

UNIVERSITETET I OSLO

Master i Romsystemer

Master in Space Systems

Velkommen til nytt studieår!

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Førsteamanuensis
ITS, UiO

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Master in Space Systems

Agenda

- Get to know each other
- Why choosing Space Systems
- Study programme
- Projects and Master thesis
- This Semester!



“Mars is there,
waiting to be reached”

Buzz Aldrin

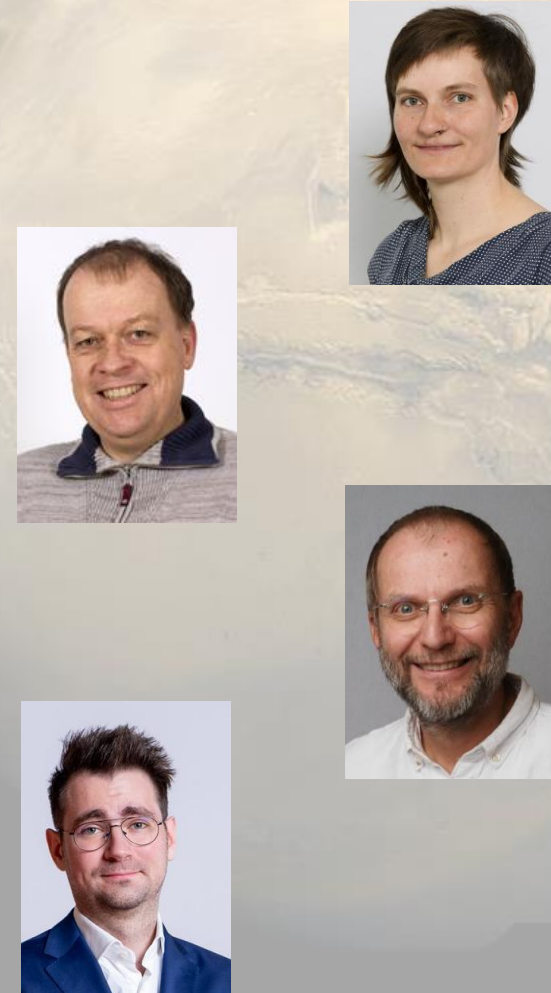
Please answer the questionnaire! <3



Who are we at ITS

Permanent employees at UiO/ITS

- **Anja Kohfeldt** (TEK4700, TEK5720)
 - Radiation detection, payload & satellite system, assembly, integration and test
- **Torbjørn Skauli** (TEK4710, TEK4010, TEK5050)
 - Hyperspectral cameras, optics
- **Svein-Erik Hamran** (CENSSS, TEK4710*)
 - Ground penetrating radar, RIMFAX, geophysics
- **Mathias Hudoba de Badyn** (TEK4090)
 - Distributed control theory, guidance, navigation, and control



Who are we at ITS

Some of the adjunct professors and temporary staff

- **John Mulholland (USN)** (TEK4000)
 - System engineering, subsea engineering
- **Mariusz Eivind Santora Grøtte (FFI)** (TEK5710)
 - Small satellite design, control systems
- **Lars Erling Bråten (FFI)** (TEK5130, TEK4710*)
 - Radio systems, communication, microsatellites
- **Elise Wright Knutsen** (TEK5720*)
 - Atmospheric physics, Mars, spectroscopy
- **Sam Holdcroft** (TEK4700*, TEK5720*)
 - (electrical) Engineering, AIT
- **Anastasios-Faidon Retselis** (TEK4700*)
 - Satellite operations, STK, digital twins



Who are we? Human maps

Speak to the other people and find your position in the room!

- When did you start studying?
- How far away from ITS is the university (or equivalent) where you did your Bachelor's?
- How many languages do you speak?
- How ambitious are you to go to space? (happy with data analysis – living on Mars)
- What is your background from your Bachelor's? (form clusters!)

Why studying Space Systems?

Current Situation

- Increased commercialisation of space business
 - Increased accessibility of space
- «New Space»
- Increased needs for security, both on national and European level
 - Andøya Spaceport

Focus in this program

- System aspect – technology in context of environment and application
- Small satellite design
- Payload development
- Regulations and way of thinking for problem solving



Where to work afterwards

«If you can make it in Space, you can make it everywhere!»

