REPORT ON THE CERTIFICATION TESTING OF A
TUNSTALL ELECTRONICS Ltd
WIRELESS KEYPAD
41004/26
WITH RESPECT TO
THE FCC RULES CFR 47, PART 15.231 10th July 2008
INTENTIONAL RADIATOR SPECIFICATION

UKAS TESTING
0971

TEST REPORT NO: 9F2299US1

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FCC ID: GSX-4100426

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INTENTIONAL RADIATOR SPECIFICATION

TEST DATE: 8th – 9th June 2009

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 Date: 2009.07.08 09:04:00 +01'00' — S HODGKINSON

APPROVED BY: Digitally signed by John Charters DN: CN = John Charters, C = GB, O = TRaC Telecoms & Radio Reason: I am approving this document Date: 2009.07.08 13:54:11 +01'00' — J CHARTERS PRODUCT MANAGER

DATE: 8th July 2009

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2. FCC EVALUATION LABORATORIES
3. TRaC Telecoms and Radio, Upholland

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The results herein relate only to the sample tested. Full results are contained in the relevant works order file.

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UKAS TESTING 0971

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-4100426
PURPOSE OF TEST:	Certification
TEST SPECIFICATION:	FCC RULES CFR 47, Part 15.231 10th July 2008
TEST RESULT:	Compliant to Specification
EQUIPMENT UNDER TEST:	Wireless Keyboard
EQUIPMENT MODEL Nos:	41004/26
ITU: EMISSION CODE:	263k0F1D
EQUIPMENT TYPE:	Periodic Transmitter
PRODUCT USE:	Personal Care Monitoring & Alarm System
CARRIER EMISSION:	5011.89µV/m @ 3m
ANTENNA TYPE:	Integral
ALTERNATIVE ANTENNA:	Not applicable
BAND 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):	+3.0Vdc
TEST DATE(s):	8th – 9th June 2009
ORDER No(s):	480029
APPLICANT:	Tunstall Electronics Ltd
ADDRESS:	Whitley Lodge Whitley Bridge Yorkshire DN14 0HR

TESTED BY: S HODGKINSON

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APPROVED BY:

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Reason: I am approving this document
Date: 2009.07.08 13:54:26 +01'00'

J CHARTERS
PRODUCT MANAGER

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	Wireless Keyboard
EQUIPMENT TYPE:	Periodic Transmitter
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 15.231 10th July 2008
TEST RESULT:	COMPLIANT Yes [X] No [ ]
APPLICANT'S CATEGORY:	MANUFACTURER [X] IMPORTER [ ] DISTRIBUTOR [ ] TEST HOUSE [ ] AGENT [ ]
APPLICANT'S ORDER No(s):	480029
APPLICANT'S CONTACT PERSON(s):	Eleanor Webb
E-mail address:	Eleanor.webb@tunstall.co.uk
APPLICANT:	Tunstall Electronics 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:	TRaC Telecoms and Radio Up Holland
UKAS ACCREDITATION No:	0971
TEST DATE(s) :	8th – 9th June 2009
TEST REPORT No:	9F2299US-1

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: 263k6F1D

4. Duty Cycle: <100%

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

6. Temperatures: Ambient (Tnom) 14.0°C

7. Supply Voltages: Vnom +3.0Vdc

   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	=	22°C(<1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	47% (<1GHz),	3m measurements >1GHz	[X]
Conditions	=	Open Area Test Site (OATS)	3m extrapolated from 1m	[ ]
Supply voltage	=	+3.0Vdc		
Channel number	=	1		

Bottom Channel	**FREQ. (MHz)**	**MEAS Rx (dBµV)**	**CABLE LOSS (dB)**	**ANT FACT. (dB/m)**	**PRE AMP (dB)**	**FIELD ST'GH (dBµV/m)**	**FIELD ST'GH (µV/m)**	**LIMIT (µV/m)**
30MHz - 88MHz							note 12	
88MHz - 216MHz							note 12	
216MHz - 960MHz	624.00 936.00	27.75 21.46	3.40 6.02	18.85 20.82	N/A N/A	50.00 48.30	316.22 260.16	598.41 598.41
960MHz - 1GHz							note 12	
1GHz - 4GHz	1.2483 1.5608 (r) 1.8695 2.1839 2.4960 (r) 2.8077 (r)	60.00 58.44 61.74 58.91 54.54 57.70	0.74 0.92 0.93 1.01 1.21 1.23	24.85 25.50 26.16 27.80 28.90 29.09	36.23 36.05 35.70 35.57 35.03 35.18	49.36pk 48.81pk 53.13pk 52.15pk 49.62pk 52.84pk	293.76pk 275.74pk 453.41pk 405.04pk 302.69pk 438.53pk	500 500 500 500 500 500

