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

In the Matter of	)	
	)	
Improving Public Safety Communications in the 800 MHz Band	)	WT Docket No. 02-55
	)	
	)	
Consolidating the 800 and 900 MHz Industrial/Land Transportation and Business Pool Channels	)	
	)	
	)	
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
	)	
	)	
Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile Satellite Service	)	ET Docket No. 95-18

COMMENTS OF TERRESTAR NETWORKS INC.

TerreStar Networks Inc. ("TerreStar") hereby comments on the Consensus Plan that was submitted in the above-captioned proceedings on December 6, 2007, by Sprint Nextel Corporation ("Sprint Nextel"), the Association for Maximum Service Television, Inc. ("MSTV"), the National Association of Broadcasters ("NAB"), and the Society of Broadcast Engineers ("SBE") (collectively, the "Joint Parties"). The Consensus Plan is the Joint Parties' response to an order that was released on November 6, 2007, in which the Commission extended for an additional 60 days the deadline by which Sprint

Nextel is required to complete the transition of 2 GHz broadcast auxiliary service ("BAS") stations to frequencies above 2025 MHz.[1] The order also required the Joint Parties to submit a consensus plan or specific proposals that would make it possible for the 2 GHz MSS licensees "to initiate service in the band while avoiding MSS-BAS interference and continuing the BAS transition."[2]

I. INTRODUCTION AND SUMMARY

The Consensus Plan represents a diligent advance, and is a product of numerous phone calls, e-mails, meetings, and other communications involving Sprint Nextel, broadcasters, BAS equipment manufacturers, BAS equipment installation companies, and the 2 GHz MSS licensees. The Consensus Plan would not have been possible without sacrifices and compromises on all sides.

As discussed below, under the Consensus Plan TerreStar should be in a position to implement the first two phases of its three-phased plan for initiating service.[3] TerreStar has presented a proposal to the Joint Parties, supported by technical analysis, for resolving issues relating to the third phase of TerreStar's plan. This third phase will begin in January 2009, eight months before the Joint Parties propose to complete BAS relocation in accordance with the Consensus

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[1] Order, FCC 07-193 (Nov. 6, 2007).
[2] *Id.* ¶ 5.
[3] These comments are limited to the impact of the Consensus Plan on TerreStar's operations. TerreStar understands that the other 2 GHz MSS licensee, New ICO Satellite Services G.P., is filing separate comments addressing considerations related to its system.

Plan. Although the Joint Parties have expressed interference concerns in connection with the proposal, TerreStar is cautiously optimistic that these concerns will be satisfied once the Joint Parties have had an opportunity to analyze the proposal more fully. As soon as a phase three accommodation is reached, the Consensus Plan will have TerreStar's support as a mechanism for resolving BAS/MSS issues associated with the eight-month period between the January 2009 beginning of phase three and the proposed August 2009 completion of BAS relocation under the Consensus Plan.

II. BACKGROUND

There are two 2 GHz bands that are dedicated to MSS service links. The 2000-2020 MHz band is used to uplink to the satellite and the 2180-2200 MHz band is used to downlink from the satellite. At present, there are seven BAS channels in the 2 GHz band. Two of these BAS channels - channels 1 and 2 – operate on frequencies that have been allocated to 2 GHz MSS uplinks, and will be displaced by 2 GHz MSS operations.

In 2004, the Commission awarded Sprint Nextel (then Nextel) 2 GHz spectrum, including 2 GHz BAS spectrum, as a replacement for 800 MHz spectrum Sprint Nextel was relinquishing to facilitate reconfiguration of public

safety spectrum in the 800 MHz band.[4] As a condition of this spectrum award, the Commission required Sprint Nextel to fund the entire upfront cost of relocating both the BAS incumbents it would be displacing and the BAS incumbents that 2 GHz MSS licensees would be displacing.[5] The deadline for Sprint Nextel to complete this BAS relocation was September 7, 2007.[6]

On September 4, 2007, the Joint Parties filed a Joint Petition requesting a twenty nine month extension of the deadline for completing relocation of BAS licensees from the 2 GHz band.[7] On September 7, 2007, the Commission *sua sponte* extended the BAS relocation deadline by 60 days, in order to provide additional time for it to consider the Joint Parties' twenty nine month extension request.[8] On November 6, 2007, the Commission *sua sponte* extended the

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[4] *Improving Public Safety Communications in the 800 MHz Band*, Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, 19 FCC Rcd 14969 (2004) ("*800 MHz Order*").

