



**KTL Radio Test Report** : 2G5762GUS2

**Applicant** : Advantra

**Apparatus Assessed** : AR100

**Date Equipment Received** : 22<sup>nd</sup> July 2002  
**Dates Of Test** : 22<sup>nd</sup> July 2002 to  
24<sup>th</sup> July 2002

**Standard Tested To** : 47CFR Parts 2, 24 and 90

**Summary:**

***The apparatus detailed above is compliant with the above standard as tested***  
*(see section 2.1 of this report for full details)*

**Authorised by** :  
: M Render, EMC and Radio Group Manager

**Issue Date** : 10<sup>th</sup> October 2002

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**Section 1:**

**Introduction**

**1.1 General**

This report contains an assessment of an apparatus against 47CFR Parts 2, 24 and 90 based upon tests carried out on samples submitted to the Laboratory.

Test performed by:

KTL  
Saxon Way  
Priory Park West  
Hull HU13 9PB  
United Kingdom

Telephone: +44 (0) 1482 801801  
Fax: +44 (0) 1482 801806  
Email: ktl@ktl.com

A handwritten signature in black ink, reading "K J Anderson". The signature is written in a cursive style with a vertical line to the left of the text.

Author(s)

K J Anderson, Senior EMC Group Engineer

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**1.2 Application for Certification (47CFR 2.1033)**

2.1033 (c) (1)	Name of applicant	:	Advantra International
	Address of applicant	:	Flanders Language Valley 90 B-8900 Ieper Belgium
	Contact	:	Frédéric Boes/Luc Van Asch/Els Ollevier
2.1033 (c) (2)	FCC Identifier	:	O33AR100
	Model Type Number	:	AR100
2.1033 (c) (3)	Installation and Operating instructions	:	User Guide (separate document)
2.1033 (c) (4)	Types of emission	:	Direct FSK, 10KF1D
2.1033 (c) (5)	Frequency Range	:	929.000 to 942.000 MHz (RX) 896.000 to 902.000 MHz (TX)
2.1033 (c) (6)	Output power range	:	0.06 to 1.92 W
2.1033 (c) (7)	Maximum power rating	:	1.92 W
2.1033 (c) (8)	dc voltage applied to power amplifier	:	3.7 V
	dc current to power amplifier	:	1.4 A
2.1033 (c) (9)	Tune up procedure for RF power	:	n/a
2.1033 (c) (10)	Schematic diagram	:	Contained in Separate Document
2.1033 (c) (11)	Label Information	:	Contained in Separate Document
2.1033 (c) (12)	Photographs	:	Contained in Appendix D
2.1033 (c) (13)	Description of modulation	:	Contained in Separate Document
2.1033 (c) (14)	Test results	:	Contained in Appendix A with supporting Graphical data in Appendix B
2.1033 (c) (15)	External RF Power Amp	:	n/a
2.1033 (c) (16)	AM Broadcast Equipment	:	n/a

### **1.3 Notes Relating To The Assessment**

With regard to this assessment, the following points should be noted:

- a) The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only.

- b) All testing was performed under the following conditions:

DC Power Supply : 3.7 Vdc (where applicable)

Barometric Pressure : 86 to 106 kPa

Note that temperature and humidity conditions can be found in the relevant test results appendix B.

- c) All dates used in this report are in the format dd/mm/yy.
- d) All testing was performed in accordance with ISO17025.

### **1.4 Variations In Test Methods**

There were no variations from normal KTL test procedures. Testing was performed in accordance with the relevant parts of ANSI C63.4.

**Section 2:****Results Summary****2.1 Result Table**

The following table summarises the tests as described in 47CFR Parts 2, 24 and 90:

Test Type	Application	Reference clauses in 47CFR	Appendix No.s in this report	Notes
RF Power Output at terminals	RF Terminal	2.1046	A1	PASS
Occupied Bandwidth	RF Terminal	2.1049(i), 24.133(a)(2) & 90.210(j)	A2 to A4	PASS
Spurious emissions at antenna terminals	RF Terminal	2.1051& 90.210(j)	A5 to A7	PASS
Field strength of spurious radiation	Antenna	2.1053& 90.210(j)	A8 to A10	PASS
Frequency stability with temperature variation	RF Terminal	2.1055 (a)(i) & 24.135	A11	PASS
Frequency stability with primary voltage variation	RF Terminal	2.1055 (d)(i) & 24.135	A12	PASS

Note: The AR100 was tested in one single build state i.e. was not modified during the testing detailed in this test report.

**2.2 Summary Of Compliance**

The samples, as assessed, satisfied the relevant requirements of 47CFR Parts 2, 24 and 90, as detailed in section 2.1 of this test report.

**2.3 Record Of Marginal Test Measurements**

No marginal results were recorded during the assessment.

**Appendix A****Formal Test Results****A1 RF Power Output at terminals**

Ambient temperature 20°C

Relative humidity 61%

RF Terminal	47CFR 2.1046
-------------	--------------

Modulation: None

Carrier Frequency (MHz)	Analyser reading (dBm)	Attenuator and cable Loss (dB)	Carrier Power (dBm)	Carrier Power (W)
896.0000	22.0	10.3	32.3	1.7
899.0000	21.7	10.3	32.0	1.6
902.0000	22.2	10.3	32.5	1.8

Plots are contained in Appendix B, Figures B.1 to B.3

**Equipment Details** (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

**A2    Occupied Band width (896 MHz)**

Ambient temperature 20°C

Relative humidity 61%

RF Terminal	47CFR 2.1049
-------------	--------------

Carrier power .....32.3 dBm (1.7 W)

Modulation: F1D

Nominal carrier frequency:896.0000 MHz

All emissions are within the limits defined in 47CFR 90.210 (j)

Emissions plots contained in Appendix B, Figures B.4 and B.5

**Equipment Details** (refer to Appendix D for further details)

Apparatus Sample Number    : S02

Test equipment used            : See Appendix D2.



