



LCIE

Rapport d'essai / Test report

N° 200807-4724C-A1-R1-E

JDE : 85366

DELIVRE A / ISSUED TO

: ADEUNIS RF
283 rue Louis Néel
38920 CROLLES
FRANCE

Objet / Subject

: Essais de compatibilité électromagnétique conformément aux normes FCC CFR 47 Part 15, Subpart C.
Electromagnetic compatibility tests according to the standards FCC CFR 47 Part 15, Subpart C.

Matériel testé / Apparatus under test :

- Produit / Product : Wireless Audio Conference System
- Marque / Trade mark : Adeunis RF
- Constructeur / Manufacturer : Adeunis RF
- Type / Model : ARF37
- N° de série / serial number * : Q1 *
- FCC ID : U3Z-ARF7531

* : information donnée par le client / information given by the customer

Date des essais / Test date

: Du 17 au 26 septembre 2008 / September 17th to 26th, 2008
18 novembre 2008 / November 18th, 2008

Lieu d'essai / Test location

: BUREAU VERITAS LCIE SUD-EST
ZI Centr'Alp – 170 rue de Chatagnon
38430 MOIRANS - France

Test réalisé par / Test performed by : Laurent CHAPUS

Ce document comporte / Composition of document : 19 pages.

MOIRANS, LE 26 NOVEMBRE 2008 / NOVEMBER 26TH, 2008

Ecrit par / Written by
Laurent CHAPUS

Approuvé par / Approved by
Yannick SAVOIE



La reproduction de ce document n'est autorisée que sous sa forme intégrale. Toute reproduction partielle (ou toute insertion de résultats dans un rapport d'accompagnement en vue de leur diffusion) doit recevoir un accord préalable et formel du LCIE. Ce document résulte d'essais effectués sur un échantillon ou une éprouvette. Il ne préjuge pas de la conformité de l'ensemble des produits fabriqués à l'objet essayé. Sauf indication contraire, la décision de conformité prend en compte l'incertitude de mesures. Il ne préjuge en aucun cas d'une décision de certification.
This document shall not be reproduced, except in full, without the written approval of the LCIE. This document contains results related only to the item tested. It does not imply the conformity of the whole production to the item tested. Unless otherwise specified, the decision of conformity takes into account the uncertainty of measures. This document does not anticipate any certification decision.



SUMMARY

1. TEST PROGRAM	3
2. SYSTEM TEST CONFIGURATION	4
3. CHANNEL SEPARATION	6
4. TIME OF OCCUPANCY	8
5. OCCUPIED BANDWIDTH.....	10
6. PEAK POWER OUTPUT (CONDUCTED)	11
7. SPURIOUS EMISSIONS (RADIATED)	13
8. TEST EQUIPMENT LIST	17
9. UNCERTAINTIES CHART	19



1. TEST PROGRAM

Standard : FCC CFR 47, PART 15, Subpart C

ANSI C63-4 (2003).

Requirements for intentional radiator. Chapter 15.247 (Operation within the band 902 - 928 MHz)

Frequency hopping transmitter.

TEST	Paragraph number	Spec.	RESULTS (comments)
Power line conducted emissions	15.207 (a)	Table 15.207 (a)	NA (battery powered equipment)
Channel separation	15.247 (a)(1)	Greater of 25 kHz or 20dB bandwidth	PASS
Time of Occupancy	15.247 (a)(1)(i)	< 0.4s in 10s	PASS (25 hopping frequencies)
20dB Occupied bandwidth	15.247 (a)(1)	500kHz	PASS
Peak Power Output	15.247 (b)	0.25 Watt (24dBm)	PASS
Spurious emissions (Antenna conducted)	15.247 (c)	- 20dBc	NA (No antenna connector)
Spurious emissions (Radiated)	15.247 (c)	Table 15.209 (a)	PASS

General conclusion:

Measures performed on the sample of the product ARF37, Sn: Q1, in configuration and description presented in this test report, show compliance levels with FCC CFR 47, Part 15 C, section 15.247 and related sections.



2. SYSTEM TEST CONFIGURATION

2.1. JUSTIFICATION

The system was configured for testing in a typical fashion (as a customer would normally use it).

2.2. HARDWARE IDENTIFICATION

• **Equipment under test (EUT):**

ARF37

Serial number: Q1
FCC ID: U3Z-ARF7531

Equipment information:

- Dimensions: 20cm x 6cm x 3cm
- Frequency band : from 915.25MHz to 927.25MHz
- Number of channel: 25
- Channel separation: 500kHz
- Antenna connector: none
- Integral antenna: 0dBi

• **Input/output:**

- Waterproof locking connector (for headset connection)

• **Auxiliaries used for testing:**

Trade Mark – Model Number (Serial number)	FCC ID	Description	Cable description
ADEUNIS RF – ARF37 * Sn: Q1	U3Z-ARF7531	Wireless Audio Conference System (915MHz)	Audio cable to headset, 1m
RRC – EasyPack Adapter Model: EZP06DC005/NC/E	None	Battery charger (4.2V/1A max)	Power cable unshielded
VARTA EasyPack # 66380 711 099	None	Rechargeable Li-Polymer battery (3.7V / 1000mAh)	None
ADEUNIS RF- Standard headset Ref: 7382-A-M32	None	Standard headset with locking connector	Audio cable, 1m

*: Equipment under test

2.3. EQUIPMENT MODIFICATIONS

None

2.4. EUT EXERCISE SOFTWARE

The EUT exercise program used during radiated testing was exercised the ARF37 in a manner similar to a typical use. It can also set in special mode with frequency hopping system disable, with permanent emission on a selected channel.



