



TEST REPORT

According to CFR 47 Part 15

CSP_COM Wifi

N°027119-CC-1-b

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EQUIPMENT FCC ID : VPM-CSP-WF
FCC CERTIFICATION TEST REPORT

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Identification : 027119-CC-1-b

FCC registration # 90469

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Summary

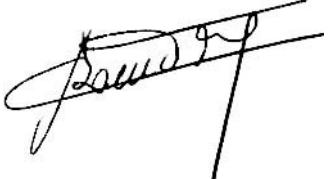
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OTHER FILES ASSOCIATED WITH THIS DOCUMENT:

- 027119 Exhibit 1 ID label VPM-CSP-WF
- 027119 Exhibit 2 External Photographs VPM-CSP-WF
- 027119 Exhibit 2b Internal Photographs VPM-CSP-WF
- 027119 Exhibit 4 user notice 86338_A VPM-CSP-WF
- 027119 Exhibit 5 Test set up photos VPM-CSP-WF
- 027119 Exhibit 6a Block diagram VPM-CSP-WF
- 027119 Exhibit 6b BOM motherboard VPM-CSP-WF
- 027119 Exhibit 6c SCM Motherboard VPM-CSP-WF
- 027119 Exhibit 6d SCM daughter board VPM-CSP-WF
- 027119 Exhibit 6e BOM daughter board VPM-CSP-WF
- 027119 Exhibit 7 functional description VPM-CSP-WF
- WIPORT-XX-Final FCC-060321F - Rev. A1
- 027119 Exhibit 8 cover letter VPM-CSP-WF



1 Reference and record of revisions of the test report:

Test report number :	Revision :	Number of pages	Modification reasons :
027119-CC-1-a	a	18	Creation, June 20, 2008
027119-CC-1-b	b	19	Addition of calibration due date, AC voltage, and some explanations for spurious.
Redactor : JL JAMET & O.ROY		Date of writing : 25 July 2008	
Technical control: O. ROY 		Quality Control: P. BOURVON 	

2 Interpretation and remarks:

2.1 RESULTS:

This equipment complies with the rules of the FCC section 15.247 and related sections concerning its radio functions. The equipment uses a certified Wifi module FCC ID: R68WIPORTG and only emitted power and spurious emissions are done up to 25GHz in the used mode: 802.11g.



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3 GENERAL INFORMATION:

3.1 APPLICANT:

CANBERRA
ZI de Vauzelle
37600 LOCHES

3.2 MANUFACTURER:

CANBERRA
ZI de Vauzelle
37600 LOCHES

3.3 TEST DATE:

June 11 to 18, 2007 and June 19 and 20, 25 2008.

3.4 TEST SITE:

GYL Technologies
Parc d'activités de Lanserre
49610 Juigné sur Loire – France
FCC registration Number : 90469



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4 INTRODUCTION:

The following test report for a data radio interface for radioactivity measurement probe (2.4 GHz radio link) is written in accordance with Part 15 of the Federal Communications Commissions. The Equipment Under Test (EUT) was a CSP_COM Wifi with sensor SG-2R. The test results reported in this document relate only to the item that was tested.

The equipment uses a certified Wifi Module but with a different antenna and thus only spurious emissions and power measurements need to be redo. The CSP-COM Wifi is internally programmed to work only with 802.11g mode.

All measurements contained in this Application were conducted in accordance with ANSI C63.4 Methods of Measurement of Radio Noise Emissions of 2001. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Some accessories are used to increase sensitivity and prevent overloading of the measuring instrument. These are explained in this report. Calibration checks are performed regularly on the instruments, and all accessories including the high pass filter, preamplifier and cables.

All radiated and conducted emissions measurements were performed manually at GYL TECHNOLOGIES. The radiated emissions measurements required by the rules were performed on the three to ten meters, open field, test site maintained by GYL Technologies Parc d'activités de Lanserre, 49610 Juigné sur Loire , France. Complete description and site attenuation measurement data have been placed on file with the Federal Communications Commission.

