CTIA
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Cellular Telecommunications & Internet Association

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

September 27, 2001

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
445 12th Street, S.W.
12th Street Lobby, TW-A325
Washington, DC 20554

***Re*: *Ex Parte* Presentation**
ET Docket No. 00-258; RM-9920; RM-9911

Dear Ms. Salas:

On September 26, 2001, the Cellular Telecommunications & Internet Association, represented by Diane Cornell, along with Steve Sharkey and Rob Kubik, Motorola Inc., and David Wye, AT&T Wireless, met with Robert Pepper, Chief, Office of Plans and Policy, David Sappington, Chief Economist, Lauren Van Wazer, Special Counsel, Office of Engineering and Technology, and Tom Stanley, Chief Engineer, Bill Lane, Chief Technologist, Charles Rush and John Spencer of the Wireless Telecommunications Bureau. The parties discussed issues related to the importance of harmonized spectrum for advanced wireless services. In particular, the parties discussed the attached presentations.

Pursuant to Section 1.1206 of the Commission's Rules, an original and one copy of this letter is being filed with your office. If you have any questions concerning this submission, please contact the undersigned.

Sincerely,

Diane Cornell

Diane J. Cornell

Attachment(s)

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HARMONIZED SPECTRUM FOR ADVANCED MOBILE SERVICES

Overview

- Two fundamental goals of U.S. commercial spectrum management must be to:
  (1) Provide an additional 200 MHz of spectrum by 2010, and
  (2) Harmonize U.S. spectrum allocations with those of our allies and trading partners around the globe.

- Harmonizing spectrum offers important economic benefits for consumers, operators and manufacturers:
  - Larger volume means lower R&D and production costs for both handsets and network infrastructure;
  - Consumers will have access to less expensive, smaller handsets,
  - New products and services will be quicker to market, and
  - U.S. mobile wireless market grows faster.

- Our major trading partners have or are planning to deploy advanced wireless services in the 1710-1850 MHz band.

- A spectrum plan currently under review by the FCC to pair only 1710-1755 MHz with 2110-2150/2160-2165 MHz could frustrate the goal of providing sufficient additional globally-harmonized spectrum. This plan:
  - offers only 90 MHz, far less than the ITU-estimated need of 200 additional MHz;
  - is not the same full band pairings currently used by the rest of the world;
  - does not provide a long-term plan for meeting the industry's spectrum requirement because it orphans spectrum in the 1755-1850 MHz band, unless spectrum in another band can be made available (because transmit and receive frequencies cannot be separated sufficiently)

- A spectrum management plan to internally pair 1710-1850 MHz, supplemented by 2110-2150/2160-2165 MHz, offers the following benefits:
  - Provides substantial portion of the ITU-estimated spectrum target of 200 additional MHz;
  - Makes commercial allocations substantially aligned with most of the rest of the world, including use of the 1710-1850 MHz band which is used for commercial mobile services globally and the 2110-2150/2160-2165 MHz band, which is or will be used for 3G downlink globally; and
  - Establishes a pathway towards globally harmonized spectrum.

- U.S. military use of spectrum bands allocated by other nations to commercial uses raises interference problems for U.S. military capabilities around the globe. The potential for interference will increase due to continued growth of commercial use of these spectrum bands.

Harmonizing Global Spectrum – The Goals

The U.S. mobile wireless industry seeks to maximize the extent to which additional spectrum made available for advanced mobile services in the United States is consistent with spectrum allocated for these services by our major trading partners. This entails two fundamental goals:

- Meeting demands for advanced commercial wireless services, both voice and data, requires additional spectrum to be delivered to the private sector in a phased approach over the next decade. An additional 200 MHz of spectrum is required no later than 2010 (390 MHz estimate by ITU minus approximately 190 MHz currently available in the United States). Industry's suggested timetable for spectrum availability:

  - 60-90 MHz by December 2004; and the remaining
  - 110-140 MHz by December 2008.

- In addition to providing a sufficient volume of spectrum, harmonizing U.S. spectrum allocations with those of our allies and trading partners around the world is an equally important goal.

Benefits of Harmonized Spectrum

The benefits of harmonized spectrum allocations are significant: they include lower costs, more rapid innovation, improved roaming and customer convenience, and accelerated market growth. Pursuing a path of disharmony – i.e., attempting to develop commercially viable advanced wireless systems in spectrum bands used by few other nations – would ensure the United States would forego these important benefits.

Lower Costs

- Production economies – larger volume means lower R&D and production costs, which could be passed on to operators and consumers. This applies both to handsets and the network infrastructure.

  - Lower costs for consumers who can purchase devices that are far less expensive because they're made in volume for a world market rather than the limited U.S. market.

  - Lower infrastructure (base station) costs because of economies of scale of deploying equipment that can be used in volume in a world market, not just in the United States. If additional spectrum were "harmonized," base station costs would be an estimated 20% less than for equipment built for non-harmonized spectrum.

- As discussed in Attachment C, there are components to "harmonization." All of these components contribute to cost savings. The greater harmonization, the greater the cost savings to be achieved.

Faster Innovation & More Choices

- The time required to develop new products and services is reduced, since multiple versions to accommodate multiple spectrum bands would not need to be developed.

- Rapid availability of new services: harmonized use ensures that U.S. consumers get products at the same time as the rest of the world. If the U.S. is not harmonized with the rest of the world, products and services will be developed for the U.S. market later.

- For manufacturers, personnel and other resource requirements are lessened by not having to develop products for multiple spectrum bands. This will be especially important in markets beyond the traditional wireless phone markets, which are dominated by a handful of large manufacturers. Smaller PDA or other device manufacturers will likely not have the ability to make different versions of their products for different markets. Again, this applies to both the device and infrastructure.

- To illustrate the effect on the consumer handset market of harmonization, consider that the major manufacturers each offer approximately 15-20 handset models in Europe and Asia for use in the GSM band, compared to approximately 5 handset models available for the GSM band in the United States. Moreover, the non-U.S. models offer a variety of features not available in the United States (e.g., SMS service, color screens for e mail, WAP internet access, paging) and offer more choice in colors and other options.

Roaming & Increased Convenience

- Easy roaming - only have to carry one handset when roaming anywhere internationally. While international roaming is currently a small percentage of use because of the need for specialized equipment, a much greater number of people traveling internationally (particularly to Canada and Mexico) would take advantage of international roaming (increasing revenues for operators) if they knew they could take their handsets overseas.

- Background information on roaming issues is detailed in Attachment C below.

- Simpler, lighter, and longer-battery-life handsets because of less need to accommodate multiple spectrum bands. If the hardware and software complexities that are needed to build multi-band handsets can be minimized or eliminated, devices can be streamlined, saving on weight/bulk.

Accelerated Growth

- Greater growth in the mobile wireless industry would be stimulated by simpler, less expensive handsets, especially when new products can be brought to market quickly.

- The ability of manufacturers to develop equipment that can be used globally will result in greater competition for equipment prices and features.

