



# **inEMI**

International Electronics Manufacturing Initiative

## **2008-9 T.C./ PEG Review – Portable & Consumer**

*Susan Noe  
SMTAI, Orlando, FL  
10/12/07*

Advancing manufacturing technology

# 2008-9 Product Emulator Descriptions

Emulators	Characteristics
Office Systems / Large Business Systems	Products which seek maximum performance from a few thousand dollar cost limit to literally no cost limit
Telecom/Datacom	Products that serve the networking, datacom and telecom markets and cover a wide range of cost and performance targets
Portable / Consumer	High volume Consumer Products for which cost is the primary driver including Hand held, battery-powered products driven by size and weight reduction
<b>Specialty Emulators</b>	<b>Defined by Operating Environment</b>
Automotive	Products which must operate in an automotive environment
Defense and Aerospace	Products which must operate in extreme environments
Medical Products	Products which must operate within a high reliability environment

# Portable & Consumer PEG Membership

- **Susan Noe, 3M Company (chair)**
  - 3M Electronics Mobile Handheld Segment Manager
  - Industry trends
  - Materials and supply chain for assembly-level integration
- **Seppo Pienimaa, Nokia**
  - Laboratory Director, Nokia Research Center Beijing
  - Industry trends
  - User interface, assembly level component selection
- **David Carey, Portelligent**
  - President
  - Consumer device teardowns, including PCBA/IC analysis
- **Jan Vardaman, TechSearch International Inc.**
  - President
  - Industry trends and supply chain
  - Semiconductor packaging
- **Tom Cipielewski, Jabil Circuit**
  - PCBA

Looking for additional PEG member with board (engine) design and/or power management experience

# Emulator Spreadsheet

- **The Portable and Consumer PEG would like to know which spreadsheet rows are most important to the TWGs that will work from them!**
- **Do the TWGs see rows that are missing that they would like PEG input on?**

# Emulator Spreadsheet

- **PWB**
  - Has someone with broad PWB experience reviewed the list to see if it could be pared down?
  - Where to include rigid flex 'boards' with integral flex arms
- **Package Costs**
  - Are we looking for cost of highest volume package?
  - How to include high performance SiPs?
- **Business Costs**
  - Parameters not relevant to PORT as it is standard practice to have established supply chains of sub-suppliers and assemblers (globally distributed production model)
- **Cycle Time: Time to add EMS**
  - Not relevant... see above

# Emulator Spreadsheet

- **Reliability**
  - Why no heat and humidity testing?
  - Drop test values in dropped height?
- **Devices/Passives**
  - Office seems to be filling these out. How about the rest of us?
  - What TWGs do these data drive? Are we collecting the right info?
- **Components/Package**
  - Is anyone using the parameters that are package technology specific (i.e. MCM, BGA?)
- **PWB/Substrates**
  - What is distinction between lines 32, 34, 39? (Lines and Spaces for substrates, thin film, and PWB)

# Emulator Spreadsheet

- **Interconnect**
  - Should Line 151 (Connector minimum mated height) be Connector Maximum Mated height for leading edge design rules?
- **Electrical**
  - Line 157 (Number of voltages). Remove? How is this used?
- **Environmental**
  - This whole section could be removed for Portable. Compliance is required for current standards. Pb-free is required. No transition time allowed.
  - Drive is to higher reuse/recycle, but quantifying is challenging
- **Thermal**
  - Use Temp and %RH (Lines 197 and 200). Combine into a Temp/Humidity most challenging condition?
  - Include highest power chip but drop rows that count how many chips are in different power brackets (Lines 206 – 210) as cooling of highest power chip will set state of the art
  - What is 'module power'? (line 210)
- **Modeling**
  - Drop or clarify

# ITRS-iNEMI Alignment

- Juan-Antonio Carballo is leading an effort within ITRS to get better alignment between the iNEMI roadmaps and the ITRS roadmaps.
- The next slide shows a section of the iNEMI-ITRS reconciliation table on power/energy issues (see tab “iNEMI-ITRS Power”).
- **The Portable and Consumer PEG is requesting involvement from TWG members to help in answering ITRS’s questions. We don’t have all the necessary expertise on our team!**

