

IMT-2000 Implementation – Spectrum and other Regulatory Considerations

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Overview

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Spectrum Management Functions and Considerations

Spectrum is a finite resource and regulators should maximize its use to protect the continued viability of current users and to provide opportunities for new services to be deployed. The demands for spectrum greatly affect the major functions of spectrum management. These functions are:

- Allocation
 - For general services such as mobile and fixed terrestrial, mobile and fixed satellite, amateur radio, etc.
- Development of service rules
 - Sets essential technical criteria
 - Minimal requirements permit operators to be flexible
- Assignment
 - To individual users or licensees
- Compliance and enforcement
 - To prevent harmful interference, unauthorized use

Regulatory Goals in Allocating and Assigning Spectrum

- Maximizing spectrum efficiency
- Ensuring equity for all citizens
- Providing adequate spectrum for national defense and public safety
- Coordinating international communications

Other Considerations for Allocating Spectrum

- Technology neutrality
 - Allocating spectrum for generic services rather than specific technologies will provide flexibility for rapid changes in the development of new technologies
- Flexible services rules
 - Making service rules as flexible as possible reduces regulatory burdens on service providers and enables them to meet their customers needs in the immediate and longer term (e.g., permits provision of fixed and mobile services by the same service provider)
- Regional/global coordination
 - Maximizing regional and global allocation commonality will assist in the development of larger economies of scale for equipment, and in the provision of “borderless” services

Techniques for Assigning Spectrum

First-come, First-served

- Pros:** speed, inexpensive
- Cons:** may not end up in hands of an entity that values it the most; value of license not taken into account; resellers instead of public may profit

Auctions

- Pros:** speed, less expensive than beauty contest, entity who places highest value on license wins, spectrum is public resource so revenues benefit citizens, provide information about economic value of spectrum
- Cons:** could lead to increased concentration in industry, may ignore non-financial public interest objectives (equity), revenue potential may create incentive for government to restrict output and raise prices

Beauty Contest

- Pros:** awards license to contender who would best service public interest, allows for equity considerations, can require licensees to serve isolated areas
- Cons:** time consuming, expensive, no rules for a “tie”, less transparent than other techniques, allows government to determine what the market wants

Lotteries

- Pros:** quick process, provides rule for “tie”
- Cons:** unqualified party can win, resellers instead of public may profit

IMT-2000 Spectrum Background

- The ITU has taken a lead role in the development and deployment of IMT-2000, and is working to develop Recommendations on spectrum usage
- The ITU's World Radio Conferences in 1992 and 2000 identified several frequency bands for the deployment of IMT-2000 systems and services
- This identification is not an allocation to a particular technology or set of technologies, nor is it an allocation to a new service – but is a recommendation to administrations to use these frequencies for IMT-2000 technologies in an attempt to harmonize use of the bands internationally

Terrestrial Frequency Bands Identified for IMT-2000

806-960 MHz

1710-1885 MHz

1885-2025 MHz

2110-2200 MHz

2500-2690 MHz

IMT-2000 technologies will be deployed in all frequency bands

Ref: World Radio Conference – 2000 (WRC-2000) Istanbul, June 5, 2000:
Footnote S5.388 is associated with Resolutions 212 and 223 (the 1.9 and 2.1 bands)
Footnote S5.384A is associated with Resolution 223 (the 1.7 and 2.5 bands)
Footnote S5.317A is associated with Resolution 224 (the 800/900 bands)

