

**A Radio Test Report**

**FOR**

**Paxton Access Ltd**

**ON**

**net10 VR reader**

**DOCUMENT NO. TRA-028550-47-01-A**

**Test Report** : TRA-028550-47-01-A

**Applicant** : Paxton Access Ltd

**Apparatus** : net10 VR reader

**Specification(s)** : CFR47 Part 15 C  
:RSS –Gen Issue 4 November 2014

**Purpose of Test** : Class II Change

**FCCID** : USE010818

**IC** :10217A-010818

**Authorised by** :

:Radio - Department Manager

**Issue Date** :23<sup>rd</sup> November 2015

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**1.1 General**

This report contains an assessment of an apparatus against Electromagnetic Compatibility Standards based upon tests carried out on samples submitted to the Laboratory.

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## **1.2 Tests Requested By**

This testing in this report was requested by :

Paxton Access Ltd  
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## **1.3 Manufacturer**

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## **1.4 Apparatus Assessed**

The following apparatus was assessed between: 6<sup>th</sup> October – 9<sup>th</sup> October 2015

Net10 VR Vandal resistant Reader makes use of 125kHz and 13.56MHz RFID technology.

## 1.5 Test Result Summary

Full details of test results are contained within Appendix A. The following table summarises the results of the assessment.

The statements relating to compliance with the standards below apply ONLY as qualified in the notes and deviations stated in sections 1.6 to 1.7 of this test report.

Full details of test results are contained within Appendix A. The following table summarises the results of the assessment.

Test Type	Regulation	Measurement standard	Result
Spurious Emissions Radiated <1000MHz	Title 47 of the CFR: Part 15 Subpart (c) 15. RSS Gen 8.9	ANSI C63.10:2013 RSS-Gen Issue 4	Pass
Intentional Emission Field Strength	Title 47 of the CFR: Part 15 Subpart (c) 15. RSS Gen 8.9	ANSI C63.10:2013 RSS-Gen Issue 4	Pass
Antenna Arrangements Integral:	Title 47 of the CFR: Part 15 Subpart (c) 15.203	-	
Antenna Arrangements External Connector	Title 47 of the CFR: Part 15 Subpart (c) 15.204	-	
Restricted Bands	Title 47 of the CFR: Part 15 Subpart (c) 15.205	-	
Maximum Frequency of Search	Title 47 of the CFR: Part 15 Subpart (c) 15.33	-	
Extrapolation Factor	Title 47 of the CFR: Part 15 Subpart (c) 15.31(f)	-	

Abbreviations used in the above table:

CFR : Code of Federal Regulations  
REFE : Radiated Electric Field Emissions

ANSI : American National Standards Institution  
PLCE : Power Line Conducted Emissions

## **1.6 Notes Relating To The Assessment**

With regard to this assessment, the following points should be noted:

The results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 1.7 of this test report (Deviations from Test Standards).

For emissions testing, throughout this test report, "Pass" indicates that the results for the sample as tested were below the specified limit (refer also to Section 2, Measurement Uncertainty).

Where relevant, the apparatus was only assessed using the monitoring methods and susceptibility criteria defined in this report.

All testing with the exception of testing at the Open Area Test Site was performed under the following environmental conditions:

Temperature	: 17 to 23 °C
Humidity	: 45 to 75 %
Barometric Pressure	: 86 to 106 kPa

All dates used in this report are in the format dd/mm/yy.

This assessment has been performed in accordance with the requirements of ISO/IEC 17025.

## **1.7 Deviations from Test Standards**

There were no deviations from the standards tested to.

