



TEST REPORT NO: RU1076/4876  
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FCC ID: OE5S821

**REPORT ON THE CERTIFICATION TESTING OF A  
GROUP 4 TECHNOLOGY Ltd  
S821  
WITH RESPECT TO  
THE FCC RULES CFR 47, PART 15.225  
INTENTIONAL RADIATOR SPECIFICATION  
ON BEHALF OF  
GROUP 4 TECHNOLOGY Ltd**

TEST DATE: 7<sup>th</sup> – 8<sup>th</sup> OCTOBER 2003

TESTED BY: ..... J CHARTERS

APPROVED BY: ..... P GREEN  
EMC PRODUCT  
MANAGER

DATE: 4<sup>th</sup> November 2003

Distribution:

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  3. TRL EMC

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<b>Notes:</b>		
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.		
4. The contents of the attached applicants 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.		



**CERTIFICATE OF CONFORMITY & COMPLIANCE**

FCC IDENTITY: OE5S821  
PURPOSE OF TEST: Certification  
TEST SPECIFICATION: FCC RULES CFR 47, Part 15.225  
TEST RESULT: Compliant to Specification  
EQUIPMENT UNDER TEST: S821  
EQUIPMENT SERIAL No: 0331331121  
ITU: EMISSION CODE: 12k0A1D  
EQUIPMENT TYPE: S821 Tag reader  
PRODUCT USE: Access/control  
CARRIER EMISSION: 27.6µV/m  
ANTENNA TYPE: Integral  
ALTERNATIVE ANTENNA: Not applicable  
BAND OF OPERATION: 13.553MHz – 13.567MHz  
CHANNEL SPACING: N/A wideband  
NUMBER OF CHANNELS: 1  
FREQUENCY GENERATION: SAW Resonator [ ] Crystal [X] Synthesiser [ ]  
MODULATION METHOD: Amplitude [X] Digital [ ] Angle [ ]  
POWER SOURCE(s): +12Vdc  
TEST DATE(s): 7<sup>th</sup> – 8<sup>th</sup> OCTOBER 2003  
ORDER No(s): R00001507  
APPLICANT: GROUP 4 TECHNOLOGY Ltd  
ADDRESS: Challenge House  
Northway Lane  
Tewkesbury  
Gloucester  
GL19 4QH

TESTED BY: ----- J CHARTERS

APPROVED BY: ----- P GREEN  
EMC PRODUCT  
MANAGER



**EQUIPMENT TEST / EXAMINATIONS REQUIRED**

1.	TEST/EXAMINATION	RULE PART	DETECTOR	APPLICABILITY
	Intentional Emission Frequency:	15.225	Quasi Peak	Yes
	Intentional Emission Field Strength:	15.225	Quasi Peak	Yes
	Intentional Emission Band Occupancy:	15.225	Quasi Peak	Yes
	Intentional Emission ERP (mW):	N/A	-	No
	Spurious Emissions – Conducted:	15.207	Quasi Peak Average	Yes
	Spurious Emissions – Radiated <1000MHz:	15.209	Quasi Peak	Yes
	Spurious Emissions – Radiated >1000MHz:	N/A	-	No
	Maximum Frequency of Search:	15.33	-	Yes
	Antenna Arrangements Integral:	15.203	-	Yes
	Antenna Arrangements External Connector:	15.204	-	No
	Restricted Bands	15.205	-	Yes
	Extrapolation Factor	15.31(f)	-	Yes

2. Product Use: Access/control
3. Emission Designator: 12K0A1D
4. Duty Cycle: <100%
5. Temperatures: Ambient (Tnom) 20°C
6. Supply Voltages: Vnom 12Vdc
- Note: Vnom voltages are as stated above unless otherwise shown on the test report page
7. Equipment Category: Single channel   
 Two channel   
 Multi-channel
9. Channel spacing: Narrowband   
 Wideband

**TRANSMITTER TESTS**

**TRANSMITTER SPURIOUS EMISSIONS – RADIATED – PART 15.209**

Ambient temperature = 20°C(<1GHz) 10m measurements <30MHz [X]  
 Relative humidity = 60% (<1GHz), 3m measurements >30MHz [X]  
 Conditions = Open Area Test Site (OATS) 10m extrapolated from 30m [X]  
 Supply voltage = 12Vdc  
 Channel number = 1

