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Wireless test report – 350995-5TRFWL

Applicant:

Eurotech SpA

Product name:

ReliaGATE 10-12

DynaGATE 10-12

Model:

REGATE-10-12-GS02

Model variant:

DYGATE-10-12-GS02

FCC ID:

UKMMRG1012

IC Registration number:

21442-MRG1012

Specifications:

- FCC 47 CFR Part 15 Subpart C, §15.209
  Radiated emission limits; general requirements.
- RSS-GEN, Issue 5, Apr. 2018, section 8.9
  Transmitter Emission Limits

Date of issue: September 14, 2018

Test engineer(s):	Yong Huang, Wireless/EMC Specialist	Signature:	
Reviewed by:	Kevin Rose, Wireless/EMC Specialist	Signature:	

Test location(s)

Company name	Nemko Canada Inc.	
Address	303 River Road	292 Labrosse Avenue
City	Ottawa	Pointe-Claire
Province	Ontario	Quebec
Postal code	K1V 1H2	H9R 5L8
Country	Canada	Canada
Telephone	+1 613 737 9680	+1 514 694 2684
Facsimile	+1 613 737 9691	+1 514 694 3528
Toll free	+1 800 563 6336	
Website	www.nemko.com	www.nemko.com
Site number	FCC: CA2040; IC: 2040A-4 (3 m SAC)	FCC: CA2041; IC: 2040G-5 (3 m SAC)

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Copyright notification

Table of contents

Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Eurotech SpA
Address	Via Fratelli Solari 3/a 33020 Amaro, UD, Italy

1.2 Test specifications

FCC 47 CFR Part 15 Subpart C, §15.209	Radiated emission limits; general requirements.
RSS-GEN, Issue 5, Apr. 2018, section 8.9	Transmitter Emission Limits for Licence-Exempt Radio Apparatus

1.3 Test methods

ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.5 below. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.5 Exclusions

As per quote, the purpose of this report is verification of transmitters colocation. Only inter-modulation products within restricted bands were assessed, other requirements were excluded from the scope of this report.

1.6 Test report revision history

Revision #	Date of issue	Details of changes made to test report
TRF	September 14, 2018	Original report issued

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, general requirements test results

Part	Test description	Verdict
§15.209	Radiated emission limits; general requirements.	Pass

2.2 ISED RSS-GEN, Issue 5, test results

Part	Test description	Verdict
8.9	Transmitter Emission Limits for Licence-Exempt Radio Apparatus	Pass

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	August 18, 2018
Nemko sample ID number	Item #2

3.2 EUT information

Product name	ReliaGATE 10-12 DynaGATE 10-12
Model	REGATE-10-12-GS02
Model variant	DYGATE-10-12-GS02
Serial number	Y117LQA0010

3.3 Technical information

All used IC test site(s) Reg. number	2040G-5
RSS number and Issue number	RSS-GEN, Issue 5, Apr. 2018, section 8.9
Frequency band	WIFI/ BT/BLE:2400–2483.5 MHz band WIFI:5150–5250 MHz, 5725–5850 MHz bands LTE North America Bands
Type of modulation	GFSK, 802.11a/n, OFDM
Emission classification (F1D, G1D, D1D)	F1D, W7D
EUT power requirements	24 $V_{DC,}$ via 120 V_{AC} adapter or battery
Antenna information	The EUT uses a unique antenna coupling. EUT has 2 antenna configurations. The max antenna peak gain is 5.47 dBi at 2.4 GHz band and 7.07 dBi at 5 GHz WIFI bands.

3.4 EUT setup diagram

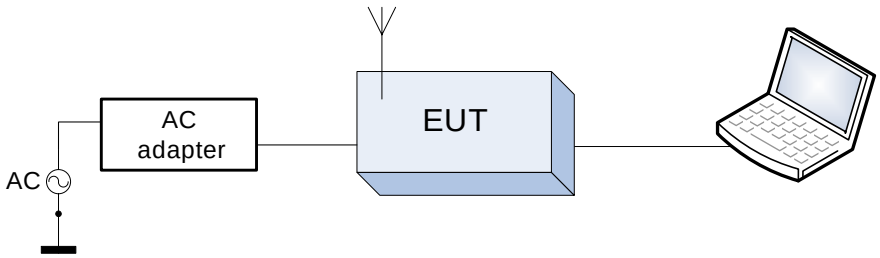


Figure 3.4-1: *Setup diagram*

3.5 EUT sub assemblies

Table 3.5-1: *EUT sub assemblies*

Description	Brand name	Model/Part number	Serial number
REGATE-10-12	Eurotech	REGATE-10-12-GS02	Y117LQA0010
AC adapter	Sunny	SYS15412424	None

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

Differences between the variants are as below. REGATE-10-12 was chosen as representative worst-case.

