

FCC Test Firm Designation Number: FR0014  
Industry Canada Test Firm Number: Site# 9545A-1

Matériel testé : <i>Equipment under test:</i>	<b>IDENTEC SOLUTIONS / i-PORTM352 UHF (Module RF)</b> <i>(Trademark / Marketing name or product reference)</i>
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Client / Demandeur: **IDENTEC SOLUTIONS AG**  
*Customer / Applicant :* Millennium Park 2  
A-6890 Lustenau - Austria

Fabricant : **IDENTEC SOLUTIONS AG**  
*Manufacturer:* Millennium Park 2  
A-6890 Lustenau - Austria

Numéro d'affaire : 12100  
*Work number :*

Référence de la proposition : 082017-22617  
*Proposal number:*

Date de l'essai : March 28<sup>th</sup>, 2018  
*Date of test:*

Objectif des essais : EMC qualification accordingly 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)*

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 des normes citées en référence.  
*Conclusion:* *The appliance complies with requirements of above mentioned standards.*

Ed.	Date	Modifications Pages /	Written by : Visa	Approved by: Visa
1	July 23 <sup>rd</sup> , 2018	Initial Edition	Laurent Chapus	Régis ANCEL

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**1. Normatives References**

FCC qualification according to:		
Standards	Applied	Title
ANSI C63.4 (2014)	X	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
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 / 15.249

Deviation from standards: None.

## 2. Test synthesis

TEST	Paragraph number FCC Part 15	Spec. FCC Part 15	RESULTS (comments)
Conducted emissions test	15.207 (a)	15.207 (a)	<b>PASS</b>
Field Strength of fundamental	15.249 (a) (c)	94dB $\mu$ V/m @3m (50mV/m @ 3m)	<b>PASS</b>
Field Strength of harmonics	15.249 (a) (c) (e)	54dB $\mu$ V/m @3m (0.5mV/m @ 3m)	<b>PASS</b>
Unwanted emissions outside the specified frequency band and harmonics	15.209 / 15.249 (d) (e)	Whichever is less stringent, either: - 50dB below level of fundamental, or; - General field strength limits, as follow: <u>Measure at 300m</u> 9-490kHz: 2400 $\mu$ V/m/F(kHz) <u>Measure at 30m</u> 0.490-1.705: 24000 $\mu$ V/m/F(kHz) 1.705-30MHz: 30 $\mu$ V/m <u>Measure at 3m</u> 30MHz-88MHz : 40 dB $\mu$ V/m 88MHz-216MHz : 43.5 dB $\mu$ V/m 216MHz-960MHz : 46.0 dB $\mu$ V/m Above 960MHz : 54.0 dB $\mu$ V/m	<b>PASS</b>

- **General conclusion:**

Measures and tests performed on the sample of the products i-PORTM352 UHF (Module), in configuration and description presented in this test report, show compliance with standards FCC CFR 47, PART 15, Subpart C.

### 3. Equipment Under Test (EUT)

Nom /  
Identification

**IDENTEC SOLUTIONS / i-PORTM352  
UHF (Module)**

Sn : 000005

FCC ID: OO4-ILR-IPM352UH

Alimentation /  
Power supply: 24V DC for RS422 interface board  
3.3V for RF module

Auxiliaires /  
Auxiliaries: - Interface board RS422 IDENTEC SOLUTIONS / i-Port-M-IF-422 Sn: 000003  
- Power supply adapter XP-POWER (Class I with PE)  
Model: VEC65US24  
- Laptop PC ASUS – F200M (KX529H) with its power supply adapter  
- USB to RS422 converter

Entrées-Sorties /  
Input / Output

	Câbles pour essai / Cables for test	Blindé / Shielded	Prévu pour >3m / Intended for >3m
Antenna Port 1 (SMA)	None	Coaxial	No
Antenna Port 2 (SMA)	None	Coaxial	No
Auxiliary ports:			
- RS422	5m, RJ45	Yes	Yes
- DC port	1.8m, 2 wires	No	No

Version programme /  
Firmware version: V102.05

Mode de fonctionnement /  
Running mode: The tested sample is able to:  
- Transmit a carrier frequency on low, middle and high channels (902.5MHz / 915MHz / 927.5MHz)

Programme de test /  
Test program /: Gen3 Tag Certification tool v1.0.0.19789

#### • Equipment information:

UHF Carrier frequency:

- Frequency band: 902 to 928 MHz
- Frequency used in Tx/Rx mode: - 902.5MHz  
- 915MHz  
- 927.5MHz
- Modulation: FSK ( $\pm 20$ kHz)
- Antenna type 1: 289070 ILR – half-wave dipole antenna SMA i-CTA868 MH (2dBi) (Tx reg value set at 36)
- Antenna type 2: RFI Model: YBS806-82 (11dBi) (Tx reg value set at 8)
- Antenna port 1 and port 2 are identical and cannot be used simultaneously.

### 4. Test conditions

Power supply voltage:  
Equipment under test : 24V DC from external power supply

### 5. Modifications of the EUT

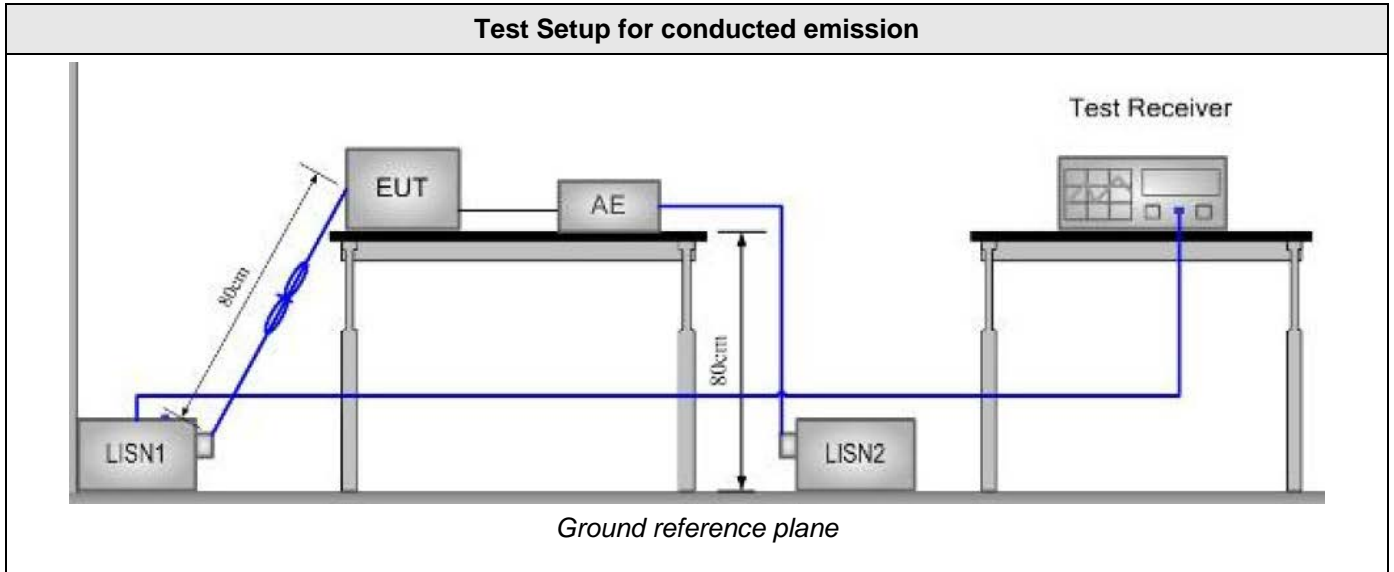
None

## 6. Conducted Emission Measurement (150kHz-30MHz)

TEST: Limits for conducted disturbance 150kHz – 30MHz				Verdict	
<p><b>Method:</b> 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.</p>				<b>Pass</b>	
Laboratory Parameters:		Required prior to the test		During the test	
Ambient Temperature		20 to 30 °C		23°C ± 2	
Relative Humidity		25 to 70 %		40% ± 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) Power adapter	
Limits					
Frequency (MHz)	Limit dB (µV)				
	Quasi-Peak	Result	Average	Result	
0.15 – 0.50	66 \ 56	<b>PASS</b>	56 \ 46	<b>PASS</b>	
0.50 - 5	56	<b>PASS</b>	46	<b>PASS</b>	
5 – 30	60	<b>PASS</b>	50	<b>PASS</b>	
Supplementary information:					
Test location: SMEE					
Test date: March 28 <sup>th</sup> , 2018. Tested by L. CHAPUS					
Power supply voltage: 110V/60Hz to power adapter					

