TEST REPORT NO: RU1277/7357

COPY NO: 2

ISSUE NO: 1

FCC ID: G2X-6460474A

REPORT ON THE CERTIFICATION TESTING OF A
TUNSTALL TELECOM Ltd
RADIO SMOKE DETECTOR
WITH RESPECT TO
FCC RULES CFR 47, PART 15.231 August 2006
INTENTIONAL RADIATOR SPECIFICATION

TEST DATE: 15th – 29th November 2006

TESTED BY: S HODGKINSON
Digitally signed by S HODGKINSON
DN: CN = S HODGKINSON, C = GB, O = TRL COMPLIANCE LTD
Reason: I am the author of this document
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S Hodgkinson

APPROVED BY: John Charters
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Date: 2006.12.13 14:37:19 Z
J Charters
Radio Section Leader

DATE: 11th December 2006

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UKAS TESTING
0728

CONTENTS

Notes:

1. Component failure during test — YES [ ] NO [X]
2. If Yes, details of failure:
3. The facilities used for the testing of the product contain in this report are FCC Listed.
4. The contents of the attached applicants declarations and other supplied information are not covered by the scope of this laboratory's UKAS or FCC accreditations' and is provided in good faith.

CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY:	G2X-6460474A
PURPOSE OF TEST:	Certification
TEST SPECIFICATION:	FCC RULES CFR 47, Part 15.231 August 2006
TEST RESULT:	Compliant to Specification
EQUIPMENT UNDER TEST:	Radio Smoke Detector
EQUIPMENT SERIAL No:	46061998 & 46062000
ITU: EMISSION CODE:	70k5F1D
EQUIPMENT TYPE:	Low Power Radio Smoke Detector
PRODUCT USE:	Personal Care Monitoring & Alarm System
CARRIER EMISSION:	4897.78 µV/m @ 3m
ANTENNA TYPE:	Integral
ALTERNATIVE ANTENNA:	Not applicable
FREQUENCY OF OPERATION:	312 MHz
CHANNEL SPACING:	Not applicable, wideband
NUMBER OF CHANNELS:	1
FREQUENCY GENERATION:	SAW Resonator [ ] Crystal [X] Synthesiser [ ]
MODULATION METHOD:	Amplitude [ ] Digital [X] Angle [ ]
POWER SOURCE(s):	+9Vdc
TEST DATE(s):	15th – 29th November 2006
ORDER No(s):	58792
APPLICANT:	Tunstall Telecom Ltd
ADDRESS:	Whitley Lodge Whitley Bridge Yorkshire DN14 0HR

TESTED BY: S HODGKINSON

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J Charters
Radio Section Leader

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	Radio Smoke Detector
EQUIPMENT TYPE:	Low Power Radio Smoke Detector
SERIAL NUMBER OF EUT:	46061998 & 46062000
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 15.231 August 2006
TEST RESULT:	COMPLIANT Yes [X] No [ ]
APPLICANT'S CATEGORY:	MANUFACTURER [X] IMPORTER [ ] DISTRIBUTOR [ ] TEST HOUSE [ ] AGENT [ ]
APPLICANT'S ORDER No(s):	58792
APPLICANT'S CONTACT PERSON(s):	Mr R Nadin
E-mail address:	R_NADIN@tunstall.co.uk
APPLICANT:	Tunstall Telecom Ltd
ADDRESS:	Whitley Lodge Whitley Bridge Yorkshire DN14 0HR
TEL:	+44 (0) 1977 661234
FAX:	+44 (0) 1977 662452
EUT(s) COUNTRY OF ORIGIN:	United Kingdom
TEST LABORATORY:	TRL Compliance
UKAS ACCREDITATION No:	0728
TEST DATE(s):	15th – 29th November 2006
TEST REPORT No:	RU1277/7357

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.

