Underwriters Laboratories Inc.
333 Pfingsten Rd.
Northbrook, IL 60062

www.ul.com/emc
(847) 272-8800

Quote Number:	618767
Project Number:	07CA15987
File Number:	MC15541
Date:	05 March 2008
Model:	IW-101A

Electromagnetic Compatibility Test Report

For

Innotek Corp

Test Report Details

Tests Performed By:	**Underwriters Laboratories Inc.** **333 Pfingsten Rd.** **Northbrook, IL 60062**
Tests Performed For:	**Innotek Corp** **11616 E. Montgomery** **Spokane, WA 99206**
Applicant Contact: Phone: E-mail:	**Harry Reed** **(509) 891-2633** **harryr@innotekcorp.com**
Test Report Date:	**05 March 2008**
Product Type:	**Smoke Detector with 433.9MHz Transmitter / Receiver**
Product standards	**FCC Part 15, Subpart C, 15.231**
Model Number:	**IW-101A**
EUT Category:	**Periodic Low Power Transmitter**
Testing Start Date:	**03 March 2008**
Date Testing Complete:	**04 March 2008**
Overall Results:	**Compliant**

Report Directory

Report Revision History

Revision Date	Description	Revised By	Revision Reviewed By
None			

1.0 G E N E R A L - Product Description

1.1 Equipment Description

The Equipment Under Test is a Smoke Detector with 433MHz Transmitter.

1.2 Device Configuration During Test

1.2.1 Equipment Used During Test:

Use	Product Type	Manufacturer	Model	Comments
EUT	Smoke Detector	Innotek Corp	IW-101A	None
Note: **EUT** - Equipment Under Test, **AE** - Auxiliary/Associated Equipment, or **SIM** - Simulator (Not Subjected to Test)				

1.2.2 Input/Output Ports:

Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	None

Note:
AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port (Not Involved in Process Control)
TP = Telecommunication Ports

1.2.3 Power Interface:

Mode # /Rated	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
1	Battery Operated	-	-	DC	-	EUT uses 3 x AA and 1 x 9V

1.3 EUT Configurations

Mode #	Description
1	Unit with batteries inserted configured in Wall Mount and Ceiling Mount Configurations in 10m chamber on 80cm support.
2	Unit with batteries inserted configured on a test bench.

1.4 EUT Operation Modes

Mode #	Description
1	Receiving / Standby
2	Transmitting (Modulated) / Test Mode / Alarm Mode

2.0 Summary

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by Underwriters Laboratories Inc. in accordance with the procedures stated in each test requirement and specification. The applicant determined the list of tests performed were applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

2.1 Deviations from standard test methods

None

2.2 Device Modifications Necessary for Compliance

None

2.3 Reference Standards

Standard Number	Standard Name	Standard Date
FCC Part 15, Subpart C, 15.231	Code of Federal Regulations, Part 15, Radio Frequency Devices	2007

2.4 Results Summary

This product is considered Class B

Requirement – Test	Result (Compliant / Non-Compliant)*
Radiated Emissions (Transmitter, Receiver and Digital)	Complaint
15.31 Pulse Train Measurement	N/A
15.231 Cease Operation	Compliant
15.231 Occupied Bandwidth	Compliant

Test Engineer:

Bartlomiej Mucha (Ext.41216)
Engineer
International EMC Services
Conformity Assessment Services-

Reviewer:

Jack L. Steiner(Ext.42307)
Section Manager
International EMC Services
Conformity Assessment Services

Any information and documentation involving UL Mark services are provided on behalf of Underwriters Laboratories Inc. (UL) or any authorized licensee of UL.

3.0 Calibration of Equipment Used for Measurement

All test equipment and test accessories are calibrated on a regular basis. The maximum time between calibrations is one year or the manufacturers' recommendation, whichever is less.

All test equipment calibrations are traceable to the National Institute of Standards and Technology (NIST); therefore, all test data recorded in this report is traceable to NIST.

4.0 EMISSIONS TEST RESULTS

The emissions tests were performed according to following regulations:

---------- United States ----------

Code of Federal Regulations Title 47	Part 15, Subpart B and Subpart C, Radio Frequency Devices

Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be verified at the time the test is conducted.

Ambient Temperature, °C	22.5 ± 2.5	Relative Humidity, %	45 ± 15	Barometric Pressure, mBar	950 ± 150

4.1 Test Conditions and Results – RADIATED EMISSIONS (Receiver / Standby and Alarm Mode / Transmitting)

Test Description	Measurements were made in a 10-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10-meter or 3-meter as stated. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.		
Basic Standard	FCC Part 15, Subpart C, 15.231		
UL LPG	80-EM-S0029		
	Frequency range	Measurement Point	
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	(10 meter measurement distance)	
	1GHz – 5GHz	(3 meter measurement distance)	

General Limits - Class B

Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak	Average
30 - 88	29.54	N/A
88 - 216	33.06	N/A
216 - 960	35.56	N/A
960 – 1,000	43.52	N/A
1,000 – 5,000	N/A	54

Transmitter Fundamental and Harmonics Limits

Frequency (MHz)	Limit (dBµV/m)	
	Quasi-Peak	Peak
433	70.37	N/A
All Harmonics below 1GHz	50.37	N/A
All Harmonics above 1GHz	N/A	60.79

Supplementary information: None

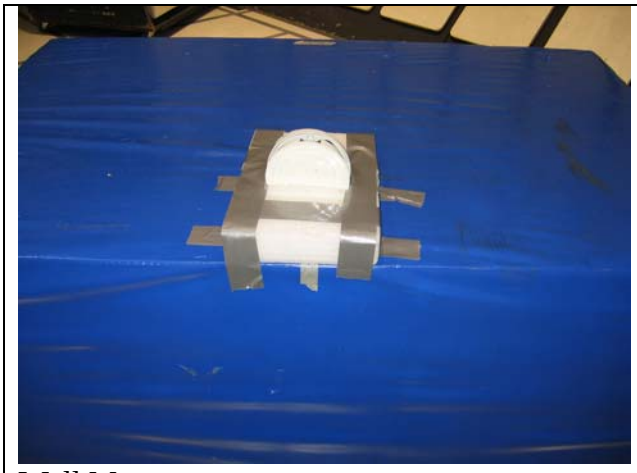
Table 1 Radiated Emissions EUT Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	1	1 and 2
Supplementary information: None		

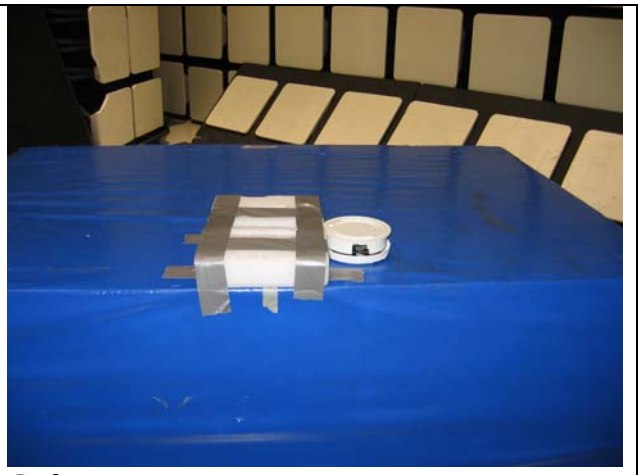
Table 2 Radiated Emissions Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	HP	8566B	EMC4085
Quasi-Peak Detector	HP	85650A	EMC4016
Bicon Antenna	Chase	VBA6106A	EMC4078
Log-P Antenna	Chase	UPA6108	EMC4076
Spectrum Analyzer	Rhode & Schwartz	FSEK	EMC4182
Antenna Array	UL	BOMS	EMC4276

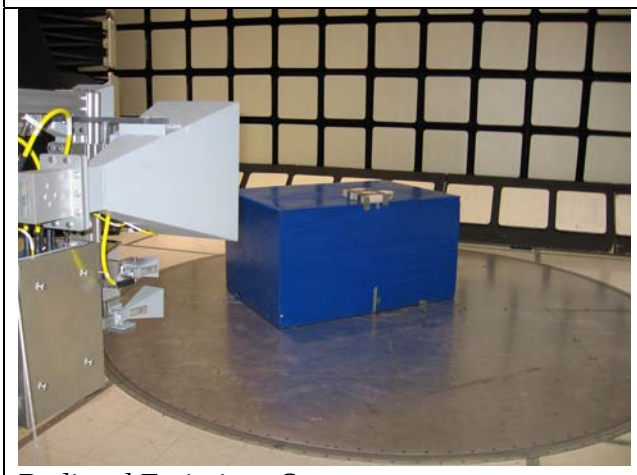
Figure 1 Test setup for Radiated Emissions



Wall Mount



Ceiling Mount



Radiated Emissions Setup

Figure 2 Radiated Emissions Graph – Receiver / Standby (Wall Mount)

