

FCC Testing of the Iridium ProtoTerminal / 9801CertusH1 In accordance with FCC 47 CFR Part 15B

Prepared for: Iridium Satellite LLC
1750 Tysons Boulevard
Suite 1400
McLean
VA 22102
United States

FCC ID: Q639801CertusH1

COMMERCIAL-IN-CONFIDENCE

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Product Service

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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Sara McRitchie	21 February 2017	
Authorised Signatory	Jensen Adams	21 February 2017	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

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. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Colin McKean	21 February 2017	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be in compliance with FCC 47 CFR Part 15B: 2015.



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Registered in Scotland at East Kilbride,
Glasgow G75 0QF, United Kingdom
Registered number: SC215164

TÜV SÜD Ltd is a
TÜV SÜD Group Company

Phone: +44 (0) 1489 558100
Fax: +44 (0) 1489 558101
www.tuv-sud.co.uk

TÜV SÜD Product Service
Octagon House
Concorde Way
Fareham
Hampshire PO15 5RL
United Kingdom



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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	21 February 2017

Table 1

1.2 Introduction

Applicant	Iridium Satellite LLC
Manufacturer	Iridium Satellite LLC
Model Number(s)	9801CertusH1
Serial Number(s)	P1387 GR 143
Hardware Version(s)	A2
Software Version(s)	A
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15B :2015
Test Plan/Issue/Date	N/A
Order Number	38114/JEHJ
Date	24-August-2016
Date of Receipt of EUT	08-December-2016
Start of Test	21-December-2016
Finish of Test	21-December-2016
Name of Engineer(s)	Colin McKean
Related Document(s)	ANSI C63.4 (2014)



Product Service

1.3 Brief Summary of Results

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

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: IDU Powering Antenna Array				
2.1	15.107	AC Power Line Conducted Emissions	Pass	ANSI C63.4
2.2	15.109	Radiated Emissions	Pass	ANSI C63.4

Table 2



1.4 Declaration of Build Status

Manufacturer	<u>Iridium</u>
Country of origin	<u>USA</u>
UK Agent	<u>TUV</u>
Technical Description	<u>Iridium ProtoTerminal</u>
Model No	<u>9801CertusH1</u>
Part No	<u>PT-H1</u>
Serial No	<u>1649004</u>
Drawing Number	<u>15051315</u>
Build Status	<u>A2</u>
Software Issue	<u>A</u>
Hardware Issue	<u>A2</u>
Highest Internally Generated Frequency	<u>2.5GHz</u>
FCC ID	<u>Q639801CertusH1</u>
Industry Canada ID	<u>4629A-9801CertusH1</u>
Signature	<u><i>Jeremy Lavine</i></u>
Date	<u><i>January 25, 2017</i></u>
D of B S Serial No	<u></u>

Note: This document has been prepared to enable manufacturers with no mechanism for producing their own Declaration of Build Status, to declare the build state of the equipment submitted for test.

No responsibility will be accepted by TÜV SÜD Product Service as to the accuracy of the information declared in this document by the manufacturer.

1.5 Product Information

1.6 Technical Description

The Equipment Under Test (EUT) was an Iridium ProtoTerminal / 9801CertusH1, consisting of an indoor unit which contains the power supply, data routing, and indoor unit lighting protection and a Outdoor Unit contains all electronics under a Radome.

A full description and detailed product specification details are available from the manufacturer.



Figure 1 - Front View

1.6.1 EUT Port/Cable Identification

Port	Max Cable Length specified	Usage	Type	Screened
AC Powered Operating				
AC Power Port	<3m	Supply	AC Mains	No
Signal	Not Specified	Connected to a Radome antenna	9 way D type	Not Specified
Signal	Not Specified	Ethernet	RJ45	Not Specified

Table 3

1.6.2 Test Configuration

Configuration	Description
AC Powered	The EUT was powered from an 115VAC 60Hz mains supply. The 9 way D-Type connector port on the EUT was connected to a radome antenna. The Ethernet port of the EUT was connected to the drive equipment via two hubs to enable the modes of operation for EMC testing.

