Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands	)	IB Docket No. 02-364
	)	
Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems	)	ET Docket No. 00-258

PETITION FOR RECONSIDERATION

THE WIRELESS COMMUNICATIONS ASSOCIATION INTERNATIONAL, INC.

Paul J. Sinderbrand
Wilkinson Barker Knauer, LLP
2300 N Street, NW
Suite 701
Washington, DC 20037-1128
202.783.4141

Its attorneys

September 8, 2004

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Wireless Communications Association International, Inc. ("WCA") petitions for partial reconsideration of the Commission's *Fourth Report and Order* in ET Docket No. 00-258 and the *Report and Order* in IB Docket No. 02-364 (collectively, the "*Reallocation Order*"). WCA does not object at this time to the Commission's decision to allocate the 2495-2500 MHz band for fixed and mobile except aeronautical mobile services. However, WCA urges the Commission to: (i) eliminate the co-primary allocation to the Big LEO Mobile Satellite Service ("MSS") in the 2496-2500 MHz band; (ii) provide for the immediate relocation of grandfathered terrestrial Broadcast Auxiliary Service ("BAS") and other facilities that operate in whole or in part within the 2496-2500 MHz band; and (iii) reduce permissible emissions in the 2496-2500 MHz band by Part 18 Industrial, Scientific and Medical ("ISM") devices marketed after December 31, 2006 to 500 microvolts/meter measured at 3 meters. These measures are essential if the 2496-2502 MHz band is to serve as viable relocation spectrum for Broadband Radio Service ("BRS") channel 1 licensees being moved from 2150-2156 MHz. Absent adoption of the rules changes WCA proposes here, the Commission may have no choice but to reverse its decision to relocate BRS channel 1 to the 2496-2502 MHz band.

If the 2496-2500 MHz band is to be productively employed for the relocation of licensees of BRS channel 1 as contemplated by the *Reallocation Order*, the Commission must remove the co-primary Big LEO MSS satellite downlink allocation from the 2496-2500 MHz band. The two services simply cannot exist on a co-channel, co-coverage basis without causing mutually-destructive interference. The Commission has wrongly assumed that so long as the MSS licensee's downlink transmissions in the 2495-2500 MHz band comport with the power flux density ("PFD") criteria set forth in Annex 2.1.2.3.1 of Resolution 46 of the ITU Radio Regulations, relocated BRS licensees will be immune to interference. In fact, engineering studies conducted on behalf of WCA illustrate that limiting PFDs to the Resolution 46 values does not prevent interference from MSS to relocated BRS channel 1 licensees. Those findings are consistent with prior Commission findings (including its determination that MSS licensees could not share their spectrum with independent providers of terrestrial services when authorizing the MSS Ancillary Terrestrial Component) and recent determinations within Study Group 8 of the International Telecommunication Union.

Similarly, relocated BRS channel 1 licensees will be unable to utilize their replacement spectrum in a viable manner unless the Commission acts now to relocate grandfathered terrestrial licensees from the band. Engineering studies conducted for WCA and the record before the Commission make clear that BRS channel 1 cannot coexist with BAS licensees utilizing channel A10. Essentially the same problem is presented by the co-channel sharing between BAS and the MSS Ancillary Terrestrial Component ("ATC"). The only available solution is that advanced by Society for Broadcast Engineers – provide BAS with three digital channels from 2450-2486 MHz and eliminate the overlap between BAS and both ATC and relocated BRS. The costs for this should be equitably divided between the Big LEO MSS licensee (which benefits by clearing the 2487.5-2493 MHz band for ATC) and the appropriate 1.7/2.1 GHz Advanced Wireless Service auction winners, who bear the burden of providing relocating BRS channel 1 licensees with cleared spectrum. Along the same lines, the other non-BAS grandfathered licensees must be relocated from the 2496-2500 MHz band because they pose an interference threat to BRS channel 1 and cannot be designed around because of their itinerant nature.

Finally, the Commission should require that ISM Devices marketed in the United States after December 31, 2006 keep emissions within the 2496-2500 MHz band to 500 microvolts/meter measured at 3 meters. ISM devices today are not subject to any power limit within that band. High-power ISM operations pose a serious potential threat to BRS channel 1 licensees, and the fact that other services have coexisted with ISM in the band says nothing of the threat to a ubiquitous fixed, portable and mobile service that will operate more sensitive equipment in closer proximity to ISM than its predecessor services. The signal strength limit proposed by WCA is the same that BRS channel 1 licensees are subject to today under the Part 15 rules applicable to intentional radiators in the 2150-2156 MHz band, and application of that limit to 2496-2500 MHz will maintain their *status quo*.

.

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

In the Matter of	)	
	)	
Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands	)))))	IB Docket No. 02-364
	)	
Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems	))))	ET Docket No. 00-258

PETITION FOR PARTIAL RECONSIDERATION

The Wireless Communications Association International, Inc. ("WCA"), by its attorneys and pursuant to Section 1.429(d) of the Commission's Rules, hereby petitions for partial reconsideration of the Commission's *Fourth Report and Order* in ET Docket No. 00-258 and the *Report and Order* in IB Docket No. 02-364 (collectively, the "*Reallocation Order*").[1] WCA does not object at this time to the Commission's decision to allocate the 2495-2500 MHz band for fixed and mobile except aeronautical mobile services. However, WCA urges the Commission on reconsideration to: (i) eliminate the co-primary allocation to the Big LEO Mobile Satellite Service ("MSS") in the 2496-2500 MHz band; (ii) provide for the

---

[1] *Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands and Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Service to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, IB Docket No. 02-364 and ET Docket No. 00-258, Report and Order, Fourth Report and Order and Further Notice of Proposed Rulemaking, FCC 04-134, (rel. July 16, 2004)["*Reallocation Order*"].

immediate relocation of grandfathered terrestrial Broadcast Auxiliary Service ("BAS") and other facilities that operate in whole or in part within the 2496-2500 MHz band; and (iii) reduce permissible emissions in the 2496-2500 MHz band by Part 18 Industrial, Scientific and Medical ("ISM") devices marketed after December 31, 2006 to 500 microvolts/meter measured at 3 meters. As will be demonstrated below, these measures are essential if the 2496-2502 MHz band is to serve as viable relocation spectrum for Broadband Radio Service ("BRS") channel 1 licensees being moved from 2150-2156 MHz as contemplated by the *Report and Order* in WT Docket No. 03-66 (the "*2.5 GHz Band Restructuring Order")* that was adopted by the Commission at the same time as the *Reallocation Order*.[2] Indeed, as WCA will address in detail in a forthcoming petition for reconsideration of the *2.5 GHz Band Restructuring Order*, absent adoption of the rules changes WCA proposes here, the Commission may have no choice but to reverse its decision to relocate BRS channel 1 to the 2496-2502 MHz band.[3]

I. INTRODUCTION AND STATEMENT OF INTEREST.

While the *Reallocation Order* addresses a variety of issues relating to the Big LEO MSS spectrum allocation at 1610-1626.5 MHz and 2483.5-2500 MHz, WCA's interest is limited to the rules and policies surrounding the reallocation of the 2495-2500 MHz band to the

---

[2] *See Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands*, WT Docket No. 03-66, Report and Order and Further Notice of Proposed Rulemaking, FCC 04-135 (rel. July 29, 2004)["*2.5 GHz Band Restructuring Order*"]. In that decision, the Commission has, *inter alia*, changed the name of the Multipoint Distribution Service to the BRS, effective upon the effective date of the new rules. While WCA recognizes that the name change will not become effective for several weeks, for ease of reference WCA will utilize "BRS" throughout this pleading.

[3] Because a summary of the *2.5 GHz Band Restructuring Order* has yet to be published in the *Federal Register*, the deadline for pleading cycle for petitions for reconsideration of that decision has yet to be established.

terrestrial fixed and mobile service except aeronautical mobile on a co-primary basis. As the trade association of the wireless broadband industry, WCA has a vital interest in the allocation of any spectrum that can be used to meet the pressing demand for wireless broadband services. That is particularly true in this case. As is a matter of record, WCA's membership includes the vast majority of licensees and lessees of BRS channel 1, a channel that currently plays a critical role in the provision of wireless broadband services in many markets and that is slated to be relocated to 2496-2503 MHz.[4]

WCA certainly agrees with the Commission that if spectrum below 2500 MHz is to be reallocated for the provision of terrestrial advanced wireless services, it makes eminently good sense to do so now, at a time when the Commission is also restructuring the 2500-2690 MHz band in WT Docket No. 03-66.[5] As the Commission has found, integrating additional spectrum below 2500 MHz into the larger 2500-2690 MHz band can "provide opportunities to promote development of new and innovative" services.[6] However, whether those opportunities will materialize depends on whether the rules governing the spectrum below 2500 MHz afford licensees reasonable protection against harmful interference. And that is where WCA and the Commission part company – WCA respectfully submits that the Commission has erroneously concluded that terrestrial wireless broadband service providers, and particularly relocated BRS

---

[4] In the *2.5 GHz Band Restructuring Order*, the Commission erroneously suggests that "[b]ecause of their frequency separation from the rest of the MDS spectrum, [BRS channels 1 and 2/2A] were not as extensively used." *See 2.5 GHz Band Restructuring Order* at ¶ 23. To the contrary, it is precisely because of that separation that channels 1 and 2/2A are utilized for subscriber-to-base communications in every frequency division duplex ("FDD") wireless broadband system that currently operates using BRS spectrum.

[5] *See Reallocation Order* at ¶ 69.

[6] *See id.* at ¶ 70.

channel 1 licensees, can make viable use of the 2496-2500 MHz band while sharing that spectrum with MSS satellite downlinks, a variety of licensed BAS and other terrestrial services and ISM devices authorized to operate without any limit on in-band power levels.

The Commission's error regarding the efficacy of sharing the 2496-2500 MHz band is particularly problematic because this is not a routine allocation of spectrum to be licensed through a competitive bidding process in which participants can independently assess the risk of interference from MSS, BAS, other terrestrial services and ISM to their particular business case and bid accordingly. Rather, the *Reallocation Order* presents a rare case in which the Commission is reallocating spectrum specifically to be licensed to a discrete class of licensees that are being relocated from other spectrum. Given the Commission's long history of assuring that licensees forced involuntarily to relocate from spectrum are left no worse off than before relocation,[7] it is impossible to address the propriety of the sharing rules and policies adopted in the *Reallocation Order* without considering their impact on the suitability of the 2496-2502 MHz band as replacement spectrum for 2150-2156 MHz. For the reasons discussed below, sharing the 2495-2500 MHz band with a variety of interfering uses permitted by the *Reallocation Order* will leave relocated BRS channel 1 licensees far worse off than they are today at 2150-2156 MHz, which BRS does not share with either MSS, BAS, other licensed

---

[7] *See, e.g., Amendments to the Commission's Rules Regarding a Plan for Sharing Costs of Microwave Relocation*, First Report and Order and Further Notice of Proposed Rulemaking, 11 FCC Rcd 8825, 8843 (1996) ["*Microwave Cost-Sharing Order*"]. Although the *Microwave Cost-Sharing Order* was not directly applicable to BRS relocation (*see id.* at 8869-79), the Commission's pronouncement that "our goal is to ensure that incumbents are no worse off than they would be if relocation were not required" is consistent with the Commission's general approach towards the relocation of incumbents. *See* Comments of WCA on Third Notice of Proposed Rulemaking, ET Docket No. 00-258, at 28-36 (filed April 14, 2003).

terrestrial users, or ISM users and which is free of the sorts of interference risks BRS channel 1 licensees will face if this petition for reconsideration is not granted.

II. DISCUSSION.

A. The Co-Primary MSS Satellite Downlink Allocation Must Be Removed From The 2496-2500 MHz Band To Avoid Harmful Interference To Co-Channel BRS Facilities.

If the 2496-2500 MHz band is to be productively employed by wireless broadband service providers in the manner contemplated by the *Reallocation Order* and the *2.5 GHz Restructuring Order*, the Commission must remove the co-primary Big LEO MSS satellite downlink allocation from the 2496-2500 MHz band. The two services simply cannot exist on a co-channel, co-coverage basis without causing mutually-destructive interference.

WCA appreciates that under the rules and policies adopted in the *Reallocation Order,* BRS channel 1 licensees have no obligation to protect co-channel Big LEO MSS operations in the 2495-2500 MHz band from harmful interference.[8] The Commission acknowledges that co-channel, co-coverage BRS operations will cause debilitating interference to the reception of satellite signals by MSS handsets, but concludes that in areas where BRS is deployed, Big LEO MSS will be able to effectively avoid that interference by using the remaining MSS spectrum to provide service.[9] WCA certainly agrees that Big LEO MSS will be unable to use the 2495-2500 MHz in or anywhere near those areas where BRS service is deployed.[10]

---

[8] *See Reallocation Order* at ¶¶ 1, 58.

[9] *See id.* at ¶¶ 72, 87. In particular, the *Reallocation Order* suggests that BRS is likely to be deployed in urban, suburban and somewhat developed rural areas, while the greatest demand for MSS is likely to be in very rural and undeveloped areas that BRS is unlikely to serve. *See id.* at ¶ 72. Moreover, the Commission concludes that in urban areas where BRS is deployed, MSS will likely be deploying an Ancillary Terrestrial Component ("ATC") in the 2487.5-2493 MHz band, and thus will be immune to interference from BRS. While WCA does not quarrel with these findings, they do beg the question,
(continued on next page)

However, the Commission's determination that Big LEO MSS must accept any interference from BRS channel 1 licensees only solves one of the two problems associated with any sharing between the two services. The other stems from the Commission's failure to provide BRS channel 1 licensees with any recourse if they suffer interference from a Big LEO MSS operator's satellite downlink facilities. WCA's concern over the potential for interference to relocated BRS channel 1 licensees is hardly hypothetical – as will be discussed below, the

---

discussed below, as to why the Commission feels compelled to retain a co-primary MSS allocation at 2495-2500 MHz. MSS clearly has no need for the spectrum. *See also 2.5 GHz Band Restructuring Order* at ¶ 27 n. 67 ("The MSS allocation is maintained however in the upper portion, so MSS can make use of these channels prior to deployment of the new BRS operations in the band, and in geographic areas, such as remote areas where new terrestrial services are not likely to deploy."). To the extent that the decision to allow MSS to remain in the 2496-2500 MHz band is predicated on allowing continued MSS use until such time as BRS deploys in the band (a rationale that is not mentioned in the *Reallocation Order*), WCA respectfully submits that there are more narrowly targeted ways to accomplish that result without giving MSS a permanent co-primary status in the band.

[10] Illustrating the severity of the interference MSS will suffer is an *ex parte* presentation that Globalstar, L.P. ("Globalstar"), the predecessor in interest to the sole remaining Big LEO MSS licensee, filed with the Commission contending that:

> A point-to-multipoint service, such as MDS, would have a much more severe impact because the typical omnidirectional transmitter would create a large circular or polygonal footprint within which a Globalstar phone could not operate. Given the size of Globalstar beams, a single terrestrial transmitter sharing S-band could interfere with a Globalstar user terminal within approximately 10 miles.

Letter from William D. Wallace to Marlene H. Dortch, IB Docket No. 02-364, at 4 (filed Feb. 26, 2004)["Globalstar Feb. 26, 2004 Ex Parte"]. Also instructive are filings that Globalstar made with the Commission in 2002 in support of its contention that an independent terrestrial service could not coexist on a co-channel, co-coverage basis with MSS. Although BRS channel 1 will not always be used in precisely the manner presumed by Globalstar in its studies, it is highly likely that some BRS licensees will deploy facilities consistent with those presumed by Globalstar. Not surprising, Globalstar predicted where spectrum is used both for base-to-subscriber communications by the terrestrial service and for an MSS downlink (as will be the case if BRS channel 1 is used for a TDD technology or the downstream channel for an FDD pair), the MSS handset will receive interference if it is within 5 to 10 kilometers of the base station (depending on the propagation model used and the terrestrial technology). *See* Response of Globalstar to FCC Public Notice DA 02-554, IB Docket No. 01-185 and ET Docket No. 95-18, Attachment at 4, 10-11 (filed Oct. 22, 2002)["Globalstar Sharing Response"]. And, where the spectrum is used both for upstream communications by the terrestrial service and for an MSS downlink (as will be the case if BRS channel 1 is used for a TDD technology or the upstream channel of an FDD

(continued on next page)

Big LEO MSS satellite downlink signals that blanket the nation will cause significant interference to BRS base stations and subscriber equipment.

The *Reallocation Order*'s clear intent is that BRS channel 1 licensees should not be subject to interference from Big LEO MSS downlink transmissions.[11] Unfortunately, the Commission wrongly presumes that so long as the MSS licensee's downlink transmissions in the 2495-2500 MHz band comport with the power flux density ("PFD") limits set forth in Annex 2.1.2.3.1 of Resolution 46 of the ITU Radio Regulations, relocated BRS licensees will be immune to interference.[12] Specifically, the *Reallocation Order* states that:

> [Relocated BRS channel 1] licensees will be protected from MSS interference because CDMA MSS systems currently are restricted in the level of power they can transmit by existing PFD limits. [footnote citing to Annex 2.1.2.3.1 of Resolution 46 of the ITU Radio Regulations] In general, PFD limits are put in place to allow terrestrial services, such as fixed and mobile, to share co-frequency with space services.[13]

Unfortunately, the Commission's conclusion is not correct.

At the outset, it must be noted that Annex 2.1.2.3.1 of Resolution 46 does not impose any absolute limit on the PFD that a Big LEO MSS licensee can generate at the earth's surface. Rather, that Annex merely sets forth the PFD limits that trigger international coordination efforts, and it does so on an "interim" basis "pending the entry into force of a permanent procedure."[14] Thus, a BRS licensee has no assurance that the Annex 2.1.2.3.1 values represent

---

pair), Globalstar predicted that unacceptable interference will occur when the two terminals are within 40 to 50 meters of each other (depending on the terrestrial technology). *See id.* at 6-7, 11-12.

[11] *See Reallocation Order* at ¶ 73.

[12] *See id. See also id.* at ¶ 58 ("CDMA MSS operators must . . . comply with existing PFD limits when operating in this band.").

