

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

Matériel testé : Equipment under test:	IDENTEC SOLUTIONS / iMARK EC (IDS1014), iMARK IC (IDS1015) (Trademark / Marketing name or product reference)
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Demandeur de certification : **IDENTEC SOLUTIONS AG**
Applicant for certification: Millennium Park 2
A-6890 Lustenau – Austria

Client : **IDENTEC SOLUTIONS AG**
Customer: Millennium Park 2
A-6890 Lustenau – Austria

Numéro d'affaire : 10123
Work number :

Référence de la proposition : DV-10212
Proposal number:

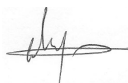
Date de l'essai : Du 29 février au 12 mars 2024
Date of test: February 29th to March 12th, 2024

Objectif des essais : EMC qualification according to following standards:
Test purpose: - CFR 47, FCC Part 15, Subpart C
(Chapter 15.249 - Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz, and 24.0–24.25 GHz)
- Industry Canada, RSS-Gen Issue 5 & RSS-210 Issue 10, section B.10
(Bands 902–928, 2400–2483.5 and 5725–5875 MHz)
Measurement standards:
ANSI C63.10 (2013)

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

Test réalisé par : Chemseddine KERMICHE
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	September 10 th , 2024	Initial Edition	Chemseddine KERMICHE Test operator	Laurent Chapus Technical Manager 

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1. Normative References

FCC qualification according to:		
Standards	Applied	Title
ANSI C63.10 (2013)	X	American National Standard for Testing Unlicensed Wireless Devices
CFR47, Part 15 (March 2024)	X	Telecommunication – Federal Communication Commission – Radio frequency devices, Sections 15.207 / 15.209 / 15.249

ISED Canada qualification according to:		
Standards	Applied	Title
RSS-Gen (Issue 5/2018, amendments 2019 and 2021)	X	General Requirements and Information for the Certification of Radio Apparatus
RSS-210 (Issue 10/2019+Amendment 2020)	X	Licence-exempt Radio Apparatus: Category I Equipment, Section B.10: Devices Operating in Frequency Bands for Any Application, Band 902-928 MHz

Deviation from standards: None.

2. Test synthesis

TEST	Paragraph number FCC Part 15 ISED RSS-210	Spec. FCC Part 15 ISED RSS-210	RESULTS (comments)
Conducted emissions test	15.207 (a) RSS-Gen: Issue 5, §8.8	15.207 (a) Table 4, §8.8	PASS
Field Strength of fundamental	15.249 (a) (c) RSS-210: Issue 10, §B.10 (a)	94dBµV/m @3m (50mV/m @ 3m)	PASS
Field Strength of harmonics	15.249 (a) (c) (e) RSS-210: Issue 10, §B.10 (a)	54dBµV/m @3m (0.5mV/m @ 3m)	PASS
Unwanted emissions outside the specified frequency band and harmonics	15.209 / 15.249 (d) (e) RSS-210: Issue 10, §B.10 (b) / RSS-Gen: Issue 5, §8.9	Whichever is less stringent, either: - 50dB below level of fundamental, or; - General field strength limits, as follow: <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 RSS-Gen: Issue 5, §6.7	BW at 99% and at -20dB	PASS
Antenna requirement	FCC 15.203 RSS-GEN § 6.8		PASS

- General conclusion:**

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

3. Equipment Under Test (EUT)

Nom /
Identification

**IDENTEC SOLUTIONS /
iMARK EC (IDS1014), iMARK IC (IDS1015)**
(Trademark / Marketing name or product reference)

Sn:
iMark EC 0.445.005.550
iMark IC 0.445.004.525

FCC ID: OO4-IDS1014
IC: 3538A-IDS1014
Model / HVIN: IDS1014 and IDS1015
Product name / PMN: iMARK EC and iMARK IC
FVIN: IDS1014: V1.0-TagType18
IDS1015: V1.0-TagType21
Modular approval: No

Alimentation /
Power supply 24V DC

Auxiliaires /
Auxiliaries
- Laptop PC Hp pavillon g6
- IDENTEC reader: i-POINT Si, model : IDS1001
- Power supply adapter (Input 100-240V)
Model: ESC30-24 (for iMark-EC) and TRG30R240V (for iMark-IC)

Entrées-Sorties /
Input / Output

	Câbles pour essai / Cables for test	Blindé / Shielded	Prévu pour >3m / Intended for >3m
DC input cable	1.5m	No	Yes
LF antenna connector (2 wires) (Only for iMark EC model)	1.5m to antenna coil	No	Yes

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 low, middle and high channels
(902.5/915/927.5MHz)

Programme de test /
Test program /

PC test program "Gen3 Tag Certification tool Version : 1.0.1.29513"

Fréquence max interne EST /
Max internal EUT frequency

927.5 MHz for RF data transmission.

Informations
supplémentaires /
Additional informations

Declaration of the applicant:
- Type of technology: Proprietary RF protocol.
- Emission bands: 902-928MHz.
- Frequency transmission band: 902.5 to 927.5MHz.
- Channel spacing 0.5MHz from 902.5 to 927.5MHz
- Modulation: (G)FSK ± 20 kHz.
- Antenna type: FPC antenna.
- Equipment intended for use as a mobile equipment.
- Equipment designed for continuous operation.
- Rated conducted output power setting software: 2dBm for IDS1014 and 5dBm for IDS1015.

Dimensions de l'EST /
Dimensions of EUT

100mm x 100mm x 40mm (Without LF external antenna)

All Information above is declared by the customer / applicant and are under his responsibility.

4. Test conditions

Power supply voltage:
Equipment under test: 24V DC from power supply adapter.
Auxiliaries: 120V AC 60Hz.

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 (30-200MHz, SAC 3m)	± 5.6dB
Radiated emission test (200-1000MHz, SAC 3m)	± 5.3dB
Radiated emission test (1-18GHz, FAC 3m)	± 5.6dB
Radiated emission test (18-40GHz, FAC 3m)	± 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

Margin value = Emission level – Limit value

Example:

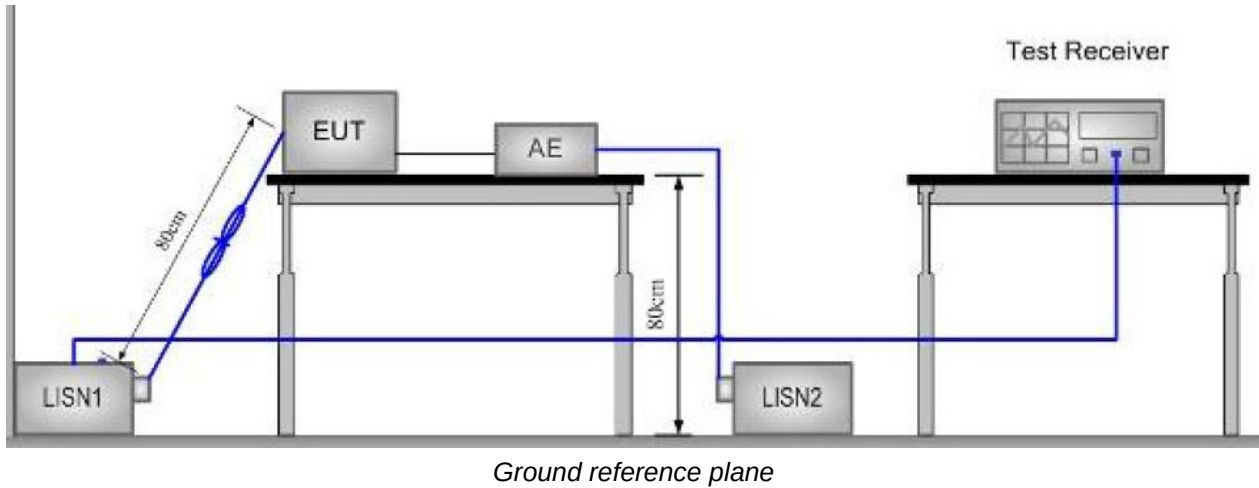
RA: 14.0dBμV / AF: 16.5 dBm⁻¹ / CF: 3.5dB / AG: 15dB

→ Total factor: 5dBm⁻¹

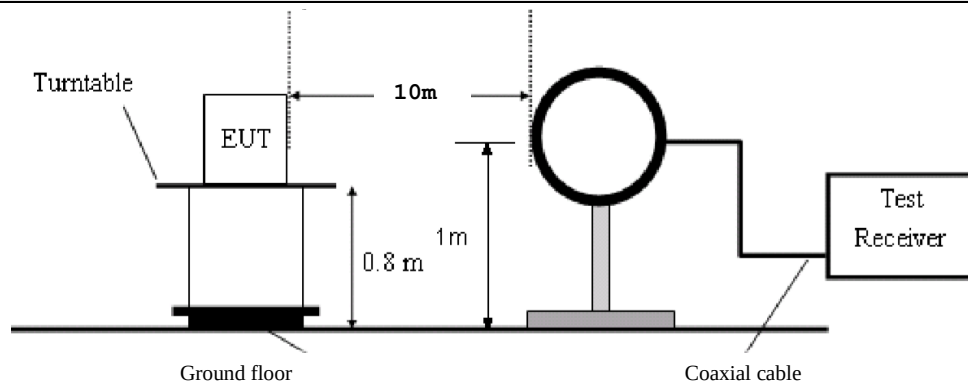
→ Field level: 19.0dBμV/m (-21.0dB for margin if limit is 40dBμV/m)

9. Test Setup Diagram

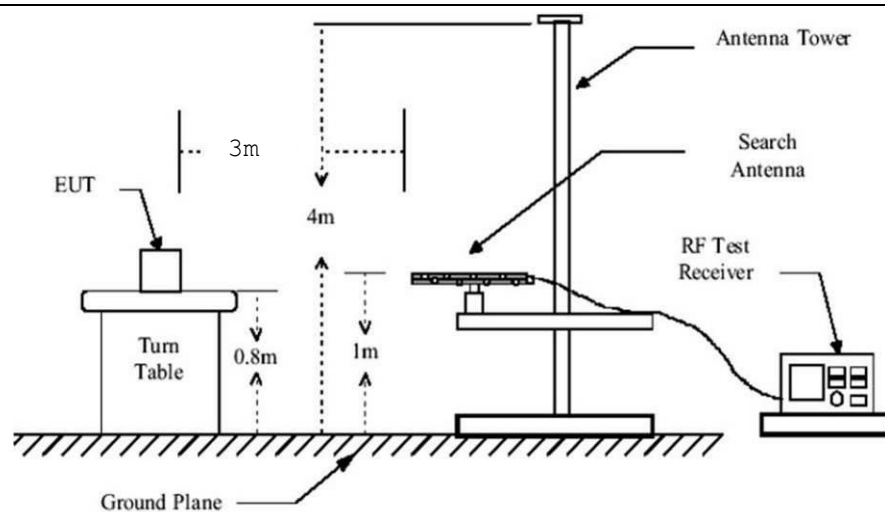
Test Setup for conducted emission



Test Setup for radiated emission

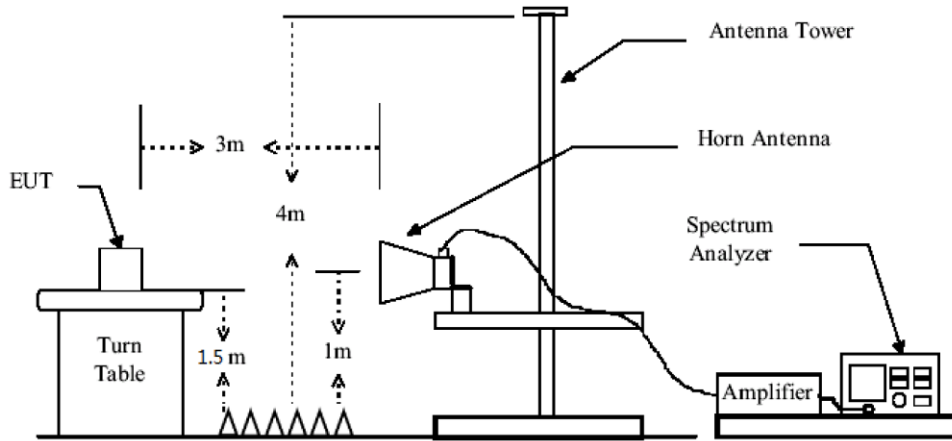


Test setup for 9k-30MHz (FS OATS)



