

TEST REPORT No: RL1061/5278
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**REPORT ON THE
CERTIFICATION TESTING OF A
PSION Inc.
INTEGRAL BATTERY POWERED
IDENTITY TAG DATA TRANSCEIVER
Part No: A2832-1014-01
WITH RESPECT TO
THE FCC 47CFR, Pt=s 15.109 & 15.225
INTENTIONAL RADIATOR
& UNINTENTIONAL RADIATOR CLASS B
SPECIFICATIONS**

TEST DATE(s): 9th to 29th June 2000

TESTED BY:
PARRY

R P I

APPROVED BY:

S P HAYES

ISSUE DATE:

Distribution Copy No=s:-

1 PSION Inc.

2 FCC EVALUATION LABORATORIES

3 TRL EMC Ltd.

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 Notes:-		
1. Component failure during test	YES	☐
	NO	☒
 2. If Yes, details of failure:-		
 3. All measurement uncertainty calculations detailed in this report are carried out in accordance with UKAS Publication NIS 81, Edition 1, May 1994, for a 95% confidence level.		
4. The contents of the attached applicant=s 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.		

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT): Part No: A2832-1014-01

EQUIPMENT TYPE: Identity Tag Data Transceiver

SERIAL NUMBER OF EUT: Engineering sample.

PURPOSE OF TEST: FCC Certification

TEST SPECIFICATION(s): FCC 47CFR Pt=s 15.109 & 15.225

TEST RESULT: COMPLIANT: Yes ☒ [X]
No ☐ []

APPLICANT=S CATEGORY: (a) MANUFACTURER ☐ []
(b) IMPORTER ☒ [X]
(c) DISTRIBUTOR ☒ [X]
(d) AGENT ☐ []

APPLICANT'S ORDER No(s): 601264

APPLICANT=S CONTACT PERSON(s): Vince Wolfe Brian James

APPLICANT: Psion Enterprise Computing On behalf of:- Psion Inc.,

ADDRESS: 92, Milton Park, 150, Baker Avenue Ext.,
Abingdon, Concord,
Oxon., MA.,
OX14. 4RY., 01742,
United Kingdom. USA.

Tel: +44 1235 443178 Tel: ++1 978 371 0310

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MANUFACTURER: i. d. Systems Ltd.

ADDRESS: Rutherford House,
Pencroft Way,
Manchester Science Park,
Manchester,
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United Kingdom.

Tel: +44 161 232 1000

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EUT(s) COUNTRY OF ORIGIN: UNITED KINGDOM

TEST LABORATORY: TRL EMC Ltd.

UKAS ACCREDITATION No: 0728

TEST DATE(s): 9th to 29th June 2000

TEST REPORT No: RL1061/5278

CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY:	ILPWARFIDHF		
PURPOSE OF TEST:	FCC Certification.		
TEST SPECIFICATION:	FCC 47CFR, Parts 15.109 & 15.225		
TEST RESULT:	Compliant to specification.		
EQUIPMENT UNDER TEST:	Part No: A2832-1014-01		
EQUIPMENT SERIAL No:	Engineering sample.		
ITU EMISSION CODE:	13k3K1DAN (or) 13k3M1DAN		
EQUIPMENT TYPE:	Identity Tag Data Transceiver.		
UTILISATION:	Identification, access & stock control.		
CARRIER EMISSION:	+33.6dB Φ V/m @ 30m		
ANTENNA TYPE:	Fixed, or Integral		
ALTERNATIVE AE:	None, as per Part 15.203.		
BAND OF OPERATION:	13.553MHz to 13.567MHz		
CHANNEL SPACING:	Not applicable.		
No. of CHANNELS:	1 (one).		
FREQUENCY CONVERSION:	Superhet	☒ ; Direct	☐ ; Regenerative ☐
INTERMEDIATE FREQUENCY:	1 st = 455kHz	☒ ; 2 nd	☐ ; 3 rd ☐
LOCAL OSCILLATOR:	Higher	☒ ; Lower	☐ ; not applicable ☐
FREQUENCY GENERATION:	SAW Resonator	☐ ; Crystal	☒ ; Synt hesizer ☐
MODULATION METHOD:	Amplitude	☐ ; Digital	☒ ; Angle ☐
POWER SOURCE(s):	+5Vdc, integral battery powered only.		
TEST DATE(s):	9 th to 29 th June 2000		
ORDER No(s):	601264		
APPLICANT:	Psion Enterprise Computing 92, Milton Park, Abingdon, Oxon., OX14. 4RY., United Kingdom.	On behalf of:-	Psion Inc., 150, Baker Avenue Ext., Concord, MA., 01742, USA.

TESTED BY: R P I PARRY

APPROVED BY: S P HAYES
EMC MANAGER

1.

EQUIPMENT SERIAL / MODEL IDENTITY	CHANNEL NUMBER	Tx NOMINAL FREQUENCY MHz	Rx NOMINAL FREQUENCY MHz	TESTS REQUIRED	REMARKS
A2832-1014-01	1	13.5625	13.5625	Rx radiated	Pt. 15.109
				Rx radiated	Pt. 15.209
				Tx radiated	Pt. 15.209
				Tx carrier	Pt. 15.225
				Tx frequency	Pt. 15.225

- | | | |
|------------------------|----------------|-------------------------------------|
| 2. Equipment category: | Single channel | ☒ |
| | Two channel | ☐ |
| | Multi-channel | ☐ |

3. Supply voltages: $V_{nom} = +5.0V_{dc}$

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

- | | | | | |
|------------------|-----------|------|---|------------|
| 4. Temperatures: | (Ambient) | Tnom | = | [see test] |
| | (Extreme) | Tmin | = | -20EC |
| | (Extreme) | Tmax | = | +50EC |

5. Transmitter maximum deviation or shift: kHz = n/a

6. Transmitter maximum bit or pulse rate & level: bps = 26,500
Level = TTL

7. Receiver rated output & impedance: dBW = TTL
 Ohms = 10kR

- | | | | |
|---------------------|------------|---|-------------------------------------|
| 8. Channel spacing: | kHz | = | n/a |
| | Narrowband | | ☒ |
| | Wholeband | | ☐ |

TESTS REQUIRED

TRANSMITTER & RECEIVER TESTS

Receiver Spurious Emissions	- Powerline	- Part 15.107	[n/a]
Receiver Spurious Emissions	- Radiated	- Part 15.109 - >30MHz	[X]
Receiver Spurious Emissions	- Radiated	- Part 15.209 - <30MHz	[X]
Transmitter Spurious Emissions	- Powerline	- Part 15.207	[n/a]
Transmitter Spurious Emissions	- Radiated	- Part 15.209.c - <30MHz	[X]
Transmitter Spurious Emissions	- Radiated	- Part 15.209.c - >30MHz	[X]
Transmitter Carrier Emission	- Radiated	- Part 15.225.a	[X]
Transmitter Carrier Frequency	- Radiated	- Part 15.225.c	[X]

Notes:-

- Equipment tested for (mains ac) 110V powerline emissions. [n/a]
- Equipment tested as (fixed) integral antenna configuration. [X]
- All tests were carried out with new batteries, as per Part 15.31.e. [n/a]
- Equipment tested for radiated emissions as per Part 15.109. [X]
- Equipment tested for radiated emissions as per Part 15.225.b {15.209.c}. [X]
- Equipment tested for unintentional radiator digital device Class B. [X]

SAMPLE CALCULATIONS

Parts 15.107 & 15.207 - Powerline.

