TEST REPORT NO: RU1078/5373

COPY NO: 2

ISSUE NO: 1

FCC ID: MJCP3

REPORT ON THE CERTIFICATION TESTING OF A
Palmer Environmental Limited
Permalog 3
WITH RESPECT TO
THE FCC RULES CFR 47, PART 90 Subpart I (b)

TEST DATE: 20th – 23rd January 2004

TESTED BY: JOHN CHARTERS — J CHARTERS

APPROVED BY: Peter Green — P GREEN
PRODUCT MANAGER
EMC

DATE: 10th May 2004

Distribution:

Copy Nos: 1. Palmer Environmental Limited

2. TCB: TRL Compliance Services Limited

3. TRL EMC

TRL COMPLIANCE SERVICES LTD EMC DIVISION
LONG GREEN FORTHAMPTON GLOUCESTER GL19 4QH UNITED KINGDOM
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FS 21805

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.

CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY:	MJCP3
PURPOSE OF TEST:	CERTIFICATION
TEST SPECIFICATION:	FCC RULES CFR 47, Part 90 Subpart I(b)
TEST RESULT:	Compliant to Specification
EQUIPMENT UNDER TEST:	Permalog 3
EQUIPMENT TYPE:	Leak Noise Logger
ITU EMISSIONS CODE:	6k80F1D
MAXIMUM CARRIER POWER: (declared by applicant)	10mW
MAXIMUM CARRIER POWER: (measured)	5.3mW
ANTENNA TYPE:	Whip Fixed
CHANNEL SPACING:	12.5kHz
CARRIER FREQUNECY	463.91MHz
NUMBER OF CHANNELS:	1
FREQUENCY GENERATION:	Crystal
MODULATION TYPE:	F1D
POWER SOURCE(s):	3.6Vdc (Battery)
TEST DATE(s):	20th -23rd January 2004
ORDER No(s):	32022
APPLICANT:	Palmer Environmental Limited
ADDRESS:	Ty Coch House Llanarnam Park Way Cwmbran Gwent NP44 3AW
TESTED BY:	JOHN CHARTERS — J CHARTERS
APPROVED BY:	Peter Green — P GREEN PRODUCT MANAGER EMC

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	Permalog 3
EQUIPMENT TYPE:	Leak Noise Logger
PURPOSE OF TEST:	CERTIFICATION
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 90 Subpart I(b)
TEST RESULT:	COMPLIANT Yes [X] No [ ]
APPLICANT'S CATEGORY:	MANUFACTURER [X] IMPORTER [ ] DISTRIBUTOR [ ] TEST HOUSE [ ] AGENT [ ]
APPLICANT'S ORDER No(s):	32022
APPLICANT'S CONTACT PERSON(s):	Mr S Harris
E-mail address:	sharris@palmer.co.uk
APPLICANT:	Palmer Environmental Limited
ADDRESS:	Ty Coch House Llanarnam Park Way Cwmbran Gwent NP44 3AW
TEL:	+44(0) 1633 489479
FAX:	+44(0) 1633 877857
MANUFACTURER:	Palmer Environmental Limited
EUT(s) COUNTRY OF ORIGIN:	United Kingdom
TEST LABORATORY:	TRL EMC
UKAS ACCREDITATION No:	0728
TEST DATE(s)	20th – 23rd January 2004
TEST REPORT No:	RU1078/5373

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.

TEST/EXAMINATION	RULE PART	Part 90.217 LIMIT	APPLICABILITY
Application for Certification	2.1033	-	Yes
RF Power Output at terminals	2.1046	120mW	Yes
Modulation Characteristics	2.1047	Not required	No (note1)
Modulation Limiting Characteristics	2.1047	Not required	No (note 1)
Occupied Bandwidth	2.1049	All signals ±25kHz of Fc must be attenuated by 30dBc	Yes
Spurious Emissions at Antenna Terminals	2.1053	-30dBc	No (note 2)
Frequency Stability	2.1055	2.5ppm of the Carrier frequency	Yes
Spurious emissions radiated		-30dBc	Yes
Frequency Spectrum to be Investigated	2.1057	-	Yes

Note 1: The Permalog is intended to transmit data only.
Note 2: The Permalog has a fixed antenna.

2. Product Use: Leak detection

3. Emission Designator: F1D

4. Temperatures: Ambient (Tnom) 21°C

5. Supply Voltages: Vnom 3.6Vdc

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

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

7. Channel spacing:
   Narrowband [X] 12.5kHz
   Wideband [ ]

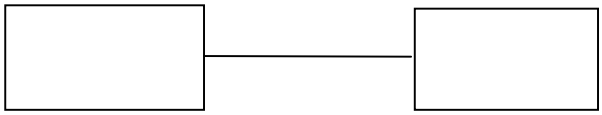
8. Test Location TRL Compliance Services
   Up Holland [X]
   Long Green [ ]

9. Modifications made during test program No modifications were performed.

COMPLIANCE TESTS

CARRIER POWER – CONDUCTED – PART 2.1046

Ambient temperature = 24°C
Relative humidity = 35%
Supply voltage = 3.6Vdc
Channel number = See test results



Spectrum Analyser TRL479 | Cable TRL279 | EUT

The Permalog antenna was removed and replaced with a cable that allowed it to be connected to the spectrum analyser. The power delivered into a 50ohm load was them measured.