Model	**ReliaGATE 10-12**					**DynaGATE 10-12**				
Variant (Base Hardware) REGATE-10-12-xx	**REGATE-10-12-GS02 (EMC Sample Unit)**	**REGATE-10-12-01**	**REGATE-10-12-02**	**REGATE-10-12-03**	**REGATE-10-12-05**	**DYGATE-10-12-GS02 (EMC Sample Unit)**	**DYGATE-10-12-01**	**DYGATE-10-12-02**	**DYGATE-10-12-03**	**DYGATE-10-12-05**
OS SW Versions Refer Note 1.	-	**REGATE-10-12-21 REGATE-10-12-31**	**REGATE-10-12-22 REGATE-10-12-32**	**REGATE-10-12-23 REGATE-10-12-33**	**REGATE-10-12-25 REGATE-10-12-35**	-	**DYGATE-10-12-21 DYGATE-10-12-31**	**DYGATE-10-12-22 DYGATE-10-12-32**	**DYGATE-10-12-23 DYGATE-10-12-33**	**DYGATE-10-12-25 DYGATE-10-12-35**
GENERAL										
Processor	TI Sitara AM3352 1GHz									
DRAM	1GB DDR3									
STORAGE	4GB eMMC, micro SD slot accessible under service panel opening, 256kbit EEPROM									
PCB Design	Both models share the same PCB design with population differences as described below (8-layers PCB)									
Ethernet	2x 10-100Mbps on shielded RJ45									
Serial	Two identical 2-lines channels(RX/TX, RA+/RB-) available on 3.5mm terminal									
Debug	RS232 3.3V TTL debug port available under service panel opening									
CAN	Two identical Can bus ports available on 3.5mm terminal header with external power delivery 5V@100mA									
Digital I/O	2x Digital Input 36V, 1kV Opto-isolated, 2x Digital Output (40VDC), 500mA fuse protected, 1KHz Max Switching(optorelay)									
USB	3x Host 2.0 (Noise and Surge Protected) - Type A – Electrically identical to DynaGATE 10-12 Variants					3x Host 2.0 (Noise and Surge Protected) - High Retention Type A - Electrically identical to ReliaGATE 10-12 Variants				
Expansion	Yes, for Side Expansion Modules (24way 2mm/2row female header)									
WIRELESS										
LTE	TELIT LE910-NA1 LTE	None	None	TELIT LE910-NA1 LTE		TELIT LE910-NA1 LTE	None	None	TELIT LE910-NA1 LTE	
WiFi	Jorjin WG7833-B0	None	Jorjin WG7833-B0	None	Jorjin WG7833-B0	Jorjin WG7833-B0	None	Jorjin WG7833-B0	None	Jorjin WG7833-B0
GPS	U-Blox NEO M8 GPS	Optional U-Blox NEO-M8x GPS Receiver				Integrated U-Blox NEO-M8x GPS Receiver				
OTHER										
RTC	Yes (Lithium BR1225 battery backup)					Yes (Supercap backup)				
Sensors	Temperature, Accelerometer									
Buttons	1x RESET, 1x user programmable available under the service panel									
LEDs	1x Power, 1x Cellular, 4x Programmable									
TPM	Factory Option									
SIM slot	2x microSIM (User Accessible under the service panel)									
Power	6-36VDC, with Transient Protection, Vehicle Ignition Sense (2W typ.)									
ENVIRONMENT										
Operating temp. range	- 20 to +70°C					- 40 to +85°C				
Storage temp. range	- 40 to +85°C									
MECHANICAL										
Enclosure	ABS Plastic					Aluminium Sheetmetal				
Ingress	IP40									
Dimensions	138.9x115.0x46.2mm (LxWxH) - with mounting bracket and SMA connectors					138.9x118.2x51.6mm (LxWxH) - with mounting bracket and SMA connectors				

Note 1: Radio module firmware and operating system based radio firmware loaded during OS boot are identical across all REGATE-10-12-xx and DYGATE-10-12-xx variants.

The EUT has WIFI and Bluetooth in 2.4 GHz band, WIFI is chosen to be the representative worst-case due to higher output power.

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060 mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

UKAS Lab 34 and TIA-603-B have been used as guidance for measurement uncertainty reasonable estimations with regards to previous experience and validation of data. Nemko Canada, Inc. follows these test methods in order to satisfy ISO/IEC 17025 requirements for estimation of uncertainty of measurement for wireless products.

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of K = 2 with 95% certainty.

Test name	Measurement uncertainty, dB
All antenna port measurements	0.55
Conducted spurious emissions	1.13
Radiated spurious emissions	3.78
AC power line conducted emissions	3.55

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002532	2 year	June 5/19
Flush mount turntable	Sunol	FM2022	FA002550	—	NCR
Controller	Sunol	SC104V	FA002551	—	NCR
Antenna mast	Sunol	TLT2	FA002552	—	NCR
3 Phase AC Power Source	apc AC Power	45 kVA	FA002677	—	VOU
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 40	FA002071	1 year	Sept. 18/18
Bilog antenna (20–2000 MHz)	Sunol	JB1	FA002517	1 year	Dec. 6/18
Horn antenna (1–18 GHz)	EMCO	3115	FA001452	1 year	Nov. 20/18
Pre-amplifier (0.5–18 GHz)	COM-POWER	PAM-118A	FA002561	1 year	Sept. 21/18
Horn antenna (18–40 GHz)	EMCO	3116	FA002487	2 year	Aug. 16/19
Pre-amplifier (18–40 GHz)	COM-POWER	PAM-840	FA002508	1 year	July 8/19
50 Ω coax cable	C.C.A.	None	FA002603	—	VOU
50 Ω coax cable	C.C.A.	None	FA002605	—	VOU
50 Ω coax cable	C.C.A.	None	FA002831	—	VOU
5150-5350 MHz Notch Filter	Microwave Circuits	N0452501	FA002690	—	VOU
2300-2583.5 MHz Notch Filter	Microwave Circuits	N0324413	FA002693	—	VOU

Note: NCR - no calibration required, VOU - verify on use

Section 8. Testing data

8.1 FCC 15.209 and RSS-GEN section 8.9 Radiated emission limits; general requirements

8.1.1 Definitions and limits

FCC:
(f) In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in §15.109 that are applicable to the incorporated digital device.

ISED:
Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 8.1-1: *FCC §15.209 and RSS-Gen – Radiated emission limits*

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/m	
0.009–0.490	2400/F	$67.6 - 20 \times \log_{10}(F)$	300
0.490–1.705	24000/F	$87.6 - 20 \times \log_{10}(F)$	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes: In the emission table above, the tighter limit applies at the band edges.
For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

Table 8.1-2: *ISED restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	12.57675–12.57725	399.9–410	7.25–7.75
0.495–0.505	13.36–13.41	608–614	8.025–8.5
2.1735–2.1905	16.42–16.423	960–1427	9.0–9.2
3.020–3.026	16.69475–16.69525	1435–1626.5	9.3–9.5
4.125–4.128	16.80425–16.80475	1645.5–1646.5	10.6–12.7
4.17725–4.17775	25.5–25.67	1660–1710	13.25–13.4
4.20725–4.20775	37.5–38.25	1718.8–1722.2	14.47–14.5
5.677–5.683	73–74.6	2200–2300	15.35–16.2
6.215–6.218	74.8–75.2	2310–2390	17.7–21.4
6.26775–6.26825	108–138	2483.5–2500	22.01–23.12
6.31175–6.31225	149.9–150.05	2655–2900	23.6–24.0
8.291–8.294	156.52475–156.52525	3260–3267	31.2–31.8
8.362–8.366	156.7–156.9	3332–3339	36.43–36.5
8.37625–8.38675	162.0125–167.17	3345.8–3358	Above 38.6
8.41425–8.41475	167.72–173.2	3500–4400	
12.29–12.293	240–285	4500–5150	
12.51975–12.52025	322–335.4	5350–5460	

Note: Certain frequency bands listed in Table 8.1-2 and above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

Table 8.1-3: *FCC restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

8.1.2 Test summary

Test start date	July 16, 2018
Test engineer	Yong Huang

8.1.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to 40 GHz.
EUT's LTE and WIFI transmitters were set to transmit continuously, different channel setting has been investigated as per provided by client's setup, only the worst-case is presented.
Radiated measurements were performed at a distance of 3 m for frequency rand below 18 GHz, and 1 m for frequency range above 18 GHz. No inter-modulation products emissions were detected above 18 GHz within 6 dB below the limit.

