REPORT ON THE

FCC Emissions Testing of a Radio Transmitter Encoder

Report No BO609443/1

November 2002

TÜV PRODUCT SERVICE

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PREPARED FOR

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APPROVED BY

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DATED 28th November 2002

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The Equipment Under Test met the requirements of FCC Part 15 Subpart C, Paragraph 15.231 for the test applied.

SUPERVISING ENGINEER

J J Laydon

EMC TEST ENGINEER

A Rushworth

REPORT BODY CONTENT

1 Status

OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specifications.
MANUFACTURING DESCRIPTION	Radio Transmitter Encoder
MANUFACTURER	RF Solutions Ltd
COUNTRY OF ORIGIN	Great Britain
MANUFACTURERS MODEL NUMBER	102C-315F Series
PART NUMBER	102C1-315, 102C2-315, 102C4-315
SERIAL NUMBER	Not serialised
BUILD STATUS	Production
TEST SPECIFICATION NUMBER	FCC Part 15 Subpart C; 2000
REGISTRATION NUMBER	BO609443/1
QUANTITY OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Unclassified
INCOMING RELEASE SERIAL NUMBER DATE	Build State Declaration BO609443/1 27th November 2002
DISPOSAL NUMBER DATE	Packing Note 51818 26th November 2002
ORDER NUMBER DATE	John Fairall 15th March 2002
START OF TEST FINISH OF TEST	6th November 2002 7th November 2202
TEST ENGINEERS	A Rushworth
RELATED DOCUMENTS	ANSI C63.4 1992. Methods of Measurements of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 10kHz to 1GHz.

2 Results

2.1 Deviations From Standard

There were no deviations from the specifications used during testing.

2.2 Brief Summary of Results

Table 2.2 below shows a brief summary of the results obtained.

Specification and Section Number	Test	Modification State	Result
FCC Part 15 Subpart C, Para. 15.231	Radiated Emissions 30MHz - 3150MHz; Enclosure Port	0	Pass

Table 2.2

3 EUT Modification Chronology

Table 3 below details modifications necessary in order for the EUT to pass the relevant tests applied.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As Supplied by Manufacturer	Not Applicable	Not Applicable

Table 3

4 System Configuration During EMC Testing

The Equipment Under Test (EUT) was functioning correctly during all testing. The EUT was installed within the test area as shown in Figure 4 and was configured to simulate a typical user installation as follows.

The EUT was fitted with an external switch which when activated allowed the EUT to continually transmit at a carrier frequency of 315MHz. The EUT model used for testing was described by the manufacturer as the 'Hi Power' model