The power line conducted emission measurements were performed in a shielded enclosure also located at the Parc d'activités de Lanserre, 49610 Juigné sur Loire, France facility

5 MEASUREMENT EQUIPMENT LIST:

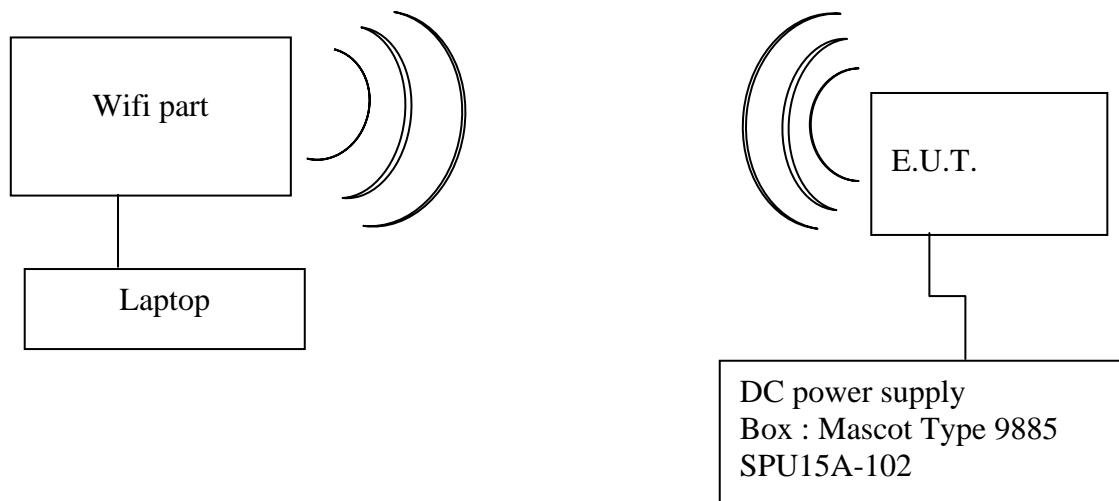
PART TYPE	MANUFACTURER	MODEL	GYL NUMBER	CALIBRATION DATE	CALIBRATION DUE DATE
RECEIVERS					
Receiver	Rohde & Schwarz	ESI 7	M02020	May-07, May 08	May 09
Spectrum analyzer	Rohde & Schwarz	FSEM 30	M02021	May-07, May 08	May 09
Filter 150 kHz	Rohde & Schwarz	EZ25	M02040	July-07, May 08	May 09
ARTIFICIAL MAINS NETWORKS					
LISN (50µH / 5/50Ω)	Rohde & Schwarz	ESH3-Z5	M02027	Jan-07,	Jan-09
ANTENNAS					
Bilog (30-2000MHz)	CHASE	CBL-6112	M02031	June-07, June-08	June-09
Bilog (30-2000MHz)	CHASE	CBL-6112	M02032	June-07, June-08	June-09
Horn antenna	EMCO	3160-09	M04002	None	None
Horn antenna	EMCO	3115	M02045	March 07, March 08	March-09



6 CONFIGURATION OF TESTED SYSTEM:

A Wi-Fi transmission is made between the EUT and the laptop which is connected to a Wi-Fi part. The measurement is done by the probe and displayed on the screen of the laptop.

Mode of control of the equipment under test and criteria are under the responsibility of Canberra For communications and Canberra for probe measurement.



7 EXERCISING TEST CONDITIONS:

7.1 Measurements according to §15.207 and 15.209 of FCC CFR 47

Measurements are done with the power supply charging the EUT battery and with a communication between the laptop/WiFi part and the EUT for conductive on power supply and for radiated measurement.

Power supply box is powered with 120V 60Hz.



8 CONFORMANCE STATEMENT:

8.1 STANDARDS REFERENCED FOR THIS REPORT:

PART 2: 2004	Frequency allocations and Radio Treaty Matters General Rules and Regulations
PART 15: 2004	Radio frequency devices
ANSI C63.4-2001	Standard format measurements/technical report personal computer and peripherals

8.2 JUSTIFICATION:

As mentioned in paragraph 5 of this report, the equipment is information technology equipment. It can be installed in residential commercial or light industry areas the following sub clause of the standard mentioned above are

- Part 15.207 and 15.209 (subpart C) for respectively conducted and radiated emission for intentional radiator.
- Part 15.247 for intentional radiator in ISM band 2.400-2.4835 GHz



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9 TEST ACCORDING TO CFR 47 Part 15

Tests performed by Jean-Luc JAMET & Olivier ROY at GYL Technologies laboratories from 11 to 18 June of 2007.

9.1 REFERENCE DOCUMENTATION:

FCC part 15 (Sub part B) §15.207, 15.209 and 15.247 of 2005

9.2 POWER LINE CONDUCTED EMISSIONS MEASUREMENTS (15.207):

The power line conducted emission measurements were performed in a semi anechoic chamber. The EUT was assembled on a non conductive 80 centimeters high wooden table. Power was fed to the EUT through a 50 ohm / 50 micro-Henry Line Impedance Stabilization Network (EUT LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Rohde and Schwartz 150 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 150 kHz. Conducted emission levels were measured on each current-carrying line with the receiver operating in the CISPR quasi-peak mode (or average mode if applicable)

9.3 RESULTS:

The conducted emissions initial measurement consists of a prescan (tester in receiver mode), in order to determine the maximum quasi peak and average values.

