



TEST REPORT

According to CFR 47 Part 15

CSP_COM Bluetooth

N° 027118-CC-1-b

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FCC CERTIFICATION TEST REPORT

EQUIPMENT FCC ID : VPM-CSP-BT

The 21 pages of this report are not sharable

Identification : 027118-CC-1-b

FCC registration # 90469

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This report concerns :

Original grant ☒

Class II change ☐

Equipment tested : **CSP_COM Bluetooth**

Equipment FCC ID : **VPM-CSP-BT**

Designed by : **CANBERRA**
ZI de Vauzelle
37600 LOCHES

Manufactured by : **CANBERRA**
ZI de Vauzelle
37600 LOCHES

Deferred grant requested per 47 CFR 0.457 (d)(1)(ii)

YES ☐

NO ☒

if yes, defer until :

Company Named agrees to notify the Commission by :

of the intended date of announcement of the product so that the grant can be issued on the date

Transition rules requested per 15.37?

YES ☐

NO ☒

If no, assumed Part 15, Subpart B for intentional or
unintentional radiator

The new 47 CFR [10-1-96 edition] provision


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Summary


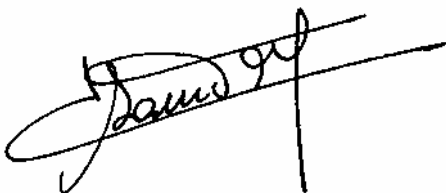
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OTHER ASSOCIATED FILES :

027118 Exhibit 1 ID label VPM-CSP-BT
027118 Exhibit 2 External Photo VPM-CSP-BT
027118 Exhibit 2b Internal Photo VPM-CSP-BT
027118 Exhibit 4 user notice VPM-CSP-BT
027118 Exhibit 5 Test set up photos VPM-CSP-BT
027118 Exhibit 6a Block diagram VPM-CSP-BT
027118 Exhibit 6b BOM daughter board VPM-CSP-BT
027118 Exhibit 6c BOM main board VPM-CSP-BT
027118 Exhibit 6d SCM daughter board VPM-CSP-BT
027118 Exhibit 6e SCM main board VPM-CSP-BT
027118 Exhibit 6e RF BOM VPM-CSP-BT
027118 Exhibit 6f 7044-E_DOS_0701 VPM-CSP-BT
027118 Exhibit 6h BT module data sheet VPM-CSP-BT
027118 Exhibit 7 System description VPM-CSP-BT

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1 Reference and record of revisions of the test report:

Test report number :	Revision :	Number of pages	Modification reasons :
027118-CC-1-a	a	20	Creation, April 02, 2008
027118-CC-1-b	b	21	New timing measurements
Redactor : JL JAMET and O. ROY		Date of writing : July 25, 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.

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3 GENERAL INFORMATION:

3.1 APPLICANT:

CANBERRA
ZI de Vauzelle
37600 LOCHES

3.2 TEST DATE:

June 11 to 18, 2007, July 25 2008
Test performed on the same device without modification

3.3 TEST SITE:

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

4 INTRODUCTION:

The following test report for 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 CSP com Bluetooth with sensor SAB 100. The test results reported in this document relate only to the item that was tested.

The Bluetooth module uses only GFSK +/-160kHz: Bluetooth basic data rate. The equipment can't be programmed with another modulation 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

