Report On

Limited FCC and Industry Canada Testing of the
Frontier Silicon Ltd Venice 6.5
In accordance with FCC CFR 47 Part 15B and ICES-003

COMMERCIAL-IN-CONFIDENCE

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Document 75917143 Report 07 Issue 2

June 2012

PREPARED FOR

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APPROVED BY

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DATED 08 June 2012

This report has been up-issued to Issue 2 to amend typographical errors.

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 CFR 47 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

Product Service

CONTENTS

Product Service

SECTION 1

REPORT SUMMARY

Limited FCC and Industry Canada Testing of the
Frontier Silicon Ltd Venice 6.5
In accordance with FCC CFR 47 Part 15B and ICES-003

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Limited FCC and Industry Canada Testing of the Frontier Silicon Ltd Venice 6.5 to the requirements of FCC CFR 47 Part 15B and ICES-003.

Objective	To perform Limited 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)	Venice 6.5
Serial Number(s)	RAD103045
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 15B and ICES-003 (2011 and 2004)
Incoming Release Date	Application Form 29 May 2012
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	FS021247 17 February 2012
Start of Test	4 April 2012
Finish of Test	9 April 2012
Name of Engineer(s)	G Lawler

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1.2 BRIEF SUMMARY OF RESULTS

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

Section	Spec Clause	Test Description	Result	Comments/Base Standard
Idle				
2.1	15.107 and 7.1	AC Line Conducted Emissions	Pass	
2.2	15.109 and 7.1	Radiated Emissions	Pass	

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1.3 APPLICATION FORM

EQUIPMENT DESCRIPTION		
Model Name/Number	Venice 6.5	
Part Number	HA-FS2026-F5xxxx ('FCC variant , 'x' depends on customer variant e.g.HA-FS2026-F50008) and HA-FS2026-05xxxx ('ETSI variant , 'x' depends on customer variant e.g.HA-FS2026-050008)	
FCC ID (if applicable)	YYX-HA-FS2026-F5	
Industry Canada ID (if applicable)		
Technical Description (Please provide a brief description of the intended use of the equipment)		The Venice 6.5 is a radio module supporting Internet Radio (WiFi or Ethernet), Networked Audio Streaming (WiFi or Ethernet), iPod/iPhone/iPad control and DAB/DAB+/FM-RDS reception when installed in a consumer audio product.

EXTREME TEMPERATURE RANGE over which the equipment is to be type tested
☐ -20°C to +55°C
☒ Other (2)
☐ Not applicable (no extreme temperature testing required)
Extreme temperature range for the host(s): 0degC to +70degC

(2) The equipment shall be tested over the following temperature ranges :

a) 0°C to +35°C for equipment for indoor use only, or intended for used in areas where the temperature is controlled within this range.

b) Over the extremes of the temperature range(s) of the declared host equipment(s) in case of plug-in radio devices.

TYPE OF ANTENNA			
☒ Integral			
Temporary RF connector provided:			☒ Yes ☐ No
☒ Antenna connector			
☐ Number of antenna assembly(ies) submitted 2			
Gain of the antenna intended for normal use:			
4.0	dBi	for assembly identified as	Onboard PIFA antenna
1.5	dBi	for assembly identified as	Integral External Antenna (Kinsun 6604313035-200)
	dBi	for assembly identified as	
	dBi	for assembly identified as	
	dBi	for assembly identified as	

Product Service

TRANSMITTER TECHNICAL CHARACTERISTICS		
TRANSMITTER OPERATING FREQUENCY RANGE(S)		
	FCC and/or Industry Canada	**EU**
Bluetooth	to MHz	to MHz
WLAN	2400 to 2483.5 MHz	2400 to 2483.5 MHz
FCC and/or Industry Canada (only)		
Highest Internally Generated Frequency 2483.5 MHz		

SPREAD SPECTRUM PARAMETERS

☐ **Bluetooth**

FHSS: Channel ☐ 79 Other	EDR ☐ Yes ☐ No

Medium Access Protocol (Customer Declaration)

.

