

Test Report

Product	Smart Brick
Name and address of the applicant	LEGO System A/S Aastvej 1 Billund 7190, Denmark
Name and address of the manufacturer	LEGO System A/S Aastvej 1 Billund 7190, Denmark
Model	PEL-1
Rating	3.7V _{DC} (Li-Ion Battery)
Trademark	LEGO
Additional information	BLE, 13.56MHz, 8.25MHz
Tested according to	FCC Part 15.209 Digital Transmission Systems Industry Canada RSS-210, Issue 11 Low Power Licence-Exempt Radio Apparatus, Category I Equipment
Order number	PRJ0078073
Tested in period	2025-07-02 to 2025-07-04
Issue date	2025-10-20
Name and address of the testing laboratory	 Instituttveien 6 Kjeller, Norway www.nemko.com CAB Number: FCC: NO0001 ISED: NO0470   An accredited technical test executed under the Norwegian accreditation scheme
 Digitally signed by Frode Sveinsen DN: cn=Frode Sveinsen, c=NO, o=Nemko Scandinavia AS, ou=ETM, email=frode.sveinsen@nemko.com Date: 2025.10.21 15:25:50 +02'00'  Digitally signed by Roy Uggerud DN: cn=Roy Uggerud, c=NO, o=Nemko Scandinavia AS, email=Roy.uggerud@nemko.com Reason: I have reviewed this document Date: 2025.10.21 16:02:11 +02'00' Prepared by [Frode Sveinsen] Approved by [Roy Uggerud]	
This report was originally distributed electronically with digital signatures. For more information, please contact Nemko Scandinavia AS.	

Revision history

Revision	Date	Comment	Sign
A	2025-09-12	First edition	FS
B	2025-10-20	Corrected Model name	FS

GENERAL REMARKS

This report applies only to the sample(s) tested. It is the manufacturer's responsibility to ensure the additional production units of this product are manufactured with identical electrical and mechanical components. The manufacturer is solely responsible for any modifications to the product that could result in non-compliance with the relevant regulations.

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Opinions expressed within this report regarding general assessments and qualifications for PASS or FAIL to the standards limits and requirements are not part of the current accreditation. Neither are opinions expressed regarding model variants covered by the testing of this report.

CALIBRATION

All instruments used in the tests given in this test report are calibrated and traceable to national or international standards. Between calibrations all test set-ups are controlled and verified on a regular basis by periodic checks to ensure, with 95% confidence, that the instruments remain within the calibrated levels.

MEASUREMENT UNCERTAINTY

Measurement uncertainties are calculated or considered for all instruments and instrument set-ups used during these tests. Uncertainty figures are found in a separate clause in this report.

1 INFORMATION

1.1 Test Item

Product	Smart Brick
Manufacturer	LEGO System A/S
Model	PEL-1
Serial number	Radiated: 0017F5, 0017G2 and 0017FU Conducted: Sample 5
FCC ID	NPI106929
ISED Canada ID	3072A-106929
Hardware version	AB1.1-STD
Software version	V2.29.0-27
Frequency Range	8.25 MHz
Operating frequency	8.25 MHz
Type of Modulation	/
User Frequency Adjustment	None
Type of Power Supply	Secondary Battery (3.7V Li-Ion)
Antenna Type	Internal Antenna

1.2 Description of Tested Device

The EUT is a Smart Brick with Bluetooth Low Energy (BLE) as well as 13.56 MHz and 8.25 MHz transmitters. The brick is charged by an inductive charger. The charging frequency is 27.12 MHz and there is no communication between charger and brick during charging.

1.3 Test Environment

Temperature:	20 - 23 °C
Relative humidity:	40 - 70 %
Normal test voltage:	3.7 V _{DC} (Nominal Battery Voltage)

The values are the limit registered during the test period.

1.4 Test Engineers

Frode Sveinsen

1.5 EUT Operating Modes

Description of operating modes	All tests were performed with the EUT set to transmit continuously in test-mode.
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1.6 Comments

All measurements were performed with the EUT powered by a fully charged battery.