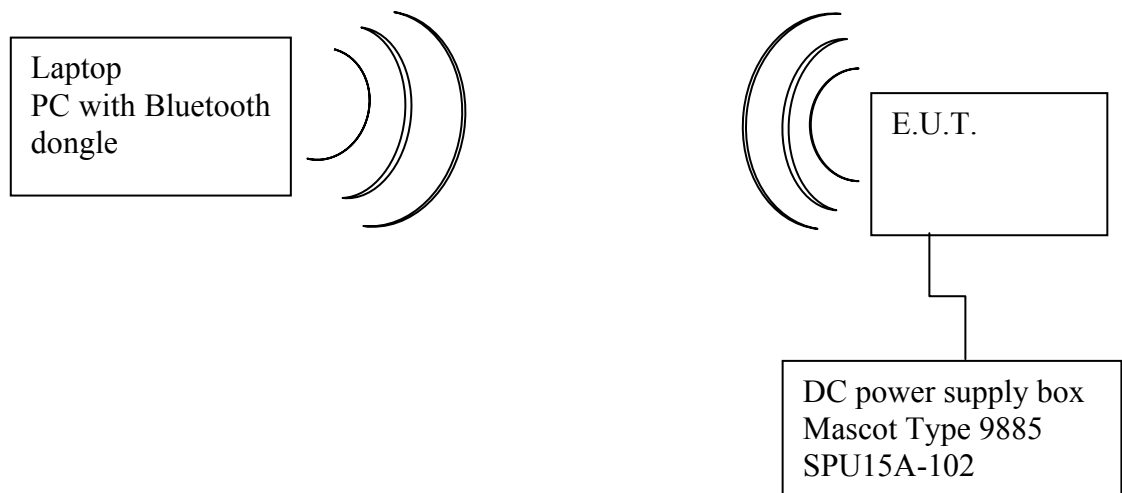
5 MEASUREMENT EQUIPMENT LIST:

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:

The EUT is with a nuclear measurement probe named SAB 100

Bluetooth transmission between EUT and a laptop equipped with a Bluetooth dongle. The measurement done by the probe is displayed on the screen of the laptop.



7 EXERCISING TEST CONDITIONS:

On the CSP com, we press the on/off key, when the blue LED blinks the product is ready.

Measurements are done in hopping mode in all channels with normal modulation.
 For measurements that need to be done in one channel, the channel used was activated with the transmission with normal modulation.

Power supply box is powered with 120V 60Hz.

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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:

The equipment is a radio data transmission 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

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 and July 2008.

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).

The power supply box Mascot SPU15A-102 was powered at 120V 60Hz during the test.

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

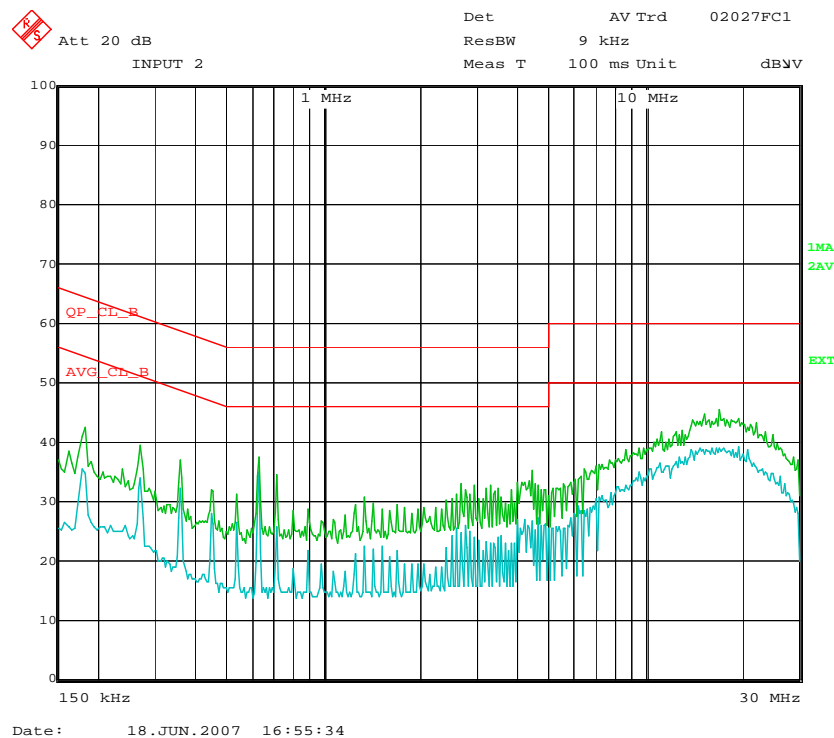
All readings are quasi-peak unless stated otherwise.

9.3.1 Power supply

9.3.1.1 Neutral:

Since no peak emissions were detected above average or quasi-peak limits data collection measurement were not performed on the EUT.

