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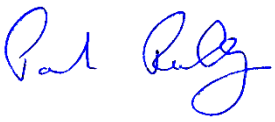
FCC Test Firm Designation	IE0002
ISED Cab Identifier	IE0001
Date	25th Jan 2024
EUT Description	Industrial RFID Reader
FCC ID	SCC10811A
IC ID	5137A-10811A
Authorised by	**Paul Reilly**
Authorised Signature:	

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

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1 EUT Description

Type:	Industrial RFID reader
Type of radio:	Stand-alone
Transmitter Type:	RFID FHSS
Operating Frequency Range(s):	902.75-927.25 MHz
Number of Channels:	50
Channel Separation:	500KHz
Antenna:	Internal and External
External Antenna Gain Max:	6dBi
Antenna impedance	50ohms
HVIN	1081-1A
FVIN	v17.1
Test Methodology:	Computer Peripheral Measurements performed according to the procedures in ANSI C63.4-2014

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

This report details tests carried out with the EUT as a computer peripheral.
The internal antenna was used for the Radiated Test

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 for EUT test as computer peripheral.
The laptop was powered via dc adapter as detailed in
During all tests there were no channels transmitting.

Environmental conditions

	Temperature	Relative Humidity
Test	°C	%
Conducted Emissions on Mains	20	40
Radiated Emissions <1GHz	21	47
Radiated Emissions >1GHz	23	53

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	X250
Lenovo AC Adapter	ADLX90LC3A

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 25th Jan 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
Quasi-Peak	0.1500	36.66	-29.34	Live
Average	0.3705	25.91	-23.79	Live
Quasi-Peak	0.3750	35.04	-24.53	Live
Average	0.3998	37.06	-11.8	Live
Quasi-Peak	0.404	41.11	-17.63	Live

Detector	Frequency	Reading	Margin	Phase
QP/ Ave	MHz	dBuV	dB	L/N
Quasi-Peak	0.1500	37.92	-28.08	Neutral
Average	0.3705	25.05	-24.65	Neutral
Quasi-Peak	0.3750	34.59	-24.98	Neutral
Average	0.3998	36.80	-12.06	Neutral
Quasi-Peak	0.4043	40.60	-18.14	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
32.97	14.5	O1	Vertical	13.8	0	1	29.3	40.0	10.7	Pass
53.04	13.4	O1	Vertical	10.1	0	1.2	24.7	40.0	15.3	Pass
74.97	15.5	O1	Vertical	9.3	0	1.4	26.2	40.0	13.8	Pass
115.00	15.6	O1	Vertical	10.1	0	1.8	27.5	43.5	16.0	Pass
240.00	5.9	O1	Vertical	15.7	0	2.5	24.1	46.0	21.9	Pass
74.97	17.2	O1	Horizontal	9.3	0	1.4	27.9	40.0	12.1	Pass
116.40	13.9	O1	Horizontal	10.1	0	1.8	25.8	43.5	17.7	Pass
165.03	9.2	O1	Horizontal	12	0	2.1	23.3	43.5	20.2	Pass
238.11	10.5	O1	Horizontal	15.5	0	2.5	28.5	46.0	17.5	Pass
398.34	6.7	O1	Vertical	16.3	0	3.1	26.1	46.0	19.9	Pass
500.00	5.6	O1	Vertical	18.3	0	3.7	27.6	46.0	18.4	Pass
625.00	15.3	O1	Vertical	19.8	0	4.2	39.3	46.0	6.7	Pass
720.00	4.5	O1	Vertical	21.4	0	4.6	30.5	46.0	15.5	Pass
907.41	-9.4	O1	Vertical	23.5	0	5.4	19.5	46.0	26.5	Pass
398.37	6.7	O1	Horizontal	16.3	0	3.1	26.1	46.0	19.9	Pass
480.30	2.2	O1	Horizontal	18	0	3.5	23.7	46.0	22.3	Pass
625.00	12.8	O1	Horizontal	19.8	0	4.2	36.8	46.0	9.2	Pass
907.17	-7.9	O1	Horizontal	23.5	0	5.4	21.0	46.0	25.0	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 **26.5 = 15.2 + 10.1 - 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
1.198	23.6	O1	Vertical	25	0	3.4	52.0	54.0	22.0	Pass
3.350	13.1	O1	Vertical	31.4	0	5.9	50.4	54.0	23.6	Pass
1.196	21.5	O1	Vertical	25	0	3.4	49.9	54.0	24.1	Pass
3.482	12.9	O1	Vertical	31.3	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 **52 = 23.6 + 25 - 0 + 3.4**

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	03-Jun-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-23	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	+/- $5x10^{-7}$
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	+/- $5x10^{-7}$
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

