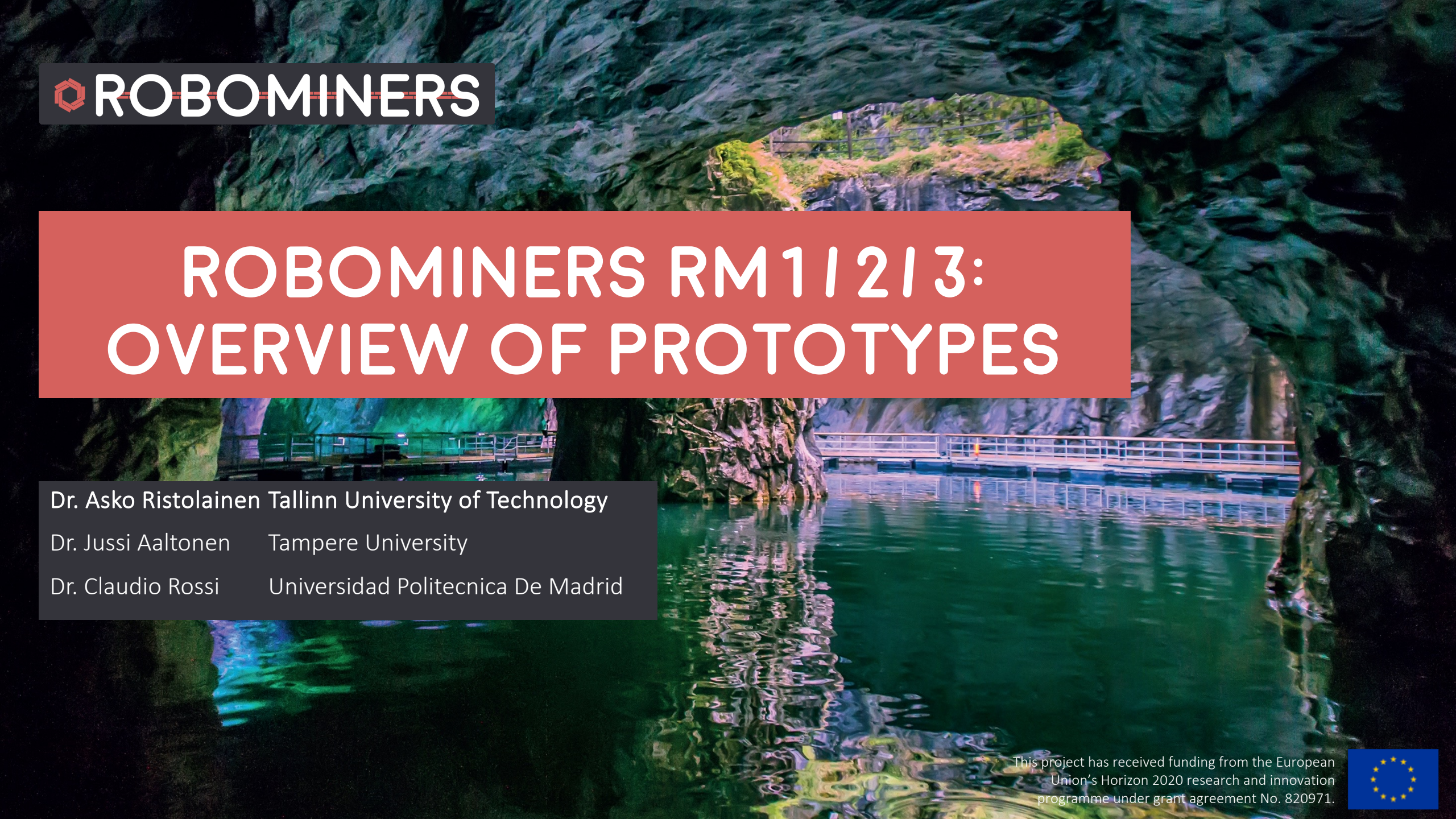


ROBOMINERS

ROBOMINERS RM1/2/3: OVERVIEW OF PROTOTYPES

Dr. Asko Ristolainen Tallinn University of Technology

Dr. Jussi Aaltonen Tampere University

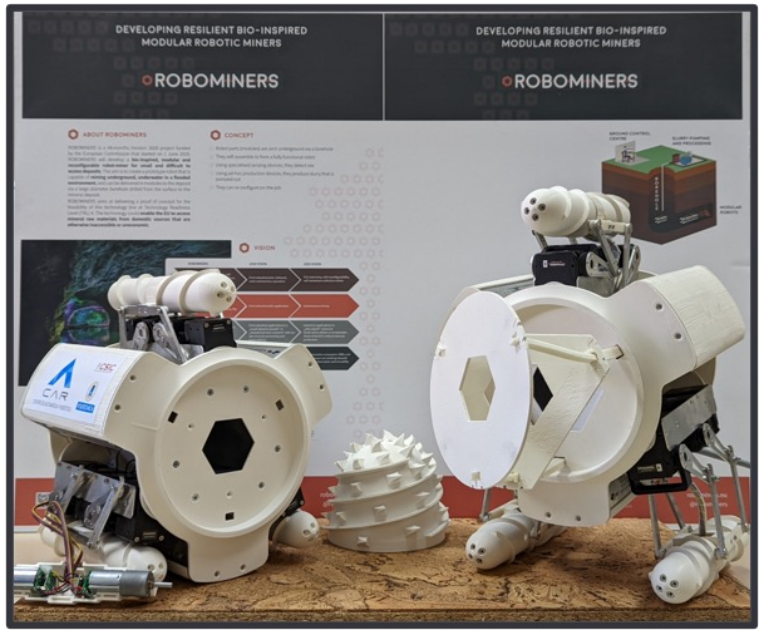
Dr. Claudio Rossi Universidad Politecnica De Madrid

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 820971.