2.5. EUT CONFIGURATION

Tests are performed with frequency hopping enable or disable.
Test are performed with a fully battery.

2.6. SPECIAL ACCESSORIES

None



3. CHANNEL SEPARATION

3.1. CLIMATIC CONDITIONS

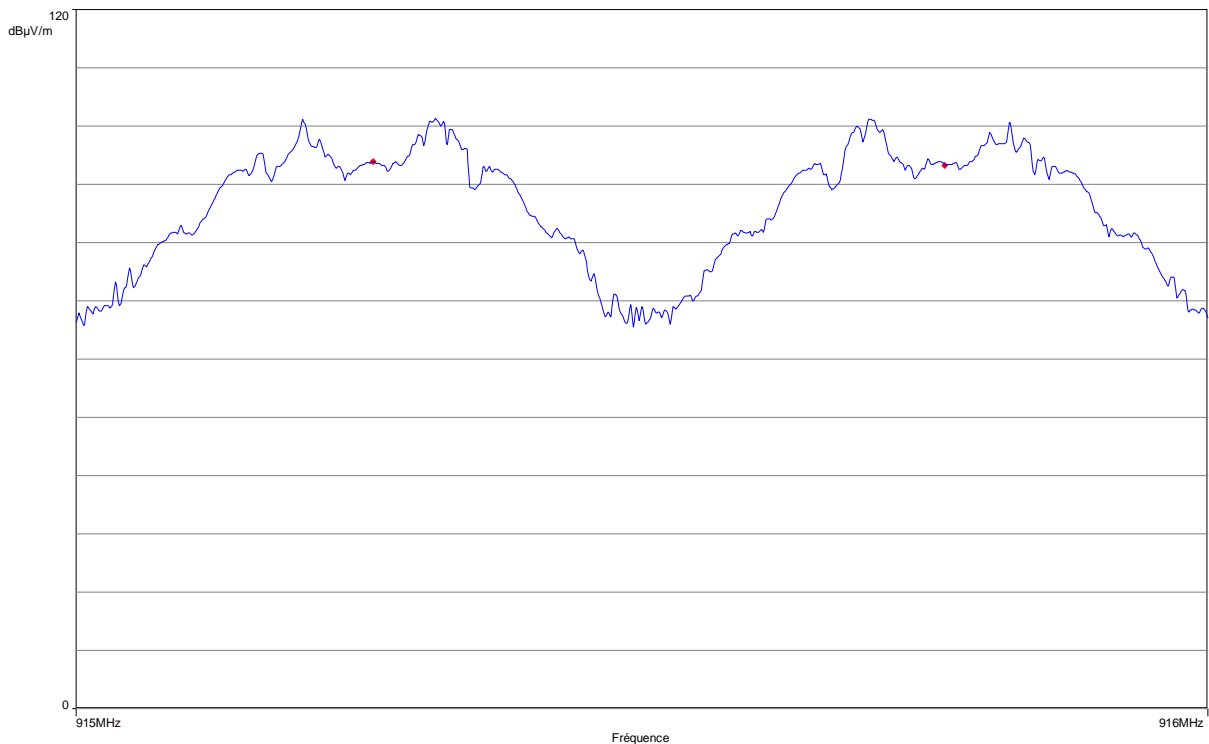
Date of test : September 25th, 2008
Test performed by : Laurent CHAPUS
Atmospheric pressure : 985mb
Relative humidity : 40%
Ambient temperature : 24°C

3.2. SET-UP

The EUT is placed on a table at 0.8m height in the semi anechoic chamber.
Power supply: fully charged battery.

