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TEST REPORT

N°: 17718995-785818-A (FILE#4772524)

Version : 02

Subject

Radio spectrum matters
tests according to standards:
47 CFR Part 15.231 & RSS-210 Issue 10 & RSS-Gen Issue 5

Issued to

Jay Electronique
Zac la bâtie, rue Champrond
38334-Saint-Ismier
France

Apparatus under test

↗ Product	Industrial Remote Controls
↗ Trade mark	CONDUCTIX wamplifier
↗ Manufacturer	Jay Electronique
↗ Model under test	MKT4631
↗ Serial number	230223101E1
↗ FCC ID	OQMKT
↗ IC	3393A-KT

Conclusion

See Test Program chapter

Test date

January 16, 2023 to January 31, 2023

Test location

Select Test Location

FCC Test site

FR0008 - 197516

ISED Test site

FR0008 - 6500A

Sample receipt date

January 16, 2023

Composition of document

41 pages

Document issued on

April 24, 2023

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	April 14, 2023	Majid MOURZAGH	Creation of the document
02	April 24, 2023	Majid MOURZAGH	Adding information on §1 an §2.2

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

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1. TEST PROGRAM

References

- 47 CFR Part 15.231
- RSS 210 Issue 10
- RSS Gen Issue 5
- ANSI C63.10-2013

Radio requirement:

Clause (47CFR Part 15.231 & RSS-249 Issue 2 & RSS-Gen Issue 5) Test Description	Test result - Comments			
Occupied Bandwidth	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
20 dB bandwidth	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
Limit of Transmission Time	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
Field strength of fundamental & Field strength of harmonics	☒ PASS	☐ FAIL	☐ NA()	☐ NP(1)
AC Power Line Conducted Emission	☐ PASS	☐ FAIL	☒ NA(2)	☐ NP(1)
Unwanted Emissions into Restricted Frequency Bands	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
Receiver Radiated emissions	☒ PASS(3)	☐ FAIL	☐ NA	☐ 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

(3): Testing covered the receive mode, and receiver spurious emissions are considered to be the same as transmitter.

PASS: EUT complies with standard's requirement

FAIL: EUT does not comply with standard's requirement

NA: Not Applicable

NP: Test Not Performed

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

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):
CONDUCTIX wampfler MK

Serial Number: 230223101E1



Equipment Under Test

Power supply:

During all the tests, EUT is supplied by V_{nom} :

For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Supply1	☐ AC ☐ DC ☒ Battery	2 AA batteries		



Voltage table used (for Power Line Conducted Emissions):

Type	Measurement performed:	
☐ AC	☐ 120VAC/60Hz	☐ 240VAC/50Hz
☐ DC	☐ +VDC	☐ -....VDC
☒ Battery	☒ +3.2VDC	☐ -....VDC
☐ USB (Laptop auxiliary)	☐ 120VAC/60Hz (Laptop auxiliary)	☐ 240VAC/50Hz(Laptop auxiliary)

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
						None

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop	HP EliteBook 830 G6	/	Use to set the EUT

Equipment information:

Type:			
Frequency band:	[430-440] MHz		
Number of Channel:	92		
Spacing channel:	75kHz		
Channel bandwidth:	25 kHz		
Antenna Type:	☐ Integral	☒ External	☐ Dedicated
Antenna connector:	☒ Yes	☐ No	☐ Temporary for test
Transmit chains:	☒ 1	☐ 2	
Receiver chains:	☒ 1	☐ 2	
Type of equipment:	☒ Stand-alone	☐ Plug-in	☐ Combined
Duty cycle:	☒ Continuous duty	☐ Intermittent duty	☐ 100% duty
Equipment type:	☒ Production model		☐ Pre-production model
Operating temperature range:	Tnom:	20°C	
Type of power source:	☐ AC power supply	☐ DC power supply	☒ Battery
Operating voltage range:	Vnom:	☐ 120V/60Hz	☒ 3.2 Vdc

Antenna Characteristic			
Antenna assembly	Gain (dBi)	Frequency Band (MHz)	Impedance(Ω)
1	0	[430-440] MHz	50

CHANNEL PLAN	
Channel	Frequency (MHz)
Cmin	430.1
Cmid	436.475
Cmax	439.925

channel 1	433.1MHz	channel 32	435.425MHz	channel 63	437.75MHz
channel 2	433.175MHz	channel 33	435.5MHz	channel 64	437.825MHz
channel 3	433.25MHz	channel 34	435.575MHz	channel 65	437.9MHz
channel 4	433.325MHz	channel 35	435.65MHz	channel 66	437.975MHz
channel 5	433.4MHz	channel 36	435.725MHz	channel 67	438.05MHz
channel 6	433.475MHz	channel 37	435.8MHz	channel 68	438.125MHz
channel 7	433.55MHz	channel 38	435.875MHz	channel 69	438.2MHz
channel 8	433.625MHz	channel 39	435.95MHz	channel 70	438.275MHz
channel 9	433.7MHz	channel 40	436.025MHz	channel 71	438.35MHz
channel 10	433.775MHz	channel 41	436.1MHz	channel 72	438.425MHz
channel 11	433.85MHz	channel 42	436.175MHz	channel 73	438.5MHz
channel 12	433.925MHz	channel 43	436.25MHz	channel 74	438.575MHz
channel 13	434MHz	channel 44	436.325MHz	channel 75	438.65MHz
channel 14	434.075MHz	channel 45	436.4MHz	channel 76	438.725MHz
channel 15	434.15MHz	channel 46	436.475MHz	channel 77	438.8MHz
channel 16	434.225MHz	channel 47	436.55MHz	channel 78	438.877MHz
channel 17	434.3MHz	channel 48	436.627MHz	channel 79	438.95MHz
channel 18	434.375MHz	channel 49	436.7MHz	channel 80	439.025MHz
channel 19	434.45MHz	channel 50	436.775MHz	channel 81	439.1MHz
channel 20	434.525MHz	channel 51	436.85MHz	channel 82	439.175MHz
channel 21	434.6MHz	channel 52	436.925MHz	channel 83	439.25MHz
channel 22	434.675MHz	channel 53	437MHz	channel 84	439.325MHz
channel 23	434.75MHz	channel 54	437.075MHz	channel 85	439.4MHz
channel 24	434.825MHz	channel 55	437.15MHz	channel 86	439.475MHz
channel 25	434.9MHz	channel 56	437.225MHz	channel 87	439.55MHz
channel 26	434.975MHz	channel 57	437.3MHz	channel 88	439.625MHz
channel 27	435.05MHz	channel 58	437.375MHz	channel 89	439.7MHz
channel 28	435.125MHz	channel 59	437.45MHz	channel 90	439.775MHz
channel 29	435.2MHz	channel 60	437.525MHz	channel 91	439.85MHz
channel 30	435.275MHz	channel 61	437.6MHz	channel 92	439.925MHz
channel 31	435.35MHz	channel 62	437.675MHz		

Modulation Type	Worst Case Modulation
FSK	☒

Hardware information		
Software (if applicable):	V. :	v0101

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 mode 2	Permanent reception

Test	Running mode
Occupied Bandwidth	☒ Test mode 1 (1) ☐ Alternative test mode()
20 dB bandwidth	☒ Test mode 1 (1) ☐ Alternative test mode()
Duty cycle	☒ Test mode 1 (1) ☐ Alternative test mode()
Limit of Transmission Time	☒ Test mode 1 (1) ☐ Alternative test mode()
Field strength of fundamental & Field strength of harmonics	☒ Test mode 1 (1) ☐ Alternative test mode()
Unwanted Emissions into Restricted Frequency Bands	☒ Test mode 1 (1) ☐ Alternative test mode()
Receiver Radiated emissions	☒ Test mode 2 (2) ☐ Alternative test mode()

- (1) Commands with the specific test software R&D tools software « HID_KEPLER v4.03" are used to set the product.
- (2) Testing covered the receive mode, and receiver spurious emissions are considered to be the same as transmitter.

2.3. EQUIPMENT LABELLING

None

2.4. EQUIPMENT MODIFICATION

☒ None ☐ Modification:

3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

Test performed by : Majid MOURZAGH
Date of test : January 18, 2023
Ambient temperature : 21 °C
Relative humidity : 39 %

3.2. TEST SETUP

- The Equipment Under Test is installed:

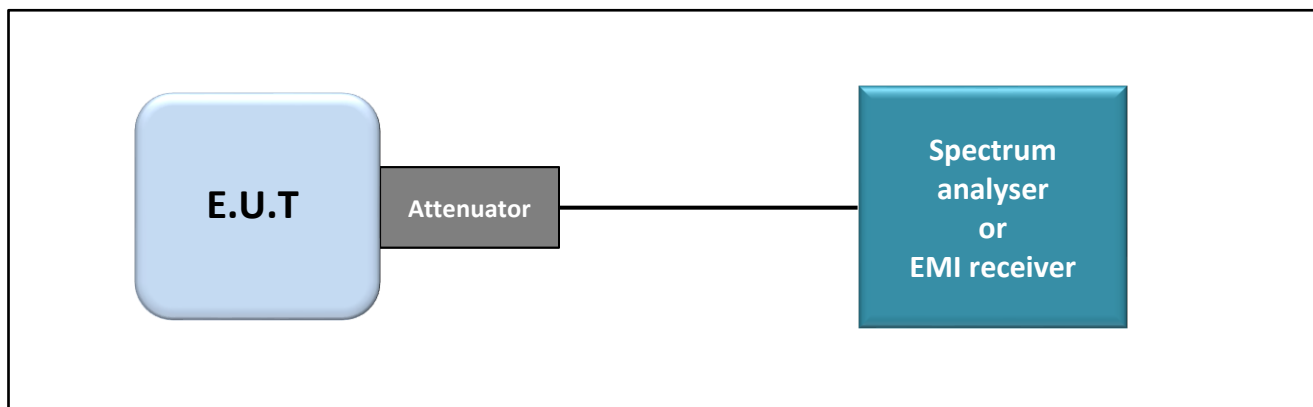
- ☒ On a table
- ☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

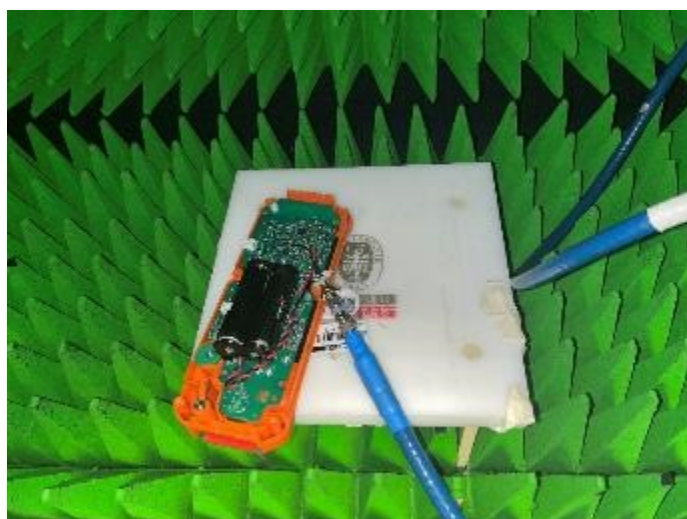
- ☒ Conducted Method
- ☐ Radiated Method

- Test Procedure:

- ☒ RSS-Gen Issue 5 § 6.7



Test set up of Occupied Bandwidth



Photograph for Occupied bandwidth

3.3. TEST EQUIPMENT LIST

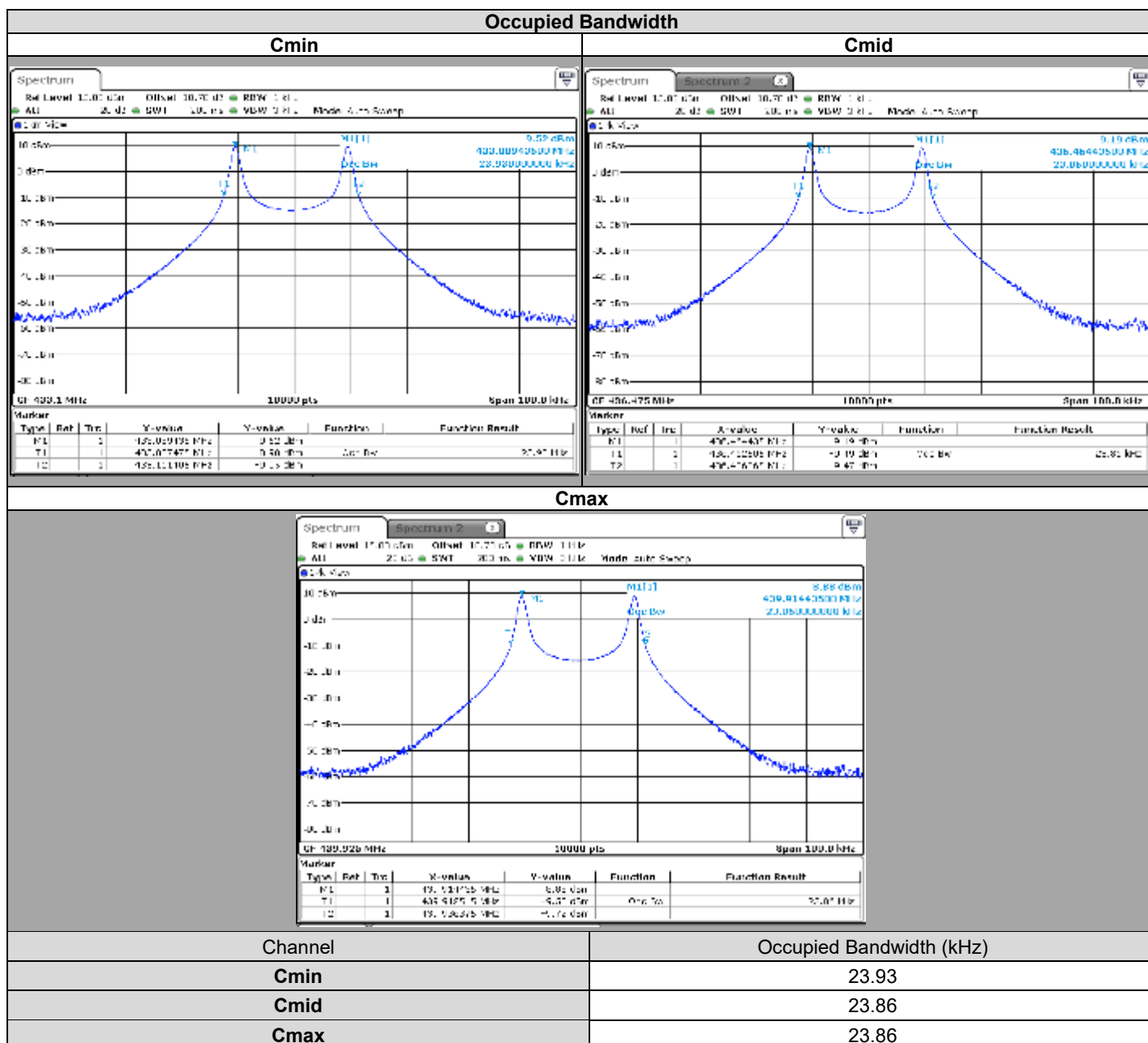
TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	09/20	01/23
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	03/21	03/23
SMA 1.5m	SUCOFLEX	18GHz	A5329863	05/22	05/23
SMA 1.5m	SUCOFLEX	18GHz	A5329864	09/22	09/23
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	11/21	11/23
Thermo-hygrometer	TESTO	608-H1	B4204120	03/23	03/25
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	01/21	05/23

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

3.4. LIMIT

None

3.5. RESULTS



3.6. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **CONDUCTIX wamplifier MK**, SN: **230223101E1**, in configuration and description presented in this test report, show levels **compliant** to the RSS-GEN Issue 5 limits.

4. 20dB EMISSION BANDWIDTH

4.1. TEST CONDITIONS

Test performed by : Majid MOURZAGH
Date of test : January 18, 2023
Ambient temperature : 21 °C
Relative humidity : 39 %

4.2. TEST SETUP

- The Equipment Under Test is installed:

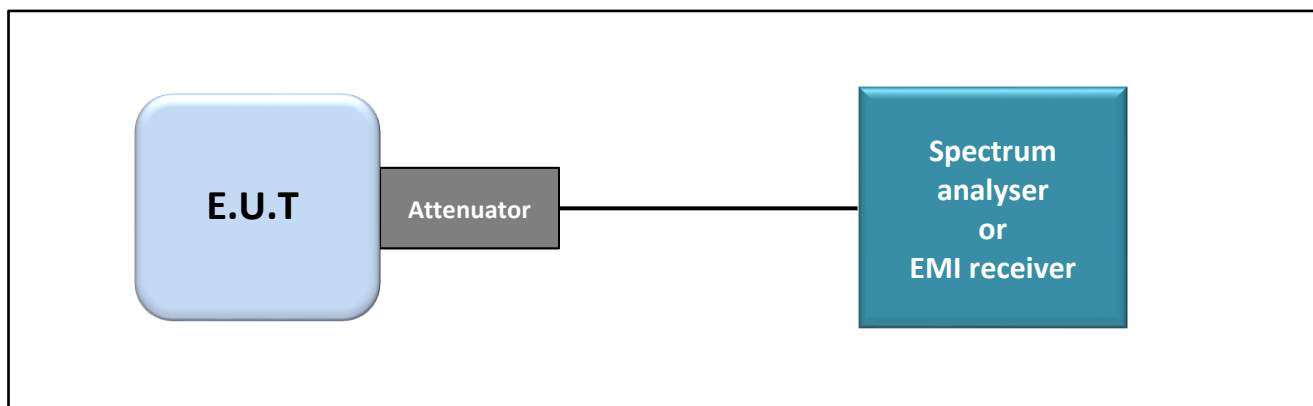
- ☐ On a table
- ☒ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

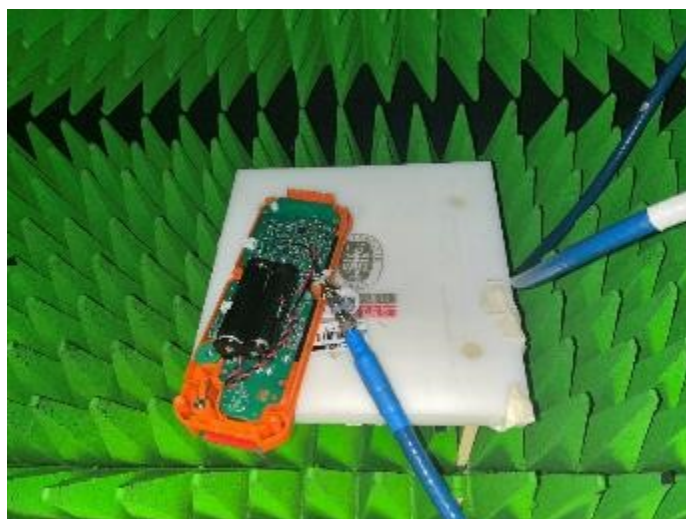
- ☒ Conducted Method
- ☐ Radiated Method

- Test Procedure:

- ☒ ANSI C63.10 § 6.9.2



Test set up of 20dB Emission Bandwidth



Photograph for 20dB emission bandwidth

4.3. **LIMIT**

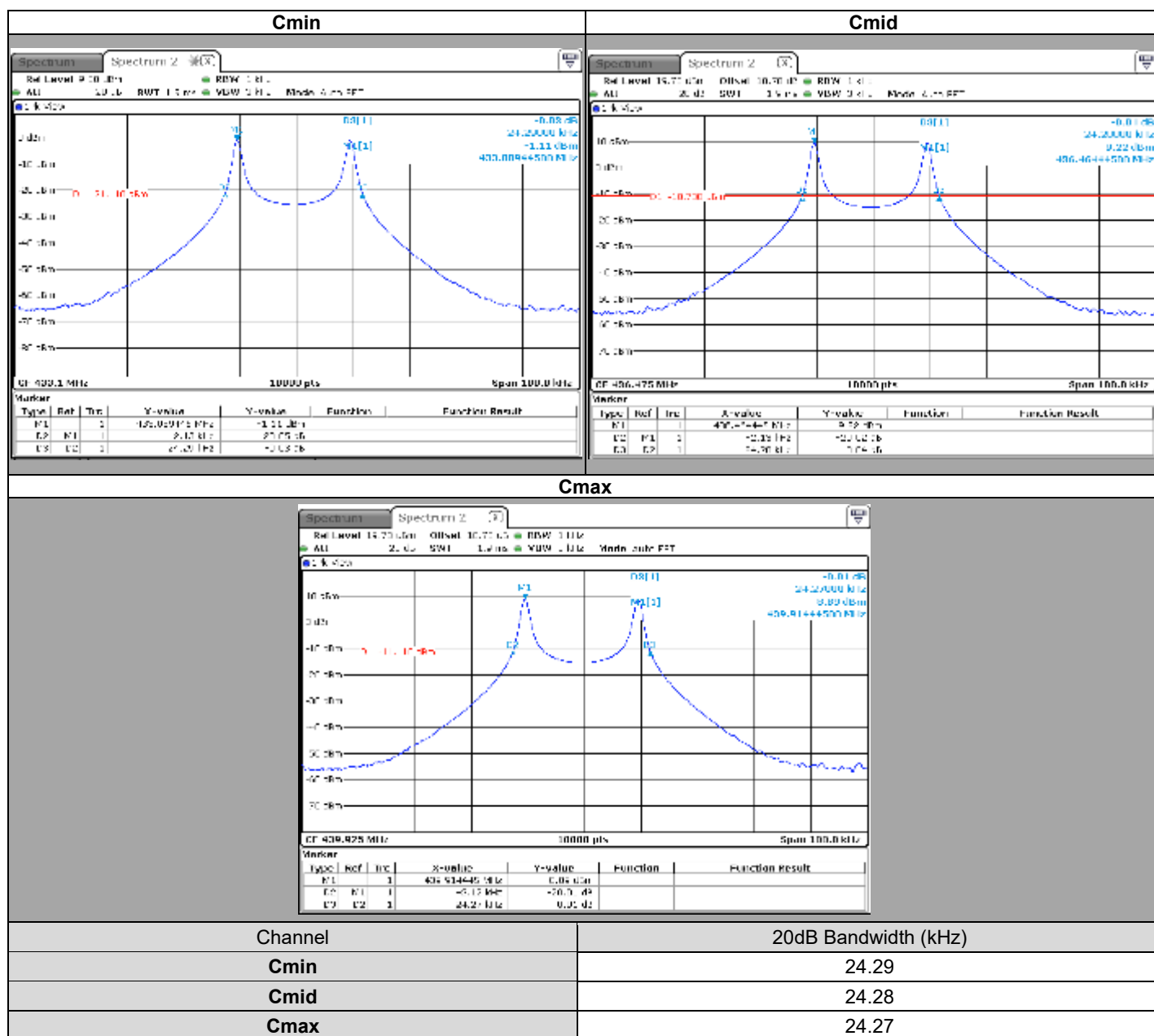
The bandwidth shall be less than 0.25% of the center frequency (for frequency between 70MHz and 900MHz)
The bandwidth shall be less than 0.50% of the center frequency (for frequency above 900MHz)

4.4. **TEST EQUIPMENT LIST**

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	09/20	01/23
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	03/21	03/23
SMA 1.5m	SUCOFLEX	18GHz	A5329863	05/22	05/23
SMA 1.5m	SUCOFLEX	18GHz	A5329864	09/22	09/23
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	11/21	11/23
Thermo-hygrometer	TESTO	608-H1	B4204120	03/23	03/25
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	01/21	05/23

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

4.5. RESULTS



4.6. CONCLUSION

20dB Emission Bandwidth measurement performed on the sample of the product **CONDUCTIX wampfler MK**, SN: 230223101E1, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 10** limits.

