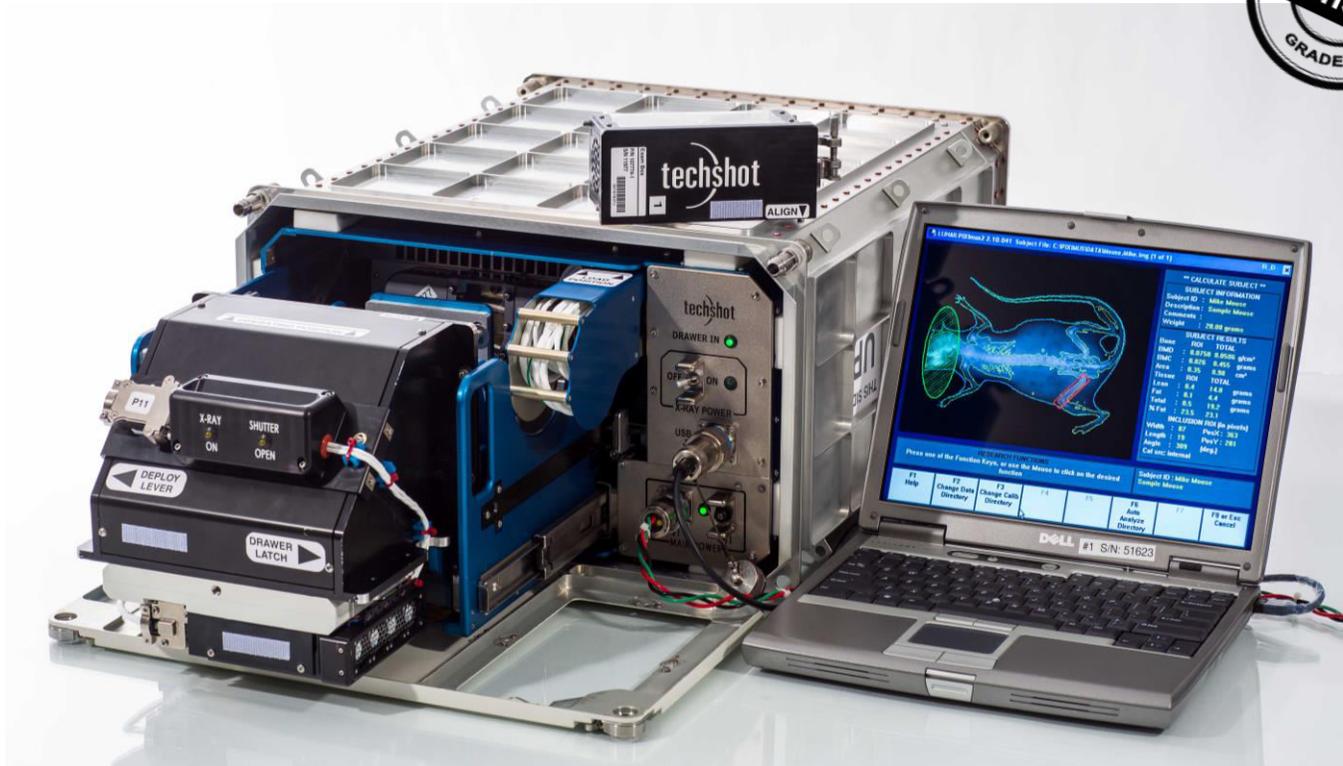# Techshot Bone Densitometer
X-ray System for Measuring Bone Density

Quantitative measures of bone and muscle loss in mice during orbital space flight are needed for the development of countermeasures for crew members by NASA and for bone-loss syndromes on Earth by commercial entities. Planned studies, academic and commercial, require on-orbit analytical methods – including bone and muscle densitometry.

The "gold standard" of bone density measurement is Dual Energy X-ray Absorptiometry (DEXA) in which the absorption of X-rays is quantified at two key X-ray energies (35kV, 80kV). This method is used to calculate absolute bone density, in g/cm^2, in humans, mice and other laboratory animals. The Techshot Bone Densitometer (BD) measures X-ray absorption by bone and soft tissue and reports bone density in mice. It can also determine soft-tissue density, lean/fat ratio and total animal mass (*i.e.,weighing mice in space*).

Techshot Bone Densitometer

The Bone Densitometer provides bone mineral and body composition results from total body imaging in less than 5 minutes. Fast imaging allows faster access to important data and is safer on animals.

The device allows automated, accurate and precise measurement of bone and tissue for small animals 10-50 g. It uses a lower X-ray energy than that used for peripheral densitometry in humans in order to achieve contrast in the extremely low density bone. Excellent precision of BMD and %Fat makes it ideal for longitudinal studies.

With an image area of 80 mm x 65 mm, the Bone Densitometer can image the entire body of most mice. The standard total body result focuses on the sub-cranial region improving sensitivity by excluding the inactive bone and tissue of the cranium. There are manual regions of interest (ROIs) for selected areas within the total body image, such as spine and femur.

The Bone Densitometer is driven by single-key commands and a graphical user interface. A single function key performs an automated image acquisition and analysis. Subject results are printed in a clear, easy-to-understand format, and data is stored electronically in a globally accepted format.

Operational Scenario

- Perform quality control procedure prior to each scanning session.

- Remove Exam Box from stowage and insert into MSG, via 6" glove port.

- Transport mouse to MSG via Mouse Transfer Box from rodent habitat.

- Place mouse into Exam Box, close lid.

- Remove Exam Box from MSG via glove port, transport to BD

- Perform DEXA scan using COTS software running on ELC.
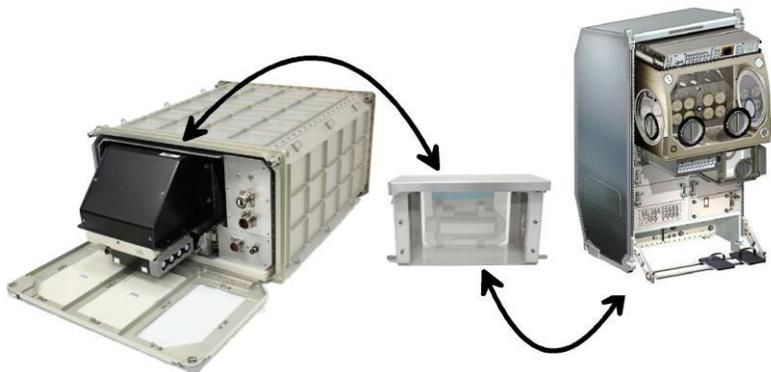
- Scan data is saved to ELC hard drive and down-linked.

- Remove Exam Box from BD image platform, transfer back to MSG.

- In MSG, open Exam Box, remove mouse.

- Clean Exam Box, load with another specimen or return it to stowage.