

Matériel testé :
Equipment under test:

ST / NUCLEO-H503RB (MB1814)
(Trademark / Marketing name or product reference)

Client / Demandeur:
Customer / Applicant : **STMicroelectronics**
9-11, rue Pierre Félix Delarue
72100 Le Mans – France

Rapport délivré à :
Issued to: **STMicroelectronics**
Yannick CAROFF
9-11, rue Pierre Félix Delarue
72100 Le Mans – France

Marque commercial :
Trademark : **ST**

Référence de la proposition :
Proposal number: 122022-25882

Numéro d'affaire :
Work number : 14876

Date de l'essai :
Date of test: Du 6 au 13 janvier 2023
January 6th to 13th, 2023

Objectif des essais :
Test purpose: Qualification CEM (Directive 2014/30/EU) suivant normes :
EMC (2014/30/EU Directive) qualification according to standards :
- EN 55032 (2015+A11/2020)
- EN 55035 (2017+A11/2020)

Lieu du test:
Test location: SMEE, 385 rue René Rambaud
38500 VOIRON - France

Test réalisé par :
Test realized by: Géraldine GUYENNOT

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

Ed.	Date	Modifications Pages	Written by:	Approved by: Visa
1	January 19 th , 2023	Initial Edition	Géraldine GUYENNOT <i>Test operator</i>	Laurent CHAPUS <i>Technical Manager</i>

La copie de ce document n'est permise que sous sa forme intégrale. Ce document est le résultat d'essais effectués sur un échantillon. Il ne préjuge pas de la conformité de l'ensemble des produits fabriqués à l'objet essayé. Pour la déclaration de conformité de l'équipement, il n'est pas tenu compte de l'incertitude de mesure. Cette nouvelle édition de ce rapport annule et remplace l'édition précédente.

Les modifications apportées à une nouvelle édition de ce rapport sont signalées par un trait vertical à gauche de la page.

This document shall not be reproduced, except in full. This document contains results related only to the item tested. It does not imply the conformity of the whole production to the item tested. For the declaration of conformity of the equipment, the measurement uncertainty is not taken into account.

This new edition of this report cancels and replaces the previous edition.

Changes made to a new edition of this report are indicated by a vertical line to the left of the page.

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Sommaire / Contents

1. REFERENCES NORMATIVES / <i>NORMATIVE REFERENCES</i>	3
2. SYNTHESE DES ESSAIS / <i>TEST SYNTHESIS</i>	4
3. EQUIPEMENT SOUS TEST (EST) / <i>EQUIPMENT UNDER TEST (EUT)</i>	6
4. CRITERE DE PERFORMANCE EN IMMUNITE / <i>IMMUNITY PERFORMANCE CRITERIA</i>	7
5. CONDITIONS PENDANT LES ESSAIS / <i>TEST CONDITIONS</i>	7
6. MODIFICATIONS DE L'EST / <i>MODIFICATIONS OF THE EUT</i>	7
7. RADIATED EMISSION MEASUREMENT (30MHZ-2GHZ)	8
8. IMMUNITY TO ELECTROSTATIC DISCHARGES (EN 61000-4-2)	14
9. RF ELECTROMAGNETIC FIELDS IMMUNITY (EN 61000-4-3)	16

1. Références Normatives / Normative references

Norme / Standard	Appliquée / Applied	Titre / Title
EN 55032 (2015+A11/2020)	X	Compatibilité électromagnétique des équipements multimédia — Exigences d'émission
CISPR 32 (2015+A1/2020)	X	<i>Electromagnetic compatibility of multimedia equipment — Emission requirements</i>
EN 55035 (2017+A11/2020)	X	Appareils de traitement de l'information — Caractéristiques d'immunité — Limites et méthodes de mesure.
CISPR 35 (2016)	X	<i>Information technology equipment – Immunity characteristics – Limits and methods of measurement</i>
EN 61000-4-2 (2009)	X	Essais d'immunité aux décharges électrostatiques / <i>Electrostatic discharge immunity test</i>
IEC 61000-4-2 (Ed2 2008)	X	
EN 61000-4-3 (2006+A1/2008+A2/2010)	X	Essais d'immunité aux champs électromagnétiques aux fréquences radioélectriques / <i>Radiated, radio- frequency, electromagnetic field immunity test.</i>
IEC 61000-4-3 (2006+A1/2007+A2/2010)	X	
EN 61000-4-4 (2012)		Essais d'immunité aux transitoires électriques rapides en salves / <i>Electrical fast transient/burst immunity test.</i>
IEC 61000-4-4 (2012)		
EN 61000-4-5 (2014)		Essai d'immunité aux ondes de choc / <i>Surge immunity test</i>
IEC 61000-4-5 (2014)		
EN 61000-4-6 (2009)		Immunité aux perturbations conduites induites par les champs radioélectriques / <i>Immunity to conducted disturbances, induced by radio-frequency fields</i>
IEC 61000-4-6 (2008)		
EN 61000-4-8 (2010)		Immunité au champ magnétique à la fréquence du réseau / <i>Power frequency magnetic field immunity test</i>
IEC 61000-4-8 (2009)		
EN 61000-4-11 (2004)		Essais d'immunité aux creux de tension, coupures brèves et variations de tension / <i>Voltage dips, short interruptions and voltage variations immunity tests</i>
IEC 61000-4-11 (2004)		
EN 61000-3-2 (2014 + 2019)		Limites pour les émissions de courant harmonique (courant appelé par les appareils inférieur ou égal à 16 A par phase) / <i>Limits for harmonic current emissions (equipment input current <= 16 A per phase)</i>
IEC 61000-3-2 (2014 + 2018)		
EN 61000-3-3 (2013+A1/2019)		Limitation des variations de tension, des fluctuations de tension et du papillotement dans les réseaux publics d'alimentation basse tension, pour les matériels ayant un courant assigné <= 16 A par phase et non soumis à un raccordement conditionnel / <i>Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection</i>
IEC 61000-3-3 (2013+A1/2017+A2/2021)		

