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FCC Test Firm Designation	IE0002
ISED Cab Identifier	IE0001
Date	25 th Sept 2024
EUT Description	RFID module
FCC ID	SCC NUR30W1
IC ID	5137A-NUR30W1
Authorised by	Paul Reilly
Authorised Signature:	

TEST SUMMARY

The equipment complies with the requirements according to the following standards.

FCC Spec.	Test Parameters	Status
15.109	Radiated Spurious Emissions	Pass
15.107	Conducted Emissions on the mains	Pass

Test Method as per Ansi 63-4 :2014

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF COMPLIANCE ENGINEERING IRELAND LTD.

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1 EUT Description

The EUT was an RFID module using frequency hopping in the 902-928MHz frequency band.

The EUT was fitted to a host pcb to allow powering and connection of external antenna. This report details tests carried out with the EUT as a computer peripheral.

1.1 EUT Operation

Operating Conditions during Test:

The EUT was connected to a laptop via usb cable for EUT test as computer peripheral.

The laptop was powered via dc adapter as detailed in section 1.1.1

During all tests there were no channels transmitting.

Environmental conditions

	Temperature	Relative Humidity
Test	°C	%
Conducted Emissions on Mains	21	42
Radiated Emissions <1GHz	21	52
Radiated Emissions >1GHz	23	55

1.1.1 Laptop, Power and cable description

Dell Laptop	Inspiron 3583
Dell AC Adapter	DPN00285K

Cable Description	Type	Length Metres
Laptop to DC power	unshielded	1
Mains lead	unshielded	1

Cable Description	Type	Length Metres
USB Type-C cable to computer	unshielded	1

1.2 Modifications

No modifications were required in order to pass the test specifications.

1.3 Date of Test

The tests were carried out on 19th and 25th Sept 2024.

1.4 Description of Test methods

Tests were performed manually, and no special test software was used.

This report contains the worst-case results as measured with the S0 antenna connected to Ant1 port on the host pcb..

2 Results for Conducted Emissions on the Mains

Conducted Emissions on the mains test was performed on the peripheral equipment for setting the channels and controlling the host PCB.

Refer to Section 1.1.1 of this report for information on the peripheral equipment.

Detector	Frequency	Reading	Margin	Phase
QP/ Ave	MHz	dBuV	dB	L/N
Quasi-Peak	0.1523	50.46	-15.48	Live
Average	0.1680	36.23	-19.26	Live
Average	0.1950	33.14	-21.57	Live
Average	0.5258	28.60	-17.4	Live
Average	3.154	24.84	-21.16	Live
Quasi-Peak	3.647	30.68	-25.32	Live

Detector	Frequency	Reading	Margin	Phase
QP/ Ave	MHz	dBuV	dB	L/N
Quasi-Peak	0.1523	51.35	-14.59	Neutral
Average	0.1680	35.95	-19.54	Neutral
Average	0.1950	32.71	-22	Neutral
Average	0.5258	25.54	-20.46	Neutral
Average	3.1538	18.62	-27.38	Neutral
Quasi-Peak	3.6465	24.14	-31.86	Neutral

Refer to Appendix B for scans

Test Result: Pass

3 Radiated Measurements

3.1 Radiated Emissions Measurements

The EUT was centered on a motorized turntable, which allows 360-degree rotation. Emissions were measured using an antenna positioned at a distance of 3-metres from the EUT (as measured from the closest point of the EUT). The radiated emissions peaks were maximised by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 metres.

Emissions below 1 GHz were measured on a test table height of 0.8metres in a semi anechoic chamber using a resolution bandwidth of 100KHz.

Emissions above 1 GHz were measured on a test table height of 0.8metres in a fully anechoic chamber using a resolution bandwidth of 1MHz.

An initial pre-scan was carried out to determine the worst-case configuration.

Measurements performed according to the procedures in ANSI C63.4-2014.

Frequency	Quasi peak Level	EUT Orientation	Antenna Polarity	Antenna Factor	Preamp Gain	Cable loss	Final Field Strength Quasi Peak	Average Limit	Margin	Result
MHz	dBuV/m		V/H	dB	dB	dB	dBuV/m	dBuV/m	dB	P/F
32.700	22.6	O1	Vertical	13.8	0	1	37.4	40.0	2.6	Pass
45.750	23.8	O1	Vertical	11.5	0	1.2	36.5	40.0	3.5	Pass
56.040	18.0	O1	Vertical	10.1	0	1.3	29.4	40.0	10.6	Pass
124.830	10.3	O1	Vertical	10.7	0	1.8	22.8	43.5	20.7	Pass
156.000	12.9	O1	Vertical	11.8	0	2	26.7	43.5	16.8	Pass
270.000	0.6	O1	Vertical	17.3	0	2.6	20.5	46.0	25.5	Pass
45.900	16.5	O1	Horizontal	11.5	0	1.2	29.2	40.0	10.8	Pass
77.640	15.2	O1	Horizontal	9.3	0	1.5	26.0	40.0	14.0	Pass
83.610	20.7	O1	Horizontal	9	0	1.5	31.2	40.0	8.8	Pass
95.970	18.6	O1	Horizontal	9.1	0	1.7	29.4	43.5	14.1	Pass
120.060	16.6	O1	Horizontal	10.7	0	1.8	29.1	43.5	14.4	Pass
156.000	18.7	O1	Horizontal	11.8	0	2	32.5	43.5	11.0	Pass
270.030	6.1	O1	Horizontal	17.3	0	2.6	26.0	46.0	20.0	Pass

Final Field Strength Quasi Peak (dBuV/m) =Quasi peak Level (dBuV/m) + Antenna Factor (dB)- Pre-amp Gain (dB) +Cable Loss (dB)

Calculation Example $36.5 = 23.8 + 11.5 - 0 + 1.2$

Test Result Pass

Frequency	Reading Peak	EUT Orientation	Antenna Polarity	Antenna Factor	Preamp Gain	Cable loss	Final Field Strength Peak	Average Limit	Margin for Peak v Average Limit +20dB	Result
GHz	dBuV/m		V/H	dB	dB	dB	dBuV/m	dBuV/m	dB	P/F
1.536	15.3	O1	Vertical	25.6	0	3.8	44.7	54.0	29.3	Pass
1.722	19.3	O1	Vertical	26.8	0	4	50.1	54.0	23.9	Pass
2.131	18.8	O1	Vertical	27.8	0	4.5	51.1	54.0	22.9	Pass
1.186	14.2	O1	Horizontal	25	0	3.4	42.6	54.0	31.4	Pass
1.428	17.2	O1	Vertical	25.3	0	3.7	46.2	54.0	27.8	Pass

