TEST REPORT NO: RU1140/5839

COPY NO: 2

ISSUE NO: 1

FCC ID: G2X-6460403

REPORT ON THE CERTIFICATION TESTING OF A
TUNSTALL ELECTRONICS LIMITED
PIR RADIO
WITH RESPECT TO
THE FCC RULES CFR 47, PART 15.231
INTENTIONAL RADIATOR SPECIFICATION

TEST DATE: 13th October 2004 – 20th October 2004

TESTED BY: Daniel Winstanley — Digitally signed by Daniel Winstanley, DN: cn=Daniel Winstanley, o=TRL Compliance, c=GB, Date: 2004.11.15 08:58:09 Z — D WINSTANLEY

APPROVED BY: Peter Green — Digitally signed by Peter Green, DN: cn=Peter Green, o=TRL Compliance Services, c=GB, Date: 2004.11.15 11:44:18 Z — P GREEN EMC PRODUCT MANAGER

DATE: 15/11/04

Distribution:

Copy Nos:
1. TUNSTALL ELECTRONICS LIMITED
2. FCC EVALUATION LABORATORIES
3. TRL EMC

TRL COMPLIANCE SERVICES LTD EMC DIVISION
MOSS VIEW NIPE LANE UP HOLLAND WEST LANCASHIRE WN8 9PY UNITED KINGDOM
TELEPHONE +44 (0)1695 556666 FAX +44 (0)1695 557077
E-MAIL test@trl-emc.co.uk www.trlcompliance.com

FS 21805

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-6460403					
PURPOSE OF TEST:	Certification					
TEST SPECIFICATION:	FCC RULES CFR 47, Part 15.231					
TEST RESULT:	Compliant to Specification					
EQUIPMENT UNDER TEST:	PIR Radio					
EQUIPMENT SERIAL No:	Engineering Sample					
ITU EMISSION CODE:	353kF1D					
PRODUCT USE:	Intruder Detection					
CARRIER EMISSION:	3162.3 μV/m @ 3m					
ANTENNA TYPE:	Integral					
ALTERNATIVE ANTENNA:	Not applicable					
CHANNEL SPACING:	Wideband					
NUMBER OF CHANNELS:	1					
FREQUENCY GENERATION:	SAW Resonator	[ ]	Crystal	[ ]	Synthesiser	[X]
MODULATION METHOD:	Amplitude	[ ]	Digital	[X]	Angle	[ ]
POWER SOURCE(s):	+9Vdc					
TEST DATE(s):	13th October 2004 – 20th October 2004					
ORDER No(s):	258234					
APPLICANT:	Tunstall Electronics Limited					
ADDRESS:	Whitley Lodge Whitley Bridge Yorkshire DN14 0HR					

TESTED BY: Daniel Winstanley — Digitally signed by Daniel Winstanley DN: cn=Daniel Winstanley, o=TRL Compliance, c=GB Date: 2004.11.15 08:58:40 Z — Signature Not Verified — D WINSTANLEY

APPROVED BY: Peter Green — Digitally signed by Peter Green DN: cn=Peter Green, o=TRL Compliance Services, c=GB Date: 2004.11.15 11:44:34 Z — Signature Not Verified — P GREEN EMC PRODUCT MANAGER

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	PIR Radio
SERIAL NUMBER OF EUT:	Engineering Sample
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 15.231
TEST RESULT:	COMPLIANT Yes [X] No [ ]
APPLICANT'S CATEGORY:	MANUFACTURER [X] IMPORTER [ ] DISTRIBUTOR [ ] TEST HOUSE [ ] AGENT [ ]
APPLICANT'S ORDER No(s):	258234
APPLICANT'S CONTACT PERSON(s):	Mr R Cooper
E-mail address:	R_cooper@tunstall.co.uk
APPLICANT:	Tunstall Electronics Limited
ADDRESS:	Whitley Lodge Whitley Bridge Yorkshire DN14 0HR
TEL:	+44 (0) 1977 661234
FAX:	+44 (0) 1977 662452
MANUFACTURER:	Tunstall Electronics Limited
EUT(s) COUNTRY OF ORIGIN:	United Kingdom
TEST LABORATORY:	TRL EMC
UKAS ACCREDITATION No:	0728
TEST DATE(s)	13th October 2004 – 14th October 2004
TEST REPORT No:	RU1140/5839

