at 37-40 GHz. Illustrative HHIs are calculated in Tables 1 and 2 for a product market including capacity from these bands. Total market capacity for these calculations is 7.8 GHz, of which 2.8 GHz are in the 37-40 GHz bands.[68] The Commission has proposed a spectrum cap of 600 MHz on the 37-40 GHz band; within this product market, that cap would yield an HHI of only 582. This is a quite unconcentrated market structure indeed, well under the Merger Guidelines' upper bound classifying markets as unconcentrated.[69]

Firms could acquire far more than 600 MHz of 37-40 GHz spectrum without this product market becoming very concentrated. If the spectrum cap were increased to allow a single firm to hold licenses for as much as 1 4 GHz of 37-40 GHz spectrum in each area, the HHI would rise only to 1345, even though two firms are assumed to hold licenses for all of the 37-40 GHz spectrum (see Table 2).[70] This HHI still falls in the middle of the range of market structures the Merger Guidelines classify as moderately concentrated.

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[68] This includes only the capacity of the 28 paired 50 MHz channels that the Commission proposes to license, since it is not clear whether services supplied over the proposed 4 unpaired 50 MHz channels would be in the same product market. The calculations further assume that about 40% of spectrum capacity in the 18 and 23 GHz bands would be available for services in this product market, and that 400 MHz of LMDS spectrum (out of a proposed total of 1000 MHz) would be available for services in this product market. Thus, these calculations do not assume that all capacity in these bands will be available for diversion to the services produced using the 37-40 GHz band.

[69] To calculate HHIs, the following assumptions have been made about the capacity firms hold outside the 37-40 GHz bands. One firm holds the licensee to the 400 MHz of capacity in the 28 GHz band available to supply this market. The Commission has proposed granting a single LMDS license in each area for 1000 MHz, but also has requested comment on granting up to three licenses. In the absence of more specific proposals for the above 40 GHz band, it is assumed that the same spectrum cap applies for this spectrum as for the 37-40 GHz bands; in this calculation, therefore, the 2.8 GHz of spectrum is held evenly by 4 firms. To simplify exposition, the size of the blocks of above-40 GHz spectrum held by individual licensees in these calculations is unconstrained by any assumptions or tentative proposals by the Commission about the bandwidth of individual licenses or by the amount of contiguous bandwidth available. Not including such constraints tends to increase calculated concentration. Licenses are not granted for blocks of spectrum in the 18 and 23 GHz bands, but for individual links. Thus, firms cannot "lock up" spectrum by licensing blocks of spectrum in these bands. To account for the possibility of multiple firms applying to license different links, the calculations assume that no firm hold licenses for more than 100 MHz of spectrum in these bands.

[70] Because we assume the same spectrum cap applies to the above 40 GHz spectrum, all of this 2.8 GHz also is split between two firms.

Both of these calculations are "worst case" market structures in an important sense. They assume that every firm with licenses in the 37-40 GHz band (and every firm licensed in the above 40 GHz bands) acquires the maximum amount of spectrum allowed under the cap. While possible, it would happen only if each licensee successfully bid for and acquired 7 (or 14) separate licenses.[71] Only then would the market concentration be as "high" as calculated.

To show how big a difference this can make, we recalculate market concentration under a spectrum cap of 1400 MHz for the 37-40 GHz band, and the above 40 GHz bands. The new calculations, however, assume that only one firm acquires the maximum allowable spectrum, while a second firm in each group of bands acquires licenses for 700 MHz, and licenses for the remaining 700 MHz are split among three more firms (see Table 3). Instead of 2 firms controlling all 37-40 GHz licenses and 2 more controlling all above 40 GHz spectrum, 5 firms hold licenses in each block of spectrum. The HHI falls from the 1345 calculated before to 917. Even though the spectrum cap is still 1400 MHz, market structure falls to the unconcentrated range.

This discussion also implies that there is a substantial policy difference between decisions on a spectrum cap and on the size of spectrum blocks to license. If the 37-40 GHz band were licensed as two 1400 MHz blocks, it would be certain that at least two firms could hold licenses in these bands in each area, but also certain that no more than two firms could hold licenses. A spectrum cap of 1400 MHz also makes it certain than at least two firms can hold licenses, but does *not* prevent more than two firms from holding licenses. Thus the market could be, and quite possibly would be, substantially less concentrated with a spectrum cap of 1400 MHz than with license blocks of 1400 MHz.

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[71] Or the firms later paid to acquire additional licenses.

Narrower Spectrum-Only Product Markets

Next we look at the market structure if the product market is narrowed further. First, we present illustrative HHIs for a product market that includes capacity from the 18 GHz, 23 GHz, and 28 GHz bands (as well as from the 37-40 GHz band), but excludes any above 40 GHz capacity.[72] These calculations are presented in Tables 4 and 5, and again make the "worst case" assumption that all licensees control the maximum bandwidth allowed under the spectrum cap. With a spectrum cap of 600 MHz for the 37-40 GHz band, the HHI is 776, still well within the unconcentrated range (see Table 4). If the spectrum cap were increased to 1400 MHz, and all licenses in the 37-40 GHz band were held by two firms, the HHI would be 1704, which the Merger Guidelines would classify as only moderately concentrated. Of course, the HHI could be considerably lower under this cap if only one firm acquired the allowable maximum of 14 separate licenses.

