

RRA-EMIESS23F550ADK-01Av1

This report cancels and replaces the test report N° RRA-EMIESS23F550ADK-01Av0

Certification Radio test report

According to the standard:

CFR 47 FCC PART 15

Equipment under test:

Novaterm® BOX 921 MHz

FCC ID: 2BEZD-NBOXV04

Company:

BERKEM DEVELOPPEMENT

Distribution: Mr BOUTIN

(Company: BERKEM DEVELOPPEMENT)

Number of pages: 31 with 2 annexes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval	
			Name and Function	Visa
1	3-Mar-25	1, 2, 3, 4	M. DUMESNIL, Radio Laboratory Manager	

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

DESIGNATION OF PRODUCT: *Novaterm® BOX 921 MHz*

Serial number (S/N): *22-222-22B*

Reference / model (P/N): *NBOX.921.1.5.24*

Software version: *0.0.0*

MANUFACTURER: *BERKEM DEVELOPPEMENT*

COMPANY CERTIFYING THE PRODUCT:

Company: *BERKEM DEVELOPPEMENT*

Address: *20, RUE JEAN DUVERT
33290
BLANQUEFORT
FRANCE*

RESPONSIBLE: *Mr BOUTIN*

COMPANY SUBMITTING THE PRODUCT:

Company: *BERKEM DEVELOPPEMENT*

Address: *20, RUE JEAN DUVERT
33290
BLANQUEFORT
FRANCE*

Responsible: *Mr BOUTIN*

Person present during the tests: *Mr KAMAL Ibrahim – (The first day)*

DATE(S) OF TEST: *From 9-Jan-24 to 11-Jan-24 and 7-Feb-24 to 14-Feb-24*

TESTING LOCATION: *EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE*

*FCC Accredited under US-EU MRA Designation Number: FR0009
Test Firm Registration Number: 873677*

TESTED BY: *B. VOVARD*

VISA:

WRITTEN BY: *B. VOVARD*

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

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REVISIONS HISTORY

Revision	Date	Modified pages	Modifications
0	15-Feb-24	/	Creation
1	03-Mar-25	1, 2, 3, 4	Update following a change in the product's marketing name

1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: **Novaterm® BOX 921 MHz**, in accordance with normative reference.

The equipment under test integrates:

- SRD Monofrequency transceiver operational in the band (902MHz – 928MHz).
- GSM / LTE-M / NBloT radio module already certified (FCCID: XMR201910BG95M3)

The host device of certified module(s) shall be properly labeled to identify the module(s) within.

2. PRODUCT DESCRIPTION

Class: B

Utilization: Residential

SRD Part :

Antenna type and gain: 0.01 dBi / integral antenna

Operating frequency range: From 902 MHz to 928 MHz

Number of channels: 1

Channel spacing: Not concerned

Modulation: GFSK2

GSM / LTE-M / NBloT Parts :

Antenna type and gain: Maximum gain of 3.3 dBi / integral SMD antenna (TE Connectivity 2108783-2)

Operating frequency range:	From 824 MHz to 849 MHz	(GSM 850)
	From 1850 MHz to 1910 MHz	(PCS 1900)
	From 1850 MHz to 1910 MHz	(LTE-M and NBloT Band 2)
	From 1710 MHz to 1755 MHz	(LTE-M and NBloT Band 4)
	From 824 MHz to 849 MHz	(LTE-M and NBloT Band 5)
	From 699 MHz to 716 MHz	(LTE-M and NBloT Band 12)
	From 777 MHz to 787 MHz	(LTE-M and NBloT Band 13)
	From 1850 MHz to 1915 MHz	(LTE-M and NBloT Band 25)
	From 824 MHz to 849 MHz	(Only LTE-M Band 26)
	From 1710 MHz to 1780 MHz	(LTE-M and NBloT Band 66)
	From 663 MHz to 698 MHz	(Only NBloT Band 71)
	From 698 MHz to 716 MHz	(LTE-M and NBloT Band 85)

Power source: 5 Vdc by adapter at 120 Vac 60 Hz

Power level, frequency range and channels characteristics are not user adjustable.
The details pictures of the product and the circuit boards are joined with this file.

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 (2024) Radio Frequency Devices

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

558074 D01 15.247 Meas Guidance v05r02
Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules.

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 247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

5. TEST EQUIPMENT CALIBRATION DATES

Emitech Number	Model	Type	Last calibration	Calibration interval (years)	Next calibration due
0	BAT-EMC V3.18.0.26	Software	/	/	/
4393	Wainwright WLJS800-C11/60EE	Low Pass Filter	06/02/2023	3	05/02/2026
6609	Hewlett Packard HPM11630	High Pass Filter	28/07/2021	3	27/07/2024
7171	R&S HL223	Antenna	19/05/2022	3	18/05/2025
7190	R&S HL223	Antenna	17/03/2022	3	16/03/2025
7240	Emco 3110	Biconical antenna	17/03/2022	3	16/03/2025
7566	Testo 608-H1	Meteo station	12/12/2022	2	11/12/2024
8262	Filtek HP12/3200-5AA	High pass filter	16/08/2022	3	15/08/2025
8508	California instruments 1251RP	Power source	(1)	(1)	(1)
8528	Schwarzbeck VHA 9103	Biconical antenna	19/05/2022	3	18/05/2025
8543	Schwarzbeck UHALP 9108A	Log periodic antenna	04/08/2021	3	03/08/2024
8590	RG214 N-5m	Cable	29/01/2024	2	28/01/2026
8719	Thurbly Thandar Instruments 1600	LISN	24/02/2022	2	24/02/2024
8732	Emitech	OATS	28/03/2022	3	27/03/2025
8750	La Crosse Technology WS-9232	Meteo station	20/11/2023	1	19/11/2024
8785	N-1.5m Emitech	Cable	23/02/2022	2	23/02/2024
8855	EMITECH	Turntable and mat controller	/	/	/
8874	N-20m Gyl Technologies	Cable	11/03/2022	2	10/03/2024
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
9399	N-1m	Cable	29/01/2024	2	28/01/2026
9489	Absorber sheath current	Emitech	24/02/2022	2	24/02/2024
10651	EMITECH	Absorber sheath current	31/01/2024	2	30/01/2026
10730	Mini-circuit ZFL-1000LN	Low-noise amplifier	16/11/2023	1	15/11/2024

