

vivaCT 40 Quality Control (QC): Density (QC1) and Structural (QC2) Calibrations

The density and structural quality control scans are performed as checks of the system. The operator must verify that the density and geometry values are within an acceptable range. If the values are not within range, the operator must contact Scanco Medical and will be required to perform repeated calibration scans and update the system to bring it back into range.

Note: Calibration phantoms are specific to the scanner. Consistent sample positioning is critical.

Locate the calibration phantom for the VivaCT 40 system. The phantom is stored in a plastic sample holder, usually on top of the scanner.



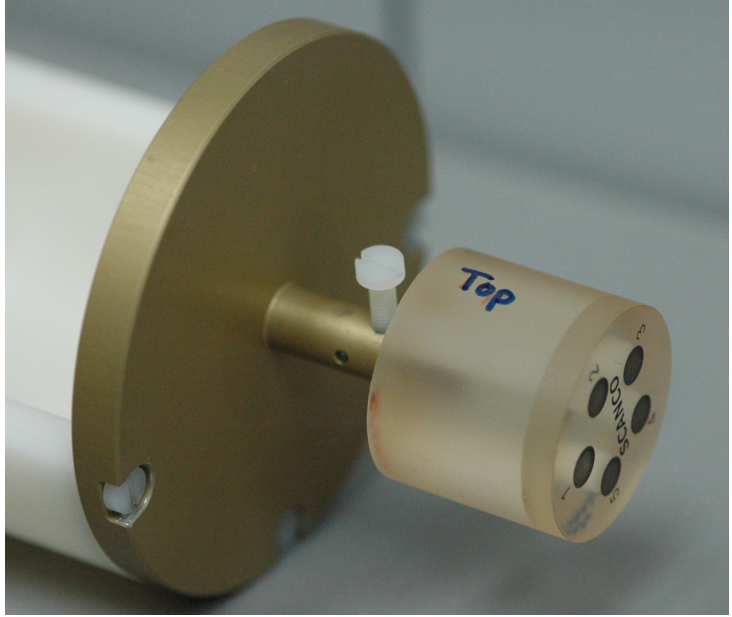
Remove the calibration phantom from the holder. Notice that the phantom is labeled and must be positioned in the scanner in a particular orientation (this is so that the pre-made gobj files for the analysis are properly aligned).

Note: The metal spindle of the phantom must be fixed to the epoxy to ensure consistent positioning. If the spindle becomes loose, it must be re-glued together and the pre-made gobj files must be updated.

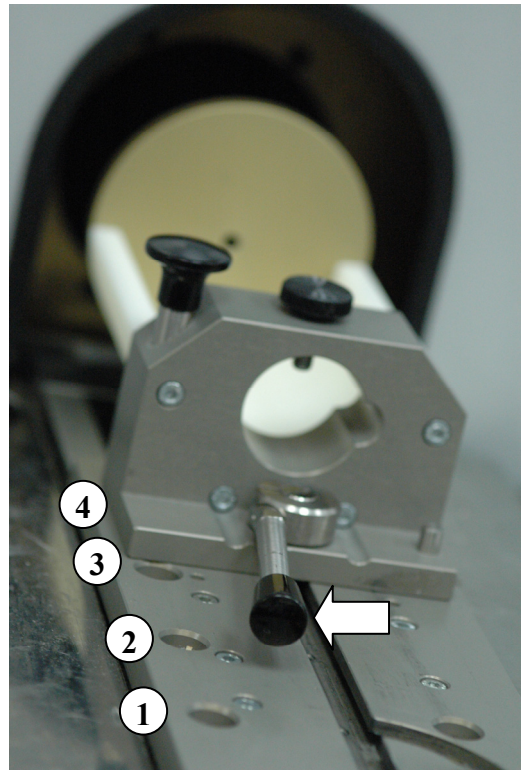


The phantom must be attached to the sample holder on the small animal bed. Ensure that the phantom is mounted correctly and cannot rotate. The “top” label should be facing up.

Here is a close-up view of the phantom attachment point:



Insert the animal bed on the track of the scanner and slide it to the position closest to the bore (#4). Lock the lever (see arrow) as shown. When locked the lever should be roughly parallel to the track, it should not be by the slot holes.



Start a QC Scan from SC5019

Interactive QC Scans:

Start the scanning program.
For QC1, select sample 1, for QC2 select sample 2.
Select QC control file.
Start scan (no scout view is performed).

