

Phantech

micro Partial Volume Correction (PVC) Phantoms

to measure recovery coefficients

Technical Specifications



INNOVATIVE HARDWARE AND SOFTWARE FOR MEDICAL IMAGING

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Madison, WI, USA

Product: micro PVC Phantoms

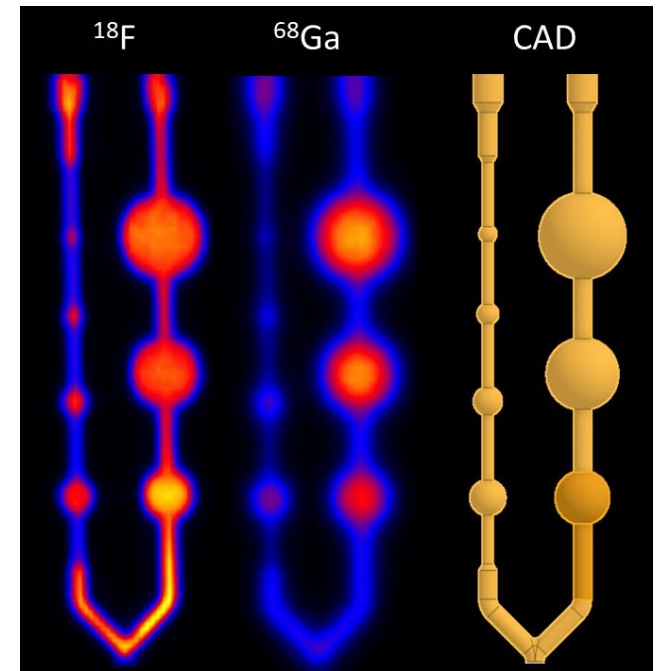
Overview

Phantech's Partial Volume Correction (PVC) phantoms are used to generate recovery coefficient (RC) curves. By comparing the measured activity concentration in each sphere to the known activity concentration, one can characterize the signal recovered as a function of sphere size (simulating tumors & organs) by an imaging system and then apply a correction factor. Quantitative accuracy is critical for molecular imaging research, especially for dosimetric and theranostic applications.

Employing Phantech's linear-filling technology, the PVC can be filled in ~30 seconds with a single loaded syringe, ensuring a uniform activity concentration in each sphere with no bubbles, and no risk of spilling. Phantech PVCs contain 7, 8, or 9 spheres in order to generate accurate RC curves. The material is a low CT density material comparable to the densities found in biological tissue.

micro PVC Key Features:

- Phantech's linear-filling technology
 - ~30 second to fill
 - Luer lock fittings ensure no spilling
 - No bubbles
 - Videos provided for step-by-step guidance
- Spheres that simulate rodent tumors, organs and tissues
- Automatic segmentation and analysis with Imalytics (Gremse-IT) Preclinical Software
 - Recovery coefficient curves (RCC) generated with the click of a button
 - Apply PVC to *in vivo* ROIs using RCCs
- 3 standard versions with varying sphere sizes (27, 34, 49mm OD)
- Fillable warm background to simulate spill-in/background
- Internal reference/normalization volume to accommodate sites that do not have tools to measure absolute activity concentration
- Custom sizing available
- Compatible with most imaging systems and modalities, including MRI

