

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

Matériel testé : <i>Equipment under test:</i>	IDENTEC SOLUTIONS / IDS1001 (i-Point Si) LF communication media (125kHz) <i>(Trademark / Marketing name or product reference)</i>
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Client / Demandeur:
Customer / Applicant : **IDENTEC SOLUTIONS AG**
Millennium Park 2
A-6890 Lustenau – Austria

Rapport délivré à :
Issued to: **IDENTEC SOLUTIONS AG**
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Référence de la proposition : 012019-23396-1
Proposal number:

Numéro d'affaire : 12928
Work number :

Date de l'essai : Du 18 au 20 mai 2020
Date of test: May 18th to 20th, 2020

Objectif des essais : EMC qualification according to following standards:
Test purpose: - CFR 47, FCC Part 15, Subpart C
- Industry Canada, RSS-Gen Issue 5
Low power transmitter below 1705KHz
Measurement standards:
ANSI C63.10 (2013)

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

Test réalisé par : Laurent CHAPUS
Test realized by:

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

Ed.	Date	Modifications / Pages	Written by : Visa	Approved by: Visa
1	August 31 st , 2020	Initial Edition	Laurent CHAPUS	Regis ANCEL
2	December 18 th , 2020	TCB review	Technical Manager	General Manager

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1. Normatives References

FCC qualification according to:		
Standards	Applied	Title
ANSI C63.10 (2013)	X	American National Standard for Testing Unlicensed Wireless Devices
CFR47, Part 15	X	Telecommunication – Federal Communication Commission – Radio frequency devices, Sections 15.207 / 15.209

Industry Canada qualification according to:		
Standards	Applied	Title
RSS-Gen (Issue 5/2019)	X	General Requirements and Information for the Certification of Radio Apparatus
RSS-210 (Issue10/2019)	X	Licence-exempt Radio Apparatus: Category I Equipment,

Deviation from standards: None.

2. Test synthesis

TEST	Paragraph number FCC Part 15 IC RSS-210	Spec. FCC Part 15 IC RSS-210	RESULTS (comments)
Conducted emissions test	15.207 (a) RSS-Gen: Issue 5, §8.8	15.207 (a) Table 4, §8.8	PASS
Unwanted emissions outside the specified frequency band and harmonics	15.209 RSS-210: Issue 10 RSS-Gen: Issue 5, §8.9	<u>Measure at 300m</u> 9-490kHz: 2400µV/m/F(kHz) 6.370µA/m/F (kHz) <u>Measure at 30m</u> 0.490-1.705: 24000µV/m/F(kHz) 63.70µA/m/F (kHz) 1.705-30MHz: 30µV/m 0.08µA/m <u>Measure at 3m</u> 30MHz-88MHz : 40 dBµV/m 88MHz-216MHz : 43.5 dBµV/m 216MHz-960MHz : 46.0 dBµV/m Above 960MHz : 54.0 dBµV/m	PASS
Occupied Bandwidth	FCC Part 15.215 c) RSS-Gen: Issue 5, §6.7	BW at 99%	PASS

- General conclusion:**

Measures and tests performed on the sample of the product **DENTEC SOLUTIONS / IDS1001**, in configuration and description presented in this test report, show compliance with standards FCC CFR 47, PART 15, Subpart C and Industry Canada RSS-Gen & RSS-210.

3. Equipment Under Test (EUT)

Nom / Identification

IDENTEC SOLUTIONS / IDS1001
(i-Point Si)

(Trademark / Marketing name or product reference)

P/N: 455970 (IDS1001)
Sn: 2019PR0175

FCC ID:

OO4-IDS1001

IC:

IC : 3538A-IDS1001

Model:

IDS1001

Alimentation / Power supply

24VDC from external power supply
Or POE (Power Over Ethernet)
Or USB port (5V)

Auxiliaires / Auxiliaries

- Laptop ASUS, model F200M
- 24V DC power supply DEUTRONIC ESC30-24 (SN: H957898 0003)

Entrées-Sorties / Input / Output

	Câbles pour essai / Cables for test	Blindé / Shielded	Prévu pour >3m / Intended for >3m
RS422 (MASTER+24V)	2m	YES	YES
RS422 (SLAVE)	2m	YES	YES
LAN port (POE/ETH 100Mbps)	2m	YES	YES
USB port	1m *	YES	NO

(*: Debug only)

Mode de fonctionnement / Running mode

Equipment running modes are:

The tested sample is able to be set in following modes:

- Transmit a modulated carrier frequency on the LF channel (125kHz) in USB mode (Low power)
- Transmit a modulated carrier frequency on the LF channel (125kHz) in 24V+RS422 or 24V+Ethernet or POE mode (Nominal power)

Note: In USB mode, the device is fully functional for all Tx modes, including NFC, UHF. The LF/125kHz is using a low power short range driver in this case.

Note: AC conducted emission performed with the test program which permits to run all RF simultaneously. AC conducted emission in USB mode is measured on the AC port of the PC.

Version programme interne / Firmware version

V101.21

Programme de test / Test program /

PC test program "Gen3 Tag Certification tool" V.0.0.14512

Informations supplémentaires / Additional informations

Declaration of the applicant:

- Type of technology: LF Marker
- Emission bands: 125kHz
- Equipment intended for use as a fixed station
- Equipment designed for continuous operation
- Antenna type: Integrated 125kHz coil
- Rated output power is set at 100%

Dimensions de l'EST / Dimensions of EUT

224mm x 214 x 46

4. Test conditions

Power supply voltage:

24V DC

Equipment under test:

230V/50Hz (Radiated emission)

Auxiliaries (AC mains):

110V/60Hz (Conducted emission)

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
Conducted RF output power at antenna port	± 1.6dB
Radiated RF output power (Peak, Power density)	± 5.6dB
DTS Bandwidth, 99% OBW	±4%
Temperature	± 1°C
Time and duty cycle calculation	±1%
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

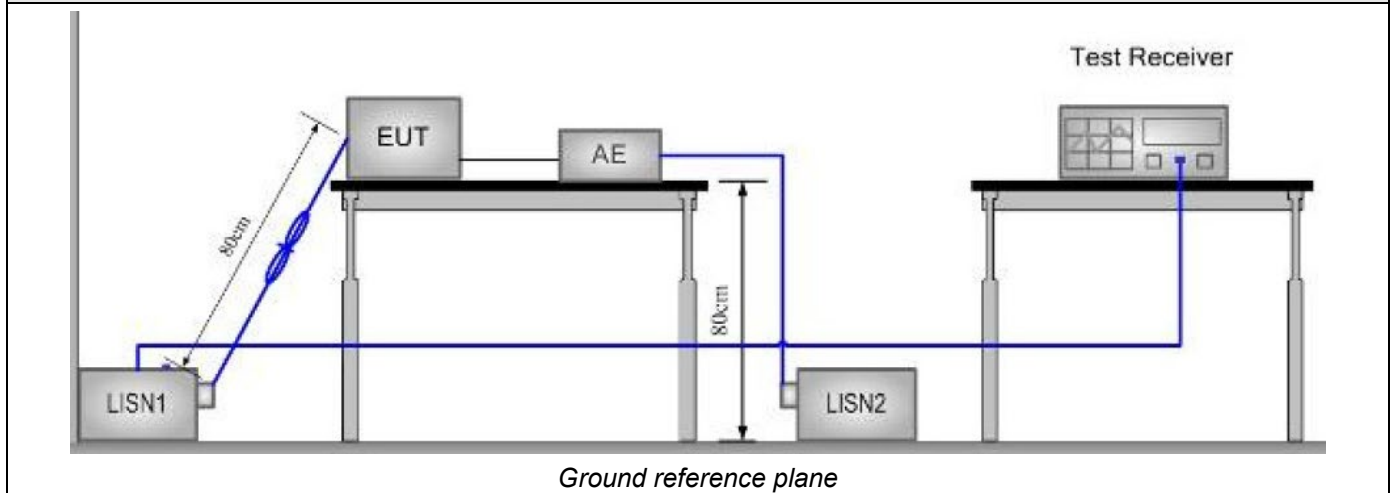
→ Field level: 19.0dBμV/m (-21.0dB for margin if limit is 40dBμV/m)

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 70 %		45% ± 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	66 \ 56	PASS	56 \ 46	PASS	
0.50 - 5	56	PASS	46	PASS	
5 – 30	60	PASS	50	PASS	
Supplementary information:					
Test location: SMEE					
Test date: May 20 th , 2020. Tested by L. CHAPUS					
Power supply voltage: 24V/DC from external power supply (AC mains 110V/60Hz)					

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
AC power supply	PACIFIC POWER	AMX-125	ALI-101-002	-	-
Attenuator / limiter	SMEE	ATT#2	ATT-171-010	2019/6	2020/6
Cable RF	Div	1m	CAB-101-021	2020/4	2021/4
Measuring receiver	Rohde&Schwarz	ESRP	REC-151-002	2019/9	2021/9
LISN (50Ω / 50µH) (Meas.)	AFJ	LS16C	RSI-101-001	2019/6	2021/6
LISN (50Ω / 50µH) (Aux.)	AFJ	LS16C	RSI-111-002	2019/6	2021/6
EMC Software	NEXIO	BAT EMC V3.18	SOF-101-001	-	-

Test Setup for conducted emission



Tabulated Results for Mains Terminal Disturbance Voltage on AC port (RS422+24V, LF+NFC+UHF)

FREQ (MHz)	Meas. PK (dBμV)	Mes. QP (dBμV)	LIMIT QP (dBμV)	Margin QP (dB)	Mes. AV (dBμV)	LIMIT AV (dBμV)	Margin AV (dB)	Line
0.162	60.86	51.83	65.36	-13.53	29.33	55.36	-26.04	L1
0.178	59.55	50.88	64.58	-13.69	35.41	54.58	-19.17	L1
0.462	49	45.71	56.66	-10.95	38.8	46.66	-7.86	L1
0.822	43.58	31.58	56	-24.42	22.2	46	-23.8	L1
1.256	46.49	33.46	56	-22.54	21.37	46	-24.63	L1
2.016	45.74	33.03	56	-22.97	20.54	46	-25.46	L1
7.376	45.61	42.63	60	-17.37	35.38	50	-14.62	L1
13.56	51.82	51.41	60	-8.59	50.46	50	0.46	L1 (1)
13.56	45.76	44.57	60	-15.43	45.88	50	-4.12	L1 (2)
24.876	56.12	55.15	60	-4.85	46.68	50	-3.32	N
0.158	60.89	52	65.57	-13.57	30.56	55.57	-25.01	N
0.454	49.83	46.11	56.8	-10.69	38.95	46.8	-7.85	N
1.62	43.96	33.31	56	-22.69	22.66	46	-23.34	N
2.104	44.29	32.82	56	-23.18	21.27	46	-24.73	N
13.56	51.44	50.96	60	-9.04	50	50	0	N (1)
13.56	45.82	44.21	60	-15.79	45.73	50	-4.27	N (2)
25.376	55.95	54.9	60	-5.1	46.46	50	-3.54	N
Frequency band investigated:			150kHz-30MHz					
RBW:			9kHz					
Voltage:			110V/60Hz					
Limit:			15.207 / RSS-GEN §8.8					
Final measurement detector:			Quasi-Peak and CISPR Average (AV)					
RESULT:			PASS					
Notes:			(1): NFC transmitter's fundamental emission band (2): Retest with a dummy load in lieu of the antenna					

