FCC and Industry Canada Testing of the Inmarsat Global Ltd Model: GSPS Core Module 2.0 In accordance with FCC 47 CFR Part 25, FCC 47 CFR Part 2 and Industry Canada RSS-170 and Industry Canada RSS-GEN

Prepared for: Inmarsat Global Ltd 99 City Road London EC1Y 1AX United Kingdom

FCC ID: YCT-GSPSCM2 IC: 8944A-GSPSCM2

COMMERCIAL-IN-CONFIDENCE

Date: May 2017 Document Number: 75935242-07 | Issue: 01

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Steven White	04 May 2017	Sadehte.
Authorised Signatory	Matthew Russell	04 May 2017	Aussell

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 25, FCC 47 CFR Part 2, Industry Canada RSS-170 and Industry Canada RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME		DATE	SIGNATURE
Testing	Dan Ralley		04 May 2017	N. Ralley
Testing	Graeme Lawler		04 May 2017	Chellender-
FCC Accreditation 90987 Octagon House, Fareham Test Laboratory		Industry Canac IC2932B-1 Oct	da Accreditation tagon House, Fareha	am Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be in compliance with FCC 47 CFR Part 25 (2015), FCC 47 CFR Part 2 (2015), Industry Canada RSS-170: Issue 3 (2015) and Industry Canada RSS-GEN : Issue 4 (2014).



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ACCREDITATION

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Product Service







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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	04 May 2017

Table 1

1.2 Introduction

Applicant	Inmarsat Global Ltd
Manufacturer	Inmarsat Global Ltd
Model Number(s)	GSPS Core Module 2.0
Serial Number(s)	IHG0000198 and IHG0000175
Hardware Version(s)	HWID3203
Software Version(s)	ER-V01.07.00
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 2 (2015)
	FCC 47 CFR Part 25 (2015)
	Industry Canada RSS-170: Issue 3 (2015) Industry Canada RSS-GEN: Issue 4 (2014)
Order Number Date	57-00141-01/1 03-June-2016
Date of Receipt of EUT	10-January-2017
Start of Test	16-January-2017
Finish of Test	16-February-2017
Name of Engineer(s)	Dan Ralley and Graeme Lawler
Related Document(s)	ANSI C63.4 (2014)
	KDB 971168 D01 v02r02



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 25, FCC 47 CFR Part 2 and Industry Canada RSS-170 and Industry Canada RSS-GEN is shown below.

Section		Specificati	on Clause		Test Description	Result	Comments/Base
	FCC Pt 25	FCC Pt 2	RSS-170	RSS-GEN			Standard
Configurat	ion: Inmarsat	Transmitting					
2.1	-	2.1047 (d)	-	-	Modulation Characteristics	Declaration	
2.2	-	2.1049	-	6.6	Occupied Bandwidth	Pass	
2.3	25.202(d)	2.1055	5.2	-	Frequency Tolerance	Pass	
2.4	25.202(f)	2.1051	5.4.3.1	6.13	Spurious Emissions at Antenna Terminals	Pass	
2.5	25.202(f)	2.1053	5.4.3.1	6.13	Radiated Spurious Emissions	Pass	ANSI C63.4 (2014)
2.6	25.204	-	5.3	-	Equivalent Isotropic Radiated Power	Pass	
2.7	25.216	2.1051	5.4.3	-	Limits on Emissions from Mobile Earth Stations for Protection of Aeronautical Radionavigation-Satellite Service	Pass	

Table 2



1.4 Declaration of Build Status

Manufacturer	Inmarsat Global Ltd.			
Country of origin	Spain			
UK Agent	Inmarsat Global Ltd.			
Technical Description	Inmarsat GSPS Core	Module 2.0		
Model No	GSPS Core Module 2	2.0		
Part No	n/a			
Serial No	IHG0000198,IHG0000196,IHG0000175,IHG000013 7			
Drawing Number	57_00141_2v1C_03			
Build Status	<u>\$3.0</u>			
Software Issue	ER-V01.07.00			
Hardware Issue	HWID3203			
Highest Internally Generated Frequency	3350MHz			
FCC ID	YCT-GSPSCM2			
Industry Canada ID	8944A-GSPSCM2			
	Signature	Ari Tastula		
	Date	12.01.2017		
	D of B S Serial No			

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

1.5.1 Technical Description

GSPS Satellite Phone Core Module for Inmarsat GMR2+ satellite network. Inmarsat GSPS CM v2 is a Satellite Phone Core Module/Modem which will provide satellite telephony, voice mail, text, email messaging and paging services to users within the Inmarsat global satellite network system.

1.6 Deviations from the Standard

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

1.7 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: IHG0000198						
0	As supplied by the customer	Not Applicable	Not Applicable			
Serial Number: IHG0000175						
0	As supplied by the customer	Not Applicable	Not Applicable			

Table 3



1.8 Test Location

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

Test Name	Name of Engineer(s)	Accreditation
Configuration: Inmarsat Transmitting		
Occupied Bandwidth	Dan Ralley	UKAS
Frequency Tolerance	Dan Ralley	UKAS
Spurious Emissions at Antenna Terminals	Dan Ralley	UKAS
Radiated Spurious Emissions	Graeme Lawler	UKAS
Equivalent Isotropic Radiated Power	Dan Ralley	UKAS
Limits on Emissions from Mobile Earth Stations for Protection of Aeronautical Radionavigation-Satellite Service	Dan Ralley	UKAS

Table 4

Office Address:

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



2 Test Details

- 2.1 Modulation Characteristics
- 2.1.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1047 (d)

2.1.2 Declaration

The data below was supplied:



Date: 24.0CT.2013 12:49:41

Figure 1 – Transmission Period





Date: 24.0CT.2013 12:45:37





Date: 24.0CT.2013 12:58:01

Figure 3 – Transmission Burst





Date: 28.0CT.2013 09:03:58

Figure 4 – Modulation Results

FCC 47 CFR Part 2, Limit Clause 2.1047 (d)

A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.



2.2 Occupied Bandwidth

2.2.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1049 Industry Canada RSS-GEN, Clause 6.6

2.2.2 Equipment Under Test and Modification State

GSPS Core Module 2.0, S/N: IHG0000175 - Modification State 0

2.2.3 Date of Test

16-January-2017

2.2.4 Test Method

This test was performed in accordance with KDB 971168 D01, Clause 4.2.

2.2.5 Environmental Conditions

Ambient Temperature20.1 °CRelative Humidity28.9 %

2.2.6 Test Results

Inmarsat Transmitting

Occupied Bandwidth (kHz)					
1626.675 MHz 1643.675 MHz 1660.475 MHz					
60.897	62.821	62.500			

Table 5

FCC 47 CFR Part 2, Limit Clause 2.1049

None specified.

Industry Canada RSS-GEN, Limit Clause

None specified.



2.2.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Туре No	TE No	Calibration Period (months)	Calibration Due
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	14-Dec-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	05-Mar-2017
Crystal Detector	Hewlett Packard	8470B	1320	12	08-Jun-2017
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	29-Jan-2017
Hygrometer	Rotronic	I-1000	3220	12	23-Aug-2017
Combiner/Splitter	Weinschel	1506A	3877	12	30-Mar-2017
Frequency Standard	Spectracom	Secure Sync 1200- 0408-0601	4393	6	05-Mar-2017
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4- NMS	4510	12	26-May-2017
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4- KMS	4520	12	16-Feb-2017
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	O/P Mon

Table 6

O/P Mon - Output Monitored using calibrated equipment



2.3 Frequency Tolerance

2.3.1 Specification Reference

FCC 47 CFR Part 25, Clause 25.202(d) FCC 47 CFR Part 2, Clause 2.1055 Industry Canada RSS-170, Clause 5.2

2.3.2 Equipment Under Test and Modification State

GSPS Core Module 2.0, S/N: IHG0000175 - Modification State 0

2.3.3 Date of Test

18-January-2017 to 25-January-2017

2.3.4 Test Method

The test was performed in accordance with FCC 47 CFR Part 2, Clause 2.1055.