- Space agencies

- Norsk Romsenter
- ESA
- EUSPA
- ...

- National institutions

- Universiteter (UiO, NTNU, UiT, UiB, utlandet)
- Metrologisk institutt
- Forsvaret, FFI
- Kystverk
- Kartverket
- NILU
- ...

- Industry

- Kongsberggruppen (KDA, Seatex, KSAT, ...)
- SpaceNorway
- Andøya Space
- EIDEL
- IDEAS
- NEO
- S&T
- Jotne IT
- ...

Study plan

Overview of the courses

4. Semester	MA thesis	MA thesis	MA thesis
3. Semester	MA thesis / elective course	MA thesis / elective course	MA thesis / elective course
2. Semester	elective course	TEK5710 Small Satellite Design / elective course	TEK5720 Space Systems Project
1. Semester	TEK 4000 Systems engineering	TEK4700 Space Systems	TEK4710 Space sensors & communication
	10 ECTS	10 ECTS	10 ECTS

Obligatorily courses: 40 SP

- TEK4000 System Engineering
- TEK4700 Space systems
- TEK4710 Space sensors & communication
- TEK5720 Project in Space Systems

Master thesis:

- Long: 60 SP
- Short: 30 SP + 30 SP courses

Recommended courses

Fra ITS

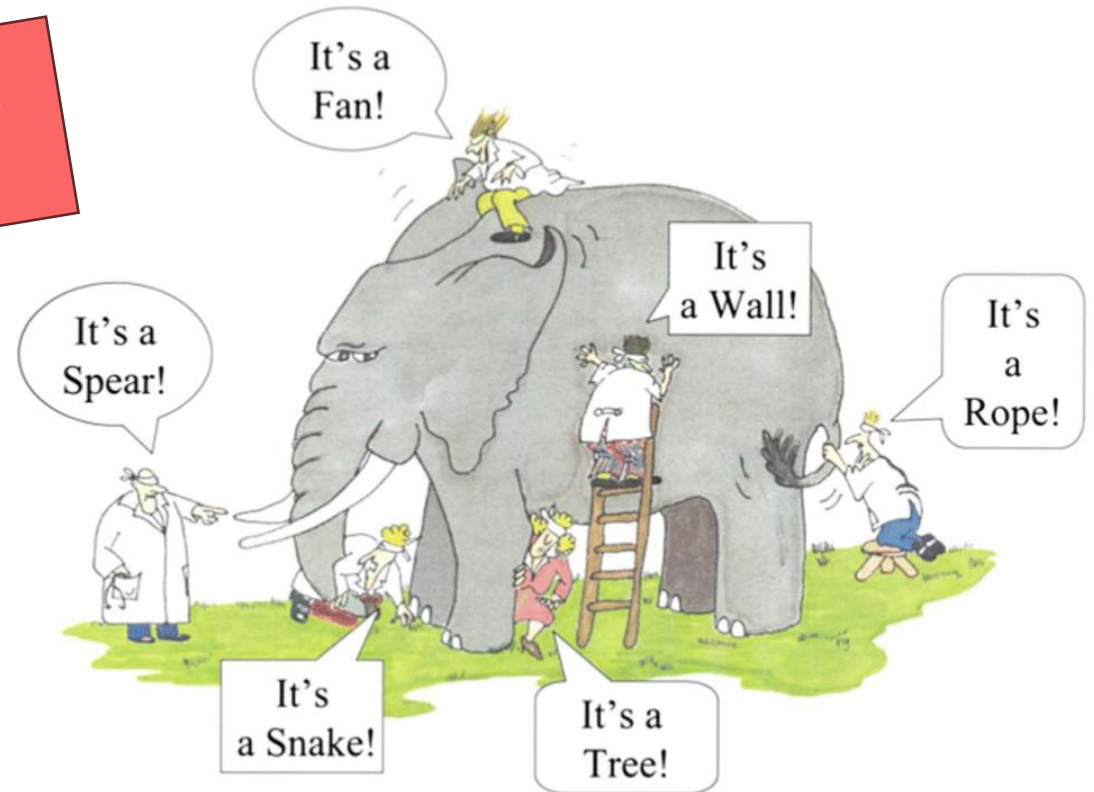
- [TEK5710 – Design av småsatellitter](#)
- [TEK5130 – Satellittkommunikasjon](#)
- [TEK4010 – Optikk og lys](#)
- [TEK4090 – Modern Control Systems and Cybernetics](#)
- [TEK4100 – Signalbehandling i radiokommunikasjon](#)
- [TEK4500 – Innføring i kryptografi](#)
- [TEK5030 – Maskinsyn](#)
- [TEK5050 – Avbildning og deteksjon av optisk og infrarød stråling](#)
- [TEK5600 – Visualisering av vitenskapelige data](#)