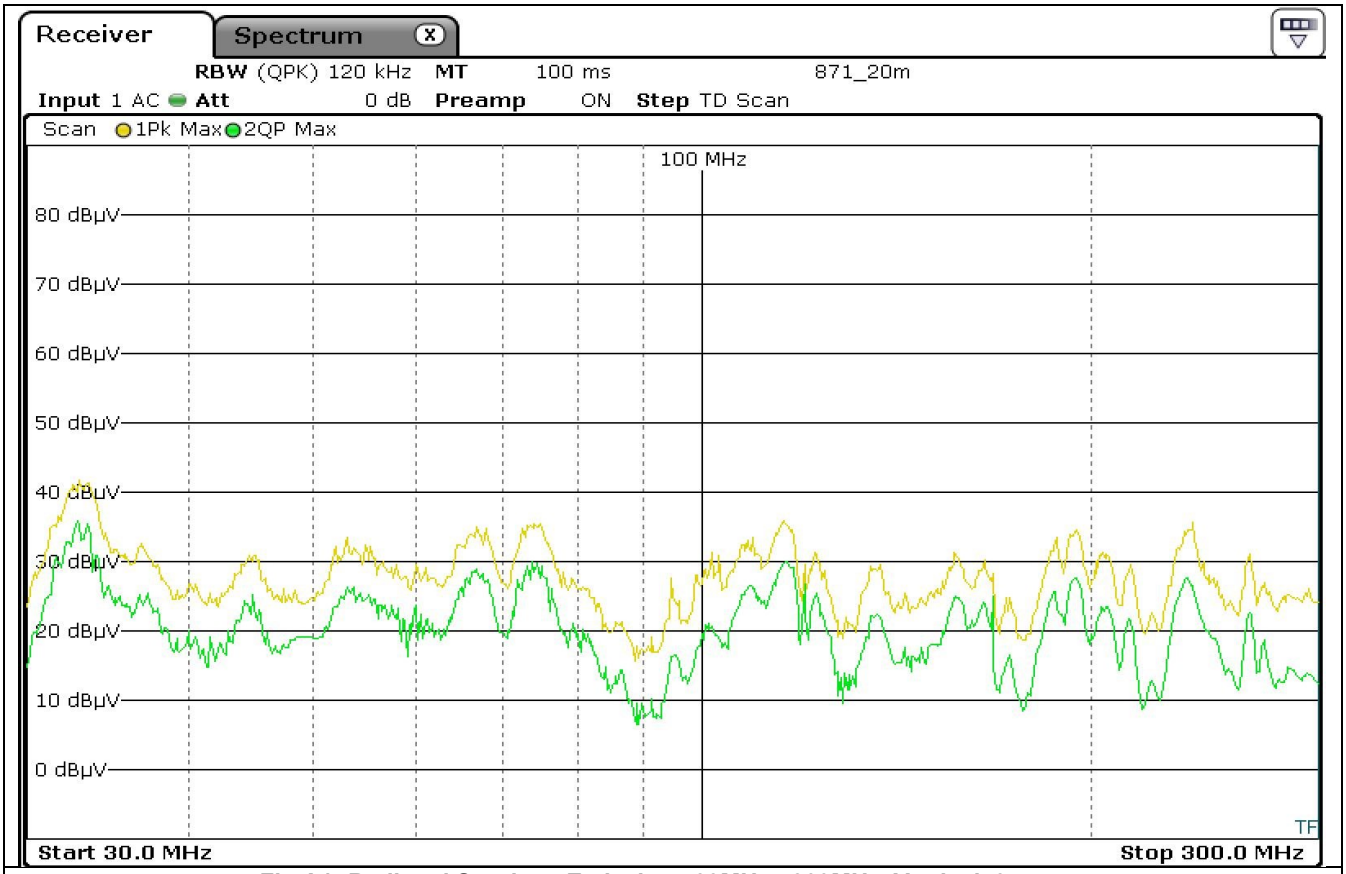


Fig A1: Radiated Spurious Emissions 30MHz - 300MHz, Vertical, 3metres

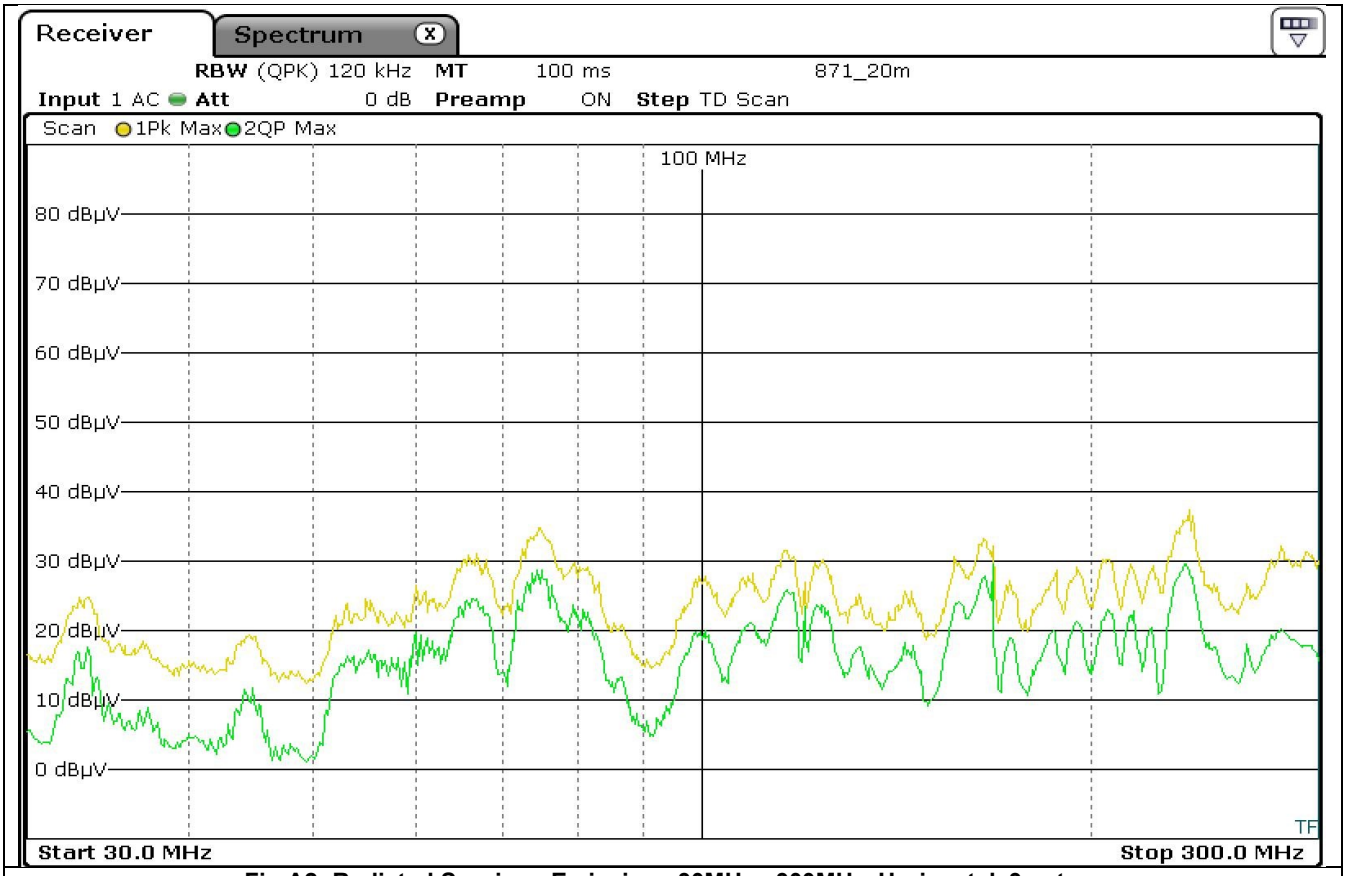


Fig A2: Radiated Spurious