

# Test Report

<b>Product</b>	Digital Intercom and Access Control System		
<b>Name and address of the applicant</b>	Defigo AS Bogstadveien 27B 0355 Oslo, NORWAY		
<b>Name and address of the manufacturer</b>	Defigo AS Bogstadveien 27B 0355 Oslo, NORWAY		
<b>Model</b>	G5 Display Unit		
<b>Rating</b>	PoE (24-54 V <sub>DC</sub> )		
<b>Trademark</b>	Defigo		
<b>Serial number</b>	865546044948145; MPQ21AN03002978; 58D3913F39C6		
<b>Additional information</b>	NFC, WCDMA, LTE		
<b>Tested according to</b>	<b>FCC Part 15.209</b> NFC reader <b>Industry Canada RSS-210, Issue 10</b> NFC reader		
<b>Order number</b>	452909		
<b>Tested in period</b>	2022-02-01 to 2022-02-03 and 2024-06-12		
<b>Issue date</b>	2024-06-12		
<b>Name and address of the testing laboratory</b>	 Instituttveien 6 Kjeller, Norway www.nemko.com	CAB Number: FCC: NO0001 ISED: NO0470	 
An accredited technical test executed under the Norwegian accreditation scheme			
 Prepared by [Frode Sveinsen]		 Approved by [G.Suhanthakumar]	
<p>This report shall not be reproduced except in full without the written approval of Nemko. Opinions and interpretations expressed within this report are not part of the current accreditation. This report was originally distributed electronically with digital signatures. For more information contact Nemko.</p>			

## Revision history

Revision	Date	Comment	Sign
00	2022-04-06	First edition	FS
01	2024-06-12	Updated test results for emissions below 30 MHz	FS



### **THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.**

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

Nemko Group authorizes the above-named entity to reproduce this report provided it is reproduced in its entirety and for use by the entity's employees only. Any reproduction of parts of this report requires approval in writing from Nemko Group.

Any use that a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Group accepts no responsibility for damages suffered by any third party caused by decisions made or actions based on this report.

## CONTENTS

<b>1</b>	<b>INFORMATION .....</b>	<b>4</b>
1.1	Test Item .....	4
1.2	Normal test condition .....	5
1.3	Test Engineer .....	5
1.4	Antenna Requirement .....	5
1.5	EUT Operating Modes .....	5
1.6	Comments .....	5
<b>2</b>	<b>TEST REPORT SUMMARY .....</b>	<b>6</b>
2.1	General .....	6
2.2	Test Summary .....	6
<b>3</b>	<b>TEST RESULTS .....</b>	<b>7</b>
3.1	Power Line Conducted Emissions .....	7
3.2	Occupied Bandwidth (99% BW) .....	8
3.3	Field Strength of Fundamental .....	9
3.4	Restricted Bands of operation .....	10
3.5	Radiated Emissions, 9 kHz – 30 MHz .....	11
3.6	Radiated Emissions, 30 – 1000 MHz .....	13
3.7	Radiated Emissions, 500 -4000 MHz, NFC + WCDMA active .....	15
<b>4</b>	<b>Measurement Uncertainty .....</b>	<b>18</b>
<b>5</b>	<b>LIST OF TEST EQUIPMENT .....</b>	<b>19</b>
<b>6</b>	<b>TEST SET-UPS .....</b>	<b>20</b>
6.1	Power Line Conducted Emission .....	20
6.2	Radiated Emissions Test .....	20

# 1 INFORMATION

## 1.1 Test Item

Name	Defigo
Model/version	G5 Display Unit
FCC ID	2A4C8DEFIGOG5D
ISED ID	28180-DEFIGOG5D
Serial number	865546044948145; MPQ21AN03002978; 58D3913F39C6
Hardware identity and/or version	v4
Software identity and/or version	C2.0.2
Frequency Range	13.56 MHz
Number of Channels	1
Output Power	0.000032 mW (calculated from formula in KDB 412172)
Type of Modulation	ASK
Antenna Connector	None
Number of Antennas	1
Power Supply	PoE (24-54 V <sub>DC</sub> )

### Description of Test Item

The EUT is a display unit with NFC reader for a digital intercom and access control system.

The EUT also contains a certified LTE Module from Quectel. See information below.

Certified Modules			
Manufacturer	Model No	Approval Numbers	Supported Frequency Bands
Quectel Wireless Solutions Co., Ltd	EG25-G	FCC ID: XMR201903EG25G IC: 10224A-201903EG25G	Band 02 – WCDMA, LTE Band 04 – WCDMA, LTE Band 05 – WCDMA, LTE Band 7 – LTE Band 12 – LTE Band 13 – LTE Band 25 – LTE Band 26 – LTE Band 38 – LTE Band 41 – LTE

## 1.2 Normal test condition

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	48 V <sub>DC</sub> (Nominal Voltage, PoE)

The values are the limit registered during the test period.

The EUT was powered by PoE from the G5 Control Unit, while the G5 Control Unit was powered with 120V 60Hz from the AC Power Source.

## 1.3 Test Engineer

Frode Sveinsen

## 1.4 Antenna Requirement

Does the EUT have detachable antenna(s)?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
If detachable, is the antenna connector(s) non-standard?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
The tested equipment has only integral antennas. Conducted tests were performed with a temporary antenna connector.		

Requirement: FCC 15.203, 15.204

## 1.5 EUT Operating Modes

Description of operating modes	Continuous TX
Additional information	The EUT was programmed to transmit continuously from the LCD Interface by using a special test software. It was only possible to select the transmit frequency, no power or modulation settings were available.

## 1.6 Comments

The EUT is a Display Unit for an entrance control system with 13.56 MHz NFC reader.

## 2 TEST REPORT SUMMARY

### 2.1 General

All measurements are traceable to national standards.

The tests were conducted for demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.209 and Industry Canada RSS-GEN Issue 5.