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





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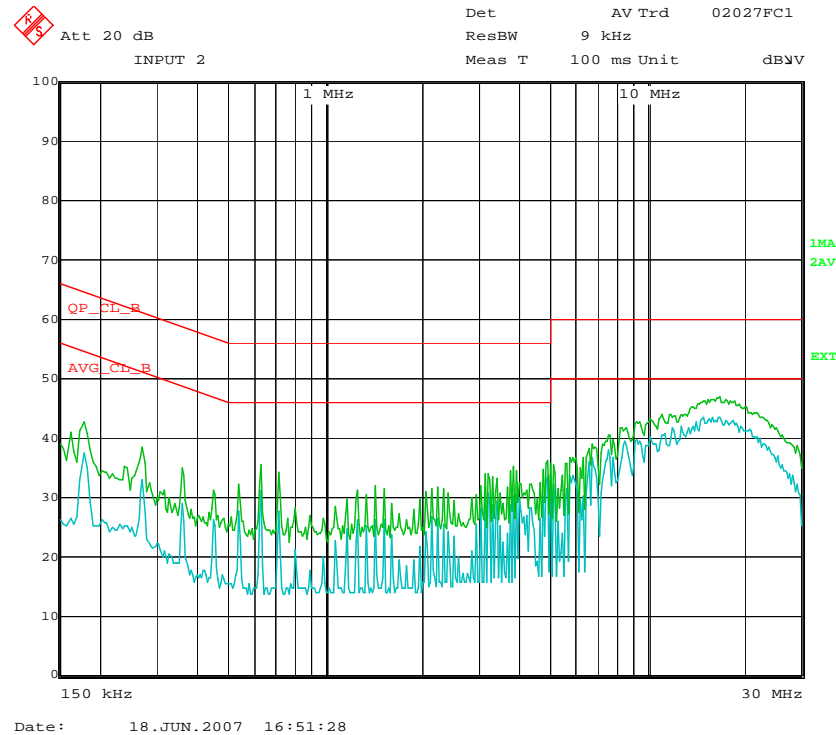
Identification : 027118-CC-1-b

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9.3.1.2 LIVE:

Since no peak emissions were detected above average or quasi-peak limits data collection measurement were not performed on the EUT.



9.4 INTERPRETATION AND REMARKS:

The equipment complies with the §15.207 requirements

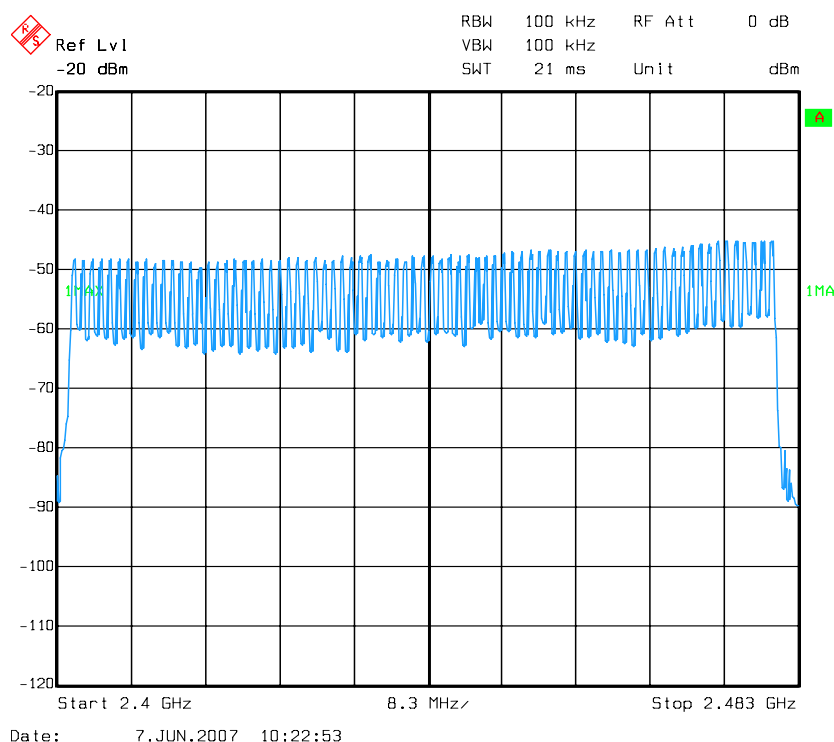
9.5 Intentional radiator operation within the band 2400 – 2483.5 MHz §15.247:

The system uses **79 channels**.

For details of frequency hopping technology used see Exhibit 7 description.

