COMPLIANCE ENGINEERING IRELAND LTD

ISO 17025 IVNAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.088T

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Project Num	**19E8414-3a**
Quotation	**Q19-2410-1**
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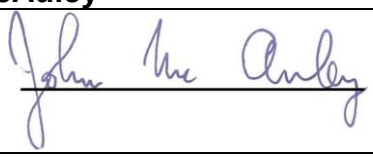
Tested By	**Michael Kirby**
Test Report By	**Michael Kirby**
FCC Test Firm Registration	**409640**
Date	**19th Dec 2019**
EUT Description	**SRD for liquid level reporting**
FCC ID	**S6T603**
Authorised by	**John McAuley**
Authorised Signature:	

TEST SUMMARY

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

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

Test Method as per Ansi 63-4 :2014

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Exhibit A – Technical Report

Table of Contents

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1.0 EUT Description

FCC ID:	S6T603

The EUT is a receiver for a liquid level gauge tank sensor which transmits to the EUT over a radio link at 914.5MHz.
The EUT acts in transmit mode only at installation when it is required to pair with the tank sensor.
When in transmit mode the EUT transmits at 915MHz.

At all other times the EUT is in receive mode.
The EUT is powered directly from a mains to dc USB adapter.

In receive mode the EUT can be connected to a laptop to exchange data over the usb port.

1.1 EUT Operation

1.1.1 Operating Conditions during Test:

The EUT was in receive mode for all tests.

1.1.2 Type of EUT TEK603 with portable computer

1.1.3 Cable lengths and types

EUT

Cable Description	Type	Length Metres
USB cable to computer	unshielded	1

Laptop

Cable Description	Type	Length Metres
Laptop to DC power	unshielded	1.8
Mains lead	unshielded	0.8

1.1.4 Peripherals

Laptop DELL Inspiron 15-548
AC Adapter Dell LA65NS2-01

1.1.5 Environmental conditions

	Temperature	Relative Humidity
Test	°C	%
Conducted Emissions	18	49
Radiated Emissions <1GHz	18	48

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 4th Dec 2019.

2.0 Results for Conducted emissions on the mains

Conducted Emissions on the mains measurements were performed as per C63.4 2014 .
Measurement uncertainty = +/- 2.9dB

3.1 Laptop

Detector	Frequency	Reading	Margin	Phase
QP/ Ave	MHz	dBuV	dB	L/N
Quasi-Peak	0.1635	39.23	-26.38	Live
Quasi-Peak	1.8510	16.59	-39.41	Live
Quasi-Peak	3.3180	13.74	-42.26	Live
Average	20.9535	26.61	-23.39	Live
Quasi-Peak	21.392	33.39	-26.61	Live
Quasi-Peak	24.018	21.29	-38.71	Live

Detector	Frequency	Reading	Margin	Phase
QP/ Ave	MHz	dBuV	dB	L/N
Quasi-Peak	0.1635	41.04	-24.57	Neutral
Quasi-Peak	0.4695	29.55	-27.32	Neutral
Average	0.4808	24.14	-22.41	Neutral
Quasi-Peak	0.7035	21.20	-34.8	Neutral
Quasi-Peak	1.1738	18.86	-37.14	Neutral
Quasi-Peak	3.0638	21.34	-34.66	Neutral
Quasi-Peak	17.6798	31.90	-28.1	Neutral
Average	21.1920	26.83	-23.17	Neutral
Quasi-Peak	21.2303	34.59	-25.41	Neutral

Test Result Pass

3. Radiated Measurements

3.1 Radiated Emissions Measurements

The EUT was centred on a motorized turntable, which allows 360-degree rotation.
Emissions below 1GHz 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 were maximised by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 metres. In this case the resolution bandwidth was 100kHz.
Emissions above 1GHz 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 were maximised by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 metres. In this case the resolution bandwidth was 1MHz.

An initial prescan was carried out to determine the worst-case configuration
Measurements performed according to the procedures in ANSI C63.4-2014

Note a transmitter was used to ensure that the receiver was actively receiving and the results were displayed on the laptop screen

Frequency MHz	Quasi Peak Level dBuV/m	Antenna Polarity	Antenna Factor dB	Cable loss dB	Final Field Strength Quasi Peak dBuV/m	Quasi Peak Limit dBuV/m	Margin dB
35.85	9.8	Vertical	11.7	0.9	22.4	40.0	17.6
41.07	15.6	Vertical	11	0.9	27.5	40.0	12.5
55.29	28	Vertical	9.8	1	38.8	40.0	1.2
63.48	22.2	Vertical	9.6	1	32.8	40.0	7.2
95.88	22.3	Vertical	9.3	1.1	32.7	43.5	10.8
144.21	22	Vertical	11.6	1.2	34.8	43.5	8.7
156	20	Vertical	11.9	1.2	33.1	43.5	10.4
382.6	1	Vertical	15.7	1.7	18.4	46.0	27.6
480	8.7	Vertical	17.8	1.7	28.2	46.0	17.8
55.29	18.9	Horizontal	9.8	1	29.7	40.0	10.3
67.59	18.2	Horizontal	9.4	1	28.6	40.0	11.4
95.88	22.4	Horizontal	9.3	1.1	32.8	43.5	10.7
168	17.8	Horizontal	12.4	1.2	31.4	43.5	12.1
480	12.9	Horizontal	17.8	1.7	32.4	46.0	13.6

Frequency GHz	Peak Level dBuV/m	Antenna Factor dB	Preamp Gain dB	Cable Loss	Antenna Polarity	Final Peak Level dBuV/m	Margin Peak v Ave Lim+20dB
3.564	57.5	30.6	37.6	4.6	Vertical	55.1	18.9
3.564	59.5	30.6	37.6	4.6	Horizontal	57.1	16.9
4.970	48.1	34	37.4	5.4	Vertical	50.1	23.9
4.050	52.4	32	37.3	4.6	Horizontal	51.7	22.3
4.820	46.2	32.3	37.1	5.2	Horizontal	46.6	27.4

Frequency GHz	Measured Average Level dBuV/m	Antenna Factor dB	Preamp Gain dB	Cable Loss	Antenna Polarity	Final Average Level dBuV/m	Margin
3.565	43.4	30.6	37.6	4.6	Vertical	41.0	13.0
3.565	48.4	30.6	37.6	4.6	Vertical	46.0	8.0