☒ **WLAN**

IEEE 802.11(b) – DSSS ☒

IEEE 802.11(g) – OFDM ☒

IEEE 802.11(n) – OFDM ☒

Supported Spatial Streams

	2.4 GHz	5GHz
Transmitter (Tx)		
Receiver (Rx)		

GI (Guard Interval) ☒ 800 ns ☒ 400 ns

Band Width ☒ 20 MHz ☒ 40 MHz

☐ **Other Technology**

☐ Direct Sequence ☐ Frequency Hopping ☐ Combined ☐ Other

DSSS	Chip Sequence Length	bit
	Spectrum Width	MHz
FHSS	Total Number of Hops	
	Dwell Time	ms
	Bandwidth Per Hop	MHz
	Maximum Separation of Hops	MHz for ETSI EN 300 328
Other		

Medium Access Protocol (Customer Declaration)

"We have implemented IEEE 802.11 (b/g/n) protocol which satisfies the medium access protocol requirement of EN 300 328".

Product Service

TRANSMITTER POWER CHARACTERSITICS								
Bluetooth								
Maximum Rated Transmitter Output								
Effective radiated power (for equipment with antenna connector)					W			
Effective radiated power (for equipment with integral antenna)					W			
Minimum Rated Transmitter Output								
Effective radiated power (for equipment with antenna connector)					W			
Effective radiated power (for equipment with integral antenna)					W			
Is transmitter intended for :								
Continuous duty						☐	Yes	☐ No
Intermittent duty						☐	Yes	☐ No
If intermittent state DUTY CYCLE								
Transmitter ON	seconds		Transmitter OFF		minutes			
Is continuous operation possible for testing purposes?						☐	Yes	☐ No
Is transmitter output power variable:						☐	Yes	☐ No
State during the test:								
Transmitter duty cycle	Tx on	Seconds	Tx Off	Seconds				
Duty cycle (Tx on /(Tx on +Tx off))		%						
☐ Continuously variable			☐ Stepped					
dB per step								
WLAN								
Maximum Rated Transmitter Output								
Effective radiated power (for equipment with antenna connector)					W			
Effective radiated power (for equipment with integral antenna)				0.1	W			
Minimum Rated Transmitter Output								
Effective radiated power (for equipment with antenna connector)					W			
Effective radiated power (for equipment with integral antenna)				0.003	W			
Is transmitter intended for :								
Continuous duty						☐	Yes	☐ No
Intermittent duty						☒	Yes	☐ No
If intermittent state DUTY CYCLE								
Transmitter ON	seconds		Transmitter OFF		minutes			
Is continuous operation possible for testing purposes?						☒	Yes	☐ No
Is transmitter output power variable:						☒	Yes	☐ No
State during the test:								
Transmitter duty cycle	Tx on	Seconds	Tx Off	Seconds				
Duty cycle (Tx on /(Tx on +Tx off))		%						
☐ Continuously variable			☒ Stepped					
1 dB per step								

Product Service

TRANSMITTER POWER SOURCE (3)					
☒ Common power source for transmitter and receiver					
☐ AC mains		State voltage			
AC supply frequency	(Hz)	VAC		Max Current	Hz
☐ Single phase			☐ Three phase		
And / Or					
☒ External DC supply					
Nominal voltage	4V, 3.3V, 1.2V		Max Current		A
Extreme upper voltage	4.2, 3.47, 1.26		Extreme lower voltage	3.8, 3.14, 1.14	
Battery					
☐ Nickel Cadmium					
☐ Lead acid (Vehicle regulated)					
☐ Alkaline					
☐ Lithium					
☐ Other Details :					
Volts nominal.					
End point voltage as quoted by equipment manufacturer			V		

(3) If a transmitter and receiver use the same power source, this should be declared. In such cases only the box for the transmitter power source should be filled in.

