

<b>Project No.</b>	24E11050-2a
<b>Quotation</b>	Q24-1904-2
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<b>FCC Test Firm Designation</b>	IE0002
<b>ISED Cab Identifier</b>	IE0001
<b>Date</b>	19 <sup>th</sup> Jun 2024
<b>EUT Description</b>	RFID module
<b>FCC ID</b>	SCC NUR30W5
<b>IC ID</b>	5137A-NUR30W5
<b>Authorised by</b>	<b>Paul Reilly</b>
<b>Authorised Signature:</b>	

**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

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## Contents

<b>1</b>	<b>EUT DESCRIPTION .....</b>	<b>3</b>
1.1	EUT OPERATION .....	4
1.1.1	<i>EUT Power and cable description .....</i>	4
1.1.2	<i>Laptop, Power and cable description .....</i>	4
1.2	MODIFICATIONS .....	5
1.3	DATE OF TEST .....	5
1.4	DESCRIPTION OF TEST METHODS.....	5
<b>2</b>	<b>RESULTS FOR CONDUCTED EMISSIONS ON THE MAINS .....</b>	<b>6</b>
<b>3</b>	<b>RADIATED MEASUREMENTS .....</b>	<b>7</b>
3.1	RADIATED EMISSIONS MEASUREMENTS .....	7
<b>4</b>	<b>LIST OF TEST EQUIPMENT .....</b>	<b>9</b>
<b>5</b>	<b>MEASUREMENT UNCERTAINTIES .....</b>	<b>10</b>
<b>APPENDIX A: RADIATED SPURIOUS EMISSIONS SCANS .....</b>		<b>11</b>
<b>APPENDIX B: CONDUCTED EMISSIONS ON THE MAINS .....</b>		<b>16</b>
<b>APPENDIX C: BLOCK DIAGRAMS OF TEST SET UP .....</b>		<b>18</b>

## 1 EUT Description

<b>Type:</b>	Industrial RFID reader
<b>Type of radio:</b>	Stand-alone
<b>Transmitter Type:</b>	RFID FHSS
<b>Operating Frequency Range(s):</b>	902.75-927.25 MHz
<b>Number of Channels:</b>	50
<b>Channel Separation:</b>	500KHz
<b>Antenna:</b>	External
<b>External Antenna Gain:</b>	4dBi
<b>Antenna impedance</b>	50ohms
<b>Test Methodology:</b>	Computer Peripheral Measurements performed according to the procedures in ANSI C63.4-2014

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

This report details tests carried out with the EUT as a computer peripheral.

### **Software used to control the EUT**

Test software (NUR RD tester version 2.0.5.2) from Nordic ID running on a standard Windows laptop was used control the EUT during test,  
This application is downloadable from Nordic ID for the purposes of testing the EUT radio interface.

## 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 1.1.2. During all tests there were no channels transmitting.

### Environmental conditions

	Temperature	Relative Humidity
Test	°C	%
Conducted Emissions on Mains	20	40
Radiated Emissions <1GHz	22	40
Radiated Emissions >1GHz	23	45

### 1.1.1 EUT Power and cable description

EUT AC Adapter	Model Number
AC Adapter	FSP 040-DAAN3

Cable Description	Type	Length Metres
USB Type-C cable to computer	unshielded	1.8
EUT to DC power cable	unshielded	2
Mains cable	unshielded	1.5

### 1.1.2 Laptop, Power and cable description

Lenovo Laptop	X230
Lenovo AC Adapter	ADLX90NCT3A

Cable Description	Type	Length Metres
Laptop to DC power	unshielded	1.5
Mains lead	unshielded	1.6

## **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 7<sup>th</sup> Jun 2024.

## **1.4 Description of Test methods**

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

Preliminary tests were carried out on all ports and this report contains the worst-case results.

## 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 of the peripheral equipment.

Detector	Frequency	Reading	Margin	Phase
QP/ Ave	MHz	dBuV	dB	L/N
Average	1.2030	26.04	-19.96	Live
Average	1.2345	26.83	-19.17	Live
Average	1.2615	25.50	-20.5	Live
Average	1.6238	26.54	-19.46	Live
Quasi-Peak	1.826	27.74	-28.26	Live
Quasi-Peak	2.045	29.24	-26.76	Live
Quasi-Peak	2.222	23.30	-32.7	Live
Average	3.251	24.45	-21.55	Live
Average	3.280	26.14	-19.86	Live
Quasi-Peak	3.287	30.76	-25.24	Live
Quasi-Peak	3.638	29.00	-27	Live
Average	3.671	24.28	-21.72	Live
Quasi-Peak	3.723	29.78	-26.22	Live
Quasi-Peak	4.081	23.89	-32.11	Live
Quasi-Peak	4.238	20.85	-35.15	Live

Detector	Frequency	Reading	Margin	Phase
QP/ Ave	MHz	dBuV	dB	L/N
Average	1.2323	27.03	-18.97	Neutral
Average	1.6238	26.65	-19.35	Neutral
Quasi-Peak	2.0400	27.81	-28.19	Neutral
Quasi-Peak	2.1120	26.67	-29.33	Neutral
Quasi-Peak	3.2010	28.16	-27.84	Neutral
Average	3.2460	26.81	-19.19	Neutral
Average	3.2483	26.38	-19.62	Neutral
Quasi-Peak	3.2775	30.98	-25.02	Neutral
Average	3.2775	26.85	-19.15	Neutral
Quasi-Peak	3.6488	28.13	-27.87	Neutral
Average	3.6668	26.27	-19.73	Neutral
Quasi-Peak	3.7163	40.04	-15.96	Neutral
Quasi-Peak	4.0763	35.95	-20.05	Neutral
Quasi-Peak	4.2315	38.16	-17.84	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
120.000	24.8	O1	Vertical	10.7	0	1.8	37.3	43.5	6.2	Pass
135.750	19.5	O1	Vertical	11.2	0	1.9	32.6	43.5	10.9	Pass
251.910	1.7	O1	Vertical	16	0	2.5	20.2	46.0	25.8	Pass
120.000	26.7	O1	Horizontal	10.7	0	1.8	39.2	43.5	4.3	Pass
251.940	9.9	O1	Horizontal	16	0	2.5	28.4	46.0	17.6	Pass
137.760	13.4	O1	Horizontal	11.2	0	1.9	26.5	43.5	17.0	Pass
603.750	-6.4	O1	Vertical	19.4	0	4.2	17.2	46.0	28.8	Pass
324.090	5.5	O1	Horizontal	14.8	0	2.9	23.2	46.0	22.8	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  $37.3 = 24.8 + 10.7 - 0 + 1.8$