- If the conducted emissions have limits showing a margin lower than 5dB, data collection measurement is performed on the six (6) highest frequencies to determine the compliance of the EUT.
- If the conducted emissions have limits showing a margin greater than 5dB, data collection measurement is not performed and the curves are given as evidence of compliance.

The following table lists worst-case conducted emission data. Specifically: emission frequency, measurement level (including cable loss and transducer factors) in quasi-peak and average mode and margin.

The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and LIVE SIDE, herein referred to as Neutral, and Live respectively.

ESI 7 EMI TEST RECEIVER IN RECEIVER MODE	
Peak measurement time	5 ms
step size	4KHz
Preamplifier	OFF
Preselector	ON
Resolution, Band With	9 kHz
Final Quasi Peak measurement time	1 s minimum
Final average measurement time	1 sec minimum

All readings are quasi-peak unless stated otherwise.



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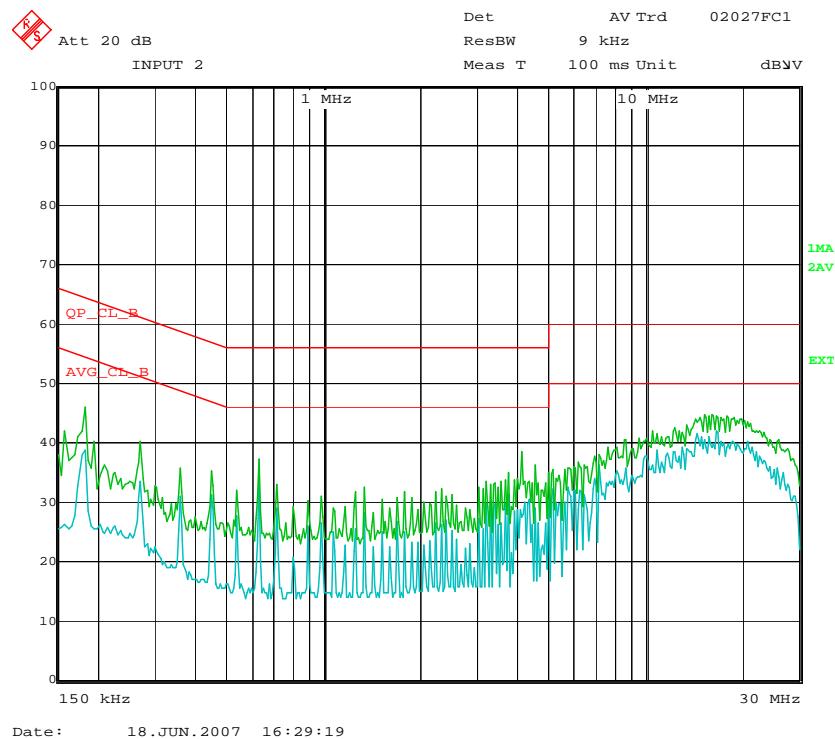
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9.3.1 Power supply

Legend: Blue curve represents average values
Green curve represents the peak values

9.3.1.1 Neutral:

Average Values			
Frequency	Average Measure	Average Limit	Margin
MHz	dB μ V	dB μ V	dB
14,406	38,1	50,0	11,9
14,494	38,9	50,0	11,1
14,582	38,6	50,0	11,4
14,942	39,8	50,0	10,2
15,298	38,7	50,0	11,3
15,746	39,5	50,0	10,5
16,642	39,3	50,0	10,7





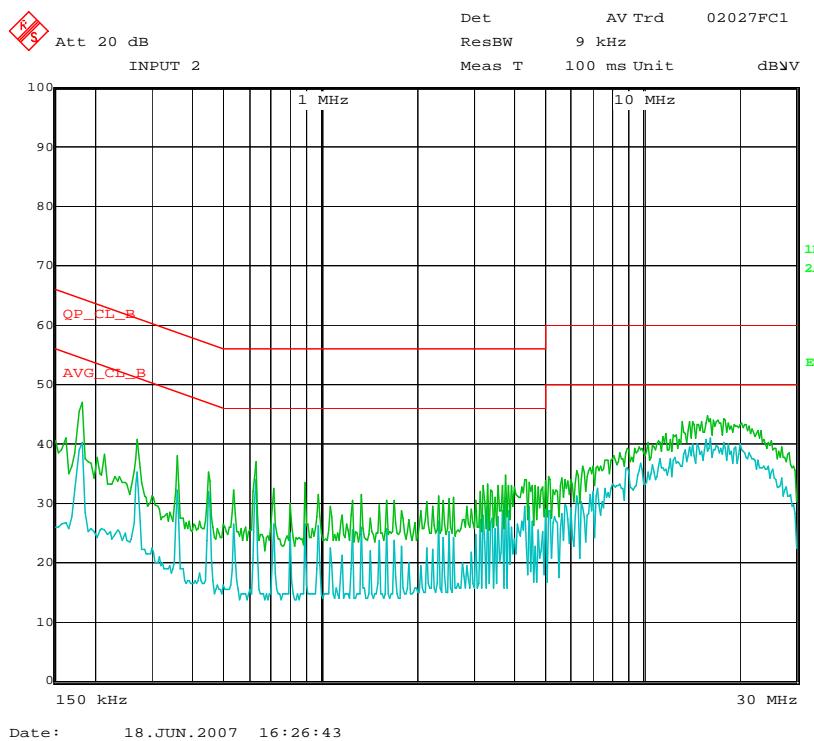
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9.3.1.2 LIVE:

Average Values			
Frequency	Average Measure	Average Limit	Margin
MHz	dBμV	dBμV	dB
13,598	37,3	50,0	12,7
14,046	37,5	50,0	12,5
14,402	37,7	50,0	12,3
14,762	38,4	50,0	11,6
14,850	38,7	50,0	11,3
14,942	37,4	50,0	12,6
15,030	38,6	50,0	11,4



9.4 INTERPRETATION AND REMARKS:

The equipment complies with the §15.207 requirements.



9.5 Intentional radiator operation within the band 2400 – 2483.5 MHz §15.247.

For channel description see Test report WIPORT-XX-Final FCC-060321F - Rev. A1

9.5.1 Maximum peak output power

The maximum peak conducted power limit is 1W.

No antenna connector is provided for the equipment; measurement is done at 3 m on an open area test site.

A variation of +/-15% of the 120V input voltage as strictly no influence to the output power.

Peak power is computed with

$$P(W) = (E(V/m) \times D(m))^2 / (30 \times G) \text{ with } G = 1 \text{ (isotropic antenna)}$$

Results	Peak* dB μ V/m At 3m	Peak corrected dB μ V/m At 3m	Peak Power (mW)
2412MHz	100.6	105.0	9.5
2437MHz	101.6	106.0	11.9
2462MHz	102.2	106.6	13.7

*Peak measurements are done with a RBW of 10MHz lower than the 20dB BW that is 16MHz. The worst case if the RBW is equal to the 20dB BW is an increment of $20\log(16.5/10) = 4.4$ dB.

Measurements in 100kHz and 1MHz RBW to compute the level at band edge using marker-delta method.

Results	Peak detector dB μ V/m At 3m (RBW=VBW=100kHz)	Peak detector dB μ V/m At 3m (RBW 1MHz VBW = 10Hz)	Peak detector dB μ V/m At 3m (RBW 1MHz VBW = 1MHz)
2412MHz	77.4	76.1	89.5
2437MHz	78.5	77.1	90.5
2462MHz	79.0	77.5	90.9

9.5.2 Antenna gain (15.247 § (b)(4)

The radiated element has a maximum gain of 2.3 dBi. (See Exhibit 7 functional description).



9.5.3 Spectral density (15.247 § (d))

The maximum spectral density of conducted power limit is 8dBm in 3kHz band.

No antenna connector is provided for the equipment; measurement is done at 3 m on an open area test site.

Peak power is computed with

$$P(W) = (E(V/m) \times D (m))^2 / (30 \times G) \text{ with } G = 1 \text{ (isotropic antenna)}$$