5. LIMIT OF TRANSMISSION TIME

5.1. TEST CONDITIONS

Test performed by : Majid MOURZAGH
Date of test : January 31, 2023
Ambient temperature : 20 °C
Relative humidity : 33 %

5.2. TEST SETUP

- The Equipment Under Test is installed:

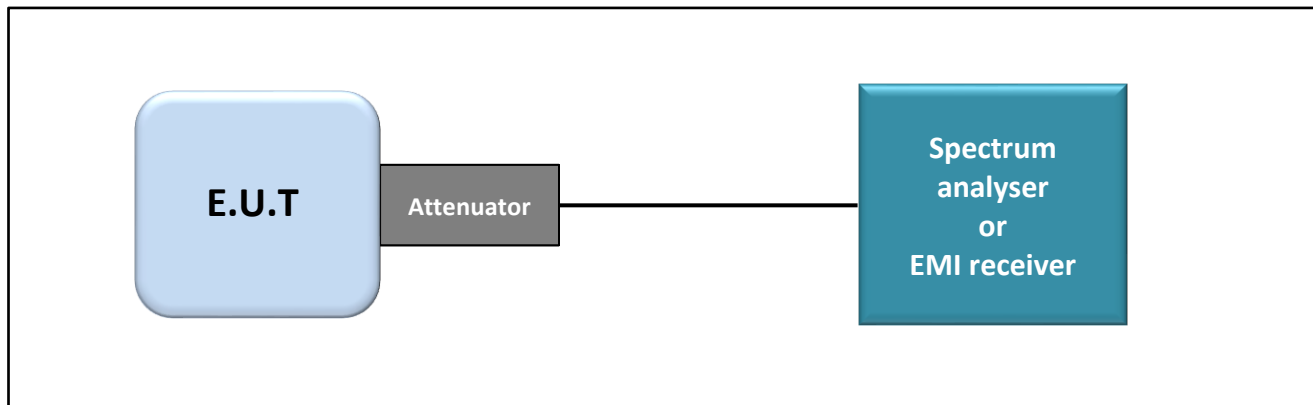
- ☐ On a table
- ☒ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

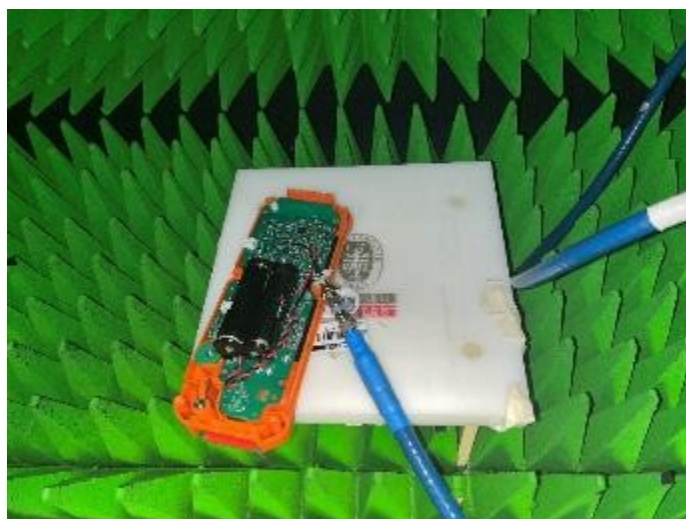
- ☒ Conducted Method
- ☐ Radiated Method

- Test Procedure:

- ☒ ANSI C63.10 § 11.6



Test set up of Limit of Transmission Time



Photograph for Limit of Transmission Time



5.3. LIMIT

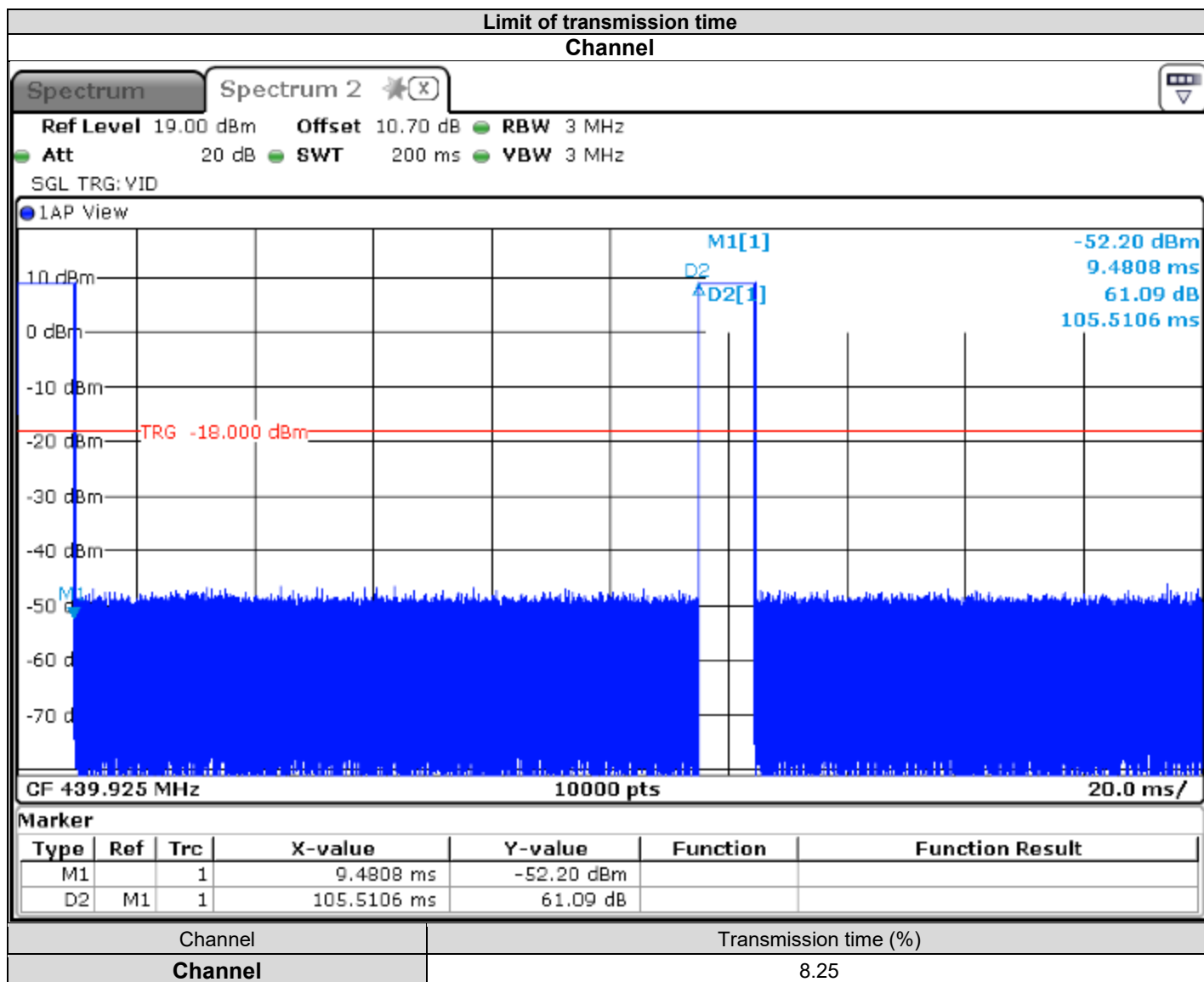
None

5.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	09/20	01/23
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	03/21	03/23
SMA 1.5m	SUCOFLEX	18GHz	A5329863	05/22	05/23
SMA 1.5m	SUCOFLEX	18GHz	A5329864	09/22	09/23
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	11/21	11/23
Thermo-hygrometer	TESTO	608-H1	B4204120	03/23	03/25
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	01/21	05/23

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

5.5. RESULTS



5.6. CONCLUSION

Duty Cycle measurement performed on the sample of the product **CONDUCTIX wampfler MK**, SN: 230223101E1, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 10** limits.

6. UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

6.1. TEST CONDITIONS

Test performed by : Majid MOURZAGH
 Date of test : January 31, 2023
 Ambient temperature : 21 °C
 Relative humidity : 39 %

6.2. TEST SETUP

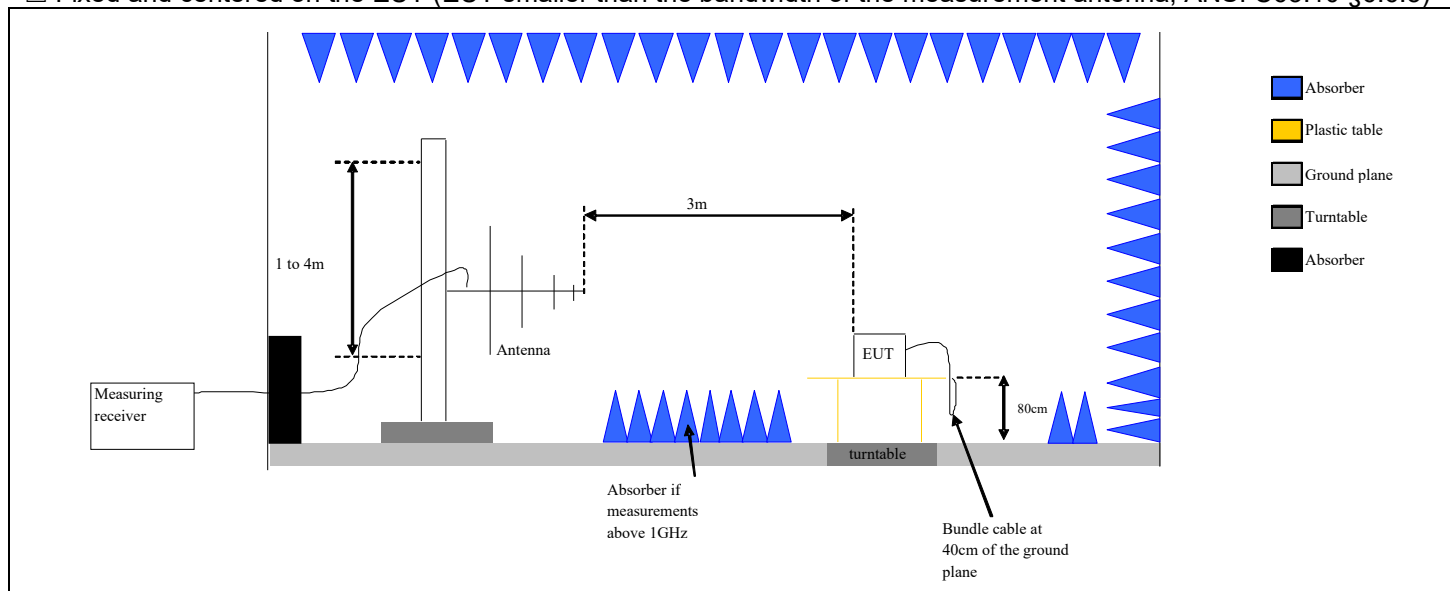
The product has been tested according to ANSI C63.10 (2013) and FCC part 15 subpart C.