2.3.5 Environmental Conditions

Ambient Temperature21.1 °CRelative Humidity26.1 %

2.3.6 Test Results

Inmarsat Transmitting

Temperature	1643.675 MHz						
	4.8 \	/ DC	5.0 \	5.0 V DC		5.2 V DC	
	Frequency Error (%)	Frequency Error (ppm)	Frequency Error (%)	Frequency Error (ppm)	Frequency Error (%)	Frequency Error (ppm)	
-30.0°C	-0.00004	-0.36504	-0.00026	-2.57959	-0.00006	-0.63273	
-20.0°C	0.00006	0.60839	-0.00005	-0.49888	0.00006	0.57189	
-10.0°C	-0.00001	-0.13385	0.00004	0.35287	0.00008	0.76657	
0.0°C	-0.00016	-1.59399	0.00001	0.13385	-0.00002	-0.19469	
+10.0°C	0.00006	0.62056	0.00019	1.92252	-0.00005	-0.52322	
+20.0°C	0.00015	1.48448	0.00001	0.08517	-0.00017	-1.66700	
+30.0°C	-0.00002	-0.15818	-0.00004	-0.35287	-0.00011	-1.05860	
+40.0°C	0.00005	0.51105	0.00000	-0.03650	0.00000	-0.03650	
+50.0°C	0.00020	2.01986	0.00015	1.46014	-0.00001	-0.08517	

Table 7



FCC 47 CFR Part 25, Limit Clause 25.202(d)

The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.

Industry Canada RSS-170, Limit Clause 5.2

For mobile earth station equipment, the carrier frequency shall not depart from the reference frequency by more than ±10 ppm.

2.3.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	14-Dec-2017
Multimeter	Fluke	79 Series III	611	12	14-Sep-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	05-Mar-2017
Crystal Detector	Hewlett Packard	8470B	1320	12	08-Jun-2017
Thermocouple Thermometer	Fluke	51	3174	12	22-Dec-2017
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	15-Sep-2017
Combiner/Splitter	Weinschel	1506A	3877	12	30-Mar-2017
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	08-Sep-2017
Frequency Standard	Spectracom	Secure Sync 1200- 0408-0601	4393	6	05-Mar-2017
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4- NMS	4510	12	26-May-2017
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4- KMS	4520	12	16-Feb-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	06-Oct-2017
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	O/P Mon

Table 8

O/P Mon – Output Monitored using calibrated equipment



2.4 Spurious Emissions at Antenna Terminals

2.4.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051 FCC 47 CFR Part 25, Clause 25.202(f) Industry Canada RSS-170 Clause 5.4.3.1 Industry Canada RSS-GEN, Clause 6.13

2.4.2 Equipment Under Test and Modification State

GSPS Core Module 2.0, S/N: IHG0000175 - Modification State 0

2.4.3 Date of Test

23-January-2017 to 16-February-2017

2.4.4 Test Method

The test was performed in accordance with KDB 971168 D01, Clause 6.

2.4.5 Environmental Conditions

Ambient Temperature	21.0 - 23.3 °C
Relative Humidity	25.4 - 34.4 %



2.4.6 Test Results

Inmarsat Transmitting







Figure 6 - 1626.675 MHz - 9 kHz to 150 kHz



🔤 Kej	ysight Spectrum	Analyzer - Swept	SA							
Mar	ker 1 163	50 Ω .930929 Gate: LO	KHZ NFE	PNO: Wide ↔ IFGain:Low	Trig: Exter Atten: 6 d	rnal1 IB	Avg Type:	RMS	09:50:22 TR T	AM Jan 24, 2017 ACE 1 2 3 4 5 6 YPE WWWWWWW DET ANNNNN
10 dE	Ref B/div Re	Offset 26.55 f 0.00 dBn	dB n						Mkr1 1 -65	63.9 kHz .14 dBm
-10.0						Ĭ				
20.0										DL1 -13.00 dBm
-20.0										
-30.0										
-40.0										
-50.0										
-60.0	1									
-70.0										
-80.0	Nu prinsi pina	ale of the gallet of	dell-antertuan	hand the particular of	<mark>oferational Haven</mark>	Alphalication	and have the part of the	ipa da di ada di an	<u>Balatapakanah</u>	olana (di sub).
-90.0	alaytaka, ana a	in in the fill all the second	a fan fatin	<mark>, in the second se</mark>	lin fine of the film film	n <mark>i a dini kana</mark> ng kal	ing the second secon	n fan i sin yn fan yn	ld ad diski djug bi	<u>ى ئەتلەر ئېرىكە</u> 1011 ئاھالەر ئېرىكە
Star #Res	t 150 kHz s BW 4.3 I	kHz		#VE	3W 300 kHz	*		#Sweep	Stop 15.00 s (30.00 MHz (15000 pts)
MSG							STATUS			





Figure 8 - 1626.675 MHz - 30 MHz to 1 GHz



🔤 Key	sight Spect	rum Analyzer - Sv	vept SA		SENSE EVT SOUL				00-20-40	
Marl	ker 1 1	.6266656 Gate: LO	666642 GHz	PNO: Fast ↔ IFGain:Low	Trig: Exter Atten: 22	mal1 dB	Avg Type:	RMS	109.39.49 TR	ACE 123456 TYPE WWWWWWW DET ANNNNN
10 dE	3/div	Ref Offset 28 Ref 40.00	3.3 dB dBm					N	1.62 3	6 67 GHz 3.43 dBm
				• ¹						
30.0										
20.0										
10.0										
0.00										
-10.0										DL1 -13.00 dBm
-20.0										
-30.0										
10.0										
-40.0										
-50.0				and the second						
Star #Res	t 1.000 5 BW 1	GHz 00 kHz		#VE	3W 300 kHz	*		#Swee	Stop 20.00 s	3.000 GHz (40000 pts)
MSG							STATUS			





Figure 10 - 1626.675 MHz - 3 GHz to 3.5 GHz



🔤 Key	sight Spectrum	Analyzer - Swept	SA							
Mar	ker 1 3.5	01200034	287 GHz		SENSE:EXT SOUR	RCE OFF AL	Avg Type:	RMS	10:46:06 TR	AM Jan 24, 2017
		Gate: LO	NFE	PNO: Fast ++ #IFGain:Low	#Atten: 0 c	iB				DET
10 dE	Re Bídiv Re	f Offset 29.4 f 0.00 dBr	dB n					M	kr1 3.501 -69	200 GHz 0.08 dBm
209						Ĭ				
-10.0										DL1 -13.00 dBm
-20.0										
-30.0										
-40.0										
50.0										
-50.0										
-60.0	1									
-70.0	- The second be served									
	Million of participation	a la construcción de la construcción			Lickness second chairs and	anipeli and anipel	No. of Concession, Name			CALCARONAL LARGE
-80.0										
-90.0										
Star #Res	t 3.5000 (s BW 30 I	GHz KHz		#VB	W 300 kHz	*		#Swee	Stop 4 p 35.00 s	.0000 GHz (35000 pts)
MSG							STATUS			





Figure 12 - 1626.675 MHz - 4 GHz to 4.5 GHz



🔤 Key	sight Spectru	um Analyzer - Swep	ot SA							
Marl	ker 1 4.	87998228 Gate: LO	5208 GHz NFE	PNO: Fast IFGain:Low	. Trig: Exter Atten: 6 d	mai1 B	Avg Type: Avg Hold: 1	RMS 05/105	09:23:13 TR	ACE 1 2 3 4 5 6 TYPE A WINNINN DET A NNNNN
10 dE	F 3/div F	Ref Offset 33.8 Ref 0.00 dB	dB m					M	kr1 4.879 -40.	982 GHz 378 dBm
-10.0										DL1 -13.00 dBm
-20.0										
-30.0								.1		
-40.0								· ·		
-50.0										
-60.0	et et i la in									entile et caixe
-70.0										
-80.0										
-90.0										
Star #Res	t 4.5000 s BW 30	GHz kHz		#VE	W 300 kHz	*		Sweep	Stop 5 151.7 ms	.0000 GHz (35000 pts)
MSG							STATUS			





