Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands	)	WT Docket No. 03-66 RM-10586
	)	WT Docket No. 03-67
Part 1 of the Commission's Rules – Further Competitive Bidding Procedures	)	
	)	MM Docket No. 97-217
Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and the Instructional Television Fixed Service Amendment of Parts 21 and 74 to Engage in Fixed Two-Way Transmissions	)	
	)	WT Docket No. 02-68 RM-9718
Amendment of Parts 21 and 74 of the Commission's Rules With Regard to Licensing in the Multipoint Distribution Service and in the Instructional Television Fixed Service for the Gulf of Mexico	)	

COMMENTS OF SPECTRUM MARKET, LLC

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Summary

SPECTRUM MARKET owners have been active in MMDS and ITFS activities for twenty years. SPECTRUM MARKET is developing an electronic marketplace for trading spectrum usage rights, designed to benefit spectrum holders and spectrum licensees, and facilitate new wireless services. SPECTRUM MARKET supports many Coalition proposals, but opposes some elements of its proposal as unworkable or otherwise contrary to the public interest.

The Coalition's market-by-market, non-synchronous, non-compulsory, Proponent-dependent transition plan is impractical, unwieldy, difficult and, in highly populated areas of the country, likely impossible of accomplishment. SPECTRUM MARKET has demonstrated the basic flaws in this transition proposal through an engineering study of transition in Washington, D.C., which, under the Coalition's plan, could be converted to the new bandplan only by converting all of the channels in a region from Virginia to New York, including 28 BTAs with a population of 43 million, 96 licensees and 172 stations under circumstances that make the transition likely impossible.

Instead the Commission should establish a uniform Sunset Date by which all transmissions must cease which do not comply with the new bandplan and rules; permit all licensees to go silent during the Conversion Period to the new bandplan; and establish construction and band usage requirements for licensees, but permit them to delegate those responsibilities, assign their costs, and/or be reimbursed by means of spectrum leases or license assignments. Further, the entire band should be assigned for low power mobile and other two-way uses.

The Coalition's proposal to retain a portion of the band for television use and to consolidate television uses in the middle of the band, will harm both the transition and the overall value

of the spectrum. By reducing channel width and requiring channel moves to the proposed television mid-band, the Coalition's plan prevents partial transitions, such as the immediate conversion of the A & B channels in Washington-Baltimore which is feasible under the SPECTRUM MARKET plan. The reservation of some 30% of the band for educational television use substantially reduces the value of the band, as does the likelihood that the Coalition's plan will create gridlock in highly populated areas of the country. In order to determine the relative value of various scenarios, SPECTRUM MARKET commissioned a valuation study of the MMDS/ITFS Spectrum by Camilla C. S. Jensen, Director, Telecom Division, of BIA Financial Network, Inc.("BIAfn"), a leading ITFS/MMDS valuation expert. She found that today the value of the MMDS/ITFS spectrum is $901.9 million; its value based on SPECTRUM MARKET's proposal, including its transition plan and its proposal to devote the entire spectrum to low power two-way services, is $20.937 billion, or 23.2 times as much. The value of the spectrum based on the Coalition's proposal ranges from the present $901.9 million, if the Coalition's transition plan produces total gridlock, to a maximum of $14.640 billion if the Coalition's transition plan were to work smoothly. The midpoint of this value range is $7.771 billion, which Ms. Jensen believes "is a good indicator of the value if the transition drags out past five years or if there would be only a partial build out of the spectrum." On that basis, the spectrum will be worth approximately 37% as much if the Coalition's plan is followed as if the Commission adopts SPECTRUM MARKET's proposal.

The new rules should specify that, effective on the date service under the present rules is no longer permitted, all leases that were originally entered into under the present regime, that is,

leases which predate adoption of the rules proposed herein, will terminate. This action promotes competition and the efficient use of the spectrum, assures that the educational licensees secure their rightful share of value, and is well within the Commission's authority.

The Commission should sanction the use of private two-sided auctions to assist in the restructuring of the spectrum, and should confine its own auction activities to the auction of unused ITFS spectrum. The employment of multiple auctions at different times to accomplish local and regional restructuring, and the auction of spectrum leases as well as licenses, can be of great restructuring utility, but the Commission's view of its authority to conduct auctions other than of unused spectrum appears to be confined to a single nationwide auction of spectrum, and no leases. SPECTRUM MARKET asks that this potentially useful activity be assigned to the private sector.

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COMMENTS OF SPECTRUM MARKET, LLC

SPECTRUM MARKET, LLC ("SPECTRUM MARKET") files herewith, by its attorneys, its Comments in this proceeding in response to the Commission's Notice of Proposed Rule Making and Memorandum Opinion and Order in the instant proceeding, released April 2, 2003 (hereafter "NPRM.").

I. Introduction

The owners of SPECTRUM MARKET have participated in MMDS and ITFS activities since the inception of MMDS in the 1980s. They hold controlling or substantial interests in

MMDS licenses in Washington, D.C., New York, N. Y., Boston, MA, Memphis, TN, Tucson, AZ, Charleston, S.C., and Beaumont and El Paso, TX. In addition, a principal of SPECTRUM MARKET was responsible for organizing a major ITFS network in Southern California which at its acme served 50,000 subscribers in Southern California.

SPECTRUM MARKET was formed in the State of Delaware in 2000. It is developing an electronic marketplace for trading spectrum usage rights, designed to benefit spectrum holders and spectrum licensees, and facilitate new wireless services. It expects that its online auction facility will be used to auction both licenses and spectrum leases. As the NPRM itself suggests,[1] and as we discuss below, private auctions can be useful and efficient vehicles for the allocation of spectrum in this band.

SPECTRUM MARKET commends the "Coalition"[2] for many aspects of its plan and particularly for taking the initiative to seek major Commission action to replace the present 2.5 GHz spectrum bandplan with a bandplan designed primarily for the provision of low power mobile services. To a substantial degree, SPECTRUM MARKET also supports the individual Coalition proposals. There are, however, some elements of the Coalition's proposal which, we submit, are unworkable or otherwise contrary to the public interest and should be replaced with different elements. We discuss these elements below.

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[1] NPRM, ¶¶ 105, 241-46.

[2] The "Coalition" consists of the Wireless Communications Association International (WCA), the National ITFS Association (NIA) and the Catholic Television Network (CTN), which joint filed a request for rule making which led to the NPRM.

II. The Coalition Transition Plan Should be Substantially Revised.

A. The market-by-market "Proponent" approach is infeasible.

In essence, the Coalition's bandplan transition proposal is as follows:

(a) "Transition to the new band plan would proceed on a market-by-market basis at the instigation of parties ('Proponents') offering to pay the conversion costs of all affected ITFS [but not MDS] operators. No deadlines would apply unless and until a Proponent offered to fund a market's transition."[3]

(b) Transition to the new bandplan requires wholesale frequency changes and power reduction.[4]

(c) A "Proponent would institute a transition for a particular market in which the following nearby licensees (even those that are not cochannel or first adjacent channel) would be required participants:[5]

(i) "Every licensee that has not previously been transitioned and that has a TIA that overlaps the GSA in which the contemplated base station will be located;[6]

(ii) "Every non-transitioned licensee with a TIA to which any of the contemplated facility's transmission antennas will have an unobstructed transmission path calculated assuming receive antenna heights of 9.1 meters above ground level and employing a smooth

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[3] NPRM, App. C, ¶ 1.
[4] NPRM, App. C, ¶¶ 2-4.
[5] NPRM, App. C at ¶ 6.
[6] *Ibid.* A "TIA" ("transition impact area") for a station is its "geographic service area" ("GSA"), plus, "in the case of ITFS licensees, the specific location of any ITFS reception site certified as eligible to receive a new downconverter under the transition rules." App. C, at ¶ 5. A "GSA" is the 35 mile-radius Protected Service Area ("PSA") specified in the Rules, reduced by half of any area of overlap with an adjoining co-channel PSA. Coalition Proposal App. C. See also NPRM App. C, ¶¶ 17-20 (Summarizing the coalition proposal on GSAs).

earth with 4/3 earth curvature propagation model;[7] and

(iii) "Every non-transitioned licensee with a GSA that overlaps the GSA of a license being transitioned pursuant to the first two conditions listed above."[8]

(d) Any "transition should . . . include any license with a GSA overlapping a GSA being transitioned."[9]

(e) A "Proponent should be permitted, at its sole discretion and at any time, to trigger the transition process with respect to any MDS or ITFS licensee that has a GSA located in whole or part within 150 miles of any portion of its GSA."[10]

(f) The Proponent has the right "in its sole discretion" to decide "at any time during the transition planning period . . . not to proceed with the transition due to transition cost considerations."[11]

We show below that this market-by-market, non-synchronous, non-compulsory, Proponent-dependent transition plan is impractical, unwieldy, difficult and likely impossible of accomplishment, and at the same time certain to increase the overall cost of conversion, to depress the value of 2.5 GHz spectrum and largely to transfer the spectrum's value from licensees to any Proponents who succeed in accomplishing a transition. By contrast, the ostensible benefit of the plan, which is to relieve ITFS licensees of the costs of conversion to the new bandplan, is largely illusory and wholly unnecessary.

The essential starting place for an evaluation of the Coalition's transition plan is an understanding of the present distribution of licensed facilities in the 2.5 GHz band. For the most

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[7] *Ibid.*
[8] *Ibid.*; ¶ Nos. supplied.
[9] *Id.* at 7.
[10] *Ibid.*
[11] *Id.* at 8.

part they consist of television transmission facilities operating from sites that are located at significant heights above average terrain, and from each such site a licensee is entitled to a "protected service area" ("PSA") defined by a 35-mile radius from the transmitter location.[12] Because this 35-mile protected zone was granted after most facilities had been established, there is a good deal of overlap of PSA boundaries of co-channel stations; hence the GSA definition proposed by the Coalition as described above, a definition with which we agree.

The band is highly congested in the eastern half of the country and in California, as can be seen from a PSA map of the contiguous 48 states.[13]

As that map shows, congestion is greatest along stretches of the Eastern seaboard, including Florida, Georgia, and Washington to Boston; in the upper Midwest, and in California. This congestion greatly complicates the task of any would-be Proponent. To demonstrate this, we furnish a study of the GSAs whose center coordinates fall within the 28 Basic Trading Areas ("BTAs") which constitute the Washington, D. C - New York City corridor.[14] This study establishes that:

(a) Any Proponent wishing to transition any GSA in this region would be required by the rules proposed by the Coalition to transition all of them. This requirement arises taking into account only the requirements relating to GSA overlap.

(b) The population of this region as of the 2000 Census, was 43 million.[15]

(c) There are 96 separate licensees in this region, with a total of 172 stations, with whom the Proponent would have to reach some form of agreement in order to accomplish

[12] *See* §§ 21.933, 21.902(d), 74.903 of the Rules.
[13] *See* Engineering Statement of Carl T. Jones, Jr., which is Appendix 1 hereto, Exhibit 2.
[14] App. 1 at pp. 5-8, Exhibits 3-13.
[15] App. 1 at p. 7.

the transition.[16] And the effort to reach agreement would be required to follow the elaborate procedure the Coalition has proposed to require a Proponent to follow. This includes seeking and obtaining information from each licensee about each licensed facility, developing a transition plan, submitting that plan to all of the licensees, awaiting and responding to objections and, if a resolution of all problems is reached, instituting the process and paying the transition costs of all ITFS licensees, or, if all does not go well, withdrawing from the plan and thereby stalling the conversion process.[17]

This procedure as applied to a single BTA with less than a dozen licensees would be difficult, intricate, time consuming, expensive, and, if there were serious licensee objections, very doubtful of accomplishment. As applied to the Washington-New York Corridor with 96 licensees and 172 stations, and also to the comparably congested regions in other parts of the country, the Commission can have no confidence that the transition would actually be accomplished at all.

Although the Coalition plan contains provisions clearly designed to make the transitions self-effectuating, they cannot be counted on to succeed. For example, the Coalition identifies nine "safe-harbors" which are designed to reduce licensee grounds for objection,[18] a rule that the Proponent's plan is to be judged for reasonableness only on its own terms and not in comparison with any counter proposal,[19] and a request that the Commission urge licensees and Proponents to agree to resolve disputes by arbitration.[20] But with 96 licensees and 172 stations, each of whose transition needs must be individually addressed, there are bound to be numerous legitimate ob-

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[16] *Ibid.*
[17] Coalition Proposal, App. B, pp. 12-29 (detailing this complex process).
[18] NPRM, App. C, ¶¶ 21-22.
[19] Coalition Proposal, App. B, pp. 20-21.
[20] Coalition Proposal, App. B, p. 27.

jections to any transition proposal. And, as the Coalition itself has made clear, the Commission cannot require arbitration.[21] The inevitable result will be a large number of individual controversies that can be resolved only by the Commission. They will be costly in time and Commission resources. The foreseeable result is gridlock.

Even if we do not have total failure, clearly we will find that only one or two entities, such as Sprint, will have the resources and past and present associations with licensees to have even a decent chance of succeeding as the Proponent for any region with station congestion such as is found in the Washington-New York corridor. And if such an entity is willing and able to devote the resources to a successful transition of the entire region, it will end up controlling far more spectrum than it can ever use efficiently for two-way mobile communications. The result will be inefficient use of the spectrum and a debasing of the value for the licensees.

B. Instead, the Commission should adopt a uniform, Proponent-free spectrum clearing plan.

By contrast, SPECTRUM MARKET proposes a transition plan which is clear, relatively easy to accomplish, holds Commission regulatory intervention to a minimum, and promotes competition and value optimization for licensees and users. The SPECTRUM MARKET plan has the following basic elements:

(a) The Commission orders that all non-conforming transmissions, *i.e.*, those that do not conform to the new rules for this band, must cease by a date certain (the "Sunset Date"), perhaps January 2008, which is the date by which the European countries are expected to make this band available for third generation applications.[22]

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[21] *Ibid.*

[22] *See* CEPT Final Report, *Frequency Usage to Facilitate a Coordinated Implementation in the Community of Third Generation Mobile and Wireless Communication Systems Operating in Ad-*

(b) The Commission issues a rule that permits all licensees to go silent during the "Conversion Period," which extends from the date of adoption of the new rules until at least six months after the Sunset Date.

(c) The Commission issues a rule that requires each licensee to have at least one conforming transmitter in operation within its GSA(s) by the end of the Conversion Period, and by five years thereafter requires that each licensee provide "substantial" service to its GSA(s), *i.e.*, 50% of the GSA area or population.

(d) Under the transition rules, all licensees are held responsible for meeting the requirements listed above, but the rules permit licensees to delegate those responsibilities, assign their costs, and/or be reimbursed, by means of assignment of licenses or spectrum leases.

(e) The Commission authorizes the use of private two-sided restructuring auctions, such as those to be offered by SPECTRUM MARKET. As discussed in detail in Section V., below, such auctions, which are preferable for existing spectrum to Commission-run auctions, will be a highly useful method by which to bring licensees and carriers together under circumstances which enable licensees to obtain optimum value and carriers to assemble spectrum in usable amounts, thereby overcoming the present highly disorganized state of the 2.5 GHz band.

We submit that this transition procedure is greatly preferable to the Proponent model, in many ways. It is simple and clear and obviates the need for all of the complicated rules and multi-party negotiations and Commission rulings that are required by the Proponent model. It completely forestalls the possibility of gridlock.

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ditional Frequency Bands as Identified by the WRC-2000 for IMT-2000 Systems, ¶ 5.5.1 (Nov. 2002).

Moreover, this plan does not merely remove the hopeless complications of the Proponent plan. It also renders largely superfluous the stated advantage of that plan, which is to pay the costs of ITFS conversion to the new bandplan.

In this connection, there are three classes of ITFS licensees to be considered. First, are those ITFS licensees which have no significant real educational television requirements, and which maintain their television service in order to lease capacity to wireless cable operators and to assure the viability of their licenses. As the Commission is aware, the wireless cable service is in drastic decline throughout the country.[23] Second are those ITFS licensees which do have present educational television requirements but which can find alternate ways, such as the internet, to meet those requirements, and which would prefer to devote all of their spectrum to cellular-type services. Under the SPECTRUM MARKET plan, both of these classes of licensees will find the bandplan transition to be cost-free because transition costs will be assumed one way or another by the carriers who make use of the spectrum for two-way services.

For those ITFS licensees which wish to continue to provide television classroom services using the 2.5 GHz band, and assuming that the Commission accepts the Coalition's proposal in

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[23] The Commission's *Ninth Annual Report on the Status of Competition in the Market for the Delivery of Video Programming,* FCC 02-328 (Rel. Dec. 31, 2002), reports that MMDS subscribership has dropped more than 50% since 1998, with a 30% drop in the last reported year alone (June 2001-June 2002), with MMDS now representing only. 0.55% of the MVDS market. *Id.*, App. B. The Report notes that over half of the)

WorldCom website indicates that it offers MMDS wireless broadband internet access in Baton Rouge, Jackson, Memphis, and Chattanooga. *See* <http://global.mci.com/about/publicpolicy/issues/mmds/>. However, it is not unlikely that its MMDS licenses would be sold off as part of the bankruptcy restructuring. Sprint stopped its MMDS rollout in 2001 and its has not announced any plans to expand this system. *See* Sprint Corporation FY 2002 Form 10K, pp. 7, 29. Nucentrix has announced it is moving its wireless cable customers to DBS and cable. *See* <http://www.nucentrix.com/welcome/wireless/cable.html>.

this regard,[24] those licensees will be faced with the need to change the frequencies of their television transmissions by the Sunset Date.[25] This cost should be very moderate, the licensees will have five years to plan for the transition, and they will be buoyed up by the revenues they obtain from two-way use on their other frequencies.[26] They, too, will be far better off than under a Proponent regime.