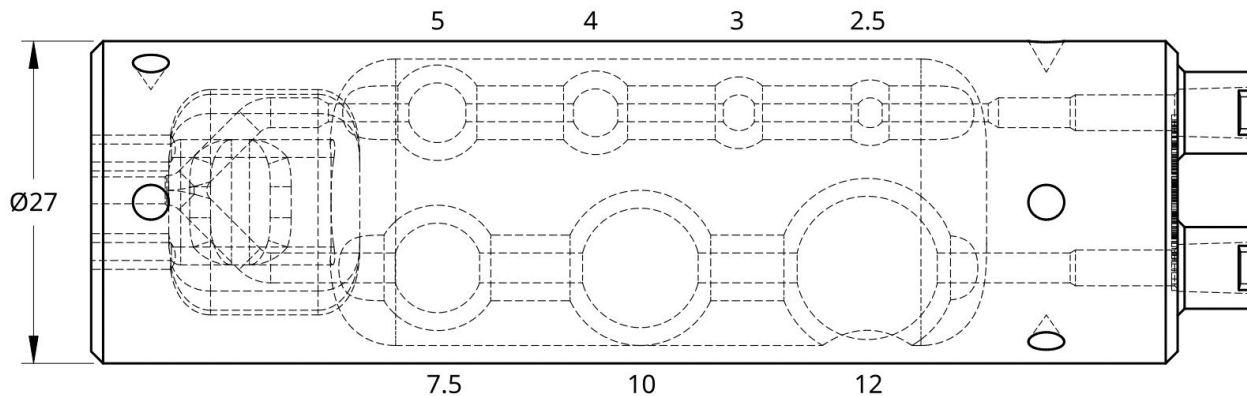


Product: micro PVC Phantoms

Note:

Our micro PVC phantoms are available in 3 sizes (27 mm OD, 34 mm OD, and 49 mm OD). The 27 mm OD PVC phantom is shown below for more detail. All units are in mm unless otherwise noted. These phantoms consist of a single custom manufactured component and three sets of commercial hardware for assembly. The PVC phantoms have three separate voids; one series of spheres to generate recovery coefficient curves, one fillable warm background, and a one reference/normalization volume (if needed).

General Parts List (Size of individual components vary by phantom size)		
Description	Quantity	Manufacturer
Main Component	1	N/A (Custom)
Luer Lock Fittings	2	McMaster-Carr
Screw O-Ring	5	McMaster-Carr
Sealing Screws	5	McMaster-Carr

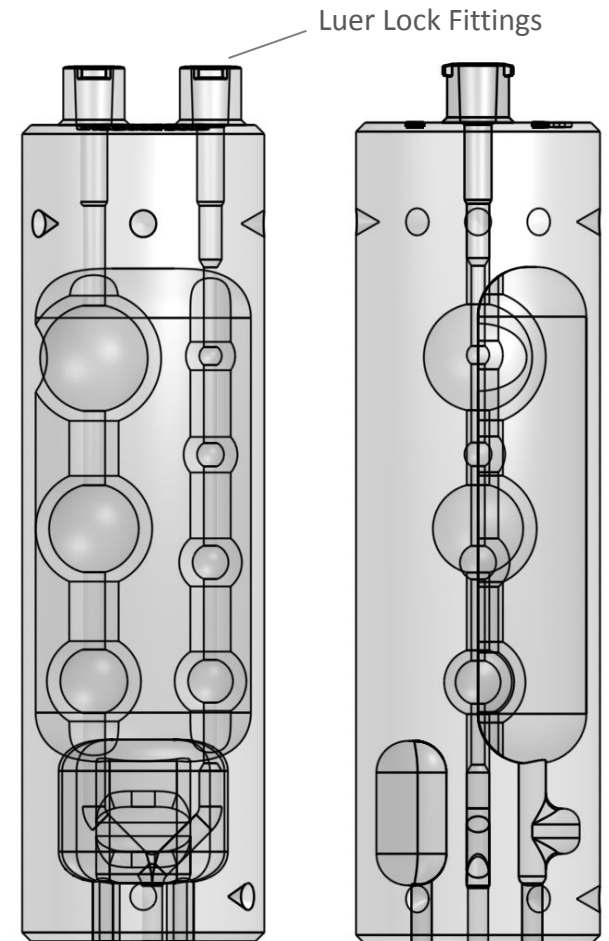


Bubble Trap

Opening for clearing

Reference Volume

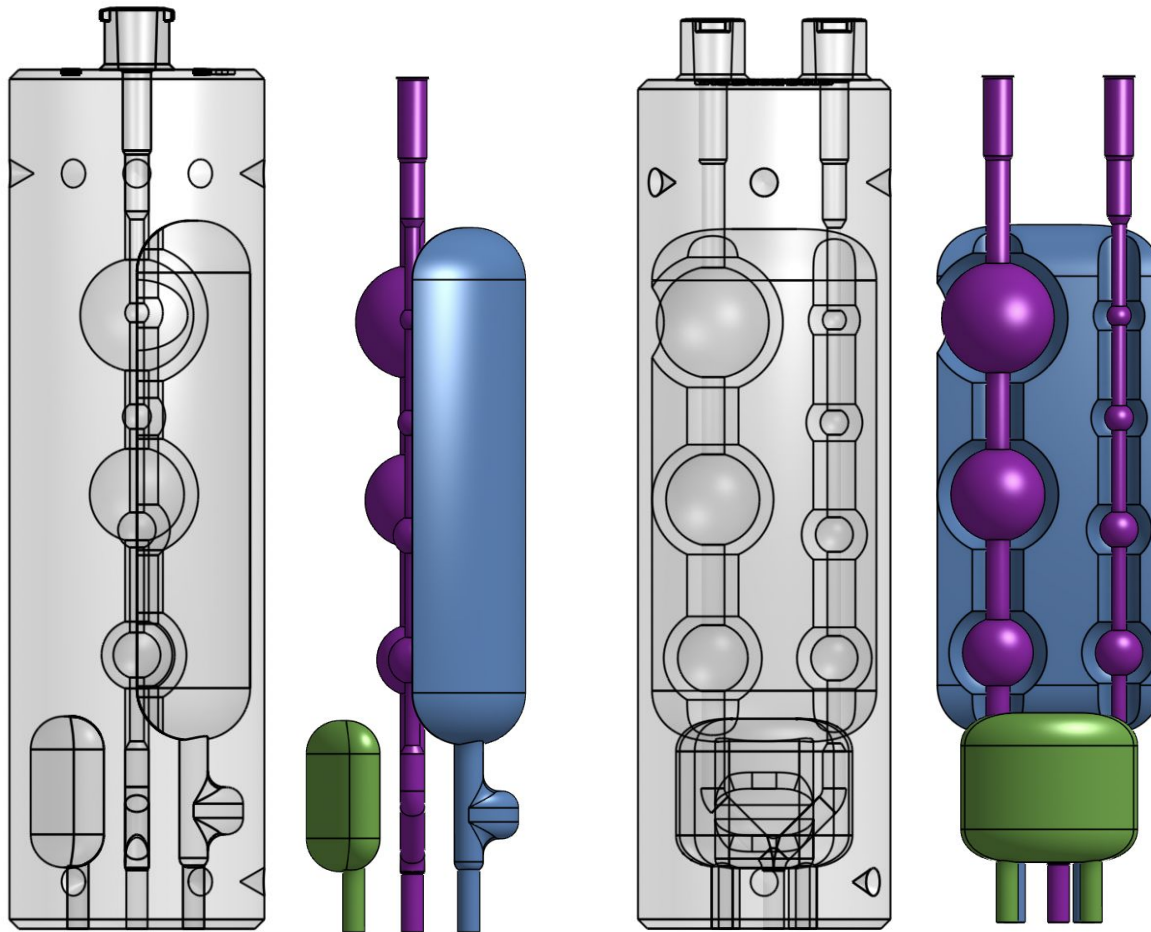
Fiducial markers for Imalytics
(Gremse-IT) compatibility



Voids sealed with screws and o-rings

Volume Details

The PVC phantoms have three separately fillable voids; **one series of spheres to generate recovery coefficient curves**, **one fillable warm background**, and a **one reference/normalization volume (if needed)**. The illustration and tables below show the color-coded voids and their respective volumes for each PVC phantom.



