TEST REPORT

Report Number: 3099352MPK-001
Project Number: 3099352
May 31, 2006

Testing performed on the
Wireless Footswitch
Models: Footswitch and Receiver
FCC ID: UBD31539
IC ID: 6590A-31539
to

FCC Part 15.249
RSS-210, Annex 2.9
For
IRIDEX Corporation

A2LA Certificate Number: 1755-01

Test Performed by:	**Test Authorized by:**
Intertek Testing Services NA, Inc	Iridex
1365 Adams Court	1212 Terra Bella Ave.
Menlo Park, CA 94025	Mountain View, CA 94043

Prepared by: **Date:** May 31, 2006

Krishna K Vemuri

Reviewed by: **Date:** May 31, 2006

David Chernomordik, EMC Technical Manager

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1.0 Summary of Tests

TEST	REFERENCE FCC Part 15C	REFERENCE IC RSS-210/ RSS-Gen	RESULT
Field Strength of Fundamental	15.249a	A2.9(1) RSS-210	Complies
Field Strength of Harmonics	15.249a	A2.9(1) RSS-210	Complies
Radiated Emissions outside the band	15.249c	A2.9(2) RSS-210	Complies
Line Conducted Emissions	15.207	7.2.2 RSS-Gen	Not Applicable *
Occupied Bandwidth	-	4.4.1 RSS-Gen	738KFXD **
Frequency Stability	-	7.2.4 RSS-Gen	5.3 ppm **
Antenna requirement	15.203	7.1.4 RSS-Gen	Complies

* The device is battery powered.
** No limit is specified in the Standard

2.0 General Description

2.1 Product Description

The Wireless Footswitch devices are intended for use with IRIDEX Laser Systems. It consists of a Footswitch transceiver and a Receiver which is also transceiver. Both transceivers have identical electronic components, but different antennas and different housings.

In normal operation, the Footswitch radio transmits data (80 bits) every time when the footswitch is pressed. The receiver receives the signal and transmit an acknowledge signal and goes to receive mode until the footswitch is pressed again.

Overview of the EUT

Applicant name & address	Iridex 1212 Terra Bella Ave. Mountain View, CA 94043
Manufacturer name & address	Iridex 1212 Terra Bella Ave. Mountain View, CA 94043
Trade Name & Model No.	Iridex, Footswitch and Receiver
FCC Identifier	UBD31539
IC Identifier	6590A-31539
Rated RF Output Power	1 mW
Frequency Range	2414 – 2456 MHz
Number of Channel(s)	4
Type of Modulation	GFSK
Data Rate	1 Mbps
Duty Cycle	11.8% - for the Footswitch in transmit mode, Less than 0.01% - for the Receiver in transmit mode
Antenna(s) & Gain	permanently connected antennas chip antenna – in the Footswitch, strip antenna – in the Receiver. Gain ~ 0 dBi

A prototype version of the EUT was received on May 19, 2006 in good operating condition. As declared by the Applicant, it is identical to production units.

2.2 Related Submittal(s) Grants

This report is for use with an application for certification of a low power transmitter.

2.3 Test Methodology

Radiated emissions measurements were performed according to the procedures in ANSI C63.4 (2003). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Data Sheet"** of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