Harmonizing Global Spectrum – Current Status

The Concept of Harmonization

- It is important to note the distinction between "spectrum" and "technology" harmonization.

- "Spectrum harmonization" refers to the use of the same spectrum bands and pairings for the deployment of advanced mobile services in different countries.

- "Technology harmonization" refers to the use of a common technology (e.g., cdma2000 or W-CDMA) for the deployment of advanced mobile services in different countries.

  - Note: In the United States, operators generally are permitted to deploy whatever services and technologies they wish – and in fact are evolving from 2G to 3G in all their licensed bands. Some other nations currently restrict the kinds of services and technologies that can be used in particular bands. For example, some European nations restrict the 1710 – 1885 MHz band to 2G (GSM) service, and restrict the 1920-1980/2110-2170 MHz paired bands to 3G. Some of these countries may relax these restrictions over time, but regardless of the decisions of other countries, the band pairings still provide important harmonization of spectrum.

- Of the two, spectrum harmonization is more important because it is more difficult and expensive to build equipment that employs the same technology (e.g., CDMA, TDMA, or GSM) operating in different bands than it is to build equipment using different technologies operating in the same band.

Where We Are Today

- Currently there is too little harmonization of commercial wireless spectrum between the U.S. and our allies and major trading partners:

  - Spectrum bands currently allocated (or being considered for allocation) to commercial mobile wireless in the U.S. largely do not correspond to the bands allocated for this use in other Regions:

- 800 MHz:
  - Used for cellular/SMR in United States.
  - Europe & Asia use the 450 & 900 MHz bands for cellular
- 1850-1910/1930-1990 MHz:
  - Used for PCS in United States.
  - Europe & Asia use 1710-1785/1805-1885 MHz bands for GSM
- 700 MHz:
  - Potentially available for commercial uses in the United States sometime after 2006 (Currently UHF channels 52-69)
  - Broadcast in Europe & Asia

– In our region (ITU Region 2), harmonization is better, but still not good:
- U.S./Canada/Mexico:
  - Cellular in 800 MHz band
  - PCS in 1850-1990 MHz band
- U.S. – Latin America:
  - Cellular in 900 MHz in Venezuela
  - PCS in 1900 MHz in Argentina, Chile, Colombia, Peru,
  - 2G in 1800 MHz in Brazil, Costa Rica

Other Countries Are Moving Ahead With Their 3G Spectrum Allocation Decisions – The United States Risks Being Left Behind

- At 15 percent of the world market (see Attachment C for details), the United States is not a large enough market to create the economies of scale that allow vendors to provide equipment that is not cost-penalized.

- Therefore, in order to avoid costly equipment or lack of equipment availability altogether, the United States must ensure that its 3G spectrum decision is consistent with advanced commercial mobile spectrum allocations widely adopted by other countries.

- The window of opportunity for making a decision that will influence the rest of the world to follow our lead is closing. Currently, the world's spectrum authorities with the help of industry are working towards developing a "global" spectrum plan for 3G under the auspices of the International Telecommunications Union (ITU)'s Working Party 8F (see next heading for more details). This ITU group is moving ahead quickly with its work to develop a final band plan for 3G and expects to define the preferred 3G band plan options at its next meeting in October and begin drafting a new ITU Recommendation for approval next year.

- If we are to influence the final outcome, we should attend the October meeting with a spectrum plan that we are ready to actively promote. Other countries have already explicitly said that they plan to move forward with a WP8F spectrum recommendations, regardless of whether the United States is still undecided.

- Equipment will be built first towards the WP8F recommendation, creating early economies of scale. If we are unsuccessful in influencing WP8F's results, smaller markets will likely follow WP8F's recommendation rather than future unknown alternatives.

Spectrum Migration Pathway Towards Global Harmonization

ITU Working Party 8F is focusing on a limited number of Options for Identifying Spectrum for IMT-2000 (3G)

- Global spectrum planning for commercial "3G" applications is reaching a crucial stage. With decisions on preferred bands due in October, the ITU's Working Party 8F (WP8F) is nearing completion of a "3G" spectrum band plan.

- At the WP8F meeting in Stockholm, the group discussed the three general bands that could be used for 3G:

  - **806-960 MHz**—it was noted that there are two principal band plans currently used around the world for mobile service, but that "the prospect of converging the two frequency arrangements into one is remote." Thus, although this band will be evolved for 3G use, it is not a likely candidate for harmonization.

  - **1710-2200 MHz**—this is the prime candidate band for harmonized use for 3G. Four preferred band plans (not necessarily mutually exclusive, potentially complementary) were identified:

    - One consistent with Europe's current GSM band plan (pairing spectrum starting at 1710 with spectrum starting at 1805), which would facilitate the evolution of 2G to 3G

    - 1755-1805 paired with 2110-2160

    - One based on the U.S. PCS band plan

    - One consistent with the WARC-92 bands which are now being auctioned and implemented throughout Europe and some parts of Asia (pairing spectrum at 1920-1980 MHz with spectrum at 2110-2170 MHz).

  - **2500-2690 MHz**—this band was discussed as a possibility for meeting the demand for additional spectrum, but the meeting concluded that it was premature to make a decision on any specific band plan within these frequencies.

- These options closely mirror CTIA proposals for a U.S. spectrum band plan.

The U.S. Government Should Allocate Additional Spectrum for Commercial Mobile Service by Fall 2001 that is Harmonized With Other Countries

1710-1850 MHz band

- 1710-1850 MHz should be allocated for commercial mobile service to facilitate harmonization with other regions.

- Internal Pairing of the 1710-1850 MHz band offers significant benefits for the United States (see Attachment A):

  - Many countries around the world (see map & list of countries, Attachment B) already use the DCS-1800 ("internal pairing") pairing for GSM, including Europe, Asia and some Latin American countries, as well as others. This results in enormous economies of scale for all equipment (handsets and infrastructure) for these markets.

  - Use of DCS 1800 pairing would allow near immediate roaming between the United States and all those other countries. Equipment for the band already exists, so R&D time/expense would be minimal.

  - Companies will, over time, use this same pairing for 3G services.

  - Many of the operators in the 1710-1885 MHz band, especially in Europe, could move to 3G faster than they currently state publicly, so the difference in time may be less than current estimates. Foreign operators will want to upgrade/evolve existing 2G networks, either to mesh with their 3G operations (if they won licenses) or compete with 3G providers (if they didn't get licenses). They could pressure regulators to allow them to do so, especially if the United States gets out ahead of them.

  - Phones could be quite simple, using equipment that could work within only one band (1710-1885), with two modes: 2G/3G. This is cheaper than having to build in two separate bands. Many new phones are likely to contain both 2G and 3G in any event to ensure backward compatibility and maximum flexibility during the build-out period.

- Even if a different pairing is ultimately chosen affecting the 1710-1850 MHz band (i.e., other than the "internal pairing" just described), spectrum in 1755-1850 MHz will still be required for commercial mobile use in order to achieve the 200 MHz of additional spectrum required by 2010.