PROTOTYPES

RM1

RM2



RM3

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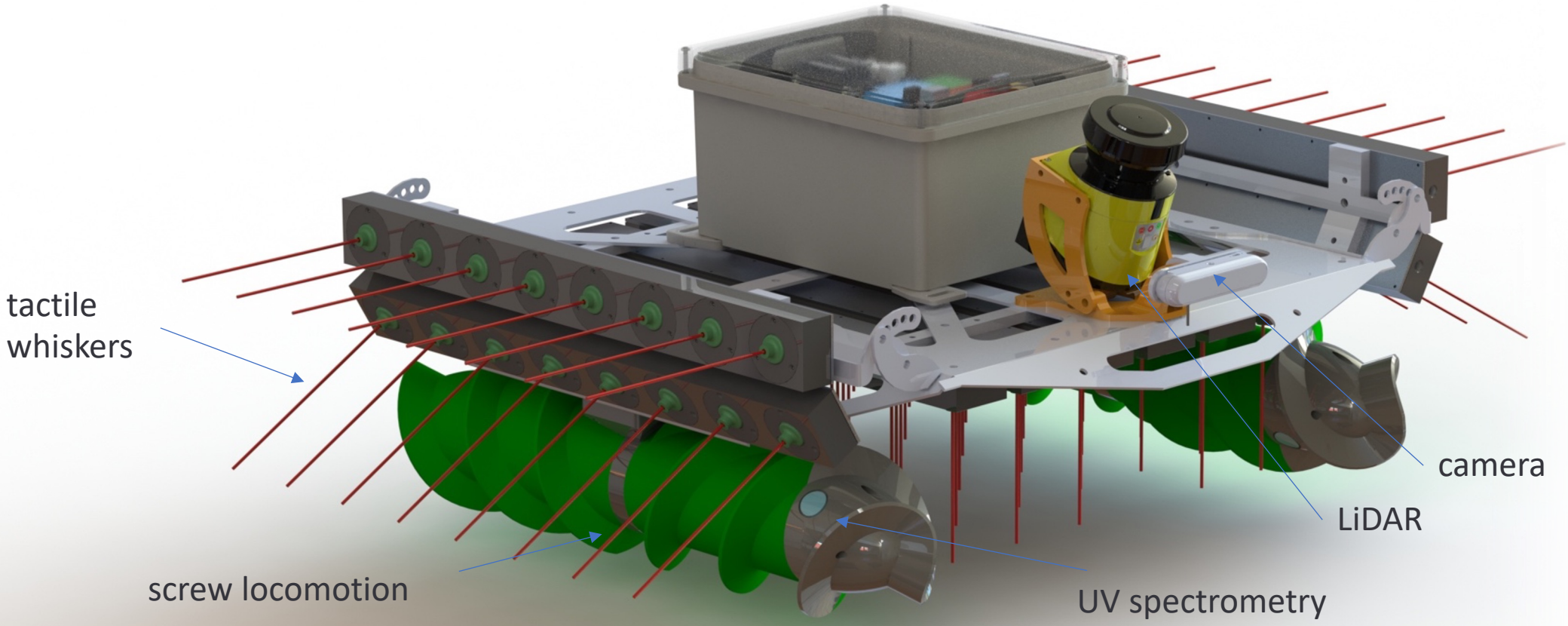
RM3 - OVERVIEW

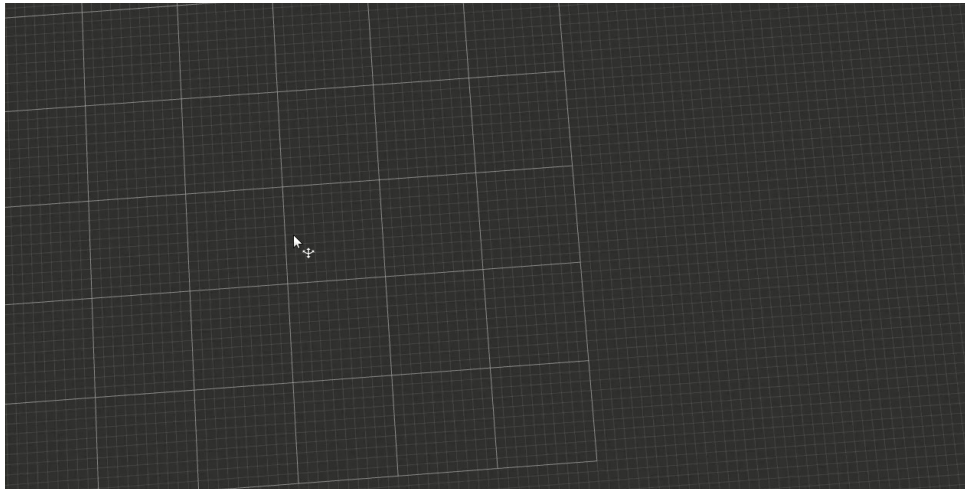
- Locomotion through matter with unknown properties
- Perception in unstructured sensory deprived environments