Test setup for 30-1000MHz (SAC 3m)

Test Setup for radiated emission



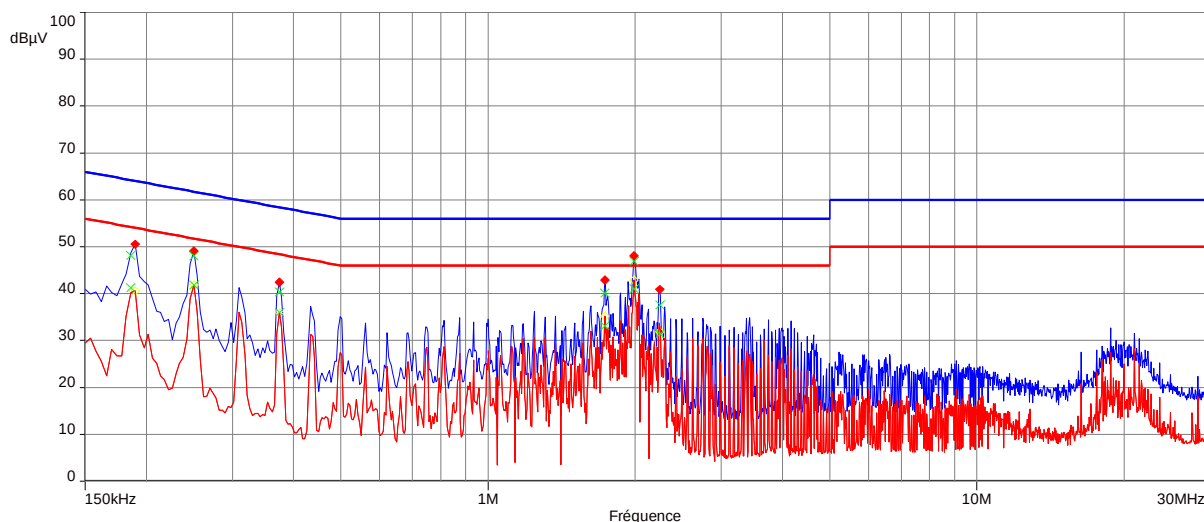
Test setup for 1-10GHz (SAC 3m, tilt antenna mast used)

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

TEST: Limits for conducted disturbance 150kHz – 30MHz				Verdict
<u>Method:</u> 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		17 - 27 °C		21°C ± 2
Relative Humidity		25 - 65 %		48% ± 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 (120V/60Hz)
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: March 12 th , 2024. Tested by C. KERMICHE Power supply voltage: 24V DC from power supply adapter 120V 60Hz.				

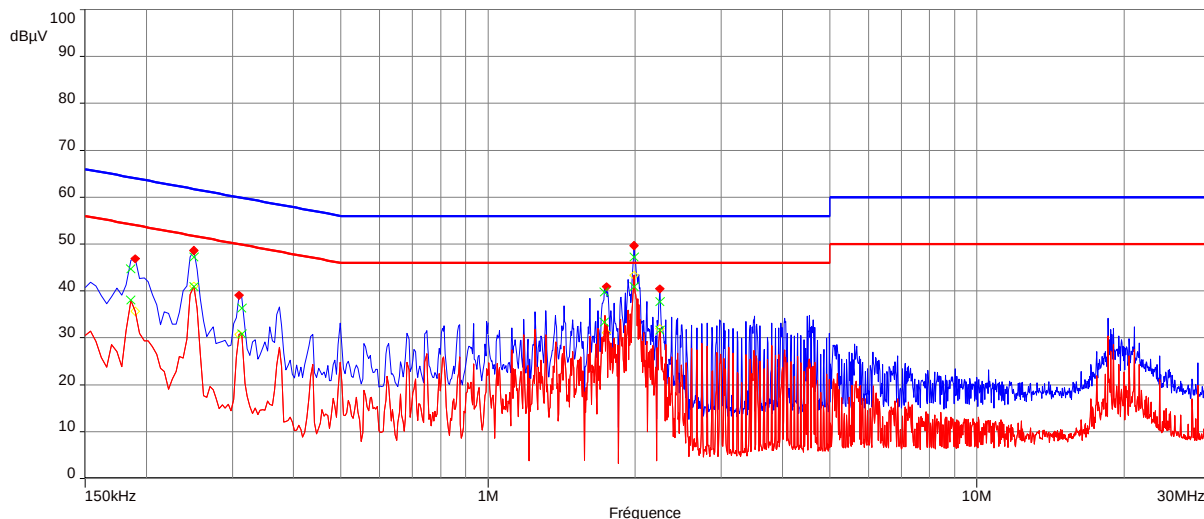
IDS1014

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



Note : Same result for all transmit modes on all channels.

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



Note : Same result for all transmit modes on all channels.

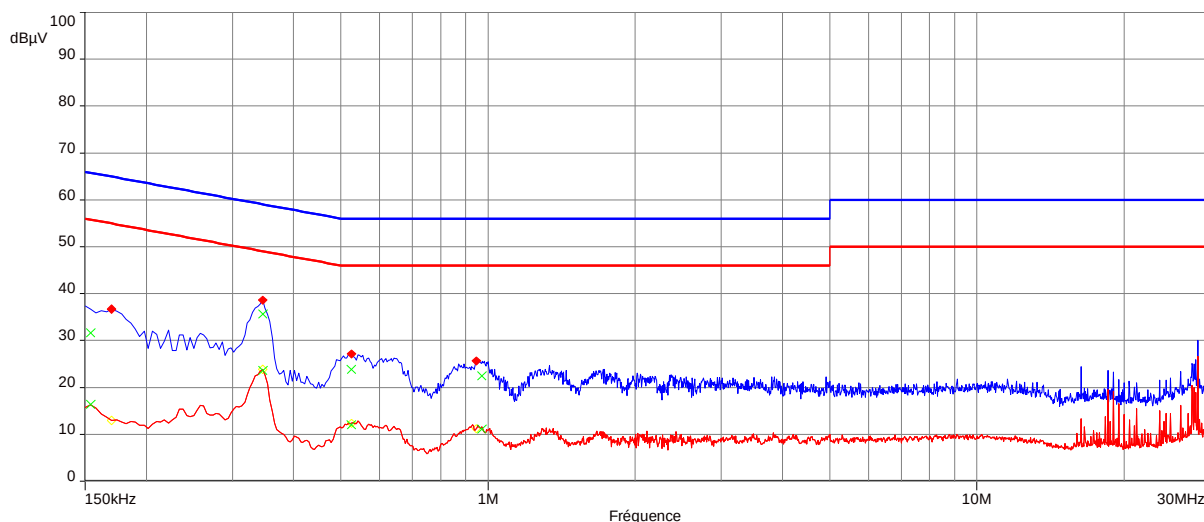
~~~~~: Peak

~~~~~: Average

| IDS1014 | | | | | | | | |
|---|----------|---------|--|-----------|---------|----------|-----------|------|
| Tabulated Results for Mains Terminal Disturbance Voltage on AC port | | | | | | | | |
| FREQ | Meas. PK | Mes. QP | LIMIT QP | Margin QP | Mes. AV | LIMIT AV | Margin AV | Line |
| 0.187916 | 51.87 | 48.12 | 64.21 | -16.09 | 41.28 | 54.21 | -12.93 | |
| 0.249219 | 51.18 | 48.01 | 61.76 | -13.75 | 41.87 | 51.76 | -9.89 | L1 |
| 0.37209 | 43.47 | 40.43 | 58.41 | -17.98 | 36.07 | 48.41 | -12.35 | L1 |
| 1.737042 | 43.63 | 40.12 | 56.00 | -15.88 | 33.16 | 46.00 | -12.84 | L1 |
| 1.988087 | 49.70 | 46.96 | 56.00 | -9.04 | 41.11 | 46.00 | -4.89 | L1 |
| 2.247907 | 41.71 | 37.66 | 56.00 | -18.34 | 31.48 | 46.00 | -14.52 | L1 |
| 0.187308 | 49.08 | 44.76 | 64.21 | -19.45 | 38.08 | 54.21 | -16.13 | N |
| 0.248784 | 49.36 | 47.26 | 61.76 | -14.50 | 40.98 | 51.76 | -10.78 | N |
| 0.312692 | 39.96 | 36.35 | 59.86 | -23.51 | 30.85 | 49.86 | -19.02 | N |
| 1.733412 | 43.61 | 39.83 | 56.00 | -16.17 | 33.44 | 46.00 | -12.56 | N |
| 1.988608 | 49.78 | 47.31 | 56.00 | -8.69 | 40.98 | 46.00 | -5.02 | N |
| 2.248255 | 41.71 | 37.69 | 56.00 | -18.31 | 31.68 | 46.00 | -14.32 | N |
| RBW: | | | 9kHz | | | | | |
| Voltage: | | | 120V/60Hz | | | | | |
| Limit: | | | FCC Part 15.207 a) / RSS-Gen: Issue 5, §8.8 Table 4 | | | | | |
| Final measurement detector: | | | Quasi-Peak and CISPR Average (AV) | | | | | |
| RESULT: | | | PASS | | | | | |
| Measured value calculation: | | | <p>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:</p> $\text{Meas.} = \text{RA} + \text{CF} + \text{ATT}_{\text{TRAN}} + \text{ATT}_{\text{LISN}}$ <p>Where Meas. = Level (dBμV)
 RA = Receiver Amplitude
 CF = Cable Factor
 ATT_{TRAN} = Transient suppressor attenuation
 ATT_{LISN} = LISN attenuation</p> <p>Margin value = Emission level – Limit value (A negative margin shows compliance to limit)</p> | | | | | |

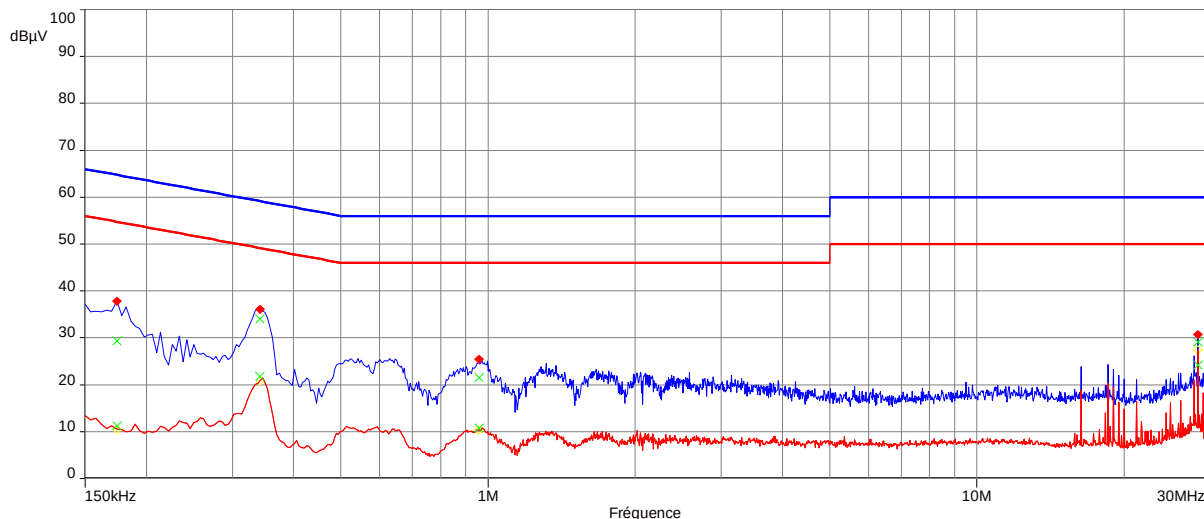
IDS1015

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



Note : Same result for all transmit modes on all channels.

