

RRA-EMIESS25A722FLO-01Av0

Certification Radio test report

According to the standard:

CFR 47 FCC PART 15

Equipment under test:

ASK Contact Less Reader

With 5 antennas

FCC ID: *T2X-V3-CLESS*

Company:

FLOWBIRD

Distribution: Mr EPENYOY

(Company: FLOWBIRD)

Number of pages: 33 with 2 annexes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval	
			Name and Function	Visa
0	27-Mar-25	Creation	M. DUMESNIL, Radio Laboratory Manager	

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This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.

Information in italics are declared by the manufacturer/customer and are under his responsibility

DESIGNATION OF PRODUCT: *ASK Contact Less Reader with 5 antennas*

Serial number (S/N): *Module: 001386*
Antenna 6: 000990
Antenna 7: 101493

Reference / model (P/N): *Module: ELM1000035854*
Antenna 6: ELM1000035203
Antenna 7: ELM1000042017

Software version: *CSC 1.24*

MANUFACTURER: *FLOWBIRD*

COMPANY SUBMITTING THE PRODUCT:

Company: *FLOWBIRD*

Address: *PARC LAFAYETTE*
6 RUE ISAAC NEWTON
25075 – BESANCON CEDEX 9 - FRANCE

Responsible: *Mr EPENYOY*

DATES OF TEST: *From 17-Feb-25 to 19-Feb-25*

TESTING LOCATION: *EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE*
EMITECH ANGERS laboratory at BEAUCOUZE (49) FRANCE
FCC Accredited under US-EU MRA Designation Number: FR0009
Test Firm Registration Number: 873677

TESTED BY: *B. VOVARD*

VISA:

A handwritten signature in black ink, appearing to read "B. Vovard", with a horizontal line underneath.

WRITTEN BY: *B. VOVARD*

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REVISIONS HISTORY

Revision	Date	Modified pages	Modifications
0	13-Mar-25	/	Creation

1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: **ASK Contact Less Reader with 5 antennas**, in accordance with normative reference.

The device under test is already approved (FCC ID: *T2X-V3-CLESS*).

This equipment is already certified (see test report n° RR-21-F221-FLO-1-A Ed. 0) but two antenna are added by the applicant for the initial certified RFID module.

This radio test report concerns the followings configurations:

- Class 2 Permissive Change: Adding two antennas to initial certification

2. PRODUCT DESCRIPTION

Utilization: "contactless" system of validation, payment or identification

Antenna type and gain: 5 External antennas (unknown gains)

Operating frequency range: From 13.110 MHz to 14.010 MHz

Number of channels: 1

Channel spacing: Not concerned

Modulation: ASK

Power source: 12 Vdc by AC/DC Adapter

Power level, frequency range and channels characteristics are not user adjustable.

3. NORMATIVE REFERENCE

The standards and testing methods related throughout this report are those listed below.

They are applied on the whole test report even though the extensions (version, date and amendment) are not repeated.

CFR 47 FCC Part 15 (2025) Radio Frequency Devices

ANSI C63.10 2013
Procedures for Compliance Testing of Unlicensed Wireless Devices.

4. TEST METHODOLOGY

Radio performance tests procedures given in CFR 47 part 15:

Subpart C – Intentional Radiators

- Paragraph 203: Antenna requirement
- Paragraph 205: Restricted bands of operation
- Paragraph 207: Conducted limits
- Paragraph 209: Radiated emission limits; general requirements
- Paragraph 212: Modular transmitter
- Paragraph 215: Additional provisions to the general radiated emission limitations
- Paragraph 225: Operation within the band 13.110-14.010 MHz

5. TEST EQUIPMENT CALIBRATION DATES

Emitech Number	Model	Type	Last calibration (DD/MM/YYYY)	Calibration interval (years)	Next calibration due (DD/MM/YYYY)
0	BAT-EMC V3.18.0.26	Software	/	/	/
1406	EMCO 6502	Loop antenna	04/04/2024	1	04/04/2025
4088	R&S FSP40	Spectrum Analyzer	10/06/2024	2	10/06/2026
7171	R&S HL223	Antenna	19/05/2022	3	18/05/2025
7566	Testo 608-H1	Meteo station	17/12/2024	2	17/12/2026
8508	California instruments 1251RP	Power source	(1)	(1)	(1)
8528	Schwarzbeck VHA 9103	Biconical antenna	19/05/2022	3	18/05/2025
8590	RG214 N-5m	Cable	29/01/2024	2	28/01/2026
8635	R&S EZ-25	High-pass filter	24/10/2024	3	24/10/2027
8719	Thurbly Thandar Instruments 1600	LISN	22/03/2024	2	22/03/2026
8732	Emitech	OATS	28/03/2022	3	27/03/2025
8785	N-1.5m Emitech	Cable	10/07/2024	2	10/07/2026
8855	EMITECH	Turntable and mat controller	/	/	/
8864	Champ libre Juigné. V3.5	Software	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
10523	EMITECH	Absorber sheath current	09/02/2024	2	08/02/2026
11832	N-8m Emitech	Cable	14/06/2024	2	14/06/2026
14903	Fluke 177	Multimeter	22/12/2023	2	21/12/2025
19266	Radiall R412706124 - 6dB	Attenuator	06/12/2023	3	05/12/2026
19267	Radiall R412706124 - 6dB	Attenuator	06/12/2023	3	05/12/2026
19462	R&S ESW44	Test receiver	25/04/2024	1	25/04/2025
19877	HYTEM - N - 5m	Cable	30/08/2024	2	30/08/2026
19898	HYTEM - N - 2.5m	Cable	30/08/2024	2	30/08/2026
19907	HYTEM - N - 5.8m	Cable	30/08/2024	2	30/08/2026
20040	COMTEST FAR-2	Anechoic chamber	/	/	/
20042	Emitech	Outside Room 3B	/	/	/
//	RS Commander V2.4.2	Software	/	/	/

(1) The equipment is not verified; instead, the output voltage is checked before each measurement with the calibrated multimeter.

6. TESTS RESULTS SUMMARY

6.1 CFR 47 part 15 requirements

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.203	ANTENNA REQUIREMENT	X				Note 1
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS	X				
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 2
FCC Part 15.212	MODULAR TRANSMITTERS			X		
FCC part 15.215	ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS					
	(a) Alternative to general radiated emission limits	X				Note 3
	(b) Unwanted emissions outside of §15.225 frequency bands	X				
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.225	OPERATION WITHIN THE BAND 13.110-14.010 MHZ					
	(a) Field strength within the band 13.553-13.567 MHz	X				
	(b) Field strength within the bands 13.410-13.553 MHz and 13.567-13.710 MHz	X				
	(c) Field strength within the bands 13.110-13.410 MHz and 13.710-14.010 MHz	X				
	(d) Field strength outside the band 13.110-14.010 MHz	X				
	(e) Carrier frequency tolerance	X				
	(f) Powered tags			X		

NAP: Not Applicable NAs: Not Asked

Note 1: Dedicated antenna with SMB or Phenix connector.

Note 2: See FCC part 15.225 (d).

Note 3: See FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.

7. MEASUREMENT UNCERTAINTY

To declare, or not, the compliance with the specifications, it was not explicitly taken into account of uncertainty associated with the result(s)

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for normal distribution corresponds to a coverage probability of approximately 95%.

Parameter	Emitech Uncertainty
RF power, conducted	$\pm 0.8\text{dB}$
Radiated emission valid to 26 GHz	
9kHz – 30MHz	$\pm 4.3\text{ dB}$
30MHz – 1GHz	$\pm 5.9\text{ dB}$
1GHz – 18GHz	$\pm 4.8\text{ dB}$
18GHz – 40GHz	$\pm 5.9\text{ dB}$
AC Power Lines conducted emissions	$\pm 3.7\text{ dB}$
Temperature	$\pm 0.95\text{ }^{\circ}\text{C}$
Humidity	$\pm 4.6\text{ \%}$

8. AC CONDUCTED EMISSIONS

Temperature (°C) : 20

Humidity (%HR): 42

Date : February 19, 2025

Technician : B. VOVARD

Standard: FCC Part 15

Test procedure:

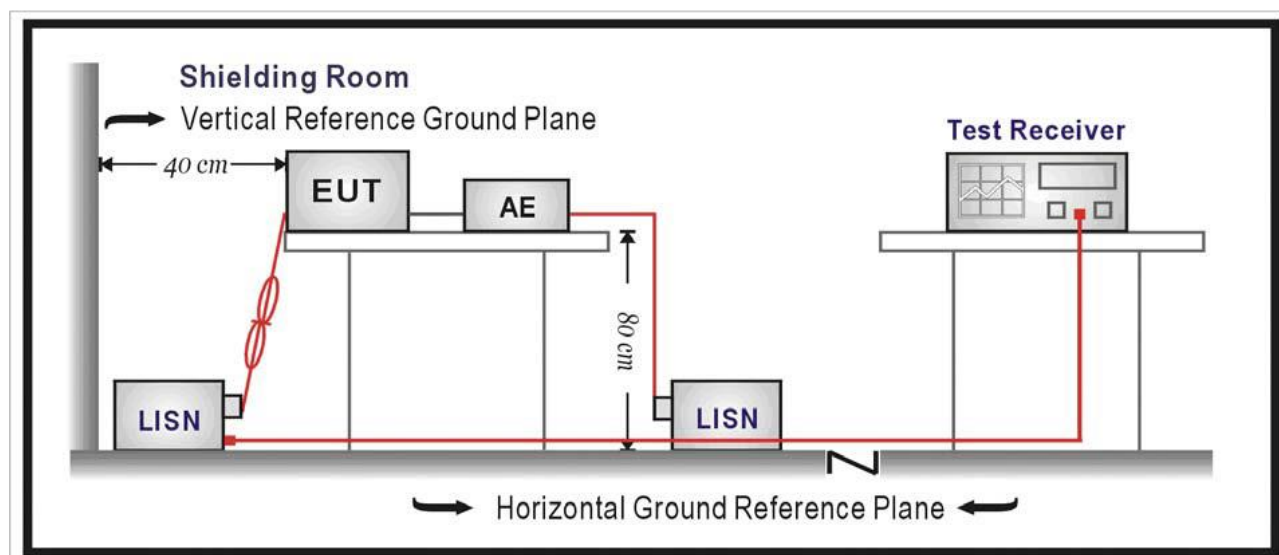
For FCC Part 15: § 15.207

Method of § 6.2 of ANSI C63.10

Software used: BAT-EMC V3.18.0.26

Test set up:

The EUT is isolated and placed on a wooden table, 0.8 m over an horizontal reference plane and 0.4 m from a vertical reference plane. It is powered by an artificial main network placed on the ground reference plane. The equipment is powered with the AC power operating voltage of 120 V / 60 Hz.



Frequency range: 150 kHz - 30 MHz

Detection mode: Peak / Quasi-peak / Average

Bandwidth: 10 kHz / 9 kHz

Equipment under test operating condition:

The equipment under test is blocked in alternance of emission and reception mode without tag, at the highest output power level at which the transmitter is intended to operate.

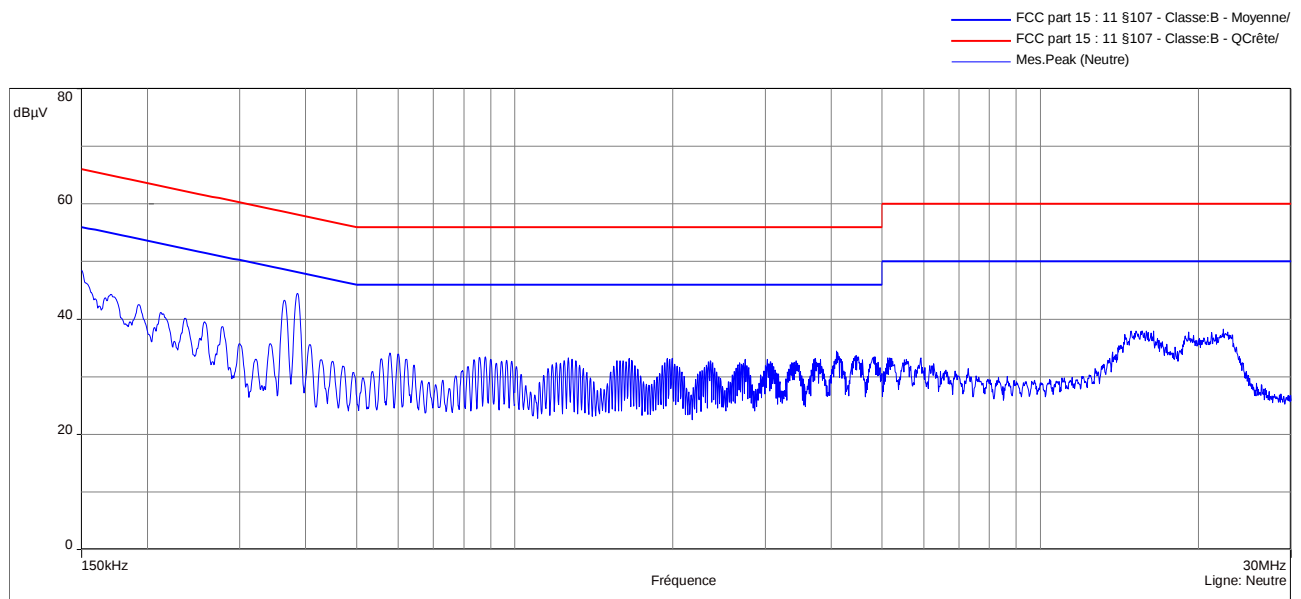
Results:

The module is tested with all antennas and with 50Ω load because the 13.56MHz fundamental appear in antenna measurements.

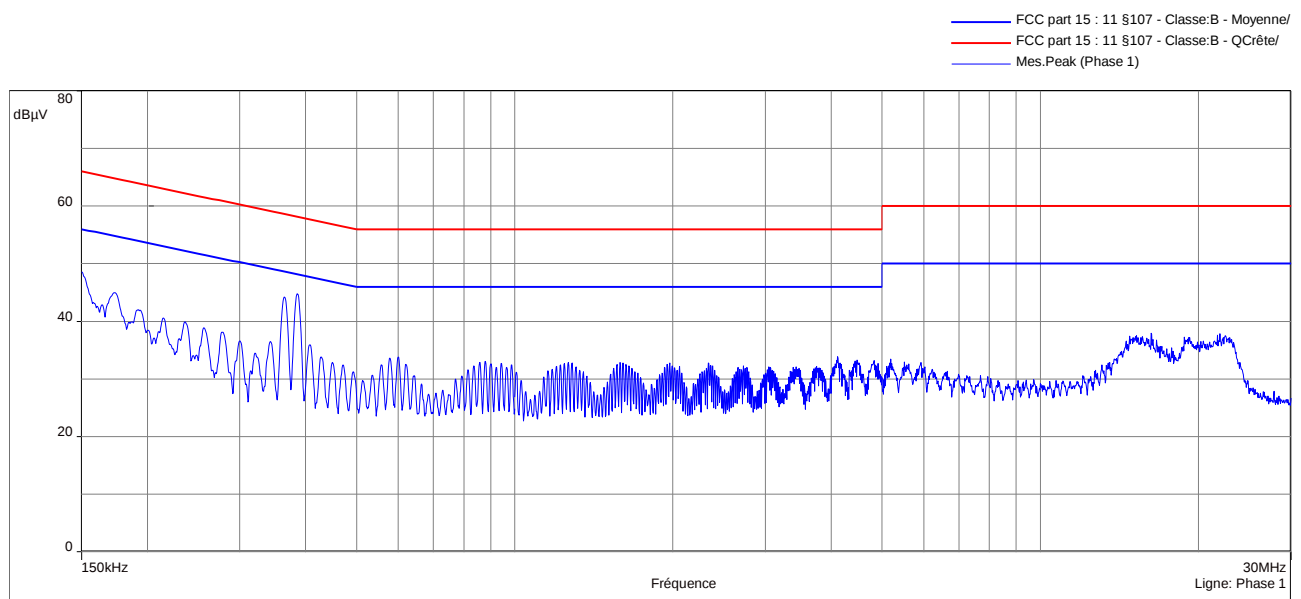
Sample N° 1: Module with 50Ω load:

Measurement on the mains power supply:

Curve N° 1: measurement on the Neutral with peak detector



Curve N° 2: measurement on the Line with peak detector



The highest frequencies are then analyzed with Quasi-peak detector and Average detector

Table N° 1: measurement on the Neutral, for the frequency range:

Frequency (MHz)	Quasi-peak (dBμV)	QP Limit (dBμV)	QP margin (dB)
0.150	44.36	66.00	21.64
0.171	41.1	64.92	23.82
0.193	38.39	63.91	25.52
0.212	35.25	63.12	27.87
0.365	42.34	58.62	16.28
0.386	43.32	58.15	14.83
0.579	30.94	56.00	25.06
0.879	30.19	56.00	25.81
1.265	29.98	56.00	26.02
1.651	29.54	56.00	26.46
1.994	29.43	56.00	26.57
2.744	28.79	56.00	27.21
4.095	29.48	56.00	26.52
14.872	32.63	60.00	27.37

Frequency (MHz)	Average (dBμV)	Average Limit (dBμV)	Average margin (dB)
0.150	30.41	56.00	25.59
0.171	28.41	54.92	26.51
0.193	25.76	53.91	28.15
0.212	23.56	53.12	29.56
0.365	41.75	48.62	6.87
0.386	42.64	48.15	5.51
0.579	30.32	46.00	15.68
0.879	29.56	46.00	16.44
1.265	29.21	46.00	16.79
1.651	28.48	46.00	17.52
1.994	28.29	46.00	17.71
2.744	26.88	46.00	19.12
4.095	26.6	46.00	19.40
14.872	27.22	50.00	22.78

Table N° 2: measurement on the Line, for the frequency range:

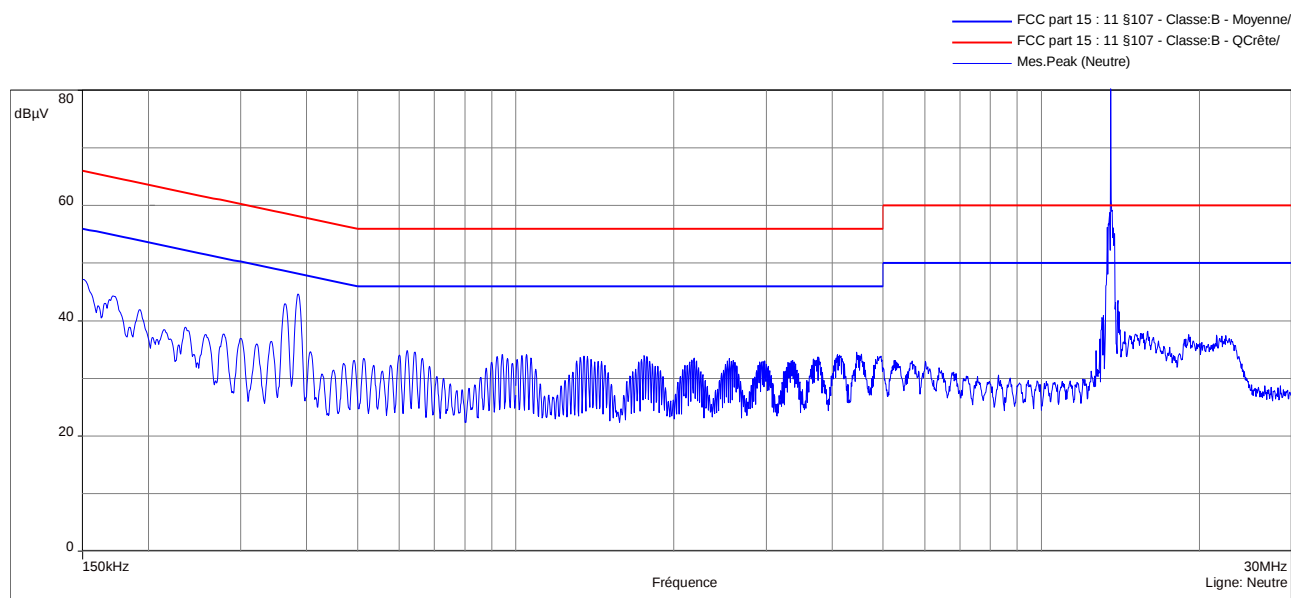
Frequency (MHz)	Quasi-peak (dBμV)	QP Limit (dBμV)	QP margin (dB)
0.150	45.25	66.00	20.75
0.174	40.99	64.79	23.80
0.194	38.86	63.86	25.00
0.365	43.28	58.62	15.34
0.386	43.83	58.15	14.32
0.600	30.49	56.00	25.51
0.879	29.45	56.00	26.55
1.264	28.74	56.00	27.26
1.587	29.19	56.00	26.81
1.971	28.38	56.00	27.62
2.338	29.18	56.00	26.82
4.118	29.82	56.00	26.18
14.802	31.17	60.00	28.83

Frequency (MHz)	Average (dBμV)	Average Limit (dBμV)	Average margin (dB)
0.150	32.58	56.00	23.42
0.174	29.35	54.79	25.44
0.194	27.03	53.86	26.83
0.365	42.82	48.62	5.80
0.386	43.17	48.15	4.98
0.600	29.75	46.00	16.25
0.879	28.75	46.00	17.25
1.264	27.75	46.00	18.25
1.587	28.31	46.00	17.69
1.971	27.01	46.00	18.99
2.338	27.86	46.00	18.14
4.118	28.13	46.00	17.87
14.802	25.89	50.00	24.11

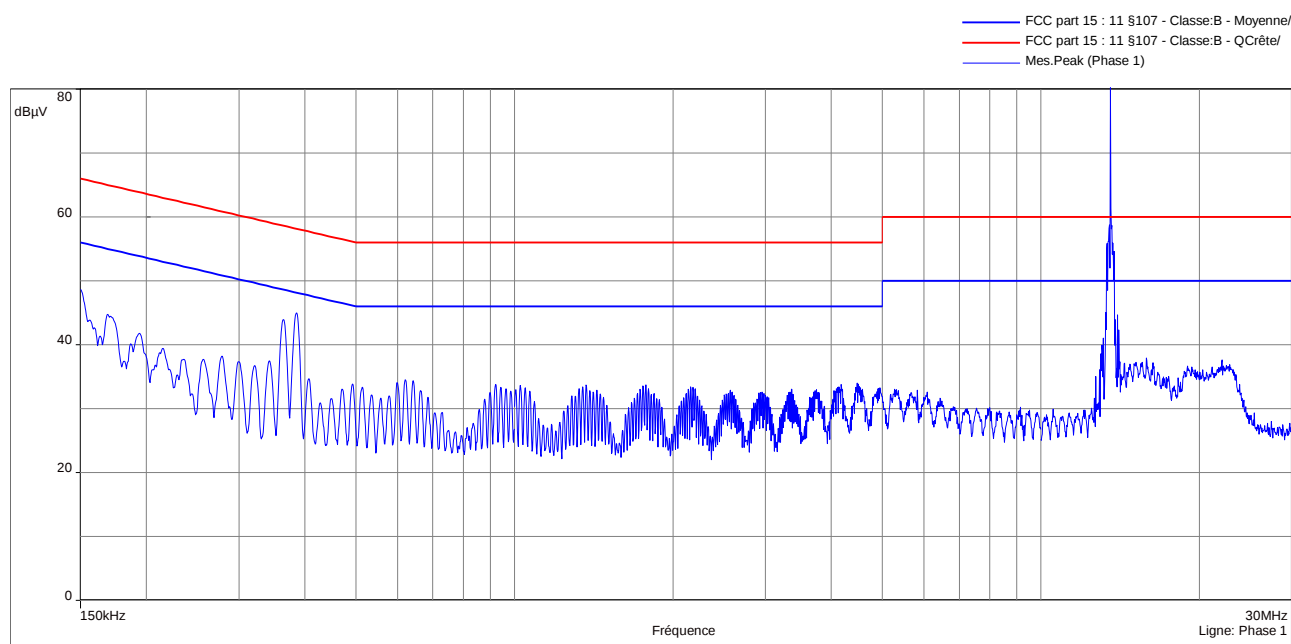
Sample N° 1: Antenna 6 - ELM1000035203:

Measurement on the mains power supply:

Curve N° 1: measurement on the Neutral with peak detector



Curve N° 2: measurement on the Line with peak detector



The highest frequencies are then analyzed with Quasi-peak detector and Average detector

Table N° 1: measurement on the Neutral, for the frequency range:

Frequency (MHz)	Quasi-peak (dBμV)	QP Limit (dBμV)	QP margin (dB)
0.150	43.89	65.98	22.09
0.172	41	64.89	23.89
0.193	37.95	63.92	25.97
0.235	34.99	62.26	27.27
0.364	42.04	58.64	16.60
0.386	43.61	58.16	14.55
0.622	32.29	56.00	23.71
0.943	30.8	56.00	25.20
1.348	30.25	56.00	25.75
1.756	30.82	56.00	25.18
4.094	30.76	56.00	25.24
4.455	30.07	56.00	25.93
15.927	31.69	60.00	28.31

Frequency (MHz)	Average (dBμV)	Average Limit (dBμV)	Average margin (dB)
0.150	30.08	55.98	25.90
0.172	28.92	54.89	25.97
0.193	26.33	53.92	27.59
0.235	24.4	52.26	27.86
0.364	41.47	48.64	7.17
0.386	42.92	48.16	5.24
0.622	31.75	46.00	14.25
0.943	30.24	46.00	15.76
1.348	29.48	46.00	16.52
1.756	29.91	46.00	16.09
4.094	29.2	46.00	16.80
4.455	27.75	46.00	18.25
15.927	26.3	50.00	23.70

Table N° 2: measurement on the Line, for the frequency range:

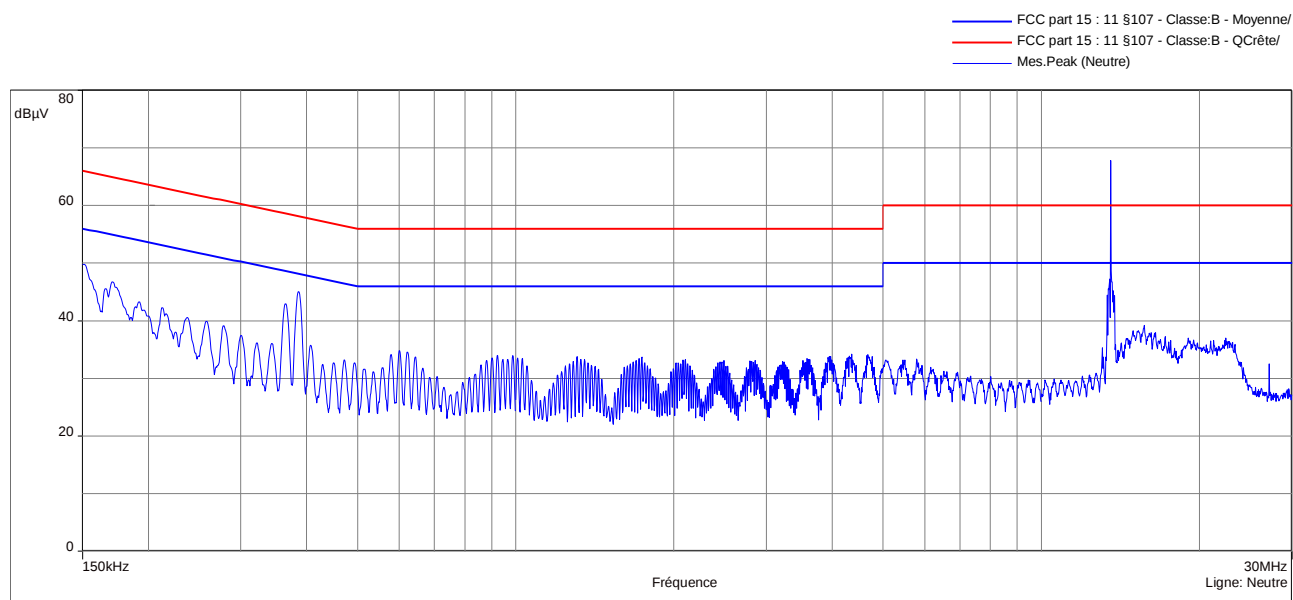
Frequency (MHz)	Quasi-peak (dBμV)	QP Limit (dBμV)	QP margin (dB)
0.150	44.95	66.00	21.05
0.169	40.57	65.01	24.44
0.194	38.23	63.85	25.62
0.278	35.21	60.86	25.65
0.364	43.12	58.63	15.51
0.386	44.14	58.15	14.01
0.493	30.8	56.12	25.32
0.621	31.86	56.00	24.14
0.922	30.2	56.00	25.80
1.369	29.21	56.00	26.79
1.777	30.22	56.00	25.78
4.476	29.69	56.00	26.31
15.877	31.15	60.00	28.85

Frequency (MHz)	Average (dBμV)	Average Limit (dBμV)	Average margin (dB)
0.150	32.49	56.00	23.51
0.169	29.57	55.01	25.44
0.194	27.7	53.85	26.15
0.278	30.19	50.86	20.67
0.364	42.66	48.63	5.97
0.386	43.52	48.15	4.63
0.493	30.26	46.12	15.86
0.621	31.25	46.00	14.75
0.922	29.54	46.00	16.46
1.369	28.3	46.00	17.70
1.777	29.17	46.00	16.83
4.476	27.48	46.00	18.52
15.877	26.06	50.00	23.94

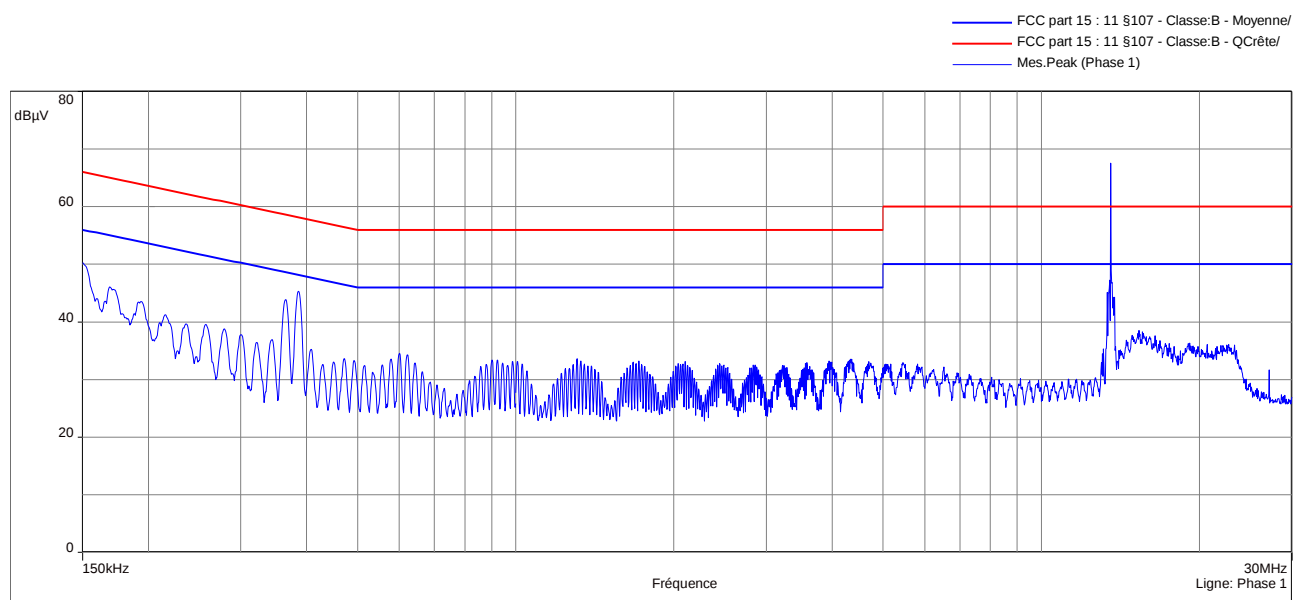
Sample N° 1: Antenna 7 - ELM1000042017:

Measurement on the mains power supply:

Curve N° 1: measurement on the Neutral with peak detector



Curve N° 2: measurement on the Line with peak detector



The highest frequencies are then analyzed with Quasi-peak detector and Average detector

Table N° 1: measurement on the Neutral, for the frequency range:

Frequency (MHz)	Quasi-peak (dBμV)	QP Limit (dBμV)	QP margin (dB)
0.151	45.74	65.94	20.20
0.171	43.07	64.90	21.83
0.365	41.9	58.62	16.72
0.386	43.79	58.14	14.35
0.408	32.32	57.70	25.38
0.601	32	56.00	24.00
0.988	30.57	56.00	25.43
1.308	30.53	56.00	25.47
1.738	30.47	56.00	25.53
4.358	29.53	56.00	26.47
15.699	31.97	60.00	28.03

Frequency (MHz)	Average (dBμV)	Average Limit (dBμV)	Average margin (dB)
0.151	31.25	55.94	24.69
0.171	29.89	54.90	25.01
0.365	41.34	48.62	7.28
0.386	43	48.14	5.14
0.408	30.92	47.70	16.78
0.601	31.44	46.00	14.56
0.988	30.01	46.00	15.99
1.308	29.81	46.00	16.19
1.738	29.51	46.00	16.49
4.358	27.07	46.00	18.93
15.699	26.35	50.00	23.65

Table N° 2: measurement on the Line, for the frequency range:

Frequency (MHz)	Quasi-peak (dBμV)	QP Limit (dBμV)	QP margin (dB)
0.150	46.59	66.00	19.41
0.169	41.62	65.01	23.39
0.365	42.98	58.62	15.64
0.386	44.24	58.15	13.91
0.601	31.57	56.00	24.43
0.903	29.52	56.00	26.48
1.308	30.17	56.00	25.83
1.716	30.37	56.00	25.63
4.356	30.22	56.00	25.78
15.351	31.08	60.00	28.92
19.139	29.91	60.00	30.09

Frequency (MHz)	Average (dBμV)	Average Limit (dBμV)	Average margin (dB)
0.150	33.44	56.00	22.56
0.169	29.63	55.01	25.38
0.365	42.54	48.62	6.08
0.386	43.52	48.15	4.63
0.601	30.94	46.00	15.06
0.903	28.85	46.00	17.15
1.308	29.4	46.00	16.60
1.716	29.36	46.00	16.64
4.356	28.57	46.00	17.43
15.351	24.83	50.00	25.17
19.139	22.73	50.00	27.27

Test conclusion:

RESPECTED STANDARD

9. OCCUPIED BANDWIDTH

Temperature (°C) : 20

Humidity (%HR): 42

Date : February 19, 2025

Technician : B. VOVARD

Standard: FCC Part 15

Test procedure:

Method of § 6.9.3 of ANSI C63.10 (99% Measurement)

Method of § 6.9.2 of ANSI C63.10 (20dB Measurement)

Test set up:

Test realized in near field.

Setting:

Measure	99%	20dB
Center frequency	The centre frequency of the channel under test	
Detector	Peak	
Span	1.5 to 5 times the OBW	2 to 5 times the OBW
RBW	1% to 5% of the OBW	1% to 5% of the OBW
VBW	3 x RBW	3 x RBW
Trace	Max hold	
Sweep	Auto	

Test operating condition of the equipment:

The equipment under test is blocked in alternance of emission and reception mode without tag, at the highest output power level at which the transmitter is intended to operate.