AUTOMATIC EQUIPMENT SWITCH OFF	
If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum and minimum calculated values this shall be clearly stated.	
☐ Applies	V cut-off voltage
☒ Does not apply	

Product Service

RECEIVER POWER SOURCE (4)					
☐ AC mains		State voltage			
AC supply frequency	(Hz)	VAC	Max Current		Hz
☐ Single phase		☐ Three phase			
And / Or					
☐ External DC supply					
Nominal voltage		Max Current		A	
Extreme upper voltage		Extreme lower voltage			
Battery					
☐ Nickel Cadmium					
☐ Lead acid (Vehicle regulated)					
☐ Alkaline					
☐ Lithium					
☐ Other Details :					
Volts nominal.					
End point voltage as quoted by equipment manufacturer		V			

(4) If a transmitter and receiver use the same power source, this should be declared. In such cases only the box for the transmitter power source should be filled in.

AUTOMATIC EQUIPMENT SWITCH OFF
If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum and minimum calculated values this shall be clearly stated.
☐ Applies V cut-off voltage
☐ Does not apply

I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Signature:  Name: Abdul Wahed Dewan

Position held: Principal RF Engineer Date: 2/4/2012

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Frontier Silicon Ltd Venice 6.5. 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 4V, 3.3V and 1.2V DC supply.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard or test plan 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

Limited FCC and Industry Canada Testing of the
Frontier Silicon Ltd Venice 6.5
In accordance with FCC CFR 47 Part 15B and ICES-003

2.1 AC LINE CONDUCTED EMISSIONS

2.1.1 Specification Reference

FCC CFR 47 Part 15B and ICES-003, Clause 15.107 and 7.1

2.1.2 Equipment Under Test and Modification State

Venice 6.5 S/N: RAD103045 - Modification State 0

2.1.3 Date of Test

9 April 2012

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 EUT is set up on a test table 800mm above a horizontal ground plane. A vertical ground plane is also required and is placed 400mm from the EUT. Where a EUT is floor standing it will be stood on but insulated from the ground plane by up to 12mm.

The EUT is powered through a Line Impedance Stabilisation Network (LISN) which is bonded to the ground plane. The EUT is located so that the distance between the EUT and the LISN is no less than 800mm. Where possible the cable between the mains input of the EUT and the LISN is 1m. Where this is not possible the cable is non inductively bundled with the bundle not exceeding 400mm in length.

A preliminary profile of the Conducted Emissions is obtained over the frequency range 150kHz to 30MHz. Any points of interest are noted for formal measurements.

During formal measurements, the measuring receiver is tuned to the emission of interest where Quasi – Peak and Average measurements are performed in a 9kHz Video and Resolution Bandwidth.

