Industry Perspective on LTE Spectrum

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LTE is the fastest ever growing mobile technology

**318 Commercial Networks**
- July 28, 2014
- Source: GSA_Evolution_to_LTE_report_280714

**111 countries**
- Source: GSA_Evolution_to_LTE_report_280714

**1889 user devices**
- July 14, 2014
- Source: GSA_lte_ecosystem_report_140714

**240+ million subs**
- June 10, 2014
- Source: Informa, 2014Q1

- **192.6 Million**
- **70 million** LTE subs in China by end of 2014
- **335 million** LTE subs by end of 2014

**318**
- 2009: 2
- 2010: 16
- 2011: 46
- 2012: 146
- 2013: 265
- 2014H1: 318
- (forecast)

**350**
- 2009: 146
- 2010: 265
- 2011: 318
- 2012: 350

**1889**
- Feb-11: 63
- Jan-12: 269
- Jan-13: 666
- Jan-14: 1371
- Jul-14: 1889

**240+ million subs**
- July 28, 2014: 2014H1
- July 14, 2014: 192.6
- June 10, 2014: 2014H1

- **70 million** LTE subs in China by end of 2014

**335 million** LTE subs by end of 2014

- Source: DIGITIMES Research

- Source: GSA_lte_ecosystem_report_140714

- Source: Informa, 2014Q1
LTE 1800M is the mainstream band

**144 (45%)** commercial network are on **1800M**

**769 (40%)** LTE devices including 376 phones support 1800M

Source: GSA_Evolution_to_LTE_report_280714, Huawei Wireless intelligence

Source: GSA_lte_ecosystem_report_140714

**Cases:**
Why LTE in 1800MHz -- Best TCO

- **2x better coverage** than 2.6GHz
- **50% less sites** than high band 2.6GHz

- Widest bandwidth with 2*75MHz
- **Re-use** GSM sites and equipment
- **Smooth refarming** GSM to LTE by SingleRAN

![Diagram showing power vs. distance for 1.8GHz, 2.1GHz, and 2.6GHz frequencies.](Image)

- 1.8GHz vs. 2.6GHz:
  - 2x better coverage
  - 50% less sites
  - 4dB less power

- 2.1GHz vs. 2.6GHz:
  - 2~3dB less power

Software Defined Radio

- Frequency
  - GSM
  - LTE

GL dual mode

Software Upgrade

Software Defined Baseband
LTE1800 best for international roaming tourists

1800M license widely available

- 350+ operators in nearly 150 countries own 1800M license.
- 70 countries have deployed 144 L1800 networks.
- China Telecom & China Unicom will launch L1800 in 2014.

Best for tourist service

- ~1 million tourists visit Nepal every year.
- 70% countries of the tourists has launched L1800.

Source: GSA report. July 2014

Source: http://www.tourism.gov.np/
APT700 has great potential, but need time to prevail

3 Billion population targeted

- 9 already auctioned (Japan, Philippines, Australia, Taiwan, New Zealand, Chile, Ecuador, Papua New Guinea, Fiji)
- 25+ intention for band 28 auction

Eco-system is being built

- 7 commercial networks (Digicel PNG in Papua New Guinea, FarEasTone and Taiwan Mobile, VDF NZ, Optus, Telstra, TNZ)
- 33 UE announced (including 26 phone)

APT700 for rural coverage

- WBB UE available
- Huawei organized Global APT700 Alliance in Feb 23. 2013

Data rate @2km

- APT700: 21Mbps
- 2600M: 5.8Mbps
Spectrum strategy: High + Low band is the best combination

**General Spectrum Strategy**
- 700MHz/900MHz Low band for coverage
- 2.6GHz High band is for capacity
- 1.8GHz is for both capacity and coverage.

**Cases of High Band + Low Band**

- **2600M+DD800**
  - 17 commercial networks in Europe and Russia

- **2600M+1800M**
  - 24 commercial networks in Europe and Asia-Pacific

- **1800M+DD800**
  - 17 commercial networks in Europe

- **1800M + APT700**
  - 6 commercial networks in APAC

Source: GSA Evolution to LTE report and Huawei Wireless MI
Case: UK EE 1800M + 2600M to fulfill coverage and capacity targets

- **2600M (20MHz)**
  - **150Mbps**

- **1800M (20MHz)**
  - **75Mbps**

- **1800M (10MHz)**
  - **30% Population**

**Forecast:**
- 13Q1: 0.3M Subs
- 13Q3: 1.2M Subs
- 14Q1: 2M Subs
- Jun. 14: 2.9M Subs
- 2014 Dec 30th: 4.2M Subs
- 2015: 6M Subs

- **300Mbps with CA (1.8G + 2.6G)**
  - (start from Tech City)

**Coverage:**
- 1800M (10MHz)
- 1800M (20MHz)
- 2600M (20MHz)

**Subscribers:**
- 14Q1: 2M Subs
- 2014 Dec 30th: 4.2M Subs
- 2015: 6M Subs

**Forecast:**
- 2014 Dec 30th: 6M Subs

**Speeds:**
- 75Mbps
- 150Mbps
- 300Mbps

- 300Mbps with CA (1.8G + 2.6G)
  - (start from Tech City)
Continuous larger bandwidth in 1800M is recommended

Current 1800M spectrum allocation in Nepal:

- Continuous spectrum (e.g. 20MHz) is better than Carrier Aggregation of separated (10MHz+10MHz) in terms of performance and TCO.

How to match standard LTE bandwidth:

- Normal: 5MHz, 10MHz, 15MHz, 20MHz
- Narrow: 1.4MHz, 3MHz

Bandwidth should be ready for refarming to LTE:

- 5MHz, 10MHz, 20MHz

Continuous spectrum (e.g. 20MHz) is better than Carrier Aggregation of separated (10MHz+10MHz) in terms of performance and TCO.
## Vision of LTE Spectrum Usage in Nepal

- Continuous large bandwidth for LTE
- Technology neutral for all bands
- Auction step by step to maximize the spectrum utilization

<table>
<thead>
<tr>
<th>Year</th>
<th>TDD 2300M/2600M</th>
<th>2600M (Band7)</th>
<th>700M (Band28)</th>
<th>1800M (Band3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>1800M Refarming</td>
<td></td>
<td></td>
<td>1800M New Auction</td>
</tr>
<tr>
<td>2015</td>
<td>1800M</td>
<td></td>
<td></td>
<td>Carrier Aggregation with APT700 / 2600M</td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td>Each Block&gt;=10M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td></td>
<td>APT700 Auction as 2nd Carrier</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td></td>
<td></td>
<td>2600M Auction as 3rd Carrier</td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>Each Block&gt;=20M</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Each Block >= 10MHz
- Each Block >= 20MHz
- Each Block >= 20MHz
- TDD 2300M/2600M New Auction
- 2600M Auction as 3rd Carrier
- APT700 Auction as 2nd Carrier
- Carrier Aggregation with APT700 / 2600M
- Technology neutral for all bands
- Auction step by step to maximize the spectrum utilization
Thank you!

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