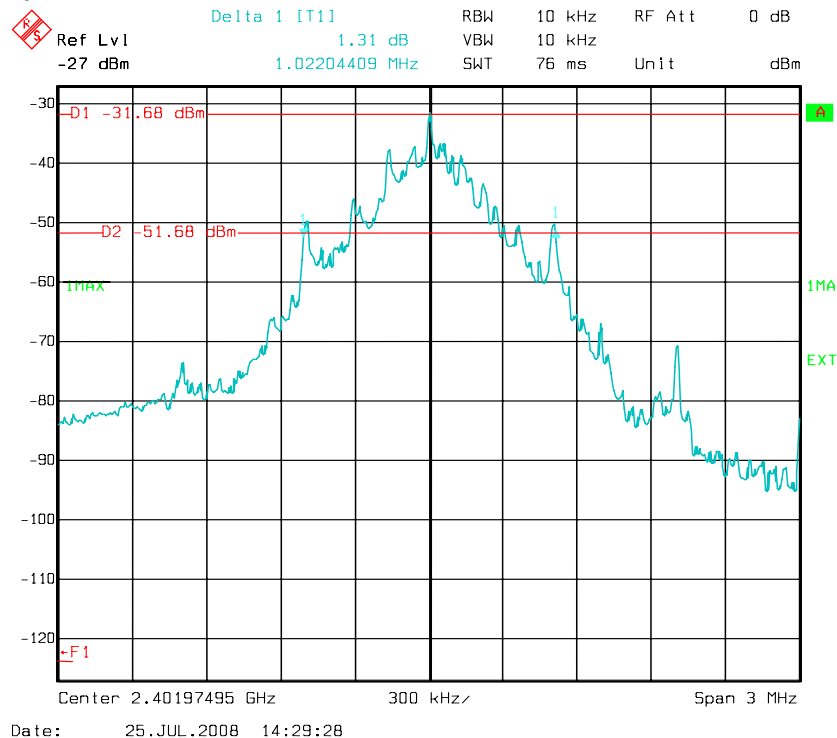
To make easier measurements a special test mode allows to select only one channel with its modulation.

9.5.1 Frequency hopping channel separation (15.247 (a) (1))

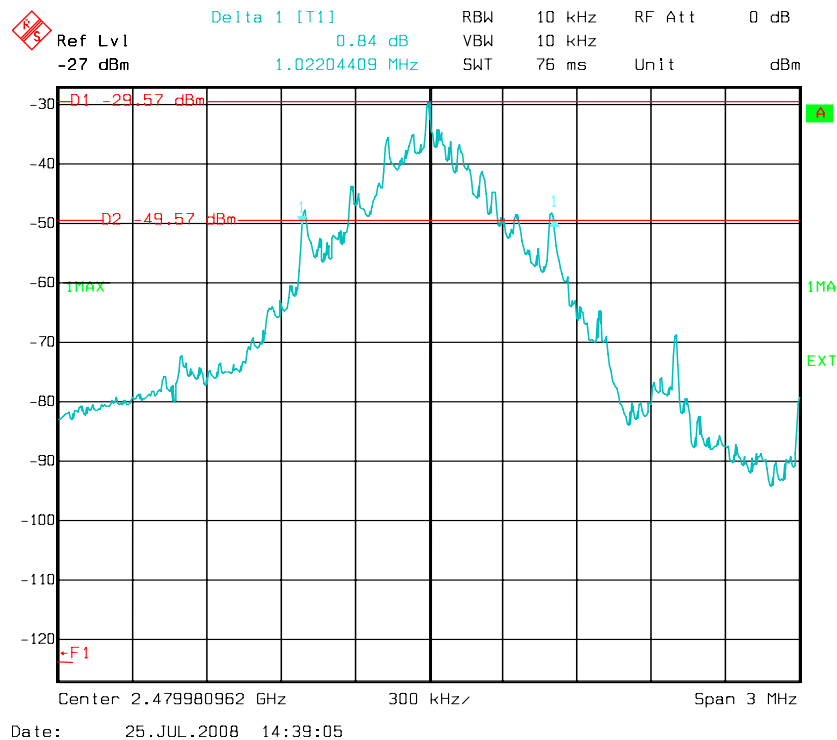


The 20dB bandwidth of each hopping channel is 1022 kHz.