Figure 14 - 1626.675 MHz - 5 GHz to 5.5 GHz



Key	ysight Spect	rum Analyzer - Swept	SA		CENCE-EXT COUR				11.00.00	
Mar	ker 1 5	6.738635389 Gate: LO	9583 GHz NFE	PNO: Fast #IFGain:Low	Trig: Exter #Atten: 0 d	mal1 IB	Avg Type: I Avg Hold: 1	RMS 05/105	11:23:33 TR	ACE 1 2 3 4 5 6 TYPE A WWWWW DET A NNNNN
10 dE	3/div	Ref Offset 30 d Ref 0.00 dBr	B n					M	kr1 5.738 -70.	635 GHz 668 dBm
-10.0										DL1 -13.00 dBm
-20.0										
-30.0										
-40.0										
-50.0										
-60.0					<u>1</u>					
-70.0										
-80.0										
-90.0										
Star #Res	t 5.500 s BW 3	0 GHz 0 kHz		#VB	W 300 kHz	*		Sweep	Stop 6 151.7 ms	6.0000 GHz (35000 pts)
MSG							STATUS			





Figure 16 - 1626.675 MHz - 6 GHz to 6.5 GHz



🛄 Kej	ysight Spectr	um Analyzer - Swept	SA							
Mar	ker 1 6	506700191 Gate: LO	1434 GHz NFE	PNO: Fast ++	Trig: Exter Atten: 6 d	mal1 B	Avg Type: Avg Hold: 1	RMS 05/105	09:14:42 TR	ACE 1 2 3 4 5 6 TYPE A WINNNN DET A NNNNN
10 dE	3/div	Ref Offset 32.2 Ref 0.00 dBr	dB n					M	kr1 6.506 -41.	700 GHz 917 dBm
-10.0										
-20.0										DL1 -13.00 dBm
-30.0										
-40.0	∳ ¹									
-50.0										
-60.0										
-70.0										
-80.0										
-90.0										
Star #Re:	t 6.5000 s BW 30) GHz) kHz		#VB	W 300 kHz	*		Sweep	Stop 7 151.7 ms	7.0000 GHz (35000 pts)
MSG							STATUS			





Figure 18 - 1626.675 MHz - 7.5 GHz to 8 GHz



RF 30 0 DC Statistics Autom Odd3030 PMEb 15,2017 Gate: LO NFE PNO: Fast IFGain:Low	Keysight Spe	ctrum Analyzer - Sv	vept SA					- # -
Gate: LO NFE PNO: Fast IFGain:Low → Trig: External 1 Atten: 6 dB Avg Hold: 105/105 Trig: Different 105/105 0 dB/div Ref 0.00 dBm 0 0 0 0 0 0 0 0 ↓ ↓ ↓ ↓ 0 0 0 0 0 ↓ ↓ ↓ ↓ ↓ 0 0 0 ↓ ↓ ↓ ↓ ↓ 0 0 ↓ ↓ ↓ ↓ ↓ 0 0 ↓ ↓ ↓ ↓ ↓ 0 0 ↓ ↓ ↓ ↓ ↓ 0 0 ↓ ↓ ↓ ↓ ↓ 0 0 ↓ ↓ ↓ ↓ ↓ 0 0 ↓ ↓ ↓ ↓ ↓ 0 0 ↓ ↓ ↓ ↓ ↓ 0 0 ↓ ↓ ↓ ↓ ↓ 0 0 ↓ ↓ ↓ ↓ ↓ 0 0 ↓ ↓ ↓ ↓ ↓ 0 0 ↓ ↓ ↓ ↓ ↓ 0 0 ↓ ↓ ↓ ↓ ↓ 0 0	LXI	RF 50 \$	2 DC	SENSE:E	OURCE OFF	ALIGN AUTO Avg Type	RMS	04:30:30 PM Feb 15, 2017 TRACE 1 2 3 4 5 6
Ref Offset 36.9 dB Ref 0.00 dBm 00 00 0 <t< th=""><th></th><th>Gate: LO</th><th>NFE</th><th>PNO: Fast Tri FGain:Low At</th><th>g: External1 ten: 6 dB</th><th>Avg Hold:</th><th>105/105</th><th>DET A NNNN</th></t<>		Gate: LO	NFE	PNO: Fast Tri FGain:Low At	g: External1 ten: 6 dB	Avg Hold:	105/105	DET A NNNN
0 Bldiv Ref 0.00 dBm 00 0 00 0 00 0 00 0 00 0 00 0 00 0 00 0 00 0 00 0 00 0 00 0 00 0 00 0 00 0 00 0 00 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0 000 0		Paf Offeat 3	S 9 dB					
000 01 02 01 02 <t< td=""><td>10 dB/div</td><td>Ref 0.00 d</td><td>Bm</td><td></td><td></td><td></td><td></td><td></td></t<>	10 dB/div	Ref 0.00 d	Bm					
200 0	-10.0				ĭ			DL1 -13.00 dDm
300 0<	-20.0							
400 0	-30.0			<u>2</u>				
Start 8.000 GHz Stop 18.000 GHz Res BW 510 kHz #VBW 3.0 MHz* Sweep 202.7 ms (40000 pts) IMR MOE TEC SCL X Y FUNCTION WDTH FUNCTION VALUE 1 1 1.1.386 83 GHz -39.537 dBm - - 3 1 1 1.1.386 83 GHz -39.537 dBm - - 10 1 - - - - - -	-40.0							
Start 8.000 GHz Stop 18.000 GHz RRes BW 510 kHz #VBW 3.0 MHz* Sweep 202.7 ms (40000 pts) INR MODE TEC SCL X Y FUNCTION FUNCTION WDTH FUNCTION VALUE 1 N 1 f 9.760.04 GHz -34.505 dBm - 2 N 1 f 9.760.04 GHz -39.537 dBm - 3 1 f 11.386.83 GHz -39.537 dBm - - 6 - - - - - - 10 - - - - - -	-50.0	~~~~						
X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE 1 1 1.386 83 GHz -334,505 dBm -34,505 dBm - 2 N 1 1 1.1.386 83 GHz -39,557 dBm - 3 N 1 1 1.1.386 83 GHz -39,557 dBm - 3 1 1 1.1.386 83 GHz -39,557 dBm - - 10 - - - - - - -	-60.0							
Start 8.000 GHz Stop 18.000 GHz RR BW 510 KHz #VBW 3.0 MHz* Sweep 202.7 ms (40000 pts) INR MODE TRC SCL X Y FUNCTION FUNCTION WDTH FUNCTION VALUE 1 N 1 f 9.760.04 GHz -34.505 dBm - 2 N 1 f 9.760.04 GHz -39.537 dBm - 3 - - - - - - - 4 - - - - - - - - 5 - - - - - - - - 6 - - - - - - - 7 - - - - - - - - 9 - - - - - - - - - - - - - - - - - - -	-70.0							
Start 8.000 GHz Res BW 510 kHz Stop 18.000 GHz #VBW 3.0 MHz* Stop 18.000 GHz Sweep 202.7 ms (40000 pts) INR MODE TRC SCL X Y FUNCTION FUNCTION WDTH FUNCTION VALUE 1 N 1 f 9.760.04 GHz -34.505 dBm -34.505 dBm - 2 N 1 f 11.386 83 GHz -39.537 dBm - 3 - - - - - - - 4 - - - - - - - 3 - - - - - - - 5 - - - - - - - 6 - - - - - - - 9 - - - - - - - - 10 - - - - - - - - - - - -	-80.0							
Start 8.000 GHz Stop 18.000 GHz Res BW 510 kHz #VBW 3.0 MHz* Sweep 202.7 ms (40000 pts) INR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE 1 N 1 f 9.760.04 GHz -34.505 dBm -34.505 dBm -34.505 dBm -34.505 dBm -34.505 dBm -34.505 dBm -39.537 dBm	-90.0							
KRR BW 510 kHz #VBW 3.0 MHz* Sweep 202.7 ms (40000 pts) MRR NOE TC SKR Y FUNCTION FUNCTION WIDTH FUNCTION VALUE 1 N 1 f 9.760.04 GHz -34.505 dBm - 2 N 1 f 11.386 83 GHz -39.537 dBm - 3 - - - - - - - 6 - - - - - - - - 9 -	Start 8.00	0 GHz		and a street of the				Stop 18.000 GHz
MRR MODE TRC: SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE 1 N 1 f 9.760 04 GHz -34,505 dBm - 3 1 f 11.386 83 GHz -39,537 dBm - - 3 1 f 11.386 83 GHz -39,537 dBm - - 6 - - - - - - - 7 -	#Res BW	510 kHz		#VBW 3.0) MHz*		Sweep	202.7 ms (40000 pts)
N 1 7 9,760 04 GHz -34,805 dBm 3 1 1 11,386 83 GHz -39,537 dBm 6 - - - 7 - - - 8 - - - 9 - - - 10 - - -	MKR MODE TR	C SCL	X	Y 24 FAF dib-	FUNCTION	FUNCTION WIDTH	F	UNCTION VALUE
	2 N 1	i i	11.386 83 GHz	-34,505 dBm -39,537 dBm				
	3							
	5							
	7							
	9							
	11							-
	1 Inco				m	STATIS		

