



# Hemispherical Anti-Twist Tracking System (HATTS)

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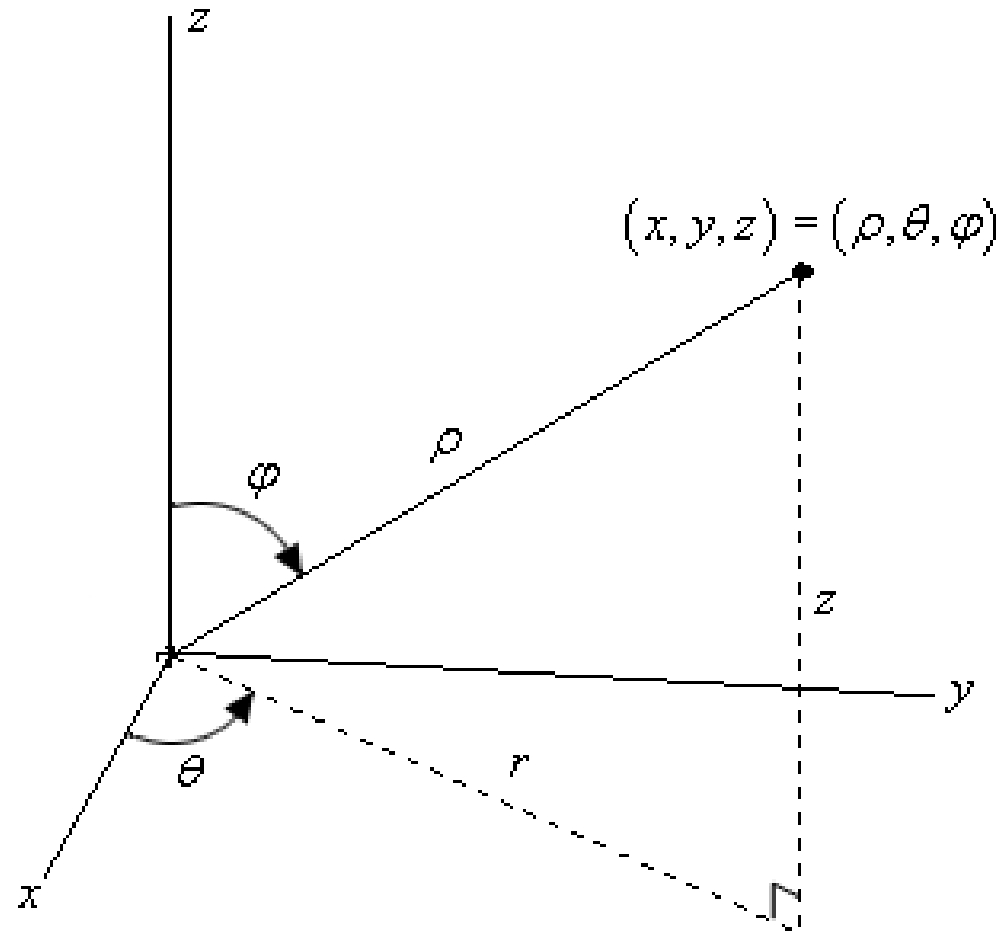


**STANFORD**  
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Space and Systems  
Development Laboratory



# Problem Statement: Hemispherical Tracking Ability



- 2 Degree of freedom hemispherical tracking
- Continuous rotation connectors
  - No twisting of wires, hoses, etc.
- Wrist joint



# Requirements for CubeSat Tracking System



- Stowed Volume  $< \frac{1}{2} U$
- Mass  $< 300$  grams
  - CubeSat  $< 1330$  grams per U
- Minimal obstruction of surface
- High reliability
  - Minimal deployment events
  - Avoid slip rings



