

**NeuWave™**

Microwave Ablation System

# Ablation Procedure Planning

**Workflow Guide**



**NeuWave™**

## For Time and Power Information

**The provided ablation zones (Length Diameter) data were obtained in ex-vivo bovine liver, porcine kidney, and porcine lung. Ex-vivo results may not indicate similar in-vivo results. Each case has unique characteristics that impact the actual in-vivo ablation zone size and shape.**

1. Laeseke et al. Multiple-Antenna Microwave Ablation: Spatially Distributing Power Improves Thermal Profiles and Reduces Invasiveness. *Journal of Interventional Oncology*. 2009; 2(2):105-112.
2. Brace, et al. Microwave Ablation with Multiple Simultaneously Powered Small-Gauge Triaxial Antennas: Results from an in Vivo Swine Liver Model. *Radiology* 2007; 224:1

Refer to the probe **Instructions For Use** for probe use information, including warnings and cautions. The most current IFU revisions for the NeuWave portfolio may be found at <http://www.e-ifu.com>

## Disclosure

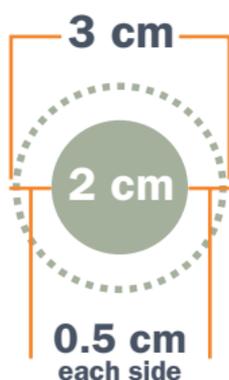
The NeuWave™ Microwave Ablation System and Accessories are indicated for the ablation (coagulation) of soft tissue in percutaneous, open surgical and in conjunction with laparoscopic surgical settings, including the partial or complete ablation of non-resectable liver tumors. The NeuWave™ Microwave Ablation System and Accessories are not indicated for use in cardiac procedures. The system is designed for facility use and should only be used under the orders of a clinician.

# NeuWave<sup>TM</sup> Pre-Procedure Planning

## Determining Ablation Zone

### 01 Lesion Size and Target Ablation

Lesion size is a primary input to determine the desired zone of ablation. Target ablation zones should incorporate the lesion plus the desired circumferential margin to help minimize the risk of incomplete ablations or additional lesion growth.



Example: 2.0 cm lesion with 0.5 cm margin = 3.0 cm desired ablation zone

### 02 In-Vivo Factors That May Influence Ablation Zone Size

Lesion size is a primary input to determine the desired zone of ablation. Target ablation zones should incorporate the lesion plus the desired circumferential margin to help minimize the risk of incomplete ablations or additional lesion growth.

In-vivo factor	Potential impact
Increased overall vascularity	Decreased ablation zone size
Decreased overall vascularity	Increased ablation zone size
Close proximity to large vessels	Decreased ablation zone size
Prior TACE or embolization	Increased ablation zone size

# NeuWave™ Pre-Procedure Planning

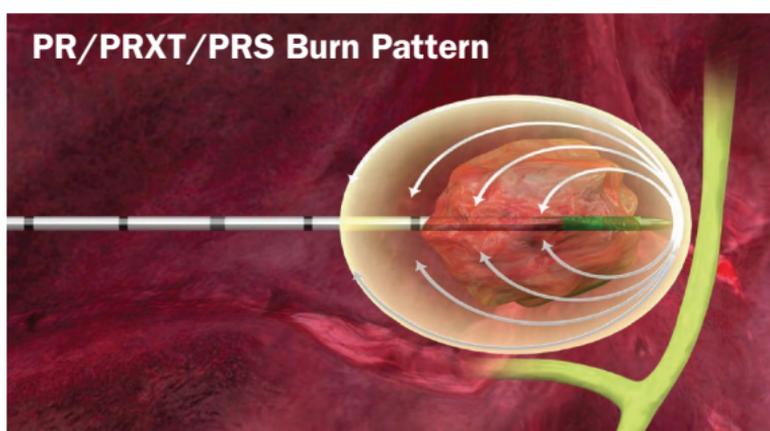
## Probe Selection

### NeuWave™ PR, PRXT, and PRS Probes

The only probes available with distal energy control to help protect non-target tissue

NeuWave™ PR XT Probe with a stiffer shaft for difficult probe placements

NeuWave™ PRS Probe with a stiffer shaft and longer cable for surgical ergonomics and workflow