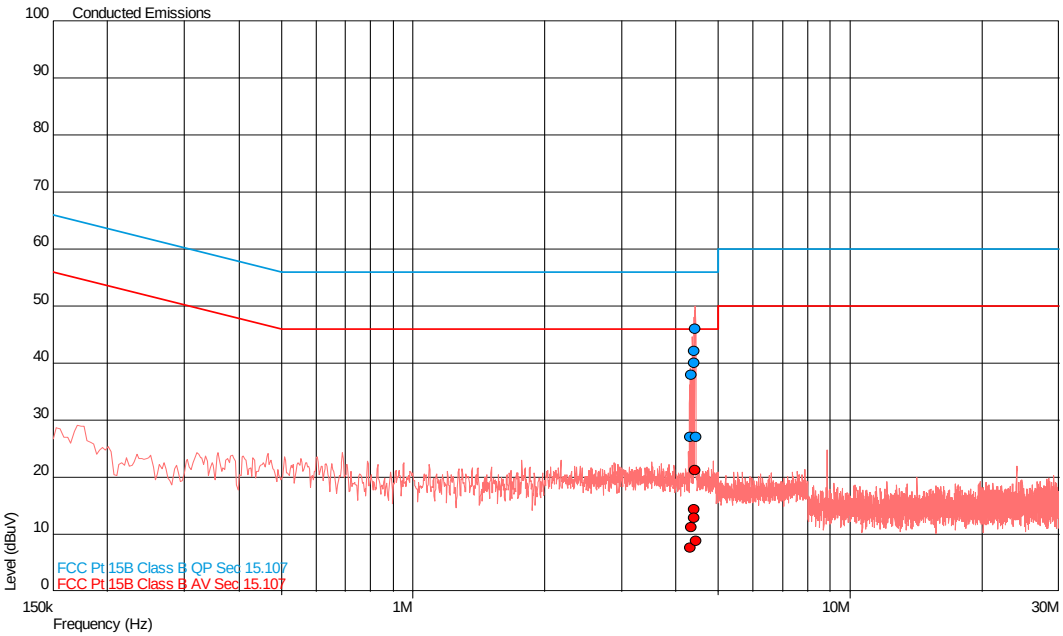
2.1.6 Environmental Conditions

Ambient Temperature	23.3°C
Relative Humidity	31.0%

Product Service

2.1.7 Test Results

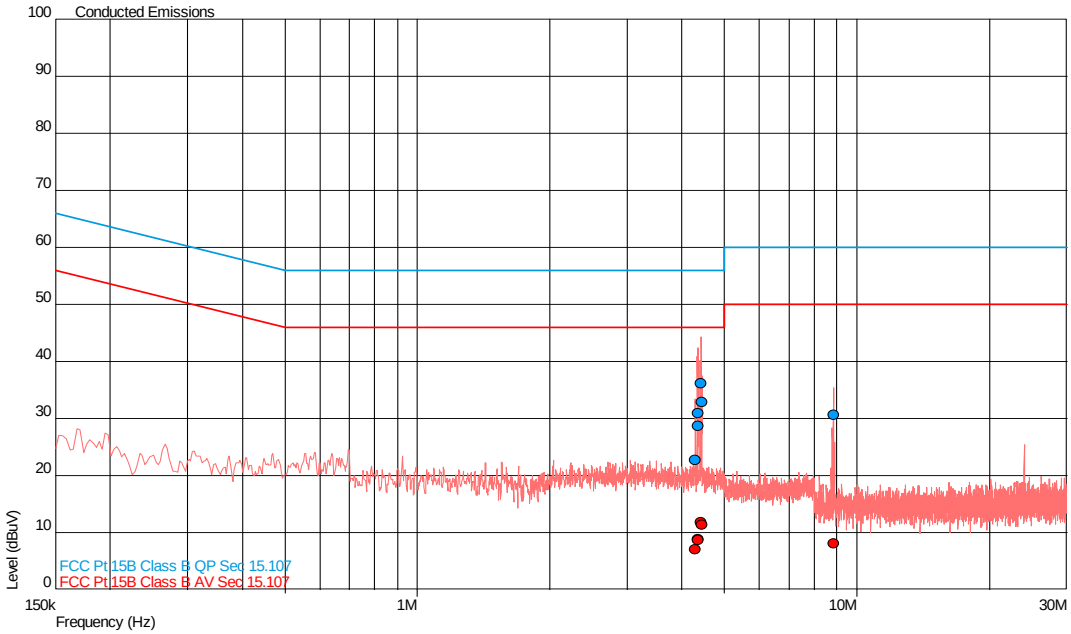
Live Line



Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)	
4.298	27.1	56.0	-28.9	7.7	46.0	-38.3	
4.337	37.9	56.0	-18.1	11.2	46.0	-34.8	
4.390	40.1	56.0	-15.9	12.8	46.0	-33.2	
4.395	42.2	56.0	-13.8	14.5	46.0	-31.5	
4.420	46.0	56.0	-10.0	21.3	46.0	-24.7	
4.447	27.2	56.0	-28.8	8.9	46.0	-37.1	

Product Service

Neutral Line



Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)	
4.288	22.7	56.0	-33.3	7.1	46.0	-38.9	
4.349	30.9	56.0	-25.1	8.8	46.0	-37.2	
4.354	28.7	56.0	-27.3	8.7	46.0	-37.3	
4.406	36.2	56.0	-19.8	11.9	46.0	-34.1	
4.441	33.0	56.0	-23.0	11.4	46.0	-34.6	
8.832	30.7	60.0	-29.3	8.1	50.0	-41.9	