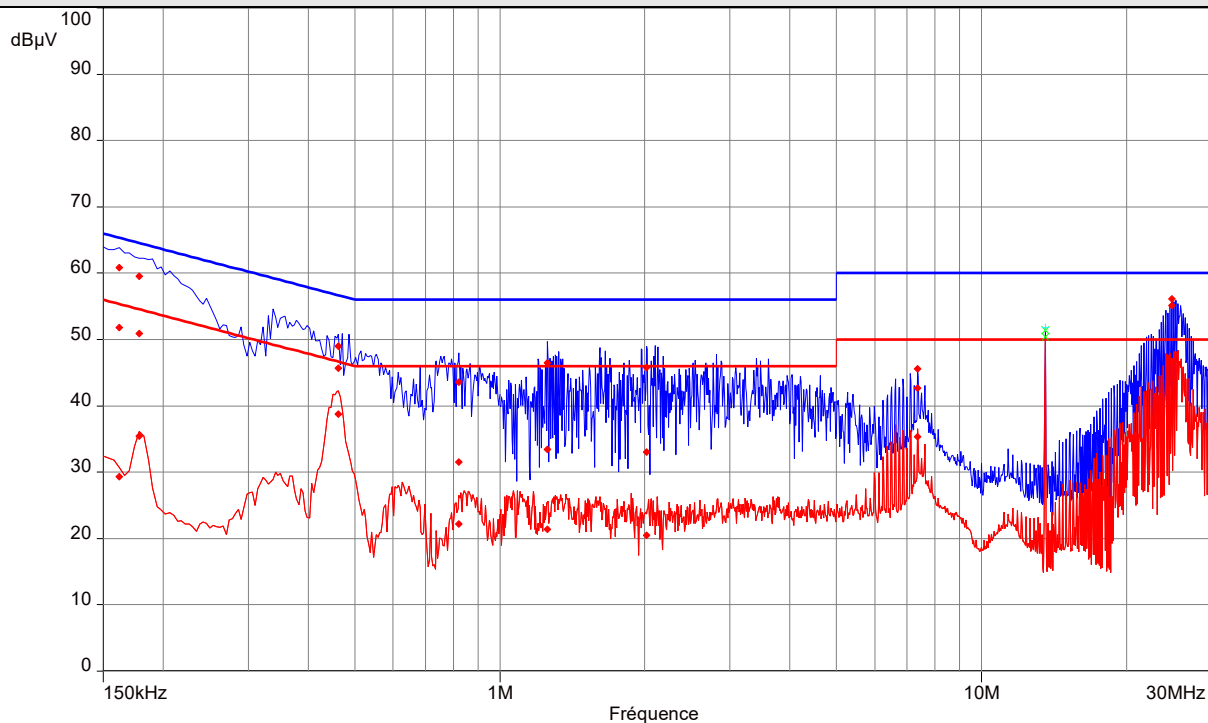
Tabulated Results for Mains Terminal Disturbance Voltage on AC port (ETHERNET+24V, LF+NFC+UHF)

FREQ	Meas. PK	Mes. QP	LIMIT QP	Margin QP	Mes. AV	LIMIT AV	Margin AV	Line
(MHz)	(dBμV)	(dBμV)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.1572	61.18	52.36	65.57	-13.21	31.57	55.57	-24	L1
0.178	59.98	51.04	64.58	-13.54	39.76	54.58	-14.82	L1
0.334	50.34	38.85	59.35	-20.5	24.53	49.35	-24.82	L1
0.454	50.07	45.93	56.8	-10.88	38.74	46.8	-8.06	L1
1.244	45.5	32.02	56	-23.98	21.26	46	-24.74	L1
1.888	43.84	31.69	56	-24.31	20.12	46	-25.88	L1
2.928	44.05	32.05	56	-23.95	21.04	46	-24.96	L1
13.56	57.08	56.81	60	-3.19	55.91	50	5.91	L1 (1)
13.56	52.14	51.49	60	-8.51	45.41	50	-4.59	L1 (2)
30	51.17	49	60	-11	43.04	50	-6.96	L1
0.178	59.25	50.95	64.58	-13.63	41.13	54.58	-13.44	N
0.462	49.86	45.76	56.66	-10.9	38.95	46.66	-7.71	N
1.328	43.22	31.5	56	-24.5	22.95	46	-23.05	N
2.12	44.79	33.11	56	-22.89	21.45	46	-24.55	N
6.624	45.04	43.12	60	-16.88	35.58	50	-14.42	N
13.56	56.59	56.29	60	-3.71	55.29	50	5.29	N (1)
13.56	51.58	50.86	60	-9.14	44.55	50	-5.45	N (2)
30	50.19	48.34	60	-11.66	41.67	50	-8.33	N
Frequency band investigated:			150kHz-30MHz					
RBW:			9kHz					
Voltage:			110V/60Hz					
Limit:			15.207 / RSS-GEN §8.8					
Final measurement detector:			Quasi-Peak and CISPR Average (AV)					
RESULT:			PASS					
Notes:			(1): NFC transmitter's fundamental emission band (2): Retest with a dummy load in lieu of the antenna					

Tabulated Results for Mains Terminal Disturbance Voltage on AC port (POE, LF+NFC+UHF)								
FREQ	Meas. PK	Mes. QP	LIMIT QP	Margin QP	Mes. AV	LIMIT AV	Margin AV	Line
(MHz)	(dBμV)	(dBμV)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.162	55.5	52.77	65.36	-12.59	34.5	55.36	-20.86	L1
0.226	47.48	41.96	62.6	-20.63	26.44	52.6	-26.15	L1
0.378	39.77	34.39	58.32	-23.93	23.45	48.32	-24.88	L1
4.948	42.25	37.3	56	-18.7	29.36	46	-16.64	L1
6.496	45.13	39.92	60	-20.08	33.13	50	-16.87	L1
13.56	51.09	50.39	60	-9.61	49.28	50	-0.72	L1
0.162	52.95	48.87	65.36	-16.49	32.57	55.36	-22.79	N
0.202	45.17	39.11	63.53	-24.42	19.73	53.53	-33.8	N
0.422	39.92	35.3	57.41	-22.11	27.66	47.41	-19.75	N
0.494	36.66	33.22	56.1	-22.88	22.05	46.1	-24.05	N
4.96	39.13	35.36	56	-20.64	28.7	46	-17.3	N
6.376	42.93	37.76	60	-22.24	31.73	50	-18.27	N
13.56	51.28	50.61	60	-9.39	49.56	50	-0.44	N
23.128	41.5	38.83	60	-21.17	32.84	50	-17.16	N
Frequency band investigated:			150kHz-30MHz					
RBW:			9kHz					
Voltage:			110V/60Hz					
Limit:			15.207 / RSS-GEN §8.8					
Final measurement detector:			Quasi-Peak and CISPR Average (AV)					
RESULT:			PASS					

Tabulated Results for Mains Terminal Disturbance Voltage on AC port (USB, LF+NFC+UHF)								
FREQ	Meas. PK	Mes. QP	LIMIT QP	Margin QP	Mes. AV	LIMIT AV	Margin AV	Line
(MHz)	(dBμV)	(dBμV)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.174	57.02	54.17	64.77	-10.59	40	54.77	-14.77	L1
0.23	52.09	48.6	62.45	-13.85	35.59	52.45	-16.86	L1
13.56	62.81	62.04	60	2.04	61.21	50	11.21	L1 (1)
13.56	49.56	49.21	60	-10.79	48.54	50	-1.46	L1 (2)
0.174	53.36	51.55	64.77	-13.22	36.75	54.77	-18.02	N
0.238	49.02	46.4	62.17	-15.76	34.13	52.17	-18.04	N
13.56	62.88	62.1	60	2.1	61.29	50	11.29	N (1)
13.56	49.23	48.94	60	-11.06	48.13	50	-1.87	N (2)
Frequency band investigated:			150kHz-30MHz					
RBW:			9kHz					
Voltage:			110V/60Hz					
Limit:			15.207 / RSS-GEN §8.8					
Final measurement detector:			Quasi-Peak and CISPR Average (AV)					
RESULT:			PASS					
Notes:			(1): NFC transmitter's fundamental emission band (2): Retest with a dummy load in lieu of the antenna					
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: $\text{Meas.} = \text{RA} + \text{CF} + \text{ATT}_{\text{TRAN}} + \text{ATT}_{\text{LISN}}$ 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 (A negative margin shows compliance to limit)					

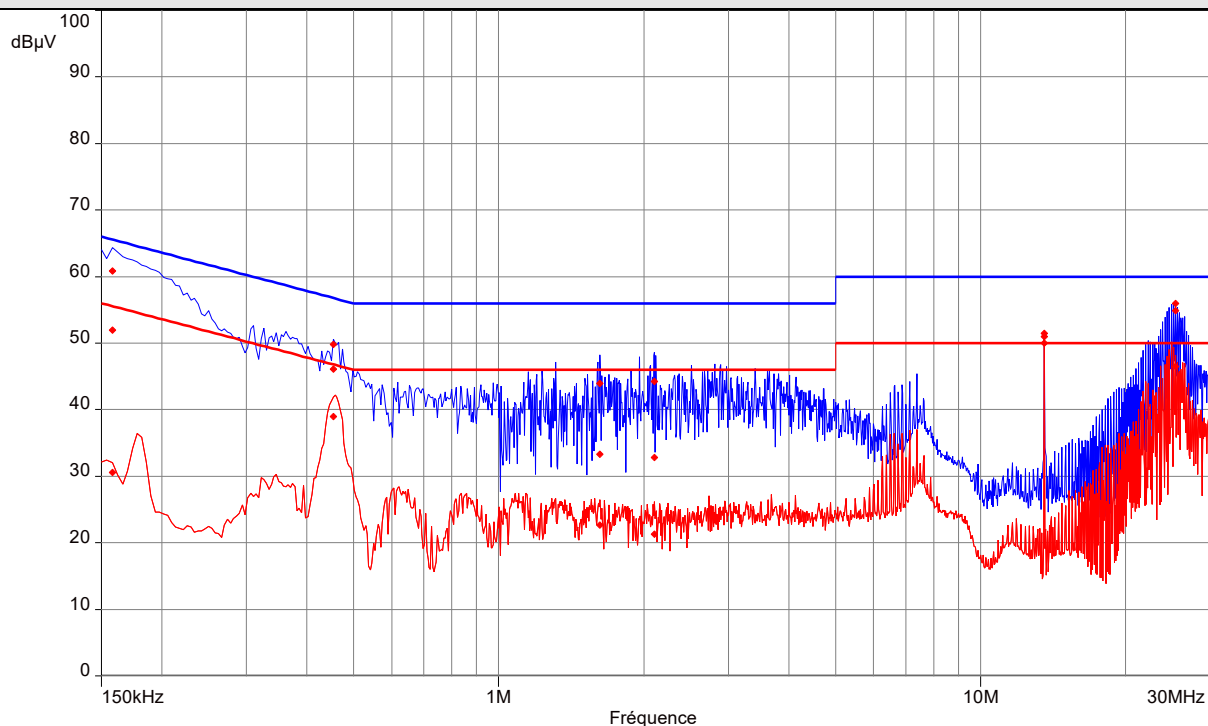
Graphical representation of Conducted Disturbance Measurement (Peak and Average detection) AC port, Line L1 (RS422+24V)



