

Radiated Emissions Class B Emissions Compliance Test Report for Product: iMOTE 1

Oregon Certification
& Environmental Lab
(OCEL)

5200 NE Elam Young
Parkway Hillsboro, OR
97124



Report Number: 07OR001
February 5, 2007



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Background

This test report documents the results of the electromagnetic compatibility testing performed by Intel Corporation, Oregon Environmental Laboratory. The results contained within this test report pertain only to the equipment under test.

Details and results of testing performed on [01/10/07](#) are contained within.



Signatures

To ensure the quality and accuracy of this documentation, the contents and test data have been thoroughly reviewed by the following qualified personnel from the Intel Oregon Environmental Lab.

Written By: Heidi Dayoob
Technical Writer

Signature:

Reviewed/
Approved By: Pete Berquist
EMC Engineer

Signature:

Applicant Information

Manufactured by:	Intel Corporation
Applicant:	Intel Corporation
Product Address:	5200 NE Elam young Parkway Hillsboro, OR 97124
Product:	Bluetooth Sensor
Model Number:	iMOTE 1

Facility Accreditation and Authorization



CERT # 1130-01

American Association for Laboratory Accreditation (A2LA)

The Intel Corporation OCEL (Oregon Certification and Environmental Lab) is accredited for emissions and immunity testing. The scope of this accreditation is in adherence to the requirements of ISO/IEC 17025: 2005. A2LA Lab Code: 110083,



Federal Communication Commission (FCC)

The 3 & 10 meter Open Area Test Site and conducted measurement facilities have been fully described in reports filed with the Federal Communication Commission, and accepted by the FCC in a letter dated May 2002. Registration number: 90687.



The Voluntary Control Council for Interference (VCCI)

The Intel Corporation OCEL has been accepted as an Associate Member to the VCCI (Voluntary Control Council for Interference). The 3 & 10 meter Open Area Test Site radiated measurement facility and conducted measurement facility have been registered in accordance with Regulations for Voluntary Control Measures. Registration numbers: R-484, C-500, and T-119.



NEMKO

The Intel Corporation OCEL is authorized by NEMKO under the test by manufacturer scheme with Laboratory Authorization number 361 as re-stated in a letter dated December 2005. Registration number: TBM-EMC 361.

The data produced by TBM-361 is accepted into the Territory of the Russian Federation. The certificate of accreditation, dated Sept. 10, 1998, was issued by the Certification Body of information, instrumental, medical & electrical equipment on behalf of the Russian Goststandart (GOST R) organization. Through MRA between NEMKO and the current Russian Organization of Certified Bodies, acceptance of data by TBM-361 remains valid for a scope, which includes GOST R 51318.22 and GOST R 50628-95.



APEC Conformity Assessment of Telecommunications Equipment

This laboratory (identifier# US0069) participates in the NIST phase-1 Laboratory CAB designation for the following economies.

Chinese - Taipei BSMI

Accreditation # SL2-IN-E-1023



Korea – MIC's Radio Research Lab



The CAB status' remains in effect while the Laboratory's A2LA scope of accreditation is valid.



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Regulatory Compliance Statement

This device, Intel Model: iMOTE 1 complies with the following regulatory standards:

FCC 47 CFR Part 15, Subpart B

This device, Intel Model: iMOTE 1, complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference.
- (2) this device must accept any interference received, including interference that may cause undesired operation.

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5200 Elam Young Parkway
Hillsboro, Oregon 97124
(503) 696-5257

In addition to the above information, the following text should be placed in the instructions to the user:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

NOTE: Consult the dealer or an experienced radio/TV technician for help.




Compliance Summary

Laboratory Receipt Date Of Sample: 01/10/07

The results contained within this test report pertain only to the equipment under test (EUT).

Radiated Emissions Test:

Radiated Emissions Test:			
Laboratory Job Number:	07-0049-OR		
Date of Test:	01/10/07	Signature:	
Judgment:	Passed by 8.6 dBμV		
Measured Results	Line 1		
Tested by:	Pete Berquist		



1 Equipment Under Test

The EUT is an Intel® Bluetooth transmitter model iMOTE 1.

1.1 Condition of EUT upon Laboratory Receipt

The laboratory received the EUT in an operational condition.

1.2 Applicable Model Numbers

Additional model numbers encompassed by the findings documented in this report:

- N/A

1.3 System Modification

Use of EMI suppression devices was not required to achieve regulatory compliance therefore; the EUT was tested as received.



