Compliance Engineering Ireland Ltd

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Project Number: 14E5020-1b

Prepared for:

Statsports Technologies Ltd.

By

Compliance Engineering Ireland Ltd

Clonross Lane

Derrockstown

Dunshaughlin

Co. Meath

FCC Site Registration: 92592

Industry Canada Assigned Site Code: 8517A-2

FCC ID: 2AC4LVP100

Date 17th Nov 2014

FCC EQUIPMENT AUTHORISATION

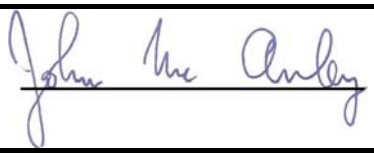
Test Report

EUT Description

Performance Sensor for Elite Athletes

Authorised :

John McAuley



TEST SUMMARY

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

FCC Part Section(s)	TEST PARAMETERS	Test Result
15.247a 2	6dB bandwidth	Pass
15.247a	99% bandwidth	Pass
15.247e	Power Spectral Density	Pass
15.247(b)1	Output power Conducted	Pass
15.247(d)1	Conducted Spurious Emissions	Pass
15.209	Radiated Spurious Emissions	Pass

Exhibit A – Technical Report

Table of Contents

1.0 EUT Description

The EUT was a multisensor for performance feedback for elite athletes.

Model:	VP100
Type:	Performance Sensor for Elite Athletes
FCC ID:	2AC4LVP100
Company:	Statsports Technologies Ltd
Contact	Arthur McMahon
Address:	1 Courtney Hill Newry ,Co Down Northern Ireland BT342EA
Phone:	+44 (0)28 3083 3334
e-mail:	a.mcmahon@statsports.ie
Test Standards:	47 CFR, Part 15.247
Type of radio:	Stand-alone
Transmitter Type:	O-QPSK
Operating Frequency Range(s):	2.405 GHz- 2.475GHz
Number of Channels:	15
Antenna:	Integral
Power configuration:	3.7 v Battery.
Ports:	Docking port
Oper. Temp Range:	5° C to +35° C
Classification:	DTS
Test Methodology:	Measurements performed according to the procedures in ANSI C63.4-2009 ANSI C63.10-2009

1.1 EUT Operation

Operating Conditions during Test:

The EUT operates over Zigbee using Channels 11 to 25 for the reporting of elite athlete performance

The EUT was powered from a rechargeable battery.

The EUT was operated in normal operating mode for all tests.

Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

☒ Normal

Temperature:	+15 to +35 ° C
Humidity:	20-75 %

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 one sample of the EUT during the month of June 2014 .

1.4 Electromagnetic Emissions Testing

The guidelines of CISPR 16-4 were used for all uncertainty calculations, estimates and expressions thereof for EMC testing. A copy of Compliance Engineering Ireland Ltd's policy for EMC Measurement Uncertainty is available on request.

RF Requirements: Spurious emissions in accordance with FCC CFR 15.107, 15.109 and 15.209. Tests were carried out to the requirements of CISPR 16-4 and ANSI C63.4-2009.

1.4.1 Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for the conducted emissions test was ±3.5 dB.

The measurement uncertainty (with a 95% confidence level) for the radiated emissions test was ±5.3 dB (from 30 to 100 MHz), ±4.7 dB (from 100 to 300 MHz), ±3.9 dB (from 300 to 1000 MHz) and ±3.8 dB (from 1 GHz to 40 GHz).

2 Emissions Measurements

2.1 Conducted Emissions Measurements

The EUT chip antenna was removed and an SMA connector was connected in its place for conducted radio test.

All tests were measured as per conducted radio test except radiated spurious emissions and conducted emissions on the mains.

The EUT was powered from rechargeable battery so conducted emissions on the mains tests were performed on a docking station with a standard EUT installed.

2.2 Radiated Emissions Measurements

Radiated Power measurements were made at the Compliance Engineering Ireland Ltd anechoic chamber located in Dunshaughlin, Co. Meath, Ireland to determine the radio noise radiated from the EUT. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.

The EUT was centred on a motorized turntable, which allows 360 degree rotation.

Emissions below 1GHz were measured using a bi-log 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 a horn antenna located at 3 metres distance from the EUT in a fully anechoic chamber. The radiated emissions were maximised by configuring the EUT and by rotating the EUT In this case the resolution bandwidth was 1MHz and video bandwidth was 1MHz. for peak measurements. The Video bandwidth was changed to 10Hz for Average measurements (as per ANSI 63.4-2009 Section 4.2.2 e) .

A Radiated Emission prescan was performed which covered the x, y and z orientations for low ,mid and high channels in horizontal and vertical polarizations. In each case the emission was maximised.

The result of this prescan showed that the highest emission for vertical polarization was with the EUT on its side (orientation3 O3) for low mid and high channels. The highest emission for vertical polarization was the high channel

A full scan for radiated emission was performed on the high channel in orientation O3 for vertical polarization and horizontal polarization.

2.3 Antenna Requirements

According to FCC 47 CFR 15.203:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

* The antennas of this E.U.T are permanently attached.

*The E.U.T Complies with the requirement of 15.203

3.0 Results for Conducted emissions on the mains

Mains Conducted Emissions results

The EUT was placed in a charger pod which was powered from the mains.

Detector	Frequency MHz	Reading dBuV	Margin dB	Phase
Average	0.670	32.02	-13.98	Live
Average	1.158	26.20	-19.80	Live
Average	2.074	30.13	-15.87	Live
Average	2.256	31.91	-14.09	Live
Average	3.842	29.25	-16.75	Live
Average	10.246	29.14	-20.86	Live
Quasi-Peak	17.194	36.56	-23.44	Live
Average	17.196	30.62	-19.38	Live
Quasi-Peak	19.883	41.47	-18.53	Live
Average	21.221	36.24	-13.76	Live

Detector	Frequency MHz	Reading dBuV	Margin dB	Phase
Average	0.305	31.98	-19.58	Neutral
Average	0.548	31.88	-14.12	Neutral
Average	1.037	28.77	-17.23	Neutral
Average	1.768	27.17	-18.83	Neutral
Average	3.476	26.62	-19.38	Neutral
Average	4.940	26.01	-19.99	Neutral
Quasi-Peak	19.757	44.44	-15.56	Neutral
Average	21.100	39.62	-10.38	Neutral

Ref Appendix C for scans

Result: Pass

4. Results

4.1 Bandwidth of Channel

4.1.1 6dB bandwidth of Channel

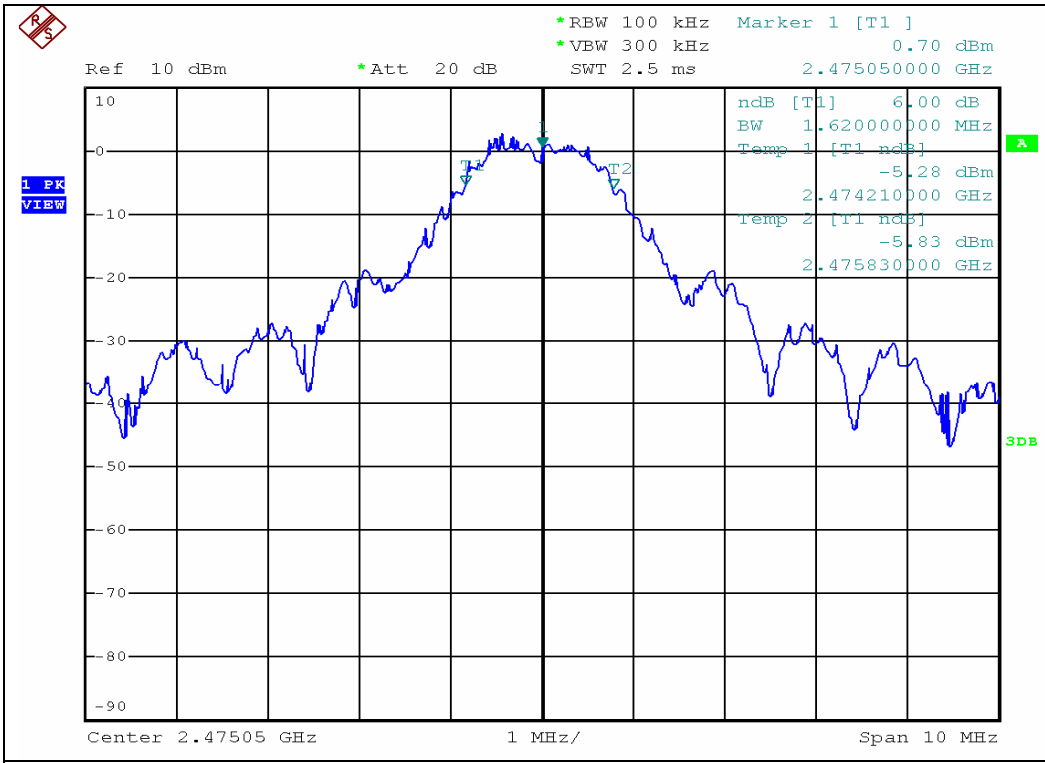


Fig 1 6dB Bandwidth

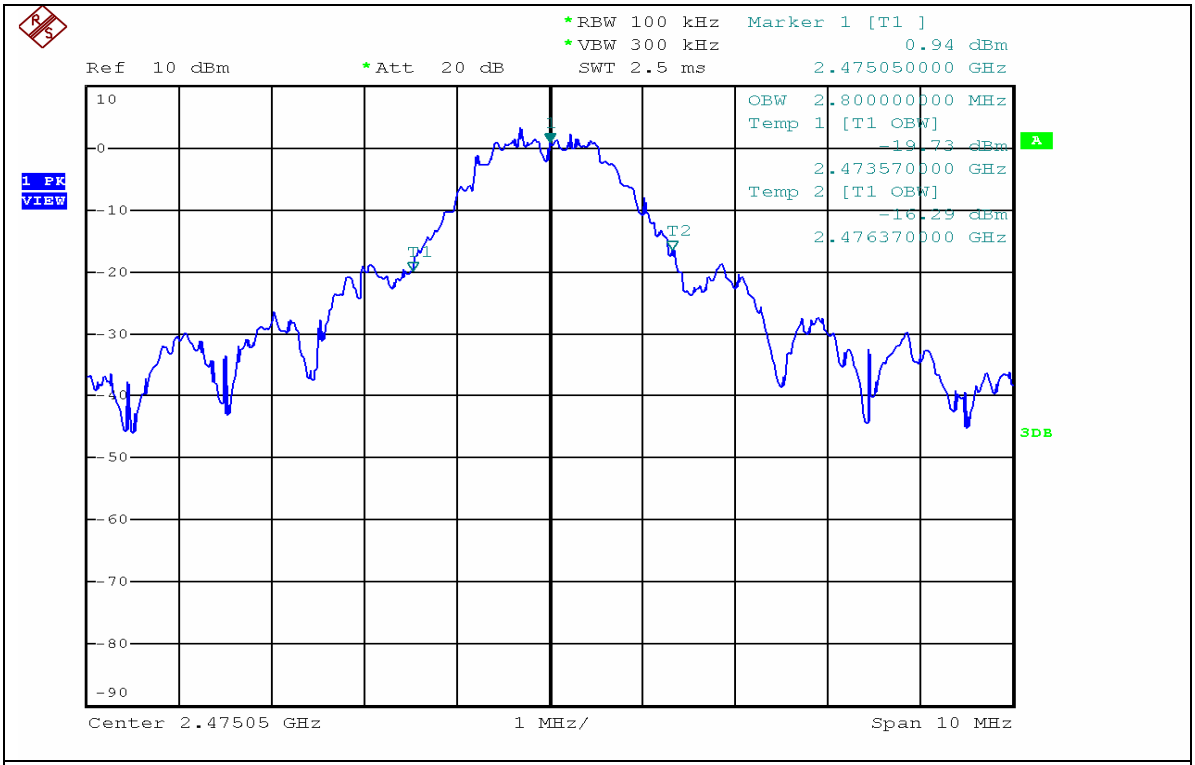


Fig 2 99% Bandwidth

Bandwidth of Channel

Channel	Operating Frequency	6dB Bandwidth	99% Bandwidth
	GHz	MHz	MHz
Low	2.405	1.74	2.96
Mid	2.44	1.66	2.85
High	2.475	1.62	2.8

