TEST REPORT ON
BLUETOOTH BCES 301199/1
CASIRA KIT

OPERATING IN THE 2.4 GHz
ISM FREQUENCY BAND.

FCC CFR 47 part 15 Tests.

TEST REPORT NUMBER
CTMS 2000/1553
October 2000

Prepared for:-

Cambridge Silicon Radio
Unit 300 Science Park
Milton Road,
Cambridge CB4 0XL

The Test Results in this report are valid for the tested unit only.

CAMBRIDGE
TEST & MEASUREMENT SERVICES

Certificate of Application

Cambridge Test and Measurement Services Ltd., certifies that the product tested was fully compliant with the requirements of Parts 15 of the FCC Code of Regulations 47CFR, the results of which are contained in this test report No: CTMS 2000/1512b

I certify that the application was prepared under my supervision and that to the best of my knowledge and belief, the facts set forth in this application and technical data, are true and correct.

Signature :

Date :

Name : David Fisher

Title : Radio Technical Manager

DATE TEST SAMPLE RECEIVED:- 19/09/00

DATE TESTING STARTED:- 19/09/00

DATE TESTING FINISHED:- 28/09/00

EQUIPMENT SERIAL NUMBER :- 3244 15 08 00

PROJECT NUMBER :- 2000/1553

TEST ENGINEER:- K D Barker

APPROVED BY:- _____ DATE _____

D.M.Fisher.
Radio Technical Manager

Report Copy No 1

TABLE OF CONTENTS

PAGE

SECTION 1.

CLIENT APPLICATION FORM and DECLARATION

APPLICANT'S DETAILS

CATEGORY OF APPLICANT (Please tick relevant box opposite)	[√]	MANUFACTURER
If box (b), (c) or (d) is ticked	[ ]	IMPORTER (b)
complete details in box below	[ ]	DISTRIBUTOR (c)
with respect to the manufacturer	[ ]	AGENT (d)

COMPANY NAME Cambridge Silicon Radio
ADDRESS Unit 300 Science Park
Milton Road,
Cambridge CB4 0XL

NAME FOR CONTACT PURPOSES Peter Flittner

TELEPHONE NO: 01223 392598 FAX No: 01223424178

Email peter.flittner@CambridgeSiliconRadio

MANUFACTURE'S DETAILS

COMPANY NAME As above.
ADDRESS

NAME FOR CONTACT PURPOSES

TELEPHONE NO. _____ FAX No. _____

Email. _____

INTENDED USE (For information only)

Details Customer evaluation or development

Product brochures included YES [ ] NO [√]

APPLICANT'S DESIGNATION (1)
The type designation may be either a single alphanumeric code or an alphanumeric code divided into two parts. Please fill in, EITHER :- TYPE DESIGNATION AS A SINGLE ALPHANUMERIC CODE:- BCES 301199/1 OR TYPE DESIGNATION IN TWO PARTS:- 1). EQUIPMENT SERIES No (2) ("MODEL NUMBER") 2). EQUIPMENT SPECIFIC No (3) ("IDENTIFICATION No")

TECHNICAL VARIANTS	
TYPE NUMBER	VARIANT

(1) This is the manufacturer's numeric or alphanumeric code or name that is specific to a particular equipment. It may contain information in coded form on the characteristics of the equipment e.g. frequency, power etc. The manufacturer is free to choose the form of the type designation.

(2) This is the number, code or trade name used by the manufacturer to describe a series or 'family' of equipment's of substantially the same mechanical and electric construction which include a number of related equipment's. This number is often referred to as the "Model No.".

(3) This is the manufacturer's identification number given to a specific equipment in the series or 'family' of equipment's. It is often referred to as the "Identification No.".

TEST SPECIFICATIONS
State the Specifications to which the testing is required. Radio. FCC part 15

EXTREME TEMPERATURE RANGE		
[ ]	Category 1 General	-20ºC to +55ºC
[ ]	Category 2 Portable equipment	-10ºC to +55ºC
[√]	Other:- Minimum Temp. [0 °C] Maximum Temp. [35 °C].	

CONSTRUCTION OF EQUIPMENT	
[ ]	Single unit (see note 4)
[√]	Multiple units describe each one clearly
	Bluetooth Terminal
	AC/DC Power Unit

Note 4 UNIT means a physically separate item of the equipment. The equipment under test may consist of two separate units. For example a car alarm with automatic paging consists of two units; the portable transceiver and associated mobile transceiver.

In this particular case additional sheets covering the transmitter and receiver characteristics for both units would be required, if unit 1and unit 2 are covered by the same TYPE DESIGNATION.

TYPE OF EQUIPMENT		
AC POWERED		
[ ] Transmitter	[ ] Simplex	[√] Integral antenna
[ ] Receiver	[ ] Duplex	[ ] Single antenna connector
[√] Transceiver	[ ] Two antenna connector	
VEHICLE BATTERY POWERED		
[ ] Transmitter	[ ] Simplex	[ ] Integral antenna
[ ] Receiver	[ ] Duplex	[ ] Single antenna connector
[ ] Transceiver	[ ] Two antenna connector	
[ ] Remote Control Head		
PORTABLE OR OTHER DC POWERED		
[ ] Transmitter	[ ] Simplex	[ ] Integral antenna
[ ] Receiver	[ ] Duplex	[ ] Single antenna connector
[ ] Transceiver	[ ] Two antenna connector	
[ ] Battery charger	[ ] Vehicle battery adapter	

TRANSMITTER TECHNICAL CHARACTERISTICS
FREQUENCY CHARACTERISTICS
Method of frequency generation [√] CRYSTAL [√] SYNTHESISER [ ] OTHER _____
Transmitter frequency alignment range 2402 - 2480 MHz Transmitter channel switching frequency range 2402 - 2480 MHz
Channel Separation 1 MHz State the maximum number of channels over which the equipment can operate - 79

TRANSMITTER R.F. POWER CHARACTERISTICS

MAXIMUM RATED TRANSMITTER OUTPUT POWER (as stated by Manufacturer)

Watts AT TRANSMITTER RF OUTPUT CONNECTOR (As defined by manufacturer)

20dBm Watts EFFECTIVE RADIATED POWER (For equipment with integral antenna)

Is transmitter intended for :-

Continuous Duty **[Õ]**
Intermittent Duty **[ ]**

If intermittent state Duty Cycle

TRANSMITTER ON MIN. TRANSMITTER OFF MINS.

IS TRANSMITTER OUTPUT POWER VARIABLE?

Yes **[ ]**	NO **[Õ]**
[ ] Continuously Variable	Maximum R.F. power (Watts)
[ ] Stepped	
dB per step	4dBm
Maximum R.F. power (Watts)	
Minimum R.F. power (Watts)	

GAIN OF ANTENNA USED WITH THE EQUIPMENT; **[1]** dBi.

INTEGRAL ANTENNA EQUIPMENT. Conducted measurement method-

Temporary 50 ohm Connector; **[Õ]** Test Fixture; **[ ]**

TRANSMITTER - MODULATION

[ ] Amplitude [√] Frequency / Angle

[ ] Other Details _____

Spread Spectrum method

[√] FHSS [ ] DSSS

For FHSS modulation state; Number of hopping channels **[79],** Dwell time/channel **[3.125]** mS and Maximum time between the re-use of a channel is **[247]** mS.

Can the transmitter be operated without modulation (see Note 5)

[ ] Yes [√] No

CLASS OF EMISSION

ITU DESIGNATION 1 : 1M00 Q1D

(if applicable) 2 :

(if applicable) 3 :

If more than three classes of emission, list separately
See UK DTI Radio Agency RA97 - Guide to Class of Emissions.

TRANSMITTER MODULATION INPUT CHARACTERISTICS ANALOGUE

Modulation input signal level for declared limiting.

Microphone socket	mV	Impedance	Ohms
Accessory socket	mV	Impedance	Ohms
Other	mV	Impedance	Ohms

Note 5 For use where direct connection is provided for test purposes

TRANSMITTER MODULATION INPUT CHARACTERISTICS DIGITAL

MODULATION BIT RATE. 1 Mbit/s
TYPE OF MODULATION

SUBCARRIER:

MSK [ ]

FFSK [ ]

DIRECT

Direct FSK [ ]

GMSK [ ]

Generalised Tamed FM [ ]

Multilevel State FM [ ]

PLL-4PSK [ ]

8 PSK [ ]

Other [√] GFSK

TRANSMITTER POWER SOURCE (see Note 6)

[√] AC Mains State voltage 100 - 240V

State Mains Frequency 50 / 60 Hz

[ ] DC Voltage

[ ] DC Maximum voltage

[ ] Other

BATTERY

[ ] Nickel Cadmium

[ ] Alkaline

[ ] Lead acid (Vehicle regulated)

[ ] Léclanche

[ ] Lithium

[ ] Other _____

End point voltage as quoted by equipment manufacturer

Note 6 If a transmitter and receiver use the same power source, this should be declared. In such cases only the box for the transmitter power source should be filled in.

AUTOMATIC EQUIPMENT SWITCH OFF

If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum voltage calculated values this shall be clearly stated.

[ ] Applies State Cut-off voltage _____V

[√] Does not apply

RECEIVER TECHNICAL CHARACTERISTICS		
RECEIVER FREQUENCY		
METHOD OF FREQUENCY GENERATION		
[√]	CRYSTAL	
[√]	SYNTHESISER	
[ ]	OTHER _____	
INTERMEDIATE FREQUENCIES		
[1.5]	1st	MHz
[ ]	2nd	MHz
[ ]	3rd	KHz
Is local oscillator injection frequency higher or lower than the receiver nominal frequency		
[ ]	Higher	
[√]	Lower	
Receiver switching frequency range (see note 7)		
2402 - 2480 MHz		
Receiver frequency alignment range (see note 8)		
2402 - 2480 MHz		

Note 7 This is the frequency range over which an equipment is capable of being switched under normal working conditions without realignment

Note 8 This is the frequency range (alignment range) over which an equipment can be adjusted to operate.

RECEIVER POWER SOURCE (see Note 6)

[ ] AC Mains State voltage _____V

State Mains Frequency Hz

and / or

EXTERNAL DC SUPPLY

Nominal voltage _____ Extreme upper voltage _____V

Extreme lower voltage _____V

BATTERY

[ ] Nickel Cadmium

[ ] Alkaline

[ ] Lead acid (Vehicle regulated)

[ ] Léclanche

[ ] Lithium

[ ] Other _____

Extreme test voltages V_{upper}._____ DC (V) V_{lower}._____ DC (V)

_____nominal DC Voltage (V)

_____DC Maximum Current (A)

AUTOMATIC EQUIPMENT SWITCH OFF

If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum voltage calculated values this shall be clearly stated.

[ ] Applies State Cut-off voltage _____V

[ ] Does not apply

Presentation of Equipment for Type testing

One or more equipments may be supplied for testing depending on power levels, frequency ranges and temporary connectors.

State the Serial numbers of all equipments supplied.

Casira Kit serial No. 3244 15 08 00

ARTESYN PSU SSL20-7605 serial No. ZCDT3588

CHANNEL IDENTIFICATION

Each equipment, whether one or more submitted for tests shall carry clear identification (such as serial number), and where applicable the frequencies associated with the channel identification displayed on the equipment.

Equipment identification e.g. serial No	CHANNEL No	NOMINAL TRANSMIT FREQUENCY MHz	NOMINAL RECEIVE FREQUENCY MHz
N/A			

OTHER ITEMS SUPPLIED		
Spare batteries (e.g. portable equipment)	[ ] Yes	[√] No
Battery charging device	[ ] Yes	[√] No
Special tools for dismantling equipment	[ ] Yes	[√] No
Encoder / Decoder	[ ] Yes	[√] No
Test interface box (if applicable)	[ ] Yes	[√] No
Full documentation on equipment	[ ] Yes	[√] No
Operating instructions	[ ] Yes	[√] No
User manual	[ ] Yes	[√] No
Frequency setting element variation chart (see note 9)	[ ] Yes	[√] No
Circuit diagrams	[ ] Yes	[√] No
Component frequency data	[ ] Yes	[√] No
P.C. Board layout, including component positioning	[ ] Yes	[√] No
Parts list	[ ] Yes	[√] No
Other	[√] Yes	[ ] No

If yes, please specify :- Headset, RS232 cable, SPI cable, PSU.

DECLARATION

Are the equipment(s) submitted representative production models?

[√] Yes [ ] No

If not, are the equipment(s) pre-production models?

[ ] Yes [ ] No

If pre-production equipment(s) are submitted will the final production equipment(s) be identical in all respects with the equipment tested?

[ ] Yes [ ] No

If no, supply full details of differences :

_____

_____

I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Signed:- _____

Name:- _____

Position:- _____

Company:- _____

Date:- _____

SECTION 2

TRANSMITTER MEASUREMENTS..

Transmitter measurements made to the relevant clauses of 47 CFR Ch. 1 (10-1-99 edition) FCC Part 15 clause 15.247, Guidelines DA 00-705**.**

TEST CONFIGURATION.

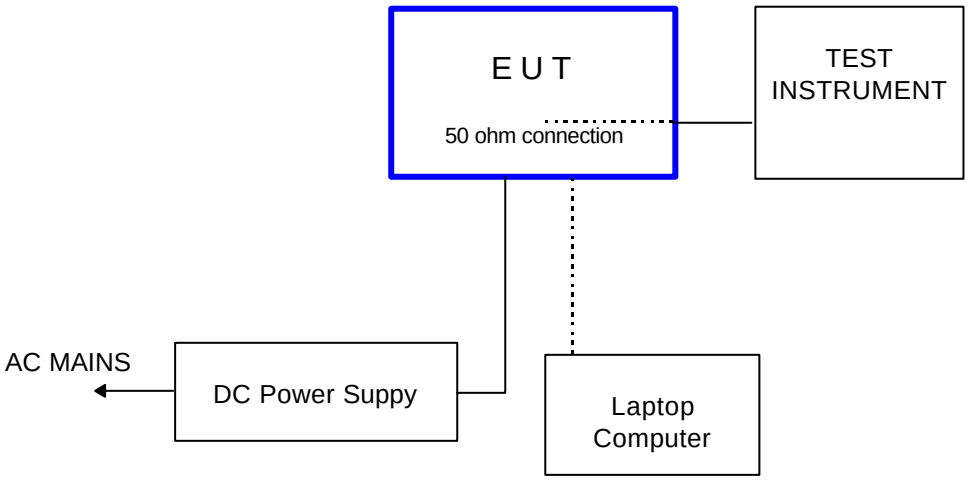
The Equipment Under Test (EUT) is the CSR CASIRA Bluetooth Development Kit consisting of a desktop unit powered by a separate AC Mains power unit.

