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1001 Pennsylvania Avenue, NW, Washington, DC 20004-2595 ▪ p202 624-2500 ▪ f202 628-5116

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June 11, 2003

BY HAND DELIVERY

Thomas S. Tycz
International Bureau
Federal Communications Commission
445 Twelfth Street, SW
Washington, DC 20554

RE: Iridium June 9, 2003, Request for Extension of STA
STA-MSC-20030515-00089 and SES-MSC-20030515-00666

Dear Mr. Tycz:

This letter is written on behalf of Globalstar, L.P., and Globalstar USA, L.L.C. (collectively, "Globalstar"), in response to the June 9, 2003, request by Iridium Constellation LLC for extension of its current Special Temporary Authority ("STA") to provide Mobile-Satellite Service in the 1620.10-1621.35 MHz frequency band (Channel 9) for an additional 30 days, until July 12, 2003. In this letter and the attachment, Globalstar explains why Iridium has not justified its request.

Globalstar has previously filed with the Commission information opposing Iridium's use of the channels in the 1610-1621.35 MHz band assigned to and used by the Globalstar system. Attached to this letter is additional information based on Globalstar's analyses of Iridium's call traffic in the Middle East. This attachment demonstrates the following:

First, the Globalstar system is experiencing harmful interference that appears to arise from Iridium's use of Channels 8 and 9 in the Middle East region. Specifically, Iridium uplink transmissions in these channels are received at Globalstar satellites, and, because of either the density of calls and/or the types of terminals in use, overload the L-to-C-band transponder's C-band solid state power amplifier ("SSPA"). Saturation reduces the ability of the SSPA to provide the desired end-to-end signal noise ratio for Globalstar users. The result in these

circumstances is increased radio link failure ("RLF") for Globalstar calls. Indeed, in the Middle East region, Globalstar is experiencing RLF in the 30-45% range.[1]

Second, Globalstar's analysis of the call traffic data submitted by Iridium in its May 8, 2003, filing demonstrates that factors other than increased call traffic may be causing Iridium's radio link failures in the Middle East. Such factors may include self-interference, satellite power limitations, and intersatellite link capacity limitations. Based on Globalstar's analysis, and the lack of additional information in Iridium's most recent request, Globalstar submits that Iridium has not justified its purported need for more spectrum in the Middle East region.

Third, as indicated in Figure 5 in our attachment, Globalstar's call traffic has dropped by about 50% in the last month in the Middle East region. Iridium indicates that its call traffic has also decreased in the Middle East region, and so, it needs less spectrum. If Iridium's call traffic has dropped by only 33%, then it should be able to stop using both Channels 8 *and* 9 (which represent one-third of its total modified spectrum access).

Iridium's most recent request simply recites a generalized need for expanded spectrum access (Channel 9) without providing additional facts and claims that it is not causing interference into Globalstar. Section 25.120 (47 C.F.R. § 25.120) requires an applicant for an STA to demonstrate "circumstances *requiring*" temporary use of facilities. Based on the attached engineering analysis, Iridium's generalized request is not sufficient to support an extension of Iridium's STA.

Moreover, as Globalstar explained in its May 23, 2003, protest in response to the Commission's *Order to Show Cause* (DA 03-1722, released May 16, 2003), "[t]he Commission's Rules do not . . . purport to have any extraterritorial application."[2] Iridium apparently concedes that the Communications Act does not authorize the Commission to grant Iridium "landing rights" for specific frequency usage globally

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[1] Globalstar needs a period of at least 48 hours when Iridium is not transmitting in Globalstar channels in order to complete its analysis of the impact of Iridium transmissions in Channels 8 and 9. Data on the type and numerical distribution of each type of Iridium earth terminal operating in the Middle East would also be useful for Globalstar's analysis.

[2] Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands, 11 FCC Rcd 12861, ¶ 53 (1996).

because it offered no defense in response to Globalstar's protest.[3] The fact that the Communications Act does not provide extraterritorial authority for spectrum licensing matters is yet another reason for the Commission to reject Iridium's request.

For the reasons set forth in this and previous Globalstar filings, Iridium's June 9, 2003, filing has not provided sufficient justification for extension of its STA. Accordingly, Globalstar urges the Commission not to accept Iridium's request for an extension of its STA for use of frequencies below 1621.35 MHz in the Middle East region and elsewhere.

Respectfully submitted,

GLOBALSTAR, L.P.
GLOBALSTAR USA, L.L.C.

