EMITECH GROUPE

RCE-100-18-101199-2-A

"This report cancels and replaces the test report N° RCE-100-18-101199-2-A Edition 0"

E.M.C Test Report

According to the standard:

FCC 47 CFR PART 15 : 2017 (§15.247)

Equipment under test:

HPV3 with radio module BLE
FCC ID: 2AHZSHPV3C-MOB

Company:

ION BEAM APPLICATIONS SA

FCC accredited: FR0004

Distribution: Mr. DE ROEK **(Company:** ION BEAM APPLICATIONS SA)

Number of pages: 33 with 4 annexes

Ed.	Date	Modified pages	Written by Name / Visa	Technical Verification and Quality Approval Name / Visa
1	29/08/19	1, 2, 4	A. BERNARD Test Technician ABe	B. PELLERIN Radio Technical 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 production of the item tested.

TEST CERTIFICATION FOR:	:	FCC Certification
NAME OF THE EQUIPMENT UNDER TEST	:	HPV3 with BLE 2.4 GHz
Serial number	:	Prototype
Reference / model (P/N)	:	P4009231
Software version	:	-
NAME OF THE MANUFACTURER	:	ION BEAM APPLICATIONS SA
ADDRESS OF THE APPLICANT	:	
Company	:	ION BEAM APPLICATIONS SA
Address	:	Chemin du Cyclotron 3 1348 LOUVAIN-LA-NEUVE BELGIQUE
Person present during the tests	:	Mr LEJEUNE
Responsible	:	Mr DE ROEK
DATE OF TESTS	:	12/03/2018
TESTS LOCATION	:	EMITECH Laboratory at Montigny-le-Bretonneux (78) - FRANCE
TESTS SUPERVISOR	:	B. PELLERIN
TESTS OPERATOR	:	A. BERNARD

TABLE OF CONTENTS

1. INTRODUCTION

This document presents the results of Electromagnetic Compatibility tests performed on the equipment «Hand pendant with BLE 2.4 GHz» according to reference documents listed below.

2. REFERENCE DOCUMENTS

FCC 47 CFR Part 15: 2017
Code of Federal Regulations. Title 47- Telecommunication
Chapter 1- Federal Communication Commission
Part 15- Radio frequency devices

ANSI C63.4: 2014
Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronics Equipment in the range of 9 kHz to 40 GHz.

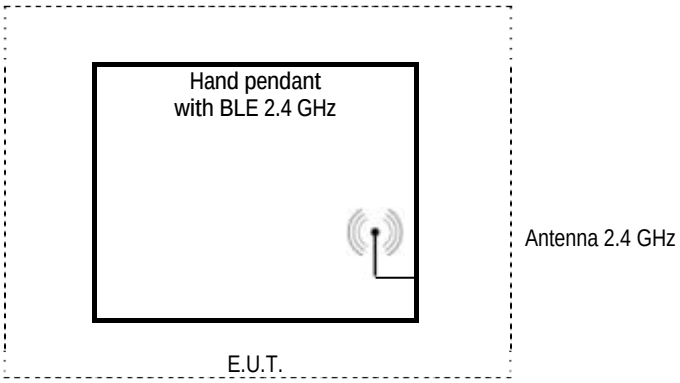
KDB 558074 D01 DTS Meas Guidance V05r02
Guidance for performing compliance measurement on Digital Transmission Systems (DTS) operating under § 15.247

3. PRODUCT DESCRIPTION

Class:	B (Medical environment)
Antenna type and gain:	Integral antenna: Not communicated
Operating frequency range:	from 2402 MHz to 2480 MHz
Number of channels:	3
Channel spacing:	2 MHz
Modulation:	-
Power source:	3 Vdc (battery)
Software power setting:	-

Modification of the equipment during the tests: No.

The equipment under test is presented in a plastic housing, intended for use portable in a medical environment; it is tested in horizontal position and vertical position. That used for all measurements in an horizontal position.
The equipment under test is recharged via a charging station supplied with 230 Vac / 50 Hz.



4. TESTS AND CONCLUSION

The following table summarizes test results of the EUT.

Subpart C of the standard FCC part 15 – Intentional radiators

Test procedure	Designation of test	Test results				Comments
		Pass	Fail	N.A.	N.P.	
15.205	Restricted bands of operation	X				
15.207	Measurement of conducted emission on AC mains ports			X		
15.209	Radiated emission limits; general requirements	X				
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				
	(c) 20 dB bandwidth and band-edge compliance			X		
15.247	Intentional radiated emissions					
	a) frequency hopping and digitally modulated					
	a) (1) hopping mode			X		
	a) (1) (i) frequency hopping in the band 902-928 MHz			X		
	a) (1) (ii) frequency hopping in the band 5725–5850 MHz			X		
	a) (1) (iii) frequency hopping in the band 2400–2483.5 MHz			X		
	a) (2) systems using digital modulation in the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz (6 dB bandwith)	X				
	b) maximum peak conducted					
	b) (1) frequency hopping in the bands 2400–2483.5 MHz or 5725–5850 MHz			X		
	b) (2) frequency hopping in the band 902-928 MHz			X		