Spectrum analyzer settings for frequencies below 30 MHz:

Detector mode	Quasi-Peak
Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Trace mode	Max Hold
Measurement time	100 ms

Spectrum analyser settings for radiated measurements within restricted bands 30 MHz to 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for average radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	10 Hz
Detector mode:	Peak
Trace mode:	Max Hold

8.1.4 Test data

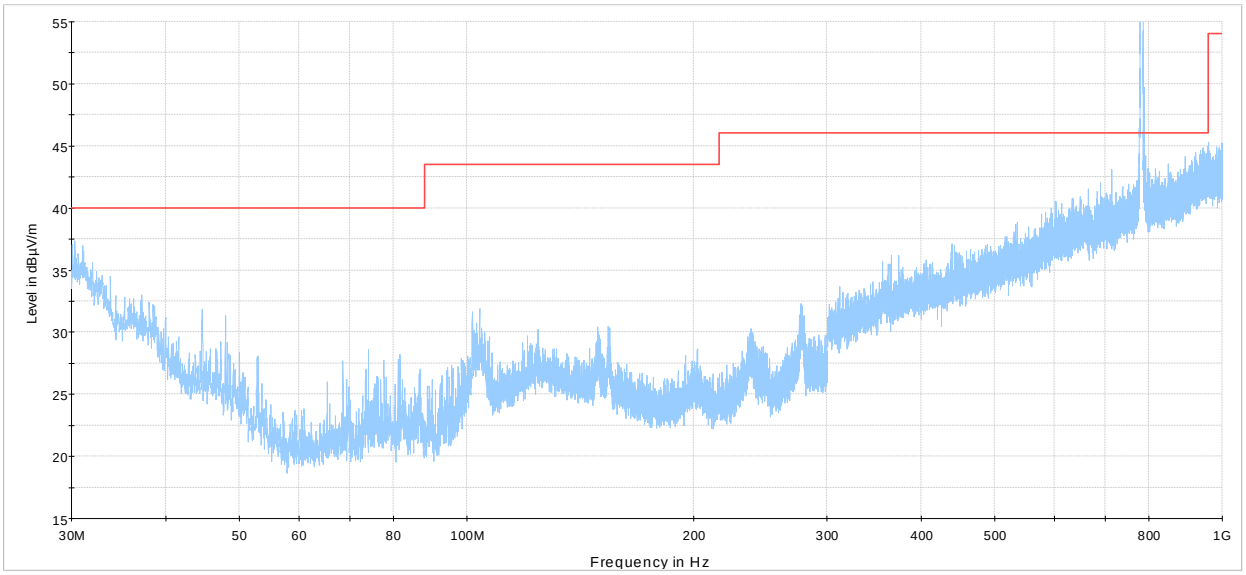


Figure 8.1-1: *Radiated spurious emissions, LTE Tx at 782 MHz, WIFI Tx at 2412 MHz*

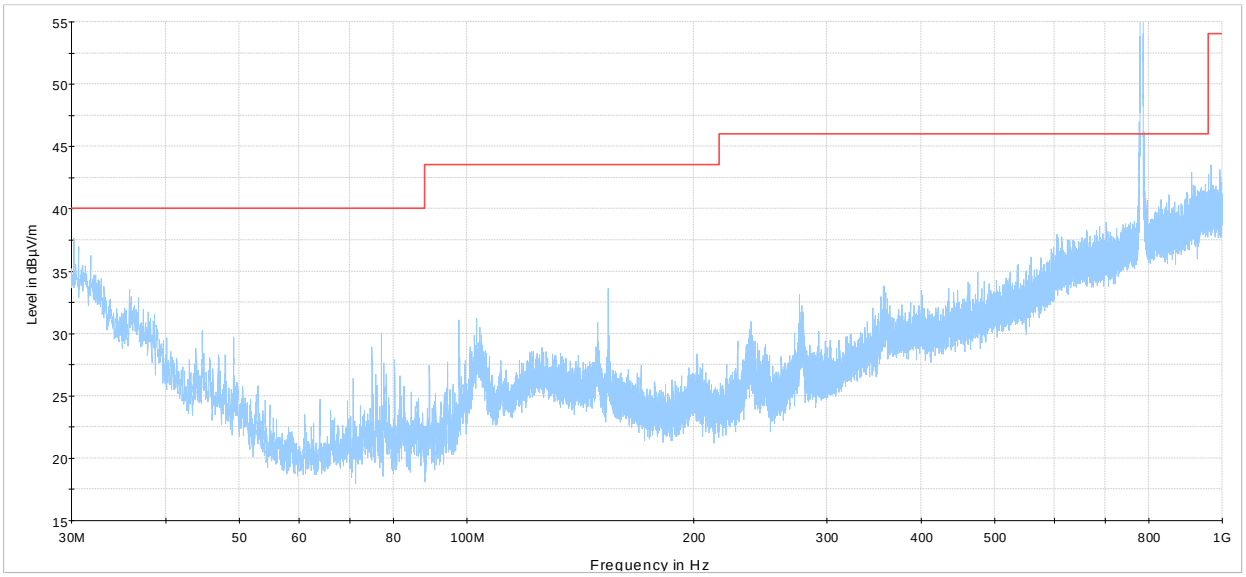


Figure 8.1-2: *Radiated spurious emissions, LTE Tx at 782 MHz, WIFI Tx at 5200 MHz*

Note: Emissions above the limit were from intentional emissions. no intermodulation emissions were detected