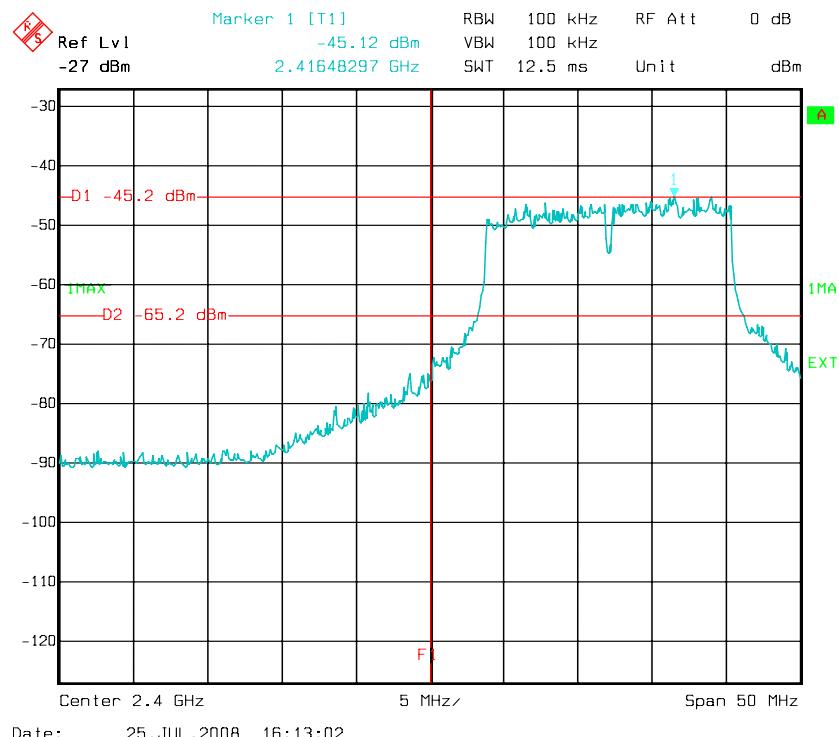
Results	density dB μ V/m At 3m	Power density (dBm)
2412MHz	63.3	-32
2437MHz	64.2	-31
2462MHz	64.9	-30

9.5.4 Spurious emissions (15.247 § (d))

In any 100 kHz bandwidth outside the frequency band, the level is at least 20 dB below that in the 100 kHz bandwidth within the band contains the highest level of the desired power, based on either an RF conducted or a radiated measurement (79 dB μ V/m at 3 m).

9.5.4.1 Band edge measurement:

For lowest channel





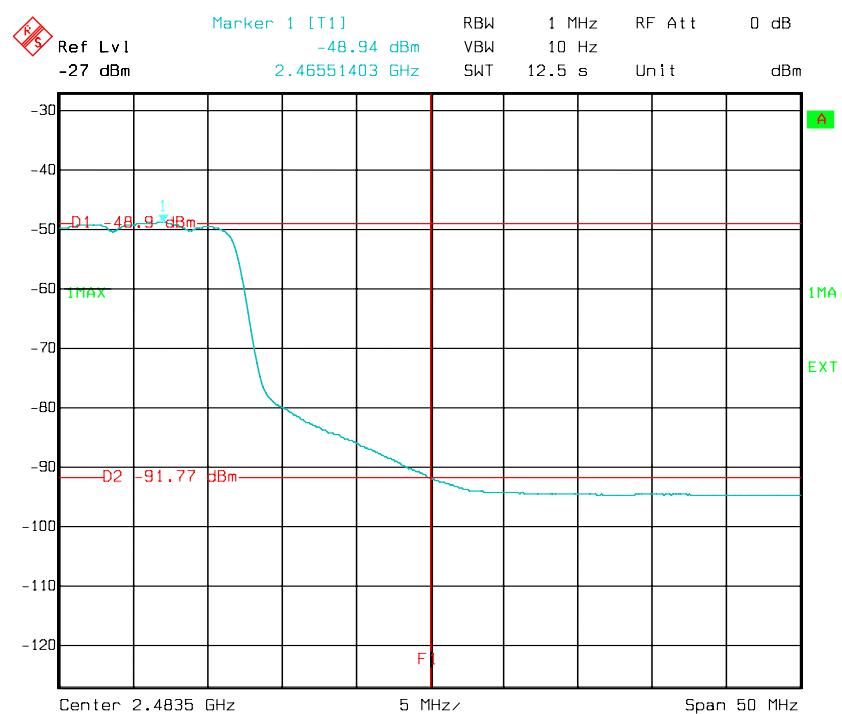
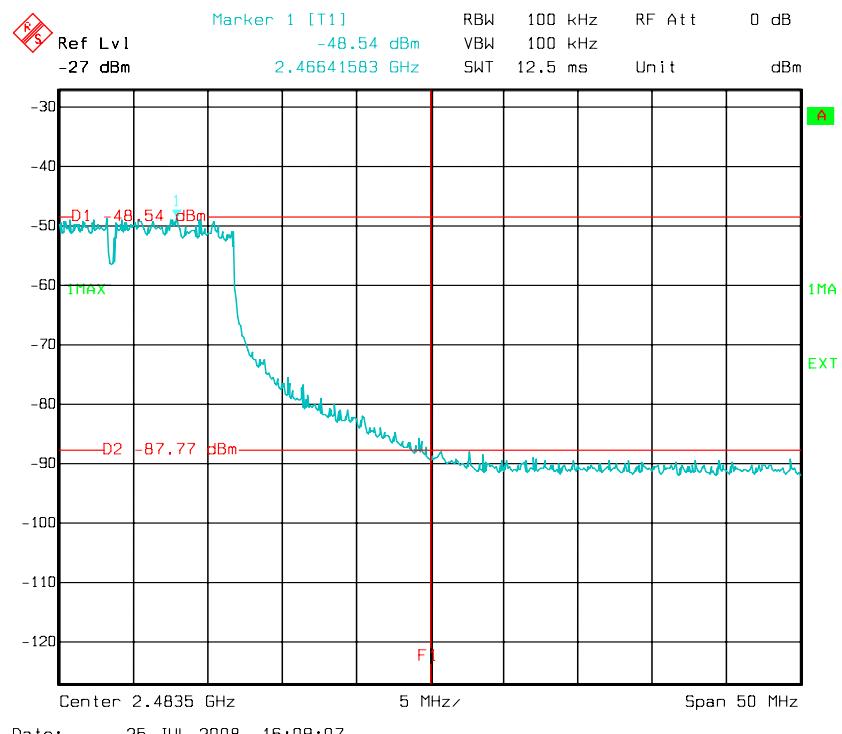
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For highest channel