Table 4

1.7 Deviations from the Standard

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

1.8 EUT Modification Record

The table below details modifications made to the EUT during the test programme.
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Serial Number: P1387 GR 143			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 5

1.9 Test Location

TÜV SÜD Product Service conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: IDU Powering Antenna array		
AC Power Line Conducted Emissions	Colin McKean	UKAS
Radiated Emissions	Colin McKean	UKAS

Table 6

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom

2 Test Details

2.1 AC Power Line Conducted Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.107

2.1.2 Equipment Under Test and Modification State

ProtoTerminal / 9801CertusH1, S/N: P1387 GR 143 - Modification State 0

2.1.3 Date of Test

21-December-2016

2.1.4 Test Method

The test was performed in accordance with ANSI C63.4, Clause 7.

2.1.5 Environmental Conditions

Ambient Temperature 20.0 °C
Relative Humidity 1015.0 %

2.1.6 Test Results

IDU Powering Antenna array

Applied supply Voltage: 115 Vac
Applied supply frequency: 60 Hz

2.1.7 Specification Limits

FCC 47 CFR Part 15, Limit Clause 15.107

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

Table 7

*Decreases with the logarithm of the frequency.

Line Under Test: Live Line

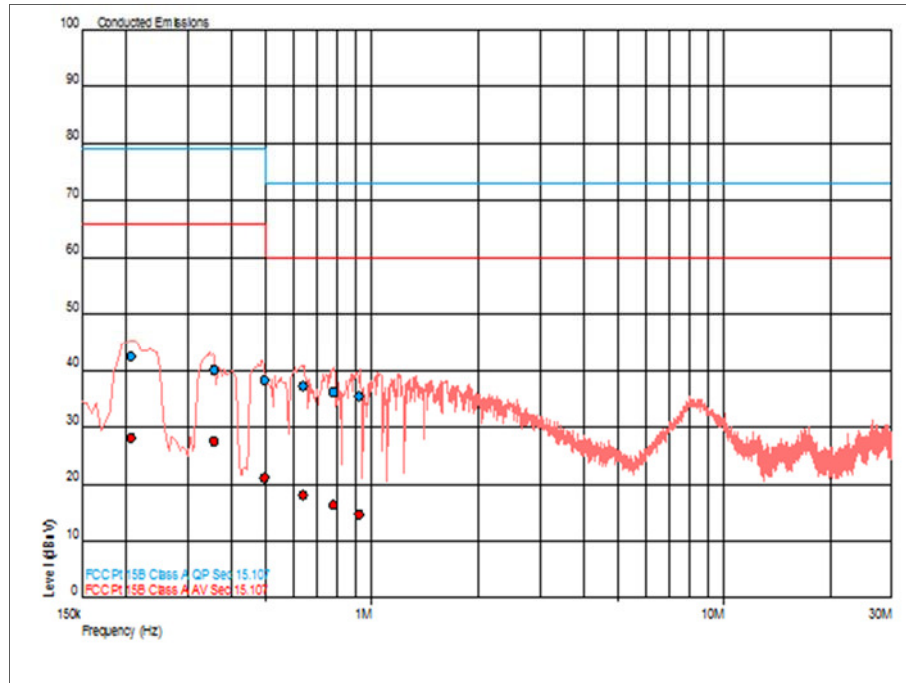


Figure 2 - Live Line

Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.207	42.4	79.0	-36.6	28.2	66.0	-37.8
0.356	40.0	79.0	-39.0	27.5	66.0	-38.5
0.496	38.3	79.0	-40.7	21.1	66.0	-44.9
0.638	37.3	73.0	-35.7	18.2	60.0	-41.8
0.778	36.2	73.0	-36.8	16.4	60.0	-43.6
0.919	35.5	73.0	-37.5	14.7	60.0	-45.3