# Existing Solutions



Slip Rings



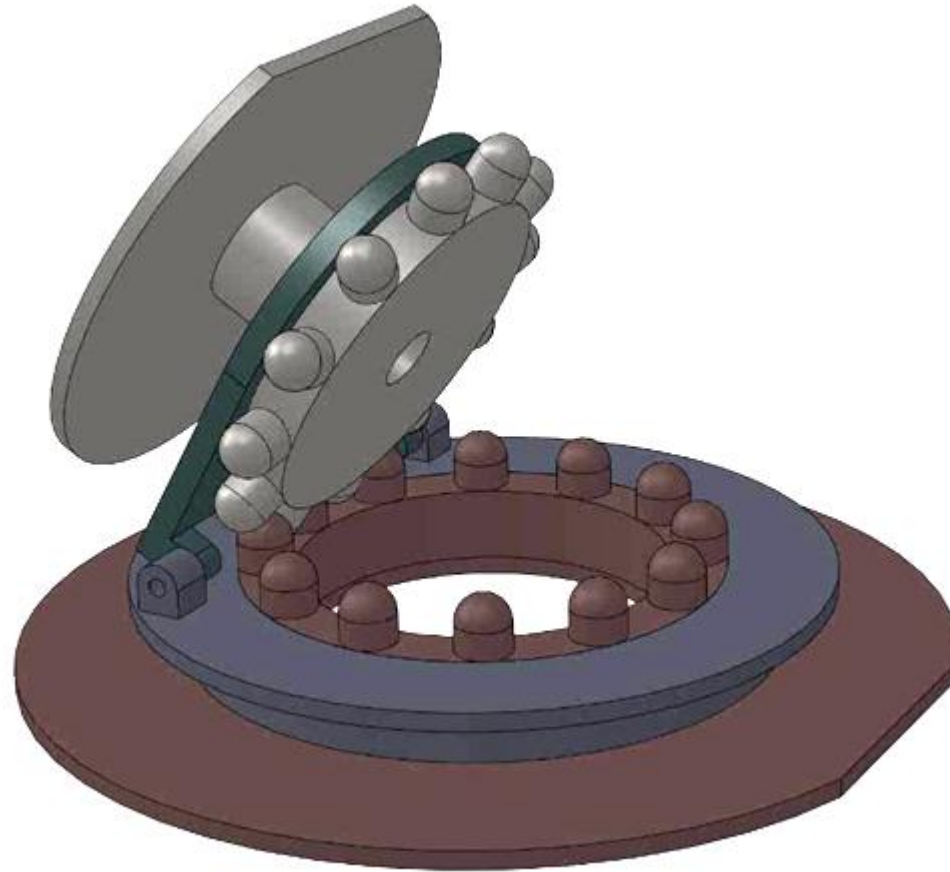
Untwist



Canfield Joint



# The HATTS Solution



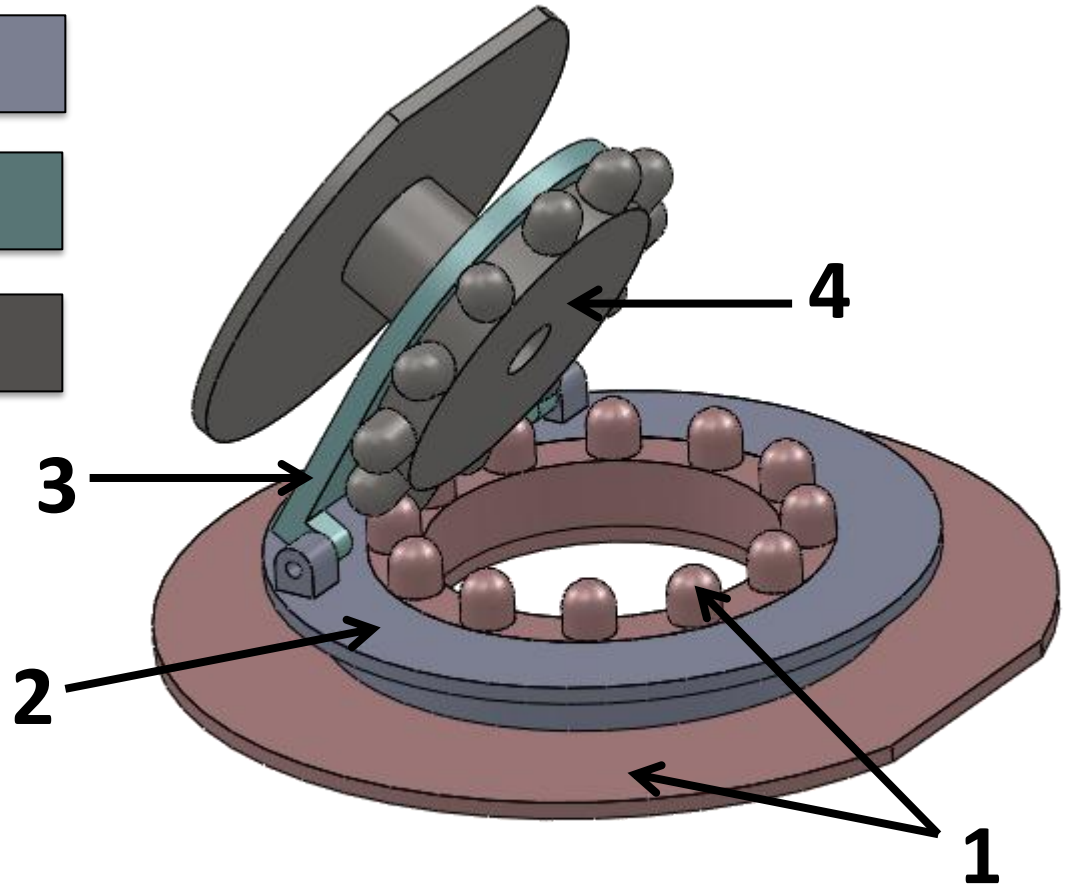