Finally, the Coalition's Proponent-based plan will prevent the partial transition of channel groups in markets or regions. Such partial transitions are permitted under the present rules,[27] and would be permitted under SPECTRUM MARKET's proposal. For example, engineering analysis of the specific licenses in the Washington-Baltimore area discloses that, without waiting for the Sunset Date, licensees holding licenses on the A and B channels in that area could group together and make possible the provision of low power mobile service on a contiguous 48 MHz block of spectrum, which would appear to be a very marketable block.[28] Those licensees could perhaps jointly market the spectrum to carriers. Or, if the Commission adopts SPECTRUM MARKET's proposal in this regard,[29] they could make use of a two-sided private auction procedure such as that offered by SPECTRUM MARKET, to accomplish the spectrum restructuring in an efficient and economical manner.

Under the Coalition's Proponent-based plan, however, such a partial transition would be impossible because, as we have demonstrated above, the Coalition's plan would require transi-

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[24] As we show in Section III, below, both public and private interests will be better served by conversion of the entire band to low power two-way services.
[25] As stated in Section III, SPECTRUM MARKET recommends that the Commission assign the entire band to low power two-way use.
[26] In a very few cases, ITFS licensees may wish to transmit television on more than one channel. As the Coalition indicates, see safe harbor #4, NPRM, ¶ 22, this, too, is manageable.
[27] *See* §§ 21.901 and 74.902 of the Commission's Rules.
[28] *See* App. 1 at pp. 6-10, Exhibits 14-17.
[29] *See* Section V, below.

tion of all of the channels in the band, and all of the stations in the Washington-New York corridor simultaneously. Moreover, as explained in Section III, below, the Coalition's proposal assigning a block of spectrum in the middle of the band for television use is also incompatible with partial transitions such we have just discussed.

III. Public and Private Short Term and Long Term Interests Will All be Served by Conversion of the Entire Band for Low Power Two-Way Services Rather Than Retaining 31.25% for Television.

The Coalition's proposal to retain a portion of the band for television use and to consolidate television uses in the middle of the band, will have adverse consequences, compared with SPECTRUM MARKET's proposal, for both the transition and for the overall value of the spectrum.

The television band proposal considerably complicates the transition process and, in fact, precludes partial transitions[30]. This is the case because the Coalition plan requires changes in the frequencies of all channels. First, the present six-MHz channels would be reduced to 5.5 MHz. Second, generally speaking, one channel of each channel group would be moved to the television mid band, and the remaining channels would move down to fill in the gaps. This process would require frequency changes for channels in every group, thereby precluding partial transitions.[31]

As to value, the Coalition proposes that for each licensee which now holds 24 MHz of spectrum, 16.5 MHz, or 68.75%, would be assigned for low power, two-way use and the remaining 31.25% would be assigned essentially for continued high-power educational television use plus an appropriate guard-band to protect the low power services from interference from televi-

[30] The three bandplans are set out in Exhibits 1 to App. 1 and 2 hereto.
[31] Some idea of the consequences of this process can be obtained by comparing the present bandplan with the Coalition's proposal; *see Ibid.*

sion transmissions. This requirement would perforce be imposed also on MMDS licensees, who have no educational obligations.[32]

SPECTRUM MARKET proposes that the entire band be assigned for low power two-way services and that television services not be permitted after the Sunset Date. In order to determine the relative value of various scenarios, SPECTRUM MARKET commissioned a valuation study of the MMDS/ITFS Spectrum by Camilla C. S. Jensen, Director, Telecom Division, of BIA Financial Network, Inc.("BIAfn"),[33] who is a leading ITFS/MMDS valuation expert.[34] The following statements of value are taken from her study.

The value of the MMDS/ITFS spectrum as it exists today is $901.9 million.[35] The value of the spectrum based on SPECTRUM MARKET's proposal, including its transition plan and its proposal to devote the entire spectrum to low power two-way services, is $20.937 billion,[36] or 23.2 times as much.

The maximum value of the spectrum based on the Coalition's proposal is $14 .640 billion, or approximately 30% less than based on SPECTRUM MARKET's proposal.[37] This reduction is based on the Coalition's proposal to reserve the mid band for educational television uses. The minimum value of the spectrum under the Coalition's proposal is the present value of the spectrum, or $901.9 million. This value would apply if the Coalition's plan results in total gridlock, so that no transition takes place. There would be an intermediate value if, because of the Coalition's transition proposal, the transition is incomplete, particularly in highly populated areas, or is significantly delayed. The midpoint of this value range is $7.771 billion, which Ms.

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[32] *See* NPRM at App. C, ¶ 3.
[33] Appendix 2 hereto.
[34] For a statement of qualifications, see App. 2 at 55-56.
[35] *Id.* at 18-22.
[36] *Id.* at 25-32.
[37] Ms. Jensen's evaluation of the Coalition's proposal is at App. 2, pp. 34-40.

Jensen believes "is a good indicator of the value if the transition drags out past five years or if there would be only a partial build out of the spectrum."[38] On that basis, the spectrum will be worth approximately 37% as much if the Coalition's plan is followed as if the Commission adopts SPECTRUM MARKET's proposal.

IV. The New Rules Should Require the Termination of Existing Leases for High-Power Transmissions.

The new rules should specify that, effective on the date service under the present rules is no longer permitted, all leases that were originally entered into under the present regime, that is, leases which predate adoption of the rules proposed herein, will terminate. This action will promote competition and the efficient use of the spectrum. It will assure that the educational organizations which are licensees in this band secure their rightful share of the enhancement of value which adoption of the new rules will make possible. And it is well within the authority of the Commission.

A. A few commercial entities currently tie up spectrum under long term leases.

Currently a few large companies hold over half of the MDS/MMDS licenses covering 75% of U.S. population.[39] In addition, Sprint and WorldCom, have leased ITFS spectrum from a large number of ITFS and MMDS licensees.[40] These leases are often long term, and, although they do not contemplate the provision of cellular or similar services, their existence in many cases may impede the free negotiation of new agreements with other parties for the provision of mobile applications..

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[38] *Id.* at 39.

[39] *Ninth Annual Report on the Status of Competition in the Market for Delivery of Video Programming*, ¶ 74, FCC 02-328 (Rel. Dec. 31, 2002).

[40] For example, as of February 2001, Sprint leased capacity on 1,394 ITFS channels and 349 MDS/Commercial ITFS channels, as well as holding 642 MDS/Commercial ITFS channels as licensee. *See* Sprint Comments, filed February 22, 2001 in ET Docket 00-258, p. 3.

B. Termination of old leases is in the public interest.

Although under the transition plan, licensees will generally remain the same, it seems clear from the number of channel and other technical changes in licensed facilities that will be required to achieve the new bandplan, that the Commission will be required to issue new or modified licenses to all licensees. SPECTRUM MARKET recommends that the Commission condition the issuance of these new or modified licenses upon the termination of pre-existing leases that were entered into while the present bandplan was in effect. As shown at Section III , herein, the spectrum will be much more valuable following the changes contemplated in this proceeding, and the Commission should permit the new marketplace to establish those values and put the spectrum to its best use, and in that connection should also pave the way for the parties to enter into new agreements which facilitate restructuring without being hampered by the existence of former leases.

Permitting the continuation of pre-existing leases would cause an enormous market distortion by preventing licensees from obtaining true value for the new services they will facilitate, and by concentrating spectrum primarily in the hands of Sprint and the successor to WorldCom. Those entities acquired control in major markets of spectrum required to provide a maximum number of television channels, which is much more spectrum than any carrier will require in any market to provide the services contemplated under the proposed new rules. If lessees of pre-existing leases are permitted to use those leases to retain control of spectrum to be used under the new regime, those lessees rather than the licensees will be the primary beneficiaries of the rule changes, and the value of the spectrum will be greatly diminished.

Moreover, as the Commission itself has recognized, potential claims by lessees may complicate and inhibit the restructuring of the spectrum.[41] The rule changes contemplated in the NPRM are so drastically different from the current rules governing the spectrum, and will be mandatory, that it would be essentially impossible for any pre-existing lease to have contemplated fully the potential changes or now to be amended without being entirely rewritten as the result of the new rules. The Commission has stated that it does not wish to be involved in adjudicating disputes between licensees and lessees regarding whether their leases contemplated rule changes.[42] Thus, given that the essential nature of the rules will be changed, the FCC will avoid disputes between licensees and lessees and create a fair environment only if the pre-existing leases are terminated and the licensees and lessees are free to negotiate contracts knowing the new rules.

C. The commission has ample authority to terminate the leases.

Spectrum leases depend on the Commission's rules, for their existence. The original ITFS rules did not permit spectrum leasing.[43] As the rules evolved, the Commission allowed first limited and then more extensive leasing of spectrum for non-educational purposes.[44]

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[41] *See* NPRM at 245. The Commission's discussion related specifically to the adverse effect of lessee claims on the effectiveness of a restructuring auction. But the same adverse effect would obviously obtain no matter what restructuring methods are employed.

[42] *See* Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licensees to Engage in Fixed Two-Way Transmissions, *Report and Order*, 13 FCC Rcd 19,112, ¶¶ 114, 131 (1998), *recon.,* 14 FCC Rcd 12,764 (1999), *further recon.,* 15 FCC Rcd 14,566 (2000) ("Two-Way Report and Order"). In that proceeding the Commission relied upon the fact that licensees would retain control because lessees required the licensee's signature on any application, and the licensee could determine whether the facilities proposed in the applications were permitted in its lease. However, it is likely that the new rules will eliminate the need for site-specific applications in this spectrum, thereby eliminating the ability of the licensee to accept or reject each facility installed by its lessee based on its lease.

[43] *See* NPRM at ¶ 7.

[44] *Id.* at 109.

However, it was clear that the educational institutions benefited from such leases and, in principle, the general public benefited from more efficient uses of the spectrum.

The current rules impose detailed restrictions and requirements on leasing of this spectrum: limiting the term, prescribing uses, requiring the lessor to have an unbridgeable right to recapture, etc.[45] ITFS licensees are currently required to file leases with the Commission.[46] Further, under Section 74.931(k) the Commission retroactively invalidated certain leases entered into after a certain date between cable companies and MDS or ITFS entities.[47] All of these instances demonstrate that since what is leased is licensed spectrum and the Commission has plenary authority to impose conditions on the uses of spectrum, it has authority here to require the termination of leases as a prerequisite to receiving the new licenses under the new bandplan. Indeed, in other proceedings the Commission has even altered real property rights between lessor and lessee where neither was an FCC license, in order to comport with new regulations[48] In another rulemaking the FCC opined:

> "The Commission has the power to prescribe a change in contract rates when it finds them to be unlawful and to modify other provisions of private contracts when necessary to serve the public interest".[49]

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[45] *See, e.g.*, 47 C.F.R. § 74.931.

[46] *See NPRM* at 118.

[47] *See* Second Report & Order, Amendment to Parts 21, 43, 74, 79 and 94, FCC 91, 302, 6 FCC Rcd 6792, ¶39 (Rel. Oct. 25, 199). Erratum, DA 91-1511, 6 FCC Rcd. 7232 (Dec. 10, 1991).

[48] *See Building Owners & Mgrs Ass'n Int'l v. FCC*, 254 F.3d 89,96 (D.C. Cir.2001) (Finding that: "Where the Commission has been instructed by Congress to prohibit restrictions on the provision of a regulated means of communication, it may assert jurisdiction over a party that directly furnishes those restrictions, and, in so doing the Commission may alter property rights created under state law.")

[49] *Promotion of Competitive Networks in Local Telecommunications Markets,* 15 FCC Rcd 22983 (October 25, 2000) , FN 354 (citing *Western Union Telegraph Co. v. FCC*, 815 F.2d 1495, 1501 (D.C. Cir. 1987)).

D. At a minimum, the Commission should clarify its existing policy limiting lease terms.

In 1998, the Commission extended the maximum ITFS lease term from ten to fifteen years.[50] Although SPECTRUM MARKET proposes that leases that predate adoption of the new rules should be terminated for the reasons stated above, it submits that, at a minimum, the Commission should clarify and enforce the fifteen-year term limitation. Many operators have employed strategies to attempt to extend the fifteen-year term including the following: 1) Starting the fifteen-year term based upon a future "start date," such as when the operator chooses to launch commercial services in the market, rather than the date the lease is executed. These types of provisions have meant that some leases that were executed many years ago have not yet "commenced" their term and will therefore tie up the licensee's spectrum for well more than fifteen years, 2) Provisions that "automatically renew" the lease where the total term would extend beyond fifteen years, 3) Provisions that provide that the licensee may not negotiate with parties other than the lessee as the lease term approaches expiration, 4) Provisions that provide that if the licensee and lessee fail to agree upon renewal terms, the lessee may force the licensee to arbitrate renewal terms, and 5) Provisions that provide the lessee with a right of first refusal that severely restricts the licensee's ability to negotiate with others, often for years, and which lessees may use to sue licensees and effectively force renewals of leases. The FCC should take this opportunity to clarify that these types of provisions, which either effectively extend the term beyond fifteen years or hamper the licensee's ability to negotiate and enter into new leases with other parties at the end of a lease term, are not permitted and must be removed from any leases. Otherwise, the spectrum could remain in the long-term control of lessees who do not use it, while

[50] *See* Two-Way Report and Order at 133-134.

instead the return of that spectrum to the marketplace would insure that it would be put to its best and highest use.

V. The Commission Should Approve the Use of Private Two-Sided Restructuring Auctions.

The Commission has suggested, that it might be desirable for it to conduct "a two sided auction to restructure spectrum. . ."[51] It has also invited comment on

> "whether alternative mechanisms, such as privately conducted secondary market auctions can or should be employed in conjunction with any FCC restructuring auction."[52]

SPECTRUM MARKET, which, as noted above, has developed an online spectrum clearinghouse designed to accomplish the very purposes advanced by the Commission, earnestly recommends that for several reasons the public interest will be better served if the Commission sanctions the use of private two-sided auctions and confines its own auction activities in this spectrum to the auction of unused ITFS spectrum.

First, we see no legal impediment to the use of private auctions for this purpose. Clearly, any auction of a license would be on terms which make Commission approval of the assignee's licensee qualifications and consent to the sale a precondition to the completion of any transaction. But that precondition would necessarily also exist in the case of a Commission-conducted auction.

Second, it is fair to say that the Commission has some doubt as to its authority to conduct private auctions of existing licenses. It states that:

> " To the extent a restructuring auction offers new initial licenses to all interested parties, we conclude that we can conduct such an auction consistent with our mandate and authority under Section 309(j).. . . To the extent that our auction process provides private parties with a secondary market for existing licenses that enhances the final license as-

[51] NPRM at 241; *see Id.* at 241-246.
[52] *Id.* at 242.

signment in a simultaneous auction of new licenses, we believe that we can design such an auction consistent with our mandate and authority. . . "[53]

This is less than a ringing announcement of its authority to auction existing licenses. Moreover, it goes no farther than declare the Commission's authority to hold a single nationwide auction in which the auction of existing licenses would "enhance" the auction of new licenses. Given the difference in number and value of the existing licenses as compared with the new ones, this is clearly the tail wagging the dog. As the Commission's staff has found,

"only in the least populated areas of the country is ITFS spectrum not currently occupied."[54]

More important is the fact that an auction process which is limited to a single nationwide auction would serve the public interest far less in the restructuring of the band than would a program that included a series of auctions covering individual markets or limited regions, including auctions to accomplish partial transitions as discussed in Section II.B., above. And the key regions in which auctions would be particularly efficacious are those where populations and licenses are highly congested, and in those areas new ITFS licensing is not possible, as noted above.

As the Commission has said, the auction process

"would enable interested parties to restructure the band rapidly by helping them learn the cost of combining and obtaining encumbered and unencumbered spectrum for new uses, without engaging in costly and time consuming bilateral and multi-lateral negotiations."[55]

A market-by-market auction process, for example, would permit carriers to aggregate in a single auction process the spectrum they would need to serve the markets in which they were interested. That ability to aggregate plus the presence of multiple competing bidders would clearly provide

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[53] *Ibid.*
[54] March 30, 2001 *Final Report, Spectrum Study of the 2500-2690 MHz Band,*" Staff Report, p. 35.
[55] *Id.* at 241.

an optimum environment from the point of view of the licensees, and should provide a definite incentive for them to participate in the auction.

A factor which the Commission may not have considered is that to a very substantial degree what will be called for will be auctions of spectrum leases rather than licenses, and the Commission has made no claim to authority to conduct spectrum lease auctions. As the Commission is aware, at present all commercial activity using ITFS spectrum, and some activity using MMDS spectrum is by way of spectrum leases from the licensees to commercial operators. Regardless of what action the Commission may or could take to authorize the sale of ITFS licenses or to permit commercial activities by educational organizations, spectrum leases will still be the method of choice for many if not most ITFS licensees and some MMDS licensees.