Emissions 30MHz - 300MHz, Horizontal, 3metres

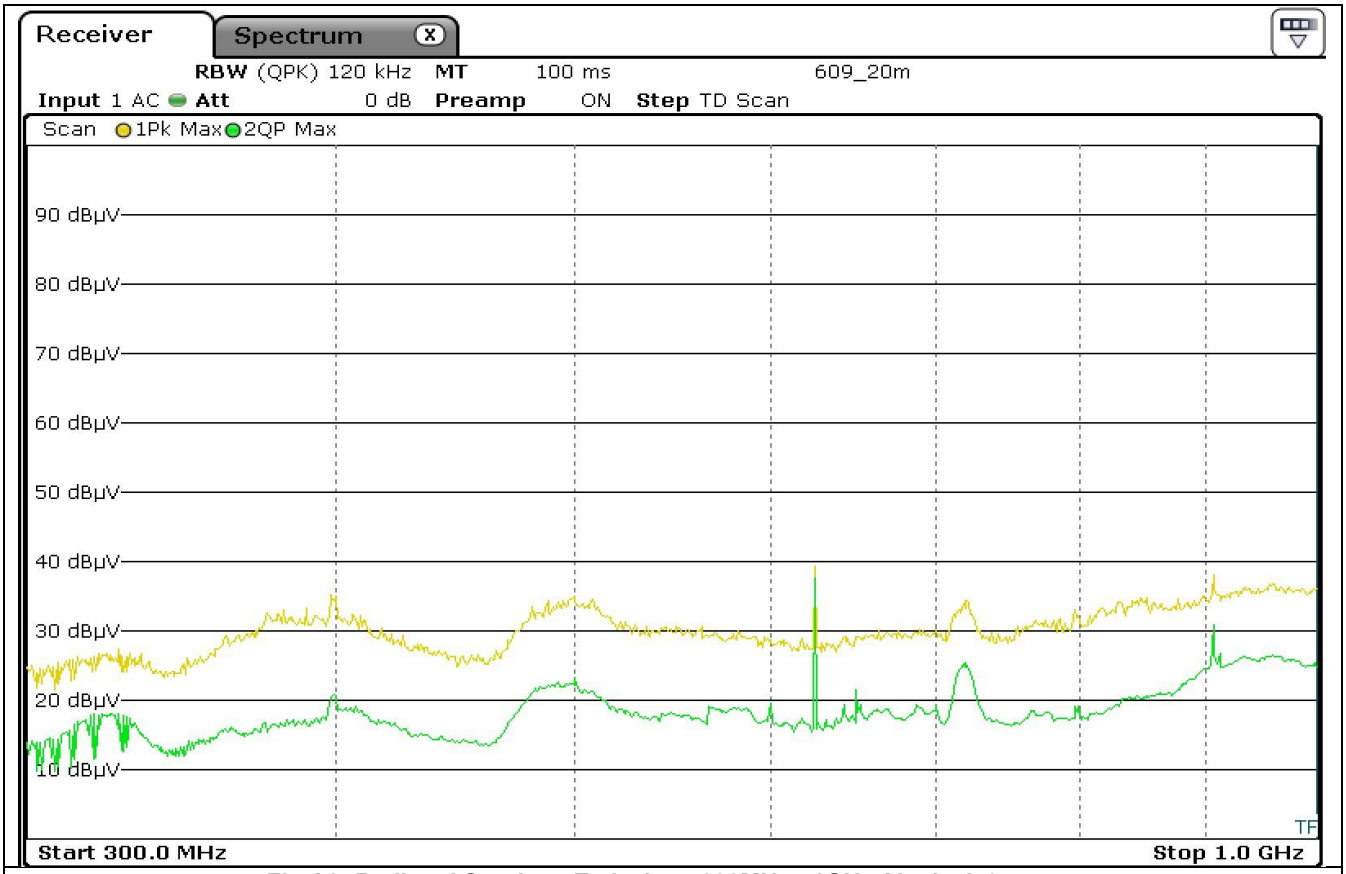


Fig A3: Radiated Spurious Emissions 300MHz - 1GHz, Vertical, 3metres

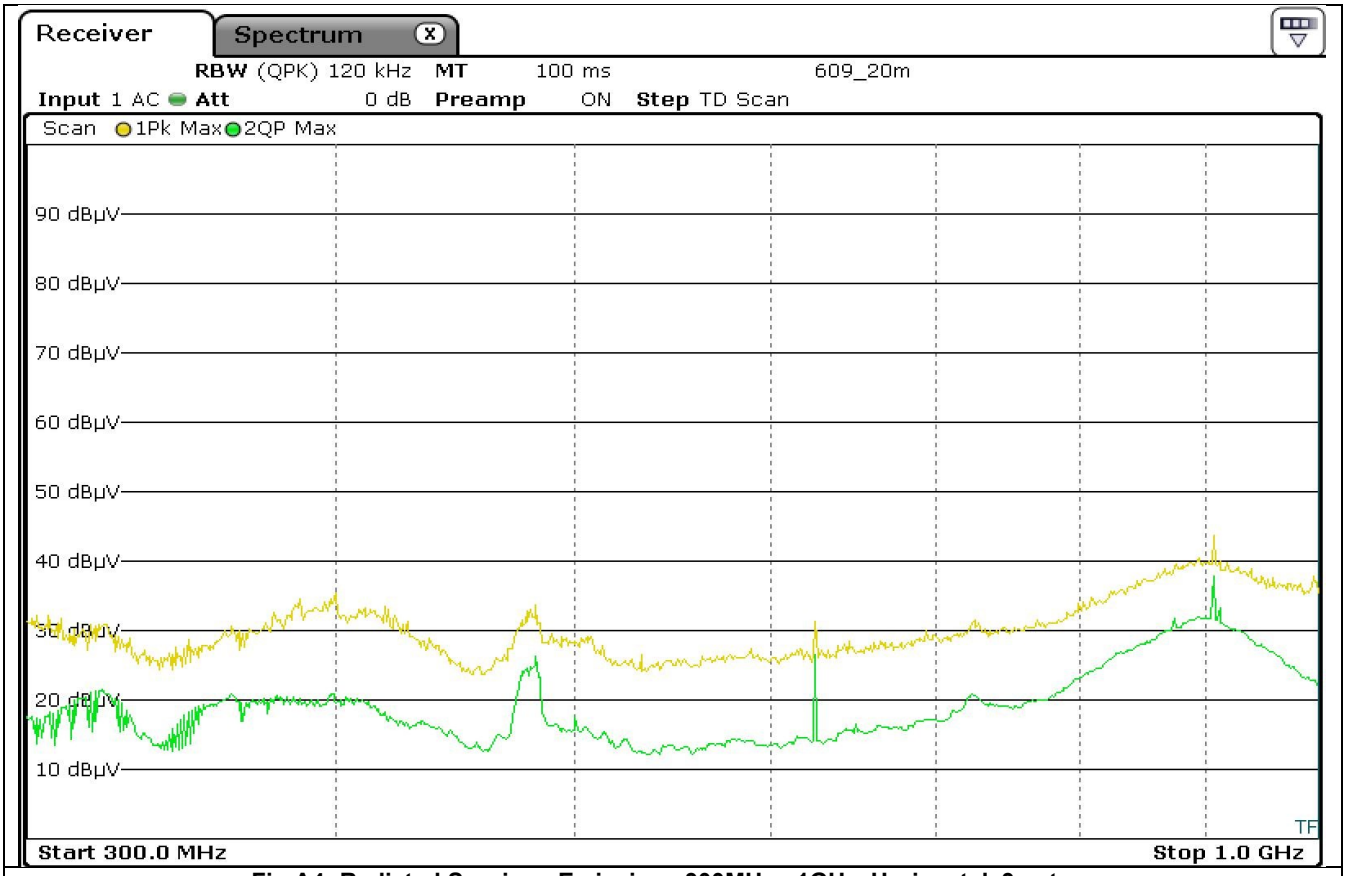