RM3 - LOCOMOTION

RM3 MAPPING AND LOCALIZATION

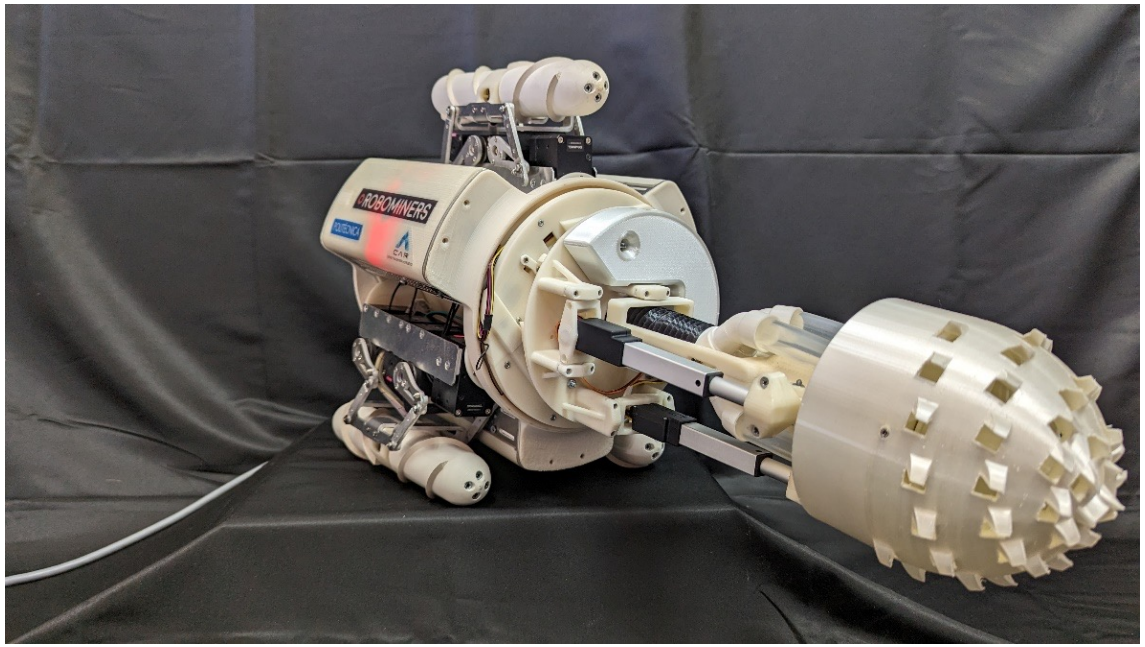
MAPPING AND LOCALIZATION



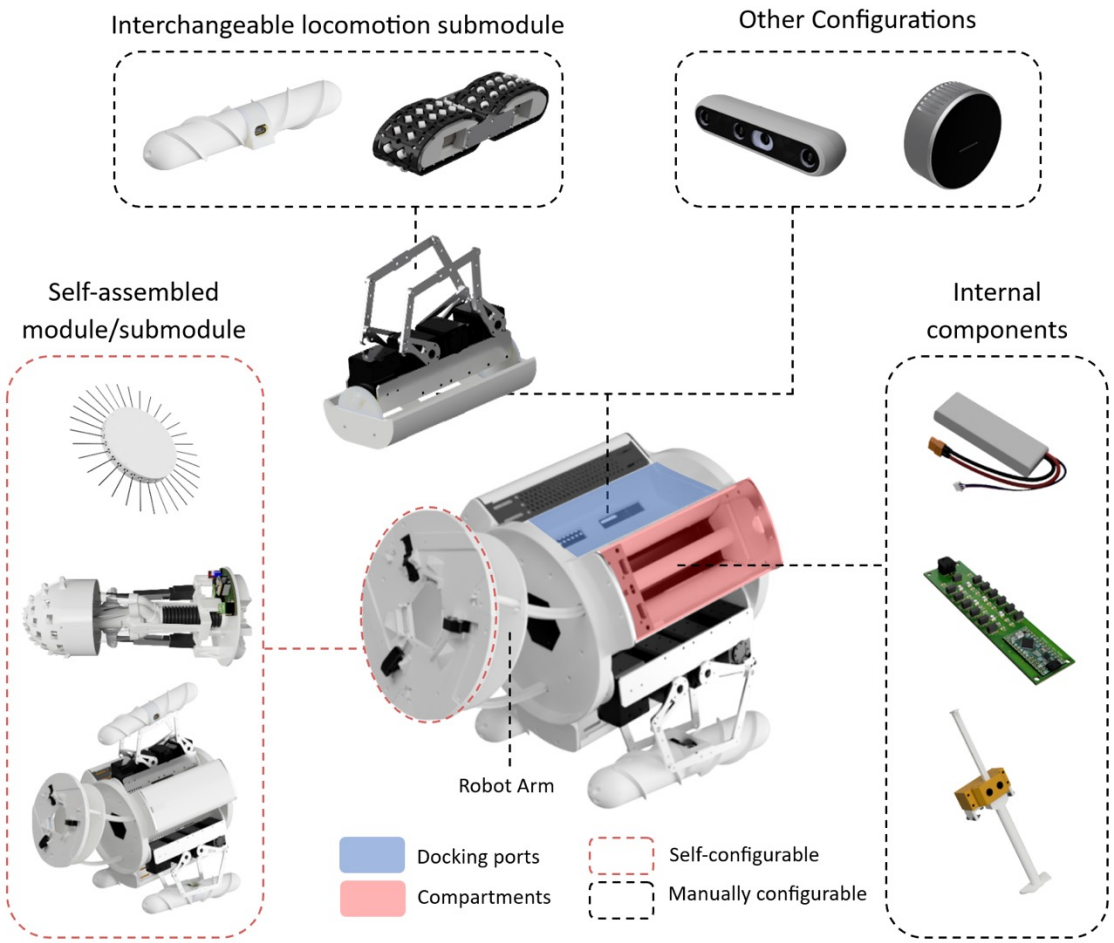
WALL FOLLOWING AND NAVIGATION

RM2 - OVERVIEW

- Studies on re-configurability
- Changing configuration during operation
- Docking mechanism for modular robots based on a soft continuum arm
- Study the robot's self-assembly capabilities