Lease auctions will provide the same band restructuring benefits as license auctions, provided that they are designed properly. There are two keys to the design of auctions that will be of maximum usefulness and value. One is to establish a standard set terms relating to auction procedures, and also a standard set of lease terms so that bidders will be presented with equivalent terms upon which to bid and the only significant variable is price. SPECTRUM MARKET has designed a standard set of terms with this in mind. The second key is to obtain as much information as possible about factors which bear on the evaluation of units of spectrum and to make that information public so that licensees and bidders are comparably well informed.[56]

Since the Commission cannot hold lease auctions, and its authority to hold license auctions with regard to existing licenses is questionable, we submit that it should authorize private two-sided auctions and itself conduct an auction only with respect to initial licenses.

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[56] Although she does not assign a specific value to the use of auctions, Ms. Jensen observes that "a commercial auction setting" would "create a more open market place for the licenses than what we have experienced historically and could therefore influence lease and license values positively, positioning especially ITFS license holders for better bargaining." App. 2 at 42.

VI. Conclusion

There have already been multiple protracted rulemakings in this band in an attempt to adapt this spectrum to changing technology and broadband demands,[57] and yet the spectrum remains largely underutilized due in part to regulatory constraints. SPECTRUM MARKET submits that it is time to end the piecemeal approach to regulation and establish rules that are truly flexible and provide certainty that the transition to advanced wireless services will be accomplished. SPECTRUM MARKET's proposals herein assure that the Commission will not be forced to revisit this band in the future and that valuable services to consumers can finally be provided using ITFS and MDS spectrum.

Respectfully submitted,

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September 8, 2003

[57] *See, e.g.,* Use of Digital Modulation by Multipoint Distribution Service and Instructional Television Fixed Service Stations, *Declaratory Rule and Order*, 14 FCC Rcd 18,839 (1996); Two-Way Report and Order; Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, *First Report and Order and Memorandum Opinion and Order*, ET Docket No. 00-258, 16 FCC Rcd 17,222 (2001).

ENGINEERING STATEMENT OF CARL T. JONES, P.E.

I. Introduction

The current licensing regimen for the 2500–2690 MHz spectrum has led to technical and economic inefficiencies as technology and the intended uses of the spectrum have changed. The spectrum was initially parceled into 6 MHz interleaved channels, and was licensed in a high-powered, high-site architecture, in order to reduce adjacent channel interference when it was intended that the spectrum be used for point-to-multipoint analog television services. However, this architecture is a technical impediment now that the spectrum is moving to mobile, digital, and data uses. To resolve this problem, and make the spectrum available for advanced wireless services, SPECTRUM MARKET proposes a plan that includes the following elements: 1) deinterleave the channels completely, 2) move all channels to low power, 3) create Geographic Service Areas (GSAs) by bifurcating overlapping Protected Service Areas (PSAs), and 4) mandate that the transition occur by a date certain for all channels.

II. The Band Plan

A. Deinterleaving of Channels

Like the Coalition, SPECTRUM MARKET supports mandatory deinterleaving of the 2500-2690 MHz spectrum. There is no longer a technical reason for interleaving channels in this frequency band and, in fact, channel interleaving combined with the present adjacent channel interference rules has been a major impediment to the migration to two-way communications.

Deinterleaving will significantly reduce the potential for adjacent channel interference. Under the present rules, a four-channel group license can have up to eight adjacent channel relationships. For example, channel C1 has adjacent channel relationships with channels B4 and D1. Similarly, channel C2 has adjacent channel relationships with channels D1 and D2, etc. By deinterleaving the spectrum, the number of adjacent channel relationships is reduced from a maximum of eight to a maximum of two, resulting in a four-to-one reduction in potential adjacent channel interference between licensees.

A comparison of the present band plan and the proposed SPECTRUM MARKET deinterleaved band plan is shown in the table below.

PRESENT BAND PLAN			PROPOSED BAND PLAN			
CHANNEL	LOWER FREQ. (MHz)	UPPER FREQ. (MHz)	CHANNEL	LOWER FREQ. (MHz)	UPPER FREQ. (MHz)	LICENSEE
A1	2500	2506	A1	2500	2506	Current A Group
B1	2506	2512	A2	2506	2512	
A2	2512	2518	A3	2512	2518	
B2	2518	2524	A4	2518	2524	
A3	2524	2530	B1	2524	2530	Current B Group
B3	2530	2536	B2	2530	2536	
A4	2536	2542	B3	2536	2542	
B4	2542	2548	B4	2542	2548	
C1	2548	2554	C1	2548	2554	Current C Group
D1	2554	2560	C2	2554	2560	
C2	2560	2566	C3	2560	2566	
D2	2566	2572	C4	2566	2572	
C3	2572	2578	D1	2572	2578	Current D Group
D3	2578	2584	D2	2578	2584	
C4	2584	2590	D3	2584	2590	
D4	2590	2596	D4	2590	2596	
E1	2596	2602	E1	2596	2602	Current E Group
F1	2602	2608	E2	2602	2608	
E2	2608	2614	E3	2608	2614	
F2	2614	2620	E4	2614	2620	
E3	2620	2626	F1	2620	2626	Current F Group
F3	2626	2632	F2	2626	2632	
E4	2632	2638	F3	2632	2638	
F4	2638	2644	F4	2638	2644	
G1	2644	2650	G1	2644	2650	Current G Group
H1	2650	2656	G2	2650	2656	
G2	2656	2662	G3	2656	2662	
H2	2662	2668	G4	2662	2668	
G3	2668	2674	H1	2668	2674	Current H1 Channel
H3	2674	2680	H2	2674	2680	Current H2 Channel
G4	2680	2686	H3	2680	2686	Current H3 Channel

In the proposed band plan, the A-Group licensee will be assigned the first four channels in the band (2500-2524 MHz), the B-Group licensee will be assigned the next four channels (2524–2548 MHz), and so on. Note that under the proposed band plan each four-channel licensee will end up with 24 MHz of contiguous spectrum and two of the licensee's 6 MHz channels will be identical to the currently assigned channels.

The I-Channels should also be deinterleaved such that each four-channel licensee that was assigned four I channels will end up with four contiguous 125 kHz channels. The proposed deinterleaved band plan for the I-Channels is shown in the following table:

PROPOSED I CHANNEL BAND PLAN

PROPOSED BAND PLAN			
CHANNEL	LOWER FREQ. (MHz)	UPPER FREQ. (MHz)	CHANNEL OF LICENSEE
I1	2686.000	2686.125	A1
I2	2686.125	2686.250	A2
I3	2686.250	2686.375	A3
I4	2686.375	2686.500	A4
I5	2686.500	2686.625	B1
I6	2686.625	2686.750	B2
I7	2686.750	2686.875	B3
I8	2686.875	2687.000	B4
I9	2687.000	2687.125	C1
I10	2687.125	2687.250	C2
I11	2687.250	2687.375	C3
I12	2687.375	2687.500	C4
I13	2687.500	2687.625	D1
I14	2687.625	2687.750	D2
I15	2687.750	2687.875	D3
I16	2687.875	2688.000	D4
I17	2688.000	2688.125	E1
I18	2688.125	2688.250	E2
I19	2688.250	2688.375	E3
I20	2688.375	2688.500	E4
I21	2688.500	2688.625	F1
I22	2688.625	2688.750	F2
I23	2688.750	2688.875	F3
I24	2688.875	2689.000	F4
I25	2689.000	2689.125	G1
I26	2689.125	2689.250	G2
I27	2689.250	2689.375	G3
I28	2689.375	2689.500	G4
I29	2689.500	2689.625	H1
I30	2689.625	2689.750	H2
I31	2689.750	2689.875	H3

B. The Proposed New Band Plan

The majority of the current spectrum is licensed in four-channel blocks, with the licensees holding 24 MHz of spectrum. SPECTRUM MARKET proposes that the licensees should retain full, flexible use of their 24 MHz of spectrum after the channels are deinterleaved as described above, and that all of the spectrum should be devoted to low-powered cellular use. Attached hereto as Exhibit 1 is a comparison of the current band plan, the Coalition's proposed band plan, and SPECTRUM MARKET's proposed band plan. The Coalition band plan reduces the current four-channel licensees to only 16.5 MHz of contiguous, flexible spectrum, while SPECTRUM MARKET's proposed band plan provides for the full 24 MHz of contiguous, flexible spectrum.

The Coalition band plan breaks the spectrum into fragments to create 42 MHz reserved for high-power downstream use (MBS)[1] and an additional 12 MHz of spectrum that is necessary for guardband (the Coalition's proposed J and K Bands) to protect the MBS. Under this plan, a licensee having no desire to use its spectrum for high-power downstream services is forced to set aside 7.5 MHz of spectrum (6 MHz in the MBS and 1.5 MHz in the J or K Bands) that is unavailable for low-power cellular use. Thus, 31% of a licensee's spectrum remains under the same restrictive rules that have prevented the successful deployment of two-way cellular services in this band. Note also that although the purported purpose of the MBS is to reserve spectrum for ITFS video, the MMDS E and F groups are also required to contribute 31% of their spectrum to the MBS and guardbands.

Although the Coalition states that the MBS spectrum might one day be converted to low-power cellular use, that scenario is probably unlikely due to severely restrictive rules and the difficulty of obtaining the large number of consents required from other licensees.[2] If the Coalition band plan is adopted, and the MBS spectrum remains underutilized as it is today, the Commission will be faced with yet another rulemaking to add flexibility to this band, requiring another transition process. Moreover, it would be an inadequate solution to merely convert the MBS spectrum to low power use, either by the licensees or by a rulemaking, because a four-channel licensee would be left with the fragments of a multi-step transition process, i.e., its channels would be separated into 16.5 MHz, 6 MHz and 1.5 MHz non-contiguous blocks. SPECTRUM MARKET's approach, on the other hand, creates 24 MHz contiguous blocks that afford maximum flexibility and efficient spectral units to provide advanced wireless services.

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[1] The MBS stands for Mid Band Segment and is comprised of the A4, B4, C4, D4, E4, F4 and G4 channels in the Coalition's proposed band plan.

[2] The Coalition Plan provides two scenarios under which MBS spectrum might be used for low-powered cellular services. In the first, an MBS frequency may be used for downstream FDD transmissions; however, this use is subject to the same overly restrictive rules that have prevented two-way service to date. In most cases, the best that could be accomplished is to convert the existing high-power, high-site operation to digital data transmission, in other words a spectrally-inefficient, downstream-only, supercell concept. In the second scenario, a licensee may attempt to convert a MBS channel to flexible use, but only if it meets the same restrictive rules as described above and obtains consents from every MBS licensee with a Transition Impact Area (TIA) (defined in Footnote 4 below) that overlaps or is within six miles of its GSA, and every co-channel MBS licensee with GSA center coordinates within 100 miles of its GSA center coordinates.

III. Geographic Service Areas

The licensees in this band currently have Protected Service Areas (PSAs). Attached hereto as Exhibit 2 is a map depicting all of the PSAs in the U.S. Clearly, PSAs are clustered and overlap one another in many populated areas, and those overlaps have severely restricted the ability of licensees to meet interference criteria when attempting to deploy services on this spectrum. To resolve this problem, SPECTRUM MARKET supports the formation of Geographic Service Areas (GSAs) as proposed in Appendix A of the Coalition's white paper.[3]

IV. Transitioning to the New Band Plan

Based on the congestion of markets, as shown in the PSA map, and the fact that the channels are interleaved, SPECTRUM MARKET proposes that the only feasible way to accomplish the transition to the new band plan is to convert all of the channels to their new frequencies and mandate low power use by a date certain. The Coalition has proposed a market-by-market approach to transition to the new band plan, and has established procedures that attempt to address the problem that it retains both low and high power uses in its proposed plan.

In order to analyze the practical effects of the Coalition's transition process, the Washington, D.C. market was selected as a sample market for analysis.

A. Coalition Definition of Required Participants in the Transition Process

Appendix B of the Coalition white paper sets forth proposed criteria for identifying those licensees that are required participants in a market transition. For purpose of this study, we include only 1) licensees that have a GSA that overlaps the GSA that is proposed to be transitioned, and 2) any non-transitioned licensee with a GSA that overlaps a GSA that is being transitioned pursuant to 1).[4] The above criteria include all GSA overlapping areas without regard to channel relationship. For example, if the licensee of the A Channel Group is to be transitioned and the GSA of the A Channel Group overlaps the GSA of an E Channel Group licensee, then the E Channel Group licensee is also a required participant to the transition process.

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[3] A Proposal for Revising the MDS and ITFS Regulatory Regime, submitted by the Wireless Communications Association International, Inc., the National ITFS Association and the Catholic Television Network, RM-10586 (filed Oct. 7, 2002).

[4] The Coalition full criteria includes as required participants: 1) any licensee that that has not previously been transitioned and that has a TIA that overlaps the GSA that is proposed to be transitioned; 2) any non-transitioned licensee with a TIA to which any of the contemplated transitioned facility's transmission antennas will have an unobstructed path over 4/3 earth to a hypothetical receive antenna having a height above ground level of 9.1 meters; and 3) any non-transitioned licensee with a GSA that overlaps a GSA that is being transitioned pursuant to 1) or 2). The Coalition proposes that a TIA is the same as a GSA for MDS licensees, but the TIA for an ITFS licensee is the GSA plus eligible receive sites that are located outside of the licensee's GSA. We have not included in this example any licensees based upon TIAs or the unobstructed path criterion. The inclusion of these licensees would only increase the number of required participants to the transition process above what is shown here.

B. Establishing GSAs for the Sample Market

To determine those licensees that will be required participants to the transition process, GSAs must be defined for the licensees in the Washington, D.C. market and in neighboring markets.

Exhibit 3 shows the PSAs in the Washington market and surrounding markets that make up the general study area. The exhibit includes the PSAs for all ITFS and MDS channels (A1 through H3). The PSAs are 35-mile circles centered on the PSA coordinates as determined from the Commission's Transitional Universal Licensing System (TULS) database. For each PSA shown in Exhibit 3, a corresponding GSA must be determined for each licensee under study. The boundaries of the GSA are established based on the original PSA boundary as modified by co-channel overlap in accordance with procedures contained in Appendix A of the Coalition's white paper. Determination of the GSA boundaries for each licensee must be performed on a channel by channel basis.[5] As an example, Exhibit 4 shows the resulting GSAs for the E Channel Group in the area of study. The GSA boundaries for all channels (A1 through H3) are shown in Exhibit 5.

C. Identifying the Required Participants to the Sample Transition Process

After establishing the GSA of each licensee in the study area, the Coalition's proposed GSA overlap criterion was applied to the Washington, D.C. market to determine the required participants to the sample transition process.

Because most of the Washington, D.C. stations are collocated,[6] it might be assumed that the GSAs of each station have identical shape; however, this is not true. Because the formation of GSAs is dependent on co-channel overlap, the GSAs of collocated stations can vary widely depending on each station's geographic relationship with other co-channel stations in neighboring markets. For example, the Washington, D.C. A Channel Group station has PSA overlap with a single A Channel Group station in Baltimore, Maryland; however, the Washington, D.C. B Channel Group station has PSA overlap with a Baltimore, Maryland B Channel Group station and an Annapolis, Maryland B Channel Group station. The resulting GSA of the Washington, D.C. market A Channel Group is shown as the shaded region on the map of Exhibit 6 and the GSA of the Washington, D.C. B Channel Group license is shown as the shaded region on the map of Exhibit 7. Comparison of Exhibits 6 and 7 indicates that the two stations have significantly different GSAs even though they are collocated.

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[5] Where overlap of two or more PSAs occurs that involves four-channel licenses, the same GSA boundary is applied to each channel in a licensee's four-channel group. However, many licenses may include only one or two channels of a four-channel group. When overlap of PSAs occurs that involves licenses with unequal numbers of channels, multiple GSAs may result for a single license that differ from channel to channel. For example a licensee of an E Group license having PSA overlap with a license consisting of only channels E1 and E2, will end up with one GSA for channels E1 and E2 and a different GSA for channels E3 and E4 due to the fact that the licensee's GSA will be established through bifurcation of the PSA overlap area for channels E1 and E2, while on channels E3 and E4 no bifurcation is required.

[6] In the Washington, D.C. market, all of the ITFS and MDS stations, with the exception of one C Group station, are collocated such that the center coordinates of each of the GSAs coincide. The GSA center coordinates of the non-collocated C group license are approximately 5 miles southwest of the coordinates of the collocated licenses so that the GSA of the C group license overlaps, to a large extent, the GSAs of the collocated licenses.

Given that the GSAs of all of the Washington, D.C. market stations overlap, a transition of one Washington, D.C. station will, by application of the Coalition's GSA overlap criterion, require inclusion of all of the Washington, D.C. licensees in the transition process. The aggregate area of the 11 Washington, D.C. market station GSAs is shown in red on the map of Exhibit 8. Those licensees having a GSA that overlaps one or more of the Washington, D.C. market station GSAs are also required participants to the transition process. The aggregate area of the secondary overlapping GSAs is shown in blue on the map of Exhibit 8. Those stations having GSA overlap with one or more of the stations identified as secondary overlapping stations are also required participants to the Washington, D.C. market transition process as shown in green on the map of Exhibit 8. The licensees in each of three additional successive sets of overlapping GSAs were determined in the same manner and the aggregate area of the corresponding GSAs is shown on the map of Exhibit 8 in yellow, purple and gray, respectively. It is apparent from the density of GSAs bordering the last included set of overlapping GSAs that this progression will continue and additional licensees will to be included as required participants to the Washington, D.C. market transition process; however, for the purposes of this sample market analysis, the process was terminated after determination of the licensees in the first six sets of overlapping GSAs.

The map of Exhibit 8 indicates that transition of the Washington, D.C. market stations will require the inclusion in the transition process of licensees in markets from Chesapeake, Virginia to New York, New York and beyond. Because the GSA overlaps are bi-directional, the same scenario would result if any market within this area were selected for transition.