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

Emitech Number	Model	Type	Last calibration	Calibration interval (years)	Next calibration due
10759	COMTEST Cage 3	Anechoic chamber	/	/	/
10771	EMCO 3117	Antenna	30/11/2022	3	30/11/2025
10788	Emitech	Outside room Hors cage	/	/	/
10789	MATURO	Turntable and mat controller NCD	/	/	/
11832	N-8m - C&C	Cable	16/02/2022	2	16/02/2024
12590	LUCIX Corp S005180M3201	Low-noise amplifier	21/06/2023	1	20/06/2024
12911	Huber + Suhner N-2m	cable	20/05/2022	2	19/05/2024
14303	SUCOFLEX N-2m	cable	01/12/2022	2	30/11/2024
14475	Oregon Scientific BAR206	Meteo station	11/04/2023	1	10/04/2024
14831	Fluke 177	Multimeter	22/12/2023	2	21/12/2025
15666	R&S FSV40	Spectrum Analyzer	27/09/2022	2	26/09/2024
15883	SUCOFLEX	cable N 5m	08/02/2023	2	07/02/2025
15913	SUCOFLEX SF104 N 2.5m	Cable	01/12/2022	2	30/11/2024
17008	R&S ESW44	Test receiver	08/02/2023	1	08/02/2024
18413	MechANC - N - 5m	Cable	15/02/2022	2	15/02/2024
19246	HYTEM - N - 5m	Cable	22/01/2024	2	21/01/2026
19249	HYTEM - N - 2.5m	Cable	22/01/2024	2	21/01/2026
19268	Radiall R412706124 - 6dB	Attenuator	06/12/2023	3	05/12/2026
//	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				
	(b) Unwanted emissions outside of §15.247 frequency bands	X				Note 3
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.247	OPERATION WITHIN THE BANDS 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz					
	(a) (1) Hopping systems			X		
	(a) (2) Digital modulation techniques	X				Note 4
	(b) Maximum peak output power	X				Note 5
	(c) Operation with directional antenna gains > 6 dBi			X		
	(d) Intentional radiator	X				
	(e) Peak power spectral density	X				
	(f) Hybrid system			X		
	(g) Frequency hopping requirements			X		
	(h) Frequency hopping intelligence			X		
	(i) RF exposure compliance	X				

NAP: Not Applicable

NAs: Not Asked

Note 1: Integral antenna without standard connector.

Note 2: See FCC part 15.247 (d).

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

Note 4: The minimum 6 dB bandwidth of the equipment is 500.7 kHz.

Note 5: Conducted measurement is not possible (integral antenna), so we used the radiated method in open field.

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	$\pm 2.7. \text{ dB}$
30MHz – 1GHz	$\pm 5.0 \text{ dB}$
1GHz – 18GHz	$\pm 5.3 \text{ dB}$
18GHz – 40GHz	$\pm 6.1 \text{ dB}$
AC Power Lines conducted emissions	$\pm 3.4 \text{ dB}$
Temperature	$\pm 1 \text{ }^{\circ}\text{C}$
Humidity	$\pm 5 \%$

8. AC CONDUCTED EMISSIONS

Temperature (°C) : 20

Humidity (%HR): 50

Date : February 7, 2024

Technician : B. VOVARD

Standard: FCC Part 15

Standard: FCC Part 15

Test procedure:

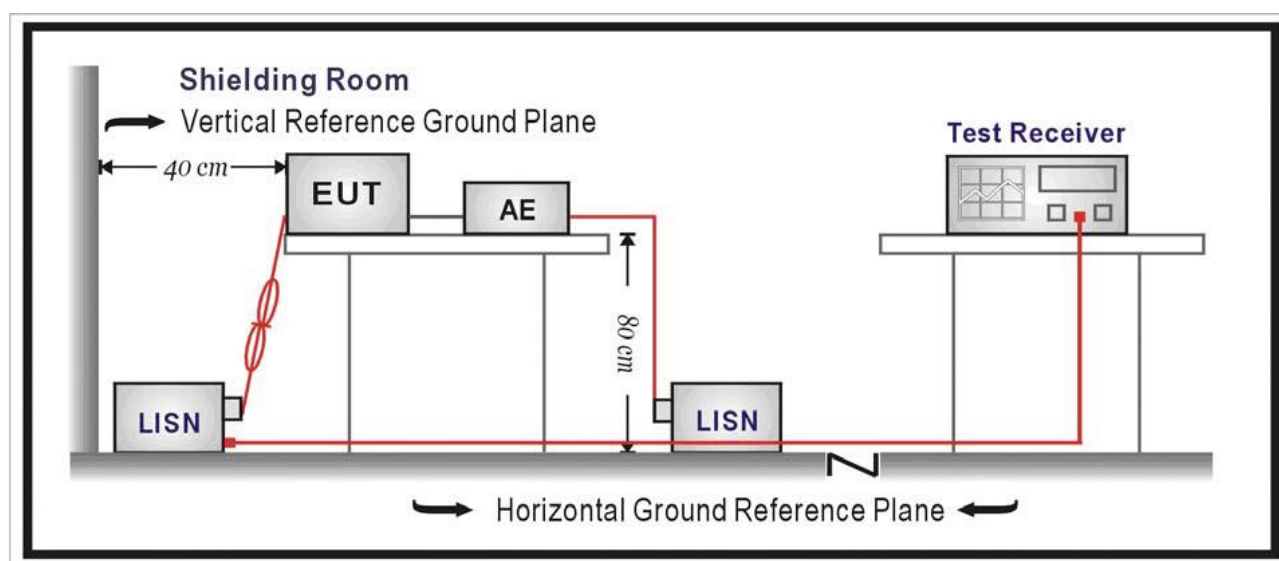
For FCC Part 15: Paragraph 15.207

Method of paragraph 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 continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

