TD-LTE Industry Support for Global Markets

TD Industry Alliance
Wang Peng

Tokyo, Japan
2012.4.25
Vision

Based on TDD technology innovation, make TDIA one of the most important industrial associations that push the development of mobile communication technologies and industry all over the world.

Mission

Integrate and coordinate the industry resources, improve the R&D and production level of mobile communication enterprises within the Alliance and realize the popularization and industrial application of TD-SCDMA & TD-LTE in global telecommunication markets.

Organization Structure of TDIA
TDD Innovation & Standardization

LTE FDD Standards

- RAN1: Physical Layer
- RAN2: L2 & RRC
- RAN3: L1 & Transport, S1/X2 AP
- RAN4: UE & eNB Tx/Rx, RRM core, RRM test, eNB test
- RAN5: Common env., Signaling, RF Tx/Rx, RF RRM

TD-LTE Standards

- RAN1 WI Completed
- RAN2/3/4 WI Completed
- RAN5 WI Completed

DL100Mbps/UL50Mbps

- R4
- R5~R7
- R8
- R9
- R10

N frequency
HSDPA: DL2.8Mbps/1.6MHz
HSUPA: UL2.2 Mbps/1.6MHz
MBMS
HSPA+: 64QAM MIMO OFDM CPC
Dual stream BF eMBMS Home eNodeB Positioning

Decrease human resource
Decrease CAPEX
Decrease OPEX

SON

Research/ standardization /industrialization
LTE-A has been chosen as one of 4G standards
- Development of TD-LTE TTCN Test Suite keep the same pace with FDD
- Verification of TD-LTE TTCN Test Code:
  - P1/P2/P3 Test Cases: 100%, P4 Test Cases: Over 50%
  - GCF P1: 100%, P2: 97%, P3: 94%, P4: 58%
Development of TD Industry

2002, TD-SCDMA industrialization, TDIA established with 8 members

2003~2008, TD-SCDMA trial / TD-LTE standardization

2009~2010
TD-SCDMA commercialization, market developed rapidly
TD-LTE industrialization

2011
TD-LTE trial & internationalization, 90 members in TDIA

2012
TD-SCDMA 300,000+ BS, TD-LTE 20,000 +BS

2013~2014
TD-SCDMA 400,000+ BS
200,000,000+ users
TD-LTE 200,000+ BS
40+ commercial/Trial

10+ Infrastructure Vendors
18+ Chipset Vendors
10+ Test Equipment Vendors
50+ UE Vendors

2002, TD-SCDMA industrialization, TDIA established with 8 members
Milestone Events of TD-LTE Industry Chain

- **2008**: TD-LTE WG by CATR in China
- **2009**: Downlink peak rate of TD-LTE: 76Mbps
- **2010**: TD-LTE trial network in Asia
- **2010**: Data Cards of Single mode from Qualcomm, Sequans, ST-E and Innofidei at World Expo
- **2011**: TD-LTE trial (CMCC Softbank)
- **2011**: TD-LTE data card in large scale
- **2011**: Japan XGP/ TD-LTE network
- **2012**: Bharti Airtel TD-LTE commercial network
- **2012**: Phase 2 of TD-LTE trial in China

**Infrastructure**

- Huawei
- Ericsson
- ZTE
- NTT DOCOMO
- Alcatel-Lucent
- Motorola

**Chipset**

- Qualcomm
- MediaTek
- ST-Ericsson
- Renesas
- Sequans
- Samsung
- Texas Instruments
- Innofidei

**Test Instrument**

- Anritsu
- Agilent Technologies
- Rohde & Schwarz
- Tektronix

**Organization**

- 3GPP
- GTI
- GCF
- LSTI
- ETSI
- World Class Standards
- ngmn
Spectrum: Lifeblood of TDD Industry

- Harmonized spectrum is necessary for IMT to achieve economy of scale.
- Frequency below 1GHz is recommended for seamless TD-LTE coverage.
- 2.6GHz band is a very promising band that can provide global roaming capability for TD-LTE.

<table>
<thead>
<tr>
<th>MHz</th>
<th>2 500</th>
<th>2 550</th>
<th>2 600</th>
<th>2 650</th>
<th>2 690</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>MS Tx</td>
<td>TDD</td>
<td>BS Tx</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 500</td>
<td>2 570</td>
<td>2 620</td>
<td>2 690</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>MS Tx</td>
<td>BS Tx (external)</td>
<td>BS Tx</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 500</td>
<td>2 570</td>
<td>2 620</td>
<td>2 690</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>Flexible FDD/TDD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 500</td>
<td></td>
<td></td>
<td></td>
<td>2 690</td>
</tr>
</tbody>
</table>
### Asia - Pacific