Frequency (MHz)	Rx (dBΦV)	LISN Correction (dB)	Cable loss (dB)	Powerline (dBΦV)
n/a	n/a	n/a	n/a	n/a

Parts 15.109, 15.209 & 15.225 - Radiated.

Frequency (MHz)	Rx (dBΦV)	3m Correction (dB)	Ae AF & Cable loss (dB/m & dB)	Field Strength @ 3m (dBΦV/m)
13.56192	+58.7 (*)	-25.1	n/a	+33.6 @ 30m
40.68000	+20.1	n/a	+18.4	+38.5 @ 3m
203.40000	+22.8	n/a	+10.9	+22.7 @ 3m

- Notes:-**
- (*) Readings under 30MHz made using a directly calibrated loop antenna in dBΦV/m.
 - Unit under test (EUT) is to be integral battery powered when in commercial use.
 - All tests carried out on the EUT used a decoupled external +5Vdc output psu.

RECEIVER TESTS

RECEIVER SPURIOUS EMISSIONS - RADIATED - PART 15.109 - >30MHz

Ambient temperature	=	+19EC (<1GHz), n/a (>1GHz)	Class A digital device	[]
Relative humidity	=	48% (<1GHz), n/a (>1GHz)	Class B digital device	[X]
Conditions	=	Open Area Test Site (OATS)	10m measurements <1GHz	[]
Supply voltage	=	Vnom	3m measurements <1GHz	[X]
Channel number	=	1	1m measurements >1GHz	[]

Frequency & Level 30MHz to 88MHz		40.680MHz	+35.8dBΦV/m @ 3m
Frequency & Level 88MHz to 216MHz		nil emissions	∃-20dB below limit
Frequency & Level 216MHz to 960MHz		nil emissions	∃-20dB below limit
Frequency & Level 960MHz to (x) MHz		nil emissions	∃-20dB below limit
Limits	30MHz to 88MHz	+39.0dBΦV/m @ 10m [] ; +40.0dBΦV/m @ 3m [X]	
	88MHz to 216MHz	+43.5dBΦV/m @ 10m [] ; +43.5dBΦV/m @ 3m [X]	
	216MHz to 960MHz	+46.4dBΦV/m @ 10m [] ; +46.0dBΦV/m @ 3m [X]	
	960MHz to (x) MHz	+49.5dBΦV/m @ 10m [] ; +54.0dBΦV/m @ 3m [X]	
Measurement Uncertainty		∇4.1dB	

Notes:-

- Results quoted are extrapolated as indicated.
- Emissions were searched to:- (x) 1000MHz inclusive, as per Part 15.33b.
- Extrapolation factor @ 20dB/decade from 10m to 1m, as per Part 15.31f.
- Extrapolation factor @ 10.5dB from 10m to 3m.
- Extrapolation factor @ 9.5dB from 3m to 1m.
- Measurements <1GHz @ 10m (Class A), or @ 3m (Class B), as per Part 15.109.
- Measurements >1GHz @ 1m, as per Part 15.31f (1).
- Receiver Detector <1GHz = CISPR, Quasi-Peak, 120kHz Bandwidth.
- Receiver Detector >1GHz = Peak Hold, 1MHz Resolution Bandwidth.
- Sample calculation, see page 6.

Test Method:-

- As per Radio - Noise Emissions, ANSI C63.4: 1992.
- Measuring distances as Notes 1, 2 & 3 above.
- EUT 0.8 metre above ground plane.
- Emissions maximised by rotation of EUT, on an automatic turntable, raising and lowering the receiver antenna between 1m & 4m in horizontal and vertical polarisations, with worst case results recorded.

Test Equipment Used:-

1. Full description at Annex B.
2. TRL190, TRL191, TRL08, TRL317, TRL274.

RECEIVER TESTS

RECEIVER SPURIOUS EMISSIONS - RADIATED - PART 15.209 - <30MHz

Ambient temperature	=	+21EC (<30MHz)	Class A digital device	[]
Relative humidity	=	72% (<30MHz)	Class B digital device	[X]
Conditions	=	Open Area Test Site (OATS)	300m extrapolated from 3m	[X]
Supply voltage	=	Vnom	30m extrapolated from 3m	[X]
Channel number	=	1	30m extrapolated from 10m	[]

Frequency & Level 9kHz to 490kHz		nil emissions	∃-10dB below limit
Frequency & Level 490kHz to 1705kHz		nil emissions	∃-10dB below limit
Frequency & Level 1705kHz to 30MHz		13.56178MHz	-5.4dBΦV/m @ 30m
Limits	9kHz to 490kHz	20Log ₁₀ [2400/F(kHz)]dBΦV/m @ 300m	
	490kHz to 1705kHz	20Log ₁₀ [24000/F(kHz)]dBΦV/m @ 30m	
	1705kHz to 30MHz	+29.5dBΦV/m @ 30m	
Measurement Uncertainty		∇4.2dB	

Notes:-

- Results quoted are extrapolated as indicated.
- Emissions were searched from 9kHz to 30MHz inclusive, as per Part 15.109e.
- Extrapolation factor @ 40dB/decade from 300m to 30m, as per Part 15.31f.
- Extrapolation factor @ graph values from 30m to 3m, as per Annex D.
- Measurements <490kHz @ 3m, as per Part 15.31f (2).
- Measurements <1705kHz @ 3m, as per Part 15.31f (2).
- Measurements <30MHz @ 3m, as per Part 15.31f (2).
- Receiver detector <30MHz = CISPR, Quasi-Peak, 10kHz Bandwidth.
- Nil emissions sensitivity of +36dBΦV/m @ 3m.
- Sample calculation, see page 6.

Test Method:-

- As per Radio - Noise Emissions, ANSI C63.4: 1992.
- Measuring distances as Notes 1 to 7 (inc) above.
- EUT 0.8 metre above ground plane.
- Emissions maximised by rotation of EUT, on an automatic turntable, raising and lowering the receiver antenna between 1m & 4m in horizontal and vertical polarisations, with worst case results recorded.

Test Equipment Used:-

- Full description at Annex B.