The delta is -48dB thus with results of 9.5.1,

Peak limit is 74dB μ V/m. Measurement with delta gives 42.9 dB μ V/m (31.1 dB margin)
Average limit is 54dB μ V/m. Measurement with delta gives 29.5 dB μ V/m (24.5 dB margin)



9.5.4.2 RADIATED EMISSIONS MEASUREMENTS (+15.209 in restricted bands):

Measurements below 1GHz

Before final measurements of radiated emissions were made on the open-field three/ten meter range; the EUT was pre-scanned in the semi anechoic at one meter distance. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to insure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a conductive turntable on isolated support, table, 0.8 meter above the ground plane. At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations. The spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode for measurements in restricted bands. No video filter less than 10 times the resolution bandwidth was used. The range of the frequency spectrum to be investigated is specified in FCC Part 15. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Summary of settings

ESI 7 EMI TEST RECEIVER IN RECEIVER MODE	
Peak measurement time	5 ms
step size	40 kHz
Preamplifier	ON
Preselector	ON
Resolution, Band With	120 kHz
Final Quasi Peak measurement time	1 s minimum
Final average measurement time	1 s minimum

All readings are quasi-peak unless stated otherwise.

Spurious emissions measurement from 1GHz to 25GHz:

A pre-scan measurement is done very close to the product (less than 10cm). Then measurements are performed at 1 m with 100kHz RBW and a max peak detector for emissions outside restricted bands and with 1MHz RBW and a max peak detector and then a video averaging (10Hz) for average measurement.

Spurious emissions are measured with normal emission and reception are also measured with a permanent emission on low channel, middle channel and high channel.

Average limit in restricted bands §15.205 at 3 m is 54 dB μ V/m (with a peak limit at 74 dB μ V/m). Otherwise, the peak limit of 20 dB under the emission level (59 dB μ V/m at 3m) is not applicable because below the peak limit of 74 dB μ V/m.