The second, narrower product market whose structure was analyzed includes capacity from the 28 GHz and above 40 GHz bands, but not from the 18 GHz and 23 GHz bands. These calculations are in Tables 6 and 7. They too assume that firms license the maximum amount of spectrum allowed, but in this case the spectrum cap is assumed to apply to the above 40 GHz spectrum as well as the 37-40 GHz band.[73] With a spectrum cap of 600 MHz applied to these two bands, the HHI is 933; this would be classified as unconcentrated under the Merger Guidelines. If the spectrum cap (for both bands) is increased to 1000 MHz, the HHI rises to 1775 but remains in the moderately concentrated range. Of course, both calculations would yield lower HHIs if it were not assumed that all firms acquired licenses for as much spectrum as possible.

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[72] Assumptions about the amount of capacity available for services in the product market, and about the spectrum controlled by individual firms, are the same as before.

[73] The same assumption was made in Tables 1, 2 and 3.

Conclusions on Concentration

This analysis provides no support for limiting firms to licenses for 600 MHz of 37-40 GHz spectrum. As discussed above, a spectrum cap serves little competitive purpose if non-spectrum-based services such as those of LECs and CAPs compete in the same product market, as there is considerable evidence they do. There is also little reason to believe a spectrum cap of 600 MHz is necessary to insure a competitive market structure, even if the product market is limited to spectrum-based service. Such a spectrum cap would constrain firm size and market concentration to levels well below those needed to allow competition. Spectrum caps could be increased to 1000 or 1400 MHz, or even higher, without yielding market structures considered highly concentrated under the Merger Guidelines. Furthermore, as discussed above, these standards themselves are overly strict for this purpose. A cap of 1000 or 1400 MHz would, for example, yield HHIs that remain far below the HHI of 2500 used by the Antitrust Division in determining whether pipeline deregulation would be in the interests of consumers.

F. Limitations on Collusive Behavior

Under the Merger Guidelines, the number and size distribution of firms in a market are important initial indicators of the likelihood of competitive behavior. This follows from a belief that market participants can more easily coordinate their behavior when they are few in number. Similarly, the costs of monitoring the behavior of others, and of enforcing any collusive arrangement by punishing "cheaters," are lower when there are few industry participants. The Guidelines properly recognize, however, that the level of competition in a market depends on more than market structure. The potential for entry and other factors limiting collusive behavior can cause concentrated markets to perform much more competitively than indicated by their structure alone.

The analysis above suggests that, even when considering only the criterion of market structure, strict spectrum caps are not necessary to protect competition. Such caps either have little impact on market concentration or could be set at levels substantially higher than proposed

by the Commission without allowing the relevant market to become concentrated. Structural considerations alone indicate no spectrum cap is needed if the product market includes non-spectrum-based services such as those of LECs and CAPs. Structural considerations alone also indicate that, even if the product market includes only spectrum-based alternatives, the cap on 37-40 GHz licenses could be set substantially above the level proposed by the Commission — at 1000 MHz or 1400 MHz or higher — without creating substantial risk of competitive problems.

Additional factors limiting collusive behavior become important only if a spectrum cap is to be set, and the issue is how far above 1000 MHz or 1400 MHz it can safely be set. The Commission then should take into account not only the resulting market structure, but additional factors that will affect market behavior and prices in determining how constraining a spectrum cap need be. Factors that make collusion more difficult and affect the ease with which deviations from a collusive outcome can be detected and punished help to determine how close to the competitive outcome the performance of the 37-40 GHz licensees will be.[74]

In this section, we briefly describe a number of factors that render any concerns about anticompetitive behavior even less important than might be suggested by conventional measures of market concentration. These factors, which influence the strategies each firm pursues and thus affect the extent of market competitiveness, are: (1) the scope for continued technological development both of 37-40 GHz technology and of technology used to supply competing services; (2) the rapid pace of regulatory change in telecommunications; (3) the structure of costs; and (4) the impact of large buyers and individual bidding for contracts.

1. Technological Development

The use of 37-40 GHz and other millimeter spectrum is sufficiently novel technologically that the Commission should expect a high degree of variability in marketing, equipment, and service choice, both across suppliers and over time. As licensees experiment with and develop

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[74] See G.J. Stigler, "A Theory of Oligopoly," Journal of Political Economy 74 (1964), pp. 44-61.

the technology, they surely will be changing the mix of services they offer and the characteristics of the individual services. New technology will expand the types of service that can be offered and allow suppliers to add features and improve the characteristics of existing services. New technology also is likely to reduce the costs of services. All are sources of market volatility that can undermine collusive agreements.

New services make collusive agreements more difficult to maintain because the price of each new service must be integrated into the existing price structure.[75] When firms are continually modifying, improving, and adding new products and services, reaching agreement on a collusive price is itself problematic. The introduction of new service packages offers opportunities to "cheat" on any putative anticompetitive agreement without provoking the "punishment" that might otherwise occur, in part because it is difficult for rivals to determine the appropriate price for a new service. As a result, new services are likely to be offered at more competitive prices, because it is easier to deviate from a collusive agreement when products are changing.[76]

In addition, rivals may perceive that the new services are being offered at prices that are "too low" because they do not know what those prices should be.[77] As technology changes the costs and characteristics of services that are offered, suppliers trying to coordinate pricing will want to adapt their pricing to these new conditions, because otherwise they will sacrifice profits. A time of change is a time of risk for firms trying to coordinate pricing because it breeds

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[75]R.A. Posner, Antitrust Law: An Economic Perspective (Chicago, IL: The University of Chicago Press, 1976), pp. 59-60.