----: Peak

----: Average

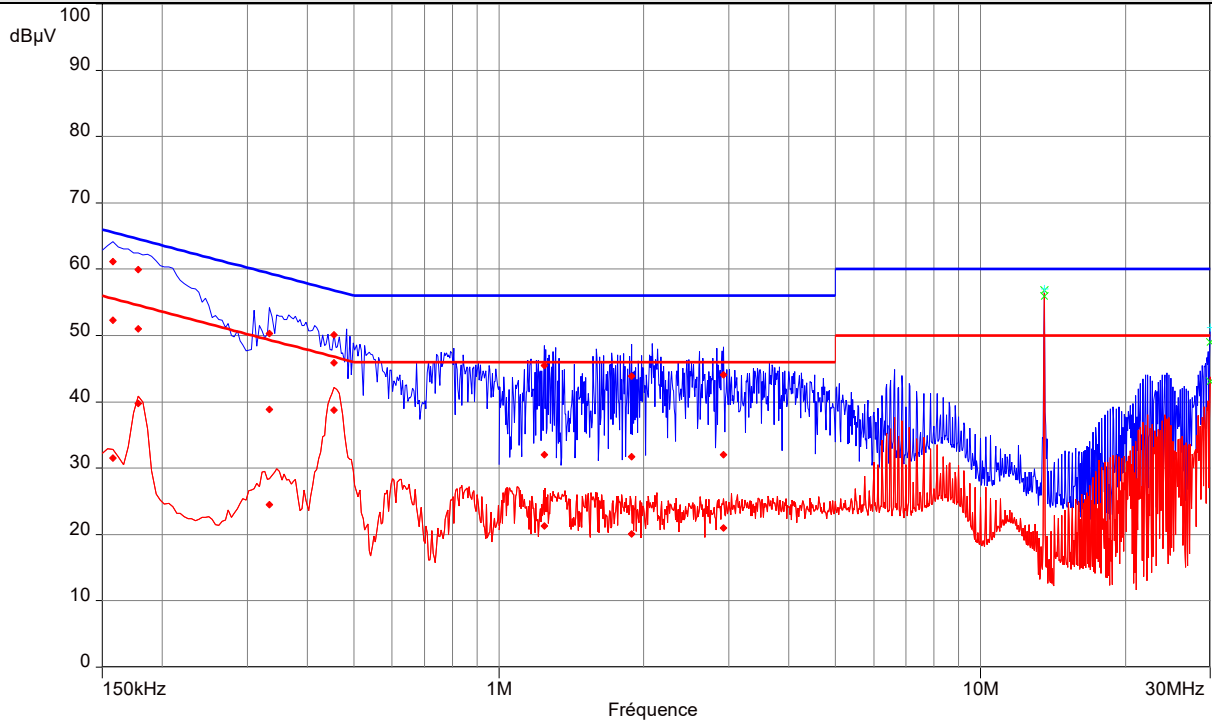
Graphical representation of Conducted Disturbance Measurement (Peak and Average detection) AC port, Line Neutral (RS422+24V)



----: Peak

----: Average

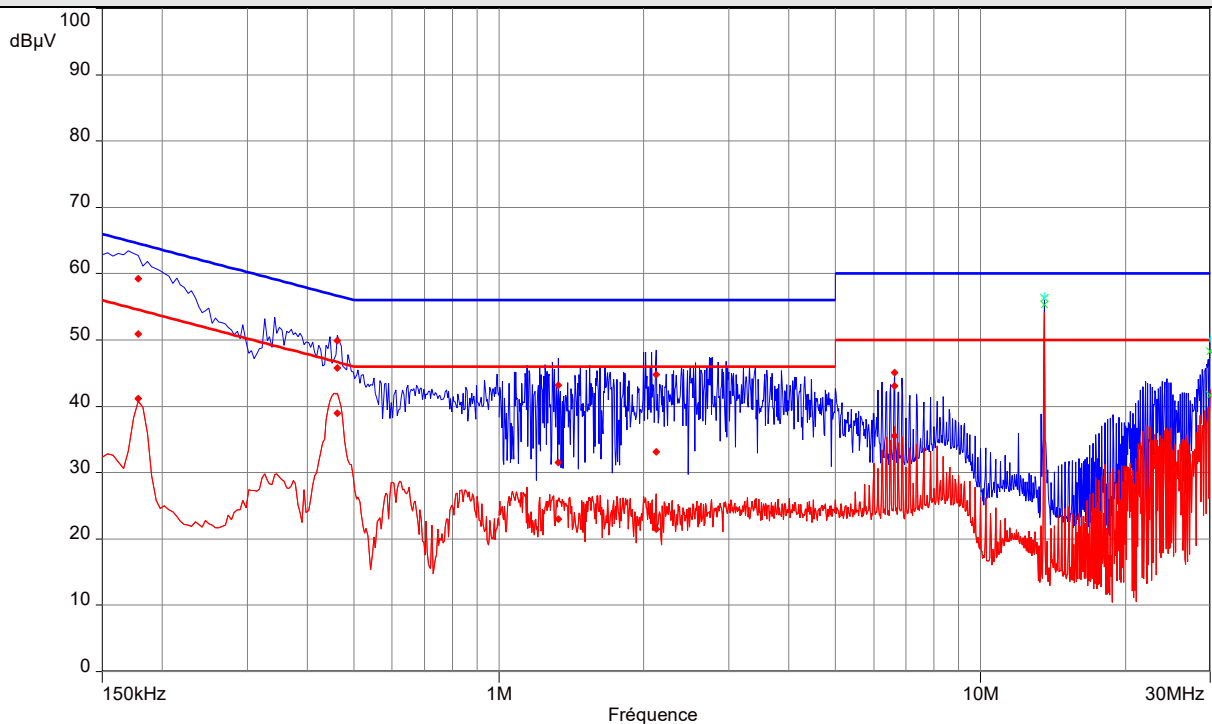
Graphical representation of Conducted Disturbance Measurement (Peak and Average detection) AC port, Line L1 (ETH+24V)



----: Peak

----: Average

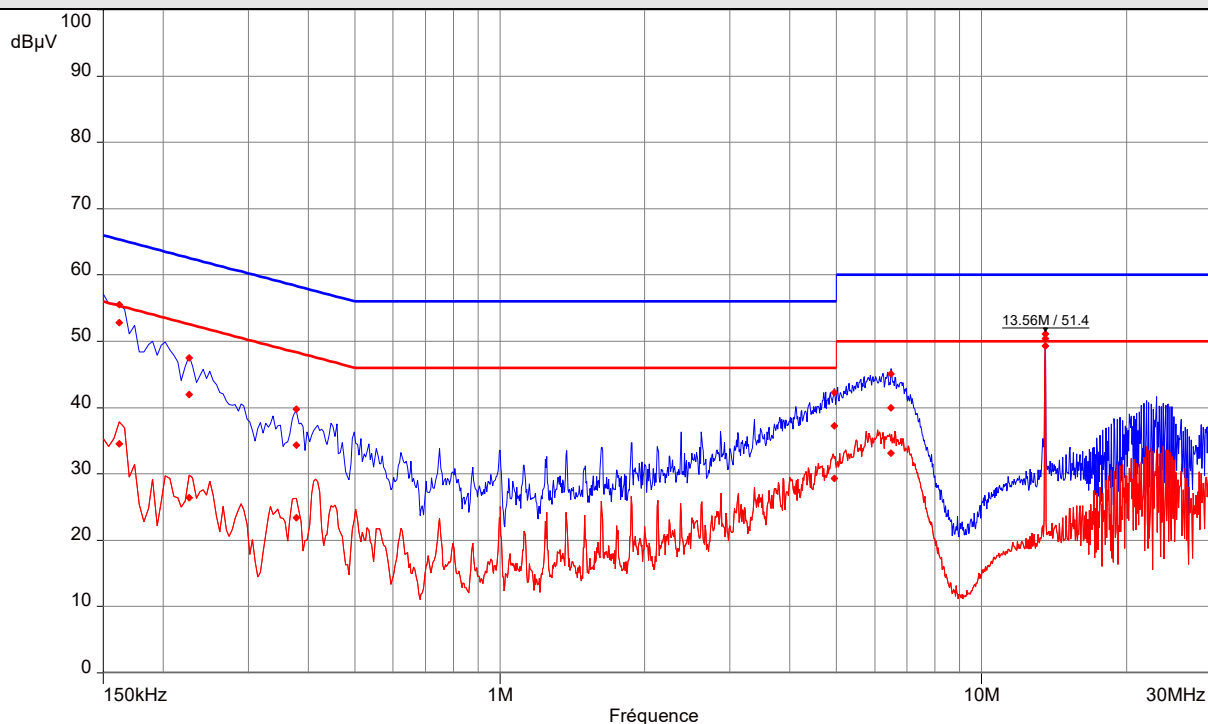
Graphical representation of Conducted Disturbance Measurement (Peak and Average detection) AC port, Line Neutral (ETH+24V)



----: Peak

----: Average

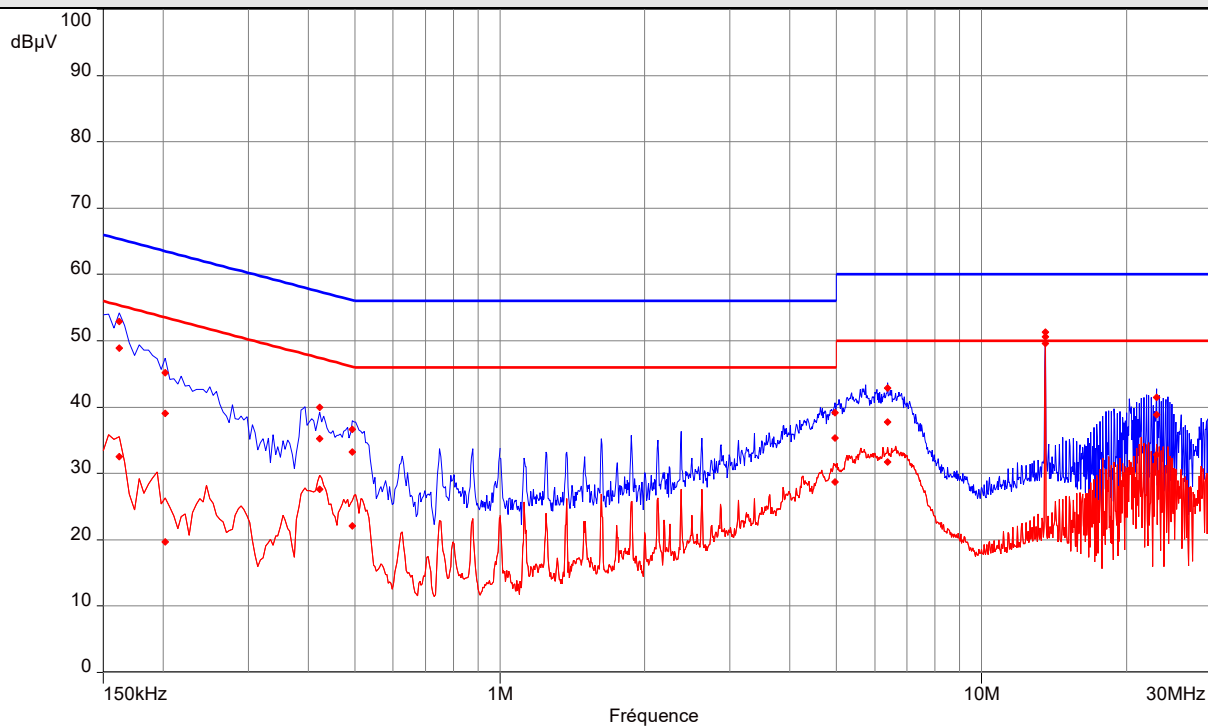
Graphical representation of Conducted Disturbance Measurement (Peak and Average detection) AC port, Line L1 (POE)