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)	-	N/A

2. Product Use: Intruder Detection

3. Emission Designator: 353kF1D

4. Duty Cycle: < 1%

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

6. Temperatures: Ambient (Tnom) 11°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 & 15.231(b)

Ambient temperature	=	11°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		

Frequency Bands (MHz)	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT.	FIELD STRENGTH (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)	Limit (µV/m)
30 - 88								
88 - 216								
216 - 960	624.0 936.0	28.7 24.55	3.0 4.0	20.5 24.95	52.2 53.5	- -	407.38 473.15	592 592
960 - 1000								
1000 - 5000	1248 1560(R) 1872 2183 2496(R) 2808(R) 3120	41.57 39.02 38.08 42.14 31.07 23.76 25.79	0.83 0.89 0.87 0.93 1.01 0.97 1.08	25.3 25.8 26.9 28.2 28.7 29.6 30.9	67.7 65.71 65.85 71.27 60.78 54.33 57.77	20 20 20 20 20 20 20	242.66 192.98 196.11 366.02 109.40 52.06 77.36	592 500 592 592 500 500 592

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 = Average, 1MHz resolution bandwidth
7 New batteries used for battery powered products.
8 (R) indicates frequency within restricted band from 15.205
9 Due to the transmitted signal lasting only 1.74 seconds a unit with modified software, which allowed continuous transmission, was used during spurious emissions testing.
10 Spurious limit level of 592 µV/m was calculated by reducing the fundamental limit level by 20 dB, as per 15.231(b)
11 Only emissions within 20 dB's of the limit are recorded

Test Method:

1 As per Radio – Noise Emissions, ANSI C63.4: 2001
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	ACTUAL EQUIPMENT USED
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
HORN ANTENNA	EMCO	3115	9010-3580	138	
HORN ANTENNA	EMCO	3115	9010-3581	139	**X**
SPECTRUM ANALYSER	TEKTRONIX	2756P	B010109	164	
BICONE ANTENNA	CHASE	BBA9106	N/A	193	
ANTENNA, LOG PERIODIC 300MHz – 1GHz	CHASE	UPA6108	1061	203	
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
ANTENNA, BICONE 20MHz - 300MHz	CHASE	VBA6106A	1193	251	
BILOG ANTENNA	CHASE	CBL6112	2098	274	
RECEIVER	ROHDE & SCHWARZ	ESVS10	837948/003	317	
RECEIVER	ROHDE & SCHWARZ	ESVS10	844594/003	352	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
V / UHF RECEIVER 20MHz - 1GHz	ROHDE & SCHWARZ	ESVS 20	838804 / 005	415	
BILOG ANTENNA	CHASE	CBL6111A	1618	191	**X**
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	**X**
RANGE 1	TRL	3 METRE	N/A	UH06	**X**
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	
SPECTRUM ANALYSER	ROHDE & SCHWARZ	ESIB 7		630	**X**

TRANSMITTER TESTS

TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.231(b)

Ambient temperature	=	14°C(<1GHz),	3m measurements @ fc	[X]
Relative humidity	=	49%(<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	[ ]

FREQ. (MHz)	MEASUREMENT Rx. READING (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)
312	54.9	1.8	13.3	70.0	-	3162.3

Limit value @ fc	**5916.6771 (µV/m)**	
Band occupancy @ -20dBc	**f lower**	**f higher**
During switched transmission	311.819 MHz	312.172 MHz
During PIR activation	311.825 MHz	312.172 MHz
During supervision transmission	311.825 MHz	312.172 MHz
Transmitter on time during switched transmission	1.74 Seconds	
Transmitter on time during PIR activation	1.73 Seconds	
Transmitter on time during supervision transmission	1.74 Seconds	

For band occupancy see spectrum analyser plots – Annex C

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. For transmitter shutdown time see Annex D
5. The transmitter sends a supervision transmission once every four hours for 1.71 second
6. Due to the transmitted signal lasting only 1.74 seconds a unit with modified software, which allowed continuous transmission, was used during the carrier power testing.