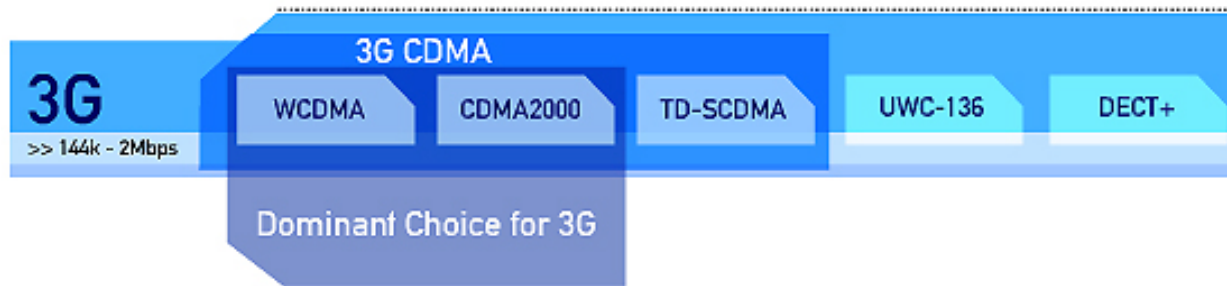
ITU Recommendation on IMT-2000 Spectrum

- Administrations are encouraged to allow existing pre-IMT-2000 systems to migrate to IMT-2000
 - The first commercial IMT-2000 systems were implemented by upgrading existing cellular and PCS systems in the 450, 800 and 1800 and 1900 MHz bands
- Administrations have the right to implement IMT-2000 in any band allocated for the Mobile Service (not just the identified bands)
 - Several countries are implementing IMT-2000 in the 450 MHz band
 - China is planning to implement IMT-2000 in the 2300-2400 MHz band
 - The United States is in the process of auctioning frequencies in the 700 MHz band that can be used for IMT-2000
- Administrations may implement IMT-2000 in the identified bands using different pairing arrangements from the ones included in the Recommendation
 - Korea's PCS operators are upgrading their systems to IMT-2000 using 1750-1780 paired with 1840-1870 MHz
 - Japan's cellular operators are upgrading their systems to IMT-2000 using 887-924 paired with 832-869 MHz

IMT-2000 Technology and Spectrum

- The ITU has approved five radio air interface standards and has identified multiple frequency bands for IMT-2000

ITU approved family of standards that meet IMT-2000 criteria*



- The IMT-2000 technologies are frequency agnostic
 - Both of the primary IMT-2000 standards, WCDMA and CDMA2000, will be deployed in multiple frequency bands
- The CDMA2000 standard is defined for:
 - 400 MHz, 800 MHz, 900 MHz, 1700 MHz, 1800 MHz, 1900MHz, and 2100 MHz
- The WCDMA standard is defined for:
 - 1800 MHz, 1900 MHz, 2100 MHz
- The decision in which bands IMT-2000 technologies are first deployed depends on regulatory decisions, the marketplace, and politics

Considerations In Choosing Frequencies for IMT-2000

- Priorities must be ranked
 - Cost of equipment (leveraging of economies of scale)
 - Advanced services (high speed Internet access, multimedia, etc.)
 - Capacity to meet projected demand
 - Evolution of existing pre-IMT-2000 systems (leveraging investments)
 - Roaming (national, regional, international)
 - Spectrum utilization and efficiency
 - Competing uses for frequencies and cost of relocation of existing systems
- Multi-band, multi-mode phones will play an important role
 - There is no single frequency band and no single technology that will be used worldwide
 - Multi-band, multi-mode phones will be necessary to provide nationwide coverage for IMT-2000 subscribers as the new networks are rolled out
 - International roaming between different IMT-2000 networks will only be possible through multi-band, multi-mode phones

Considerations In Choosing Frequencies cont.

- Technology and Frequency Selection Make a Difference
 - Economies of scale for wireless equipment already exist for pre-IMT-2000 systems existing frequency bands
 - Permitting existing systems to upgrade to IMT-2000 will maximize existing economies of scale, keep costs low, and enable new services to be delivered quickly
 - Operators deploying IMT-2000 systems in new spectrum must build an entirely new network from the ground up, which will have significant impact on network costs and time to market
 - Spectrum will continue to be a scarce and valuable resource
 - Utilization of spectrally efficient technologies in available spectrum will be critical
 - Early licensing for IMT-2000 does not equate to early deployment

IMT-2000 – What Should the Subscriber Expect?

- IMT-2000 implementation should be transparent to the user
 - IMT-2000 (3G) networks should support existing 2G customers
 - 2G subscribers should have a choice of whether to upgrade to 3G for faster data rates and more attractive applications or keep existing 2G services
 - New subscribers will more likely be using IMT-2000 services and should have a range of options to chose (from basic voice services to advanced wireless services)
 - Similarly, cost structures will range from simpler and less expensive IMT-2000 devices and services to higher fees for color displays and advanced wireless services, such as high speed Internet access



International Experience

- IMT-2000 spectrum considerations
 - United States
 - Europe
 - Asia



US – Recent Developments on Additional IMT-2000 Spectrum

- US Government recently studied the viability of making all or portion of the 1710-1755MHz and 2110-2170MHz bands available for advanced mobile wireless (3G) services
 - Commerce Department's National Telecommunications and Information Administration (NTIA)
 - Federal Communications Commission
 - Department of Defense
- The study concluded that 90MHz of this spectrum can be allocated for 3G services without disrupting communications systems critical to national security
 - 45MHz from the 1710-1755MHz band + 45Mhz from 2110-2170 MHz band
 - 1755-1770 MHz band is not viable for use by 3G in light of DOD's extensive and critical operations in this band

US – Recent Developments on Additional IMT-2000 Spectrum (Cont'd)

- The 1710-1755 MHz band:
 - This band would be substantially cleared of federal systems/users and would relocate or modify operations no later than December, 2008
- The 2110-2170 MHz band
 - It is anticipated that the FCC will initiate a rulemaking for allocation and service rules that will make 45 MHz available for advanced wireless services
 - The FCC has already established relocation procedures for fixed service users in the 2110-2150 MHz and 2160/62-2165 MHz bands
- Please note: the US Government does not specify IMT-2000 technology to a particular mobile frequency band.

