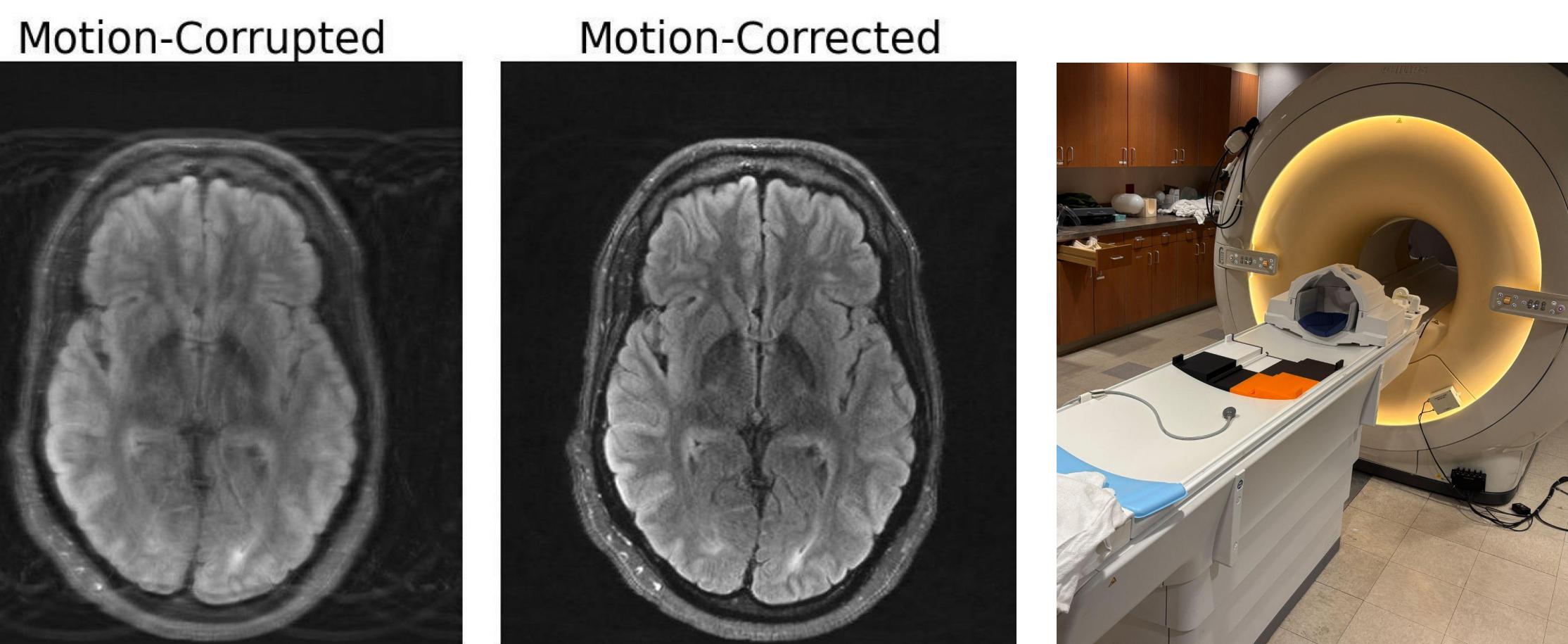


Introduction



- MRI scans are **sensitive to patient motion**, which cause interference and affects diagnosis.
- Staying still is challenging, especially for patients with **ADHD, autism, or Parkinson's**.
- Methods are being developed, but are difficult to evaluate, as **identical movements need to be repeated across multiple scans** to allow for comparisons of corrected/uncorrected images.
- These motions also **need to be at exact times** to study RF sequence dependent effects.

KKI needs a **motion platform** that can **precisely simulate patient movement** during brain scans.