Test Result: Pass

4 List of Test Equipment

Instrument	Manufacturer	Model	Serial Num	CEI Ref	Cal Due Date	Cal Interval Months
Microwave Preamplifier	Hewlett Packard	83017A	3123A00175	805	30-Sep-20	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	07-Jun-20	36
LISN	Rohde& Schwarz	ESH3-Z5	825460/003	604	16-Feb-22	36
Antenna Horn	AH Systems	SAS-200/571	373	839	14-Mar-21	36
Fully Anechoic Chamber	CEI	FAR 3M	906	906	23-Jul-22	36
Anechoic Chamber	CEI	SAR 10M	845	845	16-May-22	36
Antenna Biconical	Schwarzbeck	VHBB 9124	9124 667	871	03-Sep-21	36
Antenna Log Periodic	Chase	UPA6108	1072	609	03-Sep-21	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

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

Appendix A

Additional Test Results
For
Radiated Spurious Emissions

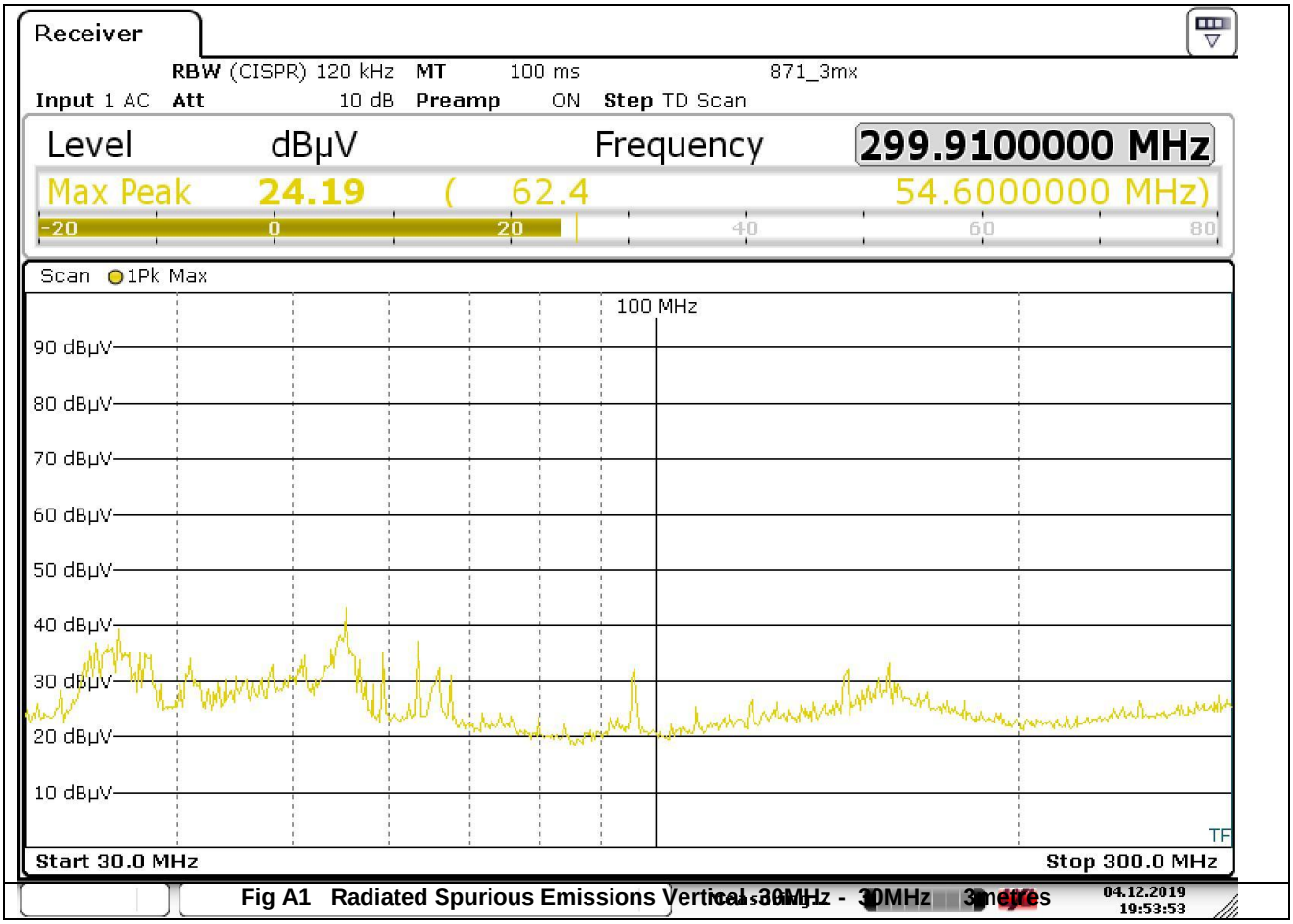

Fig A1 Radiated Spurious Emissions Vertical 30MHz - 300MHz 3metres

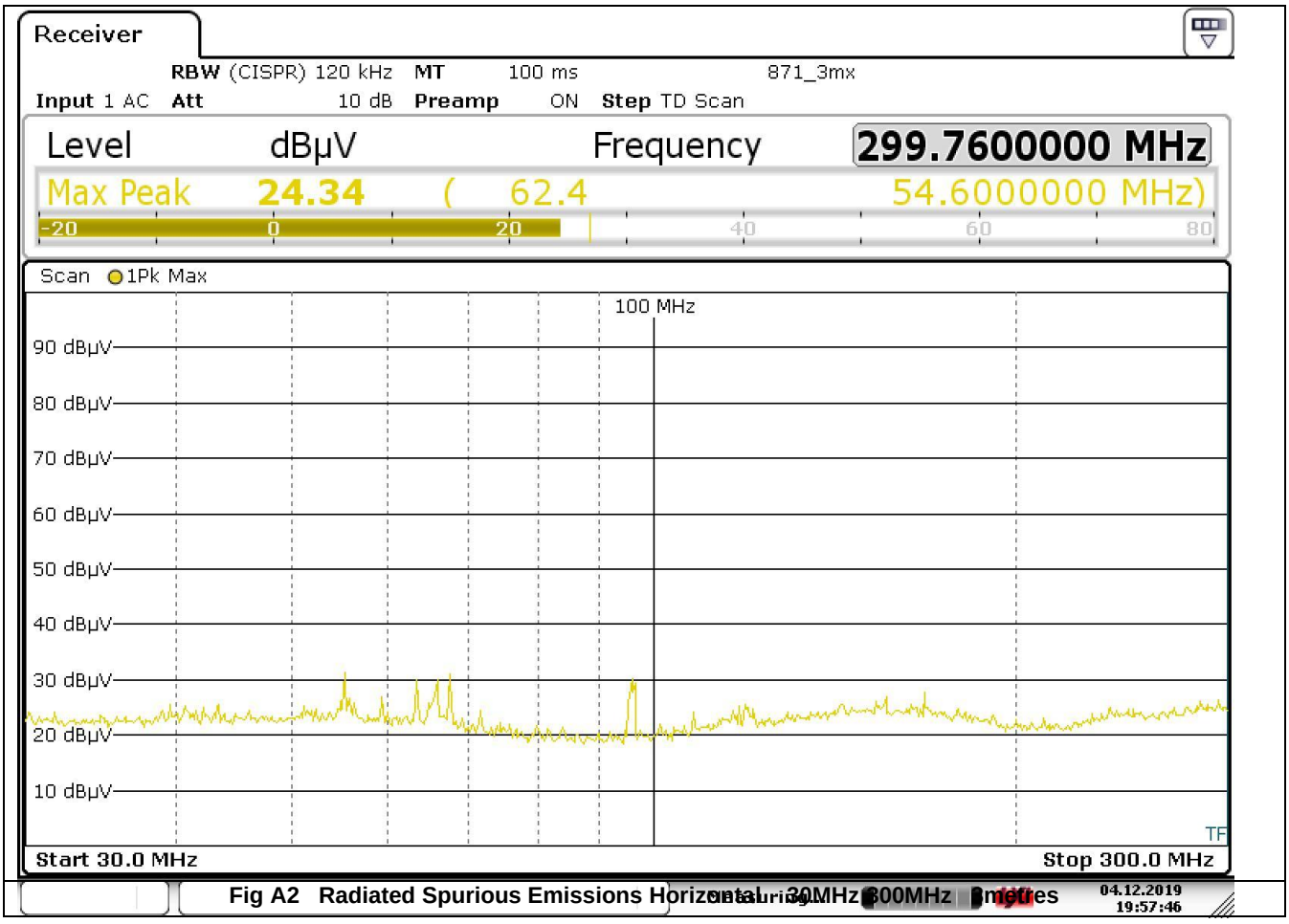

Fig A2 Radiated Spurious Emissions Horizontal 30MHz - 300MHz 3metres

Date: 4.DEC.2019 19:57:46

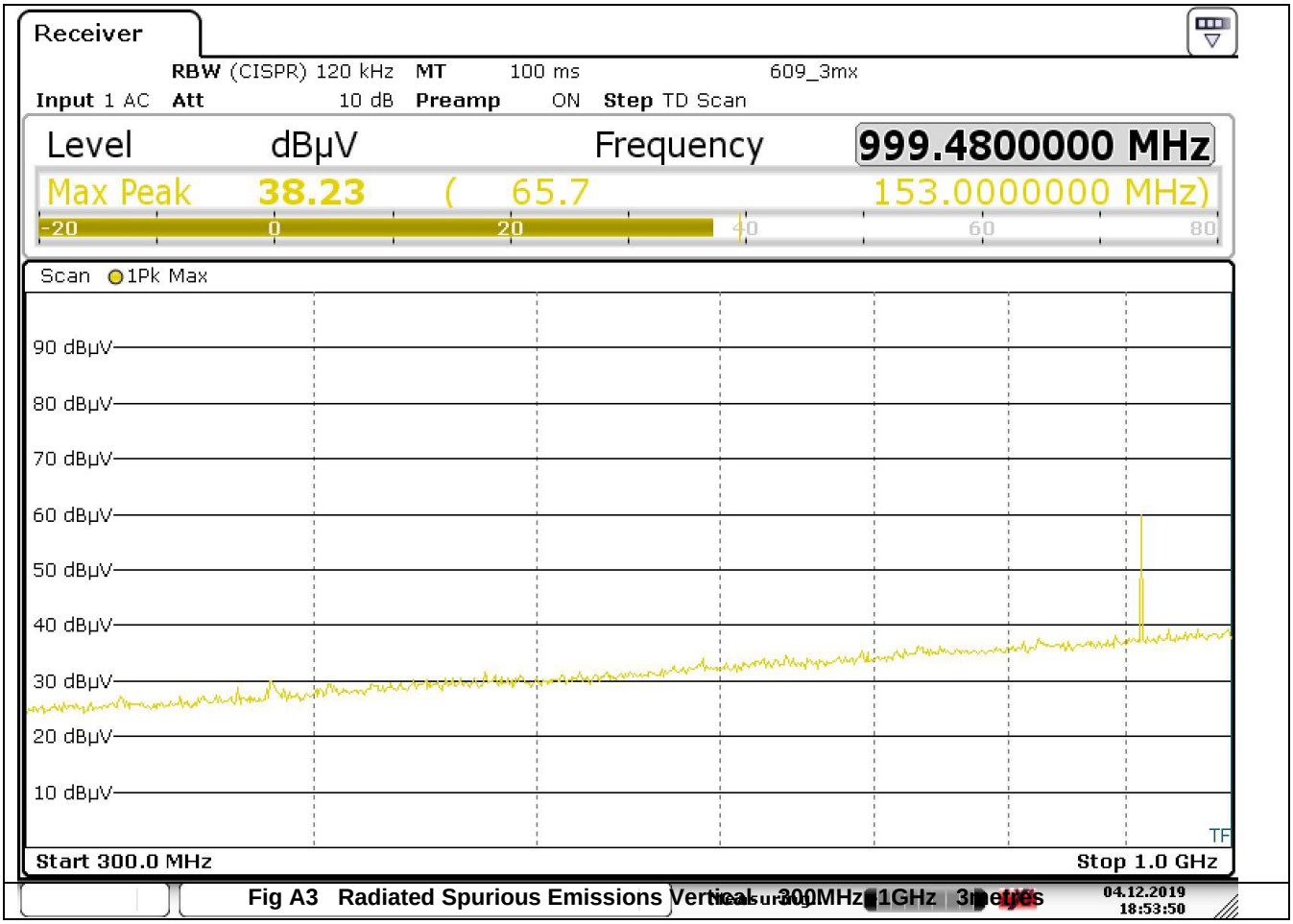

