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Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

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MAY 6 - 1997

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of	)	
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Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz, and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band, Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations	)	IB Docket No. 97-95 RM-8811

To: The Commission

MOTION TO ACCEPT FOR LATE FILING

Advanced Radio Telecom Corp. ("ART"), by its attorneys, respectfully requests that the Commission accept the late filing of its Comments in the above-captioned Rulemaking proceeding. In support of its position, ART shows the following:

ART had prepared a draft set of Comments to be filed in response to the Commission's Notice of Proposed Rulemaking in the above-captioned matter well in advance of the comment filing deadline[1]. Following the internal circulation of the draft Comments, however, the Company

[1] The above-captioned Notice of Proposed Rulemaking was published in the *Federal Register* on April 4, 1997. In accord with the Commission's Rules, the deadline for the filing of Comments was May 5, 1997.

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List A B C D E

determined that substantial revisions were required. Although ART attempted to make the revisions in a timely manner -- due mechanical difficulties -- the Company was unable to complete the necessary revisions prior to the closing of the Commission Secretary's office on May 5, 1997. ART has since been able to resolve the mechanical difficulties, and finalize its Comments. Accordingly, ART respectfully requests Commission approval to late-file its Comments, thereby allowing ART to present its position to the Commission.

As a licensee in the 38 GHz frequency band, the Commission's decision in the above-captioned rulemaking proceeding will clearly have an effect upon ART. Therefore, grant of the instant request would provide ART with the opportunity to be fairly represented in the above-captioned matter. Furthermore, the public interest would be served by enabling ART to clarify the relevant matters, facts, and legal considerations, in order to facilitate the Commission's decision[2]. Accordingly, in the interest of creating a full and complete record upon which the Commission may consider the issues in the above-captioned rulemaking proceeding, ART respectfully requests that the Commission allow it to late-file its Comments in the instant matter.

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[2] ART respectfully submits that Commission acceptance of its late-filed Comments within twenty-four (24) hours of the comment filing deadline would cause no harm to the public; rather such action would instead facilitate the creation of a full and complete record in this proceeding.

Conclusion

For all the foregoing reasons, ART respectfully requests that the Commission accept and consider its Comments in the above-captioned Rulemaking proceeding.

Respectfully submitted,
ADVANCED RADIO TELECOM CORP.

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Its Attorneys

Dated: May 6, 1997

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COMMENTS OF ADVANCED RADIO TELECOM CORP.

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EXECUTIVE SUMMARY

Advanced Radio Telecom Corp. ("ART") is one of the pioneers and among the largest operators of millimetric microwave services in the 38 GHz band. As such it has an interest in insuring that the Commission moves forward expeditiously to allocate sufficient spectrum for completion of its business plan and that of other 38 GHz licensees. ART supports the general approach of the Commission as set forth in the Notice of Proposed Rulemaking ("NPRM"), with some modifications as noted in the text of the following comments.

The foundation principles of the NPRM are sound and should be implemented. Most important among these principles is the recognition that the terrestrial fixed service ("FS") and the satellite services ("FSS") cannot share spectrum without causing unacceptable interference and must, therefore, have their own separate spectrum. This is particularly important for the terrestrial FS as it precedes to implement advanced systems.

The 38 GHz service is one of the Commission's real success stories. Among the best decisions the Commission made was to assign licenses on an area-wide or footprint basis. This enables the licensees to meet one of the basic needs of their business customers and carrier customers – quick deployment. Rapid deployment requires that the 38 GHz licensee be able to self-coordinate and design its system in advance of orders so that wherever it is called upon to deploy within its license area it can be assured that it can find available frequencies and do so quickly. This requirement in turns requires that the 38 GHz licensee not have to be concerned

with coordinating with satellite systems, even assuming that such coordination could be accomplished without unduly constricting one or both services.

In any event, it unlikely that interference between FS and FSS systems assigned to the same spectrum can be avoided. The reasons for this are amply stated in the Ad Hoc Millimeter Wave Committee Report, which is part of the US preparation for the 1997 WRC in Geneva in the Fall. One of the solutions advanced to facilitate sharing is the use by FS systems of automatic transmitter power controls ("ATPC"). There are a number of reasons why ATPC is not a viable solution, including the fact such systems do not now exist and that they promise to be expensive and difficult to install particularly given the increasing size of the installed base of equipment without ATPC.