**A3    Occupied Bandwidth (899 MHz)**

Ambient temperature 20°C

Relative humidity 61%

RF Terminal	47CFR 2.1049
-------------	--------------

Carrier power .....32.0 dBm (1.6 W)

Modulation: F1D

Nominal carrier frequency:899.0000 MHz

All emissions are within the limits defined in 47CFR 90.210 (j)

Emissions plots contained in Appendix B, Figures B.6 and B.7

**Equipment Details** (refer to Appendix D for further details)

Apparatus Sample Number    : S02

Test equipment used            : See Appendix D2.

**A4 Occupied Band width (902 MHz)**

Ambient temperature 20°C

Relative humidity 61%

RF Terminal	47CFR 2.1049
-------------	--------------

Carrier power .....32.5 dBm (1.8 W)

Modulation: F1D

Nominal carrier frequency:902.0000 MHz

All emissions are within the limits defined in 47CFR 90.210 (j) and 47CFR 24.133 (a)

Emissions plots for 47 CFR 90.210(j) are contained in Appendix B, Figures B.8 and B.9

Emissions plot for 47 CFR 24.133(a) is contained in Appendix B, Figure B.10

**Equipment Details** (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used : See Appendix D2.

**A5 Spurious Emissions at antenna terminals (896 MHz)**

Ambient temperature 21 °C

Relative humidity 55%

RF Terminal	47CFR 2.1051
-------------	--------------

Carrier Power 32.3 dBm

Modulation: F1D

Spurious Emission Levels dBm		
Frequency (MHz)	Spectrum Analyser Reading (dBm)	Substitution Signal Generator Level (dBm)
1792	-46.33	-25.8
2688	-61.33	-41.4
6272	-66.83	-44.7

Limit  $P_{(dBm)} - (50 + 10 \log(P))$        $P = \text{Carrier power in watts}$   
= -20 dBm

**Equipment Details** (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

**A6 Spurious Emissions at antenna terminals (899 MHz)**

Ambient temperature 21 °C

Relative humidity 55%

RF Terminal	47CFR 2.1051
-------------	--------------

Modulation: F1D

Spurious Emission Levels dBm		
Frequency (MHz)	Spectrum Analyser Reading (dBm)	Substitution Signal Generator Level (dBm)
1800	-46.67	-26.3
2700	-60.83	-40.5
6300	-66.33	-44.8

Limit  $P_{(dBm)} - (50 + 10 \log P)$   $P = \text{Carrier power in watts}$   
 $= -20 \text{ dBm}$

**Equipment Details** (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

**A7 Spurious Emissions at antenna terminals (902 MHz)**

Ambient temperature 21 °C

Relative humidity 55%

RF Terminal	47CFR 2.1051
-------------	--------------

Modulation: F1D

Spurious Emission Levels dBm		
Frequency (MHz)	Spectrum Analyser Reading (dBm)	Substitution Signal Generator Level (dBm)
1804	-47.17	-26.7
2706	-60.83	-40.5
6314	-68.17	-46.4

Limit  $P_{(dBm)} - (50 + 10 \log P)$        $P$  = Carrier power in watts  
= -20 dBm

**Equipment Details** (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

**A8 Transmitter Spurious Radiated Emissions (896 MHz)**

Ambient temperature 20 °C

Relative humidity 50%

Antenna	47CFR 2.1053
---------	--------------

Modulation: F1D

Spurious Emission Levels (effective radiated power dBm)			
Frequency (MHz)	Polarization of maximum emission(H/V)	Bandwidth (kHz)	Level (dBm)
1792	V	1000	-35.8
1792	H	1000	-41.8
2688	V	1000	-40.3
3584	H	1000	-38.0
4480	V	1000	-39.0
5376	H	1000	-37.3
6272	H	1000	-37.3

Limit  $P_{(dBm)} - (50 + 10 \log P)$        $P = \text{Carrier power in watts}$   
 = -20 dBm

**Equipment Details** (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

**A9 Transmitter Spurious Radiated Emissions (900 MHz)**

Ambient temperature 20 °C

Relative humidity 50%

Antenna	47CFR 2.1053
---------	--------------

Modulation: F1D

Spurious Emission Levels (effective radiated power dBm)			
Frequency (MHz)	Polarization of maximum emission(H/V)	Bandwidth* (kHz)	Level (dBm)
1800	V	1000	-37.1
2700	V	1000	-40.5
3600	V	1000	-37.8
4500	V	1000	-37.0
5400	V	1000	-38.1
6300	H	1000	-32.6

Limit  $P_{(dBm)} - (50 + 10 \log P)$   $P = \text{Carrier power in watts}$   
 $= -20 \text{ dBm}$

**Equipment Details** (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

**A10 Transmitter Spurious Radiated Emissions (902 MHz)**

Ambient temperature 20 °C

Relative humidity 50%

Antenna	47CFR 2.1053
---------	--------------

Modulation: F1D

Spurious Emission Levels (effective radiated power dBm)			
Frequency (MHz)	Polarization of maximum emission(H/V)	Bandwidth* (kHz)	Level (dBm)
1804	V	1000	-35.4
2706	V	1000	-27.0
3608	H	1000	-40.0
4510	V	1000	-38.0
5412	H	1000	-38.6
6314	H	1000	-31.2

Limit  $P_{(dBm)} - (50 + 10 \log P)$   $P = \text{Carrier power in watts}$   
 $= -20 \text{ dBm}$

**Equipment Details** (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.



**A11 Frequency Stability with Temperature Variation**

Ambient temperature 20 °C

Relative humidity 61%

Antenna	47CFR 2.1055(a)
---------	-----------------

Nominal carrier frequency (normal test conditions) 901.25625 MHz

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-40	-535.3	-0.59
-30	270.9	0.30
-20	294.3	0.33
-10	4.3	0.00
0	14.1	0.02
10	80.3	0.09
20	53.7	0.06
30	81.8	0.09
40	43.5	0.05
50	0.4	0.00
60	93.5	0.10
70	-53.1	-0.06
80	109.2	0.12
90	224.1	0.25

