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Confidential Report

Project Num	22E10132-2a Part 1 of 2
Quotation	Q22-1908-3
Prepared For	Nordic ID Oy
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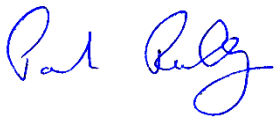
Tested By	Michael Kirby
Test Report By	Michael Kirby
FCC Test Firm Registration	409640
ISED CAB identifier:	IE0001
Date	4th Oct 2022
EUT Description	Nordic ID HH83 Barcode, Model 837-1A
Authorised by	**Paul Reilly**
Authorised Signature:	

TEST SUMMARY

Emissions were assessed to the following standards:

FCC CFR 47 Part 15
Federal Communications Commission: Part 15 Radio Frequency Devices

RSS Gen Issue 5 Amendment 1 Mar 2019 Amd 2 Feb 2021
RSS-210 Issue 10 Dec 2019 Amd Apr 2020
RSS-247 Issue 2 Feb 2017

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

FCC Part Section(s)	RSS Part Section(s)	TEST PARAMETERS	Test Result
15.203		Antenna Requirement all antennas internal	Pass
15.209,15.247,15.407	RSS-Gen 8.9, RSS 247	Spurious Emissions	Pass
15.207	RSS-Gen 8.8	Conducted Emissions on the mains	Pass

Measurements performed according to the procedures in ANSI C63.10-2013

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

Exhibit A – Technical Report

Table of Contents

Ref 22E10132-2a Part 2 of 2 for the remaining Appendices below

1.0 EUT Description

The Nordic ID HH83 which is a battery powered handheld product, with functionality for, NFC WLAN and Bluetooth

Nordic ID HH83 Barcode, Model 837-1A

and contains the following pre-approved modules

Queltec SC600Y-WF (**WLAN ABGN, BT+BLE**)
FCCID: XMR201911SC600WF ICID 10224A-2019SC600WF

1.1 EUT Operation

Operating Conditions during Test:
The equipment under test was operated during the measurement under the following conditions:
The EUT was operated with all radios on while powered from its internal battery.

A radiated test was also performed with all radios off.

Note for Conducted Emissions on the mains, the HH83 host (containing the EUT) was placed on a charging cradle which was plugged directly into the LISN

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

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 on dates 29th ,30th Sept 3rd, 4th Oct 2022.

1.4 Description of Test Methods

Tests were performed manually, and no special software was used

2 Emissions Measurements

2.1.1 Conducted Emissions Measurements

The EUT was connected to connected to a 12v DC adapter Manufacturer Kings Model KSS12_120_1000B, which was connected to the mains through a LISN and measurements were carried out using a Receiver over the frequency range 150KHz to 30MHz.

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.
A measurement antenna was positioned at a distance of 3 metres 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 meters.
Emissions below 30MHz were measured using a loop antenna. In this case the resolution bandwidth was 200Hz for frequencies below 150KHz and RBW was 9KHz for frequencies above 150KHz.

Emissions between 30MHz and 300MHz were measured using a bi-conical antenna.
Emissions between 300MHz and 1GHz were measured using a bi-log antenna. In both cases the resolution bandwidth was 120KHz.

3.0 Results for Conducted emissions

Mains Conducted Emissions results

Detector	Frequency	Reading	Margin	Phase
QP/ Ave	MHz	dBuV	dB	L/N
Quasi-Peak	0.1500	43.07	-22.93	Live
Average	0.1568	21.35	-34.46	Live
Average	0.5348	5.55	-40.45	Live
Average	1.3065	15.56	-30.44	Live
Average	1.309	15.58	-30.42	Live
Average	1.311	15.65	-30.35	Live
Average	4.038	13.83	-32.17	Live
Average	8.493	2.16	-47.84	Live
Average	11.974	4.06	-45.94	Live
Quasi-Peak	18.551	17.60	-42.4	Live

Detector	Frequency	Reading	Margin	Phase
QP/ Ave	MHz	dBuV	dB	L/N
Quasi-Peak	0.1500	40.43	-25.57	Neutral
Average	0.1568	21.65	-34.16	Neutral
Average	0.5348	6.74	-39.26	Neutral
Average	1.3065	14.79	-31.21	Neutral
Average	1.3088	14.63	-31.37	Neutral
Average	1.3110	14.33	-31.67	Neutral
Average	4.0380	10.37	-35.63	Neutral
Average	8.4930	1.42	-48.58	Neutral
Average	11.9738	4.83	-45.17	Neutral
Quasi-Peak	18.5505	17.38	-42.62	Neutral

Ref Appendix B for scans

Result: Pass

4. Spurious Emissions

4.1 Spurious Emissions with BLE and Wifi 2.4GHz

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
4.874	48.5	32.4	37.3	5.2	Vertical	0.00	48.8	74	25.2
7.311	44.2	37.7	38	6.7	Vertical	0.00	50.6	74	23.4
12.185	44.1	40.3	37.7	8.9	Vertical	0.00	55.6	74	18.4
4.874	47.5	32.4	37.3	5.2	Horizontal	0.00	47.8	74	26.2
7.311	44.1	37.7	38	6.7	Horizontal	0.00	50.5	74	23.5
12.185	43.6	40.3	37.7	8.9	Horizontal	0.00	55.1	74	18.9

Frequency	Measured Average Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Average Level	Average Limit	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
12.185	33.7	40.3	37.7	8.9	Vertical	0.00	45.2	54	8.8
12.185	33.4	40.3	37.7	8.9	Horizontal	0.00	44.9	54	9.1

4.2 Spurious Emissions with NFC and Wifi 5GHz band

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
11.550	49.0	39.6	37.4	6.6	Vertical	0.00	57.8	74	16.3
17.325	42.4	43.8	33.5	10.1	Vertical	0.00	62.8	74	11.3
11.550	51.4	39.6	37.4	6.6	Horizontal	0.00	60.2	74	13.8
17.325	43.1	43.8	33.5	10.1	Horizontal	0.00	63.5	74	10.5

Frequency	Measured Average Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Average Level	Average Limit	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
11.550	41.6	39.6	37.4	6.6	Vertical	0.00	50.41	54	3.6
17.325	31.9	43.8	33.5	10.1	Vertical	0.00	52.3	54	1.7
11.550	43.2	39.6	37.4	6.6	Horizontal	0.00	52.0	54	2.1
17.325	31.7	43.8	33.5	10.1	Horizontal	0.00	52.1	54	1.9

Test Result Pass

4.3 Spurious Emissions with NFC and BLE

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
4.804	47.4	32.4	37.1	5.2	Vertical	0.00	47.9	74	26.1
12.010	45.5	40.3	36.5	7.8	Vertical	0.00	57.1	74	16.9
4.804	47.4	32.4	37.1	5.2	Horizontal	0.00	47.9	74	26.1
12.010	45.1	40.3	36.5	7.8	Horizontal	0.00	56.7	74	17.3

Frequency	Measured Average Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Average Level	Average Limit	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
12.010	35.2	40.3	36.5	7.8	Vertical	0.00	46.81	54	7.2
12.010	34.9	40.3	36.5	7.8	Horizontal	0.00	46.5	54	7.5

Test Result Pass

4.4 Co-location

No Spurious emissions related to co-location issues were found

Test Result Pass

4.5 Carrier Power

4.5.1 BLE

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Final Peak Level	Transmitted power	Limit	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dBuV/m	dBm	dBm	dBm
2.402	103.1	27.4	38.5	3.5	Vertical	95.5	0	36.0	35.8
2.402	104.2	27.4	38.5	3.5	Horizontal	96.6	1	36.0	34.6

Note the Radiated field strength was measured at 3 metres and the conversion formula below was used to determine the EIRP in dBm $EIRP\ (dBm) = E_{3m}\ (dBuV/m) - 95.2$

Test Result Pass

4.5.2 Wifi 2.4G

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Final Peak Level	Transmitted power	Limit	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dBuV/m	dBm	dBm	dBm
2.437	118.8	27.4	38.5	3.5	Vertical	111.2	16	36.0	20.0
2.437	120.5	27.4	38.5	3.5	Horizontal	112.9	18	36.0	18.3

Note the Radiated field strength was measured at 3 metres and the conversion formula below was used to determine the EIRP in dBm $EIRP\ (dBm) = E_{3m}\ (dBuV/m) - 95.2$

Test Result Pass

4.5.3 Wifi 5G

Frequency	Measured Peak Level	Emission limit	Antenna Polarity	EUT orient	Δ Limit	Pass / Fail
MHz	dBm	dBm	V/H		dB	P/F
5775	20.36	36	Vertical	O2	15.6	Pass
5775	19.87	36	Horizontal	O2	16.1	Pass

Test Result Pass

5. Measurement Uncertainties

Measurement	Uncertainty
Radio Frequency	+/- $5x10^{-7}$
Maximum Frequency Deviation	+/- 1.7 %
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
Occupied Bandwidth	± 5%
Conducted RF power	± 1.23 dB
Conducted Spurious Emission of transmitter	± 2.14 dB
Conducted Emissions of Receivers	± 2.14 dB
RF level of uncertainty for a given BER	± 1.23 dB
Temperature	± 0.2˚C
Humidity	± 4% RH
Frequency	±0.01 ppm
Duty Cycle	+/- 5 %

Table 1: Measurement Uncertainties

The measurement uncertainties stated were calculated with a k=2 for a confidence level of 95.45%.

The test data can be compared directly to the specification limit to determine compliance, as the calculated measurement uncertainty meets the requirements of the applicable specification.

