

# **2009 University Alliance Design Competition**

## **2009 Categories**

### **#1 - Novel Design**

This category encourages unique and innovative designs that utilize SUMMiT V's strengths.

### **#2 – Characterization/Reliability/Nanoscale Phenomena**

This category emphasizes unique structure design or testing methodology for MEMS characterization, reliability, material science, and/or integration of nanotechnology with MEMS.

**Judging Criteria: Design submissions in each category will be evaluated using four criteria which will be weighted in calculating the final score as shown below:**

#### **Novel Design Judging Criteria**

- Uniqueness of design (novel sensing/transduction mechanisms, actuators, device structures etc.) 50%
- Use of SUMMiT V specific strengths (multiple layers, flatness, component libraries etc) 20%
- Usefulness of design for educational demonstrations (including K-12 as well as post secondary) 10%
- Communication of results (effectiveness of communicating device operation, modeling, theory, uniqueness, advantages etc through text, figures and tables.) 20%

#### **Characterization, Reliability and Nano-Scale Phenomena Judging Criteria**

- Unique structure or method to integrate nanotechnology with MEMS or characterize MEMS reliability, failure modes and materials properties. 50%

Note: Bonus points will be awarded for simplifying known measurement methods.

- Applicability over a large range of micro/nano-scale materials, structures or processes. 20%

- Usefulness of design for educational demonstrations. 10%
- Communication of results (effectiveness of communicating device operation, modeling, theory, uniqueness, advantages etc. through text, figures and tables.) 20%

## **White Paper Criteria**

Note: Adherence to report length restrictions and attention to proper grammar and spelling will be considered during the judging process.

- Topic is limited to the single device within the module submitted for judging for the competition.
- White paper text is limited to seven pages using Times New Roman 12 pt font.
- No limit to number of figures and tables. Must use Arial 10 pt font for all figure and table captions. Locate all figures and tables in the appendix.
- White paper will be the only judgment vehicle. AutoCAD file is for reference and fabrication purposes only.
- Submit white paper in PDF format.

***The white paper included in the design submission package should follow the journal paper format outlined below:***

Section I: Abstract (250 word limit)

Section II: Objective

Section III: Introduction

- Describe known state of the art
- How will your design, structure and/or method be different?

Section IV: Description

- Describe overall design, components and expected results.
- Specifically describe unique aspects and include 3D pictures.
- Comment on how the design exploits strengths of SUMMiT V.
- Comment on the usefulness of your design for educational demonstrations.

Section V: Principle of Operation

- Describe waveforms required and the timing of events including sequence.

- Describe measurements you will make when running the device (examples: voltage, current, optical - microscope or interferometer).

#### Section VI: Modeling

- Provide reasonable modeling and/or calculations to support novel elements of the design (examples: force calculations, kinematics emulation, thermal effect calculations, electrostatic calculations, frequency response, electrical calculations, structural calculations, etc.)

#### Section VII: Summary

#### Section VIII: Appendix

### **Rules**

- Competitors must be current members of the University Alliance Program.
- Each Alliance School may enter up to 2 modules (one per category) with up to 1/3 of the module area available for design submitted by professor (professor's design will not be judged).
- Each competing university must identify a lead student per category entered.
- Competitors must select one device to be judged from each module submitted. The device must be clearly marked and enclosed with a box drawn on the construction layer.
- The presubmission checklist and a peer review using SUMMiT V design review guidelines must be completed prior to design submission.
- Designs must pass the Design Rule Checker. Requests for DRC error or advisory rule exemptions must be submitted to [drt@drc.sandia.gov](mailto:drt@drc.sandia.gov) prior to the submission deadline.
- Design must be contained within standard 2820 $\mu$  x 6340 $\mu$  module size.
- If intending to package die, please indicate so in your Intent to Submit email.

Contestants will be required to grant to Sandia Corporation, operator of Sandia National Laboratories, the right, license and permission under patent, copyright or other intellectual or industrial property right to make, use, sell, distribute, perform, modify, reproduce and display any and all designs, drawings, or other materials submitted to Sandia by whatever means.

Sandia will only accept original designs created by students with the assistance of their professors. No professional design submissions will be accepted for this student contest. Sandia may distribute parts created by design submissions to other University Alliance Members.

## Awards

- Winning designs and Honorable Mentions from both categories will be fabricated on Sandia's May 2009 reticle set and each winning school will receive a selection of their MEMS fabricated parts for use in their curriculum.
- First place student lead and sponsoring professor from both categories will be invited to visit (all expenses paid) Sandia to present their design to Sandia's design review team, meet with MEMS experts, and tour the facilities. All other participants are welcome to attend the awards ceremony and present their design pending SNL approval.
- All UA schools regardless of participation in competition will receive Sandia designed UA661 released parts.
- The first place team from each category will receive a one year organizational membership to MANCEF. This is normally \$2000/year and will include 5 individual memberships to MANCEF, a copy of MANCEF's 1st and 2nd edition roadmap, discounts, and more. [www.mancef.org](http://www.mancef.org)