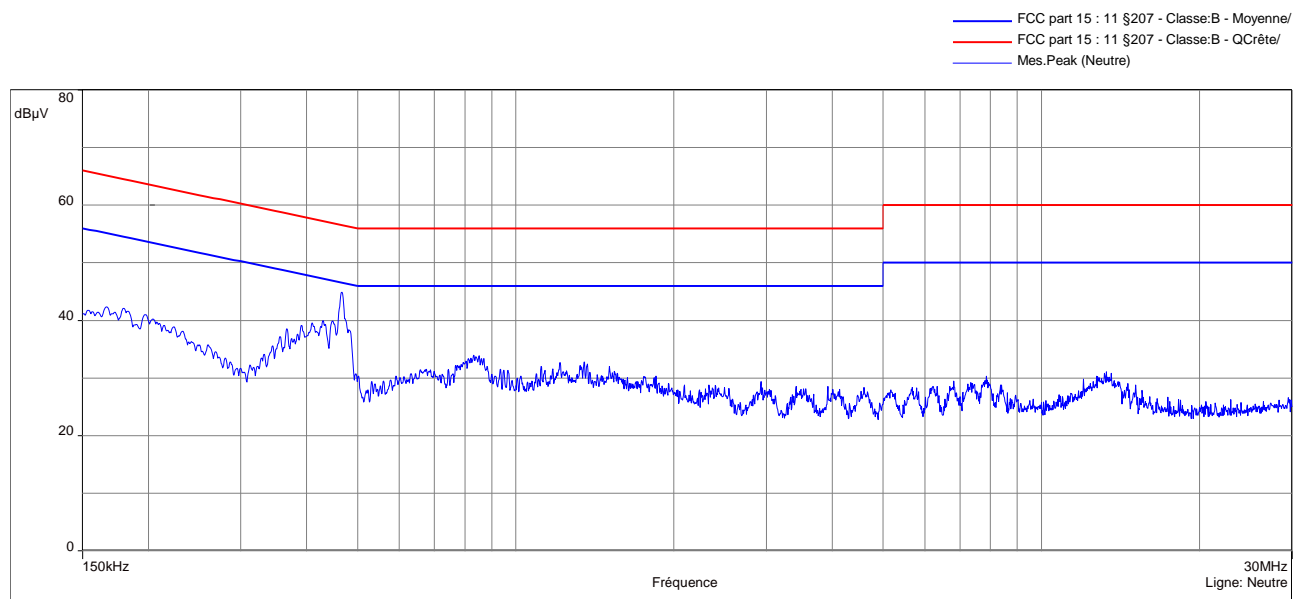
Results:

Sample N° 1:

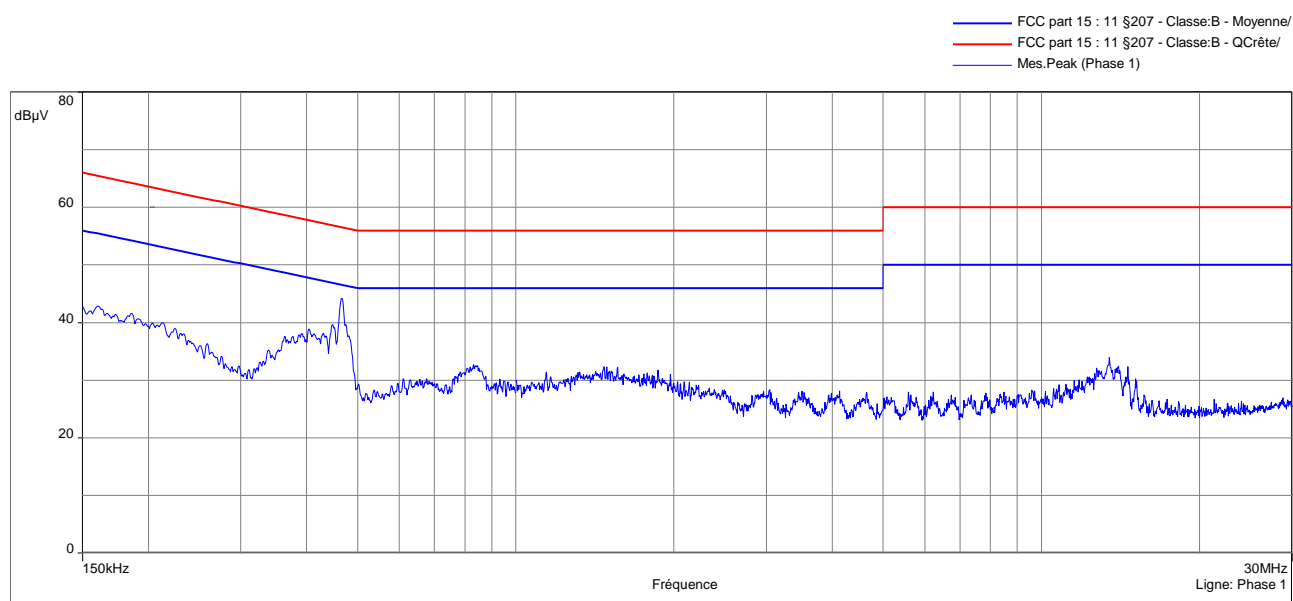
Measurement on the mains power supply:

The measurement is first realized with peak detector.

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)
0.165	33.18	65.20	32.02
0.167	33.41	65.13	31.72
0.180	33.67	64.50	30.83
0.198	32.52	63.71	31.19
0.224	30.13	62.67	32.54
0.260	26.66	61.43	34.77
0.328	24	59.50	35.50
0.345	26.78	59.09	32.31
0.356	28.35	58.82	30.47
0.367	29.25	58.57	29.32
0.391	31.49	58.04	26.55
0.410	32.15	57.65	25.50
0.430	33.27	57.26	23.99
0.448	35.17	56.91	21.74
0.461	35.12	56.68	21.56
0.467	41.9	56.57	14.67
0.471	37.08	56.49	19.41
0.484	34.43	56.27	21.84
0.496	21.26	56.06	34.80
0.658	22.92	56.00	33.08
0.812	25.39	56.00	30.61
1.118	21.3	56.00	34.70
1.214	23.96	56.00	32.04
1.349	25.04	56.00	30.96
1.508	21.83	56.00	34.17
1.758	21.81	56.00	34.19
2.398	19.14	56.00	36.86
2.928	18.69	56.00	37.31
3.415	16.91	56.00	39.09
4.595	18.19	56.00	37.81

