



Frequency Agile Microwave Bonding System (FAMOBS)

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The research aimed to manufacture a proof-of-concept device for variable frequency microwave heating. For the purpose of the feasibility study, the equipment performed only the RF-cure at high frequency for ICA bumps of micron size and/or the cure at low frequency of encapsulants. The installation of this oven on the arm of a flip-chip bonding machine for micron accuracy alignment capability and the RF-cure of underfills were postponed until the full proposal stage. The feasibility study proved that, in principle, a micro-engineered microwave oven can be fabricated.

The proof-of-concept prototype of the 'open-ended' oven comprises a dielectric filled rectangular waveguide having a short circuit at the excitation end of the waveguide shown on the left of the photograph and an open circuit at the opposite end shown in the centre, such that the target package to which heat is to be applied, can be placed easily within the evanescent fields adjacent to the dielectric interface. The prototype has been specifically designed to provide a demonstration of the formation of multiple 'hot-spots' in the open-end (fig. 1). At a lower frequency of excitation, the oven can also be used to cure uniformly paste materials such as encapsulants.

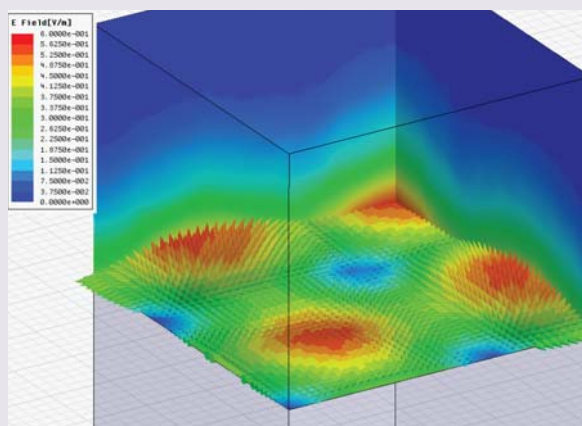


Fig. 1 Total E-field pattern at the interface for a TM_{3,3}, k mode within a quarter section of the cavity.

The project demonstrated that a set of process conditions can be achieved so that variable frequency microwave heating and cure technology can be implemented successfully into electronic component manufacture, assembly and packaging. No attempt was made to fully characterize the optimum set of parameters for RF-curing. This project enabled the creation of a unique, patentable RF-cure apparatus for insertion into a novel bonding equipment that will permit a more efficient packaging technology.

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