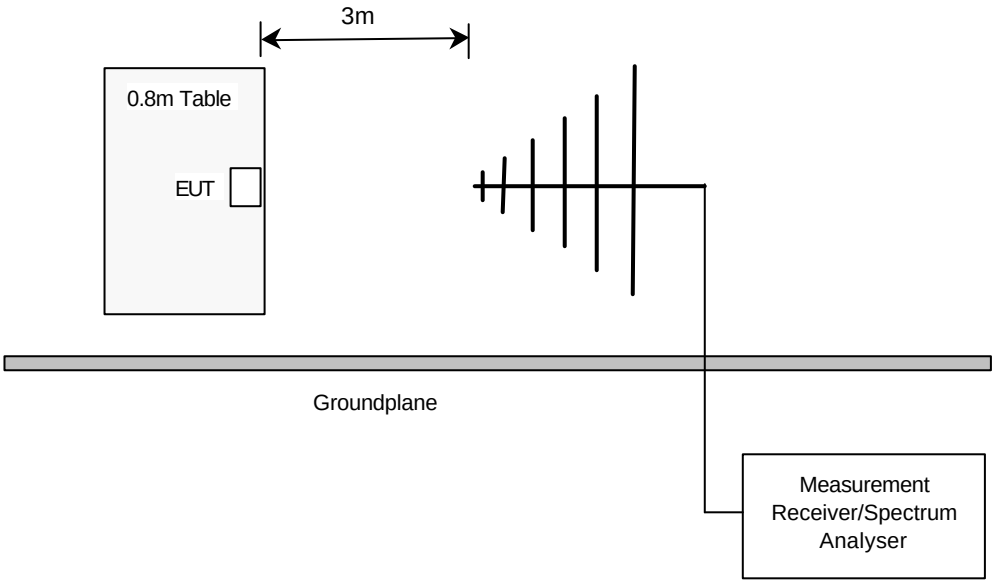


Figure 4: EUT Test Set-up

The highest clock frequency generated or used within this product, was declared by the client, as 315MHz.

5 Radiated Emissions 30MHz to 3150MHz

5.1 Enclosure Port - Test Procedure

The EUT was configured for testing as described in Section 4. A preliminary profile of the Radiated Emissions was obtained by placing the EUT in a Characterisation Chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in Horizontal and Vertical Polarisation's at a 3m distance from the EUT. The characterisation produced a list of the highest emissions and their associated antenna polarisation.

The EUT was then transferred to the Open Field Site and placed on a remotely controlled turntable. Using the information from the preliminary profiling of the EUT a search was made of the frequency spectrum from 30MHz to 3150MHz. The list of the highest emissions was then confirmed or updated under Open Site conditions. For frequencies up to 1000MHz, the emissions were formally measured using a Quasi-Peak Detector which meets the CISPR requirements.

The readings were maximised by adjusting the antenna height, polarisation and turntable azimuth in accordance with the specification. The details of the emissions were then recorded in the Job Logbook.

For frequencies over 1000MHz a Spectrum Analyser was used. For Peak measurements the Resolution and Video bandwidths were both set to 1MHz. For Average measurements a Resolution bandwidth of 1MHz and a Video bandwidth of 300kHz were used.

The readings were maximised by adjusting the antenna polarisation and turntable azimuth in accordance with the specification. The details of the emissions were then recorded in the Job Logbook.

The emissions have been measured at 3m for the 30MHz to 3150MHz ranges.

The Radiated Electric Field Emission measurements were made using a Rohde and Schwarz ESVP Test Receiver and a Hewlett Packard Spectrum Analyser.

The climatic conditions recorded at the time of this test were: -

Temperature – 18.1°C Relative Humidity – 63.2%rh Atmospheric Pressure - 1004HPa

The test was performed in accordance with FCC Part 15 Subpart C; 2000.

5.2 Enclosure Port – 30MHz to 1000MHz; Test Results

Equipment Designation : Intentional Radiator.

The EUT met the requirements of FCC Part 15 Subpart C, Paragraph 15.231 for Radiated Emissions when configured at modification state 0 for the test applied.

The levels of the EUT Fundamental and it's harmonics in the range 30MHz to 1000MHz and any other spurious emissions in this range, measured in accordance with the specification, are presented in Table 5.2 below.

Frequency	Polarity	Height	Azimuth	Field Strength at 3m		Margin	Limit	
MHz	H/V	Metres	Degrees	dBµV/m	µV/m	dB	dBµV/m	µV/m
315.024	H	1.01	062	59.5	944.1	18.1	75.6	6042
630.049	H	1.47	246	44.3	164.1	37.6	81.9	12500
945.071	H	1.00	269	46.9	221.3	35.0	81.9	12500

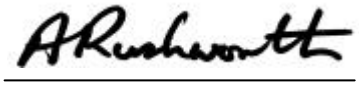
Table 5.2

The margin between the specification requirements and all other emissions was 37.6dB or more below the specification limit. There were no other emissions attributable to the EUT found in the range 30MHz to 1000MHz.

ABBREVIATIONS FOR ABOVE TABLE

H Horizontal Polarisation V Vertical Polarisation

Procedure Test Performed in accordance with ANSI C63.4; 1992.

Performed by 

A Rushworth, EMC Test Engineer.