### NeuWave™ LK Probe

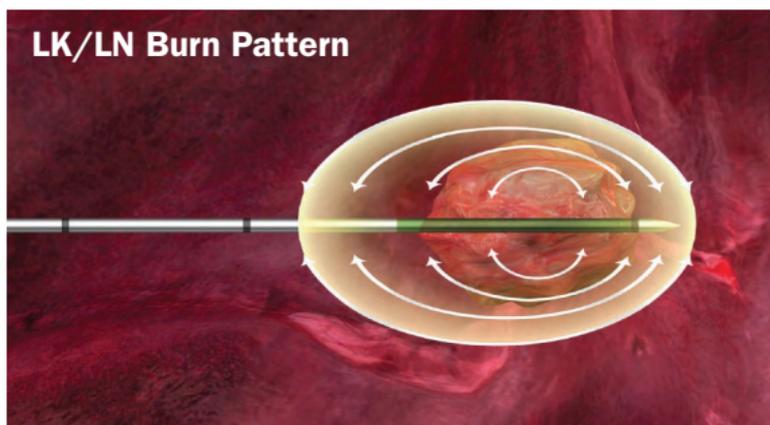
Designed for large ablation zones in all soft tissue types such as liver and kidney

NeuWave™ LK XT Probe with a stiffer shaft for difficult probe placements



### NeuWave™ LN Probe

Designed for large soft tissue ablation zones only in the lung



# NeuWave™ Pre-Procedure Planning

## Probe Selection

### 01 Proximity to Critical Structures

Proximity to critical structures and non-target tissue should be considered when selecting a probe. The NeuWave™ PR Probe has a limited ablation length to limit necrosis of adjacent tissue, including critical structures. Hydro-dissection can also be used.

### 02 Soft Tissue and Ablation Size

Tissue type and desired ablation size should be considered when selecting a probe.

NeuWave™ PR, PRXT, PRS Probes	NeuWave™ LK Probes	NeuWave™ LN Probes
Can be used in any soft tissue	Kidney Liver	Lung

Designed for large ablation zones

Soft Tissue Types	Single Probe		Multi-Probe
	Small Ablation Zone	Large Ablation Zone	
Liver	PR, PRXT, PRS	LK	Multiple synchronized probes create larger and more spherical ablation zones than a single re-positioned probe. <sup>1</sup>
Kidney	PR, PRXT, PRS	LK	
Lung	PR	LN	

# NeuWave™ Pre-Procedure Planning

## Probe Selection

### 03 Using Multiple Probes

Multiple probes can be activated simultaneously to create large, spherical ablation zones.

Larger, rounder ablations compared to sequential probe<sup>1</sup>



Higher temperatures at the periphery of the ablation zone<sup>1</sup>



More uniform temperatures across the ablation zone<sup>2\*</sup>



NeuWave™: 3 synchronized probes



COMPETITION: One probe repositioned 3 times



\*Compared to single probe sequential ablations

# NeuWave™ PR Probe

Ablation Zone Size			System Settings		
Length (cm)	Diameter (cm)	Distal Burn (cm)	# of Probes	Time (min)	Power
<b>Liver</b>					
2.6	1.3	0.3	1	1	65W
3.2	1.8	0.4	1	2	65W
3.6	2.2	0.4	1	3	65W
3.8	2.4	0.5	1	4	65W
4.0	2.5	0.5	1	5	65W
4.2	2.7	0.5	1	6	65W
4.3	2.8	0.5	1	7	65W
4.4	2.9	0.5	1	8	65W
4.5	3.0	0.6	1	9	65W
4.6	3.1	0.6	1	10	65W
.....					
5.8	4.6	N/A	2*	10	65W
6.5	5.3	N/A	3*	10	65W
<b>Kidney</b>					
2.5	1.4	0.2	1	1	65W
3.1	1.9	0.4	1	2	65W
3.4	2.2	0.4	1	3	65W
3.7	2.4	0.5	1	4	65W
3.9	2.6	0.5	1	5	65W
4.0	2.7	0.5	1	6	65W
4.2	2.8	0.6	1	7	65W
4.3	2.9	0.6	1	8	65W
4.4	3.0	0.6	1	9	65W
4.5	3.1	0.6	1	10	65W
<b>Lung</b>					
2.5	1.2	0.2	1	1	65W
3.0	1.5	0.3	1	2	65W
3.2	1.7	0.3	1	3	65W
3.4	1.8	0.3	1	4	65W
3.6	1.9	0.4	1	5	65W
3.7	2.0	0.4	1	6	65W
3.8	2.1	0.4	1	7	65W
3.9	2.2	0.4	1	8	65W
4.0	2.2	0.4	1	9	65W
4.1	2.3	0.4	1	10	65W

**DISCLAIMER: See time and power ex-vivo disclaimer on back of front cover.**

\* Multiple synchronized probes create larger and more spherical ablation zones than a single re-positioned probe.<sup>1</sup> When using multiple probes, a maximum of 2 cm spacing between probes is recommended to make a contiguous ablation zone. Ablations spaced more than 2 cm had non-contiguous results.