[76]F.M. Scherer and David Ross, *op. cit.*, p. 285, observe that "the more rapidly producers' cost functions are altered through technical change and the more unevenly those changes are diffused throughout the industry, the more likely there will be conflict regarding pricing choices."

[77]One factor that contributes to this difficulty is that firms may have different costs for new services, yet each firm is unable to gain information on the costs of its rivals. Thus, a low price might be treated as a deviation from an agreement when it only reflects the low costs of its supplier.

uncertainty and misunderstandings. Such changes create opportunities for "misunderstandings," beliefs that a rival is cutting price in violation of a collusive agreement, which will undermine firms' confidence in the stability of an agreement and may result in further price cuts. The risk is particularly great when the developments do not affect all suppliers uniformly.

For the services using the 37-40 GHz spectrum, it is predictable that the development of new technology and equipment will reduce service costs over time, but it is unlikely to do so uniformly for all suppliers. Developments may occur at different times for services in different spectrum bands, and for spectrum-based and non-spectrum-based services, and even for suppliers that use the same spectrum band but different equipment vendors. This will make it difficult for one supplier to know whether changes in services and prices of another are based on new developments that affect that other supplier, or are attempts to profit by "cheating."

Of course, technological developments may do more than alter the relationships of existing suppliers within a market. As discussed above, technological developments also may expand market boundaries or the range of firms who can supply the market. For example, technological developments may increase the range and quality of service that can be offered over the installed copper plant. Technological developments likely will increase the range of services that can be supplied using the upper reaches of the millimeter wave band.

2. *Regulatory Change*

The rapid changes in telecommunications regulation will be another powerful source of market volatility that will make it far more difficult to maintain collusive agreements. Services provided at 37-40 GHz, and other services in the same product market, are "local" telecommunications services. Changes in federal and state regulation over the past several years already have had major effects on these markets, allowing new competitors to emerge and changing the regulatory constraints on incumbent LECs. The new Telecommunications Act of 1996 will only accelerate and expand that process. As a result, new players will be introduced into the marketplace and existing relationships will be altered in ways that cannot be easily

predicted. As 37-40 GHz licensees, and competing suppliers, respond to this radically changed environment, the scope for "misunderstandings" among the growing list of competitors will increase.

3. *The Structure of Costs*

The structure of costs for suppliers to these markets can be expected to make it substantially more difficult for them to coordinate their pricing decisions. Pricing decisions, of course, depend closely on costs. The prices that firms would like to charge to maximize their profits (if only they could loosen the constraints of competition) will depend on the level and structure of their costs. In these markets, any attempt to coordinate pricing would be made more difficult by the cost structure of some suppliers, as well as the variability in cost structures across firms, across time, and across customers.

Significant differences in costs among competitors make it more difficult to agree on a common set of prices. Firms with different marginal costs usually will differ in the price they would like to see charged, which in turn can lead to pricing conflicts if they attempt to coordinate pricing.[78] As previously discussed, many, if not all, of the services relying on the 37-40 GHz spectrum, can and likely will be provided by competitors relying on coaxial cable, fiber, or (in the case of video services) satellite. Spectrum-based and cable-based services, however, have different cost structures. Cable-based technologies tend to have relatively high fixed costs and low marginal costs. Spectrum-based services have lower fixed costs and higher marginal costs for serving additional customers, since capacity is less lumpy. Thus, suppliers offering spectrum-based services are likely to have pricing preferences that differ from those of suppliers offering cable or satellite-based services. Such differences in pricing preferences would complicate any attempt at coordinated pricing behavior.

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[78] This problem is discussed in F M. Scherer, and David Ross, op. cit., pp. 238-244.

Furthermore, the high fixed cost structure of the non-spectrum-based service is itself one that makes coordination more difficult. Tacitly collusive behavior is generally believed to be less likely in industries in which a significant portion of a firm's costs must be incurred regardless of the level of its output, i.e., when fixed costs are high relative to variable costs.[79] In such circumstances, the incentive of a firm to reduce prices if demand falls short of capacity is much greater than it would be if output reductions resulted in larger reductions in costs. A firm with large fixed costs and substantial excess capacity will experience significant losses because so few of its costs decline when its output falls. On the other hand, the firm has strong incentives to increase its output by cutting prices because the change in output can be accomplished at relatively little additional cost. In such situations, pricing discipline among firms is difficult to maintain. Thus, competition from cable-based service not only increases the diversity of suppliers' cost structure, but ensures that one group of competitors has a cost structure that encourages behavior that undermines coordination.

Costs also will vary across customers for different types of services. We pointed out earlier that it may be relatively costly to serve particular customers by fiber if the costs of laying fiber cannot be spread across substantial traffic volumes. We also pointed out the possibility that, if suppliers can price-discriminate, service to such customers for whom fiber service is a relatively poor alternative might constitute a distinct product market. If so, however, the very

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[79] Scherer and Ross note:

> There is reason to believe that industries characterized by high overhead costs are particularly susceptible to pricing discipline breakdowns when a cyclical or secular decline in demand forces member firms to operate well below designed plant capacity.

They go on to observe that:

> When demand falls below levels that will sustain capacity output, the profit-maximizing enterprise with high fixed costs cuts prices more sharply and suffers more severe erosion of profits than a similarly inclined firm with low fixed costs.