Limit for 6dB Bandwidth = 500KHz

Result :- Pass

4.2 Power Spectral Density

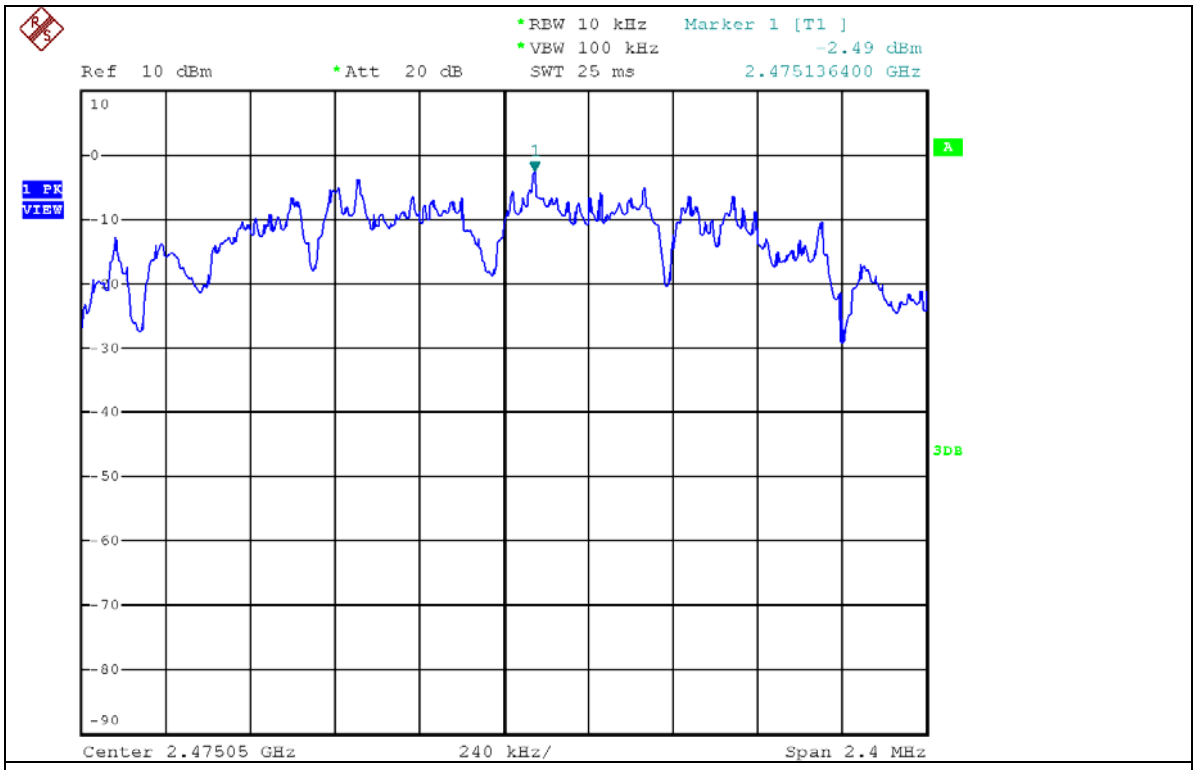


Fig 3 Power Spectral Density

Channel	Operating Frequency	Power Spectral Density	Limit
	GHz	dBm	dBm
Low	2.405	-3.74	8
Mid	2.44	-4.15	8
High	2.475	-2.49	8

Result :- Pass

4.3 Output power Conducted

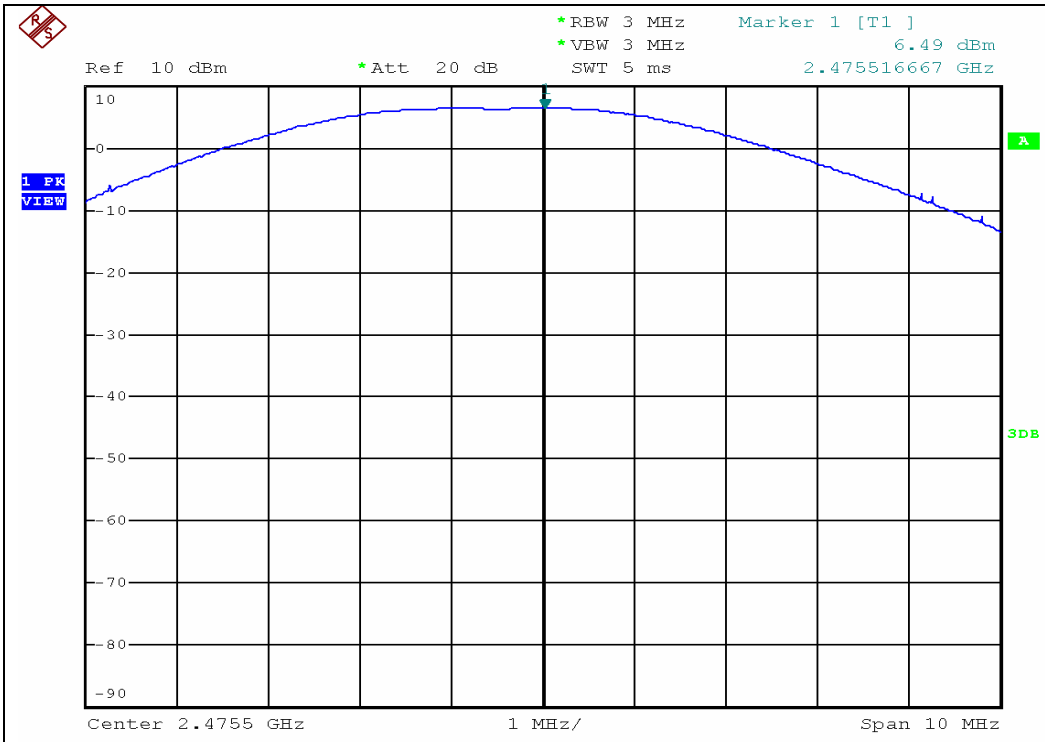


Fig 4 Output Power Conducted

Channel Frequency	Measured Level	Limit Peak Conducted Power	Margin	Result
GHz	dBm	dBm	dB	
2.405	5.85	30	24.15	Pass
2.44	6.29	30	23.71	Pass
2.475	6.49	30	23.51	Pass

4.5 Conducted Spurious Emissions

Ref scans for in Appendix A

Frequency	Peak Level	Cable Loss	Final Peak Level	Output Power	Limit	Margin dB
GHz	dBm	dB	dBm	dBm	dBm	dBm
4.811	-26.9	0.1	-26.9	1.5	-18.5	8.4
7.2136	-40.2	0.1	-40.2	1.5	-18.6	21.7
4.88	-25.9	0.1	-25.9	1.2	-18.8	7.1
7.32	-39.2	0.1	-39.2	1.2	-18.8	20.4
4.951	-25.0	0.1	-25.0	1.2	-18.8	6.2
7.42	-39.7	0.1	-39.7	1.2	-18.8	20.9

Limit : Output power -20dB

Result Pass

4.6 Radiated Spurious Emissions

4.6.1 Results for Radiated emissions

Appendix B shows the results of the scans in the anechoic chamber

Result: Pass

4.6.2 Measurements with Bilog Antenna (30MHz to 1GHz)

There were no peaks evident below 1 GHz

4.6.3 Antenna measurements (1GHz – 26 GHz)

Frequency GHz	Peak Level dBuV/m	Antenna Factor dB	Preamp Gain dB	Cable Loss dB	Antenna Polarity	EUT Orientation	Final Peak Level dBuV/m	Average Limit +20dB dBuV/m	Margin dB
4.81	68.7	32.3	37.1	5.2	Vertical	O3	68.3	74.0	5.6
4.81	64.4	32.3	37.1	5.2	Horizontal	O3	64.0	74.0	10.0
7.216	61.9	37.7	36.9	6.5	Vertical	O3	54.6	74.0	19.4
7.216	61.0	37.7	36.9	6.5	Horizontal	O3	53.7	74.0	20.3
4.881	69.8	32.3	37.1	5.2	Vertical	O3	69.4	74.0	4.6
4.881	67.3	32.3	37.1	5.2	Horizontal	O3	66.9	74.0	7.1
7.32	64.4	37.7	38	6.7	Vertical	O3	58.0	74.0	16.0
7.32	63.7	37.7	38	6.7	Horizontal	O3	57.3	74.0	16.7
4.951	74.5	34	37.3	5.2	Vertical	O3	72.6	74.0	1.4
4.951	70.0	34	37.3	5.2	Horizontal	O3	68.1	74.0	5.9
7.4235	67.4	37.7	37.5	6.3	Vertical	O3	60.9	74.0	13.1
7.423	66.0	37.7	37.5	6.3	Horizontal	O3	59.5	74.0	14.5

Frequency GHz	Final Peak Level dBuV/m	EUT Orientation	Antenna Polarity	Duty Cycle Correction dB	Average Level dBV/m	Average Limit dBuV/m	Margin dB
4.81	68.3	O3	Vertical	-28.8	39.5	54.0	14.5
4.81	64.0	O3	Horizontal	-28.8	35.2	54.0	18.8
7.216	54.6	O3	Vertical	-28.8	25.7	54.0	28.2
7.216	53.7	O3	Horizontal	-28.8	24.8	54.0	29.1
4.881	69.4	O3	Vertical	-28.8	40.5	54.0	13.4
4.881	66.9	O3	Horizontal	-28.8	38.0	54.0	15.9
7.32	58.0	O3	Vertical	-28.8	29.1	54.0	24.8
7.32	57.3	O3	Horizontal	-28.8	28.4	54.0	25.5
4.951	72.6	O3	Vertical	-28.8	43.8	54.0	10.2
4.951	68.1	O3	Horizontal	-28.8	39.3	54.0	14.7
7.4235	60.9	O3	Vertical	-28.8	32.1	54.0	21.9
7.423	59.5	O3	Horizontal	-28.8	30.6	54.0	23.4

Harmonics of Low Mid and High channels for radiated measurement

RBW = 1MHz

One Period(mS)	Pulse Width (mS)	Duty Cycle	20 log duty cycle (dB)	Duty Cycle %
97.965	**3.547**	**0.0362**	**-28.8**	**3.6**

