TEST REPORT NO: RU1289/7353

COPY NO: 2

ISSUE NO: 1

FCC ID: UTJ-TM500

REPORT ON THE CERTIFICATION TESTING OF A
THIRD MILLENNIUM SYSTEMS Ltd
TM500 HITAG CARD READER
WITH RESPECT TO
FCC RULES CFR 47, PART 15.209 August 2006
INTENTIONAL RADIATOR SPECIFICATION

TEST DATE: 23rd – 29th November 2006

TESTED BY: S HODGKINSON — Digitally signed by S HODGKINSON DN: CN = S HODGKINSON, C = GB, O = TRL COMPLIANCE LTD Reason: I am the author of this document Date: 2006.12.19 10:59:09 Z — S Hodgkinson

APPROVED BY: John Charters — Digitally signed by John Charters DN: CN = John Charters, C = GB, O = TRL Compliance Ltd Reason: I am approving this document Date: 2006.12.19 11:40:07 Z — J Charters, Radio Section Leader

DATE: 19th December 2006

Distribution:

Copy Nos:
1. Third Millennium Systems Ltd
2. FCC EVALUATION LABORATORIES
3. TRL Compliance Ltd

TRL COMPLIANCE LTD
MOSS VIEW NIPE LANE UP HOLLAND WEST LANCASHIRE WN8 9PY UNITED KINGDOM
TELEPHONE +44 (0)1695 556666 FAX +44 (0)1695 557077
E-MAIL test@trlcompliance.com www.trlcompliance.com

FS 503099

0728

CONTENTS

Notes:

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:	UTJ-TM500					
PURPOSE OF TEST:	Certification					
TEST SPECIFICATION:	FCC RULES CFR 47, Part 15.209 August 2006					
TEST RESULT:	Compliant to Specification					
EQUIPMENT UNDER TEST:	TM500 Hitag Card Reader					
ITU: EMISSION CODE:	5K3K1N					
EQUIPMENT TYPE:	Inductive Card Reader					
PRODUCT USE:	Access Control					
CARRIER EMISSION:	1.48 µV/m @ 300m					
ANTENNA TYPE:	Integral					
ALTERNATIVE ANTENNA:	Not Applicable					
FREQUENCY OF OPERATION:	125.40 kHz					
CHANNEL SPACING:	Not Applicable					
NUMBER OF CHANNELS:	1					
FREQUENCY GENERATION:	SAW Resonator	[ ]	Crystal	[X]	Synthesiser	[ ]
MODULATION METHOD:	Amplitude	[ ]	Digital	[X]	Angle	[ ]
POWER SOURCE(s):	+12Vdc					
TEST DATE(s):	23rd – 29th November 2006					
ORDER No(s):	991720					
APPLICANT:	Third Millennium Systems Ltd					
ADDRESS:	18/19 Torean Business Park Centre Panteg Way Pontypool NP4 0LS					

TESTED BY: S HODGKINSON
Digitally signed by S HODGKINSON
DN: CN = S HODGKINSON, C = GB, O = TRL COMPLIANCE LTD
Reason: I am the author of this document
Date: 2006.12.19 10:59:03 Z
S Hodgkinson

APPROVED BY: John Charters
Digitally signed by John Charters
DN: CN = John Charters, C = GB, O = TRL Compliance Ltd
Date: 2006.12.19 11:40:23 Z
J Charters
Radio Section Leader

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	TM500 Hitag Card Reader
EQUIPMENT TYPE:	Inductive Card Reader
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 15.209 August 2006
TEST RESULT:	COMPLIANT Yes [X] No [ ]
APPLICANT'S CATEGORY:	MANUFACTURER [X] IMPORTER [ ] DISTRIBUTOR [ ] TEST HOUSE [ ] AGENT [ ]
APPLICANT'S ORDER No(s):	991720
APPLICANT'S CONTACT PERSON(s):	Mr Peter Jones
E-mail address:	pete@third-millennium-sys.com
APPLICANT:	Third Millennium Systems Ltd
ADDRESS:	18/19 Torean Business Park Centre Panteg Way Pontypool NP4 0LS
TEL:	+44 (0) 1495 751 992
FAX:	+44 (0) 1495 757 448
EUT(s) COUNTRY OF ORIGIN:	United Kingdom
TEST LABORATORY:	TRL Compliance Ltd.
UKAS ACCREDITATION No:	0728
TEST DATE(s):	23rd – 29th November 2006
TEST REPORT No:	RU1289/7353

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.