Test procedure	Designation of test	Test results				Comments
		Pass	Fail	N.A.	N.P.	
	b) (3) systems using digital modulation in the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz	X				
	b) (4) maximum peak conducted > 6 dBi			X		
	b) (4) (i) frequency hopping in the band 2400–2483.5 MHz			X		
	b) (4) (ii) frequency hopping in the band 5725–5850 MHz			X		
	b) (4) (iii) fixed, point-to-point			X		
	c) directional antenna > 6 dBi					
	c) (1) fixed, point-to-point operation			X		
	c) (1) (i) in the band 2400–2483.5 MHz			X		
	c) (1) (ii) in the band 5725–5850 MHz			X		
	c) (1) (iii) fixed, point-to-point			X		
	c) (2) multiple directional beams in the band 2400–2483.5 MHz			X		
	c) (2) (i) information			X		
	c) (2) (ii) sum of the power supplied to all antennas			X		
	c) (2) (iii) one antenna for multiple directional beams			X		
	c) (2) (iv) single directional beam			X		
	d) intentional radiator	X				
	e) peak power spectral density	X				
	f) hybrid system			X		
	g) continuous data stream during the test			X		
	h) to avoid hopping on occupied channels			X		
	i) RF exposure compliance			X		P < 500 mW

N.A.: Not Applicable
N.P.: Not Performed

Conclusion:

The tested sample «Hand pendant with 2.4 GHz» submitted to the tests complies with the requirements of the standard:

- FCC 47 CFR PART 15 : 2017

According to the limits specified in this report.

5. DIGITAL MODULATION SYSTEMS

Standard: FCC 47 CFR PART 15 : 2015

Section: §15.247 a) (2)

Test configuration:

The system is tested in normalized test site.

The test unit 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.

The level was maximised in antenna height, azimuth and polarization. The maximum level measured on the spectrum analyser was recorded.

Distance of antenna: 3 meters

Instrumentation test list:

Category	Manufacturer	Type	Emitech Nr	Last validity date	Next validity date
Amplifier	Agilent	8449B	14487	11/05/2017	11/07/2018
Antenna	Emco	3115	00941	28/10/2015	28/12/2018
Cable	C&C	N-2m	11176	18/04/2016	18/06/2018
Cable	C&C	N-6m	14224	02/09/2016	02/11/2018
Cable	C&C	N-4m	14226	02/09/2016	02/11/2018
Cable	C&C	N-4m	14227	02/09/2016	02/11/2018
Spectrum analyzer	Rohde & Schwarz	FSP40 (V 4.00SP1-V3.0-10-2)	05175	01/04/2016	01/06/2018

Equipment under test operating condition:

EUT is in continuous transmission mode.

Measure conditions:

Ambient temperature (°C): 21
Relative humidity (%): 50

Resolution bandwidth: 100 kHz

Results:

Power source: 3 Vdc

6 dB bandwidth

Frequency	Mode	Results	Comments
2402 MHz	advertising	0.688 MHz	See annex n°4
2426 MHz		0.678 MHz	See annex n°4
2480 MHz		0.655 MHz	See annex n°4

20 dB bandwidth

Frequency	Mode	Results	Comments
2402 MHz	advertising	1.212 MHz	See annex n°4
2426 MHz		1.254 MHz	See annex n°4
2480 MHz		1.199 MHz	See annex n°4

Test conclusion: Complies with the requirements of the standard.

6. TRANSMITTER OUTPUT POWER

Standard: FCC 47 CFR PART 15 : 2015

Section: §15.247 b) (3)

Test configuration:

The system is tested in normalized test site.

The test unit 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.

The level was maximised in antenna height, azimuth and polarization. The maximum level measured on the spectrum analyser was recorded.

Distance of antenna: 3 meters

Instrumentation test list:

Category	Manufacturer	Type	Emitech Nr	Last validity date	Next validity date
Amplifier	Agilent	8449B	14487	11/05/2017	11/07/2018
Antenna	Emco	3115	0941	28/10/2015	28/12/2018
Cable	C&C	N-2m	11176	18/04/2016	18/06/2018
Cable	C&C	N-6m	14224	02/09/2016	02/11/2018
Cable	C&C	N-4m	14226	02/09/2016	02/11/2018
Cable	C&C	N-4m	14227	02/09/2016	02/11/2018
Spectrum analyzer	Rohde & Schwarz	FSP40 (V 4.00SP1-V3.0-10-2)	5175	01/04/2016	01/06/2018

Equipment under test operating condition:

EUT is in continuous transmission mode.