ART does not oppose principle the "underlay" plan to allow some spectrum to be used for services other than the primary service, but suggests that additional information concerning what the Commission has in mind is necessary before any decisions can be made conceding the viability and utility of underlay allocations.

ART anticipates that the private sector, with cooperation from ART and other 38 GHz licensees and equipment manufactures, will continue its inter-industry discussions and will advance alternative band plans to the Commission. One or more of these may have advantages over the NPRM's plan and ART remains open to consideration of these plans.

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Allocation of Spectrum to Upgrade Fixed	)	
and Mobile Allocations in the 40.5-42.5 GHz	)	
Frequency Band, Allocation of Spectrum	)	
in the 46.9-47.0 GHz Frequency Band for	)	
Wireless Services; and Allocation of	)	
Spectrum in the 37.0-38.0 GHz and	)	
40.0-40.5 GHz for Government Operations	)	

To: The Commission

COMMENTS OF ADVANCED RADIO TELECOM CORP.

Advanced Radio Telecom Corp. ("ART"), by and through its attorneys, respectfully submits its Comments in the above-captioned notice-and-comment rulemaking proceeding, pursuant to the Notice of Proposed Rulemaking ("NPRM") released March 24, 1997. In this NPRM, the Commission proposes to make certain changes to the allocation of radio spectrum between 36.0 and 51.4 GHz, which encompasses the frequency bands in which ART holds, manages or has a right to use 245 radio licenses, has implemented service and is serving the public. Accordingly, ART desires to assist the Commission in taking the actions that best serve the public interest

and hereby offers its initial views on the changes proposed by the Commission in this proceeding.

I. ART'S Interest In This Proceeding

ART is a pioneer in the 38 GHz service and is one of the largest operators. ART currently owns, manages or has a right to use 245 licenses issued by the Commission to provide radio microwave services in the 38 GHz radio band in 169 market areas throughout the United States. ART provides "last mile" connectivity for other service providers and business customers over fixed wireless broadband, high speed digital telecommunications circuits. ART's current customer base is comprised primarily of other services providers, such as fiber-based competitive access providers (CAPs), competitive local exchange carriers (CLECs), Personal Communications Service (PCS) providers, cellular service providers (CSPs), long distance carriers (IXCs) and local exchange carriers (LECs).

II. The High-Density, Terrestrial Fixed Broadband Service Industry is One of the Commission's Significant Successes

The 38 GHz broadband industry is one of the Commission's great success stories. Among the keys to the industry's success is the wide-area or footprint licensing, and the flexibility of the Commission's Rules. Over 800 terrestrial fixed service system authorizations have been issued by the Commission over the last several years, and are or soon will be in operation, utilizing one or more paired 50 MHz channels in the 38.6 - 40.0

GHz ("38 GHz") frequency band. These systems are area-licensed to serve a contiguous geographic region up to about 160 x 160 kilometers (and in some cases, a far larger area). The ability of the 38 GHz licensees to install new facilities within their licensed areas without obtaining additional Commission approval has enabled the industry to, for the first time, satisfy the public's need for rapid installation of facilities.

The licensed systems are providing their customers with a full range of digital local broadband voice, data and video distribution services (including mobile network backhaul) and can be readily interconnected with national and international networks. The data rates currently available on existing systems, using the capacity provided through a *single* paired 50 MHz forward and return channel, range from a single DS-1 (1.544 MB/s) up to DS-3 (44.736 MB/s), with effective isotropic radiated power ("EIRP") levels as high as 31 dBW over path lengths that can range up to about 7 kilometers. As such, these systems provide services comparable to and compatible with fiber optic networks.

According to manufacturer estimates and other sources, in addition to the substantial deployments and pending equipment orders in the United States, there are as many as 50,000 links currently operating in the 37.0 - 40.5 GHz band in Europe and other nations around the world.