2.2 RADIATED EMISSIONS

2.2.1 Specification Reference

FCC CFR 47 Part 15B and ICES-003, Clause 15.109 and 7.1

2.2.2 Equipment Under Test and Modification State

Venice 6.5 S/N: RAD103045 - Modification State 0

2.2.3 Date of Test

4 April 2012

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

A preliminary profile of the Spurious Radiated Emissions is obtained up to the 5th harmonic of the EUT's highest internally generated fundamental frequency. For frequencies from 30MHz to 18GHz the EUT is placed on a test table 800mm above the ground plane. For frequencies above 18GHz, the EUT height is increased by 200mm to a height of 1000mm. This is to ensure the beam width of the measuring antenna gives sufficient vertical coverage of the EUT.

During characterisation the turntable azimuth is adjusted from 0 to 360 degrees with the measuring antenna in one polarity. It is then repeated for the other polarity. Any frequencies of interest are noted for formal measuring later. The distance from the measuring antenna to the boundary of the EUT is 3m. Above 18GHz this distance may be reduced to 1m.

During formal measurement the spectrum analyser is tuned to the frequency of the emission. The turntable azimuth is adjusted from 0 to 360 degrees to determine the point at which the maximum emission level occurs. Then the height of the measuring antenna is adjusted from a height of 1m to 4m to determine the height at which the maximum emission level occurs. Once the point of maximum emission has been determined the emission is measured. Emissions in the 30MHz to 1GHz range are measured using a CISPR Quasi – Peak detector function in a 120kHz bandwidth. Emissions in the range 1GHz to 40GHz require Peak and Average measurements. The Peak measurements are made using a peak detector with 1MHz Resolution and Video bandwidths. The average measurements employ a peak detector with a Resolution bandwidth of 1MHz and a Video bandwidth of 10Hz. If measurements are made at a 1m measuring distance, then 10dB is added to the specification limit.

2.2.6 Environmental Conditions

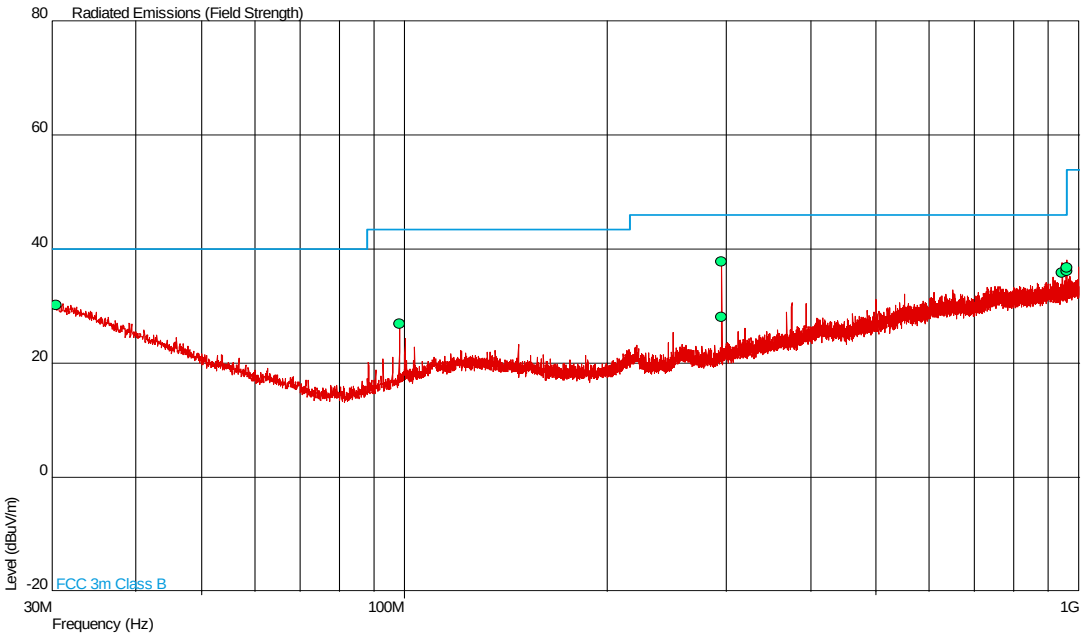
Ambient Temperature	18.9°C
Relative Humidity	30.0%