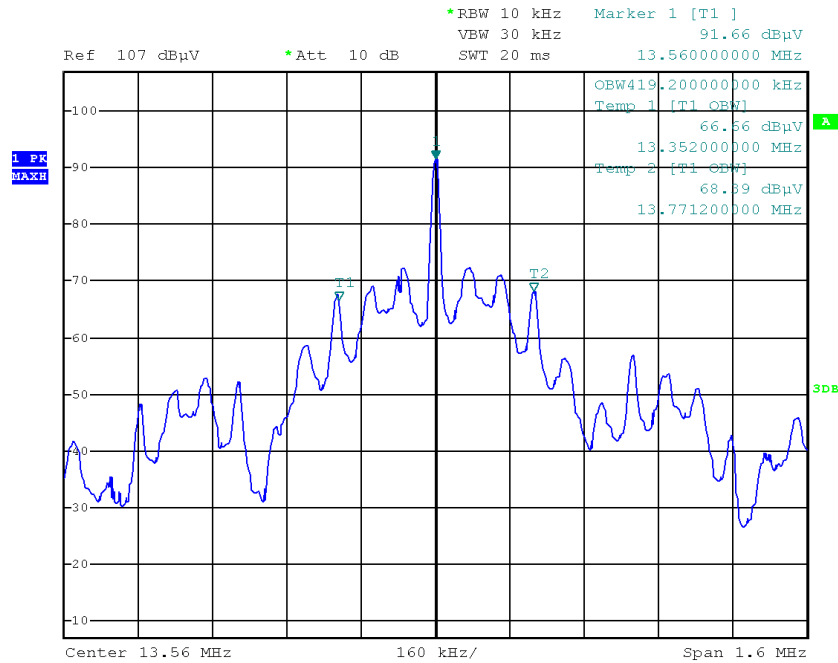
Power source: 12 Vdc by an adapter on power supply at 120 Vac 60 Hz

Percentage of voltage variation during the test (%): ± 1

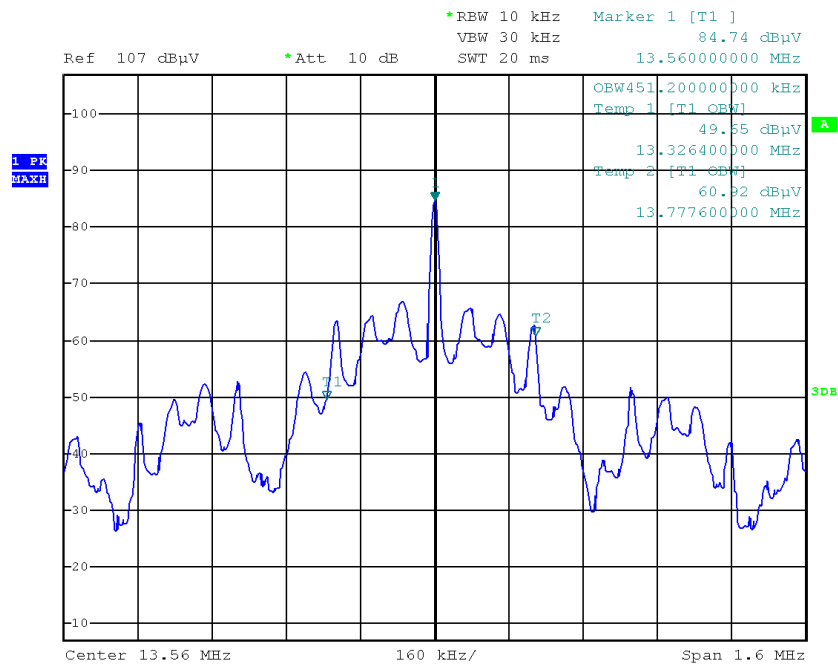
Results:

Sample N° 1

99% bandwidth – Antenna 6 - ELM1000035203:



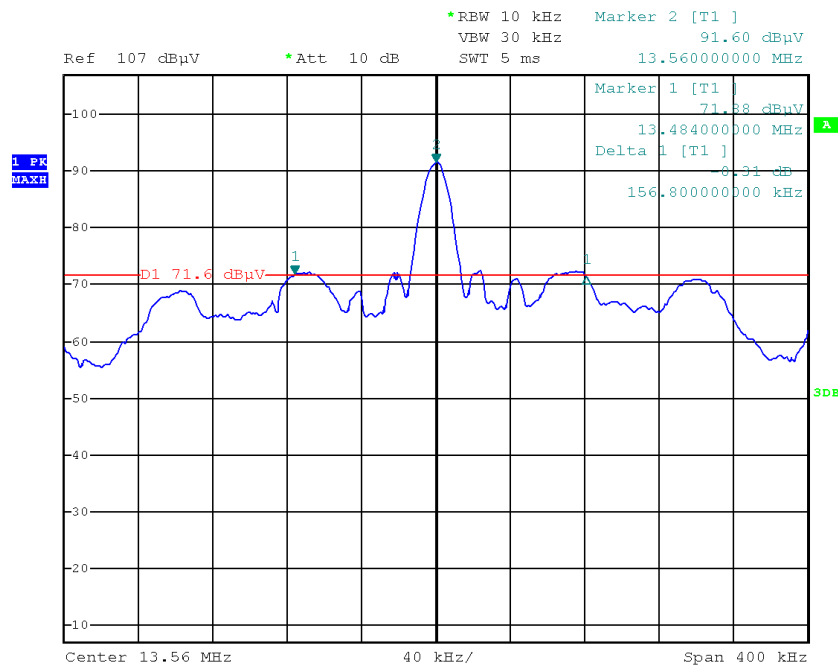
99% bandwidth – Antenna 7 - ELM1000042017:



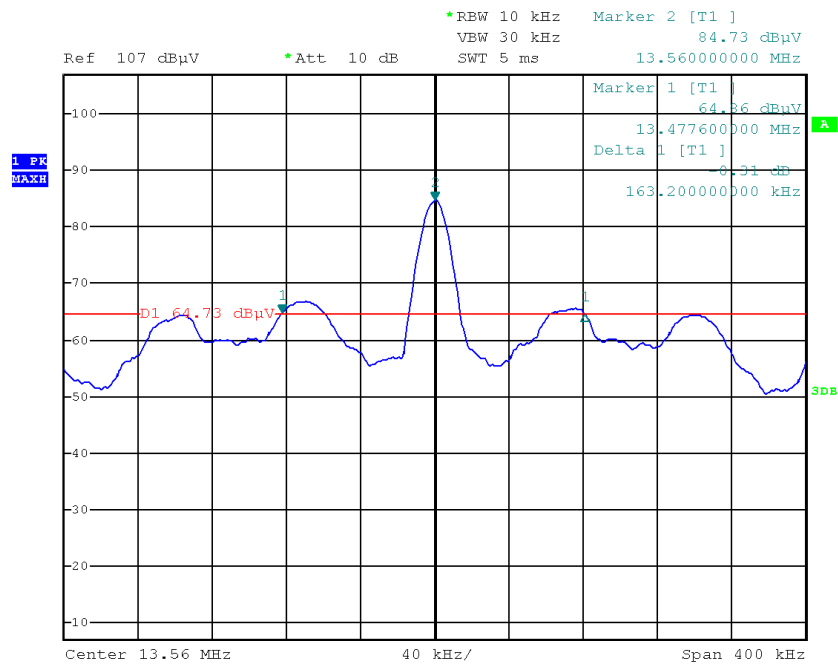
Limit:

Measure realized for reporting only

20dB bandwidth – Antenna 6 - ELM1000035203:



20dB bandwidth – Antenna 7 - ELM1000042017:



Limit:

Contains in the frequency band

10. BAND EDGE**Temperature (°C) :** 20**Humidity (%HR):** 42**Date :** February 19, 2025**Technician :** B. VOVARD**Standard:** FCC Part 15**Test procedure:**

For FCC Part 15: § 15.215

Method of § 6.10.6 of ANSI C63.10

Test set up:

Test realized in near field. All field strength measurements are correlated with the radiated maximum peak output power.

Test operating condition of the equipment:

The equipment under test is blocked in alternance of emission and reception mode without tag, at the highest output power level at which the transmitter is intended to operate.