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Operators</th>
<th>Band (MHz)</th>
<th>Frequency range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>Softbank</td>
<td>30</td>
<td>2545-2575 MHz</td>
</tr>
<tr>
<td></td>
<td>UQ Com</td>
<td>30</td>
<td>2595-2625 MHz</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Vodafone Mobile NZ Ltd</td>
<td>30</td>
<td>2540-2575 MHz</td>
</tr>
<tr>
<td></td>
<td>Blue Reach Ltd</td>
<td>30</td>
<td>2660-2690 MHz</td>
</tr>
<tr>
<td>Singapore</td>
<td>StarHub</td>
<td>12</td>
<td>2576-2588 MHz</td>
</tr>
<tr>
<td></td>
<td>Pacific Internet</td>
<td>30</td>
<td>2600-2672 MHz, 2678-2696 MHz</td>
</tr>
<tr>
<td>India</td>
<td>Bharti</td>
<td>40</td>
<td>2332.5-2352 MHz, 2305-2325 MHz</td>
</tr>
<tr>
<td>Taiwan/China</td>
<td>Fitel</td>
<td>30</td>
<td>2565-2595 MHz</td>
</tr>
<tr>
<td></td>
<td>Global On Corporation</td>
<td>30</td>
<td>2595-2625 MHz</td>
</tr>
<tr>
<td></td>
<td>Vmax Telecom</td>
<td>30</td>
<td>2660-2690 MHz</td>
</tr>
<tr>
<td></td>
<td>FET</td>
<td>30</td>
<td>2565-2595 MHz</td>
</tr>
<tr>
<td></td>
<td>Tatung Telecom</td>
<td>30</td>
<td>2595-2625 MHz</td>
</tr>
<tr>
<td>Hong Kong/China</td>
<td>21 ViaNet Group</td>
<td>30</td>
<td>2300-2330 MHz</td>
</tr>
<tr>
<td></td>
<td>CMCC</td>
<td>30</td>
<td>2330-2360 MHz</td>
</tr>
<tr>
<td></td>
<td>Hutchison</td>
<td>30</td>
<td>2360-2390 MHz</td>
</tr>
</tbody>
</table>

**USA: 2.6GHz TDD band**

- 2496MHz
- 194MHz TDD spectrum
- 2690MHz

**Hybrid: 2x70MHz FDD + 50MHz TDD**
- 2500-2570/2620-2690MHz FDD, Duplex spacing 120MHz
- 2570-2620MHz TDD

1. Operators need to upgrade its legacy network to TD-LTE
2. TD-LTE is the best choice

**Global Allocation for 2.6GHz band**

- **Europe**
- **Asia - Pacific**
Roadmap of TD-LTE Voice Solution

**LTE Initial Voice Solution**
- No Voice over LTE Data Card/CPE
  - Defined by 3GPP Protocol
  - No need for IMS network
  - Call delay longer than 2G/3G

**LTE Evolved Voice Solution**
- VoIMS+SRVCC is defined by 3GPP as the ultimate voice solution
- Challenges to meet the continuity requirement of voice traffic
- High cost for deployment of network

**CSFB (CS Fallback)**
- Defined by 3GPP Protocol
- No need for IMS network
- Call delay longer than 2G/3G

**SRVCC**
- Long-term Coexistence

<table>
<thead>
<tr>
<th>2012H1</th>
<th>2012H2</th>
<th>2013H1</th>
<th>2013H2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Roadmap of TD-LTE Terminal Instrumentation

2012Q1
- TD-SCDMA
- A
- /TD-LTE
- WCDMA
- /TD-LTE

2012Q2
- GSM/TD-SCDMA/
- WCDMA/ TD-LTE
- multi-mode
- Support for
- LTE FDD

2012Q3
- TD-SCDMA/
- WCDMA/ TD-LTE
- TTCN3 conformance testing for
- TD-LTE

2012Q4
- GSM/TD-SCDMA/
- WCDMA/ TD-LTE/LTE
- FDD multi-mode,
- covering 3GPP TS36.521-1
- All the conformance
- testing about RF, protocol,
- RRM in 3GPP
Roadmap of Antenna

**Broadband Antenna**
- **2012H1**: 8 path in trial
  - 1880-2690MHz
  - Asymmetrical half-wave dipole
- **2012H2**: 8 path in trial
- **2013H1**: 8 path in a large scale
  - 1710-2690MHz
- **2013H2**: 8 path in a large scale

**Mini Antenna**
- **2012H1**: program determined
  - Physical size reduced
  - Technical Indicators ensured
  - Efficiency improved
- **2012H2**: In trial
- **2013H1**: In trial
  - Height reduced 50%
  - Thickness reduced 55%
- **2013H2**: Available in a large scale
  - Height reduced 50%
  - Thickness reduced 58%

**Active Integrated Antenna**
- **2012H1**: In trial
  - Active modules & radiation unit connected
  - Transmission loss minimized
- **2012H2**: In trial
- **2013H1**: Available in a large scale
- **2013H2**: Available in a large scale
  - Cost reduced: 30%-50%
  - Gain improved: 0.3dB
## TD-LTE Solutions for Operators

### Traditional Operators
- Vodafone, Bharti, Softbank, UK Broadband, Hi3G, DOCOMO, Deutsche Telekom, France Telecom, SaudiTelecom, FETnet, SKT, etc.
- Existed TDD bands
- Decrease operation cost, increase system capacity
- Evolve from CSFB to SRVCC
- Evolve from data card to handset
- TDD/FDD convergence is a trend

### Wimax Operators
- Clearwire, Yota, Witore, etc.
- Existed TDD bands and subscribers
- Rich experience in TDD network deployment and operation
- Available TD-LTE and Wimax convergence solution
- Voice service over handsets

### Newly Developing Operators
- RosTelecom, Antares, Devas, Vivid, Solorz, MVS, Austar, etc.
- Easily get TDD bands with low cost
- Data cards for transition, or handsets directly
- SRVCC for voice solution directly
- Flexible business model, target on new market, such as VPN and smart city
Thank you!

wangpengl@tdia.cn
Tel: +86-10-84170081/82/83
Fax: +86-10-84170087
Http://www.tdia.cn