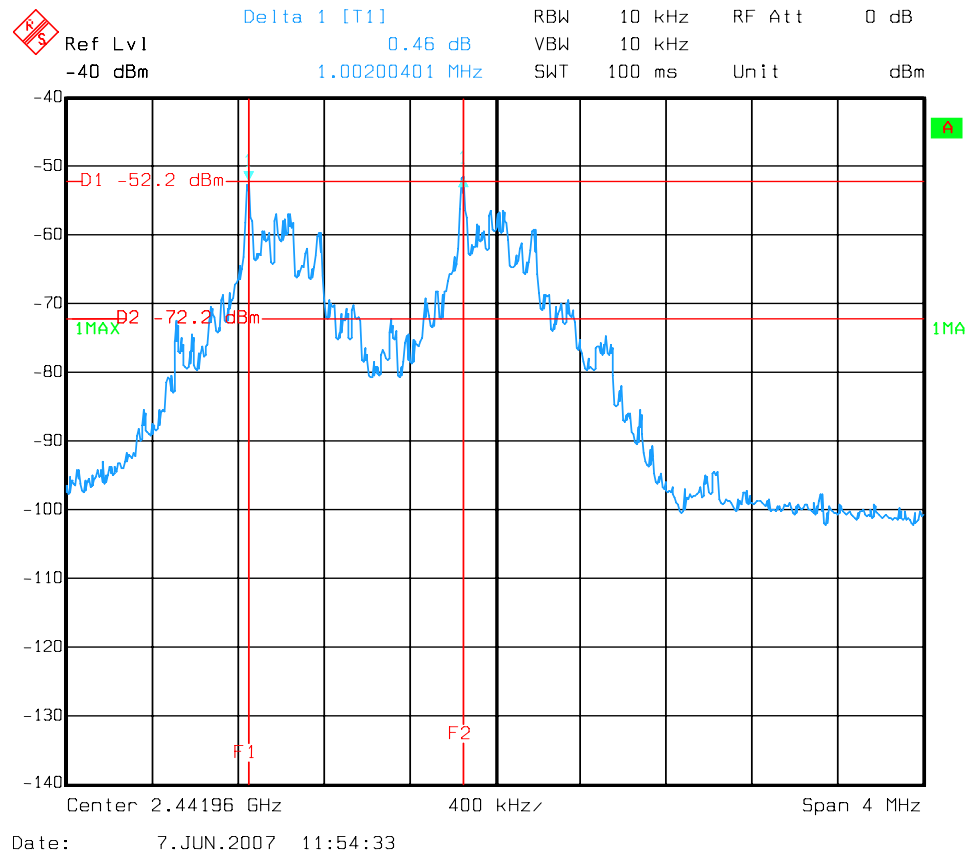
Lowest channel



Highest channel :