8.1.4 Test data, continued

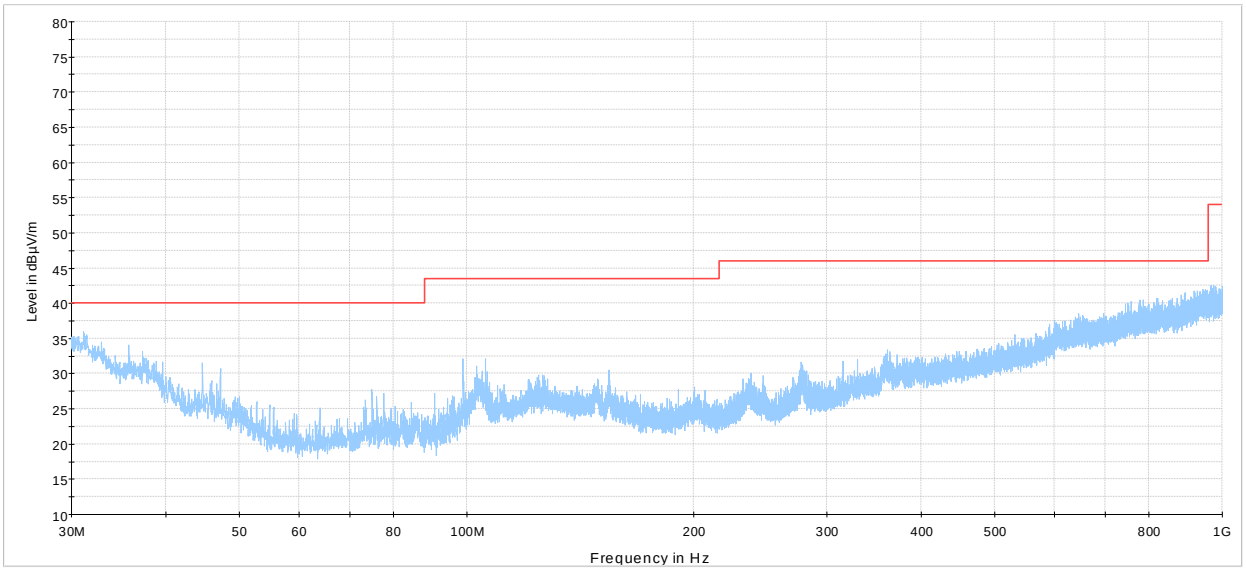


Figure 8.1-3: *Radiated spurious emissions, LTE Tx at 1883 MHz, WIFI Tx at 2412 MHz*

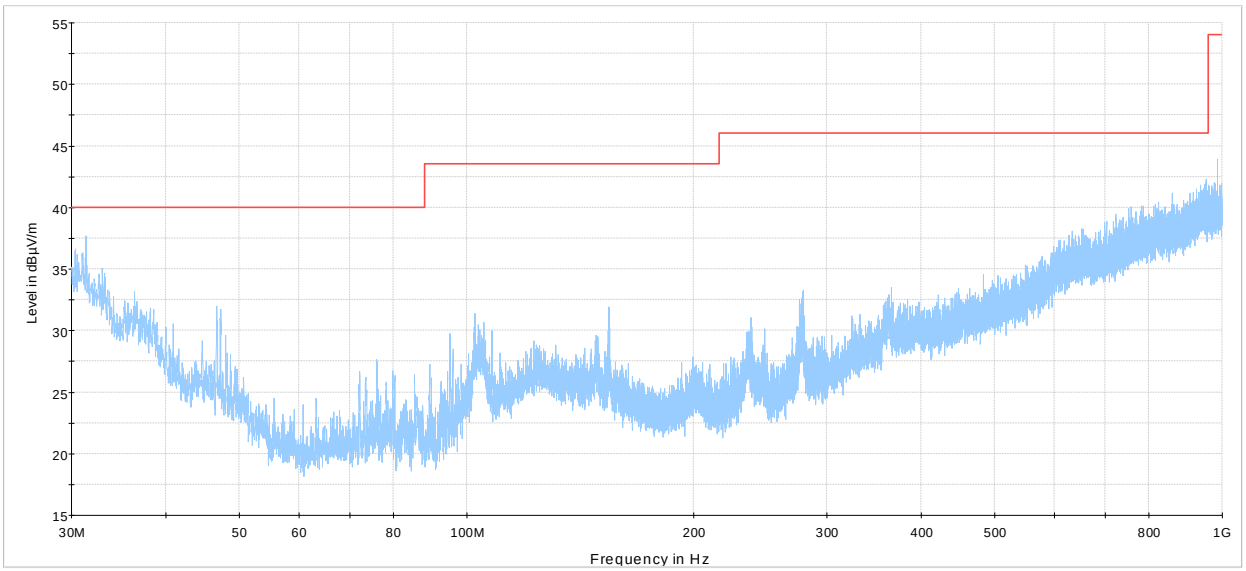


Figure 8.1-4: *Radiated spurious emissions, LTE Tx at 1883 MHz, WIFI Tx at 5200 MHz*