  - A pairing of only 1710-1755 MHz with 2110-2150/2160-2165 MHz (Option 1 in the FCC NPRM) does not provide sufficient spectrum and does not allow for a sufficient number of carriers. Thus, additional spectrum must be made available from the 1755-1850 MHz band and from above 2150 MHz.

- An alternative 1710 - 2110 MHz pairing scenario could involve a pairing of the band 1710-1770 MHz with the band 2110-2170 MHz. Thus it uses the 1755-1770 MHz band segment, and assumes a solution in the 2100 band releasing the 2150-2170 MHz spectrum for "3G" use.

    - Even in this scenario, more spectrum from the 1755-1850 MHz band must be made available for commercial use to satisfy the calculated requirement for mobile wireless services of about 200 MHz of spectrum in addition to what is currently allocated in the United States (ITU-R Report M.2023).

        - This band pairing provides 120 MHz, meaning that another 80 MHz is needed to reach 200 MHz.
        - The remaining spectrum (1770-1850 MHz) totals 80 MHz, but this spectrum cannot be paired within itself because required separation distances between transmit and receive frequencies cannot be achieved. Thus, this spectrum would have to be paired with additional spectrum (some portion of 2500-2690 MHz) to be usable and to provide required capacity.
        - This calculation still does not take into account required guard bands and duplex gap requirements.

- If the 1755-1850 MHz band is not made available for commercial mobile wireless spectrum the only other realistic option to achieve harmonization is to look to the 2500 MHz band (but see disadvantages to this, below).

2110 MHz band

- 2110-2150 MHz band should be allocated for commercial mobile service immediately, and contiguous spectrum above 2150 should be considered for allocation for commercial mobile service as well.

    - 2110-2150 MHz is already proposed for commercial use by the FCC. The FCC should also consider reallocating spectrum above 2150 to commercial mobile service. Currently:
        - 2150-2165 MHz is primarily MDS spectrum, and
        - 2165-2200 MHz is currently Mobile Satellite Service (MSS) spectrum. CTIA has a petition for rulemaking pending at the FCC seeking reallocation of this MSS spectrum if it is not effectively utilized by pending MSS applicants.
    - 2110-21XX MHz can be paired with 1755-1805 MHz, in order to achieve the benefits of "1710-1850 internal pairing" described above.

2500-2690 MHz band

- The other major spectrum band seriously under consideration for deployment of "3G" applications is the 2500-2690 MHz band.

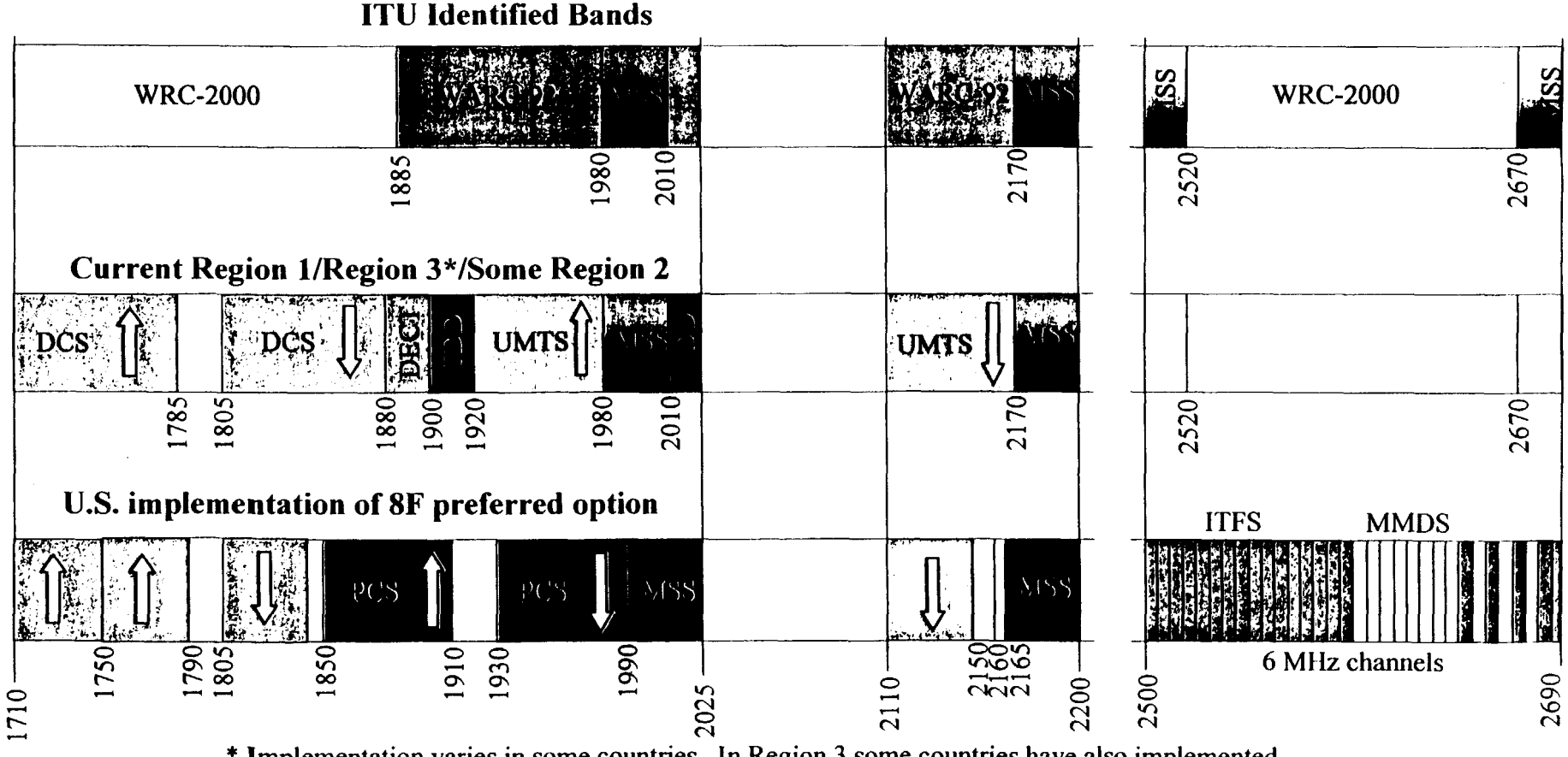
- Other nations are not expected to allocate this band to commercial mobile uses until after 2010, at the earliest, and thus, re-allocating the band would not advance the goal of harmonization in the near- to mid-term.

- In the Americas, many of our major trading partners – e.g., Canada, Mexico and Brazil – use the 2500-2690 MHz for MDS services and do not anticipate relocating these services in the near future.

- It is also important to note that the rest of the world has not determined how to use the 2500-2690 MHz band for "3G" (see note on Working Party 8F above). Some believe that this spectrum will be allocated with a symmetrical in-band pairing. Others offer that if wireless Internet services requiring asymmetrical uplink and downlink spectrum become more prevalent, more of the 2500-2690 MHz band could be needed for downlink. As a consequence, most countries are taking a "wait and see" approach before making even the most basic decisions about how to allocate and pair this spectrum.