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Attenuator / limiter	SMEE	ATT#2	ATT-171-010	2017/6	2018/6
Cable RF	Div	1m	CAB-101-021	2017/4	2018/4
LISN (50Ω / 50µH) (Meas.)	AFJ	LS16C	RSI-101-001	2017/6	2019/6
Measuring receiver	Rohde&Schwarz	ESRP	REC-151-002	2017/3	2019/3
EMC Software	NEXIO	BAT EMC V3.8	SOF-101-001	-	-
AC power supply	PACIFIC POWER	AMX-125	101-002	-	-

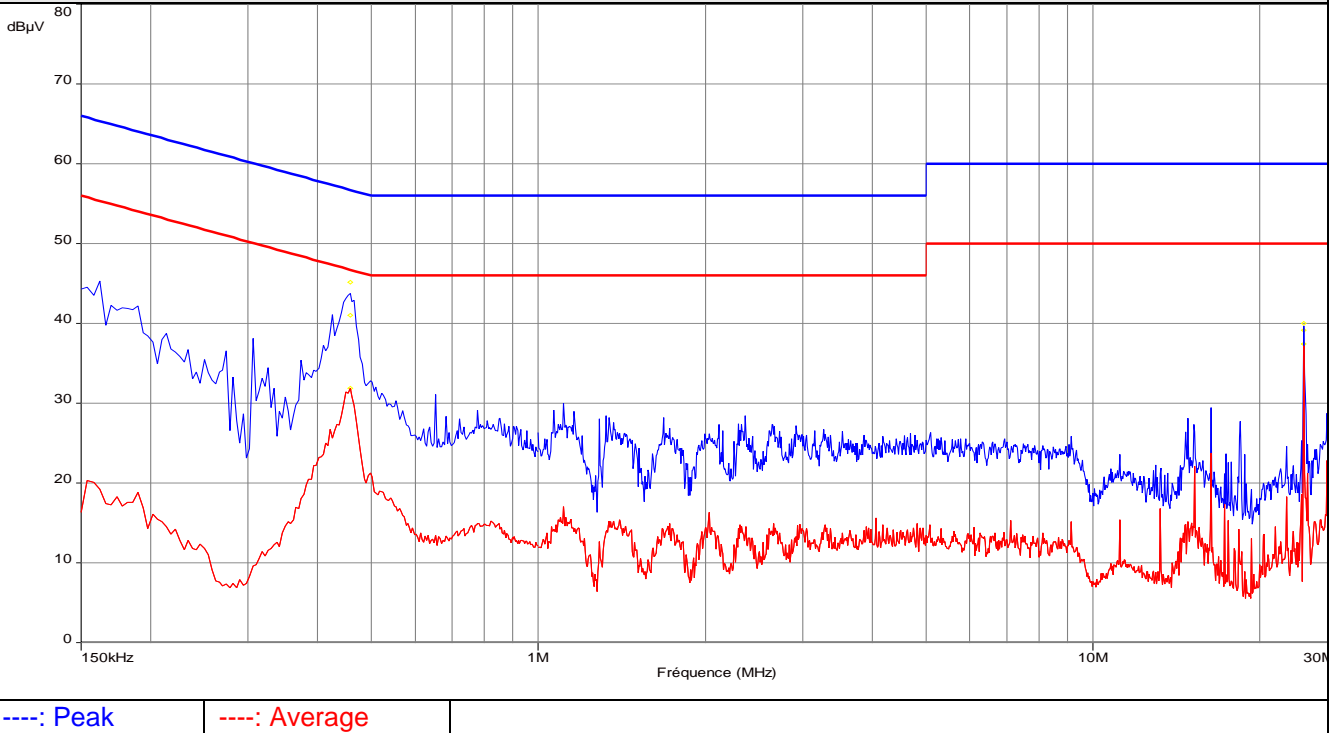
## Test Setup for conducted emission



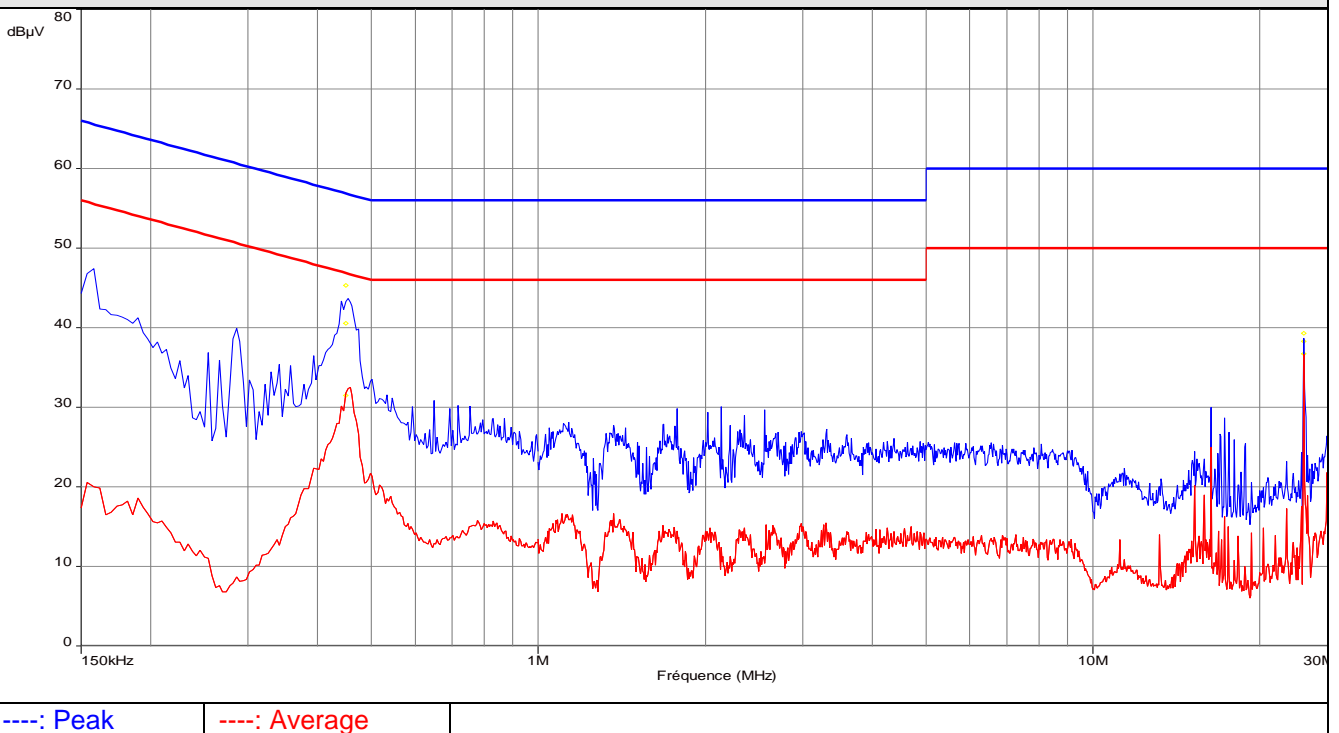
### Tabulated Results for Mains Terminal Disturbance Voltage on AC port

FREQ (MHz)	Meas. PK (dB $\mu$ V)	Mes. QP (dB $\mu$ V)	LIMIT QP (dB $\mu$ V)	Margin QP (dB)	Mes. AV (dB $\mu$ V)	LIMIT AV (dB $\mu$ V)	Margin AV (dB)	Line
0.457	45.2	41.0	56.7	<b>-15.7</b>	31.9	46.7	<b>-14.9</b>	L1
24.001	40.0	39.1	60.0	<b>-20.9</b>	37.5	50.0	<b>-12.6</b>	L1
0.450	45.4	40.6	56.8	<b>-16.2</b>	31.5	46.8	<b>-15.3</b>	Neutral
24.000	39.3	38.3	60.0	<b>-21.7</b>	36.7	50.0	<b>-13.3</b>	Neutral
<b>Frequency band investigated:</b>			150kHz-30MHz					
<b>RBW:</b>			9kHz					
<b>Voltage:</b>			110V/60Hz					
<b>Limit:</b>			FCC Part 15.209 a)					
<b>Final measurement detector:</b>			Quasi-Peak and CISPR Average (AV)					
<b>Wide Measurement Uncertainty:</b>			$\pm 3.5$ dB (k=2)					
<b>RESULT:</b>			PASS					
<b>Measured value calculation:</b>			<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 (dB<math>\mu</math>V)  RA = Receiver Amplitude  CF = Cable Factor  ATT<sub>TRAN</sub> = Transient suppressor attenuation  ATT<sub>LISN</sub> = LISN attenuation</p> <p>Margin value = Emission level – Limit value (A negative margin shows compliance to limit)  Same results for all running mode (Antenna type 1 and 2, antenna port 1 and port 2)</p>					