Frequency (MHz)	Average (dBμV)	Average Limit (dBμV)	Average margin (dB)
0.165	12.8	55.20	42.40
0.167	12.97	55.13	42.16
0.180	13.12	54.50	41.38
0.198	12.88	53.71	40.83
0.224	11.92	52.67	40.75
0.260	10.17	51.43	41.26
0.328	10.55	49.50	38.95
0.345	12.96	49.09	36.13
0.356	14.72	48.82	34.10
0.367	15.4	48.57	33.17
0.391	17.61	48.04	30.43
0.410	17.68	47.65	29.97
0.430	18.26	47.26	29.00
0.448	20.75	46.91	26.16
0.461	21.46	46.68	25.22
0.467	26.97	46.57	19.60
0.471	23.66	46.49	22.83
0.484	19.68	46.27	26.59
0.496	9.78	46.06	36.28
0.658	11.41	46.00	34.59
0.812	12.83	46.00	33.17
1.118	9.06	46.00	36.94
1.214	11.46	46.00	34.54
1.349	12.26	46.00	33.74
1.508	8.8	46.00	37.20
1.758	10.06	46.00	35.94
2.398	8.41	46.00	37.59
2.928	7.82	46.00	38.18
3.415	7.05	46.00	38.95
4.595	7.48	46.00	38.52

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

Frequency (MHz)	Quasi-peak (dBμV)	QP Limit (dBμV)	QP margin (dB)
0.161	33.4	65.44	32.04
0.186	31.89	64.22	32.33
0.213	30.99	63.08	32.09
0.225	30.42	62.64	32.22
0.259	26.53	61.47	34.94
0.276	24.08	60.94	36.86
0.338	25.3	59.24	33.94
0.364	27.65	58.65	31.00
0.404	29.75	57.77	28.02
0.430	31.98	57.25	25.27
0.448	33.95	56.91	22.96
0.462	35.29	56.66	21.37
0.467	40.65	56.57	15.92
0.482	32.63	56.31	23.68
0.490	23.57	56.16	32.59
0.538	16.65	56.00	39.35
0.611	19.24	56.00	36.76
0.677	21.14	56.00	34.86
0.784	22.15	56.00	33.85
0.831	24.43	56.00	31.57
0.877	21.28	56.00	34.72
0.933	21.23	56.00	34.77
1.143	19.79	56.00	36.21
1.323	22.69	56.00	33.31
1.473	22.32	56.00	33.68
1.562	22.76	56.00	33.24
1.865	20.81	56.00	35.19
1.969	20.48	56.00	35.52
3.041	17.19	56.00	38.81
3.507	17.42	56.00	38.58

Frequency (MHz)	Average (dBμV)	Average Limit (dBμV)	Average margin (dB)
0.161	13.73	55.44	41.71
0.186	13.13	54.22	41.09
0.213	13.1	53.08	39.98
0.225	13.29	52.64	39.35
0.259	10.66	51.47	40.81
0.276	9.67	50.94	41.27
0.338	13.12	49.24	36.12
0.364	16.43	48.65	32.22
0.404	18.71	47.77	29.06
0.430	20.16	47.25	27.09
0.448	22.7	46.91	24.21
0.462	24.83	46.66	21.83
0.467	29.01	46.57	17.56
0.482	21.7	46.31	24.61
0.490	13.28	46.16	32.88
0.538	8.4	46.00	37.60
0.611	10.7	46.00	35.30
0.677	11.86	46.00	34.14
0.784	12.48	46.00	33.52
0.831	13.57	46.00	32.43
0.877	11.78	46.00	34.22
0.933	11.68	46.00	34.32
1.143	8.48	46.00	37.52
1.323	12.84	46.00	33.16
1.473	9.76	46.00	36.24
1.562	8.02	46.00	37.98
1.865	10.92	46.00	35.08
1.969	10.4	46.00	35.60
3.041	8.93	46.00	37.07
3.507	8.83	46.00	37.17

Test conclusion:

RESPECTED STANDARD

9. OCCUPIED BANDWIDTH

Temperature (°C) : 26

Humidity (%HR): 22

Date : January 9, 2024

Technician : B. VOVARD

Standard: FCC Part 15**Test procedure:**

Method of paragraphs 11.8 of ANSI C63.10 (6dB Measurement)

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

Test set up:

Test realized in near field.

Setting:

Measure	6dB	99%
Center frequency	The centre frequency of the channel under test	
Detector	Peak	
Span	2 to 5 times the OBW	1.5 to 5 times the OBW
RBW	100kHz	1% to 5% of the OBW
VBW	300kHz	3 x RBW
Trace	Max hold	
Sweep	Auto	

Test operating condition of the equipment:

The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

Power source: 120 Vac 60 Hz by an external power supply

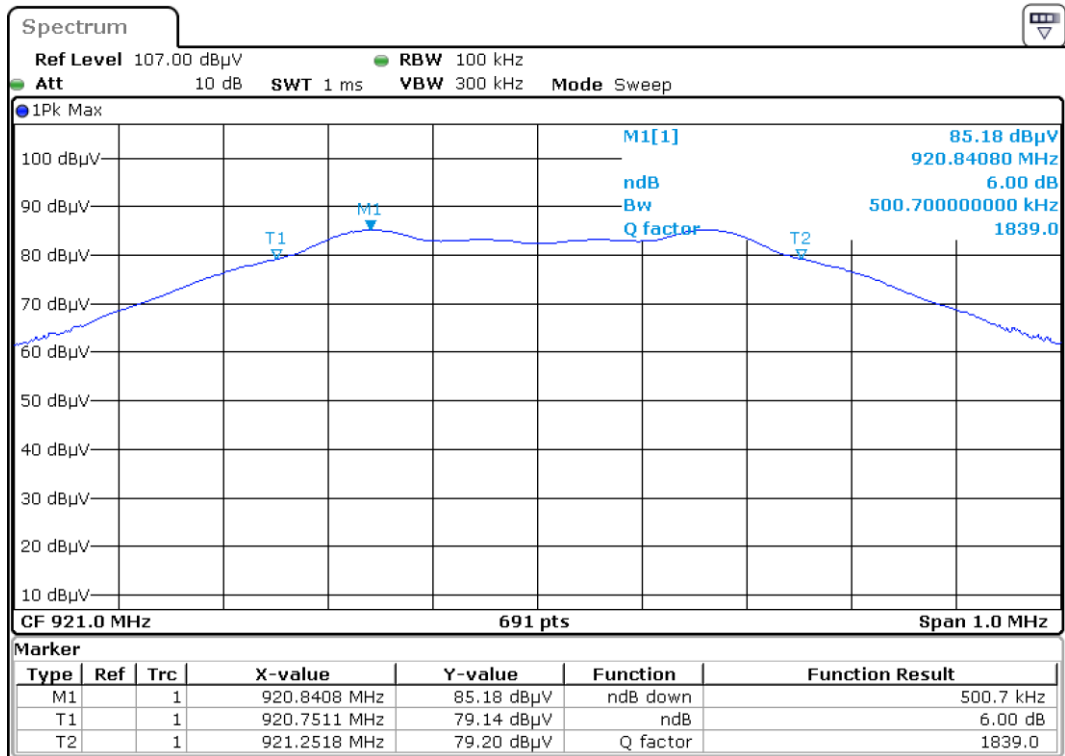
Percentage of voltage variation during the test (%):

