



LCIE

Bluetooth Low Energy Template: Release February 06th, 2020

TEST REPORT

N°: 166336-748857-A

Version : 01

Subject

**Radio spectrum matters
tests according to standards:
47 CFR Part 15.247 & RSS-247 Issue 2 & RSS-Gen Issue 5**

Issued to

**FEETME
157 Boulevard MacDonald
75019 - PARIS
FRANCE**

Apparatus under test

↳ Product	Connected insoles
↳ Trade mark	FEETME
↳ Manufacturer	FEETME
↳ Model under test	FTM-DK
↳ Serial number	DK9701000088R & DK9701000078L
↳ FCC ID	2AXOA-DKIN01

Conclusion

See Test Program chapter

Test date

March 9, 2020 to July 9, 2021

Test location

Moirans

Test Site

6500A-1 & 6500A-3

Sample receipt date

March 9, 2020

Registration Number

197516

Designation Number

FR0008

Composition of document

67 pages

Document issued on

July 13, 2021

Written by :
Armand MAHOUNGOU
Tests operator

Approved by :
Arnaud FAYETTE
Technical manager

F. Fayette

This document shall not be reproduced, except in full, without the written approval of the LCIE. This document contains results related only to the items tested. It does not imply the conformity of the whole production to the items tested. Unless otherwise specified or rule defined by the test method, the decision of conformity doesn't take into account the uncertainty of measures. This document doesn't anticipate any certification decision.

LCIE

Laboratoire Central des Industries Electriques
Une société de Bureau Veritas

ZI Centr' alp
170 rue de Chatagnon
38430 Moirans FRANCE

Tél : +33 4 76 07 36 36
contact@lcie.fr
www.lcie.fr



PUBLICATION HISTORY

Version	Date	Author	Modification
01	July 13, 2021	Armand MAHOUNGOU	Creation of the document

Each new edition of this test report replaces and cancels the previous edition. The control of the old editions of report is under responsibility of client.



SUMMARY

1. TEST PROGRAM	4
2. EQUIPMENT UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER)	5
3. OCCUPIED BANDWIDTH.....	10
4. 6DB EMISSION BANDWIDTH	16
5. DUTY CYCLE	22
6. MAXIMUM CONDUCTED OUTPUT POWER	28
7. POWER SPECTRAL DENSITY	34
8. UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS AT THE BAND EDGE	40
9. UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS.....	46
10. UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS	53
11. UNCERTAINTIES CHART	67



1. TEST PROGRAM

References

- 47 CFR Part 15.247
- RSS 247 Issue 2
- RSS Gen Issue 5
- KDB 558074 D01 DTS Meas Guidance v05r02
- ANSI C63.10-2013

Radio requirement:

Clause (47CFR Part 15.247 & RSS-247 Issue 2 & RSS-Gen Issue 5) Test Description	Test result - Comments			
Occupied Bandwidth 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
6dB Bandwidth 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA()	<input type="checkbox"/> NP(1)
Duty Cycle 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Maximum Conducted Output Power 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Power Spectral Density 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Conducted Spurious Emission at the Band Edge 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA()	<input type="checkbox"/> NP(1)
Unwanted Emissions into Non-Restricted Frequency Bands 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA()	<input type="checkbox"/> NP(1)
AC Power Line Conducted Emission 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA(2)	<input type="checkbox"/> NP(1)
Unwanted Emissions into Restricted Frequency Bands 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Receiver Radiated emissions 	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
This table is a summary of test report, see conclusion of each clause of this test report for detail.				

(1): Limited program

(2): EUT not directly or indirectly connected to the AC Power Public Network

PASS: EUT complies with standard's requirement

FAIL: EUT does not comply with standard's requirement

NA: Not Applicable

NP: Test Not Performed



L C I E

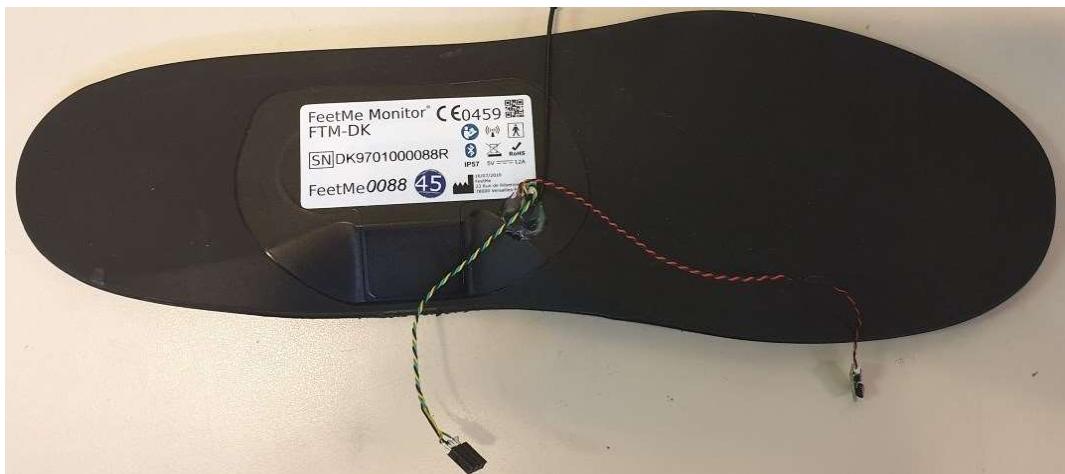
2. EQUIPMENT UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER)

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):

FEETME FTM-DK

Serial Number: DK9701000088R & DK9701000078L



Equipment Under Test


Equipment Under Test
Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
1	Battery cable	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	To supply the product during conducted test
2	Communication cable	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	To set the product in test mode

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop	-	-	To set the product


Equipment information:

Bluetooth LE Type:	<input checked="" type="checkbox"/> BLE	<input type="checkbox"/> v4.0	<input type="checkbox"/> v4.1	<input checked="" type="checkbox"/> v4.2
Frequency band:	[2400 – 2483.5] MHz			
Number of Channel:	40			
Spacing channel:	2MHz			
Channel bandwidth:	1MHz			
Antenna Type:	<input checked="" type="checkbox"/> Integral	<input type="checkbox"/> External	<input type="checkbox"/> Dedicated	
Antenna connector:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Temporary for test	
Transmit chains:	1 Single antenna			
Receiver chains	1			
Type of equipment:	<input checked="" type="checkbox"/> Stand-alone	<input type="checkbox"/> Plug-in	<input type="checkbox"/> Combined	
Ad-Hoc mode:	<input type="checkbox"/> Yes		<input checked="" type="checkbox"/> No	
Duty cycle:	<input type="checkbox"/> Continuous duty	<input type="checkbox"/> Intermittent duty	<input checked="" type="checkbox"/> 100% duty	
Equipment type:	<input checked="" type="checkbox"/> Production model		<input type="checkbox"/> Pre-production model	
Operating temperature range:	Tmin:	<input type="checkbox"/> -20°C	<input checked="" type="checkbox"/> 0°C	<input type="checkbox"/> X°C
	Tnom:	20°C		
	Tmax:	<input type="checkbox"/> 35°C	<input type="checkbox"/> 55°C	<input checked="" type="checkbox"/> 45°C
Type of power source:	<input type="checkbox"/> AC power supply	<input type="checkbox"/> DC power supply	<input checked="" type="checkbox"/> Battery	
Operating voltage range:	Vnom:	<input type="checkbox"/> 120V/60Hz	<input checked="" type="checkbox"/> 3.7 Vdc	<input type="checkbox"/> X Vdc
		<input type="checkbox"/> 240V/50Hz		

Antenna Characteristic

Antenna assembly	Gain (dBi)	Frequency Band (MHz)	Impedance(Ω)
1	4.74	2400-2483.5	50

Hardware information

Software (if applicable):	V. :	-
---------------------------	------	---



L C I E

CHANNEL PLAN

Channel	Frequency (MHz)	Channel	Frequency (MHz)
Cmin: 0	2402	Cmid: 20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	Cmax: 39	2480

DATA RATE

Data Rate (Mbps)	Modulation Type	Worst Case Modulation
1	GFSK	<input checked="" type="checkbox"/>
2	GFSK	<input checked="" type="checkbox"/>



2.2. RUNNING MODE

Test mode	Description of test mode	
Test mode 1	Permanent emission with modulation on a fixed channel in the data rate that produced the highest power	
Test	Running mode	
Occupied Bandwidth	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
6dB Bandwidth	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
Duty Cycle	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
Maximum Conducted Output Power	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
Power Spectral Density	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
Conducted Spurious Emission at the Band Edge	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
Unwanted Emissions into Non-Restricted Frequency Bands	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
AC Power Line Conducted Emission	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
Unwanted Emissions into Restricted Frequency Bands	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()

(1) Following commands are used to set the product:

a. – See document “LCIE_Setup FeetMe.docx” (provided by customer) for the command used during test.

2.3. EQUIPMENT MODIFICATION

None

Modification:



3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU
Date of test : March 13, 2020 & July 9, 2021
Ambient temperature : 26°C
Relative humidity : 46%

3.2. TEST SETUP

- The Equipment under Test is installed:

- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

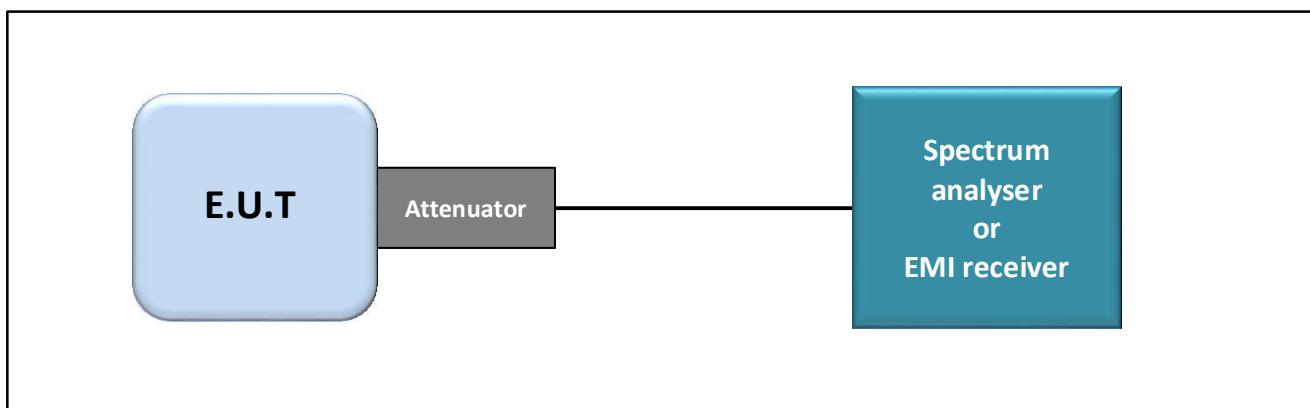
- Conducted Method
- Radiated Method

- Test Procedure:

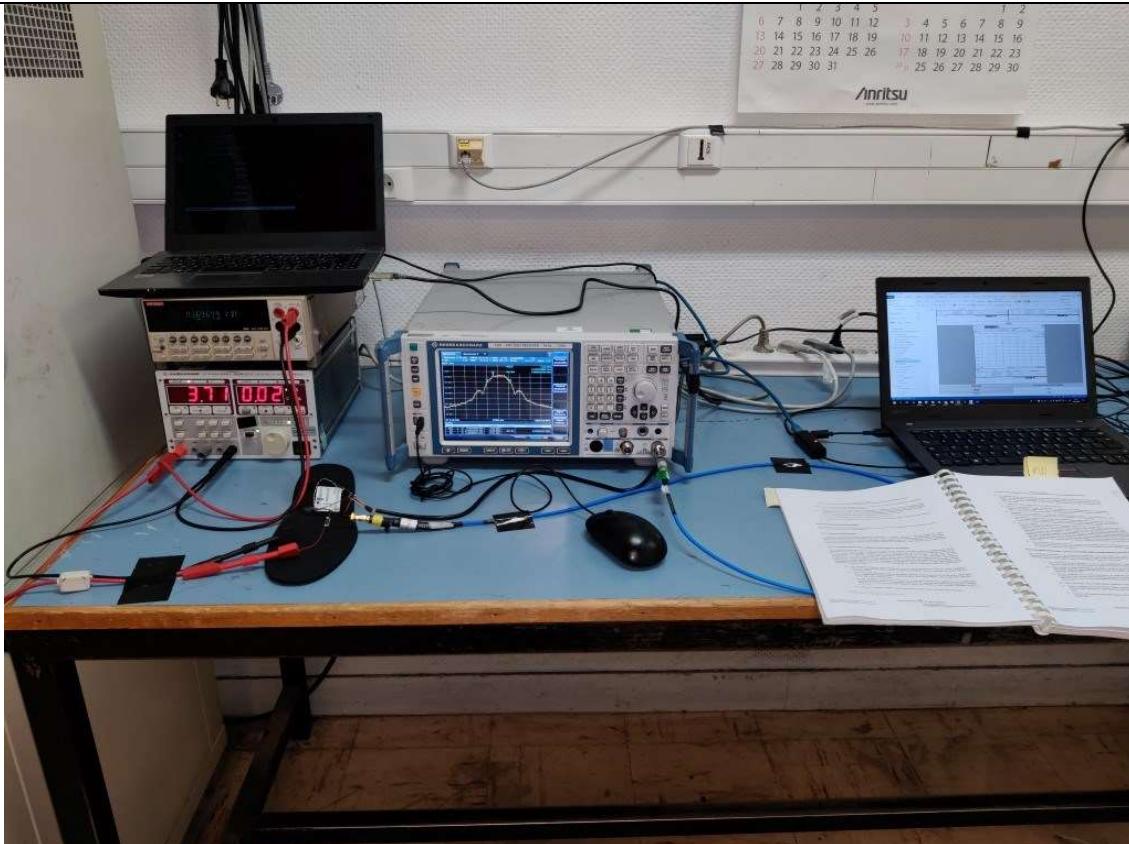
- RSS-Gen Issue 5 § 6.7
- ANSI C63.10 § 6.9.2