2 TEST REPORT SUMMARY

2.1 General

The tests were conducted on a sample of the equipment for demonstrating compliance with one or more of the following standards:

Standard	Description
FCC CFR 47 Part 15C	Unlicensed transmitters
ISED RSS-210, Issue 11	Licence-Exempt Radio Apparatus: Category I Equipment
ISED RSS-GEN Issue 5	General Requirements for Compliance of Radio Apparatus

The following standards and documents were used for one or more measurements:

Standard	Description
ANSI C63.4-2014	Unintentional Radiators
ANSI C63.10-2020 (FCC)	Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.10-2020 (ISED Canada) +cor.1-2023 +ANSI C63.10a-2024 +Errata to C63.10a-2024	Procedures for Compliance Testing of Unlicensed Wireless Devices +Corrigendum 1 +Amendment 1 +Errata to Amendment 1

All measurements are traceable to national standards.

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

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

2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-GEN Issue 5 reference	ANSI C63.10-2013 reference	Verdict
Supply Voltage Variations	15.31(e)	6.11	5.13	N/A
Number of Frequencies	15.31(m)	6.9	N/A	N/A
Antenna Requirement	15.203	6.8		N/A
Power Line Conducted Emission	15.207(a)	7.2 / 8.8		N/A
Occupied Bandwidth (99% BW)	N/A	6.7	6.9.3	Complies
Spurious Emissions (Radiated)	15.209(a)	7.3 8.9	6.3, 6.5, 6.6, 6.10	Complies

3 TEST RESULTS

3.1 Field Strength of Fundamental

FCC Part 15.209(a)

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

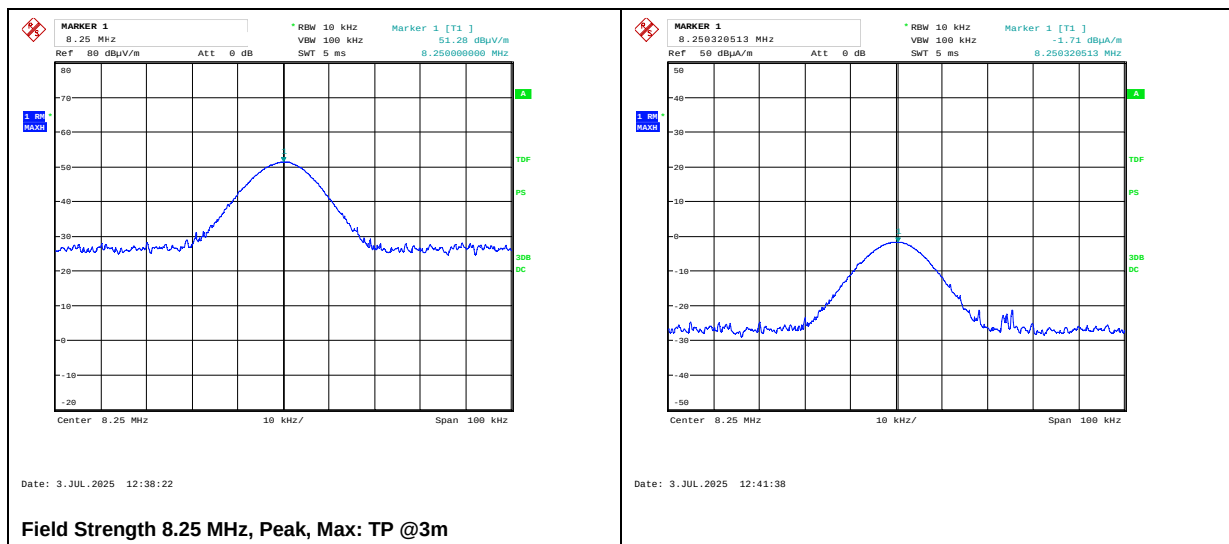
Frequency (MHz)	Measuring Distance	Field Strength	Detector	Limit	Margin
8.25	3m	51.3 dB μ V/m	Peak	69.5 dB μ V/m	18.2dB
8.25	3m	-1.7 dB μ A/m	Peak	18.1 dB μ A/m	19.8 dB

Antenna factor, amplifier gain and cable loss are included in Spectrum Analyzer "Transducer factor".

See attached graphs.