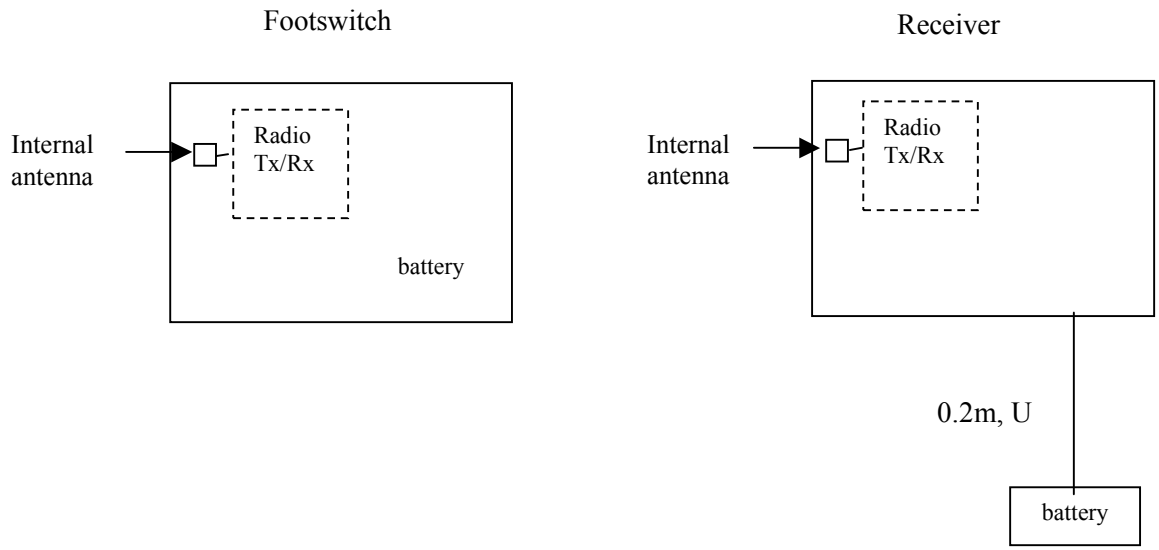
The 10m anechoic chamber and conducted measurement facility used to collect the radiated data is site #1. This test facility and site measurement data have been fully placed on file with the FCC and A2LA accredited.

3.0 System Test Configuration

3.1 Support Equipment and description

No support equipment is used

3.2 Block Diagram of Test Setup



S = Shielded **U** = Unshielded	**F** = With Ferrite **M** = Meter

3.3 Justification

For emission testing, the test procedures, as described in American National Standards Institute C63.4-1992 (2003), were employed. The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it).

During testing, all cables were manipulated to produce worst case emissions.

If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT was wired to transmit full power. Care was taken to ensure proper power supply voltages during testing.

For emission testing, both transmitters were modified to transmit signals with a high duty cycle (about 50%).

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

3.5 Mode of operation during test

During the test the EUT transmitted the modulated signal with a duty cycle of approximately 50%.

3.6 Modifications required for Compliance

No modifications were installed by Intertek Testing Services during compliance testing in order to bring the product into compliance (Please note that this does not include changes made specifically by IRIDEX prior to compliance testing).

3.7 Additions, deviations and exclusions from standards

No additions, deviations or exclusion have been made from standard.

4.0 Measurement Results

4.1 Transmitter Radiated Emissions
FCC Rules: 15.249, 15.209; IC Rules: RSS-210 (A2.9), RSS-Gen

Requirements

The Field Strength of emissions shall not exceed the following levels:
94 dB(μV/m) for fundamental frequency,
54 dB(μV/m) for harmonics.
Emissions radiated outside of the specified frequency band, except for harmonics, shall be attenuated by at least 50 dB below the level of fundamental or to the general radiated emission limits in 15.209, whichever is the lesser attenuation.

Procedure

For radiated emission measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable The signal is maximized through rotation and placement in the three orthogonal axes.

During the test the EUT is rotated and the antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance.

Radiated emission measurements were performed from 30 MHz to 25 GHz.
Analyzer resolution is:
100 kHz or greater for frequencies 1000 MHz and below,
1 MHz for frequencies above 1000 MHz. For those frequencies peak and average values were measured.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

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 is as follows:
FS = RA + AF + CF - AG
Where FS = Field Strength in dB (μV/m)
RA = Receiver Amplitude (including preamplifier) in dB (μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB(1/m)
AG = Amplifier Gain in dB
Correction Factor = CF - AG

Test Result

The data below shows the significant emission frequencies, the limit and the margin of compliance.

Radiated emissions at fundamental frequency

Footswitch

Frequency MHz	SA reading dB(uV)	Detector Peak/Ave	Antenna Factor dB(1/m)	Correction Factor dB	Duty Cycle correction dB	FS at 3m dB(uV/m)	FS Limit dB(uV/m)	Margin dB
2414	57.0	Peak	28.3	7.2	-	92.5	114.0	-22.7
2414	-	Ave	-	-	-18.6	73.9	94.0	-20.1
2422	54.1	Peak	28.3	9.8	-	92.2	114.0	-21.8
2422	-	Ave	-	-	-18.6	73.6	94.0	-20.4
2456	56.2	Peak	28.3	6.8	-	91.3	114.0	-22.7
2456	-	Ave	-	-	-18.6	72.7	94.0	-21.3