Duty Cycle correction for Average measurement of pulsed signal =Peak -28.8dB

as per ANSI C63.10-2009 Section 7.6.3

Result: Pass

4.7 Duty Cycle

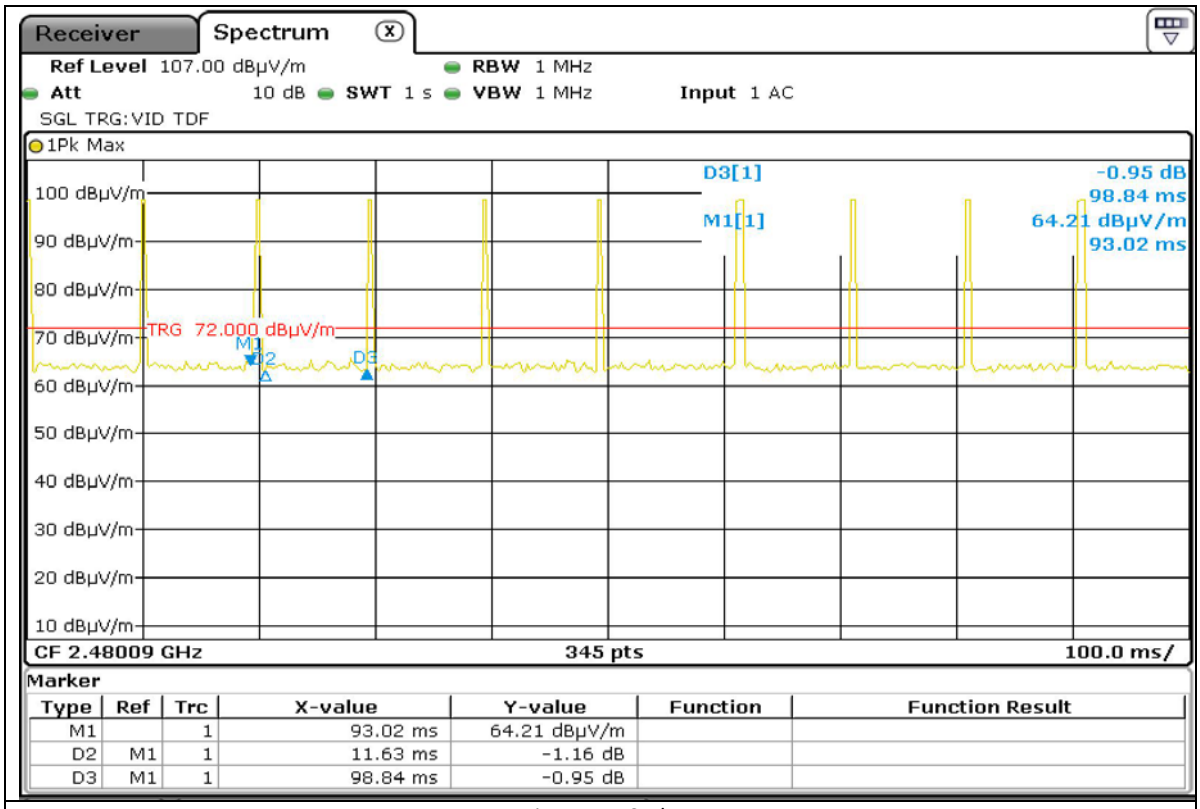


Fig5 Duty Cycle

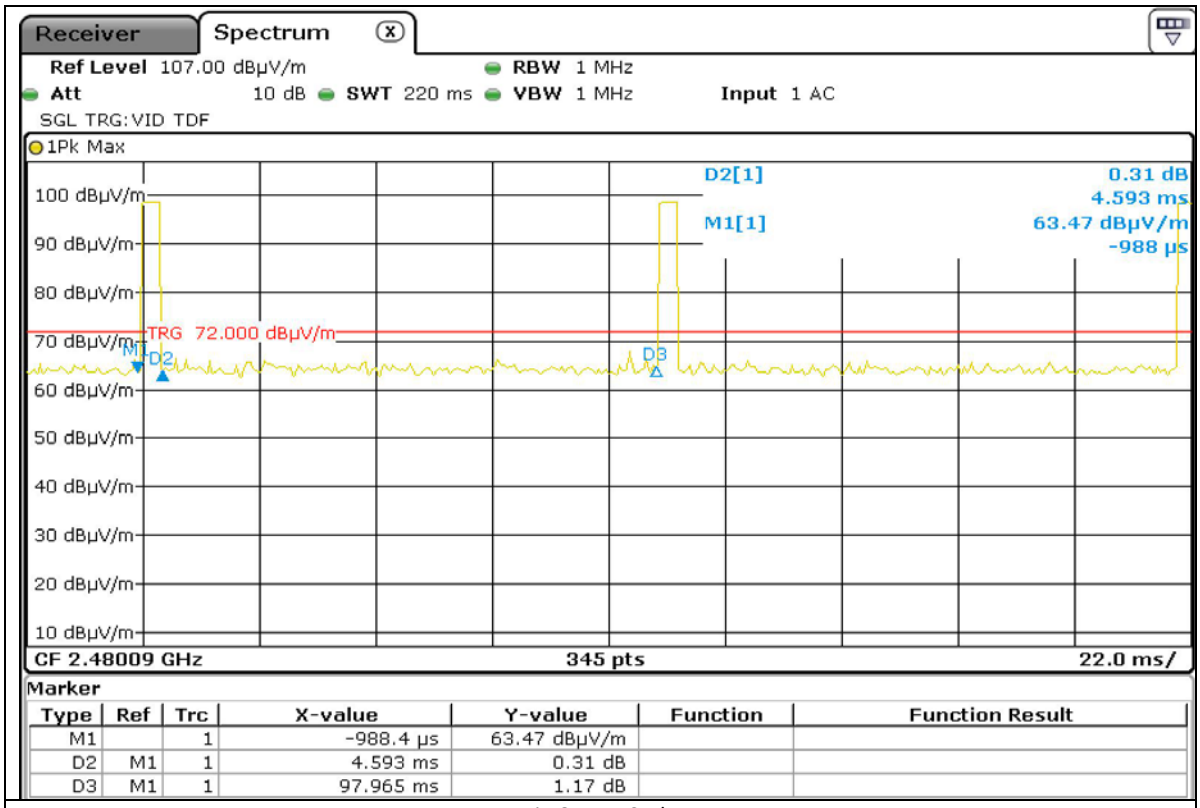


Fig 6 Duty Cycle

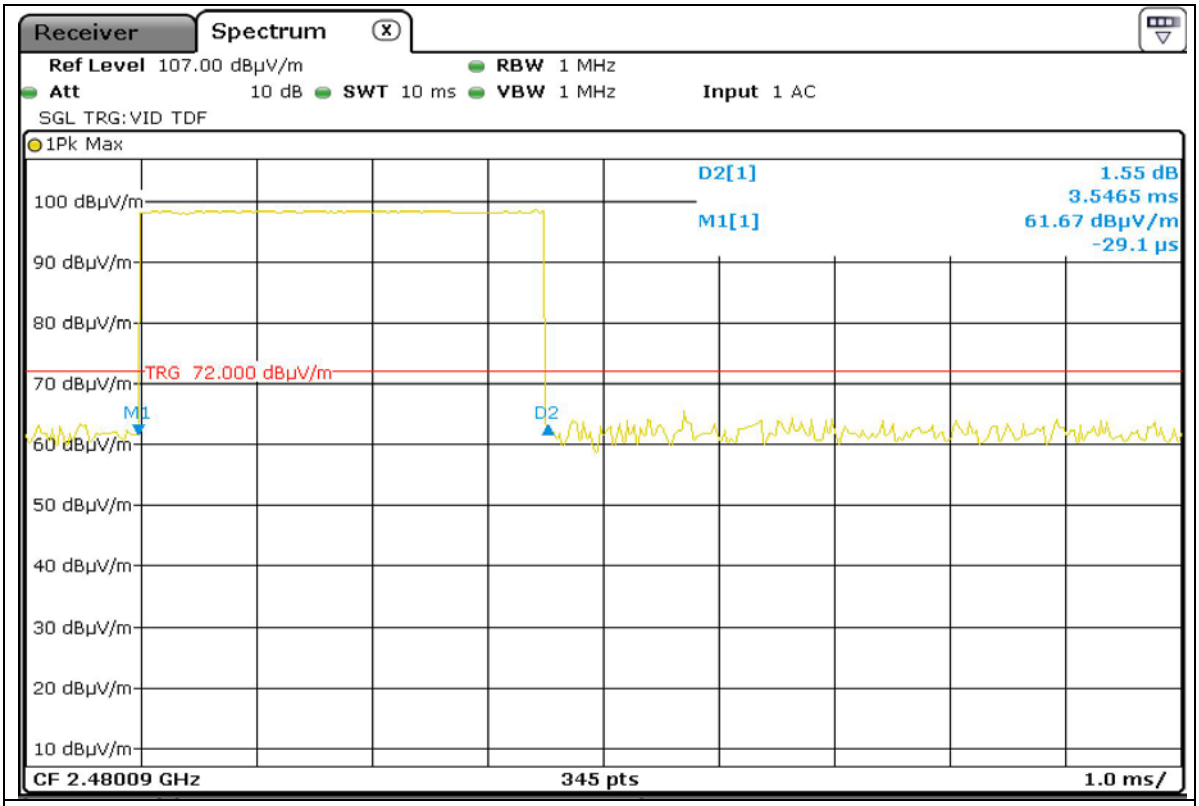


Fig 7 Duty Cycle

5.0 List of Test Equipment

Instrument	Mftr.	Model	CEI Ref No.	Cal Due Date
Trilog Antenna	Schwarzbeck	VULB 9160	889	08/09/2015
Preamplifier	Hewlett Packard	83017A	805	10/04/2015
Horn Antenna	AH Systems	SAS 200 571	839	16/05/2016
Spectrum Analyser	Rohde & Schwarz	FSP 40	850	18/06/2014
Spectrum Analyser/Receiver	Rohde & Schwarz	ESR	869	25/05/2015
Horn Antenna	A-Inflow	LB-42-25-C-KF	877	04/09/2014
Cable low loss	Micro-Coax	Utiflex UFA147A	705	18/05/2015