[13] *See id.* at ¶ 73 (citation to ITU Radio Regulations, Resolution 46, Annex 2.1.2.3.1 omitted).

[14] ITU Radio Regulations, Resolution 46.

the maximum PFD from Big LEO MSS downlinks it may be forced to suffer. Nor do the Commission's Rules provide any such assurance, as the Commission imposes no maximum PFD limit on a Big LEO MSS licensee.[15]

But simply amending Section 25.208 (which establishes the PFD limits for other satellite services) to add a new subsection limiting a Big LEO MSS licensee to the Annex 2.1.2.3.1 PFD values is not the solution. The more fundamental problem facing the Commission is that even if a Big LEO MSS licensee operates at the PFD levels specified in Annex 2.1.2.3.1, it will cause debilitating interference to the types of BRS facilities the *Reallocation Order* and the *2.5 GHz Band Restructuring Order* contemplate will be deployed at 2496-2502 MHz. Indeed, as Note 7 to Annex 2.1.2.3.1 makes clear, the coordination values were designed to provide full protection only for analogue radio-relay systems using the sharing criteria established by Recommendation ITU-R SF.357 and those values "will not provide full protection for existing digital fixed systems in all cases." While it is suggested in Annex 2.1.2.3.1 that those values may provide "adequate" protection for digital fixed services, there is no evidence that Annex 2.1.2.3.1 contemplates deployment of the sorts of ubiquitous fixed, portable and mobile cellularized service offerings that will be the predominate offerings on BRS channel 1.

Because Annex 2.1.2.3.1 does not address the technologies that are actually being deployed by BRS licensees today, WCA charged the Satellite Interference Task Group ("SITG") of its Engineering Committee with the preparation of an analysis of the potential for MSS satellite downlink signals to cause interference to BRS technology. Annexed hereto as

---

[15] *See* 47 C.F.R. § 25.208 (2003).

Attachment A is a declaration by Harry Perlow, the Chair of the SITG, reporting on the results of that analysis.[16] As Mr. Perlow details, SITG undertook a comprehensive analysis of the potential for MSS to interfere with the FDD and time division duplex ("TDD") technologies that are today deployed by BRS licensees in the 2150-2162 MHz and 2500-2690 MHz bands. Recognizing that BRS channel 1 can be used in a variety of ways, the SITG reviewed five different BRS channel 1 deployment scenarios. As Mr. Perlow notes, the SITG analysis is highly conservative, as it only evaluated the impact of a single Big LEO MSS satellite on each model deployment, while in reality it is highly likely that the receive antennas in issue will be picking up transmissions from multiple Big LEO MSS satellites simultaneously. Nonetheless, Attachment A details that *for each of the five deployment scenarios analyzed, significant harmful interference to relocated BRS channel 1 operations is predicted!*

The Satellite Interference Task Group's conclusion that the MSS satellite downlink signals will cause harmful interference to BRS operations at 2496-2500 MHz should not come as a surprise to the Commission. To the contrary, the record before the Commission is clear that the problems associated with sharing between the MSS and ubiquitous portable and mobile

---

[16] Although the Commission generally does not consider new facts on reconsideration absent special circumstances, it is well settled that where, as here, the specific proposal adopted by the Commission differs from that advanced in the applicable notice of proposed rulemaking, the Commission must permit the introduction of new information and arguments on reconsideration. *See Amendment of Section 73.202(b), FM Table of Allotments, FM Broadcast Stations, Memorandum Opinion and Order*, 19 FCC Rcd 10068, ¶ 15 (2004). None of the numerous notices of proposed rulemakings in these two proceedings identified the 2496-2502 MHz band as potential relocation spectrum for BRS channel 1 licensees, much less indicate that any replacement spectrum would be shared basis with Big LEO MSS, BAS and others. Since WCA and the other parties to this proceeding "had no prior opportunity to evaluate" the specific reallocation proposal adopted by the Commission in the *Reallocation Order*, "it [is] appropriate to permit the submission of [new] materials at the reconsideration stage." *Id.* Thus, to the extent WCA is presenting the Commission with new facts and arguments relating to the sharing of 2496-2500 MHz between relocated BRS channel 1, those facts and arguments are all admissible at this stage of the proceeding.

terrestrial systems on a co-channel basis are insurmountable absent substantial geographic separations in service areas.

For example, three years ago Commission specifically rejected efforts by satellite interests to secure an allocation of the 2500-2520/2670-2690 MHz bands for MSS, concluding that sharing between the incumbent terrestrial systems and MSS systems "was not feasible."[17] More recently, in authorizing MSS operators to provide terrestrial ATC, the Commission rejected suggestions that the MSS spectrum could be used by operators unrelated to the MSS licensee to provide domestic terrestrial services. The Commission "conclude[d] that same-band, separate operator sharing is impractical and ill-advised"[18] and that "establishing shared usage between MSS and terrestrial services would likely compromise effectiveness to such a degree that neither service would prove cost-effective, and therefore would probably not be deployed."[19] This conclusion was based on technical arguments advanced by the MSS industry to the effect that sharing of spectrum between independent MSS and terrestrial operations was not viable. For example, Globalstar advised the Commission that "independent satellite and

---

[17] *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, First Report and Order and Memorandum Opinion and Order, 16 FCC Rcd 17222, 17227-28 (2001), *cited in WRC Implementation Order*, 18 FCC Rcd at 23443-44; *Amendment of Parts 2, 25, and 87 of the Commission's Rules to Implement Decisions from the World Radiocommunication Conferences Concerning Frequency Bands Between 28 MHz and 36 GHz and to Otherwise Update the Rules in this Frequency Range*, Notice of Proposed Rulemaking, 17 FCC Rcd 19756, 19773 (2002). *See also Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, Notice of Proposed Rulemaking and Order, 16 FCC Rcd 596, 624-25 (2001)("Sharing between terrestrial and satellite systems would present substantial technical challenges in that band.").

[18] *Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands*, Report and Order, 18 FCC Rcd 1962, 1991-92 (2003)["*MSS/ATC Authorization Order*"].

terrestrial mobile systems operating in the same bands would cause debilitating interference to each other, whether the terrestrial service operates using a forward band or reverse band system with respect to the satellite service."[20]

These conclusions are fully consistent with findings reached of late within the International Telecommunications Union ("ITU") regarding the infeasibility of co-channel sharing between satellite and ubiquitous terrestrial services. For example, the meeting of ITU-R Study Group 8 that took place in December 2003 approved Report ITU-R M.2041 "Sharing and adjacent band compatibility in the 2.5 GHz band between the terrestrial and satellite components of IMT-2000." That document concludes that:

> [w]hen considering the sharing of the same frequency band between the terrestrial component of IMT-2000 and the MSS, the detailed analysis . . . shows that such sharing is not feasible over the same geographical area. Consequently, Radiocommunication Study Group 8 came to the conclusion that co-frequency sharing is not feasible for networks operating in the same geographical area.[21]

Given that the 2.4 GHz band is utilized by Big LEO MSS licensees for satellite downlink transmissions, there is no practical means by which MSS can restrict the footprint of its transmissions in the 2496-2500 MHz band to avoid interference to BRS channel 1. The only viable solution is to eliminate the co-primary MSS allocation from the 2496-2500 MHz band and restrict MSS satellite downlink service to the 11.5 MHz segment at 2483.5-2496 MHz.

---

[19] *Id.* at 1995.

[20] Globalstar Sharing Response at 5. Globalstar further explained that "[t]he only feasible method to manage the interference . . . is to offer terrestrial service in selected locations on selected channels, reusing the channels outside the relatively small boundaries of the terrestrial service area." *Id.* at 5. As this illustrates, terrestrial ATC operations will not share spectrum with satellite MSS services in any traditional sense – at no time will a given channel be used for both terrestrial and satellite service at the same time in the same location. Rather, the system operator will manage its resources, allocating given spectrum at a given location to terrestrial or to satellite service as needed.

New Operating Globalstar, LLC ("New Globalstar"), the sole remaining MSS licensee of 2.4 GHz MSS spectrum, cannot legitimately object to adoption of WCA's proposal. Under WCA's approach , New Globalstar will retain access to 11.5 MHz of spectrum for its exclusive use. It will only lose access to 4 MHz of spectrum in the 2483.5-2500 MHz band, as compared to the Commission's proposal in the *Notice of Proposed Rulemaking* in IB Docket No. 02-364 ("*Big LEO Spectrum Sharing NPRM*") to reduce Globalstar's spectrum assignment in the band by as much as 11 MHz.[22] Indeed, long before the issuance of the *Big LEO Spectrum Sharing NPRM*, Globalstar was on explicit notice that it would be denied use of the entire 16.5 MHz in the 2483.5-2500 MHz band (which was initially intended to accommodate four Big LEO CDMA systems) if it were the sole CDMA Big LEO MSS operator..

As the Commission considers the equities here, it cannot forget that when it first developed the Big LEO band plan, it anticipated that some of the systems might not be constructed, and indicated that if that circumstance should occur, then the spectrum would be re-assigned. In that context, the Commission stated that:

> In the unlikely event that only one CDMA system is implemented, we propose to reduce the bandwidth assigned to that system from 11.35 MHz to 8.25 MHz, even if some of the system's space stations are in-orbit and operating. An 8.25 MHz assignment should be sufficient to implement a viable system and should

---

[21] ITU-R Study Group 8, "Sharing and adjacent band compatibility in the 2.5 GHz band between terrestrial and satellite components of IMT-2000," Report ITU-R M.2041, at 8-9 (2003).

[22] *See Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands*, IB Docket No. 02-364, Notice of Proposed Rulemaking, 18 FCC Rcd 1962, 2091 (2003). *See also Reallocation Order* at ¶ 33. ("Under the plan adopted in this Order, spectrum in the 2483.5-2492.5 MHz and 2498-2500 MHz bands could be available for other uses."). Given that the Commission had sought comment on the reallocation of as much as 11 MHz of the 2483.5-2500 MHz MSS allocation before Globalstar was acquired by Thermo Capital Partners, L.L.C., New Globalstar's assertion prior to adoption of the *Reallocation Order* that its purchase was predicated on the assumption that 13.73 MHz to 13.905 MHz of the S-band would remain licensed to Globalstar is absolutely incredible. Globalstar Feb. 26, 2004 Ex Parte at 1.

also provide us with some flexibility when coordinating the system. It may also provide some room for expected growth.[23]

Ultimately, the Commission elected to address the situation of a remaining single CDMA Big LEO licensee only if it arose, and, now that the situation has arisen, New Globalstar cannot be heard to object to WCA's proposed modest reduction in the Big LEO MSS allocation. Clearly, the 11.5 MHz of downlink spectrum New Globalstar would retain under WCA's proposal is significantly more than the 8.25 MHz the Commission deemed sufficient for the sole remaining CDMA operator at the time of the original Big LEO allocation.

Moreover, WCA's proposal is fully consistent with Globalstar's own assertion that CDMA Big LEO operators require only 1.4 MHz of downlink spectrum for every 1 MHz of uplink spectrum, and that New Globalstar thus only requires 11.5 MHz of bandwidth at 2.4 GHz.[24] The *Reallocation Order* agreed with Globalstar's analysis, and concluded that as a

---

[23] *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*, Notice of Proposed Rulemaking, 9 FCC Rcd 1094, 1112. (1994).

[24] *See* Letter from William Wallace to Marlene H. Dortch, IB Docket No. 02-364, at 12 (filed Sept. 15, 2003). Although WCA is proposing that, for the time being, the Big LEO MSS allocation be 2483.5-2495 MHz, it should not be implied that WCA believes New Globalstar reasonable requires access to a full 11.5 MHz of downlink spectrum. Given the history of the Big LEO licensing process and Globalstar's own limited usage to date, it is difficult to envision a scenario under which Globalstar would have a legitimate need for all of the spectrum provided for under WCA's proposed approach. While Globalstar has previously claimed that it is "fully utilizing" the 2483.5-2500 MHz band, it has subsequently conceded that it is merely using 7.5 MHz of the band and has conceded that it could make do with less than the entire band. *Compare* Joint Comments of L/Q Licensee, Globalstar and Globalstar USA, IB Docket No. 02-364, at 6 (filed Jul. 11, 2003)["Globalstar Comments"] *with* Globalstar Feb. 26, 2004 Ex Parte at 1. While now is not the time to debate whether the Commission should protect Globalstar from possible flaws in its own satellite system design, the evidence introduced into the record by Iridium strongly suggests that Globalstar is using spectrum in a highly inefficient manner. *See* Letter from Peter D. Shields to Marlene H. Dortch, IB Docket No. 02-364, Attachment at 7 (filed Mar. 17, 2004). Globalstar's actual usage bears this out. In IB Docket No. 02-364, evidence has been introduced as to the current usage of the Globalstar and Iridium systems. On a relative basis, Globalstar appears to be using its spectrum much less efficiently than Iridium – for the first half of 2003, Iridium supported more than 1.5 times the number of minutes as Globalstar in less than one-fifth of the spectrum. *See id.,* Attachment at 2. Moreover, according to Globalstar, Iridium should be able to support more than

(continued on next page)

result "CDMA MSS operators need essentially exclusive access to about 11.5 megahertz (8.25 megahertz unshared in L-band X 1.4) in the S-band to utilize their spectrum most efficiently, i.e., to retain the 1 to 1.4 proportion of spectrum usage."[25] In so doing, the Commission reiterated that "the original Big LEO band plan was based on up to four CDMA MSS operators sharing the spectrum, and the sole remaining CDMA MSS operator should not expect to have unfettered access to 11.35 megahertz in the L-band and 16.5 megahertz in the S-band."[26]

That Big LEO MSS does not need shared access to the 2496-2500 MHz band is reinforced by the Commission's own recognition that the only areas of the country where Big LEO MSS will be immune to interference from BRS is those very rural areas where BRS is unlikely to be deployed.[27] In those isolated areas where Big LEO MSS will work in the 2496-2500 MHz band free from interference, satellite services may have a relatively high share of the market given the lack of alternatives, but the number of users at any given time will still be quite low from an absolute perspective because of the few persons in those isolated areas at any given time. Thus, there is no reason to believe that Big LEO MSS requires access to 16.5 MHz of downlink spectrum – the amount initially assigned to four systems and twice what the Commission proposed go to any one licensee in the case of attrition -- to serve those areas. To the contrary, from all appearances Big LEO MSS can serve these areas with far less than even the 11.5 MHz afforded it under the WCA proposal.

500,000 customers in the Continental United States alone with its 5.15 MHz of spectrum. Globalstar Comments at 13.

[25] *Reallocation Order* at ¶ 66.

[26] *Id.*

[27] *See id.* at ¶ 72.

The bottom line is simple – continued Big LEO MSS downlink transmissions in the 2496-2500 MHz band will cause debilitating interference to BRS operations in the band and are totally unnecessary to meet the legitimate needs of the sole remaining Big LEO MSS licensee. Eliminating the co-primary Big LEO MSS allocation from the 2496-2500 MHz band will be a critical first step towards clearing that band for relocated BRS channel 1 operations.

B. Terrestrial Facilities Currently Licensed To Operate In The 2496-2500 MHz Band Must Be Relocated To Avoid Harmful Interference To BRS Facilities.

In addition to the problematic Big LEO MSS satellite downlinks, the *Reallocation Order* acknowledges that "a database search shows that the 2495-2500 MHz band currently includes 108 licensees for BAS and private radio services, which are grandfathered on a primary basis: 1 local television transmission license, 12 point-to-point microwave, private-industrial business licenses, 4 conventional public safety pool licenses, 12 TV intercity licenses, 78 TV pickup licenses and 1 television translator relay license."[28] Yet, despite unrefuted evidence in the record that these sorts of facilities cannot co-exist with the types of ubiquitous fixed, portable and mobile services relocated BRS channel 1 licensees are expected to provide, the *Reallocation Order* "decline[s] to set forth a specific relocation plan for the remaining grandfathered incumbents at 2495-2500 MHz, including BAS and private land mobile operators."[29] Instead, the Commission has chosen to "provide a relocation plan, *if*

---

[28] *See Reallocation Order* at ¶ 26. Footnote NG 147 provides that "Stations in the broadcast auxiliary service and private radio services licensed as of July 25, 1985, or on a subsequent date following as a result of submitting an application for license on or before July 25, 1985, may continue to operate on a primary basis with the mobile-satellite service and the radiodetermination satellite service." 47 C.F.R. § 1.206, note NG 147 (2003).

[29] *Reallocation Order* at ¶ 67.

necessary, when we address the remaining issues in ET Docket No. 00-258 concerning AWS relocation."[30]

Any suggestion that relocation of these incumbents may not be necessary or can be put off until a later day is belied by the facts that have been placed before the Commission in this proceeding and by the Commission's findings in other related proceedings. As will be demonstrated below, it is beyond peradventure that if relocating BRS channel 1 licensees are to wind up no worse off after relocation then they are today, the Commission must take immediate steps to clear the incumbent licensed terrestrial users who pose clear risks of interference to BRS operations at 2496-2502 MHz.

1. The Commission Should Clear Grandfathered BAS Licensees From 2496-2500 MHz By Requiring AWS Auction Winners And/Or Providers Of ATC Services To Fund The Relocation Of BAS To The 2450-2486 MHz Band.

As is recognized by the Commission, the vast majority of the grandfathered licensees at issue here operate BAS facilities that utilize channel A10, which is at 2483.5-2500 MHz. Attached hereto as Attachment B is an engineering statement prepared by Kessler & Gehman Associates. Inc. ("KGA") that examines the potential for interference between relocated BRS operations and these BAS grandfathered operations.

Despite utilizing highly conservative assumptions, the KGA study finds that co-channel, co-coverage operation of itinerant BAS facilities and the sort of ubiquitous fixed, portable and mobile services that the Commission hopes to develop in the BRS bands is not possible. In each of the scenarios studied by KGA, a relocated BRS channel 1 receiver (whether base station or subscriber unit) will suffer interference if it is within many miles of a transmitting

---

[30] *Id.* (emphasis added).