Weekly QC Scans from Script (runs QC1 for 45 (discard for warm-up), 45, 55, and 70 kV and QC2):

```
$ ur
$ cd calib
$ @QC_VIVACT.COM
```

QC Scans from Script:

```
$ ur
$ cd calib
Run desired calibration:
$ @QC1_VIVACT_45KV.COM
$ @QC1_VIVACT_55KV.COM
$ @QC1_VIVACT_70KV.COM
$ @QC2_VIVACT.COM
```

QC Scans from the Command Line:

```
$ @um:uct_batch_measurement 1 1 2 106 102.0 n
$ @um:uct_batch_measurement 1 1 61 106 102.0 n
$ @um:uct_batch_measurement 1 2 4 150 93.0 n
```

In general: `$ @um:uct_batch_measurement P1 P2 P3 P4 P5 P6`

where:

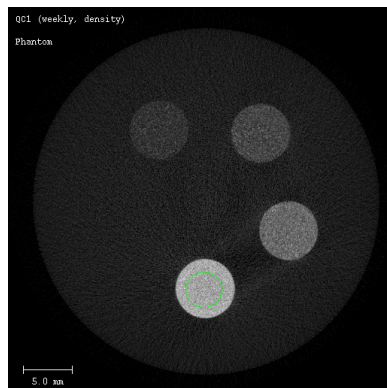
- P1: Operator
- P2: Sample
- P3: Controlfile
- P4: Number of slices*
- P5: Position of 1st slice in mm with decimal point*
- P6: Shutdown x-ray tube

*get values for P4 and P5 from the controlfile

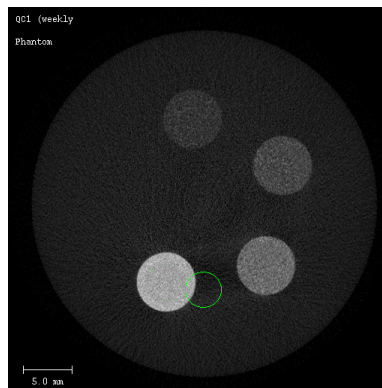
Analyzing a QC Scan (from any workstation)

When the QC1 and/or QC2 scans have reconstructed, they must be analyzed. Start the evaluation program and load the QC scan.

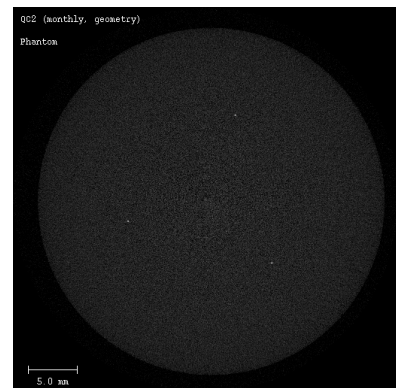
Since the phantom is consistently positioned, standard contour files (gobj files located in the uctd directory) are used for the QC1 analyses; no contours are required for the QC2 analysis. For the QC1 analysis, the gobj for the brightest hydroxyapatite rod is automatically loaded. The contour should be well centered on the rod, if it is not, reposition and rescan the calibration phantom or update the gobj files if the phantom has changed (e.g., the spindle came loose and was re-attached).



QC1 (aligned)

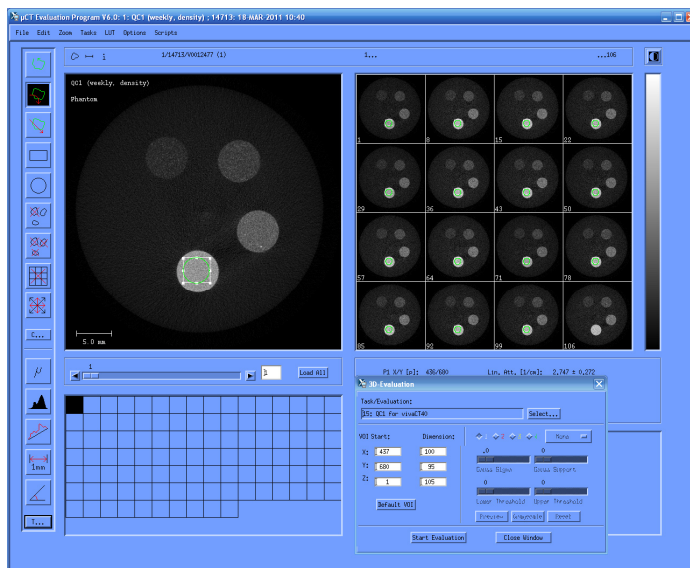


QC1 (not aligned)



QC2

Top menu → Tasks → Evaluation 3D... (or use the T... button)



The required evaluation script is automatically chosen.

It is not necessary to adjust the white box on the screen that's usually used to cut out an aim.

Press Start Evaluation.

Check the QC Results

When the evaluation is complete, you must check the results.

```
$ uct_list P1
  where:    P1:  Measurement Number
```

For QC1 evaluations, check and record the value of Mean 5. Acceptable range: 764-806 mg HA/ccm.

For QC2 evaluations, check and record the value of BV. Watch for consistency in values $\pm 2\%$.

Results are tabulated into text files found in:

DISK3: [MICROCT.PROJECTS.CALIBRATION]

Use to Check Density Quality Control:

RESULTS_QC1_VIVACT.TXT

Use to Check Structural Quality Control:

RESULTS_QC2_CL3_VIVACT.TXT

Use to Check for Noise and Detector Problems (e.g., Ring Artifacts):

RESULTS_QC2_VIVACT.TXT

When the evaluation is complete, check the results.

```
$ uct_list P1
  where:    P1:  Measurement Number
```

For QC1 evaluations, check and record the value of Mean 5. Acceptable range: 764-806 mg HA/ccm.

