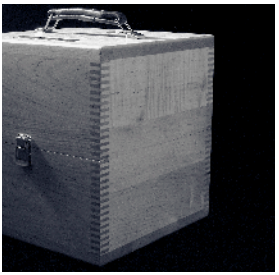
MAGPHAN®

The Phantom Laboratory

SPATIAL UNIFORMITY



SIGNAL-TO-NOISE RATIO (SNR)

SPHERICAL GEOMETRY

IN-VITRO SAMPLE TESTING
(UP TO 20CM SPHERICAL VOLUME)

GEOMETRIC DISTORTION (SPATIAL LINEARITY)

PIXEL (MATRIX) SIZE VERIFICATION

SCAN SLICE WIDTH AND CONTIGUITY

VERIFICATION OF PATIENT ALIGNMENT SYSTEM

SPATIAL RESOLUTION UP TO
11 LINE PAIRS PER CM (0.45MM RESOLUTION)

LOW CONTRAST SENSITIVITY

T1 AND T2 MEASUREMENTS

EVALUATION OF 3-DIMENSIONAL
VOLUME RECONSTRUCTION

Precise, Comprehensive Testing of MRI Scanners

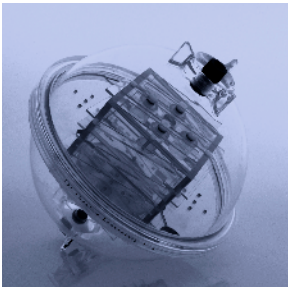
Magphan® phantoms are designed to perform a wide range of precision performance evaluations of Magnetic Resonance Imaging (MRI) Scanners.

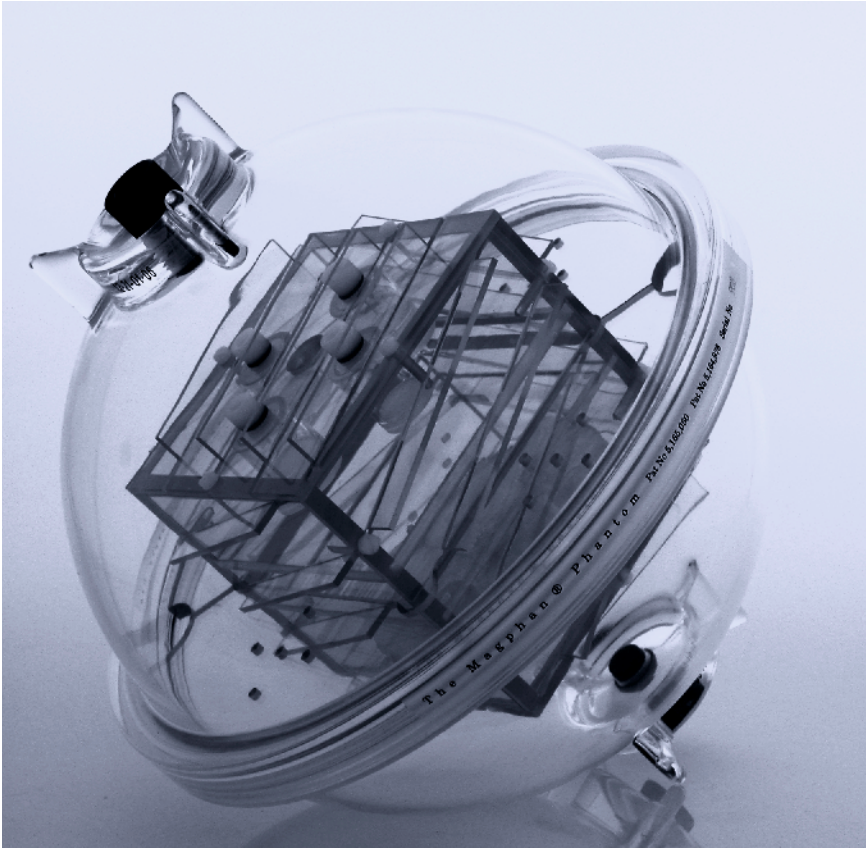
The design criteria for the Magphan® phantoms are based on physicist Dr. David Goodenough's extensive experience with MRI system evaluation and his well
documented research into the quantification of image system performance tests. The test objects that make up the current Magphan® models embody more than a decade of scientific evaluation and field experience.

