

FCC Test Firm Designation Number: FR0014
ISED Wireless Device Testing Laboratory CAB Number: FR0004

Matériel testé : <i>Equipment under test:</i>	ST / STM32M157D-EV1 & STM32M157F-EV1 (MB1263) <i>(Trademark / Marketing name or product reference)</i>
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Demandeur:
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Client :
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Marque commercial :
Trademark : **ST**

Référence de la proposition : 102019-23820
Proposal number:

Numéro d'affaire : 13300
Work number :

Date de l'essai : Du 5 au 6 mai 2020
Date of test: May 5th to 6th, 2020

Objectif des essais : EMC qualification according to standard CFR 47, FCC Part 15, Subpart B
Test purpose: & ISED Canada ICES-003 (Issue 6/2016)
Device Type: Class A Digital Device
Measurement standard: ANSI C63.4 (2014)

Lieu du test: SMEE, Rue de Taille
Test location: 38500 VOIRON - France

Test réalisé par : Géraldine Guyennot
Test realized by:

Conclusion : L'équipement satisfait aux prescriptions et essais des normes citées en
Conclusion: référence.
The appliance complies with requirements and tests of above mentioned standards.

Ed.	Date	Modifications Pages	Written by : Visa	Approved by: Visa
1	May 25 th , 2020	Initial Edition	Géraldine Guyennot <i>Test operator</i>	Laurent CHAPUS <i>Technical Manager</i>

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Contents

1. NORMATIVE REFERENCES.....	3
2. TEST SYNTHESIS.....	4
3. EQUIPMENT UNDER TEST (EUT).....	5
4. TEST CONDITIONS.....	6
5. MODIFICATIONS OF THE EUT.....	6
6. SPECIAL ACCESSORIES	6
7. MEASUREMENT UNCERTAINTY	6
8. FIELD STRENGTH CALCULATION	6
9. CONDUCTED EMISSION MEASUREMENT (150KHZ-30MHZ).....	8
10. RADIATED EMISSION MEASUREMENT (30MHZ-5GHZ)	11

1. Normative references

Standard:

FCC qualification according to:		
Standards	Applied	Title
ANSI C63.4 (2014)	X	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
CFR47, Part 15	X	Telecommunication – Federal Communication Commission – Radio frequency devices, Subpart B — Unintentional Radiators. Sections 15.107 / 15.109

ISED Canada qualification according to:		
Standards	Applied	Title
ANSI C63.4 (2014)	X	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ICES-003	X	ISED Canada ICES-003 (Information Technology Equipment (ITE)) — Limits and methods of measurement. Issue 6 (2016)

Deviation from the standard: None.

2. Test synthesis

Class A digital device:

EMISSION TEST	LIMITS			RESULTS
Conducted emissions at power supply ports 150kHz-30MHz	Frequency	Quasi-Peak (dBμV)	Average (dBμV)	PASS
	150-500kHz	79	66	
	0.5-30MHz	73	60	
Radiated emissions 30MHz-5GHz	Measure at 3m			PASS
	Frequency		Limit (dBμV/m) / Detector	
	30-88MHz		49.5 / QP	
	88-216MHz		54.0 / QP	
	216-960MHz		56.9 / QP	
	960MHz-1GHz		60.0 / QP	
	Above 1GHz		60.0 / AV 80.0 / PK	

- General conclusion:**

Measures and tests performed on the sample of the product *STM32M157D-EV1* / *STM32M157F-EV1* in configuration and description presented in this test report, show compliance with standards FCC CFR 47, PART 15, Subpart B and ICES-003 for a class A digital device.

3. Equipment Under Test (EUT)

Nom /
Identification

**STM32M157D-EV1 & STM32M157F-EV1
(MB1263)**

The equipment is composed with :

- MPU subsystem Daughterboard MB1263 (Sn: A192900007)
- Mother board MB1262-C01 (Sn: 201200090)
- LCD board (MIPI 720p) : MB1230-C01 (Sn:201200023)
- Camera board MB1379-A02 (Sn:201200079)

Alimentation /
Power supply

5V DC from external power adapter

Auxiliaires /
Auxiliaries

- Power adapter CINCON TR15RA050 (5V DC / 2A)
- Laptop ACER, model ASPIRE 1 A114-31 series (with its power supply unit) Ref: 1014399
- ADSL modem router NETGEAR DG834 (with its power supply unit) Ref: IT-0417016
- mini speaker MCL (with its power supply unit) Ref: 1014399
- USB-UART DB9 adapter
- 1 micro A/B to A adapter + 1 USB memory stick (on CN16)
- 4 USB memory stick (on CN18 & CN20)
- Loopback CAN connector (on CANFD)