TEST/EXAMINATION	RULE PART	DETECTOR	APPLICABILITY
Intentional Emission Frequency:	15.209(a)	Average	Yes
Intentional Emission Field Strength:	15.209(a)	Average	Yes
Intentional Emission Band Occupancy:	15.215(c)	Peak	Yes
Intentional Emission ERP (mW):	-	-	No
Spurious Emissions – Conducted:	15.207	Quasi Peak Average	Yes
Spurious Emissions – Radiated <1000MHz:	15.209	Quasi Peak Average	Yes
Spurious Emissions – Radiated >1000MHz:	-	-	No
Maximum Frequency of Search:	15.33	-	Yes
Antenna Arrangements Integral:	15.203	-	Yes
Antenna Arrangements External Connector:	15.204	-	Yes
Restricted Bands:	15.205	-	Yes
Extrapolation Factor:	15.31(f)	-	Yes

2. Product Use: Access Control

3. Emission Designator: 5K3K1N

4. Duty Cycle: <100%

5. Transmitter bit or pulse rate and level: 5200bps

6. Temperatures: Ambient (Tnom) 10^{o}C

7. Supply Voltages: Vnom +12Vdc

Note: Vnom voltages are as stated above unless otherwise shown on the test report page

8. Equipment Category:
   Single channel [X]
   Two channel [ ]
   Multi-channel [ ]

9. Channel spacing:
   Narrowband [ ]
   Wideband [X]

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS – RADIATED – PART 15.209

Ambient temperature	=	10^{o}C(<1GHz)	3m measurements <30MHz	[X]
Relative humidity	=	54% (<1GHz),	10m measurements <30MHz	[X]
Conditions	=	Open Area Test Site (OATS)	3m measurements <1GHz	[X]
Supply voltage	=	+12Vdc	300m extrapolated from 3m	[X]
Channel number	=	1	300m extrapolated from 10m	[X]

	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR (dB/m)	FIELD STRENGTH (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)
0.009MHz - 0.49MHz	No Significant Emissions Within 20 dB of the Limit						
0.49MHz - 1.705MHz	No Significant Emissions Within 20 dB of the Limit						
1.705MHz - 30MHz	No Significant Emissions Within 20 dB of the Limit						
30MHz - 88MHz	No Significant Emissions Within 20 dB of the Limit						
88MHz - 216MHz	No Significant Emissions Within 20 dB of the Limit						
216MHz - 960MHz	No Significant Emissions Within 20 dB of the Limit						
960MHz - 1GHz	No Significant Emissions Within 20 dB of the Limit						
1GHz - 5GHz	No Significant Emissions Within 20 dB of the Limit						
Limits	0.009 MHz to 0.49 MHz	2400/f(kHz) µV/m @ 300m					
	0.49 MHz to 1.705 MHz	24000/f(kHz) µV/m @ 30m					
	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					

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

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 80dB from 3m to 300m, as per Part 15.31f.
5 Extrapolation factor 40dB from 3m to 30m, as per Part 15.31f.
6 Measurements >1GHz @ 1m as per Part 15.31f(1).
7 Receiver detector 9kHz – 30MHz = CISPR, Quasi-Peak, 10kHz bandwidth.
Apart From the bands 9kHz-90kHz and 110kHz-490kHz where an average detector is used.
8 Receiver detector 30MHz - 1GHz = CISPR, Quasi-Peak, 120kHz bandwidth.
9 Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth.
10 New batteries used for battery powered products.
11 Emissions 20dBs below the limit are not recorded.
12 For emissions below 30MHz cable losses are assumed to be negligible.
13 F(kHz) is the frequency of operation or spurious emission.
14 See Annex C for emissions plot(s) 30MHz 1GHz.

Test Method:

1 As per Radio – Noise Emissions, ANSI C63.4: 2003.
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 >30MHz.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthagonal planes. Maximum results recorded.

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

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	**X**
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/01	UH03	**X**
RANGE 1	TRL	3 METRE	N/A	UH06	**X**
RANGE 1	TRL	10 METRE	N/A	UH07	**X**
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	**X**
RECEIVER	ROHDE & SCHWARZ	ESVS 10	841431/014	UH186	**X**

TRANSMITTER TESTS

TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.209

Ambient temperature	=	10°C(<1GHz),	3m measurements @ fc	[X]
Relative humidity	=	54%(<1GHz),	10m measurements @ fc	[X]
Conditions	=	Open Area Test Site (OATS)	30m measurements @ fc	[ ]
Supply voltage	=	+12Vdc	300m extrapolated from 3m	[X]
Channel number	=	1	300m extrapolated from 10m	[X]

FREQ. (kHz)	MEASUREMENT DISTANCE (Meters)	MEASUREMENT Rx. READING (dBµV/m)	EXTRAPOLATION FACTOR (dB)	FIELD STRENGTH (µV/m)
125.40	3	88.50	85.08	1.48
125.40	10	62.50	59.08	1.48
Limit value @ fc		**19.3(µV/m) @ 300m**		
Band occupancy @ -20 dBc		**f lower**	**f higher**	
		123.205 kHz	128.462 kHz	

See spectrum analyser plot – Annex D

Notes:
1. Results quoted are extrapolated as indicated.
2. Receiver detector @ fc = Average, 200 Hz bandwidth.
3. When battery powered the EUT was powered with new batteries.
4. For emissions below 30MHz the receiver automatically compensates for the loss due to the antenna factor of the loop antenna. This loss is 20 dBs across the measurement range 9kHz – 30MHz.
5. For emissions below 30MHz the cable loss are assumed to be negligible.
6. Peak Emissions were found to be less than or equal to the average limit and were therefore deemed to comply with 15.35(b).
7. The test results quoted are the maximum seen after the supply voltage was varied between 85% and 115% of Vnom.