2. TRL190, TRL191, TRL08, TRL07, TRL237.

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS - RADIATED - PART 15.209.c - <30MHz

Ambient temperature	=	+21EC	3m measurements <30MHz	[]
Relative humidity	=	72%	300m extrapolated from 3m	[X]
Conditions	=	Open Area Test Site (OATS)	30m extrapolated from 3m	[X]
Supply voltage	=	Vnom	30m extrapolated from 10m	[]
Channel number	=	1		

Frequency & Level 9kHz to 490kHz		nil emissions	∃-10dB below limit
Frequency & Level 490kHz to 1705kHz		nil emissions	∃-10dB below limit
Frequency & Level 1705kHz to 30MHz		nil emissions	∃-10dB below limit
Limits	9kHz to 490kHz	$20\text{Log}_{10}[2400/F(\text{kHz})]\text{dB}\Phi\text{V/m @ 300m}$	
	490kHz to 1705kHz	$20\text{Log}_{10}[24000/F(\text{kHz})]\text{dB}\Phi\text{V/m @ 30m}$	
	1705kHz to 30MHz	+29.5dBΦV/m @ 30m	
Measurement Uncertainty		∇4.2dB	

Notes:-

- Results quoted are extrapolated as indicated.
- Emissions were searched to:- (x) 1000MHz inclusive, as per Part 15.33a.
- Extrapolation factor @ 40dB/decade from 300m to 30m, as per Part 15.31f.
- Extrapolation factor @ graph values from 30m to 3m, as per Annex D.
- Measurements <490kHz @ 3m, as per Part 15.31f (2).
- Measurements <1705kHz @ 3m, as per Part 15.31f (2).
- Measurements <30MHz @ 3m, as per Part 15.31f (2).
- Receiver detector <30MHz = CISPR, Quasi-Peak, 10kHz bandwidth.
- Nil emissions sensitivity of +36dBΦV/m @ 3m.
- Sample calculation, see page 6.

Test Method:-

- As per Radio - Noise Emissions, ANSI C63.4: 1992.
- Measuring distances as Notes 1 to 7 (inc) above.
- EUT 0.8 metre above ground plane.
- Emissions maximised by rotation of EUT, on an automatic turntable, raising and lowering the receiver antenna between 1m & 4m in horizontal and vertical polarisations, with worst case results recorded.

Test Equipment Used:-

- Full description at Annex B.

2. TRL190, TRL191, TRL08, TRL07, TRL237.

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS - RADIATED - PART 15.209.c - >30MHz

Ambient temperature	=	+19EC (<1GHz), EC (>1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	48% (<1GHz), % (>1GHz)	1m measurements >1GHz	[]
Conditions	=	Open Area Test Site (OATS)	3m extrapolated from 1m	[]
Supply voltage	=	Vnom		
Channel number	=	1		

Frequency & Level 30MHz to 88MHz		40.680MHz	+38.5dB Φ V/m @ 3m
Frequency & Level 88MHz to 216MHz		203.400MHz	+33.7dB Φ V/m @ 3m
Frequency & Level 216MHz to 960MHz		nil emissions	$\geq$ -20dB below limit
Frequency & Level 960MHz to (x) MHz		nil emissions	$\geq$ -20dB below limit
Limits	30MHz to 88MHz	+40.0dB Φ V/m @ 3m	
	88MHz to 216MHz	+43.5dB Φ V/m @ 3m	
	216MHz to 960MHz	+46.0dB Φ V/m @ 3m	
	960MHz to (x) MHz	+54.0dB Φ V/m @ 3m	
Measurement Uncertainty		∇ 4.1dB	

Notes:-

- Results quoted are extrapolated as indicated.
- Emissions were searched to:- (x) 1000MHz inclusive, as per Part 15.33a.
- Extrapolation factor @ 9.5dB from 1m to 3m, as per Part 15.31f.
- Measurements >1GHz @ 1m, as per Part 15.31f (1).
- Receiver detector <1GHz = CISPR, Quasi-Peak, 120kHz bandwidth.
- Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth.
- Sample calculation, see page 6.

Test Method:-

- As per Radio - Noise Emissions, ANSI C63.4: 1992.
- Measuring distances as Notes 1 to 4 above.
- EUT 0.8 metre above ground plane.
- Emissions maximised by rotation of EUT, on an automatic turntable, raising and lowering the receiver antenna between 1m & 4m in horizontal and vertical polarisations, with worst case results recorded.

Test Equipment Used:-

- Full description at Annex B.
- TRL190, TRL191, TRL08, TRL317, TRL274.

TRANSMITTER TESTS

TRANSMITTER CARRIER EMISSION - RADIATED - PART 15.225.a

Ambient temperature	=	+21EC	3m measurements @ fc	[X]
Relative humidity	=	72%	10m measurements @ fc	[]
Conditions	=	Open Area Test Site (OATS)	30m measurements @ fc	[]
Supply voltage	=	Vnom	30m extrapolated from 3m	[]
Channel number	=	1	30m extrapolated from 10m	[]

Frequency & Level		13.56192MHz	+33.6dB Φ V/m @ 30m
Limit	13.553MHz to 13.567MHz	+80.0dB Φ V/m @ 30m	
Measurement Uncertainty		∇ 4.2dB	

Notes:-

1. Results quoted are extrapolated as indicated.
2. Extrapolation factor @ 9.5dB from 10m to 30m, as per Part 15.31f.
3. Extrapolation factor @ graph values from 3m to 10m, or 30m, as per Annex D.
4. Receiver detector @ fc = CISPR, Quasi-Peak, 10kHz bandwidth.
5. Sample calculation, see page 6.

Test Method:-

1. As per Radio - Noise Emissions, ANSI C63.4: 1992.
2. Measuring distances as Notes 1 to 7 (inc) 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 in horizontal and vertical polarisations, with worst case results recorded.

Test Equipment Used:-

1. Full description at Annex B.
2. TRL190, TRL191, TRL08, TRL07, TRL237.

TRANSMITTER TESTS

TRANSMITTER CARRIER FREQUENCY - RADIATED - PART 15.225.c

Ambient temperature = +20EC
 Relative humidity = 70%
 Conditions = Indoors
 Supply voltage = Vnom
 Channel number = 1
 Period after startup = 0mins

Tnom +20EC	Vmin (-15%)	13.562200MHz	0.002212%	-300Hz
	Vnom (✓00%)	13.562300MHz	0.001475%	-200Hz
	Vmax (+15%)	13.562300MHz	0.001475%	-200Hz
Tmin	Vnom (✓00%)	13.562300MHz	0.001475%	-200Hz
Tmax	Vnom (✓00%)	13.562000MHz	0.003687%	-500Hz
Limit		13.562500MHz ∇ 0.01% = ∇ 1356Hz(nom)		
Measurement Uncertainty		∇ 2.7 x 10 ⁻⁷ Hz [X] ; ∇ 0.0002% ∇ 200Hz []		

Notes:-

1. Equipment carrier frequency graph(s) @ Annex E [X].

Test Method:-

1. As per Radio - Noise Emissions, ANSI C63.4: 1992.
2. EUT operated and tested with a new battery [n/a].
3. EUT operated and tested @ 0, 2, 5 & 10mins after startup.
4. RF Spectrum Analyser set to:-
 - Res BW = ∇ 100Hz @ fc.
 - Video BW = as per Res BW.
 - Detector = Peak Hold.
 - Freq. Span = as appropriate.
 - Res/Span = as appropriate.
 - Scan Rate = Auto.