Attachment A

Implementation of 8F Preferred Option

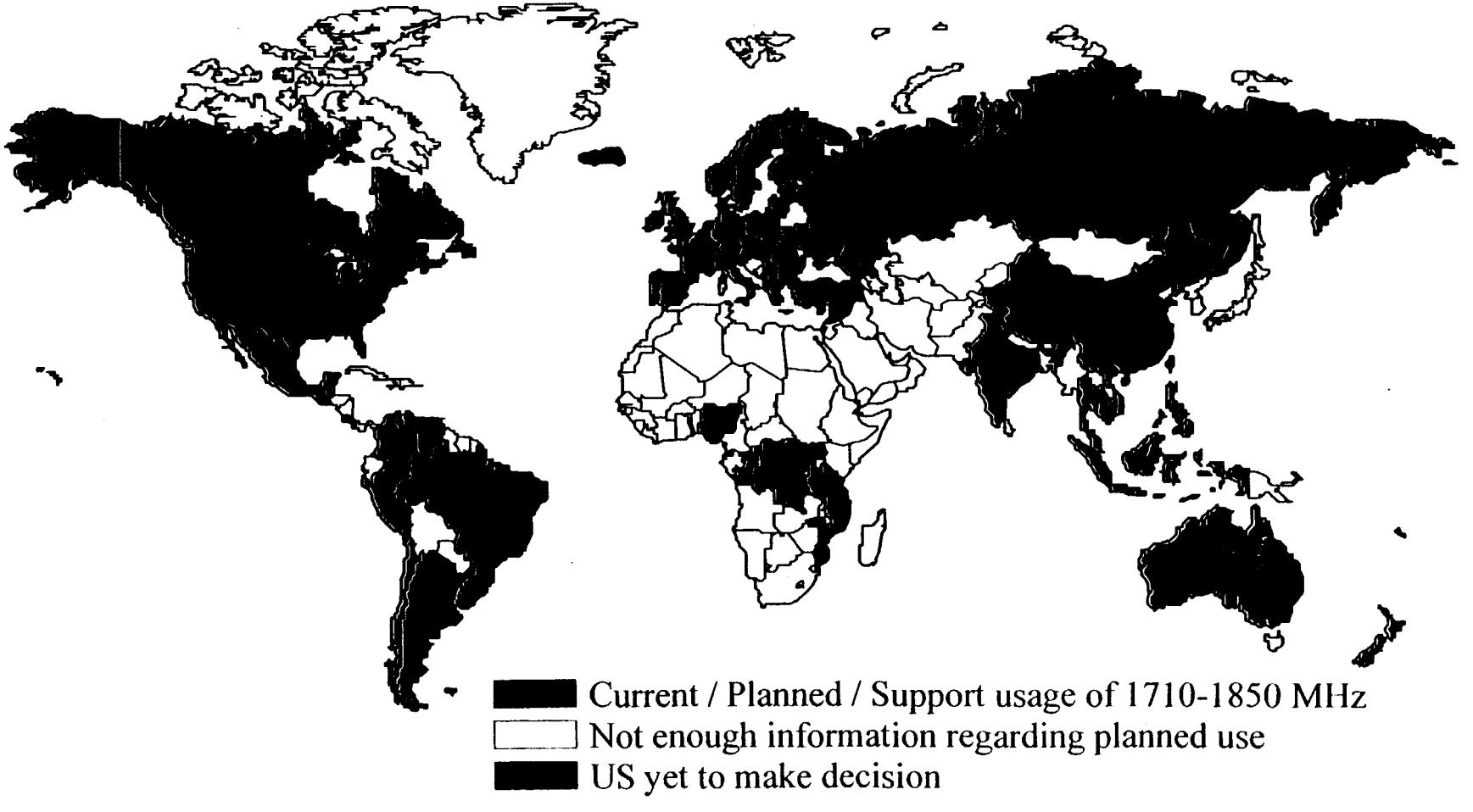


* Implementation varies in some countries. In Region 3 some countries have also implemented some PCS and other variations from Region 1

** Further technical studies are required to validate technical issues with regard to adjacent channel interference

Attachment B

Global use of 1710-1850 MHz for Mobile Services



Attachment B (cont.)

List of Countries With Advanced Mobile Services
In the 1710-1850 MHz Band

Albania
Australia
Austria
Belgium
Bulgaria
Cambodia, Kingdom of
Congo, Democratic Republic of
Czech Republic
Denmark
Equatorial Guinea
Estonia
Finland
France
Georgia
Germany
Greece
Hong Kong
Hungary
Iceland
Indonesia
Ireland
Italy
Kuwait
Latvia
Liechtenstein
Lithuania
Luxembourg
Macau
Malaysia
Malta
Mozambique
Netherlands
Nigeria
Norway
Philippines
Poland
Portugal
Reunion (La)
Romania
Russia
Singapore
Slovak Republic
Slovenia
Spain
Sweden
Switzerland
Syria
Taiwan
Tanzania
Thailand
Turkey
Uganda
Ukraine
United Kingdom
Yugoslavia, Federal Republic of

From telcom authority:
Brazil
China, Peoples Republic of
India
Korea
New Zealand
Venezuela

Supported at WRC-2000:
Argentina
Canada
Chile
Colombia
Costa Rica
El Salvador
Guatemala
Mexico
Peru
Uruguay
Venezuela

ATTACHMENT C

Questions & Answers on Spectrum Harmonization

Question: *Do the calculations made for future spectrum demand take into account both the development of new technologies and the nature of new service offerings such as wireless data or multimedia applications?*

Answer: Yes, the industry's calculations do take into account both the development of new technologies and new service applications.

There are two ITU documents which both take new spectrally-efficient technologies and new services into account. The first, Recommendation ITU-R M.1390, specifying the methodology for calculating IMT-2000 terrestrial spectrum requirements, explains its origins by stating that "there is a need to develop a new methodology for determination of spectrum requirements that can accommodate not only the new services of IMT-2000 *but also the new radio transmission technologies being developed.*" (Page 1, emphasis supplied.)

The second document, Report ITU-R M.2023, uses the method detailed in the recommendation to calculate the spectrum requirements for IMT-2000. The report notes the widening variety of services (see page 5, et seq.) and technical developments in the delivery of wireless services (see page 18 et seq.). Table 19 of the Report provides the calculations for Region 2, which includes the U.S.

The M.2023 report indicates the total forecasted terrestrial mobile spectrum required by 2010 amounts to 390 MHz in Region 2 (including the U.S.). The table assumes a total of 230 MHz is currently identified for Region 2, and that another 160 MHz is required to sum to the 390 MHz which will be required. In fact, in the U.S., only 189 MHz is currently available for CMRS service (cellular + personal communications service + specialized mobile radio). Thus, another 200 MHz is required to reach the required 390 MHz of spectrum.