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



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



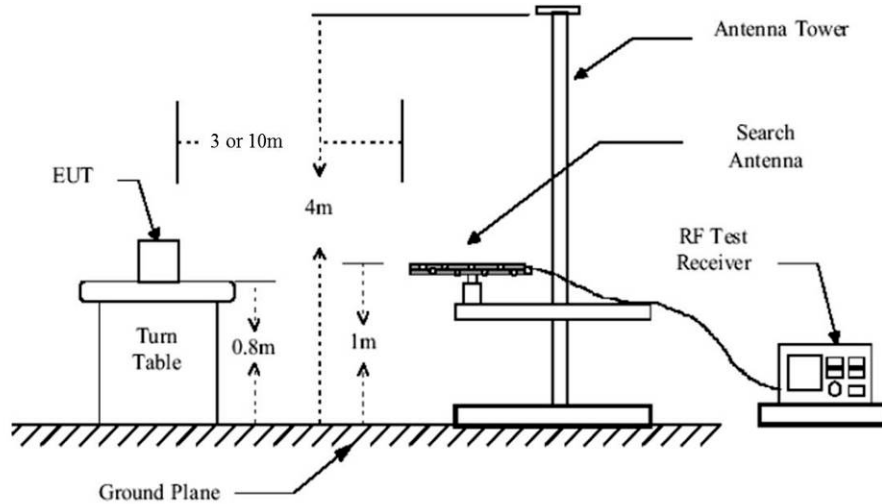


**7. Field Strength of fundamental**

<b>TEST: Field strength of fundamental / FCC part 15.249</b>		<b>Verdict</b>
<p><u>Method:</u> Measurements were made in a 3-meter Open Area Test Site (OATS) that complies to ANSI C63.4 and RSS-Gen.          Measurements were performed with peak detector using a 100kHz RBW. The VBW is set to 300kHz.          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 modulations on lowest, middle and highest channel.          Three orthogonal axis measurements on EUT are performed to obtain the maximum peak field strength.</p>		<b>Pass</b>
Laboratory Parameters:	Required prior to the test	During the test
Ambient Temperature	10 to 40 °C	21°C ± 2
Relative Humidity	10 to 90 %	40% ± 5
<b>Limits – FCC Part 15.249 (a) (c)</b>		
Frequency (MHz)	Limits (dBµV/m)	
	Level / Detector / Distance	Results
902 to 928 MHz	94dBµV/m / Pk / 3m	<b>Pass</b>
Supplementary information: Test date: March 28 <sup>th</sup> , 2018. Tested by L. Chapus		

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Log-periodic antenna	TDK	PLP3003	ANT-101-001	2017/5	2019/5
RF cable	Div	OATS/25m	CAB-101-017	2017/4	2018/4
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	-	-
Measuring Rec	Rohde&Schwarz	ESRP	REC-151-002	2017/3	2019/3

## Test Setup for radiated emission



*Test setup for 30-1000MHz*

### Tabulated Results for Field Strength of fundamental Antenna type 1 (Dipole antenna)

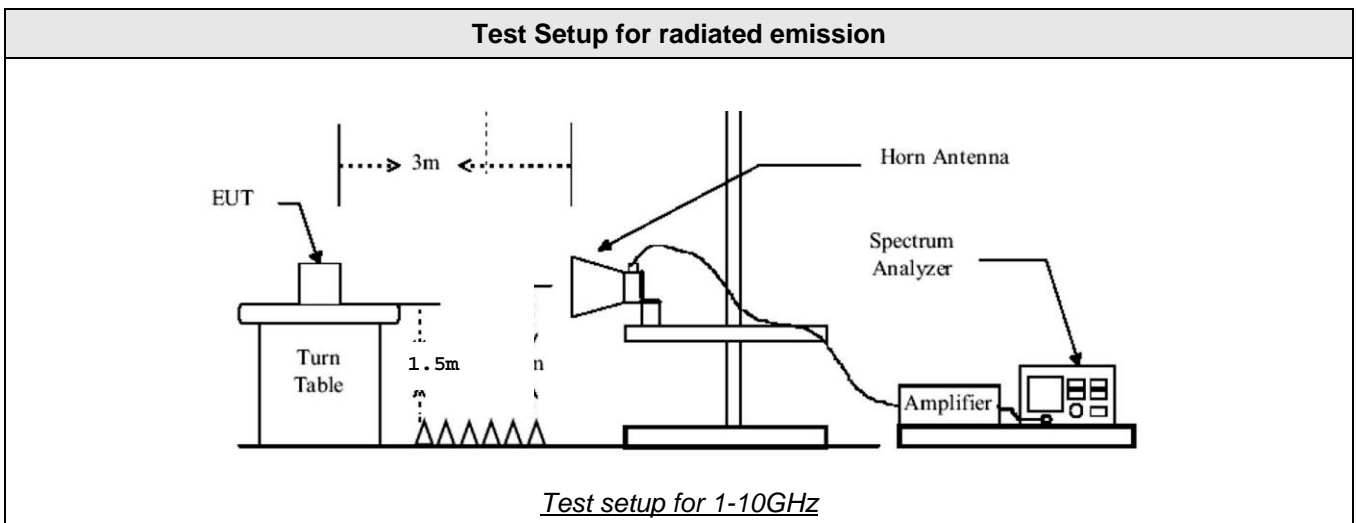
FREQ (MHz)	Field Strength 3m (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Result
902.5	93.4	94.0	Pass
915.0	92.1	94.0	Pass
927.5	91.2	94.0	Pass
<b>RBW:</b>	100kHz		
<b>Measurement distance:</b>	3m		
<b>Limit:</b>	FCC Part 15.249 (a) (c)		
<b>Final measurement detector:</b>	Peak		
<b>Wide Measurement Uncertainty:</b>	$\pm 5.6$ dB (k=2)		
<b>RESULT:</b>	PASS		
<b>Note:</b>	<p>(1): 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:  <math display="block">FS = RA + AF + CF - AG</math>           Where FS = Field Strength            RA = Receiver Amplitude            AF = Antenna Factor            CF = Cable Factor            AG = Amplifier Gain            Total factor (dB) is AF + CF – AG            Margin value = Emission level – Limit value</p> <p>(2): Three orthogonal axis measurements on EUT are performed to obtain the maximum peak field strength.</p> <p>(3): Tx REG value set at 36</p> <p>(4): Worst case results for both antenna port 1 or 2.</p>		

Tabulated Results for Field Strength of fundamental Antenna type 2 (Yagi Antenna)			
FREQ (MHz)	Field Strength 3m (dBμV/m)	Limit (dBμV/m)	Result
902.5	<b>91.3</b>	94.0	<b>Pass</b>
915.0	<b>92.5</b>	94.0	<b>Pass</b>
927.5	<b>93.7</b>	94.0	<b>Pass</b>
<b>RBW:</b>	100kHz		
<b>Measurement distance:</b>	3m		
<b>Limit:</b>	FCC Part 15.249 (a) (c)		
<b>Final measurement detector:</b>	Peak		
<b>Wide Measurement Uncertainty:</b>	± 5.6dB (k=2)		
<b>RESULT:</b>	PASS		
<b>Note:</b>	<p>(1): 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:  <math display="block">FS = RA + AF + CF - AG</math>           Where FS = Field Strength            RA = Receiver Amplitude            AF = Antenna Factor            CF = Cable Factor            AG = Amplifier Gain            Total factor (dB) is AF + CF – AG            Margin value = Emission level – Limit value</p> <p>(2): Three orthogonal axis measurements on EUT are performed to obtain the maximum peak field strength.</p> <p>(3): Tx REG value set at 8</p> <p>(4): Worst case results for both antenna port 1 or 2.</p>		