	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT. FACT. (dB/m)	FIELD STRENGTH (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)	LIMIT (µV/m)
1.705MHz - 30MHz	27.12		-	-	-2.18	19.08	0.78	30
30MHz - 88MHz	32.0	1.8	0.5	16.9	19.2	-	9.12	100
	66.45	5.4	0.7	5.0	11.1		3.6	
88MHz - 216MHz						-		
216MHz - 960MHz	217.05	35.6	1.5	8.0	45.1	-	179.9	200
	230.6	34.0	1.6	9.5	45.1		179.9	
	244.2	11.4	1.6	11.1	24.1		16.0	
	257.65	26.7	1.7	12.5	40.9		110.9	
960MHz - 1GHz						-		
1GHz - 5GHz						-		
Limits	1.705MHz to 30MHz			30µV/m @ 30m				
	30MHz to 88MHz			100µV/m @ 3m				
	88MHz to 216MHz			150µV/m @ 3m				
	216MHz to 960MHz			200µV/m @ 3m				
	960MHz to 1GHz			500µV/m @ 3m				
	1GHz to 5GHz			500µV/m @ 3m				

**See next page for the notes and test methods:**

**Notes:**

- 1 Results quoted are extrapolated as indicated
- 2 Emissions were searched to: (x) 1000MHz inclusive, as per Part 15.33a
- 3 Extrapolation factor 9.5dB from 1m to 3m, as per Part 15.31f
- 4 Extrapolation factor 19.08dB from 10m to 30m, as per Part 15.31f
- 5 Measurements >1GHz @ 1m as per Part 15.31f(1)
- 6 Receiver detector >1GHz = CISPR, Quasi-Peak, 120kHz bandwidth
- 7 Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth
- 8 New batteries used for battery powered products.
- 9 Emissions 20db's below the limit were not recorded.
- 10 For emission below 30MHz the measuring receiver automatically compensates for the loss due to the antenna factor of the loop antenna. This loss is 20dB's across the measurement range 9kHz to 30MHz.
- 11 For emissions below 30 MHz the cable losses are assumed to be negligible.

**Test Method:**

- 1 As per Radio – Noise Emissions, ANSI C63.4: 1992
- 2 Measuring distances as Notes 1 to 4 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(above 30MHz only).  
Horizontal and vertical polarisations, of the receive antenna.  
EUT orientation in three orthogonal planes.  
Maximum results recorded.

The test equipment used for the Transmitter Spurious Emissions – Radiated – Part 15.209 tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
HORN ANTENNA	EMCO	3115	9010-3580	138	
HORN ANTENNA	EMCO	3115	9010-3581	139	
SPECTRUM ANALYSER	TEKTRONIX	2756P	B010109	164	
BICONE ANTENNA	CHASE	BBA9106	N/A	193	
ANTENNA, LOG PERIODIC 300MHz - 1GHz	CHASE	UPA6108	1061	203	
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
ANTENNA, BICONE 20MHz - 300MHz	CHASE	VBA6106A	1193	251	
BILOG ANTENNA	CHASE	CBL6112	2098	274	
RECEIVER	ROHDE & SCHWARZ	ESVS10	837948/003	317	
RECEIVER	ROHDE & SCHWARZ	ESVS10	844594/003	352	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
V / UHF RECEIVER 20MHz - 1GHz	ROHDE & SCHWARZ	ESVS 20	838804 / 005	415	
BILOG ANTENNA	SCHAFFNER	CBL6112B	2761	431	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	<b>X</b>
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	<b>X</b>
RANGE 1	TRL	3 METRE	N/A	UH06	<b>X</b>
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	<b>X</b>
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	<b>X</b>
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	<b>X</b>



**TRANSMITTER TESTS**

**TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.225**

Ambient temperature	=	20°C(<1GHz),	3m measurements @ fc	[X]
Relative humidity	=	60%(<1GHz),	10m measurements @ fc	[X]
Conditions	=	Open Area Test Site (OATS)	30m measurements @ fc	[ ]
Supply voltage	=	12Vdc	30m extrapolated from 3m	[X]
Channel number	=	1	30m extrapolated from 10m	[X]

FREQ. (MHz)	MEASUREMENT DISTANCE Meters	MEASUREMENT Rx. READING (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)
13.56	3	59.9	31.08	27.86
13.56	10	47.9	19.08	27.6
Limit value @ fc		<b>10,000(µV/m)</b>		
Band occupancy @ -20dBc		<b>f lower</b>		<b>f higher</b>
		13.544920MHz		13.580520MHz