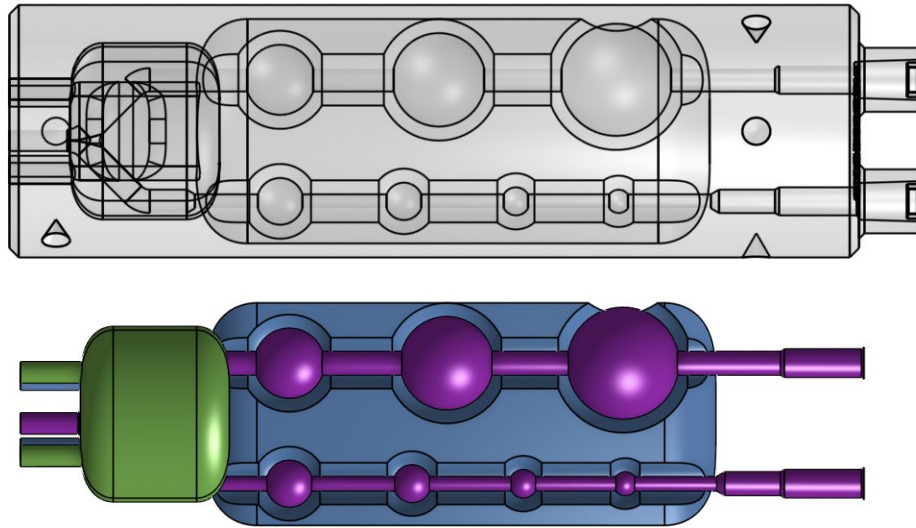
Fillable Volumes (27 mm OD Version)		
Description	Figure Color	Volume (mL)
PVC Spheres	Purple	2.34
Warm Background	Blue	9.90
Reference Volume	Green	1.69

Fillable Volumes (34 mm OD Version)		
Description	Figure Color	Volume (mL)
PVC Spheres	Purple	6.10
Warm Background	Blue	19.36
Reference Volume	Green	3.41

Fillable Volumes (49 mm OD Version)		
Description	Figure Color	Volume (mL)
PVC Spheres	Purple	16.64
Warm Background	Blue	59.00
Reference Volume	Green	11.08

Product: micro PVC Phantoms

Available Sizes: 27 mm OD, 34 mm OD, 49 mm OD



Note:

The number of spheres varies between the three versions (7 spheres for 27 mm OD, 8 for 34 mm OD, and 9 for 49 mm OD) due to space, but the configuration of the three volumes (27 mm OD shown to left) is consistent. Exact dimensions of the spheres for each PVC phantom are listed in the tables below.

Sphere Dimensions (27mm OD)		
#	D (mm)	V (mm ³)
1	2.5	8.2
2	3	14.1
3	4	33.5
4	5	65.5
5	7.5	220.9
6	10	523.6
7	12	904.8

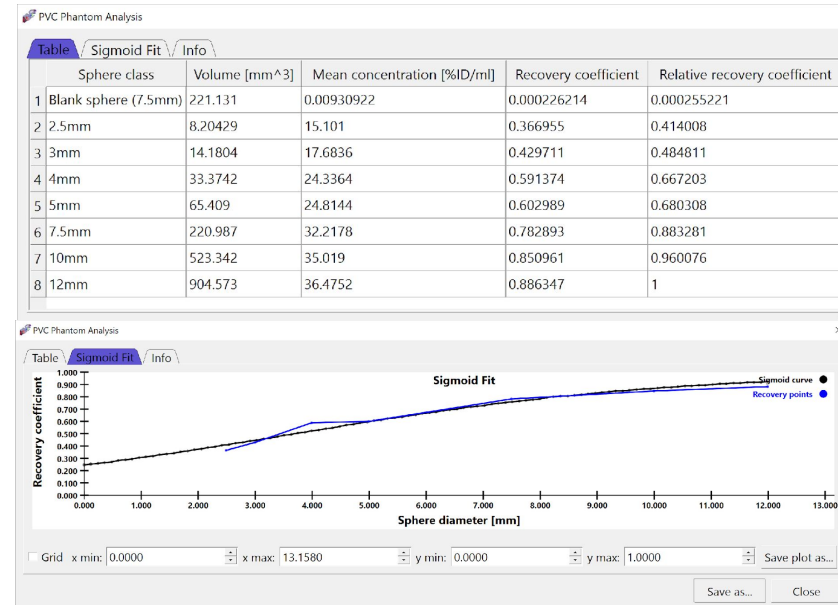
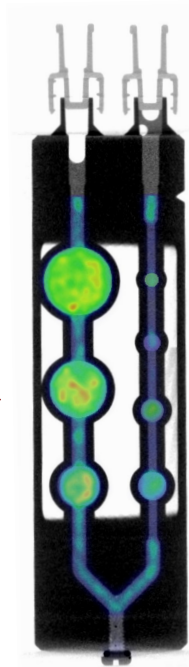
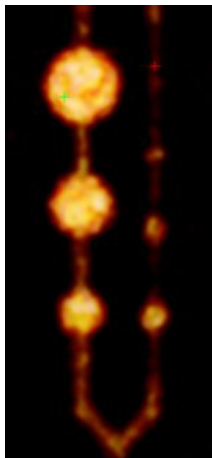
Sphere Dimensions (34 mm OD)		
#	D (mm)	V (mm ³)
1	3.8	27.6
2	5	65.4
3	6.2	125.8
4	7.8	248.7
5	9.8	493.2
6	12.4	998.2
7	14.2	1499.2
8	15.6	1989.4