Appendix A: Radios on NFC with Wifi in 2.4GHz band

Fig A1 Radiated Spurious Emissions 9KHz -30MHz 3m

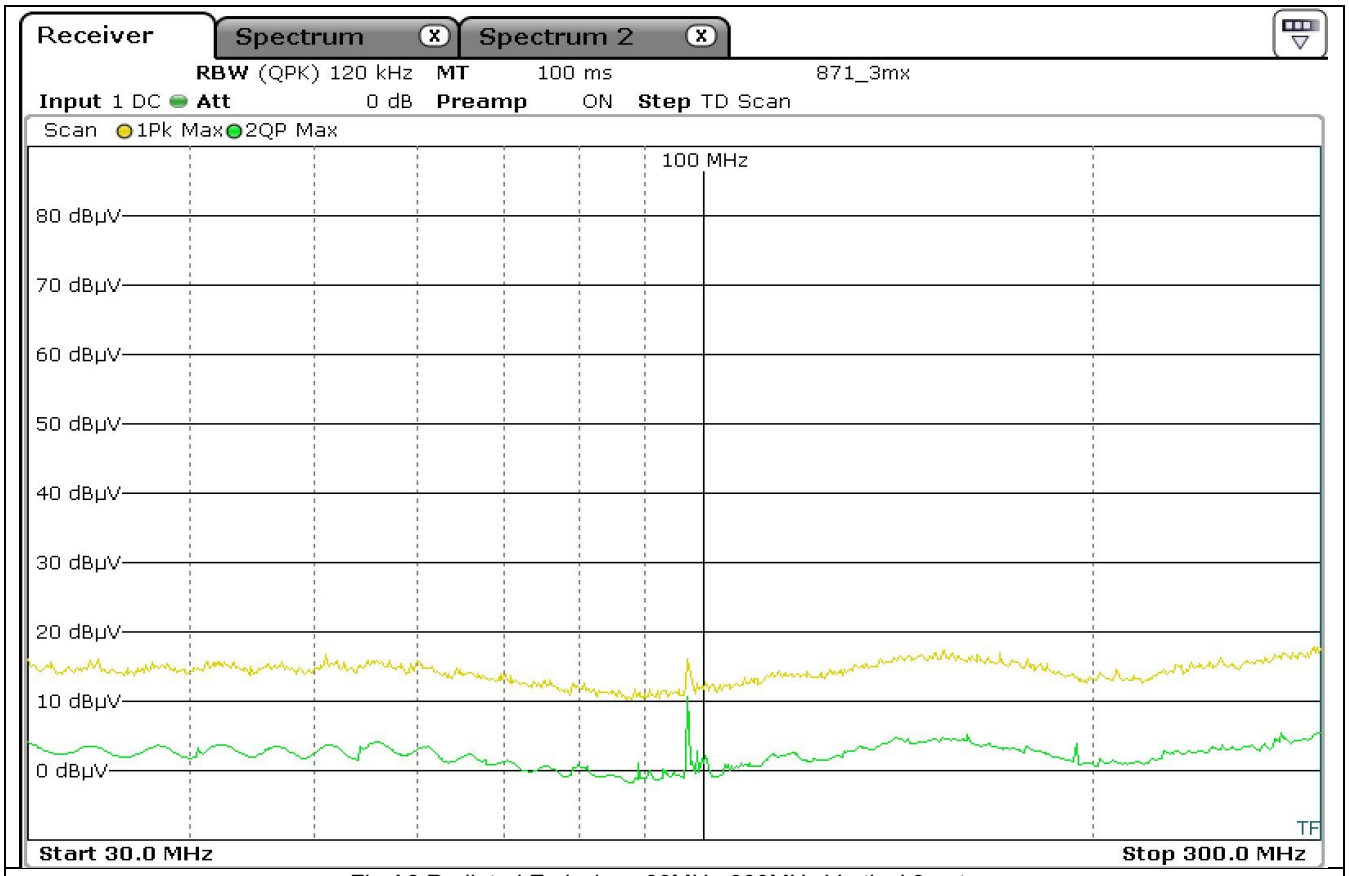


Fig A2 Radiated Emissions 30MHz-300MHz Vertical 3metres

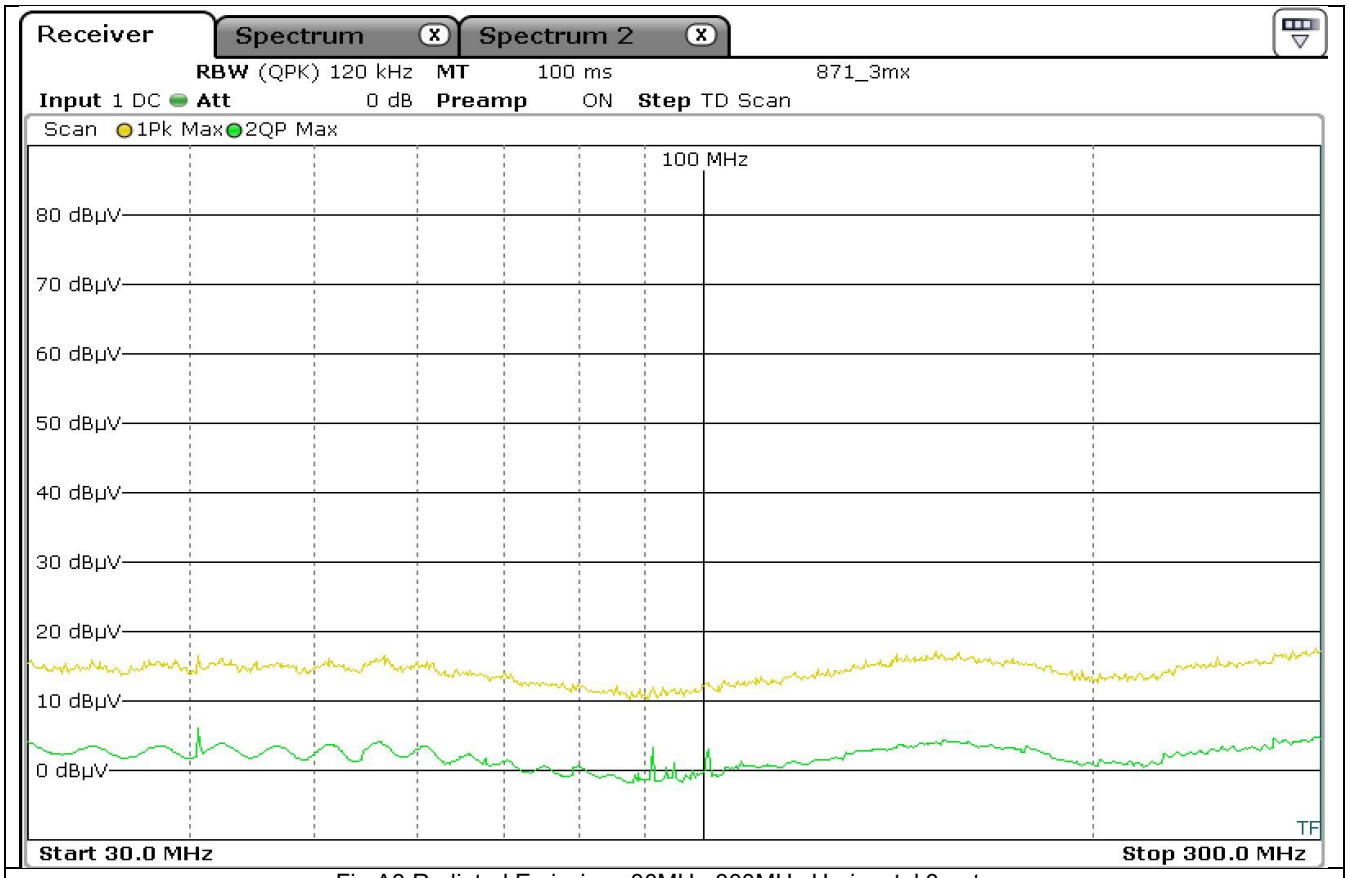


Fig A3 Radiated Emissions 30MHz-300MHz Horizontal 3metres

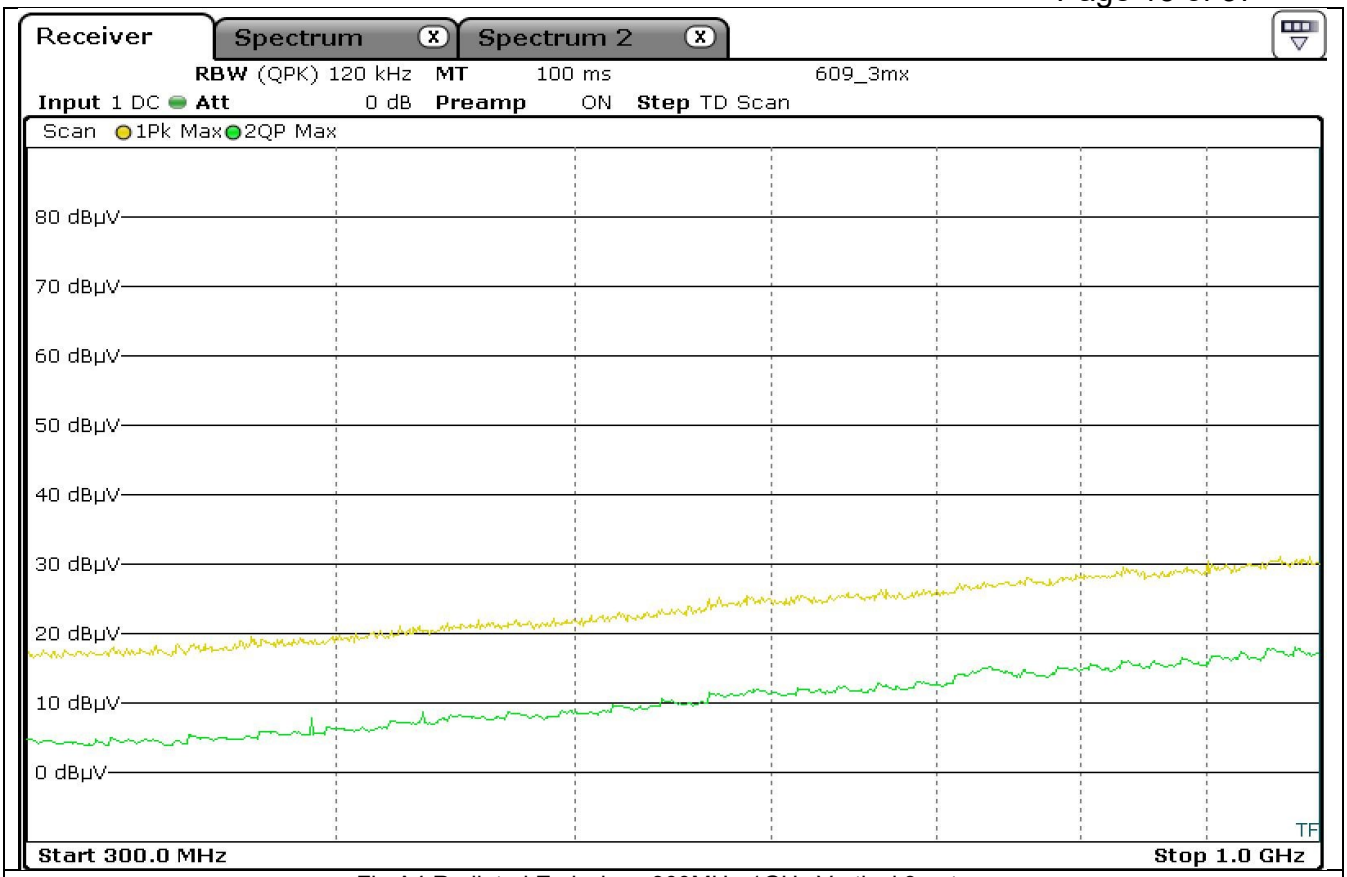


Fig A4 Radiated Emissions 300MHz-1GHz Vertical 3metres

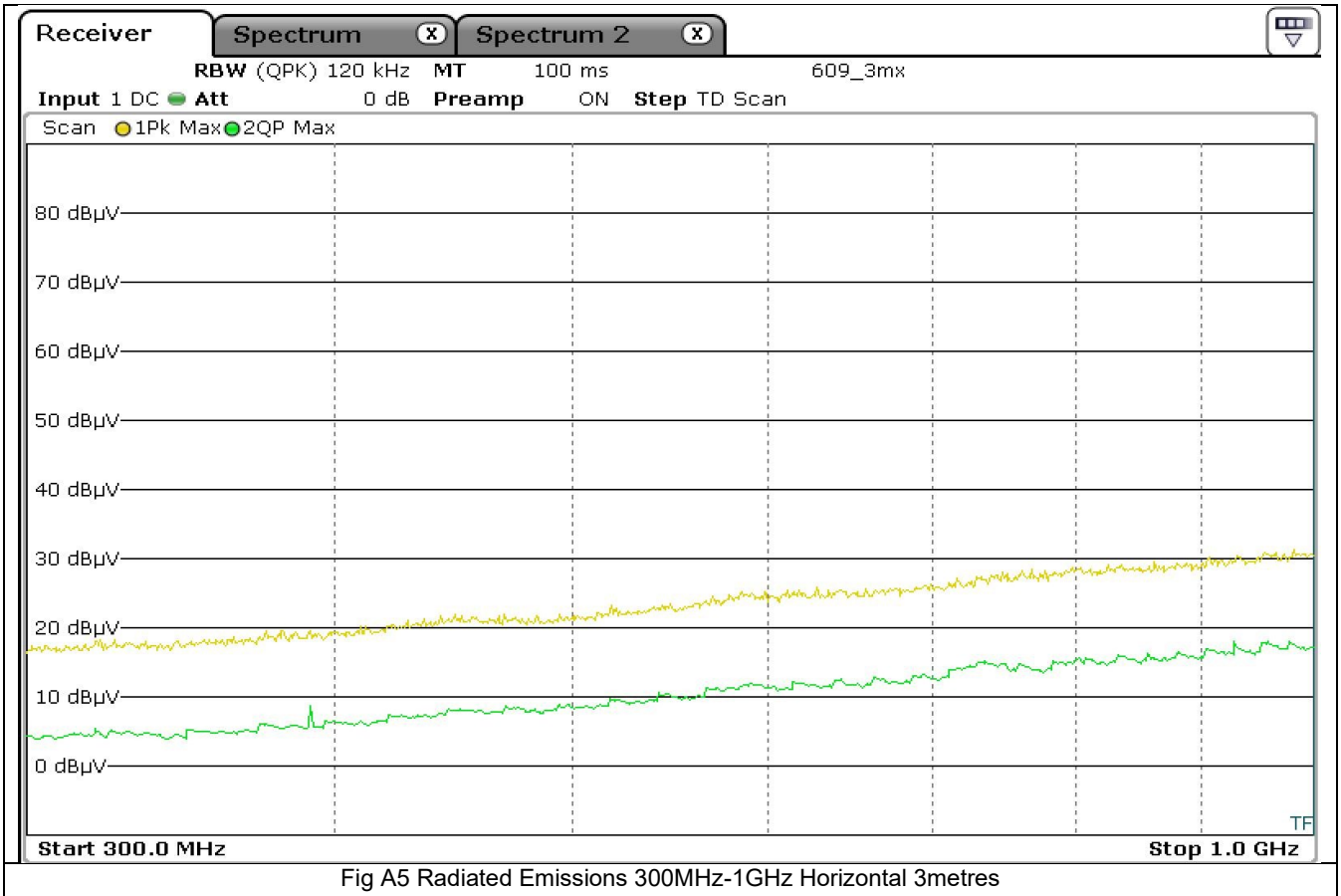


Fig A5 Radiated Emissions 300MHz-1GHz Horizontal 3metres

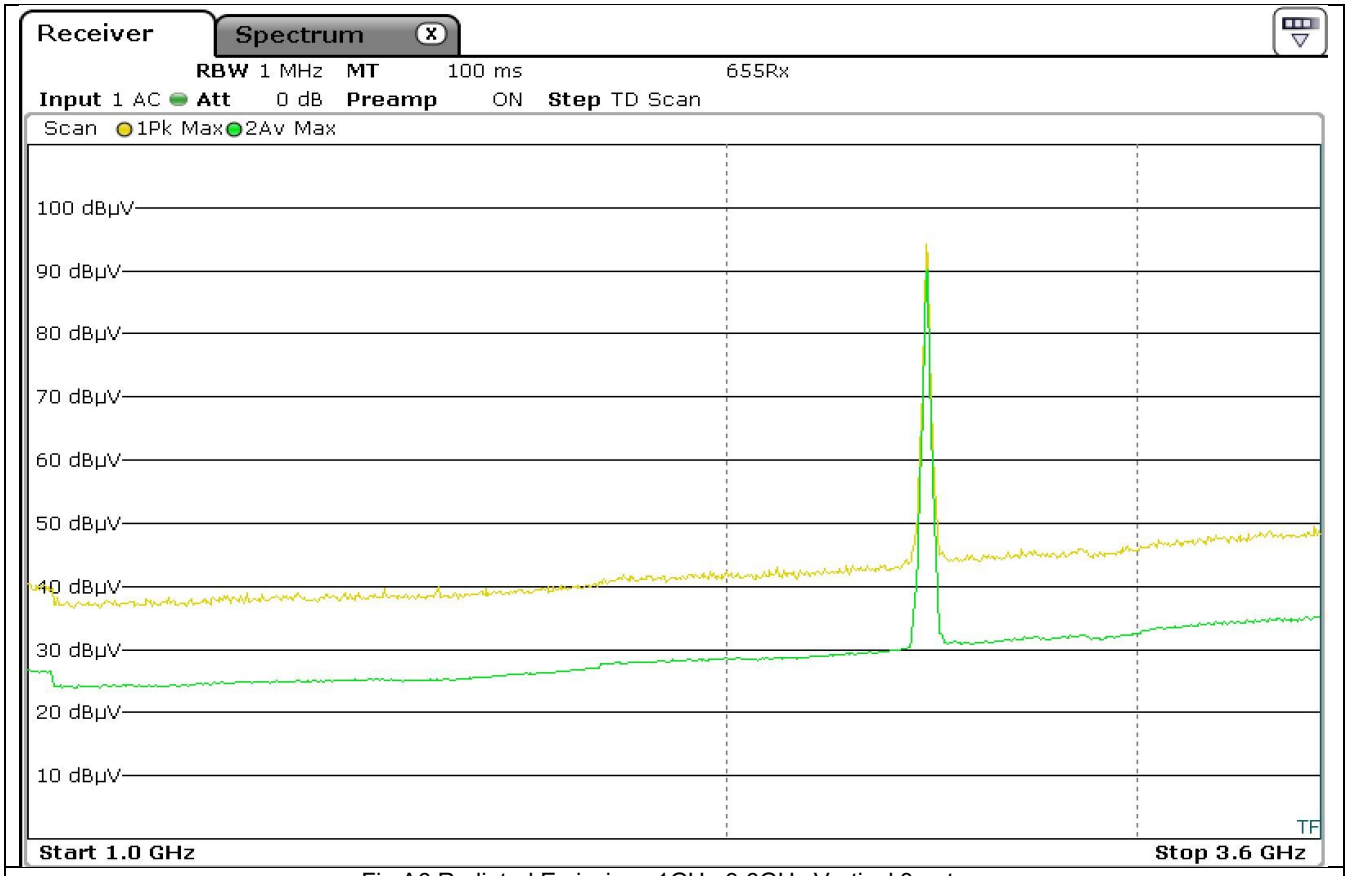


Fig A6 Radiated Emissions 1GHz-3.6GHz Vertical 3metres