----: Peak

----: Average

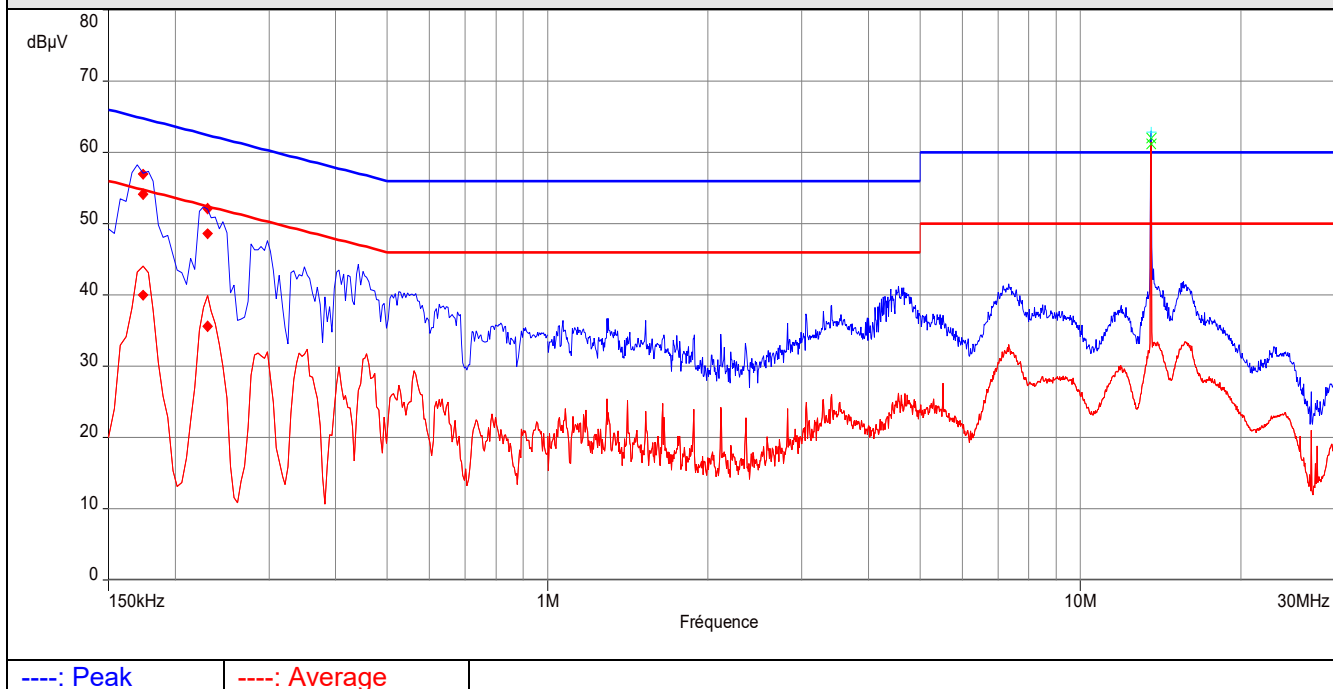
Graphical representation of Conducted Disturbance Measurement (Peak and Average detection) AC port, Line Neutral (POE)



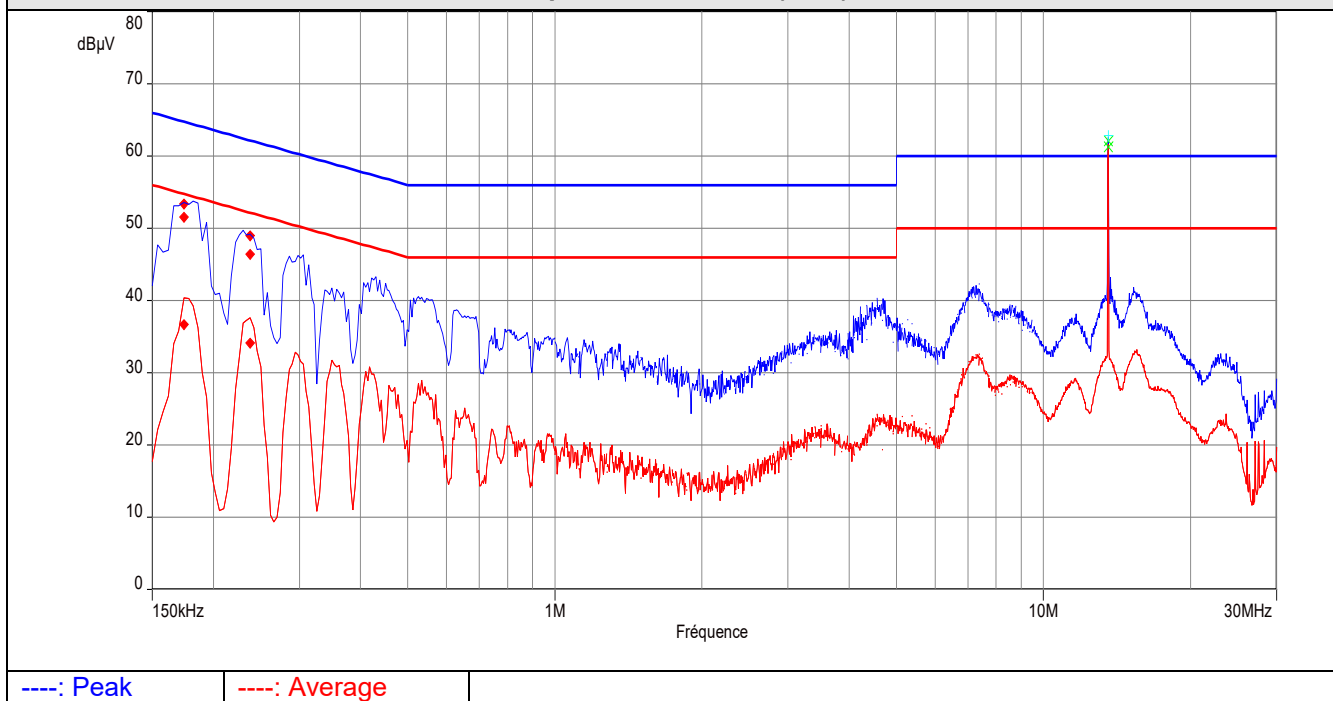
----: Peak

----: Average

Graphical representation of Conducted Disturbance Measurement (Peak and Average detection) AC port, Line L1 (USB)



Graphical representation of Conducted Disturbance Measurement (Peak and Average detection) AC port, Line Neutral (USB)

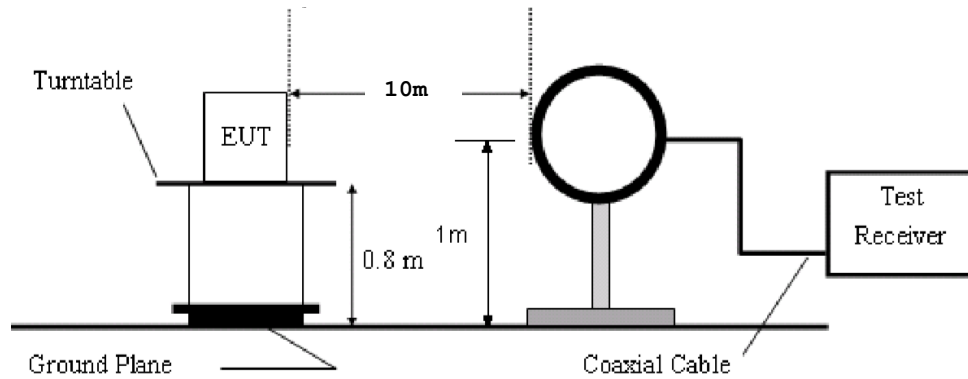


10. Radiated Emission Measurement (9kHz-10GHz)

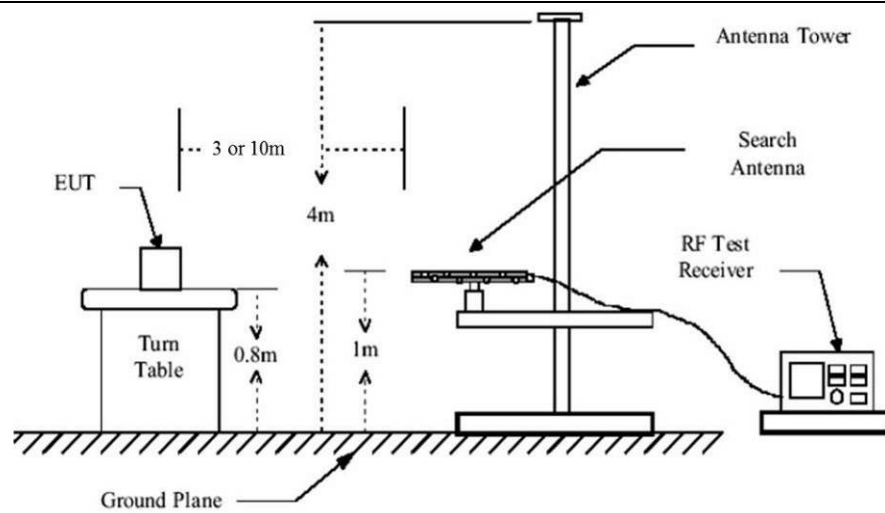
TEST: Radiated Emission Measurement (9kHz-10GHz)		Verdict
Method: Measurements were made in a 10 or 3-meter Open Area Test Site that complies to ANSI C63.4/ C63.10 for frequency below 1GHz. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements (Peak/Quasi-Peak/Average) were then performed by rotating the EUT 360° and adjusting the receive antenna height. The tested equipment is set to transmit operation with modulations on lowest, middle and highest channel. Three orthogonal axis measurements on EUT are performed to obtain the maximum peak field strength. A pre-scan frequency identification of the EUT has been performed in full anechoic chamber. The measured radiated field of the EUT is performed at 3-meters of distance for frequency 9k-1GHz. Antenna is 1.25m high in front of EUT.		Pass
Laboratory Parameters:	Required prior to the test	During the test
Ambient Temperature	20 to 30 °C	25°C ± 2
Relative Humidity	30 to 70 %	45% ± 5
Fully configured sample scanned over the following frequency range	Frequency range on each side of line	Measurement Point
	9kHz – 30MHz	10 m measurement distance
	30MHz – 10GHz	3 m measurement distance
Limits – FCC Part 15.209 / RSS-210 §7.2		
Frequency (MHz)	Limits (dBµV/m)	
	Level / Detector / Distance	Results
0.009 to 0.090	107.6 – 87.6 / AV / 10m 127.6 – 107.6 / PK / 10m	Pass
0.090 to 0.110	87.6 – 85.9 / QP / 10m	Pass
0.110 to 0.490	85.7 – 72.9 / AV / 10m 105.7 – 92.9 / PK / 10m	Pass
0.490 to 1.705	52.9 – 42.1 / QP / 10m	Pass
1.705 to 30	48.6 / QP / 10m	Pass
30 to 88	40.0 / QP / 3m	Pass
88 to 216	43.5 / QP / 3m	Pass
216 to 960	46.0 / QP / 3m	Pass
960-1000	54.0 / QP / 3m	Pass
Above 1GHz	54.0 / AV / 3m 74.0 / PK / 3m	Pass
Supplementary information: Test location: SMEE Test date: May 18th to 20th, 2020. Tested by L. Chapus		