Figure 19 - 1626.675 MHz - 8 GHz to 18 GHz









Figure 21 - 1643.675 MHz - 9 kHz to 150 kHz



🛄 Kej	ysight Spectrum /	Analyzer - Swept S/								
Mar	ker 1 163	.930929 k Gate: LO	Hz NFE I	PNO: Wide ++ FGain:Low	Trig: Exter Atten: 6 d	mal1 B	Avg Type:	RMS	03:34:01 TR T	PMJan 24, 2017 ACE 1 2 3 4 5 6 YPE WWWWWWWWW DET A N N N N N
10 dE	Ref B/div Ref	Offset 26.55 f 0.00 dBm	зв						Mkr1 1 -65	63.9 kHz 5.09 dBm
-10.0										
-20.0										DL1 -13.00 dBm
-30.0										
-40.0										
-50.0										
-60.0	1									
-70.0	<u></u>									
-80.0				In the second						
-90.0	nin andre	a (francés) (francés	i sanijila je bi nito na	en e	n a service and the second	lan da katiki katika Lan da katiki katika	<mark>kodia ili jolojan siti</mark>	aleanti derden aleanti, legel att	and sea plantaire. Is de saide sea	antan manananan Antan manananan
star #Res	t 150 kHz sBW 4.3 k	KHz		#VB	W 1.0 MHz	*		#Sweep	Stop 15.00 s	30.00 MHz (15000 pts)
MSG							STATUS			





Figure 23 - 1643.675 MHz - 30 MHz to 1 GHz



🔤 Ke	ysight Spec	trum Analyzer - Sv	vept SA							
Mar	ker 1	R⊧ 50 s 1.6437160	2 DC 92902 GHz		SENSE:EXT] SOUR	CEOFF AL	Avg Type:	RMS	03:25:38 TR	PM Jan 24, 2017 ACE 1 2 3 4 5 6
		Gate: LO	NFE	PNO: Fast ++ #IFGain:Low	Trig: Exter Atten: 22 (nal1 dB	Avg Hold: 1	05/105	1	
		Ref Offset 28	3.3 dB					N	lkr1 1.64	3 72 GHz
10 dl Log	B/div	Ref 40.00	dBm						33.	911 aBm
				🛉 1						
30.0										
20.0										
20.0										
10.0	<u> </u>									
0.00										
-10.0	——									DL1 -13.00 dBm
-20.0										
-30.0										
-40.0										
-50.0										
				and Philipping and		Conception of Deside				
Star	L) GHz							Stop	3.000 GHz
#Re	s BW '	100 kHz		#VE	BW 1.0 MHz	÷		Sweep	72.00 ms	(40000 pts)
MSG							STATUS			





Figure 25 - 1643.675 MHz - 3 GHz to 3.5 GHz



Keysigh	t Spectrum Analyzer - Swept	: SA							
Marker	RF 50 Ω r 1 3.501900190	0019 GHz		SENSE:EXT SOUP	RCE OFF AL	IGN AUTO Avg Type:	RMS	02:57:38 TR	ACE 1 2 3 4 5 6
	Gate: LO	NFE	PNO: Fast ++ #IFGain:Low	. Trig: Exter #Atten: 0 d	mai1 IB	Avg Hold: 1	105/105		
10 dB/di	Ref Offset 29.4 • Ref 0.00 dBr	dB n					N	1kr1 3.50 -64.	1 90 GHz 907 dBm
LUg									
-10.0									DL1 -13.00 dBm
-20.0									
20.0									
-30.0									
-40.0									
-50.0									
-60.0									
-70.0			und gezen and a propheters		A Martin Shitting and		A CONTRACTOR OF THE OWNER OF THE		
-80.0									
-90.0									
Start 3. #Res B	.5000 GHz W 100 kHz		#VB	W 1.0 MHz	*		Sweep	Stop 4 18.00 ms	.0000 GHz (10000 pts)
MSG						STATUS			





Figure 27 - 1643.675 MHz - 4 GHz to 4.5 GHz



🛄 Ke	sight Spectru	m Analyzer - Swept	I SA		course of cour					
Mar	ker 1 4.	930983742 Gate: LO	2393 GHz NFE	PNO: Fast ++	. Trig: Exter Atten: 6 d	mal1 B	Avg Type: Avg Hold: 1	RMS 05/105	09:27:25 TR	ACE 1 2 3 4 5 6 TYPE A WINN N N
10 de	R B/div R	tef Offset 33.8 tef 0.00 dBr	dB n					M	kr1 4.930 -40.	984 GHz 042 dBm
-10.0										DL1-13.00 dBm
-20.0										
-30.0										
-40.0									• ¹	
-50.0										
-60.0										
-70.0										
-80.0										
-90.0										
Star #Re	t 4.5000 s BW 30	GHz kHz		#VB	300 kHz	*		Sweep	Stop 5 151.7 ms	.0000 GHz (35000 pts)
MSG							STATUS			





Figure 29 - 1643.675 MHz - 5 GHz to 5.5 GHz



Keysigi	ht Spectrum Analyzer - Swept	SA		course out					
Marke	r 1 5.983548354 Gate: LO	835 GHz NFE	PNO: Fast ++	. Trig: Exter #Atten: 0 d	mal1 IB	Avg Type: Avg Hold: 1	RMS 05/105	02:39:24 TR	ACE 1 2 3 4 5 6 TYPE A WWWWW DET A NNNNN
10 dB/d	Ref Offset 30 dE	3 n					N	lkr1 5.98 -65.	3 55 GHz 751 dBm
-10.0									
-20.0									DL1-13.00 dBm
-30.0 —									
-40.0									
-50.0 —									
-60.0									1-
-70.0	Property and an internal strength of the second strength of the seco		***		te en ante an ten fan fan fan fan fan fan fan fan fan fa	Mintel a Japanpa		angi matata kana ik	an a porta de la constante
-80.0									
-90.0									
Start 5 #Res E	.5000 GHz		#VB	W 1.0 MHz	*		Sweep	Stop 6	6.0000 GHz (10000 pts)
MSG			<i>"</i> ~ C			STATUS	ewcep	rozoo mis	(receic pro)





Figure 30 - 1643.675 MHz - 6 GHz to 6.5 GHz



🔤 Kej	ysight Spec	trum Analyzer -	Swept SA								- 6 -
Mar	ker 1	6.574644 Gate: LO	989857 NF	GHz E P IF	NO: Fast	Trig: Exter Atten: 6 dl	nal1 B	Avg Type: I Avg Hold: 1	RMS 05/105	09:10:15 TR 1	AM Feb 16, 2017 ACE 1 2 3 4 5 6 TYPE A WINN N N DET A N N N N N
10 de	B/div	Ref Offset Ref 0.00	32.2 dB dBm						MI	(r1 6.574 -41.	645 GHz 406 dBm
-10.0											DL1 -13.00 dBm
-20.0											
-30.0											
-40.0											
-50.0											
-60.0											
-70.0											
-80.0											
-90.0											
Star #Re	t 6.500 s BW 3	00 GHz 30 kHz			#VB	W 300 kHz	t		Sweep	Stop 7 151.7 ms	.0000 GHz (35000 pts)
MSG								STATUS			