Although the current 38 GHz systems satisfy a substantial unmet demand, the full potential of 38 GHz has yet to be realized. Substantial advances in bandwidth compression promise to substantially increase capacity and to make the systems much more spectrally efficient. Indeed, current development plans forecast data rates as high as 310 MB/s in the near term.

A more significant advancement, however, will be the migration of the current systems to multiple point-to-point and point-to-multipoint architectures. Such architectures will be critical to the ultimate competitive success of the 38 GHz industry because such architectures will allow the systems to further reduce the deployment times and costs achievable today. In a point-to-multipoint architecture, the operator need only install the customer receive equipment when a new customer desires service, reducing the deployment time dramatically and reducing the customer cost by spreading the cost of the single hub site across many customers[1]. These narrow-sectored hub and other advanced system architectures will allow the provision of services in increasingly dense coverage configurations throughout the currently authorized service areas.

[1] Certain changes in existing Commission rules will be necessary to fully implement these planned architectures, and ART intends to file the necessary revision requests in the near future.

III. Band Segmentation Best Serves the Public Interest

In proposing the allocation of additional spectrum for the Fixed Satellite Service ("FSS") and the identification of discrete, separate frequency bands for terrestrial and satellite services in the 36.0 to 51.4 GHz spectrum,[2] the Commission recognizes that spectrum sharing between high-density deployments of terrestrial fixed and satellite fixed services in the same geographic areas is not practical, and would work to the detriment of both types of service. ART and other providers of terrestrial broadband service at 38 GHz have demonstrated repeatedly – particularly in the Ad Hoc M/W group noted in the NPRM – that sharing is not feasible. As discussed more fully below, a segmentation approach best serves the public interest by maximizing the utilization of the spectrum dedicated to each service and facilitating the commercial viability of each service.

Forcing high-density terrestrial and satellite services to share common spectrum in the same geographic areas will result in interference by each service into the other. Such interference will be nearly impossible to avoid and would require impractical, or unduly expensive, methods to mitigate. Without burdening the record here by reiterating at length the voluminous arguments and supporting documentation offered by the 38 GHz terrestrial industry to demonstrate the unfeasibility of sharing, ART instead summarizes the key points below and requests that the Commission take official notice in this

proceeding of the March, 1997 Report of the Ad Hoc M/W Committee[3] and the documentary record developed in the Committee to date.

First, the key to the success of the broadband FS industry at 38 GHz is the ability to deploy its service on demand, rather than guess at the probable location of its customers. Deployment of facilities on demand, however, requires that the service provider be able to coordinate its frequencies within days is not hours. Self-coordination by the 38 GHz FS industry is the greatest single factor making this possible. Indeed, self-coordination is the essence of the Commission's geographic licensing plan for 38 GHz FS. The imposition of spectrum sharing between high-density FS and satellite deployments would prevent the requisite quick coordination, thereby undermining the Commission's licensing plan and thwarting the benefits gained from self-coordination.

Second, sharing would create interference from each service into the other, which would be nearly impossible to avoid and would require impractical, or unduly expensive, methods to mitigate:

- Significant interference would be experienced between FS equipment and FSS ground stations deployed in geographically contiguous areas. Indeed, the occurrence of such interference is acknowledged by Motorola Satellite Systems (Motorola) in its application for the "M-Star" system. (*See,* Motorola M-Star Application).

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[2] ART recognizes that the segmentation proposed by the Commission is not total, inasmuch as the NPRM poses a novel "underlay" scheme for terrestrial services in the bands designated primarily for satellite services. ART discusses this proposal below.

[3] *See,* Report of the Ad Hoc Millimeter Wave Group on U.S. Proposals for Agenda Item 1.9.6 of WRC-97 (dated March 5, 1997).

- Significant interference would also occur between FSS space stations and FS equipment. This potential for this interference similarly is acknowledged by satellite system proponents. (*See,* Motorola M-Star Application).

What are viewed, in at least some circles, as the generally satisfactory results of FS-FSS frequency band sharing through coordination, first in the 4/6 GHz bands and then in the 11/14 GHz bands in some administrations, stimulated proposals to extend sharing to ever higher frequency bands and to other satellite services. This led to the existing co-primary FS allocations of the major radiocommunication bands up to 275 GHz. However, it was the unanimous view of the parties advocating segmentation in the Ad Hoc Millimeter Wave Committee ("Ad Hoc M/W Committee") that the FS-FSS sharing solutions proposed to date cannot be advantageously used in the 38 GHz band as they were in the lower shared bands.

