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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of

Request for Declaratory Ruling on Partial-Band Licensing of Earth Stations in the Fixed-Satellite Service that Share Terrestrial Spectrum	)	Docket No.
Petition for Rulemaking to set Loading Standards for Earth Stations in the Fixed-Satellite Service that Share Terrestrial Spectrum	)	RM No. 9649

OPPOSITION OF COMSAT CORPORATION

COMSAT Corporation
6560 Rock Spring Drive
Bethesda, Maryland 20817

Robert A. Mansbach
Its Attorney
301-214-3459

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Summary

The Fixed Wireless Coalition ("FWCC") requests the FCC to issue a declaratory ruling that an earth station in the FSS using spectrum shared with point-to-point terrestrial services may be licensed and coordinated only for the amount of spectrum for which it has demonstrated actual need, plus a 100% allowance that the earth station operator can keep in reserve. In addition, FWCC petitions the FCC to amend part 25 of its Rules, to require earth stations in the FSS to meet minimum loading requirements and to require all FSS earth stations to accept interference from new terrestrial facilities on the same basis as they accept any interference in the initial coordination.

COMSAT opposes FWCC's Petition and its Request for Declaratory Ruling. As set forth in detail in its Opposition, COMSAT believes that FWCC's proposals are counterproductive to efficient use of shared spectrum. Adopting unnecessary rules to place restrictive conditions on all types of earth station is inappropriate and unnecessary and would hinder growth, increase costs and decrease spectrum efficiency.

Contrary to FWCC's assertions, licensing of an FSS earth station for the entire allocated band is not a routine matter and is consistent with good spectrum utilization. Full band licensing is possible only when the applicant can demonstrate interference compatibility with existing Fixed Service (FS) stations over the entire band. Such full band interference compatibility is vital to enable good orbit spectrum utilization, which requires the satellite network operators to modify their earth station frequency assignments from time to time. For gateway earth stations and teleports, full band capability is also needed to accommodate capacity and connectivity growth.

FWCC incorrectly asserts that an earth station operator unfairly warehouses large amounts of spectrum when coordinating for full band operation. In fact, full band coordination of an earth station uplink band ensures that the FS operators will have the flexibility to modify and expand their frequency usage in their existing terrestrial systems. In other words, the benefits of flexible frequency band usage have been extended to both the Fixed

Service and Fixed Satellite Service operators whenever full band coordination has been achieved.

After an earth station has been licensed and activated, the ongoing coordination of that station should be accomplished in as consistent a manner as possible, a point that is made in the Petition. If there has been inconsistency sometimes regarding the acceptable level of interference into an earth station, the initial acceptance of a higher than normal level may have been a good faith effort to accommodate the FS applicant. This may have been done assuming that the "multiple entry" factor for multiple interfering sources would not be required due to the perceived unlikelihood of further interference cases on that frequency.

Finally, FWCC's allegations that earth station operators enjoy some sort of one-sided advantage over terrestrial operators is unsupported. The industry has a well-proven track record of administering workable coordination procedures. If there are any inconsistencies, as alleged by FWCC, these should be addressed in an industry forum, consistent with current practice.

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OPPOSITION OF COMSAT CORPORATION

COMSAT Corporation hereby files its Opposition in response to the Request for Declaratory Ruling ("Request") and Petition for Rulemaking ("Petition") filed by the Fixed Wireless Communications Coalition ("FWCC") in the above-captioned proceedings.

Introduction

In its Request and Petition, FWCC asks the Commission to place certain conditions and constraints on earth station operations in those frequency bands shared between the Fixed-Satellite Service ("FSS") and the terrestrial Fixed-

Service ("FS"). Specifically, FWCC asks the Commission to adopt rules to limit the bandwidth that an earth station operator can seek to coordinate with operators of terrestrial fixed point-to-point stations sharing the same spectrum allocation. FWCC requests the Commission to adopt rules requiring certification that at least 50% of the licensed bandwidth for an earth station is being used within 30 months after licensing or else the earth station's licensed bandwidth would be reduced. FWCC also asks the Commission to require all FSS earth stations to accept interference from new terrestrial facilities on the same basis as they accept any interference in the initial coordination.[1]