Entrées-Sorties /
Input / Output

	Câbles pour essai / Cables for test	Blindé / Shielded	Prévu pour >3m / Intended for >3m
AC power cable	1m (2 wires)	No	AC mains
5Vdc supply, Power jack (Attached to power adapter)	1.7m (2 wires)	No	No
ST-LINK/V2-1 (µUSB)	1m	yes	No
Ethernet (1Gbps)	RJ45 Cat5e, 1.5m	Yes	Yes
CANFD (SubD 9pts)	1.8m (SubD9)	Yes	Yes
UART (SubD 9pts)	1.8m (SubD9)	Yes	Yes
Headset, Jack	1.3m (Audio cable)	No	No
Speaker Out, Jack	1.8m1.3m (Audio cable)	No	No
USB-OTG HS (USB Key)	0.2m	Yes	No
USB HOST (USB Key)	(1)	-	-
USB HOST (USB Key)	(1)	-	-
USB HOST (USB Key)	1.8m	Yes	No
USB HOST (USB Key)	1.8m	Yes	No
SPDIF Input (RCA)	1m	No	No
SPDIF Output (RCA)	1m	No	No
µSD Card connector	(1)	-	-
Smart Card connector	(1)	-	-

(1): USB keys / µSD card / Smart card directly plugged in connector.

Version programme /
Firmware version

Demo Software version

Mode de fonctionnement /
Running mode

Powered by 5V via external power adapter.
The UART4 port is connected to the PC via USB-UART DB9 adapter.
The Ethernet port of EUT and of the PC are connected to the router.
The mini speaker is plugged to Headset connector.
Following tests are performed (Commands sent from terminal window on the PC), for conducted / radiated emission :

- Read video contained in memory key on CN18 UP + audio out on headset
- Show camera on LCD
- Send CAN commands in loop
- Combination of Memory key on CN18 Up (Log) and Memory key on CN20 Down

- Ethernet ping with the router and keep execution log on key CN18 UP

**Fréquence max interne EST /
Max internal EUT frequency** 1GHz

**Microcontrôleur de la carte /
Board's MCU** STM32MP157DAA1 / STM32MP157FAA1

**Gamme de produit certifiée /
Family Certification
Description** Two models are covered by the certification:
- STM32MP157F-EV1
- STM32MP157D-EV1
Both models have same hardware configuration. The STM32MP157D-EV1 is fitted with the STM32MP157DAA1 CPU, which has no secure boot and no cryptography (AES256, TEDS) compared to the STM32MP157FAA1.
All tests have been performed with the STM32MP157F-EV1 evaluation board.

Note: All information contain above are from manufacturer declaration.

4. Test conditions

Power supply voltage:
Equipment under test : 5V DC
AC mains : 110V/60Hz for conducted emissions
: 230V/50Hz for radiated emissions

5. Modifications of the EUT

None

6. Special accessories

None required for compliance with emission limits.

7. Measurement Uncertainty

Test Description	Expanded uncertainty
Conducted emissions test (150k-30MHz, AC mains)	± 3.5dB
Radiated emission test (9kHz-30MHz, electric field)	± 4.0dB
Radiated emission test (30-300MHz, OATS)	± 5.6dB
Radiated emission test (300-1000MHz, OATS)	± 5.3dB
Radiated emission test (1-40GHz, OATS / FAC)	± 5.6dB
Temperature	± 1°C
AC and DC voltage	±1%

Note: Expanded uncertainty at 95% confidence (k=2)

8. Field Strength Calculation

The field strength (level) is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation is as follow:

$$FS = RA + AF + CF - AG$$

Where FS = Field Strength (Level)

RA = Receiver Amplitude (Meter Reading)

AF = Antenna Factor

CF = Cable Factor



AG = Amplifier Gain

Total factor = AF+CF-AG

Margin value = Emission level – Limit value

Example:

RA: 14.0dBμV / AF: 16.5 dBm⁻¹ / CF: 3.5dB / AG: 15dB

→ Total factor: 5dBm⁻¹

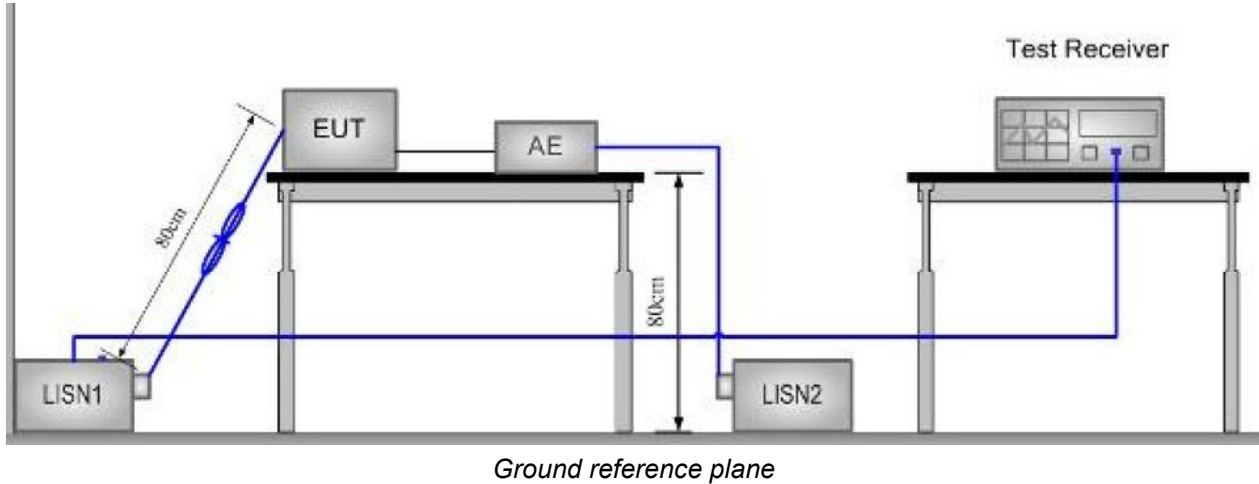
→ Field level: 19.0dBμV/m (-21.0dB for margin if limit is 40dBμV/m)