## 2.1 Measurement Uncertainty Values

**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 = **0.9dB**

**[3] Effective Radiated Power**

Uncertainty in test result = **5.5dB**

**[4] Spurious Emissions**

Uncertainty in test result = **5.5dB**

**[5] Maximum frequency error**

Uncertainty in test result =  **$5 \times 10^{-8}$**

**[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 Up to 8.1GHz = **3.31dB**  
 Uncertainty in test result 8.1GHz – 15.3GHz = **4.43dB**  
 Uncertainty in test result 15.3GHz – 21GHz = **5.34dB**  
 Uncertainty in test result) 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%**



**[12] Power Line Conduction**

Uncertainty in test result = **3.4dB**

**[13] Spectrum Mask Measurements**

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

**[14] Adjacent Sub Band Selectivity**

Uncertainty in test result = **1.24dB**

**[15] Receiver Blocking – Listen Mode, Radiated**

Uncertainty in test result = **3.42dB**

**[16] Receiver Blocking – Talk Mode, Radiated**

Uncertainty in test result = **3.36dB**

**[17] Receiver Blocking – Talk Mode, Conducted**

Uncertainty in test result = **1.24dB**

**[18] Receiver Threshold**

Uncertainty in test result = **3.23dB**

**[19] Transmission Time Measurement**

Uncertainty in test result = **7.98%**

## **Section 3:**

## **Modifications**

### **3.1 Modifications Performed During Assessment**

No modifications were performed during the assessment

## Appendix A:

## Formal Emission Test Results

Abbreviations used in the tables in this appendix:

Spec	: Specification	ALSR	: Absorber Lined Screened Room
Mod	: Modification	OATS	: Open Area Test Site
EUT	: Equipment Under Test	ATS	: Alternative Test Site
SE	: Support Equipment	Ref	: Reference
L	: Live Power Line	Freq	: Frequency
N	: Neutral Power Line	MD	: Measurement Distance
E	: Earth Power Line	SD	: Spec Distance
Pk	: Peak Detector	Pol	: Polarisation
QP	: Quasi-Peak Detector	H	: Horizontal Polarisation
Av	: Average Detector	V	: Vertical Polarisation
CDN	: Coupling & decoupling network		

**A1 Transmitter Intentional Emission Radiated**

Carrier power was verified with the EUT transmitting	
Regulation	Title 47 of the CFR: Part15 Subpart (c) RSS Gen 8.9
Measurement standard	ANSI C63.10:2013 RSS-Gen issue 4
EUT sample number	S05/S08
Modification state	0
SE in test environment	N/A
SE isolated from EUT	S01,S02,S03,S04,S10,S11,S12
EUT set up	Refer to Appendix C
Temperature	25
Photographs (Appendix F)	

FREQ. (MHz)	MEASUREMENT DISTANCE Meters	MEASUREMENT Rx. READING (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)
13.56	3	58.40	33.28	18.02
Limit value @ fc		30 µV/m		

FREQ. (kHz)	MEASUREMENT DISTANCE Meters	MEASUREMENT Rx. READING (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)
124.13kHz	3	64.70	87.98	0.069
Limit value @ fc		19.20µV/m		

- Notes:**
- 1 Results quoted are extrapolated as indicated
  - 2 Receiver detector @ fc = Average / Quasi Peak 10 / 120kHz bandwidth
  - 3 When battery powered the EUT was powered with new batteries

- Test Method:**
- 1 As per Radio – Noise Emissions, ANSI C63.10:2013
  - 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.  
EUT orientation in three orthogonal planes.  
Maximum results recorded

## A2 Unintentional Radiated Emissions

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The radiated electric field emission test applies to all spurious emissions on directly related to the transmitter. The maximum permitted field strength is listed in Section 15.109. The EUT was set to operate in a transmit mode.

The following test site was used for final measurements as specified by the standard tested to:

3m open area test site :

3m alternative test site :

Test Details:	
Regulation	Title 47 of the CFR: Part15 Subpart (c) RSS Gen 8.9
Measurement standard	ANSI C63.10:2013 RSS-Gen issue 4
Frequency range	9kHz- 1GHz
EUT sample number	S08
Modification state	0
SE in test environment	N/A
SE isolated from EUT	S01,S02,S03,S04,S10,S11,S12
EUT set up	Refer to Appendix C
Temperature	25
Photographs (Appendix F)	

The worst case radiated emission measurements for spurious emissions are listed below:

Ref No.	FREQ. (MHz)	MEAS Rx (dBμV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBμV/m)	EXTRAP FACT (dB)	FIELD ST'GH (μV/m)	LIMIT (μV/m)
1.	30.65	7.29	0.8	18.6	-	29.69	N/A	21.60	100
2.	33.75	7.77	0.8	17.1	-	25.67	N/A	19.20	100
3.	34.70	8.34	0.8	16.6	-	25.74	N/A	19.36	100
4.	40.70	14.52	1.0	13.3	-	28.82	N/A	27.60	100
5.	43.05	11.40	1.0	12.0	-	24.40	N/A	16.59	100
6.	51.70	15.69	1.0	7.6	-	24.29	N/A	16.38	100
7.	56.35	18.10	1.0	6.4	-	25.50	N/A	18.83	100
8.	59.85	20.55	1.1	6.0	-	27.65	N/A	24.12	100
9.	60.60	17.28	1.1	5.9	-	24.28	N/A	16.36	100
10.	67.80	24.29	1.2	6.3	-	31.79	N/A	38.86	100
11.	81.40	18.94	1.3	7.9	-	28.14	N/A	25.52	100
12.	83.55	15.03	1.3	8.3	-	24.63	N/A	17.04	100
13.	87.65	12.98	1.4	8.9	-	23.28	N/A	14.58	100

Ref No.	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
14.	122.05	12.12	1.6	12.4	-	26.12	N/A	20.23	150
15.	162.75	12.98	1.9	10.5	-	25.38	N/A	18.57	150
16.	189.85	18.18	2.0	8.6	-	28.78	N/A	27.47	150
17.	216.95	23.00	2.0	9.3	-	34.30	N/A	51.88	200
18.	325.45	10.05	2.5	13.6	-	26.15	N/A	20.30	200
19.	352.55	10.78	2.5	14.2	-	27.48	N/A	23.65	200
20.	379.70	11.70	2.9	14.7	-	29.30	N/A	29.17	200
21.	433.95	8.15	2.9	16.0	-	27.05	N/A	22.51	200
22.	461.05	10.07	3.1	16.6	-	29.77	N/A	30.79	200

Note: 125kHz and 13.56MHz both active.

Notes:

- 1 Any testing performed below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.10:2013: section 4.5, Table 1 For emissions below 30MHz the cable losses are assumed to be negligible.
- 2 For Frequencies below 1 GHz, RBW = 120 kHz, testing was performed with CISPR16 compliant test receiver with QP detector. Above 1 GHz tests were performed using a spectrum analyser using the following settings:

Peak                    RBW= 1MHz, VBW ≥ RBW  
Average                RBW= 1MHz, VBW ≥ RBW

The upper and lower frequency of the measurement range was decided according to 47 CFR Part 15: Clause 15.33(a) and 15.33(a)(1).

Radiated emission limits 47 CFR Part 15: Clause 15.209 for all emissions:

Frequency of emission (MHz)	Field strength $\mu\text{V}/\text{m}$	Measurement Distance m	Field strength $\text{dB}\mu\text{V}/\text{m}$
0.009-0.490	2400/F(kHz)	300	67.6/F (kHz)
0.490-1.705	24000/F(kHz)	30	87.6/F (kHz)
1.705-30	30	30	29.5
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
Above 960	500	3	54.0

- (a) Where results have been measured at one distance, and a signal level displayed at another, the results have been extrapolated using the following formula:

$$\text{Extrapolation (dB)} = 20 \log_{10} \left( \frac{\text{measurement distance}}{\text{specification distance}} \right)$$

- (b) The levels may have been rounded for display purposes.
- (c) The following table summarises the effect of the EUT operating mode, internal configuration and arrangement of cables / samples on the measured emission levels :

	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels	✓	✓	✓	✓
Effect of EUT internal configuration on emission levels	✓	✓	✓	✓
Effect of Position of EUT cables & samples on emission levels	✓	✓	✓	✓
(i) Parameter defined by standard and / or single possible, refer to Appendix D				
(ii) Parameter defined by client and / or single possible, refer to Appendix D				
(iii) Parameter had a negligible effect on emission levels, refer to Appendix D				
(iv) Worst case determined by initial measurement, refer to Appendix D				