Déviations par rapport aux méthodes normatives : Aucune
Deviation from any standard: None

2. Synthèse des essais / Test synthesis

Standard: EN 55032 / EN 61000-3-2 / EN 61000-3-3

NORME / STANDARD	CLASSIFICATION DE L'ÉQUIPEMENT / CLASSIFICATION OF THE EQUIPMENT
EN 55032	Classe B (Environnement résidentiel, commercial et industrie légère) <i>Class B (Residential, commercial and light industrial environment)</i>

ESSAI D'EMISSION / EMISSION TEST	LIMITES / LIMITS	RESULTATS / RESULTS												
Emissions conduites sur les bornes d'alimentation secteur AC / <i>Conducted emissions at AC mains power supply ports</i> 150kHz-30MHz	<table> <tr> <th>Freq.</th><th>Quasi-peak (dBμV)</th><th>Average (dBμV)</th></tr> <tr> <td>150-500kHz</td><td>66 \ 56</td><td>56 \ 46</td></tr> <tr> <td>0.5-5MHz</td><td>56</td><td>46</td></tr> <tr> <td>5-30MHz</td><td>60</td><td>50</td></tr> </table>	Freq.	Quasi-peak (dBμV)	Average (dBμV)	150-500kHz	66 \ 56	56 \ 46	0.5-5MHz	56	46	5-30MHz	60	50	N/A (1)
Freq.	Quasi-peak (dBμV)	Average (dBμV)												
150-500kHz	66 \ 56	56 \ 46												
0.5-5MHz	56	46												
5-30MHz	60	50												
Emissions conduites, réseau de télécommunication, limites en courant / <i>Limits for conducted disturbance at telecommunication ports – Current limits</i> 150kHz-30MHz (EN 55032)	<table> <tr> <th>Freq.</th><th>Quasi-peak (dBμA)</th><th>Average (dBμA)</th></tr> <tr> <td>150-500kHz</td><td>40 \ 30</td><td>30 \ 20</td></tr> <tr> <td>0.5-30MHz</td><td>30</td><td>20</td></tr> </table>	Freq.	Quasi-peak (dBμA)	Average (dBμA)	150-500kHz	40 \ 30	30 \ 20	0.5-30MHz	30	20	N/A (1)			
Freq.	Quasi-peak (dBμA)	Average (dBμA)												
150-500kHz	40 \ 30	30 \ 20												
0.5-30MHz	30	20												
Emissions conduites, réseau de télécommunication, limites en tension / <i>Limits for conducted disturbance at telecommunication ports – Voltage limits</i> 150kHz-30MHz (EN 55032)	<table> <tr> <th>Freq.</th><th>Quasi-peak (dBμV)</th><th>Average (dBμV)</th></tr> <tr> <td>0.15 – 0.50</td><td>84 \ 74</td><td>74 \ 64</td></tr> <tr> <td>0.50 – 30</td><td>74</td><td>64</td></tr> </table>	Freq.	Quasi-peak (dBμV)	Average (dBμV)	0.15 – 0.50	84 \ 74	74 \ 64	0.50 – 30	74	64	N/A (1)			
Freq.	Quasi-peak (dBμV)	Average (dBμV)												
0.15 – 0.50	84 \ 74	74 \ 64												
0.50 – 30	74	64												
Emissions rayonnées / <i>Radiated emissions</i> 30MHz-1GHz	Distance 3m (Quasi-peak) 30MHz-230MHz : 40 dBμV/m 230MHz-1GHz : 47 dBμV/m	PASS												
Emissions rayonnées / <i>Radiated emissions</i> 1GHz-6GHz *	<table> <tr> <th>Freq.</th><th>Peak (dBμV/m)</th><th>Average (dBμV/m)</th></tr> <tr> <td>1-3GHz</td><td>70.0</td><td>50.0</td></tr> <tr> <td>3-6GHz</td><td>74.0</td><td>54.0</td></tr> </table>	Freq.	Peak (dBμV/m)	Average (dBμV/m)	1-3GHz	70.0	50.0	3-6GHz	74.0	54.0	PASS			
Freq.	Peak (dBμV/m)	Average (dBμV/m)												
1-3GHz	70.0	50.0												
3-6GHz	74.0	54.0												
Emissions de courants harmoniques / <i>Harmonics current emission</i> EN 61000-3-2	EN 61000-3-2 Class A equipment	N/A (1)												
Fluctuation de tension et flicker / <i>Voltage fluctuation and flickers test</i> EN 61000-3-3	$P_{St} < 1$, $P_{It} < 0.65$, $d_c < 3.3\%$; $d_{max} < 4\%$; $T_{max} < 500ms$	N/A (1)												

N/A: Not Applicable

(1) No mains power cable, no telecommunication cable

*: The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes.

If the maximum internal frequency of the test item is less than 108 MHz, the measurements must be carried out only up to 1GHz.

If the maximum internal frequency of the test item is between 108 MHz and 500 MHz, the measurements must be carried out up to 2 GHz.

If the maximum internal frequency of the test item is between 500 MHz and 1 GHz, the measurements must be carried out up to 5GHz.

If the maximum internal frequency of the test item is above 1 GHz, the measurement must be carried out up to 6 GHz.