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



Note : Same result for all transmit modes on all channels.

~~~~~: Peak

~~~~~: Average

| IDS1015 | | | | | | | | |
|---|----------|---------|--|-----------|---------|----------|-----------|------|
| Tabulated Results for Mains Terminal Disturbance Voltage on AC port | | | | | | | | |
| FREQ | Meas. PK | Mes. QP | LIMIT QP | Margin QP | Mes. AV | LIMIT AV | Margin AV | Line |
| (MHz) | (dBμV) | (dBμV) | (dBμV) | (dB) | (dBμV) | (dBμV) | (dB) | |
| 0.152822 | 41.10 | 31.71 | 65.78 | -34.07 | 16.41 | 55.78 | -39.37 | L1 |
| 0.344437 | 38.46 | 35.65 | 59.06 | -23.41 | 23.61 | 49.06 | -25.45 | L1 |
| 0.524784 | 27.79 | 23.84 | 56.00 | -32.16 | 12.00 | 46.00 | -34.00 | L1 |
| 0.969444 | 26.44 | 22.48 | 56.00 | -33.52 | 11.09 | 46.00 | -34.91 | L1 |
| 0.174 | 38.22 | 29.36 | 64.77 | -35.41 | 11.20 | 54.77 | -43.57 | N |
| 0.342 | 37.98 | 34.05 | 59.15 | -25.11 | 21.75 | 49.15 | -27.40 | N |
| 0.958 | 25.57 | 21.52 | 56.00 | -34.48 | 10.84 | 46.00 | -35.16 | N |
| 28.292 | 31.99 | 29.11 | 60.00 | -30.89 | 24.16 | 50.00 | -25.84 | N |
| RBW: | | | 9kHz | | | | | |
| Voltage: | | | 120V/60Hz | | | | | |
| Limit: | | | FCC Part 15.207 a) / RSS-Gen: Issue 5, §8.8 Table 4 | | | | | |
| Final measurement detector: | | | Quasi-Peak and CISPR Average (AV) | | | | | |
| RESULT: | | | PASS | | | | | |
| Measured value calculation: | | | <p>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:</p> $\text{Meas.} = \text{RA} + \text{CF} + \text{ATT}_{\text{TRAN}} + \text{ATT}_{\text{LISN}}$ <p>Where Meas. = Level (dBμV)
 RA = Receiver Amplitude
 CF = Cable Factor
 ATT_{TRAN} = Transient suppressor attenuation
 ATT_{LISN} = LISN attenuation</p> <p>Margin value = Emission level – Limit value (A negative margin shows compliance to limit)</p> | | | | | |

11. Field Strength of fundamental

| TEST: Field strength of fundamental / FCC part 15.249 – RSS 210 §B.10 | | | Verdict |
|---|-----------------------------|-----------------|---------|
| <u>Method:</u> Measurements were made in a 3-meter Semi anechoic chamber (SAC) that complies with ANSI C63.4 / C63.10.
Measurements were performed with a peak detector using a 100kHz RBW.
The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements (Peak) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m.
The tested equipment is set to transmit operation with modulation on lowest, middle and highest channels.
Three orthogonal axis measurements on EUT are performed to obtain the maximum peak field strength. | | | Pass |
| Laboratory Parameters: | Required prior to the test | During the test | |
| Ambient Temperature | 20 to 30 °C | 24°C ± 2 | |
| Relative Humidity | 30 to 70 % | 45% ± 5 | |
| Limits – FCC Part 15.249 (a) (c) / RSS-210 §B.10 (a) | | | |
| Frequency (MHz) | Limits (dBµV/m) | | |
| | Level / Detector / Distance | Results | |
| 902 to 928 MHz | 94dBµV/m / Quasi-peak / 3m | Pass | |
| Supplementary information:
Test location: SMEE
Test date: February 29 th , 2024. Tested by C. KERMICHE | | | |

| Tabulated Results for Field Strength of fundamental / IDS1014 | | | | | |
|---|---------------------|---|----------|--------|--------|
| FREQ | Field Strength @ 3m | Detector | Limit | Margin | Result |
| (MHz) | (dBμV/m) | | (dBμV/m) | dB | |
| 902.5 | 90.8 | QP | 94.0 | -3,2 | Pass |
| 915.0 | 92.9 | QP | 94.0 | -1,1 | Pass |
| 927.5 | 93.9 | QP | 94.0 | -0,1 | Pass |
| RBW: | | 100kHz | | | |
| Measurement distance: | | 3m | | | |
| Limit: | | FCC Part 15.249 (a) (c) / RSS-210 §B.10 | | | |
| Final measurement detector: | | Quasi-Peak | | | |
| RESULT: | | PASS | | | |

| Tabulated Results for Field Strength of fundamental / IDS1015 | | | | | |
|---|---------------------|---|----------|--------|--------|
| FREQ | Field Strength @ 3m | Detector | Limit | Margin | Result |
| (MHz) | (dBμV/m) | | (dBμV/m) | dB | |
| 902.5 | 92.0 | QP | 94.0 | -2 | Pass |
| 915.0 | 92.7 | QP | 94.0 | -1,3 | Pass |
| 927.5 | 93.5 | QP | 94.0 | -0,5 | Pass |
| RBW: | | 100kHz | | | |
| Measurement distance: | | 3m | | | |
| Limit: | | FCC Part 15.249 (a) (c) / RSS-210 §B.10 | | | |
| Final measurement detector: | | Quasi-Peak | | | |
| RESULT: | | PASS | | | |

12. Unwanted emissions & Field Strength of harmonics

| | | |
|---|--|-----------------------------|
| TEST: Unwanted emissions outside fundamental and harmonics bands / FCC part 15.209, 15.249 - RSS-210 §B.10 / RSS-Gen §8.9 | | Verdict |
| <p>Method: Measurements were made in a 3-meter Semi Anechoic Room (SAR) for frequency 30MHz to 1GHz and in a 3-meter Full Anechoic environment (SAR with floor absorbers) above 1GHz. The Semi Anechoic Room complies with CISPR16-1-4 / ANSI C63.4 requirements. For frequency 9kHz to 30MHz, measurements are performed on a free-space open area test site at 10m distance.</p> <p>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.</p> <p>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.</p> | | Pass |
| Laboratory Parameters: | Required prior to the test | During the test |
| Ambient Temperature | 20 to 30 °C | 22°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, 15.249 (a) (c) (d) (e) / RSS-Gen §8.9, RSS-210 §B.10 (a) (b) | | |
| Whichever is less stringent, either: | | |
| Frequency (MHz) | Limits (dBµV/m) | |
| | Level / Detector / Distance | Level / Detector / Distance |
| 30 to 1000 | 50dB below the fundamental / QP / 3m | Not used |
| Above 1GHz | 50dB below the fundamental / Av / 3m
30dB below the fundamental / Pk / 3m | Not used |

Or

| 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: February 29th, 2024. Tested by C. KERMICHE

IDS1014

Graphical representation of Band-edge compliance (Radiated)

Spectrum

Ref Level 103.00 dBμV

Offset 26.00 dB

RBW (CISPR) 120 kHz

Att 10 dB

SWT 2 ms

VBW 300 kHz

Mode Sweep

PA

IPk Max

100 dBμV

90 dBμV

80 dBμV

70 dBμV

60 dBμV

50 dBμV

40 dBμV

30 dBμV

20 dBμV

10 dBμV

M1[1]

M2[1]

M1

90.65 dBμV

902.522500 MHz

41.25 dBμV

902.000000 MHz

D1 46.000 dBμV

M2

F1

CF 902.0 MHz

2000 pts

Span 2.0 MHz

EMI Measurement Marker

| Type | Ref | Trace | Frequency | Level | Final Test | ΔLimit | Final Result |
|------|-----|-------|--------------|------------|------------|--------|--------------|
| N1 | | 1 | 902.5225 MHz | 90.65 dBμV | Quasi Peak | --- | 90.67 dBμV |
| N2 | | 1 | 902.0 MHz | 41.25 dBμV | Quasi Peak | --- | 37.95 dBμV |

Low band-edge compliance

M2 = 902MHz
Quasi-Peak level below 902MHz is 37.95dBμV/m max at 3m
(limit is 46dBμV/m)
RESULT: PASS
Note: Radiated measurement

Spectrum

Ref Level 103.00 dBμV

Offset 26.00 dB

RBW (CISPR) 120 kHz

Att 10 dB

SWT 2 ms

VBW 300 kHz

Mode Sweep

PA

IPk Max

100 dBμV

90 dBμV

80 dBμV

70 dBμV

60 dBμV

50 dBμV

40 dBμV

30 dBμV

20 dBμV

10 dBμV

M1[1]

M2[1]

M1

93.82 dBμV

927.519500 MHz

37.59 dBμV

928.000000 MHz

D1 46.000 dBμV

M2

F1

CF 928.0 MHz

2000 pts

Span 2.0 MHz

EMI Measurement Marker

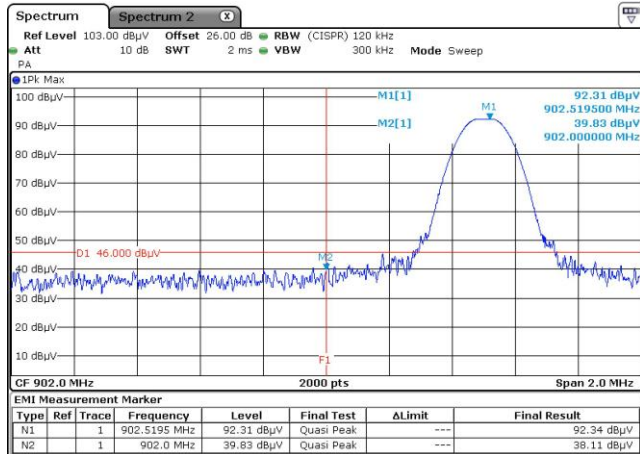
| Type | Ref | Trace | Frequency | Level | Final Test | ΔLimit | Final Result |
|------|-----|-------|--------------|------------|------------|--------|--------------|
| N1 | | 1 | 927.5195 MHz | 93.82 dBμV | Quasi Peak | --- | 90.34 dBμV |
| N2 | | 1 | 928.0 MHz | 37.59 dBμV | Quasi Peak | --- | 36.49 dBμV |

High band-edge compliance

M2 = 928MHz
Quasi-Peak level above 928MHz is 36.49dBμV/m max at 3m
(limit is 46dBμV/m)
RESULT: PASS
Note: Radiated measurement

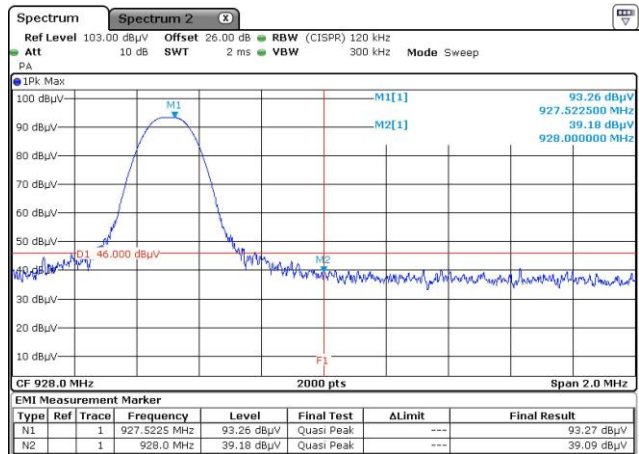
IDS1015

Graphical representation of Band-edge compliance (Radiated)



Low band-edge compliance

M2 = 902MHz
Quasi-Peak level below 902MHz is 38.11dBμV/m max at 3m
(limit is 46dBμV/m)
RESULT: PASS
Note: Radiated measurement

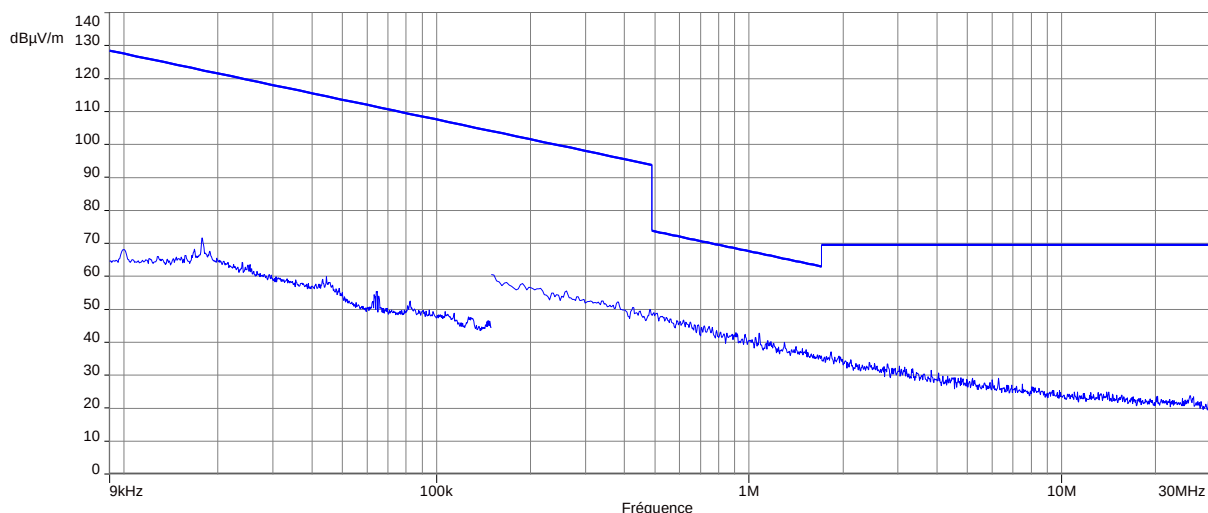


High band-edge compliance

M2 = 928MHz
Quasi-Peak level above 928MHz is 39.09dBμV/m max at 3m
(limit is 46dBμV/m)
RESULT: PASS
Note: Radiated measurement

IDS1014

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



Notes: Pre-scan graph only for identification purpose. Same result for transmit mode on all channels.