**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
1.823	18.0	O1	Vertical	27	0	4.2	49.2	54.0	24.8	Pass
1.850	14.6	O1	Horizontal	27	0	4.2	45.8	54.0	28.2	Pass
2.110	19.3	O1	Vertical	27.8	0	4.5	51.6	54.0	22.4	Pass
2.658	17.2	O1	Vertical	29.3	0	5.1	51.6	54.0	22.4	Pass
3.502	12.8	O1	Horizontal	31.4	0	6	50.2	54.0	23.8	Pass

**Final Field Strength Peak (dBuV/m) =Reading Peak (dBuV/m) + Antenna Factor (dB)- Pre-amp Gain (dB) +Cable Loss (dB)**  
 Calculation Example **49.2 = 18 + 27 - 0 + 4.2**

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

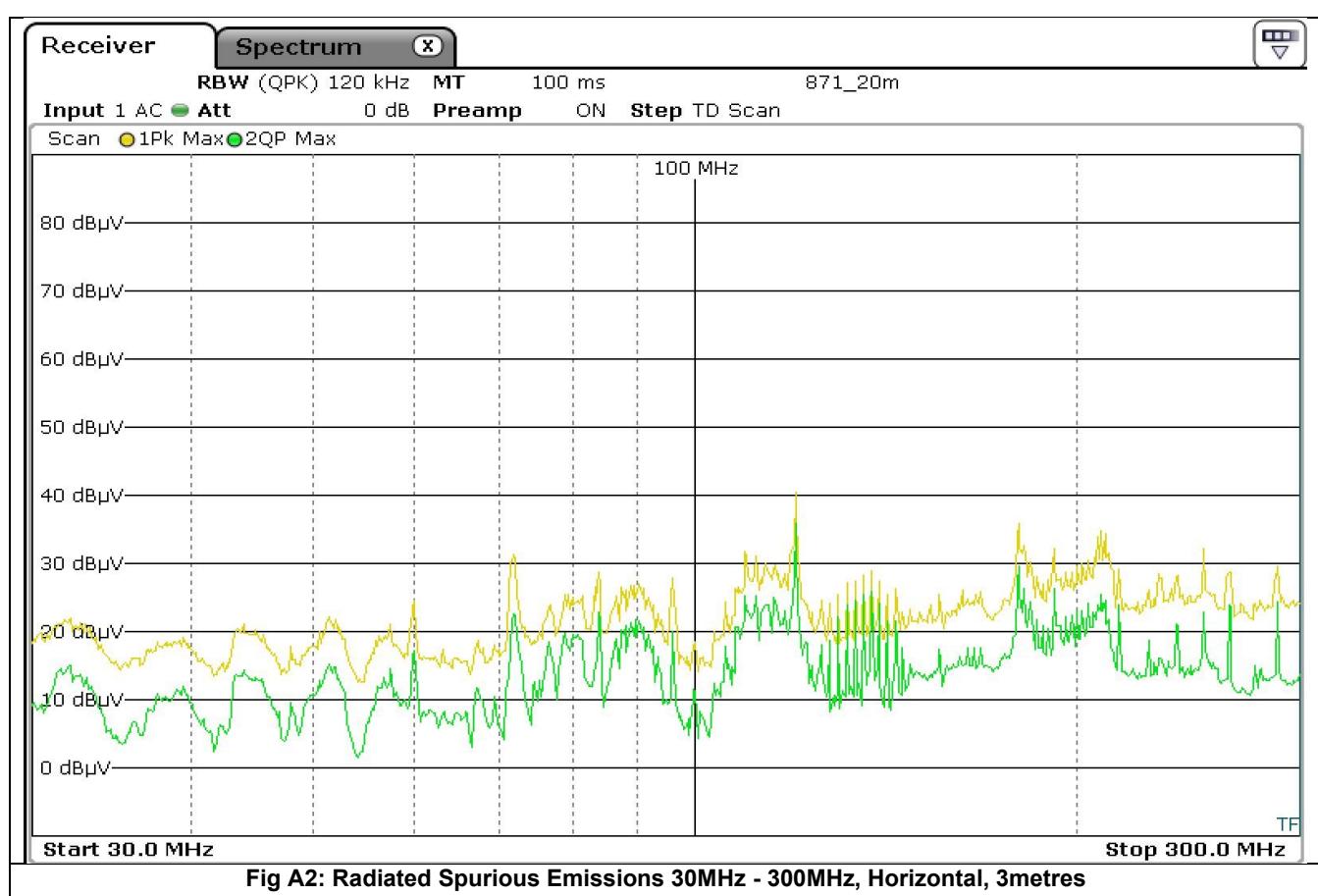
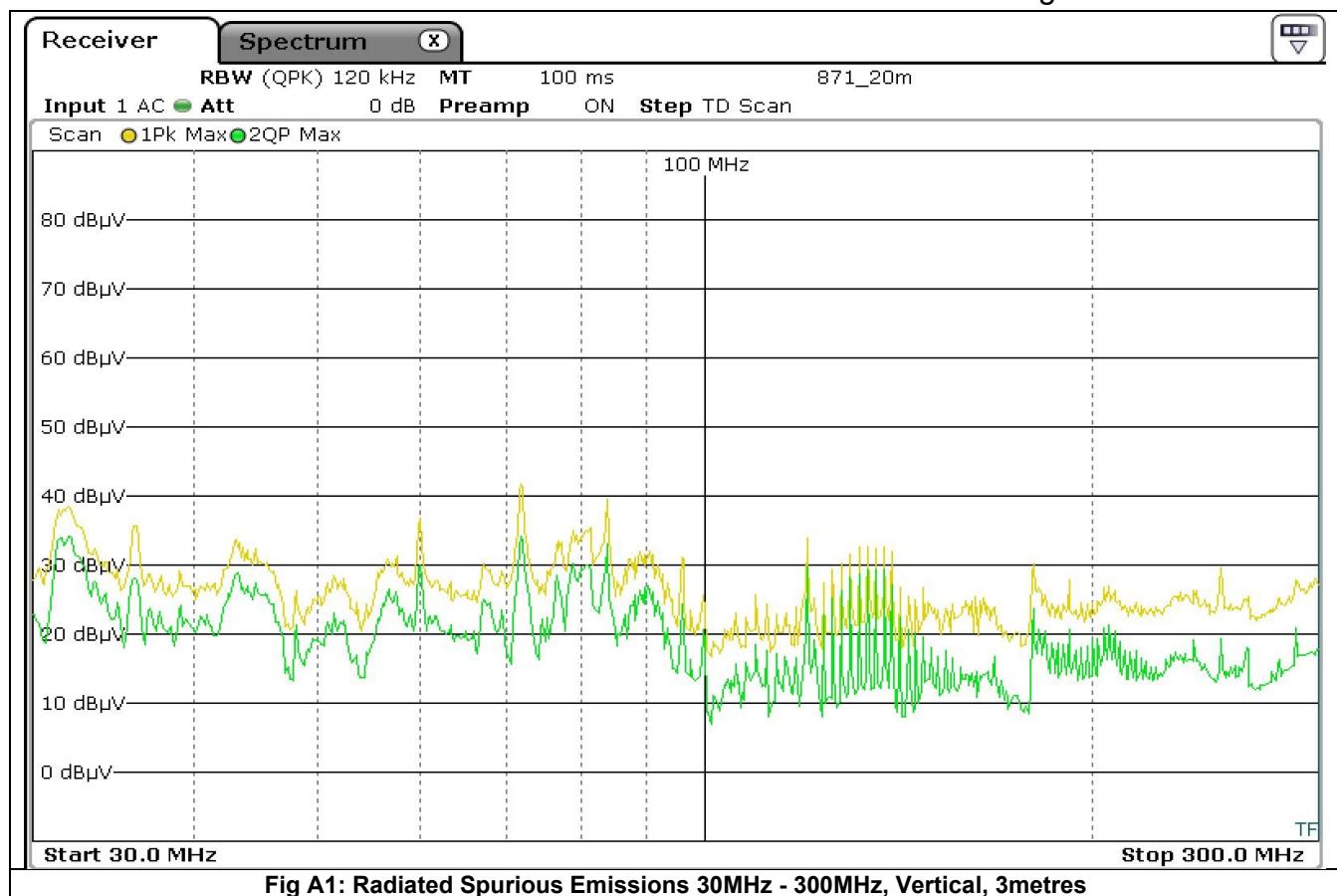
Instrument	Manufacturer	Model	Serial Num	CEI Ref	Cal Date	Cal Interval Months
Microwave Preamplifier	Hewlett Packard	83017A	3123A00175	805	30-Sep-23	12