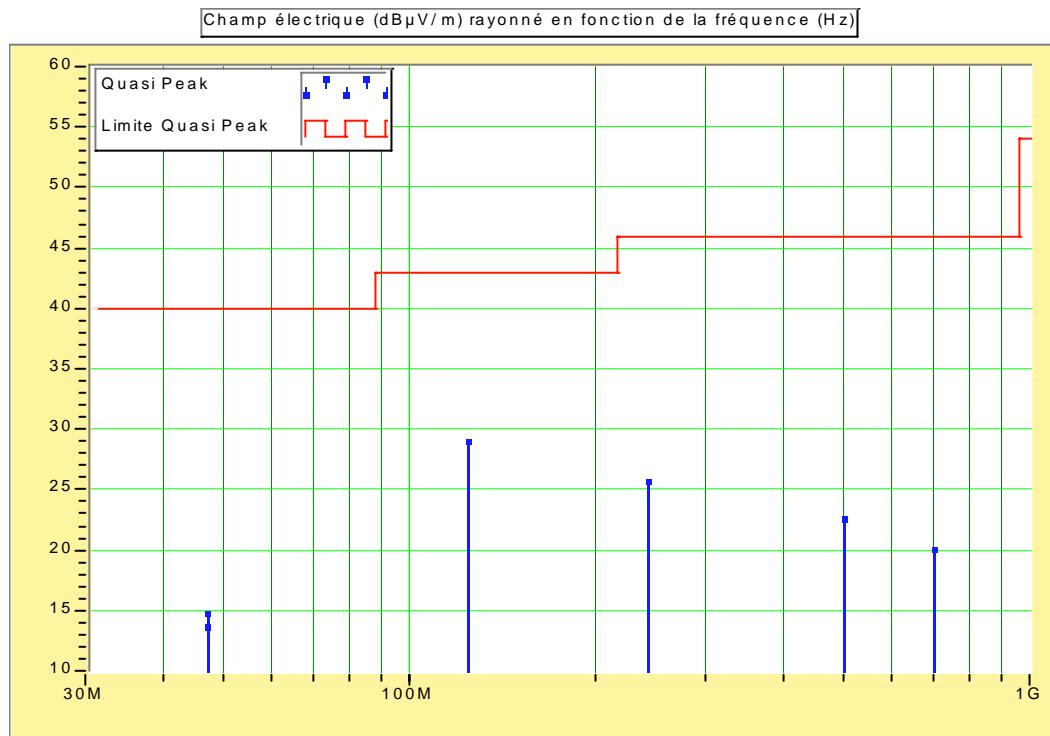


9.5.4.3 RESULTS:

The following data table lists the most significant emission frequencies, measured level, correction factor (includes cable and antenna corrections), corrected reading and the limit. The highest peaks are measured in quasi-peak detection mode at 3 meters distance.

3 m open area test site final measurements results

Frequency (MHz)	Peak (dB μ V/m)	Quasi peak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Polar.	Height (cm)	Angle (°)	Factor Corr. (dB)
47,112	18,11	13,58	40.0	26,42	V	205	0	10,87
47,195	18,75	14,87	40.0	25,13	V	164	0	10,84
124,175	33,26	29,04	43.5	10,46	V	99	0	14,54
242,599	33,00	25,80	46.0	21,20	H	155	0	16,48
499,988	28,86	22,66	46.0	24,34	V	143	0	22,44
700,041	24,81	20,17	46.0	26,83	H	233	0	24,74





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Results over 1 GHz

No spurious outside harmonics and band edges.

Max spurious for channel 2412 MHz

Freq. (MHz)	H.	Peak(1) (dB μ V/m) At 1m	Peak (1) corrected for 3 m distance (dB μ V/m)	Peak Limit (dB μ V/m)	Avg (2) (dB μ V/m) At 1 m	Avg (2) corrected for 3 m distance (dB μ V/m)	Min. Margin (dB)
4824	2	58.5	48.5	74.0	43.9	33.9	20.1
7236	3	52.5	42.5	74.0			31.5
9648	4	NF		74.0			
12060	5	NF		74.0			
14472	6	NF		74.0			
16884	7	NF		74.0			
19296	8	NF		74.0			
21708	9	NF		74.0			
24120	10	NF		74.0			

(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.

(2) Average measurement with peak detector, 1MHz RBW and 10HzVBW when frequency in restricted bands.

* NF means Noise Floor

Max spurious for channel 2437 MHz

Freq. (MHz)	H.	Peak(1) (dB μ V/m) At 1m	Peak (1) corrected for 3 m distance (dB μ V/m)	Peak Limit (dB μ V/m)	Avg (2) (dB μ V/m) At 1 m	Avg (2) corrected for 3 m distance (dB μ V/m)	Avg Limit (dB μ V/m)	Min. Margin (dB)
4874	2	59.8	49.8	74.0	46.6	36.6	54.0	17.4
7311	3	53.5	43.5	74.0			54.0	30.5
9748	4	NF		74.0				
12185	5	NF		74.0			54.0	
14622	6	NF		74.0				
17059	7	NF		74.0				
19496	8	NF		74.0			54.0	
21933	9	NF		74.0				
24370	10	NF		74.0				

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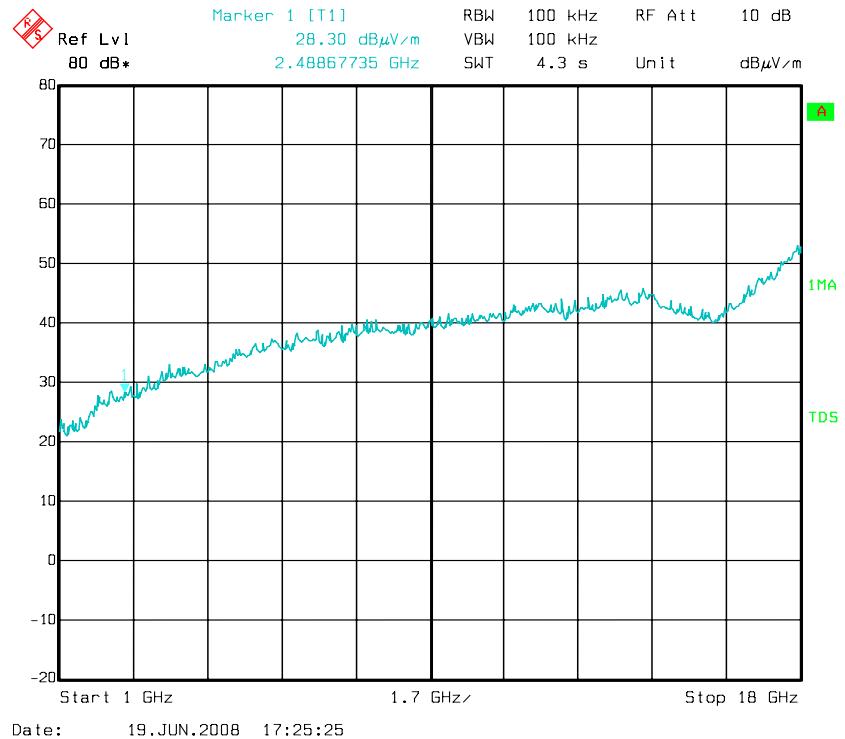
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Max spurious for channel 2462 MHz