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 |

All levels are at least 20dB below applicable limits

Supplementary information:

Frequency list measured has been created with pre-scan results.

| | |
|------------------------------|--|
| 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
(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 |

All levels are at least 20dB below applicable limits

Supplementary information:

Frequency list measured has been created with pre-scan results.

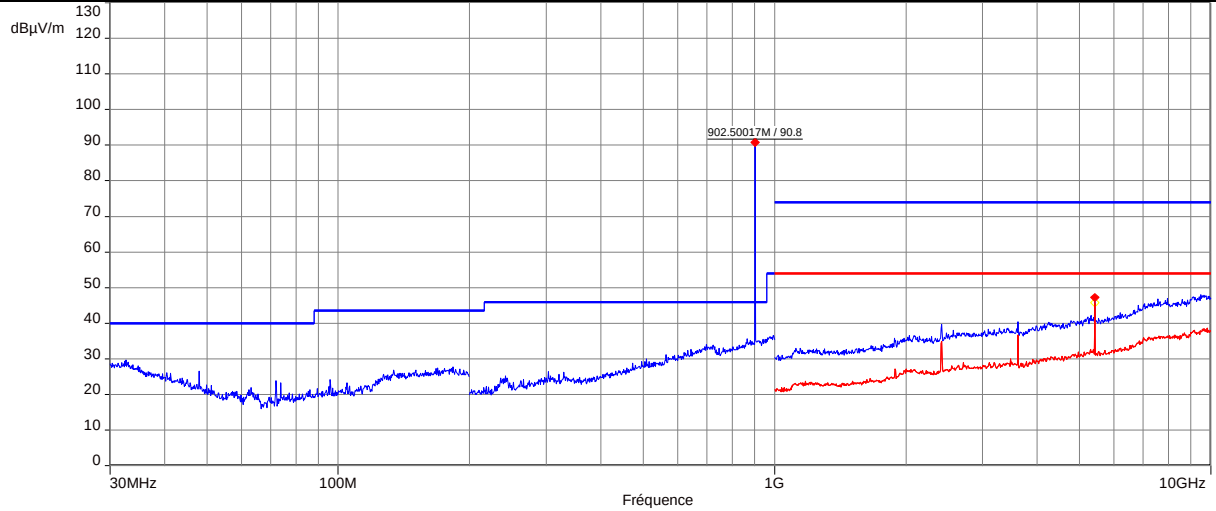
| | |
|------------------------------|---|
| Frequency band investigated: | 490kHz-30MHz |
| RBW: | 9kHz (150kHz-30MHz) |
| Measurement distance: | 10m |
| Final measurement detector: | Quasi-Peak |
| Limit: | FCC Part 15.209 / RSS-Gen |
| Note: | CF: Correction factor = Antenna factor + Cable loss
(M@30m = M@10m-19.1dB)
Loop antenna used and rotated about its axis to maximize any emission. |

IDS1014

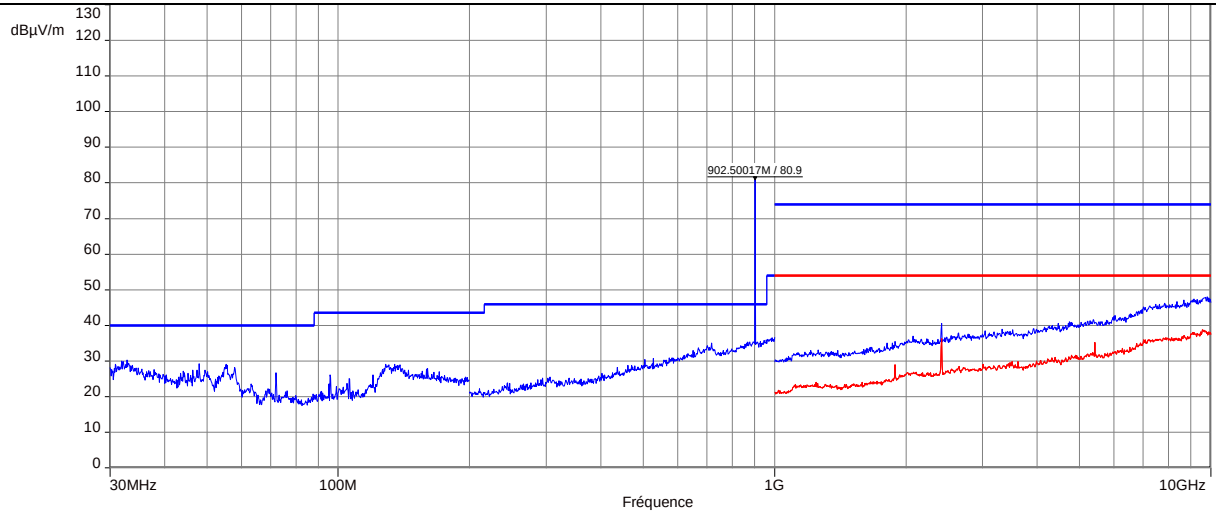
Graphical representation of Radiated Disturbance Measurement (Peak detection, Full Anechoic Chamber pre-scan, 30MHz-10GHz / 3m / Transmit mode / Worst position)

Center frequency: 902.5 MHz

HORIZONTAL POLARIZATION



VERTICAL POLARIZATION



Pre-scan graph only for identification purpose.

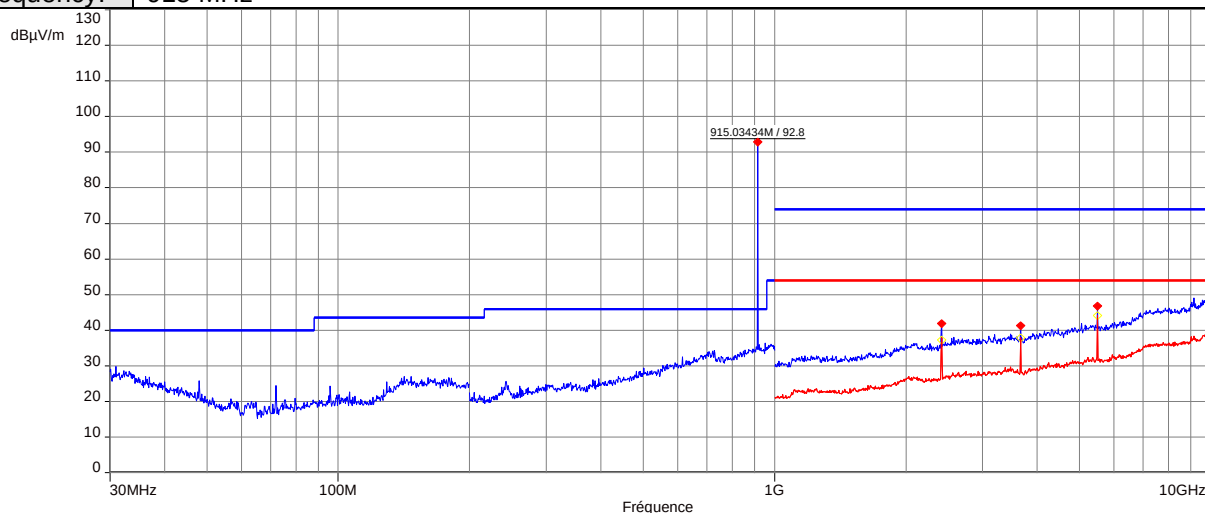
| FREQ (MHz) | Field Strength 3m PK (dBμV/m) | Field Strength 3m QP or AV (dBμV/m) | Limit PK (dBμV/m) | Margin Peak (dBμV/m) | Limit QP or AV (dB) | Margin QP or AV (dBμV/m) | Table angle (°) | Ant height (m) | Total factor (dB) | Pol (H/V) | Detector & Limit QP |
|----------------------------------|-------------------------------|-------------------------------------|---|----------------------|---------------------|--------------------------|-----------------|----------------|-------------------|-----------|---------------------|
| 5414.87504 | 48.60 | 44.54 | 74.00 | -25.40 | 54.00 | -9.46 | 236.30 | 2.13 | 0.54 | H | PK&AVG |
| Frequency and Limit band: | | | 30Mz-10GHz / FCC 15.209 / RSS-GEN | | | | | | | | |
| RBW and Limit detector: | | | Below 1GHz: RBW= 100kHz, Quasi-Peak Limit / above 1GHz: RBW= 1MHz, Peak and CISPR Average Limit | | | | | | | | |
| Results | | | PASS | | | | | | | | |

IDS1014

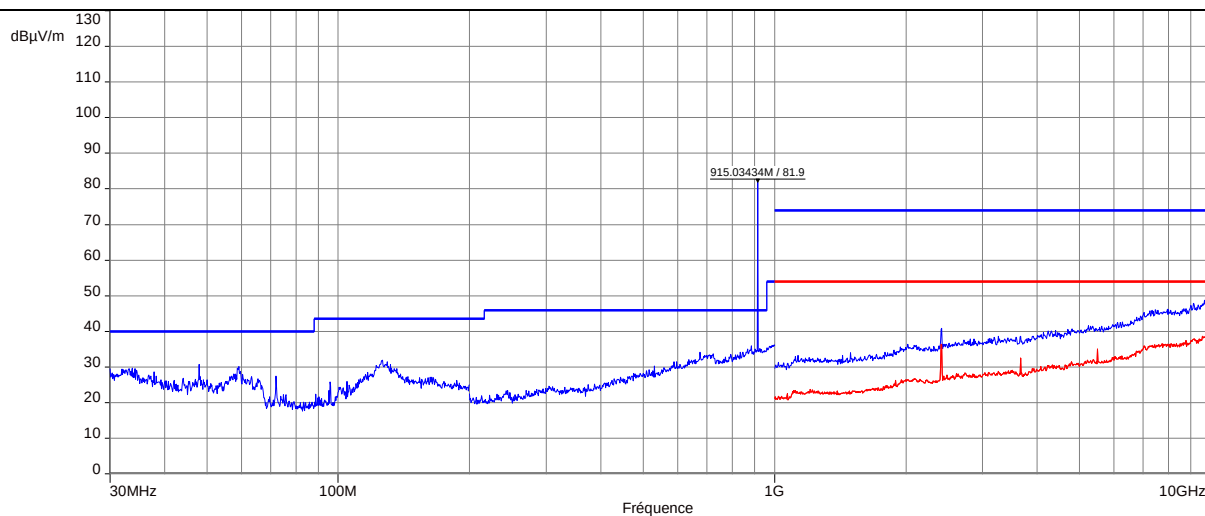
Graphical representation of Radiated Disturbance Measurement (Peak detection, Full Anechoic Chamber pre-scan, 30MHz-10GHz / 3m / Transmit mode / Worst position)

Center frequency: 915 MHz

HORIZONTAL POLARIZATION



VERTICAL POLARIZATION



Pre-scan graph only for identification purpose.

