SED

Student Experiment Documentation

Document ID: BX28_IRISC_SEDv1-0_16Jan19

Mission: BEXUS 28

Team Name: IRISC

Experiment Title: InfraRed Imaging of astronomical targets with a Stabilized Camera

Team	**Name**
Student Team Leader:	Diego Octavio Talavera Maya
Team Members:	Anja Möslinger
	Eligius Franciscus Maria Weterings
	Kimberly Tuija Steele
	Veronika Haberle
	Adam Smialek
	Ajith Kumar Baskar
	Harald Magnusson
	Niklas Ulfvarson
	Sabina Björk
	William Eriksson
University:	Luleå University of Technology

Version:	Issue Date:	Document Type:	Valid from
1.0	**January 16, 2019**	**Spec**	**January 16, 2019**

Issued by:

The IRISC Team

Approved by:

Dr. Thomas Kuhn

CHANGE RECORD

Version	Date	Changed chapter	Remarks
0	2018-12-06	New Version	
1-0		All	PDR

Abstract:

Keywords:

Contents

PREFACE

The Rocket and Balloon Experiments for University Students (REXUS/BEXUS) programme is realized under a bilateral Agency Agreement between the German Aerospace Center (DLR) and the Swedish National Space Board (SNSB). The Swedish share of the payload has been made available to students from other European countries through a collaboration with the European Space Agency (ESA).

EuroLaunch, a cooperation between the Esrange Space Center of SSC and the Mobile Rocket Base (MORABA) of DLR, is responsible for the campaign management and operations of the launch vehicles. Experts from DLR, SSC, ZARM, and ESA provide technical support to the student teams throughout the project.

The Student Experiment Documentation (SED) is a continuously updating document regarding the BEXUS student experiment IRISC - InfraRed Imaging of astronomical targets with a Stabilized Camera and will undergo reviews during the preliminary design review, the critical design review, the integration progress review, and final experiment report.

Acknowledgements

1 Introduction

1.1 Scientific Background

1.2 Mission Statement

1.3 Experiment Objectives

1.4 Experiment Concept

1.5 Team Details

1.5.1 Contact Point

Project Manager

	Diego Talavera
Address	Snårvägen 17
	981 42
	Kiruna
	Sweden
IRISC Email	contact@irisc.space
Personal Email	dietal-8@student.ltu.se

Endorsing Professor

	Thomas Kuhn
Title	Associate professor
Address	Rymdcampus 1
	981 92
	Kiruna
	Sweden
Telephone	
Email	thomas.kuhn@ltu.se

1.5.2 Team Members

The IRISC Team consists of twelve people of a number of different educational and personal backgrounds. All team members are studying at the LuleåUniversity of Technology, Kiruna Space Campus.

Diego Octavio Talavera Maya - Management

Current Education: MSc in Space Sciences and Technology (SpaceMaster).

Previous Education: BSc in Aerospace Engineering at the Autonomous University of Baja California (UABC).

Responsibilities: Project Management.

Anja Möslinger - Control system

Current Education: MSc in Space Sciences and Technology (SpaceMaster).

Previous Education:

Responsibilities: Control system (model).

Eligius Franciscus Maria Weterings - Electrical

Current Education: MSc in Space Sciences and Technology (SpaceMaster).

Previous Education: BSc in electrical engineering at the University of Rotterdam (HR) with a specialization in computer sciences and mathematics at the University Utrecht (UU).

Responsibilities: Embedded systems, electrical engineering.

Kimberly Tuija Steele - Science and Optics

Current Education: MSc in Space Sciences and Technology (SpaceMaster).

Previous Education: BSc(Astronomy)(Hons)

Responsibilities: experiment scientific background and overall objectives; defining experimental parameters; contacting and collaborating with industry partners that manufacture off-the-shelf optics components; data analysis; interpreting and documenting images; documenting and publishing findings.

Veronika Haberle - Science

Current Education: MSc in Space Sciences and Technology (SpaceMaster).

Previous Education:

Responsibilities: Outreach & data analysis.

Adam Smialek - Control system

Current Education: MSc in Space Sciences and Technology (SpaceMaster).

Previous Education: BSC in Aerospace Engineering at Warsaw University of Technology (WUT) with a specialisation in Automatics and Flight Systems

Responsibilities: Onboard control system & Outreach.

Ajith Kumar BASKAR - Mechanical

Current Education: Master Programme in Spacecraft Design

Previous Education: Bachelor of technology in Aerospace Engineering

Responsibilities: Mechanical engineering.