Fig A4: Radiated Spurious Emissions 300MHz - 1GHz, Horizontal, 3metres

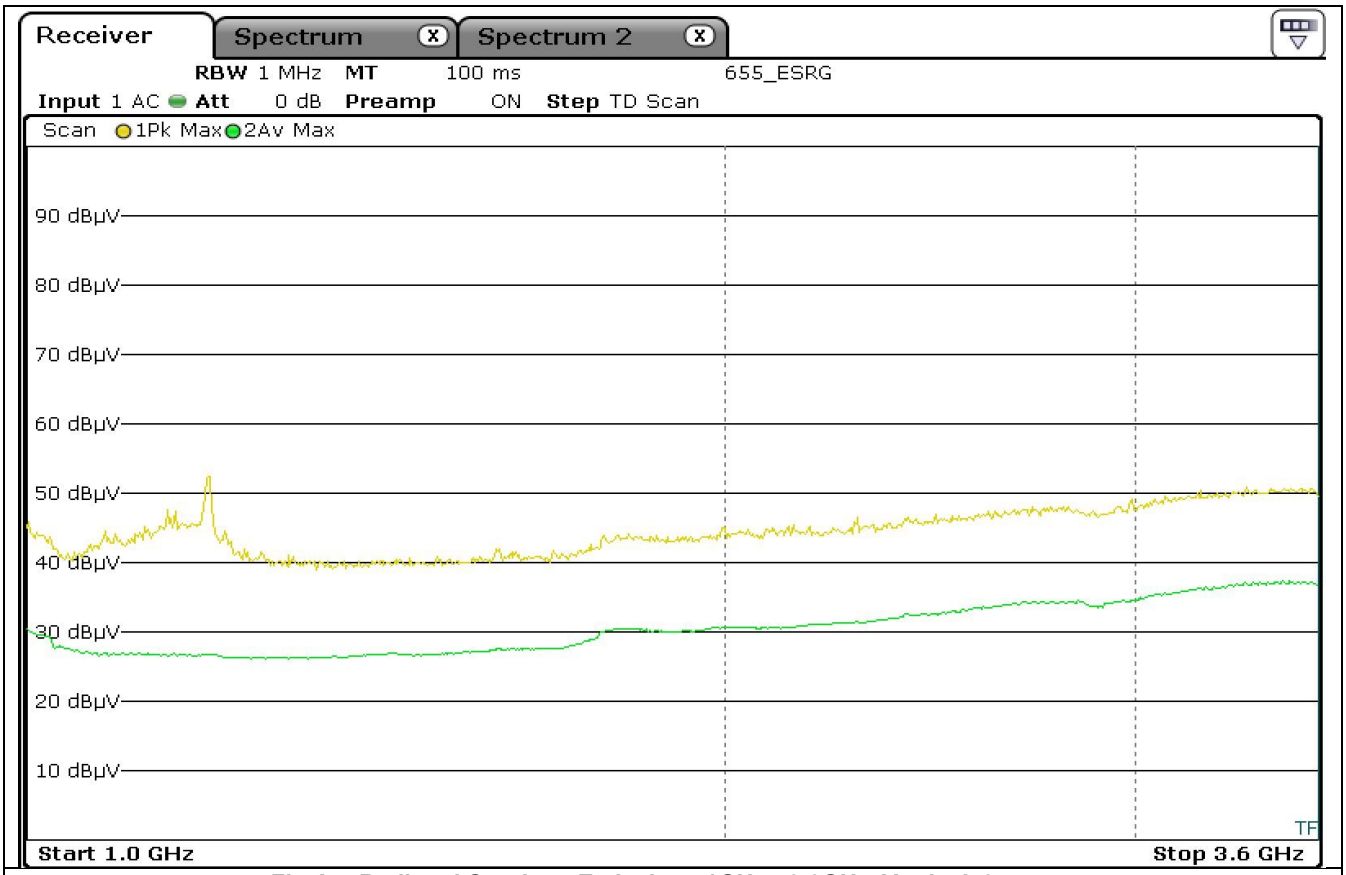


Fig A5: Radiated Spurious Emissions 1GHz - 3.6GHz, Vertical, 3metres

