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Migration to IMT-2000 in Developing countries:

The view of Policy Makers and Regulators and market reaction

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1

Why Migration

- Need of High speed data services
- Inadequacy of 2 G spectrum
- Need of additional operators in the market to increase the level of competition
- These additional operators could offer IMT-2000 services

2

The Key Considerations

- **Existing Licensing Regime**
 - Is it a hurdle for migration
- **Availability of equipment**
 - Is it that the equipment for IMT-2000 services is available only in a particular spectrum
- **Technological developments**
 - SDRs, Multi Tx-Rx in a single chip

3

Spectrum Policy

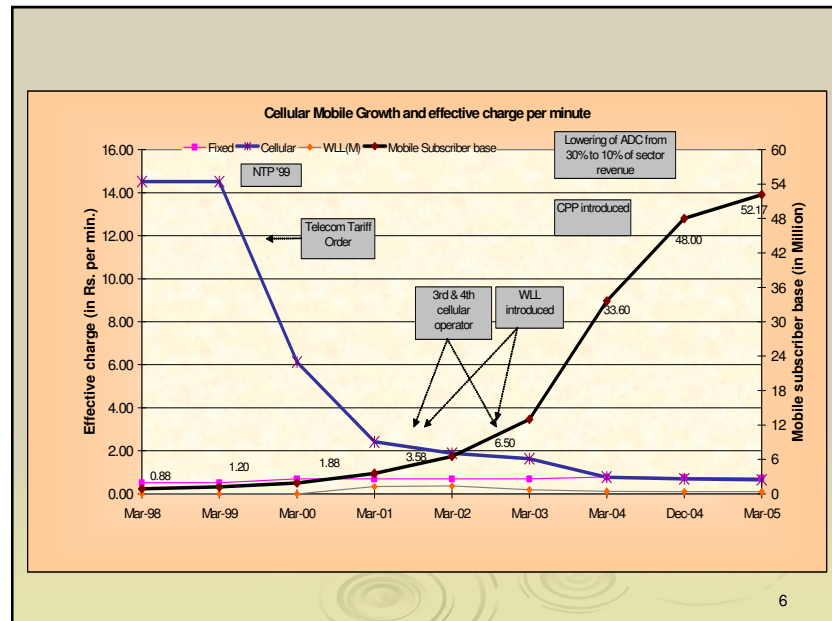
- **Efficient Utilisation of Spectrum**
- **Spectrum allocation Procedure**
- **Spectrum Pricing**

4

Growth of Mobile services

- Targeted Market
- Level of Competition
- Current penetration level
- Tariff
- Affordability
- Population coverage
- Applications

5



Other related issues

- **Spectrum Re-farming**
- **Spectrum trading**
- **Mergers and Acquisitions**
- **Surrender of spectrum**

7

Spectrum allocation for 2/2.5 G Cellular Mobile services

	International allocations*	Indian allocation
450 MHz	Spectrum allocated in some countries: 452.5-457.475/ 452 – 456.475/ 450-454.8/ 411.675 – 415.850/ 415.5-419.975 479-483.48/ 455.23-459.99/ 451.310-455.730 Details are given in table	Not allocated
800 MHz	824 – 849 MHz paired with 869 –894 MHz	824 – 844 paired with 869 – 889 MHz <i>(Used to provide WLL (M) & CDMA based mobile services)</i>

8

Spectrum allocation for 2/2.5 G Cellular Mobile services

	International allocations*	Indian allocation
900 MHz	890 – 915 MHz paired with 935 – 960 MHz (880 – 890 MHz paired with 925 – 935 MHz E-GSM band)	890 – 915 paired with 935 – 960 MHz** <i>(Used by 1st, 2nd and 3rd Cellular Mobile Service Providers for GSM)</i>
1800 MHz	1710 – 1785 MHz paired with 1805 – 1880 MHz	1710 – 1785 paired with 1805 – 1880 MHz <i>(Used by 4th CMSP and for additional allocations to 1st, 2nd and 3rd CMSPs.)</i>
1900 MHz	1850 – 1910 MHz paired with 1930 – 1990 MHz <i>(North American PCS band)</i>	1880–1900 MHz is earmarked for Micro cellular technologies based on TDD

9

Data Speed for IMT-2000 Services

Stationary	2 Mbps
Pedestrian	384 kbps
Vehicular	144 kbps

10

Spectrum for IMT-2000 Services

- ITU-R Recommendations M.1036
- WARC-92 identified bands
 - 1885-2025 MHz
 - 2110- 2200 MHz
- WRC-2000 identified bands
 - 806-960 MHz
 - 1710-1885 MHz
 - 2500-2690 MHz