Table 8

Line Under Test: Neutral line

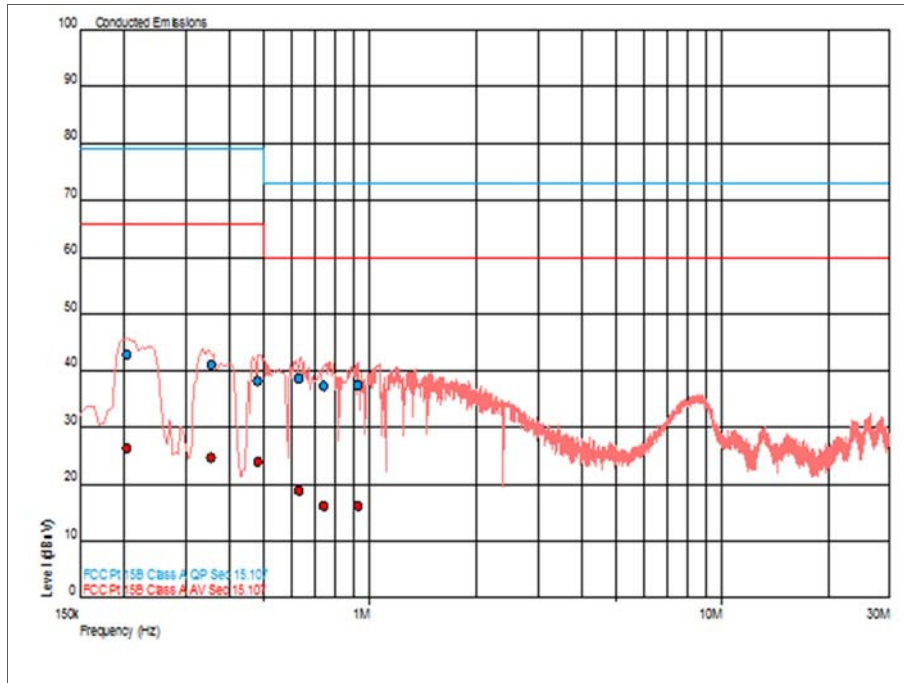


Figure 3 - Neutral Line

Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.204	42.8	79.0	-36.2	26.4	66.0	-39.6
0.354	40.9	79.0	-38.1	24.6	66.0	-41.4
0.480	38.2	79.0	-40.8	23.9	66.0	-42.1
0.630	38.6	73.0	-34.4	18.9	60.0	-41.1
0.741	37.2	73.0	-35.8	16.2	60.0	-43.8
0.923	37.4	73.0	-35.6	16.2	60.0	-43.8

Table 9



Figure 4 - Test Setup – Conducted Emissions

2.1.8 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 7.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Dual Power Supply Unit	Thurlby	PL320	288	-	TU
LISN	Rohde & Schwarz	ESH2-Z5	17	12	11-Feb-2017
Transient Limiter	Hewlett Packard	11947A	2378	12	6-Jul-2017
Test Receiver	Rohde & Schwarz	ESIB40	2941	12	24-Feb-2017
Cable (2m N-Type)	Teledyne	SA90-195-2MTR	4058	12	12-Apr-2017
Cable (Rx, Nm-Nm, 7m)	Scott Cables	SLU18-NMM-07.00M	4498	6	1-Jun-2017

Table 10

TU – Traceability Unscheduled

2.2 Radiated Emissions

2.2.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.109

2.2.2 Equipment Under Test and Modification State

ProtoTerminal / 9801CertusH1, S/N: P1387 GR 143 - Modification State 0

2.2.3 Date of Test

21-December-2016

2.2.4 Test Method

The test was performed in accordance with ANSI C63.4, Clause 8.

2.2.5 Environmental Conditions

Ambient Temperature 20.0 °C
Relative Humidity 1015.0 %

2.2.6 Test Results

IDU Powering Antenna array

Highest frequency generated or used within the EUT: 1.626 GHz

Upper frequency test limit: 10GHz

2.2.7 Specification Limits

FCC 47 CFR Part 15, Limit Clause 15.109

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

Table 11

Frequency of Emission (MHz)	Field Strength (dBμV/m)	
	Linear Average Detector	Peak Detector
Above 1000	49.5	69.5