8.1.4 Test data, continued

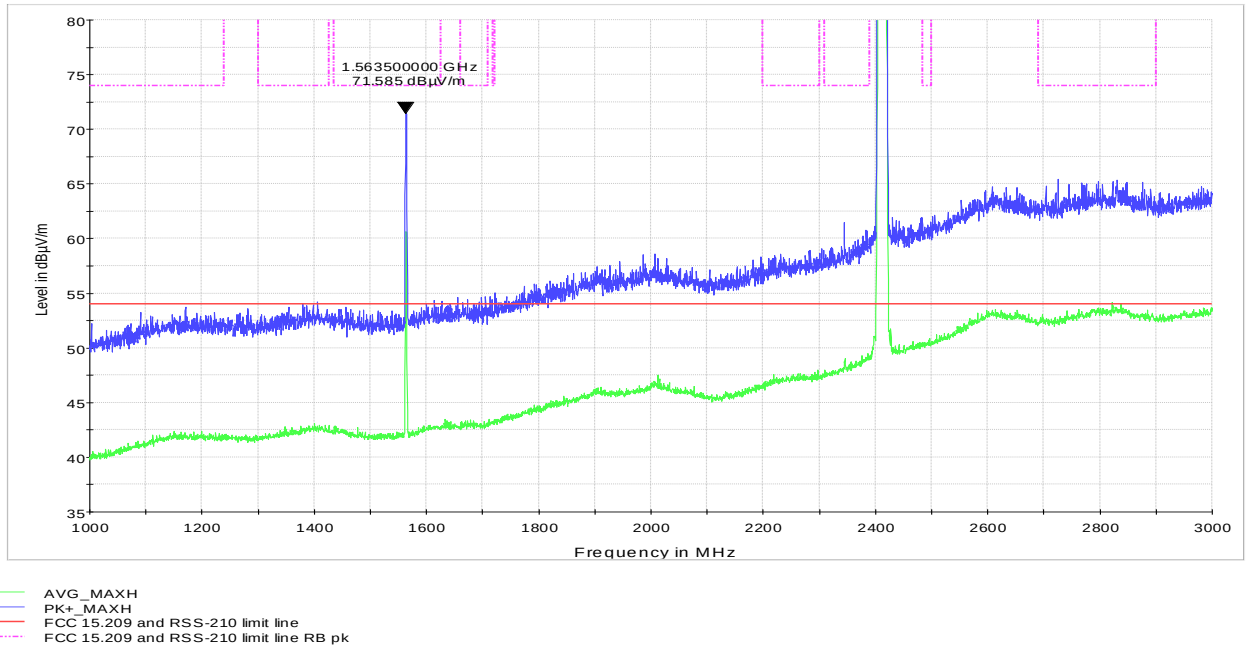


Figure 8.1-5: *Radiated spurious emissions, LTE Tx at 782 MHz, WIFI Tx at 2412 MHz*

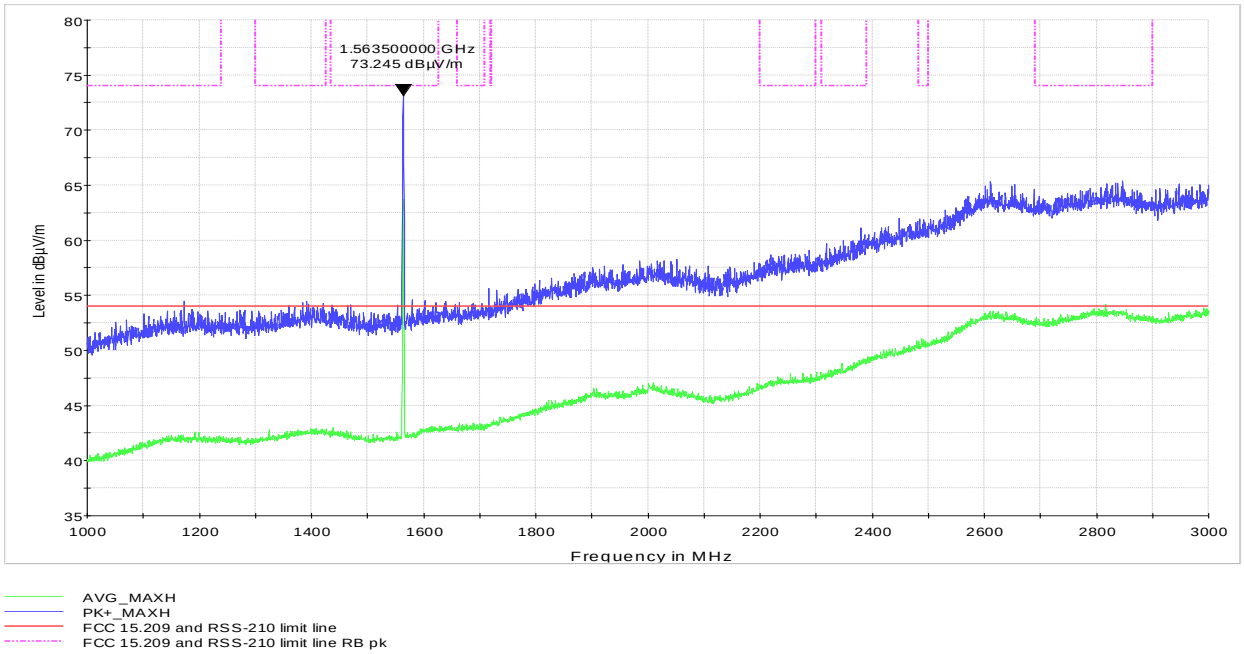


Figure 8.1-6: *Radiated spurious emissions, LTE Tx at 782 MHz, WIFI Tx at 5200 MHz*

Note: Emissions above the limit were from intentional emissions or their harmonic, no intermodulation emissions were detected