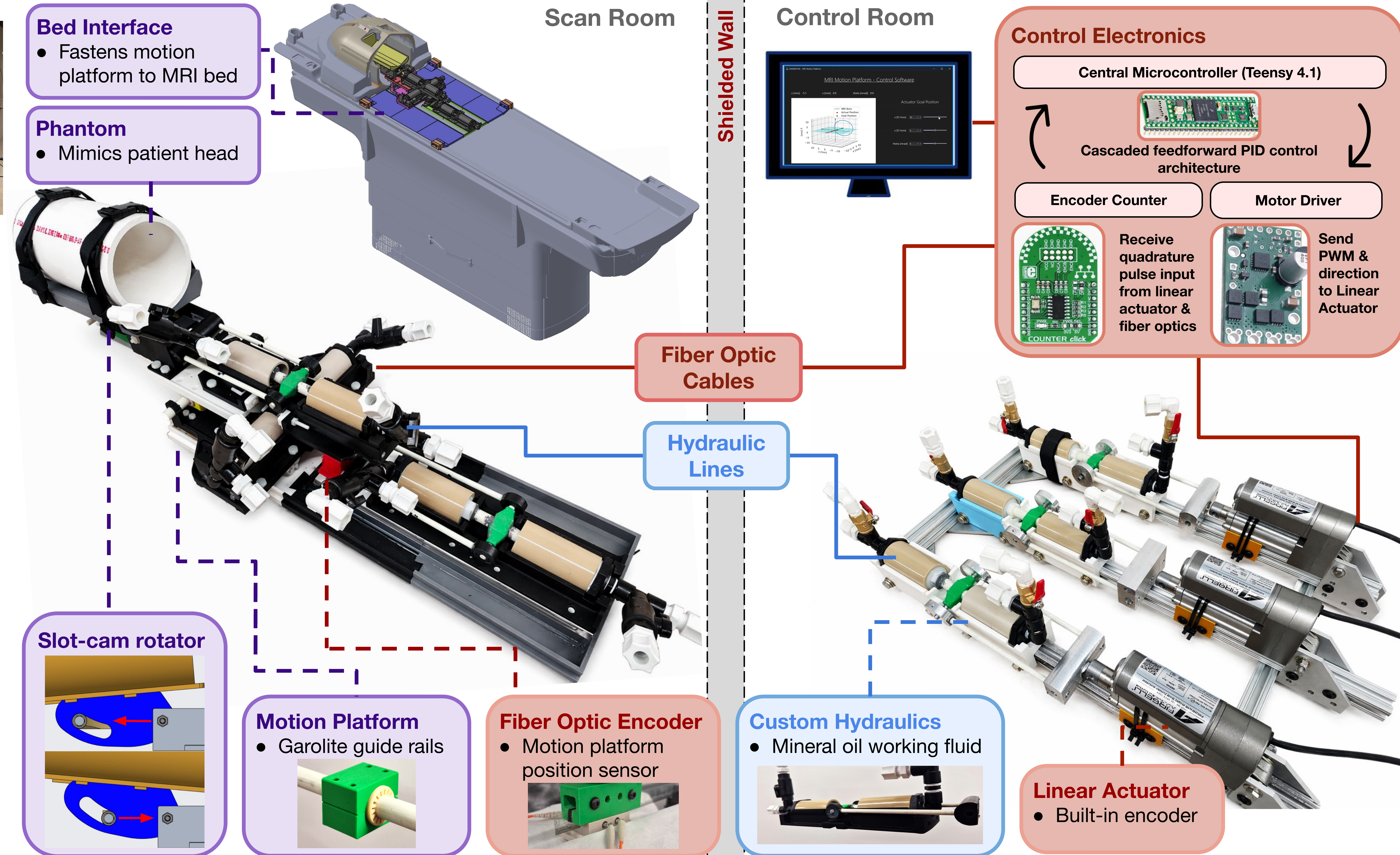
This will allow them to:

- **Improve correction techniques,**
- **Provide insight on exact effects of motion,**
- **Help determine if scans need to be repeated.**

Requirements

- Must be MRI-safe and non-interfering**
- Must mimic patient motion**
- Must have 3 Degrees of Freedom**
- Must achieve: $\pm 10\text{mm}$ in translation
 $\pm 5^\circ$ in rotation**
- Must achieve accuracy of 0.1mm and 0.5°**
- Must follow programmed path and log data**

System Overview



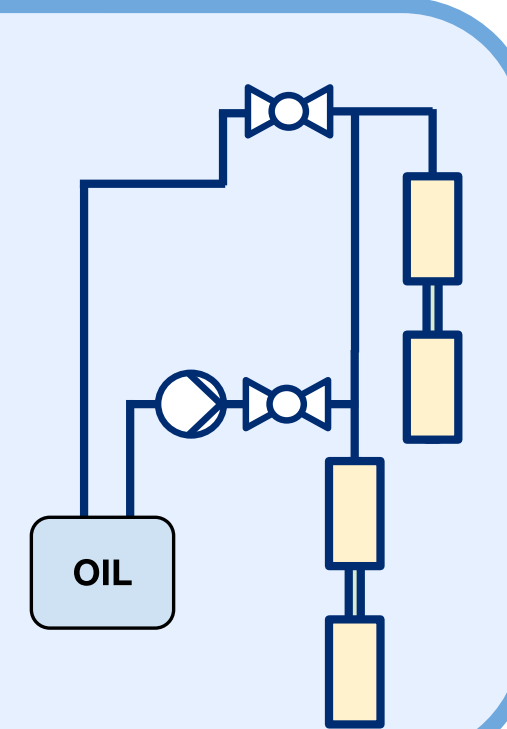
Testing and Performance

Hydraulic Tests

- **Maximum ~70 psi**
→ 2x expected pressure
- **Drip tray can hold 2x total fluid volume in case of failure (1.14L)**
- **Absorbent pads prevent spillage**

