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Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

Federal Communications Commission  
Office of Secretary

In re Application of )  
Iridium LLC )  
For Authority to Launch and )  
Operate the MACROCELL )  
Mobile Satellite System in the )  
2 GHz and 28 GHz Bands )

File No.: 187-SAT-P/LA-97

Received

JAN - 6 1998

Satellite Policy Branch  
International Bureau

PETITION TO DENY

Hughes Communications Galaxy, Inc. ("HCG") petitions the Commission to deny the application of Iridium LLC ("Iridium") for authority to launch and operate the MACROCELL Mobile Satellite System in the 2 GHz and 28 GHz bands (the "MACROCELL Application"). HCG has an interest in this proceeding as the licensee of the Spaceway satellite system ("Spaceway"),<sup>1</sup> which will experience harmful interference from the proposed MACROCELL system.

Iridium's MACROCELL Application must be denied because it is fundamentally inconsistent with the 28 GHz Band Plan fashioned by the Commission less than 18 months ago and endorsed by representatives from across the satellite industry, including Iridium's affiliate, Motorola.<sup>2</sup> Rather than proposing a satellite system that is consistent with the 28 GHz Band Plan, Iridium seeks a waiver from one of the essential components of the plan. Namely, Iridium seeks an exemption from the requirement, codified at 47 CFR §25.258(c), that its proposed system employ repeating ground tracks to minimize interference into GSO FSS spacecraft from

<sup>1</sup> See Hughes Communications Galaxy, DA-97-971 (released May 9, 1997) (corrected by Erratum released July 29, 1997).

<sup>2</sup> Motorola Inc., which together with its affiliates is the owner of a 19.6% membership interest in Iridium, was an active participant in the rulemaking process that led to the 28 GHz Band Plan. See Consolidated Reply of Motorola, CC Docket No. 92-297 (filed November 4, 1996) at 1.

its feeder links in the 29.25-29.5 GHz band. The waiver request is, essentially, an attempted end-run around those provisions of the 28 GHz Band Plan that Iridium finds unacceptable. There is no good cause, much less any cause, to grant this waiver and undermine one of the very important foundations of the 28 GHz Band Plan. Moreover, Iridium's proposed system *will cause harmful interference to HCG's licensed Spaceway system*. The Iridium analysis does not, as it is required to do, demonstrate the feasibility of co-existing with GSO FSS systems already licensed in the band, let alone demonstrate that it will not preclude the subsequent entry of additional GSO FSS systems into the band. For these reasons, Iridium's MACROCELL Application must be denied.

**I. Grant of The MACROCELL Application Would Jeopardize the 28 GHz Band Plan**

After more than three years of careful deliberations between the Commission and a broad segment of industry, the 28 GHz Band Plan was adopted. Each portion of that plan represents a precise, calculated arrangement arrived at after lengthy negotiations among all interested parties. Iridium, in its MACROCELL Application, disregards not only the substance of the 28 GHz Band Plan, but also the conciliatory balance achieved by the plan.

The 29.25-29.5 GHz portion of the band within which Iridium seeks to operate its MACROCELL feeder uplinks was the subject of a delicate compromise crafted by and between the Commission, NGSO MSS systems, and GSO FSS systems. The Commission originally proposed a "first-come, first-served" solution for NGSO MSS and GSO FSS access to this part of the band, but, as Hughes, TRW and other GSO FSS interests unequivocally demonstrated, that solution provided no basis for equitable access to the band by multiple satellite systems.<sup>3</sup> Moreover, the "first-come, first-served" solution would effectively permit Iridium's first

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<sup>3</sup> See Comments of HCG, CC Docket No. 92-297 (filed Sept. 7, 1996) at 11-18; Comments of GE American Communications, CC Docket No. 92-297 (filed Sept. 7, 1996); Comments of TRW, CC Docket No. 92-297 (filed Sept. 7, 1996) at 18.

generation NGSO MSS system to preclude GSO FSS operations in large geographic areas.<sup>4</sup> Realizing the inequity inherent in this approach, the Commission rejected a “first-come, first-served” solution.