Limits	30MHz to 88MHz	100µV/m @ 3m
	88MHz to 216MHz	150µV/m @ 3m
	216MHz to 960MHz	598.41µV/m @ 3m
	960MHz to 1GHz	500µV/m @ 3m
	1GHz to 4GHz	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 9.5dB from 1m to 3m, as per Part 15.31f
4 Measurements >1GHz @ 1m 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 See Annex F for Emissions Graph(s)
9 Due to the transmitted signal lasting only 1.80 seconds a modified unit, which allowed continuous transmission, was used during spurious emissions testing.
10 (r) Denotes restricted band .
11 Spurious limit level of 598.41µV/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.
13 Peak emissions below Average limits. Measurements >1GHz

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 tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	EQUIPMENT USED
RADIO COMMUNICATIONS ANALYSER	R & S	CMTA 52	894715 / 003	05	
LOOP ANTENNA	R & S	HFH2	881058-53	07	
ENVIRONMENTAL CHAMBER (temp)	SHARETREE	TCC125 - 815P	CS 203	11	
HORN ANTENNA	EMCO	3115	9010 - 3580	138	**X**
HORN ANTENNA	EMCO	3115	9010 - 3581	139	
RF SIGNAL GEN	MARCONI	2042	119388 / 080	176	
TEMPERATURE INDICATOR	FLUKE	52 Series II	74700044	426	
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	
RF SIGNAL GEN	AGILENT	8341B	2819A02239	552	
PRE AMPLIFIER	AGILENT	8449B	3008A016	572	**X**
RECEIVER	R & S	ESHS 10	830051/001	UH03	
RECEIVER	R & S	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	**X**
MULTIMETER	AVOmeter	M3004	M3270006	UH41	
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	**X**
POWER SUPPLY	THANDOR	PL320QMD	044749	UH100	
OSCILLOSCOPE	TEKTRONIX	TDS520B	B020491	UH122	
POWER METER	MARCONI	6960B	237036/001	UH132	
RECEIVER	R & S	ESVS 10	841431/014	UH186	**X**
RECEIVER	R & S	ESHS 10	841429/012	UH187	
BILOG ANTENNA	YORK	CBL611/A	1618	UH191	
500W AUDIO AMPLIFIER	PRO POWER	STA-162	688200474	UH196	
POWER SENSOR	MARCONI	6920	1564	UH228	
SPECTRUM ANALYSER	R & S	FSU	200034	UH281	**X**
RF SIGNAL GEN	HP	83630B	3722A00588	UH340	

TRANSMITTER TESTS

TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.231 September 2007

Ambient temperature	=	14^{o}C(<1GHz),	3m measurements @ fc	[X]
Relative humidity	=	45%(<1GHz),	10m measurements @ fc	[ ]
Conditions	=	Open Area Test Site (OATS)	30m measurements @ fc	[ ]
Supply voltage	=	+6Vdc	30m extrapolated from 3m	[ ]
Channel number	=	1	30m extrapolated from 10m	[ ]

FREQ. (MHz)	**MEASUREMENT Rx. READING (dBµV)**	**CABLE LOSS (dB)**	**ANT FACTOR (dB/m)**	**FIELD STRENGTH (dBµV/m)**	**FIELD STRENGTH (µV/m)**
312.0	58.3	2.3	13.4	74.0	5011.89

Limit value @ fc	**5916.6 (µV/m)**	
Band occupancy @ -20dBc	**f lower**	**f higher**
	311.868589 MHz	312.132211 MHz
	Occupied Bandwidth	**Limit**
	263.62 kHz	780 kHz
Transmitter on time during Alarm Condition	1.84 Seconds	Removal of the alarm condition
Transmitter on time during manual trigger transmission.	1.84 Seconds	Deactivation within 5 seconds of manual trigger release
Supervision Transmission	304.48ms	2 seconds per hour

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

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 Supervision transmission repeated every 4 hours.