Power source: 12 Vdc by an adapter on power supply at 120 Vac 60 Hz

Percentage of voltage variation during the test (%): ± 1

Results:

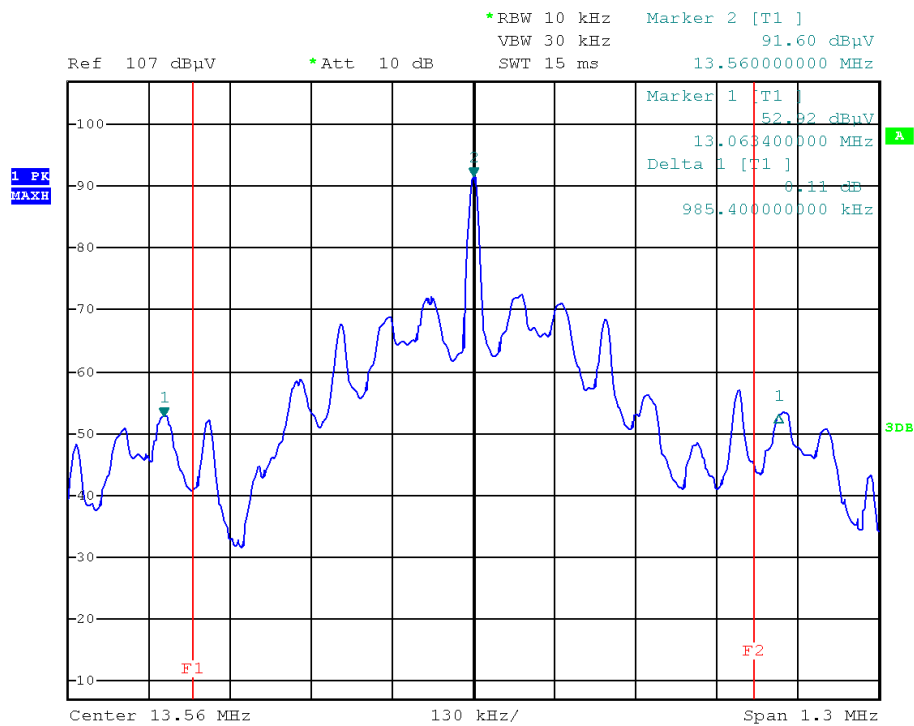
Lower Band Edge: From 13.090 MHz to 13.110 MHz

Upper Band Edge: From 14.010 MHz to 14.030 MHz

Sample N° 1: Antenna 6 - ELM1000035203:

Fundamental frequency (MHz)	Field Strength Level of fundamental (dBμV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
13.56	40.84	Peak	13.063	-38.68	2.16	48.63	46.47
13.56	40.84	Peak	14.048	-38.57	2.27	48.63	46.36

(1) Marker-Delta method

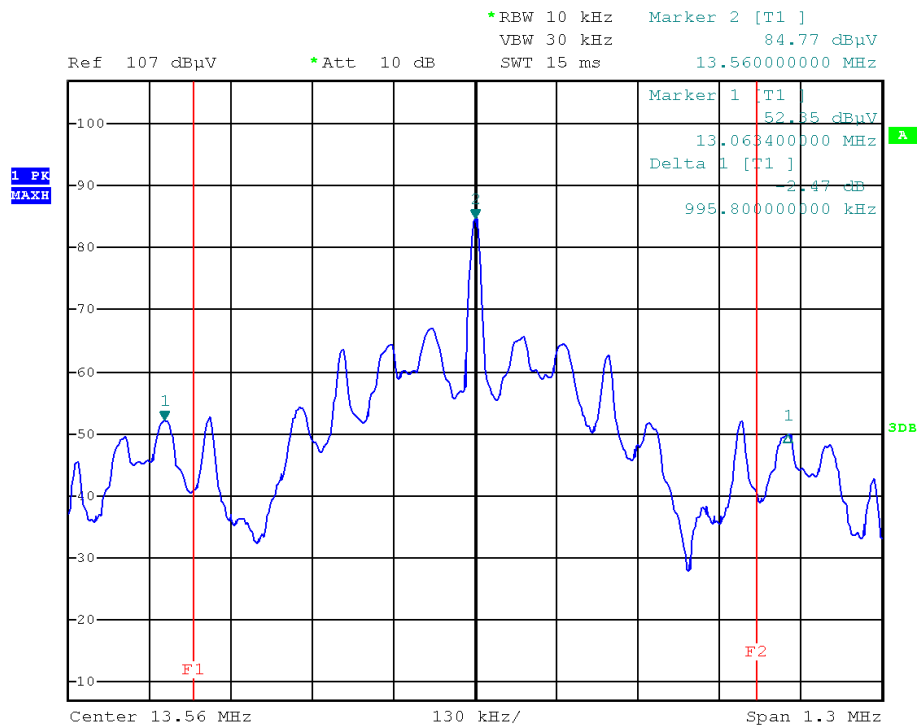


Lower Band Edge: From 13.090 MHz to 13.110 MHz
Upper Band Edge: From 14.010 MHz to 14.030 MHz

Sample N° 1: Antenna 7 - ELM1000042017:

Fundamental frequency (MHz)	Field Strength Level of fundamental (dB μ V/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
13.56	32.27	Peak	13.063	-32.42	-0.15	48.63	48.78
13.56	32.27	Peak	14.059	-34.89	-2.62	48.63	51.25

(1) Marker-Delta method



Test conclusion:

RESPECTED STANDARD

11. OPERATION WITHIN THE BAND 13.110 – 14.010 MHZ**Temperature (°C) :** 15**Humidity (%HR):** 57 to 50**Date :** March 17, 2025 and
March 18, 2025**Technician :** B. VOVARD**Standard:** FCC Part 15**Test procedure:**

For FCC Part 15: § 15.209, § 15.225 (a), (b), (c), (e)

Method of § 6.3 of ANSI C63.10

Method of § 6.4 of ANSI C63.10

Method of § 6.8 of ANSI C63.10

Test set up: (Refer Appendix 2)

First an exploratory radiated measurement was performed. During this phase the product is oriented in three orthogonal planes.

Then the final measurement is realized with the product on the most critical orientation.

The system is tested in an open area test site (OATS). The EUT is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test.

See test setup in appendix 2

For the frequency stability measurement, see radio report “**RR-21-F221-FLO-1-A Ed. 0**”.

Detection mode: Quasi-peak ($F < 1$ GHz)**Bandwidth:** 9 kHz ($150 \text{ kHz} < F < 30\text{MHz}$)**Distance of antenna:** 10 meters**Antenna height:** 1 meter**Antenna polarization:** oriented in the vertical plane. The lowest point of the loop is 1m above ground level.**Equipment under test operating condition:**

The equipment under test is blocked in alternance of emission and reception mode without tag, at the highest output power level at which the transmitter is intended to operate.

Power source: 12 Vdc by an adapter on power supply at 120 Vac 60 Hz

Percentage of voltage variation during the test (%): ± 1

Results:

Sample N° 1: Antenna 6 - ELM1000035203:

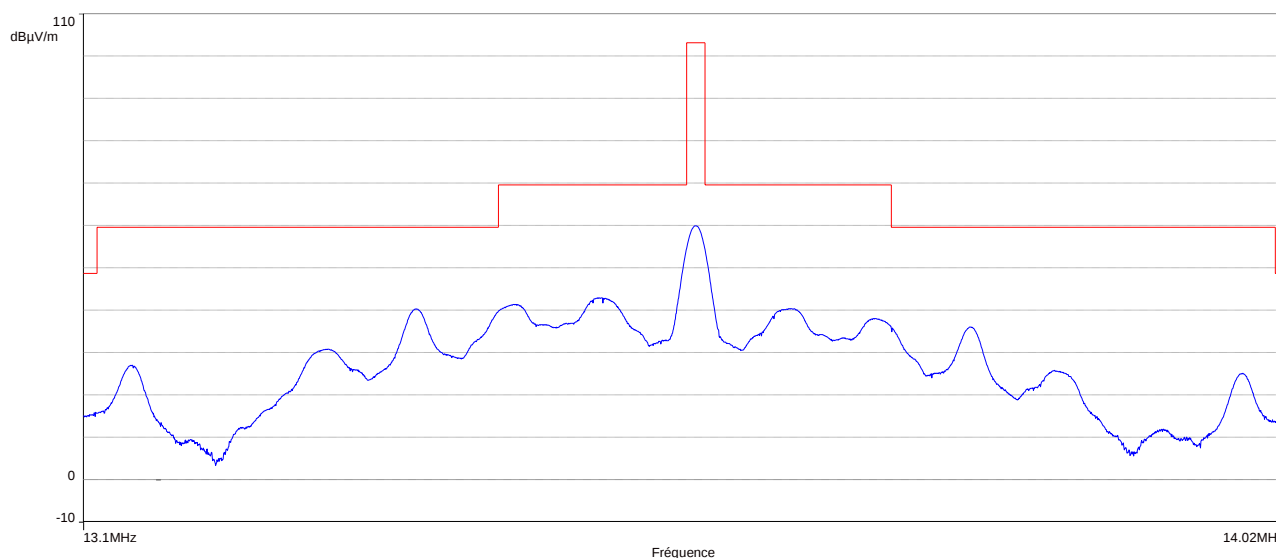
Carrier field strength

	Field strength (dB μ V/m) at frequency: 13.56 MHz
Normal test conditions measure at 10 m	59.92
Normal test conditions correlated at 30 m	40.84
Limits at 30m (dB μ V/m)	84
Margin (dB)	43.16

Polarization of test antenna: perpendicular at the equipment at 0 degree.