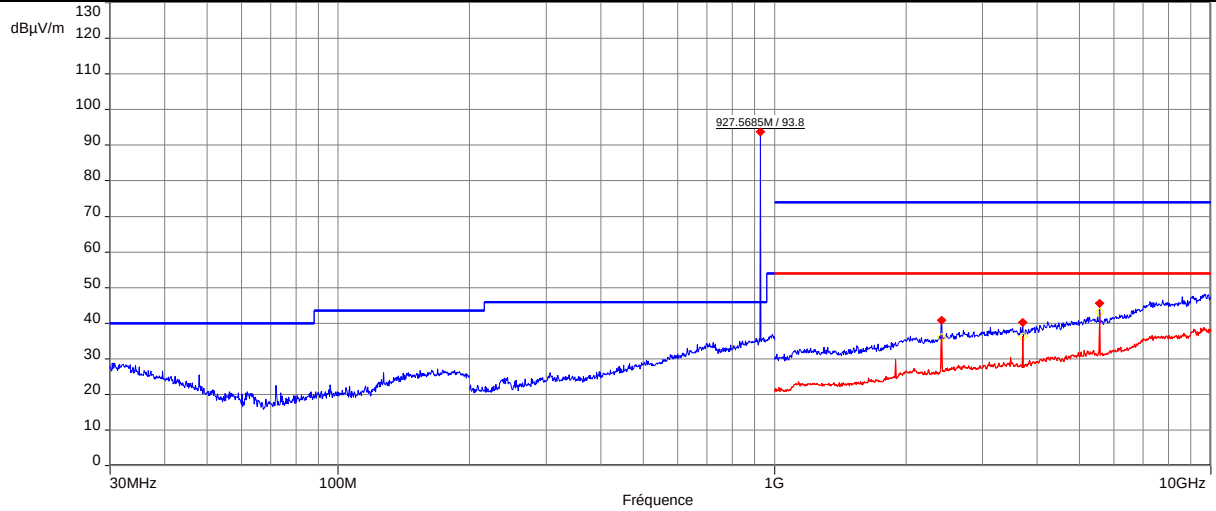
| FREQ (MHz) | Field Strength 3m PK (dBμV/m) | Field Strength 3m QP or AV (dBμV/m) | Limit PK (dBμV/m) | Margin Peak (dBμV/m) | Limit QP or AV (dB) | Margin QP or AV (dBμV/m) | Table angle (°) | Ant height (m) | Total factor (dB) | Pol (H/V) | Detector & Limit QP |
|---------------------------|-------------------------------|-------------------------------------|---|----------------------|---------------------|--------------------------|-----------------|----------------|-------------------|-----------|---------------------|
| 2413.0284 | 40.63 | 23.78 | 74.00 | -33.37 | 54.00 | -30.22 | 130.20 | 2.79 | -7.86 | H | PK&AVG |
| 3660.1159 | 42.93 | 37.26 | 74.00 | -31.07 | 54.00 | -16.74 | 262.50 | 1.33 | -5.25 | H | PK&AVG |
| 5490.16078 | 48.63 | 45.15 | 74.00 | -25.37 | 54.00 | -8.85 | 239.40 | 1.47 | 0.56 | H | PK&AVG |
| Frequency and Limit band: | | | 30Mz-25GHz / FCC 15.209 / RSS-GEN | | | | | | | | |
| RBW and Limit detector: | | | Below 1GHz: RBW= 100kHz, Quasi-Peak Limit / above 1GHz: RBW= 1MHz, Peak and CISPR Average Limit | | | | | | | | |
| Results | | | PASS | | | | | | | | |

IDS1014

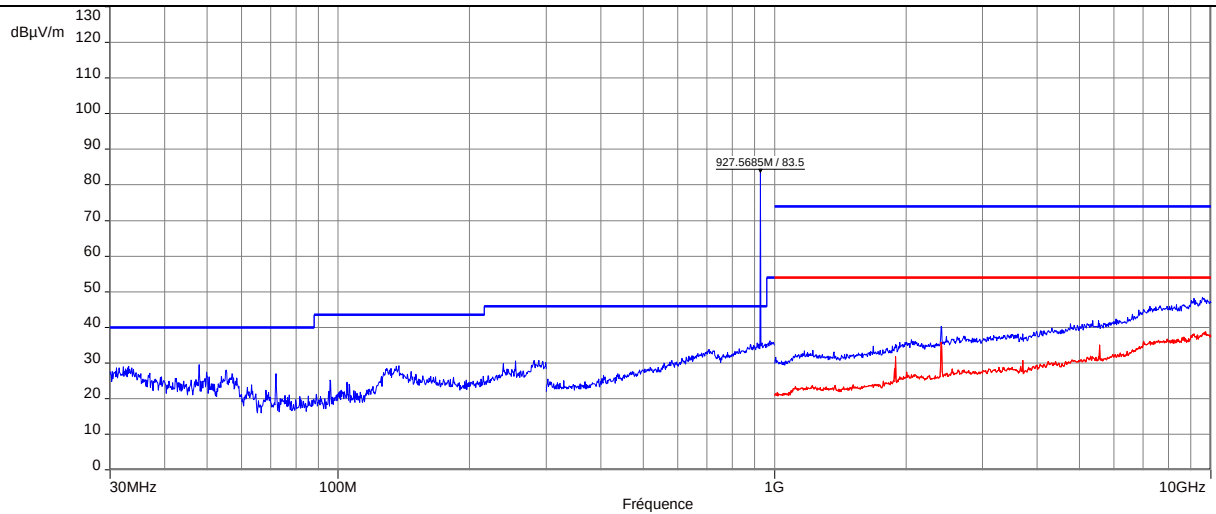
Graphical representation of Radiated Disturbance Measurement (Peak detection, Full Anechoic Chamber pre-scan, 30MHz-10GHz / 3m / Transmit mode / Worst position)

Center frequency: 927.5 MHz

HORIZONTAL POLARIZATION



VERTICAL POLARIZATION

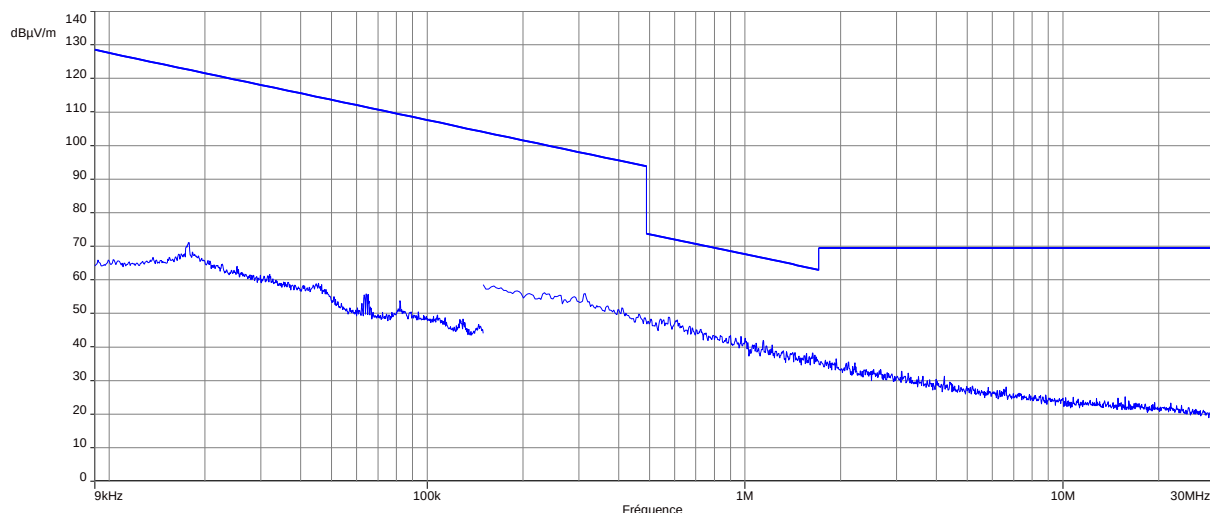


Pre-scan graph only for identification purpose.

| FREQ (MHz) | Field Strength 3m PK (dBμV/m) | Field Strength 3m QP or AV (dBμV/m) | Limit PK (dBμV/m) | Margin Peak (dBμV/m) | Limit QP or AV (dB) | Margin QP or AV (dBμV/m) | Table angle (°) | Ant height (m) | Total factor (dB) | Pol (H/V) | Detector & Limit QP |
|----------------------------------|-------------------------------|-------------------------------------|---|----------------------|---------------------|--------------------------|-----------------|----------------|-------------------|-----------|---------------------|
| 2416.05149 | 40.55 | 23.74 | 74.00 | -33.45 | 54.00 | -30.26 | 79.70 | 1.11 | -7.84 | H | PK&AVG |
| 3709.83522 | 41.11 | 34.58 | 74.00 | -32.89 | 54.00 | -19.42 | 279.50 | 1.26 | -5.32 | H | PK&AVG |
| 5565.00071 | 47.81 | 42.83 | 74.00 | -26.19 | 54.00 | -11.17 | 235.60 | 1.50 | 0.66 | H | PK&AVG |
| Frequency and Limit band: | | | 30Mz-25GHz / FCC 15.209 / RSS-GEN | | | | | | | | |
| RBW and Limit detector: | | | Below 1GHz: RBW= 100kHz, Quasi-Peak Limit / above 1GHz: RBW= 1MHz, Peak and CISPR Average Limit | | | | | | | | |
| Results | | | PASS | | | | | | | | |

IDS1015

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



Notes: Pre-scan graph only for identification purpose. Same result for transmit mode on all channels.

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 |

All levels are at least 20dB below applicable limits

Supplementary information:

Frequency list measured has been created with pre-scan results.

| | |
|------------------------------|--|
| 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
(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 |

All levels are at least 20dB below applicable limits

Supplementary information:

Frequency list measured has been created with pre-scan results.

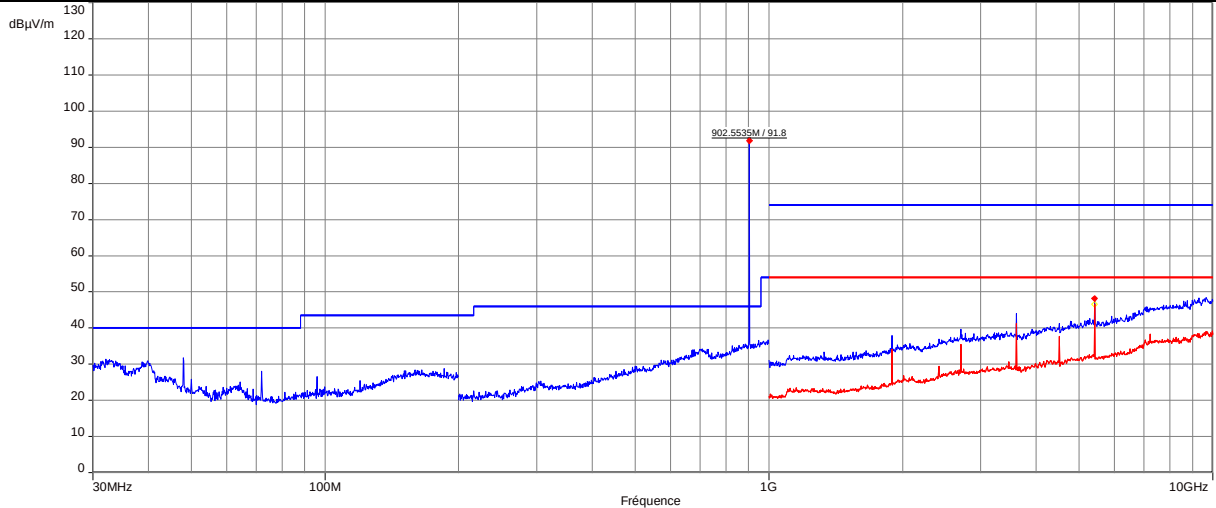
| | |
|------------------------------|---|
| Frequency band investigated: | 490kHz-30MHz |
| RBW: | 9kHz (150kHz-30MHz) |
| Measurement distance: | 10m |
| Final measurement detector: | Quasi-Peak |
| Limit: | FCC Part 15.209 / RSS-Gen |
| Note: | CF: Correction factor = Antenna factor + Cable loss
(M@30m = M@10m-19.1dB)
Loop antenna used and rotated about its axis to maximize any emission. |

