

Supplementary Figures:

Development and characterization of a low intensity vibrational system for microgravity studies

Omor M. Khan¹, Will Gasperini¹, Chess Necessary², Zach Jacobs², Sam Perry², Jason Rexroat², Kendall Nelson², Paul Gamble², Twyman Clements², Maximilien DeLeon³, Sean Howard¹, Anamaria Zavala¹, Mary Farach-Carson³, Elizabeth Blaber⁴, Danielle Wu³, Aykut Satici¹, Gunes Uzer¹

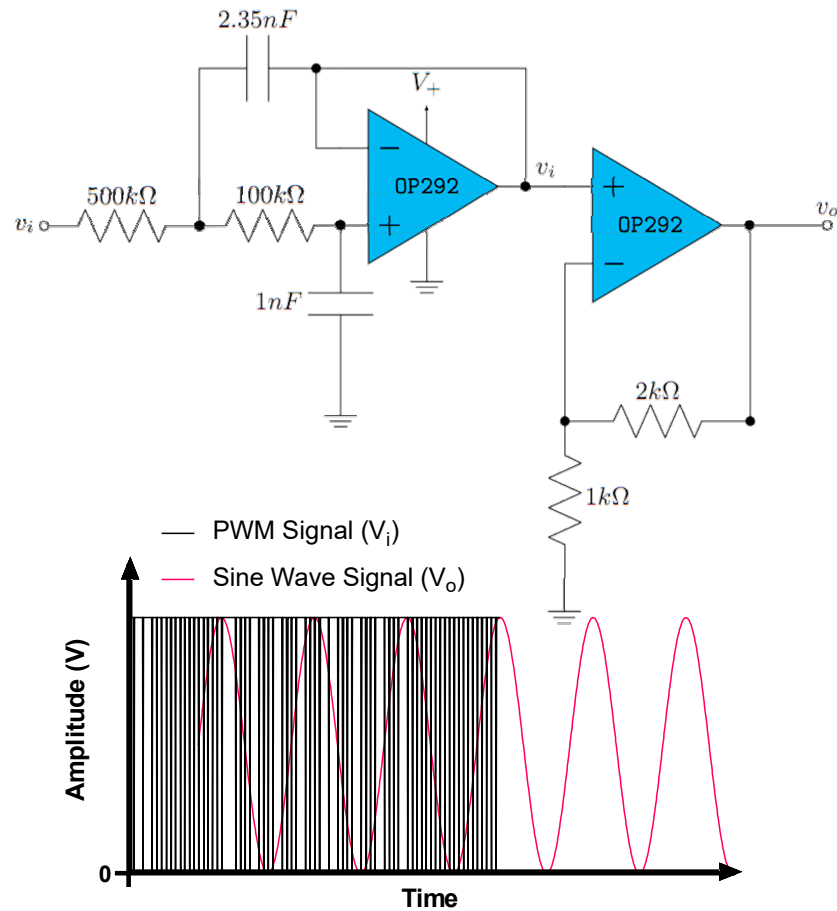
¹Department of Mechanical and Biomedical Engineering, Boise State University,