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	
8.45 MHz	3000 μ V/m	69.5 dB μ V/m
8.45 MHz	8 μ A/m	18.1 dB μ A/m
Limits above are with Quasi-Peak Detector		



3.2 99% Occupied Bandwidth

ISED Canada RSS-GEN Issue 5, Clause 6.7

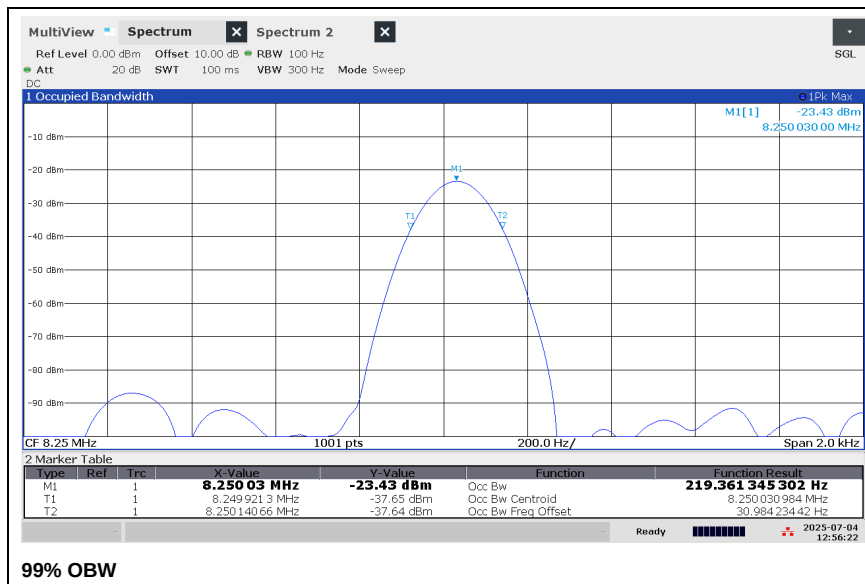
Measurement procedure: ANSI C63.10-2013 Clause 6.9.3 / 7.8.3

Measurement Data:

Occupied Bandwidth (99%)	
Operating Frequency	8.25 MHz
Measured OBW (99%)	219 Hz

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

Masured on Brick



3.3 Spurious Emissions (Radiated)

FCC Part 15.209(a)

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measuring Distance: 9 kHz- 30 MHz: 10m
30 – 200 MHz: 3m

Frequency (MHz)	Tx Freq (MHz)	Measuring Distance	Pol.	Field Strength (dBµV/m)	Detector	Limit (dBµV/m)	Margin (dB)
0.009-30	8.45	10m	LP/TP	See plots	Peak	See plots	>10
41.25	8.45	3m	VP	29.5	QP	40.0	10.5
57.75	8.45	3m	VP	30.2	QP	40.0	9.8
74.25	8.45	3m	VP	29.8	QP	40.0	10.2
90.75	8.45	3m	VP	18.9	QP	43.5	24.6

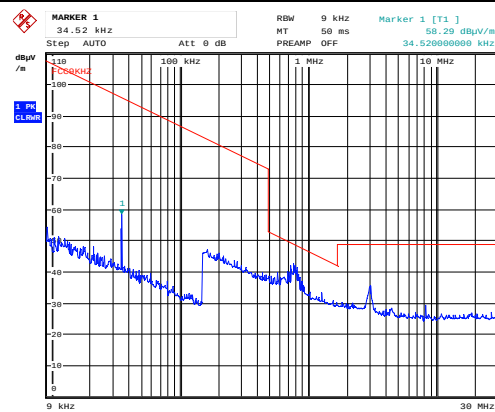
Spurious Emissions were measured from 9 kHz to 1000 MHz.

Antenna factor, amplifier gain and cable loss are included in Spectrum Analyzer "Transducer factor".

See attached graphs.

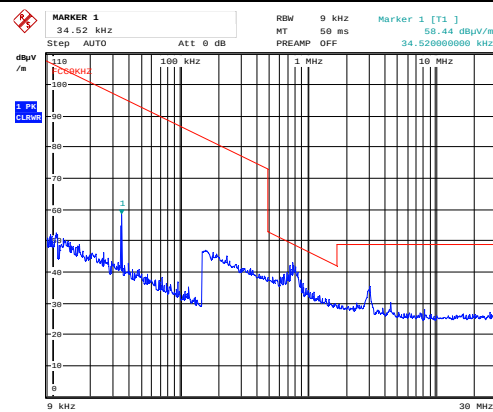
Requirements/Limit

FCC	Part 15.209		
ISED	RSS-GEN Issue 5, Clause 8.9		
	Radiated emission limit		
Frequency	FCC (µV/m)	ISED (µA/m)	Distance
0.009 – 0.490 MHz	2400 / F (kHz)	6.37 / F (kHz)	300 m
0.490 – 1.705 MHz	24000 / F (kHz)	63.7 / F (kHz)	30 m
1.705 – 30 MHz	30	0.08	30 m
	Radiated emission limit		
Frequency	FCC and ISED		Distance
30 – 88 MHz	100 µV/m	40 dBµV/m	3 m
88 – 216 MHz	150 µV/m	43.5 dBµV/m	3 m
216 – 960 MHz	200 µV/m	46 dBµV/m	3 m
Above 960 MHz	500 µV/m	54 dBµV/m	3 m
Limits are with Quasi Peak Detector, except: Limit in the bands 9-90kHz, 110-490kHz and above 1000MHz are with Average Detector			