9. Conducted Emission Measurement (150kHz-30MHz)

TEST: Limits for conducted disturbance 150kHz – 30MHz				Verdict
Method: The LISN is placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane. This distance was between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment were at least 0,8 m from the AMN. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on lines were made at the output of the LISN. The EUT is 80cm above the ground reference plane and 40cm from the vertical ground plane. The AC power cable is 1m length.				Pass
Laboratory Parameters:		Required prior to the test		During the test
Ambient Temperature		20 to 30 °C		25°C ± 2
Relative Humidity		25 to 65 %		52% ± 5
Fully configured sample scanned over the following frequency range		Frequency range on each side of line		Measurement Point
		150kHz to 30MHz		AC input port (110V)
Limits				
Frequency (MHz)	Limit dB (µV)			
	Quasi-Peak	Result	Average	Result
0.15 – 0.50	79	Pass	66	Pass
0.50 - 30	73	Pass	60	Pass
Supplementary information: Test location: SMEE Test date: May 5 th , 2020 by Géraldine Guyennot Power supply voltage: 5V DC / AC mains: 110V / 60Hz				

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Attenuator / limiter	SMEE	ATT#2	ATT-171-010	2019/6	2020/6
Cable RF	Div	1m	CAB-101-021	2020/4	2021/4
LISN (50Ω / 50µH) (Meas.)	AFJ	LS16C	RSI-101-001	2019/6	2021/6
LISN (50Ω / 50µH) (Aux.)	AFJ	LS16C	RSI-101-002	2019/6	2021/6
Measuring receiver	Rohde&Schwarz	ESRP	REC-151-002	2019/9	2021/9
Ref. Comb generator	SMEE	EMCT-250K	REF-141-004	-	-
EMC Software	NEXIO	BAT EMC V3.18	SOF-101-002	-	-