8.1.4 Test data, continued

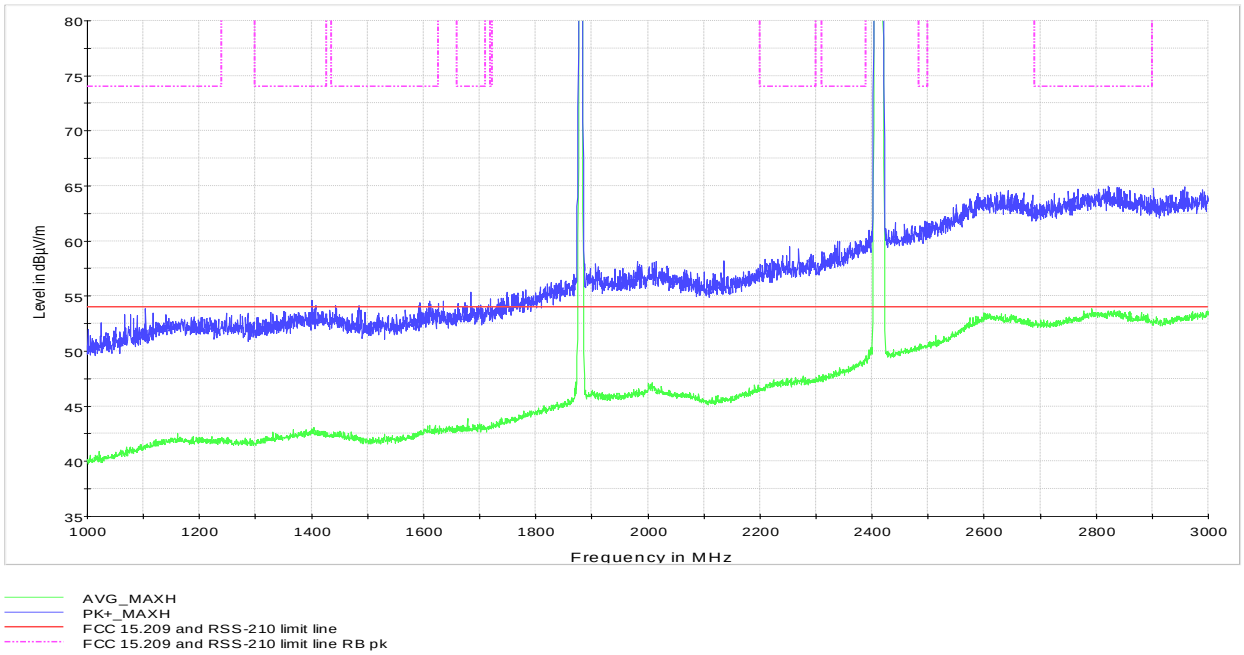


Figure 8.1-7: *Radiated spurious emissions, LTE Tx at 1883 MHz, WIFI Tx at 2412 MHz*

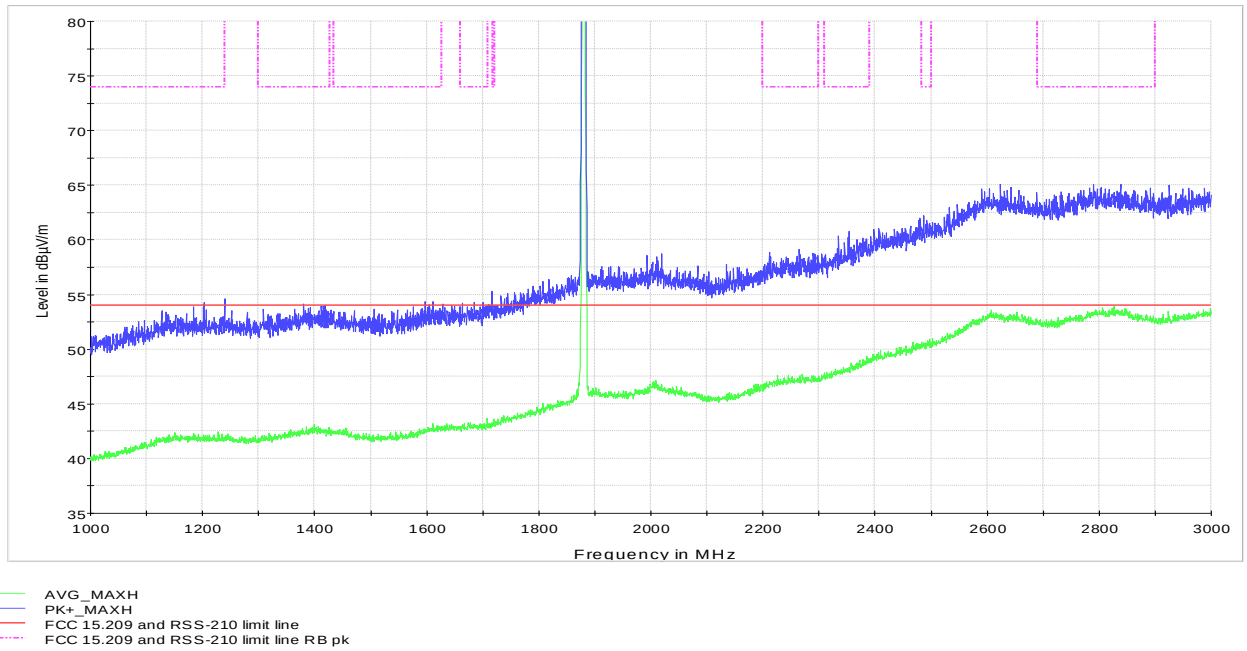


Figure 8.1-8: *Radiated spurious emissions, LTE Tx at 1883 MHz, WIFI Tx at 5200 MHz*

Note: Emissions above the limit were from intentional emissions.

8.1.4 Test data, continued

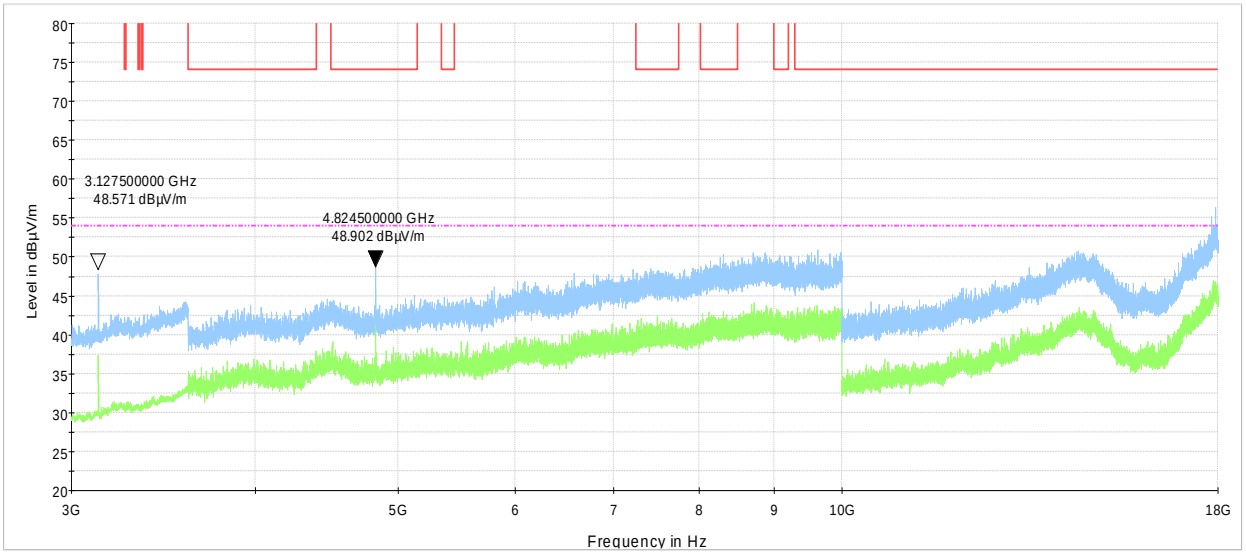


Figure 8.1-9: *Radiated spurious emissions, LTE Tx at 782 MHz, WIFI Tx at 2412 MHz*