Table 12

30 MHz to 1 GHz

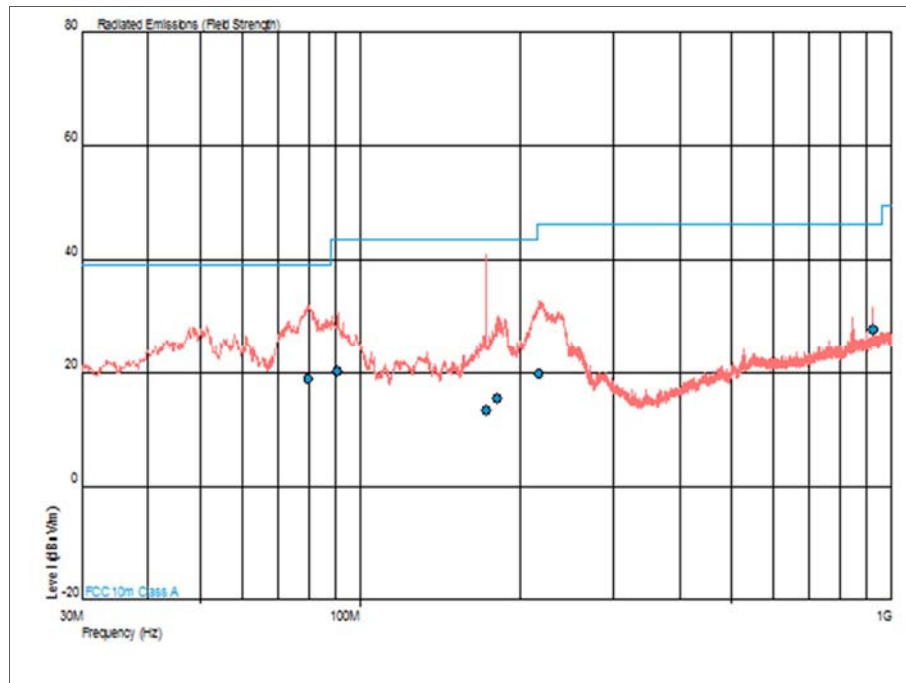


Figure 5 - Horizontal and Vertical Polarity

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
79.948	18.9	39.1	-20.2	72	1.00	Horizontal
90.700	20.2	43.5	-23.3	196	1.00	Horizontal
172.962	13.4	43.5	-30.1	285	1.00	Vertical
181.355	15.4	43.5	-28.1	316	1.28	Horizontal
217.035	19.8	46.4	-26.6	152	1.09	Vertical
923.444	27.6	46.4	-18.8	113	1.00	Vertical

Table 13

1 GHz to 10GHz

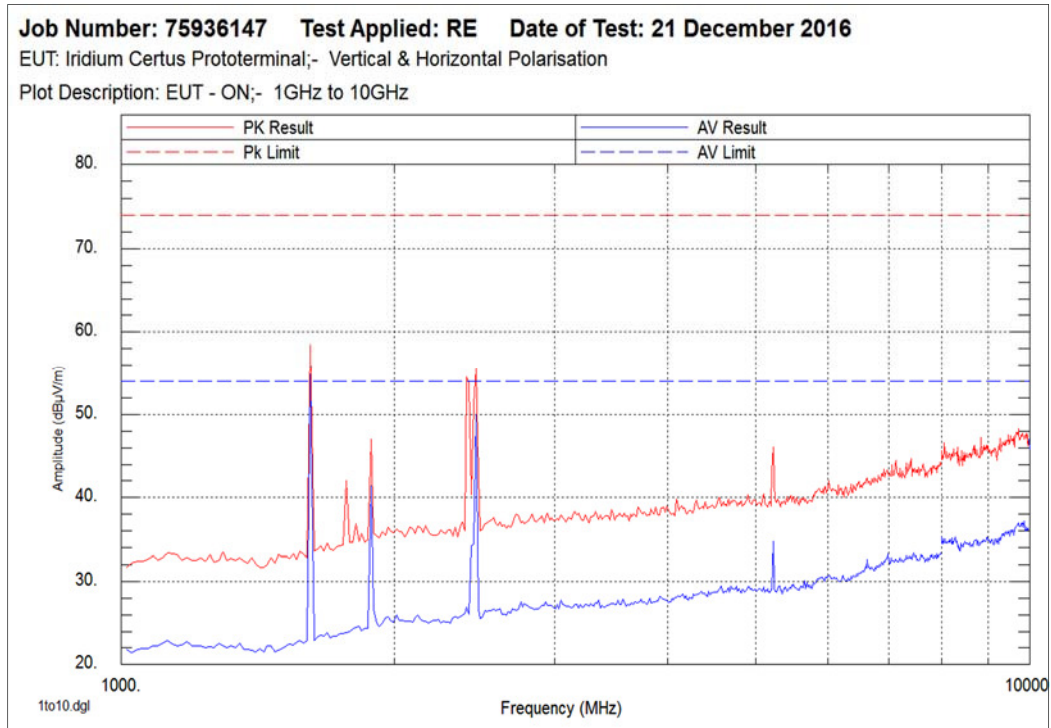


Figure 6 - Graphical Results – 1 GHz to 10 GHz

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)		Angle (°)	Height (m)	Polarisation
	Peak	Average	Peak	Average	Peak	Average			
1.617	11.32	1.03	74	54	-62.68	-52.97	0	1.0	Vertical
1.88	12.95	2.38	74	54	-61.05	-51.62	0	1.0	Vertical
2.45	1364	3.9	74	54	-60.36	-50.10	0	1.0	Vertical