Scherer and Ross, *op. cit.*, pp. 286. 288.

conditions that would create that distinct market — fiber cost disadvantage and price discrimination — also could make coordinated pricing difficult in those markets.

The number of customers for whom fiber is a poorer alternative is likely to contract over time. To price-discriminate against this group of customers, suppliers would have to coordinate on which customers belong to this group and should be offered the higher prices, and on how much higher the prices should be, both of which could be changing over time. Here again are opportunities for the sort of disagreements and "misunderstandings" that can undermine pricing coordination. Even if a *hypothetical* monopolist might be able, *hypothetically,* to price-discriminate against a group of customers for whom fiber service is a poorer alternative, discrimination against those customers would not be sustainable in fact since, for the reasons discussed here and above, spectrum-only markets should be competitive, both because they are relatively unconcentrated and because coordinated behavior would be difficult.

4. Large Buyers and Individual Bidding

Licensees at 37-40 GHz, and others who compete with them, can be expected to sell some service through contracts to large buyers for substantial volumes of services. For example, circuits will be sold to businesses with substantial demands for private networks, or to CAPs or IXCs who in turn use the circuits to connect to customers. Contracts for large volumes of service over a substantial period of time, with terms that are confidential, give suppliers increased incentives to deviate from any attempt at coordinated pricing. Such conditions increase the profits that can be gained by deviating from an agreement.[80]

This factor is particularly important for evaluating the competitive effects of any narrower product markets that might result from price discrimination. Such price discrimination is most likely to occur where firms make specialized bids to particular customers, rather than relying on standard pricing guidelines to develop quotes. Such specialized bids typically are

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[80] This incentive for deviating from coordinated pricing is discussed in the Merger Guidelines at ¶2.12.

made when large amounts of service are at stake. It is costly for suppliers to learn in detail about the needs of a particular customer, and then to prepare a special cost analysis and pricing bid. It is not worth bearing such costs unless the potential gain, the profits from winning the contract, are correspondingly large. This means, however, that individual bidding for contracts — a practice that might generate narrow product markets — occurs in circumstances in which pricing coordination is difficult. Even when a small number of suppliers are bidding, competition to get large contracts can be fierce.

In sum then, there is a variety of important market and regulatory conditions that will inhibit the 37-40 GHz licensees, and the other suppliers with whom they compete, from either reaching or enforcing a collusive agreement. When such factors are present, even transactions that increase concentration beyond certain trigger levels, like those in the Merger Guidelines, will likely not threaten to reduce competition.

G. Implications for a Spectrum Cap Policy

The Commission's *Notice* requests comment on whether 37-40 GHz service constitutes a distinct product market, and on whether a spectrum cap on 37-40 GHz licenses of 600 MHz for paired channels is appropriate The analysis above, and the conclusions reached, help answer these questions.

First, we think it most unlikely that 37-40 GHz service will constitute a distinct product market. An appropriate product market very likely includes service supplied using other spectrum, and may well also include service supplied over fiber optic and other wireline capacity. Second, if the product market includes cable-based service, there is no need to cap the amount of 37-40 GHz spectrum a firm can license in order to protect competition. Even if the product market is limited to spectrum-based service, a spectrum cap of 600 MHz appears to be unnecessarily restrictive. The cap could be substantially loosened — indeed it probably could be increased to at least 1400 MHz — without creating a substantial risk that firms would be able to acquire increased market power by holding multiple licenses in the 37-40 GHz band.

Implications for the Level of a Spectrum Cap

The rationale for capping licenses to a particular spectrum band rests directly on two premises: first, that the spectrum cap is a clear and direct constraint on market structure and concentration, and second, that policy intervention is necessary to limit market concentration and the exercise of market power. Both premises must be reexamined when service offered with the capped spectrum is not a distinct product market, but instead competes in a broader market with other service. Our analysis concludes that it is most unlikely that services offered at 37-40 GHz will constitute a distinct product market.

If the product market is broader than 37-40 GHz service, a cap on licenses in the 37-40 GHz spectrum should be evaluated in terms of the need to control concentration in the broader market and the effects of a cap on that broader market. There is little rationale for controlling the number or size of firms using a particular production technology, apart from the effect on overall market concentration. If 37-40 GHz service competes in the same product market with non-spectrum-based technology, it is most unlikely that any cap is justified on the amount of 37-40 GHz spectrum a firm can license. The 37-40 GHz spectrum would constitute only a small proportion of total capacity in such a product market, and allowing one firm to acquire all of the licenses to this spectrum would have little impact on overall market concentration. If service offered with the 37-40 GHz spectrum competes only with service using other spectrum, any cap on licensing within this band should take into account the effect on concentration in this broader market. Concentration of licenses for the 37-40 GHz spectrum, by itself, is not important. Our analysis indicates that it is not necessary to set the spectrum cap for this band at 600 MHz in order to prevent undue concentration in broader spectrum-only product markets.

If the overall market structure is competitive, there is no need to constrain the structure of some subset of the market. Competitive conditions will prevent suppliers to the market, regardless of whether or not they use 37-40 GHz spectrum, from exercising market power. Consumers who demand those services should have access to them at competitive prices —

regardless of whether they are businesses using the services for a WAN, or PCS suppliers seeking backhaul capacity. Competitive markets also mean that consumers with substantial demands should be able to make efficient "make or buy" decisions. If it is more efficient to buy those services from a carrier than to self-supply, the service should be available at a low competitive price that reflects this efficiency. Alternatively, if self-supply is more efficient, the consumer should be able to acquire the necessary spectrum rights. The spectrum would be worth more to such customers than it would be to a carrier who held the spectrum and sold the services on a competitive market.