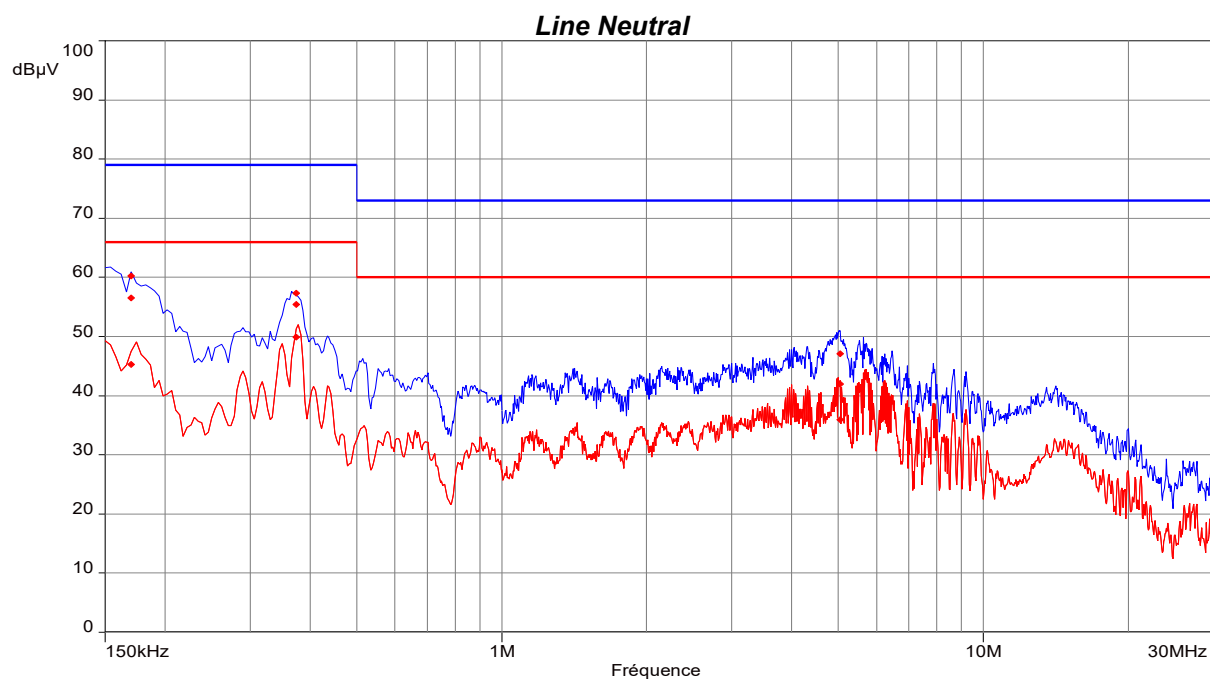
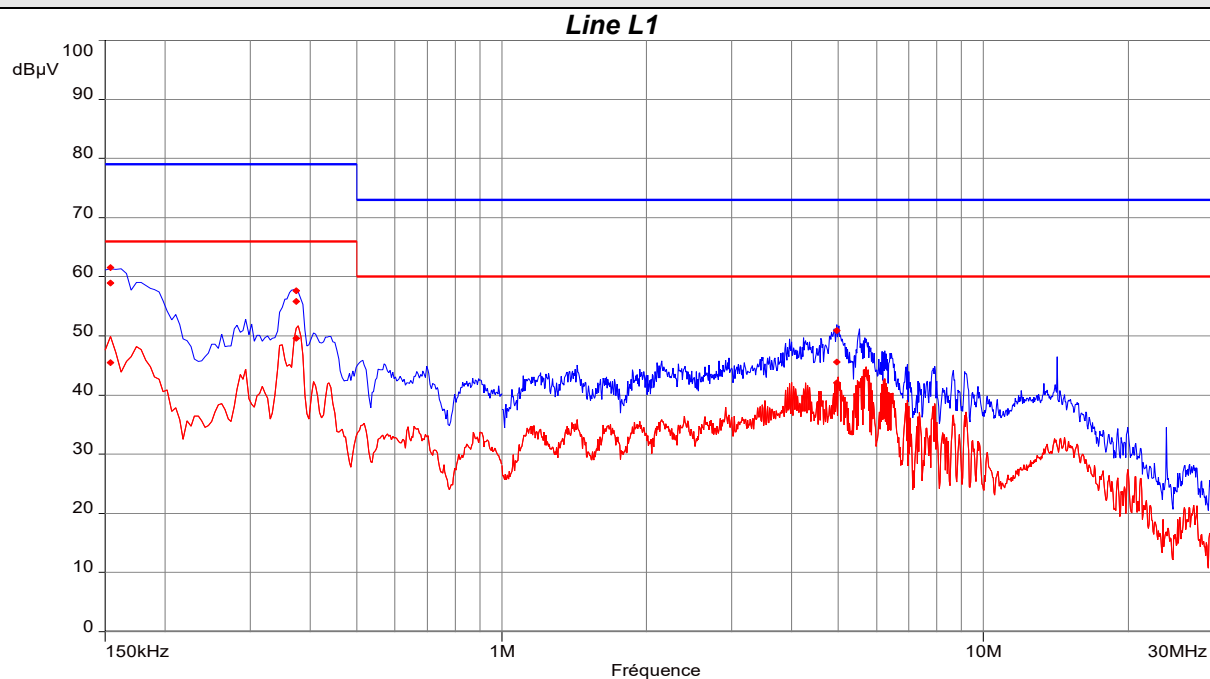
Test Setup for conducted emission



Tabulated Results for Mains Terminal Disturbance Voltage on AC port

FREQ (MHz)	Meas. PK (dBμV)	Mes. QP (dBμV)	LIMIT QP (dBμV)	Margin QP (dB)	Mes. AV (dBμV)	LIMIT AV (dBμV)	Margin AV (dB)	Line
0.1542	61.52	58.97	79	-20.03	45.49	66	-20.51	L1
0.3735	57.66	55.82	79	-23.18	49.56	66	-16.44	L1
4.9608	50.96	45.61	73	-27.39	42.06	60	-17.94	L1
0.1716	60.21	56.53	79	-22.47	45.33	66	-20.67	N
0.3749	57.31	55.4	79	-23.6	49.94	66	-16.06	N
5.0458	47.12	41.93	73	-31.07	35.97	60	-24.03	N
Frequency band investigated:		150kHz-30MHz						
RBW:		9kHz						
Voltage:		110V / 60Hz						
Limit:		15.107 / ICES-003, Class A						
Final measurement detector:		Quasi-Peak and CISPR Average (AV)						
RESULT:		PASS						
Measured value calculation:		The measured value (level) is calculated by adding the Cable Factor, the Transient suppressor attenuation and LISN attenuation from the receiver amplitude reading. The basic equation is as follow: Meas. = RA + CF + ATT_{TRAN} + ATT_{LISN} Where Meas. = Level (dBμV) RA = Receiver Amplitude CF = Cable Factor ATT_{TRAN} = Transient suppressor attenuation ATT_{LISN} = LISN attenuation Margin value = Emission level – Limit value						

Graphical representation of Conducted Disturbance Measurement (Peak and Average detection) AC port (5V DC power adapter) – Video mode



Note : Same results for all running modes.