Final Field Strength Peak (dBuV/m) =Reading Peak (dBuV/m) + Antenna Factor (dB)- Pre-amp Gain (dB) +Cable Loss (dB)
 Calculation Example $44.7 = 15.3 + 25.6 - 0 + 3.8$

Average measurements were not performed where the final field strength peak reading was below the average limit of 54 dBuV/m

Refer to Appendix A for scans

Test Result: Pass

4 List of Test Equipment

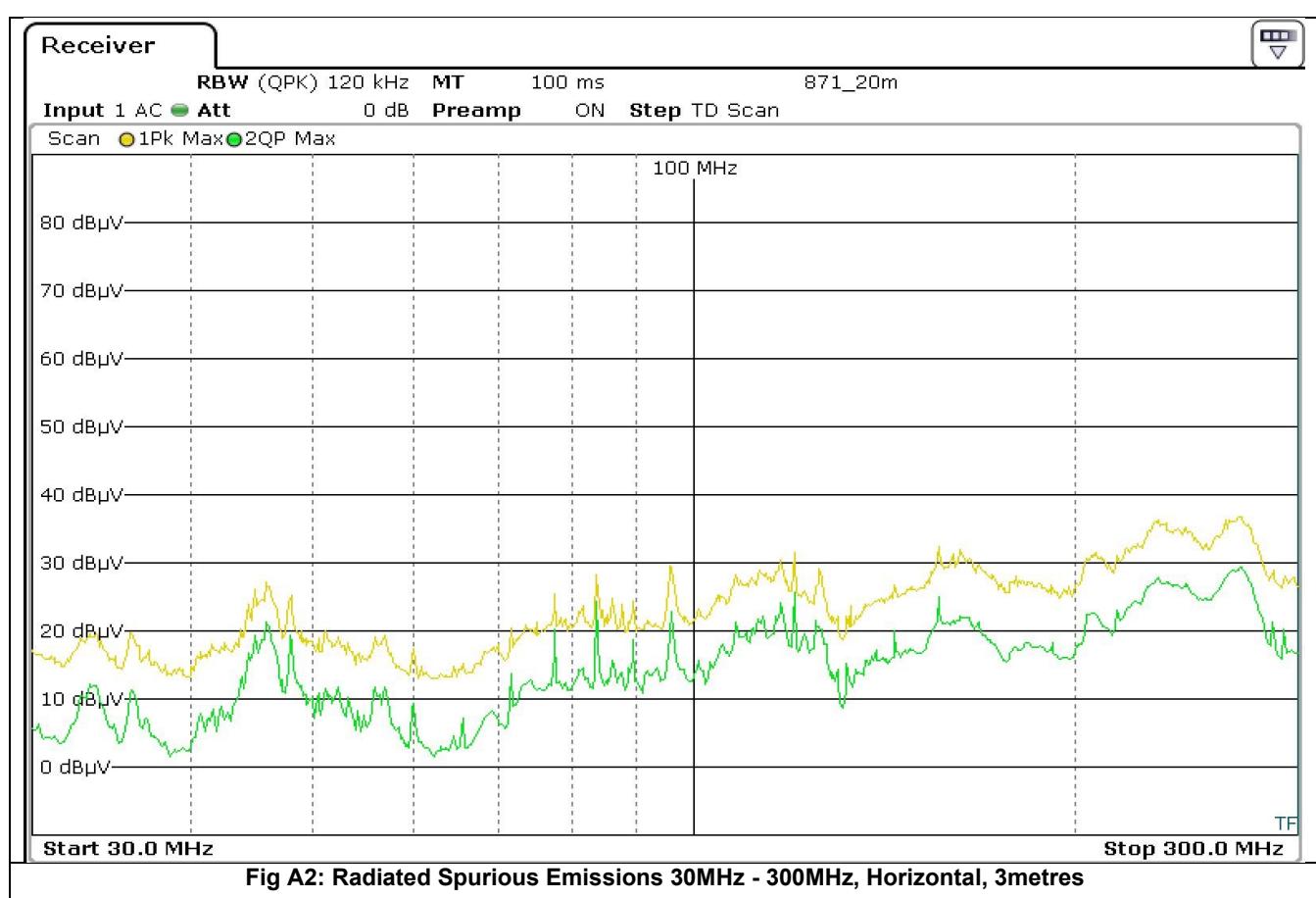
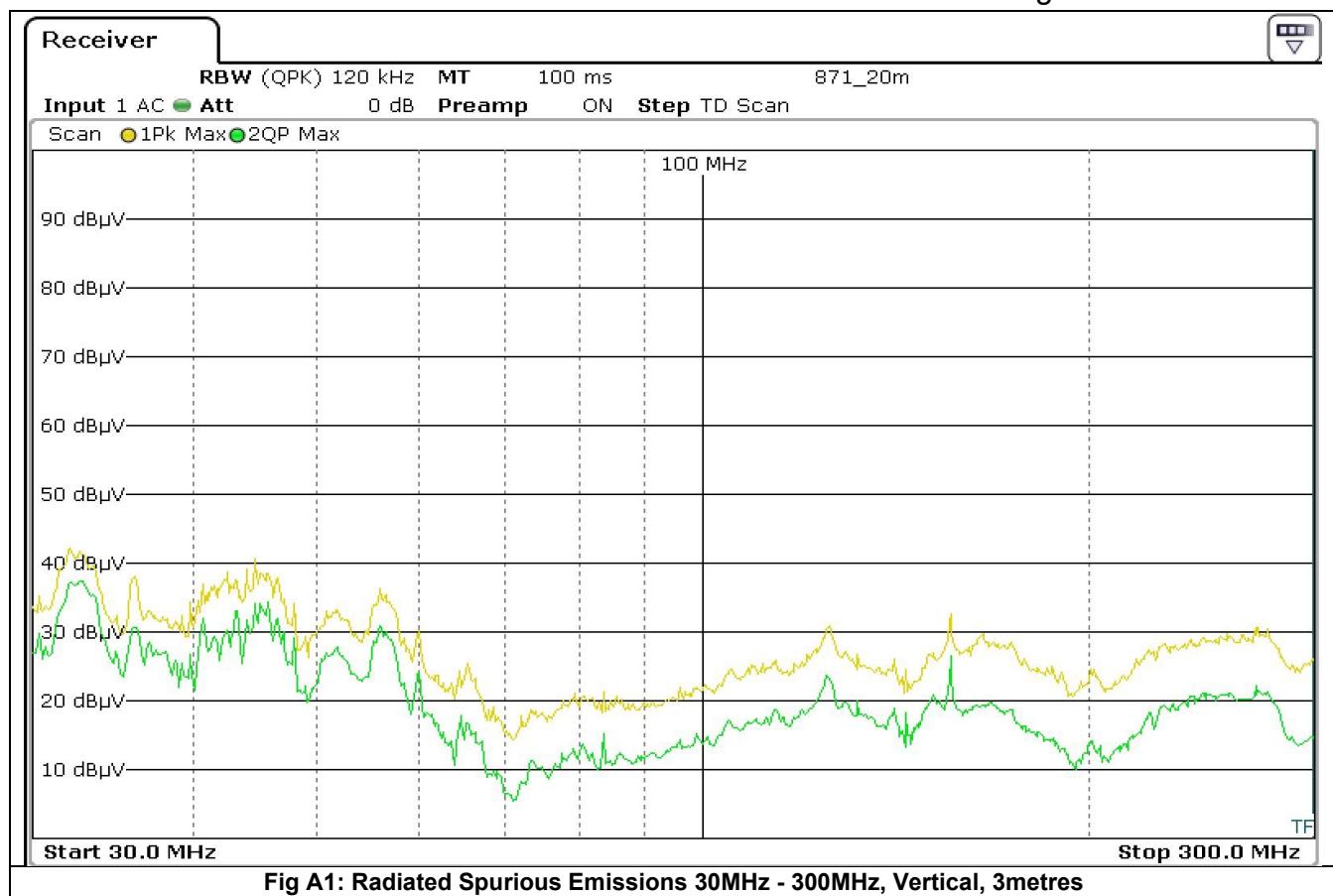
Instrument	Manufacturer	Model	Serial Num	CEI Ref	Cal Date	Cal Interval Months
Microwave Preamplifier	Hewlett Packard	83017A	3123A00175	805	29-Sep-23	12
Spectrum Analyser 30Hz-40GHz	Rohde & Schwarz	FSP40	100053	850	08-Dec-21	36
Test Receiver 3.6GHz	Rohde & Schwarz	ESR	1316.3003k03-101625-s	869	23-May-23	36
Antenna Horn	EMCO	3115	2363	1100	19-Feb-23	36
Fully Anechoic Chamber	CEI	FAR 3M	906	906	11-May-23	36
Anechoic Chamber	CEI	SAR 10M	845	845	10-Sep-22	36
Antenna Biconical	Schwarzbeck	VHBB 9124	9124 667	871	04-Oct-21	36
Antenna Log Periodic	AH Systems	SAS200/510	1001	784	14-Nov-22	36
Cable 20m				1213	02-Aug-24	12
Cable purple Ktype 1.8m				917	02-Aug-24	12
Cable HF Ktype 1.5m				705	02-Aug-24	12
LISN	Rohde & Schwarz	ESH3-Z5	825460/003	604	22-Feb-23	36