In support, FWCC claims that earth stations are permitted to "warehouse" huge amounts of unused bandwidth over unlimited azimuths, even if the spectrum is needed by terrestrial operators.[2] FWCC also alleges that current procedures and practices under Commission rules to coordinate and use shared spectrum favor satellite users. In this regard, FWCC implies that fixed terrestrial operators are required to use the spectrum efficiently

[1] Petition at 1 and at Appendix C at i and ii .
[2] Petition at 4.

whereas earth station operators do not have such requirements.[3]

In its Comments, COMSAT will show that grant of FWCC's Petition and Request would severely constrain the operations and growth of U.S. earth stations and work against efficient use of the allocated spectrum by satellite operators. FWCC's proposals are counterproductive to efficient use of shared spectrum and should not be adopted. As set forth in detail below, FWCC does not present a true picture of the sharing environment nor of the benefits of sharing to both terrestrial and satellite services. Therefore, its Petition and Request should be denied as contrary to the public interest.

I. Commission policies and practices for sharing have fostered growth.

Sound spectrum management dictates that inter-service sharing be promoted where feasible. Terrestrial microwave and satellite earth stations have successfully shared spectrum over the past 34 years for particular types of satellite and terrestrial operations.

[3] *Id.* at 3-5.

The ease or difficulty in implementing sharing arrangements varies, depending on the technology at the time and on the technical and operational characteristics of the stations being coordinated. Adopting unnecessary rules to place restrictive conditions on all types of earth station operations, as called for in the Petition, is not appropriate and would only serve to hinder growth, increase costs and decrease spectrum efficiency.

The Commission's sharing policies have fostered growth in the satellite industry and have permitted flexibility in the shared bands to adapt to changing market demands. At the same time, these policies have fostered competition in satellite services. FSS earth stations and high density terrestrial FS networks have coexisted in the shared allocations, with equal rights for both. This has worked exceedingly well ever since the advent of commercial satellite communications. Yet, in this Petition, FWCC asks the Commission to put constraints on the satellite communications industry without showing how the public interest would be served by such actions.

II. Commission policies have successfully accommodated a variety of earth stations in shared bands.

The number, types, and characteristics of earth stations operating in shared bands have changed over the years. The technical principles embodied in the Commission's rules for frequency coordination worked well in the 1960s when high capacity gateway earth stations sited in remote areas like Andover, Maine and Etam, West Virginia were constructed. The rules have withstood the test of time. Gateway earth stations and smaller "workhorse" stations continue to successfully use the shared allocations at 6/4 GHz and 11/14 GHz on a co-primary basis with terrestrial microwave networks. This is true not only in the United States, but is also the case around the world.

The coordination procedures developed and incorporated into the ITU International Radio Regulations ("Radio Regulations") and the Commission's Rules were specifically formulated to provide equal rights to the shared spectrum so that both satellite and terrestrial services could operate and grow without harmful radio interference. This arrangement has been successful and the rules proposed in

the Petition make no sense whatsoever for the large gateway earth stations. Indeed, left only with these types of earth stations, we doubt if FWCC would have filed its Petition.

However, both satellite and terrestrial services have changed over the years. Today there is a full range of earth stations from small installations with a single antenna to very large teleport facilities with a number of antennas. Operation may be in a single shared band or in multiple bands. On the other hand, cable television systems with numerous head-end earth stations support a major TV consumer market at 4 GHz. While this undoubtedly made coordination more difficult for FS stations, it also fostered a major U.S. industry in the 1970's and 1980's. Yet today, much of this service is accommodated in the satellite exclusive Ku-band allocations. Nonetheless, both the FSS and the FS have found it possible to coexist and prosper under the Commission's current rules.

Furthermore, migration from radio relay (FS) to fiber cable for long haul backbone terrestrial networks significantly relieved the sharing situation in the 1990's. This, in turn, encouraged growth of satellite teleport facilities located around major cities to satisfy demand

for both domestic and international communication services. These teleports require the entire bandwidth of the allocations and considerable freedom to access the geostationary arc in order to make them economically viable, since they must be able to operate with many satellites while providing a broad range of services.

