



TEST REPORT NO: RU1005/3358
COPY NO: 2
ISSUE NO: 2
FCC ID: OE5S674

**REPORT ON THE
CERTIFICATION TESTING OF A
GROUP 4 TECHNOLOGY Ltd.
S674 PROXIMITY READER TRANSMITTER
WITH RESPECT TO THE FCC 47CFR, Part 15.209
INTENTIONAL RADIATOR SPECIFICATION**

TEST DATE(s): 26th & 27th September 2001

TESTED BY: J CHARTERS

APPROVED BY: S P HAYES

I SSUE DATE: 2nd November 2001

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Notes:-		
1. Component failure during test	YES NO	[] [X]
2. If Yes, details of failure:-		
3. All measurement uncertainty calculations detailed in this report are carried out in accordance with UKAS Publication NIS 81, Edition 1, May 1994, for a 95% confidence level.		
4. The contents of the attached applicant's 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.		

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT): S674 PROXIMITY READER

EQUIPMENT TYPE: TAG READER TRANSMITTER

SERIAL NUMBER OF EUT: Engineering sample

PURPOSE OF TEST: FCC CERTIFICATION

TEST SPECIFICATION: FCC 47CFR Part15.209

TEST RESULT: COMPLIANT YES
NO

APPLICANT'S CATEGORY: (a) MANUFACTURER
(b) IMPORTER
(c) DISTRIBUTOR
(d) AGENT

APPLICANT'S ORDER No(s): P11486

APPLICANT'S CONTACT PERSON: Mr Eric Porter

APPLICANT: GROUP 4 TECHNOLOGY Ltd.

ADDRESS: Challenge House
Northway Lane
Tewkesbury
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TEL: +44 1684 850977

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MANUFACTURER: GROUP 4 TECHNOLOGY Ltd.

ADDRESS: As above

EUT(s) COUNTRY OF ORIGIN: United Kingdom

TEST LABORATORY: TRL EMC LTD

UKAS ACCREDITATION No: 0728

TEST DATE(s): 26th & 27th September 2001

TEST REPORT No: RU1005/3358



CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY: OE5S674

PURPOSE OF TEST: FCC Certification

TEST SPECIFICATION: FCC 47CFR, Part 15.209

TEST RESULT: Compliant to Specification

EQUIPMENT UNDER TEST: S674 PROXIMITY READER

EQUIPMENT SERIAL No: Engineering Sample

EQUIPMENT TYPE: TAG READER Transmitter

UTILISATION: Wall mounted

ITU EMISSION CODE: 17k0A1D

CARRIER EMISSION: 0.15FV/m @ 300m

ANTENNA TYPE: Fixed/ Integral, part of PCB tracking

ALTERNATIVE AE: None, as per Part 15.203, no external connection

BAND OF OPERATION: 110 -160 kHz

CHANNEL SPACING: n/a (Wideband)

No. of CHANNELS: 1

FREQUENCY GENERATION: SAW Resonator []; Crystal ; Synthesizer []

MODULATION METHOD: Amplitude ; Digital []; Angle []

POWER SOURCE(s): 9Vdc - 14Vdc

TEST DATE(s): 26th & 27th September 2001

ORDER No(s): P11486

APPLICANT: GROUP 4 TECHNOLOGY Ltd.

TESTED BY: J CHARTERS

APPROVED BY: S P HAYES
EMC MANAGER

TESTS REQUIRED

TRANSMITTER TESTS

Transmitter Spurious Emissions - Powerline	- Part 15.207	[]
Transmitter Carrier Emission - Radiated	- Part 15.209.a	[X]
Transmitter Spurious Emissions - Radiated	- Part 15.209.c - <30MHz	[X]
Transmitter Spurious Emissions - Radiated	- Part 15.209.c - >30MHz	[X]

Notes:-

1. Equipment tested for (mains ac) 110V powerline emissions. []
2. Equipment tested as (fixed) integral antenna configuration.
No external antenna port available. [X]
3. All tests were carried out with new batteries, as per Part 15.31.e. []

SAMPLE CALCULATIONS

Part 15.209 - Radiated.

