Report on the FCC and IC Testing of the

LARS THRANE A/S
Communications System, Model: LT3100

In accordance with FCC 47 CFR Parts 15 and 25 and Industry Canada RSS-247, RSS-170 and RSS-GEN (Simultaneous Transmission)

Add value.
Inspire trust.

Prepared for: LARS THRANE A/S
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FCC ID: 2AP9E-07183100 IC: 24065-07183100

COMMERCIAL-IN-CONFIDENCE

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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Adam Porteous	04 April 2019	
Authorised Signatory	Matthew Russell	04 April 2019	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD 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 Parts 15 and 25 and Industry Canada RSS-247, RSS-170 and RSS-GEN (Simultaneous Transmission). The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Graeme Lawler	04 April 2019	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

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

EXECUTIVE SUMMARY
A sample of this product was tested and found to be compliant with FCC 47 CFR Parts 15 and 25 and Industry Canada RSS-247, RSS-170 and RSS-GEN (Simultaneous Transmission).

ACCREDITATION
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).

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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	05 July 2018
2	Added missing item of test equipment	04 April 2019

1.2 Introduction

Applicant	LARS THRANE A/S
Manufacturer	LARS THRANE A/S
Model Number(s)	Communications System: LT-3100 Control Unit: LT-3110 Antenna: LT-3130 Handset Cradle: LT-3120 Handset Unit: LT3121
Serial Number(s)	Communications System: 00001730 Antenna: 00001668 Handset: 00002071
Hardware Version(s)	1.00
Software Version(s)	1.01R
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15: 2017 FCC 47 CGR Part 25: 2017 Industry Canada RSS-247 (Issue 2) February 2017 Industry Canada RSS-170 (Issue 3) July 2015 Industry Canada RSS-GEN (Issue 4) November 2014
Order Number Date	QAF 08-March-2018
Date of Receipt of EUT	03-April-2018
Start of Test	25-April-2018
Finish of Test	25-April-2018
Name of Engineer(s)	Graeme Lawler
Related Document(s)	ANSI C63.10 (2013) ANSI C63.26 (2015)

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Parts 15 and 25 (Simultaneous Transmission) is shown below.

Section	Specification Clause					Test Description	Result	Comments/Base Standard
	Part 15	Part 25	RSS-247	RSS-170	RSS-GEN			
Configuration and Mode: Iridium Transmit + Bluetooth								
2.1	15.247 (d) and 15.205	25.202 (f)	5.5	5.4.3.1	6.13	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	

1.4 Application Form

EQUIPMENT DESCRIPTION	
Model Name/Number	LT-3100 satellite communications System
Part Number	LT-3110, LT-3120, LT-3121, LT-3130
Hardware Version	1.00
Software Version	1.01R
FCC ID (if applicable)	2AP9E - 07183100
Industry Canada ID (if applicable)	24065 - 07183100
Technical Description (Please provide a brief description of the intended use of the equipment)	Satellite Communication System for voice and data communication

INTENTIONAL RADIATORS									
Technology	Frequency Band (MHz)	Conducted Declared Output Power (dBm)	Antenna Gain (dBi)	Supported Bandwidth (s) (MHz)	Modulation Scheme(s)	ITU Emission Designator	Test Channels (MHz)		
							Bottom	Middle	Top
L-Band	1616-1626,50	38.2dBm	1		DE-QPSK/DE-BPSK	41K7Q7W	1616.020833		1625.979166
Bluetooth	2402-2480	8dBm	0,5		GFSK/DQPSK		2402MHz		2480MHz

UN-INTENTIONAL RADIATOR	
Highest frequency generated or used in the device or on which the device operates or tunes	2480 (Bluetooth)
Lowest frequency generated or used in the device or on which the device operates or tunes	1616.020833 (L-Band)
Class A Digital Device (Use in commercial, industrial or business environment) ☐ Class B Digital Device (Use in residential environment only) ☒	

Power Source			
AC	Single Phase	Three Phase	Nominal Voltage
External DC	Nominal Voltage	Maximum Current	
	12 / 24V	3.7A	
Battery	Nominal Voltage	Battery Operating End Point Voltage	
Can EUT transmit whilst being charged?	Yes ☐ No ☐		

EXTREME CONDITIONS					
Maximum temperature	+55	°C	Minimum temperature	-25	°C

Ancillaries
Please list all ancillaries which will be used with the device.