± 1

Results:

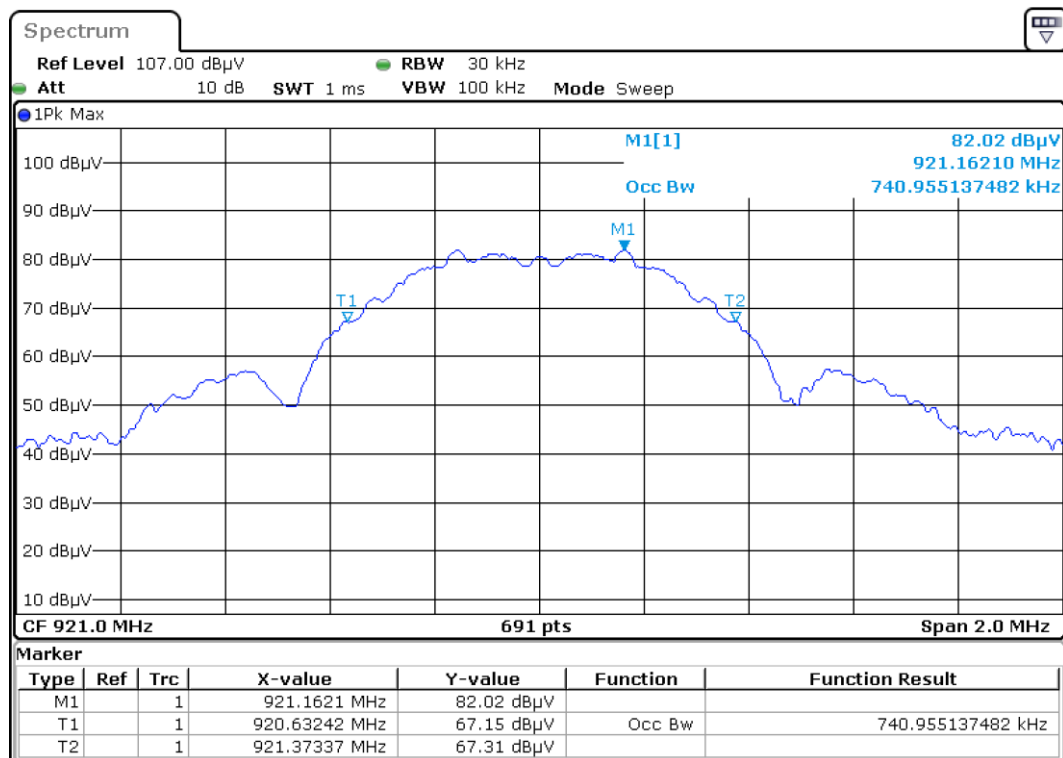
Sample N° 1

6dB bandwidth – Channel 921 MHz


Limit:

Shall be at least 500 kHz

99% bandwidth – Channel 921 MHz



Measure realized for reporting only

Test conclusion:

RESPECTED STANDARD

10. BAND EDGE**Temperature (°C) :** 26**Humidity (%HR):** 22**Date :** January 9, 2024**Technician :** B. VOVARD**Standard:** FCC Part 15**Test procedure:**

Method of paragraph 11.13.2 of ANSI C63.10

Method of paragraph 11.13.3 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 continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

Power source: 120 Vac 60 Hz by an external power supply

Percentage of voltage variation during the test (%):

 ± 1

Results:

Lower Band Edge: From 900 MHz to 902 MHz

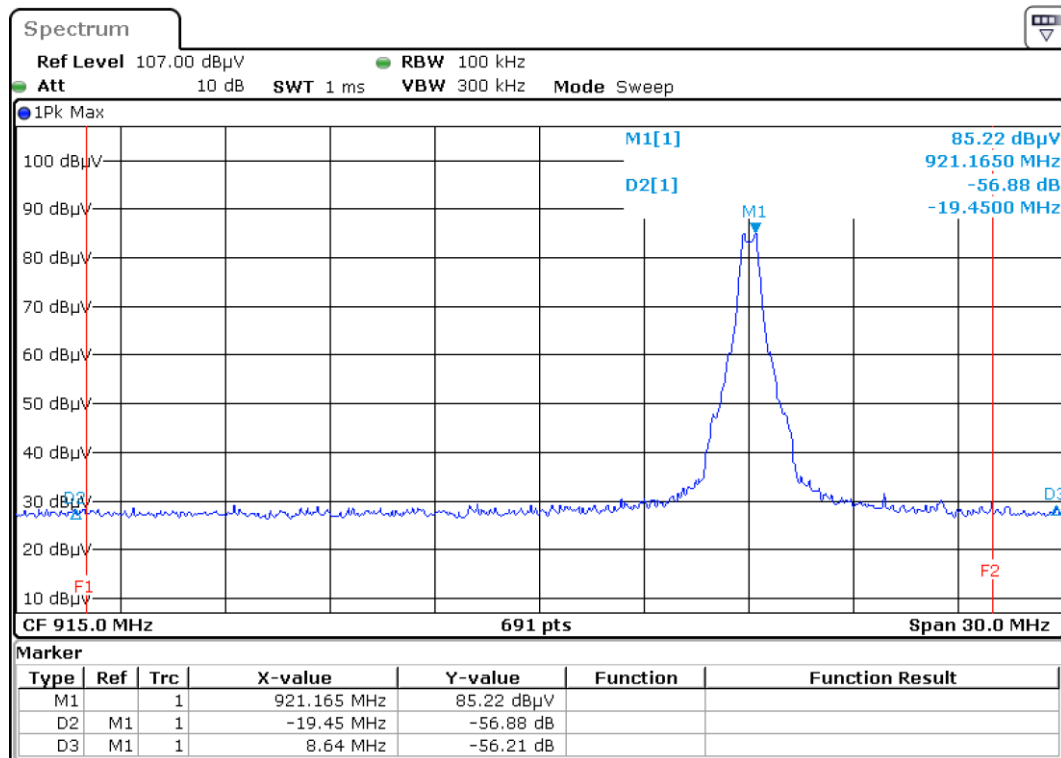
Upper Band Edge: From 928 MHz to 930 MHz