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

Radiated tests were made in a semi-anechoic chamber at measuring distances of 3m and 10m.

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

<input checked="" type="checkbox"/> New Submission	<input checked="" type="checkbox"/> Production Unit
<input type="checkbox"/> Class II Permissive Change	<input type="checkbox"/> Pre-production Unit
DXX Equipment Code	<input type="checkbox"/> Family Listing

### 2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-GEN Issue 5 reference	ANSI C63.10-2013 Reference	Result
Supply Voltage Variations	15.31 (e)	6.11	5.13	Complies
Antenna Requirement	15.203	6.8	5.8	Complies
Power Line Conducted Emission	15.207 (a)	8.8	7.3 (C63.4-2014)	Complies
Occupied Bandwidth (99% BW)	N/A	6.7	6.9.3	Complies
Field Strength of Fundamental	15.209 (a)	8.9	6.4	Complies
Spurious Emissions (Radiated)	15.209	8.9 8.10	6.3, 6.4, 6.5, 6.6	Complies

### 3 TEST RESULTS

#### 3.1 Power Line Conducted Emissions

FCC Part 15.207

ISED ICES-003 Issue 7, Clause 3.2

RSS-GEN Issue 5, Clause 8.8

Measurement procedure: ANSI C63.4-2014 using 50  $\mu$ H/50 ohms LISN.

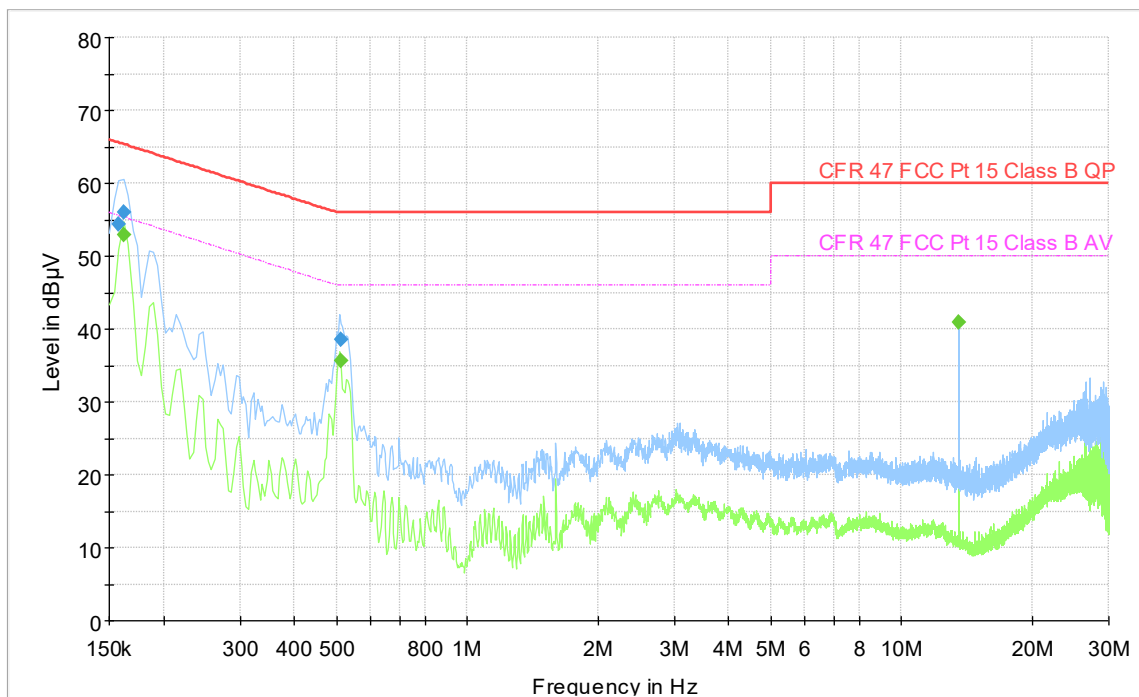
Test Results: Complies with Class B limits

Measurement Data: See attached plots.

Highest measured value (L1 and N):

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Average (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter
0.158	54.32	---	65.57	11.25	1000	9	L1	OFF
0.162	---	52.99	55.36	2.37	1000	9	N	OFF
0.162	55.97	---	65.36	9.39	1000	9	N	OFF
0.512	---	35.70	46.00	10.30	1000	9	L1	OFF
0.512	38.60	---	56.00	17.40	1000	9	L1	OFF
13.560	---	40.99	50.00	9.01	1000	9	L1	OFF

Full Spectrum



Control Unit, EUT was connected to Control Unit by Power over Ethernet

### 3.2 Occupied Bandwidth (99% BW)

ISED Canada RSS-GEN Issue 5, Clause 6.7

Measurement procedure: ANSI C63.10-2013 Clause 6.9.3

Test Results: Complies

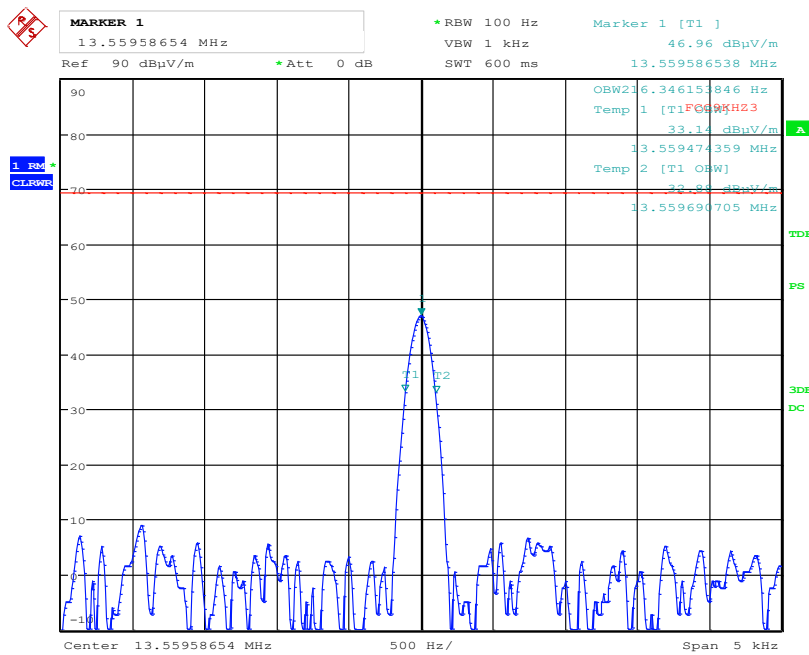
**Measurement Data:**

Carrier Frequency	Occupied Bandwidth (99% BW)
13.56 MHz	216 Hz

See attached plots.