Test Method:
1. As per Radio – Noise Emissions, ANSI C63.4: 2003
2. Measuring distances 3m.
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.
   Horizontal and vertical polarisations, of the receive antenna > 30 MHz.
   EUT orientation in three orthagonal planes.Maximum results recorded.

The test equipment used for the Transmitter Intentional Emission – Radiated – Part 15.209 test is shown below:

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	**X**
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/01	UH03	**X**
RANGE 1	TRL	3 METRE	N/A	UH06	**X**
RANGE 1	TRL	10 METRE	N/A	UH07	**X**

TRANSMITTER TESTS

TRANSMITTER CONDUCTED EMISSIONS – AC POWER LINE Part 15.207

Ambient temperature = 18°C(<1GHz),
Relative humidity = 53%(<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)
No Significant Emissions within 20 dBs of the Limit				

Notes: 1 See worst case plot in Annex E.
2 Measurements were taken of both live and neutral lines.
3 Only emissions within 20dBs of the limit are recorded.

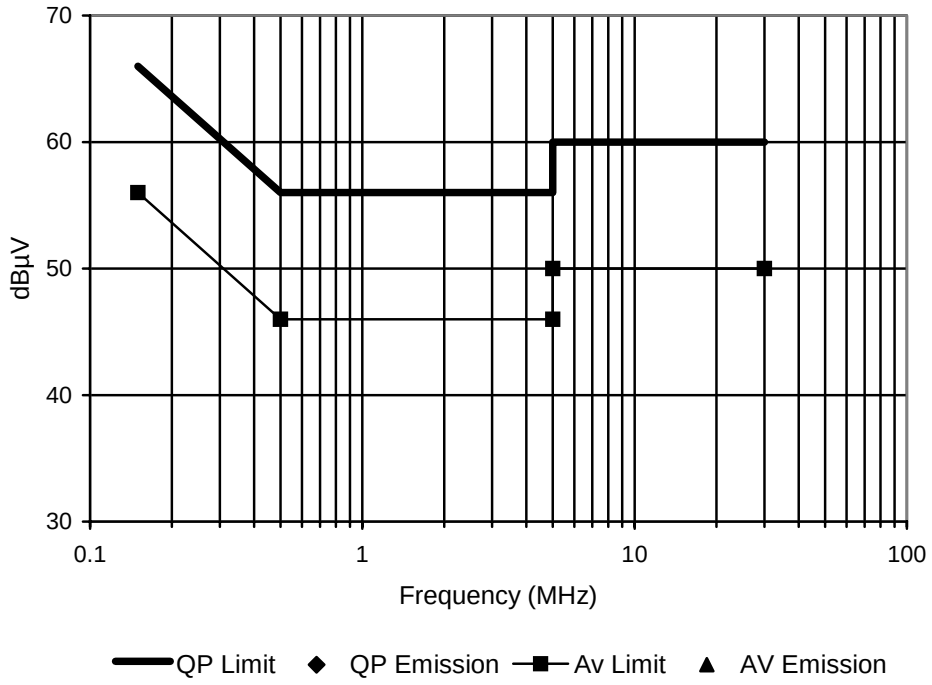
Test Method: 1 As per Radio – Noise Emissions, ANSI C63.4: 2003

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	ESHS 10	830051/01	UH03	**X**
LISN/AMN	ROHDE & SCHWARZ	ESH3-Z5	863906/018	UH05	**X**