Figure 32 - 1643.675 MHz - 7 GHz to 7.5 GHz



🔤 Kej	ysight Specti	rum Analyzer - Swep	t SA							
Mar	ker 1 7	RF 50 Ω	1733 GHz		SENSE:EXT SOUR	RCE OFF AL	IGN AUTO Avg Type:	RMS	02:29:00 TR	PM Jan 24, 2017 ACE 1 2 3 4 5 6
intea		Gate: LO	NFE	PNO: Fast ++ #IFGain:Low	. Trig: Exter #Atten: 0 d	mal1 iB	Avg Hold: 1	05/105		
10 dE	3/div	Ref Offset 30.7 Ref 0.00 dBi	dB m					N	1kr1 7.97 -65.	3 35 GHz 357 dBm
- ¢g										
-10.0										DL1 -13.00 dBm
-20.0										
-30.0										
-40.0										
50.0										
-50.0										
-60.0										↓ ¹
-70.0	a seril ergoler			and statements in the second statement of	The state of the second second second	And and Barry Shares			and the factor of the	designational a disarba
-80.0										
-00.0										
-90.0										
Star	t 7.500	0 GHz							Stop 8	3.0000 GHz
#Re	s BW 1	00 kHz		#VB	W 1.0 MHz	*		Sweep	18.00 ms	(10000 pts)
MSG							STATUS			





Figure 34 - 1643.675 MHz - 8 GHz to 18 GHz









Figure 36 - 1660.475 MHz - 9 kHz to 150 kHz



🔤 Keysig	ht Spectrum Analyzer - Sw	ept SA							
Marke	RF 50 Ω ar 1 167 91119	2 kHz		SENSE:EXT SOUR	CE OFF A	Avg Type:	RMS	03:54:57 TR	PM Jan 24, 2017 ACE 1 2 3 4 5 6
	Gate: LO	NFE	PNO: Wide ++ #IFGain:Low	. Trig: Exter Atten: 6 d	mal1 B	Avg Hold: 1	05/105	1	
10 dB/o	Ref Offset 26 liv Ref 0.00 dl	6.55 dB Bm						Mkr1 1 -64.	67.9 kHz 612 dBm
3									
-10.0									DL1 -13.00 dBm
-20.0									
-30.0 —									
10.0									
-40.0									
-50.0									
-60.0									
.70.0									
							1		
-80.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	manpan	*****	and the second	An and the second	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	4940/V/101491994444	******	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
-90.0									
Start *	150 kHz		#\/E		*		Swaan	Stop	30.00 MHz
MSG	50 KH2		#VE			STATUS	Sweep	0.999 1115	(13000 pts)
						0111100			





Figure 38 - 1660.475 MHz - 30 MHz to 1 GHz



🛄 Kej	/sight Spe	ctrum Analyzer - Swep	ot SA							
Mar	ker 1	RF 50 Ω 1.66051651 Gate: LO	2913 GHz NFE	PNO: Fast 🔸	Trig: Exter	nal1	Avg Type: Avg Hold: 1	RMS 05/105	04:01:52 TR	PM Jan 24, 2017 ACE 1 2 3 4 5 6 TYPE A
10 dE	3/div	Ref Offset 28.3 Ref 40.00 d	3 dB Bm	#IFGain:Low	Atten: 22 c	D		N	1kr1 1.66 34.	0 52 GHz 006 dBm
30.0										
20.0										
10.0										
0.00										
-10.0										DL1 -13.00 dBm
-20.0										
-30.0										
~40.0										
-50.0										
Star #Re:	t 1.00 s BW	0 GHz 100 kHz		#VE	3W 1.0 MHz*			Sweep	Stop 72.00 ms	3.000 GHz (40000 pts)
MSG							STATUS			





Figure 40 - 1660.475 MHz - 3 GHz to 3.5 GHz



Keysight S	pectrum Analyzer - Swept	t SA							
(X) Markor	RF 50 Ω			SENSE:EXT SOUR	CE OFF AL	IGN AUTO	RMS	04:28:42 TR	PM Jan 24, 2017
Marker	Gate: LO	NFE	PNO: Fast ++ #IFGain:Low	Trig: Exter #Atten: 0 d	mal1 IB	Avg Hold: 1	05/105	1	
10 dB/div	Ref Offset 29.4 Ref 0.00 dBr	dB n					N	lkr1 3.50 -64.	3 80 GHz 872 dBm
-10.0									DL1 -13.00 dBm
-20.0									
-30.0									
-40.0									
-50.0									
-60.0									
-70.0			interesting in the second second	and a balance		State of the local division of the local div			Contract of all from the
-80.0									
-90.0									
Start 3.5 #Res BW	000 GHz / 100 kHz		#VB	W 1.0 MHz	*		Sweep	Stop 4 18.00 ms	.0000 GHz (10000 pts)
MSG						STATUS			





Figure 42 - 1660.475 MHz - 4 GHz to 4.5 GHz



🔤 Key	sight Spectru	m Analyzer - Swept	SA							
Mari	ker 1 4.9	RF 50 Ω 981385182 Gate: LO	A34 GHz	PNO: Fast	Trig: Exter Atten: 6 d	rnal1 B	ALIGN AUTO Avg Type: Avg Hold: 1	RMS 05/105	02:10:40 TR	PM Feb 15, 2017 ACE 1 2 3 4 5 6 TYPE A WWW DET A NNNNN
10 dE Log	R 3/div R	ef Offset 31 di ef 0.00 dBr	B n					MI	kr1 4.981 -39.	385 GHz 173 dBm
-10.0										DL1 -13.00 dBm
-20.0										
-30.0										<u> </u>
-40.0										
-50.0										
-60.0										
-70.0										
-80.0										
-90.0										
Star #Res	t 4.5000 s BW 30	GHz kHz		#VB	W 1.0 MHz	*		Sweep	Stop 5 142.3 ms	6.0000 GHz (35000 pts)
MSG							STATUS			





Figure 44 - 1660.475 MHz - 5 GHz to 5.5 GHz



Keysight	Spectrum Analyzer - Swept	: SA							
<mark>01</mark> Marker	RF 50 Ω	DC 7337 CHz		SENSE:EXT SOUR	CE OFF AL	Avg Type:	RMS	04:33:20 TR	PM Jan 24, 2017
marker	Gate: LO	NFE	PNO: Fast ++ #IFGain:Low	. Trig: Exter #Atten: 0 d	mal1 IB	Avg Hold: 1	05/105		
10 dB/div	Ref Offset 30 d Ref 0.00 dBr	B n					N	1kr1 5.73 -65.	3 67 GHz 826 dBm
209									
-10.0									DL1 -13.00 dBm
-20.0									
-30.0									
-40.0									
-50.0									
-60.0					A LANGE AND A LANGE		and a state state state		erfe Alian The Million Prot
-70.0	and the second sec	A COLORADO				and the fick state in a state	and the second		
-80.0									
~									
-50.0									
Start 5.5 #Res Bl	5000 GHz N 100 kHz		#VB	W 1.0 MHz	*		Sweep	Stop 6 18.00 ms	.0000 GHz (10000 pts)
MSG						STATUS			





Figure 46 - 1660.475 MHz - 6 GHz to 6.5 GHz



🛄 Kej	sight Spectr	um Analyzer - Swept	: SA							- 6 -
Mar	ker 1 6	641961198 Gate: LO	8891 GHz NFE	PNO: Fast> IFGain:Low	Trig: Exter Atten: 6 d	mal1 B	Avg Type: Avg Hold: 1	RMS 05/105	02:55:43 TR	ACE 1 2 3 4 5 6 TYPE A WINN N DET A N N N N N
10 dE	3/div	Ref Offset 32.2 Ref 0.00 dBr	dB n					M	(r1 6.641 -38.	961 GHz 433 dBm
-10.0										DL1 -13.00 dBm
-20.0										
-30.0										
-40.0										
-50.0										
-60.0										
-70.0										
-80.0										
-90.0										
Star #Res	t 6.5000 s BW 30) GHz) kHz		#VE	3W 1.0 MHz	*		Sweep	Stop 7 142.3 ms	.0000 GHz (35000 pts)
MSG							STATUS			