Attribution

This analysis also has implications for determining the percent of ownership or attributable interest a firm may acquire before it must count licenses of the acquired firms against a spectrum cap. The Commission has proposed setting this attribution limit at 5 percent.[81] Under this proposal, if one firm acquires a 6 percent ownership interest in another with 37-40 GHz licenses, the spectrum cap would constrain the licenses the two firms could hold just as if the firms had merged.

Relatively small partial ownership interests, however, should not be expected to have the same effect on behavior, and in particular on the exercise of market power, as full ownership. The effective level of concentration created when a firm acquires a partial ownership interest in another on the order of 5 or 10 percent, or even upwards of 20 percent, will be lower than if the firms had merged. Setting a low trigger level for attributable interest effectively tightens the constraint of the spectrum cap on effective concentration when one firm acquires a partial ownership interest in another The lower the trigger point for the ownership interest, the tighter the constraint on effective concentration.

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[81] Notice at ¶112.

This suggests that the appropriate level of the spectrum cap, and of the trigger point for ownership, should be considered together. A very low trigger point for ownership interest should not be necessary if, even under the spectrum cap, concentration in the product market can only rise to levels where the exercise of market power is unlikely. In this case, a still tighter constraint on market structure will not be necessary, yet this is exactly what setting a low trigger point for ownership does if a firm with licenses acquires partial interests in another licensee.

III. Markets and the Efficient Use of Spectrum: Auctions, Speculators, and Reclamation

The Commission has asked for comment on a number of issues, other than that of how much spectrum any single licensee might acquire. Among these, the Commission solicits comment on its intention to delay the auction of the 39 GHz portion of the band in order to permit it to review the behavior of incumbent licensees. Specifically, the Commission has proposed that it be able to reclaim 39 GHz spectrum that is not sufficiently utilized within 18 months of its final decision in this rulemaking, and place that reclaimed spectrum in an auction along with the remaining unlicensed 39 GHz spectrum. The Commission also intends to impose a number of buildout and technical "quality" requirements on all 37-40 GHz licensees.[82]

As described more fully below, the Commission's reclamation proposal and its detailed proposals regarding buildout and technical requirements are in large part premised on a belief that incumbent licensees to whom the Commission has "given away" 39 GHz spectrum are not likely to place that spectrum in its highest-valued uses. The Commission apparently believes

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[82] If an auction is not used, the Commission is considering relying on an administrative licensing procedure that would impose a number of very stringent requirements on any prospective licensee before it grants a license in the 37-40 GHz band. These requirements include a demonstration that there is a clear and present need for the license, that non-RF solutions are infeasible (an almost impossible burden given the wide range of applications for this spectrum), that the licensee comply with a strict buildout requirement, and that the licensee not be granted more than one paired channel until that channel is 100 percent utilized.

that, absent an auction, a significant portion of the 37-40 GHz band may be underutilized unless the Commission assumes a much more active role in mandating how that spectrum may be used. Even with an auction, the Commission is reluctant to leave as many decisions as possible to the licensee, specifying some technical standards and buildout requirements.

This section begins by describing why the Commission can rely on licensees to maximize the value of the 37-40 GHz spectrum without the need to impose very specific buildout and technical requirements.[83] Against that background, the section explains why the initial assignment of licenses is generally no bar to the deployment of the 37-40 GHz band in those uses that maximize the value of the spectrum to consumers (end-users). Thus, the Commission's proposal to possibly reclaim the spectrum of some of the 39 GHz spectrum of incumbent licensees and auction that spectrum will not improve spectrum allocation from the vantage point of end-users. This section then details the significant costs that will be imposed on consumers and on the Commission if it adopts its reclamation proposal. Finally, the section describes why, if the Commission nonetheless pursues its reclamation proposal, it should proceed very cautiously in attempting to distinguish among "responsible" licensees of 39 GHz and others.

A. Market Forces and the Efficient Use of Spectrum: With or Without Auctions

The Commission apparently believes that an auction of the licenses is the only way that the associated spectrum will find its way to its highest-valued uses:

> Competitive bidding is an extremely efficient method for assuring...that channels are assigned to only applicants with the greatest need for the spectrum.[84]

Indeed, one underlying theme that pervades the *Notice* is concern that spectrum speculation and the administrative "give-away" of licenses undermines this assignment. For example, the

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[83] Of course, the Commission may be required to establish interference standards or frequency coordination requirements along the "borders" of the licensed area. The issue here is whether even more requirements are necessary.

[84] *Notice*, ¶ 25.

Commission notes that the substantial increase in license applications in the 39 GHz portion of the band "may have been filed by speculators looking only for windfall profits in an aftermarket."[85] With respect to possible spectrum reclamation, the Commission notes that its purpose is to "minimize speculation without harming 39 GHz licensees who are responsibly developing the spectrum they have been assigned."[86]

From the standpoint of consumers, the important economic policy issue is whether the 37-40 GHz spectrum will be used in a way that most benefits them. The Commission appears to believe that, in the absence of regulatory prescriptions, there is a potentially serious principle-agent problem with licensees: Licensees may not use the spectrum in a way that best serves consumers (which is the way economists would define the "public interest"). In particular, the Commission quite clearly regards the holding of a license for later resale as an example of spectrum inefficiency. Thus, even if licenses are awarded by an auction, the Commission is proposing to mandate both the buildout pace and a substantial number of the technical requirements governing the use of the spectrum. As the above excerpt from the *Notice* makes clear, the belief that licensees cannot be completely "trusted" to use the spectrum in a way that maximizes its value clearly underlies the Commission's view that some or many of the incumbent 39 GHz licensees are "irresponsible."