See spectrum analyser plot – Annex C

**Notes:**

- 1 Results quoted are extrapolated as indicated
- 2 The 3m-10m extrapolation factor is 12.0 calculated from the results above  
Extrapolation factor 10-30m is 19.08dB using the extrapolation factor of 40dB/decade as per 15.331(f)
- 3 Receiver detector @ fc = Quasi Peak 120kHz bandwidth
- 4 When battery powered the EUT was powered with new batteries
- 5 For emission below 30MHz the measuring receiver automatically compensates for the loss due to the antenna factor of the loop antenna. This loss is 20dB's across the measurement range 9kHz to 30MHz.
- 6 For emission below 30 MHz the cable losses are assumed to be negligible.

**Test Method:**

- 1 As per Radio – Noise Emissions, ANSI C63.4: 1992
- 2 Measuring distances 3m & 10m (to produce extrapolation factor)
- 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.(above 30MHz only)  
Horizontal and vertical polarisations, of the receive antenna.  
EUT orientation in three orthogonal planes.  
Maximum results recorded

The test equipment used for the Transmitter Intentional Emission – Radiated – Part 15.225 tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
HORN ANTENNA	EMCO	3115	9010-3580	138	
HORN ANTENNA	EMCO	3115	9010-3581	139	
SPECTRUM ANALYSER	TEKTRONIX	2756P	B010109	164	
BICONE ANTENNA	CHASE	BBA9106	N/A	193	
ANTENNA, LOG PERIODIC 300MHz - 1GHz	CHASE	UPA6108	1061	203	
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
ANTENNA, BICONE 20MHz - 300MHz	CHASE	VBA6106A	1193	251	
BILOG ANTENNA	CHASE	CBL6112	2098	274	
RECEIVER	ROHDE & SCHWARZ	ESVS10	837948/003	317	
RECEIVER	ROHDE & SCHWARZ	ESVS10	844594/003	352	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
V / UHF RECEIVER 20MHz - 1GHz	ROHDE & SCHWARZ	ESVS 20	838804 / 005	415	
BILOG ANTENNA	SCHAFFNER	CBL6112B	2761	431	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	<b>X</b>
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	<b>X</b>
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	<b>X</b>

## TRANSMITTER TESTS

### TRANSMITTER EMISSIONS – FREQUENCY TOLERANCE Part 15.225 (c)

Ambient temperature = 20°C  
Relative humidity = 60%

Fc @ Vnom Tnom = 13.562810MHz

TEMPERATURE	VOLTAGE	FREQUENCY MHz	DEVIATION kHz	LIMIT kHz
-20°C	12.0	13.562810	0	±1.356
+50°C	12.0	13.563320	-0.51	±1.356

TEMPERATURE	VOLTAGE	FREQUENCY MHz	DEVIATION kHz	LIMIT kHz
+20°C	13.8	13.563020	-0.21	±1.356
+20°C	10.2	13.563220	-0.41	±1.356

**Notes:** 1 One hour was allowed for temperature stabilisation.

**Test Method:**

- 1 EUT was placed inside the environmental chamber and temperature adjusted accordingly.
- 2 The DC power was varied from an external dc power supply.
- 3 Frequency was recorded on the spectrum analyzer.

The test equipment used for the Transmitter Frequency Tolerance – Part 15.225 (c) test was:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
LISN / AMN	ROHDE & SCHWARZ	ESH3-Z5	83746/010	289	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
ENVIRONMENTAL CHAMBER	SHARETREE	TCC 125-815P	CS 203	11	<b>X</b>
POWER SUPPLY	MANSON	EP603	60316619	UH177	<b>X</b>
MULTIMETER	AVO METER	M3004	M3270006	UH41	<b>X</b>
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	
LISN/AMN	ROHDE & SCHWARZ	ESH3-Z5	863906/018	UH05	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	<b>X</b>

**TRANSMITTER TESTS**

**TRANSMITTER CONDUCTED EMISSIONS – AC POWER LINE Part 15.207**

Ambient temperature = 20°C(<1GHz),  
 Relative humidity = 60%(<1GHz),  
 Conditions = Power Line Laboratory  
 Supply voltage = 110V AC  
 Supply Frequency = 60Hz