The CSR CASIRA Bluetooth Development Kit tested had external connections for;

Power, 5V dc.
USB port
COM 1, 9 way 'D' Serial port
Audio Connector

The different operation modes of the transmitter required for each test were selected from test software on a computer connected to the serial port. The "Inquiry" and "page" modes of operation use less than the 75 channel hops required in 15.247, therefore measurements for Direct Sequence Systems are included for these modes.

To enable conducted measurements to be made the top cover and internal antenna were removed which gave access to the 50 ohm connector on the main circuit board.



Configuration of the test system.

Procedure: Based on FCC Rules Part 15 and ANSI 63.4-1992. Class B (Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz).

TEST HOUSE DETAILS

All of the tests described in the following report were performed at Cambridge Test and Measurement Services Limited (CTMS). The address is as follows:

Cambridge Test and Measurement Services Limited
PO Box 465
St. Andrews Road
Cambridge
CB4 1ZJ
England

Tel: 01223 876876
Fax: 01223 876851

Website: www.ctms.co.uk

FCC REGISTRATION

Cambridge Test and Measurement Services is a FCC registered test house.
FCC registration No. 93385.

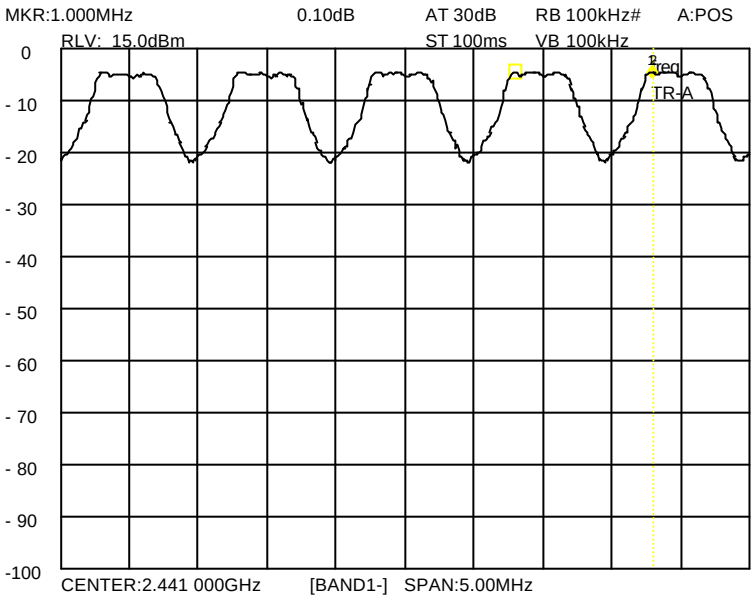
Ambient temperature....22.....°C Relative humidity...55....%

TRANSMITTER CARRIER FREQUENCY SEPARATION.

FCC Part 15 clause 15.247 (a), Guidelines DA 00-705.

EUT MODE - HOPPING.

The Carrier Frequency separation measured ; 1.00 MHz, see plot below. The separation is the same through the operating band with the plot made around the centre channel.



FILE 012. Carrier Frequency Separation.

LIMITS: Clause 15.247 (a)

Minimum separation:	25 kHz

TEST EQUIPMENT USED:- TMS 6,10, RS326-8366 blue cable..

Ambient temperature....22..°C Relative humidity.....55.%

NUMBER OF HOPPING FREQUENCIES.

EUT MODE - HOPPING.

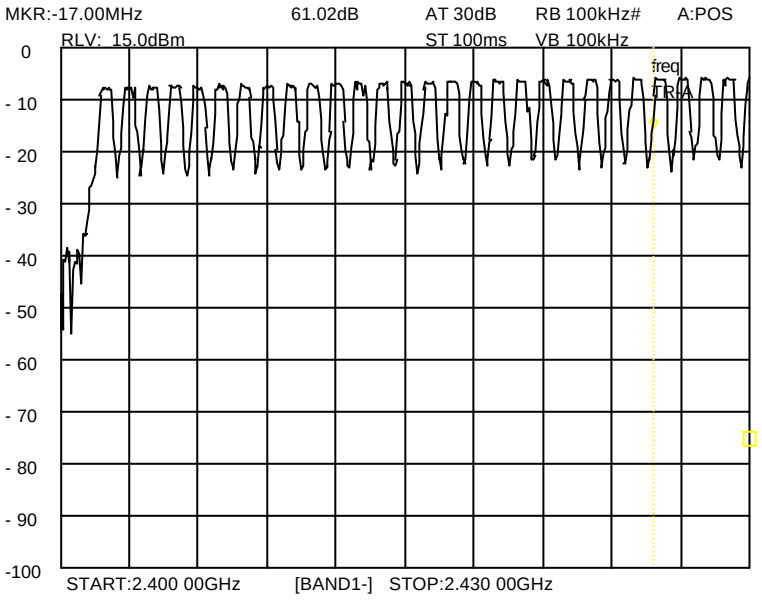
The number of Hopping Frequencies used was measured using the peak hold facility with the total band split into three sections because of the large number of frequencies to be recorded. The band splits used were 2400 to 2430 MHz, 2430 to 2460 MHz and 2460 to 2490 MHz, see file plots below.

Number of Hopping Frequencies.	**79**

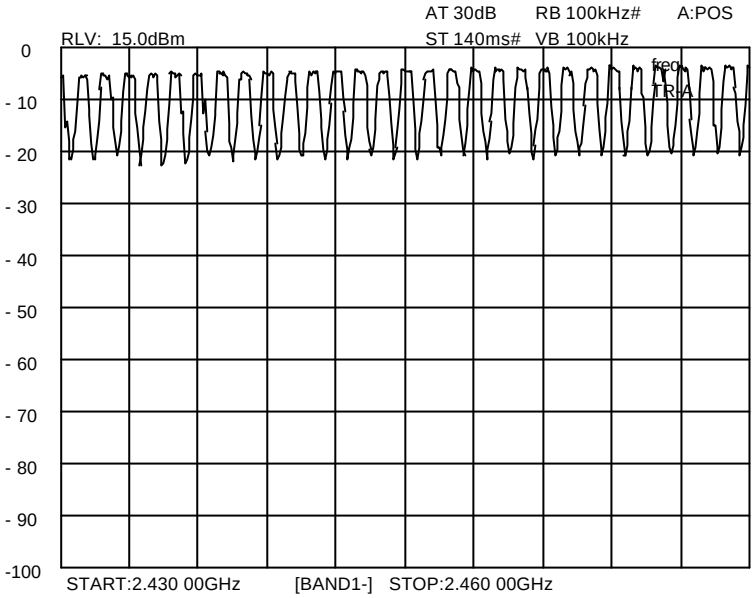
LIMITS: Clause 15.247 (a)

Minimum Number of Hopping Channels	**75**

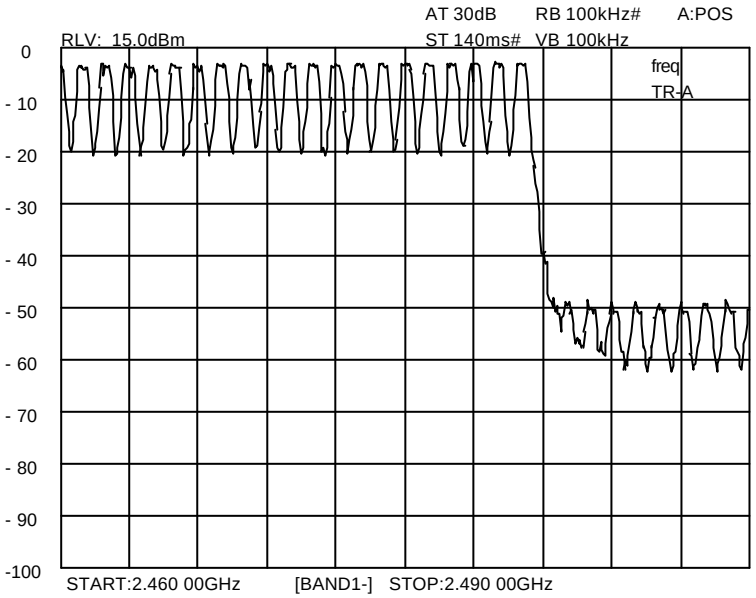
Spectrum plots.



File 0015. Channels in the Frequency range 2400 to 2430 MHz.



File 0016. Channels in the Frequency range 2430 to 2460 MHz.



File 0017. Channels in the Frequency range 2460 to 2490 MHz.

TEST EQUIPMENT USED:- TMS 6,10, RS326-8366 blue cable.

Ambient temperature....22.....°C Relative humidity...55.....%

TRANSMITTER TIME OF OCCUPANCY (DWELL TIME).

FCC Part 15 clause 15.247 (a), Guidelines DA 00-705.

EUT MODE - HOPPING.

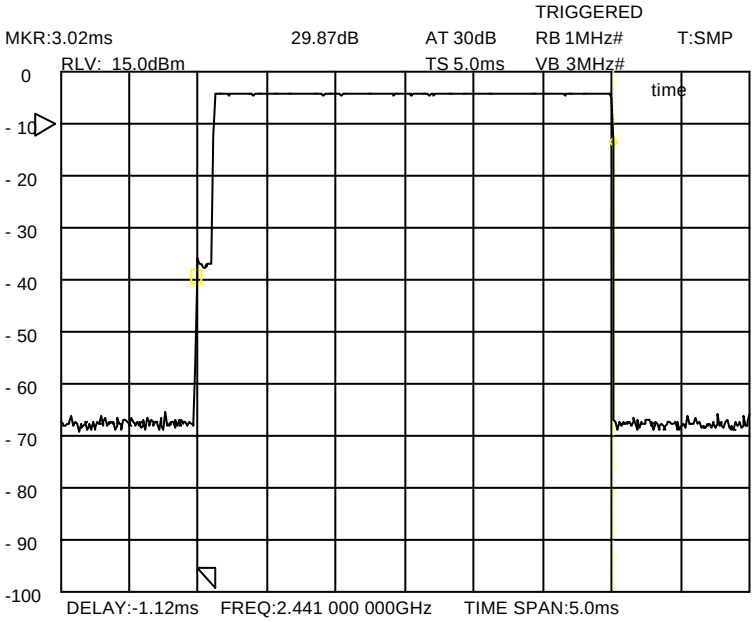
The EUT Dwell Time maximum is defined by operating test mode 'DH 5' and the minimum time by operating test mode 'DH 1'. Measurements were made in both these operating modes as shown below. The channel reuse time was then measured over a one second period to determine the total time of occupancy over the 30 second period defined.

TEST MODE	SINGLE OCCASION DWELL TIME
DH 5	3.02 ms
DH 1	0.522 ms

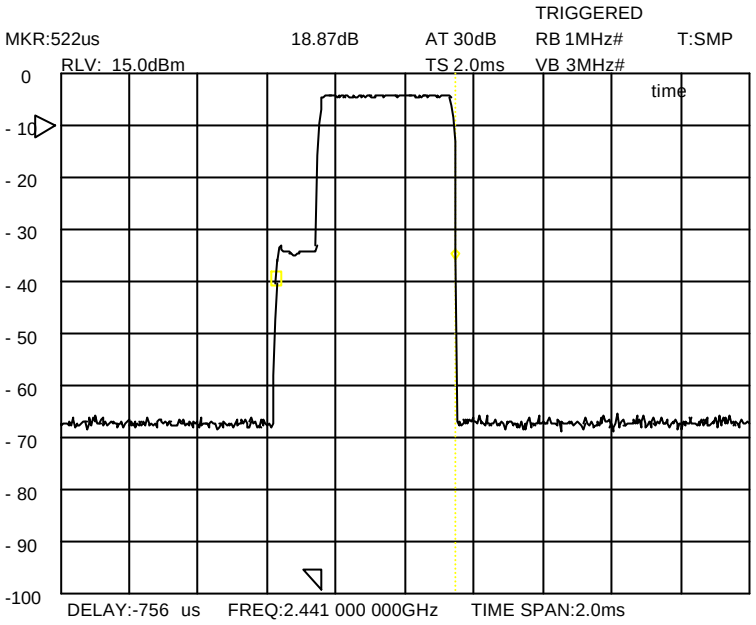
Mode DH 5 Dwell time within a 30 second period.	0.181 seconds.

LIMITS: Clause 15.247 (a).