1. Market Forces and the Efficient Use of Spectrum

There is no basis for the Commission to believe that permitting licensees themselves to determine how the 37-40 GHz band will be used in terms of services provided or technical quality will be inimical to the interests of consumers, regardless of how those licenses are initially awarded. Put differently, the Commission can rely on market forces alone to guide the decisions of licensees in a way that will advance the interests of end-users.

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[85] *Notice*, ¶ 7.

[86] *Notice*, ¶ 106.

As discussed in detail in the previous section of this report, the Commission should expect that the 37-40 GHz licensees will compete vigorously among themselves, with licensees in other parts of the spectrum, and with "wireline" providers for the patronage of customers. Those licensees who better satisfy end-users can expect to be more profitable than other licensees. This profit incentive in turn will ensure that licensees deploy their spectrum awards in a manner that tends to minimize the cost of providing any particular service to any particular customer, to allocate the use of the spectrum most efficiently across the services provided, and to find new and innovative uses for the spectrum.

Of course, licensees may not share a common view as to how the spectrum should be deployed, particularly because services using this spectrum are in the very early process of market development. Nonetheless, the expectation should be that each licensee has a profit incentive to search for the most effective deployment. As a result of that market experimentation, the most profitable deployment will be imitated by other licensees over time. As the former chairman of the now-defunct Civil Aeronautics Board, Professor Alfred Kahn, observed with respect to the deregulated airline industry,

> Our uncertainty about the outcome of the competitive struggle is no reason to prevent its taking place; the only sensible prescription is to give the competitors freedom to slough off their artificial handicaps by entering and leaving markets, as they please.[87]

The wisdom of the Commission's proposal to permit licensees in the 37-40 GHz band flexibility in choosing what services to provide clearly recognizes the role market-based decisions play in allocating resources to higher-valued uses. As a result of the Commission's permissive policies, the licensees can determine how best to use their spectrum award, and they will do so by searching for the most profitable mix of spectrum uses. This, in turn, will (as a general matter) be the mix that best satisfies consumer demands. If instead the Commission had

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[87] Alfred E. Kahn, "Applications of Economics to an Imperfect World," American Economic Review: Papers and Proceedings (May 1979), p. 6.

restricted the spectrum to a very narrowly-defined service, it is likely that some or much of the spectrum would not be placed in its highest-valued uses, thereby reducing the social value of the spectrum. In effect, the Commission has made the tentative decision that the policy most likely to result in placing the spectrum in its highest-valued uses is one that that permits licensees motivated by profit rather than Commission prescription to choose the appropriate service mix.

2. *Are Rules for Buildout or Technical "Quality" Standards Needed?*

If the Commission's proposals are adopted, all 37-40 GHz licensees must comply with a number of buildout and technical requirements. Similarly, in the event the alternative administrative assignment procedure is adopted, the Commission is prepared to ensure "responsible" stewardship of the spectrum by specifying a much larger array of buildout and technical quality requirements

The contrast between the Commission's market-based policies with respect to spectrum use and its restrictive policies with respect to buildout and engineering requirements is both stark and unnecessary. Just as the Commission can rely on competitive market forces and the profit motive of licensees to guide the 37-40 GHz spectrum to its most highly valued uses, it can also rely on market forces to ensure that licensees will tend not to deploy the spectrum in inefficient ways. For example, if a licensee were too slow (or too rapid) in building out his/her licensed geographic area, or were "packing" too little information into the spectrum, the licensees would be earning less than the maximum profits possible. This profit penalty in turn would encourage the licensee to alter the rate of buildout or to "pack" more information into the available spectrum. If the licensee did not respond to that penalty, another entity would observe the failure of the licensee to exploit the additional profit opportunities and be willing to pay more for the license than it is worth to the incumbent licensee.

The kind of requirements the Commission proposes to impose on licensees to ensure "spectrum efficiency" is precisely the kind of "micro-management" policy that this Commission and other regulatory agencies have been eliminating since at least the 1980s. In defining how

licensees should use their spectrum to provide a service array, the Commission is replacing the judgment of the profit-motivated licensee with that of the Commission, which is unlikely to have the volume of information on how best to produce 37-40 GHz services that is possessed by the licensee. In describing how unlikely it was that the Civil Aeronautics Board could pick which of the airline carriers would be the most "responsible" recipients of route awards, Professor Kahn noted that:

> it seems to me even less likely that we can hope to achieve the most efficient performance of the transportation [industry] by *prescribing* how the thousands of markets should be served...I find it difficult to see how these uncertainties [of market outcomes] tilt the balance in the direction of a reliance on predictably ignorant regulation in preference to an uncertainly predictable market process.[88]

There is unlikely to be any unique set of profit-maximizing choices for all markets at all times. The composition of end-users in geographic areas and therefore the best composition of services to provide are likely to vary substantially. In addition, the "best" way to deploy the spectrum, in terms of marketing as well as service composition and technical standards, may not be common knowledge. These are services using a different technology from the status quo (i.e., twisted-pair cable, coaxial cable and fiber), and considerable uncertainty surrounds the costs and demands of, and marketing strategies for, the 37-40 GHz band. If the Commission rather than the market dictates to the prospective licensees or incumbent 39 GHz licensees a minimum buildout speed and minimum standards of spectrum efficiency that must be satisfied for the licensees to be qualified as "responsible," the licensees' ability to experiment with alternative cost, demand, and marketing strategies will be greatly limited. As a result, the Commission will have foregone opportunities to advance the interests of consumers by enabling licensees to match spectrum use and transmission quality with what is likely to be a wide variety of end-user demands. In addition, reducing the spectrum flexibility of the licensees will lower

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[88] *Id.*

the maximum amount that a bidder is willing to pay for the spectrum because the restrictions will limit the ability of the licensee to deploy the spectrum in the most profitable way.