Test Method:
1. As per Radio – Noise Emissions, ANSI C63.4: 2001
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 tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
HORN ANTENNA	EMCO	3115	9010-3580	138	
HORN ANTENNA	EMCO	3115	9010-3581	139	
SPECTRUM ANALYSER	TEKTRONIX	2756P	B010109	164	
BICONE ANTENNA	CHASE	BBA9106	N/A	193	
ANTENNA, LOG PERIODIC 300MHz – 1GHz	CHASE	UPA6108	1061	203	
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
ANTENNA, BICONE 20MHz - 300MHz	CHASE	VBA6106A	1193	251	
BILOG ANTENNA	CHASE	CBL6111A	1618	191	**X**
RECEIVER	ROHDE & SCHWARZ	ESVS10	837948/003	317	
RECEIVER	ROHDE & SCHWARZ	ESVS10	844594/003	352	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
V / UHF RECEIVER 20MHz - 1GHz	ROHDE & SCHWARZ	ESVS 20	838804 / 005	415	
BILOG ANTENNA	SCHAFFNER	CBL6112B	2761	431	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	**X**
RANGE 1	TRL	3 METRE	N/A	UH06	**X**
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

ANNEX A

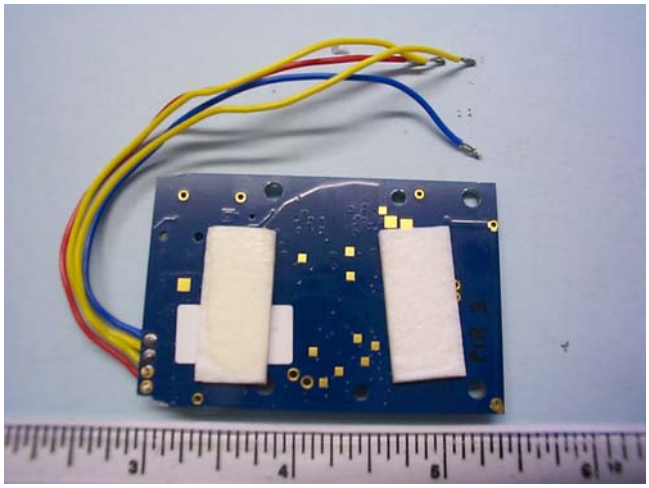
PHOTOGRAPHS

PHOTOGRAPH No. 1 **TEST SETUP**

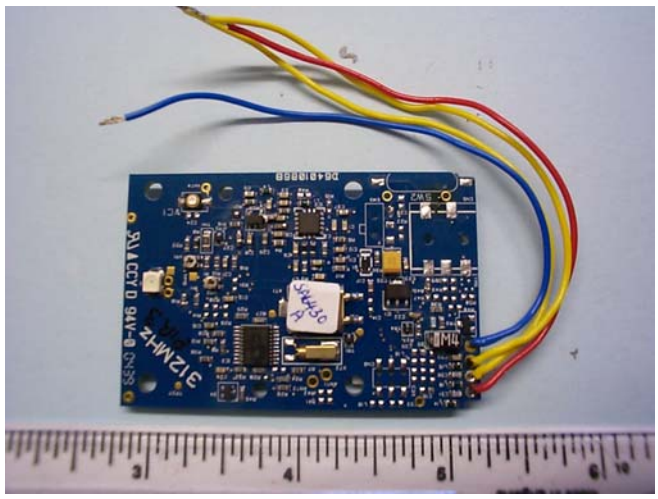
PHOTOGRAPH No. 2 **TRANSMITTER FRONT VIEW**

