

Simple-tune Small-Animal RF Litz or Litzcage Modules

MRI coils with best sensitivity, homogeneity, and convenience.

With rf coils, the most important criteria usually are S/N, B_1 homogeneity, and reliability. For S/N, simply check the 90° pulse spec. Regardless of whether it's single or double resonance, shielded or unshielded, linear or circular polarization, short or long, surface or volume, one simple relationship always holds for a given voxel size and other conditions:

$$S / N \propto (\tau_{90} \sqrt{P})^{-1}$$

where τ_{90} is the 90° pulse length (we specify for a hard pulse) and P is the transmitter power. Many of the smaller coils listed in the tables have S/N better by factors of 1.5 to 3 than published birdcages of similar size and tuning.



Doty RF *Litz* or *Litzcage* Coil Modules

Easy tuning

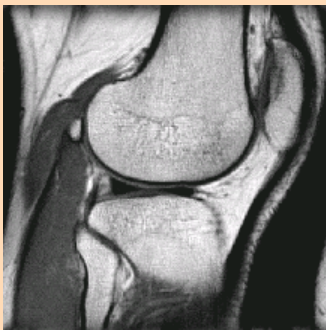
Doty *Litz* and *Litzcage* coils are easily tuned and matched to the full range of samples with negligible loss in efficiency, channel separation, or symmetry. Tuning range is an order of magnitude greater than with conventional coils and tuning methods. Do you have difficulty matching and tuning with certain samples? Are you tired of tweaking numerous adjustments to try to get acceptable B_1 homogeneity with your samples? Does your τ_{90} drop by less than a factor of two (at constant power) when your sample diameter drops by a factor of 2? If you answered yes to any of the above, a Doty *Litz* or *Litzcage* coil could improve your results.

Versatile, Robust Design

In Doty imaging modules, the rf *Litz* or *Litzcage* coils are enclosed in the rf shield and packaged in an integrated aesthetic cover. Coil dimensions can be customized to your specifications.

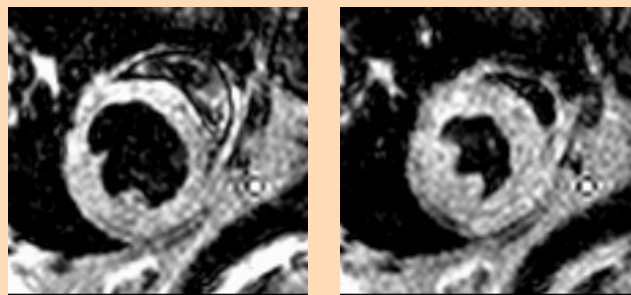
Exceptional Sensitivity

The linear *Litz* or CP (circular polarization) quadrature *Litzcage* coils have SNR 10-15% higher than with conventional linear or quadrature birdcages of similar dimensions – and often much better. The B_1 homogeneity is 10-30% better and the coils have improved B_0 homogeneity. Simple-tune *Litz* coils can be easily double-tuned. With all the improvements, customers are usually surprised that there is also usually a substantial cost advantage in choosing Doty coils.



T2 Adult Knee,
Image at 3T in a 16 cm
Doty *Litz* coil.

Courtesy of Qing Yang, Ph.D.
Hershey Medical Center, PA.



Beating Mouse Heart
Stills from FLASH images
at 4.7 T in a 2.4 cm Doty *Litz* coil.

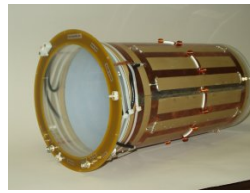
Courtesy of: Frederick H. Epstein, Ph.D., Brent A.
French, Ph.D., and Stuart S. Berr, Ph.D., Depts. of Radi-
ology and Biomedical Engineering, Univ. of Virginia.



5 year old's Knee Image
Acquired in a 120 mm ID
Doty *Litz* Coil at 125 MHz.

Courtesy of:
Bernard Dardzinski, Ph.D.,
Children's Hospital Medical
Center, Univ. of Cincinnati.