IDS1015

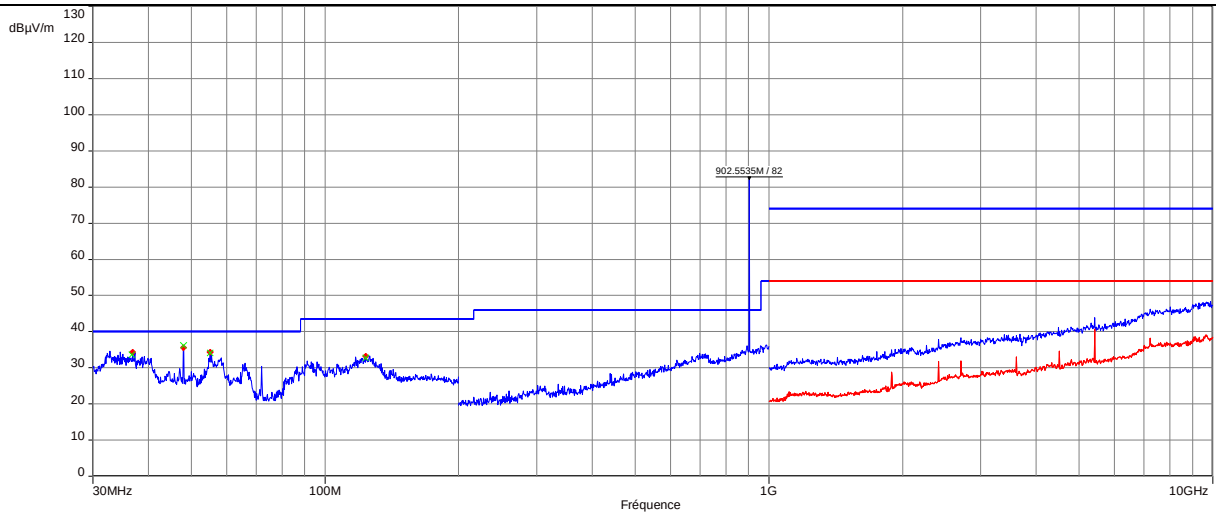
Graphical representation of Radiated Disturbance Measurement (Peak detection, Full Anechoic Chamber pre-scan, 30MHz-10GHz / 3m / Transmit mode / Worst position)

Center frequency: 902.5 MHz

HORIZONTAL POLARIZATION



VERTICAL POLARIZATION



Pre-scan graph only for identification purpose.

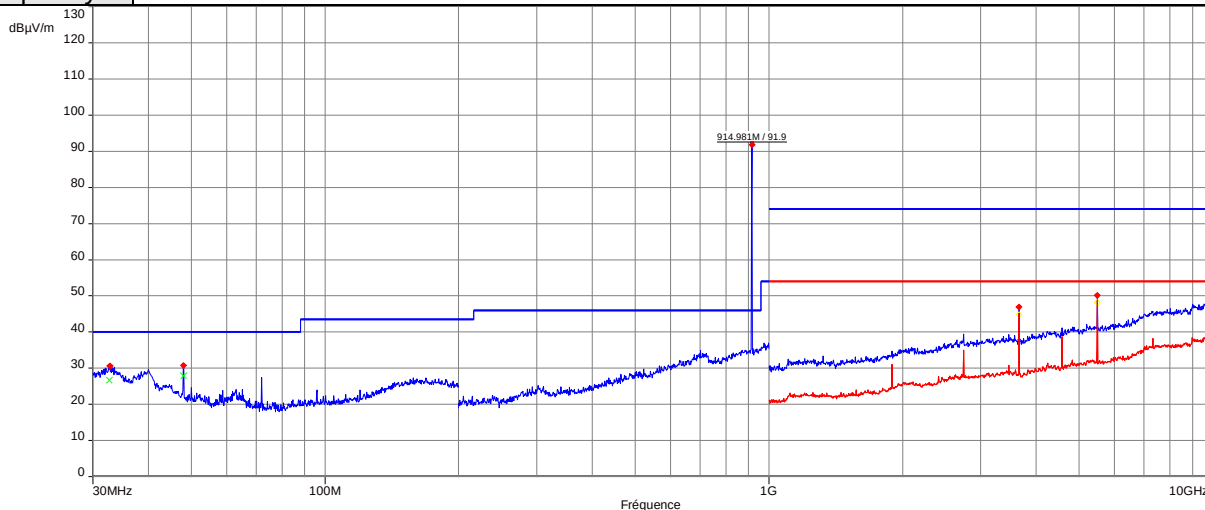
| FREQ (MHz) | Field Strength 3m PK (dBμV/m) | Field Strength 3m QP or AV (dBμV/m) | Limit PK (dBμV/m) | Margin Peak (dBμV/m) | Limit QP or AV (dB) | Margin QP or AV (dBμV/m) | Table angle (°) | Ant height (m) | Total factor (dB) | Pol (H/V) | Detector & Limit QP |
|----------------------------------|-------------------------------|-------------------------------------|---|----------------------|---------------------|--------------------------|-----------------|----------------|-------------------|-----------|---------------------|
| 5415.06251 | 50.19 | 46.00 | 74.00 | -23.81 | 54.00 | -8.00 | 201.00 | 1.52 | 0.54 | H | PK&AVG |
| 36.717944 | 33.64 | 27.80 | - | - | 40.00 | -12.20 | 352.60 | 1.07 | 17.08 | V | QP |
| 48.002649 | 36.24 | 33.42 | - | - | 40.00 | -6.58 | 360.00 | 1.00 | 13.01 | V | QP |
| 55.135425 | 34.08 | 27.68 | - | - | 40.00 | -12.32 | 360.00 | 1.00 | 9.88 | V | QP |
| 123.601623 | 32.76 | 26.41 | - | - | 43.50 | -17.09 | 0.10 | 1.00 | 12.53 | V | QP |
| Frequency and Limit band: | | | 30Mz-10GHz / FCC 15.209 / RSS-GEN | | | | | | | | |
| RBW and Limit detector: | | | Below 1GHz: RBW= 100kHz, Quasi-Peak Limit / above 1GHz: RBW= 1MHz, Peak and CISPR Average Limit | | | | | | | | |
| Results | | | PASS | | | | | | | | |

IDS1015

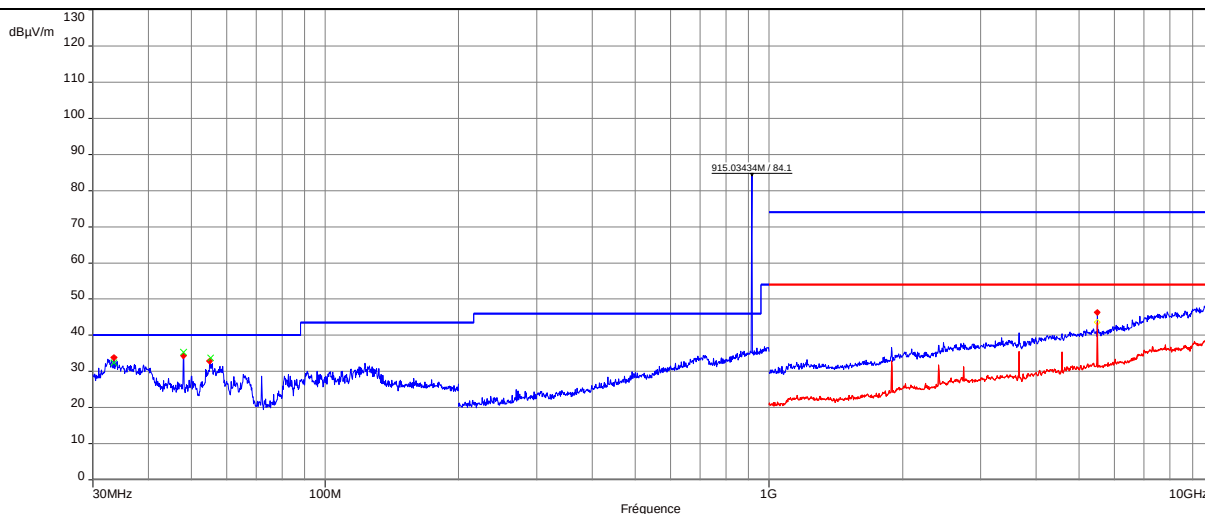
Graphical representation of Radiated Disturbance Measurement (Peak detection, Full Anechoic Chamber pre-scan, 30MHz-10GHz / 3m / Transmit mode / Worst position)

Center frequency: 915 MHz

HORIZONTAL POLARIZATION



VERTICAL POLARIZATION



Pre-scan graph only for identification purpose.

| FREQ (MHz) | Field Strength 3m PK (dBμV/m) | Field Strength 3m QP or AV (dBμV/m) | Limit PK (dBμV/m) | Margin Peak (dBμV/m) | Limit QP or AV (dB) | Margin QP or AV (dBμV/m) | Table angle (°) | Ant height (m) | Total factor (dB) | Pol (H/V) | Detector & Limit QP |
|------------|-------------------------------|-------------------------------------|-------------------|----------------------|---------------------|--------------------------|-----------------|----------------|-------------------|-----------|---------------------|
| 32.678635 | 26.64 | 22.47 | - | - | 40.00 | -17.53 | 216.90 | 1.74 | 18.17 | H | QP |
| 47.99895 | 27.95 | 26.61 | - | - | 40.00 | -13.39 | 0.00 | 2.89 | 13.01 | H | QP |
| 3660.20341 | 47.42 | 44.33 | 74.00 | -26.58 | 54.00 | -9.67 | 234.20 | 1.09 | -5.25 | H | PK&AVG |
| 5490.1006 | 51.67 | 48.69 | 74.00 | -22.33 | 54.00 | -5.31 | 205.20 | 1.10 | 0.56 | H | PK&AVG |
| 33.456849 | 32.44 | 25.34 | - | - | 40.00 | -14.66 | 354.70 | 1.00 | 17.99 | V | QP |
| 47.994682 | 35.39 | 32.72 | - | - | 40.00 | -7.28 | 360.00 | 1.00 | 13.01 | V | QP |
| 55.19512 | 33.68 | 27.37 | - | - | 40.00 | -12.63 | 360.00 | 1.00 | 9.86 | V | QP |
| 5489.90282 | 48.83 | 44.64 | 74.00 | -25.17 | 54.00 | -9.36 | 240.70 | 2.68 | 0.56 | V | PK&AVG |

Frequency and Limit band: 30Mz-25GHz / FCC 15.209 / RSS-GEN

RBW and Limit detector: Below 1GHz: RBW= 100kHz, Quasi-Peak Limit / above 1GHz: RBW= 1MHz, Peak and CISPR Average Limit