Question*: How many wireless subscribers are there in the U.S. compared with Europe, Asia, and the rest of the world?*

Answer: Measured by both wireless subscribers and service revenues, the U.S. wireless market makes up no more than one-fifth of the global market.

Subscribers: The U.S. subscriber base as of Dec. 31, 2000, was 109.5 million – or about 15% of the total global wireless subscribers. According to the May 9, 2001 issue of *Global Mobile*, Western European wireless subscribership was 243.6 million, Asia Pacific subscribership was 233.7 million, Latin American subscribership was 63.1 million, and total global wireless subscribership was 730.9 million as of December 31, 2000.

It has been estimated that there will be 1.4 billion wireless subscribers worldwide by the end of 2005. Of that number, about 200 million will be U.S. subscribers. Thus, by the end of 2005, the U.S. will have about 14 percent of global wireless subscribers.

Revenues: Total annual reported U.S. wireless service revenues for 2000 amounted to $54.3 billion, of which 32.5 percent were attributable to PCS. (Source: CTIA semi-annual survey; including $1.8 billion in toll revenues). Globally, mobile wireless revenues were $273 billion for 2000. (*See* "ITU Telecommunications Indicators Update," April – June 2001, at page 2.) Thus, the U.S. generates roughly 20 percent of global wireless revenues.

We do not have reported figures for aggregate mobile revenues by country or region outside of the U.S. An estimate may be derived by using the ITU's global average monthly revenue figure of $39 per subscriber for 2000, and applying it to the mid-year 2000 Western European subscriber base of 194.0 million, to produce an estimated year 2000 mobile revenue figure of $90.8 billion. Thus, Western Europe would generate approximately 33 percent of global wireless revenues.

With a 15-20% share of the global market, the U.S. will be at a significant disadvantage if our spectrum is not harmonized:

- The significant economies of scale will not be available in the U.S.
- Wireless equipment will be built first towards specifications that meet the 85% share of the market.
- Applications developers will also build to the specifications required by the 85% share of the market.

Question: *What is roaming, and how does it work?*

Answer: At its most basic, roaming refers to a wireless user traveling outside of their home service area. There are two components to roaming – first, technical compatibility (*i.e.*, the use of common technologies and bands), and second, a business relationship between the serving carrier in the market in which the user attempts to place and receive calls and their home carrier. This business relationship would include an administrative or billing arrangement for the exchange of call-related data between the serving carrier and the home carrier. (see Attachment D for a graphic schematic showing the roaming billing flow from the call through the bill payment.)

Billing and financial settlement for roaming services is provided by several companies, including CTIA's affiliate CIBERNET, which provides such services for over 250 mobile operators in 70 countries.

Question: *What are the technical requirements for roaming?*

Answer: There are really two types of roaming: First is *seamless* roaming in which there is a common technology and common band plan in the home and roaming markets. The U.S. and Latin American cellular operators originally used a common analog standard (AMPS) and common band plan. This made inter-American roaming technically possible (although fraud prevention measures were and are required as a

predicate for financial security). However, the U.S. and Europe used different bands – the U.S. using the 800 MHz band for its cellular systems, and Europe using the 450 and 900 MHz bands. Europe later introduced second generation wireless systems (GSM) in the 900 and 1800 MHz bands. At that time, the U.S. moved to using the 1900 MHz band for our PCS systems.

Being out of synch in this fashion means that roaming between Europe and the U.S. requires either (1) a second phone (and sometimes a second number), to which calls placed to your original phone/number would be forwarded; or (2) that a user possess a phone with multi-band capability (covering both the U.S. and European bands) and potentially multi-mode capability depending on the nature of the serving operator's network in the U.S. Thus a consumer wishing to use a single phone in the U.S. and Europe might need a phone with (1) GSM for Europe, and TDMA and analog capability for the U.S., or (2) GSM for Europe and CDMA for the U.S., or (3) a GSM phone able to operate on both the European and U.S. bands.

Some GSM-based systems permit users to extract the SIM card (which contains subscriber billing information) from one GSM phone and insert it in another GSM phone – which would enable roaming to occur on GSM networks in different bands. This type of roaming would still require users to have two phones oriented to the two different bands. This variety of roaming is non-seamless.

Question: *What's the impact of having different band plans on roaming?*

Answer: The result of the common band plans for the U.S. and Latin America and the difference between the U.S. and Europe is that roaming for U.S. subscribers and visitors to the U.S. has been greater on an inter-American basis than between the U.S. and Europe. (Roaming between European, African, and Asian systems using the GSM technology has been higher than between the U.S. and those countries given the technology and band plans in place. *See* Telegeography's "International Traffic from Mobile Phones," 2000, at pages 132-133.)

Question: *How really common is roaming? How important is it to wireless users?*

Answer: Domestically roaming relationships and agreements have been widely negotiated, and technically feasible. In the United States, almost $4 billion in roaming revenues were generated in the year 2000 by consumers placing and receiving calls in markets outside of their home service areas. These calls amounted to almost 21 billion minutes of use, about 8 percent of the total reported wireless minutes of use of 258.9 billion in 2000. Roaming revenues comprised more than 7 percent of total U.S. wireless revenues for 2000, and have traditionally amounted to more than 10 percent of all revenues. Over 6 billion roaming calls were made by more than 464 million roamers in the U.S. in the year 2000.

Question: *What is the size of the international roaming market?*

Answer: The GSM Association estimated that last year there were almost 2 billion minutes of international roaming per month worldwide – an annual total of 24 billion international roaming minutes.

A recent report by the Strategis Group prepared for the Universal Wireless Communications Consortium (representing TDMA-based systems) focusing on TDMA systems in the U.S. and six Latin American countries: Argentina, Brazil, Chile, Columbia, Mexico, and Venezuela, estimated the potential value of inter-American roaming in 2000 at $470 million (for these six countries and the U.S., excluding Canada). Of this, $278 million was U.S-to-Latin America roaming, and $133 million was Latin America-to-U.S. roaming. Over $358 million involved roaming between the U.S. and Mexico.

The report estimates that by 2003, the total potential inter-American roaming market (excluding Canada) may increase in value to over $890 million, with $672 million being U.S.-to-Latin America, and over $147 million being Latin America-to-U.S. roaming. The potential value of roaming between the U.S. and Mexico was estimated at $719 million by 2003.

In this context, it is important to note that the new PCS licenses in Brazil were not mapped to the U.S. PCS band plan, but were instead mapped to the European GSM band plan, thus making *seamless* roaming infeasible with the U.S. PCS operators, but facilitating Brazilian – European roaming.