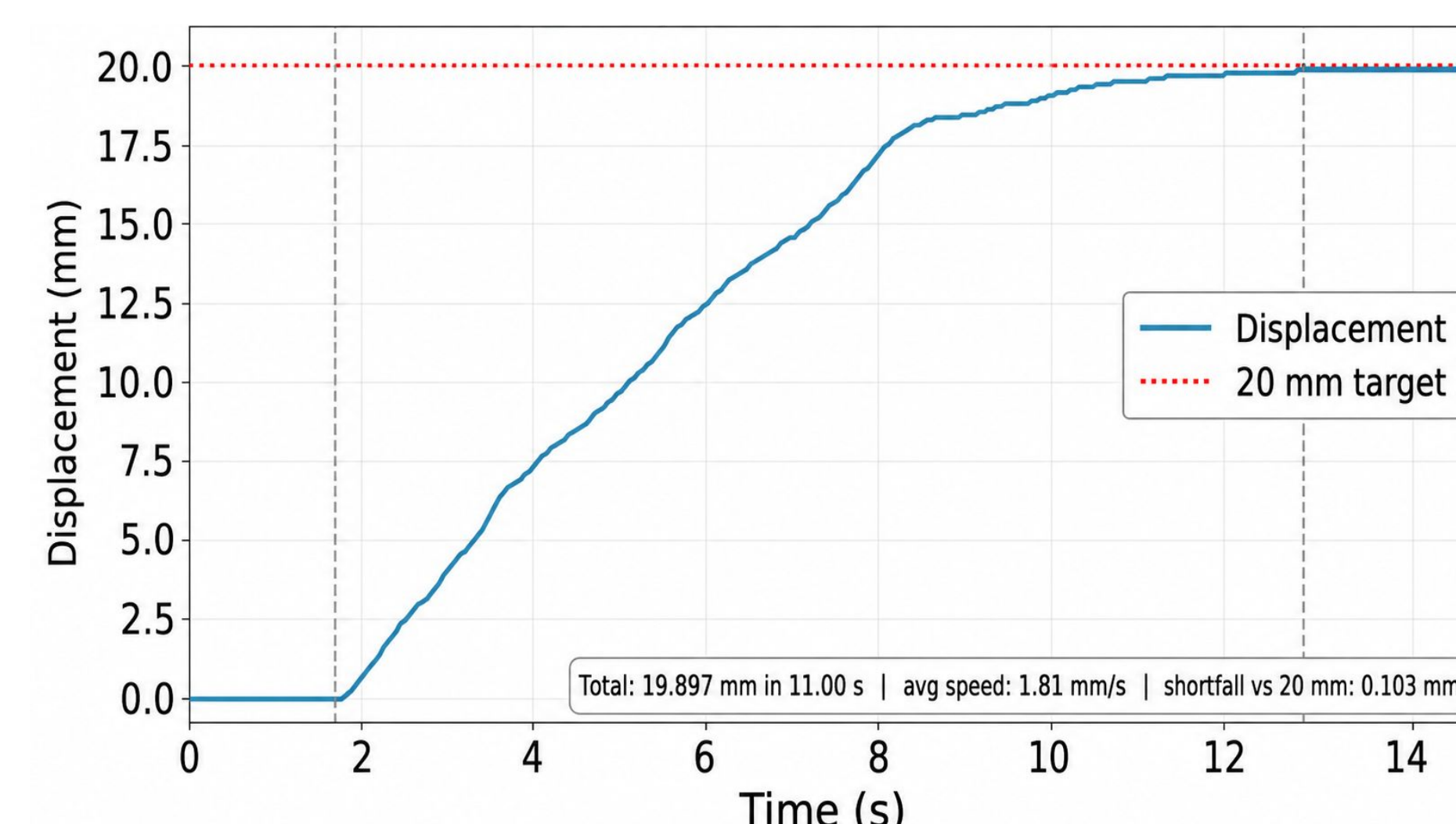
Bleeding

- Oil pump used to bleed fluid lines
- Ball valves for easy disconnect



Encoder Tests

- **< 0.5% position error**
- **< 0.1 mm displacement detection**



Conclusions

- ✓ **MRI compatible motion platform**
- ✓ **3 D.o.F. with desired range of motion**
- ✓ **Follows programmed path and logs data**
- ✚ **MRI-safe encoder system developed**

Future Goals

- **Integrate encoder**
- **Optimize hydraulic pistons**
- **Machined plastic components**
- **Fatigue testing and verification**
- **Improve leak-proofing & bleed**