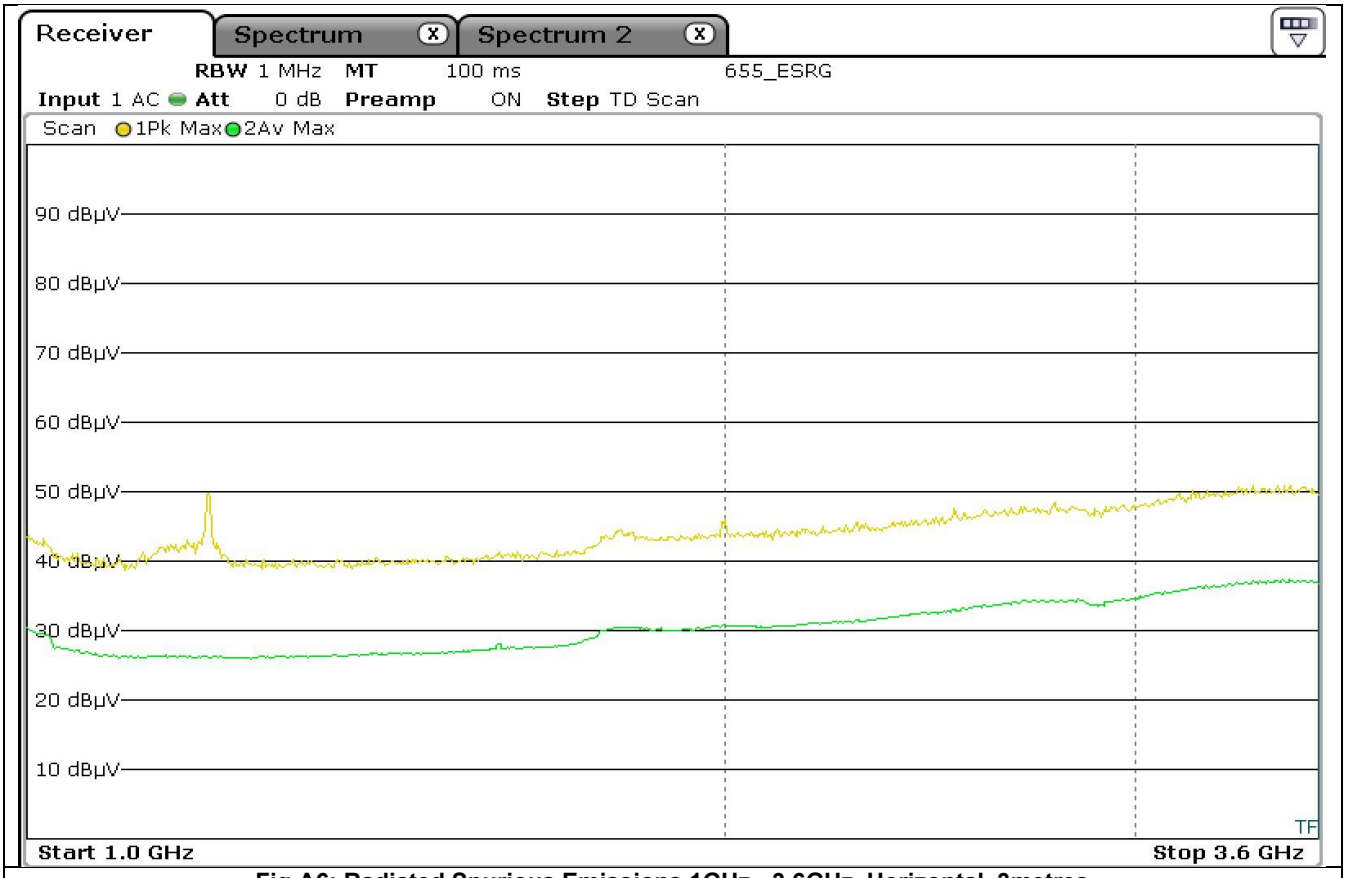


Fig A6: Radiated Spurious Emissions 1GHz - 3.6GHz, Horizontal, 3metres

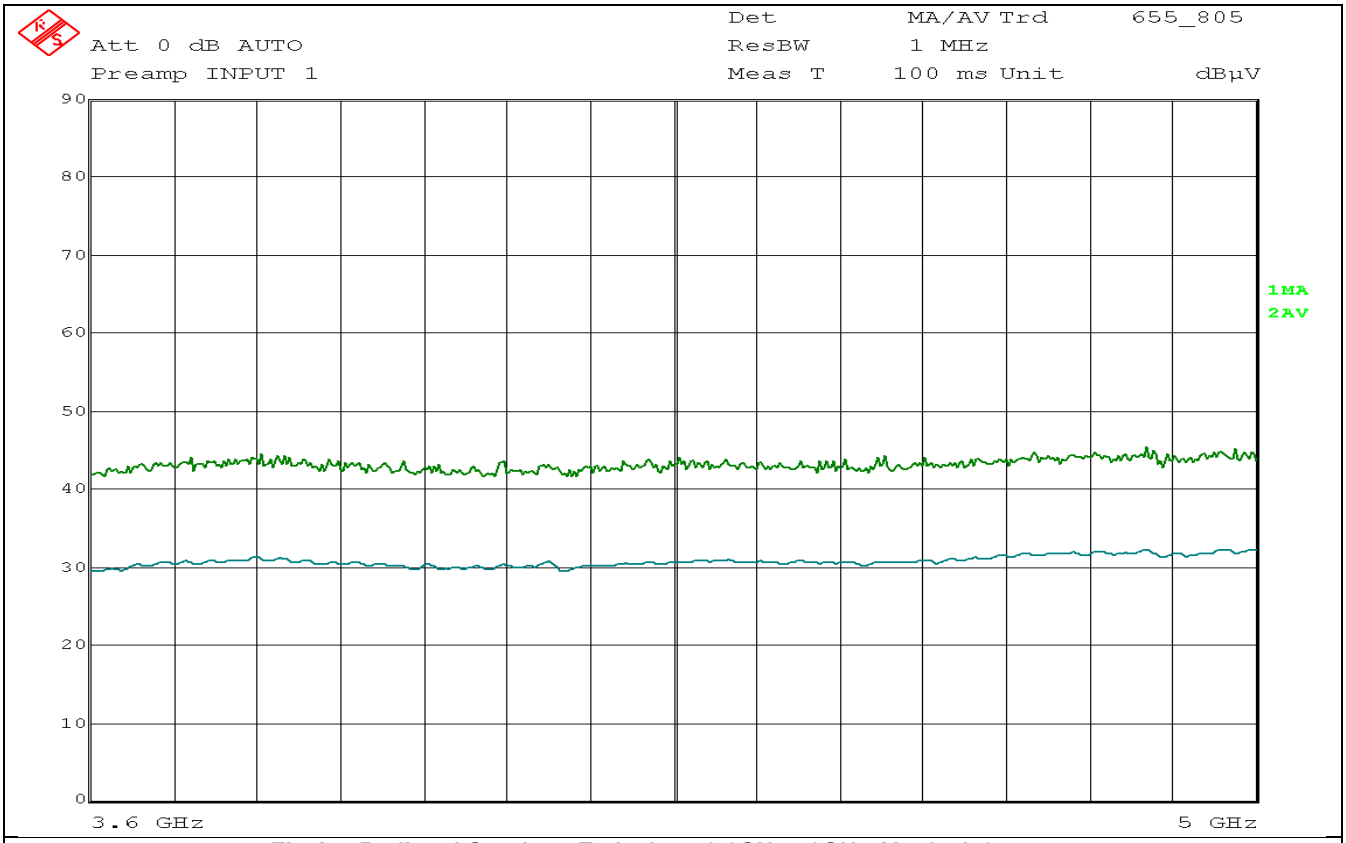