Fig A3 Radiated Spurious Emissions Vertical 300MHz-1GHz 3metres

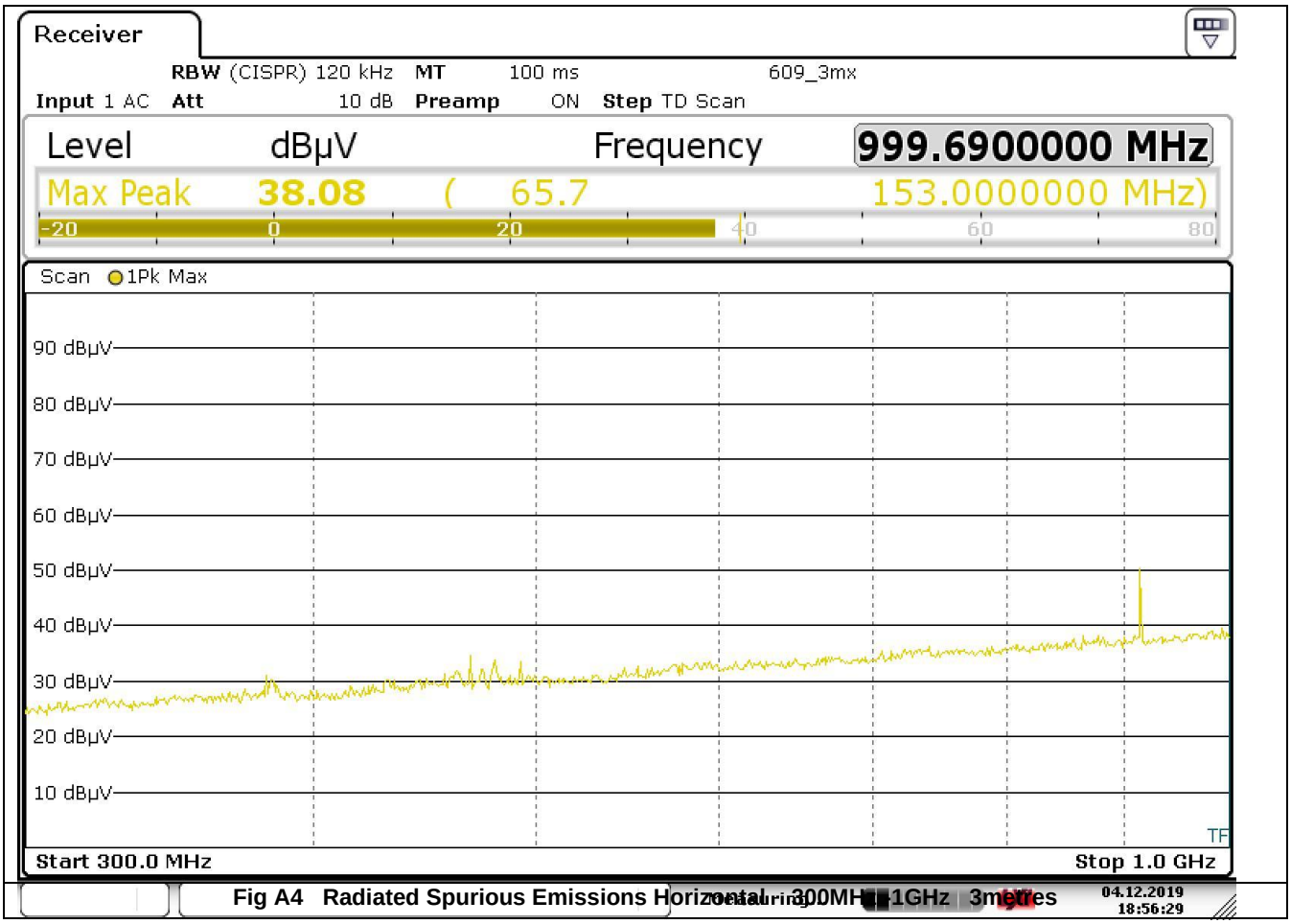

Fig A4 Radiated Spurious Emissions Horizontal 300MHz-1GHz 3metres

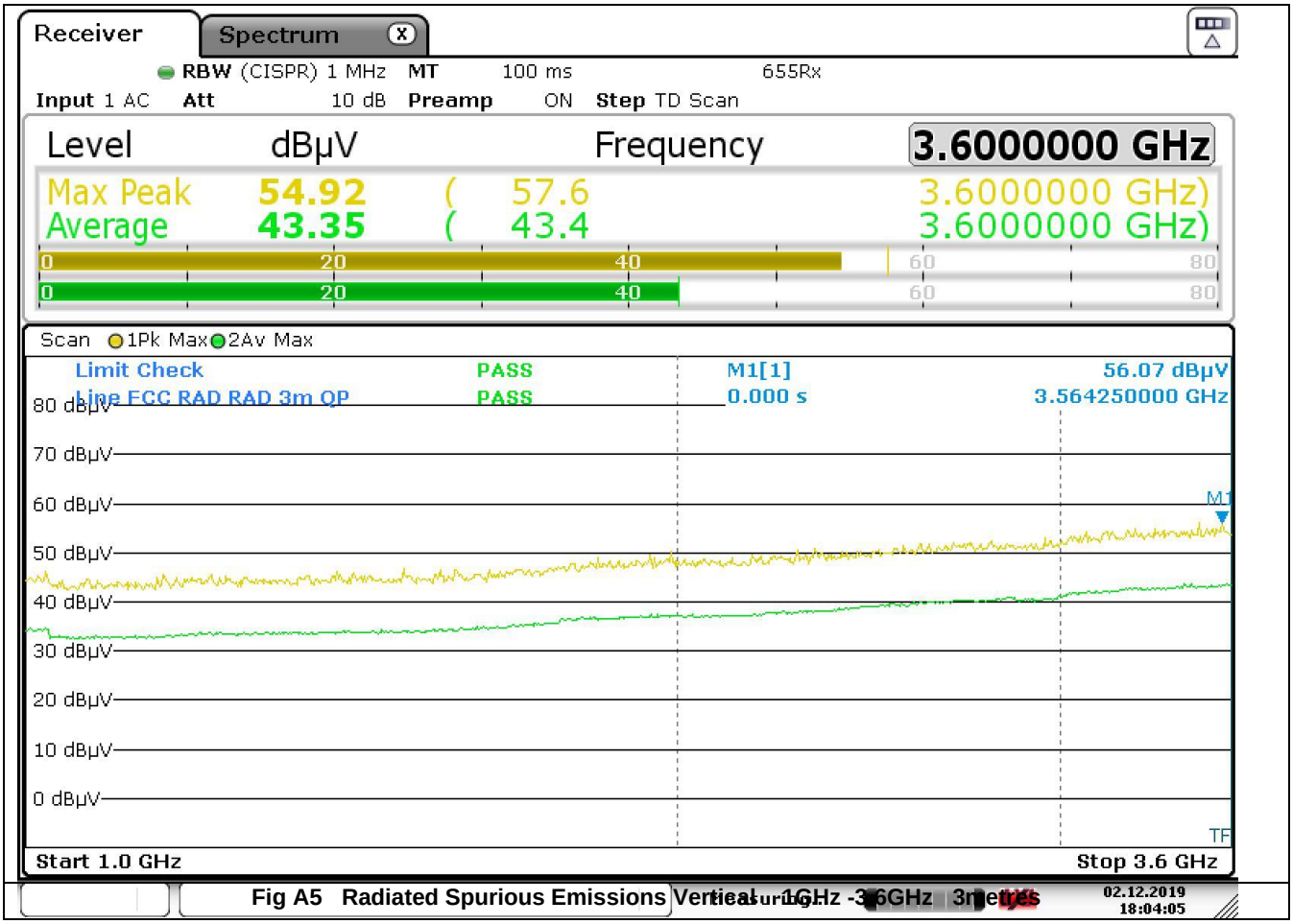

Fig A5 Radiated Spurious Emissions Vertical 1GHz -3.6GHz 3metres

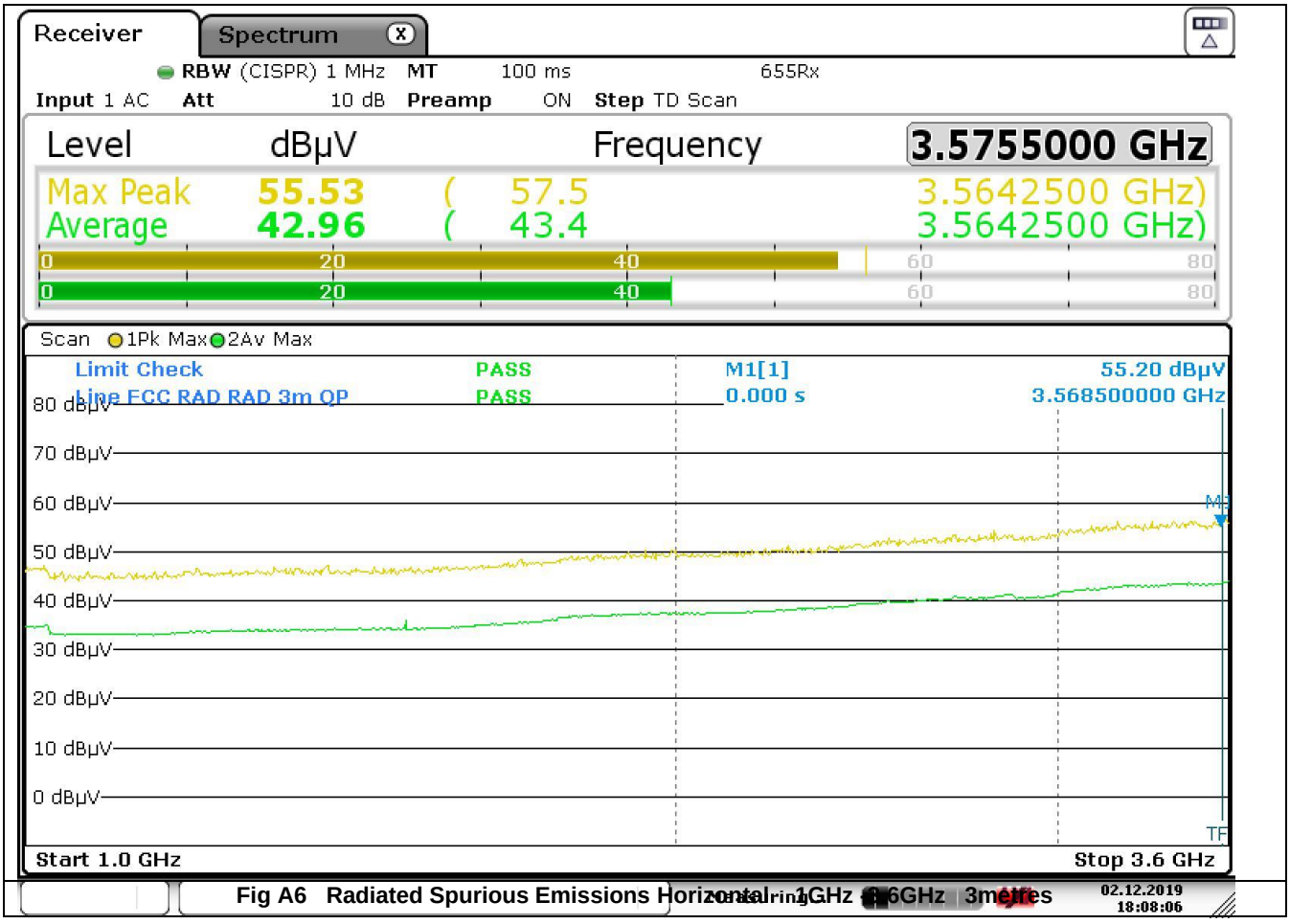