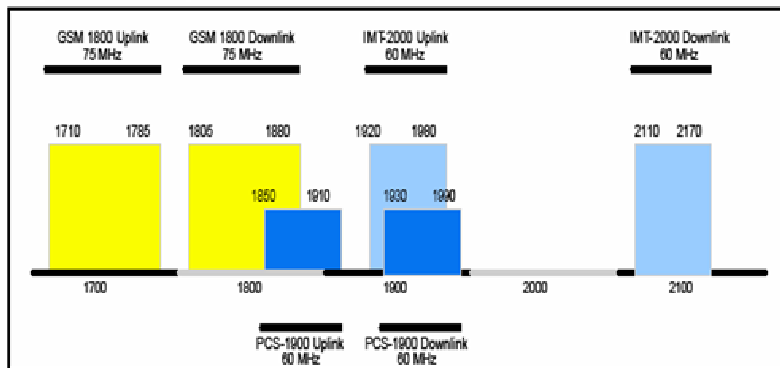
11

Frequency Arrangements in the band 1710-2200 MHz band

<i>Frequency arrangements</i>	<i>Mobile station transmitter (MHz)</i>	<i>Centre gap (MHz)</i>	<i>Base station transmitter (MHz)</i>	<i>Duplex separation (MHz)</i>	<i>Un-paired spectrum (e.g. for TDD) (MHz)</i>
<i>B1</i>	1920-1980	130	2110-2170	190	1880-1920; 2010-2025
<i>B2</i>	1710-1785	20	1805-1880	95	None
<i>B3</i>	1850-1910	20	1930-1990	80	1910-1930
<i>B4 (harmonized with B1 and B2)</i>	1710-1785 1920-1980	20 130	1805-1880 2110-2170	95 190	1900-1920; 2010-2025
<i>B5 (harmonized with B3 and parts of B1 and B2)</i>	1850-1910 1710-1755 1755-1805	20 50 305	1930-1990 1805-1850 2110-2160	80 95 355	1910-1930
<i>B6 (harmonized with B3 and parts of B1 and B2)</i>	1850-1910 1710-1770	20 340	1930-1990 2110-2170	80 400	1910-1930

12

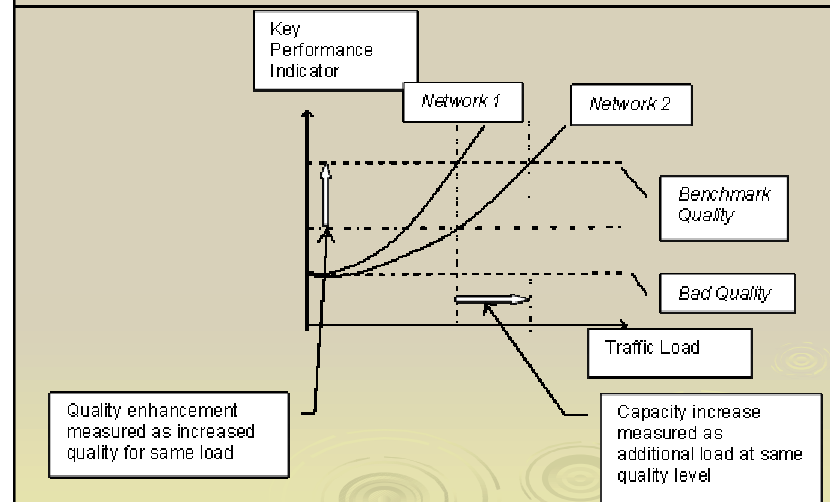
Interference Issue: IMT-2000 2 GHz Vs. 1.9 GHz band



BaseStation to Base Station Interference: CDMA2000 TX will cause interference into the WCDMA RX
 Mobile Station to Mobile Station Interference: WCDMA TX will cause interference into CDMA 2000 RX

13

Spectral Efficiency Concept



Efficient Utilisation of Spectrum

For cellular mobile systems, it can be expressed as

$$\text{SUE} = \frac{\text{(Traffic in Erlangs)}}{\text{(Amount of Spectrum in MHz) X (Area in Sq. Kms)}} \quad \text{For a specified GoS}$$

› SUE = Spectrum Utilisation Efficiency

15

Efficient Utilisation of Spectrum

➤ Is it practically possible to measure efficiency based on this formulae?

➤ Is it necessary?

16

Spectrum Pricing

- **Auction**
- **AIP**
- **Cost Recovery**
- **Percentage of Revenue**
- **Based on Market indicators**
- **Beauty Contest**

17

THANK YOU

18