For months thereafter, NGSO MSS and GSO FSS interests considered and rejected numerous sharing arrangements. The primary obstacle hindering agreement in the 29.1-29.5 GHz band segment involved the existence of substantial signal interference when NGSO MSS feeder link earth stations operate in the same frequency band as GSO FSS systems. Because of such interference, Motorola steadfastly insisted that the Iridium system could not share with any of the dozen GSO FSS systems that had been proposed.<sup>5</sup> The Commission called a series of meetings to bring closure to these sharing issues, and Motorola actively participated in those meetings. As a result of those meetings, months of careful deliberation, and Motorola’s unwillingness to share, the following solution was reached: the NGSO MSS system feeder link band would be separated into two parts: (i) one part for NGSO MSS system types, such as the Iridium system, that are not designed to share with the GSO FSS, and (ii) one part for NGSO MSS system types (such as TRW’s Odyssey) that can share with the GSO FSS. Moreover, in order to facilitate sharing, certain conditions that are intended to minimize or regularize events of interference were agreed to, thus allowing affected parties to make appropriate adjustments to their systems to facilitate sharing. The parties who developed these criteria supplemented the record with additional analyses of the terms and conditions under which this solution was feasible.<sup>6</sup>

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<sup>4</sup> See Comments of HCG, CC Docket No. 92-297 (filed Sept. 7, 1996) at 14-15.

<sup>5</sup> See, e.g., June 5, 1996 HCG, AT&T, GE American and Motorola Ex Parte Presentation, CC Docket No. 92-297; see also materials distributed by the FCC at February 16, 1996 status conference in CC Docket No. 92-297 (determining that no band sharing between Motorola’s Iridium and the GSO FSS is possible; announcing the sharing principles agreed to between TRW’s Odyssey and the GSO FSS).

<sup>6</sup> See HCG Ex Parte Presentation, CC Docket No. 92-297 (filed February 6, 1996); TRW Ex Parte Presentation, CC Docket No. 92-297 (filed June 3, 1996); GE American Communications Ex Parte Presentation, CC Docket No. 92-297 (filed February 8, 1996); HCG Ex Parte Presentation, CC Docket No. 92-297 (filed February 26, 1996); FCC Ex Parte Presentation, CC Docket No. 92-297 (filed January 19, 1996); FCC Ex Parte Presentation, CC Docket No. 92-297 (filed February 5, 1996).

Finally, in June 1996, representatives from various sectors of the satellite industry, including Motorola, endorsed in writing the 28 GHz Band Plan proposed in the Third Notice of Proposed Rulemaking, "*as supplemented by the interservice sharing rules that have been agreed to subsequently.*"<sup>7</sup> The Commission faithfully reflected the terms of this industry-wide solution in the 28 GHz service rules it has adopted. These conditions include the use of repeating ground tracks by NGSO MSS systems at 29.25-29.5 GHz, as reflected in section §25.258 of the Commission's Rules.

Iridium's MACROCELL Application conveniently ignores this negotiating history and effectively ignores the 28 GHz Band Plan by seeking to utilize the entire 29.1-29.5 GHz band segment when Iridium is entitled to utilize only the portion of the band segment that is reserved for NGSO MSS system types that are not able to share with the GSO FSS -- the 29.1-29.25 GHz band segment. As set forth below, Iridium knowingly proposes a system that will cause harmful interference to GSO FSS systems operating in the 29.25-29.5 GHz band, and thereby threatens to negate part of the very purpose of the 28 GHz Band Plan. The MACROCELL Application must be denied because it jeopardizes the entire 28 GHz Band Plan.

### **III. Iridium's Technical Showing Fails**

Iridium's MACROCELL Application also should be denied because it fails to comply with Section 25.258(d) of the Commission's Rules, which provides that "NGSO MSS systems applying to use the 29.25-29.5 GHz band, for feeder link earth station uplink, will have to demonstrate that their system can share with the authorized U.S. GSO/FSS systems operating in this band." Iridium's claim that the MACROCELL system can share the 29.25-29.5 GHz band with GSO FSS systems without causing harmful interference simply is not supported by its technical data. As described in HCG's technical analysis, attached as Exhibit A, MACROCELL

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<sup>7</sup> See Letter from Cellular Vision USA, Inc., AT&T, HCG, Teledesic Corporation, Motorola, the University of Texas--Pan American, Phillips Electronics, Titan Information Systems, CellularVision of New York, L.P., M/A Com, Inc., Rio Vision of Texas, Inc., International CellularVision Association, CellularVision Technology and Telecommunications, L.P. and GE American Communications, Inc. to the FCC, CC Docket No. 92-297 (filed June 3, 1996) (emphasis supplied); see also Letter from HCG, AT&T, GE American Communications, and Motorola to the FCC, CC Docket No. 92-297 (filed June 6, 1996).