Measurement Procedure:

- a) RBW shall be in the range of 1% to 5% of the anticipated occupied bandwidth
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW
- c) SPAN = Capture all products of the modulation process
- d) Detector = Peak.
- e) Trace mode = max hold.
- f) Sweep = auto couple.
- g) Allow the trace to stabilize.
- h) OBW 99% function of spectrum analyzer used



Test set up of Occupied Bandwidth



Photograph for Occupied bandwidth

3.3. **LIMIT**

None

3.4. **TEST EQUIPMENT LIST**

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2019/07	2021/07
Cable + Attenuateur 20dB	PASTERNACK	PE350-150CM	A5329865	2019/09	2021/09
Multimeter	KEITHLEY	2000	A1242090	2020/03	2022/03
Programmable DC power supply	ROHDE & SCHWARZ	NGSM32/10	A7040074	See multimeter	See multimeter

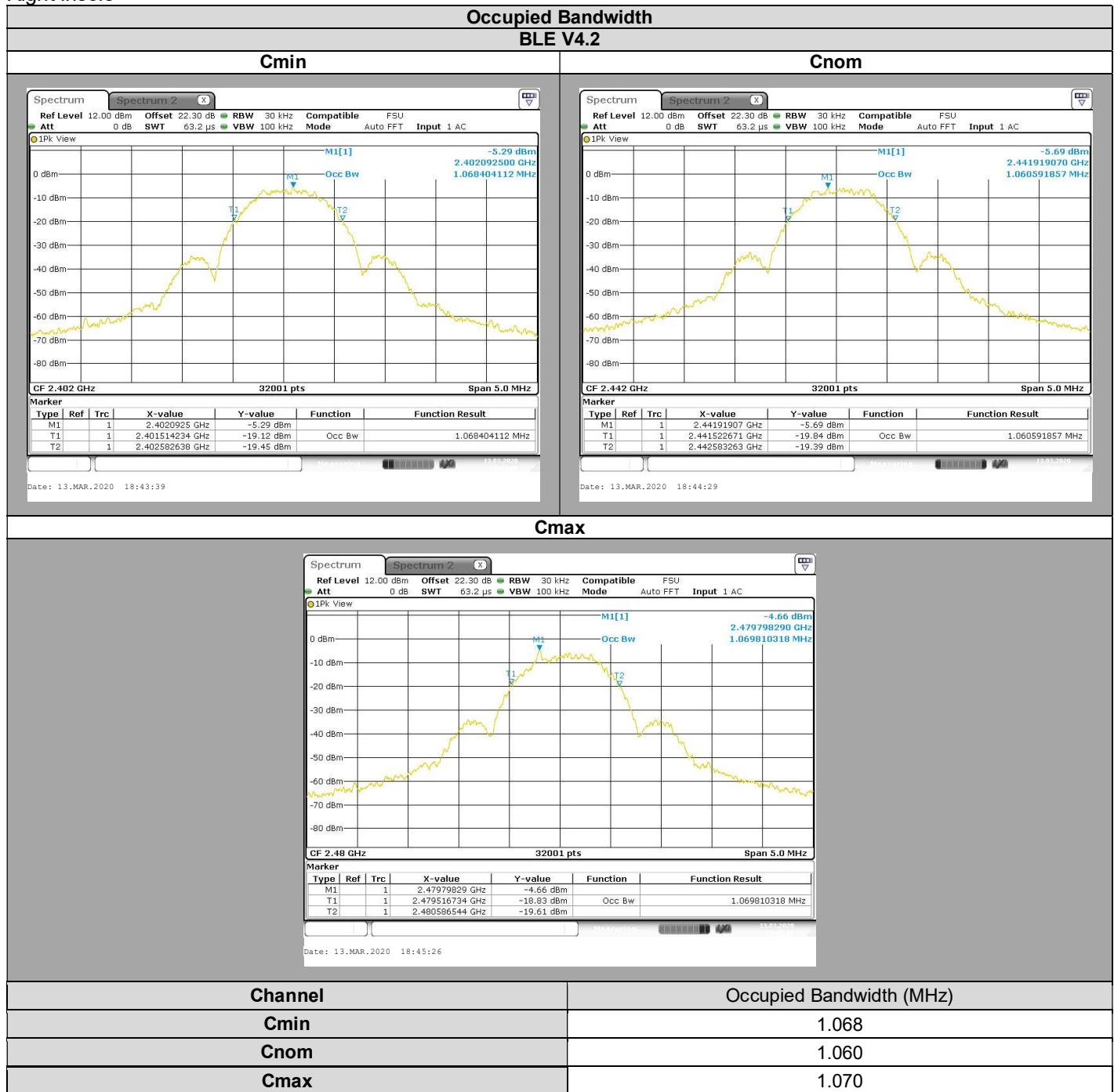
Note: In our quality system, the test equipment calibration due is more & less 2 months