Test Equipment Used:-

1. Full description at Annex B.
2. TRL190, TRL191, TRL11, TRL05, TRL164.

Conclusion:-

1. Total maximum to minimum variation = 300Hz = 0.0022%.

TRANSMITTER TESTS

TRANSMITTER CARRIER FREQUENCY - RADIATED - PART 15.225.c

Ambient temperature = +20EC
 Relative humidity = 70%
 Conditions = Indoors
 Supply voltage = Vnom
 Channel number = 1
 Period after startup = **2mins**

Tnom +20EC	Vmin (-15%)	13.562200MHz	0.002212%	-300Hz
	Vnom (∇00%)	13.562200MHz	0.002212%	-300Hz
	Vmax (+15%)	13.562200MHz	0.002212%	-300Hz
Tmin	Vnom (∇00%)	13.562300MHz	0.001475%	-200Hz
Tmax	Vnom (∇00%)	13.562000MHz	0.003687%	-500Hz
Limit		13.562500MHz ∇0.01% = ∇1356Hz(nom)		
Measurement Uncertainty		∇2.7 x 10 ⁻⁷ Hz [X] ; ∇0.0002% ∇200Hz []		

Notes:-

1. Equipment carrier frequency graph(s) @ Annex E [X].

Test Method:-

1. As per Radio - Noise Emissions, ANSI C63.4: 1992.
2. EUT operated and tested with a new battery [n/a].
3. EUT operated and tested @ 0, 2, 5 & 10mins after startup.
4. RF Spectrum Analyser set to:-
 - Res BW = ∇100Hz @ fc.
 - Video BW = as per Res BW.
 - Detector = Peak Hold.
 - Freq. Span = as appropriate.
 - Res/Span = as appropriate.
 - Scan Rate = Auto.

Test Equipment Used:-

1. Full description at Annex B.
2. TRL190, TRL191, TRL11, TRL05, TRL164.

Conclusion:-

1. Total maximum to minimum variation = 300Hz = 0.0022%.

TRANSMITTER TESTS

TRANSMITTER CARRIER FREQUENCY - RADIATED - PART 15.225.c

Ambient temperature = +20EC
 Relative humidity = 70%
 Conditions = Indoors
 Supply voltage = Vnom
 Channel number = 1
 Period after startup = **5mins**

Tnom +20EC	Vmin (-15%)	13.562200MHz	0.002212%	-300Hz
	Vnom (∇00%)	13.562200MHz	0.002212%	-300Hz
	Vmax (+15%)	13.562200MHz	0.002212%	-300Hz
Tmin	Vnom (∇00%)	13.562300MHz	0.001475%	-200Hz
Tmax	Vnom (∇00%)	13.562000MHz	0.003687%	-500Hz
Limit		∇0.01% = ∇1356Hz(nom)		
Measurement Uncertainty		∇2.7 x 10 ⁻⁷ Hz [X] ; ∇0.0002% ∇200Hz []		

Notes:-

1. Equipment carrier frequency graph(s) @ Annex E [X].

Test Method:-

1. As per Radio - Noise Emissions, ANSI C63.4: 1992.
2. EUT operated and tested with a new battery [n/a].
3. EUT operated and tested @ 0, 2, 5 & 10mins after startup.
4. RF Spectrum Analyser set to:-
 - Res BW = ∇100Hz @ fc.
 - Video BW = as per Res BW.
 - Detector = Peak Hold.
 - Freq. Span = as appropriate.
 - Res/Span = as appropriate.
 - Scan Rate = Auto.

Test Equipment Used:-

1. Full description at Annex B.
2. TRL190, TRL191, TRL11, TRL05, TRL164.

Conclusion:-

1. Total maximum to minimum variation = 300Hz = 0.0022%.

TRANSMITTER TESTS

TRANSMITTER CARRIER FREQUENCY - RADIATED - PART 15.225.c

Ambient temperature = +20EC
 Relative humidity = 70%
 Conditions = Indoors
 Supply voltage = Vnom
 Channel number = 1
 Period after startup = **10mins**

Tnom +20EC	Vmin (-15%)	13.562200MHz	0.002212%	-300Hz
	Vnom (∇00%)	13.562200MHz	0.002212%	-300Hz
	Vmax (+15%)	13.562200MHz	0.002212%	-300Hz
Tmin	Vnom (∇00%)	13.562300MHz	0.001475%	-200Hz
Tmax	Vnom (∇00%)	13.562000MHz	0.003687%	-500Hz
Limit		∇0.01% = ∇1356Hz(nom)		
Measurement Uncertainty		∇2.7 x 10 ⁻⁷ Hz [X] ; ∇0.0002% ∇200Hz []		

Notes:-

- Equipment carrier frequency graph(s) @ Annex E [X].

Test Method:-

- As per Radio - Noise Emissions, ANSI C63.4: 1992.
- EUT operated and tested with a new battery [n/a].
- EUT operated and tested @ 0, 2, 5 & 10mins after startup.
- RF Spectrum Analyser set to:-
 - Res BW = ∇100Hz @ fc.
 - Video BW = as per Res BW.
 - Detector = Peak Hold.
 - Freq. Span = as appropriate.
 - Res/Span = as appropriate.
 - Scan Rate = Auto.

Test Equipment Used:-

- Full description at Annex B.
- TRL190, TRL191, TRL11, TRL05, TRL164.

Conclusion:-

- Total maximum to minimum variation = 300Hz = 0.0022%.