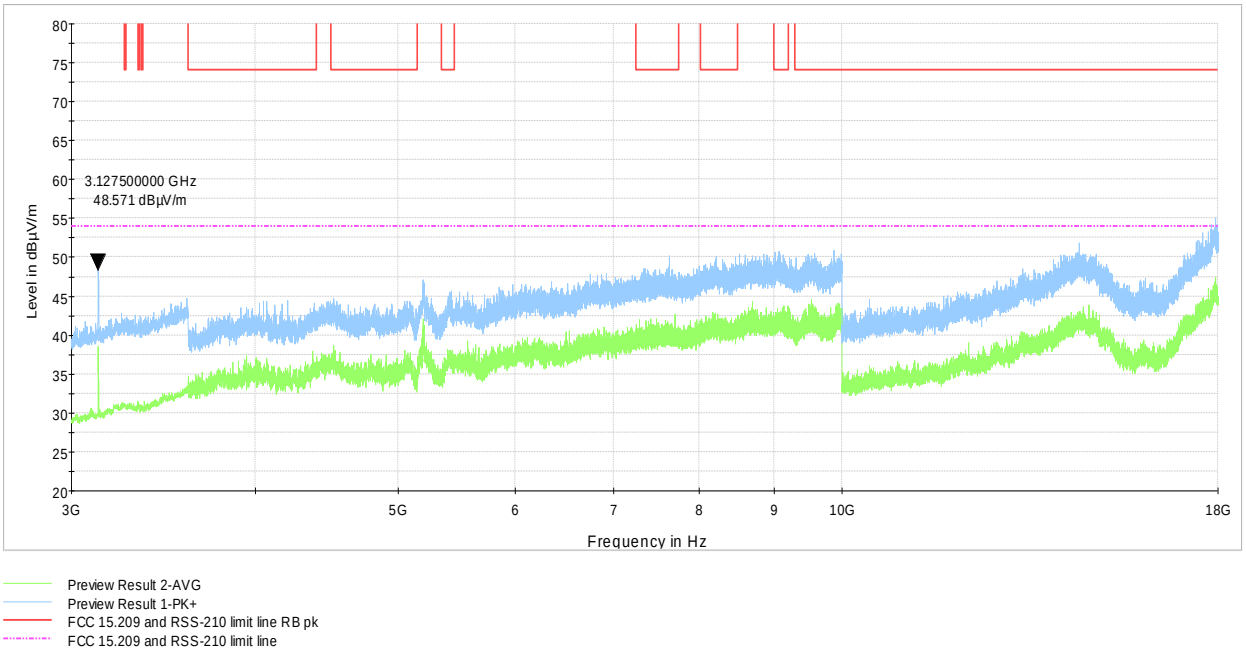


Figure 8.1-10: *Radiated spurious emissions, LTE Tx at 782 MHz, WIFI Tx at 5200 MHz*

8.1.4 Test data, continued

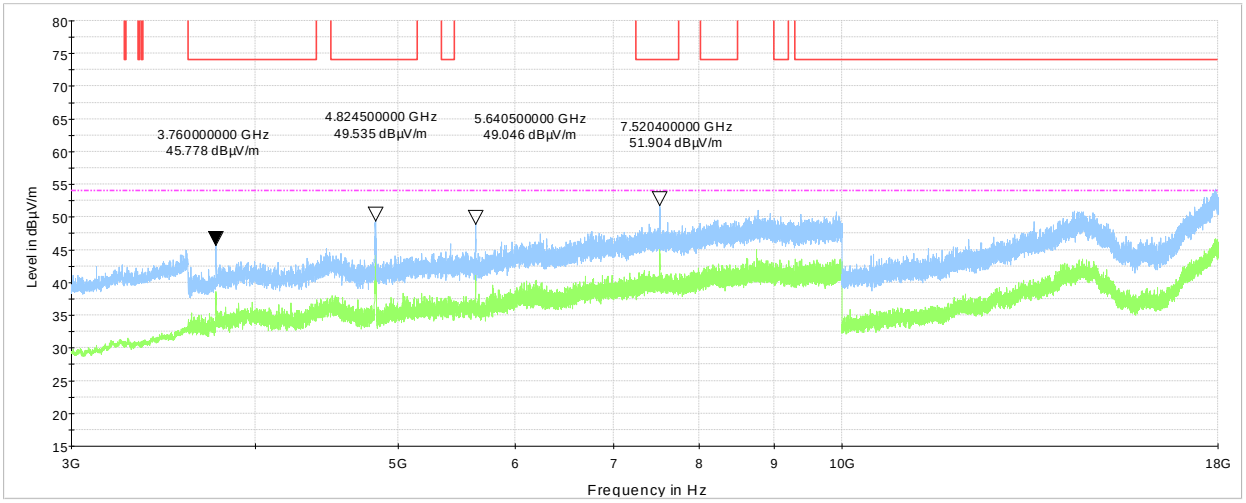


Figure 8.1-11: *Radiated spurious emissions, LTE Tx at 1883 MHz, WIFI Tx at 2412 MHz*

