



# Durability Testing of a Lunar Surface Excavation Rover

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## 1. Introduction

PRIMROSE, the Prototype Regolith In-situ Mining Rover with Onboard Surface Excavator, is the Michigan Tech Planetary Surface Technology Development Lab's submission for Phase 2 of NASA's Break the Ice Lunar Centennial Challenge.

PRIMROSE is a lunar excavation and material transportation rover utilizing a chain trencher as its primary means of material excavation and collection. It is driven by an adjustable height chassis that allows it to vary the height of its trencher for excavation and transportation. Material is stored in an onboard hopper for transportation to a simulated material processing facility.



**PRIMROSE Excavating Icy Lunar Regolith Simulant**



**PRIMROSE on the Regolith Simulant Transportation Track**



**Level 2 Excavation Site**

## 2. Level 2 Results

The main goal of the Level 2 Durability Demonstration Test was to excavate and deliver 800kg per day of icy lunar regolith simulant to a material processing site 500m away on simulated lunar terrain.

CLSM was used as a simulant to represent icy lunar regolith, and the simulated lunar terrain was made of a lunar highland regolith simulant similar to Michigan Tech's MTU-LHT-1A.

<i>Target Mass Delivery</i>	800 kg/day
<i>Actual Mass Delivered</i>	2987 kg
<i>PRIMROSE Mass</i>	332 kg
<i>Total Landed Mass</i>	477 kg
<i>Energy Used</i>	61 kWh
<i>Total Distance Travelled</i>	30 km

## 3. Level 3 Improvements

To prepare for the final competition in Huntsville, Alabama, several changes were made to PRIMROSE to improve performance and reliability. The main changes were increased wheel size, improved connectivity, redesigned material conveyor, and modified steering architecture.



**PRIMROSE Mobility Field Testing**

