

URM

Jerin Roberts

General  
Overview

Purpose  
Internal  
Structure  
Problems

Solutions

Pulley Design  
Chain Drive  
Design

Performance

Data Collection  
Methods  
Data

Next Steps



THOMPSON RIVERS  
UNIVERSITY

# Umbilical Retrieval Mechanism (URM) Update

Jerin Roberts

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# Overview

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# URM Function

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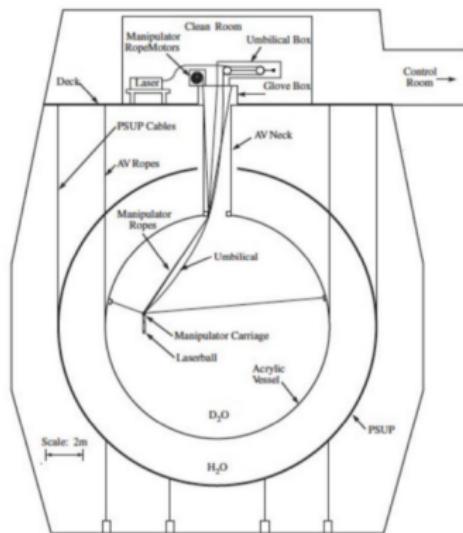
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Controls the deployment and storage of the source umbilical for the SNO+ detector



# How it Works

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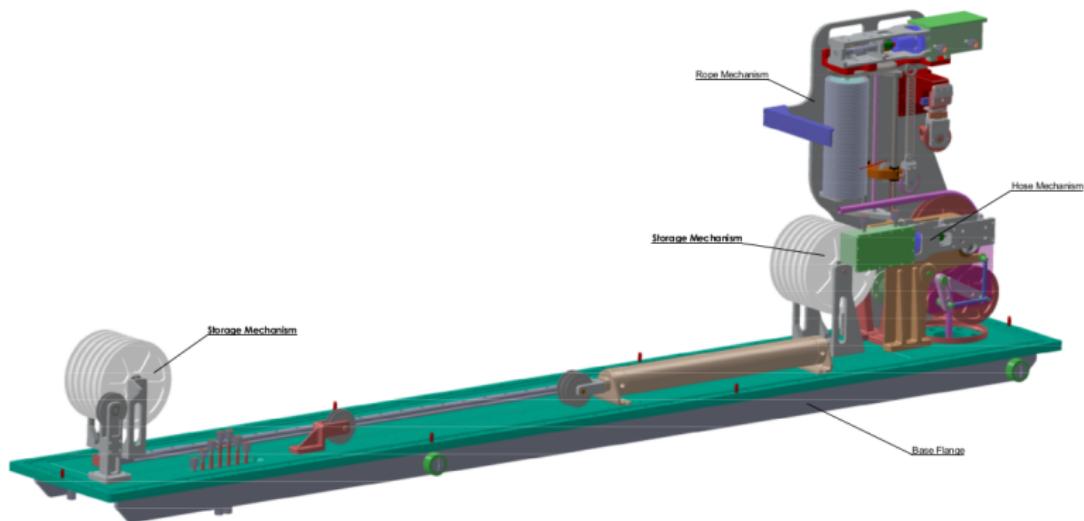
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# Drive Pulley Assembly Before:

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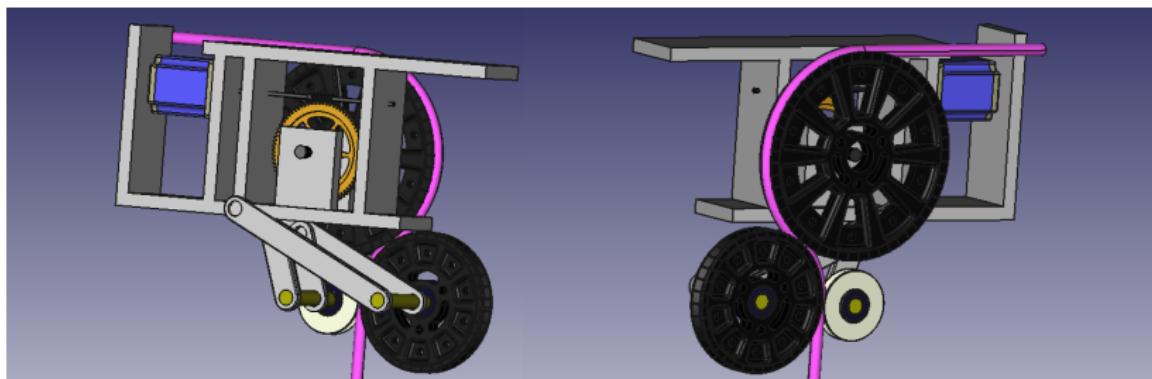
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The drive pulley assembly extends and retracts the umbilical