Figure 48 - 1660.475 MHz - 7 GHz to 7.5 GHz



🔤 Kej	ysight Spectrun	n Analyzer - Swept Si	A		SENSE EXT SOUL				04:42:43	ON 120 24, 2017
Mar	ker 1 7.9	896989698 Gate: LO	897 GHz	PNO: Fast FGain:Low	Trig: Exter #Atten: 0 d	mal1 iB	Avg Type: Avg Hold: 1	RMS 05/105	TR	ACE 1 2 3 4 5 6 TYPE A WINNIN DET A NNNNN
10 dE	Re Bídiv R e	ef Offset 30.7 d ef 0.00 dBm	В					N	1kr1 7.98 -65.	9 70 GHz 187 dBm
-10.0										DL1 -13.00 dBm
-20.0										
-30.0										
10.0										
-40.0										
-50.0										
-60.0										1
.70.0	a a a a a a a a a a a a a a a a a a a	katena panji di ka pang	al a sector of the sector	a in the subscript of the	shaddi internet		a constant of	410-(<i>1</i> 40-0-15)-110-	gelones de la gio de la	
70.0										
-80.0										
-90.0										
Star #Re	t 7.5000 s BW 100	GHz) kHz		#VB	W 1.0 MHz	×		Sweep	Stop 8 18.00 ms	.0000 GHz (10000 p <u>ts)</u>
MSG							STATUS			





Figure 50 - 1660.475 MHz - 8 GHz to 18 GHz

Remarks

The authorized channel bandwidth was declared by the manufacturer as 70 kHz.



FCC 47 CFR Part 2, Limit Clause 25.202(f)

The average power of unwanted emissions shall be attenuated below the average output power, P(dBW), of the transmitter, as specified below:

- 1) 25 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 50%, up to and including 100% of the authorised bandwidth;
- 2) 35 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 100%, up to and including 250% of the authorised bandwidth;
- 3) 43 + 10 Log p (watts) in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 250% of the authorised bandwidth.

Industry Canada RSS-170, Limit Clause 5.4.3.1

The average power of unwanted emissions shall be attenuated below the average output power, P(dBW), of the transmitter, as specified below:

- 25 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 50%, up to and including 100% of the occupied bandwidth or necessary bandwidth, whichever is greater
- 35 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 100%, up to and including 250% of the occupied bandwidth or necessary bandwidth, whichever is greater
- 43 + 10 Log p (watts) in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 250% of the occupied bandwidth or necessary bandwidth, whichever is greater.

2.4.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Туре No	TE No	Calibration Period (months)	Calibration Due
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	14-Dec-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	05-Mar-2017
Crystal Detector	Hewlett Packard	8470B	1320	12	08-Jun-2017
Hygrometer	Rotronic	I-1000	3220	12	23-Aug-2017
Combiner/Splitter	Weinschel	1506A	3877	12	30-Mar-2017
Frequency Standard	Spectracom	Secure Sync 1200- 0408-0601	4393	6	05-Mar-2017
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4- NMS	4510	12	26-May-2017
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4- KMS	4520	12	16-Feb-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	06-Oct-2017
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	O/P Mon

Table 9

O/P Mon – Output Monitored using calibrated equipment



2.5 Radiated Spurious Emissions

2.5.1 Specification Reference

FCC 47 CFR Part 25, Clause 25.202(f) FCC 47 CFR Part 2, Clause 2.1051 Industry Canada RSS-170, Clause 5.4.3.1 Industry Canada RSS-GEN, Clause 6.13

2.5.2 Equipment Under Test and Modification State

GSPS Core Module 2.0, S/N: IHG0000198 - Modification State 0

2.5.3 Date of Test

18-January-2017 to 22-January-2017

2.5.4 Test Method

The test was performed in accordance with KDB 971168 D01, Clause 7.

2.5.5 Environmental Conditions

Ambient Temperature18.9 - 19.9 °CRelative Humidity24.0 - 25.0 %

2.5.6 Test Results

Inmarsat Transmitting

Frequency (MHz)	Result (dBm)
*	

Table 10 - 1626.675 MHz - 30 MHz to 1 GHz Emissions Results

*No emissions were found within 20 dB of the limit.





Figure 51 - 1626.675 MHz - 30 MHz to 1 GHz

Frequency (MHz)	Result (dBm)
*	

Table 11 - 1626.675 MHz - 1 GHz to 18 GHz Emissions Results

*No emissions were found within 20 dB of the limit.







Figure 52 - 1626.675 MHz - 1 GHz to 3 GHz

Figure 53 - 1626.675 MHz - 3 GHz to 8 GHz





Figure 54 - 1626.675 MHz - 8 GHz to 18 GHz



Frequency (MHz)	Result (dBm)
*	

Table 12 - 1643.675 MHz - 30 MHz to 1 GHz Emissions Results

*No emissions were found within 20 dB of the limit.



Figure 55 - 1643.675 MHz - 30 MHz to 1 GHz



Frequency (MHz)	Result (dBm)
*	

Table 13 - 1643.675 MHz - 1 GHz to 18 GHz Emissions Results

*No emissions were found within 20 dB of the limit.



Figure 56 - 1643.675 MHz - 1 GHz to 3 GHz







Figure 57 - 1643.675 MHz - 3 GHz to 8 GHz

Figure 58 - 1643.675 MHz - 8 GHz to 18 GHz



Frequency (MHz)	Result (dBm)
*	

Table 14 - 1660.475 MHz - 30 MHz to 1 GHz Emissions Results

*No emissions were found within 20 dB of the limit.



Figure 59 - 1660.475 MHz - 30 MHz to 1 GHz

Frequency (MHz)	Result (dBm)
*	

Table 15 - 1660.475 MHz - 1 GHz to 18 GHz Emissions Results

*No emissions were found within 20 dB of the limit.







Figure 60 - 1660.475 MHz - 1 GHz to 3 GHz

Figure 61 - 1660.475 MHz -: 3 GHz to 8 GHz





Figure 62 - 1660.475 MHz - 8 GHz to 18 GHz

Remarks

The authorized channel bandwidth was declared by the manufacturer as 70 kHz.

FCC 47 CFR Part 2, Limit Clause 25.202(f)

The average power of unwanted emissions shall be attenuated below the average output power, P(dBW), of the transmitter, as specified below:

- 1) 25 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 50%, up to and including 100% of the authorised bandwidth;
- 2) 35 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 100%, up to and including 250% of the authorised bandwidth;
- 3) 43 + 10 Log p (watts) in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 250% of the authorised bandwidth.

Industry Canada RSS-170, Limit Clause 5.4.3.1

The average power of unwanted emissions shall be attenuated below the average output power, P(dBW), of the transmitter, as specified below:

- 25 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 50%, up to and including 100% of the occupied bandwidth or necessary bandwidth, whichever is greater;
- 35 dB in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 100%, up to and including 250% of the occupied bandwidth or necessary bandwidth, whichever is greater;
- 43 + 10 Log p (watts) in any 4 kHz band, the centre frequency of which is offset from the channel frequency by more than 250% of the occupied bandwidth or necessary bandwidth, whichever is greater.