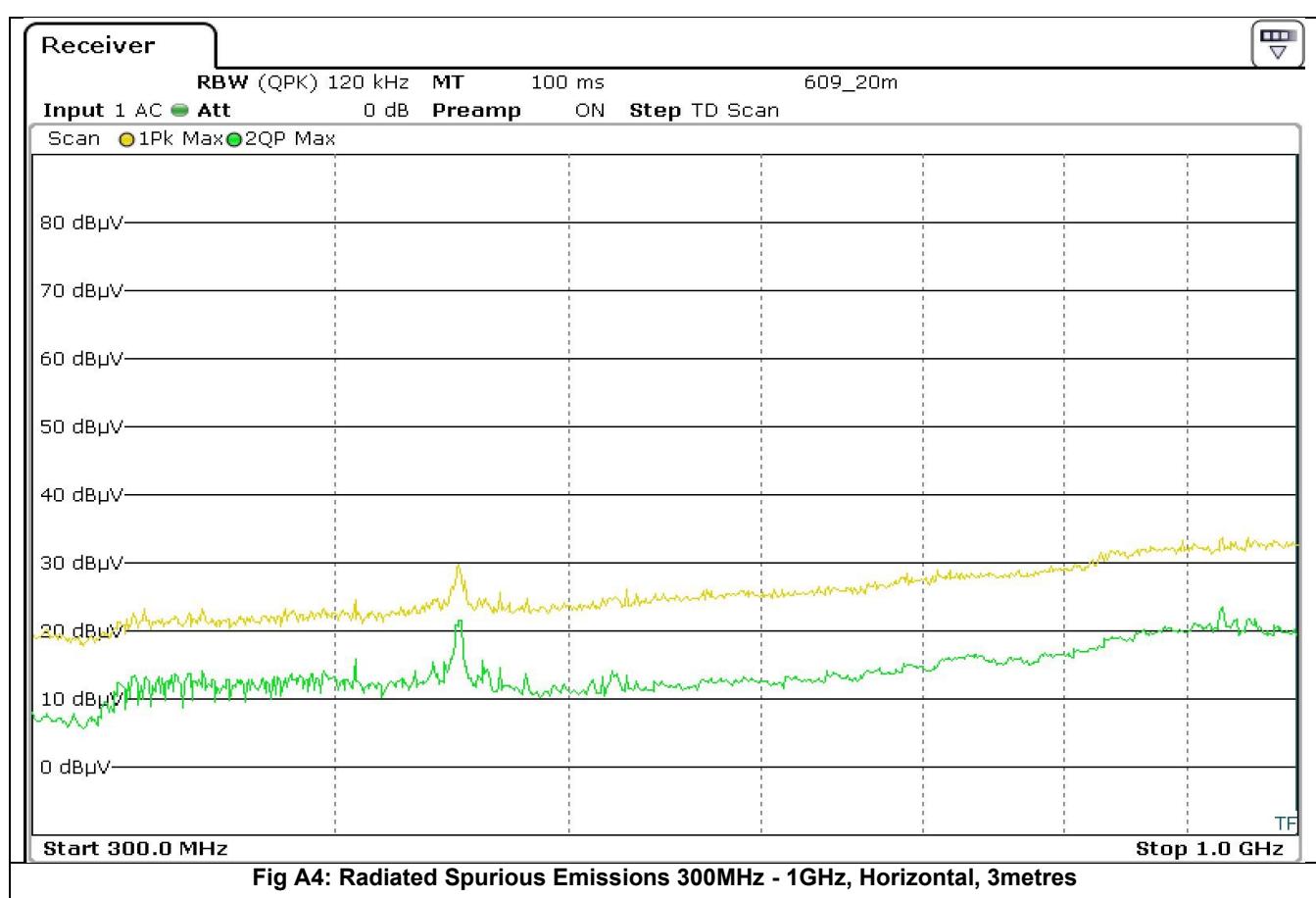
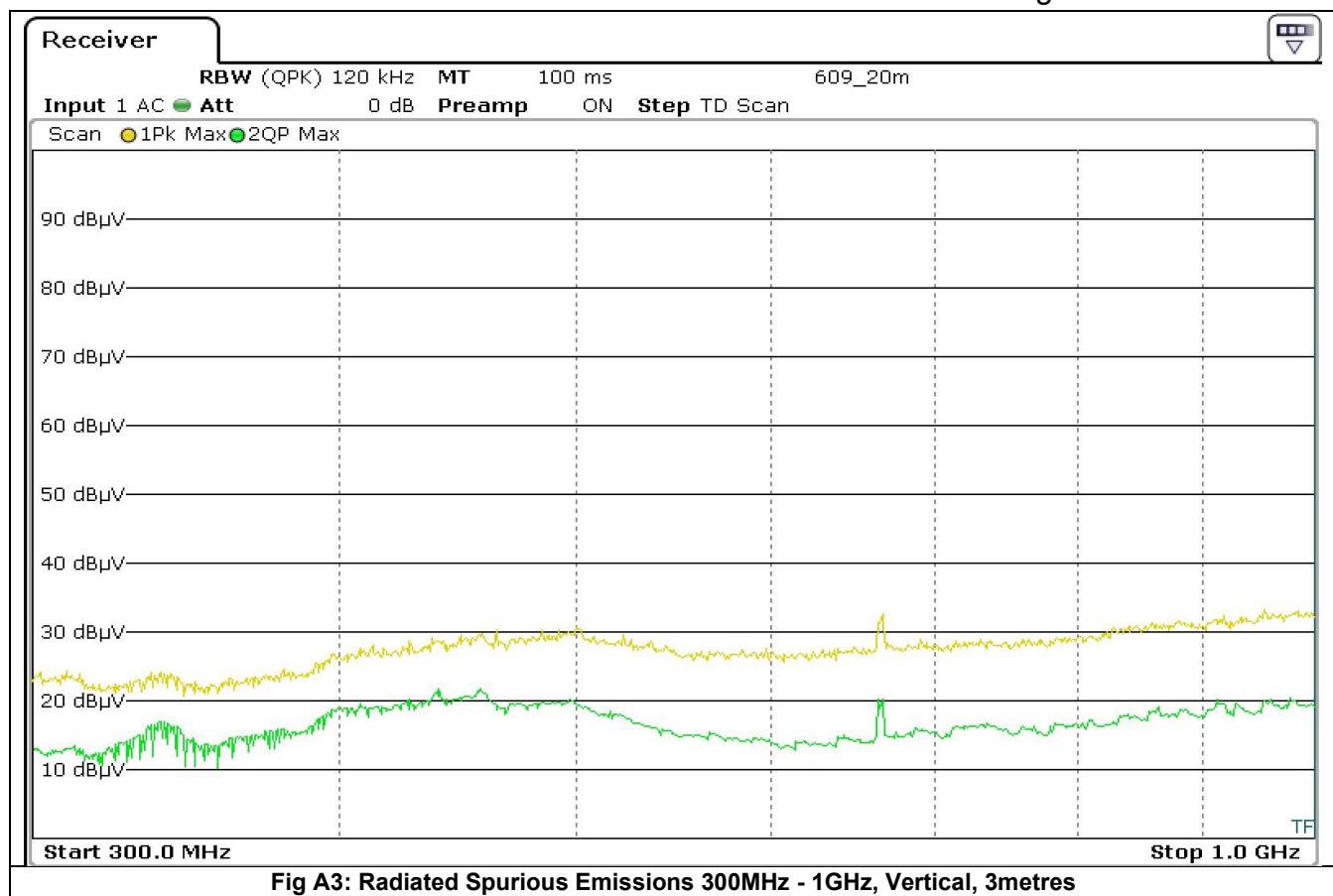
5 Measurement Uncertainties

