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Confidential Report

Project Num	20E8588-2a Part 1 of 2
Quotation	Q19-2805-1
Prepared For	Nordic ID Oy
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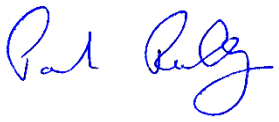
Test Report By	Michael Kirby
FCC Test Firm Registration	409640
IC Site Registration	
Date	23rd Mar 2020
EUT Description	Nordic ID HH83 RFID ACD, Model 837-2A
Authorised by	**Paul Reilly**
Authorised Signature:	

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
RSS-210 Issue 10 Dec 2019

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 antenna internal	Pass
15.209,	RSS-Gen 8.9	Spurious Emissions	Pass
15.207	RSS-Gen 8.8	Conducted Emissions on the mains	Pass

Exhibit A – Technical Report

Table of Contents

Ref 20E8588-2a Part 2 of 2 for the remaining Appendices below

1.0 EUT Description

The Nordic ID HH83 which is a battery powered handheld product, consists of 2 models, the first containing functionality for UHF RFID, WLAN and Bluetooth
and the second identical model, except that UHF RFID functionality is removed

a) Nordic ID HH83 RFID ACD, Model 837-2A

which contains the following pre-approved modules

Nordic ID NUR2-1W **UHF RFID** FCCID: SCCNUR21W ICID:5137A-NUR21W
Nordic ID 13.56MHz **NFC** FCCID: SCC837 ICID:5137A-837
Queltec SC600Y-WF (**WLAN ABGN, BT+BLE**)
FCCID: XMR201911SC600WF ICID 10224A-2019SC600WF

b) Nordic ID HH83 Barcode, Model 837-1A
which is a sub-populated version of the 837-2A

and contains the following pre-approved modules

Nordic ID 13.56MHz **NFC** FCCID: SCC837 ICID:5137A-837
Queltec SC600Y-WF (**WLAN ABGN, BT+BLE**)
FCCID: XMR201911SC600WF ICID 10224A-2019SC600WF

All tests were performed on the Nordic ID HH83 RFID ACD, Model 837-2A

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 26th 28th Feb and 3rd 5th and 6th Mar 2020.

1.4 Description of Test Methods

Tests were performed manually, and no special software was used

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 C63.4-2014.

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 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**

Ambient Temp 21.6deg C RH =31.2%

Mains Conducted Emissions results

Detector	Frequency	Reading	Margin	Phase
QP/ Ave	MHz	dBuV	dB	L/N
Quasi-Peak	0.1590	44.31	-21.43	Live
Quasi-Peak	0.1950	41.26	-23.45	Live
Quasi-Peak	0.2288	38.88	-24.87	Live
Quasi-Peak	0.2580	38.42	-24.49	Live
Quasi-Peak	0.389	40.80	-18.39	Live
Average	0.389	37.65	-11.54	Live
Average	0.713	25.75	-20.25	Live
Average	0.744	25.69	-20.31	Live
Average	0.778	24.98	-21.02	Live
Quasi-Peak	0.789	28.51	-27.49	Live
Average	0.809	24.65	-21.35	Live
Quasi-Peak	13.560	41.09	-18.91	Live
Average	21.525	33.54	-16.46	Live
Average	21.527	33.40	-16.6	Live
Average	21.530	33.42	-16.58	Live

Detector	Frequency	Reading	Margin	Phase
QP/ Ave	MHz	dBuV	dB	L/N
Quasi-Peak	0.1590	44.23	-21.51	Neutral
Quasi-Peak	0.1950	41.38	-23.33	Neutral
Quasi-Peak	0.2288	39.02	-24.73	Neutral
Quasi-Peak	0.2580	38.58	-24.33	Neutral
Quasi-Peak	0.3885	41.07	-18.12	Neutral
Average	0.3885	37.79	-11.4	Neutral
Average	0.7125	24.85	-21.15	Neutral
Average	0.7440	24.98	-21.02	Neutral
Average	0.7778	24.07	-21.93	Neutral
Quasi-Peak	0.7890	27.22	-28.78	Neutral
Average	0.8093	23.96	-22.04	Neutral
Quasi-Peak	13.5600	40.42	-19.58	Neutral
Average	21.5250	32.91	-17.09	Neutral
Average	21.5273	32.74	-17.26	Neutral
Average	21.5295	32.85	-17.15	Neutral

Ref Appendix B for scans

Result: Pass

4. Spurious Emissions

4.1 Spurious Emissions with all radios on (Wifi 2.4GHz band)

Frequency GHz	Peak Level dBuV/m	Antenna Factor dB	Preamp Gain dB	Cable Loss dB	Antenna Polarity	Final Peak Level dBuV/m	Average Limit +20dB dBuV/m	Margin dB
1.8295	38.8	24.8	38.6	1.6	Vertical	51.0	74.0	23.0
2.745	38.5	29.4	38.4	3.8	Vertical	43.7	74.0	30.3
1.8295	34.6	24.8	38.6	1.6	Vertical	46.8	74.0	27.2
2.745	38.6	29.4	38.4	3.8	Vertical	43.8	74.0	30.2
3.659	41.7	30.6	37.6	4.6	Vertical	44.1	74.0	29.9
4.573	43.2	32.3	37	5.0	Horizontal	42.9	74.0	31.1
5.488	52.5	34.2	37.5	5.6	Horizontal	50.2	74.0	23.8
6.403	50.3	34.2	36.8	6.8	Horizontal	46.1	74.0	27.9
7.313	53.6	37.7	38	6.7	Horizontal	47.2	74.0	26.7
3.659	40.5	30.6	37.6	4.6	Horizontal	42.9	74.0	31.0
4.573	44.0	32.3	37	5.0	Horizontal	43.7	74.0	30.3
5.488	52.8	34.2	37.5	5.6	Horizontal	50.5	74.0	23.4
6.403	50.4	34.2	36.8	6.8	Horizontal	46.2	74.0	27.8
7.313	53.3	37.7	38	6.7	Horizontal	46.9	74.0	27.1

4.2 Spurious Emissions with all radios on (Wifi 5GHz band)

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
98.7	6.6	Vertical	9.4	1.1	17.1	43.5	26.4
105.96	3.6	Vertical	9.8	1.1	14.5	43.5	29.0
614.1	0.6	Vertical	19.6	2	22.2	46.0	23.8
711.16	0.8	Horizontal	21	2.1	23.9	46.0	22.1
962.79	-0.8	Horizontal	24.2	2.4	25.8	54.0	28.2
978.22	-1.8	Horizontal	24.3	2.4	24.9	54.0	29.1
98.7	4.6	Vertical	9.4	1.1	15.1	43.5	28.4
153.54	-8.8	Vertical	11.9	1.2	4.3	43.5	39.2
585.75	0.8	Vertical	19.2	1.8	21.8	46.0	24.2
729.06	1.9	Vertical	21.3	2.1	25.3	46.0	20.7
956.02	-1.44	Horizontal	24.1	2.4	25.06	46.0	21.0

Frequency GHz	Peak Level dBuV/m	Antenna Factor dB	Preamp Gain dB	Cable Loss dB	Antenna Polarity	Final Peak Level dBuV/m	Average Limit +20dB dBuV/m	Margin dB
1.8295	39.3	24.8	38.6	1.6	Vertical	51.5	74.0	22.5
2.745	38.5	29.4	38.4	3.8	Vertical	43.7	74.0	30.3
1.8295	34.4	24.8	38.6	1.6	Horizontal	46.6	74.0	27.4
2.745	38.1	29.4	38.4	3.8	Horizontal	43.3	74.0	30.7

Test Result Pass

4.3 Co-location

No Spurious emissions related to co-location issues were found

Test Result Pass

4.4 Carrier Power

Note the Radiated field strength was measured at 3 metres and
the conversion formula below was used to determine the EIRP in dBm

$$EIRP\ (dBm) = E_{3m}\ (dBuV/m) - 95.2$$

UHF RFID

Frequency	EIRP
MHz	dBm
914.75	29.2

Bluetooth

Frequency	Measurement
GHz	dBm
2.402	8

Wifi 2.4G

Frequency	Measurement
GHz	dBm
2.437	16.3

Wifi 5G

Frequency	Measurement
GHz	dBm
5.775	25.8

Appendix A:

Scan Results

All Radios on with Wifi in 2.4GHz band

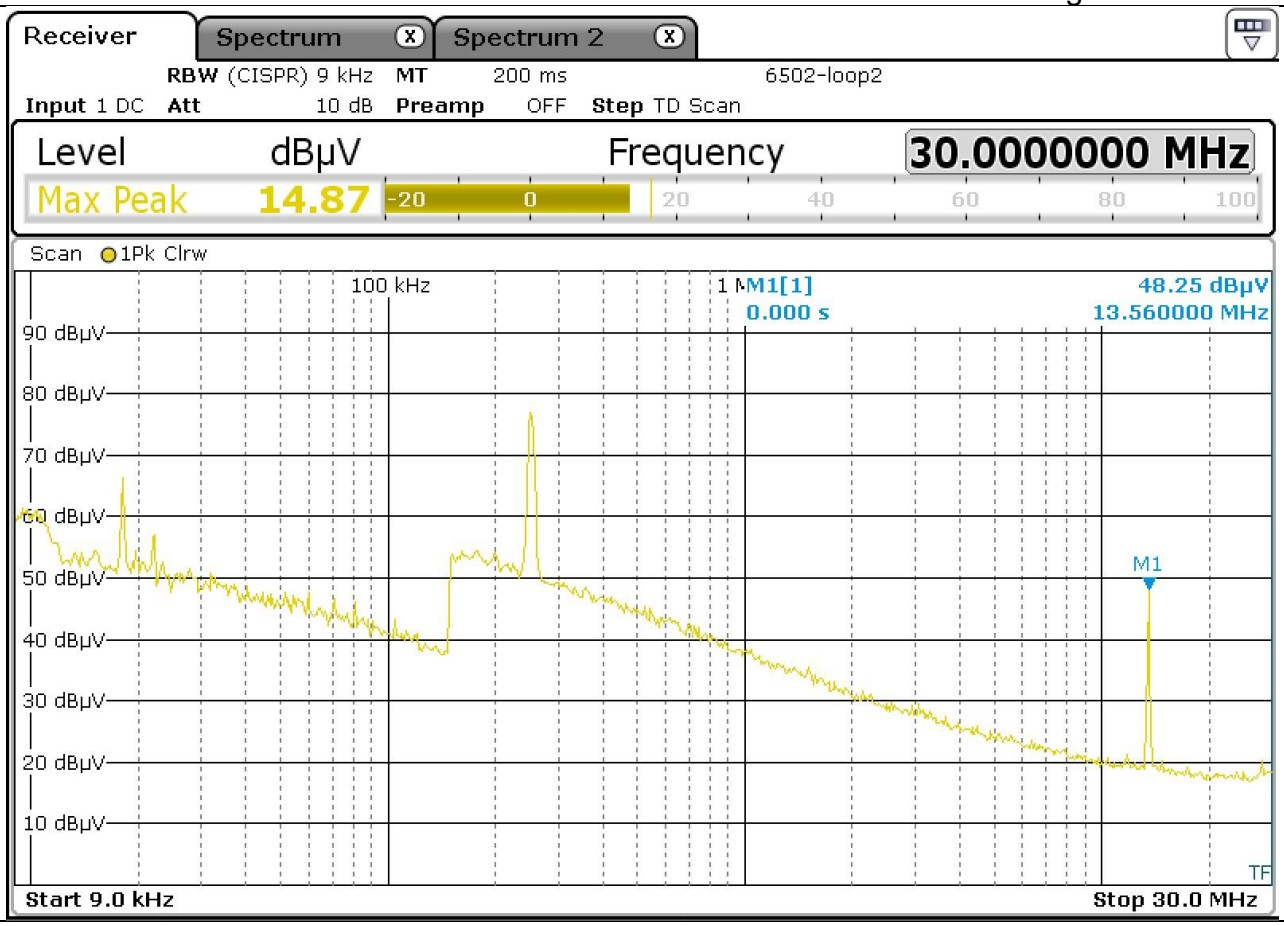


Fig A1 Radiated Spurious Emissions 9KHz -30MHz 3m

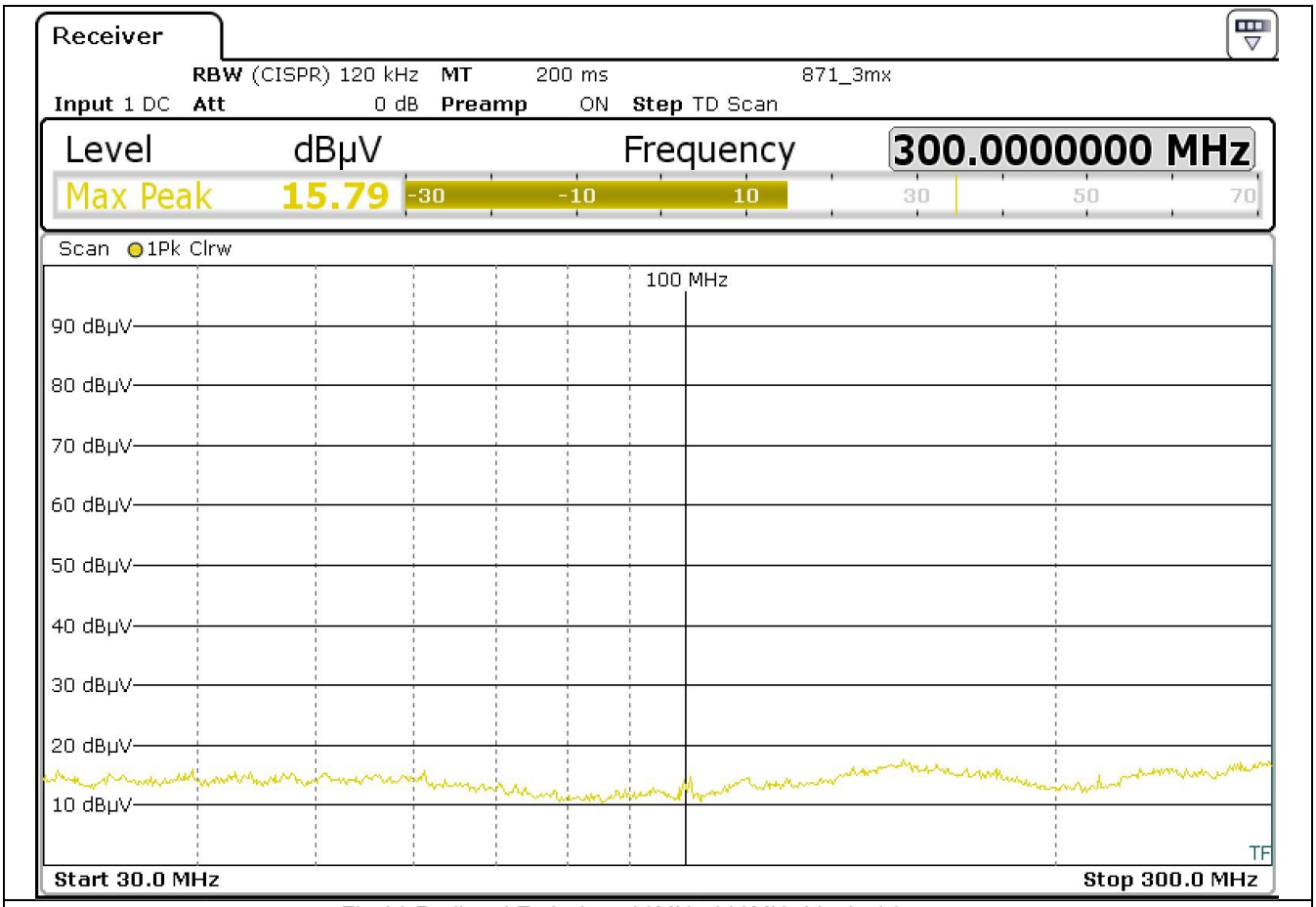


Fig A2 Radiated Emissions 30MHz-300MHz Vertical 3metres

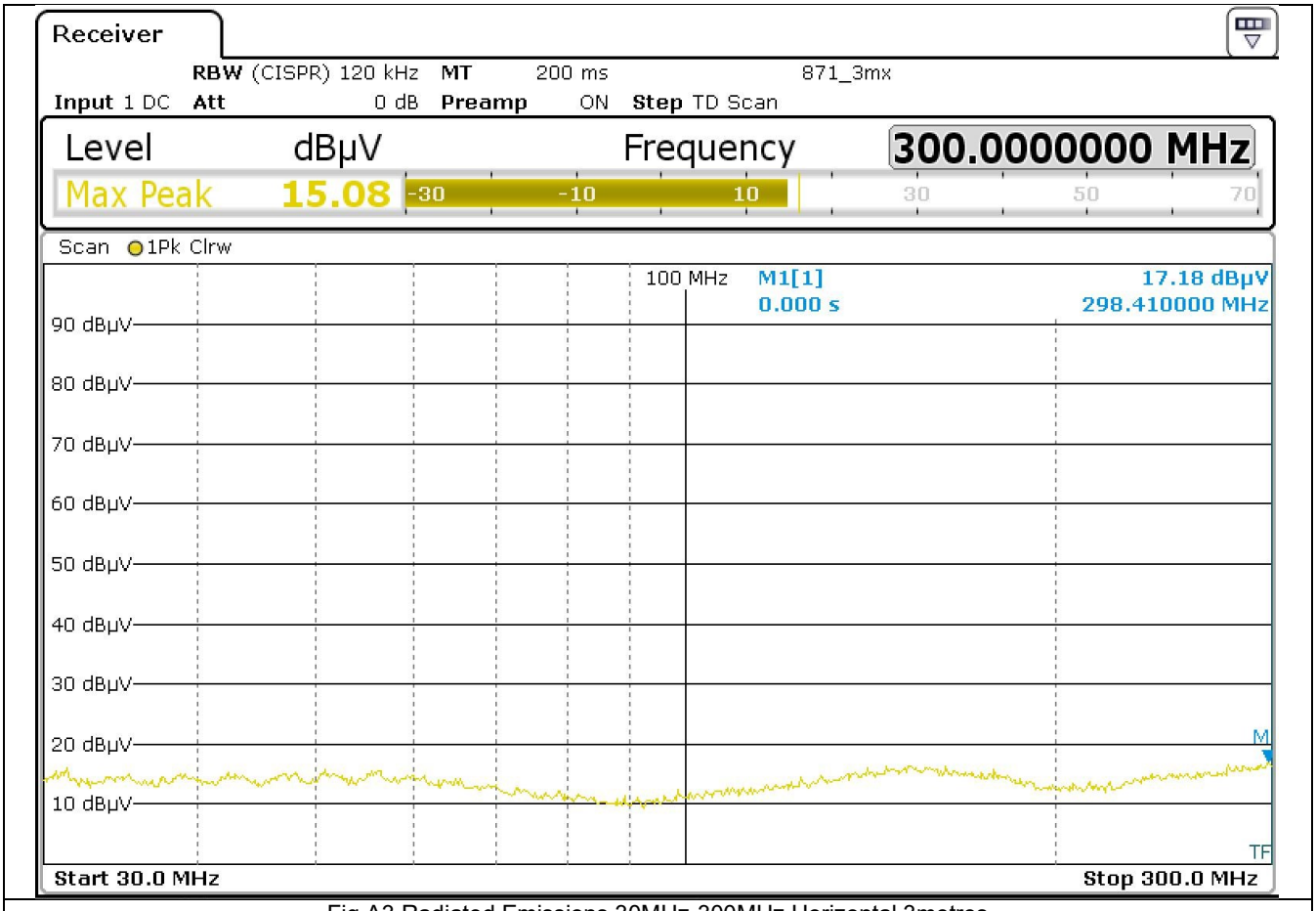


Fig A3 Radiated Emissions 30MHz-300MHz Horizontal 3metres

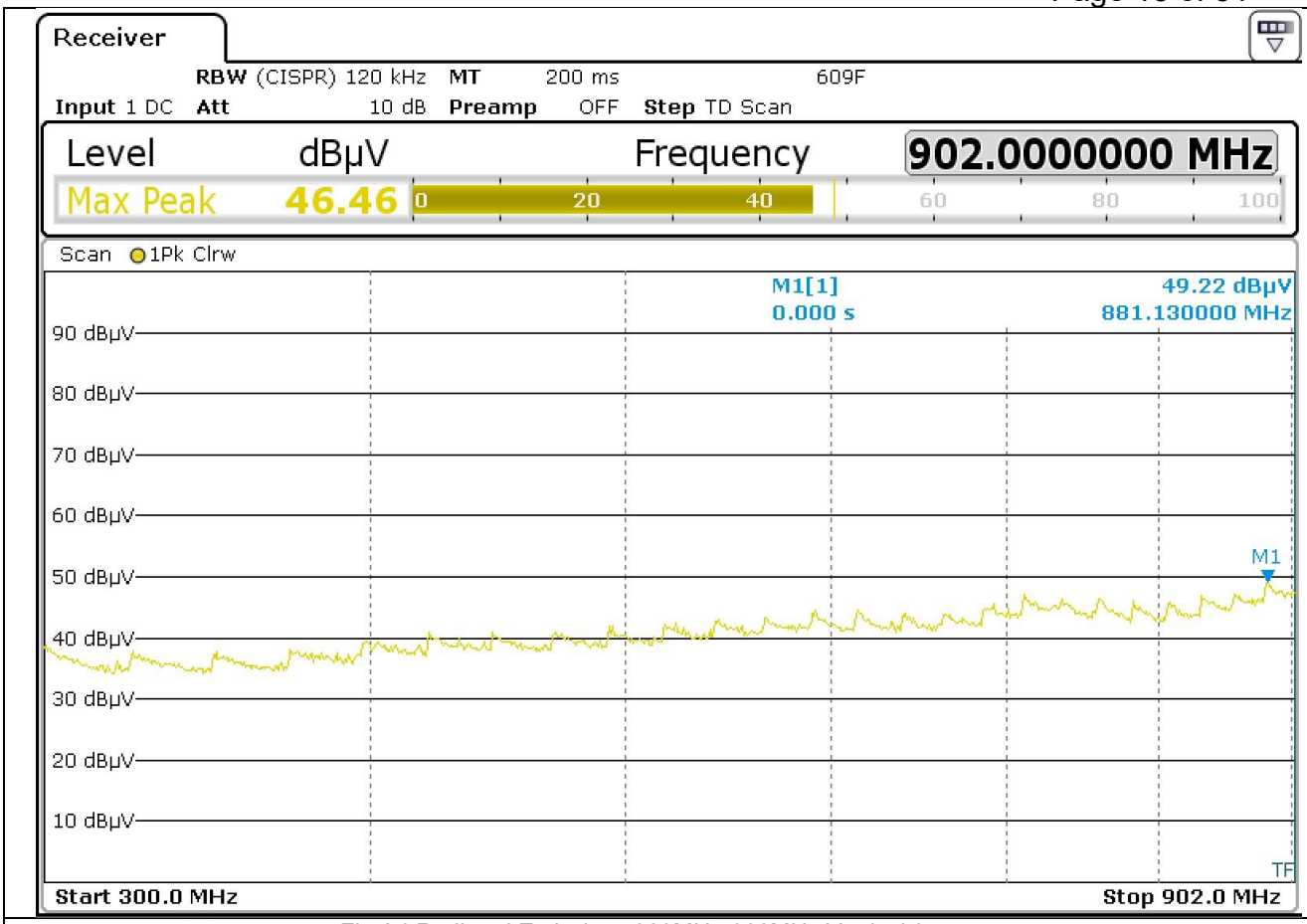


Fig A4 Radiated Emissions 300MHz-902MHz Vertical 3metres

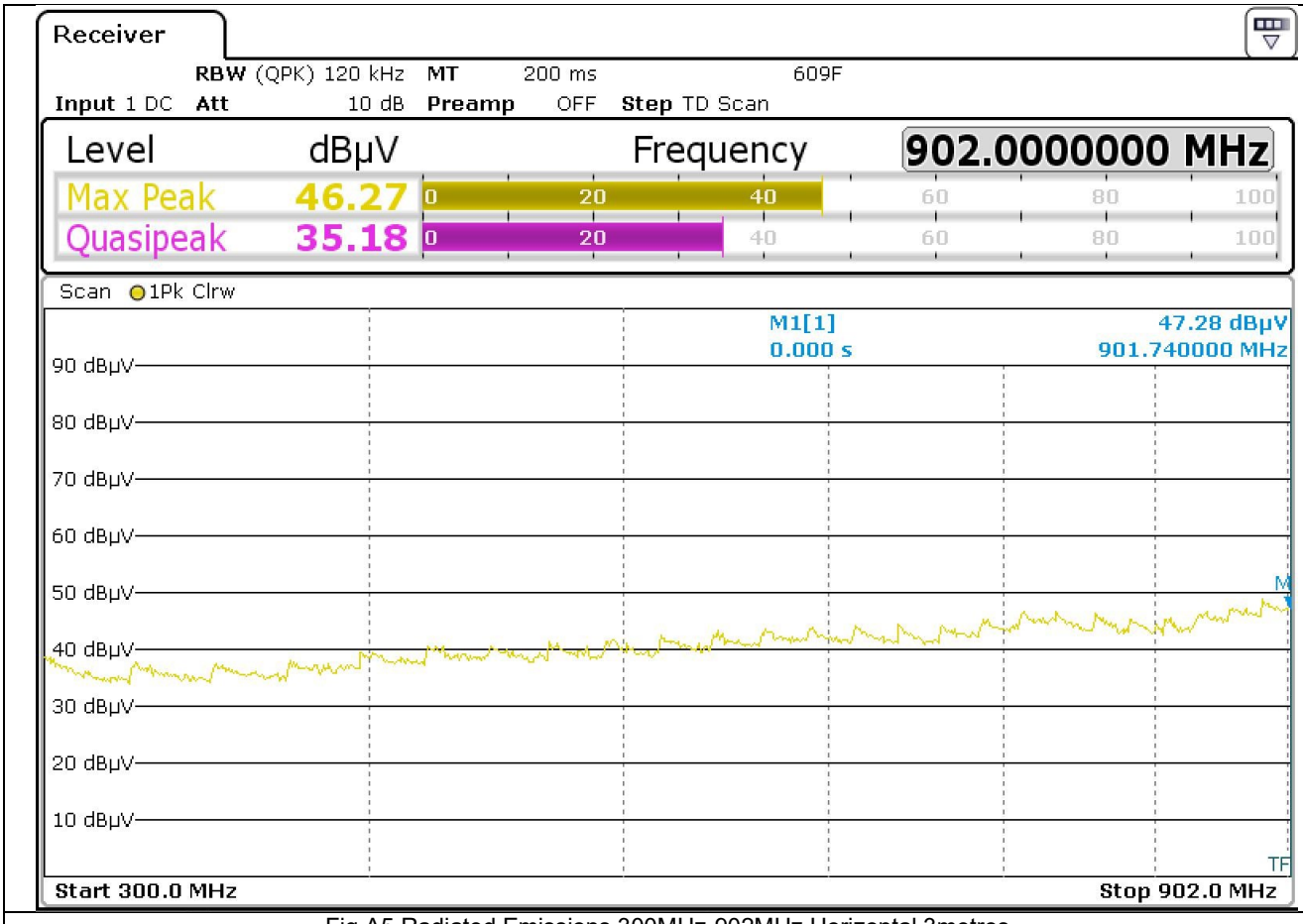


Fig A5 Radiated Emissions 300MHz-902MHz Horizontal 3metres

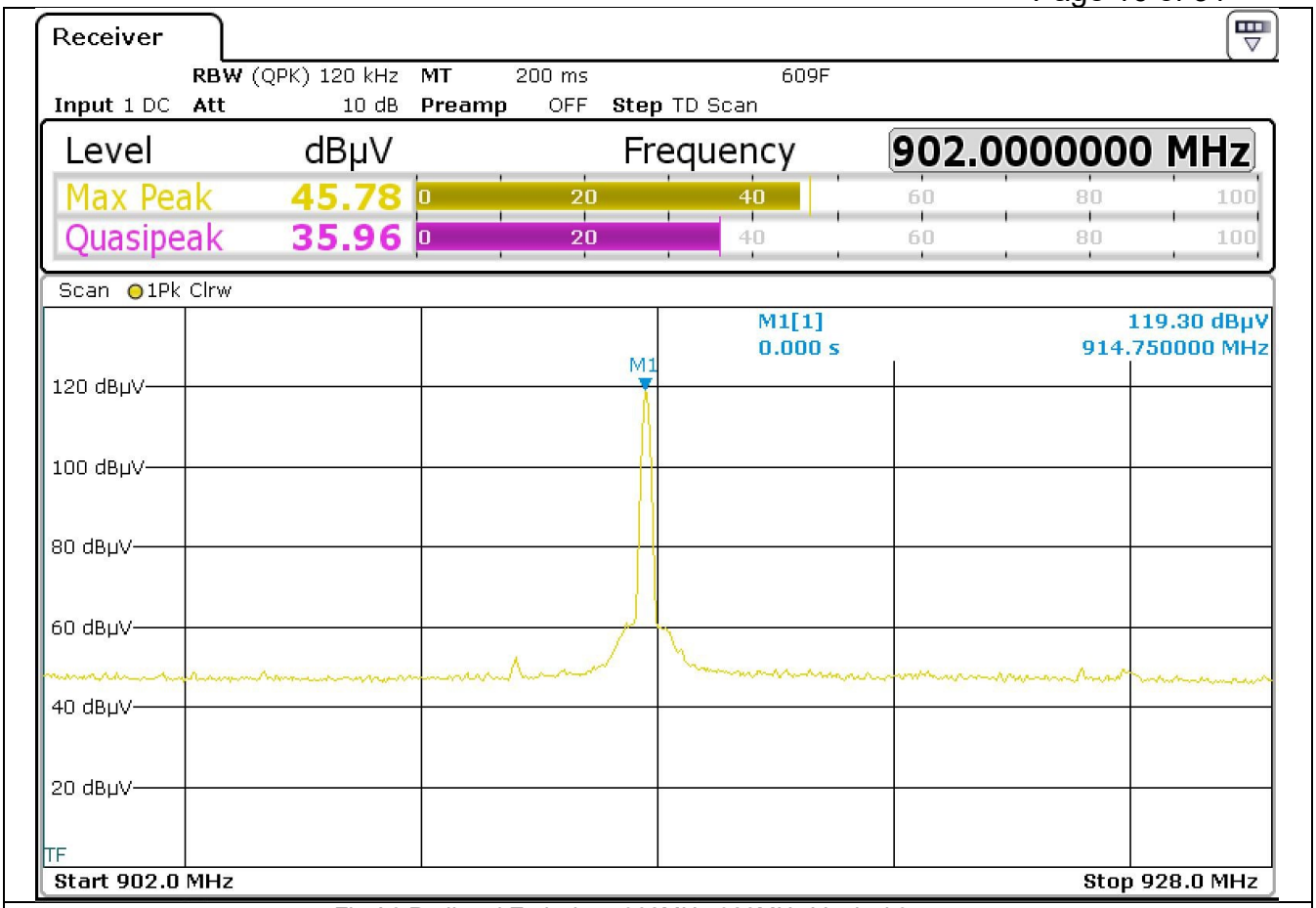


Fig A6 Radiated Emissions 902MHz-928MHz Vertical 3metres

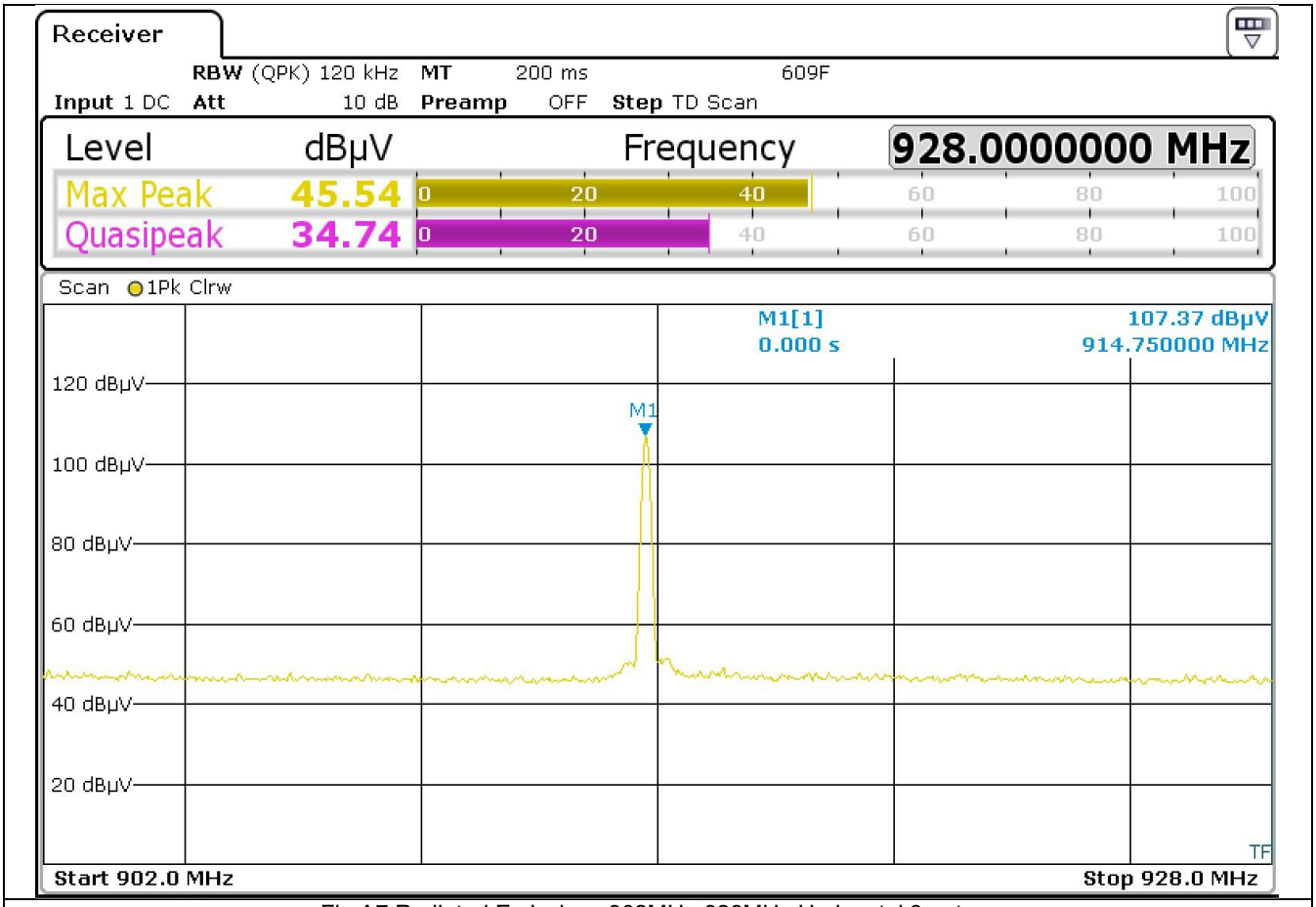


