

## **ECTC in Las Vegas**

What happens in Las Vegas at ECTC, doesn't stay in Las Vegas, it is shared here.

This year's ECTC, or electronics components technology conference, was held in Las Vegas' Cosmopolitan, May 28—31<sup>st</sup>, 2013. Here are some conference statistics:

- Over 1,300 attendees, the highest attendance ever, from 26 countries
- 377 technical papers, presented in 36 oral and five interactive presentation sessions, including a student poster session
- 12 sessions focused on 3D/TSV, including several of the best attended sessions of the conference
- 16 professional development courses attended by over 300 participants
- 95 Technology Corner exhibitors – also a new record

In addition to the regular daytime sessions and courses, there were two special sessions on Tuesday, and three evening seminars that were all very well attended.

### **ECTC Special Session**

- Chaired by Sam Karikalan of Broadcom Corporation on the collaboration between wafer foundries, OSATs, and materials and tool suppliers as the key to the success of next generation packaging

This ECTC special session on Tuesday morning included speakers Jerry Tzou of TSMC, David McCann of GLOBALFOUNDRIES, Kurt Huang of UMC, Jon Casey of IBM Corporation, and Herb Huang of SMIC, and was titled “The Role of Wafer Foundries in Next Generation Packaging”. The main thrust of this was that collaborative development is critical, and that there must be a supply chain integration between foundry and OSAT to make 2.5- and 3-D integration come to life. That is, there needs to be a blurring of lines between the parties involved, where everyone pitches to make it all

happen, rather than the compartmentalizing the tasks as what happens now. Packaging innovation is required to take place once the line and space lithographies drop to 90 nanometers (nm) and below, such as 2.5- and 3-D innovation. Scaling can occur down to 7 nm, as foreseen at this time.

The three business models exist for 3-D interconnect:

- FEOl (front end of line)
- MEOl (middle end of line)
- BEOl (back end of line)

UMC was promoting an Open Eco-System, which is working for 2.5-D currently, and in the formulation mode for 3-D now. Cost is an issue for these interconnect models currently, and combined efforts on EDA tools and reliability testing would help all participants.

Creating a heterogeneous 3-D integrated stacked package will offer huge performance benefits, but will be a major challenge with tight integration requirements as well. Power management will be critical in development of these powerful packages. Dissipating the heat is even more critical in handheld devices, as production of 6 watts is too hot an item to hold in one's hand. At this rate, a 4K video would operate at 40GHz, and the battery would be used up in about ten minutes.

An idea to handle the heat is to place the hottest chip on top, and use fine micro-fluidic cooling for cooling the entire device structure.

The purpose in creating these complex packaging structures is primarily for bandwidth for small phones and tablets, but also for computing power. Future markets for these package innovations include smart wearables such as small watches and glasses. Streaming videos with a crisp image will also be possible with the extra bandwidth.

### **ECTC Panel Session**

- Co-chaired by Ricky Lee of the Hong Kong University of Science and Technology and Kouchi Zhang of TU Delft &

## Philips Lighting on the growing market of LED for solid-state lighting

Speakers include Ling Wu of China Solid State lighting Alliance, Mark McClear of Cree Components, Ron Bonne of Philips Lumileds, Nils Ekamp of TNO, and Michael McLaughlin of Yole Development. This session occurred on Tuesday May 28<sup>th</sup>.

### **ECTC Plenary Session**

- Chaired by Lou Nicholls of Amkor Technologies on the “Packaging Challenges Across the Wireless Market Supply Chain”

Speakers included on the Wednesday evening session were Timo Hentonen of Nokia, Steve Bezuk of Qualcomm Technologies, Waite Warren of RFMD, Roger St. Amand of Amkor Technology, and SoonJin Cho of SEMCO.

Handheld devices in the wireless market, such as cellular telephones, ultrabooks, and more, are collectively experiencing an 18 percent compound annual growth rate (CAGR). Challenges and issues include:

- Thermal – get the heat out
- Get more functionality into the smallest form factor possible, and more features = more power = more heat
- The next pitch node
- Materials and processes, such a low-k, lower k dielectrics, low CTE resin, and glass cloth. Thin materials needed but need to be stiff to address warpage issues.
- Mechanical, including ultra-thin of <150  $\mu\text{m}$ , CTE, warpage
- Electrical, including signal integrity
- Supply chain roadmaps and collaborative efforts to ensure seamless integration
- Higher data rate / more bandwidth. Need to send and receive at the same time, and the need for Microshield™.