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 September 2007 tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	EQUIPMENT USED
RADIO COMMUNICATIONS ANALYSER	R & S	CMTA 52	894715 / 003	05	
LOOP ANTENNA	R & S	HFH2	881058-53	07	
ENVIRONMENTAL CHAMBER (temp)	SHARETREE	TCC125 - 815P	CS 203	11	
AE, DRG HORN, 1GHz - 18GHz	EMCO	3115	9010 - 3580	138	
AE, DRG HORN, 1GHz - 18GHz	EMCO	3115	9010 - 3581	139	
RF SIGNAL GEN	MARCONI	2042	119388 / 080	176	
TEMPERATURE INDICATOR	FLUKE	52 Series II	74700044	426	
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	
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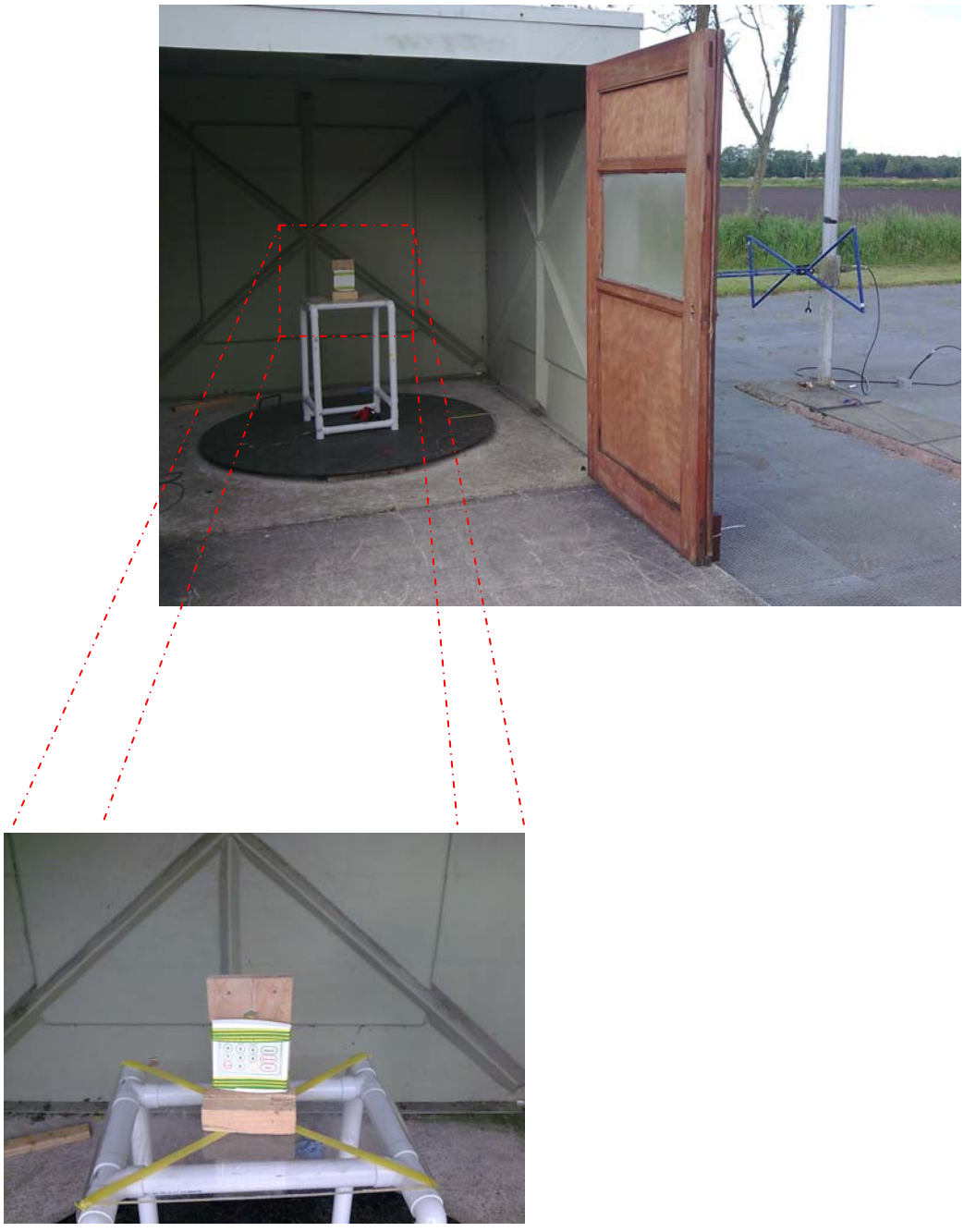
RECEIVER	R & S	ESHS 10	830051/001	UH03	
RECEIVER	R & S	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	**X**
MULTIMETER	AVOmeter	M3004	M3270006	UH41	
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	**X**
POWER SUPPLY	THANDOR	PL320QMD	044749	UH100	
OSCILLOSCOPE	TEKTRONIX	TDS520B	B020491	UH122	**X**
POWER METER	MARCONI	6960B	237036/001	UH132	
RECEIVER	R & S	ESVS 10	841431/014	UH186	**X**
RECEIVER	R & S	ESHS 10	841429/012	UH187	
BILOG ANTENNA	YORK	CBL611/A	1618	UH191	
500W AUDIO AMPLIFIER	PRO POWER	STA-162	688200474	UH196	
POWER SENSOR	MARCONI	6920	1564	UH228	
SPECTRUM ANALYSER	R & S	FSU	200034	UH281	
RF SIGNAL GEN	HP	83630B	3722A00588	UH340	