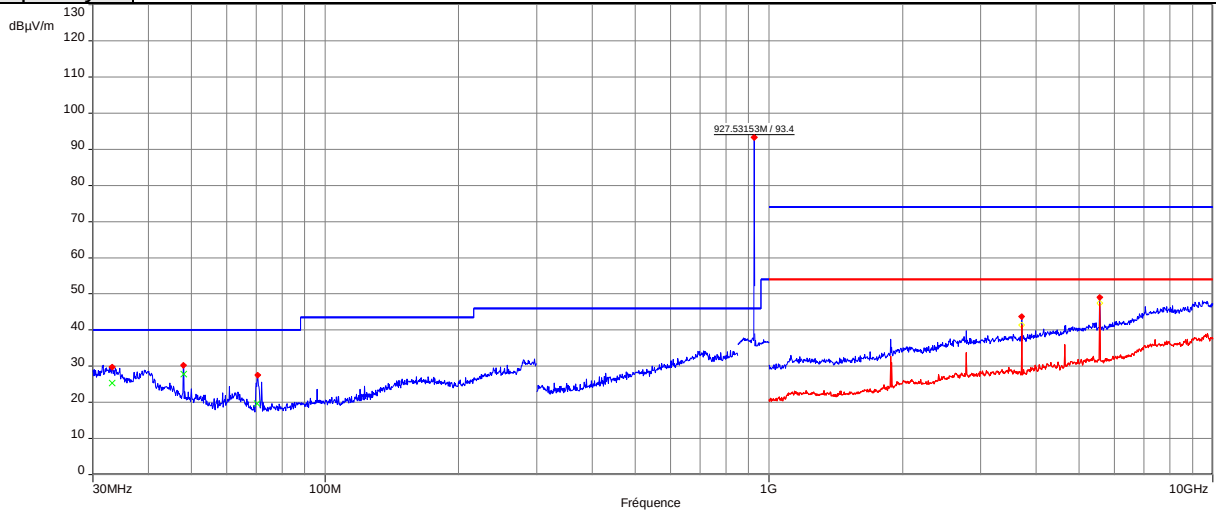
Results PASS

IDS1015

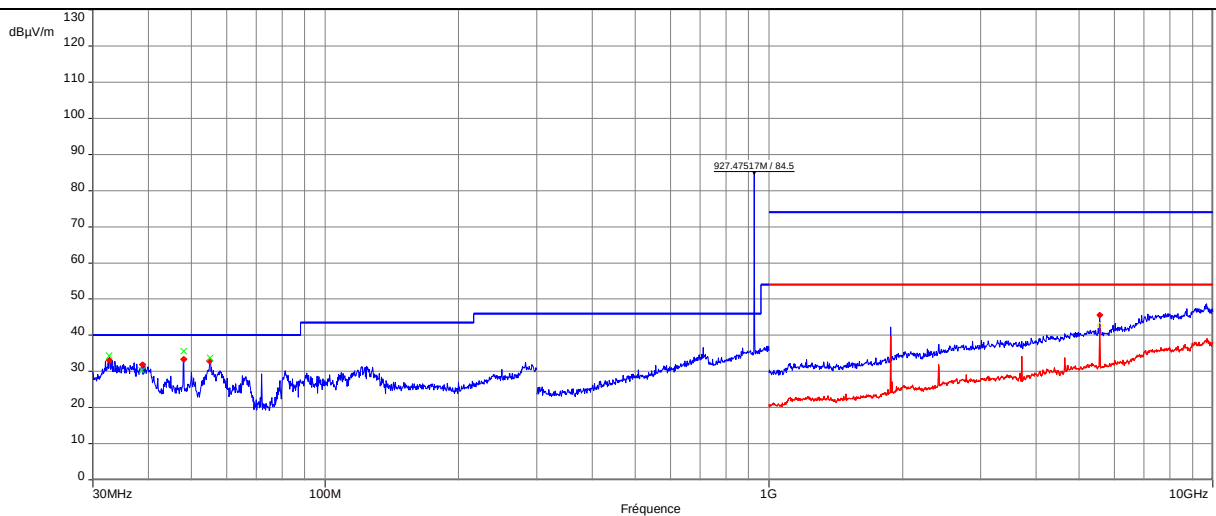
Graphical representation of Radiated Disturbance Measurement (Peak detection, Full Anechoic Chamber pre-scan, 30MHz-10GHz / 3m / Transmit mode / Worst position)

Center frequency: 927.5 MHz

HORIZONTAL POLARIZATION



VERTICAL POLARIZATION



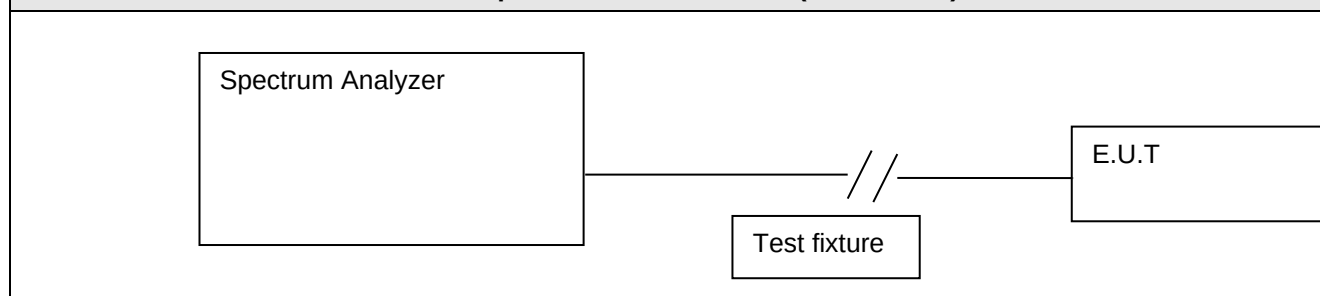
Pre-scan graph only for identification purpose.

| FREQ (MHz) | Field Strength 3m PK (dBμV/m) | Field Strength 3m QP or AV (dBμV/m) | Limit PK (dBμV/m) | Margin Peak (dBμV/m) | Limit QP or AV (dB) | Margin QP or AV (dBμV/m) | Table angle (°) | Ant height (m) | Total factor (dB) | Pol (H/V) | Detector & Limit QP |
|----------------------------------|-------------------------------|-------------------------------------|---|----------------------|---------------------|--------------------------|-----------------|----------------|-------------------|-----------|---------------------|
| 33.146962 | 25.31 | 21.40 | - | - | 40.00 | -18.60 | 356.10 | 1.74 | 40.00 | H | QP |
| 48.002182 | 27.87 | 26.48 | - | - | 40.00 | -13.52 | 0.00 | 2.89 | 40.00 | H | QP |
| 70.306721 | 19.70 | 11.30 | - | - | 40.00 | -28.70 | 360.00 | 2.91 | 40.00 | H | QP |
| 3709.9619 | 41.16 | 33.91 | 74.00 | -32.84 | 54.00 | -20.09 | 135.50 | 1.09 | -5.32 | H | PK&AVG |
| 5565.02291 | 51.08 | 47.62 | 74.00 | -22.92 | 54.00 | -6.38 | 200.50 | 1.28 | 0.66 | H | PK&AVG |
| 32.606561 | 34.36 | 27.13 | - | - | 40.00 | -12.87 | 360.00 | 1.00 | 18.19 | V | QP |
| 38.675271 | 30.35 | 24.33 | - | - | 40.00 | -15.67 | 211.10 | 1.00 | 16.48 | V | QP |
| 48.000517 | 35.58 | 32.73 | - | - | 40.00 | -7.27 | 360.00 | 1.00 | 13.01 | V | QP |
| 55.089817 | 33.73 | 27.46 | - | - | 40.00 | -12.54 | 360.00 | 1.00 | 9.90 | V | QP |
| 5565.15969 | 47.28 | 42.29 | 74.00 | -26.72 | 54.00 | -11.71 | 183.40 | 1.27 | 0.66 | V | PK&AVG |
| Frequency and Limit band: | | | 30Mz-25GHz / FCC 15.209 / RSS-GEN | | | | | | | | |
| RBW and Limit detector: | | | Below 1GHz: RBW= 100kHz, Quasi-Peak Limit / above 1GHz: RBW= 1MHz, Peak and CISPR Average Limit | | | | | | | | |
| Results | | | PASS | | | | | | | | |

13. Occupied bandwidth (99%)

| TEST: Occupied bandwidth (99%) / RSS-GEN | | | Verdict |
|--|----------------------------|-----------------|---------|
| <p><u>Method:</u> The setup is in an anechoic chamber. The spectrum analyzer is connected to the measuring antenna. A radiated measurement is performed.</p> <p>The RBW is set in the range of 1% to 5% of the occupied bandwidth, with VBW ≥ 3 x RBW.</p> <p>The SPAN is wide enough to capture all products of the modulation process.</p> <p>A Peak detector is used.</p> <p>Measure is performed with OBW 99% function of the spectrum analyser.</p> <p>The tested equipment is set to transmit operation with modulation on low, mid and high channels.</p> | | | Pass |
| Laboratory Parameters: | Required prior to the test | During the test | |
| Ambient Temperature | 20 to 30 °C | 22°C ± 2 | |
| Relative Humidity | 30 to 70 % | 45% ± 5 | |
| Supplementary information: | | | |
| Test location: SMEE | | | |
| Test date: March 8 th , 2024. Tested by C. KERMICHE | | | |

Test Setup for radiated emission (Test fixture)

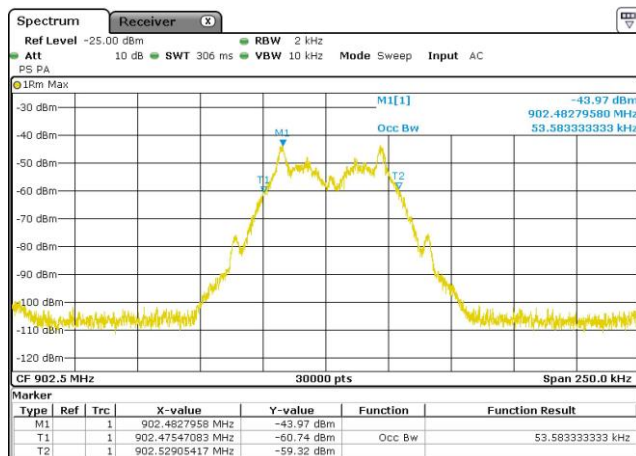


| IDS1014 | |
|--|------------------|
| Tabulated Results for 99% Occupied Bandwidth | |
| Frequency
(MHz) | Results
(kHz) |
| 902.5 | 53.583 |
| 915.0 | 53.558 |
| 927.5 | 53.658 |
| Tabulated Results for 20dB Bandwidth | |
| Frequency
(MHz) | Results
(kHz) |
| 902.5 | 57.017 |
| 915.0 | 57.000 |
| 927.5 | 56.458 |

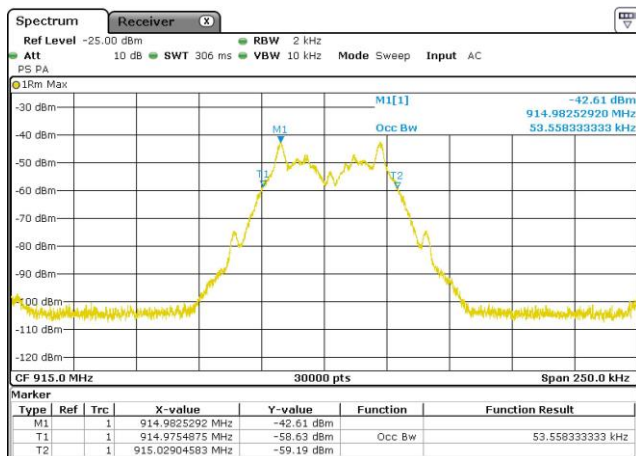
| IDS1015 | |
|--|------------------|
| Tabulated Results for 99% Occupied Bandwidth | |
| Frequency
(MHz) | Results
(kHz) |
| 902.5 | 53.475 |
| 915.0 | 53.583 |
| 927.5 | 53.592 |
| Tabulated Results for 20dB Bandwidth | |
| Frequency
(MHz) | Results
(kHz) |
| 902.5 | 56.658 |
| 915.0 | 56.158 |
| 927.5 | 56.467 |

IDS1014

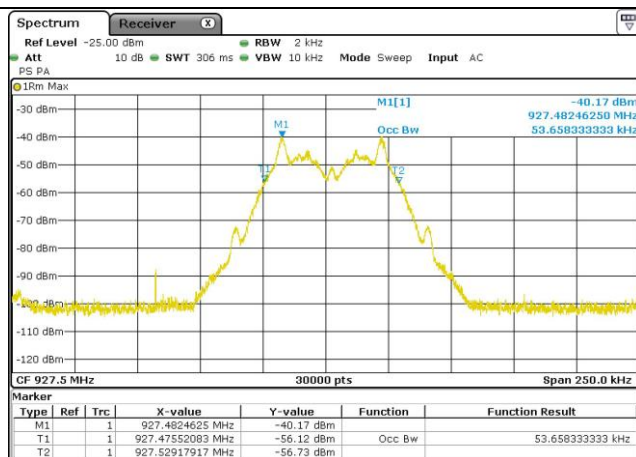
Graphical representation of 99% Occupied Bandwidth