Fig A7: Radiated Spurious Emissions 3.6GHz - 6GHz, Vertical, 3metres

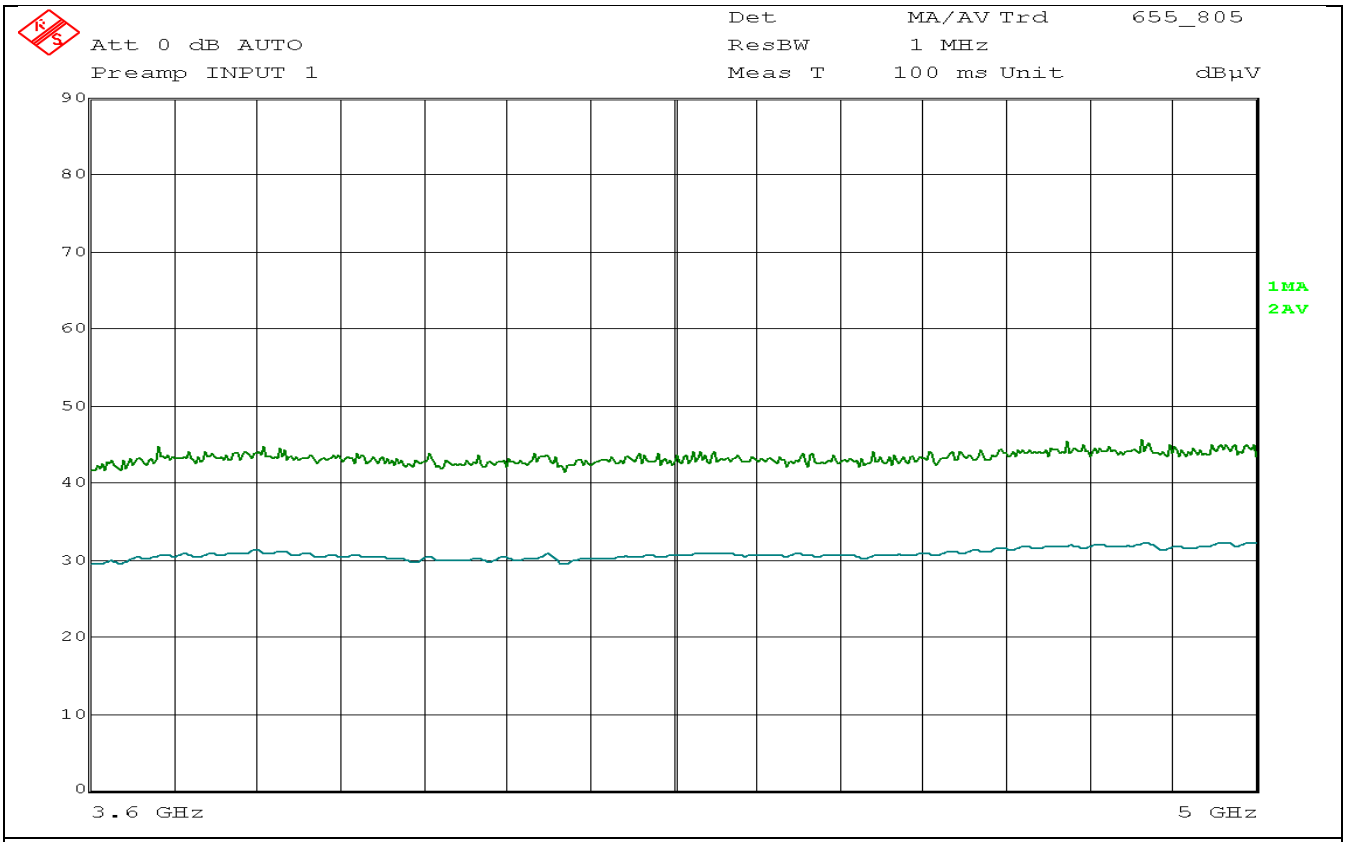


Fig A8: Radiated Spurious Emissions 3.6GHz - 6GHz, Horizontal, 3metres