L C I E

3.5. RESULTS

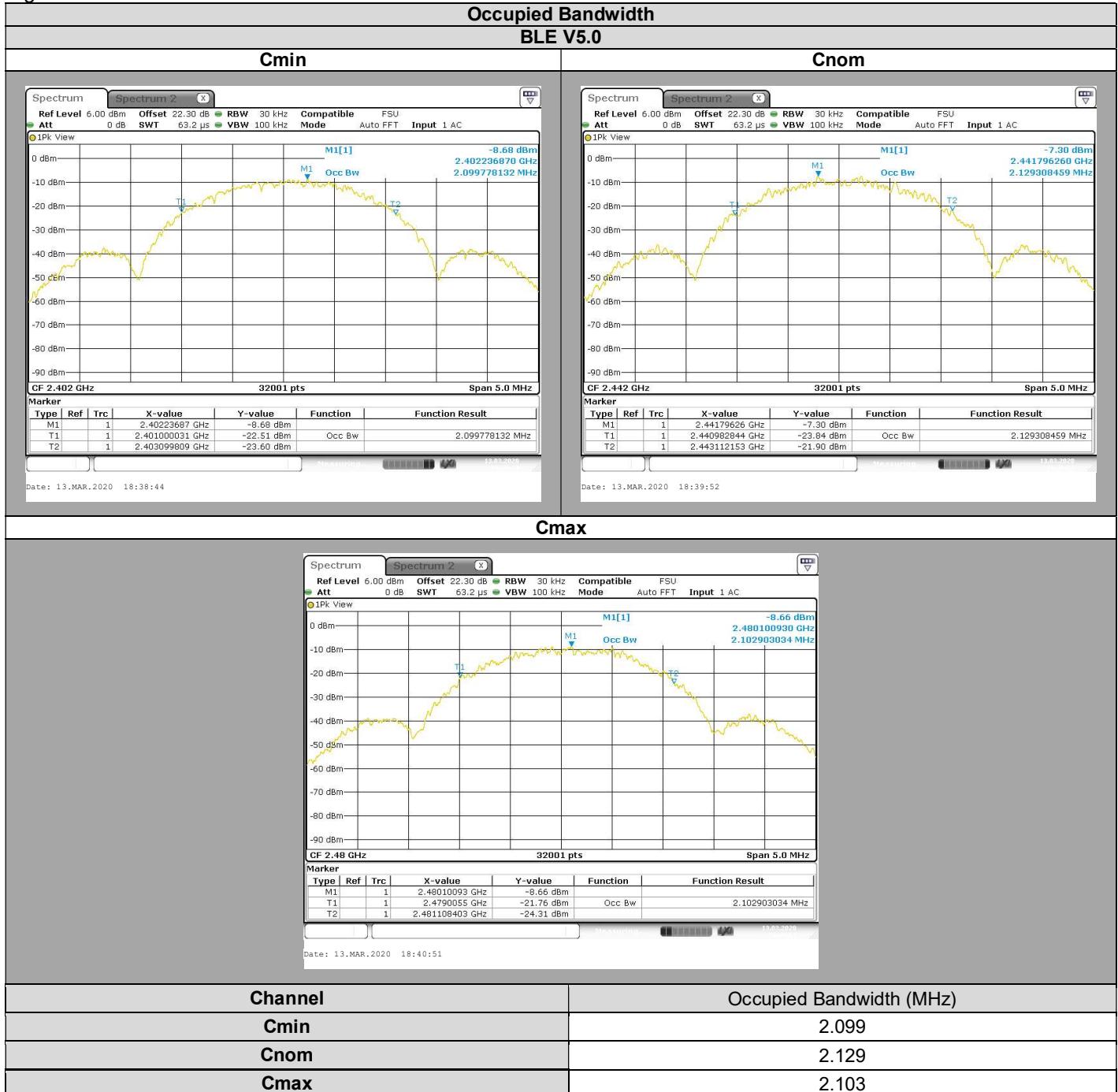
Right insole





L C I E

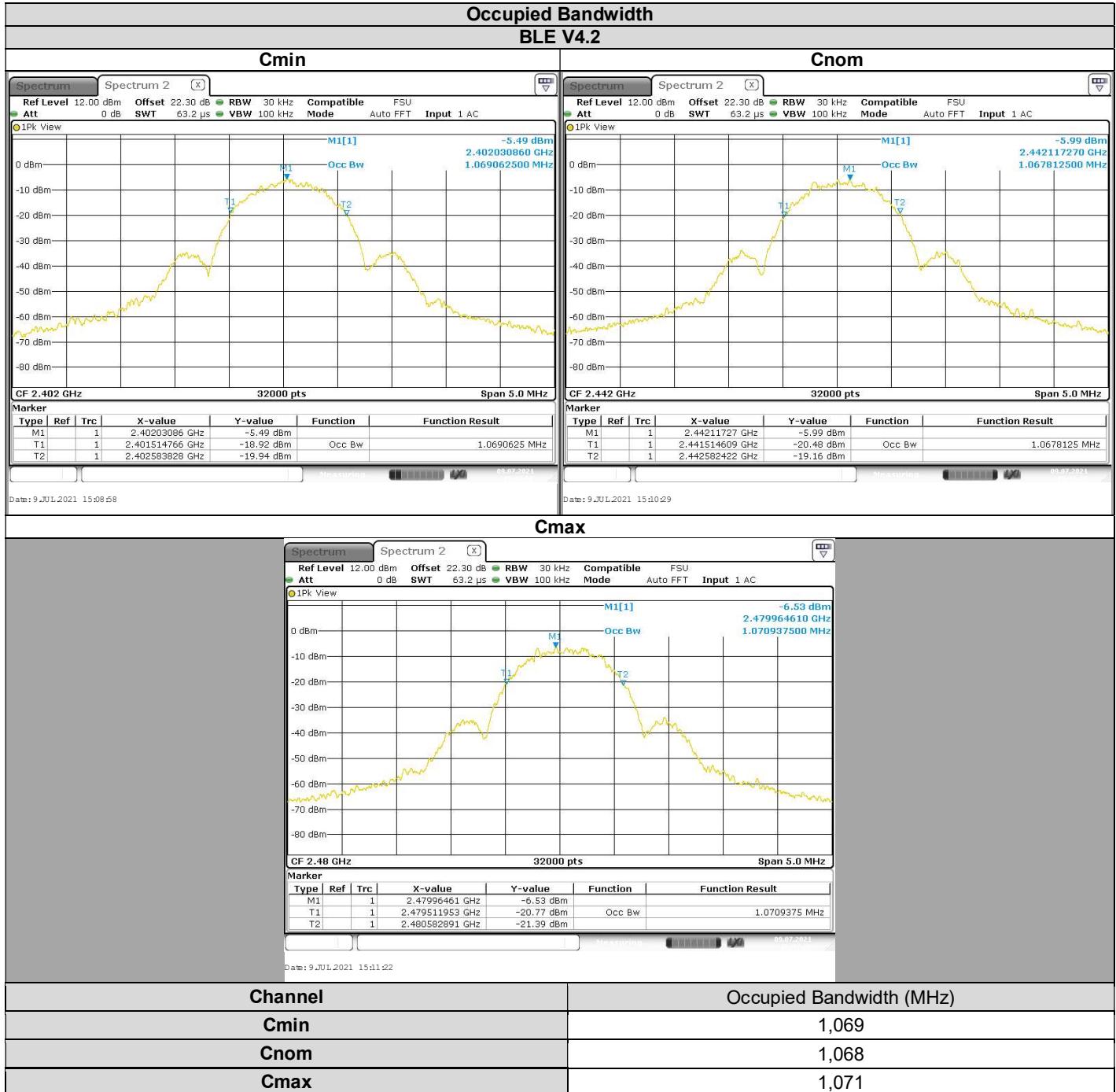
Right insole





L C I E

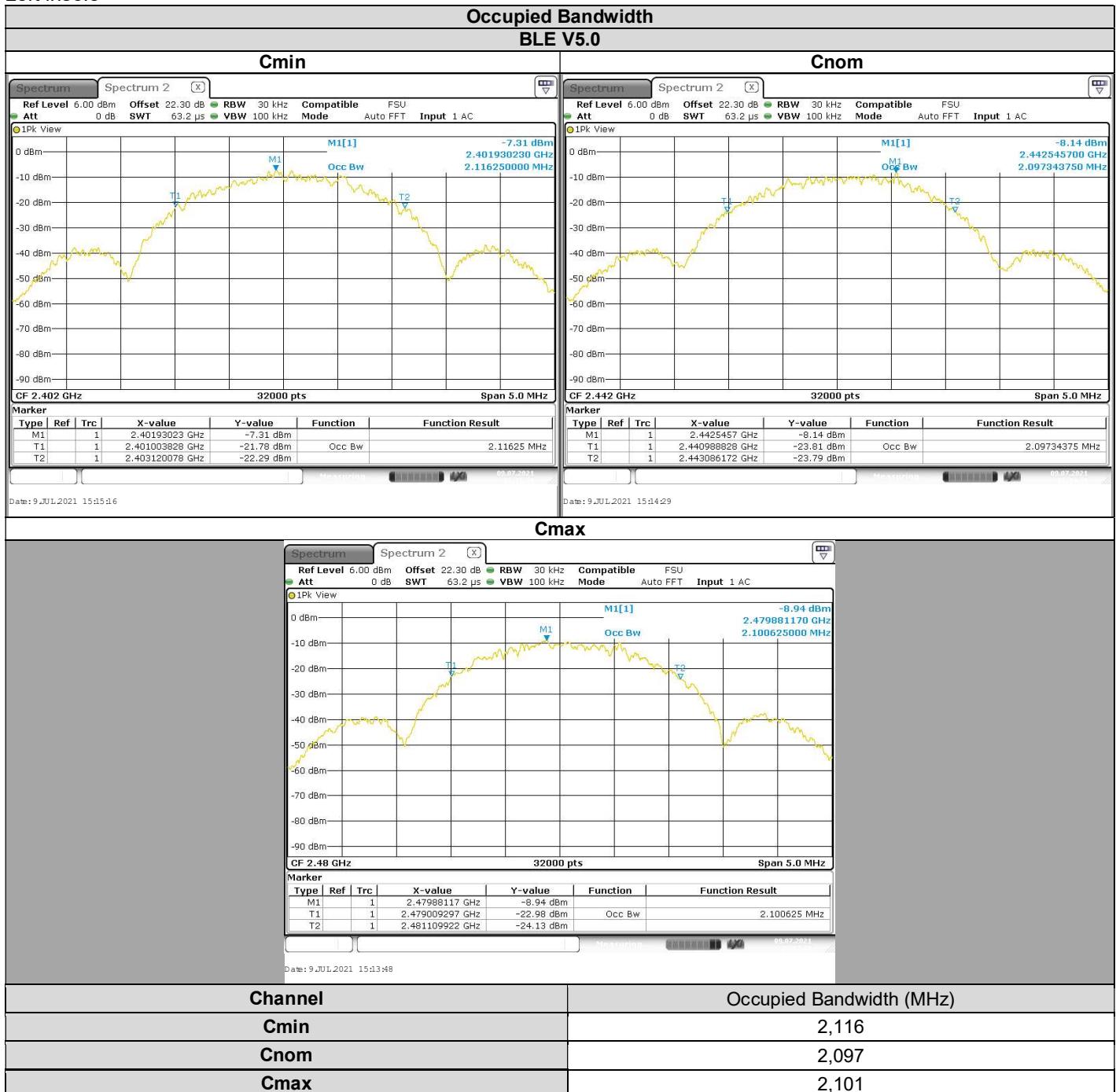
Left insole





L C I E

Left insole



3.6. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **FEETME FTM-DK**, SN: **DK9701000088R & DK9701000078L**, in configuration and description presented in this test report, show levels compliant to the **47 CFR PART 15.247 & RSS-GEN ISSUE 5** limits.



4. 6dB EMISSION BANDWIDTH

4.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU
Date of test : March 13, 2020 & July 9, 2021
Ambient temperature : 26°C
Relative humidity : 46%

4.2. TEST SETUP

- The Equipment under Test is installed:

- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

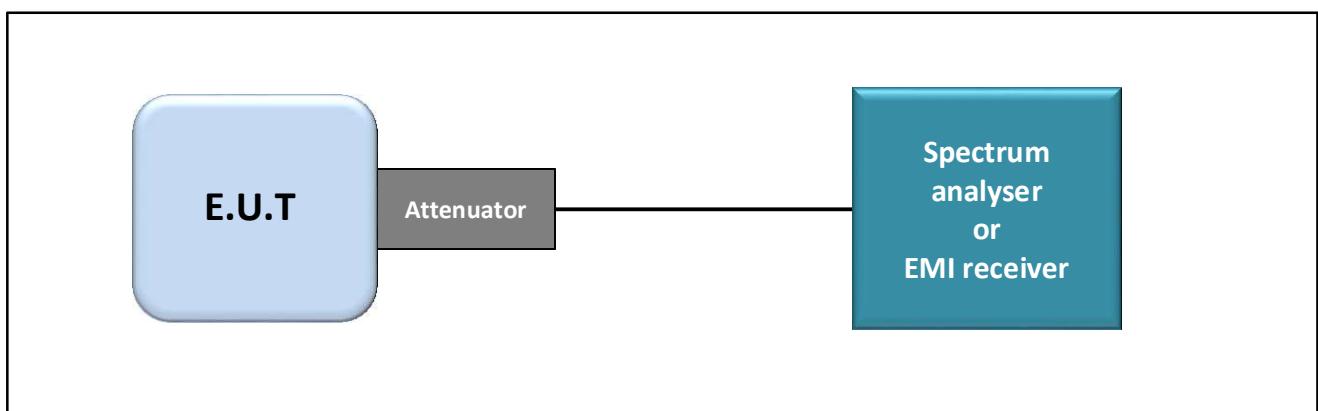
- Conducted Method
- Radiated Method

- Test Procedure:

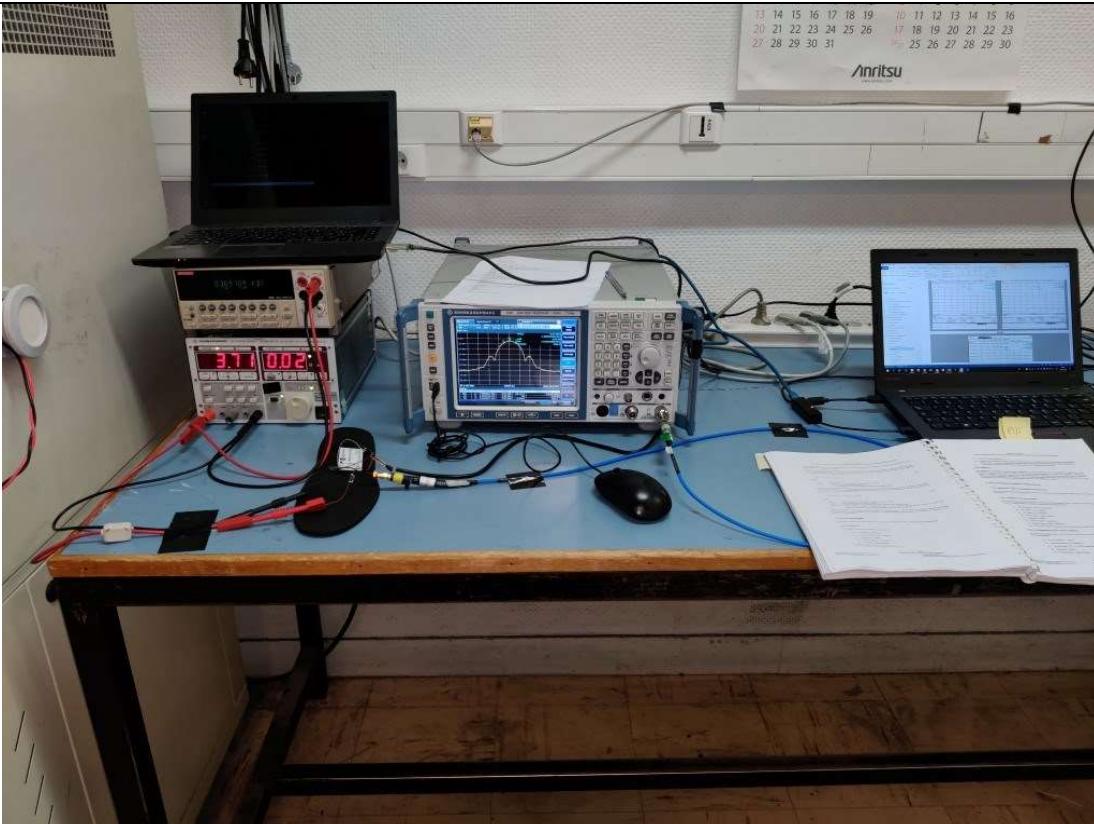
- ANSI C63.10 § 11.8.1
- ANSI C63.10 § 11.8.2

Measurement Procedure:

1. Set resolution bandwidth (RBW) = 100kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer.



Test set up of 6dB Emission Bandwidth



Photograph for 6dB emission bandwidth

4.3. LIMIT

Frequency range	The 6dB bandwidth Limit
2400MHz to 2483.5MHz	$\geq 500\text{kHz}$

4.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2019/07	2021/07
Cable + Attenuateur 20dB	PASTERNACK	PE350-150CM	A5329865	2019/09	2021/09
Multimeter	KEITHLEY	2000	A1242090	2020/03	2022/03
Programmable DC power supply	ROHDE & SCHWARZ	NGSM32/10	A7040074	See multimeter	See multimeter

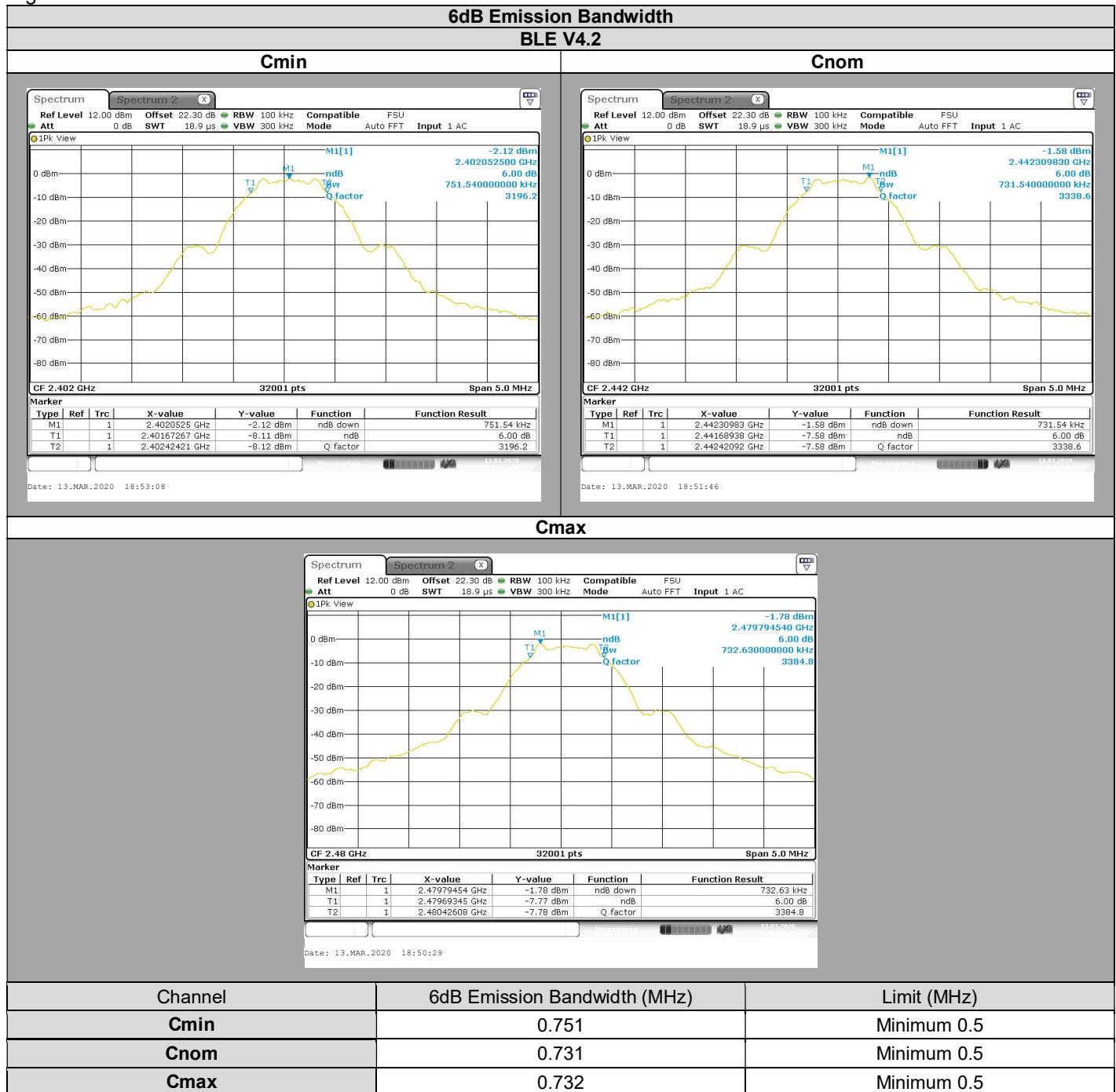
Note: In our quality system, the test equipment calibration due is more & less 2 months