Limit:  $\pm 1$  ppm

**Equipment Details** (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

**A12 Frequency Stability with Primary Voltage Variation**

Ambient temperature 20 °C

Relative humidity 61%

Antenna	47CFR 2.1055(d)
---------	-----------------

Nominal carrier frequency (normal test conditions) 901.25625 MHz

Nominal primary supply voltage ( $V_{\text{nom}}$ ) 3.7 V

Primary Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
3.145 ( $V_{\text{nom}} \times 0.85$ )	-23	-0.03
3.38 ( $V_{\text{nom}} \times 0.9$ )	26.7	0.03
3.515 ( $V_{\text{nom}} \times 0.95$ )	131.3	0.15
3.7 ( $V_{\text{nom}}$ )	120.3	0.13
3.883 ( $V_{\text{nom}} \times 1.05$ )	192	0.21
4.07 ( $V_{\text{nom}} \times 1.1$ )	164.4	0.18
4.255 ( $V_{\text{nom}} \times 1.15$ )	120.7	0.13
4.5 ( $V_{\text{max}}$ )	213.7	0.24

Limit:  $\pm 1$  ppm**Equipment Details** (refer to Appendix D for further details)

Apparatus Sample Number : S02

Test equipment used See Appendix D2.

## Appendix B:

## Supporting Graphical Data

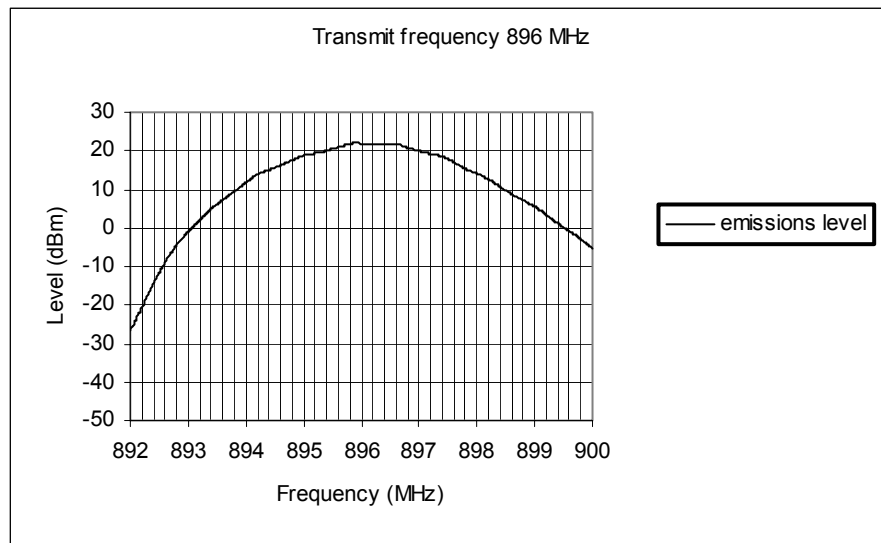


Figure B.1 – Carrier Power at 896MHz

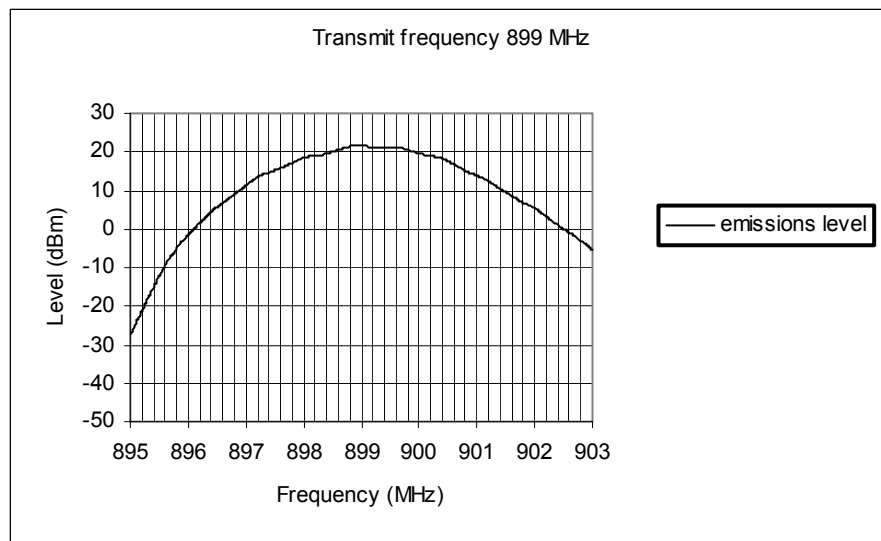
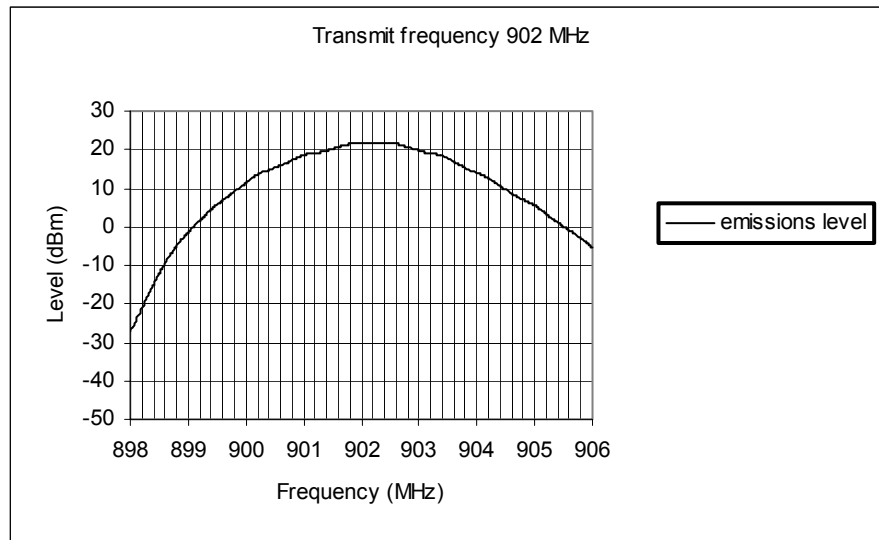
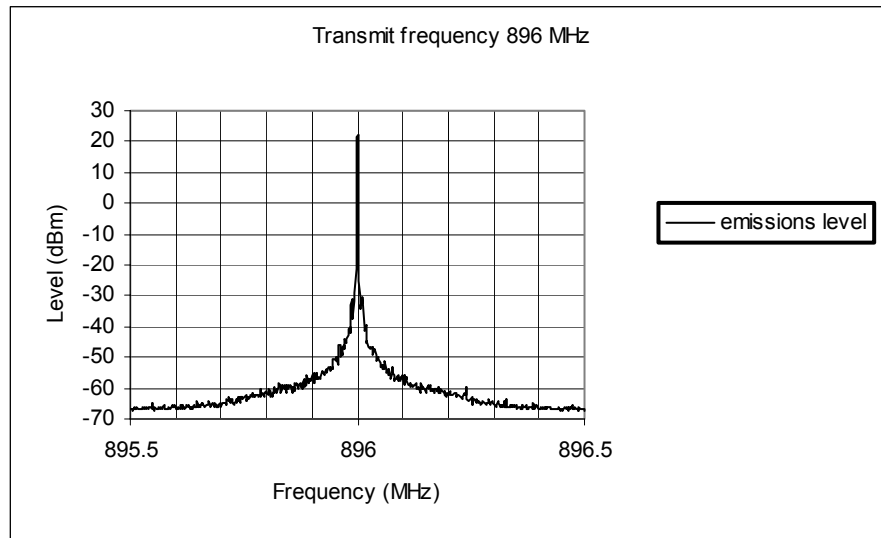