Although the map of Exhibit 8 shows that aggregate area of the GSAs of the licensees that will be required participants to the Washington, D.C. market transition, it does not convey the complexity of the overlapping situation or the numbers of stations and licensees involved. Based on analysis of the first six sets of GSA overlaps, as described above, there are 172 licenses included in the transition process and 96 different licensees. The PSA center coordinates of the included licenses are located in 28 different Basic Trading Areas (BTAs), the population of which totals more than 43,000,000 people.

A tabulation of the 172 included licenses is contained in Exhibit 9. Under each of the 172 included licenses is a tabulation of all licenses that have overlapping GSAs with the included license. This tabulation of GSA overlaps provides a clearer picture of the robust nature of the interconnection between licensees and between markets with regard to the Coalition's transition process. Analysis of the tabulated GSA overlaps reveals that for the 172 included licenses, the minimum number of GSA overlaps for a single license is 6 while the maximum number is 41. The number of licenses with 10 or greater GSA overlaps is 153 (89%), the number of licenses with 20 or greater GSA overlaps is 57 (33.1%), the number of licenses with 30 or greater GSA overlaps is 16 (9.3%) and 3 licenses have 40 or greater GSA overlaps. There are a total of 1,861 unique GSA overlaps between licenses within the study area.

The interconnection between licensees through GSA overlaps is graphically depicted on the map of Exhibit 10. The red stars on the map represent the center coordinates of all of the ITFS and MDS licenses within the study area and the immediate surrounding area. Where licenses are collocated, a single star represents all licenses centered at that location. The lines

interconnecting the license locations represent one or more GSA overlaps between licenses at the connected locations. The map of Exhibit 10 demonstrates the complexity of the GSA overlap situation throughout the study area and the number of possible paths that connect distant markets through GSA overlap.

The map of Exhibit 11 is an expanded view of the Washington D.C. market and surrounding area. The number associated with each connecting line on the map represents the number of different GSA overlaps that exist between the licenses at the two connected locations. For example there are 26 different overlapping GSAs between the collocated Washington DC licenses and the collocated Baltimore, Maryland licenses.

The maps of Exhibits 12 and 13 are expanded views of the Philadelphia and New York markets, respectively. Because of the number and density of the GSA overlap connections between license sites on these maps, the number of GSA overlaps represented by each connecting line has been omitted. However, these maps clearly demonstrate the complexity of the GSA overlaps that will connect licenses and markets together under the Coalition's transition plan.

D. The SPECTRUM MARKET Approach

The above analysis leads to the unavoidable conclusion that the transition of a single channel in the Washington, D.C. market, as an example, requires a "proponent" to transition hundreds of other channels in other markets, some of which the proponent will likely have no interest in, held by nearly one hundred licensees, some of whom will be totally unaffiliated with the proponent. It is clear from Exhibit 2 that Washington, D.C. is not unique in its congestion of PSAs and that this transition problem will occur in many areas throughout the country.

SPECTRUM MARKET proposes a simple and feasible transition plan for the 2500–2690 MHz band that mandates a date certain for the cessation of all high-power, high-site operations on all channels. The SPECTRUM MARKET plan does not, however, restrict a licensee or a group of licensees from deinterleaving their spectrum and converting to low power operation prior to the transition date should it be possible to do so. A licensee or group of licensees proposing to transition to low power operation prior to the transition date would have to be sufficiently removed from high power sites so as not to receive debilitating interference and the proposed low-power transmissions could not cause harmful interference to non-transitioned high-power receive sites.

In order to evaluate the potential for transitioning to low power operation prior to the transition date, a sample scenario was studied in the Washington, D.C., Baltimore, Maryland and Annapolis, Maryland markets. In the sample scenario, the A and B Channel Group licensees jointly propose to convert to low power operation. The A and B Group stations in Washington are collocated and the A and B Group stations in Baltimore are also collocated. The GSAs of the A Group licensees in the Washington and Baltimore markets are shown on the map of Exhibit 14 and the GSAs of the B Group licensees in all three markets are shown on the map of Exhibit 15. In order to provide a guard band between low-power and high-power operations and thereby minimize the potential for interference to and from the proposed low power operation, it is

assumed that transmissions on Channel B4 in all three markets would be inhibited until the transition date.

The primary interference issue is high-power, high-site, co-channel interference to low power base station reception. This is due to the requirement that the base station's receiver be capable of receiving extremely low level signals from distant mobile transmitters. In the example studies contained in Attachments 1 and 2 of the Coalition's Reply Comments in RM-10586,[7] the threshold of interference was specified to be a received interfering signal power equal to or greater than -107 dBm for a 6 MHz bandwidth. This corresponds to a signal power 6 dB below the thermal noise of the receiver, assuming a receiver noise figure of 5 dB. This same level of interfering signal power was used in the instant study as the threshold of interference.

Co-channel interference studies were performed for all neighboring market A and B Channel Group stations assuming that these stations continue to operate with their licensed transmission facilities. For this study, the low power base station receive sites are assumed to operate with an omni-directional, vertically polarized, receive antenna having a gain of 16 dBi and a height above ground of 30 meters. The propagation model and time and location variability that were used in the above-cited Coalition interference studies were also used in the instant study.

The shaded region on the map of Exhibit 16 shows the area within the Washington and Baltimore A Channel Group GSAs where a low power base station is predicted to receive an interfering signal power greater than -107 dBm (threshold of interference). The map of Exhibit 16 indicates that the area within the Washington GSA is predicted to be relatively free of co-channel interference while the northern and eastern regions of the Baltimore GSA are predicted to receive interference at a level exceeding the threshold. Low power cellular services would therefore be possible over a large portion of the Washington and Baltimore market A Channel Group GSAs prior to the transition date. Even within the shaded regions of the map, low power cellular services may be possible through employment of mitigation measures such as the use of directional antennas or antenna beam tilt.

Those areas where a low power base station is predicted to receive co-channel interference from neighboring market stations on the B Channel Group are shown in the shaded regions of Exhibit 17. In this case, the GSAs of the Washington, Baltimore and Annapolis markets are included in the study. As was the case with the A Channel Group study, the Washington market B Channel Group GSA is predicted to be relatively free of co-channel interference from neighboring market stations. Within the Baltimore and Annapolis market GSAs, predicted interference is confined primarily to the eastern portions of the GSAs. It is apparent from review of Exhibit 17 that large portions of the most populated areas of the combined GSAs are predicted to be free of co-channel interference from neighboring market, high-power, stations and therefore low power cellular operations can be implemented in these areas prior to the transition date. As was stated above, even within the shaded regions on the map of Exhibit 17, cellular services may be possible through the employment of interference mitigation measures.

---

[7] Reply Comments of WCA, NIA, and CTN, filed Nov. 29, 2002, to Proposal by the Wireless Communications Association International, Inc., the National ITFS Association and the Catholic Television Network for Revising the MDS and ITFS Regulatory Regime, RM-10586.

Co-channel interference from the proposed cellular operations to high-power station receive sites in neighboring markets for the sample market study, is highly unlikely due to: 1) the low transmitter power of the cellular base station (typically 20 watts EIRP for macro-cells); 2) the low antenna height (typically 30 meters above ground) and; 3) the directional antenna discrimination provided by the high-power station receive antenna.[8]

Thus, unlike in the Coalition proposal, licensees would retain the right to commence low power cellular operations in compliance with applicable interference rules and enhance the use of their spectrum prior to the transition date, without being dependent on a proponent; while at the same time the SPECTRUM MARKET proposal insures that all licensees will transition to low power cellular operations under the new band plan by a date certain.

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September 5, 2003

[8] The licensee converting to low power cellular use would be required to adhere to the interference criteria in the new rules to protect any affected licensees that may still be operating prior to the transition date, including any requirements to prevent interference to ITFS receive site downconverters, etc.

APPENDIX 2

THE MMDS/ITFS SPECTRUM IN THE UNITED STATES

ESTIMATES OF VALUE IN THREE SCENARIOS

AS OF AUGUST 1, 2003

PREPARED FOR
SPECTRUM MARKET, LLC

Project No. 5103008

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September 2, 2003

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Re: Valuation of the MMDS/ITFS Spectrum in three scenarios in the US as of August 1, 2003.

Dear Mr. Frank:

Pursuant to your request, I have prepared an analysis to estimate the fair market value of the MMDS/ITFS Spectrum in the US, as of August 1, 2003, under three specified scenarios.

Based on the data, analyses, and conclusions set forth in the report that follows, it is my opinion that the value of the spectrum, as of August 1, 2003, is as follows:

1. Value of the spectrum as it exists today .....$901.9 million
2. Value of the spectrum under SPECTRUM MARKET LLC's proposal.....$20.937 billion
3. Value of the spectrum under the Coalition's proposal.....$901.9 million to $14.640 billion[1]

Respectfully Submitted,

BIA FINANCIAL NETWORK, INC.

Camilla C.S. Jensen
Director, Telecom Division

[1] Please see report for details. The value range is dependent on the smoothness of the transition to the new band plan.

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INTRODUCTION

INTRODUCTION

BIAfn has been retained by SPECTRUM MARKET, LLC ("SMC") to estimate the fair market value of the MMDS/ITFS Spectrum in the United States, as of August 1, 2003, under three specified scenarios:

1. Value of the spectrum as it exists today *
2. Value of the spectrum under SPECTRUM MARKET LLC's proposal *
3. Value of the spectrum under the Coalition's proposal *

* These proposals are defined in detail later in the report

The analyses in this report are intended to be used to support a response to the FCC's Notice Of Proposed Rule Making and Memorandum Opinion And Order ("NPRM" and "MO&O") adopted on March 13, 2003 and released April 2, 2003. This analysis speaks only as of the date specified herein and only for the analysis purpose specified herein. The intended users of the report are SPECTRUM MARKET LLC personnel and their advisors, Holland & Knight, LLP.

Definition of Terms

For the purposes of this report, the following definitions apply:

- **Fair Market Value** - the price, expressed in terms of cash equivalents, at which property would change hands between a hypothetical willing and able buyer and a hypothetical willing and able seller, acting at arms length in an open and unrestricted market, when neither is under compulsion to buy or sell and when both have reasonable knowledge of the relevant facts. [2]

- **MDS and MMDS** - Multipoint Distribution System ("MDS") and Multichannel Multipoint Distribution System ("MMDS"), together historically referred to as "Wireless Cable." These services permit the delivery of video programming similar to cable television to subscribers through wireless microwave transmitting and receiving antennas. The terms MDS and

[2] This definition and the valuation approach definitions in the following paragraphs were drawn from the American Society of Appraisers Business Valuation Glossary at *http://www.appraisers.org*. The definitions are the same as those in the American Society of Appraisers *Business Valuation Standards*, October, 2002.

MMDS are often used interchangeably. The FCC coined the term "MDS" at a time when it was making only two channels available for the service, at 2150-2162 MHz. It began using the term "MMDS" when formulating rules making additional channels for the service available in the 2500-2690 MHz band.[3] In September 1998, the FCC expanded the uses of the wireless cable spectrum by adopting what is called the "Two-Way Rule." The Two-Way Rule permits the use of wireless cable frequencies for two-way digital communications. Previously this spectrum could be used only for the one-way transmission of television programming. This change in the FCC regulations makes it possible for a wireless cable operator to provide data transmissions, such as high speed internet access service, or voice transmissions, such as local loop telephone service, as well as television programming, in its service area. In an effort to make more uses of the band, the FCC added a mobile allocation to the 2500-2690 MHz band. The mobile allocation, adopted on September 6, 2001, was implemented in an effort to provide "near-term and long-term flexibility for the use of the spectrum, thereby making this band potentially available for advanced mobile and fixed wireless services, including third generation ("3G") and future generations of wireless systems."[4]

- **ITFS** - Instructional Television Fixed Services. ITFS frequency channels were originally designated for transmission of instructional material to selected receiving locations in accredited public and private schools, colleges and universities for the formal education of students. In 1983, the FCC also began allowing ITFS licensees to lease excess capacity on their facilities to commercial entities.[5]

- **The Coalition** – A group of ITFS and commercial wireless industry representatives made up of the National ITFS Association (NIA), the Wireless Communications Association International ("WCA") and the Catholic Television Network ("CTN"). WCA is the trade association of the wireless broadband industry. NIA is a non-profit, professional organization of ITFS licensees, applicants and others interested in the ITFS. CTN is an association of Roman Catholic archdioceses and dioceses that operate many of the largest parochial school systems in the United States.[6]

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[3] Source: FCC Notice of Proposed Rule Making, March 13, 2003 (FCC 03-56), page 3.

[4] FCC's First Report and Order and Memorandum Opinion and Order. FCC 01-256 adopted September 6, 2001, released September 24, 2001.

[5] Source: FCC Notice of Proposed Rule Making, March 13, 2003 (FCC 03-56), page 9.

[6] Source: FCC Notice of Proposed Rule Making, March 13, 2003 (FCC 03-56), page 4.

- **Valuation Approaches:**

  a. The **Income Approach** is a general way of determining a value indication of a business, business ownership interest, security, or intangible asset using one or more methods that convert anticipated benefits into a present single amount.

  b. The **Market Approach** is a general way of determining a value indication of a business, business ownership interest, security, or intangible asset by using one or more methods that compare the subject to similar businesses, business ownership interests, securities, or intangible assets that have been sold.

  c. The **Cost Approach** is a general way of estimating a value indication of an individual asset by quantifying the amount of money that would be required to replace the future service capability of that asset.

For the valuation analyses in this report, we relied primarily on the market approach and secondarily on the income approach.

Rights and Limiting Conditions

BIA*fn* assumes no responsibility for matters of a legal nature affecting the spectrum being analyzed. The analysis also assumes that the spectrum is free and clear of all liens and other encumbrances unless otherwise specifically stated. All information provided by the client, or obtained from other external sources, was assumed to be accurate and no steps were taken to independently verify the material.

Projections may be included in this analysis. Projections and assumptions are inherently subject to uncertainty and may be greatly influenced by events that are unforeseeable or otherwise differ or vary from reasonable expectations. Consequently, operating results may vary from the projections set forth in the valuation, commensurately affecting the value of this asset.

The contents of this report should in no way be construed as a recommendation to invest in, or otherwise contribute funds to MMDS/ITFS entities, SPECTRUM MARKET, LLC, or to an other entity. The conclusions in this report represent my opinion as to the probable value at which the assets that are the subject of this report would trade on the valuation date, given the assumptions presented in the report and the market conditions prevailing at that time.

This analysis speaks only as of the date specified herein and only for the analysis purpose specified herein. The client warrants that any reports, analyses, or other documents prepared or it by BIA*fn* will be used only in compliance with all applicable laws and regulations.

Hypothetical Conditions: At the request of the client, this report has been prepared assuming certain hypothetical conditions occur (the "scenarios"). Readers are reminded that we have no information on, and express no opinion about, the likelihood of any of these conditions actually occurring.

BACKGROUND

BACKGROUND

Definition of the Spectrum at Issue

The MMDS and ITFS spectrum that is the subject of this report consists of 31 six-megahertz channels in the 2500-2690 MHz band, of which 20 channels (A, B, C, D, and G channels) have been allocated for ITFS and 11 channels (E, F, and H channels) have been allocated for MMDS. (This does not include the two additional MDS channels at 2150-2162 MHz.). The current band plan is included in Exhibit 1.

Licensing of the Spectrum[7]

ITFS licenses are site-based licenses. Prior to 1995, MDS licenses were also site-based, but in 1995, the FCC adopted rules to change the site based approach on unused MDS spectrum and also introduced competitive bidding. The FCC auctioned off 493 licenses for the spectrum (one for each BTA) for $216,240,000.[8] The licensees who acquired their spectrum through competitive bidding are required to protect pre-existing site-based licensees. Under current rules, if an incumbent site-based MDS license is forfeited, the incumbent's service area shall be merged with other MMDS licenses and become part of the geographic area licensee's service area.

Given the instructional nature of the ITFS service and the reservation of ITFS spectrum for noncommercial educational use, the FCC thought it possible that Congress did not intend for ITFS licenses to be auctioned. Accordingly, the Commission did not proceed immediately with an auction of ITFS applications, but sought Congressional guidance with regard to auctioning ITFS by proposing that Congress exempt ITFS applications from competitive bidding. To date, however, Congress has given no indication that it intends to exempt ITFS applications from competitive bidding. The FCC has not yet conducted an ITFS auction.

[7] This section is extracted from the FCC Notice of Proposed Rule Making, March 13, 2003 (FCC 03-56), pages 10-13.

[8] FCC Auction Number 6.

There are 1,587 licensees who, as a group, hold 2,320 ITFS licenses, and 403 licensees who, as a group, hold 2,444 MMDS licenses.[9] In total, there are currently 4,764 MMDS/ITFS licenses outstanding.

In 1993, the FCC allowed ITFS licensees to shift their required educational programming onto fewer than their authorized number of channels by channel loading, i.e., an ITFS licensee could move all of its ITFS program requirements onto one of its four channels so that it could lease the remaining three channels on a twenty-four-hour basis to a wireless cable operator.

In 1996, the FCC permitted MDS and ITFS licensees to employ digital technologies. In 1998 the FFC allowed MDS and ITFS licensees to construct digital two-way systems capable of providing high-speed, high capacity broadband service, including two-way Internet service via cellularized communication systems. The FCC also adopted a number of ITFS rule changes that permit licensees to meet the ITFS educational programming requirements by providing voice and data services. In a digital environment, the ITFS licensee must retain 5% of its capacity for such ITFS programming. In addition, ITFS leases may now extend for a period of fifteen years.

