

MR Elastography Phantom

Scanning Parameter Recommendations

- To set-up the phantom for scanning, refer to the illustrations in the MRE PHANTOM USER GUIDE included with each MRE Phantom.
- Use the following recommended MRE Phantom imaging parameters that are specific to your Philips MR scanner.

Philips - 2D MRE Phantom Parameter Recommendations			
Scanners and Sequences (Note 1)	Scanner	Ingenia and Achieva	Ingenia and Achieva
	Field Strength	1.5T	3T
	Software versions (Verified)	R5.3.1	R5.3.1
	Software versions (Compatible)	>= R5.3.0	>= R5.3.0
	Software versions INCOMPATIBLE	R3.x.x (Achieva)	R3.x.x (Achieva)
	Pulse sequence	GRE MRE	GRE MRE
	Mode	2D	2D
Setup	Phantom Setup	See MRE PHANTOM USER GUIDE with Phantom Kit.	
	Coil (Note 2)	Head or Torso/Spine	
Slice Positioning	Place one coronal slice at the center of the height of the phantom.		
Information Input (Pretend Patient)	Position	feet-first, supine	feet-first, supine
	Weight	150 Lbs (68 kg)	150 Lbs (68 kg)
	Height	5 ft (1.5 m)	5 ft (1.5 m)
Coil (Note 2)	Coil	Head	Head
Imaging Parameters	Imaging Plane	Coronal	Coronal
	Uniformity	CLEAR	CLEAR
	Number of slices	4	4
	Slice thickness (mm)/gap	10 mm / 0 mm	10 mm / 0 mm
	FOV RL/FH (mm)	420/420 (Note 4)	420/420 (Note 4)
	Voxel size, FH x RL	0.75 x 3.0 (ACQ Matrix roughly 256x64)	0.75 x 3.0 (ACQ Matrix roughly 256x64)
	Reconstruction Matrix (Note 6)	288	144
	Foldover direction	Right-Left	Right-Left
	REST Slabs (saturation bands)	N/A	N/A
	Scan Mode	M2D	M2D

Imaging Parameters	TE (msec)	Shortest (approx 20ms)	Shortest (approx 20ms)
	TR (msec)	50	50
	Flip Angle (degree)	20	20
	Water Fat Shift	Maximum	Maximum
	Bandwidth (Hz/Pixel) (Reported) (Note 1)	Approx 298 Hz/pixel	Approx 298 Hz/pixel
	Acceleration (Note 4)	SENSE	SENSE
	Acceleration factor (Note 4)	1	1
	Shimming Volume	Auto	Auto
	Scan time	~27s	~27s
Motion tab (Driver Parameters) (Note 5)	Respiratory Compensation (Breath holds)	No	No
	NSA (Averages)	1 (only 1 is supported)	1 (only 1 is supported)
	Wave amplitude, Percentage (%)	User defined, 10%	User defined, 5%
	Frequency (Hz)	60	60
	Direction (of MEG) (Reported)	AP	AP
	Gradient strength (MEG) (mT/m) <i>Only reported in patch</i>	18.4 (Note 3)	18.4 (Note 3)
	Patient experience scan	No	No
Phase offsets (<i>not visible and not changeable</i>)	4	4	
Specific Parameters (To be specified)	Uniformity correction	No	No
	Geometry Correction	No	No

NOTES:

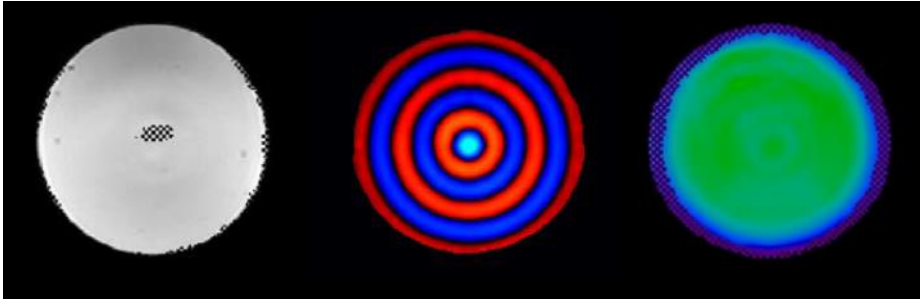
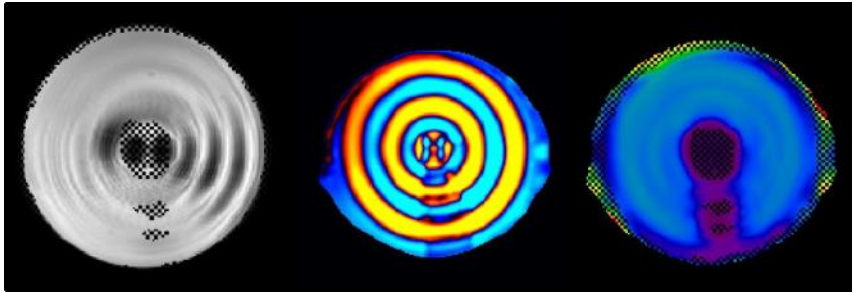
- (1) Specific tab and parameters vary based on different software versions and MRE sequences; the generic MRE parameters for driver and motion encoding gradients are the guideline to those specific tab and parameters (MRE-related); overall, this recommendation is conservative so that it can be successfully performed at all software versions and scanners.
- (2) Use of a multi-channel RX head coil is preferred. Alternatively, the Torso/Spine coils can be used.
- (3) 20cm FOV is a minimum value for phantom studies, smaller FOVs may reduce SNR or confidence and should be avoided. Larger FOV may be used and may be beneficial for correlation to in vivo scans.
- (4) SENSE acceleration factor $R = 1$ is recommended for QA scans, particularly when using multi-channel coils with adequate coverage. $R > 1$ can be used, particularly for correlation to in vivo sequences. Larger FOVs may be desirable to avoid aliasing artifacts. If using coils with insufficient coverage (due to the phantom's small size), SENSE is not recommended.
- (5) Performance may vary based on gradient hardware performance and maximum gradient amplitude. 20mT/m is a good value for 10% acoustic amplitude in phantom; 4mT/m is good for 50% acoustic amplitude.
- (6) Approximate reconstruction matrix size based on the specified voxel size. May vary by system.