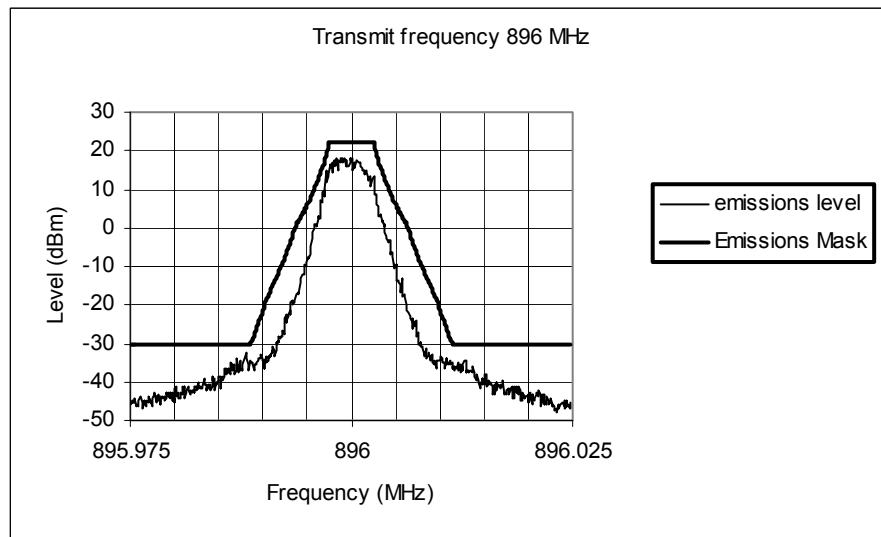
Figure B.2 – Carrier Power at 899MHz



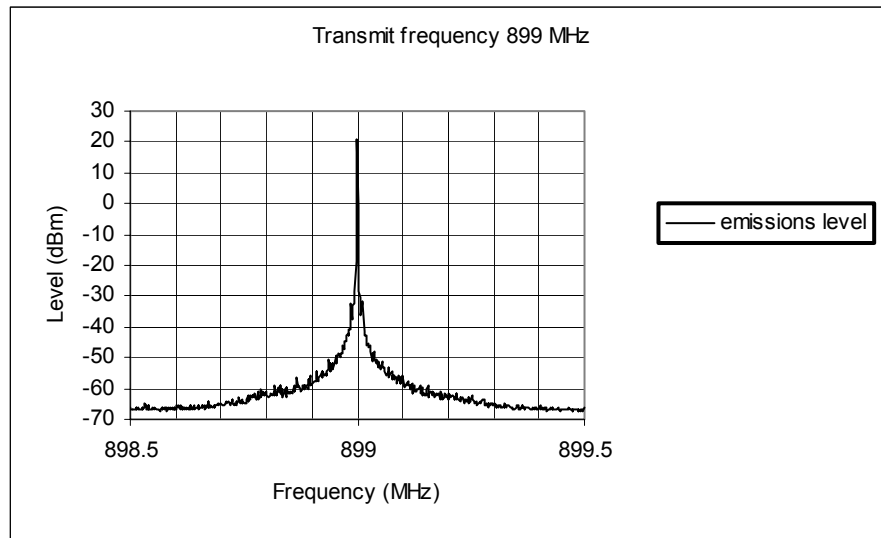
**Figure B.3 – Carrier Power at 902 MHz**



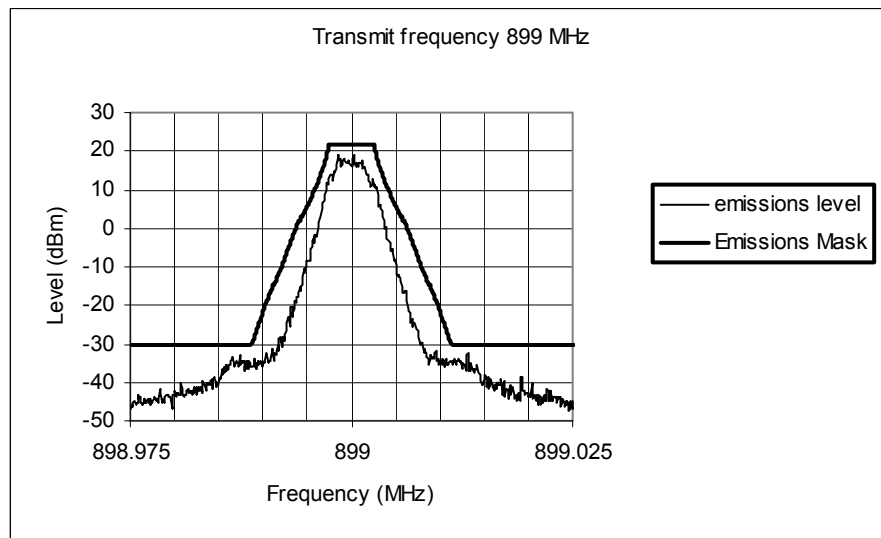
**Figure B.4 – Occupied bandwidth at 896 MHz (1 MHz span)**