# HATTS Components

1. Fixed base with gear

2. Rotating platform

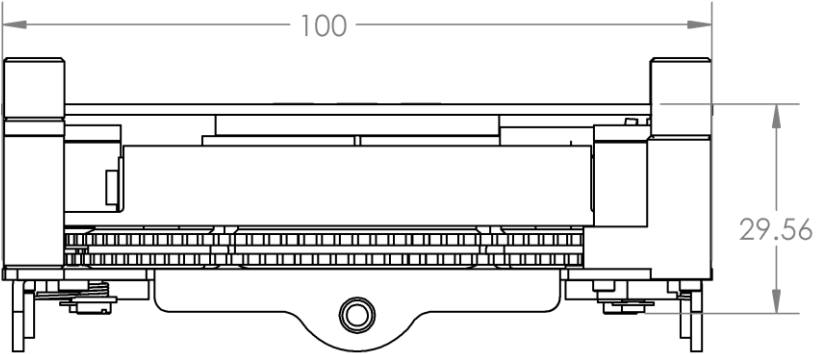
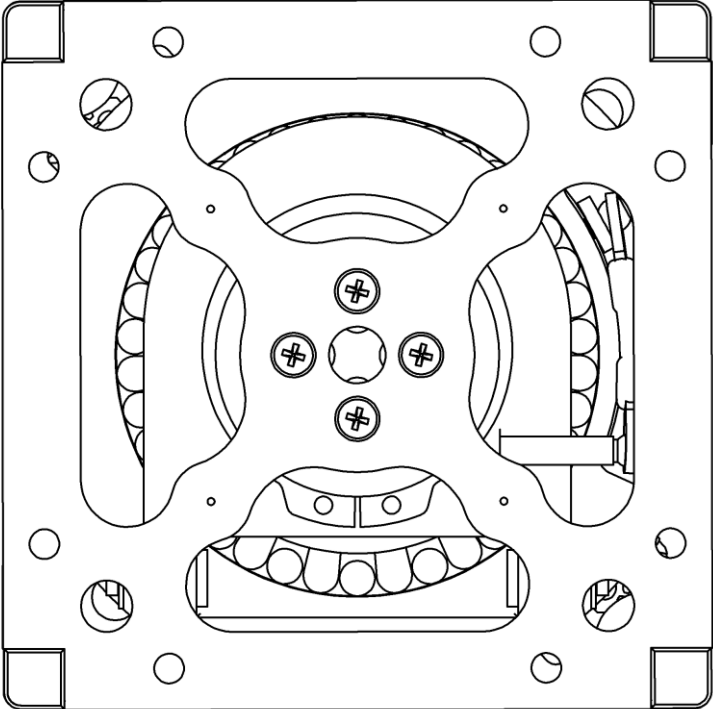
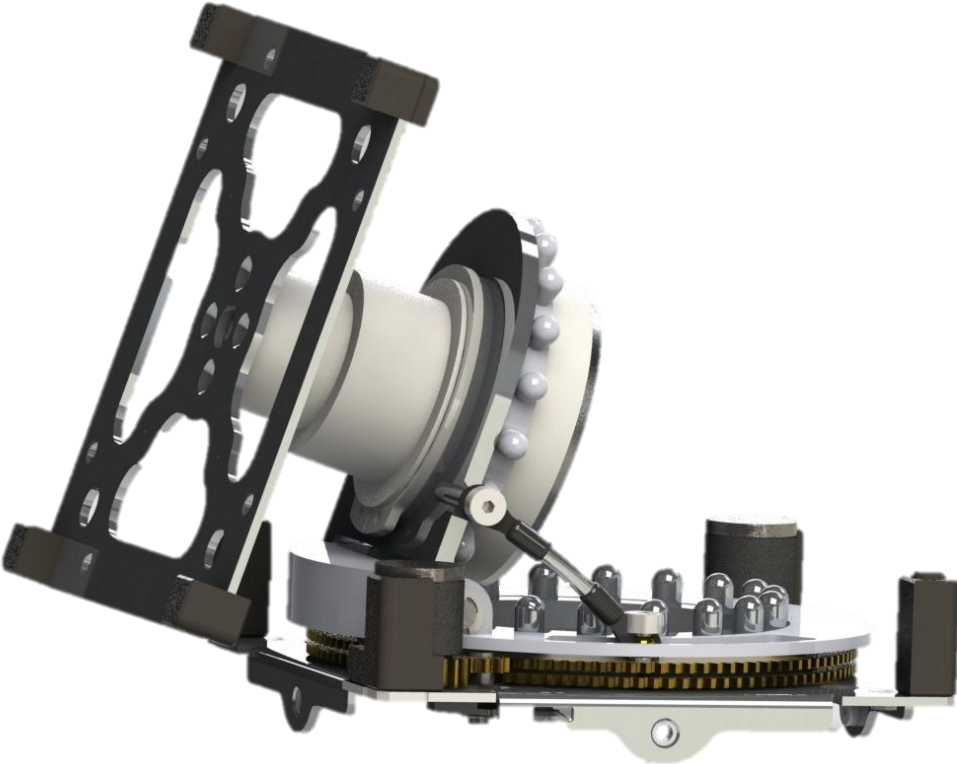
3. Elevation platform