# NeuWave™ PR XT Probe

Ablation Zone Size			System Settings		
Length (cm)	Diameter (cm)	Distal Burn (cm)	# of Probes	Time (min)	Power
<b>Liver</b>					
2.6	1.4	0.3	1	1	65W
3.1	1.9	0.3	1	2	65W
3.5	2.2	0.4	1	3	65W
3.7	2.5	0.4	1	4	65W
3.9	2.6	0.4	1	5	65W
4.0	2.8	0.5	1	6	65W
4.2	2.9	0.5	1	7	65W
4.3	3.0	0.5	1	8	65W
4.4	3.1	0.5	1	9	65W
4.4	3.2	0.5	1	10	65W
.....					
5.6	4.7	N/A	2*	10	65W
6.0	5.2	N/A	3*	10	65W
<b>Kidney</b>					
2.4	1.4	0.2	1	1	65W
3.0	1.9	0.3	1	2	65W
3.3	2.2	0.4	1	3	65W
3.5	2.3	0.4	1	4	65W
3.7	2.5	0.5	1	5	65W
3.9	2.6	0.5	1	6	65W
4.0	2.7	0.5	1	7	65W
4.1	2.8	0.5	1	8	65W
4.2	2.9	0.6	1	9	65W
4.3	3.0	0.6	1	10	65W

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\* Multiple synchronized probes create larger and more spherical ablation zones than a single re-positioned probe.<sup>1</sup> When using multiple probes, a maximum of 2 cm spacing between probes is recommended to make a contiguous ablation zone. Ablations spaced more than 2 cm had non-contiguous results.

# NeuWave™ PRS 15 Probe

Ablation Zone Size			System Settings		
Length (cm)	Diameter (cm)	Distal Burn (cm)	# of Probes	Time (min)	Power
<b>Liver</b>					
2.1	1.3	0.2	1	1	65W
2.7	1.8	0.3	1	2	65W
3.1	2.2	0.4	1	3	65W
3.3	2.4	0.4	1	4	65W
3.5	2.6	0.4	1	5	65W
3.7	2.7	0.4	1	6	65W
3.8	2.9	0.5	1	7	65W
3.9	3.0	0.5	1	8	65W
4.0	3.1	0.5	1	9	65W
4.1	3.1	0.5	1	10	65W
.....					
2.6	1.6	0.3	1	1	80W
3.2	2.1	0.4	1	2	80W
3.6	2.5	0.4	1	3	80W
3.8	2.7	0.5	1	4	80W
4.0	2.9	0.5	1	5	80W
4.2	3.0	0.5	1	6	80W
4.3	3.2	0.5	1	7	80W
4.4	3.3	0.5	1	8	80W
4.5	3.4	0.5	1	9	80W
4.6	3.4	0.6	1	10	80W
.....					
5.6	4.4	0.4	2*	10	80W
6.2	4.9	0.4	3*	10	80W

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\* Multiple synchronized probes create larger and more spherical ablation zones than a single re-positioned probe.<sup>1</sup> When using multiple probes, a maximum of 2 cm spacing between probes is recommended to make a contiguous ablation zone. Ablations spaced more than 2 cm had non-contiguous results.

# NeuWave™ PRS 15 Probe

PRS Probes

Ablation Zone Size			System Settings		
Length (cm)	Diameter (cm)	Distal Burn (cm)	# of Probes	Time (min)	Power
<b>Kidney</b>					
2.0	1.2	0.2	1	1	65W
2.6	1.6	0.3	1	2	65W
2.9	1.9	0.3	1	3	65W
3.1	2.0	0.4	1	4	65W
3.3	2.2	0.4	1	5	65W
3.5	2.3	0.4	1	6	65W
3.6	2.4	0.4	1	7	65W
3.7	2.5	0.4	1	8	65W
3.8	2.5	0.5	1	9	65W
3.9	2.6	0.5	1	10	65W
.....					
2.5	1.4	0.3	1	1	80W
3.1	1.9	0.4	1	2	80W
3.4	2.1	0.4	1	3	80W
3.6	2.3	0.4	1	4	80W
3.8	2.4	0.5	1	5	80W
3.9	2.6	0.5	1	6	80W
4.0	2.7	0.5	1	7	80W
4.1	2.7	0.5	1	8	80W
4.2	2.8	0.5	1	9	80W
4.3	2.9	0.5	1	10	80W

**DISCLAIMER: See time and power ex-vivo disclaimer on back of front cover.**

\* Multiple synchronized probes create larger and more spherical ablation zones than a single re-positioned probe.<sup>1</sup> When using multiple probes, a maximum of 2 cm spacing between probes is recommended to make a contiguous ablation zone. Ablations spaced more than 2 cm had non-contiguous results.