A. Frequency Coordination is Not Workable

It has been suggested that the FS into FSS ground station interference could be cured by geographic separation and frequency coordination of the FS and FSS ground sites. Such frequency coordination, however, would be extremely difficult, expensive and time-consuming, in light of the high-density deployments being increasingly experienced in FS. Under such a scenario, the ability for rapid, cost effective deployment would suffer a catastrophic blow, eviscerating the essence of the Commission's geographic licensing plan for 38 GHz FS.

As stated in the Ad/Hoc M/W Committee Report[4]:

> Frequency band sharing through coordination makes use of geographical and frequency separation, site selection and in some cases also shielding. In the 4/6 GHz and 11/14 GHz bands the intra-service and inter-service distances between adjacent stations typically range from several kilometers to tens and hundreds of kilometers, which is in most cases sufficiently large to allow effective sharing through coordination. In the 39/49 GHz bands, by contrast, operational and economical viability requires high-density deployment of both FS and FSS, primarily in urban and suburban business areas -- often at the same customer locations. High-density FS and FSS deployment has become technically feasible through the development of compact and cost efficient radios, through the use of the smaller antennas that can be readily utilized in the millimeter wave bands, and through shorter frequency reuse distances due to the propagation conditions in these bands. These conditions allow large numbers of FS and FSS user terminals to be easily mounted on rooftops and building sides throughout a service area at very high geographic densities.

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[4] *See,* Report of the Ad Hoc Millimeter Wave Group on U.S. Proposals for Agenda Item 1.9.6 of WRC-97 (dated March 5, 1997) at page .

The high concentrations of potential FS and FSS subscribers in tall buildings and in other dense deployment situations require comparatively short intra-service and inter-service station spacings in the 38 GHz band, ranging from a few meters to a few tens of meters between stations mounted on the same building, and from a few tens to hundreds of meters between stations on adjacent buildings or in adjacent blocks. This is orders of magnitude shorter than the calculated 39/49 GHz bands interservice coordination and separation distances on the order of 30 - 40 km, and as much as about 97 km, presented in a static-case interference analysis presented in Document USWP 4-9S/23 Rev.1. Co-frequency sharing under these conditions would therefore clearly impose operationally and economically unacceptable deployment restrictions on either one or both services. In addition, contrary to the sharing conditions in the 4/6 GHz and 11/14 GHz bands, where site selection and shielding, as well as frequency separation, greatly facilitate band sharing, these measures are grossly ineffective in the 39/49 GHz bands for the following reasons.

The applicability of site selection and shielding to reduce the necessary inter-service separation distances by avoiding line-of-sight exposure is severely limited by the overriding need of both services to assure line-of-sight subscriber connectivity that enables service provisioning in the first place. Since the latter necessarily prevails in the characterization of service deployment requirements, station siting on rooftops of tall buildings or high up on building sides is a predominant deployment condition because it maximizes the number of potential subscribers within line-of-sight. All of the above-stated deployment factors combine to result in required interservice separation distances that will prevent either one or both services from achieving their attainable deployment potential if co-frequency sharing is imposed. The effectiveness of inter-service frequency separation within the shared band is also greatly reduced due to the wider channel bandwidths of many of the proposed FSS system deployments, as compared to the FS channel bandwidths that are typically employed. This exhausts the possibilities of establishing mutually tolerable sharing conditions at deployment levels that make both services operationally and economically justifiable.

It has been proffered that a 1 km zone of interference for FSS earth stations would solve the interference problem. ART believes, however, that such a "localized secondary status" for FSS earth stations would be unacceptable to some commercial satellite

operators and sources of financing for those systems. Furthermore, in addition to considerable doubt that such an approach could be effectively implemented, it is likely that the actual distances that would result from a reasonable use of automatic transmitter power controls ("ATPC"), if they were to be implemented despite their drawbacks discussed below, would be measured in the tens of kilometers. This would either defeat this exclusion zone solution, or require FSS operators to accept interference from a much larger radius than 1 kilometer.