The foregoing demonstrates the dynamic nature of the marketplace where advanced satellite technology and the changing use of the shared bands over the years have fostered a variety of new services. The same can be said about terrestrial fixed service operations. High-density backbone terrestrial radio networks are quite different today than in the past, generally using bandwidth efficient digital modulation techniques. The fixed service has shown itself able to provide point-to-point microwave links interconnecting multiple cellular hub-stations under the current FCC rules for frequency coordination.

Fixed Wireless Access Service ("FWA") also falls within the broad range of fixed services. The Commission has proposed that the FWA could operate in the 4 GHz band at

3650-3700 MHz and possibly displace the vital operations of earth stations in that band.[4]

COMSAT opposes any action that would displace FSS earth station operations in the 3650-3700 MHz band. Nonetheless, we have advocated that consideration be given to the possibility of developing sharing arrangements in the band between FSS and FWA taking into account the different characteristics of the stations involved.[5]

Historically, the Commission's policies have been designed to accommodate change; to promote efficient and flexible use of the spectrum; and to ensure that coordination arrangements are in place to permit stations to operate without harmful radio interference. Moreover, they have proven able to accommodate sweeping changes in delivery of services for the public benefit in their current form. FWCC's Petition is contrary to FCC policies which have worked well since their implementation.

One key element that made satellite and terrestrial sharing feasible, which is fundamental to sharing

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[4] *See* ET Docket No. 98-237.
[5] *See* Comments of COMSAT Corporation filed February 16, 1999 in ET Docket No. 98-237.

arrangements, is the cooperative spirit among operators to accommodate each other's special requirements to the extent possible. This is a critical part of the coordination process that is necessary to resolve potential harmful interference cases.

Agreements between operators can be reached on the means to mitigate interference and one or both parties may agree to accept particular operating limitations or to take other actions to mitigate the interference, such as providing artificial shielding. Both parties can generally accept operating restrictions, such as limitations in azimuth/elevation or frequency use, without incurring undue costs, and not sacrificing flexibility to the extent that the business case is undermined. This is what makes sharing work.

We realize that parties may differ over what is a sound business requirement for needed flexibility versus an attempt to "warehouse" spectrum. The line between warehousing spectrum and having sufficient spectrum for growth and operational flexibility is not always clear to operators sharing frequency bands. However, as we demonstrate below, there has been no attempt that we are

aware of to "warehouse" spectrum for FSS use, nor do the Commission's procedures provide for such results.

III. Gateway/Teleport earth stations need full band clearance.

Satellite and terrestrial operations have different needs. Commission policies have accommodated the changing nature of the operations within the shared bands. Today, as thirty years ago, it is sound business practice and good spectrum management to coordinate on a co-channel full band basis between high density gateway/teleport type earth stations and high density backbone terrestrial microwave networks. The principle then and now is that full band coordination permits both services to grow and operate within the allocated spectrum with sufficient bandwidth determined by market demand and the operational requirements of each service.

However, co-equal sharing between two different services, both allocated on a primary basis in the same frequency bands, does not mean that both have the same operational needs for frequency flexibility across the band. The two services are different and the same limitations and constraints do not equally apply to both services.

For good reasons, the Commission has not placed rigid loading requirements on earth station licenses that would restrict their opportunity to coordinate on a full band basis. A terrestrial fixed station site may not need full band flexibility, and therefore would not typically be equipped with transmit/receive capability to operate across a 500 MHz band. But a gateway/teleport type earth station, with multiple antennas and a full range of ground communication equipment, would need this bandwidth. It is needed to provide the operational flexibility to meet existing and changing marketplace demand and to accommodate changing space segment configurations.

Placing limitations on spectrum use, as suggested by FWCC, is neither good business practice nor sound spectrum management. Regulatory rules with limitations on spectrum use at these types of earth stations could result in having to find additional earth station sites for the growth bandwidth. This would result if the operator were not allowed to coordinate the full band and reach agreement through the coordination process on as much spectrum as feasible in the initial application.