ANNEX A

PHOTOGRAPHS

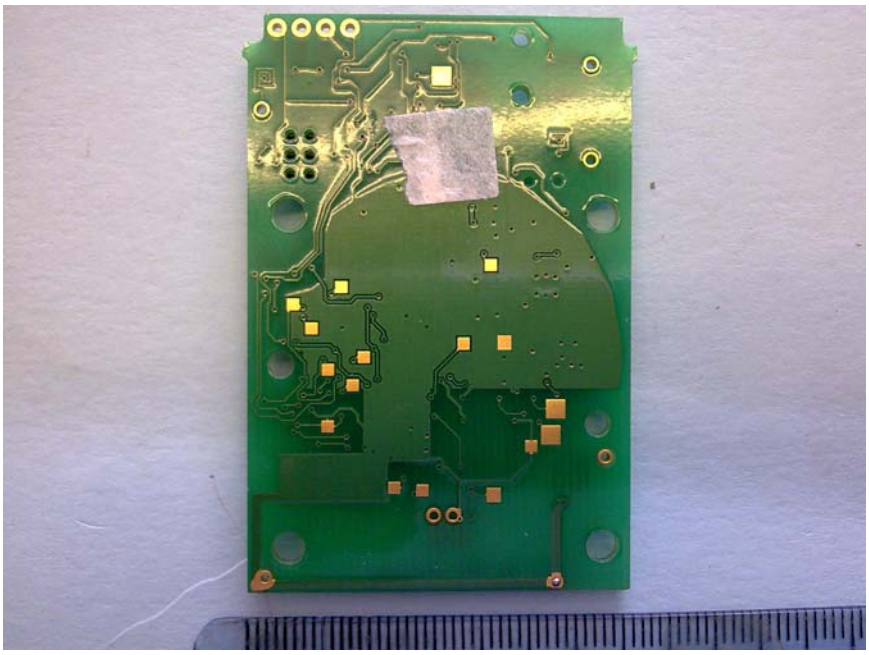
PHOTOGRAPH No. 1 **TEST SETUP**



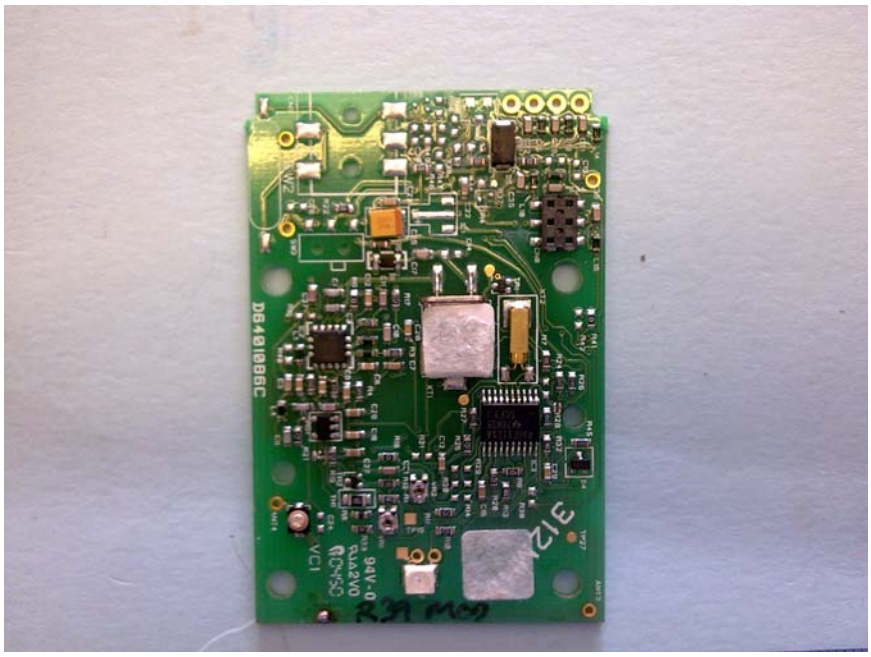
PHOTOGRAPH No. 2 **TRANSMITTER FRONT VIEW**