*will cause substantial interference into a Spaceway satellite.<sup>8</sup> This fact alone warrants summary denial of MACROCELL's Application.*

Similarly, Spaceway will interfere with MACROCELL's uplinks. However, in this case, Iridium baldly claims that several mitigation techniques may be employed by GSO FSS systems operating in the 29.25-29.5 GHz band to reduce the level of potentially harmful interference into the MACROCELL system network.<sup>9</sup> This claim is flawed in two respects. First, it impermissibly attempts to place the burden of interference mitigation on *currently licensed* GSO FSS systems, such as Spaceway. Section 25.258 of the Commission's Rules already addresses which type of system bears responsibility for mitigating harmful interference: the burden squarely falls on NGSO MSS systems, such as the proposed MACROCELL system, which must employ repeating ground tracks and other techniques to minimize harmful interference.<sup>10</sup> Second, the techniques that Iridium proposes will not work in any event.

Iridium suggests that GSO FSS systems in the 29.25-29.5 GHz band restrict their uplink power to the minimum necessary in order to mitigate interference into the MACROCELL feeder uplink. This suggestion fails to recognize that licensed GSO FSS systems, such as Spaceway, operating at the minimum power needed to provide the required signal quality will, nevertheless, cause interference into the MACROCELL satellites at 29.25-29.5 GHz. Thus, Iridium is mistaken when it suggests that GSO FSS systems will cause interference only when they are operating at a higher EIRP to compensate for signal attenuation due to bad weather. The fact is that Spaceway, operating at minimum power would, even in clear sky conditions, cause unacceptable interference into the MACROCELL satellites if MACROCELL were authorized at 29.25-29.5 GHz.

Moreover, Iridium mistakenly assumes that GSO FSS systems operating in the

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<sup>8</sup> The attached technical analysis is intended to demonstrate that MACROCELL creates a substantial threat of interference, and is not intended to present each and every possible incompatibility between the two systems.

<sup>9</sup> MACROCELL Application at A-36-40.

<sup>10</sup> See 47 CFR §25.258(c).

29.25-29.5 GHz band segment will utilize only a few large co-frequency earth terminals. Relying on this mistaken assumption, Iridium posits that successful coordination with these few large earth terminals is possible, and claims, as a result of such coordination, a further reduction in harmful interference. Contrary to Iridium's assumption, Spaceway, a GSO FSS system that is licensed in the 29.25-29.5 GHz band, is authorized as a system that will contain ubiquitously deployed earth stations. Moreover, the suggestion that GSO FSS systems in the 29.25-29.5 GHz band limit the size and number of their earth terminals was squarely rejected in the 28 GHz proceeding.<sup>11</sup> There is no basis for concluding that GSO FSS systems operating in the 29.25-29.5 GHz band will only deploy a few large earth terminals. Rather, the burden is on Iridium to ensure that its systems is consistent with the Commission's 28 GHz Band Plan. In light of these demonstrated technical incompatibilities, there is simply no basis on which to believe that Iridium can conform MACROCELL with the rules that govern MSS feeder links at 29.25-29.5 GHz.<sup>12</sup>

#### **IV. Grant of Iridium's Waiver Request Would Frustrate the Purpose of the 28 GHz Band Plan**

Even more audacious than its proposal to make the GSO FSS bear the burden of coordinating with MACROCELL is Iridium's request for waiver of Section 25.258(c), which is an essential component of the 28 GHz Band Plan compromise. That section of the Commission's Rules clearly states that "NGSO MSS satellites operating in [the 29.25-29.5 GHz] frequency band shall compensate for nodal regression due to the oblate shape of the Earth, and thus maintain constant successive sub-satellite ground tracks on the surface of the Earth." The use of repeating ground tracks is an essential element of the 28 GHz Band Plan solution agreed upon and was one of the factors that convinced a skeptical GSO FSS industry that coordination could

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<sup>11</sup> See generally *First Report and Order*, CC Docket No. 92-297, FCC 96-311 (released July 22, 1996) ¶¶ 33, 72-74.

