JOURNAL OF SYNCHROTRON RADIATION

Volume 22 (2015)

Supporting information for article:

Design of a mouse restraint for synchrotron-based computed tomography imaging

Kenneth B. Gagnon, Sally Caine, Nazanin Samadi, Mercedes Martinson, Melanie van der Loop, Jane Alcorn, L. Dean Chapman, George Belev and Helen Nichol

S1. Computer aided design (CAD)

A free 3D CAD software download, Google SketchUp 2014, was used to draft the various components of the restraint device. The overall dimensions of the restraint device (8.0 L x 8.5 W x 22.0 H cm) were constrained by the size and maneuverability of the Biomedical Imaging and Therapy bending magnet (BMIT-BM) beamline imaging stage at the Canadian Light Source (Saskatoon, SK, Canada). In addition, the restraint device was divided into several components based on the build volume (24.6 L x 15.2 W x 15.5 H cm) of the 3D printer. The final designs were saved and exported into a digital file format (.stl) suitable for the MakerBot Replicator 2X Desktop 3D printer. All SketchUp files are available for download from the Gene Expression Mapping using Synchrotron light (GEMS) website (http://www.medicine.usask.ca/com-research/health-research-groups/gems-phase-iii/index.php).

S2. 3D rapid prototyping

The MakerBot Replicator 2X Desktop 3D printer creates objects by extruding a non-toxic biodegradable polylactic acid (PLA), heated to 230°C, through a computer-controlled nozzle that can move in both the x- and y-axis onto an anodized aluminium build platform (heated to 110°C) that can move in the z-axis. The 3D object created by the CAD software is sliced into hundreds of thin horizontal layers which the printer builds by additive manufacturing. This fused-filament fabrication technology extrudes PLA in 100 μm layers onto the build platform and successive layers of material are added until the object is completed. Three millimeter holes were drilled on either side of the restraint upright for a flexible silicone tubing to hold the animal stationary. The PLA surface is unaffected by disinfectants and can be cleaned between imaging events.