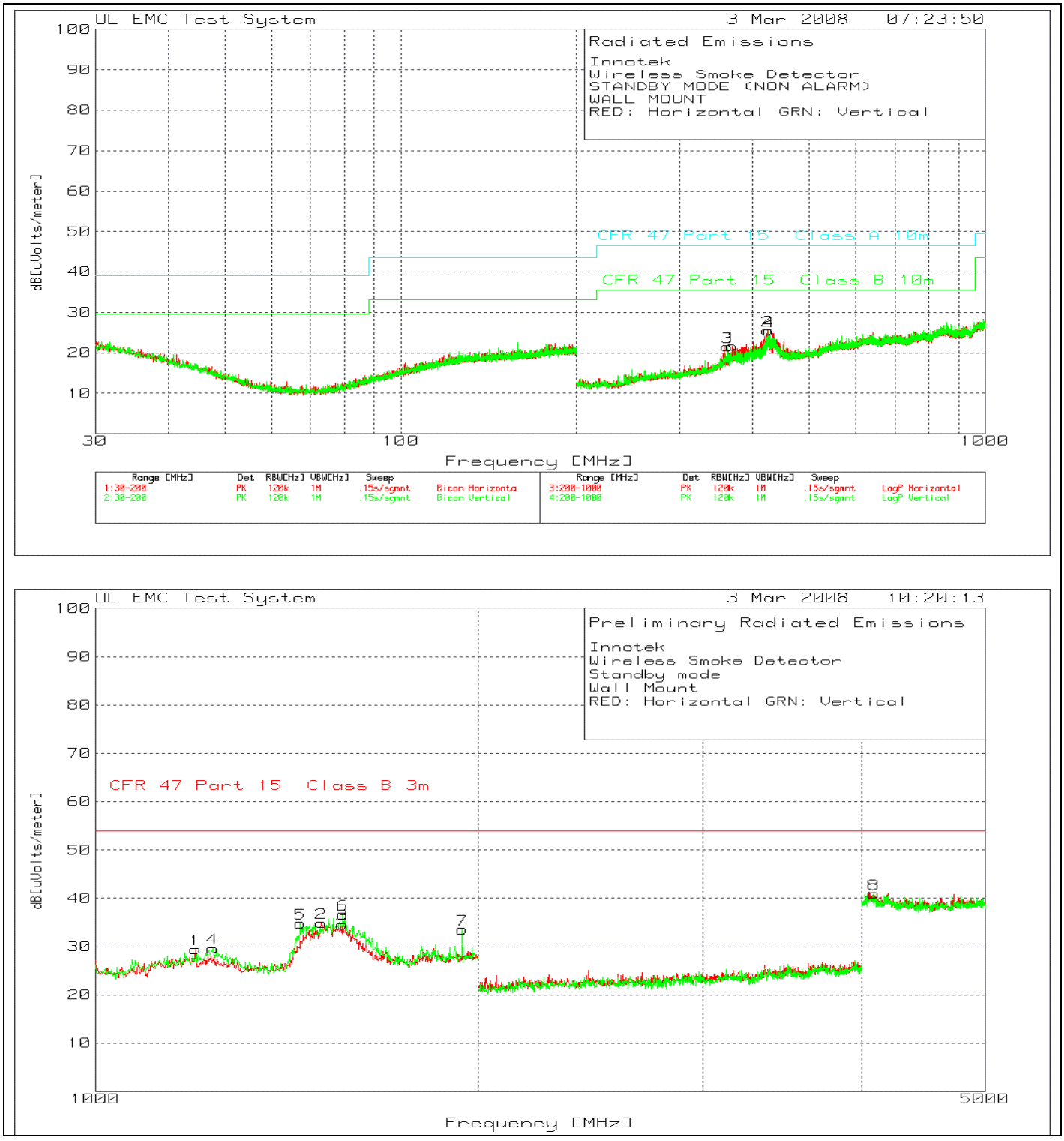


Table 3 Radiated Emissions Data Points – Receiver / Standby (Wall mount)

Innotek
Wireless Smoke Detector
STANDBY MODE (NON ALARM)
WALL MOUNT
RED: Horizontal GRN: Vertical

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4	5	6
1	368.8733	39.4 pk	-32.5	14.8	21.7	-	-	46.4	35.6	-	-
	Azimuth:155	Height:203 Horz		Margin [dB]		-	-	-24.7	-13.9	-	-
2	424.4317	41.5 pk	-32.2	16.2	25.5	-	-	46.4	35.6	-	-
	Azimuth:345	Height:203 Horz		Margin [dB]		-	-	-20.9	-10.1	-	-
3	361.8786	39.1 pk	-32.5	14.9	21.5	-	-	46.4	35.6	-	-
	Azimuth:16	Height:99 Vert		Margin [dB]		-	-	-24.9	-14.1	-	-
4	426.63	41.2 pk	-32.1	16.3	25.4	-	-	46.4	35.6	-	-
	Azimuth:357	Height:400 Vert		Margin [dB]		-	-	-21	-10.2	-	-

LIMIT 3: CFR 47 Part 15 Class A 10m
LIMIT 4: CFR 47 Part 15 Class B 10m

Innotek
Wireless Smoke Detector
Standby mode
Wall Mount
RED: Horizontal GRN: Vertical

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4	5	6
1	1198.397	60.75 pk	-55.99	24.7	29.46	54	-	-	-	-	-
		Height:150 Horz		Margin [dB]		-24.54	-	-	-	-	-
2	1505.01	64.4 pk	-54.92	25.4	34.88	54	-	-	-	-	-
		Height:150 Horz		Margin [dB]		-19.12	-	-	-	-	-
3	1563.126	63.53 pk	-54.63	25.7	34.6	54	-	-	-	-	-
		Height:150 Horz		Margin [dB]		-19.4	-	-	-	-	-
4	1236.473	60.6 pk	-55.82	24.8	29.58	54	-	-	-	-	-
		Height:100 Vert		Margin [dB]		-24.42	-	-	-	-	-
5	1448.898	64.33 pk	-54.84	25.3	34.79	54	-	-	-	-	-
		Height:150 Vert		Margin [dB]		-19.21	-	-	-	-	-
6	1565.13	65.57 pk	-54.6	25.7	36.67	54	-	-	-	-	-
		Height:150 Vert		Margin [dB]		-17.33	-	-	-	-	-
7	1941.884	59.5 pk	-53.27	27.3	33.53	54	-	-	-	-	-
		Height:100 Vert		Margin [dB]		-20.47	-	-	-	-	-
8	4086.172	63.81 pk	-51.28	28.4	40.93	54	-	-	-	-	-
		Height:100 Vert		Margin [dB]		-13.07	-	-	-	-	-

LIMIT 1: CFR 47 Part 15 Class B 3m

pk - Peak detector
qp - Quasi-Peak detector

Due to large margin between the limit and the scan trace only peak data was recorded. No measurements were considered necessary.

Figure 3 Radiated Emissions Graph – Receiver / Standby (Ceiling Mount)