---: Peak

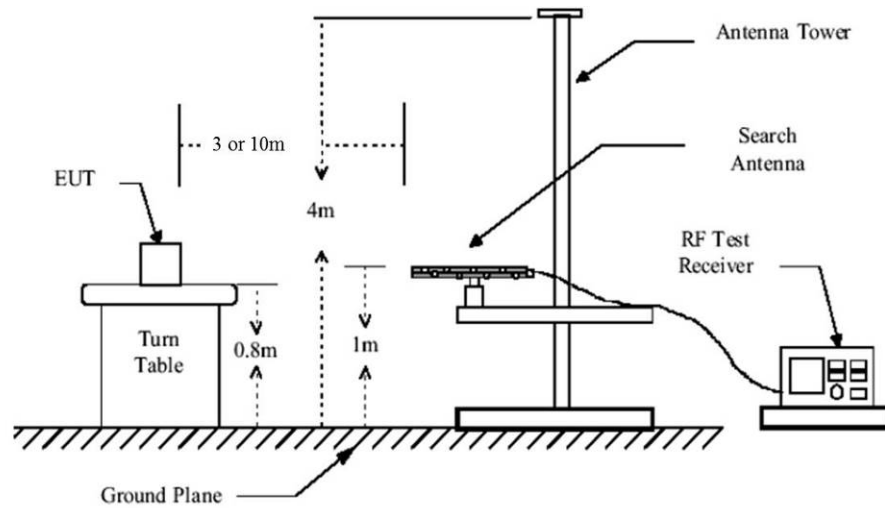
---: Average

10. Radiated Emission Measurement (30MHz-5GHz)

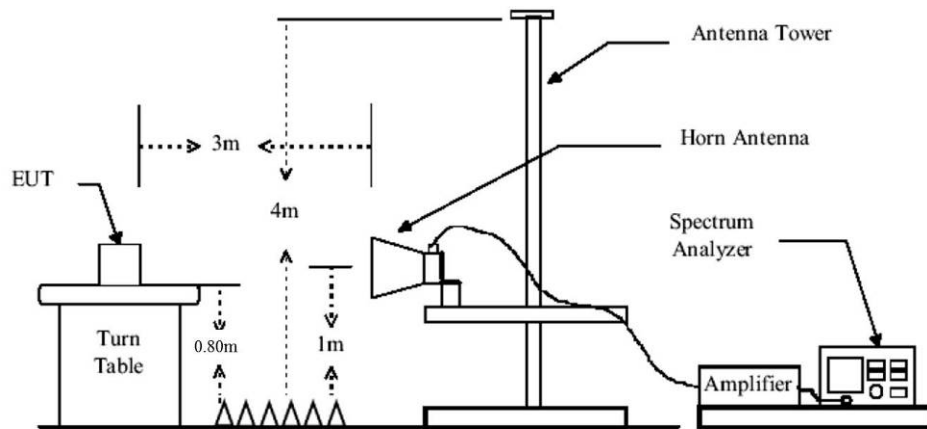
TEST: Limits for radiated disturbance 30 MHz – 5 GHz		Verdict
Method: Measurements were made in a 3-meter Open Area Test Site (OATS) that complies to ANSI C63.4 and CISPR 16-1-4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3 meter. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements (Peak, Quasi-peak, Average) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable. A pre-scan frequency identification of the EUT has been performed in full anechoic chamber. The measured radiated field of the EUT is realised at 3-meters of distance. Antenna is 1.25-meters high. The pre-characterization graphs are obtained in PEAK detection. (Max-hold of continuous 360° rotation)		Pass
Laboratory Parameters:	Required prior to the test	During the test
Ambient Temperature	20 to 30 °C	24°C ± 2
Relative Humidity	25 to 65 %	51% ± 5
Fully configured sample scanned over the following frequency range	Frequency range on each side of line	Measurement Point
	30MHz – 1GHz	3 m measurement distance
	1GHz – 5GHz	3 m measurement distance
Limits		
Frequency (MHz)	Limit (dBµV/m)	
	Level / Detector / Distance	Results
30 to 88	49.5 / QP / 3m	Pass
88 to 216	54.0 / QP / 3m	Pass
216 to 960	56.9 / QP / 3m	Pass
960 to 1000	60.0 / QP / 3m	Pass
Above 1GHz	60.0 / AV / 3m 80.0 / PK / 3m	Pass
Supplementary information: Test location: SMEE Test date: May 6 th , 2020 by Géraldine GUYENNOT Power supply voltage: 5V DC / AC mains: 230V / 50Hz		

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Biconnic antenna	COM-POWER	AB- 900	ANT-101-003	2019/6	2021/6
BiConiLog antenna	EMCO	3142B	ANT-101-010	2019/8	2021/8
Horn antenna	ETS-LINDGREN	3115	ANT-141-013	2018/10	2020/10
Log-periodic antenna	EMCO	3146	ANT-191-019	2019/6	2021/6
RF cable	Div	OATS/25m	CAB-101-017	2020/4	2021/4
RF cable	Pasternack	PE302-120/3m	CAB-131-024	2020/4	2021/4
RF cable	HUBER+SUHNER	RG214U/3m	CAB-141-026	2020/4	2021/4
RF cable	HUBER+SUHNER	RG214U/3m	CAB-141-029	2020/4	2021/4
RF cable	HUBER+SUHNER	SF104/3m	CAB-141-030	2020/4	2021/4
Anechoic chamber	COMTEST	214263	CAG-141-001	2017/6	2020/6
OATS	Div	3/10m	SIT-101-001	2017/7	2020/7
Antenna mast	Innco- Systems	MA4000EP	MAT-101-001	-	-
Turntable	Innco- Systems	DS1200S	PLA-101-001	-	-
Turntable	Innco- Systems	CT0800	PLA-141-002	-	-
Measuring Rec	Rohde&Schwarz	ESRP	REC-151-002	2019/9	2021/9
Ref. Comb generator	SMEE	EMR-10M	REF-111-002	-	-
EMC Software	NEXIO	BAT EMC V3.18	SOF-101-001	-	-