ANTENNA CHARACTERISTICS						
☒	Antenna connector			State impedance	50	Ohm
☐	Temporary antenna connector			State impedance		Ohm
☒	Integral antenna	Type	Helix			
☐	External antenna	Type				

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

Name: Carsten Thomsen

Position held: CTO Date: 04-07-2018

1.5 Product Information

1.5.1 Technical Description

LT-3100 Communications 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: 00001730			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 1

1.8 Test Location

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

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: Iridium Transmit + Bluetooth		
Radiated Spurious Emissions (Simultaneous Transmission)	Graeme Lawler	UKAS

Table 2

Office Address:

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

2 Test Details

2.1 Radiated Spurious Emissions (Simultaneous Transmission)

2.1.1 Specification Reference

FCC 47 CFR Parts 15.247 (d) and 15.205
FCC 47 CFR Part 25.202(f)
Industry Canada RSS-247, Clause 5.5
Industry Canada RSS-170, Clause 5.4.3.1
Industry Canada RSS-GEN, Clause 6.13

2.1.2 Equipment Under Test and Modification State

LT3100, S/N: 00001730 - Modification State 0

2.1.3 Date of Test

25-April-2018

2.1.4 Test Method

Testing was performed in accordance with ANSI C63.26-2015 clause 5.5.

Pre-scans were performed using the direct field strength method. Any emissions found within 10 dB of the specification limit were formally measured using the substitution method.

The limit line on the pre-scan plots was calculated from equation c) in clause 5.2.7

2.1.5 Environmental Conditions

Ambient Temperature	19.9 °C
Relative Humidity	36.0 %

2.1.6 Test Results

Iridium Transmit + Bluetooth

The EUT was configured for simultaneous transmission in the following mode of operation:

Technology	Frequency Band (MHz)	Channel Frequency (MHz)
Bluetooth	2400 MHz to 2483.5 MHz	2440 MHz
Iridium	1610 MHz to 1626.50 MHz	1621.020833 MHz

Table 3 - Modes of Operation

Frequency (MHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dB)	
	Peak	Average	Peak	Average	Peak	Average
*						