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Log-periodic antenna	EMCO	3146	ANT-191-019	2019/6	2021/6
Biconnic antenna	COM-POWER	AB- 900	ANT-101-003	2019/6	2021/6
Loop antenna	EMCO	6502	ANT-101-009	2019/8	2021/8
BiConiLog antenna	EMCO	3142B	ANT-101-010	2019/8	2021/8
Horn antenna	ETS-LINDGREN	3115	ANT-141-013	2018/10	2021/10
Spectrum analyzer	Rohde&Schwarz	FSV40	ASP-171-004	2019/8	2021/8
RF cable	Div	OATS/25m	CAB-101-017	2020/4	2021/4
RF cable	Pasternack RF	PE302-120	CAB-131-024	2019/4	2020/6
RF cable	HUBER+SUHNER	RG214U	CAB-141-026	2019/4	2020/6
RF cable	HUBER+SUHNER	RG214U	CAB-141-029	2019/4	2020/6
RF cable	HUBER+SUHNER	SF104	CAB-141-030	2019/4	2020/6
Pre-amplifier	Pasternack RF	PE1524	PRE-101-002	2019/6	2020/6
Anechoic chamber	COMTEST	214263	CAG-141-001	2017/6	2020/6
OATS	Div	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-141-001	-	-
Measuring Rec	Rohde&Schwarz	ESRP	REC-151-002	2019/9	2021/9
EMC Software	NEXIO	BAT EMC V3.18	SOF-101-001	-	-

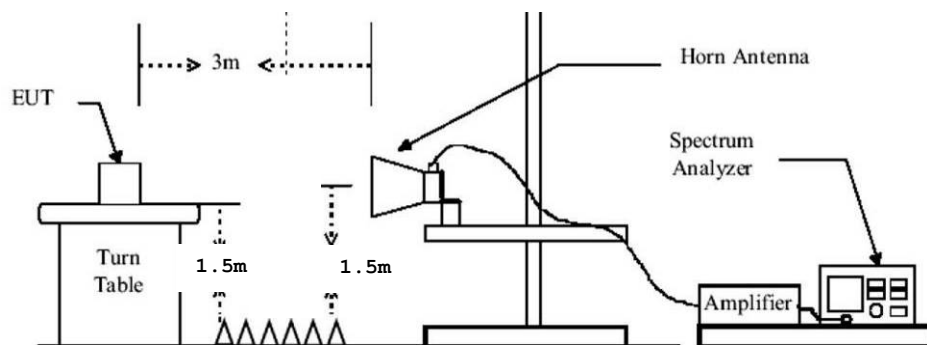
Test Setup for radiated emission



Test setup for 9k-30MHz



Test setup for 30-1000MHz (3m)



Test setup for 1-10GHz

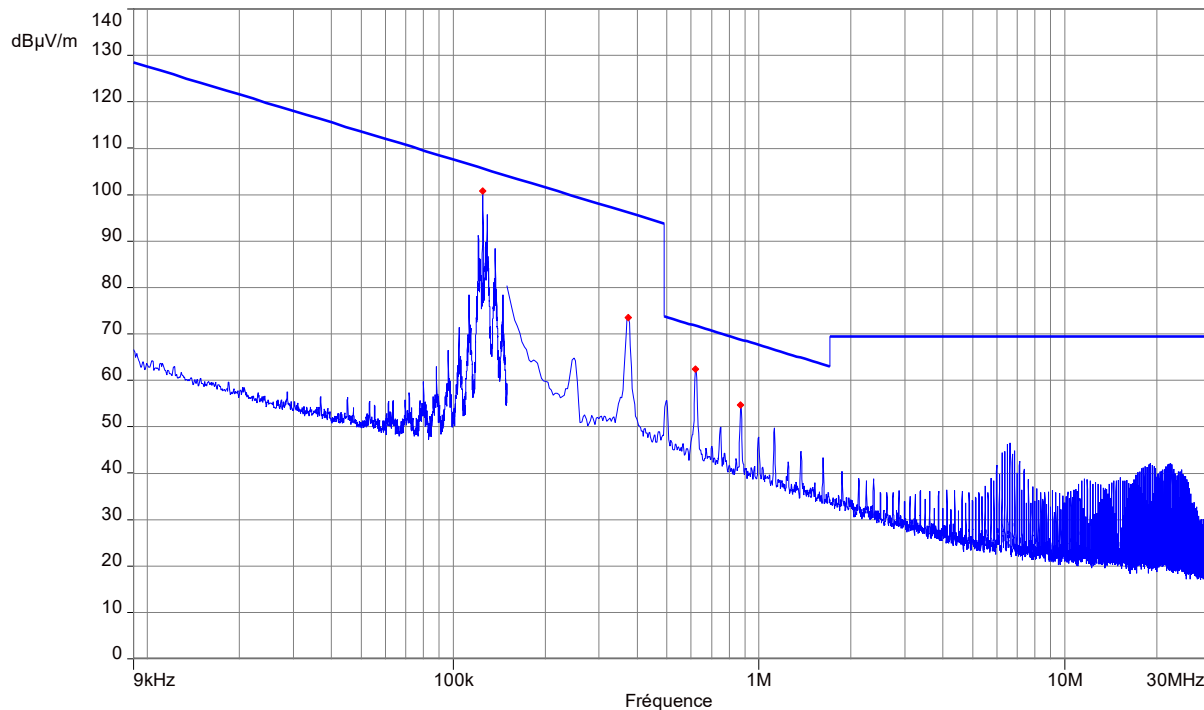
Tabulated Results for Unwanted emissions (9kHz-490kHz)							
FREQ	RF field @ 300m	Limit @ 300m	Detector	Margin	Ant. angle	Table angle	Correc. Fact. (CF)
MHz	dBμV/m	dBμV/m	Pk / QP / AV	dB	Degree	Degree	dB
0.125	23.1 *1	25.6	AV	-2.5	90	65	10.6
0.125	26.1 *1	45.6	Pk	-19.5	90	65	10.6
0.375	-10.8 *1	16.1	AV	-26.9	90	50	10.5
0.375	9.9 *1	36.1	Pk	-26.2	90	50	10.5
Supplementary information: Frequency list measured on the Open Area Test Site has been created with pre-scan results. Worst case results for all communication modes.							
Frequency band investigated:		9kHz-490kHz					
RBW:		200Hz (9kHz-150kHz) 9kHz (150kHz-30MHz)					
Measurement distance:		10m					
Final measurement detector:		Peak / Quasi-Peak / Average					
Limit:		FCC Part 15.209 / RSS-Gen					
Note:		CF: Correction factor = Antenna factor + Cable loss *1: Measure have been done at 10m distance and corrected according to requirements of 15.209.e / RSS-Gen clause 6.5) (M@300m = M@10m-59.1dB) Loop antenna used and rotated about its axis to maximize any emission.					

Tabulated Results for Unwanted emissions (490kHz-30MHz)							
FREQ	RF field @ 30m	Limit @ 30m	Detector	Margin	Ant. angle	Table angle	Correc. Fact. (CF)
MHz	dBμV/m	dBμV/m	Pk / QP	dB	Degree	Degree	dB
0.625	27.3 *1	31.7	QP	-4.4	0	65	10.5
0.875	22.7 *1	28.8	QP	-6.1	0	75	10.5
Supplementary information: Frequency list measured on the Open Area Test Site has been created with pre-scan results. Worst case results for all communication modes.							
Frequency band investigated:		490kHz-30MHz					
RBW:		9kHz (150kHz-30MHz)					
Measurement distance:		10m					
Final measurement detector:		Quasi-Peak					
Limit:		FCC Part 15.209 / RSS-Gen					
Note:		CF: Correction factor = Antenna factor + Cable loss *1: Measure have been done at 10m distance and corrected according to requirements of 15.209.e / RSS-Gen clause 6.5) (M@30m = M@10m-19.1dB) Loop antenna used and rotated about its axis to maximize any emission.					

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	Degré	(QP) dBμV/m	dB
31.713	28.3	43.2	10.2	38.5	53.4	V	100	300	40	-1.5
47.373	29.2	32.0	10.7	39.9	42.7	V	100	0	40	-0.1
58.710	27.3	30.8	10.2	37.5	41.0	V	100	100	40	-2.5
174.987	12.9	24.6	17.0	29.9	41.6	V	100	0	40	-10.1
198.347	12.9	16.5	19.0	31.9	35.5	H	100	0	40	-8.1
260.108	26.8	29.4	14.5	41.3	43.9	V	187	170	46	-4.7
499.680	18.5	23.1	21.2	39.7	44.3	V	140	200	46	-6.3
624.990	14	19.8	22.8	36.8	42.6	V	120	235	46	-9.2
Supplementary information:										
Frequency list measured on the Open Area Test Site is created with pre-scan results.										
Frequency band investigated:			30MHz-1GHz							
RBW:			120kHz							
Measurement distance:			3m							
Limit:			FCC Part 15.209 / RSS-Gen §8.9							
Final measurement detector:			Quasi-Peak							
RESULT:			PASS							
Note:										

Tabulated Results for Unwanted emissions (1GHz-10GHz)				
FREQ	Field level	Detector	Limit	Result
(MHz)	dBμV/m		(dBμV/m)	
Levels at least 10dB below limits		Pk	74 Pk	Pass
Levels at least 10dB below limits		Av	54 Av	Pass
RBW		1MHz (CISPR)		
Measurement distance:		3m		
Limit:		FCC Part 15.209 / RSS-Gen §8.9		
Final measurement detector:		Peak / CISPR Average		
RESULT:		PASS		

