Report On

FCC and Industry Canada Testing of the
Frontier Silicon Ltd Minuet/FS5332
In accordance with FCC 47 CFR Part 15B and ICES-003

COMMERCIAL-IN-CONFIDENCE

FCC ID: YYX-FS5332
IC: 11458A-FS5332

Document 75934517 Report 10 Issue 2 July 2016

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REPORT ON FCC and Industry Canada Testing of the
Frontier Silicon Ltd Minuet/FS5332
In accordance with FCC 47 CFR Part 15B and ICES-003

Document 75934517 Report 10 Issue 2

July 2016

PREPARED FOR Frontier Silicon Ltd
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APPROVED BY

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Authorised Signatory

DATED 29 July 2016

This report has been up-issued to Issue 3 to amend the FCC and IC ID's.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15B and ICES-003. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

G Lawler

UKAS TESTING 0141

Product Service

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Product Service

SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
Frontier Silicon Ltd Minuet/FS5332
In accordance with FCC 47 CFR Part 15B and ICES-003

1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC and Industry Canada Testing of the Frontier Silicon Ltd Minuet/FS5332 to the requirements of FCC 47 CFR Part 15B and ICES-003.

Objective	To perform FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Frontier Silicon Ltd
Model Number(s)	Minuet/FS5332
Serial Number(s)	RAD108621 (Module) & RAD108181 (Platform) - Radiated
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15B (2015) ICES-003 (2016)
Incoming Release Date	Declaration of Build Status 11 July 2016
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	FS160438 08 April 2016
Start of Test	5 July 2016
Finish of Test	10 July 2016
Name of Engineer(s)	G Lawler
Related Document(s)	ANSI C63.4 (2014)

Product Service

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15B and ICES-003 is shown below.

Section	Specification Clause		Test Description	Result	Comments/Base Standard
	Part 15B	ICES-003			
Idle with receiver operating					
2.1	15.107	6.1	AC Line Conducted Emissions	Pass	
2.2	15.109	6.2	Radiated Emissions	Pass	

Product Service

1.3 DECLARATION OF BUILD STATUS

MAIN EUT			
MANUFACTURING DESCRIPTION	Wi-Fi and Bluetooth Module		
MANUFACTURER	Frontier Silicon Limited		
MODEL NAME/NUMBER	Minuet/FS5332		
PART NUMBER	HA-FS5332-xxxxxx (where xxxxxxx denotes the customer variant eg HA-FS5332-000001)		
SERIAL NUMBER			
HARDWARE VERSION	Rev6		
SOFTWARE VERSION	NS1.0.13		
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	2400-2483.5MHz, 5150-5350MHz, 5427MHz-5825MHz		
RECEIVER FREQUENCY OPERATING RANGE (MHz)	2400-2483.5MHz, 5150-5350MHz, 5427MHz-5825MHz		
COUNTRY OF ORIGIN	China		
INTERMEDIATE FREQUENCIES	Not specified		
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)	2G00F7D, 5G00F7D		
MODULATION TYPES: (i.e. GMSK, QPSK)	DBPSK, BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM		
HIGHEST INTERNALLY GENERATED FREQUENCY	5825MHz		
OUTPUT POWER (W or dBm)	WLAN: 20dBm EIRP; BT: 9.9dBm EIRP		
FCC ID	YYX-FS5332		
INDUSTRY CANADA ID	11458A-FS5332		
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Minuet is a module, which when installed in a consumer audio product enables high-quality audio streaming over Wi-Fi, Bluetooth and Ethernet.		
BATTERY/POWER SUPPLY			
MANUFACTURING DESCRIPTION	Not specified		
MANUFACTURER	GME		
TYPE	Switching power adapter		
PART NUMBER	GME10C-050200FX		
VOLTAGE	5V DC		
COUNTRY OF ORIGIN	China		
MODULES (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
POWER			
FCC ID			
COUNTRY OF ORIGIN			
INDUSTRY CANADA ID			
EMISSION DESIGNATOR			
DHSS/FHSS/COMBINED OR OTHER			
ANCILLARIES (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
SERIAL NUMBER			
COUNTRY OF ORIGIN			

I hereby declare that that the information supplied is correct and complete.