Position of equipment: 1 see photos in appendix 2 (azimuth: 274°)

Field strength within the band 13.110-14.010 MHz



Sample N° 1: Antenna 7 - ELM1000042017:

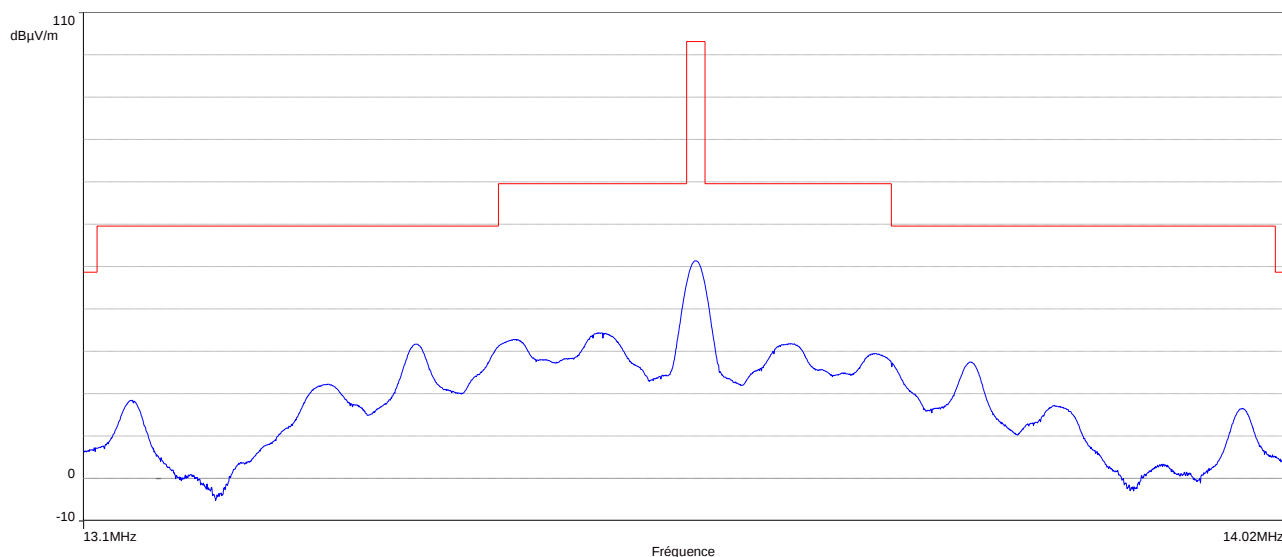
Carrier field strength

	Field strength (dB μ V/m) at frequency: 13.56 MHz
Normal test conditions measure at 10 m	51.35
Normal test conditions correlated at 30 m	32.27
Limits at 30m (dB μ V/m)	84
Margin (dB)	51.73

Polarization of test antenna: perpendicular at the equipment at 0 degree.

Position of equipment: 3 see photos in appendix 2 (azimuth: 93°)

Field strength within the band 13.110-14.010 MHz



Test conclusion:

RESPECTED STANDARD

12. FIELD STRENGTH OUTSIDE THE BAND 13.110-14.01 MHZ**Temperature (°C) :** 15**Humidity (%HR):** 57 to 50**Date :** March 17, 2025 and
March 18, 2025**Technician :** B. VOVARD**Standard:** FCC Part 15**Standard:** FCC Part 15**Test procedure:**

For FCC Part 15: § 15.209, § 15.225 (d)

Method of § 6.3 of ANSI C63.10

Method of § 6.4 of ANSI C63.10

Method of § 6.5 of ANSI C63.10

Test set up: (Refer Appendix 2)

First an exploratory radiated measurement was performed. During this phase the product is oriented in three orthogonal planes.

Then the final measurement is realized with the product on the most critical orientation.

The measure is realized on open area test site under 1 GHz.

When the system is tested in an open area test site (OATS), the EUT is placed on a rotating table, 0.8m from a ground plane.

Zero degree azimuths correspond to the front of the device under test.

See test setup in appendix 2

Frequency range: From 9 kHz to 140MHz (10th harmonic of the highest fundamental frequency (13.56MHz)**Detection mode:** Quasi-peak ($F < 1$ GHz)**Bandwidth:** 200Hz ($9 \text{ kHz} < F < 150\text{kHz}$)
9 kHz ($150 \text{ kHz} < F < 30\text{MHz}$)
120 kHz ($30 \text{ MHz} < F < 1 \text{ GHz}$)**Distance of antenna:** 10 meters (in open area test site)**Antenna height:** 1 to 4 meters (in open area test site)**Antenna polarization:** vertical and horizontal (only the highest level is recorded)

Equipment under test operating condition:

The equipment under test is blocked in alternance of emission and reception mode without tag, at the highest output power level at which the transmitter is intended to operate.

Power source: 12 Vdc by an adapter on power supply at 120 Vac 60 Hz

Percentage of voltage variation during the test (%): ± 1

Results:

Sample N° 1: Antenna 6 - ELM1000035203:

Below 30 MHz

Frequencies (MHz)	Detector P QP Av	Position	Antenna height (cm)	Degree (°)	RBW (kHz)	Polarization (Parallel Perpendicular)	Field strength Measured at 10 m (dBμV/m)	Field strength Computed at 30 m (dBμV/m)	Limits (dBμV/m)	Margin (dB)
27.12	QP	1	100	0	9	Parallel	14.79	-4.28	29.5	33.78

Above 30 MHz

Frequencies (MHz)	Detector P QP Av	Position		Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits (dBμV/m)	Margin (dB)
40.68	QP	3	100	179	100	V	28.41	38.87	40	1.13
54.24	QP	1	100	194	100	V	26.94	37.40	40	2.60
67.80	QP	2	230	248	100	V	19.89	30.35 (1)	40	9.65
81.36	QP	3	143	324	100	V	25.73	36.19	40	3.81
108.48	QP	3	100	206	100	V	23.78	34.24	43.5	9.26
122.04	QP	1	100	277	100	V	21.58	32.04 (1)	43.5	11.46
135.60	QP	3	100	0	100	V	21.60	32.06 (1)	43.5	11.44

P= Peak, QP=Quasi-peak, Av=Average

(1) Noise floor

Applicable limits: for 9 kHz ≤ F ≤ 490 kHz : 2400/F(kHz) at 300 meters
for 490 kHz < F ≤ 1.705 MHz : 24000/F(kHz) at 30 meters
for 1.705 MHz < F ≤ 30 MHz : 29.5 dBμV/m at 30 meters
for 30 MHz < F ≤ 88 MHz : 40 dBμV/m at 3 meters
for 88 MHz < F ≤ 216 MHz : 43.5 dBμV/m at 3 meters
for 216 MHz < F ≤ 960 MHz : 46 dBμV/m at 3 meters
Above 960 MHz : 54 dBμV/m at 3 meters

Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.

Sample N° 1: Antenna 7 - ELM1000042017:

Below 30 MHz

Frequencies (MHz)	Detector P QP Av	Position	Antenna height (cm)	Degree (°)	RBW (kHz)	Polarization (Parallel Perpendicular)	Field strength Measured at 10 m (dBμV/m)	Field strength Computed at 30 m (dBμV/m)	Limits (dBμV/m)	Margin (dB)
27.12	QP	1	100	158	9	Parallel	19.33	0.25	29.5	29.25

Above 30 MHz

Frequencies (MHz)	Detector P QP Av	Position		Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits (dBμV/m)	Margin (dB)
40.68	QP	3	100	80	100	V	27.84	38.30	40	1.70
54.24	QP	1	100	252	100	V	23.61	34.04	40	5.96
67.80	QP	1	213	255	100	V	23.70	34.16	40	5.84
81.36	QP	1	175	300	100	V	25.11	35.57	40	4.43
108.48	QP	1	124	289	100	V	31.12	41.58	43.5	1.92
122.04	QP	1	129	309	100	V	22.75	33.21	43.5	10.29
135.60	QP	2	100	23	100	V	20.70	31.16 (1)	43.5	12.34

P= Peak, QP=Quasi-peak, Av=Average

(1) Noise floor

Applicable limits: for $9 \text{ kHz} \leq F \leq 490 \text{ kHz}$: $2400/F(\text{kHz})$ at 300 meters
for $490 \text{ kHz} < F \leq 1.705 \text{ MHz}$: $24000/F(\text{kHz})$ at 30 meters
for $1.705 \text{ MHz} < F \leq 30 \text{ MHz}$: $29.5 \text{ dB}\mu\text{V/m}$ at 30 meters
for $30 \text{ MHz} < F \leq 88 \text{ MHz}$: $40 \text{ dB}\mu\text{V/m}$ at 3 meters
for $88 \text{ MHz} < F \leq 216 \text{ MHz}$: $43.5 \text{ dB}\mu\text{V/m}$ at 3 meters
for $216 \text{ MHz} < F \leq 960 \text{ MHz}$: $46 \text{ dB}\mu\text{V/m}$ at 3 meters
Above 960 MHz : $54 \text{ dB}\mu\text{V/m}$ at 3 meters

Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.