Receiver

Frequency MHz	SA reading dB(uV)	Detector P/A	Antenna Factor dB(1/m)	Correction Factor dB	Duty Cycle correction dB	FS at 3m dB(uV/m)	FS Limit dB(uV/m)	Margin dB
2414	59.3	Peak	28.3	7.2	-	94.8	114.0	-19.2
2414	-	Ave	-	-	-61.9	32.9	94.0	-61.1
2422	57.7	Peak	28.3	9.8	-	95.8	114.0	-18.2
2422	-	Ave	-	-	-61.9	33.9	94.0	-60.1
2456	60.1	Peak	28.3	6.8	-	95.2	114.0	-18.8
2456	-	Ave	-	-	-61.9	33.3	94.0	-60.7

Radiated emissions at harmonics

Footswitch

Frequency MHz	SA reading dB(uV)	Detector P/A	Antenna Factor dB(1/m)	Correction Factor dB	Duty Cycle correction dB	FS dB(uV/m)	FS Limit dB(uV/m)	Margin dB
Tx @ 2414 MHz								
4828.0	57.8	Peak	33.3	-20.2		70.9	74.0	-3.1
4828.0	-	Ave	-	-	-18.6	52.3	54.0	-1.7
7242.0	46.3	Peak	36.0	-24.0		58.3	74.0	-15.7
7242.0	-	Ave	-	-	-18.6	39.7	54.0	-14.3
9656.0	43.0 *	Peak	38.0	-21.0		60.0	74.0	-14.0
9656.0	-	Ave	-	-	-18.6	41.4	54.0	-12.6
Tx @ 2422 MHz								
4844	54.5	Peak	33.4	-22.6		65.3	74.0	-8.7
4844	-	Ave	-	-	-18.6	46.7	54.0	-7.3
7266	45.5	Peak	36.0	-25.3		56.2	74.0	-17.8
7266	-	Ave	-	-	-18.6	37.6	54.0	-16.4
9688	42.1 *	Peak	38.0	-23.8		56.3	74.0	-17.7
9688	-	Ave	-	-	-18.6	37.7	54.0	-16.3
Tx @ 2456 MHz								
4912	55.0	Peak	33.3	-19.3		69.0	74.0	-5.0
4912	-	Ave	-	-	-18.6	50.4	54.0	-3.6
7368	46.6	Peak	36.0	-22.6		60.0	74.0	-14.0
7368	-	Ave	-	-	-18.6	41.4	54.0	-12.6
9824	42.3 *	Peak	38.0	-21.4		58.9	74.0	-15.1
9824	-	Ave	-	-	-18.6	40.3	54.0	-13.7

* Noise floor

Note: All other emissions not reported are noise floor which is at least 10 dB below the limit.

Radiated emissions at harmonics

Receiver

Frequency MHz	SA reading dB(uV)	Detector P/A	Antenna Factor dB(1/m)	Correction Factor dB	Duty Cycle correction dB	FS dB(uV/m)	FS Limit dB(uV/m)	Margin dB
Tx @ 2414 MHz								
4828.0	57.5	Peak	33.3	-20.2		70.6	74.0	-3.4
4828.0	-	Ave	-	-	-18.6	52.0	54.0	-2.0
7242.0	46.9	Peak	36.0	-24.0		58.9	74.0	-15.1
7242.0	-	Ave	-	-	-18.6	40.3	54.0	-13.7
9656.0	43.0 *	Peak	38.0	-21.0		60.0	74.0	-14.0
9656.0	-	Ave	-	-	-18.6	41.4	54.0	-12.6
Tx @ 2422 MHz								
4844	55.5	Peak	33.4	-22.6		66.3	74.0	-7.7
4844	-	Ave	-	-	-18.6	47.7	54.0	-6.3
7266	45.9	Peak	36.0	-25.3		56.6	74.0	-17.4
7266	-	Ave	-	-	-18.6	38.0	54.0	-16.0
9688	42.1 *	Peak	38.0	-23.8		56.3	74.0	-17.7
9688	-	Ave	-	-	-18.6	37.7	54.0	-16.3
Tx @ 2456 MHz								
4912	55.6	Peak	33.3	-19.3		69.6	74.0	-4.4
4912	-	Ave	-	-	-18.6	51.0	54.0	-3.0
7368	46.8	Peak	36.0	-22.6		60.2	74.0	-13.8
7368	-	Ave	-	-	-18.6	41.6	54.0	-12.4
9824	42.3 *	Peak	38.0	-21.4		58.9	74.0	-15.1
9824	-	Ave	-	-	-18.6	40.3	54.0	-13.7

* Noise floor

Note: All other emissions not reported are noise floor which is at least 10 dB below the limit.