ANNEX A

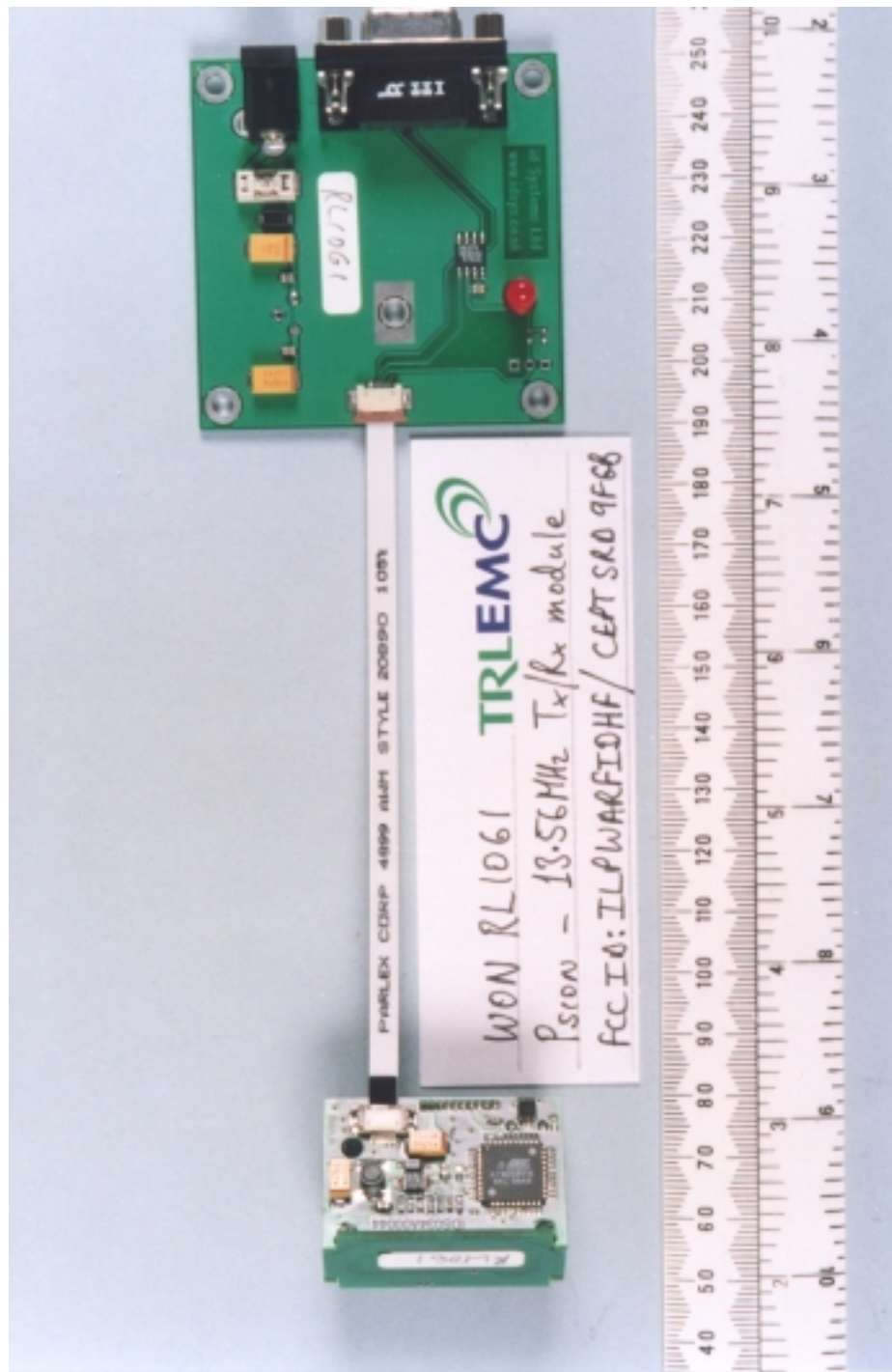
PHOTOGRAPHS OF THE EQUIPMENT: (taken on completion of all tests)



Photograph A-1
Title: Test site with Tx/Rx.

ANNEX A

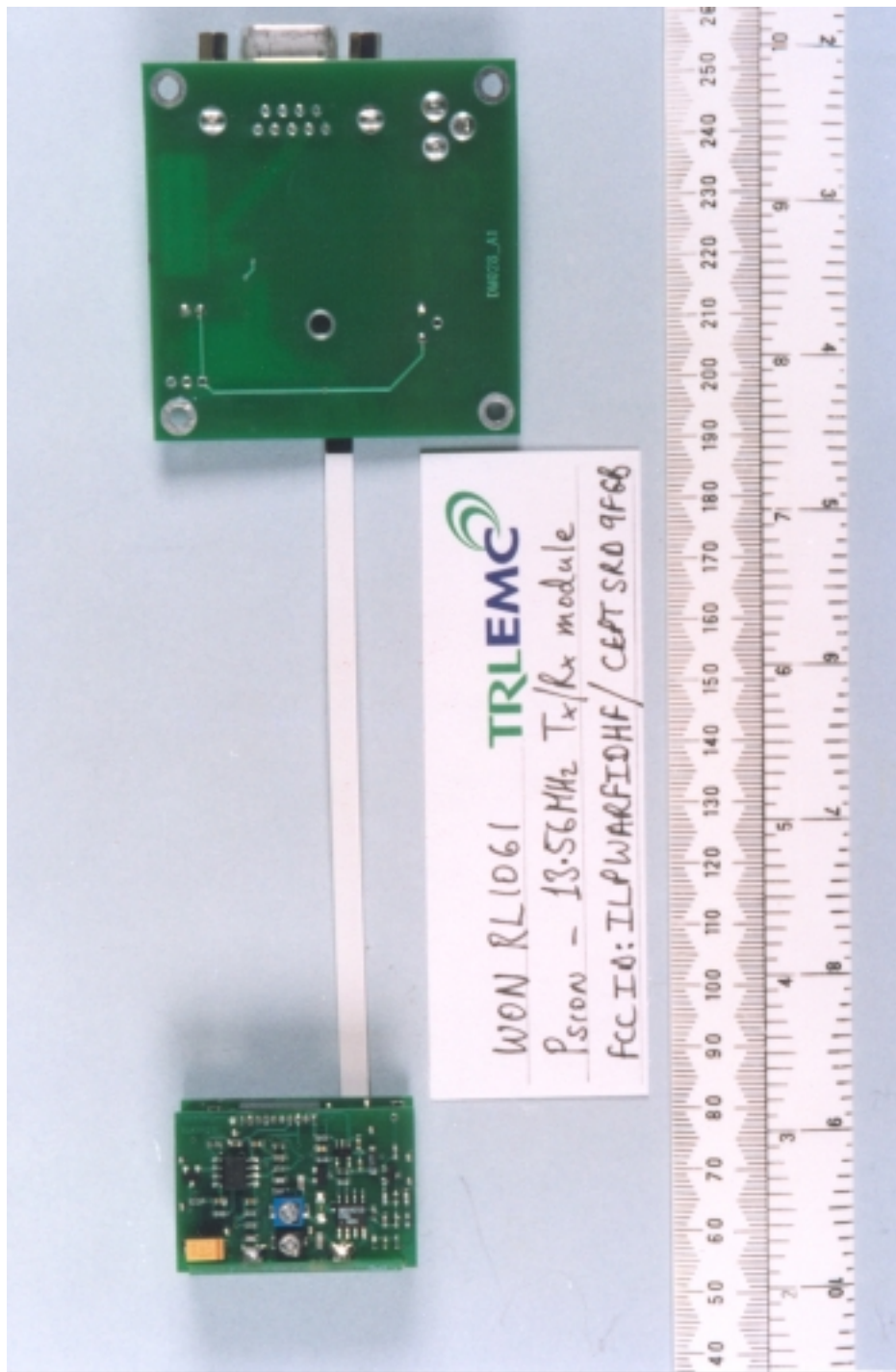
PHOTOGRAPHS OF THE EQUIPMENT: (taken on completion of all tests)



Photograph A2
Title: Tx/Rx, front view & interface.

ANNEX A

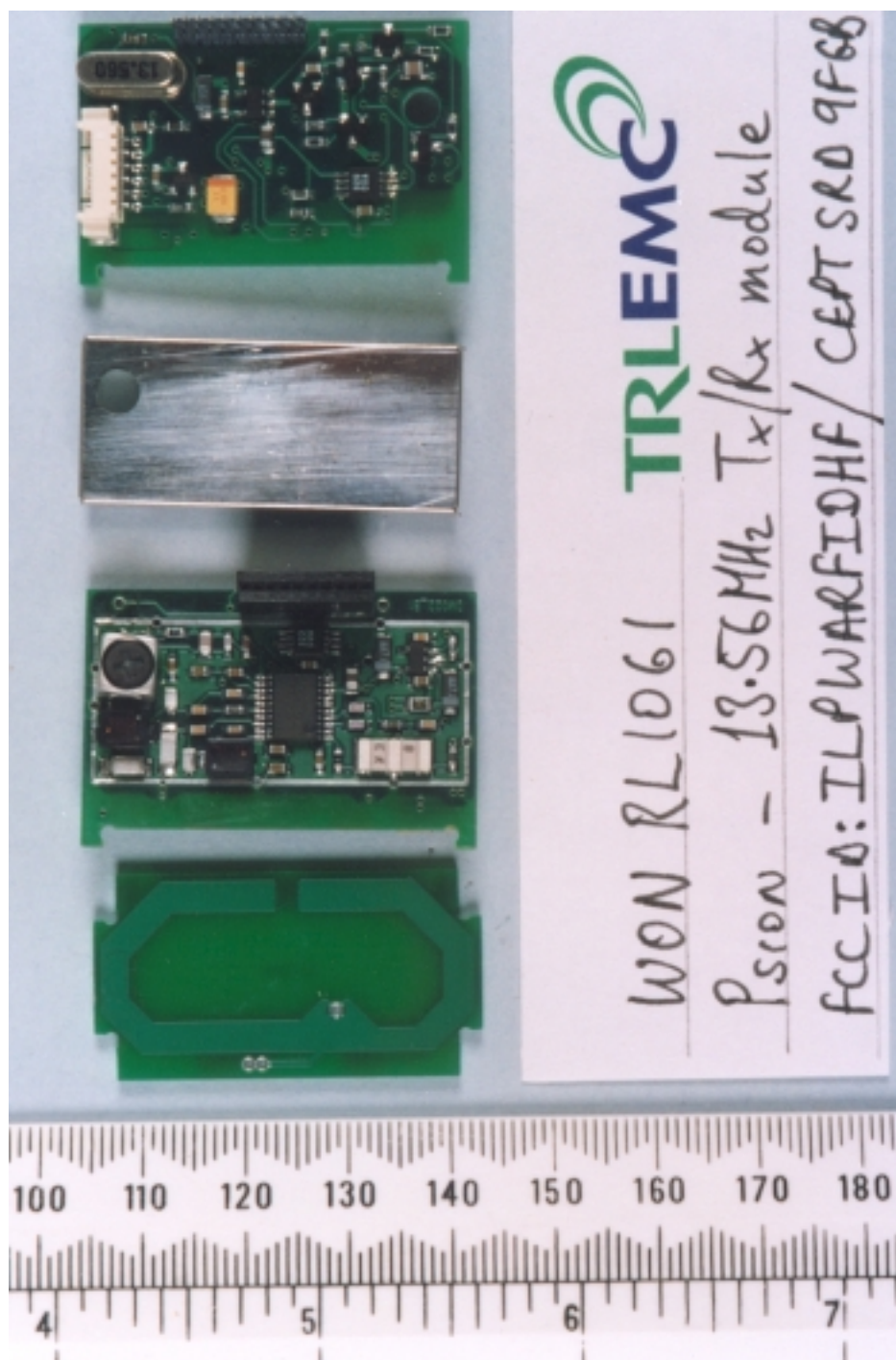
PHOTOGRAPHS OF THE EQUIPMENT: (taken on completion of all tests)



Photograph A3
Title: Tx/Rx, rear view & interface.

