Nemko GmbH & Co. KG
Reetzstraße 58
D-76327 Pfinztal
Tel.: + 49 (0) 7240 – 63 - 0
Fax: + 49 (0) 7240 – 63 - 11

DAkkS Deutsche Akkreditierungsstelle
D-PL-18175-01-01
D-PL-18175-01-02
D-PL-18175-01-03
D-PL-18175-01-04

Report No. 399615-03

FCC TEST REPORT / IC TEST REPORT

Product	Track Box Passive
Name and address of the applicant	race result AG Joseph-von-Fraunhofer-Str. 11 D - 76327 Pfinztal (Germany)
Name and address of the manufacturer	race result AG Joseph-von-Fraunhofer-Str. 11 D - 76327 Pfinztal (Germany)
Model	RR10
Rating	100 – 240 VAC
Trademark	race result
Serial number	20953
Technologies	RFID 915 MHz 2.4 GHz (IEEE 802.15.4) LTE/3G
Tested according to	**FCC Part 15.33, 15.205, 15.209 & 15.247** **ISED Canada RSS-247 Issue 2** **RSS-GEN Issue 5** For details of applied tests refer to test summary
Report number	399615-03
Tested in period	2020-06-16- 2020-07-21
Issue date	2020-07-28
Name and address of the testing laboratory	**Nemko GmbH & Co. KG** Reetzstraße 58 D-76327 Pfinztal Tel.: + 49 (0) 7240 – 63 - 0 Fax: + 49 (0) 7240 – 63 – 11 Bundesnetzagentur BNetzA-CAB-17/21-17	FCC No: 973501 IC OATS: 10921A

Prepared by [F. Hupbauer]	Approved by [Dipl.-Ing. P. Lukas]

Template version: B

CONTENTS

1 INFORMATION

1.1 Test Item

Technology Tested:	RFID 915 MHz	
Typ of Unit:	Transciever	
Transmit Frequency Range:	902 – 928 MHz (US band)	
Transmit Channels Tested:	Channel ID	Channel Frequency (MHz)
	Bottom	902.5
	Middle	915.0
	Top	927.5

Technology Tested:	2.4 GHz IEEE 802.15.4		
Typ of Unit:	Transciever		
Transmit Frequency Range:	2400 – 2483.5 MHz		
Transmit Channels Tested:	Channel ID	RF Channel	Channel Frequency (MHz)
	Bottom	1	2405
	Middle	5	2435
	Top	0	2480

Technology Tested:	WCDMA Band II		
Transmit Frequency Range:	1850 – 1910 MHz		
Transmit Channels Tested:	Channel ID	RF Channel	Channel Frequency (MHz)
	Bottom	9262	1852.4
	Top	9938	1907.6

Technology Tested:	WCDMA V		
Transmit Frequency Range:	824 – 849 MHz		
Transmit Channels Tested:	Channel ID	RF Channel	Channel Frequency (MHz)
	Bottom	4132	826.4
	Top	4233	846.6

Description of Test Item

The device is an RFID reader for passive transponders. It is mainly used for sports timing. Additionally, the device contains a 2.4 GHz (IEEE 802.15.4) and GSM Bands module for data transmission. For mobile use, the device can be powered by rechargeable internal batteries.

1.2 Normal test conditions

Temperature:	19 - 22 °C
Relative humidity:	45 - 60 %
Normal test voltage:	120V / 60Hz

The values are the limit registered during the test period.

1.3 Test Engineer(s)

Frederic Hupbauer; Abdoufataou Salifou

1.4 Description of modification for Modification Filing

Not applicable.

1.5 Family List Rational

Not Applicable.

1.6 Antenna Requirement

Is the antenna detachable? ☐ Yes ☒ No

If detachable, is the antenna connector non-standard? ☐ Yes ☐ No

Type of antenna connector: N/A

Ref. FCC §15.203

1.7 Worst-Case Configuration and Mode

Radiated Emissions was performed with the EUT set to transmit at the channel with the highest output power as worst-case scenario.

1.8 Comments

The measurement were done with the EUT powered by 120V / 60Hz. It was checked that power variations between 85% and 115% did not have any influence on the measurements.

2 TEST REPORT SUMMARY

2.1 General

All measurements are tracable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.247 and Industry Canada RSS-247 Issue 2.

Tests were performed in accordance with ANSI C63.4-2014 and and ANSI C63.10-2013.

Radiated tests were performed in a semi-anechoic shielded room (f < 1 GHz) and a fully-anechoic shielded room (f > 1 GHz) at a measuring distance of 3m.

A description of the test facility is on file with the FCC and Industry Canada.

Test setup photo document: 399615-03TRFFCC Annex – Test set-up photos

☒ New Submission	☒ Production Unit
☐ Class II Permissive Change	☐ Pre-production Unit
DSS Equipment Code	☐ Family Listing

2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-247 Issue 2, RSS-GEN Issue 4 reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	Complies
Antenna Requirement	15.203	6.8 (RSS-GEN)	Complies[1]
Spurious Emissions (Radiated)	15.247(d) 15.109(a) 15.209(a)	5.5 (RSS-247) 6.13 (RSS-GEN) 8.9 (RSS-GEN)	Complies[2]

[1] The tested equipment has integrated antennas only

[2] Only partial test were performed with LTE because the module is already certificied (FCC ID: XMR201903EG25G).

3 TEST RESULTS

3.1 Transmitter radiated emission RFID top channel / 3G Band II bottom channel / 2.4GHz bottom channel

Para. No.: 15.247 (d) / 15.209 (a)

Para. No.: RSS-247 5.5 / RSS-Gen 8.9

Transmitter radiated emission from 9 kHz to 30 MHz.

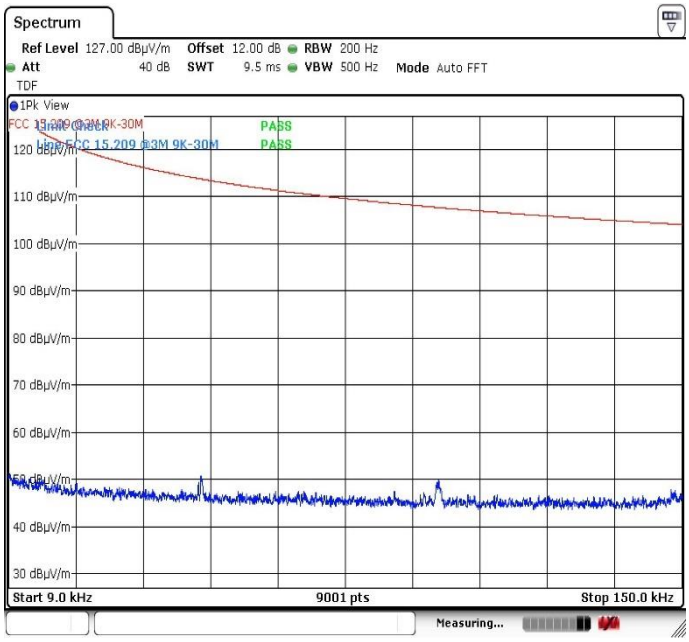
Test Performed by: Abdoufataou Salifou	**Date of Test:2020-06-16**

Test Results: Complies

Measurement Data for 927.5 MHz + 1852.4 MHz + 2405 MHz:

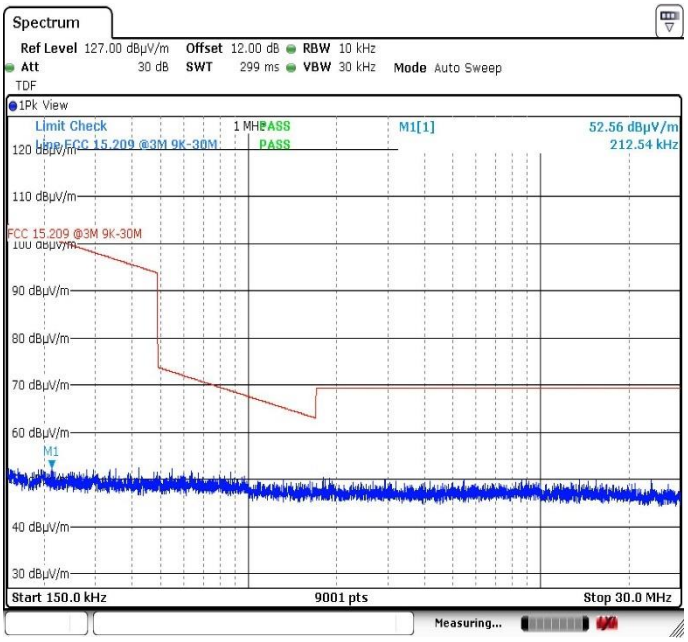
Measured Frequency (MHz)	Carrier Frequency (MHz)	Antenna	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
No spurious emissions were detected					

Transmitter radiated emission from 9 kHz to 30 MHz Plots:



Radiated Emissions, 9 – 150 kHz

Plot-No.:399615-086



Radiated Emissions, 150 kHz – 30 MHz

Plot-No.:399615-084

Transmitter radiated emission from 30 to 1000 MHz

Test Performed by: Abdoufataou Salifou	Date of Test: 2020-06-16

Test Results: Complies

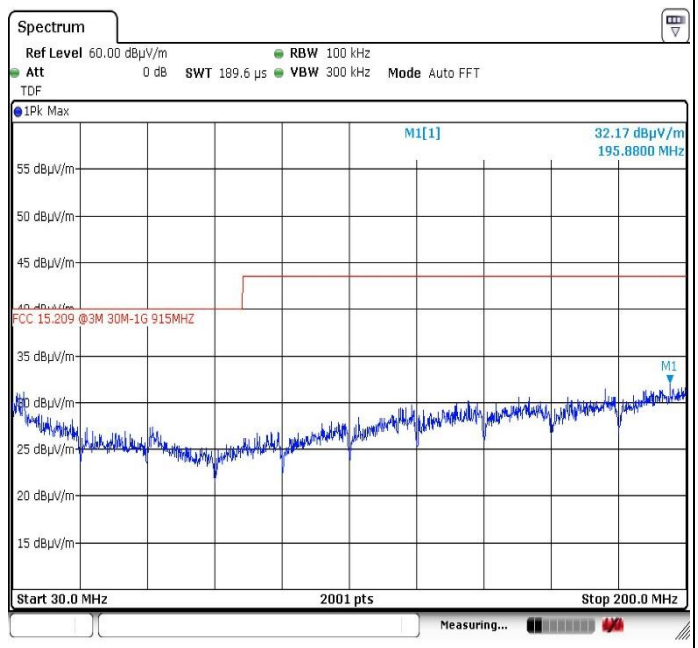
Measurement Data for 927.5 MHz + 1852.4 MHz + 2405 MHz:

Measured Frequency (MHz)	Carrier Frequency (MHz)	Antenna Polarisation	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
876.26	927.44	V	43.38	46.0	2.62

Requirements/Limit

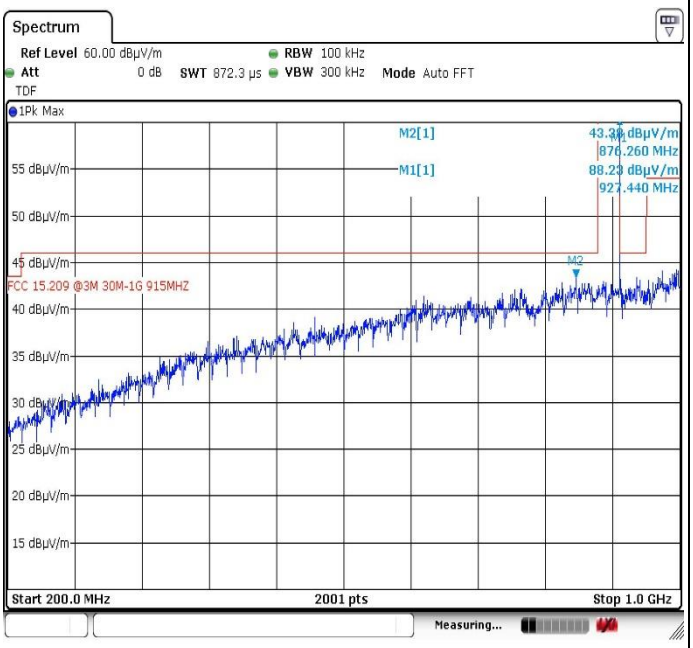
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency (MHz)	Quasi Peak (µV/m)	Quasi Peak (dBµV/m)
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

Radiated emission from 30 to 1000 MHz Plots:



Radiated Emissions, 30 – 200 MHz

Plot-No.:399615-014



Radiated Emissions, 200 MHz – 1 GHz

Plot-No.:399615-012

Transmitter radiated Emissions from 1 GHz to 18 GHz

Test Performed by: Abdoufataou Salifou	Date of Test:2020-07-08

Test Results: Complies

Measurement Data for 927.5 MHz + 1852.4 MHz + 2405 MHz:

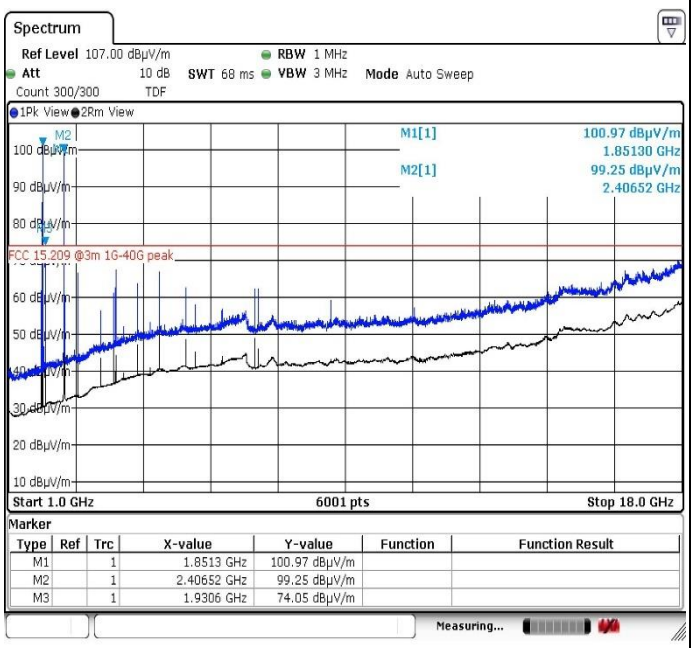
Measured Frequency (MHz)	Antenna Polarisation	Peak Emission (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Calculated Average (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
2782.470	Vertical	63.81	74.0	10.19	43.81	54.0	10.19
3710.001	Vertical	65.71	74.0	8.29	45.71	54.0	8.29
4258.143	Vertical	66.86	74.0	7.14	46.86	54.0	7.14
4811.103	Vertical	68.10	74.0	5.90	48.10	54.0	5.90
7213.446	Vertical	65.61	74.0	8.39	45.61	54.0	8.39

Average Values are calculated from Peak Values by Duty Cycle Correction Factor.