TEST/EXAMINATION	RULE PART	DETECTOR	APPLICABILITY
Intentional Emission Frequency:	15.231(b)	Quasi Peak	Yes
Intentional Emission Field Strength:	15.231(b)	Quasi Peak	Yes
Intentional Emission Band Occupancy:	15.231(c)	Peak	Yes
Intentional Emission ERP (mW):	-	-	No
Spurious Emissions – Conducted:	15.207	-	No
Spurious Emissions – Radiated <1000MHz:	15.231(b) 15.209	Quasi Peak	Yes
Spurious Emissions – Radiated >1000MHz:	15.231(b) 15.209	Quasi Peak Average	Yes
Maximum Frequency of Search:	15.33	-	Yes
Antenna Arrangements Integral:	15.203	-	Yes
Antenna Arrangements External Connector:	15.204	-	N/A
Restricted Bands:	15.205	-	Yes
Extrapolation Factor:	15.31(f)	-	Yes

2. Product Use: Personal Care Monitoring & Alarm System

3. Emission Designator: 70k5F1D

4. Duty Cycle: <100%

5. Transmitter bit or pulse rate and level: 1000bps

6. Temperatures: Ambient (Tnom) 9^{o}C

7. Supply Voltages: Vnom +9Vdc

Note: Vnom voltages are as stated above unless otherwise shown on the test report page

8. Equipment Category:
   Single channel [X]
   Two channel [ ]
   Multi-channel [ ]

9. Channel spacing:
   Narrowband [ ]
   Wideband [X]

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS – RADIATED – PART 15.209

Ambient temperature	=	9°C(<1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	39% (<1GHz),	0.3m measurements >1GHz	[X]
Conditions	=	Open Area Test Site (OATS)	3m extrapolated from 0.3m	[X]
Supply voltage	=	+9Vdc		
Channel number	=	1		

	FREQ (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT	FIELD STRENGTH (dBµV/m)	EXTRAP FACTOR (dB)	FIELD STRENGTH (µV/m)	Limit (µV/m)
1.705MHz - 30MHz	Note 12							
30MHz - 88MHz	Note 12							
88MHz - 216MHz	Note 12							
216MHz - 960MHz	Note 12							
960MHz - 1GHz	Note 12							
1GHz - 5GHz	Note 12							

Limits	1.705MHz to 30MHz	30µV/m @ 30m
	30MHz to 88MHz	100µV/m @ 3m
	88MHz to 216MHz	150µV/m @ 3m
	216MHz to 960MHz	200µV/m @ 3m
	960MHz to 1GHz	500µV/m @ 3m
	1GHz to 5GHz	500µV/m @ 3m

Notes:

1 Results quoted are extrapolated as indicated.
2 Emissions were searched to: (**x**) 1000MHz inclusive, as per Part 15.33a.
3 Extrapolation factor 20dB from 0.3m to 3m, as per Part 15.31f.
4 Measurements >1GHz @ 0.3m as per Part 15.31f(1).
5 Receiver detector <1GHz = CISPR, Quasi-Peak, 120kHz bandwidth.
6 Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth.
7 New batteries used for battery powered products.
8 Due to the transmitted signal lasting only 1.48 seconds a modified unit, which allowed continuous transmission, was used during spurious emissions testing.
10 (r) Denotes restricted band .
11 Spurious limit level of 489µV/m was calculated by reducing the fundamental limit level by 20 dB, as per 15.231(b).
12 Only emissions within 20 dB's of the limit are recorded.

Test Method:

1 As per Radio – Noise Emissions, ANSI C63.4: 2003
2 Measuring distances as Notes 1 to 4 above
3 EUT 0.8 metre above ground plane
4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthagonal planes.
Maximum results recorded.

