# A HIGH POWER DRIVING AND SELECTION FIELD COIL FOR AN OPEN MPI SCANNER

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**INTRODUCTION:** An open MPI scanner was first introduced in [1]. We decided to push the concept further by designing a mini-pig sized scanner. The results of this design are in part presented in this abstract. The design objective for this scanner is to have a 360° acces to the subject. The imaging volume will be of 60 x 60 x 60 mm³ with a voxel size of 2 x 2 x 1mm³. A 3D Lissajous trajectory using signals in the range of 25 kHz will be used [2]. Here, the combined drive and selection coil is presented.

**METHODS:** Three coil pairs are used to make this scanner: two D drive coil pairs are used to move the Field Free Point (FFP) in a plane parallel to the scanner surface and one circular coil pair is used to perpendicularly move it to the surface. This circular coil pair is also used to generate the selection field. Only this last coil pair is presented here. A special care has been taken to cope with the high voltage resulting from the 25 kHz driving field. The cooling flow has also been simulated and validated, in order to deal with the scanner heat loss. Finally, a full sized prototype of the coil has been produced, in order to validate the multi-layer design of the Litz-wire coils. This prototype also integrates heat sensors to monitor the inner temperature of the coil.

**RESULTS:** Three Litz wires have been used in parallel in order to decrease the layer to layer voltage down to 4 kV and the coil voltage down to 8 kV. A two millimeter thick epoxy plate has been glued between each layer, in order to prevent any electrical breakdown between the layers. A special epoxy has been used to minimize the inner temperature of the coil, which reached 180 °C with a dissipated power of 5.2 kW. The use of parallel Litz wire leads to currents having different phase angle in every wire which has to be corrected.

**CONCLUSION:** A high power Litz-wire-based coil has been produced. The cooling system has been validated, even if improvements have to be done, especially on the connection points, as one has been de-soldered during one test. The phase angle of the signal in the three parallel wires has to be corrected before further AC tests are conducted. Finally, a higher flow speed will be applied, in order to increase the applied power.

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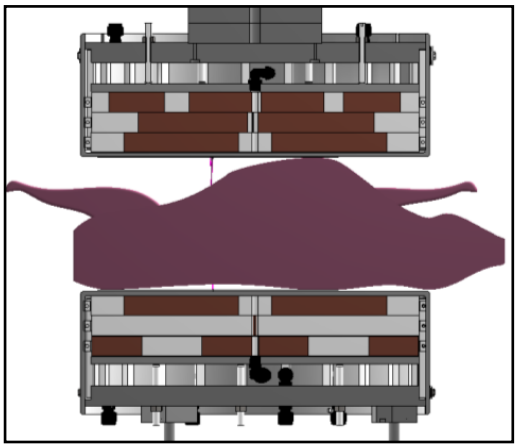

***Figure 1.*** Cross section view of the scanner containing a mini-pig.

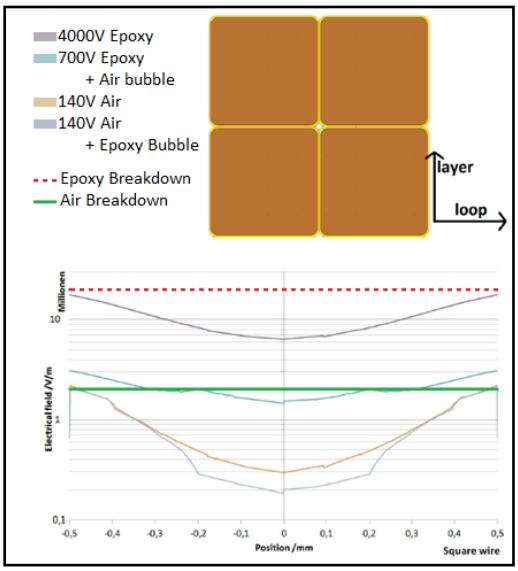


***Figure 2.*** Electrical field and breakdown voltage between two layers of a coil made with a square Litz wire with a side of 7.3 mm. The material between the 4 wire changes between air and epoxy with and without a 0.4 mm bubble in the middle. The voltage difference is applied between the top and the bottom layer.

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