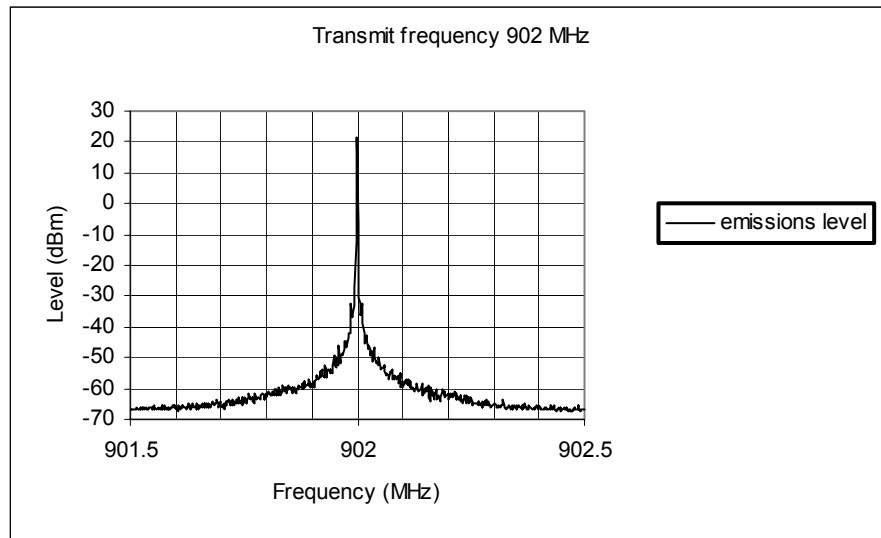
**Figure B.5 – Occupied bandwidth at 896MHz (50 kHz span)**



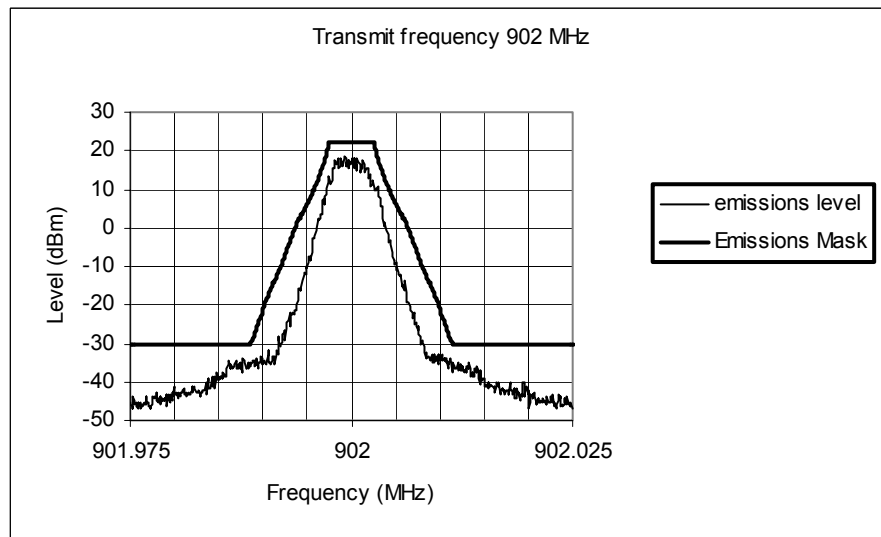
**Figure B.6 – Occupied bandwidth at 899 MHz (1 MHz span)**