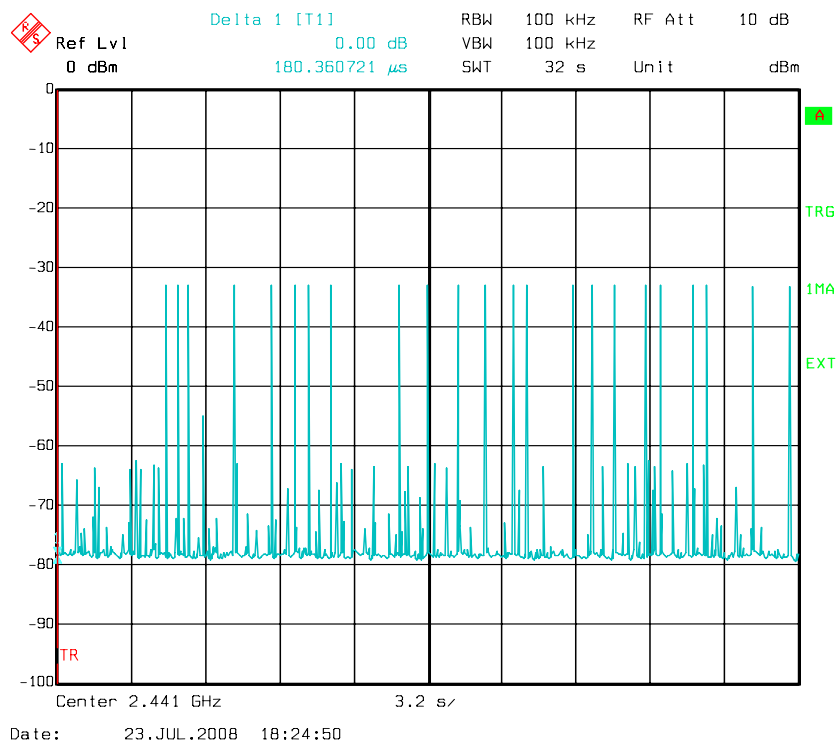
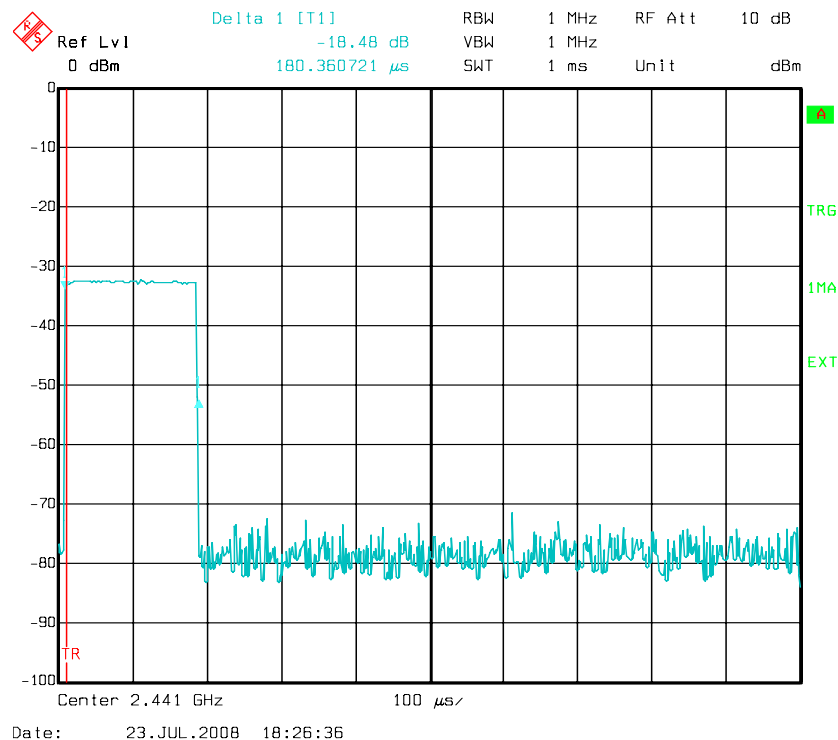


The channel separation is 1000 kHz which is not greater than the 20dB bandwidth. So the Maximum peak conducted output power limit will be 0.125W



9.5.1.1 15.247 § (a) (1) (iii)

The measurement during a long transmission gives **180 μs** on each channel with 24 transmissions on an observation period of 31.6 s. So the average time within a period of $24 \times 0.18 = 4.32 \text{ ms}$ which is less than the 400 ms limit.



9.5.2 Maximum peak output power

The maximum peak conducted power can't be measured in this product (internal antenna without connector).

According to DA 00-705, the alternative test procedure is used to calculate the conducted peak power.

$$P = \frac{(E \cdot d)^2}{30G}$$

For calculation, G is taken to be 1 (isotropic antenna, worst case).

The conducted limit is 0.125W.

A voltage variation of +/-15% of the AC input has strictly no influence on output power.

Measurements are done on OATS at 3 m distance with 1MHz RBW.

Results	Frequency (MHz)	3 m dBμV/m	Power (mW)
Lowest Channel	2.402	78.19	0.02
Central Channel	2.441	80.70	0.035
Highest Channel	2.480	83.34	0.065