2.5.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Туре No	TE No	Calibration Period (months)	Calibration Due
Pre-Amplifier	Phase One	PS04-0086	1533	12	29-Jul-2017
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygrometer	Rotronic	HYGROPALM 1	2338	12	21-Sep-2017
Multimeter	Iso-tech	IDM101	2417	12	30-Sep-2017
Antenna (Bilog)	Chase	CBL6143	2904	24	11-Jun-2017
Cable (N-N, 8m)	Rhophase	NPS-2302-8000- NPS	3248	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	12-Nov-2017
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Suspended Substrate Highpass Filter	Advance Power Components	11SH10- 3000/X18000-O/O	4412	12	23-Mar-2017
Cable (Yellow, Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000- KPS	4527	6	O/P Mon
Cable (Rx, SMAm-SMAm 0.5m)	Scott Cables	SLSLL18-SMSM- 00.50M	4528	6	03-Feb-2017
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	27-Feb-2017
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	O/P Mon

Table 16

TU - Traceability Unscheduled O/P Mon – Output Monitored using calibrated equipment



2.6 Equivalent Isotropic Radiated Power

2.6.1 Specification Reference

FCC 47 CFR Part 25, Clause 25.204 Industry Canada RSS-170, Clause 5.3

2.6.2 Equipment Under Test and Modification State

GSPS Core Module 2.0, S/N: IHG0000175 - Modification State 0

2.6.3 Date of Test

13-February-2017

2.6.4 Test Method

The test was performed in accordance with KDB 971168, clause 5.4.1.

2.6.5 Environmental Conditions

Ambient Temperature	22.5 °C
Relative Humidity	27.8 %

2.6.6 Test Results

Inmarsat Transmitting

EIRP (dBm)			
1626.675 MHz 1643.675 MHz 1660.475 MHz			
28.596 28.260 28.342			

Table 17

FCC 47 CFR Part 25, Limit Clause 25.204

+40 dBW in any 4 kHz band for $\theta \le 0^{\circ}$ +40 + 3 θ dBW in any 4 kHz band for $0^{\circ} < \theta \le 5^{\circ}$ For angles of elevation of the horizon greater than 5° there shall be no restriction as to the equivalent isotropically radiated power transmitted by an earth station towards the horizon.

Industry Canada RSS-170, Limit Clause 5.3

The application for MES certification shall state the MES e.i.r.p. that is necessary for satisfactory communication. The maximum permissible e.i.r.p. will be the stated necessary e.i.r.p. plus a 2 dB margin. If a detachable antenna is used, the certification application shall state the recommended antenna type and manufacturer, the antenna gain and the maximum transmitter output power at the antenna terminal.



2.6.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Туре No	TE No	Calibration Period (months)	Calibration Due
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	14-Dec-2017
Multimeter	Fluke	79 Series III	611	12	14-Sep-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	05-Mar-2017
Crystal Detector	Hewlett Packard	8470B	1320	12	08-Jun-2017
Signal Generator (250kHz to 4GHz)	Agilent Technologies	E4433B	2893	12	18-Aug-2017
Hygrometer	Rotronic	I-1000	3220	12	23-Aug-2017
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000- 3PS	3702	12	13-Dec-2017
Combiner/Splitter	Weinschel	1506A	3877	12	30-Mar-2017
Frequency Standard	Spectracom	Secure Sync 1200- 0408-0601	4393	6	05-Mar-2017
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4- SMS	4514	12	16-Feb-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	06-Oct-2017
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	O/P Mon

Table 18

O/P Mon - Output Monitored using calibrated equipment



2.7 Limits on Emissions from Mobile Earth Stations for Protection of Aeronatical Radionavigation-Satellite Service

2.7.1 Specification Reference

FCC 47 CFR Part 25, Clause 25.216 Industry Canada RSS-170, Clause 5.4.3

2.7.2 Equipment Under Test and Modification State

GSPS Core Module 2.0, S/N: IHG0000175 - Modification State 0

2.7.3 Date of Test

13-February-2017

2.7.4 Test Method

The test was performed in accordance with KDB 971168 D01, Clause 6, FCC CFR 47 Part 25, Clause 25.216 and Industry Canada RSS-170, Clause 5.4.3.

2.7.5 Environmental Conditions

Ambient Temperature22.3 °CRelative Humidity37.6 %

2.7.6 Test Results

Inmarsat Transmitting

Frequency (MHz)	Level (dBW)
1574.731	-72.32

Table 19 - 1626.675 MHz - Broadband Emission Results

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





Figure 63 - 1626.675 MHz – Broadband Emissions



Frequency (MHz)	Level (dBW)
*	

Table 20 - 1626.675 MHz - Discrete Emission Results

*No emissions were detected within 6 dB of the limit.

Keysight	Spectrum Analyzer - Swept SA				
Marker	RF 50 Ω DC	GH7	SENSE:EXT SOURCE OFF	ALIGN AUTO Avg Type: RMS	12:27:03 PM Feb 13, 2017 TRACE 1 2 3 4 5 6
PASS	Gate: LO NF	E PNO: Wide ++ IFGain:High	. Trig: External1 #Atten: 0 dB	Avg Hold: 105/105	DET A NNNNN
10 dB/div	Ref Offset 27.4 dB Ref -20.00 dBm			1	/lkr1 1.606 815 GHz -55.653 dBm
Tra	ice 1 Pass				
-30.0					
-40.0					
-50.0		1			
-60.0	~~,~.hearin.e.,	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	\$~~~}~~}~~~		*******
-70.0					
-80.0					
60.0					
-90.0					
-100					
-110					
Start 1.6	605000 GHz				Stop 1.610000 GHz
#Res BV	N 1.0 MHz	#VB	W 3.0 MHz*	Swe	ep 2.533 ms (1001 pts)
MSG				STATUS	

Figure 64 - 1626.675 MHz - Discrete Emissions



Frequency (MHz)	Level (dBW)
*	

Table 21 - 1643.675 MHz - Broadband Emission Results

*No emissions were detected within 6 dB of the limit.

🔤 Key	sight Spectrum Analyzer	- Swept SA							
Mark	rer 1 1 60320		7	SENSE:EXT SOURC	E OFF A	Avg Type:	RMS	11:49:02 TR	AM Feb 13, 2017 ACE 1 2 3 4 5 6
intear i	Gate: LO	D NFE	PNO: Fast + IFGain:Low	. Trig: Extern Atten: 6 dB	hal1	Avg Hold: 2	205/205	1	
10 dB	Ref Offse Idiv Ref -30.	t 27.4 dB 00 dBm					M	(r1 1.603 -54.	206 GHz 584 dBm
-40.0									DL1 -40.00 dBm
-50.0									1
-60.0	00,0%	Kang ang ang ang ang ang ang ang ang ang	angangang ^k al ^a ng kang kang kang kang kang kang kang ka		******	an an an Antonio an an	**********	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
-70.0									
-80.0									
-90.0									
-100									
-120									
Start	1.55900 GHz							Stop 1.	60500 GHz
#Res	BW 1.0 MHz		#VE	W 3.0 MHz*		074710	Sweep	0 1.000 ms	(1001 pts)
MSG						STATUS			

Figure 65 - 1643.675 MHz - Broadband Emissions



Frequency (MHz)	Level (dBW)
*	

Table 22 - 1643.675 MHz - Discrete Emission Results

*No emissions were detected within 6 dB of the limit.

Keysigh	t Spectrum Analyzer - Swept	t SA							
(X/ L Morko	RF 50 Ω			SENSE:EXT] SOUR	CE OFF AL	IGN AUTO	PMS	12:28:33 TR	PM Feb 13, 2017
PASS	Gate: LO	NFE	PNO: Wide 🔸 IFGain:High	. Trig: Exter #Atten: 0 d	nal1 B	Avg Hold: 1	05/105	T	
10 dB/di	Ref Offset 27.4 Ref -20.00 d	dB Bm					Mk	r1 1.609 -56.	010 GHz 718 dBm
TI	race 1 Pass								
-30.0									
-40.0									
-50.0								1	
-60.0		******	~~~~ ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			•••••		~~~~	
-70.0									
~ ~									
-80.0									
-90.0									
-100									
-110									
Start 1	605000 CH7							Stop 1.6	10000 CH7
#Res B	W 1.0 MHz		#VE	3.0 MHz*	:		Sweep	2.533 ms	(1001 pts)
MSG						STATUS			