Requirements/Limit

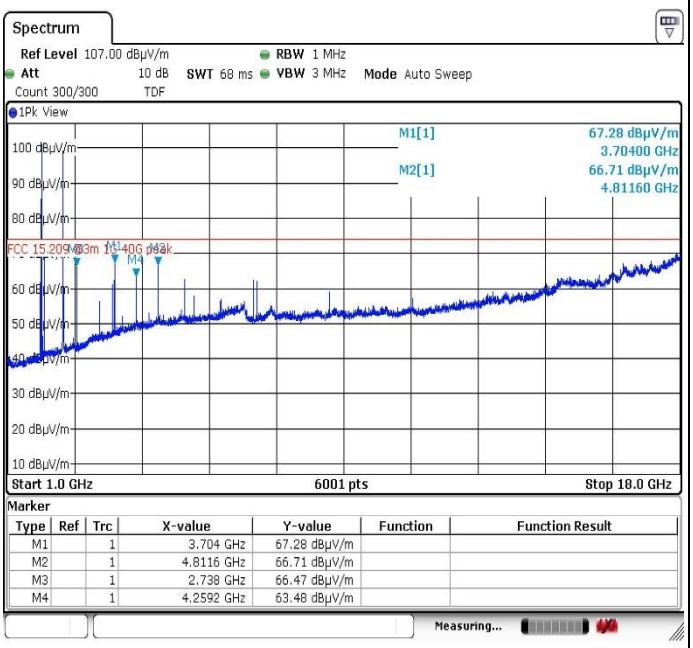
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	**AV (dBµV/m)**	**PK (dBµV/m)**
Above 1 GHz	54	74

Radiated Emissions from 1 GHz to 18 GHz Plots:



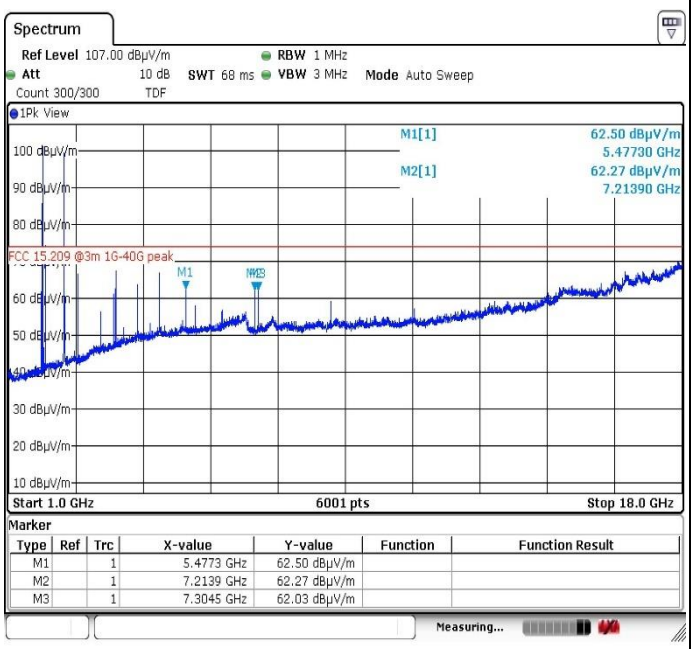
1 - 18 GHz, 927.5 MHz + 1852.4 MHz + 2405 MHz

Plot-No.:399615-182

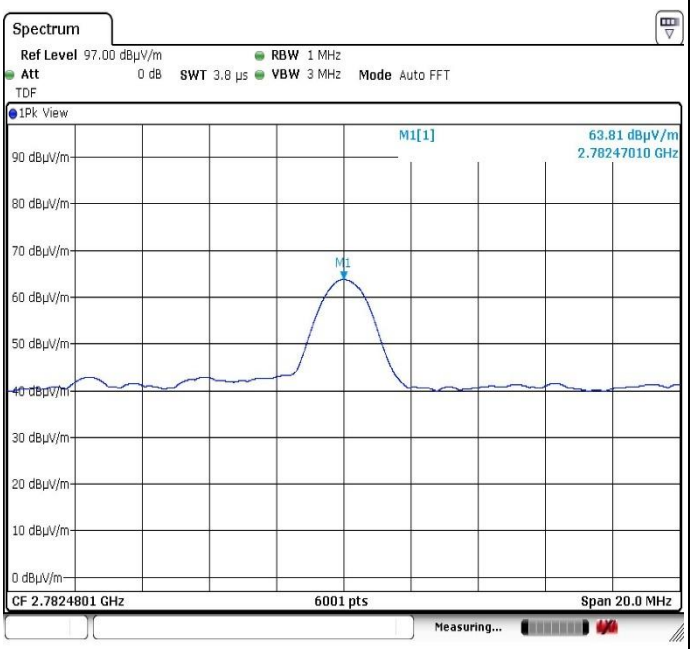


1 GHz – 18 GHz Peak Detected Spurious

Plot-No.:399615-187

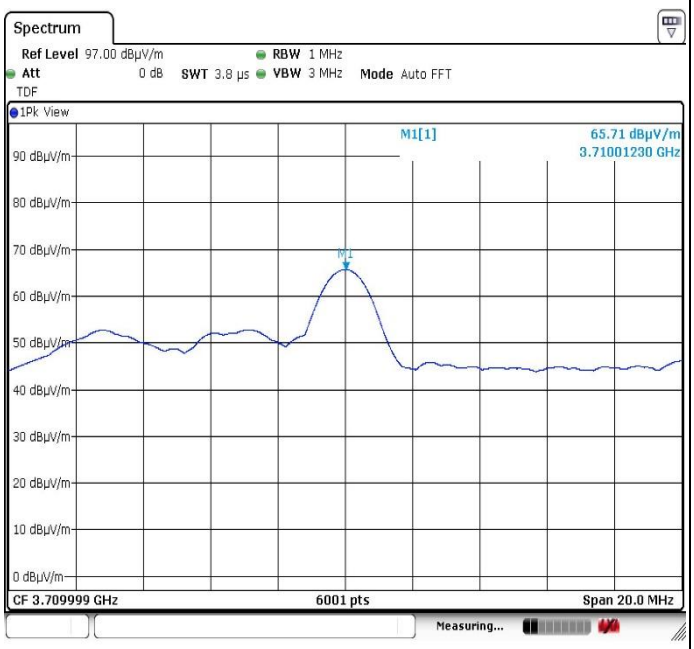


1 GHz – 18 GHz Peak Detected Spurious



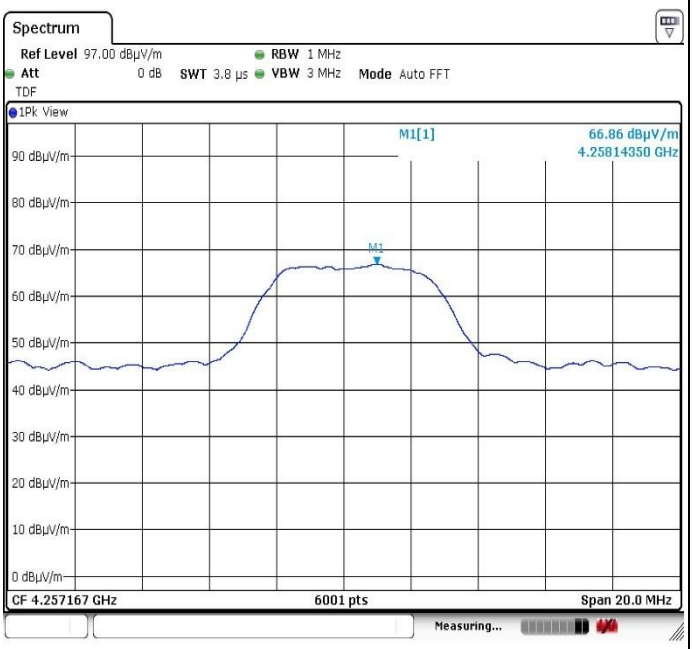
Radiated detected Peak Emissions at 2.782 GHz

Transmitter radiated detected emission Plots:



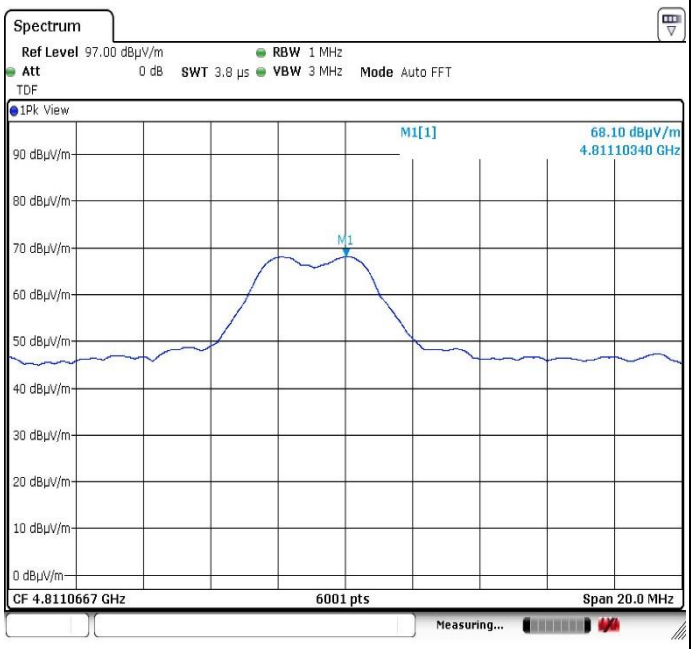
Radiated detected Peak Emissions at 3.710 GHz

Plot-No.:399615-258



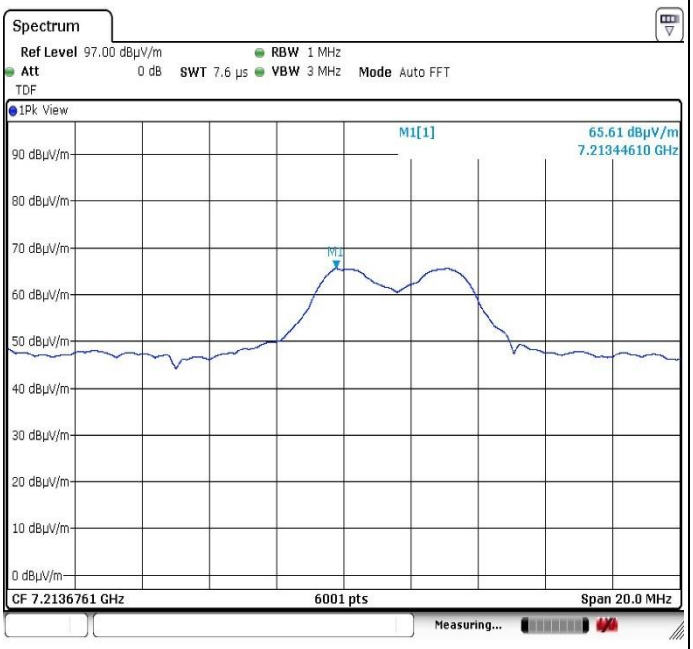
Radiated detected Peak Emissions at 4.257 GHz

Plot-No.:399615-259



Radiated detected Peak Emissions at 4.811 GHz

Plot-No.:399615-263



Radiated detected Peak Emissions at 7.213 GHz

Plot-No.:399615-261

Radiated Emissions from 18 GHz to 25 GHz

Test Performed by: Abdoufataou Salifou	Date of Test:2020-07-08

Test Results: Complies

A pre-scan was performed above 18 GHz and no spurious emissions were detected.

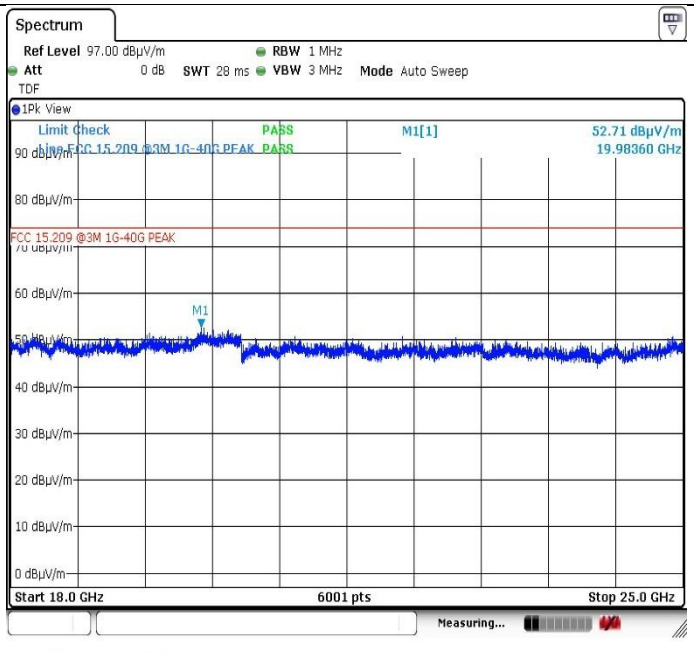
Measurement Data for 927.5 MHz + 1852.4 MHz + 2405 MHz:

Measured Frequency (MHz)	Carrier Frequency (MHz)	Antenna	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
No spurious emissions were detected					

Requirements/Limit

FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	**AV (dBµV/m)**	**PK (dBµV/m)**
Above 1 GHz	54	74

Radiated Emissions from 18 GHz to 25 GHz Plots:



18 - 25 GHz, 927.5 MHz + 1852.4 MHz + 2405 MHz

Plot-No.:399615-284

3.2 Transmitter radiated emission RFID bottom channel / 3G Band II top channel / 2.4GHz top channel

Para. No.: 15.247 (d) / 15.209 (a)
Para. No.: RSS-247 5.5 / RSS-Gen 8.9

Transmitter radiated emission from 9 kHz to 30 MHz.