Table 1. Hardware Internal to the EUT

Description	Manufacturer	Model Number	Serial Number
Imote USB/UART board	Intel	N/A	N/A
6MHz xtal	N/A	CSTCR6M00G	N/A
Dual USB UART IC	N/A	FT2232C	N/A
LVDO regulator	N/A	LTC1844-3.3	N/A
Imote A3 BT board	Intel	N/A	N/A
12MHz 20ppm Xtal	N/A	ECS-120-CD-0330	N/A
Bluetooth IC	Zeevo	TC2001	N/A
Sw. Reg IC	Torex	6377A303SR	N/A
AC-DC USB adapter	Dynex	DX-IPAC	DynexGWKS 6J06



2 Test Configuration

Pre-scans of the EUT were performed in a 3 meter semi-anechoic chamber to investigate the worst case of cable placement, video resolution and refresh rate. All test data in this report refers to the established worst-case configuration.

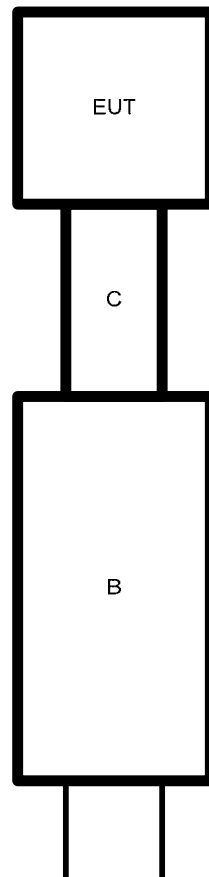
2.1 Adapters/ Peripherals/ I/O Devices

The peripheral devices and cables (external of the EUT) used during testing are reflected in the table and diagram below.

Table 2. Peripherals and I/O Cables External of the EUT

Diagram	Description	Manufacturer	Model Number	Serial Number	Cable Description
B	AC-DC-USB Adapter	Dynex	DX-IPAC	GWKS 6J06	No Cable
C	USB to mini-USB Adapter	-----	-----	-----	No Cable
S	LAN Hub	LinkSys	SD2008	REE105600 0965	6.0m unshielded LAN cable w/o ferrite.
T	Client PC	IBM	T30	78-FDAP2	1.0m unshielded LAN cable w/o ferrite.

Diagram 1 Test Setup Block Diagram



3 Radiated Emissions Test

The radiated emissions data was taken with the test methodologies stated in FCC.

No modifications or deviations from the test methods were implemented to achieve regulatory compliance.

3.1 Test Procedure

The data contained in section 4.2 Radiated Emissions Test Summary, lists the significant emission frequencies, antenna height and polarity, turntable azimuth, corrected reading, and the limit. The frequency range investigated was 30 MHz to 18 GHz.

NOTE: Explanation of the corrected readings is given in 5.1.2 "Field Strength Calculation".

Unless otherwise designated, radiated emissions testing was performed at the following antenna to EUT distance:

- 3 meters for FCC measurements 30 MHz to 18 GHz

NOTE: Final measurements were performed on the suspect frequencies that were found to be the closest to the limit.

A complete spectral scan of the EUT emissions was performed at the final measurement site.

3.1.1 Field Strength Calculation

The field strength was 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 follows:

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

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

Assume a receiver reading of 52.5 dB μ V is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a corrected field strength reading of 32 dB μ V/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m (corrected field strength reading)}$$

The 32 dB μ V/m value can be mathematically converted to its corresponding level in μ V/m.

$$\text{Level in } \mu\text{V/m} = 10^{[(32 \text{ dB}\mu\text{V/m})/20]} = 39.8 \mu\text{V/m}$$



3.2 Test Instruments

The following table contains detailed information of the lab test equipment utilized during radiated emissions testing.

Table 3. Radiated Emissions Test Equipment

Equipment	Manufacturer/ Model Number	Serial Number	Calibration Due
EMI Receiver	Rohde & Schwarz/ESI40	100204	10-16-2007
Temperature & Humidity Meter	HTAB-176	40635	11-20-2007
Bilog Antenna	Schaffner-Chase/CBL6111C	2792	10-12-2007
Preamplifier	Com-Power/PA-122	2121	03-01-2007
Horn Antenna	ETS/3117	51797	11-27-2007



3.3 Radiated Emissions Test Data

3.3.1 FCC Class B Measured Data

EUT Input Power for Test:	120VAC/60Hz
Test Method:	ANSI C63.4
Specification Limits:	FCC, Class B
Judgment:	Passed by – 5.1dB(uV/m)

Table 4. 3 Meter 30 MHz to 1 GHz Data

Test Location: Intel Corporation •5200 NE Elam Young Pkwy • Hillsboro OR 97124 • 503-696-5257

