This file provides information about the dynamic image sets in the folders QIBA_v12_Tofts_GE and QIBA_v12_Tofts_Siemens.

This data set is similar to version 9 (sampling interval and offset, S0, and noise vary), but this set also varies T1 tissue.

The image data for the GE and Siemens sets are identical. The only difference is that the GE series contains DICOM headers that a GE machine would generate, while the Siemens series contains DICOM headers from a simulated Siemens machine*.

Two sets of images are provided for each series. DICOM part 10 format images are in the DICOM directory. XML files are in the XML directory. The XML images allow the values for the DICOM tags to be altered using a text editor, and new DICOM images can then be generated using dcm4che's tool called "xml2dcm," available at http://www.dcm4che.org/confluence/display/d2/dcm4che2+DICOM+Toolkit.

This series varies the sampling interval, temporal jitter (timing offset), tissue T1, S0, and simulated noise level (sigma). Noise was applied using the formula $A = \sqrt{(R + r1)^2 + (r2)^2}$ where A is output "actual" signal intensity with noise, R is the input "noiseless" signal intensity, and $r1$ and $r2$ are gaussian noise with mean 0 and SD sigma.

The T1 values used are {200, 500, 2000, 5000} msecs.
For each series, the value of S0 in tissue equals the value in the blood vessel.

The sampling interval, timing offset, S0, and sigma value combinations, for each T1 tissue value, are as follows:

6s,0s,500,5	6,3,500,5	10,0,500,5	10,5,500,5
6s,0s,500,50	6,3,500,50	10,0,500,50	10,5,500,50
6s,0s,1000,10	6,3,1000,10	10,0,1000,10	10,5,1000,10
6s,0s,5000,75	6,3,5000,75	10,0,5000,75	10,5,5000,75
6s,0s,5000,100	6,3,5000,100	10,0,5000,100	10,5,5000,100
6s,0s,5000,250	6,3,5000,250	10,0,5000,250	10,5,5000,250
6s,0s,10000,100	6,3,10000,100	10,0,10000,100	10,5,10000,100

For each T1 tissue {200, 500, 2000, 5000}

The fixed parameters used to generate this data are:

Flip angle = 30 degrees
Repetition Time = 5 msecs
Assumed T1 (in blood vessel) = 1440 msecs

GE timing information is included in the DICOM headers at fields 0008,0032 (Acquisition Time) and 0018,1060 (Trigger Time). The imaging start time for Siemens machines is given in the DICOM headers at fields 0008,0030 (Study Time) and 0008,0031 (Series Time), and acquisition time for each image is given in the DICOM headers at fields 0008,0032 (Acquisition Time) and 0008,0033 (Image Time).

A 5 minute study is simulated, with injection of contrast agent occurring at 60 seconds. Thus, the total duration of imaging is 360 seconds.

The input function was derived from the JSim model ToftsKermode_two_parameter_20120103.proj (available on the QIBA page of our website). A link to the JSim website is also provided. This function representing a blood concentration time curve was converted to a plasma concentration time curve assuming a blood hematocrit of 45%. The relaxivity of the gadolinium contrast agent at 1.5 T was assumed to be 0.0045 mmol^{-1} msec^{-1} (Stanisz GJ, Henkelman RM. Gd-DTPA relaxivity depends on macromolecular content. Magn Reson Med. 2000 Nov;44(5):665-7. PubMed PMID: 11064398).

The naming convention for the study folders is
"<sampling interval>_jit_<timing offset>_T1_<T1_tissue>_S0_<s0 value>_sigma_<sigma value>".
Thus, 6s_jit_0s_T1_200_S0_500_sigma_5 has a sampling interval of 6 seconds, an offset of 0 seconds, a T1 tissue value of 200, an S0 value of 500, and a sigma value of 5.

The data in the test image is organized as follows:

The test data is generated using several combinations of Ktrans and Ve, using the modified Tofts Kermode 2-parameter model. The Ktrans takes values {0.01, 0.02, 0.05, 0.1, 0.2, 0.35}. The Ve takes values {0.01, 0.05, 0.1, 0.2, 0.5}.

The test data contains 10*10 pixels patches of each Ktrans and Ve combination. While generating the test data, the Ve values {0.01, 0.05, 0.1, 0.2,0.5} vary along the x axis. Ktrans values {0.01, 0.02, 0.05, 0.1, 0.2, 0.35} vary along the y axis.

The Vascular region of interest is the bottom 50*10 pixels strip of the image. The peak of the Vascular region is the top-left 25*10 pixels strip of the image. This strip also contains time point labels given in seconds. The Zero patch (Ktrans=0.0, Ve=0.5) is the top-right 25*10 pixels strip of the image.

The following is a detailed list giving the specific Ktrans,Ve combination used to generate each 10*10 pixel patch. The x,y location specifies the upper-left corner of each 10*10 pixel patch containing a specific Ktrans,Ve combination.

x	y	Ktrans	Ve
0	10	0.01	0.01
0	20	0.02	0.01
0	30	0.05	0.01
0	40	0.1	0.01
0	50	0.2	0.01
0	60	0.35	0.01
10	10	0.01	0.05
10	20	0.02	0.05
10	30	0.05	0.05
10	40	0.1	0.05
10	50	0.2	0.05
10	60	0.35	0.05
20	10	0.01	0.1
20	20	0.02	0.1
20	30	0.05	0.1
20	40	0.1	0.1
20	50	0.2	0.1
20	60	0.35	0.1
30	10	0.01	0.2
30	20	0.02	0.2
30	30	0.05	0.2
30	40	0.1	0.2
30	50	0.2	0.2
30	60	0.35	0.2
40	10	0.01	0.5
40	20	0.02	0.5
40	30	0.05	0.5
40	40	0.1	0.5
40	50	0.2	0.5
40	60	0.35	0.5

* Slight modifications to the DICOM headers may be required in order to make them compatible with a particular software package.