Fra andre institutter

- [AST2210 – Observasjonsastronomi](#)
- [FYS-STK4155 – Anvendt dataanalyse og maskinlæring](#)
- [FYS4220 – Sanntids og embedded datasystemer](#)
- [FYS4231 – Sensorer og måleteknikk](#)
- [FYS4240 – Datainnsamling og kontroll](#)
- [FYS4260 – Mikrosystemer og elektronikk byggemetoder](#)
- [FYS4600 – Romfysikk og –teknologi](#)
- [FYS4640 – Romvær og navigasjonssatellittsystemer](#)
- [GEO-AST4410 – Planetologi](#)
- [GEO4520 – Advanced remote sensing and topographic analysis](#)
- [IN4160 – Digital systemkonstruksjon](#)
- [IN5200 – Avansert digital systemkonstruksjon](#)
- [IN5400 – Maskinlæring for bildeanalyse \(videreført\)](#)

TEK4000 Systems Engineering

- Workshop-based course
- Dates for space students*:
 - Block 1: 4.-5. September
 - Block 2: 10.-12. September
 - Group presentation 19. September
 - MBSE: 30.10. (TBC, but week 44)
- Home assignment in prep for oral exam
- Course assignment in preparation of project course TEK5720 in spring



TEK5720 Project in Space systems

Andøya Space Visit

TEK5720 Project course includes a 5 day visit to Andøya Space range (in April/Mai 2026).

Programme:

- Launch of project payload on a weather balloon
- Assembly, Integration and Test (AIT) training
 - Environmental testing, mostly mechanical tests
 - Clean room working environment



Student Events

- CaNoRock @ Andøya



- Workshops and industry gatherings



- Mulighet for å delta I internasjonale konferanser



Practical experience!



- 2 student organisation:
 - Building fuelled rockets
 - CubeSats

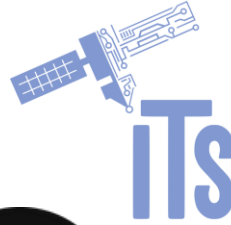


Master Thesis

Different options!



CENSSS
Centre for Space Sensors and Systems



- CENSSS projects
- Other ITS projects
- Student organisation: Portal Space, Lyra,...
- a (CENSSS) industry partner
- Own ideas



UNIVERSITY
OF OSLO



FFI Forsvarets
forskningsinstitutt
Norwegian Defence Research Establishment



ideas
Integrated Detector Electronics AS

neo
NORSK ELEKTRO OPTIKK AS

Jotne

LYNKEOS
TECHNOLOGY LTD

s[&t



i s p a c e

KSAT
KONGSBERG
KONGSBERG SATELLITE SERVICES

CENSSS will address challenges and opportunities in the science, technology and business of “New-Space” satellite systems for Earth Observation, as well as of Space Exploration (to the Moon and Mars), by focusing on novel sensors and sensor systems.