Frequency (MHz)	Level at Spectrum Analyser (dBm)	Cable & Attenuator loss (dB)	Level (dBm)	Level (mW)	Limit (mW)
463.91	6.85	0.45	7.3	5.3	120

The level in dBm was converted to mW using the following equation:

$mW = 10_{10}(\text{power dBm}/10)$

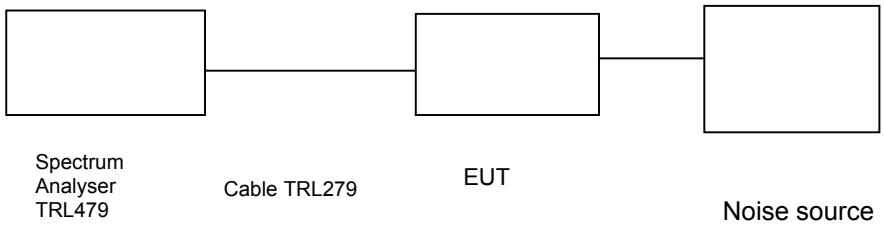
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
ATTENUATOR	BIRD	8304-300-N	N/A	220	
CABLE	ROSENBERGER	MICRO COAX	N/A	279	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	179	

TRANSMITTER TESTS

MODULATION CHARACTERISTICS TEST – CONDUCTED – Part 2.1047(a)

Ambient temperature	=	N/A	Radio Laboratory
Relative humidity	=	N/A	
Supply voltage	=	3.6Vdc	
Channel number	=	See test results	

This test is not applicable the carrier output power is less than 120mW. The transmitter only sends data and not an audio signal.



This test was performed to show compliance with the mask .

The test equipment used for the Transmitter Modulated Channel tests is shown overleaf:

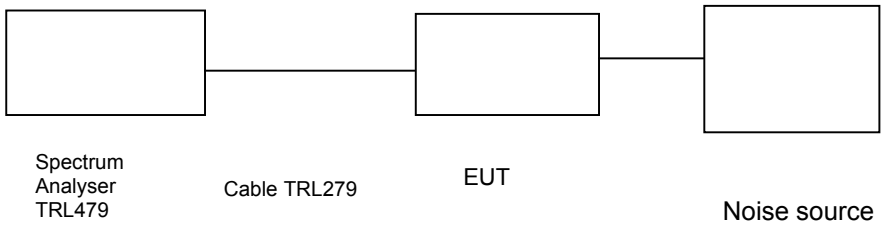
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	
ATTENUATOR	BIRD	8304-300-N	N/A	220	
CMTA	RHODE AND SCHWARZ	CMTA52	89715/003	05	
CABLE	ROSENBERGER	MICRO COAX	N/A	279	
SIGNAL GENERATOR	MARCONI	2042	119388/080	179	

TRANSMITTER TESTS

MODULATION LIMITING CHARACTERISTICS TEST – CONDUCTED – Part 2.1047 (b)

Ambient temperature	=	N/A	Radio Laboratory
Relative humidity	=	N/A	
Supply voltage	=	3.6Vdc	
Channel number	=	See test results	

This test is not applicable the carrier output power is less than 120mW. The transmitter only sends data and not an audio signal.



This test was performed to show compliance with the mask . The input signal was set to produce the maximum deviation in the transmitted signal.

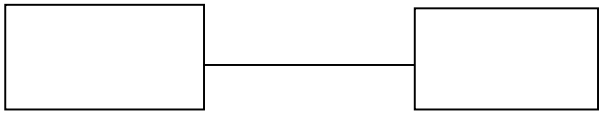
The test equipment used for the Transmitter Modulated Channel tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	
ATTENUATOR	BIRD	8304-300-N	N/A	220	
CMTA	RHODE AND SCHWARZ	CMTA52	89715/003	05	
CABLE	ROSENBERGER	MICRO COAX	N/A	279	
SIGNAL GENERATOR	MARCONI	2042	119388/080	179	

TRANSMITTER TESTS

OCCUPIED BANDWIDTH – CONDUCTED – Part 2.1049

Ambient temperature	=	21ºC	Radio Laboratory
Relative humidity	=	48%	
Supply voltage	=	3.6Vdc	
Channel number	=	See test results	