**SIGNIFICANT EMISSIONS**

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	CONDUCTOR (L or N)	EMISSION (dBµV)
0.15	38.99	Quasi Peak	L	66.00
0.2	34.47	Quasi Peak	L	63.61
13.56	58.82	Quasi Peak	L	60.00
27.125	45.38	Average	L	60.00
13.56	39.83	Average	L	50.00

**Notes:**

- 1 See attached plot
- 2 Scans on both Live and Neutral lines were performed . Only worst case emissions are reported

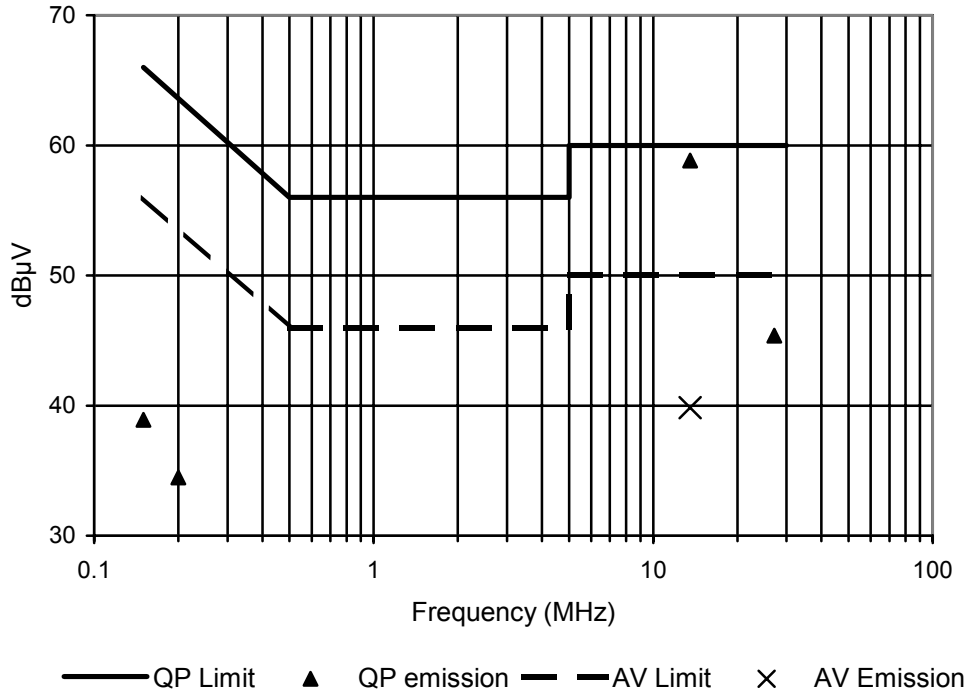
**Test Method:** 1 As per Radio – Noise Emissions, ANSI C63.4: 1992

The test equipment used for the Transmitter Conducted Emissions – AC Power Line Part 15.207 test was:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
LISN / AMN	ROHDE & SCHWARZ	ESH3-Z5	83746/010	289	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	<b>X</b>
LISN/AMN	ROHDE & SCHWARZ	ESH3-Z5	863906/018	UH05	<b>X</b>
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

