

**Otokinetics:** This project highlights SBM’s capabilities in the areas of finite element modeling and multi-physics analysis, as well as independent validation and verification. The client, OtoKinetics Inc., is developing a fully-implantable wireless hearing aid system for direct acoustic stimulation of the cochlea. SBM designed, simulated, and optimized a fully hermetic, sealed fluidic micro-actuator driven by a micro-fabricated PZT transducer for this purpose. Using COMSOL multi-physics toolkit and CAD design with SolidWorks, the team designed and iterated a device structure until it met customer requirements for delivered acoustic power efficiency. The team also carried out analyses of frequency response, residual stress and overall system gain. A complete drawing package was prepared, and a sample lot of devices was manufactured using this build-to-print set of drawings. Following fabrication, SB Microsystems validated system performance in a custom benchtop set-up, and as-fabricated results were compared to modeled predictions. Deviations for performance were explored by further incorporating more detailed as-built characteristics of the device into the multiphysics model (e.g. laser welding beads were incorporated into the model to explore the second order effects of that detail on device performance.) Additional work on this system has included the modeling of a wireless inductively-coupled power and data transmission systems.

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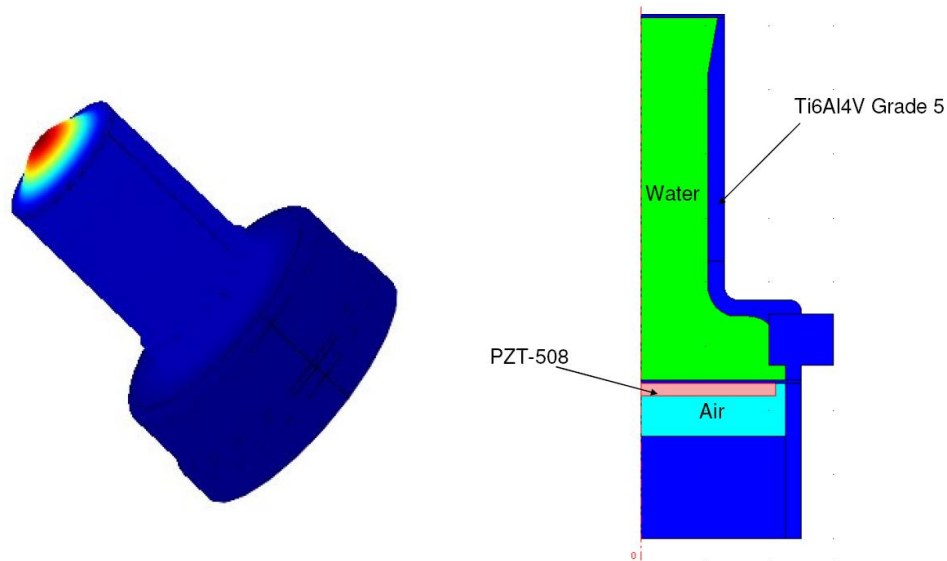


Figure 1: Three dimensional (3D) model (left) and two dimensional (2D) axially-symmetric model (right) of the micro-actuator. The 2D model was used for the final device analysis and validated by comparing the results with selected 3D test cases