Freq. (MHz)	H.	Peak(1) (dB μ V/m) At 1m	Peak (1) corrected for 3 m distance (dB μ V/m)	Peak Limit (dB μ V/m)	Avg (2) (dB μ V/m) At 1 m	Avg (2) corrected for 3 m distance (dB μ V/m)	Avg Limit (dB μ V/m)	Min. Margin (dB)
4924	2	57.6	47.6	74.0	43.2	33.2	54.0	20.8
7386	3	52.3	42.3	74.0			54.0	31.7
9848	4	NF		74.0				
12310	5	NF		74.0			54.0	
14772	6	NF		74.0				
17234	7	NF		74.0				
19696	8	NF		74.0			54.0	
22158	9	NF		74.0			54.0	
24620	10	NF		74.0				

Noise Floor from 1GHz to 18GHz



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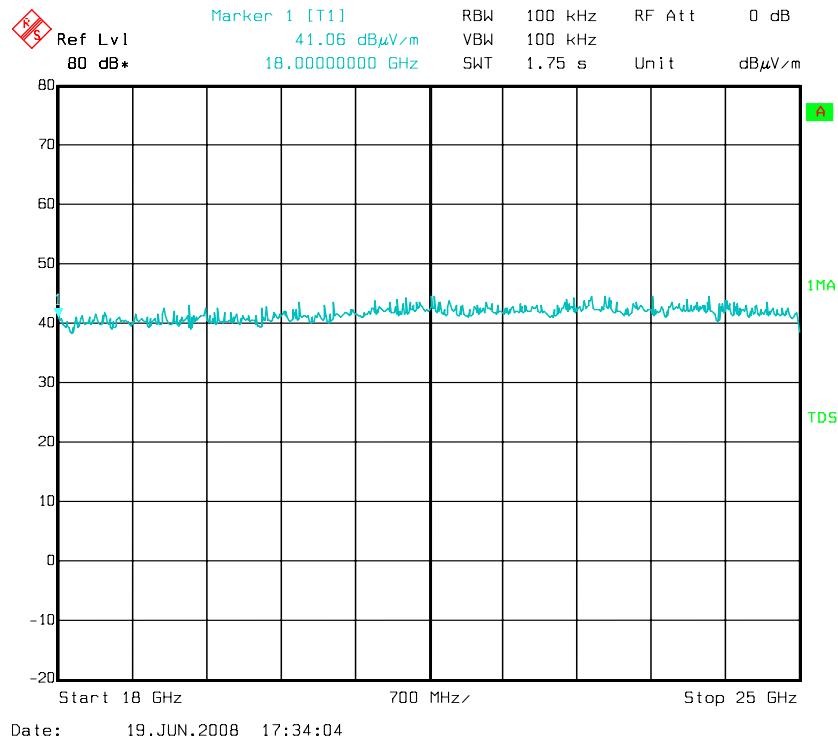
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Noise Floor from 18GHz to 25GHz



9.6 INTERPRETATION AND REMARKS:

The equipment complies with the §15.209 requirements.



9.6.1 Exposition of public to radio frequency energy.

In the frequency range of this product, the limit of S is 1mW/cm².

With the formula given in OET 65 and the measurement done for the power and antenna gain, we can compute that the minimum distance between a body and the antenna is:

$$\begin{aligned} R &= \text{square root (EIRP/(4*Pi*S))} \\ R &= \text{square root (0.0137/ (4*Pi*1))} \\ R &= 3.3 \text{ cm} \end{aligned}$$

The normal use of this product is with the antenna at a distance greater than 20cm.

In accordance with bulletin OET 65 C, there is no need to make SAR evaluation for such device.

9.7 Antenna requirements

Not applicable because the antenna is not replaceable without modifying the product.