BAS mobile unit. Indeed, KGA's analyses show that that at modest antenna height assumptions interference to BRS channel 1 facilities can range 11-39 miles (depending on the deployment scenario) and can extend much, much farther if antennas are farther above ground level than assumed.. Similarly, KGA concludes that whether relocated BRS channel 1 is used for mobile transmissions or for base station transmissions, BAS use will be adversely impact.[31]

That BRS and BAS cannot share the same spectrum should come as no surprise to the Commission, as it is well established in the record. For example, in response to a proposal that BRS channels 1 and 2 be relocated to the 2490-2500 MHz band, WCA's Reply Comments in response to the *NPRM* in IB Docket No. 02-364 provided the Commission with a detailed discussion of the adjacent channel interference to relocated BRS stations that would be caused by analog BAS operations on channel A9 (2467-2483.5 MHz).[32]

At that time, WCA did not even address the question of cochannel interference from BAS operations on Channel A10 (2483.5-2500 MHz), relying on the Commission's pronouncement in the February 10, 2003 *MSS/ATC Authorization Order* that no grandfathered BAS operations remained on that band.[33] Of course, the Commission later learned that it had been wrong – there are a myriad of BAS facilities that continue to remain licensed to operate on 2483.5-2500 MHz. In a Petition for Reconsideration of the *MSS/ATC Authorization Order*,

---

[31] The KGA study also establishes that analog BAS operations on channel A9 will cause adjacent channel interference to relocated BRS channel1 operations under certain scenarios. As a result, simply eliminating BAS channel A10 and forcing the broadcasters to make due with their other BAS capacity would not be a viable solution unless the Commission also restricted operations on channel A9 to digital service complying with the digital BAS spectral mask (which is more stringent than the analog mask).

[32] *See* Reply Comments of WCA, IB Docket No. 02-364, Ex. 1 at 9-13 (filed July 25, 2003).

[33] *See MSS/ATC Authorization Order,* 18 FCC Rcd at App. C. at § 4.2.2 ("our records indicate that there are no grandfathered BAS facilities licensed in the 2483.5 – 2500 MHz Band.").

the Society of Broadcast Engineers ("SBE") presented the Commission with evidence that as many as 87 BAS stations continue to be authorized to operate on Channel A10.[34] SBE established that operation of ATC systems "would cause massive interference" to BAS operations, and proposed as a solution that ATC system operators be required to replace existing 2.4 GHz BAS equipment with digitized technology that could operate without any spectrum overlap with ATC.[35]

Significantly, although it termed its responsive filing an "Opposition" because it did not concede that any BAS stations are today licensed to operate on channel A10, Globalstar went on to agree that "[i]f there are a few such operational BAS stations, then relocation is an appropriate remedy."[36] While Globalstar committed to the funding of relocations, it has sought to impose a variety of conditions on its obligations, the most significant of which, for present purposes, is that it only be required to fund conversions in those areas where it operates ATC facilities.[37] In its Reply, SBE has made a compelling case that because of the mobile nature of so much 2.4 GHz BAS equipment, a conversion of all BAS facilities in the 2.4 GHz band to digital technology is required.[38]

The Commission's decision to relocate BRS channel 1 licensees to the 2496-2502 MHz band only reinforces the wisdom of this proposed approach to the problem. BAS simply cannot

---

[34] *See* Petition of Society of Broadcast Engineers for Reconsideration, IB Docket No. 01-185, 1-3 (filed April 4, 2003).

[35] *Id* at 2-3.

[36] Opposition of Globalstar to Petition for Reconsideration, IB Docket No. 01-185, at 3 (filed March 3, 2004).

[37] *See id.* at 3-5.

[38] *See* Reply of Society of Broadcast Engineers, IB Docket No. 01-185 (March 30, 2004).

co-exist on a co-channel, co-coverage basis with either ATC or BRS, and thus the best solution is to relocate BAS to spectrum below the 2487.5-2493 MHz band designated for ATC. WCA understands that SBE will be proposing a plan under which the 2.4 GHz BAS channel plan would be revised to consist of three digital channels at 2450-2462 MHz (A8), 2462-2474 MHz (A9) and 2474-2482 MHz (A10). WCA believes that such a channelization plan makes eminently good sense, that it should be adopted and that BAS should be relocated to 2450-2483.5 MHz as quickly as possible to expedite the interference-free relocation of BRS channel 1 to 2496-2502 MHz. Consistent with the Commission's long-standing policy that the beneficiaries of an involuntary relocation fund that relocation, WCA urges the Commission to require that costs of converting 2.4 GHz BAS to this plan be equitably divided between New Globalstar, which benefits from the clearing of its ATC spectrum, and the appropriate 1.7/2.1 GHz AWS auction winners, who benefit from the clearing of BRS channel 1 licensees from 2150-2162 MHz to viable replacement spectrum.

2. The Commission Should Mandate The Relocation Of Non-BAS Terrestrial Users From The 2496-2500 MHz Band At The Expense Of The AWS Auction Winners.

Migrating BAS to a digital service in the 2450-2486 MHz band as proposed by SBE will be a step in the right direction towards making the 2496-2500 MHz band a suitable band for BRS relocation, but more is necessary. The *Reallocation Order* acknowledges that, in addition to BAS, there are a variety of other terrestrial users of the band.[39] What the *Reallocation Order* does not address is that these users pose a very real threat to relocated BRS channel 1 operations and that they can readily be relocated to other spectrum.

---

[39] *See Reallocation Order* at ¶ 26.

There should be no question that these facilities cannot co-exist with relocated BRS channel 1 operations. When the Commission granted MSS authority to provide ATC, it specifically acknowledged that "[t]he operation of ATC base stations in the 2483.5-2500 MHz band could potentially cause interference to the grandfathered fixed and temporary-fixed stations in this band. Additionally, there is a potential for interference from the grandfathered fixed and temporary-fixed stations to the ATC MTs."[40] Nonetheless, the Commission was able to proceed with the authorization of ATC last year because: (i) it imposed an absolute obligation on ATC system operators to protected the grandfathered facilities from harmful interference; and (ii) the MSS licensees deploying ATC bore the risk of interference from those grandfathered facilities to their own ATC systems.

The present situation is similar to that before the Commission last year in that ATC facilities have technical and operating characteristics that will not be materially different from some BRS deployments. Thus, to the extent the Commission has found that grandfathered non-BAS terrestrial operations will cause interference to and suffer interference from ATC, it is equally true that grandfathered non-BAS terrestrial operations will cause interference to and suffer interference from relocated BRS channel 1 licensees. However, the present situation is quite dissimilar from that before the Commission last year because relocating BRS licensees neither are being asked either to provide absolute protection to the grandfathered facilities nor are they being saddled with the obligation to accept any interference caused by grandfathered

---

[40] *MSS/ATC Authorization Order*, App. C at § 4.2.1.

operations. These are fundamental differences, and yet they are ignored by the *Reallocation Order*.[41]

Because the Commission itself has acknowledged the risk of interference to the BRS channel 1 licensees being relocated to 2496-2502 MHz, it cannot merely slough off responsibility for addressing the problem until some future date. Rather, the Commission on reconsideration should make clear that these grandfathered licensees will have to relocate to alternative spectrum. The AWS auction winners that benefit from the relocation of BRS channel 1 licensees from 2150-2156 MHz should bear the financial obligations associated with the relocation of these grandfathered licensees (although WCA recognizes that such relocation will also benefit Big LEO ATC system operators and would not object were the relocation costs split among the two classes of licensee in a fair manner).[42]

---

[41] Although not addressed in the *Reallocation Order*, the *2.5 GHz Band Restructuring Order* suggests, albeit in summary fashion, that relocated BRS licensees should be able to share the band through coordination. *2.5 GHz Restructuring Order* at ¶ 28. What this ignores, however, is that BRS channel 1 will likely be used for the provision of ubiquitously-available portable and mobile services, thus making coordination impractical.

[42] In prior filings in ET Docket No. 00-258, WCA has addressed in detail the policies that should govern the relocation of incumbent licensees in any spectrum designated as the replacement spectrum for BRS channel 1. *See, e.g.* Letter from Karen B. Possner, *et al* to Michael K. Powell, ET Docket No. 00-258, App. A (filed April 7, 2004); Letter from Karen B. Possner, *et al* to Michael K. Powell, ET Docket No. 00-258 IB Docket No. 01-185 and ET Docket No. 95-18, App. A (filed July 11, 2002). While WCA need not repeat that discussion here, it must emphasize the importance of providing BRS channel 1 licensees with the ability, if they choose, to self-relocate, with the costs of that endeavor being reimbursed by the appropriate party or parties. BRS channel 1 licensees have had the dark cloud of relocation hanging over them for almost four years now, and the result has been that many have deferred deployment plans pending identification of replacement spectrum. Those licensees should not now be placed in a situation where they cannot deploy using their new spectrum until after the 1.7/2.1 GHz auction or some other event outside their control. While BRS licensees should not be required to fund their own relocation if they choose not to, they certainly should have the freedom to engage in self-help and later recover their expenses. This same right was afforded fixed microwave service licensees, and there is no rational basis for treating BRS channel 1 licensees differently. *See Amendment to the Commission's Rules Regarding a Plan for Sharing the Costs of Microwave Relocation*, 12 FCC Rcd 2705, 2717-18 (1997).

Relocation of these other users from the 2496-2500 MHz band should not cause any serious dislocation. For example, the private microwave licenses in issue are temporary fixed point-to-point licenses that are authorized to operate over substantial regions of the country at relatively high power levels (EIRPs range from 51.3 to 65.2 dBM.[43] The temporary fixed nature of the operations make coordination by BRS licensees impossible. Although WCA has not been able to review all of the grandfathered licenses, it appears that most authorize operations with narrow channels (470-800 kHz wide) anywhere within the 2453.5-2496.3 MHz band. Thus, it does not appear that restricting these licensees from operating in the 2496-2500 MHz band would impose any hardship.[44]

The situation involving the four public safety poll licenses is similar. Three are three statewide licenses (MI, NH and MA) and one that authorizes operations within a 6 kilometer radius in Kansas Apparently, firefighters use the 2450-2500 MHz band to broadcast a video signal from the scene of a fire back to a collection point. The authorized transmitter power is 300 mW and from WCA's review of ULS, it does not appear that there is any limitation on antenna gain or transmission antenna height. Again, because of the mobile nature and the large area of operation, coordination by BRS licensees is not possible. However, each of the four licensees is authorized with emission bandwidths of only 16 MHz, but allowed to operate anywhere within a 50 MHz band. WCA respectfully submits that banning such grandfathered operations from the 2496-2500 MHz band will not have any serious adverse ramifications for

---

[43] One of the license holders is Chevron, which is authorized to use these frequencies in a rectangular area that encompasses California, Oregon and Washington.

[44] To the extent that any costs are involved, those costs should be borne by the appropriate AWS auction winners who benefit from the relocation of BRS channel 1 from 2150-2156 MHz.

these four licensees, as they will all have ample spectrum to continue their operations in the remaining spectrum.

Along the same lines, the sole Local TV Transmission Service is a nationwide license allowing a temporary fixed or mobile station to transmit on the following frequencies 1990-2110, 2450-2500, 6425-6525, 13200-13250, 17700-23600 and 31000-31300 MHz. While the mobile nature of this authorization precludes effective coordination by the BRS channel 1 licensee, elimination of the 2496-2500 MHz band from the list of authorized frequencies would leave the licensee with ample spectrum on which to continue operating.

In short, the record is clear that these non-BAS grandfathered users pose a serious interference threat to relocated BRS 1 operations, and can readily operate elsewhere.

C. The Commission Should Require That ISM Devices Marketed In The United States After December 31, 2006 Operate In Compliance With The Part 15 Intentional Radiator Limits In The 2496-2500 MHz Band.

Finally, the Commission should modify Part 18 to provide relocated BRS channel 1 licensees with assurance that their ubiquitous fixed and mobile wireless broadband services will not suffer interference as a result of sharing the band with unlicensed ISM uses regulated under Part 18.

Under Section 18.305(a) of the Commission's Rules, ISM equipment is not subject to any limitation on the power it can emit within the 2496-2500 MHz band. Having high-power ISM equipment share spectrum with the ubiquitous portable and mobile services envisioned by the Commission would appear to be a recipe for disaster. While the Commission concludes that continued ISM operations in the band will not prove problematic for relocated BRS stations, it cites to no technical analysis of the impact ISM will have on the ubiquitous fixed, portable and mobile service BRS channel 1 will be used to offer, but instead bases its conclusion on the statement that "MSS, BAS and private radio licensees have operated in this band for many years under the provisions of footnote 5.150 of the ITU radio regulations without significant interference problems."[45] WCA is not so sanguine.

WCA submits that the Commission's analysis falls short in two respects. First, the existing applications in the 2496-2500 MHz band all differ significantly from the advanced wireless services that the Commission contemplates for the band going forward. What the Commission's analysis ignores is that current users of the band either tend to be in relatively remote areas or utilize high-power, high-gain antenna systems that are relatively immune to ISM interference. By contrast, BRS channel 1 is being used today primarily in connection with wireless Internet access services offered to residential and business subscribers. Thus, relocated BRS channel 1 operations will be operating at lower power levels, and will be in closer proximity to ISM devices, than any of the current terrestrial incumbents. None of the existing services provide ubiquitous service throughout urban areas where ISM use is greatest. None of the existing services rely on a network of highly-sensitive omnidirectional base stations that are difficult to isolate from cochannel signals. And none of the existing service involve the use of mobile receivers by consumers that are likely to be in the vicinity of such sources of ISM interference as microwave ovens. As such, the ability of the current incumbents to co-exist with ISM is not predictive of the experience relocated BRS licensees are likely to face.

Second, the *Reallocation Order* ignores the very real possibility that, as technology (particularly filter technology) evolves in the future, ISM devices will operate at increasingly

---

[45] *Reallocation Order* at ¶ 67.

high signal strength levels within the 2496-2500 MHz band. Even if one assumes that ISM devices today do not pose a significant threat of interference to existing users of the 2496-2500 MHz band, that is likely because the filters employed by ISM equipment manufacturers to comply with the spectral mask of Section 18.305(b) require significant signal roll-off in the 2496-2500 MHz band in order to meet the mask at 2500 MHz. However, as filter technology evolves, the Commission cannot discount the possibility that equipment will be able to operate in the 2496-2500 MHz band at increasingly high signal strength levels unless Section 18.305(a) is amended to limit signal strength within the 2496-2500 MHz band shared with BRS.

Thus, WCA urges the Commission to require that all Part 18 ISM devices marketed in the United States after December 31, 2006 restrict their emissions in the 2496-2500 MHz band to 500 microvolts/meter, measured at 3 meters. This is the emission limit applicable to unlicensed intentional radiators under Section 15.209(a) of the Commission Rules, and is the maximum emission level to which BRS licensees have been subjected in the 2150-2156 MHz band.[46] WCA appreciates that the Commission cannot, as a practical matter, require compliance with this standard by operators of ISM equipment that is already in the field, and that ISM vendors could be harmed if the Commission imposed this new rule on a flash-cut basis. Therefore, in an effort to fairly accommodate the legitimate needs of ISM interests, WCA proposes that equipment sold prior to December 31, 2006 should be permitted to continue in operation on a grandfathered basis indefinitely. Admittedly, adoption of WCA's proposal will not leave relocated BRS licensees as well off as they are today, since they will be subject to higher levels of interference from ISM equipment sold prior to December 31, 2006.

---

[46] *See* 47 C.F.R. § 15.209(a).

On balance, however, WCA will accept this compromise approach, as adoption of this proposal provides relocated BRS channel 1 licensees reasonable assurance that they will not suffer additional interference as a result of the current lack of any limit on ISM signal strength in the 2496-2500 MHz band, while fairly accommodating the legitimate interests of ISM equipment vendors and users.

III. CONCLUSION

The *Reallocation Order*, coupled with the *2.5 GHz Band Restructuring Order*, represents a valuable step in the march towards identifying suitable spectrum to which BRS channel 1 licensees can relocate and thereby free the 2150-2156 MHz band for auction. However, the 2496-2500 MHz band can only serve as suitable relocation spectrum if BRS channel 1 licensees can utilize their new channel at 2496-2502 MHz without harmful interference from co-channel licensed and unlicensed sources. For the reasons set forth above, WCA submits that further Commission action is required before the 2496-2502 MHz band can be deemed suitable replacement spectrum for the 2150-2156 MHz band. Thus, WCA urges the Commission to: (i) eliminate the co-primary allocation to the Big LEO MSS in the 2496-2500 MHz band; (ii) provide for the immediate relocation of grandfathered terrestrial BAS and other facilities that operate in whole or in part within the 2496-2500 MHz band; and (iii) reduce permissible emissions in the 2496-2500 MHz band by Part 18 ISM devises marketed after December 31, 2006 to 500 microvolts/meter measured at 3 meters.

Respectfully submitted,

THE WIRELESS COMMUNICATIONS ASSOCIATION INTERNATIONAL, INC.

By: *Paul J. Sinderbrand*
Paul J. Sinderbrand

Wilkinson Barker Knauer, LLP
2300 N Street, NW
Suite 701
Washington, DC 20037-1128
202.783.4141

Its attorneys

September 8, 2004

ATTACHMENT A

ATTACHMENT A

DECLARATION OF HARRY W. PERLOW REGARDING SHARING OF 2496-2500 MHz BETWEEN MSS AND BRS

I, Harry W. Perlow, under penalty of perjury, hereby declare that the following is true and correct to the best of my information, knowledge and belief:

1. I am Chair of the Satellite Interference Task Group ("SITG") of the Engineering Committee of the Wireless Communications Association International, Inc. ("WCA"). I have 31 years experience in wireless technologies. I am qualified to provide the opinions and analyses presented in this Declaration.