ANNEX A

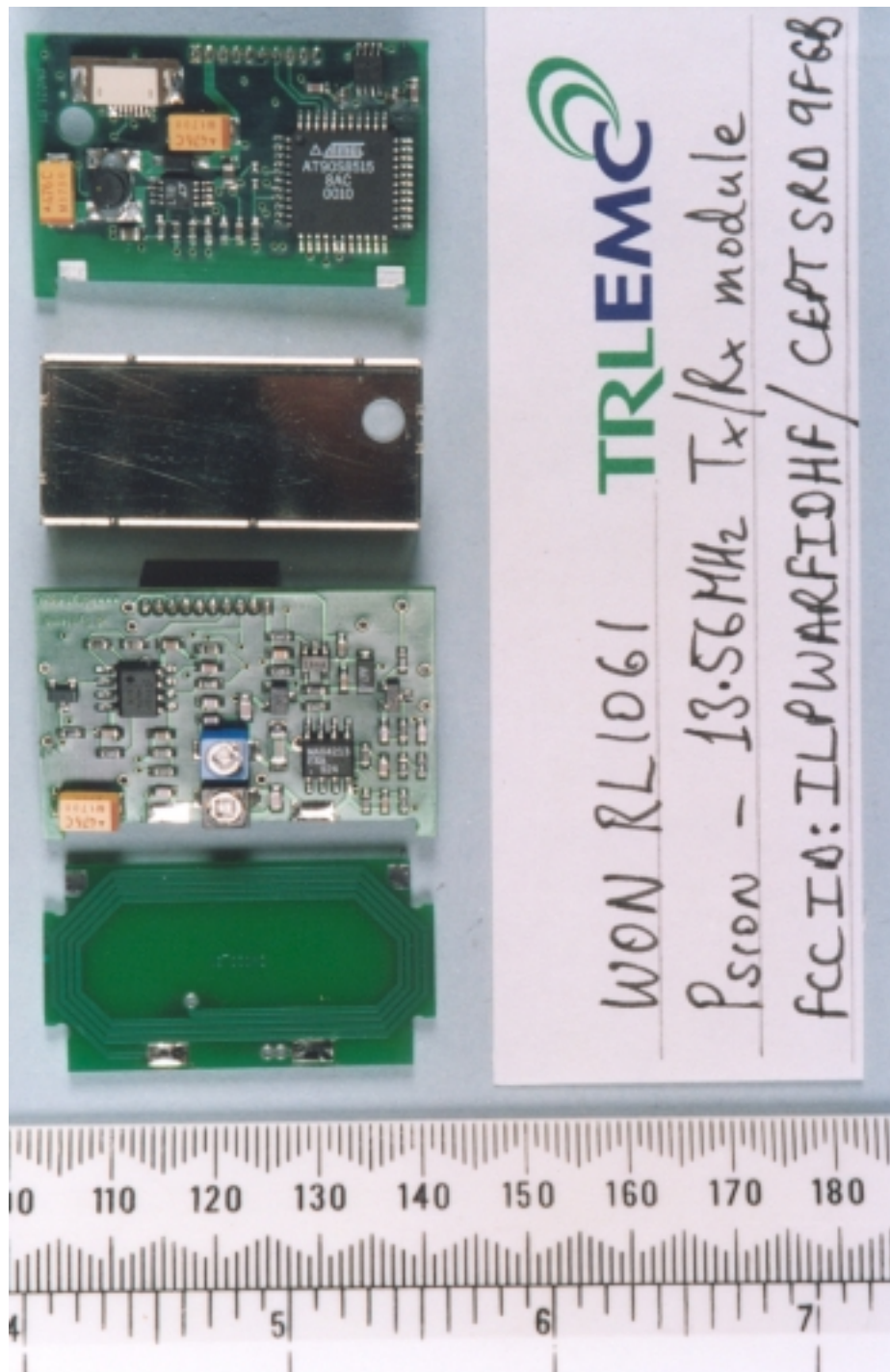
PHOTOGRAPHS OF THE EQUIPMENT: (taken on completion of all tests)



Photograph A4
Title: Tx/Rx pcb=s, top, w/o rf shield.

ANNEX A

PHOTOGRAPHS OF THE EQUIPMENT:
(taken on completion of all tests)



Photograph A5
Title: Tx/Rx pcb=s, bottom.

ANNEX B

TEST EQUIPMENT LIST

INSTRUMENT	SUPPLIER	TYPE No	SERIAL No	TRL EMC No
LF / HF RECEIVER, 9kHz - 30MHz	ROHDE&SCHWARZ	ESH2	879014 / 028	TRL 06
RF PULSE LIMITER	ROHDE&SCHWARZ	ESH3Z2	M494	TRL 06A
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE&SCHWARZ	HFH2	881058 - 53	TRL 07
RANGE 1 (3 - 30m)	TRL	N/A	N/A	TRL 08
VARIAC, 230V, 10A	ZENITH	100R	V265537	TRL 12
dc PSU, VARIABLE, 30v, 10A, 300W	TOPWARD ELECTRONIC	23010	899672	TRL 15
RF SIGNAL GEN, 10kHz - 1000MHz	MARCONI	2022	119022 / 205	TRL 17
LISN, ac MAINS	CHASE	MN2050	1431	TRL 25
HF RECEIVER, 150kHz - 30MHz	CHASE	HFR2000	2158	TRL 26
LF RECEIVER, 9kHz - 150kHz	CHASE	LFR1000	1020	TRL 27
HF RECEIVER, 150kHz - 30MHz	CHASE	HFR2000	2187	TRL 28
AE, DIPOLE, 20MHz - 300MHz	CHASE	VHA9103	7106	TRL 35
AE, DIPOLE, 20MHz - 300MHz	CHASE	VHA9103	7011	TRL 36
AE, DIPOLE, 300MHz - 1GHz	CHASE	VHA9105	7107	TRL 37
AE, DIPOLE, 300MHz - 1GHz	CHASE	VHA9105	N/A	TRL 38
ATU, RECEIVER, 9kHz - 30MHz	SCHWARZBECK	FMZL1514	1514338	TRL 42
COAX LOAD, 2W, N, 50Ω, dc - 4GHz	BIRD	8360NM	N/A	TRL 113
COAX LOAD, 2W, N, 50Ω, dc - 4GHz	BIRD	8360NM	N/A	TRL 114
COAX LOAD, 2W, BNC, 50Ω, dc - 4GHz	BIRD	8360B	N/A	TRL 115
COAX LOAD, 2W, BNC, 50Ω, dc - 4GHz	BIRD	8360B	N/A	TRL 116
COAX LOAD, 1W, BNC, 50Ω,	SUHNER	65BNC - 50 - 0 - 1	N/A	TRL 117

ANNEX B

TEST EQUIPMENT LIST

INSTRUMENT	SUPPLIER	TYPE No	SERIAL No	TRL EMC No
dc - 1GHz (min)				
AE, DRG HORN, 1GHz - 18GHz	EMCO	3115	9010 - 3580	TRL 138
AE, DRG HORN, 1GHz - 18GHz	EMCO	3115	9010 - 3581	TRL 139
RF ANALYSER, 10kHz - 60GHz	TEKTRONIX	2756P	B010109	TRL 164
MULTIMETER (mc) 20k Ω / V (sens)	AVO	MODEL 8, MK.V.	0545248	TRL 169
RF SIGNAL GEN, LOW NOISE -90dBc, 10kHz - 5.4GHz	MARCONI	2042	119388 / 080	TRL 176
RANGE 2 (3 - 10m)	TRL	N/A	N/A	TRL 182
VARIAC, 230V, 10A	VARATLAN	Z710R	N/A	TRL 186
ANTENNA MAST	CHASE	HM9104	N/A	TRL 189
MULTIMETER (dig)	ISOTECH	IDM91	00606606	TRL 190
THERMOMETER & HYGROMETER	RS	212 - 146	N/A	TRL 191
AE, BICONE, 20MHz - 300MHz	CHASE	BBA 9106	N/A	TRL 193
SCOPE, 20MHz, 2CH, DIG STORAGE	BECKMAN	9302	2090044	TRL 197
AE, LOG PERIODIC, 300MHz - 1GHz	CHASE	UPA6108	1061	TRL 203
ac PSU, VARIABLE, 300V, 5A, 1kVA, 45Hz - 440Hz	MAGNUS	MP500	1108	TRL 204
TRANSFORMER, ISOLATION, 240Vac	RS	209 - 099	N/A	TRL 205
TRANSFORMER, ISOLATION, 110Vac	RS	208 - 636	N/A	TRL 206
LISN, 3ph MAINS ac	SCHWARZBECK	NSKL8128	8128151	TRL 207
COAX LOAD, 5W, BNC, 50 Ω , dc - 4GHz	BIRD	80BNM	5866	TRL 223
dc PSU, VARIABLE, 15/30V, 2/1A, 30W	WIER	731	88829	TRL 224
VARIAC, 230V, 2A	REGULAC	RB3 - MT	N/A	TRL 225
VARIAC, 230V, 2A	REGULAC	RB3 - MT	N/A	TRL 226
THERMOMETER & HYGROMETER	RS	212 - 124	227	TRL 227