Name: Abdul Wahed Dewan Position held: Principal RF Engineer
Date: 11/07/2016

Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Frontier Silicon Ltd Minuet/FS5332. A full technical description can be found in the manufacturer's documentation.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 5.00 V DC supply.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

Industry Canada Company Address Code
IC2932B-1 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard were made during testing.

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.

Product Service

SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
Frontier Silicon Ltd Minuet/FS5332
In accordance with FCC 47 CFR Part 15B and ICES-003

Product Service

2.1 AC LINE CONDUCTED EMISSIONS

2.1.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.107
ICES-003, Clause 6.1

2.1.2 Equipment Under Test and Modification State

Minuet/FS5332 S/N: RAD108621 (Module) & RAD108181 (Platform) - Modification State 0

2.1.3 Date of Test

5 July 2016

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

The test was performed in accordance with ANSI C63.4, Clause 7 and ICES-003, Clause 6.1.

Remarks

A mains supply cable of 1 m length was used to supply mains power to the EUT from the LISN.

All final measurements were assessed against the Class B emission limits in FCC 47 CFR Part 15, Clause 15.107 and ICES-003, Clause 6.1.

2.1.6 Environmental Conditions

Ambient Temperature	22.1°C
Relative Humidity	45.0%

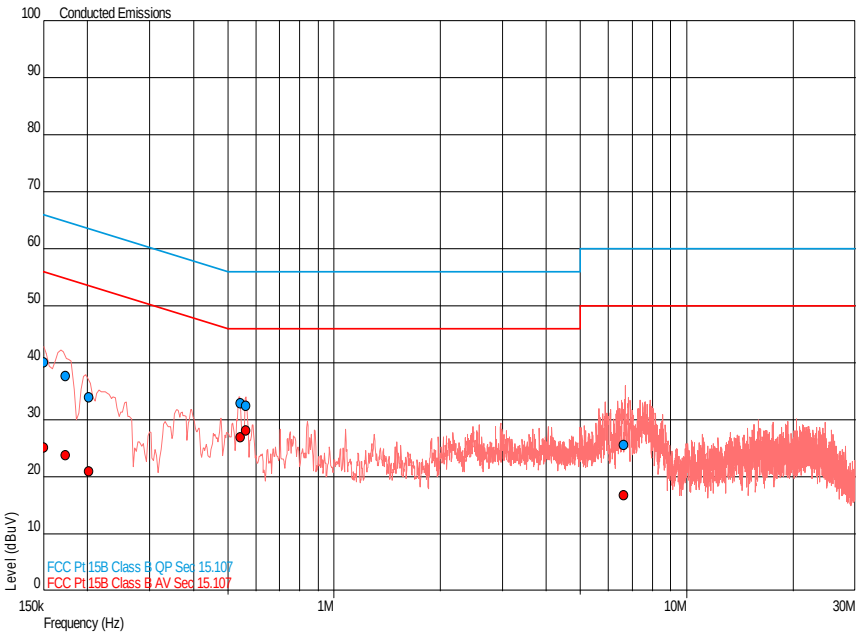
Product Service

2.1.7 Test Results

Idle with receiver operating, Live Line Results

Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (µV/m)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.150	40.1	66.0	-25.9	25.2	56.0	-30.8
0.173	37.6	64.8	-27.2	23.7	54.8	-31.1
0.202	34.0	63.5	-29.5	20.9	53.5	-32.6
0.542	32.9	56.0	-23.1	26.9	46.0	-19.1
0.563	32.5	56.0	-23.5	28.1	46.0	-17.9
6.635	25.6	60.0	-34.4	16.9	50.0	-33.1

