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*Paper Abstract*

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**Gov't Agency/Lab the Subject Technology Was Developed By/For:** JPL, Director's Discretionary Fund

**Contract No.(if applicable):**

**Paper Title:** A High Frequency Electronic Packaging Technology

**Category:** Electronics (or Adv. manufacturing)

**Description:**

Commercial and ([ev.rrme.nmt communications, radar, and information systems face the challenge of cost and mass reduction via the application of advanced packaging technology. A majority of both government and industry support has been focused on low frequency digital electronics. However, higher operating frequencies for both digital and analog circuits will be required for future systems. This paper discusses the kick-off of a JPL sponsored Director’s Discretionary Fund project to specifically address the needs of high frequency packaging. We are working with industry, universities (Massachusetts Institute of Technology, The University of Michigan, University of Colorado, and California Institute of Technology), NASA Lewis Research Center, and Do1 to characterize and analyze high frequency multichip module packages. We will present our initial progress for this effort which complements our ongoing work on manufacturable n-illimeter-wave packages.

Our project is divided into two broad categories: package material systems and RFI performance. The former category evaluates advanced materials for multichip modules. Low cost alumina substrates with excellent surface finish are readily available but the thermal conductivity of alumina is not adequate for some applications. Aluminum nitride provides high thermal conductivity but commercially available substrates do not have adequate surface finish for high frequency applications (30-40GHz) and are relatively expensive, in order to take advantage of both the surface finish of alumina and the high thermal conductivity of AlN, we deposited AlN films on alumina substrates using rf reactive sputtering of Al in argon/nitrogen plasma. These structures were then characterized for thermal stability, metallization adhesion and chemical stability and compared. In addition, as part of this task we will work with industry to characterize multi-metal systems and high density interconnection techniques.
in the second category of this effort, we are investigating a novel application of non-invasive electro-optic probing to characterize both digital and RF circuits. The initial step is to demonstrate that this technique can be applied to a closed structure. Using this technique, an active RF/mixed-signal multichip phased array module will be characterized. We are also developing full-wave electromagnetic CAD techniques which industry can adopt to accurately analyze active circuits in a package environment.