Customer: **Juha Junkkarinen**
 Specification: **FCC B RADIATED**
 Work Order #: **07-0049-OR**
 Test Type: **Maximized Emissions**
 Equipment:
 Manufacturer:

Date: 1/10/2007
 Time: 12:48:17
 Sequence#: 1
 Tested By: Test Engineer

Test Conditions / Notes:

Search 30 MHz to 18 GHz--iMote on AC adapter

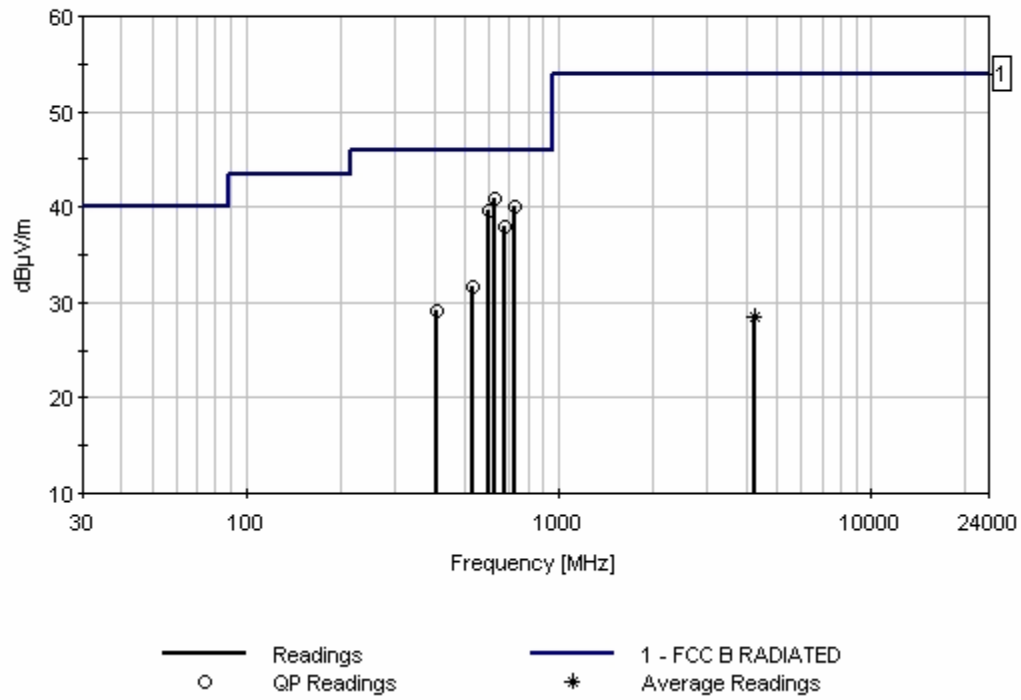
Transducer Legend:

T1=pa-122 5337 T2=Storm 3 Meter 003 10-4-07
 T3=CBL6111C-2792 Due 10-12-07 T4=3117-51797 11-14-07

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	625.853M QP	15.0	+0.0	+6.0	+19.9	+0.0	+0.0 156	40.9	46.0	-5.1	Horiz 162
2	722.138M QP	13.3	+0.0	+6.2	+20.6	+0.0	+0.0 144	40.1	46.0	-5.9	Horiz 146
3	601.784M QP	13.8	+0.0	+6.0	+19.8	+0.0	+0.0 274	39.6	46.0	-6.4	Horiz 194
4	673.999M QP	12.0	+0.0	+6.1	+19.8	+0.0	+0.0 275	37.9	46.0	-8.1	Horiz 156
5	529.569M QP	7.5	+0.0	+5.8	+18.4	+0.0	+0.0 160	31.7	46.0	-14.3	Horiz 241
6	409.214M QP	7.3	+0.0	+5.5	+16.3	+0.0	+0.0 220	29.1	46.0	-16.9	Vert 275
7	4285.875M Ave	15.0	+28.9	+8.1	+0.0	+34.2	+0.0 18	28.4	54.0	-25.6	Vert 102
^	4285.875M	28.6	+28.9	+8.1	+0.0	+34.2	+0.0 18	42.0	54.0	-12.0	Vert 102

Intel Corporation Date: 1/10/2007 Time: 12:48:17 Juha Junkkarinen VVO#: 07-0049-OR
FCC B RADIATED Test Distance: 3 Meters Sequence#: 1



3.4 Radiated Emissions Test Setup Photos

Test Setup, Front View



Test Setup, Rear View