POWER LINE CONDUCTION EMISSIONS

Limits Part 15.207

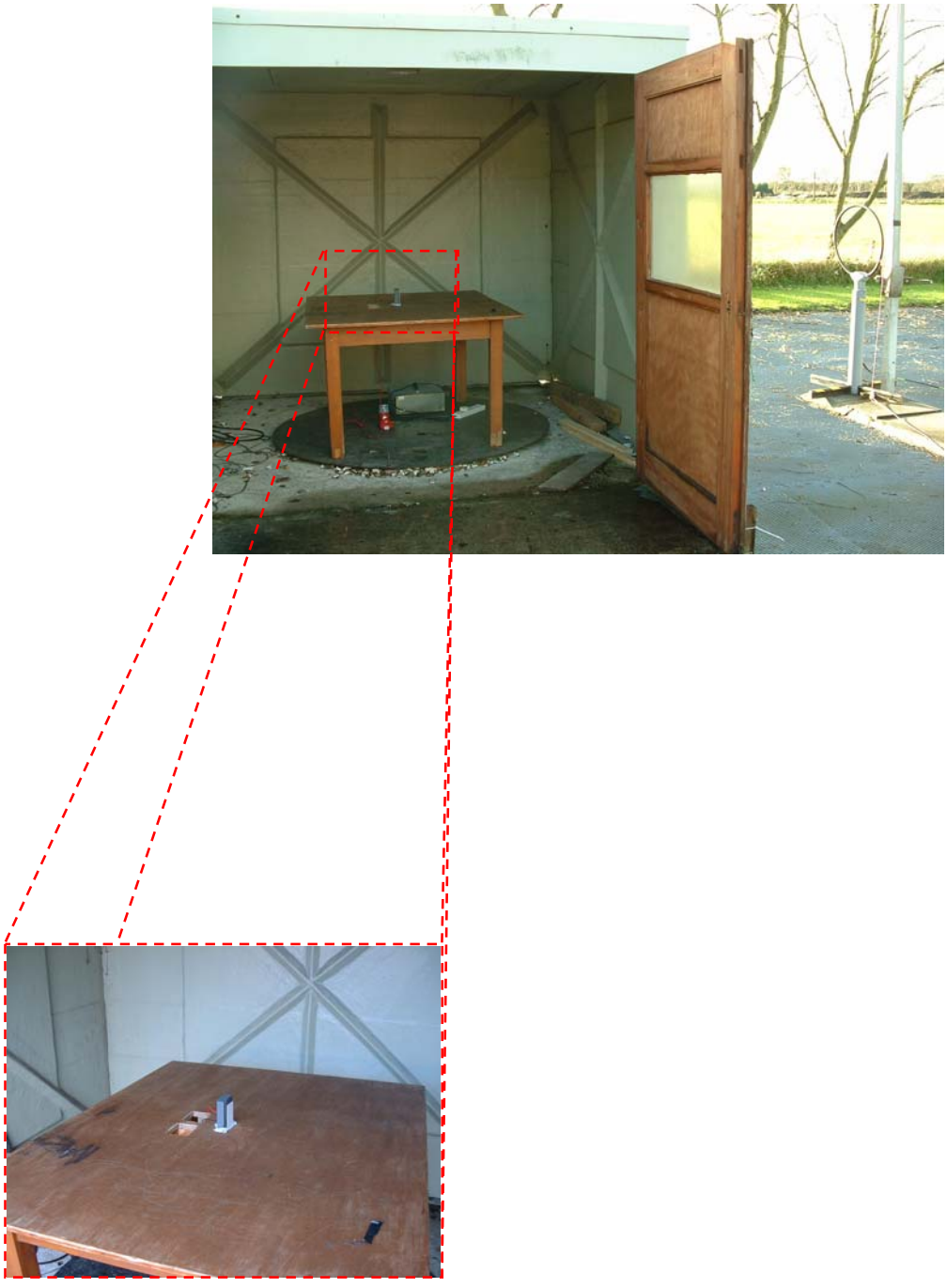


No Emissions Detected within 20 20dB of the limit

ANNEX A

PHOTOGRAPHS

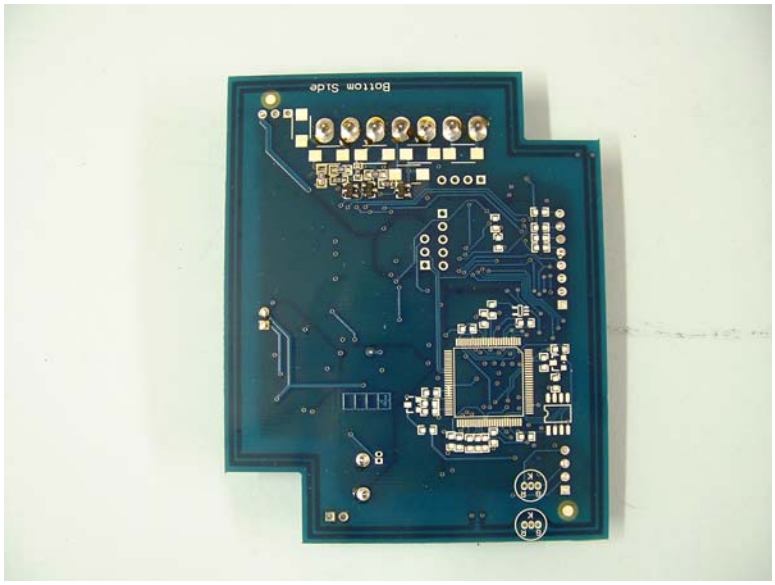
PHOTOGRAPH No. 1 **TEST SETUP**



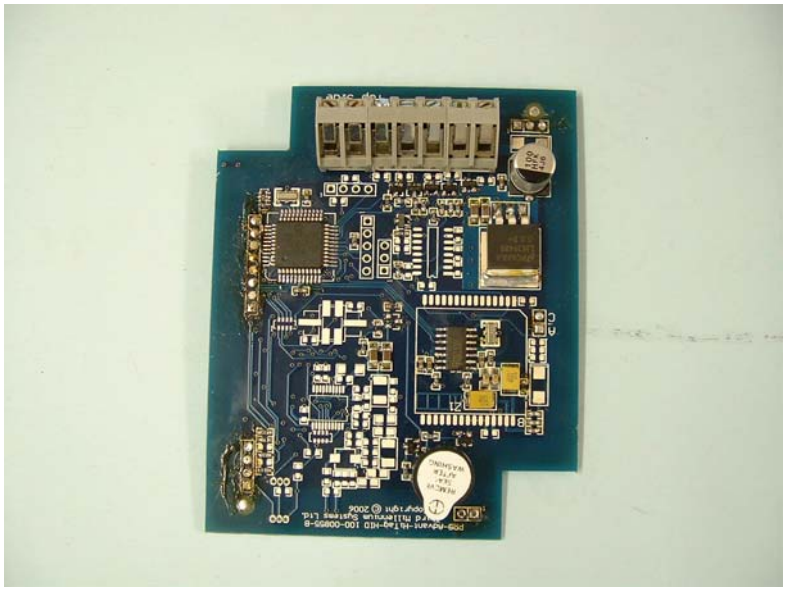
PHOTOGRAPH No. 2 **TRANSMITTER FRONT VIEW**

PHOTOGRAPH No. 3 **TRANSMITTER REAR VIEW**

PHOTOGRAPH No. 4 **TRANSMITTER PCB TRACK SIDE**

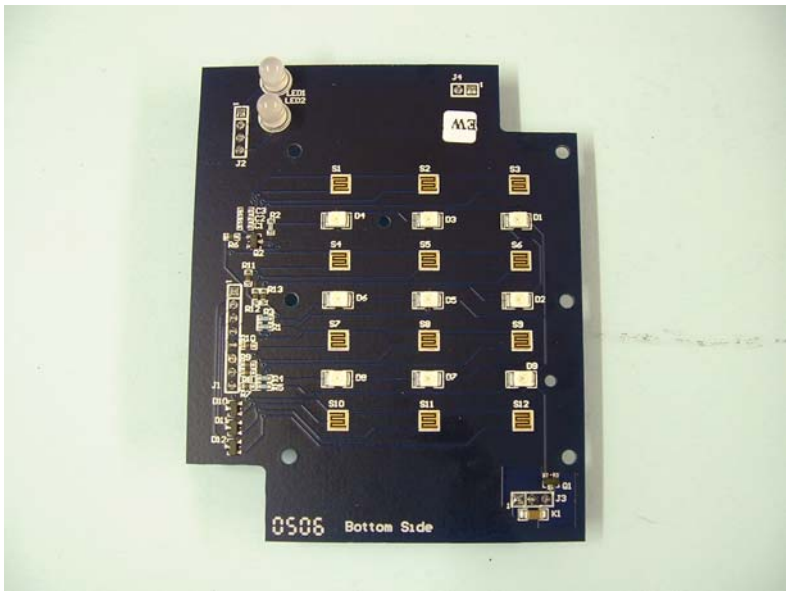


PHOTOGRAPH No. 5 **TRANSMITTER PCB COMPONENT SIDE**



PHOTOGRAPH No. 6 **KEYPAD PCB TRACK SIDE**

PHOTOGRAPH No. 7 **KEYPAD PCB COMPONENT SIDE**



PHOTOGRAPH No. 8 **ANTENNA**

ANNEX B

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

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

ANNEX C

EMISSIONS GRAPH(s)

TRL Compliance Services Ltd

23 Nov 2006 15:52

E-Field Radiation (30MHz-1GHz)

EUT:	RF TAG READER
Manuf:	Third Millennium Systems Ltd
Op Cond:	Prescan 30MHz - 1000MHz
Operator:	S Hodgkinson.
Test Spec:	Part15
Comment:	Unit on permanent Tx ,no tag.
	Rx antenna Vertical.