Appendix B: Conducted Emissions on the Mains

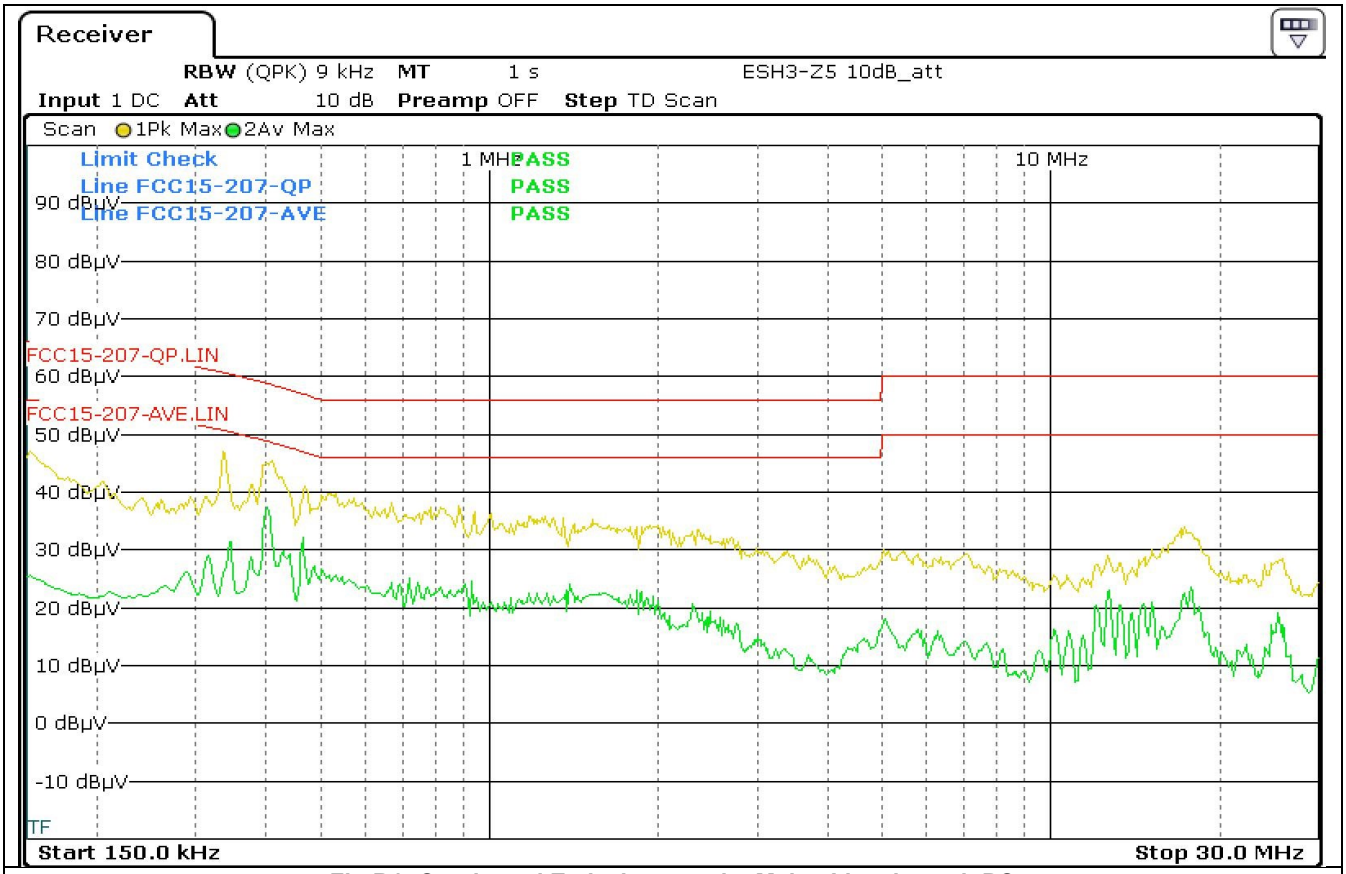


Fig B1: Conducted Emissions on the Mains Live through PC

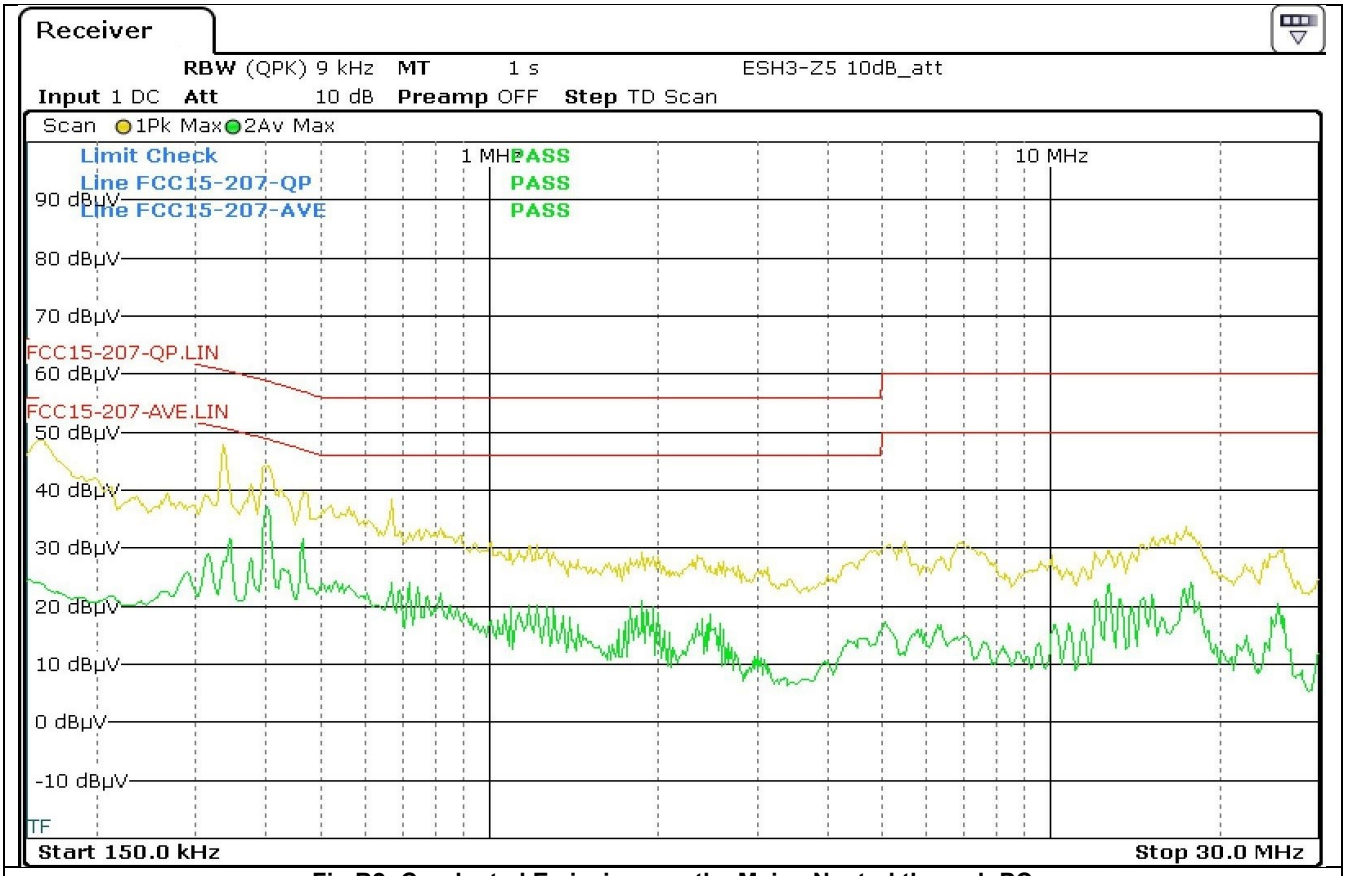