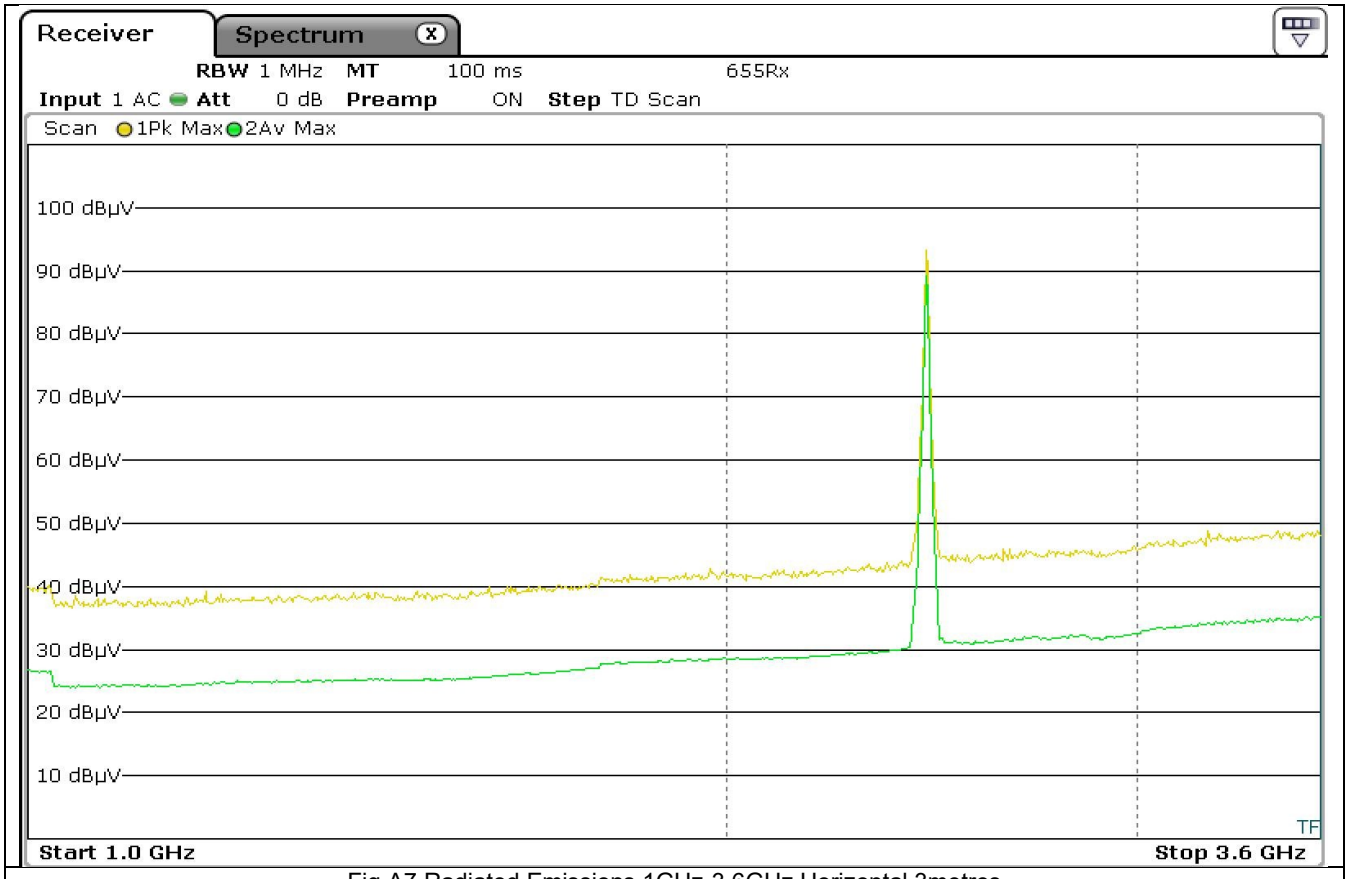


Fig A7 Radiated Emissions 1GHz-3.6GHz Horizontal 3metres

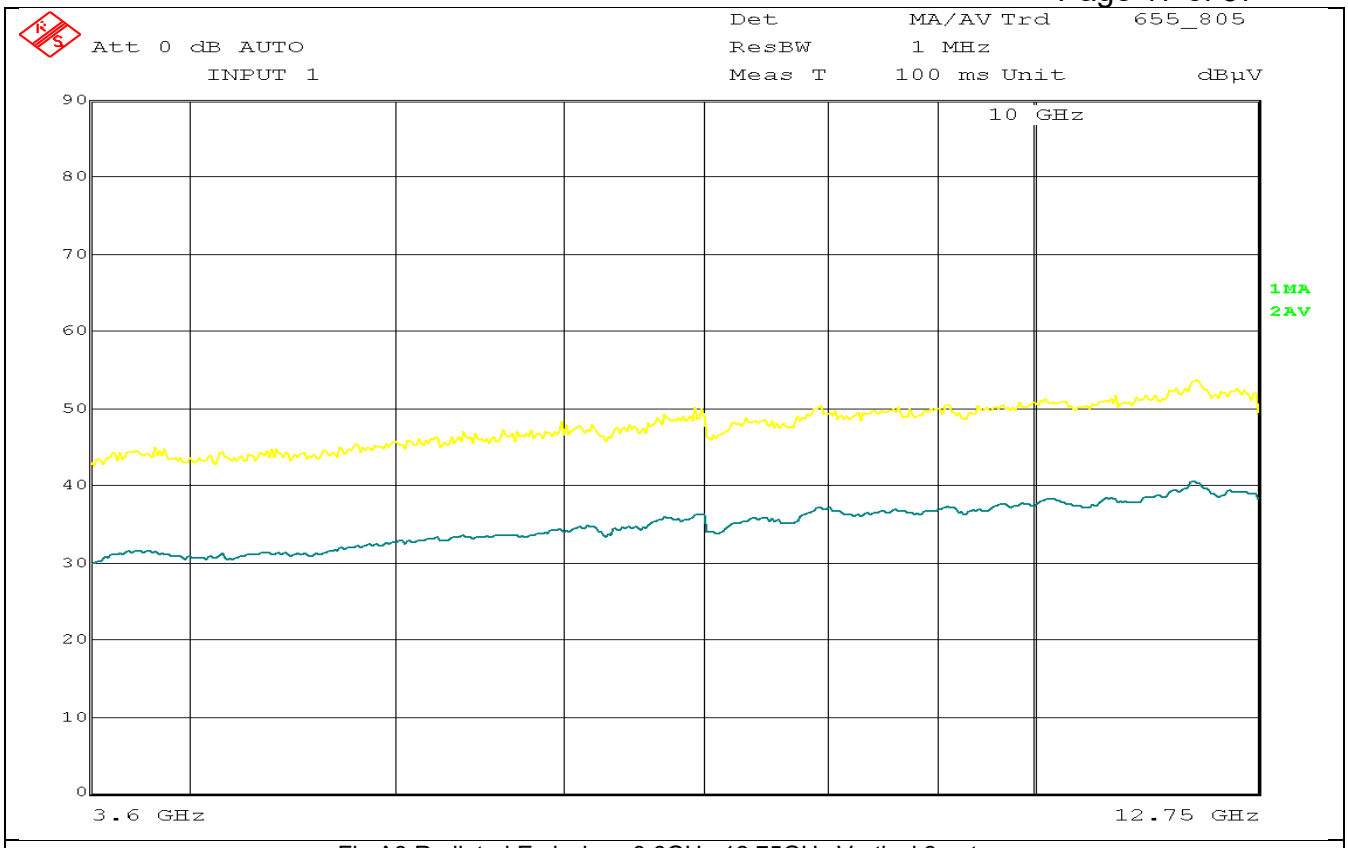


Fig A8 Radiated Emissions 3.6GHz-12.75GHz Vertical 3metres

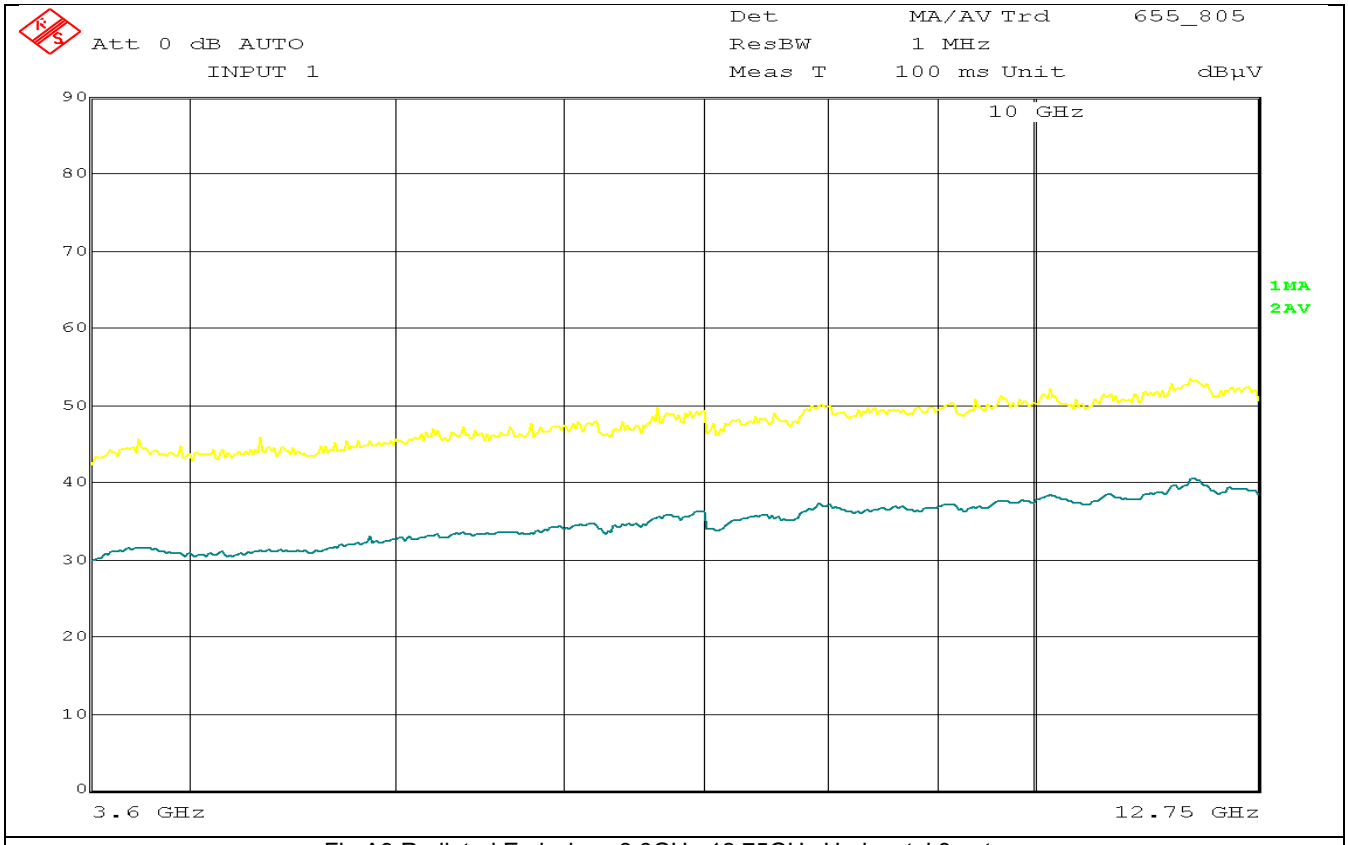


Fig A9 Radiated Emissions 3.6GHz-12.75GHz Horizontal 3metres

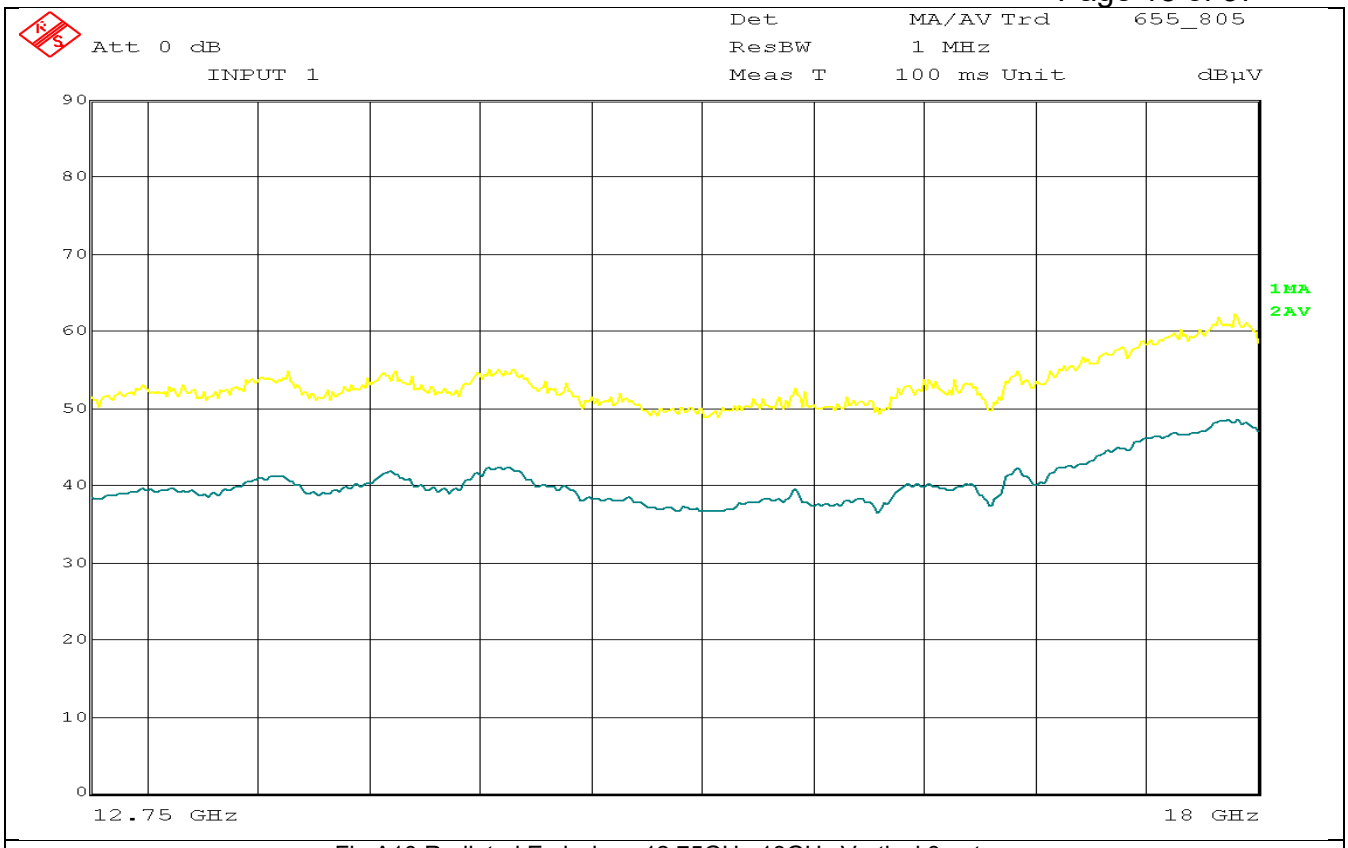


Fig A10 Radiated Emissions 12.75GHz-18GHz Vertical 3metres

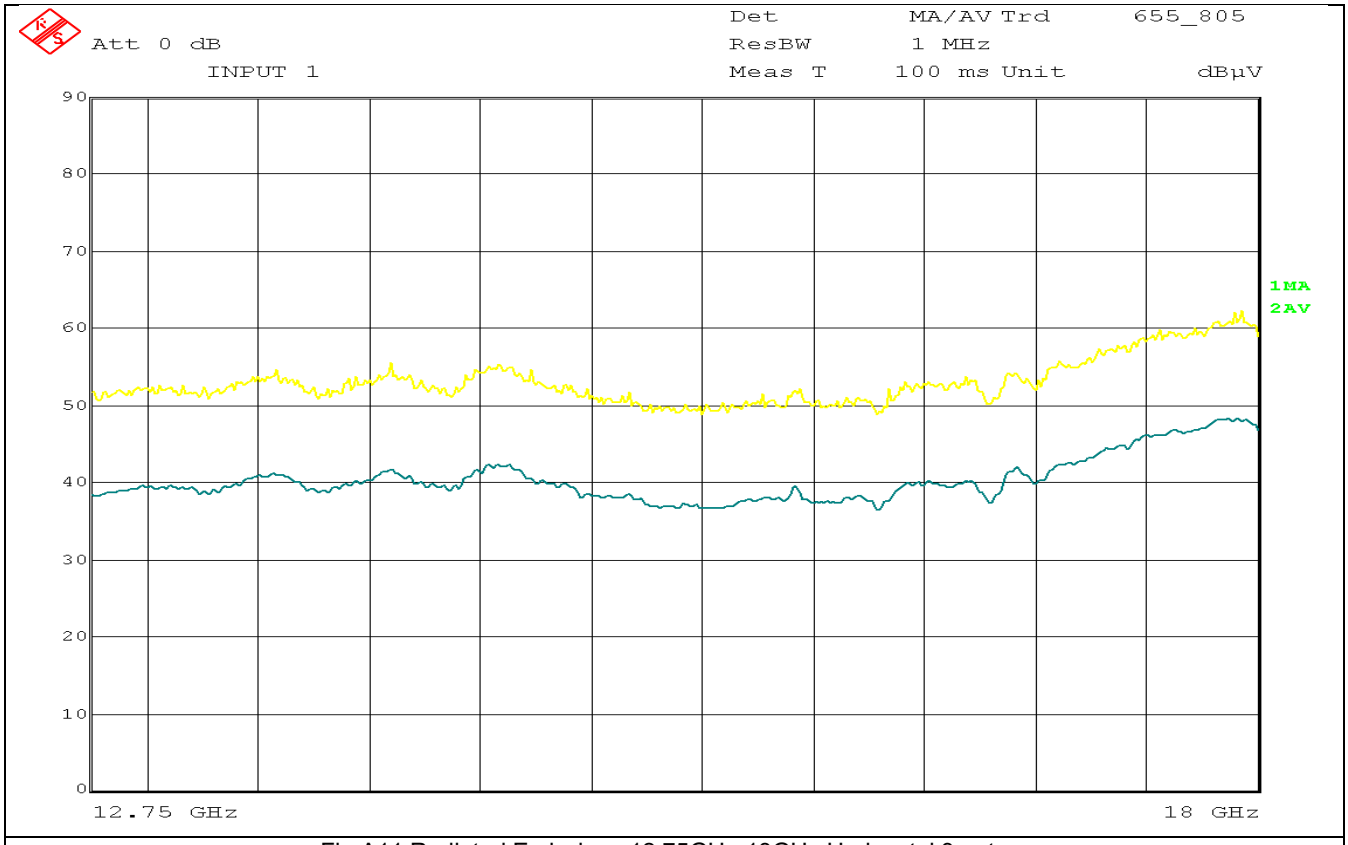


Fig A11 Radiated Emissions 12.75GHz-18GHz Horizontal 3metres

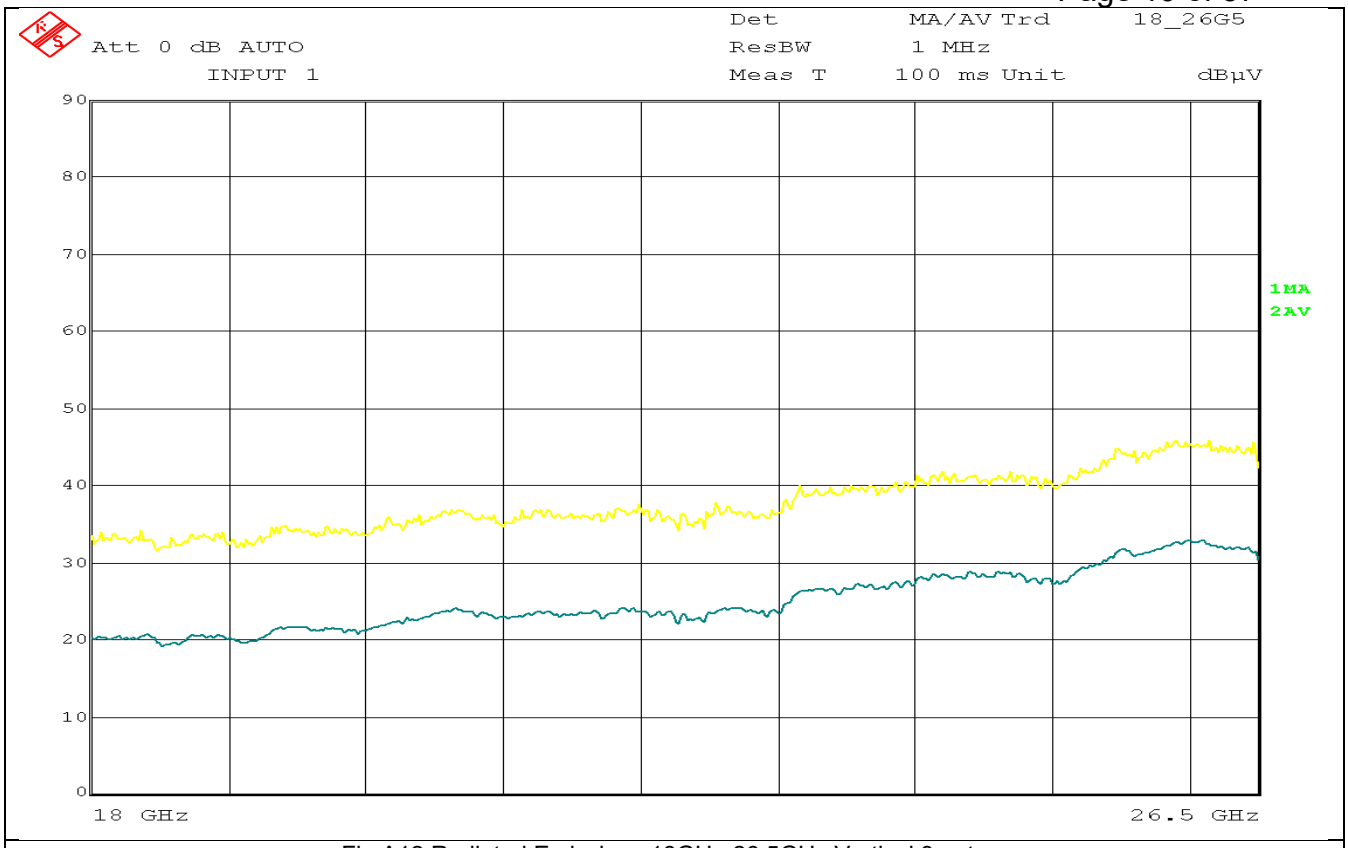


Fig A12 Radiated Emissions 18GHz-26.5GHz Vertical 3metres