²Space Tango, Inc., 611 Winchester Lexington KY 40505, United States,

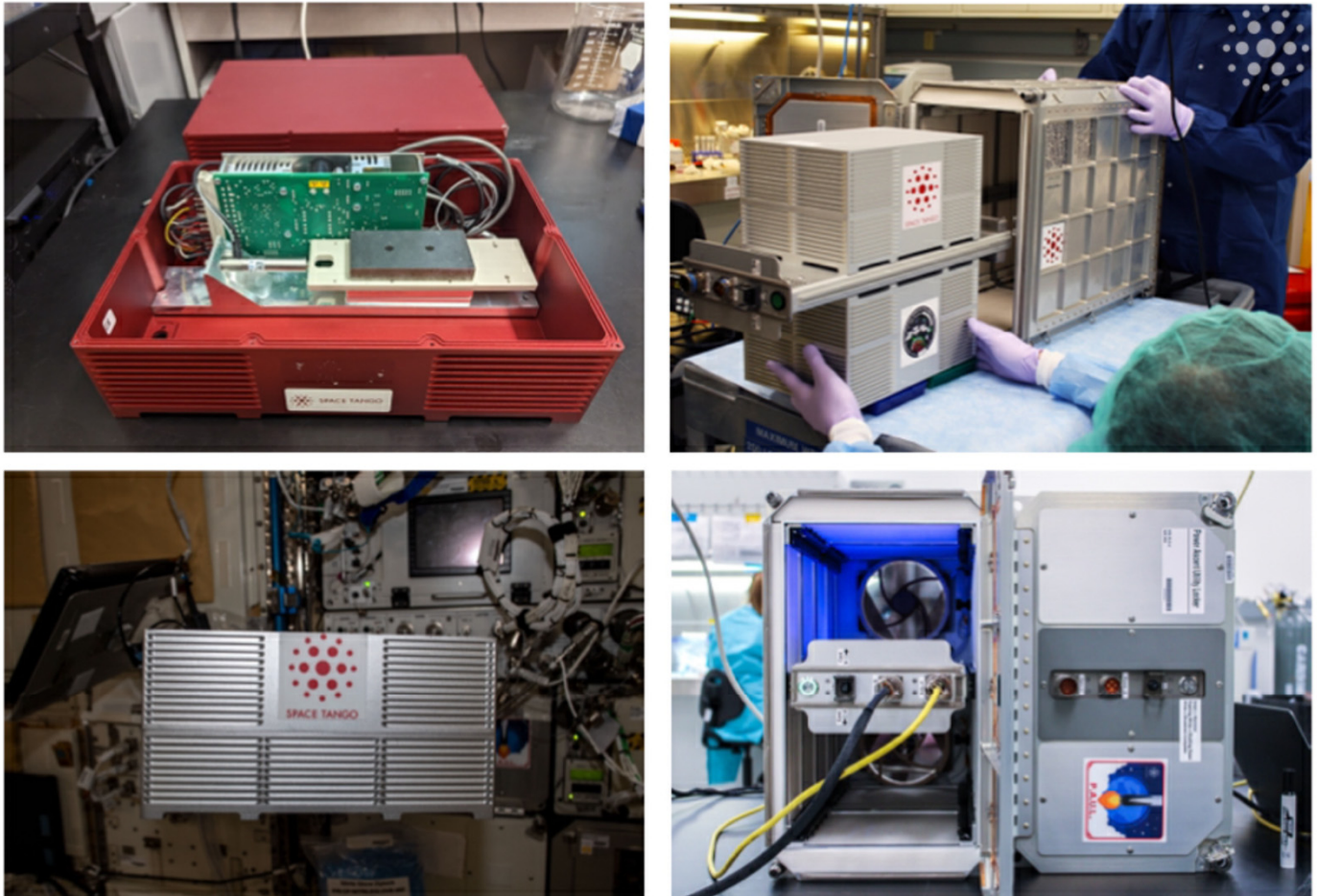
³Department of Bioengineering, Rice University, ⁴Center for Biotechnology and Rd.