Product Service

2.2.7 Test Results

Channel 1

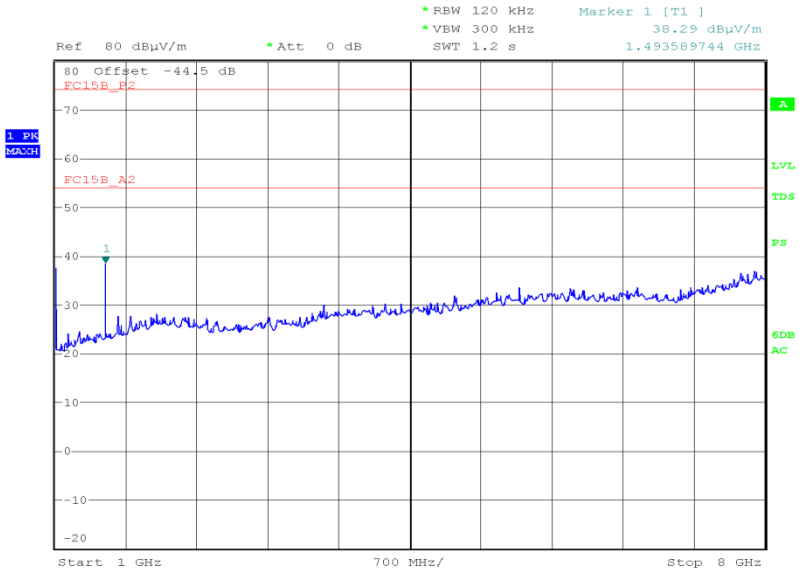
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBµV/m)	QP Level (µV/m)	QP Limit (dBµV/m)	QP Limit (µV/m)	QP Margin (dBµV/m)	QP Margin (µV/m)	Angle (Deg)	Height (m)	Polarity	
30.427	30.2	32.4	40.0	100	-9.8	67.6	357	1.00	Horizontal	
98.302	27.0	22.4	43.5	150	-16.5	127.6	0	1.25	Vertical	
294.910	37.8	77.6	46.0	200	-8.2	122.4	0	1.03	Horizontal	
294.943	28.1	25.4	46.0	200	-17.9	174.6	187	1.00	Vertical	
944.007	35.8	61.7	46.0	200	-10.2	138.3	14	1.00	Horizontal	
957.803	36.2	64.6	46.0	200	-9.8	135.4	171	1.00	Horizontal	
957.887	36.8	69.2	46.0	200	-9.2	130.8	142	1.00	Vertical	

Product Service

1 GHz to 8 GHz



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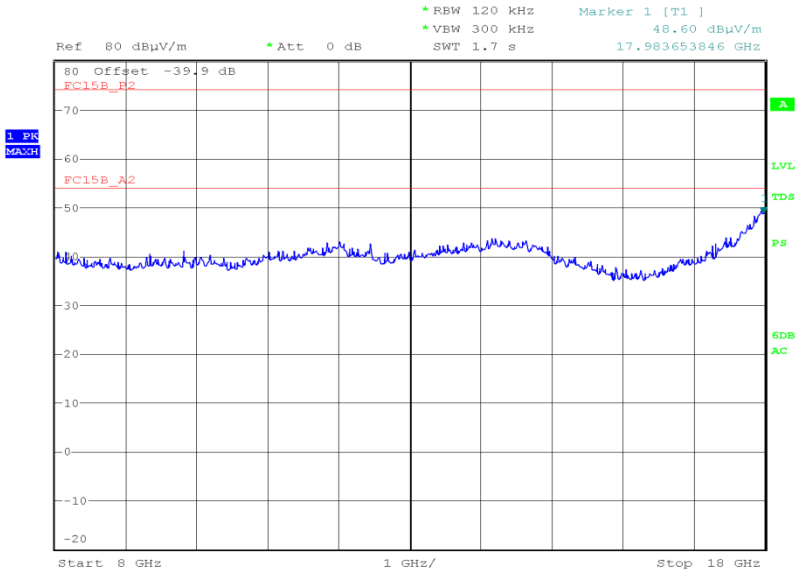
8 GHz 18 GHz