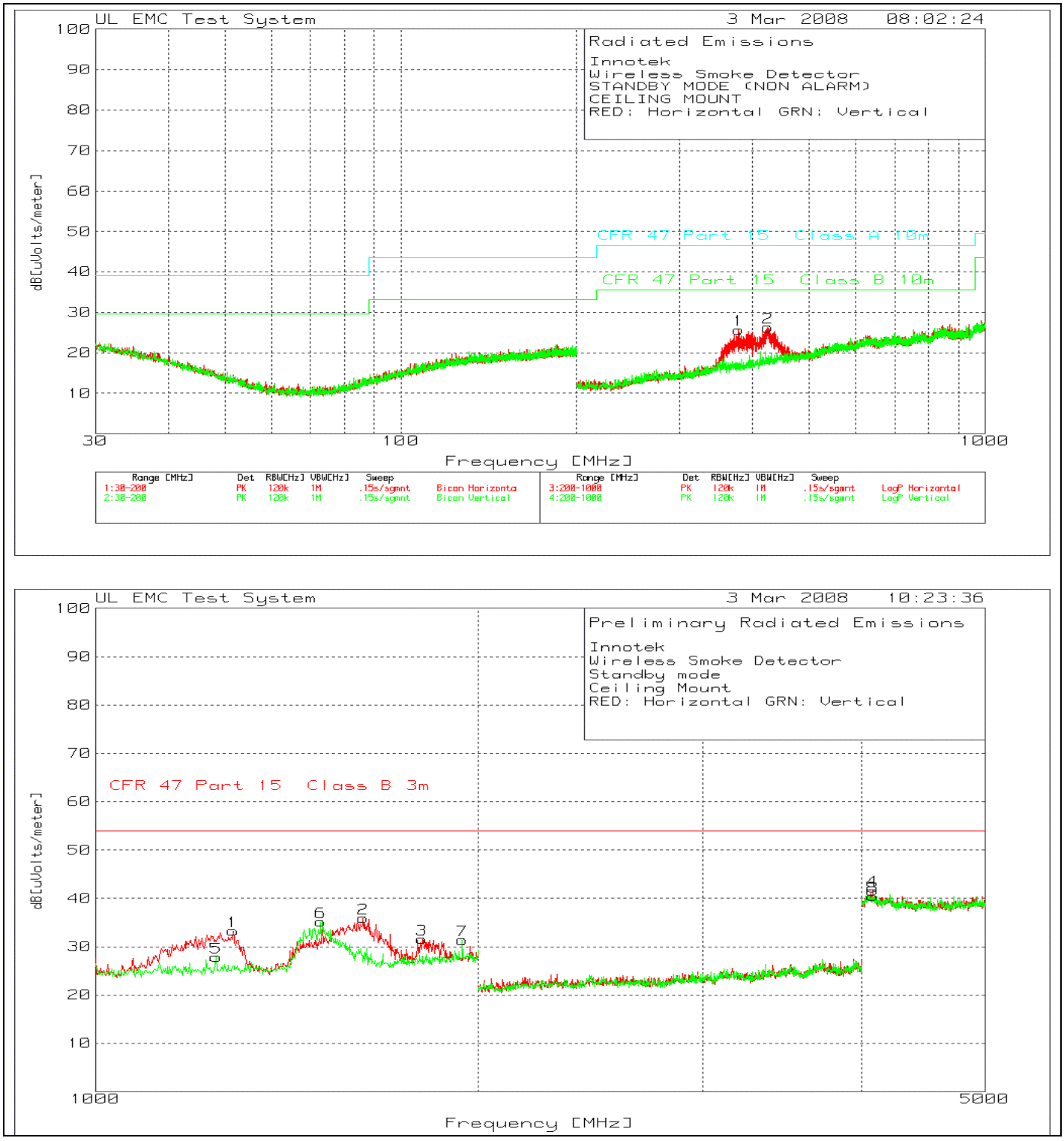


Table 4 Radiated Emissions Data Points – Receiver / Standby (Ceiling mount)

```
 Innotek
 Wireless Smoke Detector
 STANDBY MODE (NON ALARM)
 CEILING MOUNT
 RED: Horizontal GRN: Vertical

      Test     Meter     Gain/Loss  Transducer  Level  Limit:1      2       3       4       5       6
No. Frequency  Reading    Factor     Factor  dB[uVolts/meter]
     [MHz]     [dB(uV)]     [dB]      [dB]
=============================================================================================================
1  378.666      43 pk        -32.3     15        25.7      -        -     46.4    35.6      -       -
   Azimuth:142   Height:299 Horz     Margin [dB]           -        -     -20.7   -9.9      -       -
2  425.0312     42.3 pk      -32.2     16.2      26.3      -        -     46.4    35.6      -       -
   Azimuth:231   Height:299 Horz     Margin [dB]           -        -     -20.1   -9.3      -       -

LIMIT 1: NONE
LIMIT 2: NONE
LIMIT 3: CFR 47 Part 15  Class A 10m
LIMIT 4: CFR 47 Part 15  Class B 10m

pk - Peak detector
qp - Quasi-Peak detector

 Innotek
 Wireless Smoke Detector
 Standby mode
 Ceiling Mount
 RED: Horizontal GRN: Vertical

      Test     Meter     Gain/Loss  Transducer  Level  Limit:1      2       3       4       5       6
No. Frequency  Reading    Factor     Factor  dB[uVolts/meter]
     [MHz]     [dB(uV)]     [dB]      [dB]
=============================================================================================================
1  1282.565     63.84 pk     -55.49    24.9      33.25   54         -       -       -       -       -
                 Height:100 Horz     Margin [dB]          -20.75     -       -       -       -       -
2  1623.246     64.16 pk     -54.15    25.9      35.91   54         -       -       -       -       -
                 Height:149 Horz     Margin [dB]          -18.09     -       -       -       -       -
3  1805.611     58.63 pk     -53.79    26.7      31.54   54         -       -       -       -       -
                 Height:100 Horz     Margin [dB]          -22.46     -       -       -       -       -
4  4078.156     64.46 pk     -51.27    28.4      41.59   54         -       -       -       -       -
                 Height:150 Horz     Margin [dB]          -12.41     -       -       -       -       -
5  1244.489     58.85 pk     -55.81    24.8      27.84   54         -       -       -       -       -
                 Height:100 Vert     Margin [dB]          -26.16     -       -       -       -       -
6  1503.006     64.63 pk     -54.89    25.4      35.14   54         -       -       -       -       -
                 Height:150 Vert     Margin [dB]          -18.86     -       -       -       -       -
7  1941.884     57.32 pk     -53.27    27.3      31.35   54         -       -       -       -       -
                 Height:150 Vert     Margin [dB]          -22.65     -       -       -       -       -
8  4080.16      63.31 pk     -51.29    28.4      40.42   54         -       -       -       -       -
                 Height:100 Vert     Margin [dB]          -13.58     -       -       -       -       -

LIMIT 1: CFR 47 Part 15  Class B 3m
```

Due to large margin between the limit and the scan trace only peak data was recorded. No measurements (quasi-peak or average) were considered necessary.

Figure 4 Radiated Emissions Graph – Wall Mount (Alarm Mode / Transmitting)

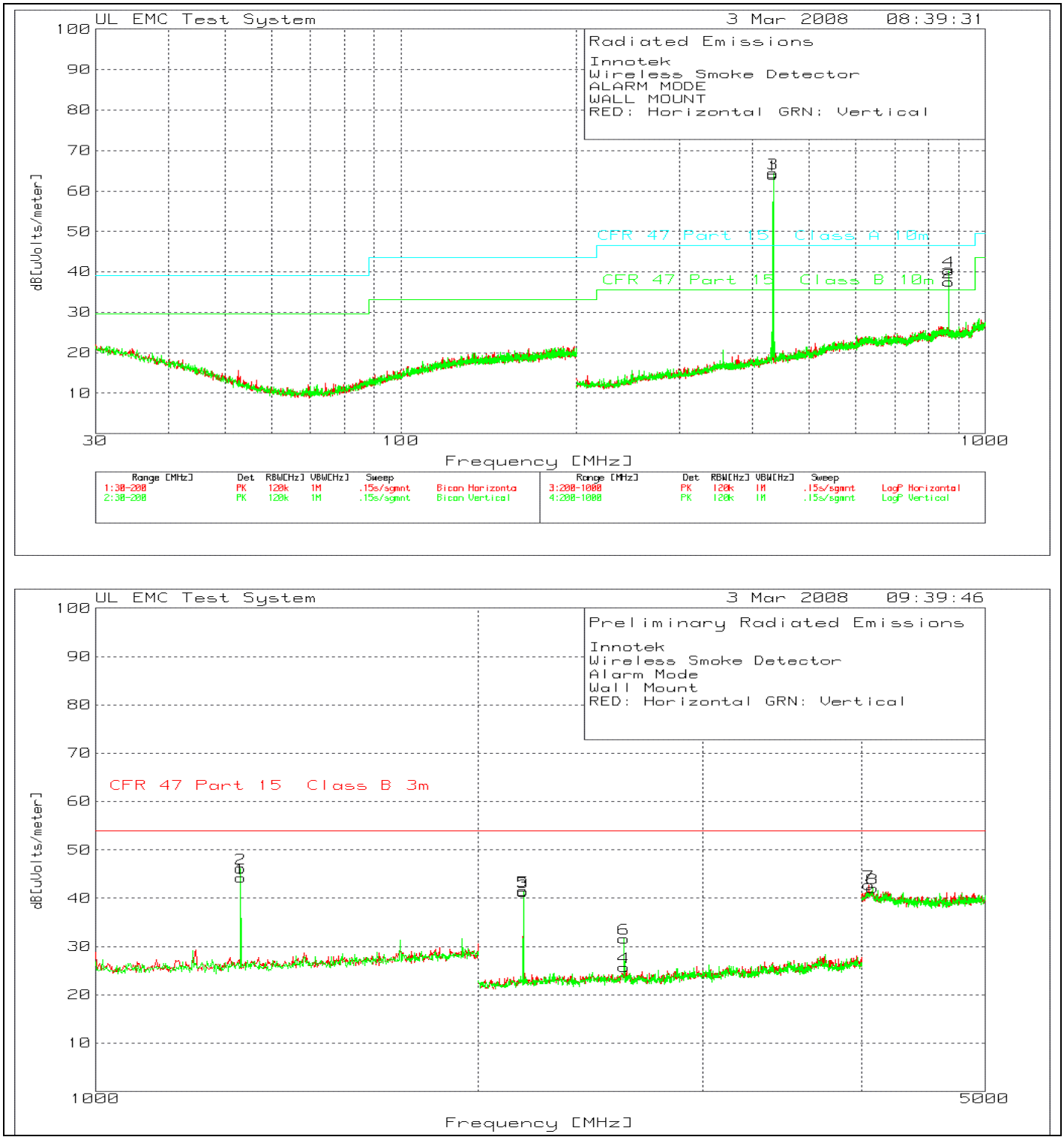


Table 5 Radiated Emissions Data Points - Wall Mount (Alarm Mode / Transmitting)

Innotek
Wireless Smoke Detector
ALARM MODE
WALL MOUNT
RED: Horizontal GRN: Vertical

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4	5	6
1	433.7109	79.7 pk	-32.1	16.4	64	-	-	70.37	35.6	-	-
	Azimuth:181	Height:200 Horz		Margin [dB]		-	-	17.6	28.4	-	-
2	866.7555	46.6 pk	-31.8	22.7	37.5	-	-	46.4	35.6	-	-
	Azimuth:68	Height:103 Horz		Margin [dB]		-	-	-8.9	1.9	-	-
3	433.8441	80.1 pk	-32.1	16.4	64.4	-	-	46.4	35.6	-	-
	Azimuth:30	Height:403 Vert		Margin [dB]		-	-	18	28.8	-	-
4	866.7555	49.4 pk	-31.8	22.7	40.3	-	-	46.4	35.6	-	-
	Azimuth:245	Height:200 Vert		Margin [dB]		-	-	-6.1	4.7	-	-

LIMIT 3: CFR 47 Part 15 Class A 10m
LIMIT 4: CFR 47 Part 15 Class B 10m

General Radiated Emissions Limits shown above, special limits apply to transmitter fundamental and harmonics emissions. See table below for final measurements.