2. I have prepared this Declaration to report on technical studies conducted by the SITG in support of a Petition for Partial Reconsideration being filed by WCA in connection with the *Report and Order* in IB Docket No. 02-364 and the *Fourth Report and Order* in ET Docket No. 00-258 (collectively, the *Reallocation R&O*). In the *Reallocation R&O,* the Commission has reallocated the 2495-2500 MHz band on a co-primary basis to fixed and mobile except aeronautical services and, in a companion order adopted at the same time (the "*2.5 GHz Band Restructuring Order*"), has designated the 2496-2502 MHz band as replacement spectrum for Broadband Radio Service ("BRS") channel 1 licensees being displaced from 2150-2162 MHz. Addressing the possibility that relocated BRS licensees might be subject to interference from Big LEO Mobile Satellite Service ("MSS") co-channel, co-coverage operations, in Paragraph 72 of the *Reallocation R&O* the Commission concludes that "BRS will be protected from MSS interference because CDMA MSS systems currently are restricted in the level of power they can transmit by existing PFD limits," citing ITU Radio Regulations, Resolution 46, Annex 2.1.2.3.1 as the source of the existing PFD limits. The SITG has been tasked with providing an independent assessment of that conclusion.

3. To accomplish that task, SITG has prepared several studies. Under the rules and policies adopted in the *2.5 GHz Band Restructuring Order*, the 2496-2502 MHz band will be available for use by licensees for the provision of a variety of fixed, portable and mobile services utilizing a variety of technologies. Thus, it is essential for SITG to analyze a representative sampling of deployment scenarios. To do so, SITG studied five deployment scenarios: (1 and 2) use of 2496-2502 MHz for the transmission of digital signals from a fixed subscriber terminal to a base station utilizing Frequency Division Duplex ("FDD") technology with the operating characteristics of currently-deployed first generation BRS channel 1 systems; (3) use of 2496-2502 MHz for the transmission of digital signals from a base station to a portable/mobile subscriber terminal utilizing Time Division Duplex ("TDD") technology with the characteristics of currently-deployed Navini second generation subscriber terminals; and (4 and 5) use of 2496-2502 MHz for the transmission of digital signals from a base station utilizing TDD technology with the operating characteristics typical of second generation TDD systems.

4. Although Annex 2.1.2.3.1 merely establishes the MSS satellite PFD levels that trigger international coordination, and does not establish any hard limits on MSS satellite operations, for purposes of its analyses the SITG has presumed that Big LEO MSS will operate at, but not above, the Annex 2.1.2.3.1 values. Although Annex 2.1.2.3.1 provides PFD values to be measured over both 4 kHz and 1 MHz bandwidths (-144 dBW/m² and -128 dBW/m², respectively), the Big LEO MSS interests have generally utilized the 4 kHz value and the

studies conducted by SITG for each deployment scenario follow suit. SITG did conduct some studies utilizing the 1 MHz bandwidth PFD limits, and the results were not materially different from those reported here based on the 4 kHz bandwidth PFD limits.

5. For purposes of its analyses, SITG has presumed that the victim BRS facility will be within the footprint of only a single Big LEO MSS satellite. As a practical matter, it is highly likely that BRS facilities will often be within the footprint of multiple satellites simultaneously. However, studies of interference to terrestrial facilities from multiple satellites are complex, because the satellite signals generally arrive at the terrestrial antenna from differing angles, and thus assumptions must be made regarding the angles of arrival, calculations of undesired signal strength made for each satellite signal, and the results accumulated. Because SITG's studies have demonstrated that debilitating interference will be suffered by BRS if only a single Big LEO satellite is within view of BRS facilities and to simplify its presentation, SITG will refrain from burdening the record with its analyses of multi-satellite interference unless requested to submit additional studies by the Commission. Suffice it to say that, as substantial the interference will be when only a single Big LEO MSS satellite is within view, the problem is materially magnified when a BRS facility is within view of more than one Big LEO MSS satellite.

6. SITG considers harmful interference to occur when the predicted I_{sat}/N exceeds -10 dB at a given satellite elevation. This approach is consistent with taken by International Telecommunication Union Study Group 8, which in December 2003 approved Report ITU-R M.2041 "Sharing and adjacent band compatibility in the 2.5 GHz band between the terrestrial and satellite components of IMT-2000." As evidenced by Tables 4 and 6 to Annex 1 of that Report, the consensus with Study Group 8 is that -10 dB is the appropriate I_{sat}/N benchmark for defining interference to terrestrial base stations and mobile units. Although SITG recognizes that BRS channel 1 may or may not be utilized for the provision of IMT-2000 services, SITG does not believe that the interference criteria for other uses of the channel will be materially different.

7. The first case study calculates interference from a single MSS satellite downlink to a base station with the technical characteristics of base stations actually deployed by BRS channel 1 licensees today. More specifically, SITG modeled based on a 3 dB receiver noise figure and a Decibel Model DB973HG12E-R sectorized antenna. The SITG calculated interference to this base station receiver/antenna combination from a Big LEO MSS satellite radiating at the Annex 2.1.2.3.1 values. The results of the SITG's calculations are presented in Exhibit 1.

8. As demonstrated in Exhibit 1, the PFD values specified in Annex 2.1.2.3.1 produce, for this base station receiver/antenna combination, I_{sat}/N ratios well in excess of -10 dB at all satellite elevations between 0 and 90 degrees, save for 23 degrees. Indeed, at most angles of arrival, the PFD values specified in Annex 2.1.2.3.1 produce I_{sat}/N ratios in excess of 0 dB. As a result, the SITG concludes that at the PFD values specified in Annex 2.1.2.3.1, base stations with these characteristics will suffer harmful interference.

9. The second case study calculates interference from a single MSS satellite downlink to a base station with the technical characteristics of other base stations actually deployed by BRS channel 1 licensees today. For these studies, SITG modeled based on a 3 dB receiver noise figure and a Conifer Model QH-2150 sectorized antenna. The SITG calculated interference

to this base station receiver/antenna combination from a Big LEO MSS satellite radiating at the Annex 2.1.2.3.1 values. The results of the SITG's calculations are presented in Exhibit 2.

10. As demonstrated in Exhibit 2, the PFD values specified in Annex 2.1.2.3.1 produce, for this base station receiver/antenna combination, I_{sat}/N ratios well in excess of -10 dB at all satellite elevations between 0 and 51 degrees. As a result, the SITG concludes that at the PFD values specified in Annex 2.1.2.3.1, base stations with these characteristics will suffer harmful interference.

11. The third case study calculates interference from a single Big LEO MSS satellite downlink to a Navini Networks Model Ripwave 2.5/2.6 subscriber terminal, which has a 4.5 dB noise figure and a built-in 7.5 dBi gain omnidirectional antenna. The SITG selected this model subscriber terminal/antenna combination because it is widely-deployed by BRS licensees providing wireless broadband service in the United States. As in the first and second cases, the SITG calculated interference to this subscriber terminal/antenna combination from a single Big LEO MSS satellite radiating at the Annex 2.1.2.3.1 values. The results of the SITG's calculations are presented in Exhibit 3.

12. As demonstrated in Exhibit 3, this terminal/antenna combination the PFD values specified in Annex 2.1.2.3.1 produce I_{sat}/N ratios well in excess of -10 dB at all satellite elevations between 0 and 90 degrees. Indeed, the predicted I_{sat}/N ratio exceeds 0 dB at every elevation above 8 degrees and exceeds 10 dB at every elevation above 24 degrees. As a result, the SITG concludes that at the PFD values specified in Annex 2.1.2.3.1, subscriber terminal stations with these characteristics will suffer harmful interference from co-channel Big LEO downlink transmissions.

13. The fourth case study calculates interference from the MSS satellite downlink to a base station with the technical characteristics of a second generation base station. More specifically, SITG modeled based on a 3 dB receiver noise figure and an Andrew Corp. Model Andrew DMA18W090-H antenna. The SITG calculated interference to this base station receiver/antenna combination from a Big LEO MSS satellite radiating at the Annex 2.1.2.3.1 values. The results of the SITG's calculations are presented in Exhibit 4.

14. As demonstrated in Exhibit 4, the PFD values specified in Annex 2.1.2.3.1 produce, for this base station receiver/antenna combination, I_{sat}/N ratios in excess of -10 dB are produced at all but six of the 91 elevations studied and frequently exceed 0 dB. As a result, the SITG concludes that at the PFD values specified in Annex 2.1.2.3.1, second generation base stations with these characteristics will suffer harmful interference.

15. The fifth case study is a variation on the fourth, calculating interference from the MSS satellite downlink to a second generation base station with a 3 dB receiver noise figure and an Decibel Model 111-H antenna. The SITG calculated interference to this base station receiver/antenna combination from a Big LEO MSS satellite radiating at the Annex 2.1.2.3.1 values. The results of the SITG's calculations are presented in Exhibit 5.

16. As demonstrated in Exhibit 5, the PFD values specified in Annex 2.1.2.3.1 produce, for this base station receiver/antenna combination, I_{sat}/N ratios in excess of -10 dB are produced at 0-7 degrees, 9-16 degrees, 18-23 degrees, 26-59 degrees and 67-77 degrees. As a result, the SITG concludes that at the PFD values specified in Annex 2.1.2.3.1, second generation base stations with these characteristics will suffer harmful interference.

17. Finally, I am aware of significant work being done to develop new generations of subscriber terminals, such as laptop computers and PDAs, that will incorporate built-in flat panel or phased array antennas. Indeed, the LCD screens of laptop computers are an ideal location for a phased array or flat-panel antenna. Because users of such devices will need to tilt the laptop cover or PDA for viewing, the built-in antennas will need to have a wide vertical elevation pattern and thus will have significant gain in the direction of a Big LEO MSS satellite at 20 to 50 degrees when the device is used out-of-doors. Manufacturers will need to install antennas with wide patterns so that the user will not have to aim the device at the base station location. I expect that these devices will have gain in the 12 dBi range and it can be expected that as much as 6 to 10 dBi of that gain will directed toward a Big LEO satellite at 20 to 50 degrees. My calculations show that, under such conditions, MSS systems operating in the United States would likely cause the I_{sat}/N to exceed -10 dB.

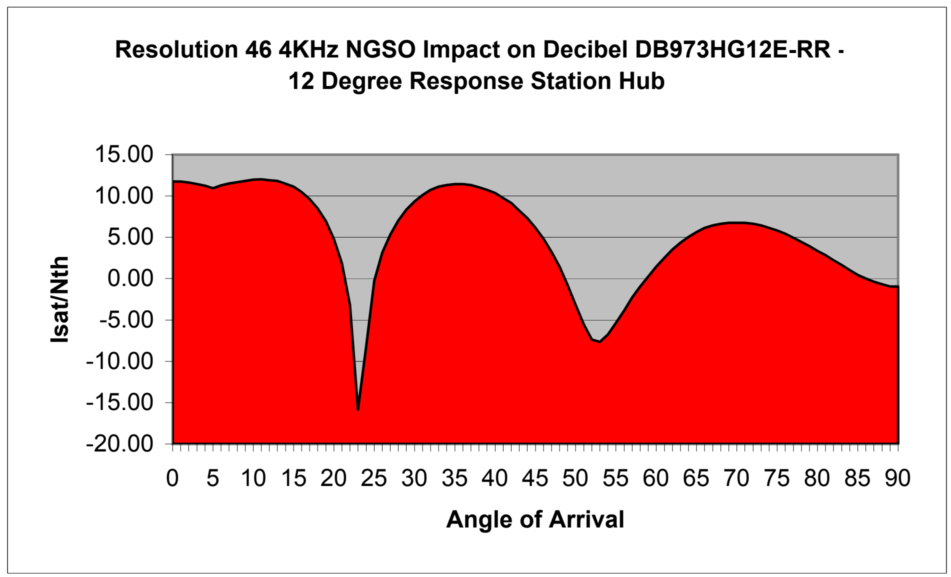
/s/ *Harry W. Perlow*

Harry W. Perlow

Dated: September 8, 2004

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel DB973HG12E-R Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	20.15	20.15	20.05	19.85	19.65	19.35	19.05	18.65	18.15	17.65
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-185.13	-185.13	-185.03	-184.83	-184.63	-184.33	-184.03	-183.63	-183.13	-182.63
Satellite elevation in degrees	0	1	2	3	4	5	6	7	8	9
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-144	-144	-144	-144	-144	-144	-143.35	-142.7	-142.05	-141.4
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-173.39	-173.39	-173.39	-173.39	-173.39	-173.39	-172.74	-172.09	-171.44	-170.79
Isat/N	**11.73**	**11.73**	**11.63**	**11.43**	**11.23**	**10.93**	**11.28**	**11.53**	**11.68**	**11.83**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	12.02	12.02	11.92	11.74	11.55	11.27	11.60	11.83	11.97	12.11
BRS Antenna data 0 - 90 degrees	0	1	2	3	4	5	6	7	8	9
Decibel DB973HG12E-R Elevation Tab Data Gain in dBd	18	18	17.9	17.7	17.5	17.2	16.9	16.5	16	15.5
Number of Simultaneous Satellites Received	1									



PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel DB973HG12E-R Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	17.15	16.55	15.75	15.05	14.05	13.05	11.75	10.25	8.45	6.25
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-182.13	-181.53	-180.73	-180.03	-179.03	-178.03	-176.73	-175.23	-173.43	-171.23
Satellite elevation in degrees	10	11	12	13	14	15	16	17	18	19
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-140.75	-140.1	-139.45	-138.8	-138.15	-137.5	-136.85	-136.2	-135.55	-134.9
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-170.14	-169.49	-168.84	-168.19	-167.54	-166.89	-166.24	-165.59	-164.94	-164.29
Isat/N	**11.98**	**12.03**	**11.88**	**11.83**	**11.48**	**11.13**	**10.48**	**9.63**	**8.48**	**6.93**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	12.25	12.30	12.16	12.11	11.78	11.46	10.86	10.08	9.06	7.74
BRS Antenna data 0 - 90 degrees	10	11	12	13	14	15	16	17	18	19
Decibel DB973HG12E-R Elevation Tab Data Gain in dBd	15	14.4	13.6	12.9	11.9	10.9	9.6	8.1	6.3	4.1

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel DB973HG12E-R Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	3.45	-0.15	-5.85	-19.15	-12.05	-4.85	-1.45	0.75	2.45	3.75
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-168.43	-164.83	-159.13	-145.83	-152.93	-160.13	-163.53	-165.73	-167.43	-168.73
Satellite elevation in degrees	20	21	22	23	24	25	26	27	28	29
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-134.25	-133.6	-132.95	-132.3	-131.65	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-163.64	-162.99	-162.34	-161.69	-161.04	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**4.78**	**1.83**	**-3.22**	-15.87	**-8.12**	**-0.27**	**3.13**	**5.33**	**7.03**	**8.33**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	6.03	4.02	1.69	0.11	0.62	2.88	4.85	6.45	7.82	8.93
BRS Antenna data 0 - 90 degrees	20	21	22	23	24	25	26	27	28	29
Decibel DB973HG12E-R Elevation Tab Data Gain in dBd	1.3	-2.3	-8	-21.3	-14.2	-7	-3.6	-1.4	0.3	1.6

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel DB973HG12E-R Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	4.75	5.55	6.15	6.55	6.75	6.85	6.85	6.75	6.45	6.15
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-169.73	-170.53	-171.13	-171.53	-171.73	-171.83	-171.83	-171.73	-171.43	-171.13
Satellite elevation in degrees	30	31	32	33	34	35	36	37	38	39
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**9.33**	**10.13**	**10.73**	**11.13**	**11.33**	**11.43**	**11.43**	**11.33**	**11.03**	**10.73**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	9.81	10.54	11.09	11.46	11.64	11.74	11.74	11.64	11.36	11.09
BRS Antenna data 0 - 90 degrees	30	31	32	33	34	35	36	37	38	39
Decibel DB973HG12E-R Elevation Tab Data Gain in dBd	2.6	3.4	4	4.4	4.6	4.7	4.7	4.6	4.3	4

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, r = .65 dB
0 - 5 degrees = P
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20r

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel DB973HG12E-R Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	5.75	5.15	4.55	3.65	2.75	1.55	0.25	-1.35	-3.15	-5.35
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-170.73	-170.13	-169.53	-168.63	-167.73	-166.53	-165.23	-163.63	-161.83	-159.63
Satellite elevation in degrees	40	41	42	43	44	45	46	47	48	49
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**10.33**	**9.73**	**9.13**	**8.23**	**7.33**	**6.13**	**4.83**	**3.23**	**1.43**	**-0.77**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	10.72	10.17	9.63	8.84	8.07	7.08	6.07	4.92	3.79	2.64
BRS Antenna data 0 - 90 degrees	40	41	42	43	44	45	46	47	48	49
Decibel DB973HG12E-R Elevation Tab Data Gain in dBd	3.6	3	2.4	1.5	0.6	-0.6	-1.9	-3.5	-5.3	-7.5

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel DB973HG12E-R Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-7.75	-10.15	-11.95	-12.25	-11.35	-9.95	-8.45	-6.85	-5.55	-4.35
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-157.23	-154.83	-153.03	-152.73	-153.63	-155.03	-156.53	-158.13	-159.43	-160.63
Satellite elevation in degrees	50	51	52	53	54	55	56	57	58	59
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**-3.17**	**-5.57**	**-7.37**	**-7.67**	**-6.77**	**-5.37**	**-3.87**	**-2.27**	**-0.97**	**0.23**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	1.71	1.06	0.73	0.69	0.83	1.11	1.49	2.02	2.55	3.13
BRS Antenna data 0 - 90 degrees	50	51	52	53	54	55	56	57	58	59
Decibel DB973HG12E-R Elevation Tab Data Gain in dBd	-9.9	-12.3	-14.1	-14.4	-13.5	-12.1	-10.6	-9	-7.7	-6.5

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel DB973HG12E-R Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-3.15	-2.05	-1.05	-0.25	0.45	1.05	1.55	1.85	2.05	2.15
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-161.83	-162.93	-163.93	-164.73	-165.43	-166.03	-166.53	-166.83	-167.03	-167.13
Satellite elevation in degrees	60	61	62	63	64	65	66	67	68	69
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**1.43**	**2.53**	**3.53**	**4.33**	**5.03**	**5.63**	**6.13**	**6.43**	**6.63**	**6.73**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	3.79	4.46	5.13	5.70	6.22	6.68	7.08	7.32	7.49	7.57
BRS Antenna data 0 - 90 degrees	60	61	62	63	64	65	66	67	68	69
Decibel DB973HG12E-R Elevation Tab Data Gain in dBd	-5.3	-4.2	-3.2	-2.4	-1.7	-1.1	-0.6	-0.3	-0.1	0