Sample N° 1 F = 921 MHz

Fundamental frequency (MHz)	Field Strength Level of fundamental (dBμV/m) – Measured at 10m	Field Strength Level of fundamental (dBμV/m) – Computed at 3m	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)
921	94.5	104.96	Peak	901.715	56.88	48.08	84.96	36.88
921	94.5	104.96	Peak	929.805	56.21	48.75	84.96	36.21

(1) Marker-Delta method

Transmission mode at 921MHz



Test conclusion:

RESPECTED STANDARD

11. PEAK CONDUCTED OUTPUT POWER**Temperature (°C) :** 23**Humidity (%HR):** 45**Date :** February 14, 2024**Technician :** B. VOVARD**Standard:** FCC Part 15**Test procedure:**

For FCC Part 15: paragraph 15.247 (b)

RBW≥DTS bandwidth method of paragraph 11.9.1.1 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 these two normal positions.

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, 0.8m from a ground plane.

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

See test setup in appendix 2

Distance of antenna: 10 meters**Antenna height:** 1 to 4 meters**Antenna polarization:** vertical and horizontal (only the highest level is recorded)

The measurement of the radiated electro-magnetic field is realized with an analyser and peak detector. The resolution bandwidth is adjusted at 1 MHz and video bandwidth at 3 MHz. (11.9.1.1 of ANSI C63.10)

Finally the radiated electro-magnetic field is converted in dBm with the following formula:

$$\text{EIRP(dBm)} = E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8;$$
 where D is the measurement distance in meters and antenna Gain = 0.01 dBi (integral PCB Antenna)

Equipment under test operating condition:

The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

Power source: 120 Vac 60 Hz by an external power supply

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

Results:

Sample N° 1 F = 921 MHz

	Electro-magnetic field at 10m (dB μ V/m):	Maximum Peak conducted output power (1)		Limit (W)
		(dBm)	(W)	
Nominal supply voltage:	94.5	9.73	0.00939	1

Polarization of test antenna: horizontal (height: 344 cm)

Position of equipment: Position 2 - (azimuth: 127 degrees)

Maximum Peak conducted output power:

EIRP(dBm) = E (dB μ V/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna

Gain = 0.01 dBi.

Test conclusion:

RESPECTED STANDARD

12. RADIATED SPURIOUS EMISSIONS**Temperature (°C) :** 23**Humidity (%HR):** 45**Date :** February 14, 2024**Technician :** B. VOVARD**Standard:** FCC Part 15**Test procedure:**

For FCC Part 15: paragraph 15.205, paragraph 15.209, paragraph 15.247 (d)

Emissions in non-restricted frequency bands method of paragraph 11.11 of ANSI C63.10

Emissions in restricted frequency bands method of paragraph 11.12 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 these two normal positions

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 and in anechoic chamber above 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.

When the system is tested in anechoic chamber, the EUT is placed on a rotating table, 1.5 m 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 10GHz - 10th harmonic of the highest fundamental frequency (921MHz)**Detection mode:** Quasi-peak ($F < 1$ GHz)Peak / Average ($F > 1$ GHz)**Bandwidth:** 200Hz ($9 \text{ kHz} < F < 150\text{kHz}$)
9 kHz ($150 \text{ kHz} < F < 30\text{MHz}$)
120 kHz ($30 \text{ MHz} < F < 1 \text{ GHz}$)
100 kHz / 1 MHz ($F > 1 \text{ GHz}$)**Distance of antenna:** 10 meters (in open area test site) / 3 meters (in anechoic room)**Antenna height:** 1 to 4 meters (in open area test site) / 1.5 meter (in anechoic room)**Antenna polarization:** vertical and horizontal (only the highest level is recorded)

Equipment under test operating condition:

The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

Power source: 120 Vac 60 Hz by an external power supply

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

Results:

Sample N° 1 F = 921 MHz

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	RBW (kHz)	Position	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 m (dB μ V/m)	Limits at 3 m (dB μ V/m)	Margin (dB)
1842.7	P	157	100	1	V	48.84	84.96	36.12
2762.5 (1)	P	152	1000	1	H	50.98 (2)	74	23.02
3684.4 (1)	P	150	1000	1	H	44.66 (2)	74	29.34
4604.2 (1)	P	150	1000	1	V	46 (2)	74	28
5524.9	P	155	100	1	H	49.1	84.96	35.86
6448.3	P	150	100	2	V	49.8	84.96	35.16
7366.6 (1)	P	150	1000	1	H	47 (2)	74	27
8287.6 (1)	P	161	1000	1	H	59.5	74	14.5
8287.6 (1)	Av	161	1000	1	H	53.8	54	0.2

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

(1) Restricted bands of operation in 15.205

(2) The peak level is lower than the average limit (54 dB μ V/m)

Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

The highest level recorded in a 100 kHz bandwidth is 100.56 dB μ V/m at the frequency of 921MHz.

So the applicable limit is 80.56 dB μ V/m.

In addition, radiated emissions which fall in the restricted band, as defined in section 15.205 (a), must also comply with the radiated emission limits specified in section 15.209 (a) (see section 15.205 (c)).

Test conclusion:

RESPECTED STANDARD

13. PEAK CONDUCTED POWER SPECTRAL DENSITY**Temperature (°C) :** 23**Humidity (%HR):** 45**Date :** February 14, 2024**Technician :** B. VOVARD**Standard:** FCC Part 15**Test procedure:**

For FCC Part 15: paragraph 15.247 (e), paragraph 15.247 (f)

PKPSD (Peak PSD) method of paragraph 11.10.2 of ANSI C63.10

Test set up:**Test set up:** (Refer Appendix 2)

First an exploratory radiated measurement was performed.

During this phase the product is oriented in these two normal positions.

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, 0.8m from a ground plane.

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

See test setup in appendix 2

Distance of antenna: 10 meters**Antenna height:** 1 to 4 meters**Antenna polarization:** vertical and horizontal (only the highest level is recorded)

The measurement of the radiated electro-magnetic field is realized with an analyser.

Span:	750 kHz
Resolution bandwidth:	3 kHz
Video bandwidth:	10 kHz
Detector:	Peak
Number of points:	2001
Sweep time:	Auto
Trace mode:	MaxHold

Then the peak marker function is used.