Interdisciplinary Studies, Department of Biomedical Engineering, Rensselaer

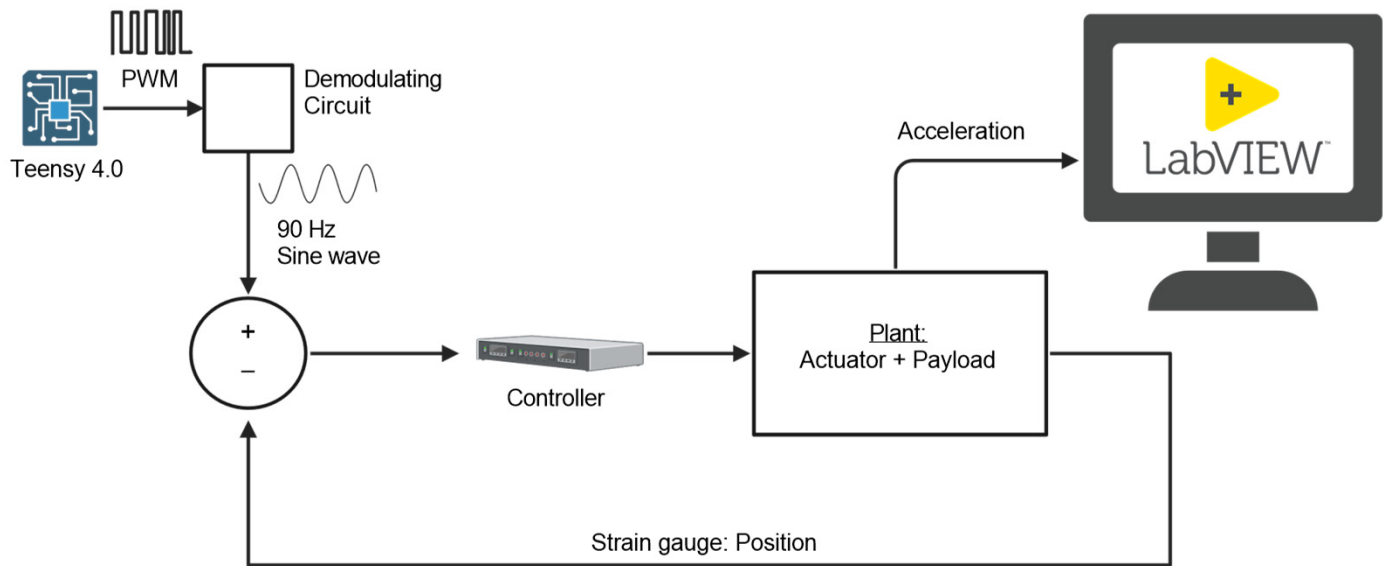
Polytechnic Institute



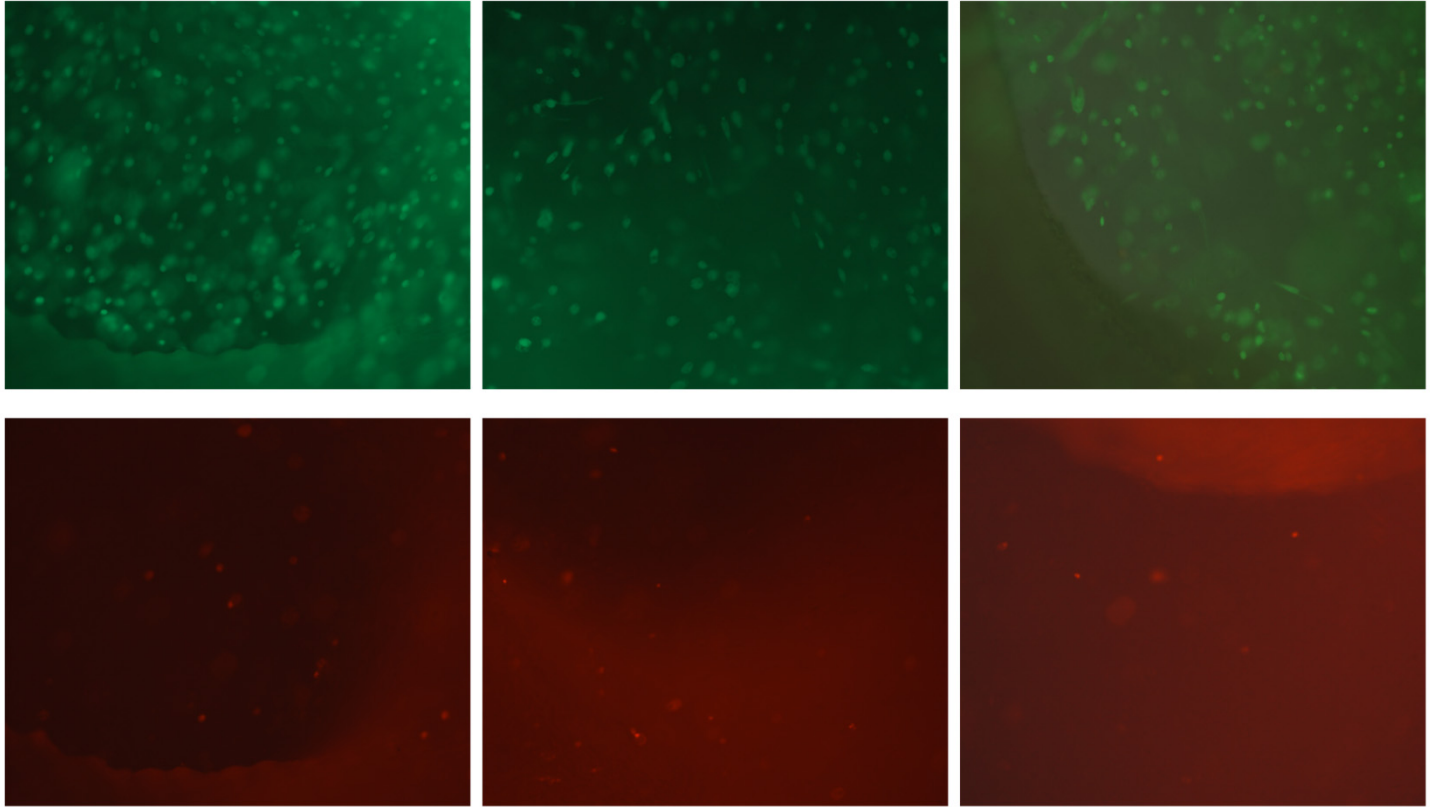
Supplementary Figure 1: Custom circuit diagram (top) to generate sine wave signal from Teensy 4.0 microcontroller. PWM signal (square wave) coming from the microcontroller is filtered by the demodulating circuit to get a sine wave output that will be used as an input signal for the LIV.



