Spectrum Planning Progress in Taiwan

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National Communications Commission
Taiwan
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Spectrum Allocation in Taiwan

- Telecom Market Status
- Existing Mobile Comm. Spectrum
- Upcoming Mobile Comm. Spectrum
- UHF Spectrum
- Unlicensed Spectrum
- Low-Power Wireless Microphone
- Short-Range Radar for Automobile
- Personal Locator Beacon
2013 Revenues of Fixed-Line Services

- Value-Added Service: 33% ($1.77bn)
- Leased-Circuit Business: 22% ($1.19bn)
- Long Distance Telephony: 3% ($0.16bn)
- Local Telephony: 26% ($1.36bn)
- International Telephony: 14% ($0.72bn)
- MOD: 2% ($0.12bn)

Total: USD 5.3 billion
2013 Revenue of Mobile Services

- Other (PHS): 0% ($0.01bn)
- 2G: 8% ($0.58bn)
- 3G: 92% ($6.64bn)

Total: USD 7.2 billion
### 4G Spectrum Auction

- **SMRA**
- **Auction sessions start on 9/3 end on 10/30, 2013**

<table>
<thead>
<tr>
<th>Winning Bidders</th>
<th>Bandwidth</th>
<th>Total Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chunghwa Telecom</td>
<td>70 MHz</td>
<td>USD 1,302 m</td>
</tr>
<tr>
<td>Far Eastone Telecom</td>
<td>60 MHz</td>
<td>USD 1,043 m</td>
</tr>
<tr>
<td>Taiwan Mobile</td>
<td>60 MHz</td>
<td>USD 967 m</td>
</tr>
<tr>
<td>Taiwan Star Cellular (Ting Hing)</td>
<td>20 MHz</td>
<td>USD 121 m</td>
</tr>
<tr>
<td>Asia Pacific Telecom</td>
<td>20 MHz</td>
<td>USD 214 m</td>
</tr>
<tr>
<td>Ambit Microsystem (Foxconn)</td>
<td>40 MHz</td>
<td>USD 306 m</td>
</tr>
</tbody>
</table>
4G Service Status

- There are five 4G operators. The top three operators launched 4G LTE services in end of May 2014, after fulfillment of the minimum requirement of 250 LTE BSs.
- Taiwan Star Telecom launched 4G service on 8/25, 2014.
- Asia Pacific Telecom has been granted permission to launch service on 10/22, 2014.
- There are 2.7m 2G users and 25.5 m 3G users.
- There are 1.7 m 4G users and the number is expected to reach 3m by end of 2014.
4G Signal Coverage

- Total of 6697 LTE BSs have been in operation and 5567 LTE BSs are under construction by 10/24 2014.
- 95% of population will be covered by LTE signal by end of 2014.
540 MHz spectrum have been assigned for 2G, 3G, 4G, WiMAX and PHS mobile services.

<table>
<thead>
<tr>
<th>Band</th>
<th>Expiration Date</th>
<th>Band</th>
<th>Expiration Date</th>
<th>Band</th>
<th>Expiration Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>700 MHz</td>
<td>4G (2030.12.31)</td>
<td>800 MHz</td>
<td>3G (2018.12.31)</td>
<td>900 MHz</td>
<td>4G (2030.12.31)</td>
</tr>
<tr>
<td>(703-748</td>
<td></td>
<td>(825-845</td>
<td></td>
<td>(885-915</td>
<td></td>
</tr>
<tr>
<td>、758-803)</td>
<td></td>
<td>、870-890)</td>
<td></td>
<td>、930-960)</td>
<td></td>
</tr>
<tr>
<td>1800 MHz</td>
<td>4G (2030.12.31)</td>
<td>1900 MHz</td>
<td>PHS (1905-1915)</td>
<td>2100 MHz</td>
<td>3G (2018.12.31)</td>
</tr>
<tr>
<td>(1710-1770</td>
<td></td>
<td>(1885-1915)</td>
<td>(2016.4)</td>
<td>(1915-1975</td>
<td></td>
</tr>
<tr>
<td>、1805-1865)</td>
<td></td>
<td></td>
<td></td>
<td>、2110-2165)</td>
<td></td>
</tr>
<tr>
<td>2100 MHz</td>
<td>3G TDD (2018.12.31)</td>
<td>2600 MHz</td>
<td>WiMAX (2016)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2010-2025)</td>
<td></td>
<td>(2565-2625</td>
<td></td>
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</tr>
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<td></td>
<td>、2660-2690)</td>
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</table>

2G licenses expire on June 30, 2017.
4G spectrum auction in 2013 includes existing 2G spectrum.
Upcoming Mobile Comm. Spectrum

- Releasing 190 MHz spectrum in **2.6 GHz band** (2500 - 2690 MHz) in 2015. Existing WiMAX operators currently are using 90 MHz.

- Auctioning, in 2016 - 2017 time frame, 205 MHz spectrum in **800 MHz, 1900 MHz** and **2000 MHz** bands after 3G and PHS licenses expire.

- Will comply to ITU spectrum allotment in **2.3 - 2.4 GHz** and **3.4 - 3.6 GHz** bands for 4G mobile service.

- Will comply to international standards in SDL(supplemental downlink) and LTE-U technologies.
530 - 608 MHz is allocated for six 6 MHz Single Frequency TV Networks.

Other spectrum in UHF band (300 - 700 MHz) are under utilized and have potential for spectrum sharing.

Transmitting at the same power level, an UHF BS can cover an area of 6 Km radius while a GSM (1800 MHz) BS can only cover an area of 2.5 Km radius.

An indoor UHF band AP can replace 9 WiFi APs.
### Unlicensed Spectrum

<table>
<thead>
<tr>
<th>Band</th>
<th>Technologies</th>
<th>Band Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4 GHz</td>
<td>IEEE802.11b/g/n</td>
<td>83.5 MHz</td>
</tr>
<tr>
<td>(2400-2483.5 MHz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 GHz</td>
<td>IEEE802.11a/n/ac</td>
<td>455 MHz</td>
</tr>
<tr>
<td>(5250-5350 MHz, 5470-5825 MHz)</td>
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</tr>
</tbody>
</table>

Will allocate 5150 - 5250 MHz and 5825 - 5850 MHz for unlicensed wireless LAN use.

Will allocate 57 - 66 GHz for unlicensed small cell BS backhaul and WiGig use.
Low-Power Wireless Microphone

◆ Wireless microphone operating in 794 - 806 MHz band causes interference with 4G.

◆ New shared-use spectrum will be allocated for low-power wireless microphone.

- **485 - 530 MHz**: Share use with police, fire department, taxi and other users.

- **753 - 758 MHz**: 4G guard band. Must tolerate interference from 4G.

- **1790 - 1805 MHz**: 4G guard band. Must tolerate interference from 4G.
Short-Range Radar for Automobile

- 25.9 - 26.65 GHz is existing spectrum for SRR.
- Expanding 24.25 - 25.9 GHz spectrum for SRR.
Personal Locator Beacon

- Frequency at **406 MHz** is allocated for PLB use.
- PLB equipment must conform to message format defined by COSPAS-SARSAT and pass type-approval by NCC.
- Must register at the Rescue Coordination Organization.
- No license or fee requirement imposed by NCC.
Questions or Suggestions?

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