Test report issued under the responsibility of:
EMITECH LYON laboratory
MRA US-EU Designation Number: FR0013
Canadian CAB Identifier : FR0007

RADIO TEST REPORT

FCC part 15.247
RSS-247_Issue 2, February 2017

Company ..... :	**INSIGHT SIP**
Address..... :	13 chemin de la halte 06130 GRASSE FRANCE

Test item description. ..... :	**LoRa and bluetooth low energy module with integrated antenna**
Trade Mark. ..... :	InsightSIP
Manufacturer. ..... :	InsightSIP
Model/Type reference..... :	ISP4520-US
FCC ID..... :	2AAQS-ISP4520
IC. ..... :	1136A-ISP4520
Ratings..... :	1.8Vdc to 3.6Vdc

Testing Laboratory ..... :	**EMITECH LYON laboratory**
Address..... :	ZI de Mi-Plaine 7 rue Georges Méliès 69680 CHASSIEU FRANCE

Report Reference No..... :	**R120-19-105 133-01-6_A**
Test procedure. ..... :	FCC IC Certification
Diffusion..... :	Mr MOREL
Applicant's name. ..... :	INSIGHT SIP
Date of issue..... :	11/01/2021
Total number of pages..... :	59
Revision. ..... :	0
Modified page(s)..... :	Creation
Compiled by..... :	T VINAY
Approved by (+ signature)..... :	D MONTAULON (Technical Manager)

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REPORT INDEX:

1. GENERAL INFORMATIONS 3
2. REFERENCE DOCUMENT(S) 4
3. EQUIPMENT TECHNICAL DESCRIPTION 5
3.1. TEST CONDITIONS 5
3.2. EUT GENERAL VIEW 5
3.3. EUT SRD ANTENNA + PCB 6
3.4. EUT MECHANICAL AND ELECTRICAL DESIGN 7
3.5. EUT INPUT/OUTPUT PORTS 7
3.6. SUPPORTING EQUIPMENT USED DURING TEST 8
3.7. EUT RADIO SPECIFICATIONS 11
4. RESULT SUMMARY 12
5. RF EXPOSURE 14
6. MEASUREMENT UNCERTAINTY 14
7. TEST CONDITIONS AND RESULTS 15
7.1. OCCUPIED BANDWIDTH 15
7.2. 6DB, 20DB BANDWIDTH, CARRIER FREQUENCY SEPARATION AND NUMBER OF CHANNELS 19
7.3. MAXIMUM PEAK CONDUCTED POWER OF THE INTENTIONAL RADIATOR 28
7.4. POWER SPECTRAL DENSITY 30
7.5. BAND-EDGE COMPLIANCE OF CONDUCTED EMISSIONS (TRANSMITTER) 34
7.6. RADIATED SPURIOUS EMISSIONS 36
7.7. MEASUREMENT OF FREQUENCY STABILITY §15.215 (C) AND RSS-GEN 58

1. GENERAL INFORMATIONS

This document submits the results of Radio tests performed on the equipment **LoRa and bluetooth low energy module with integrated antenna ISP4520-US** (denominated hereafter E.U.T.: equipment under test) according to document(s) listed in §2 of this test report.

TESTING PROCEDURE AND TESTING LOCATION:

Testing Laboratory	EMITECH LYON laboratory
Address	ZI de Mi-Plaine 7 rue Georges Méliès 69680 CHASSIEU FRANCE
Test procedure.	FCC IC Certification
Tested by	T VINAY
Test supervisor	None
Date of receipt of test item	N/A
Date (s) of performance of tests	From 31st March to 07th April of 2020 The 17th August of 2020 The 26th August of 2020 The 7th January of 2021

APPLICANT'S GENERAL INFORMATIONS:

Company name	INSIGHT SIP
Company address.	13 chemin de la halte 06130 GRASSE FRANCE
Person(s) present during the tests.	No representative for company attended the tests.
Responsible.	Mr MOREL

GENERAL REMARKS:

The test results presented in this report relate only to the object tested.
The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
Throughout this report the decimal separator is point.

POSSIBLE TEST CASE VERDICTS:

Test case does not apply to the test object.	N/A
Information not communicated.	N/C
Test case not performed	N/P
Test object does meet the requirement.	P (Pass)
Test object does not meet the requirement.	F (Fail)
Test object was not subjected to all tests.	I (Inconclusive)

DEFINITIONS AND ABBREVIATIONS:

E.U.T.	Equipement under test	AE	Ancillary equipment
RBW	Resolution bandwidth	VBW	Video bandwidth
OATS	Open area test site	FAR	Full anechoic room
RF	Radio frequency	NTR	Nothing to report
SRD	Short Range Device	GPS	Global Positioning System

2. REFERENCE DOCUMENT(S)

NORMATIVE REFERENCES:

The following referenced documents are necessary for the application of the present test report.

FCC part 15
Code of federal regulations. Title 47- Telecommunication Chapter 1- Federal Communication Commission. Part 15- Radio frequency devices Subpart B- Unintentional Radiators. Limits and methods of measurement of radio disturbance. Characteristic of information technology equipment.

FCC part 15.247
Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850MHz. (frequency hopping and digitally modulated)

RSS-247_Issue 2, February 2017
Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence Exempt Local Area Network (LE-LAN) Devices

RSS/CNR-Gen, Issue 5, March 2019
Exigences générales et information relatives à la certification du matériel de radiocommunication

ANSI C 63.10:2013
American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

ANSI C 63.4:2014
American National Standard for Methods of measurement of Radio-Noise from low-voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

3. EQUIPMENT TECHNICAL DESCRIPTION

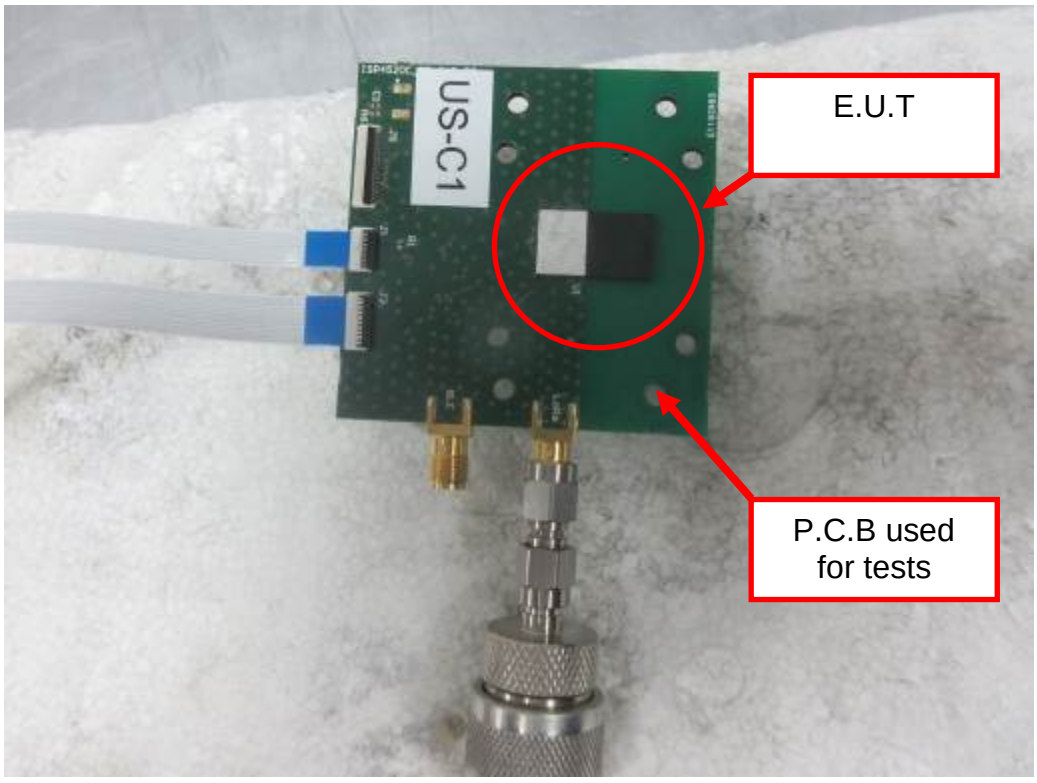
3.1. Test Conditions

Test item description.	:	LoRa and bluetooth low energy module with integrated antenna
Model/Type reference.	:	ISP4520-EU
Trade Mark.	:	InsightSIP
FCC ID.	:	2AAQS-ISP4520
IC.	:	1136A-ISP4520
Serial number (S/N).	:	Non applicable
Part number (P/N).	:	Non applicable
Software version.	:	*BLE : DTM* *LoRa : custom test FW*
Firmware version.	:	*BLE : DTM* *LoRa : custom test FW*
Type of sample.	:	Standard equipment
Function(s).	:	LoRa and bluetooth low energy module with integrated antenna
Manufacturer name.	:	InsightSIP
Address.	:	Village d'entreprise Green Side 400 Avenue Roumanille BP 309 06906 SOPHIA ANTIPOLIS

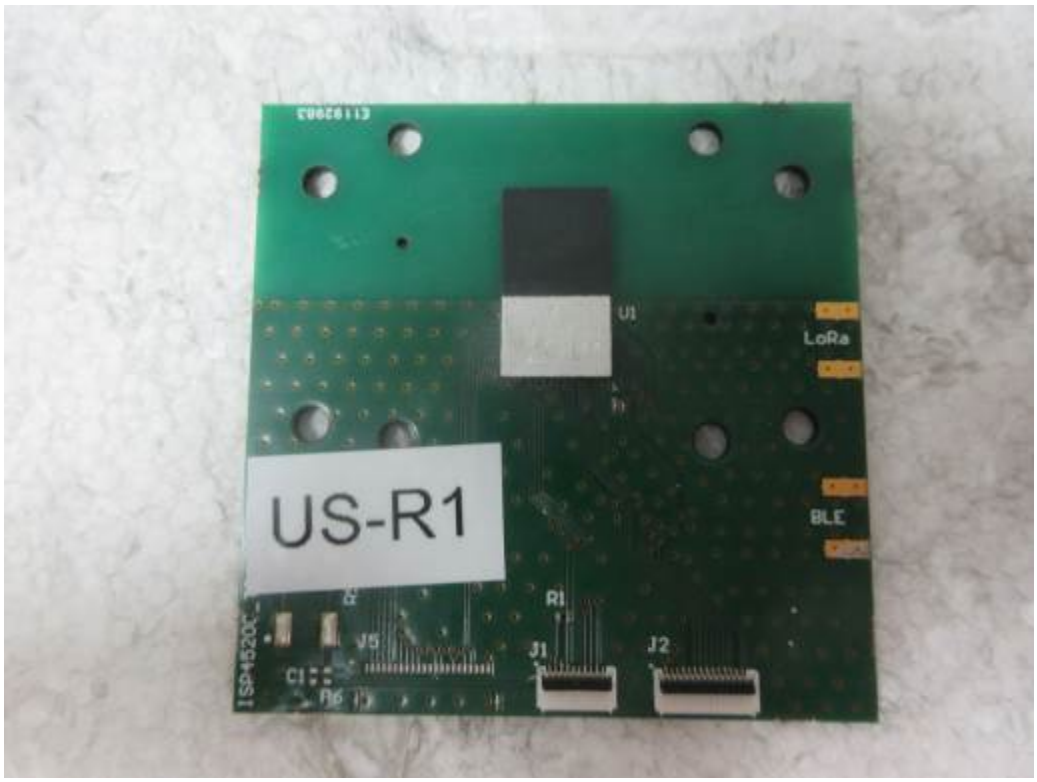
General product information:

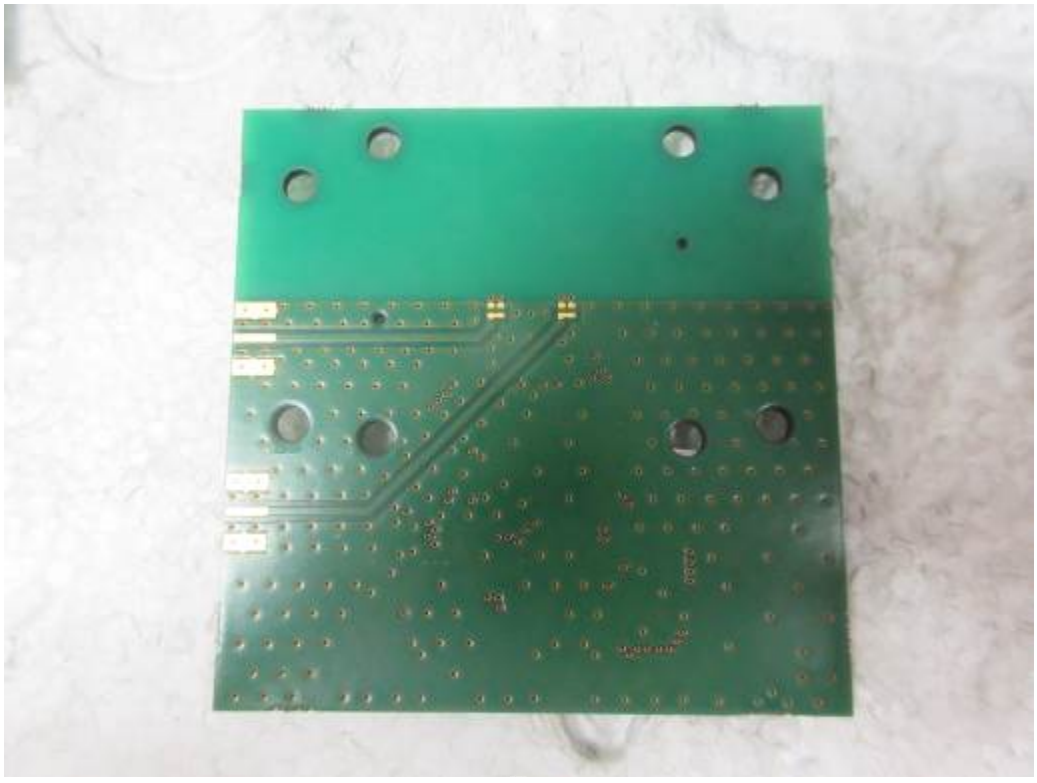
N/A

3.2. EUT General view



3.3. EUT SRD Antenna + PCB





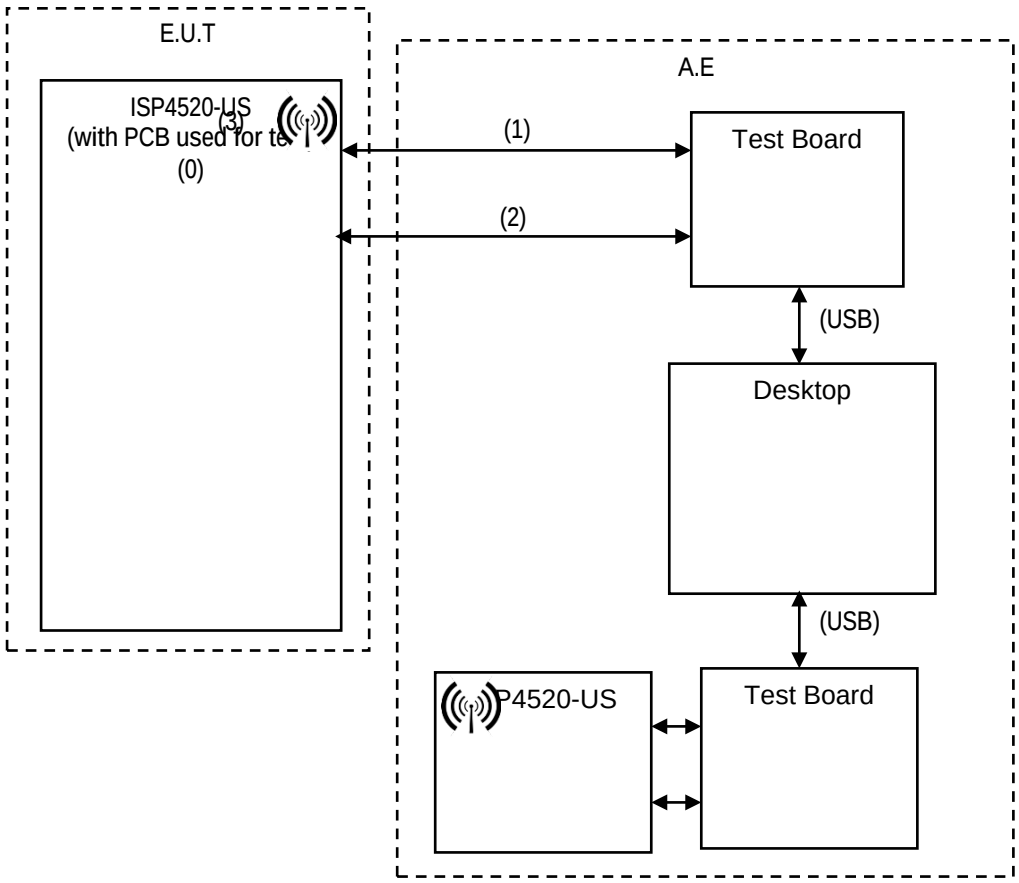
3.4. EUT Mechanical and Electrical Design

Power supply. ..... : *3.3 Vdc*
Power supply range. ..... : *1.8Vdc to 3.6Vdc*
Power type. ..... : *USB*
Power (W). ..... : *0.400*
Nominal current (A). ..... : *0.120*
Dimensions (L x W x H) (m). ..... : *0.0098 x 0.0172 x 0.0017*
Weight (kg). ..... : *0.062*
Temperature range (°C). ..... : *-30 to 85*
Ground bounding strap. ..... : *No*

Comments:

N/A

3.5. EUT Input/Output ports



PORT	NAME	TYPE	LENGHT	CABLE TYPE	COMMENTS
0	Main frame	N/E	N/A	Metallic/ceramic	
1	Control cable 1	DC and I/O	L = 20cm	Unshielded	This cable is not part of the EUT. He is only present for EUT tests
2	Control cable 2	DC and I/O	L = 20cm	Unshielded	This cable is not part of the EUT. He is only present for

					EUT tests
3	RF Antennas	RF	N/E	N/E	BLE and LoRa

AC/DC : AC/DC Converter port
I/O.....: Input or Output port
N/E .....: Non Electrical port

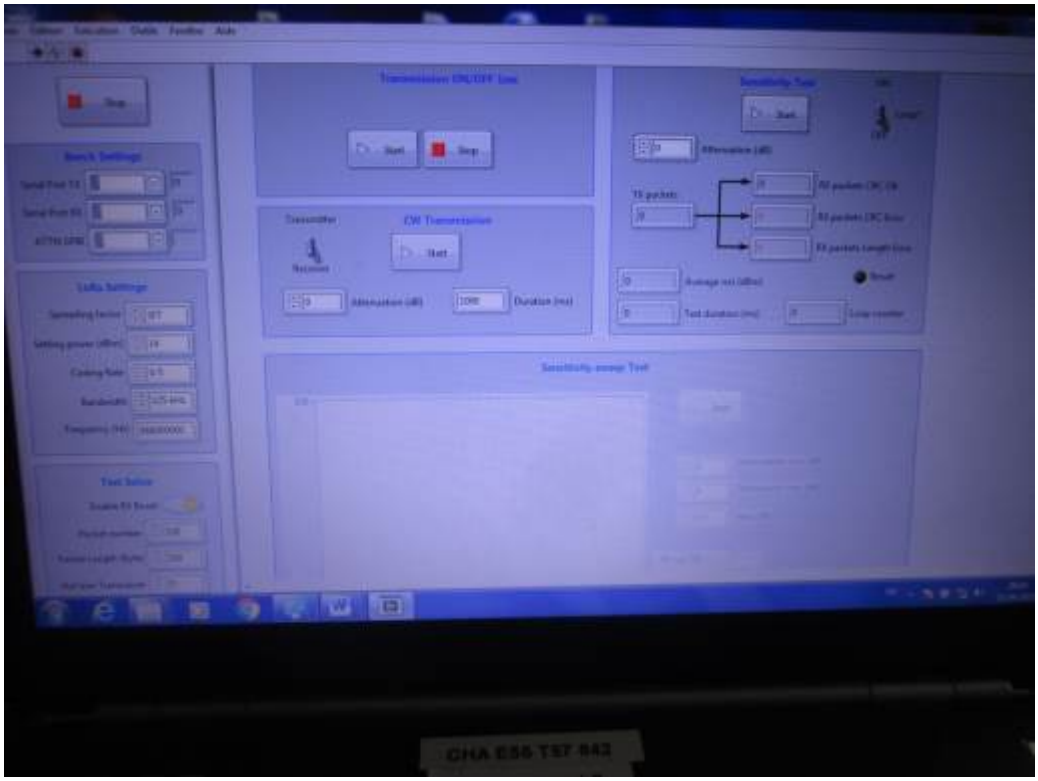
AC.....: Alternative current port
TP .....: Telecommunication port

DC .....: Discontinuous current port
RF.....: Radio frequency port

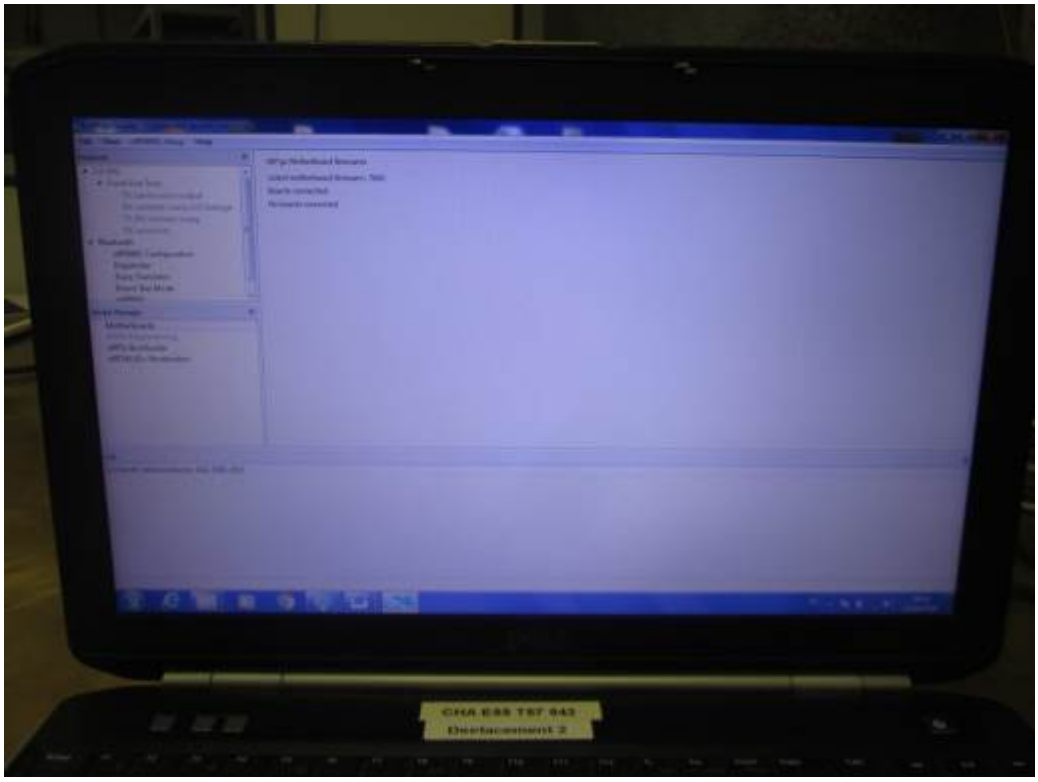
3.6. Supporting Equipment Used During Test

Sample subject to the tests was tested with following equipment.