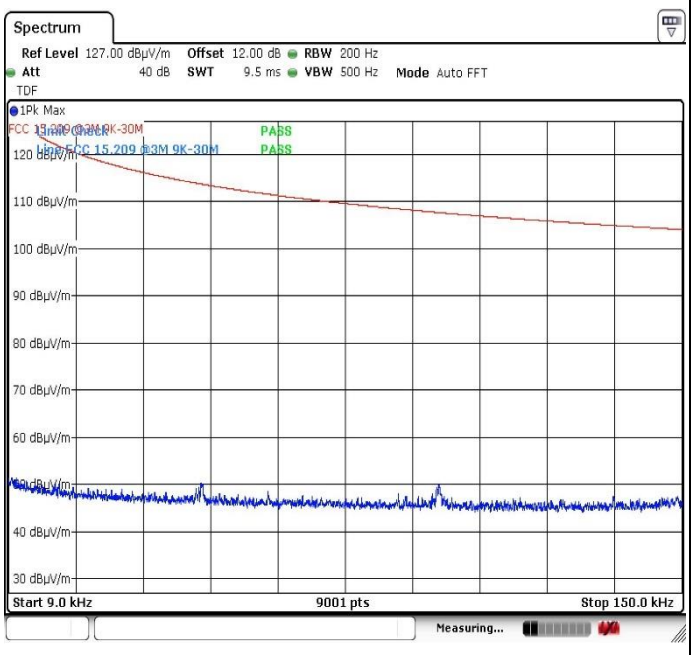
Test Performed by: Abdoufataou Salifou	Date of Test:2020-06-16

Test Results: Complies

Measurement Data for 902.5 MHz + 1907.6 MHz + 2480 MHz:

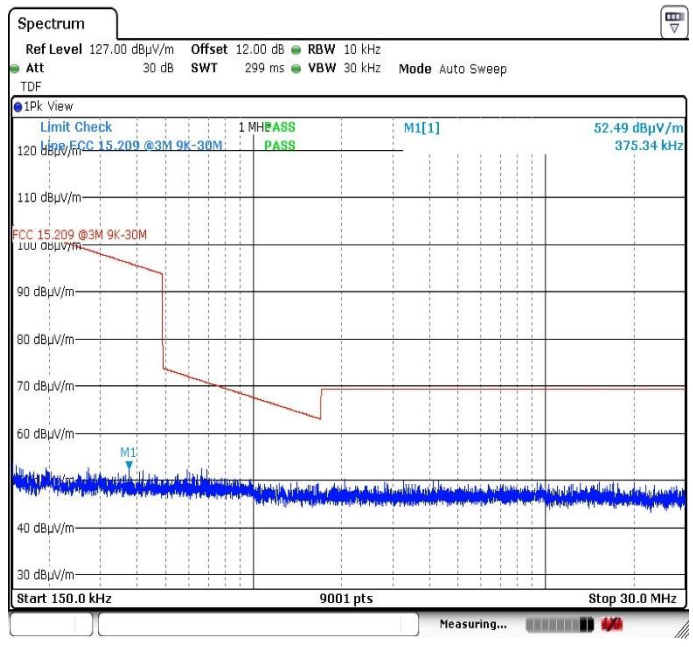
Measured Frequency (MHz)	Carrier Frequency (MHz)	Antenna	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
No spurious emissions were detected					

Transmitter radiated emission from 9 kHz to 30 MHz Plots:



Radiated Emissions, 9 – 150 kHz

Plot-No.:399615-083



Radiated Emissions, 150 kHz – 30 MHz

Plot-No.:399615-085

Transmitter radiated emission from 30 to 1000 MHz

Test Performed by: Abdoufataou Salifou	Date of Test: 2020-06-16

Test Results: Complies

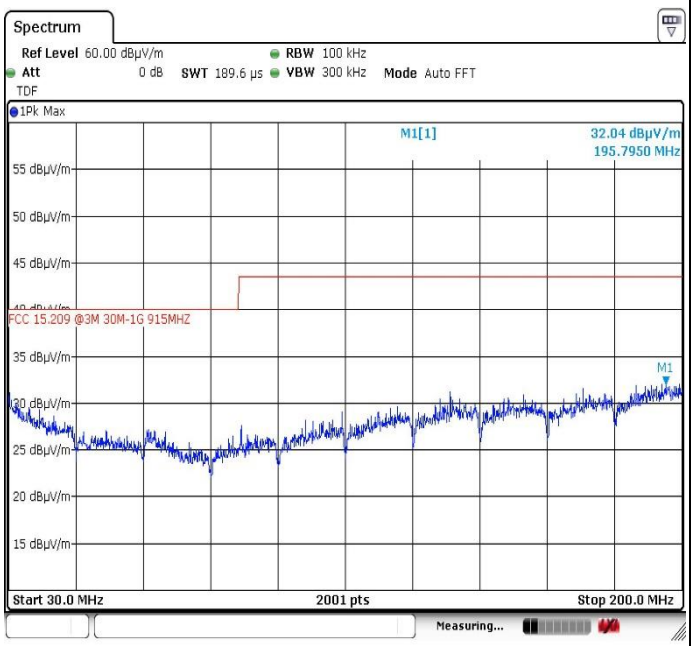
Measurement Data for 902.5 MHz + 1907.6 MHz + 2480 MHz:

Measured Frequency (MHz)	Carrier Frequency (MHz)	Antenna Polarisation	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
856.672	902.65	V	43.50	46.0	2.50
754.72	902.65	V	42.84	46.0	3.16

Requirements/Limit

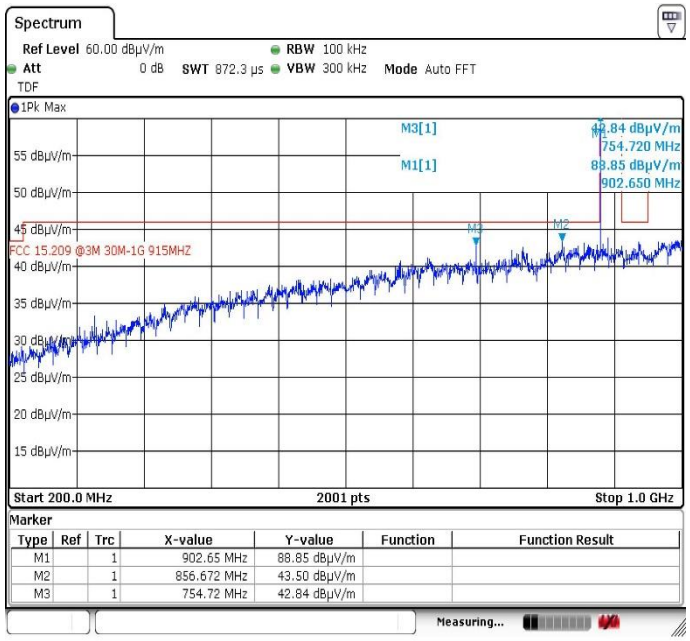
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency (MHz)	Quasi Peak (µV/m)	Quasi Peak (dBµV/m)
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

Radiated emission from 30 to 1000 MHz Plots:



Radiated Emissions, 30 – 200 MHz

Plot-No.:399615-013



Radiated Emissions, 200 MHz – 1 GHz

Plot-No.:399615-011

Radiated Emissions from 1 GHz to 18 GHz

Test Performed by: Abdoufataou Salifou	Date of Test:2020-07-08

Test Results: Complies

Measurement Data for 902.5 MHz + 1907.6 MHz + 2480 MHz:

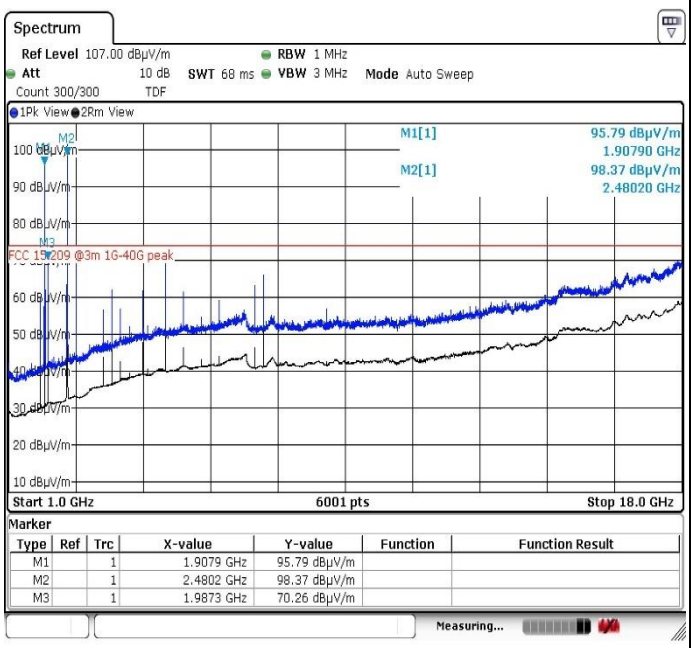
Measured Frequency (MHz)	Antenna Polarisation	Peak Emission (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Calculated Average (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
2707.503	Vertical	69.45	74.0	4.55	49.45	54.0	4.55
3610.050	Vertical	62.07	74.0	11.93	42.07	54.0	11.93
4388.942	Vertical	63.67	74.0	10.33	43.67	54.0	10.33
4961.176	Vertical	68.66	74.0	5.34	48.66	54.0	5.34
7438.501	Vertical	65.97	74.0	8.03	45.97	54.0	8.03

Average Values are calculated from Peak Values by Duty Cycle Correction Factor.

Requirements/Limit

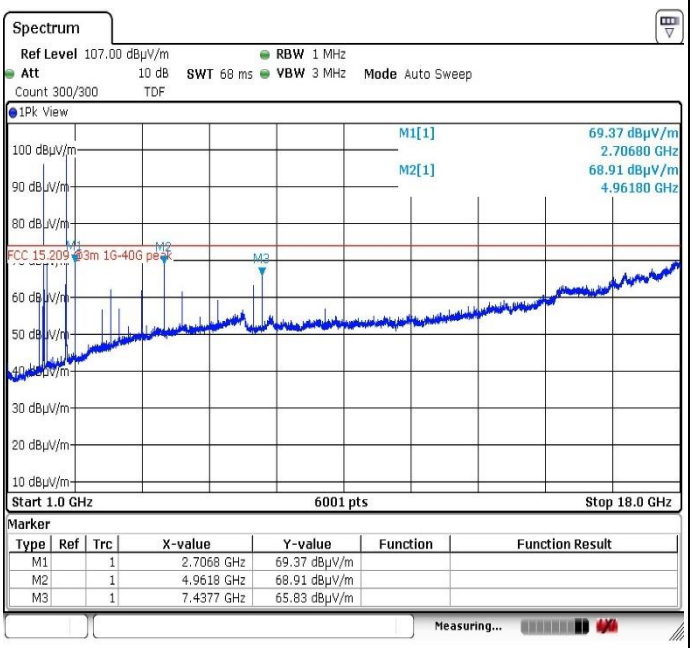
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	**AV (dBµV/m)**	**PK (dBµV/m)**
Above 1 GHz	54	74

Radiated Emissions from 1 GHz to 18 GHz Plots:



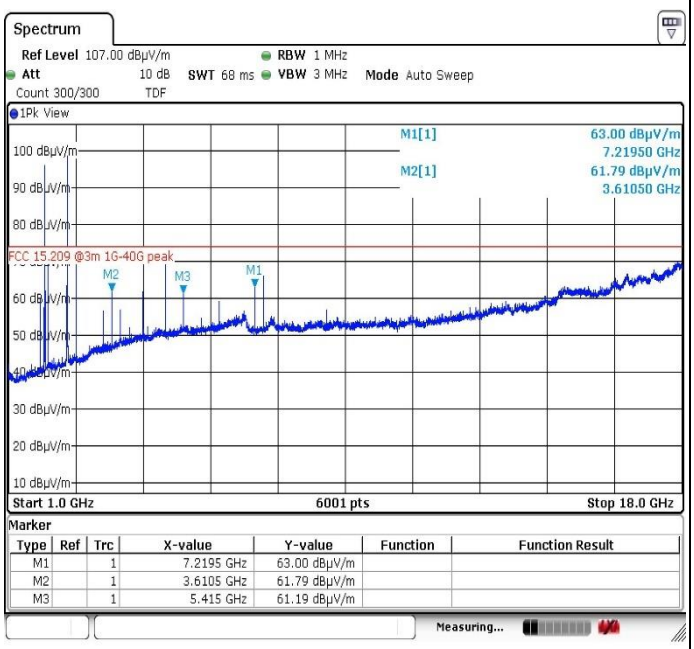
1 - 18 GHz, 902.5 MHz + 1907.6 MHz + 2480 MHz