# POWER LINE CONDUCTION EMISSIONS

Quasi Peak and Average Limit Part 15.207



**ANNEX A**  
**PHOTOGRAPHS**





PHOTOGRAPH No. 2

**TRANSMITTER FRONT VIEW**



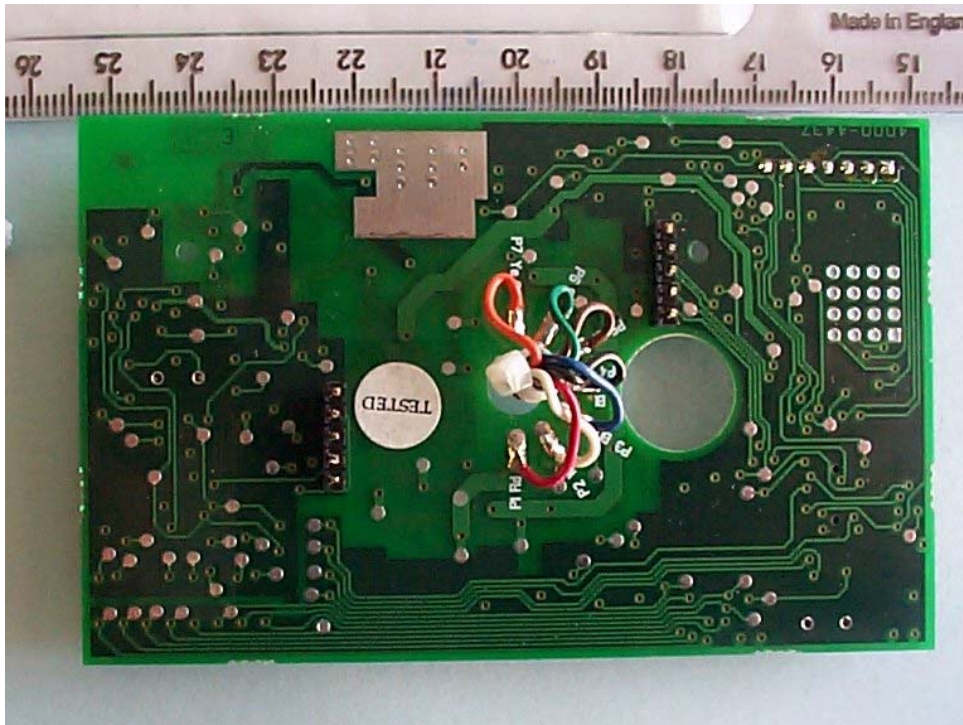
PHOTOGRAPH No. 3

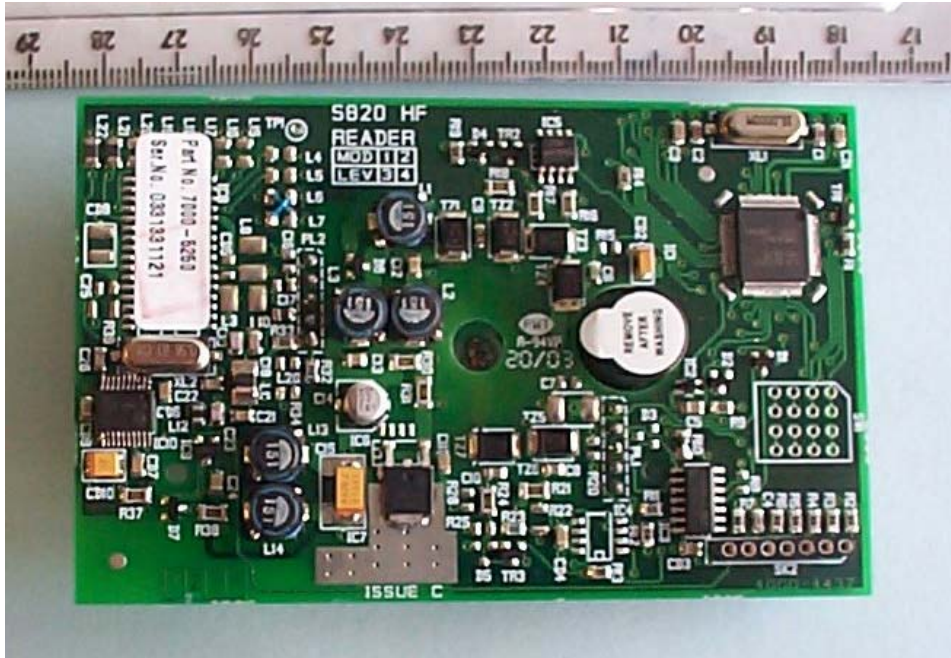
TRANSMITTER REAR VIEW



PHOTOGRAPH No. 4

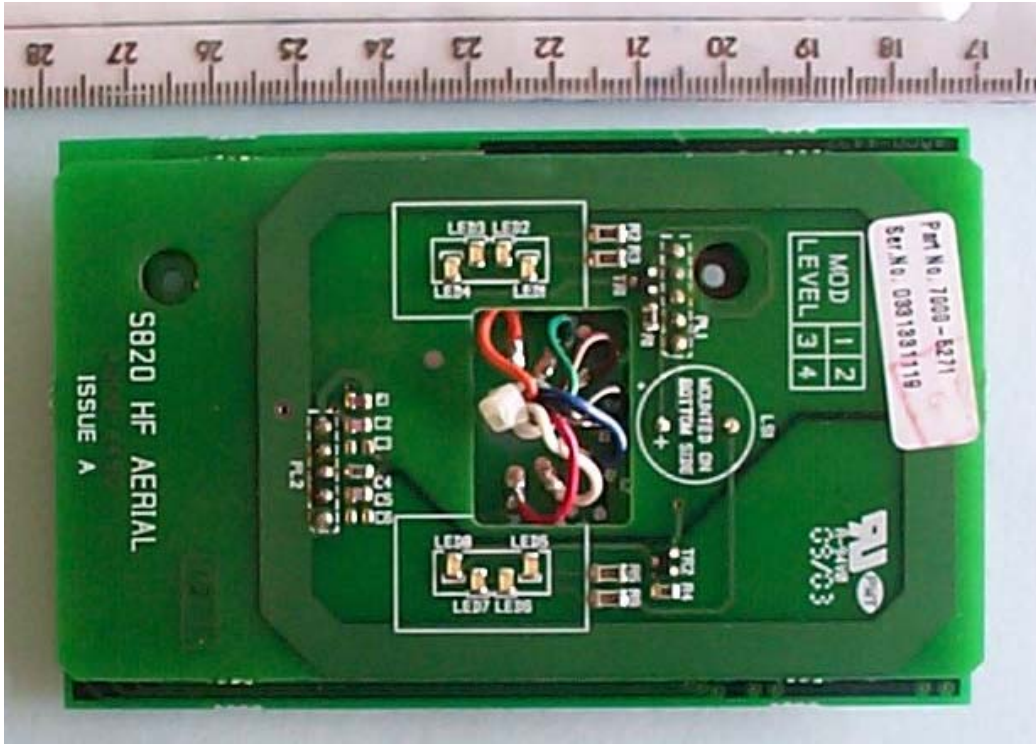
TRANSMITTER PCB TRACK SIDE



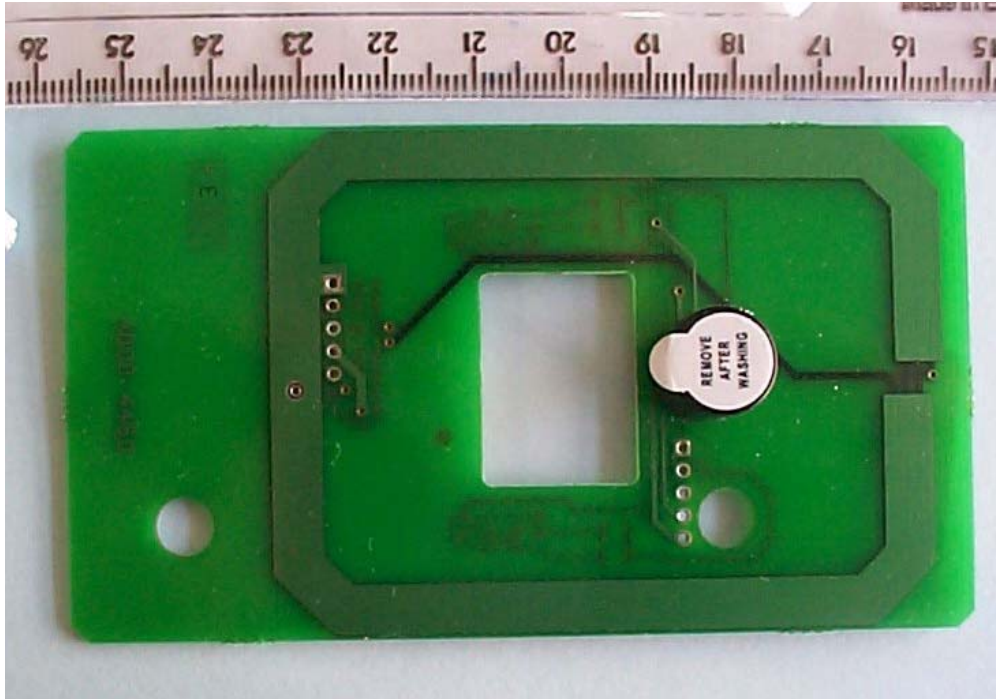


PHOTOGRAPH No. 6

ANTENNA PCB COMPONENT SIDE







PHOTOGRAPH No. 8

**TEST SETUP**



**ANNEX B**  
**APPLICANT'S SUBMISSION OF DOCUMENTATION LIST**



### APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

a.	TCB	-	APPLICATION	<input checked="" type="checkbox"/>