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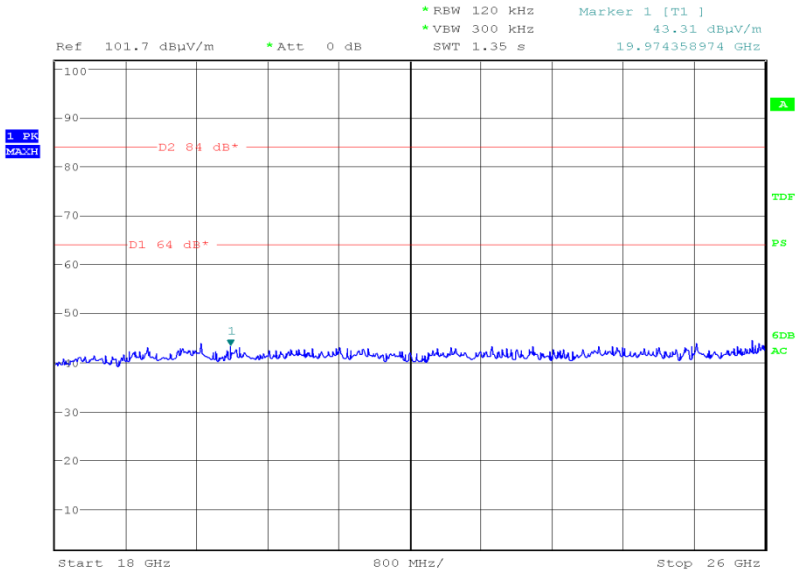
Product Service

18 GHz to 26 GHz



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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 (1 Phase)	Chase	MN 2050	336	12	23-Mar-2013
Transient Limiter	Hewlett Packard	11947A	1032	12	22-Jun-2012
Screened Room (5)	Rainford	Rainford	1545	36	3-Feb-2014
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	29-Sep-2012
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
Section 2.2 - Radiated Emissions					
30V/5A Power Supply	Farnell	L30-5	191	-	O/P Mon
Antenna (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	13-Sep-2013
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	14-Nov-2012
Dual Power Supply Unit	Thurlby	PL320	288	-	TU
Filter (High Pass)	Lorch	SHP7-7000-SR	566	12	20-Feb-2013
Antenna (Double Ridge Guide)	Q-Par Angus Ltd	QSH 180K	1511	24	2-Aug-2012
Pre-Amplifier	Phase One	PS04-0086	1533	12	20-Sep-2012
Pre-Amplifier	Phase One	PSO4-0087	1534	12	26-Sep-2012
Screened Room (5)	Rainford	Rainford	1545	36	3-Feb-2014
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
DC Power Supply Unit	Farnell	LT30-2	2116	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	12-May-2013
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	22-Aug-2012
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	29-Sep-2012
3 GHz High Pass Filter	K&L Microwave	11SH10-3000/X18000-O/O	3552	12	14-Apr-2012
'2.92mm' - '2.92mm' RF Cable (2m)	Rhophase	KPS-1503-2000-KPS	3694	12	TU
'2.92mm' - '2.92mm' RF Cable (2m)	Rhophase	KPS-1503-2000-KPS	3695	12	TU
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3703	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	26-Aug-2012
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Low Noise Amplifier	Wright Technologies	APS04-0085	3969	12	8-Jul-2012

TU – Traceability Unscheduled
O/P MON – Output Monitored with Calibrated Equipment

3.2 MEASUREMENT UNCERTAINTY

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

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