Spectrum Analyser 30Hz-40GHz	Rohde & Schwarz	FSP40	100053	850	11-Dec-21	36
Test Receiver 3.6GHz	Rohde & Schwarz	ESR	1316.3003k03-101625-s	869	24-May-23	36
Receiver N9038A EMI 3Hz - 8.4 GHz	Keysight	MXE N9038A	MX60320104	1204	28-Feb-23	36
Antenna Horn	EMCO	3115	2363	1100	22-Feb-23	36
Fully Anechoic Chamber	CEI	FAR 3M	906	906	24-Jul-22	36
Anechoic Chamber	CEI	SAR 10M	845	845	22-Nov-22	36
Antenna Biconical	Schwarzbeck	VHBB 9124	9124 667	871	07-Oct-21	36
Antenna Log Periodic	Chase	UPA6108	1072	609	10-Sep-21	36
Antenna Horn Standard Gain 18-26.5GHz	A-Info	LB-42-25-C-KF	J2021091103028	877	30-Jul-23	12
Cable 20m				1213	16-May-24	12
Cable purple Ktype 1.8m				917	30-Jul-23	12
Cable HF Ktype 1.5m				705	30-Jul-23	12
LISN	Rohde & Schwarz	ESH3-Z5	825460/003	604	22-Feb-23	36