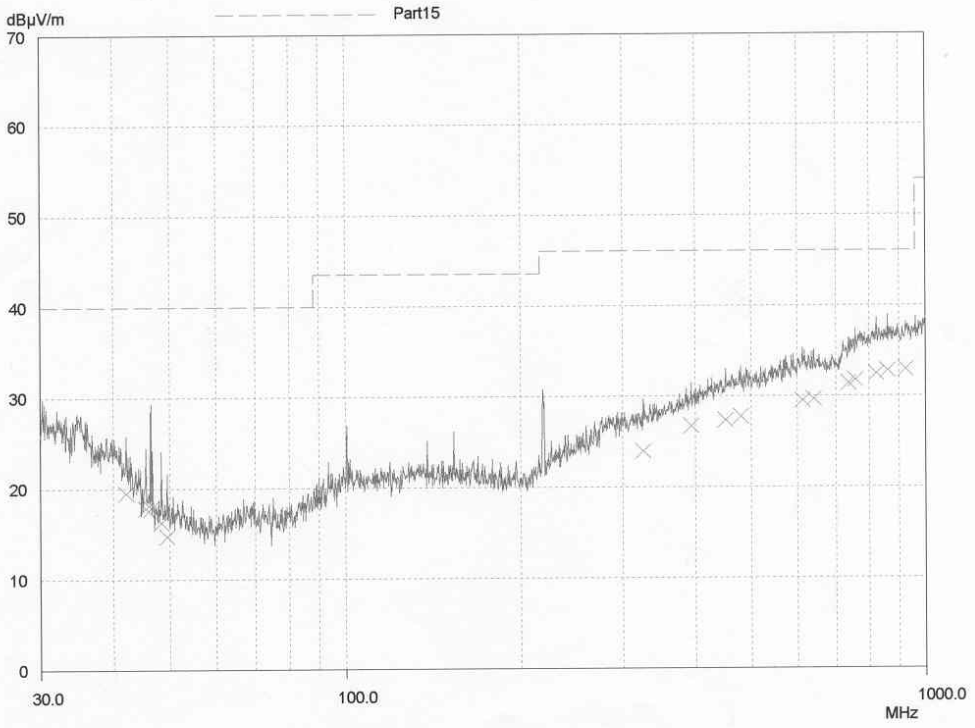
Scan Settings (1 Range)

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

Transducer	No.	Start	Stop	Name
1	21	30MHz	1000MHz	UH72
	22	30MHz	1000MHz	UH93

Final Measurement:

Detector:	X QP
Meas Time:	2sec
Subranges:	50
Acc Margin:	10 dB



PAGE 1

TRL Compliance Services Ltd

23 Nov 2006 15:17

E-Field Radiation (30MHz-1GHz)

EUT:	RF TAG READER
Manuf:	Third Millennium Systems Ltd
Op Cond:	Prescan 30MHz - 1000MHz
Operator:	S Hodgkinson.
Test Spec:	Part15
Comment:	Unit on permanent Tx ,card present.
	Rx antenna Vertical.

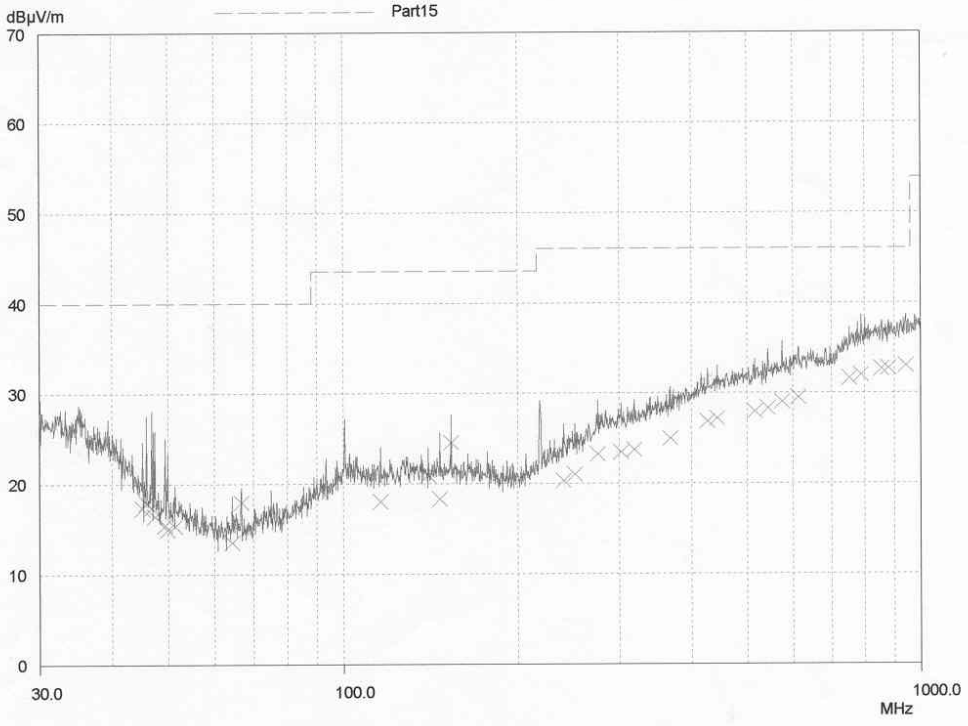
Scan Settings (1 Range)

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

Transducer	No.	Start	Stop	Name
1	21	30MHz	1000MHz	UH72
	22	30MHz	1000MHz	UH93

Final Measurement:

Detector:	X QP
Meas Time:	2sec
Subranges:	50
Acc Margin:	10 dB

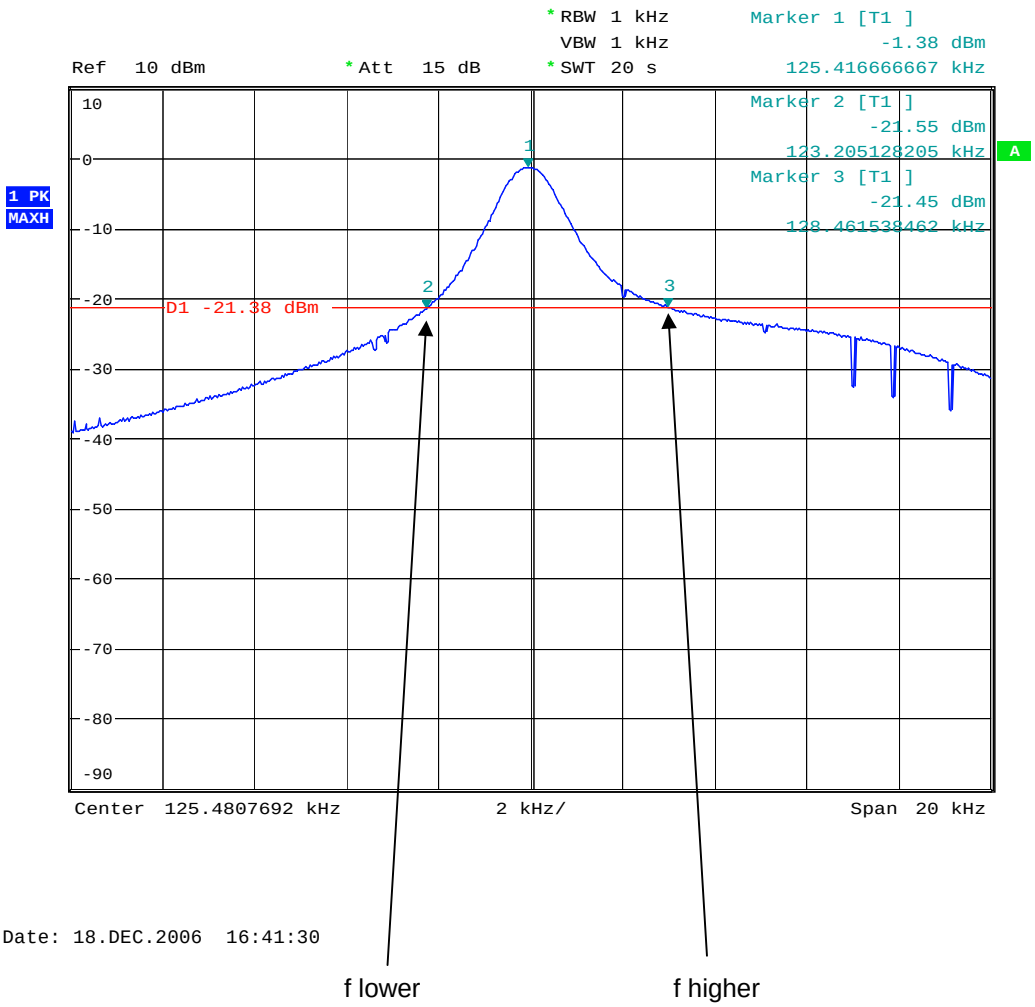


PAGE 1

ANNEX D

BANDWIDTH PLOT

BANDWIDTH PLOT



f lower	=	123.205 kHz
f higher	=	128.462 kHz
Occupied Bandwidth	=	5.257 kHz

ANNEX E

POWERLINE CONDUCTION GRAPH(s)

29 Nov 2006 08:57

Powerline Conduction

150kHz - 30MHz

EUT:	PR4 RF CARD READER
Manuf:	THIRD MILLENNIUM LTD
Op Cond:	LISN UH05, cable UH21 & Receiver UH187
Operator:	S HODGKINSON
Test Spec:	EN55022 Class B (or Variant)
Comment:	Neutral Line, 110V, 60Hz
	Unit in permanent tx mode,card located next to unit.