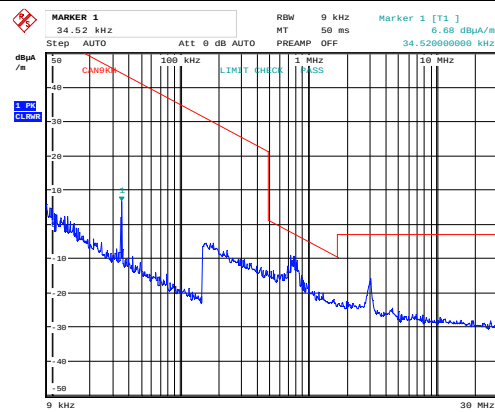
Date: 3.JUL.2025 14:29:33

Radiated Emissions, 0.09 - 30MHz, Peak, LP @10m
(The signal at 34.5 kHz is inherent noise)



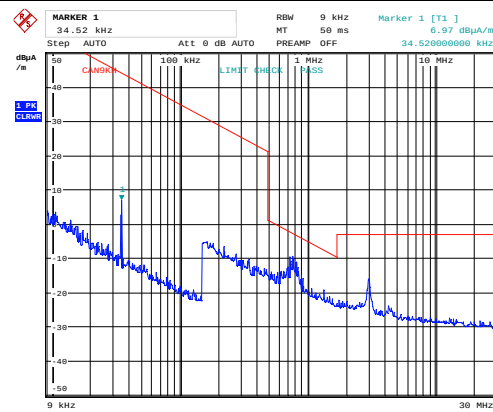
Date: 3.JUL.2025 14:28:05