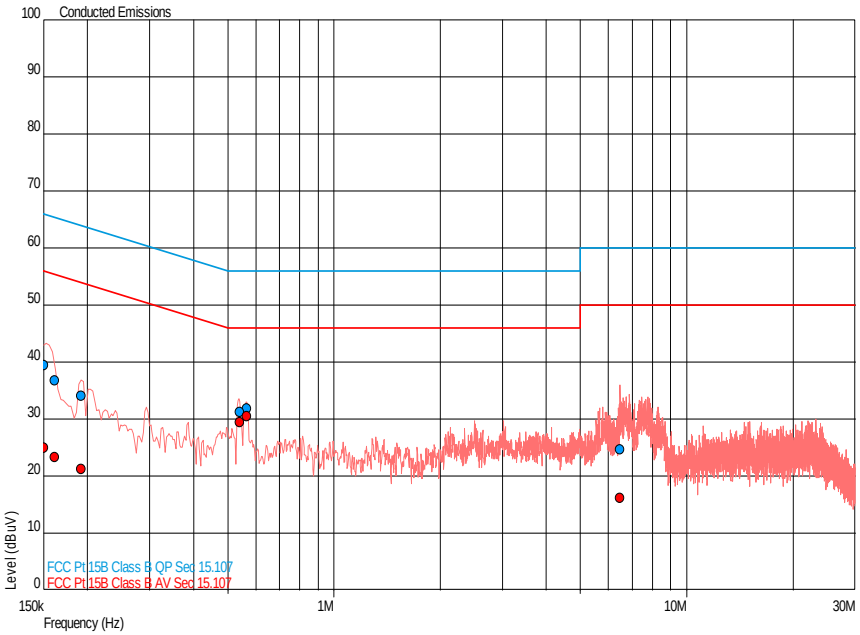
Idle with receiver operating, Live Line Plot



Idle with receiver operating, Neutral Line Results

Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (µV/m)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.150	39.5	66.0	-26.5	25.0	56.0	-31.0
0.161	36.9	65.4	-28.5	23.3	55.4	-32.1
0.192	34.1	64.0	-29.8	21.3	54.0	-32.7
0.540	31.2	56.0	-24.8	29.4	46.0	-16.6
0.564	31.9	56.0	-24.1	30.5	46.0	-15.5
6.461	24.7	60.0	-35.3	16.2	50.0	-33.8

Idle with receiver operating, Neutral Line Plot



FCC 47 CFR Part 15, Limit Clause 15.107 and ICES-003, Limit Clause 6.1

Class B

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

*Decreases with the logarithm of the frequency.

Product Service

2.2 RADIATED EMISSIONS

2.2.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.109
ICES-003, Clause 6.2

2.2.2 Equipment Under Test and Modification State

Minuet/FS5332 S/N: RAD108621 (Module) & RAD108181 (Platform) - Modification State 0

2.2.3 Date of Test

5 July 2016 & 10 July 2016

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

The test was performed in accordance with ANSI C63.4, Clause 8 and ICES-003, Clause 6.2.

Remarks

When frequencies greater than 18 GHz were measured the EUT was positioned 1 m above the horizontal reference ground plane.

All final measurements were assessed against the Class B emission limits in FCC 47 CFR Part 15, Clause 15.109 and ICES-003, Clause 6.2.