PHOTOGRAPH No. 3 **TRANSMITTER REAR VIEW**

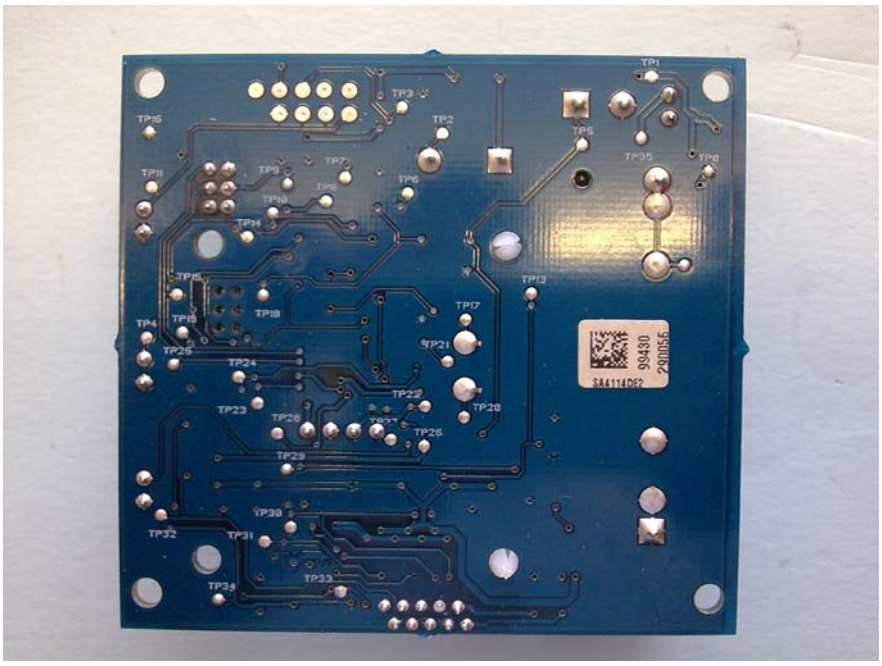
PHOTOGRAPH No. 4 **RF PCB TRACK SIDE**



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



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



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

ANNEX B

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

ANNEX B

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%**

ANNEX C

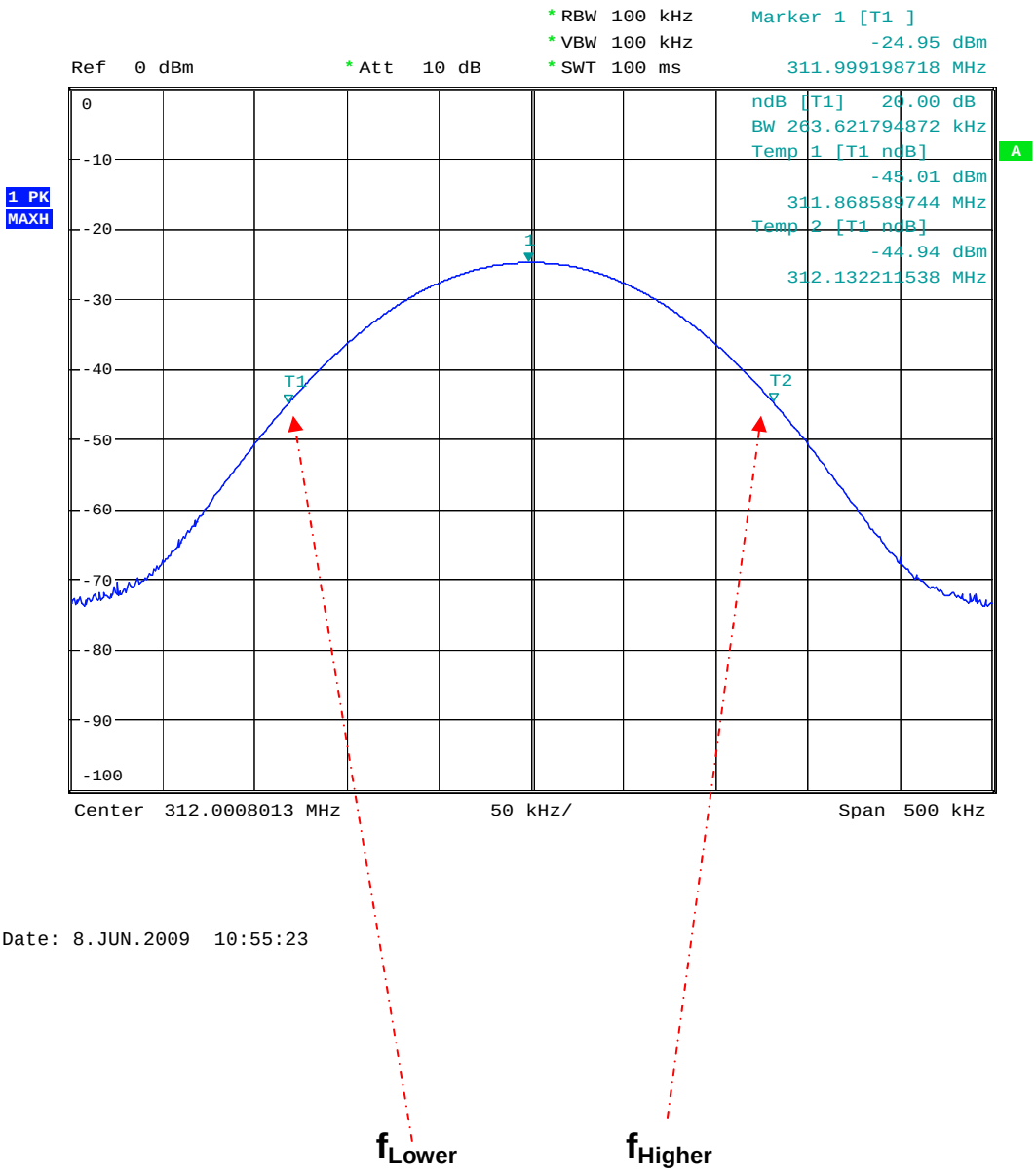
TEST EQUIPMENT CALIBRATION

TRL Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH06/07	IC OATS Submission	TRL	01/06/2007	24	01/06/2009
UH028	Log Periodic Ant	Schwarbeck	30/05/2007	24	30/05/2009
UH029	Bicone Antenna	Schwarbeck	22/05/2007	24	22/05/2009
UH041	Multimeter	AVOmeter	15/01/2008	12	15/01/2009
UH093	Bilog Antenna	Chase	21/05/2007	24	21/05/2009
UH105	Signal Generator	Marconi	04/06/2008	12	04/06/2009
UH162	ERP Cable Cal	TRL	02/01/2007	12	02/01/2008
UH253	1m Cable N type	TRL	18/01/2008	12	20/01/2009
UH254	1m Cable N type	TRL	18/01/2008	12	20/01/2009
UH269	1m Cable N type	TRL	18/01/2008	12	20/01/2009
UH270	1m Cable N type	TRL	18/01/2008	12	20/01/2009