Appendix A

Additional Test Results

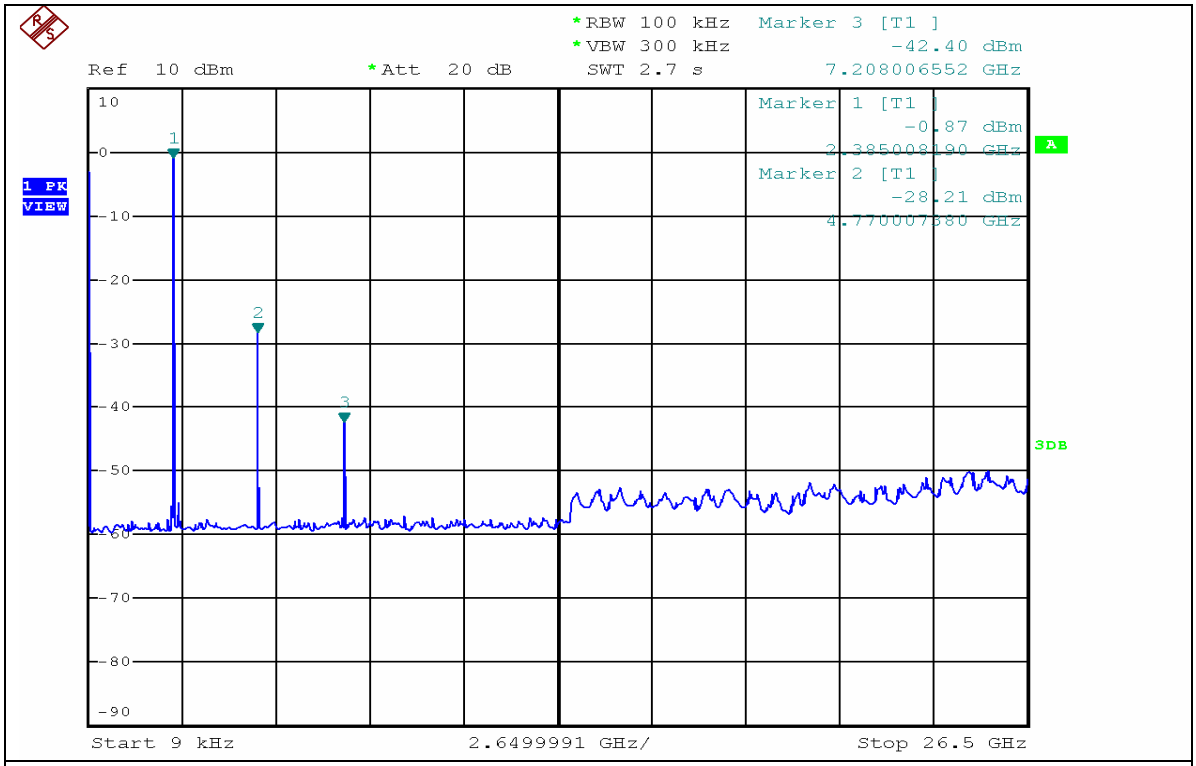


Fig A1 Low Channel Conducted Spurious Emissions 30MHz -26 GHz

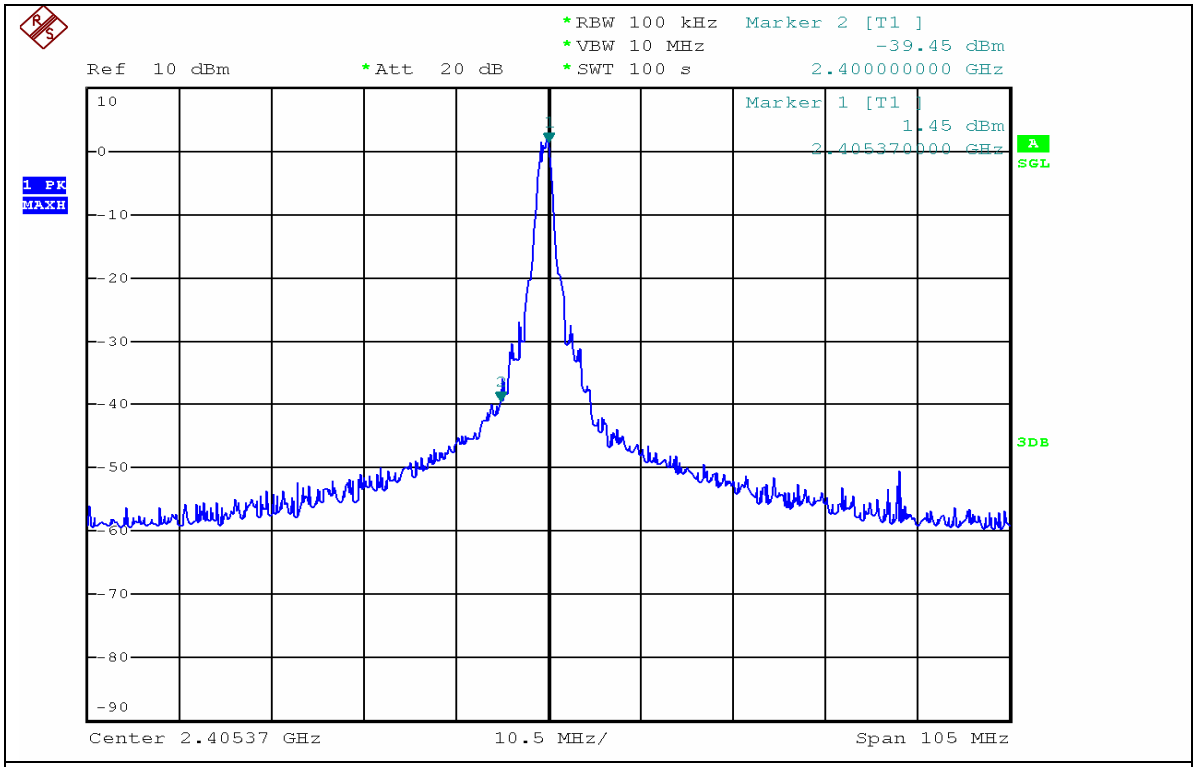


Fig A2 Low Channel Conducted Spurious Emissions Lower Band Edge

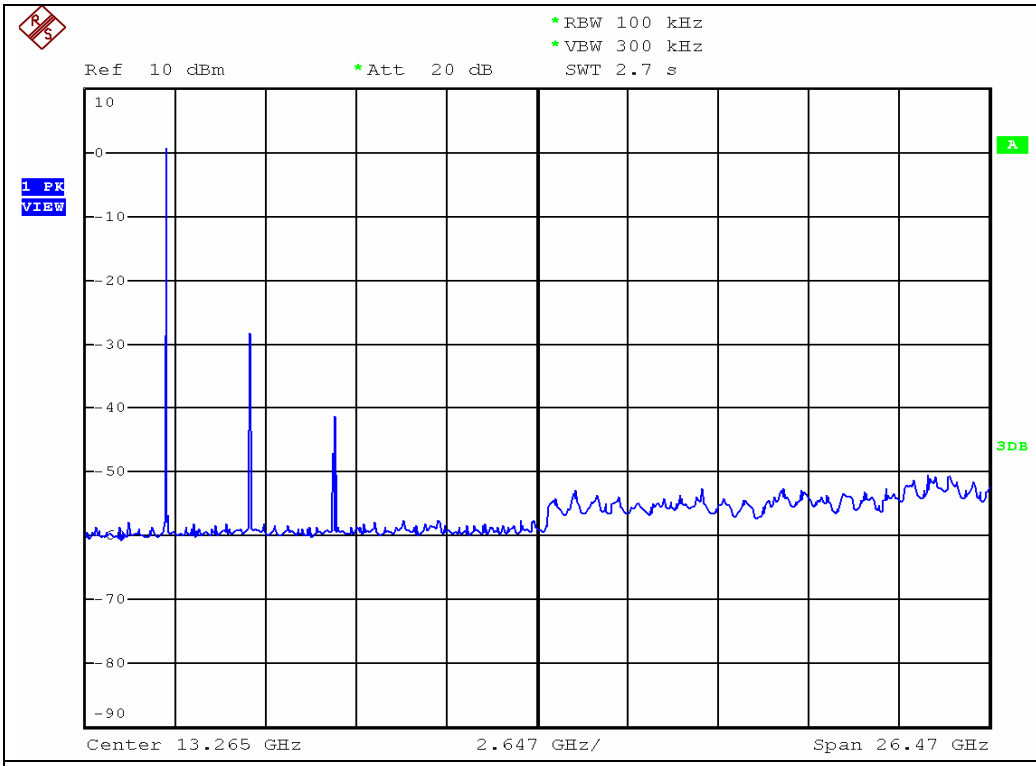


Fig A3 Mid channel Conducted Spurious Emissions 30MHz -26 GHz

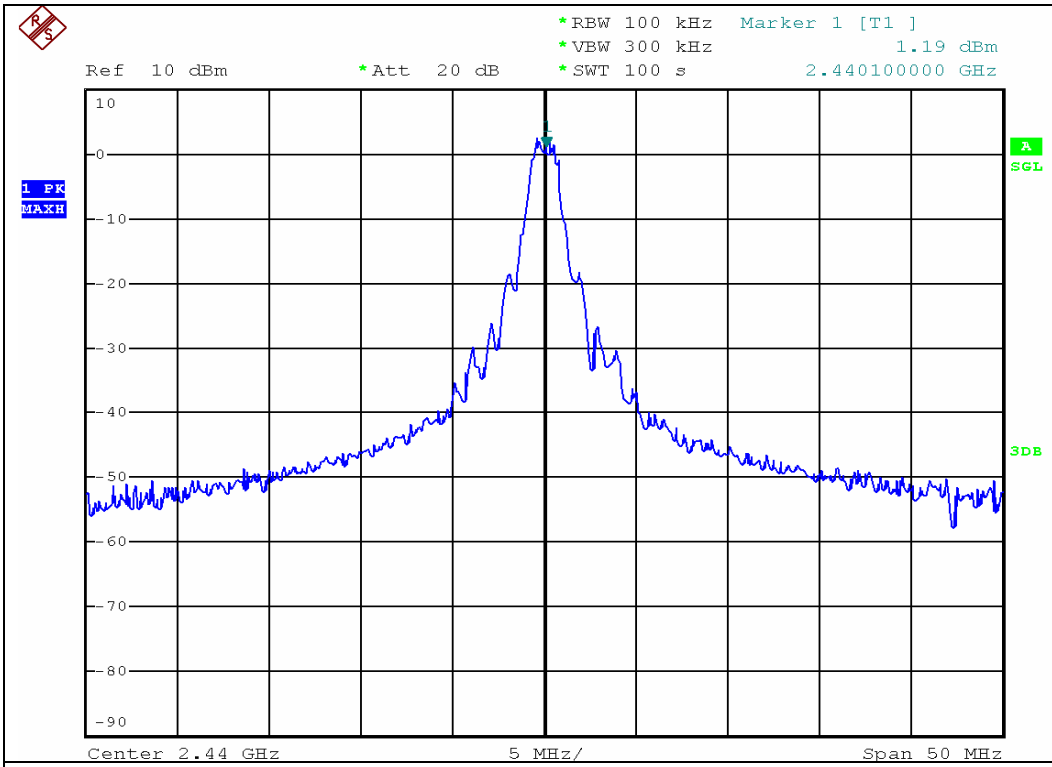


Fig A4 Mid channel Conducted Spurious Emissions

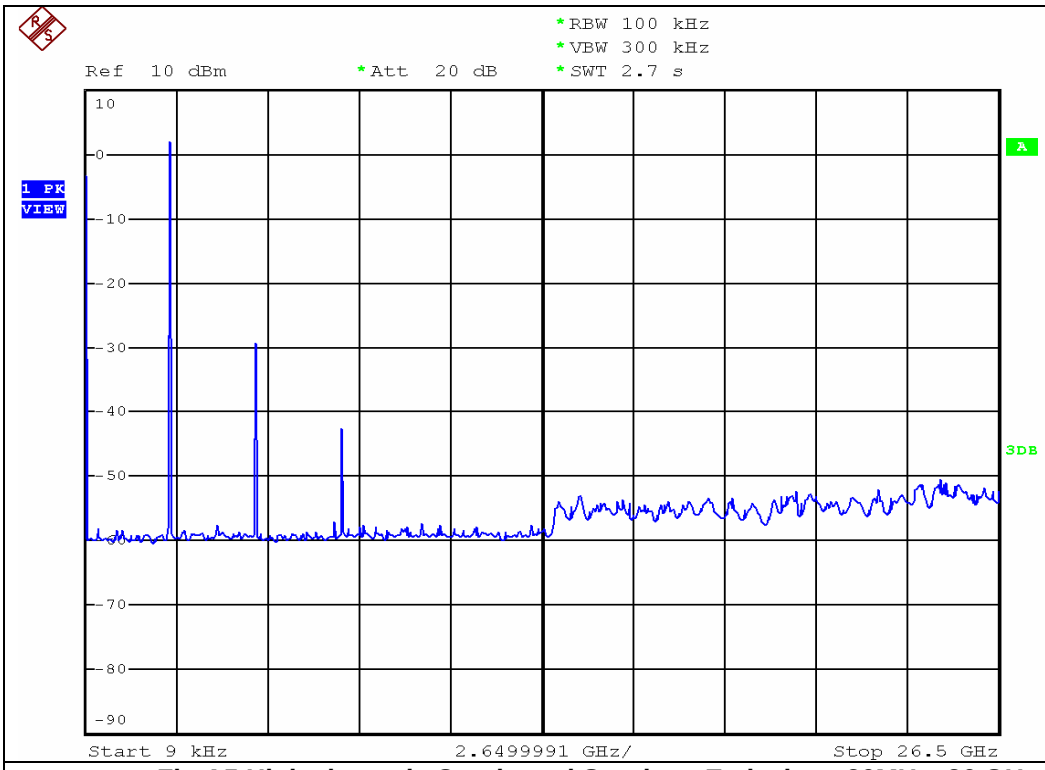