iNEMI Parameter	COLOR	Comments/Clarifying Questions
Number of Voltages	Red	
Minimum Logic Family Voltage	Red	
Maximum Logic Family Voltage	Red	This voltage is a function of I/O standards. Therefore, it may not be a critical parameter to align
Normal Logic Family Voltage	Green	We need to match this voltage to the ITRS "core logic" supply voltage
<b>POWER</b>		
Power	Yellow	QUESTION FOR iNEMI: Is this parameter referring to battery technology?
Spec. energy	Green	Assume this refers to battery technology, it should match with ITRS
Energy dens	Red	QUESTION FOR ITRS and iNEMI: Is this iNEMI parameter (watts per liter) implied by energy density (watts per area) in ITRS?
Specific power	Red	QUESTION FOR ITRS and iNEMI: Is this iNEMI parameter (watts per kg) implied by energy density (watts per area) in ITRS?
Shelf life	Red	QUESTION FOR iNEMI: Is this a requirement for the on-board battery ?
Avg. standby power	Green	QUESTION FOR iNEMI: Why is this requirement not included with numbers in the emulator?
Voltage (avg.)	Red	QUESTION FOR INEMI: Does this refer to "IR" voltage drop across the board? If yes, then it is too second-order for this iNEMI-ITRS reconciliation.
Voltage (min.)	Red	QUESTION FOR iNEMI: Why is this requirement not included with numbers in the emulator?
Current (avg.)	Red	COMMENT: It would be more important to ITRS to know ,maximum current, not average current.
Run Time Before Recharge	Green	
Min. and Max. Operating Temperature	Green	COMMENT: For ITRS, this is important to know for reliability, PVT corner, leakage power consumption, etc.
Max Reflow Temp	Red	COMMENT FROM ITRS: this is not so important for chip operational parameters (relevant to mfg yield, via stack packaging, etc.)
<b>THERMAL</b>		
Use Ambient Operating Temperature Range	Red	
Thermal Design Power (Hottest Chip)	Green	COMMENT FROM ITRS: Values are too low! ITRS tracks (a) max. power for each driver (e.g. consumer) and (b) max power that package in general handles
Max Current per Device	Green	COMMENT FROM ITRS: This is very important for us, since we can analyze bottom-up from chip content (memory, logic, I/O) to board
Thermal Design Flux (Hottest Chip)	Green	
Cooling Method	Green	COMMENT FROM ITRS: This is a good parameter, s necessary to align assumptions between portable consumer emulator (iNEMI) and driver (ITRS)
Number of Chips W/Some Heat Sink	Red	
Device Cooling Air Temperature (Inside the Box)	Red	
Device Cooling Rail Temperature	Red	
Chips W/ Power < 2W	Red	
Chips W/ Power From 2 - 5 W	Red	
Chipc W/ Power From 5 - 10 W	Red	
Chips W/ Power > 10 W	Red	
Module Power	Yellow	COMMENT FROM ITRS: while iNEMI tracks board and package power density, ITRS is concerned with chip-level and first-level packages

# ITRS Alignment

"Dr. Juan Antonio Carballo" <antonio@argoncap.com>



# Other Requests from Portable & Consumer PEG

- **Still looking for addition to team (as Co-chair or as member) with expertise in chip selection and board design**
- **Also need input on the following sections of the Emulator**
  - **Electrical**
  - **Power**
  - **Components/Package**
- **Input on any other section of Emulator spreadsheet is welcome!**