Plot-No.:399615-264



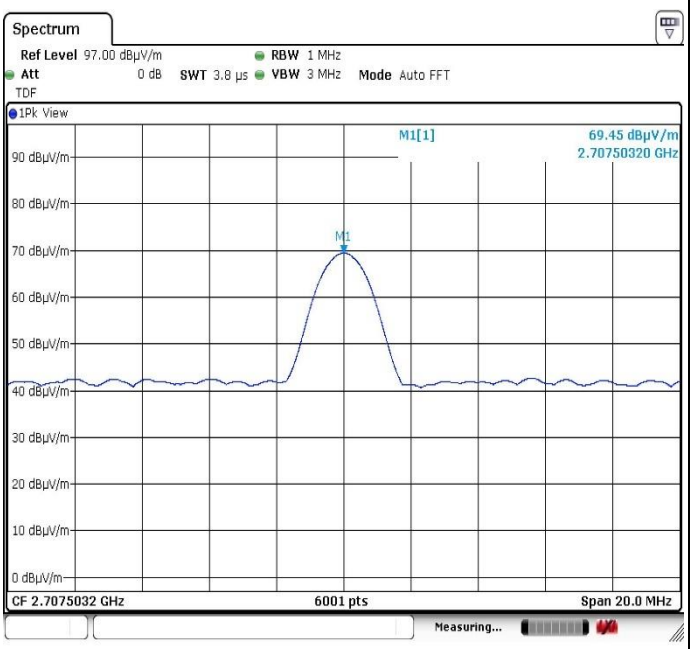
1 GHz – 18 GHz Peak Detected Spurious

Plot-No.:399615-266



1 GHz – 18 GHz Peak Detected Spurious

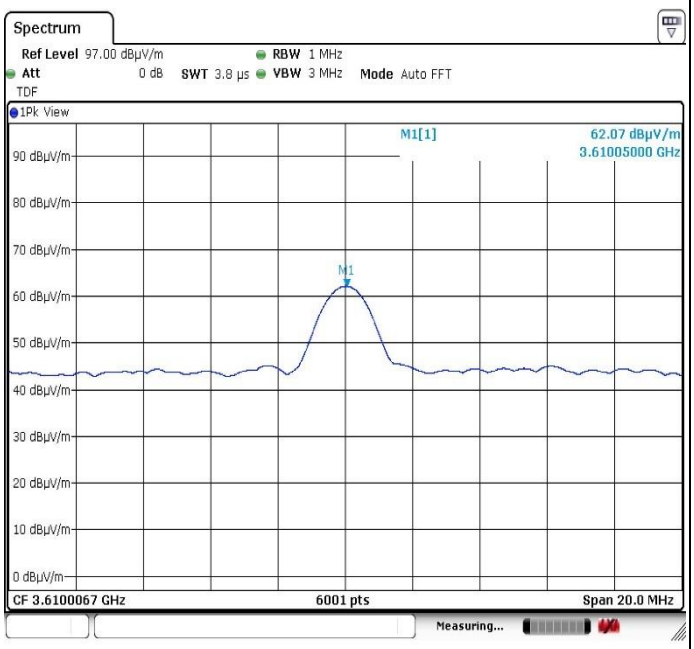
Plot-No.:399615-267



Radiated detected Peak Emissions at 2.707 GHz

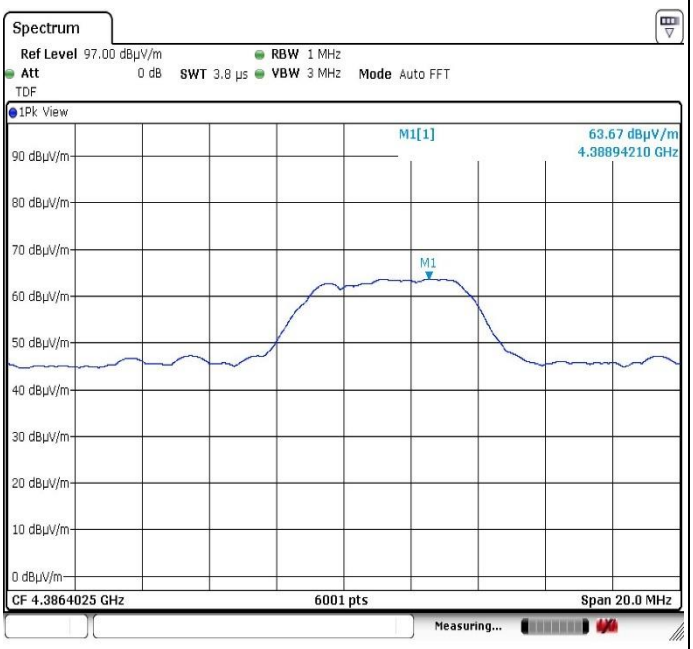
Plot-No.:399615-268

Radiated detected emission Plots:



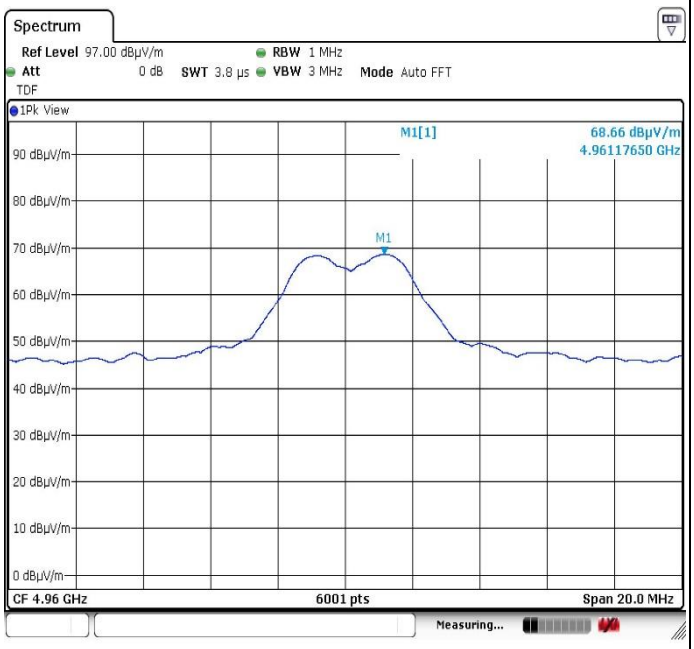
Radiated detected Peak Emissions at 3.610 GHz

Plot-No.:399615-271



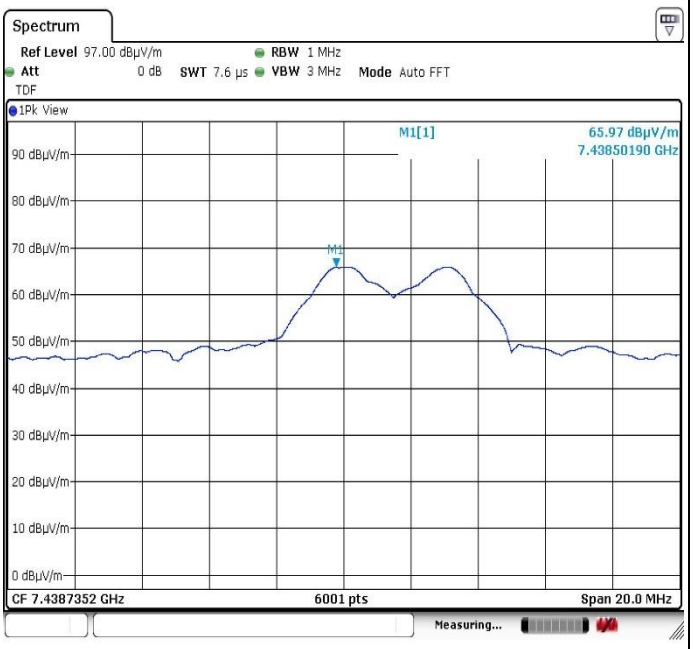
Radiated detected Peak Emissions at 4.386 GHz

Plot-No.:399615-272



Radiated detected Peak Emissions at 4.96 GHz

Plot-No.:399615-269



Radiated detected Peak Emissions at 7.438 GHz

Plot-No.:399615-270

Radiated Emissions from 18 GHz to 25 GHz

Test Performed by: Abdoufataou Salifou	Date of Test:2020-07-08

Test Results: Complies

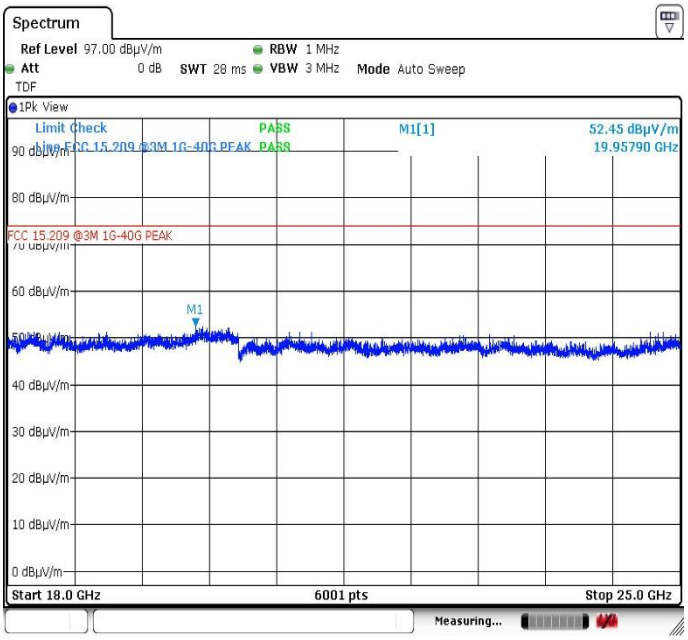
Measurement Data for 902.5 MHz + 1907.6 MHz + 2480 MHz:

Measured Frequency (MHz)	Carrier Frequency (MHz)	Antenna	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
No spurious emissions were detected					

Requirements/Limit

FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	**AV (dBµV/m)**	**PK (dBµV/m)**
Above 1 GHz	54	74

Radiated Emissions from 18 GHz to 25 GHz Plots:



18 - 25 GHz, 902.5 MHz + 1907.6 MHz + 2480 MHz

Plot-No.:399615-282

3.3 Transmitter radiated emission RFID bottom channel / 3G Band V top channel / 2.4GHz bottom channel

Para. No.: 15.247 (d) / 15.209 (a)
Para. No.: RSS-247 5.5 / RSS-Gen 8.9

Transmitter radiated emission from 9 kHz to 30 MHz.

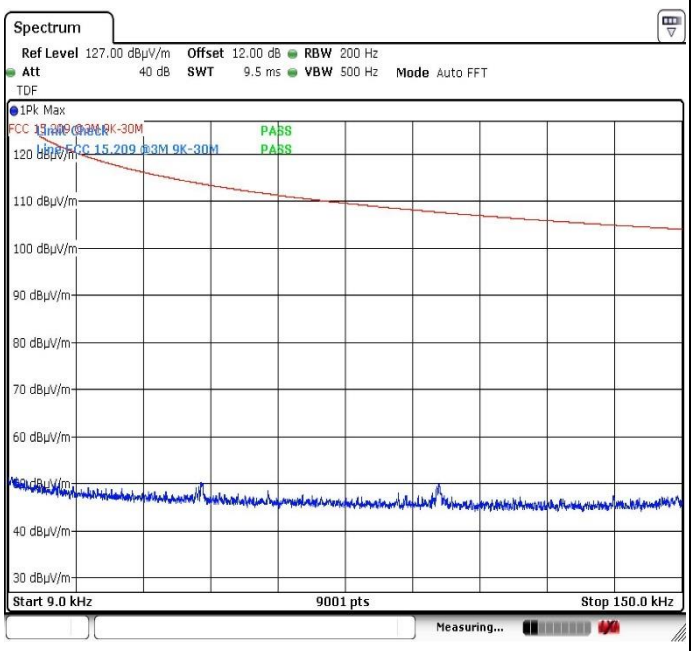
Test Performed by: Abdoufataou Salifou	Date of Test:2020-07-21

Test Results: Complies

Measurement Data for 927.5 MHz + 1852.4 MHz + 2405 MHz:

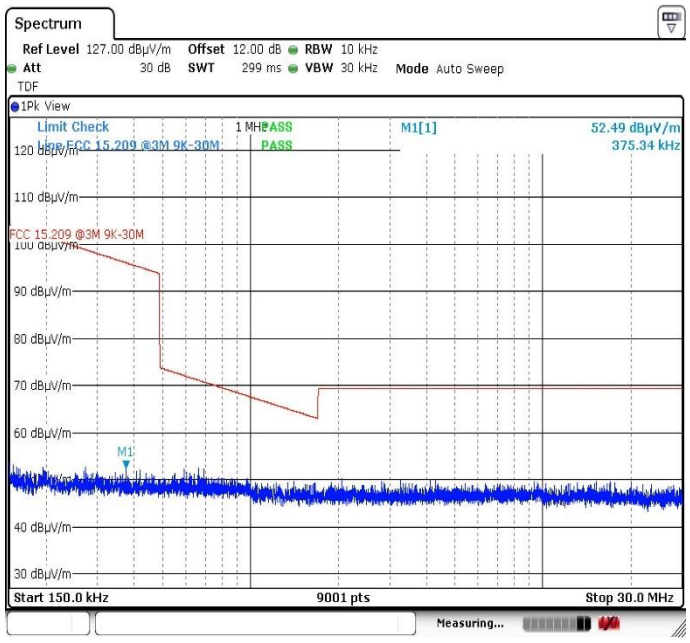
Measured Frequency (MHz)	Carrier Frequency (MHz)	Antenna	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
No spurious emissions were detected					

Transmitter radiated emission from 9 kHz to 30 MHz Plots:



Radiated Emissions, 9 – 150 kHz

Plot-No.:399615-083



Radiated Emissions, 150 kHz – 30 MHz

Plot-No.:399615-085

Transmitter radiated emission from 30 to 1000 MHz

Test Performed by: Abdoufataou Salifou	Date of Test: 2020-07-21

Test Results: Complies

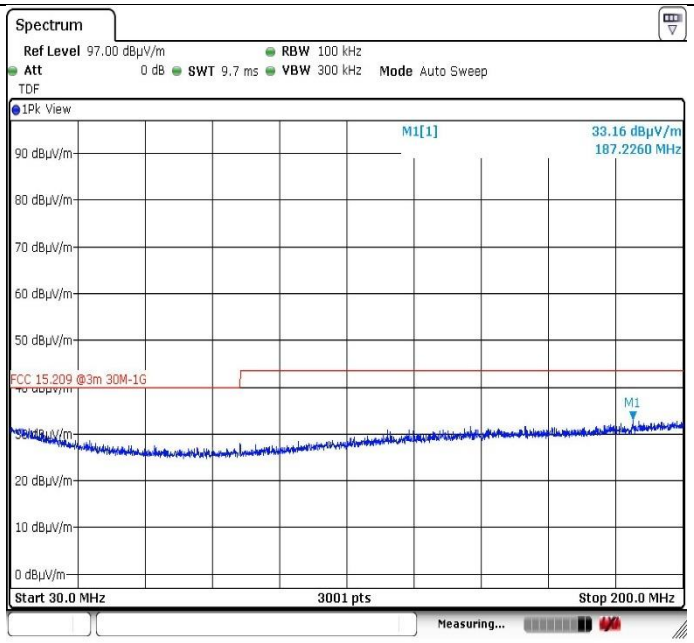
Measurement Data for 902.5 MHz + 846.6 MHz + 2405 MHz:

Measured Frequency (MHz)	Antenna Polarisation	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
737.310	Vertical	36.93	46.0	9.07
788.900	Vertical	42.71	46.0	3.29

Requirements/Limit

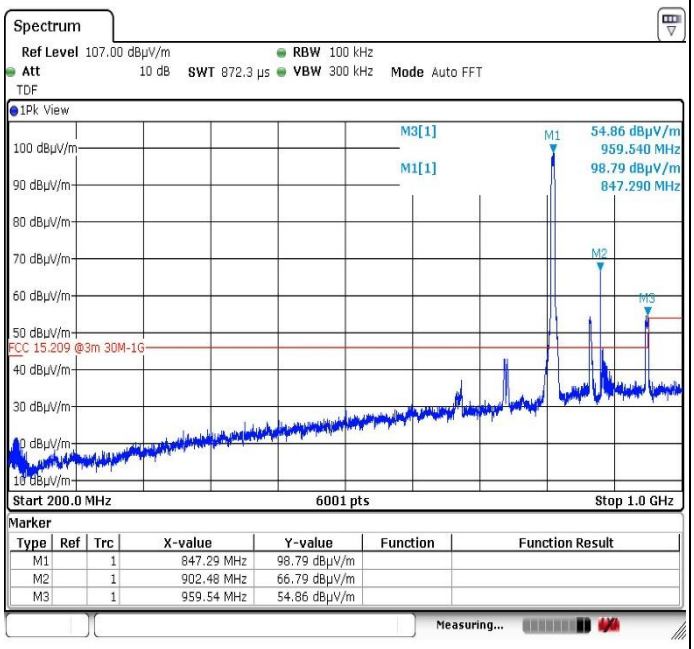
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency (MHz)	**Quasi Peak (µV/m)**	**Quasi Peak (dBµV/m)**
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

Radiated emission from 30 to 1000 MHz Plots:



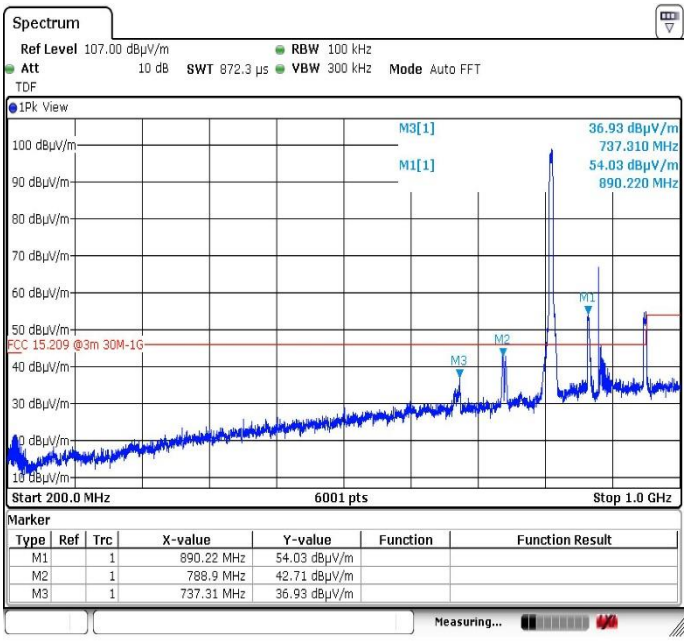
Radiated Emissions, 30 – 200 MHz

Plot-No.:399615-081



Radiated Emissions, 200 MHz – 1 GHz

Plot-No.:399615-312



Radiated Emissions, 200 MHz – 1 GHz

Plot-No.:399615-313

Transmitter radiated Emissions from 1 GHz to 18 GHz

Test Performed by: Abdoufataou Salifou	Date of Test:2020-07-21

Test Results: Complies

Measurement Data for 902.5 MHz + 846.6 MHz + 2405 MHz:

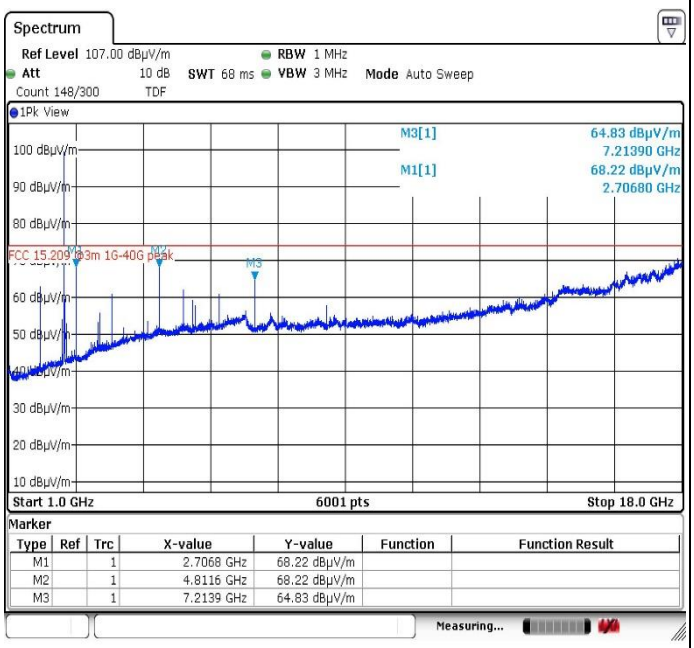
Measured Frequency (MHz)	Antenna Polarisation	Peak Emission (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Calculated Average (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
1805.000	Vertical	63.03	74.0	10.97	43.03	54.0	10.97
2707.503	Vertical	68.55	74.0	5.45	48.55	54.0	5.45
4811.070	Vertical	68.27	74.0	5.73	48.27	54.0	5.73
5414.970	Vertical	61.90	74.0	12.10	41.90	54.0	12.10
6317.413	Vertical	59.48	74.0	14.52	39.48	54.0	14.52
7216.628	Vertical	65.77	74.0	8.23	45.77	54.0	8.23

Average Values are calculated from Peak Values by Duty Cycle Correction Factor.

Requirements/Limit

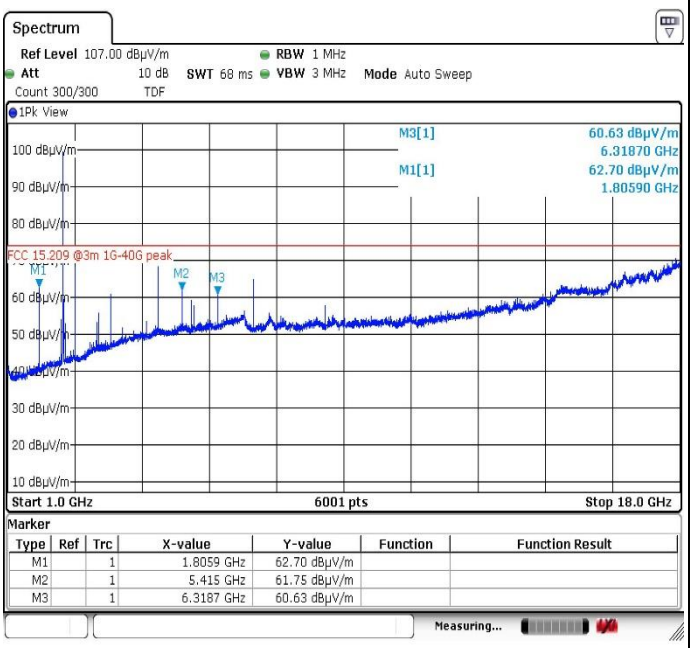
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	**AV (dBµV/m)**	**PK (dBµV/m)**
Above 1 GHz	54	74

Radiated Emissions from 1 GHz to 18 GHz Plots:



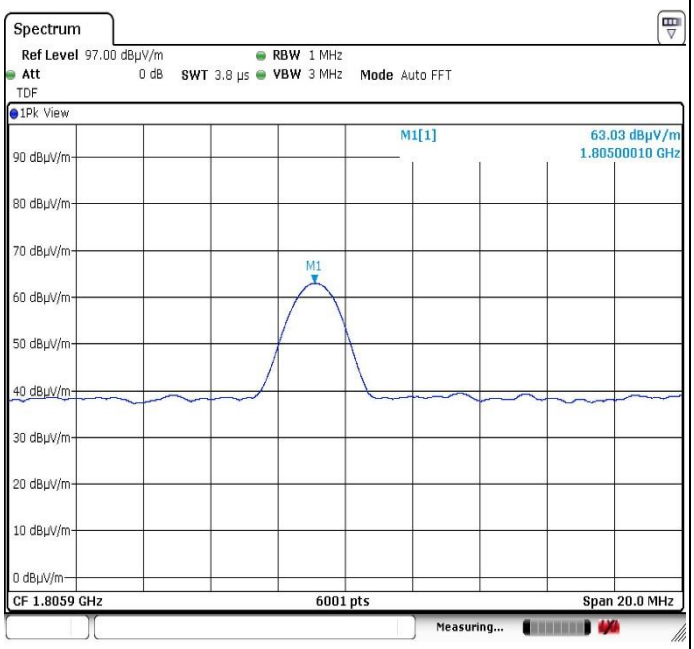
1 - 18 GHz, 902.5 MHz + 846.6 MHz + 2405 MHz

Plot-No.:399615-298



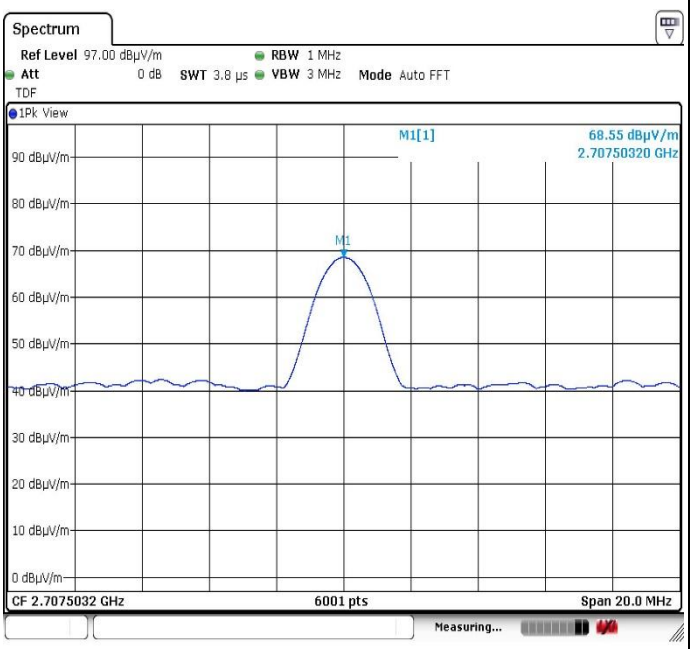
1 - 18 GHz, 902.5 MHz + 846.6 MHz + 2405 MHz

