850MHz to be the mainstream FD LTE band for India telecom market

November 2013
Summary

With the recent approval of the draft M&A guidelines by the Telecom Commission and recommendations on the auction of 800MHz (technically speaking, LTE Band 5, referred to as 850MHz), and the in principal approval of spectrum sharing and trading, there appears to be a very distinct possibility of Band 5 emerging as the mainstream FD LTE band in the India market. This FD LTE deployment on 850MHz can be used along with 2300MHz for a dual-band TD-FD network, and over a period of time to a multi-band network similar to the Sprint Spark.

The 850MHz frequency isn’t a mainstream band for LTE deployment globally, and has been used mainly in deployments in Asian markets such as Korea and Philippines and reported trials in the U.S. However, the equipment and device ecosystem is much more evolved than the 700MHz APT band that India has opted for:

- OEM trials of FD LTE on 850MHz in India indicate a peak site throughput in excess of 50Mbps using 3MHz spectrum, and 120Mbps\(^1\) using 5MHz spectrum
- The current mainstream smartphones from vendors such as Samsung, Nokia and Apple, including a version of iPhone 5C, A1429, support Band 5 LTE, and this ecosystem will become more developed by the next financial year

Operators currently using the 850MHz band for providing CDMA services have initiated the process of migrating their subscribers to their GSM network, starting with low-data usage subscribers. They are also offering dual band CDMA-GSM handsets to support the migration process, and removing inactive users to reduce the load on CDMA network. This means that the CDMA voice traffic can be supported using potentially a single carrier of 1.25MHz (or 2.5MHz initially) to provide continuity to the existing user base of dongles before they migrate to FD LTE. Voice can be provided using dual radio CDMA/LTE handsets similar to the U.S. LTE/CDMA operators, with single radio VoLTE devices introduced later.

If the existing CDMA band becomes relatively free due to above initiatives and migration roadmap, then 4G operators can go for spectrum sharing / roaming agreements with CDMA operators and acquire balance spectrum in the 850MHz auction so that they have access to 6.25MHz to 7.5MHz of 850MHz (5MHz for FD LTE and 1.25MHz/2.5MHz for CDMA fallback). This enables a rapid pan-India go-to-market on 850MHz FD LTE in FY14, with 2300MHz TD LTE providing in-fill coverage and capacity.

In addition to the operational considerations of migration, there are economic considerations around one-time spectrum payout for 850MHz holdings (for spectrum beyond 2.5MHz), any charges for liberalization, and the balance between the spectrum acquired from 850MHz auction vs. accessed through roaming/sharing.

As detailed later in this note, we also expect M&As only in limited situations, with operators considering spectrum sharing and trading for getting access to spectrum.

\(^1\) With 2x2 MIMO
Indian operators have limited spectrum & technology deployment options in the near term (before FY17)

Indian operators have been considering multiple spectrum-technology combinations based on their current spectrum assets, market-specific data strategy as well as the longer-term spectrum & technology evolution roadmap (e.g. 900MHz spectrum being used for HSPA now and for LTE in the future). We categorize these techno-commercial models into four broad categories (please refer Figure 1):

- **4G only operators**: Operators with a primary focus on LTE services, with voice support on LTE (using VoLTE) with no underlying support for GSM
- **2G+3G operators**: Operators with current spectrum holdings in the 1800MHz and 900MHz band, along with 2100MHz holdings in few circles, but no 2300MHz spectrum
- **2G+4G operators**: Operators with only a 1800MHz regional footprint, with a potential plan of moving directly to 700MHz FD LTE in the long term (or 1800MHz FD LTE in the short term)
- **2G+3G+4G operators**
  - Integrated: Operators which already have spectrum across 900MHz, 1800MHz, 2100MHz and 2300MHz
  - Inorganic: A new entity formed by merger and amalgamation of two or three operators with assets in 850MHz, 900MHz, 1800MHz, 2100MHz and 2300MHz