The test equipment used for the Transmitter Spurious Emissions – Radiated – Part 15.209 test are shown overleaf:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
HORN ANTENNA	EMCO	3115	9010-3580	138	**X**
SPECTRUM ANALYSER	R & S	FSU 46	200034	UH281	**X**
RANGE 1	TRL	3 METRE	N/A	UH06	**X**
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	**X**
RECEIVER	ROHDE & SCHWARZ	ESVS 10	841431/014	UH186	**X**

TRANSMITTER TESTS

TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.231

Ambient temperature	=	9°C(<1GHz),	3m measurements @ fc	[X]
Relative humidity	=	39%(<1GHz),	10m measurements @ fc	[ ]
Conditions	=	Open Area Test Site (OATS)	30m measurements @ fc	[ ]
Supply voltage	=	+9Vdc	30m extrapolated from 3m	[ ]
Channel number	=	1	30m extrapolated from 10m	[ ]

EUT	FREQ (MHz)	MEASUREMENT Rx. READING (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	FIELD STRENGTH (µV/m)
Radio Smoke Detector	312	58.40	2.07	13.33	73.8	4897.78
Limit value @ fc		**5916.6 (µV/m)**				
Band occupancy @ -20dBc		**f lower**			**f higher**	
		311.973878 MHz			312.044390 MHz	
		Occupied Bandwidth			**Limit**	
		70.512820 kHz			780 kHz	
Transmitter on time during Alarm Condition		1.48 Seconds from trigger			Removal of the alarm condition	
Transmitter on time during manual transmission. Manual Trigger		1.48 Seconds from trigger			Deactivation within 5 seconds of manual trigger release	

For band occupancy see spectrum analyser plots – Annex C
For transmitter timing pulses see oscilloscope plots – Annex D

Notes:
1. Results quoted are extrapolated as indicated.
2. Receiver detector @ fc = Quasi Peak 120kHz bandwidth.
3. When battery powered the EUT was powered with new batteries.
4. Due to the transmitted signal lasting only 1.48 seconds a modified unit, which allowed continuous transmission, was used during spurious emissions testing.
5. The EUT does not utilise supervisions transmissions as per 15.231(a)(3).

Test Method:
1. As per Radio – Noise Emissions, ANSI C63.4: 2003.
2. Measuring distances 3m.
3. EUT 0.8 metre above ground plane.
4. Emissions maximised by rotation of EUT, on an automatic turntable.
   Raising and lowering the receiver antenna between 1m & 4m.
   Horizontal and vertical polarisations, of the receive antenna.
   EUT orientation in three orthagonal planes.
   Maximum results recorded.

The test equipment used for the Transmitter Intentional Emission – Radiated – Part 15.231 August 2006 tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	R & S	FSU 46	200034	UH281	**X**
RANGE 1	TRL	3 METRE	N/A	UH06	**X**
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	**X**
OSCILLOSCOPE	TEKTRONIX	TDS520B	B020491	UH122	**X**
RECEIVER	ROHDE & SCHWARZ	ESVS 10	841431/014	UH186	**X**