William D. Wallace

CROWELL & MORING LLP
1001 Pennsylvania Avenue, N.W.
Washington D.C. 20004
(202) 624-2500

Of Counsel:

William F. Adler
Vice President, Legal and
Regulatory Affairs
Globalstar, L.P.
3200 Zanker Road
San Jose, CA 95134
(408) 933-4401

Enclosure

[3] Iridium requested extension of its STA to provide "global Mobile-Satellite Service" in Channel 9. However, its STA is limited to use of Channel 9 on a co-primary basis with Globalstar in the Middle East Region and on secondary basis everywhere else in the world. See *Order to Show Cause*, DA 03-1722, ¶ 5 (released May 16, 2003).

cc: Marsha J. MacBride
Bryan Tramont
Scott Delacourt
Jennifer Gilsenan
Cassandra Thomas
Linda Haller
Karl Kensinger
Fern Jarmulnek
Peter D. Shields
Karl Nebbia
Jack Zinman
Stephen Lett
Paul J. Feldman

Attachment

GLOBALSTAR, L.P. AND GLOBALSTAR USA, L.L.C.
ENGINEERING ANALYSIS
(June 11, 2003)

Part I: Analysis of Interference into Globalstar

1. Summary of Globalstar Analysis of Its Radio Link Failures

Globalstar has been conducting an intensive series of experiments aimed at understanding our call performance in the Middle East, and in particular, trying to isolate the cause of the increased Radio Link Failure (RLF) rate in the region served by the Riyadh gateway. As stated in Globalstar's Letter of May 13, 2003, Globalstar has been experiencing unusually high rates of Radio Link Failure in the Middle East, and its engineers were interested to note that Iridium, in its May 8 Letter, also mentioned that Iridium has been experiencing interference "in a small group of carriers in the upper end of Iridium's operating band." Since then, Globalstar engineers have re-examined the initial hypothesis that these localized failures were caused by external interference. If the same external interference were affecting Globalstar and Iridium, one would expect it to cause failures at the upper end of the Globalstar band (and the lower end of the Iridium band). Instead, several channels at both ends of the Globalstar band are affected (and Iridium states that it had problems in the upper end of its band). One possibility is that there are several interferers operating in different parts of the 1610-1626.5 MHz band; in fact, Globalstar has observed some of these in its Channels 1 and 3. In addition, Globalstar's entire L-band performance is affected by "power-robbing" in the Globalstar L-to-C satellite transponder that is caused by the combined power of Globalstar traffic and external emitters (Iridium and other unknown sources) falling in the 1610-1626.5 MHz band. Further analysis of these issues is being undertaken, with more remote monitoring equipment being incorporated into several of Globalstar's Middle East and European gateways.

2. Mechanism By Which Iridium Is Causing Harmful Interference To Globalstar

Between April 8 and April 11, Globalstar noticed that the Radio Link Failure (RLF) rate in the region served by its Riyadh gateway increased from approximately 10 percent on average to approximately 30 percent on average, and it has stayed in the 30 to 45 percent range since. Initially, Globalstar engineers thought that the reason for this increased rate was some sort of localized interference in the Middle East, and not attributable to Iridium, inasmuch as any Iridium related effect should have started only after April 11 when Iridium received authority to operate in channel 9. At that time, Globalstar changed its frequency assignments in the Riyadh gateway area to free up channel 9 for Iridium use, expecting that the RLF would improve. However, this has not been the case. Globalstar engineers then initiated a detailed analysis of large amounts of data from several gateways in the Middle East (especially comparing performance at other gateways around the world), as well as an analysis of large amounts of satellite telemetry. We now suspect that the increased RLF is, in fact, caused by Iridium's use of

Channels 8 and 9. Analysis to confirm this finding is ongoing. The Iridium-induced degradation even after Globalstar reassigned frequencies in the Riyadh gateway to avoid Channels 8 and 9 is explained below.

The Globalstar return link signals go through the L-to-C transponder, with signals from each L-band beam passing through the beam's own L-to-C upconverter. The signal from eight of the sixteen L-band beams are translated into C-band feederlink frequencies on one polarization, and the remaining eight L-band beams are similarly mapped to the other C-band polarization. The signals from all eight L-band beams corresponding to one polarization at C-band pass through a common C-band solid state power amplifier (SSPA). Thus, all the Iridium signals in Channel 8 and Channel 9 in eight of these beams are passed through the same C-band SSPA, along with the desired Globalstar signals from those beams in channels 1 through 9. Globalstar has found that at peak hour in the Middle East (which coincides with Iridium's peak hours of 1600 Z to 1900 Z), the combined Globalstar and Iridium signals at L-band are driving the C-band SSPAs into saturation, thereby reducing their ability to amplify the signals and provide the desired end-to-end signal to noise ratio for Globalstar users. This manifests itself as a Radio Link Failure. Figures 1 and 2 show typical periods of time when a satellite which is serving Iraq (Basra and Baghdad in particular) experiences a peak C-band power level of 1.9 to 2 volts. The interpretation of the peak value of 2 volts in the telemetry is that telemetry values of 1.7 volts and above correspond to saturation of the SSPA. When Iridium is operating in its licensed L-band, Globalstar engineers have managed to alleviate the saturation problem by onboard filter settings that reject frequencies corresponding to Channels 10 through 13 (the Iridium band); however, these filter settings do not allow Channels 8 and 9 to be rejected because they are within Globalstar's authorized band. Again, these saturating peak loads in the Middle East have been occurring after Iridium started using Channels 8 and 9.