Measure conditions:

Ambient temperature (°C): 21
Relative humidity (%): 50

Resolution bandwidth: 2 MHz

Results:

Power source: 3 Vdc

Frequency	Mode	Electro-magnetic field (dBµV/m)	TP* (dBm)	Limit (dBm)
2402 MHz	advertising	84.31	- 13.1	+ 30
2426 MHz		86.08	- 11.3	+ 30
2480 MHz		85.00	- 12.4	+ 30

* TP = $(E \times d)^2 / (30 \times 1.64)$ for d = 3 m

Test conclusion: Complies with the requirements of the standard.

7. PEAK POWER SPECTRAL DENSITY

Standard: FCC 47 CFR PART 15 : 2015

Section: §15.247 e)

Test configuration:

The system is tested in normalized test site.

The test unit 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.

The level was maximised in antenna height, azimuth and polarization. The maximum level measured on the spectrum analyser was recorded.

Distance of antenna: 3 meters

Instrumentation test list:

Category	Manufacturer	Type	Emitech Nr	Last validity date	Next validity date
Amplifier	Agilent	8449B	14487	11/05/2017	11/07/2018
Antenna	Emco	3115	0941	28/10/2015	28/12/2018
Cable	C&C	N-2m	11176	18/04/2016	18/06/2018
Cable	C&C	N-6m	14224	02/09/2016	02/11/2018
Cable	C&C	N-4m	14226	02/09/2016	02/11/2018
Cable	C&C	N-4m	14227	02/09/2016	02/11/2018
Spectrum analyzer	Rohde & Schwarz	FSP40 (V 4.00SP1-V3.0-10-2)	5175	01/04/2016	01/06/2018

Equipment under test operating condition:

EUT is in continuous transmission mode.

Measure conditions:

Ambient temperature (°C): 21
Relative humidity (%): 50

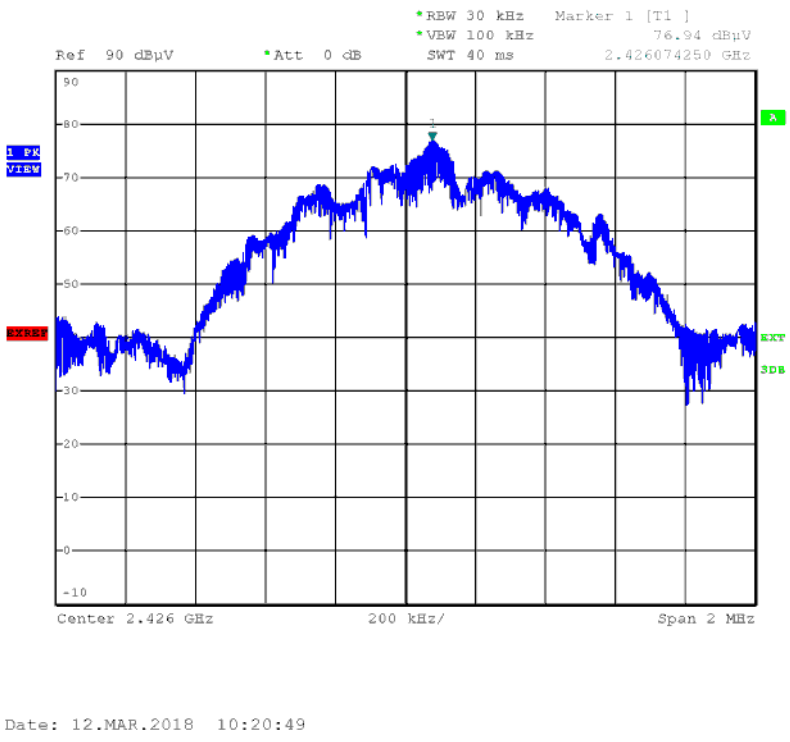
Resolution bandwidth: 30 kHz
Video bandwidth: 100 kHz

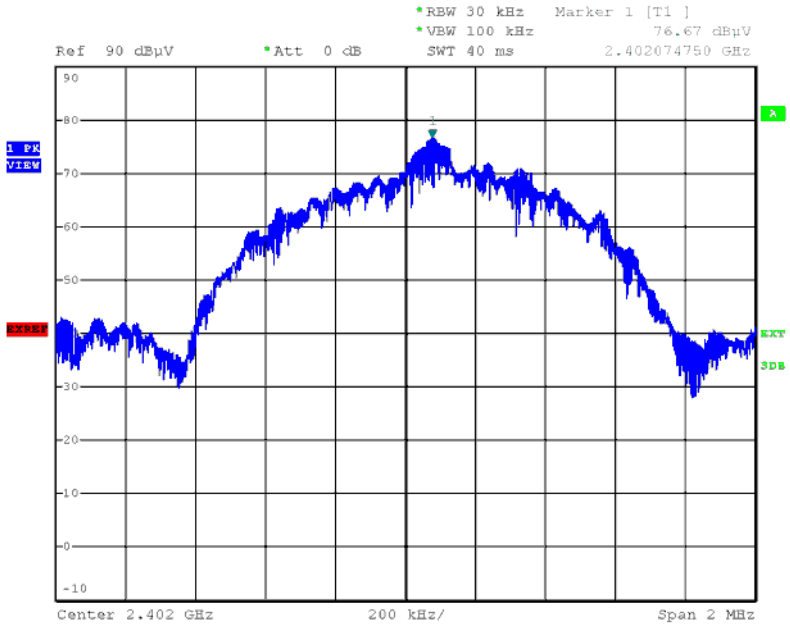
Results:

Power source: 3 Vdc

Frequency	Mode	Electro-magnetic field (dBµV/m)	PPSD* (dBm)	Limit (dBm)
2402 MHz	Advertising	80.4	- 17.0	+ 8.0
2426 MHz		80.7	- 16.6	
2480 MHz		82.0	- 15.4	

* PPSD = $(E \times d)^2 / (30 \times 1.64)$ for d = 3 m





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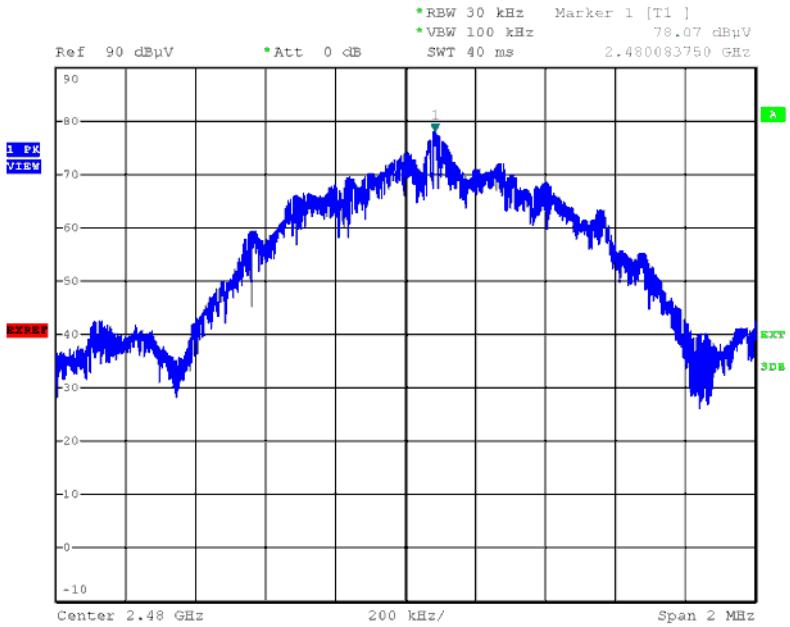

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Test conclusion: Complies with the requirements of the standard.

8. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSIONS LIMITATION

Standard: FCC 47 CFR PART 15 : 2015

Sections: §15.215 (b) and §15.247 (d)

Instrumentation test list:

Category	Manufacturer	Type	Emitech Nr	Last validity date	Next validity date
Amplifier	Agilent	8449B	14487	11/05/2017	11/07/2018
Antenna	Emco	3115	0941	28/10/2015	28/12/2018
Cable	C&C	N-2m	11176	18/04/2016	18/06/2018
Cable	C&C	N-6m	14224	02/09/2016	02/11/2018
Cable	C&C	N-4m	14226	02/09/2016	02/11/2018
Cable	C&C	N-4m	14227	02/09/2016	02/11/2018
Spectrum analyzer	Rohde & Schwarz	FSP40 (V 4.00SP1-V3.0-10-2)	5175	01/04/2016	01/06/2018

Equipment under test arrangement:

The system is tested in normalized test site.
The test unit 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.
The level was maximised in antenna height, azimuth and polarization. The maximum level measured on the spectrum analyser was recorded.

Results:

Ambient temperature (°C): 21
Relative humidity (%): 50

Lower Band Edge: from 2310 MHz to 2390 MHz
Upper Band Edge: from 2483.5 MHz to 2500 MHz

Polarization of test antenna: Horizontal (height = 170 cm)
Position of equipment: azimuth = 170° } For 2402 MHz

Polarization of test antenna: Horizontal (height = 150 cm)
Position of equipment: azimuth = 170° } For 2480 MHz

- Advertising Mode

Fundamental frequency (MHz)	Field Strength Level of fundamental (dBµV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) *	Calculated Max Out of Band Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)
2378.800	73.54	Average	2402.0875	41.2	32.3	54.0	4.4
2488.847	70.66	Average	2489.120	38.1	32.5	54.0	5.4

* According to step 2 of Marker-Delta Method DA 00-705.

Band-edge curves are given in annex 5.

9. *UNINTENTIONAL RADIATED EMISSIONS AND TRANSMITTER UNWANTED EMISSION IN THE BAND 9 kHz – 25 GHz*

Standard: FCC 47 CFR PART 15 : 2015

Section: §15.205; 15.209 and §15.247

Equipment under test arrangement:

The equipment under test (EUT) is placed on a non-conductive test table at 0.8 m above the horizontal metal ground plane.