Table 14



Figure 7 - Test Setup – Radiated Emissions Below 1 GHz

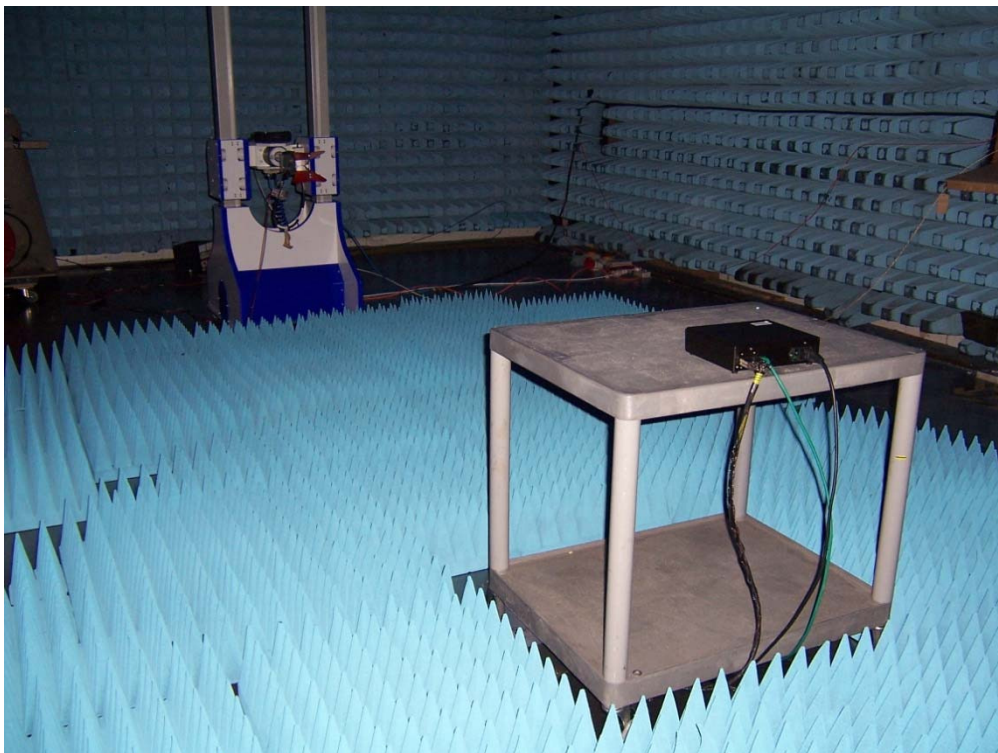


Figure 8 - Test Setup - Radiated Emissions Above 1 GHz



2.2.8 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 7.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Dual Power Supply Unit	Thurlby	PL320	288	-	TU
Turntable Controller	Heinrich Diesel	HD 050	280	-	TU
Antenna (Bilog)	Schaffner	CBL6143	287	24	18-Apr-2018
Pre-Amplifier	Phase One	PS04-0086	1533	12	29-Jul-2017
Screened Room (7)	Siemens	S M	1547	0	20-Dec-2017
Test Receiver	Rohde & Schwarz	ESIB40	2941	12	24-Feb-2017
Compliance 5 Emissions	Schaffner	C5e Software V.5.00.00	3275	-	N/A - Software
Cable (2m N-Type)	Teledyne	SA90-195-2MTR	4058	12	12-Apr-2017
1GHz to 8GHz Low Noise Amplifier	Wright Technologies	APS04-0085	4365	12	17-Oct-2017
Cable (Rx, Nm-Nm, 7m)	Scott Cables	SLU18-NMNM-07.00M	4498	6	1-Jun-2017
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	29-Dec-2016
Mast Controller	matur GmbH	NCD	4810	-	TU
Tilt Antenna Mast	matur GmbH	TAM 4.0-P	4811	-	TU

Table 15

TU – Traceability Unscheduled



3 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
AC Power Line Conducted Emissions	150 kHz to 30 MHz, LISN, ± 3.7 dB
Radiated Emissions	30 MHz to 1 GHz: ± 5.2 dB
	1 GHz to 40 GHz: ± 6.3 dB

Table 16