Test Setup for radiated emission



Test setup for 30MHz-1GHz



Test setup for 1-5GHz

Tabulated Results for Radiated Disturbance (3m measurement on Open Area Test Site, 30MHz-1GHz)

FREQ	Meter reading	Meter reading	Total factor	Field level	Field level	Pol	Antenna height	Table angle	Limit	Margin
MHz	(QP) dBμV	(Pk) dBμV	dB	(QP) dBμV/m	(Pk) dBμV/m		cm	Degree	(QP) dBμV/m	dB
132.200	27.5	36.7	13.9	41.4	50.6	V	110	300	54	-12.6
144.180	28.1	35.9	13.7	41.8	49.6	V	100	330	54	-12.2
168.000	25.4	29.6	15.9	41.3	45.5	V	100	190	54	-12.7
374.990	29.6	31.3	17.8	47.4	49.1	V	140	300	56.9	-9.5
432.500	25.6	27.2	19.4	45.0	46.6	H	100	320	56.9	-11.9
624.980	28.2	31.0	23.4	51.6	54.4	H	140	220	56.9	-5.3

Supplementary information:

Frequency list measured on the Open Area Test Site has been created with pre-scan results.

Worst case results shown for all running modes.

Frequency band investigated:	30MHz-1GHz
RBW:	120kHz
Measurement distance:	3m
Limit:	FCC Part 15.109 / ICES-0003, Class A
Final measurement detector:	Quasi-Peak
RESULT:	PASS

Tabulated Results for Radiated Disturbance (3m measurement on Open Area Test Site, 1GHz-5GHz)

FREQ	Meter reading	Meter reading	Total factor	Field level	Field level	Pol	Ant height	Table angle	Limit	Limit	Margin	Margin
MHz	(PK) dBμV	(AV) dBμV	dB	(PK) dBμV/m	(AV) dBμV/m		cm	Degree	(PK) dBμV/m	(AV) dBμV/m	(PK) dB	(AV) dB

Levels are at least 10dB below applicable limits

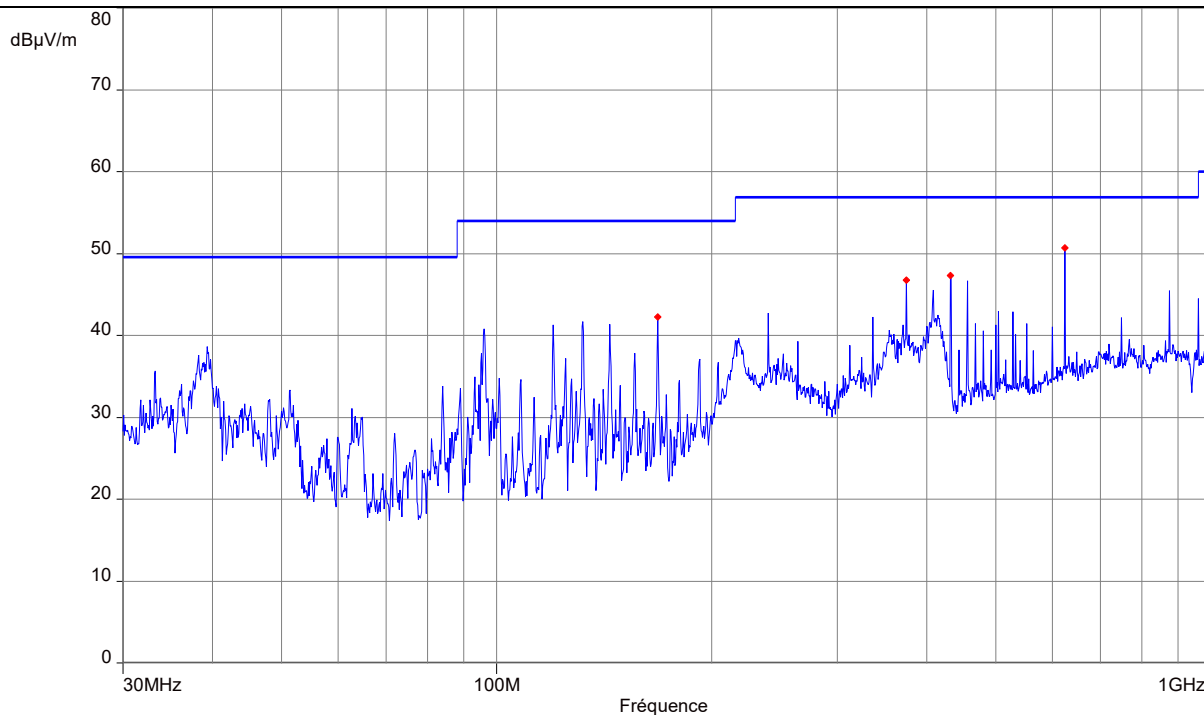
Supplementary information:

Frequency list measured on the Open Area Test Site has been created with pre-scan results.