The mobile allocation, adopted on September 6, 2001, was implemented in an effort to provide "near-term and long-term flexibility for the use of the spectrum, thereby making this band potentially available for advanced mobile and fixed wireless services, including third generation ("3G") and future generations of wireless systems."[10]

The FCC's Notice of Proposed Rule Making (NPRM)

On April 2, 2003 the FCC released a Notice of Proposed Rule Making (FCC 03-56, March 13, 2003) which seeks, in the FCC's words, to "promote competition, innovation and investment in wireless broadband services, and to promote educational services. Additionally, the Commission also seeks to foster the development of innovative service offerings to consumers as well as educational, medical and other institutions, simplify the licensing process and delete obsolete and unnecessary

[9] Transitional ULS Database Public Access Files and Broadband Licensing System (BLS) Download Files for ITFS & MDS radio services. Available for download http://wireless.fcc.gov/cgi-bin/wtb-itfsmdsdata.pl

[10] FCC's First Report and Order and Memorandum Opinion and Order. FCC 01-256 adopted September 6, 2001, released September 24, 2001

regulatory burdens."[11]

The provisions of the NPRM can be summarized as follows:[12]

Concerning the New Band Plan:

> The NPRM suggests that there are two basic ways of modifying the band plan to resolve the problem resulting from incompatibility between high power one-way services and low power two-way services.
>
> One way is to segment the band (either into three main segments, with the high power segment located between two low-power segments, as the Coalition suggests, or using other segmentation approaches it examined in the 2001 3G Final Report). The FCC seeks comments on the alternative segmentation approaches.
>
> The other approach suggested by the FCC is not to segment the band at all, but impose across-the-board power limits. In essence, this solves the incompatibility between high power video and low power data operations by simply terminating high power video transmissions, forcing all future ITFS service to be provided on a cellularized basis.

Concerning the creation of Geographic Service Areas (GSA):

> The FCC contemplates adopting a GSA for each incumbent ITFS and MDS station channel consisting of the 35 mile radius PSA circle, adjusted by "splitting the football" where PSAs overlap.

The Coalition's Proposal

On October 7, 2002, the Coalition submitted a paper entitled "A Proposal for Revising the MDS and ITFS Regulatory Regime" concerning recommendations for changing the rules governing the 2500-2690 MHz band. In general, the Coalition argues that the band is not being used to the extent possible and that rule changes are necessary to allow new services to develop.[13]

The major provisions of the Coalitions Proposal are:[14]

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[11] Source: FCC Notice of Proposed Rule Making, March 13, 2003 (FCC 03-56), page 3.

[12] Source: Todd Gray's summary - http://www.itfs.org, Aug 5, 2003.

[13] Source: FCC Notice of Proposed Rule Making, March 13, 2003 (FCC 03-56), page 16.

[14] Source: Todd Gray's summary - http://www.itfs.org Aug 5, 2003, unless otherwise noted. For details on the Coalition's proposal please consult their paper "A Proposal for Revising the MDS and ITFS Regulatory Regime."

Band plan:

The Coalition proposed a new band plan under which ITFS and MDS licensees would operate one-way, high power, big stick services in a middle portion of the band consisting of seven contiguous 6 MHz channels called the "Mid Band Segment" or "MBS." For each ITFS and/or MMDS channel group (the A, B, C, D, E, F, and G groups), one of the group's channels (A4, B4, C4, D4, E4, F4), and G4) would be moved to the MBS, using spectrum now occupied by ITFS and MMDS channels (C3, D3, C4, D4, E1, F1 and E2). The remaining ITFS spectrum would be allocated to two low power, two-way bands. The "Lower Band Segment" or "LBS" would be below the MBS on the band, and the "Upper Band Segment" or "UBS" would be above the MBS.

The Coalition proposes two 6 MHz guard bands separating the LBS from the MBS, and the MBS from the UBS. The existing I Band (the 125 kHz response channels that are associated with each ITFS channel) would remain in place.

Each existing four channel ITFS licensee would, upon transition to the new band plan, typically be a licensee of one 6 MHz MBS channel (which should be usable either for analog or digital video services on a big stick, downstream basis using the licensee's existing transmission system), three contiguous 5.5 MHz low power two-way channels in either the LBS or UBS (which should be usable for two way operations either by the licensee itself, or under a lease or other cooperative basis with others), 1.5 MHz of Transitional Band spectrum, and its four 125 kHz I Band channels (which will be relocated so as to be contiguous to each other). See Exhibit 1 for an illustration of the band plan.

Geographic Service Areas:

Under the Coalition proposal, the current 35 mile Protected Service Areas ("PSAs") would be modified where necessary by evenly splitting any overlap areas that already exist where one licensee's PSA overlaps with other co-channel licensees' PSAs, creating for each licensee an exclusive "Geographic Service Area" ("GSA") for each channel. The GSA will be the area in which a particular licensee's station will be protected from interference, and in which it will be able to provide its own services on a flexible basis.

Transition plan:

"Transition to the new band plan would proceed on a market-by-market basis at the instigation of parties ('Proponents') offering to pay the conversion costs of all affected ITFS [but not MDS] operators. No deadlines would apply unless and until a Proponent offered to fund a market's transition." [15] Instead, any party that wishes to take advantage of the new band plan and rules in any given market (the "Proponent") would be required to take steps to transition the current video operations of each ITFS licensee in that market to the MBS channel(s) of that licensee, at no cost to the ITFS licensee. In many cases, adjacent markets with sufficient proximity would also have to be transitioned to the new band plan prior to any commercial operations in the original market, to prevent interference between the original and adjacent markets.

[15] Source: FCC Notice of Proposed Rule Making, March 13, 2003 (FCC 03-56), Appendix C

SPECTRUM MARKET, LLC's Proposal [16]

SPECTRUM MARKET agrees with the Coalition proposal on several major points. However, several areas differ and these differences will affect the transition and use of the spectrum. We have included factors below that we deem to be value drivers and that will affect the value of SPECTRUM MARKET's proposal compared to the Coalition.[17]

Band plan:

SPECTRUM MARKET LLC proposes not to segment the band at all and to implement across-the-board power limits only allowing low power usage of the spectrum. The plan outlines that the 190 MHz ITFS/MMDS spectrum should be cleared and open to use for wireless voice and data applications. See Exhibit 1 for an illustration of the band plan.

Geographic Service Areas:

SPECTRUM MARKET suggests the same definition of the GSA's as the Coalition.

The Transition Plan:

SPECTRUM MARKET proposes a transition plan that entails following basic elements:

All licensees must convert and cease all non-conforming transmissions by a defined date (the Sunset Date).[18] Under the conversion period all licensees are permitted without risk to their licenses to go silent. By the completion of the Conversion Period, each licensed facility should have at least one conforming transmitter in operation and by five years thereafter the licensee should be providing substantial service to its GSA.

All licensees are responsible for meeting the requirements listed above, but are permitted to delegate those responsibilities, assign the costs, and/or receive reimbursement, by means of license assignment or spectrum leases. Private auctions, such as those to be offered by SPECTRUM MARKET, will be a primary method by which to bring licensees and carriers together.

[16] SPECTRUM MARKET, LLC's proposal was supplied to us by Holland and Knight.

[17] For more details see the "Comments of SPECTRUM MARKET LLC" dated September 5th 2003.

[18] SPECTRUM MARKET LLC suggests January 2008, which is the date by which the European countries are expected to make this band available for third generation applications. For valuation purposes, we have assumed that all conversion will be completed as of this date.

Valuation Overview

VALUATION OVERVIEW

BIAfn has been retained by SPECTRUM MARKET, LLC ("SMC") to estimate the fair market value of the MMDS/ITFS Spectrum in the United States, as of August 1, 2003, under three specified scenarios:

1. Value of the spectrum as it exists today
2. Value of the spectrum under SPECTRUM MARKET LLC's proposal
3. Value of the spectrum under the Coalition's proposal

For scenario #1 we only applied a market approach in which we determined the value of the spectrum by analyzing current and historical prices paid for the spectrum. We did not perform an income approach valuation for this case as we are of the opinion that business models for the spectrum are limited primarily due to the current interference problems and the interleaving nature of the spectrum. An income approach would be highly speculative. Therefore, although little data is available on current transactions, we have chosen to rely on them as they are the best indicators of the value of the spectrum as it exists today.

For scenario two and three we applied the market approach to value the spectrum. Specifically, we researched wireless spectrum's characteristics and analyzed data available that indicate the current value of such spectrum. After detailed analyses we concluded that PCS spectrum with appropriate adjustments is the most comparable spectrum to MMDS and ITFS under SPECTRUM MARKET and the Coalitions' proposals. Details on the spectrum we considered for comparison are included in Exhibit 2. We then tested the estimates for reasonableness by using the income approach. Details are contained in the sections that follow.

We understand that there are no exact comparables in the market place to the spectrum in subject. However, we believe the existing wireless voice/data spectrum can be compared to the ITFS/MMDS spectrum for the 2nd and 3rd scenarios given that we assume the spectrum can be used for low power technologies and assume more contiguous and efficient use of the spectrum with minimal interference issues. We therefore assumed that the licensees of the spectrums would use it for the highest investment use, which is for wireless voice and data applications. Moreover, many international countries allocated this band for the 3G purposes, which indicate that the comparison to the PCS spectrum can be made.[19]

[19] Source: "Report 6 – UMTS/IMT-2000 Spectrum", June 1999

PART 1

VALUATION OF THE MMDS/ITFS SPECTRUM AS IT EXISTS TODAY

PART 1

Valuation Of The MMDS/ITFS Spectrum As It Exists Today

The Current Scenario

Today, MDS/MMDS licenses are issued on a geographic area basis (by BTA), however the majority of all MDS and MMDS licenses are site based. ITFS licenses are only issued site specific. ITFS licensees are authorized to construct digital two-way systems capable of providing high-speed, high capacity broadband service, including two-way Internet service via cellularized communication systems. However, as the band is now structured, high power one-way services and low power two-way services are incompatible. In addition, there has been only limited rollout of two-way services by the major commercial license holders, Sprint, MCIWorldcom, Nucentrix, and Bell South. We believe that the majority of the license holders have been waiting for direction from the FCC regarding the new band plan, modified interference protection, etc. In addition, the downturn in the economy has created a "capital crunch" for the telecommunications industry and has limited an already complicated rollout of data services.

Therefore as the spectrum stands today there are several factors that has kept the spectrum from developing to its potential. We believe that the major hindrances to the spectrum materializing on its potential to include:

- The proposed rulemaking still up in the air;
- Incompatibility between high power fixed operations to two-way cellular like operations;
- The existing system of interleaved channels. Contiguous spectrum blocks are needed for two-way cellular like applications;
- Site-by-site licensing creates an administrative nightmare and would be served by being defined by geographic areas;
- The need for interferences consents from adjacent licensees limits the feasibility of a business model.

Market Approach for Scenario 1

In estimating the fair market value of the MMDS licenses and the excess spectrum of the ITFS licensees in the US, we researched the marketplace for sales of similar licenses. We have a database

consisting of 32 MMDS transactions occurring from 1999 through 2003. While ITFS licenses are effectively almost identical from a use perspective, they differ in their marketability. Generally, ITFS licenses are less marketable than MMDS/MDS licenses and may therefore be discounted relative to MMDS/MDS licenses.

We maintain a continued research effort of the FCC filings to update any new transactions that have purchase prices publicly available and also continuously search company SEC documents, press releases and other publications that follow mergers and acquisitions. The 32 transactions are the only that we have been able to verify and get enough detail to include in this analysis. Nine of the transactions were transactions of operating systems, which means that the acquirer not only acquired the rights to the licenses but also parts of or whole operating companies.

Since operators are focusing on providing high-speed Internet access through the licenses, the purchase price to household ratio is a relevant ratio. The overall mean of all transactions since 1999 is $15.78. Yet, the average price per household for transactions occurring in January 2001 and forward was only $2.99[20]. We also, where possible, looked at the indicated value derived through a value per household per market per channel. This ratio gives a better multiple than the price per household multiple because it also accounts for the broadband capacity per household purchased per market. We were able to identify the number of channels, households and markets for 21 these transactions. The multiples for the transactions vary considerably from $0.05 per household per channel to $3.35. The median was $0.55 and the average was $0.93 per household per channel. Only including the transactions that occurred from January 2001 and forward, the median price is $0.52, and the simple average is $0.39 per household per channel.

We relied solely on the market approach in this valuation scenario as there are many problems with the interleaved spectrum and current regulation of the spectrum that makes an income approach speculative. Some of the factors that has kept the spectrum values and the business model feasibility at bay include:

- Interference problems between high power operations with low power from two-way cellular like operations.
- Interferences consents from adjacent licensees have at times grid locked deployment of markets.

[20] Two transactions in 2001 were purchased through option agreements that were entered into before the two-way ruling and therefore do not reflect the current market dynamics. These two transactions are not included in this analysis.

- Technology – the technology has until recently been too expensive and has suffered from Line of Sight (LOS) problems.

We discounted the price per household multiple entirely because it does not consider the amount of spectrum included in the transaction. Therefore, we only looked at the price per household per channel multiple to account for the broadband involved in the market.

MMDS Licenses

There is a total of 70 MHz assigned to MMDS holders in the current band plan. For valuation purposes we have valued this spectrum throughout the US covering population of 289,546,864.[21] In estimating the value of the MMDS spectrum we utilized two multiples. First we applied the Median price paid per household per channel since 2001 to infer the value. However, to make this valuation section comparable to the two following scenarios, we converted this multiple to be on a per pop per MHz basis. The median per pop per MHz price paid in since January 2001 was determined at $0.024.

The second multiple we applied is based on the Nextel Communications, Inc.'s bid to purchase MCIWorldCom's MMDS assets for $144 million.[22] In addition to MCIWorldcom's MMDS licenses, Nextel acquired 18 tower sites and various leases.[23] Based on data from the Transitional ULS Database Public Access Files and Broadband Licensing System (BLS) Download Files for ITFS & MDS radio services, we have estimated that MCI WorldCom's MMDS licenses cover approximately 43.7 million households or a population of 116.2 million.[24] For the purposes of estimating the price per pop per MHz, we have assumed that they have gathered access to approximately 12 to 18 channels in a given market for an average of 15 channels or 90 MHz. In other words we are assuming that they on average will acquire all MMDS licenses (70 MHz) and the rights to use approximately 20 MHz ITFS spectrum in each market. We have not adjusted the purchase price for

[21] Source: Market Statistics , Inc.'s Demographics USA(C) 2002. We grew the pops by 0.9% annually to the valuation date 8/1/03.

[22] Source: June 30th filing by WorldCom with the US Bankruptcy Court.

[23] Source: Nextel Corporations, Inc's spokeswoman Audrey Schaeffer.

[24] These analyses include only commercial MDS and MMDS licenses that have filed for conditional or licensed status. The analyses do not take into account any lease agreements with ITFS license holders or include any pending transfers of licenses not mentioned in the companies' most current FCC Licensee Qualification Report (Form 430). The Population estimates are based on information in MapInfo and 2002 US Census Data. The coverage maps are drawn based on the 35-mile protected service area from the transmitter site and do not take into account the entire Basic Trading Areas (BTAs).

the antenna sites acquired, as they are not material in this analysis. Using the above information we determined that Nextel will pay an approximate $0.014 per pop per MHz for the MCI WorldCom licenses.

Table 1 illustrates the application of the multiples to the spectrum available today. The value as of August 1, 2003 of the MMDS spectrum as it exists today is therefore determined to be $523.6 million based on recent M&A and $305.1 million based on Nextel's bid to purchase MCIWorldcom's fixed wireless assets.

Although, we are using very few data points to determine the value of the spectrum as it exists today, we believe that this methodology is the most appropriate given the public available information today. In addition, Nextel's bid of the spectrum illustrates that there is an inherent interest in the spectrum. Whether Nextel will use the additional acquired spectrum for its own services or as a strategic tool to have a stronger negotiation position with the FCC to get contiguous spectrum for their current services is unknown. However, we believe that although the spectrum was sold in an auction, which at times commands a premium, the uncertainty of the spectrum's future and the fact that the spectrum was purchased out of bankruptcy counteract this premium. Therefore, we believe analyzing this transaction is very appropriate.

ITFS Licenses

For this valuation we have valued the total spectrum that is available to entities eligible to hold ITFS spectrum. Therefore, we have assumed that there is a total of 120 MHz available again covering a population of 289,546,864.

We caution here that this value is assuming that the licenses are free of any lease commitment. We made this assumption because it is impossible to determine the value of the numerous leases that exists between ITFS license holders and commercial operators today without analyzing the contracts. We have seen many lease contracts and can conclude that it is rare that the lease's value equals the underlying asset of the license value. Some of this discrepancy should be captured in the marketability discount, which is detailed below. However, historically even applying a significant marketability discount to the ITFS licenses, the lease payments have not approached the license values. Therefore in reality as the ITFS licenses stand today the value to the ITFS license holders is lower. However, on an overall basis, the value of each ITFS license based on the combined economic benefit for which a commercial and non-commercial player would receive for the spectrum is the value conclusion listed below. In theory this amount equals the value that could

reasonably be expected to get from the ITFS licenses, assuming that no leases were currently in place and that the value of the licenses would be maximized.