To compile evidence that Iridium is causing these C-band power amplifier peaks, Globalstar temporarily placed certain satellites in an even narrower band mode, designated "L3," which allows only Channels 1 through 6 to be passed through the satellite, but suppresses Channels 7 through 9. This is not the normal mode (which is designated "L2"), because normally, Channels 7 through 9 are also carrying Globalstar traffic. However, in order to adapt to Iridium's use of Channels 8 and 9, Globalstar assigned only Channel 7 to carry its traffic in the Middle East region. During this experiment, the traffic on Channel 7 was purposely reduced to a negligible level. Thus, the differences between the observed peak C-band power seen on a satellite when it is in the narrower-band "L3" mode versus the C-band power levels seen in normal "L2" mode are attributable to non-Globalstar sources of uplink power in Channels 7, 8 and 9.

As an example, Figure 3 shows the C-band power for a satellite in "L2" mode and one in "L3" mode as they pass over Basra, Iraq, during the peak traffic hours of 1600 Z to 1900 Z. Satellite 15, which is in the wider band mode "L2," and which is amplifying signals and interference in channels 1-9 clearly has much larger peaks as it passes over Basra than Satellite 1, which is in the narrower band mode "L3." Another example is given in Figure 4, which shows the C-band satellite power for a Satellite 59 in mode "L2" and Satellite 38 in mode "L3" as they pass over Basra during the peak traffic hours. Again, Satellite 59 in the wider band mode has much larger peaks than Satellite 38 in the narrower band mode.

These examples show that the effect of Iridium operations in Channels 8 and 9 is to drive the Globalstar satellites' C-band amplifiers into saturation, thereby reducing their capability to amplify signals in all the return link frequencies at peak hour. This has the direct effect of increasing Radio Link Failure rates during peak hours over the Middle East. The increased Radio Link Failure rates after Iridium was authorized to operate are depicted in Figure 5, which shows that the percentage of Radio Link Failures at the Riyadh gateway increased from before to after April 11. Also shown is the variation in weekly traffic in the Iraq region; this curve shows that even though traffic, after increasing in the first part of the graph, dropped in the second half of the graph, the RLF rate remains high. These curves indicate that the C band saturation effect started to occur as soon as Iridium began using Channel 9.

To get similar saturation effects with Globalstar-only signals would take a much higher level of Globalstar traffic than the rest of the Globalstar system was designed to handle. In other words, similar power robbing by Globalstar-only signals cannot occur.

Iridium user terminals are licensed to operate at burst EIRP levels of up to 11.95 dBW or 15.66 watts (Call Sign E960132). From the very strong Iridium signals that Globalstar engineers have observed in channels 8 and 9, the EIRP from Iridium user terminals has indeed been calculated in the range of 15.66 watts. In the case of Globalstar, power control is used to keep the power from each user down to the minimum need to close the link. As a result, each Globalstar user typically transmits only 100 to 200 milliwatts of EIRP on average. Since each Iridium user is on only 1/8th of the time, an Iridium user transmitting at 15.66 watts burst EIRP would effectively rob the power that would otherwise have served between 15.66/8/.2 and 15.66/8/.1, i.e., between 9 and 19 Globalstar users.

3. Globalstar's Proposal to Confirm Observations

Globalstar engineers are continuing to try to reduce the Radio Link Failure rate in the Middle East to acceptable levels. Because so many factors, including Globalstar traffic, frequency assignments, external interference, Iridium traffic in Channels 8 and 9 (which appears in-band to Globalstar's satellites and subtracts satellite power in the L-to-C transponder), are varying at the same time, it is challenging to test different hypotheses and to isolate the impact of alternative system configurations. It would be extremely useful to Globalstar to take measurements when Iridium is not using Channels 8 and 9. Globalstar's call performance results from this experiment will be reported to the Commission and Iridium.