2.2.6 Environmental Conditions

Ambient Temperature	20.8 - 22.1°C
Relative Humidity	45.0 - 65.0%

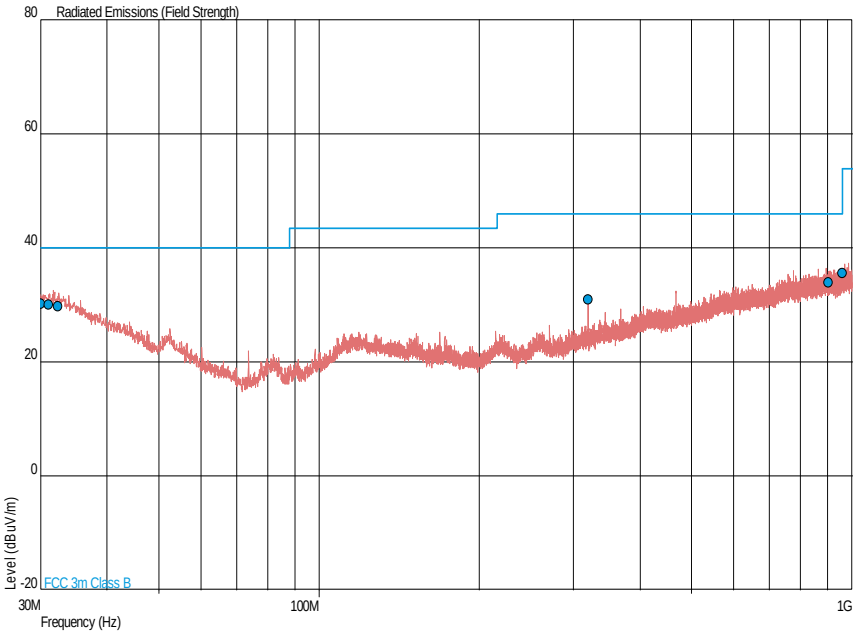
Product Service

2.2.7 Test Results

Idle with receiver operating, 30 MHz to 1 GHz Results

Frequency (MHz)	Quasi-Peak Level (dBµV/m)	Quasi-Peak Level (µV/m)	Quasi-Peak Margin (dµV/m)	Quasi-Peak Margin (µV/m)	Angle (°)	Height (m)	Polarisation
30.016	30.3	32.7	-9.7	-67.3	136	1.00	Horizontal
31.066	30.1	32.0	-9.9	-68.0	174	1.00	Vertical
32.370	29.8	30.9	-10.2	-69.1	322	1.00	Horizontal
319.509	30.9	35.1	-15.1	-164.9	173	1.56	Vertical
902.052	33.9	49.5	-12.1	-150.5	13	1.27	Vertical
960.000	35.6	60.3	-10.4	-139.7	356	1.00	Vertical

Idle with receiver operating, 30 MHz to 1 GHz Plot

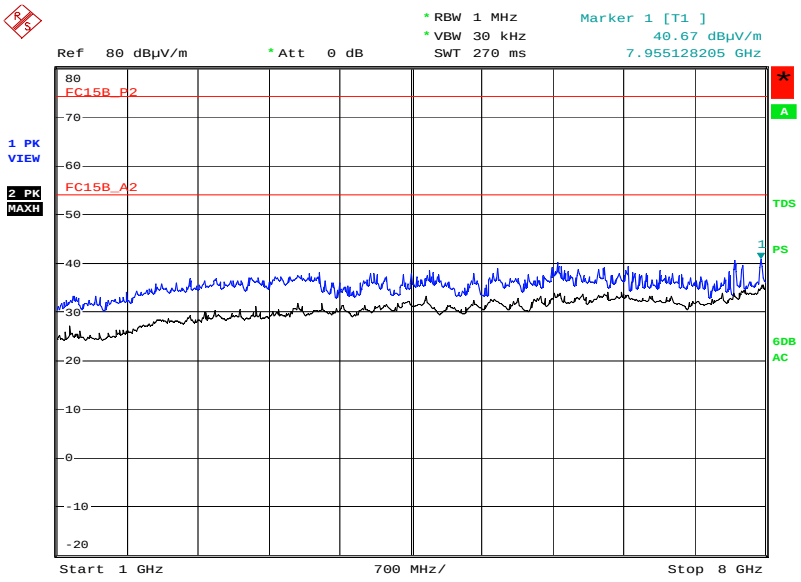


Idle with receiver operating, 1 GHz to 30 GHz Results

Frequency (MHz)	Average Level (dBµV/m)	Peak Level (dBµV/m)	Average Level (µV/m)	Peak Level (µV/m)	Angle (deg)	Height (m)	Polarisation
*							

*No emissions were detected within 10 dB of the limit.

Idle with receiver operating, 1 GHz to 8 GHz Plot



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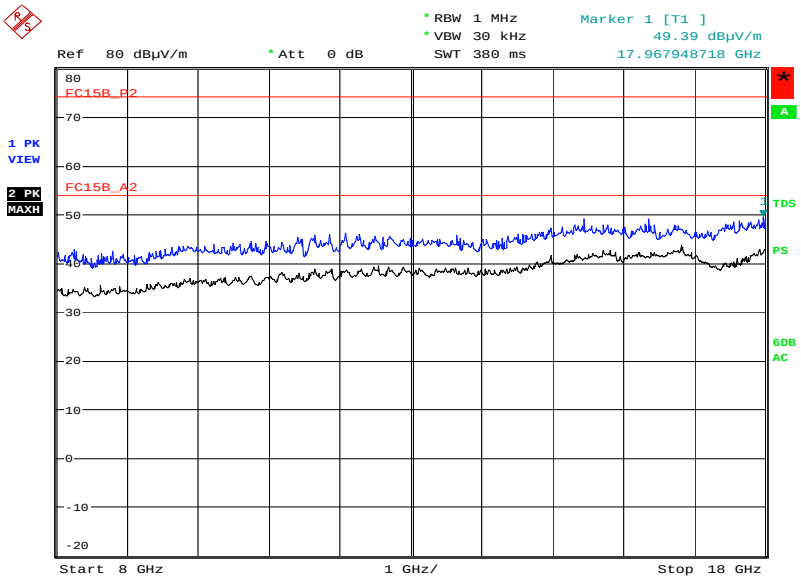
Idle with receiver operating, 8 GHz to 18 GHz Plot