Fig A5 High channel Conducted Spurious Emissions 30MHz -26 GHz

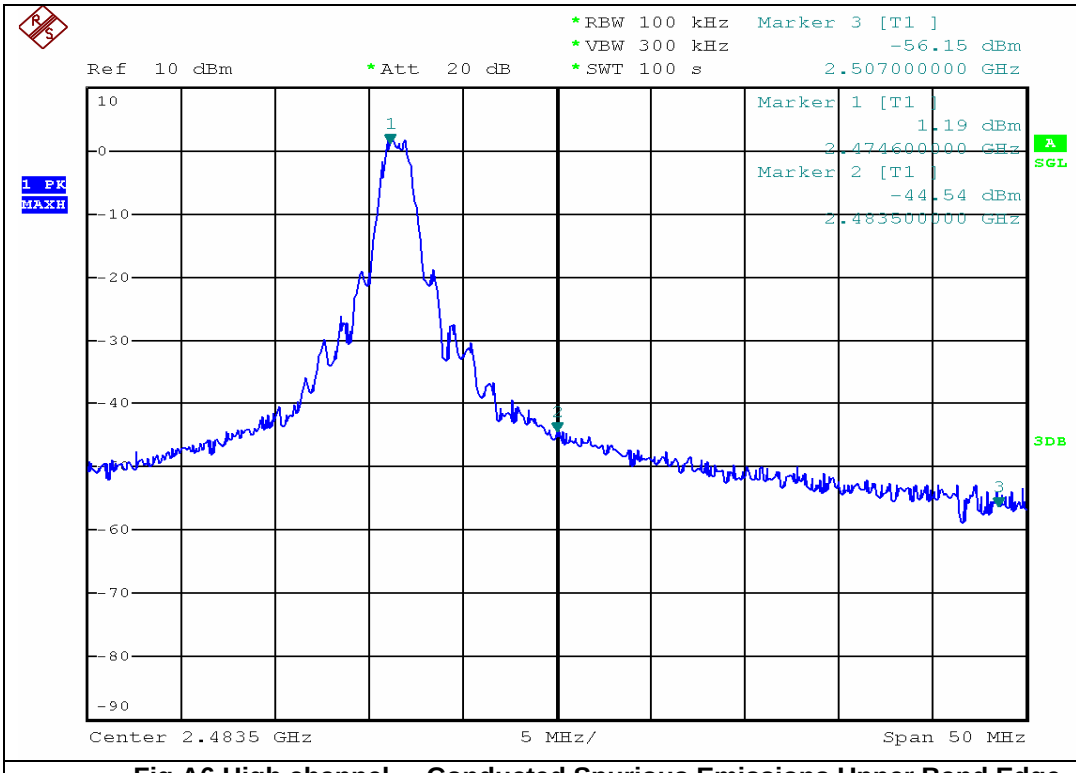


Fig A6 High channel Conducted Spurious Emissions Upper Band Edge

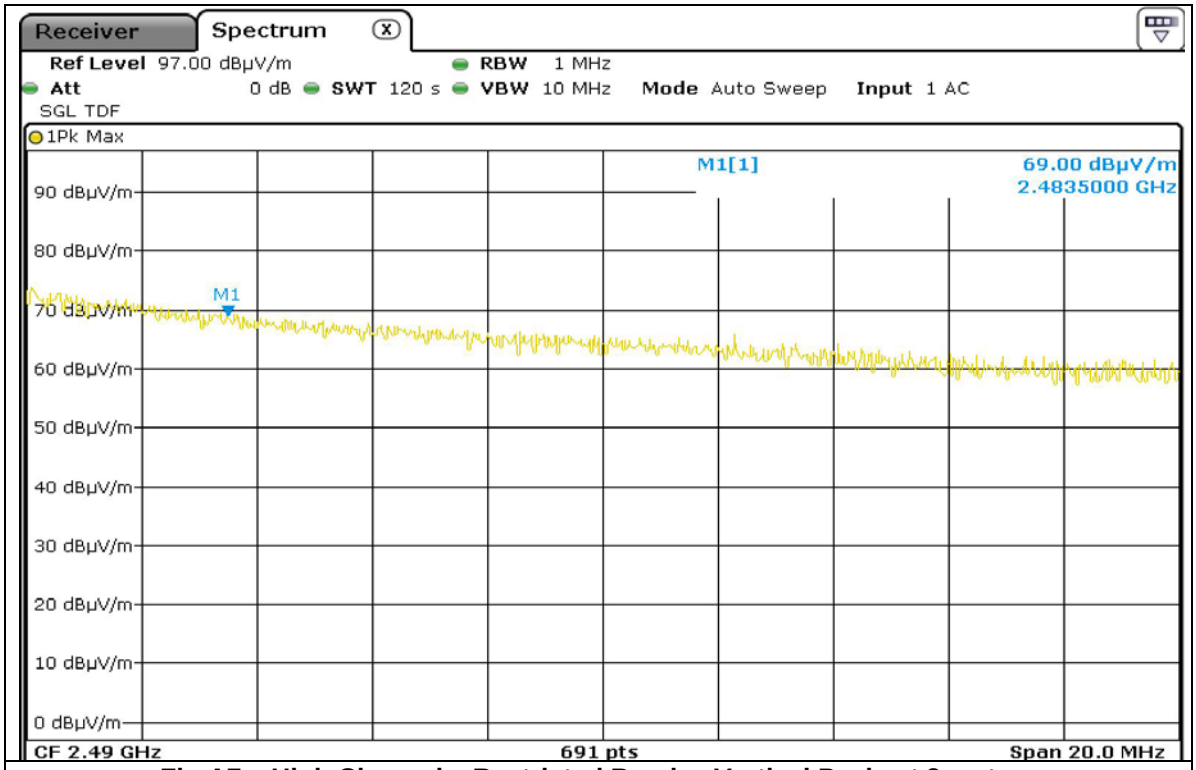


Fig A7 High Channel Restricted Band Vertical Peak at 3 metres

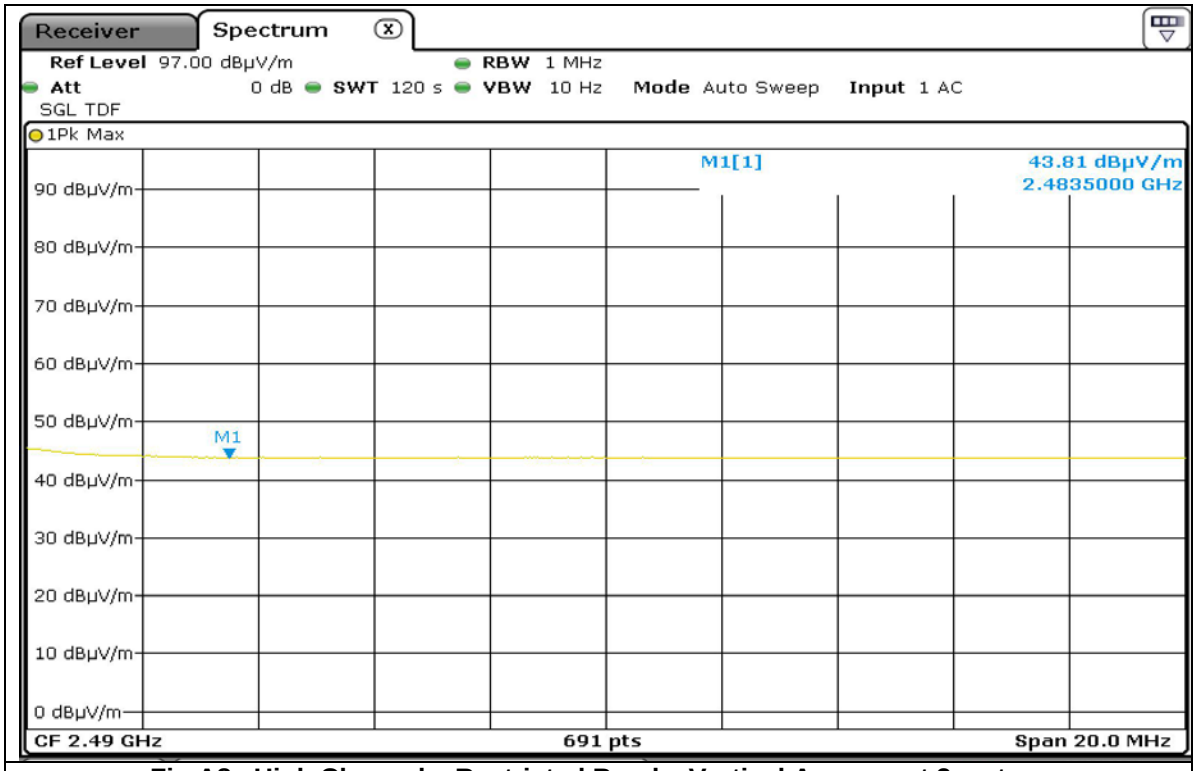


Fig A8 High Channel Restricted Band Vertical Average at 3 metres

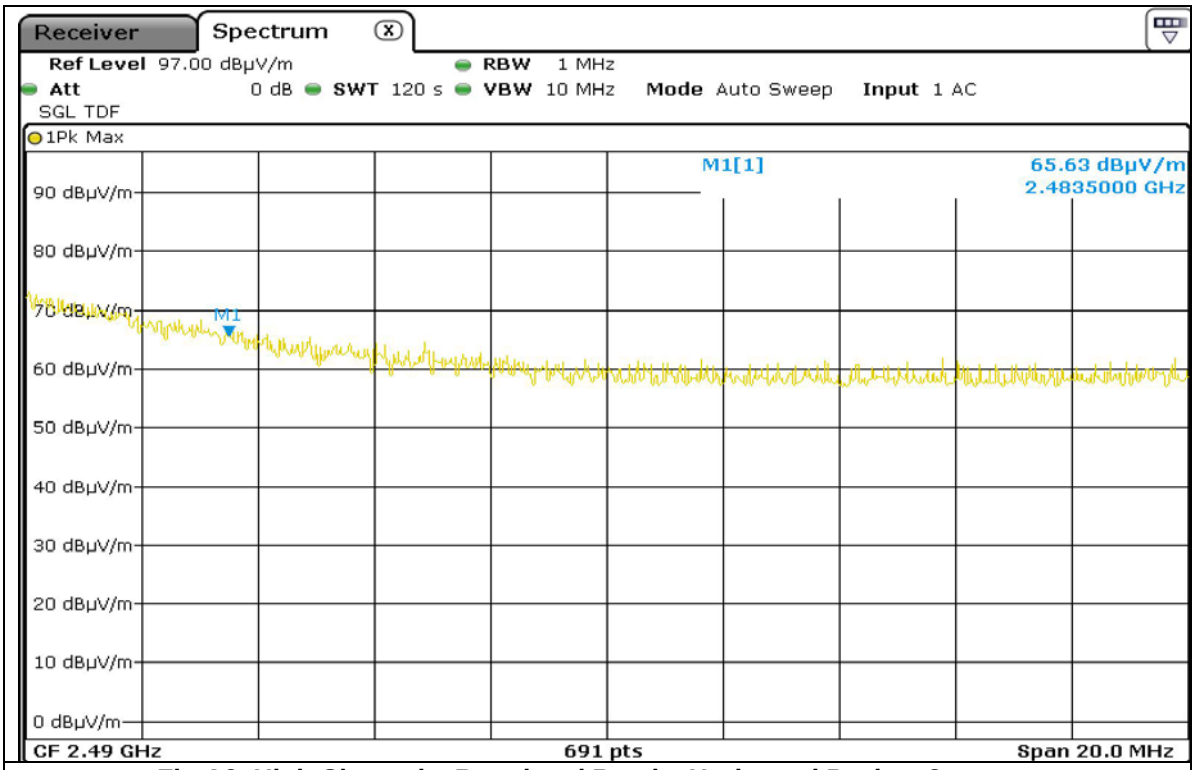


Fig A9 High Channel Restricted Band Horizontal Peak at 3 metres