Frequency (kHz)	Rx (dBFV)	Ae AF & Cable loss (dB/m & dB)	Field Strength @ 3m (dBFV/m)	Extrapolation 3-300m Factor (dB)	Field Strength @ 300m (FV/m)
125.81	89.7	20dB/m 0.1dB	109.8	126	0.15

TRANSMITTER TESTS

TRANSMITTER CARRIER EMISSION - RADIATED - PART 15.209.a

Ambient temperature	=	19EC	3m measurements <30MHz	[X]
Relative humidity	=	56%	1m measurements >1GHz	[]
Conditions	=	Open Area Test Site (OATS)	300m extrapolated from 3m	[X]
Supply voltage	=	14Vnom	30m extrapolated from 3m	[]
Channel number	=	1	3m extrapolated from 1m	[]

Frequency & Level	125.81kHz	0.15FV/m
Limit	19.0FV/m @ 300m	
Measurement Uncertainty	±4.2dB	

Fl (kHz)	Fh (kHz)	Band occupancy @ -30dBc
123.34	128.18	4.84kHz

Notes:-

1. Results quoted are extrapolated as indicated.
2. Extrapolation factor @ 40dB/decade from 300m to 30m, as per Part 15.31f.
3. Extrapolation factor graph values from 30m to 3m, as per Annex C.
4. Extrapolation factor @ 9.5dB from 1m to 3m, as per Part 15.31f.
5. Measurements <490kHz @ 3m, as per Part 15.31f (2).
6. Measurements <1705kHz @ 3m, as per Part 15.31f (2).
7. Measurements <30MHz @ 3m, as per Part 15.31f (2).
8. Measurements >1GHz @ 1m, as per Part 15.31f (1).
9. Receiver detector <30MHz = CISPR, Average, 10kHz bandwidth.
10. Receiver detector <1GHz = CISPR, Quasi-Peak, 120kHz bandwidth.
11. Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth.
12. Sample calculation, see page 6.

Test Method:-

1. As per Radio - Noise Emissions, ANSI C63.4: 1992.
2. Measuring distances as Notes 1 to 7 (inc) above.
3. EUT 0.8 metre above ground plane.
4. Emissions maximised by orientating the EUT in three axis, with worst case results recorded.

Test Equipment Used:-

1. Full description at Annex B.
2. TRLUH05, TRL07, TRLUH120

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS - RADIATED - PART 15.209.c - <30MHz

Ambient temperature	=	19EC	3m measurements <30MHz	[]
Relative humidity	=	56%	300m extrapolated from 3m	[X]
Conditions	=	Open Area Test Site (OATS)	30m extrapolated from 3m	[]
Supply voltage	=	14Vnom		
Channel number	=	1		

Frequency & Level 9kHz to 490kHz	375.19kHz	1.05x10 ⁻³ FV/m (-59.6 dBFV/m)
Frequency & Level 490kHz to 1705kHz	501.00kHz 626.81kHz 1130.05kHz	0.01FV/m (-39.9 dBFV/m) 0.03FV/m(-29.8 dBFV/m) 7.8x 10 ⁻³ FV/m(-42.1 dBFV/m)
Frequency & Level 1705kHz to 30MHz	No emissions above sensitivity 31.6x10 ⁻⁶ FV/m @ 300m	
Limits	9kHz to 490kHz	2400/F(kHz)FV/m @ 300m
	490kHz to 1705kHz	24000/F(kHz)FV/m @ 30m
	1705kHz to 30MHz	+29.8 dBFV/m @ 30m
Measurement Uncertainty	±4.2dB	

Notes:-

1. Results quoted are extrapolated as indicated.
2. Emissions were searched to:- 1000 MHz inclusive, as per Part 15.33a.
3. Extrapolation factor @ 40dB/decade from 300m to 30m, as per Part 15.31f.
4. Extrapolation factor graph values from 30m to 3m, as per Annex C.
5. Measurements <490kHz @ 3m, as per Part 15.31f (2).
6. Measurements <1705kHz @ 3m, as per Part 15.31f (2).
7. Measurements <30MHz @ 3m, as per Part 15.31f (2).
8. Receiver detector <30MHz = CISPR, Quasi-Peak, 10kHz bandwidth.
9. Nil emissions sensitivity of 63FV/m @ 3m, 31.6x10⁻⁶FV @ 300m
10. Sample calculation, see page 6.

Test Method:-

1. As per Radio - Noise Emissions, ANSI C63.4: 1992.
2. Measuring distances as Notes 1 to 7 (inc) above.
3. EUT 0.8 metre above ground plane.
4. Emissions maximised by orientating the EUT in three axis, with worst case results recorded.