Innotek
Wireless Smoke Detector
RED: Horizontal GRN: Vertical

Harmonic #	Frequency MHz	Azimuth	Height	Ant. Polarization	Measurement Distance	Detector	Meter Reading dBuV	Gain/Loss Factor dB	Transducer Factor dB	Level dBuV/m	Duty Cycle Factor dB	Corrected Level dBuV/m	Limit dBuV/m	Margin dB
Celinig, 1ST	433.6939	72	152	H	10	QP	79.51	-32.1	16.4	63.81	-7.95	55.86	70.37	-14.51
Celinig, 1ST	433.6962	179	394	V	10	QP	80.41	-32.1	16.4	64.71	-7.95	56.76	70.37	-13.61
Ceiling, 2nd	867.3910	275	122	H	10	QP	46.03	-31.8	22.7	36.93	-7.95	28.98	50.37	-21.39
Ceiling, 2nd	867.3905	88	215	V	10	QP	49.24	-31.8	22.7	40.14	-7.95	32.19	50.37	-18.18

pk - Peak detector
qp - Quasi-Peak detector

Innotek
Wireless Smoke Detector
Alarm Mode
Wall Mount
RED: Horizontal GRN: Vertical

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4	5	6
1	1300.601	74.67 pk	-55.37	24.9	44.2	54	-	-	-	-	-
		Height:100 Horz		Margin [dB]		-9.8	-	-	-	-	-
3	2168.168	71.75 pk	-52.17	21.7	41.28	54	-	-	-	-	-
		Height:100 Horz		Margin [dB]		-12.72	-	-	-	-	-
4	2602.603	54.96 pk	-51.54	22.3	25.72	54	-	-	-	-	-
		Height:100 Horz		Margin [dB]		-28.28	-	-	-	-	-
7	4050.1	65.83 pk	-51.48	28.4	42.75	54	-	-	-	-	-
		Height:150 Horz		Margin [dB]		-11.25	-	-	-	-	-
2	1300.601	76.62 pk	-55.37	24.9	46.15	54	-	-	-	-	-
		Height:100 Vert		Margin [dB]		-7.85	-	-	-	-	-
5	2168.168	71.95 pk	-52.17	21.7	41.48	54	-	-	-	-	-
		Height:150 Vert		Margin [dB]		-12.52	-	-	-	-	-
6	2602.603	60.84 pk	-51.54	22.3	31.6	54	-	-	-	-	-
		Height:150 Vert		Margin [dB]		-22.4	-	-	-	-	-
8	4078.156	64.95 pk	-51.27	28.4	42.08	54	-	-	-	-	-
		Height:150 Vert		Margin [dB]		-11.92	-	-	-	-	-

LIMIT 1: CFR 47 Part 15 Class B 3m

Innotek
Wireless Smoke Detector
Alarm Mode
Wall Mount
RED: Horizontal GRN: Vertical

Maximized Peak Data – Correction Factor is not applied nor needed.

Frequency [MHz]	Test Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4	5	6
1301.021	79.08 pk	-55.37	24.9	48.61	54	-	-	-	-	-
Azimuth: 268	Height:100 Vert		Margin [dB]:		-5.39	-	-	-	-	-
1301.1353	77.28 pk	-55.36	24.9	46.82	54	-	-	-	-	-
Azimuth: 247	Height:141 Horz		Margin [dB]:		-7.18	-	-	-	-	-
2168.3627	73.94 pk	-52.17	21.7	43.47	54	-	-	-	-	-
Azimuth: 86	Height:109 Vert		Margin [dB]:		-10.53	-	-	-	-	-
2602.0972	67.08 pk	-51.55	22.3	37.83	54	-	-	-	-	-
Azimuth: 42	Height:101 Vert		Margin [dB]:		-16.17	-	-	-	-	-
2168.493	73.82 pk	-52.17	21.7	43.35	54	-	-	-	-	-
Azimuth: 100	Height:108 Horz		Margin [dB]:		-10.65	-	-	-	-	-

LIMIT 1: CFR 47 Part 15 Class B 3m

pk - Peak detector

Figure 5 Radiated Emissions Graph – Ceiling Mount (Alarm Mode / Transmitting)

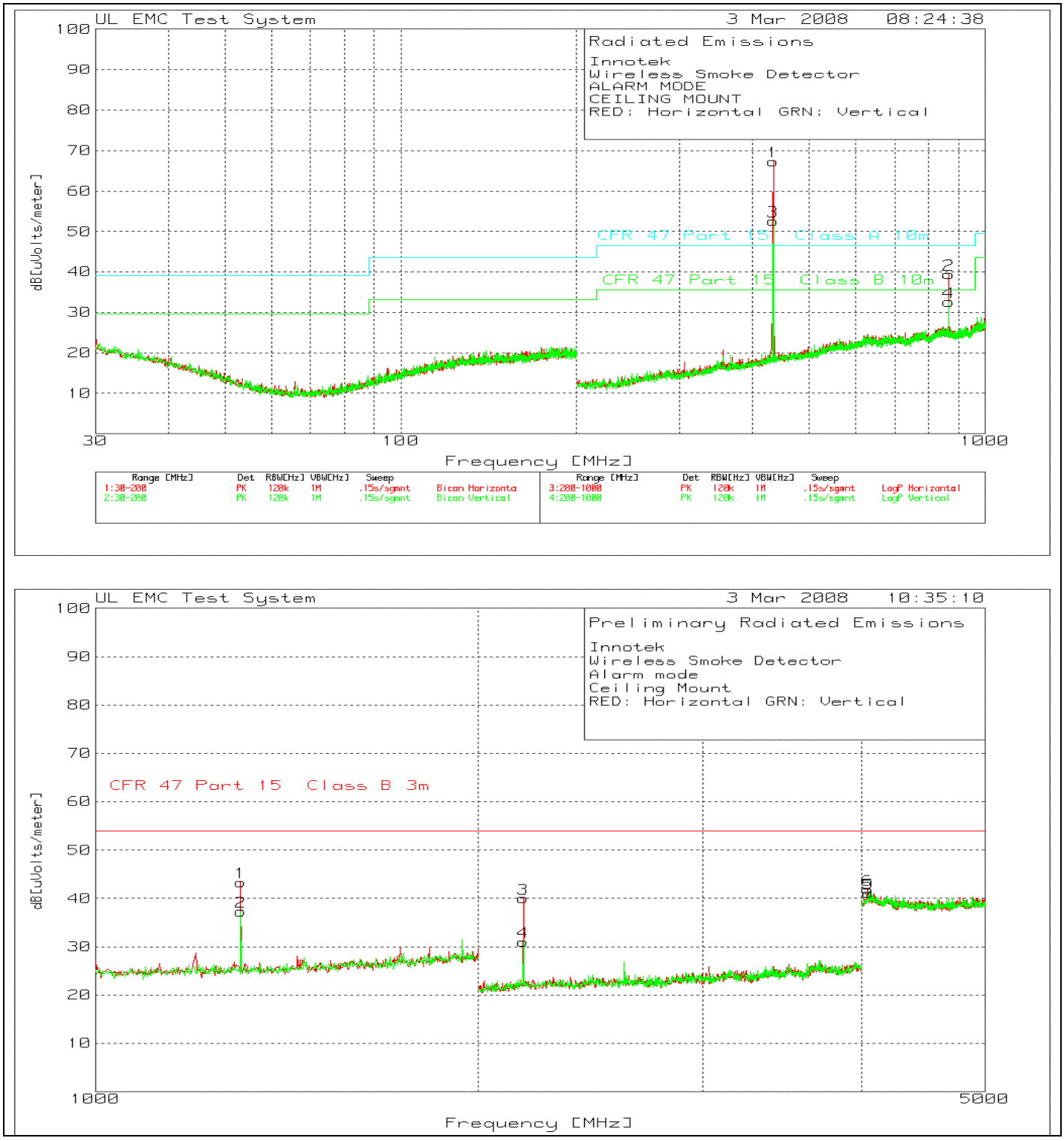


Table 6 Radiated Emissions Data Points - Wall Mount (Alarm Mode / Transmitting)

Innotek
Wireless Smoke Detector
ALARM MODE
CEILING MOUNT
RED: Horizontal GRN: Vertical

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4	5	6
1	433.7109	83 pk	-32.1	16.4	67.3	-	-	46.4	35.6	-	-
	Azimuth:218	Height:201 Horz		Margin [dB]		-	-	20.9	31.7	-	-
2	866.7555	48.5 pk	-31.8	22.7	39.4	-	-	46.4	35.6	-	-
	Azimuth:180	Height:99 Horz		Margin [dB]		-	-	-7	3.8	-	-
3	433.7109	68.3 pk	-32.1	16.4	52.6	-	-	46.4	35.6	-	-
	Azimuth:321	Height:201 Vert		Margin [dB]		-	-	6.2	17	-	-
4	866.7555	41.7 pk	-31.8	22.7	32.6	-	-	46.4	35.6	-	-
	Azimuth:55	Height:201 Vert		Margin [dB]		-	-	-13.8	-3	-	-

LIMIT 1: NONE
LIMIT 2: NONE
LIMIT 3: CFR 47 Part 15 Class A 10m
LIMIT 4: CFR 47 Part 15 Class B 10m

General Radiated Emissions Limits shown above, special limits apply to transmitter fundamental and harmonics emissions. See table below for final measurements.