# T.C. Emulator Spreadsheet Review, Discussion Format: 15 Minutes

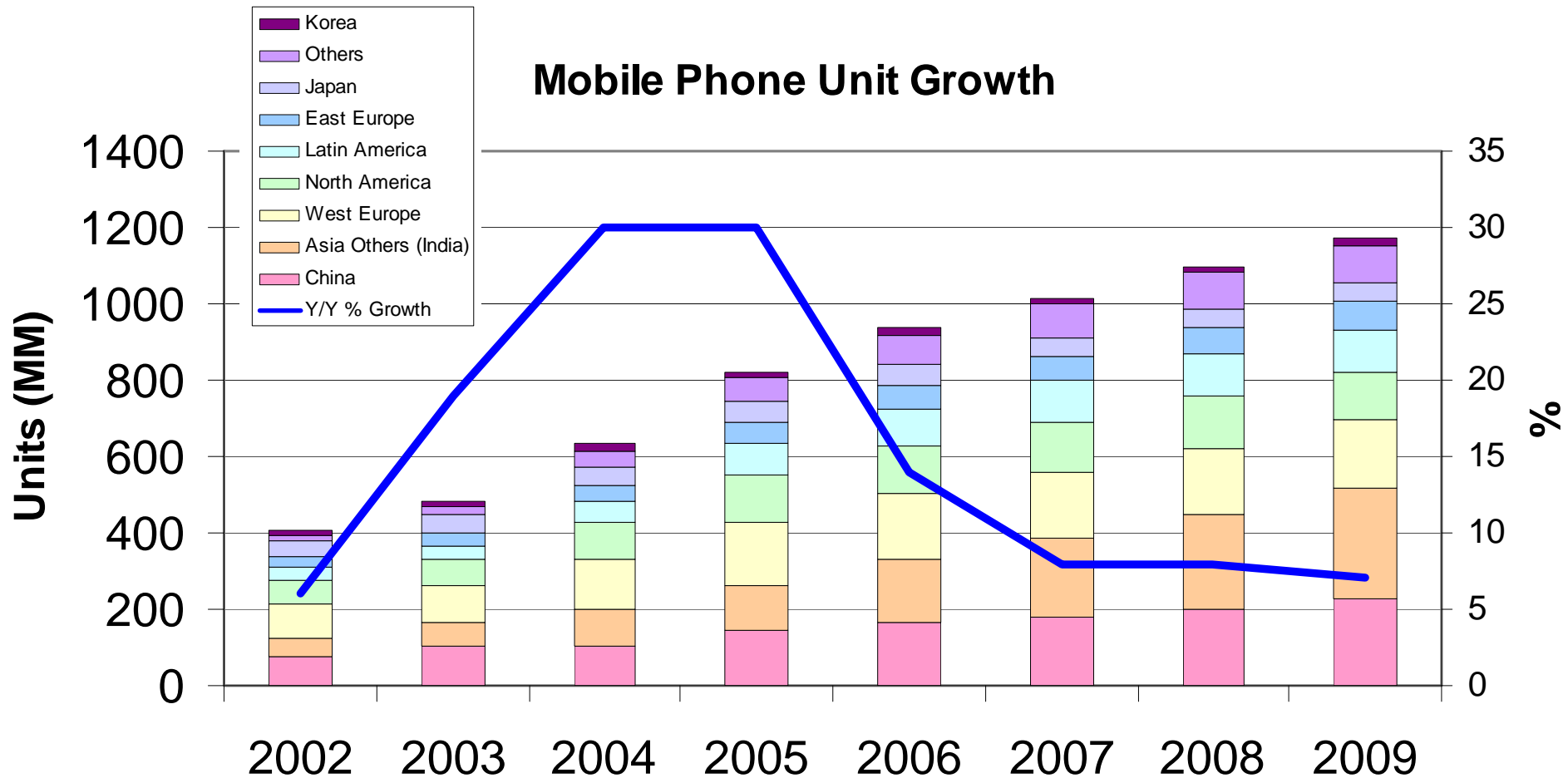
## General Areas of Review, Feedback and Discussion:

- **Data / Format Review Summary**
  - **Feedback/Discussion on PEG Suggestions Concerning New Parameters/Metrics/Format**
  - **Any Situation Analysis Feedback**
    - **State of Industry Segment and Technology**
    - **Key Drivers: cost, performance, size, market?**
  - **Any Critical (Infrastructure) Issues Feedback**
  - **Summary of Discussion / Suggested Changes**