# NeuWave™ PRS 35 Probe

Ablation Zone Size			System Settings		
Length (cm)	Diameter (cm)	Distal Burn (cm)	# of Probes	Time (min)	Power
<b>Liver</b>					
3.0	2.1	0.4	1	3	80W
3.3	2.4	0.4	1	4	80W
3.5	2.6	0.4	1	5	80W
3.7	2.7	0.5	1	6	80W
3.8	2.8	0.5	1	7	80W
4.0	3.0	0.5	1	8	80W
4.1	3.1	0.5	1	9	80W
4.2	3.1	0.5	1	10	80W
.....					
3.2	2.1	0.3	1	1	140W
3.9	2.7	0.4	1	2	140W
4.3	3.0	0.5	1	3	140W
4.6	3.3	0.5	1	4	140W
4.9	3.4	0.6	1	5	140W
5.1	3.6	0.6	1	6	140W
5.2	3.7	0.6	1	7	140W
5.3	3.8	0.6	1	8	140W
5.5	3.9	0.7	1	9	140W
5.6	4.0	0.7	1	10	140W
.....					
5.8	5.0	N/A	2*	10	110W
5.7	5.6	N/A	3*	10	80W

**DISCLAIMER: See time and power ex-vivo disclaimer on back of front cover.**

\* Multiple synchronized probes create larger and more spherical ablation zones than a single re-positioned probe.<sup>1</sup> When using multiple probes, a maximum of 2 cm spacing between probes is recommended to make a contiguous ablation zone. Ablations spaced more than 2 cm had non-contiguous results.

# NeuWave™ PRS 35 Probe

PRS Probes

Ablation Zone Size			System Settings		
Length (cm)	Diameter (cm)	Distal Burn (cm)	# of Probes	Time (min)	Power
<b>Kidney</b>					
2.8	1.9	0.4	1	3	80W
3.1	2.1	0.4	1	4	80W
3.4	2.2	0.5	1	5	80W
3.6	2.4	0.5	1	6	80W
3.7	2.5	0.5	1	7	80W
3.9	2.6	0.5	1	8	80W
4.0	2.6	0.5	1	9	80W
4.1	2.7	0.6	1	10	80W
.....					
2.8	1.9	0.4	1	1	140W
3.6	2.4	0.5	1	2	140W
4.0	2.7	0.5	1	3	140W
4.3	2.9	0.6	1	4	140W
4.6	3.0	0.6	1	5	140W
4.8	3.2	0.6	1	6	140W
4.9	3.3	0.7	1	7	140W
5.1	3.4	0.7	1	8	140W
5.2	3.5	0.7	1	9	140W
5.3	3.5	0.7	1	10	140W

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\* Multiple synchronized probes create larger and more spherical ablation zones than a single re-positioned probe.<sup>1</sup> When using multiple probes, a maximum of 2 cm spacing between probes is recommended to make a contiguous ablation zone. Ablations spaced more than 2 cm had non-contiguous results.

# NeuWave™ LK Probe

Ablation Zone Size			System Settings		
Length (cm)	Diameter (cm)	Distal Burn (cm)	# of Probes	Time (min)	Power
<b>Liver</b>					
6.4	4.8	N/A	2*	10	95W
6.4	5.0	N/A	3*	10	65W
.....					
5.3	3.0	0.1	1	4	140W
5.5	3.2	0.1	1	5	140W
5.7	3.4	0.2	1	6	140W
5.9	3.5	0.3	1	7	140W
6.0	3.7	0.3	1	8	140W
6.2	3.8	0.4	1	9	140W
6.3	3.9	0.4	1	10	140W
<b>Kidney</b>					
4.7	3.0	0.0	1	9	90W
4.8	3.1	0.1	1	10	90W
.....					
5.2	3.1	0.0	1	5	140W
5.4	3.3	0.1	1	6	140W
5.5	3.4	0.2	1	7	140W
5.7	3.5	0.3	1	8	140W
5.8	3.6	0.4	1	9	140W
6.0	3.7	0.4	1	10	140W

**DISCLAIMER: See time and power ex-vivo disclaimer on back of front cover.**

\* Multiple synchronized probes create larger and more spherical ablation zones than a single re-positioned probe.<sup>1</sup> When using multiple probes, a maximum of 2 cm spacing between probes is recommended to make a contiguous ablation zone. Ablations spaced more than 2 cm had non-contiguous results.