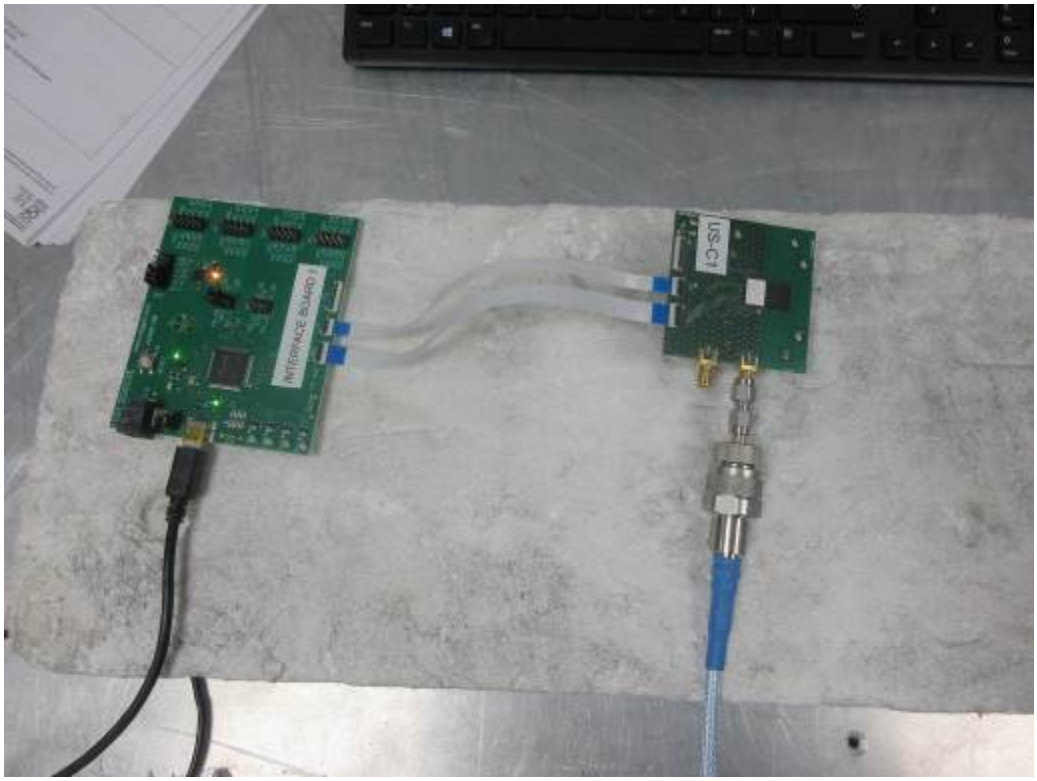
PRODUCT TYPE	MANUFACTURER	MODEL	N°EMITECH / COMMENTS
Desktop	DELL	N/A	Provided by the customer
Interface board with RF module	Insight SIP		

(EA)
Desktop ***HMI LoRa tester (Insight software)*** 

HMI Bluetooth Low Energy (nRFgo Studio – Nordic semi conductor)



Interface board with RF module



3.7. EUT Radio Specifications

a) General Informations
According to manufacturer's declarations : EUT type..... : Transmitter Technology ..... : SRD Environmental profile..... : Data transmission Temperature range..... : -30/+85 °C Antenna type ..... : Integral Antenna Gain..... : 6dBi (Max) **Comments:** N/A
b) Transmitter Paramitters (Tx)
Frequency bands..... : 902MHz-928MHz RF Power..... : 1W max (standard value) Number of channels / Separation..... : 64 for FHSS/200kHz 8 for DSSS/1.6MHz Modulation type ..... : LORA Duty cycle ..... : N/C Tested frequency..... : 903MHz-914.2MHz (DSSS)
c) Receiver Parameters (Rx)
Frequency bands..... : 903MHz-914.2MHz (DSSS) Category/Class ..... : pointless Bandwidth..... : pointless

4. RESULT SUMMARY

TEST DESIGNATION	SEVERITY	VERDICT	BASIC STANDARDS / COMMENTS
SUBPART A - GENERAL			
Labeling requirements		PASS	15.19 / See certification documents
Information to user		PASS	15.21 / See certification documents
Home-built devices		N/A	15.23
Kits		N/A	15.25
Special Accessories		PASS	15.27 / See certification documents
Inspection by the Commission		N/A	15.29
Measurement standards		PASS	15.31
Test procedure for CPU boards and computer power supplies		N/A	15.32
Frequency range of radiated measurements		PASS	15.33
Measurement detector functions and bandwidths		PASS	15.35
Transition provisions for compliance with the rules		PASS	15.37 / See certification documents
SUBPART B – UNINTENTIONAL RADIATORS			
Equipment authorization			15.101
- Verification		N/A	
- Declaration of Conformity		N/A	
CPU boards and power supplies used in personal computers		N/A	15.102
Exempted device		N/A	15.103
Information to the user		PASS	15.105 / See certification documents
Conducted limits		N/A	15.107 / Battery powered equipment
Radiated emission limits	Class B	PASS	15.109
Antenna power conduction limits for receivers		N/A	15.111
Power line carrier systems		N/A	15.113
TV interface devices, including cable system terminal devices		N/A	15.115
TV broadcast receivers		N/A	15.117
Cable ready consumer electronics equipment		N/A	15.118
Program blocking technology requirements for TV receivers		N/A	15.120
Scanning receivers and frequency converters used with scanning receivers		N/A	15.121
Labeling of digital cable ready products		N/A	15.123
SUBPART C –INTENTIONAL RADIATORS			

TEST DESIGNATION	SEVERITY	VERDICT	BASIC STANDARDS / COMMENTS
Equipment authorization requirement		**PASS**	**15.201 / Transmitter part is subject to Certification procedure**
Certified operating frequency range		**N/A**	**15.202**
Antenna requirement		**PASS**	**15.203 / Dedicated integral antenna**
External radio frequency power amplifiers and antenna modifications		**N/A**	**15.204**
Restricted bands of operation		**PASS**	**15.204**
Conducted limits	**Class B**	**N/A**	**15.207 / Battery powered equipment**
Radiated emission limits; general requirements	**Class B**	**PASS**	**15.209**
Tunnel radio systems		**N/A**	**15.211**
Modular transmitters		**N/A**	**15.212**
Cable locating equipment		**N/A**	**15.213**
Cordless telephones		**N/A**	**15.214**
Additional provisions to the general radiated emission limits		**PASS**	**15.215**
Operation within the band 902-928MHz, 2400-2483.5MHz and 5725-5850MHz			**15.247**
- **Frequency hopping and digitally modulated**		**-**	**a)**
- Frequency hopping system		N/P	a) (1)
- Digital modulation system		PASS	a) (2) BW > 500kHz
- **Maximum peak conducted output power**		**-**	**b)**
- For hopping system in the 2400-2483.5 MHz and 5725-5850 MHz bands		N/A	b) (1)
- For hopping system in the 902-928MHz band		N/P	b) (2)
- For system using digital modulation in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands		PASS	b) (3) BW > 500kHz
- **Operation with directional antenna gains > 6 dBi**		**N/A**	**c)**
- **Out-of-band emissions**		**PASS**	**d)**
- **Power spectral density conducted**		**PASS**	**e)**
- **Hybrid system**		**N/A**	**f)**
- **Frequency hopping additional requirements**		**N/P**	**g) See certification documents**
- **Frequency hopping intelligence**		**N/P**	**h) See certification documents**
- **RF exposure compliance**		**PASS**	**i)**

Sample subject to the test complies with the requirements of the reference document(s) listed in §2 of this test report and, where applicable, with deviation(s) specified in this document.

To declare, or not, the compliance with the specifications, it was not explicitly taken account of uncertainty associated with the results.

Opinion(s) and interpretation(s): N/A

5. RF EXPOSURE

Conducted measurement = 9.026dBm
Maximum antenna gain = 6dBi
Maximum EIRP with antenna gain of 6dBi = 34.67 mW (eirp) at 902.3MHz

In accordance with KDB 447498 D01 General RF Exposure Guidance v06:
PSD= EIRP/(4*π*R2)=162.2/(4*π*(20 cm)²)= 0.0063 mW/cm²
Limit= 0.61 mW/cm² (f /1500 if 300<f< 1500 MHz)

6. MEASUREMENT UNCERTAINTY

PARAMETER	MAXIMAL EMITECH UNCERTAINTY	MINIMAL STANDARD UNCERTAINTY
Radio frequency	± 1 x 10^{-7}	±1 x 10^{-7}
RF power, conducted		
RF power	± 0.8dB	± 1 dB
Power spectral density	± 2.3dB	± 3 dB
Occuped bandwidth		
RF power	± 1.2 %	± 5 %
Conducted emission (spurious)		
f ≤ 1 GHz	± 0.8 dB	± 3 dB
1 GHz - 12.75 GHz	± 1.6 dB	
Radiated emission (PAR / PIRE / RNE)		
f ≤ 62.5 MHz	± 5.1 dB	± 6 dB
62.5 MHz - 1 GHz	± 5.1 dB	± 6 dB
1 GHz - 18 GHz	± 5.2 dB	± 6 dB
18 GHz – 26 GHz	± 5.1 dB	± 6 dB
26 GHz – 40 GHz	± 5.4 dB	± 6 dB
PIRE and power spectral density with diode	± 5.4 dB	± 6 dB
Radiated emission (magnetic field)		
9kHz – 30MHz	± 2.7 dB	± 6 dB
Supply voltages	± 3 %	± 3 %
Temperature	± 1 °C	± 1°C
Humidity	± 5 %	± 5 %
Time / Duty cycle	± 4.4 %	± 5 %
Radiated emission (electric field for FCC standard)		
9kHz – 30MHz	± 2.7 dB	/
30MHz – 1GHz	± 5.2 dB	/
1GHz – 18GHz	± 5.3 dB	/
18GHz – 26GHz	± 5.5 dB	/
26GHz – 40GHz	± 5.5 dB	/

For the calcul of expanded uncertainty, the confidence interval is 95 % (k=2).

7. TEST CONDITIONS AND RESULTS

7.1. Occupied Bandwidth

Reference standard:	FCC part 15 Radio part 15.247 and RSS-247
Test method:	FCC part 15.247 and RSS-247
Test description: The occupied bandwidth (OBW) is the Frequency Range in which 99 % of the total mean power of a given emission falls. The residual part of the total power being denoted as β, which, in cases of symmetrical spectra, splits up into β/2 on each side of the spectrum. Unless otherwise specified, β/2 is taken as 0,5 %. The maximum occupied bandwidth includes all associated side bands above the appropriate emissions level and the frequency error or drift under extreme test conditions. EUT is connected to the measuring receiver via 50Ω attenuator(s).	

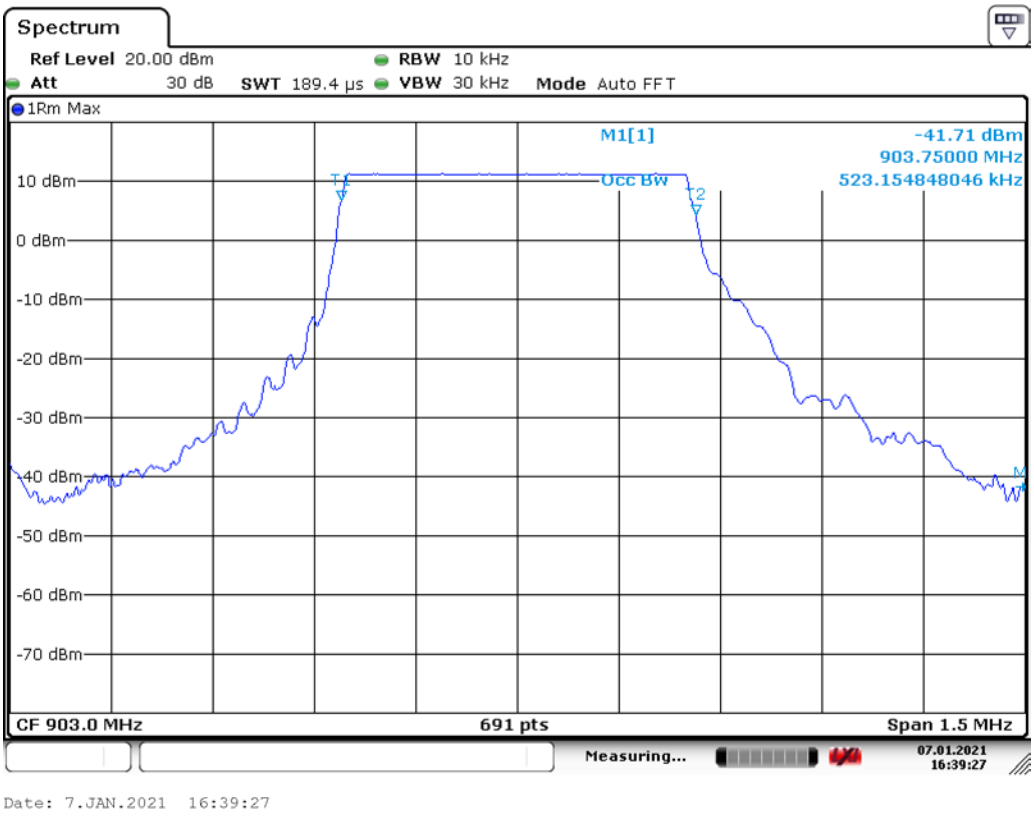
TESTED PARAMETER	OBW	SEVERITY	RESULT TAB.	VERDICT
Lora 500kHz	>512.3 kHz	>500kHz	/	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	16.4 °C
Relative Humidity	20 to 75 %	31.7 %
Atmospheric pressure	N/A	994 hPa
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Spectrum Analyzer	Agilent Technologies	N9010A	11316	12/05/2020	12/07/2021
Cable	H&S	N-1m	15931	04/12/2018	04/02/2021
Attenuator	Narda	6dB	6549	18/06/2019	18/08/2021

Blank cells = Permanent validity

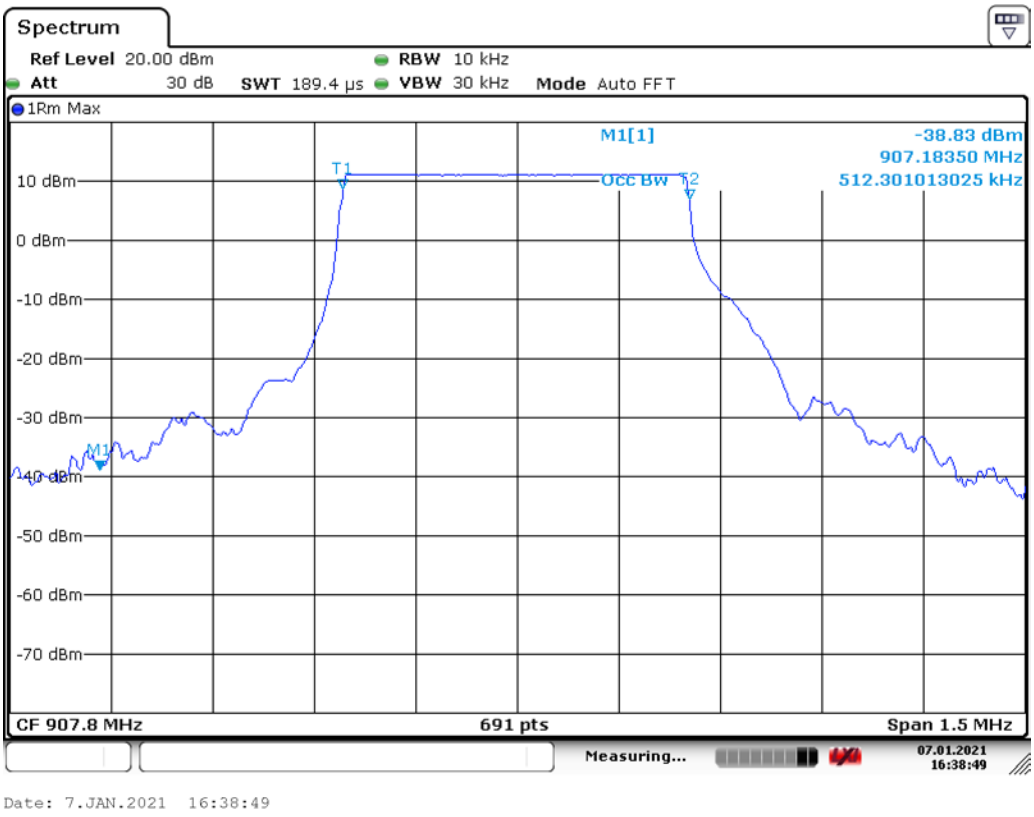
OCCUPIED BANDWIDTH - GRAPH		
LORA 500KHZ		EMI6000
EUT mode:	Tx digital modulated mode	
Test Date:	07/01/2021	
Test Operator:	TVI	



Results:	The system has an OBW of 523.15 kHz

EUT modification(s): N/A

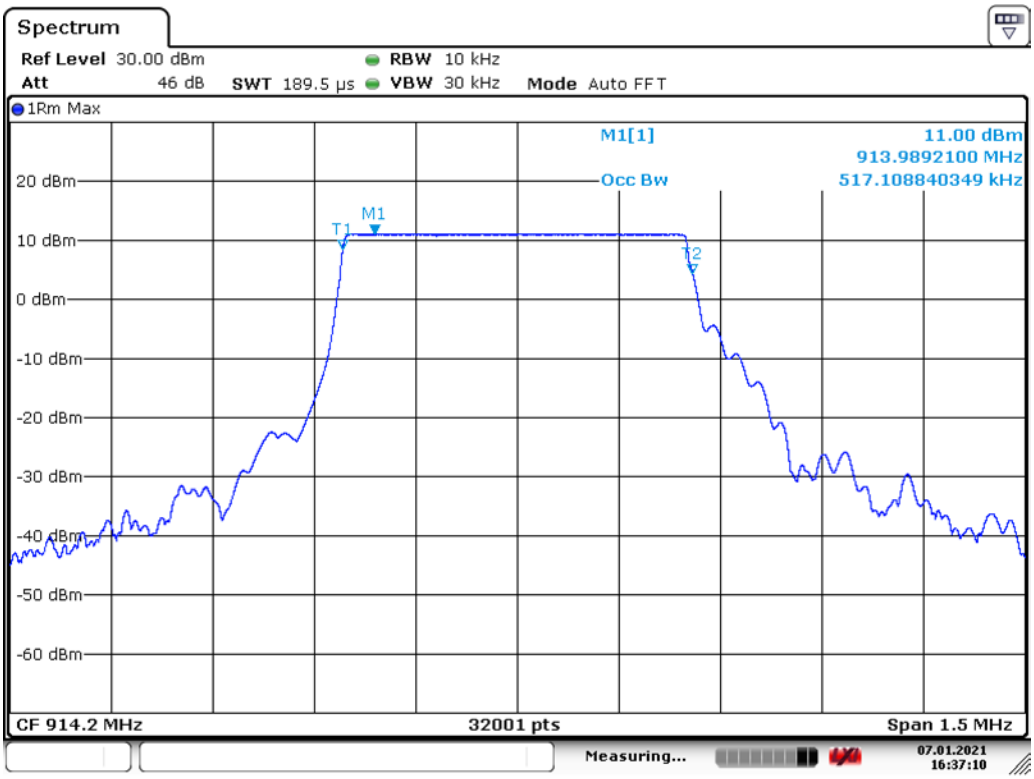
OCCUPIED BANDWIDTH - GRAPH		
LORA 500KHZ		EMI6000
EUT mode:	Tx digital modulated mode	
Test Date:	07/01/2021	
Test Operator:	TVI	



Results:	The system has an OBW of 512.3 kHz

EUT modification(s): N/A

OCCUPIED BANDWIDTH - GRAPH		
LORA 500KHZ		EMI6000
EUT mode:	Tx digital modulated mode	
Test Date:	07/01/2021	
Test Operator:	TVI	



Results:	The system has an OBW of 517.1 kHz

EUT modification(s): N/A

7.2. 6dB, 20dB bandwidth, Carrier Frequency separation and Number of Channels

Reference standard:	FCC part 15 Radio part 15.247 and RSS-247
Test method:	FCC part 15.247 and RSS-247
Test description: a) (2): Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz. EUT is connected to the measuring receiver via 50Ω attenuator(s). Tests are done in max-hold mode in order to capture all channels.	

