



Percentage of Water Retained in Icy Lunar Regolith Simulant During Transfer into a Sample Container

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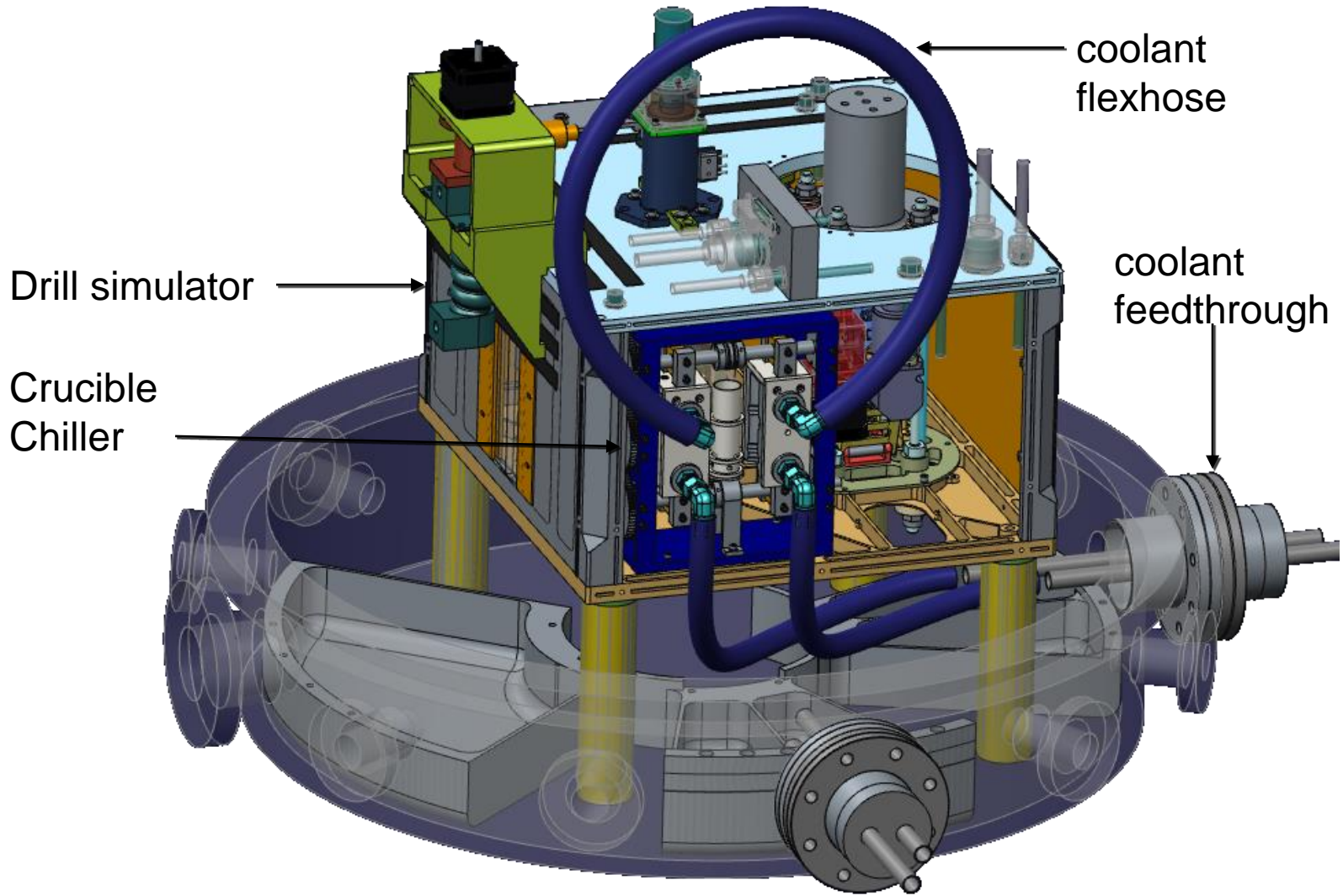
Background