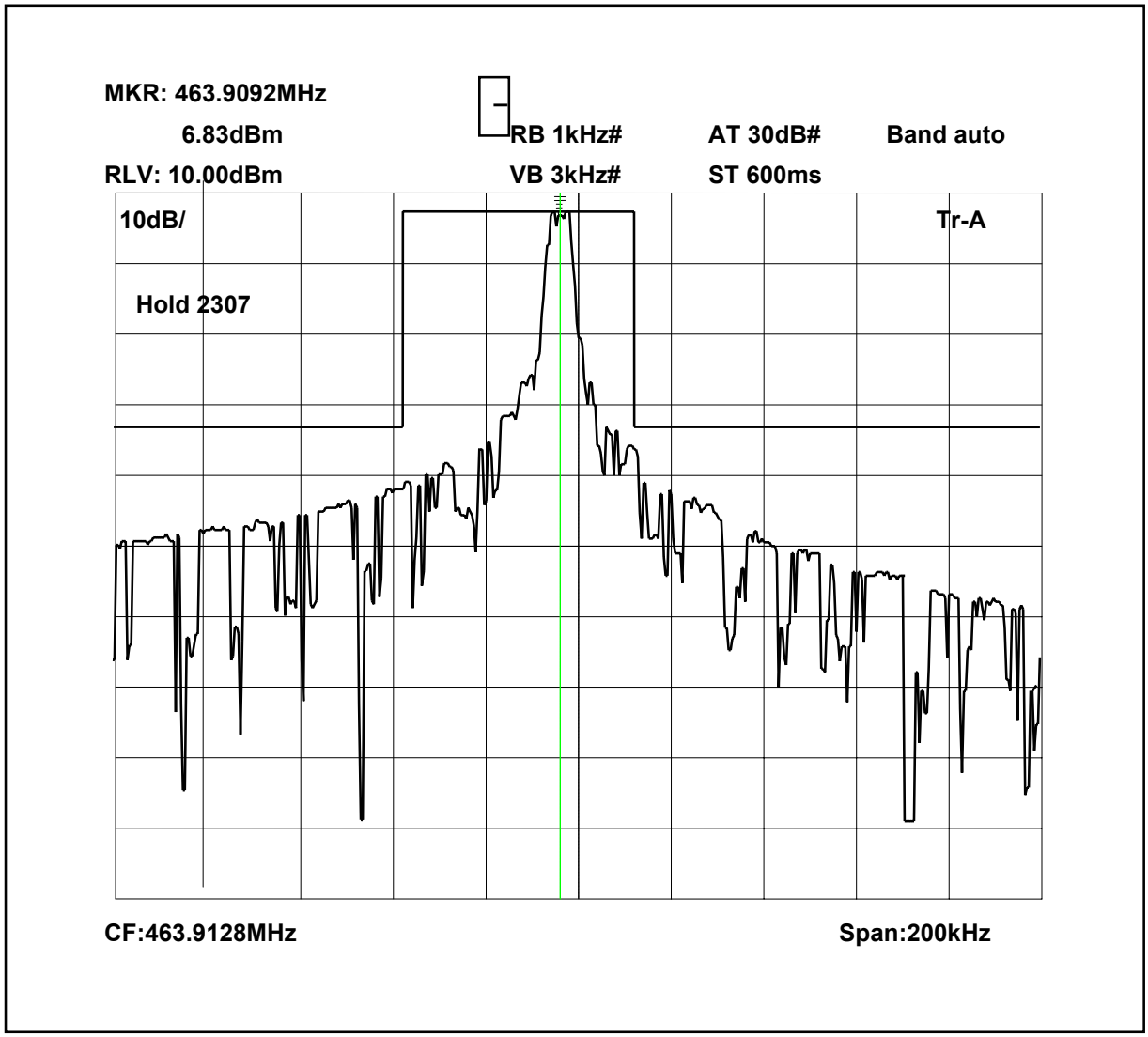
Spectrum Analyser TRL479 | Cable TRL279 | EUT

This test was performed to show compliance with the mask set in 90.217(b) for equipment designed to operate with a 12.5kHz channel spacing. The transmitter was set to operate transmitting at maximum power at the highest data rate. The resolution bandwidth was set to 1kHz to ensure the emissions level was accurately read.

See overleaf for analyser plot of spectrum mask

Test equipment used for occupied bandwidth test:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
ATTENUATOR	BIRD	8304-300-N	N/A	220	
CABLE	ROSENBERGER	MICRO COAX	N/A	279	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	179	



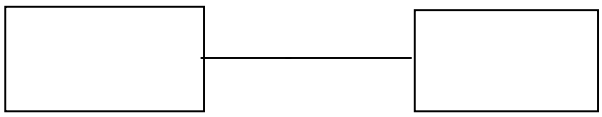
Modulation Bandwidth Plot

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1011

Ambient temperature	=	N/A			
Relative humidity	=	N/A	Test Signal	=	N/A
Supply voltage	=	3.6Vdc			

This test is not applicable as the Permalog 3 has a fixed antenna.



Spectrum Analyser TRL479

Cable TRL279

EUT

The test was set up as per the diagram. The unit was tested operating at maximum power.