The option of trying to find two or more sites for earth stations in the same general area, each with partial spectrum use, is neither economically feasible nor spectrum efficient. These gateway types of earth stations are generally in operation at these sites for 20 or more years. The projected demand justifying the construction of the earth station may not all materialize in the first 30 months of operation as would be required by the loading proposal in the Petition. We believe that the Commission's current practice of allowing full band coordination is sound and serves the public interest and should continue without new rules.[6]

IV. Current licensing and coordination procedures work well.

Section C of the Petition suggests that the present coordination and licensing procedures do not encourage earth station operators to make efficient use of spectrum.[7]

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[6] The Petition refers to alleged instances of inconsistent treatment of fixed stations during the ongoing coordination process after the earth station has been licensed. COMSAT agrees that earth station operators should coordinate with subsequent fixed service applicants in a consistent manner. Nevertheless, we believe that most of these shortcomings derive more from the lack of certain documented data than from a deliberate abuse of the coordination process. In any event, new Commission rules are not the answer to these kind of practical problems. We believe that the fixed and fixed-satellite operators can explore remedies to particular problems as part of the continuing efforts to improve the coordination process.

[7] Petition at 5.

This is simply not true. To begin with, the FCC earth station license application (Form 312) requires the applicant to declare the full particulars of the planned operation including the bands of operation for each RF carrier. Furthermore, the Commission's Rules state that "specific r.f. carrier frequencies within the authorized frequency band shall be selected by the licensee to avoid unacceptable levels of interference being caused to other earth, space, or terrestrial stations. Any coordination agreements, both domestic and international, concerning specific frequency usage constraints, including non-use of particular frequencies within the frequency bands listed in the station authorization, are considered to be conditions of the station authorization."[8]

It is true that the rules provide for flexibility in the choice of particular RF frequencies within the coordinated and authorized earth station operating band. That flexibility exists because earth stations normally require flexibility to accommodate changes in the international and domestic communications satellite environment (e.g., interference potential from new adjacent

[8] 47 C.F.R. Section 25.275.

satellites, changes in transponder frequency plans, replacement satellite transitions, etc.).

V. FSS earth station operators have no advantage over FS operators.

FWCC suggests that earth station operators enjoy some sort of one-sided advantage over FS operators in the frequency coordination procedures.[9] However, FWCC focuses only on the earth station receive bands, where the burden is naturally on the terrestrial applicant as the potential cause of interference into an earth station.[10] If one were to consider the corresponding scenario of an earth station applicant attempting to achieve coordination with existing terrestrial radio systems, one would see that the earth station applicants are faced with a similarly challenging task as was the experience of one of our customers.[11]

The assertion in the Petition that an earth station operator can break a coordination agreement with a terrestrial operator, preempting a coordinated frequency

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[9] Petition at 6.
[10] *Id.*
[11] Recently, one of COMSAT's customers was unable to coordinate an earth station in the Los Angeles area anywhere within the shared 11 GHz band, forcing a move, and consequent satellite reconfiguration, to the satellite exclusive allocation above 11.7 GHz.

from the terrestrial operator, is inconsistent with the provisions of Section 25.275 cited above.[12] In short, the notion that there is some sort of one-sided advantage for the earth station operator over the terrestrial FS operator does not hold water when one examines the FCC rules and considers the procedures for both the earth station uplink and downlink bands.

A. There are no inconsistent coordination criteria.

FWCC suggests that current procedures permit an earth station operator to apply inconsistent criteria in coordination.[13] This assertion is not supported by any citations in the coordination rules, and seems to be based upon some anecdotal experience. In reality, there are certain reference criteria which are used by the industry for coordination between satellite and terrestrial systems. They provide for both single entry and multiple entries of interference sources.[14] When an applicant agrees to accept a higher interference level - either single entry or multiple entry - than the one calculated using the reference criteria, then that acceptance is normally

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[12] Petition at 6.
[13] *Id.* at 7.
[14] *See* Section 25.251 of the Commission's Rules.

documented during the coordination process. It should then become part of the record for authorization.

In short, the procedures do not provide for inconsistent application of the coordination criteria. Nevertheless, in practice there may be instances when potential interference resolution comes down to a site survey where a building or some other obstacle may provide sufficient shielding. However, that fact may not be documented in a database to be taken into account in subsequent cases.