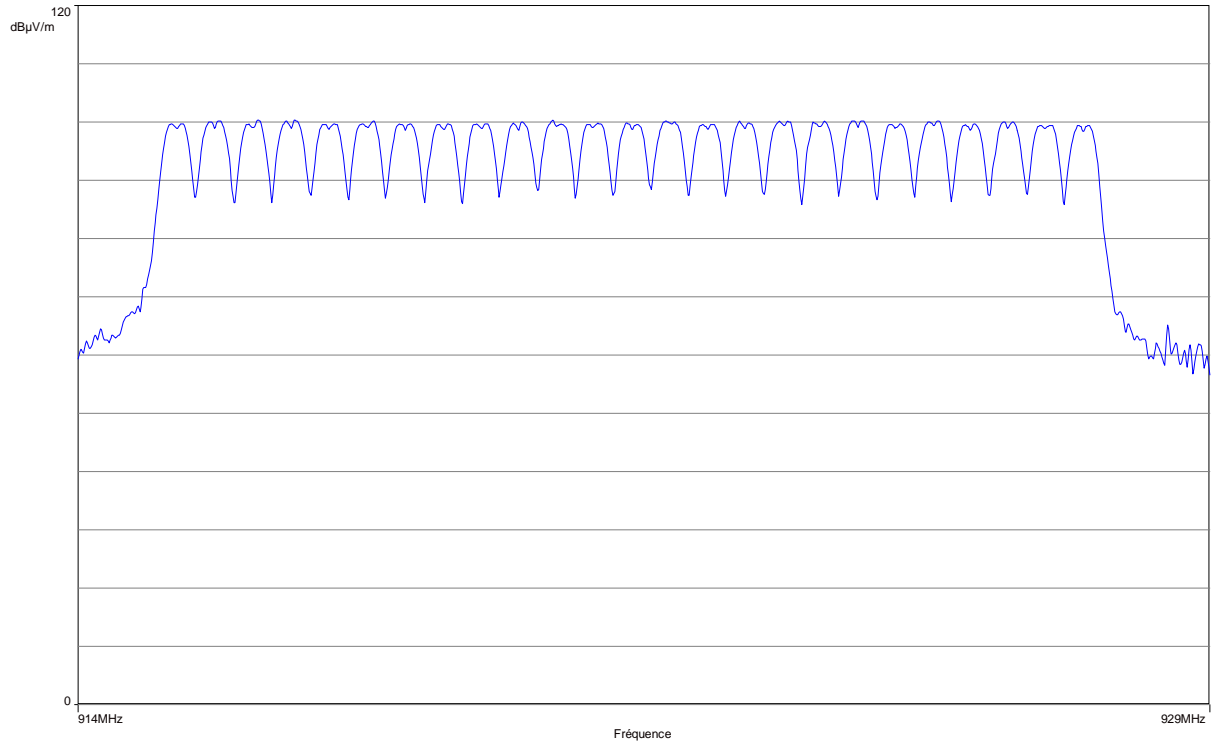
3.3. MEASUREMENT DATA

Measured channel separation: **500kHz**
Measured number of channel: **25**



Channel separation
RBW = 100kHz / VBW = 300kHz

Marker: 915.262MHz
Marker: 915.767MHz
Marker delta: **505kHz**



Number of channel: 25 channels
RBW = 100kHz / VBW = 300kHz



4. TIME OF OCCUPANCY

4.1. CLIMATIC CONDITIONS

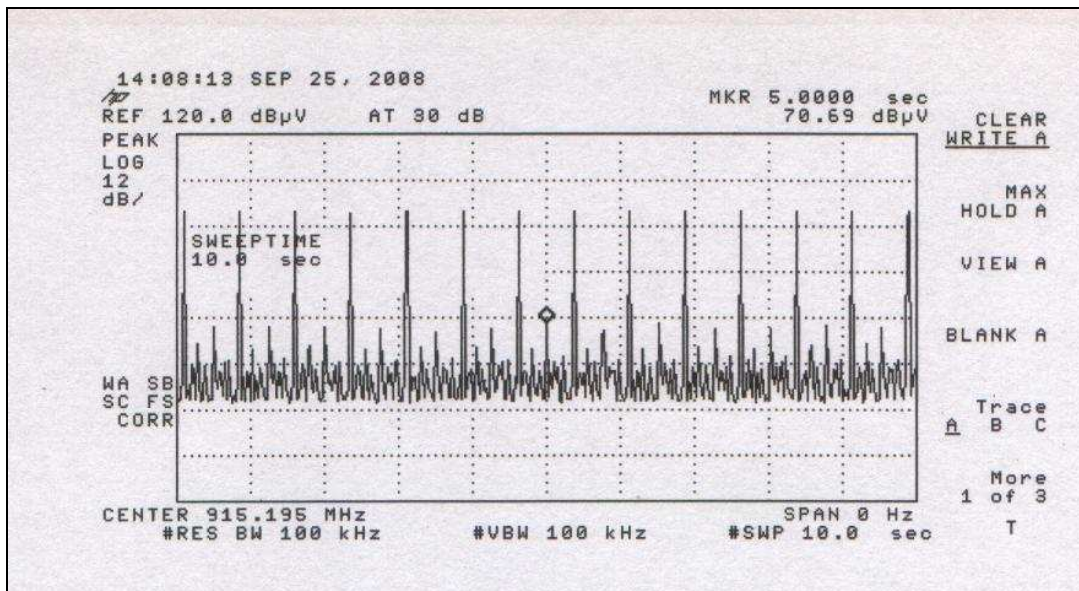
Date of test : September 25th, 2008
Test performed by : Laurent CHAPUS
Atmospheric pressure : 985mb
Relative humidity : 40%
Ambient temperature : 24°C