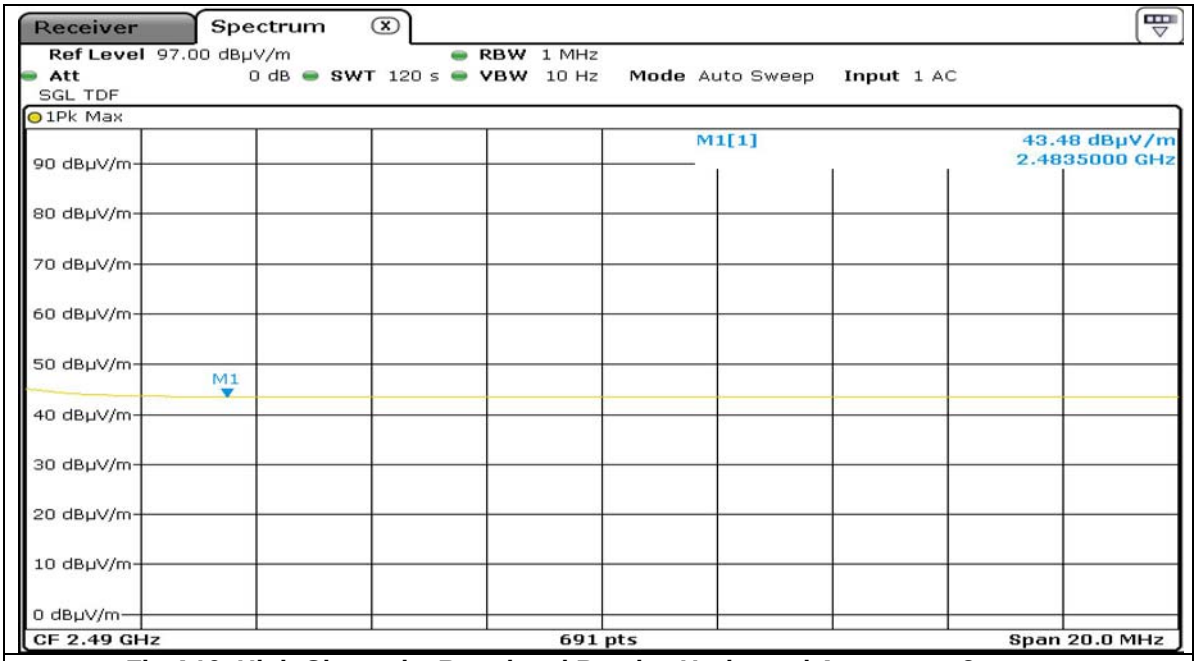


Fig A10 High Channel Restricted Band Horizontal Average at 3 metres

Appendix B

Additional Test Results

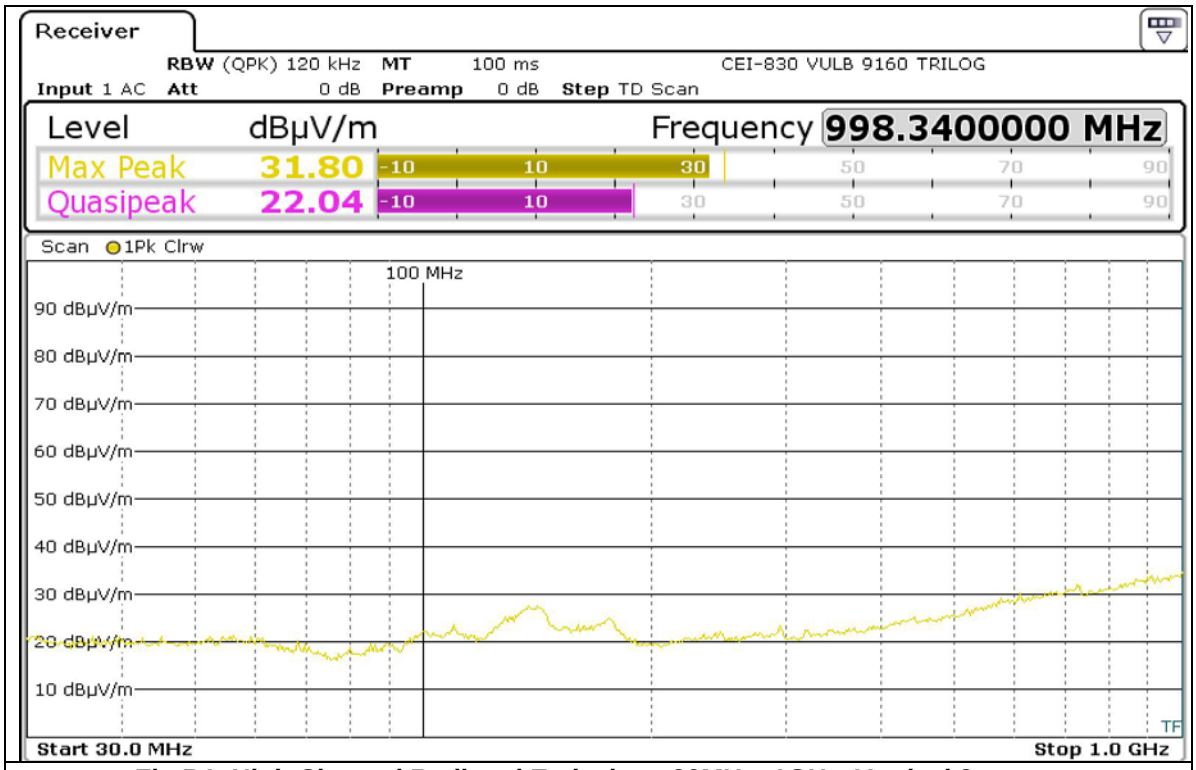


Fig B1 High Channel Radiated Emissions 30MHz -1GHz Vertical 3metres

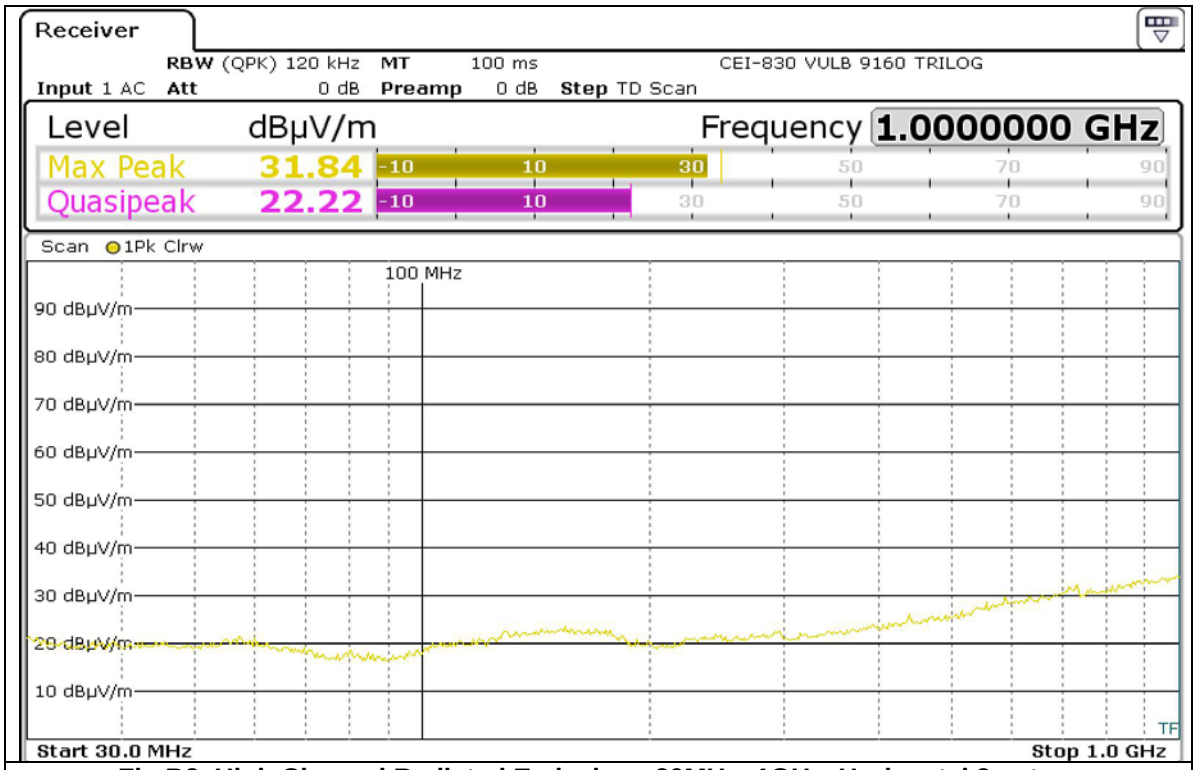


Fig B2 High Channel Radiated Emissions 30MHz -1GHz Horizontal 3metres

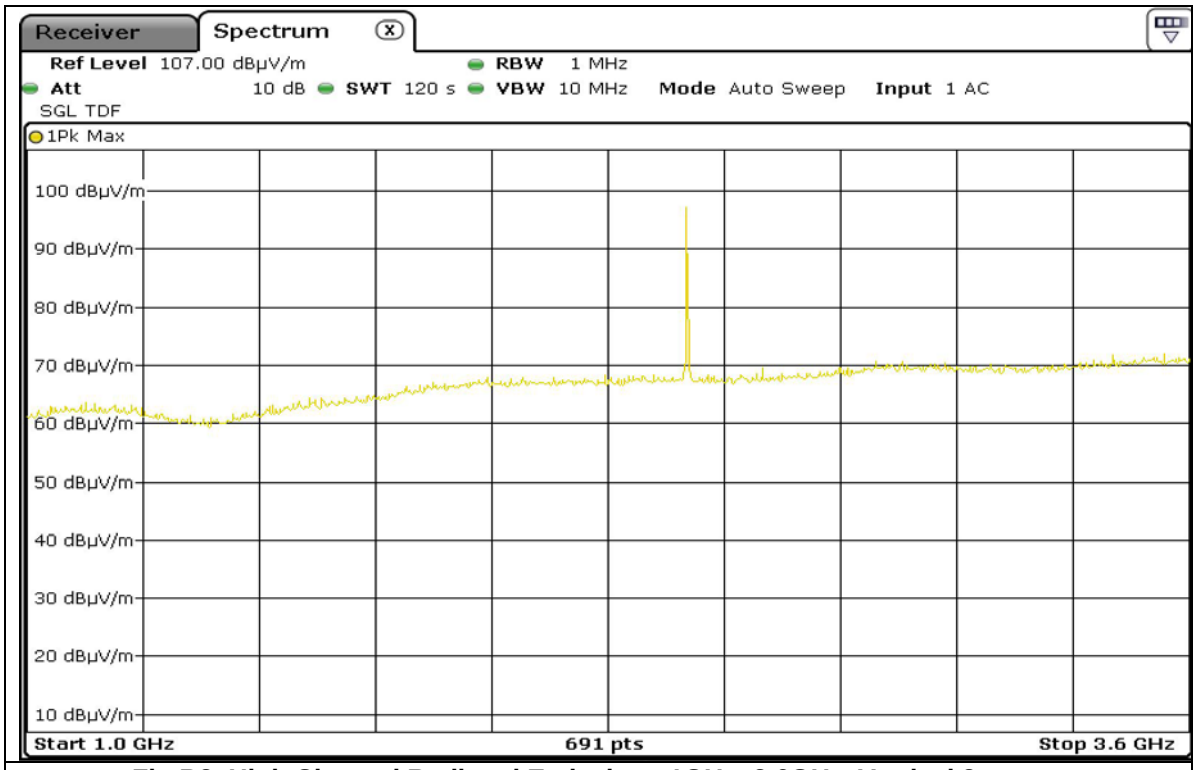


Fig B3 High Channel Radiated Emissions 1GHz -3.6GHz Vertical 3metres

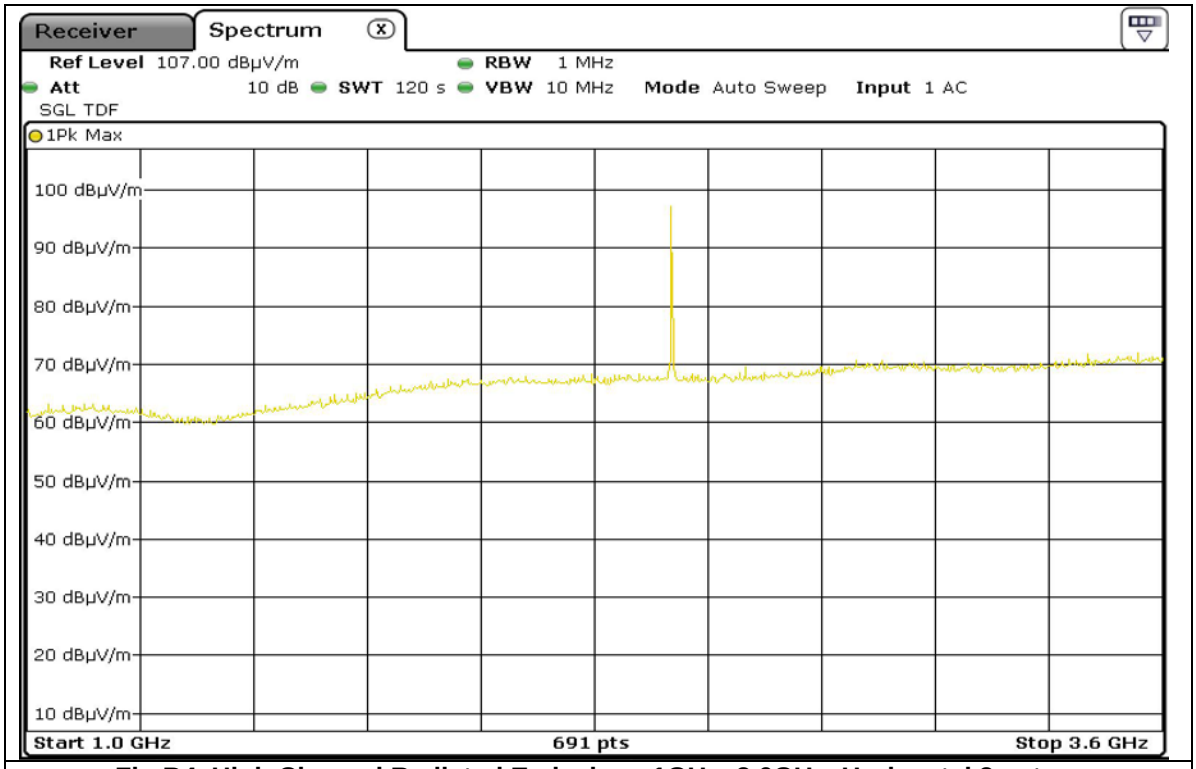