5.3 Enclosure Port - 1000MHz to 3150MHz; Test Results

Equipment Designation : Intentional Radiator.

The EUT met the requirements of FCC Part 15 Subpart C Paragraph 15.231 for Radiated Emissions, when configured at modification state 0, for the test applied.

The levels of the EUT harmonics in the range 1000MHz to 3150MHz and any other spurious emissions in this range, measured in accordance with the specification, are presented in Table 5.3 below.

Frequency	Polarity	Height	Azimuth	Field Strength at 3m		Margin	Limit	
MHz	H/V	Metres	Degrees	dBµV/m	µV/m	dB	dBµV/m	µV/m
1260.33	V	1.00	200	42.0	125.9	39.90	81.90	12500
1575.17	V	1.00	060	40.6	107.2	13.38	53.98	500
1890.17	V	1.00	185	62.3	1258.9	19.60	81.90	12500
2205.25	V	1.00	185	52.1	402.7	1.88	53.98	500
2520.50	V	1.00	180	37.6	75.9	44.30	81.90	12500
2835.42	V	1.00	275	40.3	103.5	13.68	53.98	500
3150.42	V	1.00	330	47.2	229.1	34.70	81.90	12500

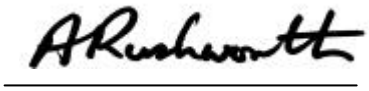
Table 5.3

The margin between the specification requirements and all other emissions was 44.3dB or more below the specification limit. There were no other emissions attributable to the EUT found in the range 1000MHz to 3150MHz.

ABBREVIATIONS FOR ABOVE TABLE

H Horizontal Polarisation V Vertical Polarisation

Procedure Test Performed in accordance with ANSI C63.4; 1992.

Performed by 

A Rushworth, EMC Test Engineer.

6 Emission Testing Instrumentation

Instrument	Manufacturer	Type No	EMC No
Computer	Opus	PCV	CV5
Test Receiver	Rohde and Schwarz	ESVP	1806
Test Receiver	Rohde and Schwarz	ESVP	1807
Spectrum Monitor	Rohde and Schwarz	EZM	1811
Biconical Antenna	Emco	3110	1847
Log Periodic Antenna	Emco	3146	1850
Bilog Antenna	Chase	CBL6111B	2451
Turntable & Controller	British Turntables	RH253	1858
Automatic Antenna Mast & Controller	Emco	1050	1844/5
Antenna Mast	Electrometrics	AMU74A	1853
Plotter	Hewlett Packard	7550A	---
Open Area Test Site	Assessment Services	OATS 2	2280
Thermohydrograph	Rotronic	A1 Hygromer	3162
HPA Monitor	Diplex	---	1932

7 System Measurement Uncertainty

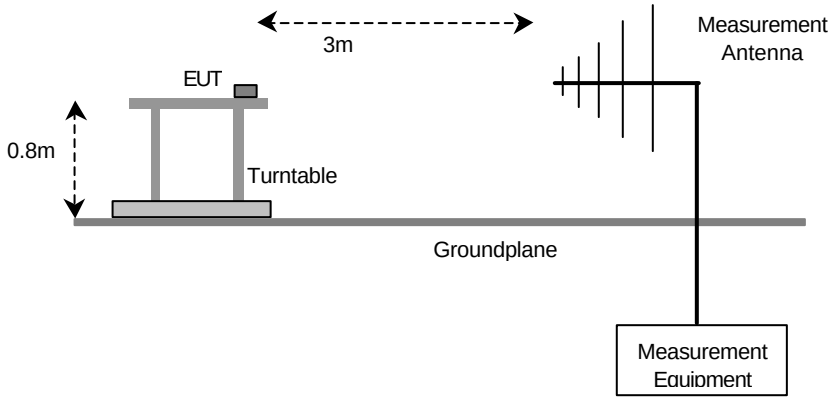
For a 95% confidence level, the measurement uncertainties for defined systems, in accordance with UKAS Lab 34 are: -