US – IMT-2000 Commercial Developments

- Wireless carriers are free, and encouraged, to evolve their existing networks in their current spectrum
- As of September, 2002, five of the sixteen commercial 3G carriers in the world have launched CDMA2000 services in the United States
 - Verizon Wireless
 - Sprint PCS
 - Leap Wireless
 - Metro PCS
 - Monet
- Evolving 2G CDMA networks to IMT-2000 allows existing infrastructure to be used and reduces significant new costs
- Other carriers such as AT&T Wireless and Cingular have begun migrating their TDMA networks to GSM and GPRS (2.5G)

Europe – Recent Developments on IMT-2000

- European Union legislation called on national administrations to allow operators to launch commercial IMT-2000 services by the beginning of 2002
 - **There are no commercial UMTS (WCDMA) operators in Europe – only two trial systems in Monaco and Isle of Man. Several operators publicly announced delays and consolidation leads to unused licenses. Recent auctions have found few or no bidders.**
- During 2000-2001 the sector invested some €110bn on IMT-2000 licenses thereby raising the debt level of telecom operators
 - **The dramatic increase of debt has led to falling stock values, credit rating downgrades, higher interest rates on commercial paper, lack of investment funds and lending caps (which hurt alternative carriers and new entrants)**

Europe – Recent Developments on IMT-2000 (Cont'd)

- By the 3rd quarter of 2002, sixty-one IMT-2000 licences will have been issued in the European Union – but still no commercial 3G services...
 - IMT-2000 license conditions (especially roll-out obligations) have been difficult to meet due to the unavailability of UMTS equipment
 - Spain, Portugal and Belgium have postponed their roll-out deadlines
 - Operators in Sweden and Finland complied with roll-out obligations, albeit by setting up minimal network configurations used for experimental, rather than for trial or commercial services
 - License payments and fees have been lowered
 - In France, after a partial completion of the licensing procedure, the license price was considerably lowered in order to couple payments to the future business case
 - ...leading to tenders that failed to attract sufficient bidders for IMT-2000 licenses (France, Belgium, Greece and Luxembourg)

Europe - Obstacles to the Physical Deployment of Networks

- Obtaining the authorization for installing base stations in Europe is a challenge
 - Alleged health impact resulting from the electromagnetic emissions by base stations risks an impact on the schedule of roll-out and may increase costs unexpectedly
 - Environmental concerns, as many new 3G masts must be erected
 - Local and regional decision processes vary considerably
 - Compliance with emission regulations are issued at a national level and are not harmonized throughout the EU

Asia: Leading IMT-2000

- Korea and Japan are leading IMT-2000 implementation
- Multiple IMT-2000 technologies will co-exist in the region
- Korea launched IMT-2000 services in October of 2000, and is successfully offering commercial services of up to 2.4 Mbps – making it the country with the highest penetration of broadband in both wireline and wireless
- The Asian culture's fascination with technology and wireless has fostered significant growth in the software development industry due to the demand of new IMT-2000 applications and services, such as location based and security
- The future implementation of IMT-2000 in China and India is already impacting the range and cost of wireless devices

3G CDMA Commercial Launches



18 commercial 3G CDMA operators in 8 countries:



OPERATOR

2000

2001

2002

2003

2004

SK Telecom (S. Korea)

Oct. 1, 2000

Jan. 28, 2002

KTF (S. Korea)

May 2001

May 8, 2002

LG Telecom (S. Korea)

May 2001

NTT DoCoMo (Japan)

Oct. 1, 2001

Monet Mobile (USA)

Oct. 24, 2001

Zapp Mobile (Romania)

Dec. 7, 2001

Telesp Celular (Brazil)

Dec. 10, 2001

Leap Wireless (Cricket, USA)

Jan. 17, 2002

Verizon Wireless (USA)

Jan. 28, 2002

MetroPCS (USA)

Feb. 1, 2002

Bell Mobility (Canada)

Feb. 12, 2002

KDDI (Japan)

April 1, 2002

Centennial P.R. (Puerto Rico)

April 4, 2002

Telefonica Celular (Brazil)

April 16, 2002

Telus Mobility (Canada)

June 3, 2002

Telecom New Zealand

July 22, 2002

SmartCom PCS (Chile)

July 28, 2002

Sprint PCS

August 8, 2002

CDMA 2000 1X

WCDMA

CDMA 2000 1xEV-DO

As of August 2002

Concluding Remarks

- The importance of IMT-2000 for consumers is the availability of services at affordable prices
- It is important to reassess forecasts of infrastructure and terminal equipment in light of delays and changes in regulation
- Government policies have a critical impact on the successful introduction of advanced wireless services
- Governments should learn from regulatory successes and failures
- Timing is essential, especially for developing countries where wireless networks will be in many cases the primary means for mass access for basic telephony and the Internet



***THANK YOU VERY MUCH FOR YOUR
ATTENTION!***

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