# NeuWave™ LK XT Probe

Ablation Zone Size			System Settings		
Length (cm)	Diameter (cm)	Distal Burn (cm)	# of Probes	Time (min)	Power
<b>Liver</b>					
6.8	4.9	N/A	2*	10	95W
6.5	5.3	N/A	3*	10	65W
.....					
5.5	3.5	0.0	1	6	140W
5.7	3.7	0.0	1	7	140W
5.9	3.8	0.1	1	8	140W
6.0	3.9	0.1	1	9	140W
6.2	4.0	0.2	1	10	140W
<b>Kidney</b>					
4.6	2.9	0.0	1	4	140W
4.8	3.1	0.1	1	5	140W
5.0	3.2	0.2	1	6	140W
5.1	3.4	0.2	1	7	140W
5.3	3.5	0.3	1	8	140W
5.4	3.5	0.3	1	9	140W
5.5	3.6	0.4	1	10	140W

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\* Multiple synchronized probes create larger and more spherical ablation zones than a single re-positioned probe.<sup>1</sup> When using multiple probes, a maximum of 2 cm spacing between probes is recommended to make a contiguous ablation zone. Ablations spaced more than 2 cm had non-contiguous results.



# NeuWave™ LN Probe

Ablation Zone Size			System Settings		
Length (cm)	Diameter (cm)	Distal Burn (cm)	# of Probes	Time (min)	Power
<b>Lung</b>					
6.7	3.5	0.0	1	9	140W
6.9	3.5	0.0	1	10	140W

**DISCLAIMER: See time and power ex-vivo disclaimer on back of front cover.**

\* Multiple synchronized probes create larger and more spherical ablation zones than a single re-positioned probe.<sup>1</sup> When using multiple probes, a maximum of 2 cm spacing between probes is recommended to make a contiguous ablation zone. Ablations spaced more than 2 cm had non-contiguous results.



# NeuWave™ SR Probe

The NeuWave™ SR Probe is ideal for laparoscopic ablations where additional probe length and stiffness are desired.

Ablation Zone Size			System Settings		
Length (cm)	Diameter (cm)	Distal Burn (cm)	# of Probes	Time (min)	Power
<b>Liver</b>					
6.6	5.1	N/A	2*	10	95W
6.3	5.2	N/A	3*	10	65W
.....					
5.7	3.8	0.0	1	6	140W
5.9	3.9	0.1	1	7	140W
6.1	4.0	0.2	1	8	140W
6.2	4.1	0.2	1	9	140W
6.3	4.2	0.3	1	10	140W
<b>Kidney</b>					
5.4	3.3	0.0	1	6	140W
5.6	3.4	0.1	1	7	140W
5.7	3.5	0.1	1	8	140W
5.9	3.6	0.2	1	9	140W
6.0	3.7	0.3	1	10	140W

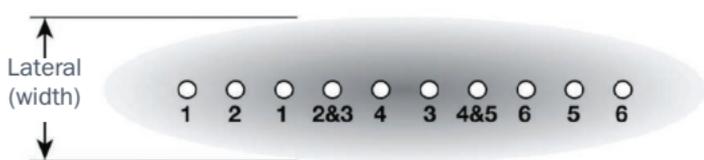
**DISCLAIMER: See time and power ex-vivo disclaimer on back of front cover.**

\* Multiple synchronized probes create larger and more spherical ablation zones than a single re-positioned probe.<sup>1</sup> When using multiple probes, a maximum of 2 cm spacing between probes is recommended to make a contiguous ablation zone. Ablations spaced more than 2 cm had non-contiguous results.



# Pre-Transsection Coagulation with NeuWave™ PR, PRXT, and PRS Probes

Use the following “picket fence” pattern to create a line of ablated tissue prior to resection.