Standard: EN 55035 (2017+A11/2020)

TEST D'IMMUNITÉ / IMMUNITY TEST	NIVEAU D'ESSAI / TEST LEVEL	Critère exigé / Expected criteria	RESULTATS / RESULTS
Décharges électrostatique / Electrostatic discharges (ESD) EN 61000-4-2	± 4kV Décharges contact / <i>Contact discharge</i> ± 8kV Décharges dans l'air / <i>Air Discharges</i>	B	PASS
Champ rayonné RF / Radiated RF field EN 61000-4-3	3V/m 80MHz-1GHz (1% step freq.) + 1.8 / 2.6 / 3.5 / 5GHz (Spot freq.) AM 80% @ 1kHz	A	PASS
Transitoires Rapides en Salve / Electrical Fast Transient EN 61000-4-4	± 1kV : Alim. AC / <i>Power port AC</i> ± 0.5kV : Alim. DC / <i>Power port DC</i> ± 0.5kV : Lignes / <i>Lines</i> (Signal & Telecommunication >3m)	B	N/A (1)
Immunité aux ondes de choc / Immunity to surges. EN 61000-4-5	± 1kV (L → N) ± 2kV (L → PE / N → PE) Alimentation réseau AC / <i>Mains (AC)</i>	B	N/A (1)
Immunité aux ondes de choc / Immunity to surges. IEC 61000-4-5	± 0.5kV (L1 → L2) ± 0.5kV (L → PE / N → PE) Alimentation réseau DC / <i>Mains (DC)</i>	B	N/A (1)
Immunité aux ondes de choc / Immunity to surges. IEC 61000-4-5	± 1kV (Lignes / <i>Lines</i> → GND) Accès non blindé, symétrique (Câble extérieur, réseau ou antenne) <i>Unshielded symmetrical port</i> (<i>Outdoor cable, network or antenna</i>)	C	N/A (1)
Immunité aux ondes de choc / Immunity to surges. IEC 61000-4-5	± 0.5kV (Blindage / <i>Shield</i> → GND) Accès blindé ou coaxial (Câble extérieur, réseau ou antenne) <i>Shielded port or coaxial (Outdoor cable,</i> <i>network or antenna)</i>	B	N/A (1)
Immunité RF conduite / RF conducted immunity EN 61000-4-6	3V 150kHz to 10MHz, AM 80% @ 1kHz 3V to 1V 10MHz to 30MHz, AM 80% @ 1kHz 3V 30MHz to 80MHz, AM 80% @ 1kHz Alimentation réseau AC, DC / <i>Mains (AC, DC)</i> Signal & Telecommunication >3m	A	N/A (1)
Immunité aux champs magnétiques à la fréquence du réseau / Immunity to power frequency magnetic field EN 61000-4-8	1 A/m @ 50Hz & 60Hz	A	NA (2)
Creux de tension et interruptions brèves / Voltage dips and short interruptions for AC mains EN 61000-4-11	Niveau d'essai / <i>Test level</i>	B C C	N/A (1)
	0%		
	70%		
	0%		

N/A: Not Applicable

(1) Equipment is not directly connected to AC mains and has not outdoor lines.

(2) Applicable only to equipment containing devices susceptible to magnetic fields

3. Equipement Sous Test (EST) / Equipment Under Test (EUT)

Nom /
Identification

ST / NUCLEO-H503RB (MB1814)
(Trademark / Marketing name or product reference)

MB1841-H503RB-B01
Sn: M222700005

Alimentation /
Power supply

5V DC

Auxiliaires /
Auxiliaries

- Laptop ASUS, model F200 (with its power supply unit)

Ref: LABO_05

Entrées-Sorties /
Input / Output

	Câbles pour essai / Cables for test	Blindé / Shielded	Prévu pour >3m / Intended for >3m
USB Micro-C (ST-LK)	1.0m	Yes	No
USB Micro-C (USER)	1.0m	Yes	No

Version programme /
Firmware version

Demo software

Mode de fonctionnement /
Running mode

Powered by 5V via ST-LK connector.
The LED LD1 is lighting red, the LED LD3 is lighting green and the LED LD2 is switching green.

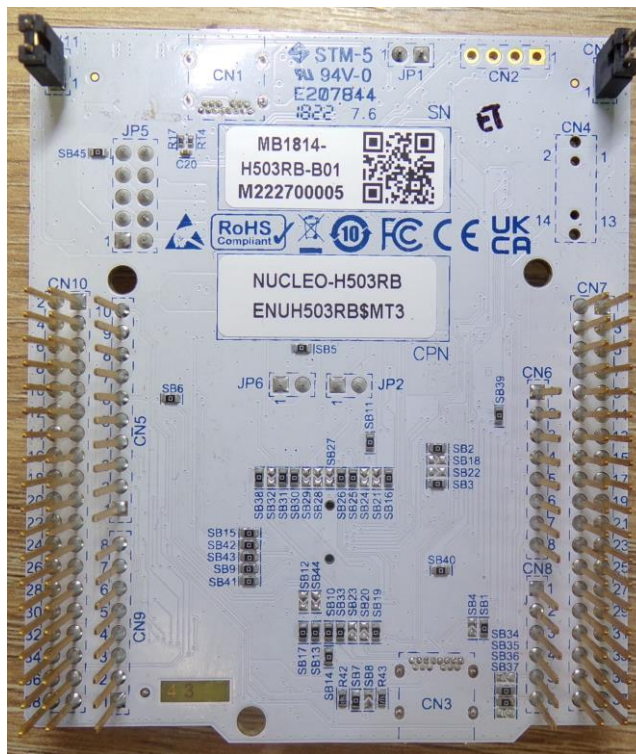
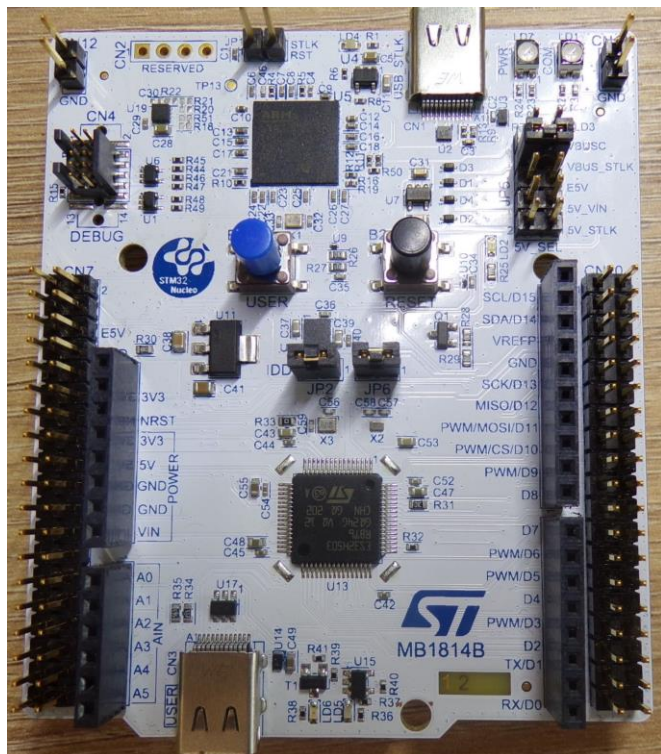
Fréquence max interne EST /
Max internal EUT frequency