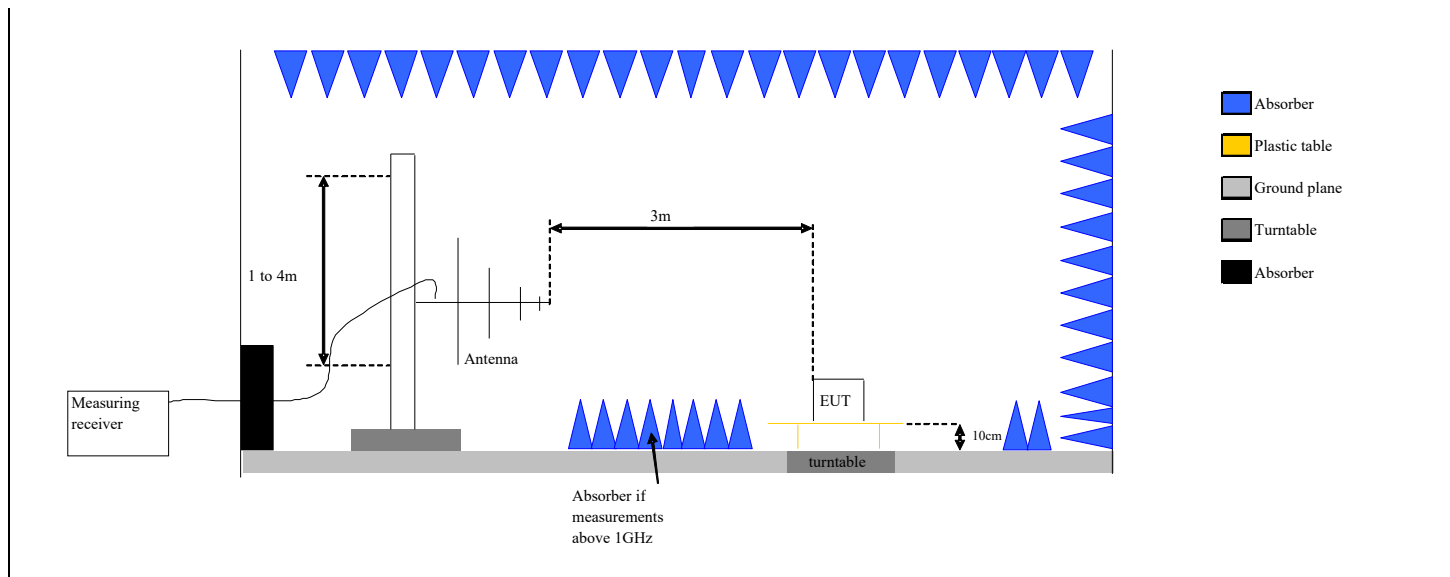
Test is performed in parallel, perpendicular and ground parallel axis with a loop antenna below 30MHz. Measurement bandwidth was 200Hz below 150kHz and 9kHz between 150kHz & 30MHz. The level has been maximised by the turntable rotation of 360 degrees range on all axis of EUT used in normal configuration. Antenna height was 1m. The EUT is placed **on an open area test site**. Distance between measuring antenna and the EUT is **10m**.

Test is performed in horizontal (H) and vertical (V) polarization with **bilog** between 30MHz & 1GHz and with a horn antenna above 1GHz. Measurement bandwidth was 120kHz below 1GHz and 1MHz above 1GHz. The level has been maximised by the turntable rotation of 360 degrees range on all axis of EUT used in normal configuration. The EUT is placed at 1.5m high above 1GHz and at 0.8m high under 1GHz. The EUT is placed **in a semi-anechoic chamber** above 1GHz and **on an open area test site** from 30MHz to 1GHz. Distance between measuring antenna and the EUT is **3m**. The height antenna is varied from 1m to 4m from 30MHz to 1GHz and above 1GHz is:

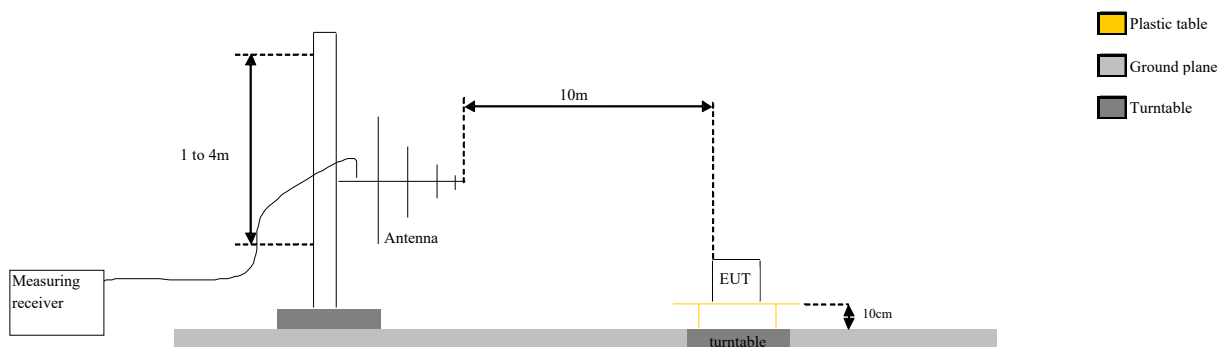
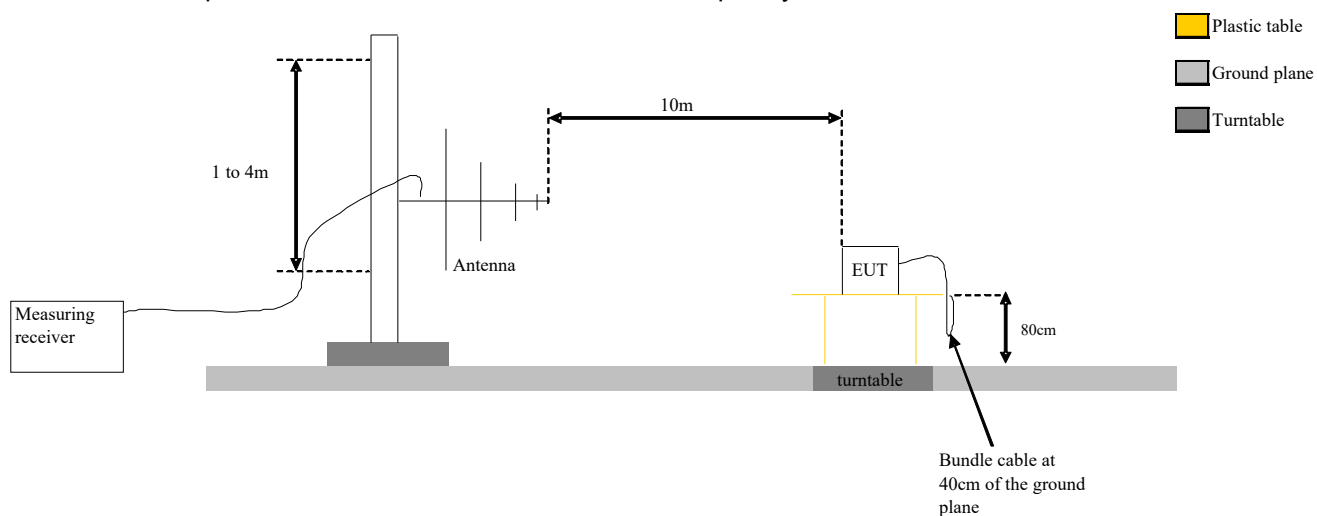
☐ On mast, varied from 1m to 4m

☒ Fixed and centered on the EUT (EUT smaller than the bandwidth of the measurement antenna, ANSI C63.10 §6.6.5)

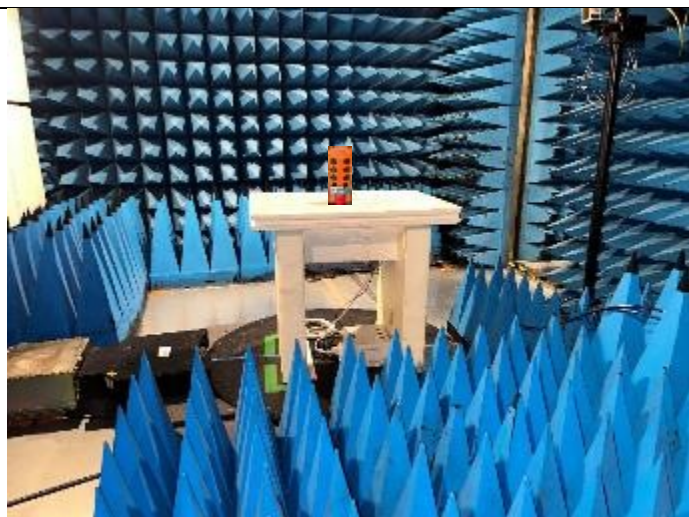
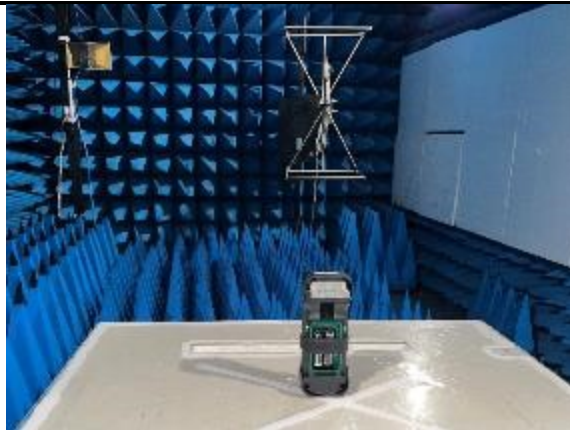




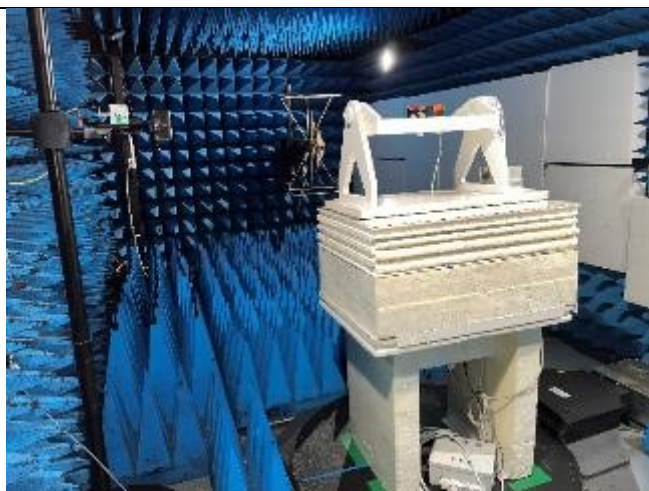
Test set up of Unwanted Emissions in Restricted Frequency Bands in semi anechoic chamber



Test Set up for radiated measurement in open area test site



Test setup under 1GHz



Test Setup above 1GHz

Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands

6.3. LIMIT

Measure at 300m		
Frequency range	Level	Detector
9kHz-490kHz	67.6dB μ V/m /F(kHz)	QPeak
Measure at 30m		
Frequency range	Level	Detector
490kHz-1.705MHz	87.6dB μ V/m /F(kHz)	QPeak
1.705MHz-30MHz	29.5dB μ V/m	QPeak
Measure at 10m		
Frequency range	Level	Detector
30MHz to 88MHz	29.5dB μ V/m	QPeak
88MHz to 216MHz	33dB μ V/m	QPeak
216MHz to 960MHz	35.5dB μ V/m	QPeak
960MHz to 1000MHz	43.5dB μ V/m	QPeak
Above 1000MHz	63.5dB μ V/m	Peak
	43.5dB μ V/m	Average
Measure at 3m		
Frequency range	Level	Detector
30MHz to 88MHz	40dB μ V/m	QPeak
88MHz to 216MHz	43.5dB μ V/m	QPeak
216MHz to 960MHz	46B μ V/m	QPeak
960MHz to 1000MHz	54dB μ V/m	QPeak
Above 1000MHz	74dB μ V/m	Peak
	54dB μ V/m	Average

6.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Amplifier 10MHz - 18GHz	LCIE SUD EST	—	A7102082	05/22	05/24
Antenna Bi-log	AH System	SAS-521-7	C2040180	02/21	02/23
Antenna horn 18GHz	EMCO	3115	C2042029	03/22	03/25
BAT EMC	NEXIO	v3.21.0.32	L1000115		
Cable 0.75m	-	18GHz	A5329900	08/22	08/24
Comb EMR HF	YORK	CGE01	A3169114		
CONTROLLER	INNCO	CO3000	D3044034		
Filtre 0.8GHz-18GHz	PASTERNAK	PE87FL1018	A7484075	12/22	12/24
Multimeter - CEM	FLUKE	189	A1240171	09/21	09/23
Rehausse Table C3	LCIE	—	F2000511		
Rehausse Table C3	LCIE	—	F2000507		
Semi-Anechoic chamber #3 (BF)	SIEPEL	—	D3044017_BF	04/22	04/25
Semi-Anechoic chamber #3 (VSWR)	SIEPEL	—	D3044017_VSWR	04/22	04/25
SMA Cable 18GHz 0.5m	TELEDYNE	18GHz	A5330059	02/23	02/24
SMA Cable 18GHz 0.5m	TELEDYNE	18GHz	A5330060	02/23	02/24
SMA Cable 18GHz 0.6m	TELEDYNE	18GHz	A5330055	02/23	02/24
SMA Cable 18GHz 3.5m	TELEDYNE	18GHz	A5330058	02/23	02/24
SMA Cable 18GHz 6m	TELEDYNE	18GHz	A5330057	02/23	02/24
Spectrum analyzer	ROHDE & SCHWARZ	FSU 26	A4060058	09/21	09/23
Table C3	LCIE	—	F2000461		
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	01/21	05/23
TILT	INNCO	TILT	D3044033		
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371		
Turntable controller (Cage#3)	ETS Lingren	Model 2090	F2000444		
Antenna Mat (OATS)	ETS Lingren	2071-2	F2000392		
Biconic Antenna	EATON	94455-1	C2040234	03/21	03/23
Cable (OATS)	—	1GHz	A5329623	09/22	09/23
Emission Cable	CABELTEL	6GHz	A5329069	05/22	05/23
Emission Cable	MICRO-COAX	1GHz	A5329656	08/22	08/23
Emission Cable	RADIALEX		A5329061	08/22	08/23
OATS	—	—	F2000409	07/22	07/23
Table C1/OATS	LCIE	—	F2000445		
Turntable (OATS)	ETS Lingren	Model 2187	F2000403		

