**In-situ Sensing of Interface Delamination in IC Packaging**

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**Objectives:**

- Detect pre-existing thermal interface material failure and sealant delamination in the heat sink region
- Develop stress sensitive CNT & CNF multifunctional membrane for spatial strain monitoring of IC packages
- *In-situ* sensing of delamination and prognosis modeling

**Proposed Approach**

- Implement a novel guided wave approach to detect and quantify delamination at the Integrated heat sink interface.
- Enable resolution enhancement over Scanning acoustic microscopy.
- Enhance resolution by using Matching pursuit decomposition (MPD) and Time Frequency (TF) analysis.

**Problem Statement**

- Delamination detection.
- Bond line thickness measurement.
- Interfaces:
  - IHS – PTIM / Si-PTIM
  - IHS – Sealant / SR-Sealant

**Complex Laminate**

- Study propagation of guided waves in Si-TIM-IHS interface.
- Cohesive zone modeling of interfaces by performing fracture tests (Mode 1 and 2).
- Material property characterization under loading conditions.

**Fundamental Study on Guided Waves in IC Packages**

**Inspection of Intel Samples**

Bucky paper multifunctional membrane

**Embedded Strain Sensing**

- Develop CNT integration methods in IC Packages
- CNT nanocomposites with self sensing capability
- Process development for scalable fabrication of CNT buckypaper
- Accurate strain and crack quantification using *in-situ* electrical measurements

**Bucky Paper TIM**

- Better thermal properties than Thermal interface material*

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*Carbon nanofiber based buckypaper used as a thermal interface material. Lafi2 Et Al.*

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