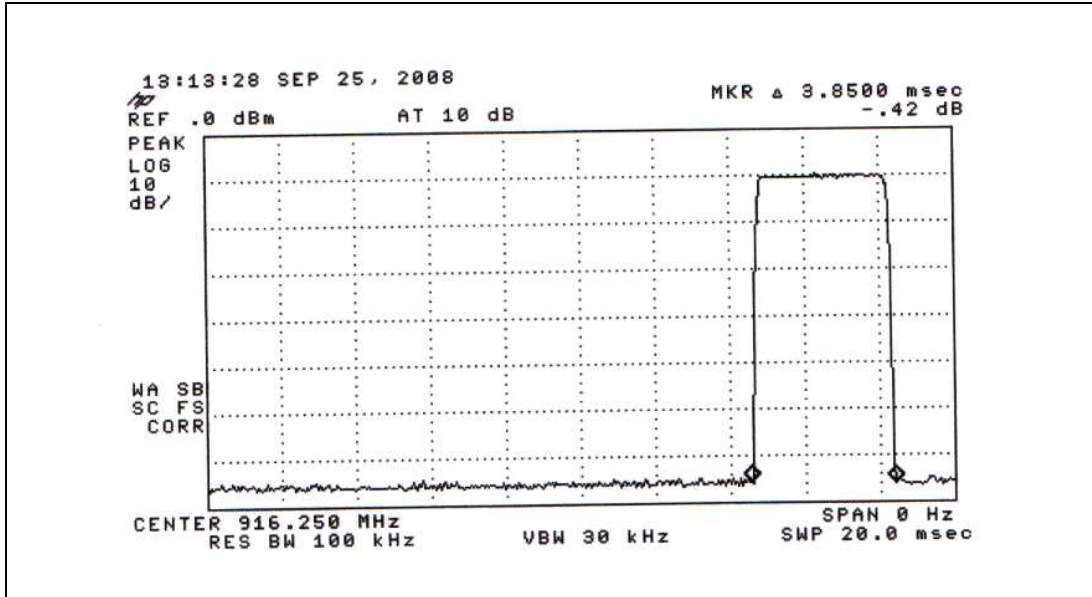
4.2. SET-UP

The EUT is placed on a table at 0.8m height in the semi anechoic chamber.
Power supply: fully charged battery.

4.3. MEASUREMENT DATA

Measured time of occupancy: 3.85ms on a channel appearing 14 times in a period of 10s → 53.9ms
Note: Each channel is able to transmit 4,75ms maximum every 750ms as declared by the manufacturer.
The maximum time of occupancy for each channel is thus **63.3ms** on a period of 10s. (Limit is 400ms)







5. OCCUPIED BANDWIDTH

5.1. CLIMATIC CONDITIONS

Date of test : November 18th, 2008
Test performed by : Laurent CHAPUS
Atmospheric pressure : 980mb
Relative humidity : 40%
Ambient temperature : 21°C

5.2. SET-UP

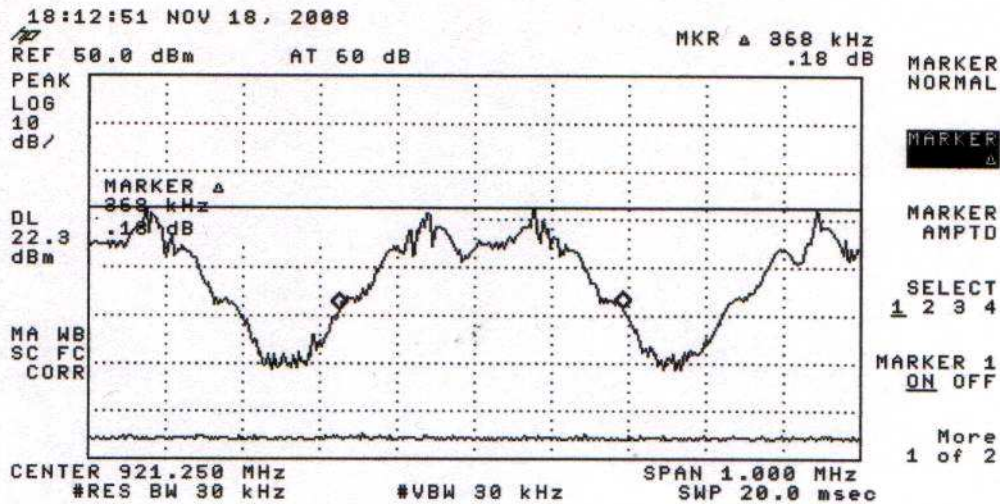
The tested equipment is set to transmit operation with frequency hopping enable.
Power supply: fully charged battery.

- **Method of measurement**

Conducted measurement (Added antenna connector installed on the equipment)

5.3. MEASUREMENT DATA

Measured 20dB bandwidth: **368kHz**



$$\text{Occupied bandwidth} \\ \underline{RBW = 30\text{kHz} / VBW = 30\text{kHz}}$$

Note: Markers are 20dB below the peak output power.



6. PEAK POWER OUTPUT (CONDUCTED)

6.1. CLIMATIC CONDITIONS

Date of test : November 18th, 2008
 Test performed by : Laurent CHAPUS
 Atmospheric pressure : 980mb
 Relative humidity : 40%
 Ambient temperature : 21°C

6.2. SET-UP

The tested equipment is set to transmit operation with frequency hopping enable.
 Power supply: fully charged battery.

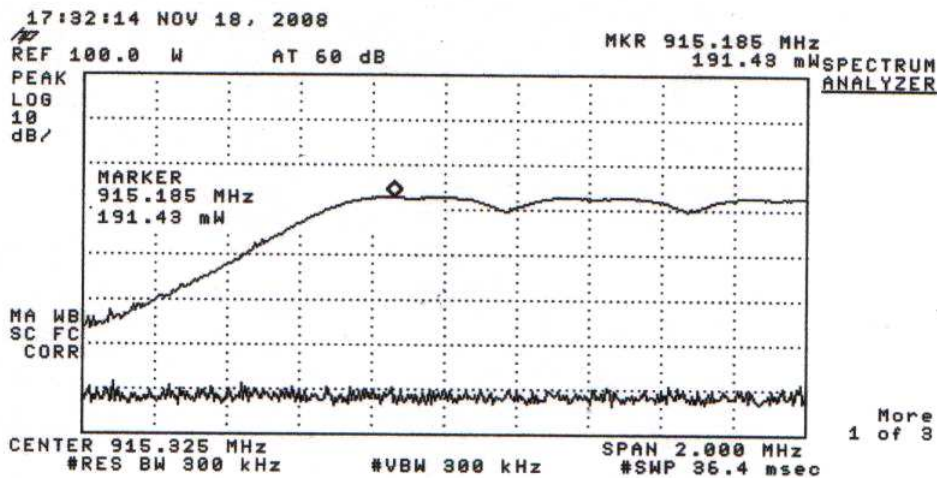
- **Method of measurement**
- Conducted measurement (Added antenna connector installed on the equipment)