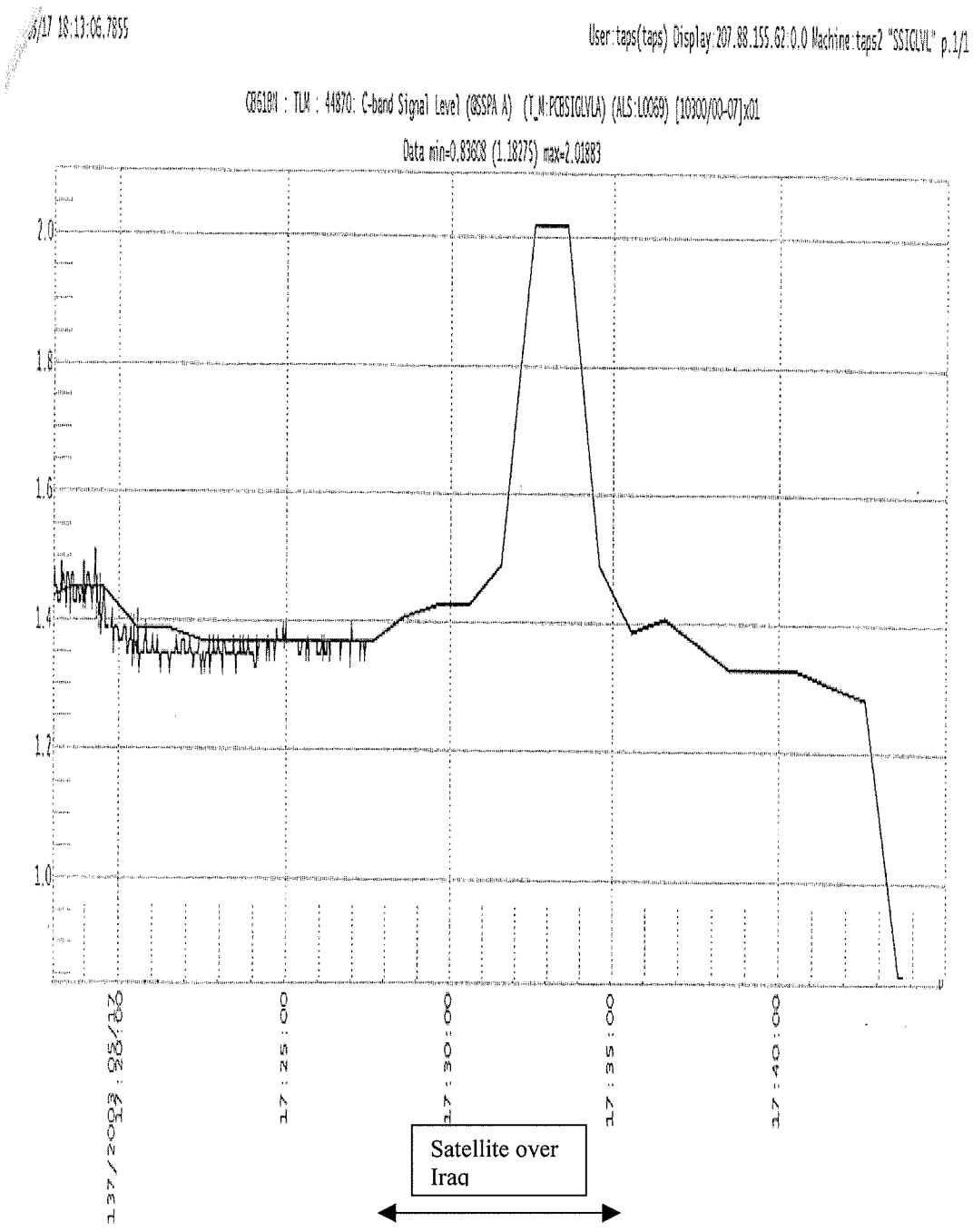

Figure 1: Satellite C-band SSPA telemetry data showing peak of 2 volts as satellite beams pass over Iraq.