RM2 - OVERVIEW



12-15V, 300W (MAX) I BATTERY: 3S 2200 MAH

I2C, TTL (INTERNO)

UART (COUPLING MECHANISM)

WI-FI/BLUETOOTH (EXTERN)

IMU (9 GDL), ENCODERS, CURRENT

DYNAMIXEL(ENCODER, TEMPERATURE, CURRENT, VOLTAGE)

DC MOTORS

SERVOS DYNAMIXEL (XM430 -W350 – T)

SERVOS DYNAMIXEL (XL330 –M288 – T)

WEIGHT: 4,5 KG

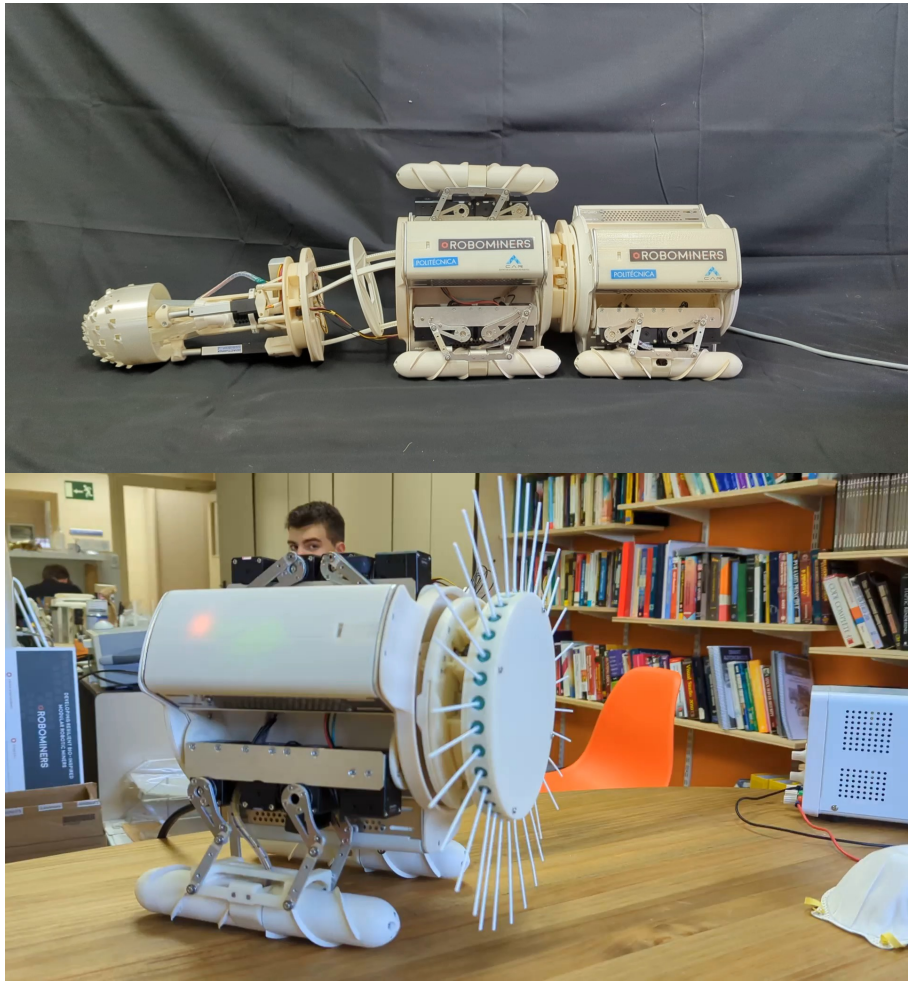
LENGHT: 21 CM I DIAMETER: 30-40 CM

RM2 - SELF-CONFIGURATION

COUPLING MANEUVER

Robot Coupling Maneuvers

DIFFERENT GADGETS: TACTILE SENSORS. PRODUCTION TOOL



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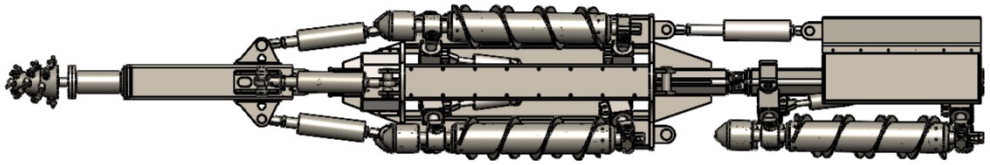
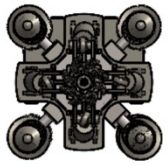
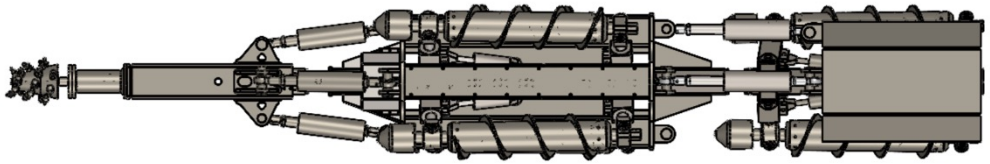
RM1 - FULL SCALE PROTOTYPE