Figure 1: Techno-commercial model options for operators in India

<table>
<thead>
<tr>
<th>Tech Model</th>
<th>GSM support</th>
<th>Data Coverage</th>
<th>Data Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>4G only</td>
<td>• Nil</td>
<td>• 850MHz FD LTE</td>
<td>• 2300MHz TD LTE</td>
</tr>
<tr>
<td>2G + 3G</td>
<td>• 1800MHz</td>
<td>• 2100MHz HSPA</td>
<td>• 2100MHz HSPA [DC with 900MHz]</td>
</tr>
<tr>
<td></td>
<td>• 900MHz</td>
<td>• 900MHz HSPA²</td>
<td></td>
</tr>
<tr>
<td>2G + 4G</td>
<td>• 1800MHz</td>
<td>• 700MHz FD LTE</td>
<td>• 850MHz FD LTE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 850MHz FDLTE</td>
<td>• 1800MHz FD LTE</td>
</tr>
<tr>
<td>2G + 3G + 4G Integrated</td>
<td>• 1800MHz</td>
<td>• 900MHz HSPA</td>
<td>• 2300MHz TD LTE</td>
</tr>
<tr>
<td>Integrating</td>
<td></td>
<td>• 2100MHz HSPA</td>
<td></td>
</tr>
<tr>
<td>2G + 3G + 4G Inorganic</td>
<td>• 1800MHz</td>
<td>• 850MHz FD LTE</td>
<td>• 2300MHz TD LTE³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 2100MHz HSPA</td>
<td></td>
</tr>
</tbody>
</table>

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² Only for circles where 900MHz is coming up for auction and available for liberalized use
³ Only for specific M&A scenario with operator holding 2300MHz assets
4G Only operators: 850MHz FDLTE through sharing / auctions, with no potential M&A activity

Time-to-market remains the primary focus of operators with current holdings in 2300MHz, along with the ability to provide a compelling consumer proposition. There are a few options for deployment of LTE for these operators:

- **700MHz FD LTE**: India has adopted the APT band, which does not have a ready LTE ecosystem as of now (unlike 700MHz US band). Even if the auctions for 700MHz happen in FY15, the deployment will get pushed to FY16/17, which will be too late to address the data market opportunity.
- **1800MHz FD LTE**: 5MHz spectrum can be acquired through the auctions but the limited coverage will result in higher Capex to achieve equivalent coverage.
- **850MHz FD LTE**: Rapid go-to-market by deploying LTE base stations on 40,000 sites with pan-India coverage. The spectrum can be made available through sharing/roaming agreements with CDMA operators as well as through auctions, allowing launch of a dual mode 850MHz FD LTE and 2300MHz TD LTE network in 2014.

The reported surrender of 850MHz spectrum (beyond 2.5MHz) by a CDMA operator and the proposed vacation of 850MHz by PSU operators will result in up to 10MHz of spectrum in seven circles and up to 5MHz in all circles. If this spectrum is put on auction then operators have the opportunity to build a credible 850MHz LTE offering.

This spectrum can be used along with roaming / spectrum sharing agreements with operators with existing 850MHz spectrum on about 40,000 sites, to build a CDMA fallback (1.25MHz to 2.5MHz) and FD LTE 5MHz offering. The existing CDMA operators are shifting their focus to GSM and HSPA with active migration of users from CDMA to GSM, launch of dual mode GSM+CDMA handsets, reduction in inactive user base and densification of macro network.

The economic trade-offs around the amount of spectrum to acquire through auction vs. retaining existing spectrum (retaining 2.5MHz or higher) and liberalization cost (if any) will need evaluation, along with seamless migration of current CDMA users to either GSM or LTE without incurring significant subsidy costs.

We do not expect any significant M&A activity by 4G only operators given the requirement to pay market value of spectrum, high debt levels of potential targets, no final guideline on SUC charges as well as no tangible contribution in developing a high capacity wireless model.
**2G+3G operators: Acquisition of 900MHz high value base or 2100MHz spectrum assets**

Operators with current GSM offerings on 1800MHz / 900MHz, and a fragmented 2100MHz footprint in few circles are expected to go for developing a stronger 3G business in the short-term to monetize the data potential of their existing user base rather than make fresh investments in LTE. This will mean deploying 900MHz acquired through upcoming auctions for HSPA, or DC HSPA in circles with 2100MHz and providing a strong user experience on 3G for smartphone users.