**Requirements:**

No requirement for 99% BW, reported for information only.



Date: 1.FEB.2022 09:59:21

**99% Occupied Bandwidth**



### 3.3 Field Strength of Fundamental

FCC Part 15.209 (a)

ISED Canada RSS-GEN Issue 5, Clause 8.9

Measurement procedure: ANSI C63.10-2013 Clause 6.4

Test Results: Complies

#### Measurement Data:

Carrier Frequency (MHz)	Measuring Distance	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
13.56	3m	50.3	69.5	19.2

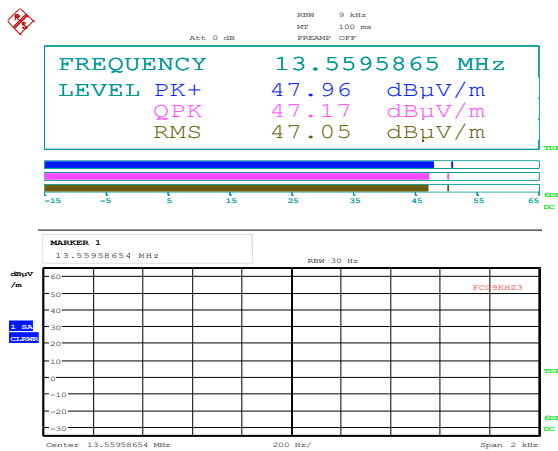
Measured with QuasiPeak Detector.

Maximum was measured with Transversal Polarization.

See attached plots.

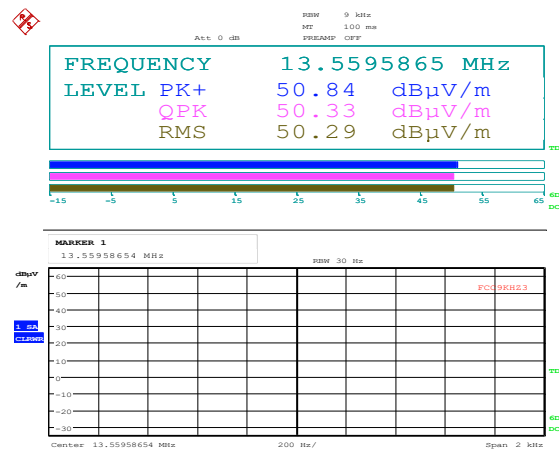
#### Requirements:

The maximum radiated field strength shall not exceed the following limits:



Date: 1.FEB.2022 09:56:33

Fundamental Emissions, LP @3m



Date: 1.FEB.2022 09:53:05

Fundamental Emissions, TP @3m

### 3.4 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 Canada (MHz)	FCC (GHz)	ISED Canada (GHz)
0.090-0.110		<b>0.96-1.24</b> <b>1.3-1.427</b>	<b>0.96-1.427</b>
0.495-0.505		1.435-1.6265	
2.1735-2.1905		1.6455-1.6465	
	<b>3.020-3.026</b>	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	
	<b>5.677-5.683</b>	2.4835-2.5	
6.215-6.218		<b>2.69-2.9</b>	<b>2.655-2.9</b>
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		<b>3.6-4.4</b>	<b>3.5-4.4</b>
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	
<b>108-121.94</b> <b>123-138</b>	<b>108-138</b>	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.

### **3.5 Radiated Emissions, 9 kHz – 30 MHz**

**FCC Part 15.209**

**ISED Canada RSS-GEN Issue 5, Clause 8.9**

**Measurement procedure: ANSI C63.10-2013 Clause 6.4**

**Test Results: Complies**

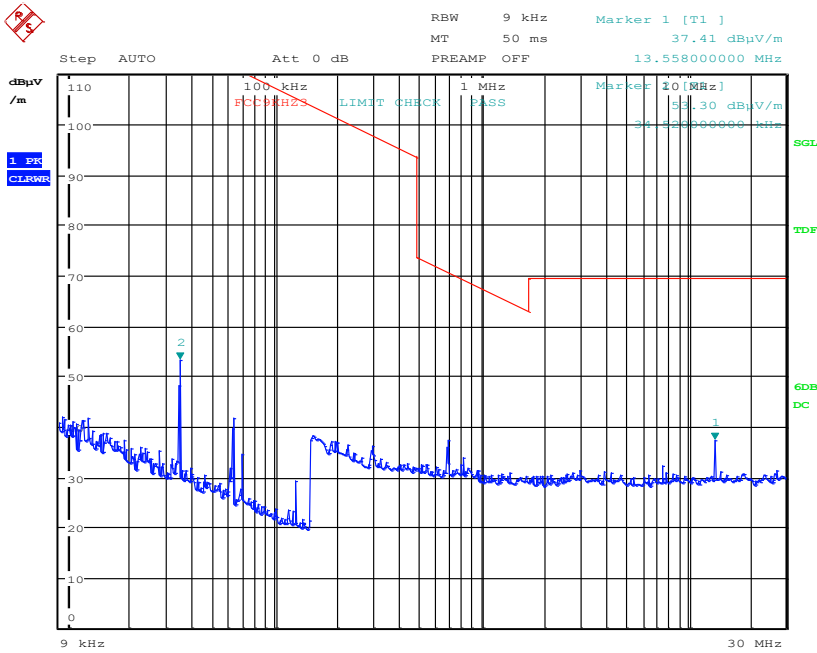
Measuring distance 3m with Peak detector.