**8. Field Strength of harmonics**

<b>TEST: Field Strength of harmonics / FCC part 15.249</b>		<b>Verdict</b>											
<p><u>Method:</u> Measurements were made in a 3-meter Full Anechoic Chamber that complies to ANSI C63.10. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements were then performed by rotating the EUT 360° and adjusting the receive antenna height.</p> <p>The tested equipment is set to transmit operation with modulations on lowest 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 pre-scan radiated field of the EUT is performed at 3 or 1.6meters of distance for frequency 960MHz-10GHz.</p>		<b>Pass</b>											
Laboratory Parameters:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Required prior to the test</th> <th style="width: 33%;">During the test</th> </tr> </thead> <tbody> <tr> <td>Ambient Temperature</td> <td style="text-align: center;">10 to 40 °C</td> </tr> <tr> <td>Relative Humidity</td> <td style="text-align: center;">10 to 90 %</td> </tr> <tr> <td>Fully configured sample scanned over the following frequency range</td> <td> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Frequency range on each side of line</th> <th style="width: 50%;">Measurement Point</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">30MHz – 9.3GHz</td> <td style="text-align: center;">3 m measurement distance</td> </tr> </tbody> </table> </td> </tr> </tbody> </table>		Required prior to the test	During the test	Ambient Temperature	10 to 40 °C	Relative Humidity	10 to 90 %	Fully configured sample scanned over the following frequency range	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Frequency range on each side of line</th> <th style="width: 50%;">Measurement Point</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">30MHz – 9.3GHz</td> <td style="text-align: center;">3 m measurement distance</td> </tr> </tbody> </table>	Frequency range on each side of line	Measurement Point	30MHz – 9.3GHz
Required prior to the test	During the test												
Ambient Temperature	10 to 40 °C												
Relative Humidity	10 to 90 %												
Fully configured sample scanned over the following frequency range	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Frequency range on each side of line</th> <th style="width: 50%;">Measurement Point</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">30MHz – 9.3GHz</td> <td style="text-align: center;">3 m measurement distance</td> </tr> </tbody> </table>	Frequency range on each side of line	Measurement Point	30MHz – 9.3GHz	3 m measurement distance								
Frequency range on each side of line	Measurement Point												
30MHz – 9.3GHz	3 m measurement distance												
<b>Limits – FCC Part 15.249 (a) (c) (e)</b>													
Frequency bands for harmonics (MHz)	Limits (dBµV/m)												
	Level / Detector / Distance	Results											
1804 to 1856	54.0 / AV / 3m 74.0 / PK / 3m	<b>Pass</b>											
2706 to 2784	54.0 / AV / 3m 74.0 / PK / 3m	<b>Pass</b>											
3608 to 3712	54.0 / AV / 3m 74.0 / PK / 3m	<b>Pass</b>											
4510 to 4640	54.0 / AV / 3m 74.0 / PK / 3m	<b>Pass</b>											
5412 to 5568	54.0 / AV / 3m 74.0 / PK / 3m	<b>Pass</b>											
6314 to 6496	54.0 / AV / 3m 74.0 / PK / 3m	<b>Pass</b>											
7216 to 7424	54.0 / AV / 3m 74.0 / PK / 3m	<b>Pass</b>											
8118 to 8352	54.0 / AV / 3m 74.0 / PK / 3m	<b>Pass</b>											
9020 to 9280	54.0 / AV / 3m 74.0 / PK / 3m	<b>Pass</b>											
Supplementary information: Test date: March 28 <sup>th</sup> , 2018. Tested by L. Chapus													

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Horn antenna	ETS-LINDGREN	3115	ANT-141-013	2014/3	2019/3
RF cable	Pasternack RF	PE302-120	CAB-131-024	2017/6	2018/6
RF cable	HUBER+SUHNER	SF104	CAB-141-030	2017/6	2018/6
High-Pass filter	Wainwright Inst.	HK6-948-1200	FIL-141-004	2017/6	2018/6
Pre-amplifier	Pasternack RF	PE1524	PRE-101-002	2017/6	2018/6
Anechoic chamber	COMTEST	214263	CAG-141-001	2017/6	2020/6
OATS	Div	10m	SIT-101-001	2017/7	2020/7
Turntable	Innco- Systems	CT0800	PLA-141-001	-	-
Measuring Rec	Rohde&Schwarz	ESRP	REC-151-002	2017/3	2019/3
Spectrum analyzer	Rohde&Schwarz	FSV40	ASP-171-004	2017/5	2019/5



Tabulated Results for Field strength of harmonics (1GHz-9.3GHz, Antenna type 1, Dipole antenna)				
FREQ (MHz)	Field level dB $\mu$ V/m	Detector	Limit (dB $\mu$ V/m)	Result
Levels at least 10dB below limits		<b>Pk</b>	74.0	<b>Pass</b>
Levels at least 10dB below limits		<b>Av</b>	54.0	<b>Pass</b>
Tabulated Results for Field strength of harmonics (1GHz-9.3GHz, Antenna type 2, Yagi antenna)				
FREQ (MHz)	Field level dB $\mu$ V/m	Detector	Limit (dB $\mu$ V/m)	Result
Levels at least 10dB below limits		<b>Pk</b>	74.0	<b>Pass</b>
Levels at least 10dB below limits		<b>Av</b>	54.0	<b>Pass</b>
<b>RBW</b>	1MHz			
<b>Measurement distance:</b>	3m			
<b>Limit:</b>	FCC Part 15.249 (a) (c) (e)			
<b>Final measurement detector:</b>	Peak / Average			
<b>Wide Measurement Uncertainty:</b>	$\pm 5.6$ dB (k=2)			
<b>RESULT:</b>	PASS			
<b>Notes:</b>	<p>(1): 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:  <math>FS = RA + AF + CF - AG</math>            Where FS = Field Strength            RA = Receiver Amplitude            AF = Antenna Factor            CF = Cable Factor            AG = Amplifier Gain            Total factor (dB) is <math>AF + CF - AG</math>            Margin value = Emission level – Limit value</p> <p>(2): Peak pre-scans not performed at 3-meters distance are corrected as follow:  <math>M@3m = M@D_m + 20 \times \log (D_m / 3m)</math>            Where D is the measurement distance in meter</p> <p>(3): Three axis measurement performed for equipment under test            (4): Worst case results for both antenna port 1 or 2.            (5): See pre-scan graphs in chapter 9 (Unwanted emissions)</p>			

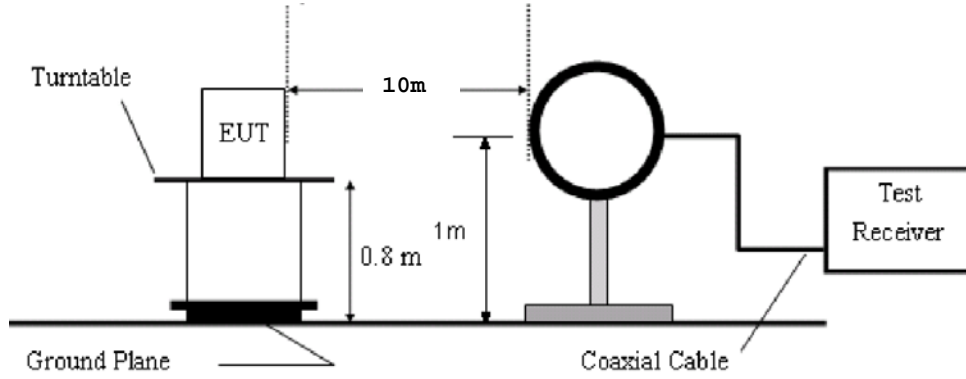
**9. Unwanted emissions**

<b>TEST: Unwanted emissions outside fundamental and harmonics bands / FCC part 15.209, 15.249</b>		<b>Verdict</b>
<p><u>Method:</u> Measurements were made in a 3-meter Full Anechoic Chamber that complies to ANSI C63.10. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements were then performed by rotating the EUT 360° and adjusting the receive antenna height.</p> <p>The tested equipment is set to transmit operation with modulations on lowest 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 pre-scan radiated field of the EUT is performed at 3 or 1.6meters of distance for frequency 960MHz-10GHz.</p>		<b>Pass</b>
Laboratory Parameters:	Required prior to the test	During the test
Ambient Temperature	10 to 40 °C	23°C ± 2
Relative Humidity	10 to 90 %	40% ± 5
Fully configured sample scanned over the following frequency range	Frequency range on each side of line	Meas. point
	9kHz – 30MHz	10 m
	30MHz – 9.3GHz	3 m
<b>Limits – FCC Part 15.209, 15.249 (d) (e)</b>		
<b>Whichever is less stringent, either:</b>		
Frequency (MHz)	Limits (dBµV/m)	
	Level / Detector / Distance	Results
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
<b>Or</b>		
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	<b>Pass</b>
0.090 to 0.110	87.6 – 85.9 / QP / 10m	<b>Pass</b>
0.110 to 0.490	85.7 – 72.9 / AV / 10m 105.7 – 92.9 / PK / 10m	<b>Pass</b>
0.490 to 1.705	52.9 – 42.1 / QP / 10m	<b>Pass</b>
1.705 to 30	48.6 / QP / 10m	<b>Pass</b>
30 to 88	40.0 / QP / 3m	<b>Pass</b>
88 to 216	43.5 / QP / 3m	<b>Pass</b>
216 to 960	46.0 / QP / 3m	<b>Pass</b>
960 to 1000	54.0 / QP / 3m	
Above 1GHz	54.0 / AV / 3m 74.0 / PK / 3m	<b>Pass</b>
Supplementary information: Test date: March 28 <sup>th</sup> , 2018. Tested by L. Chapus		