PHOTOGRAPH No. 3 **TRANSMITTER REAR VIEW**

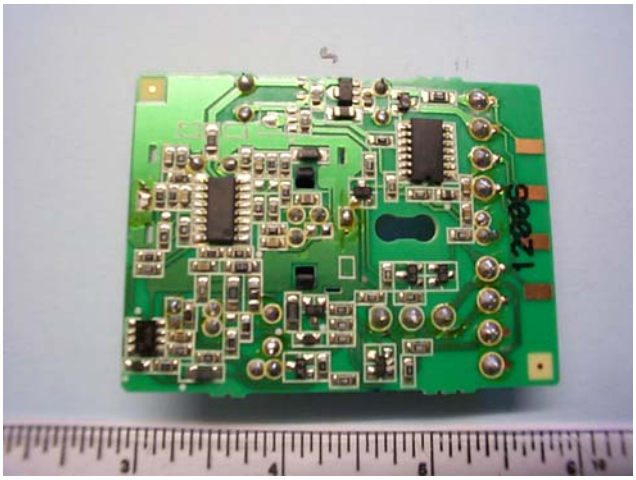
PHOTOGRAPH No. 4 **TRANSMITTER PCB TRACK SIDE**



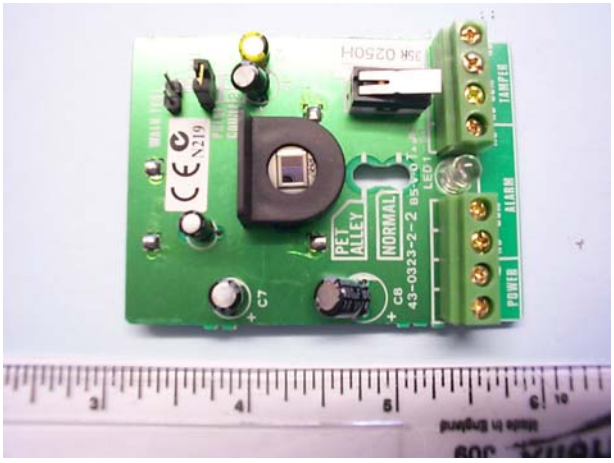
PHOTOGRAPH No. 5 **TRANSMITTER PCB COMPONENT SIDE**



PHOTOGRAPH No. 6 **PIR PCB COMPONENT SIDE**



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



ANNEX B

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

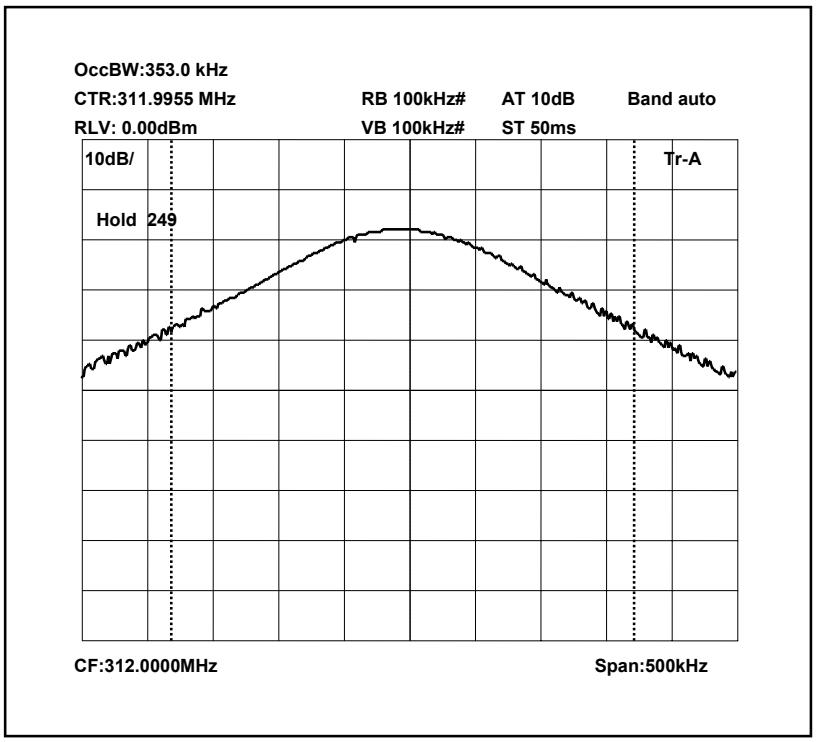
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

a.	TCB	-	APPLICATION	[X]
		-	FEE	[X]
b.	AGENT'S LETTER OF AUTHORISATION	-		[X]
c.	MODEL(s) vs IDENTITY	-		[X]
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		[X]
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