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel DB973HG12E-R Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	2.15	2.15	2.05	1.85	1.55	1.25	0.85	0.35	-0.15	-0.65
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-167.13	-167.13	-167.03	-166.83	-166.53	-166.23	-165.83	-165.33	-164.83	-164.33
Satellite elevation in degrees	70	71	72	73	74	75	76	77	78	79
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**6.73**	**6.73**	**6.63**	**6.43**	**6.13**	**5.83**	**5.43**	**4.93**	**4.43**	**3.93**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	7.57	7.57	7.49	7.32	7.08	6.84	6.53	6.14	5.77	5.41
BRS Antenna data 0 - 90 degrees	70	71	72	73	74	75	76	77	78	79
Decibel DB973HG12E-R Elevation Tab Data Gain in dBd	0	0	-0.1	-0.3	-0.6	-0.9	-1.3	-1.8	-2.3	-2.8

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel DB973HG12E-R Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-1.25	-1.75	-2.35	-2.95	-3.55	-4.15	-4.55	-4.95	-5.25	-5.55
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-163.73	-163.23	-162.63	-162.03	-161.43	-160.83	-160.43	-160.03	-159.73	-159.43
Satellite elevation in degrees	80	81	82	83	84	85	86	87	88	89
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**3.33**	**2.83**	**2.23**	**1.63**	**1.03**	**0.43**	**0.03**	**-0.37**	**-0.67**	**-0.97**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	4.99	4.66	4.27	3.90	3.56	3.23	3.03	2.83	2.69	2.55
BRS Antenna data 0 - 90 degrees	80	81	82	83	84	85	86	87	88	89
Decibel DB973HG12E-R Elevation Tab Data Gain in dBd	-3.4	-3.9	-4.5	-5.1	-5.7	-6.3	-6.7	-7.1	-7.4	-7.7

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel DB973HG12E-R Base Station Antenna)

Desired frequency in MHz	2496
Bandwidth in KHz	4
BRS antenna gain dBi	-5.55
BRS Receiver noise figure dB	3
KTB Noise floor dBW	-167.98
BRS system sensitivity in dBW/4KHz	-159.43
Satellite elevation in degrees	90
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131
Conversion factor dB(m2)	-29.39
Satellite signal strength in dBW/4KHz	-160.39
Isat/N	**-0.97**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**
Rise in BRS Noise Floor	2.55
BRS Antenna data 0 - 90 degrees	90
Decibel DB973HG12E-R Elevation Tab Data Gain in dBd	-7.7

Number of Simultaneous Satellites Received

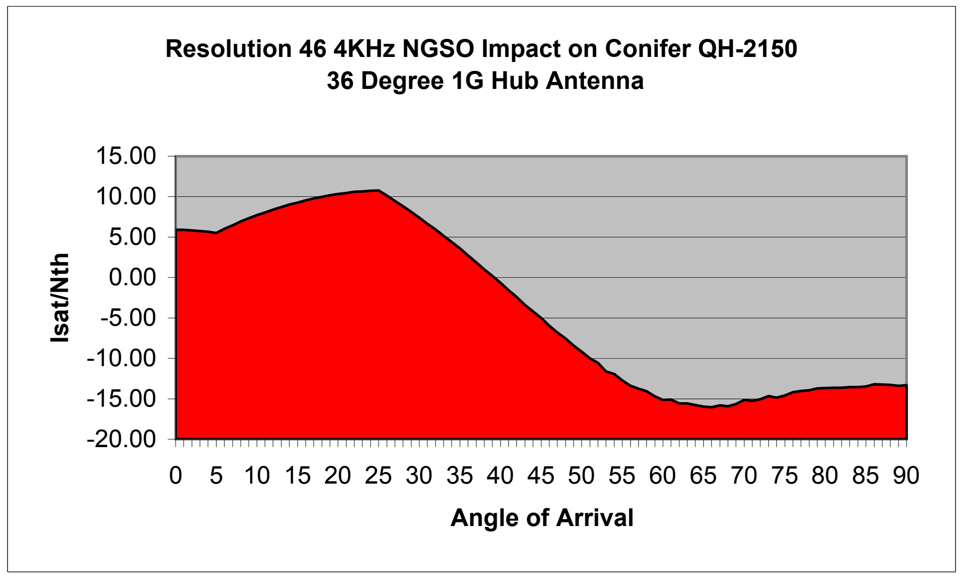
PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Conifer QH-2150 Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	14.33	14.32	14.24	14.16	14.07	13.92	13.77	13.57	13.39	13.13
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-179.31	-179.3	-179.22	-179.14	-179.05	-178.9	-178.75	-178.55	-178.37	-178.11
Satellite elevation in degrees	0	1	2	3	4	5	6	7	8	9
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-144	-144	-144	-144	-144	-144	-143.35	-142.7	-142.05	-141.4
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-173.39	-173.39	-173.39	-173.39	-173.39	-173.39	-172.74	-172.09	-171.44	-170.79
Isat/N	**5.91**	**5.90**	**5.82**	**5.74**	**5.65**	**5.50**	**6.00**	**6.45**	**6.92**	**7.31**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	6.91	6.90	6.83	6.77	6.70	6.58	6.98	7.34	7.73	8.05
BRS Antenna data 0 - 90 degrees	0	1	2	3	4	5	6	7	8	9
Confer QH-2150 Tab Data Gain in dBd	12.18	12.17	12.09	12.01	11.92	11.77	11.62	11.42	11.24	10.98

Number of Simultaneous Satellites Received 1



PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Conifer QH-2150 Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	12.87	12.57	12.27	11.94	11.6	11.2	10.81	10.39	9.95	9.48
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-177.85	-177.55	-177.25	-176.92	-176.58	-176.18	-175.79	-175.37	-174.93	-174.46
Satellite elevation in degrees	10	11	12	13	14	15	16	17	18	19
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-140.75	-140.1	-139.45	-138.8	-138.15	-137.5	-136.85	-136.2	-135.55	-134.9
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-170.14	-169.49	-168.84	-168.19	-167.54	-166.89	-166.24	-165.59	-164.94	-164.29
Isat/N	**7.70**	**8.05**	**8.40**	**8.72**	**9.03**	**9.28**	**9.54**	**9.77**	**9.98**	**10.16**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	8.39	8.69	8.99	9.27	9.55	9.77	10.00	10.21	10.40	10.56
BRS Antenna data 0 - 90 degrees	10	11	12	13	14	15	16	17	18	19
Confer QH-2150 Tab Data Gain in dBd	10.72	10.42	10.12	9.79	9.45	9.05	8.66	8.24	7.8	7.33

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Conifer QH-2150 Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	8.98	8.48	7.96	7.38	6.81	6.2	5.57	4.89	4.26	3.55
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-173.96	-173.46	-172.94	-172.36	-171.79	-171.18	-170.55	-169.87	-169.24	-168.53
Satellite elevation in degrees	20	21	22	23	24	25	26	27	28	29
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-134.25	-133.6	-132.95	-132.3	-131.65	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-163.64	-162.99	-162.34	-161.69	-161.04	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**10.31**	**10.46**	**10.59**	**10.66**	**10.74**	**10.78**	**10.15**	**9.47**	**8.84**	**8.13**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	10.70	10.84	10.96	11.02	11.10	11.13	10.55	9.94	9.38	8.76
BRS Antenna data 0 - 90 degrees	20	21	22	23	24	25	26	27	28	29
Confer QH-2150 Tab Data Gain in dBd	6.83	6.33	5.81	5.23	4.66	4.05	3.42	2.74	2.11	1.4

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Conifer QH-2150 Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	2.83	2.09	1.34	0.56	-0.2	-0.98	-1.86	-2.73	-3.59	-4.38
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-167.81	-167.07	-166.32	-165.54	-164.78	-164	-163.12	-162.25	-161.39	-160.6
Satellite elevation in degrees	30	31	32	33	34	35	36	37	38	39
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**7.41**	**6.67**	**5.92**	**5.14**	**4.38**	**3.60**	**2.72**	**1.85**	**0.99**	**0.20**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	8.14	7.52	6.91	6.30	5.73	5.18	4.58	4.04	3.54	3.11
BRS Antenna data 0 - 90 degrees	30	31	32	33	34	35	36	37	38	39
Confer QH-2150 Tab Data Gain in dBd	0.68	-0.06	-0.81	-1.59	-2.35	-3.13	-4.01	-4.88	-5.74	-6.53

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Conifer QH-2150 Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-5.26	-6.17	-6.97	-7.99	-8.76	-9.59	-10.56	-11.39	-12.14	-12.98
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-159.72	-158.81	-158.01	-156.99	-156.22	-155.39	-154.42	-153.59	-152.84	-152
Satellite elevation in degrees	40	41	42	43	44	45	46	47	48	49
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**-0.68**	**-1.59**	**-2.39**	**-3.41**	**-4.18**	**-5.01**	**-5.98**	**-6.81**	**-7.56**	**-8.40**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	2.69	2.29	1.98	1.63	1.41	1.19	0.98	0.82	0.70	0.59
BRS Antenna data 0 - 90 degrees	40	41	42	43	44	45	46	47	48	49
Confer QH-2150 Tab Data Gain in dBd	-7.41	-8.32	-9.12	-10.14	-10.91	-11.74	-12.71	-13.54	-14.29	-15.13

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Conifer QH-2150 Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-13.76	-14.57	-15.12	-16.19	-16.5	-17.29	-17.97	-18.35	-18.67	-19.3
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-151.22	-150.41	-149.86	-148.79	-148.48	-147.69	-147.01	-146.63	-146.31	-145.68
Satellite elevation in degrees	50	51	52	53	54	55	56	57	58	59
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**-9.18**	**-9.99**	-10.54	-11.61	-11.92	-12.71	-13.39	-13.77	-14.09	-14.72
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	No	No	No	No	No	No	No	No
Rise in BRS Noise Floor	0.50	0.42	0.37	0.29	0.27	0.23	0.19	0.18	0.17	0.14
BRS Antenna data 0 - 90 degrees	50	51	52	53	54	55	56	57	58	59
Confer QH-2150 Tab Data Gain in dBd	-15.91	-16.72	-17.27	-18.34	-18.65	-19.44	-20.12	-20.5	-20.82	-21.45

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Conifer QH-2150 Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-19.72	-19.69	-20.14	-20.14	-20.35	-20.57	-20.62	-20.41	-20.5	-20.25
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-145.26	-145.29	-144.84	-144.84	-144.63	-144.41	-144.36	-144.57	-144.48	-144.73
Satellite elevation in degrees	60	61	62	63	64	65	66	67	68	69
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	-15.14	-15.11	-15.56	-15.56	-15.77	-15.99	-16.04	-15.83	-15.92	-15.67
Predicted Interference (Isat/N in excess of -10 dB)	No	No	No	No	No	No	No	No	No	No
Rise in BRS Noise Floor	0.13	0.13	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.12
BRS Antenna data 0 - 90 degrees	60	61	62	63	64	65	66	67	68	69
Confer QH-2150 Tab Data Gain in dBd	-21.87	-21.84	-22.29	-22.29	-22.5	-22.72	-22.77	-22.56	-22.65	-22.4

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Conifer QH-2150 Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-19.74	-19.83	-19.64	-19.26	-19.45	-19.18	-18.77	-18.63	-18.55	-18.28
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-145.24	-145.15	-145.34	-145.72	-145.53	-145.8	-146.21	-146.35	-146.43	-146.7
Satellite elevation in degrees	70	71	72	73	74	75	76	77	78	79
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	-15.16	-15.25	-15.06	-14.68	-14.87	-14.60	-14.19	-14.05	-13.97	-13.70
Predicted Interference (Isat/N in excess of -10 dB)	No	No	No	No	No	No	No	No	No	No
Rise in BRS Noise Floor	0.13	0.13	0.13	0.15	0.14	0.15	0.16	0.17	0.17	0.18
BRS Antenna data 0 - 90 degrees	70	71	72	73	74	75	76	77	78	79
Confer QH-2150 Tab Data Gain in dBd	-21.89	-21.98	-21.79	-21.41	-21.6	-21.33	-20.92	-20.78	-20.7	-20.43

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Conifer QH-2150 Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-18.24	-18.23	-18.2	-18.12	-18.12	-18.04	-17.78	-17.83	-17.88	-17.97
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-146.74	-146.75	-146.78	-146.86	-146.86	-146.94	-147.2	-147.15	-147.1	-147.01
Satellite elevation in degrees	80	81	82	83	84	85	86	87	88	89
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	-13.66	-13.65	-13.62	-13.54	-13.54	-13.46	-13.20	-13.25	-13.30	-13.39
Predicted Interference (Isat/N in excess of -10 dB)	No	No	No	No	No	No	No	No	No	No
Rise in BRS Noise Floor	0.18	0.18	0.18	0.19	0.19	0.19	0.20	0.20	0.20	0.19
BRS Antenna data 0 - 90 degrees	80	81	82	83	84	85	86	87	88	89
Confer QH-2150 Tab Data Gain in dBd	-20.39	-20.38	-20.35	-20.27	-20.27	-20.19	-19.93	-19.98	-20.03	-20.12

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Conifer QH-2150 Base Station Antenna)

Desired frequency in MHz	2496
Bandwidth in KHz	4
BRS antenna gain dBi	-17.92
BRS Receiver noise figure dB	3
KTB Noise floor dBW	-167.98
BRS system sensitivity in dBW/4KHz	-147.06
Satellite elevation in degrees	90
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131
Conversion factor dB(m2)	-29.39
Satellite signal strength in dBW/4KHz	-160.39
Isat/N	-13.34
Predicted Interference (Isat/N in excess of -10 dB)	No
Rise in BRS Noise Floor	0.20
BRS Antenna data 0 - 90 degrees	90
Confer QH-2150 Tab Data Gain in dBd	-20.07

Number of Simultaneous Satellites Received

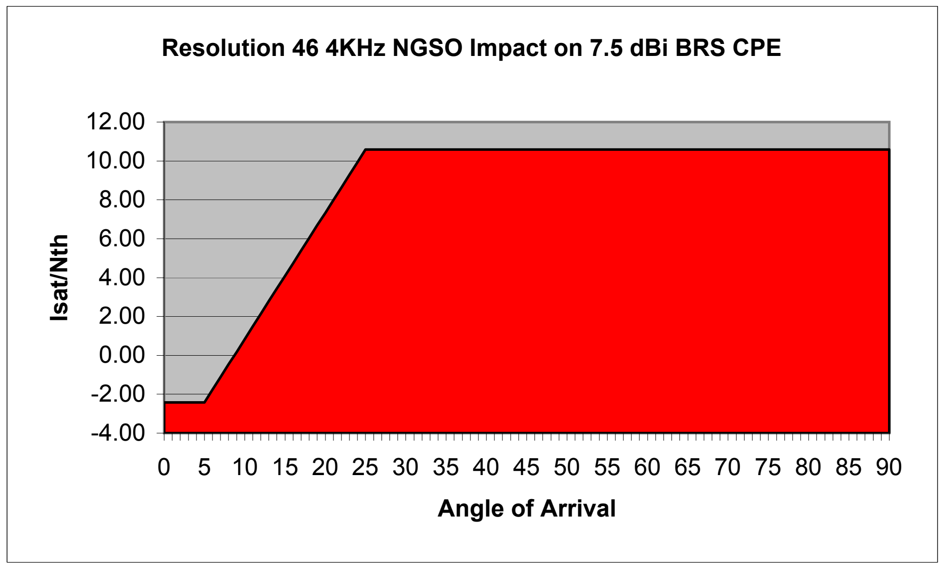
PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Navini CPE)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
BRS Receiver noise figure dB	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98
Satellite elevation in degrees	0	1	2	3	4	5	6	7	8	9
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-144	-144	-144	-144	-144	-144	-143.35	-142.7	-142.05	-141.4
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-173.39	-173.39	-173.39	-173.39	-173.39	-173.39	-172.74	-172.09	-171.44	-170.79
Isat/N	**-2.42**	**-2.42**	**-2.42**	**-2.42**	**-2.42**	**-2.42**	**-1.77**	**-1.12**	**-0.47**	**0.18**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	1.97	1.97	1.97	1.97	1.97	1.97	2.22	2.49	2.78	3.10
BRS Antenna data 0 - 90 degrees	0	1	2	3	4	5	6	7	8	9
Navini CPE Antenna Tab Data 7.5 dBi Omni	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Number of Simultaneous Satellites Received	1									

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*



By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Navini CPE)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
BRS Receiver noise figure dB	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98
Satellite elevation in degrees	10	11	12	13	14	15	16	17	18	19
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-140.75	-140.1	-139.45	-138.8	-138.15	-137.5	-136.85	-136.2	-135.55	-134.9
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-170.14	-169.49	-168.84	-168.19	-167.54	-166.89	-166.24	-165.59	-164.94	-164.29
Isat/N	**0.83**	**1.48**	**2.13**	**2.78**	**3.43**	**4.08**	**4.73**	**5.38**	**6.03**	**6.68**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	3.45	3.82	4.21	4.62	5.06	5.52	5.99	6.49	7.00	7.53
BRS Antenna data 0 - 90 degrees	10	11	12	13	14	15	16	17	18	19
Navini CPE Antenna Tab Data 7.5 dBi Omni	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Navini CPE)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
BRS Receiver noise figure dB	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98
Satellite elevation in degrees	20	21	22	23	24	25	26	27	28	29
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-134.25	-133.6	-132.95	-132.3	-131.65	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-163.64	-162.99	-162.34	-161.69	-161.04	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**7.33**	**7.98**	**8.63**	**9.28**	**9.93**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	8.07	8.63	9.19	9.77	10.35	10.95	10.95	10.95	10.95	10.95
BRS Antenna data 0 - 90 degrees	20	21	22	23	24	25	26	27	28	29
Navini CPE Antenna Tab Data 7.5 dBi Omni	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Navini CPE)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
BRS Receiver noise figure dB	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98
Satellite elevation in degrees	30	31	32	33	34	35	36	37	38	39
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95
BRS Antenna data 0 - 90 degrees	30	31	32	33	34	35	36	37	38	39
Navini CPE Antenna Tab Data 7.5 dBi Omni	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Navini CPE)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
BRS Receiver noise figure dB	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98
Satellite elevation in degrees	40	41	42	43	44	45	46	47	48	49
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95
BRS Antenna data 0 - 90 degrees	40	41	42	43	44	45	46	47	48	49
Navini CPE Antenna Tab Data 7.5 dBi Omni	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Navini CPE)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
BRS Receiver noise figure dB	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98
Satellite elevation in degrees	50	51	52	53	54	55	56	57	58	59
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95
BRS Antenna data 0 - 90 degrees	50	51	52	53	54	55	56	57	58	59
Navini CPE Antenna Tab Data 7.5 dBi Omni	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Navini CPE)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
BRS Receiver noise figure dB	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98
Satellite elevation in degrees	60	61	62	63	64	65	66	67	68	69
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95
BRS Antenna data 0 - 90 degrees	60	61	62	63	64	65	66	67	68	69
Navini CPE Antenna Tab Data 7.5 dBi Omni	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Navini CPE)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
BRS Receiver noise figure dB	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98
Satellite elevation in degrees	70	71	72	73	74	75	76	77	78	79
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95
BRS Antenna data 0 - 90 degrees	70	71	72	73	74	75	76	77	78	79
Navini CPE Antenna Tab Data 7.5 dBi Omni	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Navini CPE)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
BRS Receiver noise figure dB	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98	-170.98
Satellite elevation in degrees	80	81	82	83	84	85	86	87	88	89
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**	**10.58**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95
BRS Antenna data 0 - 90 degrees	80	81	82	83	84	85	86	87	88	89
Navini CPE Antenna Tab Data 7.5 dBi Omni	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Navini CPE)