The spurious at 34.5 kHz is inherent noise in the chamber and does not come from the EUT.

See attached plots.

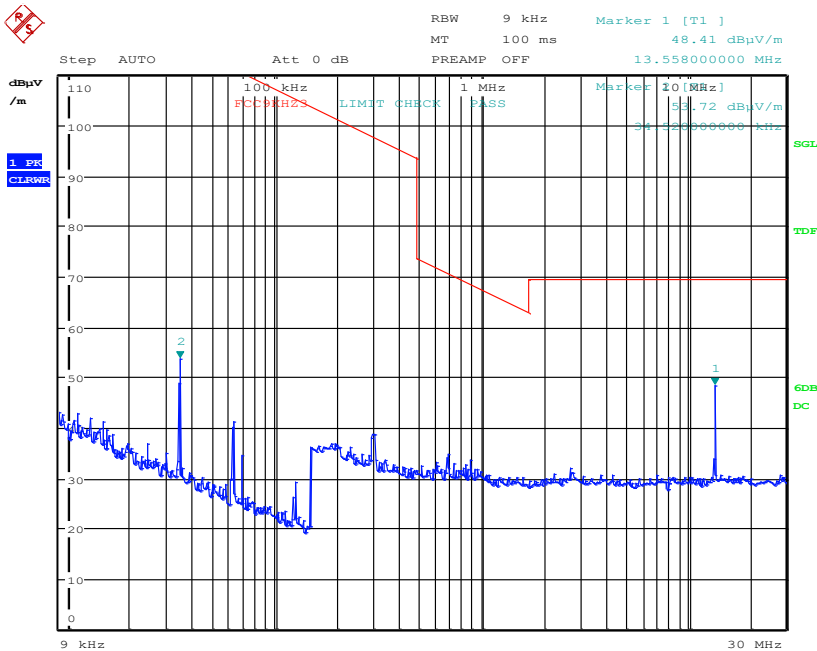
(The component at 34.5kHz is inherent noise in the chamber)

Limit is converted to 3m and 10m using 40 dB/decade according to 15.31 (f)(2).



Date: 12.JUN.2024 12:08:32

**Radiated Emissions 9 kHz - 30 MHz, Longitudinal Pol @3m**



Date: 12.JUN.2024 11:48:27

**Radiated Emissions 9 kHz - 30 MHz, Transversal Pol @3m**

### 3.6 Radiated Emissions, 30 – 1000 MHz

FCC Part 15.209

ISED Canada RSS-GEN Issue 5, Clause 8.9

Measurement procedure: ANSI C63.10-2013 Clause 6.5

Test Results: Complies

Measurement Data:

Detector: Peak

Measuring distance 3m

Tested with 13.56 MHz NFC active

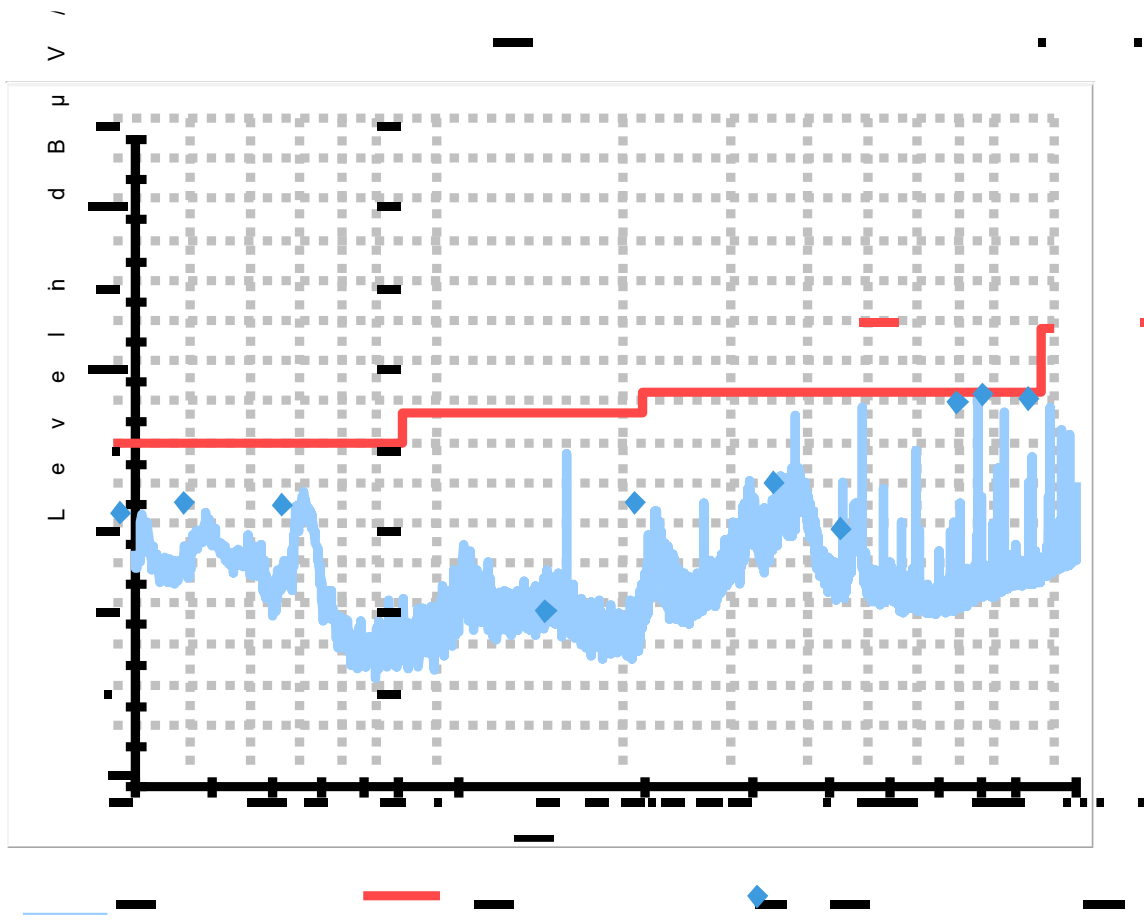
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
30.577300	31.18	40.00	8.82	1000.0	120.000	103.0	V	278.0
38.943250	32.52	40.00	7.48	1000.0	120.000	102.0	V	11.0
56.258450	32.32	40.00	7.68	1000.0	120.000	100.0	V	220.0
149.814050	19.16	43.50	24.34	1000.0	120.000	215.0	H	254.0
209.093450	32.38	43.50	11.12	1000.0	120.000	258.0	V	177.0
350.184300	34.99	46.00	11.01	1000.0	120.000	200.0	V	0.0
450.043000	29.22	46.00	16.78	1000.0	120.000	131.0	V	192.0
696.600450	44.84	46.00	1.16	1000.0	120.000	117.0	H	0.0
766.260750	45.75	46.00	0.25	1000.0	120.000	114.0	H	154.0
905.580600	45.21	46.00	0.79	1000.0	120.000	374.0	H	0.0

