

This file provides information about the T1 Mapping image sets in the folders QIBA_v14_Tofts_GE and QIBA_v14_Tofts_Siemens.

This data set simulates images obtained when a patient has a lower cardiac output. These patients would be expected to have lower and broader input functions. Note that this reduced cardiac output does not affect the T1 Mapping images.

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>.

The reduced cardiac output data set has two primary series. The first ("QIBA_T1_20150713") has imaging parameters identical to version 5. The second series ("QIBA_T1_fa30_Vary_Int_Off_20150713") has imaging parameters identical to version 9 – S0, T1 tissue, and noise are varied.

I. QIBA_T1_20150713

Repetition Time = 5 msec

Assumed T1 (in tissue) = 1000 msec

Assumed equilibrium magnetization (in tissue) = 50000

Assumed T1 (in blood vessel) = 1440 msec

Assumed equilibrium magnetization (in blood vessel) = 50000

II. QIBA_Dyn_fa30_Vary_Int_Off_20150713

Repetition Time = 5 msec

Assumed T1 (in blood vessel) = 1440 msec

The T1 tissue values used are {200, 500, 2000, 5000} msec.

For each series, the value of S0 in tissue equals the value in the blood vessel.

This series provides T1 mapping images corresponding to the appropriate dynamic images. Tissue T1, S0, and simulated noise level (sigma) are varied. 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.

For all sets in (I) and (II), the signal intensity images were generated for the following different flip angles: 3, 6, 9, 15, 24, 35 degrees. The files in the T1 Mapping folders have the following flip angles:

filename	flip angle (in degrees)
fa3	3
fa6	6
fa9	9
fa15	15
fa24	24
fa35	35

The JSim model T1_S0_model_20110902.proj was used to generate all signal intensity images. This model can be downloaded from a link provided on the QIBA page of our website. A link to download the JSim software is also provided.

The naming convention for the study folders is

"<sampling interval>_jit_<timing offset>_S0_<s0 value>_sigma_<sigma value>".

Thus, 6s_jit_0s_S0_500_sigma_5 has a sampling interval of 6 seconds, an offset of 0 seconds (dynamic data only), an S0 value of 500, and a sigma value of 5.

The signal intensity for the T1 mapping images was calculated using Equation 1 in the paper Comparison of three physiologically-based pharmacokinetic models for the prediction of contrast agent distribution measured by dynamic MR imaging, Barboriak DP, MacFall JR, Viglianti BL, Dewhurst MW. J Magn Reson Imaging. 2008 Jun;27(6):1388-98.

The data in the test image is organized as follows: The top 50*70 pixels in the image represent the tissue. The vascular region of interest is the bottom 50*10 pixels strip of the image.

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