<sup>12</sup> Cf. MACROCELL Application at Exhibit D to Form 312

work with certain classes of NGSO MSS.<sup>13</sup>

The use of repeating ground tracks is critical to the solution in the 29.25-29.5 GHz band segment because it renders a large number of GSO orbital locations effectively precoordinated. As TRW has stated, with respect to the Odyssey system which is capable of using this part of the band, no significant interference issues exist with respect to a significant percentage of the GSO orbital locations because they do not receive interference “hits” from Odyssey, and many of the intersections of that NGSO system with GSO satellites occur over the ocean, where the likelihood of a problem is minimal.<sup>14</sup>

There is no basis for Iridium’s attempt to “waive” out of a requirement that is essentially the crux of a compromise that took over three years to reach. One reason the 28 GHz Band Plan took so long to formulate was the need to carefully balance many competing interests. The entire band plan is placed in jeopardy when individual applicants seek to essentially re-write the rules by waiving out of particular requirements. Although the Commission is authorized to grant waivers “if good cause therefor is shown,”<sup>15</sup> Iridium simply has not met the requisite requirement of demonstrating that “special circumstances warrant a deviation from the general

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<sup>13</sup> See Comments of TRW, CC Docket No. 92-297 (filed September 7, 1996) at 25. TRW first emphasized the interference reduction benefits of repeating ground tracks in its September 7, 1995 comments in the 28 GHz Proceeding. See e.g., Co-Directional Frequency Sharing Between Odyssey Feeder Links and GSO/FSS Service Links, at 5, (distributed at February 5, 1996 status meeting and contained in FCC Ex Parte Submission of February 6, 1996) (coordination aided by modification to Odyssey satellite phasing); Memorandum from TRW Counsel dated January 16, 1996 (contained in FCC Ex Parte Submission of January 22, 1996) (“TRW Memo”), CC Docket No. 92-297 at 3 (describing repeating ground tracks as mitigation measure). This requirement was discussed at the January 19 and February 5, 1996 status conferences that the FCC convened for the very purpose of discussing sharing between the GSO FSS and NGSO MSS feeder links. Motorola, an Iridium member, was present at those meetings and never voiced any opposition. In fact, HCG confirmed the need for this requirement in its February 6, 1996 letter clarifying its sharing solution with the NGSO MSS. See HCG Ex Parte Presentation, CC Docket No. 92-297 (filed Feb. 6, 1996) (sharing possible with Odyssey due to relatively few spacecraft of Odyssey system and the fact that TRW uses predictable, repeating ground tracks; Iridium architecture does not include elements that make this method of sharing applicable; sharing solution based on premise there is no spectrum overlap between Iridium and GSO FSS).

<sup>14</sup> TRW Memo at 3. The Technical Analysis contained in Exhibit A further details the benefits to the GSO FSS of this requirement.

<sup>15</sup> 47 CFR §1.3.

rule and such deviation will serve the public interest.”<sup>16</sup>

As part of its justification for a waiver of this provision, Iridium relies on the fact that Motorola has filed a petition for reconsideration seeking to have the Commission change this rule. What Iridium conveniently fails to disclose to the Commission is the fact that its petition was strongly opposed by HCG, TRW, GE, Lockheed, and AT&T, each of whom was actively involved in the development of Section 25.258 in the 28 GHz Rulemaking. Those parties amply demonstrated in their responsive filings to the Motorola reconsideration petition why there is no merit in that request, and why the grant of the relief that Motorola has requested would upset the balance in the 28 GHz Band Plan.<sup>17</sup> There is simply no cause for waiving the requirements of Section 25.258 for MACROCELL because (i) HCG’s Spaceway system has been authorized pursuant to a final order; (ii) HCG is proceeding with its Spaceway system design in reliance on Section 25.258, which is currently in full force and effect; (iii) HCG has demonstrated herein how MACROCELL will interfere with Spaceway; and (iv) Iridium did not seek a stay of the effectiveness of Section 25.258 when it could have done so.

In summary, the Commission should deny Iridium’s waiver request because that request threatens to undermine the carefully crafted compromise present in the 28 GHz Band Plan. The grant of this and similar waiver requests to opt out of particular requirements of the 28 GHz Band Plan could destroy the entire scheme in a piece-meal fashion and “would be likely to lead to a large number of similar requests, effectively undermining the rule without the benefit of a formal rulemaking proceeding.”<sup>18</sup> The Commission simply may not grant this type of waiver

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<sup>16</sup> Northeast Cellular Telephone Co. v. FCC, 897 F.2d 1164 (D.C. Cir. 1990); WAIT Radio v. FCC, 418 F.2d 1153 (D.C. Cir. 1969).

<sup>17</sup> HCG incorporates by reference the arguments it has made in its Opposition (filed October 21, 1996) and its Reply Comments (filed October 31, 1996), both filed in CC Docket 92-297 in response to the Motorola Petition for Reconsideration.