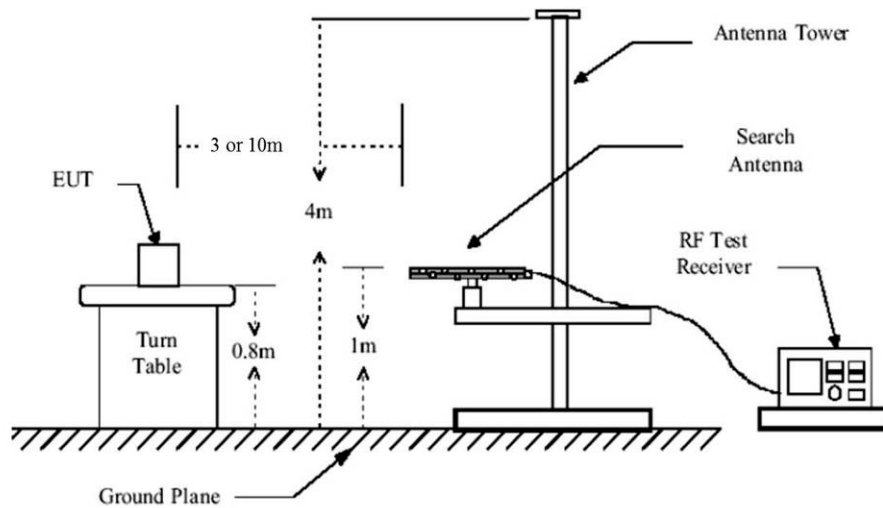
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Log-periodic antenna	TDK	PLP3003	ANT-101-001	2017/5	2019/5
Biconnic antenna	COM-POWER	AB- 900	ANT-101-003	2017/5	2019/5
Loop antenna	EMCO	6502	ANT-101-009	2017/8	2019/8
BiConiLog antenna	EMCO	3142B	ANT-101-010	2017/7	2019/7
Horn antenna	ETS-LINDGREN	3115	ANT-141-013	2014/3	2019/3
RF cable	Div	OATS/25m	CAB-101-017	2017/4	2018/4
RF cable	Pasternack RF	PE302-120	CAB-131-024	2017/6	2018/6
RF cable	HUBER+SUHNER	RG214U	CAB-141-026	2017/4	2018/4
RF cable	HUBER+SUHNER	RG214U	CAB-141-029	2017/4	2018/4
RF cable	HUBER+SUHNER	SF104	CAB-141-030	2017/6	2018/6
High-Pass filter	Wainwright Inst.	HK6-948-1200	FIL-141-004	2017/6	2018/6
Pre-amplifier	Pasternack RF	PE1524	PRE-101-002	2017/6	2018/6
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	2017/3	2019/3
Spectrum analyzer	Rohde&Schwarz	FSV40	ASP-171-004	2017/5	2019/5



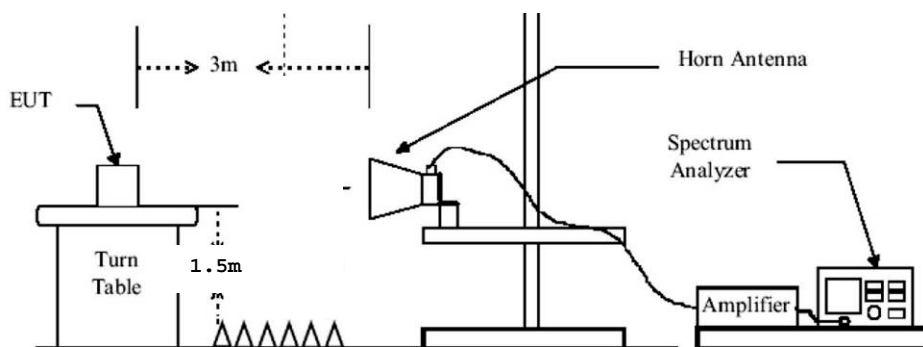
**Test Setup for radiated emission**



*Test setup for 9k-30MHz*



*Test setup for 30-1000MHz*



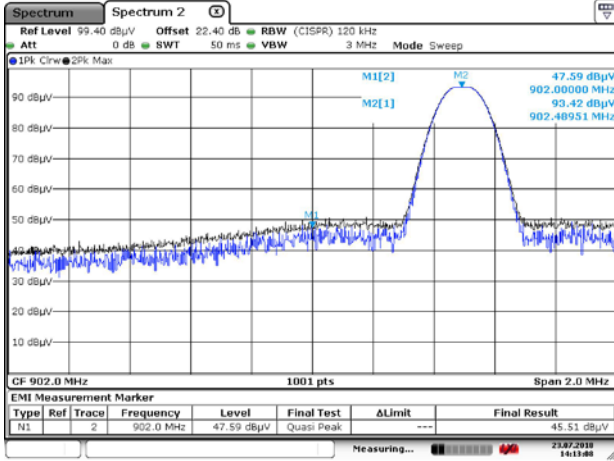
*Test setup for 1-10GHz*

Tabulated Results for Unwanted emissions (9kHz-30MHz) Antenna type 1 (Dipole) / Antenna type 2 (YAGI)						
FREQ	RF field @ 30m	Limit @ 30m	Margin	Antenna angle	Table angle	Correc. Fact. (CF)
MHz	(QP) dB $\mu$ V/m	(QP) dB $\mu$ V/m	dB	Degree	Degree	dB
Levels are at least 10dB below applicable limits						
Supplementary information: Frequency list measured on the Open Area Test Site has been created with pre-scan results.						
<b>Frequency band investigated:</b>		9kHz-30MHz				
<b>RBW:</b>		200Hz (9kHz-150kHz) 9kHz (150kHz-30MHz)				
<b>Measurement distance:</b>		10m				
<b>Limit:</b>		FCC Part 15.209 – 15.249				
<b>Final measurement detector:</b>		Quasi-Peak				
<b>Wide Measurement Uncertainty:</b>		$\pm 3.5$ dB (k=2)				
<b>Note:</b>		CF: Correction factor = Antenna factor + Cable loss *1: Measure have been done at 10m distance and corrected according to requirements of 15.209.e) (M@30m = M@10m-19.1dB)				

Tabulated Results for Unwanted emissions (30MHz-1GHz) Antenna type 1 (Dipole)					
FREQ	Meter reading	Total factor	Field level	Limit	Margin
MHz	(QP) dB $\mu$ V	dB	(QP) dB $\mu$ V/m	(QP) dB $\mu$ V/m	dB
902.0	16.1	29.4	<b>45.5</b>	46.0	-0.5
928.0	13.7	29.3	<b>43.0</b>	46.0	-3.0
Tabulated Results for Unwanted emissions (30MHz-1GHz) Antenna type 2 (Yagi)					
FREQ	Meter reading	Total factor	Field level	Limit	Margin
MHz	(QP) dB $\mu$ V	dB	(QP) dB $\mu$ V/m	(QP) dB $\mu$ V/m	dB
902.0	13.9	29.4	<b>43.3</b>	46.0	-2.7
928.0	15.9	29.3	<b>45.2</b>	46.0	-0.8
Supplementary information: Frequency list measured on the Open Area Test Site has been created with pre-scan results.					
<b>Frequency band investigated:</b>		30MHz-1GHz			
<b>RBW:</b>		120kHz			
<b>Measurement distance:</b>		3m			
<b>Limit:</b>		FCC Part 15.209 or 15.249			
<b>Final measurement detector:</b>		Quasi-Peak			
<b>Wide Measurement Uncertainty:</b>		$\pm 5.6$ dB (k=2)			
<b>RESULT:</b>		PASS			
<b>Notes:</b>		<p>(1): 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:  <math>FS = RA + AF + CF - AG</math>            Where FS = Field Strength            RA = Receiver Amplitude            AF = Antenna Factor            CF = Cable Factor            AG = Amplifier Gain            Total factor (dB) is <math>AF + CF - AG</math>            Margin value = Emission level – Limit value</p> <p>(2): Limits 15.209 used            (3): Three axis measurement performed for equipment under test            (4): Worst case results for both antenna port 1 or 2.</p>			