For maximum meter reading at each frequency, the antenna height is adjusted between 1 m and 4 m above the ground plane. A 360 degrees rotation of the EUT is performed in vertical and horizontal polarization. The frequency azimuth and antenna height are presented in the table on the next pages.

The E.U.T. is blocked in continuous transmission.

Frequencies range: 9 kHz – 30 MHz
30 MHz - 1 GHz
1 GHz – 25 GHz

Detection mode: Quasi-peak for 9 kHz – 30 MHz
Quasi-peak for 30 MHz - 1 GHz
Average for 1 GHz – 25 GHz

Resolution bandwidth: 200 Hz for 9 kHz – 150 kHz
9 kHz for 150 kHz – 30 MHz
120 kHz for 30 MHz - 1 GHz
1 MHz for 1 GHz – 25 GHz

Measurement distance: 3 meters from 9 kHz to 30 MHz
3 meters from 30 MHz to 25 GHz

- Limit for emission radiated outside the frequency band, except the harmonics, shall be attenuated by at least 20 dB below the level of fundamental or the general radiated emission limits.

From 9 kHz to 30 MHz

Frequencies range	Limit (µV/m)
9 – 490 kHz	2400/F (F in kHz) *
490 – 1705 kHz	24000/F (F in kHz) **
1.705 – 30 MHz	30 **

* Limits in µV/m can be extrapolated to 3 m using 40 dB / decade.
** Limits in µV/m can be extrapolated to 3 m using 20 dB / decade.

From 30 MHz to 25 GHz

Frequencies range (MHz)	Limit (dBµV/m)	(µV/m)
30 to 88	40.0	100
88 to 216	43.5	150
216 to 960	46.0	200
Above 960	54.0	500

Instrumentation test list:

Category	Manufacturer	Type	Emitech Nr	Last validity date	Next validity date
Amplifier	HP	8447F - 26dB	14447	27/02/2017	27/04/2018
Amplifier	Agilent	8449B	14487	11/05/2017	11/07/2018
Antenna	Schwarzbeck	VHA 9103	00317	18/02/2015	18/04/2018
Antenna	Emco	3115	00941	28/10/2015	28/12/2018
Antenna	Oritel	CM 42/25	01045	21/03/2015	21/05/2018
Antenna	Schwarzbeck	UHALP 9108	03106	07/04/2017	07/06/2019
Cable	C&C	K-2m	11132	15/04/2016	15/06/2018
Cable	C&C	K-2m	11133	15/04/2016	15/06/2018
Cable	C&C	N-8m	11174	18/04/2016	18/06/2018
Cable	C&C	N-2m	11176	18/04/2016	18/06/2018
Cable	C&C	N-2m	11178	16/04/2016	16/06/2018
Cable	C&C	N-2m	11182	20/04/2016	20/06/2018
Cable	C&C	N-6m	14224	02/09/2016	02/11/2018
Cable	C&C	N-4m	14226	02/09/2016	02/11/2018
Cable	C&C	N-4m	14227	02/09/2016	02/11/2018
Shielded enclosure	Comtest	SAC 3m	14803	---	---
Spectrum analyzer	Rohde & Schwarz	FSP40 (V 4.00SP1-V3.0-10-2)	05175	01/04/2016	01/06/2018
Spectrum analyzer	Rohde & Schwarz	ESR7	12811	01/08/2017	01/10/2018

Results:

Ambient temperature (°C): 21
Relative humidity (%): 50
Power source: 3 Vdc

BLE in advertising mode - Frequency 2402 MHz

No significant frequency has been found other than those given above between 9 kHz to 1GHz and 1 GHz to 25 GHz.

BLE in advertising mode - Frequency 2426 MHz

No significant frequency has been found other than those given above between 9 kHz to 1GHz and 1 GHz to 25 GHz.

BLE in advertising mode - Frequency 2480 MHz

No significant frequency has been found other than those given above between 9 kHz to 1GHz and 1 GHz to 25 GHz.

Test conclusion:

The equipment complies with the requirements of the standard.

« □□□ *End of report, 4 annexes to be forwarded* □□□ »

ANNEX 1:

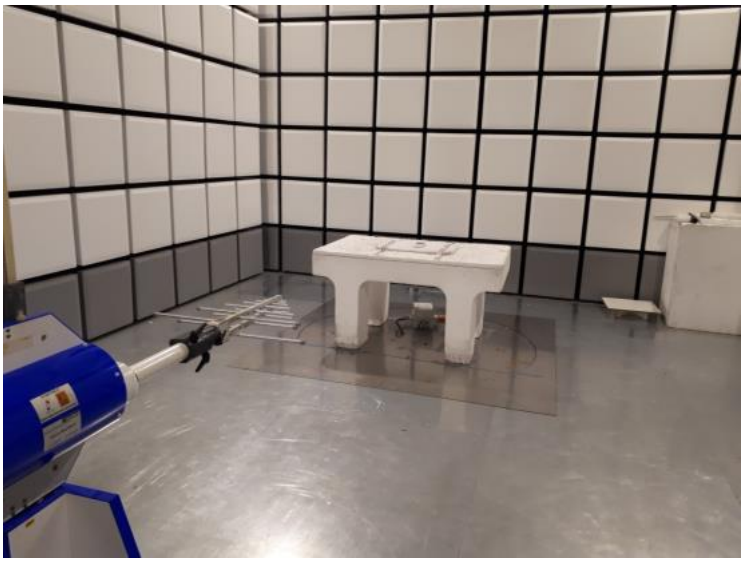
EXTERNAL PHOTOGRAPHS


Xperia Home


www.emitech.fr

ANNEX 2:

TEST SETUP PHOTOGRAPHS

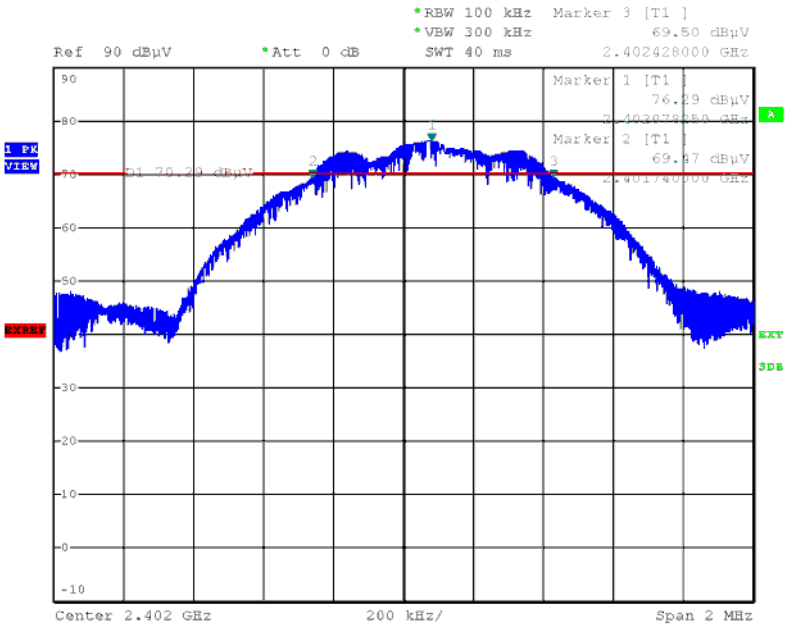


ANNEX 3:

6 dB BANDWIDTH
20 dB BANDWIDTH

6 dB BANDWIDTH

Frequency 2402 MHz



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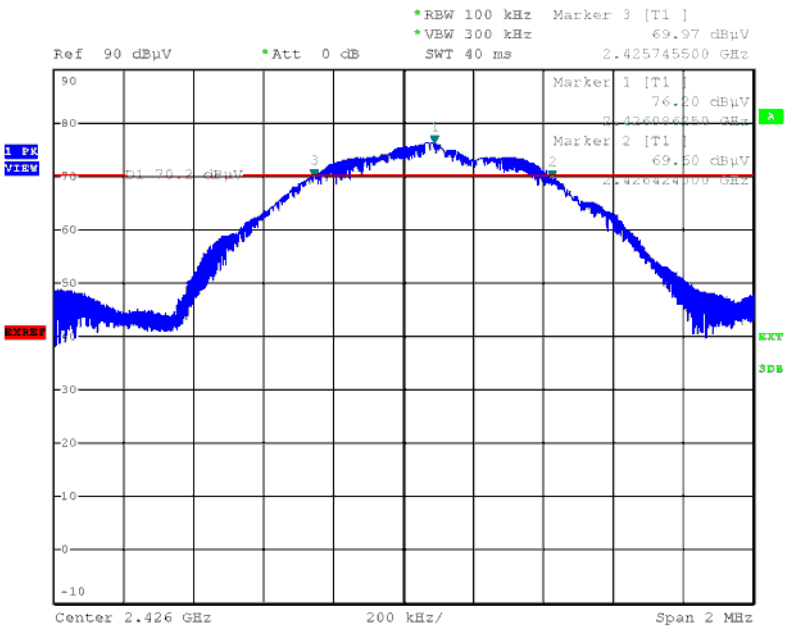
Frequency 2426 MHz