<sup>18</sup> Turro v. FCC, 859 F.2d 1498, 1499 (D.C. Cir. 1988) (upholding a FCC decision to deny a waiver request on the grounds that it was preferable to address the policy concerns raised by the waiver applicant in a rulemaking proceeding rather than a waiver proceeding).



request that would have the effect of eviscerating the general rule.<sup>19</sup>

**V. Conclusion**

The MACROCELL Application must be denied because it threatens the delicate compromise embodied in the Commission's 28 GHz Band Plan. That band plan was adopted to ensure that sufficient separate spectrum was available for incompatible satellite systems to operate without causing interference with one another in any particular band segment. MACROCELL will both interfere with Spaceway and experience interference from Spaceway. The interference mitigation techniques advocated in the MACROCELL Application to mitigate Spaceway's interference into MACROCELL will not work and would unduly constrain the operation of licensed GSO FSS satellite systems at 29.25-29.5 GHz in any event. If Iridium chooses to operate in the 29.25-29.5 GHz band, it should be required to comply with the 28 GHz Band Plan and the related rules. Until and unless it does so, the Commission must deny the MACROCELL Application.

Respectfully submitted,

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December 22, 1997

<sup>19</sup> See, e.g., In re Associated Press Request for Waiver of Section 25.203(c)(3) of the Commission's Rules, 64 Rad.Reg. 2d 632 (1987) (denying a waiver from a requirement mandating prior frequency coordination by earth station applicants in frequency bands shared with terrestrial radio services because a waiver would defeat the purpose of the prior coordination requirement).

EXHIBIT A

# **Interference Analysis Between SPACEWAY™ and MACROCELL in the 29.25 - 29.50 GHz Band**

## **I. Introduction**

This paper shows that Iridium LLC's MACROCELL does not meet the technical requirements of the Commission's rules for non-geostationary (NGSO) Mobile-Satellite Service (MSS) systems to operate in the 29.25-29.50 GHz band. First, Iridium LLC has not demonstrated that MACROCELL feeder links can share spectrum with the GSO FSS SPACEWAY™ system as specified in Section 25.258(d) (47 CFR, Chapter 1). Second, MACROCELL operations will violate the letter and spirit of Section 25.258(c) (47 CFR, Chapter 1) which requires NGSO MSS systems to incorporate repeating ground tracks in their constellation designs.

## **II. Iridium LLC Has Not Demonstrated that MACROCELL Feeder Links Can Share Spectrum with SPACEWAY™**

MACROCELL is a proposed low-Earth-orbit (LEO) mobile-satellite system, whereas SPACEWAY™ is a geostationary orbit (GSO) Fixed-Satellite Service (FSS) system which has been licensed by the Commission to be constructed, launched, and operated. Technical descriptions and parameters of the two systems are taken from each

respective system's application<sup>1</sup>. Interference analyses show that, in the 29.25-29.50 GHz band, MACROCELL feeder link uplinks will cause harmful interference into SPACEWAY™ uplinks and that SPACEWAY™ uplinks will preclude MACROCELL uplink operations. Thus the arguments provided in MACROCELL application demonstrating that MACROCELL can share spectrum with GSO FSS systems are deficient.

The example in Attachment 1 shows how a MACROCELL uplink will cause harmful interference into a SPACEWAY™ uplink. In the example, the boresight of a MACROCELL uplink is aligned with the boresight of a SPACEWAY™ satellite beam so that the MACROCELL feeder link earth station is located at the SPACEWAY™ satellite's antenna beam peak. The SPACEWAY™ beam refers to the High Powered Narrow Spot beam in the SPACEWAY™ application. The SPACEWAY™ terminal is assumed to be located at the edge of the SPACEWAY™ beam.

Attachment 1 shows an Eb/Io of 2.8 dB. This is more than 18 dB below the level SPACEWAY™ has budgeted for interference from a single adjacent satellite, and 6.5 dB below the level SPACEWAY™ has budgeted for total interference. Thus, the MACROCELL uplink would cause harmful interference to the SPACEWAY™ uplink.