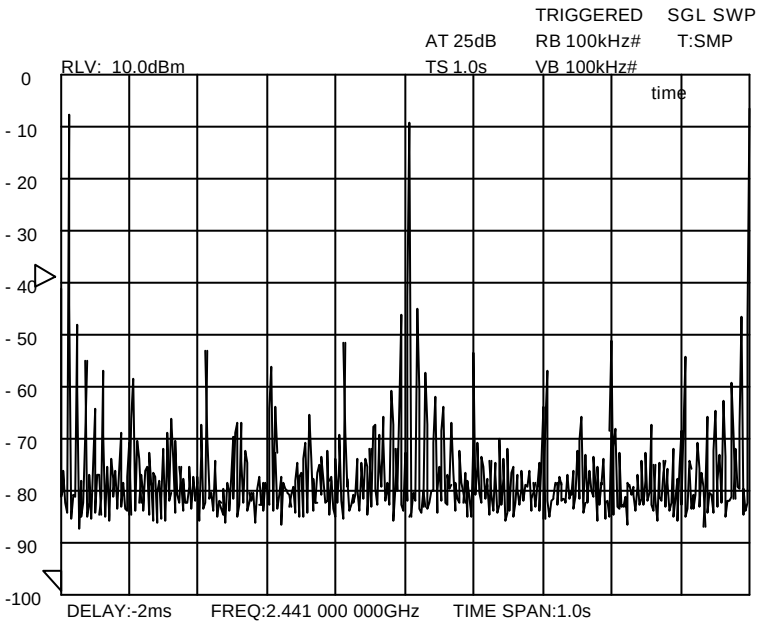
Maximum Dwell time within a 30 second period.	LESS THAN 0.4 seconds.



File 013. DH 5 MODE DWELL TIME.



File 014. .DH 1 MODE DWELL TIME.



File 030. Plot showing the channel reuse every 0.5 second.

TEST EQUIPMENT USED:- TMS 6,10, RS326-8366 blue cable.

Ambient temperature....22..°C Relative humidity.....55.%

TRANSMITTER 20 dB BANDWIDTH.

EUT MODE - HOPPING ON A SINGLE FREQUENCY.

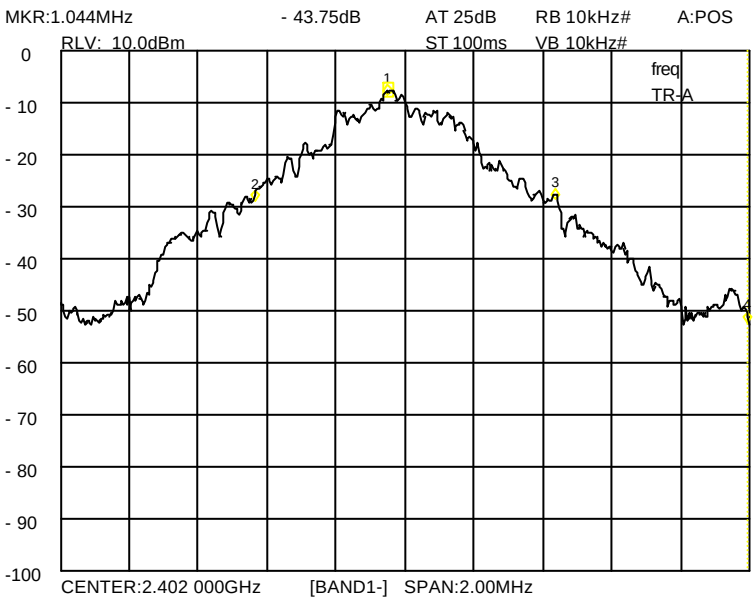
The 20 dB bandwidth of the transmitter was measured on the lowest, middle and highest working frequencies., see file plots below.

OPERATING FREQUENCY MHz.	20 dB BANDWIDTH MHz.
2402	0.872
2441	0.864
2480	0.864

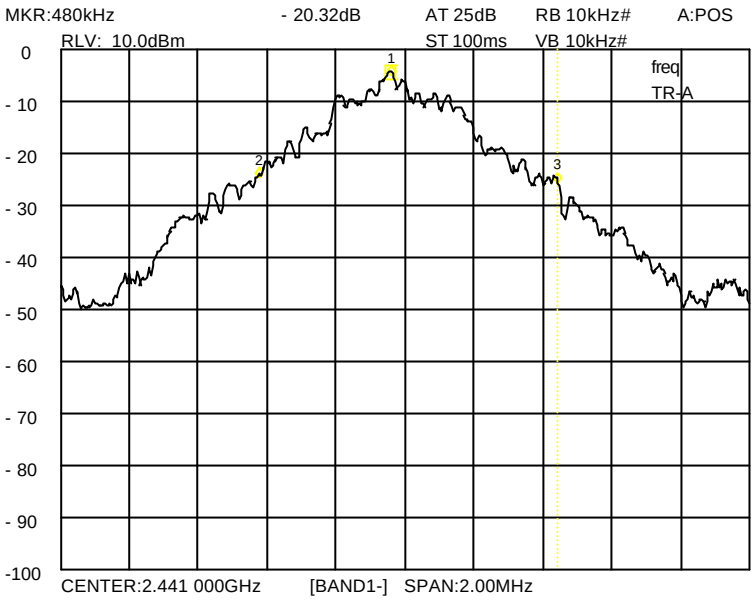
LIMITS: Clause 15.247 (a)

Maximum 20 dB Bandwidth	1 MHz

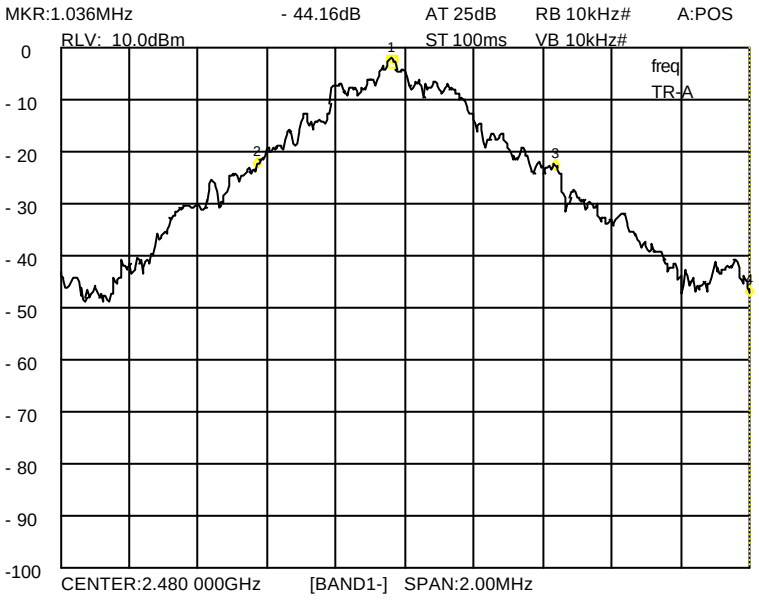
Spectrum plots.



File 002. Bandwidth of the2402 MHz channel.



File 004. Bandwidth of the2441 MHz channel.



File 006. Bandwidth of the2480 MHz channel.

TEST EQUIPMENT USED:

TMS 6,10, RS326-8366 blue cable..

Ambient temperature....22.....°C Relative humidity...55....%

TRANSMITTER PEAK POWER OUTPUT. (CONDUCTED).

FCC Part 15 clause 15.247 (b), Guidelines DA 00-705.

EUT MODE - HOPPING ON A SINGLE FREQUENCY.

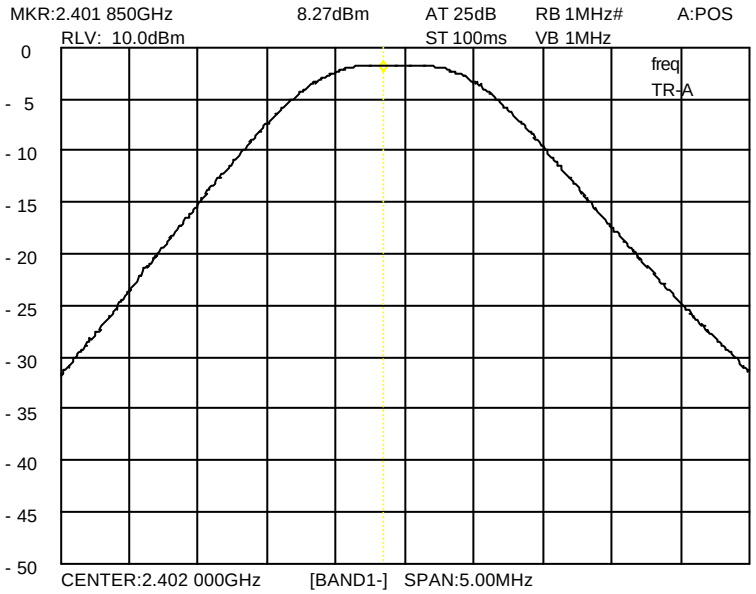
Power from internal antenna connector measured with a Spectrum Analyser peak hold with peak detection.

TEST CONDITIONS		TRANSMITTER PEAK OUTPUT POWER (dBm)		
		FREQUENCY 2402 MHz	FREQUENCY 2441 MHz	FREQUENCY 2480 MHz
T_{nom}(..22..)°C	V_{nom}(.230.)Vac	8.27	11.06	13.02

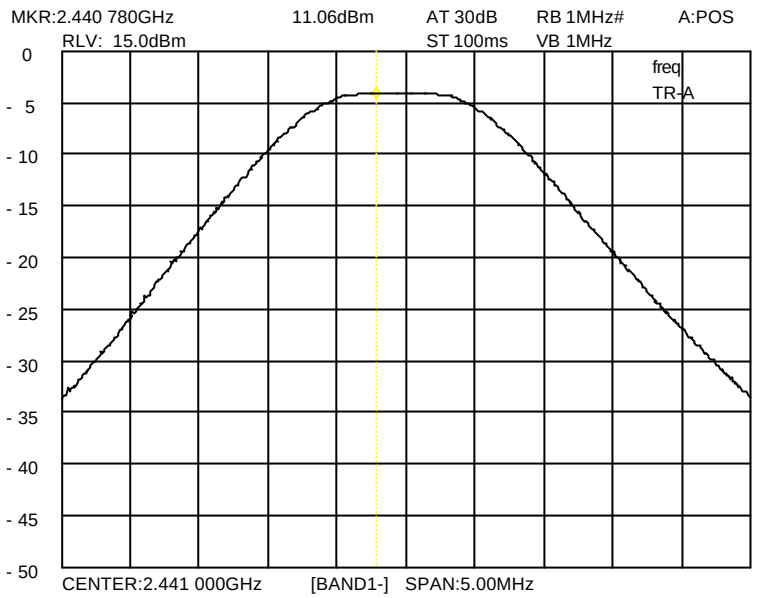
LIMITS: Clause 15.247 (a)

Maximum Peak Output Power.	**1 Watt (+30 dBm)**

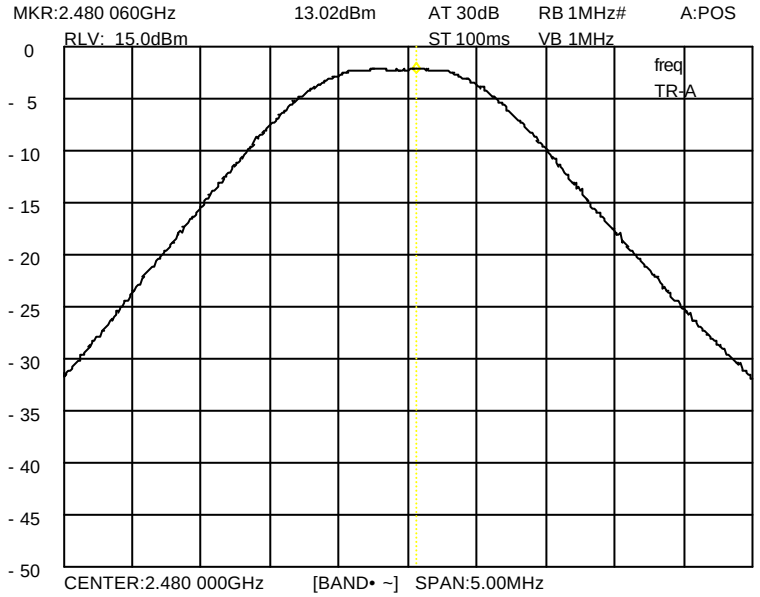
TEST EQUIPMENT USED:- TMS 6,10, RS326-8366 blue cable..



File 007. Power Output on 2402 MHz.



File 008. Power Output on 2441 MHz



File 009. Power Output on 2480 MHz

NOTE. The power outputs measured above are also valid for the Direct Sequence Spread Spectrum mode of operation using less than the 75 hopping frequencies.

Ambient temperature....22.....°C Relative humidity...55.....%

TRANSMITTER BAND-EDGE COMPLIANCE

FCC Part 15 clause 15.247 (c), Guidelines DA 00-705.

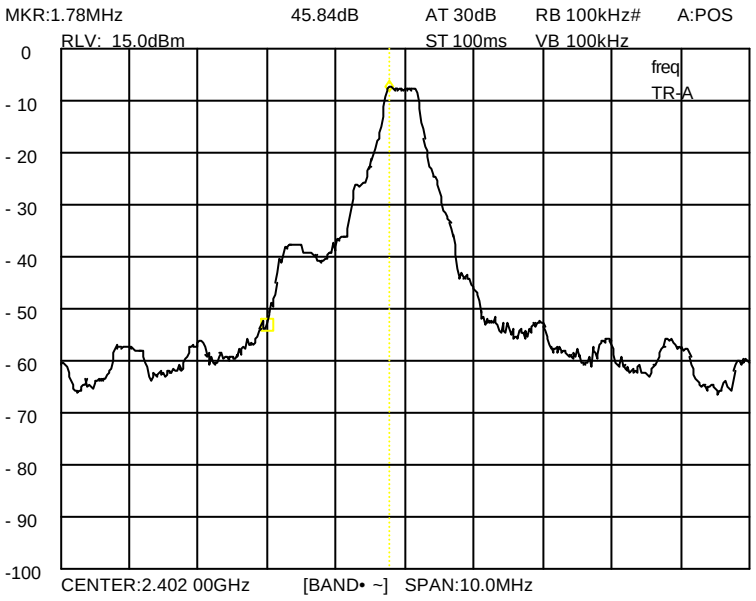
EUT MODE - HOPPING ON A SINGLE FREQUENCY.