6.3. MEASUREMENT DATA

Measurement result:
 Measurements are performed in normal test conditions.
 Spectrum analyser is set in peak detection, with max-hold mode.
 Integral antenna gain: 0dBi.

Low channel

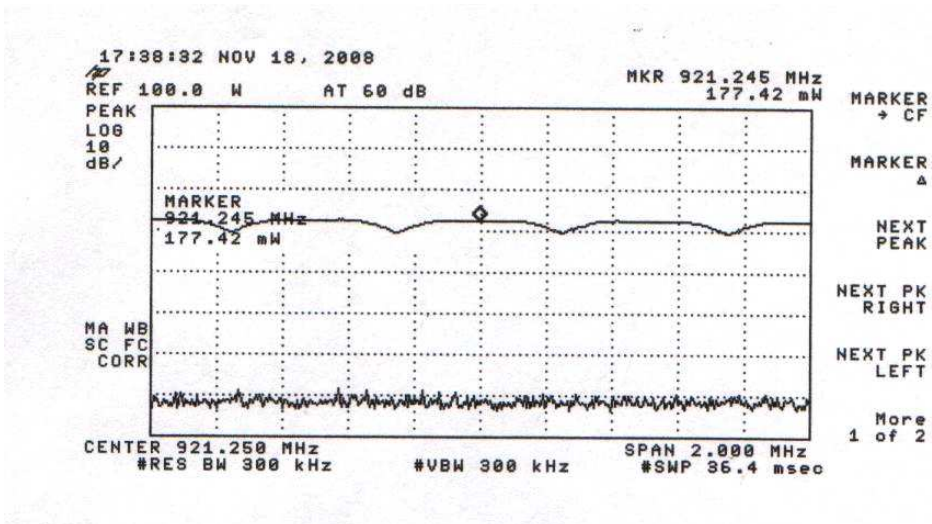
Frequency (MHz)	Measure (W)	Limit (W)
915.250	0.1914	0.250





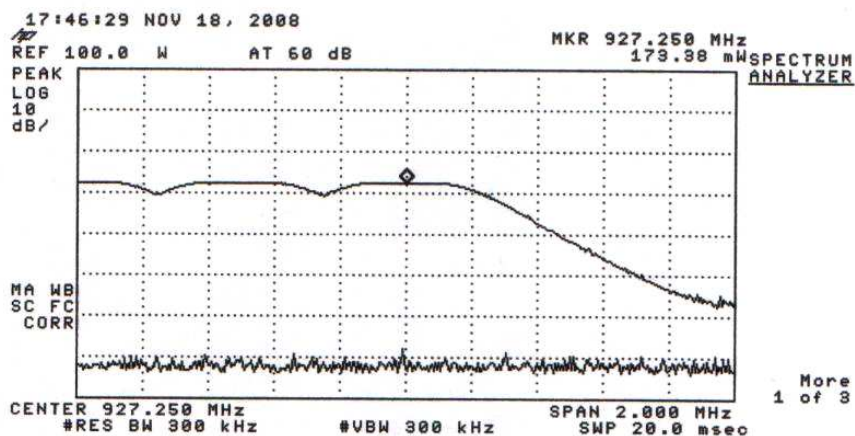
Mid channel

Frequency (MHz)	Measure (W)	Limit (W)
921.250	0.1774	0.250



High channel

Frequency (MHz)	Measure (W)	Limit (W)
927.250	0.1734	0.250





7. SPURIOUS EMISSIONS (RADIATED)

7.1. CLIMATIC CONDITIONS

Date of test : September 17th, 2008
Test performed by : Laurent CHAPUS
Atmospheric pressure : 990mb
Relative humidity : 45%
Ambient temperature : 24°C

7.2. TEST SETUP

The installation of EUT is identical for pre-characterization measurement in a 3 meters semi-anechoic chamber and for measures on a 3 meters Open site.
Power supply: Fully charged battery

Equipment configuration and running mode:

- EUT is ON;
- EUT was transmitting continuously on low, mid and high channels, with normal modulation for spurious emissions measurement
- EUT was transmitting continuous and hopping function was enable for bandedge measurement.

The product has been tested according to ANSI C63.4(2003), FCC part 15 subpart C. Radiated Emission were measured on an open area test site. A description of the facility is on file with the FCC.

The product has been tested at a distance of **3 meters** from the antenna.

Antenna height search was performed from 1m to 4m for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range.
Equipment was moved to position that maximized emission. (3 axis measurements)

• Method of measurement

Radiated emission. No antenna connector on the tested equipment.
Frequency band investigated is 9kHz to 10GHz.