Two examples in Attachment 2 show how MACROCELL uplink operations will be precluded by SPACEWAY™ uplinks. In the first example, the SPACEWAY™ uplink designated as "cable" represents the case of a SPACEWAY™ uplink used for

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<sup>1</sup> For MACROCELL parameters, see *Application to Launch and Operate the MACROCELL Satellite System, September 26, 1997*. For SPACEWAY™ parameters, see *Application of Hughes Communications Galaxy, Inc., Before the Federal Communications Commission for GALAXY/SPACEWAY™: A Global System of Geostationary Ka/Ku Band Communications Satellites, System Amendment, September 29, 1995*.

cable programming distribution. It is assumed that the cable uplink signal enters through the sidelobes of the MACROCELL antenna at the -30 dB contour. The cable uplink earth station is assumed to be located far away from the MACROCELL feeder link earth station, and that the MACROCELL satellite antenna receive pattern has a narrow main lobe. The first example in Attachment 2 shows an  $E_b/I_o$  of -0.7 dB for a MACROCELL uplink with a SPACEWAY™ cable uplink as the interferer. MACROCELL's minimum  $E_b/(N_o+I_o)$  is 7.7 dB (MACROCELL application at A-47). Thus, even without accounting for thermal noise, MACROCELL's minimum required  $E_b/(N_o+I_o)$  will not be met. Accounting for thermal noise, the  $E_b/(N_o+I_o)$  becomes -1.0 dB, which of course, is well below the operating point of 7.7 dB.

In the second example, the SPACEWAY™ uplinks designated as "High Powered Narrow Spot" represent the ubiquitous consumer and small business terminals used for applications such as Internet access, narrow band data communications, and personal video services. It is assumed that the ubiquitous terminals' uplink signals enter through the main lobe of the MACROCELL satellite receive antenna at the -3 dB contour. These ubiquitous terminals are assumed to be located close to the MACROCELL feeder link earth station. Another assumption is that there are at least 50 of these ubiquitous terminals, which collectively co-use the entire 25 MHz bandwidth of the MACROCELL uplink. Attachment 2 shows an  $E_b/I_o$  of -0.7 dB for a MACROCELL uplink with SPACEWAY™ ubiquitous terminals as the interferers. Thus, even without accounting for thermal noise, the MACROCELL's minimum required  $E_b/(N_o+I_o)$  will not be met. Accounting for thermal noise, the  $E_b/(N_o+I_o)$  becomes -1.0 dB, which is even further below the operating point of 7.7 dB.

**III. Iridium LLC's MACROCELL Sharing Arguments Are Unduly Restrictive on GSO FSS Operations**

In the FCC's *First Report and Order and Fourth Notice of Proposed Rulemaking* (FCC 96-311), Appendix B, paragraph 4d states that, "NGSO MSS systems applying to use the 29.25-29.5 GHz band, for feeder link earth station uplink, will have to demonstrate that their system can share with the authorized U.S. GSO FSS systems operating in this band." The above examples show just the contrary for MACROCELL, that it cannot share spectrum with the authorized GSO FSS SPACEWAY™ system. Iridium LLC, in its MACROCELL application, discusses sharing issues, but its four arguments on MACROCELL's sharing capability with GSO FSS systems are unconvincing.

The first argument states that MACROCELL will not cause harmful interference "into [a] GSO network due to the approximate 30 dB differential range loss" between the MACROCELL orbit and the GSO orbit (MACROCELL application at A-38 to A-39). The example in Attachment 1 shows otherwise. The MACROCELL uplink EIRP is still too high. This EIRP level will cause harmful interference into a SPACEWAY™ uplink. The 30 dB differential range loss is insufficient to minimize the detrimental effects of MACROCELL uplink's EIRP on a GSO FSS uplink.

In the other three arguments, Iridium LLC seeks to show that MACROCELL operations will not be affected by approved GSO FSS systems. The first argument advances that "the GSO network must restrict its uplink power to the minimum necessary

to close the link in accordance with Part 25.204(d) of the FCC Rules” (MACROCELL application at A-39). Section 25.204(f) states that “all earth stations in the FSS in the 20/30 GHz band shall employ adaptive uplink power control or other methods of fade compensation such that the earth station transmissions shall be conducted at the power level required to meet the desired link performance while reducing the level of mutual interference between networks.” Based on the power levels for the SPACEWAY™ system, it has been shown that MACROCELL cannot share spectrum with GSO FSS systems. These SPACEWAY™ uplink power levels are already “reduced” or “minimum” in that they are reduced from the power levels to be used under rain conditions and in that they are the minimum required to provide SPACEWAY™ quality of service. Therefore, MACROCELL cannot share spectrum with SPACEWAY™ even with SPACEWAY™ uplinks operating at minimum power levels.

The second argument states that difficulty in coordination will force GSO FSS systems to severely limit the ubiquity of terminals uplinking in the same spectrum as MACROCELL. The SPACEWAY™ application correctly conveys the intent that thousands of ubiquitous SPACEWAY™ terminals will be deployed. It states that, “each GALAXY/SPACEWAY™ satellite has a capacity of approximately 11,500 simultaneous full duplex 384 kbps channels . . . HCG estimates that GALAXY/SPACEWAY™ will be able to serve more than 5 million high speed access users” (SPACEWAY™ application at pp. 34-35). Iridium LLC cannot assume that the use of “ubiquitous terminals” will not be widespread.

