

Test report

327248-1R2TRFWL

Date of issue: August 3, 2017

Applicant:

Eddy Home Inc.

Product:

Eddy Hub

Model:

HUBV1

FCC ID:

2AKHG-HUBV1

IC Registration number:


22180-HUBV1

Specifications:

- ◆ FCC 47 CFR Part 15.247, Part 22 (h), and Part 24 (e)
- ◆ RSS-132, 133, and 247

Test location

Company name	Nemko Canada Inc.
Address	303 River Road
City	Ottawa
Province	Ontario
Postal code	K1V 1H2
Country	Canada
Telephone	+1 613 737 9680
Facsimile	+1 613 737 9691
Toll free	+1 800 563 6336
Website	www.nemko.com
Site number	FCC: 176392; IC: 2040A-4 (3 m semi anechoic chamber)

Tested by	Kevin Rose, Wireless/EMC Specialist
Reviewed by	David Duchesne, Senior EMC/Wireless Specialist
Review date	August 3, 2017
Reviewer signature	

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.

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Eddy Home Inc.
Address	1600-25 Sheppard Ave. W., Toronto, ON, Canada, M2N 6S6

1.2 Test methods

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

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. 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.

1.4 Exclusions

None

1.5 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued
R1	Clarification of voltage levels
R2	TCB comments



Section 2. Summary of test results

2.1 Co location test results

Test description	Verdict
Co Location	Pass



Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	March 23, 2017
Nemko sample ID number	1 and 2

3.2 EUT information

Product name	Eddy Hub
Model	HUBV1
Serial number	NA
Part number	NA
Power requirements	120 Vac 60 Hz
Operational frequencies	GSM 850 MHz, PCS 1900 MHz, Band V (850 MHz) Band II (1900 MHz), 2.4 GHz wi-fi, ISM 915
Software details	1.1.3.1

3.3 Technical information

Applicant IC company number	22180
IC UPN number	HUBV1
All used IC test site(s) Reg. number	2040A-4

3.4 Product description and theory of operation

The Eddy Hub is a LoRa gateway serving to provide connectivity from LoRa end node devices to the internet through cellular, WiFi, or Ethernet.

3.5 EUT exercise details

- The Transmitters were operational per the Customers test plan

3.6 EUT setup details

Table 3.6-1: EUT sub assemblies

Description	Brand name	Model/Part number	Serial number	Rev.
Cellular module	Particle	U260		
Wifi module	Particle	P1		

Table 3.6-2: EUT interface ports

Description	Qty.
DC power	1
Ethernet	1
uUSB (internal)	2
JTAG(internal)	1
SWD(internal)	1

Table 3.6-3: Support equipment

Description	Brand name	Model/Part number	Serial number	Rev.
AC adapter				

Table 3.6-4: Inter-connection cables

Cable description	From	To	Length (m)
µUSB	EUT	Diag. / flashing PC	1

3.7 EUT setup diagram

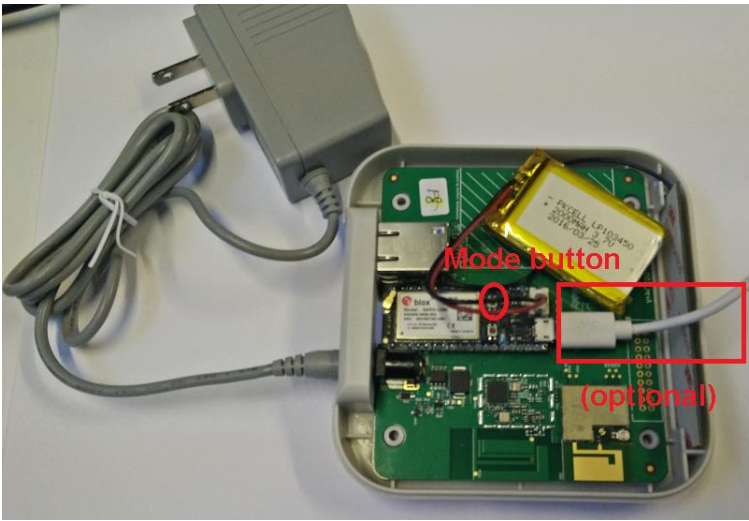


Figure 3.7-1: Setup diagram

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

None

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 $\pm 5\%$, for which the equipment was designed.



Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

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	FA002047	1 year	Dec. 01/17
Horn antenna (1–18 GHz)	EMCO	3115	FA000825	1 year	Apr. 26/17
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Apr. 28/17
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Jan. 31/18
Pre-amplifier (1–18 GHz)	JCA	JCA118-503	FA002091	1 year	April 26/17

Note: None

Section 8. Testing data

8.1 Co Location Per customer request.

8.1.1 Definitions and limits

The Following test case senarios were evaluated.