The spurious limit was calculated as follows:

At least 43 + 10 log PdB

$(10\log P_{watts}) – (43+10\log (P_{watts} * 1000)) =$ LIMIT =-13 dBm

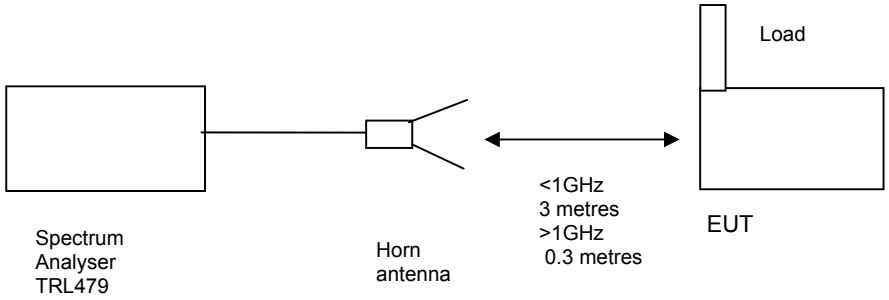
The test equipment used for the Transmitter Conducted Emissions:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
ATTENUATOR	BIRD	8304-300-N	N/A	220	
CABLE	ROSENBERGER	MICRO COAX	N/A	279	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	179	

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053

Ambient temperature	=	18°C	Test Signal = F1D
Relative humidity	=	46%	
Conditions	=	OATS	
Supply voltage	=	3.6Vdc	
Supply Frequency	=	N/A	



The test was set up as per the diagram. The level at the input was adjusted to compensate for the loss of the interconnecting cable. The unit was tested operating with modulation. The EUT was place on a turntable and mounted 0.8metre above the ground plane. The frequency spectrum 9kHz to 10GHz was investigated by first rotating the EUT on the turntable and the raising and lowering the antenna. The level on the measuring receiver are recorded in the table below:

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more that 25kHz the power of that emission should be attenuated by at least 30dBc.

Carrier power = 102dBµV/m @ 3 m therefore limit = 102 -30 = 72dBµV/m @ 3m

Frequency MHz	Level at Spectrum Analyser (dBµV)	Antenna Factor (dB/m)	Cable loss (dB)	Extrapolation Factor (dB)	Level @ 3 metres (dBµV/m)	Limit @ 3 metres (dBµV/m)
927.82	34.64	20.2	0.65	-	55.49	72
1391.73	32.00	25.6	0.65	20	38.25	72
71855.64	32.72	26.1	0.70	20	39.49	72
2319.55	46.10	29.3	0.78	20	56.18	72
2783.46	34.29	29.7	0.70	20	44.86	72
3711.29	30.24	31.8	0.90	20	41.54	72

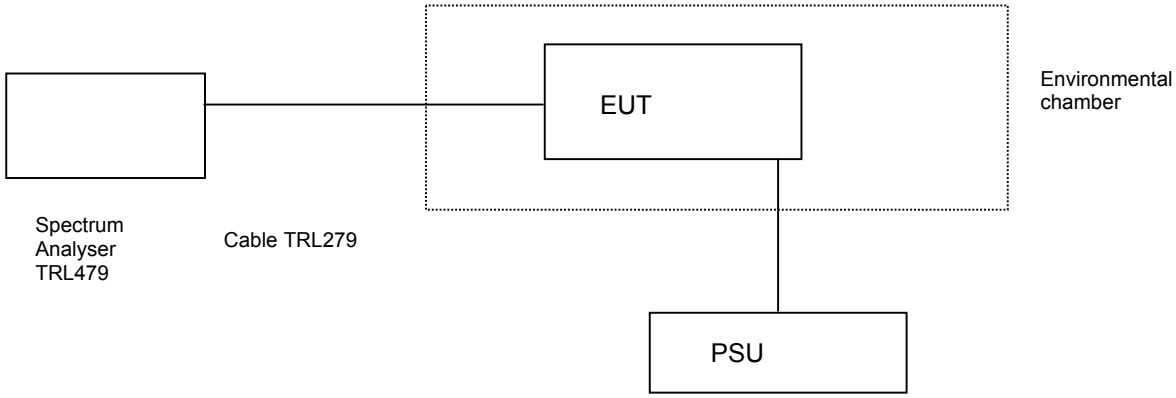
Note: extrapolation factor from 0.3 – 3 metres 20dB

The test equipment used for the Transmitter Spurious Emissions:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
HORN	EMCO	3115	9010-3581	139	**X**
ATTENUATOR	BIRD	8304-300-N	N/A	220	**X**
CABLE	ROSENBERGER	MICRO COAX	N/A	279	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	179	**X**

Temperature
TRANSMITTER - FREQUENCY STABILITY– CONDUCTED – PART 2.1046

Ambient temperature	=	20°C
Relative humidity	=	46%
Supply voltage	=	3.6Vdc
Transmit Frequency nomimal	=	See test results



Frequency stability over temperature variation measurements were made with the RF output of the EUT connected to the input of the spectrum analyzer and the EUT placed inside an environmental chamber. The temperature was varied in 10ºC steps from -30ºC to +50ºC. The temperature of 20ºC was used as the reference to determine the change in frequency. The EUT was allowed to stabilize before measurements were taken. The Resolution Bandwidth was set to 1kHz to enable small changes in frequency could be detected.