Fig A6 Radiated Spurious Emissions Horizontal 1GHz -3.6GHz 3metres

Date: 2.DEC.2019 18:08:06

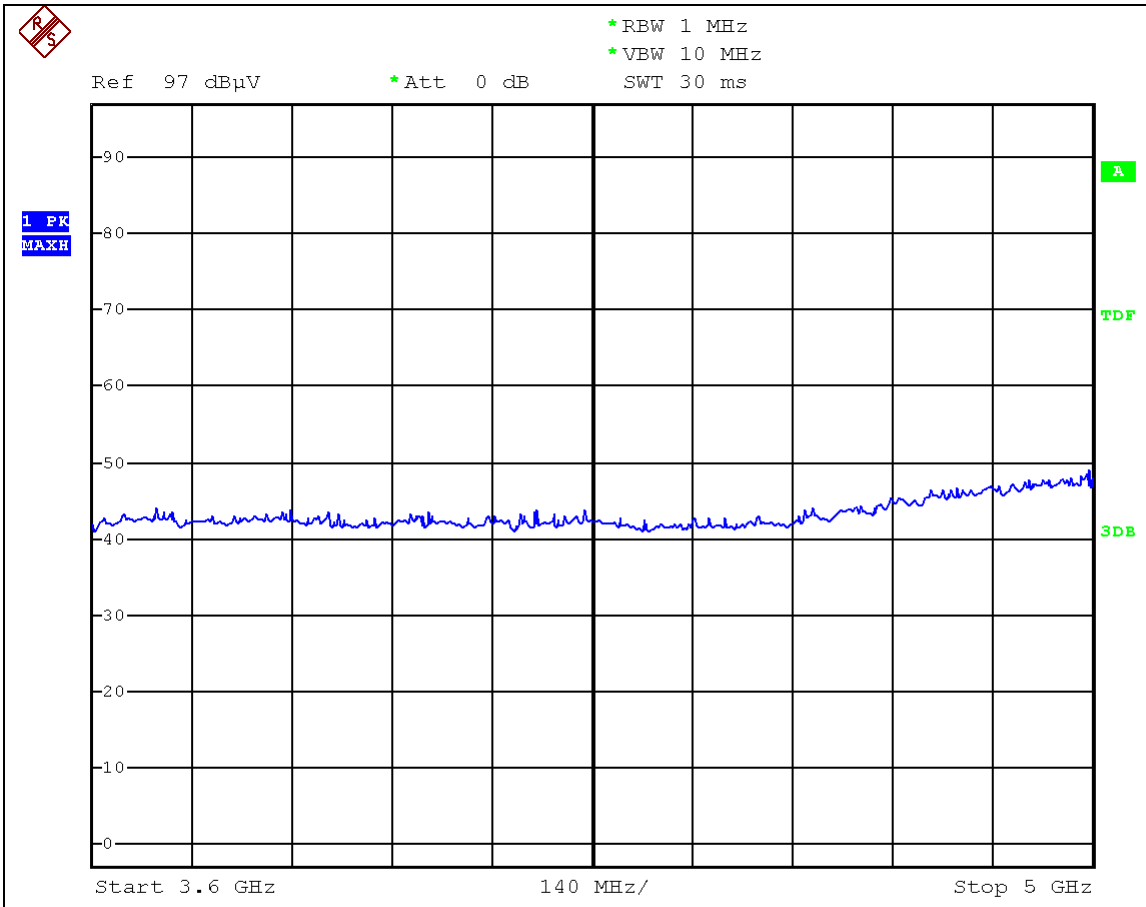

Fig A7 Radiated Spurious Emissions Vertical 3.6GHz -5GHz 3metres

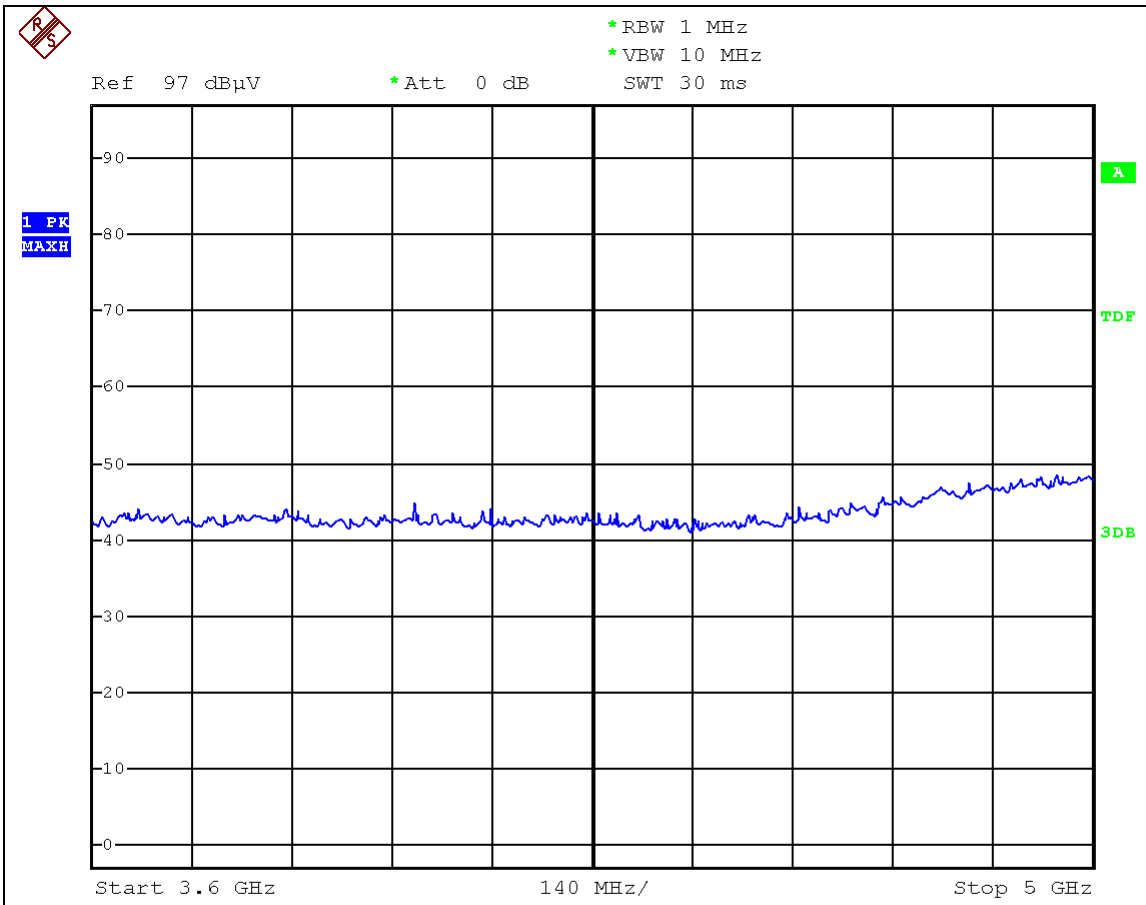

Fig A8 Radiated Spurious Emissions Horizontal 3.6GHz -5GHz 3metres

Date: 2.DEC.2019 19:40:52

Appendix B

Conducted Emissions on the mains