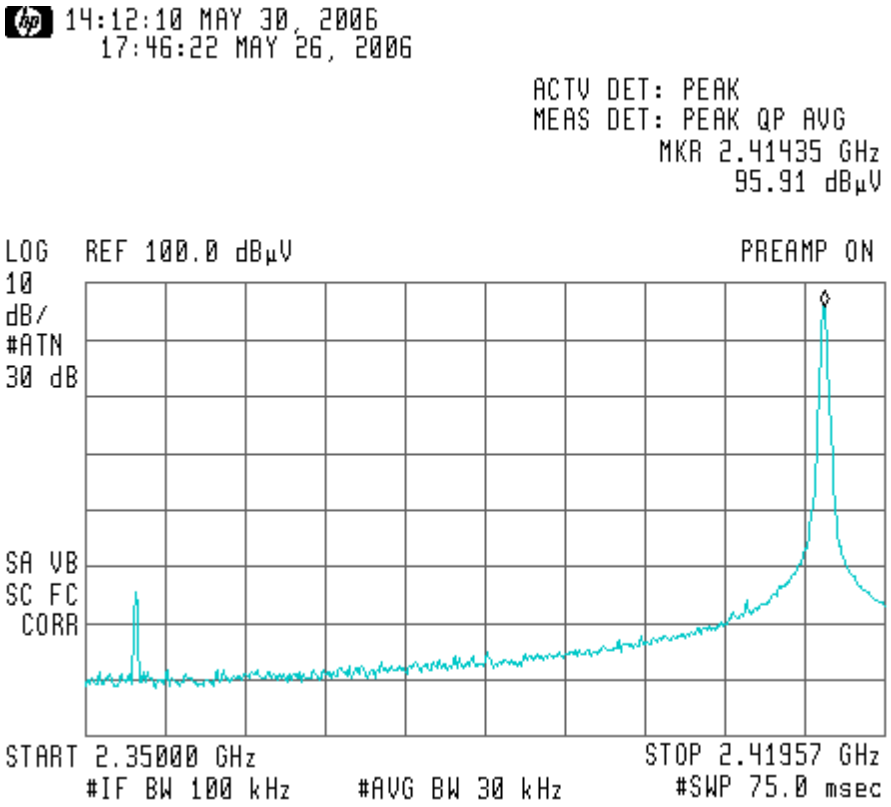
4.2 Out of Band Emission Plots

The horn antenna was placed close to the transmitter (3-4 cm). The spectrum analyzer reading was plotted. The following plots show the relative spurious emission level of the transmitter.

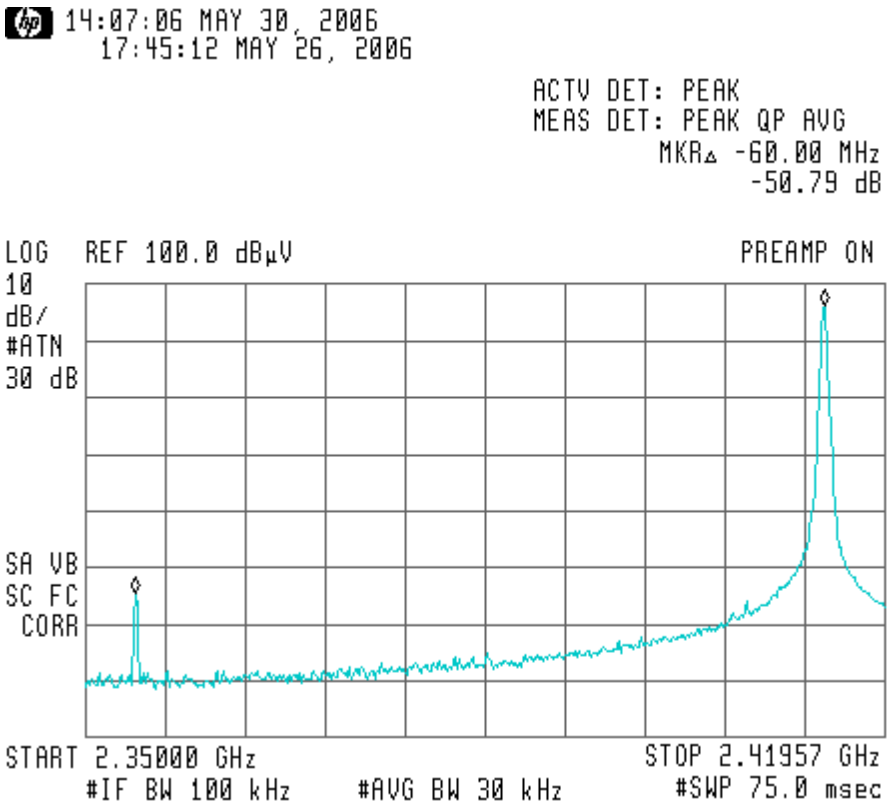
Plot #	Description
1	Scan from 2.35 GHz to 2.4157 GHz. Reference level at lowest channel
2	Scan from 2.35 GHz to 2.4157 GHz, delta=50.8 dB between level at fundamental and level at 2.35435 GHz
3	Scan from 1 GHz to 2.35 GHz, delta=51.4 dB between level at fundamental and level at 1.209 GHz
4	Scan from 2.45 GHz to 2.5 GHz. Reference level at highest channel
5	Scan from 2.5 GHz to 6.5 GHz; delta=39.1 dB between level at fundamental and level at 4.921 GHz (second harmonic) *