TESTED PARAMETER	RESULT	SEVERITY	RESULT TAB.	VERDICT
Number of channels	8	informative	/	**PASS**
Channels separation	1.6MHz	informative	/	**PASS**
6dB Bandwidth	520.72kHz	>500kHz	/	**PASS**
20dB Bandwidth	686.32kHz	>500kHz	/	**PASS**

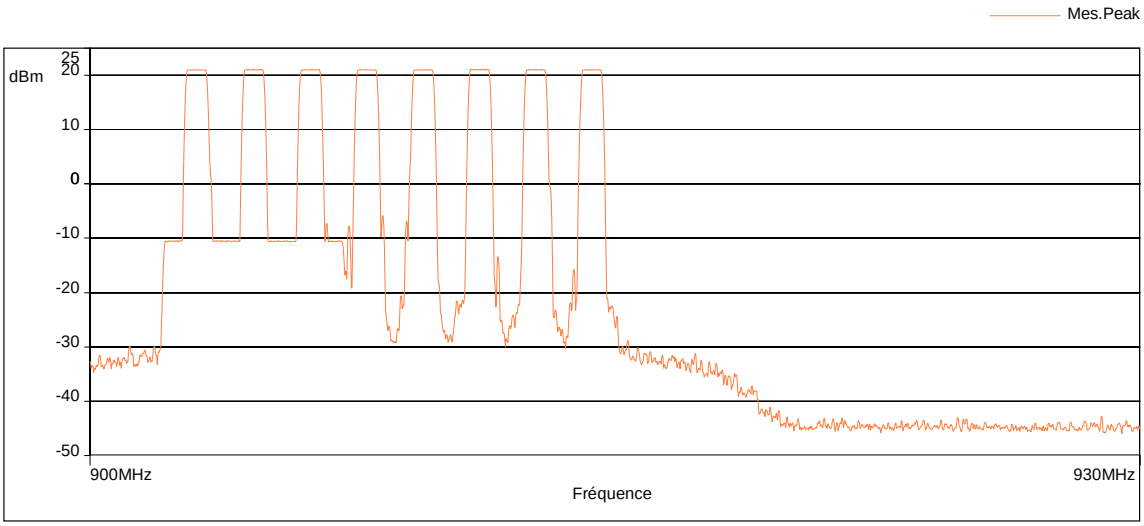
LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	*See Graph(es)*
Relative Humidity	20 to 75 %	*See Graph(es)*
Atmospheric pressure	N/A	*See Graph(es)*
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED

CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Spectrum Analyzer	Agilent Technologies	N9010A	11316	14/05/2019	14/07/2020
Spectrum Analyzer	Agilent Technologies	N9010A	11316	12/05/2020	12/07/2021
Cable	H&S	N-1m	15931	04/12/2018	04/02/2021
Attenuator	Narda	6dB	6549	18/06/2019	18/08/2021

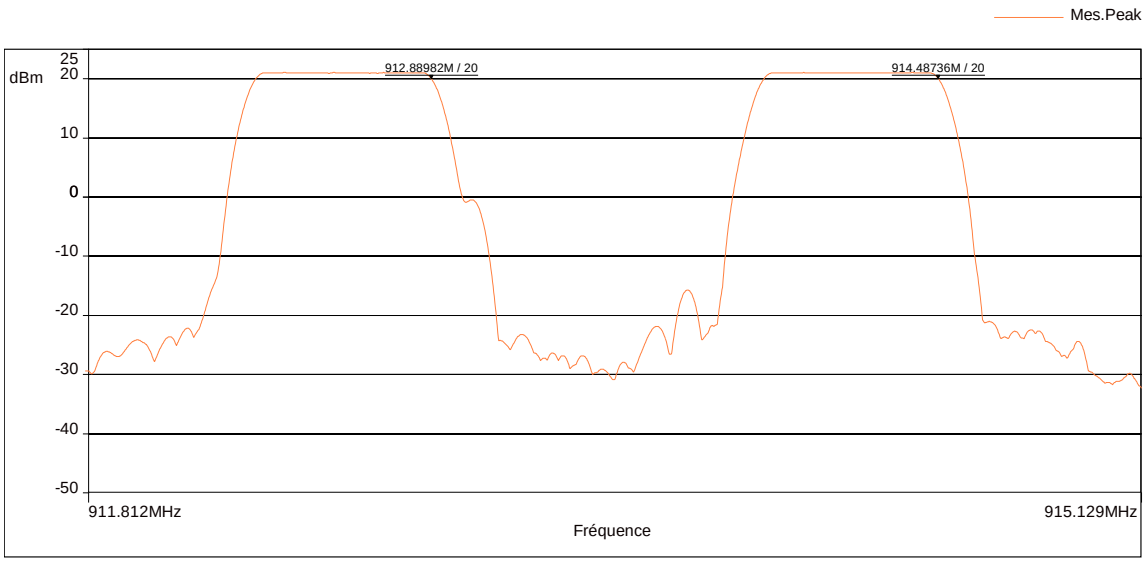
Blank cells = Permanent validity

NUMBER OF CHANNELS FOR DIGITALLY MODULATED SYSTEMS - GRAPH			
LORA 500KHZ		EMI4574	
EUT mode:	Tx digital modulated mode	**T (°C):**	16.4
Test Date:	31/03/2020	**H (%):**	31.7
Test Operator:	TVI	**P (hPa):**	994



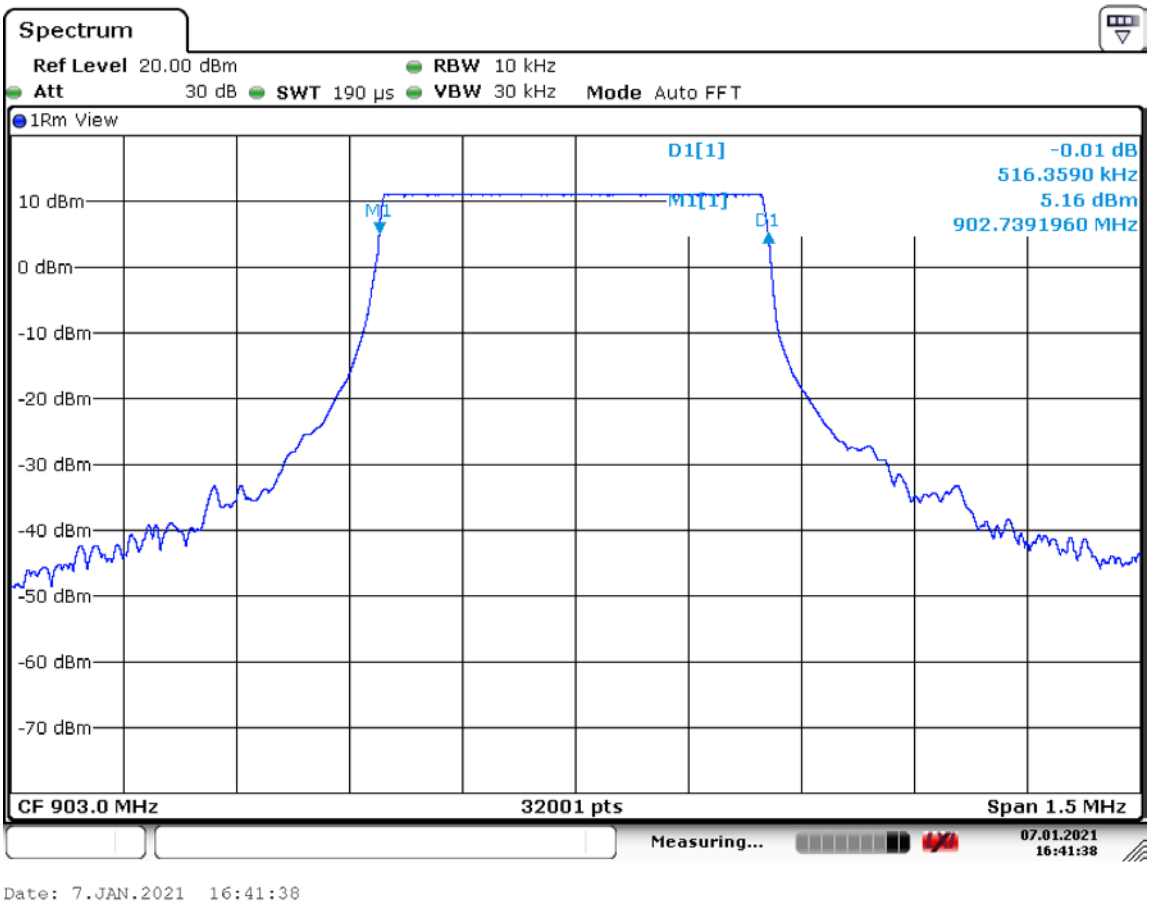
POSITION	FREQUENCIES	RBW	VBW	DETECTOR
RF port	900MHz-930MHz	100kHz	300kHz	Peak max hold
Configuration:	N/A			
Comments:	Informative: The system uses 8 channels			
EUT modification(s): N/A				

CHANNEL SEPARATION FOR DIGITALLY MODULATED SYSTEMS - GRAPH			
LORA 500KHZ		EMI6002	
EUT mode:	Tx digital modulated mode	**T (°C):**	16.4
Test Date:	31/03/2020	**H (%):**	31.7
Test Operator:	TVI	**P (hPa):**	994



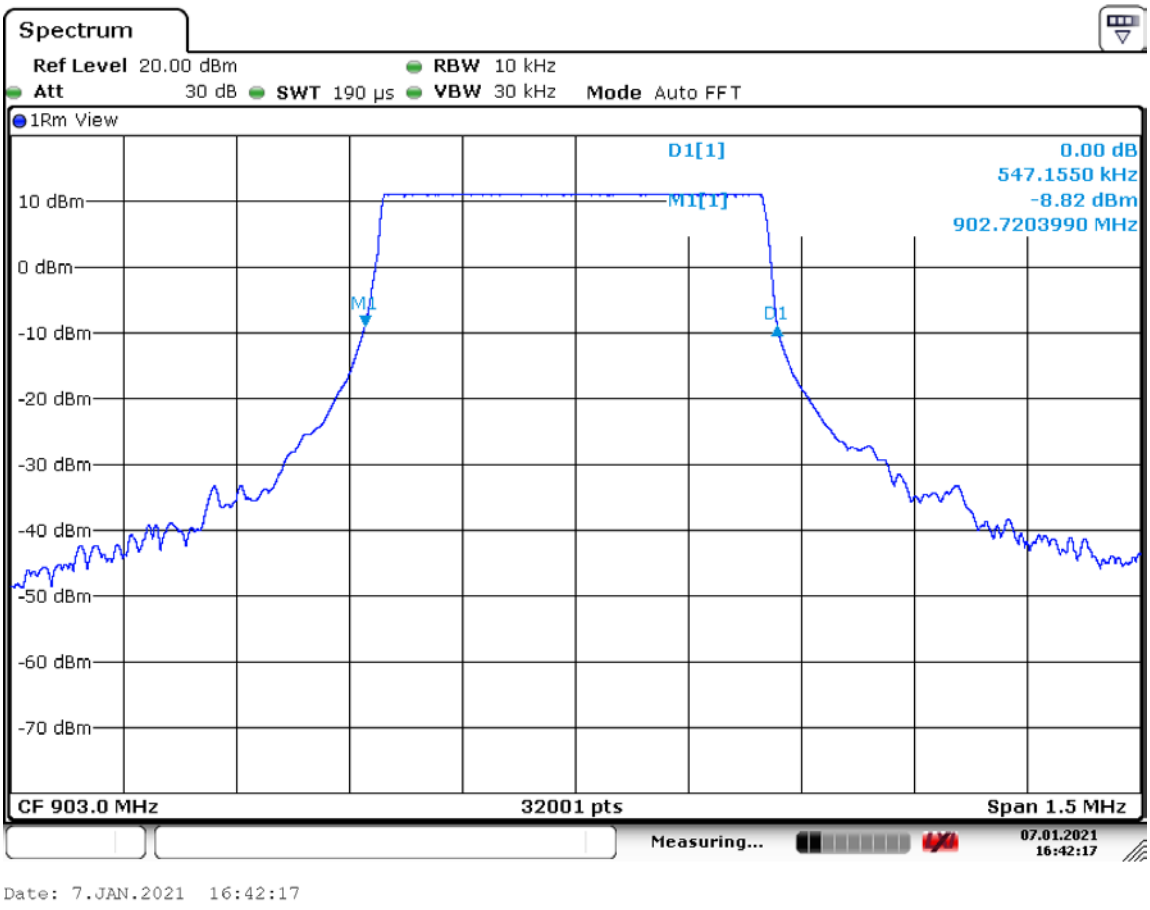
POSITION	FREQUENCIES	RBW	VBW	DETECTOR
RF port	911.8MHz-915.2MHz	100kHz	300kHz	Peak max hold
Configuration:	N/A			
Comments:	Informative: The channels separation is almost 1.598MHz.			
EUT modification(s): N/A				

6DB BANDWIDTH FOR DIGITALLY MODULATED SYSTEMS - GRAPH			
LORA 500KHZ		-	
EUT mode:	Tx digital modulated mode	**T (°C):**	16.4
Test Date:	07/01/2021	**H (%):**	31.7
Test Operator:	TVI	**P (hPa):**	994



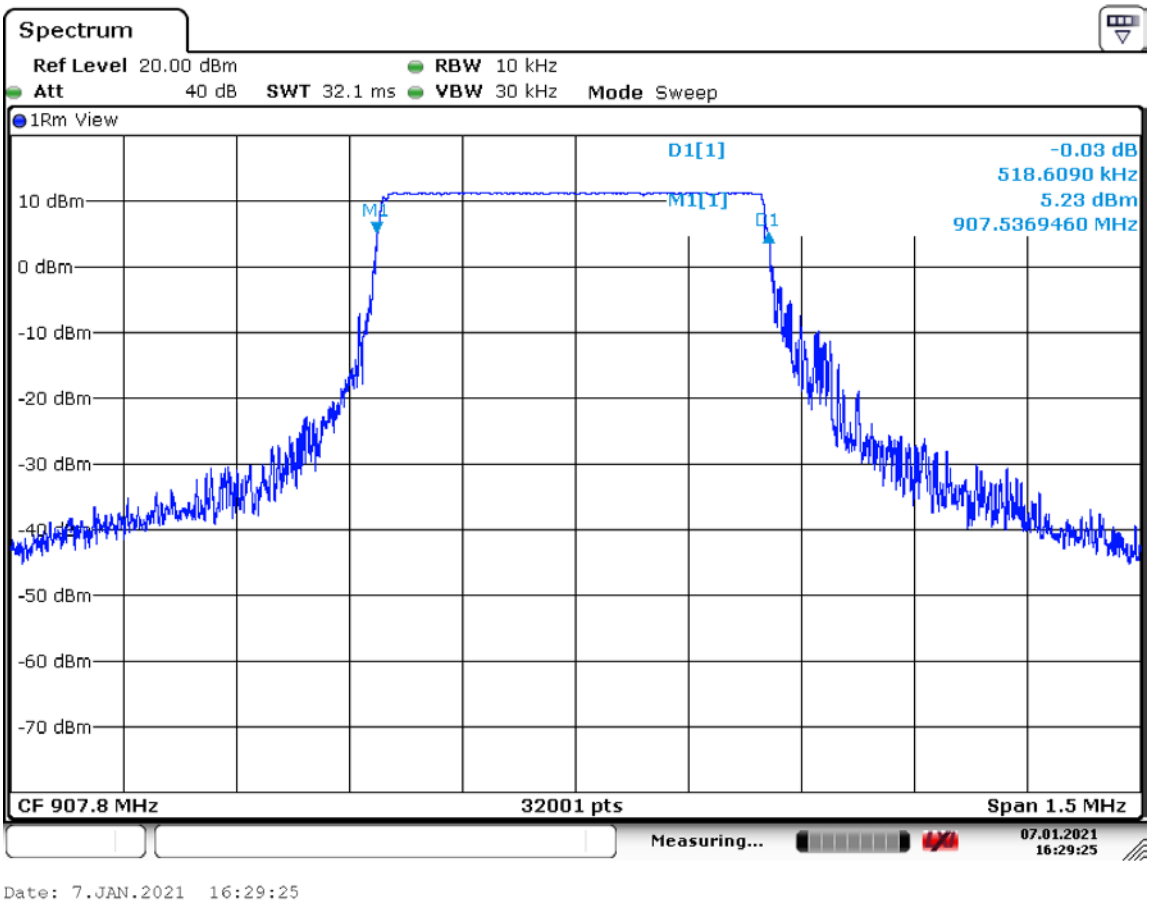
POSITION	FREQUENCIES	RBW	VBW	DETECTOR
RF port	903MHz	10kHz	30kHz	Peak max hold
Configuration:	N/A			
Comments:	The 6dB bandwidth is 516.359 kHz			
EUT modification(s): N/A				

20DB BANDWIDTH FOR DIGITALLY MODULATED SYSTEMS - GRAPH			
LORA 500KHZ		EMI6004	
EUT mode:	Tx digital modulated mode	**T (°C):**	16.4
Test Date:	07/01/2021	**H (%):**	31.7
Test Operator:	TVI	**P (hPa):**	994



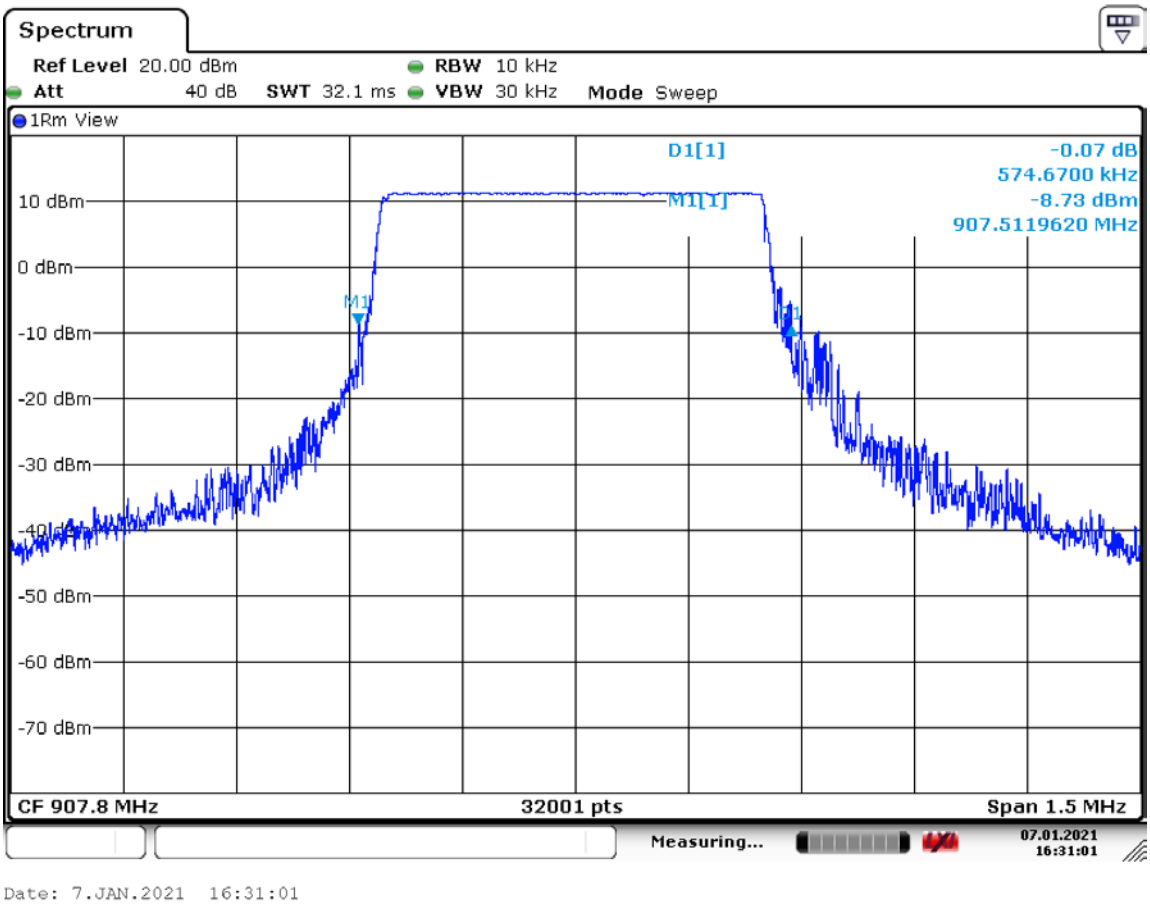
POSITION	FREQUENCIES	RBW	VBW	DETECTOR
RF port	903MHz	10kHz	30kHz	Peak max hold
Configuration:	N/A			
Comments:	The 20dB bandwidth is 547.155 kHz			
EUT modification(s): N/A				

6dB Bandwidth for digitally modulated systems - Graph			
LoRa 500kHz		-	
EUT mode:	Tx digital modulated mode	**T (°C):**	16.4
Test Date:	07/01/2021	**H (%):**	31.7
Test Operator:	TVI	**P (hPa):**	994