Finally the radiated electro-magnetic field is converted in dBm with the following formula:

$$\text{EIRP(dBm)} = E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8;$$
where D is the measurement distance in meters and antenna Gain = 0.01 dBi.

Equipment under test operating condition:

The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

Power source: 120 Vac 60 Hz by an external power supply

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

Sample N° 1 F = 921 MHz

	Electro-magnetic field (dB μ V/m): At 10 meters	Maximum Peak conducted power density(1) (dBm / 3 kHz)	Limit (dBm / 3 kHz)
Nominal supply voltage:3Vdc	82.1	-2.67	8

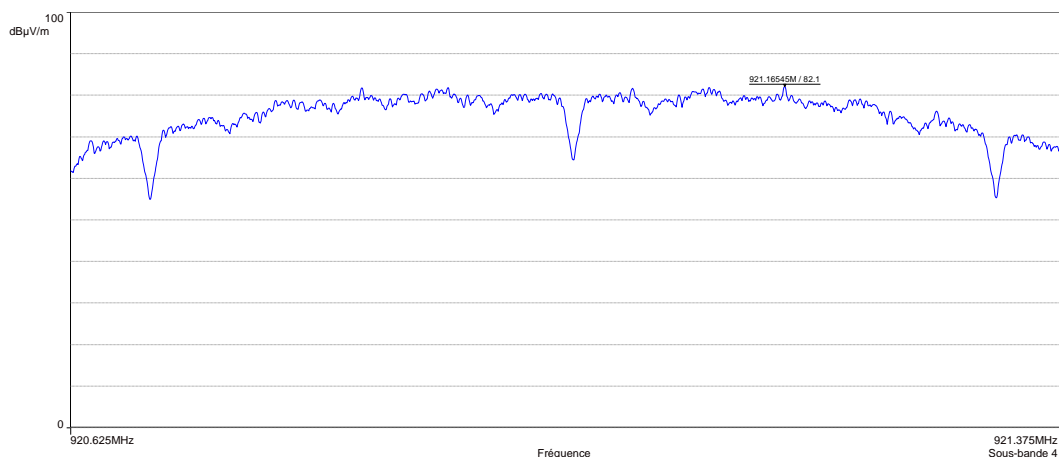
Polarization of test antenna: horizontal (height: 344 cm)

Position of equipment: Position 2 - (azimuth: 127 degrees)

Maximum Peak conducted output power:

EIRP(dBm) = E (dB μ V/m) + 20log(D) - 104.8; where D is the measurement distance in meters and antenna

Declared maximum antenna gain: 0.01 dBi



Test conclusion:

RESPECTED STANDARD

□□□ End of report, 2 appendixes to be forwarded □□□

APPENDIX 1: Test equipment list

AC Conducted emission

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	10788
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESW44	Rohde & Schwarz	17008
LISN 1600	Thurbly Thandar Instruments	8719
High-pass filter EZ-25	Rohde & Schwarz	10651
Absorber sheath current	Emitech	9489
Cable N-5m RG214	GYL Technologies	8590
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.18.0.26	0000

Occupied bandwidth

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
N-2M Cable	Huber + Suhner	12911
N-5M Cable	MechANC	18413
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	RS Commander V2.4.2	//

Band edge

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
N-2M Cable	Huber + Suhner	12911
N-5M Cable	MechANC	18413
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station WS-9232	La Crosse Technology	8750
Software	RS Commander V2.4.2	//

Peak conducted output power

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Log periodic antenna HL223	Rohde & Schwarz	7190
N-1.5m-3GHz OATS Cable	GYL TECHNOLOGIES	8785
N-20m-1GHz OATS Cable	EMITECH	8874
N-8m-3GHz OATS Cable	C & C	11832
Attenuator 6dB 6GHz 1W	Radiall	19268
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station BAR 206	Oregon Scientific	14475
Software	BAT-EMC V3.18.0.26	0000

Radiated spurious emissions

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Full anechoic chamber	EMITECH	10759
Turntable and mat controller NCD	MATURO	10789
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Biconical antenna VHA 9103	Schwarzbeck	8528
Biconical antenna 3110	Emco	7240
Log periodic antenna HL223	Rohde & Schwarz	7171
Log periodic antenna HL223	Rohde & Schwarz	7190
Antenna 3117	ETS-Lindgren	10771
Low-noise amplifier ZFL-1000LN	Mini-circuit	10730
Low-noise amplifier S005180M3201	LUCIX Corp.	12590
N-5M Cable	HYTEM	19246
N-2.5M Cable	HYTEM	19249
N-1M Cable	SUCOFLEX	9399
N-2M Cable	SUCOFLEX	14303
N-5M Cable	SUCOFLEX	15883
N-2.5M Cable	H & S	15913
N-1.5m-3GHz OATS Cable	GYL TECHNOLOGIES	8785
N-20m-1GHz OATS Cable	EMITECH	8874
N-8m-3GHz OATS Cable	C & C	11832
Low pass filter WLJS800-C11/60EE	Wainwright	4393
High pass filter HPM11630	Micro-Tronics	6609
High pass filter HP12/3200-5AA	Filtek	8262
Attenuator 6dB 6GHz 1W	Radiall	19268
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station 608-H1	Testo	7566
Meteo station WS-9232	La Crosse Technology	8750
Meteo station BAR 206	Oregon Scientific	14475
Software	BAT-EMC V3.18.0.26	0000