Small Animal Modules Typical *RF Litz* Coil Specifications CP(Circular Polarization) Quadrature

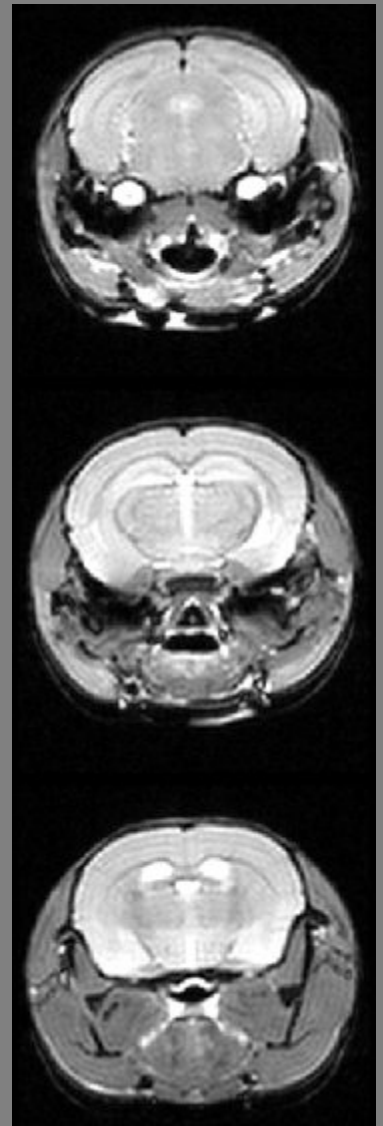


Clear I.D. mm	Coil Rung Length	Shield Diameter	¹ H MHz	τ ₉₀ , μs	Square pulse, Power, W	
					Light Load (30 mM saline 75% diameter)	Heavy Load (100 mM saline 75% diameter)
18	25	37	600	25	45	100
25	22	52	500	25	50	120
38	33	80	500	60	25	100
50	65	80	500	90	50	250
63	55	94	500	100	60	250
100	85	150	300	120	100	400
200	250	250	200	500	200	700

Mouse Brain Images

This T2 spin-echo experiment on a live mouse brain using a 2 cm linear *Litz* coil in a 4.7 T horizontal magnet demonstrated substantially better B₁ homogeneity and better S/N than a quadrature birdcage of similar dimensions. The *Litz* coil easily tuned and matched to any load in less than a minute.

Images Courtesy of Joel R. Garbow, Ph.D. Washington University, St. Louis, Missouri, USA.



Small Animal Modules Typical Double-tuned *RF Litz* Coil Specifications

Clear I.D. mm	Shield Dia. mm	Tuning	¹ H MHz	For ¹ H			For X= ³¹ P		
				t ₉₀ (μs)	LL Power (W)	HL Power (W)	t ₉₀ (μs)	LL Power (W)	HL Power (W)
15	50	¹ H/X	500	23	26	31	34	24	28
34	72	¹ H - ¹⁹ F	200	26	26	80			
34	79	¹ H/X	500	38	68	170	65	50	110
62	94	¹ H - ¹⁹ F	80	17	300	550	--	--	--
100	150	¹ H - ¹⁹ F	128	65	150	760	--	--	--
100	150	¹ H/X	200	110	120	510	220	50	180
130	200	¹ H/X	170	150	120	700	310	50	240
140	210	¹ H/X	128	130	140	700	275	55	240



Linear *RF Litz* Coil

For the above coils, the length of the homogeneous region is 80% of the coil ID. Coils with a multi-X channel normally tune ³¹P through ¹³C simply by changing plug-in capacitors. A "light load" is a spherical 30 mM saline sample of diameter 75% of the coil ID. A "heavy load" is a cylindrical 100 mM saline sample of diameter 75% of the coil ID and length extending well beyond the homogeneous region. All coils feature simple tuning, highest B₁ homogeneity, an external rf shield, and susceptibility matching near the sample region. They are resistant to mechanical shock, over-power, and moisture.

LL: Refers to a light load

HL: Refers to a heavy load