Fig A7 Radiated Emissions 902MHz-928MHz Horizontal 3metres

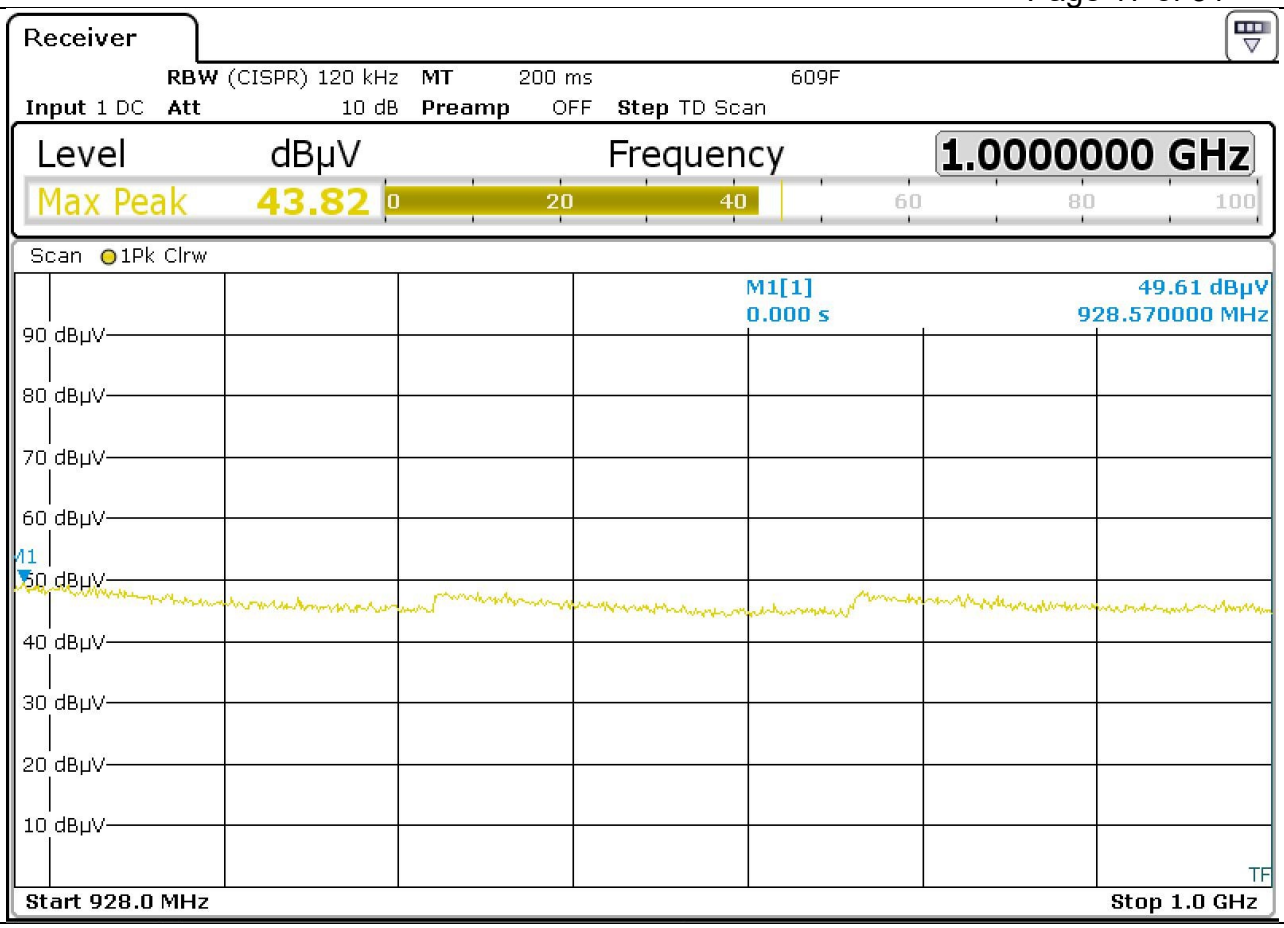


Fig A8 Radiated Emissions 928MHz-1GHz Vertical 3metres

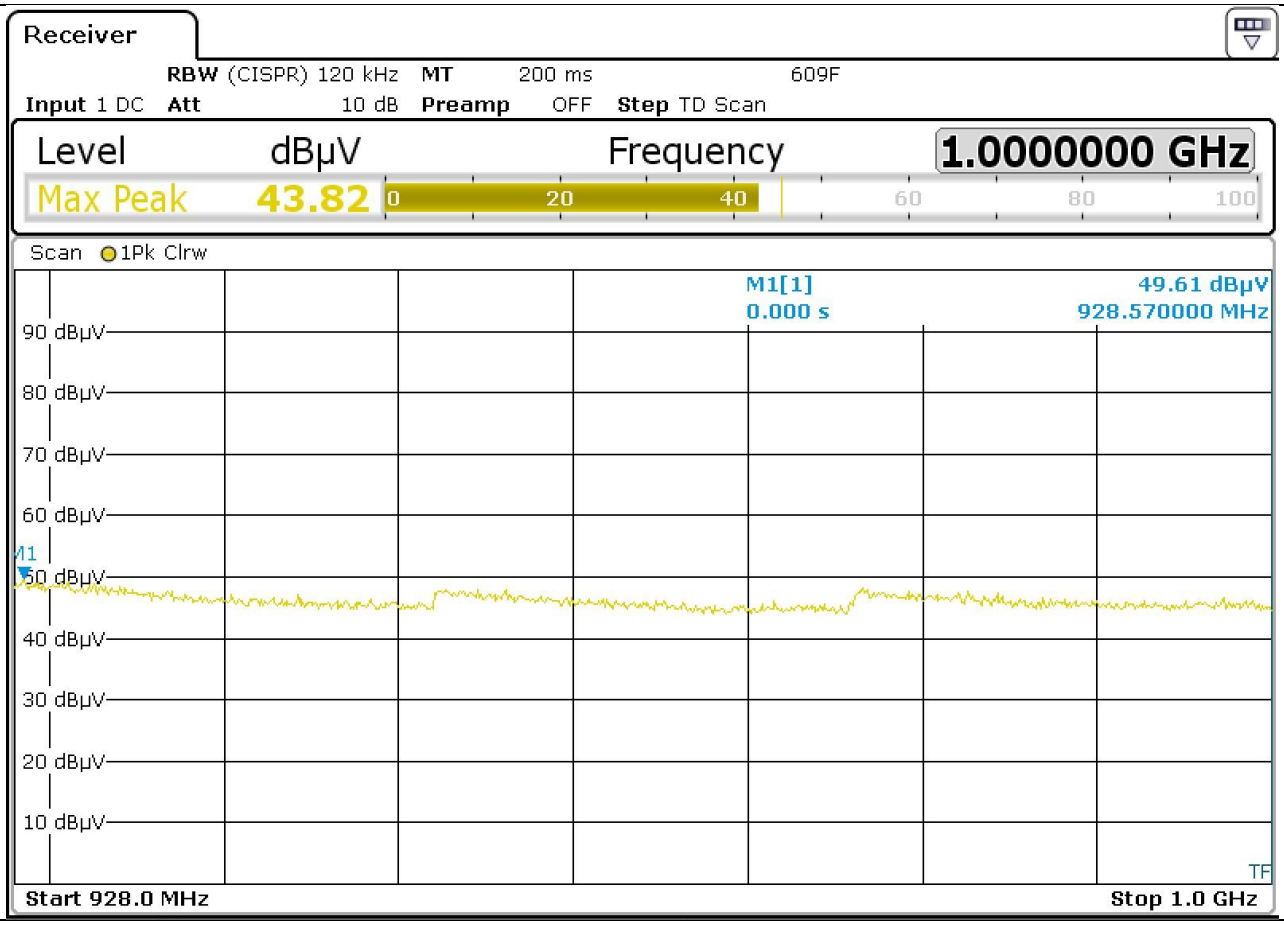


Fig A9 Radiated Emissions 928MHz-1GHz Horizontal 3metres

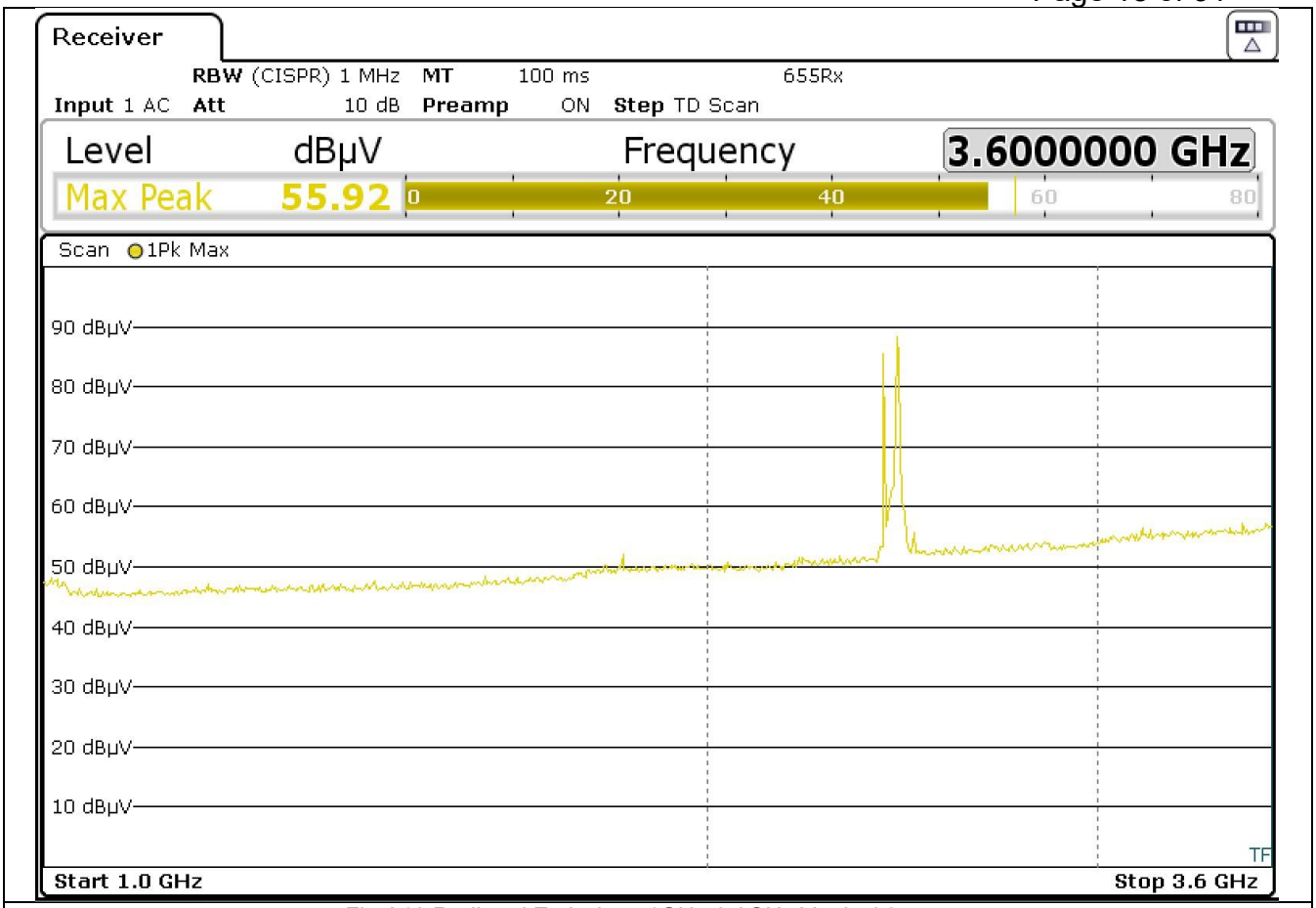


Fig A10 Radiated Emissions 1GHz-3.6GHz Vertical 3metres

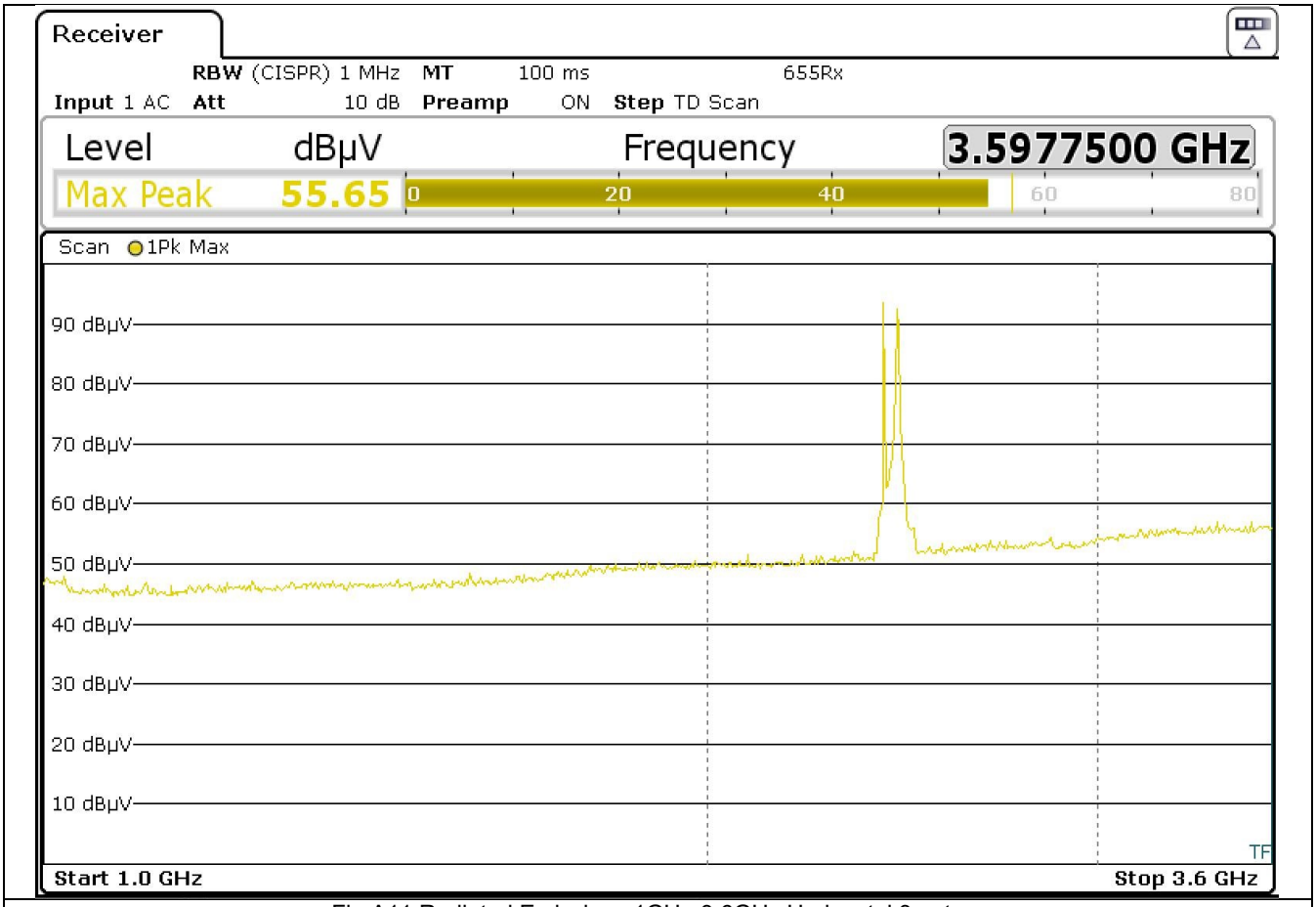
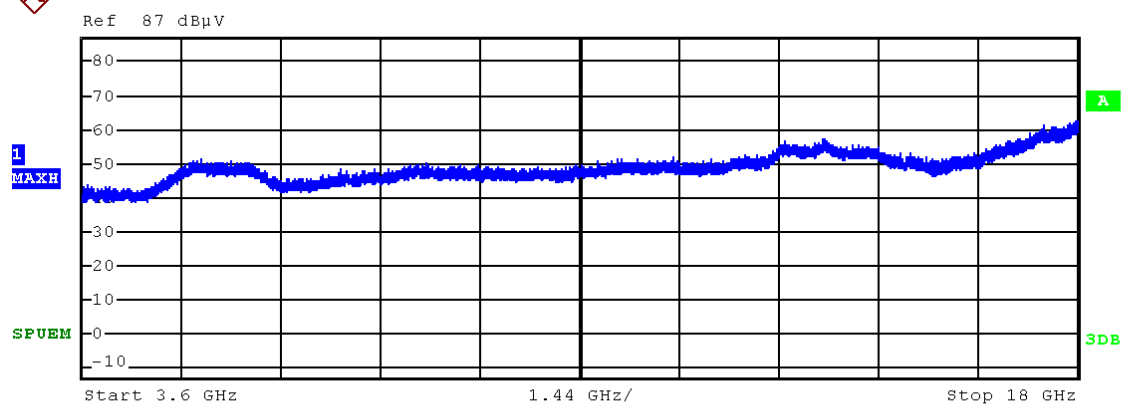
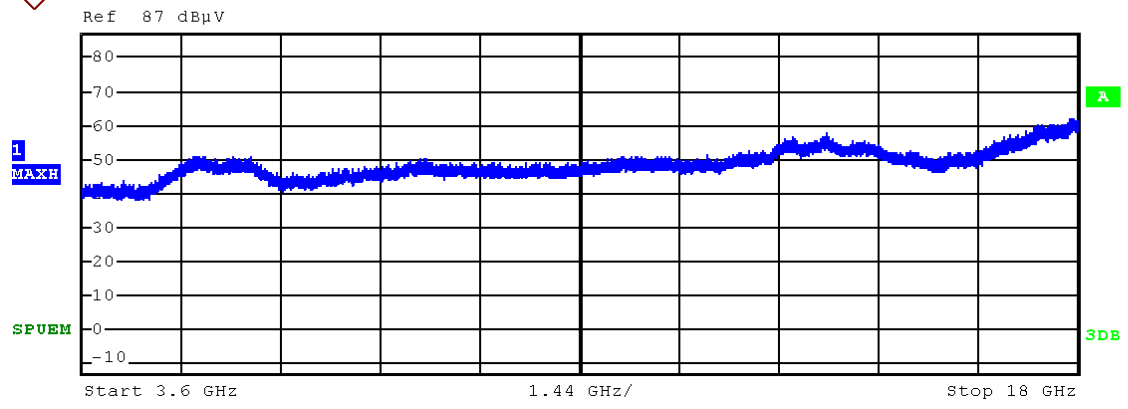


Fig A11 Radiated Emissions 1GHz-3.6GHz Horizontal 3metres



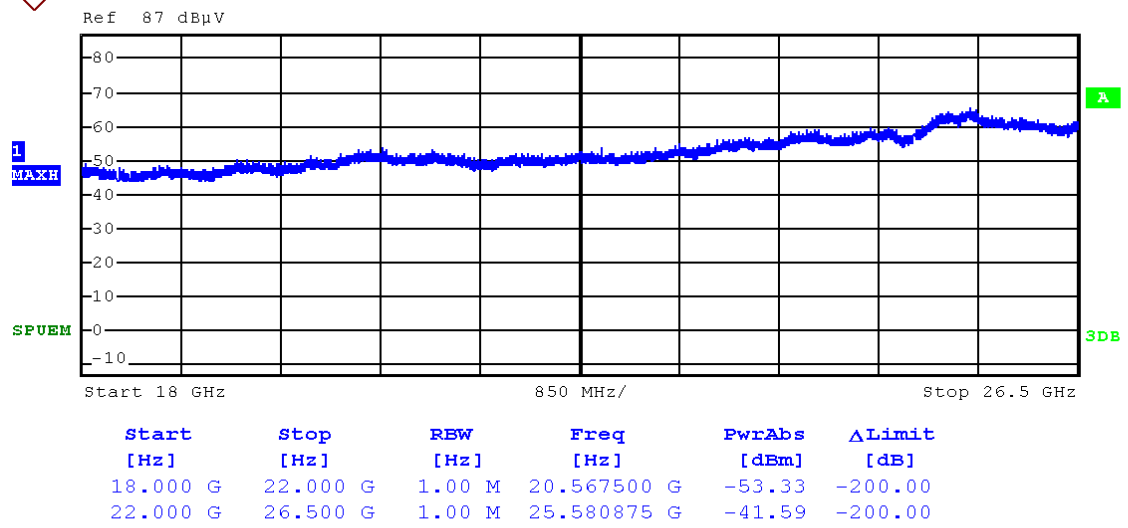
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
3.600 G	7.500 G	1.00 M	5.319413 G	-55.50	-200.00
7.500 G	11.500 G	1.00 M	11.358500 G	-55.28	-200.00