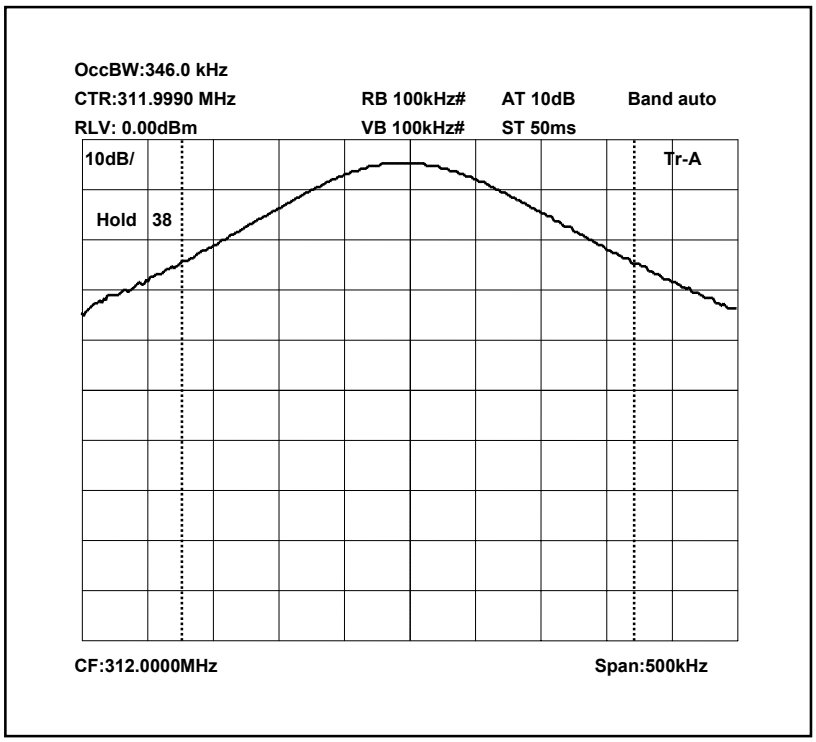
BANDWIDTH PLOT(s)

SWITCHED INPUT BANDWIDTH PLOT



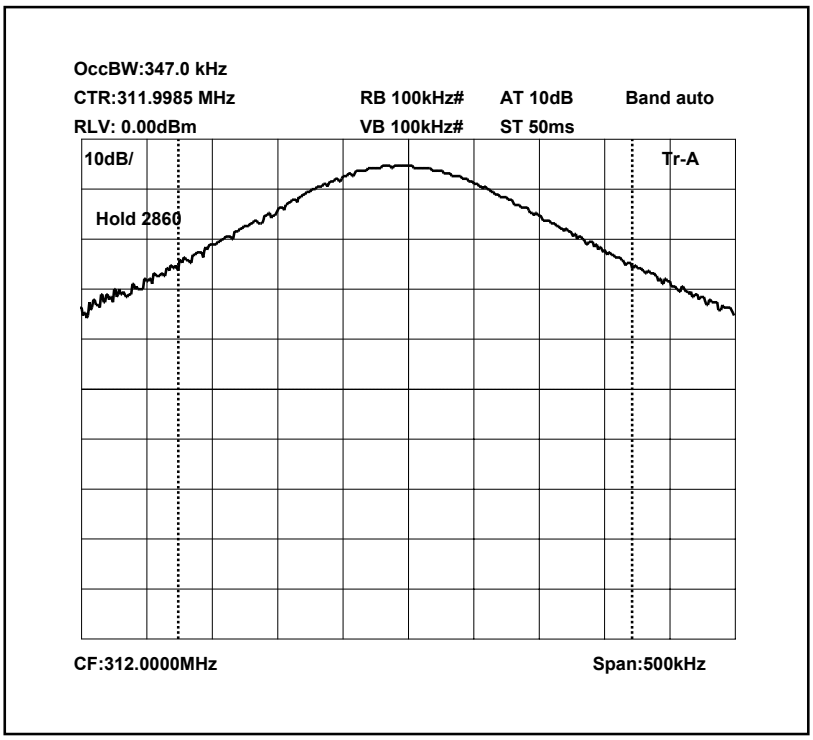
Occupied Bandwidth = 353 kHz
f lower = 311.819 MHz
f higher = 312.172 MHz