Desired frequency in MHz	2496
Bandwidth in KHz	4
BRS antenna gain dBi	7.5
BRS Receiver noise figure dB	4.5
KTB Noise floor dBW	-167.98
BRS system sensitivity in dBW/4KHz	-170.98
Satellite elevation in degrees	90
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131
Conversion factor dB(m2)	-29.39
Satellite signal strength in dBW/4KHz	-160.39
Isat/N	**10.58**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**
Rise in BRS Noise Floor	10.95
BRS Antenna data 0 - 90 degrees	90
Navini CPE Antenna Tab Data 7.5 dBi Omni	7.5

Number of Simultaneous Satellites Received

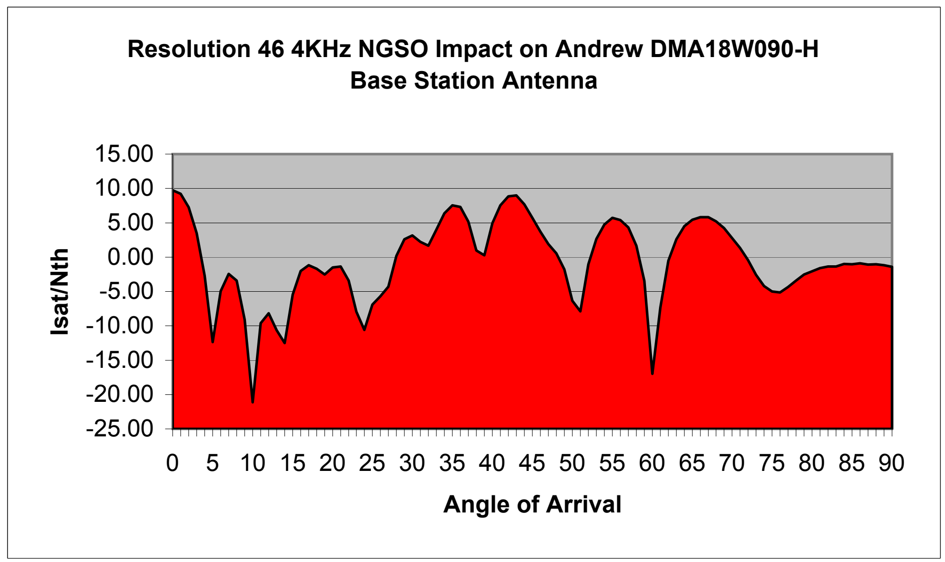
PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Andrew DMA18W090-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	18.15	17.65	15.69	11.91	5.72	-3.93	2.81	4.67	3.05	-3.28
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-183.13	-182.63	-180.67	-176.89	-170.7	-161.05	-167.79	-169.65	-168.03	-161.7
Satellite elevation in degrees	0	1	2	3	4	5	6	7	8	9
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-144	-144	-144	-144	-144	-144	-143.35	-142.7	-142.05	-141.4
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-173.39	-173.39	-173.39	-173.39	-173.39	-173.39	-172.74	-172.09	-171.44	-170.79
Isat/N	**9.73**	**9.23**	**7.27**	**3.49**	**-2.70**	-12.35	**-4.96**	**-2.45**	**-3.42**	**-9.10**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	10.17	9.72	8.02	5.10	1.87	0.25	1.20	1.96	1.63	0.50
BRS Antenna data 0 - 90 degrees	0	1	2	3	4	5	6	7	8	9
Andrew DMA18W090-H Ant. Elev. Tab Data Gain in dBd	16	15.5	13.54	9.76	3.57	-6.08	0.66	2.52	0.9	-5.43

Number of Simultaneous Satellites Received 1



PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Andrew DMA18W090-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-15.97	-5.09	-4.32	-7.41	-9.96	-3.56	-0.76	-0.57	-1.74	-3.21
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-149.01	-159.89	-160.66	-157.57	-155.02	-161.42	-164.22	-164.41	-163.24	-161.77
Satellite elevation in degrees	10	11	12	13	14	15	16	17	18	19
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-140.75	-140.1	-139.45	-138.8	-138.15	-137.5	-136.85	-136.2	-135.55	-134.9
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-170.14	-169.49	-168.84	-168.19	-167.54	-166.89	-166.24	-165.59	-164.94	-164.29
Isat/N	-21.14	**-9.61**	**-8.19**	-10.63	-12.53	**-5.48**	**-2.03**	**-1.19**	**-1.71**	**-2.53**
Predicted Interference (Isat/N in excess of -10 dB)	No	**Yes**	**Yes**	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	0.03	0.45	0.61	0.36	0.24	1.08	2.11	2.46	2.24	1.93
BRS Antenna data 0 - 90 degrees	10	11	12	13	14	15	16	17	18	19
Andrew DMA18W090-H Ant. Elev. Tab Data Gain in dBd	-18.12	-7.24	-6.47	-9.56	-12.11	-5.71	-2.91	-2.72	-3.89	-5.36

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Andrew DMA18W090-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-2.85	-3.36	-6.07	-11.21	-14.54	-11.51	-10.28	-8.87	-4.43	-2
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-162.13	-161.62	-158.91	-153.77	-150.44	-153.47	-154.7	-156.11	-160.55	-162.98
Satellite elevation in degrees	20	21	22	23	24	25	26	27	28	29
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-134.25	-133.6	-132.95	-132.3	-131.65	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-163.64	-162.99	-162.34	-161.69	-161.04	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**-1.52**	**-1.38**	**-3.44**	**-7.93**	-10.61	**-6.93**	**-5.70**	**-4.29**	**0.15**	**2.58**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	2.32	2.38	1.62	0.65	0.36	0.80	1.04	1.38	3.09	4.49
BRS Antenna data 0 - 90 degrees	20	21	22	23	24	25	26	27	28	29
Andrew DMA18W090-H Ant. Elev. Tab Data Gain in dBd	-5	-5.51	-8.22	-13.36	-16.69	-13.66	-12.43	-11.02	-6.58	-4.15

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Andrew DMA18W090-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-1.43	-2.35	-2.9	-0.6	1.79	2.95	2.71	0.56	-3.63	-4.31
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-163.55	-162.63	-162.08	-164.38	-166.77	-167.93	-167.69	-165.54	-161.35	-160.67
Satellite elevation in degrees	30	31	32	33	34	35	36	37	38	39
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**3.15**	**2.23**	**1.68**	**3.98**	**6.37**	**7.53**	**7.29**	**5.14**	**0.95**	**0.27**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	4.87	4.27	3.93	5.44	7.28	8.24	8.04	6.30	3.51	3.15
BRS Antenna data 0 - 90 degrees	30	31	32	33	34	35	36	37	38	39
Andrew DMA18W090-H Ant. Elev. Tab Data Gain in dBd	-3.58	-4.5	-5.05	-2.75	-0.36	0.8	0.56	-1.59	-5.78	-6.46

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Andrew DMA18W090-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	0.33	2.97	4.28	4.42	3.11	1.15	-0.86	-2.67	-4.02	-6.39
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-165.31	-167.95	-169.26	-169.4	-168.09	-166.13	-164.12	-162.31	-160.96	-158.59
Satellite elevation in degrees	40	41	42	43	44	45	46	47	48	49
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**4.91**	**7.55**	**8.86**	**9.00**	**7.69**	**5.73**	**3.72**	**1.91**	**0.56**	**-1.81**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	6.13	8.26	9.40	9.52	8.38	6.76	5.26	4.07	3.30	2.20
BRS Antenna data 0 - 90 degrees	40	41	42	43	44	45	46	47	48	49
Andrew DMA18W090-H Ant. Elev. Tab Data Gain in dBd	-1.82	0.82	2.13	2.27	0.96	-1	-3.01	-4.82	-6.17	-8.54

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Andrew DMA18W090-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-10.94	-12.47	-5.63	-1.92	0.15	1.15	0.82	-0.26	-2.92	-8.03
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-154.04	-152.51	-159.35	-163.06	-165.13	-166.13	-165.8	-164.72	-162.06	-156.95
Satellite elevation in degrees	50	51	52	53	54	55	56	57	58	59
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**-6.36**	**-7.89**	**-1.05**	**2.66**	**4.73**	**5.73**	**5.40**	**4.32**	**1.66**	**-3.45**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	0.90	0.65	2.52	4.54	5.99	6.76	6.50	5.69	3.92	1.62
BRS Antenna data 0 - 90 degrees	50	51	52	53	54	55	56	57	58	59
Andrew DMA18W090-H Ant. Elev. Tab Data Gain in dBd	-13.09	-14.62	-7.78	-4.07	-2	-1	-1.33	-2.41	-5.07	-10.18

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Andrew DMA18W090-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-21.57	-11.93	-5.11	-1.99	-0.07	0.86	1.25	1.25	0.64	-0.37
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-143.41	-153.05	-159.87	-162.99	-164.91	-165.84	-166.23	-166.23	-165.62	-164.61
Satellite elevation in degrees	60	61	62	63	64	65	66	67	68	69
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	-16.99	**-7.35**	**-0.53**	**2.59**	**4.51**	**5.44**	**5.83**	**5.83**	**5.22**	**4.21**
Predicted Interference (Isat/N in excess of -10 dB)	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	0.09	0.73	2.76	4.50	5.83	6.54	6.84	6.84	6.37	5.61
BRS Antenna data 0 - 90 degrees	60	61	62	63	64	65	66	67	68	69
Andrew DMA18W090-H Ant. Elev. Tab Data Gain in dBd	-23.72	-14.08	-7.26	-4.14	-2.22	-1.29	-0.9	-0.9	-1.51	-2.52

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Andrew DMA18W090-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-1.79	-3.25	-5.03	-7.18	-8.77	-9.59	-9.72	-8.93	-7.98	-7.11
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-163.19	-161.73	-159.95	-157.8	-156.21	-155.39	-155.26	-156.05	-157	-157.87
Satellite elevation in degrees	70	71	72	73	74	75	76	77	78	79
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**2.79**	**1.33**	**-0.45**	**-2.60**	**-4.19**	**-5.01**	**-5.14**	**-4.35**	**-3.40**	**-2.53**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	4.63	3.73	2.79	1.90	1.40	1.19	1.16	1.36	1.64	1.93
BRS Antenna data 0 - 90 degrees	70	71	72	73	74	75	76	77	78	79
Andrew DMA18W090-H Ant. Elev. Tab Data Gain in dBd	-3.94	-5.4	-7.18	-9.33	-10.92	-11.74	-11.87	-11.08	-10.13	-9.26

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Andrew DMA18W090-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-6.67	-6.18	-5.95	-5.93	-5.59	-5.61	-5.5	-5.66	-5.6	-5.78
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-158.31	-158.8	-159.03	-159.05	-159.39	-159.37	-159.48	-159.32	-159.38	-159.2
Satellite elevation in degrees	80	81	82	83	84	85	86	87	88	89
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**-2.09**	**-1.60**	**-1.37**	**-1.35**	**-1.01**	**-1.03**	**-0.92**	**-1.08**	**-1.02**	**-1.20**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	2.09	2.29	2.38	2.39	2.54	2.53	2.58	2.51	2.53	2.45
BRS Antenna data 0 - 90 degrees	80	81	82	83	84	85	86	87	88	89
Andrew DMA18W090-H Ant. Elev. Tab Data Gain in dBd	-8.82	-8.33	-8.1	-8.08	-7.74	-7.76	-7.65	-7.81	-7.75	-7.93

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Andrew DMA18W090-H Base Station Antenna)

Desired frequency in MHz	2496
Bandwidth in KHz	4
BRS antenna gain dBi	-5.98
BRS Receiver noise figure dB	3
KTB Noise floor dBW	-167.98
BRS system sensitivity in dBW/4KHz	-159
Satellite elevation in degrees	90
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131
Conversion factor dB(m2)	-29.39
Satellite signal strength in dBW/4KHz	-160.39
Isat/N	**-1.40**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**
Rise in BRS Noise Floor	2.37
BRS Antenna data 0 - 90 degrees	90
Andrew DMA18W090-H Ant. Elev. Tab Data Gain in dBd	-8.13

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

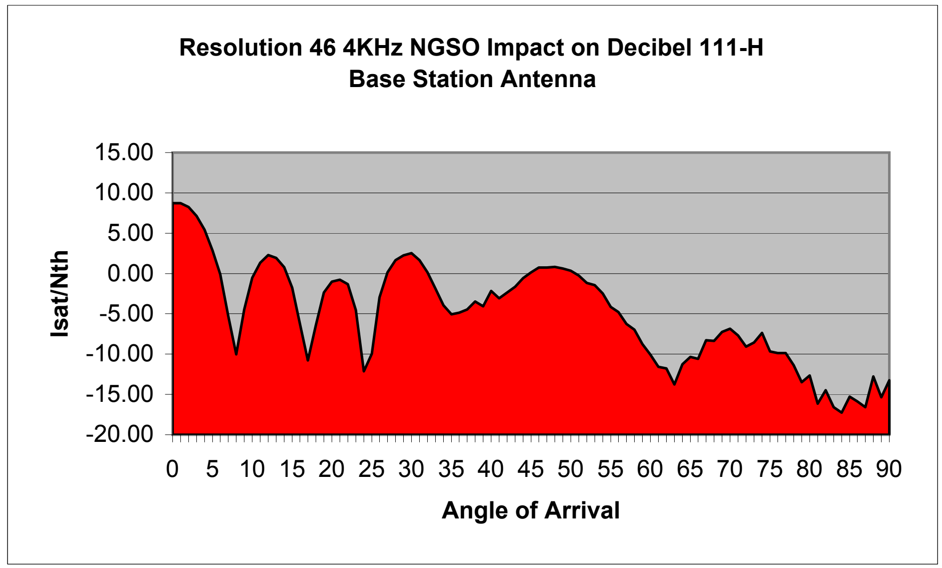
By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel 111-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	17.15	17.15	16.65	15.55	13.85	11.25	7.65	1.85	-3.55	1.35
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-182.13	-182.13	-181.63	-180.53	-178.83	-176.23	-172.63	-166.83	-161.43	-166.33
Satellite elevation in degrees	0	1	2	3	4	5	6	7	8	9
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-144	-144	-144	-144	-144	-144	-143.35	-142.7	-142.05	-141.4
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-173.39	-173.39	-173.39	-173.39	-173.39	-173.39	-172.74	-172.09	-171.44	-170.79
Isat/N	**8.73**	**8.73**	**8.23**	**7.13**	**5.43**	**2.83**	**-0.12**	**-5.27**	-10.02	**-4.47**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No	**Yes**
Rise in BRS Noise Floor	9.28	9.28	8.84	7.90	6.53	4.66	2.95	1.13	0.41	1.33
BRS Antenna data 0 - 90 degrees	0	1	2	3	4	5	6	7	8	9
Decibel 111-H Elevation Tab Data Gain in dBd	15	15	14.5	13.4	11.7	9.1	5.5	-0.3	-5.7	-0.8

Number of Simultaneous Satellites Received 1

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*



By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel 111-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	4.65	5.85	6.15	5.15	3.35	0.15	-4.95	-10.15	-6.45	-3.05
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-169.63	-170.83	-171.13	-170.13	-168.33	-165.13	-160.03	-154.83	-158.53	-161.93
Satellite elevation in degrees	10	11	12	13	14	15	16	17	18	19
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-140.75	-140.1	-139.45	-138.8	-138.15	-137.5	-136.85	-136.2	-135.55	-134.9
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-170.14	-169.49	-168.84	-168.19	-167.54	-166.89	-166.24	-165.59	-164.94	-164.29
Isat/N	**-0.52**	**1.33**	**2.28**	**1.93**	**0.78**	**-1.77**	**-6.22**	-10.77	**-6.42**	**-2.37**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**
Rise in BRS Noise Floor	2.76	3.73	4.30	4.08	3.42	2.22	0.93	0.35	0.89	1.99
BRS Antenna data 0 - 90 degrees	10	11	12	13	14	15	16	17	18	19
Decibel 111-H Elevation Tab Data Gain in dBd	2.5	3.7	4	3	1.2	-2	-7.1	-12.3	-8.6	-5.2

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz

P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB

0 - 5 degrees = *P*

5 -25 degrees = P + r * (Angle - 5)

25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel 111-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-2.35	-2.75	-3.95	-7.85	-16.05	-14.55	-7.55	-4.45	-2.95	-2.35
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-162.63	-162.23	-161.03	-157.13	-148.93	-150.43	-157.43	-160.53	-162.03	-162.63
Satellite elevation in degrees	20	21	22	23	24	25	26	27	28	29
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-134.25	-133.6	-132.95	-132.3	-131.65	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-163.64	-162.99	-162.34	-161.69	-161.04	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**-1.02**	**-0.77**	**-1.32**	**-4.57**	-12.12	**-9.97**	**-2.97**	**0.13**	**1.63**	**2.23**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	2.53	2.64	2.40	1.30	0.26	0.42	1.78	3.08	3.90	4.27
BRS Antenna data 0 - 90 degrees	20	21	22	23	24	25	26	27	28	29
Decibel 111-H Elevation Tab Data Gain in dBd	-4.5	-4.9	-6.1	-10	-18.2	-16.7	-9.7	-6.6	-5.1	-4.5