Figure 66 - 1643.675 MHz - Discrete Emissions



Frequency (MHz)	Level (dBW)
*	

Table 23 - 1660.475 MHz - Broadband Emission Results

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

Keysight	Spectrum Analyzer - Swept	SA .							
Marker	RF 50 Ω 0			SENSE:EXT SOUR	CE OFF AL	IGN AUTO Ava Type:	RMS	11:49:45 TF	AM Feb 13, 2017
marker	Gate: LO	NFE	PNO: Fast ++	. Trig: Exter Atten: 6 d	mal1 B	Avg Hold: 2	205/205		
10 dB/div	Ref Offset 27.4 d Ref -30.00 dE	iB Im					М	kr1 1.581 -56.	540 GHz 771 dBm
-40.0									DL1 -40.00 dBm
-50.0					1				
-60.0	and an and the second	~~~~~				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
-70.0									
-80.0									
-90.0									
-110									
-120									
Start 1.	55900 GHz		#\/B	W 2 0 MH-	*		Swaa	Stop 1.	60500 GHz
MSG	N 1.0 WINZ		#VB	W 5.0 WINZ		STATUS	Swee	p 1.000 ms	(Toor pis)

Figure 67 - 1660.475 MHz - Broadband Emissions



Frequency (MHz)	Level (dBW)			
*				

Table 24 - 1660.475 MHz - Discrete Emission Results

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

Keysight	ht Spectrum Analyzer - Swep	t SA							
UV L	RF 50 Ω			SENSE:EXT SOUR	CE OFF AL	IGN AUTO	DMS	12:29:16	PM Feb 13, 2017
PASS	Gate: LO	NFE	PNO: Wide ++	Trig: Exter #Atten: 0 d	nal1 B	Avg Hold: 1	105/105		
10 dB/di	Ref Offset 27.4 iv Ref -20.00 d	dB Bm					M	(r1 1.608 -56.	760 GHz 761 dBm
	race 1 Pass								
-30.0									
-40.0									
-50.0							1		
-60.0								man	
-70.0									
-80.0									
-90.0									
-100									
-110									
Start 1 #Res B	.605000 GHz 3W 1.0 MHz		#VB	W 3.0 MHz			Sweep	Stop 1.6 2.533 ms	10000 GHz (1001 pts)
MSG						STATUS			

Figure 68 - 1660.475 MHz - Discrete Emissions



Frequency (MHz)	Level (dBW)			
*				

Table 25 Carrier-off - Broadband Emission Results

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

🔤 Keysight Sp	bectrum Analyzer - Swept SA								
Markor 1	RF 50 Ω DC			SENSE:EXT SOUR	CE OFF A	Ava Type:	RMS	12:18:28 TF	PM Feb 13, 2017
Warker	1.6011260000	NFE I	PNO: Fast 🔸	Trig: Free #Atten: 0 d	Run B	Avg Hold: 2	205/205		
10 dB/div	Ref Offset 27.4 dE Ref -40.00 dBn	3 n					M	kr1 1.601 -65.	126 GHz 441 dBm
-50.0									DL1 -50.00 dBm
-60.0								1	
-70.0		*********	and a part of the set	*****	****	*****			****
-80.0									
-90.0									
-100									
-120									
-130									
Start 1.5	5900 GHz		#\/B	W 2 0 MIL-			#Durea	Stop 1.	61000 GHz
#Res BW	1.0 WHZ		#VB	W 3.0 MH2		STATUS	#Swee	p 2.000 ms	(1001 pts)

Figure 69 - Carrier-off - Broadband Emissions



Frequency (MHz)	Level (dBW)
*	

Table 26 - Carrier-off - Discrete Emission Results

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

Keysight Sp	ectrum Analyzer - Swept SA	1							- 0 💌
L L	RF 50 Ω DC			SENSE:EXT SOUR	CE OFF AL	IGN AUTO	DMC	12:18:04	PM Feb 13, 2017
Marker 1	1.604900000	NFE F	PNO: Fast 🔸	. Trig: Free #Atten: 0 d	Run B	Avg Hold: 2	05/205	1	
10 dB/div	Ref Offset 27.4 dl Ref -40.00 dBi	B m					Mł	(r1 1.604 -65.	900 GHz 374 dBm
-50.0									DL1 -50.00 dBm
-60.0									1
-70.0								~~~~~~~~~~~	
-80.0									
-90.0									
-100									
-110									
-130									
Start 1.55	5900 GHz							Stop 1.	61000 GHz
#Res BW	1.0 MHz		#VB	W 3.0 MHz	t		#Sweep	2.000 ms	(1001 pts)
MSG						STATUS			

Figure 70 - Carrier-off - Discrete Emissions

FCC 47 CFR Part 25, Limit Clause 25.216

25.216(c) The e.i.r.p. density of emissions from mobile earth stations placed in service after July 21, 2002 with assigned uplink frequencies between 1610 MHz and 1660.5 MHz shall not exceed -70 dBW/MHz, averaged over any 2 millisecond active transmission interval, in the band 1559–1605 MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed -80 dBW, averaged over any 2 millisecond active transmission interval, in the 1559–1605 MHz band.

25.216(g) Mobile earth stations manufactured more than six months after FEDERAL REGISTER publication of the rule changes adopted in FCC 03–283 with assigned uplink frequencies in the 1610–1626.5 MHz band shall suppress the power density of emissions in the 1605–1610 MHz band-segment to an extent determined by linear interpolation from -70 dBW/MHz at 1605 MHz to -10 dBW/MHz at 1610 MHz averaged over any 2 millisecond active transmission interval. The e.i.r.p of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed a level determined by linear interpolation from -80 dBW at 1605 MHz to -20 dBW at 1610 MHz, averaged over any 2 millisecond active transmission interval.

25.216(i) The e.i.r.p density of carrier-off state emissions from mobile earth stations manufactured more than six months after FEDERAL REGISTER publication of the rule changes adopted in FCC 03–283 with assigned uplink frequencies between 1 and 3 GHz shall not exceed -80 dBW/MHz in the 1559–1610 MHz band averaged over any two millisecond interval.



2.7.7 Test Location and Test Equipment Used

This test was carried out in RF Chamber 8 and RF Laboratory 1.

Instrument	Manufacturer	Туре No	TE No	Calibration Period (months)	Calibration Due
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	14-Dec-2017
Multimeter	Fluke	79 Series III	611	12	14-Sep-2017
Crystal Detector	Hewlett Packard	8470B	1320	12	08-Jun-2017
Hygrometer	Rotronic	I-1000	3220	12	23-Aug-2017
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	09-Sep-2017
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	15-Sep-2017
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000- 3PS	3702	12	13-Dec-2017
Combiner/Splitter	mbiner/Splitter Weinschel		3877	12	30-Mar-2017
DC - 12.4 GHz 10 dB Attenuator	C - 12.4 GHz 10 dB Suhner		3965	12	25-Oct-2017
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	08-Sep-2017
DC to TTL Converter	TUV SUD Product Service	GSPS CORE MODULE 2.0	4378	-	ΤU
Frequency Standard	Spectracom	Secure Sync 1200- 0408-0601	4393	6	05-Mar-2017
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4- SMS	4514	12	16-Feb-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	12-Jan-2018
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	06-Oct-2017
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	O/P Mon
2 metre SMA Cable	IW Microwave	3PS-1806LC-788- 3PS	4829	12	24-Jan-2018

Table 27

TU - Traceability Unscheduled

O/P Mon - Output Monitored using calibrated equipment



3 Measurement Uncertainty

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

Test Name	Measurement Uncertainty			
Modulation Characteristics	-			
Occupied Bandwidth	± 1.87 kHz			
Frequency Tolerance	± 3.54 Hz			
Spurious Emissions at Antenna Terminals	± 3.08 dB			
Radiated Spurious Emissions	30 MHz to 1 GHz: ± 5.1 dB 1 GHz to 18 GHz: ± 6.3 dB			
Equivalent Isotropic Radiated Power	Conducted: ± 0.7 dB Radiated: 1 GHz to 18 GHz: ± 6.3 dB			
Limits on Emissions from Mobile Earth Stations for Protection of Aeronatical Radionavigation-Satellite Service	Conducted: ± 3.45 dB Radiated: ± 6.3 dB			

Table 28