<500MHz

Microcontrôleur de la carte /
Board's MCU

STM32H503RBT6

Photographies de l'équipement sous test / Photography of the equipment under test



4. Critère de performance en immunité / Immunity performance criteria

Criteria A: The equipment shall operate as intended without loss of function during and after the test. There shall be no change of state during test (no unintentional response from user button or change of mode).

No USB disconnection is permitted.

The status of LED must not be changed.

Criteria B: The equipment shall operate as intended without loss of function after the test. A temporary dysfunction is permitted during the test. A reset of EUT is permitted. A problem of USB communication is permitted but no disconnection of the USB is allowed on the PC devices manager.

Criteria C: The equipment may be recoverable by the operator after the test and operate as intended without loss of function. The equipment may loss one or more function during the test.

Control: A visual control is performed on the device (LED). The ST-Link communication is verified on the laptop (window for mass storage device NOD_H503RB).

5. Conditions pendant les essais / Test conditions

Tension d'alimentation / Power supply voltage:

Equipment sous test / *Equipment under test* : 5V DC

Auxiliaires / *Auxiliaries* : 230V/50Hz

6. Modifications de l'EST / Modifications of the EUT

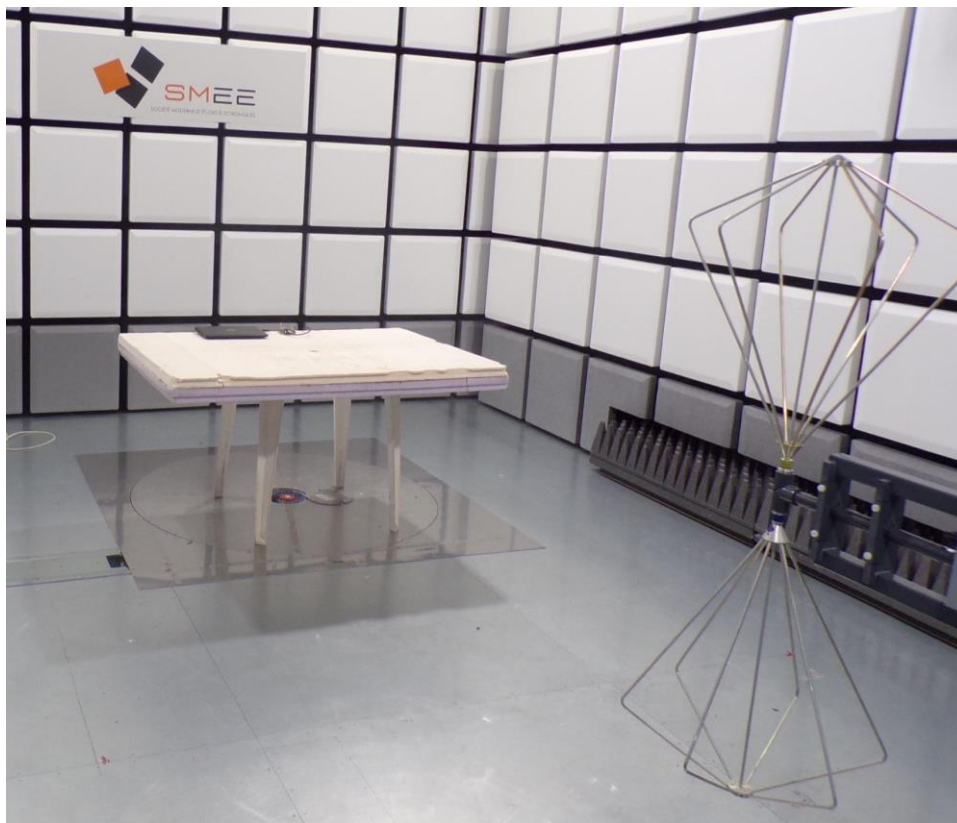
None

7. Radiated Emission Measurement (30MHz-2GHz)

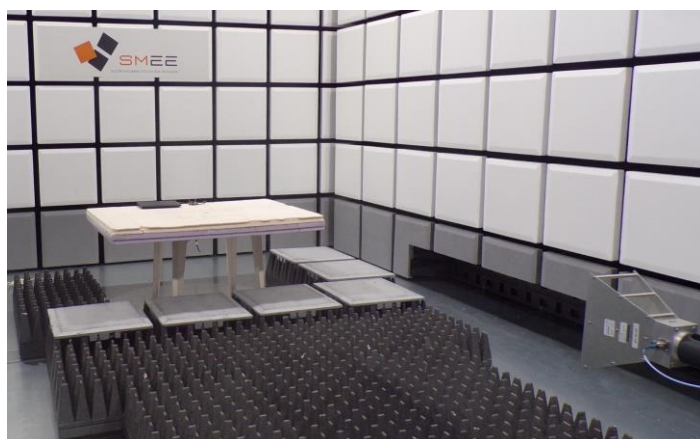
EN 55032	TEST: Limits for radiated disturbance 30 MHz – 2 GHz		Verdict
<u>Method:</u> Measurements were made in a 3-meter Semi Anechoic Room (SAR) that complies to CISPR 16-1-4. For frequency below 1GHz, a SAR environment is used with a ground plane. Above 1GHz, a full anechoic environment is used with RF absorbers placed on the floor. 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. Data graphs are given for each polarity. 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.			PASS