Fig B4 High Channel Radiated Emissions 1GHz -3.6GHz Horizontal 3metres

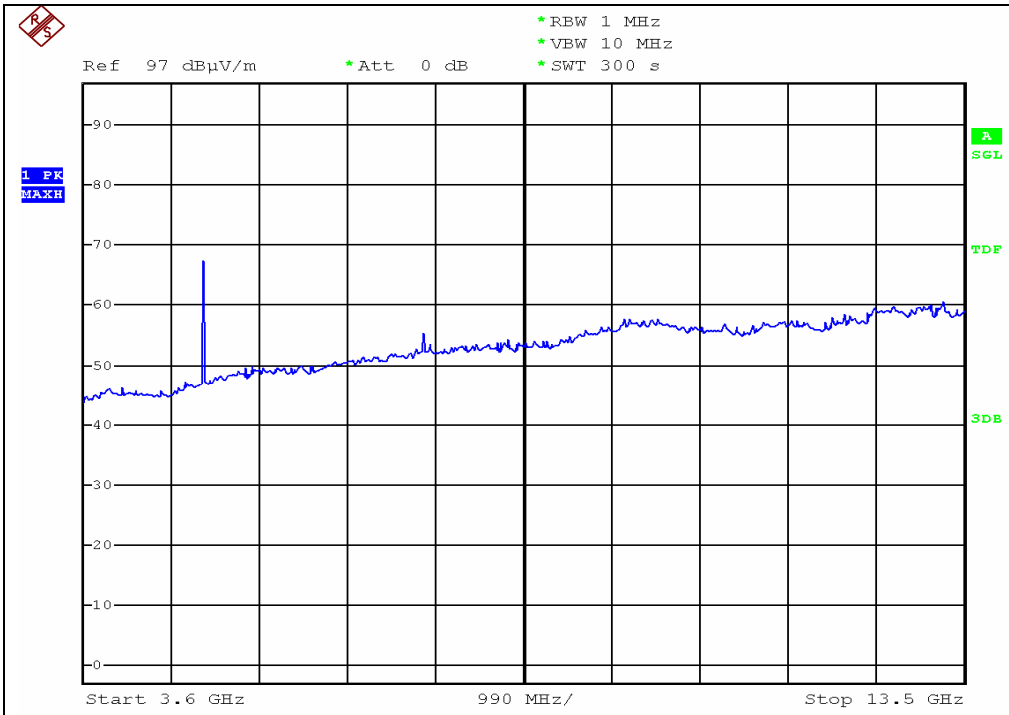


Fig B5 High Channel Radiated Emissions 3.6GHz -13.5GHz Vertical 3metres

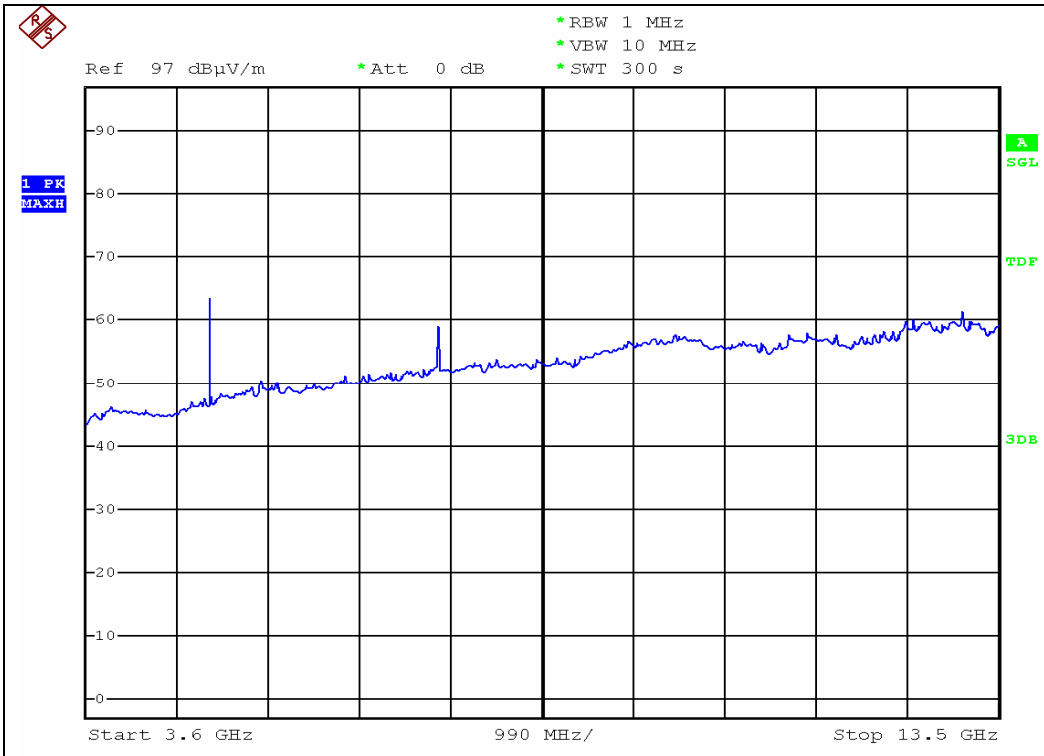


Fig B6 High Channel Radiated Emissions 3.6GHz -13.5GHz Horizontal 3metres

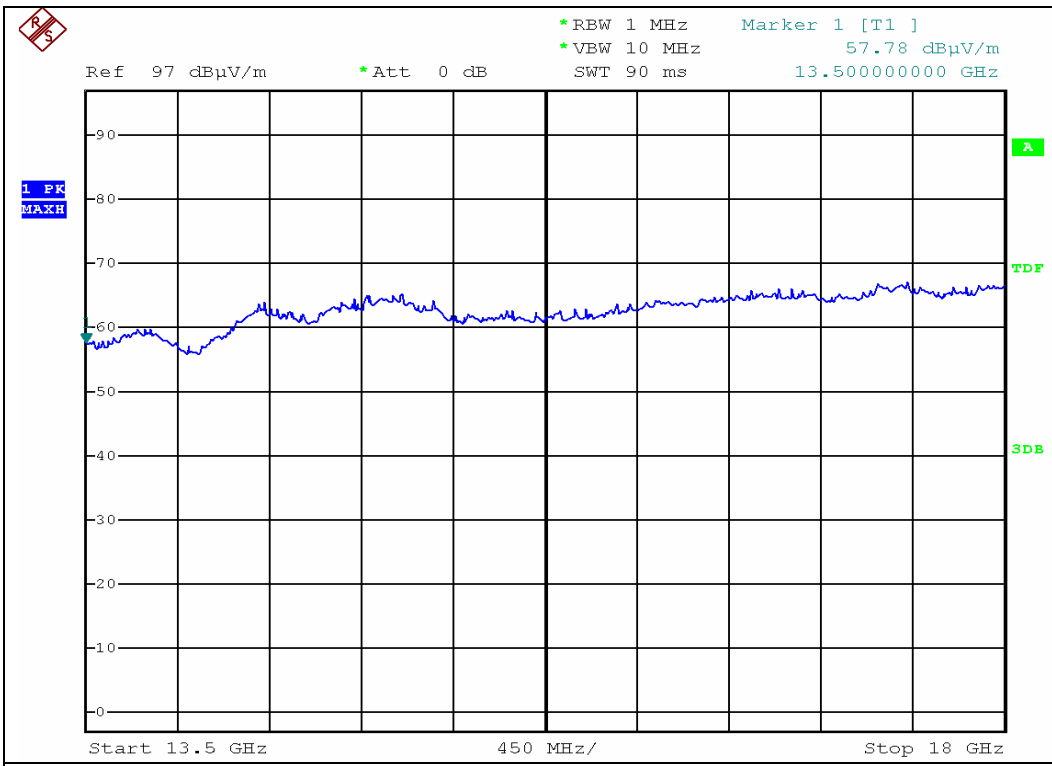


Fig B7 High Channel Radiated Emissions 13.5GHz -18GHz Vertical 3metres

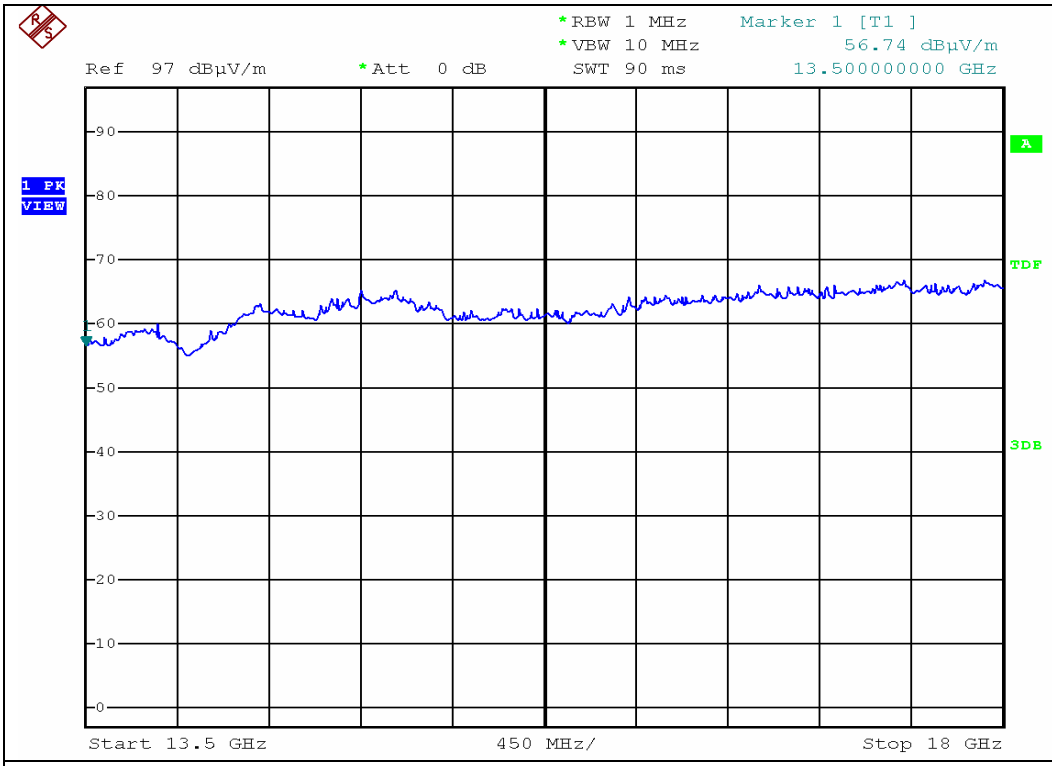