ANNEX A

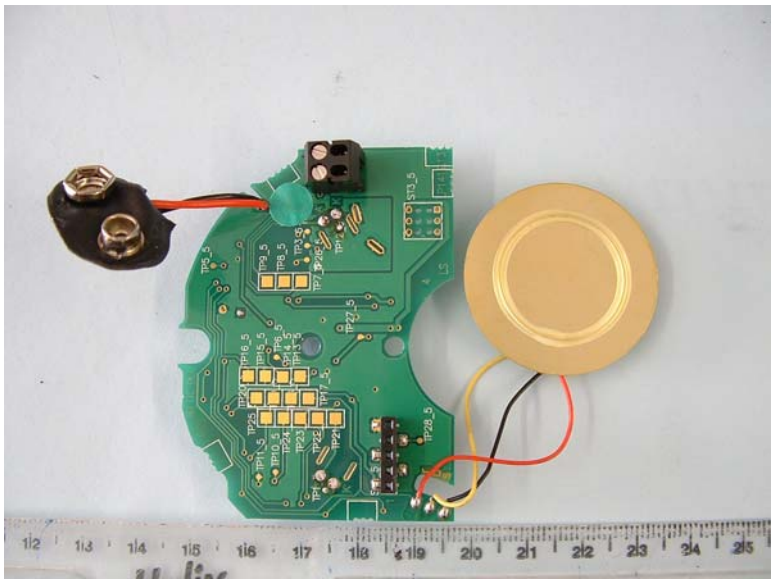
PHOTOGRAPHS

PHOTOGRAPH No. 1 **TEST SETUP**

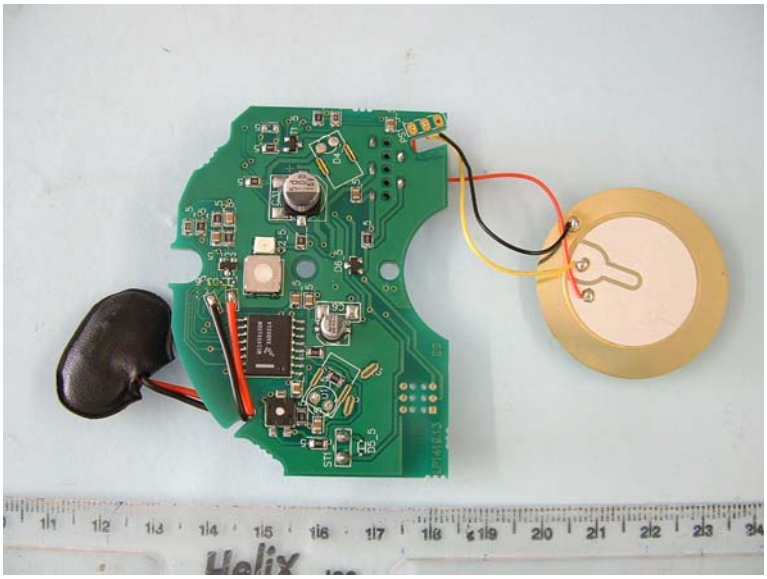
PHOTOGRAPH No. 2 **TRANSMITTER TOP VIEW**

PHOTOGRAPH No. 3 **TRANSMITTER BOTTOM VIEW**

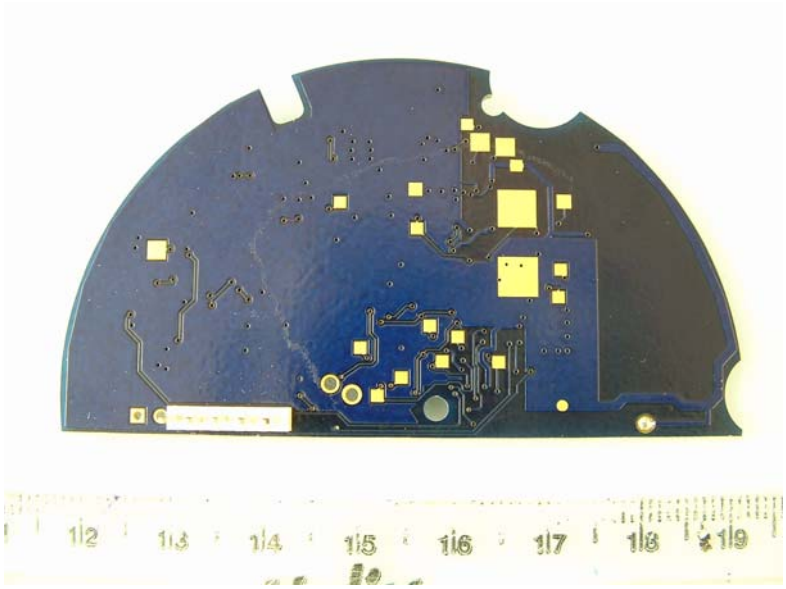
PHOTOGRAPH No. 4 **CONTROL PCB TRACK SIDE**