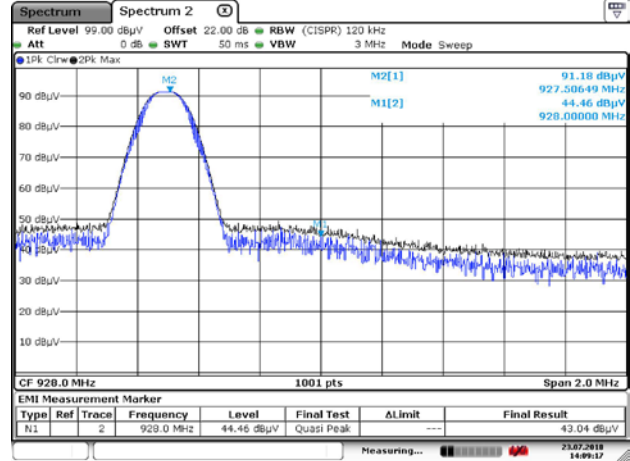
Tabulated Results for Unwanted emissions (1GHz-9.3GHz, Antenna type 1, Dipole antenna)				
FREQ (MHz)	Field level dB $\mu$ V/m	Detector	Limit (dB $\mu$ V/m)	Result
Levels at least 10dB below limits		<b>Pk</b>	74.0	<b>Pass</b>
Levels at least 10dB below limits		<b>Av</b>	54.0	<b>Pass</b>
Tabulated Results for Field Unwanted emissions (1GHz-9.3GHz, Antenna type 2, Yagi antenna)				
FREQ (MHz)	Field level dB $\mu$ V/m	Detector	Limit (dB $\mu$ V/m)	Result
Levels at least 10dB below limits		<b>Pk</b>	74.0	<b>Pass</b>
Levels at least 10dB below limits		<b>Av</b>	54.0	<b>Pass</b>
<b>RBW</b>	1MHz			
<b>Measurement distance:</b>	3m			
<b>Limit:</b>	FCC Part 15.249 (a) (c) (e)			
<b>Final measurement detector:</b>	Peak / Average			
<b>Wide Measurement Uncertainty:</b>	$\pm 5.6$ dB (k=2)			
<b>RESULT:</b>	PASS			
<b>Notes:</b>	<p>(1): 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:  <math>FS = RA + AF + CF - AG</math>            Where FS = Field Strength            RA = Receiver Amplitude            AF = Antenna Factor            CF = Cable Factor            AG = Amplifier Gain            Total factor (dB) is <math>AF + CF - AG</math>            Margin value = Emission level – Limit value</p> <p>(2): Peak pre-scans not performed at 3-meters distance are corrected as follow:  <math>M@3m = M@D_m + 20 \times \log (D_m / 3_m)</math>            Where D is the measurement distance in meter</p> <p>(3): Three axis measurement performed for equipment under test</p> <p>(4): Worst case results for both antenna port 1 or 2.</p>			

## Graphical representation of Band-edge compliance (Radiated) Antenna type 1 (Dipole antenna)



### Low band-edge compliance

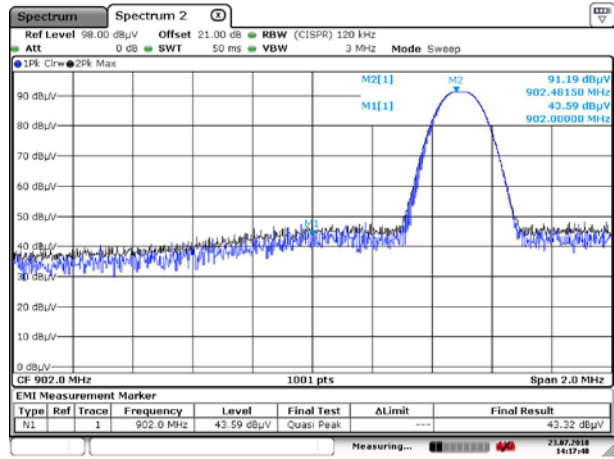
F1 = 902MHz  
 Quasi-Peak level below 902MHz is 45.5dBµV/m max at 3m  
 (limit is 46dBµV/m @ 3m)  
**RESULT: PASS**  
 Note: Radiated measurement



### High band-edge compliance

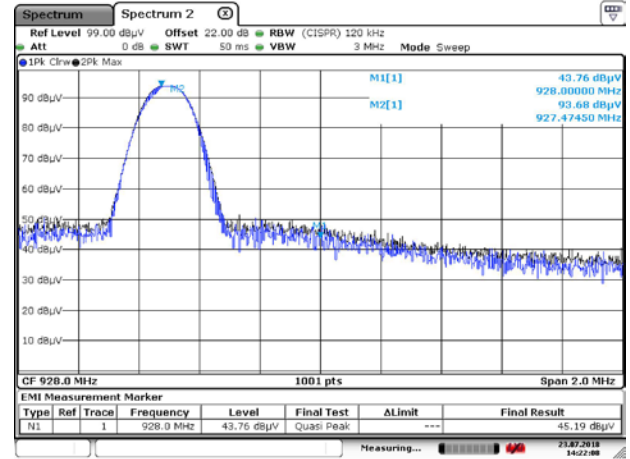
F1 = 928MHz  
 Quasi-Peak level above 928MHz is 43.0dBµV/m max at 3m  
 (limit is 46dBµV/m @ 3m)  
**RESULT: PASS**  
 Note: Radiated measurement

## Graphical representation of Band-edge compliance (Radiated) Antenna type 2 (Yagi antenna)



### Low band-edge compliance

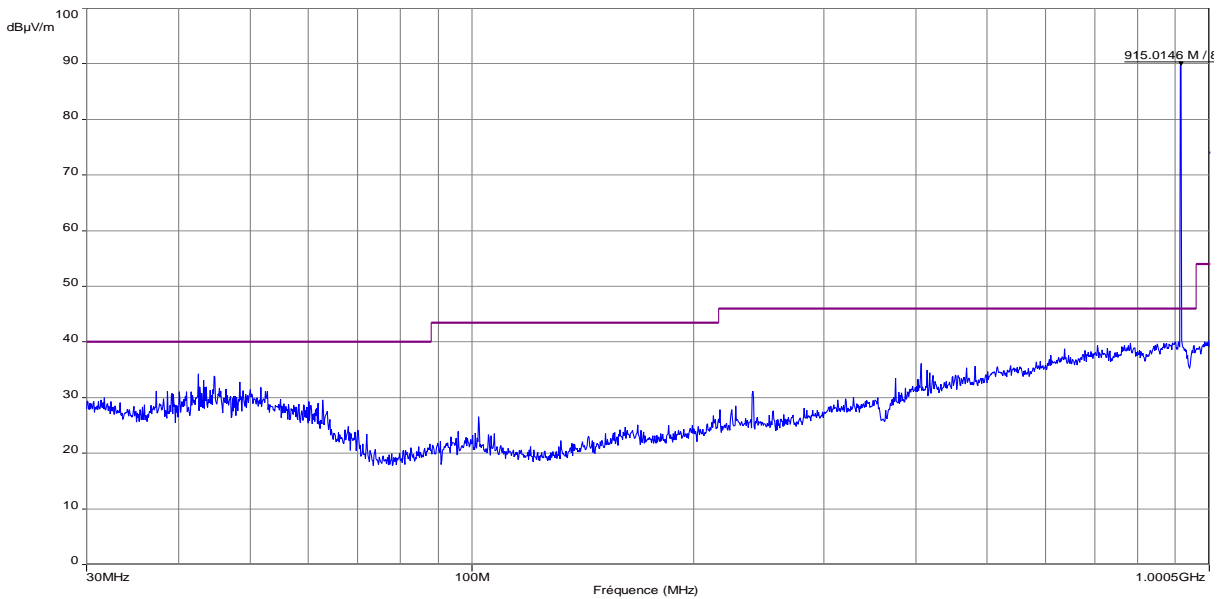
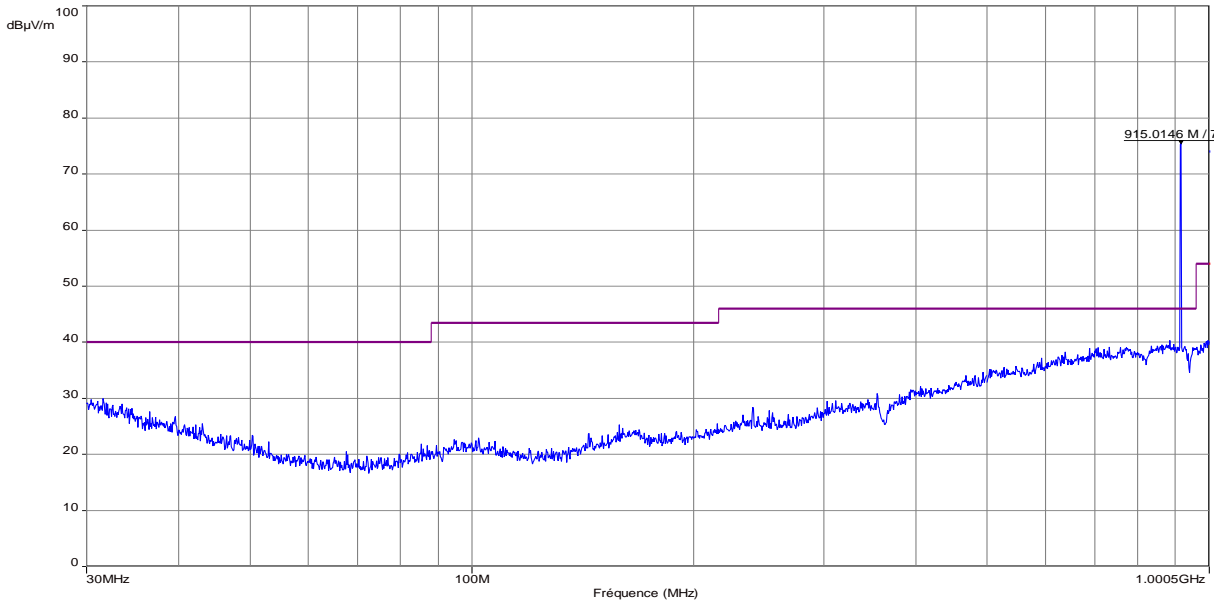
F1 = 902MHz  
 Quasi-Peak level below 902MHz is 43.3dBµV/m max at 3m  
 (limit is 46dBµV/m @ 3m)  
**RESULT: PASS**  
 Note: Radiated measurement