## **Appendix B:**

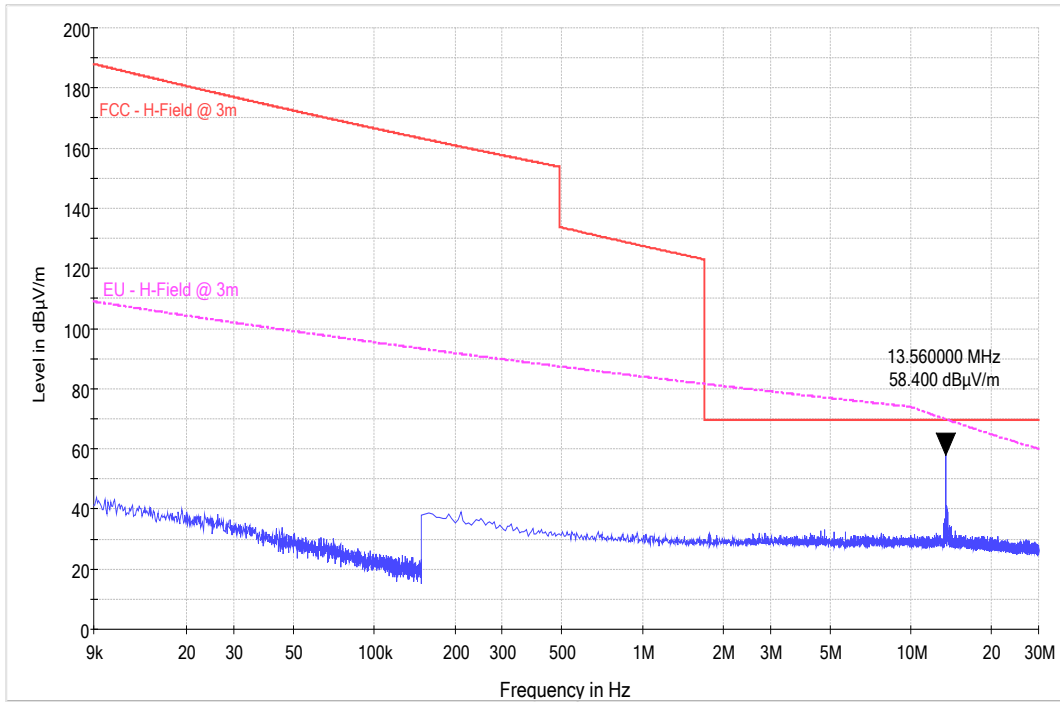
## **Supporting Graphical Data**

This appendix contains graphical data obtained during testing.

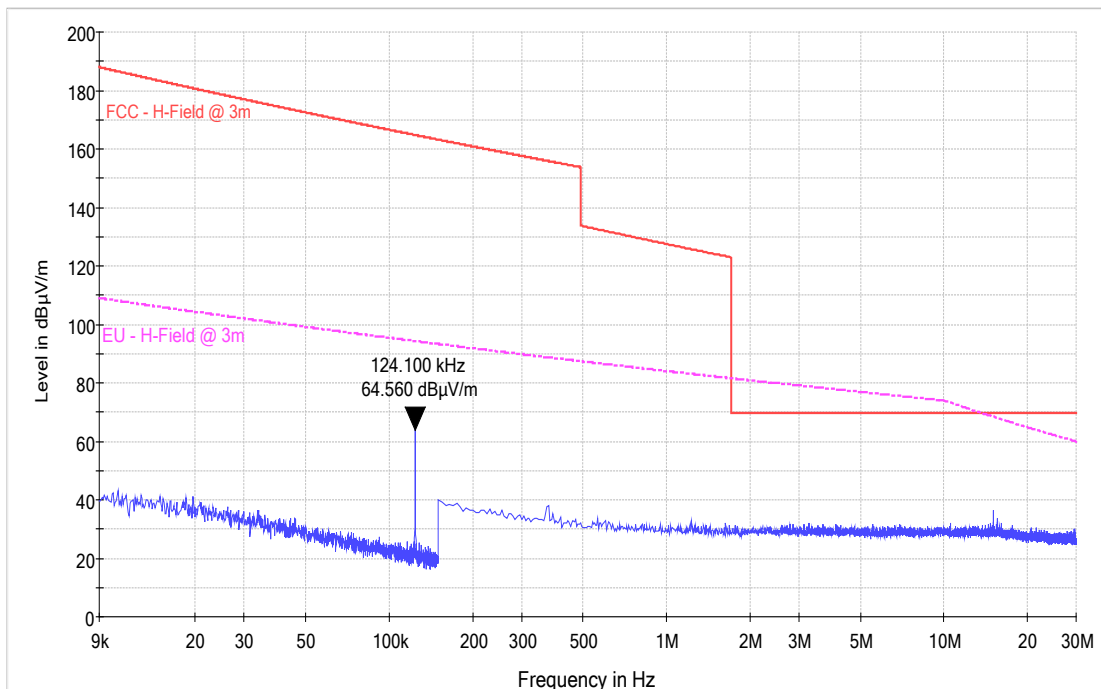
Notes:

- (a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.
- (b) The time and date on the plots do not necessarily equate to the time of the test.
- (c) Where relevant, on power line conducted emission plots, the limit displayed is the average limit, which is stricter than the quasi peak limit.
- (d) Appendix C details the numbering system used to identify the sample and its modification state.
- (e) The plots presented in this appendix may not be a complete record of the measurements performed, but are a representative sample, relative to the final assessment.

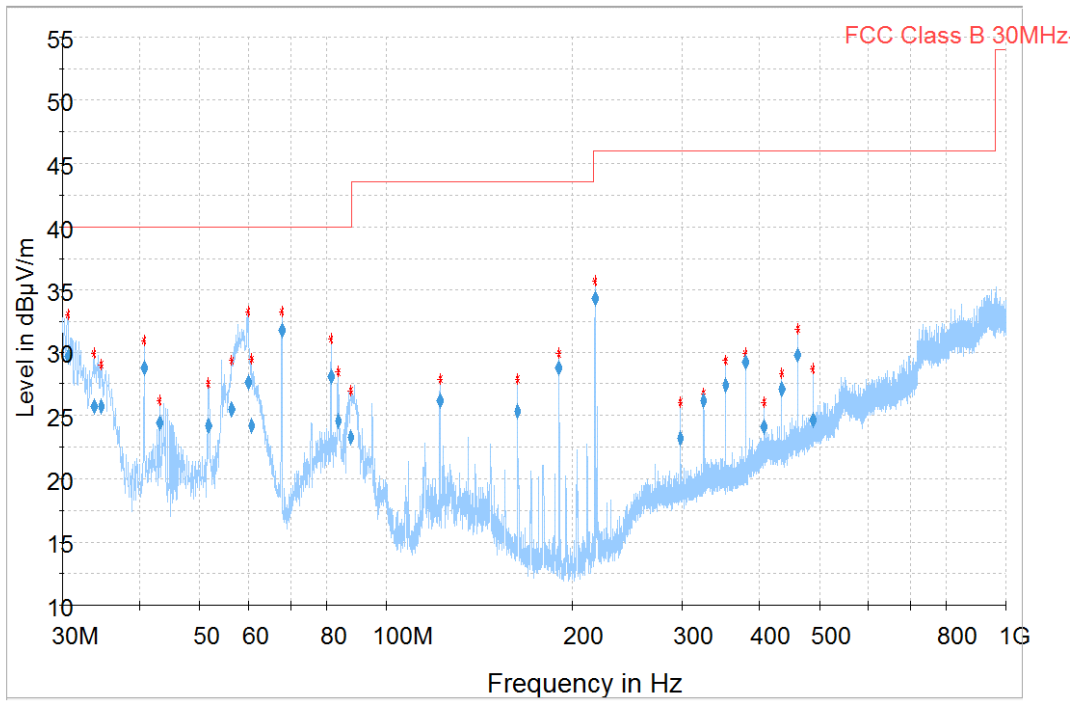
Radiated spurious emissions 9 kHz to 30 MHz  
13.56MHz



Radiated spurious emissions 9 kHz to 30 MHz  
125kHz



# Unintentional Radiated spurious emissions 30 MHz to 1 GHz



## Appendix C: Additional Test and Sample Details

This appendix contains details of:

1. The samples submitted for testing.
2. Details of EUT operating mode(s)
3. Details of EUT configuration(s) (see below).
4. EUT arrangement (see below).