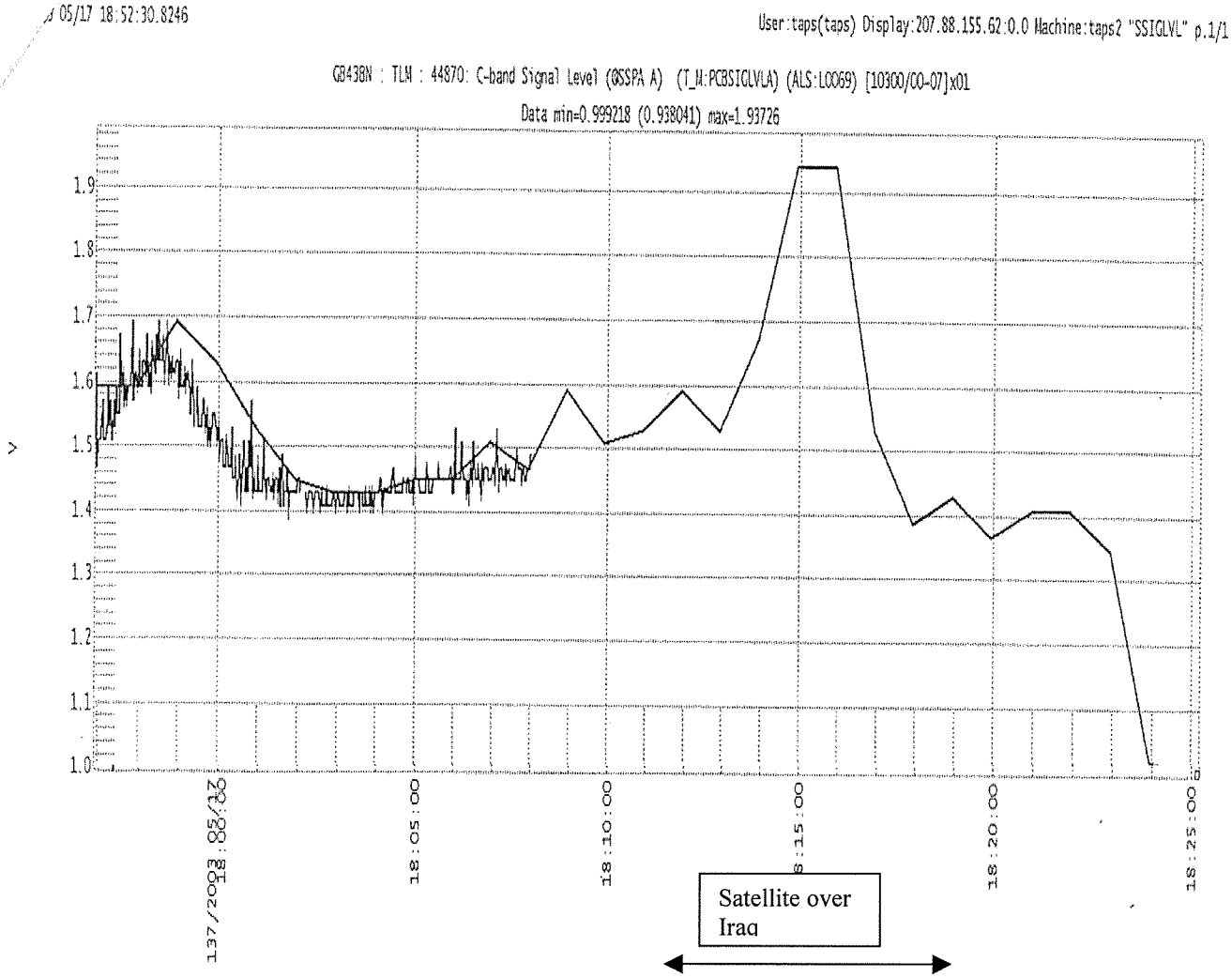

Figure 2: Satellite C-band SSPA telemetry data showing peak of 1.94 volts as satellite beams pass over Iraq.