The EUT was set to operate on the lowest operating frequency and the level at the lower band-edge was measured. The upper band-edge level was then measured with the EUT operating on the highest operating frequency.

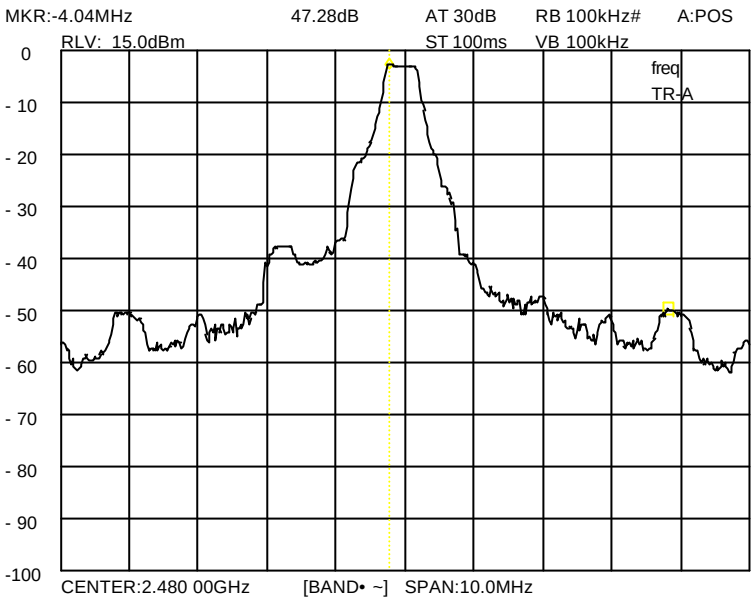
BAND-EDGE FREQUENCY MHz	ATTENUATION dB RELATIVE TO PEAK CARRIER POWER
2400	-45.8
2483.5	-47.2

LIMITS: Clause 15.247 c.

Level at Band-edge compared to in-band level.	20 dB below.



File 010, Lower Band-edge measurement.



File 011, Upper Band-edge measurement.

TEST EQUIPMENT USED :- TMS 6,10, RS326-8366 blue cable.

Ambient temperature....22.....°C Relative humidity.....48....%

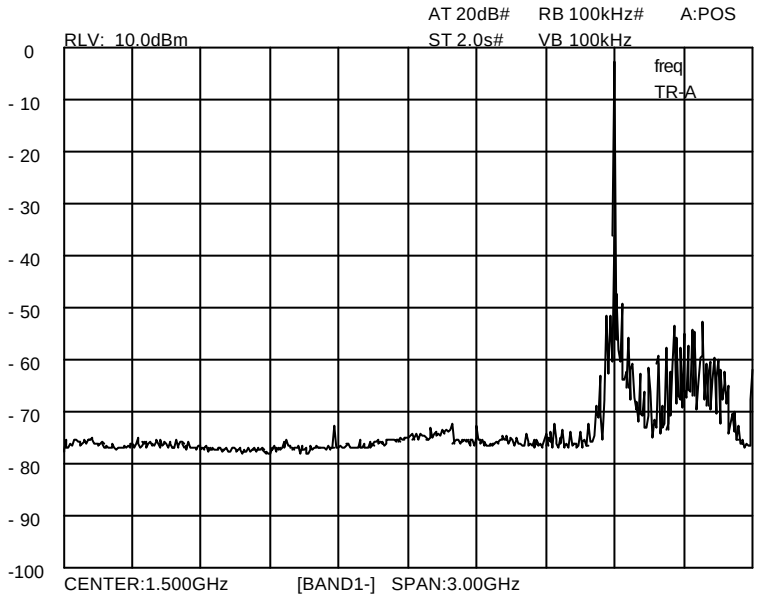
TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED).

FCC Part 15 clause 15.247 (c), Guidelines DA 00-705.

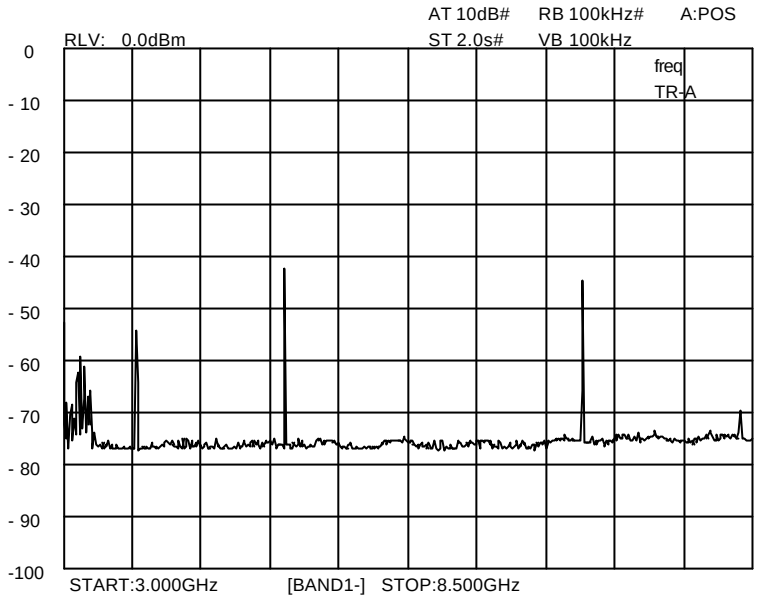
EUT MODE - HOPPING ON A SINGLE FREQUENCY.

The spurious RF conducted emissions were measured with the EUT set to low, middle and high transmit frequencies. The EUT was transmitting at its maximum data rate with the maximum channel occupancy time. At each frequency the spectrum was scanned from 0 MHz to 26.5 GHz.

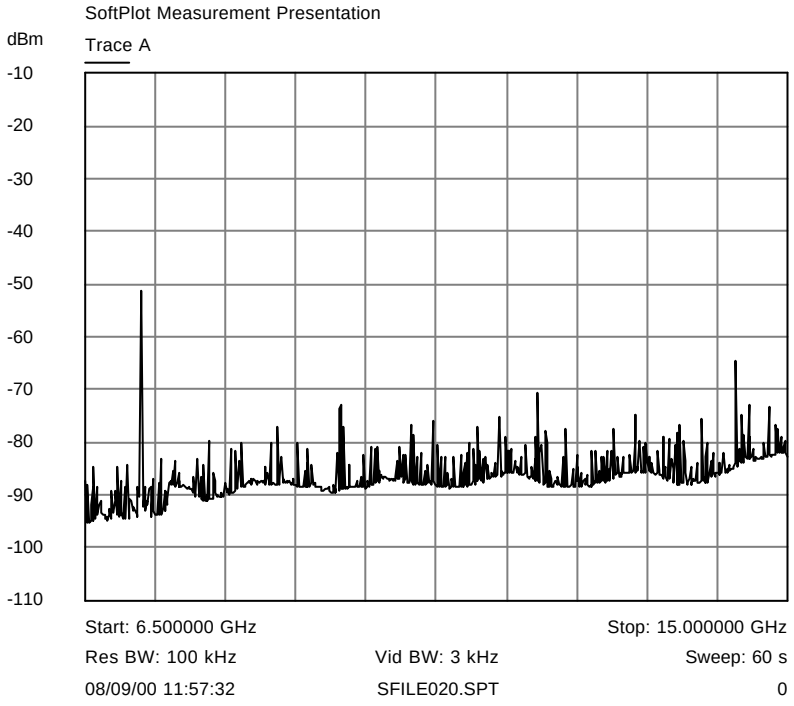
Spectrum plots with Transmitter Operating on 2.4020GHz non hopping.



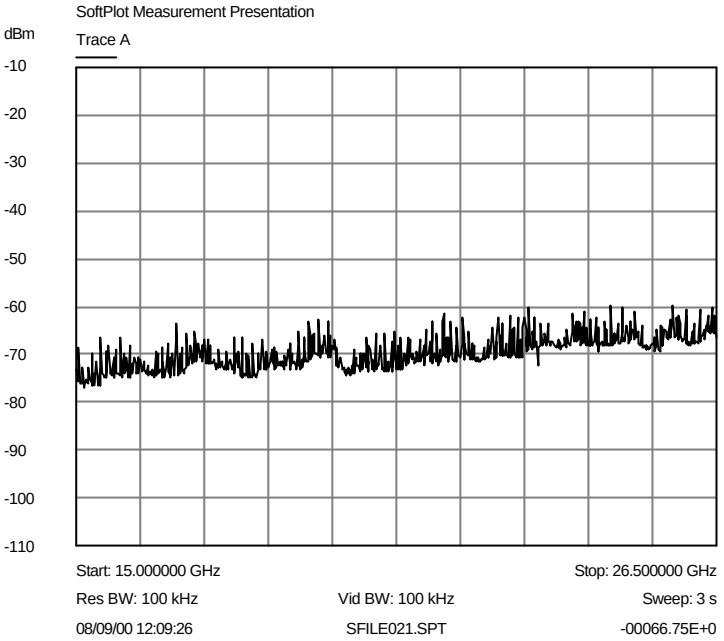
0-3.0GHz Spectrum



3-0-8.5 GHz Spectrum.

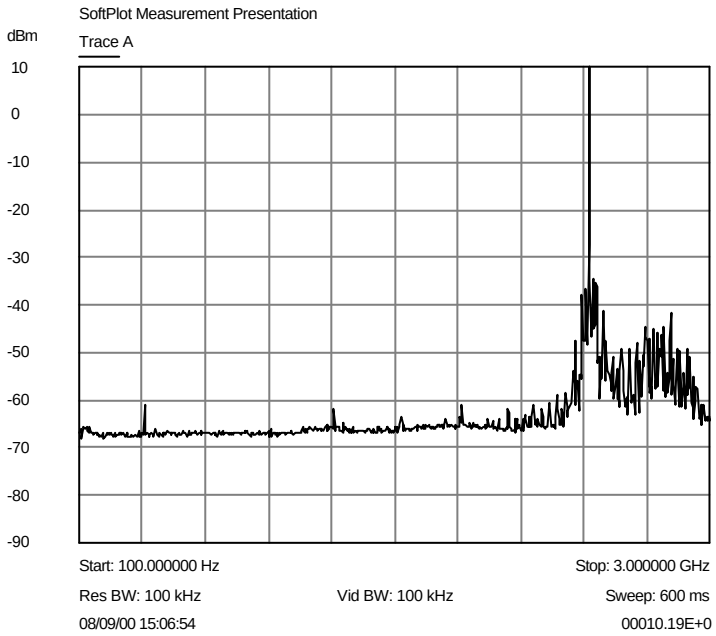


6.5-15.0 GHz Spectrum.

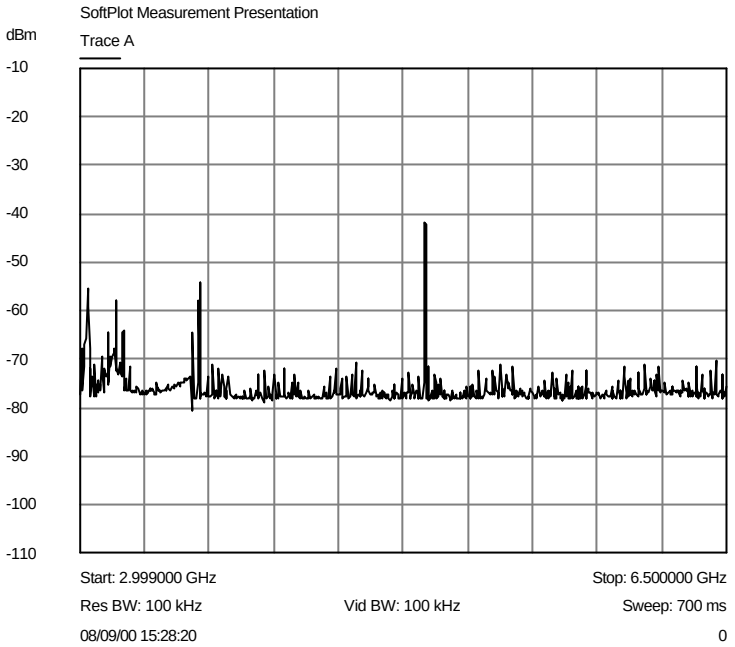


15.0-26.5 GHz Spectrum.

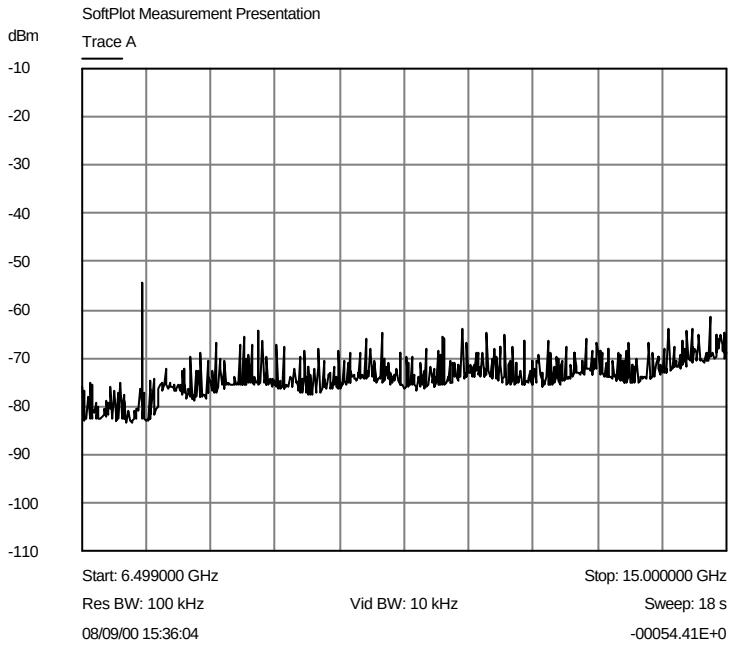
Spectrum plots with Transmitter Operating on 2.4410GHz non hopping.