Harmonic #	Frequency MHz	Azimuth	Height	Ant. Polarization	Measurement Distance	Detector	Meter Reading dBuV	Gain/Loss Factor dB	Transducer Factor dB	Level dBuV/m	Duty Cycle Factor dB	Corrected Level dBuV/m	Limit dBuV/m	Margin dB
Celinig, 1ST	433.6971	115	213	H	10	QP	84.06	-32.1	16.4	68.36	-7.95	60.41	70.37	-9.96
Celinig, 1ST	433.6946	9	154	V	10	QP	66.99	-32.1	16.4	51.29	-7.95	43.34	70.37	-27.03
Ceiling, 2nd	867.3924	141	102	H	10	QP	48.55	-31.8	22.7	39.45	-7.95	31.5	50.37	-18.87
Ceiling, 2nd	867.3899	76	363	V	10	QP	42.17	-31.8	22.7	33.07	-7.95	25.12	50.37	-25.25

Innotek
Wireless Smoke Detector
Alarm mode
Ceiling Mount
RED: Horizontal GRN: Vertical

No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4	5	6
1	1300.601	73.79 pk	-55.37	24.9	43.32	54	-	-	-	-	-
		Height:100 Horz		Margin [dB]		-10.68	-	-	-	-	-
3	2168.168	70.45 pk	-52.17	21.7	39.98	54	-	-	-	-	-
		Height:100 Horz		Margin [dB]		-14.02	-	-	-	-	-
6	4042.084	64.95 pk	-51.62	28.5	41.83	54	-	-	-	-	-
		Height:150 Horz		Margin [dB]		-12.17	-	-	-	-	-
2	1300.601	67.75 pk	-55.37	24.9	37.28	54	-	-	-	-	-
		Height:150 Vert		Margin [dB]		-16.72	-	-	-	-	-
4	2168.168	61.49 pk	-52.17	21.7	31.02	54	-	-	-	-	-
		Height:100 Vert		Margin [dB]		-22.98	-	-	-	-	-
5	4048.096	64.07 pk	-51.5	28.5	41.07	54	-	-	-	-	-
		Height:150 Vert		Margin [dB]		-12.93	-	-	-	-	-

LIMIT 1: CFR 47 Part 15 Class B 3m

Innotek
Wireless Smoke Detector
Alarm mode
Ceiling Mount
RED: Horizontal GRN: Vertical

Maximized Peak Data – Correction Factor is not applied nor needed.

Frequency [MHz]	Test Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4	5	6
1 - 2GHz 1000 - 2000MHz										
1300.9589	78.98 pk	-55.37	24.9	48.51	54	-	-	-	-	-