# State of Industry Segment

## Mobile Phone Volumes Dominate

### Mobile Phone Unit Growth

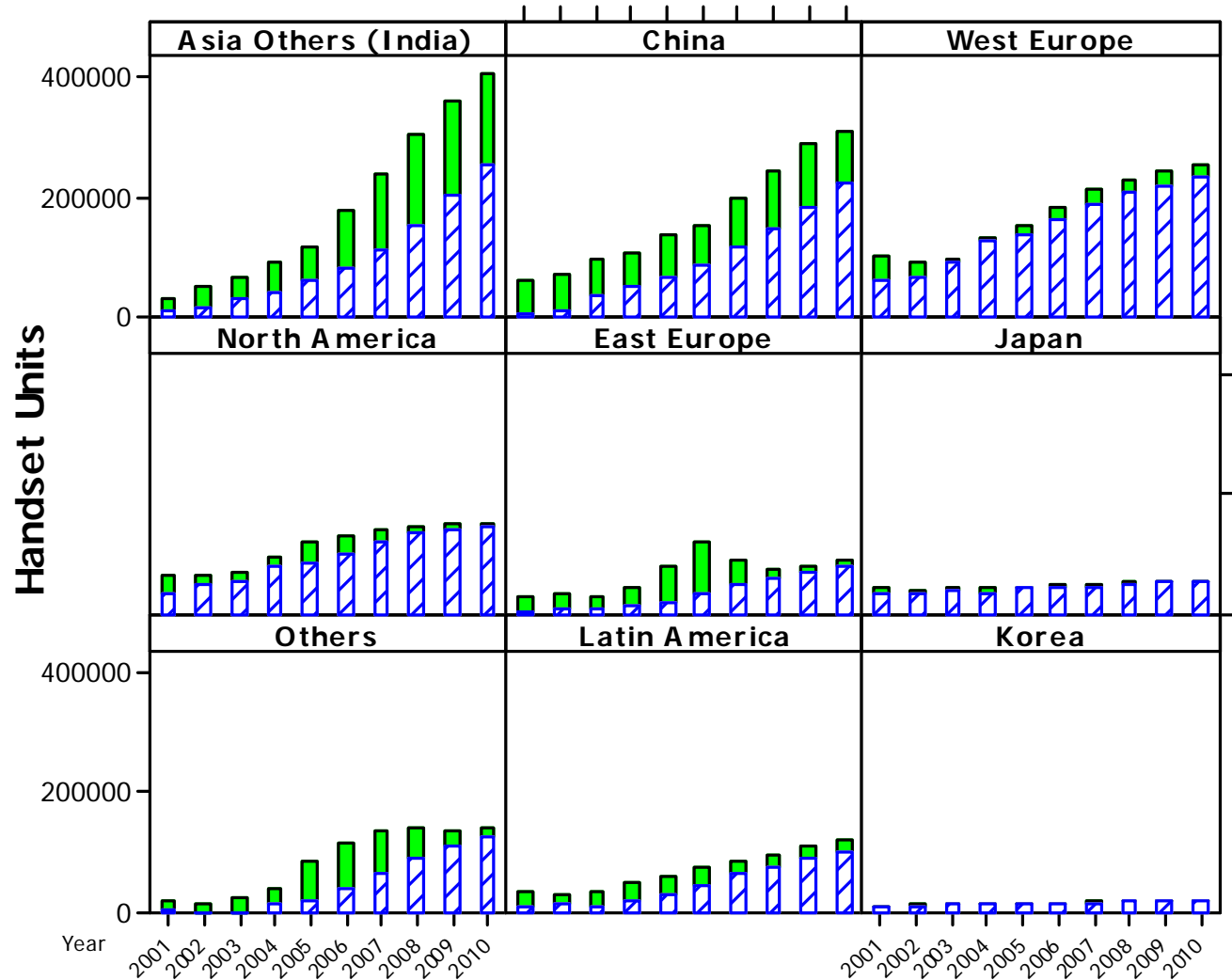


**830MM mobile phones vs. 15MM PDAs vs. 60MM MP3 players**



Source: Gartner Dataquest, Display Search, Business Week

# Mobile Phone Demand by Region



# Key Drivers: cost, performance, size, market

- **Thinner devices with longer battery life**
- **Increased robustness in adverse environments**
- **Divergence between products for developed markets and emerging markets**
  - **High functionality devices**
  - **“Aspirational” devices**
- **“Cradle to Cradle” product lifecycle management**
- **Supply chain consolidation**
  - **Integrated solutions vs. individual material components**
  - **Vertical integration within supply chain**
- **Manufacturing close to consumption**
  - **Expansion in India and Eastern Europe for final assembly**

# Increased Functionality

- Wireless in everything
  - Cellular, VOIP, Bluetooth, etc.
- Continued convergence of functionality into cell phones (PDA, MP3, GPS, multiple cameras, digital video, gaming, home security, portable medical)
- More functionality drives consumer purchase of replacement devices
- More functionality drives service revenue for OEMs and wireless carriers
  - iTunes -> iPhone
  - Nokia “Ovi” including Nokia Music Store, and purchase of Navteq
- Flash memory for on-board and removable data storage/sharing
- Unique user interfaces
  - Touch with tactile feedback
  - Reconfigurable user interfaces (different functions in different modes)
  - Gesture recognition

# Technology Implications

- **Higher frequency devices (e.g. video) and more transceivers**
  - Greater concerns about EMI
  - Emergence of thermal issues
- **New antennae designs**
- **Increased use of SiP**
  - Prismark reports increased shipments for mobile devices including front-end modules, transceivers, and radio modules
- **New manufacturing alternatives: thinner, flexible**
  - Printed electronics
  - New display technologies
- **Lower power, lower resistance, thinner components**
  - Connectors
  - LEDs
  - Rigid flex (future... printed electronics?)

# Format for Product Emulator Chapters

- Executive Summary (half page)
- Introduction
- Situation Analysis
  - Benchmark state of **Industry** and Technology
  - Key Drivers: cost, performance, size, **market**
  - Chart 2007 vs. 2009 forecast differences
- Roadmap of Quantified Key Attribute Needs (2009 – 2019)
- Critical (Infrastructure) Issues –
  - Identify Paradigm Shifts
  - Provide Vision of Final Assembly Process
  - Discuss System Test
- Prioritized Technology Requirements and Trends: Research, Development, Implementation
- Contributors



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**INEMI**

Advancing manufacturing technology