Semiconductor Evolution to 4G: Mobile WiMAX, LTE, and other 4G Technologies

Alex Sum – VP Product Marketing/BD
Trend: Technology Convergence Beyond 3G

- 1995: 1G (Analog) - AMPS
- 2000: 2G (Digital) - GSM/CDMA
- 2005: 3G - W-CDMA/CDMA2000/ TD-SCDMA
- 2010+: 3.5G - 802.16m
- 2010+: 4G - LTE
- 2010+: 802.16e-2005
- 2010+: 802.16-2004
- 2010+: 5 GHz WLAN
- 2010+: 2.4 GHz WLAN

Data Rates:
- ~14.4 kbps
- 144 kbps
- 384 kbps
- <50 Mbps
- <100 Mbps
Most WiMAX operators are ‘green field’ operators characterized by:

- They do NOT own existing cellular networks (with a few exceptions), but in large #s
- They provide low cost alternatives to higher cost DSL, and high cost 3G services
- They provide data speed much better than current 3G, and even 3.5G cellular
- They are serving developed, as well as under-developed countries
- They are meeting the ‘market hunger’ for high, uninterrupted data speed
- With Mobile dual mode devices available, it levels the wireless playing field
- 16m, if it is released in time, will match those higher performances of LTE

Most cellular operators are lining up in LTE with Verizon, Vodafone, KDDI, DoCoMo, CMCC- an awesome bunch!

- FDD is ahead of TDD by at least 6 months
- Just like UMTS, and WiMax, initial device introduction will follow maturation trend, of course with some surprises
  - Data-centric with datacards, dongles
  - Femto APs
  - Finally Embedded devices and handsets
LTE Roll-out like UMTS, WiMax? Or Faster?

Forecast LTE Subscribers, 2010~2015 [Source: Analysis Research, 2007]
WiMAX Global Momentum Continues to Build

Mobile WiMAX Certification
1. 18 devices certified
2. 8 devices in process
3. 49 devices in plugfest
4. 12 vendors for 3.5 GHz
5. 100 devices in pipeline by year end!

Deployments
6. Over 308 planned & commercial networks in 118 countries

Vendors
7. 19 offering baseband chips
8. 28 producing client devices
9. 29 supplying infrastructure
10. 15 offering radio transceivers
11. 8 offering Base Station processors

Performance
12. 2-3x today’s 3G solutions & scalability to 10x in the future

1: WiMAX Forum
3: Informa Telecoms & Media, 2008
4. 2-3x based upon actual network performance in Korea and U.S.; 10x per IEEE 802.16m Systems Requirements Document
GCT is WiMax Focused

GCT has 3 product lines
1. Mobile WiMax PL - WiMax only, WiMax+Wifi, Femto APs
3. RF Transceivers PL – WiMax RF, CDMA2000/EVDO RF and others
   - In-house ‘Cellular RF capability’ enables GCT to be the industry’s first in RF+BB single chips to serve multiple suitable markets as required

WiMax Design Philosophy
- GCT’s design philosophy is to squeeze every bit out of cost and performance by using ‘special design techniques’ to lower down power consumption and size in a given process node, thus avoiding pitfalls to use more expensive process of less desirable cost/performance.
- GCT will continue to roll-out more dual-mode integrated designs as well with smaller process nodes
- GCT will continue to shrink die size and reduce cost to meet future market needs
WiMAX Single Chip Offerings

Monolithic (RF & BB) Single Chip (GDM7205 & GDM7213)
- Lowest power consumption
- Smallest form factor design
- Lowest system cost
- Market/field proven solution

Monolithic WiMAX+WiFi Single Chip (GDM7215)
- Enhanced access coverage
- Wide embedded application
- Lowest system cost
- Smallest form factor design
Embedded Reference Design Offerings

- Enables MID, Netbook, PDA, Smartphones and other gadgets!

Full Mini Card
Top View

Half Mini Card
Top View

Bottom View

15mm x 15mm
World’s Smallest Module
Commercial Launch CY09 and Beyond

CPE/Terminals
- WiMAX/WiFi AP Portable Router
- World Wide WiMAX CPE, CPE+Voice, CPE+WiFi AP
- Sensei (Moda) WiMAX Dongle Express Card
- Gemtek P1 (Wiggy) WiMAX USB
- Wide World WiMAX USB
- USB Dongle for S.E. Asia

Handhelds
- Yukyung WiMAX MID
- Sambo WiMAX MID
- WiMAX/WiFi/HSDPA Smart Phone
- WiMAX VOIP Phone
- WiMAX VOIP Phone

Femto APs
- WiMAX Femto Repeater
- IB-Cell WiMAX Femto AP
- WiMAX Femto AP

More Design-Wins and Operator will be announced Quarterly!
Conclusion

- WiMax is a growing into a very large world market, certainly not a niche. It will pay off handsomely for all those who has invested and persisted in this market. 16m will prove itself to be a strong competitor for LTE.
- LTE is lagging behind WiMax by two years, and has quite a catch-up to do in a hurry, and is intended to surpass WiMax.
- WiMax, LTE, both are OFDMA based, could be complimentary regardless, and could even converge 😊
- Strong eco-system build-up in WiMax will benefit GCT moving forward
- GCT is keeping a close eye on the industrial trend and its developments.
Thank You !