Azimuth: 82	Height:139 Horz		Margin [dB]:	-5.49		-	-	-	-	-
1301.2134	73.42 pk	-55.36	24.9	42.96	54	-	-	-	-	-
Azimuth: 3	Height:166 Vert		Margin [dB]:	-11.04		-	-	-	-	-
2 - 4GHz 2000 - 4000MHz										
2168.3758	68.63 pk	-52.17	21.7	38.16	54	-	-	-	-	-
Azimuth: 266	Height:124 Vert		Margin [dB]:	-15.84		-	-	-	-	-
2168.3918	74.24 pk	-52.17	21.7	43.77	54	-	-	-	-	-
Azimuth: 195	Height:124 Horz		Margin [dB]:	-10.23		-	-	-	-	-

LIMIT 1: CFR 47 Part 15 Class B 3m

pk - Peak detector

4.2 Test Conditions and Results – Pulse Train

Test Description	Measurements were made in the laboratory environment. A Dipole (or equivalent) antenna tuned to the transmit frequency was attached to the input of a spectrum analyzer. The pulse train was measured with the spectrum analyzer set to zero span at the fundamental frequency.
Basic Standard	FCC Part 15 Subpart A, 15.35
Pulse Train Limits	
There are no limits for this test. This data is used to calculate the averaging correction factor that is applied to the measured peak radiated emissions results.	

Table 7 Pulse Train Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	2
Supplementary information: None		

Table 8 Pulse Train Calculation

Pulse Width (mS)	Total Transmission time or 100ms which ever is lesser	Average Correction Factor (dB) $20\log\left(\frac{PulseWidth}{TotalTransmissionTime}\right)$
40ms	100ms	7.95dB

Table 9 Pulse Train Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Agilent	E7405A	EMC4242
Near Filed Probe	EMCO	-	-

Figure 6 Test Setup for Pulse Train

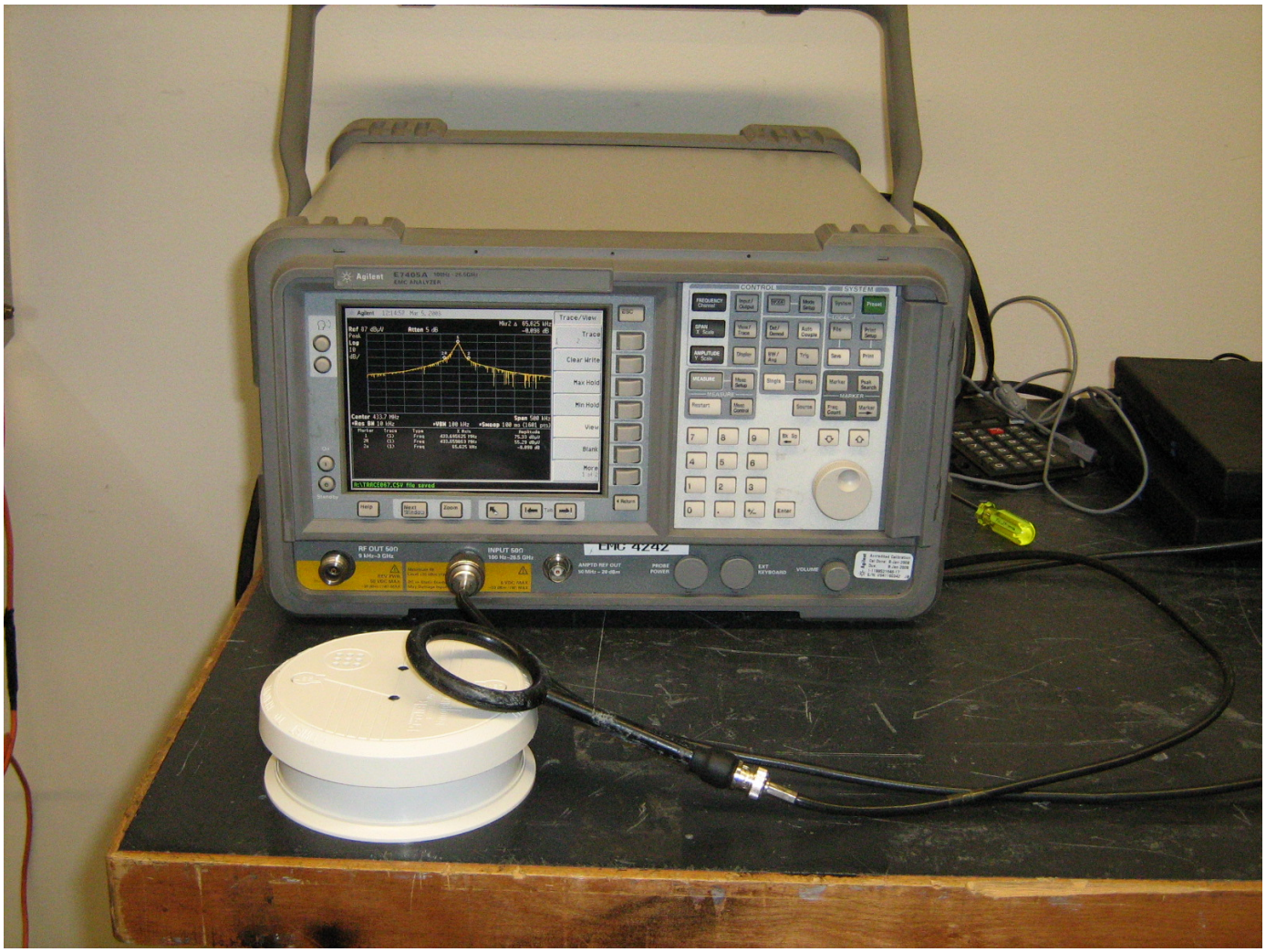
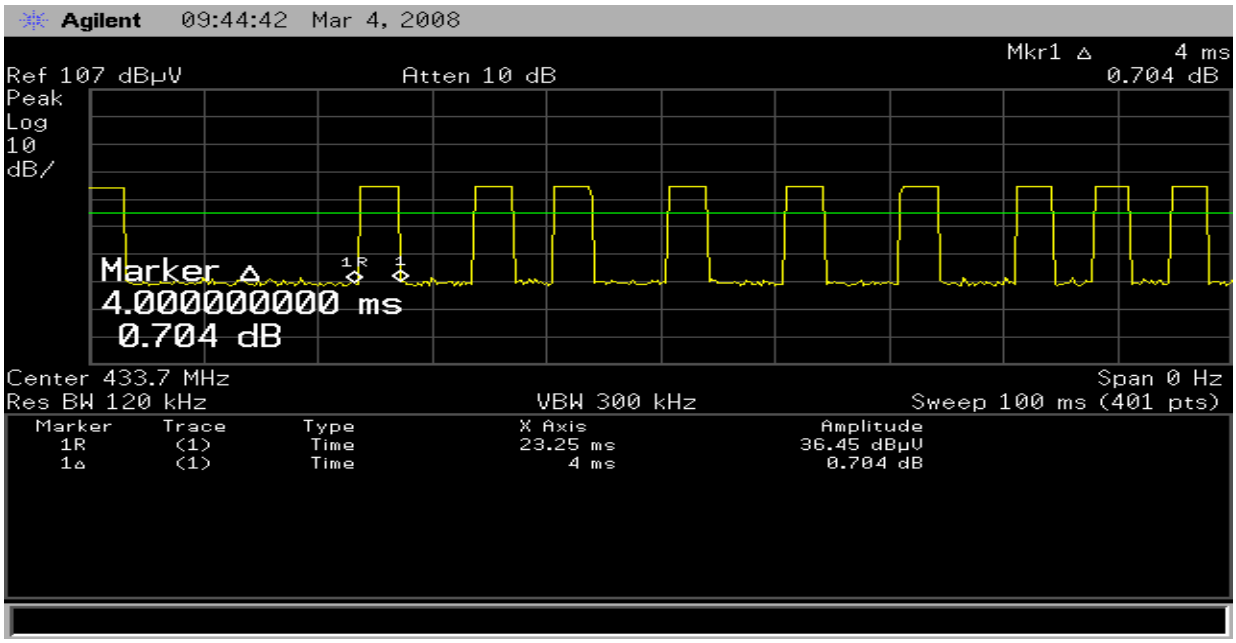
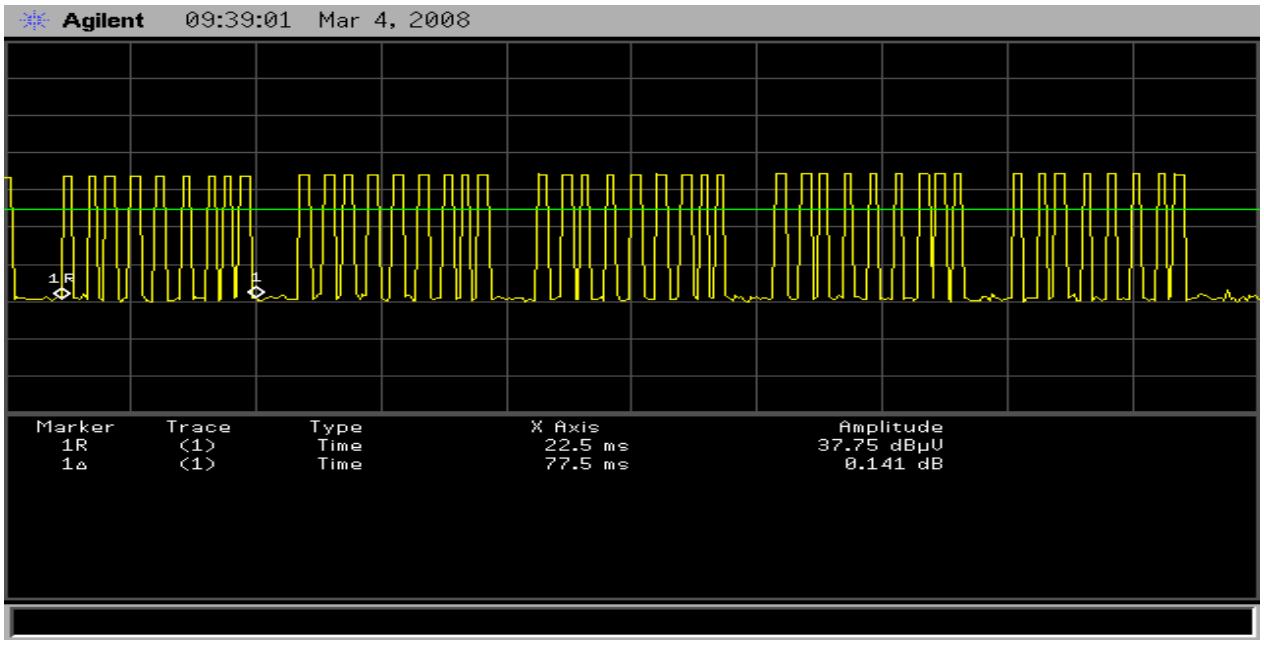