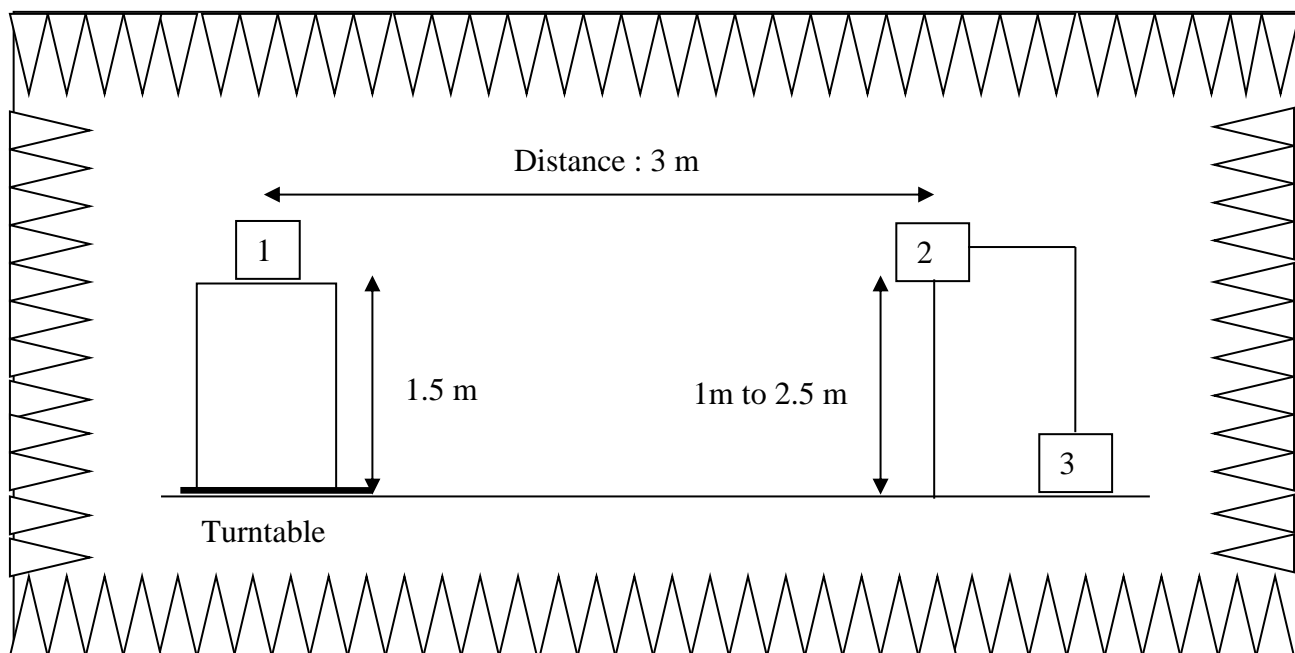
Peak conducted power spectral density

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Log periodic antenna HL223	Rohde & Schwarz	7190
N-1.5m-3GHz OATS Cable	GYL TECHNOLOGIES	8785
N-20m-1GHz OATS Cable	EMITECH	8874
N-8m-3GHz OATS Cable	C & C	11832
Attenuator 6dB 6GHz 1W	Radiall	19268
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	14831
Meteo station BAR 206	Oregon Scientific	14475
Software	BAT-EMC V3.18.0.26	0000

APPENDIX 2: Radiated Test Setup

Anechoic chamber setup

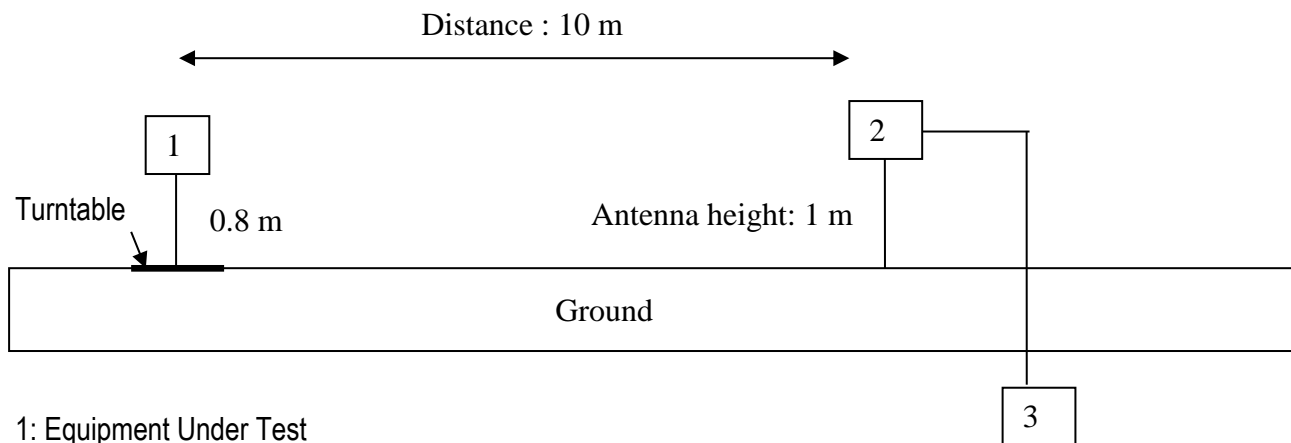
Above 1 GHz



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

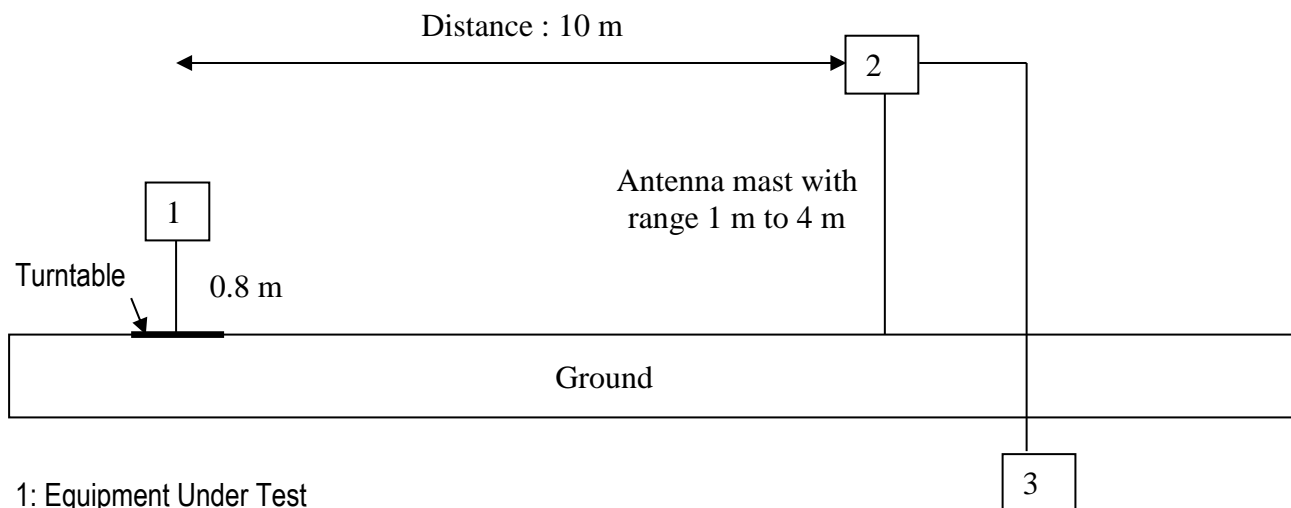
Open area setup

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