**Figure B.7 – Occupied bandwidth at 899 MHz (50 kHz span)**

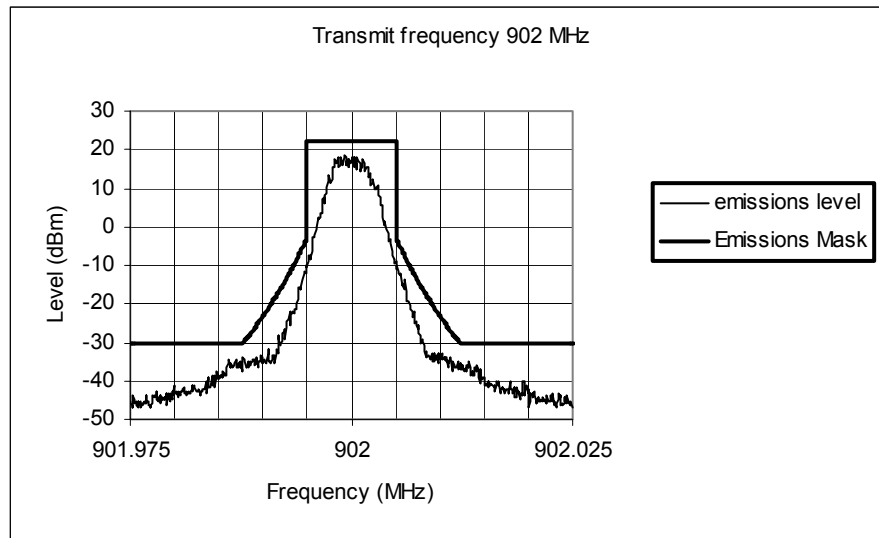


**Figure B.8 – Occupied bandwidth at 902 MHz (1 MHz span)**



**Figure B.9 – Occupied bandwidth at 902 MHz (50 kHz span) Part 90 Mask**





**Figure B.10 – Occupied bandwidth at 902 MHz (50 kHz span) Part 24 Mask**

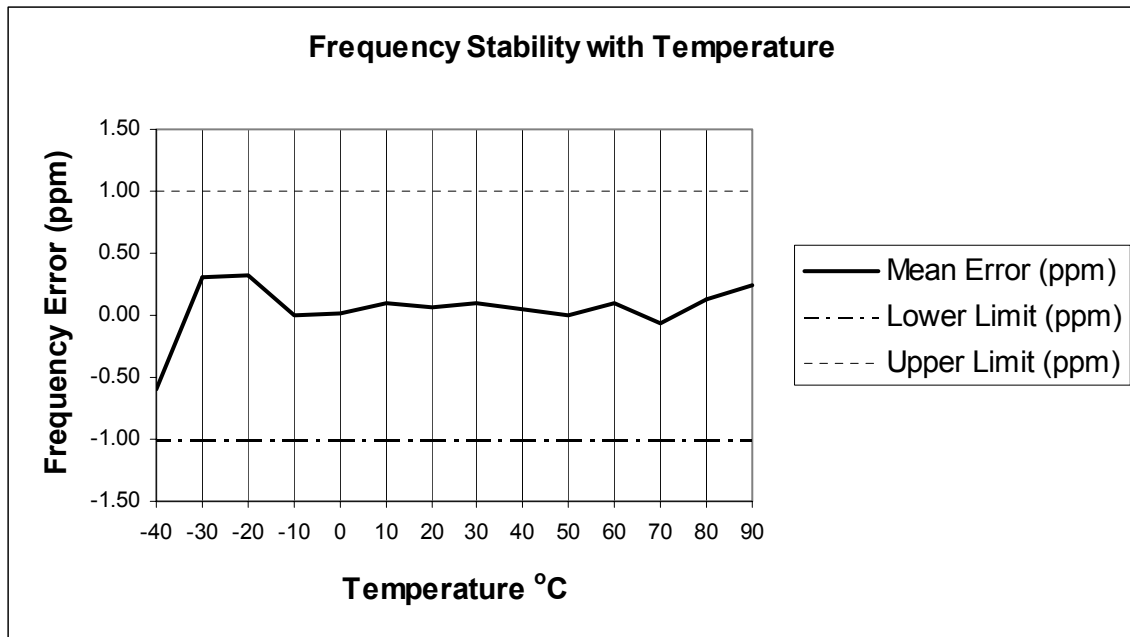


Figure B.11 – Frequency stability with temperature variation at 901.25625 MHz