In the case of interference from a MACROCELL uplink into a SPACEWAY™ uplink, the ubiquity of the SPACEWAY™ terminals means that, very likely, there would

be a SPACEWAY™ terminal located within the same area as a MACROCELL feeder link earth station. In that case, the boresight of a SPACEWAY™ satellite antenna beam would be directed towards both a SPACEWAY™ terminal and a MACROCELL feeder link earth station. Then, the SPACEWAY™ uplink would receive interference from the MACROCELL uplink which is mitigated neither by any MACROCELL earth station antenna discrimination nor by any SPACEWAY™ satellite antenna discrimination (Attachment 1's example).

In the case of interference from SPACEWAY™ uplinks into a MACROCELL uplink, the ubiquity of SPACEWAY™ terminals would very likely place many of them close to the MACROCELL feeder link earth station. The MACROCELL satellite would have an antenna beam pointed towards its feeder link earth station and "almost towards" many SPACEWAY™ terminals. The notion of "almost towards" is used instead of "towards" because SPACEWAY™ terminals are assumed to be located at the -3 dB contour of the MACROCELL satellite receive antenna beam (Second example in Attachment 2).

In the third argument, Iridium LLC states that the antenna discrimination of GSO earth stations must be designed to support 2 degree spacing between GSO satellites, and that this will be adequate to prevent interference from GSO FSS uplinks into MACROCELL uplinks. The relatively narrow antenna beamwidths mandated by the 2 degree spacing requirement will reduce the amount of time that MACROCELL uplinks are inoperable due to interference from SPACEWAY™ uplinks. The problem is that, Iridium LLC has provided no data to show how long their uplinks will be inoperable given such antenna beamwidths. As Attachment 2 examples show that MACROCELL



uplink power is almost 9 dB too low for simultaneous operation with SPACEWAY™ uplinks, one can reasonably extrapolate that the GSO FSS user terminal antennas don't have to be exactly pointed at the MACROCELL satellite to preclude proper MACROCELL uplink operations. And even with relatively narrow antenna beamwidths, there may be a considerable amount of time when the MACROCELL uplink would be inoperable.

#### **IV. MACROCELL Will Violate Section 25.258(c) of the Commission's Rules**

As part of its MACROCELL application, Iridium LLC seeks a waiver of Section 25.258(c) of the Commission's rules, which states that "NGSO MSS satellites operating in this frequency band shall compensate for nodal regression due to the oblate shape of the Earth, and thus maintain constant successive sub-satellite ground tracks on the surface of the Earth." NGSO MSS' use of repeatable ground tracks facilitates intersystem coordination with GSO FSS systems. Because NGSO crossings with the GSO arc would be fixed, GSO orbit positions that can potentially be affected by NGSO operations will readily be identified and possibly avoided.

If MACROCELL maintained "constant successive sub-satellite ground tracks," and its orbit and beam parameters were known, interference into SPACEWAY™ uplinks could readily be calculated for each MACROCELL satellite and its associated feeder links. Then the total interference from the MACROCELL system into a SPACEWAY™ satellite would be a simple combination of interference between each MACROCELL satellite and that particular SPACEWAY™ satellite.

**V. Conclusion**

In conclusion, Iridium LLC has not shown that MACROCELL can share spectrum with GSO FSS systems. On the contrary, it has been shown that MACROCELL and the GSO FSS SPACEWAY™ system cannot share spectrum. If MACROCELL feeder link uplinks used the 29.25-29.50 GHz band, SPACEWAY™ uplinks as well as MACROCELL uplinks will be unable to operate. Because Iridium LLC requests for a waiver of Section 25.258(c) of the Commission's rules, MACROCELL fails to meet the Commission's technical requirements for an NGSO MSS system operating in the 29.25-29.50 GHz band.

**Attachment 1**

(MACROCELL Comm.)