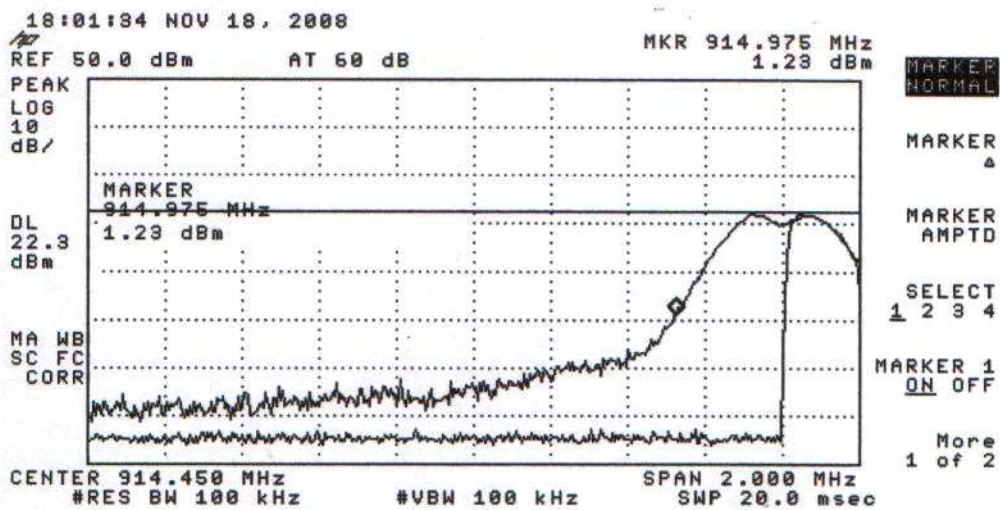
A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber.
The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization with appropriate measuring antennas. The EUT is being rotated on 360° during the measurement.
Final measurements are performed on the 3-meters Open Area test Site.



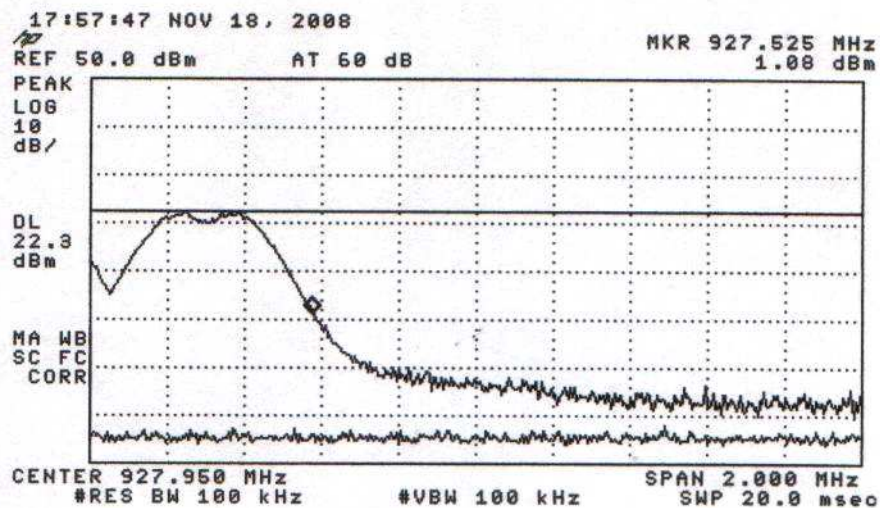
7.3. TEST SEQUENCE AND RESULTS

7.3.1. Band Edge plots

In any 100 kHz bandwidth outside the frequency band, the level shall be at least 20 dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on conducted measurement.



Low Band Edge (RBW = 100kHz / VBW = 100kHz)



High Band Edge (RBW = 100kHz / VBW = 100kHz)

Note: Markers are 20dB below the peak output power in the frequency band 902MHz-928MHz.



7.3.2. Measurement data: spurious emissions

EUT Configuration: Transmit at 915.25MHz

No	Frequency (MHz)	Measured field (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Peak / Average	Comments
1	915.250	122.1	-			Fundamental
2	1830.500	63.9	102.2	-38.3	PK	
3	2745.750	63.3	74.0	-10.7	PK	Restricted band
	2745.750	50.7	54.0	-3.3	AV	Restricted band
4	3661.000	63.1	74.0	-10.9	PK	Restricted band
	3661.000	52.0	54.0	-2.0	AV	Restricted band
5	4576.250	58.9	74.0	-15.1	PK	Restricted band (Noise floor)
	4576.250	38.9	54.0	-15.1	AV	Restricted band (Noise floor)
6	5491.500	60.6	74.0	-13.4	PK	Restricted band (Noise floor)
	5491.500	40.6	54.0	-13.4	AV	Restricted band (Noise floor)
7	6406.750	63.4	102.2	-38.8	PK	(Noise floor)
8	7322.000	65.6	74.0	-8.4	PK	Restricted band (Noise floor)
	7322.000	45.6	54.0	-8.4	AV	Restricted band (Noise floor)
9	8237.250	68.3	74.0	-5.7	PK	Restricted band (Noise floor)
	8237.250	48.3	54.0	-5.7	AV	Restricted band (Noise floor)
10	9152.500	68.8	74.0	-5.2	PK	Restricted band (Noise floor)
	9152.500	48.8	54.0	-5.2	AV	Restricted band (Noise floor)