For QC2 evaluations, check and record the value of BV. Watch for consistency in values.

Results are tabulated into text files found in:

DISK3: [MICROCT.PROJECTS.CALIBRATION]

Use to Check Density Quality Control:

RESULTS_QC1_UCT35.TXT

RESULTS_QC1_VIVACT.TXT

Use to Check Structural Quality Control:

RESULTS_QC2_CL3_UCT35.TXT

RESULTS_QC2_CL3_VIVACT.TXT

Use to Check for Noise and Detector Problems (e.g., Ring Artifacts):

RESULTS_QC2_UCT35.TXT

RESULTS_QC2_VIVACT.TXT

Example: Extracting Mean 5 value for QC1 analysis

```
$ uct_list 8366
Processing measurement 8366
Name : C0007184
Sample-Name : QC1 (weekly, density)
Sample-Nr : 1
Meas-Nr : 8366
Meas-Date : 09-OCT-2008 09:51
Oper Meas, Eval : Wei, Wei
Date of Birth :
Sample-Remarks :
Meas-Remarks :
Site : Phantom
Meas-NrofSlices : 106
Scanner ID : 5019
RAW Location : DK0: [MICROCT.DATA.00000001.00008366]
IMA Location : DK0: [MICROCT.DATA.00000001.00008366]
Segmentation: -----
Sigma : -
Support : -
Threshold : -
in Units : -
Direct: -----
TV : -
BV : -
BV/TV : -
Conn.Dens.: -
SMI : -
Tb.N* : -
Tb.Th* : -
Tb.Sp* : -
Tb.1/N.SD*: -
Tb.Th.SD* : -
Tb.Sp.SD* : -
Mean1 ±SD : -15.4255 +- 54.9221 [mg HA/ccm]
Mean2 ±SD : 99.6166 +- 75.4005 [mg HA/ccm]
Mean3 ±SD : 208.5215 +- 87.9881 [mg HA/ccm]
Mean4 ±SD : 413.4305 +- 99.6990 [mg HA/ccm]
Mean5 ±SD : 790.8713 +- 107.5897 [mg HA/ccm]
TRI (Plate Model): -----
TV : -
BV : -
BS : -
BV/TV : -
BS/BV : -
Tb.Th : -
Tb.Sp : -
Tb.N : -
Anisotropy: -----
|H1| : - H1x: - H1y: - H1z: -
|H2| : - H2x: - H2y: - H2z: -
|H3| : - H3x: - H3y: - H3z: -
DA : -
Dim X : 0
Dim Y : 0
Dim Z : 0
Pos X : 1
Pos Y : 1
Pos Z : 1
El-Siz X : -
El-Siz Y : -
El-Siz Z : -
```

Example: Extracting BV value for QC2 analysis

```
$ uct_list 8368
Processing measurement 8368
Name : C0007185
Sample-Name : QC2 (monthly, geometry)
Sample-Nr : 2
Meas-Nr : 8368
Meas-Date : 09-OCT-2008 09:59
Oper Meas, Eval : Wei,
Date of Birth :
Sample-Remarks :
Meas-Remarks :
Site : Phantom
Meas-NrofSlices : 150
Scanner ID : 5019
RAW Location : DK0: [MICROCT.DATA.00000002.00008368]
IMA Location : DK0: [MICROCT.DATA.00000002.00008368]
Segmentation: -----
Sigma : 0.00
Support : 0
Threshold : 230
in Units : 6
Direct: -----
TV : 4315.3091
BV : 0.0919
BV/TV : 0.0000
Conn.Dens.: -
SMI : -
Tb.N* : -
Tb.Th* : -
Tb.Sp* : -
Tb.1/N.SD*: -
Tb.Th.SD* : -
Tb.Sp.SD* : -
Mean1 ±SD : - +- - [mg HA/ccm]
Mean2 ±SD : - +- - [mg HA/ccm]
Mean3 ±SD : - +- - [mg HA/ccm]
Mean4 ±SD : - +- - [mg HA/ccm]
Mean5 ±SD : - +- - [mg HA/ccm]
TRI (Plate Model): -----
TV : -
BV : -
BS : -
BV/TV : -
BS/BV : -
Tb.Th : -
Tb.Sp : -
Tb.N : -
Anisotropy: -----
|H1| : - H1x: - H1y: - H1z: -
|H2| : - H2x: - H2y: - H2z: -
|H3| : - H3x: - H3y: - H3z: -
DA : -
Dim X : 2048
Dim Y : 2048
Dim Z : 150
Pos X : 1
Pos Y : 1
Pos Z : 1
El-Siz X : 0.0190
El-Siz Y : 0.0190
El-Siz Z : 0.0190
```