Laboratory Parameters:	Required prior to the test	During the test	
Ambient Temperature	17 - 27 °C	20°C ± 2	
Relative Humidity	25 - 65 %	48% ± 5	
Running mode	Demo mode.		
Fully configured sample scanned over the following frequency range	Frequency range on each side of line	Measurement Point	
	30MHz – 1GHz	3m	
	1GHz – 6GHz	3m	
Limits			
Frequency (MHz)	Limit (dBµV/m)		
	Level / Detector / Distance	Results	
30 to 230	40 / QP / 3m	Pass	
230 to 1000	47 / QP / 3m	Pass	
1000-2000	70 / Pk / 3m 50 / Av / 3m	Pass	
2000-3000		N/A	
3000-5000	74 / Pk / 3m 54 / Av / 3m	N/A	
5000-6000		N/A	
Supplementary information: Test location: SMEE Test date: January 6 th , 2023 by Géraldine GUYENNOT Power supply voltage: 5V DC via ST-Link with laptop.			

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Biconnic antenna	COM-POWER	AB- 900	ANT-101-003	2019/06	2023/06
Log-periodic antenna	EMCO	3146	ANT-191-019	2021/7	2023/7
Horn antenna	COM-POWER	AH-118	ANT-101-004	2021/7	2024/7
RF cable	HUBER+SUHNER	SF104	CAB-141-030	2022/4	2023/3
RF cable	HUBER+SUHNER	SF102 (KN6m)	CAB-171-033	2022/4	2023/3
RF cable	TMS	LMR-400 / 9m	CAB-201-039	2022/4	2023/3
Semi anechoic room	COMTEST	218292	CAG-201-002	2022/4	2025/2
Antenna mast	Innco- Systems	MA4640-XP-ET	MAT-201-002	-	-
Turntable	Innco- Systems	DS1500-S-1t	PLA-201-003	-	-
Measuring Rec	Rohde&Schwarz	ESRP	REC-151-002	2022/4	2023/3
Spectrum analyzer	Rohde&Schwarz	FSV40	ASP-171-004	2021/10	2023/10
Pre-amplifier	COM-POWER	1-18GHz	PRE-221-005	2022/4	2023/3
Ref. Comb generator	SMEE	EMR-10M	REF-111-002	-	-
Ref. Comb generator	SMEE	EMR 1-6GHz	REF-141-003	-	-
EMC Software	NEXIO	BAT EMC V3.21	SOF-101-001	-	-

Photo of test setup for Radiated Disturbance



Test setup in semi anechoic room (30M-1GHz)

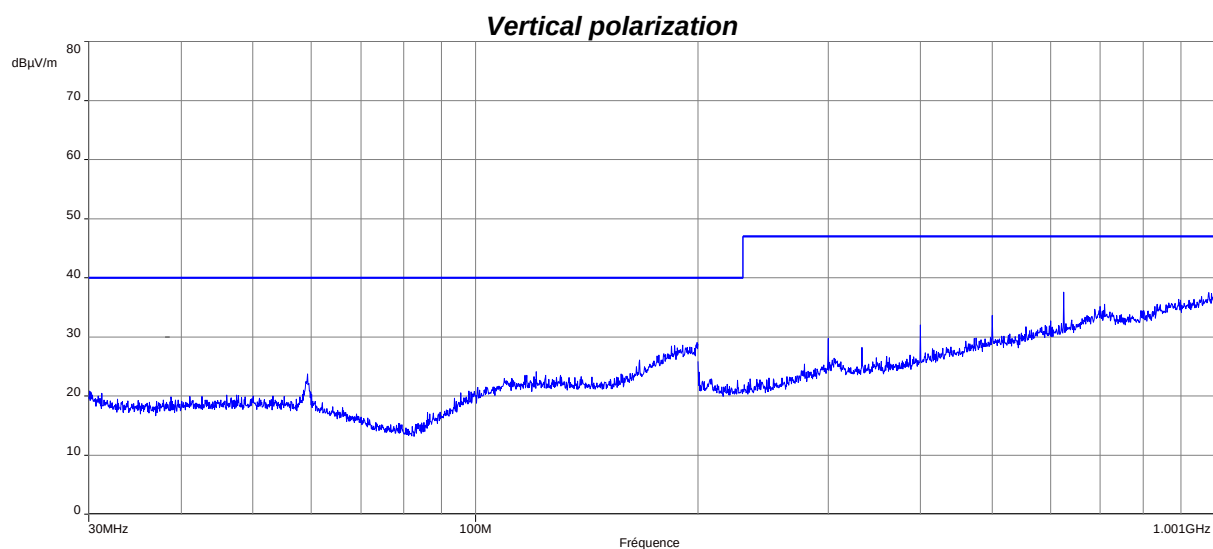
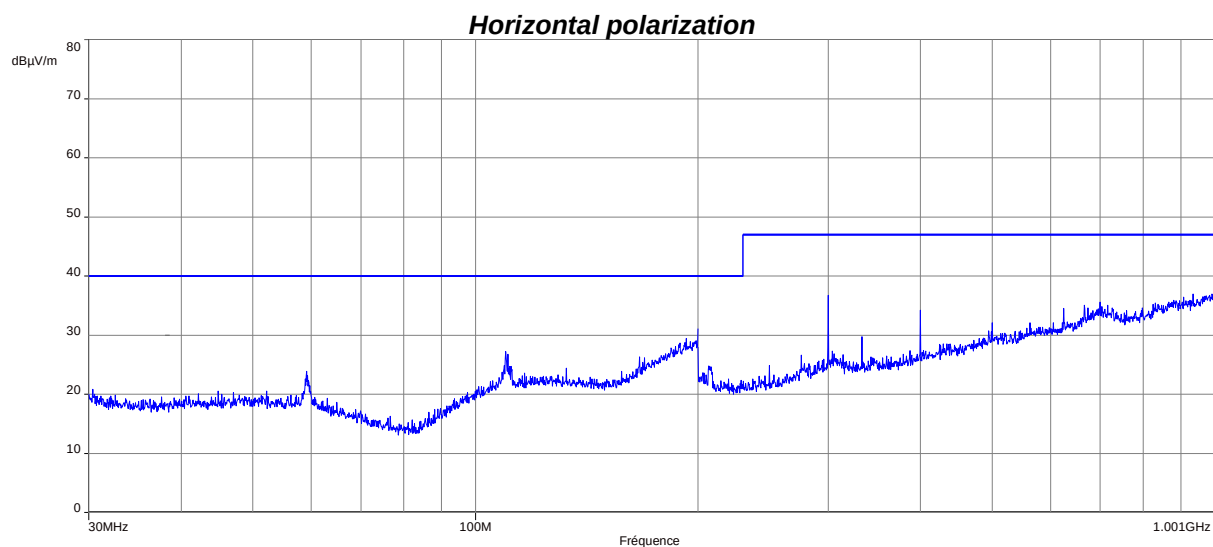