3. *Is Spectrum Reclamation Needed to Ensure Efficient Use of Spectrum?*

The Commission apparently believes that the market is not encouraging incumbent 39 GHz licensees to make the most efficient use of the spectrum because many of these licensees are speculators or otherwise "irresponsible." Thus, the Commission is prepared to judge which of the incumbent 39 GHz licensees are "responsible" by specifying in some detail the extent to which the licensee's geographic area must be built out if the incumbent is to retain its license. This is unnecessary. Auctions are clearly more efficient than administrative proceedings in deciding who should be awarded spectrum. However, it is not true that licenses awarded through an administrative process are unlikely to be placed in their highest-valued uses unless subject to detailed spectrum use requirements imposed by the Commission. The fact that some of the spectrum was "given away" to licensees through the administrative process will not prevent that spectrum from being used in the most economically efficient manner.

To be sure, the incentives for the licensee to use the spectrum efficiently are most apparent in an auction environment. The auction winner will pay what is likely to be a substantial sum of money for the right to use the auctioned spectrum. One can reasonably presume that the new licensee valued the spectrum more than any of the other prospective licensees.[89]

In order for the new licensee to earn an adequate return on that substantial investment, the licensee will be diligent in using that spectrum in the most efficient way possible. Specifically, the winning bidder has an incentive to choose that marketing strategy, that buildout

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[89] Of course, bidding mistakes can occur. If, after the auction, one of the losing bidders values the spectrum more than the winning bidder, that losing bidder will be able to pay the winner an amount that exceeds the value placed on the license by the winner. If the winning bidder bid too much for the spectrum, the price penalty will provide an incentive for the bidder to be more careful in future auctions and in future marketplace decisions.

pace, and that quality of the various services provided so as to maximize the profits of the spectrum "asset" on which the bid was based. Depending on demand conditions and other factors that are specific to individual geographic areas, the profitable buildout pace may be quite slow; some end-users may only be willing to pay for a relatively low-quality, low-price service; while other end-users may be willing to pay a higher price for transmission capacity that exceeds current needs but is reserved for future demands by the end-users.

The description of why the profit-driven decisions of the licensee are in the interests of consumers applies equally, but perhaps less obviously, to licensees who acquired their spectrum awards through the administrative process rather than by auction.[90] The Commission has "given away" a valuable asset to incumbent 39 GHz licensees. But in order to maximize its asset value, the licensee will have to use the spectrum in the most profitable way possible. That is, this licensee will be confronted with the same set of choices regarding spectrum use, marketing strategies, buildout rates, and the like, as the licensee who acquired the license through an auction. If this licensee makes the "wrong" choices, the licensee will be foregoing profits. This licensee will experience the same profit penalty as the auction winner, thereby encouraging the licensee to make its choices as carefully as that of the auction winner.[91]

If the licensee fails to maximize the value of the spectrum asset, other entities will be able to pay the licensee more for the spectrum than it is "worth" to the licensee.[92] In this way, a well-functioning competitive market tends to guide resources to their highest-valued uses by

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[90] This discussion is based on the Coase Theorem; see Ronald M. Coase, "The Problem of Social Cost," Journal of Law and Economics (1960), pp. [illegible]-44.

[91] To make this point more concretely, an individual may inherit a very expensive house that the individual intends to sell. Even though that individual paid nothing for the house, he/she will have every incentive to sell the house at nothing less than the market price.

[92] For this market mechanism to work efficiently, temporal restrictions on license transfers should be eliminated or at least minimized.

guiding the spectrum to those users who place the highest value on that spectrum, regardless of whether the initial licensees recognize that value.

In summary, the fact that a licensee did not acquire the license through an auction does not imply at all that the license will not be used in the most economically efficient manner. The initial distribution of spectrum among licensees is largely irrelevant to the placement of that spectrum in its highest-valued uses. Consequently, reclamation of the spectrum of those incumbent 39 GHz licensees who appear to the Commission as something less than "responsible" will not enhance the value of the spectrum to end-users. Indeed, as discussed subsequently, end-users will ultimately be harmed by a reclamation policy.

4. *The Role of Speculation*

In addition to dictating how non-spectrum resources should be marshaled to use the 37-40 GHz band, profit maximization may dictate that the licensee reserve significant amounts or all of its licensed spectrum for future use. For example, the licensee may anticipate the development of a new technology to satisfy an inadequately met end-user demand. If the licensee were to commit that spectrum to some current use or user, the licensee would earn immediate profits, but might be unable (as a result of contractual or financial commitments) to deploy that spectrum using the new technology when it became available. In deciding whether to use the spectrum now or to wait for the arrival of the new technology, the licensee compares the immediate profits—an indicator of the value that end-users place on the spectrum in current uses—with future profits—an indicator of the value that end-users place on the spectrum in that future use. If the profitability of waiting is greater than the immediate profitability, the licensee will hold the spectrum in reserve, a decision that benefits end-users as a group.