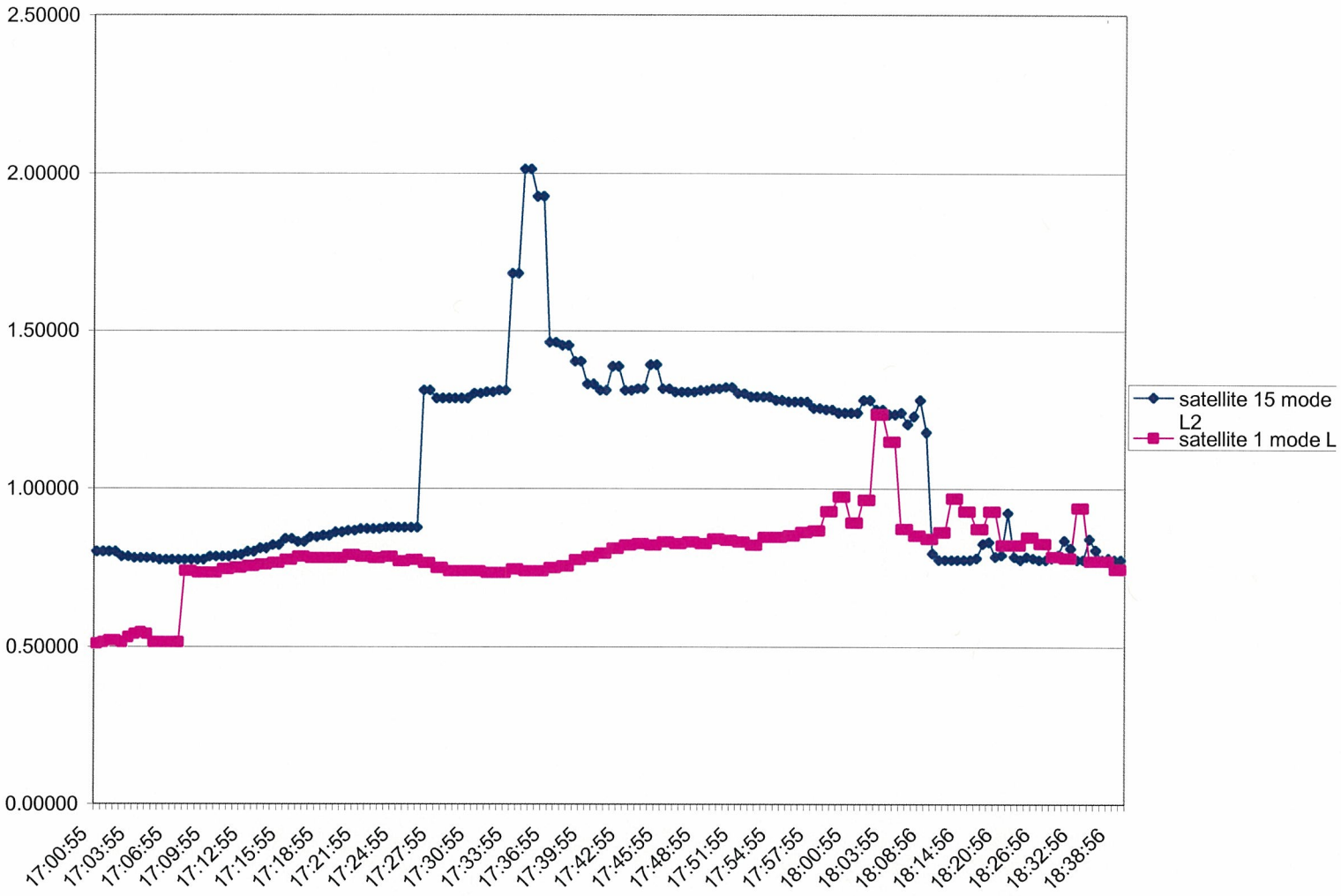

Figure 3: C-band SSPA output for two satellites; satellite 15 is in the wider band mode 'L2', and passes over Basra from 17:25:30 to 17:47:31 Z; satellite 1 is in the narrower-band mode 'L3' and passes over Basra from 18:20:00 to 18:39:24 Z.

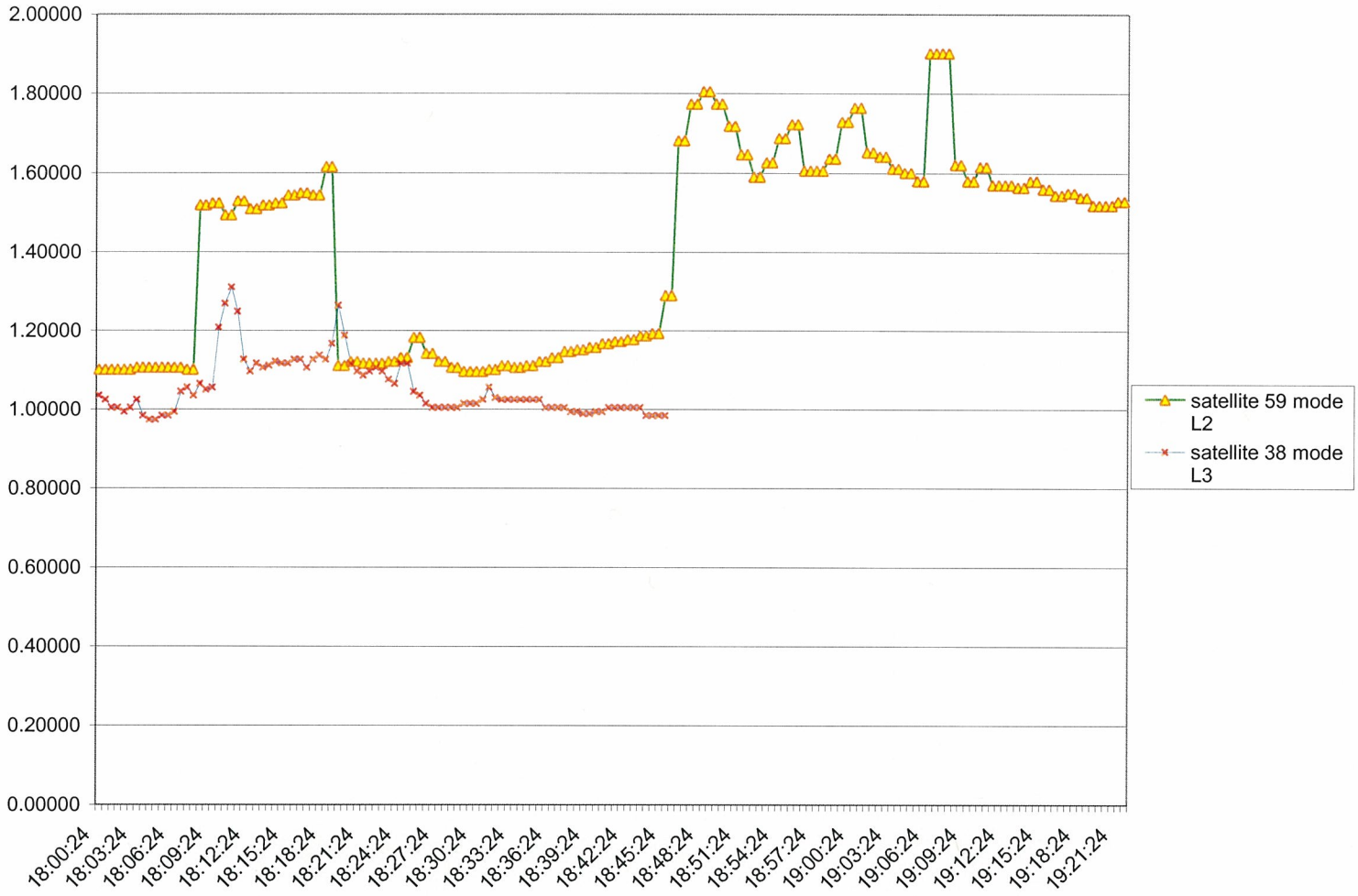

Figure 4: C-band SSPA output for two satellites; satellite 59 is in the wider band mode 'L2', and passes over Basra from 18:45:05 to 19:07:41 Z; satellite 38 is in the narrower-band mode 'L3' and passes over Basra from 18:53:45 to 19:14:06 Z.