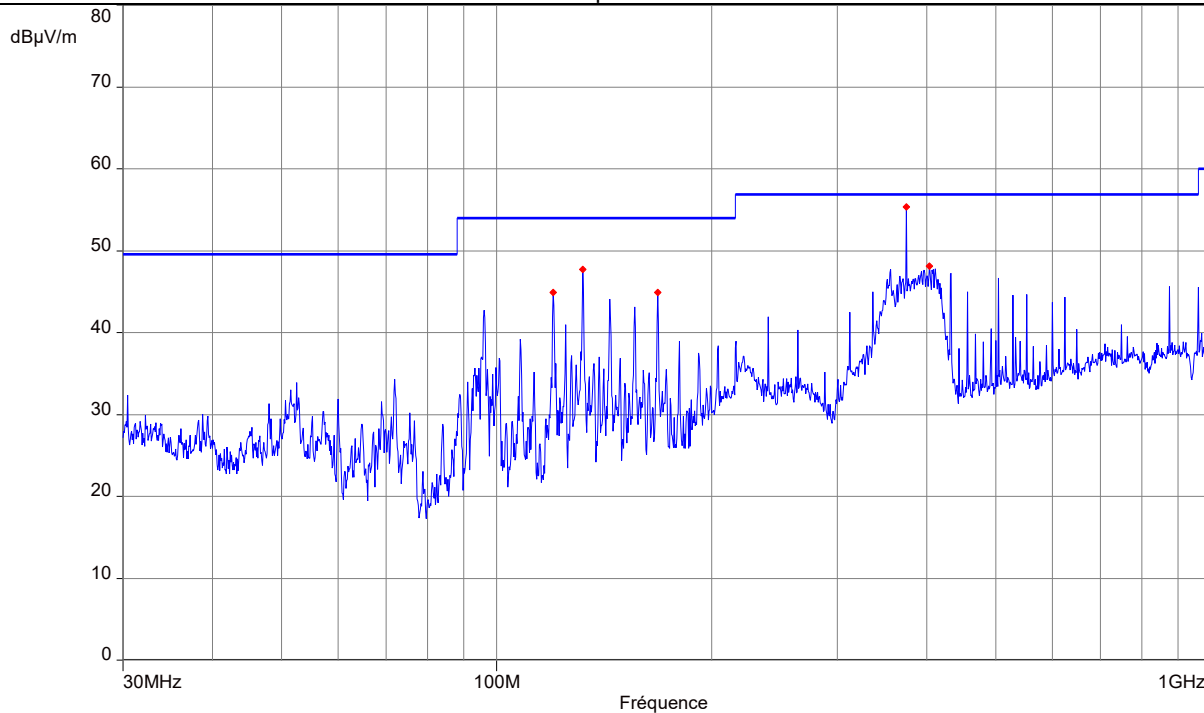
Frequency band investigated:	1GHz-5GHz
RBW:	1MHz
Measurement distance:	3m
Limit:	FCC Part 15.109 / ICES-0003, Class A
Final measurement detector:	Peak (PK) / CISPR Average (AV)
RESULT:	PASS

Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 30MHz-1GHz / 3m) – Video mode

Horizontal polarization



Vertical polarization



----- : Peak measure

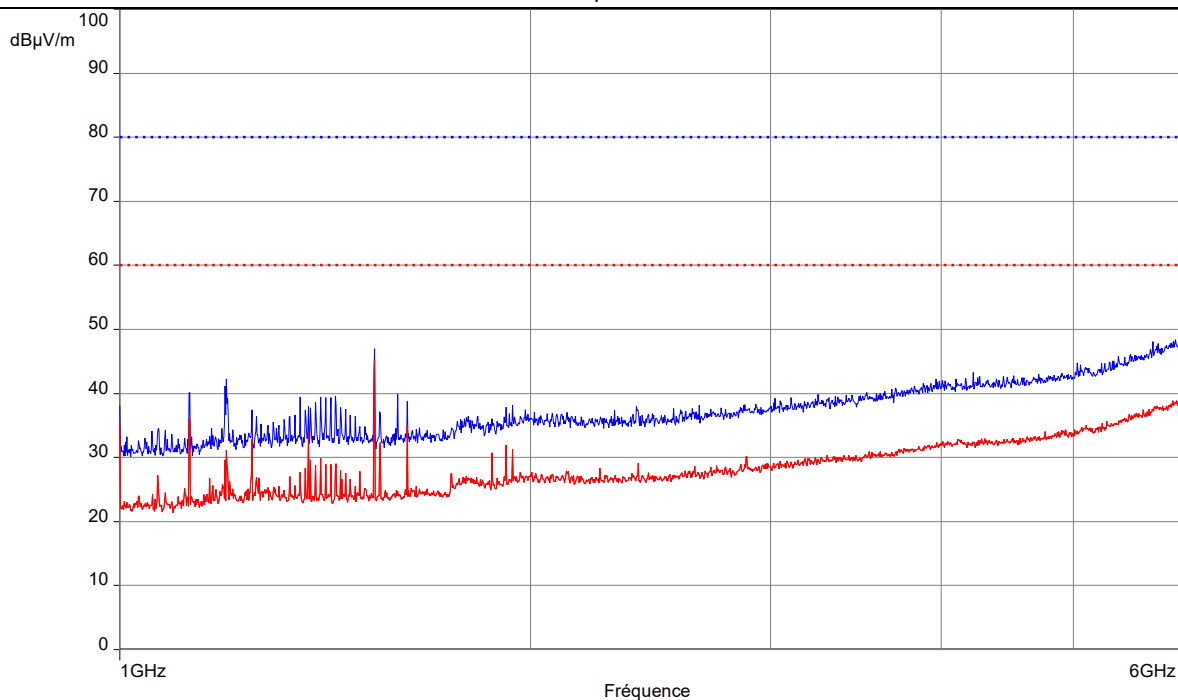
----- : Class A limit (3m)