Figure 7 Pulse Train Graph



100ms Data



500ms Capture

The worst case pulse train shows ten 40mS transmitions in 100ms.

4.3 Test Conditions and Results – Cease Operation

Test Description	Measurements were made in the laboratory environment. A Dipole (or equivalent) antenna tuned to the transmit frequency was attached to the input of a spectrum analyzer. The device was operated and the transmission time measured with the spectrum analyzer set to zero span at the fundamental frequency.
Basic Standard	15.231(a)
Cease Operation Limits	
The transmissions shall stop within 5 seconds of either a button being released or if automatically controlled transmissions shall be stopped 5 seconds after transmissions begin.	

Table 10 Cease Operation Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	2
Supplementary information: None		

Table 11 Cease Operation Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Agilent	E7405A	EMC4242
Near Filed Probe	EMCO	-	-

In All cases (learn or test mode) the transmitter ceases operation in less then 300mS.

Figure 8 Test Setup for Cease Operation

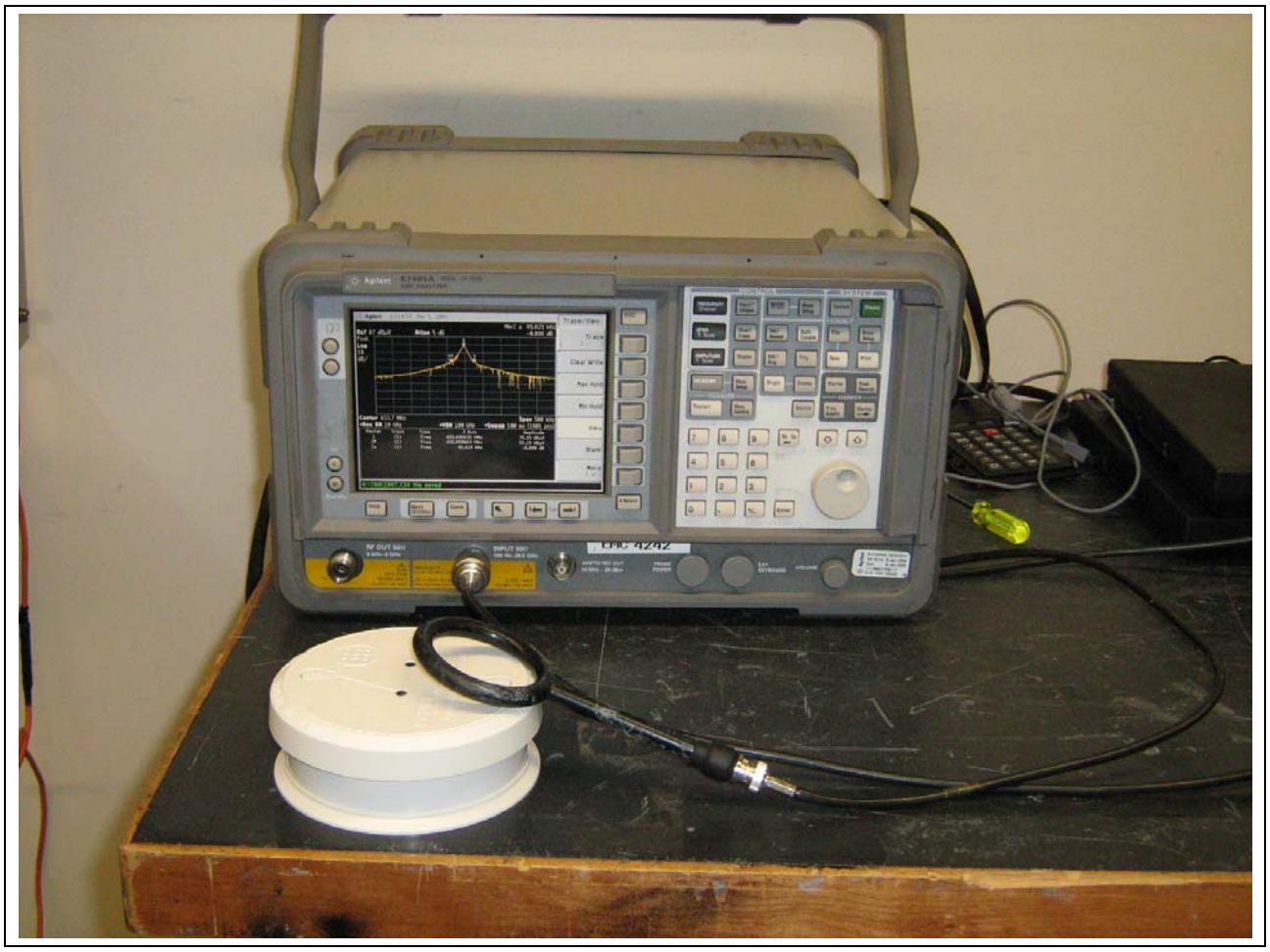
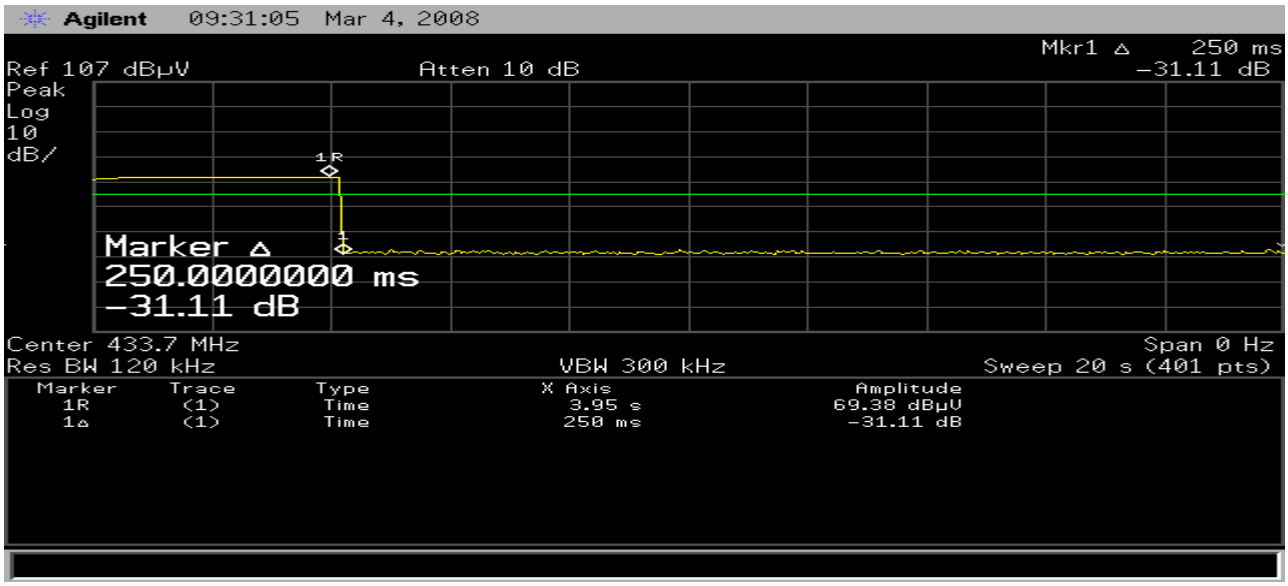
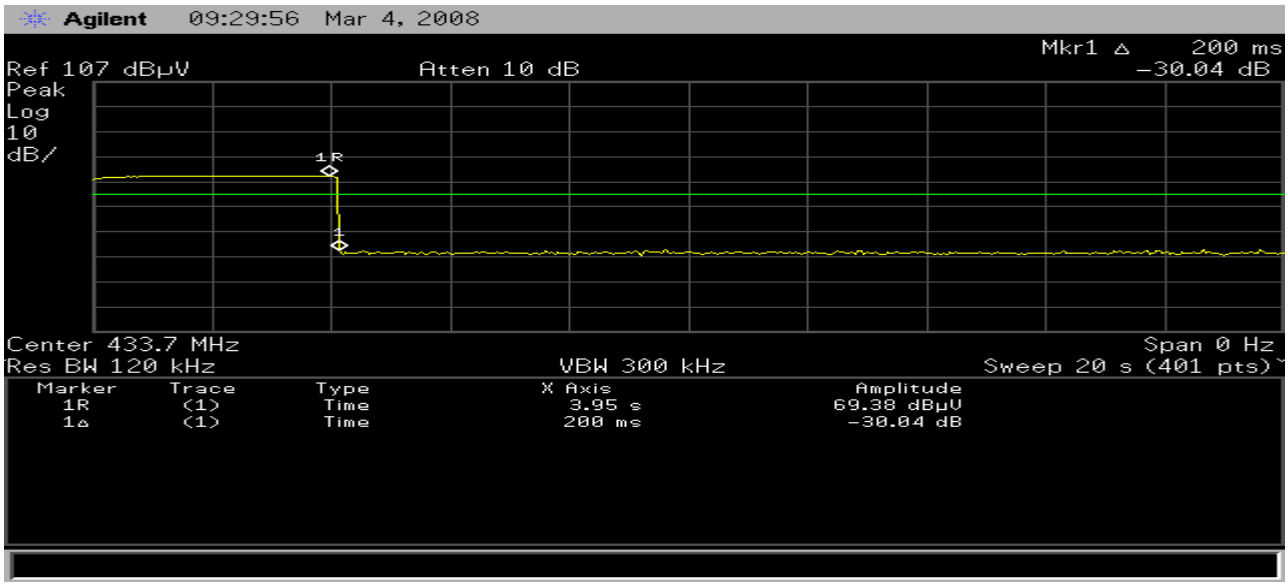


Figure 9 Cease Operation Graph



Learn Mode Cease Operation (250ms)



Test Mode / Transmit (identical to the stop of alarm condition) Cease Operation Time (200ms)

4.4 Test Conditions and Results – Bandwidth Measurements

Test Description	Measurements were made in the laboratory environment. A Dipole (or equivalent) antenna tuned to the transmit frequency was attached to the input of a spectrum analyzer. The device was operated and the spectrum analyzer resolution bandwidth set per the appropriate standard.
Basic Standard	
Occupied Bandwidth Limits	
0.25% of the Center Frequency (1.083MHz for 433MHz)	

Table 12 Occupied Bandwidth Configuration Settings

Power Interface Mode #	EUT Configurations Mode #	EUT Operation Mode #
1	2	2
Supplementary information: None		

Table 13 Occupied Bandwidth Spectrum Analyzer Settings

Resolution Bandwidth (MHz)	Occupied Bandwidth Requirements	
	dB	%
0.01	-20	99
Supplementary information: None		

Table 14 Occupied Bandwidth Test Equipment

Description	Manufacturer	Model	Identifier
Spectrum Analyzer	Agilent	E7405A	EMC4242
Near Filed Probe	EMCO	-	-