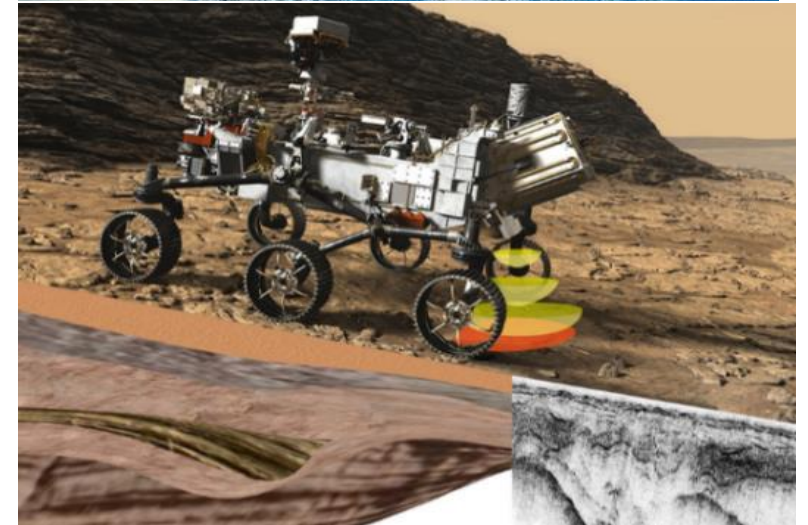
Center for Space Sensors and Systems - CENSSS



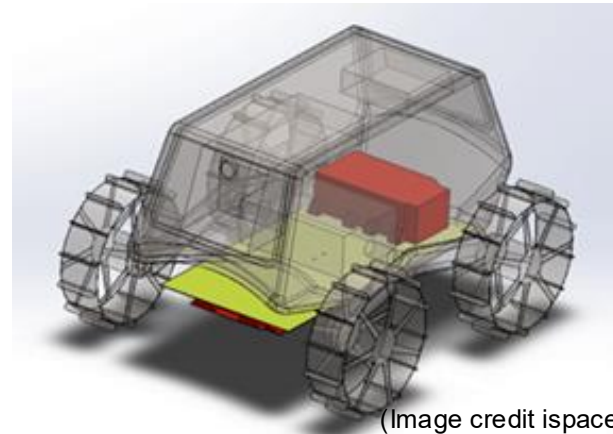
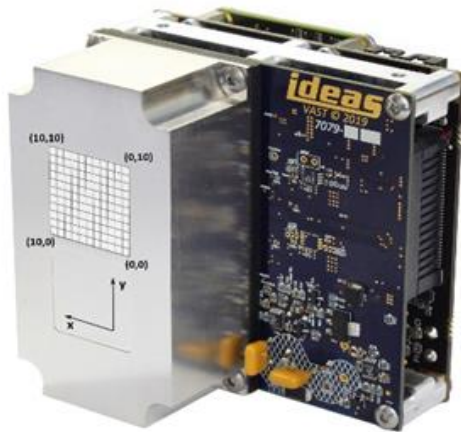
- Funded by the Norwegian Research Council and UiO for 5 + 3 years, started 2020
- Two major business innovation areas:
 - A National New-Space (small, low-cost satellites) capability for UN's SDGs and for national interests
 - Space Exploration ("to the Moon and Mars").



AISSat image
credit FFI



Artist illustration show
RIMFAX image the
subsurface of Mars.
(Background image
credit NASA)



(Image credit ispace)

CENSSAT-1: UiO's first satellite!