- We have confirmed the presence of water ice in permanently shadowed regions on the poles of the moon but currently do not have enough data to develop an ice mining architecture
- A resource prospecting mission is needed to determine the concentration of water ice and other volatiles as well as how those concentrations vary with depth and location
- The OVEN (Optimized Volatile Extraction Node) system was developed for a lunar resource prospecting mission. It is designed to take samples from a drill, weigh them, seal them, and provide a controlled release of volatiles for analysis

Test Objective:

- Quantify sublimation/desorption losses during the transfer of samples from a simulated drill into the OVEN system

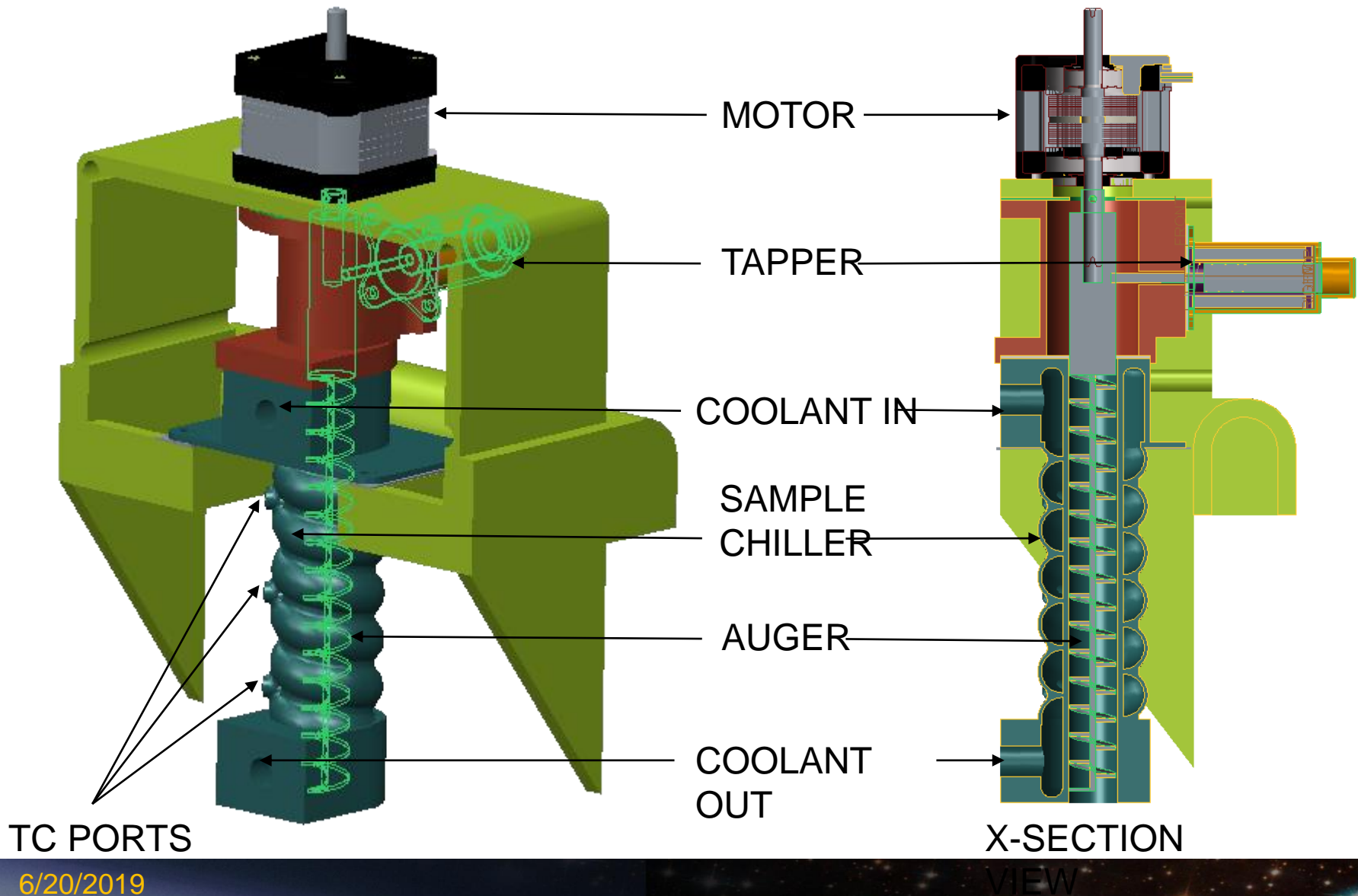