Clearly, this is a description of "speculative" decision-making. The conclusion that one should draw, however, is not that speculators are "irresponsible" but rather that speculators assist the market in allocating spectrum use over time in a way that increases its value to consumers. As one popular introductory economics text has noted,

> The economic function of speculators is to "move" goods from periods of abundance to periods of scarcity—where the "move" will be across space, time, or uncertain states of nature. Even though speculators never once see a carton of eggs or a bushel of wheat, they may help even out the price differences of these commodities among regions, or over time. They do this by buying at a time or place when goods are abundant and prices are low and selling when goods are scarce and prices are high...Ideal speculation serves the important function of reducing the variation in consumption [across time or regions], and ...increases [total consumer satisfaction].[93]

The early licensees in the 39 GHz portion of the band anticipated that this spectrum would become valuable at some point in the near future. In acquiring the licenses through the administrative process, some licensees that merely "held" the license for sale to future licensees served the function of preventing that spectrum from being used for current but ultimately lower-valued uses. This is true even though these licensees paid nothing directly for their licenses and, in selling the licenses, will earn so-called "windfall" profits if their expectations are correct. Of course, it is the prospect of such profits that drives speculators to serve the interests of consumers.

5. *Summary*

A number of conclusions can be drawn from this discussion. First, regardless of how the 39 GHz licenses were initially acquired, the Commission can rely on market forces to allocate the associated spectrum in a way that serves the interests of consumers. Specifically, market forces will guide licenses to those licensees most capable of using them profitably, and will determine both the best mix of services to be provided and the quality mix of those services. Thus, the Commission's apparent perception that "idle" licenses need to be reclaimed in order to place the associated spectrum in its highest-valued uses is misplaced.

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[93] Paul A. Samuelson and William D. Nordhaus, Economics (1992), p. 198.

Consequently, the Commission should not delay the auction of the 39 GHz portion of the band solely for purposes of distinguishing "responsible" licensees from others. No such distinction can likely be made credibly, and there is no reason to believe that the competitive market process will not guide *all* of the 39 GHz spectrum to those uses perceived as most valuable regardless of how the licenses were initially obtained. Instead, the Commission should consider auctioning any currently unlicensed 39 GHz spectrum. This approach would have the administrative advantage of enabling the Commission to auction off all of the available spectrum contemporaneously. The contemporaneous auction also could have an efficiency advantage if some prospective licensees believed that there were interdependencies in holding licenses in the 37 GHz and 39 GHz portions of the band that could not be realized if the two bands were auctioned at substantially different points in time.

Second, the discussion here suggests that the Commission's approach in regulating the use of the 37-40 GHz licenses should be to minimize interventions that can strain market-directed outcomes. The Commission can rely on market forces—the competition among licensees and between licensees and other competitors—to "impose" buildout requirements or technical requirements on licensees to ensure that the spectrum is used to maximize consumer benefits. The Commission need not, should not, and ultimately cannot second-guess what those "market" requirements will be. As now-Supreme Court Justice Stephen Breyer has observed,

> ...*modesty* is desirable in one's approach to regulation. It should be painfully apparent that whatever problems one has with an unregulated status quo, the regulatory alternatives will also prove difficult. Before advocating the use of regulation, one must be quite clear that the unregulated market possesses serious defects for which regulation offers a cure.[94]

Finally, the Commission's suspicion of speculative activity is unwarranted because speculation assists the market in placing spectrum (in this case) in its highest-valued uses.

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[94] Stephen Breyer, Regulation and its Reform (1982), p.184.

B. The Costs of Spectrum Reclamation

The previous section described why the Commission can rely on market forces to allocate 39 GHz spectrum to its highest-valued uses, regardless of how the licensee initially acquired the spectrum. Thus, the Commission need not reclaim "idle" spectrum in order to permit an auction to perform this allocative function. It follows, therefore, that there is no need for the Commission to attempt to distinguish between "responsible" licensees and others. While there are unlikely to be any consumer benefits deriving from spectrum reclamation, there will be costs that the Commission should weigh before adopting a reclamation policy. First, in the short run, the prospect of spectrum reclamation may impair the ability of current licensees to supply or market their services. Second, in the long run, this policy could impair incentives for entrepreneurs to find ways of profitably using fallow spectrum or to invest in new ways to use spectrum resources. The policy would also reduce the proceeds from future auctions. Before discussing each of these issues in greater detail, a stylized description of the process of developing fallow spectrum may serve as a useful background for that discussion.

1. A Stylized Version of the Entrepreneurial Process

At the outset, an entrepreneur or entrepreneurs must develop at least the intuition that the fallow spectrum may in fact be profitably used. At this stage of the process, the entrepreneur may or may not sink substantial costs into verifying that intuition. Nonetheless, the entrepreneur's attention is directed towards that fallow spectrum by the prospect of future profits.

To determine whether or not the possible use of this spectrum is a "business," the spectrum developer begins to narrow the scope of uncertainty associated with costs and demand. To reduce uncertainty about costs, the entrepreneur makes expenditures to develop preliminary engineering plans and begins exploring alternative means of providing the anticipated uses. Part of this exploration may be to work with equipment manufacturers to determine whether the necessary equipment will be available at a "reasonable" cost. This effort clearly requires the