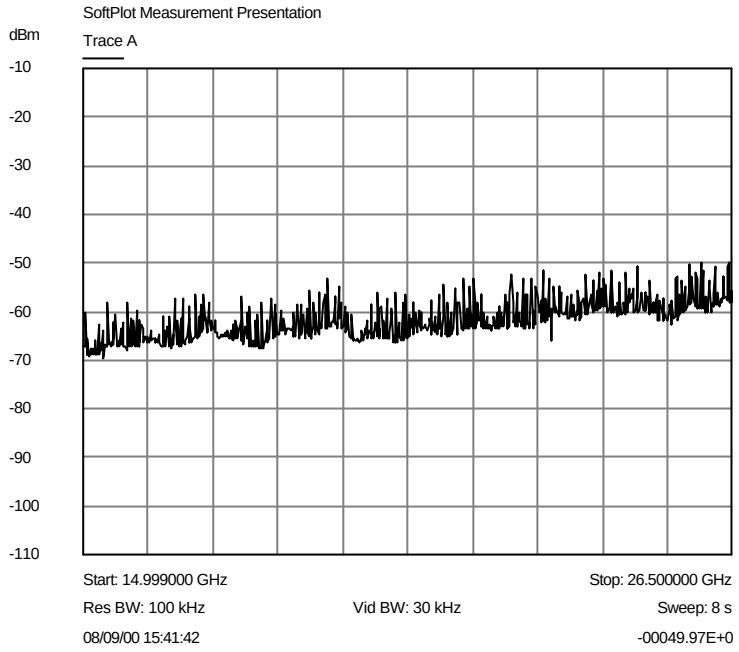
100Hz-3.0 GHz Spectrum



2.99-6.50GHz Spectrum.

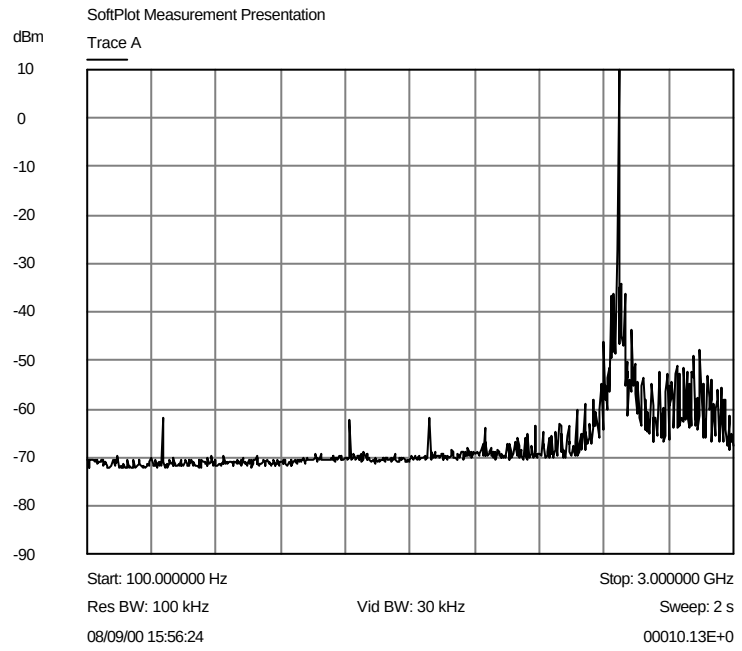


6.5-15.0GHz Spectrum.

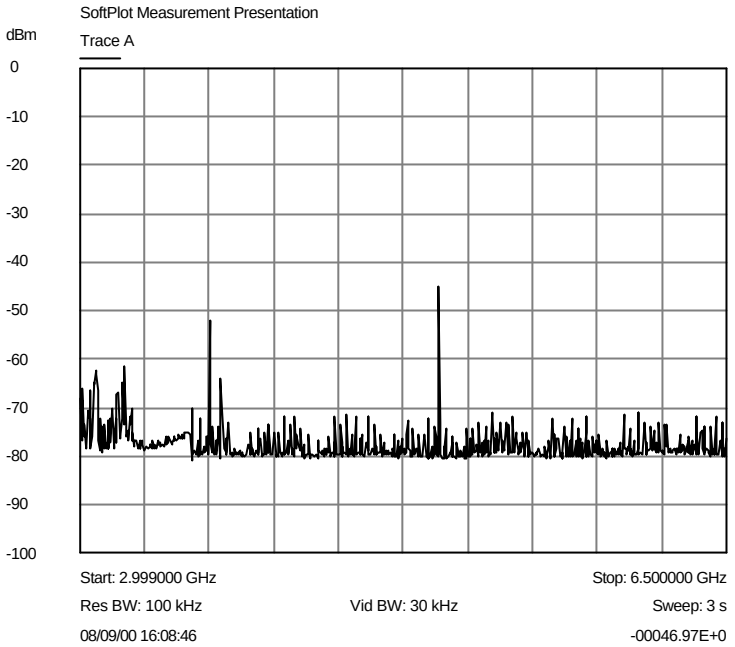


15.0-26.5GHz Spectrum.

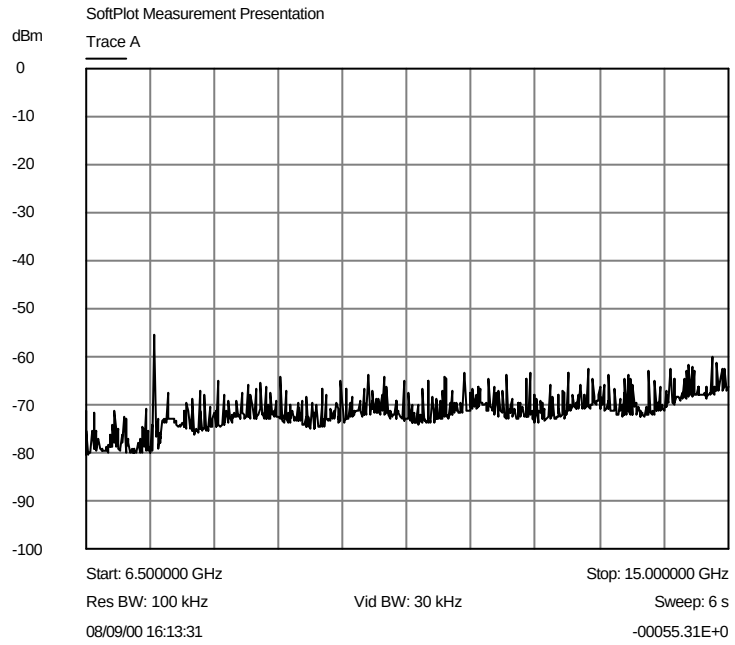
Spectrum plots with Transmitter Operating on 2.4800GHz non hopping.



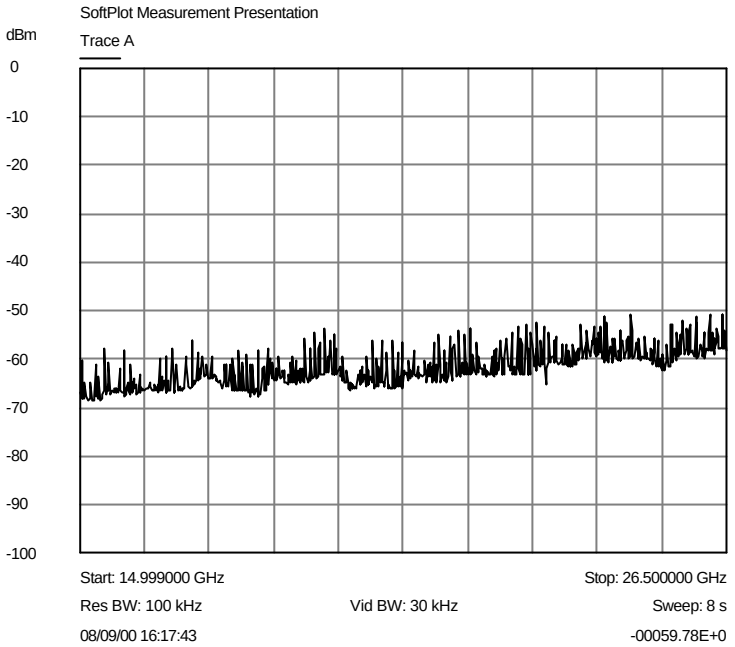
100Hz-3.0GHz Spectrum.



3.0-6.5 Spectrum.



6.5-15.0GHz Spectrum.



15.0-26.5GHz Spectrum.

LIMITS: Clause 15.247 (c).

Any 100kHz outside 2400-2483.5 MHz Range	Level Below in-band Power
9kHz to 24.8GHz	20dB

TEST EQUIPMENT USED:- TMS 69, 6,10, RS326-8366 blue cable.

DIRECT SEQUENCE SPREAD SPECTRUM MEASUREMENTS.

The EUT operates in two modes which use less than the 75 separate channel limit for the Hopping measurements. The two modes are 'Inquiry mode' and 'Page mode'.

The following measurements have been made to cover the FCC requirements for these modes of operation;-

Number of channels used.
Power Density.
6dB Bandwidth.
Time of Occupancy (Dwell Time).

Ambient temperature....22..°C Relative humidity.....55.%

DSSS INQUIRY MODE NUMBER OF HOPPING FREQUENCIES.

EUT MODE - INQUIRY MODE HOPPING.

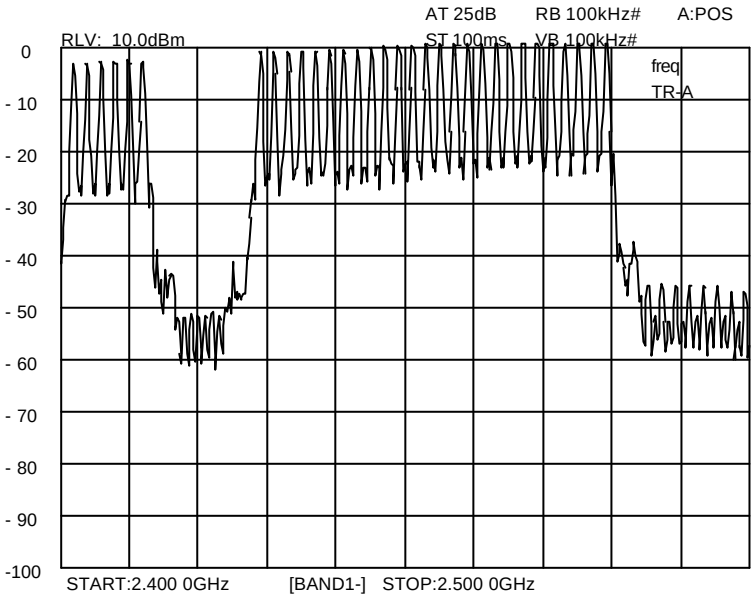
The number of Hopping Frequencies used was measured using the peak hold facility in the 2.4-2.5GHz band.

Number of Hopping Frequencies.	**32**

LIMITS: Clause 15.247 (a)

Maximum Number of Hopping Channels	**75**

Spectrum plots.



File 031. Channels in the Frequency range 2400 to 2500 MHz.

TEST EQUIPMENT USED:- TMS 69, 6,10, RS326-8366 blue cable.

Ambient temperature....22..°C Relative humidity.....55.%

DSSS PAGE MODE NUMBER OF HOPPING FREQUENCIES.

EUT MODE - PAGE MODE HOPPING.

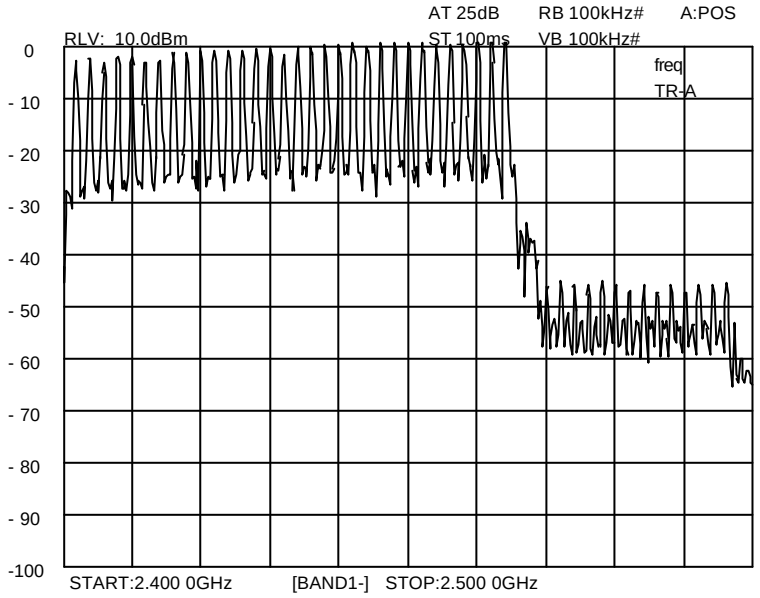
The number of Hopping Frequencies used was measured using the peak hold facility in the 2.4-2.5GHz band.

Number of Hopping Frequencies.	**32**

LIMITS: Clause 15.247 (a)

Maximum Number of Hopping Channels	**75**

Spectrum plots.



File 031. Channels in the Frequency range 2400 to 2500 MHz.

TEST EQUIPMENT USED:- TMS 6,10, RS326-8366 blue cable.

Ambient temperature.....22..°C Relative humidity...55.%

TRANSMITTER PEAK POWER DENSITY.