11.500 G	15.500 G	1.00 M	14.326500 G	-49.28	-200.00
15.500 G	18.000 G	1.00 M	17.991563 G	-43.98	-200.00

Fig A12 Radiated Emissions 3.6GHz-18GHz Vertical 3metres



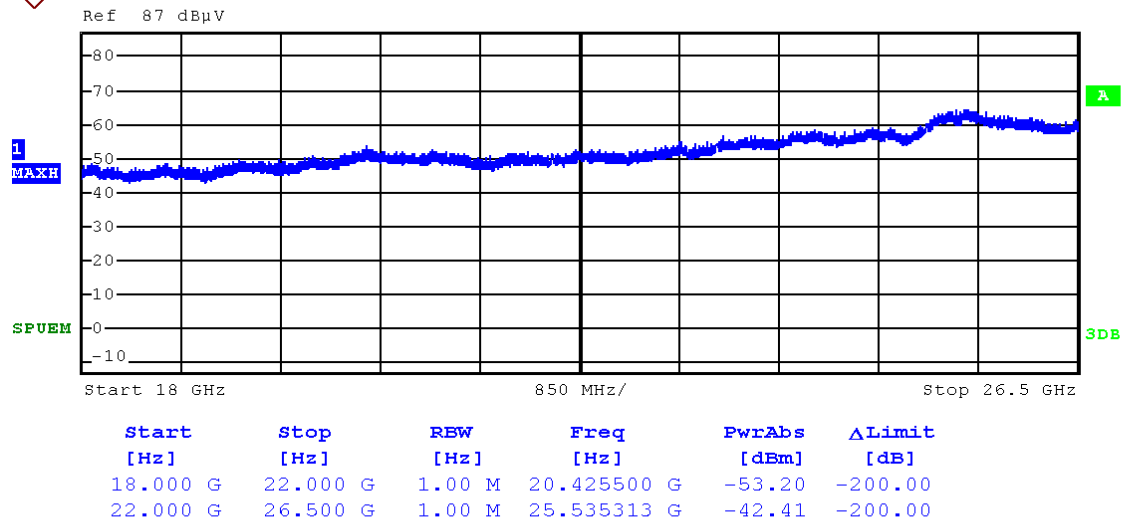
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
3.600 G	7.500 G	1.00 M	6.047250 G	-55.87	-200.00
7.500 G	11.500 G	1.00 M	11.434000 G	-55.73	-200.00
11.500 G	15.500 G	1.00 M	14.363500 G	-49.06	-200.00
15.500 G	18.000 G	1.00 M	17.897500 G	-44.61	-200.00

Fig A13 Radiated Emissions 3.6GHz-18GHz Horizontal 3metres



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
18.000 G	22.000 G	1.00 M	20.567500 G	-53.33	-200.00
22.000 G	26.500 G	1.00 M	25.580875 G	-41.59	-200.00

Fig A14 Radiated Emissions 18GHz-26.5GHz Vertical 3metres



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
18.000 G	22.000 G	1.00 M	20.425500 G	-53.20	-200.00
22.000 G	26.500 G	1.00 M	25.535313 G	-42.41	-200.00

Fig A15 Radiated Emissions 18GHz-26.5GHz Horizontal 3metres

Appendix B:

Scan Results

All Radios on with Wifi in 5GHz band

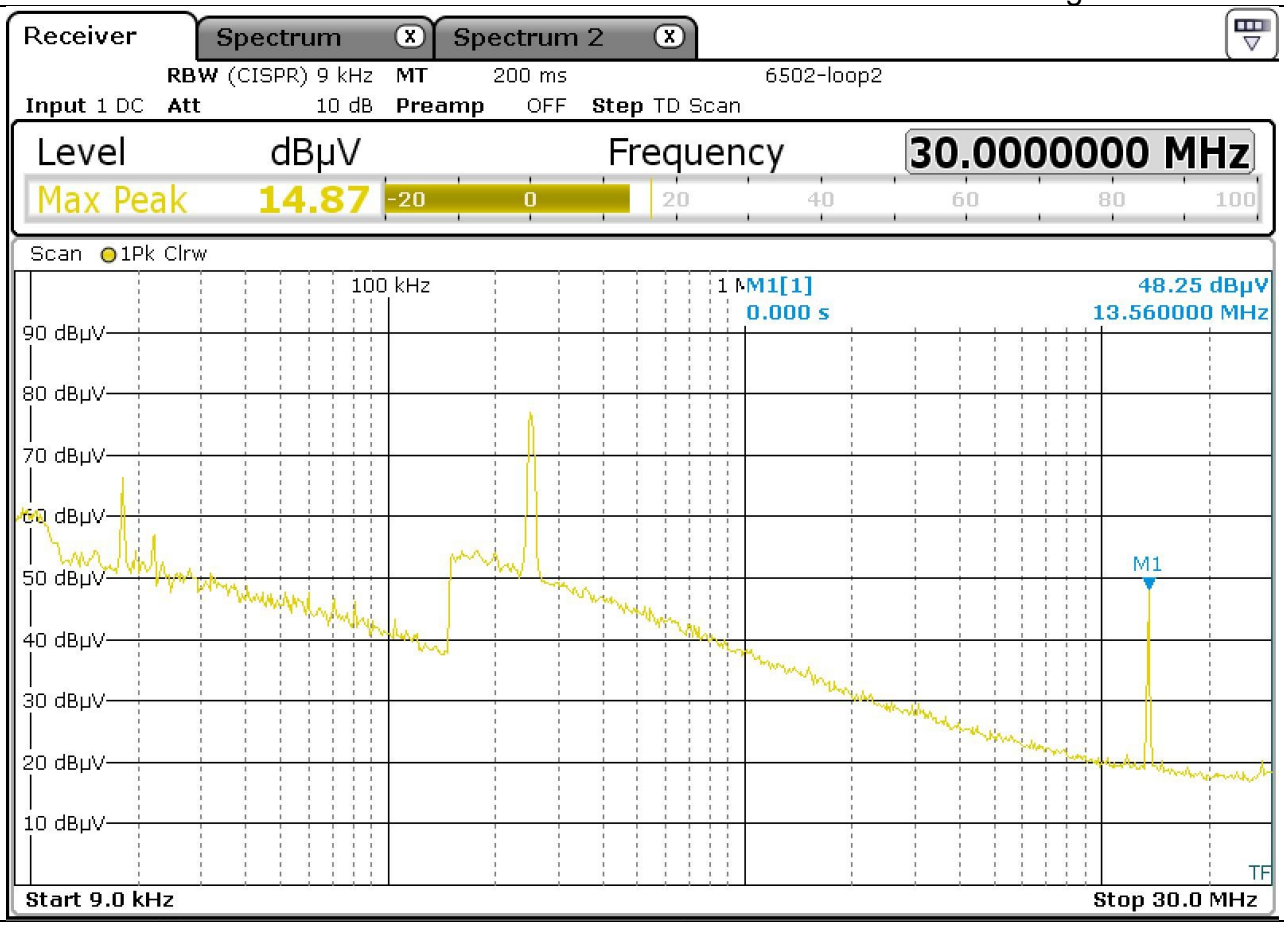


Fig B1 Radiated Spurious Emissions 9KHz -30MHz 3m

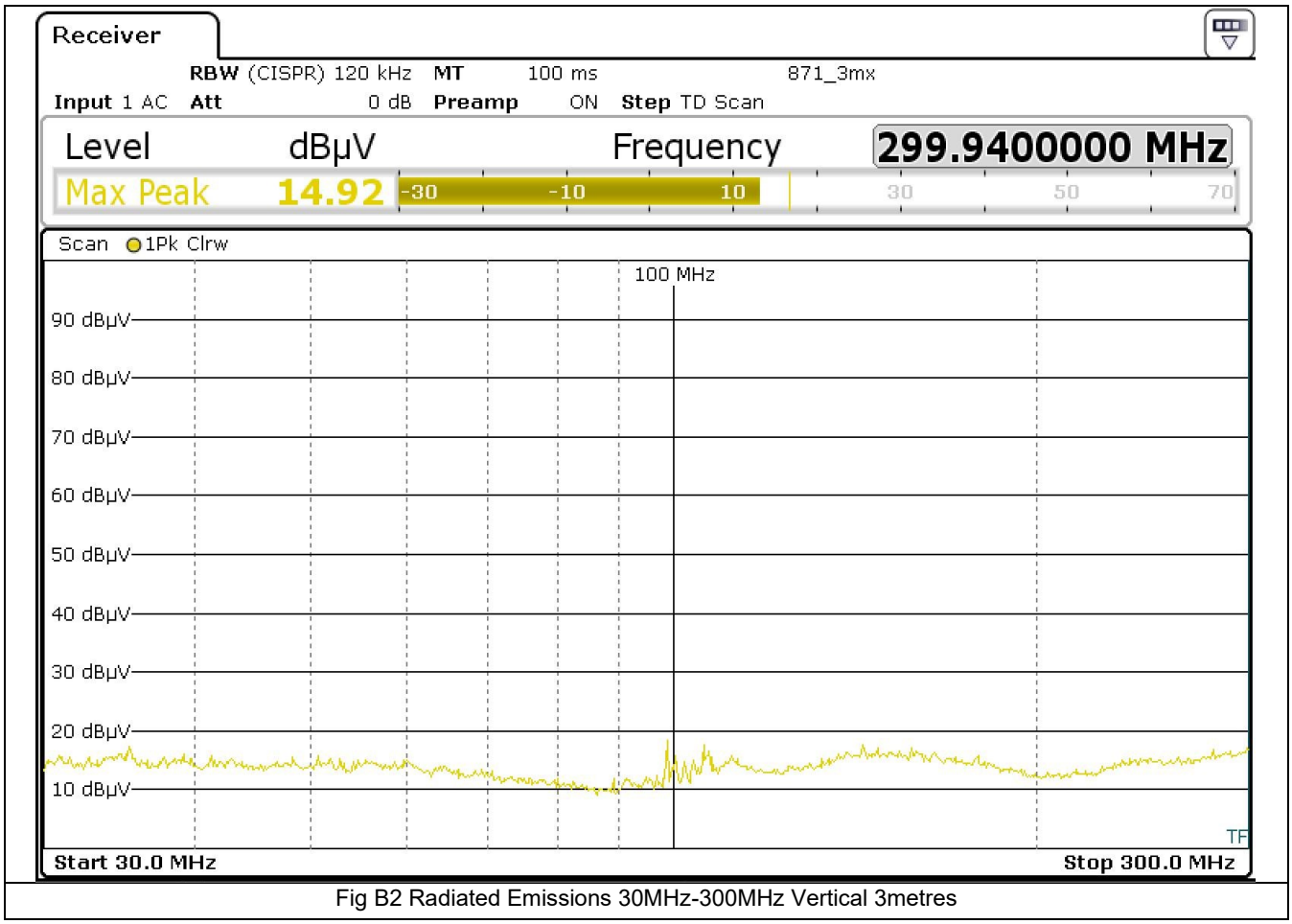


Fig B2 Radiated Emissions 30MHz-300MHz Vertical 3metres

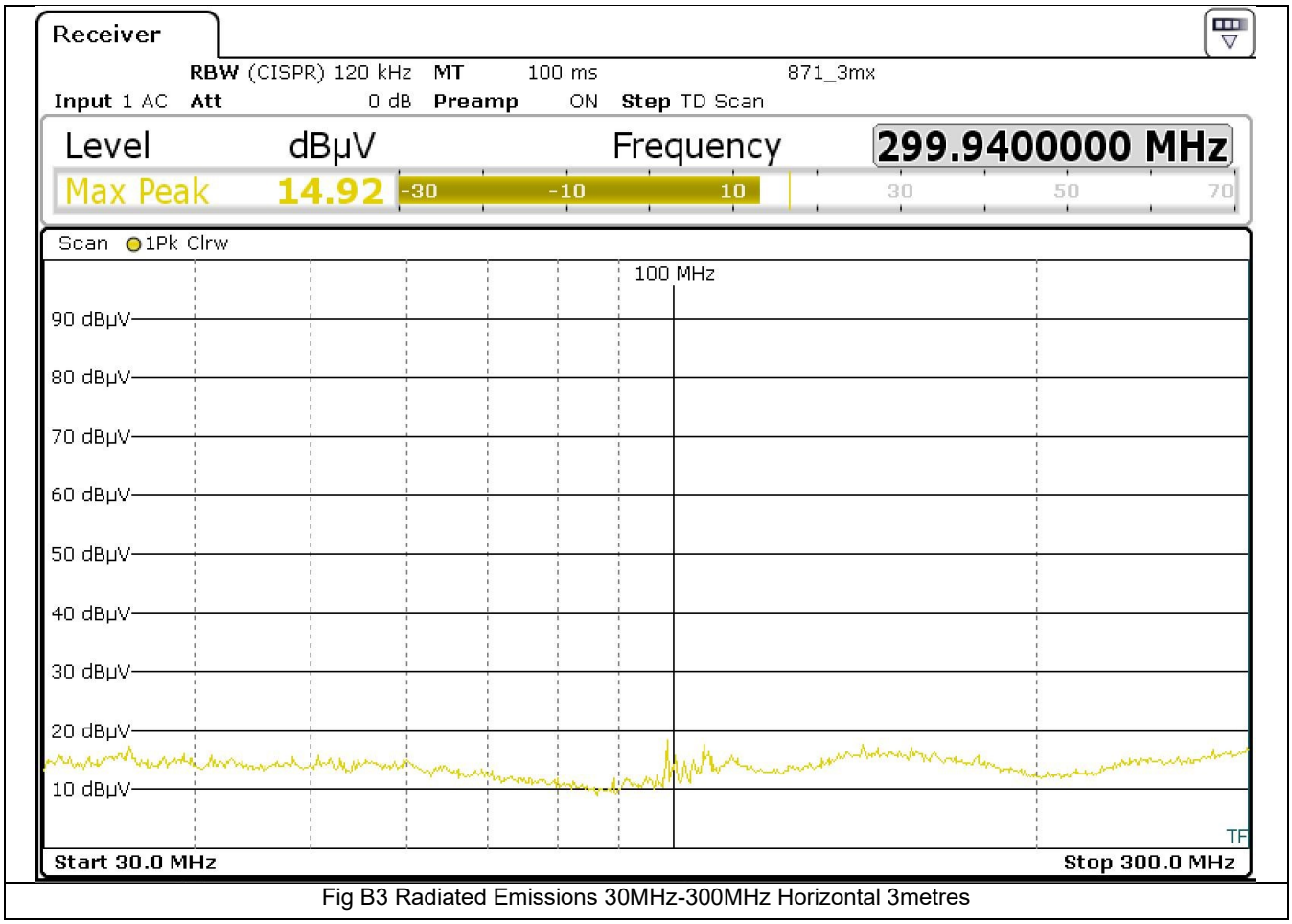


Fig B3 Radiated Emissions 30MHz-300MHz Horizontal 3metres

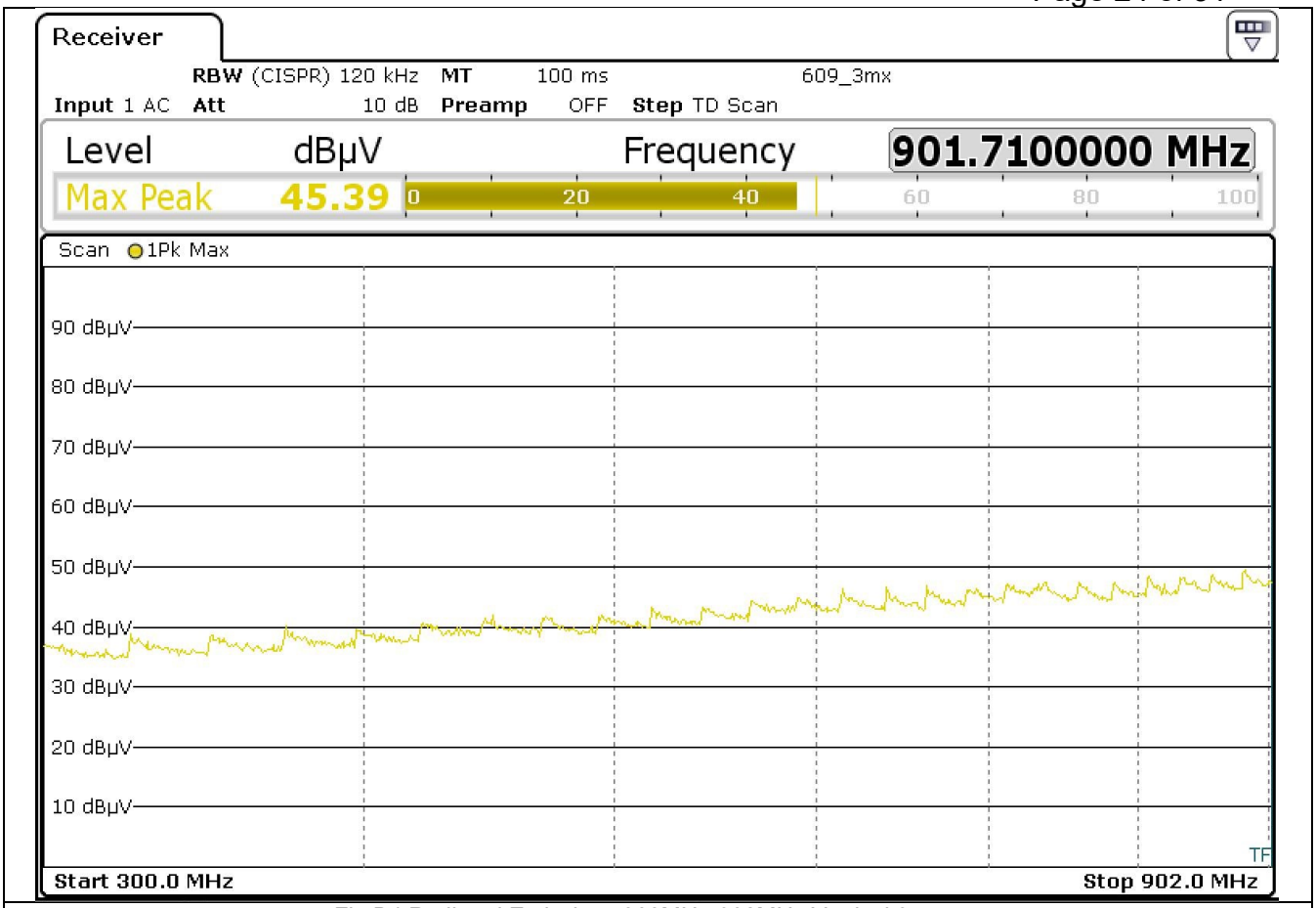


Fig B4 Radiated Emissions 300MHz-902MHz Vertical 3metres

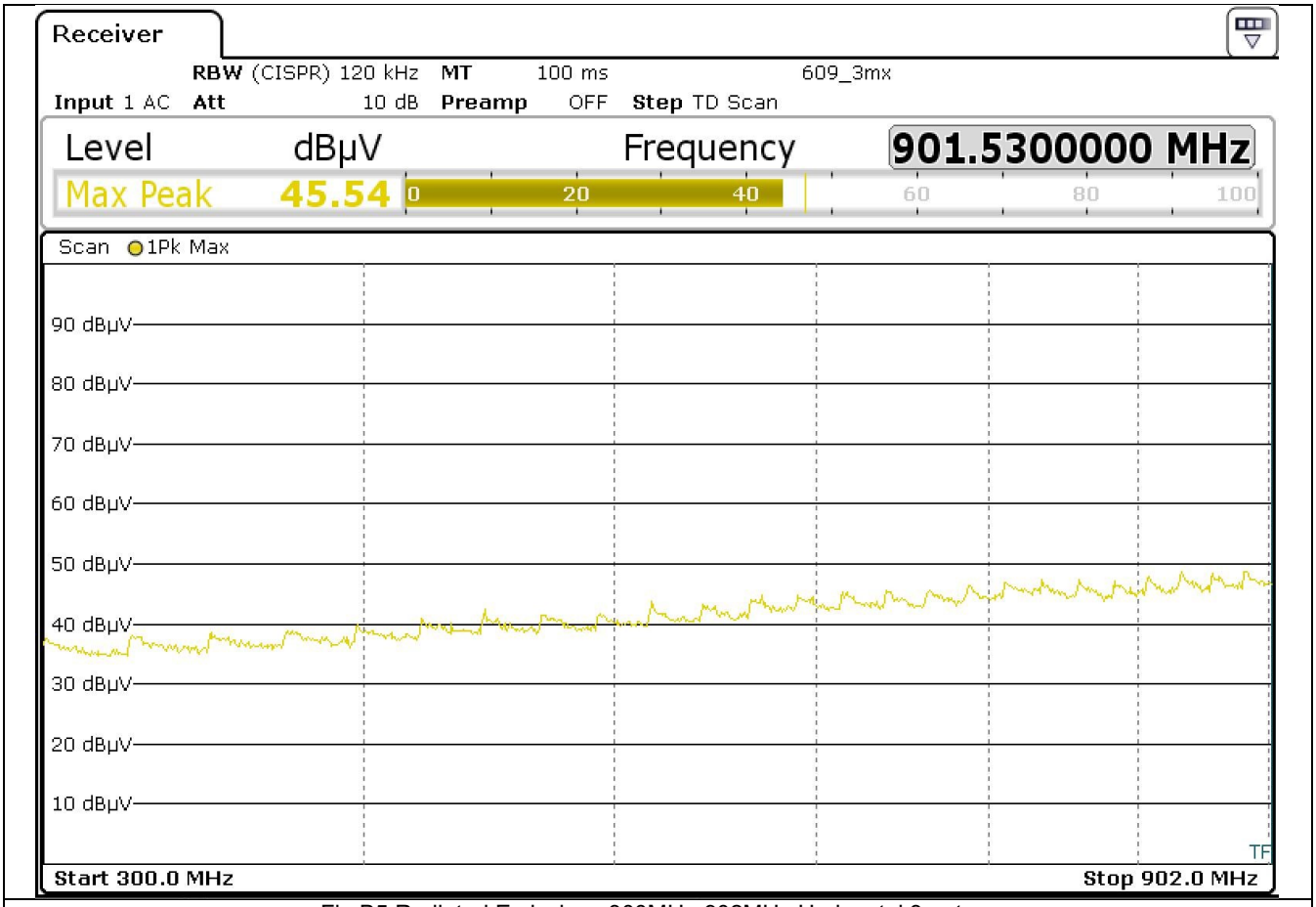


Fig B5 Radiated Emissions 300MHz-902MHz Horizontal 3metres

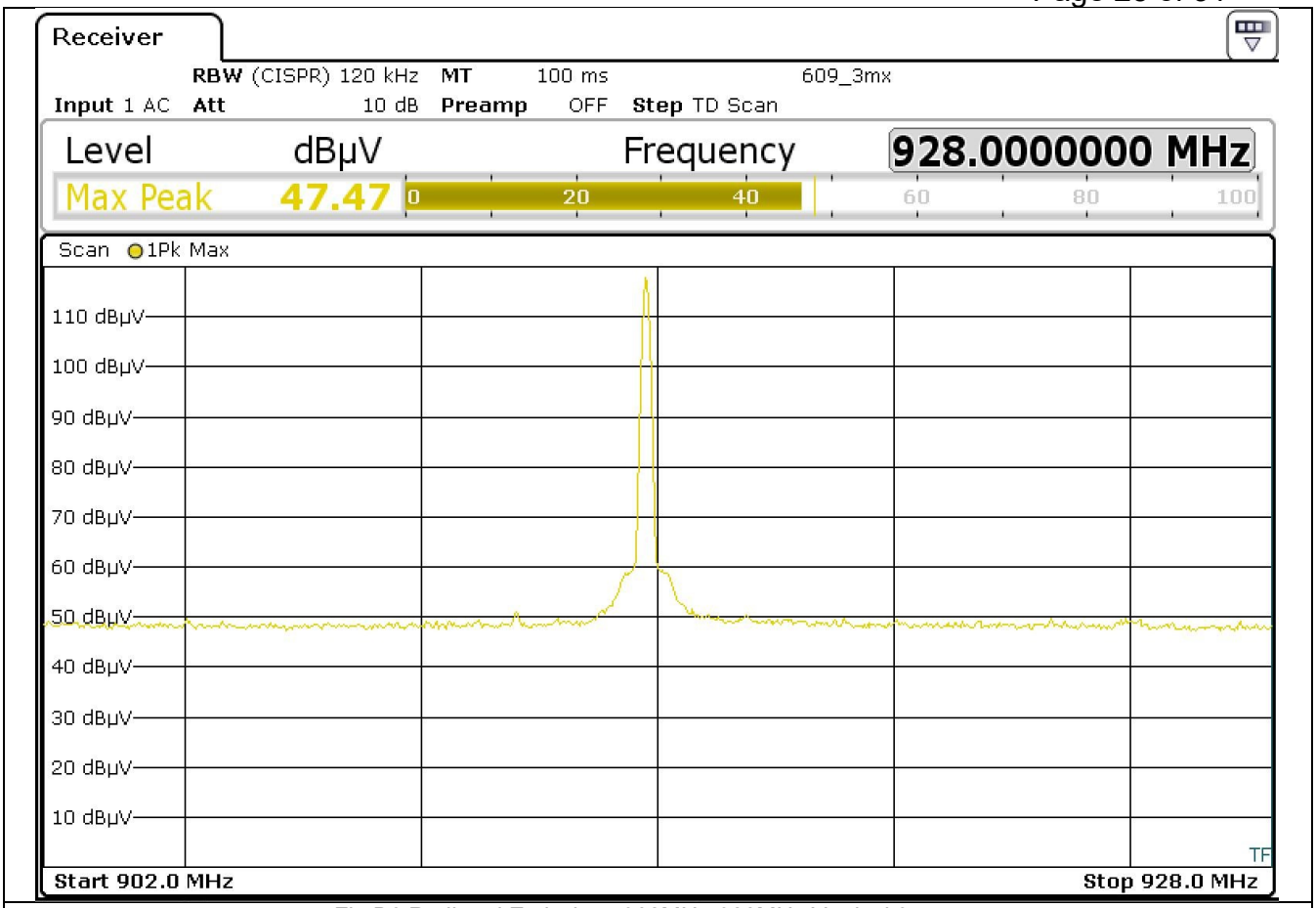


Fig B6 Radiated Emissions 902MHz-928MHz Vertical 3metres

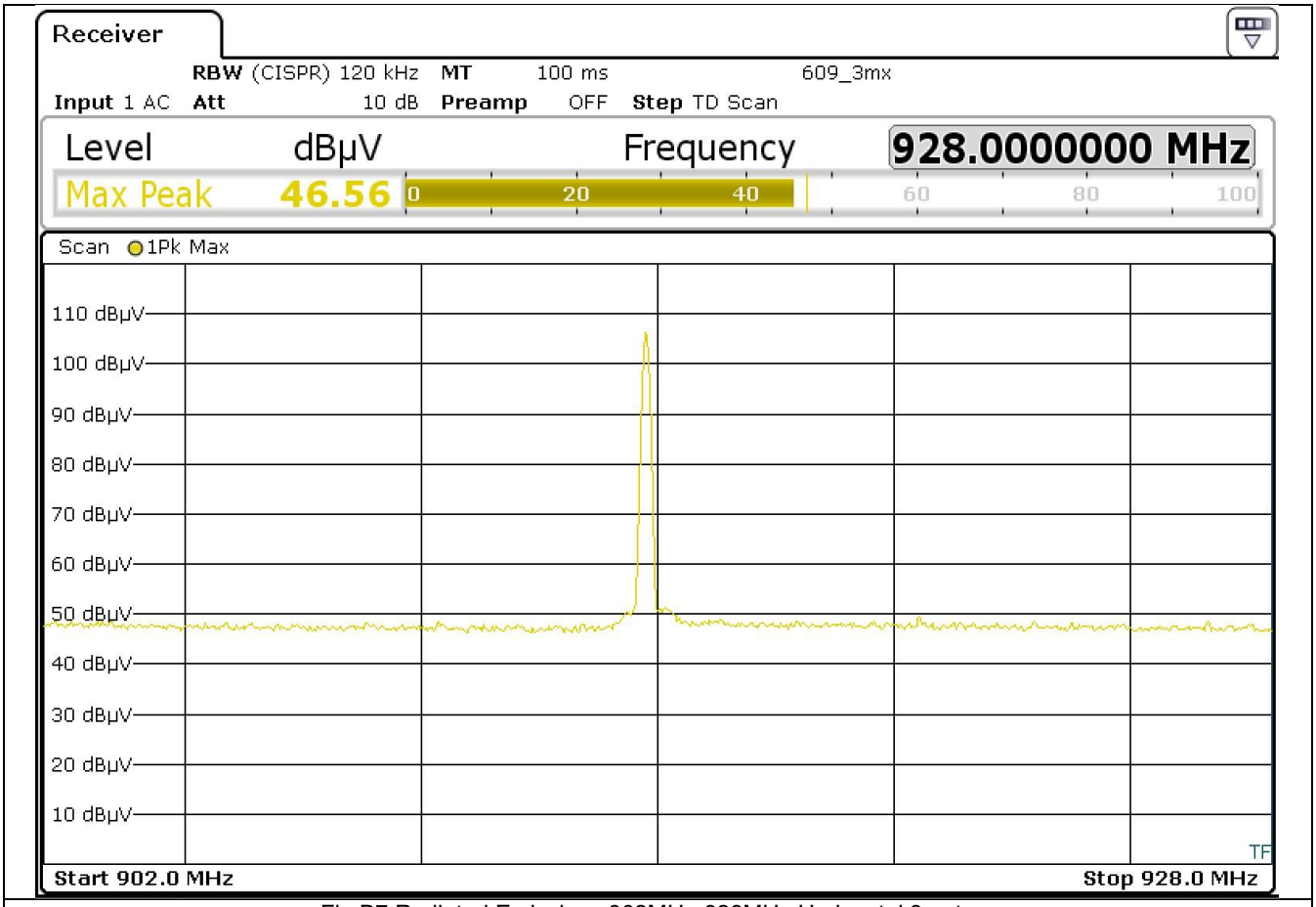


Fig B7 Radiated Emissions 902MHz-928MHz Horizontal 3metres

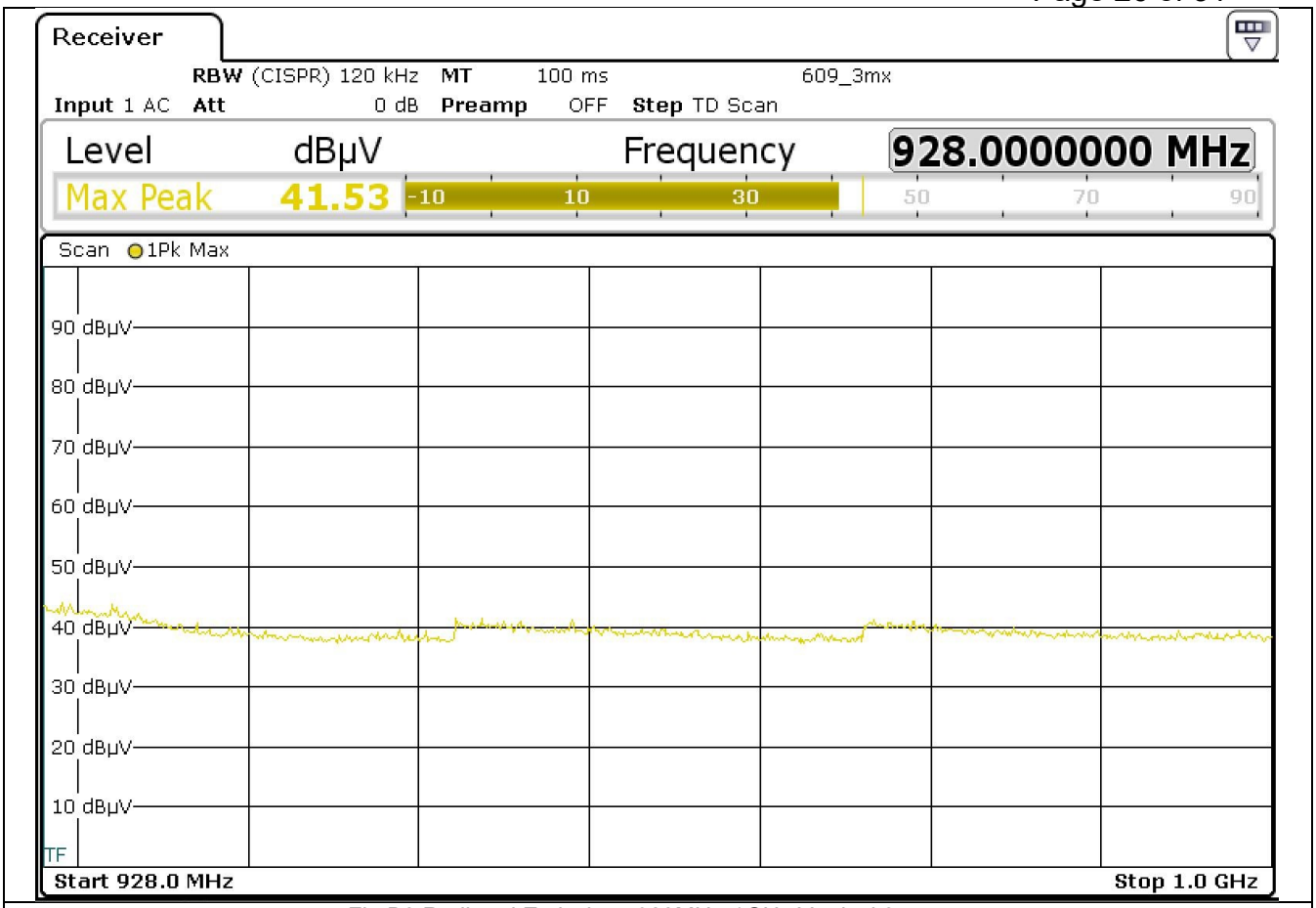


Fig B8 Radiated Emissions 928MHz-1GHz Vertical 3metres

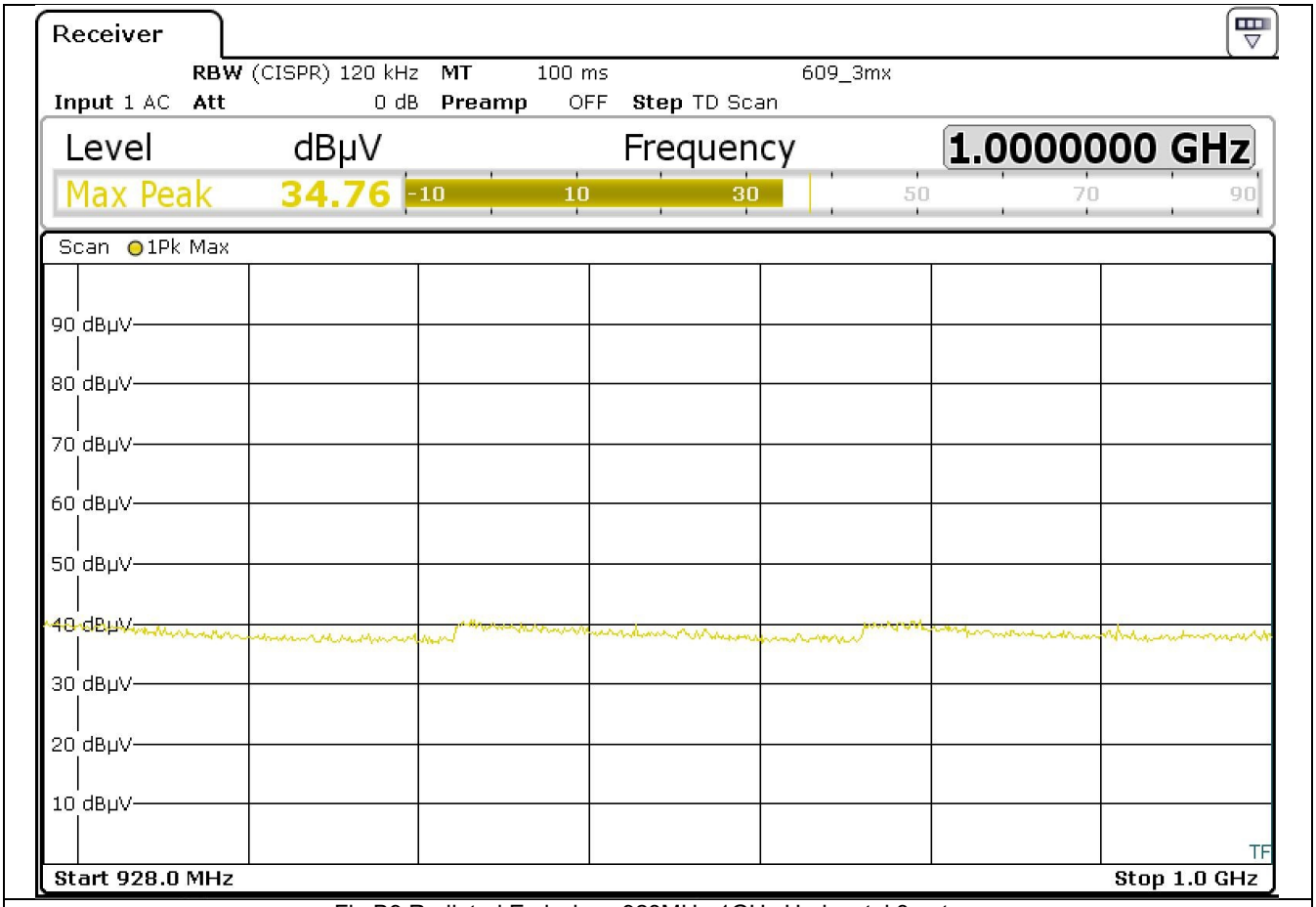


Fig B9 Radiated Emissions 928MHz-1GHz Horizontal 3metres

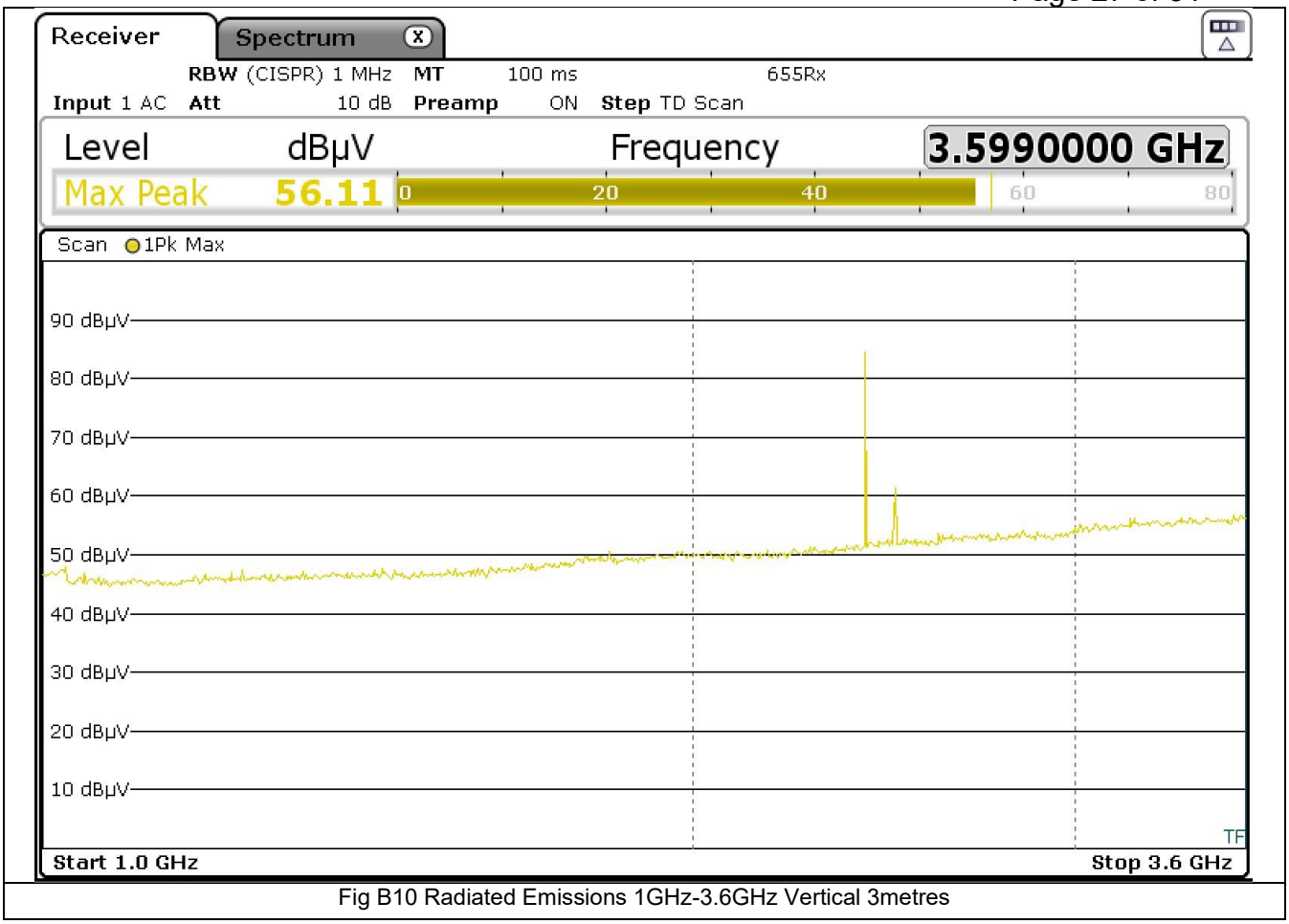


Fig B10 Radiated Emissions 1GHz-3.6GHz Vertical 3metres

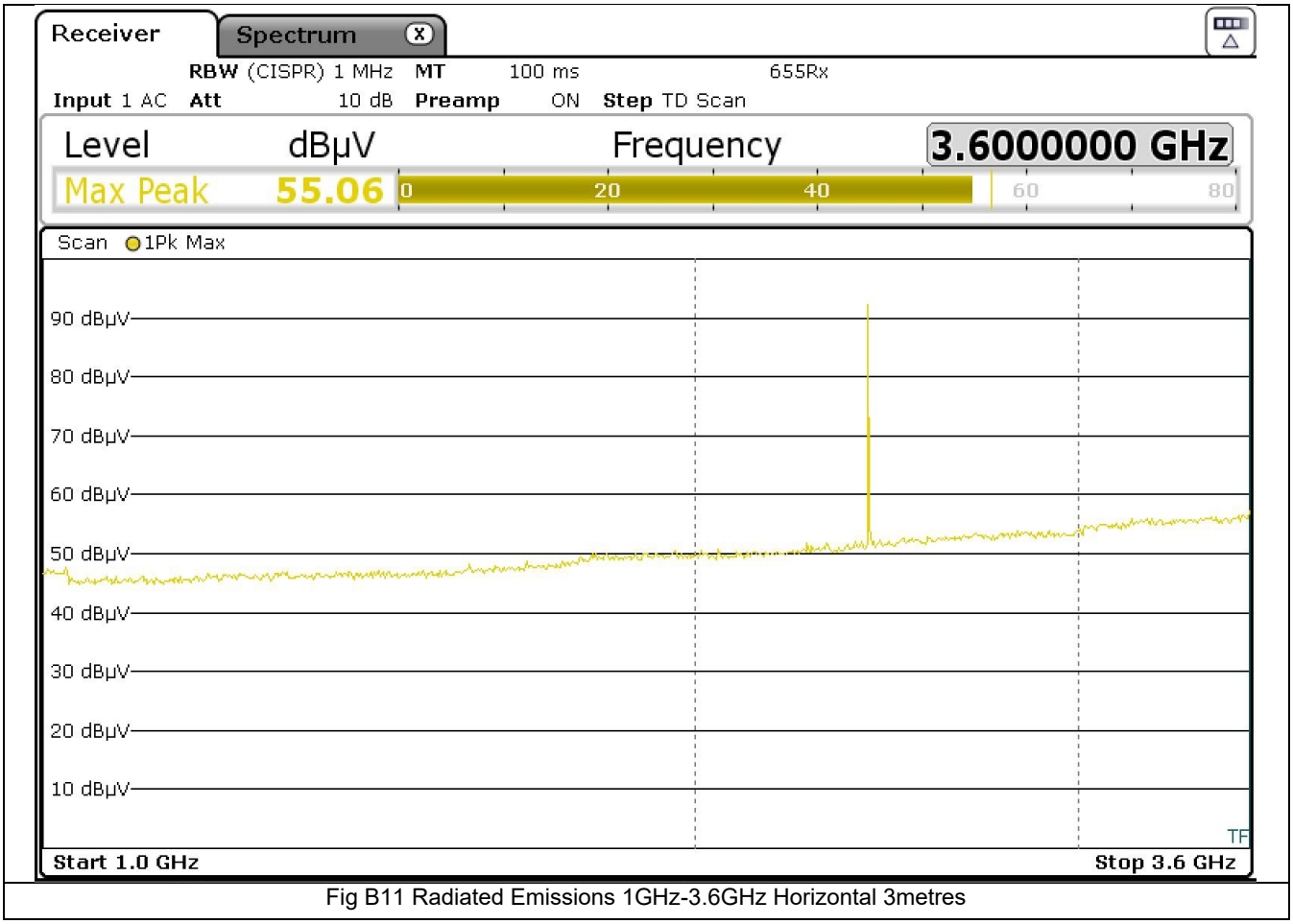
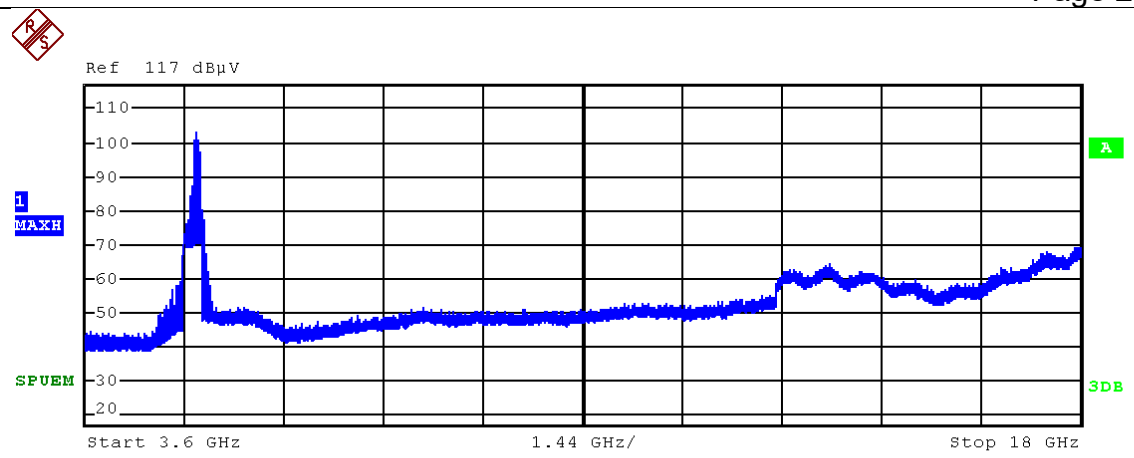
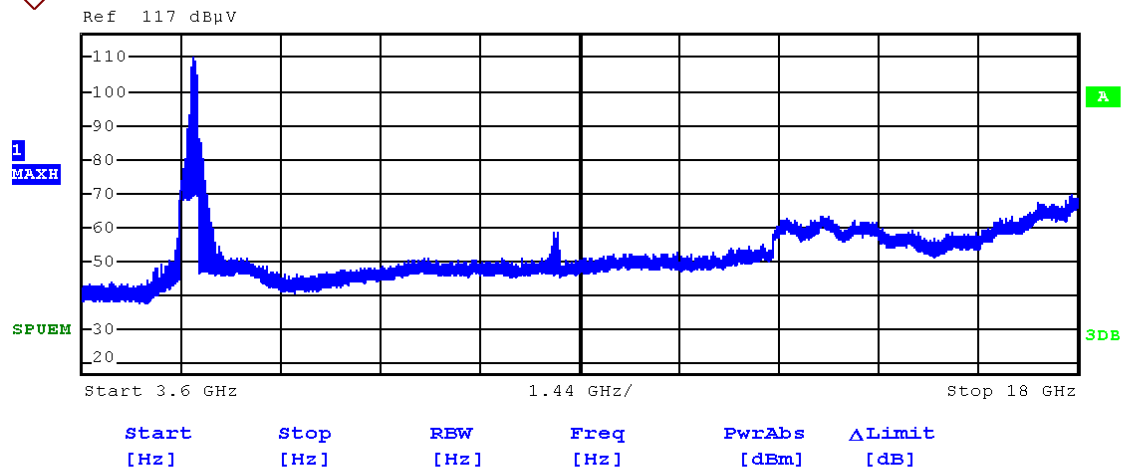