L C I E

4.5. RESULTS

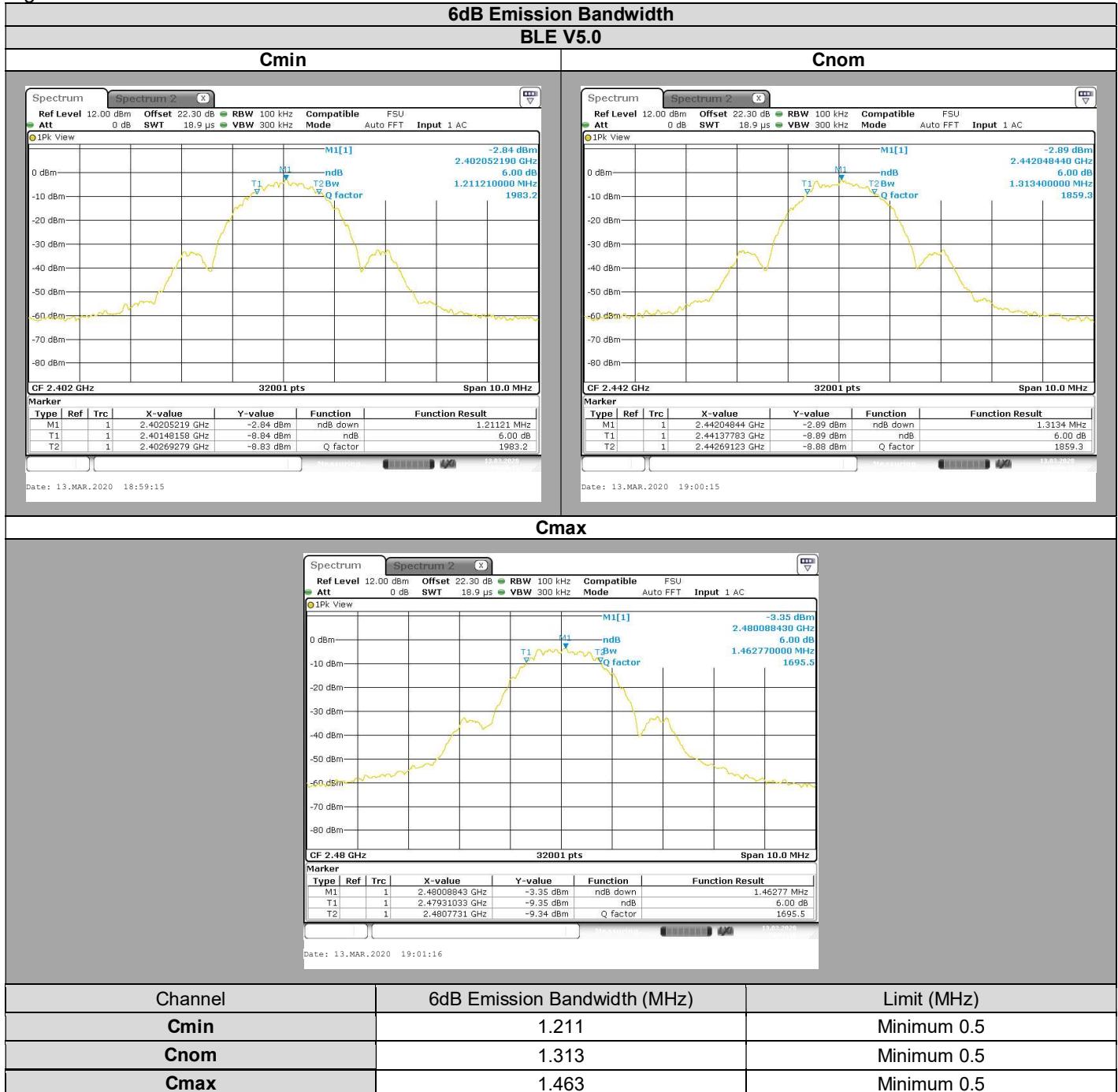
Right insole





L C I E

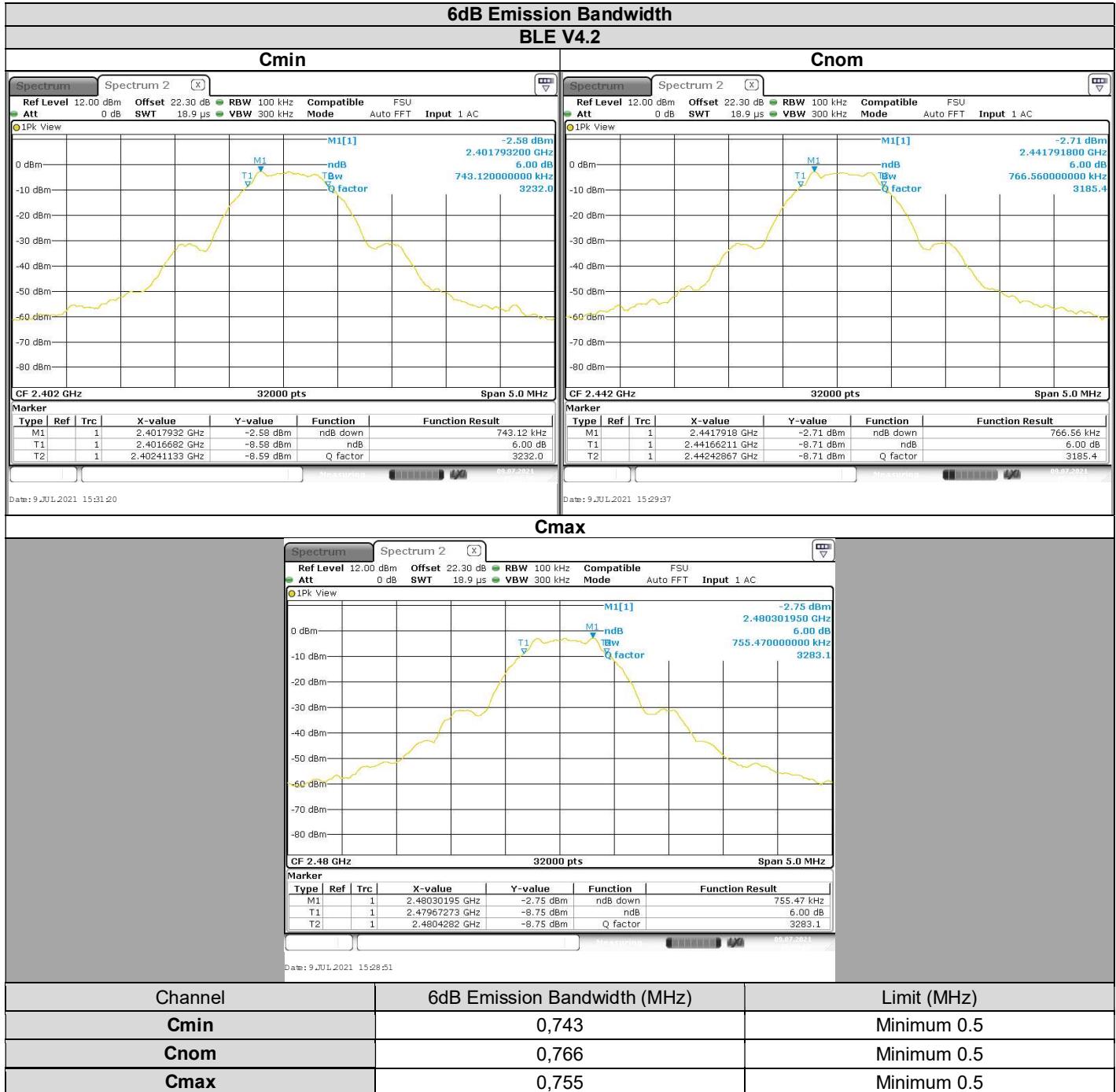
Right insole





L C I E

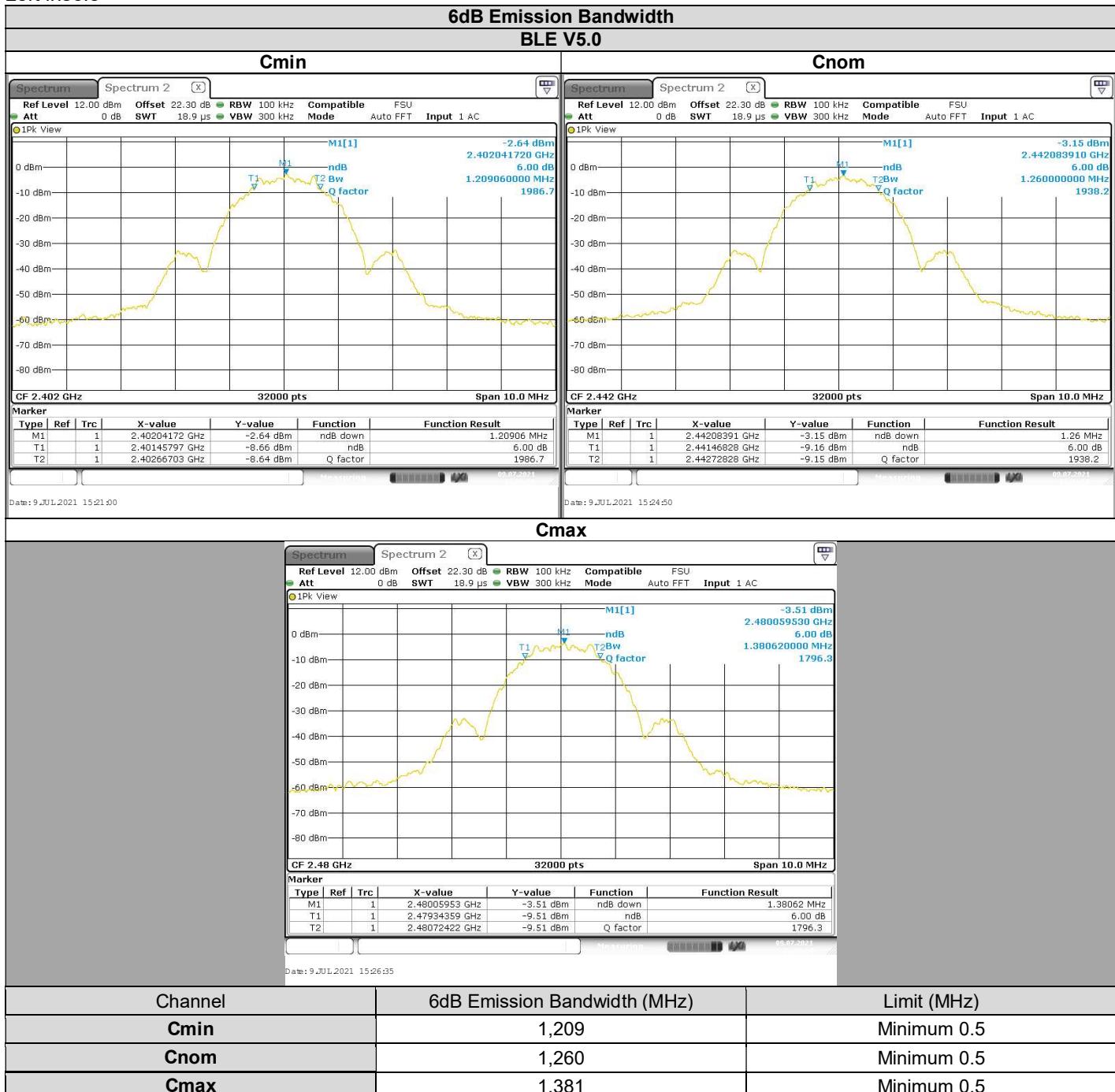
Left insole





L C I E

Left insole



4.6. CONCLUSION

6dB Emission Bandwidth measurement performed on the sample of the product **FEETME FTM-DK**, SN: **DK9701000088R & DK9701000078L**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.