A low Pass Filter at 1GHz was used for measurements below 1 GHz.

See plots.

#### 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	
Frequency	Radiated emission limit @3 meters	
30 – 88 MHz	100 µV/m	40.0 dBµV/m
88 – 216 MHz	150 µV/m	43.5 dBµV/m
216 – 960 MHz	200 µV/m	46.0 dBµV/m
960 – 1000 MHz	500 µV/m	54.0 dBµV/m
	Limits above are with Quasi Peak Detector	



Radiated Emissions 30 - 1000 MHz @3m

### 3.7 Radiated Emissions, 500 -4000 MHz, NFC + WCDMA active

FCC Part 15.209

ISED Canada RSS-GEN Issue 5, Clause 8.9

Measurement procedure: ANSI C63.10-2013 Clause 6.6

Test Results: Complies

**Measurement Data:**

Measuring distance: 3m (0.5 – 4 GHz)

A Band Reject Filter for the 2.4GHz band was used for measurements above 1 GHz.

A low Pass Filter at 1 GHz was used below 1 GHz.

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer “Transducer factor”

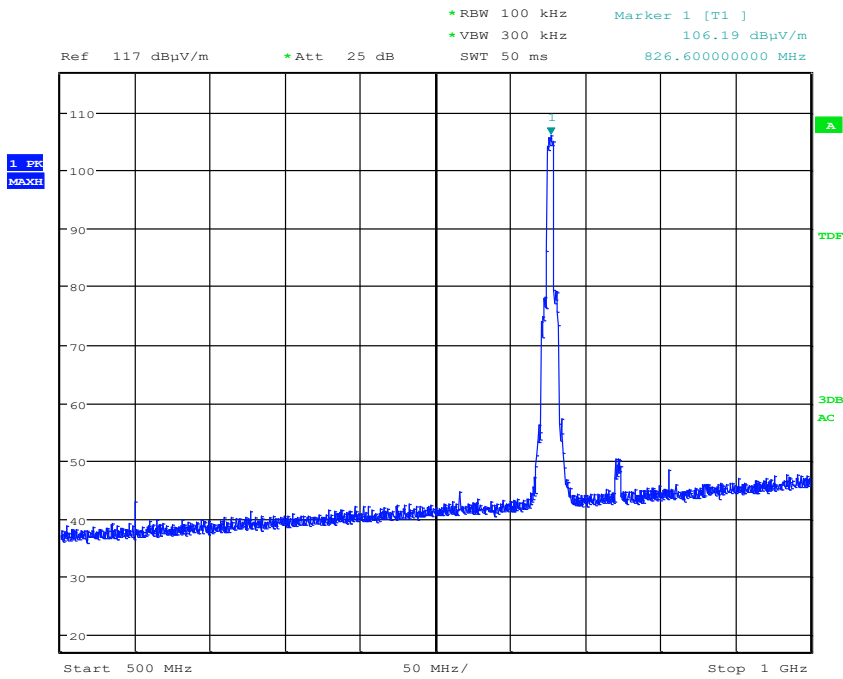
The WCDMA link was established with a R&S CMW500 cellular tester.

All intermodulation products were below the limits for unlicensed devices.

See plots.