Patented Spherical Design

The Magphan®'s patented spherical design combines precise alignment of spherical geometry with cubic geometry. As magnetic field characteristics are mapped according to spherical harmonics, natural magnetic fields extend to diagonally symmetric volumes (DSVs), or spheres. This symmetry is the reason the AAPM Task Group's Report number 6a, titled "Acceptance Testing of Magnetic Resonance Imaging Systems," recommends the spherical shape. Imaging performance is evaluated in the transaxial, coronal, sagittal and oblique planes by rotating the sphere.

The Magphan® is also available with a conventional cylindrical housing for test groups and manufacturers who base their performance specifications on cylindrical phantoms.





SPHERICAL MAGPHAN® (SMR100) is a urethane sphere composed of two hemispherical shells connected with a threaded ring. The shells together have an outer diameter of 21cm and an inner diameter of 20cm. The test cube assembly can be quickly removed without tools for greater imaging flexibility and easy access for cleaning and maintenance.

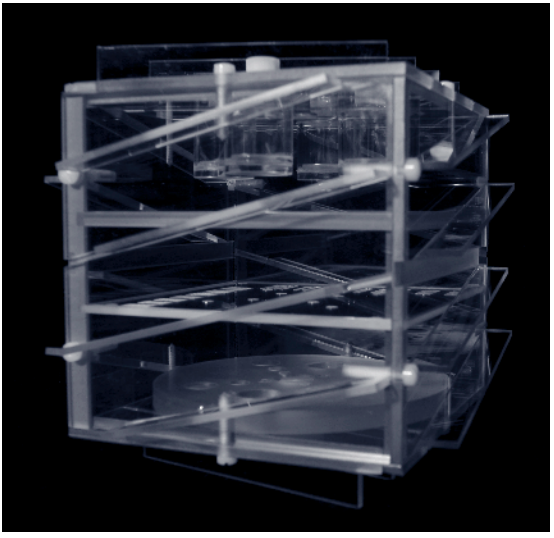
CYLINDRICAL MAGPHAN® (SMR170) is readily aligned in most conventional head and body coils. The acrylic cylinder has an outer diameter of 20cm and an inner diameter of 19cm.

10cm TEST CUBE

Both the cylindrical and spherical Magphans® use a 10cm Test Cube for image quality measurements. Manufactured from 6mm-thick polycarbonate plastic the Test Cube has an outer diameter of 10cm. The Test Cube contains the Slice Thickness Ramps, Sensitometry Vials, a High Resolution Test Plate and a Low Contrast Disk.

The Test Cube plates can be assembled in the standard 2-D configuration, with dual opposed slice thickness ramps which allow operators to rapidly verify that the phantom's z axis is precisely aligned perpendicular to the imaging plane.

Nylon screws hold the unit together, allowing you to change test plates or cube sides into a 3-dimensional configuration. The 3-D configuration allows x, y, and z slice geometry measurements to be obtained from a single data acquisition.



Slice Thickness Ramps

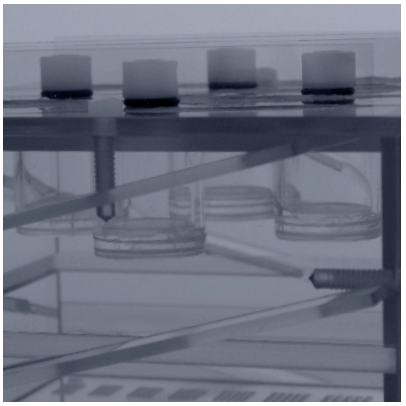
phantom position
scan slice width
multi slice spacing and contiguity
patient alignment (x, y and z axes)

The slice thickness ramps are mounted on the exterior of the Test Cube. The ramps, which are 2mm thick and 10mm wide, are placed at a shallow 14° angle to the phantom's axes, providing a magnification factor of 4x for slice width measurements. Opposed ramps cross at the center of the cube's test planes for alignment verification.

Sensitometry Vials

T1 and T2 measurements

The sensitometry samples are stored in four cylindrical vials with an outer diameter of 1.9cm and an inner diameter of 1.6cm. The vials can be filled with a variety of solutions through 0.6cm (1/4 inch) ports on the outside of the cube for T1 and T2 measurements.