5. DUTY CYCLE

5.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU
Date of test : March 13, 2020 & July 9, 2021
Ambient temperature : 26°C
Relative humidity : 46%

5.2. TEST SETUP

- The Equipment under Test is installed:

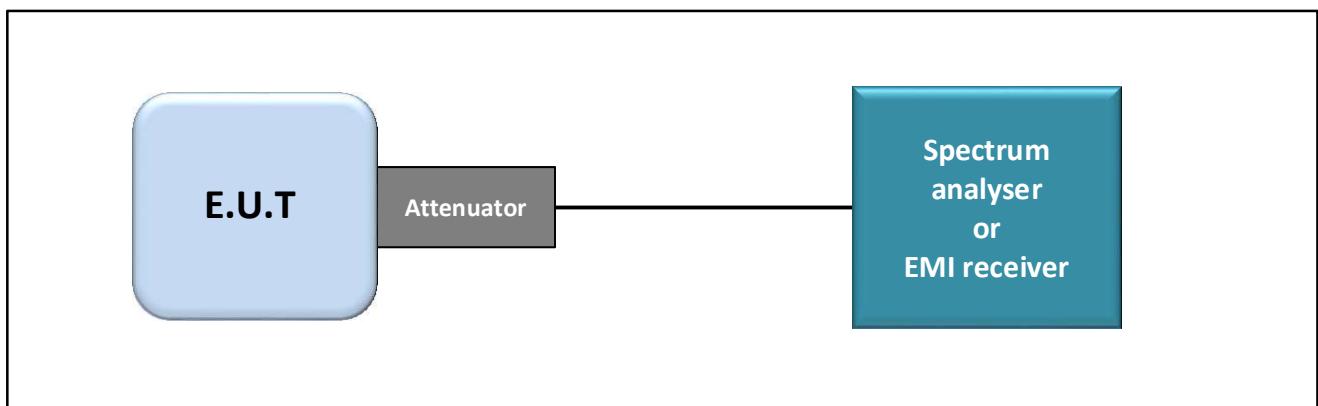
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

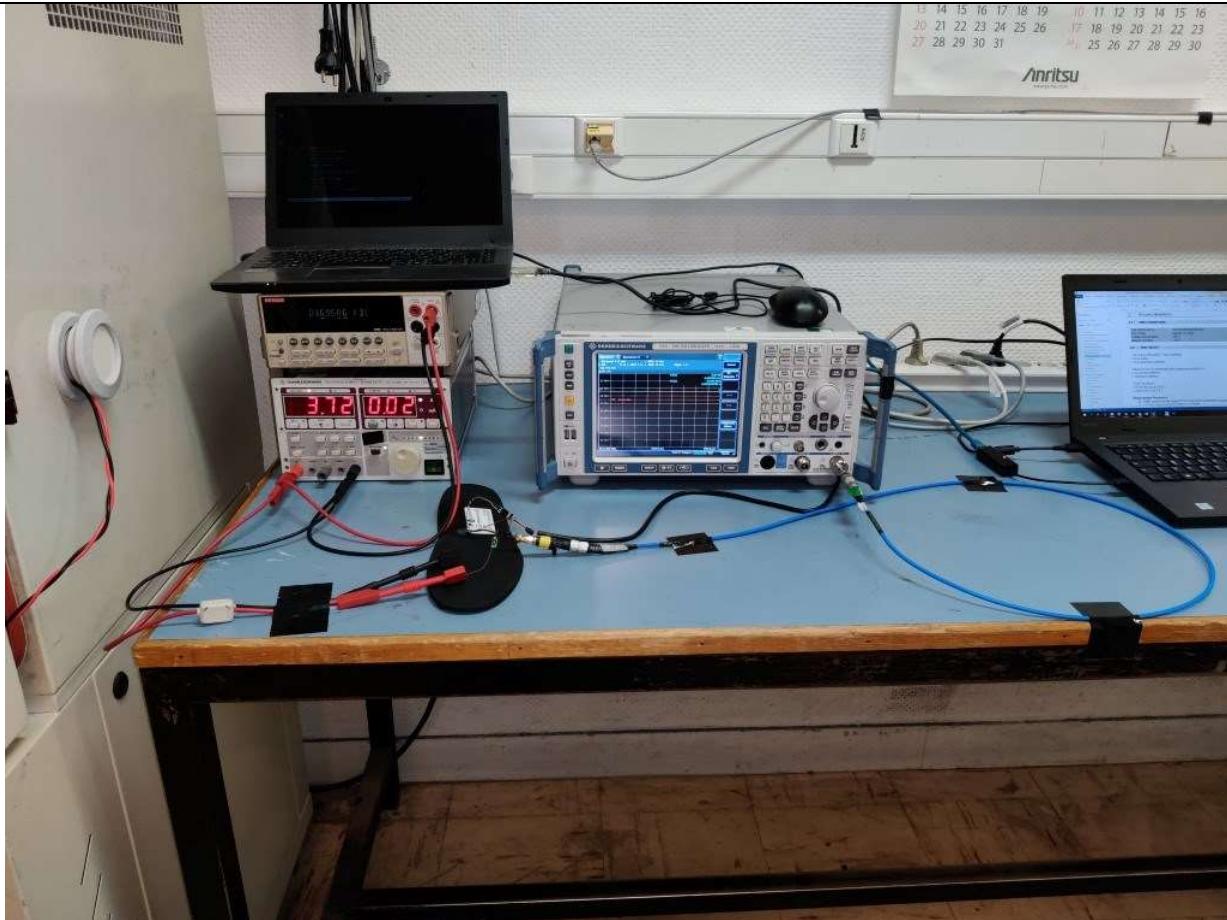
- Conducted Method
- Radiated Method

- Test Procedure:

- ANSI C63.10 § 11.6



Test set up of Duty Cycle



Photograph for Duty Cycle

5.3. LIMIT

None

5.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2019/07	2021/07
Cable + Attenuateur 20dB	PASTERNACK	PE350-150CM	A5329865	2019/09	2021/09
Multimeter	KEITHLEY	2000	A1242090	2020/03	2022/03
Programmable DC power supply	ROHDE & SCHWARZ	NGSM32/10	A7040074	See multimeter	See multimeter

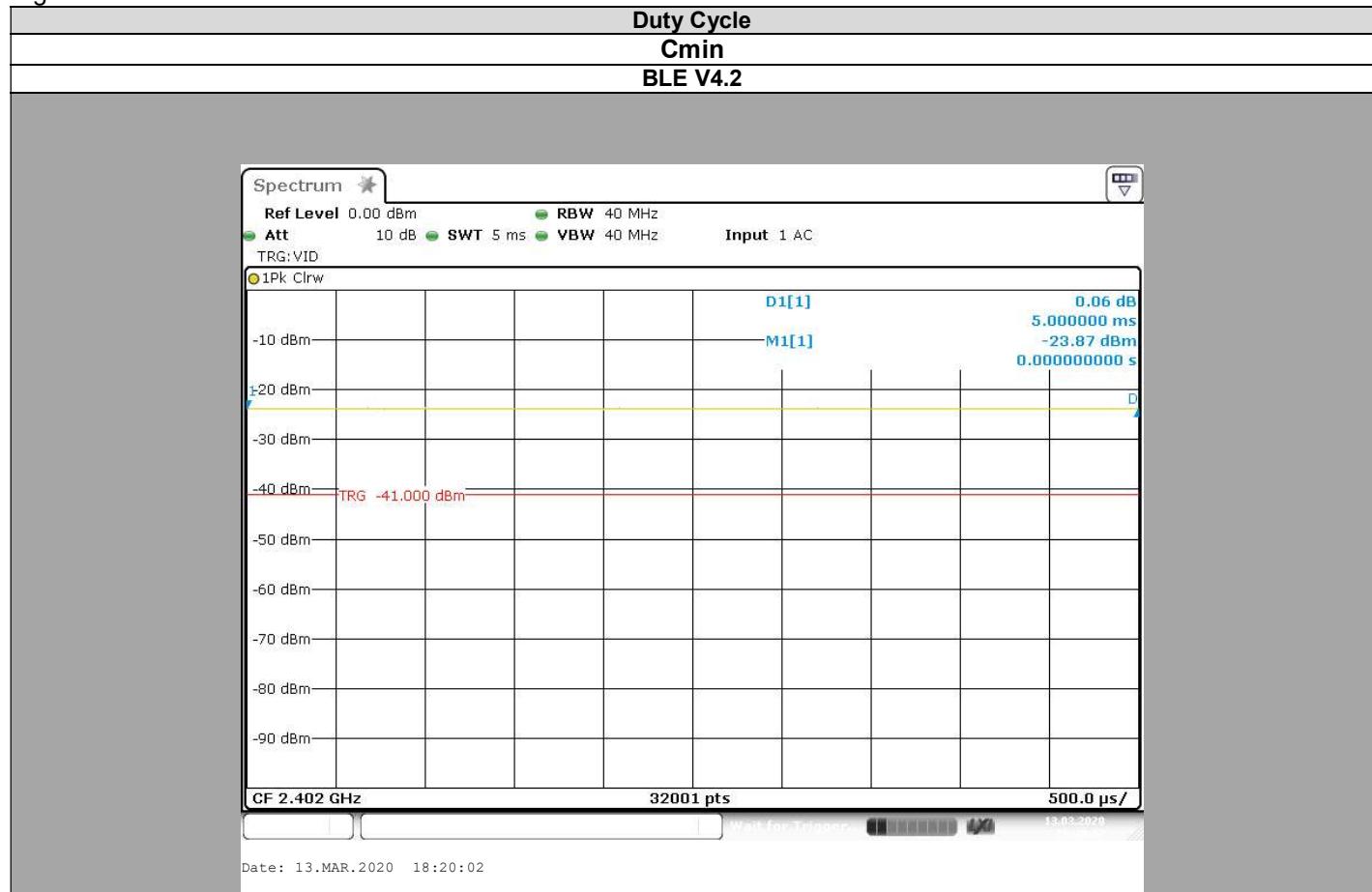
Note: In our quality system, the test equipment calibration due is more & less 2 months



L C I E

5.5. RESULTS

Right insole



Channel	Duty Cycle (%)	Duty Cycle Correction (dB)
Channel	100	$20\log\left(\frac{1}{\text{duty cycle}}\right) = 0$



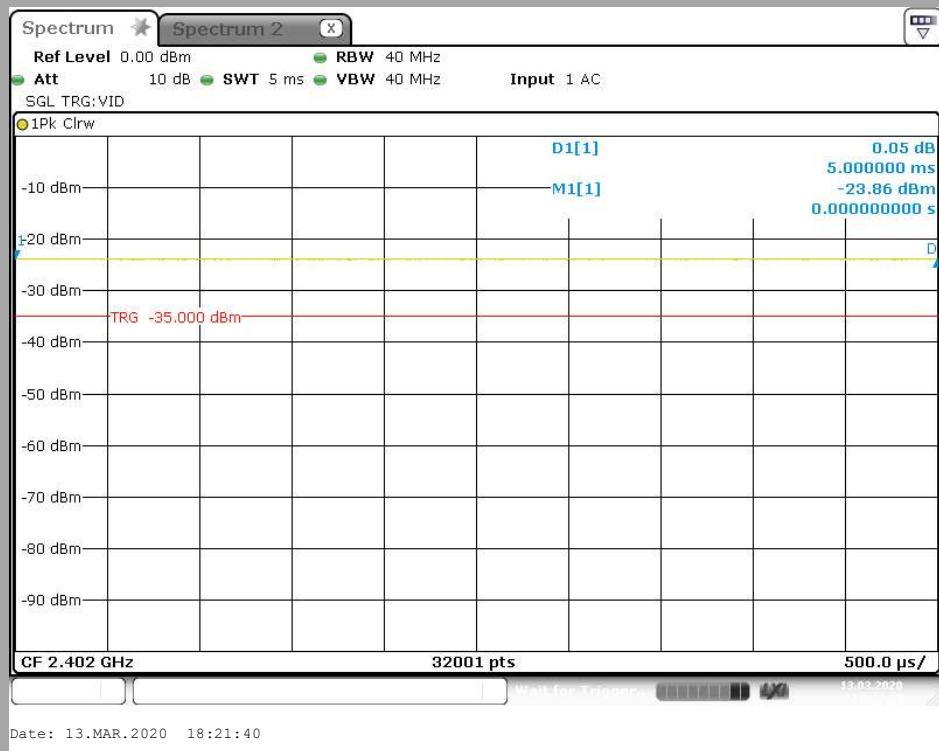
L C I E

Right insole

Duty Cycle

Cmin

BLE V5.0



Channel	Duty Cycle (%)	Duty Cycle Correction (dB)
Channel	100	$20\log\left(\frac{1}{duty\ cycle}\right) = 0$