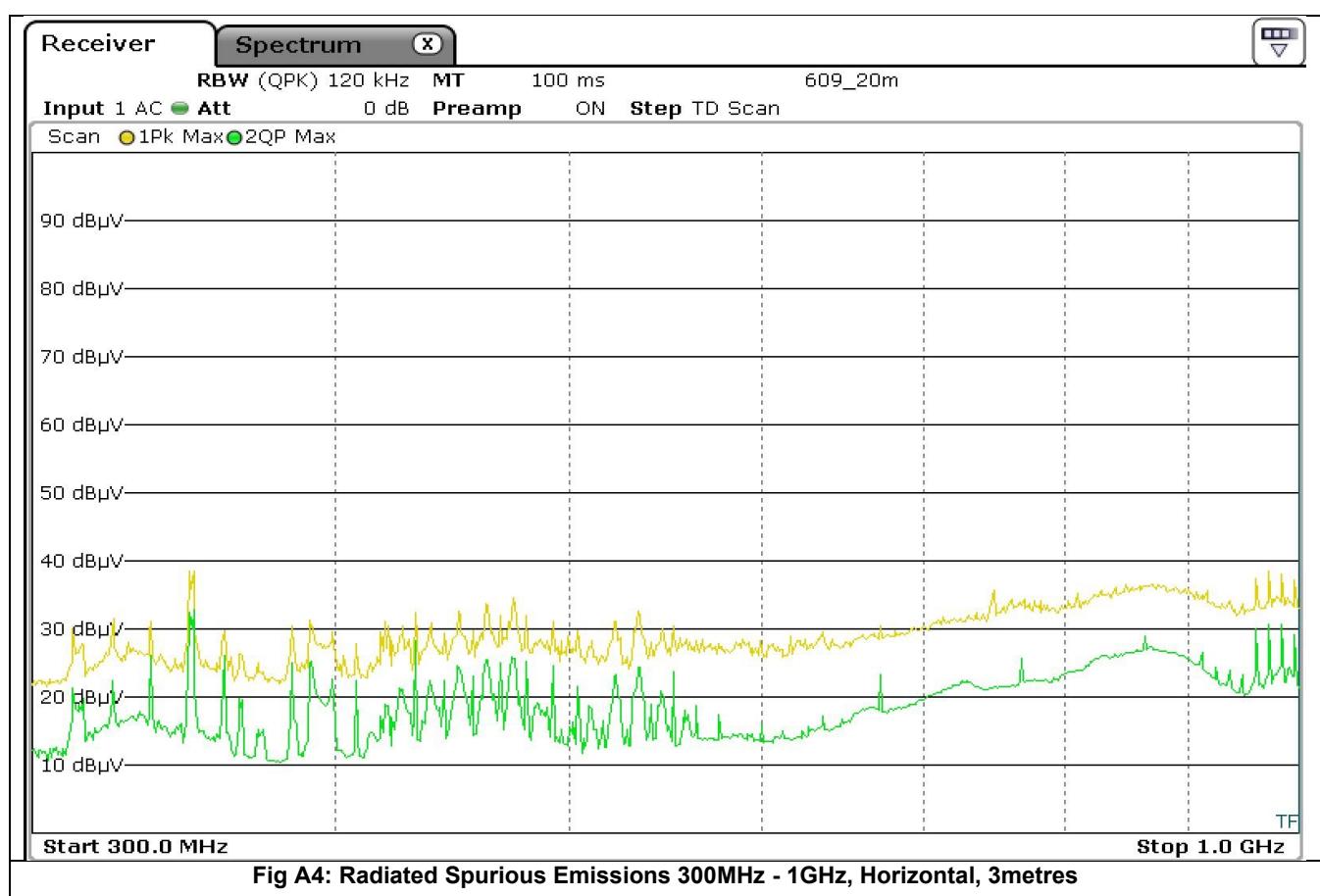
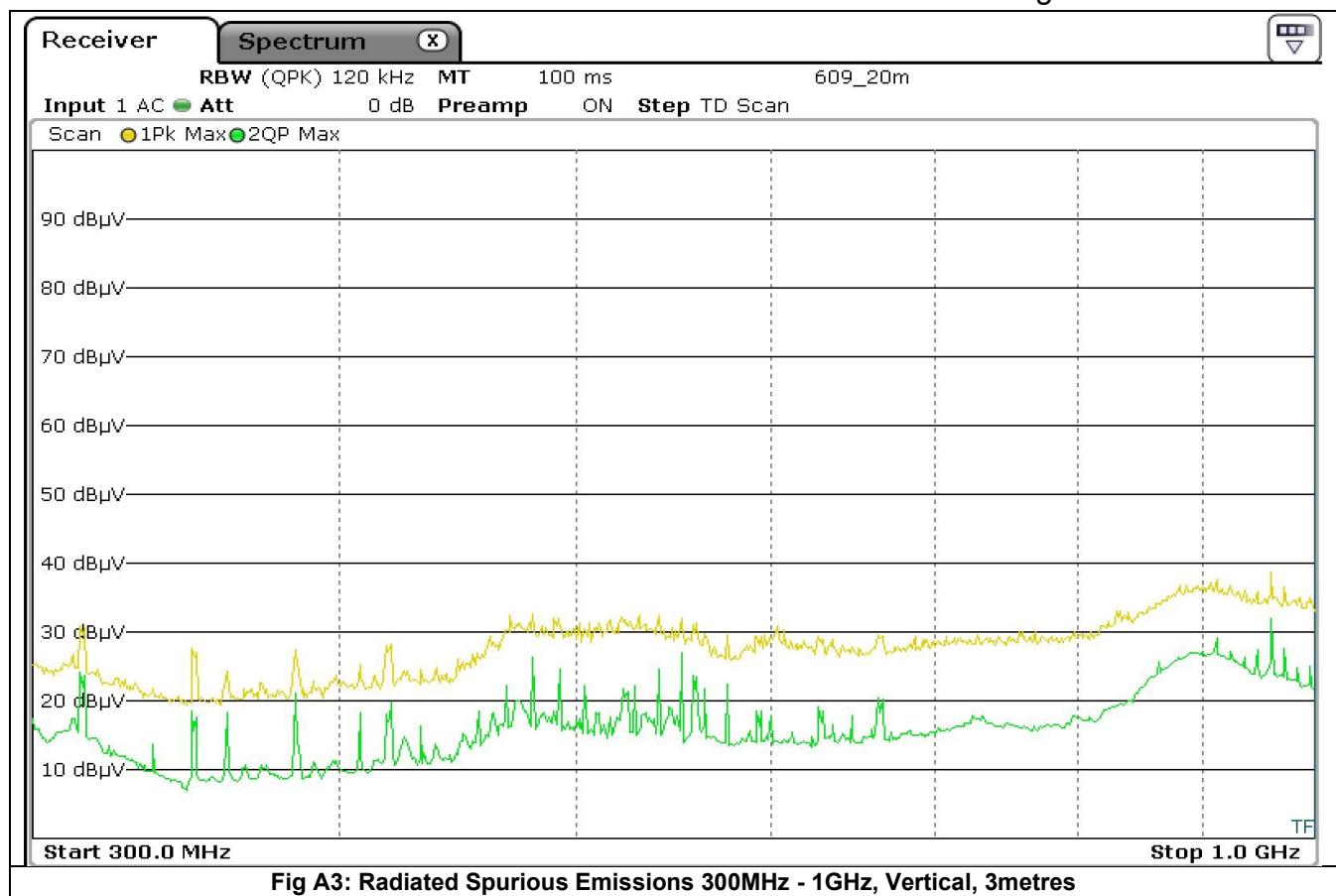
## 5 Measurement Uncertainties