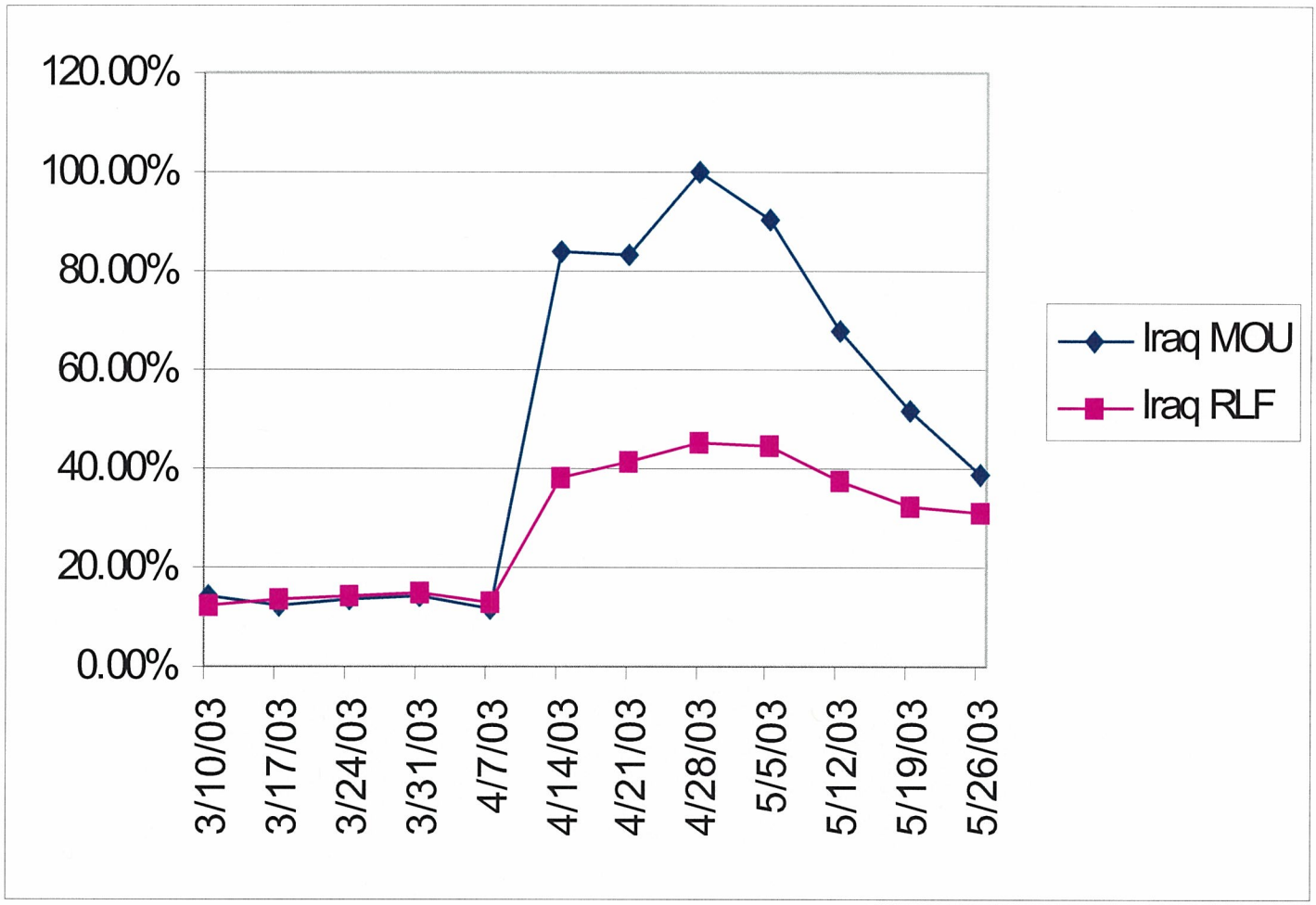

Figure 5: Weekly Minutes of Use (MOU) in Iraq as a percentage of the highest weekly traffic seen, and Radio Link Failure (RLF) rates for Globalstar system while serving Iraq.

Part II: Response to Specific Claims in Iridium's May 8 Letter

1. Overview Of Part II

In its May 8 Letter, Iridium offers data to show that it is handicapped by a lack of spectrum. In fact, all the points that Iridium makes are broad generalizations that do not prove that it needs additional spectrum to accommodate its subscribers at an acceptable level of service quality. This Part II shows that Iridium's alleged need for Channels 8 and 9 arises from an inefficient use of spectrum that should not be rewarded. Allocating its frequencies in an inefficient manner and then providing call success rate data, as Iridium has done in its May 8 Letter, simply demonstrates that its quality of service is better when its users are spread across more spectrum. Every wireless licensee in the World could make such a showing no matter how much spectrum it held.