Test setup in full anechoic room (1-2GHz) (semi anechoic room with absorbers on the floor)

Tabulated Results for Radiated Disturbance (3m measurement in semi anechoic room, 30MHz-1GHz)								
FREQ	Field level QP	Field level Pk	CF total	Pol	Antenna height	Table angle	Limit QP	Margin
MHz	dBμV/m	dBμV/m	dB		m	Degree	dBμV/m	dB
Levels are at least 10dB below applicable limits								
Supplementary information: Frequency list has been created with pre-scan results.								
Frequency band investigated:			30MHz-1GHz					
RBW:			120kHz					
Measurement distance:			3m					
Limit:			EN 55032 / CISPR 32, Class B					
Final measurement detector:			Quasi-Peak					
Wide Measurement Uncertainty:			± 5.2dB (k=2)					
RESULT:			PASS					
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 (dB) is $AF + CF - AG$ Margin value = Emission level – Limit value (Negative margin denotes compliant result) Example: Meter reading: 14.0dBμV – Antenna factor: 16.5 dBm⁻¹ – Cable Factor: 3.5dB Amplifier Gain: 15dB → Total factor is 5dBm⁻¹ Field level: 19.0dBμV/m (-21.0dB for margin if limit is 40dBμV/m)					

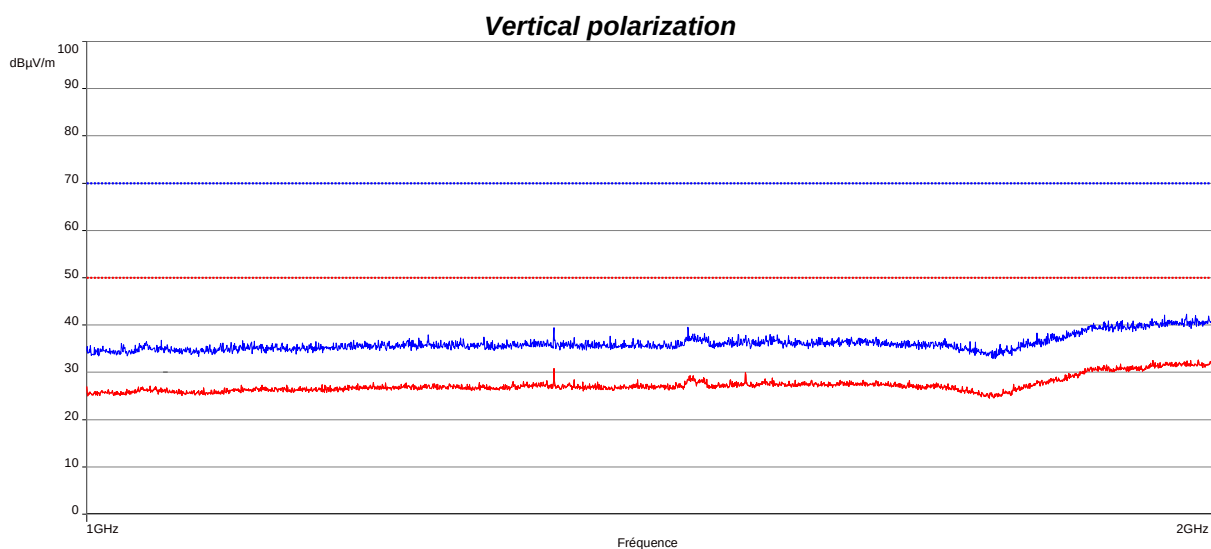
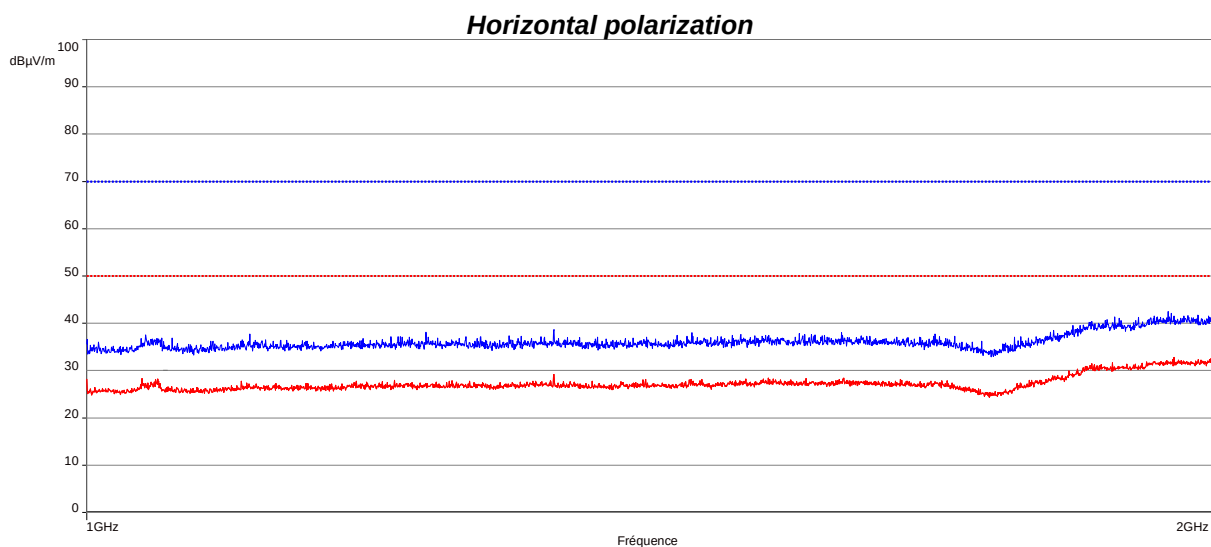
Tabulated Results for Radiated Disturbance (3m measurement, 1GHz-2GHz)												
FREQ	Field level PK	Field level AV	Total factor	Pol	Ant height	Table angle	Limit PK	Limit AV	Margin PK	Margin AV	FREQ	Field level PK
MHz	dBμV/m	dBμV/m	dB	H/V	m	Degree	dBμV/m	dBμV/m	dB	dB	MHz	dBμV/m
Levels are at least 10dB below applicable limits												
Supplementary information: Frequency list has been created with pre-scan results.												
Frequency band investigated:					1GHz-2GHz							
RBW:					1MHz							
Measurement distance:					3m							
Limit:					EN 55032 / Class B							
Final measurement detector:					Peak (PK) / CISPR Average (AV)							
Wide Measurement Uncertainty:					± 5.2dB (k=2)							
RESULT:					PASS							