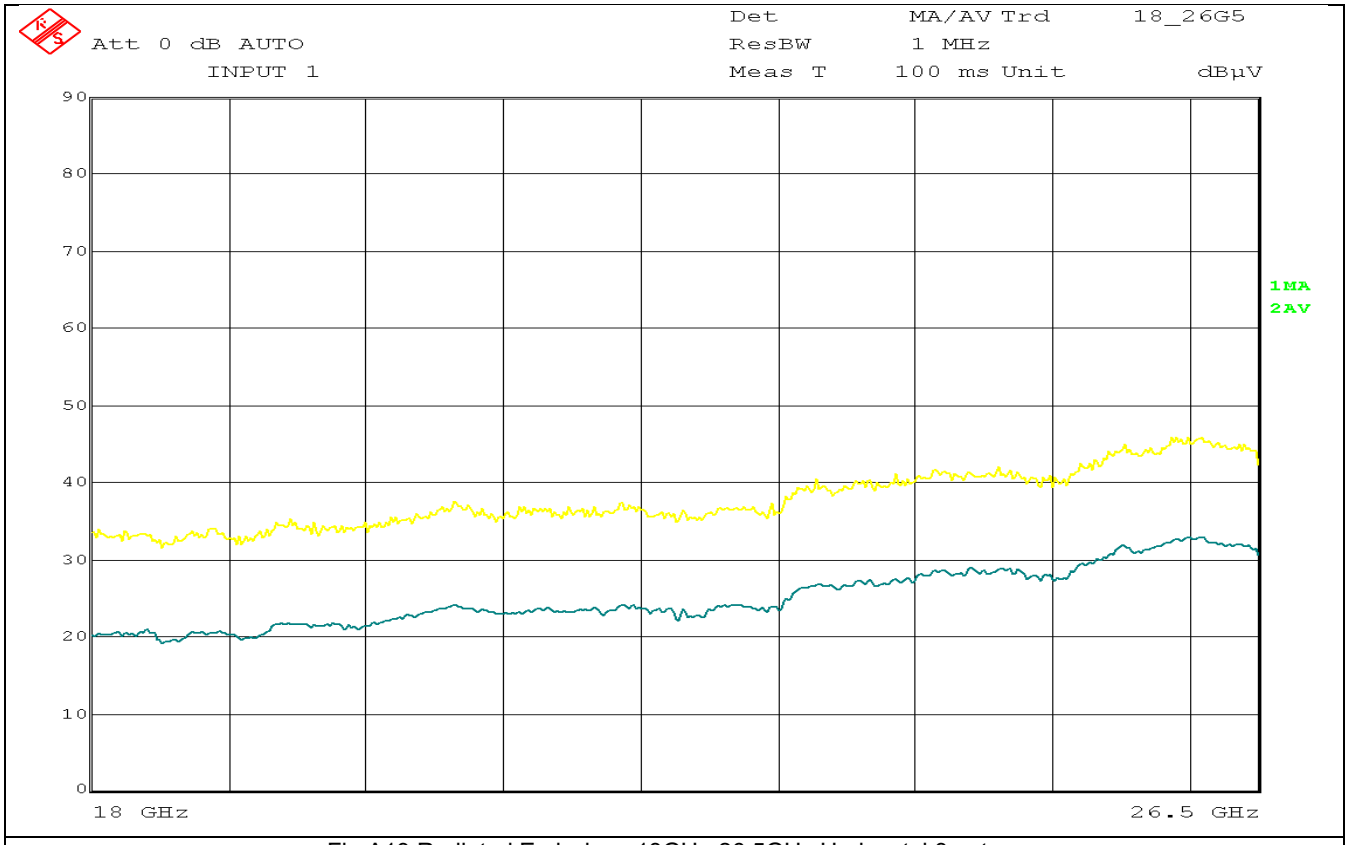


Fig A13 Radiated Emissions 18GHz-26.5GHz Horizontal 3metres

Appendix B: Radios on NFC with Wifi in 5GHz band

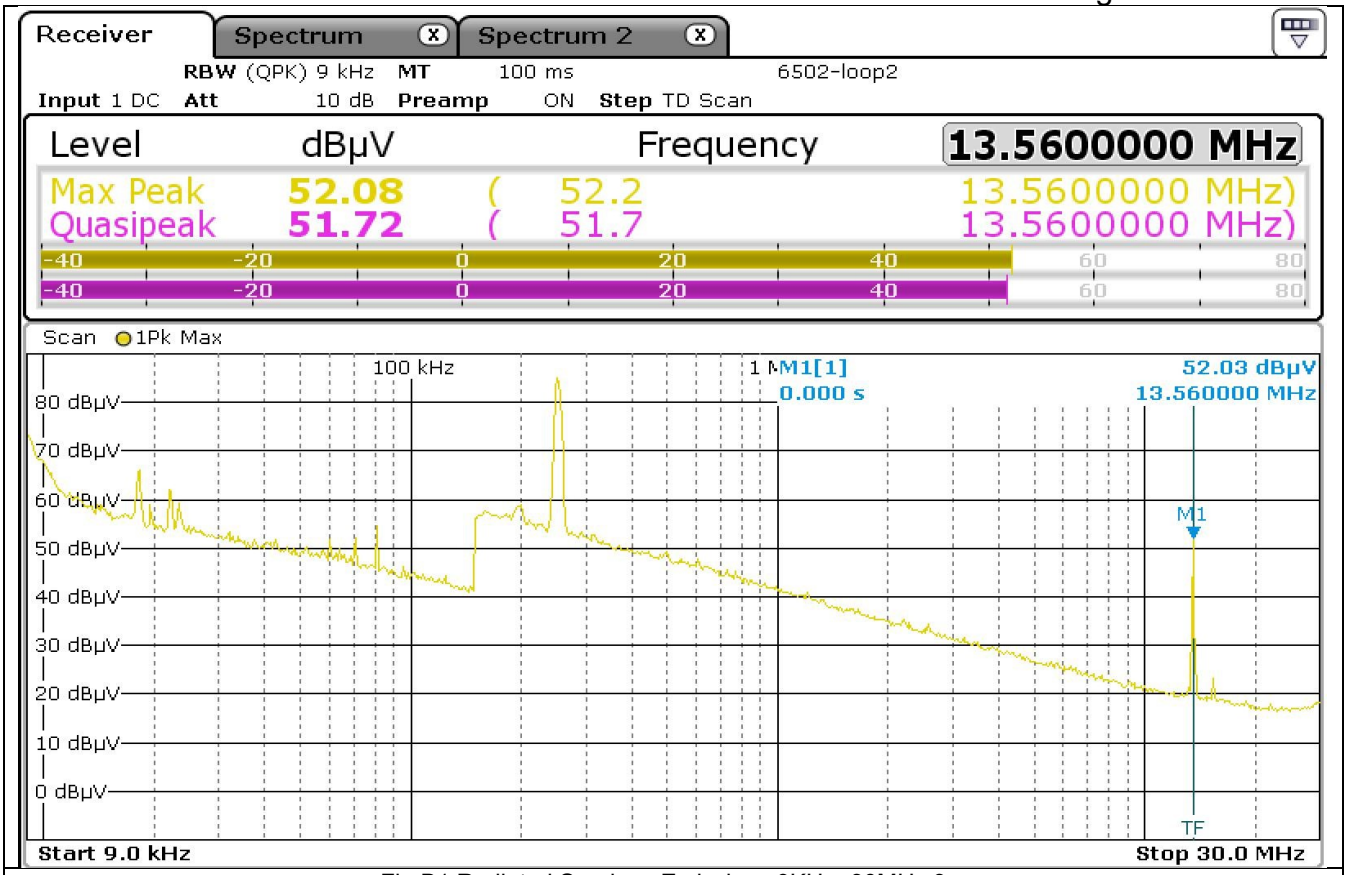


Fig B1 Radiated Spurious Emissions 9KHz -30MHz 3m

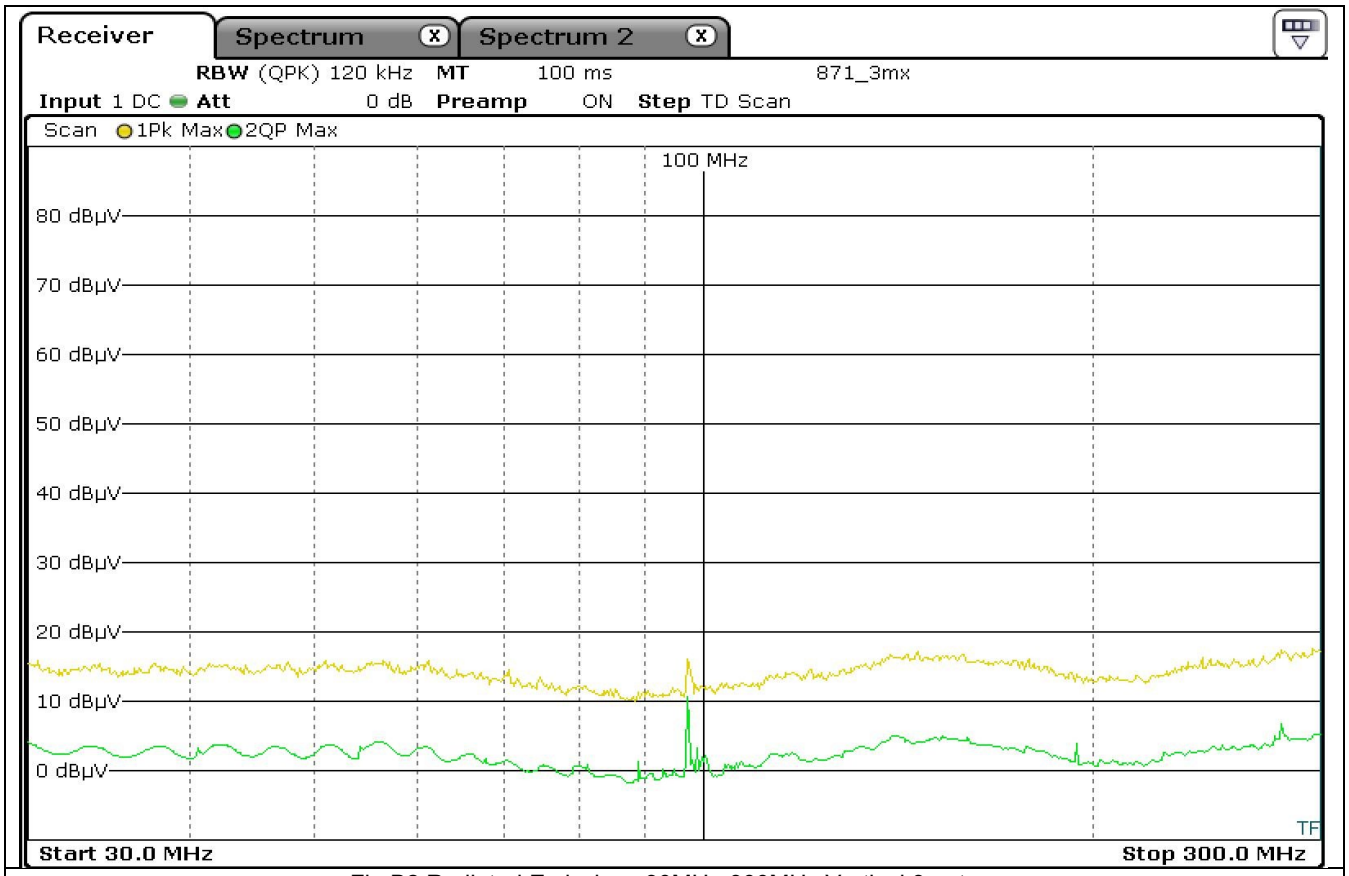


Fig B2 Radiated Emissions 30MHz-300MHz Vertical 3metres

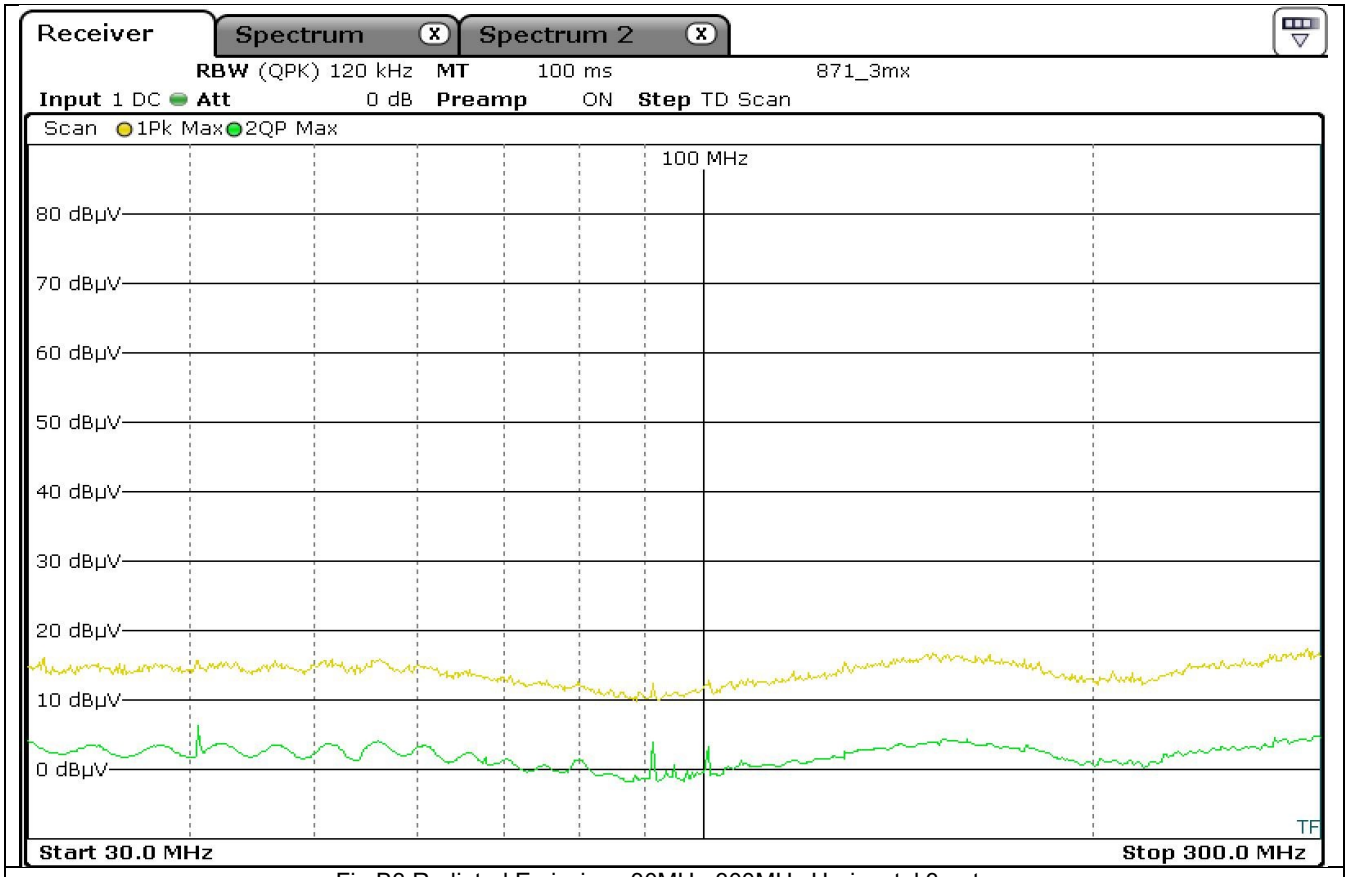


Fig B3 Radiated Emissions 30MHz-300MHz Horizontal 3metres

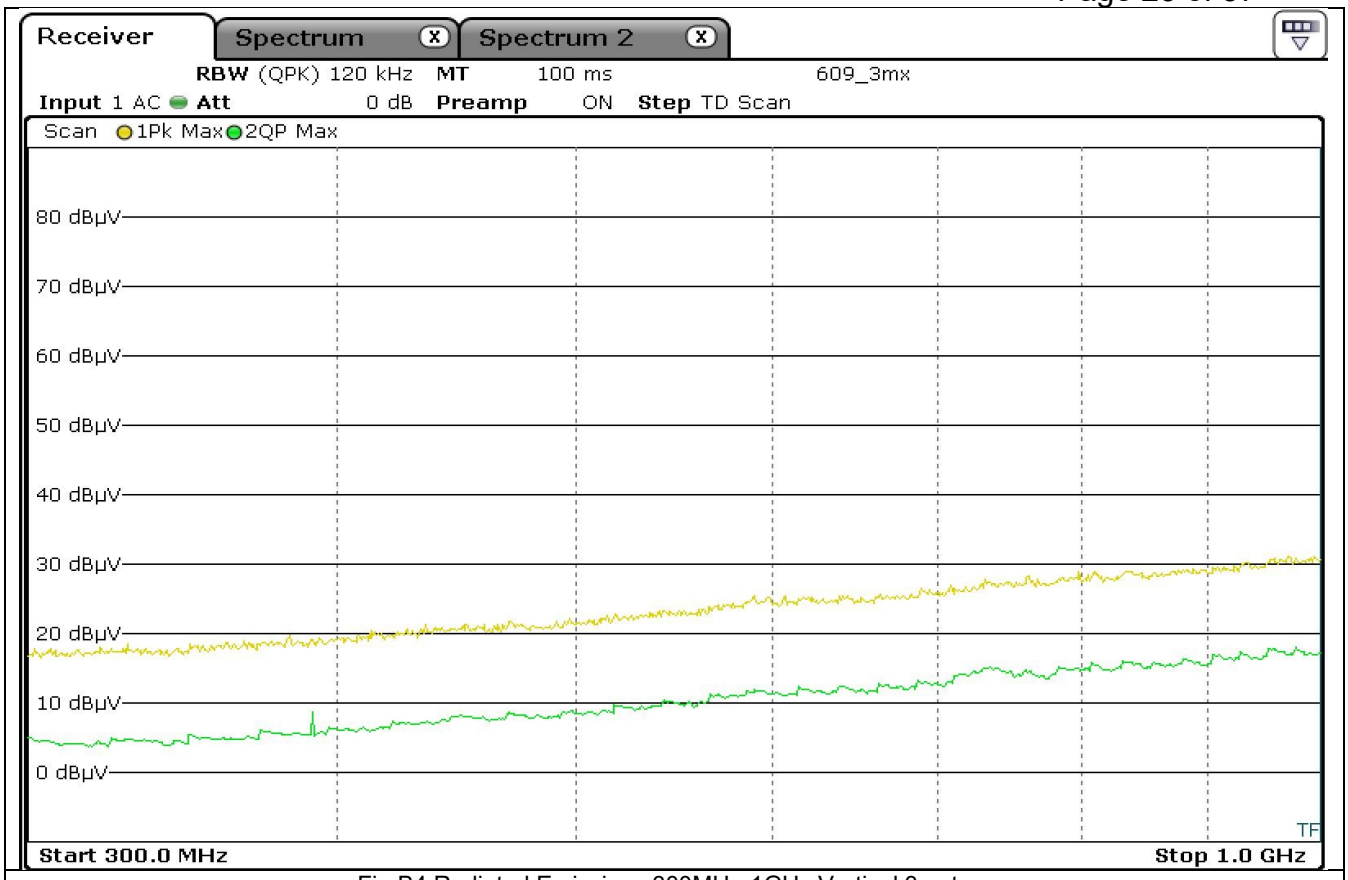


Fig B4 Radiated Emissions 300MHz-1GHz Vertical 3metres

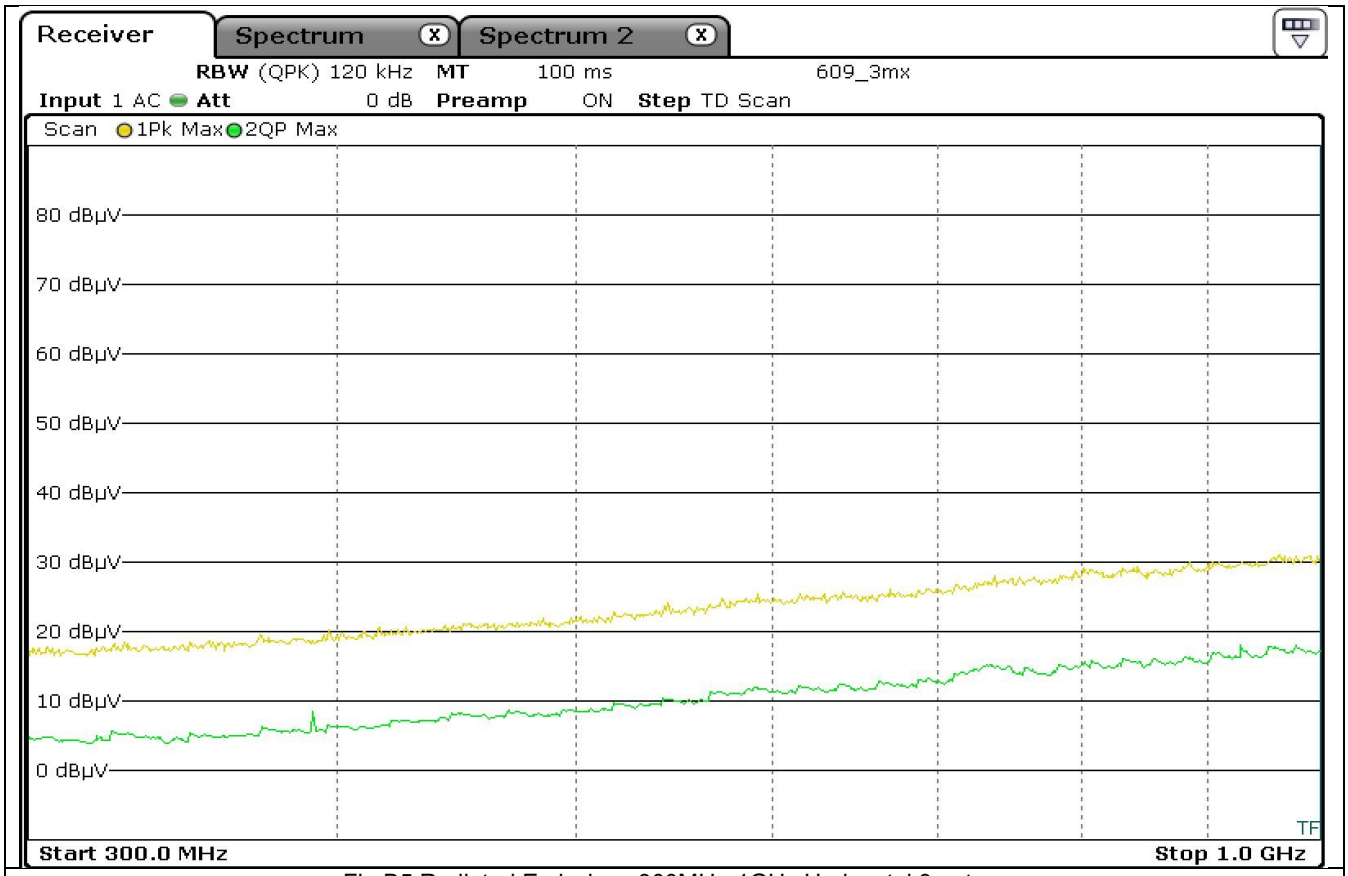