		-	FEE	<input checked="" type="checkbox"/>
b.	AGENT'S LETTER OF AUTHORISATION	-		<input checked="" type="checkbox"/>
c.	MODEL(s) vs IDENTITY	-		<input type="checkbox"/>
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		<input type="checkbox"/>
e.	LABELLING	-	PHOTOGRAPHS	<input type="checkbox"/>
		-	DECLARATION	<input type="checkbox"/>
		-	DRAWINGS	<input checked="" type="checkbox"/>
f.	TECHNICAL DESCRIPTION	-		<input checked="" type="checkbox"/>
g.	BLOCK DIAGRAMS	-	Tx	<input checked="" type="checkbox"/>
		-	Rx	<input type="checkbox"/>
		-	PSU	<input type="checkbox"/>
		-	AUX	<input type="checkbox"/>
h.	CIRCUIT DIAGRAMS	-	Tx	<input checked="" type="checkbox"/>
		-	Rx	<input type="checkbox"/>
		-	PSU	<input type="checkbox"/>
		-	AUX	<input type="checkbox"/>
i.	COMPONENT LOCATION	-	Tx	<input checked="" type="checkbox"/>
		-	Rx	<input type="checkbox"/>
		-	PSU	<input type="checkbox"/>
		-	AUX	<input type="checkbox"/>
j.	PCB TRACK LAYOUT	-	Tx	<input checked="" type="checkbox"/>
		-	Rx	<input type="checkbox"/>
		-	PSU	<input type="checkbox"/>
		-	AUX	<input type="checkbox"/>
k.	BILL OF MATERIALS	-	Tx	<input checked="" type="checkbox"/>
		-	Rx	<input type="checkbox"/>
		-	PSU	<input type="checkbox"/>
		-	AUX	<input type="checkbox"/>
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		<input checked="" type="checkbox"/>