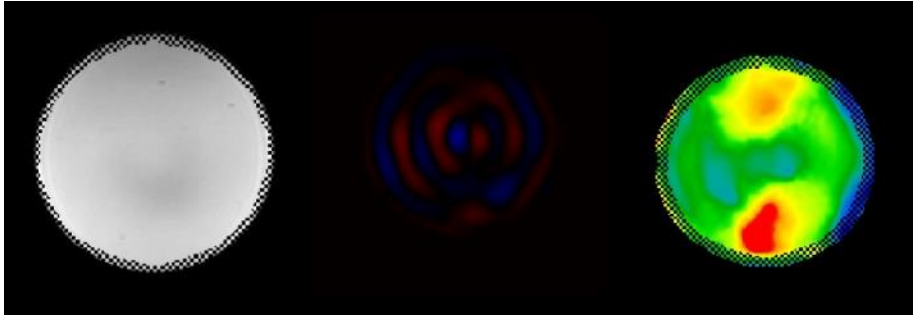
Questions - Questions regarding the Resoundant MRE Phantom Scanning Parameter Recommendations may be directed to:

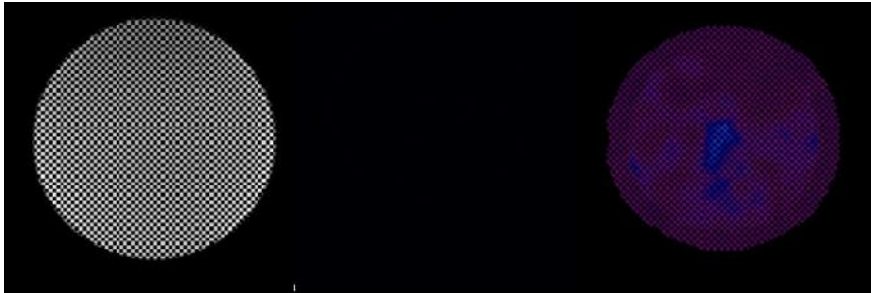
Resoundant, Inc.
421 First Avenue SW STE 204W
Rochester, Minnesota 55902 USA
Phone: 507.322.0011
Email: mreinfo@resoundant.com

Phantom Scanning Results

The following table outlines the expected phantom scanning results, including sample images, visual descriptions, and troubleshooting tips.

Normal Phantom Scan Results			
Magnitude, Wave, and Color Elastogram images			
Qualitative Description of Results	Magnitude Image	Wave Image	Elastogram
	<ul style="list-style-type: none"> No “ripples” or motion present. Circular, homogeneous appearance (may see slight distortion from EPI-based sequences) 	<ul style="list-style-type: none"> Red/blue waves Concentric circles 	<ul style="list-style-type: none"> Large region of high confidence May see confidence hatch out on edges or in the very center. This is acceptable
Amplitude Too High			
Magnitude, Wave, and Color Elastogram images			
Qualitative Description of Results	Magnitude Image	Wave Image	Elastogram
	<ul style="list-style-type: none"> “Ripples” or motion present (phase dispersion). 	<ul style="list-style-type: none"> Wave images oversaturated 	<ul style="list-style-type: none"> Stiffness irregular
Troubleshooting Tips	Decrease amplitude to 5-10%.		

Amplitude Too Low			
Magnitude, Wave, and Color Elastogram images			
Qualitative Description of Results	Magnitude Image	Wave Image	Elastogram
		<ul style="list-style-type: none"> Wave images undersaturated/black 	<ul style="list-style-type: none"> Stiffness irregular
Troubleshooting Tips	<p>Confirm proper phantom set-up: passive driver secured tightly to phantom with belt, tube connected between active and passive driver.</p> <p>May be due to leak in tubing or passive driver, or active driver failing.</p>		

No Amplitude			
Magnitude, Wave, and Color Elastogram images			
Qualitative Description of Results	Magnitude Image	Wave Image	Elastogram
		<ul style="list-style-type: none"> No waves 	<ul style="list-style-type: none"> No regions of high confidence (completely hatched out)
Troubleshooting Tips	<p>Confirm the active driver is on and amplitude set to 5-10%.</p> <p>Confirm tube between active and passive driver is connected.</p> <p>May be due to active or passive driver failure.</p>		