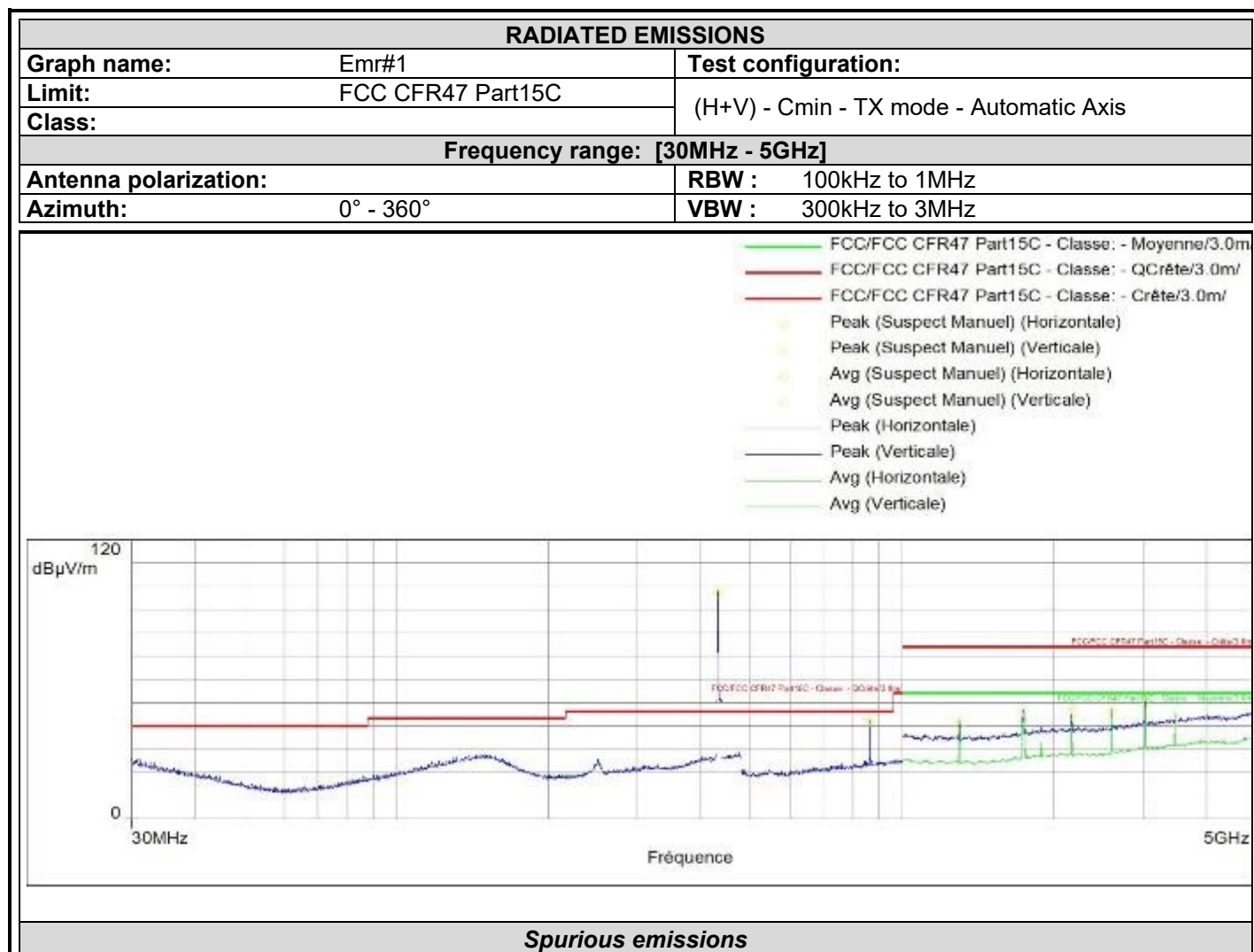
Note: In our quality system, the test equipment calibration due is more & less 2 months

6.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None ☐ Divergence:

6.6. RESULTS

Results in the frequency band [30-1000] MHz:



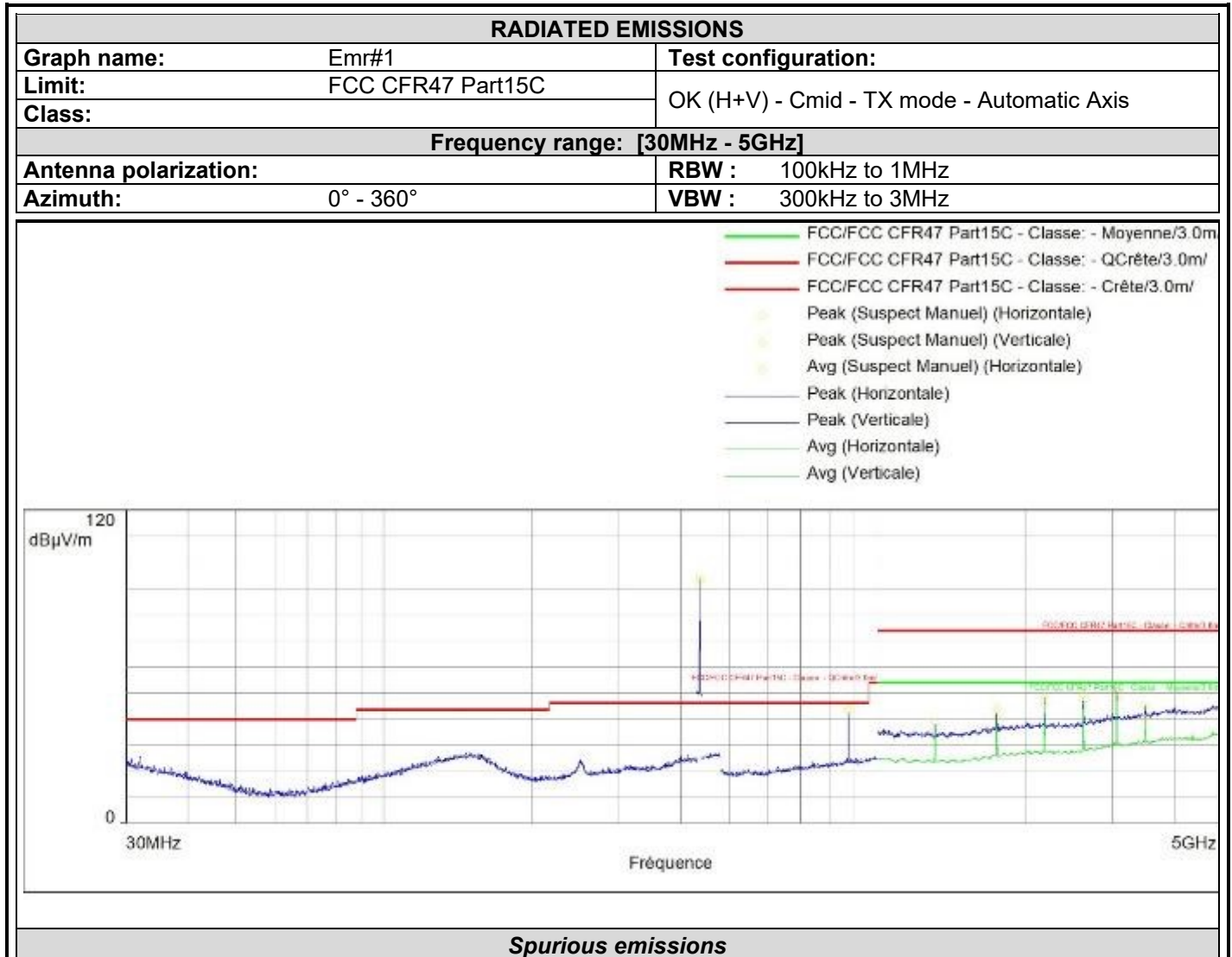
Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Lim.Q-Peak (dBμV/m)	Polarization	Correction (dB)
433.090*	93.8	/	/	/	46.0	Horizontal	21.6
866.256**	42.2	/	/	/	46.0	Horizontal	1.9
1735.600**	47.3	74.0	42.0	54.0	/	Horizontal	-29.2
2165.200**	47.7	74.0	44.8	54.0	/	Horizontal	-27.6
2598.400**	47.7	74.0	45.7	54.0	/	Horizontal	-26.8
3031.600**	51.2	74.0	49.3	54.0	/	Horizontal	-23.9
3464.800**	44.8	74.0	41.4	54.0	/	Horizontal	-23.2
433.090*	95.0	/	/	/	46.0	Vertical	21.6
866.204**	41.7	/	/	/	46.0	Vertical	1.9
1299.200**	42.6	74.0	40.1	54.0	/	Vertical	-30.9

*: Fundamental see §7.5

** : Harmonic fundamental see §7.5



L C I E



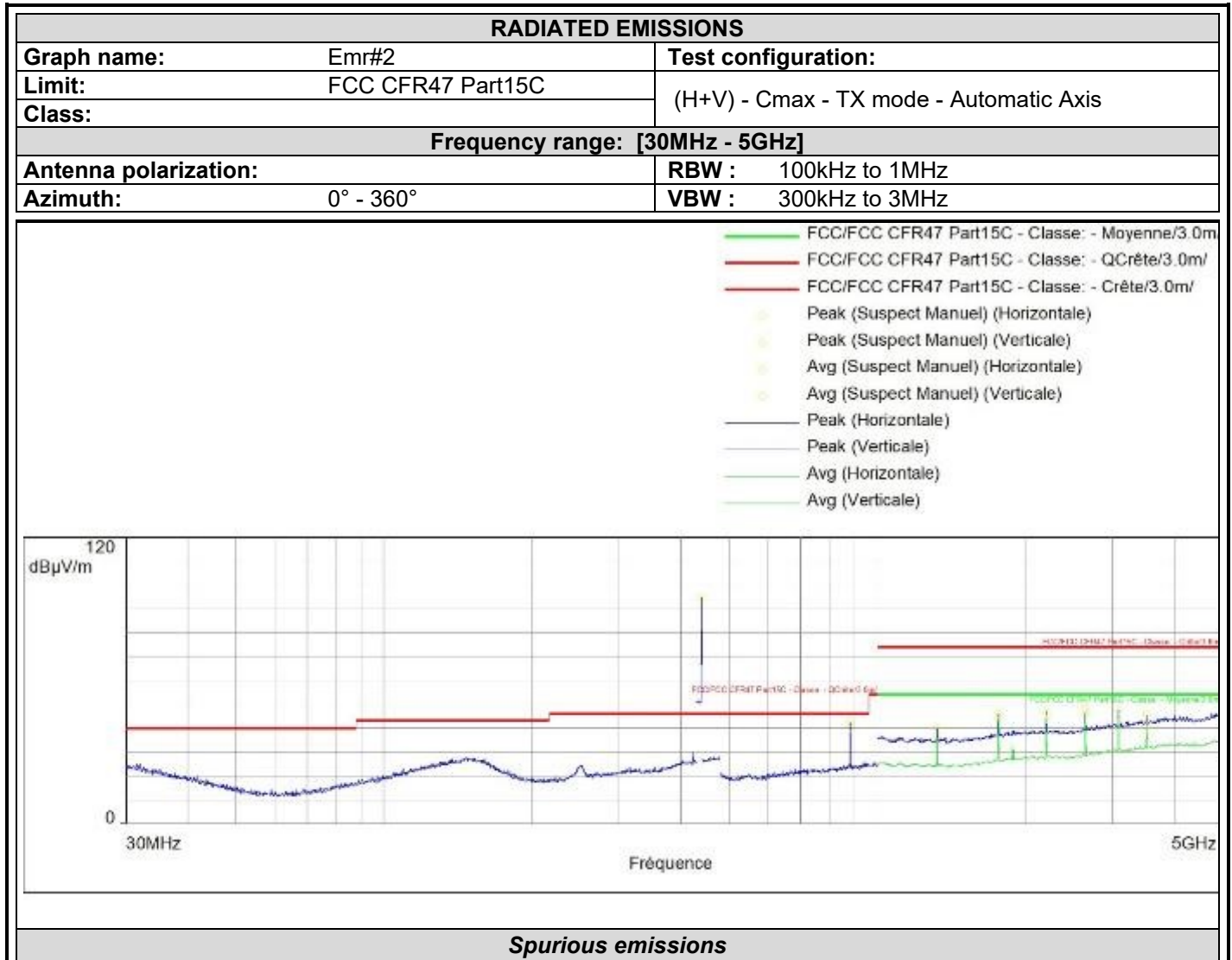
Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Lim.Q-Peak (dBμV/m)	Polarization	Correction (dB)
436.470*	93.7	/	/	/	46.0	Horizontal	20.8
873.016**	43.1	/	/	/	46.0	Horizontal	2.0
1309.200**	38.4	74.0	35.1	54.0	/	Horizontal	-31.1
1746.000**	44.0	74.0	41.2	54.0	/	Horizontal	-29.3
2182.400**	48.3	74.0	45.7	54.0	/	Horizontal	-27.8
2618.800**	49.1	74.0	47.2	54.0	/	Horizontal	-27.0
3055.600**	50.9	74.0	48.0	54.0	/	Horizontal	-24.3
3491.600**	45.1	74.0	40.1	54.0	/	Horizontal	-23.6
436.470*	93.8	/	/	/	46.0	Vertical	20.8
873.016**	43.6	/	/	/	46.0	Vertical	2.0