# URM Problems

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## Sources of Slippage:

- 1 LAB as Scintillator (low coefficient of friction)
- 2 LAB and Water compatible umbilical
- 3 Pulley Design (collects LAB reducing friction)
- 4 Umbilical Storage System (Pneumatic Cylinder)

# Original Design

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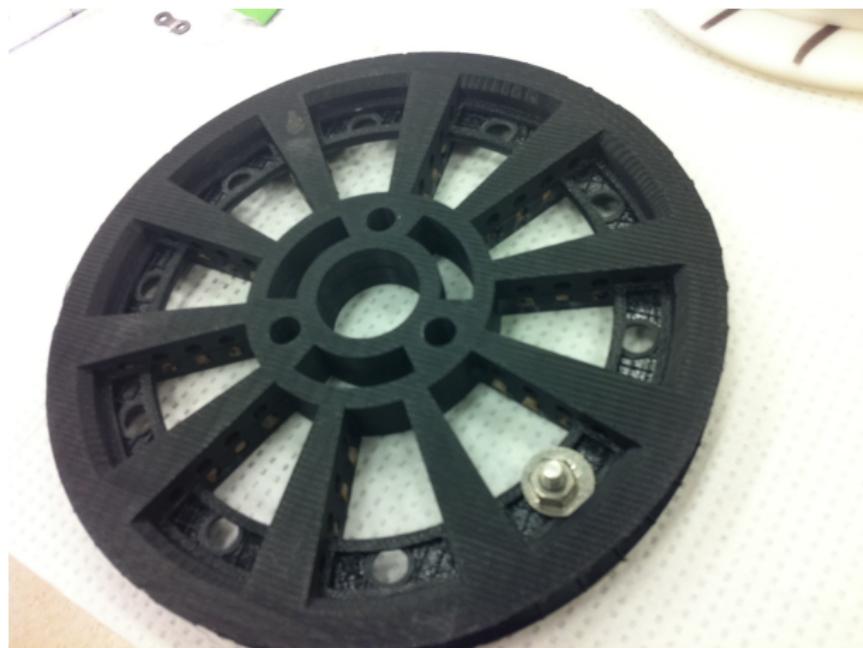
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# The Drive Pulley Design

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# FEM Radial Load

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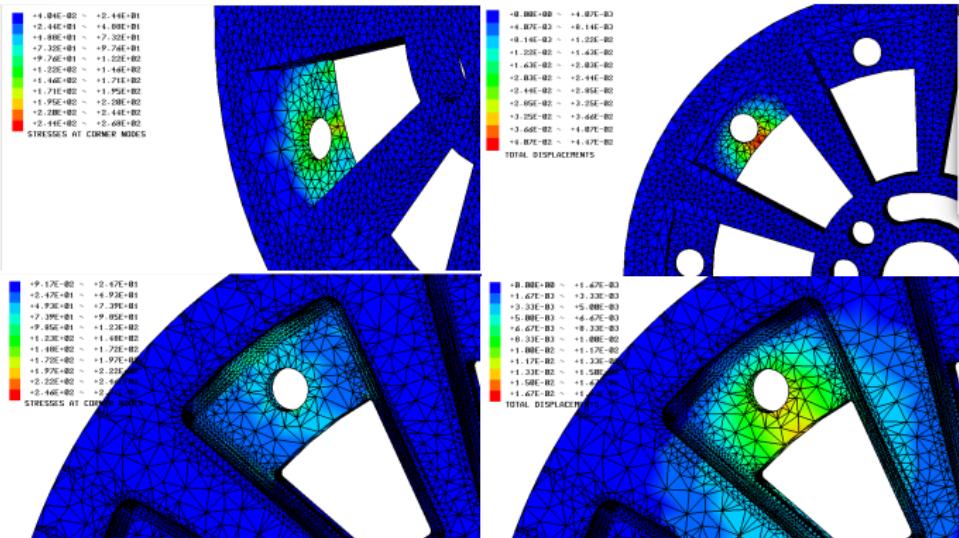
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# FEM Equatorial Load