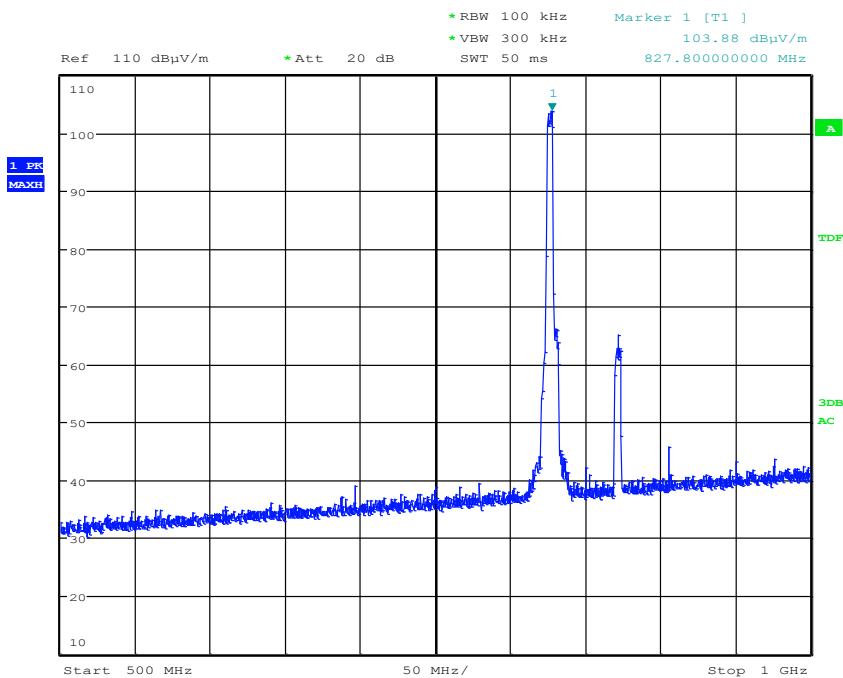
**Requirements/Limit**

FCC	Licensed Standards
ISED	ISED RSS for Licenced devices
	Radiated emission limit
Frequency	Average Detector
30 – 26000 MHz	-13.0 dBm (~82 dBµV/m @3m)



Date: 2.FEB.2022 13:45:39

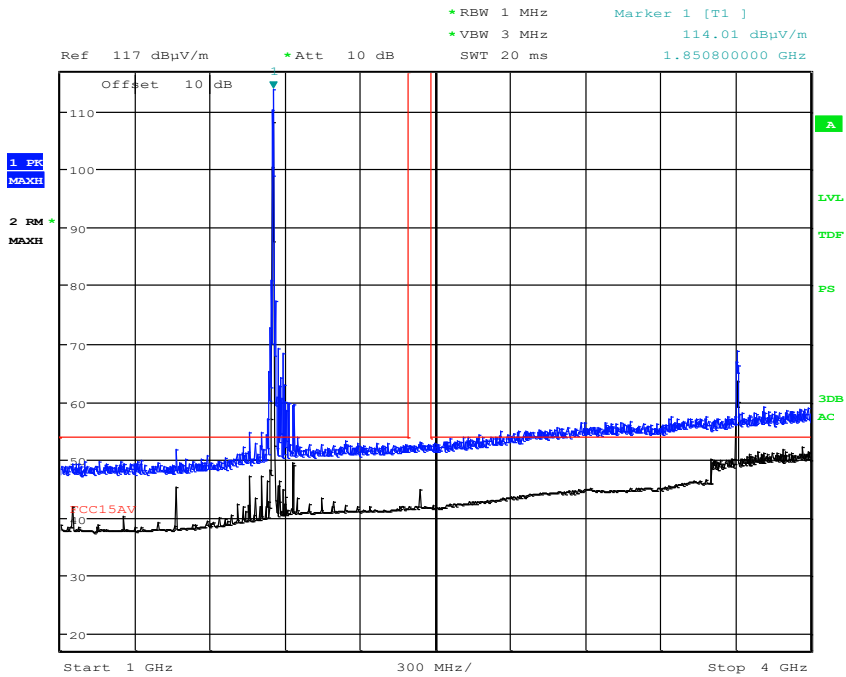
**Radiated Emissions 500 - 1000 MHz, VP @3m, NFC + WCDMA Band 05 Ch4357 active**



Date: 2.FEB.2022 13:42:31

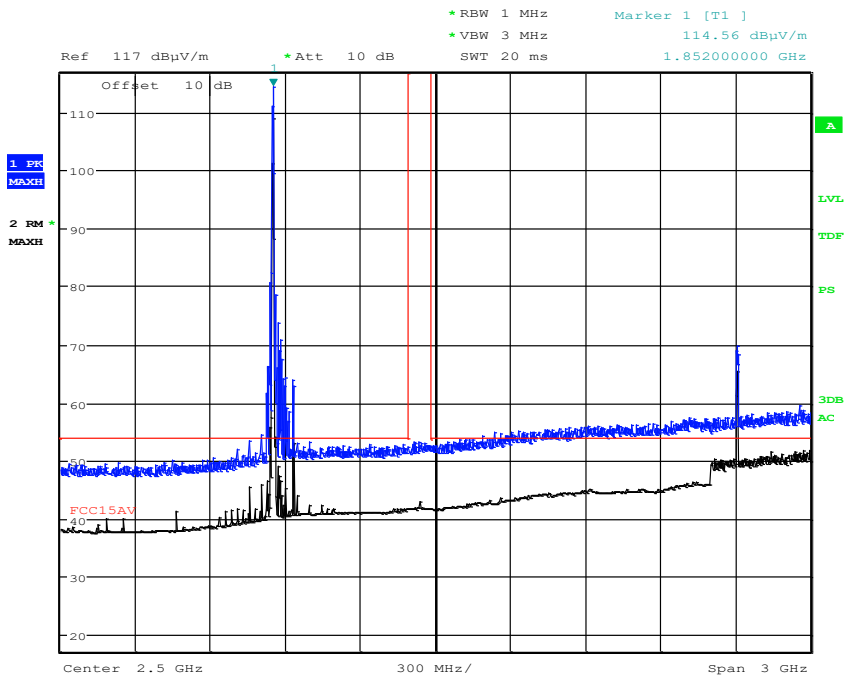
**Radiated Emissions 500 - 1000 MHz, HP @3m, NFC + WCDMA Band 05 Ch4357 active**