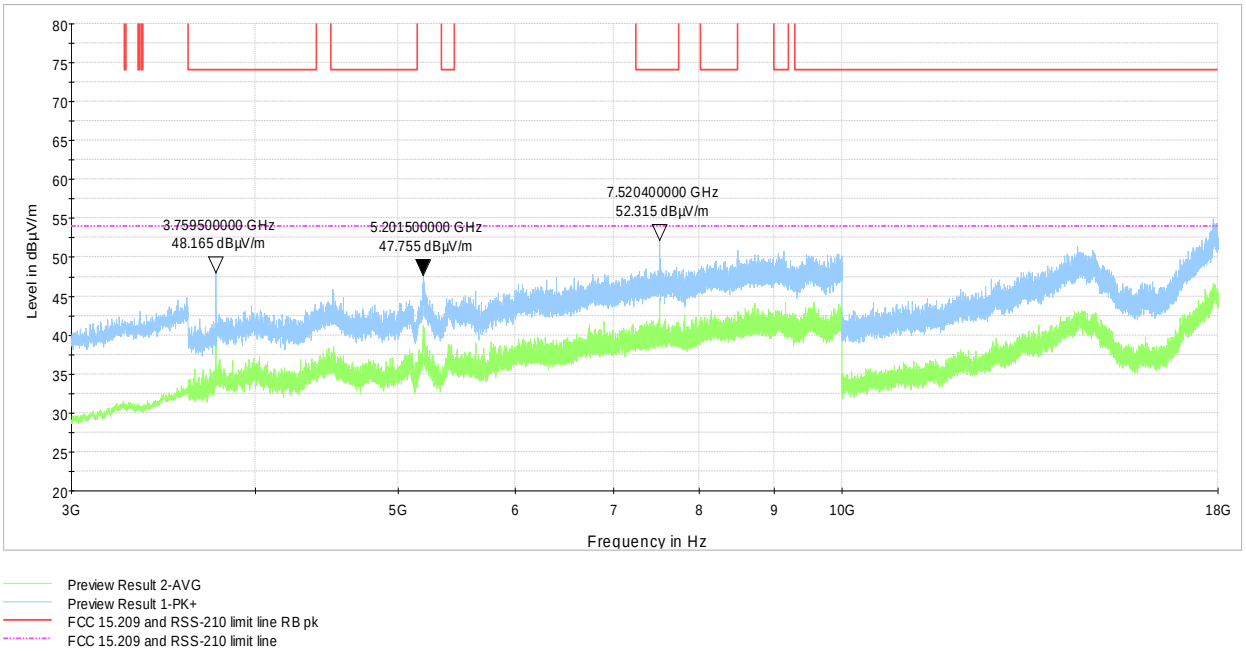
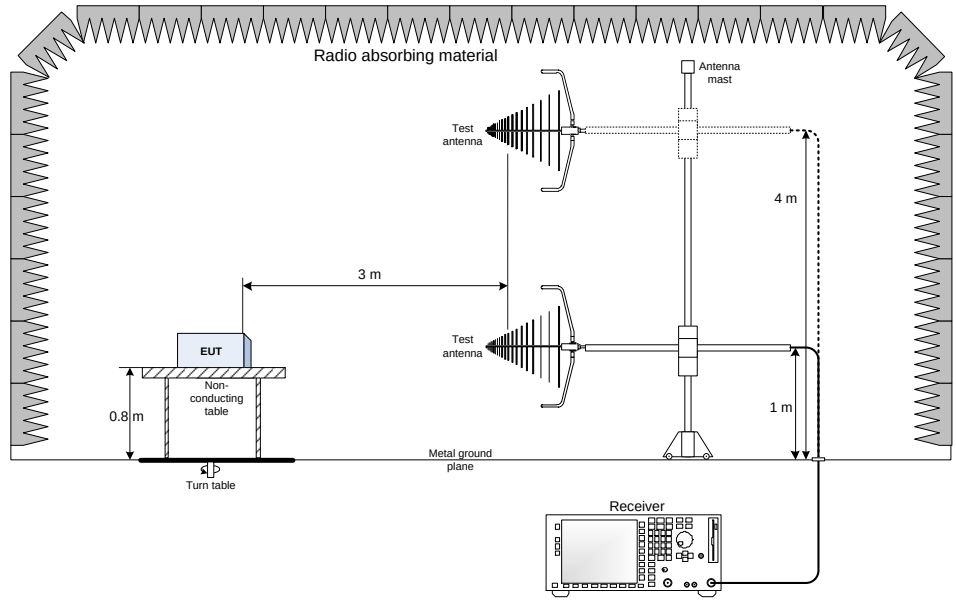


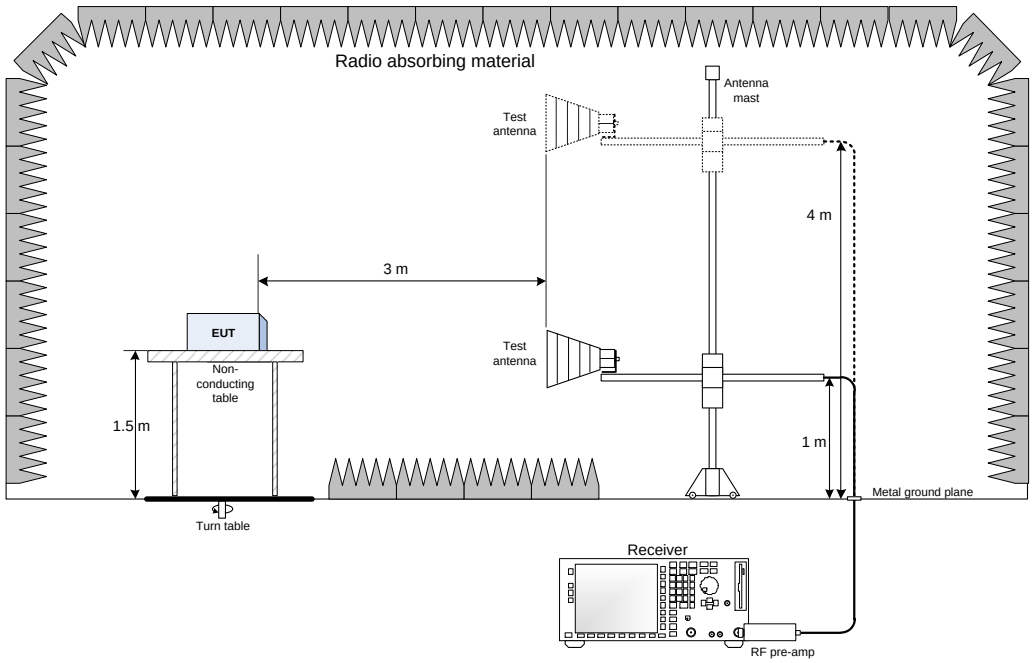
Figure 8.1-12: *Radiated spurious emissions, LTE Tx at 1883 MHz, WIFI Tx at 5200 MHz*

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up for frequencies below 1 GHz



9.2 Radiated emissions set-up for frequencies above 1 GHz



(End of report)