*: Fundamental see §7.5

**: Harmonic fundamental see §7.5



L C I E



Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Lim.Q-Peak (dBμV/m)	Polarization	Correction (dB)
439.922*	93.6	/	/		46.0	Horizontal	21.6
879.880**	42.9	/	/		46.0	Horizontal	2.0
2199.600**	47.4	74.0	45.3	54.0		Horizontal	-27.4
2639.600**	48.2	74.0	46.4	54.0		Horizontal	-26.4
3079.600**	47.6	74.0	43.8	54.0		Horizontal	-24.0
3519.600**	45.4	74.0	40.9	54.0		Horizontal	-23.1
439.944*	94.7	/	/		46.0	Vertical	21.6
879.880**	40.4	/	/		46.0	Vertical	2.0
1319.600**	40.0	74.0	36.7	54.0		Vertical	-30.9
1759.600**	46.1	74.0	44.3	54.0		Vertical	-28.9

*: Fundamental see §7.5

**: Harmonic fundamental see §7.5

QUALIFICATION (30MHz-1GHz): 10 meters measurement on the Open Area Test Site.
Frequency list has been created with semi-anechoic chamber pre-scan results.
Measurements are performed using a QUASI-PEAK detection.

Test Frequency (MHz)	Meter Reading dB(μV)	Detector (Pk/QP/Av)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Transducer Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
No significant frequency observed										

*Note: Measure have been done at 10m distance and corrected according to requirements of 15.209.e)
(M@3m = M@10m+10.5dB)*

Results in the frequency band [1-5] GHz:

QUALIFICATION (1GHz- 5GHz): The frequency list is created from the results obtained during the pre-characterization in anechoic chamber.
Measurements are performed using a PEAK and AVERAGE detection.

Test Frequency (MHz)	Meter Reading dB(μV)	Detector (Pk/Av)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Transducer Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
No significant frequency observed										

6.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **CONDUCTIX wampfler** MK, SN: **230223101E1**, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 10** limits.

7. FIELD STRENGTH OF EMISSION & FIELD STRENGTH OF HARMONICS

7.1. TEST CONDITIONS

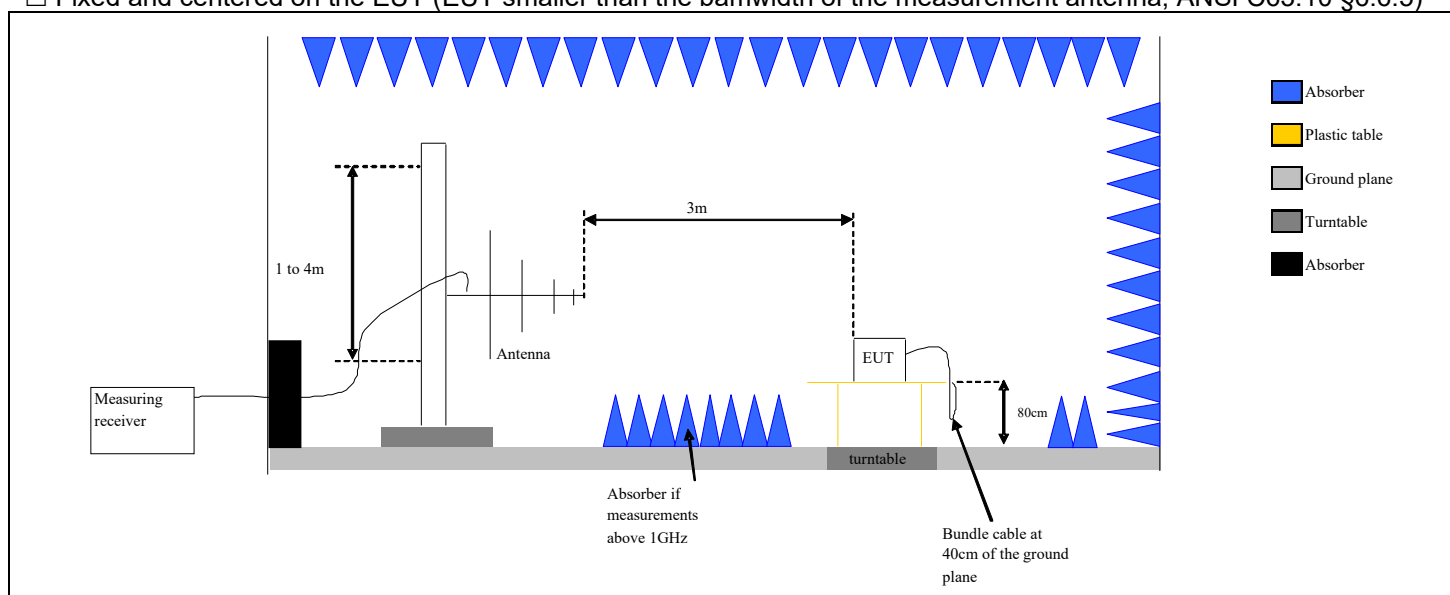
Test performed by : Majid MOURZAGH
 Date of test : January 31, 2023
 Ambient temperature : 21 °C
 Relative humidity : 39 %

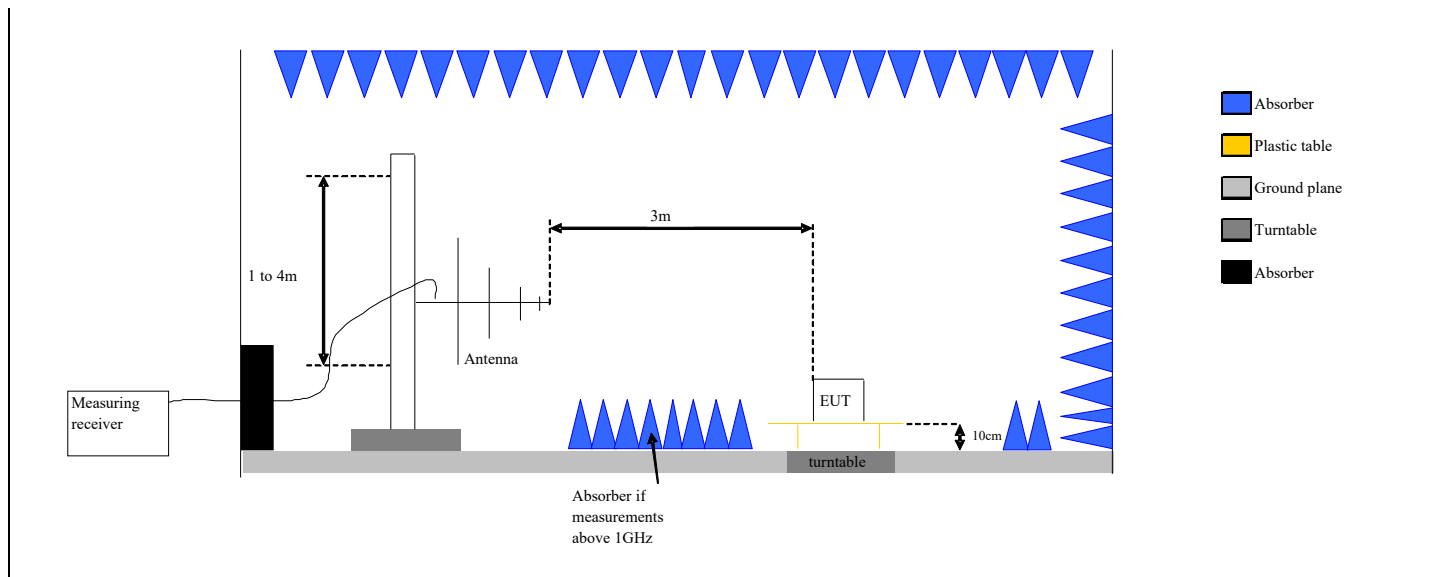
7.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013) and FCC part 15 subpart C. Test is performed in horizontal (H) and vertical (V) polarization with **bilog** between 30MHz & 1GHz and with a horn antenna above 1GHz. Measurement bandwidth was 120kHz below 1GHz and 1MHz above 1GHz. The level has been maximised by the turntable rotation of 360 degrees range on all axis of EUT used in normal configuration. The EUT is place at 1.5m high above 1GHz and at 0.8m high under 1GHz. The EUT is placed **in a full anechoic chamber** above 1GHz and **in a full anechoic chamber** from 30MHz to 1GHz. Distance between measuring antenna and the EUT is **10m**. The height antenna is varied from 1m to 4m from 30MHz to 1GHz and above 1GHz is :

