

## METHODOLOGY FOR FINDING THE 10 GRAM ON THE IDX 660 SAR SYSTEM

First I will discuss the method for finding the 1g average and go on to 10g average.

The method for finding the one gram average on the 660 systems consisted of a single z axis scan on the hot spot (highest reading found during the area scan). The first sample point (measurement), on the axis scan, started with the probe at the surface and then the robot moved the probe up in z incremental step (SAR Scan Step Size). The system would then use these points to extrapolate the center of the probe dipoles to the surface of the phantom. This extrapolation distance is known as the probe offset.

An average slope is determined from the three data points nearest to the surface of the phantom, and is then used to calculate attenuation of SAR energy density with height above the phantom surface, as shown in the following equations.

$$\text{Slope} = \frac{\frac{E_{\text{tot } Z1}}{E_{\text{tot } Z2}} + \frac{E_{\text{tot } Z2}}{E_{\text{tot } Z3}}}{2}$$

$$E_{\text{tot } Z0} = E_{\text{tot } Z1} \cdot e^{\text{exp}}, \text{ where } \text{exp} = \ln(\text{Slope}) \cdot \frac{\text{Offset}}{\text{Spacing}}$$

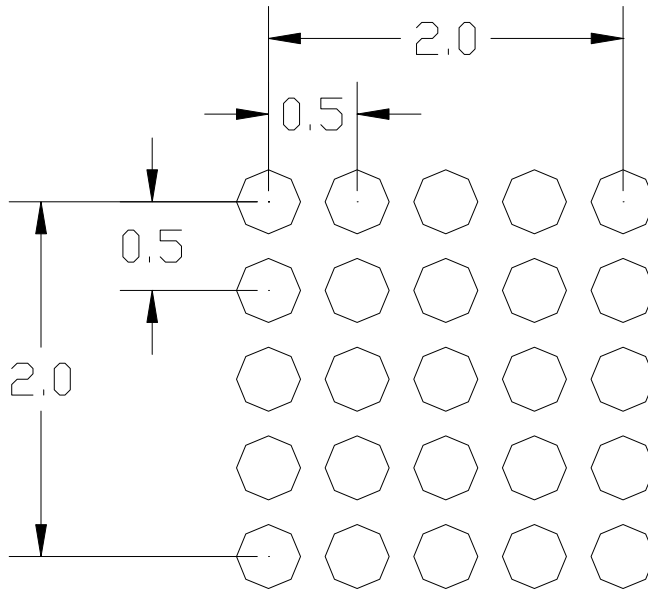
Where:  $E_{\text{tot } Zn}$  = total voltage at point n in the +Z direction (measured value)  
 $E_{\text{tot } Z0}$  = total voltage for dipole at phantom surface (extrapolated value)  
Offset = distance from center of probe dipoles to the physical tip of probe  
(approximately 0.2 cm - 0.3 cm)  
Spacing = Z distance between measurement points (SAR Scan Step Size)

The exposure of 1 gram of simulated tissue is calculated using the measurement from a location 1 cm above the phantom surface ( $E_{\text{tot } 1\text{cm}}$ ). An average SAR value for a cube weighing 1 gram is the average of the values  $E_{\text{tot } 1\text{cm}}$  and  $E_{\text{tot } Z0}$ .

$$\text{SAR (mW/g)} = \frac{E_{\text{tot } Z0} + E_{\text{tot } 1\text{cm}}}{2} \cdot \frac{\text{CF}}{\text{Sensor Factor}}$$

$E_{\text{tot } 1\text{cm}}$  is found using linear interpolation. The Sensor factor is an arbitrary value of 10.8 mV per mW/cm<sup>2</sup>. CF is the conversion factor and is determined during a temperature calibration.

Now to find the 10g average the IDX 660 system used a 2x2x2 cm cube. This size of cube took into account a tissue density of 1.25 g/cm<sup>3</sup>. The system does 25 axis scans in a 5 x 5 grid with a 0.5 cm x,y spacing; for a total of 2 x 2 cm square region.



After the 25 axis scans are done the system does the same surface extrapolation as the 1g. But it uses the Z value at 2 cm instead of the 1 cm to do the average. This is done for all 25 points and then these 25 values are averaged to get the 10g value.