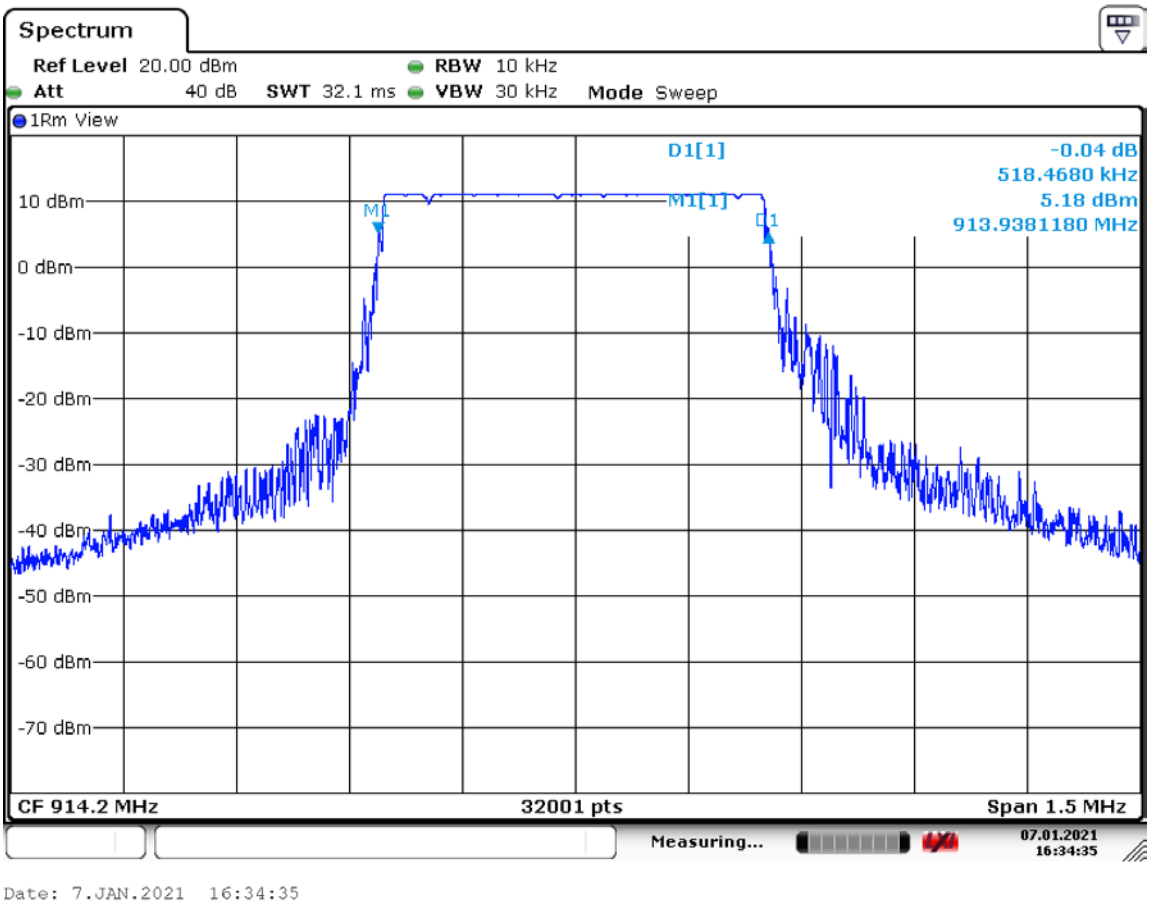
Position	Frequencies	RBW	VBW	Detector
RF port	907.8 MHz	10kHz	30kHz	Peak max hold
Configuration:	N/A			
Comments:	The 6dB bandwidth is 518.609 kHz			
EUT modification(s): N/A				

20DB BANDWIDTH FOR DIGITALLY MODULATED SYSTEMS - GRAPH			
LORA 500KHZ		EMI6004	
EUT mode:	Tx digital modulated mode	**T (°C):**	16.4
Test Date:	07/01/2021	**H (%):**	31.7
Test Operator:	TVI	**P (hPa):**	994



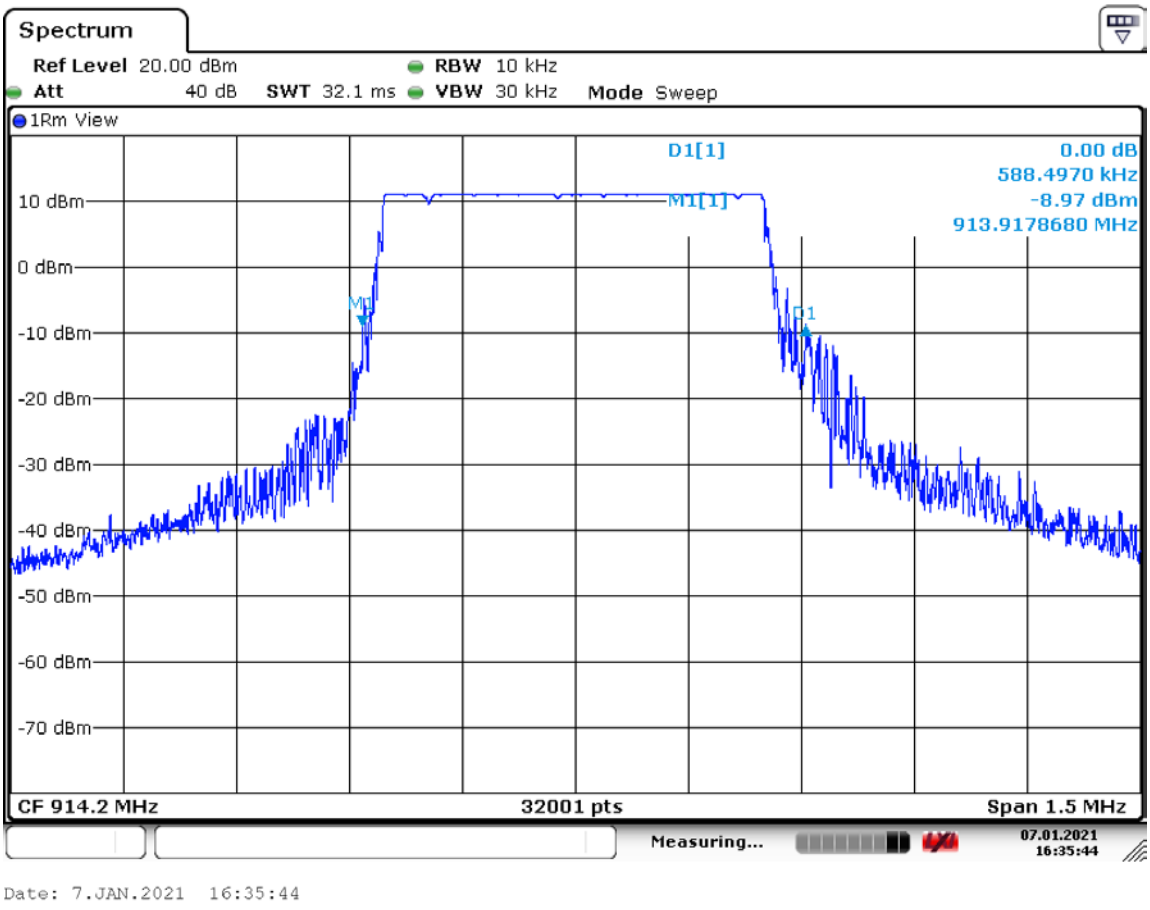
POSITION	FREQUENCIES	RBW	VBW	DETECTOR
RF port	907.8 MHz	10kHz	30kHz	Peak max hold
Configuration:	N/A			
Comments:	The 20dB bandwidth is 574.67 kHz			
EUT modification(s): N/A				

6dB Bandwidth for digitally modulated systems - Graph			
LoRa 500kHz		-	
EUT mode:	Tx digital modulated mode	**T (°C):**	16.4
Test Date:	07/01/2021	**H (%):**	31.7
Test Operator:	TVI	**P (hPa):**	994



Position	Frequencies	RBW	VBW	Detector
RF port	914.2MHz	10kHz	30kHz	Peak max hold
Configuration:	N/A			
Comments:	The 6dB bandwidth is 518.468 kHz			
EUT modification(s): N/A				

20DB BANDWIDTH FOR DIGITALLY MODULATED SYSTEMS - GRAPH			
LORA 500KHZ		EMI6004	
EUT mode:	Tx digital modulated mode	**T (°C):**	16.4
Test Date:	07/01/2021	**H (%):**	31.7
Test Operator:	TVI	**P (hPa):**	994



POSITION	FREQUENCIES	RBW	VBW	DETECTOR
RF port	914.2MHz	10kHz	30kHz	Peak max hold
Configuration:	N/A			
Comments:	The 20dB bandwidth is 588.497 kHz			
EUT modification(s): N/A				

7.3. Maximum peak conducted power of the intentional radiator

Reference standard:	FCC part 15 Radio part 15.247 and RSS-247
Test method:	FCC part 15.247 and RSS-247

Test description: b) (3)

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

EUT is connected to the measuring receiver via 50Ω attenuator(s).Only the highest levels are recorded.

TESTED CONFIGURATION	RESULTS	SEVERITY	RESULT TAB.	VERDICT
Low channel – LoRa 500kHz	21.154 dBm	1W (30dBm)	EMI6030	**PASS**
Central channel – LoRa 500kHz	21.109 dBm	1W (30dBm)	EMI6030	**PASS**
High channel – LoRa 500kHz	21.097 dBm	1W (30dBm)	EMI6030	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	25.3 °C
Relative Humidity	20 to 75 %	44.6 %
Atmospheric pressure	N/A	1021 hPa
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	**BRAND**	**TYPE**	**IDENTIFIER**	**CAL. DATE**	**CAL. DUE**
Spectrum Analyzer	Agilent Technologies	N9010A	11316	14/05/2019	14/07/2020
Cable	H&S	N-1m	15931	04/12/2018	04/02/2021
Attenuator	Narda	6dB	6549	18/06/2019	18/08/2021

Blank cells = Permanent validity

PUISSANCE MOYENNE CONDUITE - TABULATED RESULTS				
LORA 500KHZ				-
Frequency (MHz)	**$P_{conducted}$ (dBm)**	**$Gain_{dBi}$**	**P_{eirp} (dBm)**	**Limit $_{eirp}$ (dBm)**
903	21.154	6dBi (Max)	27.157	36
907.8	21.109	6dBi (Max)	27.109	36
914.2	21.097	6dBi (Max)	27.097	36

$P_{erp} = P_{conducted}$ + antenna $Gain_{dBd}$; $Gain_{dBd} = Gain_{dBi}$ - 2.15dB
$P_{erp} = P_{conducted} + Gain_{dBi}$ - 2.15dB
$P_{eirp} = P_{erp}$ + 2.15dB
$P_{eirp} = P_{conducted} + Gain_{dBi}$
In case of a dedicated antenna the antenna gain (in dB, i.e. relative to a dipole) is declared by the manufacturer.

Using the formula $E_{(V/m)} = \sqrt{(30P_{dBm}G_{dBi})}/d_{(m)}$ where P is the conducted power and G the maximum antenna gain. Equivalent maximum E-field should be approximatively of 110.25dBµV/m.

7.4. Power spectral density

Reference standard:	FCC part 15 Radio part 15.247 and RSS-247
Test method:	FCC part 15.247 and RSS-247

Test description: e)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

EUT is connected to the measuring receiver via 50Ω attenuator(s).Only the highest levels are recorded.

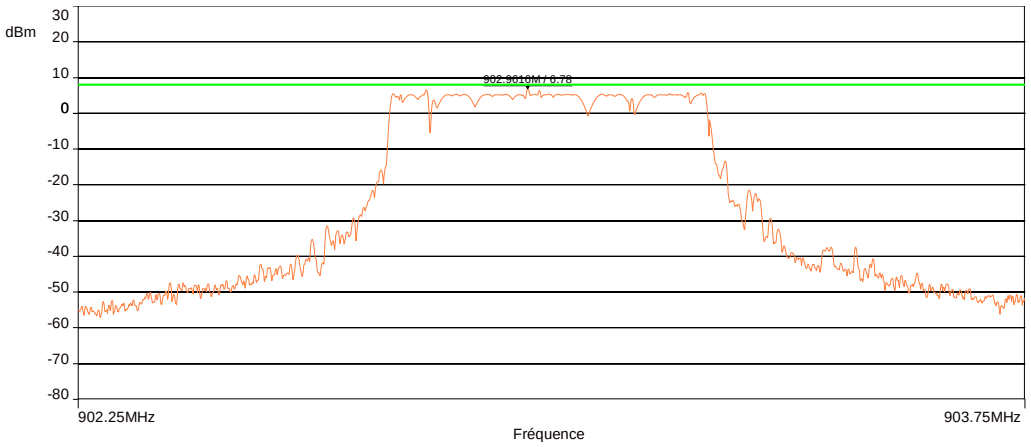
TESTED CHANNEL	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
Low channel (maximum power)	Lora 500kHz	8dBm/3kHz	EMI4683	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	23.3 °C
Relative Humidity	20 to 75 %	51.2 %
Atmospheric pressure	N/A	1000 hPa
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	**BRAND**	**TYPE**	**IDENTIFIER**	**CAL. DATE**	**CAL. DUE**
Spectrum Analyzer	Agilent Technologies	N9010A	11316	12/05/2020	12/07/2021
Cable	H&S	N-1m	15931	04/12/2018	04/02/2021
Attenuator	Narda	6dB	6549	18/06/2019	18/08/2021

Blank cells = Permanent validity

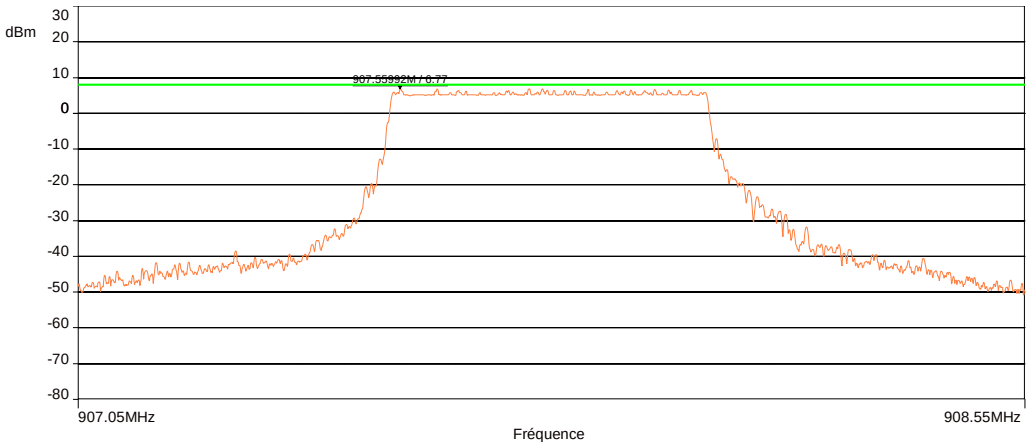
POWER SPECTRAL DENSITY - GRAPH		
LOW CHANNEL		EMI4631
EUT mode:	Tx digital modulated mode	
Test Date:	07/01/2021	
Test Operator:	TVI	



EUT modification(s): N/A

MAXIMUM EFFECTIVE RADIATED POWER SPECTRAL DENSITY - TABULATED RESULTS			
LOW CHANNEL			EM4631
Frequency	**Frequency Fc**	**Level (dBm/3kHz)**	**Limit (dBm/3kHz)**
903MHz	N/A	6.78	8

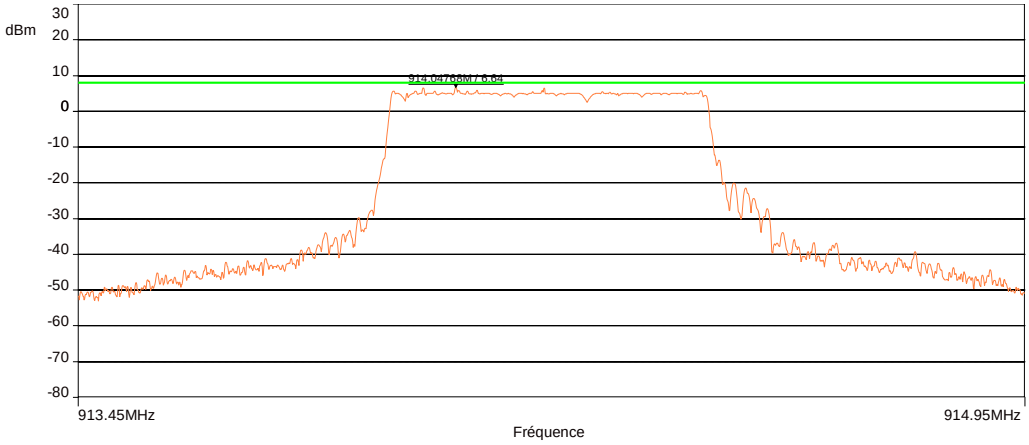
POWER SPECTRAL DENSITY - GRAPH		
CENTRAL CHANNEL		EMI4625
EUT mode:	Tx digital modulated mode	
Test Date:	07/01/2021	
Test Operator:	TVI	



EUT modification(s): N/A

MAXIMUM EFFECTIVE RADIATED POWER SPECTRAL DENSITY - TABULATED RESULTS			
CENTRAL CHANNEL			EMI4625
Frequency	**Frequency Fc**	**Level (dBm/3kHz)**	**Limit (dBm/3kHz)**
907.8 MHz	N/A	6.77	8

POWER SPECTRAL DENSITY - GRAPH	
HIGH CHANNEL	
EUT mode:	Tx digital modulated mode
Test Date:	07/01/2021
Test Operator:	TVI



EUT modification(s): N/A

MAXIMUM EFFECTIVE RADIATED POWER SPECTRAL DENSITY - TABULATED RESULTS			
HIGH CHANNEL			
Frequency	**Frequency Fc**	**Level (dBm/3kHz)**	**Limit (dBm/3kHz)**
914.2 MHz	N/A	6.64	8

7.5. Band-edge compliance of conducted emissions (Transmitter)

Reference standard:	FCC part 15 Radio part 15.247 and RSS-247
Test method:	FCC part 15.247 subclause d) and RSS-247

Test description: d)

In any 100 kHz bandwidth outside the frequency band in which the 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

EUT is connected to the measuring receiver via 50Ω attenuator(s).Only the highest levels are recorded.

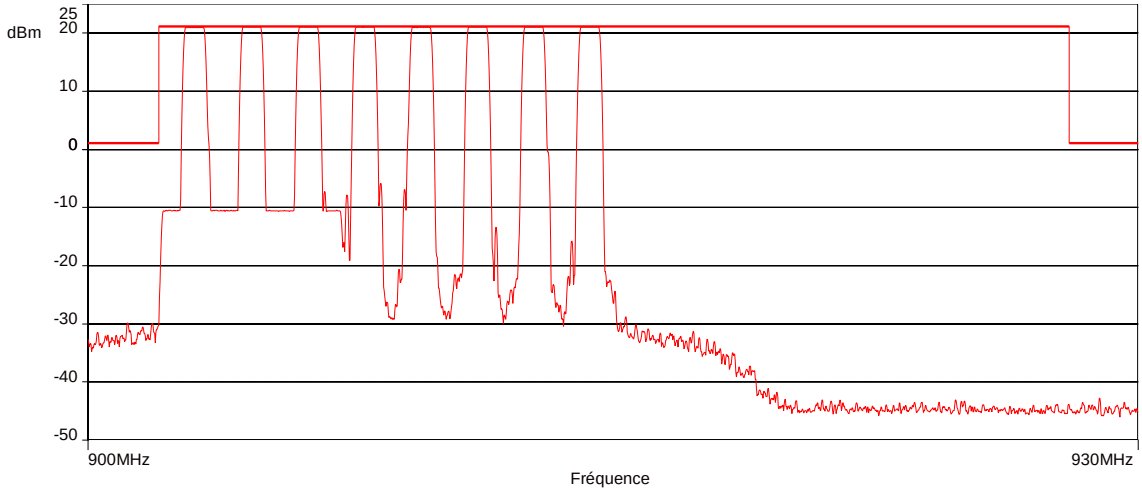
TESTED CONFIGURATION	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
Lora / 500kHz	900MHz-930MHz	20dBc	EMI6041	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	*See Graph(es)*
Relative Humidity	20 to 75 %	*See Graph(es)*
Atmospheric pressure	N/A	*See Graph(es)*
Test method deviation: N/A		
Supplementary information: N/A		

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Spectrum Analyzer	Agilent Technologies	N9010A	11316	14/05/2019	14/07/2020
Cable	H&S	N-1m	15931	04/12/2018	04/02/2021
Attenuator	Narda	6dB	6549	18/06/2019	18/08/2021

Blank cells = Permanent validity

BAND EDGE COMPLINACE - GRAPH			
LORA / 500KHZ		EMI6041	
EUT mode:	Tx digital modulated mode	**T (°C):**	16.4
Test Date:	01/04/2020	**H (%):**	31.7
Test Operator:	TVI	**P (hPa):**	994



POSITION	FREQUENCIES	RBW	VBW	DETECTOR
RF port	900MHz-930MHz	100kHz	300kHz	Peak
Configuration:	N/A			
Comments:	No Out of Band Emissions			
EUT modification(s): N/A				

7.6. Radiated spurious emissions

Reference standard:	FCC part 15 Radio part 15.247 and RSS-247
Test method:	FCC part 15.109, 15.209, 15.205, 15.215 RSS-247, CNR Gen

General test setup: For f <30MHz, EUT is set on an insulating support at 80cm above the ground reference plane.

Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3-meter in a semi-anechoic chamber. The EUT was rotated 360°in order to maximize radiated levels. Test antenna was oriented in 3 axes (0°, 45° and 90°).

Final measurements (quasi-peak) were then performed in a 10-meter Open Area Test Site that complies to CISPR 16 in the same measurement conditions.

For f > 30MHz, EUT is set on an insulating support at 80cm above the ground reference plane (150cm for f >1GHz).

Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3-meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities.

Final measurements (quasi-peak or average) were then performed in a semi-anechoic chamber or Open Area Test Site that complies to CISPR 16. The EUT was rotated 360° about its azimuth and adjusting the receive antenna height from 1 to 4 m.

All frequencies were investigated, where applicable.

For portable equipements a research of maximum level is done on the 3 axes. Only the highest levels are recorded.

TESTED CONFIGURATION	PARAMETER	SEVERITY	RESULT TAB.	VERDICT
Lora Tx mode 500kHz, Tx mode	9kHz-30MHz	15.209	See below	**PASS**
Lora Tx mode 500kHz, Tx mode	30MHz-1GHz	15.209	See below	**PASS**
Lora Tx mode 500kHz, Tx mode	1GHz-10GHz	15.209	See below	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	*See Graph(es)*
Relative Humidity	20 to 75 %	*See Graph(es)*
Atmospheric pressure	N/A	*See Graph(es)*

Test method deviation: N/A

Supplementary information:

From 9 kHz to 30MHz: limit indicated on the curves is calculated with 40 dB/decade extrapolation factor and 51.5 dB conversion factor.

From 30MHz to 1GHz Quasi peak limit provided is the limit given in §15.209.

Above 1GHz average limit in restricted bands §15.205 is 54dBµV/m. Otherwise, the limit is 20dB under carrier emission level at 3m without averaging.

TEST EQUIPMENT USED					
CATEGORY	BRAND	TYPE	IDENTIFIER	CAL. DATE	CAL. DUE
Cable	HYTEM	N-7m	10134	29/01/2019	29/03/2021
Preamplifier	Agilent Technologies	8449B	10262	11/05/2020	11/07/2021
Spectrum Analyzer	Agilent Technologies	N9010A	11316	14/05/2020	14/07/2021
Filter	Micro-Tronics	High pass	14038	04/10/2018	04/12/2021
Cable	H&S	N-5m	15909	04/12/2018	04/02/2021
Horn Antenna	Schwarzbeck	9120B	6970	17/01/2018	17/03/2021
Cable	HYTEM	N-6m	7695	04/10/2018	04/12/2020
Log periodic antenna	Emco	3146A	5609	26/08/2020	26/10/2023
Biconic antenna	Rohde & Schwarz	HK116	6118	26/08/2020	26/10/2023
Preamplifier	RFPA	RF30400-27-LNA	6136	04/05/2020	04/07/2021
Cable	/	N-10m	7537	20/09/2018	20/11/2020
Cable	HYTEM	N-10.5m	7655	21/09/2018	21/11/2020
Attenuator	Weinschel Associated	WA1W/6-3-34	14006	21/09/2018	21/11/2021
Cable	H&S	N-3m	15202	05/05/2020	05/07/2022
Antenna	Emco	6502	6155	25/01/2019	25/03/2021
Cable	H&S	BNC	16008	14/01/2019	14/03/2021
Cable	H&S	BNC	16009	14/01/2019	14/03/2021
Cable	H&S	BNC	16016	14/01/2019	14/03/2021
Converter		-51.5dB	9997		
Receiver	Rohde & Schwarz	FSV40	15776	23/12/2019	23/02/2021
Software	Nexio		0000		

Blank cells = Permanent validity

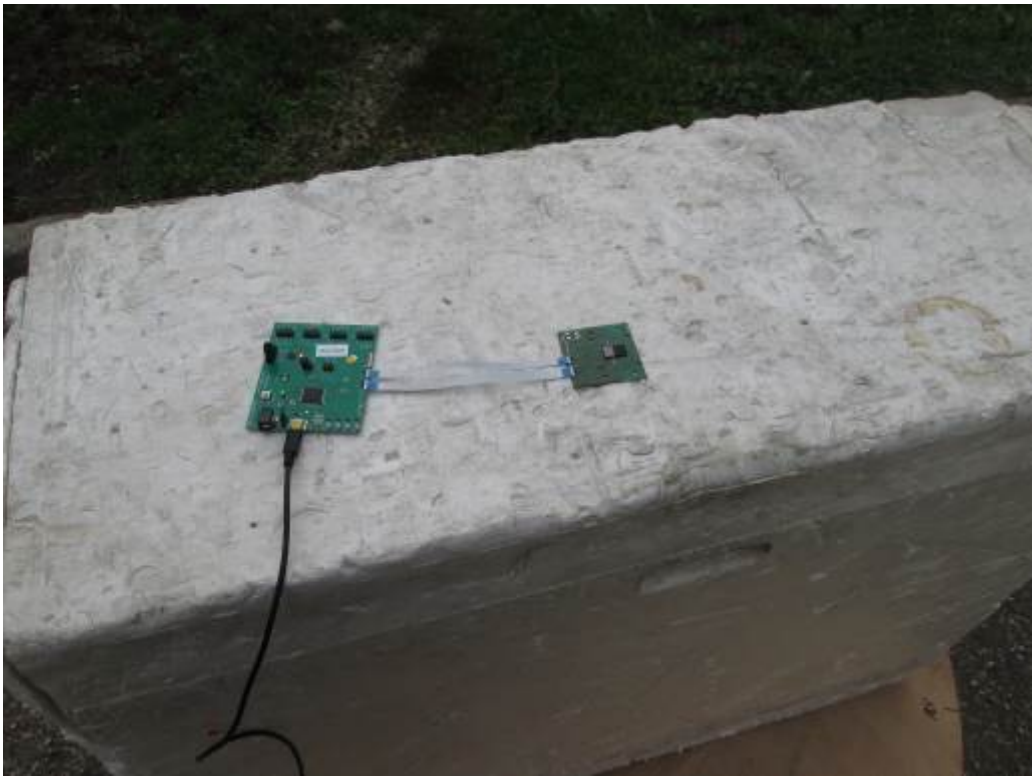
RADIATED SPURIOUS EMISSIONS - TABULATED RESULTS				
TX MODE / LOW, CENTRAL & HIGHEST CHANNEL				
Frequency (MHz)	**Position / Polarization**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Margin (dB)**
31.2	Pos 1 / Vertical	26.1 (QP)	40.0	13.9
46.5	Pos 1 / Vertical	37.5	40.0	2.5
120.0	Pos 1 / Vertical	40.7	43.5	2.8
240.0	Pos 1 / Vertical	31.8	46.0	14.2
480.0	Pos 1 / Vertical	41.7	46.0	4.3
870.9	Pos 1 / Vertical	43.8	46.0	2.2
882.3	Pos 1 / Vertical	42.1	46.0	3.9
960.1	Pos 1 / Vertical	36.8 (QP)	54.0	17.2
120.0	Pos 1 / Horizontal	36.7	43.5	6.8
360.0	Pos 1 / Horizontal	36.6	46.0	9.4
480.0	Pos 1 / Horizontal	38.2	46.0	7.8
720.3	Pos 1 / Horizontal	40.5	46.0	5.5
831.5	Pos 1 / Horizontal	31.8 (QP)	46.0	14.2
870.9	Pos 1 / Horizontal	34.6 (QP)	46.0	11.4
882.4	Pos 1 / Horizontal	34.4 (QP)	46.0	11.6
960.1	Pos 1 / Horizontal	35.8 (QP)	54.0	8.2
1731	Pos 1 / Vertical	54.7	73.8 (1)	19.1

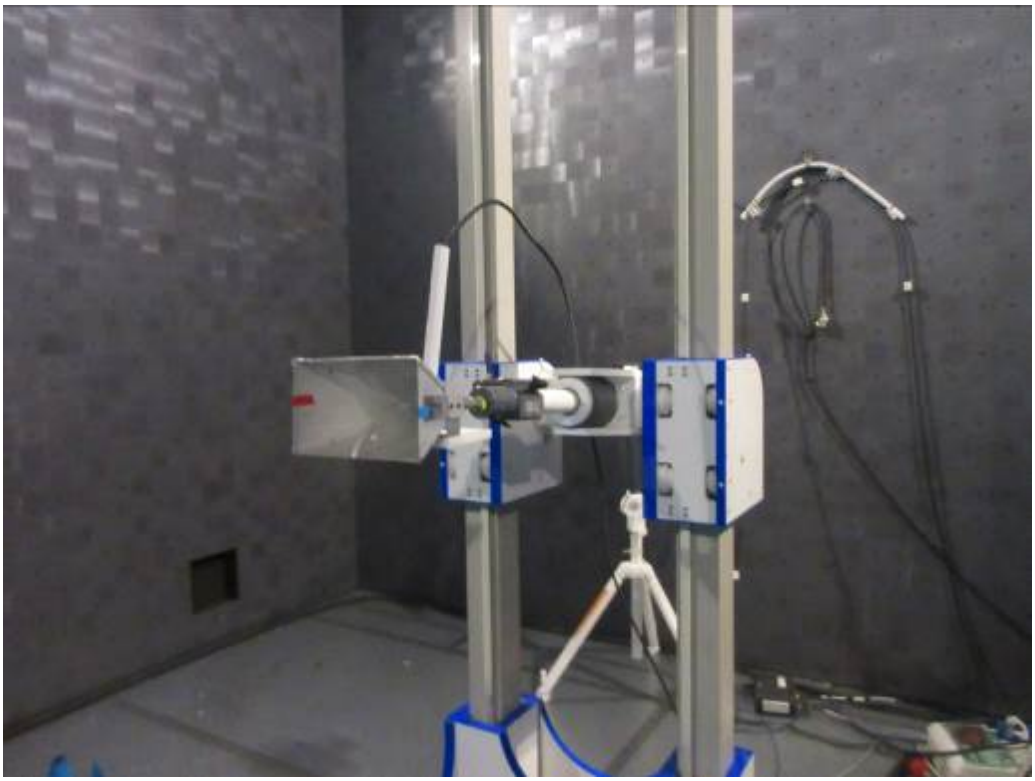
RADIATED SPURIOUS EMISSIONS - TABULATED RESULTS				
TX MODE / LOW, CENTRAL & HIGHEST CHANNEL				
Frequency (MHz)	**Position / Polarization**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Margin (dB)**
1882	Pos 1 / Vertical	60.3	73.8 (1)	13.5
1926	Pos 1 / Vertical	60.1	73.8 (1)	13.7
2434	Pos 1 / Vertical	50.9	73.8 (1)	22.9
2514	Pos 1 / Vertical	53.6	73.8 (1)	20.2
2707	Pos 1 / Vertical	49.8	73.8 (1)	24.0
1734	Pos 1 / Horizontal	51.5	73.8 (1)	22.3
1885	Pos 1 / Horizontal	55.4	73.8 (1)	18.8
2501	Pos 1 / Horizontal	50.8	73.8 (1)	23.0
2707	Pos 1 / Horizontal	50.2	73.8 (1)	23.6
5414	Pos 1 / Horizontal	50.9 (Av)	54.0	3.1
30.9	Pos 2 / Vertical	26.9	40.0 (QP)	13.1
47.7	Pos 2 / Vertical	37.8	40.0	2.2
120.0	Pos 2 / Vertical	39.0 (QP)	43.5	4.5
480.0	Pos 2 / Vertical	41.0	54.0	13.0
870.8	Pos 2 / Vertical	36.4 (QP)	46.0	9.6
882.4	Pos 2 / Vertical l	43.7	46.0	2.3
960.1	Pos 2 / Vertical	39.2 (QP)	54.0	14.8
120.0	Pos 2 / Horizontal	35.6	43.5	7.9
960.1	Pos 2 / Horizontal	39.2 (QP)	54.0	14.8
1732	Pos 2 / Vertical	52.8	73.8 (1)	21.0
1884	Pos 2 / Vertical	53.5	73.8 (1)	20.3
1929	Pos 2 / Vertical	54.3	73.8 (1)	19.5
2745	Pos 2 / Vertical	51.8	73.8 (1)	22.0
1731	Pos 2 / Horizontal	49.7	73.8 (1)	24.1
1897	Pos 2 / Horizontal	55.7	73.8 (1)	18.1
1924	Pos 2 / Horizontal	56.2	73.8 (1)	17.6
2477	Pos 2 / Horizontal	54.7	73.8 (1)	19.1
2745	Pos 2 / Horizontal	52.5	73.8 (1)	21.3
30.9	Pos 3 / Vertical	38.3	40.0	1.7
48.1	Pos 3 / Vertical	35.7	40.0	4.3
120.0	Pos 3 / Vertical	40.4	43.5	3.1
480.0	Pos 3 / Vertical	40.9	46.0	5.1
870.9	Pos 3 / Vertical	40.6	46.0	5.4
882.0	Pos 3 / Vertical	40.8	46.0	5.2
960.1	Pos 3 / Vertical	39.7 (QP)	54.0	14.3
120.0	Pos 3 / Horizontal	35.6	43.5	7.9
480.0	Pos 3 / Horizontal	36.6	46.0	9.4
841.4	Pos 3 / Horizontal	33.8 (QP)	46.0	12.2
882.1	Pos 3 / Horizontal	39.3 (QP)	46.0	6.7
960.1	Pos 3 / Horizontal	37.9 (QP)	54.0	17.1
1738	Pos 3 / Vertical	58.4	73.8 (1)	15.4
1884	Pos 3 / Vertical	58.1	73.8 (1)	15.7
1928	Pos 3 / Vertical	56.2	73.8 (1)	17.6
2514	Pos 3 / Vertical	53.6	73.8 (1)	20.2
2744	Pos 3 / Vertical	53.9	73.8 (1)	19.9
7319	Pos 3 / Vertical	53.2 (Av)	54.0	0.8
1731	Pos 3 / Horizontal	51.3	73.8 (1)	22.5

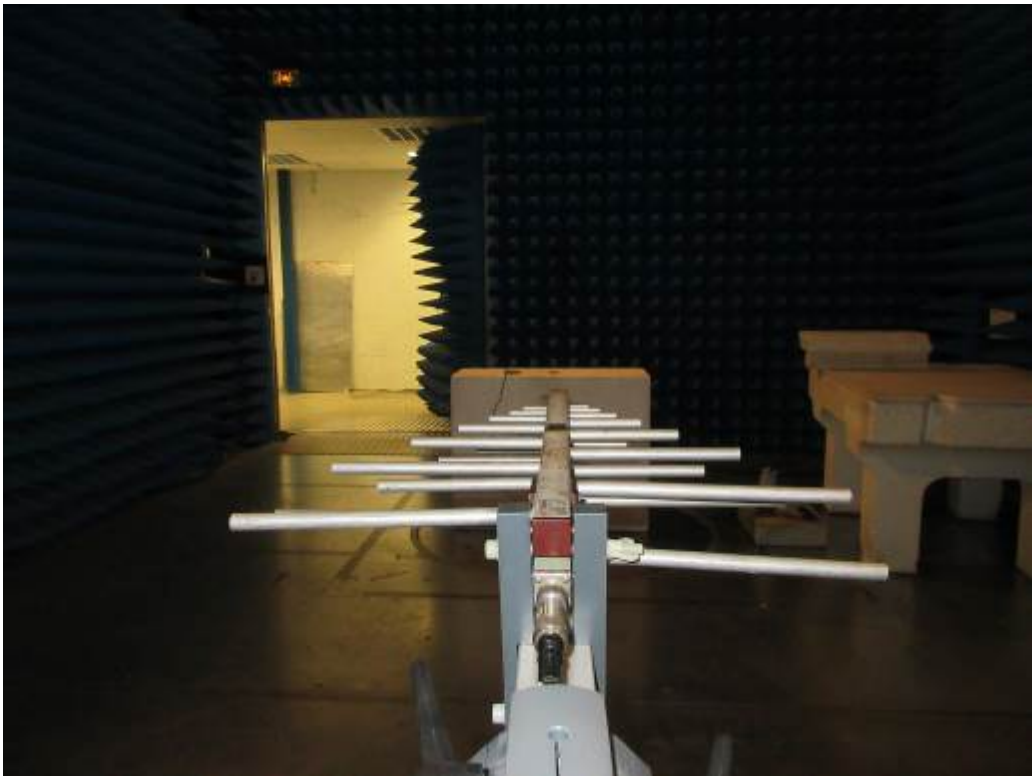
RADIATED SPURIOUS EMISSIONS - TABULATED RESULTS				
TX MODE / LOW, CENTRAL & HIGHEST CHANNEL				
Frequency (MHz)	**Position / Polarization**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Margin (dB)**
1882	Pos 3 / Horizontal	60.7	73.8 (1)	13.1
2510	Pos 3 / Horizontal	59.0	73.8 (1)	14.8
2745	Pos 3 / Horizontal	49.5	73.8 (1)	24.3
5489	Pos 3 / Horizontal	51.3 (Av)	73.8 (1)	2.7

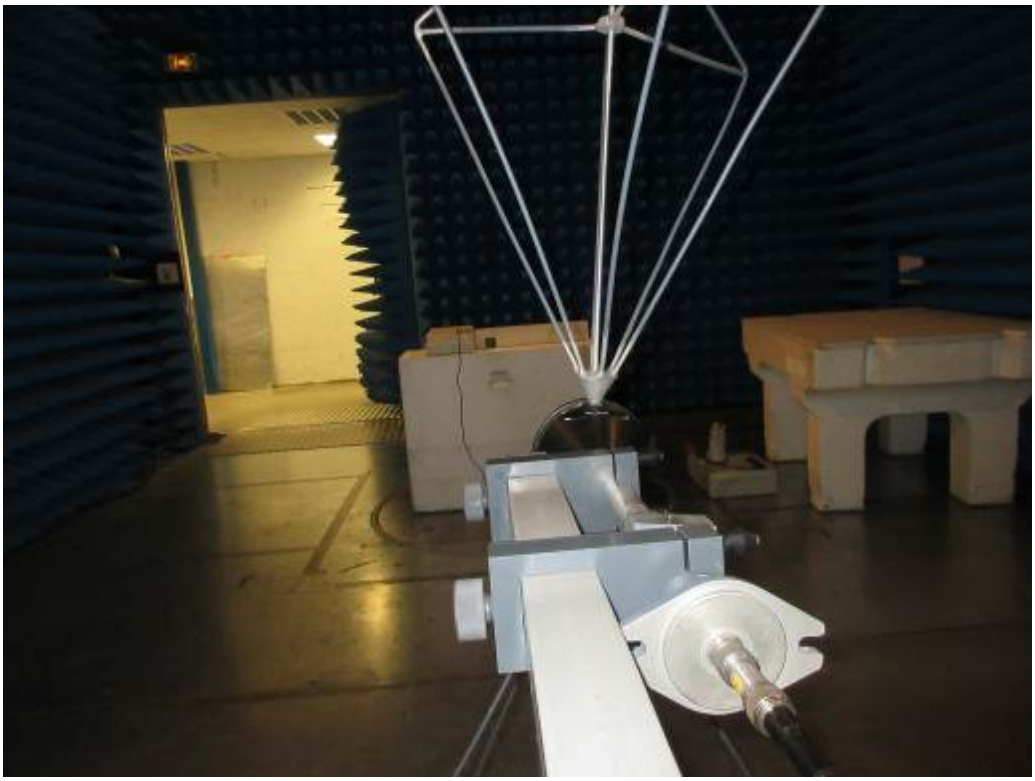
V= Vertical H=Horizontal
Spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported

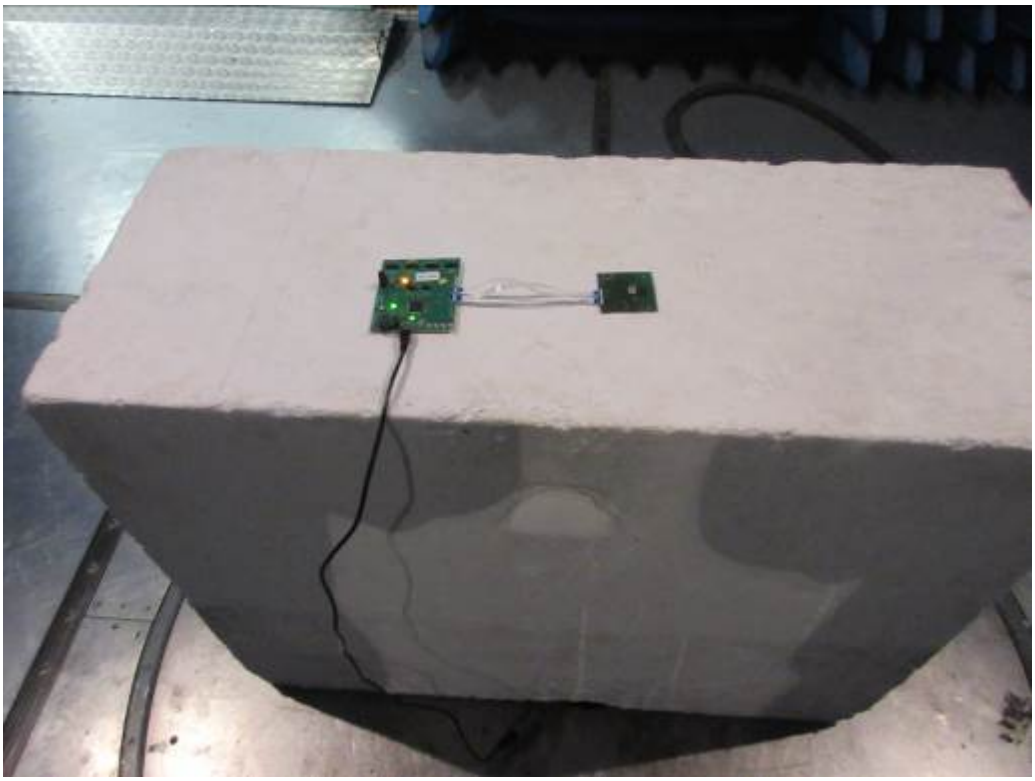
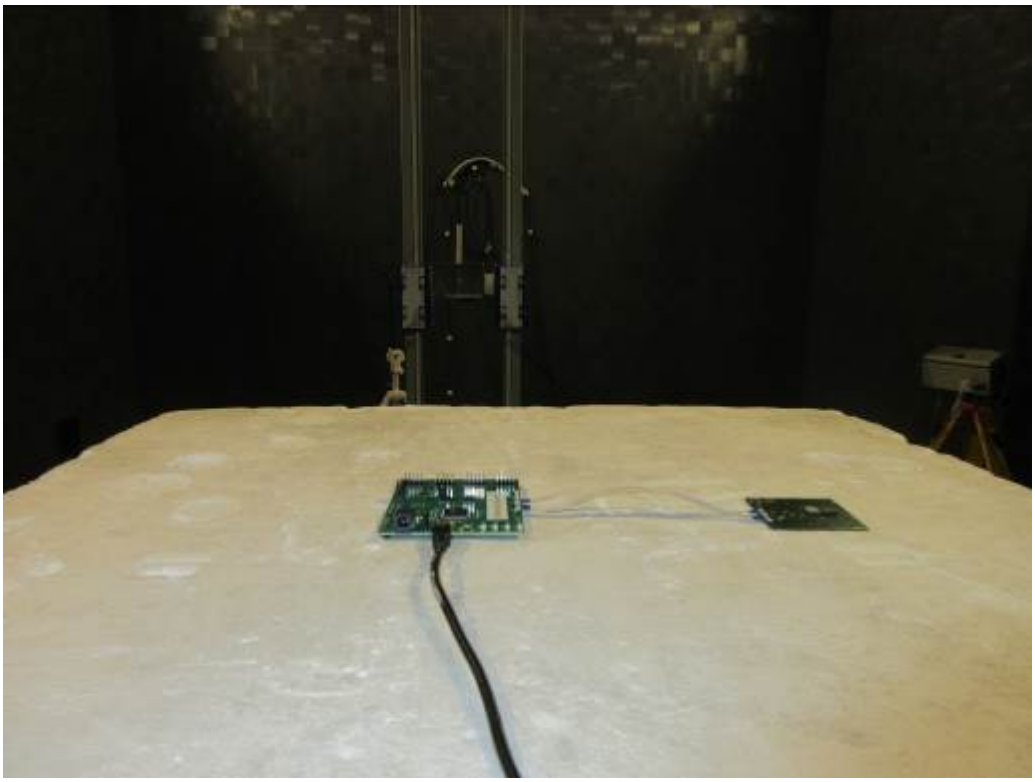
Note 1 : The limit outside the restricted bands are 30 dB below the carrier power.
The lowest power of the carrier is 103.8 dBµV/m, so limit is 73.8 dBµV/m.

TEST SETUP PHOTO(S) RADIATED EMISSIONS (F<30MHZ)


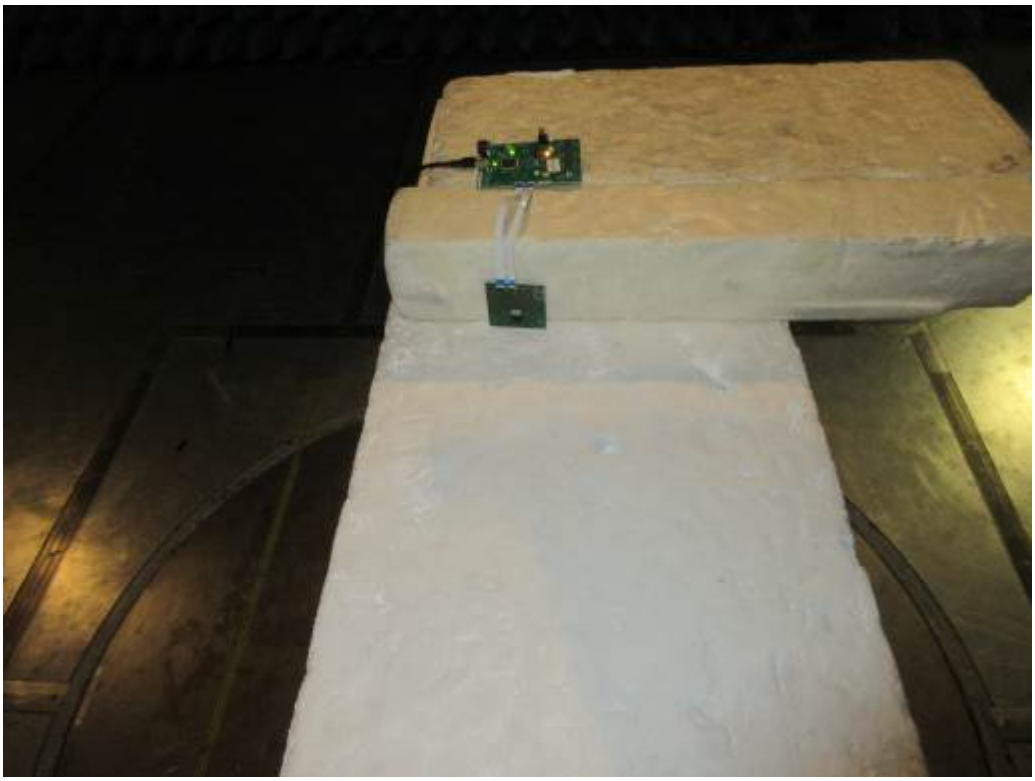
TEST SETUP PHOTO(S) RADIATED EMISSIONS (F>1GHZ)


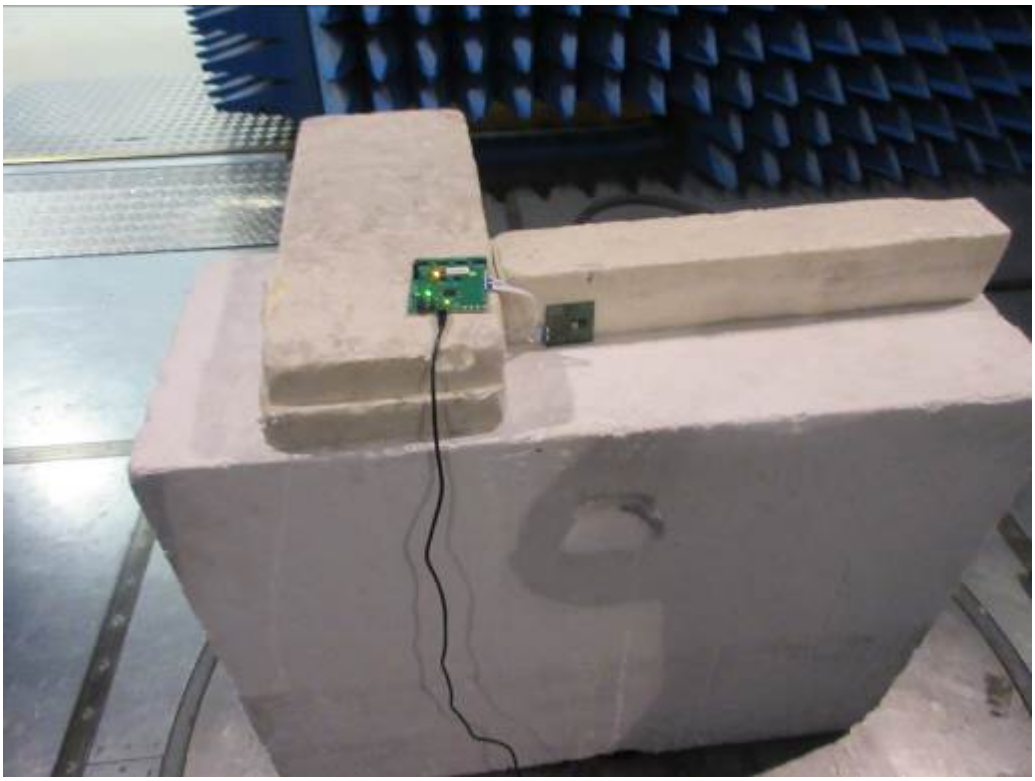
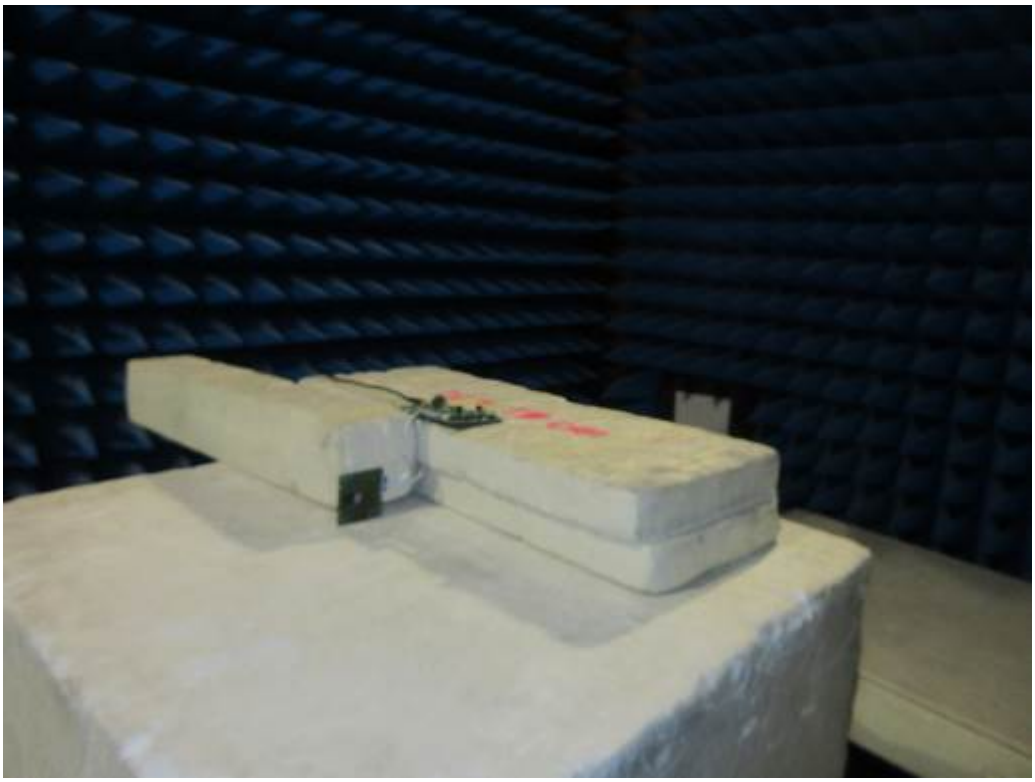
TEST SETUP PHOTO(S) RADIATED EMISSIONS (300MHZ>F>1GHZ)


TEST SETUP PHOTO(S) RADIATED EMISSIONS (3MHZ>F>300MHZ)


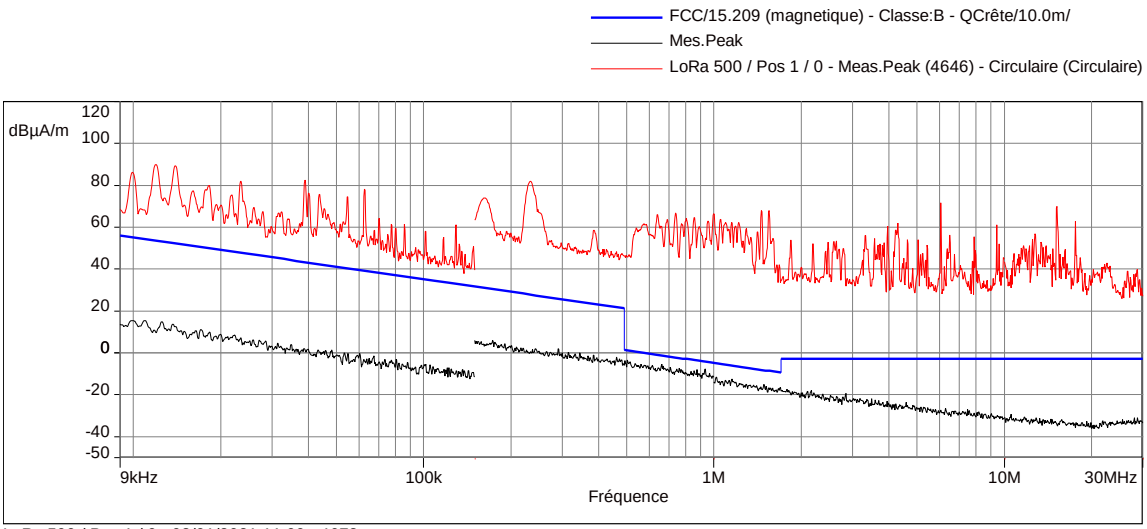
TEST SETUP PHOTO(S) RADIATED EMISSIONS – POSITION 1



TEST SETUP PHOTO(S) RADIATED EMISSIONS – POSITION 2

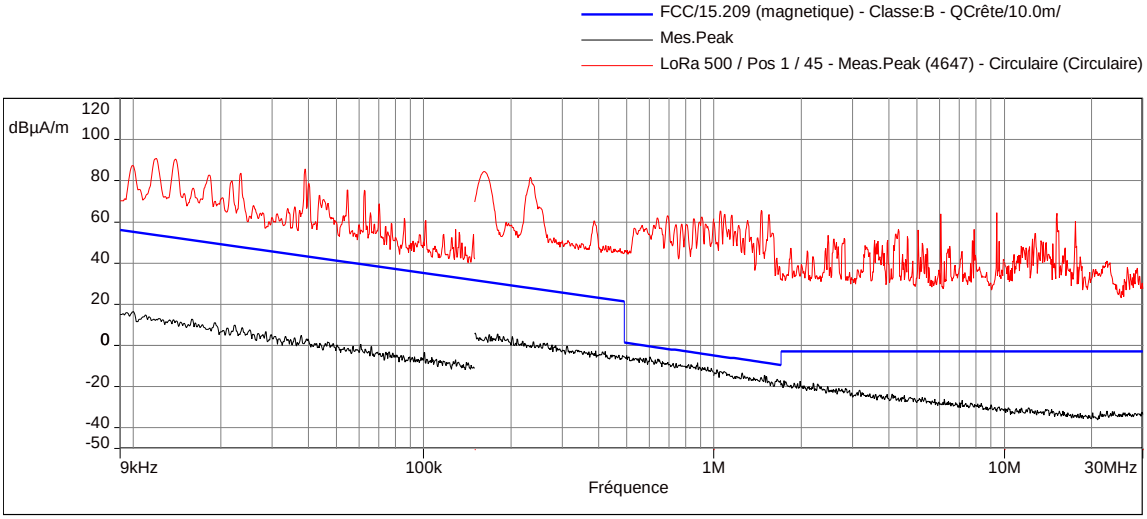


TEST SETUP PHOTO(S) RADIATED EMISSIONS – POSITION 3



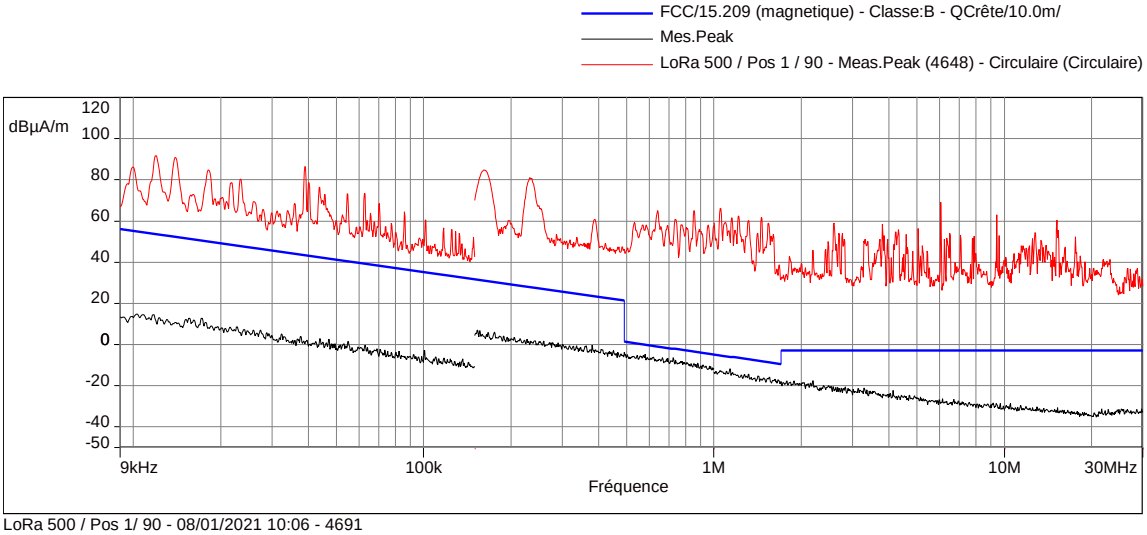
RADIATED SPURIOUS EMISSIONS - GRAPH			
TX MODE (F<30MHZ) / LOWEST, CENTRAL & HIGHEST CHANNELS / POSITION 1		EMI4673 & 4690 & 4691	
EUT mode:	Tx mode	**T (°C):**	4.3
Test Date:	07/01/2021	**H (%):**	22.4
Test Operator:	TVI	**P (hPa):**	999



LoRa 500 / Pos 1 / 0 - 08/01/2021 11:00 - 4673



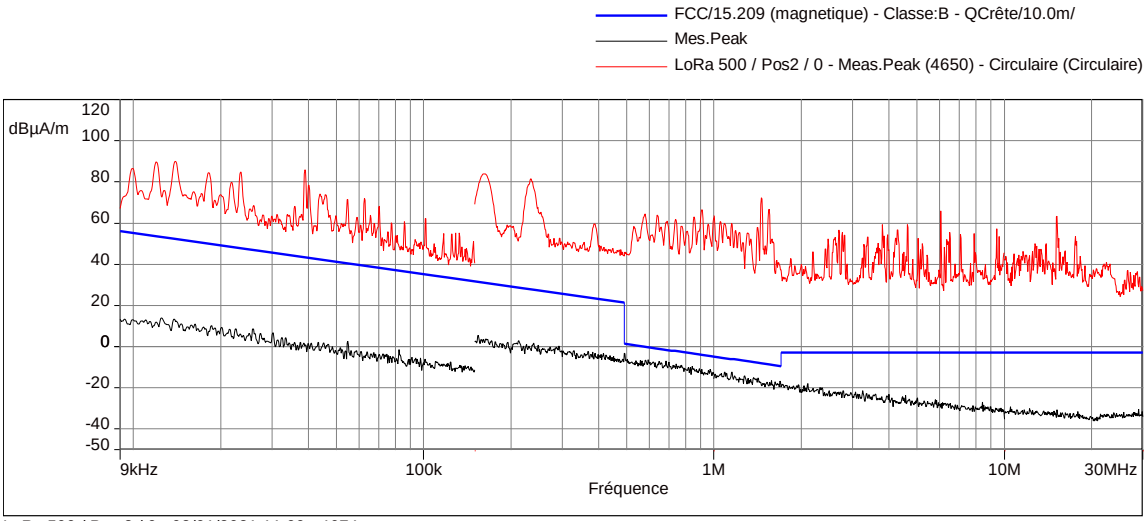
LoRa 500 / Pos 1/ 45 - 08/01/2021 10:54 - 4690



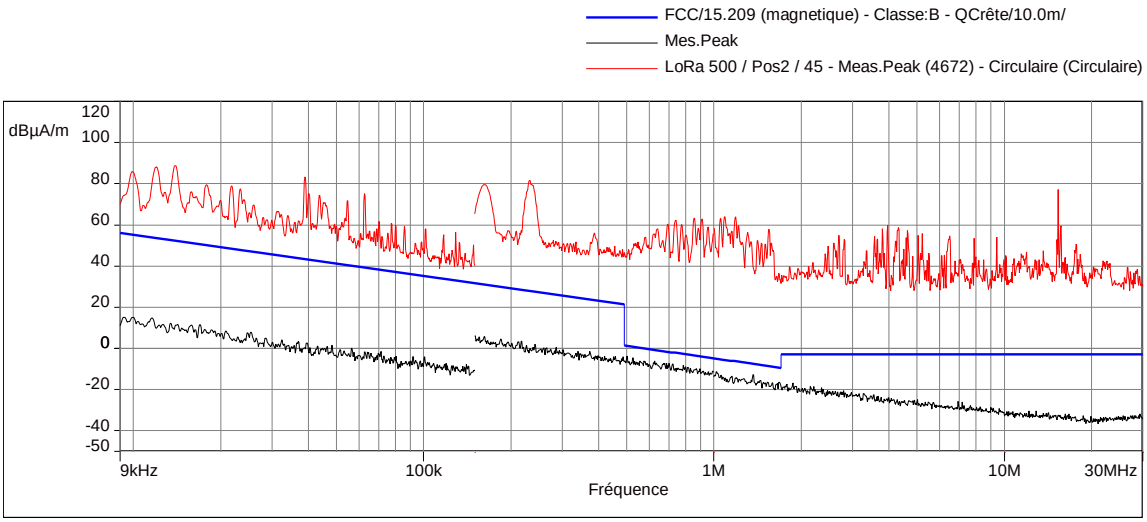
LoRa 500 / Pos 1/ 90 - 08/01/2021 10:06 - 4691

RADIATED SPURIOUS EMISSIONS - GRAPH				
TX MODE (F<30MHZ) / LOWEST, CENTRAL & HIGHEST CHANNELS / POSITION 1				EMI4673 & 4690 & 4691
POSITION	**FREQUENCIES**	**RBW**	**VBW**	**DETECTOR**
0°	9kHz-150kHz	200Hz	1kHz	Peak
0°	150kHz-1MHz	9kHz	30kHz	Peak
0°	200MHz-1GHz	9kHz	30kHz	Peak
45°	9kHz-150kHz	200Hz	1kHz	Peak
45°	150kHz-1MHz	9kHz	30kHz	Peak
45°	200MHz-1GHz	9kHz	30kHz	Peak
90°	9kHz-150kHz	200Hz	1kHz	Peak
90°	150kHz-1MHz	9kHz	30kHz	Peak
90°	200MHz-1GHz	9kHz	30kHz	Peak
Configuration:	N/A			
Comments:	The EUT was placed in sweep mode, from the first to the last. The black graphs represent the level measured in FAR, used to know which peak come from the EUT and which come from the environment. No spurious detected			
EUT modification(s): N/A				

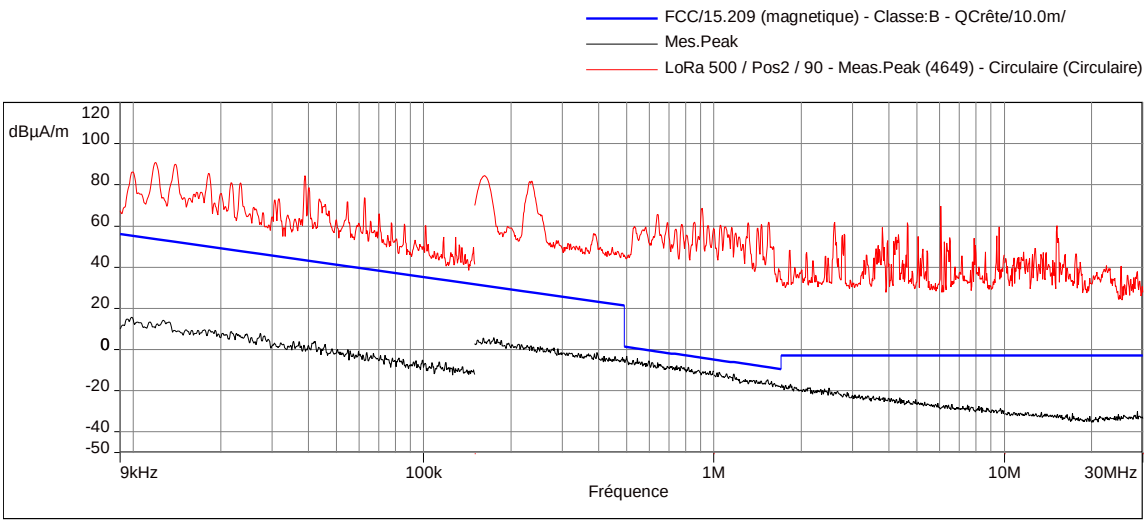
RADIATED SPURIOUS EMISSIONS - GRAPH			
TX MODE (F<30MHZ) / LOWEST, CENTRAL & HIGHEST CHANNELS / POSITION 2		EMI4674 & 4689 & 4692	
EUT mode:	Tx mode	**T (°C):**	4.3
Test Date:	07/01/2021	**H (%):**	22.4
Test Operator:	TVI	**P (hPa):**	999



LoRa 500 / Pos 2 / 0 - 08/01/2021 11:00 - 4674



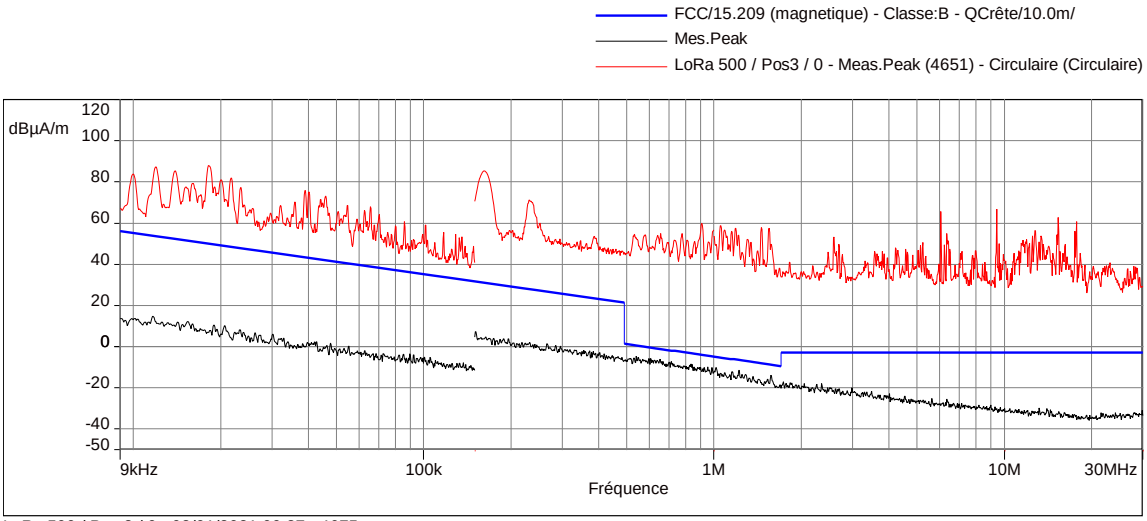
LoRa 500 / Pos 2/ 45 - 08/01/2021 10:03 - 4689



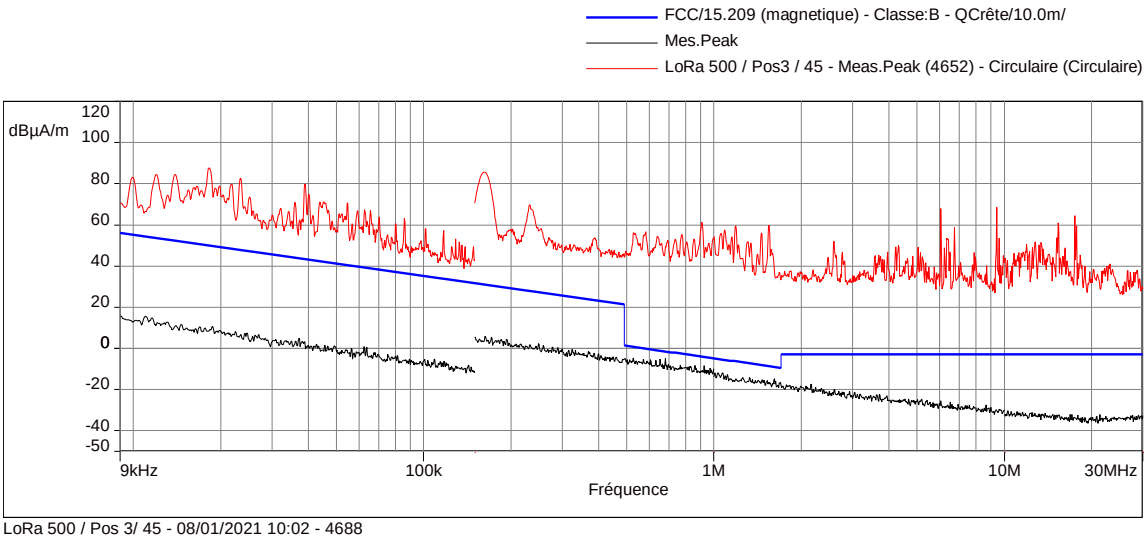
LoRa 500 / Pos 2/ 90 - 08/01/2021 10:08 - 4692

RADIATED SPURIOUS EMISSIONS - GRAPH				
TX MODE (F<30MHZ) / LOWEST, CENTRAL & HIGHEST CHANNELS / POSITION 2				EMI4674 & 4689 & 4692
POSITION	**FREQUENCIES**	**RBW**	**VBW**	**DETECTOR**
0°	9kHz-150kHz	200Hz	1kHz	Peak
0°	150kHz-1MHz	9kHz	30kHz	Peak
0°	200MHz-1GHz	9kHz	30kHz	Peak
45°	9kHz-150kHz	200Hz	1kHz	Peak
45°	150kHz-1MHz	9kHz	30kHz	Peak
45°	200MHz-1GHz	9kHz	30kHz	Peak
90°	9kHz-150kHz	200Hz	1kHz	Peak
90°	150kHz-1MHz	9kHz	30kHz	Peak
90°	200MHz-1GHz	9kHz	30kHz	Peak
Configuration:	N/A			
Comments:	The EUT was placed in sweep mode, from the first to the last. The black graphs represent the level measured in FAR, used to know which peak come from the EUT and which come from the environment. No spurious detected			
EUT modification(s): N/A				

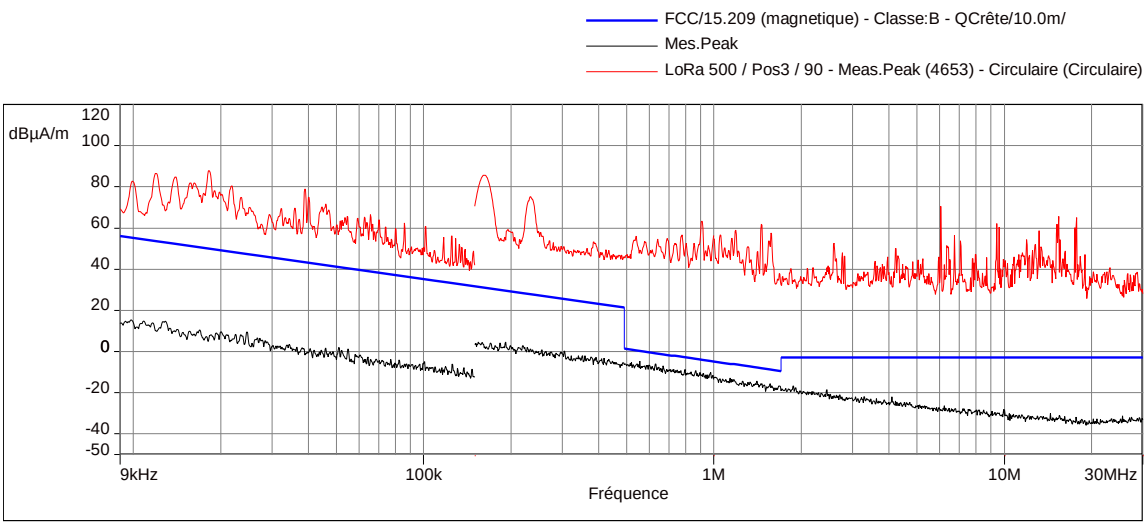
RADIATED SPURIOUS EMISSIONS - GRAPH			
TX MODE (F<30MHZ) / LOWEST, CENTRAL & HIGHEST CHANNELS / POSITION 3		EMI4675 & 4688 & 4693	
EUT mode:	Tx mode	**T (°C):**	4.3
Test Date:	07/01/2021	**H (%):**	22.4
Test Operator:	TVI	**P (hPa):**	999



LoRa 500 / Pos 3 / 0 - 08/01/2021 09:37 - 4675



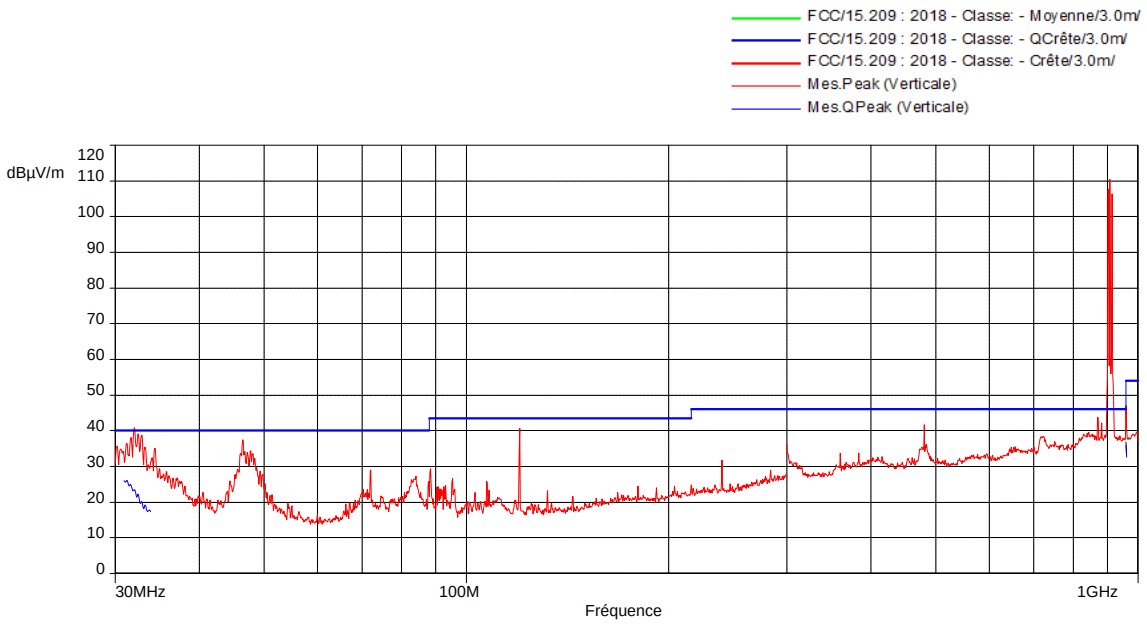
LoRa 500 / Pos 3/ 45 - 08/01/2021 10:02 - 4688

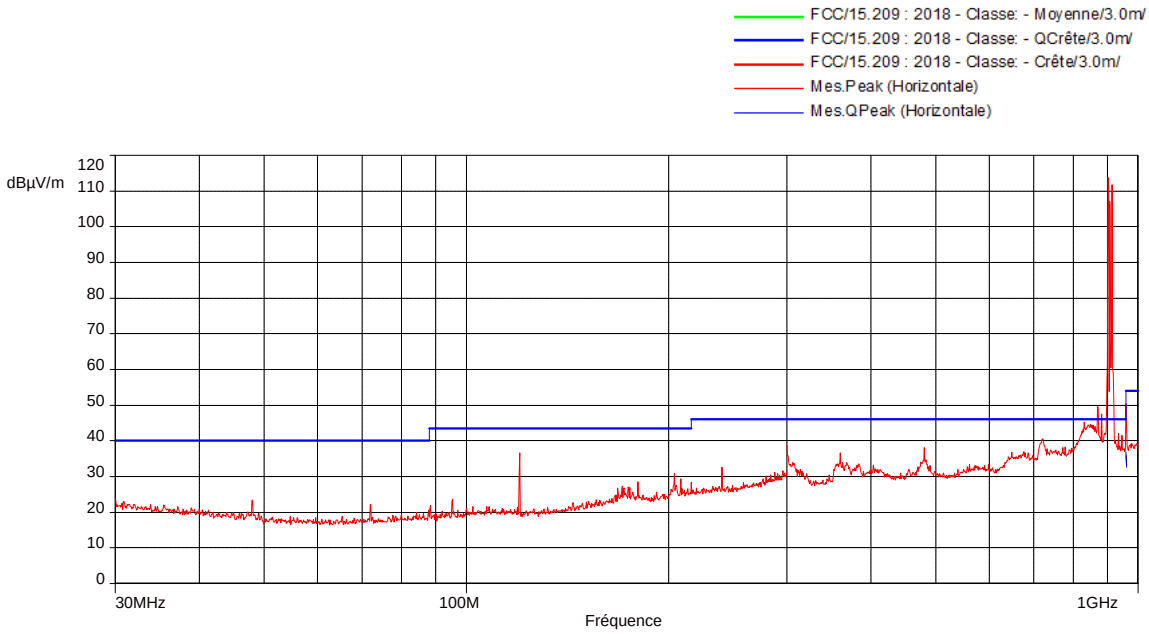


LoRa 500 / Pos 3/ 90 - 08/01/2021 10:09 - 4693

RADIATED SPURIOUS EMISSIONS - GRAPH				
TX MODE (F<30MHZ) / LOWEST, CENTRAL & HIGHEST CHANNELS / POSITION 3				EMI4675 & 4688 & 4693
POSITION	**FREQUENCIES**	**RBW**	**VBW**	**DETECTOR**
0°	9kHz-150kHz	200Hz	1kHz	Peak
0°	150kHz-1MHz	9kHz	30kHz	Peak
0°	200MHz-1GHz	9kHz	30kHz	Peak
45°	9kHz-150kHz	200Hz	1kHz	Peak
45°	150kHz-1MHz	9kHz	30kHz	Peak
45°	200MHz-1GHz	9kHz	30kHz	Peak
90°	9kHz-150kHz	200Hz	1kHz	Peak
90°	150kHz-1MHz	9kHz	30kHz	Peak
90°	200MHz-1GHz	9kHz	30kHz	Peak
Configuration:	N/A			
Comments:	The EUT was placed in sweep mode, from the first to the last. The black graphs represent the level measured in FAR, used to know which peak come from the EUT and which come from the environment. No spurious detected			
EUT modification(s): N/A				

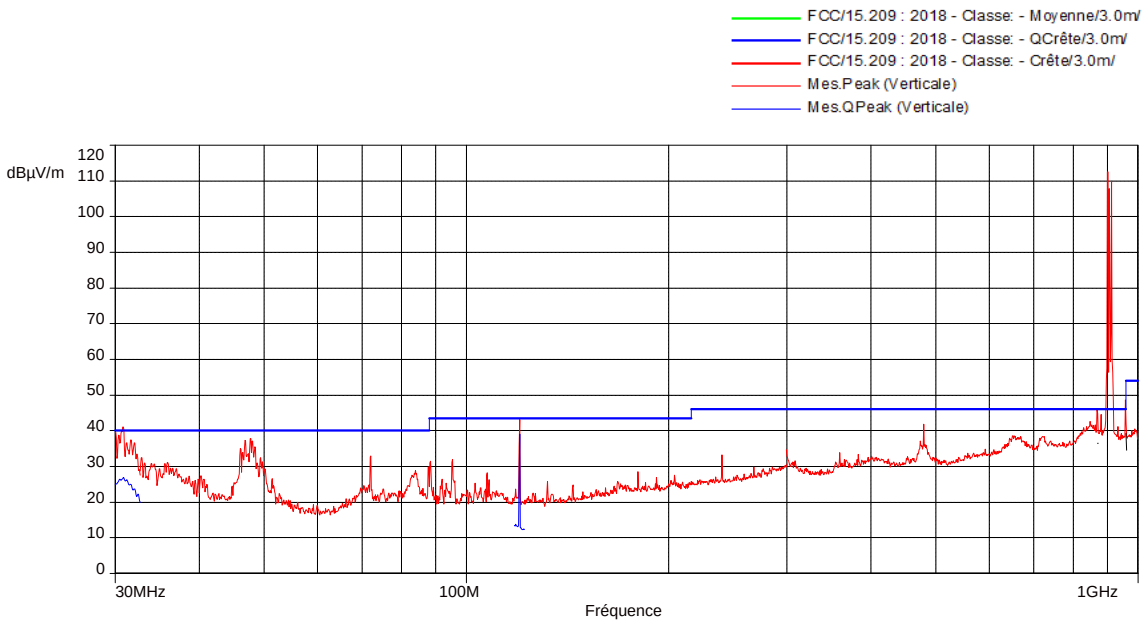
RADIATED SPURIOUS EMISSIONS - GRAPH			
TX MODE (F<1GHZ) / LOWEST, CENTRAL & HIGHEST CHANNELS / POSITION 1		EMI4619	
EUT mode:	Tx mode	**T (°C):**	22.3
Test Date:	26/08/2020	**H (%):**	24.6
Test Operator:	TVI	**P (hPa):**	994

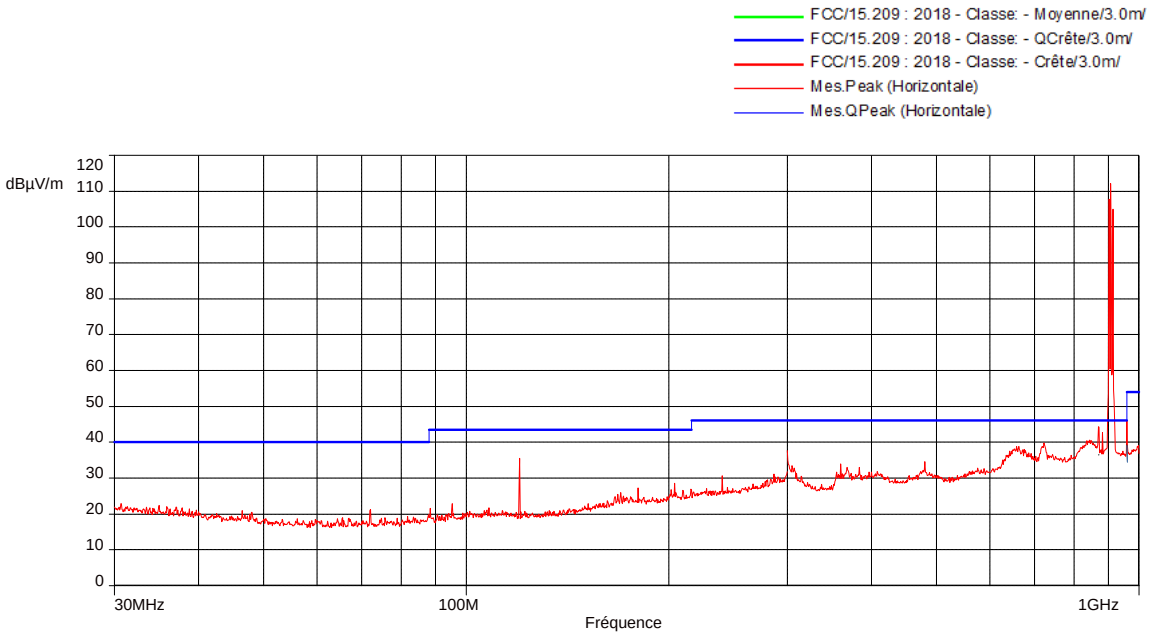




POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	30MHz-200MHz	100kHz	300kHz	Peak
Horizontal	30MHz-200MHz	100kHz	300kHz	Peak
Horizontal	200MHz-1GHz	100kHz	300kHz	Peak & QPeak
Vertical	200MHz-1GHz	100kHz	300kHz	Peak & QPeak
Configuration:	N/A			
Comments:	The EUT was placed in sweep mode, from the first to the last.			
EUT modification(s): N/A				

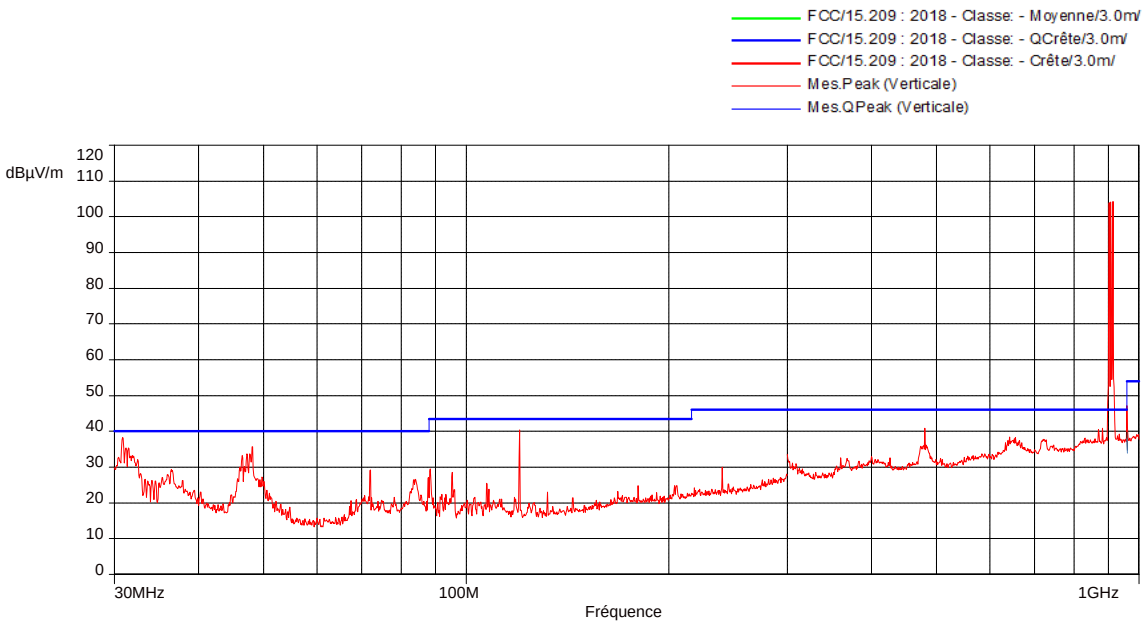
RADIATED SPURIOUS EMISSIONS - GRAPH			
TX MODE (F<1GHZ) / LOWEST, CENTRAL & HIGHEST CHANNELS / POSITION 2		EMI4623	
EUT mode:	Tx mode	**T (°C):**	22.3
Test Date:	26/08/2020	**H (%):**	24.6
Test Operator:	TVI	**P (hPa):**	994