Low Channel



Mid Channel

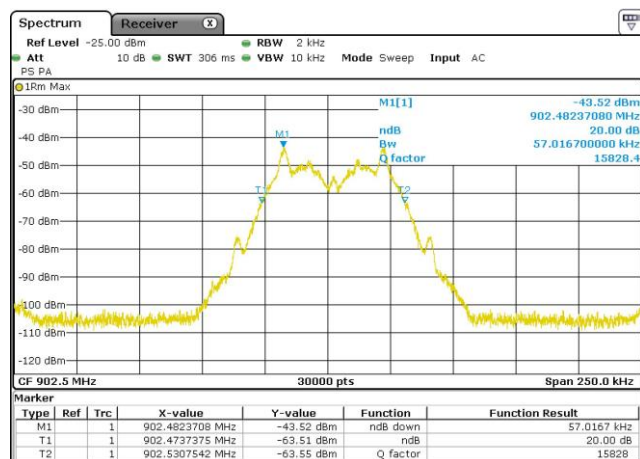


High Channel

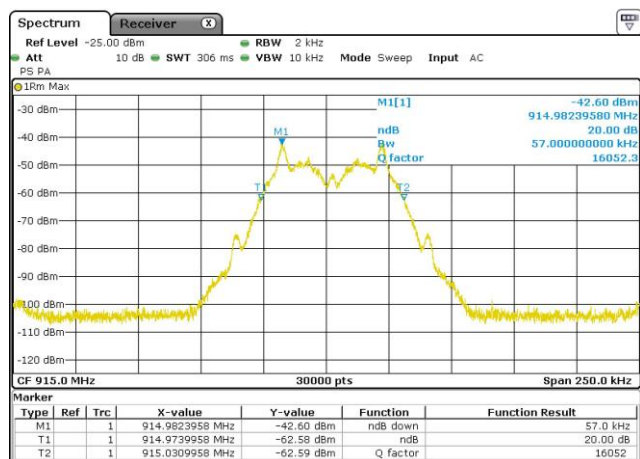
| | |
|------------------------------|-----------------|
| Frequency band investigated: | 902 to 928MHz |
| RBW / VBW : | 2kHz / 10kHz |
| Measurement detector: | Peak / Max hold |

IDS1014

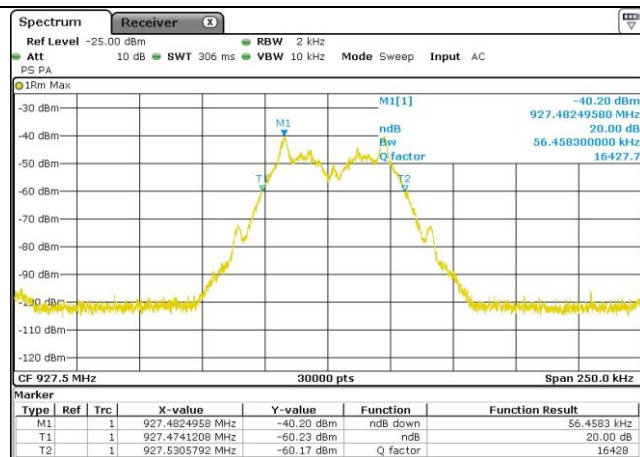
Graphical representation of 20dB Occupied Bandwidth



Low Channel



Mid Channel



High Channel

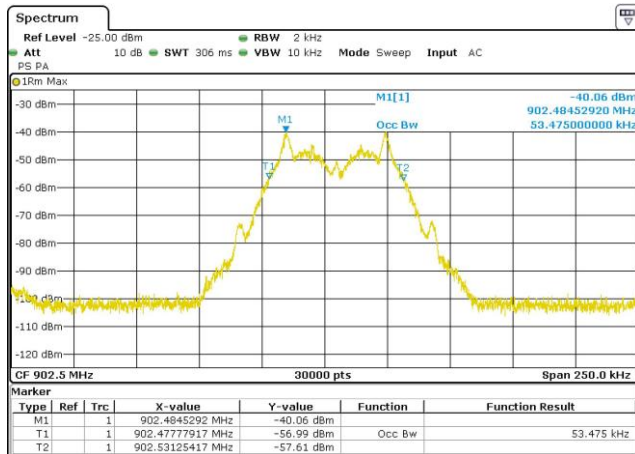
Frequency band investigated: 902 to 928MHz

RBW / VBW : 2kHz / 10kHz

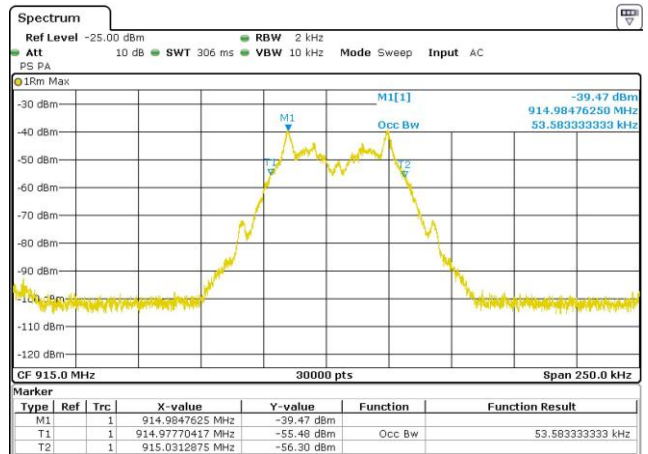
Measurement detector: Peak / Max hold

IDS1015

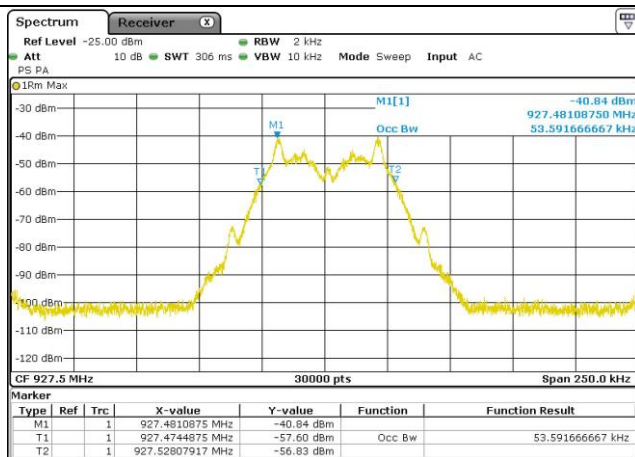
Graphical representation of 99% Occupied Bandwidth



Low Channel



Mid Channel

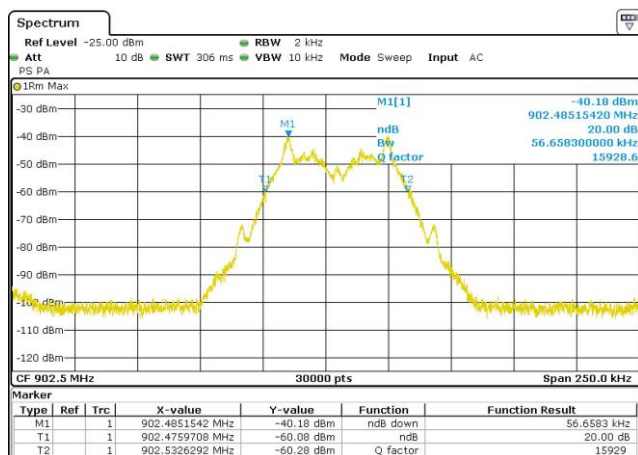


High Channel

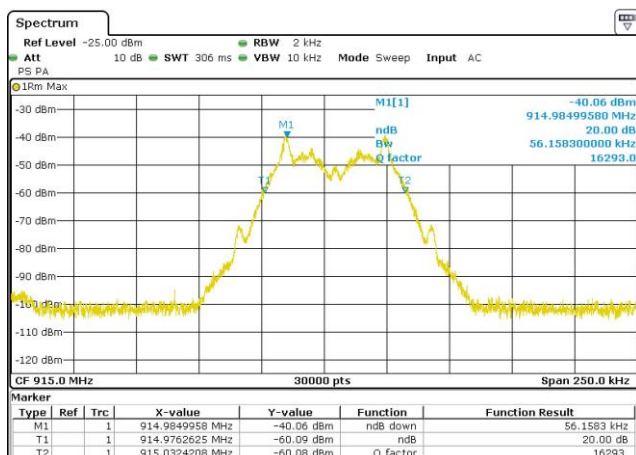
| | |
|------------------------------|-----------------|
| Frequency band investigated: | 902 to 928MHz |
| RBW / VBW : | 2kHz / 10kHz |
| Measurement detector: | Peak / Max hold |

IDS1015

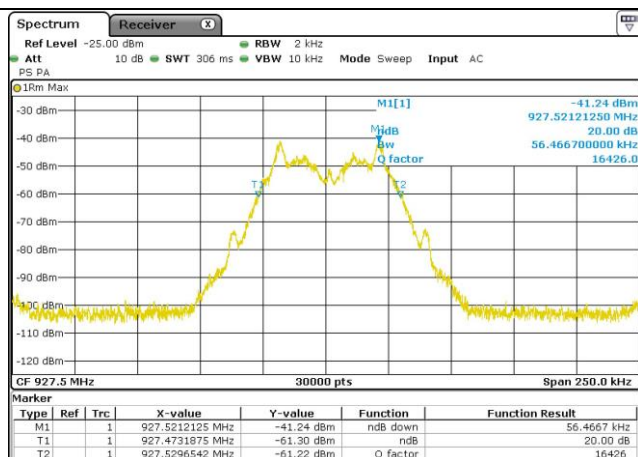
Graphical representation of 20dB Occupied Bandwidth



Low Channel



Mid Channel



High Channel

Frequency band investigated: 902 to 928MHz

RBW / VBW : 2kHz / 10kHz

Measurement detector: Peak / Max hold

14. Test Equipment List

| Description | Manufacturer | Model | ID | Date Cal. | Nxt. Cal. |
|----------------------|------------------|---------------|-------------|-----------|-----------|
| Loop antenna | EMCO | 6502 | ANT-101-009 | 2023/9 | 2025/9 |
| Log-periodic antenna | EMCO | 3146 | ANT-191-019 | 2024/3 | 2026/3 |
| Biconnic antenna | COM-POWER | AB- 900A | ANT-201-021 | 2023/01 | 2025/1 |
| Horn antenna | COM-POWER | AH-118 | ANT-101-004 | 2021/7 | 2024/7 |
| High-Pass filter | Wainwright Inst. | HK6-948-1200 | FIL-141-004 | 2023/4 | 2024/4 |
| RF cable | HUBER+SUHNER | SF126E / 2m | CAB-231-043 | 2023/4 | 2024/4 |
| RF cable | HUBER+SUHNER | SF104E / 5.3m | CAB-231-044 | 2023/4 | 2024/4 |
| RF cable | HUBER+SUHNER | SF126E / 7m | CAB-231-045 | 2023/4 | 2024/4 |
| 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 | CT0800 | PLA-141-001 | - | - |
| Turntable | Innco- Systems | DS1500-S-1t | PLA-201-003 | - | - |
| Pre-amplifier | COM-POWER | 1-18GHz | PRE-221-005 | 2023/4 | 2024/4 |
| Measuring Rec | Rohde&Schwarz | ESRP | REC-151-002 | 2021/12 | 2024/6 |
| Spectrum analyzer | Rohde&Schwarz | FSV40 | ASP-171-004 | 2021/10 | 2024/4 |
| EMC Software | NEXIO | BAT EMC | SOF-101-001 | - | - |
| Ref. Comb generator | SMEE | EMR-10M | REF-111-002 | - | - |
| Ref. Comb generator | SMEE | EMR 1-6GHz | REF-141-003 | - | - |

END OF REPORT.