Date: 2.FEB.2022 14:37:01

**Radiated Emissions 1000 - 4000 MHz, VP @3m, NFC + WCDMA Band 02 Ch9662 active**



Date: 2.FEB.2022 14:39:17

**Radiated Emissions 1000 - 4000 MHz, HP @3m, NFC + WCDMA Band 02 Ch9662 active**

## 4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		Uncertainty
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted	< 3.6 GHz	±0.6 dB
	> 3.6 GHz	±0.9 dB
Spurious Emissions, Radiated	< 1 GHz	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Spectrum Mask Measurements	Frequency	±5 %
	Amplitude	±1.0 dB
Frequency Error		±0.6 ppm
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.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2022-01 2024-01	2023-01 2025-01
2	JB3	Bilog Antenna	Sunol	N-4525	2020-03	2023-03
3	3115	Horn Antenna	EMCO	LR 1330	2016-10	2026-10
4	HFH2-Z2	Loop Antenna	Rohde & Schwarz	LR 1660	2019-06 2022-01	2022.06 2025-01
5	310	Preamplifier	Sonoma Inst.	LR 1686	2022-08	2023-08
6	8449B	Preamplifier	Hewlett Packard	LR 1322	2021-08	2022-08
7	ENV216	LISN	Rohde & Schwarz	LR 1665	2019-11	2021-11
8	ESCI3	EMI Receiver	Rohde & Schwarz	N 4259	2019-10	2021-10
9	6812B	AC Power Source	Agilent	LR 1515	2020-04	2022-04
10	RG223	RF Cables	Suhner	N/A	COU	

COU = Calibrate on Use

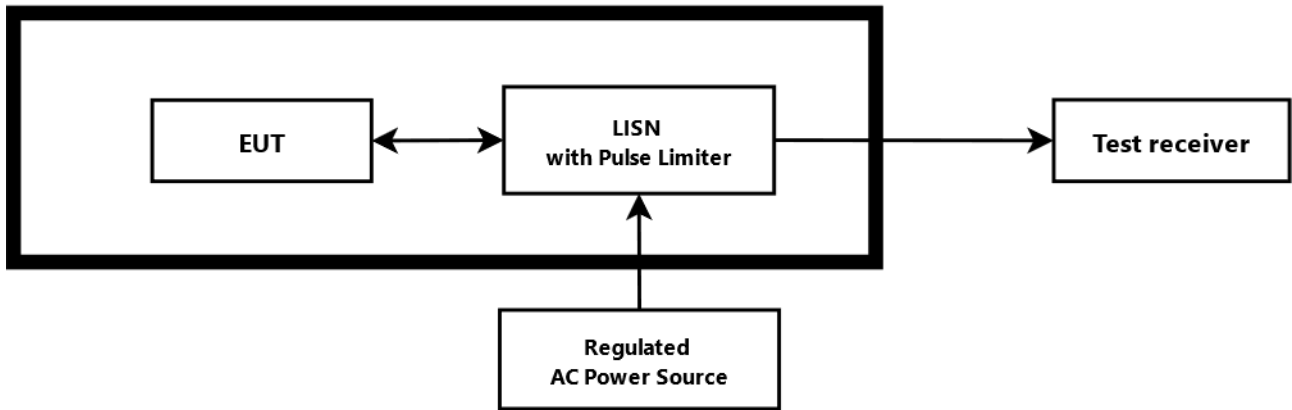
The software listed below has been used for one or more tests.

No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.50.40	EMC test software
2	Nemko AS	RSPlot	1.0.8.0	Screenshots from R&S Spectrum Analyzers