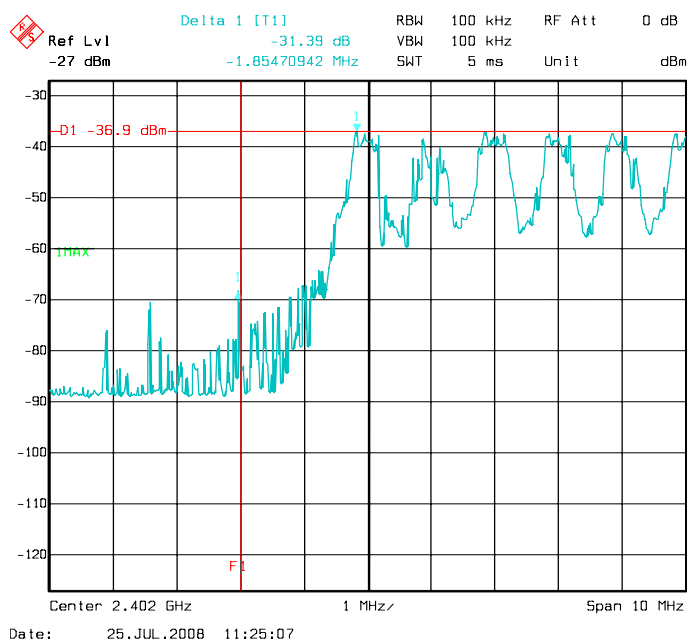


9.5.3 Spurious emissions (15.247 § (d))

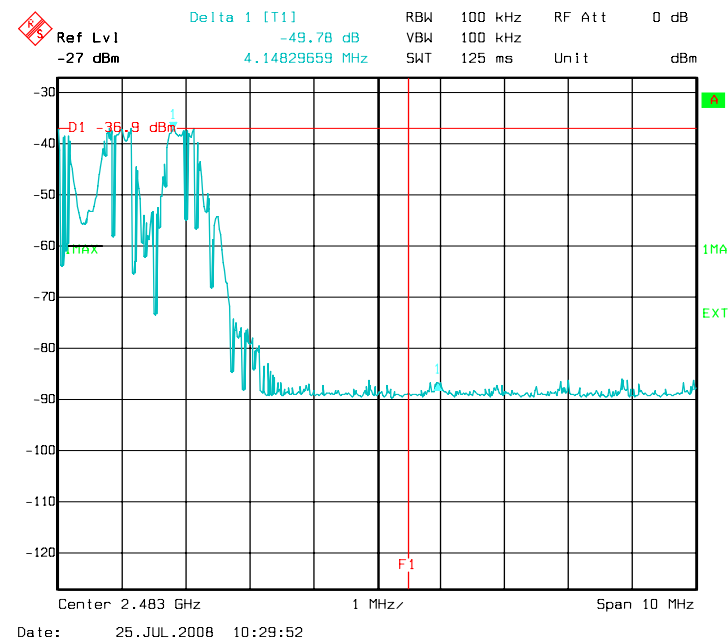
In any 100 kHz bandwidth outside the frequency band, the level is at least 20 dB below that in the 100kHz bandwidth within the band contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

9.5.3.1 Band edge measurement:

For lowest channel



For highest channel



The delta is -49dB thus with results of 9.5.2,

Peak limit is 74dB μ V/m. Measurement with delta gives 35.3 dB μ V/m (38.7 dB margin)

Average limit is 54dB μ V/m. Measurement with delta gives a peak emission at 35.3 dB μ V/m (18.7 dB margin) without averaging.

9.5.3.2 RADIATED EMISSIONS MEASUREMENTS (15.209 in restricted bands):

Radiated emissions measurement results from 30MHz to 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. 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 dBμV/m (with a peak limit at 74 dBμV/m). Otherwise, the limit is only 20 dB under the emission level (87.88 dBμV/m at 3m) without averaging with duty cycle factor.

The averaging correction factor is used only when necessary (margin lower than 10dB) and when the spurious radiation is pulsed in the same manner as the normal emission.

9.5.3.3 RESULTS:

Spurious emissions below 1GHz

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.