* Field Strength measurement at 3 m distance was performed on the second harmonic. The result is presented in sec. 4.1

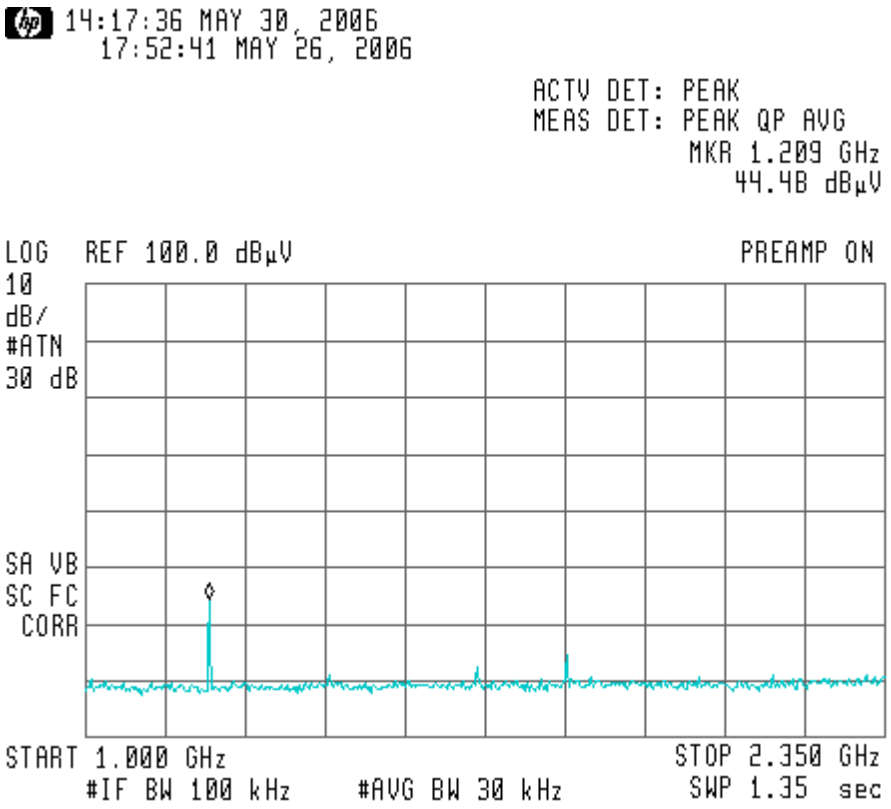
Plot 1


14:12:10 MAY 30, 2006
17:46:22 MAY 26, 2006
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.41435 GHz
95.91 dBµV
LOG
10
dB/
#ATN
30 dB
REF 100.0 dBµV
PREAMP ON
SA VB
SC FC
CORR
START 2.35000 GHz
#IF BW 100 kHz
#AVG BW 30 kHz
STOP 2.41957 GHz
#SWP 75.0 msec

