2	41.4	65.8	-24.4	-9.1	Pass	0	1	Vertical

Table 9: Electric Field Emissions, 2nd harmonic, 300ml in front right of oven

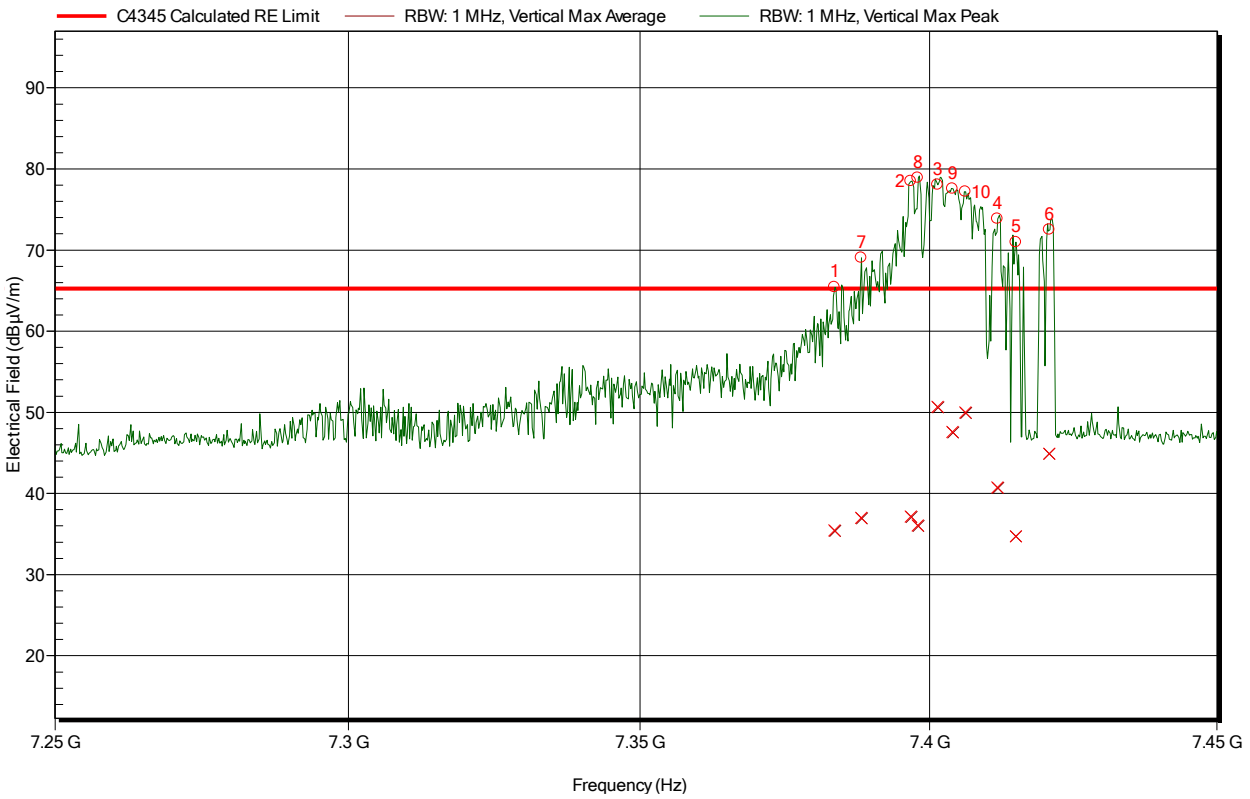


Figure 15: Electric field emissions, 3rd harmonic, 700ml in centre of oven

Frequency GHz	Peak dBµV/m	Average dBµV/m	Average Limit dBµV/m	Average Difference dB	Average Correction dB	Average Status	Angle degrees	Height m	Polarization
7.384	65.4	35.5	65.8	-30.3	-5.7	Pass	0	1	Vertical
7.397	78.5	37.2	65.8	-28.6	-5.7	Pass	0	1	Vertical
7.401	78.1	50.7	65.8	-15.1	-5.6	Pass	0	1	Vertical
7.412	73.8	40.8	65.8	-25	-5.6	Pass	0	1	Vertical
7.415	71	34.7	65.8	-31.1	-5.6	Pass	0	1	Vertical
7.421	72.5	44.9	65.8	-20.9	-5.6	Pass	0	1	Vertical
7.388	69	37	65.8	-28.8	-5.7	Pass	0	1	Vertical
7.398	78.9	36.1	65.8	-29.7	-5.6	Pass	0	1	Vertical
7.404	77.6	47.6	65.8	-18.2	-5.6	Pass	0	1	Vertical
7.406	77.2	50	65.8	-15.8	-5.6	Pass	0	1	Vertical

