Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
ANSYS, Inc. Request for Waiver of Rule Section 1.1307(b)(2)	)	OET Docket No.10-166

COMMENTS OF CAMBRIDGE CONSULTANTS, INC.

Cambridge Consultants, Inc. herewith submits comments in support of the request of ANSYS, Inc. for a waiver of Section 1.1307(b)(2) of the Commission's Rules, 47 C.F.R. § 1.1307(b)(2), to permit routine environmental evaluation of medical implant or body-worn equipment authorized for use in the Medical Device Radiocommunication Service (MedRadio) by finite element method (FEM) computational modeling.

Cambridge Consultants, Inc. (CCI) is an outsourced product development partner for multidisciplinary product development including wireless product development and medical product development. Specific to this proceeding, CCI utilizes ANSYS' High Frequency Structure Simulator (HFSS) FEM electromagnetic modeling software on antenna systems we design for clients. One of our technology specialization areas is designing antenna systems for implantable devices which are constrained to operating in the MedRadio frequency band (401-406 MHz). The above referenced rule states that environmental evaluation of RF exposure prior to equipment authorization may be done by either laboratory measurement techniques or analysis via finite difference time domain (FDTD) computational modeling. Though there are differences between FDTD and FEM (to be detailed below), the fundamental results for these two simulation methods are nearly identical, as detailed in the following references:

[1] A. Bhobe, C. Holloway, and M. Picket-May, "Meander Delay Line Challenge Problem: A comparison using FDTD, FEM and MOM," *IEEE International Symposium on Electromagnetic Compatibility*, vol. 2, pp.805-810, August 2001.

[2] S. Georgakopoulos, A. Polycarpou, C. Balanis, and C. Birtcher, "Analysis of Coupling between Cavity-Backed Slot Antennas: FDTD, FEM & Measurements," *IEEE antennas and Propagation Society International Symposium*, vol. 1, pp. 582-585, July 1999.

FEM is an alternate computational method yielding equivalent results as FDTD and should be considered equivalent for equipment authorization.

In general, FDTD and FEM approach the solving of Maxwell's Equations from different perspectives. FDTD meshes the device under analysis with fixed dimension rectangular cells (Yee cells), while FEM uses an unstructured mesh, typically tetrahedral. FEM constructs Green's functions requiring the solution of dense and sparse matrices, while FDTD solves Maxwell's equations in a fully explicit way via updates of the field values time-step by time-step (thereby explicitly following the electromagnetic waves as they propagate through the structure). As a result, a single FDTD simulation can provide data over an ultra-wide frequency range whereas a FEM simulation step is for a particular frequency. FDTD's time-step approach is also inherently parallel in nature and can achieve excellent scaling of computational resources. Both methods perform volumetric sampling of the electric fields throughout the entire space.

In situations where computational resources are not an issue, both these methods yield nearly identical data, making either method equivalent for evaluating RF exposure. One advantage for FEM is how an unstructured mesh conforms to curved surfaces better. Communication antennae for implanted medical devices are frequently laminar conforming to the surface of the implant housing. The shape of implant housings usually takes on intricate curvatures needed to conform to the available spaces within the human body. FEM modeling, by virtue of its unstructured mesh, allows better modeling for these unique and extensive changes in

curvature. Conforming to these changes in curvature also allows high precision grids to be used where the medium properties are changing rapidly, as they are in the human body, or where the field strengths vary quickly as they do in close proximity to the antenna. FDTD can produce coarse and fine meshes, but the precision needed to satisfy the Courant condition is best provided by the unstructured mesh present in FEM modeling.

Also, since RF implantables are constrained to single frequency band operation (i.e. MedRadio), the frequency-based FEM approach provides no loss in generality over an FDTD approach.

In light of the foregoing, Cambridge Consultants, Inc. respectfully requests that the Commission approve ANSYS' request for waiver as in the public interest.

Respectfully submitted,

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Cambridge Consultants, Inc.