Graphical representation of Radiated Disturbance Measurement (Peak detection, Semi Anechoic Room pre-scan, 30MHz-1GHz / 3m)



----- : Peak measure / Class B limit

Graphical representation of Radiated Disturbance Measurement (Peak and Average detection, Full Anechoic Room pre-scan, 1Gz-2GHz / 3m)



----- : Peak measure / Class B limit

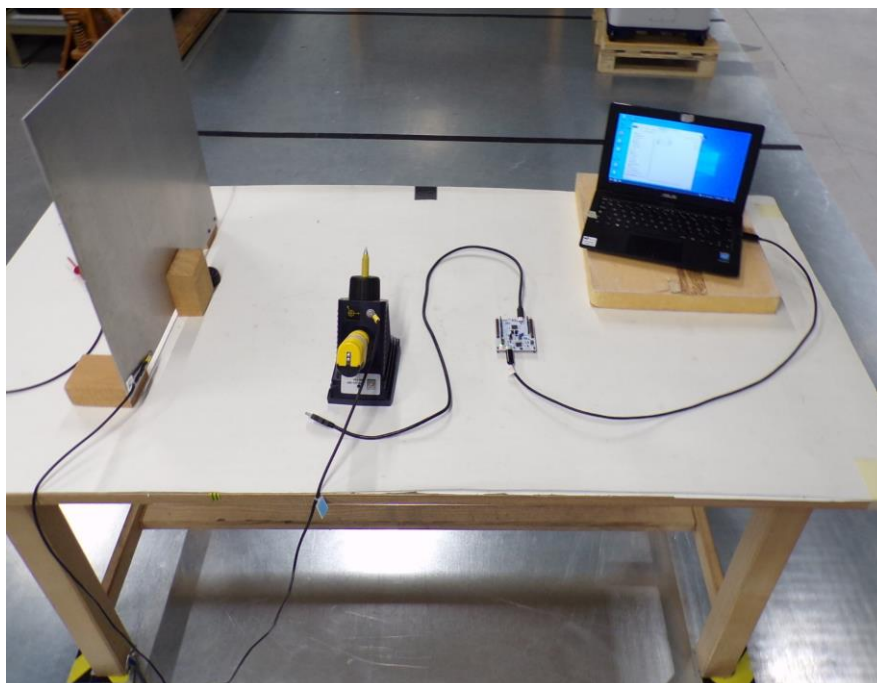
----- : Average measure / Class B limit

8. Immunity to Electrostatic Discharges (EN 61000-4-2)

EN 61000-4-2	TEST: Electrostatic discharges (ESD)		Verdict
Method: The test is intended to demonstrate the immunity of equipment subjected to static electricity discharges from operators directly and to adjacent objects. The equipment under test is placed on a wooden table, 0.8 m high, standing on the ground reference plane. A horizontal coupling plane (HCP), 1.6 x 0.8 m, is placed on the table. The EUT and the cables are isolated from the coupling plane by an insulating support 0.5 mm thick. The vertical coupling plane (VCP) of dimensions 0.5 m x 0.5 m is placed parallel to, and positioned at a distance of 0.1 m from, the EUT.			PASS
Laboratory Parameters:	Required prior to the test	During the test	
Ambient Temperature	17 - 27 °C	20°C ± 2	
Relative Humidity	30 - 60 %	41% ± 5	
Running mode	Demo mode		
Applied Levels			
Discharge type	Discharge Level (kV)		Number of discharges per location (each polarity)
	Positive	Negative	
Air – Direct	2, 4, 8	2, 4, 8	10
Contact – Direct	2, 4	2, 4	10
Contact – Indirect	2, 4	2, 4	10
Discharge location	See photo documentation of the test set-up All external locations accessible by hand. Horizontal plate (HCP), Vertical coupling plate (VCP)		
Supplementary information: Test location: SMEE Test date: January 13 th , 2023 by Géraldine GUYENNOT Power supply voltage: 5V DC via USB Link / Laptop			