Frequency Stability at 3.6Volts dc

Temperature (°C)	Frequency (MHz)	Drift (kHz)	Limit (kHz)
-30	463.916	-0.004	1.159
-20	463.916	-0.004	1.159
-10	463.920	0	1.159
0	463.916	-0.004	1.159
10	463.916	-0.004	1.159
20	463.920	0	1.159
30	463.916	-0.004	1.159
40	463.916	-0.004	1.159
50	463.902	-0.018	1.159

Section 90.213 (a)1 gives a limit of 2.5ppm for a 12.5kHz channel spacing

Frequency Stability at 3.0Volts dc

Temperature (°C)	Frequency (MHz)	Drift (kHz)	Limit (kHz)
-30	463.916	-0.004	1.159
-20	463.912	-0.008	1.159
-10	463.908	-0.012	1.159
0	463.916	-0.004	1.159
10	463.916	-0.004	1.159
20	463.916	-0.004	1.159
30	463.920	0	1.159
40	463.908	-0.012	1.159
50	463.908	-0.012	1.159

Section 90.213 (a)1 gives a limit of 2.5ppm for a 12.5kHz channel spacing

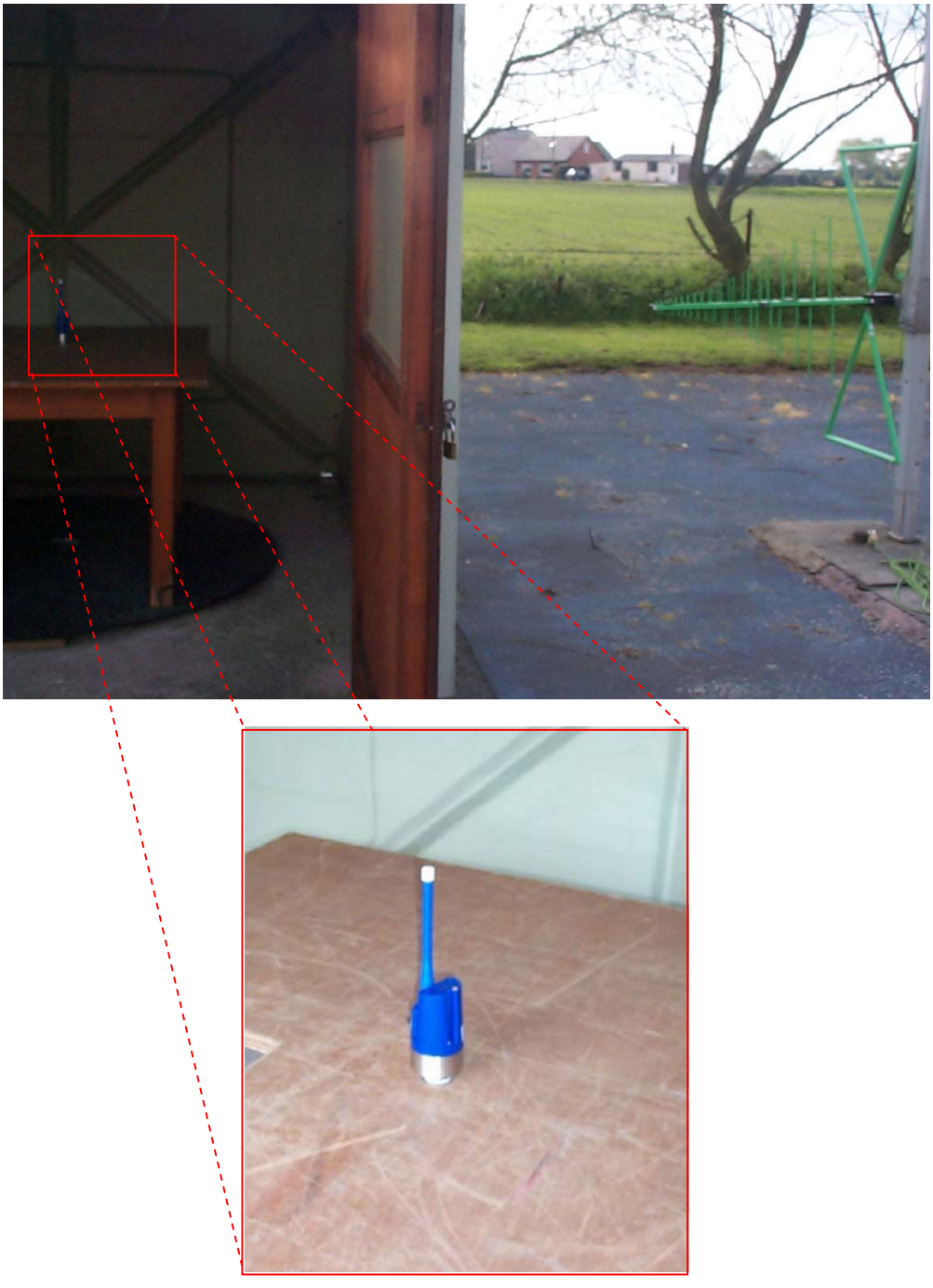
Test equipment used for the frequency stability test:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
ATTENUATOR	BIRD	8304-200	N/A	103	**X**
ATTENUATOR	BIRD	8304-300-N	N/A	220	**X**
CABLE	ROSENBERGER	MICRO COAX	N/A	279	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	179	**X**