ANNEX B

TEST EQUIPMENT LIST

INSTRUMENT	SUPPLIER	TYPE No	SERIAL No	TRL EMC No
THERMOMETER & HYGROMETER	RS	212 - 124	228	TRL 228
THERMOMETER & HYGROMETER	RS	212 - 124	229	TRL 229
THERMOMETER & HYGROMETER	RS	212 - 124	230	TRL 230
THERMOMETER & HYGROMETER	RS	212 - 124	231	TRL 231
AE, LOG PERIODIC, 300MHz - 1GHz	EMCO	3146	N/A	TRL 233
dc PSU, VARIABLE, (2x) 32V, 3A, 100W	THURLBY THANDAR	PL330	046542	TRL 235
LF / HF RECEIVER, 9kHz - 30MHz	ROHDE&SCHWARZ	ESHS20	837960 / 003	TRL 237
LISN, ac MAINS	ROHDE&SCHWARZ	ESHS3 - Z5	839135 / 013	TRL 238
MULTIMETER, (dig)	ISOTECH	IDM97	32202147	TRL 239
THERMOMETER & BAROMETER	RS	216435	N/A	TRL 240
COAX CABLE, 50Ω, 18GHz, TNC, 1.25m	W L GORE	3390 / 265 / 1	8420202	TRL 249
COAX CABLE, 50Ω, 18GHz, TNC, 1.25m	W L GORE	3390 / 265 / 1	8420223	TRL 250
AE, BICONE, 20MHz - 300MHz	CHASE	VBA6106A	1193	TRL 251
AE, EASY 1, 30MHz - 1GHz	FARNELL	S30280	017	TRL 253
RF SIGNAL GEN, LOW NOISE -90dBc, 10kHz - 5.4GHz	MARCONI	2042	119562 / 021	TRL 254
SCOPE, 400MHz, 4CH, DIG STORAGE	TEKTRONIX	TDS460A	B020781	TRL 258
RF SIGNAL GEN, 10kHz - 1GHz	MARCONI	2022D	119224 - 023	TRL 264
MULTIMETER, (dig)	ISOTECH	IDM97 RMS	32202307	TRL 273
AE, BILOG, 20MHz - 2GHz	CHASE	CBL6112	2098	TRL 274
COAX ADAPTOR, 18GHz, TNC / N	ROSENBERGER	05S106 - K0053	N/A	TRL 275
COAX ADAPTOR, 18GHz, TNC / N	ROSENBERGER	05S106 - K0053	N/A	TRL 276
COAX ADAPTOR,	ROSENBERGER	05S106 - K0053	N/A	TRL 277

ANNEX B

TEST EQUIPMENT LIST

INSTRUMENT	SUPPLIER	TYPE No	SERIAL No	TRL EMC No
18GHz, TNC / N				
COAX ADAPTOR, 18GHz, TNC / N	ROSENBERGER	05S106 - K0053	N/A	TRL 278
COAX CABLE, 18GHz, N, 0.5M	ROSENBERGER	RTK161 - GP - Nm90 - 50cms	N/A	TRL 279
COAX CABLE, 18GHz, N, 3.0M	ROSENBERGER	RTK161 - GP - Nm90 - 300cms	N/A	TRL 280
COAX CABLE, 50Ω, 4GHz, N, 12m	TRL	WESTFLEX 103	N/A	TRL 286
COAX CABLE, 50Ω, 4GHz, N, 12m	TRL	WESTFLEX 103	N/A	TRL 287
LISN, ac MAINS	ROHDE&SCHWARZ	ESH3 - Z5	837469 / 010	TRL 289
AE, BILOG, 20MHz - 1GHz	CHASE	CBL6111B	1945	TRL 290
MULTIMETER (dig)	ISOTECH	IDM97 RMS	32202547	TRL 291
MULTIMETER (dig)	ISOTECH	IDM97 RMS	32202565	TRL 292
THERMOMETER & BAROMETER	RS	216435	N/A	TRL 293
COAX CABLE, 50Ω, 26.5GHz, SMA, 2m, c/w 3 ADAPTORS	GORE	145	MFR65474	TRL 308
V / UHF RECEIVER, 20MHz - 1GHz	ROHDE&SCHWARZ	ESVS10	837948 / 003	TRL 317
RF PULSE LIMITER	ROHDE&SCHWARZ	ESH3Z2	A400	TRL 318
RF SIGNAL GEN, 9kHz - 1.2GHz	MARCONI	2023	112224 / 036	TRL 320
AE, LOG PERIODIC, 300MHz - 1GHz	CHASE	UPA6108	1016	TRL 344
V / UHF RECEIVER, 20MHz - 1GHz	ROHDE&SCHWARZ	ESVS10	844594 / 0003	TRL 352
LF / HF RECEIVER, 9kHz - 30MHz	ROHDE&SCHWARZ	ESHS10	844077 / 019	TRL 353
COAX CABLE, 50Ω, 4GHz, N, 0.5m	TRL	NA	NA	TRL 358
COAX CABLE, 50Ω, 4GHz, N, 16m	TRL	NA	NA	TRL 359
COAX CABLE, 50Ω, 4GHz, N, 1m	TRL	NA	NA	TRL 360
THERMOMETER & HYGROMETER	RS	204 - 072	NA	TRL 363
THERMOMETER	RS	204 - 072	NA	TRL 364

ANNEX B

TEST EQUIPMENT LIST

INSTRUMENT	SUPPLIER	TYPE No	SERIAL No	TRL EMC No
& HYGROMETER				
THERMOMETER & HYGROMETER	RS	204 - 072	NA	TRL 365
THERMOMETER & HYGROMETER	RS	204 - 072	NA	TRL 366
V / UHF RECEIVER, 20MHz - 1GHz	ROHDE&SCHWARZ	ESVS20	838804 / 005	TRL 415
RF ANALYSER, 9kHz - 1GHz	WAYNE KERR	SSA1000A	9800001488	TRL 416
LF / HF RECEIVER, 9kHz - 30MHz	ROHDE&SCHWARZ	ESHS10	830051 / 001	TRLUH 03
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE&SCHWARZ	HFH - Z2	892246 / 023	TRLUH 23
RF ANALYSER, dc - 26.5GHz	MARCONI	2380	152089 / 009	TRLUH 120
		2386	152076 / 044	

ANNEX C

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

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