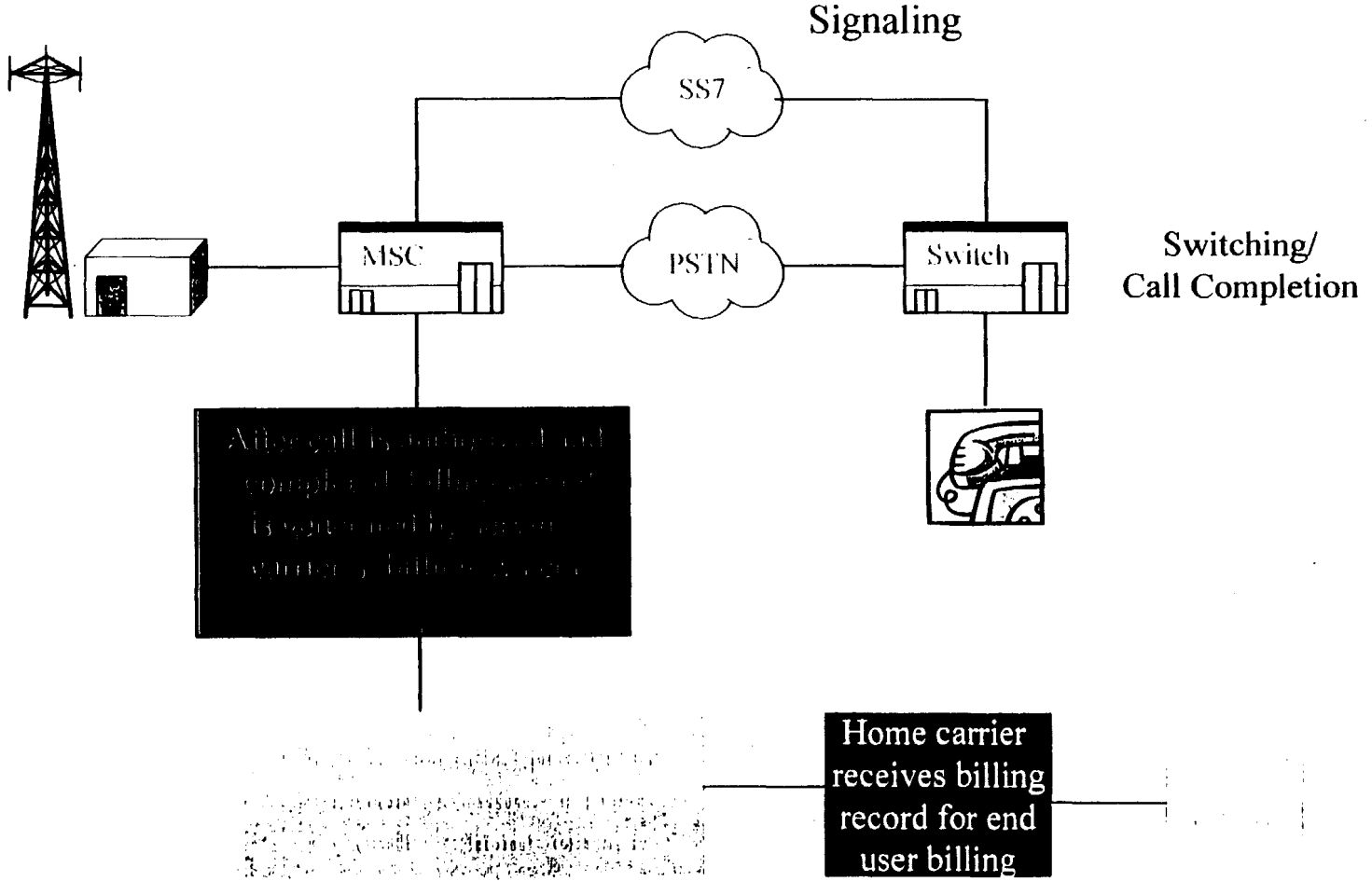
Question: *Do band plans have to be exactly the same to capture the benefits of harmonization?*

Answer: The question has been raised whether or not being "close" in frequency helps achieve economies of scale, or whether spectrum has to be aligned exactly in order to achieve any benefit. As a general rule, "closer is better" because a possibility exists to reuse some components, but the benefits vary on a case-by-case basis.

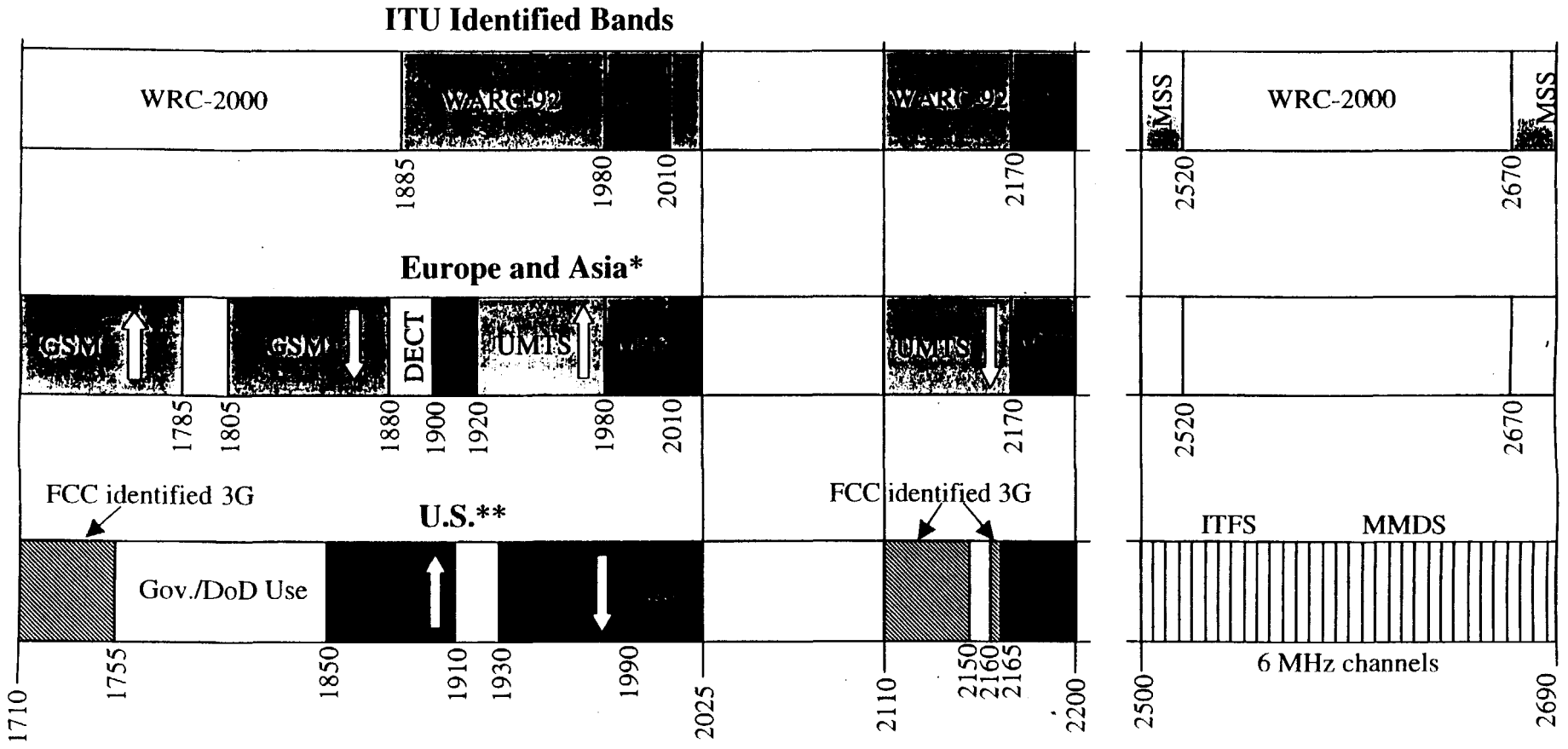
In general, greater harmonization offers greater benefits primarily due to the economies of scale of building to one set of technical specifications. But, even modest degrees of harmonization can offer important technological similarities that yield economies of scale. There is wide variation to the engineering possibilities, but if bands overlap or are immediately adjacent to global bands, and are used for the same purpose (e.g., mobile transmit), a single receiver or transmitter could be employed in phones useable in different markets.