In the analyses, when determining the excess capacity of the ITFS channels in the US we applied two adjustments to the multiple applied to the MMDS licenses. First we have assumed that the ITFS license holders are rational investors and that the highest and best use from a valuation perspective is to lease 95% of their excess capacity. We have not assigned a value to the spectrum that is being used for educational purposes. Although, we recognize that it has a value to the public and provides especially rural areas with long distance learning, we have only determined the commercial value of the spectrum and have not and do not voice an opinion of the value of long distance learning to the U.S.

Second, Purchasers of ITFS licenses are subject to certain restrictions. The company must be a federal and state recognized religious/educational non-profit Corporation operating under a 501-C-3 group exemption. Not until it has been ruled out that the licenses can be sold to other non-profit entities is it possible for commercial operators to acquire the licenses. The discount applicable is difficult to identify due to lack of statistical information. However, since the licenses cannot trade freely a discount is warranted and based on our experience valuing in excess of 500 ITFS and MMDS licenses we applied a discount of 35%.[25] Based on these adjustments, the price per pop multiple based on the historical transactions is $0.017 and based on the Nextel bid $0.010.

Table 1 also illustrates the application of the ITFS multiples to the spectrum available today. The value as of August 1, 2003 of the ITFS spectrum as it exists today is therefore determined to be $524.3 million based on recent M&A and $305.5 million based on Nextel's bid to purchase MCIWorldcom's fixed wireless assets.

Value Conclusion

In conclusion, we have weighted each value conclusion derived from the analyses by half, the value of the MMDS spectrum and the excess capacity ITFS spectrum in the US as of August 1, 2003, is therefore estimated at $901,894,422, rounded to **$901.9 million** per the market approach.

[25] This discount is in line with what we have seen in ITFS lease negotiations and transactions. These transactions are not publicized and can therefore not be included in this report.

Table 1
MMDS/ITFS Spectrum as it Exists Today

	MMDS (74 MHz)		ITFS (120 MHZ) [1]	
	M&A	Nextel's Bid	M&A	Nextel's Bid
US POPs 289,546,864				
Price per Pop per Channel	$ 0.147	$ 0.085	$ 0.095	$ 0.056
Price per Pop per MHz	$ 0.024	$ 0.014	$ 0.016	$ 0.009
Implied Fair Market Value	**$ 523,579,104**	**$ 305,085,516**	**$ 524,286,643**	**$ 305,497,794**
Total Value per M&A	**$ 1,047,865,747**			
Total Value based on Nextel	**$ 610,583,310**			
Value Conclusion	**$ 901,894,422**			

[1] Marketability Discount Applied for ITFS spectrum being non-commercial and an adjustment to reflect that a max of 95% of spectrum can be leased.

PART 2

VALUATION OF THE MMDS/ITFS SPECTRUM UNDER SPECTRUM MARKET LLC'S PROPOSAL

PART 2

Valuation Of The MMDS/ITFS Spectrum Under SPECTRUM MARKET LLC's Proposal

SPECTRUM MARKET LLC's Proposal

While SPECTRUM MARKET supports the Coalition proposals, SPECTRUM MARKET believes some elements of the Coalition proposal should be replaced with different elements due to the difficulties and high costs of transition procedures of the plan. Therefore, SPECTRUM MARKET LLC suggests instead that a system of uniform spectrum clearing should be adopted, as illustrated in the suggested band plan in Exhibit 1. The plan calls for the 190 MHz ITFS/MMDS spectrum to be cleared and open to use for wireless voice and data applications. It also strengthens the notion that all non-conforming transmissions must cease by a certain date.

Valuation of SPECTRUM MARKET LLC's Scenario

To value the scenario proposed by SPECTRUM MARKET, LLC, we inferred the value of the ITFS/MMDS spectrum based primarily on the market approach. For market comparisons that would shed light on the value of ITFS/MMDS 190 MHz spectrum, we looked at transactions for PCS licenses and PCS auction 35.

We also considered comparing the MMDS/ITFS spectrum to cellular and SMR spectrum. However, although the spectrum is somewhat comparable there is not enough cellular license transaction data available to make meaningful comparisons, and SMR spectrum is highly interleaved, consisting of very small channels, typically 0.25 and 1.25 MHz, which makes a comparison with licenses having 24 MHz of contiguous spectrum available impossible. Therefore, although we have more information available on license transactions and auction, we have omitted comparisons based on cellular and SMR spectrum. For more detail on cellular, SMR and PCS spectrum, please refer to Exhibit 2.

In our market approach, for the reasons stated above, we have relied on comparing the MMDS/ITFS spectrum to PCS license values only. Then we performed the income approach valuation to test the reasonableness of the market approach. In the paragraphs that follow, each of these procedures is explained in detail.

Market Approach

We started out our analysis by analyzing recent license transactions and looking at the PCS C&F Block "auction 35" held in January 2001. This auction is the re-auction of NextWave licenses, which was taken away later by the US Supreme Court. We also identified 31 transactions of PCS licenses in 2003. In only four of these transactions, however, was it possible to identify the spectrum involved as well as the population covered. Due to the limitations of the data population data for the transactions, we decided to rely on Auction 35 to determine the various multiples paid for different size markets. We made the assumption that the relative value of the different market sizes will remain the same today. In Auction 35 there was a premium paid for the licenses compared to the transactions in the market place at the time. In order to account for this and for a general trend of decline in prices paid for PCS licenses we made a time adjustment based on four methodologies that are explained in detail below.

We calculated four different median prices per pop per MHz depending on the pop size of the auction 35 data: median for pops less than 200,000; between 200,000 and 500,000; between 500,000 and 1 million; and more than 1 million. The median price per pop per MHz for BTAs with pops less than 200,000 was $0.56; pops between 200,000 and 500,000, $0.94; pops between 500,000 and 1 million, $1.41; and pops over 1 million, $3.43.

Then we applied the time adjustment factor to those multiples. For the time adjustment factor calculation, we considered the following information: 1) a price change in 34 PCS licenses that Cingular recently offered to purchase from Nextwave from a price that was paid at the auction for those licenses; 2) a price change in 50 PCS licenses that Verizon recently purchased from Northsight

from a price that was paid at the auction for those prices[26]; 3) a change in Wireless Index[27]; and 4) a change in multiples of the overall PCS M&A transactions in the market place. By taking into account all of the above information, we applied the time adjustment factor of 75% to bring the auction 35 data to the valuation date.

Those adjustments produce median price per pop per MHz of $0.14 for BTAs with pops less than 200,000, $0.24 for BTAs with pops between 200,000 and 500,000, $0.35 for BTAs with pops between 500,000 and 1 million, and $0.86 for BTAs with pops over 1 million. We applied those multiples to each BTA and multiplied by the BTA pops and the MMDS spectrum size of 70 MHz. Then we added the values of all the BTAs and produced $12.372 billion. This represents the value of 70 MHz of MMDS spectrum.

For the rest of the ITFS spectrum of 120 MHz, we considered the following factors: 1) marketability discount to reflect that ITFS licenses have the restrictions on commercial ownership; 2) excess capacity adjustment where we assume that only 95% of the spectrum capacity can be used for commercial purposes; 3) value implications on wireless spectrum due to the potential excess capacity of the spectrum.

First, we reasoned that ITFS and MMDS licenses are practically identical with the major difference being ITFS' more limited marketability. ITFS licenses are less marketable than MMDS licenses given the restrictions on commercial ownership, and therefore applied a marketability discount of 35% on the price per pop per MHz multiple used for MMDS spectrum.

Secondly, we used a total amount of ITFS spectrum of 114 MHz (=95% x total ITFS spectrum of 120 MHz) to reflect that only 95% of the spectrum can be commercially used.[28]

[26] Some of the Northsight licenses that Verizon purchased were in the markets not included in auction 35. While using the actual numbers for the BTAs that were included in auction 35, we predicted the prices that would have been paid at auction 35 for markets that were not included in auction 35. We ran a regression analysis on auction 35 data to predict the values for the markets that were not auctioned off.

[27] Source: Monthly newsletters "Kagan Telecom Investor" published by Kagan.

[28] Under this scenario we have assumed that educators will use the spectrum for data casting only and that traditional high power video services would cease on this band the latest on January 1, 2008. Long distance video services

Lastly, we researched how much spectrum will be needed for wireless voice and data applications in the future to determine the implications of 190 MHz excessive spectrum on the values of other wireless licenses such as PCS. The FCC set aside 90 MHz spectrum for the 3G purposes and at the time of the auction 35, the wireless operators were aware of the fact that more spectrum will be available for the 3G applications in the future.[29] Thus, we believe that the additional spectrum up to 90 MHz should not affect the values of wireless licenses. Therefore, we applied no discount on the MMDS spectrum of 70 MHz and the ITFS spectrum of 20 MHz. For the remaining ITFS spectrum of 94 MHz (=114 MHz – 20 MHz), we applied a 20% discount to reflect the excess supply as of the valuation date. We believe that a higher discount is not warranted given that approximately spectrum of 400 MHz will be needed by year 2005 and 550 MHz by year 2010 as shown in the table below.

Table 1. Result of Terrestrial Spectrum Requirement Calculations

Services	Year 2005	Year 2010
High interactive MM	35 MHz	85 MHz
Medium & high MM	102 MHz	227 MHz
Switched data	14 MHz	10 MHz
Simple messaging	2 MHz	2 MHz
Speech	214 MHz	230 MHz
Total	366 MHz[30]	554 MHz[31]
Total (allowing for spectrum division)	403 MHz	582 MHz

Source: UMTS/IMT-2000 Spectrum, No. 6 Report from the UMTS Forum.

Taking all the factors above into consideration produces the value of the ITFS spectrum of $10.914 billion. We then added the value of the MMDS spectrum of $12.372 billion. Therefore, we estimate the ITFS/MMDS spectrum of 190 MHz under SPECTRUM MARKET, LLC's scenario per the market approach to be $23.287 billion. This represents $0.42 per pop per MHz.

therefore must use different means to broadcast its programs, but data casting will be available for educators.

[29] Source: FCC's Final Report, March 30, 2001. Spectrum Study of the 2500-2690 MHz band. The Potential for Accommodating third Generation Mobile Systems.

[30] Includes existing 2nd generation spectrum

[31] Trunking inefficiency and guard bands must be allowed for, due to multiple operators, and public/private and service category segmentation. This is assumed to improve from 10% in the year 2005 to 5% in the year 2010.

Income Approach

To verify that the reasonableness of the market approach we also applied the income approach. In the income approach we assumed that a regional mobile wireless voice operator would purchase the spectrum and build it out gradually reaching full coverage by January 2008 at which time all high power operations cease. In the three scenarios in the valuation model we assumed the operator would be the 6th and 7th carrier, respectively, in a market covering a total population of 1.0 million, which is a typical size for independent regional operators.

The valuation model contains projections for PCS penetration rates, churn, ARPU (Average Revenue Per Unit), the license holder's penetration rates, direct expenses, and operating expenses to derive projected EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization). The projections are based on industry averages as well as our experience. We have relied on various industry reports for this analysis, including, but not limited too: Wireless Industry Report, Spring 2003 by JP Morgan; The Wireless Industry Scorecard, 1Q 2003, by Legg Mason Equity Research, and Wireless Telecom Investor, Dec 10, 2002.

Projected EBITDA in the model is adjusted for taxes, depreciation, capital expenditures, and contributions to working capital in order to derive projected net cash flows to the purchaser of the licenses. An allowance for working capital was also included, which we have estimated at 5.59% of the change in gross revenues each year.[32]

Next, the projected net cash flows where discounted to present value using a discount rate of 12.114%.[33] Projected cash flows beyond year ten were estimated using a perpetuity formula. The perpetuity was calculated by estimating the year ten operating cash flow and dividing this figure by

[32] According to Robert Morris Associates', Annual Statement Studies, 2002/2003, the typical telecommunications company, has a ratio of sales to net working capital of 13.4. In other words, approximately (1/17.9), or 5.59% of a typical telecommunications company's increase in revenues must be invested in working capital.
[33] The discount rate is based on a weighted average cost of capital approach. The equity rate is based on a CAPM model and the debt rate is based on a BAA bond rate adjusted for taxes.

the discount rate of 12.114% less an estimated long-term growth rate of approximately 4.0%. The cumulative discounted cash flows from the operation of the operations through year ten were then summed with the present value of the perpetuity.

Using this approach we estimated a range of values that represents the amount that a typical operator would be willing to pay for the licenses. The resulting price per pop multiple indicates that an average operator would be willing to pay $15.50 per pop for the licenses assuming they would be the 6th carrier. We assumed that the operator would have 24 MHz of spectrum available and thus the price per pop per MHz multiple was estimated to be $0.65. Interestingly, the value of the licenses declined drastically as we performed a sensitivity analysis assuming that the buyer would be the 7th operator in the market. Under this scenario the price per pop equaled $7.28 and the price per pop per MHz equaled $0.30. Similarly, as in the previous section, when applying the multiples to our valuation we adjusted the ITFS licenses to only reflect the excess capacity that can be used. We also applied a marketability discount of 35% to the ITFS licenses in this valuation. We also applied the 20% adjustment to 94 MHz of ITFS spectrum similarly to the adjustment made in the market approach.[34]

Based on the income approach we determined three values. The Conservative value assumes that the MMDS spectrum will sell at a similar price to what the 7th player would pay for in our Income approach ($0.30 per pop per MHz). For the middle scenario, we relied on the average of the 6th and 7th player scenario for the valuation of the spectrum, which was $0.48. Finally, for the high value we applied the multiple derived assuming that the license holder would be the 6th player, which was $0.65 per pop per MHz. Again we applied the appropriate adjustments for capacity and marketability for the ITFS licenses. Table 2 summarizes the results of the three scenarios. The value of the MMDS/ITFS spectrum under SPECTRUM MARKET's proposal therefore ranges from

[34] For the remaining ITFS spectrum of 94 MHz (=114 MHz – 20 MHz), we applied a 20% discount to reflect the excess supply as of the valuation date. We believe that a higher discount is not warranted given that approximately spectrum of 400 MHz will be needed by year 2005 and 550 MHz by year 2010 as shown in the table below.

almost $11.6 billion to 24.7 billion, for an average value of $18.6 billion using the income approach.

TABLE 2
FAIR MARKET VALUE OF SCENARIO 2 USING THE INCOME APPROACH

	Conservative	Middle	High Value
MMDS Spectrum	$ 6,150,749,450	$ 9,634,438,772	$ 13,118,128,094.27
ITFS Spectrum	$ 5,437,262,514	$ 9,827,127,547.67	$ 11,596,425,235.34
Total Fair Market Value	**$ 11,588,011,964**	**$ 19,461,566,320**	**$ 24,714,553,330**
Average price per pop per MHz	**$ 0.21**	**$ 0.35**	**$ 0.45**
Average Value	**$ 18,588,043,871**		
	$ 0.34		

Summary and Value Conclusion

As we believe that both of the methods (income approach and market approach) produced reasonable estimates, we decided to develop a final value by averaging the two results. In so doing, we developed our final fair market value estimate for ITFS/MMDS spectrum under SPECTRUM MARKET LLC's proposal of $20,937,332,360 rounded to $20.937 billion (see Table 3). This is equivalent to $0.38 per pop per MHz, which is in line with the $0.44 median price per pop per MHz paid in other countries that auctioned off the 3G spectrum.[35]

[35] Source: Kagan Wireless Telecom Atlas and Databook, 2002.

Table 3

ITFS/MMDS Spectrum Valuation
Scenario 2 (Spectrum Market's Proposal)

1) Based on recent transactions & PCS auction 35

Fair market value of ITFS/MMDS Spectrum ----------	**$23,286,620,850**
ITFS/MMDS Covered Pops.....	289,546,864
ITFS/MMDS Total Spectrum Size----------	190
Inferred price per pop per MHz multiple from PCS auction 35 (build up approach).....	**$0.42**

2) Based on DCF analyses

Fair market value of ITFS/MMDS Spectrum----------	**$18,588,043,871**
ITFS/MMDS Covered Pops.....	289,546,864
ITFS/MMDS Total Spectrum Size----------	190
Inferred price per pop per MHz multiple from DCF analysis.....	**$0.34**

Fair market value of ITFS/MMDS Spectrum as of August 1, 2003:	**$20,937,332,360**
Price Per Pop Per MHz:	**$0.38**

PART 3

VALUATION OF THE MMDS/ITFS SPECTRUM UNDER THE COALITION'S PROPOSAL

PART 3

Valuation Of The MMDS/ITFS Spectrum Under The Coalition's Proposal

The Coalition's Proposal

In order to resolve the incompatibility between high power one-way services and low power two-way services, the Coalition proposes to segment the band into three main segments, with the high power segment located between two low-power segments. The Coalition's proposal to transition from the existing band plan to the new band plan is a major difference from SPECTRUM MARKET's proposal. The Coalition proposes the following: "Transition to the new band plan would proceed on a market-by-market basis at the instigation of parties ('Proponents') offering to pay the conversion costs of all affected ITFS [but not MDS] operators. No deadlines would apply unless and until a Proponent offered to fund a market's transition."[36] In our opinion the band plan and the transition process in the two scenarios are the main drivers that will affect differing values in the two scenarios. The affect of the differences are described in the following section.

The coalition also suggests that the current 35 mile Protected Service Areas (PSAs) would be modified where necessary by evenly splitting any overlap areas that already exist where one licensee's PSA overlaps with other co-channel licensees' PSAs, creating for each licensee an exclusive Geographic Service Area (GSA) for each channel. SPECTRUM MARKET's proposal supports this division and therefore will not affect any value differences in the two scenarios.