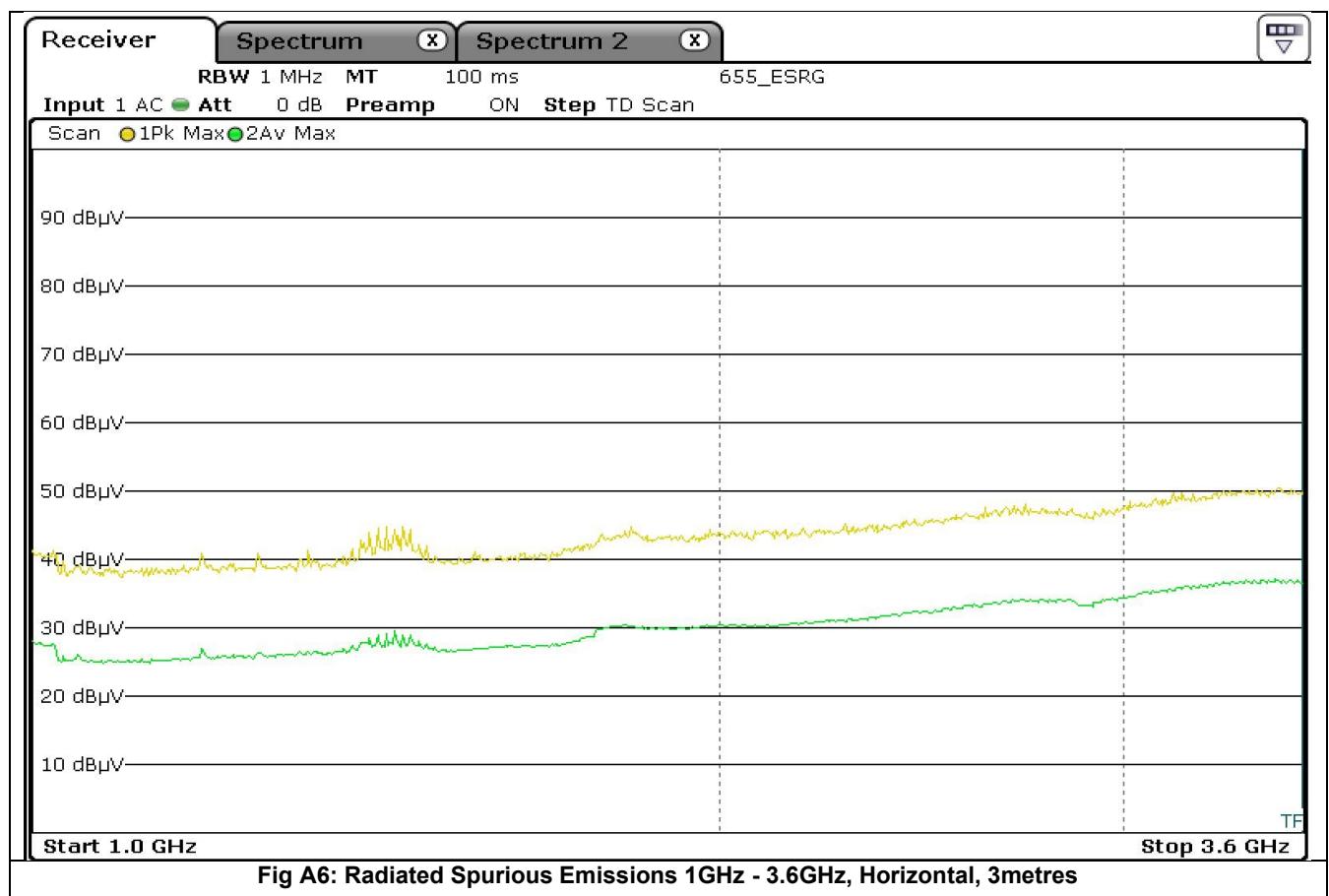
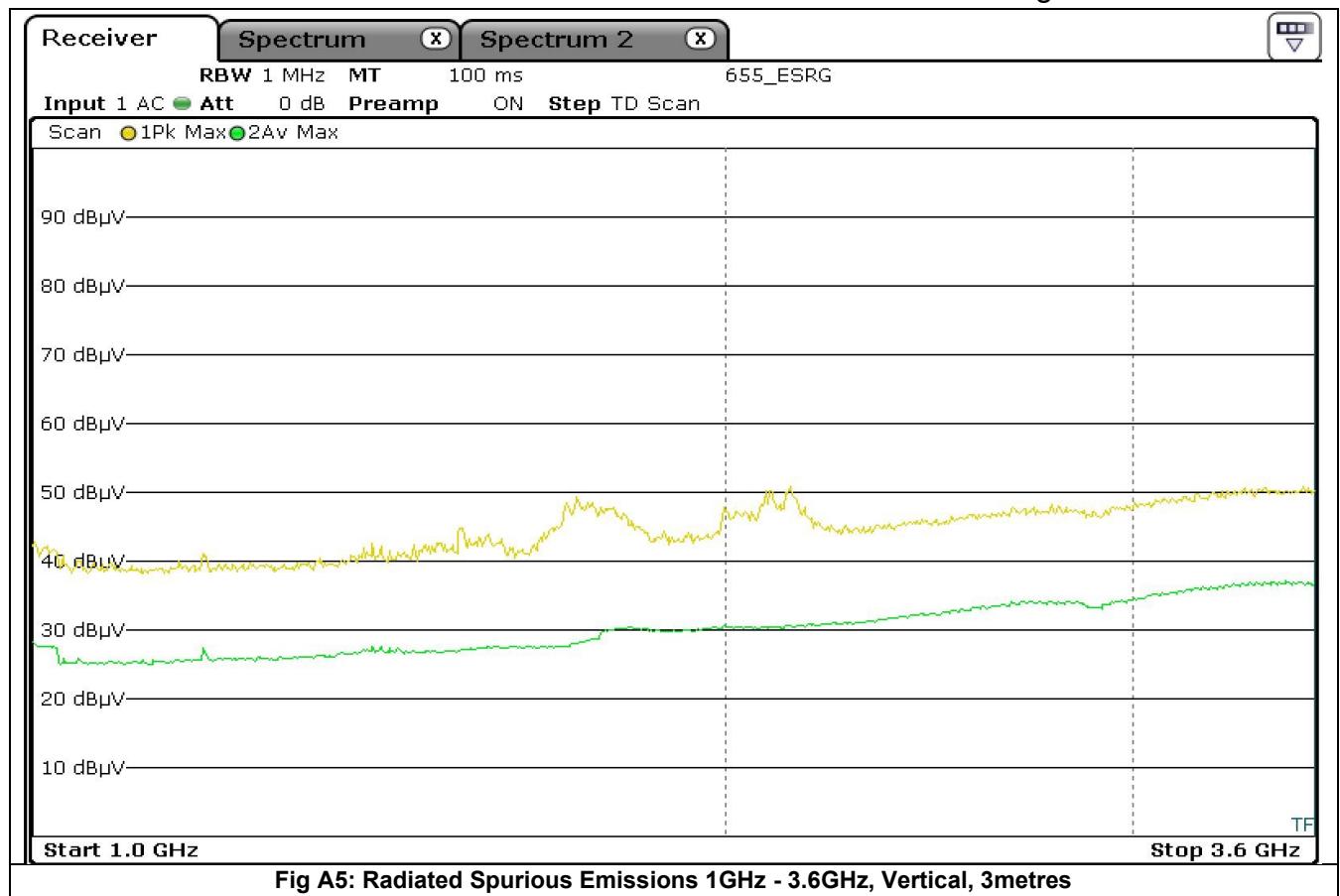
Measurement	Uncertainty
Radio Frequency	+/- 5×10^{-7}
Maximum Frequency Deviation	+/- 1.7 %
Conducted Emissions	+/- 1 dB
Radiated Emission 30MHz-100MHz	+/- 5.3 dB
Radiated Emission 100MHz-300MHz	+/- 4.7 dB
Radiated Emission 300MHz-1GHz	+/- 3.9 dB
Radiated Emission 1GHz-40GHz	+/- 3.8 dB
Modulation bandwidth	+/- 5×10^{-7}
Duty Cycle	+/- 5 %
Power supply	± 0.1 VDC
Temperature	± 0.2 °C
Frequency	± 0.01 ppm