- Full scale robot miner
  - 5m long - 0.8m diameter - 1350 kg - total power 35kW
- Water hydraulics – safe for the environment
- Custom built slurry extraction with on-line LIBS spectrometry
- Can operate under water – up to 1000m







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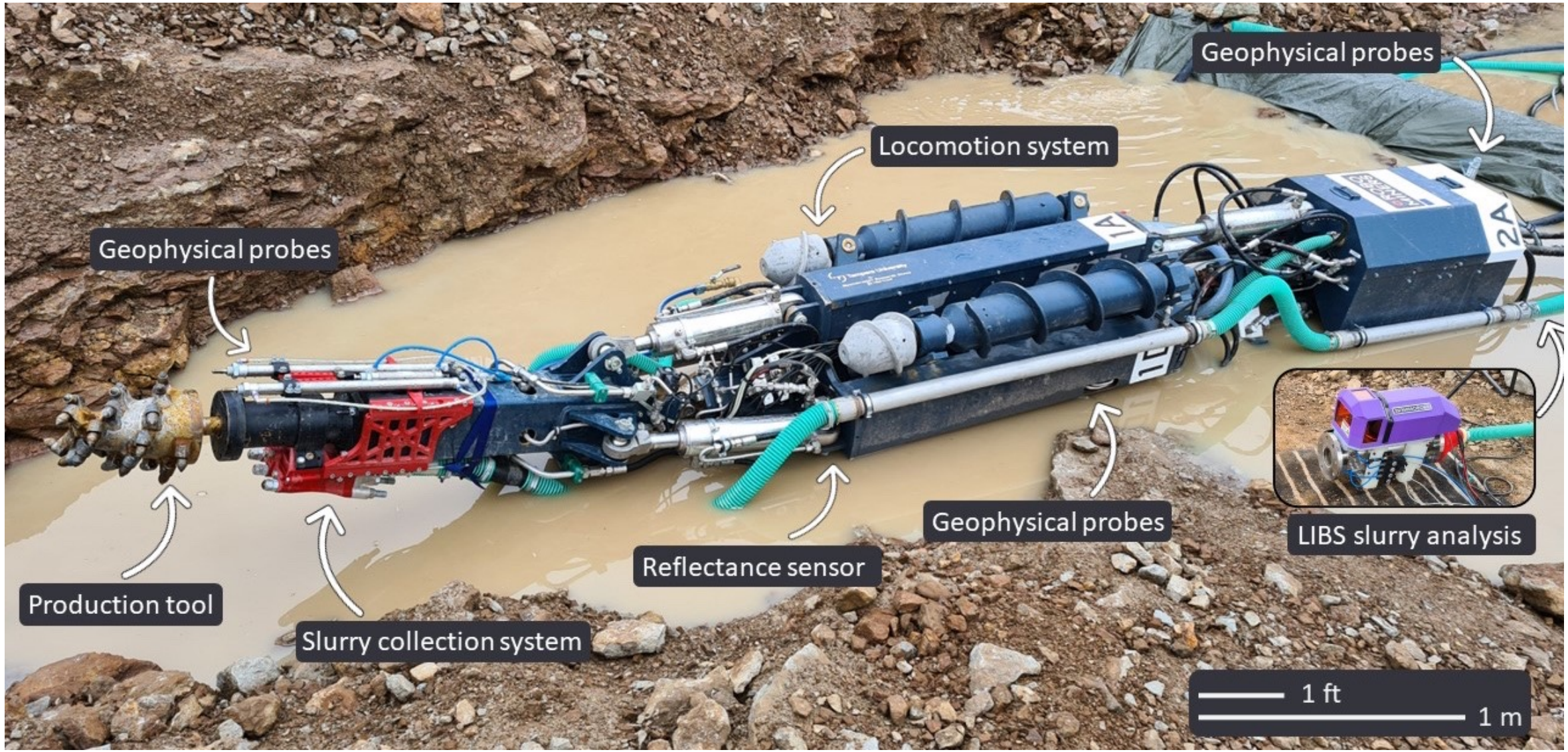
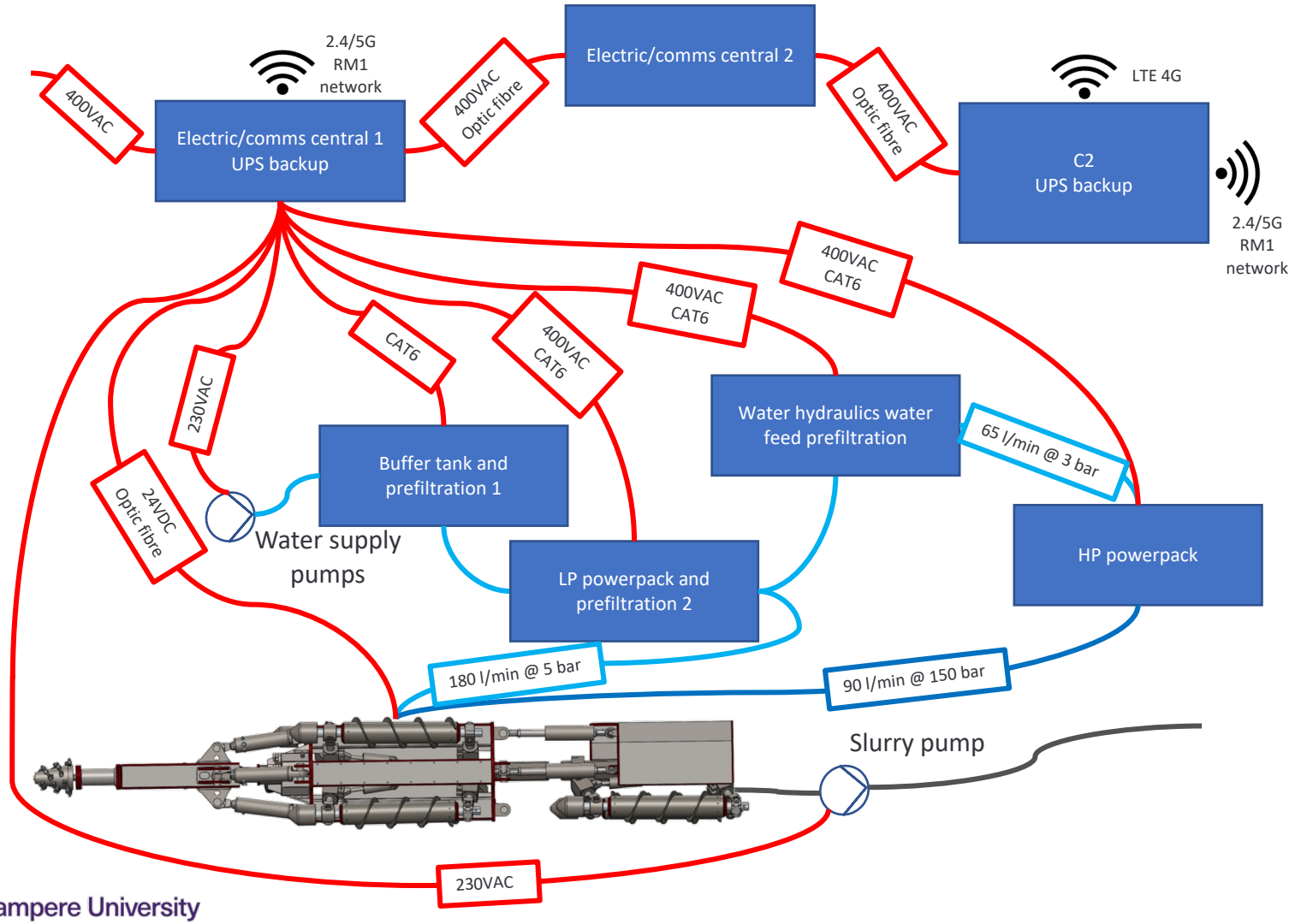
RM1 - OVERVIEW