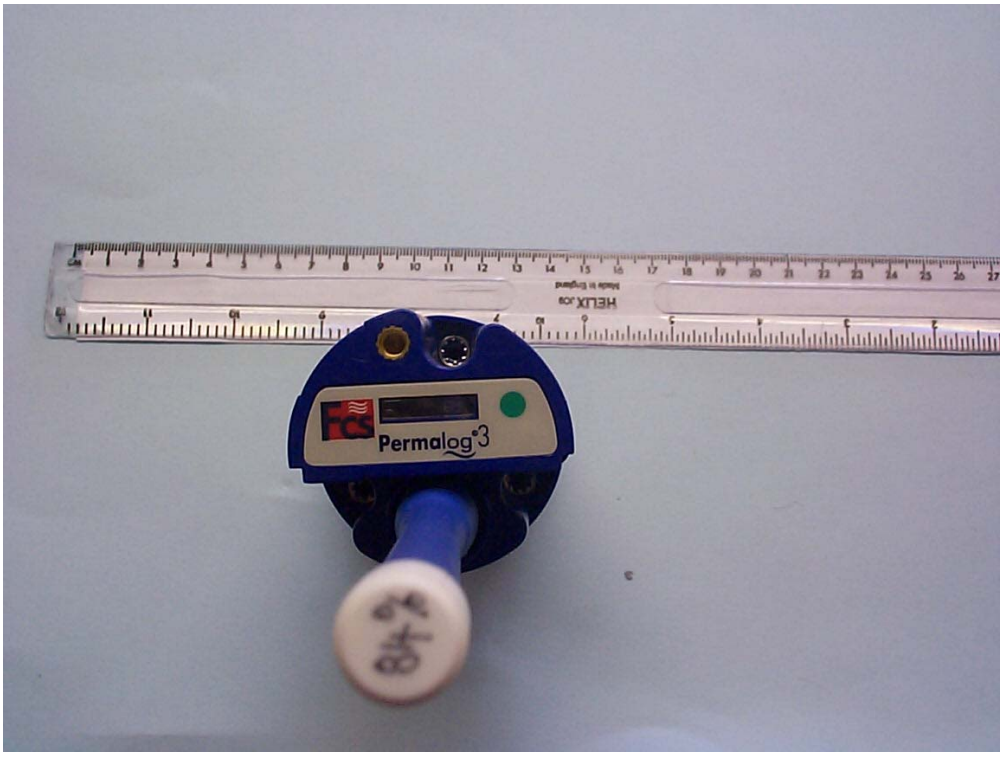
ANNEX A

PHOTOGRAPHS

PHOTOGRAPH No. 1 **TEST SETUP**

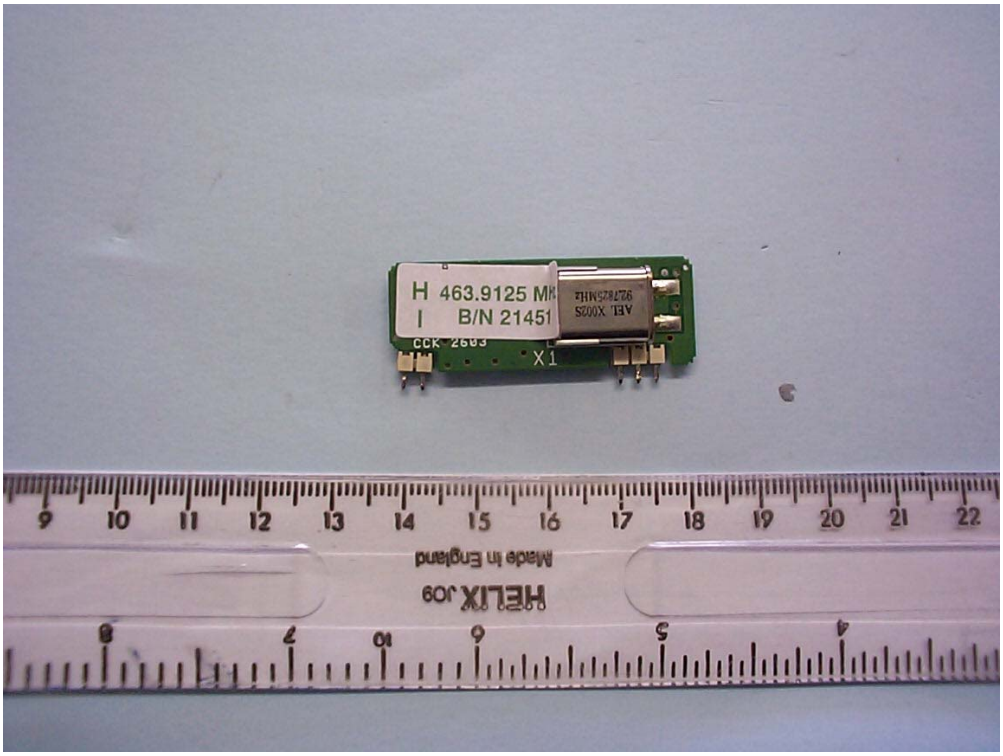


PHOTOGRAPH No. 2 **Equipment Overview**