- Routing density and embedding passive devices in the 2012 – 2013 time frame, and active devices in 2014 and 2015. Challenges will include via to pad alignment, reliability (crack and alignment), low profile but high capacitance, and substrate yield.
- The move from a cored substrate to coreless to achieve a thinner substrate and thus package height (1.1 mm to 0.6 mm). Minimize thickness variation to minimize warpage.
- Bump volume and volume uniformity
- $\mu$ bump mounting in the future
- Interposer thinness and metal count layers are also challenges.

The handset thickness is going down, to 6 mm in the case of the latest Nokia phone. The PoP solution contains a memory and processor, and is thinner than a penny, which must stay flat. The supply chain for a product must be coordinated with for two years prior to product launch to ensure that the product will come together in time for market.

Copper pillars allow for a finer pitch, which are connected via thermal compression. By moving to finer pitch, the package design can move from a full array pattern to a peripheral array, thus reducing the metal layers on the substrate from four to two, reducing costs. Warpage can be controlled by applying pressure to the top of the package during the heat cycle of this process.

When a second die is attached to a package substrate on the underside of the package using flip chip interconnection for a Possum™ style package, warpage is controlled by employing a 0-2-2 substrate.

Warpage is controlled on bare die on the corners by putting a lid on the top of this die.

The next issue for this market in a low cost interposer (LCI). Currently interposers are predominantly silicon, but laminate and glass are being explored. A supply chain must be created for these materials if they are to become viable alternatives as interposers.

## **CPMT Seminar**

- Co-chaired by Kishio Yokouchi of Fujitsu Interconnect Technologies Ltd. and Venky Sundaram of the Georgia Institute of Technology on advanced low loss dielectric materials for high frequency and high bandwidth applications

Speakers at the Thursday evening seminar include Yuka Suzuki of Zeon Corporation, Yasuyuki Mizuno of Tsukuba Research Laboratory, Hitachi Chemical Co., Ltd., Shin Teraki of NAMICS Corporation, and Hirohisa Narahashi of The Research Institute for Bioscience Products & Fine Chemical, Ajinomoto Co., Inc.

## **Modeling Special Session**

- Co-chaired by Yong Liu of Fairchild Semiconductor and Dan Oh of Altera on “Modeling and Simulation Challenges in 3D Systems”

## **Luncheon Keynote**

The ECTC Keynote Speaker, Dr. Chris Welty from IBM, brought his vision and experience on solving engineering problems in a very entertaining presentation on the design and competition of the Watson supercomputer in the Jeopardy! TV game show during Wednesday’s luncheon. Watson was designed to compete against former star players on Jeopardy! without having access to the Internet, and had to compute an answer to the question given within only seconds. The size of Watson dictated that this supercomputer, the size of a room, had to sit outside the televised viewing room, and not in the actual viewing room on a chair. As Dr. Welty stated, Watson, in technical terms, sucked at the game. The hilarious answers provided by Watson to the questions stemmed from a lack of being able to understand the actual questions being asked, which would include an understanding of nouns, verbs, etc. Watson’s “brain” did word searches in its database and came up with answers based on the frequency of how often a word was mentioned in news articles. Thus the actual question was not answered correctly, and reprogramming of Watson had to occur for it to have the ability to recognize the actual question. Since this was an engineering conference, I guess the

concept of trying to teach Watson how to understand the question fit right in...

### **More News from ECTC Las Vegas**

Corporate sponsors, including the gala sponsors, include Nanium, Amkor, DOW Electronic Materials, AMAT, Microsoft and STATSChipPAC. The luncheon and program sponsors include Corning, ASE, GLOBALFOUNDRIES, NCAP, Invensas and HD MicroSystems.

Photos taken at the conference are posted on Flickr:  
<http://www.flickr.com/photos/38916807@N07/sets/72157633891833244/>

Next year's conference will be held May 27-30, 2014, at the Walt Disney World Swan & Dolphin Hotel in Lake Buena Vista, Florida, USA.