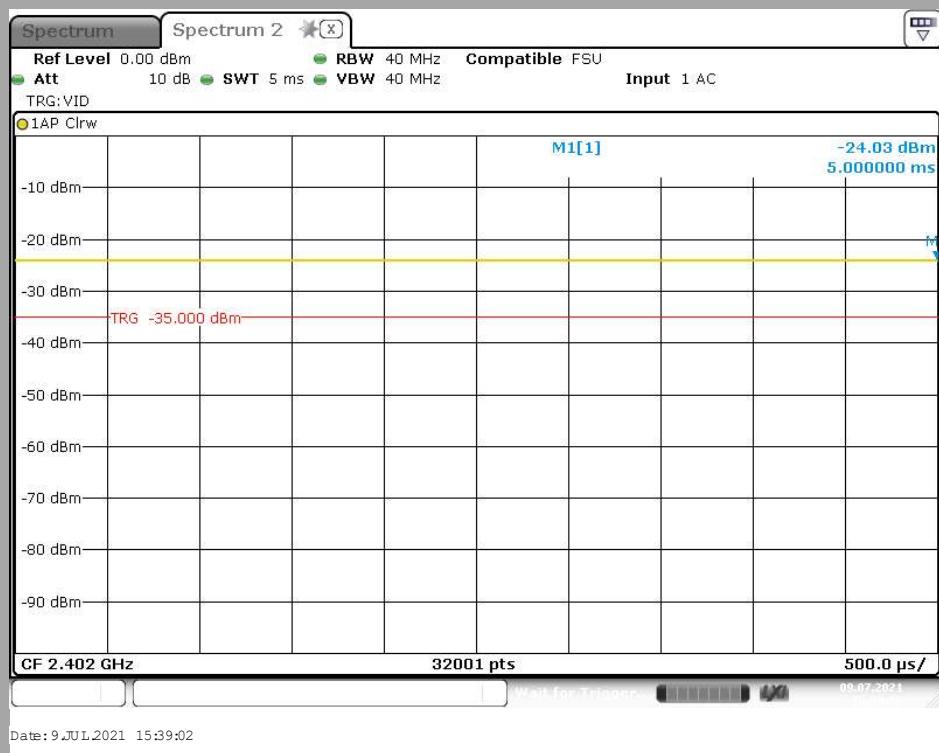
L C I E

Left insole

Duty Cycle

Cmin

BLE V4.2



Channel	Duty Cycle (%)	Duty Cycle Correction (dB)
Channel	100	$20\log\left(\frac{1}{duty\ cycle}\right) = 0$

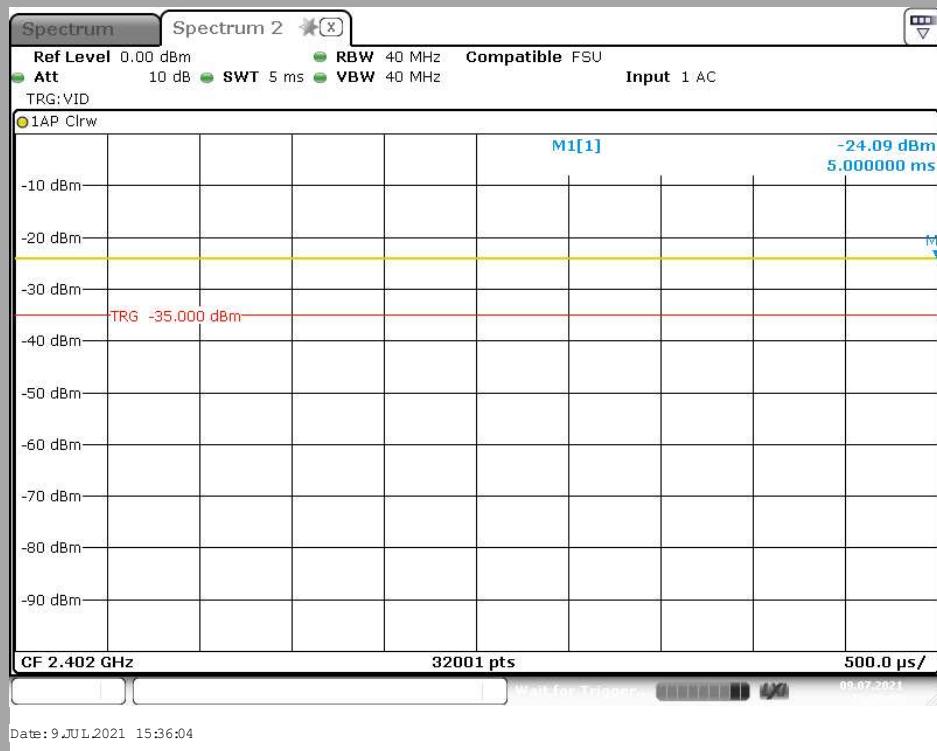


Left insole

Duty Cycle

Cmin

BLE V5.0



Channel	Duty Cycle (%)	Duty Cycle Correction (dB)
Channel	100	$20\log\left(\frac{1}{duty\ cycle}\right) = 0$

5.6. CONCLUSION

Duty Cycle measurement performed on the sample of the product **FREETME FTM-DK**, SN: **DK9701000088R & DK9701000078L**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.



6. MAXIMUM CONDUCTED OUTPUT POWER

6.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU
Date of test : March 13, 2020 & July 9, 2021
Ambient temperature : 26°C
Relative humidity : 46%

6.2. TEST SETUP

- The Equipment under Test is installed:

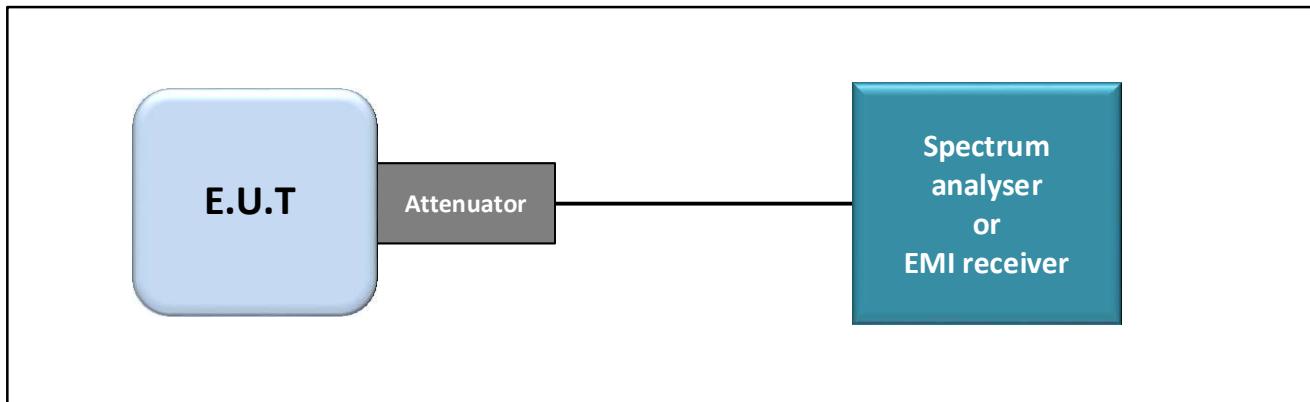
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

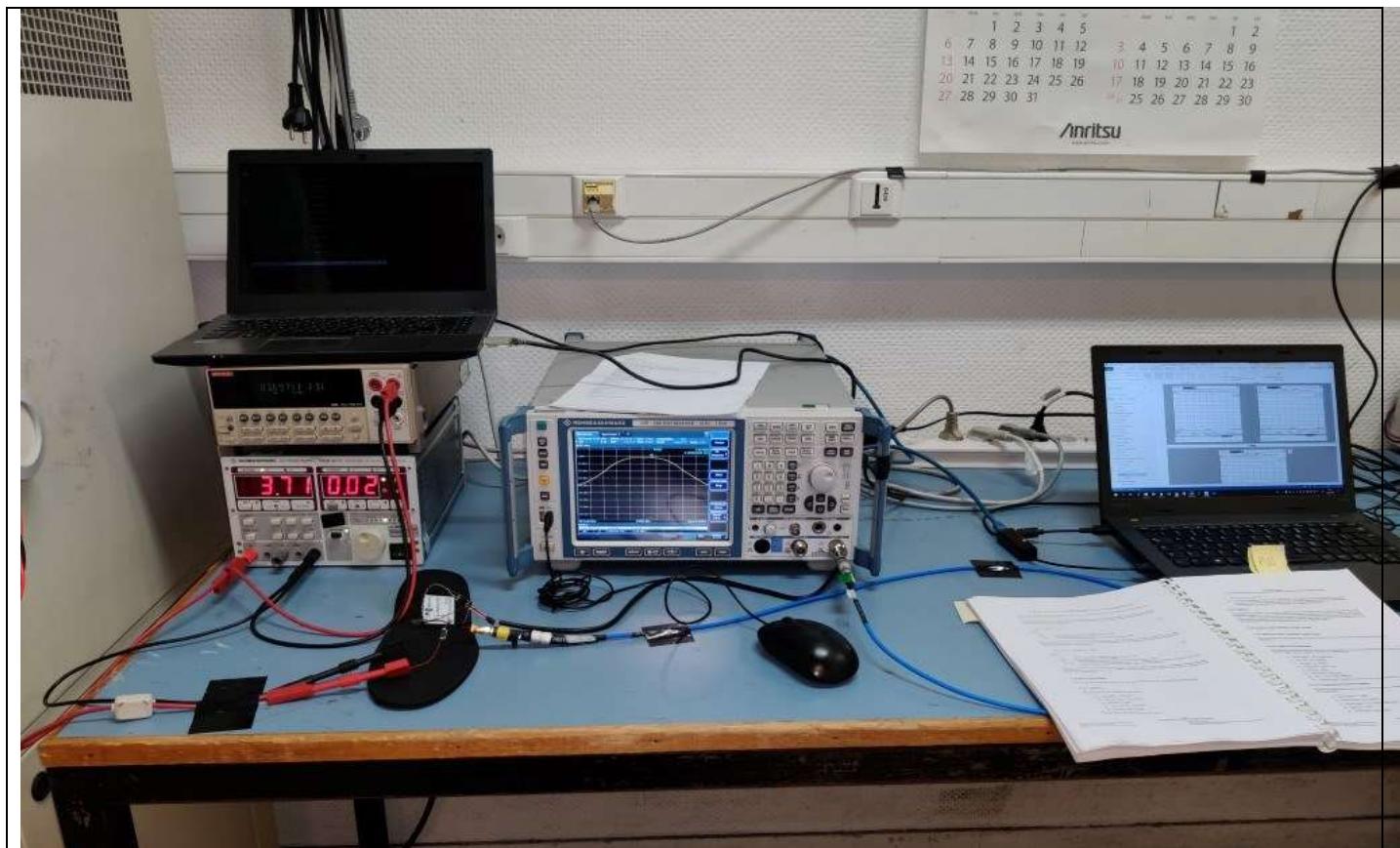
- Conducted Method
- Radiated Method

- Test Procedure:

- ANSI C63.10 § 11.9.1.1
- ANSI C63.10 § 11.9.1.2
- ANSI C63.10 § 11.9.2.2.2 (Method AVGSA-1)
- ANSI C63.10 § 11.9.2.2.4 (Method AVGSA-2)



Test set up of Maximum Conducted Output Power



Photograph for Maximum Conducted Output Power

6.3. LIMIT

Frequency range	Maximum Conducted Output Power
2400MHz	≤30dBm*

*Remark: Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

6.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2019/07	2021/07
Cable + Attenuateur 20dB	PASTERNACK	PE350-150CM	A5329865	2019/09	2021/09
Multimeter	KEITHLEY	2000	A1242090	2020/03	2022/03
Programmable DC power supply	ROHDE & SCHWARZ	NGSM32/10	A7040074	See multimeter	See multimeter

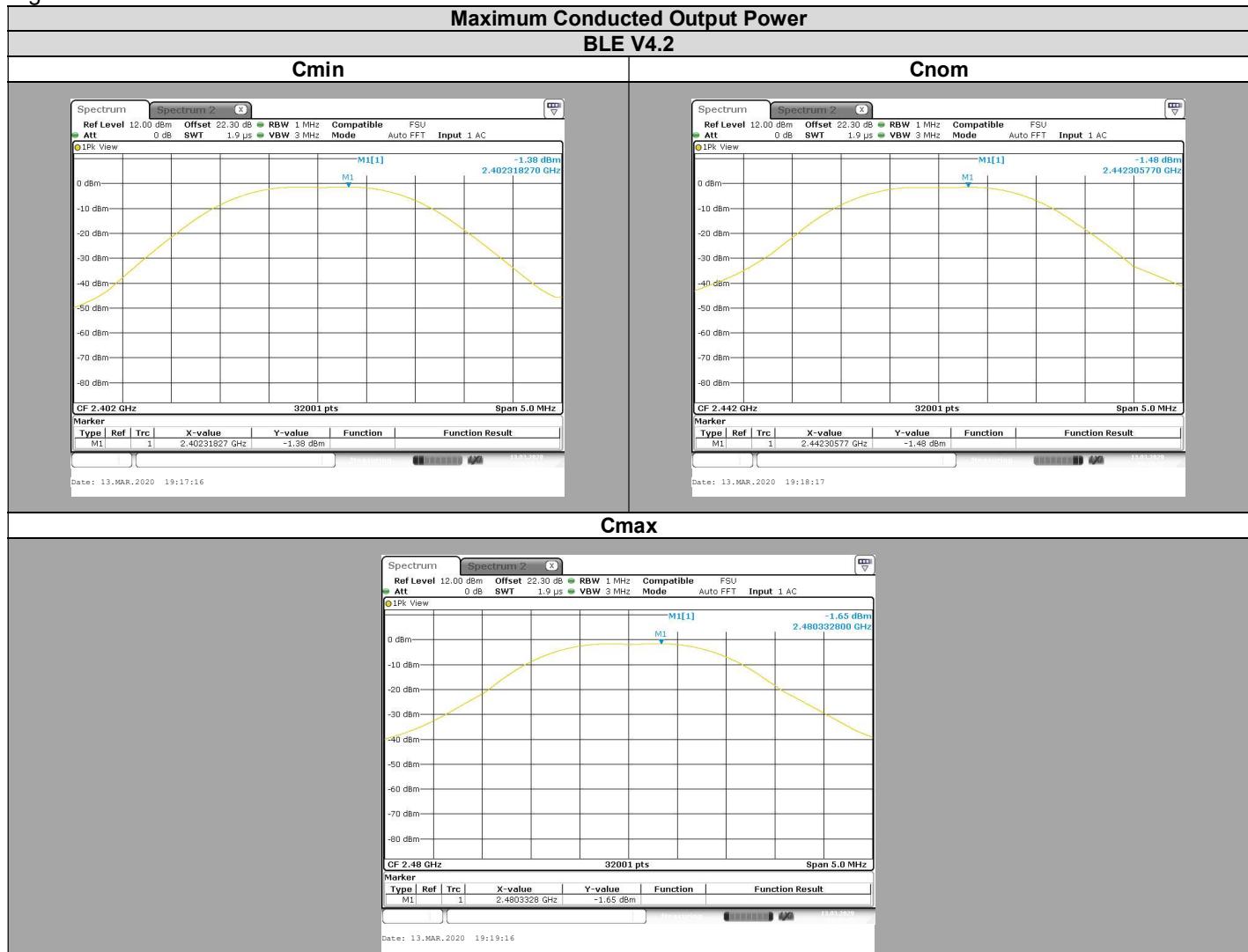
Note: In our quality system, the test equipment calibration due is more & less 2 months