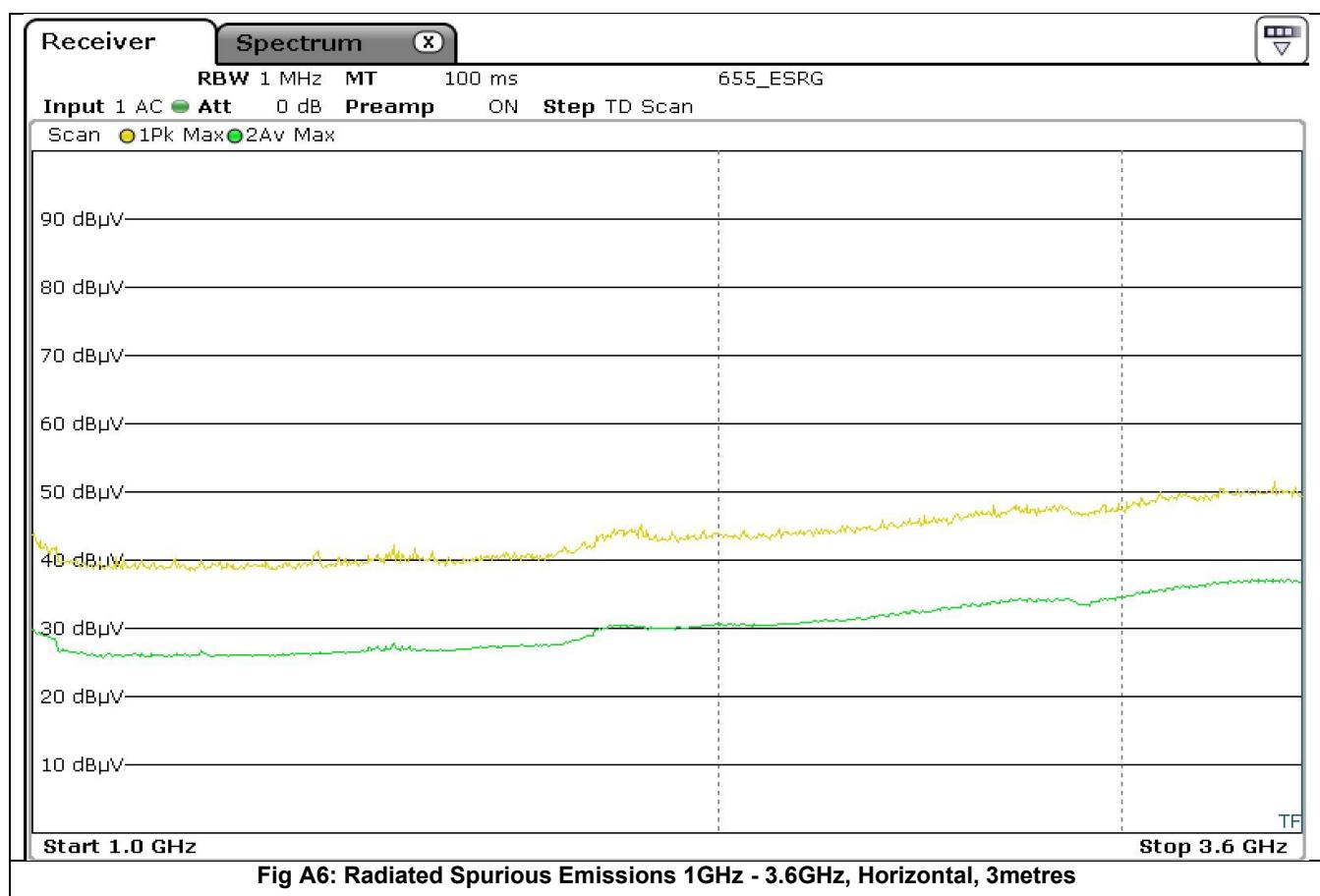
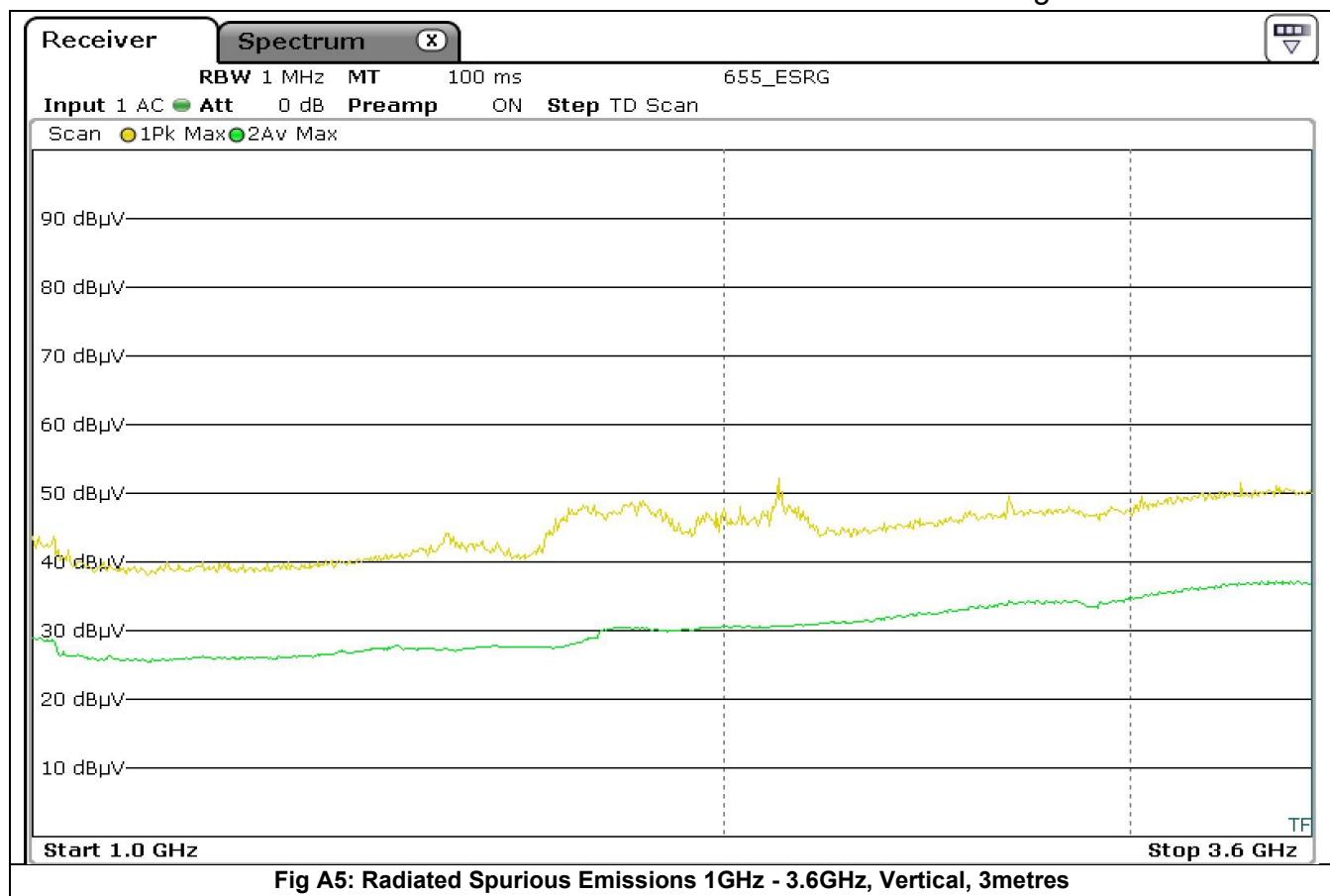
Measurement	Uncertainty
Radio Frequency	+/- $5 \times 10^{-7}$
Maximum Frequency Deviation	+/- 1.7 %
Conducted Emissions	+/- 1 dB
Radiated Emission 30MHz-100MHz	+/- 5.3 dB
Radiated Emission 100MHz-300MHz	+/- 4.7 dB
Radiated Emission 300MHz-1GHz	+/- 3.9 dB
Radiated Emission 1GHz-40GHz	+/- 3.8 dB
Modulation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