Table 4 - 30 MHz to 1 GHz Emissions Results

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

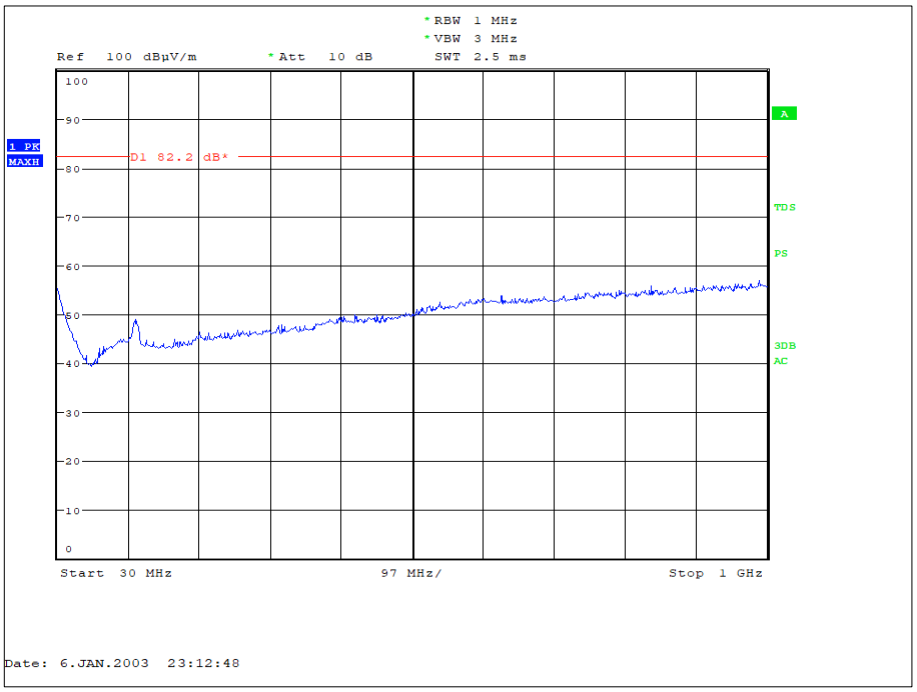

Figure 1 - 30 MHz to 1 GHz - Horizontal and Vertical

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dB)	
	Peak	Average	Peak	Average	Peak	Average
*						