Table 10: Electric Field Emissions, 3rd harmonic, 700ml in centre of oven

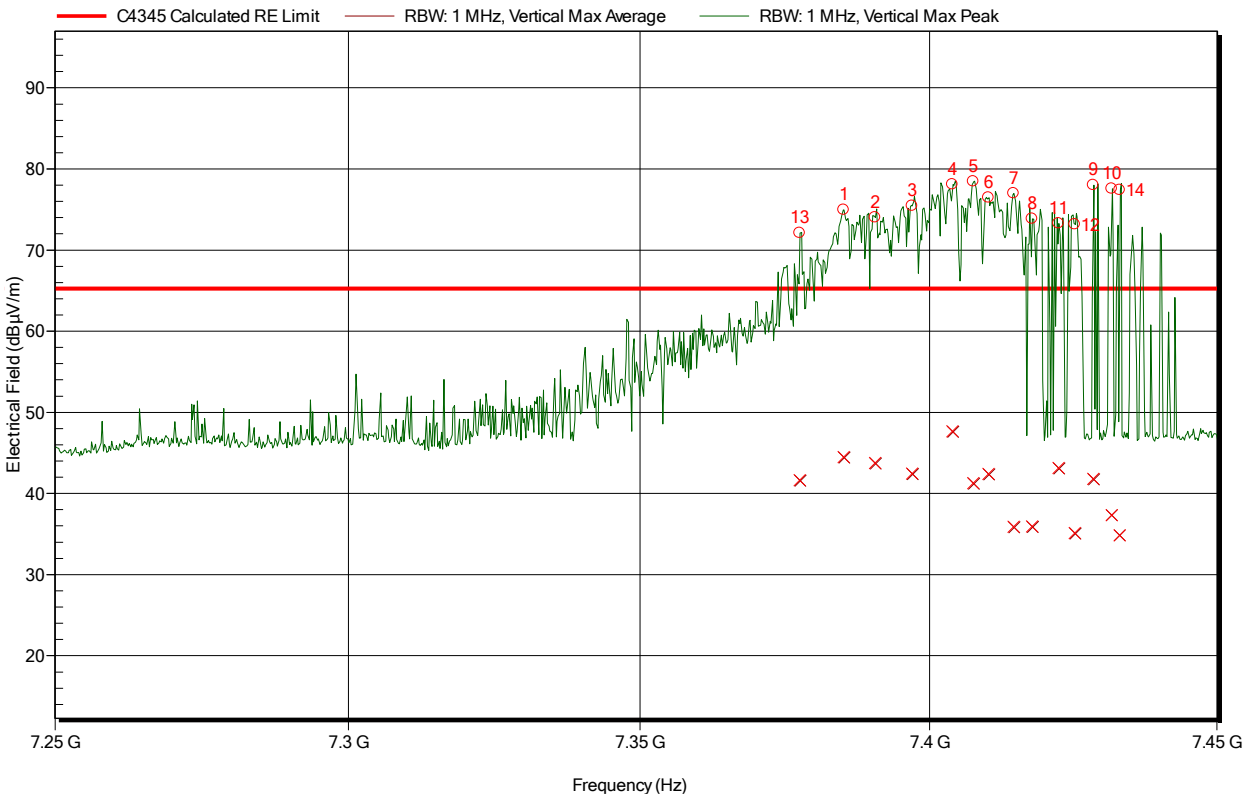


Figure 16: Electric field emissions, 3rd harmonic, 700ml in front right of oven

Frequency GHz	Peak dBµV/m	Average dBµV/m	Average Limit dBµV/m	Average Difference dB	Average Correction dB	Average Status	Angle degrees	Height m	Polarization
7.385	74.9	44.5	65.8	-21.3	-5.7	Pass	0	1	Vertical
7.391	74	43.8	65.8	-22	-5.7	Pass	0	1	Vertical
7.397	75.4	42.5	65.8	-23.3	-5.7	Pass	0	1	Vertical
7.404	78.1	47.7	65.8	-18.1	-5.6	Pass	0	1	Vertical
7.408	78.5	41.3	65.8	-24.5	-5.6	Pass	0	1	Vertical
7.41	76.5	42.4	65.8	-23.4	-5.6	Pass	0	1	Vertical
7.415	77	35.9	65.8	-29.9	-5.6	Pass	0	1	Vertical
7.418	73.9	35.9	65.8	-29.9	-5.6	Pass	0	1	Vertical
7.428	78	41.8	65.8	-24	-5.6	Pass	0	1	Vertical
7.432	77.5	37.3	65.8	-28.5	-5.6	Pass	0	1	Vertical
7.422	73.3	43.2	65.8	-22.6	-5.6	Pass	0	1	Vertical
7.425	73.2	35.1	65.8	-30.7	-5.6	Pass	0	1	Vertical
7.378	72.1	41.6	65.8	-24.2	-5.7	Pass	0	1	Vertical
7.433	77.4	34.8	65.8	-31	-5.6	Pass	0	1	Vertical