Test Equipment Used:-

1. Full description at Annex B.
2. TRL07, TRLUH120

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS - RADIATED - PART 15.209.c - >30MHz

Ambient temperature	=	18EC (<1GHz),	n/a EC (>1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	48% (<1GHz),	n/a % (>1GHz)	1m measurements >1GHz	[]
Conditions	=	Open Area Test Site (OATS) 3m extrapolated from 1m			[]
Supply voltage	=	+14Vnom			
Channel number	=	1			

Frequency & Level 30MHz to 88MHz		No emissions above sensitivity 10FV/m
Frequency & Level 88MHz to 216MHz		No emissions above sensitivity 10FV/m
Frequency & Level 216MHz to 960MHz		No emissions above sensitivity 10FV/m
Frequency & Level 960MHz to 1000 MHz		No emissions above sensitivity 10FV/m
Limits	30MHz to 88MHz	+100FV/m @ 3m
	88MHz to 216MHz	+150FV/m @ 3m
	216MHz to 960MHz	+200FV/m @ 3m
	960MHz to 1000 MHz	+500FV/m @ 3m
Measurement Uncertainty		±4.1dB

Notes:-

1. Results quoted are extrapolated as indicated.
2. Emissions were searched to:- 1000MHz inclusive, as per Part 15.33a.
3. Extrapolation factor @ 9.5dB from 1m to 3m, as per Part 15.31f.
4. Measurements >1GHz @ 1m, as per Part 15.31f (1).
5. Receiver detector <1GHz = CISPR, Quasi-Peak, 120kHz bandwidth.
6. Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth.
7. Sample calculation, see page 6.
8. Nil emissions sensitivity of 10FV/m

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 in horizontal and vertical polarisations, with worst case results recorded.

Test Equipment Used:-

1. Full description at Annex B
2. TRL08, TRL07, TRLUH120.

ANNEX A

PHOTOGRAPHS OF THE EQUIPMENT:
(taken on completion of all tests)

Photograph A-1
Title: Tx, front.

ANNEX A

PHOTOGRAPHS OF THE EQUIPMENT:
(taken on completion of all tests)

Photograph A2
Title: Tx, rear.

ANNEX A

PHOTOGRAPHS OF THE EQUIPMENT:
(taken on completion of all tests)

Photograph A3
Title: Tx, rf pcb ,top

ANNEX A

PHOTOGRAPHS OF THE EQUIPMENT:
(taken on completion of all tests)

Photograph A4
Title: Tx, rf pcb, bottom

ANNEX A

PHOTOGRAPHS OF THE EQUIPMENT:
(taken on completion of all tests)

Photograph A-5
Title: Tx on test site

ANNEX B

TEST EQUIPMENT LIST

INSTRUMENT	SUPPLIER	TYPE No	SERIAL No	TRL EMC No
LF / HF RECEIVER, 9kHz - 30MHz	ROHDE&SCHWARZ	ESH2	879014 / 028	TRL 06
RF PULSE LIMITER	ROHDE&SCHWARZ	ESH3Z2	M494	TRL 06A
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE&SCHWARZ	HFH2	881058 - 53	TRL 07
RANGE 1 (3 - 30m)	TRL	N/A	N/A	TRL 08
VARIAC, 230V, 10A	ZENITH	100R	V265537	TRL 12
dc PSU, VARIABLE, 30v, 10A, 300W	TOPWARD ELECTRONIC	23010	899672	TRL 15
RF SIGNAL GEN, 10kHz - 1000MHz	MARCONI	2022	119022 / 205	TRL 17
LISN, ac MAINS	CHASE	MN2050	1431	TRL 25
HF RECEIVER, 150kHz - 30MHz	CHASE	HFR2000	2158	TRL 26
LF RECEIVER, 9kHz - 150kHz	CHASE	LFR1000	1020	TRL 27
HF RECEIVER, 150kHz - 30MHz	CHASE	HFR2000	2187	TRL 28
AE, DIPOLE, 20MHz - 300MHz	CHASE	VHA9103		TRL 35
AE, DIPOLE, 20MHz - 300MHz	CHASE	VHA9103	7011	TRL 36
AE, DIPOLE, 300MHz - 1GHz	CHASE	VHA9105	7107	TRL 37
AE, DIPOLE, 300MHz - 1GHz	CHASE	VHA9105	N/A	TRL 38
ATU, RECEIVER, 9kHz - 30MHz	SCHWARZBECK	FMZL1514	1514338	TRL 42
COAX LOAD, 2W, N, 50Ω, dc - 4GHz	BIRD	8360NM	N/A	TRL 113
COAX LOAD, 2W, N, 50Ω, dc - 4GHz	BIRD	8360NM	N/A	TRL 114
COAX LOAD, 2W, BNC, 50Ω, dc - 4GHz	BIRD	8360B	N/A	TRL 115