Note: - Pre-scan graph only for identification purpose.
- Worst case results shown for video mode.

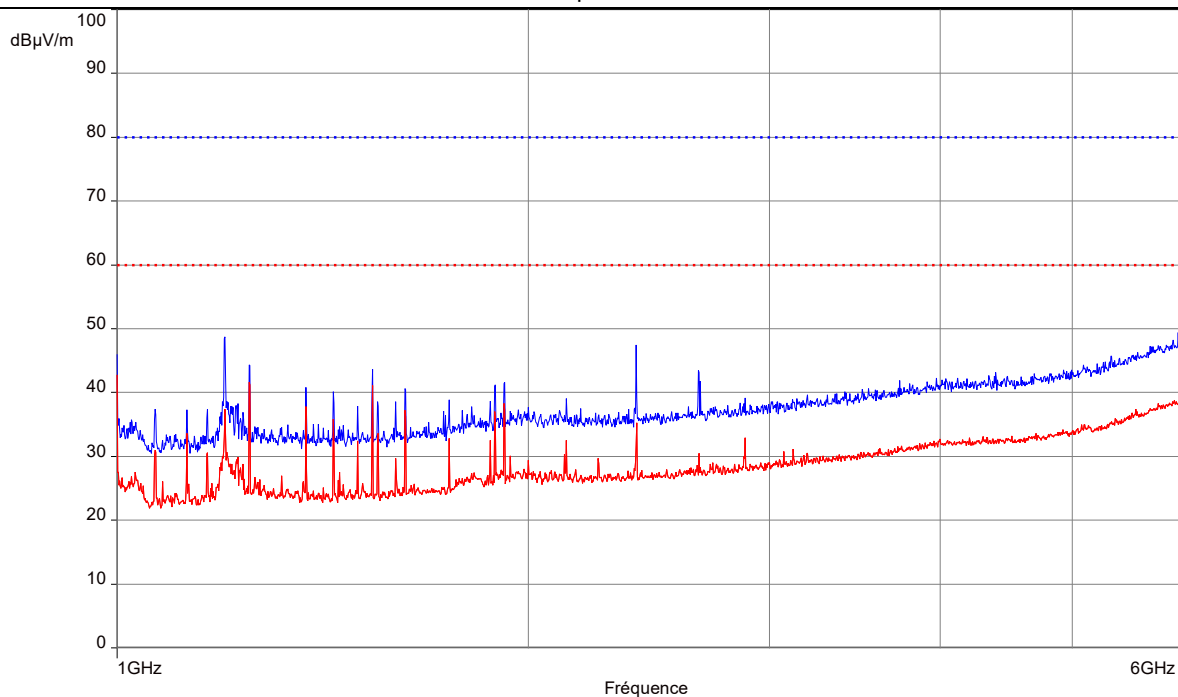
PEAK LIST			
Frequency (MHz)	Peak Level (dBμV/m)	Limit (dBμV/m)	Polarization
168.138	42.29	54.0	H
374.967	46.77	56.9	H
432.381	47.31	56.9	H
624.962	50.72	56.9	H
120.092	44.89	54.0	V
132.126	47.74	54.0	V
168.138	44.93	54.0	V
374.997	55.33	56.9	V
404.038	48.08	56.9	V

Graphical representation of Radiated Disturbance Measurement (Peak & AV detection, anechoic chamber pre-scan, 1GHz-5GHz / 3m) – Video mode

Horizontal polarization



Vertical polarization



----- : Peak measure / limit

----- : Average measure / limit

Note: - Pre-scan graph only for identification purpose.

PEAK LIST

Frequency (MHz)	Average Level (dBμV/m)	Limit (dBμV/m)	Polarization
-----------------	------------------------	----------------	--------------

Levels are at least 10 dB below applicable limits