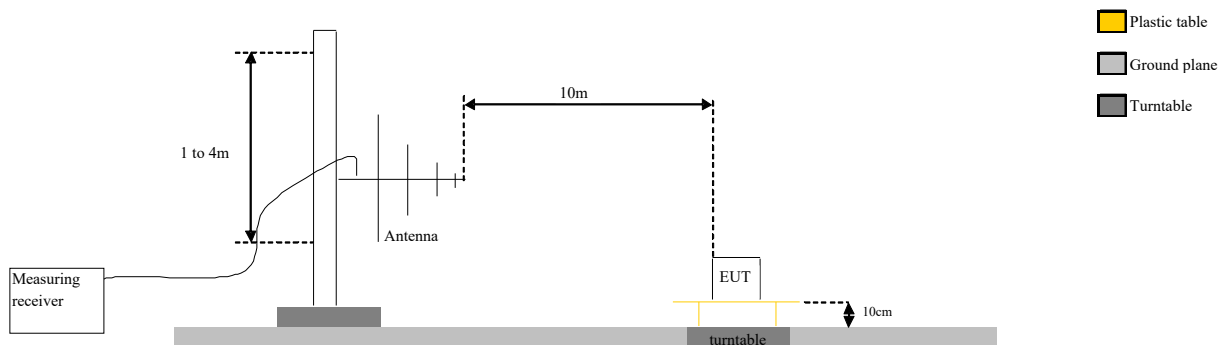
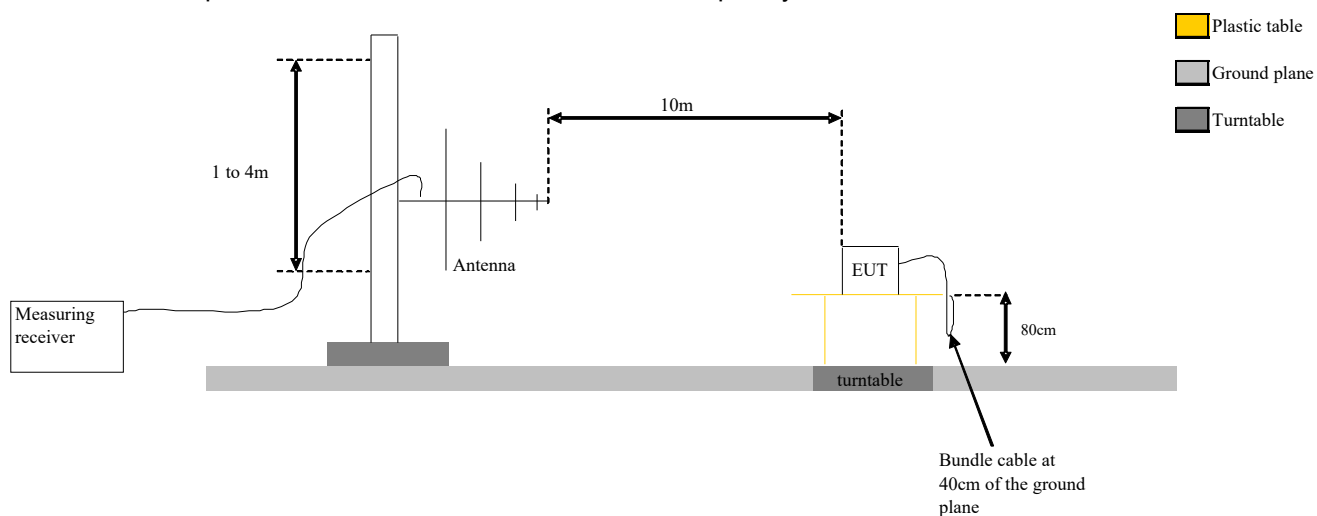
☒ On mast, varied from 1m to 4m

☐ Fixed and centered on the EUT (EUT smaller than the bandwidth of the measurement antenna, ANSI C63.10 §6.6.5)

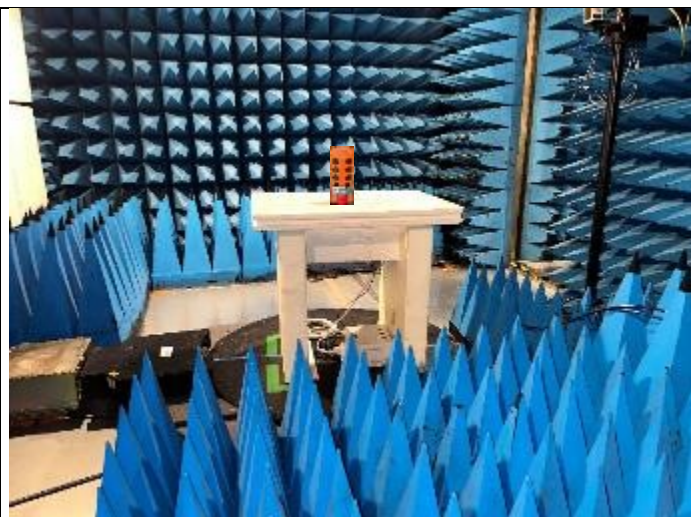
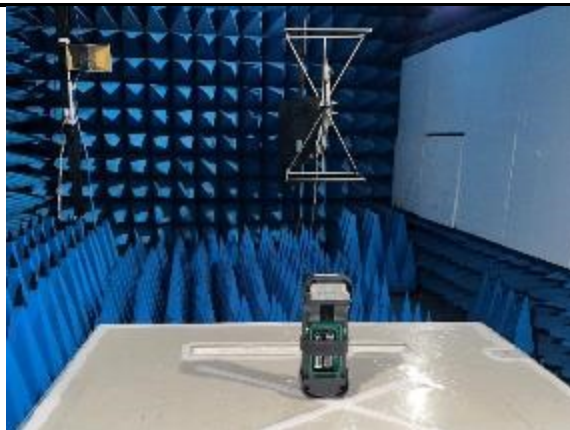




Test set up of Unwanted Emissions in Restricted Frequency Bands in semi anechoic chamber



Test Set up for radiated measurement in open area test site



Test setup under 1GHz



Test Setup above 1GHz

Photograph for Field strength of fundamental & Field strength of harmonics



7.3. LIMIT

§15.231		
Measure at 10m		
Frequency range	Level	Detector
260MHz to 470MHz	60.35-71.4dBμV/m	QPeak
Measure at 3m		
Frequency range	Level	Detector
260MHz to 470MHz	70.85-81.90dBμV/m	QPeak

7.4. TEST EQUIPMENT LIST

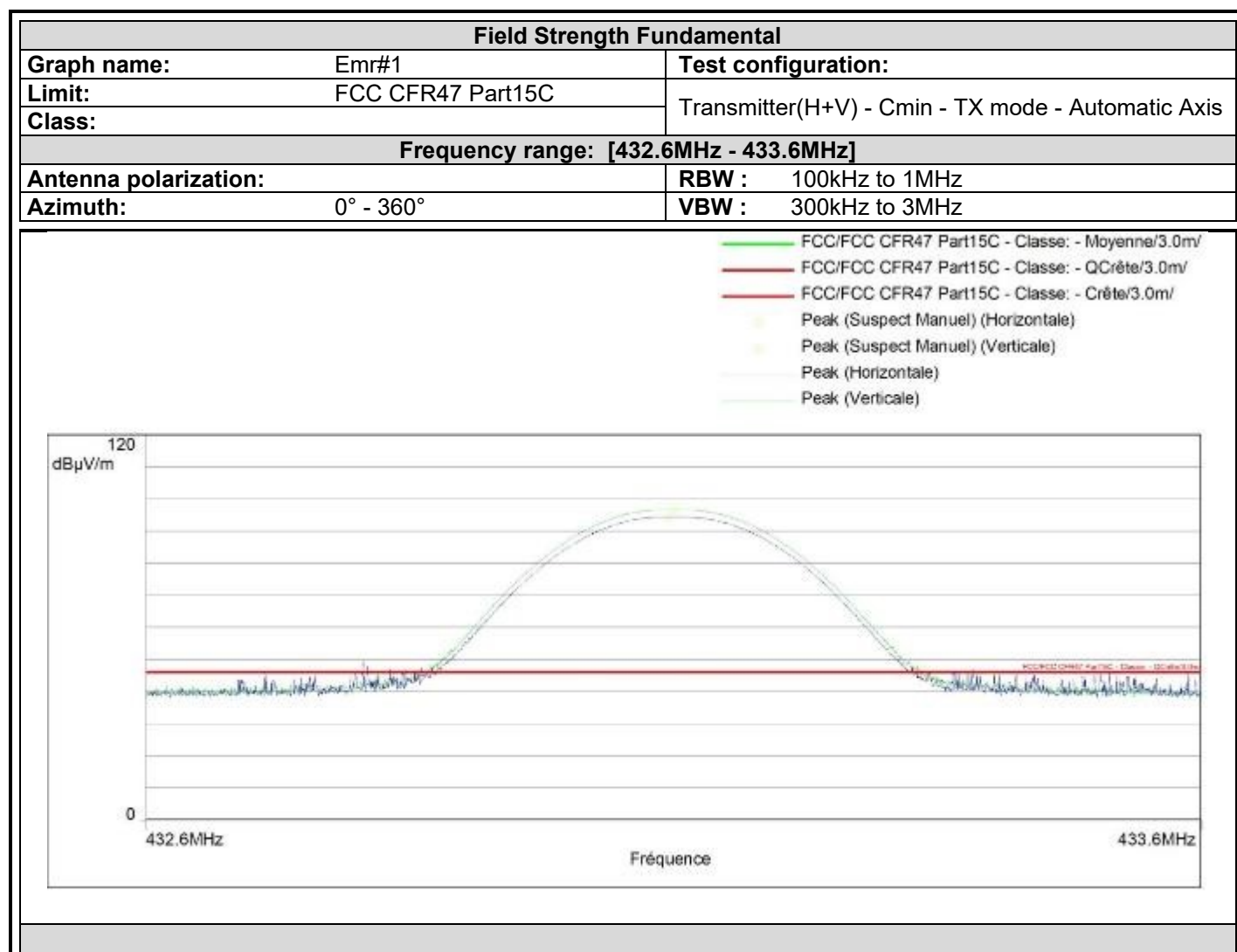
TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Amplifier 10MHz - 18GHz	LCIE SUD EST	—	A7102082	05/22	05/24
Antenna Bi-log	AH System	SAS-521-7	C2040180	02/21	02/23
Antenna horn 18GHz	EMCO	3115	C2042029	03/22	03/25
BAT EMC	NEXIO	v3.21.0.32	L1000115		
Cable 0.75m	-	18GHz	A5329900	08/22	08/24
Comb EMR HF	YORK	CGE01	A3169114		
CONTROLLER	INNCO	CO3000	D3044034		
Filtre 0.8GHz-18GHz	PASTERNAK	PE87FL1018	A7484075	12/22	12/24
Multimeter - CEM	FLUKE	189	A1240171	09/21	09/23
Rehausse Table C3	LCIE	—	F2000511		
Rehausse Table C3	LCIE	—	F2000507		
Semi-Anechoic chamber #3 (BF)	SIEPEL	—	D3044017_BF	04/22	04/25
Semi-Anechoic chamber #3 (VSWR)	SIEPEL	—	D3044017_VSWR	04/22	04/25
SMA Cable 18GHz 0.5m	TELEDYNE	18GHz	A5330059	02/23	02/24
SMA Cable 18GHz 0.5m	TELEDYNE	18GHz	A5330060	02/23	02/24
SMA Cable 18GHz 0.6m	TELEDYNE	18GHz	A5330055	02/23	02/24
SMA Cable 18GHz 3.5m	TELEDYNE	18GHz	A5330058	02/23	02/24
SMA Cable 18GHz 6m	TELEDYNE	18GHz	A5330057	02/23	02/24
Spectrum analyzer	ROHDE & SCHWARZ	FSU 26	A4060058	09/21	09/23
Table C3	LCIE	—	F2000461		
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	01/21	05/23
TILT	INNCO	TILT	D3044033		
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371		
Turntable controller (Cage#3)	ETS Lingren	Model 2090	F2000444		
Antenna Mat (OATS)	ETS Lingren	2071-2	F2000392		
Biconic Antenna	EATON	94455-1	C2040234	03/21	03/23
Cable (OATS)	—	1GHz	A5329623	09/22	09/23
Emission Cable	CABELTEL	6GHz	A5329069	05/22	05/23
Emission Cable	MICRO-COAX	1GHz	A5329656	08/22	08/23
Emission Cable	RADIALEX		A5329061	08/22	08/23
OATS	—	—	F2000409	07/22	07/23
Table C1/OATS	LCIE	—	F2000445		
Turntable (OATS)	ETS Lingren	Model 2187	F2000403		