Test Overview



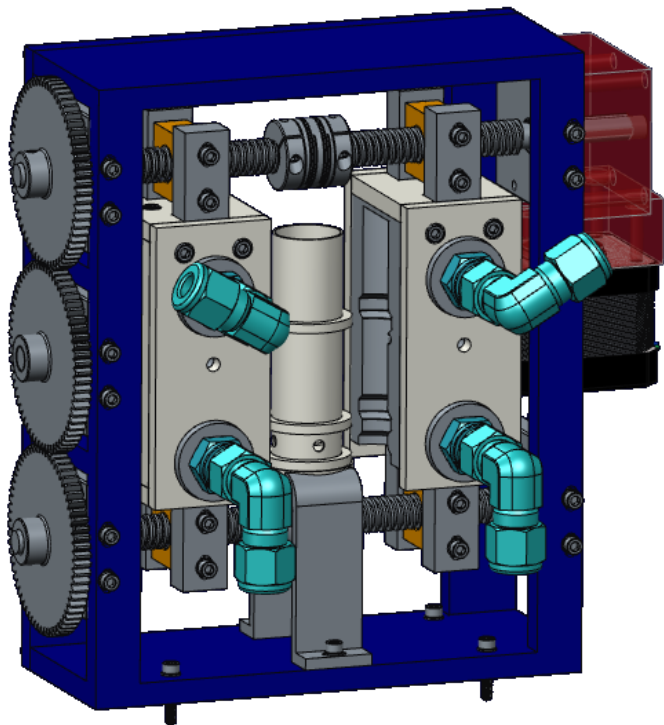
Sample Preparation



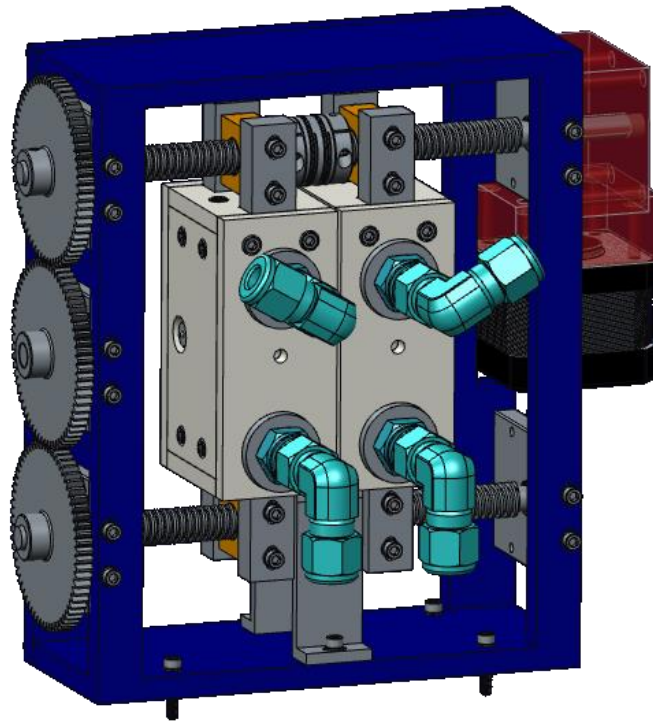
Drill Simulator



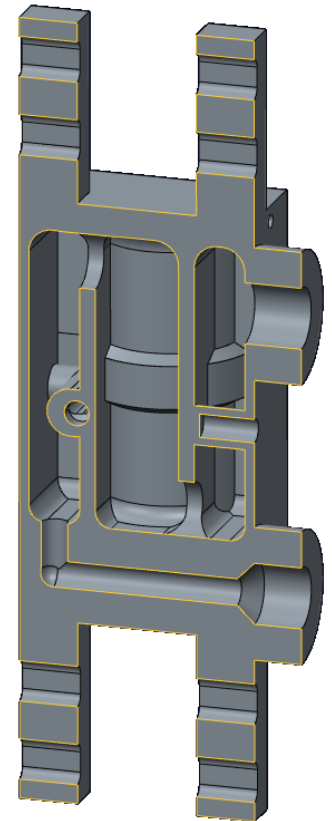
Crucible Chiller



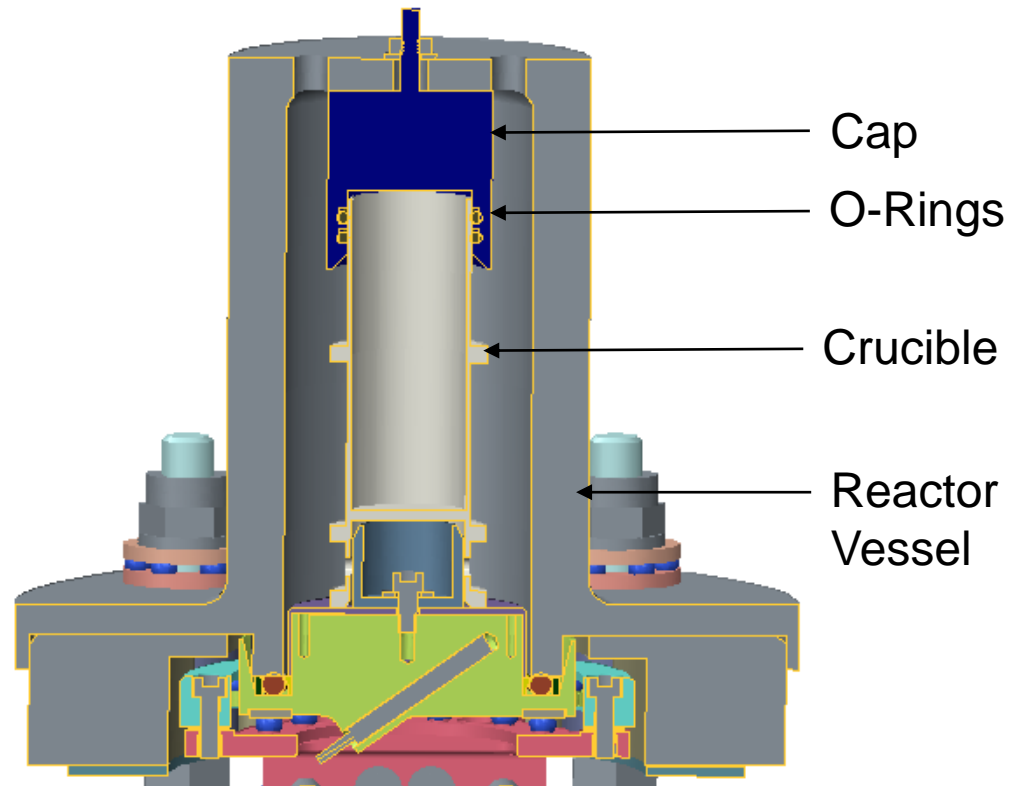
Open



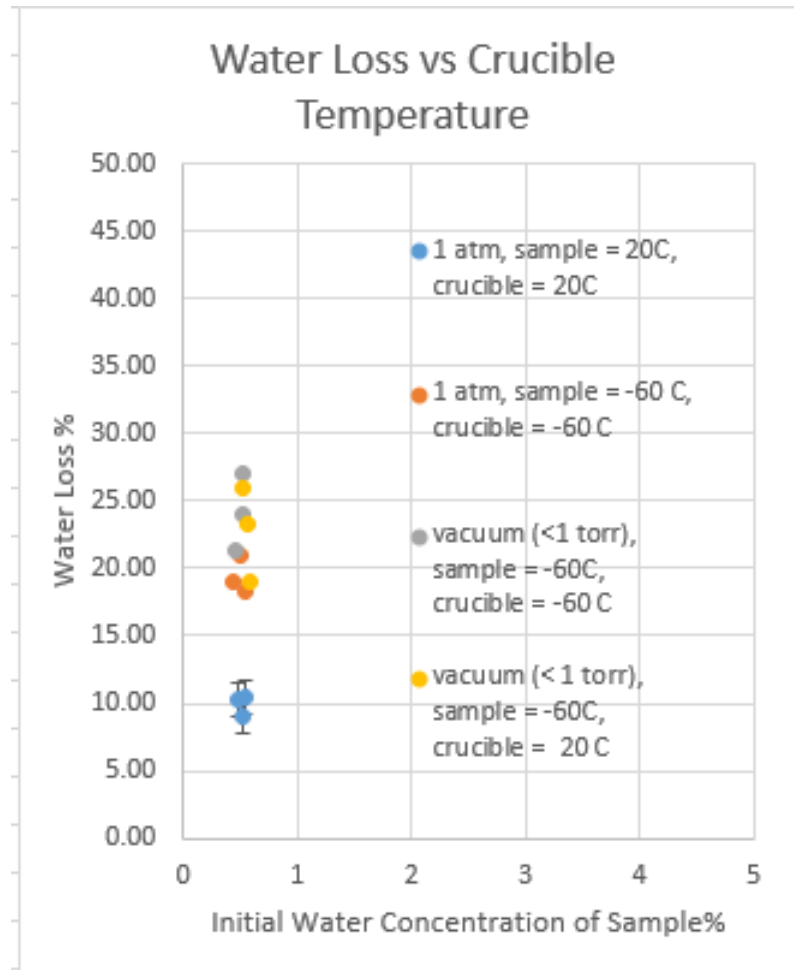
Closed



X-section of
coolant flowpath



X-section of sealed crucible

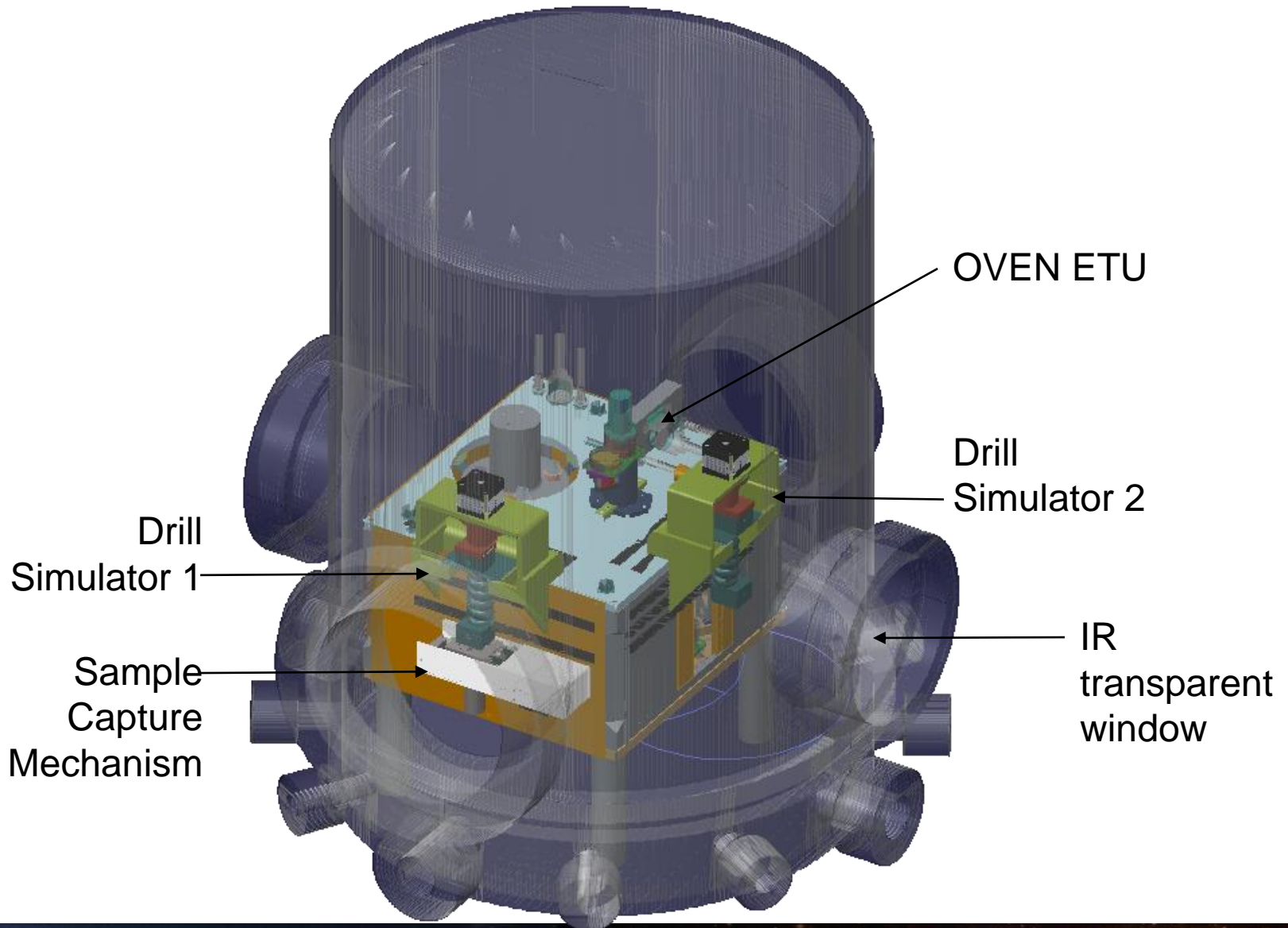