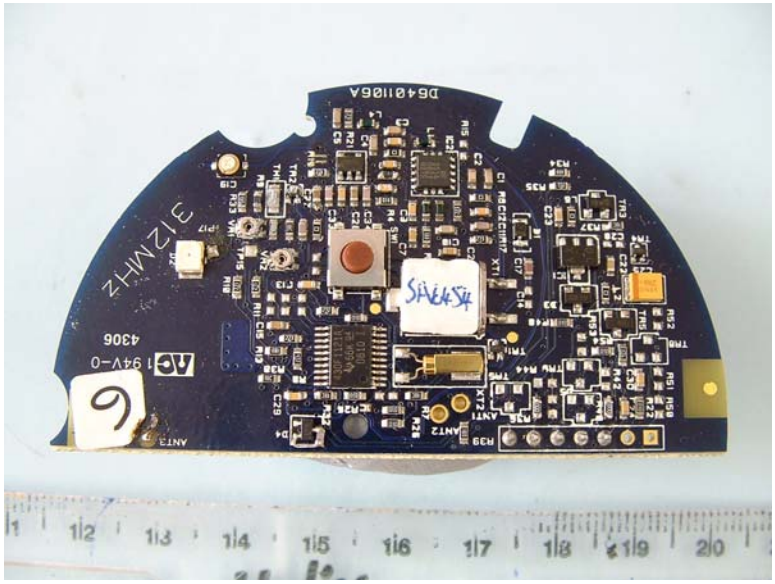
PHOTOGRAPH No. 5 **CONTROL PCB COMPONENT SIDE**



PHOTOGRAPH No. 6 **RF PCB TRACK SIDE**



PHOTOGRAPH No. 7 **RF PCB COMPONENT SIDE**



ANNEX B

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

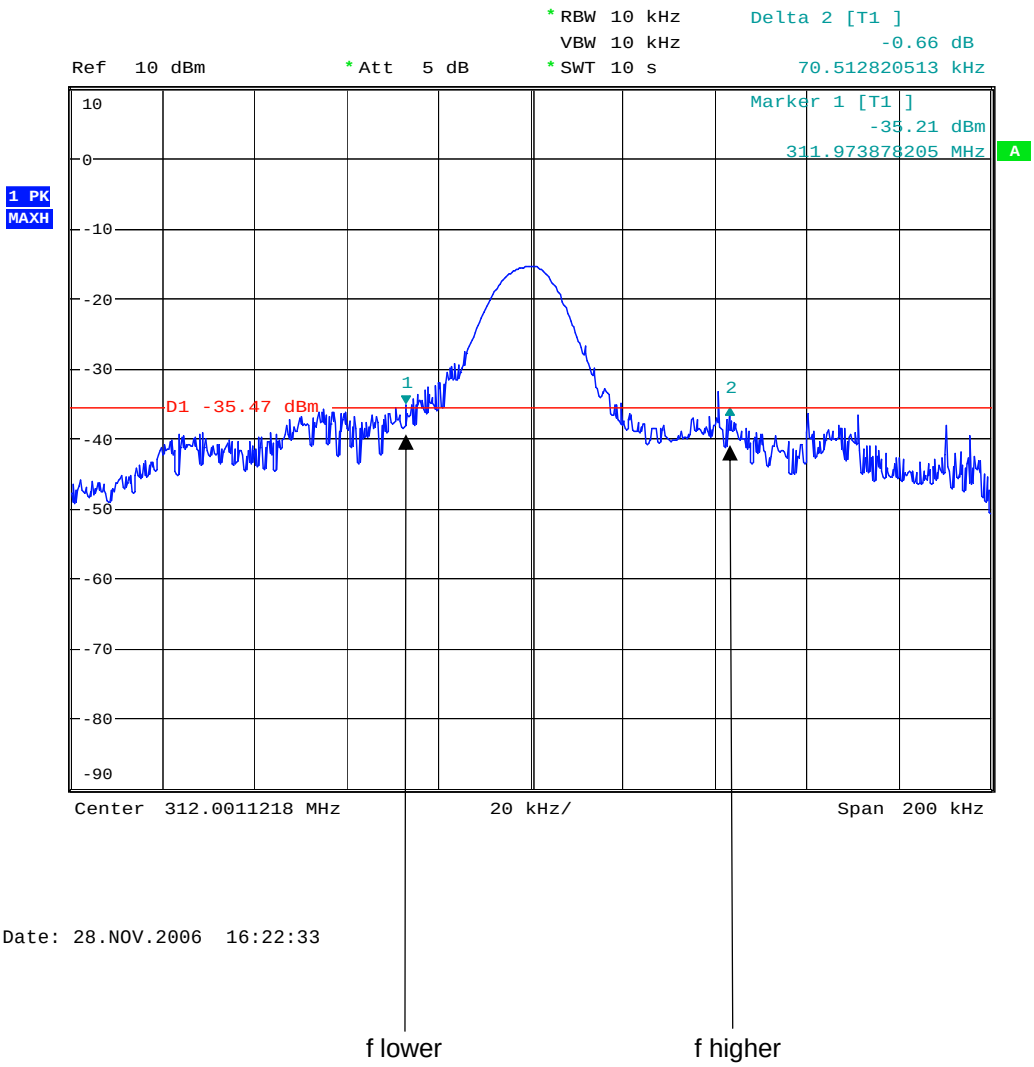
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