[5] *800 MHz Order*, ¶ 261. The 2 GHz MSS licensees have an independent obligation to ensure that BAS channels 1 and 2 are cleared. *See* 47 C.F.R. § 74.690(e). It would be impractical and counterproductive, however, for them to engage in clearance efforts that are parallel to Sprint Nextel's.

[6] *See Commission Seeks Comment on Ex Parte Presentations and Extends Certain Deadlines Regarding the 800 MHz Public Safety Interference Proceeding*, WT Docket No. 02-55, Public Notice (Oct. 22, 2004).

[7] In a prior filing, Sprint Nextel had suggested that BAS relocation could be delayed for twelve to twenty four months. Based on this filing, on April 2, 2007, TerreStar requested in this docket that the Commission initiate a proceeding to review and revise the conditions for both BAS and MSS operation in the MSS uplink portion of the band. *See* TerreStar's Request for Proceeding to Expedite the BAS Relocation Process (April 2, 2007).

[8] Order, FCC 07-162 (Sept. 11, 2007).

relocation deadline for an additional 60 days and required the Joint Parties to submit a consensus plan or make specific proposals within 30 days.[9]

III. PHASES ONE AND TWO OF TERRESTAR'S SERVICE PLANS

There are three phases to TerreStar's plans for initiating service. The understandings arrived at thus far by the Joint Parties and TerreStar resolve BAS clearing issues associated with the first two of these phases.

The first phase of TerreStar's service plans involves in-orbit testing ("IOT"). Following the launch of TerreStar's first satellite, which is scheduled for the third quarter of 2008,[10] TerreStar will run a series of test communications between the satellite and various ground stations. The ground stations will be deployed in a limited number of well-defined areas. Some of these ground stations will simulate mobile earth terminal ("MET") to satellite communications and be intermittent in nature, while others will be calibration earth stations used in connection with beam forming and will be constant. In either case, TerreStar is satisfied, based on its discussions with the Joint Parties, that its IOT can be coordinated with BAS licensees at the local level or conducted in areas where BAS channels 1 and 2 have been cleared. [11]

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[9] Order, FCC 07-193 (Nov. 6, 2007).

[10] The FCC milestone for launching TerreStar's satellite is September 30, 2008.

[11] For example, many in-orbit tests involving MET simulation can be coordinated to occur during times when BAS channels 1 and 2 are not in use, or alternatively BAS feeds, whether live or transmitted and recorded for subsequent broadcast, can be

The second phase of TerreStar's plans involves the initiation of satellite plus ancillary terrestrial component ("ATC") services in a limited number of trial markets. TerreStar has identified three priority markets for this purpose. Under the Consensus Plan, these markets all would be cleared by July 2008, which satisfies TerreStar's implementation schedule requirements.[12]

IV. PHASE THREE OF TERRESTAR'S SERVICE PLANS

In the third phase of TerreStar's plans, the company will make the satellite (*i.e.*, non-ATC) portion of its service available nationwide. Having nationwide satellite service capability is an essential element of TerreStar's system, and many potential customers, including public safety first responders, will insist upon it.

To satisfy customer requirements, TerreStar needs nationwide satellite capability beginning in January 2009. Among other things, TerreStar's public safety mission requires it to be satellite-ready in January 2009 in order to begin the six month process of system check in, coordination, and other preparations that are necessary to provide service during that year's hurricane season.

There is an eight-month gap in phase three between TerreStar's service requirements and the Consensus Plan's clearance schedule. Although a

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assigned with coordination to channels 3 through 7. CES operations have been sited in areas with no possible effect on BAS receive stations.

[12] TerreStar will be able to deploy satellite/ATC networks in other markets that either have been cleared pursuant to the Joint Parties' proposed clearance schedule or have been coordinated with local BAS licensees. For example, TerreStar has plans for operating pilot projects in portions of Vermont and other states on that basis.

substantial number of markets will have been cleared by January 2009, under the Consensus Plan BAS clearance would not be completed until August 2009. To bridge this gap, TerreStar has proposed to the Joint Parties that MSS and BAS stations share BAS channels 1 and 2 between January 2009 and August 2009 in the remaining uncleared markets. TerreStar's proposal is supported by a technical analysis prepared by du Treil, Lundin & Rackley ("dLR"), a copy of which is attached to these comments, and is accompanied by an offer to coordinate operations.[13]

As stated in the dLR report, TerreStar has conducted field tests and bench tests to evaluate interference potential. The field tests were conducted in Salt Lake City to evaluate the impact of TerreStar's operations on KSL(TV)'s BAS stations. The bench tests were performed at a test lab to simulate the performance of a representative BAS receiver in the presence of a test signal representative of a TerreStar handset.