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

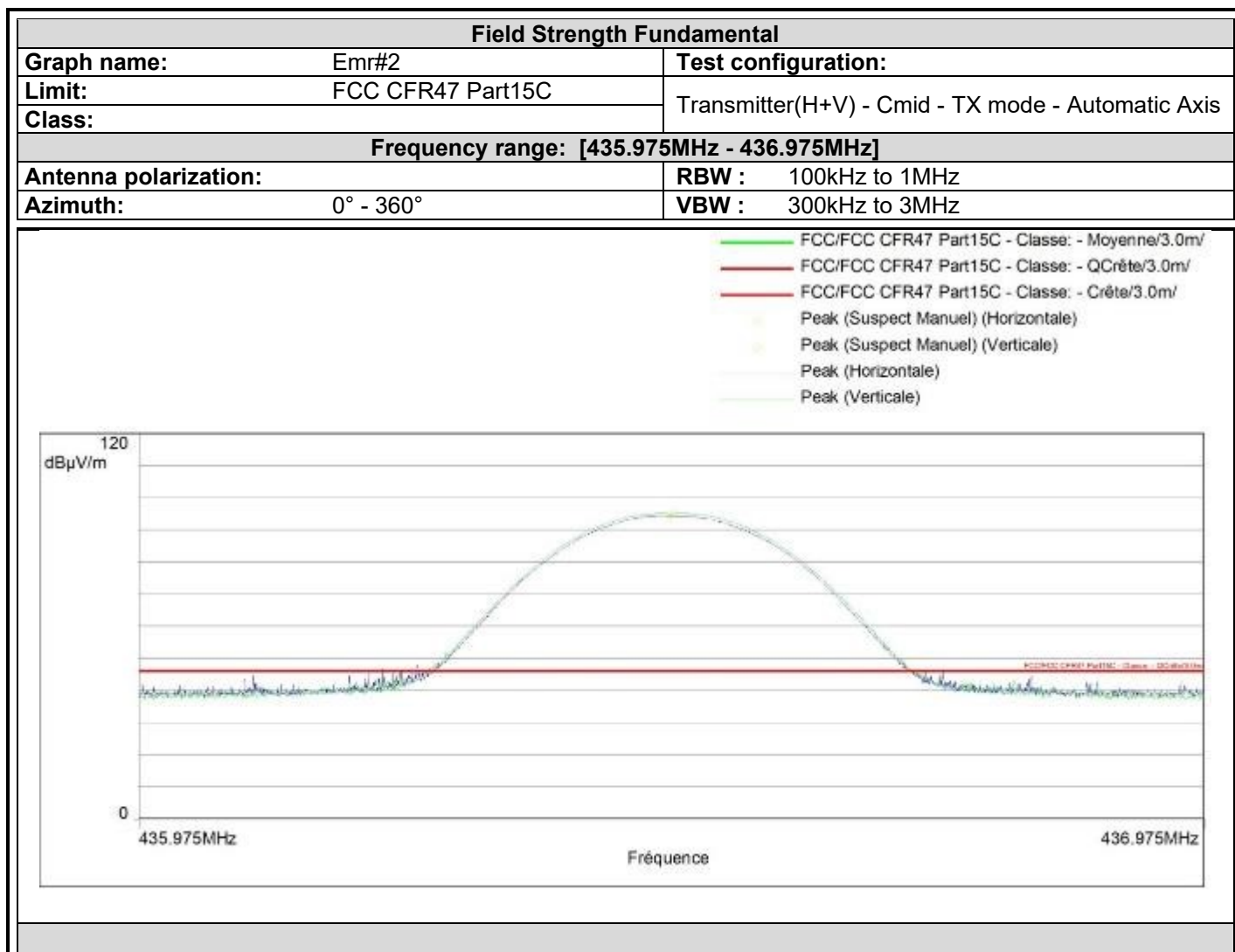
7.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None ☐ Divergence:

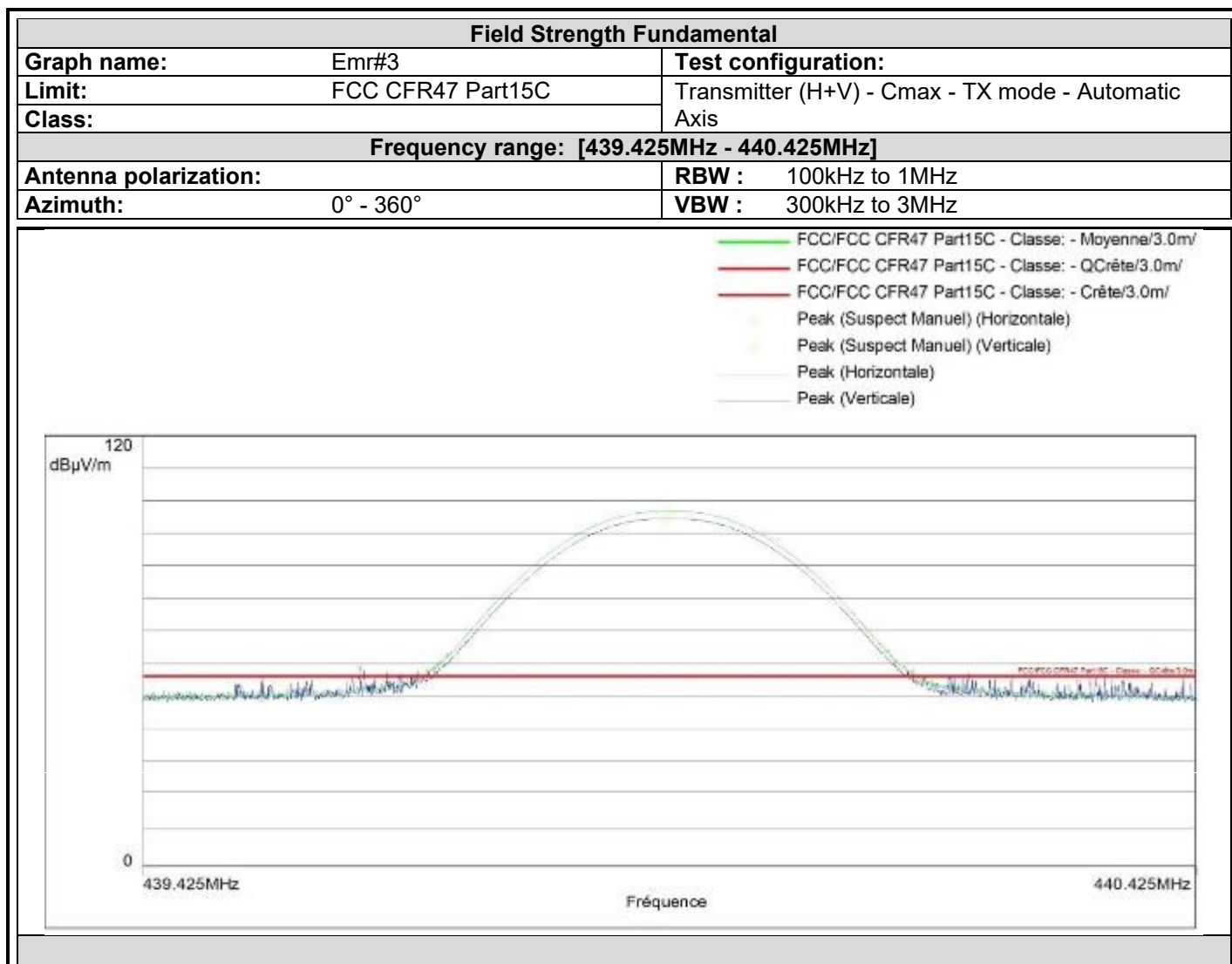
7.6. RESULTS



Frequency (MHz)	Peak (dBμV/m)	Lim.Q-Peak (dBμV/m)	Polarization	Correction (dB)
433.095	94.3	100.8	Horizontal	21.0
433.101	96.6	100.8	Vertical	21.0



Frequency (MHz)	Peak (dBµV/m)	Lim.Q-Peak (dBµV/m)	Polarization	Correction (dB)
436.473	94.2	100.8	Horizontal	20.8
436.476	95.0	100.8	Vertical	19.6



Frequency (MHz)	Peak (dBµV/m)	Lim.Q-Peak (dBµV/m)	Polarization	Correction (dB)
439.973	94.1	100.8	Horizontal	16.8
439.976	95.2	100.8	Vertical	16.6

Duty cycle/average factor calculations:

§15.35(c) When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed; the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

Duty cycle or average factor = $20 \times \log_{10} (Tx100ms/100ms)$

$Tx100ms = 8.25$ (see § 5.5)

= $20 \times \log_{10}(8.25/100)$

= -21.67 (20 dB duty cycle is the maximum allowable peak to average ratio)

Cmin								
Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Peak - Lim.Peak (dB)	Duty cycle Factor (dB)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Avg - Lim.Avg (dB)	Polarization
433.09	94.3	100.8	-6.5	20	74.3	80.8	-6.5	Horizontal
866.256	42.2	80.8	-38.6	20	22.2	60.8	-38.6	Horizontal
1735.6	47.3	74	-26.7	20	27.3	54	-26.7	Horizontal
2165.2	47.7	80.8	-33.1	20	27.7	60.8	-33.1	Horizontal
2598.4	47.7	80.8	-33.1	20	27.7	60.8	-33.1	Horizontal
3031.6	51.2	80.8	-29.6	20	31.2	60.8	-29.6	Horizontal
3464.8	44.8	80.8	-36	20	24.8	60.8	-36	Horizontal
433.09	96.6	100.8	-4.2	20	76.6	80.8	-4.2	Horizontal
866.204	41.7	80.8	-39.1	20	21.7	60.8	-39.1	Vertical
1299.2	42.6	74	-31.4	20	22.6	54	-31.4	Vertical

Cmid								
Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Peak - Lim.Peak (dB)	Duty cycle factor (dB)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Avg - Lim.Avg (dB)	Polarization
436.47	94.2	100.8	-6.6	20	74.2	80.8	-6.6	Horizontal
873.016	43.1	80.8	-37.7	20	23.1	60.8	-37.7	Horizontal
1309.2	38.4	74	-35.6	20	18.4	54	-35.6	Horizontal
1746	44	80.8	-36.8	20	24	60.8	-36.8	Horizontal
2182.4	48.3	80.8	-32.5	20	28.3	60.8	-32.5	Horizontal
2618.8	49.1	80.8	-31.7	20	29.1	60.8	-31.7	Horizontal
3055.6	50.9	80.8	-29.9	20	30.9	60.8	-29.9	Horizontal
3491.6	45.1	80.8	-35.7	20	25.1	60.8	-35.7	Horizontal
436.47	95	100.8	-5.8	20	75	80.8	-5.8	Vertical
873.016	43.6	80.8	-37.2	20	23.6	60.8	-37.2	Vertical

Cmax								
Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Peak - Lim.Peak (dB)	Duty cycle Factor (dB)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Avg - Lim.Avg (dB)	Polarization
439.922*	94.1	100.8	-6.7	20	74.1	80.8	-6.7	Horizontal
879.880**	42.9	80.8	-37.9	20	22.9	60.8	-37.9	Horizontal
2199.600**	47.4	80.8	-33.4	20	27.4	60.8	-33.4	Horizontal
2639.600**	48.2	80.8	-32.6	20	28.2	60.8	-32.6	Horizontal
3079.600**	47.6	80.8	-33.2	20	27.6	60.8	-33.2	Horizontal
3519.600**	45.4	80.8	-35.4	20	25.4	60.8	-35.4	Horizontal
439.944*	95.2	100.8	-5.6	20	75.2	80.8	-5.6	Horizontal
879.880**	40.4	80.8	-40.4	20	20.4	60.8	-40.4	Horizontal
1319.600**	40	74	-34	20	20	54	-34	Vertical
1759.600**	46.1	80.8	-34.7	20	26.1	60.8	-34.7	Vertical

7.7. CONCLUSION

Field strength of fundamental & Field strength of harmonics measurement performed on the sample of the product **CONDUCTIX wampfler** MK, SN: **230223101E1**, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 10** limits.

8. UNCERTAINTIES CHART

<i>Kind of measurement</i>	<i>Wide uncertainty laboratory</i>
Occupied Channel Bandwidth	±2.8 %
Humidity	±3.2 %
Power Spectral Density, Conducted	±1.7 dB
Radio frequency	±0.3 ppm
RF power, conducted	±1.2 dB
RF power, radiated (Full anechoic chamber above 1GHz)	±3.7 dB
RF power, radiated (Semi anechoic chamber & open test site)	±5.6 dB
Spurious emission, conducted	±2.3 dB
Spurious emission, radiated (Full anechoic chamber above 1GHz)	±3.8 dB
Spurious emission, radiated (Semi anechoic chamber & open test site)	±5.7 dB
Temperature	±0.75 °C
Time	±2.3 %
Voltage	±1.7 %

The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the standard. The conformity of the sample is directly established by the applicable limit values. This table includes all uncertainties maximum feasible for testing in the laboratory, whether or not made in this report.