Table 8.1-1: Test case

Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2

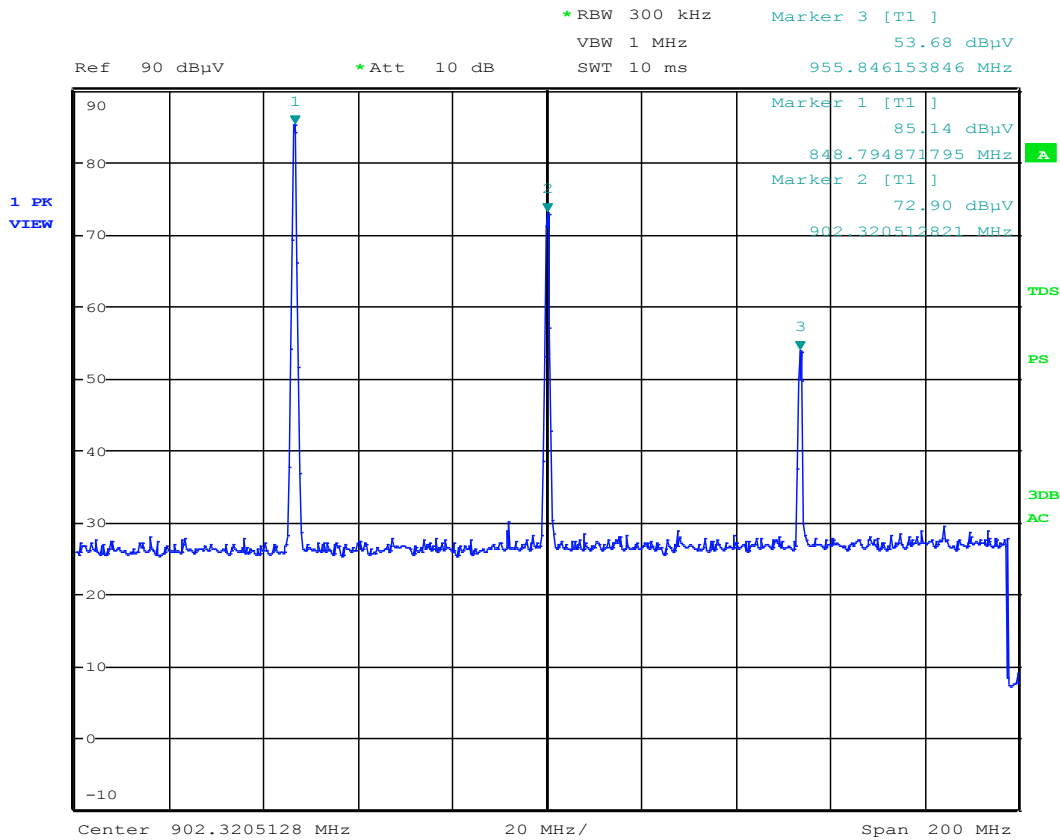
8.1.2 Test summary

Test date	June 20, 2017	Temperature	23 °C
Test engineer	Kevin Rose	Air pressure	1004 mbar
Verdict	Pass	Relative humidity	39 %

8.1.3 Observations, settings and special notes

None

8.1.4 Test data



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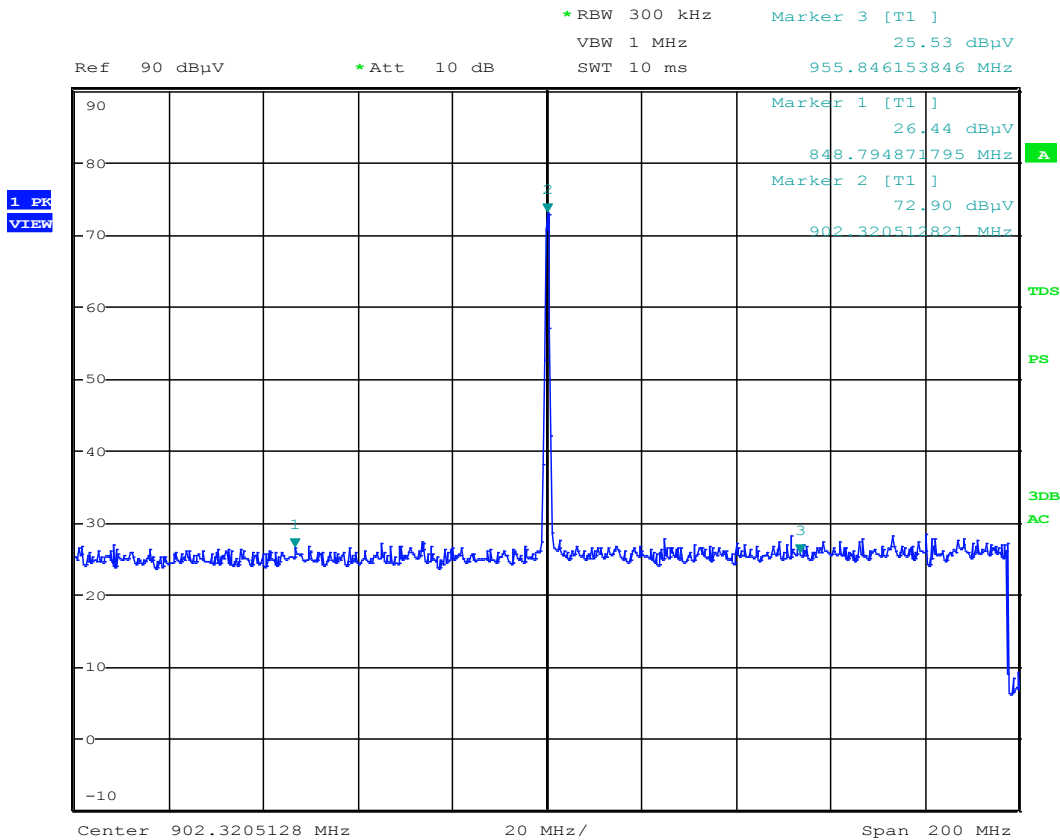
Plot 8.1-1: 955 MHz is caused when the cellular is operational No interaction with the 903 MHz

Table 8.1-2: Scenario 1

Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2

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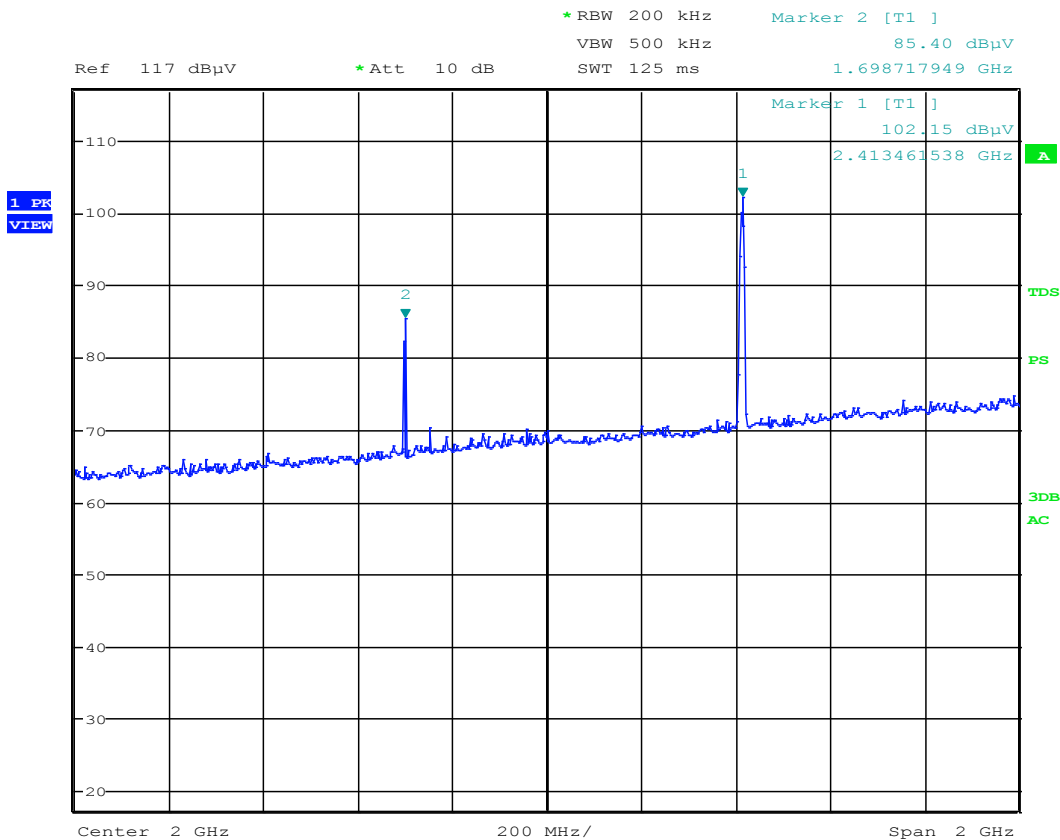