Moreover, the coordination difficulties that new applicants have with an operator of an existing station may be due in part to poor execution of procedures. For example, a potential interference victim may accept an interference level which is higher than the single entry criterion, assuming that the likelihood of multiple entries at that same frequency is extremely unlikely. If the potential victim is a new applicant, then that assumption is a dangerous one and should not entitle the new applicant from claiming subsequent protection at the single entry criterion.

However, the potential victim may be an existing earth station operator who accommodated a new terrestrial fixed applicant in a spirit of goodwill by accepting a higher level than called for by the standard single entry criterion. That operator should not be faulted for resorting to the standard single entry criterion with a subsequent applicant.

Finally, FWCC's proposal regarding the details of how consistency should be applied in the frequency coordination process is not appropriate for inclusion in the Commission rules.[15] COMSAT agrees that consistency in applying the procedures is important. However, the anecdotal information provided in the Petition does not justify new rules when the industry has a sound track record of administering workable coordination procedures. Clearly, consistency in the application of detailed analysis and the possible use of additional simplifying assumptions might be helpful in facilitating future coordination. However, any such inconsistencies, as mentioned in the petition, would be better addressed in an industry forum.[16]

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[15] Petition at 10-12.

[16] The National Spectrum Managers Association (NSMA) has been successful in adopting workable coordination procedures and the FWCC may wish to raise these issues in that forum.

VI. A declaratory ruling restricting an earth station's accessible bandwidth is unnecessary.

FWCC asks the FCC to issue a declaratory ruling that restricts earth stations using shared spectrum to bandwidth actually needed.[17] The declaratory ruling is not necessary or desirable.[18] FWCC's request that terrestrial system planners have access to shared frequencies that the earth stations are not using is already satisfied by the Commission rules.

Earth station applicants are already required to coordinate and accept whatever frequency band restrictions are necessary in order avoid unacceptable interference into or from terrestrial stations. Such restrictions become a condition of their license.[19] And, under the present coordination procedures, terrestrial operators can engineer-in fixed stations using directive antennas, selective siting for r.f. signal blockage, and other measures.

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[17] Petition at 8.
[18] *Id.* at 8.
[19] *See* Section 25.275 of the Commission's Rules.

The rigidity that would result from the suggested declaratory ruling to restrict earth station access to bandwidth would result in an untenable situation for U.S. earth stations. In particular, the gateway/teleport type earth station complexes would no longer be economically viable. The likely result of any general restriction on bandwidth would be a proliferation of low capacity earth stations to attempt to compensate for the inability of gateway and teleport earth stations to accommodate traffic growth.

Efforts to coordinate multiple earth station sites would lead, in turn, to increased coordination difficulties to both the FS and FSS system planners for no good reason. Such rigidity of frequency assignments to earth stations would make space segment connectivity reconfigurations nearly intractable. It would also make resolution of domestic and international inter-satellite system coordination problems much more difficult, if not impossible, in many cases.

The proposal of a 100% excess bandwidth assignment allowance does not begin to satisfy the needed satellite

frequency assignment flexibility.[20] Typical earth station carriers range from 0.5 to 36 MHz in occupied bandwidth. The proposed rule, if adopted, would result in a tuning flexibility only on the order of 1 MHz for the narrowest and 72 MHz for the widest in this range. Such small amounts of agility would make carrier frequency relocation difficult, since they frequently require shifts greater than 72 MHz.

This would have a chilling effect on efficient use of the shared bands by satellite operators. COMSAT was recently able to make some 72 MHz of bandwidth, an entire transponder, available on the INTELSAT satellite at 174E (186W) to accommodate service needs of one of our largest customers. This was only possible by extensive relocation of almost 35 carriers over a period of a few weeks. The FWCC Petition would have either precluded this, or required extensive earth station license modifications in a very short time. Moreover, on average, COMSAT, in cooperation with earth station owner operators, who are our customers, relocates some 200 carriers each year with the objective of making the most efficient use of the satellite resource. Thus, were the provisions of the FWCC Petition in place,

[20] Petition at 8.

the satellite operator, the earth station owner/operators and the Commission would all share a heavy, unnecessary and unwarranted burden. This is not conducive to efficient spectrum usage.