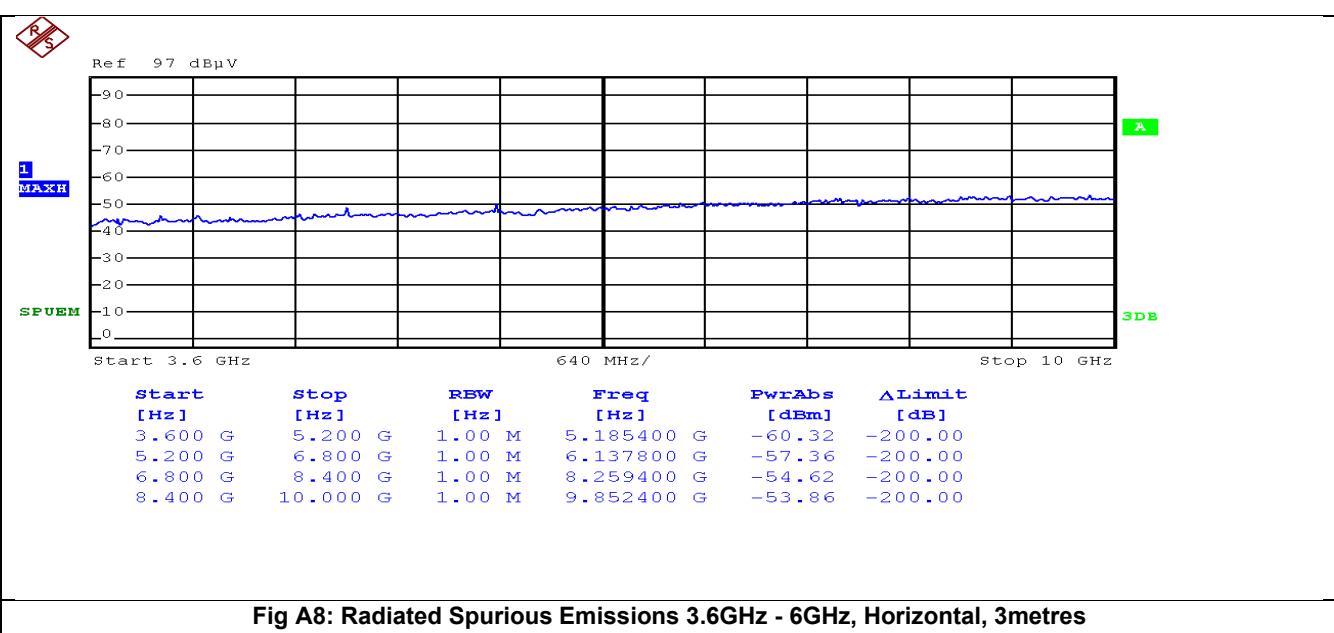
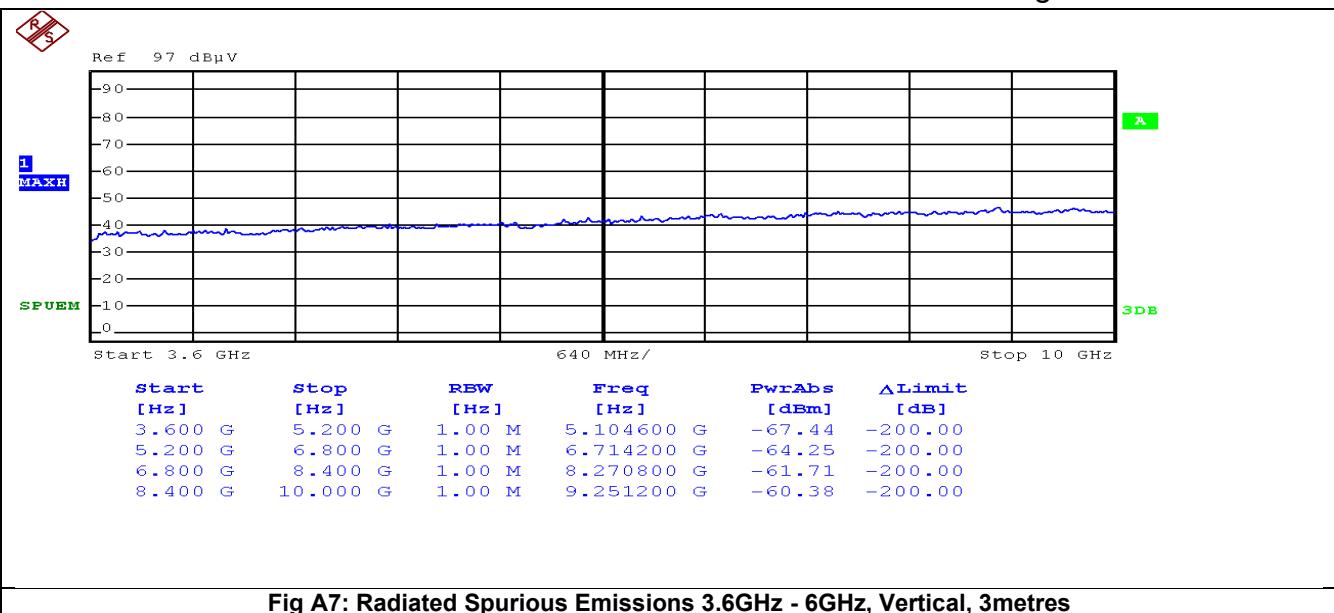
The measurement uncertainties stated were calculated with a  $k=2$  for a confidence level of over 95% as per ETS TR100 028.