EUT Configuration: Transmit at 921.25MHz

No	Frequency (MHz)	Measured field (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Peak / Average	Comments
1	921.250	123.2	-			Fundamental
2	1842.500	63.2	103.2	-39.0	PK	
3	2763.750	61.8	74.0	-12.2	PK	Restricted band
	2763.750	49.5	54.0	-4.5	AV	Restricted band
4	3685.000	64.5	74.0	-9.5	PK	Restricted band
	3685.000	52.6	54.0	-1.4	AV	Restricted band
5	4606.250	58.9	74.0	-15.1	PK	Restricted band (Noise floor)
	4606.250	38.9	54.0	-15.1	AV	Restricted band (Noise floor)
6	5527.500	60.6	74.0	-13.4	PK	Restricted band (Noise floor)
	5527.500	40.6	54.0	-13.4	AV	Restricted band (Noise floor)
7	6448.750	63.4	103.2	-38.8	PK	(Noise floor)
8	7370.000	65.6	74.0	-8.4	PK	Restricted band (Noise floor)
	7370.000	45.6	54.0	-8.4	AV	Restricted band (Noise floor)
9	8291.250	68.3	74.0	-5.7	PK	Restricted band (Noise floor)
	8291.250	48.3	54.0	-5.7	AV	Restricted band (Noise floor)
10	9212.500	68.8	103.2	-5.2	PK	(Noise floor)



EUT Configuration: Transmit at 927.25MHz

No	Frequency (MHz)	Measured field (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Peak / Average	Comments
1	927.250	122.9	-			Fundamental
2	1854.500	62.7	102.9	-39.5	PK	
3	2781.750	62.4	74.0	-11.6	PK	Restricted band
	2781.750	49.7	54.0	-4.3	AV	Restricted band
4	3709.000	64.8	74.0	-9.2	PK	Restricted band
	3709.000	52.8	54.0	-1.2	AV	Restricted band
5	4636.250	58.9	74.0	-15.1	PK	Restricted band (Noise floor)
	4636.250	38.9	54.0	-15.1	AV	Restricted band (Noise floor)
6	5563.500	60.6	74.0	-13.4	PK	Restricted band (Noise floor)
	5563.500	40.6	54.0	-13.4	AV	Restricted band (Noise floor)
7	6490.750	63.4	102.9	-38.8	PK	(Noise floor)
8	7418.000	65.6	74.0	-8.4	PK	Restricted band (Noise floor)
	7418.000	45.6	54.0	-8.4	AV	Restricted band (Noise floor)
9	8345.250	68.3	74.0	-5.7	PK	Restricted band (Noise floor)
	8345.250	48.3	54.0	-5.7	AV	Restricted band (Noise floor)
10	9272.500	68.8	102.9	-5.2	PK	(Noise floor)

Note 1: Peak measurement with 100 kHz RBW and VBW when frequency outside restricted bands.

Peak measurement with 1MHz RBW and VBW when frequency in restricted bands.

Note 2: Peak measurement with 1MHz RBW and 10Hz VBW when frequency in restricted bands.

7.4. FIELD STRENGTH CALCULATION

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

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

Where
 FS = Field Strength
 RA = Receiver Amplitude
 AF = Antenna Factor
 CF = Cable Factor
 AG = Amplifier Gain

Assume a receiver reading of 52.5dBµV is obtained. The antenna factor of 7.4 and a cable factor of 1.1 are added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dBµV/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m}$$

The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32\text{dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}.$$