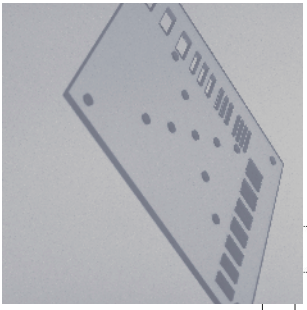
High Resolution Test Plate

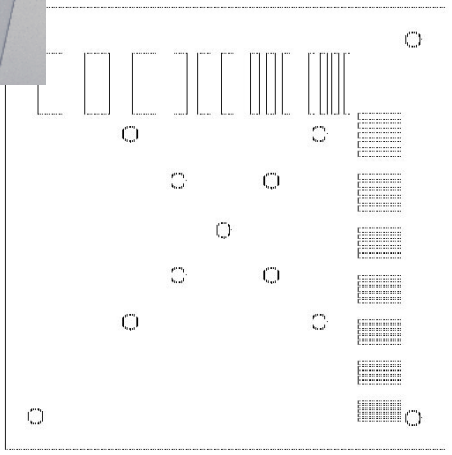
high resolution measurements

geometric distortion (spatial linearity)

A high resolution gauge is cut into a 2mm-thick acrylic plate that is supported by channels inside the Test Cube. The high-resolution test is performed by using a series of rectangular slots that form a test pattern which ranges from one to eleven line pairs per cm (5mm to 0.45mm resolution). The slots for testing between one and four line pairs per cm are 1.25cm long, and 0.9cm long for tests involving between five and eleven line pairs per cm.

To test for geometric distortion (spatial linearity), 3mm holes are spaced in square patterns of 2cm, 4cm, and 8cm. The system's geometric distortion can be evaluated by measuring the distance between these holes.

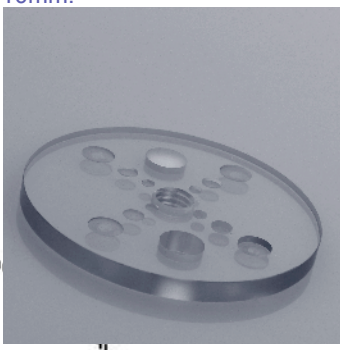


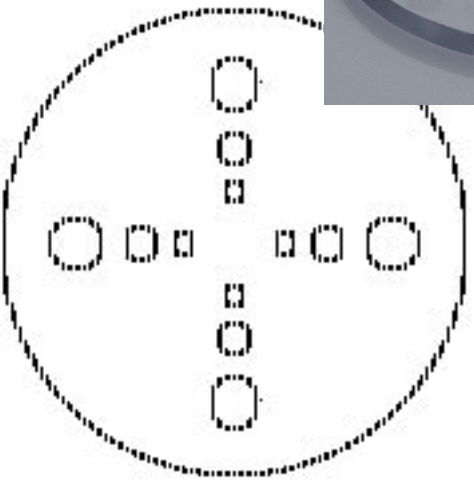


Low Contrast Disk

low contrast sensitivity

This test is performed with an acrylic disk mounted on the base of the Test Cube. Circular recesses in the disk generate low contrast images through volume averaging. The four sets of three circular recesses are 0.5mm, 0.75mm, 1.0mm, and
2.0mm deep, with diameters of 4mm, 6mm, and 10mm.





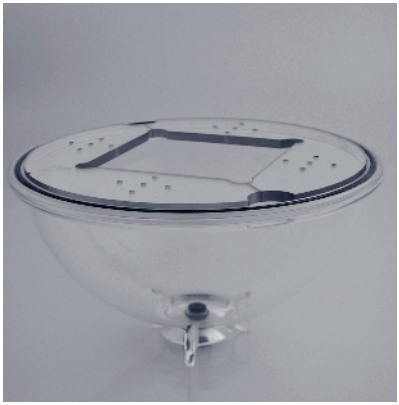
Cube Support Disk

geometric distortion (spatial linearity)

pixel (matrix) size verification

The two-piece Cube Support Disk holds the cube inside the phantom housing and can be easily installed and removed. Along with fixing the test cube's position, the support disk provides information for spatial linearity measurements.