**Appendix A: Radiated Spurious Emissions Scans**









**Appendix B: Conducted Emissions on the Mains**

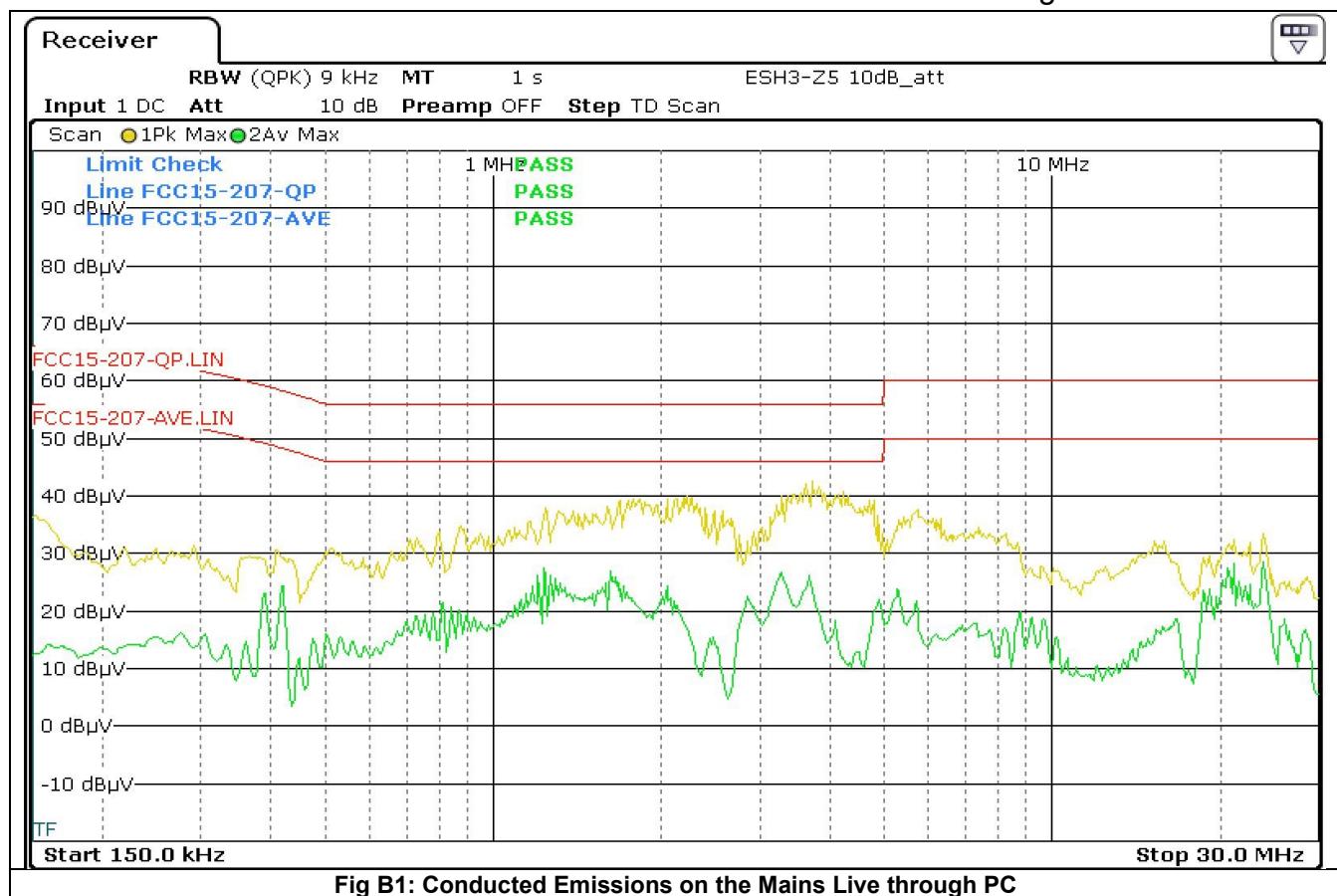


Fig B1: Conducted Emissions on the Mains Live through PC