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel 111-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-2.05	-2.95	-4.45	-6.45	-8.55	-9.65	-9.45	-9.05	-8.05	-8.65
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-162.93	-162.03	-160.53	-158.53	-156.43	-155.33	-155.53	-155.93	-156.93	-156.33
Satellite elevation in degrees	30	31	32	33	34	35	36	37	38	39
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**2.53**	**1.63**	**0.13**	**-1.87**	**-3.97**	**-5.07**	**-4.87**	**-4.47**	**-3.47**	**-4.07**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	4.46	3.90	3.08	2.18	1.47	1.18	1.23	1.33	1.61	1.44
BRS Antenna data 0 - 90 degrees	30	31	32	33	34	35	36	37	38	39
Decibel 111-H Elevation Tab Data Gain in dBd	-4.2	-5.1	-6.6	-8.6	-10.7	-11.8	-11.6	-11.2	-10.2	-10.8

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel 111-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-6.75	-7.65	-6.95	-6.25	-5.15	-4.45	-3.85	-3.85	-3.75	-3.95
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-158.23	-157.33	-158.03	-158.73	-159.83	-160.53	-161.13	-161.13	-161.23	-161.03
Satellite elevation in degrees	40	41	42	43	44	45	46	47	48	49
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**-2.17**	**-3.07**	**-2.37**	**-1.67**	**-0.57**	**0.13**	**0.73**	**0.73**	**0.83**	**0.63**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	2.06	1.74	1.99	2.26	2.74	3.08	3.39	3.39	3.45	3.34
BRS Antenna data 0 - 90 degrees	40	41	42	43	44	45	46	47	48	49
Decibel 111-H Elevation Tab Data Gain in dBd	-8.9	-9.8	-9.1	-8.4	-7.3	-6.6	-6	-6	-5.9	-6.1

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel 111-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-4.25	-4.85	-5.75	-6.05	-7.05	-8.75	-9.35	-10.85	-11.55	-13.35
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-160.73	-160.13	-159.23	-158.93	-157.93	-156.23	-155.63	-154.13	-153.43	-151.63
Satellite elevation in degrees	50	51	52	53	54	55	56	57	58	59
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**0.33**	**-0.27**	**-1.17**	**-1.47**	**-2.47**	**-4.17**	**-4.77**	**-6.27**	**-6.97**	**-8.77**
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	3.18	2.88	2.47	2.34	1.95	1.41	1.25	0.92	0.80	0.54
BRS Antenna data 0 - 90 degrees	50	51	52	53	54	55	56	57	58	59
Decibel 111-H Elevation Tab Data Gain in dBd	-6.4	-7	-7.9	-8.2	-9.2	-10.9	-11.5	-13	-13.7	-15.5

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel 111-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-14.65	-16.15	-16.35	-18.35	-15.85	-14.95	-15.15	-12.85	-12.95	-11.85
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-150.33	-148.83	-148.63	-146.63	-149.13	-150.03	-149.83	-152.13	-152.03	-153.13
Satellite elevation in degrees	60	61	62	63	64	65	66	67	68	69
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	-10.07	-11.57	-11.77	-13.77	-11.27	-10.37	-10.57	**-8.27**	**-8.37**	**-7.27**
Predicted Interference (Isat/N in excess of -10 dB)	No	No	No	No	No	No	No	**Yes**	**Yes**	**Yes**
Rise in BRS Noise Floor	0.41	0.29	0.28	0.18	0.31	0.38	0.37	0.60	0.59	0.75
BRS Antenna data 0 - 90 degrees	60	61	62	63	64	65	66	67	68	69
Decibel 111-H Elevation Tab Data Gain in dBd	-16.8	-18.3	-18.5	-20.5	-18	-17.1	-17.3	-15	-15.1	-14

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel 111-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-11.45	-12.25	-13.65	-13.15	-11.95	-14.25	-14.45	-14.45	-15.95	-18.05
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-153.53	-152.73	-151.33	-151.83	-153.03	-150.73	-150.53	-150.53	-149.03	-146.93
Satellite elevation in degrees	70	71	72	73	74	75	76	77	78	79
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	**-6.87**	**-7.67**	**-9.07**	**-8.57**	**-7.37**	**-9.67**	**-9.87**	**-9.87**	-11.37	-13.47
Predicted Interference (Isat/N in excess of -10 dB)	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No	No
Rise in BRS Noise Floor	0.81	0.69	0.51	0.57	0.73	0.45	0.43	0.43	0.31	0.19
BRS Antenna data 0 - 90 degrees	70	71	72	73	74	75	76	77	78	79
Decibel 111-H Elevation Tab Data Gain in dBd	-13.6	-14.4	-15.8	-15.3	-14.1	-16.4	-16.6	-16.6	-18.1	-20.2

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel 111-H Base Station Antenna)

Desired frequency in MHz	2496	2496	2496	2496	2496	2496	2496	2496	2496	2496
Bandwidth in KHz	4	4	4	4	4	4	4	4	4	4
BRS antenna gain dBi	-17.25	-20.75	-19.05	-21.15	-21.85	-19.85	-20.45	-21.15	-17.35	-19.95
BRS Receiver noise figure dB	3	3	3	3	3	3	3	3	3	3
KTB Noise floor dBW	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98	-167.98
BRS system sensitivity in dBW/4KHz	-147.73	-144.23	-145.93	-143.83	-143.13	-145.13	-144.53	-143.83	-147.63	-145.03
Satellite elevation in degrees	80	81	82	83	84	85	86	87	88	89
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131	-131	-131	-131	-131	-131	-131	-131	-131	-131
Conversion factor dB(m2)	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39	-29.39
Satellite signal strength in dBW/4KHz	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39	-160.39
Isat/N	-12.67	-16.17	-14.47	-16.57	-17.27	-15.27	-15.87	-16.57	-12.77	-15.37
Predicted Interference (Isat/N in excess of -10 dB)	No	No	No	No	No	No	No	No	No	No
Rise in BRS Noise Floor	0.23	0.10	0.15	0.09	0.08	0.13	0.11	0.09	0.22	0.12
BRS Antenna data 0 - 90 degrees	80	81	82	83	84	85	86	87	88	89
Decibel 111-H Elevation Tab Data Gain in dBd	-19.4	-22.9	-21.2	-23.3	-24	-22	-22.6	-23.3	-19.5	-22.1

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

Impact of NGSO MSS at Resolution 46 PFDs on BRS System (Decibel 111-H Base Station Antenna)

Desired frequency in MHz	2496
Bandwidth in KHz	4
BRS antenna gain dBi	-17.85
BRS Receiver noise figure dB	3
KTB Noise floor dBW	-167.98
BRS system sensitivity in dBW/4KHz	-147.13
Satellite elevation in degrees	90
Satellite PFD in dB(Wm2/4 KHz) per ITU R46 for NGSO	-131
Conversion factor dB(m2)	-29.39
Satellite signal strength in dBW/4KHz	-160.39
Isat/N	-13.27
Predicted Interference (Isat/N in excess of -10 dB)	No
Rise in BRS Noise Floor	0.20
BRS Antenna data 0 - 90 degrees	90
Decibel 111-H Elevation Tab Data Gain in dBd	-20

Number of Simultaneous Satellites Received

PFD specification in R46 for NGSO at 2483.5 to 2500 MHz
P = -144 dB(Wm2) in 4 KHz, *r* = .65 dB
0 - 5 degrees = *P*
5 -25 degrees = P + r * (Angle - 5)
25 - 90 degrees P + 20*r*

By Harry Perlow

ATTACHMENT B

Interference Considerations Involving The Broadcast Auxiliary Service In Connection With The Relocation of MDS-1 To The 2496–2502 MHz Band

PREPARED BY

KESSLER AND GEHMAN ASSOCIATES, INC.
Telecommunications Consulting Engineers
507 N. W. 60TH STREET, SUITE C
GAINESVILLE, FLORIDA
Phone: 352-332-3157
Fax: 352-332-6392

Introduction

Kessler and Gehman Associates, Inc. ("KGA") is a professional engineering firm, specializing in the design and evaluation of telecommunications systems for more than 40 years. The firm has been involved in virtually every phase of TV and FM broadcast, microwave communications, fiber optic, cable TV and wireless cable (MDS/ITFS), satellite earth stations, and two-way radio communications systems. The services rendered by KGA have ranged from consulting services on a daily basis to studies of technical and economic feasibility and the design and construction follow-up of major telecommunications systems in widely diverse geographical areas. In particular the firm has had extensive experience in the design of systems in geographical areas where special attention has had to be devoted to effects of meteorological variations on system propagation reliability. Baseband information carried on communications systems designed by the firm includes video, data, telemetry, supervisory, wide bandwidth audio, and telephone either in combination or individually.

The qualifications of the firm's key technical personnel are a matter of record with the Federal Communications Commission. KGA has represented many clients before the FCC in a variety of matters, including rule making and waiver requests of the Commission's rules to accommodate specialized telecommunications systems. While the firm maintains a continuous dialogue with equipment suppliers, contractors and manufacturers of television, radio and telecommunications equipment, its relationship to such companies is limited solely to the contacts necessary for the planning and implementation of systems for the firm's clients. The firm engages only in providing consulting services to its clients, and is thus not involved in the promotion, manufacture, sale or installation of any equipment. KGA or its personnel are members of the Association of Federal Communications Consulting Engineers ("AFCCE") and the Institute of Electrical and Electronic Engineers ("IEEE").

Background

KGA has analyzed technical issues associated with relocating Multipoint Distribution Service channel 1 ("MDS-1") from the 2150-2156 MHz band to 2496-2502 MHz, which the FCC has labeled BRS1. The lower 4 MHz of the new BRS1 channel, 2496-2500 MHz, will be shared with Broadcast Auxiliary Service ("BAS") channel A-10 (2483.5-2500 MHz). For the reasons set forth below, KGA respectfully submits that the proposal is laden with difficulties that will result in significant interference to BRS1 operations from the itinerant operations of BAS electronic news gathering ("ENG") facilities.

As shown in Table 1A and depicted on Figure 1A, the FCC reallocated the 6 MHz MDS-1 channel from 2150-2156 MHz to 2496-2502 MHz and renamed it BRS1. The lower 4 MHz of the new BRS1 channel is shared with BAS channel A-10.

Channel	Bandwidth	Band Range
BAS CHANNEL A-8	17.0 MHz	2450-2467 MHz
BAS CHANNEL A-9	16.5 MHz	2467-2483.5 MHz
BAS CHANNEL A-10	16.5 MHz	2483.5-2500 MHz
BRS1	6 MHz	2496-2502 MHz
1A - CURRENT BAS ALLOCATIONS WITH NEW OVERLAPPING BRS1		
DIGITAL BAS CH A-8	12.0 MHz	2450-2462 MHz
DIGITAL BAS CH A-9	12.0 MHz	2462-2474 MHz
DIGITAL BAS CH A-10	12.0 MHz	2474-2486 MHz
BRS1	6 MHz	2496-2502 MHz
1B - POSSIBLE DIGITIZED BAS REALLOCATION WITH NEW BRS1		

TABLE 1 - BAND PLANS FOR 2450 TO 2500 MHZ

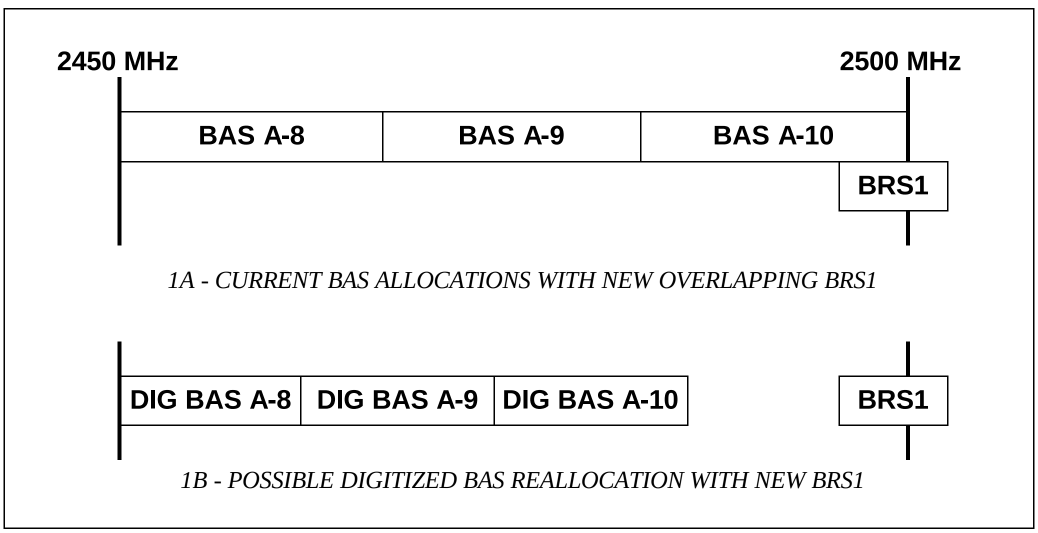


FIGURE 1 - BAND PLANS FOR 2450 TO 2500 MHZ

Table 1B and Figure 1B show the BAS channel reallocation recommended by the Society of Broadcast Engineers ("SBE"). The SBE proposal would convert the BAS equipment to digital using 12 MHz channels, which would limit the BAS allocation to 36 MHz, beginning with 2450

MHz and ending at 2486 MHz. This recommendation would provide a 10 MHz space between digitized BAS stations and the new BRS1 channel.

Interference Analysis Methodology

BAS Transmitting Facilities

To cover news, traffic, weather, cultural, and sporting events throughout a market area, ENG mobile facilities routinely setup at temporary, ever-changing locations within their licensed area of operation to broadcast live reports back to the broadcaster's studio. These mobile facilities are typically configured with 10-12 watt transmitters, which are mounted on a telescoping mast to eliminate feed-line loss. The gain of transmitting antennas used on mobile units depends on the type of mobile unit (vehicle in motion, vehicle parked, or portable tripod) and the distance between the mobile unit and the R/O site, but the gain ranges from 13 dBi to 25 dBi, with a typical unit using a 20-dBi gain and a beamwidth of about 12 degrees. FCC Section 74.636 limits the transmitter power output to 12 watts and the EIRP to a maximum of 35 dBW (3,162 watts) for BAS mobile operations emanating from the ENG facilities[1]. The resulting signal power from the ENG facility is the equivalent of a high-powered broadcast facility on wheels (or wings in the case of helicopters and blimps) with an ability to transmit from any location, in any direction, and at any time within a market.

It is recognized that interference potential can be limited by terrain obstructions that block the line-of-sight between the interfering BAS antenna and the BRS1 receiving antenna. The primary transmitting facilities of BAS stations are the mobile units, usually consisting of trucks with pneumatic masts that can raise the transmitting antennas to heights to 30 feet or more, but the transmitting facilities can also be mounted on helicopters and blimps. To be conservative I made all calculations using a height of 30 feet for BAS stations.

BAS Receiving Facilities

BAS receiving facilities typically consist of one or more central receive locations with omni-directional or steer-able antennas mounted as high as possible to minimize blockage of the signal, between the mobile transmitting antenna and the fixed receiving antenna, caused by terrain, trees and man-made obstacles. The gain of such antennas is typically 16-20 dBi. A gain of 16 dBi and a height of 300 feet have been used for conservative calculations. Much greater separations would be required for many stations using higher gains and/or antenna heights.

---

[1] As a point of reference, an EIRP of 35 dBW is 2dB (1.58 times) higher than the maximum allowable EIRP for a BRS1 Base station.

BRS1 Receiving Facilities

I evaluated three types of BRS1 receiving facilities; a Base station typical of that deployed in FDD systems using BRS1 for upstream communications used to receive signals from Customer Premise Equipment ("CPE"), a CPE used to receive signals from the Base station, and a Base station using technical characteristics of some of the TDD systems being deployed in the 2.5 GHz band also for receiving signals from CPE stations. It is recognized that antenna heights are designed for each specific fixed-facility, but a minimal height of 80 feet above ground level ("AGL") was used for BRS1 Base stations to represent the lower end of the height range and 500 feet AGL was used for high-power/high-height base stations to represent the upper end of the height range, although much greater heights have been designed to cover large areas. Also, a conservative height of 5 feet AGL was used for CPE stations even though there is no prohibition against a subscriber taking the CPE to an office or apartment located in a multi-story building. Therefore, the minimum separations that are limited by line-of-sight should be considered as "best-case", meaning that greater separations may frequently be required to avoid interference. The following is a summary of the parameters of each type of facility:

Type	**Noise Figure (dB)**	**Receiving Antenna Gain (dBi)**	**Antenna Height (Feet AGL)**
BRS1 Base Station	3.0	20.15	80
BRS1 CPE 7.5 dBi	4.5	7.5	5
BRS1 2^{nd} Generation Base	3.0	18.15	500

Noise Floor Protection

The methodology used in this report to analyze the potential adverse consequences of the band reallocation is to calculate the impact of co-channel and adjacent channel interference from BAS to BRS1. For purposes of this analysis, interference occurs when a victim receiver's noise floor is degraded by more than 1 dB from an interfering transmitter. The 1-dB degradation criteria was chosen because this represents a significant reduction in the potential coverage area of a communications system, which equates to reduced coverage areas, dropped calls or sessions, the inability to make calls or establish connections, and overall system performance degradation. In order to avoid a 1-dB degradation of the noise floor, the interfering signal must be at least 5.9 dB below the existing noise floor. The impact of interference can be minimized or eliminated by physical separation between a victim receiver and an interfering transmitter although, as discussed below, the required separation distance cannot always be achieved in a practical manner in the real world. The impact of interference will be evaluated by calculating the required physical separation distance between a victim receiver and an interfering transmitter in order to avoid a significant impact to system performance. As stated above, the separations have been reduced to account for line-of-sight blockage over a smooth earth ($K=4/3$).