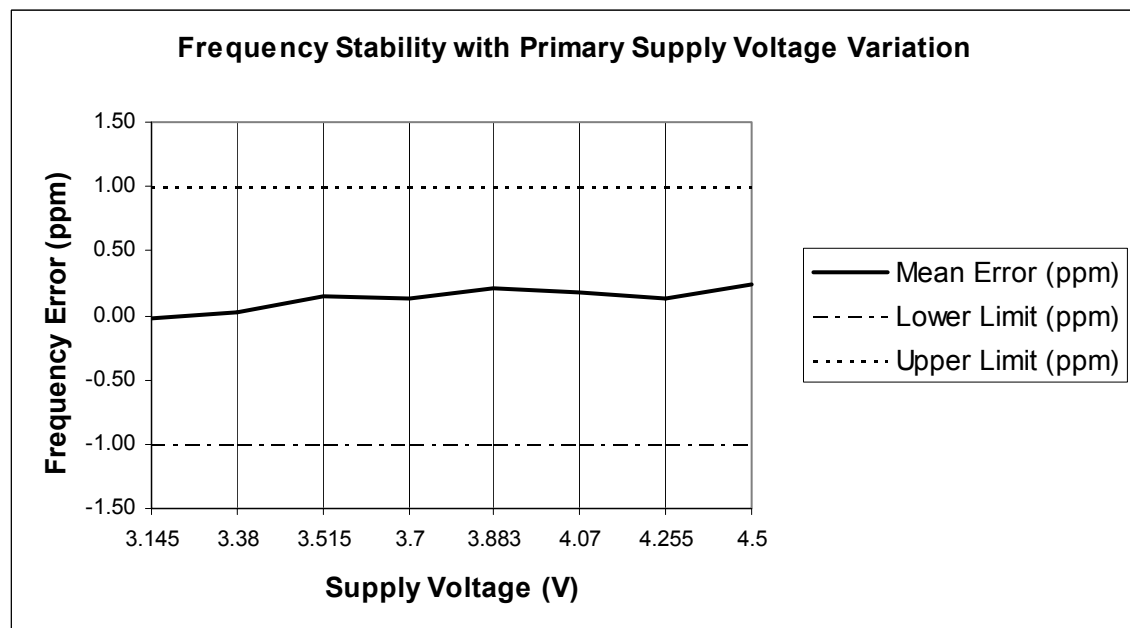


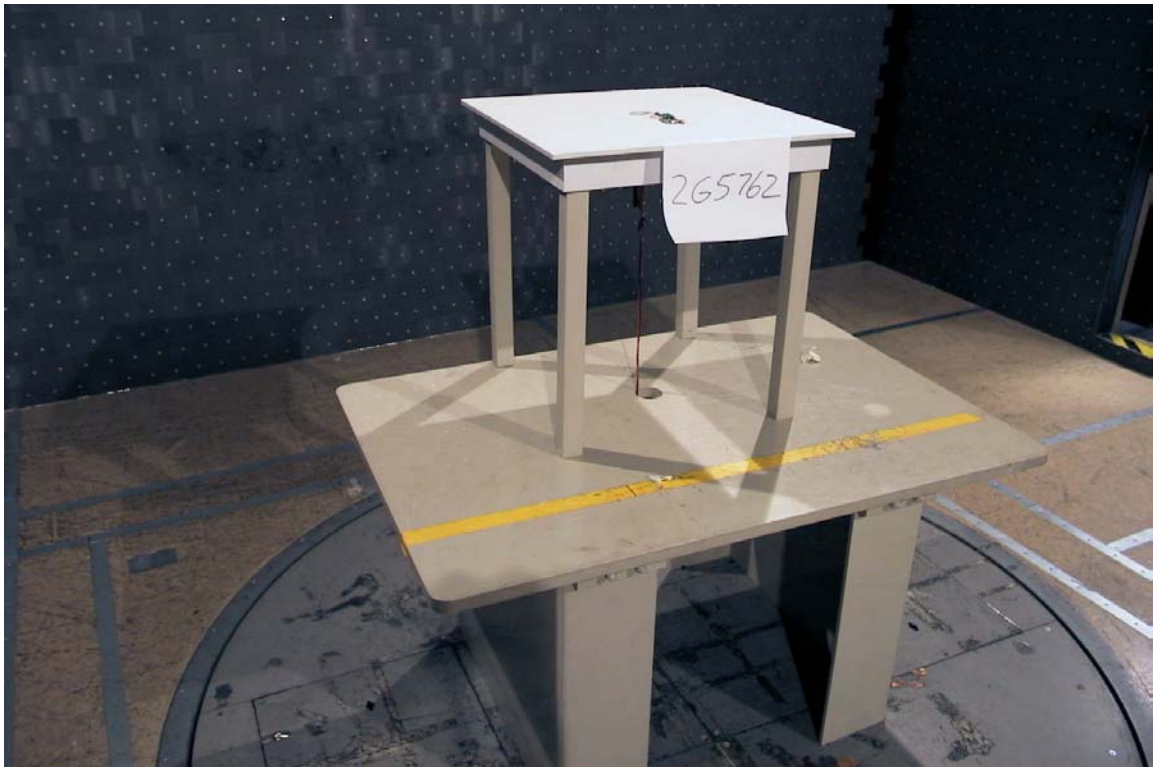
Figure B.11 – Frequency stability with primary voltage variation at 901.25625 MHz

**Appendix C:**

**Photographs**

The following photographs were taken of the test samples:

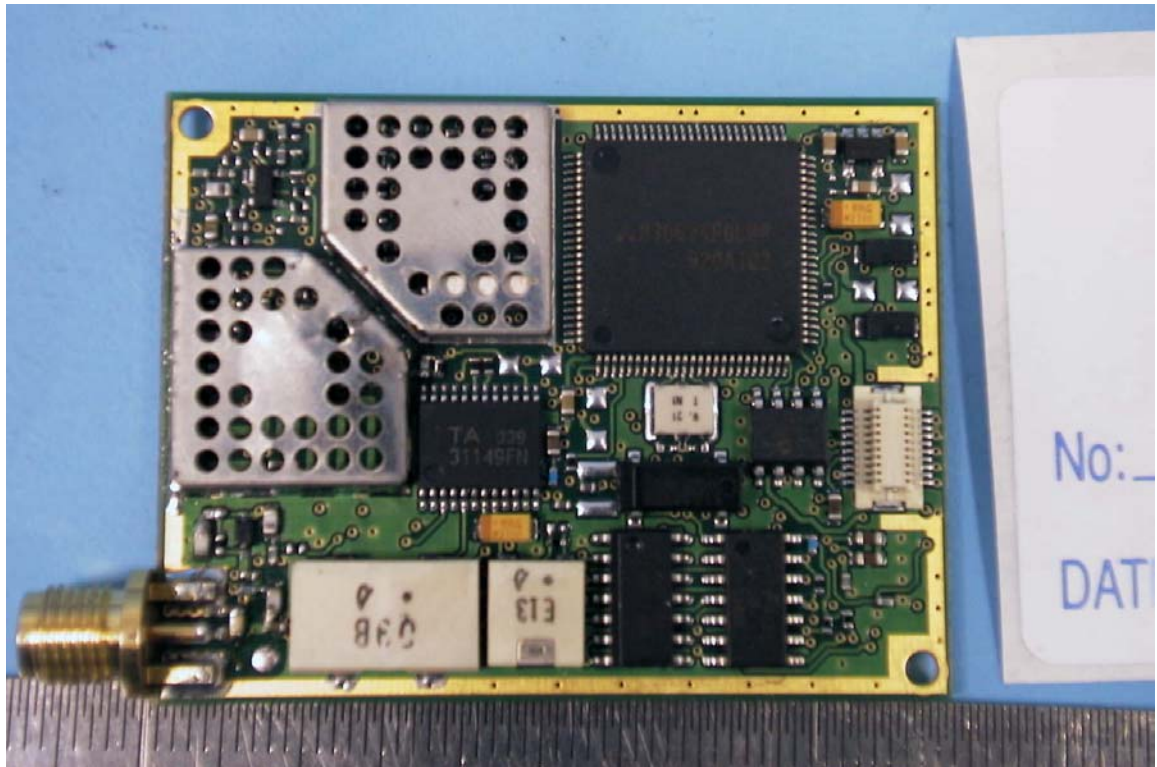
1. Spurious emissions 30 MHz to 10 GHz
2. Spurious emissions 9 kHz to 30 MHz
3. EUT Top view
4. EUT Bottom view