8. TEST EQUIPMENT LIST

	N°LCIE	TYPE	COMPANY	REF	SN
RADIATED EMISSION MEASUREMENT (SEMI-ANECHOIC CHAMBER #1)					
	A7102024VO	Amplifier 8 GHz	HEROTEK	A1080304A	222033
	A7102019VO	Amplifier 9 KHz – 1300 MHz	HEWLETT PACKARD	8447F Opt 64	3113A06394
	A7105006VO	Amplifier 9 KHz – 1300 MHz	HEWLETT PACKARD	8447D Opt 64	
X	C2040145VO	Antenna Bi-Log XWing	TESEQ	CBL6144	25903
X	C2042027VO	Antenna horn	EMCO	3115	6382
	C2042028VO	Antenna horn 26GHz	SCHWARZBECK	BBHA 9170	BBHA9170232
X	C2040052VO	Antenna Loop	ELECTRO-METRICS	EM-6879	690234
X	F2000407	Antenna mast	MATURO Gmbh	AM 4.0	/037/1270308
X	A5329189VO	Cable EMI (s-Anechoic chamber)			
	A5329192VO	Cable Radiat EMI			
X	A5329198VO	Cable Radiat EMI			
X	A2642019VO	Measurement Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	100131
X	D3044016VO	Semi-Anechoic chamber #1	SIEPEL		
	A4060033VO	Spectrum Analyzer 9KHz – 12.8GHz	HEWLETT PACKARD	8596E	3409u00537
X	A4060018VO	Spectrum Analyzer 9KHz – 26.5GHz	HEWLETT PACKARD	8593E	3409u00537
	A4060016VO	Spectrum analyzer 9kHz –1.8GHz	HEWLETT PACKARD	8591E	3536A00384
	A4049060VO	Adapter quasi-peak	HEWLETT PACKARD	HP85650A	
	A4060028VO	Spectrum analyzer display	HEWLETT PACKARD	HP85662A	
	A4060029VO	Spectrum analyzer	HEWLETT PACKARD	HP8568B	
	A4060030VO	Pre-selector RF	HEWLETT PACKARD	HP85685A	
X	F2000406	Turntable chamber	MATURO Gmbh	TT 2.0 SI	/053/1270308
X	F2000408	Turntable controller chamber	MATURO Gmbh	Multiple Control Unit	MCU/060/1270308
X	A3169050VO	Radiated emission comb generator	BARDET		PR17B
RADIATED EMISSION MEASUREMENT (OPEN AREA TEST SITE)					
	A4049059VO	Adapter quasi-peak	HEWLETT PACKARD	HP85650A	2811A01134
	A7102024VO	Amplifier 8 GHz	HEROTEK	A1080304A	222033
X	A7102026VO	Amplifier 8-26GHz	ALDETEC	ALS01452	1
	A7102019VO	Amplifier 9 KHz – 1300 MHz	HEWLETT PACKARD	8447F Opt 64	3113A06394
X	C2040050VO	Antenna biconic	EMCO	3104C	9401-4636
	C2040051VO	Antenna Bi-log	CHASE	CBL6111A	1628
X	C2042027VO	Antenna horn	EMCO	3115	6382
	C2042028VO	Antenna horn 26GHz	SCHWARZBECK	BBHA 9170	BBHA9170232
X	C2040056VO	Antenna log-periodic	EMCO	3146	2178
	C2040052VO	Antenna Loop	ELECTRO-METRICS	EM-6879	690234
X	F2000288VO	Antenna mast	EMCO	1050	
	C2040057VO	Antenna monopole	AH SYSTEM	SAS-551	181
X	A5329048VO	Cable EMR OATS	SUCOFLEX	106G	553
X	A5329185VO	Cable OATS	UTIFLEX		
	A5329188VO	Cable OATS (Mast at 10m)	UTIFLEX		
X	A5329076VO	Cable OATS (Mast at 3m)	UTIFLEX		
	A5329196VO	Cable OATS (Turntable)	UTIFLEX		
	A2640011VO	Measurement receiver 9kHz–30MHz	ROHDE ET SCHWARZ	ESH3	972079/117
X	A2642019	Measurement Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	100131
	A4060027VO	Pre-selector RF	HEWLETT PACKARD	HP85685A	2837A00784
X	A3169050VO	Radiated emission comb generator	BARDET		PR17B
	A4060017VO	Spectrum analyzer	HEWLETT PACKARD	HP8568B	2732A04155
X	A4060018VO	Spectrum Analyzer 9KHz – 26.5GHz	HEWLETT PACKARD	8593E	3409u00537
	A4060016VO	Spectrum analyzer 9kHz –1.8GHz	HEWLETT PACKARD	8591E	3536A00384
	A4060019VO	Spectrum analyzer display	HEWLETT PACKARD	HP85662A	2816A16603
X	F2000403VO	Turntable	ETS LINDGREN	Model 2187	
X	F2000286VO	Turntable / Antenna mast controller	ETS LINDGREN	Model 2066	
PEAK OUTPUT POWER (CONDUCTED MEASUREMENT)					
	A7102024VO	Amplifier 8 GHz	HEROTEK	A1080304A	222033
	A7102019VO	Amplifier 9 KHz – 1300 MHz	HEWLETT PACKARD	8447F Opt 64	3113A06394
	A7105006VO	Amplifier 9 KHz – 1300 MHz	HEWLETT PACKARD	8447D Opt 64	
	A2642019VO	Measurement Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	100131
X	A4060033VO	Spectrum Analyzer 9KHz – 12.8GHz	HEWLETT PACKARD	8596E	3409u00537
	A4060018VO	Spectrum Analyzer 9KHz – 26.5GHz	HEWLETT PACKARD	8593E	3409u00537
	A4060016VO	Spectrum analyzer 9kHz –1.8GHz	HEWLETT PACKARD	8591E	3536A00384
	A4049060VO	Adapter quasi-peak	HEWLETT PACKARD	HP85650A	
	A4060028VO	Spectrum analyzer display	HEWLETT PACKARD	HP85662A	



	N° LCIE	TYPE	COMPANY	REF	SN
	A4060029VO	Spectrum analyzer	HEWLETT PACKARD	HP8568B	
	A4060030VO	Pre-selector RF	HEWLETT PACKARD	HP85685A	

**9. UNCERTAINTIES CHART**

Type de mesure / Kind of measurement	Incertitude élargie laboratoire / Wide uncertainty laboratory (k=2) ± x	Incertitude limite du CISPR / CISPR uncertainty limit ± y
Mesure des perturbations conduites en tension sur le réseau d'énergie <i>Measurement of conducted disturbances in voltage on the power port</i>	3.57 dB	3.6 dB
Mesure des perturbations conduites en tension sur le réseau de télécommunication <i>Measurement of conducted disturbances in voltage on the telecommunication port.</i>	3.28 dB	A l'étude / Under consid.
Mesure des perturbations discontinues conduites en tension <i>Measurement of discontinuous conducted disturbances in voltage</i>	3.47 dB	3.6 dB
Mesure des perturbations conduites en courant <i>Measurement of conducted disturbances in current</i>	2.90 dB	A l'étude / Under consid.
Mesure du champ électrique rayonné sur le site en espace libre de Moirans <i>Measurement of radiated electric field on the Moirans open area test site</i>	5.07 dB	5.2 dB