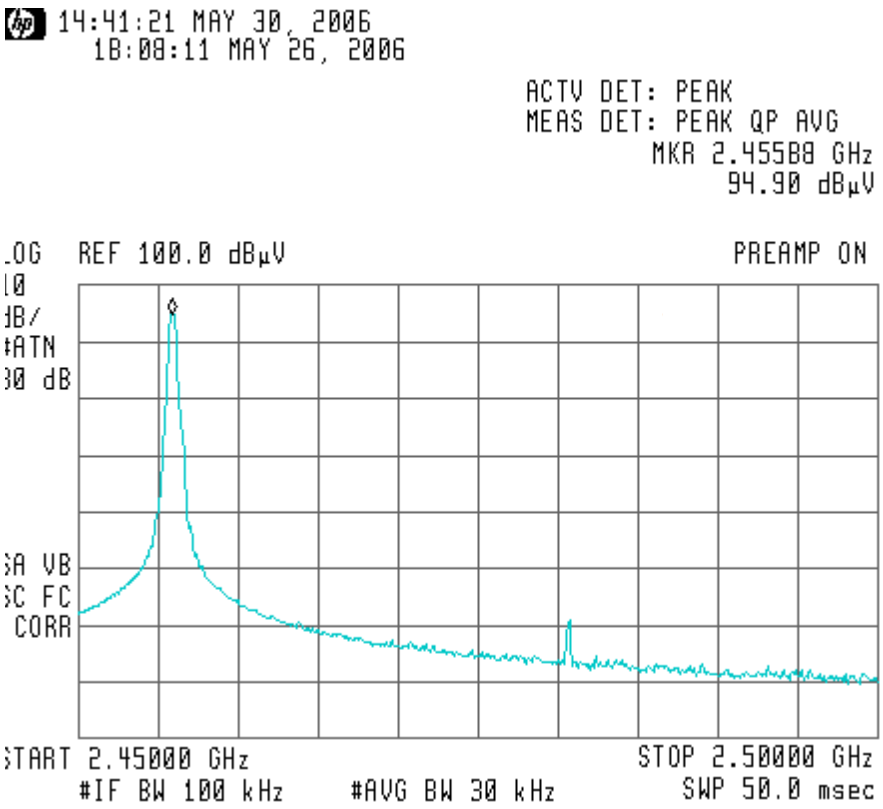
Plot 2


14:07:06 MAY 30, 2006
17:45:12 MAY 26, 2006
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ -60.00 MHz
-50.79 dB
LOG
10
dB/
#ATN
30 dB
REF 100.0 dBµV
PREAMP ON
SA VB
SC FC
CORR
START 2.35000 GHz
#IF BW 100 kHz
#AVG BW 30 kHz
STOP 2.41957 GHz
#SWP 75.0 msec