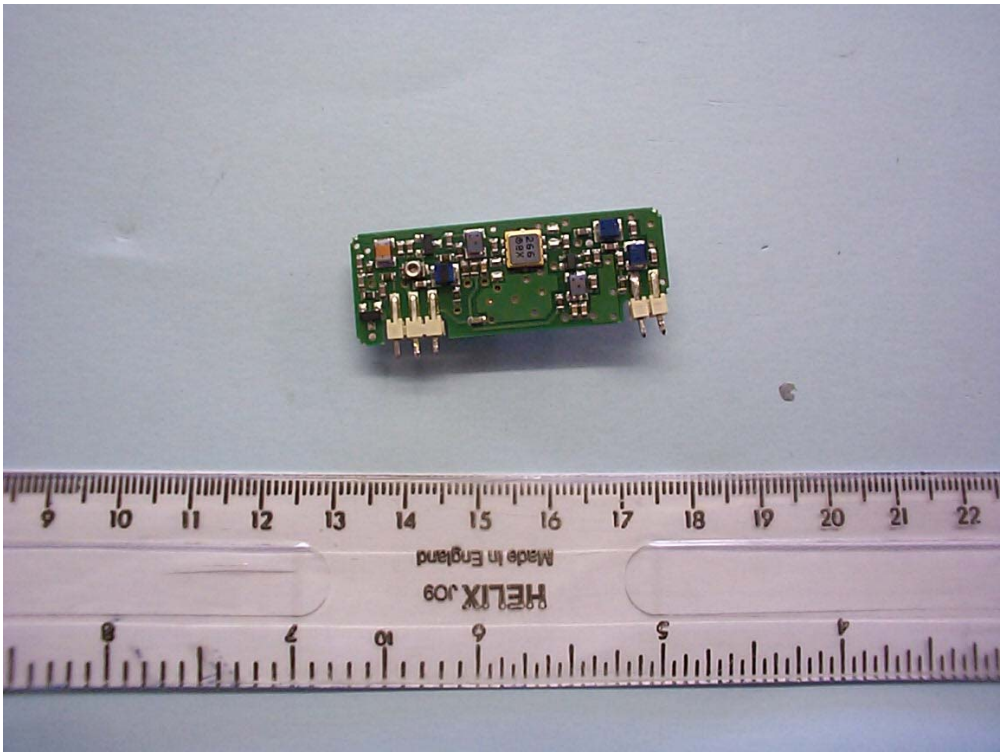


PHOTOGRAPH No. 3 **Equipment Overview**

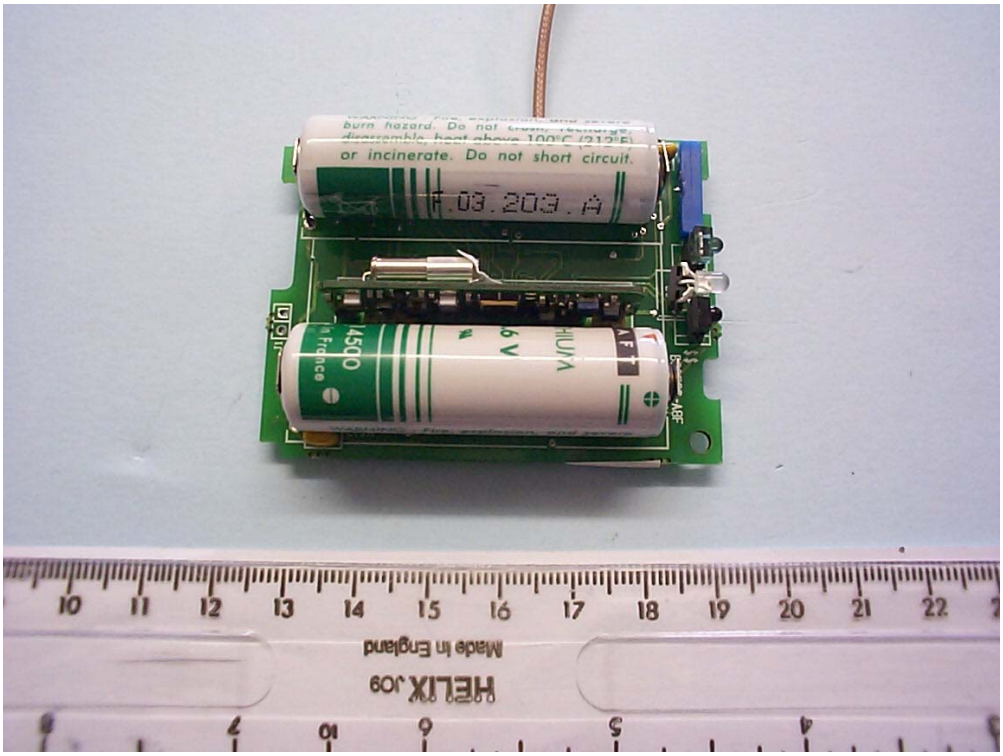
PHOTOGRAPH No. 4 **Transmitter PCB Top**