Section 2, below, points out several discrepancies between Iridium's analysis and data to demonstrate that Iridium did not need access to Channel 8 or 9 in order to serve its Middle East traffic, and that some factors other than spectrum availability are limiting its ability to serve users in the Middle East.

2. Iridium's Data and Analysis Contain Several Discrepancies

Iridium, in its May 8 Letter, makes several statements that are either inconsistent or incompatible with the data presented in Attachments 1 through 4 of that Letter.

a. Attachment 1 to the May 8 Letter shows the total Middle East calls remaining almost unchanged (or even dropping slightly) around April 26, while Attachment 2 shows the traffic supported on Channels 8 and 9 going from about 35,000 call-minutes to 65,000 call-minutes just with the addition of Channel 8 on April 26. This large jump, which is not reflected in any increase in the total *number of calls* in Attachment 1, is more likely due to a change in the pattern of frequency allocations than due to increased traffic. Further the supposed traffic jump on April 26 is not reflected in the top curve in Attachment 4 to the May 8 Letter, which shows the "Max. connections on SV" staying relatively unchanged after the addition of Channel 8. We further note that the curve did not even increase on April 11 with the addition of Channel 9 because the traffic ramp-up had already occurred before April 11. Attachment 4 shows that the maximum number of calls per satellite did not increase as Iridium's spectrum increased by approximately fifty percent. Since most of Iraq is covered with only one Iridium satellite more than sixty percent of the time, if the maximum connections on a satellite did not increase with the inclusion of Channel 8, it is not clear how capacity went up as shown in Attachment 2. Attachments 1 and 4 together actually support the position that the addition of Channels 8 and 9 did not increase the total number of calls per satellite or SV, but merely allowed Iridium to spread its users out over a wider frequency band, just because it could. Other factors such as satellite power, or satellite-to-satellite cross-link capacity limitations or other network limitations, rather than the spectrum allocation, must be the true limiting factor(s) on Iridium's capacity.

Referring again to the topmost curve in Attachment 4 to the May 8 Letter, the maximum number of connections on an SV is around 360, even before and after the addition of channels 8

and 9. This number is only 9.4% of the maximum number of L-band uplink channels per satellite of 3,840 which was given in Table R-1 of Iridium's Minor Amendment filed with the FCC in the Big LEO Proceeding. This Minor Amendment formed the basis of Iridium's capacity estimates in the Negotiated Rulemaking (NRM) in CC Docket No. 92-166. Note that this 9.4% is quite close to Globalstar's May 1 estimates of Iridium's capacity utilization.

b. On page 3 of the May 8 Letter, Iridium asserts that Globalstar's estimate of Iridium's spectrum utilization contains numerous flaws. Iridium then makes sweeping statements about dense and distributed traffic, which actually seem to agree with Globalstar's observations. Iridium first states that "more widely distributed traffic optimizes the frequency reuse potential of the Iridium system," that "the Iridium traffic emanating out of the Middle East region has remained extremely 'dense' geographically," and that Globalstar's estimates fail to take into consideration this dense traffic. In these statements, Iridium tries to create the impression that the traffic density is much smaller than a satellite footprint so that optimal frequency reuse cannot be achieved. In a second statement, Iridium says that "at any given moment, channels 8 and 9 are actually being distributed throughout the satellite footprint covering the Middle East and surrounding regions." Here, Iridium says that the frequencies are being reused throughout the satellite footprint.

Both statements cannot be true. The first statements imply that the reason for Iridium's inability to reuse its assigned frequencies efficiently is the "dense" nature of the call traffic, and so it needs more spectrum for Middle East traffic. The second statement that "at any given moment, channels 8 and 9 are actually being distributed throughout the satellite footprint covering the Middle East and surrounding regions," is an admission that Iridium is not using Channels 8 and 9 efficiently to solve its *localized* traffic problems in the Middle East. Moreover, Iridium's apparent inability to handle *dense* traffic explains why Globalstar's studies are not recording as many Iridium carriers as would be expected based on Iridium's channel capacity suggested during the NRM.

c. On page 8 of the May 8 Letter, Iridium says that "it is these intra-system channel reuse degradations that have been dramatically improved (but not eliminated) by the additional STA spectrum." However, performance degradation can be caused by self-interference arising from intra-system channel reuse because the sidelobes of the nearby beams that are using the same frequency appear as self-interference. The effect is indistinguishable from external interference. The degradation can also be due to satellite power limitations, or an increase in traffic, both of which lead to a reduction in observed carrier-to-interference ratio or C/I. It is extremely difficult to separate the effects of all these factors. Iridium does not demonstrate how its engineers determined whether the interference contributing to the observed C/I is self-interference or external interference in a region which they acknowledge is rich in RF interference.

d. Finally, Iridium does not accept Globalstar's previous assertion on page 6 that an independent consultant measured Iridium's call drop rate to be 18.4 percent in the summer of 2002 (as opposed to its claimed 1%). Iridium states on the next page 7 that its real world call drop rate is 10% across four regions. Note that 10% is closer to the consultant's measured real-world call drop rates than the 1 % which Iridium claims is its world-wide call drop rate.