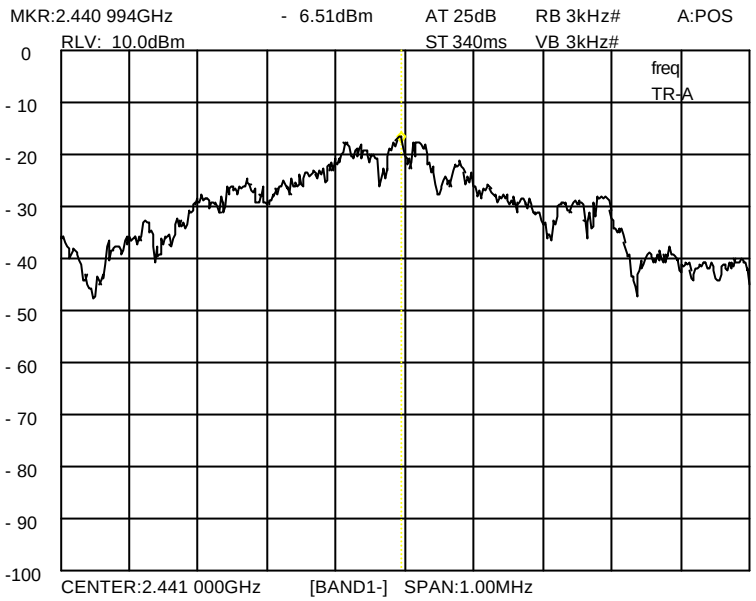
FCC Part 15 clause 15.247(d), Guidelines DA 00-705.

Testing of the DSSS mode power density was carried out on the nearest operating channel to the middle of the band.

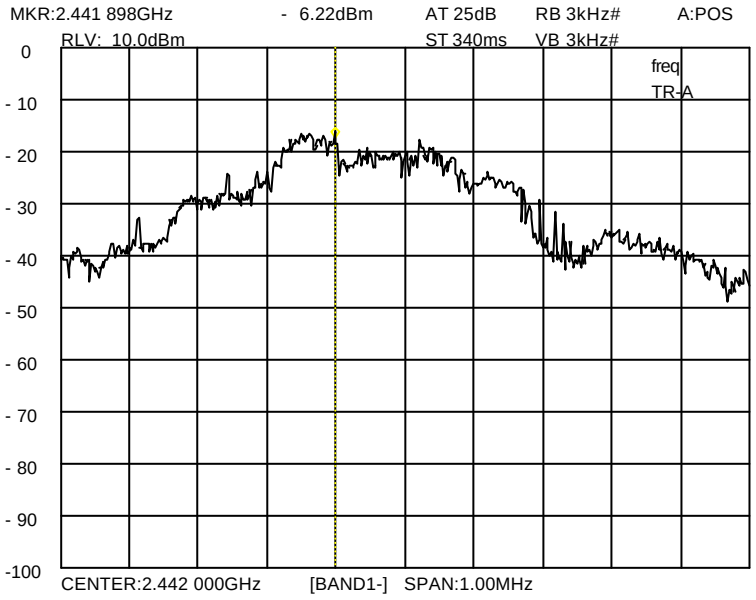
TEST FREQUENCY	**Peak Power Density/3kHz.**
2.441GHz INQUIRY MODE	-6.51 dBm/3kHz
2.442GHz PAGE MODE	-6.22 dBm/3kHz.

LIMITS: Clause 15/247 (d)

Peak Power Density in 3kHz Bandwidth	+8dBm/3kHz



File 034. Inquiry mode Peak Power Density.



File 033. Page mode Peak Power Density.

TEST EQUIPMENT USED:- TMS 6,10, RS326-8366 blue cable..

Ambient temperature....22.....°C Relative humidity...55.....%

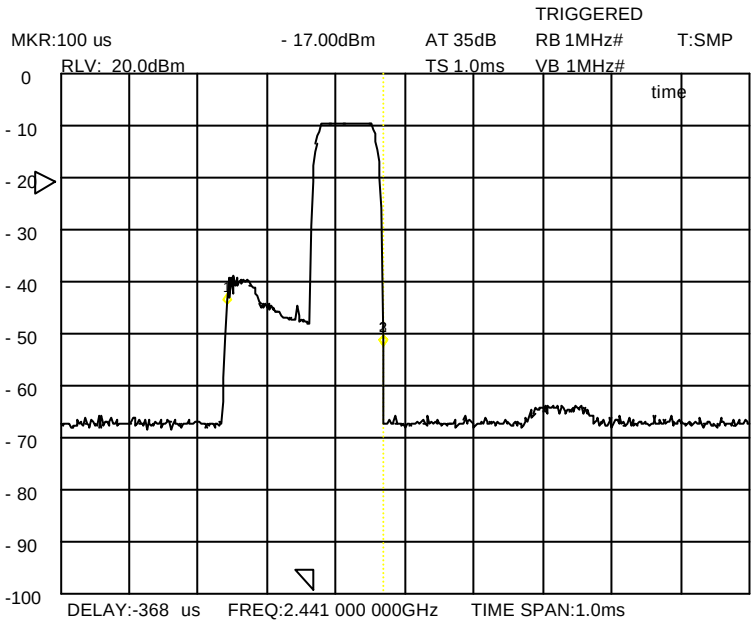
DSSS MODE TRANSMITTER TIME OF OCCUPANCY (DWELL TIME).

FCC Part 15 clause 15.247 (a), Guidelines DA 00-705.

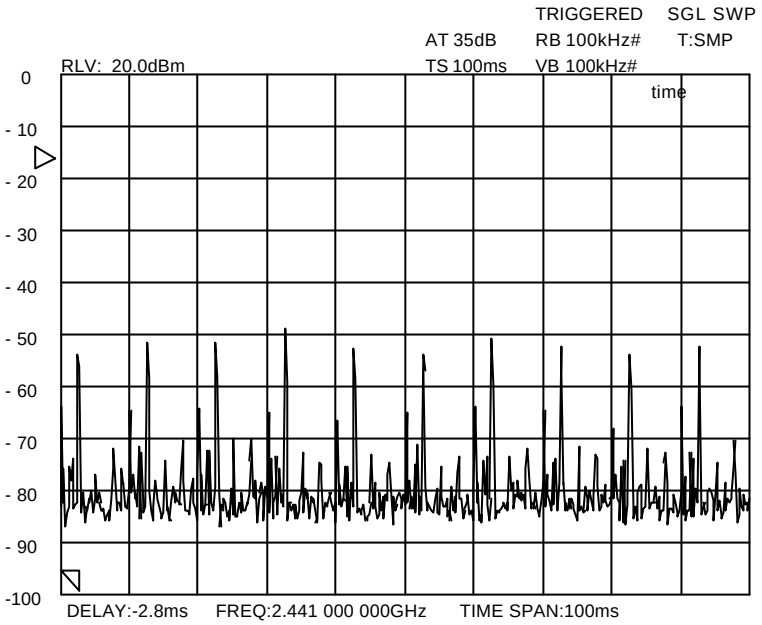
EUT MODE - INQUIRY AND PAGE MODE HOPPING.

The EUT Dwell Time for the Inquiry and Page Modes was measured to give full information on these modes of operation. There is no FCC requirement for this measurement.

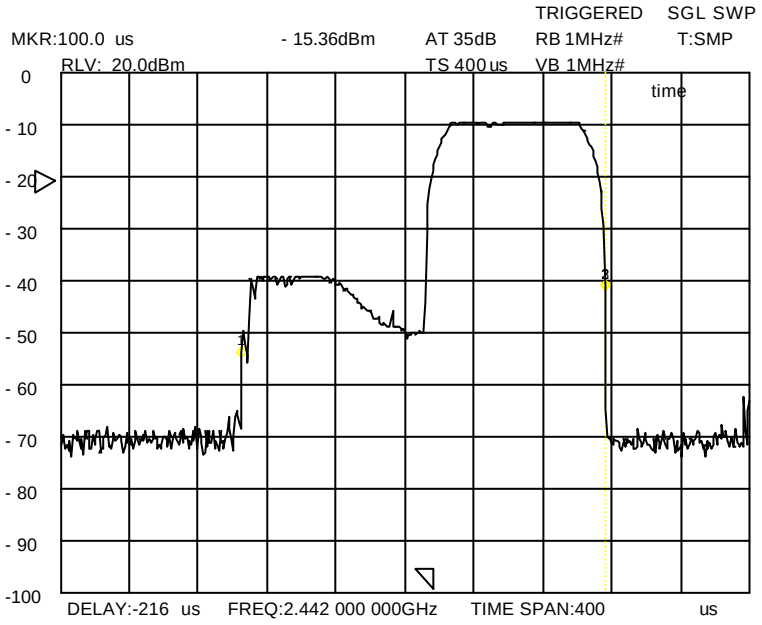
TEST MODE	30 SECOND OCCUPANCY TIME
INQUIRY	678 ms
PAGE	378ms



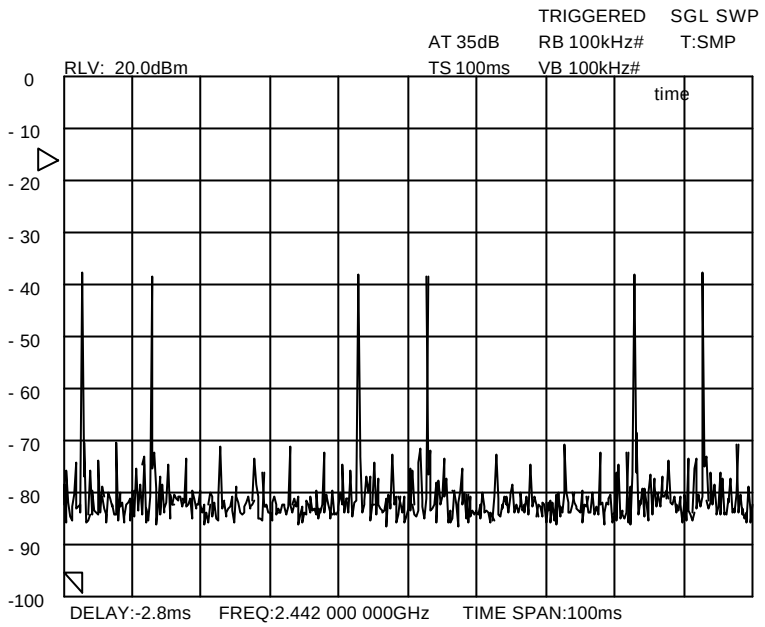
File 039. INQUIRY MODE SINGLE TIME ON CHANNEL.



File 044. INQUIRY MODE CHANNEL REUSE.



File 041. .PAGE MODE SINGLE TIME ON CHANNEL.



File 043. PAGE MODE CHANNEL REUSE.

TEST EQUIPMENT USED:- TMS 69, 6,10, RS326-8366 blue cable.

Ambient temperature....22..°C Relative humidity.....55.%

DSSS TRANSMITTER 6 dB BANDWIDTH.

EUT MODE - INQUIRY AND PAGE MODES HOPPING ON A SINGLE FREQUENCY.

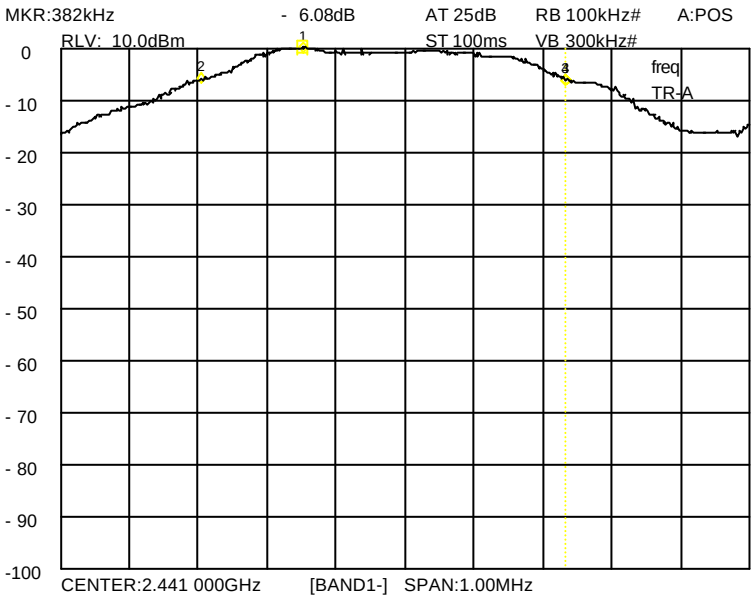
The 6 dB bandwidth of the transmitter was measured on the middle frequency., see file plots below.

OPERATING MODE AND FREQUENCY MHz.	6 dB BANDWIDTH kHz.
INQUIRY MODE 2441	530
PAGE MODE 2442	520

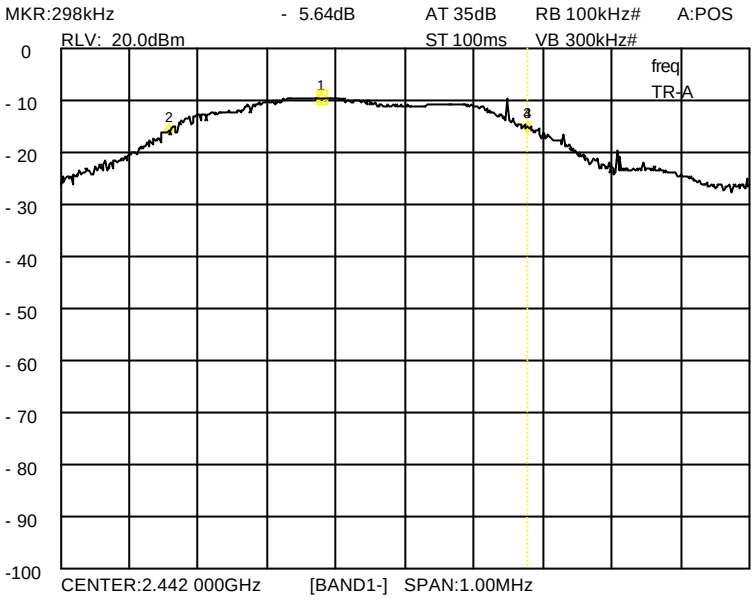
LIMITS: Clause 15.247 (a)

Minimum 6 dB Bandwidth	500 kHz

Spectrum plots.