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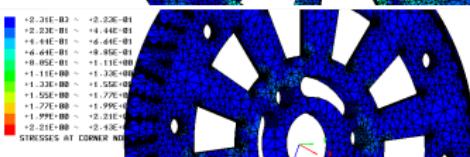
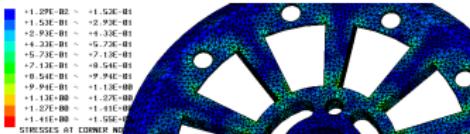
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# Chain Drive Design

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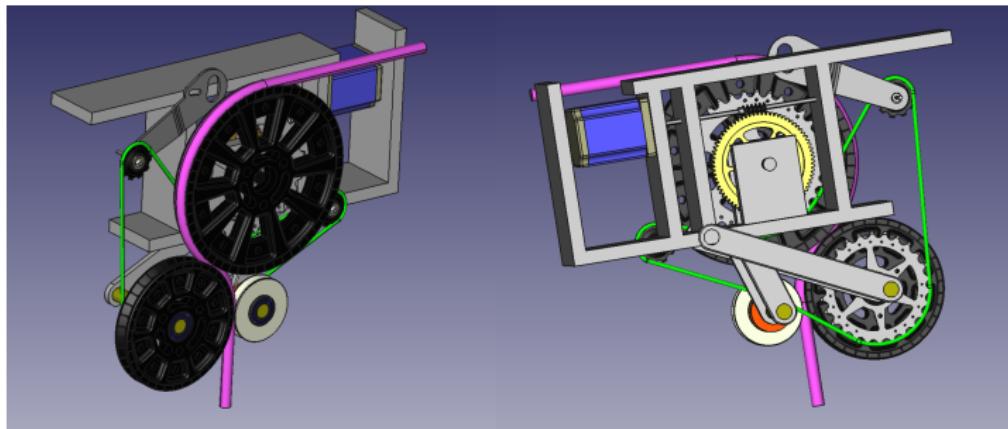
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# Chain Drive Design

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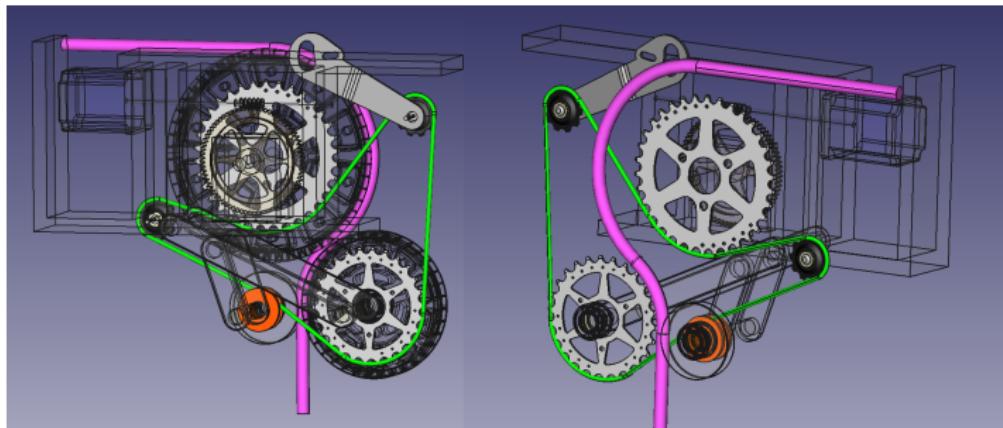
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# Steps Per Unit Length

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Adjusted the steps per unit length to ensure changePos value resulted in same physical displacement

## Example (MOTOR.DAT)

```
MOTOR: urm1umbilicalmotor
POSITION: -3669.5588
STEPS_PER_UNIT: 305
UNITS: CM
START_SPEED: 3.0
CRUISE_SPEED: 3.0
MAX_SPEED: 4.0
NORM_ACCEL: 1.5
MAX_ACCEL: 3.0
END;
```

# Chain Drive System

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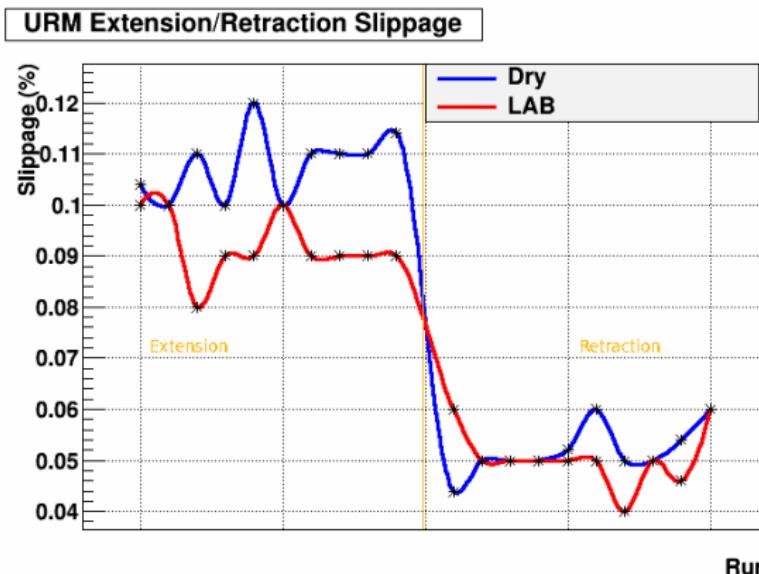
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# Chain Drive vs Non-chain drive