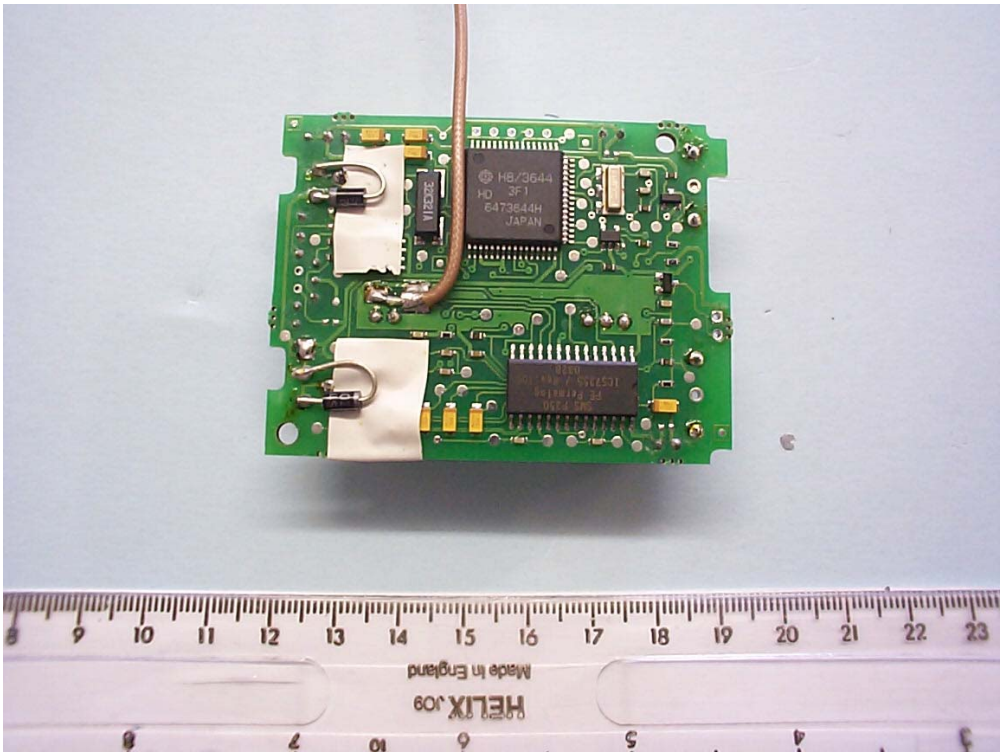
PHOTOGRAPH No. 5 **Transmitter PCB Bottom**



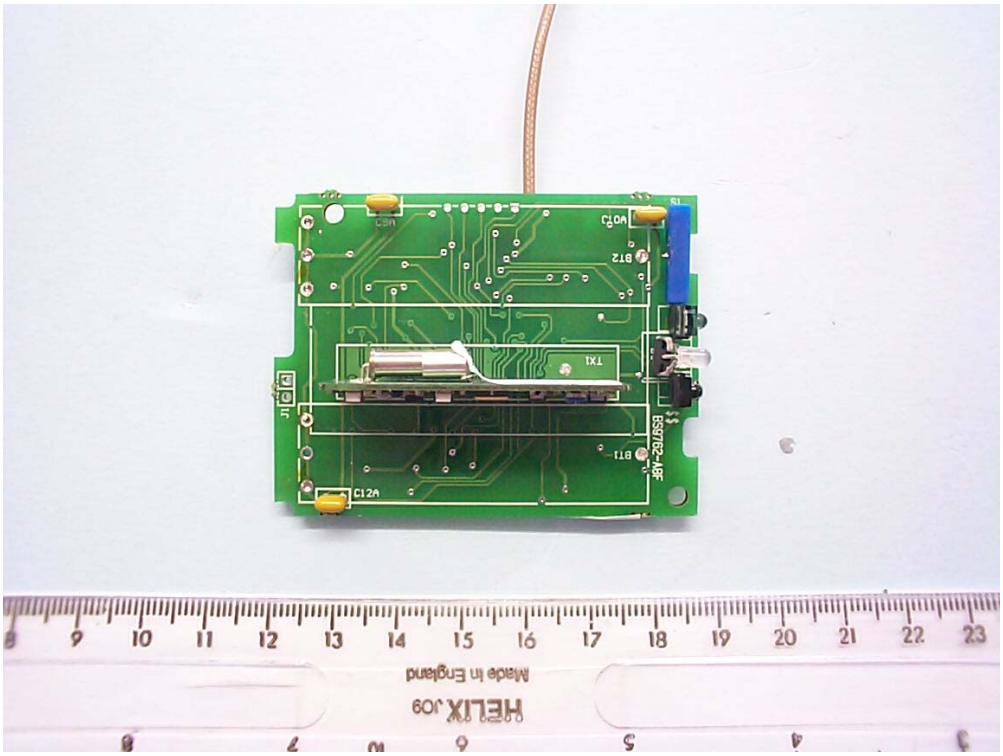
PHOTOGRAPH No. 6 **Main PCB (Batteries in place)**



PHOTOGRAPH No. 7 **Main PCB Bottom**



PHOTOGRAPH No. 9 **Main PCB Batteries Removed**



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	[ ]
		-	DECLARATION	[ ]
		-	DRAWINGS	[ ]
f.	TECHNICAL DESCRIPTION	-		[X]
g.	BLOCK DIAGRAMS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
h.	CIRCUIT DIAGRAMS	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
i.	COMPONENT LOCATION	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
j.	PCB TRACK LAYOUT	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
k.	BILL OF MATERIALS	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[X]