Table 11: Electric Field Emissions, 3rd harmonic, 700ml in front right of oven

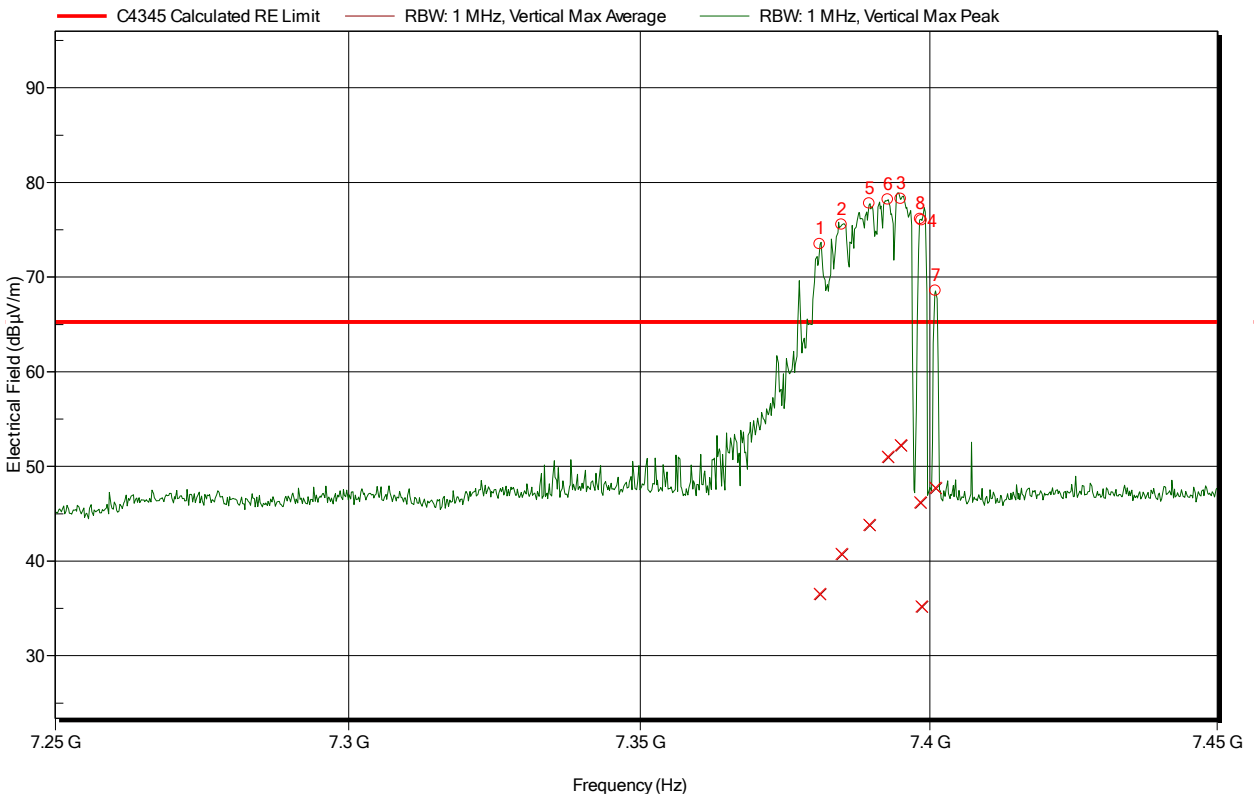


Figure 17: Electric field emissions, 3rd harmonic, 300ml in centre of oven

Frequency GHz	Peak dBµV/m	Average dBµV/m	Average Limit dBµV/m	Average Difference dB	Average Correction dB	Average Status	Angle degrees	Height m	Polarization
7.381	73.5	36.5	65.8	-29.3	-5.7	Pass	0	1	Vertical
7.385	75.5	40.7	65.8	-25.1	-5.7	Pass	0	1	Vertical
7.395	78.3	52.3	65.8	-13.5	-5.7	Pass	0	1	Vertical
7.399	76	35.2	65.8	-30.6	-5.6	Pass	0	1	Vertical
7.39	77.8	43.8	65.8	-22	-5.7	Pass	0	1	Vertical
7.393	78.2	51	65.8	-14.8	-5.7	Pass	0	1	Vertical
7.401	68.6	47.8	65.8	-18	-5.6	Pass	0	1	Vertical
7.398	76.1	46.2	65.8	-19.6	-5.6	Pass	0	1	Vertical