Test conclusion:

RESPECTED STANDARD

□□□ End of report, 1 appendix to be forwarded □□□

APPENDIX 1: Test equipment list

AC Conducted emissions

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room 3B	Emitech	20042
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESW44	Rohde & Schwarz	19462
LISN 1600	Thurbly Thandar Instruments	8719
High-pass filter EZ-25	Rohde & Schwarz	8635
Cable N-5m RG214	GYL Technologies	8590
Absorber sheath current	Emitech	10523
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Software	BAT-EMC V3.18.0.26	0000

Occupied bandwidth

TYPE	MANUFACTURER	EMITECH NUMBER
Full anechoic chamber 2	EMITECH	20040
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
N-2.5M Cable	HYTEM	19898
N-5M Cable	HYTEM	19877
N-5.8M Cable	HYTEM	19907
Loop antenna 6502	EMCO	1406
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Software	RS Commander V2.4.2	//

Band edge

TYPE	MANUFACTURER	EMITECH NUMBER
Full anechoic chamber 2	EMITECH	20040
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
N-2.5M Cable	HYTEM	19898
N-5M Cable	HYTEM	19877
N-5.8M Cable	HYTEM	19907
Loop antenna 6502	EMCO	1406
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Software	BAT-EMC V3.18.0.26	0000

Operation within the band 13.110 – 14.010 MHz

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Test receiver ESW44	Rohde & Schwarz	19462
Loop antenna 6502	EMCO	1406
N-3GHz Cable	GYL Technologies	8785
N-8M Cable	C & C	11832
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Software	Champ libre Juigné. V3.5	8864

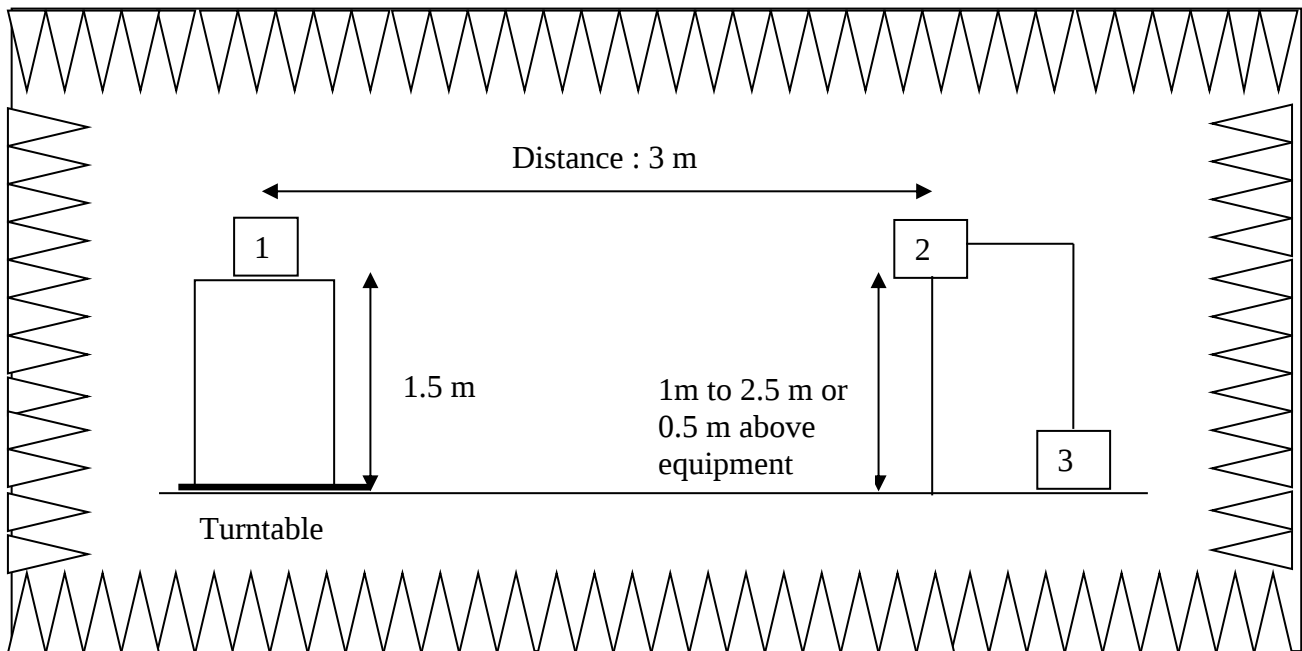
Field strength outside the band 13.110-14.010 MHz

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Test receiver ESW44	Rohde & Schwarz	19462
Loop antenna 6502	EMCO	1406
Biconical antenna VHA 9103	Schwarzbeck	8528
Log periodic antenna HL223	Rohde & Schwarz	7171
Attenuator 6dB 6GHz 1W	Radiall	19266
Attenuator 6dB 6GHz 1W	Radiall	19267
N-3GHz Cable	GYL Technologies	8785
N-8M Cable	C & C	11832
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Software	Champ libre Juigné. V3.5	8864

APPENDIX 2: Radiated Test Setup

Anechoic chamber setup

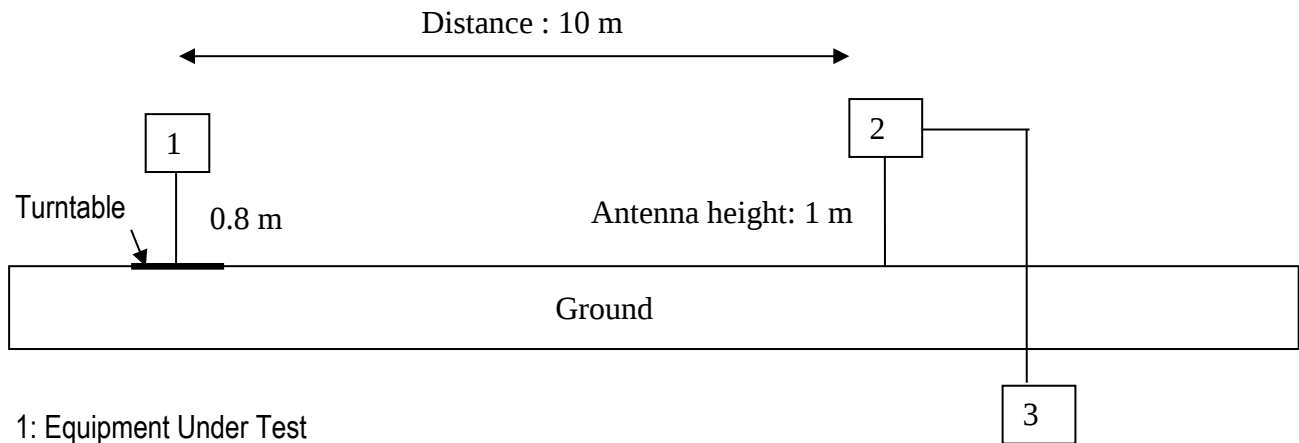
Above 1 GHz



- 1: Equipment Under Test
- 2: Measurement antenna
- 3: Measurement equipment

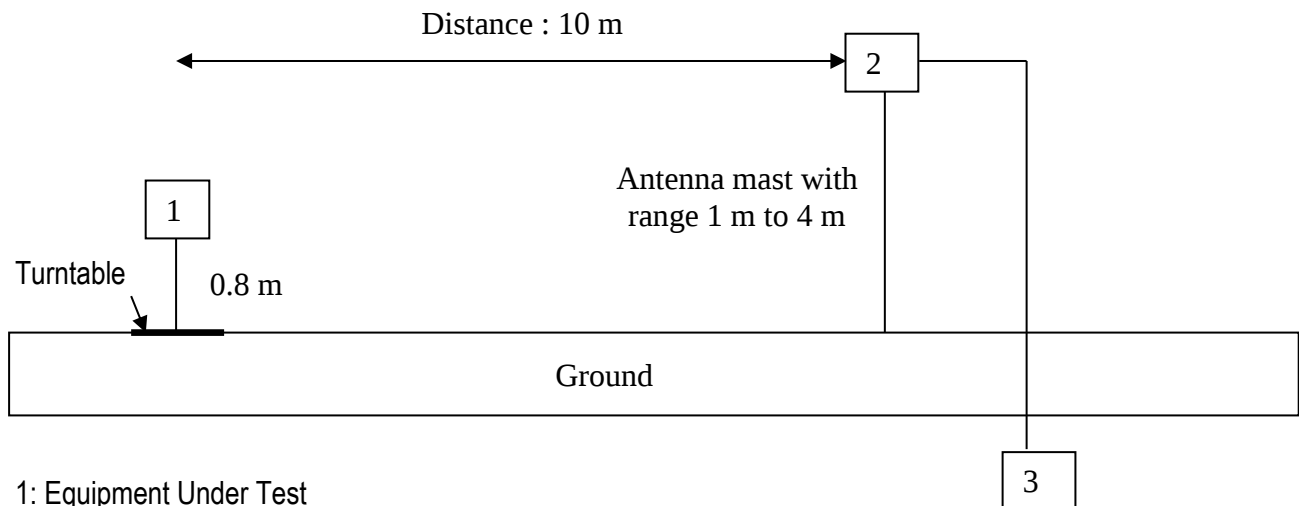
Open area setup

Below 30 MHz



- 1: Equipment Under Test
- 2: Measurement antenna
- 3: Measurement equipment

Between 30 MHz and 1 GHz



- 1: Equipment Under Test
- 2: Measurement antenna
- 3: Measurement equipment