Attachment D

Roaming caller places call



Spectrum For IMT-2000



* Implementation varies in some countries. In Asia some countries have also implemented some PCS and other variations from Europe

** Brazil and Venezuela decision to implement DCS bands aligns with Europe and Asia use rather than U.S.

Evaluation Criteria

	Bands	How much additional spectrum does it provide toward 200 MHz requirement?	Does it provide available spectrum for advanced mobile services in stages before 2010?	Same duplex direction for advanced mobile services as trading partners?	Same pairing for advanced mobile services as trading partners?	Cost/Availability of equipment	Provide blocks large enough for capacity & competition?	Opportunity cost/ Economic impact
A	**806-960 MHz (Cellular & SMR)**	None. Already being used for mobile services, therefore not additional spectrum. Already counted in 200 MHz requirement.	Can be used for advanced mobile services, but does not provide additional spectrum. Existing operators will migrate to advanced mobile services in accordance with market forces.	Partially. Same as Mexico, Canada, and other countries in Region 2; plus some countries in Asia. Different from rest of world.	Partially. Same as Mexico, Canada, and other countries in Region 2; plus some countries in Asia. Different from rest of world.	3G equipment will be available in this band, but will not benefit from significant economies of scale.	Yes, but already used for 1G and 2G services.	Already being used for mobile services.
B	**1850-1910/1930-1990 MHz (PCS)**	None. Already being used for mobile services, therefore not additional spectrum. Already counted in 200 MHz requirement.	Can be used for advanced mobile services, but does not provide additional spectrum. Existing operators will migrate to advanced mobile services in accordance with market forces.	Partially. Same as Mexico & Canada and some other countries in Region 2; plus some countries in Asia. Different from rest of world.	Partially. Same as Mexico & Canada and some other countries in Region 2; plus some countries in Asia. Different from rest of world.	3G equipment will be available in this band, but will not benefit from significant economies of scale.	Yes, but already used for 2G services.	Already being used for mobile services.
C	**1920-1980/2110-2170 MHz (used for IMT-2000 in Europe and in some Asian countries.)**	Initially none. 1900 band spectrum would be refarmed from PCS band. Spectrum made available because of transition could be paired with other spectrum at a later date.	No. The refarming of PCS spectrum would take many years, and additional spectrum would need to be made available to accomplish this transition.	Partially. Different from Mexico, Canada and some other countries in Region 2; plus some countries in Asia. Same as most of rest of the world.	Partially. Different from Mexico, Canada and some other countries in Region 2; plus some countries in Asia. Same as most of rest of the world.	Relatively low because equipment widely deployed elsewhere. However, there are significant additional costs associated with abandoning existing equipment in order to refarm band.	Yes. Presumably no change to overall capacity or competition.	Major delay in spectrum availability because of PCS incumbent users. Potential disruption to existing customers. Potentially leaves significant blocks of spectrum "orphaned" after the transition. Commercial fixed microwave incumbents in 2110-2150 MHz, and MDS incumbent users in 2150-2160 MHz would need to be relocated. MSS allocation in 2165-2170 MHz would have to be changed.

Evaluation Criteria

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D	**700 MHz** **747-762/777-792 MHz (UHF Channels 60-69)** **698-746 MHz (UHF Channels 52-59)**	78 MHz (in several blocks) 30 MHz (one 20 MHz and one 10 MHz block) + 48 MHz (as yet unpaired) Available amounts are significantly less because of guardbands, incumbents and possible separation requirements for 52-59 spectrum.	Not likely. Spectrum not available until 2006 at the earliest; could be much later depending on DTV transition.	No - no other countries using this spectrum for mobile services, or expected to use it in the 2010 timeframe. This spectrum used by broadcasting services around the world.	No - no other countries using this spectrum for mobile services, or expected to use it in the 2010 timeframe. This spectrum used by broadcasting services around the world.	Significantly higher cost and delayed availability because U.S. would be standalone market.	60-69 spectrum provides adequate size blocks, but not enough to support multiple competitors. 52-59 spectrum could not be internally paired to provide adequate duplex separation for advanced mobile services.	Already allocated or proposed for commercial use, but will not be available for many years
E	**1710-1755/2110-2150&2160-2165 MHz (FCC Option 1 & NTIA Option 3)**	Theoretical maximum 90 MHz (2x45). In practice, significantly less could be available because of incumbents (including USG protected sites) & guardbands.	Yes, should be available by 2004.	Yes. Duplex directions in 1710-1755 MHz would exactly match those currently being used by countries with DCS 1800 bandplan. In addition, the duplex direction for the spectrum at 2110-2150 MHz would match the direction of the spectrum currently being auctioned and implemented for 3G in Europe.	No - pairing unique in world.	There will be a cost penalty for equipment because this pairing is unique internationally, but penalty is less than if there were no overlap with bands utilized for IMT-2000 elsewhere.	Appropriate spectrum blocks feasible. Limit on competitive opportunities.	USG incumbents in 1710-1755 MHz and commercial fixed microwave incumbents in 2110-2150 would need to be relocated.

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F	1710-1770 (or higher)/2110-2170 (or higher) MHz (variation on FCC Option 1 & NTIA Option 2)	Theoretical maximum 120 MHz (2x60). In practice, significantly less could be available because of incumbents & guardbands.	Yes, part available by 2004; part later depending on relocation of incumbents.	Yes. Duplex directions in 1710-1785 MHz would exactly match those currently being used by countries with DCS 1800 bandplan. In addition, the duplex direction for the spectrum at 2110-2170 MHz would match the direction of the spectrum currently being auctioned and implemented for 3G in Europe.	No - pairing unique in world.	There will be a cost penalty for equipment because this pairing is unique internationally, but penalty is less than if there were no overlap with bands utilized for IMT-2000 elsewhere.	Yes.	US 3 incumbents in 1710-1770 MHz, commercial fixed microwave incumbents in 2110-2150 MHz, and MDS incumbents in 2150-2160 MHz would need to be relocated. MSS allocation in 2165-2170 MHz would have to be changed.