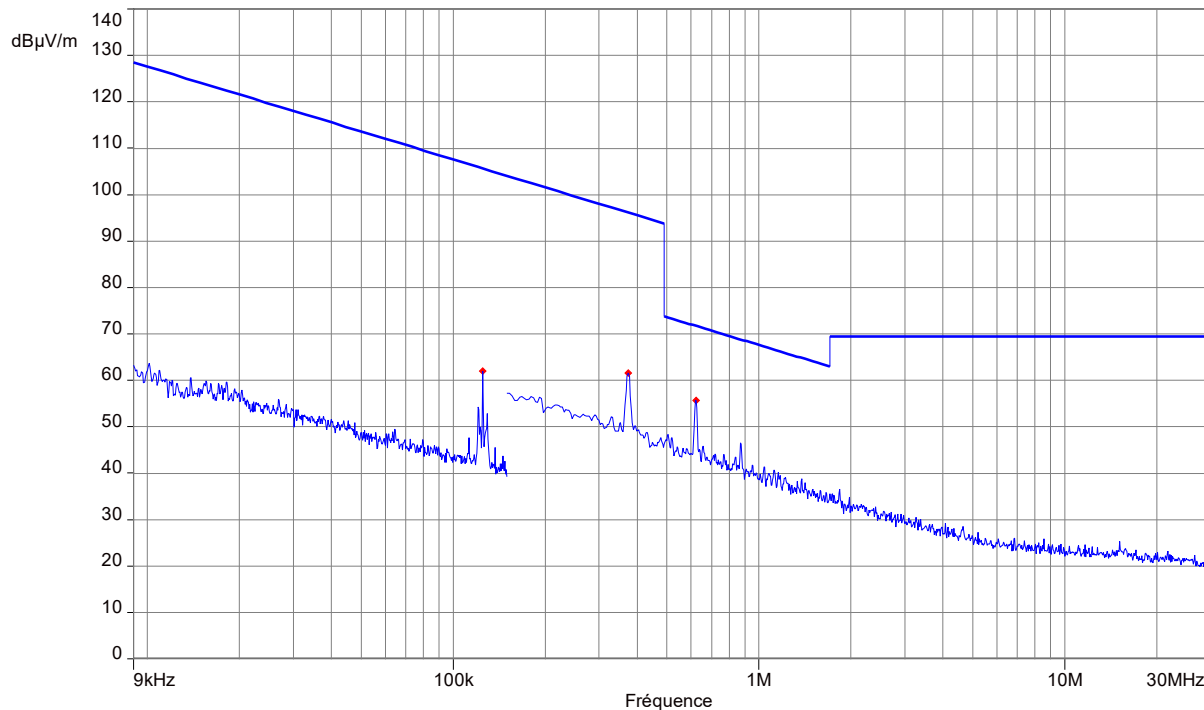
Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 9kHz-30MHz / 3m / Parallel & Perpendicular antenna position / Transmit mode)



Notes: Pre-scan graph only for identification purpose. Nominal power LF mode. (24V or POE power supply)

Frequency band investigated:	9kHz-30MHz		
Unit :	dBμV/m		
RBW :	200Hz (9kHz-150kHz) 9kHz (150kHz-30MHz)		
Antenna polarization :	Parallel & Perpendicular to measurement axis		
Measurement detector:	Peak		
Frequency (MHz)	Peak Level (dBμV/m)	Limit (dBμV/m)	Polarization
0.125031	100.85	105.6	
0.373897	73.55	96.2	
0.621677	62.39	71.7	
0.872442	54.66	68.8	

Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 9kHz-30MHz / 3m / Parallel & Perpendicular antenna position / Transmit mode)

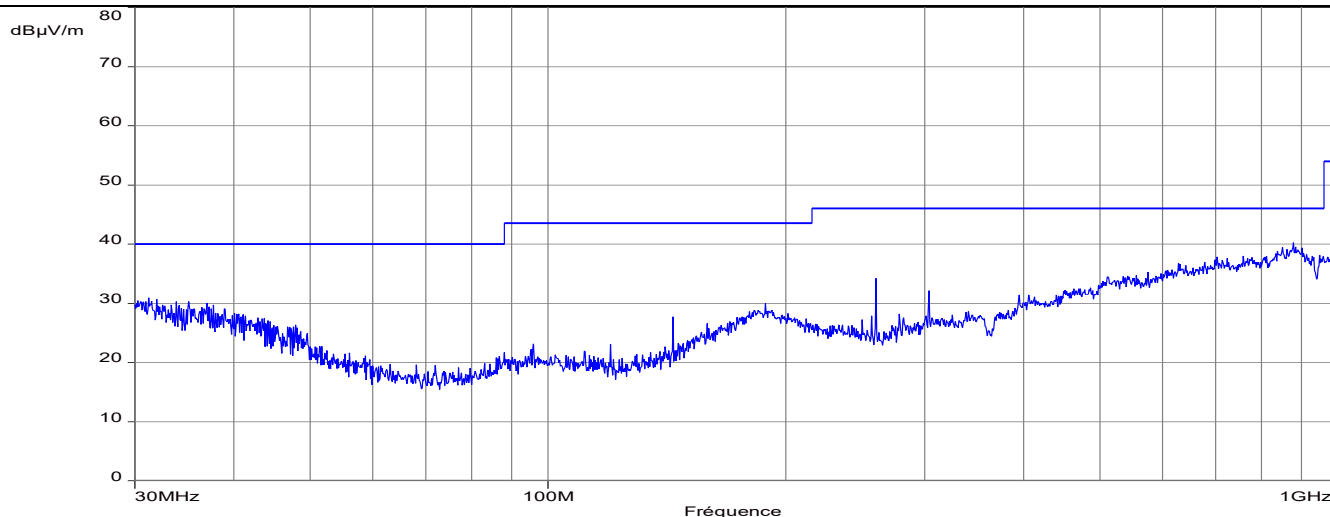


Notes: Pre-scan graph only for identification purpose. Low power LF mode. (USB 5V power supply)

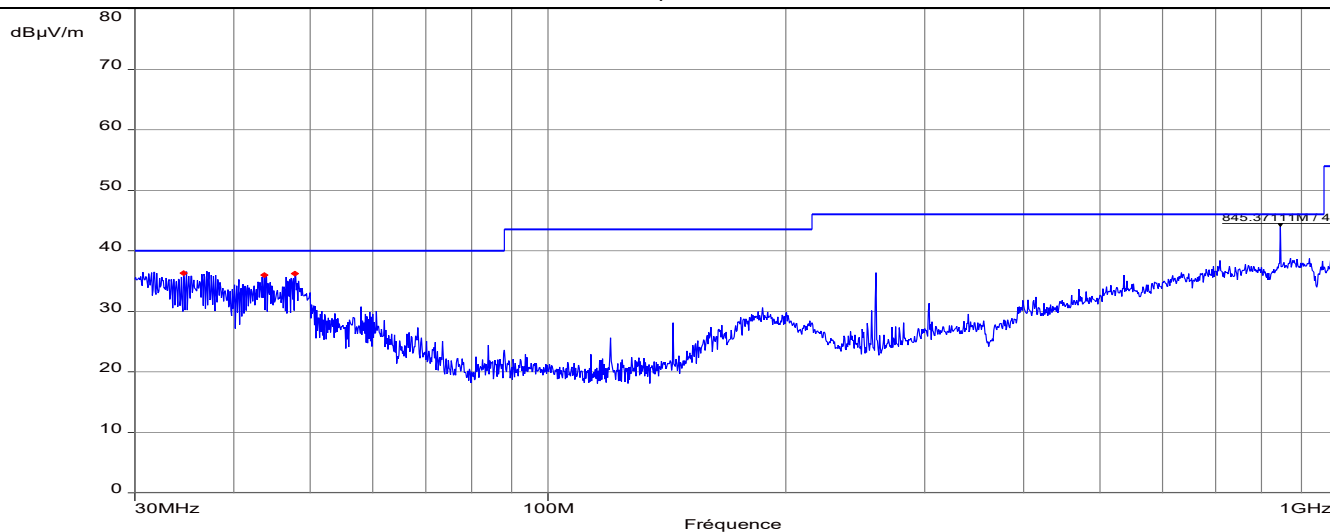
Frequency band investigated:	9kHz-30MHz		
Unit :	dBµV/m		
RBW :	200Hz (9kHz-150kHz) 9kHz (150kHz-30MHz)		
Antenna polarization :	Parallel & Perpendicular to measurement axis		
Measurement detector:	Peak		
Frequency (MHz)	Peak Level (dBµV/m)	Limit (dBµV/m)	Polarization
0.125031	61.99	105.6	
0.373897	61.55	96.2	
0.624662	55.71	71.7	

Graphical representation of Radiated Disturbance Measurement (Anechoic chamber pre-scan, 30MHz-1GHz / 3m) / RS422+24V

Horizontal polarization



Vertical polarization



----- : Peak measure / limits

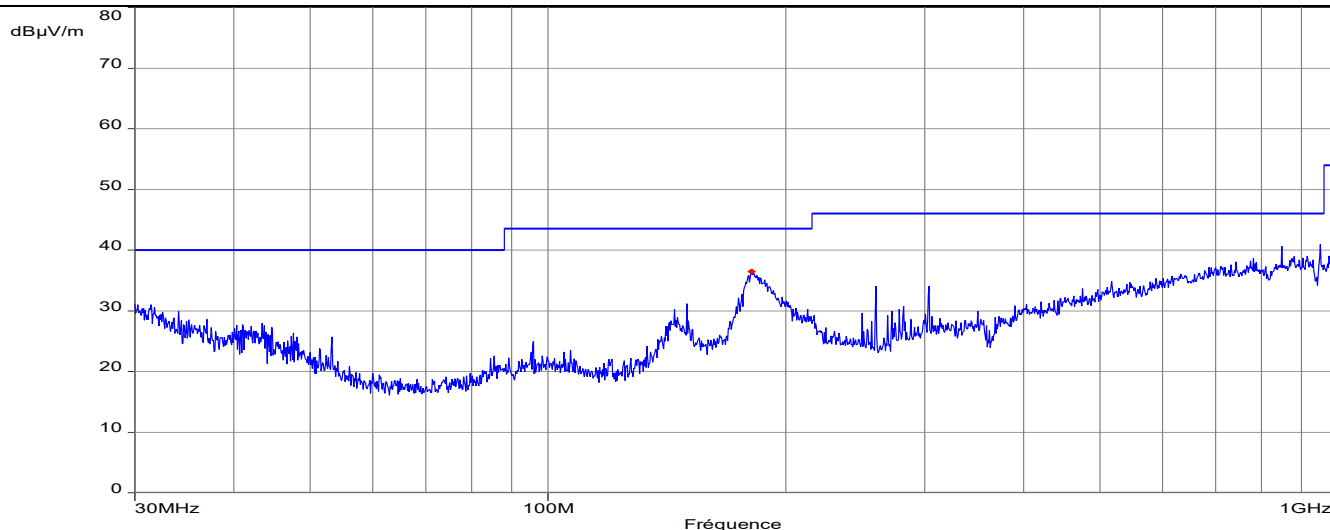
Note: Pre-scan graph only for identification purpose.