PIR ACTIVATION BANDWIDTH PLOT



Occupied Bandwidth = 346 kHz
f lower = 311.826 MHz
f higher = 312.172 MHz

SUPERVISION TRANSMISSION BANDWIDTH PLOT

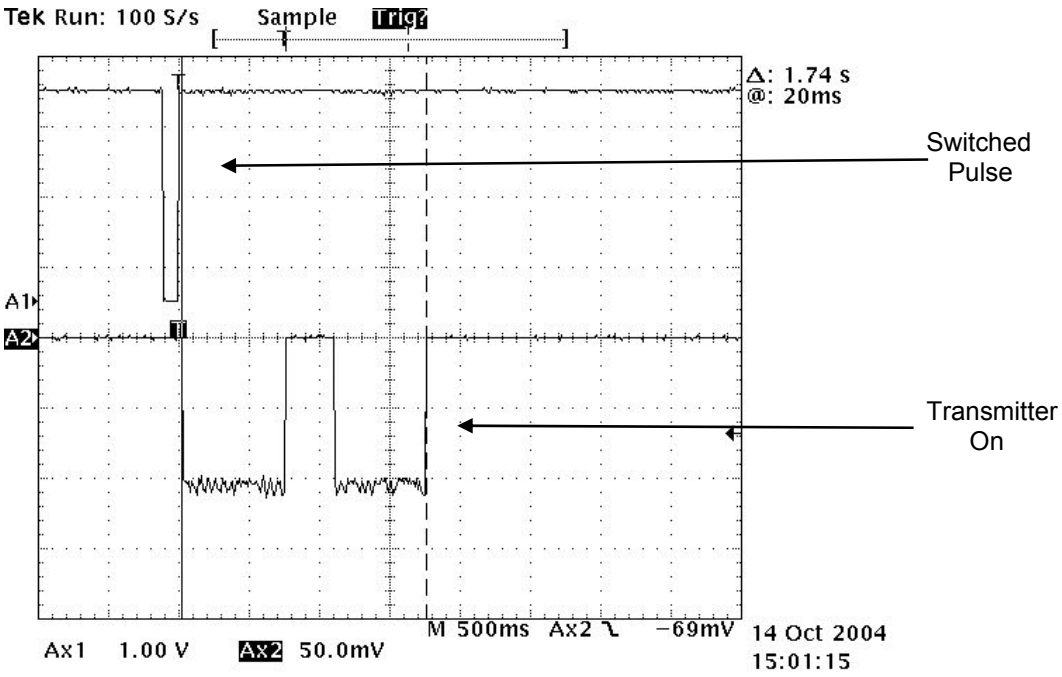


Occupied Bandwidth = 347 kHz
f lower = 311.825 MHz
f higher = 312.172 MHz

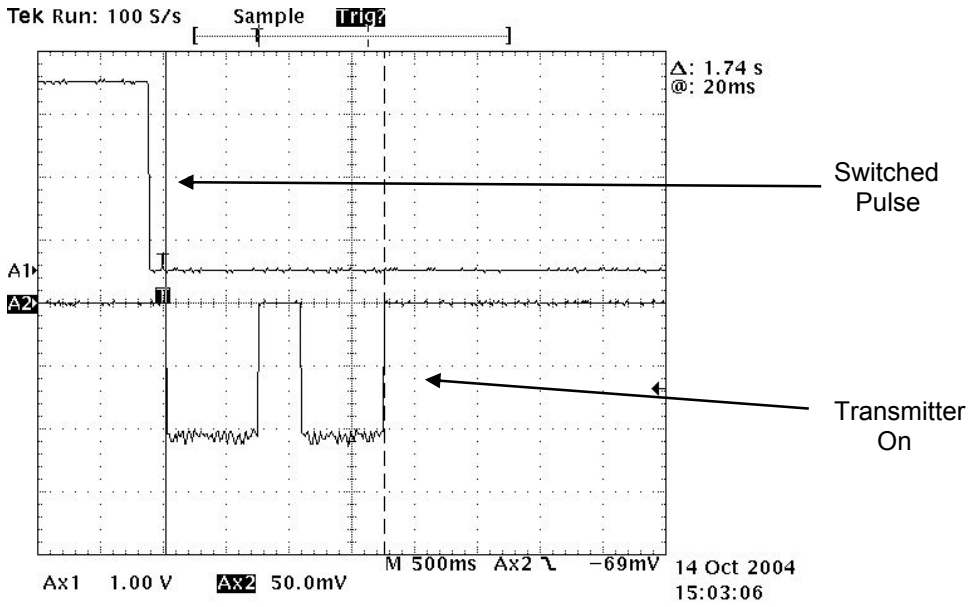