### High band-edge compliance

F1 = 928MHz  
 Quasi-Peak level above 928MHz is 45.2dBµV/m max at 3m  
 (limit is 46dBµV/m @ 3m)  
**RESULT: PASS**  
 Note: Radiated measurement

**Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 30MHz-1GHz / 3m / Horizontal & Vertical, Transmit mode at 915MHz)  
Antenna type 1 (Dipole antenna)**

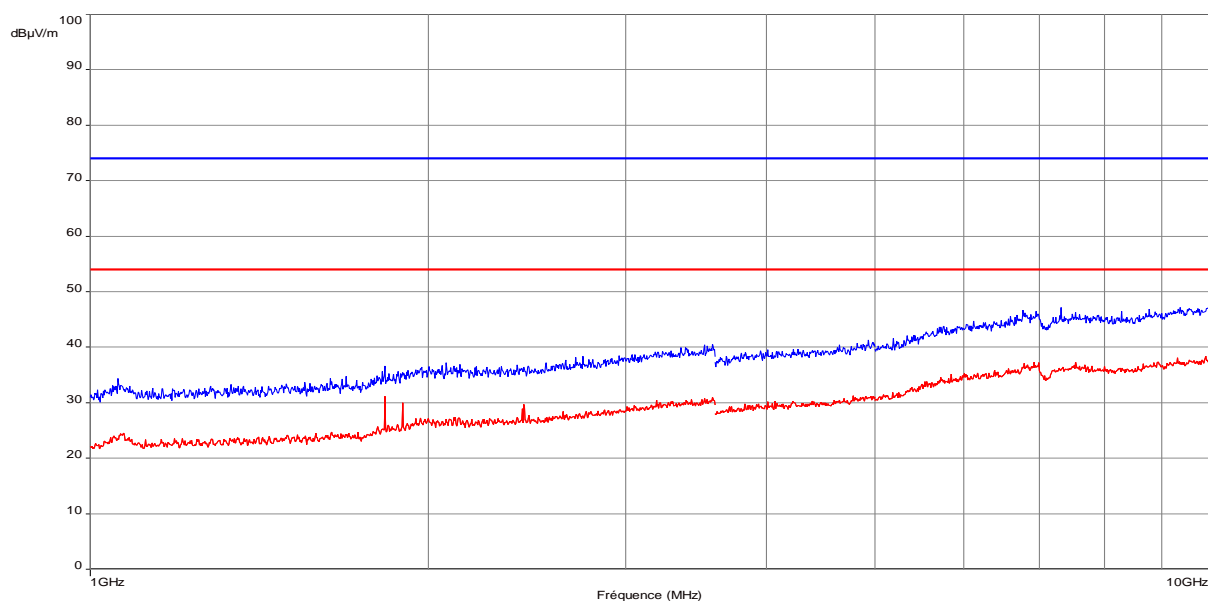
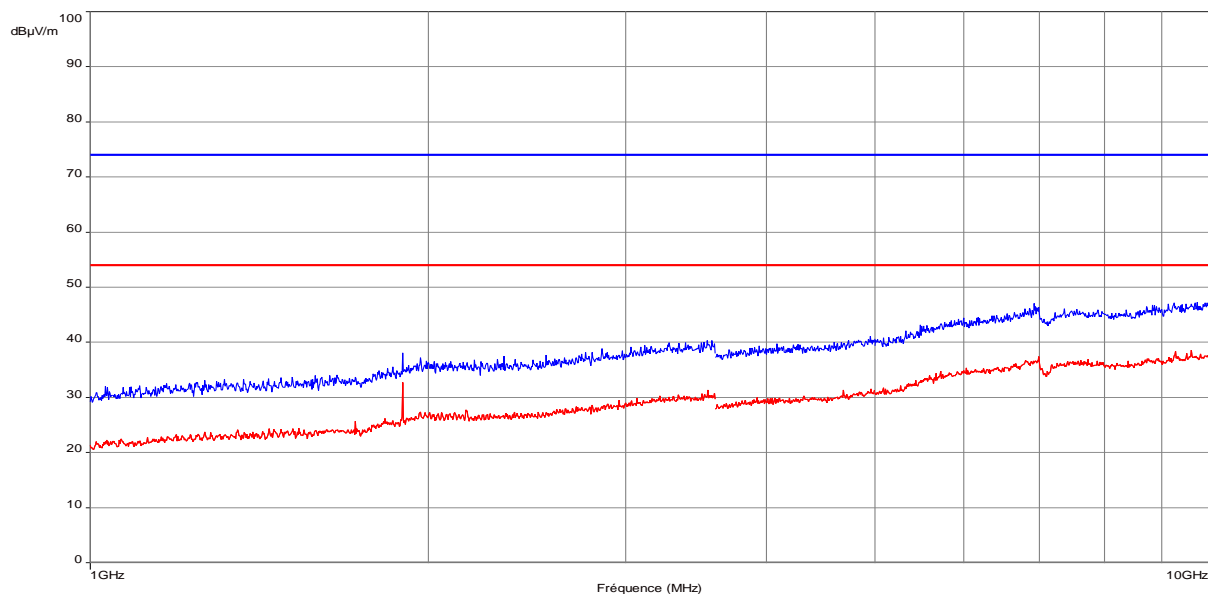


Note: Pre-scan graph only for identification purpose.

Same results for low and high channels. EUT with the transmit antenna is set vertically.

<b>Frequency band investigated:</b>	30MHz-1GHz
<b>Unit :</b>	dBµV/m
<b>RBW :</b>	100kHz
<b>Antenna polarization :</b>	Horizontal and vertical
<b>Limit:</b>	15.209
<b>Measurement detector:</b>	Peak
<b>Wide Measurement Uncertainty:</b>	± 5.6dB (k=2)

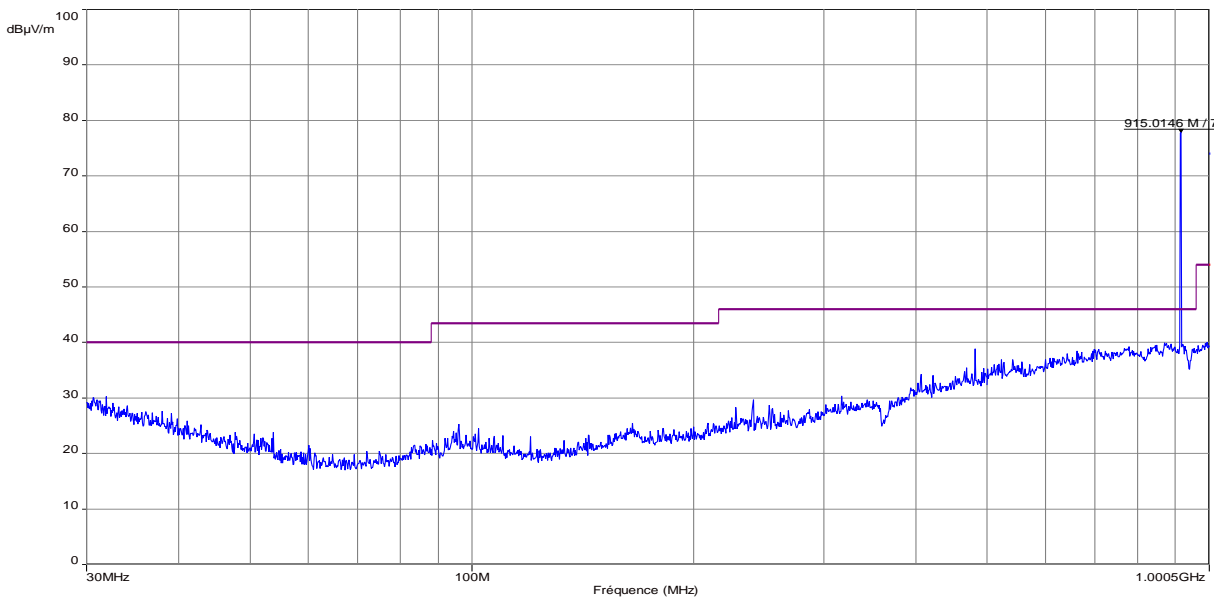
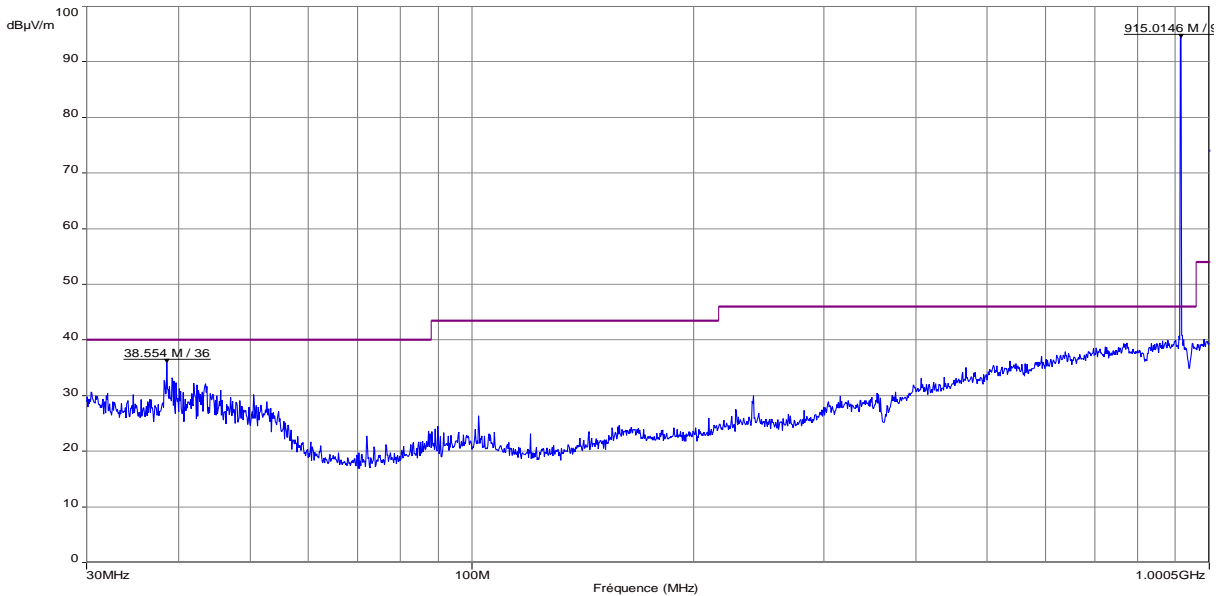
**Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 1GHz-9GHz / 3m / Horizontal & Vertical / Transmit mode at 915MHz)  
Antenna type 1 (Dipole antenna)**