File 036. Bandwidth of the Inquiry Mode 2441 MHz channel.



File 038. Bandwidth of the Page Mode 2442 MHz channel.

TEST EQUIPMENT USED: TMS 6,10, RS326-8366 blue cable..

SECTION 3

A C POWERLINE CONDUCTED EMISSIONS.

A C POWERLINE CONDUCTED EMISSIONS

Procedure: Based on FCC Rules Part 15 Subpart B, FCC ANSI 63.4-1992. Class B.

The EUT was supplied with a separate, lump in cord, detachable mains power supply. The mains lead was bundled to give a 1m test lead between the EUT and the Line Impedance Stabilising Network (LISN). The test configuration is shown below, with the EUT consisting of the Power unit and the CASIRA KIT together on the table.

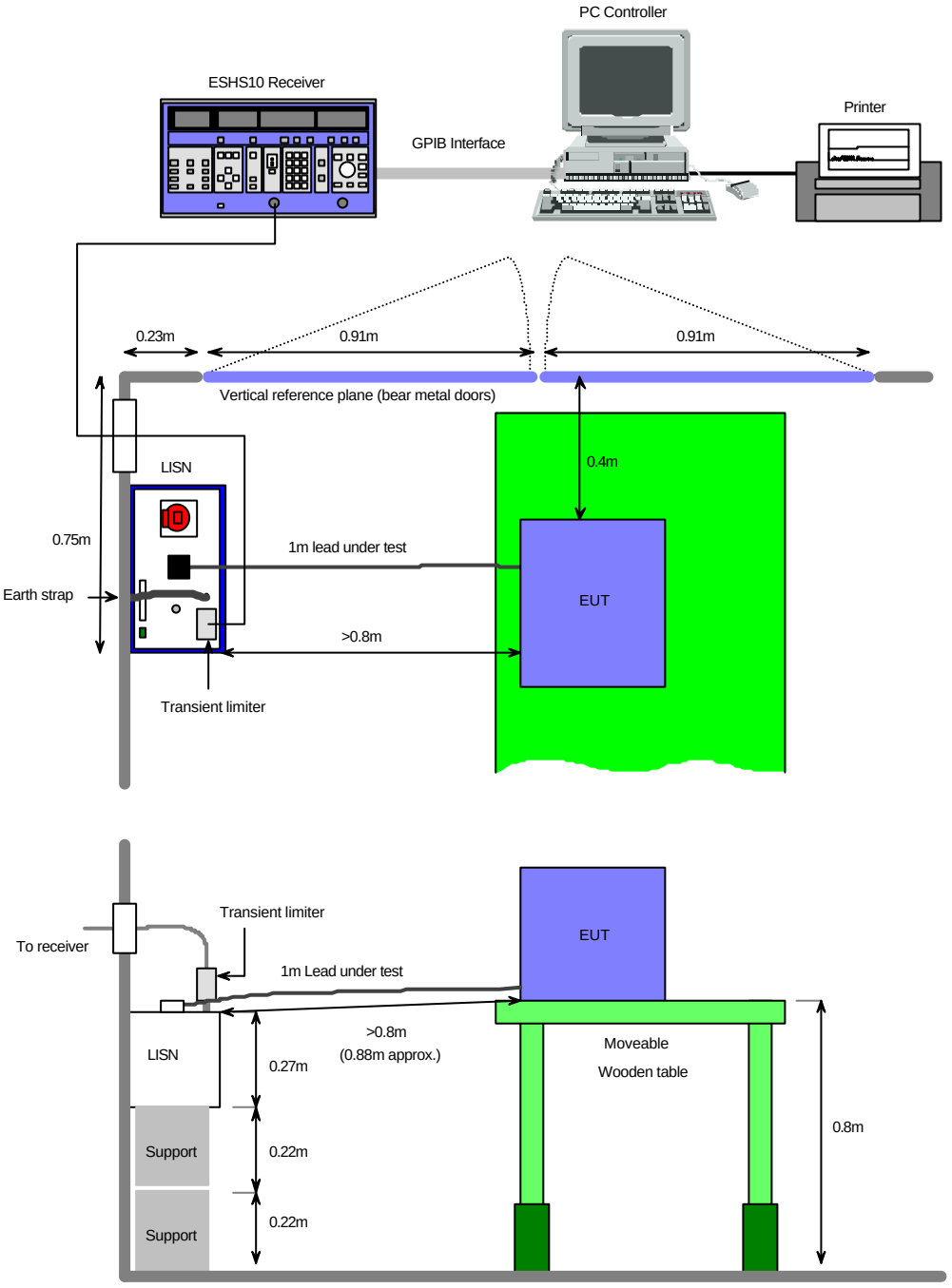
Using the Rohde and Schwarz ESxS-K1 software package V2.10 to control the receiver, a full incremental sweep was performed from 450kHz to 30 MHz on the Line and Neutral outputs of the LISN.

Note 1: The transient limited insertion loss is approximately 10dB, the insertion losses were entered into the software package which automatically corrected the results.

The conducted emissions were recorded with both 110V and 230V supply voltages.

The results are given in APPENDIX 1.

TEST EQUIPMENT USED: TMS 916, 912, 905, 817, 941, 10.

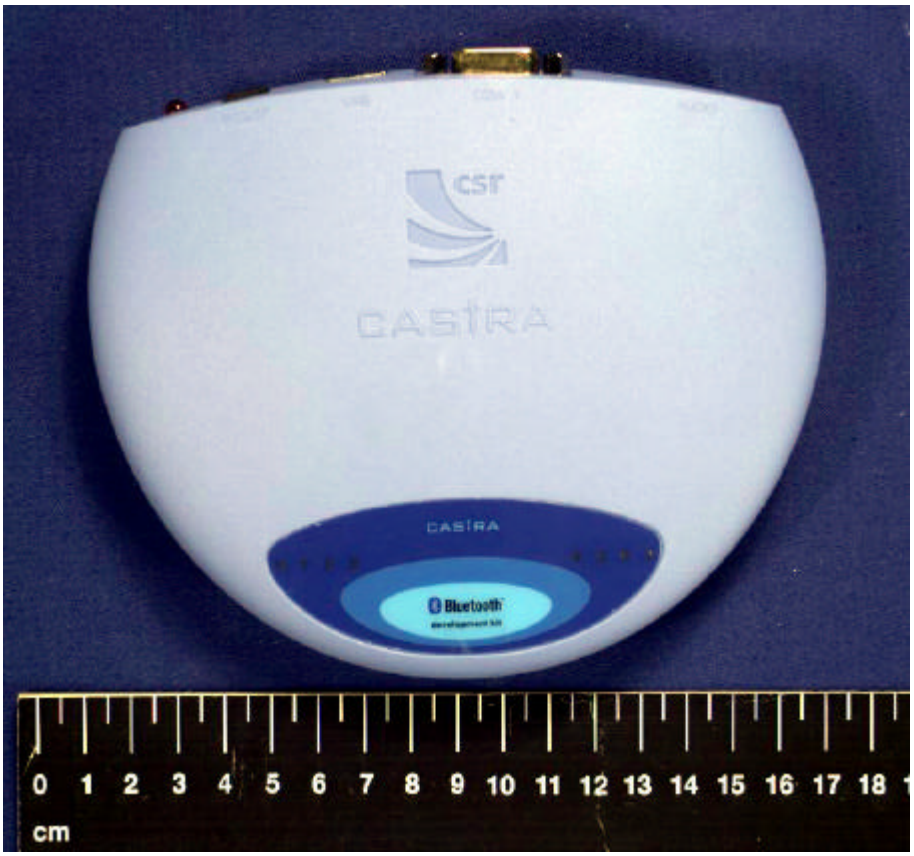


TEST CONFIGURATION FOR A C POWERLINE MEASUREMENT.

SECTION 4

PHOTOGRAPHS OF EQUIPMENT

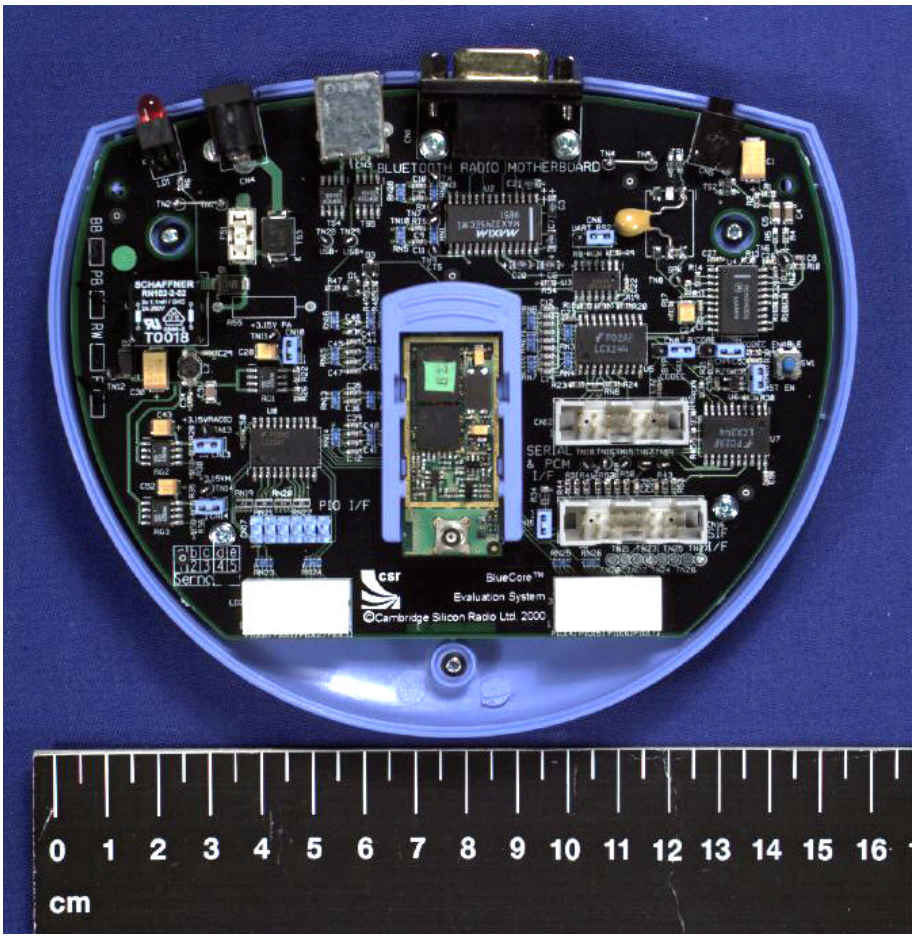
Top View



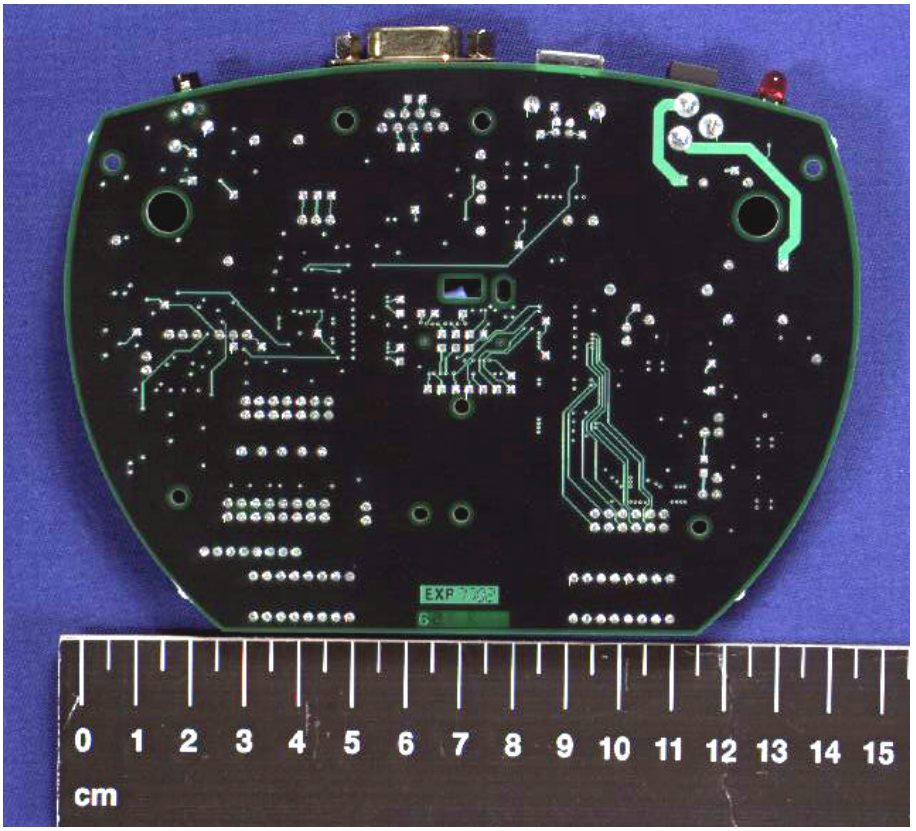
Bottom View


CASIRA
Bluetooth
development kit
csr
Cambridge Silicon Radio Ltd
Unit 300, Science Park
Cambridge CB4 0WL
United Kingdom
Telephone: +44 8708 416249
Facsimile: +44 1223 424178
CE 0985
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
cm

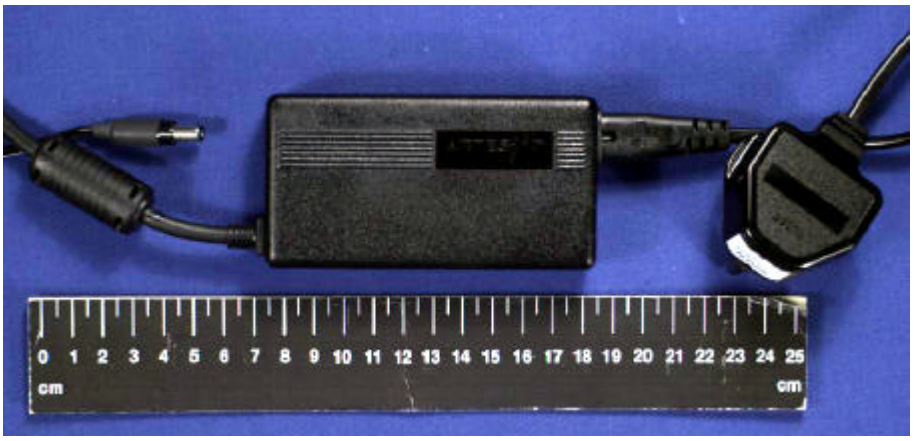
Circuit Board Top View.