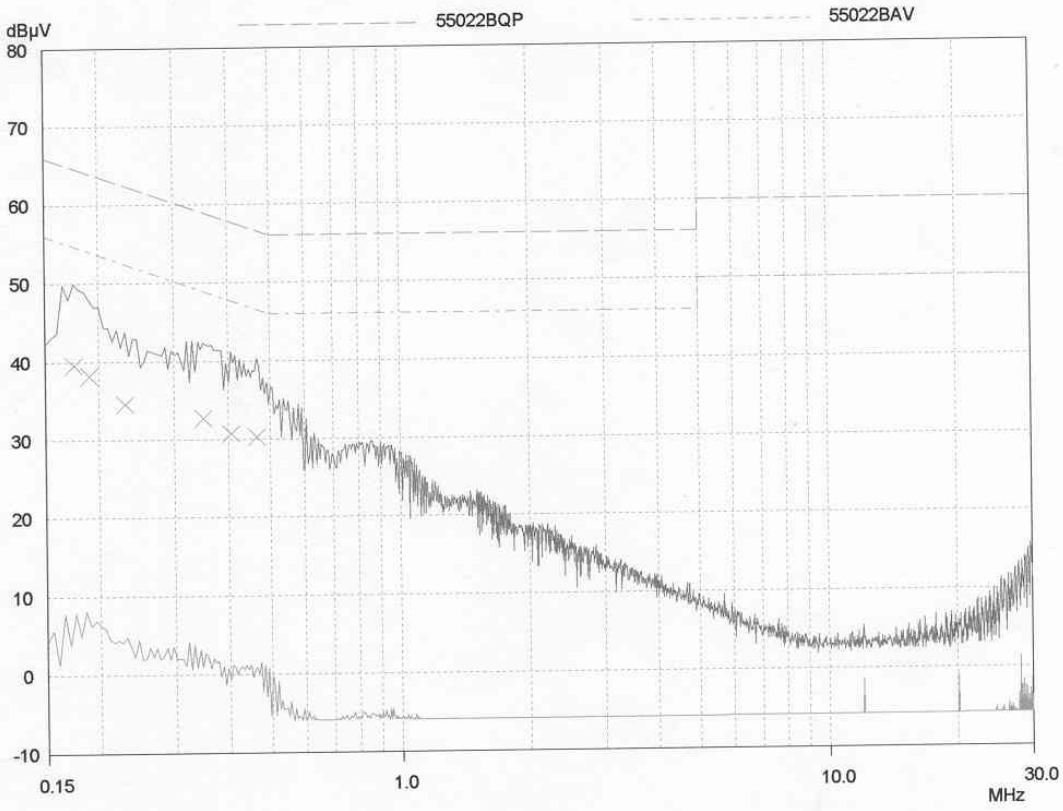
Scan Settings (1 Range)

Frequencies			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



PAGE 1

ANNEX F

TEST EQUIPMENT CALIBRATION

TRL Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
L007	Loop Antenna	R&S	29/03/2005	24	29/03/2007
UH003	Receiver < 30MHz	R&S	24/07/2006	12	24/07/2007
UH005	LISN	R&S	11/04/2006	12	11/04/2007
UH006	3m Range	TRL	19/04/2006	12	19/04/2007
UH007	10m Range	TRL	19/04/2006	12	19/04/2007
UH186	Receiver > 30MHz	R&S	01/02/2006	12	01/02/2007
UH187	Receiver < 30MHz	R&S	24/07/2006	12	24/07/2007

ANNEX G

MEASUREMENT UNCERTAINTY

Radio Testing – General Uncertainty Schedule

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence where no required test level exists.

[1] Adjacent Channel Power

Uncertainty in test result = **1.86dB**

[2] Carrier Power

Uncertainty in test result (Equipment - TRLUH120) = **2.18dB**
Uncertainty in test result (Equipment – TRL05) = **1.08dB**
Uncertainty in test result (Equipment – TRL479) = **2.48dB**

[3] Effective Radiated Power

Uncertainty in test result = **4.71dB**

[4] Spurious Emissions

Uncertainty in test result = **4.75dB**

[5] Maximum frequency error

Uncertainty in test result (Equipment - TRLUH120) = **119ppm**
Uncertainty in test result (Equipment – TRL05) = **0.113ppm**
Uncertainty in test result (Equipment – TRL479) = **0.265ppm**

[6] Radiated Emissions, field strength OATS 14kHz-18GHz Electric Field

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**, Uncertainty in test result (30MHz – 1GHz) = **4.6dB**, Uncertainty in test result (1GHz-18GHz) = **4.7dB**

[7] Frequency deviation

Uncertainty in test result = **3.2%**

[8] Magnetic Field Emissions

Uncertainty in test result = **2.3dB**

[9] Conducted Spurious

Uncertainty in test result (Equipment TRL479) Up to 8.1GHz = **3.31dB**
Uncertainty in test result (Equipment TRL479) 8.1GHz – 15.3GHz = **4.43dB**
Uncertainty in test result (Equipment TRL479) 15.3GHz – 21GHz = **5.34dB**
Uncertainty in test result (Equipment TRLUH120) Up to 26GHz = **3.14dB**

[10] Channel Bandwidth

Uncertainty in test result = **15.5%**

[11] Amplitude and Time Measurement – Oscilloscope

Uncertainty in overall test level = **2.1dB**, Uncertainty in time measurement = **0.59%,** Uncertainty in Amplitude measurement = **0.82%**

[11] Power Line Conduction

Uncertainty in test result = **3.4dB**

[12] Spectrum Mask Measurements

Uncertainty in test result = **2.59% (frequency)**
Uncertainty in test result = **1.32dB (amplitude)**

[13] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[14] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[15] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[16] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[17] Receiver Threshold

Uncertainty in test result = **3.23dB**

[18] Transmission Time Measurement

Uncertainty in test result = **7.98%**