ANNEX D

TRANSMITTER ON TIME PLOT(s)

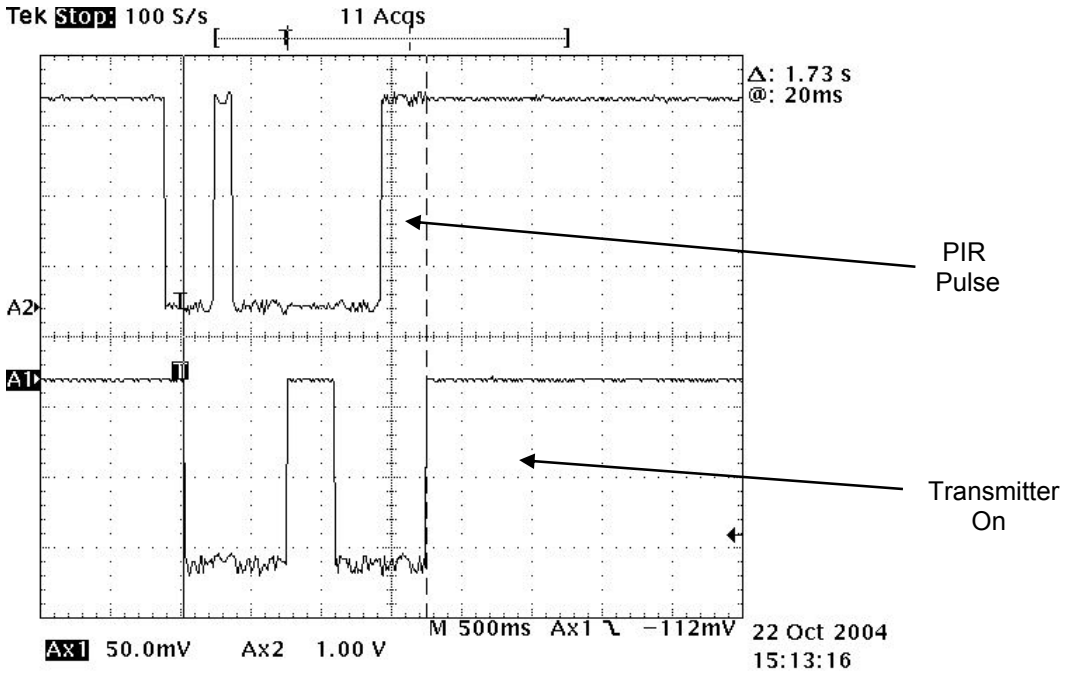
Transmitter On Time Switched Input Shorter Than Transmit Time



Transmitter On Time Switched Input Longer Than Transmit Time



Transmitter On Time PIR Activation



Supervision Transmission On Time