B. Power Controls Do Not Afford a Viable Solution

The FS power controls proposed as a solution to this interference dilemma also are not a viable solution. Equipment manufacturers confirm that power-controlled equipment does not now exist, and thus the installed base equipment does not employ power control. To the degree dynamic controls could be made available, they would be expensive and difficult to install and operate, again undermining the key competitive strength of the 38 GHz FS industry.

The application of ATPC would require a drastic redesign of the fixed service in the 38 GHz band. Such a solution, at least as advanced by Motorola, would require a new FS EIRP density limit approximately 44 dB below current operating levels, and would rely heavily on the use of FS ATPC at levels between about 40 - 50 dB.

TIA/EIA Telecommunications System Bulletin TSB10-F ("TIA Bulletin 10") specifically states that further study of the use of ATPC above 12 GHz is warranted and that, regardless of this need for study, serious problems with the use of ATPC in these bands exist. Additionally, the National Spectrum Managers Association has recommended against the use of ATPC in bands above 30 GHz.

And, contrary to the assertions of sharing proponents, there would be no overall cost savings to FS providers from ATPC. As documented by leading microwave equipment manufacturers, the use of ATPC as proposed would require substantial and expensive research and development efforts and a conservatively estimated 30-50% increase in equipment costs.

Implementation of ATPC would also necessitate the use of monitoring equipment at both transmit and receive sites, as well as the addition of other expensive radio components. All of these modifications would add failure points to FS systems that would reduce rather than increase mean-time between failures. The equipment in use today – equipment without power control – has proven to be highly reliable in the field, which is a critical factor to customer acceptance. In practice, the predominant system availability limiting factor is rain attenuation, which can be readily dealt with by careful attention to path length in the deployment process. The use of ATPC would do nothing to improve the reliability of FS implementations, but could, in fact, degrade them in several key performance and availability respects.

ATPC implementation would also require the massive replacement of equipment in a number of countries. There are substantial FS operations in the 38.6 - 40.0 GHz band in more than 150 cities in the United States. Furthermore, there are thousands of 37/39 GHz FS links operating in the U.K. and Germany, with the U.K. rapidly approaching a full saturation point. Additionally, a number of other nations are in various stages of licensing the deployment of additional 37/39 GHz systems. In fact, the demand for equipment in these bands is so high that equipment manufacturers are experiencing a significant backlog in the production of the radios required for current deployment commitments. Based on customer contracts and other evidence of service demand, it is safe to assume that, by the year 2000, there will be at least 100,000 37/39 GHz links installed in the United States, and at least as many outside the United States.

Furthermore, ATPC will not preclude interference from FS stations into FSS earth station receivers, nor will it play any substantial role in avoiding intraservice FS interference. In fact, the ATPC proposed by Motorola would likely increase intraservice and interservice interference as a result of uncorrelated rain fading events (*i.e.,* instances where the intended receiver is under rain conditions and victim receivers are not) into victim (unintended) FS receivers and victim FSS earth stations on the order of 50 dB above desired receive levels).

C. 38 GHz FS Operations Are Using Elevation Angles That Would Increase the Likelihood of Interference With FSS Space Stations

It is a central element of ART's business planning and operations that operation elevations up to 40 degrees (or perhaps more) are required for some FS installations and are preferred for many installations to increase spectrum reuse by avoiding horizontal radiation[5]. ART has substantial concern over the potential interference particularly into these higher elevation paths from non-geostationary systems with higher density transmissions than proposed by Motorola for its M-Star System (particularly systems that are actually designed to meet the high availability objectives that are evident in the wireless broadband services market). There are also similar concerns over the prospect of interference into the FS from the low-elevation emissions of geostationary FSS systems (particularly foreign and international systems).