Fig B5 Radiated Emissions 300MHz-1GHz Horizontal 3metres

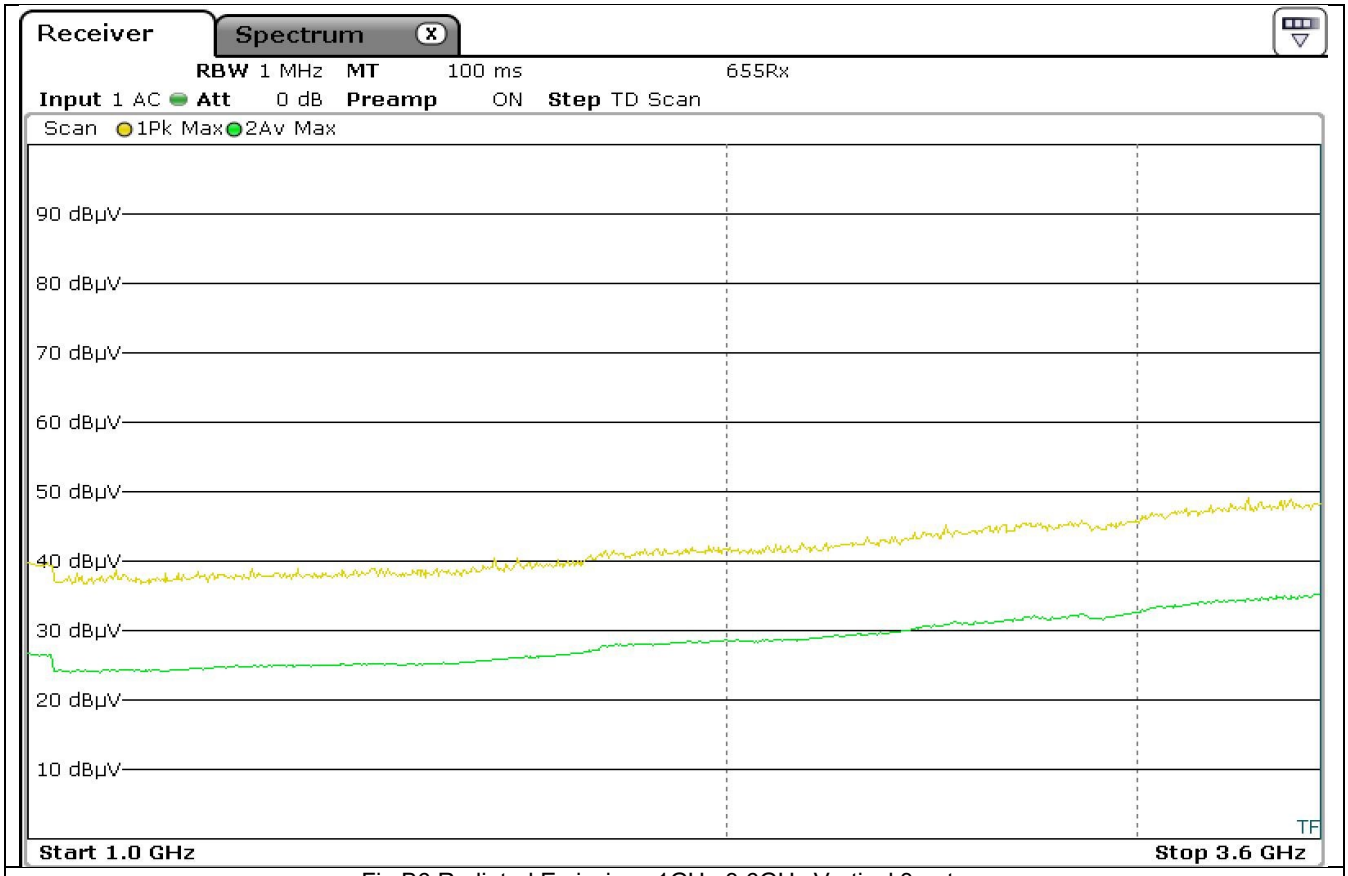


Fig B6 Radiated Emissions 1GHz-3.6GHz Vertical 3metres

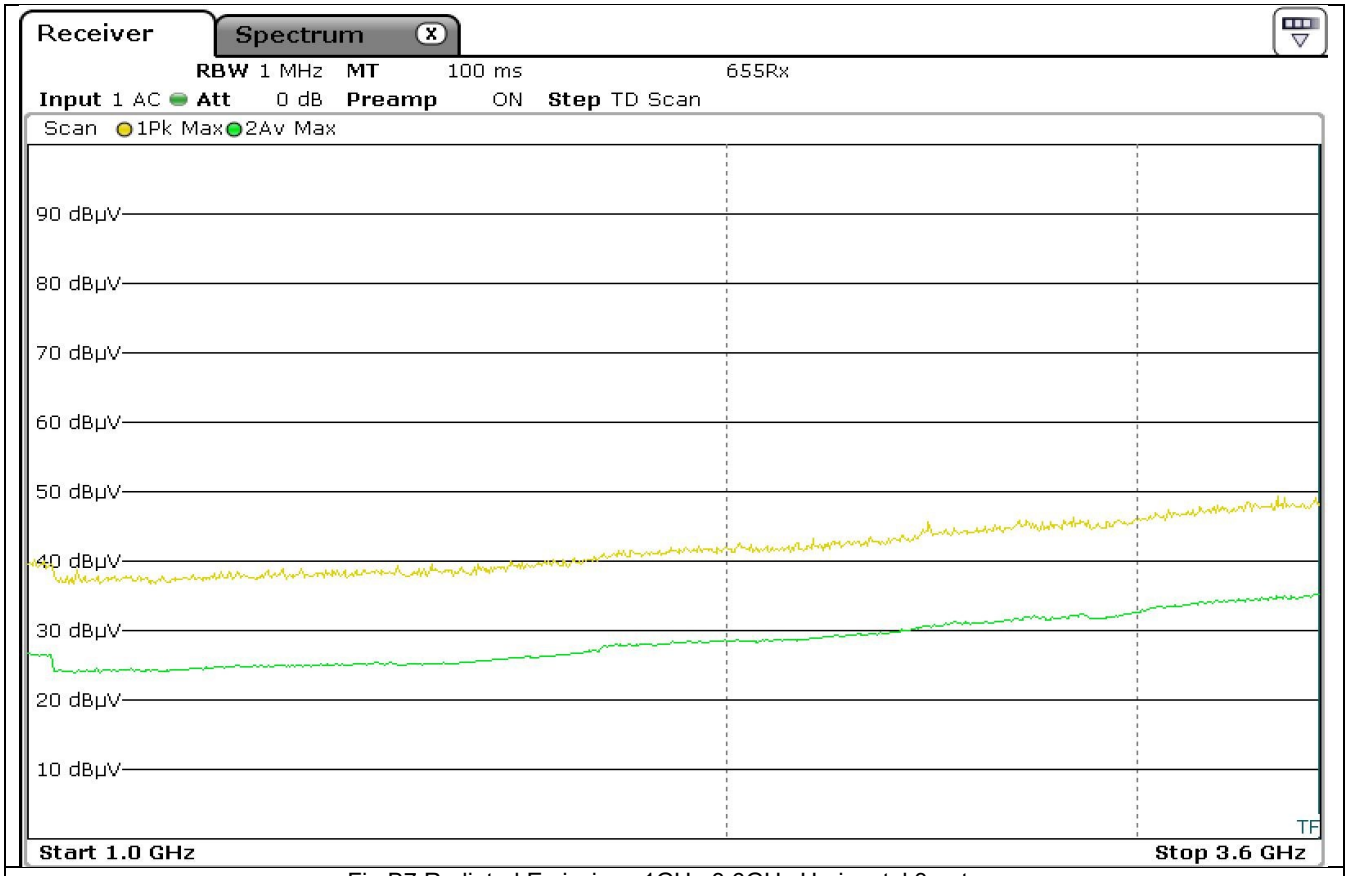


Fig B7 Radiated Emissions 1GHz-3.6GHz Horizontal 3metres

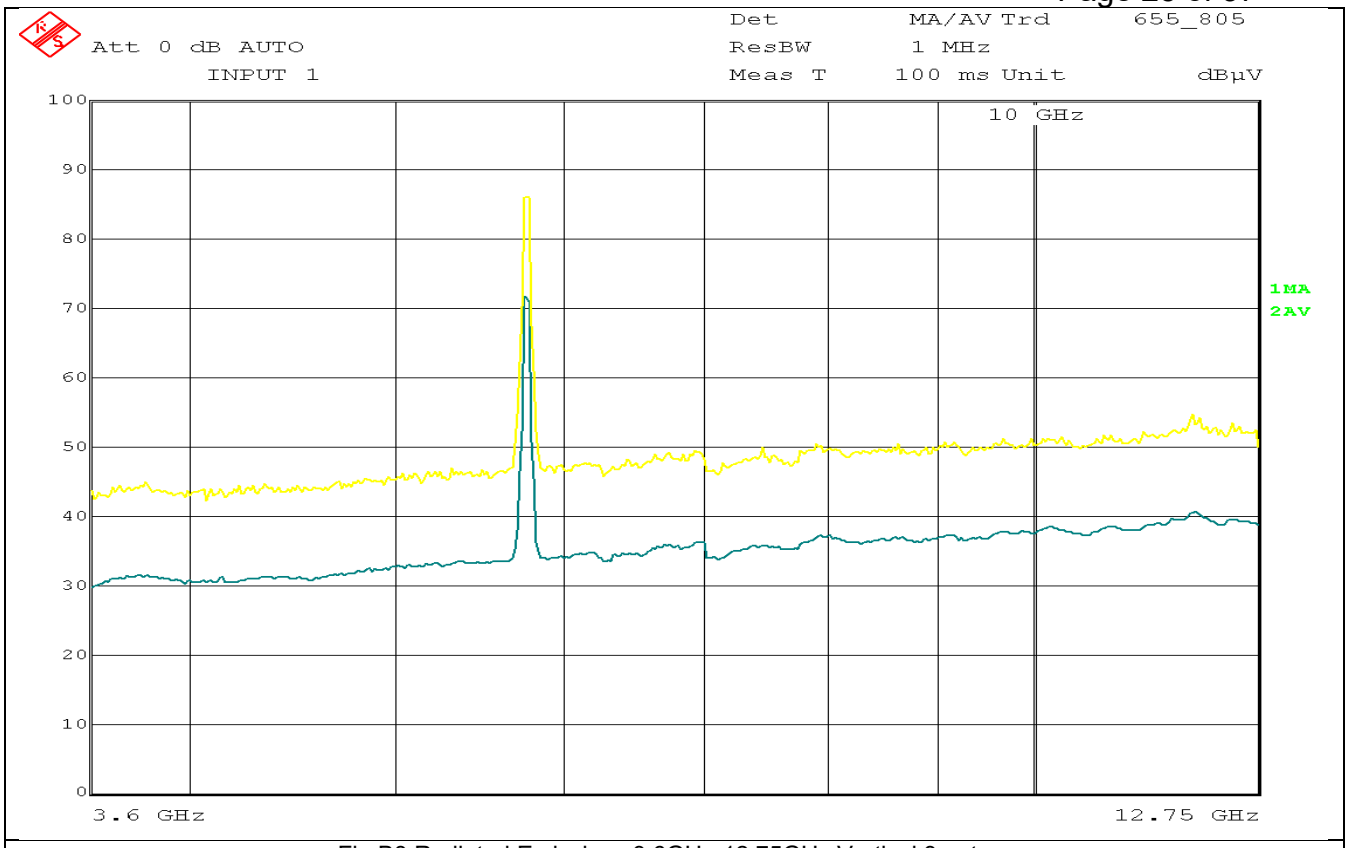


Fig B8 Radiated Emissions 3.6GHz-12.75GHz Vertical 3metres

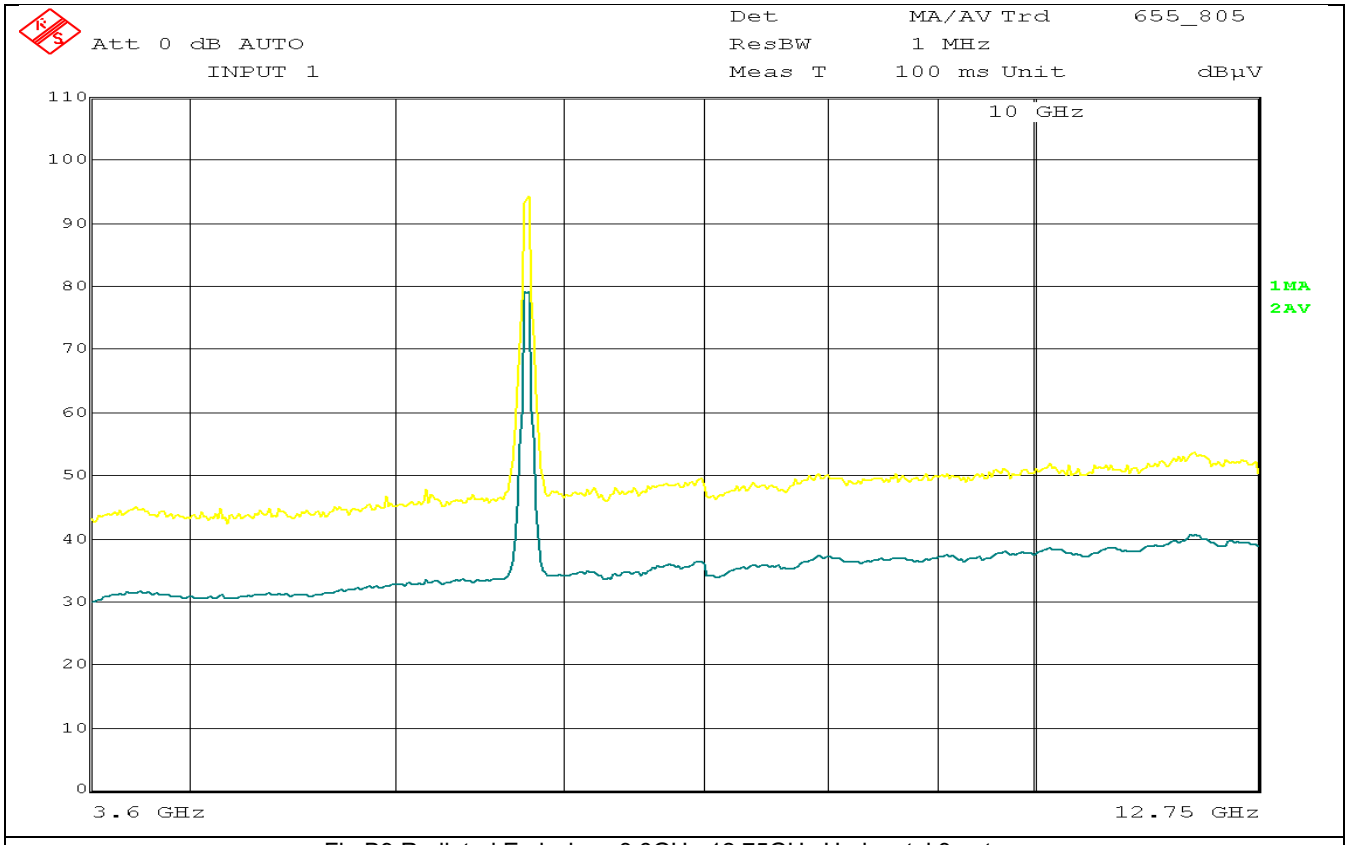


Fig B9 Radiated Emissions 3.6GHz-12.75GHz Horizontal 3metres

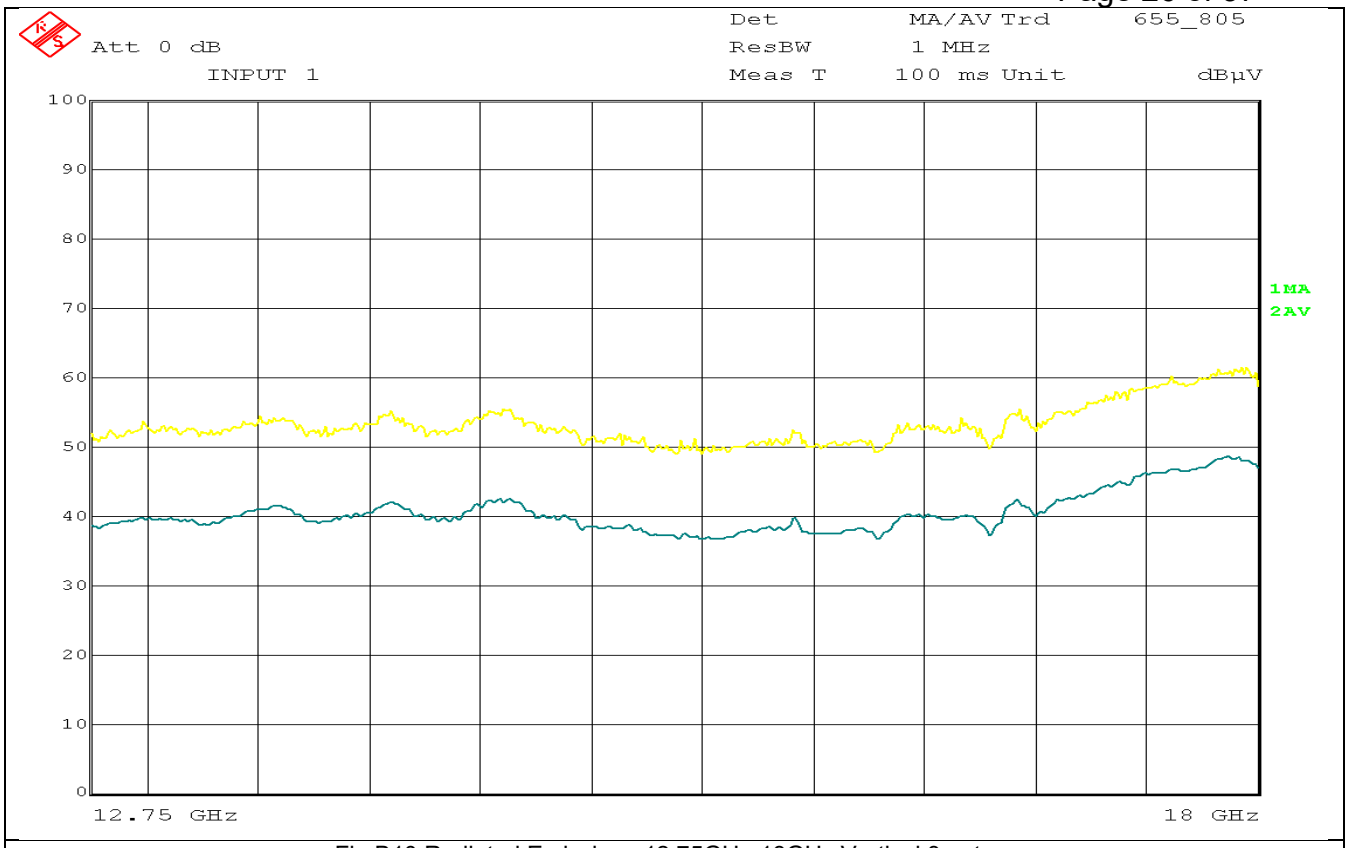


Fig B10 Radiated Emissions 12.75GHz-18GHz Vertical 3metres

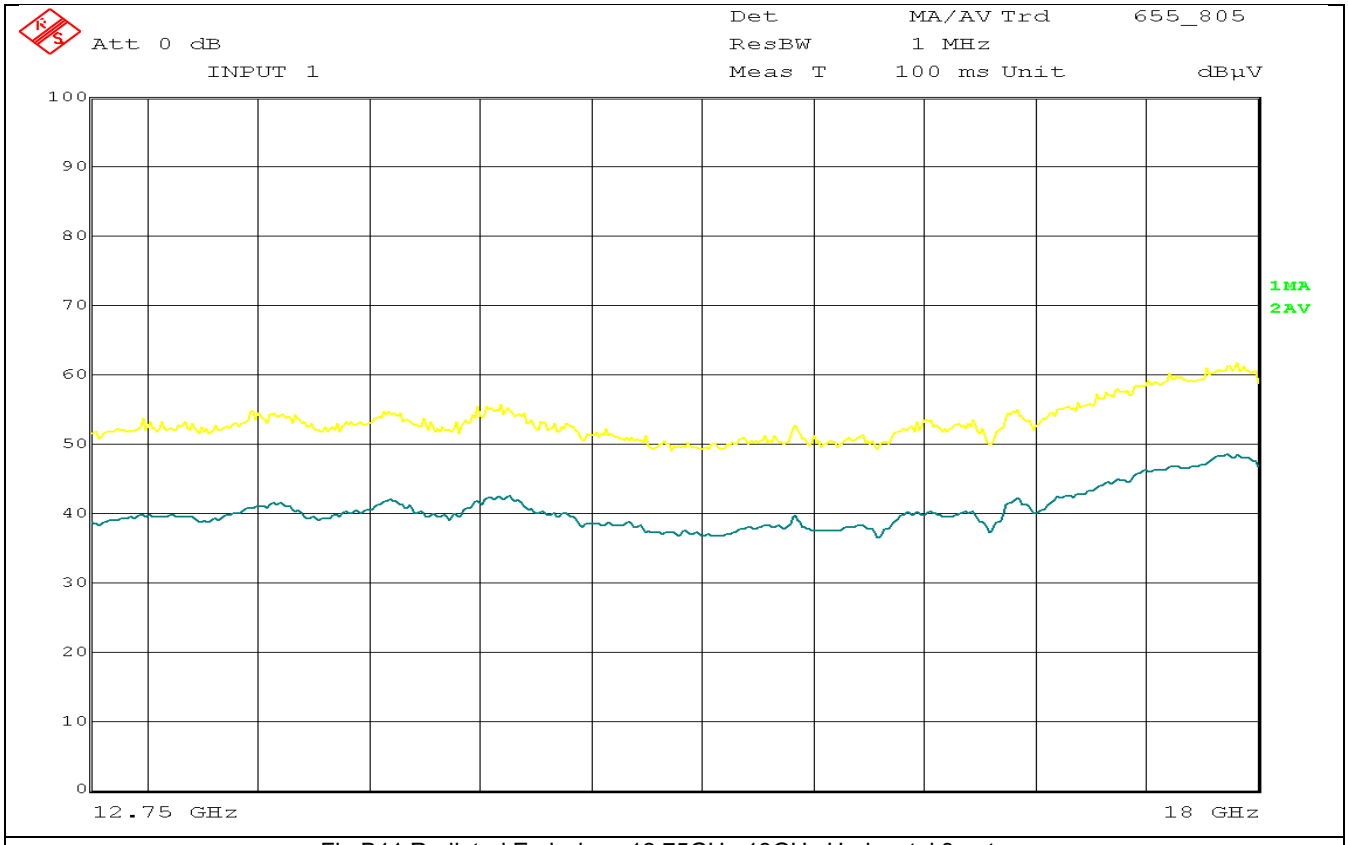