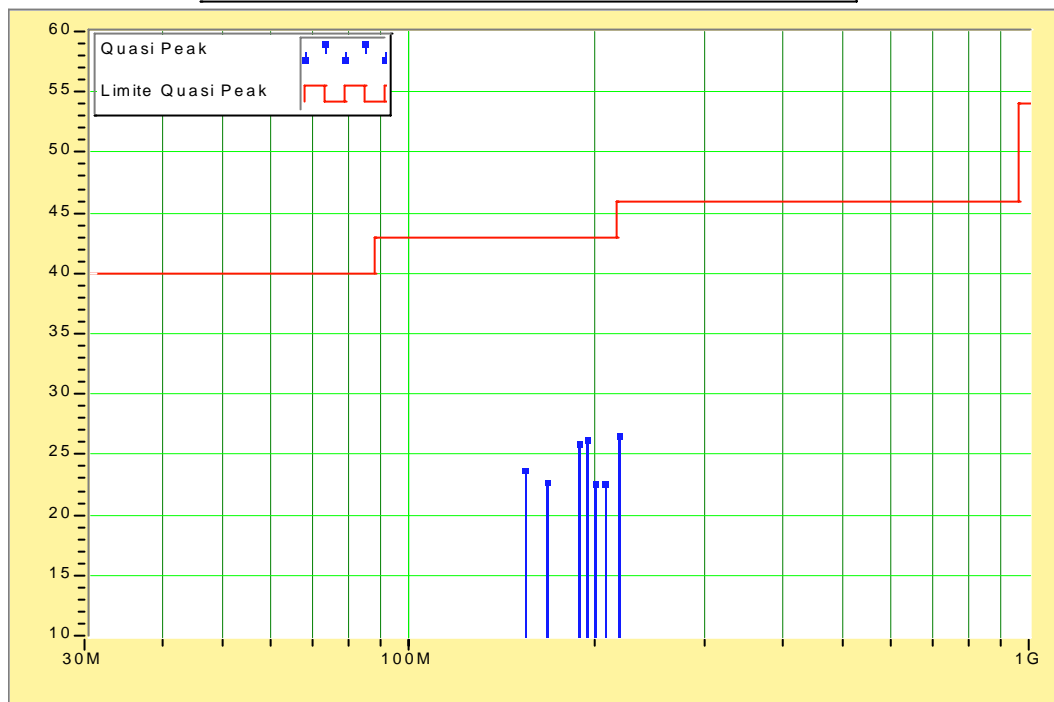
3 m open area test site final measurements results


Limit used is limit for unintentional radiator which also corresponds to limit in restricted bands This limit is more severe than the requirement of part 15.247 for spurious emissions.

Spurious emissions in below 1GHz are with a permanent modulation and hopping active.

Frequency (MHz)	Peak (dBμV/m)	Quasi peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polar.	Height (cm)	Angle (°)	Factor Corr. (dB)
154.235	28.44	23.77	43.5	19.73	V	102	175	13.42
166.472	26.82	22.78	43.5	20.72	V	111	175	13.83
188.352	29.38	25.82	43.5	17.68	V	114	175	14.80
193.237	30.43	26.23	43.5	17.27	V	102	175	15.76
199.518	33.17	22.63	43.5	20.87	V	102	175	16.99
207.692	32.30	22.53	43.5	20.97	V	106	175	16.97
218.160	28.44	26.51	46.0	16.49	V	106	175	16.82

Champ électrique (dBμV/m) rayonné en fonction de la fréquence (Hz)



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Spurious emissions measurement results from 1GHz to 25GHz:

Spurious emissions are made with a permanent communication between EUT and laptop using the frequency hopping. Both devices are far enough from each other to ensure that only one is measured. Spurious measurements are also done with a permanent emission at Lowest frequency, middle frequency and highest frequency.

There is no radiation founded over noise floor.

9.6 Exposition of public to radio frequency energy.

In the frequency range of this product, the limit of S is $1\text{mW}/\text{cm}^2$.

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:

For

$$R = \text{square root} (EIRP/(4*\pi*1))$$

$$R = \text{square root} (0.000065/(4*\pi*1))$$

$$R = 0.23 \text{ cm}$$

The safe distance is far lower if we consider the averaging possibility.

The normal use of this product is with the antenna near the hand 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 (§15.203)

Not applicable because the antenna is located inside EUT and it's not replaceable without modifying the module board.

9.8 Measurement of frequency stability §15.215 (c)

The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Measurements were conducted according to the operating temperature range given in the installation guide.

Frequencies (GHz)

Results				
Temperature	-10°C		50°C	
Power Supply	4.5 V	5.5 V	4.5 V	5.5 V
Channel Fb	2.401817	2.401817	2.401805	2.401968
Channel Fc1	2.448170	2.448170	2.448171	2.448171
Channel Fh	2.476817	2.476817	2.476803	2.476803

Neither voltage nor temperature variations affect the frequency stability that is better than ± 10 ppm