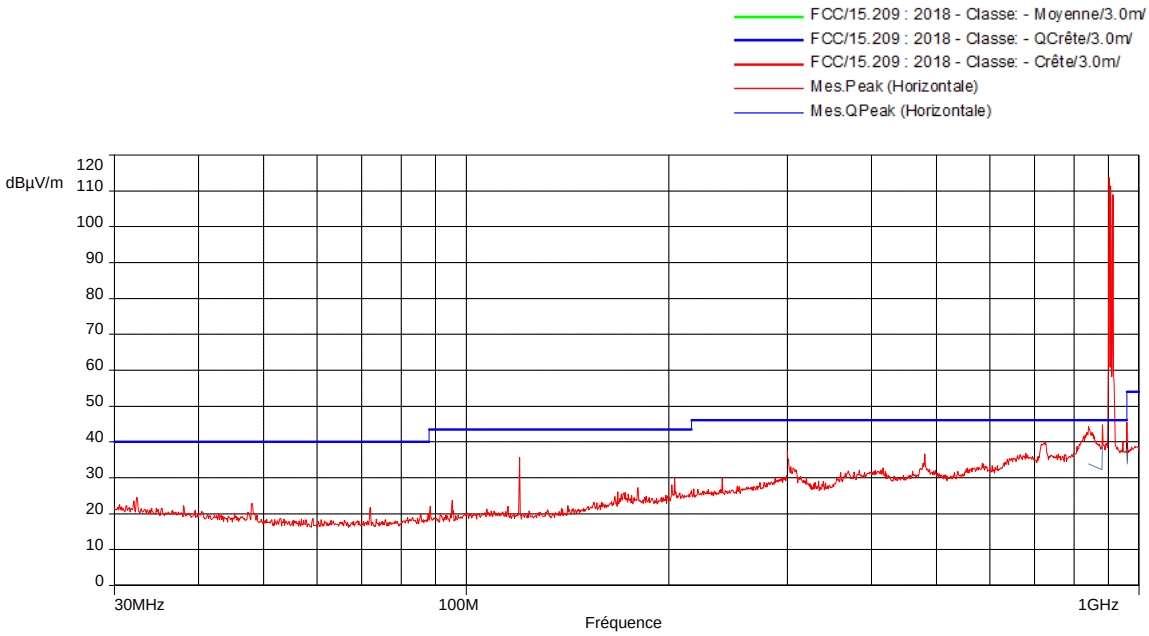




POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	30MHz-200MHz	100kHz	300kHz	Peak
Horizontal	30MHz-200MHz	100kHz	300kHz	Peak
Horizontal	200MHz-1GHz	100kHz	300kHz	Peak & QPeak
Vertical	200MHz-1GHz	100kHz	300kHz	Peak & QPeak
Configuration:	N/A			
Comments:	The EUT was placed in sweep mode, from the first to the last.			
EUT modification(s): N/A				

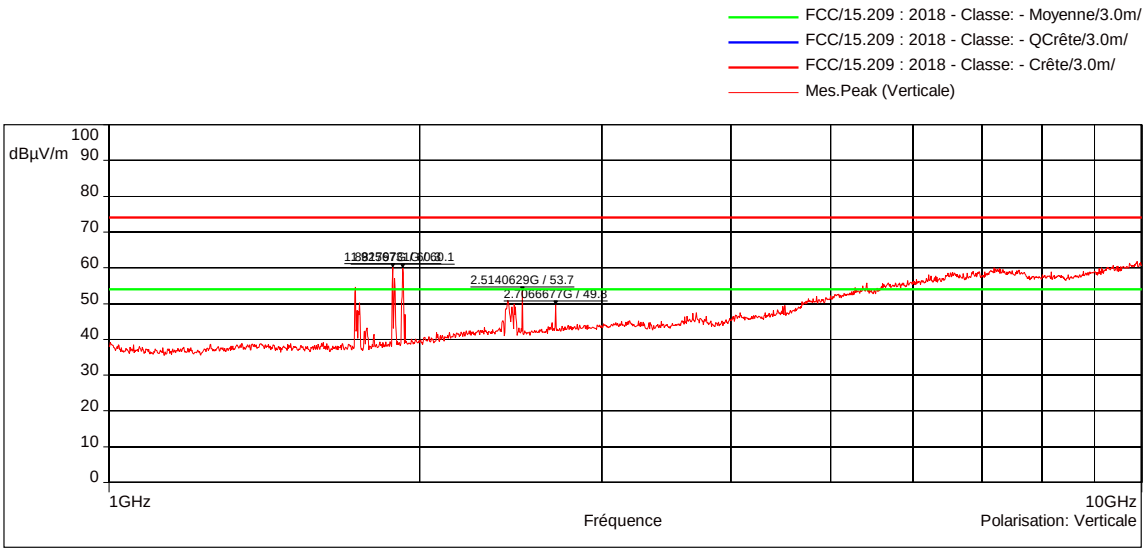
RADIATED SPURIOUS EMISSIONS - GRAPH			
TX MODE (F<1GHZ) / LOWEST, CENTRAL & HIGHEST CHANNELS / POSITION 3		EMI4624	
EUT mode:	Tx mode	**T (°C):**	22.3
Test Date:	26/08/2020	**H (%):**	24.6
Test Operator:	TVI	**P (hPa):**	994

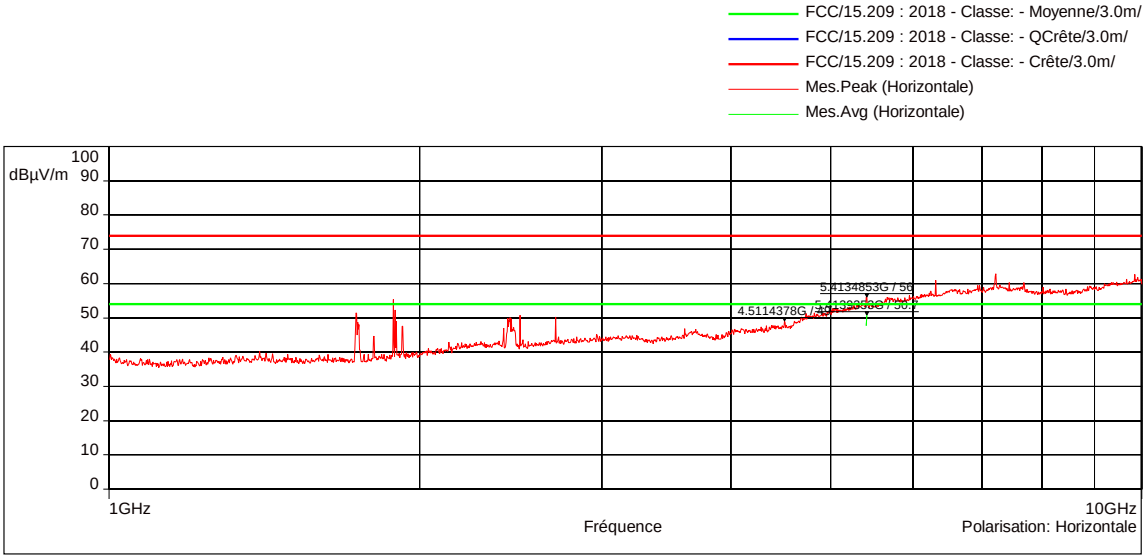




POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	30MHz-200MHz	100kHz	300kHz	Peak
Horizontal	30MHz-200MHz	100kHz	300kHz	Peak
Horizontal	200MHz-1GHz	100kHz	300kHz	Peak & QPeak
Vertical	200MHz-1GHz	100kHz	300kHz	Peak & QPeak
Configuration:	N/A			
Comments:	The EUT was placed in sweep mode, from the first to the last.			
EUT modification(s): N/A				

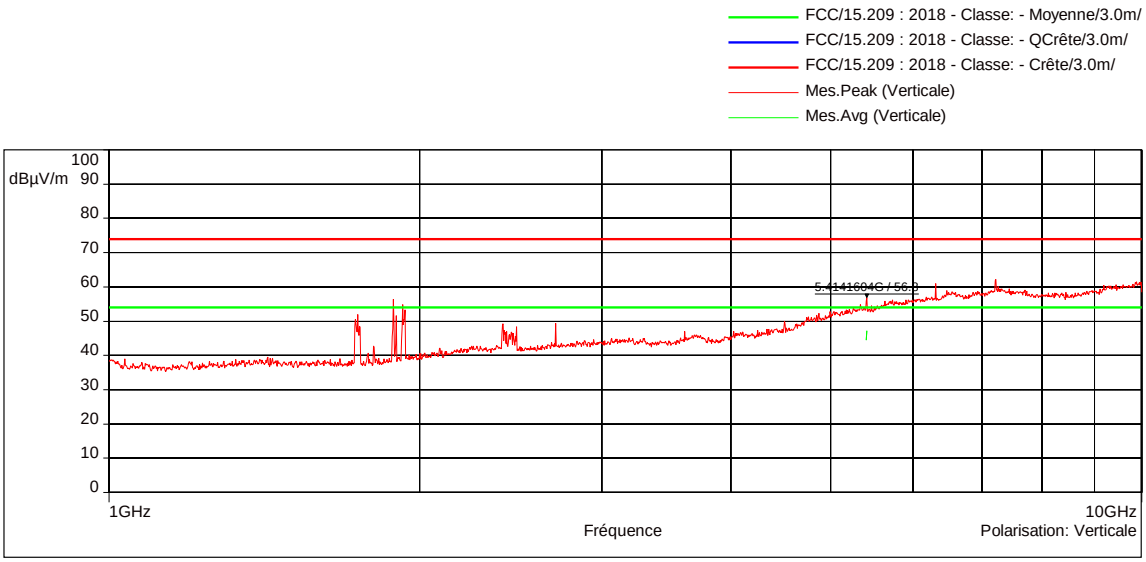
RADIATED SPURIOUS EMISSIONS - GRAPH			
TX MODE (F>1GHZ) / LOWEST, CENTRAL & HIGHEST CHANNELS / POSITION 1		EMI4610	
EUT mode:	Tx mode	**T (°C):**	22.3
Test Date:	17/08/2020	**H (%):**	24.6
Test Operator:	TVI	**P (hPa):**	994

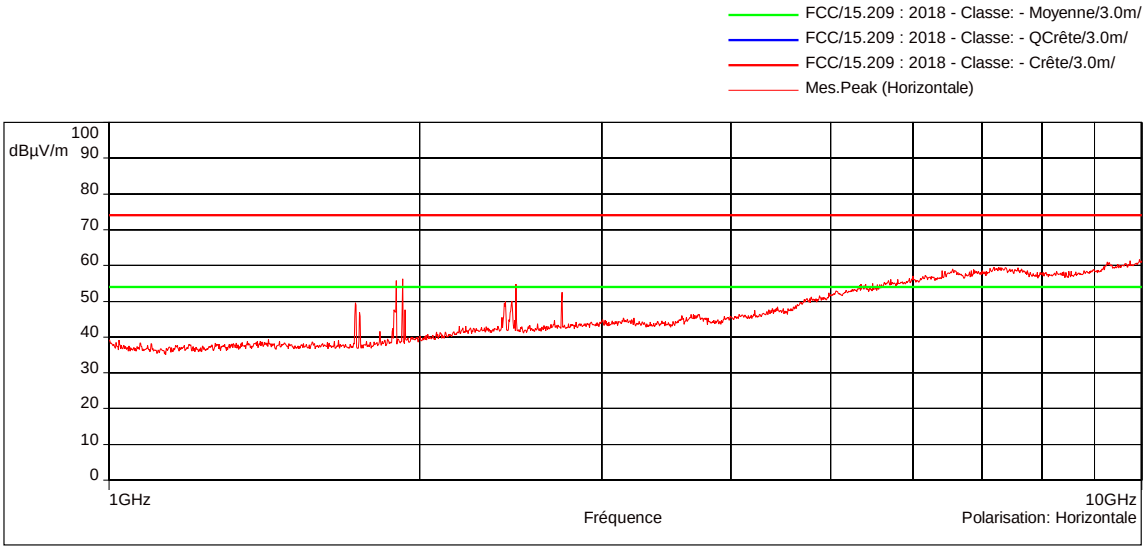




POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	1GHz-10GHz	1MHz	3MHz	Peak and Avg
Horizontal	1GHz-10GHz	1MHz	3MHz	Peak and Avg
Configuration:	N/A			
Comments:	See tables for finals measurements. The EUT was placed in sweep mode, from the first to the last.			
EUT modification(s): N/A				

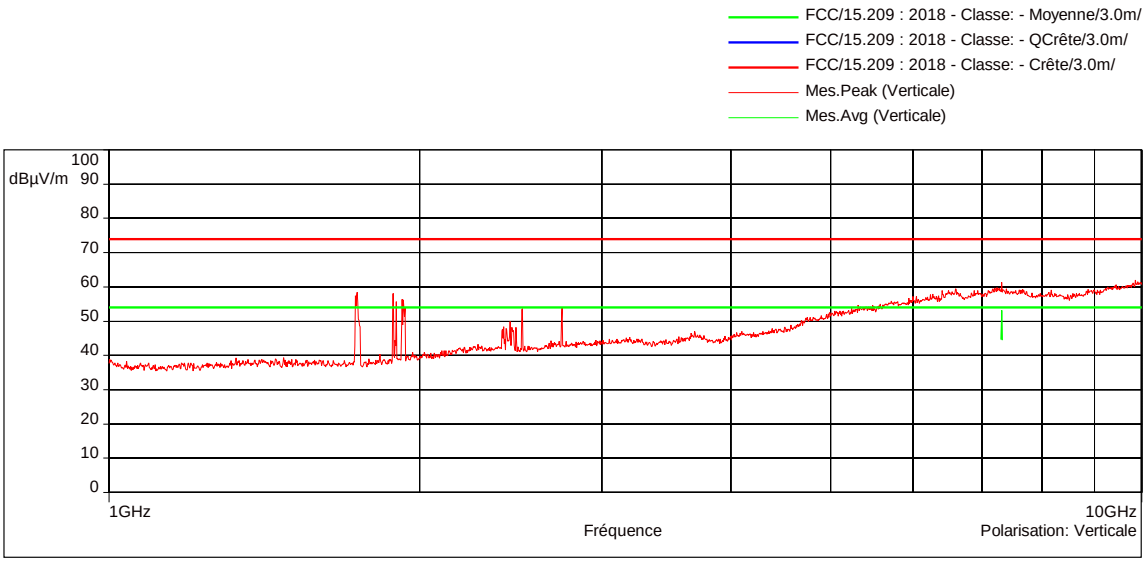
RADIATED SPURIOUS EMISSIONS - GRAPH			
TX MODE (F>1GHZ) / LOWEST, CENTRAL & HIGHEST CHANNELS / POSITION 2		EMI4612	
EUT mode:	Tx mode	**T (°C):**	22.3
Test Date:	17/08/2020	**H (%):**	24.6
Test Operator:	TVI	**P (hPa):**	994

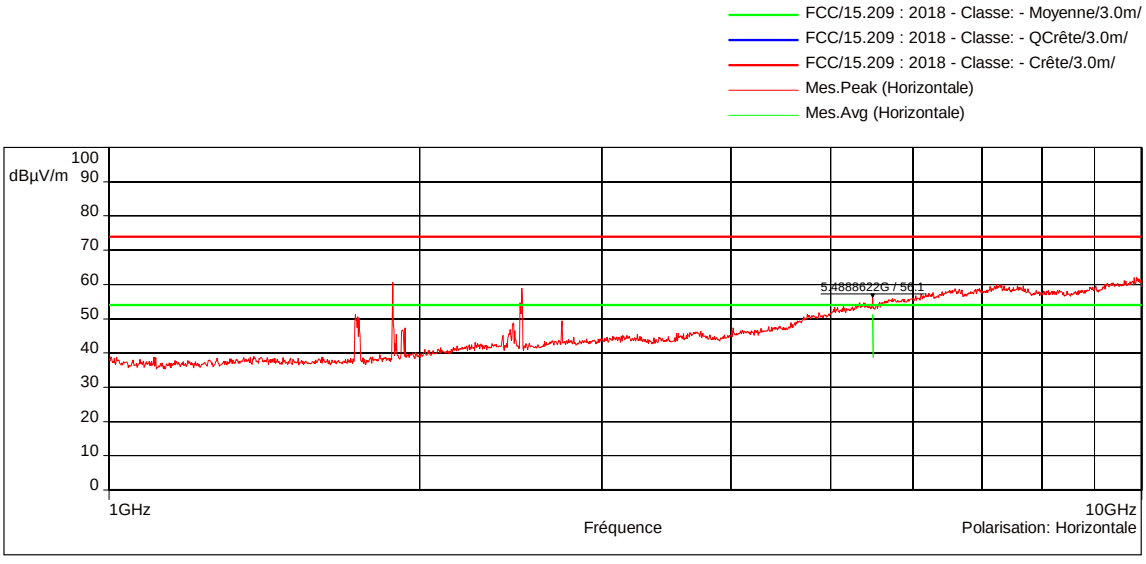




POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	1GHz-10GHz	1MHz	3MHz	Peak and Avg
Horizontal	1GHz-10GHz	1MHz	3MHz	Peak and Avg
Configuration:	N/A			
Comments:	See tables for finals measurements. The EUT was placed in sweep mode, from the first to the last.			
EUT modification(s): N/A				

RADIATED SPURIOUS EMISSIONS – GRAPH			
TX MODE (F>1GHZ) / LOWEST, CENTRAL & HIGHEST CHANNELS / POSITION 3		EMI4614	
EUT mode:	Tx mode	**T (°C):**	22.3
Test Date:	17/08/2020	**H (%):**	24.6
Test Operator:	TVI	**P (hPa):**	994





POSITION	FREQUENCIES	RBW	VBW	DETECTOR
Vertical	1GHz-10GHz	1MHz	3MHz	Peak and Avg
Horizontal	1GHz-10GHz	1MHz	3MHz	Peak and Avg

Configuration:	N/A
Comments:	See tables for finals measurements. The EUT was placed in sweep mode, from the first to the last.

EUT modification(s): N/A

7.7. Measurement of Frequency Stability §15.215 (C) And RSS-GEN

Reference standard:	FCC part 15 Radio part 15.215 c)
Test method:	FCC part 15 Radio part 15.215 c) and RSS Gen
General test setup: The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation. EUT is set inside the climatic enclosure. EUT is connected to the measuring receiver via 50Ω attenuator(s).	

TEST CASE	EUT MODE	SEVERITY	RESULT TAB.	VERDICT
Tx mode	Permanent emission mode	902-928 MHz	-	**PASS**

LABORATORY PARAMETERS:	REQUIRED PRIOR TO THE TEST	DURING THE TEST
Ambient Temperature	15 to 35 °C	N/A
Relative Humidity	20 to 75 %	N/A
Atmospheric pressure	N/A	N/A
Test method deviation: N/A		
Supplementary information: EUT power supply is replaced by a stabilized power supply.		

TEST EQUIPMENT USED					
CATEGORY	**BRAND**	**TYPE**	**IDENTIFIER**	**CAL. DATE**	**CAL. DUE**
Spectrum Analyzer	Agilent Technologies	N9010A	11316	14/05/2019	14/07/2020
Cable	H&S	N-1m	15931	04/12/2018	04/02/2021
Software	Nexio		0000		
Thermohygrometer	Testo	608-H1	15790	12/11/2018	12/01/2021
Climatic chamber	CLIMATIS	EXCAL 4014-TA	12398	04/03/2020	04/05/2022

BAT-EMC software version: V3.18.0.26
Blank cells = Permanent validity

TEST SETUP PHOTO(S)

EFFECTIVE RADIATED POWER - TABULATED RESULTS				
Test Case	**Temperature (°C)**	**Power supply (Vdc)**	**Frequency (MHz)**	**Frequency error (kHz)**
Normal conditions / Low channel	25	3.3 (1)	902.301038	-
Extremes tests conditions / Low channel	-30	3.3 (1)	902.300753	0.753
Extremes tests conditions / Low channel	85	3.3 (1)	902.301123	1.123
Normal conditions / Central channel	25	3.3 (1)	907.800972	-
Extremes tests conditions / Central channel	-30	3.3 (1)	907.801142	1.142
Extremes tests conditions / Central channel	85	3.3 (1)	907.801027	1.027
Normal conditions / High channel	25	3.3 (1)	914.900982	-
Extremes tests conditions / High channel	-30	3.3 (1)	914.900915	0.915
Extremes tests conditions / High channel	85	3.3 (1)	914.901010	1.010

Note 1 : The voltage of the EUT is provided by an EA, which regulate the voltage of the EUT. Modifying the voltage of provided would only modify the voltage of the EA, and not the EUT.

EUT MODIFICATIONS	OPERATOR	TEST DATE	RESULT TAB.
N/A	TVI	03/04/2020	-

End of test report