1.0 PURPOSE:

The eXplore Locus MicroCT scanner is used in conjunction with the RS console to scan, acquire, and reconstruct specimens for in-depth three-dimensional analysis. A series of two-dimensional projections captured during the acquisition process are reconstructed into a three-dimensional volume at the RS console using GE eXplore software.

2.0 SCOPE:

The methods described outline the sequence of a typical scanning procedure that is only applicable for scans performed by the RS scanner. The laboratory area where the scans are performed will vary between a Containment Level 1 or Containment Level 2 laboratory depending on the specimen being scanned. Analysis methods and techniques on full-resolution reconstructed regions of interest will not be outlined.

3.0 RESPONSIBILITIES:

3.1 Users that have had training from qualified individuals operate the scanner and are responsible for performing image acquisition, improvement and reconstruction.

3.2 Trained personnel execute procedures related to animal preparation and decontamination of the area if necessary.

4.0 DEFINITIONS:

Acquisition – The process of acquiring CT images. i.e. scanning.

ADU – Arbitrary Digital Units

Center of Rotation – The vertical axis of the reconstructed three-dimensional volume.

Operator – A trained individual with working knowledge of the GE eXplore software.

Reconstruction – The process of converting many single projections taken during the same scan into a single three-dimensional volume.

RS console – The computer located beside the RS scanner that acquires and reconstructs the scanned images. The RS scanner is directly connected to this console.

RS scanner – Locus MicroCT Scanner

ROI – Region of Interest

Specimen – The object that is being imaged.

5.0 REFERENCES:

GE Healthcare eXplore Locus User Manual

6.0 EQUIPMENT:

eXplore Locus MicroCT Scanner
RS Console

7.0 PROCEDURES:

All references to programs related to GE software can be found under the following directory: Start → Program Files → GE Medical Systems → eXplore utilities.

7.0.1 PRELIMINARY PROCEDURE

1. Know what protocol will be used for scanning the specimen.
2. Refer to the SOP that complies with the specimen being scanned for preparation and handling procedures.

DOC #	Object
100	Living rat/mouse
110	Non-living rat/mouse
120	Rat/mouse ligament
130	Phantom

7.0.2 SYSTEM WARMUP

A green light at the side of the CT scanner (next to the power cables) indicates that the scanner is ON and a system warmup will not necessary.

1. If the CT scanner is OFF, turn the key located on the machine clockwise. If the key Is not in the machine, contact a facilitator for the key.
2. Log onto the RS console.
3. A warmup process should automatically start. This process will take about 3 minutes. If the warmup process does not start:
   a. Run **Warm-up App**
   b. Click **Idle**.
   c. Wait for a popup window to appear that says “X-rays are now warmed up” on **Scan Control** to continue with scanning.

7.0.3 CHANGING THE DATA DIRECTORY

1. Goto **Start → Program Files → GE Medical Systems** and run **GEMS eXplore System Controls**.
2. Type in the new working directory. The drive can only be switched between D: and R:.

7.0.1 SCANNING

1. Run **eXplore Scan Utility**.
2. Choose **Scan New Subject** or **Add to Existing Subject**. Record the scan number that is shown, the number becomes the directory whereby the acquired images will be located.
3. Enter a descriptive name for the scan and click **Accept**.

4. Select the scanning protocol.
5. Click **Fluoro** to view the position of the specimen. it may take a few minutes.
6. Move the acquired bed view to centralize the ROI.
7. Close the window to proceed.
8. Click **Start Scan** to begin scanning. This may take 10-15 minutes depending on the number of frames being acquired, and other protocol parameters.

7.0.2 RECONSTRUCTION

After images have been acquired from the RS scanner, the array of two-dimensional projections needs to be combined into a three-dimensional volume. The following processes are done with the eXplore Reconstruction Utility.

A. LOAD AND CORRECT SCAN IMAGES*.*

1. Run **eXplore Reconstruction Utility**.
2. Click **Load Scan** to load the log file pertaining to your scan. This log file will be found under the directory that corresponds to the scan number.
   NOTE: All log files are named evolver.log by default.
3. Click **Correct**.

C. OBTAIN CALIBRATION VALUES

1. Click **Advanced**.
2. Select **Reconstruction**.
3. Select **32-bit slice**.
4. Click **Recon**. eXplore MicroView is launched automatically once a reconstruction is complete.
5. Press ‘7’ and ‘8’ to select a rectangular region of air in the volume. Press ‘M’ to display the average ADU value of the selected region. Record this value.
6. Repeat step 5 to obtain the ADU values for water and bone.
7. Click **Advanced**.
8. Select **Reconstruction**.
9. Enter the recorded ADU values as the calibration values.
10. Click **OK**.

B. ADJUST THE CENTER OF ROTATION

1. Check the **Mini Volume** checkbox.
2. Click **Thumbnail**.
3. Get a 2D slice.
4. Click **Recon**. This will give you a thumbnail view of a 2D slice.
5. Notice the direction of the wisps. If the wisps are to the left, the Center of Rotation value will need to be increased. If the wisps are to the right, the Center of Rotation value will need to be decreased.
6. Click **Advanced**.
7. Select **Reconstruction**.
8. Change the Center of Rotation value. Click **OK**.
9. Repeat steps 4-8 until the Center of Rotation is well adjusted.

D. RECONSTRUCT A REGION OF INTEREST

1. Check the **Mini Volume** checkbox.
2. Click **Thumbnail**.
2. Click **Recon**. eXplore MicroView is launched automatically once a reconstruction is complete.
3. Press 'Ctrl+7' to designate the intersection of the three planes as the first corner.
4. Move the three planes to define the second corner.
5. Press 'Ctrl+8' to designate the intersection of the three planes as the second corner.
6. Press 'S' to save the region coordinates.
7. Press **Load Crop** to load the saved coordinates.
8. Uncheck the **Mini-Volume** checkbox.
9. Press **Full Volume**. Click **Recon**.

E. QUEUING RECONSTRUCTION JOBS

It is sometimes useful to queue reconstruction jobs to save time for an operator.

1. Clicking **Append** moves a reconstruction job into the job queue. More jobs can be added by clicking **Append**.
2. Click **Job Manager** to view the job queue.

7.0.3 SYSTEM SHUTDOWN

This procedure is rarely performed on the RS scanner. Only on rare situations, such as a scheduled power outage, should this procedure be performed.

1. Shutdown the RS console.
2. Turn the key in the RS scanner counter-clockwise. You should now be able to take the key out. The green light by the power cables will be off.

8.0 REPORTING AND DOCUMENTATION:

None.

9.0 REVIEWS AND REVISIONS:

This procedure shall be reviewed for compliance and effectiveness and revised as necessary.