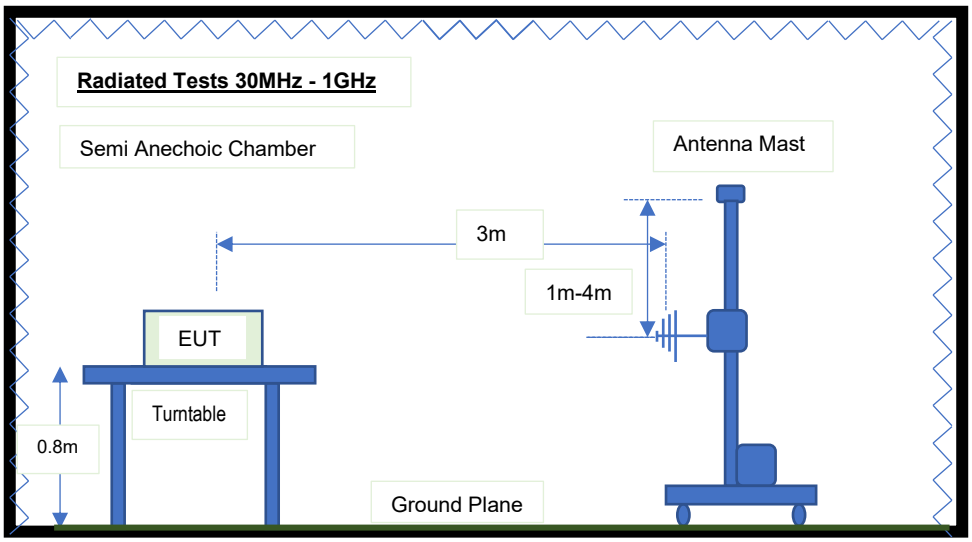
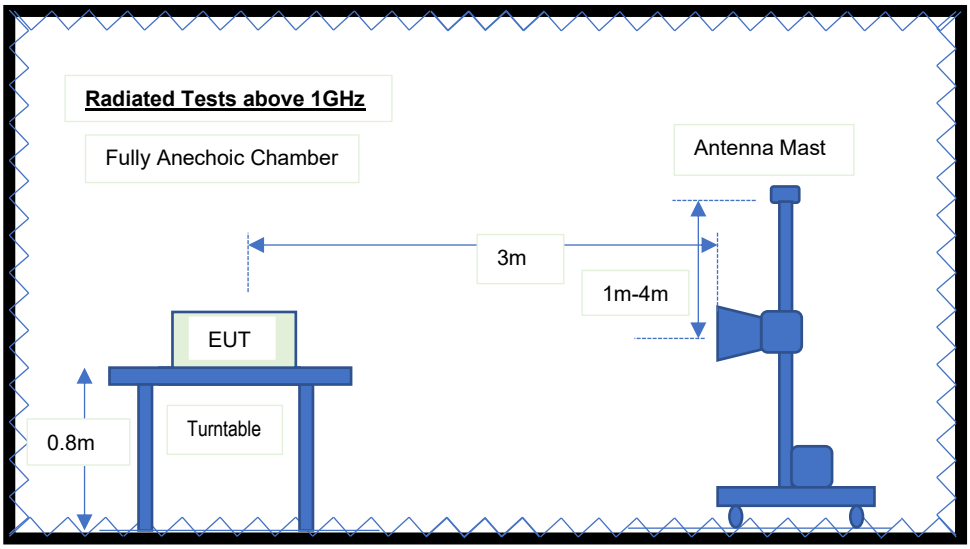


Fig B2: Conducted Emissions on the Mains Neutral through PC

Appendix C: Block Diagrams of test set up





End of Report