**ANNEX C**  
**BANDWIDTH PLOT**

### BANDWIDTH PLOT

OccBW:35.6 kHz

CTR:13.5627 MHz

RLV:-10.00dBm

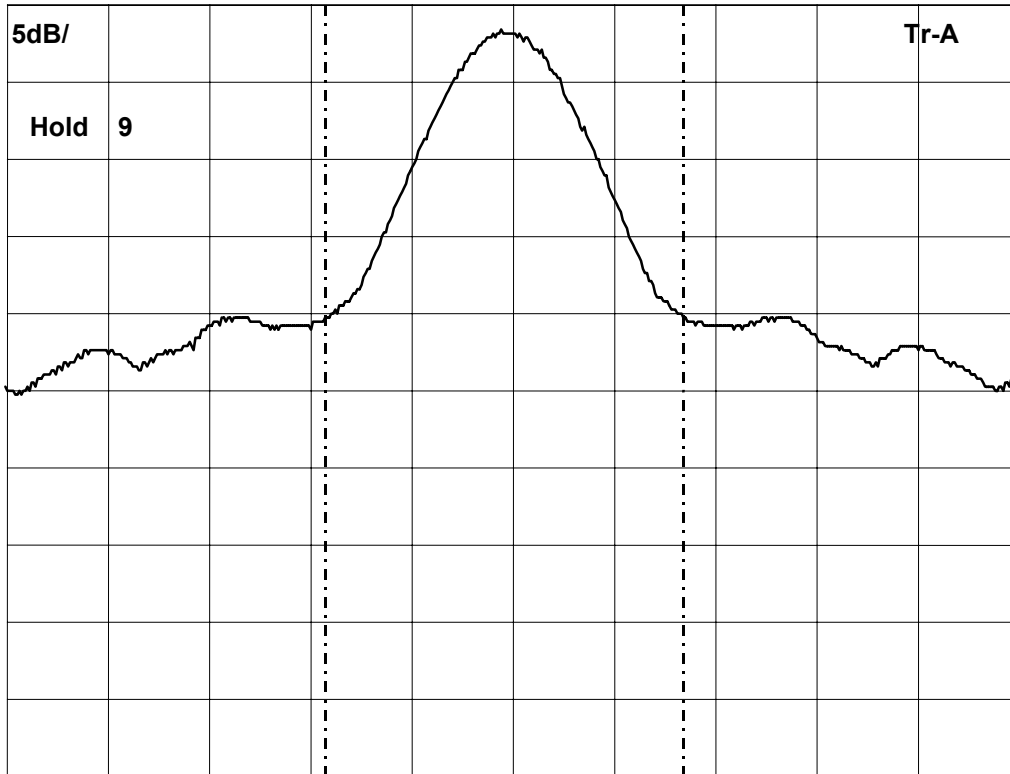
RB 10kHz#

AT 10dB#

Band auto

VB 1kHz#

ST 5.0s#



CF:13.5635MHz

Span:100kHz

**ANNEX D**  
**SCAN DATA**

Powerline Conduction

07 Oct 2003 10:18

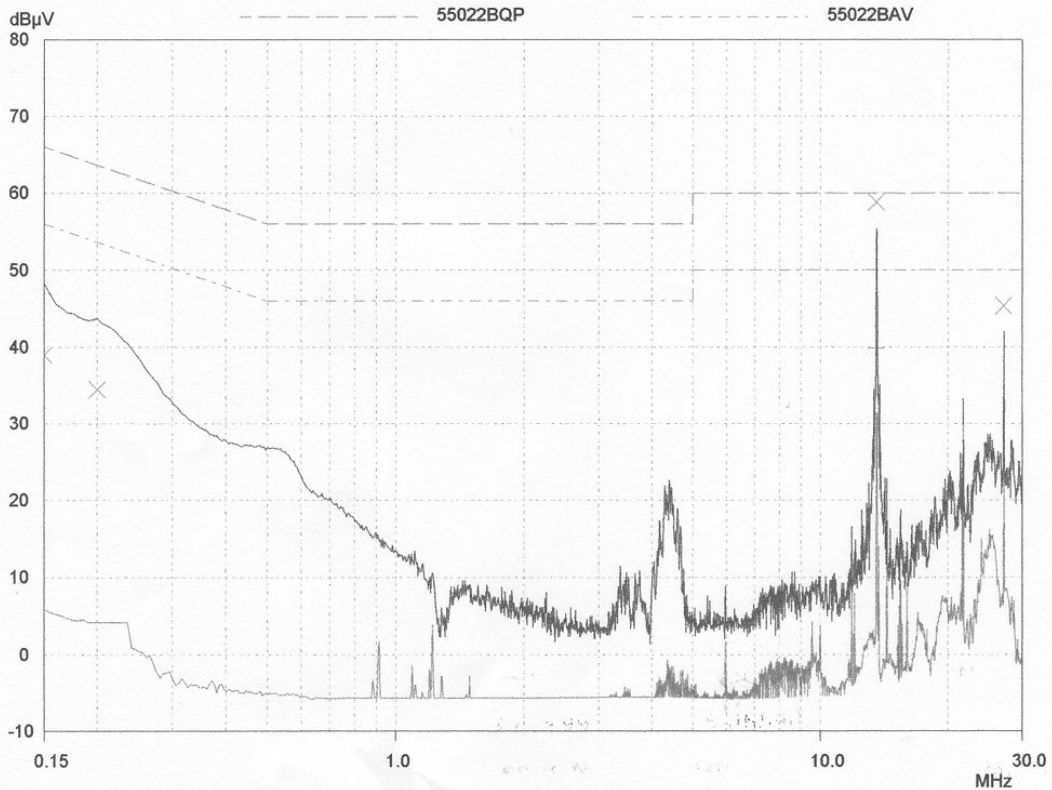
150kHz - 30MHz

EUT: S821  
 Manuf: Group 4  
 Op Cond: LISN UH5, UH21  
 Operator: J Charters  
 Test Spec: FCC part 15  
 Comment: Live line 110VAC

Scan Settings (1 Range)				Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	5kHz	10kHz	PK+AV	50msec	Auto	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	150kHz	30MHz	UH21

Final Measurement: Detectors: X QP / + AV  
 Meas Time: 2sec  
 Subranges: 25  
 Acc Margin: 20 dB



E-Field Radiation

EUT: S821  
 Manuf: Group 4  
 Op Cond: 3m Indoor Prescan  
 Operator: J Charters  
 Test Spec: EN55022  
 Comment: TX reading tag

Scan Settings (1 Range)				Receiver Settings					
Frequencies		Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
Start	Stop								
30MHz	1000MHz	50kHz	120kHz	PK	1msec	Auto	ON	60dB	

Transducer	No.	Start	Stop	Name
1	15	30MHz	1000MHz	TRLUH72
	21	30MHz	1000MHz	CBL6112B

Prescan Measurement: Detector: X PK  
 Meas Time: see scan settings  
 Subranges: 50  
 Acc Margin: 10 dB