RM1 – ROBOTIC SYSTEM



Command & control centre (C2)

- 2 x operator and monitoring station
- Control network hub
- UPS backup for 230VAC

Electric/comms central 1

- Power supply (400VAC, 240VAC, 24 VDC)
- UPS backup for 230VAC and 24VDC grid
- Fibre optic network hub
- CAT6 network hub

HP powerpack

- Water hydraulic system power supply (90 l/min @ 150 bar)
- Return water filtration (5 µm)
- 2 x dual supply water filtration (10 µm and 5 µm)

LP powerpack and prefiltration 2

- Auxiliary water supply (180 l/min @ 5 bar, 4 kW)
- Water hydraulics water feed (65 l/min @ 3 bar, 1,5 kW)
- 2 x water hydraulics water feed prefiltration (25 µm)

Water supply pumps

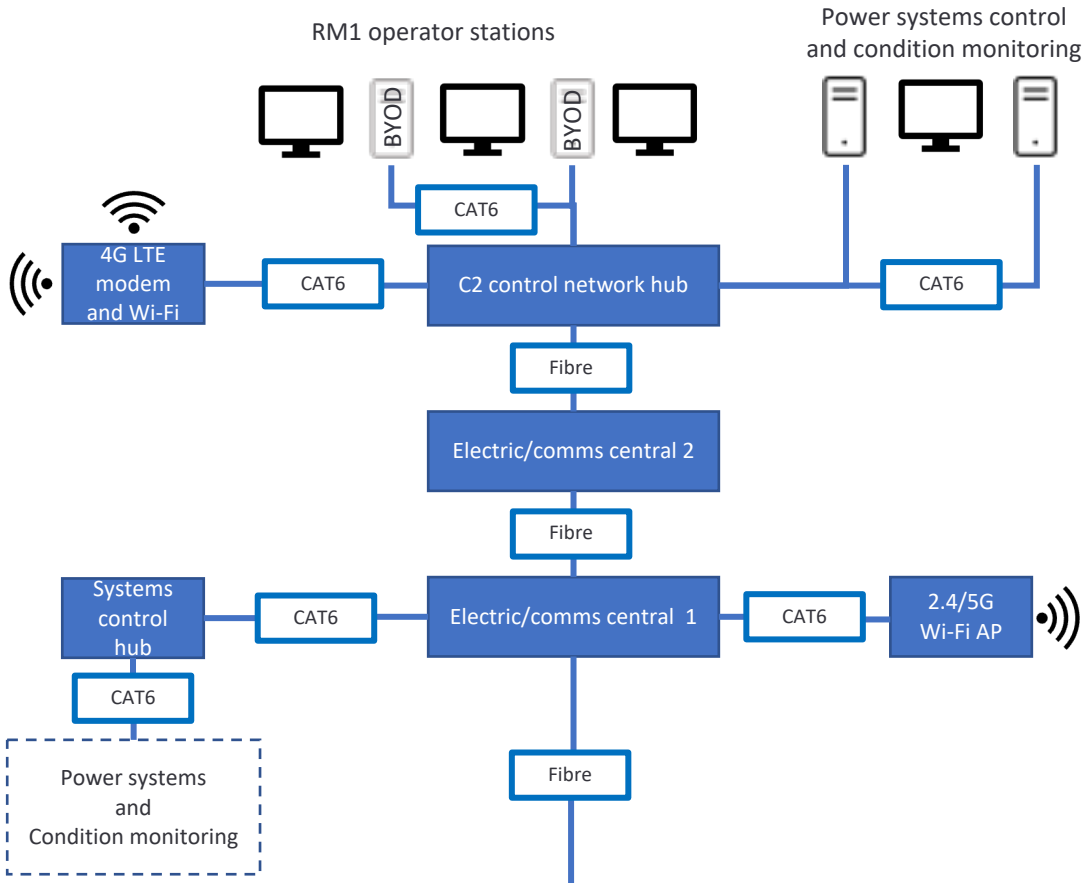
- Water feed to buffer tank

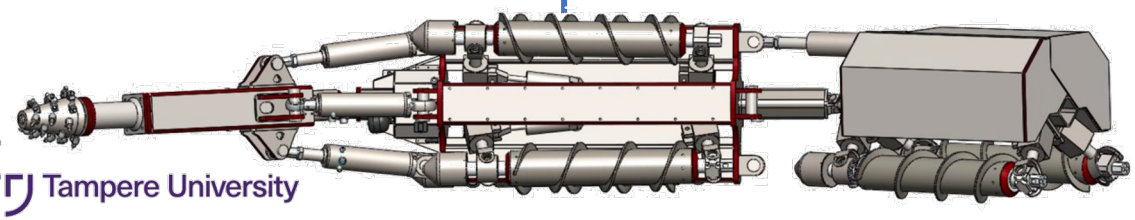
Buffer tank and prefiltration 1

- 5 m^3 buffer tank
- Water prefiltration (75 µm)