Throughout testing, the following numbering system is used to identify the sample and it's modification state:

**Sample No:** Sxx Mod w

where:

xx	= sample number	eg. S01
w	= modification number	eg. Mod 2

The following terminology is used throughout the test report:

**Support Equipment (SE)** is any additional equipment required to exercise the EUT in the applicable operating mode. Where relevant SE is divided into two categories:

SE in test environment: The SE is positioned in the test environment and is not isolated from the EUT (e.g. on the table top during REFE testing).

SE isolated from the EUT: The SE is isolated via filtering from the EUT. (e.g. equipment placed externally to the ALSR during REFE testing).

**EUT configuration** refers to the internal set-up of the EUT. It may include for example:

- Positioning of cards in a chassis.
- Setting of any internal switches.
- Circuit board jumper settings.
- Alternative internal power supplies.

Where no change in EUT configuration is **possible**, the configuration is described as "single possible configuration".

**EUT arrangement** refers to the termination of EUT ports / connection of support equipment, and where relevant, the relative positioning of samples (EUT and SE) in the test environment.

For further details of the test procedures and general test set ups used during testing please refer to the related document "EMC Test Methods - An Overview", which can be supplied by TRaC Global upon request.

**C1) Test samples**

The following samples of the apparatus were submitted by the client for testing :

Sample No.	Description	Identification
S05	13.56MHz RFID Anti vandal RFID door sensor	N/A
S07	Standard (both RFID on) Anti Vandal RFID door sensor	N/A
S08	125kHz RFID Anti vandal RFID door sensor	N/A

The following samples of apparatus were submitted by the client as host, support or drive equipment (auxiliary equipment):

Sample No.	Description	Identification
S01	Net10 Controller	N/A
S02	Net10 door connector	2782321
S03	POE	POE31U-1AT
S04	3 Com Switch	3CFSU05
S10	1 mtr Ethernet cable	N/A
S11	3 mtr Ethernet cable	N/A
S12	1 mtr Ethernet cable	N/A

**C2) EUT Operating Mode During Testing.**

During testing, the EUT was exercised as described in the following tables :

Test	Description of Operating Mode
All tests detailed in this report	

Test	Description of Operating Mode:
ALL	EUT Transmitting 125kHz, and 13.56MHz

**C3) EUT Configuration Information.**

The EUT was submitted for testing in one single possible configuration.

#### C4) List of EUT Ports

The tables below describe the termination of EUT ports:

Sample : S08  
Tests : Radiated Emissions

Port	Description of Cable Attached	Cable length	Equipment Connected
Ethernet Switch	Ethernet cable	1mtr	POE Injector
POE Injector	Ethernet cable	3mtr	Net10 Controller
Net10 Controller	Ethernet cable	1mtr	Net10 door connector
Net10 door connector	Reader Cable RS485	5mtr	RFID Reader



## C5 Details of Equipment Used

For Radiated Measurements:

Element Ref	Type	Description	Manufacturer	Date Calibrated.
U003	ESHS10	Receiver	R&S	25/06/2016
L007	hfh2	Loop Antenna	R&S	10/04/2015
U191	CBL611/A	Bilog	Chase	26/02/2015
L317	ESVS10	Receiver	R&S	26/02/2015
REF940	ATS	Radio Chamber - PP	Rainford EMC	08/09/2014

Test Chamber Registration Number

REF940	ATS	IC Reg Radio Chamber - PP	3930B-4	Rainford EMC	19/11/2014
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**Appendix D:**

**Additional Information**

No additional information is included within this test report.

## **Appendix E:**

## **Photographs and Figures**

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement.
2. Radiated electric field emissions arrangement.

Photograph 1



Photograph 2

