Contribution ID: **79**

Type: **not specified**

Fabrication, Assembly, and Evaluation of Cu-Sn and Cu-Cu Bump Bonding arrays for Ultra-Fine Pitch Hybridization and 3D Integration

Thursday, 25 September 2008 11:15 (25 minutes)

Summary

The use of collapsible (solder) bump interconnects in pixel detector hybridization has been shown to be very successful. However, as pixel sizes decrease, the use of non-collapsible metal-to-metal bump bonding methods is needed to push the interconnect dimensions smaller. Furthermore, these interconnects are compatible with 3D intgration technologies which are being considered to increase overall pixel and system performance. These metal-to-metal bonding structures provide robust mechanical and electrical connections and allow for a dramatic increase in pixel density. Of particular interest are Cu-Cu thermocompression bonding and Cu/Sn-Cu solid-liquid diffusion bonding processes.

Working with Fermilab, RTI undertook a demonstration to show that these bump structures could be reliably used to interconnect devices designed with 20 micron I/O pitch. Cu and Cu-Sn bump fabrication processes were developed to provide a well-controlled surface topography necessary for the formation of low resistance, high yielding, and reliable interconnects. The electrical resistance and yield has been quantified based on electrical measurements of daisy chain test structures and the mechanical strength of the bonding has been quantified through die shear testing. The reliability has been characterized through studies of the impact of thermal exposure on the mechanical performance of the bonds. Cross-section SEM analysis, coupled with high resolution energy dispersive spectroscopy, has provided insight into the physical and chemical nature of the bonding interfaces and aided in the evaluation of the long-term stability of the bonds.

Presenter: HUFFMAN, Alan (RTI)

Session Classification: 3D Bonding