Table 12: Electric Field Emissions, 3rd harmonic, 300ml in centre of oven

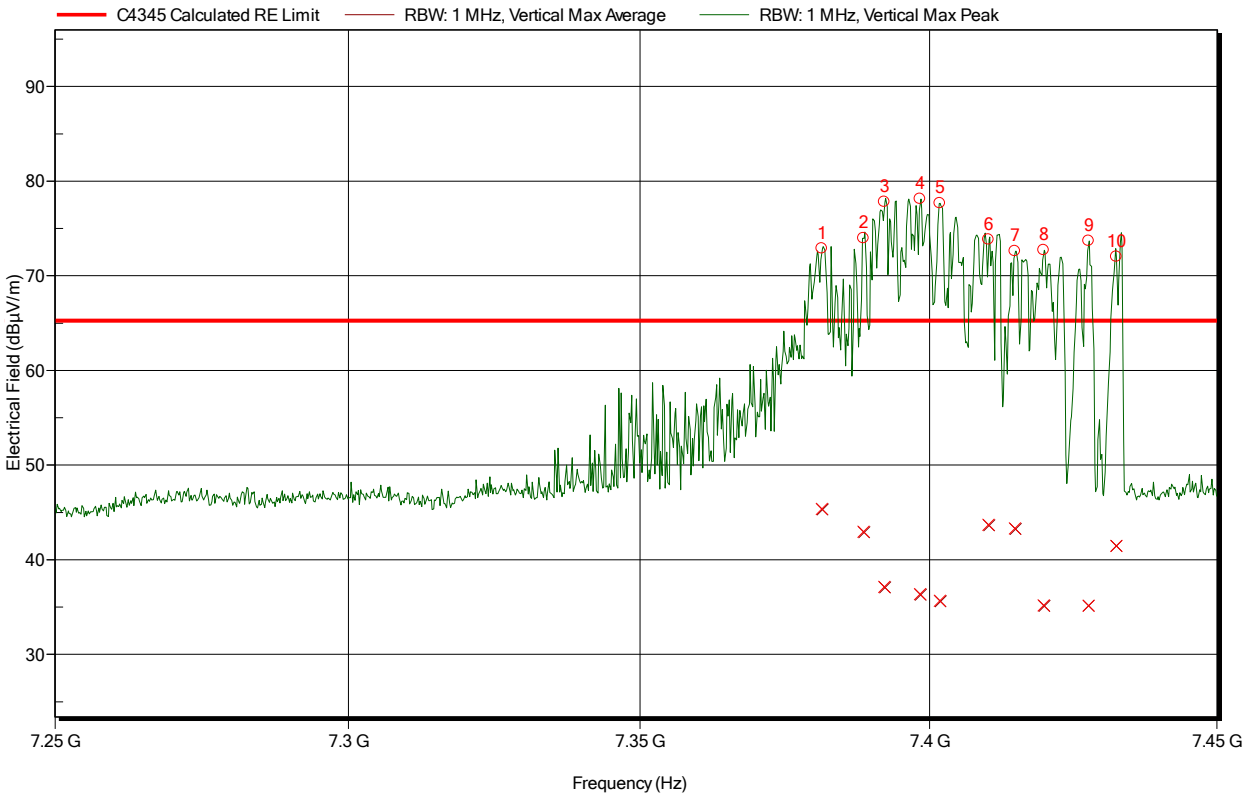


Figure 18: Electric field emissions, 3rd harmonic, 300ml in front right of oven

Frequency GHz	Peak dBµV/m	Average dBµV/m	Average Limit dBµV/m	Average Difference dB	Average Correction dB	Average Status	Angle degrees	Height m	Polarization
7.381	72.9	45.4	65.8	-20.4	-5.7	Pass	0	1	Vertical
7.389	74	43	65.8	-22.8	-5.7	Pass	0	1	Vertical
7.392	77.8	37.1	65.8	-28.7	-5.7	Pass	0	1	Vertical
7.398	78.1	36.4	65.8	-29.4	-5.6	Pass	0	1	Vertical
7.402	77.7	35.7	65.8	-30.1	-5.6	Pass	0	1	Vertical
7.41	73.8	43.7	65.8	-22.1	-5.6	Pass	0	1	Vertical
7.415	72.6	43.3	65.8	-22.5	-5.6	Pass	0	1	Vertical
7.42	72.7	35.2	65.8	-30.6	-5.6	Pass	0	1	Vertical
7.428	73.7	35.2	65.8	-30.6	-5.6	Pass	0	1	Vertical
7.432	72	41.5	65.8	-24.3	-5.6	Pass	0	1	Vertical

Table 13: Electric Field Emissions, 3rd harmonic, 300ml in front right of oven

6.4.12 Electric field emissions, 18GHz to 24.5GHz

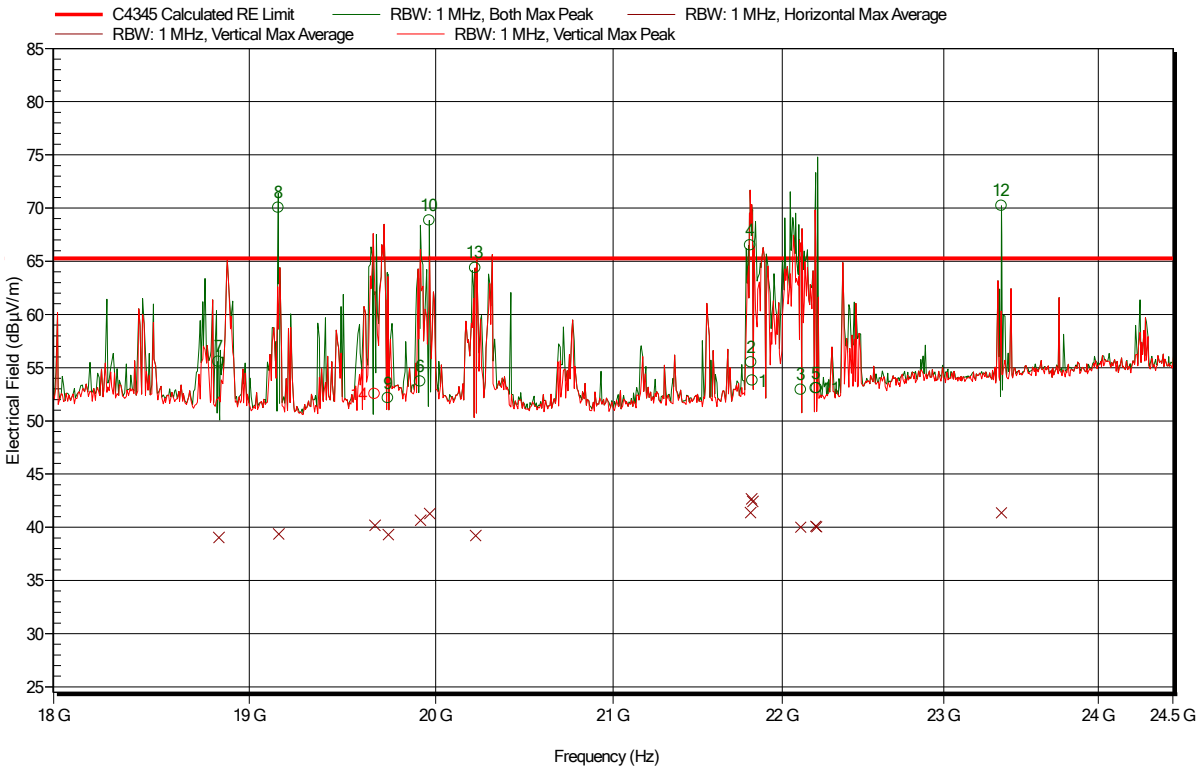


Figure 19: Electric field emissions Plot, 18GHz to 24.5GHz

Frequency GHz	Peak dBµV/m	Average dBµV/m	Average Limit dBµV/m	Average Difference dB	Average Correction dB	Average Status	Angle degrees	Height m	Polarization
21.819	53.79	42.47	65.8	-22.33	16.2	Pass	60	2.3	Vertical
21.813	55.5	42.71	65.8	-22.59	16.2	Pass	175	2.7	Vertical
22.112	52.92	40	65.8	-25.3	16.7	Pass	280	2.3	Vertical
21.806	66.49	41.42	65.8	-23.88	16.2	Pass	310	1.9	Vertical
22.203	53.07	40.11	65.8	-25.19	17	Pass	285	3.6	Vertical
19.913	53.71	40.68	65.8	-24.62	14.4	Pass	325	1.2	Horizontal
18.839	55.56	39.08	65.8	-26.22	14.6	Pass	70	1	Horizontal
19.152	70.04	39.42	65.8	-25.88	14.2	Pass	250	3.6	Horizontal
19.737	52.14	39.35	65.8	-25.95	14.3	Pass	305	1.2	Vertical
19.965	68.82	41.32	65.8	-23.98	14.4	Pass	300	1.8	Horizontal
22.21	53.06	40.02	65.8	-25.28	17	Pass	295	3.9	Horizontal
23.368	70.2	41.34	65.8	-23.96	19.3	Pass	315	1.2	Horizontal
20.219	64.38	39.26	65.8	-26.04	14.3	Pass	150	1.1	Vertical
19.666	52.52	40.22	65.8	-25.08	14.3	Pass	95	2.3	Horizontal

Table 14: Electric Field Emissions Peaks, 18GHz to 24.5GHz

6.4.13 Average correction factors

The total average corrections are shown in the above table. This correction figure consists of Preamplifier gain (PG), Antenna factor (AF); Attenuator loss (AL) and Cable loss (CL).

Field strength (FS) is calculated as follows:

FS (dBµV/m) = Indicated Signal Level (dBµV) - PG (dB) + AF (dB) + AL (dB) + CL (dB)

6.4.14 Sample Data

The Average level at 9.727GHz

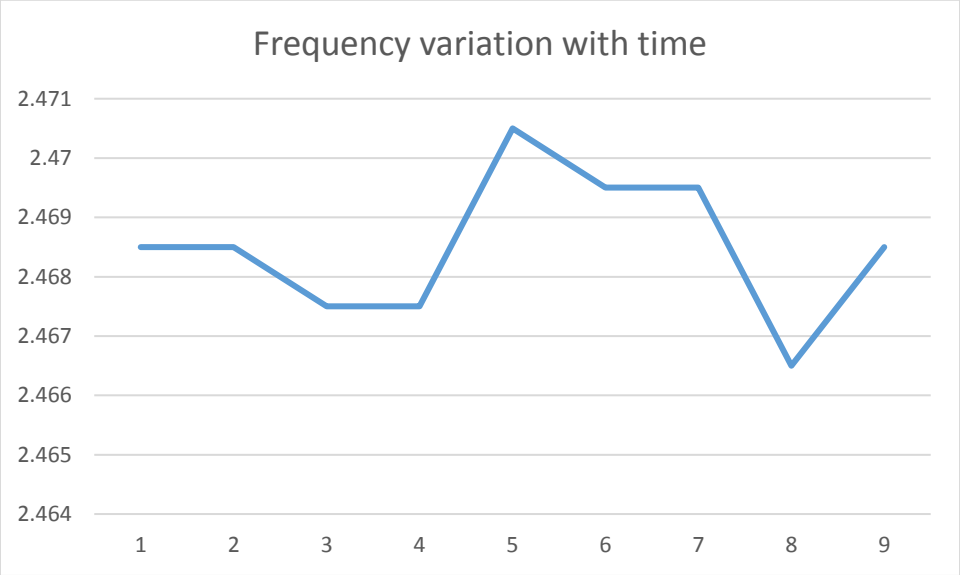
FS (dBµV/m) = 38.96dBµV/m = 39.64dBµV – 52.33dB + 38.09dB + 0dB + 13.56dB

Section 7 Frequency Variation

7.1.1 Frequency Variation with time

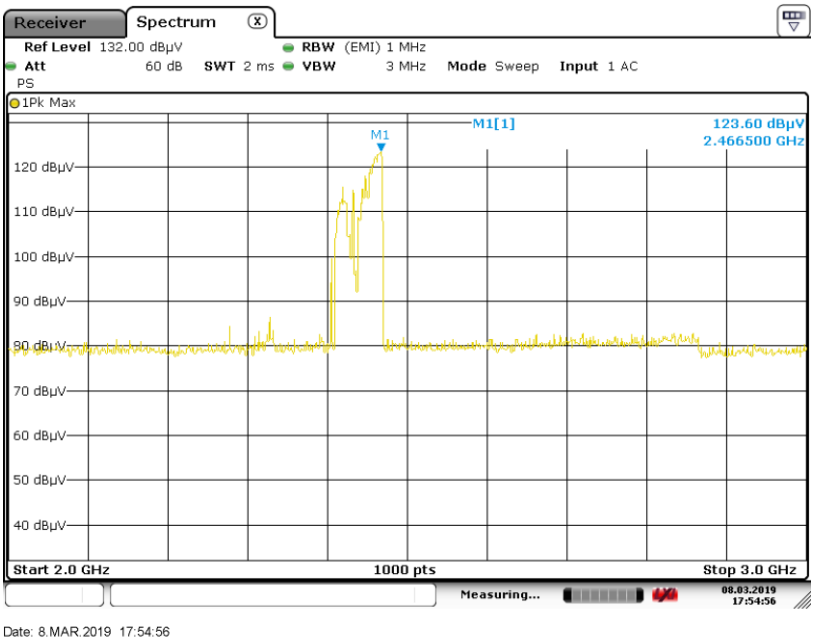
The operating frequency range specified in CFR 18.301 is 2.45GHz +/- 50MHz. The method of MP5 para 4.5(a) was used. Measurement of the operating frequency were made at 5 minute intervals and are tabulated below:

Time (min)	Frequency (GHz)
0	2.4685
5	2.4685
10	2.4675
15	2.4675
20	2.4705
25	2.4695
30	2.4695
35	2.4665
40	2.4685

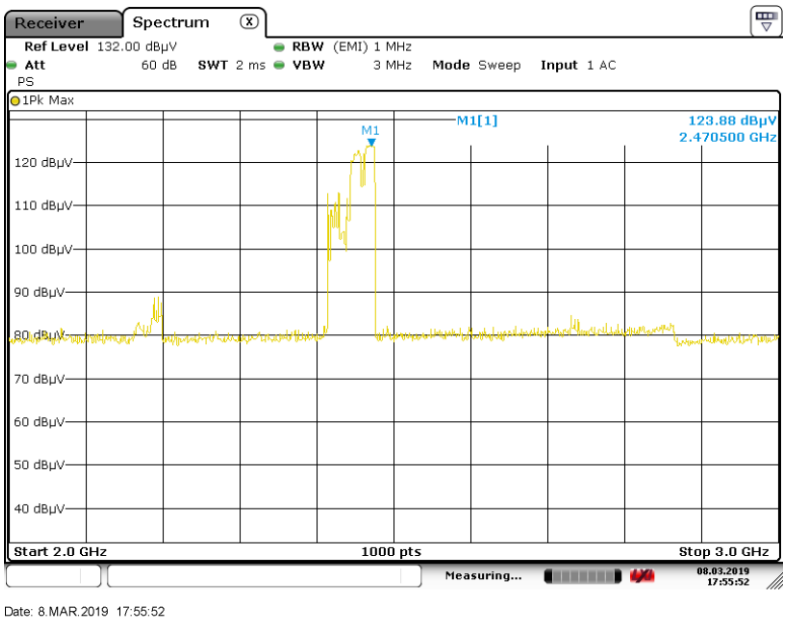


7.1.2 Frequency Variation line voltage

The operating frequency range specified in CFR 18.301 is 2.45GHz +/- 50MHz. The method of MP5 para 4.5(b) was used. Measurement of the operating frequency were made at line voltages of 176Vac (80% of 220Vac) and 275Vac (125% of 220Vac).



Operating frequency at 176Vac



Operating frequency at 275Vac

Frequency extremes were 2.4665GHz were 2.4705GHz, within allowed margins.

Appendix A EUT Test Photos

Photographs are supplied as separate exhibits.

Appendix B Test Equipment List

Conducted Emissions

Item	Serial No.	Last Calibration Date	Calibration Interval
Rohde & Schwarz ESR 7	C0499	01/02/2018	12 Months
Narda LISN	C0413	12/10/2018	24 Months
Cable	C5	11/1/2018	12 Months
Cable	D4	19/1/2018	12 Months
10dB Transient limiter	78087	29/1/2018	12 Months

Radiated Emissions Equipment

Item	Serial No.	Last Calibration Date	Calibration Interval
Laboratory 1 Semi-Anechoic Chamber	Lab 1	07/12/2016	36 Months
ETS Lindgren 2017B Mast (1 – 4m) with tilting mechanism	--	N/A	N/A
Rohde & Schwarz ESR 26	101464	18/04/2018	12 Months
Teseq CBL6112D Bilog Antenna	49040	15/08/2018	12 Months
6dB Attenuator (For use with Bilog Antenna)	C0506B	15/08/2018	12 Months
HF25 Cable (For use from 9kHz to 18GHz)	181004-001	15/01/2019	12 Months
HF14 Cable (For use from 9kHz to 18GHz)	167003-001	15/01/2019	12 Months
HF17 Cable (For use from 9kHz to 18GHz)	167002-001	15/01/2019	12 Months
EMCO 3115 Horn Antenna	9712-5380	02/05/2018	24 Months
BONN BLMA 0118-5A Preamplifier	149759	07/01/2019	12 Months
RS 1313 thermometer	C0488	Feb 2018	12 months
K type thermocouple	434858	Feb 2018	12 months

Note: The last two items were used during determination of output power in order to calculate the radiated emissions limit.