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Table ESD	SMEE	ESD01	ACC-101-014	-	-
Generator ESD	SCHAFFNER	NSG435	GEN-101-007	2022/01	2025/01

Photo of test setup for Immunity to Electrostatic Discharges



Tabulated Results for Electrostatic Discharges

Nominal Voltage (V)	5V
Nominal Frequency (Hz)	DC

Indirect discharges: Contact

Indirect Discharge location	Contact discharge voltage (kV)	Polarity	Remark
Horizontal Coupling Plane	2, 4	+ & -	Pass (1)
Vertical Coupling Plane	2, 4	+ & -	Pass (1)

Direct discharges: Air and Contact

Air Discharge location	Air discharge voltage (kV)	Polarity	Remark
No enclosure	2, 4, 8	+ & -	N/A
Contact Discharge location	Contact discharge voltage (kV)	Polarity	Remark
USB type C connector (ST-Link)	2, 4	+ & -	Pass (2)
USB type C connector (User)	2, 4	+ & -	Pass (2)

Note: equipment with ESD warning for accessible sensitive components / connectors. (Evaluation board without enclosure). Direct discharges are not applied on components.

(1) No problem observed. Criteria A observed.

(2) Modification of switching frequency of LED LD2. (Criteria B observed)

9. RF Electromagnetic Fields Immunity (EN 61000-4-3)

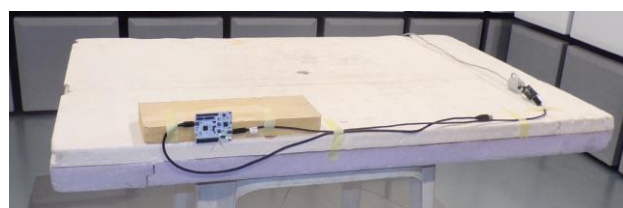
EN 61000-4-3	TEST: RF electromagnetic fields (EN 61000-4-3)		Verdict
Method: The test allows estimating of the radiated immunity of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 80MHz to 6GHz. The interference is applied on the enclosure of the equipment. EUT is positioned on different positions. Test is performed in an anechoic chamber. Antennas are 1.5-meter high. For frequencies below 1GHz, a BiConiLog antenna is used at 2.2 meters distance; for frequencies above 1GHz, a horn antenna is used at 2.5-meter distance. Test is performed in horizontal and vertical antennas polarizations.			PASS
Laboratory Parameters:	Required prior to the test	During the test	
Ambient Temperature	17 - 27 °C	21°C ± 2	
Relative Humidity	25 - 65 %	41% ± 5	
Running mode	Demo mode		
Test specifications			
Calibration requirements	Uniform Field Area (UFA)	1.5 m x 1.5 m (80MHz-6GHz) – 16 Points	
		75 % of grid points within tolerance -0 / +6 dB	
Frequency bandwidth	80MHz to 5GHz		
Level	80MHz-1GHz : 3V/m (Amplitude modulation 80 % / 1 KHz sine wave) Frequency step : 1% with 3s dwell time		
	1.8 / 2.6 / 3.5 / 5GHz : 3V/m (Amplitude modulation 80 % / 1 KHz sine wave) Spot frequencies : 10s dwell time		
Supplementary information: Test location: SMEE Test date: January 10 th & 13 th , 2023 by Géraldine GUYENNOT Power supply voltage: 5V DC via ST-Link / Laptop			

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	COM TEST	218292	CAG-201-002	2022/2	2025/2
BiConiLog antenna	EMCO	3142B	ANT-101-010	2022/6	2024/6
Horn Antenna	ETS-LINDGREN	3115	ANT-141-013	2022/6	2024/6
RF cable	Various	3m	CAB-101-013	2022/6	2024/6
RF cable	TMS	LMR-400 / 1.5m	CAB-201-040	2022/6	2024/6
RF cable	TMS	LMR-400 / 4m	CAB-201-041	2022/6	2024/6
RF Amplifier	Amplifier Research	200W-1000M2A	AMP-191-006	2022/6	2024/6
RF Amplifier	EXODUS	1-6GHz	AMP-201-007	2022/6	2024/6
RF coupler	Mini-Circuit	ZGDC35-93HP+	COU-171-003	2022/6	2024/6
RF coupler	Amplifier Research	DC6180	COU-191-007	2022/6	2024/6
RF generator	HP	E4438C	GRF-171-004	2022/6	2024/6
Power meter	HP	437B	PWM-101-001	2022/6	2024/6

Test Equipment Used

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Power probe	HP	8481A	SDE-171-006	2022/6	2024/6
RF field probe	NARDA	PMM EP-600	SDE-201-007	2020/8	2023/8

Photo of test setup for Radio Frequency Electromagnetic Fields



Face 1



Face 2

Tabulated Results for RF Electromagnetic Field 80MHz to 5GHz

Nominal Voltage (V)		5V	
Nominal Frequency (Hz)		DC	
Antenna polarization	Position of the equipment under test	Frequency (MHz) - Level (V/m)	Comments
Horizontal	Face 1	80MHz to 1GHz - 3V/m 1.8 / 2.6 / 3.5 / 5GHz - 3V/m	Pass (1)
	Face 2	80MHz to 1GHz - 3V/m 1.8 / 2.6 / 3.5 / 5GHz - 3V/m	Pass (1)
Vertical	Face 1	80MHz to 1GHz - 3V/m 1.8 / 2.6 / 3.5 / 5GHz - 3V/m	Pass (1)
	Face 2	80MHz to 1GHz - 3V/m 1.8 / 2.6 / 3.5 / 5GHz - 3V/m	Pass (1)

(1): No problem observed. Criteria A observed.