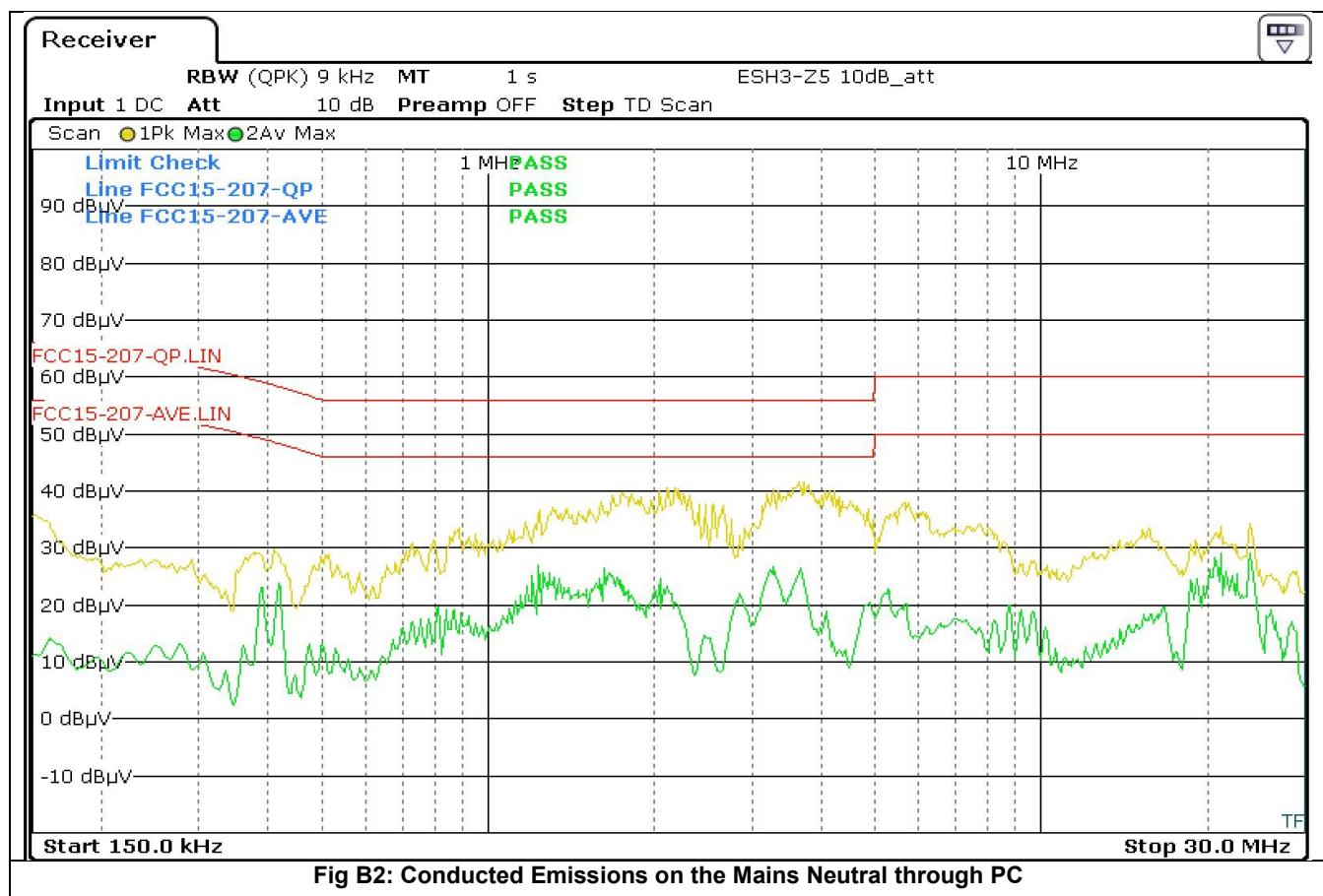
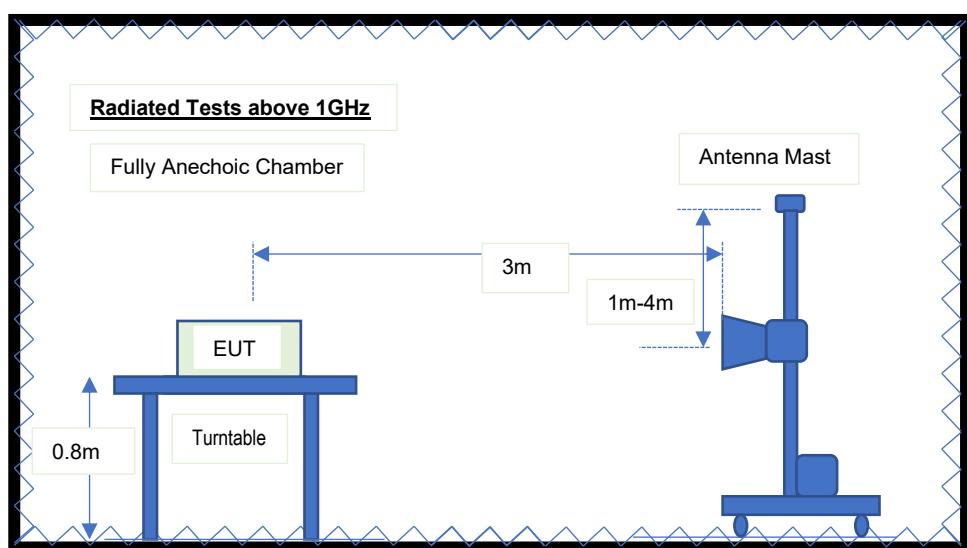
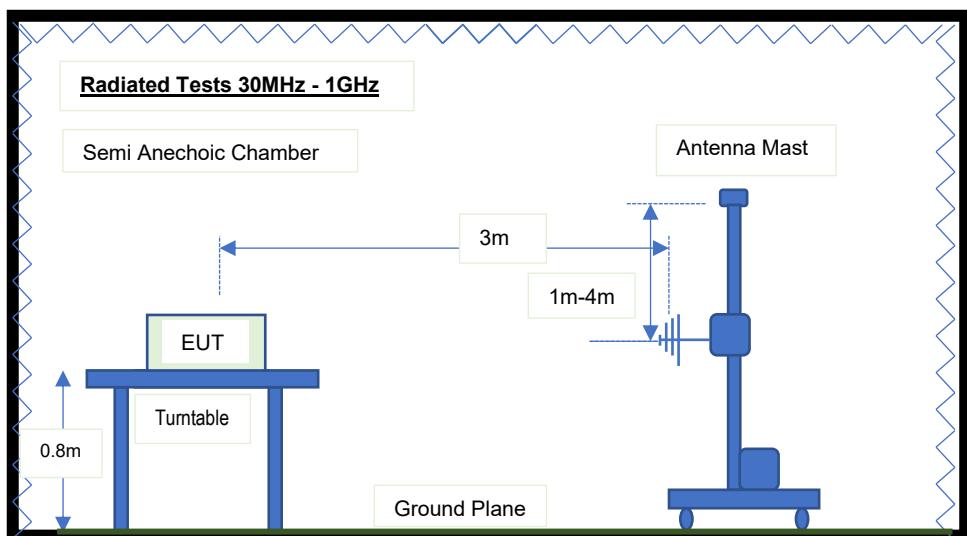


Fig B2: Conducted Emissions on the Mains Neutral through PC

**Appendix C: Block Diagrams of test set up**

**End of Report**