UH271	1.5m Cable N type	TRL	18/01/2008	12	20/01/2009
UH272	1.5m Cable N type	TRL	18/01/2008	12	20/01/2009
UH273	2m Cable N type	TRL	18/01/2008	12	20/01/2009
UH274	2m Cable N type	TRL	18/01/2008	12	20/01/2009
UH281	Spectrum Analyser	R&S	25/10/2007	12	25/10/2008
L005	CMTA	R&S	30/10/2007	12	30/10/2008
L007	Loop Antenna	R&S	22/05/2007	24	22/05/2009
L103	Attenuator	Bird		Calibrate in Use	
L112	Attenuator	Bird		Calibrate in Use	
L138	1-18GHz Horn	EMCO	23/05/2007	24	23/05/2009
L139	1-18GHz Horn	EMCO	23/05/2007	24	23/05/2009
L170	Combiner	Elcom		Calibrate in Use	
L176	Signal Generator	Marconi	06/06/2008	12	06/06/2009
L220	Attenuator	Bird		Calibrate in Use	
L426	Temperature Indicator	Fluke	22/01/2008	12	22/01/2009
L479	Analyser	Anritsu	11/12/2007	12	11/12/2008
L572	Pre Amplifier	HP		Calibrate in Use	
TRL254	Signal Generator	Marconi	04/06/2008	12	04/06/2009
TRL225	Attenuator	Spinner		Calibrate in Use	
TRL246	Attenuator	Bird		Calibrate in Use	
UH191	Bilog Antenna	Chase	11/08/2006	24	11/08/2008

ANNEX D

BANDWIDTH PLOT

BANDWIDTH PLOT



f_{Lower} = 311.868589 MHz
f_{Higher} = 312.132211 MHz
Occupied Bandwidth = 263.62 kHz

ANNEX E

EMISSIONS GRAPH(s)