Fig B11 Radiated Emissions 1GHz-3.6GHz Horizontal 3metres



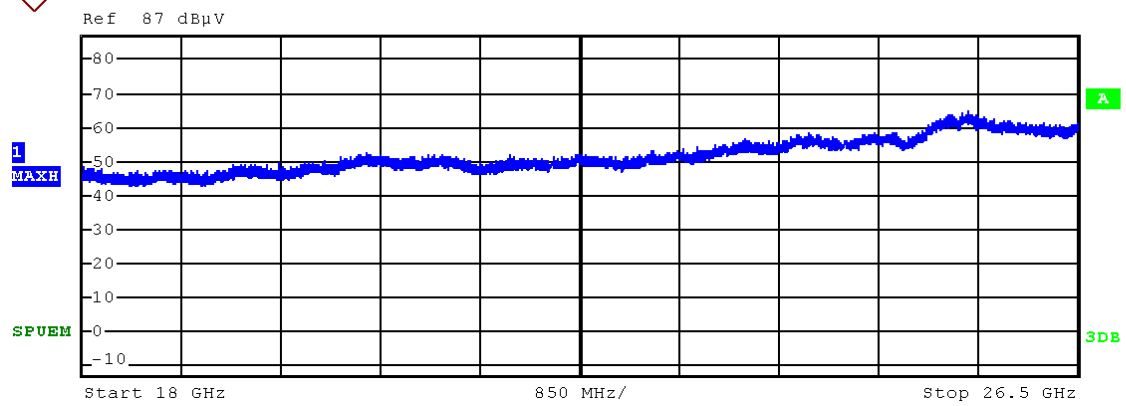
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
3.600 G	5.050 G	1.00 M	5.048369 G	-40.25	-200.00
5.050 G	5.300 G	1.00 M	5.207969 G	-3.75	-200.00
5.300 G	7.500 G	1.00 M	5.301925 G	-26.55	-200.00
7.500 G	11.500 G	1.00 M	11.414500 G	-54.14	-200.00
11.500 G	15.500 G	1.00 M	14.364000 G	-42.52	-200.00
15.500 G	18.000 G	1.00 M	17.961562 G	-37.48	-200.00

Fig B12 Radiated Emissions 3.6GHz-18GHz Vertical 3metres



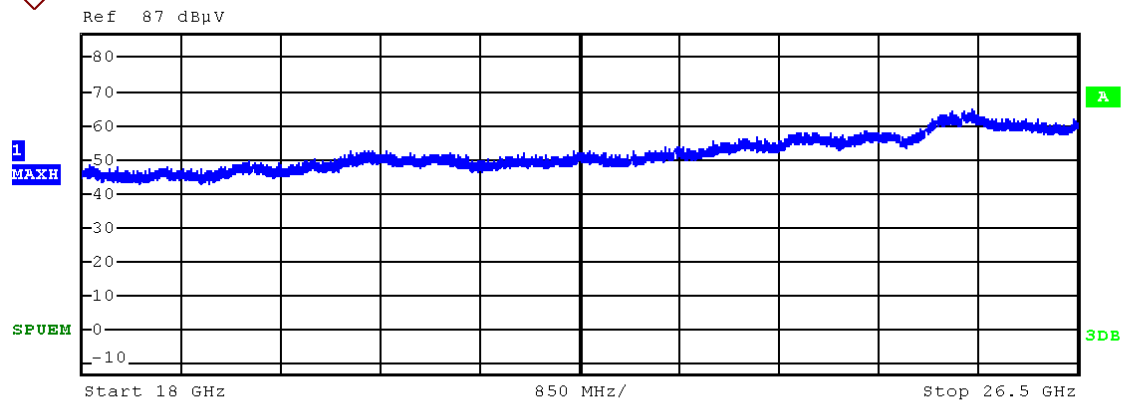
Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
3.600 G	5.050 G	1.00 M	5.047281 G	-38.59	-200.00
5.050 G	5.300 G	1.00 M	5.207750 G	3.15	-200.00
5.300 G	7.500 G	1.00 M	5.300000 G	-20.62	-200.00
7.500 G	11.500 G	1.00 M	10.487500 G	-48.00	-200.00
11.500 G	15.500 G	1.00 M	14.297000 G	-43.24	-200.00
15.500 G	18.000 G	1.00 M	17.906875 G	-37.22	-200.00

Fig B13 Radiated Emissions 3.6GHz-18GHz Horizontal 3metres



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
18.000 G	22.000 G	1.00 M	20.423000 G	-54.11	-200.00
22.000 G	26.500 G	1.00 M	25.557250 G	-42.12	-200.00

Fig B14 Radiated Emissions 18GHz-26.5GHz Vertical 3metres



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
18.000 G	22.000 G	1.00 M	20.291000 G	-54.21	-200.00
22.000 G	26.500 G	1.00 M	25.598875 G	-42.13	-200.00

Fig B15 Radiated Emissions 18GHz-26.5GHz Horizontal 3metres

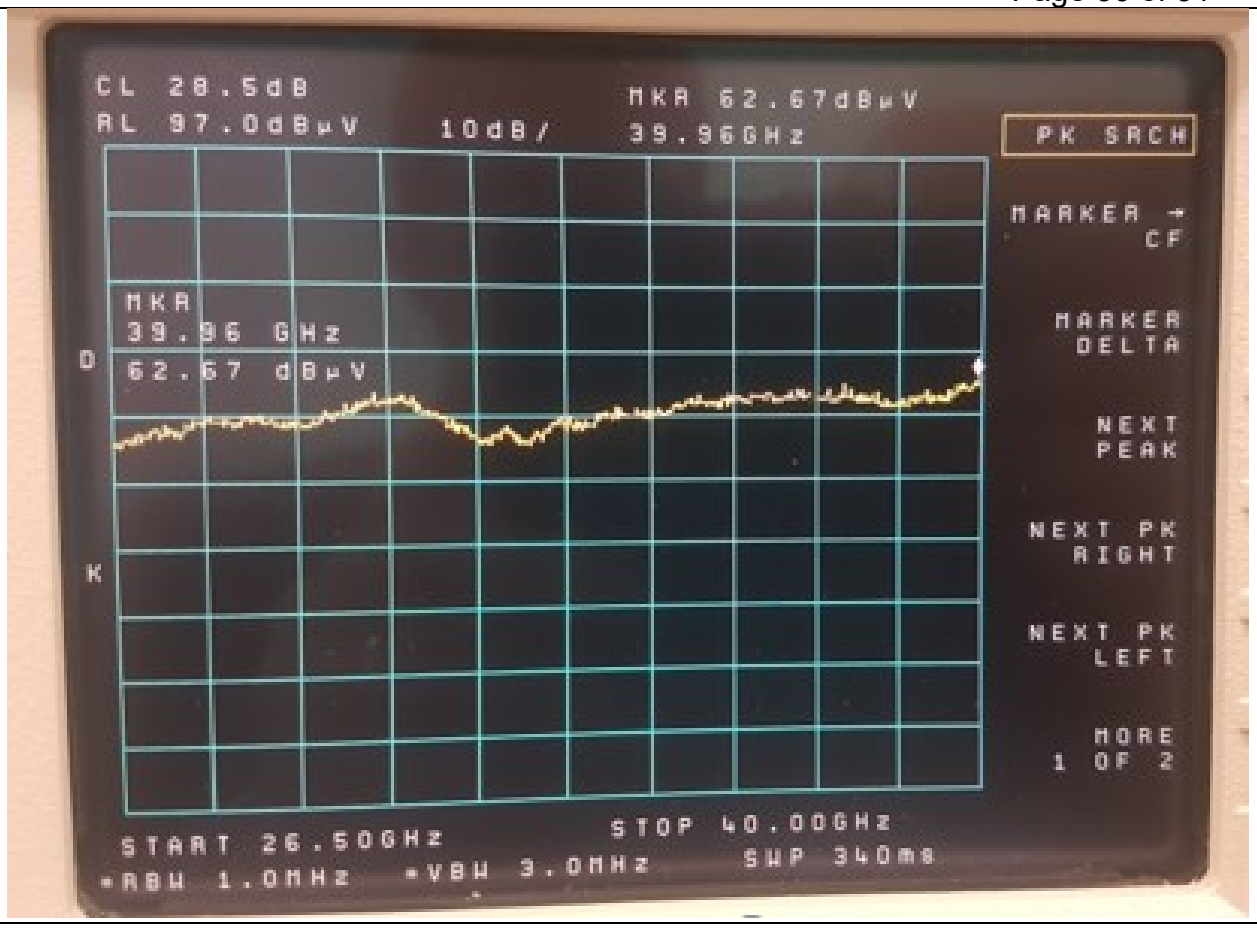


Fig B16 Radiated Emissions 26.5GHz-40GHz Vertical 0.3metres

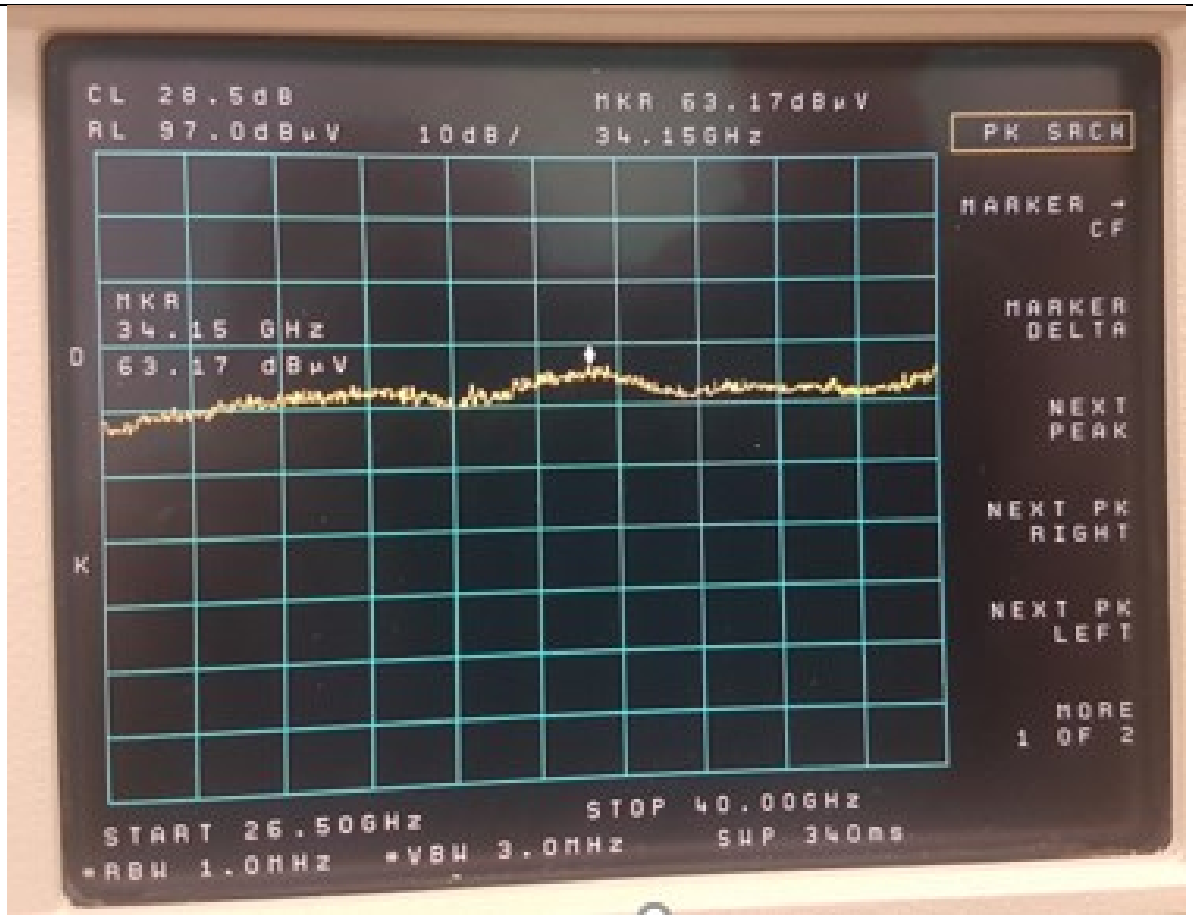


Fig B17 Radiated Emissions 26.5GHz-40GHz Horizontal 0.3metres

Ref 20E8588-2a Part 2 of 2 for appendices C-F

End of Part 1 of Report