Valuation of the Coalition Party's Scenario

To value the scenario proposed by the Coalition, we used the same analysis of PCS auction 35 data as in the valuation of the SPECTRUM MARKET LLC Scenario. However, we made the following additional assumptions:

- The mid-band segment for the high power one-way service (42 MHz) and the guard bands (12 MHz) was not considered for this valuation because it will be used for non-commercial

[36] Source: FCC Notice of Proposed Rule Making, March 13, 2003 (FCC 03-56), Appendix C

purposes.[37]

- The number of available MHz for MMDS spectrum is 51 MHz.
- The number of available MHz for ITFS spectrum is 85 MHz.
- We applied 20% discount to reflect the excess supply of spectrum for 46 MHz of ITFS spectrum (= 85 MHz – 39 MHz where 39 MHz = 90 MHz (that was set aside by the FCC – 51MHz of MMDS spectrum).
- Adjustment reflecting the possible difficulties in the transition process

As we explained in the valuation of SPECTRUM MARKET LLC's proposal, we first calculated four different median prices per pop per MHz, depending on the pop size of the auction 35 data. We then applied the time adjustment factor of 75% to those multiples based on the analyses by considering the following data points: 1) a price change in 34 PCS licenses that Cingular recently offered to purchase from Nextwave from a price that was paid at the auction for those licenses; 2) a price change in 50 PCS licenses that Verizon recently purchased from Northsight Communications from a price that was paid at the auction for those prices; 3) a change in the Wireless Index; and 4) a change in multiples of the overall PCS M&A transactions in the market place.

We applied those time-adjusted multiples to each BTA and then multiplied the result by the BTA pops and the MMDS spectrum size of 51 MHz. Then we added the values of all the BTAs. This process produced a value indication of $9.014 billion, which, in our opinion, represents the value of 70 MHz of MMDS spectrum.

For the rest of the ITFS spectrum of 85 MHz, we considered the following factors: 1) a marketability discount to reflect that ITFS licenses have the restrictions on commercial ownership; 2) a restriction stating that only 95% of spectrum capacity can be used for commercial purposes; 3) value implications on wireless spectrum due to the potential excess capacity of the spectrum.

[37] In this section we have not assigned a value to the spectrum that is being used for educational purposes. Although, we recognize that it has a value to the public and provides especially rural areas with long distance learning, we have only determined the commercial value of the spectrum and have not and do not voice an opinion of the value of long distance learning to the US in this report.

Taking all the factors above into consideration produces a value of the ITFS spectrum of $7.858 billion, to which we added the value of the MMDS spectrum of $9.014 billion. Therefore, we estimate the ITFS/MMDS spectrum of 190 MHz under the Coalition's scenario per the market approach to be $16.872 billion. This is equivalent to $0.31 per pop per MHz.

Income Approach

The income approach was performed suing the same analyses as in the SPECTRUM MARKET, LLC, only adjusting for less spectrum being available for commercial purposes. In summary, we determined three values. The Conservative value assumes that MMDS spectrum will sell at a similar price to what the 7th player would pay for in our Income approach ($0.30 per pop per MHz). For the median scenario we relied on the average of the 6th and 7th player scenario for the valuation of the spectrum, which was $0.48. Finally, for the high value, we applied the multiple derived assuming that the license holder would be the 6th player of $0.65 per pop per MHz. Again the appropriate adjustments for capacity and marketability for the ITFS licenses where taken. Table 4 summarizes the results. The value of the MMDS/ITFS spectrum under the Coalition's proposal therefore ranges from almost $8.4 billion to 15.6 billion for an average value of $12.4 billion using the income approach.

TABLE 4
FAIR MARKET VALUE OF SCENARIO 3 USING THE INCOME APPROACH

Third Scenario	Conservative	Middle	High Value
MMDS Spectrum	$ 4,481,260,314	$ 7,019,376,820	$ 9,557,493,325.83
ITFS Spectrum	$ 3,918,027,400	$ 6,137,137,497.91	$ 6,107,425,637.03
	$ 8,399,287,713	**$ 13,156,514,318**	**$ 15,664,918,963**
Average price per pop per MHz	**$ 0.15**	**$ 0.24**	**$ 0.28**
Or Simply	**$ 12,406,906,998**		
	$ 0.23		

Summary

As in scenario 2, we believe that both methods (income approach and market approach) produced reasonable estimates, so we decided to develop a final estimate by averaging the two resulting values. In this manner we developed our final fair market value estimate for ITFS/MMDS under the Coalition's proposal of $14,639,661,568 rounded to $14.640 billion (see Table 5). This is equivalent to $0.27 per pop per MHz. We have not included difficulties in transitioning the spectrum from the current band plan to the proposed plan in this value conclusion, but have included that consideration in the following section.

Table 5

ITFS/MMDS Spectrum Valuation
Per Market Approach

1) Based on recent transactions & PCS auction 35

Fair market value of ITFS/MMDS Spectrum ----------	**$16,872,416,139**
ITFS/MMDS Covered Pops.....	289,546,864
ITFS/MMDS Total Spectrum Size----------	190
Inferred price per pop per MHz multiple from PCS auction 35 (build up approach).....	**$0.31**

2) Based on DCF analyses

Fair market value of ITFS/MMDS Spectrum----------	**$12,406,906,998**
ITFS/MMDS Covered Pops.....	289,546,864
ITFS/MMDS Total Spectrum Size----------	190
Inferred price per pop per MHz multiple from DCF analysis.....	**$0.23**

Fair market value of ITFS/MMDS Spectrum as of August 1, 2003:	**$14,639,661,568**
Price Per Pop Per MHz:	**$0.27**

Transition Plan Effect on Value

Based on the analysis presented to us from SPECTRUM MARKET, LLC, we believe that the transition process as suggested by the Coalition can have a significant effect on value especially in densely populated areas. It is our understanding that it will be nearly impossible for a license holder in the Washington, DC area to change to the new band plan unless all license holders in the northeast consent and change at the same time. In addition, we believe that not setting a time limit to when the conversion to the new band is to take place might cause the spectrum to be used minimally and not live up to its value potential. Given this scenario, we performed an opportunity cost analysis to incorporate the various possibilities of success of the transition plan. In the analysis we made the following assumptions: a) The transition would be smooth b) The transition would be partial (commercial operators only change selected markets) or, c) that the transition takes longer than January 1, 2008, which was assumed under SPECTRUM MARKET, LLC's proposal, and finally, d) The transition is grid locked.

Scenario a) and d) are simple. Scenario a) is the value conclusion derived earlier of $14.640 billion Scenario d) assumes a total gridlock, so the band plan would therefore stay as it exists today and the value equals the value derived in scenario one of $901.9 million.

Naturally, the value of Scenario b) and c) would be between the value range of the best and worst-case scenario. The midpoint of this value range is $7.771 billion, which we believe is a good indicator of the value if the transition drags out past five years or if there would only be a partial build out of the spectrum.

Value Conclusion

Our final fair market value estimate for ITFS/MMDS under the Coalition's proposal is determined to be in the $901.9 million to $14.640 billion depending on how smooth the transition process will be.

SUMMARY AND CONCLUSION

SUMMARY AND CONCLUSION

In conclusion, we have analyzed the current MMDS and ITFS spectrum, the Coalition's proposal as well as SPECTRUM MARKET's proposal to determine the value under the three scenarios. The assigned fair market values of the three scenarios as of August 1, 2003 are as follows.

1. **Value of the spectrum as it exists today .....$901.9 million**
2. **Value of the spectrum under SPECTRUM MARKET LLC's proposal.....$20.937 billion**
3. **Value of the spectrum under the Coalition's proposal.....$901.9 million to $14.640 billion**[38]

There are several factors that determined the value and they are outlined in detail in the report. The value of the spectrum as it exists today is based on comparisons with historical prices paid for similar spectrum and Nextel Communication's bid to acquire MCIWorldcom's fixed wireless assets.

The value of SPECTRUM MARKET's proposal and the Coalition's proposal was determined based on comparison with PCS spectrum prices. The major difference between SPECTRUM MARKET's and the Coalition's proposal is that more spectrum is made available for commercial use in SPECTRUM MARKET's proposal. SPECTRUM MARKET is proposing to create a band plan that is used for low power applications only and a total of 184 MHz of spectrum would be available for commercial use. In the Coalition proposal a middle band for high power services is proposed including a 6MHz guard band, which leaves about 132 MHz available for commercial deployment – about 28% less.

The second major differences in the two proposals affecting value are the suggested transition processes. The Coalition does not propose a schedule or a date by which license holders must have converted to the new band plan. Based on information provided by SPECTRUM MARKET's

[38] The value range is dependent on the smoothness of the transition process.

engineers, this can cause several problems especially in densely populated areas. To change one license would set off a ripple effect of a high number having to convert to avoid interference problems. We have adjusted the Coalition value conclusion to include this transition process, which we believe is less smooth and can cause the conversion process to drag out beyond 2008.

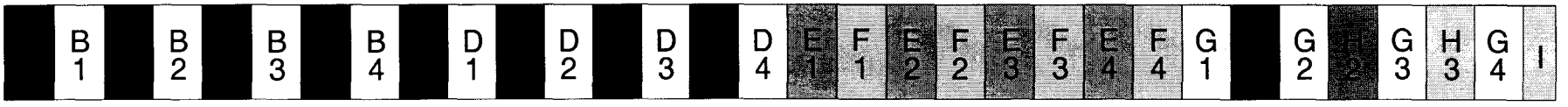
There are two other factors, which we have not adjusted for that will cause the Coalition proposal to potentially be of lesser economic value compared to the SPECTRUM MARKET proposal. We have not adjusted for these factors but want to mention them as potential value influencers. SPECTRUM MARKET suggests a commercial auction setting in which licenses and leases could be auctioned off. This would in create a more open market place for the licenses than what we have experienced historically and could therefore influence lease and license values positively, positioning especially ITFS license holders for better bargaining. Finally, the Coalition's band plan is segmented with a middle band and an upper and lower band, whereas SPECTRUM MARKET's band plan is unsegmented. Historically, less complicated and more contiguous spectrum has influenced spectrum values positively. However, we cannot assess if or if at all, the Coalition's segmentation will affect the value of the commercial spectrum as large pieces of contiguous spectrum remain under this plan.

EXHIBITS

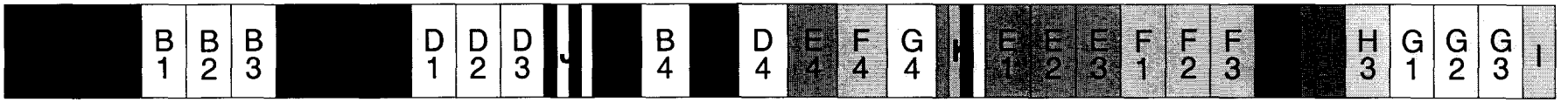
Exhibit 1

Band Plan of the three Scenarios

PRESENT MDS / ITFS CHANNEL ASSIGNMENTS



COALITION DEFAULT BANDPLAN



PROPOSED LOW-POWER ONLY BANDPLAN

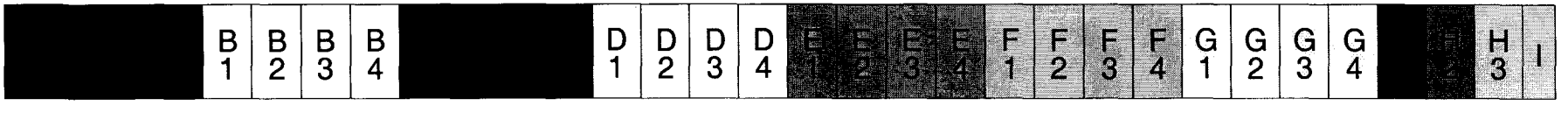


Exhibit 2

Spectrum Comparison with Wireless Carriers

Introduction

Cellular, Personal Communications Service (PCS), and iDEN technologies are often referred to as "wireless" because they use FM radio waves to transmit calls instead of standard phone lines. As people with wireless phones move about, their calls are transferred via a computerized switch between operating areas called cells. Each cell site has its own transmission tower to cover a specific geographic area, generally several miles in diameter. The cell is linked to a locally owned and operated Mobile Telephone Switching Office (MTSO), which connects calls to the public switched telephone network. As callers move from one place to another, their calls are handed off to the next cell site for optimal signal strength and call clarity. This arrangement of multiple cells lets callers travel throughout a territory and maintain a quality conversation.

This overview of the wireless industry will discuss the technologies used by the wireless operators, the band plans and the Federal Communications Commission's (FCC) license auctions in these bands, and a summary of recent industry trends and outlook for the future to give an overview of the differences of each wireless spectrum.

Technologies[39]

Digital Cellular, or PCS:
Within a few years after analog cellular systems were introduced in 1983, it became apparent that higher capacity, more reliable, and lower cost wireless systems were needed to meet booming demand. Predictions were made that system capacity would be saturated by the 1990's, first in the largest cities, then in other locations.

In response, the FCC declared in 1987 that cellular licensees could employ alternative cellular technologies in the 800 MHz band, provided that interference to other cellular systems was not created. This encouraged the cellular industry to search for new transmission techniques that would increase the efficiency of radio spectrum use compared to existing analog systems.

[39] Source: Judy Berck, Intel Corporation (http://www.pcsdata.com/history.htm)

Time Division Multiple Access technology (TDMA) and Frequency Division Multiple Access (FDMA) technology both evolved from the original analog. TDMA equipment was demonstrated and tested in 1991 in Dallas and Sweden. Newer, more comprehensive standards have been released since, including TDMA IS-136 (also called Digital AMPS or D-AMPS), CDMA IS-95, and the European Global System for Mobile Communications (GSM) standard. Each of these has inherent advantages over AMPS technology.

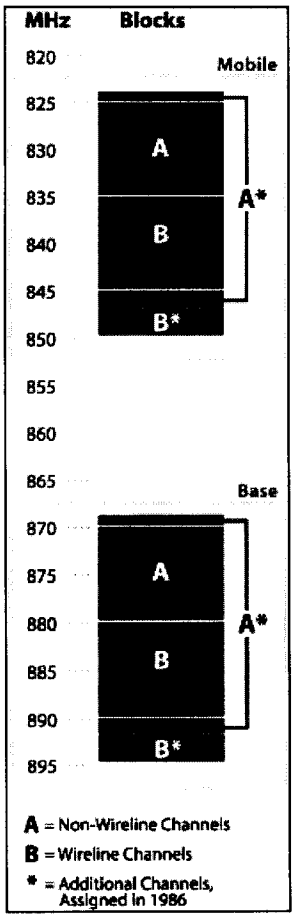
In the United States, GSM specifications on the 1900 MHz band were developed starting in 1995. Commercial GSM 1900 cellular systems have been operating in the US since 1996, first in the Washington DC area. GSM is currently the only one that permits automatic roaming between North American, European and Asian countries.

The table below summarizes the various cellular/PCS/iDEN technologies and their applications.

Company	Classification	Technology	Frequency Band
Various Cellular	Analog Cellular	**AMPS** (analog or FDMA)	800MHz
Sprint PCS	PCS	**CDMA** (IS-95)	1900MHz
Verizon Wireless	Digital Cellular or PCS	**CDMA** (IS-95)	800 MHz or 1900MHz
AT&T Wireless	Digital Cellular or PCS	**TDMA** (IS-136 or Digital-AMPS or D-AMPS or NA-TDMA)	800MHz or 1900MHz
Cingular	Digital Cellular or PCS	**TDMA** (IS-136 or Digital-AMPS or D-AMPS or NA-TDMA)	800MHz or 1900MHz
VoiceStream DT (T-Mobile)	PCS	**GSM 1900** (sometimes called PCS-1900 or DCS-1900)	1900MHz only
Nextel	SMR	**iDEN**	800MHz (SMR) or 900MHz or 220 MHz or 450-512 MHz

Cellular Bandplan[40]

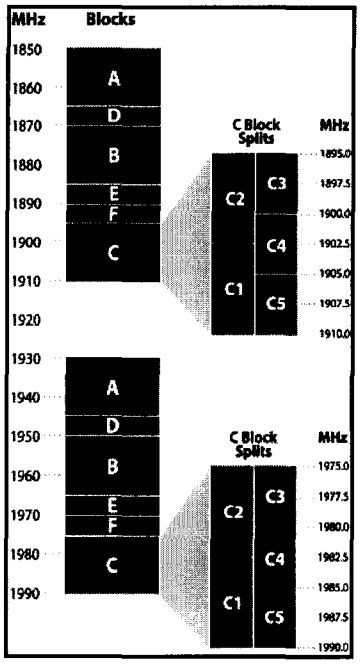
When the Commission first established cellular service rules, cellular spectrum was allocated into 40 megahertz of spectrum: a 20 MHz block, 825 to 845 MHz, was designated for transmissions made by mobile units, and a separate 20 MHz block, from 870 to 890 MHz, was allocated for base station transmissions. The 40 MHz allocation accommodated 666 channel pairs (a channel pair consists of a mobile frequency and a corresponding base frequency).



Cellular systems in each market area were divided into two channel blocks, Block A and Block B, each consisting of 20 MHz of spectrum. Block B licenses were initially limited to wireline carriers — common carriers that offered public landline telephone service in portions of the cellular markets that they sought to serve. Block A was limited to non-wireline cellular systems. This wireline/non-wireline distinction no longer exists.