a.	TCB	-	APPLICATION	[X]
		-	FEE	[X]
b.	AGENT'S LETTER OF AUTHORISATION	-		[X]
c.	MODEL(s) vs IDENTITY	-		[ ]
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		[ ]
e.	LABELLING	-	PHOTOGRAPHS	[X]
		-	DECLARATION	[ ]
		-	DRAWINGS	[ ]
f.	TECHNICAL DESCRIPTION	-		[X]
g.	BLOCK DIAGRAMS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
h.	CIRCUIT DIAGRAMS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
i.	COMPONENT LOCATION	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
j.	PCB TRACK LAYOUT	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
k.	BILL OF MATERIALS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[X]

ANNEX C

BANDWIDTH PLOT

BANDWIDTH PLOT

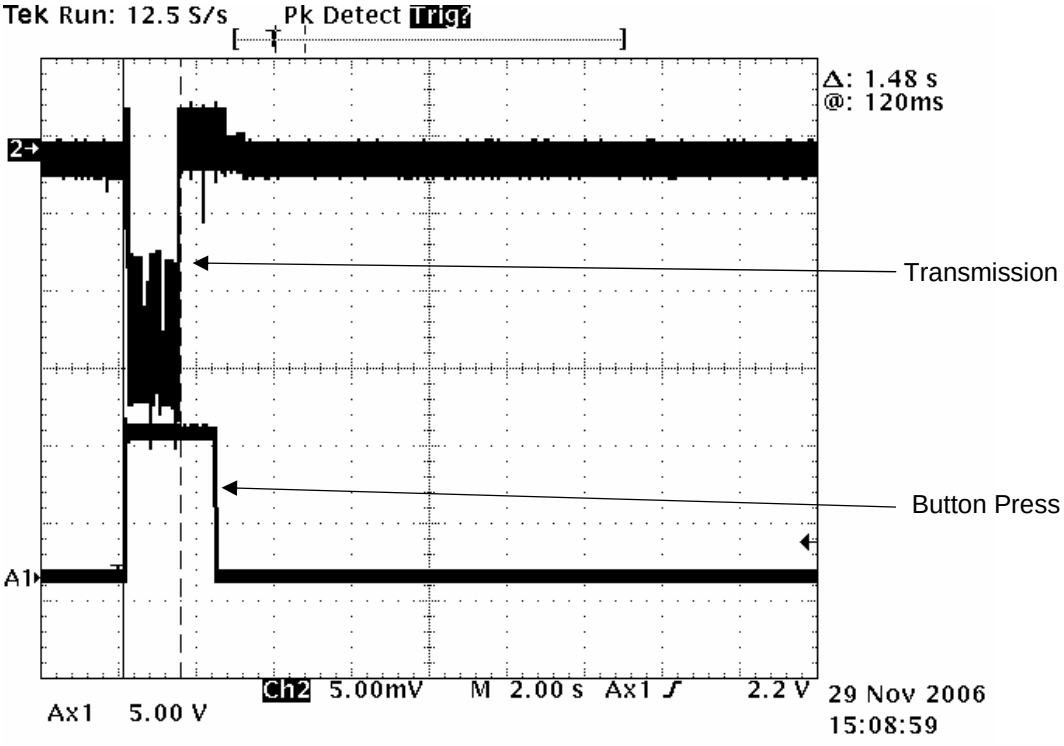


Occupied bandwidth = 70.512820 kHz
f lower = 311.973878 MHz
f higher = 312.044390 MHz