The only M&A and spectrum management initiatives by these operators will be for
- 900MHz base: Acquiring stand-alone operators with a high value customer base on 900MHz
- 2100MHz spectrum: Completing their regional footprint, or augmenting their current 5MHz spectrum holding to 10MHz through spectrum trading. The availability of such 2100MHz spectrum may be possible in case of merger among two to three entrants with the new entity focusing mainly on LTE and adopting a leaner 3G footprint

**2G+4G operators: Optimization of existing 2G business, with leapfrog to 4G, and opportunistic acquisition**

Operators with a regional 2G footprint have the option to go for an acquisition to get access to a pan-India footprint as well as economies of scale. However, the current M&A guidelines, concentrated value in 900MHz circles, high rotational churn in 1800MHz base as well as expectation mismatch around valuations make this option very difficult to execute profitably.

The other option for these operators is to go for the following bands:
- 900MHz: Potentially allowing launch of HSPA (with GSM on 1800MHz) although the re-farming process is staggered across years and will not provide a national footprint / scale benefit in the short term
- 1800MHz: Contiguous spectrum for FD LTE through auctions esp. in circles where they already have a 1800MHz GSM footprint, although the Capex requirement will be higher to achieve equivalent coverage
- 850MHz: Advantage of a fallback option on 1800MHz which allows for CSFB voice on LTE network, and develop an offering which can compete reasonably well with 900MHz HSPA. However, given the limited amount of 850MHz spectrum and the lack of a 2300MHz band access needs to be considered
- 700MHz: Timing of auctions and eco-system maturity remain under question

In summary, these operators are expected to go for a 700MHz FD LTE option, and in the near term will focus on developing their 2G footprint on 1800MHz, and achieving operational profitability. We believe that an acquisition initiative by these operators will be very opportunistic.
2G+3G+4G operators: Likelihood of merger among entrants, incumbent already acquired 2300MHz assets

**Integrated:** Operators with current spectrum holding in 2G (900MHz / 1800MHz), 3G (2100MHz) and 4G (2300MHz) bands are expected to focus on using 900MHz for HSPA, or DC HSPA along with 2100MHz. Unlike operators with 2G and 3G, these operators also have 2300MHz band which can be used for high capacity services, especially in dense urban areas and metro markets, although the coverage gets limited due to the higher frequency.

The M&A potential for these operators is similar to that for 2G+3G operators, with the added acquisition of 2300MHz, and we have seen some of these deals getting closed.

**Inorganic:** Only a merger among the entrants can form such an operator entity with current spectrum holdings across multiple bands. With rationalization of the pooled holdings, such an entity can offer GSM on 1800MHz, HSPA on 2100MHz and LTE on 850MHz (supported by 2300MHz in specific merger situations).

Such a merger has a high probability given the weak operational and financial situation of some of the operators, and the promoter groups contemplating exit from non-core businesses.

In summary, the M&A guidelines and the current spectrum auction situation is expected to result in select transactions, with operators also considering spectrum sharing and trading as a means for getting access to spectrum to develop their technology roadmaps (Please refer Figure 2).

**Figure 2: Expected M&A and spectrum management initiatives**

<table>
<thead>
<tr>
<th>Tech Model</th>
<th>M&amp;A</th>
<th>Spectrum sharing</th>
<th>Spectrum trading</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4G only</strong></td>
<td>-</td>
<td>850MHz for FD LTE</td>
<td>-</td>
</tr>
<tr>
<td><strong>2G + 3G</strong></td>
<td>900MHz standalone</td>
<td>-</td>
<td>2100MHz for HSPA</td>
</tr>
<tr>
<td><strong>2G + 4G</strong></td>
<td>Opportunistic</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>2G + 3G + 4G* Integrated</strong></td>
<td>• 2300MHz</td>
<td>-</td>
<td>2100MHz for HSPA</td>
</tr>
<tr>
<td></td>
<td>• 900MHz standalone</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>2G + 3G + 4G* Inorganic</strong></td>
<td>Merger among 1800MHz entrants</td>
<td>-</td>
<td>• 2100MHz • 2300MHz</td>
</tr>
</tbody>
</table>

Also, such a spectrum demand-supply situation is expected to result in 850MHz emerging as the primary band for FD LTE in India, until 700MHz comes to the market...
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