For Radiated Emissions, Quasi-Peak Measurements using the ESVP Test Receiver and Bilog Antenna: -

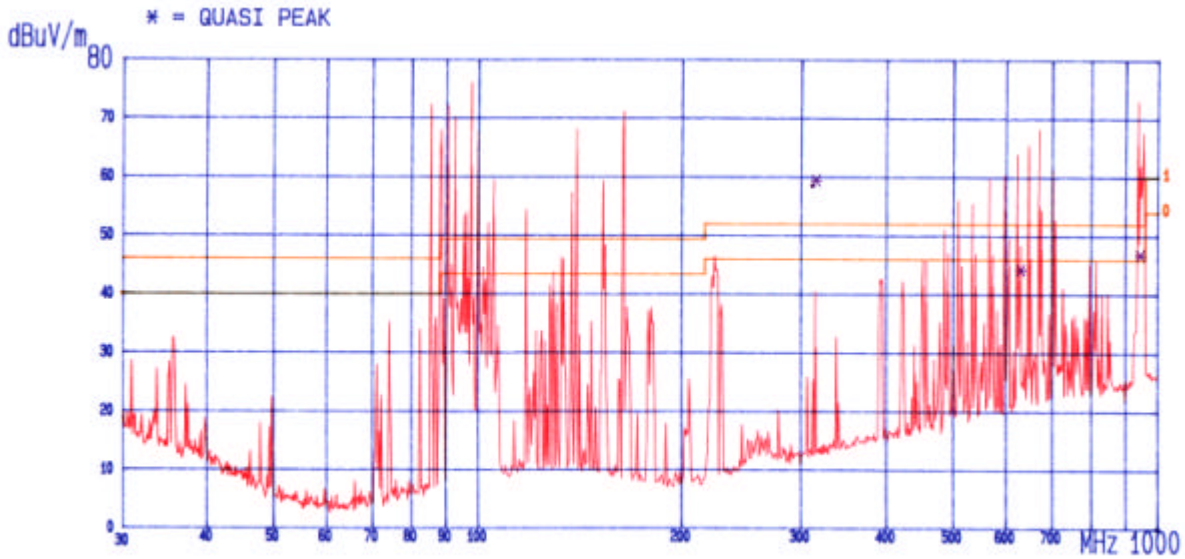
Frequency	±5ppm + 500Hz
Amplitude	±4.1dB

8 Radiated Emissions

8.1 Test Set-up for Radiated Emissions 30MHz to 3150MHz



8.2 30MHz - 1000MHz Emissions Profile



9 Test Configuration Photographs

9.1 Radiated Electric Field Emissions - 30MHz to 1000MHz

Photograph of the Radiated Electric Field Emissions Configuration - 30MHz to 1000MHz

9.2 Radiated Electric Field Emissions - 1000MHz to 3150MHz

Photograph of the Conducted Emissions Configuration – 1000MHz to 3150MHz

10 FCC Compliance Letter

FEDERAL COMMUNICATIONS COMMISSION
Laboratory Division
7435 Oakland Mills Road
Columbia, MD. 21046

September 08, 2000

Registration Number: 90986

BABT Product Service
Snitterfield Road
Bearley, Stratford-upon-Avon
Warwickshire CV37 0EX
United Kingdom
Attention: Jensen Adams

Re: Measurement facility located at Bearley
3 & 10 meter site
Date of Listing: September 08, 2000

Gentlemen:

Your submission of the description of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The description has, therefore, been placed on file and the name of your organization added to the Commission's list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that this filing must be updated for any changes made to the facility, and at least every three years from the date of listing the data on file must be certified as current.

If requested, the above mentioned facility has been added to our list of those who perform these measurement services for the public on a fee basis. An up-to-date list of such public test facilities is available on the Internet on the FCC Website at WWW.FCC.GOV, E-Filing, OET Equipment Authorization Electronic Filing.

Sincerely,

Thomas W Phillips
Electronics Engineer

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