



iNEMI

International Electronics Manufacturing Initiative

Halogen-Free Project

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Advancing manufacturing technology

Proactive Programs

“Industry should take a proactive approach, work with stakeholders, and direct our activities where there is technical/ecological evidence we could and should be doing a better job to protect the environment. We should involve stakeholders in the process of evaluating alternative technologies to determine trade-offs between product functionality, environmental impact, reliability, safety, and cost.”

Two Projects on Bromine Free Substrates

- **Participants:**
 - **US EPA**
 - **Electronics industry through iNEMI**
 - **Other Stakeholders including NGOs**
- **Environmental Objective**
 - **Evaluate environmental risk of brominated and alternative flame retardants in PWB substrates**
- **Unique Characteristics**
 - **Industry lead proactive study to evaluate:**
 - **The technology risks of alternatives**
 - **EPA lead partnership to evaluate:**
 - **The environmental risks**

Halogen-free Project

Overall Project Objectives:

- **Build on industry knowledge and capability,**
- **Consider unique market segment requirements,**
- **Identify technology readiness and gaps,**
- **Stimulate supply capability, and**
- **Recommend standards development opportunities**

Revised Project Schedule

- **Phase I (Design) Feb 1 '06 – Sept 30 '06**
- **Phase II (Test) Feb 15 '07 – Mar'08**
- **Phase III (Results) Mar'08 – Apr'08**
- **Release Results Apr '08 (iNEMI members)
Apr '08 (APEX-Public)**

Anticipated Outcomes

1. Validate electrical and mechanical properties

- Loss tangent and Dk modeling over required range of signal speed
- Mechanical performance validation for lead free assembly (Delamination)
- Critical Test Parameter Evaluation (CAF, IST, Flex etc)

2. Validate material supplier and PCB manufacturer infrastructure capability

3. Estimate costs

- Volume market leader for new material may not achieve cost parity with best-in-class FR4

Phase 1: Design (Complete)

Goal: *Review prior work and make recommendations for testing needed. Investigation should take into account the needs of electronic product sectors represented by iNEMI membership.*

- **Identify market segment requirements**
- **Identify candidate materials**
- **Identify key performance characteristics and test criteria**
- **Design test vehicle(s) and test methodologies, leverage standards where possible**

Phase 2 : Build & Test - Underway

Goal: Develop, manage, and execute performance testing.

- **Develop evaluation schedule**
- **Procure parts and test vehicles**
- **Assign teams to carry out completion of the testing in a standardized fashion**
- **Perform mechanical and reliability testing on test vehicles.**

Phase 3 : Results

Goal: *Compile results, assess significance, make recommendations, and publish report.*

- **Assess performance relative to market segment requirements.**
- **Assess technology readiness / identify gaps**
- **Assess manufacturing capability and supply capacity**
- **Publish results**

Phase 2: Develop, Manage, and Execute Performance Testing

- **Test Vehicles**

- **Electrical:**

- **IBM Short Pulse Propagation Method - SMASPP2z**



- **High Temp Reflow Compatibility, Test Vehicle Options:**

- **IBM HOP31 High Temp Reflow Laminate Assessment Test Vehicle**
 - **Intel Materials Evaluation Board (MEB II)**



Teams Identified To Date

Project Status

- **Material Evaluation :** **90% Complete**
- **TV Builds :** **60% Complete**
- **Assembly Simulation :** **25% Complete**
- **Testing :** **Begins October 15th**



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