Plot-No.:399615-299



Radiated detected Peak Emissions at 1.805 GHz

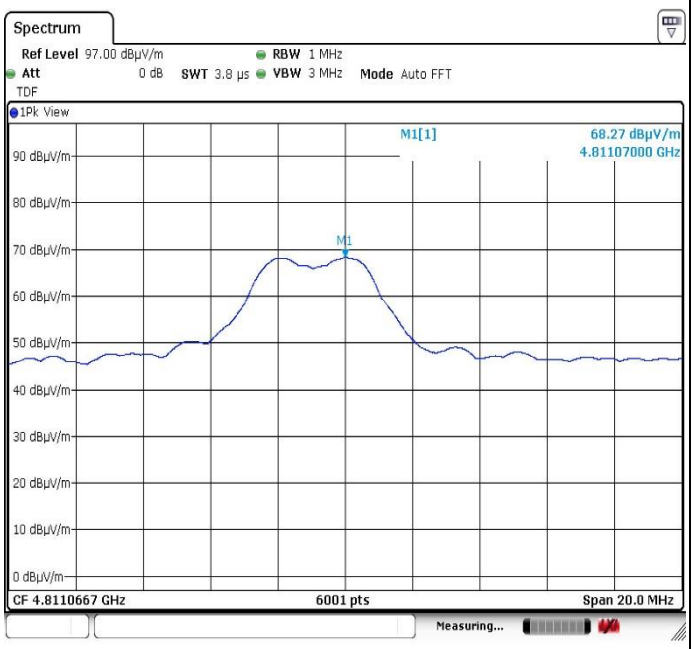
Plot-No.:399615-303



Radiated detected Peak Emissions at 2.707 GHz

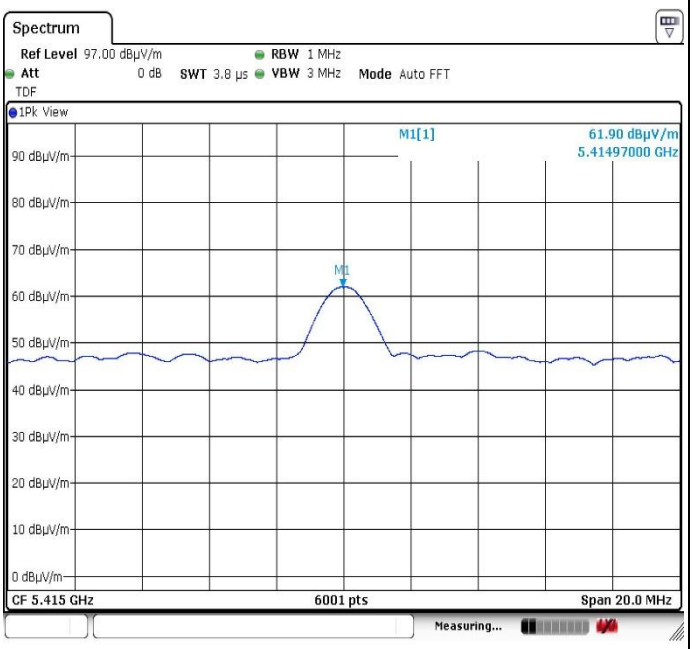
Plot-No.:399615-300

Transmitter radiated detected emission Plots:



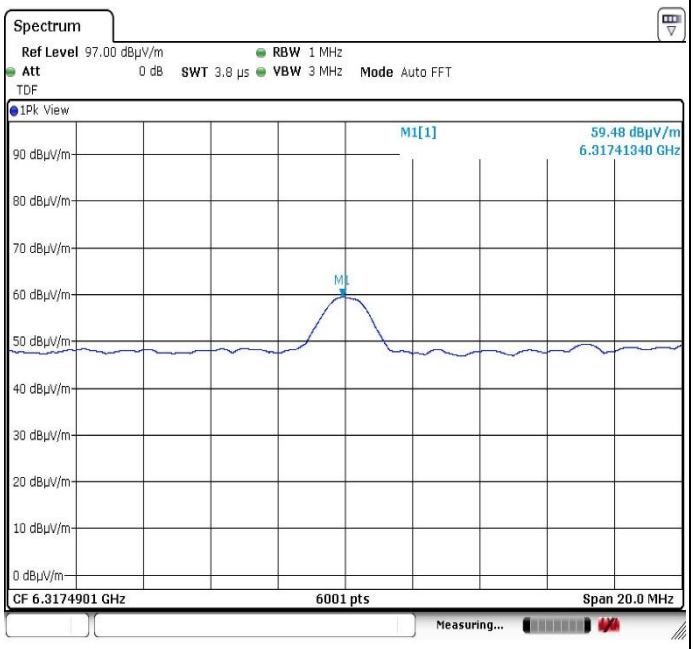
Radiated detected Peak Emissions at 4.811 GHz

Plot-No.:399615-301



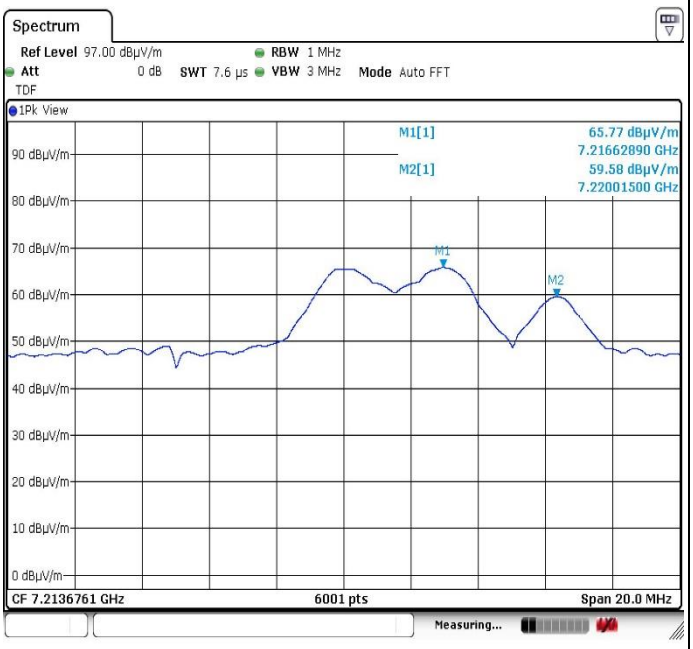
Radiated detected Peak Emissions at 5.415 GHz

Plot-No.:399615-304



Radiated detected Peak Emissions at 6.317 GHz

Plot-No.:399615-305



Radiated detected Peak Emissions at 7.213 GHz

Plot-No.:399615-302

Radiated Emissions from 18 GHz to 25 GHz

Test Performed by: Abdoufataou Salifou	Date of Test:2020-07-21

Test Results: Complies

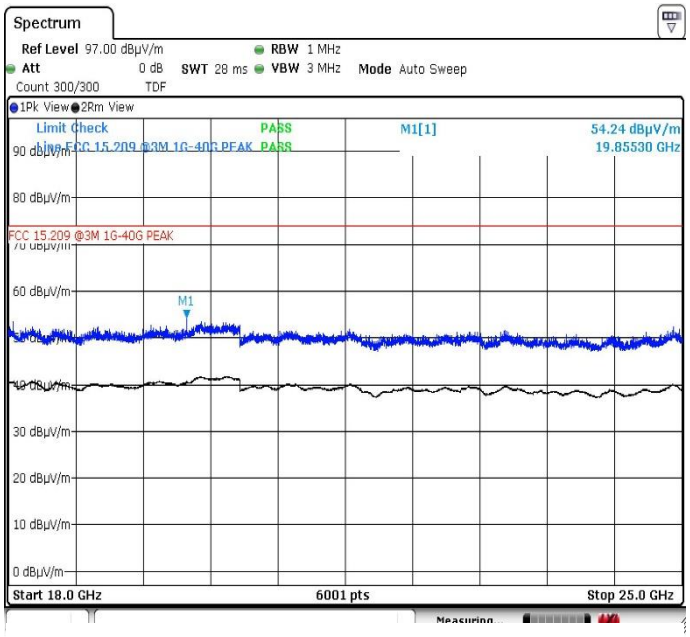
Measurement Data for for 902.5 MHz + 846.6 MHz + 2405 MHz:

Measured Frequency (MHz)	Carrier Frequency (MHz)	Antenna	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
No spurious emissions were detected					

Requirements/Limit

FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	AV (dBµV/m)	PK (dBµV/m)
Above 1 GHz	54	74

Radiated Emissions from 18 GHz to 25 GHz Plots:



18 - 25 GHz, 902.5 MHz + 846.6 MHz + 2405 MHz

Plot-No.:399615-306

3.4 Transmitter radiated emission RFID top channel / 3G Band V bottom channel / 2.4GHz top channel

Para. No.: 15.247 (d) / 15.209 (a)
Para. No.: RSS-247 5.5 / RSS-Gen 8.9

Transmitter radiated emission from 9 kHz to 30 MHz.

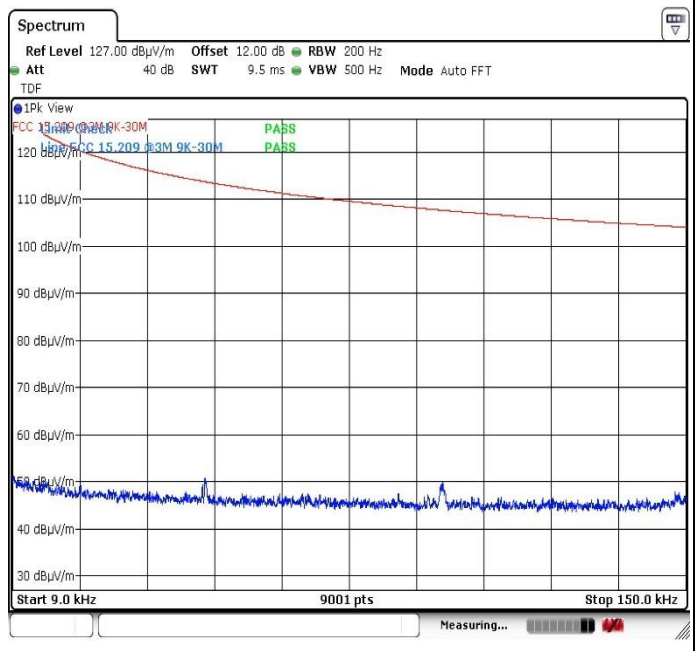
Test Performed by: Abdoufataou Salifou	**Date of Test:2020-06-16**

Test Results: Complies

Measurement Data for 927.5 MHz + 826.4 MHz + 2480 MHz:

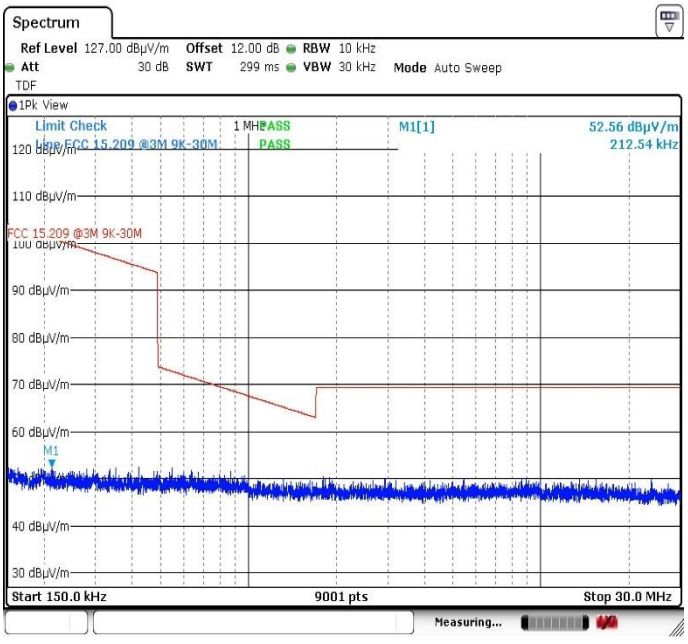
Measured Frequency (MHz)	Carrier Frequency (MHz)	Antenna	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
No spurious emissions were detected					

Transmitter radiated emission from 9 kHz to 30 MHz Plots:



Radiated Emissions, 9 – 150 kHz

Plot-No.:399615-086



Radiated Emissions, 150 kHz – 30 MHz

Plot-No.:399615-084

Transmitter radiated emission from 30 to 1000 MHz

Test Performed by: Abdoufataou Salifou	Date of Test: 2020-06-16

Test Results: Complies

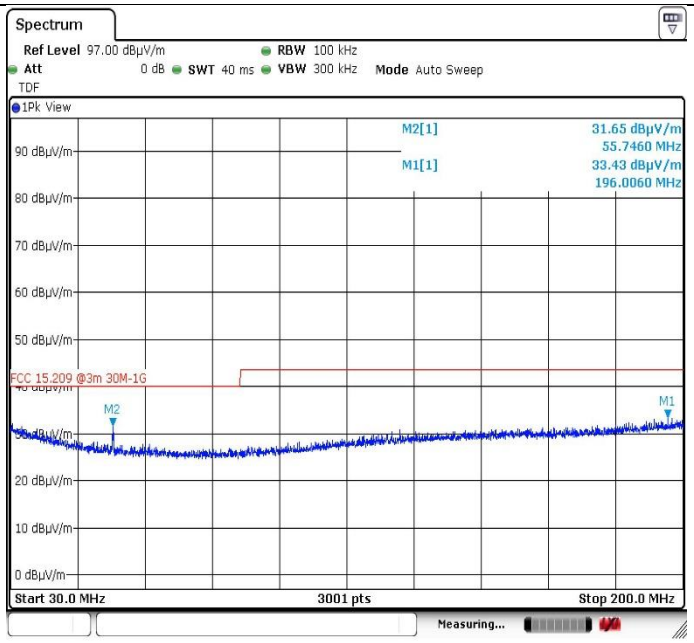
Measurement Data for 927.5 MHz + 826.4 MHz + 2480 MHz:

Measured Frequency (MHz)	Antenna Polarisation	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
727.450	Vertical	44.30	46.0	1.70

Requirements/Limit

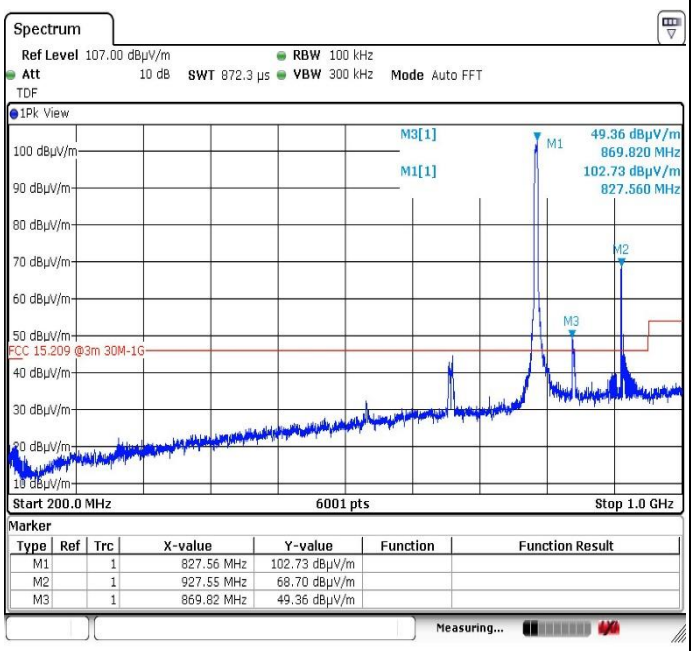
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency (MHz)	**Quasi Peak (µV/m)**	**Quasi Peak (dBµV/m)**
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