TP @10m



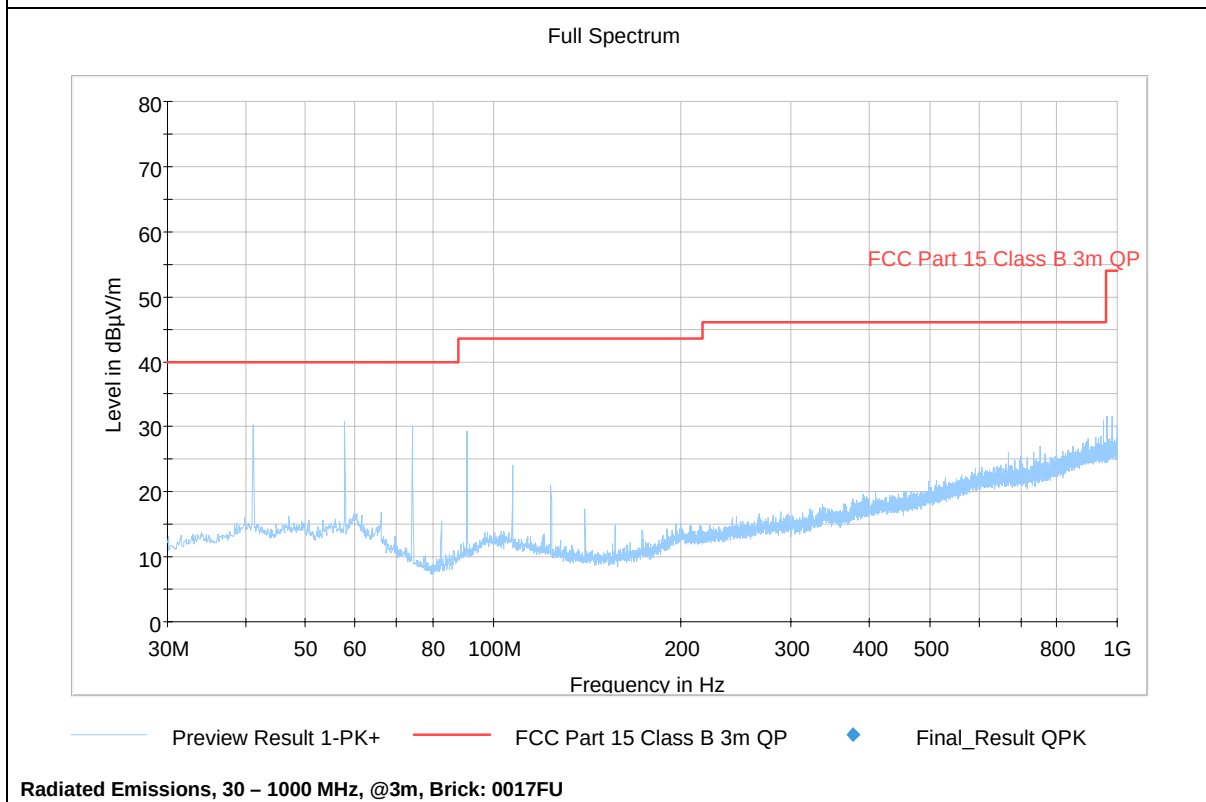
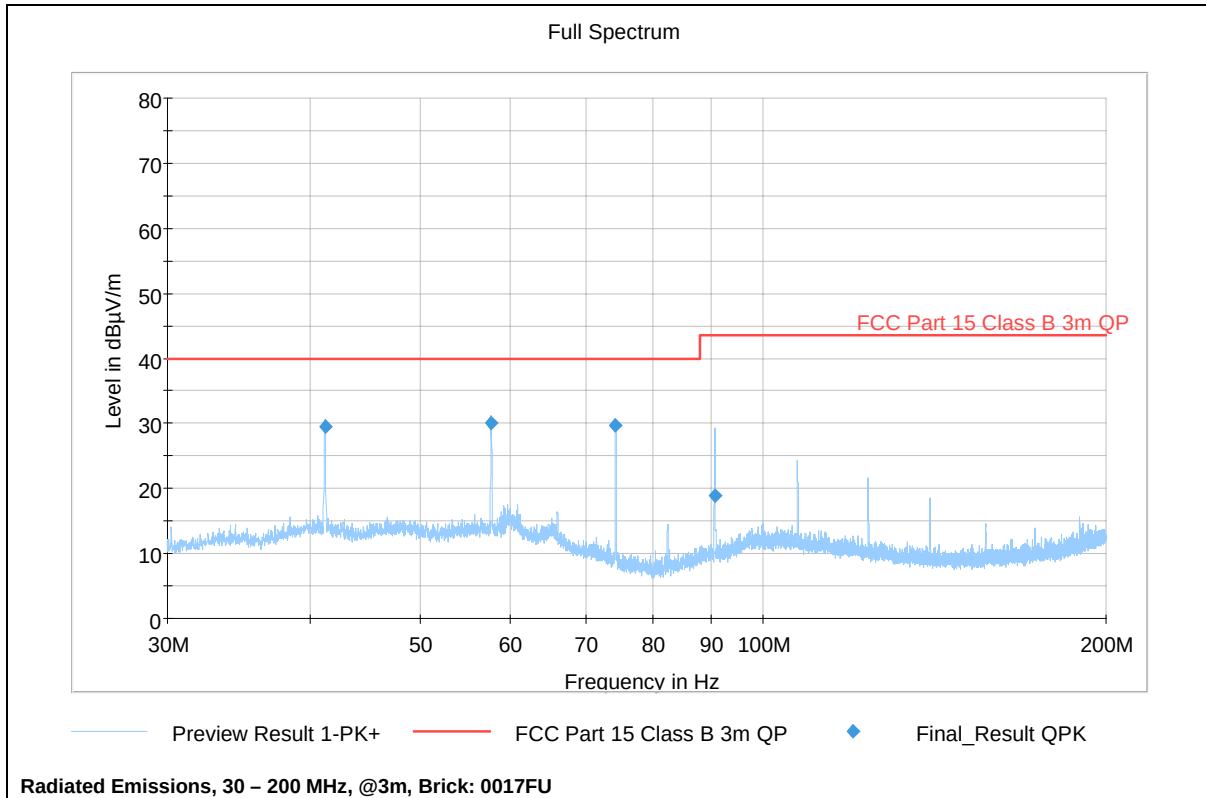
Date: 3.JUL.2025 14:39:31

Radiated Emissions, 0.09 - 30MHz, Peak, LP @10m
(The signal at 34.5 kHz is inherent noise)