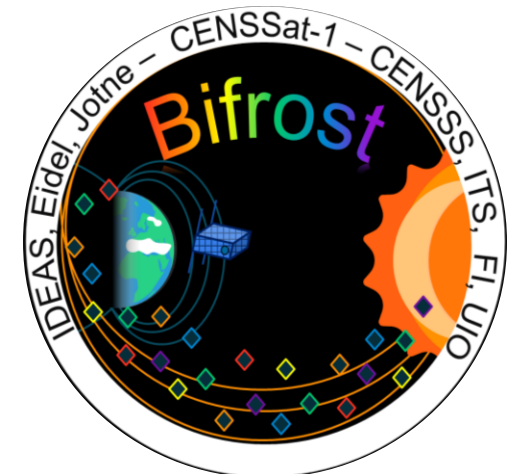
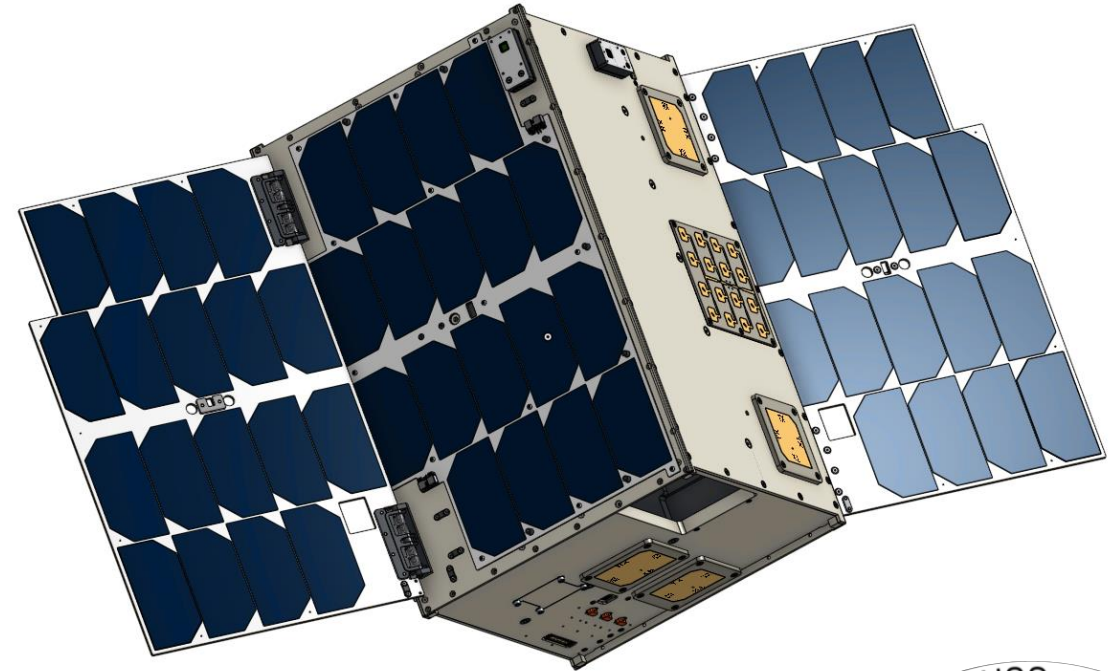
12U CubeSat

Mission:

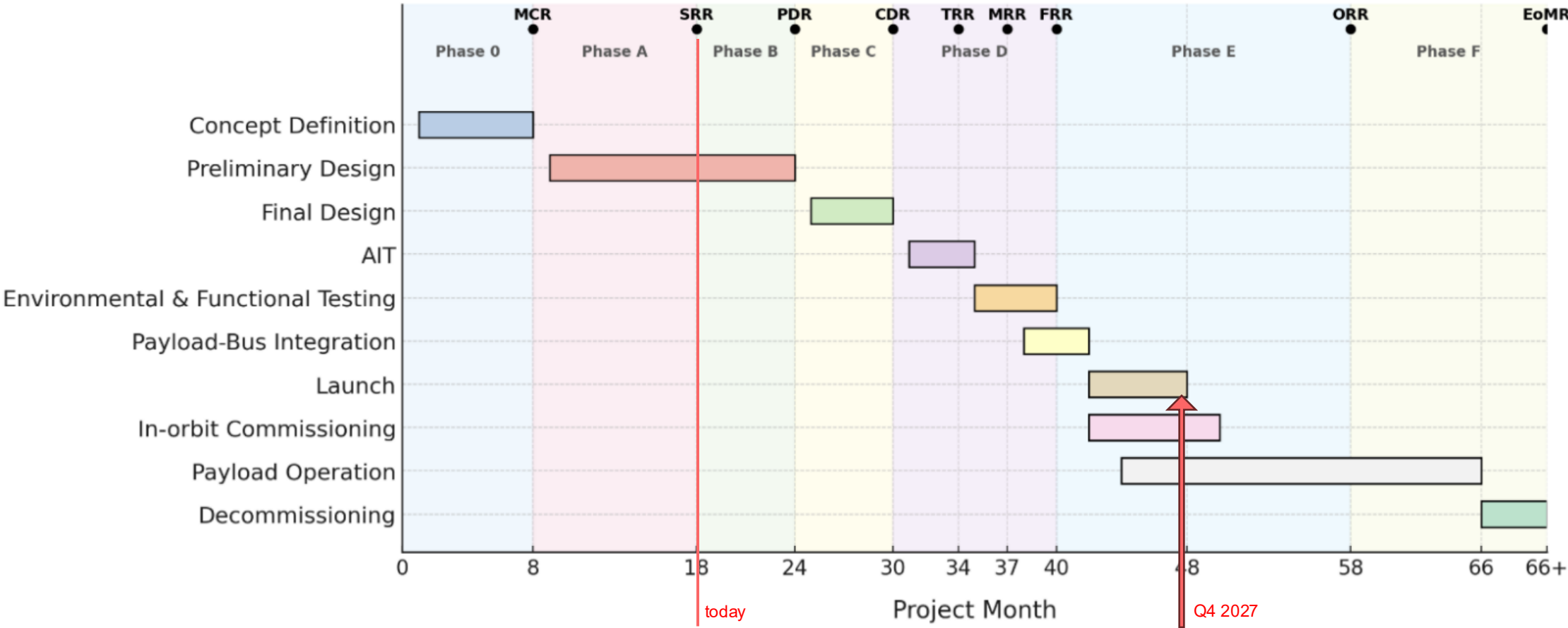
- Investigate relation between solar activity and atmospheric response (aurora, ozone layer)
- ADCS experiments (optimal control and drag)
- Technology demonstration