L C I E

6.5. RESULTS

Right insole



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	22.3	4.74	-1.38	30
Cnom	22.3	4.74	-1.48	30
Cmax	22.3	4.74	-1.65	30

TEST REPORT

N° 166336-748857-A

Version : 01

Page 30/67



L C I E

Right insole

Maximum Conducted Output Power

BLE V5.0

Cmin



Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	22.3	4.74	-1.39	30
Cnom	22.3	4.74	-1.47	30
Cmax	22.3	4.74	-1.56	30

TEST REPORT

Version : 01

N° 166336-748857-A

Page 31/67



L C I E

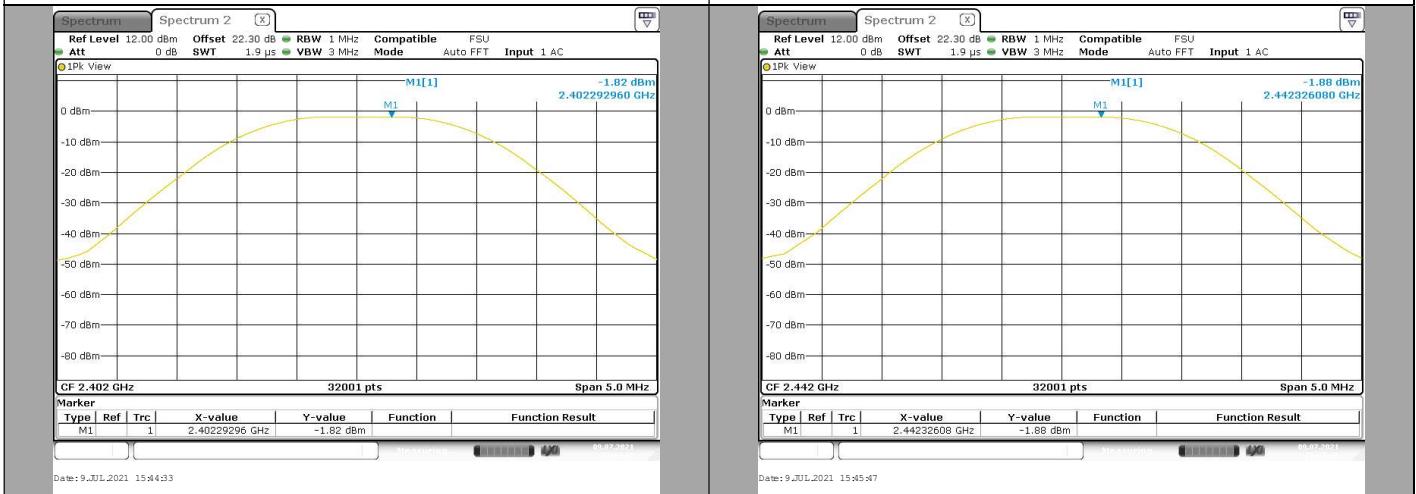
Left insole

Maximum Conducted Output Power

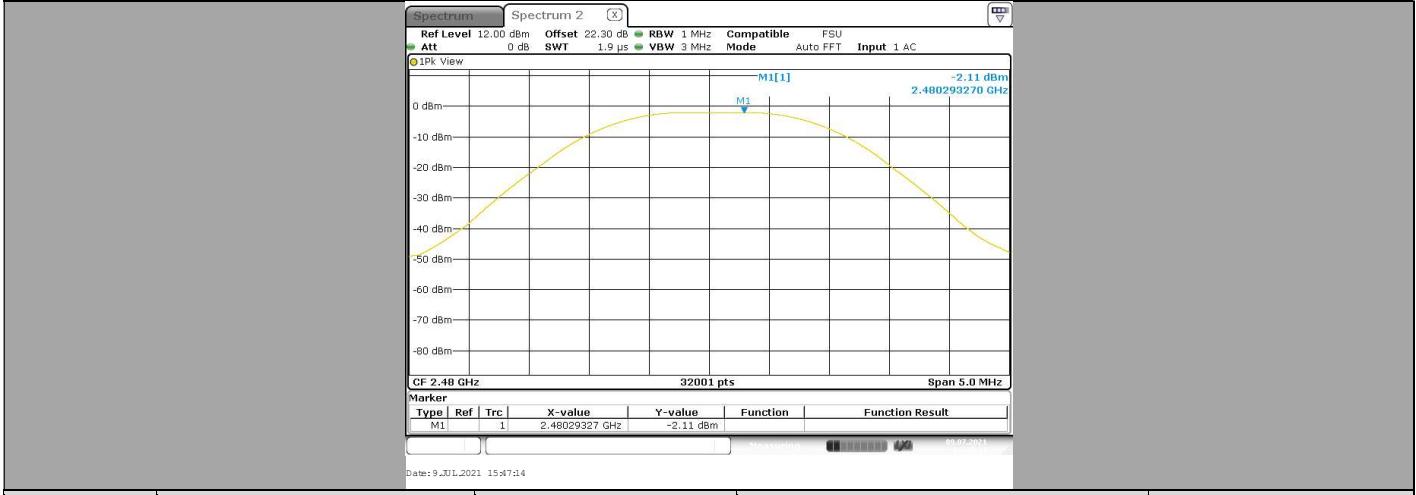
BLE V4.2

Cmin

Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	22.3	4.74	-1,82	30
Cnom	22.3	4.74	-1,88	30
Cmax	22.3	4.74	-2,11	30



L C I E

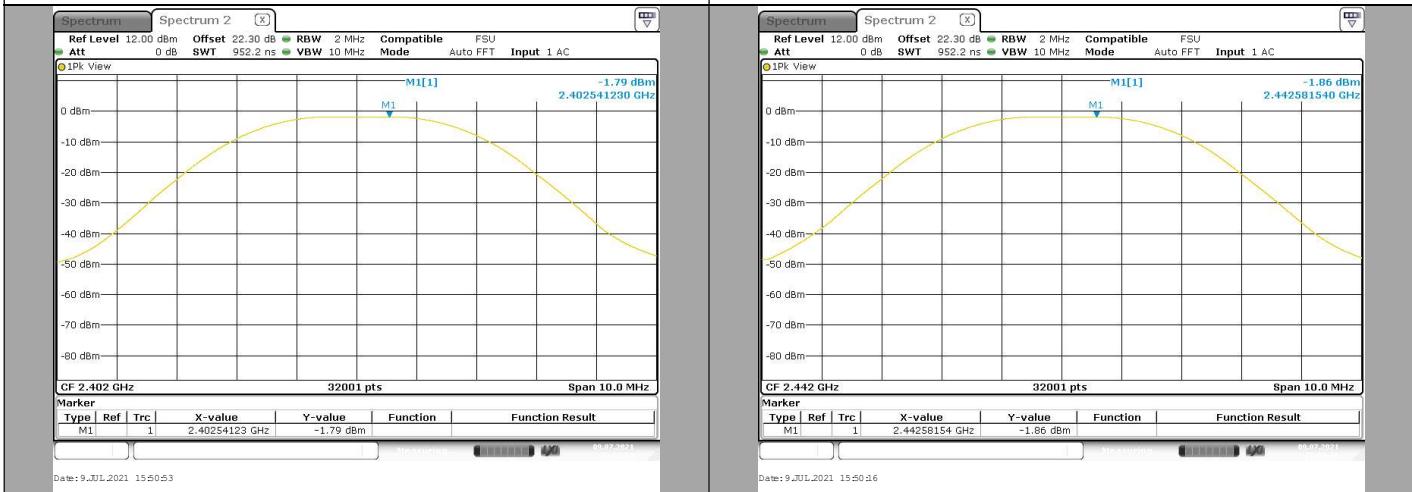
Left insole

Maximum Conducted Output Power

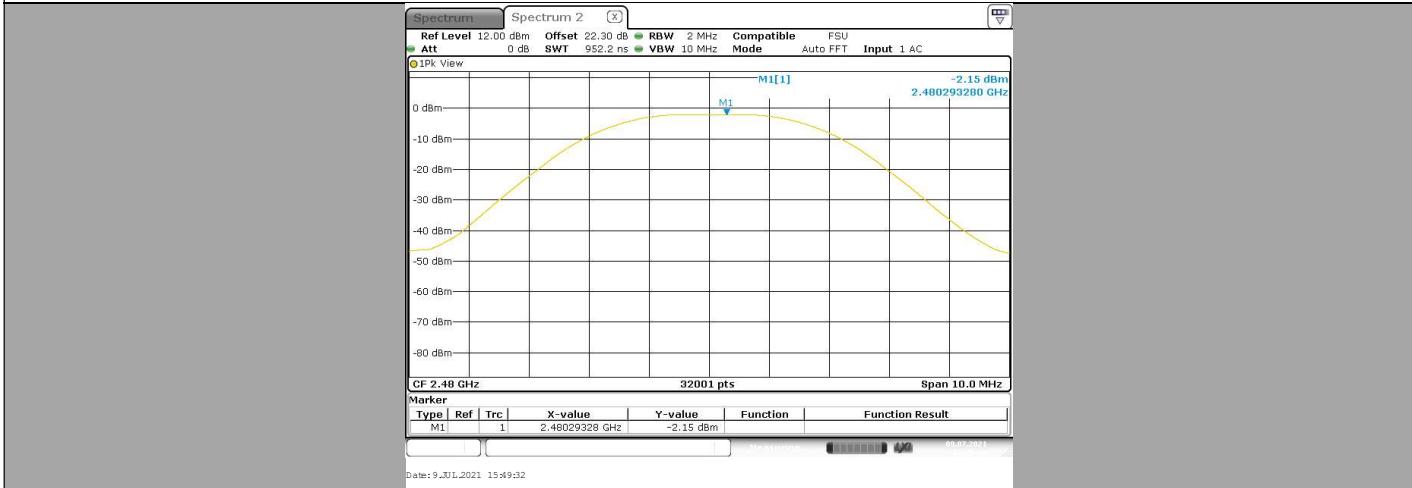
BLE V5.0

Cmin

Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	22.3	4.74	-1,79	30
Cnom	22.3	4.74	-1,86	30
Cmax	22.3	4.74	-2,15	30

6.6. CONCLUSION

Maximum Conducted Output Power measurement performed on the sample of the product **FEEETME FTM-DK**, SN: **DK9701000088R & DK9701000078L**, in configuration and description presented in this test report, show levels compliant to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.