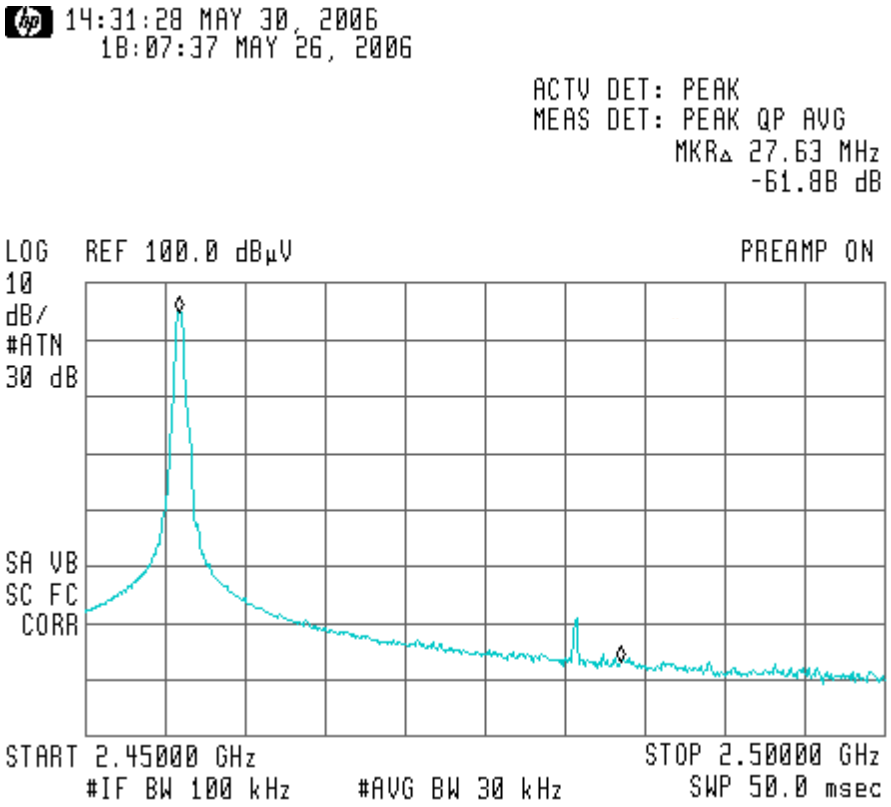
Plot 3


14:17:36 MAY 30, 2006
17:52:41 MAY 26, 2006
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.209 GHz
44.4B dBµV
LOG
10
dB/
#ATN
30 dB
REF 100.0 dBµV
PREAMP ON
SA VB
SC FC
CORR
START 1.000 GHz
#IF BW 100 kHz
#AVG BW 30 kHz
STOP 2.350 GHz
SWP 1.35 sec

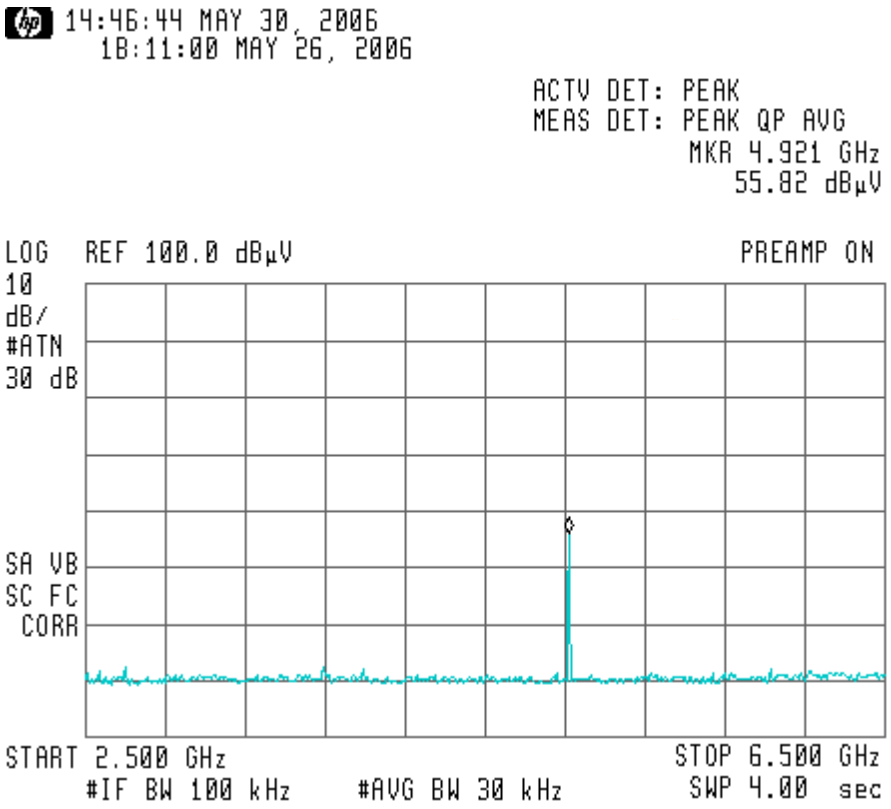
Plot 4


14:41:21 MAY 30, 2006
18:08:11 MAY 26, 2006
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.455888 GHz
94.90 dBµV
.OG REF 100.0 dBµV
PREAMP ON
10
dB/
ATN
30 dB
SA VB
SC FC
CORR
START 2.45000 GHz
STOP 2.50000 GHz
#IF BW 100 kHz
#AVG BW 30 kHz
SWP 50.0 msec