Table 15 Bandwidth Test Results

20dB BW	**65.625kHz**
99% BW (calculated from trace data points)	**147.813kHz**

Figure 10 Test Setup for Occupied Bandwidth

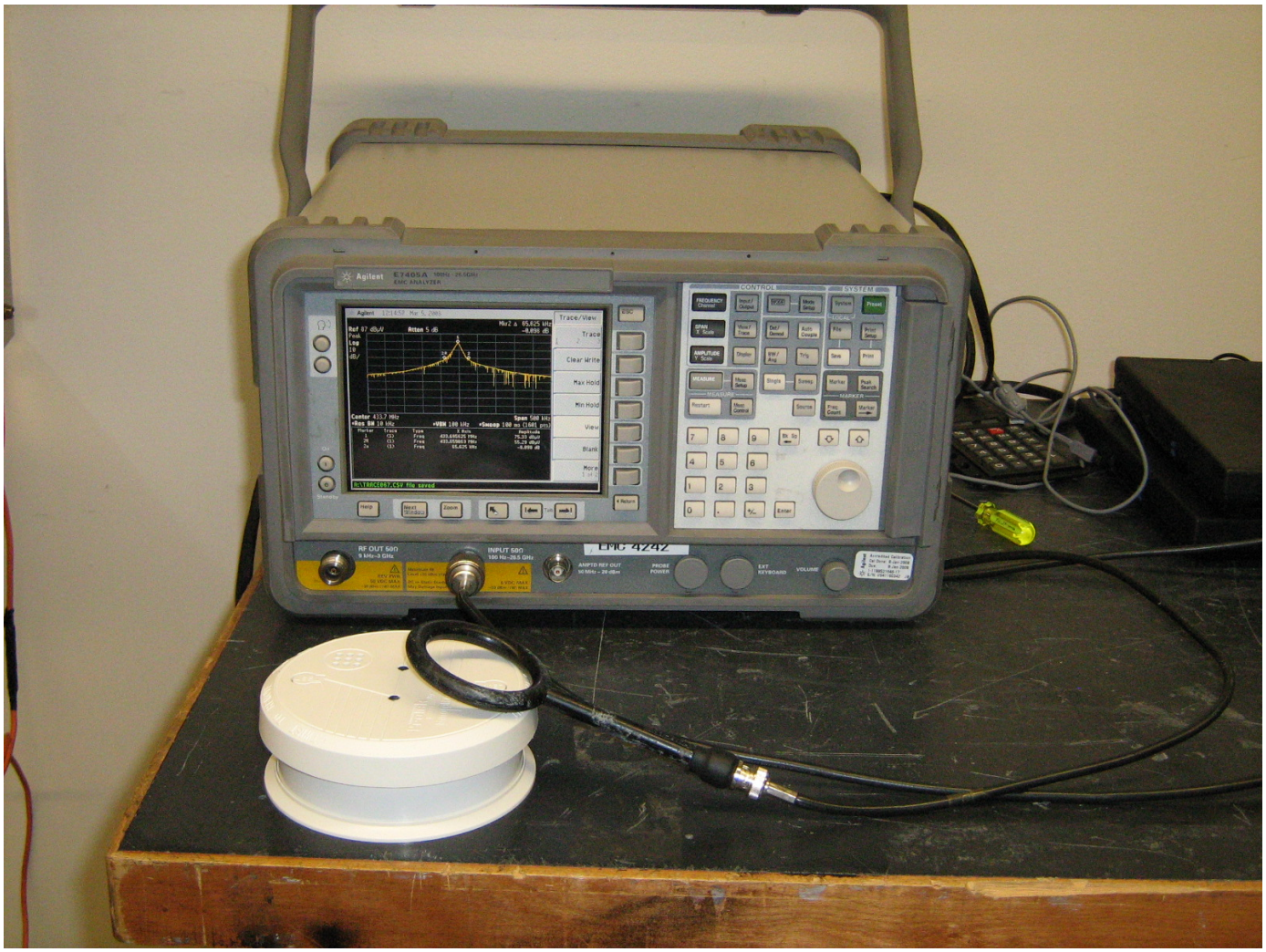


Figure 11 Occupied 20dB Bandwidth Graph

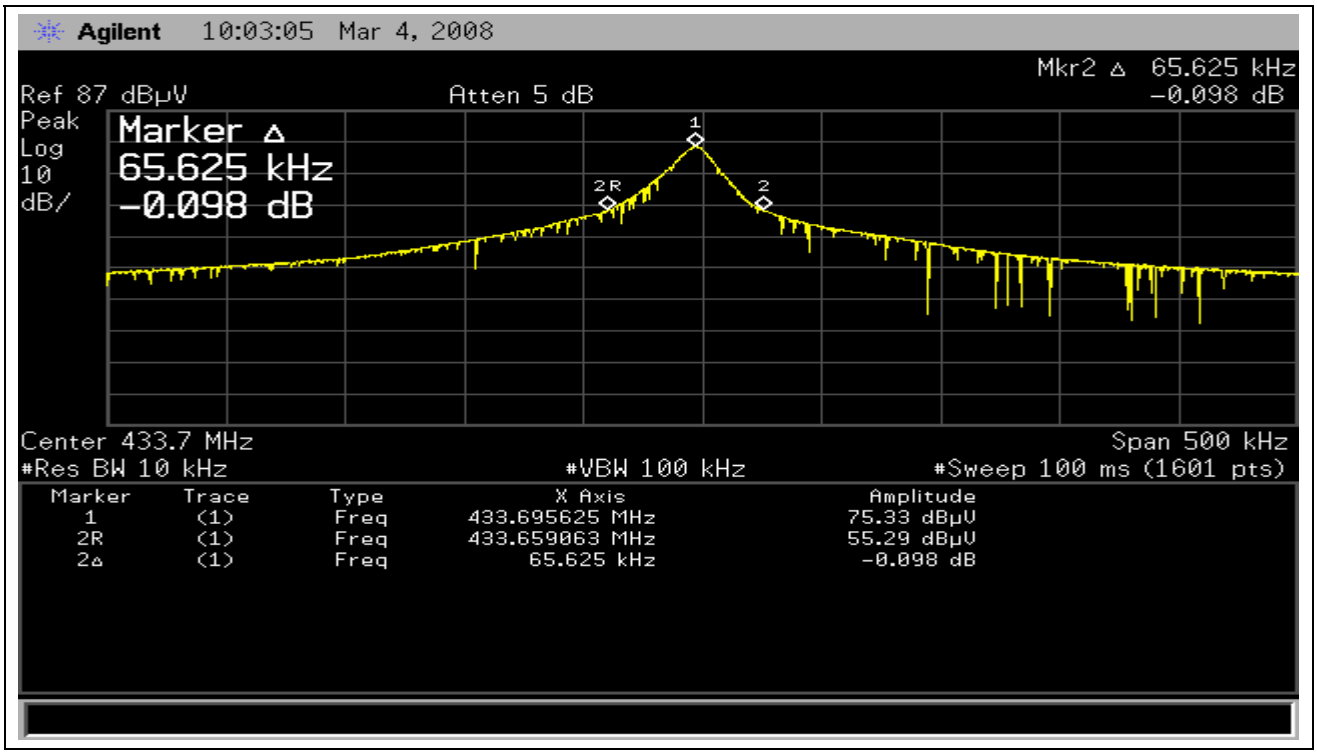
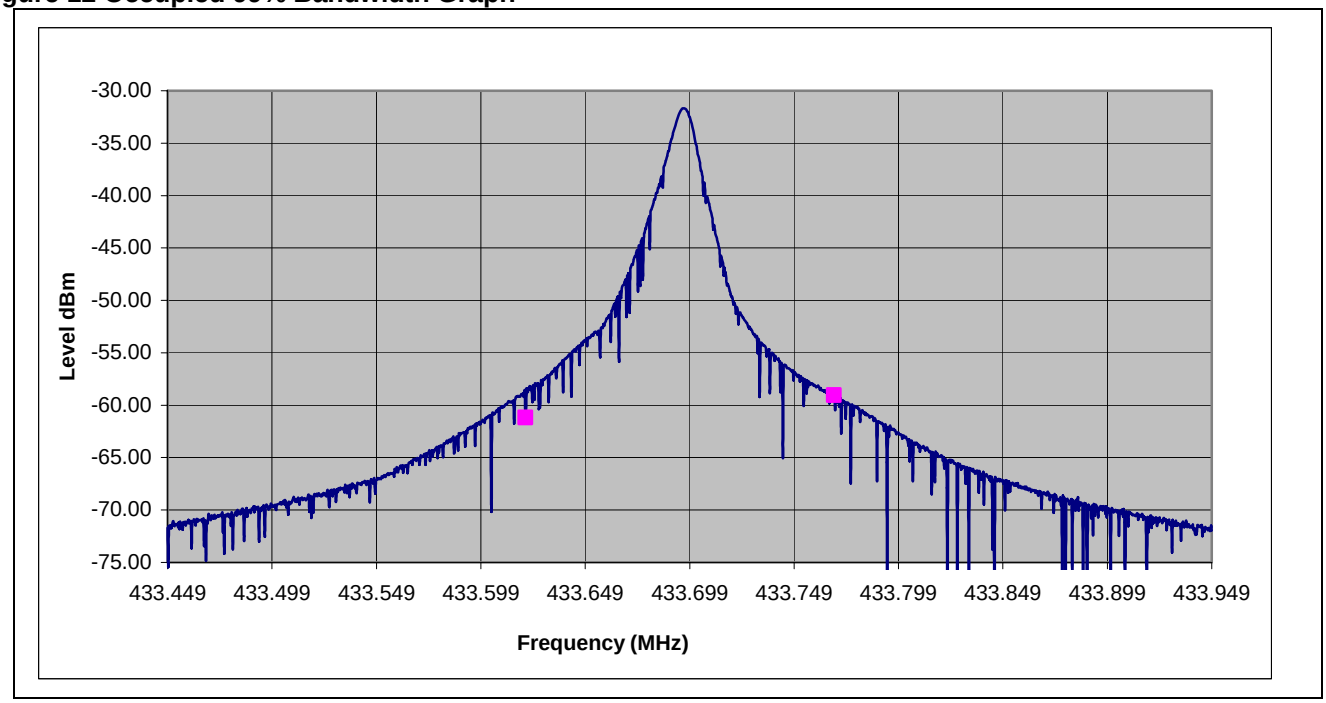


Figure 12 Occupied 99% Bandwidth Graph



Appendix A

Accreditations and Authorizations

NVLAP Lab code: 100414-0

NVLAP: Recognized under the National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC EN17025 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. For a full scope listing see http://ts.nist.gov/ts/htdocs/210/214/scopes/1004140.htm

FCC: Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland (Ref. No. 91044).

Industry Canada Industrie Canada

Industry of Canada: Accredited by Industry Canada for performance of radiated measurements. Our test site complies with RSP 100, Issue 7, Section 3.3. File #: IC 2180

VCCI: Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test report have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. Registration Nos.: Radiated Emissions R-621, Conducted Emissions C-642.

ICASA: ICASA (Independent Communications Authority of South Africa) has appointed UL as a Designated Test Laboratory to test Telecommunications equipment for type approval in compliance with CISPR 22 to assist in fulfilling its mandate under section 54(1) of the Telecommunications Act, 1996 (Act 103 of 1996).

NIST/CAB: Validated by the European Commission as a U.S. Conformity Assessment Body (CAB) of the U.S.-EU Mutual Recognition Agreement (MRA) for the Electromagnetic Compatibility - Council Directive 89/336/EEC, Article 10 (2). Also validated for the Telecommunication Equipment-Council Directive 99/5/EC, Annex III and IV, Identification Number: 0983.
NIST/CAB: Provisioned to act as a U.S. Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the Asia Pacific Economic Cooperation (APEC) MRA between the American Institute in Taiwan (AIT) and the United States. Our laboratory is considered qualified to test equipment subject to the applicable EMC regulations of the Chinese Taipei Bureau of Standards, Metrology and Inspection (BSMI) which require testing to CNS 13438 (CISPR 22).
NIST/CAB: Recognized by the Infocomm Development Authority of Singapore (IDA) under the Asia Pacific Economic Cooperation Mutual Recognition Agreement (APEC MRA). Our laboratory is provisionally designated to act as a Conformity Assessment Body (CAB) under Appendix B, Phase I Procedures, of the APEC MRA. Our scope of designation includes IDA TS EMC (CISPR 22), IEC 61000-4-2, -4-3, -4-4, -4-5, and -4-6