ANNEX B

TEST EQUIPMENT LIST

INSTRUMENT	SUPPLIER	TYPE No	SERIAL No	TRL EMC No
COAX LOAD, 2W, BNC, 50Ω, dc - 4GHz	BIRD	8360B	N/A	TRL 116
COAX LOAD, 1W, BNC, 50Ω, dc - 1GHz (min)	SUHNER	65BNC - 50 -0- 1	N/A	TRL 117
AE, DRG HORN, 1GHz - 18GHz	EMCO	3115	9010 - 3580	TRL 138
AE, DRG HORN, 1GHz - 18GHz	EMCO	3115	9010 - 3581	TRL 139
RF ANALYSER, 10kHz - 60GHz	TEKTRONIX	2756P	B010109	TRL 164
MULTIMETER (mc) 20kΩ / V (sens)	AVO	MODEL 8, MK.V.	0545248	TRL 169
RF SIGNAL GEN, LOW NOISE -90dBc, 10kHz - 5.4GHz	MARCONI	2042	119388 / 080	TRL 176
RANGE 2 (3 - 10m)	TRL	N/A	N/A	TRL 182
VARIAC, 230V, 10A	VARATLAN	Z710R	N/A	TRL 186
ANTENNA MAST	CHASE	HM9104	N/A	TRL 189
MULTIMETER (dig)	ISOTECH	IDM91	00606606	TRL 190
THERMOMETER & HYGROMETER	RS	212 - 146	N/A	TRL 191
AE, BICONE, 20MHz - 300MHz	CHASE	BBA 9106	N/A	TRL 193
SCOPE, 20MHz, 2CH, DIG STORAGE	BECKMAN	9302	2090044	TRL 197
AE, LOG PERIODIC, 300MHz - 1GHz	CHASE	UPA6108	1061	TRL 203
ac PSU, VARIABLE, 300V, 5A, 1kVA, 45Hz - 440Hz	MAGNUS	MP500	1108	TRL 204
TRANSFORMER, ISOLATION, 240Vac	RS	209 - 099	N/A	TRL 205
TRANSFORMER, ISOLATION, 110Vac	RS	208 - 636	N/A	TRL 206
LISN, 3ph MAINS ac	SCHWARZBECK	NSKL8128	8128151	TRL 207
COAX LOAD, 5W, BNC, 50Ω, dc - 4GHz	BIRD	80BNCM	5866	TRL 223

ANNEX B

TEST EQUIPMENT LIST

INSTRUMENT	SUPPLIER	TYPE No	SERIAL No	TRL EMC No
dc PSU, VARIABLE, 15/30V, 2/1A, 30W	WIER	731	88829	TRL 224
VARIAC, 230V, 2A	REGULAC	RB3 - MT	N/A	TRL 225
VARIAC, 230V, 2A	REGULAC	RB3 - MT	N/A	TRL 226
THERMOMETER & HYGROMETER	RS	212 - 124	227	TRL 227
THERMOMETER & HYGROMETER	RS	212 - 124	228	TRL 228
THERMOMETER & HYGROMETER	RS	212 - 124	229	TRL 229
THERMOMETER & HYGROMETER	RS	212 - 124	230	TRL 230
THERMOMETER & HYGROMETER	RS	212 - 124	231	TRL 231
AE, LOG PERIODIC, 300MHz - 1GHz	EMCO	3146	N/A	TRL 233
dc PSU, VARIABLE, (2x) 32V, 3A, 100W	THURLBY THANDAR	PL330	046542	TRL 235
LF / HF RECEIVER, 9kHz - 30MHz	ROHDE&SCHWARZ	ESHS20	837960 / 003	TRL 237
LISN, ac MAINS	ROHDE&SCHWARZ	ESHS3 - Z5	839135 / 013	TRL 238
MULTIMETER, (dig)	ISOTECH	IDM97	32202147	TRL 239
THERMOMETER & BAROMETER	RS	216435	N/A	TRL 240
COAX CABLE, 50Ω, 18GHz, TNC, 1.25m	W L GORE	3390 / 265 / 1	8420202	TRL 249
COAX CABLE, 50Ω, 18GHz, TNC, 1.25m	W L GORE	3390 / 265 / 1	8420223	TRL 250
AE, BICONE, 20MHz - 300MHz	CHASE	VBA6106A	1193	TRL 251
AE, EASY 1, 30MHz - 1GHz	FARNELL	S30280	017	TRL 253
RF SIGNAL GEN, LOW NOISE -90dBc, 10kHz - 5.4GHz	MARCONI	2042	119562 / 021	TRL 254
SCOPE, 400MHz, 4CH, DIG STORAGE	TEKTRONIX	TDS460A	B020781	TRL 258
RF SIGNAL GEN, 10kHz - 1GHz	MARCONI	2022D	119224 - 023	TRL 264