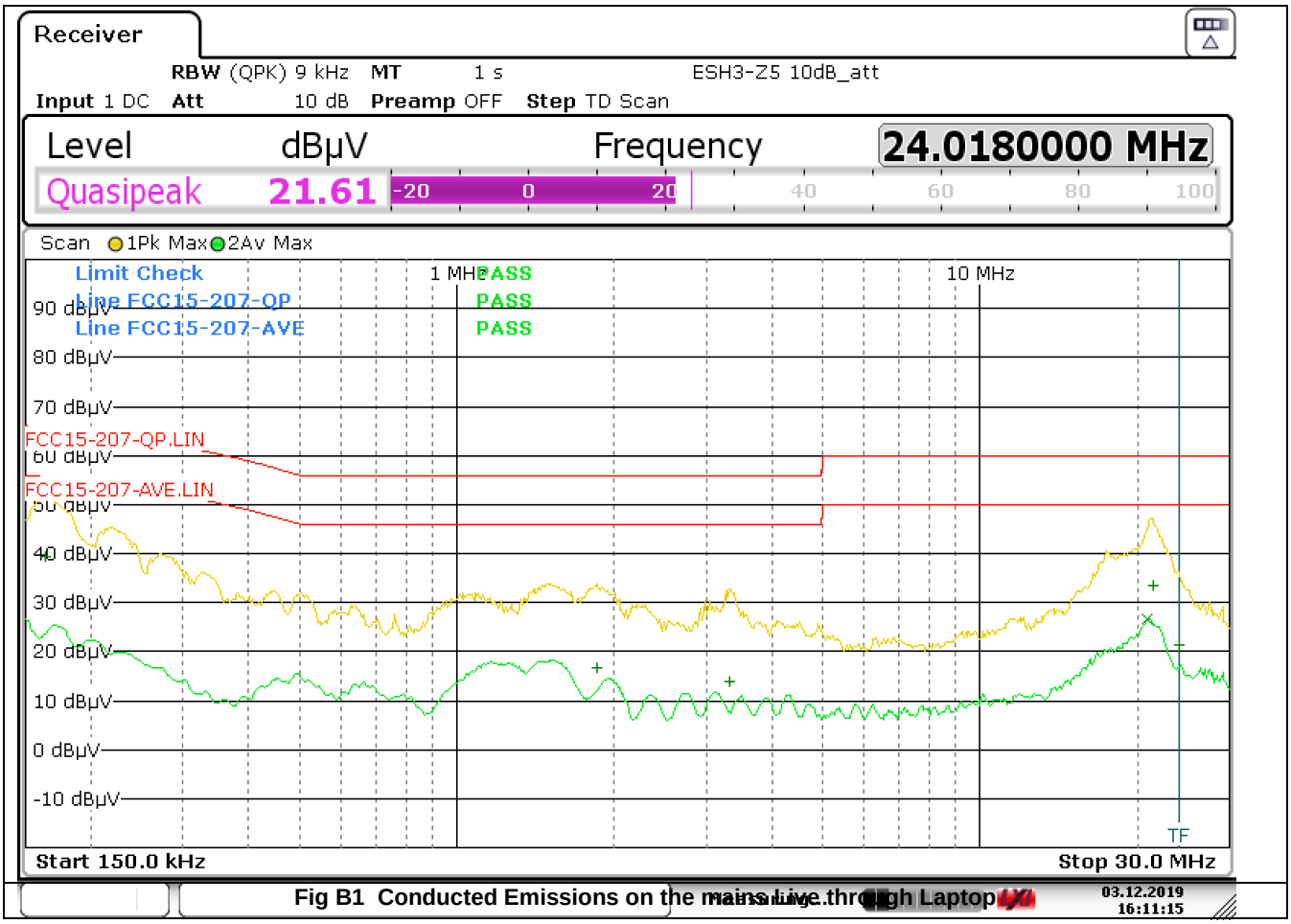

Fig B1 Conducted Emissions on the mains Live through Laptop PSU

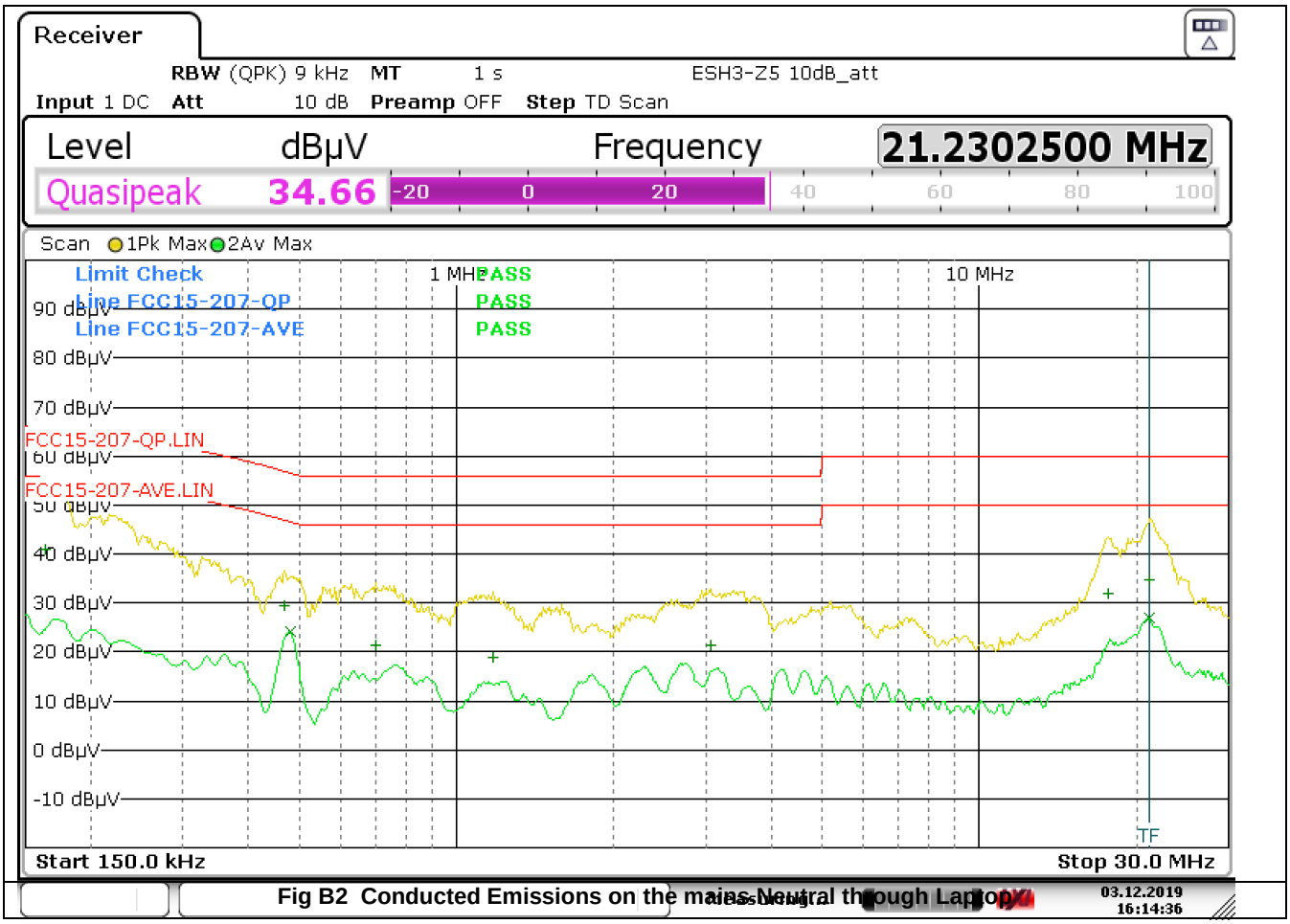

Fig B2 Conducted Emissions on the mains Neutral through Laptop PSU

Appendix C

Test Set up

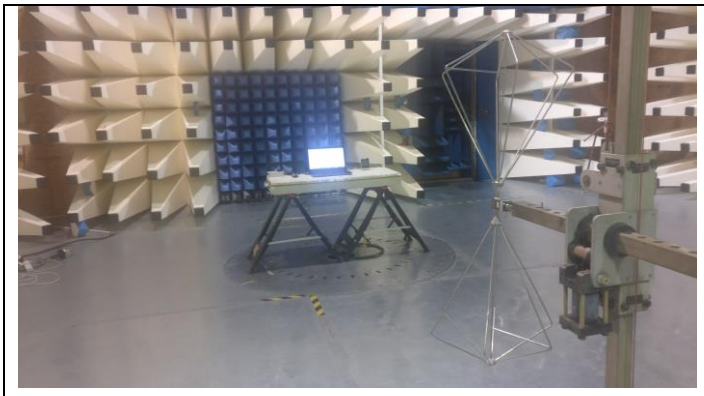

Fig C1 Radiated Emissions

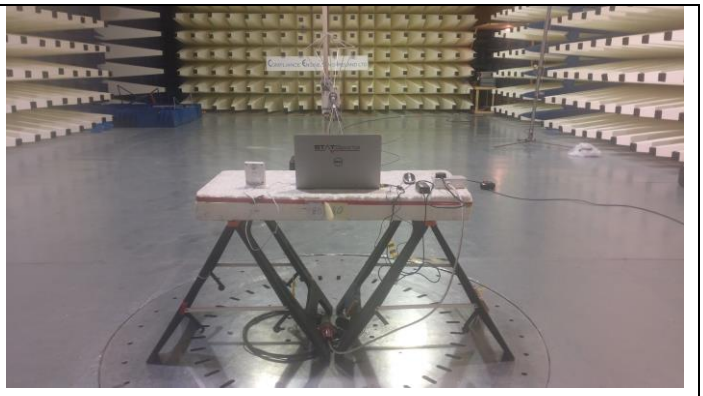