Table 5 - 1 GHz to 25 GHz Emissions Results

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

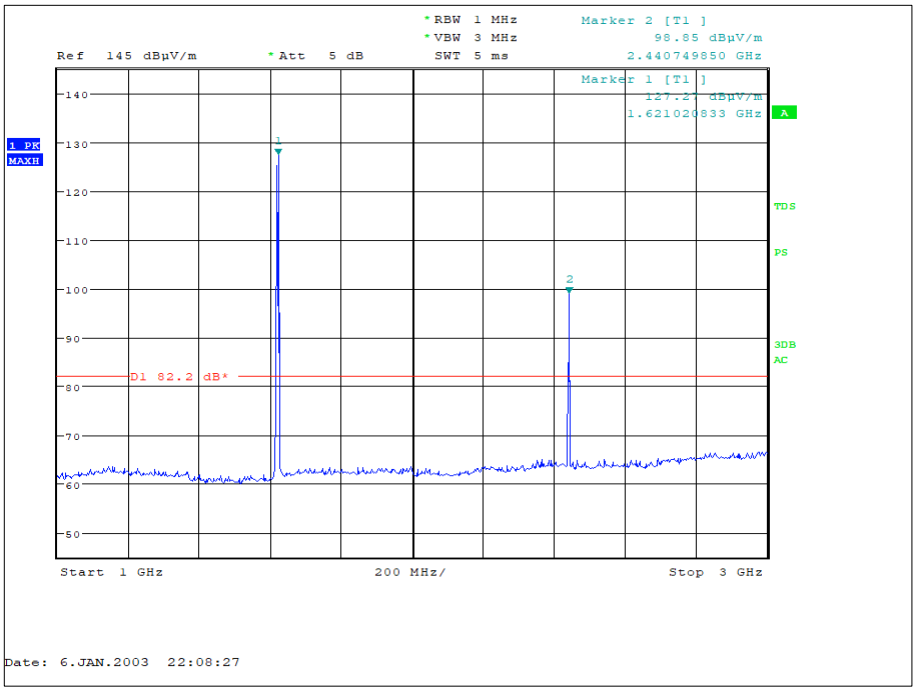

Figure 2 - 1 GHz to 3 GHz - Horizontal and Vertical

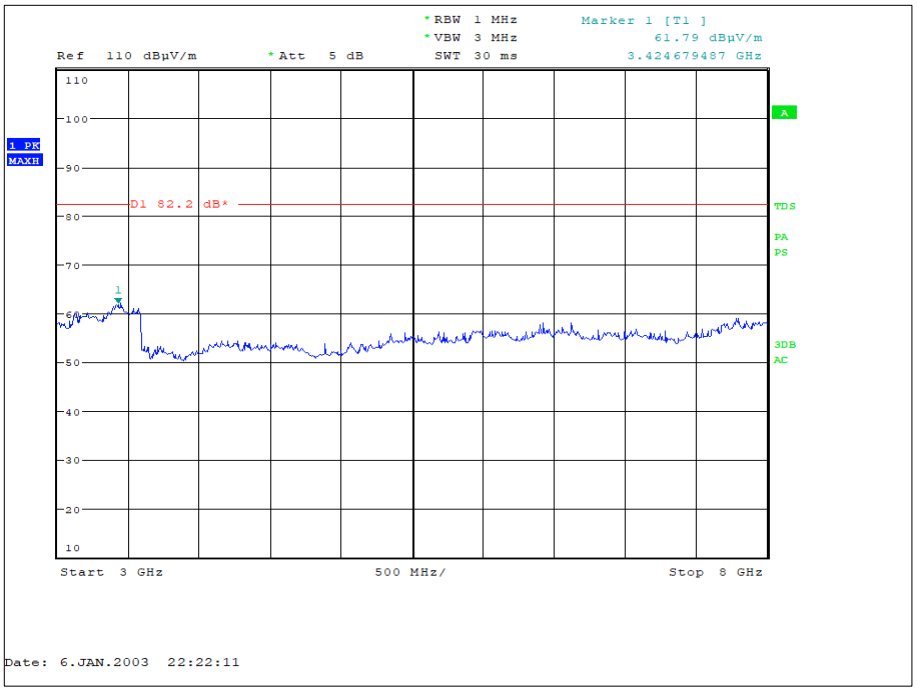

Figure 3 - 3 GHz to 8 GHz - Horizontal and Vertical

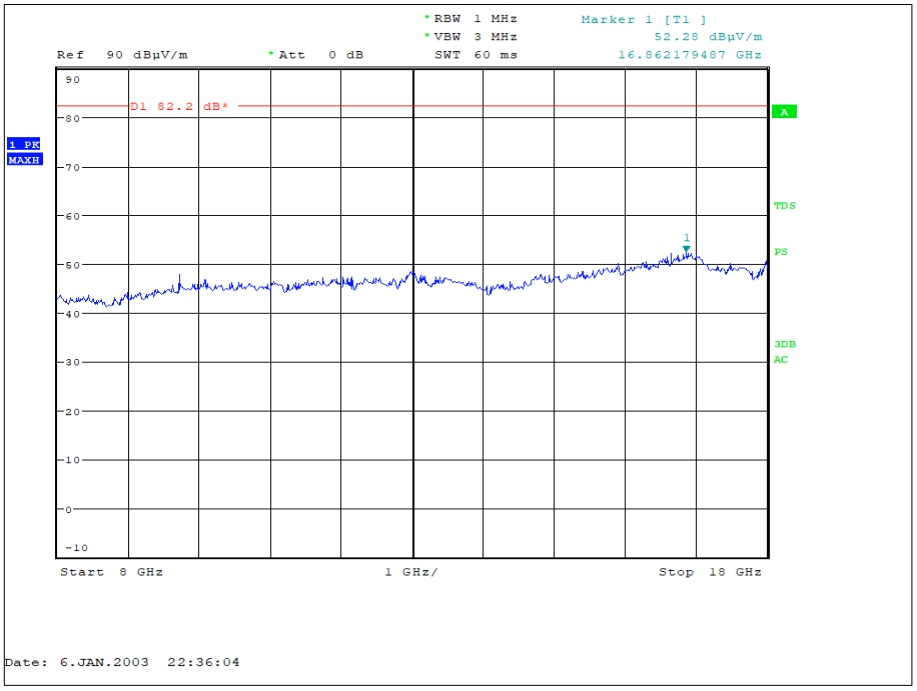

Figure 4 - 8 GHz to 18 GHz - Horizontal and Vertical

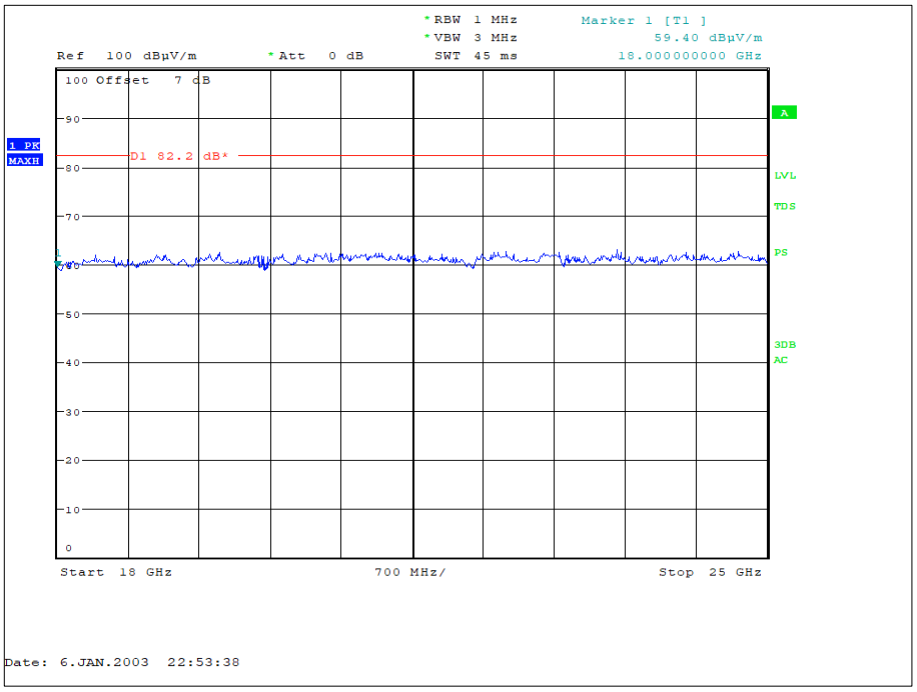

Figure 5 - 18 GHz to 25 GHz - Horizontal and Vertical

FCC 47 CFR Parts 15.247(d), 15.205, and 25.202(f)

The least stringent limit from the applicable rule parts was used to determine compliance for Radiated Emissions testing of multiple transmission sources.

The least stringent applicable limit was:

Rule Part	Limit
Part 25.202(f)	-13 dBm (EIRP) / 82.2 dBµV/m at 3m.
RSS-170 Clause 5.4.3.1	-13 dBm (EIRP) / 82.2 dBµV/m at 3m.

Table 6 - Limit Table

2.1.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Antenna 18-40GHz (Double Ridge Guide)	Q-Par Angus Ltd	QSH 180K	1511	24	07-Dec-2018
Pre-Amplifier	Phase One	PS04-0086	1533	12	12-Jan-2019
18GHz - 40GHz Pre-Amplifier	Phase One	PSO4-0087	1534	12	02-Feb-2019
Screened Room (5)	Rainford	Rainford	1545	36	19-Jul-2018
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygromer	Rotronic	A1	2138	12	21-Feb-2019
Antenna (Bilog)	Chase	CBL6143	2904	24	08-Aug-2019
Cable (N-N, 8m)	Rhophase	NPS-2302-8000-NPS	3248	12	02-May-2018
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	05-May-2018
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	Maturo Gmbh	NCD	3917	-	TU
1501A 4.0M Km Km Cable	Rhophase	KPS-1501A-4000-KPS	4301	12	19-Feb-2019
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4412	12	14-Jun-2018
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	22-May-2018
Cable (Yellow, Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4527	6	15-Aug-2018
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	01-Mar-2019
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	12-Feb-2019
Digital Radio Test Set	Racal	6103B	N/A	-	TU

Table 7

TU - Traceability Unscheduled

3 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Radiated Spurious Emissions (Simultaneous Transmission)	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB

Table 8