### **Selected Images from the ECTC Conference**

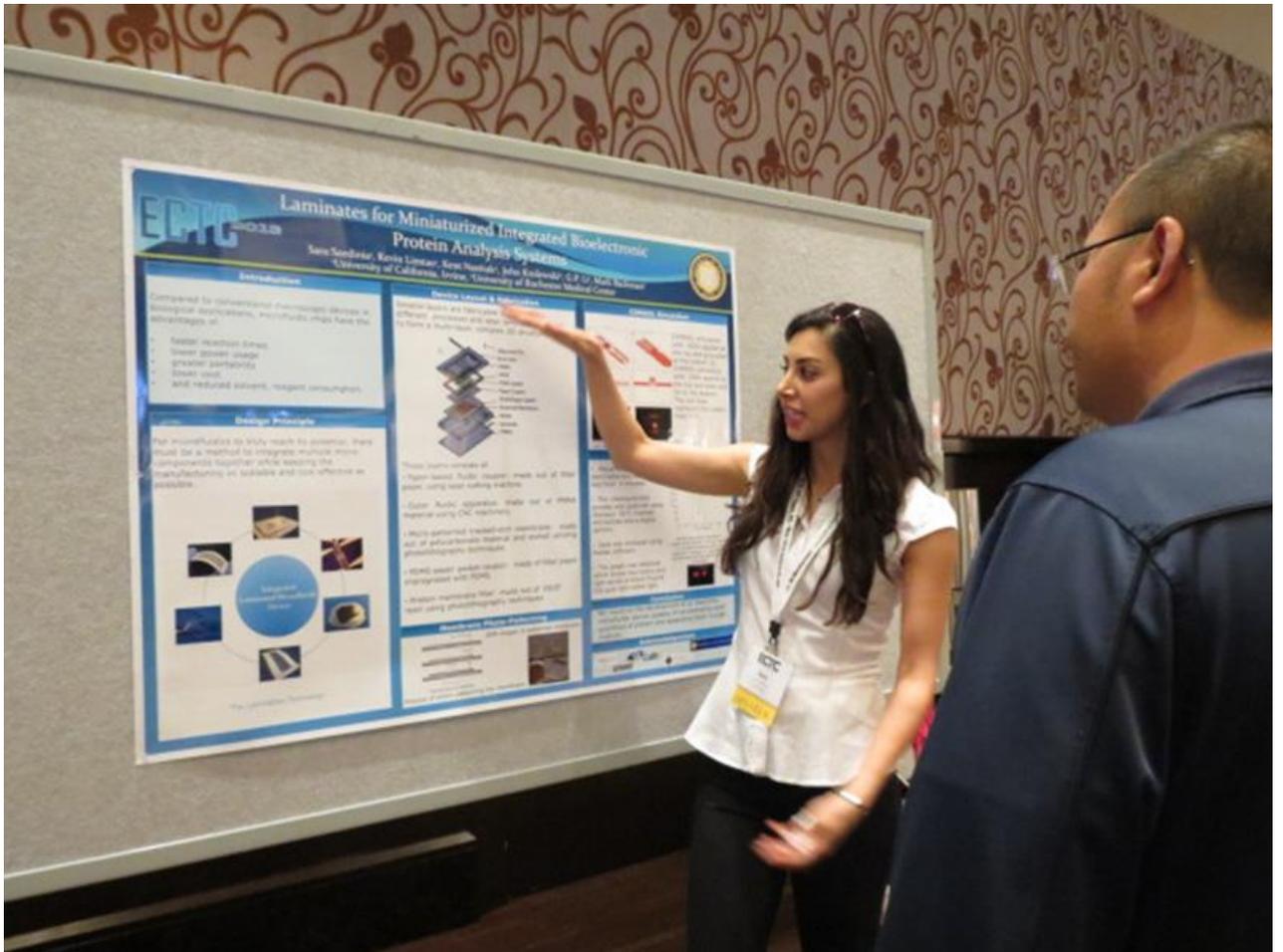
## Conference Organizers



## Conference Presentation



## Poster Presentation



**Sandra Winlker, Annette Teng and unknown person.**