## 6 TEST SET-UPS

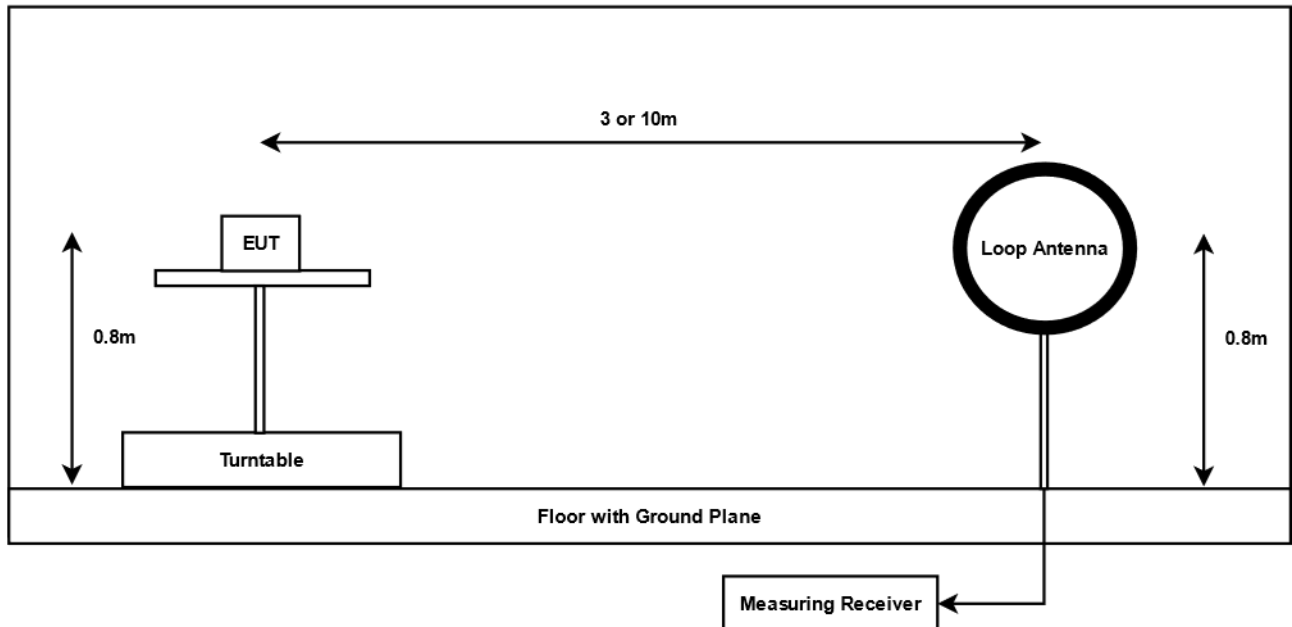
### 6.1 Power Line Conducted Emission

Shielded Room



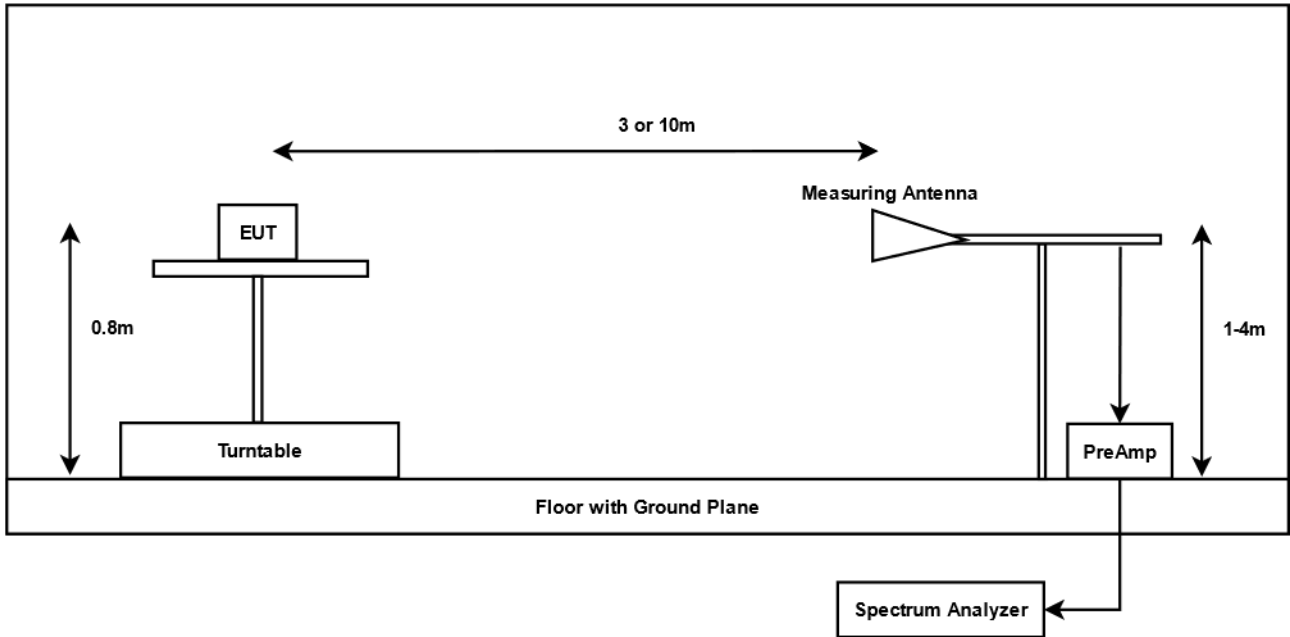
### 6.2 Radiated Emissions Test

Anechoic Chamber with Ferrite Tiles and Absorbers



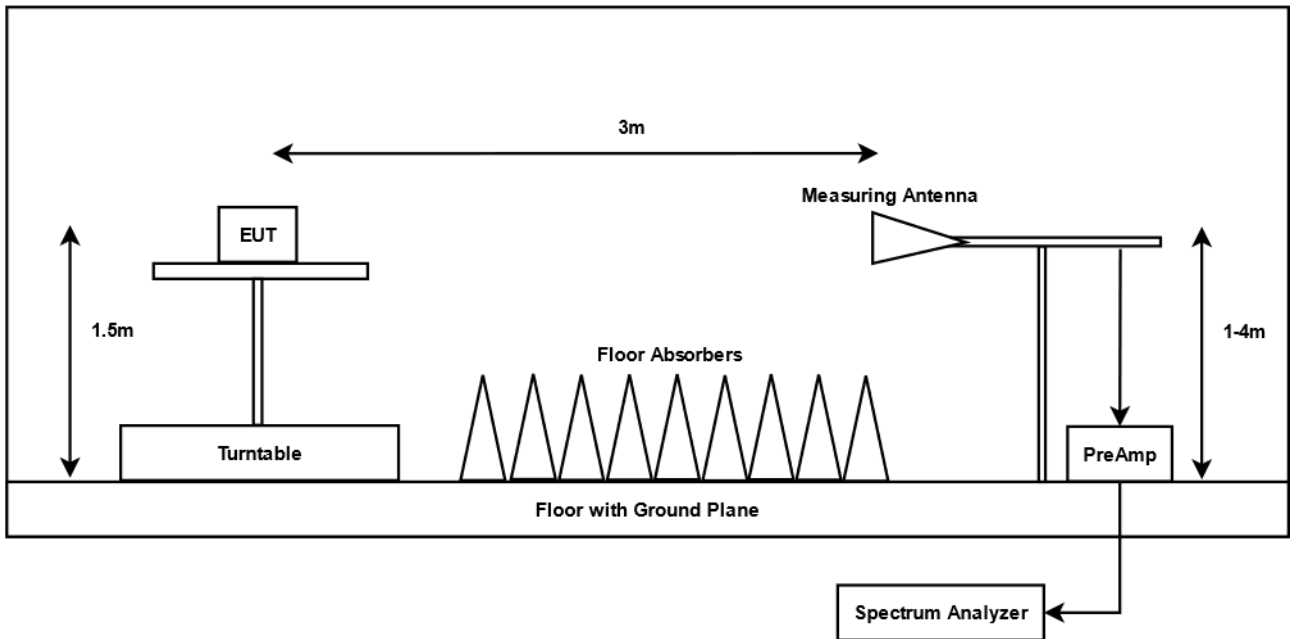
Test Set-up below 30 MHz

Anechoic Chamber with Ferrite Tiles and Absorbers



**Test Set-up 30-1000 MHz**

Anechoic Chamber with Ferrite Tiles and Absorbers



**Test Set-up 1 GHz and above**

A pre-amplifier is used for all measurements above 30 MHz, and High-Pass or Band-Pass filter is used for all harmonics.