- Transfer time for all data was ~ 30 seconds

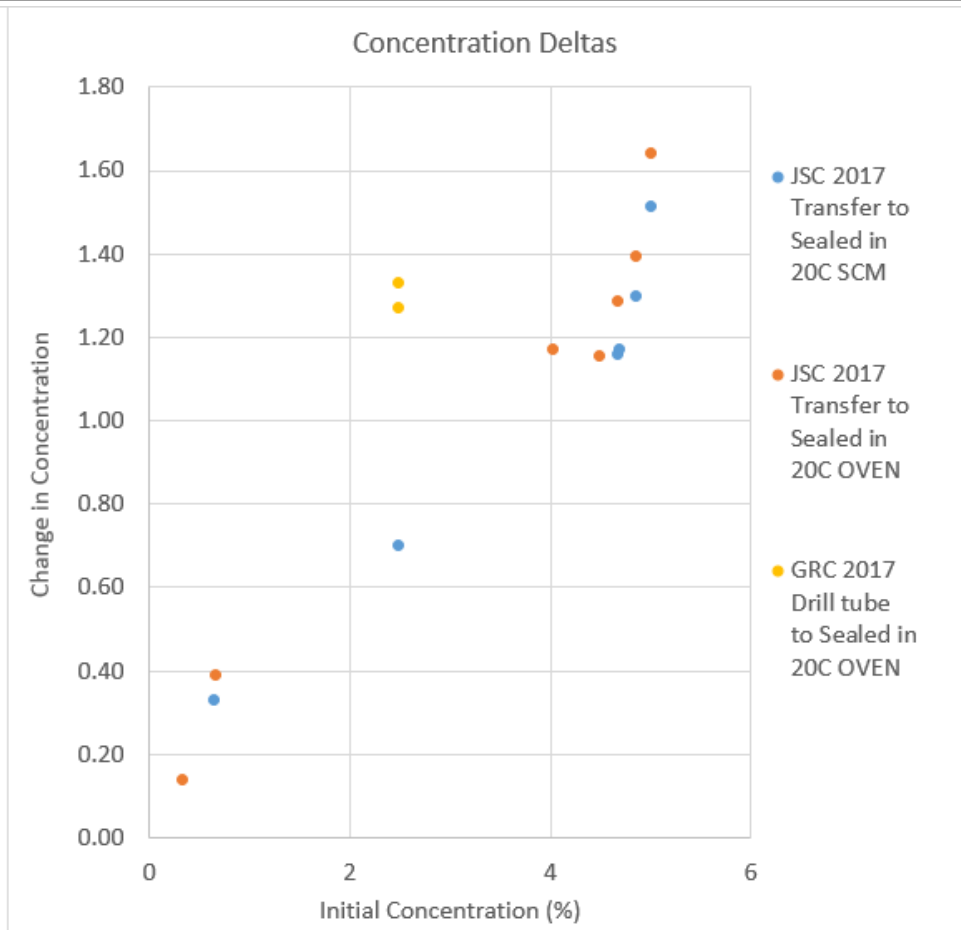
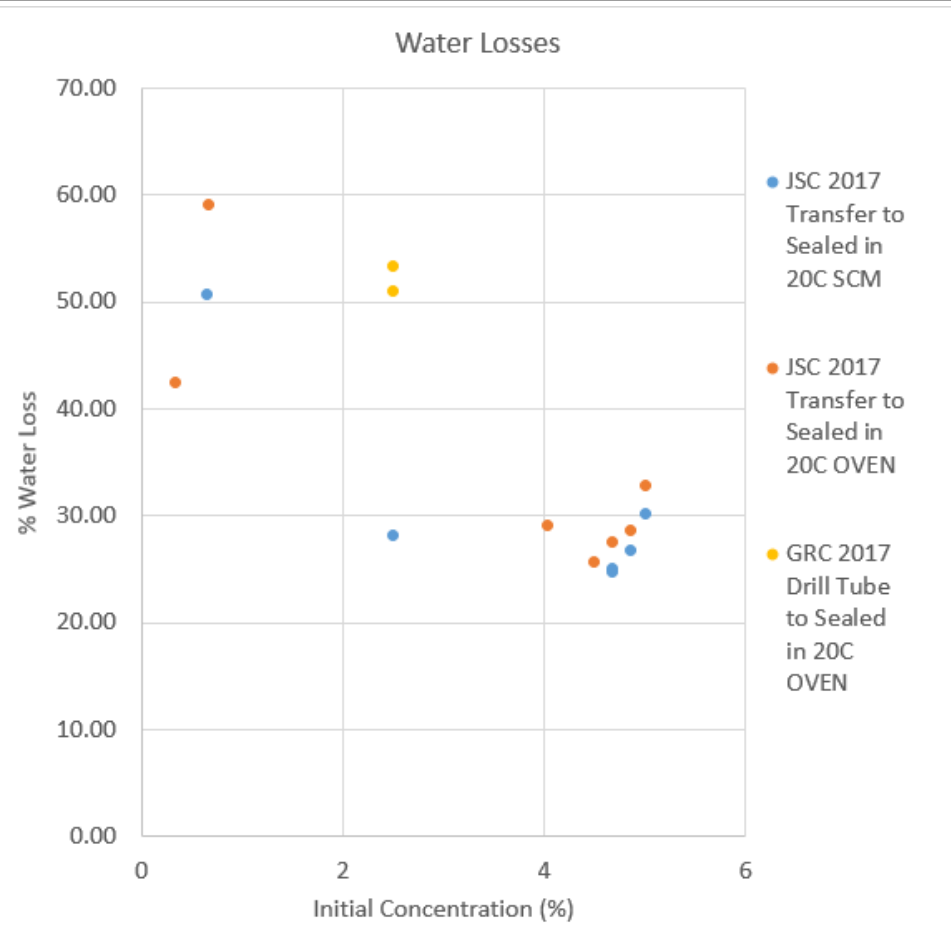
Related Work:

- Kleinhenz, J. E., Zacny, K., & Smith, J. (2015). Impact of drilling operations on lunar volatiles capture: Thermal vacuum tests. In *8th Symposium on Space Resource Utilization* (p. 1177).
- Poston, M. J., Grieves, G. A., Aleksandrov, A. B., Hibbitts, C. A., Dyar, M. D., & Orlando, T. M. (2013). Water interactions with micronized lunar surrogates JSC-1A and albite under ultra-high vacuum with application to lunar observations. *Journal of Geophysical Research: Planets*, 118(1), 105-115.
- Andreas, E. L. (2007). New estimates for the sublimation rate for ice on the Moon. *Icarus*, 186(1), 24-30.

Backup – Previous Test Configuration



Backup - Data from Previous Testing



- This data set represents tests that were performed to determine water losses that occur specifically in the OVEN (from the time crucible is full to the time it is sealed). It also includes data from the integrated GRC test that OVEN participated in
- Transfer times for blue and orange data were ~ 3 minutes