TRaC Telecoms & Radio

08 Jun 2009 10:12

Radiated E-Field Emissions

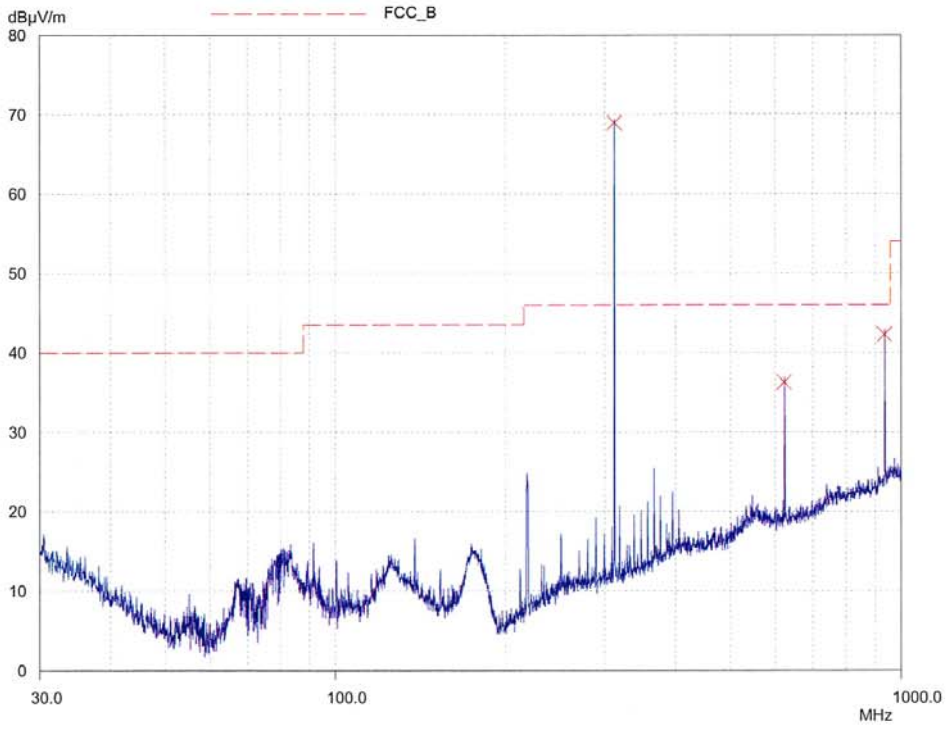
EUT:	Wireless Keyboard
Manuf:	Tunstall
Op Cond:	3m Indoor Prescan MAC Chamber
Operator:	S Hodgkinson
Test Spec:	EN SRD
Comment:	Unit in permanent Tx mode. keyboard facing Rx antenna, unit Vertical. battery powered. Rx antenna Vertical.
Result File:	txvert~1.dat : Wireless Keyboard

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30MHz	1000MHz	50kHz	120kHz	PK	1msec	Auto	ON	60dB

Transducer	No.	Start	Stop	Name
3	20	30MHz	1000MHz	UH372
	21	30MHz	1000MHz	UH213PS
	22	30MHz	1000MHz	UH70

Final Measurement:		
	Detector:	X QP
	Meas Time:	2sec
	Subranges:	50
	Acc Margin:	20 dB