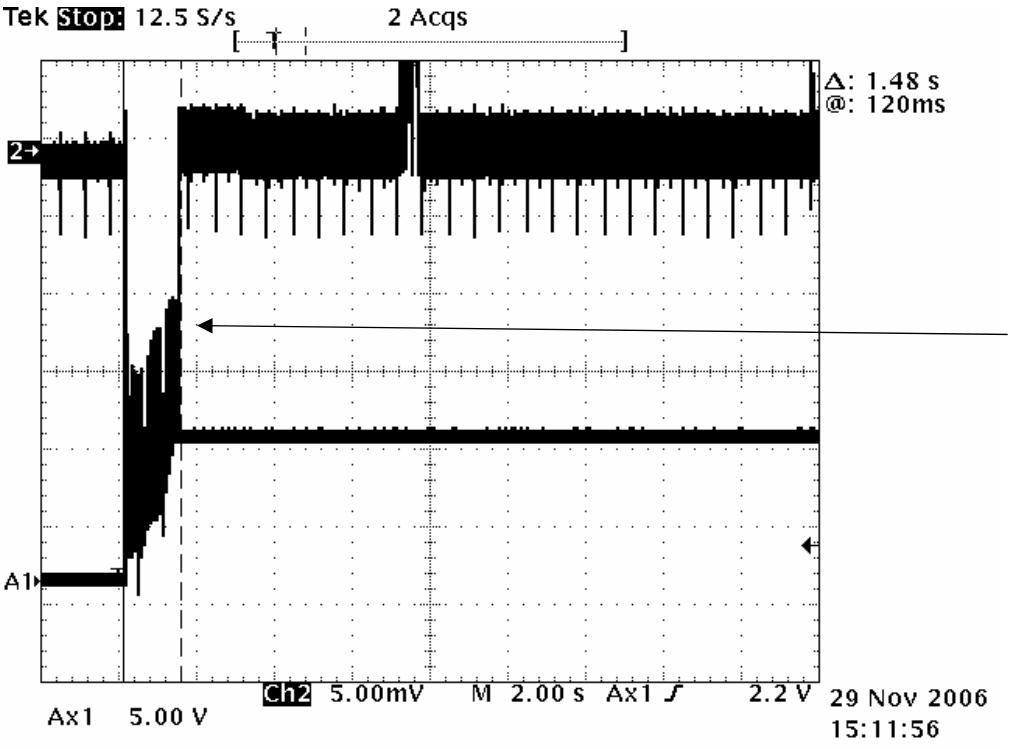
ANNEX D

TRANSMITTER TIMING PULSES

Manual Trigger



Automatic Transmission



TX on time = 1.48sec

The Smoke Detector does not poll out a regular periodic transmission as per 15.231(a)(3). The pulses shown above occur during the sensor being triggered smoke being present (alarm) condition. The pulse occurs once and is not repeated at regular intervals. The pulses only reoccur if the smoke is dissipated and smoke becomes present again (alarm) condition occurs.