Marker List :

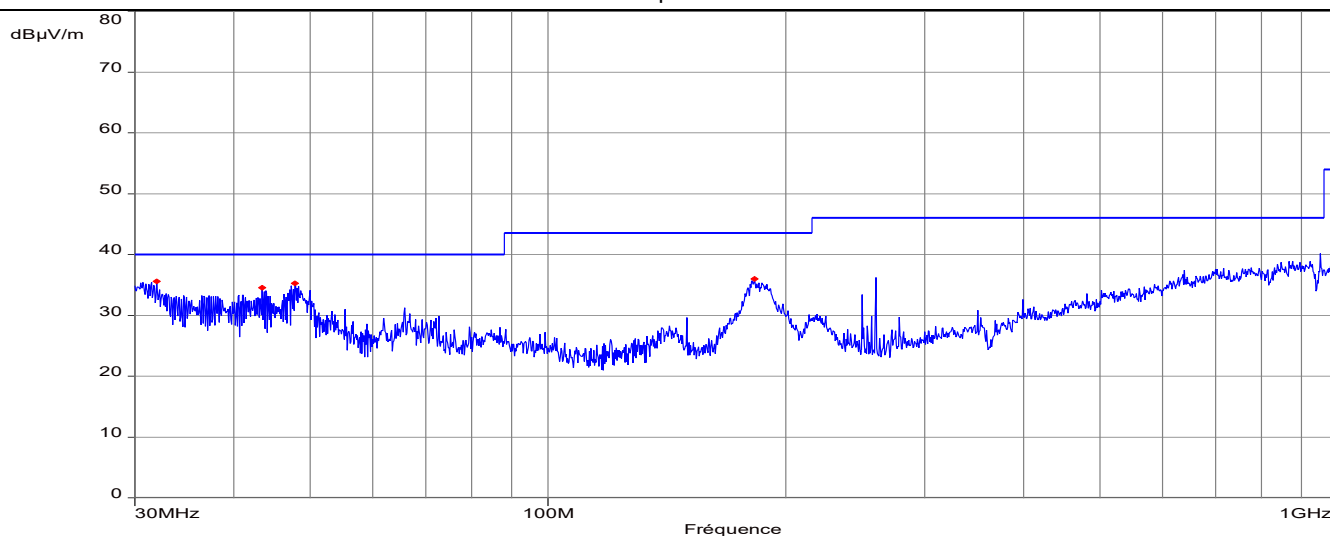
Frequency (MHz)	Peak Level (dBμV/m)	Limit (dBμV/m)	Polarization
34.6076	36.33	43.5	V
43.732	35.98	43.5	V
47.8546	36.2	43.5	V

Graphical representation of Radiated Disturbance Measurement (Anechoic chamber pre-scan, 30MHz-1GHz / 3m) / ETH+24V

Horizontal polarization



Vertical polarization



----- : Peak measure / limits

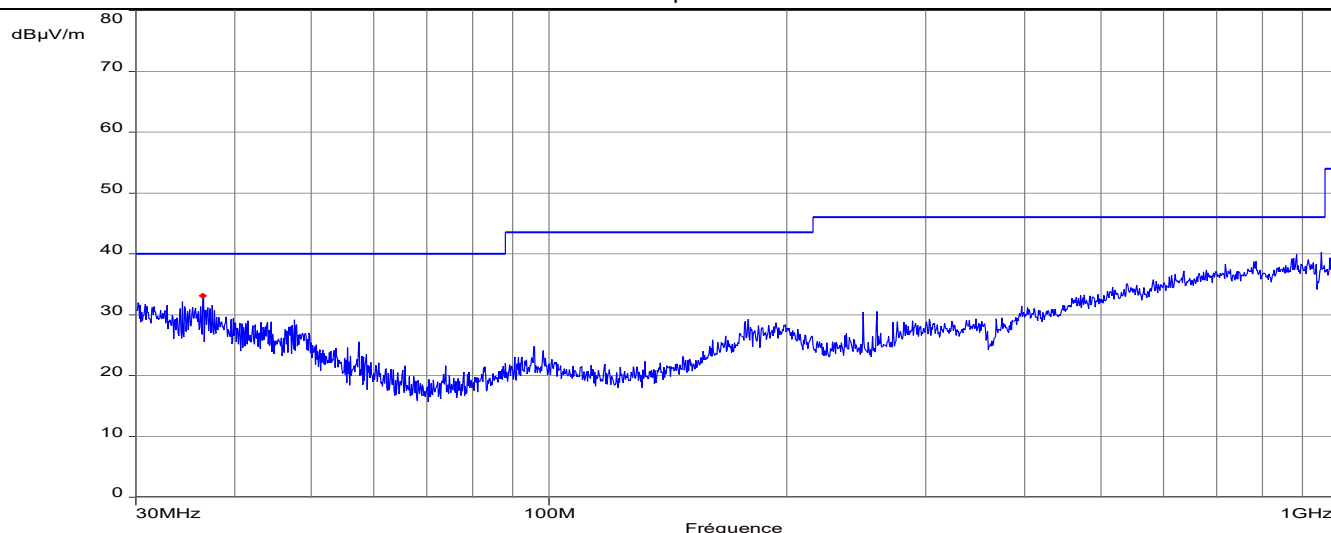
Note: Pre-scan graph only for identification purpose.

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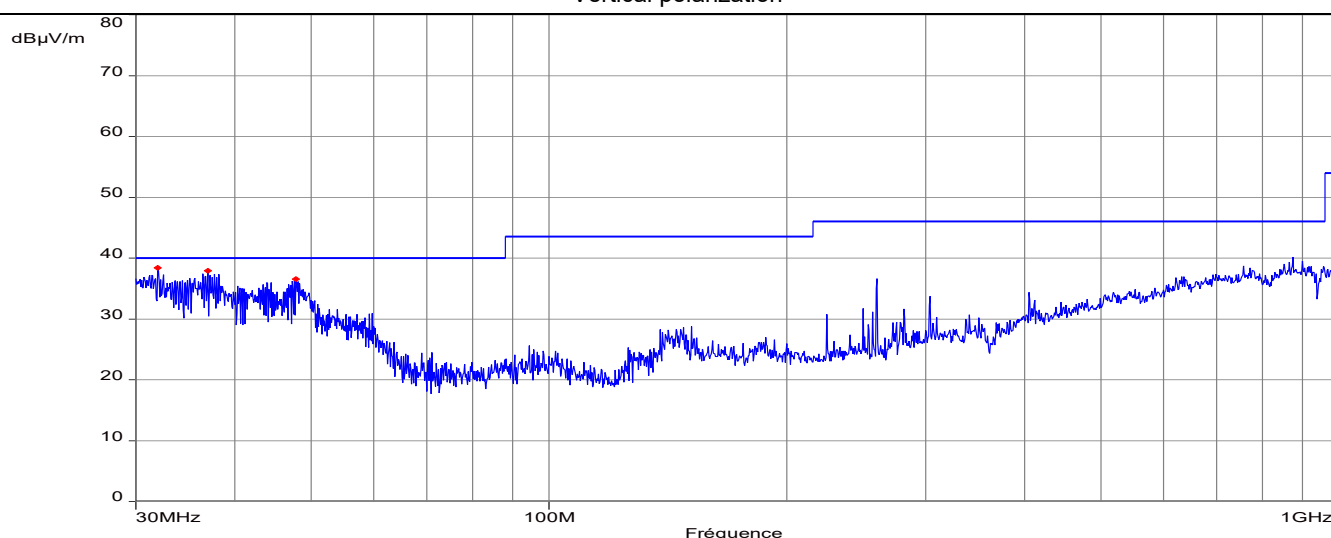
Frequency (MHz)	Peak Level (dBμV/m)	Limit (dBμV/m)	Polarization
181.264	36.5	43.5	H
31.9704	35.56	40.0	V
43.4895	34.52	40.0	V
47.8546	35.27	40.0	V
182.749	36	43.5	V

Graphical representation of Radiated Disturbance Measurement (Anechoic chamber pre-scan, 30MHz-1GHz / 3m) / POE

Horizontal polarization



Vertical polarization



----- : Peak measure / limits

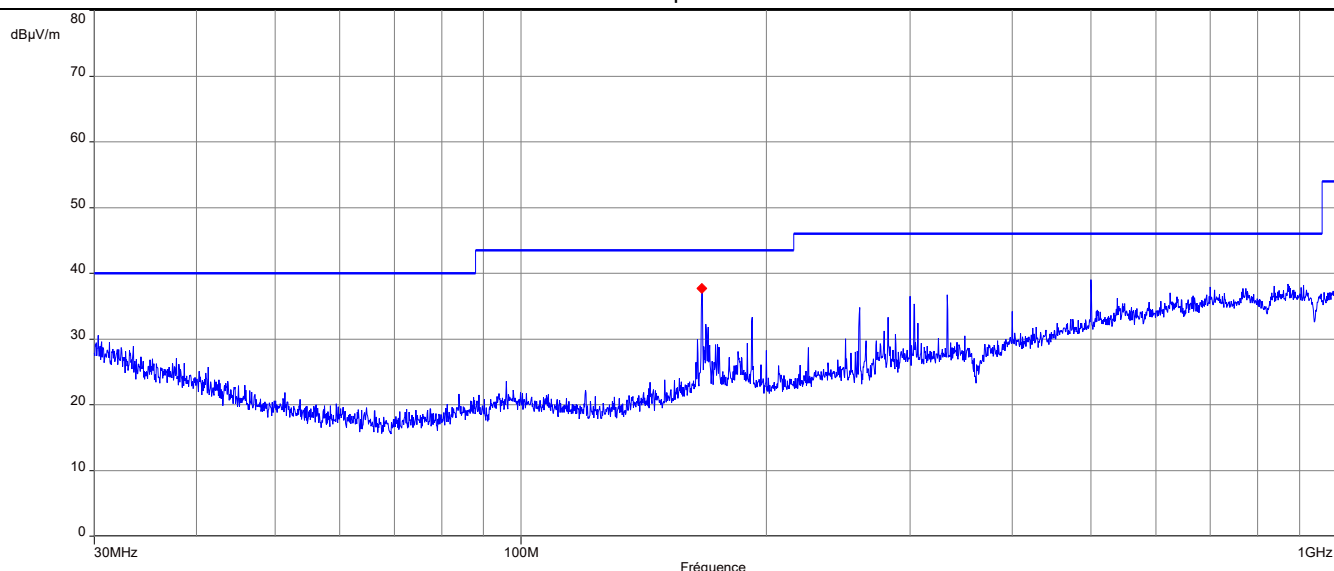
Note: Pre-scan graph only for identification purpose.