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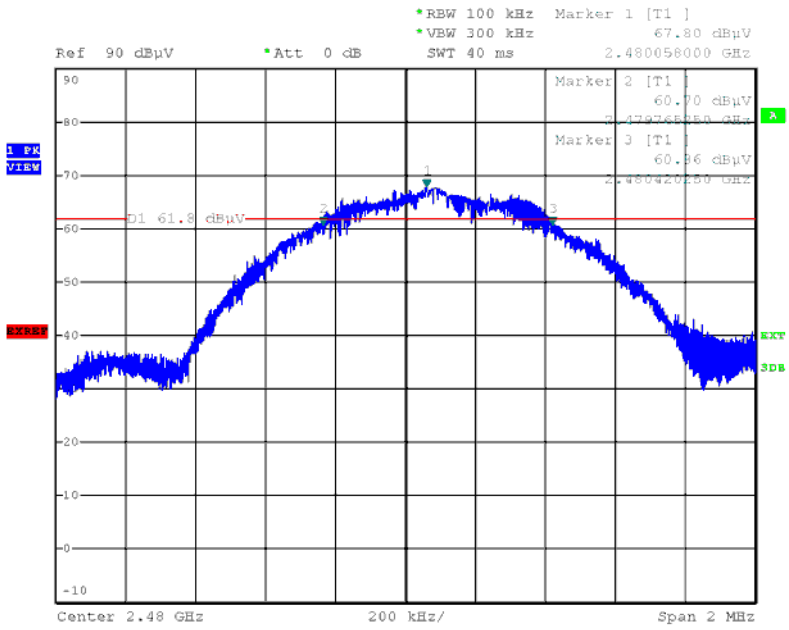
Frequency 2480 MHz



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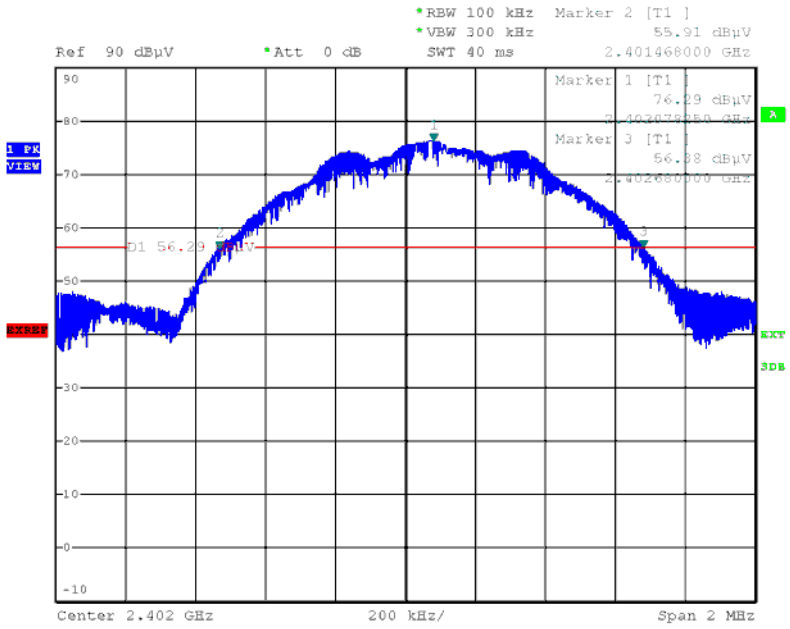
20 dB BANDWIDTH

Frequency 2402 MHz



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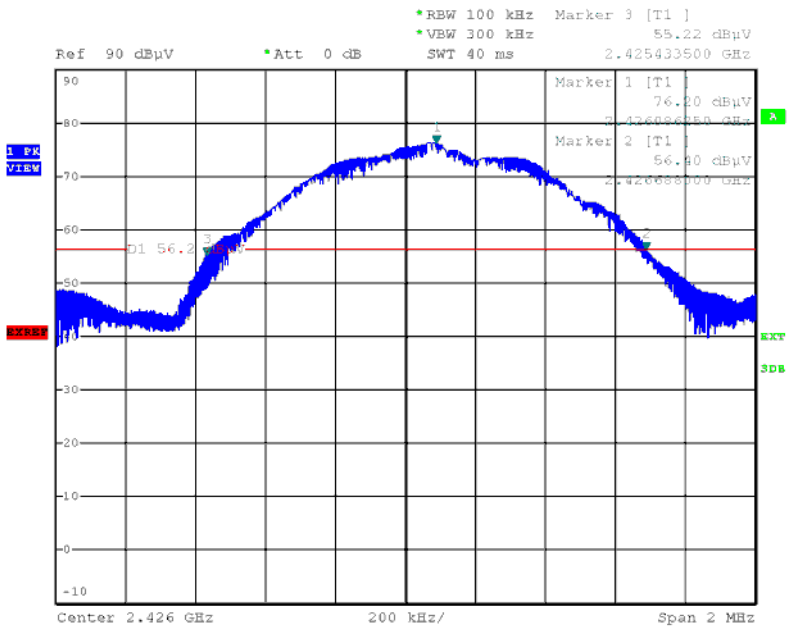
Frequency 2426 MHz