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Plot 8.1-2: 903 MHz stand alone

Table 8.1-3: Test case Scenario 1

Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2

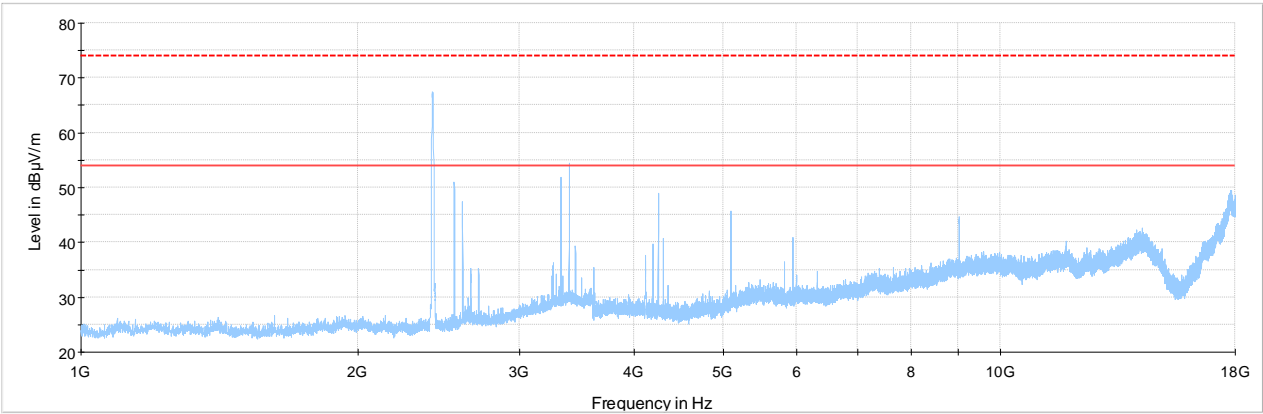


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Plot 8.1-3: 848.8 MHz 2nd Harmonic

Table 8.1-4: Test case Scenario 1

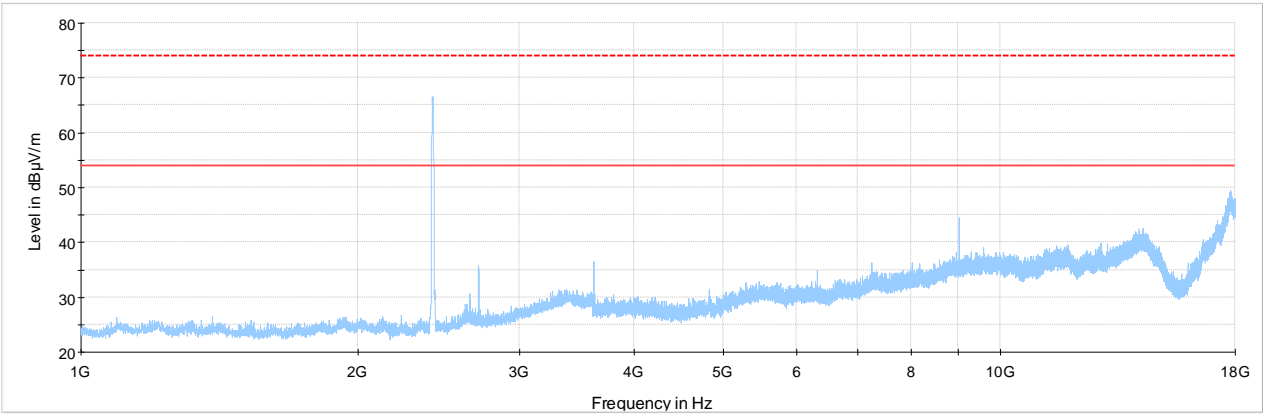
Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2



Plot 8.1-4: Cell module creates the spikes. The limit for it is -13 dBm

Table 8.1-5: Test case Scenario 1

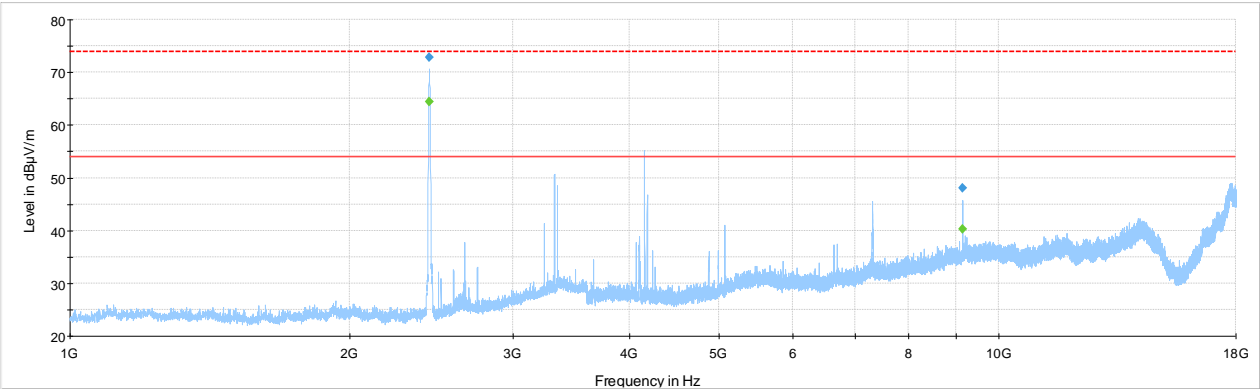
Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2



Plot 8.1-5: No cell on to prove the signals

Table 8.1-6: Test case Scenario 1

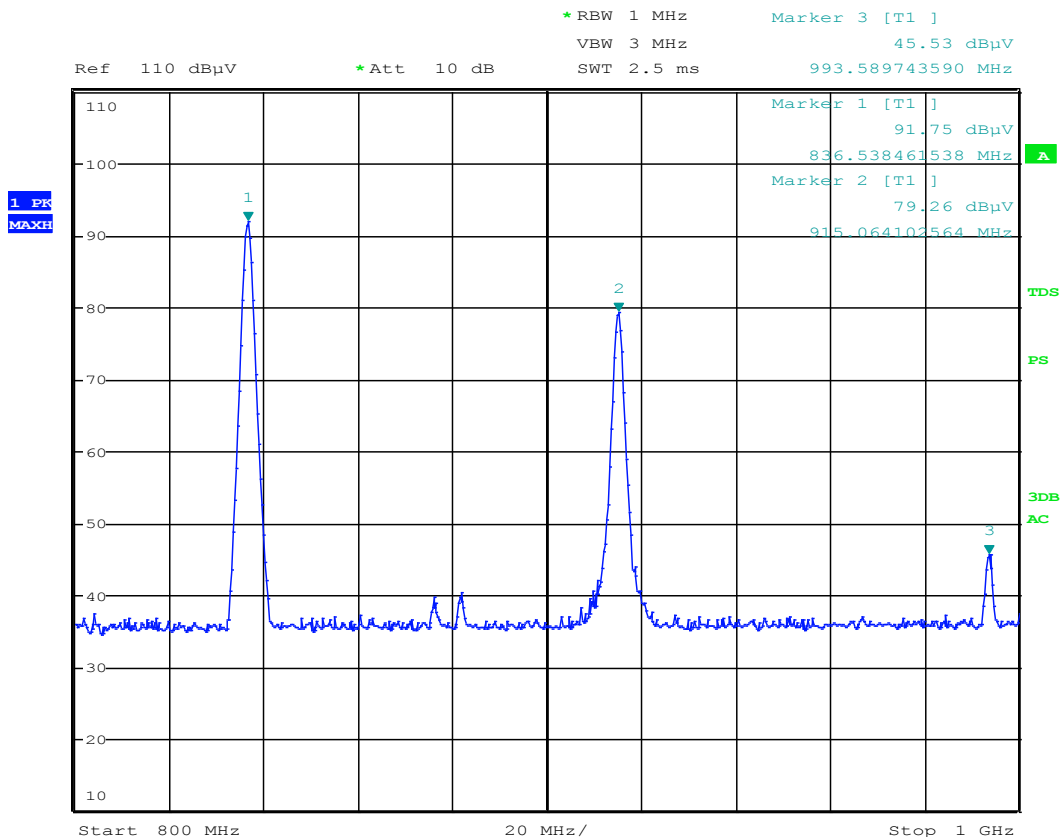
Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2



Plot 8.1-6: 1–18 GHz using the 3000-12000 MHz filter

Table 8.1-7: Test case Scenario 2

Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2

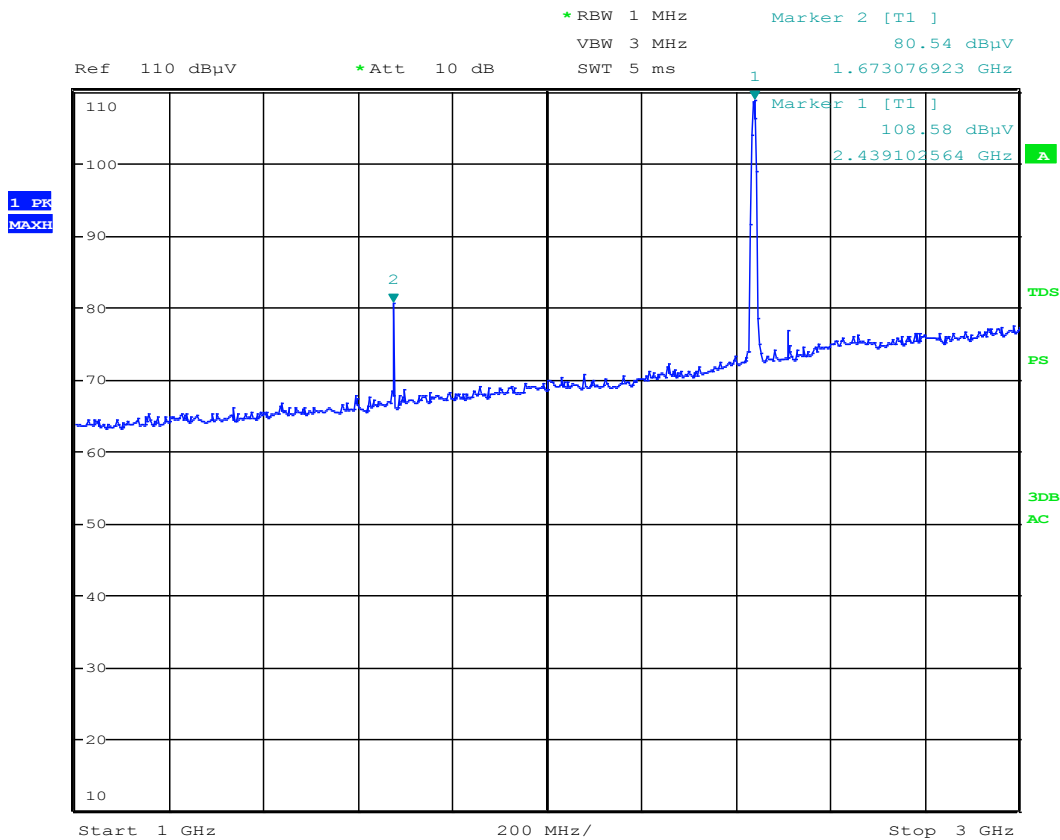


Date: 20.JUN.2017 03:51:47

Plot 8.1-7: Intermodulation Between 915 and 836.6 TX Below the limit. 54 dBμV/m

Table 8.1-8: Test case Scenario 2

Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2

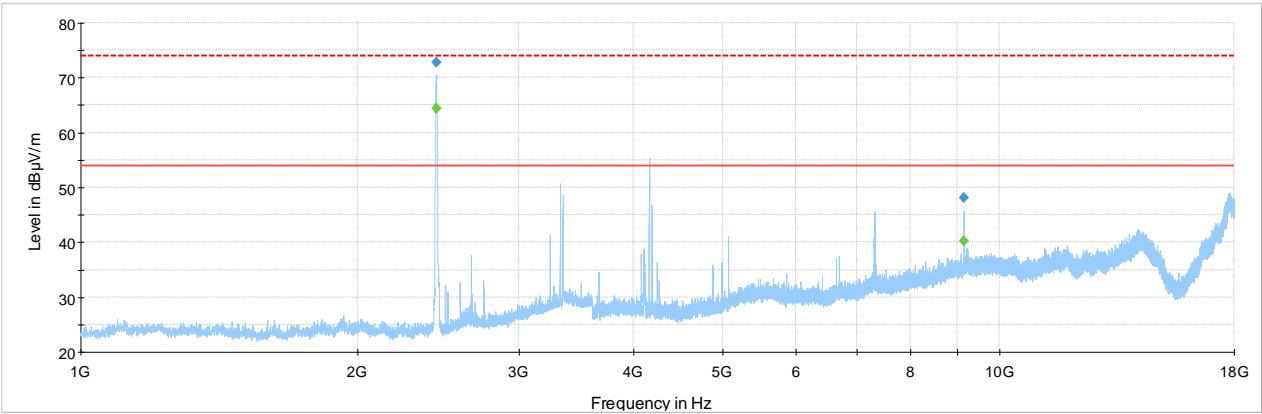


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Plot 8.1-8: 915, 2442 and 836.6 with no filter

Table 8.1-9: Test case Scenario 2

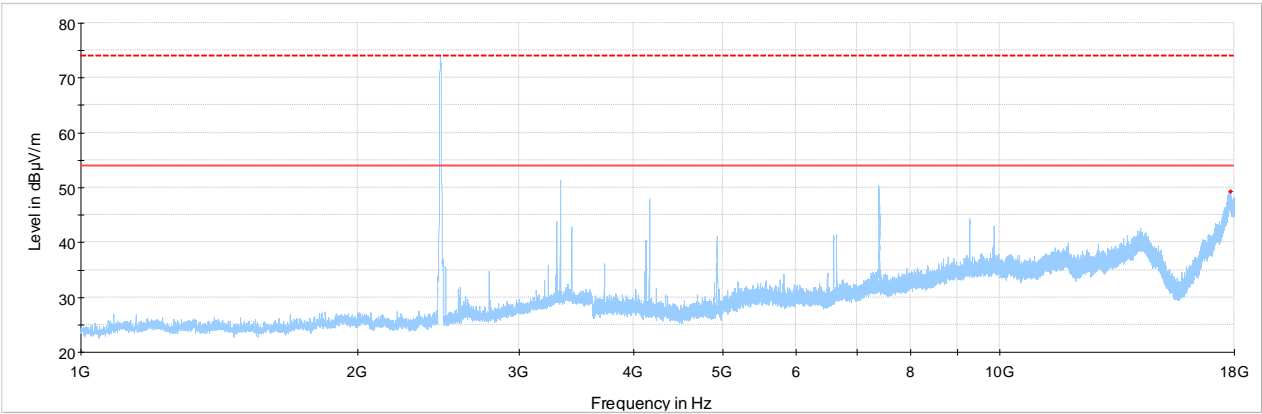
Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2



Plot 8.1-9: 915, 2442 NO CELL 836.6 using the 3000-12000 MHz filter

Table 8.1-10: Test case Scenario 2

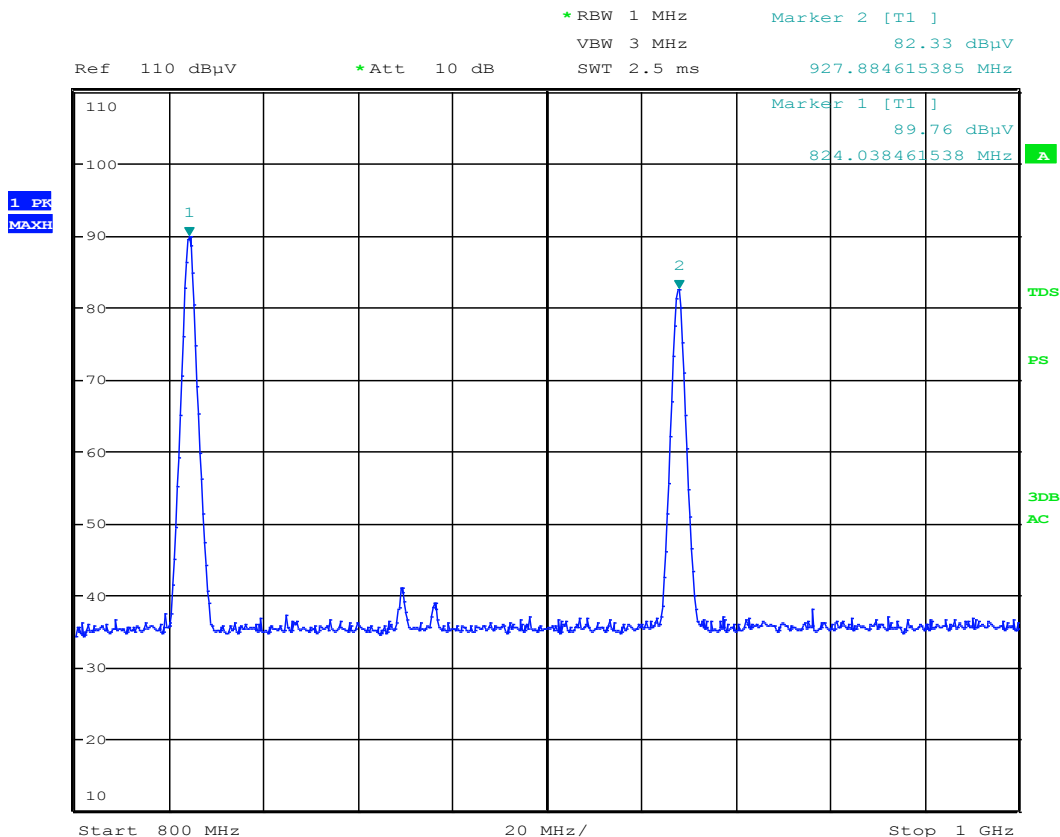
Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2



Plot 8.1-10: 927.5, 2462, 824.2 with filter

Table 8.1-11: Test case Scenario 3

Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2

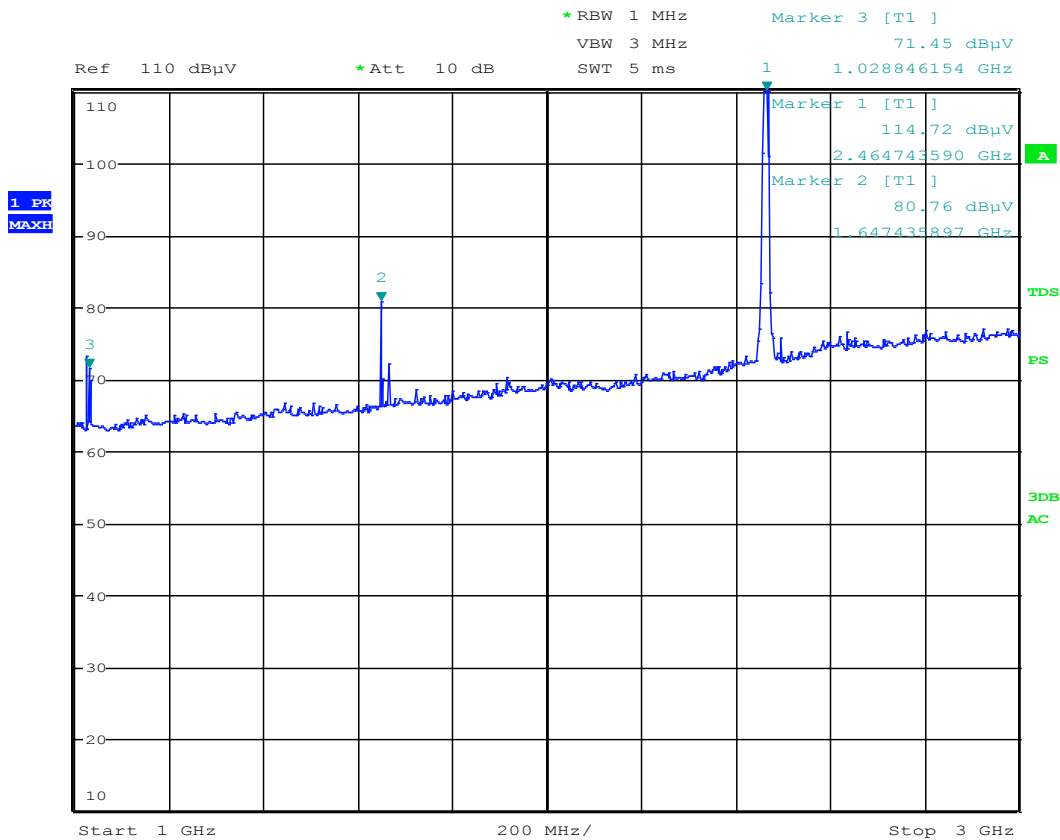


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Plot 8.1-11: 927.5, 2462, 824.2 no filter

Table 8.1-12: Test case Scenario 3

Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2

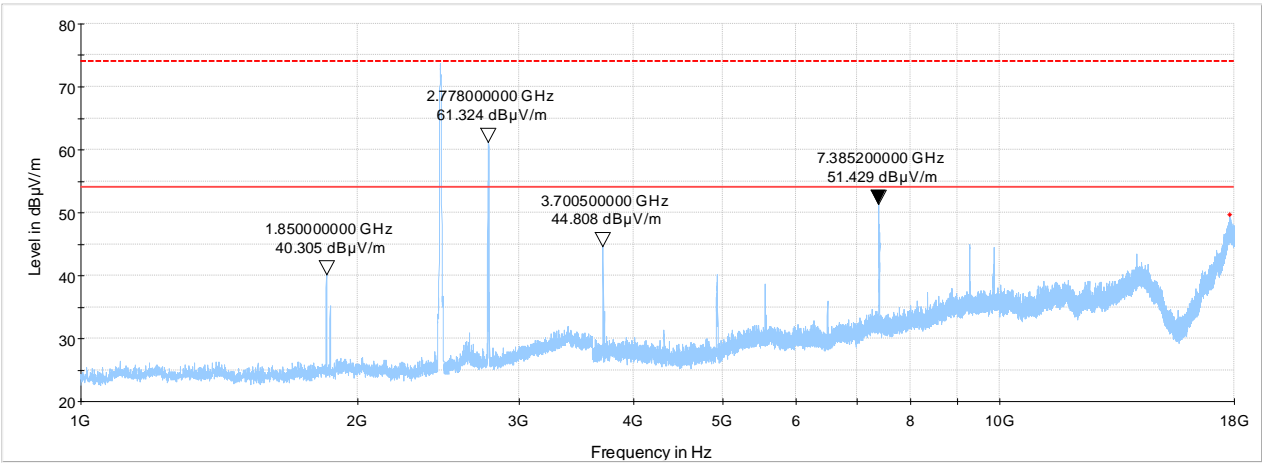


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Plot 8.1-12: 927.5, 2462, 824.2 no filter

Table 8.1-13: Test case Scenario 3

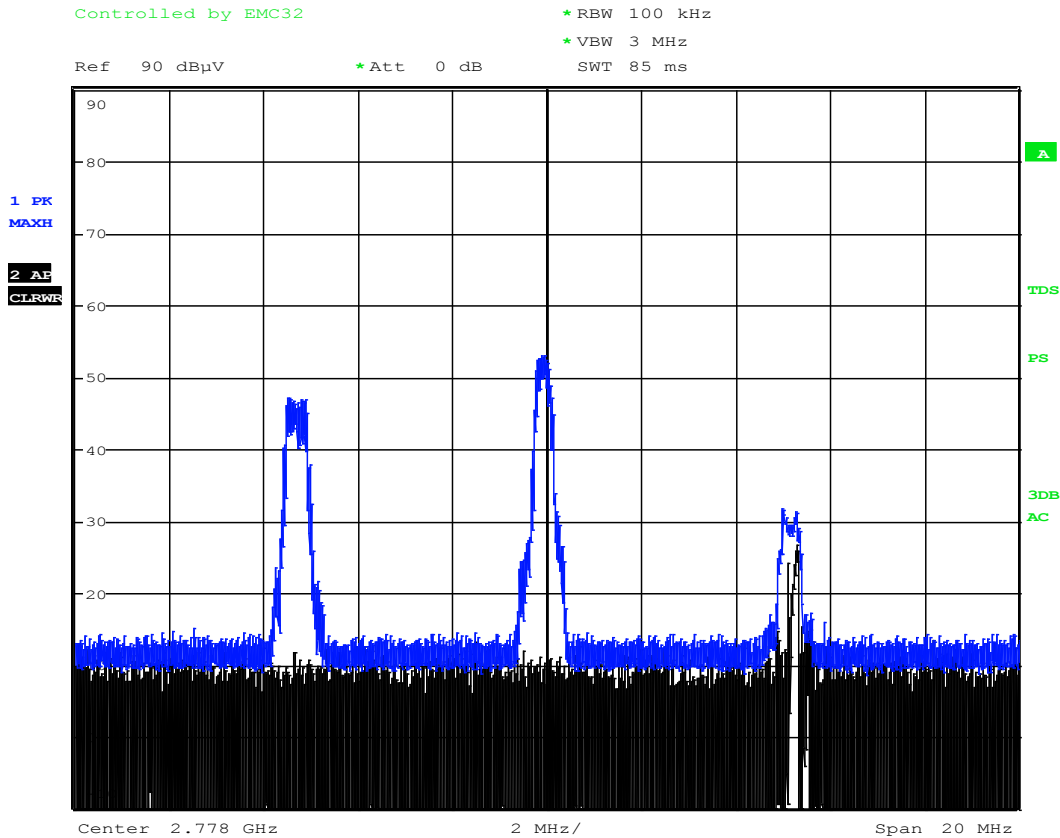
Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2



Plot 8.1-13: 927.5, 2462, 1850 filter. 2.778 GHz is only present when the Cell is on

Table 8.1-14: Test case Scenario 4

Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2

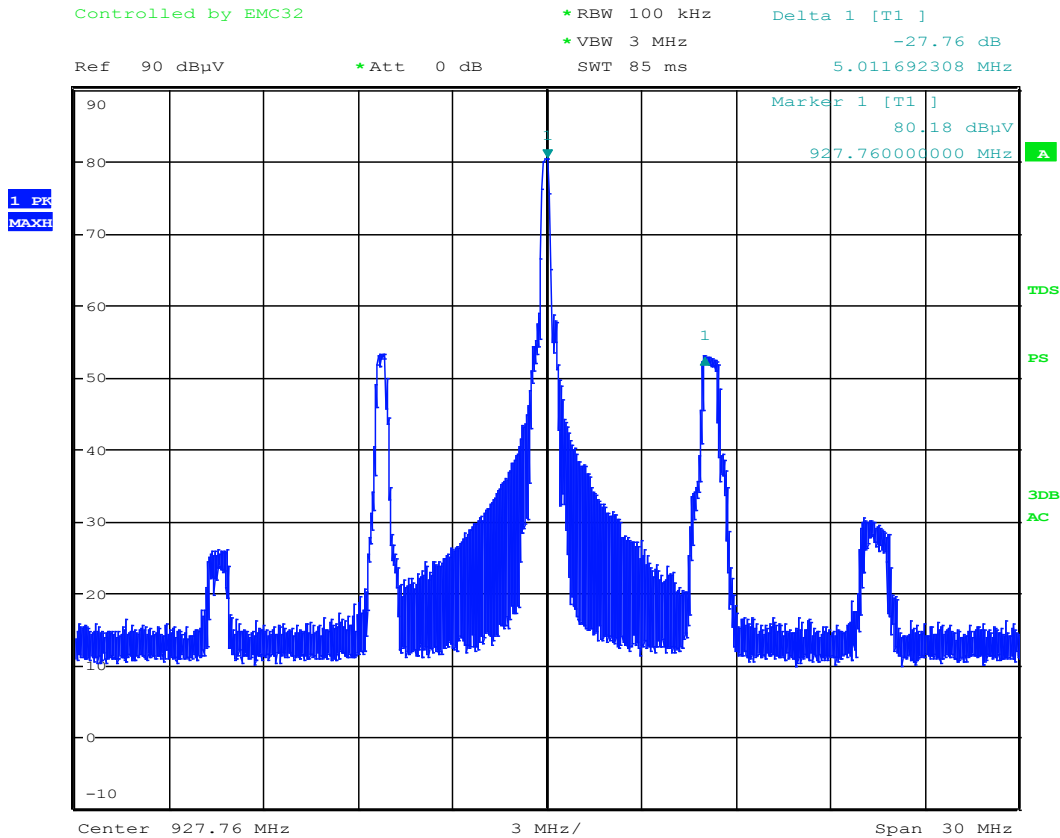


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Plot 8.1-14: With Cell and without Cell to show the signal

Table 8.1-15: Test case Scenario 4

Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2



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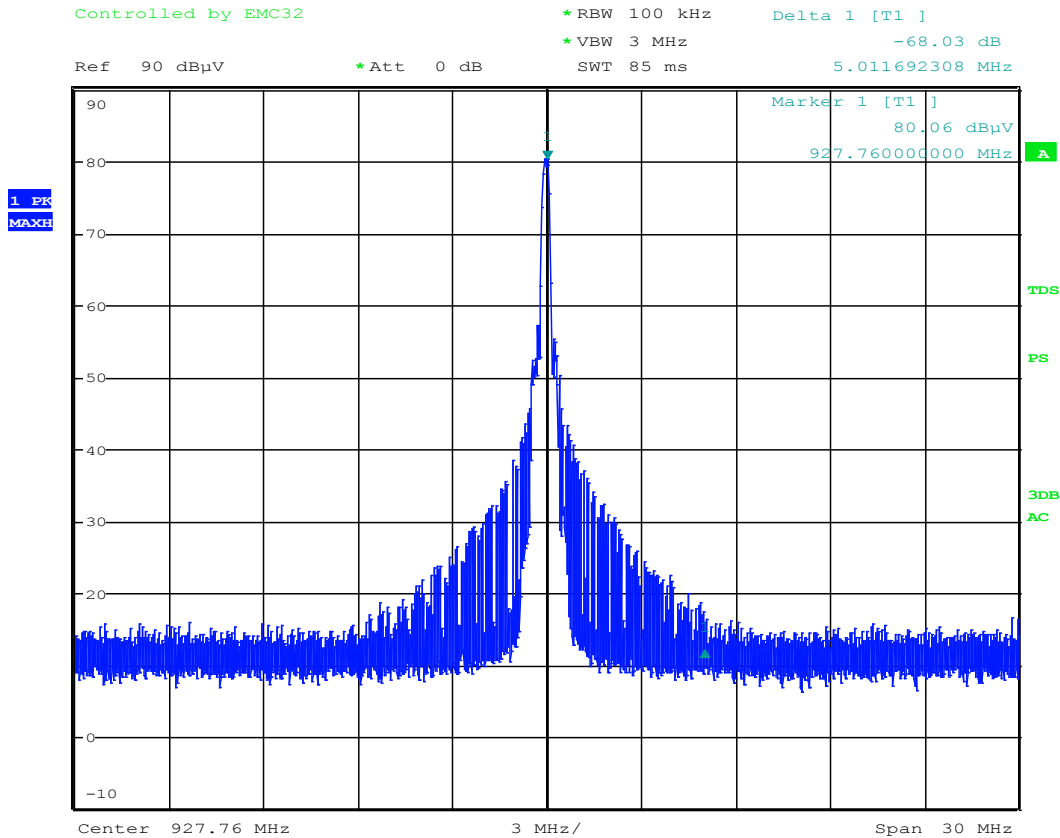
Plot 8.1-15: 927.5, 2462, 1850 no filter

Table 8.1-16: Test case Scenario 4

Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2

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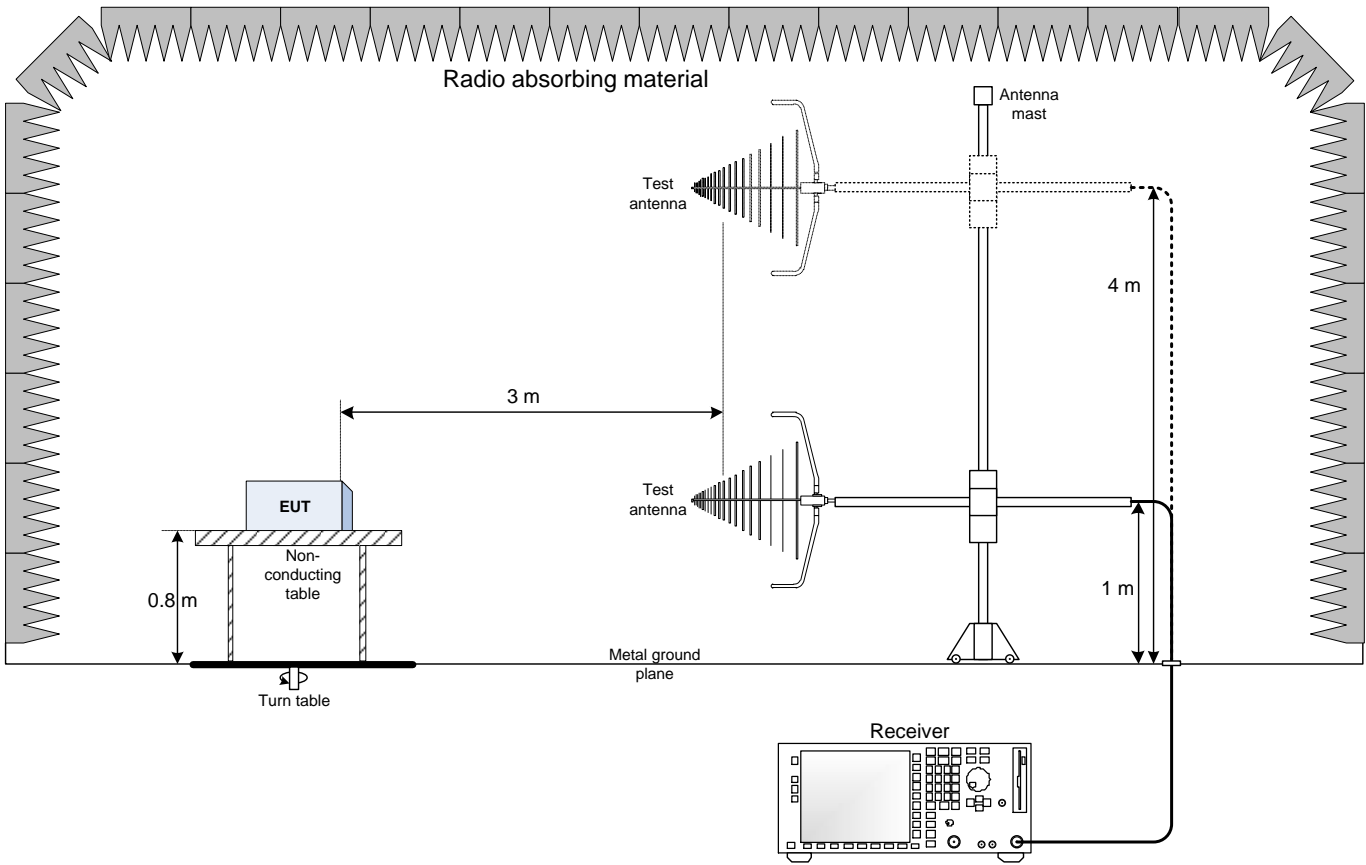
Plot 8.1-16: 927.5, 2462 No 1850

Table 8.1-17: Test case Scenario 4

Scenario	LoRa Frequency	Wi-Fi Frequency	Cellular Frequency
#1	903	2412	848.8
#2	915	2442	836.6
#3	927.5	2462	824.2
#4	927.5	2462	1850.2

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