D. Band Segmentation is the Appropriate Solution

Establishing new exclusive FS and FSS allocations within the existing co-primary allocations, particularly in the 37.5 - 40.5 GHz and 47.2 - 50.2 GHz bands, would allow both services to be deployed by administrations to their full potential in terms of subscriber density, system capacity, service quality, cost effectiveness and spectral

[5] In some instances, ART is designing links that would operate from a series of one- or two-story buildings to a high-rise commercial building, in order to avoid horizontal paths that would extend the length traveled by the signals and thus reduce the ability to reuse the same channel.

efficiency, by allowing each service to independently optimize the multiple trade-offs between coverage density, service quality, cost effectiveness and spectral efficiency. While this solution does reduce the actual amount of spectrum available to both the fixed service and the fixed satellite service, it effectively increases resulting system capacities and minimizes disruption to the directly affected services, as well as to services allocated in other bands above 30 GHz.

ART expects that the preponderance of the comments will reach a similar conclusion that band segmentation better serves the public interest and the interests of the FS and FSS communities than forcing unworkable sharing solutions on these services. ART also anticipates that there will be varying and creative views among the advocates of band segmentation as to the precise shape that segmentation should take and the bands that should be allocated for the various services. Indeed, ART expects that the creativity of the private sector may identify alternative plans that offer even greater flexibility, clarity, security and spectral resources for involved services than the Commission's proposal. Accordingly, ART believes that most appropriate and useful assistance it can provide the Commission in reaching a final decision in this matter will be to provide, in the reply round, a single document that that analyzes, compares and contrasts the proposed alternatives.

It is important to note at this stage, however, one apparent benefit of the band plan proposed by the Commission. Under the current U.S. allocation arrangement from 36.0 to

51.4 GHz, FSS is allocated 4.0 GHz for uplinks but only 1.9 GHz for downlinks, and only *500 MHz* of the total is not shared with terrestrial services. FS is allocated a total of 9.2 GHz of spectrum on a primary basis, but *6.4 GHz* is shared with the satellite services. Under the band plan proposed by the Commission, FSS will be allocated an equal amount of spectrum for uplink and downlink, 2 GHz each, for a total of 4 GHz – *and none of this spectrum would be shared with terrestrial services* (except through underlay). FS would be allocated less spectrum overall on a primary basis - 7.8 GHz - but importantly only 1 GHz of this will be shared with satellite services. Even though FS would be allocated less spectrum, its overall useable spectrum would be increased. As discussed above, the absence of sharing in these services would allow both services to utilize their allocated spectrum much more efficiently. Creative approaches to segmentation that are likely to be offered by the private sector may find ways to designate even greater amounts of spectrum to these services, perhaps even to accommodate the 2 x 3 GHz spectrum request of M-Star type systems, which ART would not oppose provided its own spectrum needs are similarly protected.

IV. The Underlay Approach Requires Clarification

In paragraphs 23 and 24 of the Commission's NPRM, the Commission has proposed a novel allocation scheme that would designate certain bands where FSS is the primary use for a second use, on an underlay basis "in a manner that would not interfere

with the predominant use."[6] In general, ART favors approaches that maximize flexibility to develop spectrum for terrestrial uses in addition to other uses, provided that sharing does not undermine the feasibility of any sharing service. One such possible approach is the "underlay" concept proposed by the Commission. Before a final assessment can be made regarding the feasibility of this approach, however, certain clarifications of the rights and responsibilities attending designation as an "underlay" service are necessary.

- Is designation as an underlay service a new allocation somewhere between a primary and secondary allocation?
- What elements of a primary allocation does this designation include?
- How do "first in time, first in right" rules apply to underlay services?
- What obligations does a later primary designated service have to the economic integrity of an earlier implemented underlay service?
- Indeed, can an underlay service even be implemented before the primary service is implemented -- *i.e.,* can something be underlayed under something that doesn't yet exist?

[6] *See,* Notice of Proposed Rulemaking in IB Docket No. 97-95, RM-8811 (released March 24, 1997), at Paragraphs 23 and 24.

V. Conclusion

For all of the foregoing reasons, ART believes that the Commission is on the right track to finding a long-term solution to the sharing issues that currently affect the bands in which ART operates, or desires to operate, and to solving these problems for other valuable services that are likely to be implemented in the future, both terrestrially and from space. The facilitation of the licensing, construction and long-term success of all of these services is in the public interest.

Respectfully submitted,
ADVANCED RADIO TELECOM CORP.

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Dated: May 6, 1997