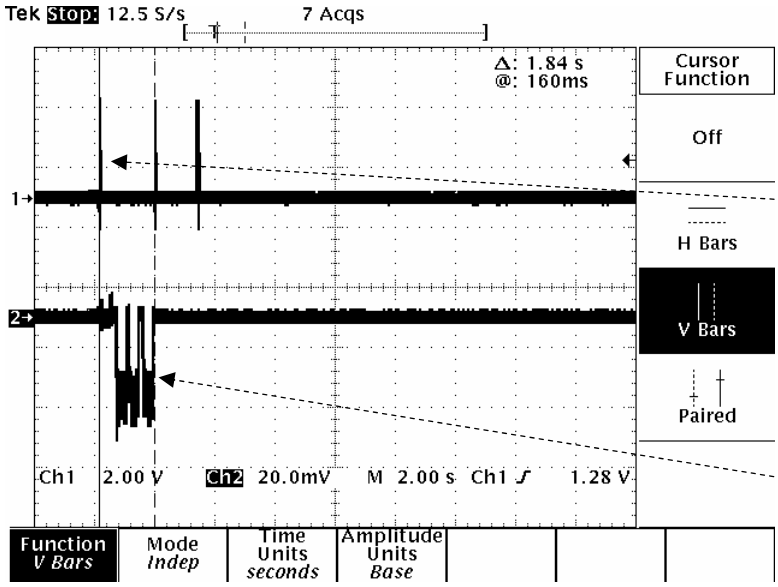


PAGE 1

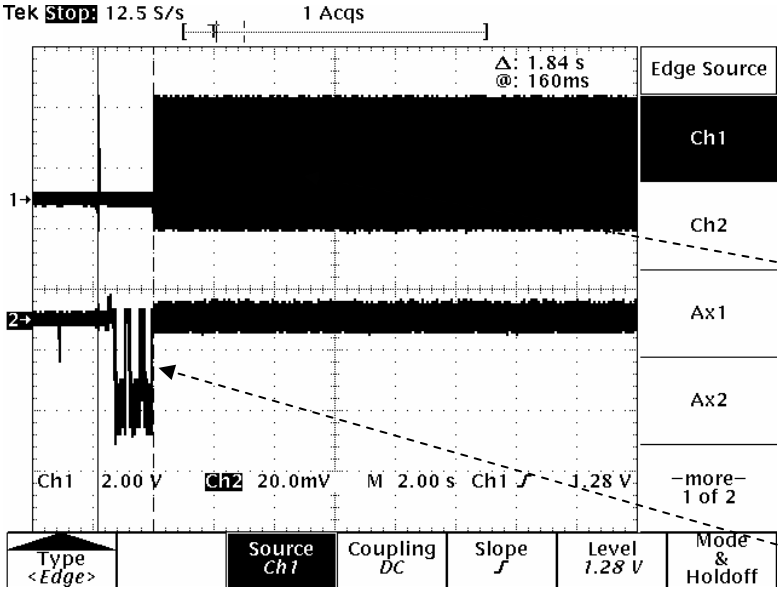
ANNEX F

TRANSMITTER TIMING PULSES

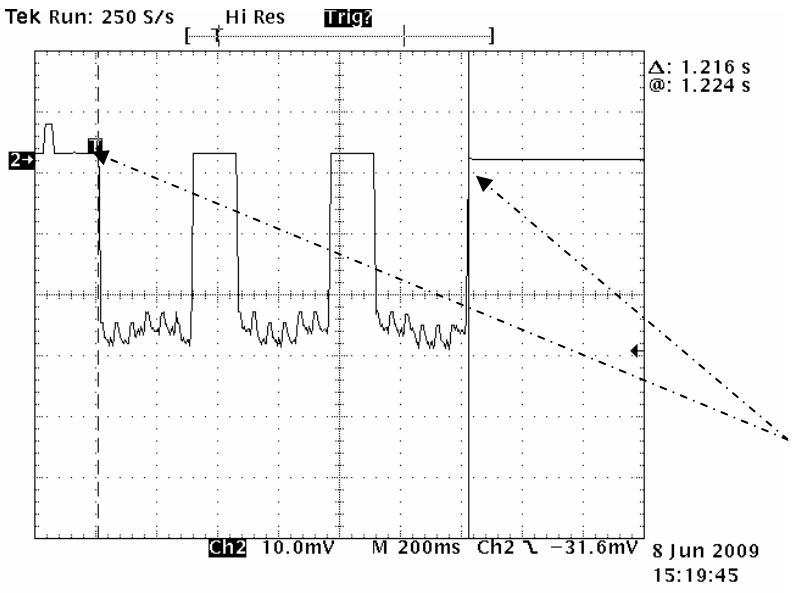
Single Key Press



Key Held Down

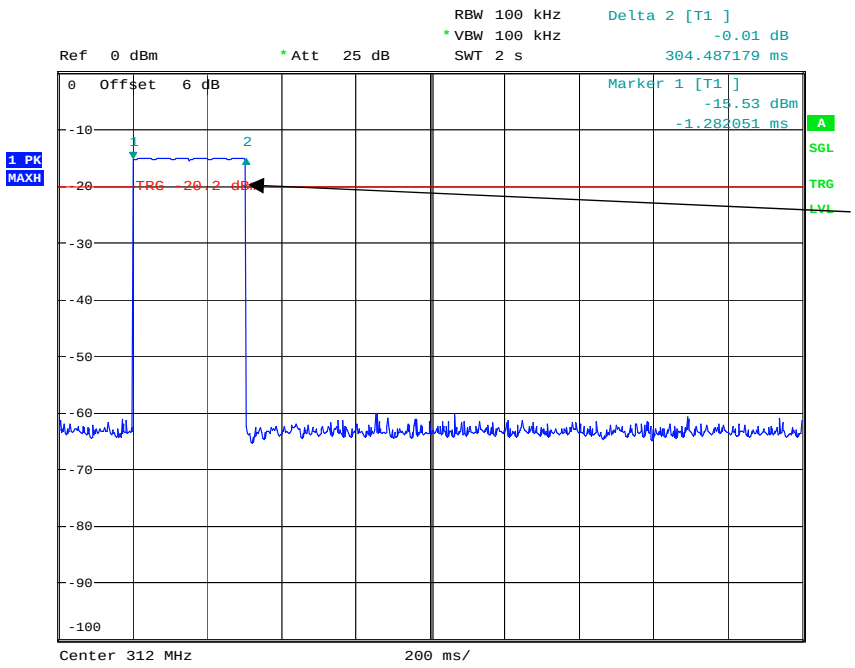


TX ON



TX ON

Auto presence Transmission



Auto presence Transmission

Date: 2.JUL.2009 08:35:41

Equipment switched on and left over an 8 hour period
1 Auto Presence Transmission every 4 hours.