Harald Magnusson - Software

Current Education: Master Programme in Space Engineering, Luleå University of Technology

Previous Education:

Responsibilities: Software (onboard & ground station).

Niklas Ulfvarson - Software

Current Education: Master Programme in Space Engineering, Luleå University of Technology

Previous Education:

Responsibilities: Software (onboard & ground station).

Sabina Björk - Electrical

Current Education: Master Programme in Space Engineering, Luleå University of Technology

Previous Education: -

Responsibilities: Energy technology, electrical engineering.

William Eriksson - Software

Current Education: Master Programme in Space Engineering, Luleå University of Technology

Previous Education:

Responsibilities: Software (onboard & ground station).

2 Experiment Requirements and Constraints

A list of requirements and constraints are listed below. The requirements are separated in functional, performance, design and operational requirements.

2.1 Functional Requirements

F.1 The telescope shall successfully track the celestial bodies of interest.

F.2 The camera shall take images in the near infrared (NIR) spectrum.

2.2 Performance Requirements

P.1 The gimbal stabilization system shall point the telescope towards the celestial body with an accuracy of at least 1 arc seconds.

P.2 The optics shall be cable of making pictures of 0.5-1.5 x 0.3-1 degrees.

P.3 The NIR camera shall make images in the range of 720-850 to 1200 nm.

P.4 The NIR camera shall have a resolution of at least 16 MP.

P.5 The NIR camera shall be able to make images with exposure times between 0.5 and 150 seconds.

P.6 The experiment shall measure the location and orientation of the gondola.

2.3 Design Requirements

D.01 The experiment shall be able to operate in the temperature profile of the BEXUS environment.

D.02 The experiment shall be able to operate in the pressure profile of the BEXUS environment.

D.03 The experiment shall be able to operate in the vibration profile of the BEXUS environment.

D.04 The absolute position of the telescope relative to the gondola shall be known with a accuracy of 0.1 degrees.

D.05 The supporting structure shall not twist by more than 0.1 degrees.

D.06 The experiment shall never be pointed directly at the sun $\pm$ 27 degrees.

D.07 The experiment shall be able to fly during the entire day.

D.08 The temperature of the NIR camera shall be held at $0 \pm 5\,^{\circ}$C.

D.09 The images obtained shall be send to a ground station by the E-link system with a maximum data rate of 1000 kilo bits per second.

D.10 The experiment shall be mounted at the side of the gondola.

D.11 The experiment shall not consume more power than 250 Wh.

D.12 The volume of the experiment shall not exceed 65 x 40 x 40 cm.

D.13 The mass of the experiment shall not exceed 20 kg.

D.14 The experiment shall be able to run for at least 2.5 hours.

D.15 The experiment shall be able to function autonomously.

D.16 The data stored in the experiment shall be able to survive the landing.

2.4 Operational Requirements

O.1 The experiment shall be able to be controlled by the ground station when requested.

O.2 The experiment shall rotate to a 'safe' location while descending.

2.5 Constraints

C.1 The shared E-link data transfer rates are limited by coverage and quality of reception.

C.2 There shall be no direct internet connection on the ground station.

C.3 The mass and volume should fit inside the gondola together with the other experiments.

C.4 The budget for the experiment is limited by the generous companies and organizations that sponsor IRISC.

3 Project Planning

3.1 Work Breakdown Structure

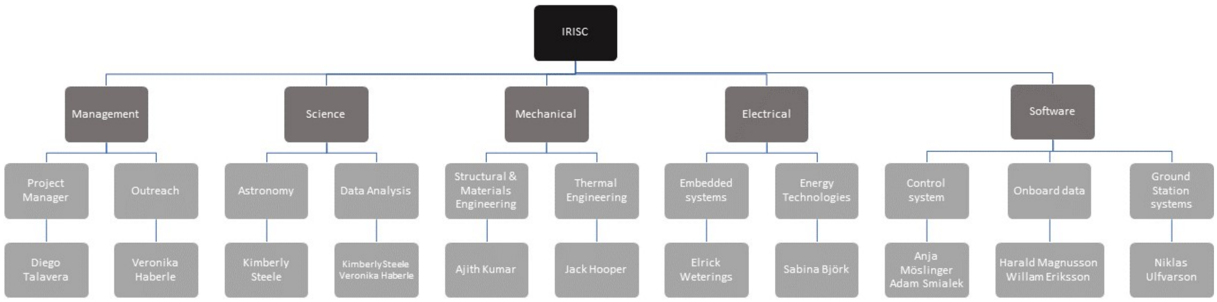

Figure 3.1.1: Yes, it looks ugly, I'll change it later, also the WBS below (Diego)