Sphere Dimensions (49 mm OD)		
#	D (mm)	V (mm ³)
1	3.8	27.6
2	5	65.4
3	6.2	125.8
4	7.8	248.7
5	9.8	493.2
6	12.4	998.2
7	15.6	1989.4
8	19.6	3940
9	24.8	7979.3

Automatic segmentation and analysis with Imalytics (Gremse-IT) Preclinical Software

Automated Analysis Workflow

1. Fill micro PVC phantom
2. Perform PET or SPECT scan
3. Load image file into Imalytics (compatible with most systems)
4. Select the phantom from the dropdown menu
5. Generate and save report



Product: micro PVC Phantoms

Filling Instructions



Phantech Partial Volume Correction
Filling Instructional Video

Filling Instructions

- Fill the phantom using an appropriate size syringe with a luer lock adapter (Refer to the Phantech PVC sizes chart on page 3 of this packet to determine the total fill volume)
- Add food coloring for better visualization of successful filling
- For filling with radiometals, creating slightly acidic pH will prevent sticking to the phantom
- To lower water surface tension and prevent bubbles, a small amount (<1% v/v) of a surfactant can be used

Filling steps:

1. Attach first syringe filled with desired contrast agent to the Luer Lock fitting connected to the small spheres side. Turn luer lock syringe until slight resistance is felt, and then give another 1/8 turn.
 2. Attach a second empty syringe to the other fitting on the large spheres side (before attaching the syringe to the luer lock fitting, prime the syringe by retracting and then compressing the plunger).
 3. With the phantom vertical and the luer locks facing down, slowly push the solution upward into the phantom.
 4. When the solution reaches the apex, invert the phantom so the luer locks fittings are on top of the phantom.
 5. Continue to slowly push the solution upward into the phantom until the solution completely fills the channel
 6. Remove the second syringe and replace it with a luer lock cap (1/8 turn after initial resistance)
 7. Remove the first syringe and replace with a luer lock cap (1/8 turn after initial resistance)
 8. Wrap phantom in Parafilm and then scan (if warm background is filled, position phantom with bubble trap facing up)
- Emptying: simply use an empty syringe to slowly draw the fluid out of the phantom.
 - Cleaning: flush the phantom with saline followed by several passes of air. Leave caps off and allow phantom to completely dry.
WARNING: Do NOT use organic solvents such as acetone, EtOH, isopropyl alcohol, denatured alcohol or other harsh chemicals to fill or clean Phantech phantoms; these chemicals may compromise their integrity. Use saline for filling and cleaning. Neutral pH of filling solution is recommended but slightly acidic solutions are tolerated for short-time use with radiometals, for example. Empty the phantoms as soon as possible after use and then store them in a protective case in a dry location. Do NOT autoclave. If applicable, inspect O-rings before each use. Replace O-rings if they appear dried or cracked.