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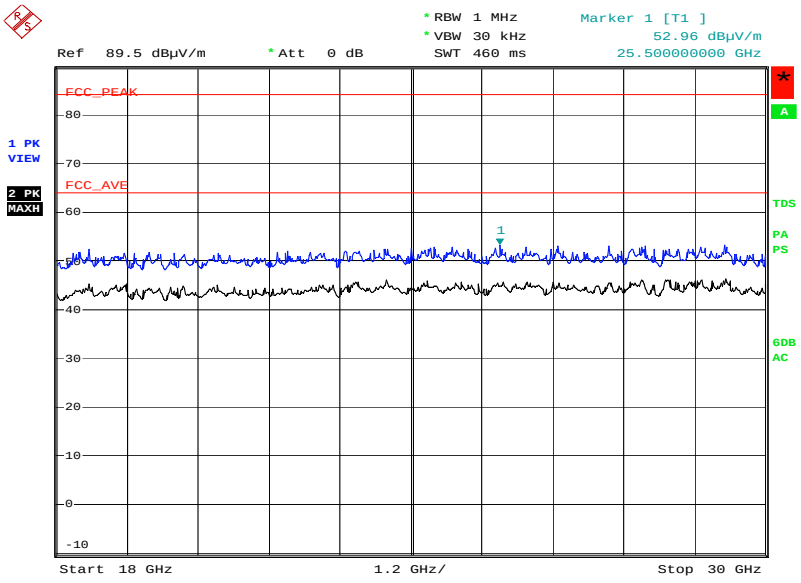
Idle with receiver operating, 18 GHz to 30 GHz Plot



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FCC 47 CFR Part 15, Limit Clause 15.109

Class B

Frequency of Emission (MHz)	Field Strength (µV/m)
30 to 88	100.0
88 to 216	150.0
216 to 960	200.0
Above 960	500.0

ICES-003, Limit Clause 6.2

Class B

Frequency of Emission (MHz)	Quasi-Peak (dBµV/m)
30 to 88	40.0
88 to 216	43.5
216 to 960	46.0
960 to 1000	54.0

Frequency of Emission (MHz)	Field Strength (dBµV/m)	
	Linear Average Detector	Peak Detector
Above 1000	54.0	74.0

Product Service

SECTION 3

TEST EQUIPMENT USED

Product Service

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 – AC Line Conducted Emissions					
LISN	Rohde & Schwarz	ESH2-Z5	17	12	11-Feb-2017
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Hygrometer	Rotronic	A1	1388	12	13-Apr-2017
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Transient Limiter	Hewlett Packard	11947A	2377	12	16-Feb-2017
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	2-Nov-2016
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
Section 2.2 - Radiated Emissions					
Multimeter	Iso-tech	IDM-101	466	12	11-Sep-2016
Hygrometer	Rotronic	A1	1388	12	13-Apr-2017
Pre-Amplifier	Phase One	PS04-0086	1533	12	30-Jul-2016
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	11-Jun-2017
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	2-Nov-2016
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Cable (Yellow, Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4527	-	TU
PoE Testbox	TUV SUD Product Service		4635	-	TU
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	29-Dec-2016

TU – Traceability Unscheduled

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	MU
AC Line Conducted Emissions	± 3.2 dB
Radiated Emissions	30 MHz to 1 GHz: ± 5.1 dB 1 GHz to 40 GHz: ± 6.3 dB

Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).