Evaluation Criteria

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G	**1710-1755/1805-1850 MHz (FCC Option 2 / NTIA Option 1)**	Theoretical maximum 90 MHz (2x45). In practice, significantly less could be available because of incumbents & guardbands.	Yes, if a significant part of the 1805-1850 MHz band can be made available in the 2004/2005 time frame.	Yes. Duplex directions in 1710-1755/1805-1850 MHz would exactly match those currently being used by countries with DCS 1800 bandplan.	Very similar, but not exactly the same. The full DCS 1800 band plan pairs 1710-1785 MHz with 1805-1880 MHz. This option would pair a subset of that spectrum. This is due to the fact that U.S. PCS systems now operate mobile transmit frequencies from 1850-1880 MHz, which is currently used for DCS 1800 base transmit frequencies. Because of these incompatible uses, not all the spectrum used for DCS 1800 is available in the U.S. This is one of the preferred bandplans for IMT-2000 in the ITU.	This option is most likely to produce handsets capable of global roaming in a cost effective way and in a timeframe that doesn't stretch for decades. This option also produces a 20% savings in base station costs over the other bandplan options addressed in this document because base stations are already being manufactured for these bands.	Appropriate spectrum blocks feasible. Limit on competitive opportunities.	If this option were chosen, incumbent USG users would have to share or be moved, which would involve finding comparable spectrum (if sharing is infeasible), and compensating the incumbents for moving. Any relocations would take place in a staged manner, and fully reimbursed. To the extent that these systems are planned to move in the future in any event, this process would enable the relocation to be paid for without an additional appropriation from Congress. If the USG remains in this band, it will be difficult in the future to harmonize our commercial mobile spectrum with allocations being used by our major trading partners.

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H	**1710-1755/1805-1850 & 1755-1790/2110-2145 MHz (FCC Option 2/NTIA Option 1 with industry addition)**	Theoretically provides approximately 160 (2x80) MHz of spectrum. In practice significantly less could be available because of incumbents & guardbands.	Yes, if significant parts of the 1710-1755/1805-1850 MHz band can be made available in the 2004/2005 time frame. This would allow immediate harmonization with the DCS 1800 band plan users. The auction of all or a significant part of the 1755-1790/2110-2150 MHz band could then follow at a later time, appropriately set to meet incumbent users' and operators' needs. Such a staging allows companies to plan for new spectrum in a timeframe more compatible with their business plans, and would also ease incumbent transitions out of the band.	Yes. Duplex directions in 1710-1755/1805-1850 MHz would exactly match those currently being used by countries with DCS 1800 bandplan. In addition, the duplex direction for the spectrum at 2110-2150 MHz would match the direction of the spectrum currently being auctioned and implemented for 3G in Europe.	Very similar, but not exactly the same. The full DCS 1800 bandplan pairs 1710-1785 MHz with 1805-1880 MHz. This option would pair a subset of that spectrum. This is due to the fact that US PCS systems now operate mobile transmit frequencies from 1850-1880 MHz, which is currently used for DCS-1800 base transmit frequencies. Because of these incompatible uses, not all the spectrum used for DCS 1800 is available in the US. This is one of the preferred bandplans for IMT-2000 in the ITU.	This option is most likely to produce handsets capable of global roaming in a cost effective way and in a timeframe that doesn't stretch for decades. This option also produces a 20% savings in base station costs over the other band plan options addressed in this document because base stations are already being manufactured for these bands.	Yes. This option would allow between 5-8 licenses for 3G competitors if 20-30 MHz (2x10 or 2x15) blocks were used; or, smaller blocks could be auctioned to form "building blocks", providing more licenses (but which could not be used alone for a 3G service).	If this option were chosen, incumbent USG users would have to share or be moved, which would involve finding comparable spectrum (if sharing is infeasible), and compensating the incumbents for moving. Any relocations would take place in a staged manner, and fully reimbursed. To the extent that these systems are planned to move in the future in any event, this process would enable the relocation to be paid for without an additional appropriation from Congress. If the USG remains in this band, it will be difficult in the future to harmonize our commercial mobile spectrum with allocations being used by our major trading partners.

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	Bands	How much additional spectrum does it provide toward 200 MHz requirement?	Does it provide available spectrum for advanced mobile services in stages before 2010?	Same duplex direction for advanced mobile services as trading partners?	Same pairing for advanced mobile services as trading partners?	Cost/Availability of equipment	Provide blocks large enough for capacity & competition?	Opportunity cost/ Economic impact
I	**2500-2690 MHz** **Several options are possible:** **internal pairing (within 2500-2690 band)** **or** **45 MHz from 2500-2690 MHz paired with 1710-1755 MHz** **or** **45 MHz from 2500-2690 MHz paired with 2110-2150 / 2160-65 MHz** **(second two alternatives are FCC Option 3)**	Theoretical maximum 190 MHz (unpaired) if entire band is included. But, if paired internally, spectrum that could be available on a paired basis is approximately 30 MHz less because of the separation required between the mobile-to-base and base-to-mobile directions. If external pairing, theoretical maximum 90 MHz (2x45). Whether internally or externally paired, in practice significantly less could be available because of incumbents & guardbands.	Elsewhere around the world, this spectrum is not anticipated to be made available until sometime after 2010.	Unclear. This band is not expected to be used for 3G until sometime after 2010 by Europe and Asia. In the Americas, many of our major trading partners—Canada, Mexico and Brazil for example—use the 2500-2690 MHz for MDS services and do not anticipate relocating these services in the near future. As a consequence, most countries will wait to see how the initial 3G market develops before they determine duplex directions for this spectrum.	Unclear. As with duplex directions, the pairing for advanced mobile services to be used by our trading partners remains undetermined. This band is not expected to be used for 3G until sometime after 2010 by Europe and Asia. In the Americas, many of our major trading partners—Canada, Mexico and Brazil for example—use the 2500-2690 MHz for MMDS services and do not anticipate relocating these. As a consequence, most countries will wait to see how the initial 3G market develops before they determine pairing arrangements for this spectrum.	With no indications of a particular band plan for this spectrum in the near- to medium-term, there are currently no plans to develop equipment for this band. Consequently, any equipment would entail a significant cost penalty.	If sufficient portions of this spectrum were made available, this band could yield large enough blocks (2x10 MHz or 2x15 MHz), and support competitive opportunities.	If this option were chosen, incumbent ITFS/MDS users would have to move, which would involve finding comparable spectrum, and compensating the incumbents for moving. Any relocations could take place in a staged manner, and fully reimbursed. Relocation of ITFS and MDS would be complicated because of the interleaving of ITFS and MDS operations. However, some of these systems could be accommodated with fiber alternatives.

NOTE: Lower bands are typically mobile-to-base transmission direction (Mtx); higher bands are typically base-to-mobile transmission direction (Btx).