Due to the growth in demand for cellular service, the Commission reevaluated the cellular bandplan in 1986. The Commission allocated an additional five MHz of spectrum to each cellular system, increasing the spectrum designated for each block to 25 megahertz. The additional spectrum increased the number of channel pairs in each block to 416 channel pairs. The frequency allocation for mobile transmissions now ranges from 824 to 849 MHz, and from 869 to 894 MHz for base station transmissions.

[40] Source: www.fcc.gov



PCS Bandplan

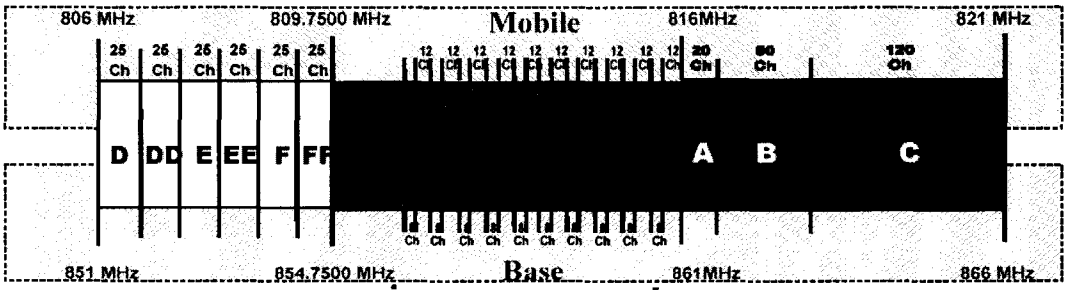
Broadband PCS spectrum is used for both mobile and fixed services, including both voice and advanced two-way data capabilities. Operators of this PCS spectrum offer services in competition with existing cellular and SMR license holders. Broadband PCS operates in the 1850-1910 MHz and 1930-1990 MHz bands. The 120 MHz of spectrum is divided into six frequency blocks, A-F. Blocks A-C are 30 MHz each, whereas Blocks D-F are 10 MHz each. Some C block licenses were further split into multiple licenses. C-1 and C-2 licenses are 15 MHz each, and C-3, C-4, and C-5 block licenses are 10 MHz each. The figure on the left shows the PCS bandplan.

The following section gives a brief description of the FCC's assignment of this spectrum to the existing operators.

SMR Bandplan

SMR systems were originally intended to provide primarily dispatch service, with only minimal interconnection to the public switched telephone network (PSTN). However, the SMR service was so successful that other bands were opened to private carriers over the years, and SMR-like systems are now found at 900 MHz, 220 MHz and 450-512 MHz.

Businesses of all kinds are typical users of SMR service, especially those with the need for one-to-many communications, such as fleets of vehicles or groups of employees on the road. Customers use either mobile units, generally mounted in the vehicle, or portable units, handheld radios that can look similar to cellular or PCS telephones.



General Category Pool

SMR Category Pool

Public Safety, Industrial/Land Transportation & Business Pools

FCC License Auctions

In the 1993 Omnibus Budget Reconciliation Act, Congress directed the FCC to allocate radio spectrum by competitive bidding. The act also mandated that the FCC provide opportunities for small businesses, women, minority-owned firms, and rural telephone companies. The FCC went through several rounds of comments and eventually issued its Broadband PCS Reconciliation Order, which established bandwidth assignments for 120 MHz of spectrum in the 1.9 GHz band and geographic area designations. It established three 30 MHz licenses and three 10 MHz licenses for two types of service areas: 51 Major Trading Areas ("MTAs") and 493 Basic Trading Areas ("BTAs"). The A and B block licenses were 30 MHz allocations for the 51 MTAs. The C-Block auctions were designed for small businesses and were for 30 MHz of spectrum in the 493 BTAs. The D, E and F auctions were for 10 MHz licenses in the BTAs, with the F-Block restricted to small businesses.

Comparison with ITFS/MMDS Spectrum

	Cellular	PCS	SMR (iDEN)	ITFS/MMDS
Band	824-849; 869-894 MHz	1850-1910 1930-1990 MHz	806-809.75, 851-854.75, 816-821, 861-866, 896-901 (half), 935-940 (half) MHz etc	2500-2686, 2150-2160 MHz
Spectrum Size	50 MHz	120 MHz	26.5 MHz*	198 MHz
Major Players	Verizon, Cingular, AT&T Wireless	Sprint PCS, T-Mobile, Cingular, Verizon, AT&T	Nextel	Sprint, Nextel, Nucentrix
Technology	TDMA/CDMA	TDMA/CDMA/GSM	iDEN	
# of Markets	306 MSAs & 428 RSAs	51 MTAs (A/B) or 493 BTAs (C-F)		

* Only for 800, 900 MHz SMR Band.

A and B Block Auctions

The A-Block and B-Block licenses were auctioned simultaneously beginning in December 1994. As a result, 99 individual licenses were auctioned, as three had previously been granted under the Pioneer's Preference Program for companies involved in pioneering research and development. The auction ran 112 rounds and ended on March 13, 1995. A total of $7.7 billion in cash was raised from just 18 firms. The average price of the 30 MHz spectrum in this auction was approximately $15.50/Pop. The big winners were Sprint Spectrum (formerly WirelessCo), AT&T Wireless and PrimeCo (a partnership between AirTouch, Bell Atlantic, NYNEX and US West). Other substantial players included: Aerial, Omnipoint, Powertel (formerly known as InterCel) and Western Wireless.

The C-Block Auction

The C-Block auction commenced in December 1995, ran 184 rounds, and ended on May 6, 1996. The auction was restricted to small businesses, in keeping with the Congressional mandate, and involved favorable financing to create opportunities for entrepreneurs to enter the wireless industry. The auctions were hotly contested with 89 firms having winning bids on the 493 licenses. The auction generated a surprisingly high $10.1 billion in aggregate net bids, representing approximately $38.00/Pop or $1.27 per pop per MHz, more than double the previous auction average. This was 144% higher than the A/B-Block pricing. Given the financing structure, however, winners only had to initially pay a 10% down payment, resulting in a $9 billion debt to the government.

D/E/F-Block Auctions

The D, E, and F-Block auctions occurred simultaneously beginning in August 1996 and finishing on January 14, 1997. The D and E blocks were open to all firms, while the F-Block, similar to the C-Block, was open to only qualified small businesses. The D and E-Block bids were for cash, while the F-Block winners were offered government financing, though at less attractive terms than offered to C-Block winners. Rather than the 10% down payment and 6 years of interest-only offered in the C-Block, the F-Block required 20% down and offered interest-only for 2 years.

The combined D/E/F-Block auction resulted in $2.5 billion, or in aggregate $9.60/Pop or $0.96 per pop per MHz for the three 10 MHz blocks of spectrum. The D-Block resulted in $947 million in cash bids, or $3.61/Pop, while the E-Block was close behind at $927 million, or $3.54/Pop. The F-Block bidding was less, $642 million, or $2.45/Pop. It is interesting to note that the all cash bidding averaged higher than the favorably financed F-Block licenses.

C and F Block Broadband PCS Auction 35

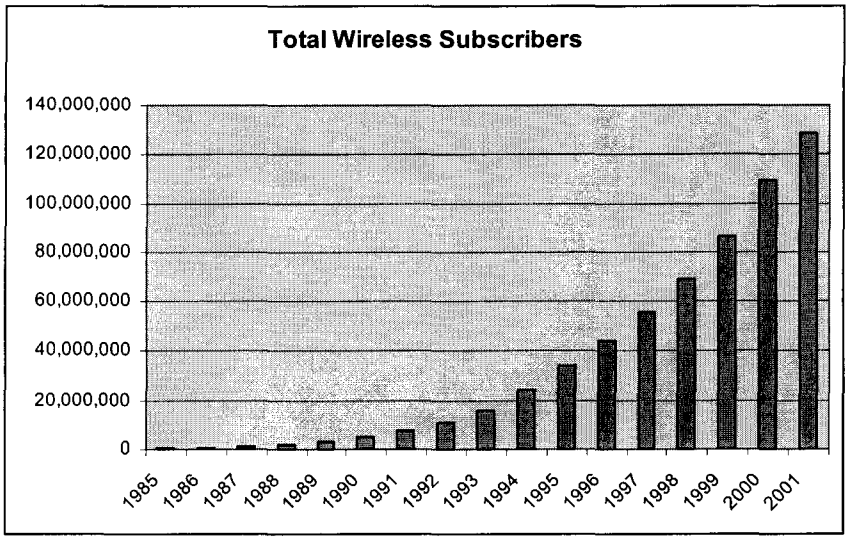
The C and F Block Broadband PCS Auction was held in December 2000-January 2001. 422 licenses were auctioned off (312 10 MHz C block, 43 15 MHz C block, and 67 10 MHz F block licenses). These licenses are for operation on frequencies for which licenses had automatically cancelled or had otherwise been returned to the FCC. In connection with the auction, each 30 MHz C Block license was reconfigured into three 10 MHz licenses, and all BTAs were divided into two categories: "Tier 1" BTAs (with populations greater than 2.5 million) and "Tier 2" (remaining BTAs). Some licenses were open to all bidders in "open" bidding, while other licenses were available only to entrepreneurs in "closed" bidding. In order to qualify as an "entrepreneur," for closed bidding, an applicant, had to have had gross revenue of less than $125 million in each of the last two years and had to have had less than $500 million in total assets.[41]

Operating Trends and Outlook for the Future

Recent technology developments as well as the FCC auctions have impacted both the competitive nature of the industry and its overall performance in terms of subscribers and average revenue per user (ARPU). The following section illustrates existing trends, and forecasts future trends in the wireless industry.

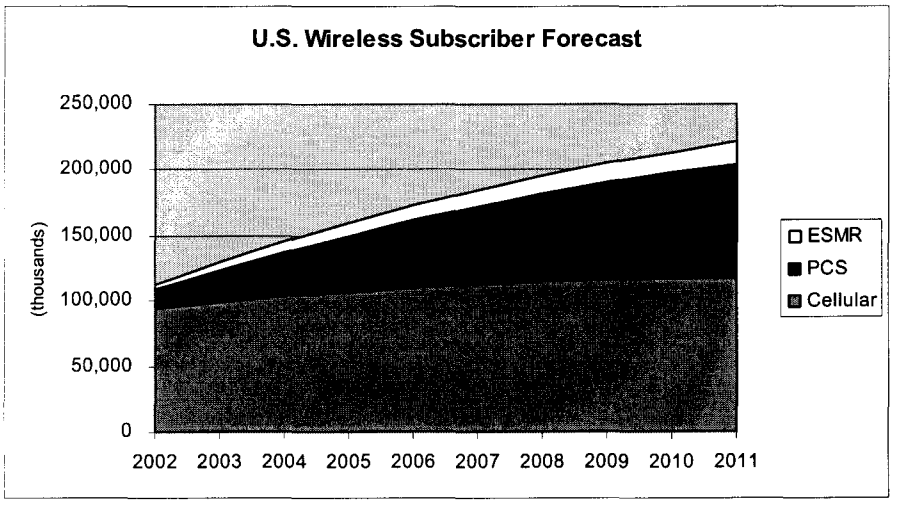
The chart below illustrates the growth in the number of wireless (cellular and PCS) users in the U.S. between 1985 and 2001. Although subscriber growth rates are declining, the industry still shows significant growth. In 1996, there were 44 million subscribers. By the end of 2001, there were 128 million, a compounded annual growth rate of 23.9% over that five-year period.

[41] Source: FCC Auction 35 Fact Sheet (http://wireless.fcc.gov/auctions/35/factsheet.html)



Source: CTIA Wireless Industry Survey Results, 2002

The next chart summarizes analysts' forecasts for wireless subscribers in the United States during the next nine years.[42] PCS subscribers account for the majority of the growth, averaging about 10% a year before leveling off around 102,000 million in 2011. Cellular growth is considerably flatter, averaging about 2.0% a year before leveling out at 118 million in 2011.



The following is a chart of estimated churn rates and ARPU for the U.S. cellular and PCS markets.

[42] Sources: Kagan Associates, Donaldson, Lufkin & Jenrette, J.P. Morgan, and BIA estimates.

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cellular ARPU	$46.85	$46.97	$47.45	$47.47	$47.76	$48.65	$48.43	$48.80	$49.05
Cellular Churn	2.2%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%
PCS ARPU	$52.11	$53.08	$54.37	$55.57	$55.54	$56.10	$56.89	$57.09	$57.53
PCS Churn	2.6%	2.5%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.3%
ESMR ARPU	$70.26	$72.06	$74.09	$75.12	$74.88	$74.53	$74.81	$75.04	$74.84
ESMR Churn	2.1%	2.1%	2.1%	2.1%	2.1%	2.0%	2.0%	2.0%	1.9%

Source: Paul Kagan Associates, 2002

Recent Developments

In January 2003, the FCC eliminated its rules that prohibited a single entity from having a combined attributable interest of 20% or greater in broadband PCS, cellular, and specialized mobile radio licenses totaling more than 25 MHz in any geographic area. The FCC will analyze spectrum transactions on a case-by-case basis, imposing limits when market conditions warrant them. The elimination of the cap will allow the larger carriers to acquire smaller carriers in specific areas, as well as a merger between larger groups.

In March 2003, the FCC announced it would conduct a full review of its spectrum management in the US in order to address spectrum issues and emerging technologies. The FCC is considering allowing school systems to raise cash by divesting wireless spectrum granted to them from the federal government for educational purposes.

On May 15th 2003, the FCC adopted a spectrum-leasing rule, which will allow and encourage spectrum license holders43 to freely lease unused and unwanted spectrum. The new rules allow for two leasing options. The first option, "spectrum manager" leasing, allows for the licensee to lease the spectrum without prior FCC approval, as long as the licensee maintains both legal and working control of the spectrum. The second option offers a de facto leasing option, allowing the lessee to have working control of the spectrum, while the leaseholder retains legal control of the spectrum.

[43] This includes both mobile and fixed services.

Exhibit 4

Biography of Camilla C.S. Jensen

Camilla Jensen is the Director of Telecom with BIA Financial Network, Inc. (BIAfn)), a financial consulting firm specializing in the appraisal of wireless telecommunications and broadcast properties, and business plans and strategic analyses. Ms. Jensen's specialties include valuing telecommunications, wireless spectrum, and broadcast companies as well as working with these companies to develop and define operating strategies. Ms. Jensen has valued almost all types of commercial spectrum including MMDS, ITFS, PCS, SMR, paging, LMDS, IVDS, broadcast, and L-Band.

Ms. Jensen's expertise includes financial modeling for a variety of purposes, such as asset allocations, fair market valuations, stock valuations, guideline company analysis and business plans. She has built comprehensive operating models for companies and has been involved in the valuation of more than 50 billions of dollars worth of companies and spectrum in primarily the cellular, PCS, paging, SMR, and fixed wireless industries.

Ms. Jensen is a leading ITFS/MMDS valuation expert and has spoken at a variety of industry events. Most recently she spoke on "Options for ITFS License holders" at the NIA conference in Tampa, Florida. She has also spoken at the NIA and the WCA on "Establishing ITFS Spectrum Values." Ms. Jensen has been involved in the valuation of in excess of 500 ITFS and MMDS licenses over the past several years.

Ms. Jensen has been quoted in the Chronicle for Higher Education on her ITFS expertise. The Chronicle is a national publication for higher education. She has also been quoted in Investors Business Daily, the Dallas Business Journal, and Internet.com on telecom fixed wireless trends and telecom bankruptcies.

Prior to joining BIAfn, Ms. Jensen's professional experiences have included positions in management consulting, public relations, and marketing research with organizations including Freddie Mac, and the European American Chamber of Commerce. In addition, Ms. Jensen is fluent in several languages including German, Danish, and conversational in French and Swedish.

Ms. Jensen earned her Master's in International Commerce and Modern Languages with concentration in the German language and Germany, from Odense University in Odense, Denmark. She received her M.B.A. concentrating in finance from American University in Washington, DC.

Biography of Y. Jinnie Lee

Y. Jinnie Lee is a Senior Financial Analyst with BIA Financial Network, Inc. (BIA), a financial consulting firm specializing in the appraisal of mobile communications and broadcast properties, and business plans and strategic analyses. Jinnie Lee's specialties include valuing private and public companies in various industries as well as financial modeling and strategic consulting for the clients.

Jinnie Lee has extensive equity and high-yield bond valuation experience. Most recently, Ms. Lee held an investment banking position with Brouillette, Barry, Farmer & Korando, LLP, which specializes in telecommunications and information technology start-ups. She was engaged in valuing and consulting various projects including Aexis Telecom in Italy, Vobix, First Light Communications, etc.

Prior to investment banking, she held an associate position with Samsung Securities in Korea as an equity research analyst. She played a key role in the IPO of Korea Tobacco and Ginseng, a major state-run corporation in Korea, and supported the domestic and global institutional sales force and portfolio managers with recommendations. She was ranked the second-best retail stock analyst in Asia in a survey by Reuters in 1999.

Ms. Lee was also a credit research analyst at Samsung, analyzing the fair market value in orderly liquidations of high-yield foreign currency denominated bonds in Korea. She published credit reports of major Korean blue chip companies including Samsung Electronics and SK Telecom.

Ms. Lee graduated from EWHA Women's University in Korea with a B.A in French Literature. She received her M.B.A. degree from the Stern School of Business, New York University. Her degree included a major in Finance and Accounting with a specialization in Media, Entertainment, and Telecommunication Industries. During her MBA, Ms. Lee also interned as a financial analyst at Warner Brothers in New York.