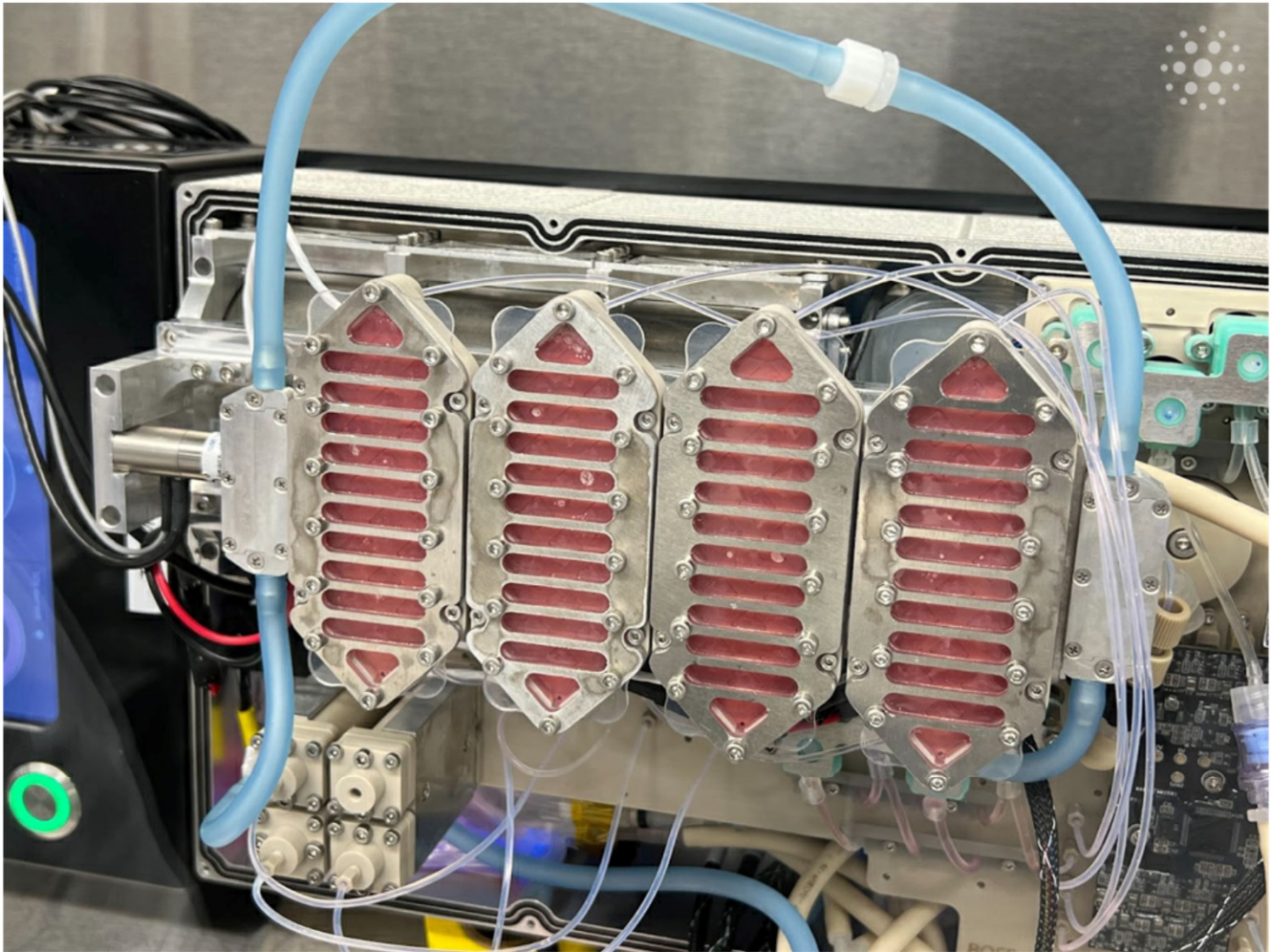
Supplementary Figure 2: CubeLab (top and bottom-left) facility that will house the vibrational bioreactor and the biological samples. The PAUL (top and bottom-right) facility designed to house and provide mechanical, electrical, and network interface from the outside



Supplementary Figure 3: Experiment schematic of the LIV regimen from signal generation to data acquisition and visualization in labVIEW



Supplementary Figure 4: Additional Live/Dead assay images across various scaffold locations and samples, demonstrating a predominance of live cells over dead ones. These images further validate the biocompatibility and cell-supportive nature of the scaffold materials used in the study.



Supplementary Figure 5: CubeWells within the CubeLab module, showcasing the custom-designed well plates developed for holding hydrogel-encapsulated scaffolds. The design incorporates a secure lid system to prevent sample spillage during spaceflight, with scaffolds protected by a biocompatible PDMS layer, further sealed by a metal lid for added safety and integrity during experiments in space.