7. POWER SPECTRAL DENSITY

7.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU
Date of test : March 13, 2020 & July 9, 2021
Ambient temperature : 26°C
Relative humidity : 46%

7.2. TEST SETUP

- The Equipment Under Test is installed:

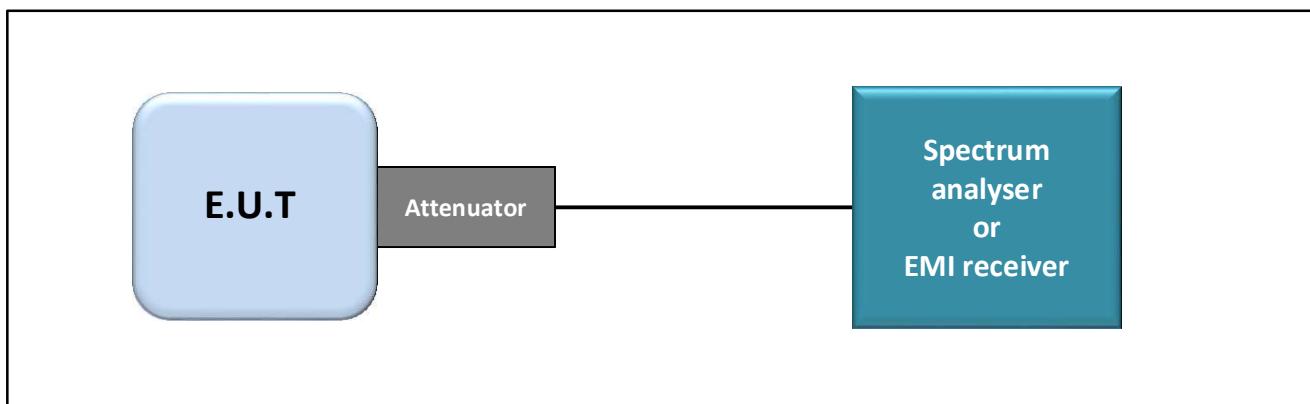
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

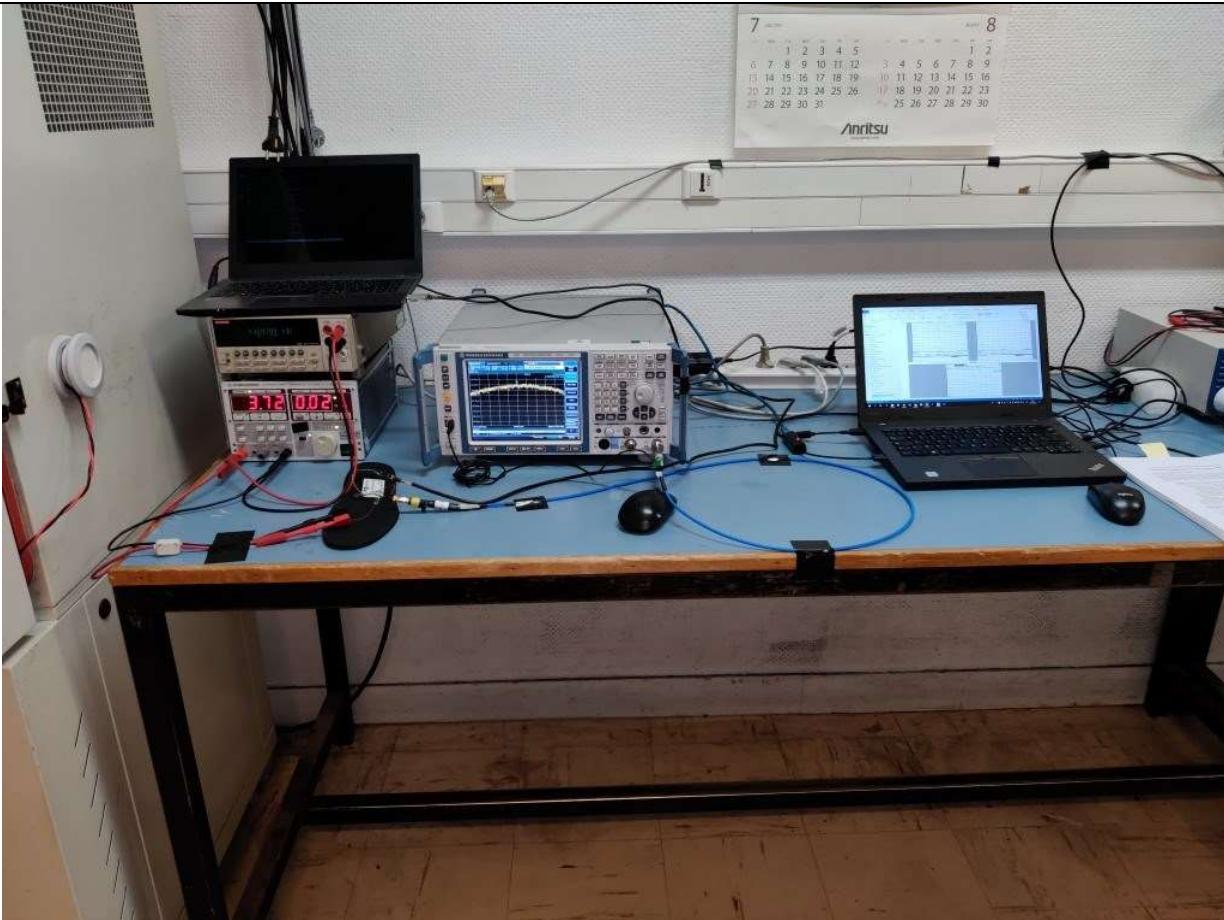
- Conducted Method
- Radiated Method

- Test Procedure:

- ANSI C63.10 § 11.10.2 (Method PKPSD)
- ANSI C63.10 § 11.10.3 (Method AVGPSD-1)



Test set up of Power Spectral Density



Photograph for Power Spectral Density

7.3. LIMIT

Frequency range	Power Spectral Density
2400MHz to 2483.5MHz	≤8dBm/3kHz*

*Remark: Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

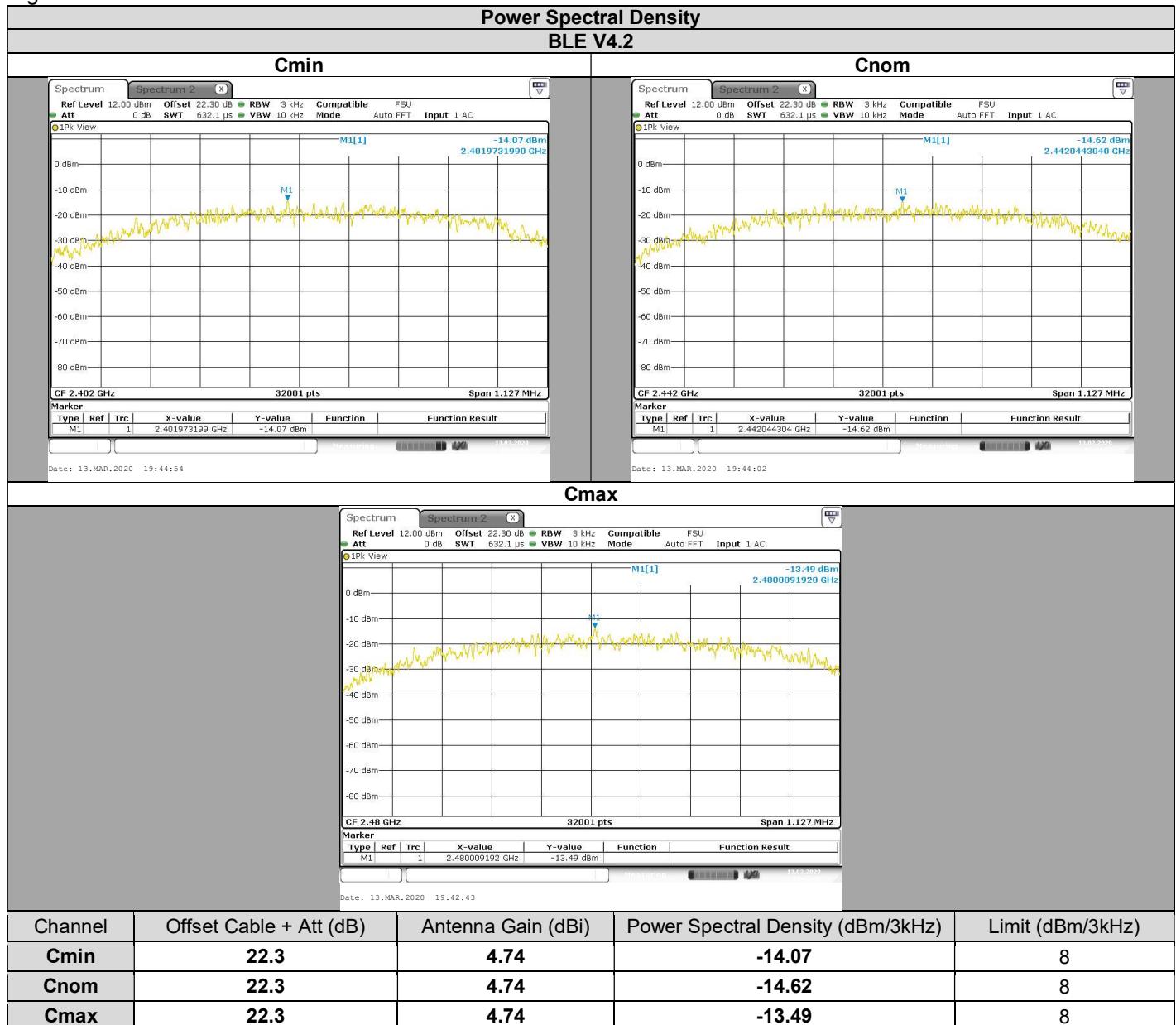
7.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2019/07	2021/07
Cable + Attenuateur 20dB	PASTERNACK	PE350-150CM	A5329865	2019/09	2021/09
Multimeter	KEITHLEY	2000	A1242090	2020/03	2022/03
Programmable DC power supply	ROHDE & SCHWARZ	NGSM32/10	A7040074	See multimeter	See multimeter

Note: In our quality system, the test equipment calibration due is more & less 2 months

7.5. RESULTS

Right insole

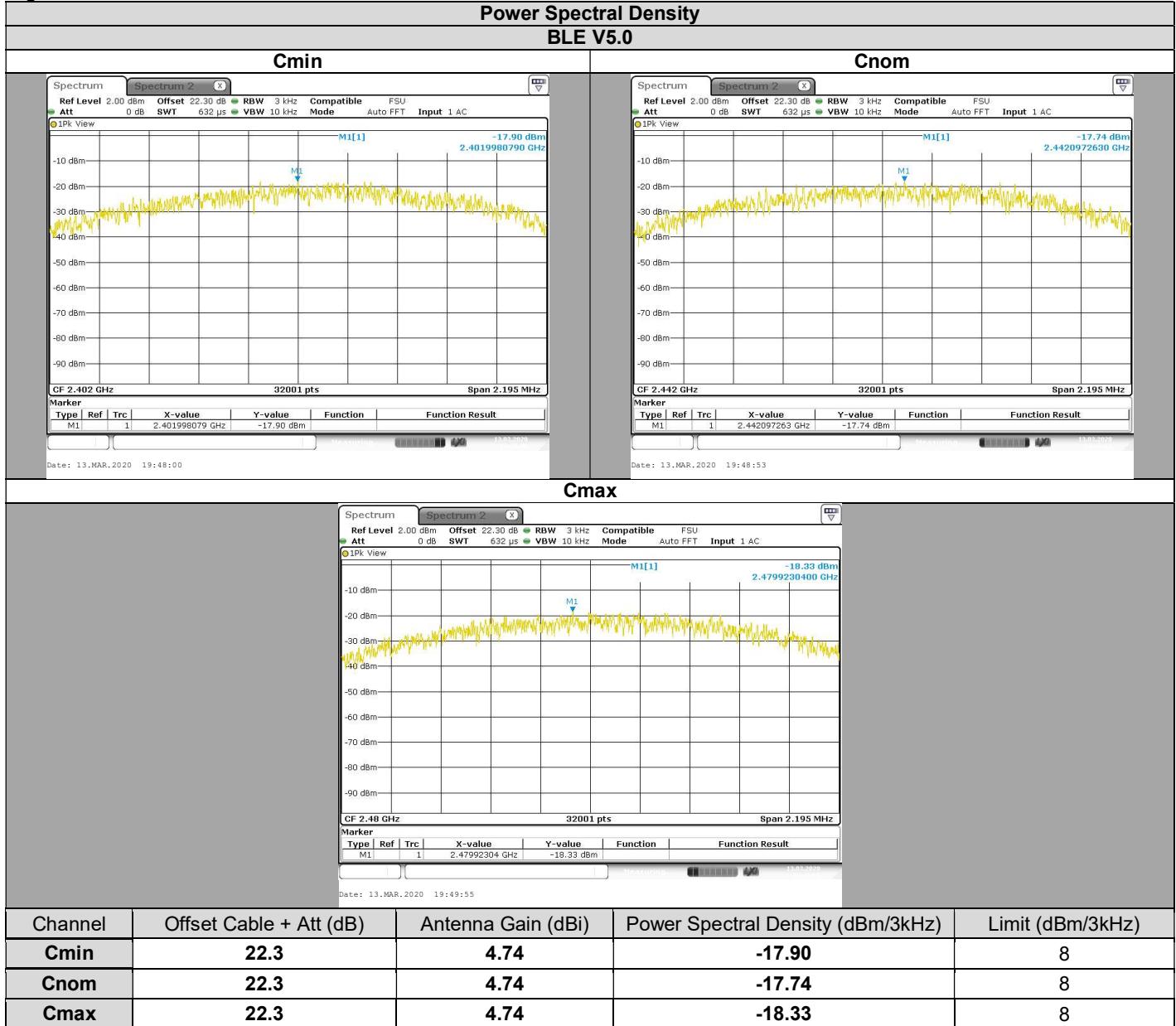


Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Cmin	22.3	4.74	-14.07	8
Cnom	22.3	4.74	-14.62	8
Cmax	22.3	4.74	-13.49	8



L C I E

Right insole



TEST REPORT

N° 166336-748857-A

Version : 01

Page 37/67