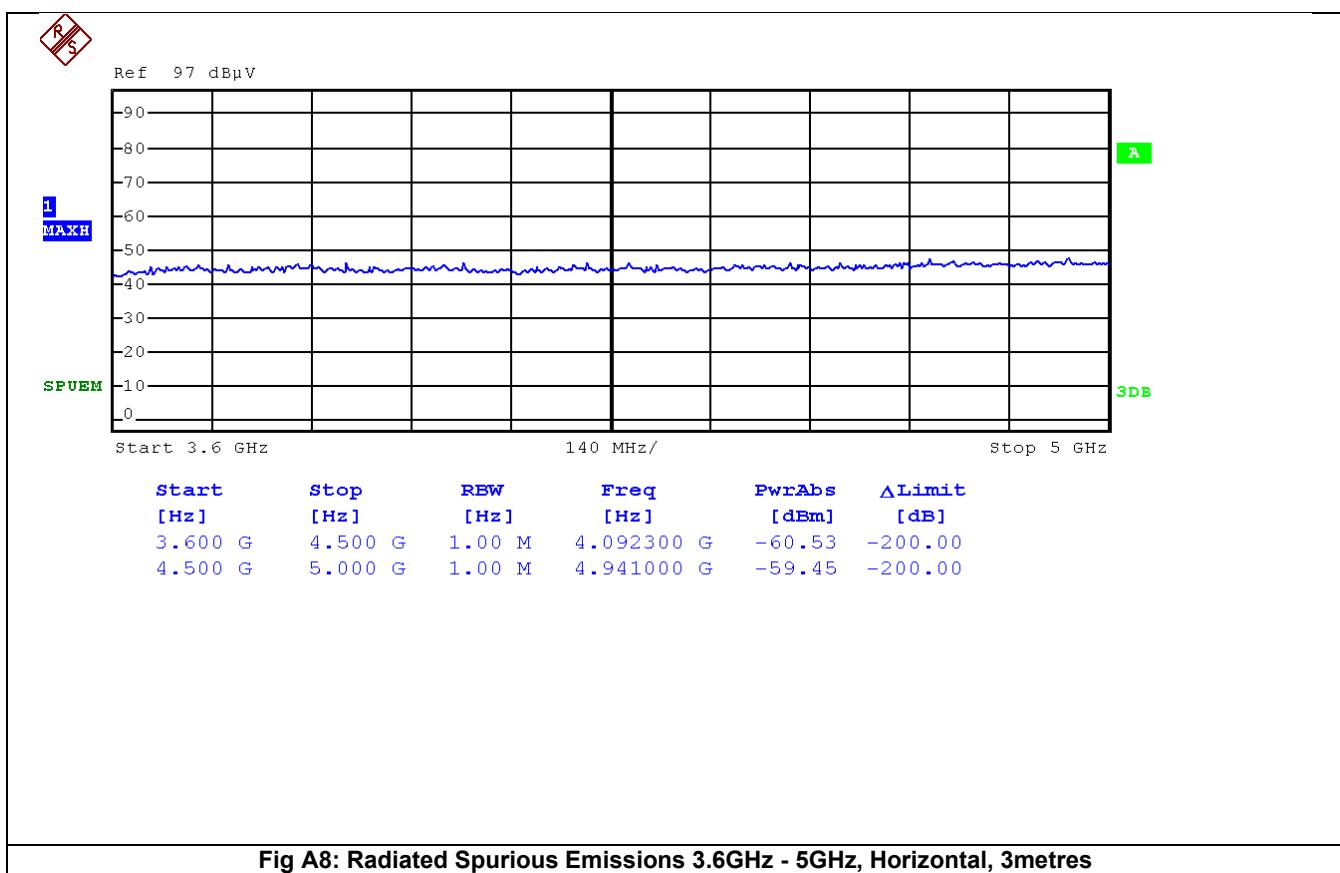
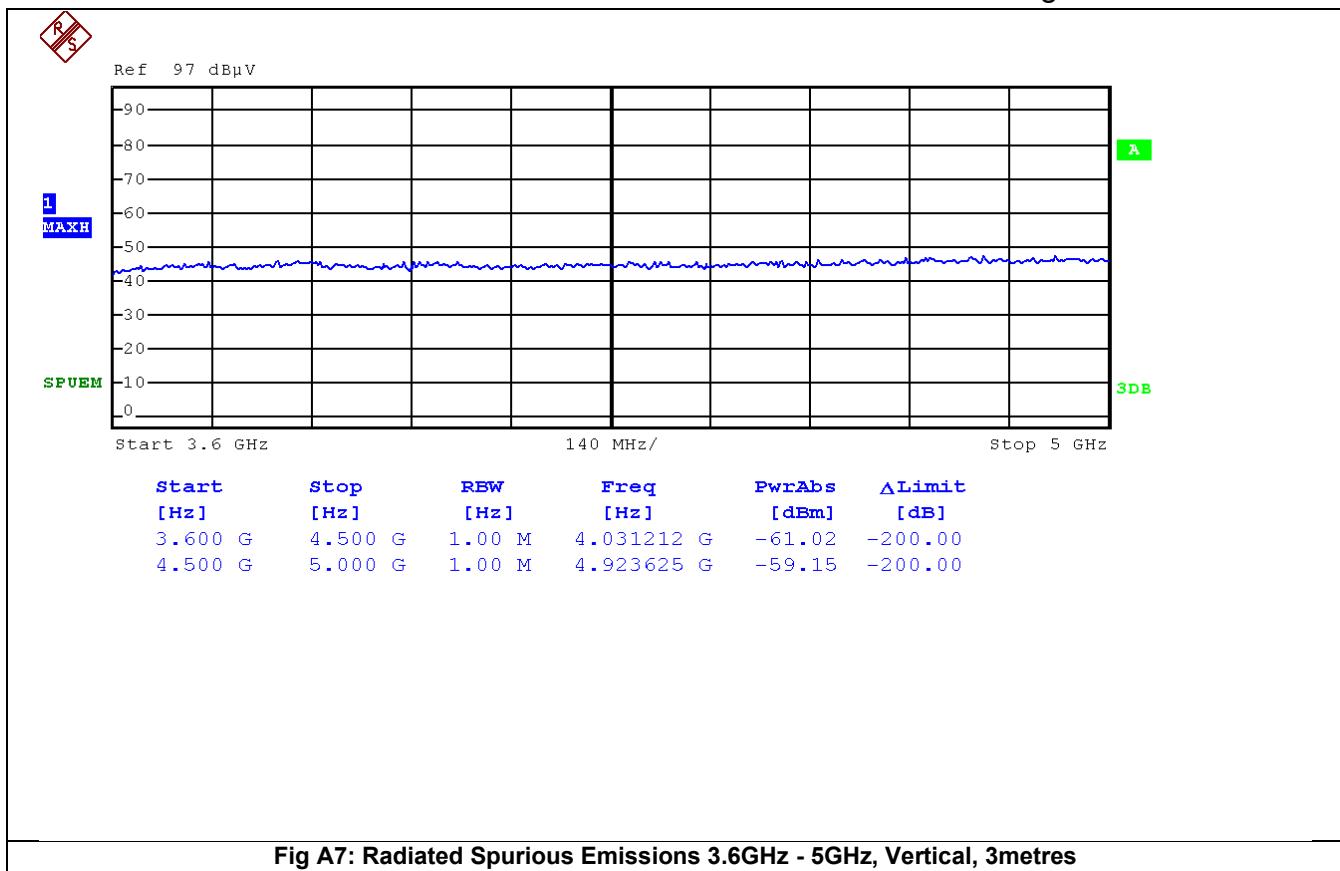
The measurement uncertainties stated were calculated with a k=2 for a confidence level of over 95% as per ETS TR100 028.