Radiated emission from 30 to 1000 MHz Plots:



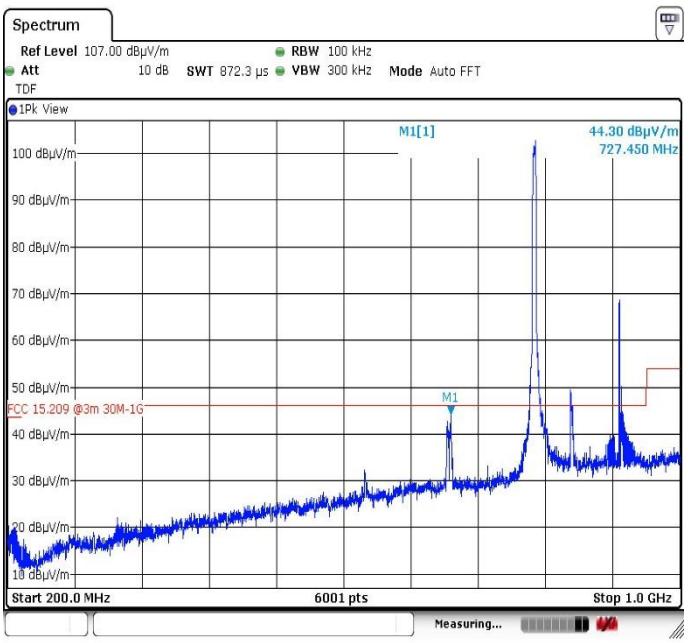
Radiated Emissions, 30 – 200 MHz

Plot-No.:399615-082



Radiated Emissions, 200 MHz – 1 GHz

Plot-No.:399615-318



Radiated Emissions, 200 MHz – 1 GHz

Plot-No.:399615-319

Radiated Emissions from 1 GHz to 18 GHz

Test Performed by: Abdoufataou Salifou	Date of Test:2020-07-08

Test Results: Complies

Measurement Data for 927.5 MHz + 826.4 MHz + 2480 MHz:

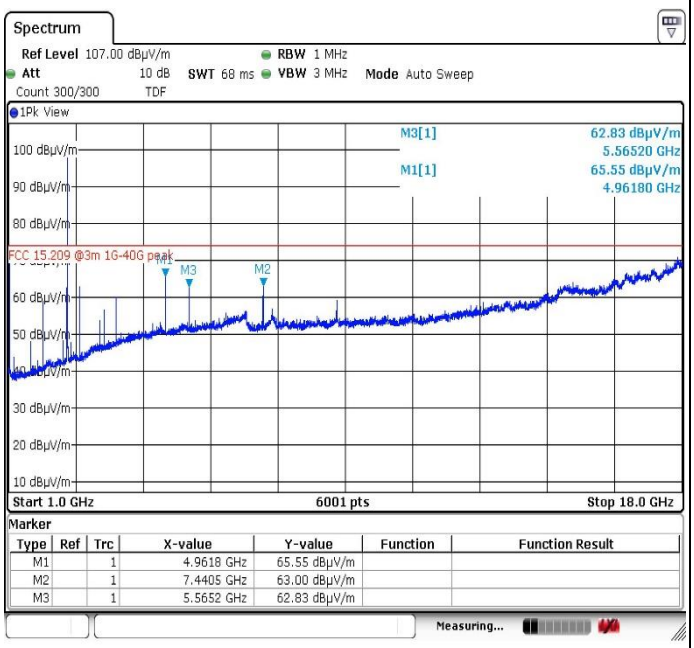
Measured Frequency (MHz)	Antenna Polarisation	Peak Emission (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	Calculated Average (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)
2782.506	Vertical	63.68	74.0	10.32	43.68	54.0	10.32
3710.049	Vertical	62.69	74.0	11.31	42.69	54.0	11.31
4961.159	Vertical	67.65	74.0	6.35	47.65	54.0	6.35
5564.975	Vertical	63.58	74.0	10.42	43.58	54.0	10.42
7441.774	Vertical	64.33	74.0	9.67	44.33	54.0	9.67
9275.002	Vertical	60.21	74.0	13.79	40.21	54.0	13.79

Average Values are calculated from Peak Values by Duty Cycle Correction Factor.

Requirements/Limit

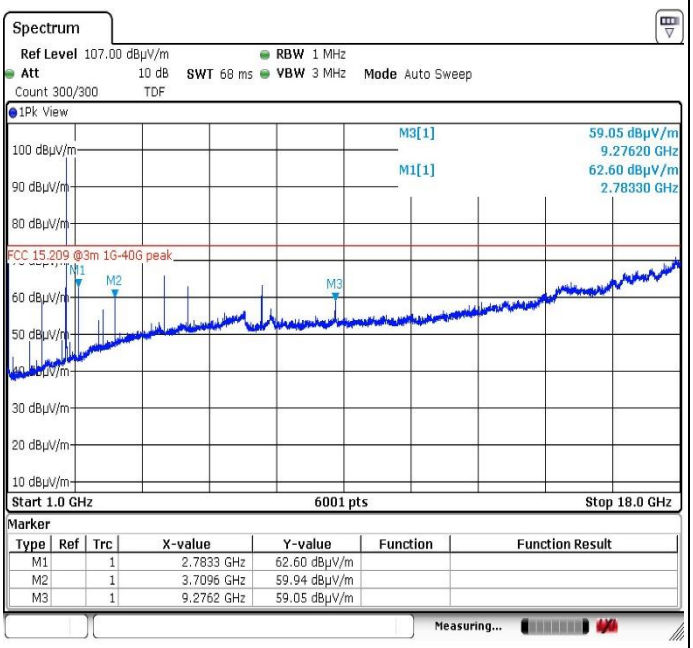
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	**AV (dBµV/m)**	**PK (dBµV/m)**
Above 1 GHz	54	74

Radiated Emissions from 1 GHz to 18 GHz Plots:



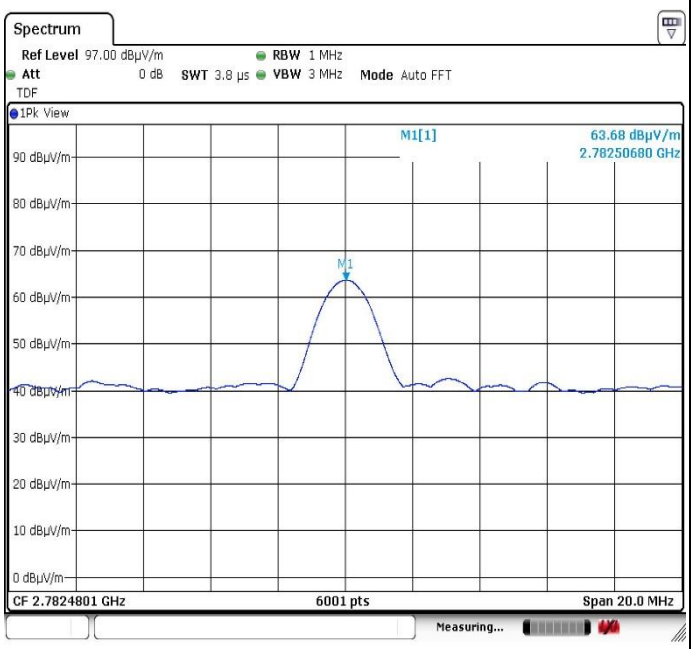
1 - 18 GHz, 927.5 MHz + 826.4 MHz + 2480 MHz

Plot-No.:399615-264



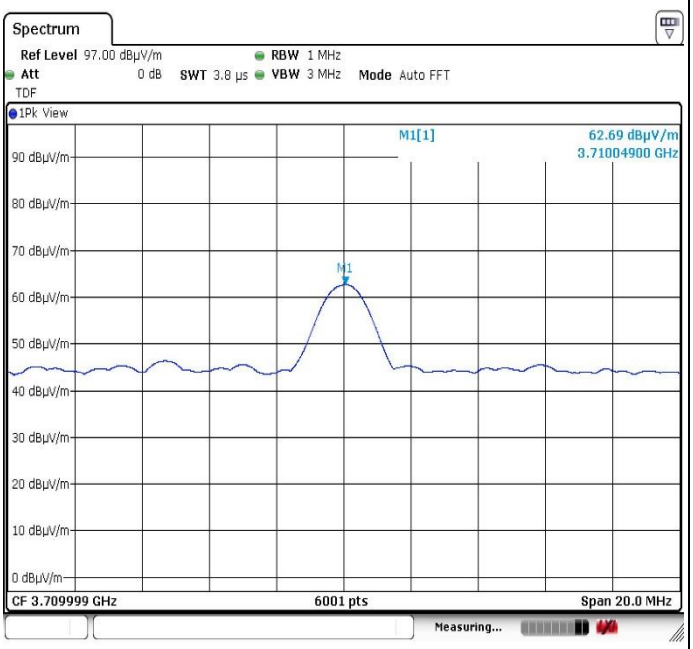
1 - 18 GHz, 927.5 MHz + 826.4 MHz + 2480 MHz

Plot-No.:399615-266



Radiated detected Peak Emissions at 2.782 GHz

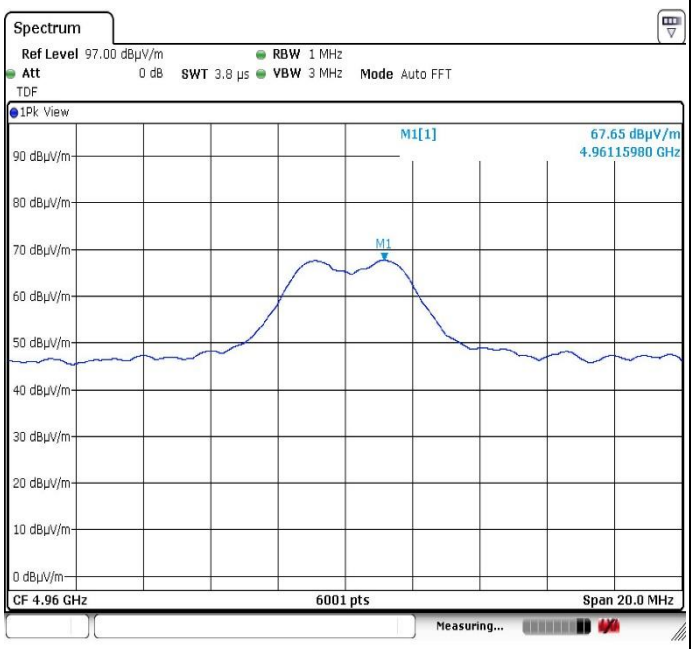
Plot-No.:399615-294



Radiated detected Peak Emissions at 3.709 GHz

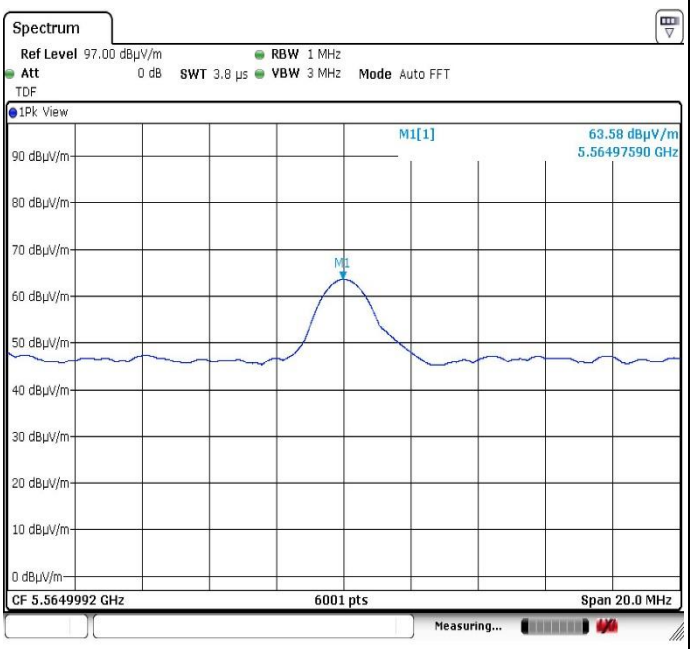
Plot-No.:399615-295

Radiated detected emission Plots:



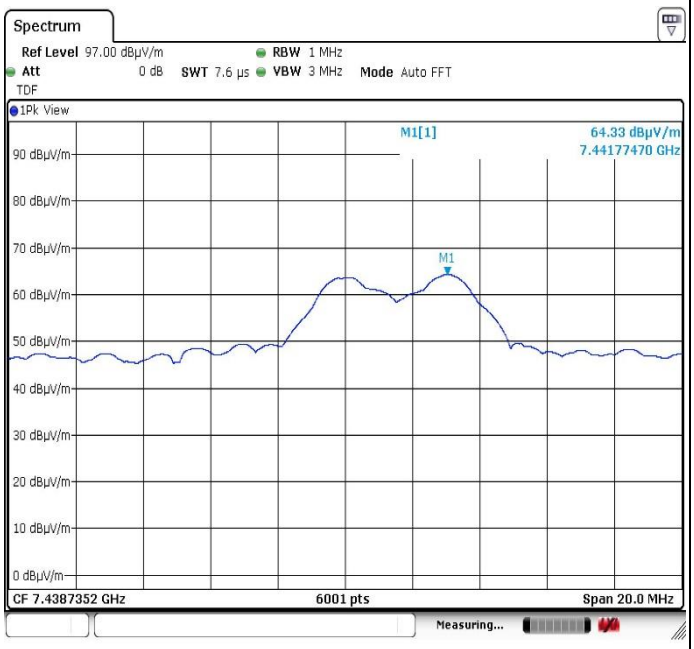
Radiated detected Peak Emissions at 4.960 GHz