4. Anti-Twist Gear



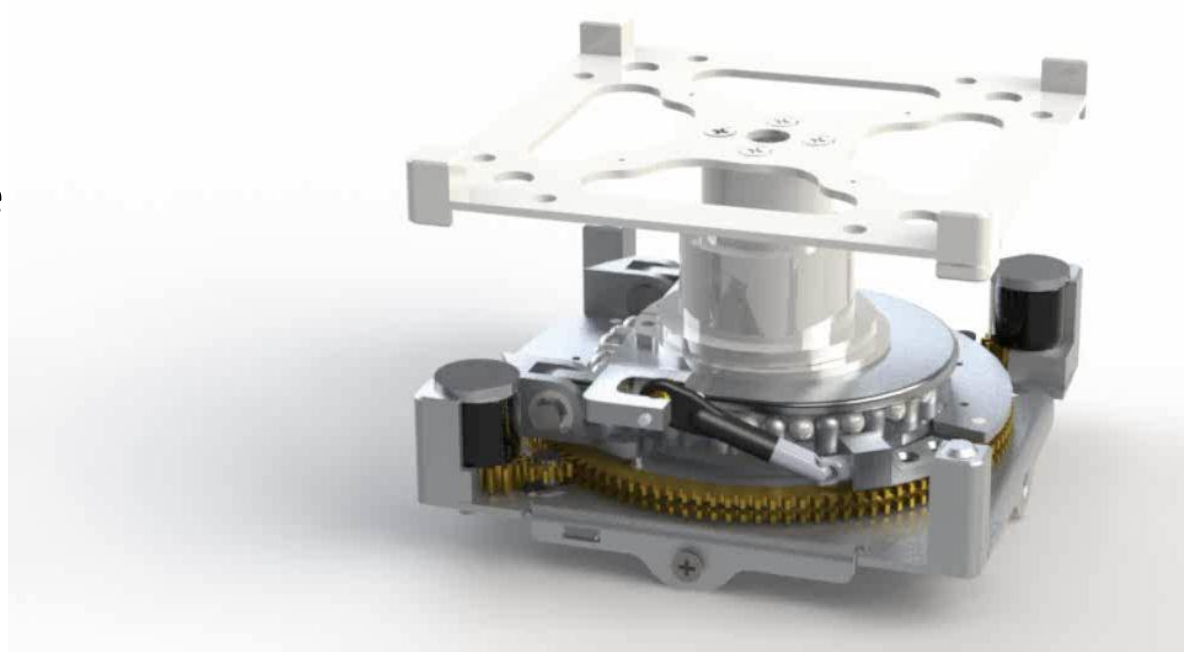
# CubeHATTS Specifications

- Mass: ~ 250 grams
- Stowed Volume:  
10cm x 10cm x 2.9 cm



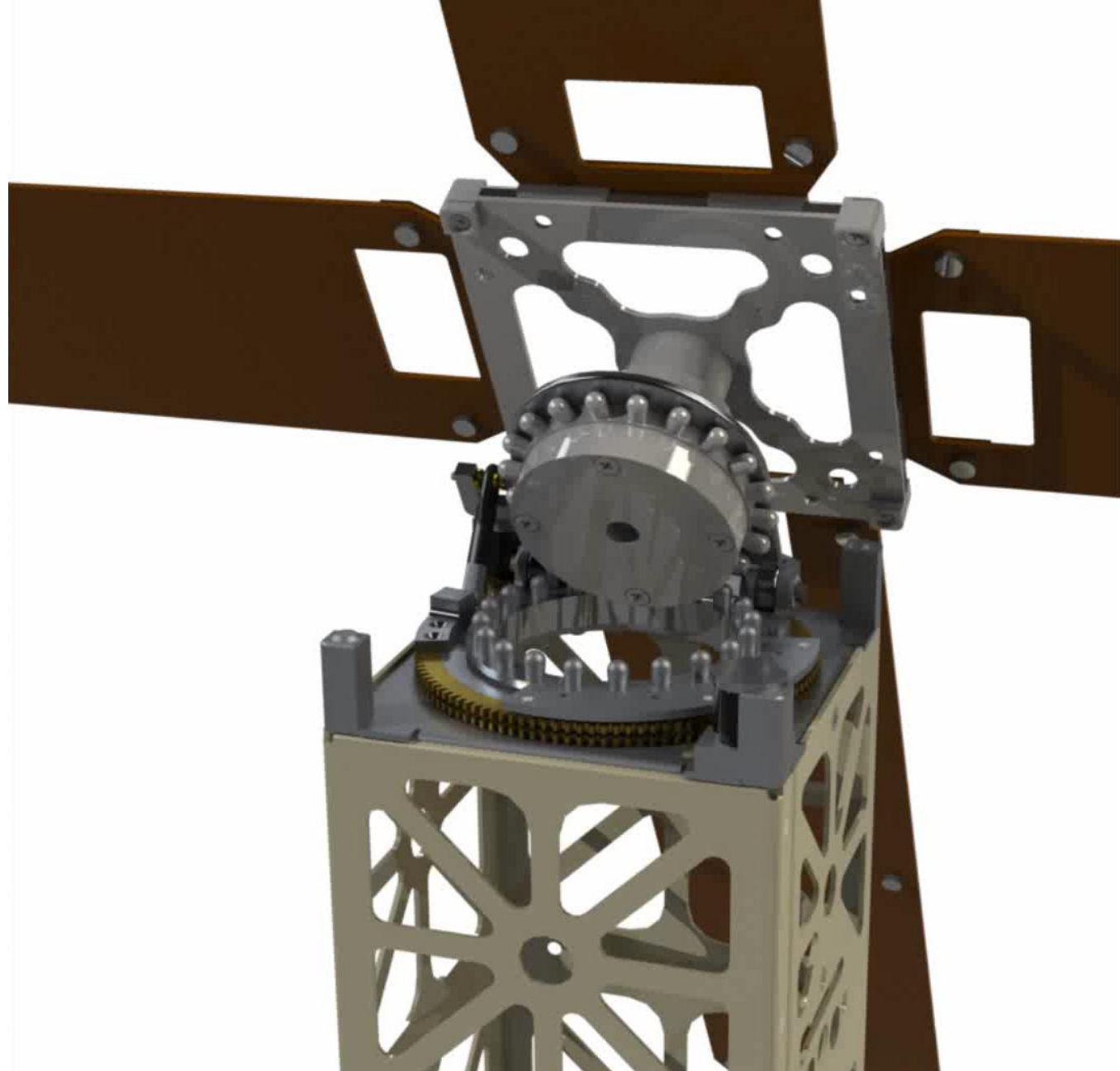
# CubeSat Implementation Details

- Dual coaxial gears to control azimuth & elevation
- Identical and rigidly mounted driving motors
- Telescoping arm for single action deployment
- Ball gears allow engagement through full range of elevation angles





# CubeHATTS Status



- Work Completed:
  - CubeHATTS v1.1 design
  - Test unit
- Further Work
  - Lifetime analysis
  - Weight reduction



# CubeHATTS Prototype

- Prove out high risk items
  - Ball Gears
  - Coaxial Gears
  - Elevation Arm
  - Bearings
- Fast time-to-test