Fig B11 Radiated Emissions 12.75GHz-18GHz Horizontal 3metres

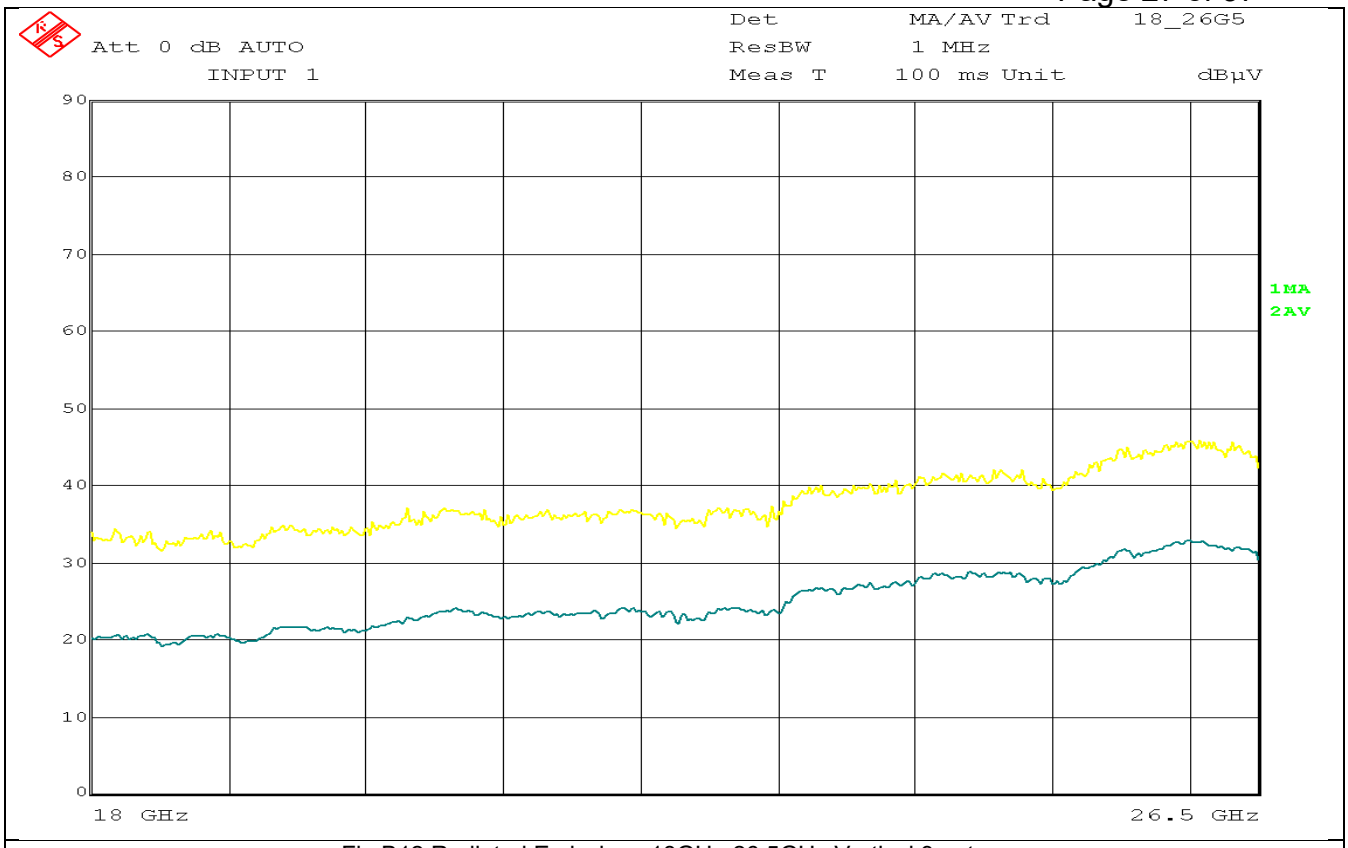


Fig B12 Radiated Emissions 18GHz-26.5GHz Vertical 3metres

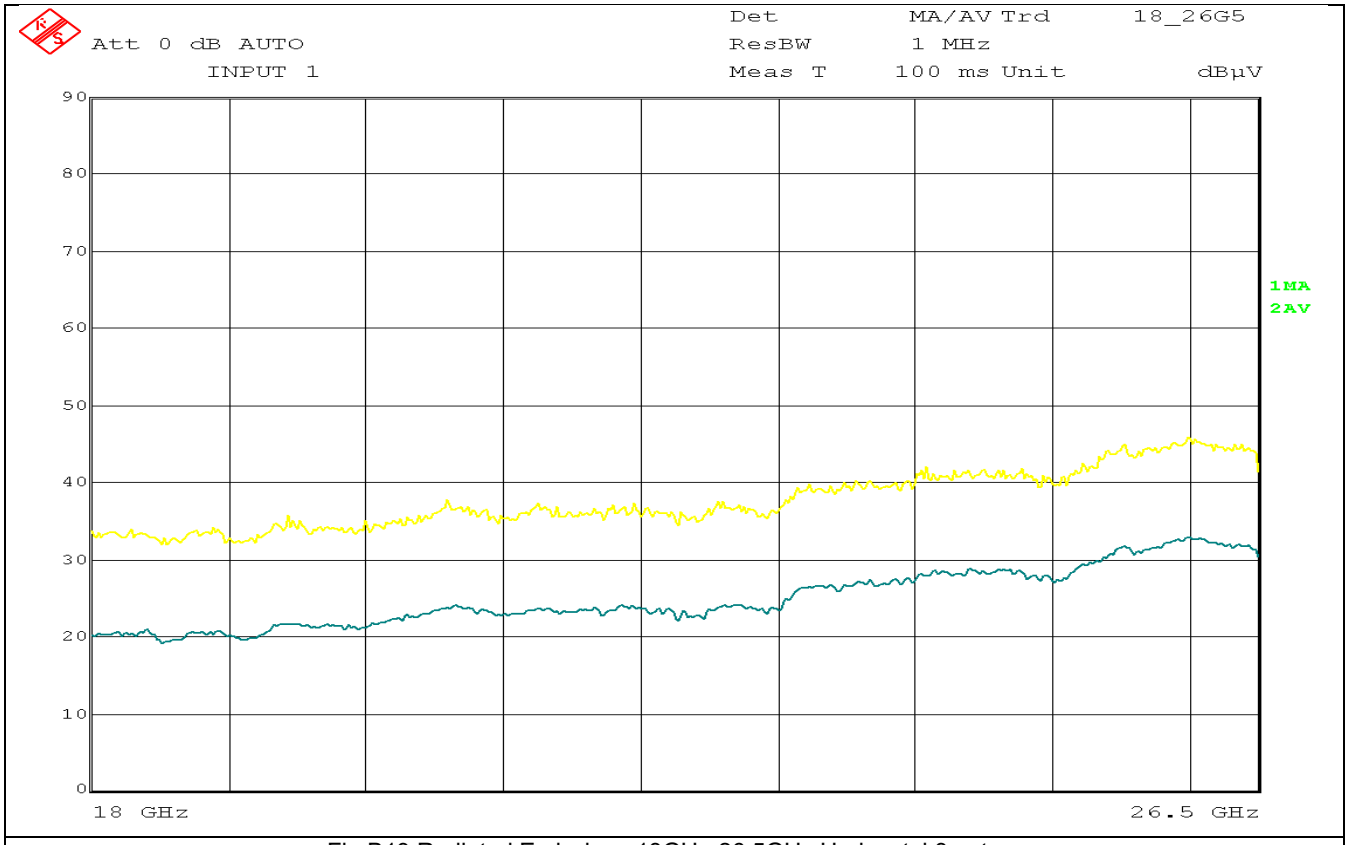


Fig B13 Radiated Emissions 18GHz-26.5GHz Horizontal 3metres

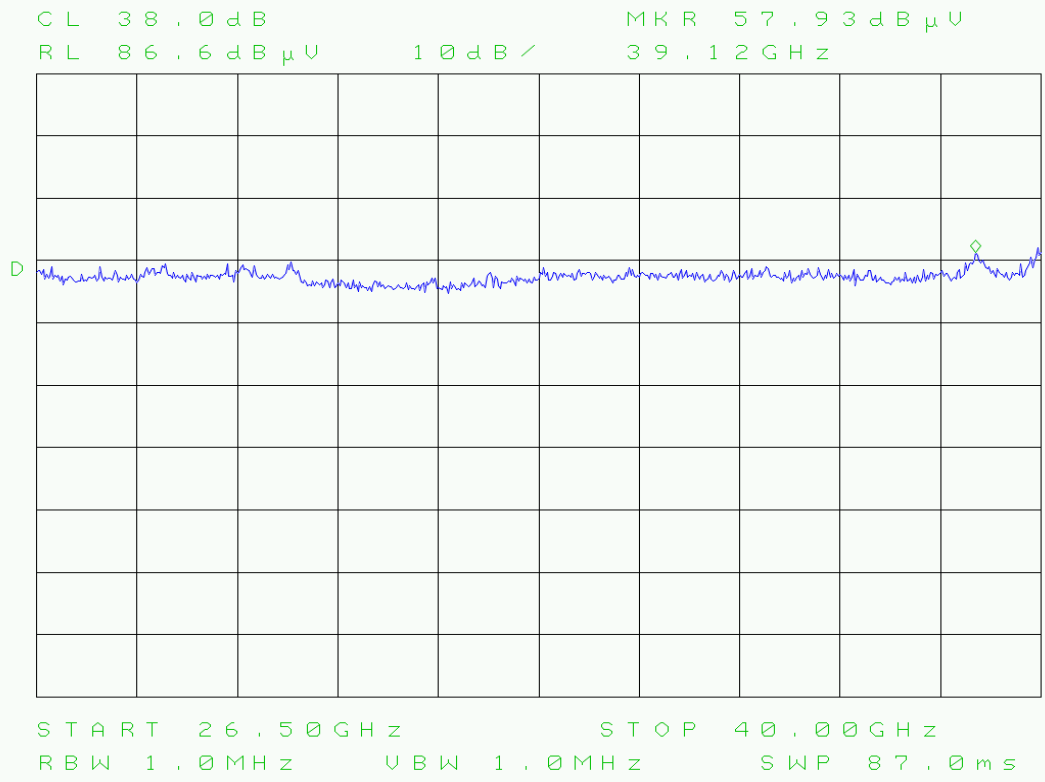


Fig B14 Radiated Emissions 26.5GHz-40GHz Vertical 1metre

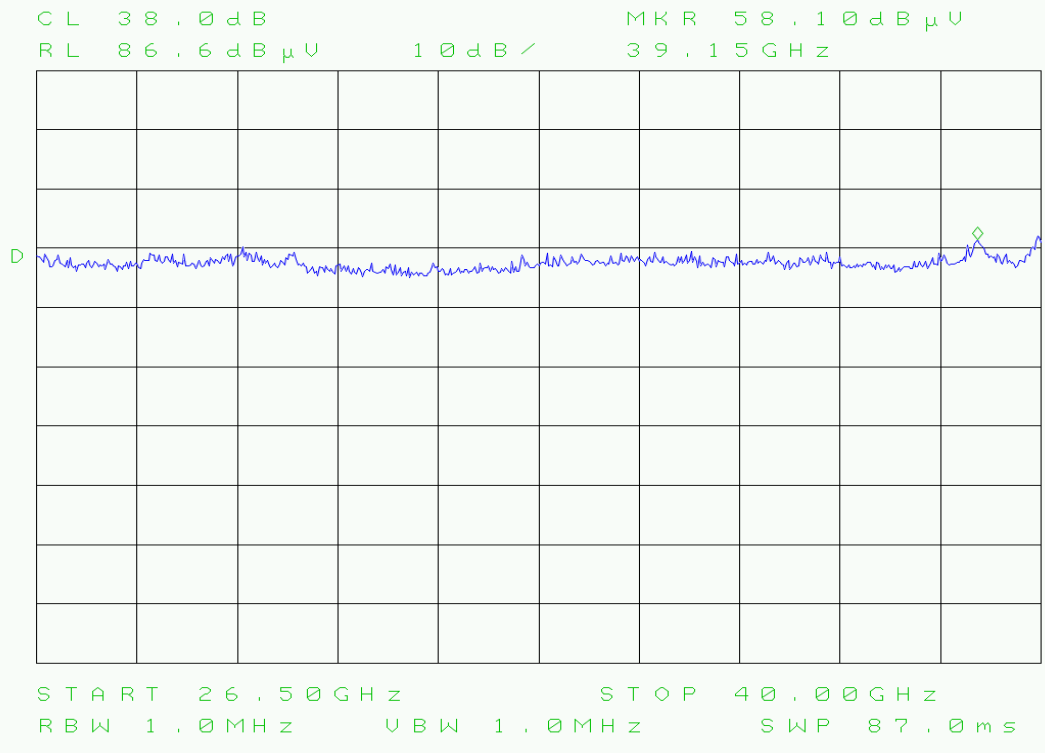


Fig B15 Radiated Emissions 26.5GHz-40GHz Horizontal 1metre

Appendix C: Radios on NFC and BLE

Fig C1 Radiated Spurious Emissions 9KHz -30MHz 3m

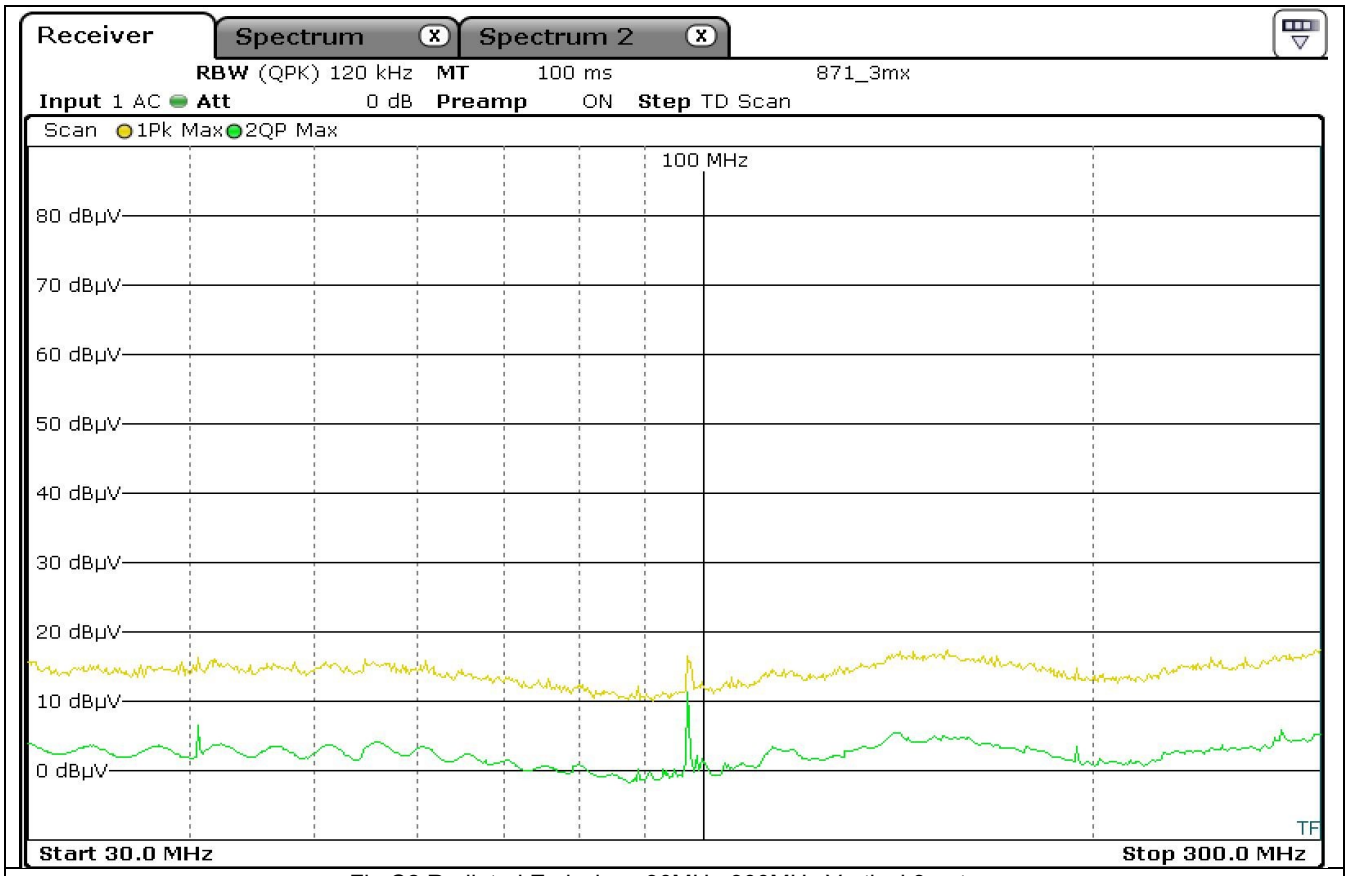


Fig C2 Radiated Emissions 30MHz-300MHz Vertical 3metres