FWCC's proposal to require certification of the loading in each satellite r.f. carrier is also unnecessary, since efficient loading of satellite carriers is inherent in satellite capacity economics. The higher the transmitted bit rate, the higher the bandwidth and satellite power required, which in turn are the primary cost drivers for the satellite link. This is a marketplace driven incentive for satellite earth station operators to be spectrum efficient. Regulatory rules would be counter-productive. Further, the administrative and regulatory costs to the Commission and the industry to implement an unnecessary certification program would be large and wasteful.

Moreover, efficient use of the allocated frequency bands has been a hallmark of satellite communication system design for thirty years. This is primarily based on two technologies. The first is satellite antenna designs which illuminate only a portion of the visible earth with good

polarization isolation. The second is advances in satellite power amplifiers that increase the available EIRP. The first technique allows use of a given frequency at least six times. The impact of higher EIRP is to make bandwidth efficient digital modulation techniques practical. Today, operation of satellite communication links with as many as four information bits per transmitted bit is practical.

As stated above, the marketplace enters into the equation. Bandwidth and EIRP are what the satellite service provider sells; both provider and customer are well aware that achieving the desired service quality with satellite EIRP consistent with the occupied bandwidth is the most economical situation for both parties. For the FSS, technology advances and the marketplace have achieved efficient spectrum usage.

VII. Other issues

FWCC suggests that a wide variety of terrestrial microwave services in bands shared with Fixed-Satellite Services can be covered by a single set of rule changes. That suggestion simply is not practical because of the

differences between sharing constraints in FSS uplink and downlink bands, as well as substantial differences in the different terrestrial services in the seven listed frequency bands. For example, some of the services such as LMDS and BAS make use of antennas with little, if any directivity. Furthermore, the satellite services differ, with the higher bands listed being used not only for geostationary satellite links, but non-geostationary ones as well.

The description of terrestrial system loading requirements in the Petition is misleading, since Section 101.141 of the Commission's Rules refers to a requirement that excessively wide individual RF emissions are not to be tolerated. Furthermore, this requirement does not apply to all of the bands identified in the Petition. In the case of the Part 25 FSS requirements, such requirements have not been necessary. This is because the economic penalties of using excessively wide bandwidth carriers that are lightly loaded are too great. The relatively high cost of associated satellite power and bandwidth prohibits this type of operation for satellite systems.

The assertion that earth stations are routinely licensed for all azimuths at all elevations is simply

incorrect for most types of earth stations.[21] The range of azimuths and elevation for a typical earth station is limited to the on-station satellite service arc of interest. In the case of earth stations accessing the geostationary arc, there is a specific visible arc for which coordination is attempted. Review of a number of licenses for COMSAT earth stations shows that none of them permits operation outside of the azimuths and elevation angles to specific satellites, or to a specific portion of the geostationary arc. Moreover, these licenses do not permit operation over the full allocated bands.

For earth stations operating to non-geostationary satellites, the range of azimuths and elevations to be coordinated depends upon the orbits of the satellite constellation to be accessed and are not necessarily widely dispersed (e.g., for repeating ground track orbits). There are a few Tracking, Telemetry, Control, and Monitoring (TTC&M) earth stations[22] which are, in fact, coordinated for all directions down to 5 degrees elevation. This enables these stations to support necessary transmission of commands

[21] *Id.* at 4.

[22] Some of the earliest COMSAT stations constructed in the 1960's were required to serve that role for the embryonic INTELSAT system of that time and were sited in remote locations to enable the necessary frequency coordination for all azimuths.

and reception of telemetry in transfer orbit, or, in the case of a non-geostationary constellation TTC&M station, to support on station operations.

Conclusion

For the reasons discussed above, the Commission should deny the Request and dismiss the Petition. The proposed rule changes to Part 25 of the Commission rules are not necessary and would increase the cost of satellite communications while decreasing the flexibility of satellite and terrestrial operations to efficiently share spectrum.

Respectfully submitted,
COMSAT Corporation

By _____
Robert A. Mansbach
Its Attorney

6560 Rock Spring Drive
Bethesda, MD 20817

301-214-3459

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