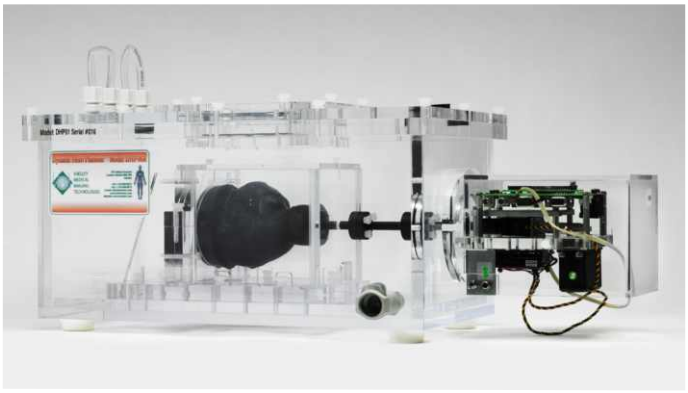
Dynamic Multi-modality Heart Phantoms

MRI Compatible Multi-Modality Heart Motion Phantom Model: DHP-MRI

Ultrasound & CT Compatible Multi-Modality Heart Motion Phantom Model: DHP-01



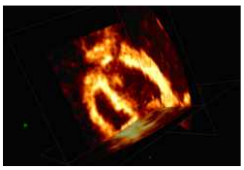
Ideal for imaging dynamic cardiac structure, cardiac function and image guidance.

The MRI compatible multi-modality heart motion phantom (Model: DHP-MRI) features; pneumatic control, an MRI & CT compatible tissue equivalent heart, a versatile acrylic tank and heart motion control software. To achieve ultrasound compatibility the Model: PVAH-01 tissue equivalent heart would be required. [Replace the Model: PVAH-MRI tissue equivalent heart with thePVAH-01 tissue equivalent heart for ultrasound applications.]

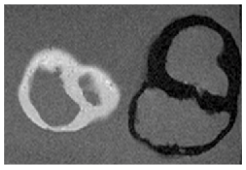
The ultrasound & CT compatible multi-modality heart motion phantom (DHP-01) features; dual servo control, an ultrasound & CT compatible PVA heart, a versatile acrylic tank and heart motion control software. Designed for apical and transesophageal imaging views. For CT and X-ray imaging a 3D grid of four 1 mm stainless steel balls positioned on the heart acrylic cradle and the heart acrylic cover ensure accurate measurements while imaging.

The acrylic tank design provides access for fluid flow tubing to be connected to each ventricle, for catheter related devices to be introduced, as well as special ports for a transesophageal probe to be positioned beneath the heart.

Tri-planar rendering through one phase of a dynamic 3D CT scan of the heart phantom.



Tri-planar rendering through one phase of a dynamic 3D US scan of the heart phantom.



T1 weighted spin-echo sequence of two heart phantoms illustrating control of the MR relaxation parameters of mycardium.

Product Description

Shelley's dynamic multi-modality anthropomorphic heart phantom is ideal for sophisticated analysis and validation of cardiac motion techniques related to the medical imaging.

The dynamic human heart replica is made of a hydrogel material that realistically mimics the biomechanical properties (elasticity) of human soft tissue and incorporates anatomically correct left and right ventricle structures for imaging under ultrasound, CT, X-ray and MRI. The hydrogel is doped with contrast materials to mimic soft tissue under ultrasound, CT, x-ray and MR imaging.

User-friendly software, precise dual motion control and an actuator are connected to the hydrogel heart phantom allowing for independent control of compression, stretching and torsion motion of tissue deformation. The Model: DHP-01 motion control software allows users to easily program and execute sophisticated cardiac motion events, including RR intervals and arrhythmia. ECG signals can be input to drive/synchronize the timing of the heart contraction.

Applications

The phantom is designed for a wide range of development & validation studies in cardiac imaging, including:

- image processing: segmentation and visualization algorithms, real-time processing, morphological and anatomical characterization
- dynamic multi-modality and intra-modality image registration and fusion involving ultrasound, CT, x-ray & MR
- elastography: strain estimation, deformation tracking and tissue tagging acquisition and analysis
- dynamic, real-time, and motion-compensated data collection and reconstruction algorithms
- interventional device navigation: position & orientation
- characterization and correction of cardiac motion artifacts

Dynamic Multi-modality Heart Phantoms

Features

- 3D data available for left and right ventricles
- Left and right ventrical anatomy
- Realistic biomechanical properties
- Multi-modality compatibility
- Realistic cardiac motion
- Programmable (including arrhythmia for Model: DHP-01)
- ECG signal input to drive the timing of the contraction
- Simulation of regular and time varying RR intervals
- Acoustic window for multi-angle ultrasound imaging
- Standardized ventricle IN & OUT ports for fluid and device access
- Apical and transesophageal imaging views
- Coronary tubing

Benefits

- Perform multi-modality experiments / assessments.
- Makes 3D cardiac modeling and multi-modality imaging development, that require a great deal of testing and re-testing in the lab, easier by using a realistic dynamic phantom.
- Reproduce realistic cardiac motion helps to develop and test novel reconstruction and acquisition techniques and in order to get the best possible image quality.
- Allows control of cardiac rate to test against sources of artifacts in a controlled manner.
- A very cost effective tool for shortening the research and development cycle when designing new methods for image based diagnostics and interventions.
- Increase the pace and productivity of your medical imaging research projects.
- Reduces reliance on animal studies and human volunteers.

Specifications / Requirements

Hydrogel heart specifications

PVA moulded construction
Left ventricle volume, 76 ml
Right ventricle volume, 66 ml

Model: PVAH-MRI

MRI & CT Compatible

Model: PVAH-01

Ultrasound & CT Compatible

Specifications / Requirements Con't.

Motion specifications
Model: DHP-MRI

200 bpm
41° rotation
2.8 cm (1.1 inches) stroke

Pnuematic Regulator
for Model DHP-MRI

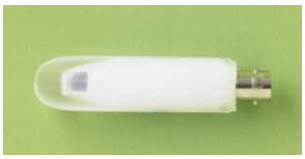
Platform/Tank specifications

Tank/Reservoir O.D. Dimensions:
L: 18.5" x W: 9.5" x H: 9.69"

Total length with controls is 26.7"
Total Weight 15.9Kg (34.5Lbs.)

DHP-MR ECG Adapter

The MRI compatible MR Finger product allows for the production of an ECG-compatible trigger signal by outputting a TTL signal to an MRI scanners plethysmograph.



Motion specifications
Model: DHP-01

88 bpm
41° rotation
2.8 cm (1.1 inches) stroke

Controller specifications

VSA v4.0
RAPU Manager Controller
ASICC II Board
2 HITEC servos; HS 6965HB; HS 815BB
USB connection

Electrical specifications

110 Volt AC input
5 volt 2.6 amp DC power
5 Volt 3 amp DC power
9 Volt battery
(ASICC II Board)

Computer Requirements

Windows ME/2000/XP/Vista with mouse
USB 1.1/2.0 port
SD/SDHC storage card

DHP-01 ECG Adapter

The Model PI-ECG1 ECG Adapter is a passive level converter that connects to the DHP-01. It produces a 5 millivolt ECG-like signal from a digital TTL (0-5 volt) pulse signal.

Patent Pending

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