BAS channel A-10 is located at 2483.5-2500 MHz, the upper 4 MHz of which would be shared with the new BRS1, so BAS/ENG facilities present a potential for co-channel interference to BRS1 by desensitization to BRS1 base station operations in the 2496-2502 MHz band. BAS channel A-9 is located at 2467–2483.5 MHz, only 12.5 MHz away from the 2496-2500 MHz BRS1 channel. The out-of-band emissions ("OOBE") of analog BAS channel A-9 stations also have the potential for causing adjacent channel interference to BRS1 stations. Adjacent channel interference has been evaluated using the FCC's OOBE requirements for analog BAS stations.

Section 74.637(a)(1) of the FCC's rules requires that BAS analog transmitters adhere to the following:

> *"(i) On any frequency removed from the assigned (center) frequency by more than 50% up to and including 100% of the authorized bandwidth: At least 25 dB in any 100 kHz reference bandwidth (BREF);*
> *(ii) On any frequency removed from the assigned (center) frequency by more than 100% up to and including 250% of the authorized bandwidth: At least 35 dB in any 100 kHz reference bandwidth;*
> *(iii) On any frequency removed from the assigned (center) frequency by more than 250% of the authorized bandwidth at least 43 + 10 Log10 (P mean in watts) or 80 dB, which ever is the lesser attenuation, in any 100 KHz reference bandwidth".*

The OOBE limitations specified for BRS1 are based on an attenuation of 43 + 10Log (P_w) [dB] outside the channel's edge for both base stations and CPE. CPE OOBE attenuation is increased to 55 + 10Log (P_w) [dB] at and beyond 5.5 MHz from the channel's edge. Base station OOBE attenuation may be increased to 67 + 10Log (P_w) [dB] outside the channel under certain conditions.

Results of Interference Analyses

BRS1 Shared Use of 2496-2500 MHz Will Result In Destructive Interference From BAS Stations

Figure 2 is a series of tables showing the minimum mileage separation required between BAS and BRS1 stations to avoid co-channel interference.

Figure 2A demonstrates the separation required to avoid interference to BRS1 Base station receiving facilities. Whether analog or digital, co-channel BAS will cause harmful interference to BRS1 base stations absent substantial separation distances that would range over 18,000 miles under a flat earth model and that exceed 20 miles under conservative antenna height assumptions. Note that if one considers use of BAS in helicopters and blimps, and BRS1 base stations with antenna heights of 200 feet above ground level, or greater, the zone in which BRS1 base stations will suffer interference is substantially greater.

Figure 2B demonstrates the separation required to avoid interference to BRS1 CPE receiving facilities. Whether analog or digital, co-channel BAS will cause harmful interference to BRS subscriber units absent substantial separation distances that would range over 3,600 miles under a flat earth model and that exceed 11 miles under conservative antenna height assumptions. Again, note that these calculations are highly conservative in the assumptions regarding both BAS and BRS antenna heights, and that if one considers use of BAS in helicopters and blimps, and BRS1 subscriber terminals being used more than 5 feet above ground level, the zone in which BRS1 user stations will suffer interference is substantially greater.

Figure 2C demonstrates the separation required to avoid interference to BRS1 Base stations using 2500 MHz TDD system receiving facilities. Whether analog or digital, co-channel BAS will cause harmful interference to BRS subscriber units absent substantial separation distances that would range over 14,000 miles under a flat earth model and that exceed 39 miles under conservative antenna height assumptions. Again, note that these calculations are highly conservative in the assumptions regarding both BAS and BRS antenna heights, and that if one considers use of BAS in helicopters and blimps, and BRS1 subscriber terminals being used more than 5 feet above ground level, the zone in which BRS1 user stations will suffer interference is substantially greater.

Adjacent channel Analog BAS Stations Will Cause Destructive Interference To BRS1 Stations

Figure 3 is a series of tables showing the minimum mileage separation required between BAS and BRS1 stations to avoid adjacent-channel interference.

Figure 3A demonstrates the separation required to avoid interference to BRS1 Base station receiving facilities. Analog BAS operating on Channel A9 will cause harmful adjacent channel interference to BRS1 base stations absent separation distances of that would range to 334 miles under a flat earth model and that exceed 20 miles under conservative antenna height assumptions. Again, note that these calculations are highly conservative in the assumptions regarding both BAS and BRS antenna heights, and that if one considers use of BAS in helicopters and blimps, and BRS1 base stations 200 feet AGL, the zone in which BRS1 base stations will suffer interference is substantially greater.

Figure 3B demonstrates the separation required to avoid interference to BRS1 CPE receiving facilities. Analog BAS operating on Channel A9 will cause harmful adjacent channel interference to BRS1 user stations absent separation distances of that would range to 66 miles under a flat earth model and that exceed 11 miles under conservative antenna height assumptions. Again, note that these calculations are highly conservative in the assumptions regarding both BAS and BRS antenna heights, and that if one considers use of BAS in helicopters and blimps, and BRS1 base stations 200 feet AGL, the zone in which BRS1 base stations will suffer interference is substantially greater.

Figure 3C demonstrates the separation required to avoid interference to BRS1 Base stations using 2500 MHz TDD system receiving facilities. Analog BAS operating on Channel A9 will cause harmful adjacent channel interference to BRS1 user stations absent separation distances of that would range to 265 miles under a flat earth model and that exceed 39 miles under conservative antenna height assumptions. Again, note that these calculations are highly conservative in the assumptions regarding both BAS and BRS antenna heights, and that if one considers use of BAS in helicopters and blimps, and BRS1 base stations 200 feet AGL, the zone in which BRS1 base stations will suffer interference is substantially greater.

BRS1 Stations Will Cause Destructive Co-channel Interference To BAS Stations

Figure 4 consists of a group of tables depicting the interference from BRS1 to BAS receiving facilities.

Figure 4A demonstrates the separation required to avoid co-channel interference from BRS1 Base station facilities. Whether BAS is analog or digital, BRS base stations will cause substantial cochannel interference to BAS receivers absent substantial separation distances that would range over 15,000 miles under a flat earth model and that exceed 37 miles under conservative antenna height assumptions.

Figure 4B demonstrates the separation required to avoid interference from BRS1 CPE facilities. Whether BAS is analog or digital, BRS CPE will cause substantial cochannel interference to BAS receivers absent substantial separation distances that would range over 380 miles under a flat earth model and that exceed 28 miles under conservative antenna height assumptions.

Conclusions

BAS facilities located at 2450-2500 MHz are effectively mobile high power operations that may operate anywhere at anytime in the ENG licensed areas, and coordination with BRS1 is impossible because BRS1 at 2496-2500 MHz would be utilized on a ubiquitous basis for communications throughout the same service area. The co-channel separation distances summarized above make it impossible for BRS1 to provide ubiquitous coverage of a metropolitan area if it must protect BAS. For the reasons given above the 2496-2500 MHz band is not suited for shared operations between BAS and BRS-1 stations.

Restricting BAS to digital operations and either abandoning channel A-10 or relocating BAS to the 36 MHz at 2450-2486 MHz will permit BRS1 and BAS to coexist.

My calculations have been reviewed by SBE and found to be correct.

This engineering statement has been prepared by or under the direct supervision of Robert Gehman, Jr., who states under penalty of perjury that he is a professional engineer registered in the states of Florida, Maryland and Mississippi, he is president of Kessler and Gehman Associates, Inc., and the information contained in this statement is true and correct to the best of his knowledge and belief.

KESSLER AND GEHMAN ASSOCIATES, INC.

Robert Gehman, Jr., P.E.
President

September 7, 2004

FIGURE 2 - Co-Channel BAS into BRS-1

A - BAS to BRS-1 Base

Digital BAS Mobile Co-Channel into BRS-1 Base Receiver

BAS Maximum EIRP for Mobile	35.00	dBW
Bandwidth	12	MHz
EIRP/6 MHz	31.99	dBW
Co-Channel	0.00	dB
BAS Mobile EIRP	31.99	dBW
BRS Base Rx Antenna	20.15	dBi
Bandwidth of BRS Receiver	6	MHz
Noise figure of BRS Receiver	3.00	dB
KTB Noise Floor of BRS Receiver	-136.22	dBW
BRS Receiver Threshhold for 1 dB rise	-139.22	dBW
Distance Separation - Signal Calculations	22,025	miles
Distance Separation - Line of Sight	20	miles
Minimum Separation to Avoid Interference	**20**	**miles**

Analog BAS Mobile Co-Channel into BRS-1 Base Receiver

BAS Maximum EIRP for Mobile	35.00	dBW
Bandwidth	16.5	MHz
EIRP/6 MHz	30.61	dBW
Co-Channel	0.00	dB
BAS Mobile EIRP	30.61	dBW
BRS Base Rx Antenna	20.15	dBi
Bandwidth of BRS Receiver	6	MHz
Noise figure of BRS Receiver	3.00	dB
KTB Noise Floor of BRS Receiver	-136.22	dBW
BRS Receiver Threshhold for 1 dB rise	-139.22	dBW
Distance Separation - Signal Calculations	18,783	miles
Distance Separation - Line of Sight	20	miles
Minimum Separation to Avoid Interference	**20**	**miles**

Height of BAS Mobile Transmit Antenna	30	feet
Height of BRS-1 Base Receiver Antenna	80	feet
Line of Sight	**20**	miles

FIGURE 2 - Co-Channel BAS into BRS-1

B - BAS to BRS-1 7.5 dBi Antenna

Digital BAS Mobile Co-Channel into BRS-1 CPE Receiver

BAS Maximum EIRP for Mobile	35.00	dBW
Bandwidth	12	MHz
EIRP/6 MHz	31.99	dBW
Co-Channel	0.00	dB
BAS Mobile EIRP	31.99	dBW
BRS CPE Rx Antenna	7.50	dBi
Bandwidth of BRS Receiver	6	MHz
Noise figure of BRS Receiver	4.50	dB
KTB Noise Floor of BRS Receiver	-136.22	dBW
BRS Receiver Threshhold for 1 dB rise	-137.72	dBW
Distance Separation - Signal Calculations	4,319	miles
Distance Separation - Line of Sight	11	miles
Minimum Separation to Avoid Interference	**11**	**miles**

Analog BAS Mobile Co-Channel into BRS-1 CPE Receiver

BAS Maximum EIRP for Mobile	35.00	dBW
Bandwidth	16.5	MHz
EIRP/6 MHz	30.61	dBW
Co-Channel	0.00	dB
BAS Mobile EIRP	30.61	dBW
BRS CPE Rx Antenna	7.50	dBi
Bandwidth of BRS Receiver	6	MHz
Noise figure of BRS Receiver	4.50	dB
KTB Noise Floor of BRS Receiver	-136.22	dBW
BRS Receiver Threshhold for 1 dB rise	-137.72	dBW
Distance Separation - Signal Calculations	3,683	miles
Distance Separation - Line of Sight	11	miles
Minimum Separation to Avoid Interference	**11**	**miles**

Height of BAS Mobile Transmit Antenna	30	feet
Height of BRS-1 CPE Receiver Antenna	5	feet
Line of Sight	**11**	miles

FIGURE 2 - Co-Channel BAS into BRS-1

C - BAS to BRS-1 2500 MHz TDD Base

Digital BAS Mobile Co-Channel into 2500 MHz TDD Receiver

BAS Maximum EIRP for Mobile	35.00	dBW
Bandwidth	12	MHz
EIRP/6 MHz	31.99	dBW
Co-Channel	0.00	dB
BAS Mobile EIRP	31.99	dBW
BRS CPE Rx Antenna	18.15	dBi
Bandwidth of BRS Receiver	6	MHz
Noise figure of BRS Receiver	3.00	dB
KTB Noise Floor of BRS Receiver	-136.22	dBW
BRS Receiver Threshhold for 1 dB rise	-139.22	dBW
Distance Separation - Signal Calculations	17,495	miles
Distance Separation - Line of Sight	39	miles
Minimum Separation to Avoid Interference	**39**	**miles**

Analog BAS Mobile Co-Channel into 2500 MHz TDD Receiver

BAS Maximum EIRP for Mobile	35.00	dBW
Bandwidth	16.5	MHz
EIRP/6 MHz	30.61	dBW
Co-Channel	0.00	dB
BAS Mobile EIRP	30.61	dBW
BRS CPE Rx Antenna	18.15	dBi
Bandwidth of BRS Receiver	6	MHz
Noise figure of BRS Receiver	3.00	dB
KTB Noise Floor of BRS Receiver	-136.22	dBW
BRS Receiver Threshhold for 1 dB rise	-139.22	dBW
Distance Separation - Signal Calculations	14,920	miles
Distance Separation - Line of Sight	39	miles
Minimum Separation to Avoid Interference	**39**	**miles**

Height of BAS Mobile Transmit Antenna	30	feet
Height of BRS-1 2nd Generation Antenna	500	feet
Line of Sight	**39**	miles

FIGURE 3 - BAS operating in Channel A-9

A - BAS to BRS-1 Base

Analog BAS Mobile 2467-2483.5 into BRS-1 Base Receiver

BAS Maximum EIRP for Mobile	35.00	dBW
Bandwidth	16.5	MHz
EIRP/6 MHz	30.61	dBW
OOBE Atten at 2496 MHz	**35.00**	dB
BAS Mobile OOBE EIRP	-4.39	dBW
BRS Base Rx Antenna	20.15	dBi
Bandwidth of BRS Receiver	6	MHz
Noise figure of BRS Receiver	3.00	dB
KTB Noise Floor of BRS Receiver	-136.22	dBW
BRS Receiver Threshhold for 1 dB rise	-139.22	dBW
Distance Separation - Signal Calculations	334	miles
Distance Separation - Line of Sight	20	miles
Minimum Separation to Avoid Interference	**20**	**miles**

Height of BAS Mobile Transmit Antenna	**30**	feet
Height of BRS-1 Base Receiver Antenna	**80**	feet
Line of Sight	**20**	miles

FIGURE 3 - BAS operating in Channel A-9

B - BAS to BRS-1 7.5 dBi Antenna

Analog BAS Mobile 2467-2483.5 MHz into BRS-1 CPE Receiver

BAS Maximum EIRP for Mobile	35.00	dBW
Bandwidth	16.5	MHz
EIRP/6 MHz	30.61	dBW
OOBE Atten at 2496 MHz	**35.00**	dB
BAS Mobile OOBE EIRP	-4.39	dBW
BRS CPE Rx Antenna	7.50	dBi
Bandwidth of BRS Receiver	6	MHz
Noise figure of BRS Receiver	4.50	dB
KTB Noise Floor of BRS Receiver	-136.22	dBW
BRS Receiver Threshhold for 1 dB rise	-137.72	dBW
Distance Separation - Signal Calculations	66	miles
Distance Separation - Line of Sight	11	miles
Minimum Separation to Avoid Interference	**11**	**miles**

Height of BAS Mobile Transmit Antenna	**30**	feet
Height of BRS-1 CPE Receiver Antenna	**5**	feet
Line of Sight	**11**	miles

FIGURE 3 - BAS operating in Channel A-9

C - BAS to BRS-1 2500 MHz TDD Base

Analog BAS Mobile 2467-2483.5 MHz into 2500 MHz TDD Rcvr

BAS Maximum EIRP for Mobile	35.00	dBW
Bandwidth	16.5	MHz
EIRP/6 MHz	30.61	dBW
OOBE Atten at 2496 MHz	35.00	dB
BAS Mobile OOBE EIRP	-4.39	dBW
BRS CPE Rx Antenna	18.15	dBi
Bandwidth of BRS Receiver	6	MHz
Noise figure of BRS Receiver	3.00	dB
KTB Noise Floor of BRS Receiver	-136.22	dBW
BRS Receiver Threshhold for 1 dB rise	-139.22	dBW
Distance Separation - Signal Calculations	265	miles
Distance Separation - Line of Sight	39	miles
Minimum Separation to Avoid Interference	**39**	**miles**

Height of BAS Mobile Transmit Antenna	30	feet
Height of BRS-1 2nd Generation Antenna	500	feet
Line of Sight	**39**	miles

FIGURE 4 - Co-Channel BRS1 into BAS

A - BRS-1 Base Station to BAS Fixed Receiver

BRS-1 Base into Analog BAS Fixed Receiver Co-Channel

BRS Maximum EIRP for Mobile	33.00	dBW
Bandwidth	6	MHz
EIRP/16.5 MHz	37.39	dBW
Co-Channel	0.00	dB
BRS OOBE EIRP	37.39	dBW
BAS Rx Antenna	16.00	dBi
Bandwidth of BAS Receiver	16.5	MHz
Noise figure of BAS Receiver	3.00	dB
KTB Noise Floor of BAS Receiver	-131.83	dBW
BAS Receiver Threshhold for 1 dB rise	-134.83	dBW
Distance Separation - Signal Calculations	15,343	miles
Distance Separation - Line of Sight	37	miles
Minimum Separation to Avoid Interference	**37**	**miles**

Height of BRS-1 Base Transmit Antenna	80	feet
Height of BAS Fixed Receiver Antenna	300	feet
Line of Sight	**37**	miles

FIGURE 4 - Co-Channel BRS1 into BAS

B - BRS-1 CPE to BAS Fixed Receiver

BRS-1 CPE into Analog BAS Fixed Receiver Co-Channel

BRS Maximum EIRP for Mobile	3.01	dBW
Bandwidth	6	MHz
EIRP/16.5 MHz	7.40	dBW
Co-Channel	0.00	dB
BRS OOBE EIRP	7.40	dBW
BAS Rx Antenna	16.00	dBi
Bandwidth of BAS Receiver	16.5	MHz
Noise figure of BAS Receiver	5.00	dB
KTB Noise Floor of BAS Receiver	-131.83	dBW
BAS Receiver Threshhold for 1 dB rise	-132.83	dBW
Distance Separation - Signal Calculations	386	miles
Distance Separation - Line of Sight	28	miles
Minimum Separation to Avoid Interference	**28**	**miles**

Height of BRS-1 CPE Antenna	5	feet
Height of BAS Fixed Receiver Antenna	300	feet
Line of Sight	**28**	miles