Slurry pump

RM1 – CONTROL NETWORK





- RM1 operator and monitoring stations
  - RM1 robotic functions
  - Control computers - BYOD

  2x 50” HD screens
  1x 50” HD screen for spectators
- Power systems control
  - **All systems (including RM1) emergency stop**
  - Remote start/stop of power systems
  - Automated functions
- Condition monitoring
  - Power grids status
    - 400 VAC grid status
    - 230 VAC grid status
    - 24 VDC status
  - Networks status
  - Power systems status
    - HP powerpack (pressure, tank level, temperature)
    - LP powerpack (pressure, temperature)
    - Filtration (clogging indication)
    - Buffer tank (water level)

  1x 24” HD screens

All screen views switchable with HDMI-switch

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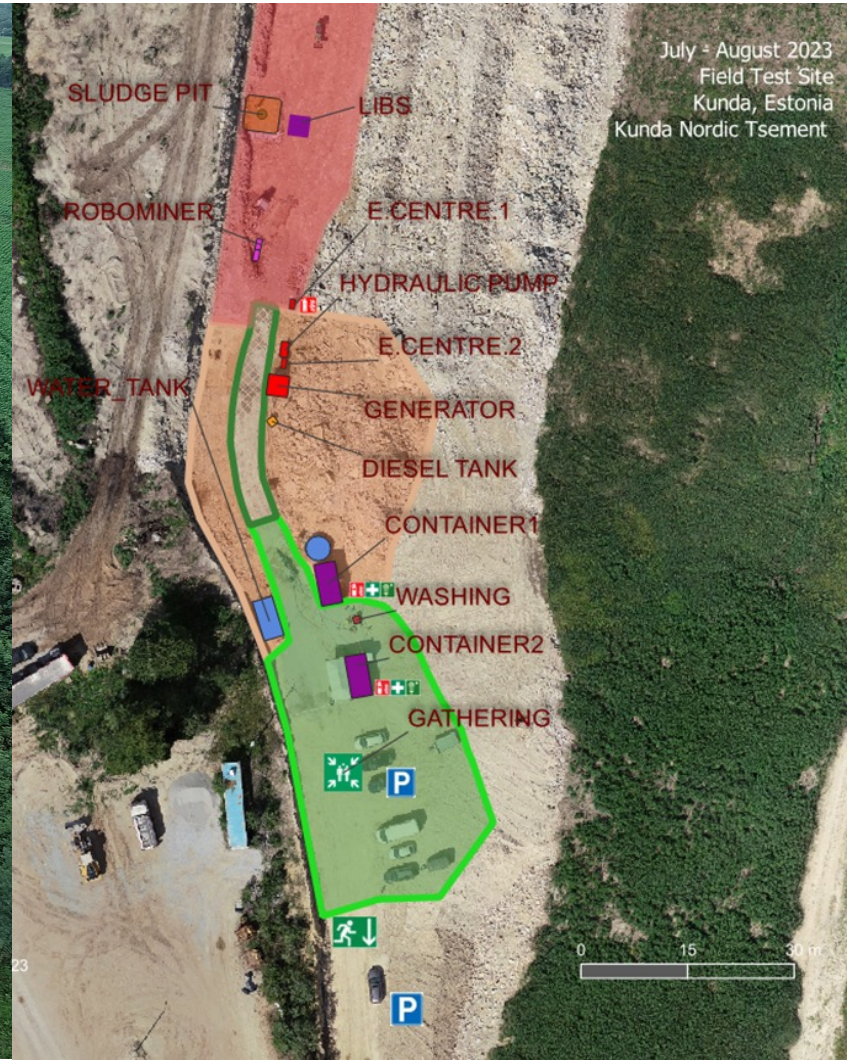
RM1-INTEGRATION AND DEMO