Fig B8 High Channel Radiated Emissions 13.5GHz -18GHz Horizontal 3metres

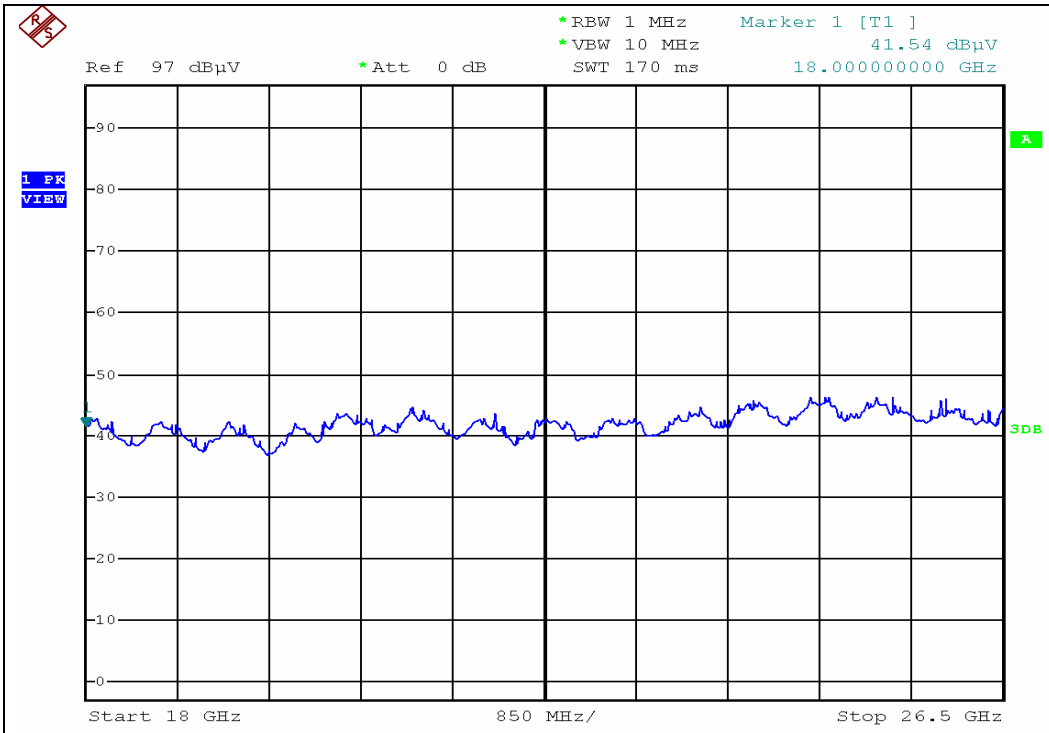


Fig B9 High Channel Radiated Emissions 18GHz -26GHz Vertical 0.1metres

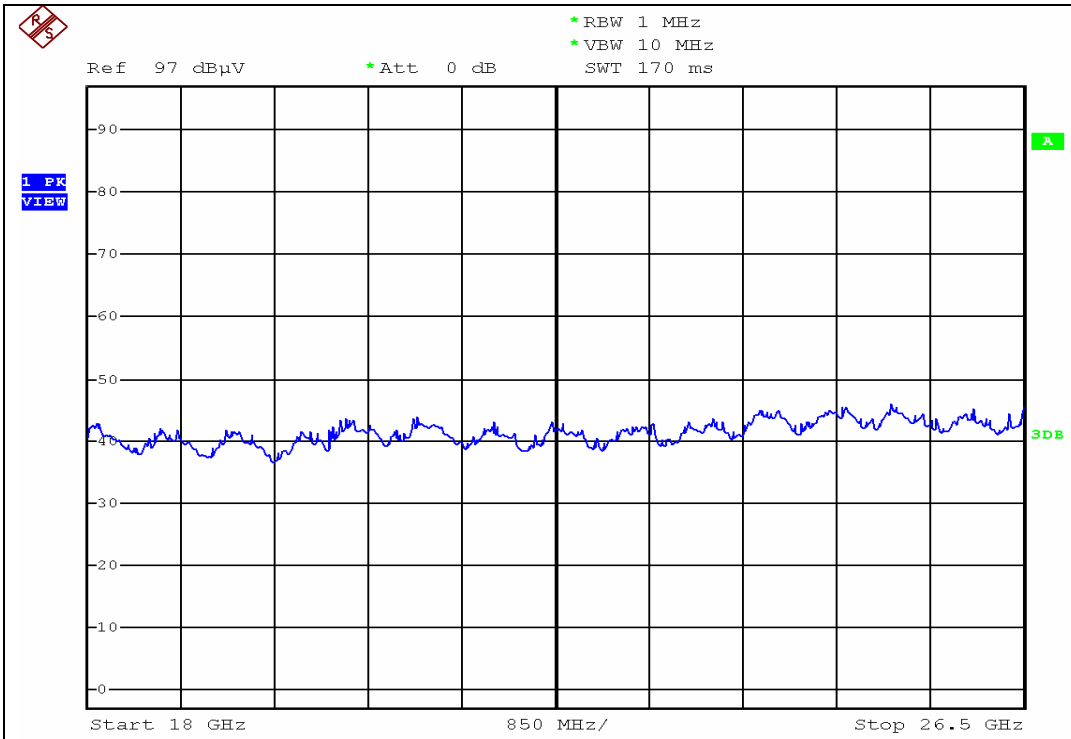


Fig B10 High Channel Radiated Emissions 18GHz -26GHz Horizontal 0.1metres

Appendix C **Conducted Emissions on the mains**

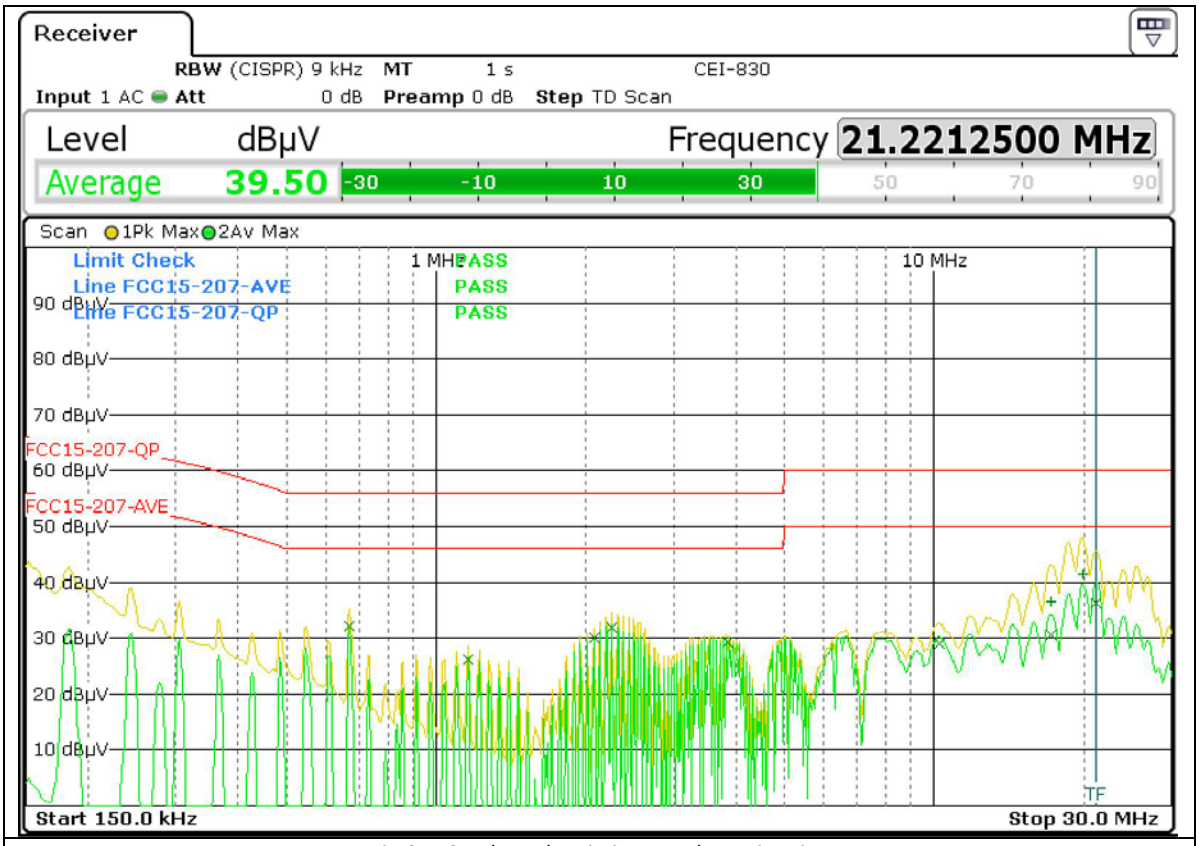


Fig C1 Conducted Emissions on the mains Live

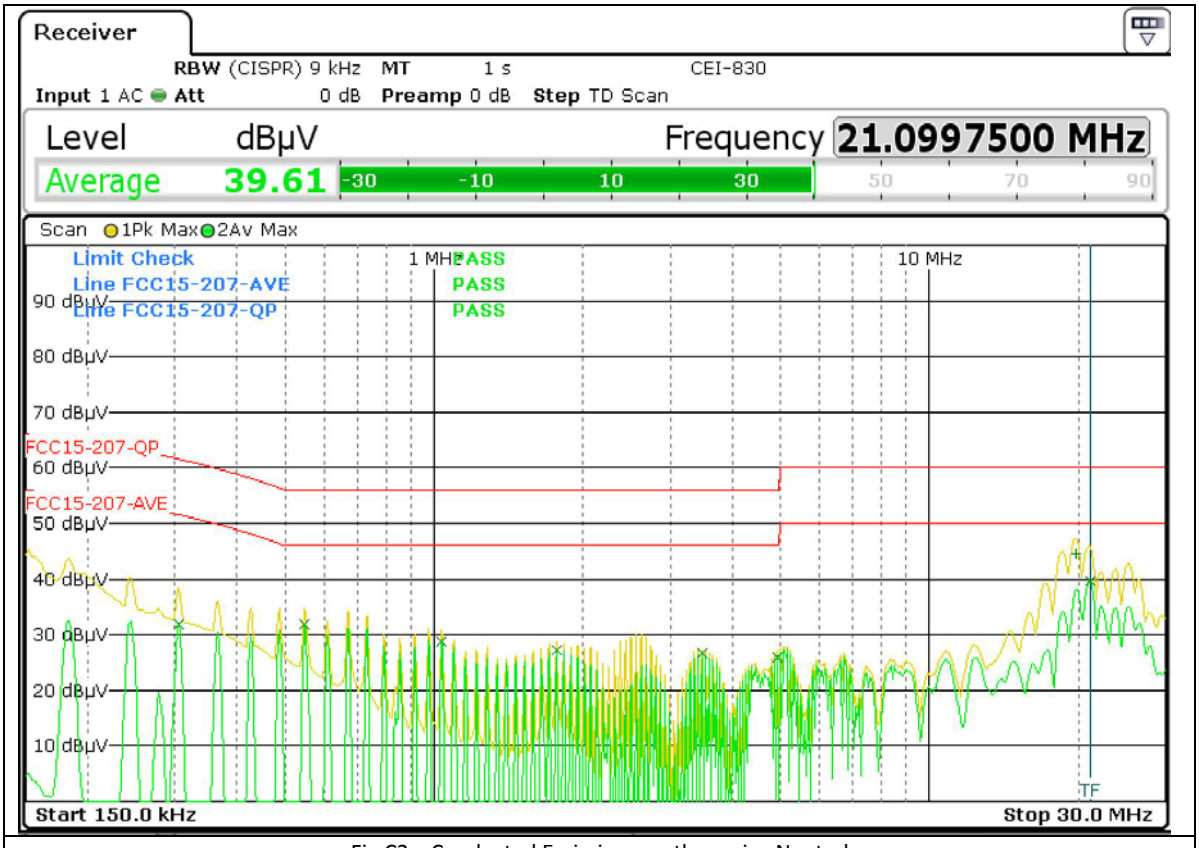


Fig C2 Conducted Emissions on the mains Neutral