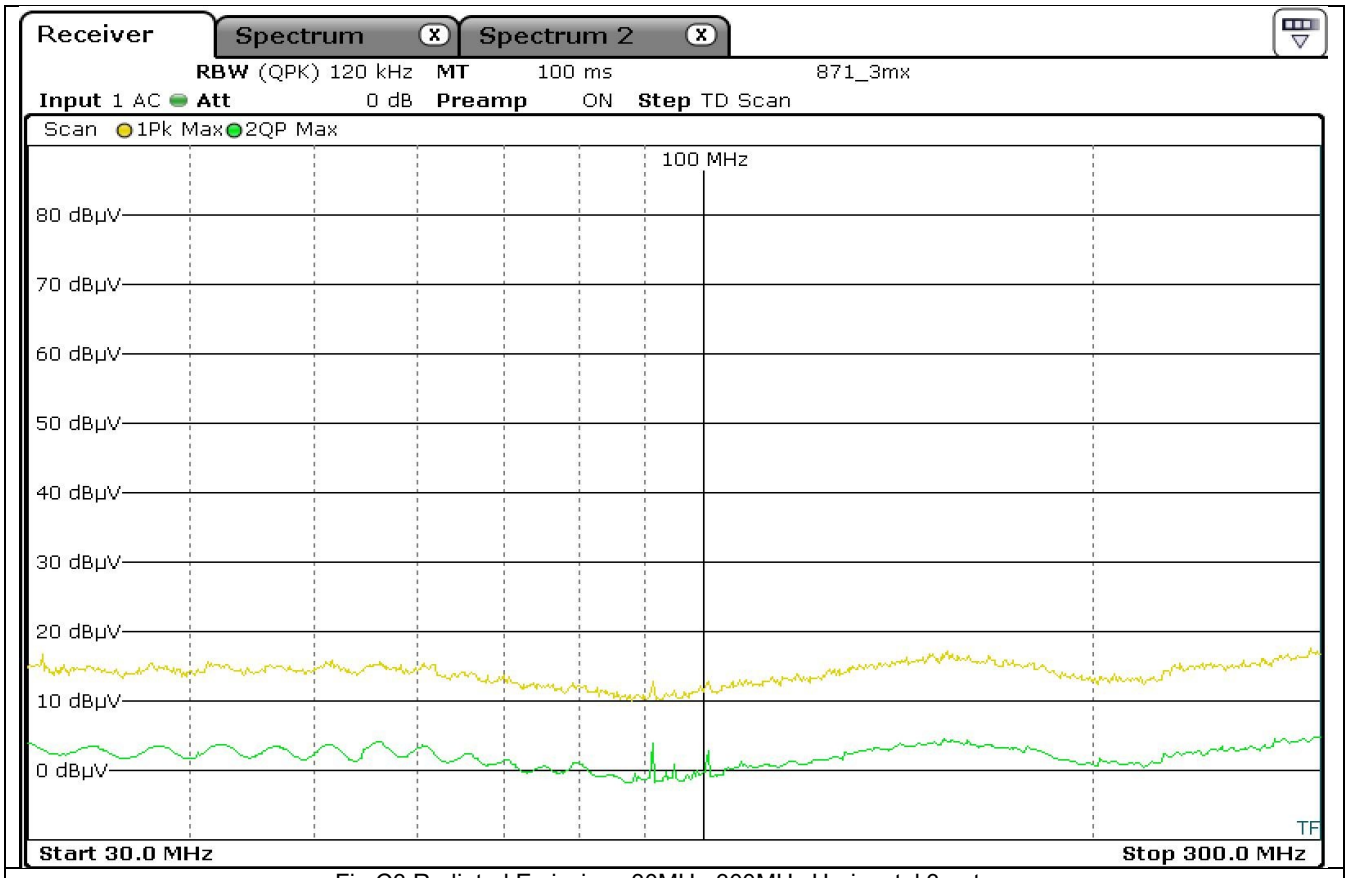


Fig C3 Radiated Emissions 30MHz-300MHz Horizontal 3metres

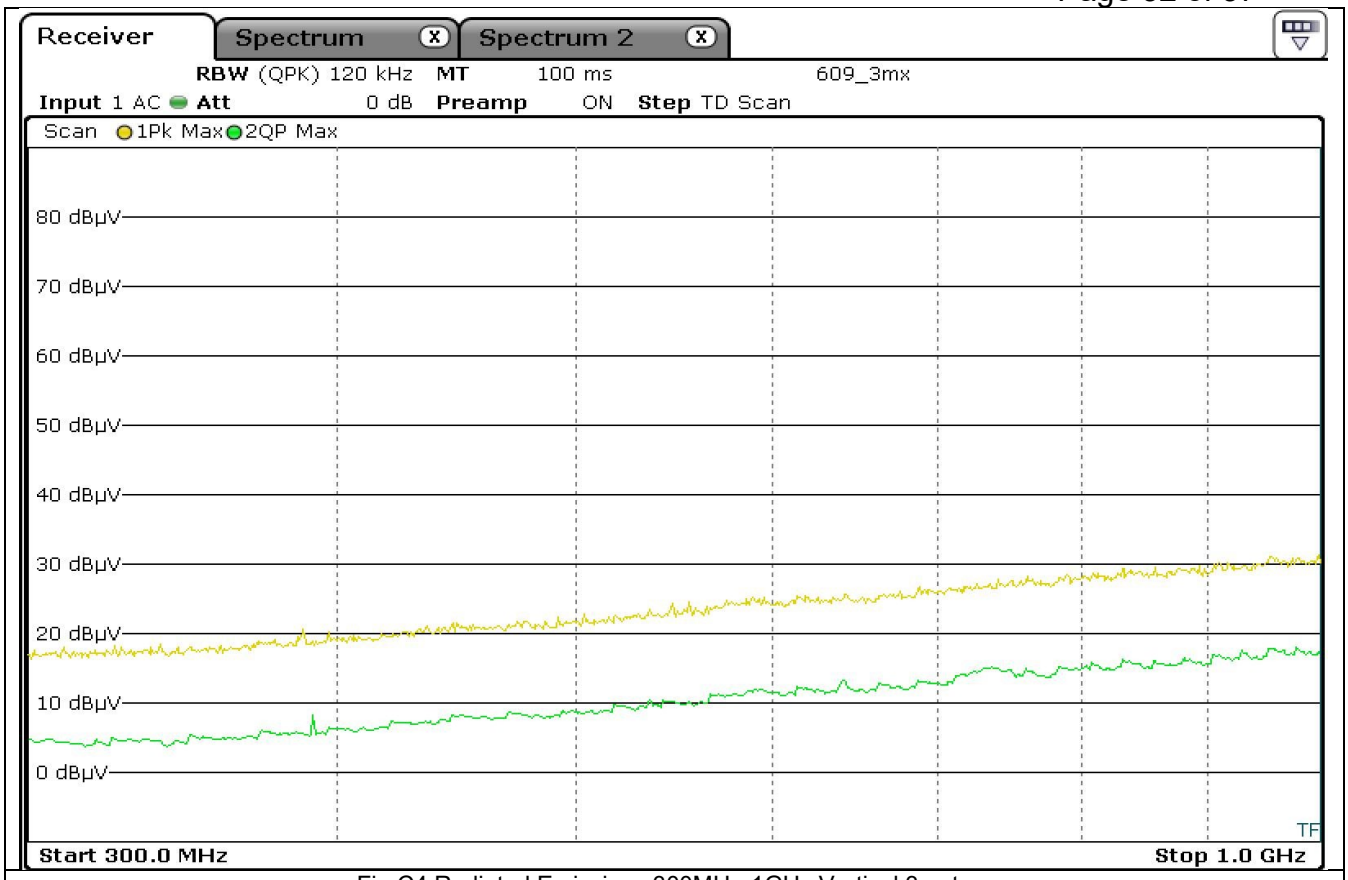


Fig C4 Radiated Emissions 300MHz-1GHz Vertical 3metres

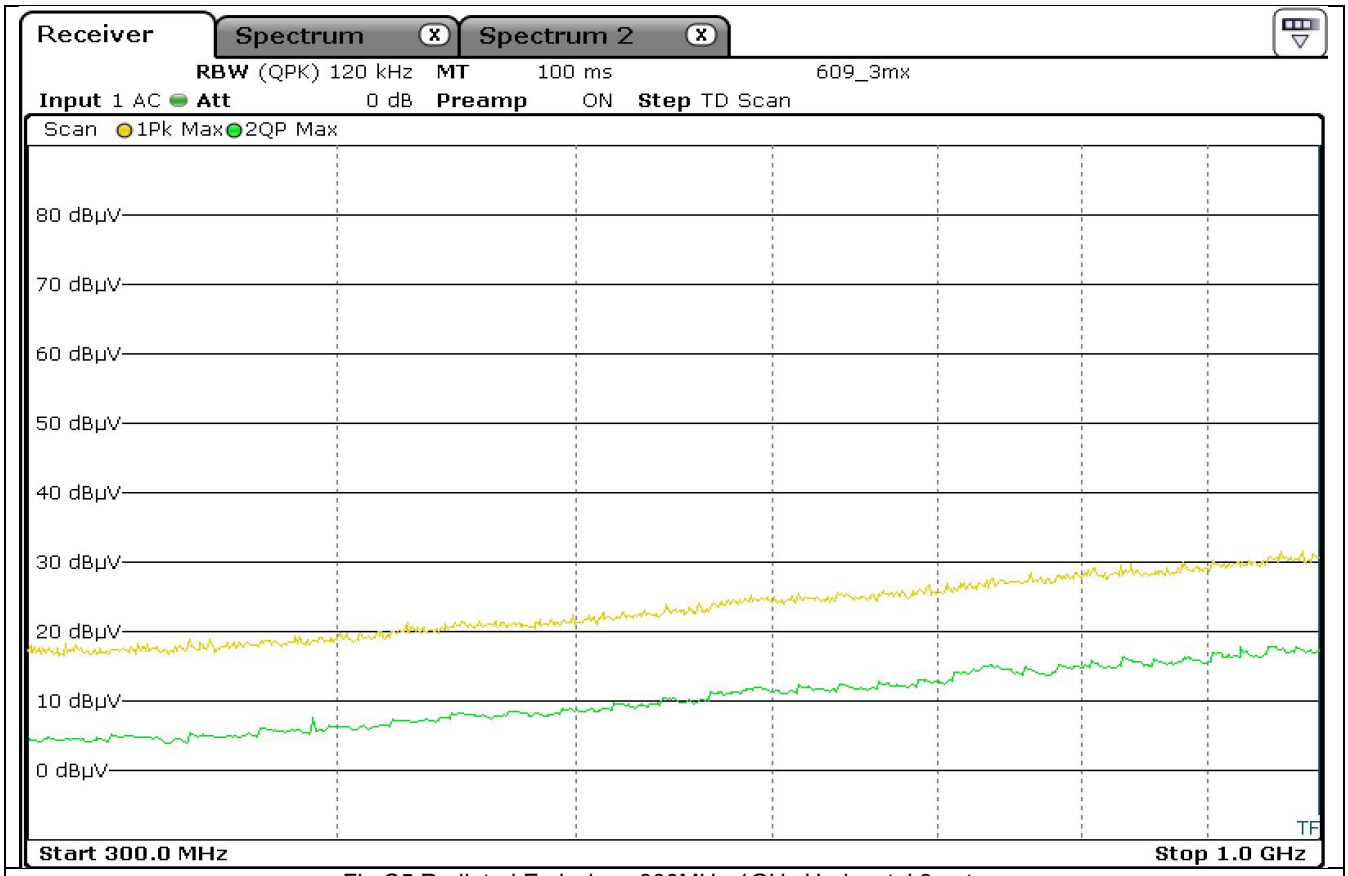


Fig C5 Radiated Emissions 300MHz-1GHz Horizontal 3metres

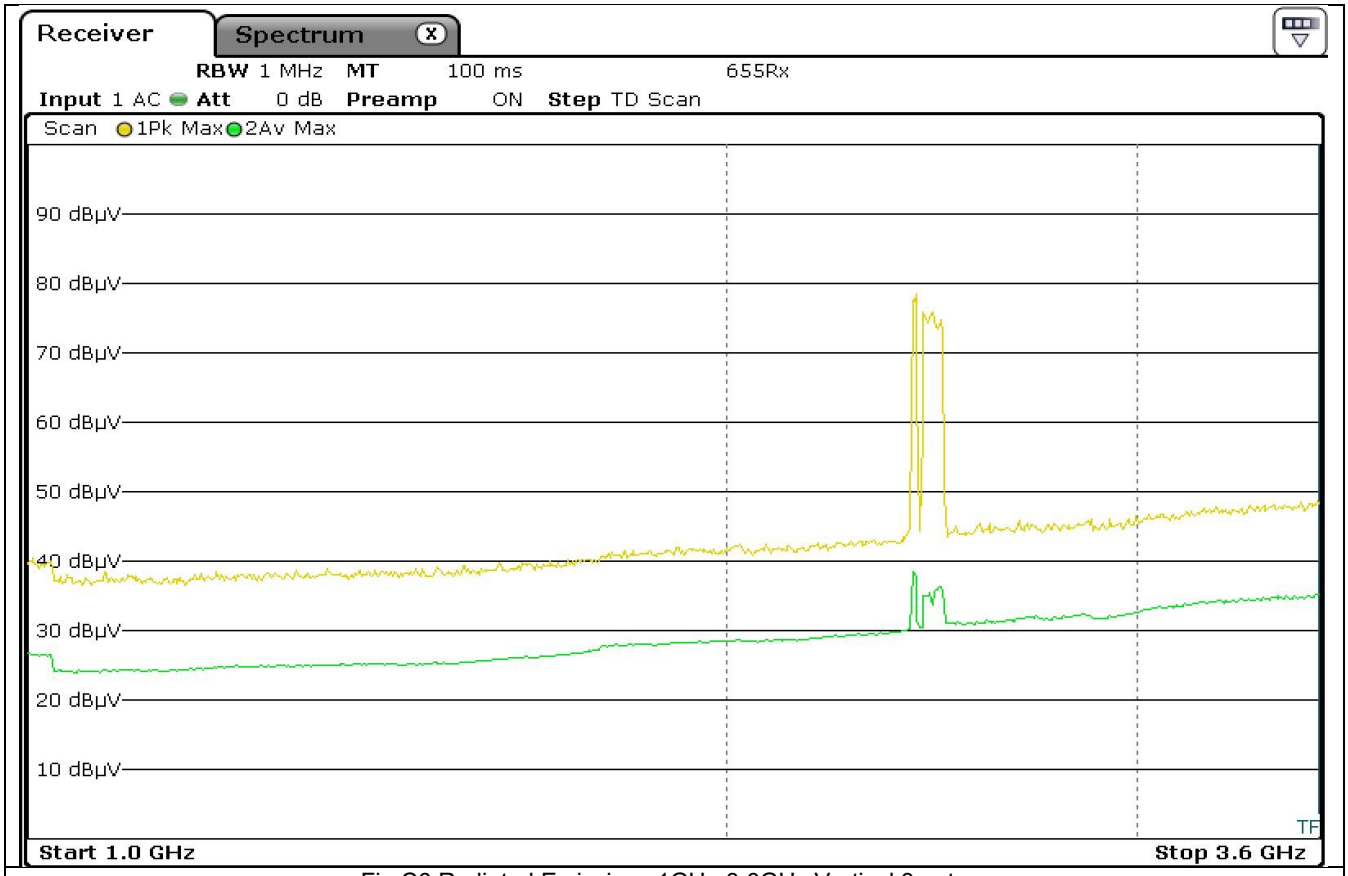


Fig C6 Radiated Emissions 1GHz-3.6GHz Vertical 3metres

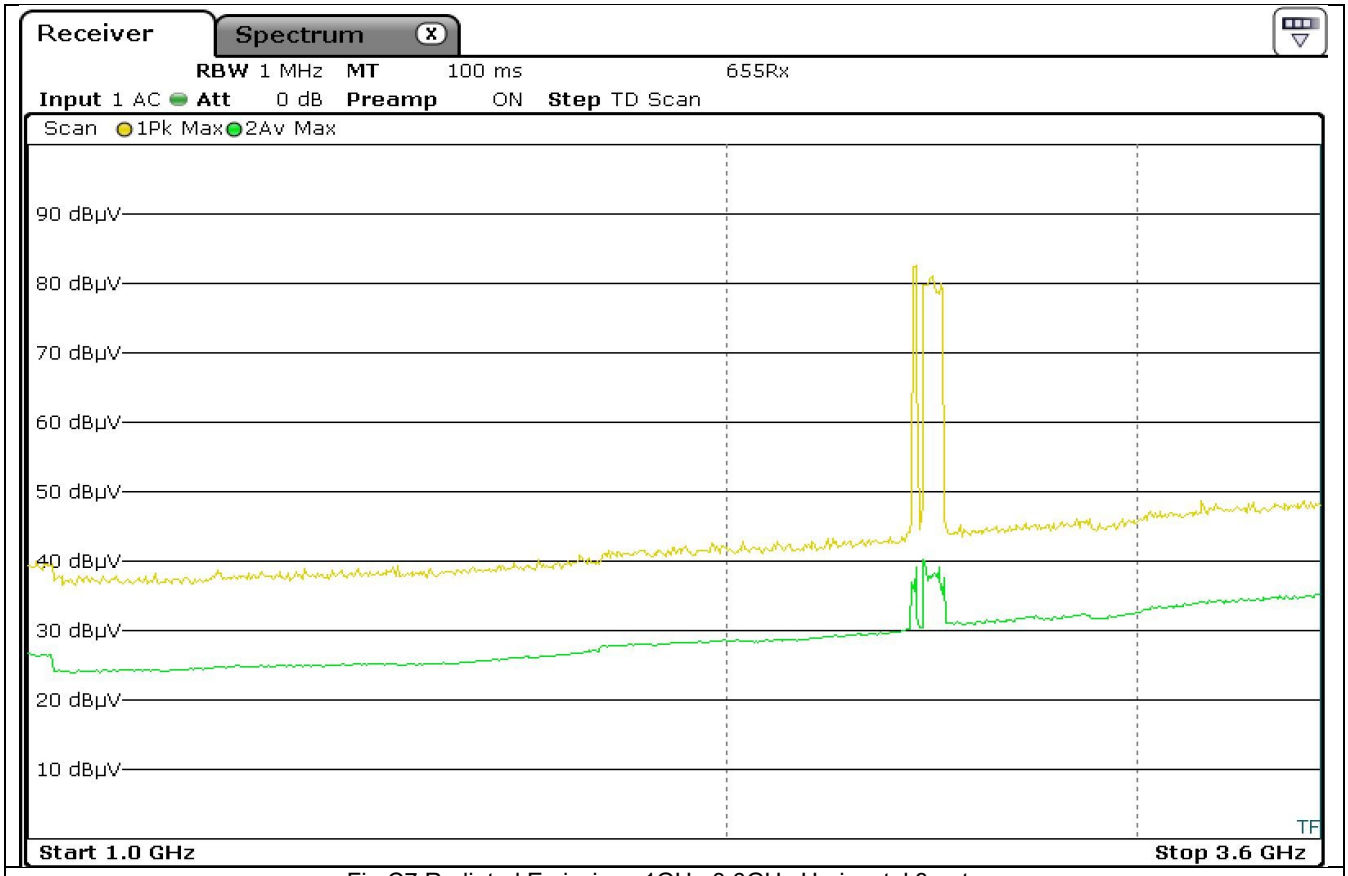


Fig C7 Radiated Emissions 1GHz-3.6GHz Horizontal 3metres

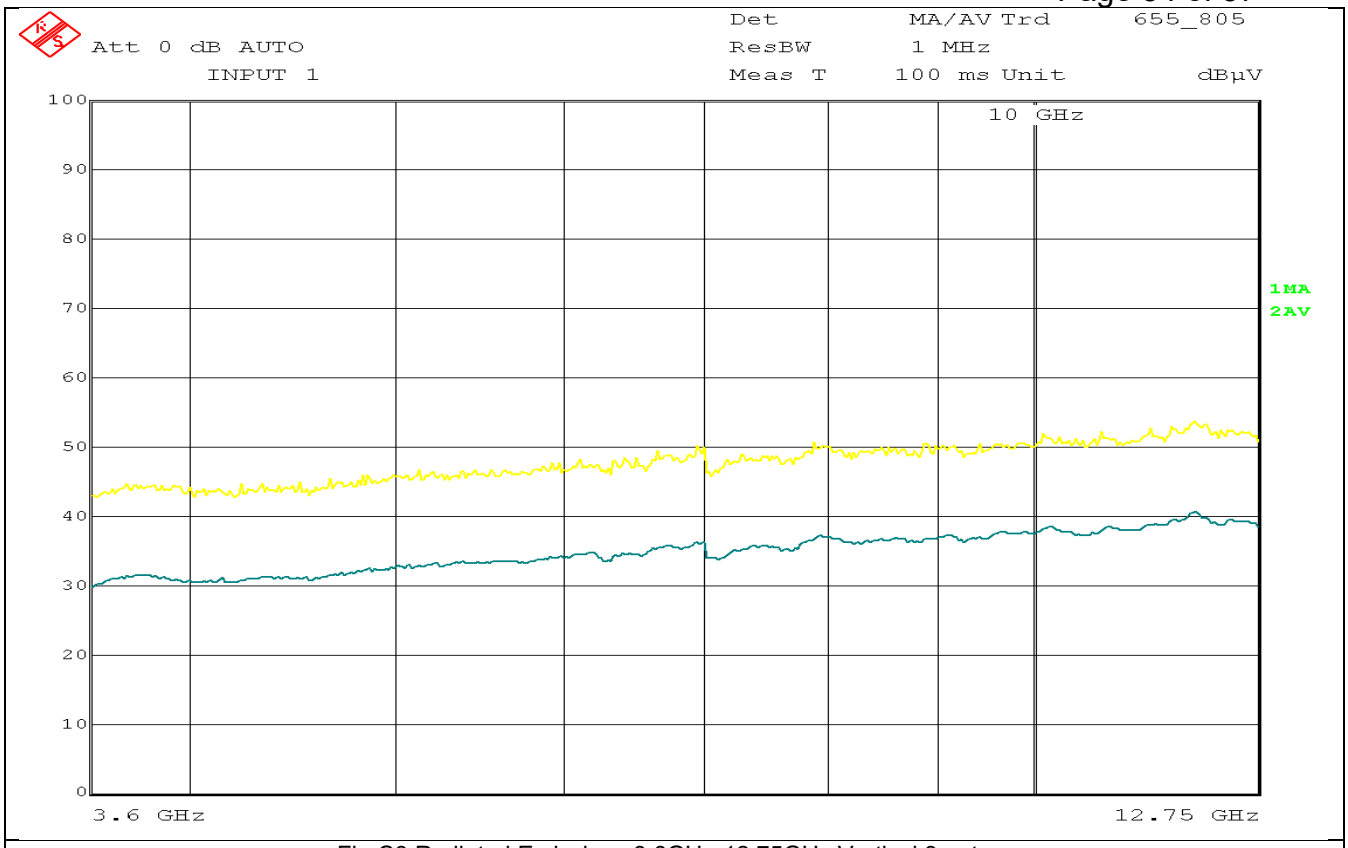


Fig C8 Radiated Emissions 3.6GHz-12.75GHz Vertical 3metres