ANNEX B

TEST EQUIPMENT LIST

INSTRUMENT	SUPPLIER	TYPE No	SERIAL No	TRL EMC No
MULTIMETER, (dig)	ISOTECH	IDM97 RMS	32202307	TRL 273
AE, BILOG, 20MHz - 2GHz	CHASE	CBL6112	2098	TRL 274
COAX ADAPTOR, 18GHz, TNC / N	ROSENBERGER	05S106 - K0053	N/A	TRL 275
COAX ADAPTOR, 18GHz, TNC / N	ROSENBERGER	05S106 - K0053	N/A	TRL 276
COAX ADAPTOR, 18GHz, TNC / N	ROSENBERGER	05S106 - K0053	N/A	TRL 277
COAX ADAPTOR, 18GHz, TNC / N	ROSENBERGER	05S106 - K0053	N/A	TRL 278
COAX CABLE, 18GHz, N, 0.5M	ROSENBERGER	RTK161 - GP - Nm90 - 50cms	N/A	TRL 279
COAX CABLE, 18GHz, N, 3.0M	ROSENBERGER	RTK161 - GP - Nm90 - 300cms	N/A	TRL 280
COAX CABLE, 50Ù, 4GHz, N, 12m	TRL	WESTFLEX 103	N/A	TRL 286
COAX CABLE, 50Ù, 4GHz, N, 12m	TRL	WESTFLEX 103	N/A	TRL 287
LISN, ac MAINS	ROHDE&SCHWARZ	ESH3 - Z5	837469 / 010	TRL 289
AE, BILOG, 20MHz - 1GHz	CHASE	CBL6111B	1945	TRL 290
MULTIMETER (dig)	ISOTECH	IDM97 RMS	32202547	TRL 291
MULTIMETER (dig)	ISOTECH	IDM97 RMS	32202565	TRL 292
THERMOMETER & BAROMETER	RS	216435	N/A	TRL 293
COAX CABLE, 50Ù, 26.5GHz, SMA, 2m, c/w 3 ADAPTORS	GORE	145	MFR65474	TRL 308
V / UHF RECEIVER, 20MHz - 1GHz	ROHDE&SCHWARZ	ESVS10	837948 / 003	TRL 317
RF PULSE LIMITER	ROHDE&SCHWARZ	ESH3Z2	A400	TRL 318
RF SIGNAL GEN, 9kHz - 1.2GHz	MARCONI	2023	112224 / 036	TRL 320
AE, LOG PERIODIC, 300MHz - 1GHz	CHASE	UPA6108	1016	TRL 344
V / UHF RECEIVER, 20MHz - 1GHz	ROHDE&SCHWARZ	ESVS10	844594 / 0003	TRL 352

INSTRUMENT	SUPPLIER	TYPE No	SERIAL No	TRL EMC No
LF / HF RECEIVER, 9kHz - 30MHz	ROHDE&SCHWARZ	ESHS10	844077 / 019	TRL 353
COAX CABLE, 50Ω, 4GHz, N, 0.5m	TRL	NA	NA	TRL 358
COAX CABLE, 50Ω, 4GHz, N, 16m	TRL	NA	NA	TRL 359
COAX CABLE, 50Ω, 4GHz, N, 1m	TRL	NA	NA	TRL 360
THERMOMETER & HYGROMETER	RS	204 - 072	NA	TRL 363
THERMOMETER & HYGROMETER	RS	204 - 072	NA	TRL 364
THERMOMETER & HYGROMETER	RS	204 - 072	NA	TRL 365
THERMOMETER & HYGROMETER	RS	204 - 072	NA	TRL 366
V / UHF RECEIVER, 20MHz - 1GHz	ROHDE&SCHWARZ	ESVS20	838804 / 005	TRL 415
RF ANALYSER, 9kHz - 1GHz	WAYNE KERR	SSA1000A	9800001488	TRL 416
LF / HF RECEIVER, 9kHz - 30MHz	ROHDE&SCHWARZ	ESHS10	830051 / 001	TRLUH 03
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE&SCHWARZ	HFH - Z2	892246 / 023	TRLUH 23
RF ANALYSER, dc - 26.5GHz	MARCONI	2380	152089 / 009	TRLUH 120
		2386	152076 / 044	

ANNEX C

MEASURING DISTANCE EXTRAPOLATION GRAPH(S)