Geometric distortion is tested by measuring the diameter of the Magphan® in the x and y directions. Geometric distortion can also be evaluated by measuring the distance between the 3mm holes that are configured into 8cm, 10cm and 12cm squares in the support disk.



Outer Housing

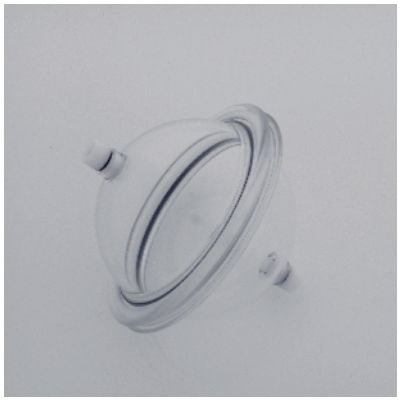
spatial uniformity
signal to noise ratio (SNR)
spherical geometry
in-vitro sample testing (up to 20 cm spherical volume)

The housing components consist of an Outer Housing and a Cube Support Disk (which supports the 10cm Test Cube). Comprehensive spatial uniformity measurements can be made using the phantom housing with the test cube and support
disk removed. The housings are easy to clean and allow the use of gels as well as liquid solutions. Multiple ports allow unrestricted flow when draining.

Note: Magphan® phantoms are not supplied with contrast fill solutions. Customers are required to add their own fill solutions.

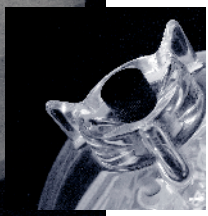
Optional 10cm Sphere

An optional sphere with a diameter of 10cm can be mounted inside the 20cm sphere or used on its own. This sphere is useful for testing the magnetic field homogeneity and uniformity characteristics of MRI scanners. The magnetic field is specified in parts per million of diagonally symmetric volumes (DSVs).



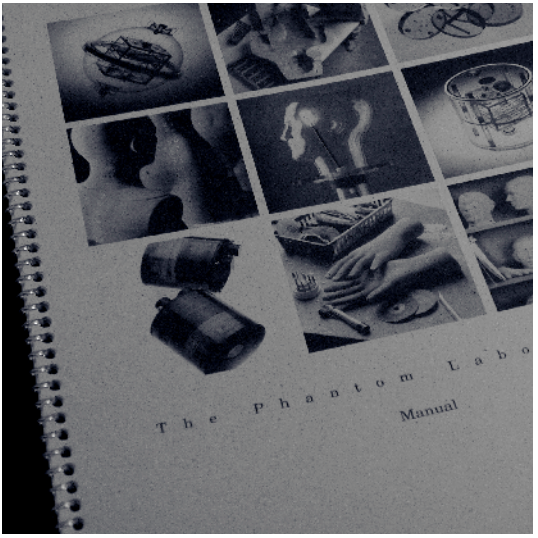
Custom Hardwood Case

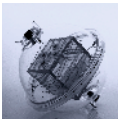
Magphan® phantoms arrive assembled in a sturdy and attractive maple case. The case for the Spherical phantom includes a machined insert to hold the phantom when removing the locking ring to open the sphere — no tools required.



Operations manual

Your Magphan® phantom includes a comprehensive operations manual, complete with one-year limited warranty information and a sample test program. (We do not make specific recommendations on the content of your quality assurance program because each medical imaging facility has its own unique set





Other Products from The Phantom Laboratory

Specphan™ Phantom used to evaluate SPECT and PET imaging systems.

Catphan® Phantom used to evaluate CT scanner image quality.

RANDO® Phantom used for radiotherapy treatment planning.

RSVP Phantom™ used for radiosurgery position and dose verification.

RSVP Phantom Pelvis™ for IMRT dose verification.

Sectional Phantoms made with natural bone, used for technologist training.

The Phantom Patient™, a full body phantom made with natural bone, for positioning and imaging training.

Custom and OEM Phantoms. Let us know what you need and we'll be happy to discuss your specific requirements.

The Phantom Laboratory is committed to the manufacture of high quality products. Our comprehensive quality system is registered in compliance with the internationally recognized ISO9001:2000 standard.

contact us for answers to your questions, for

current prices, for a delivery date...

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