RM1-INTEGRATION AND DEMO

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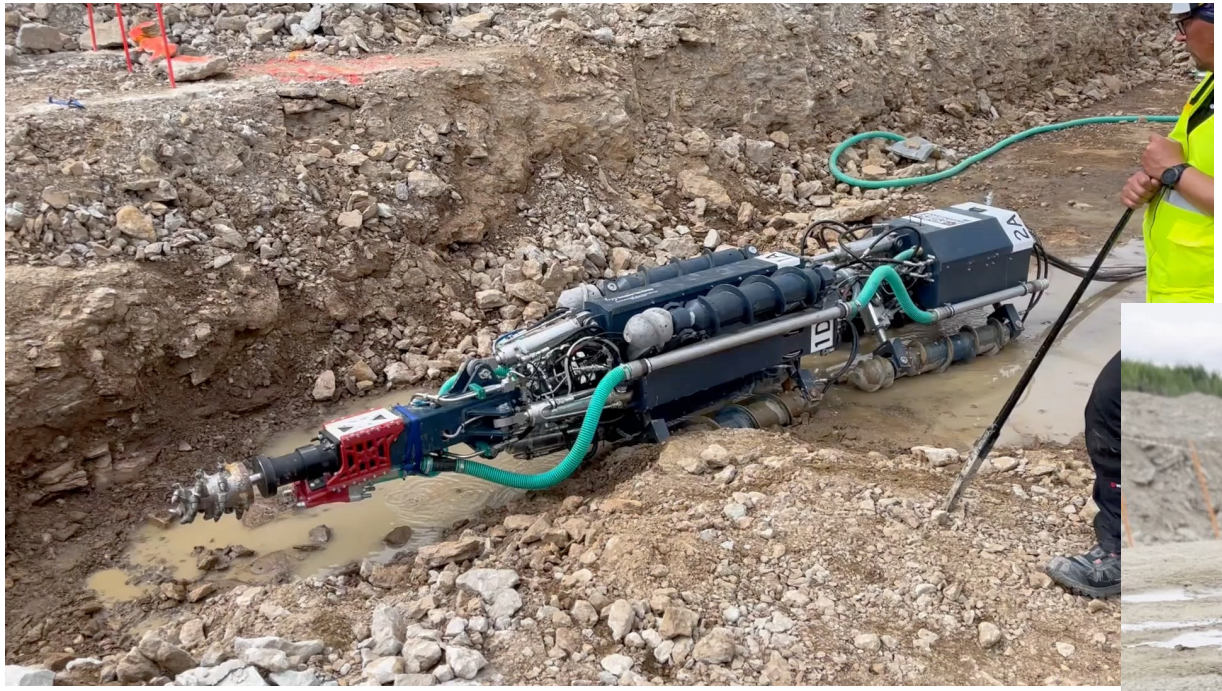
RM1 - LOCOMOTION



RM1-ROCK CUTTING

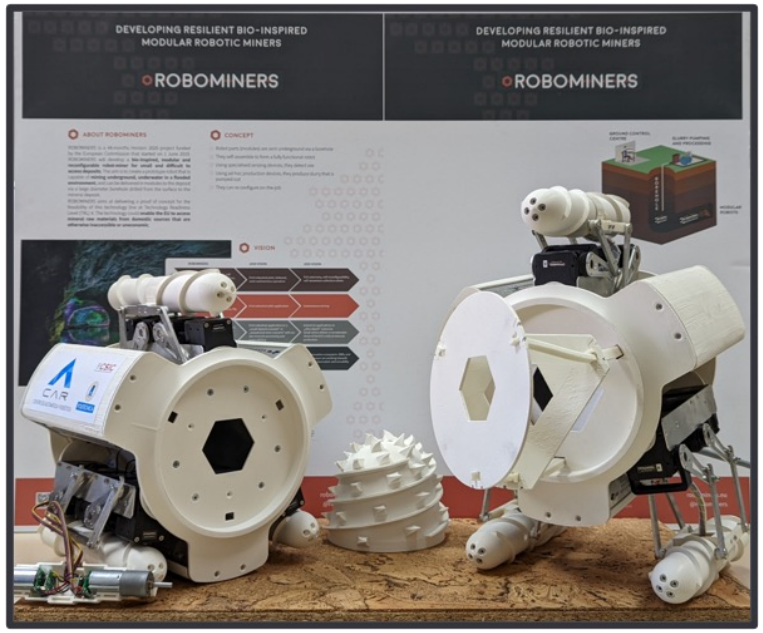
DRY CUTTING

WET CUTTING

THANK YOU FOR YOUR ATTENTION

RM1

RM2



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DISSEMINATION

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