Nyttelaster:

- Multi-needle Langmuir Probe (m-NLP)
- Gamma-ray and Neutron spectrometer («AstraLEO»)
- Multi-spectral camera
- Space-debris radar (→UiT)
- Experimental OBC (→TychoSpace)



CENSSAT-1 Timeline



RIMFAX Science Operation Center - RSOC

Operates the RIMFAX GPR on the NASA Mars 2020 Perseverance Rover Mission

Images the Martian subsurface to more than 10 meter depth

RIMFAX Science Team with participants from:
UCLA, Univ. of Arizona, Connell University, Planetary
Science Institute, JPL/Caltech, TU Dresden, and UiO



SER3NE Overview

Scientific Goals:

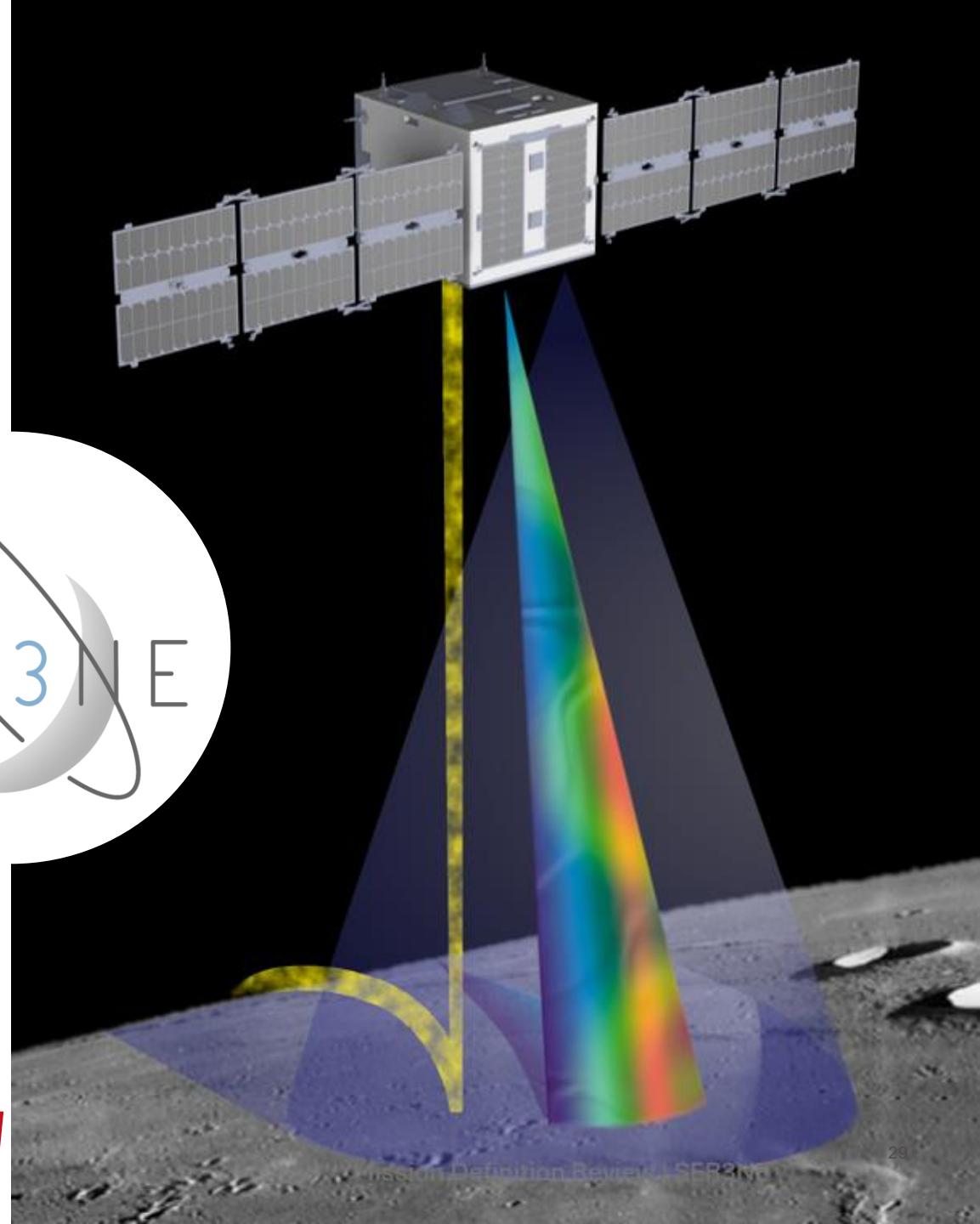
- To unravel inner solar system **volatile origin** and delivery processes
- Uncover the **geological processes** that shaped the Moon and inner solar system bodies
- Prospecting **lunar resources** for ISRU

→ High resolution elemental abundance mapping

- Neutron Lifetime
- Orbital evolution of the Earth-Moon system

Proposed Payloads:

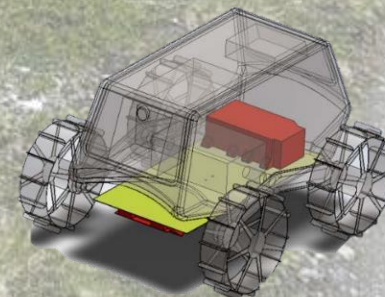
- Gamma-ray & Neutron Spectrometer (GRiNS)
- Laser Altimeter (LA)
- Lunar Infrared Pointing Spectrometer (LIPS)



GRiNS Field Demonstration

1. Demonstrate the GRiNS instrument in the field, outside lab environment
2. Verify data from field measurement
 - Establishing and verifying a detector simulation model for a scintillator-based GRND
 - Establishing and verifying an environmental model
3. Demonstrating capability of measuring differences in hydrogen content in the ground
4. Estimating the composition of the ground
5. Providing infrastructure for mobile instrument deployment

Project driven by
Master students



Kickstart the semester



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- TEK4000 System Engineering
 - In 6 days in September
 - 1 day end of October
 - By John Mulholland
- TEK4700 Space systems
 - Tuesdays
 - By Anja Kohfeldt
- TEK4710 Space sensors & communication
 - Mondays
 - By Torbjørn Skauli

Your first
lecture
next week!

Student groups & Interview

- For TEK 47000: Pairs of 2 students as sparing partners and for presentation
- Do you have a favorite group partner?

Interviews:

- We want to talk to all of you individually!
- Topics: your interest, motivation, potential Master thesis topics, anything we can do for you
- Dates: in September



[https://www.uio.no/studier/program/
romsystemer/](https://www.uio.no/studier/program/romsystemer/)

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