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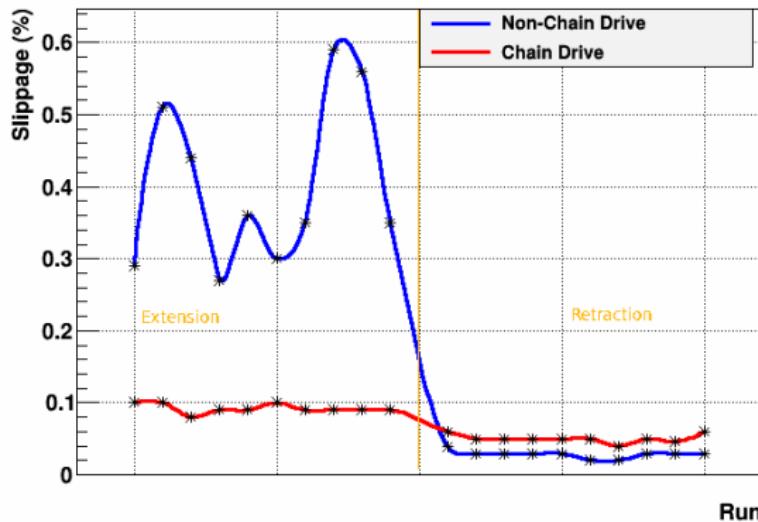
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**URM Extension and Retraction Slippage (LAB)**



# Chain Drive vs Non-chain drive

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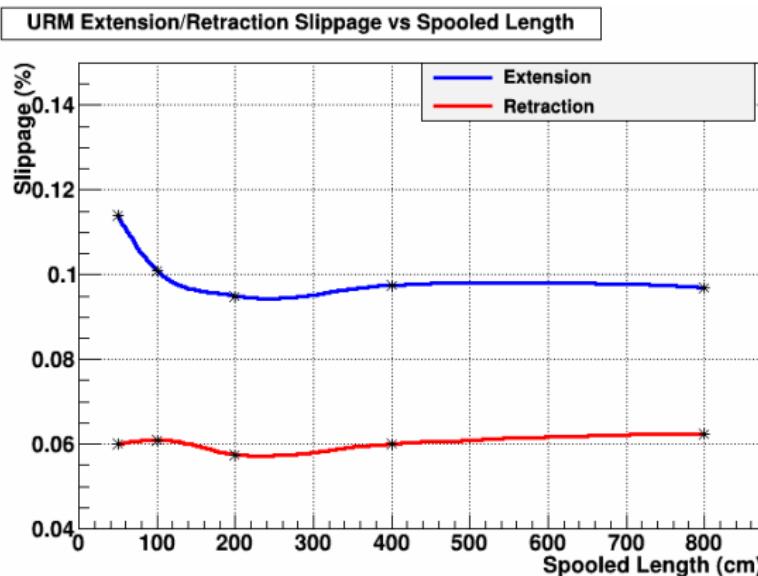
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# Future Goals

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## Next Steps:

- 1 Install and Test new guide pulley
- 2 Investigate the Possibility of Driving small pulley
- 3 Design New LAB application system
- 4 Design simple device for testing pulley track patterns
- 5 Data!!

# Invisible Nucleon Decay

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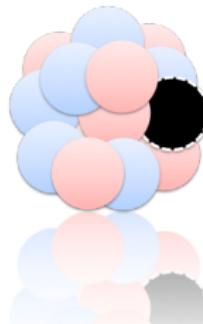
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## Update:

- 1 Nucleon generator has been run in RAT ( $n$  to  $3v$ )
- 2 Curve Fitting
- 3 Validate Results

# References

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[Lawrence Garcia \(2014\)](#)

Umbilical Tests and Detector Data Analysis



[Jose Maneira, Rui Alves \(2013\)](#)

URM design for SNO+, LIP-Coimbra

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# Questions