Fig C2 Radiated Emissions

Fig C3 Radiated Emissions

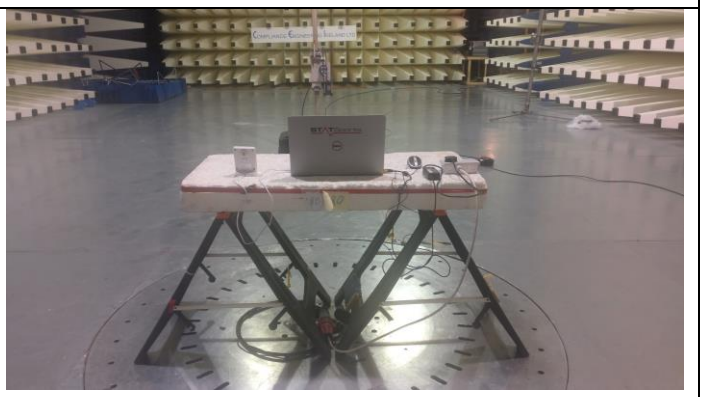

Fig C4 Radiated Emissions

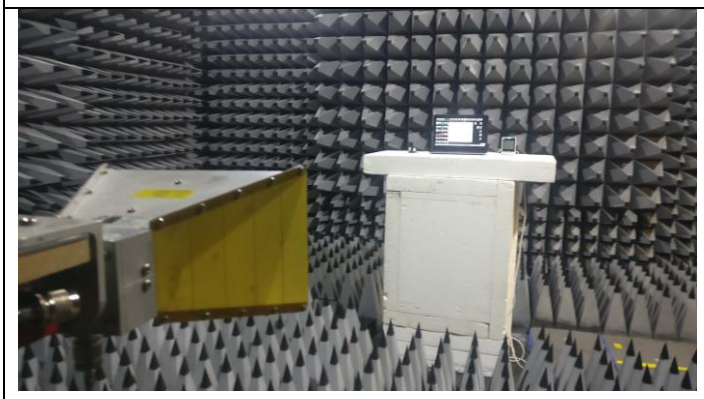

Fig C5 Radiated Emissions

Fig C6 Radiated Emissions

Fig C7 Radiated Emissions close up

	
Fig C8 Conducted Emissions mains Laptop	**Fig C9 Conducted Emissions mains Laptop**

End of Report