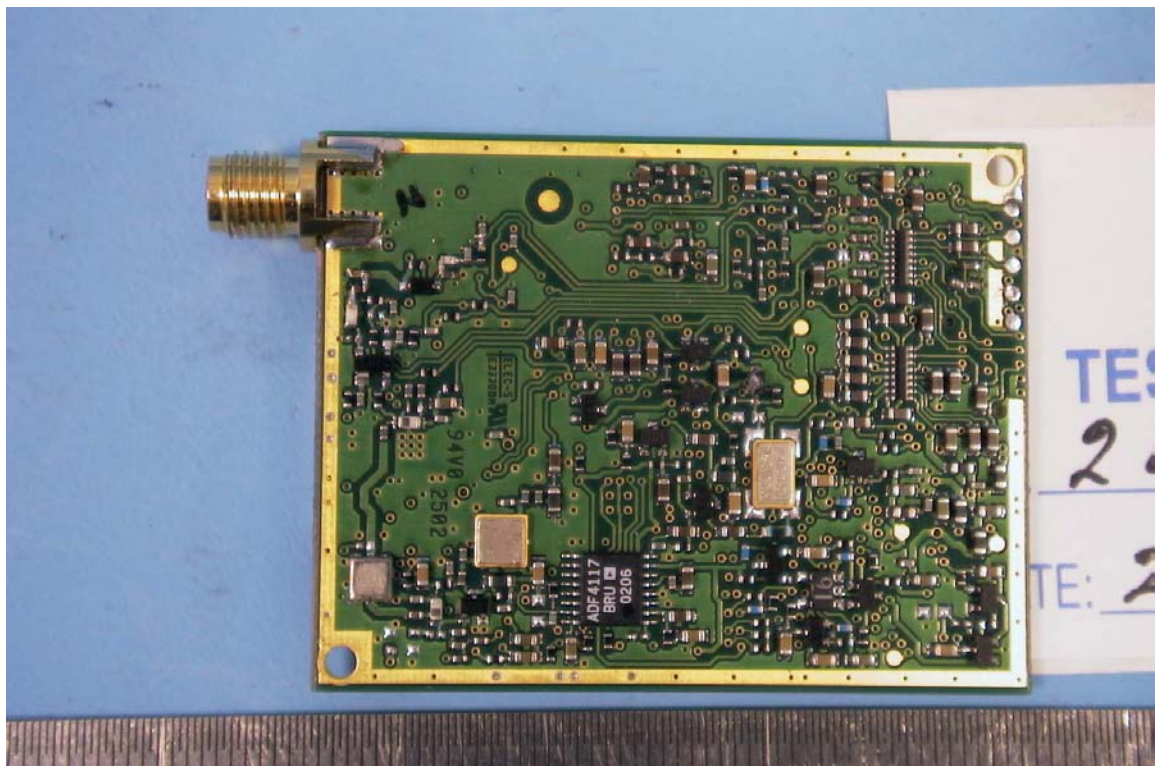
Photograph 1



Photograph 2



Photograph 3



Photograph 4

**Appendix D:****Equipment Used For Testing**

To facilitate inclusion on each page of the test equipment used for related tests, each item of equipment used during testing (including test samples, support equipment, test equipment and ancillaries such as cables) are identified/numbered by the Test Laboratory.

**D1)** The following samples of apparatus were available for testing or use as drive equipment (and used as detailed in Appendix A):

Sample No.	Description	Identification
S01	AR100 RF Module	None
S02	AR100 RF Module	None
S03	AR100 RF Module	None
S04	Tescom TC 2000A Pager Pester	2000A120059
S05	Dell Latitude XP Laptop PC	98418
S06	PA1 PSU for S05 above	81407
S07	Devkit PCB V1.1 (host for S01 to S03)	None
S08	AR100 Programmer Interface	IP1964.67P0004

**D2)** The following test equipment was available for use during testing (and used as detailed in appendix B):

\* Indicates equipment used.

Frequency stability :

RFG / REF	Type	Description	Manufacturer	Used
S04	TC 2000A	Pager Tester	Tescom	*
RFG001	2A	Off Air Frequency Standard	Quartzlock	*
REF496	34401	Multimeter	HP	*
REF239	310	Power supply	Farnell	*
RFG327	CMTA	Radiocommunications analyser	R & S	
RFG 365		Temperature Chamber	JTS	*

RF Power output at terminals, Occupied Bandwidth and Spurious emissions at antenna terminals:

RFG / REF	Type	Description	Manufacturer	Used
RFG127	HP8563E	Spectrum analyser	HP	*
RFG067	R3261A	Spectrum analyser	Advantest	
RFG214	ESAI	Analyser / Receiver	R & S	
REF496	34401	Multimeter	HP	
REF239	310	Power supply	Farnell	*
RFG 273	Model 2	Attenuator 20 dB	Wienschel	*

Field strength of spurious radiation (effective radiated power) :

RFG No	Type	Description	Manufacturer	Used
274	Lab 10	Large anechoic chamber	KTL	*
142	Lab 13	Medium anechoic Chamber		
	OATS	10m test site	KTL	
231	Blue Bilog	Bilog antenna	Chase	*
244	CBL6111			
095	3109	Bicon antenna	EMCO	
131		Bicon antenna		
132		Bicon antenna		
025	3146	Log periodic antenna	EMCO	
081		Log periodic antenna		
191		Log periodic antenna		
129		Horn antenna		*
130		Horn antenna		*
		Dipole set	EMCO	*
		Dipole set	EMCO	
007	8447F	Dual pre amp	HP	
008	8447D	Pre Amp	HP	*
307	8449B	Microwave pre amp	HP	*
067	R3261A	Spectrum analyser	Advantest	
127	HP8563E	Spectrum analyser	HP	*
214	ESAI	Spec Analyser/Test Receiver (LF/HF)	R & S	*
013	ESVP	Test Receiver	R & S	
126	ESVS 20	Test Receiver	R & S	
016	SMG	Signal generator	R & S	
227	MI2024	Signal generator	Marconi	
349	MI2032	Signal generator	Marconi	*
351		High pass filter set	Mini circuits	
276	N	RF coaxial cable 1.0m		
277	N	RF coaxial cable 1.0m		
280	N	RF coaxial cable 2.0m		
303	N	RF coaxial cable 2.0m		
249	N	RF coaxial cable 3.0m		*
255	N	RF coaxial cable		*
264	N	RF coaxial cable 1.0m		*
270	N	RF coaxial cable 4.5m		
137	N	HF coaxial cable 2.0m		*
158	N	HF coaxial cable 7.0m		*
312	Adapter	HF coaxial cable		*
313	Adapter	HF coaxial cable		*
352	N	RF coaxial cable		
353	N	RF coaxial cable		
222	N	RF coaxial cable		
247	N	RF coaxial cable		
251	N	RF coaxial cable		
REF239	310	Power supply	Farnell	*



**Appendix E:**

**Additional Information**

No additional information is included.