Uplink Interference to GSO Space Station		Comments
Interferor Carrier EIRP (dBW)	49.6	MACROCELL Application
Bandwidth Mismatch Factor (dB)	-17.0	0.5 MHz SPACEWAY, 25 MHz MACROCELL
GSO S/S Antenna Gain Towards Interferor (dBi)	46.5	SPACEWAY Satellite Beam Peak
Free Space Loss @ 29.5 GHz (dB)	-213.7	Note Elevation Angle Below
GSO Orbit Altitude (km)	35,786	
Interferor Elevation Angle to GSO S/S (deg)	25.0	
Interferor Slant Range to GSO S/S (km)	39,070	
Interferor Power Received by GSO S/S (dBW)	-134.6	
Desired Carrier EIRP (dBW)	39.3	SPACEWAY Application (High Power Narrow Spots)
GSO S/S Antenna Gain Towards Desired Signal (dBi)	41.5	SPACEWAY Satellite Beam Edge
Free Space Loss @ 29.5 GHz (dB)	-213.7	Note Elevation Angle Below
GSO Orbit Altitude (km)	35,786	
Desired E/S Elevation Angle to GSO S/S (deg)	25.0	
Desired E/S Slant Range to GSO S/S (km)	39,070	
Desired Power Received by GSO S/S (dBW)	-132.9	
C/I (dB)	1.7	
Eb/lo (dB)	2.8	(384 kbps Burst Rate, 500 kHz Bandwidth)
Minimum Required Eb/lo for One Adjacent Satellite (dB)	20.9	SPACEWAY Application
Minimum Required Eb/lo From All Sources (dB)	9.3	SPACEWAY Application
Note: This analysis is not to be construed to be comprehensive and inclusive of all potential incompatibilities and is intended only to be exemplary of the potential problems.		

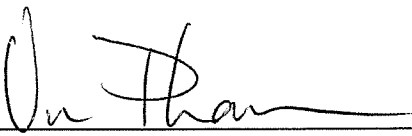
Attachment 2

(MACROCELL Comm.)

Uplink Interference to LEO Space Station (SPACEWAY Cases)	Cable	High Power Narrow Spots	Comments
Interferer Carrier EIRP (dBW)	84.9	39.3	SPACEWAY Application
Bandwidth Mismatch Factor (dB)	-1.6	17.0	25 MHz MACROCELL, 36 and 0.5 MHz SPACEWAY
LEO S/S Antenna Gain Towards Interferer (dBi)	0.1	27.1	
Free Space Loss @ 29.5 GHz (dB)	-186.3	-186.3	Note Elevation Angle Below
LEO Orbit Altitude (km)	862.4	862.4	MACROCELL Apogee
Interferer Elevation Angle to LEO S/S (deg)	25.0	25.0	
Interferer Slant Range to LEO S/S (km)	1665	1665	
Interferer Power Received by LEO S/S (dBW)	-102.9	-102.9	
Desired Carrier EIRP (dBW)	49.6		MACROCELL Application
LEO S/S Antenna Gain Towards Desired Signal (dBi)	30.1		MACROCELL Application
Free Space Loss @ 29.5 GHz (dB)	-186.3		Note Elevation Angle Below
LEO Orbit Altitude (km)	862.4		MACROCELL Apogee
Desired E/S Elevation Angle to LEO S/S (deg)	25.0		
Desired E/S Slant Range to LEO S/S (km)	1665		
Desired Power Received by LEO S/S (dBW)	-106.6		
C/I (dB)	-3.7	-3.7	
Eb/lo (dB)	-0.7	-0.7	(12.5 Mbps Burst Rate, 25 MHz Bandwidth)
Eb/(lo+No) (Including Adjacent System lo Only)	-1.0	-1.0	
Eb/No (dB)	11.0	11.0	MACROCELL Application
Minimum Required Eb/(No+lo) (dB)	7.7	7.7	MACROCELL Application
Note: This analysis is not to be construed to be comprehensive and inclusive of all potential incompatibilities and is intended only to be exemplary of the potential problems.			

Engineering Certification

We hereby certify that we are the technically qualified persons responsible for preparation of the engineering information contained in this petition, that we are familiar with Part 25 of the Commission's Rules, that we have either prepared or reviewed the engineering information submitted in this application, and that it is complete and accurate to the best of our knowledge.

By: 

Vu Phan, Manager  
Hubert Chew, Project Engineer  
Regulatory Affairs & Spectrum Management  
Hughes Communications, Inc.

December 22, 1997

**CERTIFICATE OF SERVICE**

I, Karen McWhorter, hereby certify that the foregoing Petition to Deny of Hughes Communications Galaxy, Inc. was mailed first-class on December 22, 1997 to the following:

Patricia A. Mahoney  
Iridium LLC  
1575 Eye Street, N.W.  
Suite 500  
Washington, D.C. 20005

*Karen McWhorter*

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Karen McWhorter