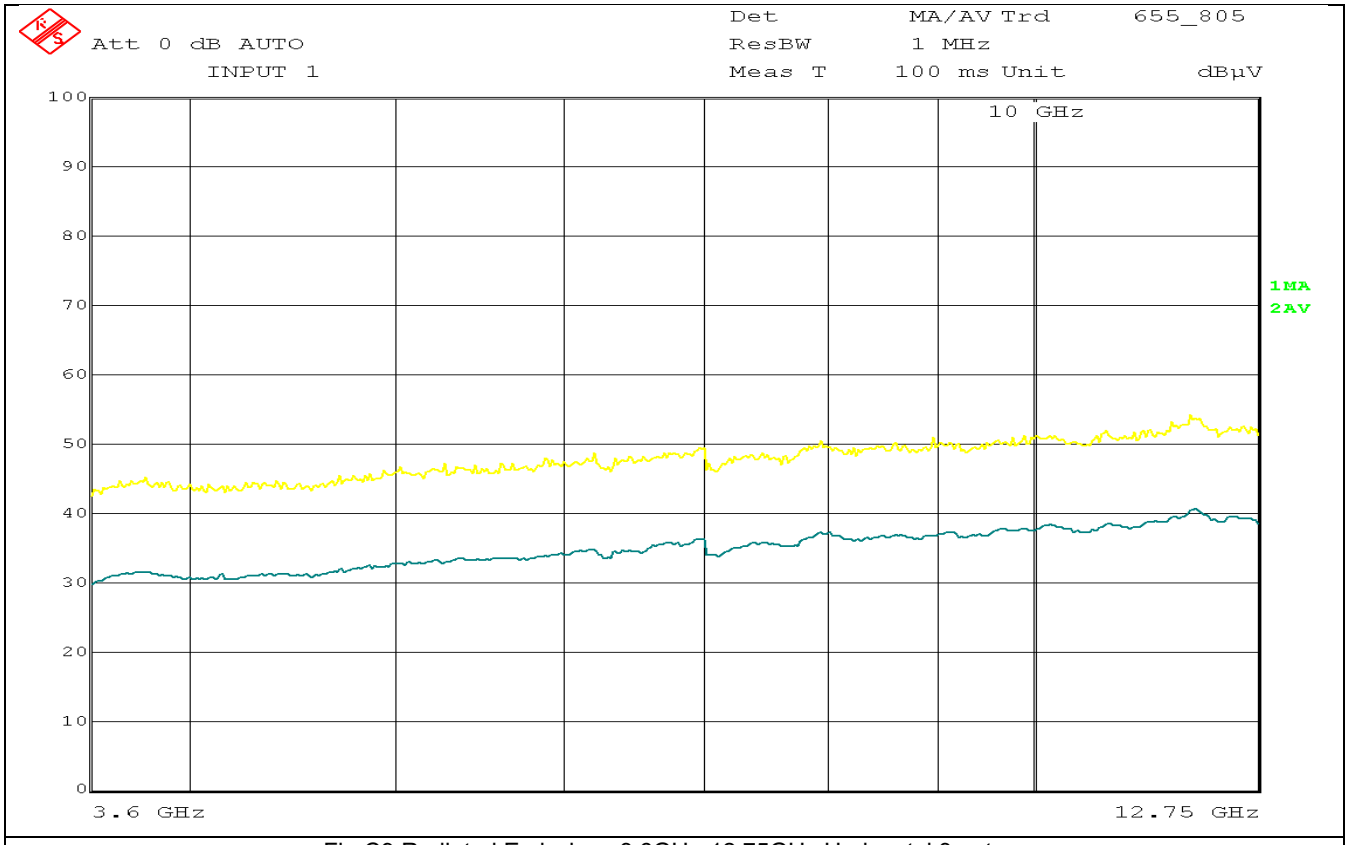


Fig C9 Radiated Emissions 3.6GHz-12.75GHz Horizontal 3metres

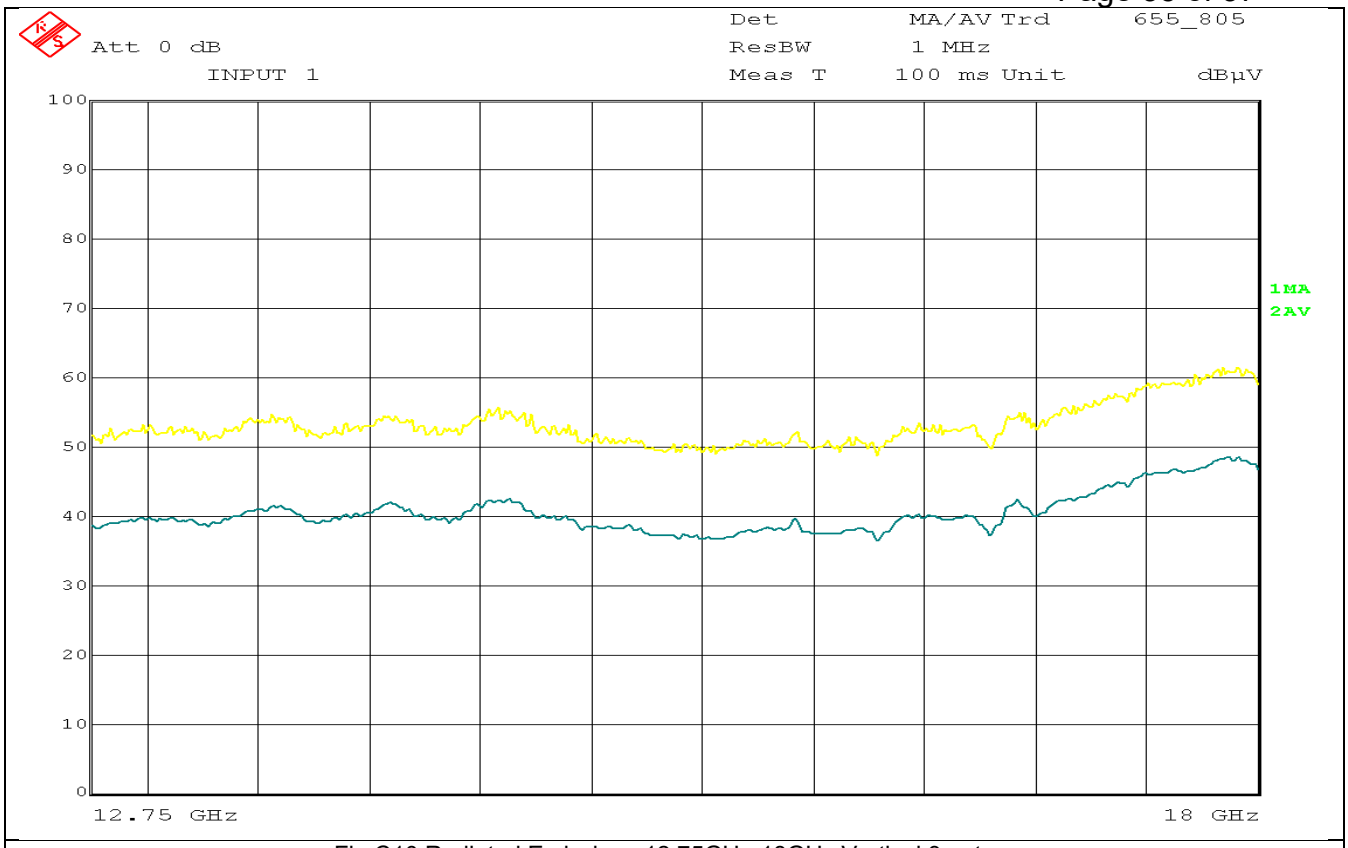


Fig C10 Radiated Emissions 12.75GHz-18GHz Vertical 3metres

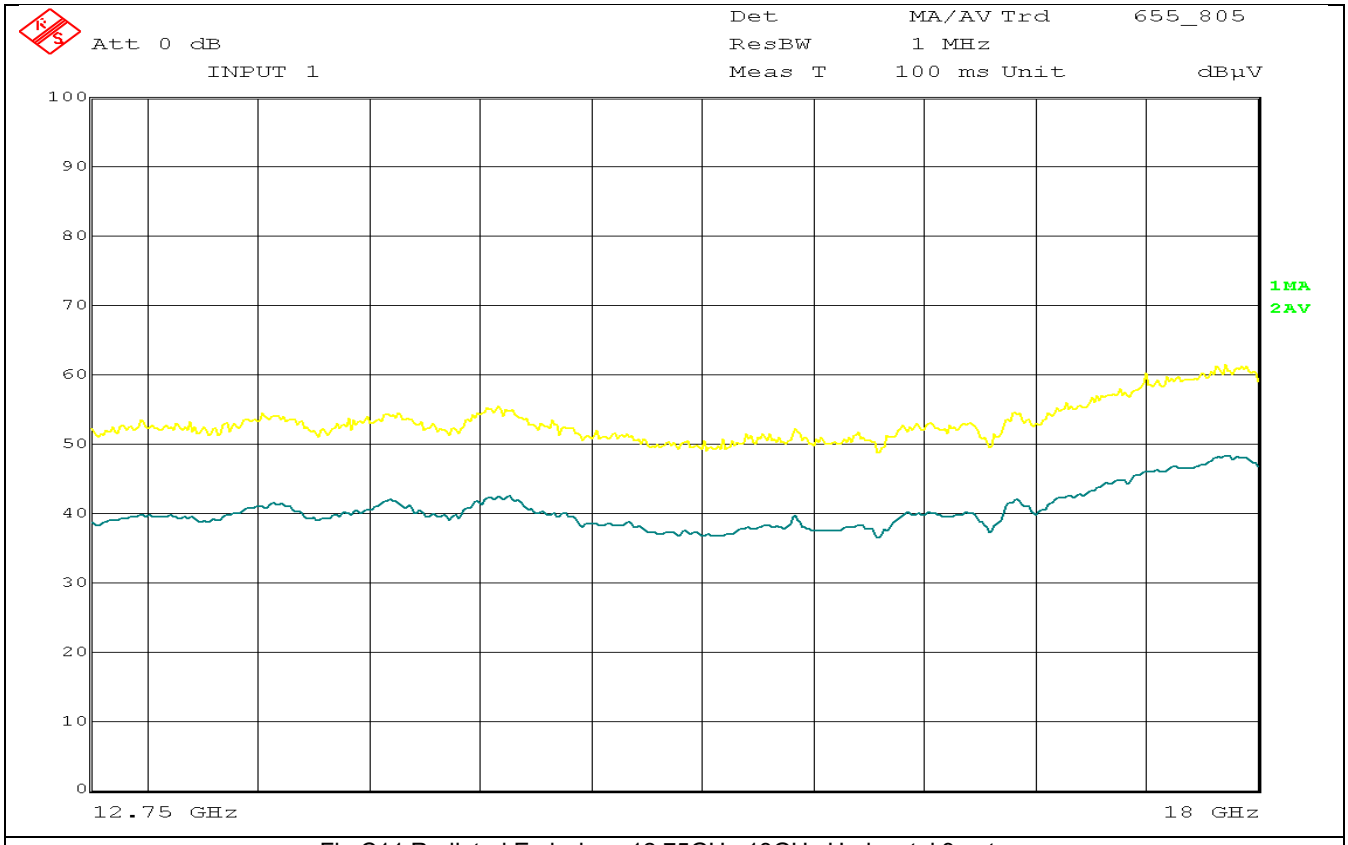


Fig C11 Radiated Emissions 12.75GHz-18GHz Horizontal 3metres

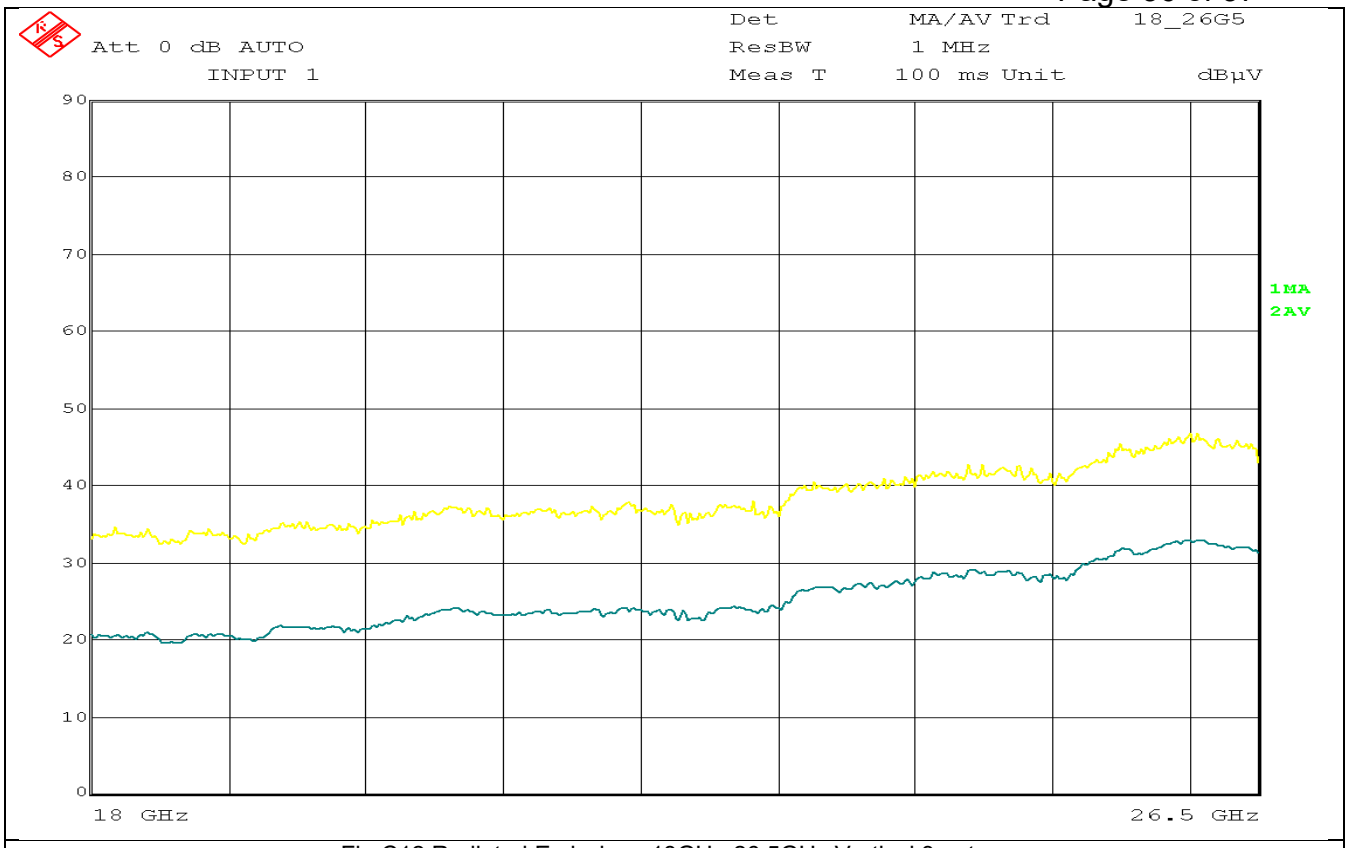


Fig C12 Radiated Emissions 18GHz-26.5GHz Vertical 3metres

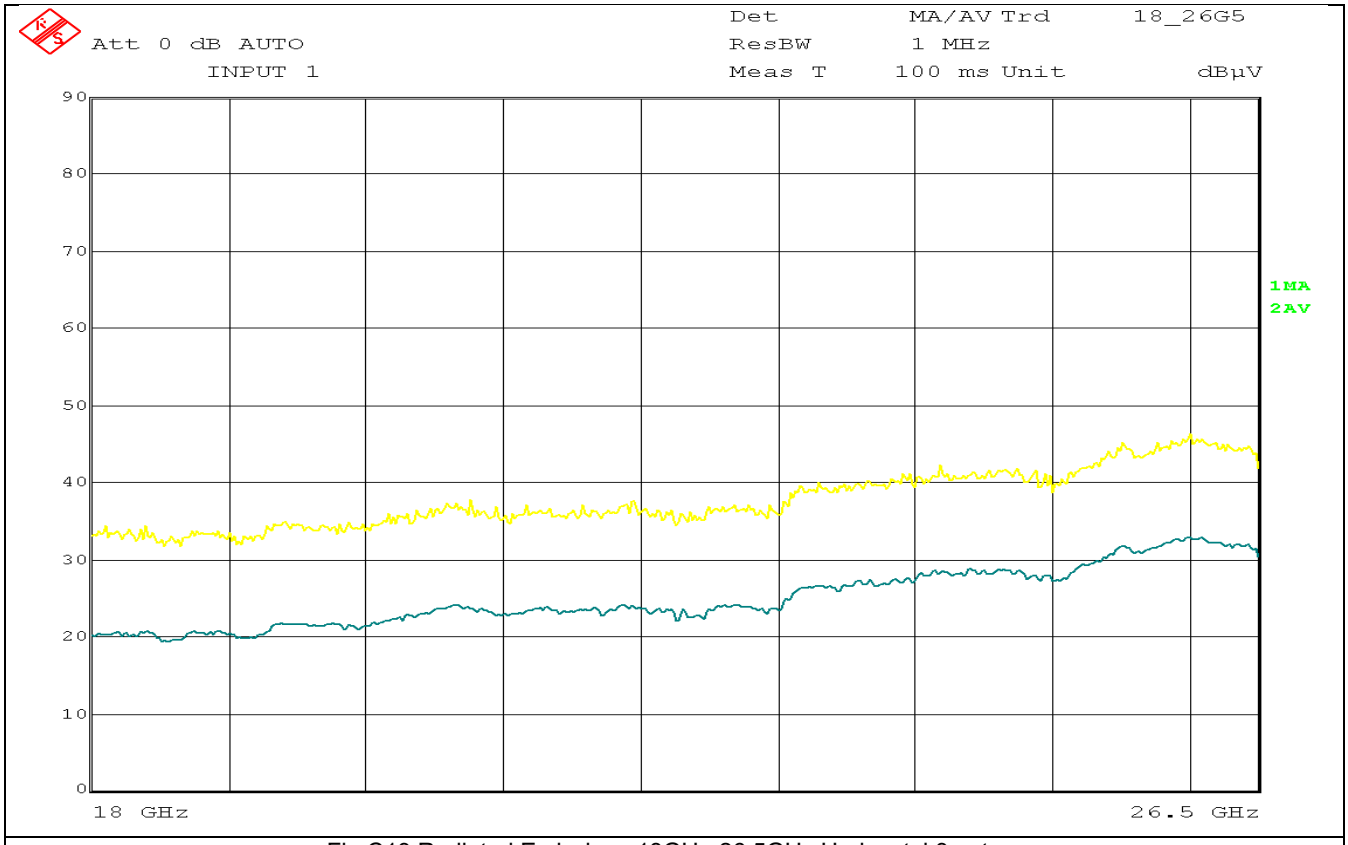


Fig C13 Radiated Emissions 18GHz-26.5GHz Horizontal 3metres

Ref 22E10132-2b Part 2 of 2 for appendices D-F

End of Part 1 of Report