ANNEX E

EQUIPMENT CALIBRATION

TRL Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH006	3m Range ERP CAL	TRL	06/01/2006	12	06/01/2007
UH028	Log Periodic Ant	Schwarbeck	28/04/2005	24	28/04/2007
UH029	Bicone Antenna	Schwarbeck	27/04/2005	24	27/04/2007
UH041	Multimeter	AVOmeter	20/12/2005	12	20/12/2006
UH093	Bilog Antenna	Schaffner	19/08/2006	24	19/08/2008
UH122	Oscilloscope	Tektronix	07/06/2005	24	07/06/2007
UH132	Power meter	Marconi	03/01/2006	12	03/01/2007
UH162	ERP Cable Cal	TRL	06/01/2006	12	06/01/2007
UH186	Receiver	R&S	01/02/2006	12	01/02/2007
UH228	Power Sensor	Marconi	03/01/2006	12	03/01/2007
UH253	1m Cable N type	TRL	23/02/2006	12	23/02/2007
UH254	1m Cable N type	TRL	05/01/2006	12	05/01/2007
UH265	Notch filer	Telonic	24/06/2005	12	24/06/2006
UH271	1m Cable N type	TRL	23/02/2006	12	23/02/2007
UH273	1m Cable N type	TRL	23/02/2006	12	23/02/2007
UH281	Spectrum Analyser	R&S	24/07/2006	12	24/07/2007
L005	CMTA	R&S	05/12/2005	12	05/12/2006
L007	Loop Antenna	R&S	29/03/2005	24	29/03/2007
L138	1-18GHz Horn	EMCO	15/04/2005	24	15/04/2007
L139	1-18GHz Horn	EMCO	03/05/2005	24	03/05/2007
L176	Signal Generator	Marconi	15/02/2006	12	15/02/2007
L193	Bicone Antenna	Chase	12/10/2003	24	12/10/2005
L203	Log Periodic Ant	Chase	21/10/2003	24	21/10/2005
L254	Signal Generator	Marconi	04/01/2006	12	04/01/2007
L280	18GHz Cable	Rosenberger	05/01/2006	12	05/01/2007
L343	CCIR Noise Filter	TRL	07/06/2005	12	07/06/2006
L426	Temperature Indicator	Fluke	04/01/2006	12	04/01/2007
L479	Analyser	Anritsu	18/11/2005	12	18/11/2006
L552	Signal Generator	Agilent	25/04/2005	12	25/04/2006
N/A	High Pass Filter	AFL	23/02/2006	12	23/02/2007

ANNEX F

MEASUREMENT UNCERTAINTY

Radio Testing – General Uncertainty Schedule

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence where no required test level exists.

[1] Adjacent Channel Power

Uncertainty in test result = **1.86dB**

[2] Carrier Power

Uncertainty in test result (Equipment - TRLUH120) = **2.18dB**
Uncertainty in test result (Equipment – TRL05) = **1.08dB**
Uncertainty in test result (Equipment – TRL479) = **2.48dB**

[3] Effective Radiated Power

Uncertainty in test result = **4.71dB**

[4] Spurious Emissions

Uncertainty in test result = **4.75dB**

[5] Maximum frequency error

Uncertainty in test result (Equipment - TRLUH120) = **119ppm**
Uncertainty in test result (Equipment – TRL05) = **0.113ppm**
Uncertainty in test result (Equipment – TRL479) = **0.265ppm**

[6] Radiated Emissions, field strength OATS 14kHz-18GHz Electric Field

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**, Uncertainty in test result (30MHz – 1GHz) = **4.6dB**, Uncertainty in test result (1GHz-18GHz) = **4.7dB**

[7] Frequency deviation

Uncertainty in test result = **3.2%**

[8] Magnetic Field Emissions

Uncertainty in test result = **2.3dB**

[9] Conducted Spurious

Uncertainty in test result (Equipment TRL479) Up to 8.1GHz = **3.31dB**
Uncertainty in test result (Equipment TRL479) 8.1GHz – 15.3GHz = **4.43dB**
Uncertainty in test result (Equipment TRL479) 15.3GHz – 21GHz = **5.34dB**
Uncertainty in test result (Equipment TRLUH120) Up to 26GHz = **3.14dB**

[10] Channel Bandwidth

Uncertainty in test result = **15.5%**

[11] Amplitude and Time Measurement – Oscilloscope

Uncertainty in overall test level = **2.1dB**, Uncertainty in time measurement = **0.59%,** Uncertainty in Amplitude measurement = **0.82%**

[11] Power Line Conduction

Uncertainty in test result = **3.4dB**

[12] Spectrum Mask Measurements

Uncertainty in test result = **2.59% (frequency)**
Uncertainty in test result = **1.32dB (amplitude)**

[13] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[14] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[15] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[16] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[17] Receiver Threshold

Uncertainty in test result = **3.23dB**

[18] Transmission Time Measurement

Uncertainty in test result = **7.98%**