Circuit Board Bottom View.



AC Power Supply, Top View.



A C Power Supply Bottom View.

SECTION 5

TEST INSTRUMENTS and ANCILLARIES USED FOR RADIO & EMC TESTING.

Each item of test equipment has a unique number allocated by Cambridge Test and Measurement Services This number is listed on each page of the test report where this instrument was used in the test specified on that page.

TEST LAB No.	DESCRIPTION	MANUFACTURER	TYPE	SERIAL No
1	Audio Analyzer	Hewlett Packard	HP 8903 B	3011A09130
2	Oscilloscope	Philips	PM 3375	DM546029
3	R.F. Generator	Rohde & Schwarz	SMPD	880627/003
4	Digital Mulitimeter	Philips	PM 2534	DY002910
5	R.F. Generator	Hewlett Packard	HP 8642A	2748A01501
6	Spectrum Analyzer	Anritsu	MS 2602A	MT88057
7	RF Power Meter	Hewlett Packard	435B	2449U01762
8	RF Power Sensor	Hewlett Packard	8481B	2350A03194
9	R.F. Generator	Hewlett Packard	HP 8640B	1415U00184
10	ThermoHygrometer	Radio Spares	TH200	0896/253
11	10dB Attenuator	Bird	8343-100	633
12	High Pass Filter	Anritsu	MP526D	M12524
13	High Pass Filter	Anritsu	MP526B	M15624
14	High Pass Filter	Anritsu	MP526A	M09521
15	Notch Filter	Telonic Altair	TTR 95-3EE	70063-1
16	Notch Filter	Telonic Altair	TTR 375-3EE	0004-1
17	Notch Filter	Telonic Altair	TTR 190-3EE	60435-5
18	Modulation Analyzer	Hewlett Packard	8901B	2642A01009
19	Audio Power Meter	Marconi	TF 893A	190134/050
20	Power Supply	Kingshill	18V10C	562
21	Power Supply	Kingshill	18V10C	561
22	Audio Power Meter	Marconi	TF 893A	58507/017
23	Receiver	Chase	UHR4000	6081
24	Attenuator 30 dB	Bird	8321	1058
25	Attenuator 10 dB	Bird	8343/100	623
26	Variable Attenuator	Telonic	8120A 50ohm	90789-4
27	50 Ohm Load 10W	Termaline	8053	7456
28	Attenuator 20 dB	Marconi	6535/4	625
29	50 Ohm Load 50W			
30	Dual Directional Coupler	Hewlett Packard	778D	16835
31	Adjacent Channel Power Meter	Rohde & Schwarz	NKS	879169/011
32	Mains Variac			
33	R.F. Generator	Rohde & Schwarz	SMH	894091-012
34	Audio Analyzer	Hewlett Packard	HP 8903 B	3011A09131
35	Signal Generator	Marconi	2032	119855-057
36	Environmental Oven	Heraeus Votsch	VMT 04/30	24558
37	Environmental Oven	Heraeus Votsch	VMT 04/240	27730
38	Environmental Oven	Heraeus Votsch	VMT 04/140	28785

TEST LAB No.	DESCRIPTION	MANUFACTURER	TYPE	SERIAL No
39	Environmental Oven	Heraeus Votsch	VMT 04/16	24682
40	R.F. Generator	Hewlett Packard	8657A	2929A00908
41	Signal Generator	Marconi	2018	118421/001
42	RF Power Sensor	Hewlett Packard	8481A	2702A77623
43	Signal Generator	Hewlett Packard	8657A	2849U01043
44	Dual Directional Coupler	Hewlett Packard	777D	07041
45	Attenuator	Weinschel	Model 1	AX4024
46	Attenuator	Weinschel	Model 1	AX2978
47	50Ω Termination	Wiltron	28N50-3	600051
48	Modulation Analyzer	Hewlett Packard	8901B	2806A01910
49	Modulation Analyzer	Hewlett Packard	8901B	3028A03136
50	Modulation Analyzer	Hewlett Packard	8901B	2920A02137
51	Attenuator	Narda	766-3	
52	Signal Generator	Hewlett Packard	8656B	2838UO5964
53	Audio Analyzer	Hewlett Packard	HP 8903 B	2836A05550
54	Signal Generator	Hewlett Packard	8656B	2838U05943
55	Audio Analyzer	Hewlett Packard	HP 8903 B	2836A05420
56	Signal Generator	Hewlett Packard	8656B	2703U03451
57	Digital Mulitimeter	Philips	PM 2534	DY002945
58	RF Power Meter	Hewlett Packard	435B	2005A03070
59	RF Power Sensor	Hewlett Packard	8481B	1801A01640
60	Audio Power Meter	Marconi	TF 893A	190102-006
61	R.F Generator	Rohde & Schwarz	SMH	883951-012
62	Audio Power Meter	Marconi	TF 893A	190113-081
63	Audio Power Meter	Marconi	TF 893A	58930-096
64	Signal Generator	Hewlett Packard	8656B	2838U05945
65	Modulation Analyzer	Hewlett Packard	8901A	2324A02929
66	Comms Test Set	Schlumberger	4040	0725122
67	Digital Mulitimeter	Hewlett Packard	HP 34401A	US36090783
69	Spectrum Analyzer	Advantest	R3271	15050051
70	Attenuator 30 dB	Bird 100W	8323	611
71	Attenuator 10 dB	Narda	765-10	8310
72	Attenuator 10 dB	Narda	765-10	8901
73	Off Air Standard	Quartzlock	2A	41125
74	Power Supply	Hewlett Packard	6632A	2851A-01862
75	Power Supply	Kingshill	18V10C	594
76	Com Test Set	Rohde & Schwarz	CMT	883398/071
77	Signal Generator	Hewlett Packard	8673B	2823A01376
78	Horn Antenna	ETS Systems	3160-08	9911-1109
79	Horn Antenna	ETS Systems	3160-09	9911-1186
80	Digital Thermometer	RS	206-3722	831016600
101	R.F. Coax Cable 0.5M	LOCAL		TMS RF 101

TEST LAB No.	DESCRIPTION	MANUFACTURE	TYPE	SERIAL No
102	R.F. Coax Cable 0.75M	LOCAL		TMS RF 102
103	R.F. Coax Cable 0.5M	LOCAL		TMS RF 103
104	R.F. Coax Cable 1.0M	LOCAL		TMS RF 104
105	R.F. Coax Cable 1.0M	LOCAL		TMS RF 105
106	R.F. Coax Cable 0.75M	LOCAL		TMS RF 106
107	R.F. Coax Cable 1.0M	LOCAL		TMS RF 107
108	R.F. Coax Cable 0.75M	LOCAL		TMS RF 108
109	R.F. Coax Cable 0.75M	LOCAL		TMS RF 109
110	R.F. Coax Cable 0.5M	LOCAL		TMS RF 110
111	R.F. Coax Cable 0.75M	LOCAL		TMS RF 111
112	R.F. Coax Cable 1.0M	LOCAL		TMS RF 112
113	R.F. Coax Cable 1.0M	LOCAL		TMS RF 113
114	R.F. Coax Cable 1.0M	LOCAL		TMS RF 114
115	R.F. Coax Cable	LOCAL		TMS RF 115
116	R.F. Coax Cable	LOCAL		TMS RF 116
117	R.F. Coax Cable	LOCAL		TMS RF 117
118	R.F. Coax Cable	LOCAL		TMS RF 118
119	R.F. Coax Cable 4.0M	LOCAL		TMS RF 119
120	R.F. Coax Cable 5.7M	LOCAL		TMS RF 120
121	R.F. Coax Cable 30M	LOCAL		TMS RF 121
122	R.F. Coax Cable 40M	LOCAL		TMS RF 122
123	R.F. Coax Cable	LOCAL		TMS RF 123
124	R.F. Coax Cable	LOCAL		TMS RF 124
125	R.F. Coax Cable	LOCAL		TMS RF 125
126	R.F. Coax Cable	LOCAL		TMS RF 126
127	R.F. Coax Cable	LOCAL		TMS RF 127
128	R.F. Coax Cable 3.0M	Midwest Mircowave	CSY-3M3M-52-003-MA	9946-001
129	R.F. Coax Cable 3.0M	Midwest Mircowave	CSY-3M3M-52-003-MA	9946-002
130	R.F. Coax Cable 3.0M	Midwest Mircowave	CSY-3M3M-52-003-MA	9946-003
201	4 WAY COMBINER	ANZAC	DS 312	TMS COMB 201
202	4 WAY COMBINER	ANZAC	DS -4-4	TMS COMB 202
203	4 WAY COMBINER	ANZAC	DS -4-4	TMS COMB 203
204	4 WAY COMBINER	ANZAC	DS 312	TMS COMB 204
205	2 WAY COMBINER	SUHNER	4901.01B	TMS COMB 205
206	2 WAY COMBINER	SUHNER	4901.01B	TMS COMB 206
301	MIXER/FILTER 12.5 KHz	LOCAL		TMS FILT 301
302	MIXER/FILTER 25.0 KHz	LOCAL		TMS FILT 302
801	100 Watt Amplifier	Amplifier Research	100W1000M1	14195
802	Field Strength Meter	Holaday	HI-4400	60825
803	25 Watt Amplifier	Amplifier Research	25A250	6805
804	Power Supply	Kingshill	18V10C	686
805	Modulation Meter	Marconi	2305	169810-046
806	A.F. Oscillator	Marconi	TF2000	351220-02
807	Coulping Clamp	Schaffner	CDN 125	62436

TEST LAB No.	DESCRIPTION	MANUFACTURER	TYPE	SERIAL No
808	Current Probe	Chase		10500792
809	Screened Chamber	Rayproof		6366
810	Screened Chamber	Belling Lee		74152
812	Dipoles	Anritsu	MP534A, 34E3610, EP-0169	M08533,M22021, M22021
813	Dipoles	Anritsu	MP534A, 34E3610, EP-0169	M21921,M21921, M53022
814	Dipoles	Anritsu	MP534A, 34E3610, EP-0169	M11112,M11112, X0002
815	Dipoles	Anritsu	MP534A, 34E3610, EP-0169	X1992,M13832, X0003
816	Screened Chamber	Rayproof		
817	Screened Chamber	Rayproof		
818	30W 1-2GHz Amp	Milmega	AS0102-30R	992410
901	Spectrum Analyzer	Advantest	R3261C	51720046
902	Isotropic Probe	Holaday	HI-4421G	84838
903	Antenna	Chase	Bi Log	1668
904	Antenna	Rohde & Schwarz	Log Periodic	321312-30
905	Transient Limiter	Chase	CFL 9206	1067
906	ESD Gun	Keytek	MZ-15	9107193
907	ThermoHygrometer	Radio spares	TH200	0896-256
908	Manometer	Digitron	P200 AH	663
909	Signal Generator	Marconi	2030	119628-013
910	Interference test System	Schaffner	NSG600	3008
911	Double AC Supply Variator	Schaffner	NSG642	104
912	Line Impedence Stabilising Network	Chase	MN2053	5309
913	Isotropic Probe	Amplifier Research	FP2000	16294
914	Antenna Biconical	Schwarzbeck	VHBA9123	7440
915	Log Periodic	Chase	UPA6108	1065
916	EMI Test Receiver	Rohde & Schwarz	ESHS10	835499/0016
917	EMI Test Receiver	Rohde & Schwarz	ESVS10	843207/0015
918	RF Power Meter	Bird	4421	3220
919	RF Power Sensor	Bird	4022	6840
920	LISN	Chase	MN20216	2544
921	Comb Generator	RN Electronics	RN 5102	235
922	Indoor Corner Reflector	Local		
923	Gaussmeter	Hirst	GM04	GM0327
924	Hall Probe	Hirst	TP002	PT1954
925	CDN Coupler	Local		
926	CDN Coupler	Schaffner	M3	14415

TEST LAB No.	DESCRIPTION	MANUFACTURER	TYPE	SERIAL No
927	Radiation Meter	Schaffner	EMC20	M-0065
928	Probe	Schaffner	802	K-0095
929	Current Probe	Schaffner	CSP8441	223
930	RF Power Meter	Rohde & Schwarz	NRVS	826149/042
931	RF Power Sensor	Rohde & Schwarz	NRVS Z5	828.3818.03
932	CDN Coupler	Schaffner	CDN-M3-16	9919
933	Antenna 2GHz	York EMC	CB2614A	4116
934	Matching Networks	Schaffner	TRA150	14066
935	Matching Networks	Schaffner	KAL	14050
936	Helmholtz Coil	Local		
937	Mains Flicker	Schaffner	CCN1000	X71748
938	3KV AC Amp	Schaffner	CCN1007	
939	Signal Generator	Rohde & Schwarz	SMY01	826575/008

APPENDIX 1

The Following the Pages are not consistent with rest of this report and therefore are not part of the numbered pages of this report.

Graph Reference	Details
001553c.dat	Conducted Emissions Live Line 110V Supply.
001553d.dat	Conducted Emissions Neutral Line 110V Supply.
001553a.dat	Conducted Emissions Live Line 230V Supply.
001553b.dat	Conducted Emissions Neutral Line 230V Supply.