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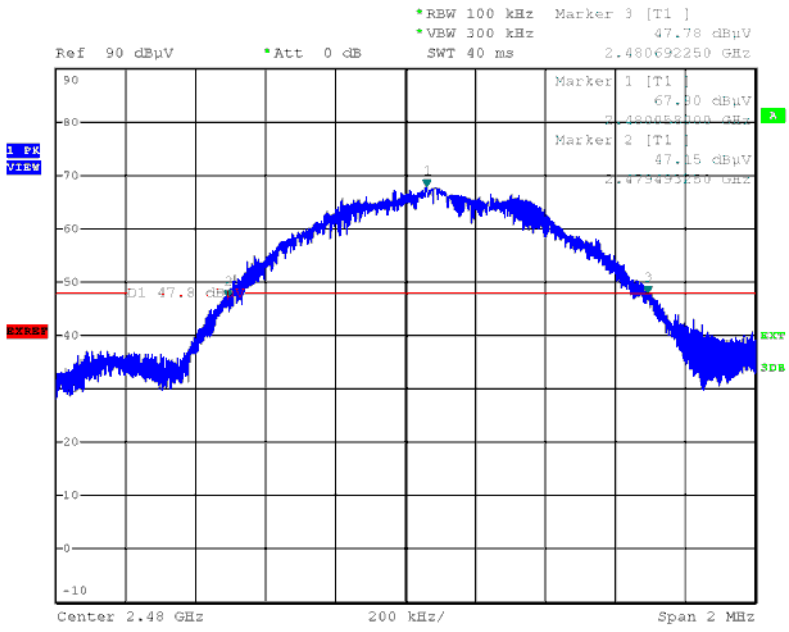
Frequency 2480 MHz



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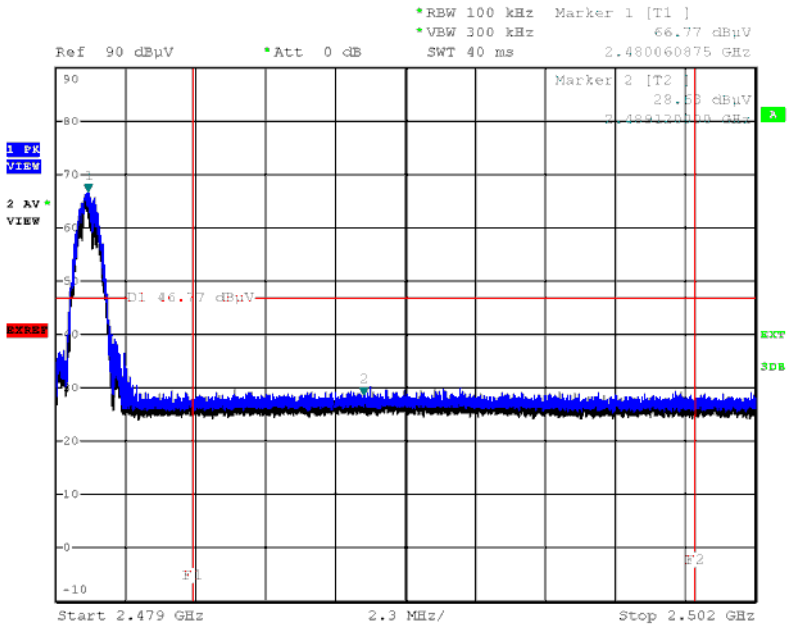
ANNEX 4:

BAND EDGE



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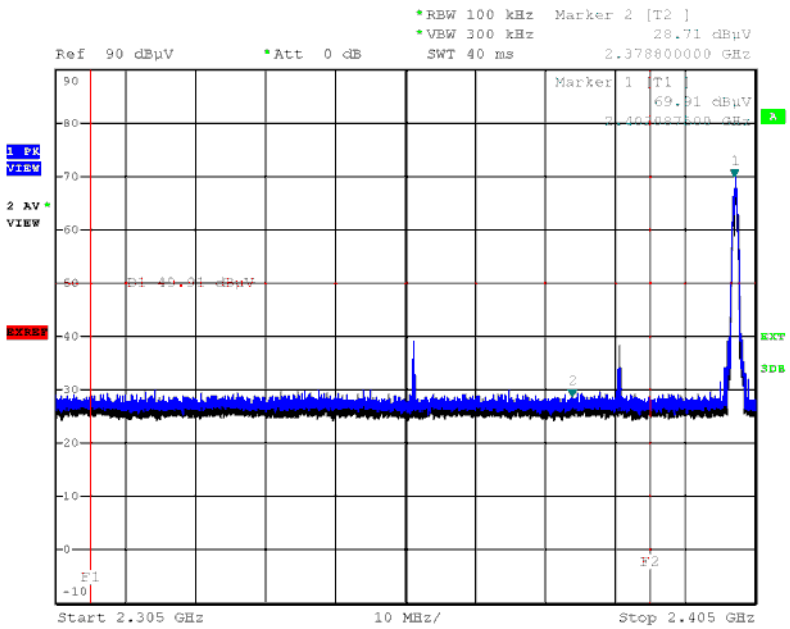

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