Appendix A: Radiated Spurious Emissions Scans









Appendix B: Conducted Emissions on the Mains

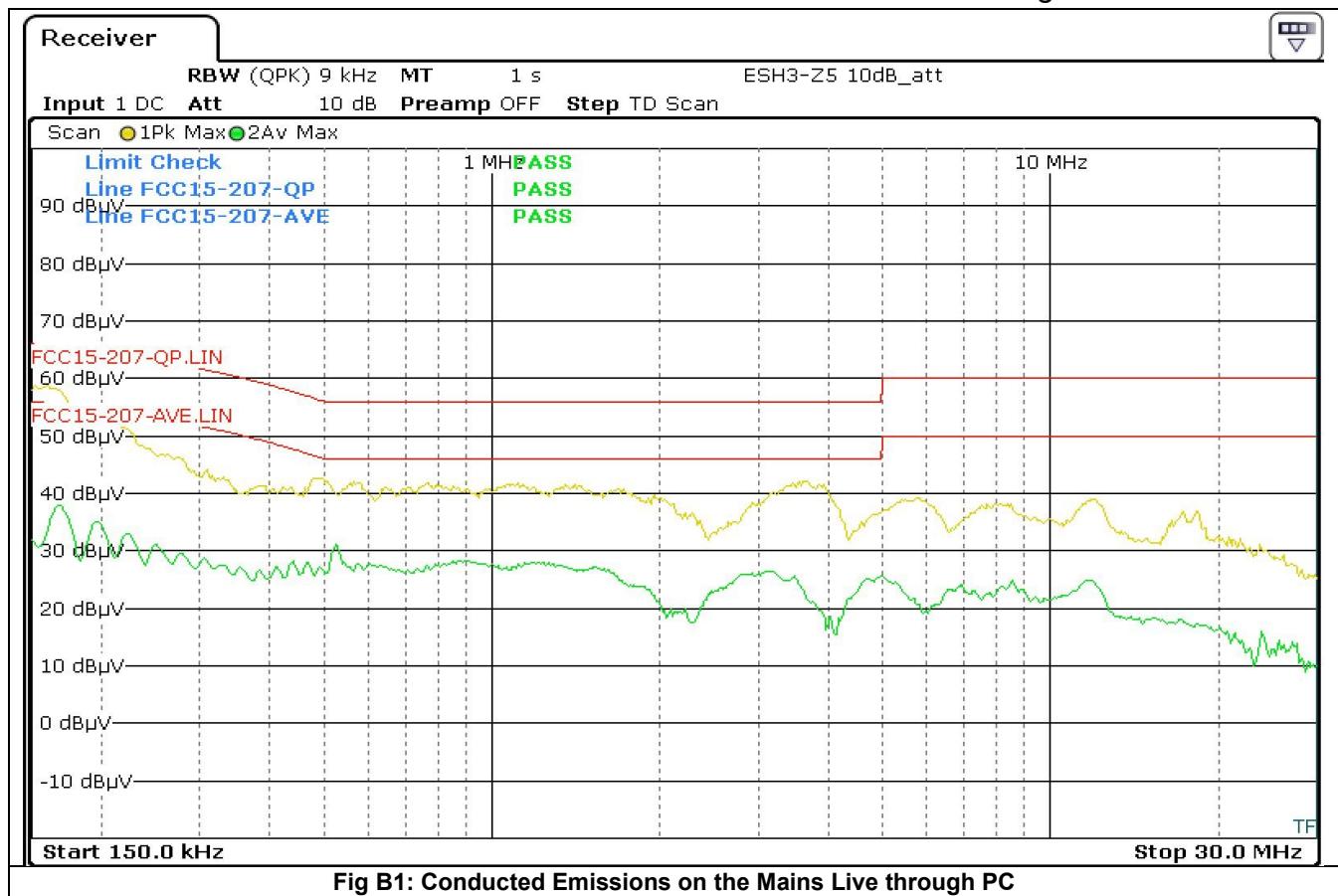


Fig B1: Conducted Emissions on the Mains Live through PC

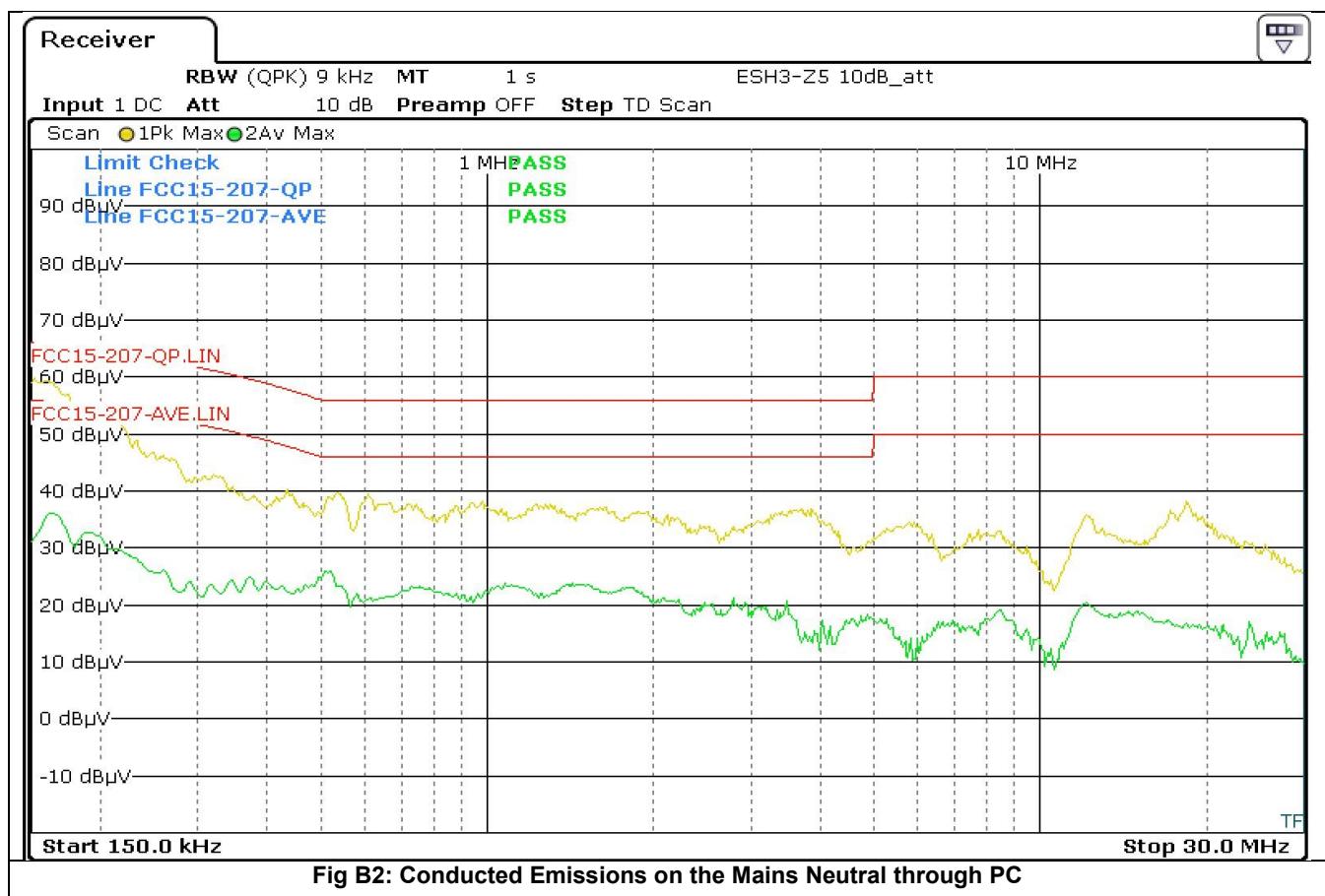