Plot 5

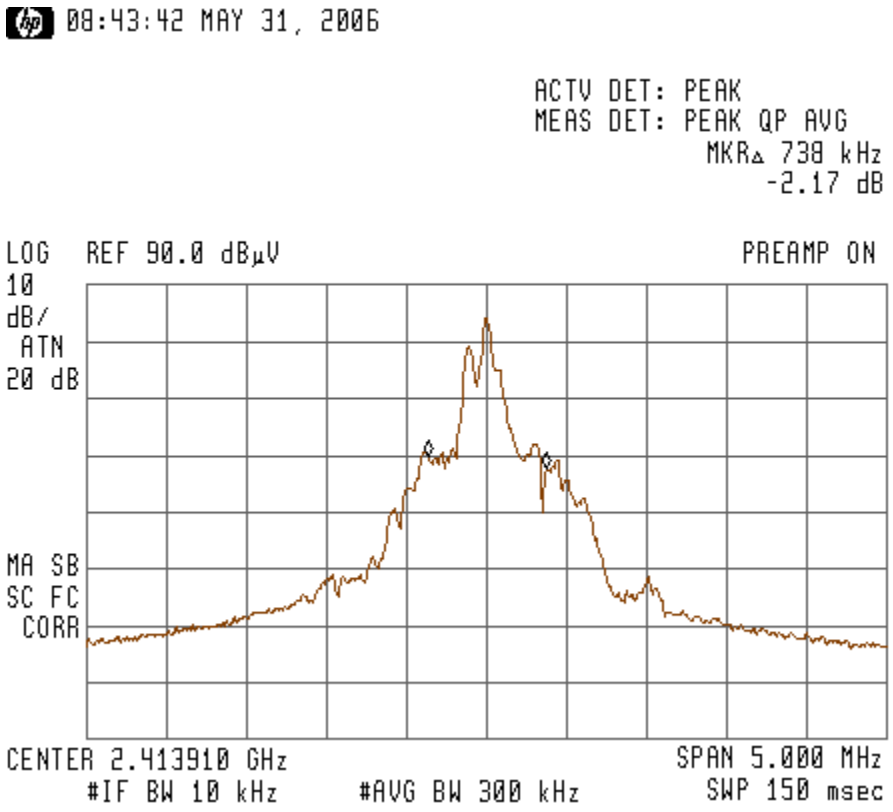

14:31:28 MAY 30, 2006
18:07:37 MAY 26, 2006
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 27.63 MHz
-61.88 dB
LOG
10
dB/
#ATN
30 dB
REF 100.0 dBµV
PREAMP ON
SA VB
SC FC
CORR
START 2.45000 GHz
#IF BW 100 kHz
#AVG BW 30 kHz
STOP 2.50000 GHz
SWP 50.0 msec

Plot 6


14:46:44 MAY 30, 2006
18:11:00 MAY 26, 2006
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.921 GHz
55.82 dBµV
LOG
10
dB/
#ATN
30 dB
REF 100.0 dBµV
PREAMP ON
SA VB
SC FC
CORR
START 2.500 GHz
#IF BW 100 kHz
#AVG BW 30 kHz
STOP 6.500 GHz
SWP 4.00 sec

4.3 Occupied Bandwidth

The 99% emission bandwidth was measured with the spectrum analyzer build-in measurement facility. The Emission Designator is defined as 738KFXD.



4.4 Frequency Stability
RSS-Gen

The transmitter was placed in the temperature chamber. The horn antenna was placed close to the transmitter (3-4 cm) and connected to the spectrum analyzer.. The spectrum analyzer reading of the transmitting frequency was recorded.

Temperature	Frequency (MHz)	Deviation
-20^0 C	2413.8628	-8.5 kHz
$+20^0$ C	2413.8713	-
$+50^0$ C	2413.8584	-12.9 kHz

5.0 Antenna Requirement

The transmitters have a permanently connected onboard antennas.
Please refer to the attached documentation for details.

6.0 List of test equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
BI-Log Antenna	EMCO	3143	9509-1160	12	11/29/06
Horn Antenna	EMCO	3115	9107-3712	12	6/8/06
Horn Antenna	EMCO	3160-09	ITS51	#	#
Pre-Amplifier	Sonoma Inst.	310	185634	12	7/05/06
Pre-Amplifier	Hewlett Packard	8449B	3008A01168	12	1/17/07
Spectrum Analyzer	R & S	FSP40	036612004	12	10/3/06
RF Filter Section	Hewlett Packard	85460A	3448A00267	12	9/12/06
EMI Receiver	Hewlett Packard	8546A	3710A00373	12	9/12/06

No Calibration required

7.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 / 3099352	KK	May 31, 2006	Original document