Plot-No.:399615-291



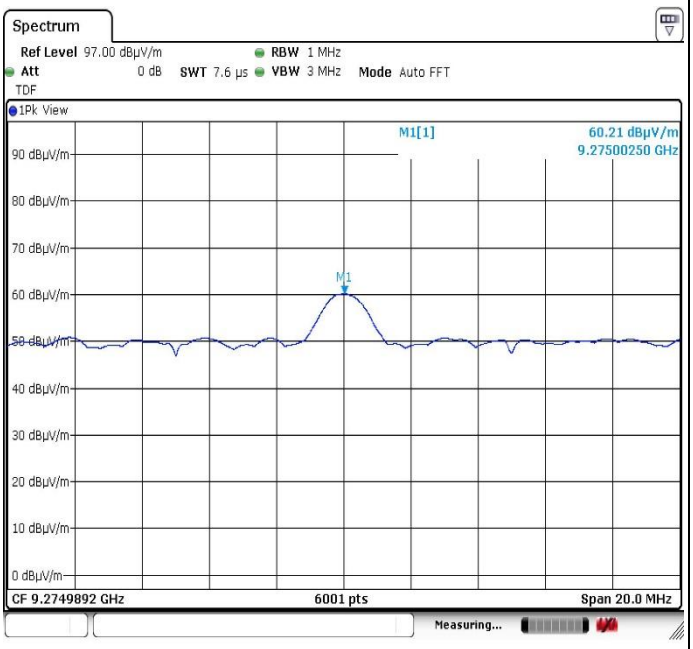
Radiated detected Peak Emissions at 5.564 GHz

Plot-No.:399615-293



Radiated detected Peak Emissions at 7.438 GHz

Plot-No.:399615-292



Radiated detected Peak Emissions at 9.274 GHz

Plot-No.:399615-296

Radiated Emissions from 18 GHz to 25 GHz

Test Performed by: Abdoufataou Salifou	Date of Test:2020-07-08

Test Results: Complies

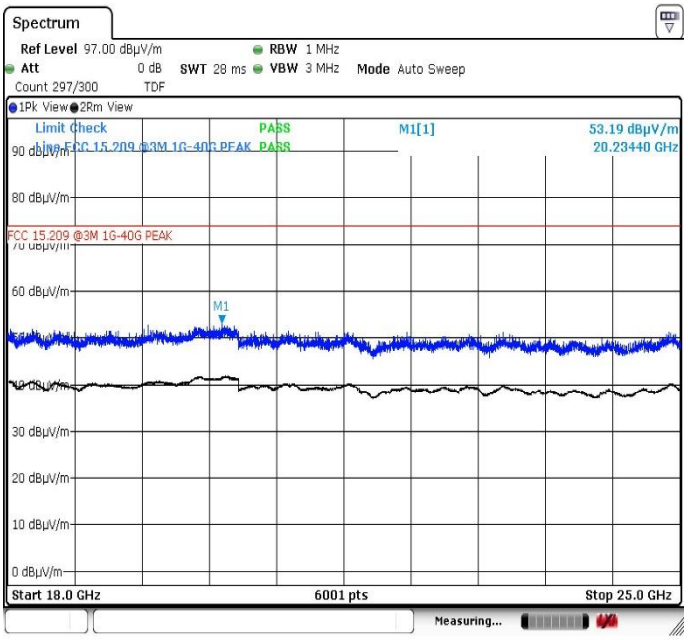
Measurement Data for 927.5 MHz + 826.4 MHz + 2480 MHz:

Measured Frequency (MHz)	Carrier Frequency (MHz)	Antenna	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
No spurious emissions were detected					

Requirements/Limit

FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	**AV (dBµV/m)**	**PK (dBµV/m)**
Above 1 GHz	54	74

Radiated Emissions from 18 GHz to 25 GHz Plots:



18 - 25 GHz, 927.5 MHz + 826.4 MHz + 2480 MHz

Plot-No.:399615-282

Restricted Bands of operation

Restricted Bands of operation for FCC and ISED are defined in FCC Part 15.205 and ISED RSS-GEN, Issue 5 clause 8.10.

Generally, no fundamentals are allowed in the restricted bands and all emissions must comply with the limits in FCC 15.209 or RSS-GEN, Issue 5, clause 8.9.

FCC (MHz)	ISED (MHz)	FCC (GHz)	ISED (GHz)
0.090-0.110		**0.96-1.24** **1.3-1.427**	**0.96-1.427**
0.495-0.505		1.435-1.6265	
2.1735-2.1905		1.6455-1.6465	
	3.020-3.026	1.660-1.710	
4.125-4.128		1.7188-1.7222	
4.17725-4.17775		2.2-2.3	
4.20725-4.20775		2.31-2.39	
	5.677-5.683	**2.4835-2.5**	
6.215-6.218		**2.69-2.9**	**2.655-2.9**
6.26775-6.26825		3.26-3.267	
6.31175-6.31225		3.332-3.339	
8.291-8.294		3.3458-3.358	
8.362-8.366		**3.6-4.4**	**3.5-4.4**
8.37625-8.38675		4.5-5.15	
8.41425-8.41475		5.35-5.46	
12.29-12.293		7.25-7.75	
12.51975-12.52025		8.025-8.5	
12.57675-12.57725		9.0-9.2	
13.36-13.41		9.3-9.5	
16.42-16.423		10.6-12.7	
16.69475-16.69525		13.25-13.4	
16.80425-16.80475		14.47-14.5	
25.5-25.67		15.35-16.2	
37.5-38.25		17.7-21.4	
73-74.6		22.01-23.12	
74.8-75.2		23.6-24.0	
108-121.94 **123-138**	**108-138**	31.2-31.8	
149.9-150.05		36.43-36.5	
156.52475-156.52525		Above 38.6	
156.7-156.9			
162.0125-167.17			
167.72-173.2			
240-285			
322-335.4			
399.9-410			
608-614			

Frequencies in **Bold** text are specific for FCC or ISED, all other frequencies are common.

4 MEASUREMENT UNCERTAINTY

Measurement Uncertainty Values		
Test Item		**Uncertainty**
Out of Band Emissions, Conducted	**< 3.6 GHz**	±0.8 dB
	> 3.6 GHz	±1.2 dB
Spurious Emissions, Radiated	**< 200 MHz**	±4.77 dB
	200 MHz - 1 GHz	±5.02 dB
	1 GHz – 18 GHz	±4.94 dB
	> 18 GHz	±5.91 dB
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

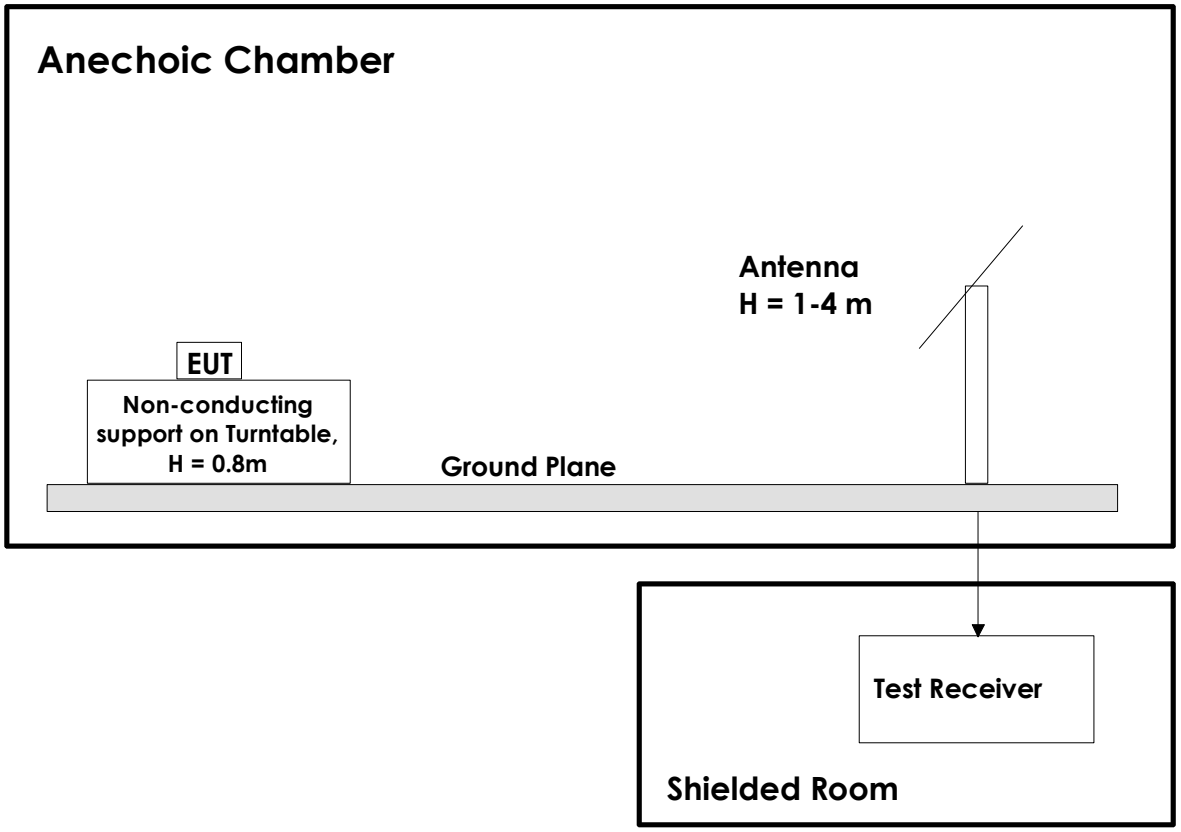
5 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

Inv.-Nr.	Instrument/ ancillary	Manufacturer	Type	Serial number	Cal. Date	Cal. Due
1-0037	Artificial mains network, 3ph	Rohde & Schwarz	ESH2-Z5	882394/019	2019-09	2020-09
1-0040	Biconical antenna	Rohde & Schwarz	HK116	888945/007	2017-07	2020-07
1-0054	Pulse limiter	Rohde & Schwarz	ESH3-Z2	3MSE/0099	2019-09	2020-09
1-0055	LogPer antenna	Rohde & Schwarz	HL223	826517/014	2017-07	2020-07
1-0072	Artificial mains network, 1ph	Rohde & Schwarz	ESH3-Z5	840062/001	2019-09	2020-09
1-0080	Turntable	H. Deisel	DS 420	1361114	N / A	N / A
1-0200	Trilog antenna	Schwarzbeck	VULB 9163	VULB 9163-107	2019-02	2022-02
1-0361	Semi anechoic chamber	Reinhold & Mahla	3m	1124	2019-12	2021-12
1-0364	Antenna cable 2	Kabelwerk Eupen	CMS / RG 214-N/7	none	2019-09	2022-09
1-0604	EMI test receiver	Rohde & Schwarz	ESU8	100203	2019-09	2020-09
1-0611	Spectrum analyzer	Rohde & Schwarz	FSV 40	100898	2019-09	2020-09
1-0614	Log.-per. antenna	Schwarzbeck	STLP 9148	STLP 9148-133	2019-08	2022-08
1-0615	Pre amplifier	Schwarzbeck	BBV-9718	BBV 9718-191	2019-09	2020-09
1-0619	Coaxial cable (to SAC)	Huber+Suhner	SF106/2x11N-651/2m	70168/6	2019-09	2022-09
1-0620	Antenna cable 3	Huber+Suhner	SF106/2x11N-651/3m	70619/6	2019-09	2022-09
1-0624	EMI-Software Radimation	DARE	Radimation	not applicable	N / A	N / A
1-0770	Horn antenna	Schwarzbeck	BBHA 9170	BBHA 9170-477	2018-06	2021-06
1-0771	Horn antenna	Schwarzbeck	BBHA 9170	BBHA 9170-476	2018-03	2021-03
1-0772	Horn antenna	Schwarzbeck	BBHA 9120D	BBHA 9120D-972	2018-03	2021-03
1-0781	Pre amplifier	Schwarzbeck	BBV 9721	BBV 9721-001	2019-09	2020-09
1-0782	Antenna cable	Huber & Suhner	FB142A1060002020	75193-01	2017-10	2020-10
1-0794	Coaxial cable	Rosenberger	FB142A0010002020	65627-01	2017-10	2020-10
1-0806	Controller	Innco	CO 3000	821/34571114/L	N / A	N / A
1-0807	Antenna mast	Innco	MA-400-XPET	4681114	N / A	N / A
1-0870	10 dB Attenuator	mini circiuts	BW-N10W5+	1429	2019-09	2022-09
1-0871	10 dB Attenuator	mini circiuts	BW-N10W5+	1414	2019-09	2022-09
1-0925	Coaxial cable	HARBOUR	RG316 MIL	#003	2019-09	2022-09
1-0927	Coaxial cable	HARBOUR	RG316 MIL	#005	2019-09	2022-09
1-0993	6 dB Attenuator	mini circiuts	BW-N6W5+	1725	2017-10	2020-10
1-0994	3 dB Attenuator	mini circiuts	BW-N3W5+	1734	2017-10	2020-10
1-0995	6 dB Attenuator	mini circiuts	UNAT-6+	15542	2017-09	2021-09
1-1012	Coaxial cable	Rosenberger	LA2-018-2000	010-1964471 0001	2018-09	2021-09
1-1037	Coaxial cable	Schwarzbeck	AK 9515H	AK 9515H #91	2018-09	2021-09

6 BLOCK DIAGRAM

6.1 Test Site Radiated Emission



Measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers.

Revision history

Version	Date	Comment	Sign
00	2020-07-28	First version	FH

End of Report