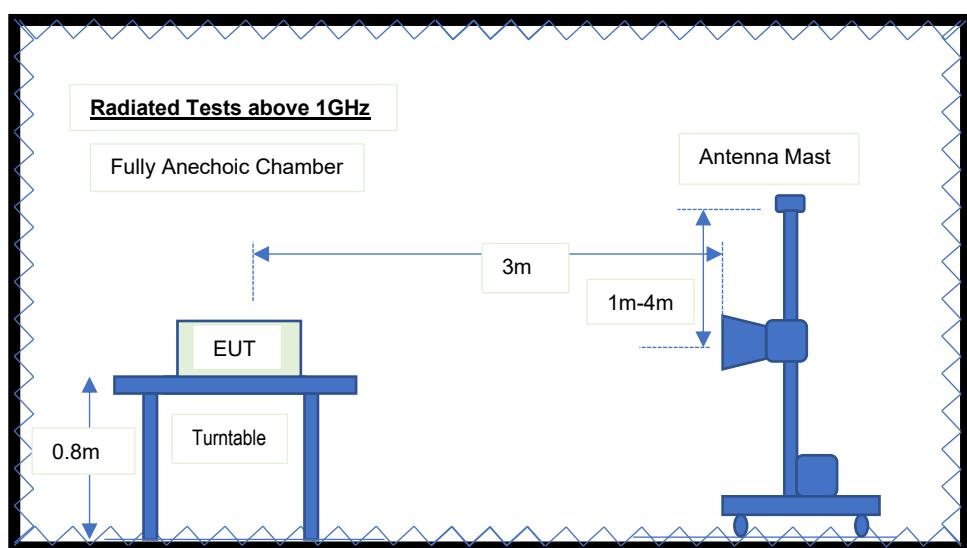
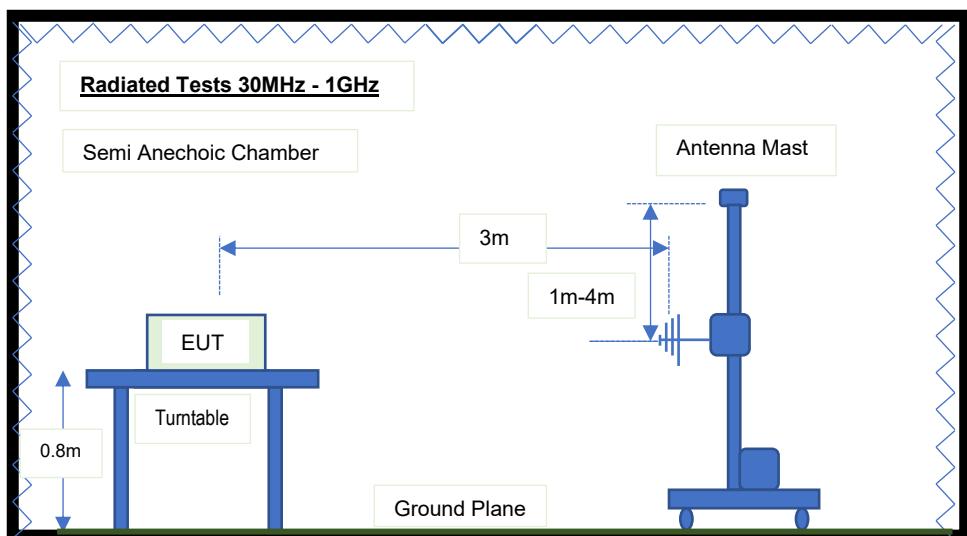


Fig B2: Conducted Emissions on the Mains Neutral through PC

Appendix C: Block Diagrams of test set up



End of Report