First probe placement



Second probe placement



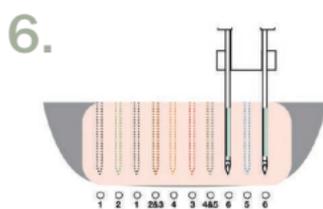
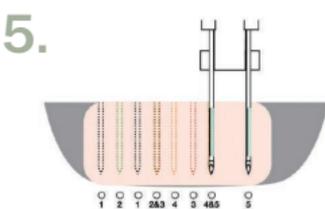
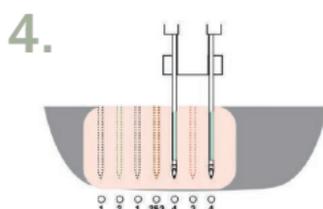
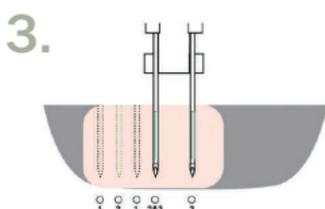
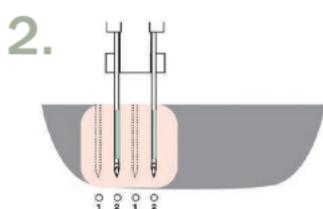
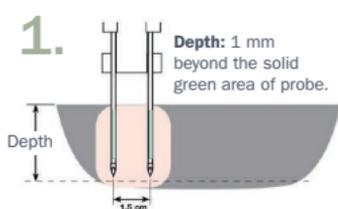
Third probe placement



Forth probe placement



Fifth probe placement



# Pre-Transsection Coagulation with NeuWave™ PR, PRXT, and PRS Probes

1. Use the NeuWave™ System in Surgical Mode.
2. Perform “Test” of each probe.
3. Insert two (2) NeuWave™ 17-gauge or 15-gauge ablation probes into the Dual Probe Clip. Using the probe clip ensures both 1.5 cm spacing between the probes, as well as parallel probe placement.
4. Insert the two (2) probes into the target tissue. This first placement will correspond to the probes labeled “1”.

**NOTE:** For all probe insertions, ensure that the probes are inserted at least 1 mm beyond the solid green area of the probe. If the probes are inserted to a more shallow depth, a reflected power error may occur.

5. Deliver power at the desired power and time settings by pressing the “On” button or depressing and holding the footswitch.
6. Remove the probes from the target tissue and move the probes linearly such that one probe is placed between the coagulation zones created by the first probe placement, corresponding to the probes labeled “2”.
7. Deliver power at the desired power and time settings by pressing the “On” button or depressing and holding the footswitch.
8. Remove the probes linearly such that one probe is placed approximately in the same location as the previous placement and one probe is in uncoagulated tissue.

# Pre-Transaction Coagulation with NeuWave™ PR, PRXT, and PRS Probes

## NeuWave™ PR Probes (2)

Ablation Zone Size		System Settings		
Lateral (width) (cm)	Depth (cm)	# of Probes	Time	Power
<b>Liver</b>				
1.3	1.6	2	20 sec	65W
1.6	1.8	2	20 sec	95W

## NeuWave™ PRXT Probes (2)

Ablation Zone Size		System Settings		
Lateral (width) (cm)	Depth (cm)	# of Probes	Time	Power
<b>Liver</b>				
1.7	2.1	2	20 sec	65W
2.1	2.2	2	20 sec	95W

## NeuWave™ PRS 15 Probes (2)

Ablation Zone Size		System Settings		
Lateral (width) (cm)	Depth (cm)	# of Probes	Time	Power
<b>Liver</b>				
1.5	2.1	2	20 sec	80W
1.8	2.1	2	20 sec	110W

## NeuWave™ PRS 35 Probe (1)

Ablation Zone Size		System Settings		
Lateral (width) (cm)	Depth (cm)	# of Probes	Time	Power
<b>Liver</b>				
1.0	1.7	1	20 sec	85W
1.5	2.2	1	20 sec	110W

**DISCLAIMER:** See time and power ex-vivo disclaimer on back of front cover.

**See the NeuWave™ User Manual for 1 probe PTC guidance.**

Results were obtained by following the technique for Pre-Transaction Coagulation identified in the NeuWave™ System Manual (for revision 1.2.x and higher) using two NeuWave™ PR Probes in the Dual Probe Clip accessory, a 1.5 cm probe spacing and coagulating in ex-vivo bovine liver and porcine kidney. Single probe data was obtained using a 0.75 cm spacing.



For instructional videos  
and additional information  
on the use of NeuWave™  
Microwave Ablation  
System, please visit:

