**SCANNING SKULLS WITH VIVA-CT SCANNER**

*Scanning with the Scanco Medical ‘VivaCT 40’ Small Animal Preclinical Microtomography Scanner, using the ‘μCT V6.1’ scanning program.*

**I. SCAN SAMPLES**

** A. SET UP SAMPLES**

1. If samples are in ethanol, then remove them and allow them to air-dry on a paper towel.

***NOTE****: Remove only the heads that will immediately be used in the scanner. Four heads for mice, two for rats.*

2. Label the lid of the vials numerically from left-to-right, starting with *‘1’*. Never mix up the heads.

3. Check to make sure that the heads sit level. If they are not level, use scissors to cut off extra skin or muscle at the base of the skull until they do.

4. Enter the Sample Database (.xlsx) file from the Work Computer. ***NOTE:*** *Login: user or useradmin; pass: !user01! or !user02!*

5. Add the *Vial ID* from the sample container to the database. This is whatever specimen number you are using.

6. Add a *Scan-Name* to describe the sample to the database. This is the unique name you will use to find the sample in the scanning computer.

|  |  |
| --- | --- |
| Vial ID | Scan Name |
| 00077E9CBE | LP\_Chi\_Rats\_00077E9CBE |

 **B. INPUT SAMPLES**

1. Go to the Scanner Computer, and open the **SAMPLES**  window.

***NOTE:*** *There are three windows always open on the Desktop: the MAIN MENU , the SESSION MANAGER , and the LOG . windows.*

*Do not EVER close these windows, because you will need to restart the entire scanner to get them back.*

2. Add the previously chosen *Scan Name* into the dialog box, and click Save.

3. This will produce a *Sample Number*. Add this to the Sample Database.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Sample# | *Measure#* | *ScanDate* | *DICOM* | *MPIstaff* | *RAWtape* | *DelDCM* | *IMAtape* |
| *7674* |  |  |  |  |  |  |  |

4. Press New to continue to the next air-drying sample, and repeat the previous steps.

5. Add the ‘*Sample Number’* to the lid of the vials, and wait for the samples to finish air-drying (*>20 minutes*). **WAIT**

 **C. ADD SAMPLES INTO SCANNER**

1. Place the PVC sample bed (with foam layer) into the metal CT sample tray.

2. Place samples on the sample bed, nose-first, facing the forward direction of the bed.

***NOTE****: Make sure to line up multiple heads on the sample bed numerical order, such that the nose of head 1 is the first to enter the CT.*

3. Affix the heads into the sample bed with tape.

***NOTE****: Use a small strip of paper towel between the tape adhesive and the sample’s hair to prevent it from sticking. Make sure to push down so that the sample/tape does not shift while in the scanner.*

4. Fit the sample tray into the CT scanner, and slide it until the tray-pin fits into the third slot.

5. Close the door all the way.

 **D. SET UP THE BATCH SCAN**

1. Go to the Scanner Computer, and open the **TOMOGRAPHY**  window.

2. Enter the first Sample Number into the dialog box, and click Save.

3. Enter the appropriate Control File – for **bird** heads: *18. ACS Standard 20*

for **mouse** heads: *18. ACS Standard 20*

for **rat** heads: *19. ACS Standard 30*

4. Click Scout-View and set *Start Position: 22.7* and *End Position: 150*

5. Click Scout-View. **WAIT**

6. Cycle between Scout View colors by clicking on the color spectrum. Black bones against a white background is usually the best.

7. Click Reference-Line to set the area to be scanned.

A. Hover the cursor to the front of the skull (and add +1mm additional distance as buffer).

B. Press and hold the Shift Key.

C. Hover the cursor to the back of the skull (and add +1mm additional distance as buffer).

D. Click the RMB to set the start and end of the scan area. You may now move the mouse freely.

8. Click Batch Measurement.

9. This will produce a *Measurement Number*. Add this number to the Sample Database.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Sample#* | Measure# | *ScanDate* | *DICOM* | *MPIstaff* | *RAWtape* | *DelDCM* | *IMAtape* |
| *7674* | 11431 |  |  |  |  |  |  |

10. Click TOMOGRAPHY > Other (do not close the *Scout-View* window) to repeat the *Reference Line* for the other samples.

11. Click Start Batch Scans. (It should take *~2.5 hrs* for 2 rat heads.)

12. While batch is scanning, set up the next sample set into the database and air-dry them. **WAIT**

13. Add the current *Scan Date* to the Sample Database.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Sample#* | *Measure#* | ScanDate | *DICOM* | *MPIstaff* | *RAWtape* | *DelDCM* | *IMAtape* |
| *7674* | *11431* | 22.02.16 |  |  |  |  |  |

14. It is okay to leave a scan running overnight. The next person will put the samples in the vials you left in the morning. **STOP**

**II. EXPORT & SAVE FILES**

***NOTE:*** *The following steps do not need to be done every time, only after one or two sessions of scanning.*

 **A. CONVERT TO DICOM**

1. Open the **EVALUATION**  window.

2. Search for the *Sample #* of the sample you will convert, then select Tasks > Evaluation 3D.

***NOTE****: If you get an error, and some of the scanned images appear blank, then you have entered a Sample# that is still being scanned!*

3. Use the *Selection Square* to highlight the entire scanned sample. Select the edges of the sample so the square is as small as possible.

RMB – Drag Square; CMB – Expand Square.

4. Adjust the boundaries, adding or substracting the X- and Y-axis distances to add buffer to the DICOM exports:

***AXIS VOI Dimension***

*X-axis* -50 +100

*Y-axis* -50 +100

5. **IMPORTANT** Click Select and choose *14. Convert to DICOM*. Click OK. ***NOTE****: Absolutely do not forget to do this.*

6. Click Start Evaluation.

7. Click Exit.

8. Put an ‘X’ in the *DICOM* cell in the Sample Database.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Sample#* | *Measure#* | *ScanDate* | DICOM | *MPIstaff* | *RAWtape* | *DelDCM* | *IMAtape* |
| *7674* | *11431* | *22.02.16* | X |  |  |  |  |

 **B. SAVE DICOM TO *MPISTAFF***

1. **IMPORTANT** Make sure that the *DICOM Evaluation* is completed in the **LOG**  window.

***NOTE****: Always check this, otherwise you may find that you’ve only saved a portion of the DICOMs because you transferred in the middle of the Evaluation process.*

2. Go to the Work Computer and open the MicroCT FTP application.

3. Select FTP Connection and Connect.

***NOTE:*** *Profile MicroCT; host 72.16.2.250; User microct; Pass \*\*\*\*\*\*\**

4. Navigate to *DISK2:[MICROCT.DATA]* and find the folder *Sample #* with subfolder *Measurement #* of the sample to save.

5. Select All, then deselect the two IMA files at the top of the list. (ie. *C001439.ISQ, C001439.RSQ, and C001439.SCV*)

6. Click Download Selected Files and navigate to your scan folder in */mpistaff/User.*

7. Click Make New Folder and name it the same as the *Measurement #* and click OK.

8. Put and ‘X’ in the *MPIstaff* cell in the Sample Database, and repeat the previous steps for the next sample.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Sample#* | *Measure#* | *ScanDate* | *DICOM* | MPIstaff | *RAWtape* | *DelDCM* | *IMAtape* |
| *7674* | *11431* | *22.02.16* | *X* | X |  |  |  |

 **C. BACKUP RAW**

***NOTE1****:The RAW backup must be done very frequently, after about 8 scans, because they take up the most space.*

1. Open the **BACKUP PROGRAM**  window.

2. Select the scans that will be saved to the tape. Use CTRL to select multiple scans.

3. Click Raw, Move To, and Tape ◆***RAW***◆***MOVE TO***  ** ***TAPE***

◇ *Ima* ◇ *Copy To*

4. Make sure that the correct Raw-Tape is loaded, and click Start.

5. Add the *Tape-RAW Number* to the Sample Database.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Sample#* | *Measure#* | *ScanDate* | *DICOM* | *MPIstaff* | RAWtape | *DelDCM* | *IMAtape* |
| *7674* | *11431* | *22.02.16* | *X* | *X* | 025 |  |  |

 **D. DELETE DICOM**

1. Enter the **SESSION MANAGER ** window.

***NOTE:*** *Do not EVER close the SESSION MANAGER window, because it will close all the windows on the screen and the only way to get them back is to restart the scanner.*

2. Select Views > MicroCT:Data, select the *Sample #* and then the *Measure #*, and then highlight all files ending in *.DCM*.

3. Select Command > Delete [◦◦◦], however click on the [◦◦◦] icon to the right of the “Delete”.

4. Deselect the *Request Confirmation* option and press OK.

5. Put and ‘X’ in the *Delete DICOM* cell in the Sample Database.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Sample#* | *Measure#* | *ScanDate* | *DICOM* | *MPIstaff* | *RAWtape* | DelDCM | *IMAtape* |
| *7674* | *11431* | *22.02.16* | *X* | *X* | *025* | X |  |

 **E. BACKUP IMA**

1. Open the **BACKUP PROGRAM**  window.

***NOTE1****: The IMA backup is the very last thing you must do. If you backup the IMA prior to deleting the DICOM files, then you will lose access to the DICOM files entirely.* ***NOTE2****: Unlike the RAW files, the IMA backup doesn’t need to be done as frequently. It’s safe to do it every 10-20 files.*

2. Click Dismount and wait for the tape to eject.

3. Take out the Raw-Tape and insert the Image-Tape.

4. Click Mount.

5. Select the scans that will be saved to the tape. Use CTRL to select multiple scans.

6. Click Image, Move To, and Tape ◇ *Raw* ◆***MOVE TO***  ** ***TAPE***

◆***IMA***◇ *Copy To*

7. Make sure that the correct Image-Tape is loaded, and click Start.

8. Add the *Tape-IMA Number* to the Sample Database, then dismount the Image-Tape and reinsert the Raw-Tape.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Sample#* | *Measure#* | *ScanDate* | *DICOM* | *MPIstaff* | *RAWtape* | *DelDCM* | IMAtape |
| *7674* | *11431* | *22.02.16* | *X* | *X* | *025* | *X* | 060 |

9. Make a mark in the Sample Database to signify that the processing of the sample files is complete. For example, highlight the cells so that only the highlighted rows can be used for landmarking or other evaluation.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Sample#* | *Measure#* | *ScanDate* | *DICOM* | *MPIstaff* | *RAWtape* | *DelDCM* | *IMAtape* |
| *7674* | *11431* | *22.02.16* | *X* | *X* | *025* | *X* | *060* |

**III. TAPE MAINTAINANCE**

 **A. INITIALIZE A NEW TAPE**

*This is what needs to be done when the current tape is filled, and a new tape needs to be set up.*

1. Go to the Scanner Computer, and open the **BACKUP PROGRAM**  window.

2. Click Dismount to remove the Current (Full) Tape.

3. Insert the New Tape (labeled with the new name) and click Initialize.

4. A prompt will ask for confirmation of the initialization, and ask for a tape name.

5. Type the new tape name into the dialog box.

6. Click Mount.

7. At this point, the tape is already set up and ready to be recorded on to.

 **B. WEEKLY DATABASE BACKUP**

*Once a week, the scanner will prompt for a weekly backup to be made.*

1. Randomly, an error message will appear, saying that a weekly backup needs to be made. This can be ignored if you really need to, but try not to.

2. Click OK.

3. Open the **BACKUP PROGRAM**  window.

4. Click Dismount and press the Eject button to remove the Current Tape.

5. Insert the WBU4 Tape and click Mount.

6. In the Weekly Database Backup box, select Interactive: ◆ *INTERACTIVE*

◇ *Batch*

7. Click DB Backup to Tape., then click Yes when the prompt appears asking if the “Special Backup Tape” is inserted.

8. Check that the 3D-μCT Data Management window says that a full backup has been performed.

9. Click Dismount, and press the Eject button. Insert the Previous Tape and click Mount.

 **C. RECALL IMA FILES**

*If you transferred all your Image Files to IMA-Tape, you have to recall your data in Upper left window if you like to delete more DICOMs of samples which you transferred to mpistaff folder before.*

1. Enter the **SESSION MANAGER ** window.

2. Select View > MicroCT Data.

3. Select your Sample ID from the middle column.

4. Select your Measurement ID from the middle column.

5. The window will tell you which Image Tape your sample is saved in.

6. From here, you may dismount the current tape, mount the specified tape, and then save the recalled IMA file to Disk.

**VIVA-CT SCANNER QUICK-SUMMARY**

**I. SCAN SAMPLES**

A. SET UP

>> *Vial ID #* to database

>> *Scan-Name* to database

B. SAMPLES

 SAMPLES

*Scan-Name* >> Save

>> *Sample #* to database

New and repeat.

C. SCANNER

D. BATCH SCAN

 TOMOGRAPHY

*Sample Number* >> Save

Control File >> *18. ACS Standard 20* (bird)

*18. ACS Standard 20* (mouse)

*19. ACS Standard 30* (rat)

Scout-View >> *Start 22.7*, *End 150*

Scout-View

Reference-Line > Front (+1mm) >> Shift Key

Back (+1mm) >> RMB

Batch Measurement

>> *Measure #* to database

TOMOGRAPHY > Other

>> Start Batch Scans

>> *Scan Date* to database

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**SESSION MANAGER:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| Samples | Tomogrphy | Evaluation | μCT Ray | Backup | Exit |

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**II. EXPORT & SAVE FILES**

A. CONVERT TO DICOM

 EVALUATION

*Sample#* >> (Alt+3) Tasks > Evaluation 3D

*Selection Square* >> RMB/CMB

*AXIS VOI Dimension*

*X-axis* -50 +100

*Y-axis* -50 +100

Select >> *14. Convert to DICOM* >> OK

>> Start Evaluation >>Exit/New (Ctrl+O)

>> *DICOM* to database

B. SAVE DICOM TO *MPISTAFF*

 LOG >> Check if DICOM is complete.

MicroCT FTP >> FTP Connection >> Connect

*/DISK2:[MICROCT.DATA]*/*Sample#*/*Measure#*

Select All >> deselect IMA

Download Selected Files

*/mpistaff/* >> Make New Folder > “*Measure#*” >> OK

>> *MPIstaff* to database

D. BACKUP RAW

 BACKUP PROGRAM >> *Sample #*

◆ *RAW* >> ◆ *MOVE TO* >> * TAPE*

>> Start

>> *RAWtape* to database

C. DELETE DICOM

 SESSION MANAGER >> Views > MicroCT:Data

*Sample #* >> *Measure #* >> *.DCM*

Command > Delete [◦◦◦]

Deselect *Request Confirmation* >> OK

>> *DelDCM* to database

E. BACKUP IMA

BACKUP PROGRAM

Dismount >> Insert Tape >> Mount

*Sample#*

◆ *IMAGE* >> ◆ *MOVE TO* >> * TAPE*

>> Start

>> *IMAtape* to database

Dismount >> Insert Tape >> Mount