Marker List :

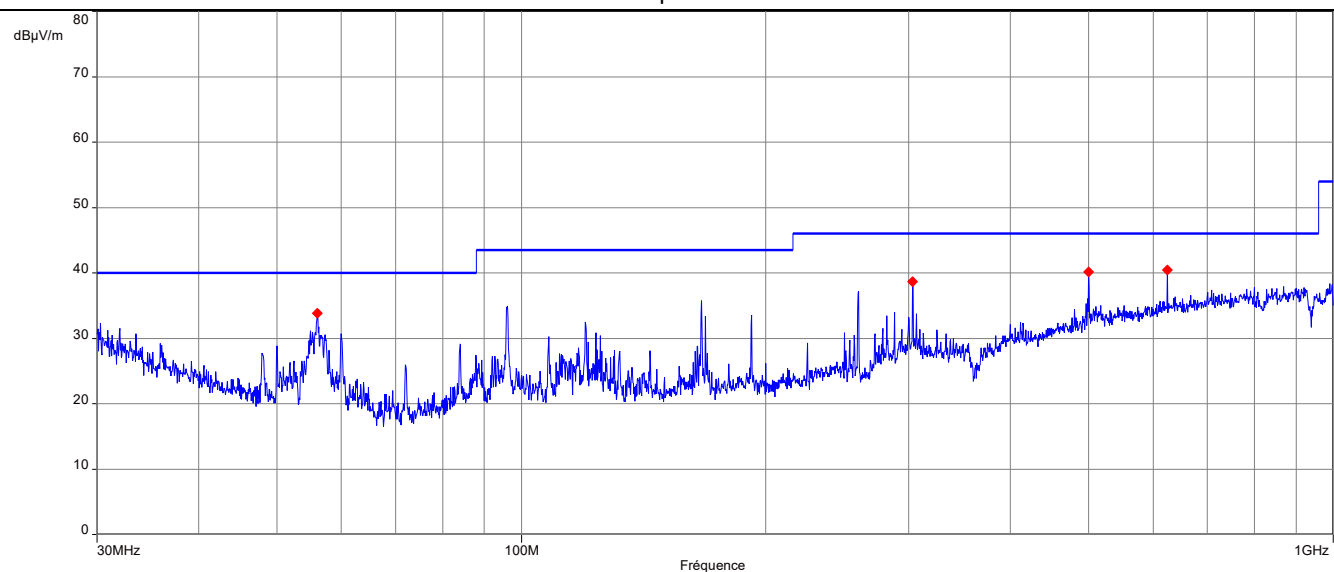
Frequency (MHz)	Peak Level (dBμV/m)	Limit (dBμV/m)	Polarization
32.0007	38.37	40.0	V
37.0024	37.91	40.0	V
47.8546	36.58	40.0	V

Graphical representation of Radiated Disturbance Measurement (Anechoic chamber pre-scan, 30MHz-1GHz / 3m) / USB

Horizontal polarization



Vertical polarization



----- : Peak measure / limits

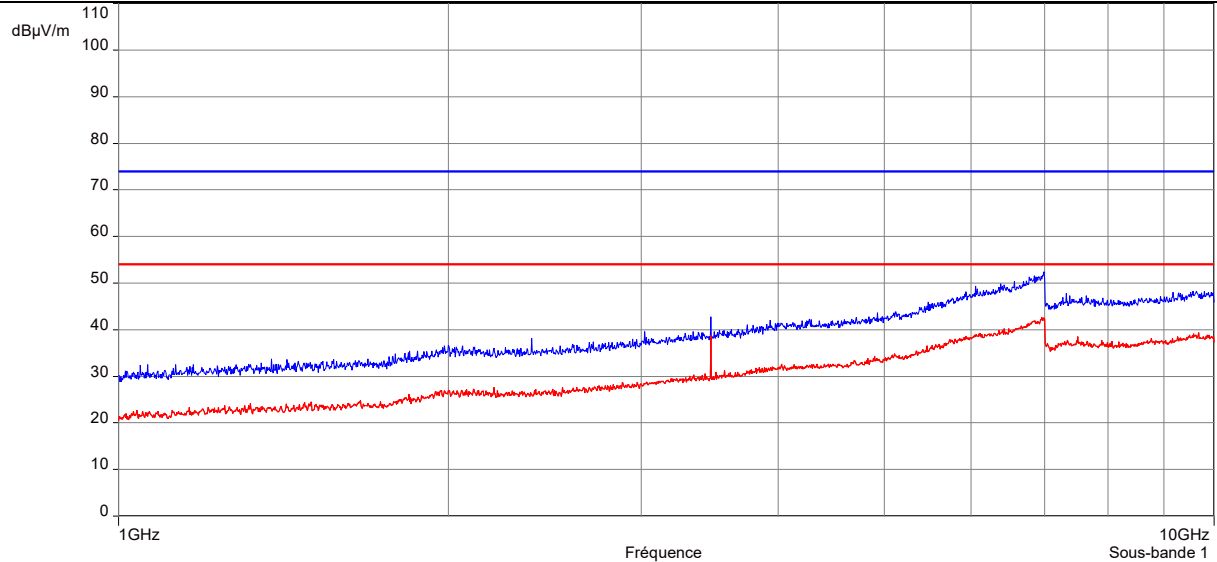
Note: Pre-scan graph only for identification purpose.

Marker List :

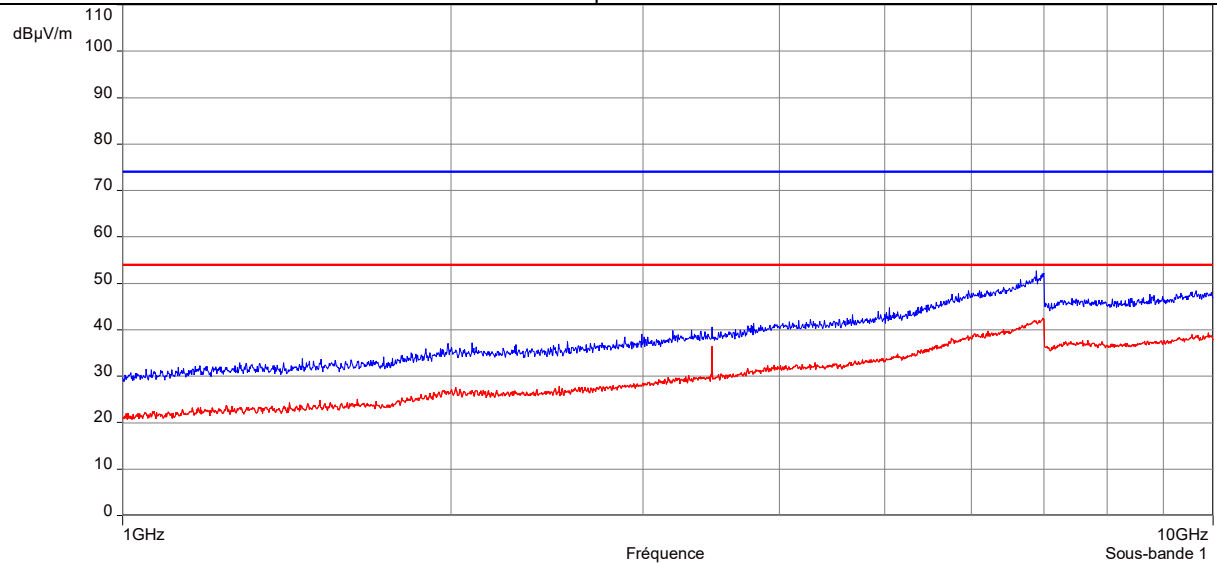
Frequency (MHz)	Peak Level (dBμV/m)	Limit (dBμV/m)	Polarization
166.744	37.67	43.5	H
56.0696	33.81	40.0	V
303.427	38.69	43.5	V
499.98	40.16	46.0	V
624.992	40.43	46.0	V

Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 1GHz-10GHz / 3m)

Horizontal polarization



Vertical polarization



----- : Peak measure / limit

----- : AVG measure / limit

Note: Pre-scan graph only for identification purpose. Same results for all communication modes.

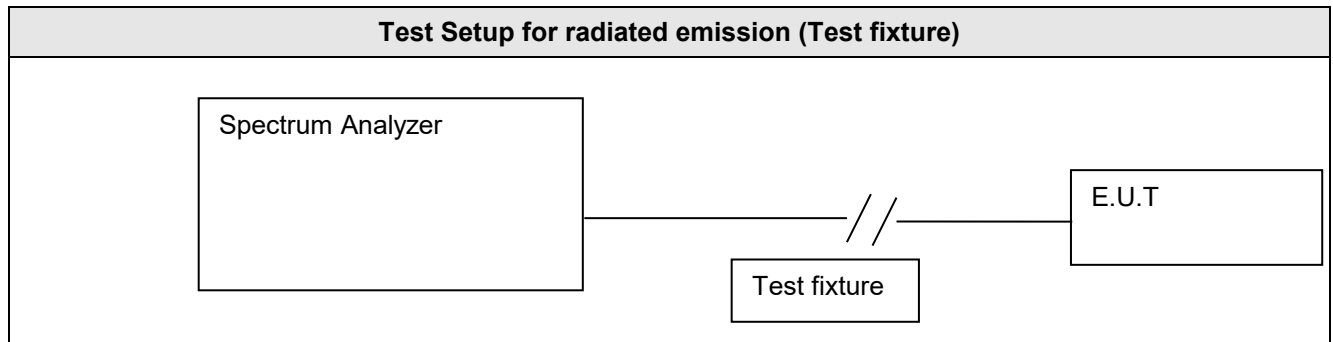
Marker List :

Frequency (MHz)	Peak Level (dBμV/m)	Limit (dBμV/m)	Polarization
None	-	-	-

11. 99% Occupied Bandwidth

TEST: Occupied Bandwidth / 15.215 – RSS-Gen			Verdict
Method: The setup is in an anechoic chamber. The spectrum analyzer is connected to the measuring antenna. The RBW is set at 1kHz, with VBW $\geq 3 \times$ RBW. The SPAN is wide enough to capture all products of the modulation process. A MaxHold Peak detector is used. Measures are performed with OBW 99% function of the spectrum analyser.			Pass
Laboratory Parameters:	Required prior to the test	During the test	
Ambient Temperature	10 to 40 °C	20°C	
Relative Humidity	10 to 90 %	55%	
Supplementary information: Test location: SMEE Test date: May 18th, 2020. Tested by L. Chapus			

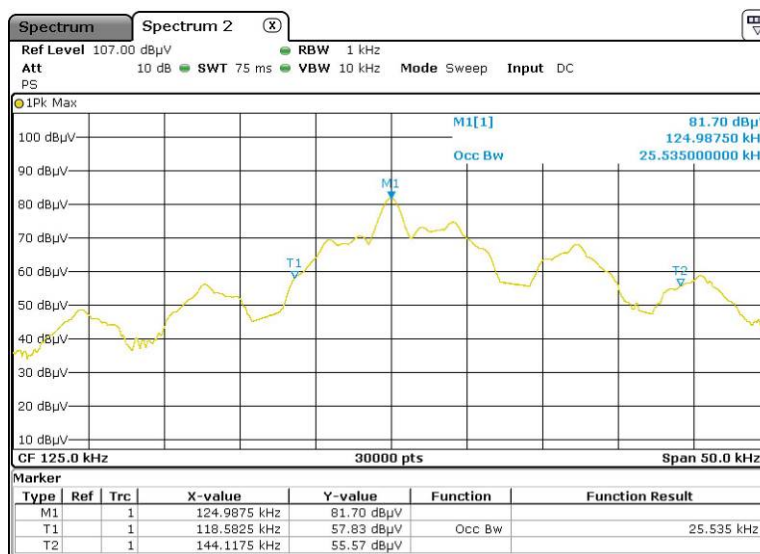
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Measuring Rec.	Rohde&Schwarz	ESRP	REC-151-002	2019/9	2021/9
Loop antenna	EMCO	6502	ANT-101-009	2019/8	2021/8
RF cable	HUBER+SUHNER	RG214U	CAB-141-026	2019/4	2020/6
RF cable	HUBER+SUHNER	RG214U	CAB-141-029	2019/4	2020/6
Anechoic chamber	COMTEST	214263	CAG-141-001	2017/6	2020/6



Tabulated Results for Occupied Bandwidth (99%)

Frequency (kHz)	99% Bandwidth (kHz)
124.9875	25.535

Graphical representation of Occupied Bandwidth



99% Occupied Bandwidth

Frequency:	125kHz
RBW / VBW:	1kHz / 10kHz
Measurement detector:	Peak