Date: 3.JUL.2025 14:06:04

TP @10m



4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		Uncertainty
Output Power		±0.5 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
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	2025-01	2026-01
2	FSW43	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2025-01	2026-01
3	FMZB 1513	Loop Antenna	Schwarzbeck	N-4892	2023-10	2026-10
4	VULB 9163	BiLog Antenna	Schwarzbeck	LR 1616	2023-09	2026-09
5	310	Preamplifier	Sonoma Inst.	LR 1686	2024-09	2025-09

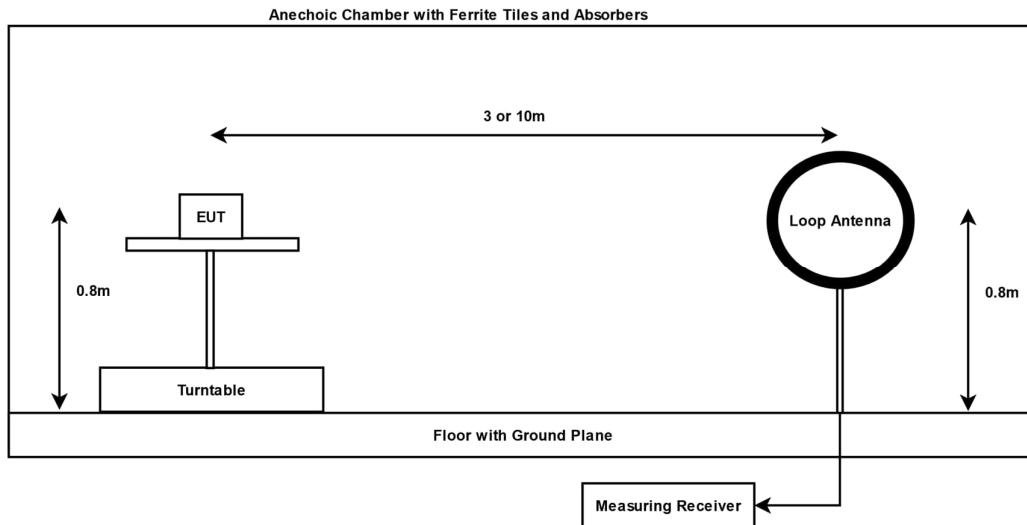
The software listed below has been used for one or more tests in this report.

No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.60.20	Power Line Conducted test software
3	Nemko	RSPlot	1.0.8.0	Screenshots from R&S Spectrum Analyzers

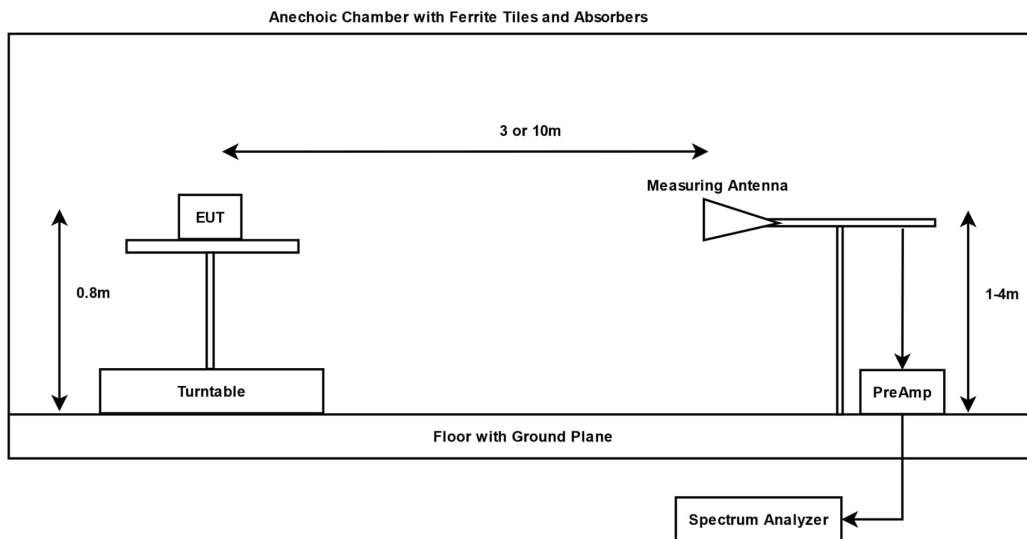
6 BLOCK DIAGRAM

6.1 Test Site Radiated Emission

6.2 Radiated Emissions Test



10m Chamber, below 30 MHz



10m Chamber, 30-200 MHz