Note: Pre-scan graph only for identification purpose.  
Same results for low and high channels. EUT with the transmit antenna is set vertically.

<b>Frequency band investigated:</b>	1GHz-9GHz
<b>Unit :</b>	dBµV/m
<b>RBW :</b>	1MHz
<b>Antenna polarization :</b>	Horizontal and Vertical
<b>Limit:</b>	15.209
<b>Measurement detector:</b>	Peak
<b>Wide Measurement Uncertainty:</b>	± 5.6dB (k=2)

**Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 30MHz-1GHz / 3m / Horizontal & Vertical, Transmit mode at 915MHz)  
Antenna type 2 (Yagi antenna)**



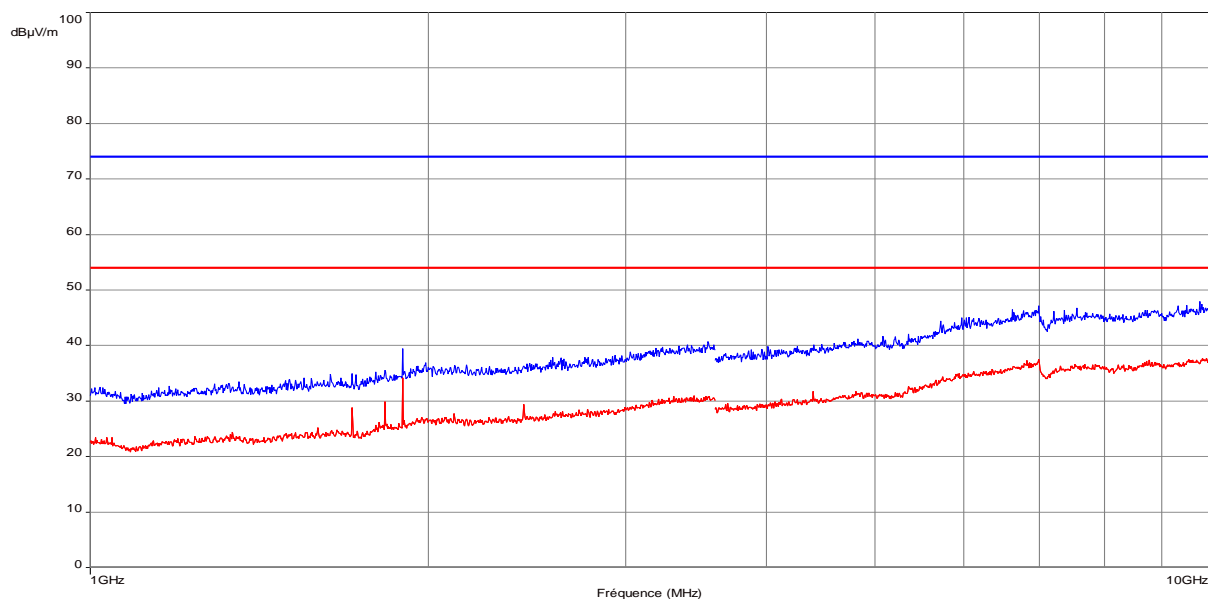
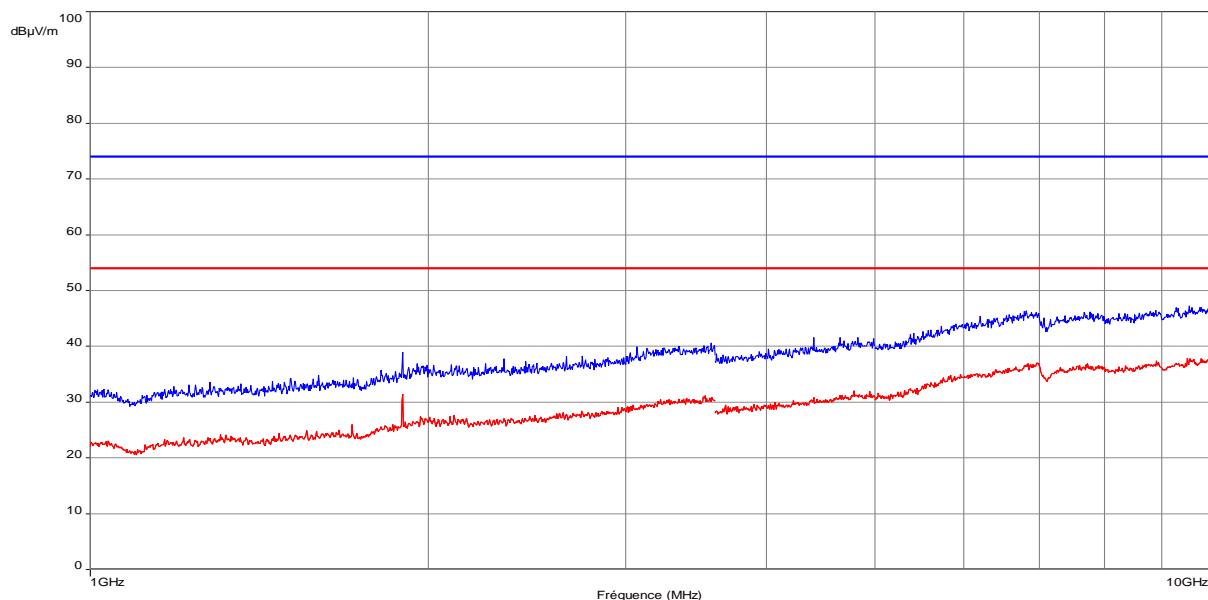
Note: Pre-scan graph only for identification purpose.

Same results for low and high channels. EUT with the transmit antenna is set vertically.

<b>Frequency band investigated:</b>	30MHz-1GHz
<b>Unit :</b>	dBμV/m
<b>RBW :</b>	100kHz
<b>Antenna polarization :</b>	Horizontal and vertical
<b>Limit:</b>	15.209
<b>Measurement detector:</b>	Peak
<b>Wide Measurement Uncertainty:</b>	± 5.6dB (k=2)



**Graphical representation of Radiated Disturbance Measurement (Peak detection, Anechoic chamber pre-scan, 1GHz-9GHz / 3m / Horizontal & Vertical / Transmit mode at 915MHz)  
Antenna type 2 (Yagi antenna)**



Note: Pre-scan graph only for identification purpose.

Same results for low and high channels. EUT with the transmit antenna is set vertically.

<b>Frequency band investigated:</b>	1GHz-9GHz
<b>Unit :</b>	dBµV/m
<b>RBW :</b>	1MHz
<b>Antenna polarization :</b>	Horizontal and Vertical
<b>Limit:</b>	15.209
<b>Measurement detector:</b>	Peak
<b>Wide Measurement Uncertainty:</b>	± 5.6dB (k=2)