The test results are summarized in the dLR report. The principal conclusions are as follows:

- A TerreStar handset transmitting in satellite mode should not cause interference to BAS digital operations on BAS Channels 1 and 2 that are narrowed in place.

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[13] The technical analysis presented in these comments addresses the possibility that BAS operations would be interfered with by transmissions from user handsets to TerreStar's satellite. TerreStar also has evaluated the possibility that its customers' handset-to-satellite communications would be interfered with by BAS transmissions, and suggests resolving any interference issues through coordination on a case-by-case basis.

- A TerreStar handset transmitting in satellite mode is unlikely to cause interference to analog operations on BAS channels 1 and 2 using the normal BAS receiver I.F. bandwidth selection unless the handset is located in close proximity to the BAS receive site, the BAS link is at or near threshold condition, and the MSS handset is in the path between the BAS receiver and transmitter.

- A TerreStar handset transmitting in satellite mode on specific frequencies should not cause interference to BAS analog operations occurring on channels 1 and 2 using the narrow BAS receiver I.F. bandwidth.[14]

TerreStar has offered to coordinate 24/7 with channel 1/channel 2 BAS licensees in uncleared markets during the January-August 2009 gap period. Such coordination could include both prior coordination (*e.g.*, notice of ENG operations prior to transmission) as well as ongoing coordination to the extent any interference is detected by either BAS licensees or TerreStar customers.

In sum, MSS and BAS stations can share in uncleared markets during the eight-month gap period.[15] TerreStar's sharing proposal has the added advantage of giving any BAS licensee using channels 1 and 2 after January 2009 that is not

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[14] In light of the inordinate power disparity between a BAS signal and a TerreStar handset, moreover, an extremely unlikely confluence of factors is required for there even to be a potential interference event. There must be an active analog BAS feed that is susceptible to interference. At the same time that the analog BAS feed is active, there must be the required geometry and symmetry to place a TerreStar handset in the antenna pattern of the BAS transmission path. At the same time that these events have occurred, the TerreStar handset has to be in communication with the satellite. And all of these events must conjoin at a time when a large percentage of BAS markets already will have been cleared and, because TerreStar's service will be in its infancy, only a small number of TerreStar handsets will have been deployed. Given these circumstances, TerreStar has calculated that in the 100 largest markets there would at most be a single interference event every 2.2 years.

[15] To the extent there is slippage in the Joint Parties' clearance schedule beyond the conclusion of the eight-month period, however, then in assessing any further extension requests from the Joint Parties the Commission should take into account the impact on MSS of having to share and coordinate for a more extended period.

satisfied with the proposed sharing arrangement an incentive to relinquish use of the spectrum more quickly.[16]

CONCLUSION

In view of the foregoing, as soon as the issues associated with TerreStar's phase three service plans have been resolved the Commission should approve the Consensus Plan as a mechanism for resolving BAS/MSS issues associated with the eight-month period between the January 2009 beginning of phase three and the proposed August 2009 completion of BAS relocation under the Consensus Plan. The Commission should consider issuing another short extension of the current deadline to permit the parties to reach an understanding with respect to the third phase of MSS service introduction. Like the most recent

[16] This could mean seeking to relocate to digital spectrum more quickly or in some markets coordinating use of the remaining base channels more heavily.

extension, any additional extension should be short lived and require the Joint Parties to report on progress with respect to MSS/BAS operations during the period from January 2009 to August 2009.

Respectfully submitted,

TERRESTAR NETWORKS INC.

By: /s/Douglas I. Brandon
Douglas I. Brandon
Vice President for Regulatory Affairs
TerreStar Networks Inc.
12010 Sunset Hills Road, 9th Floor
Reston, VA 20191
(703) 483-7800

OF COUNSEL:
Joseph A. Godles
GOLDBERG, GODLES, WIENER & WRIGHT
1229 Nineteenth Street, N.W.
Washington, DC 20036
(202) 429-4900

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TERRESTAR NETWORKS
BAS IMPACT FROM TERRESTAR HANDSET SATELLITE EMISSIONS
INTERIM REPORT
DECEMBER 3, 2007

EXECUTIVE SUMMARY

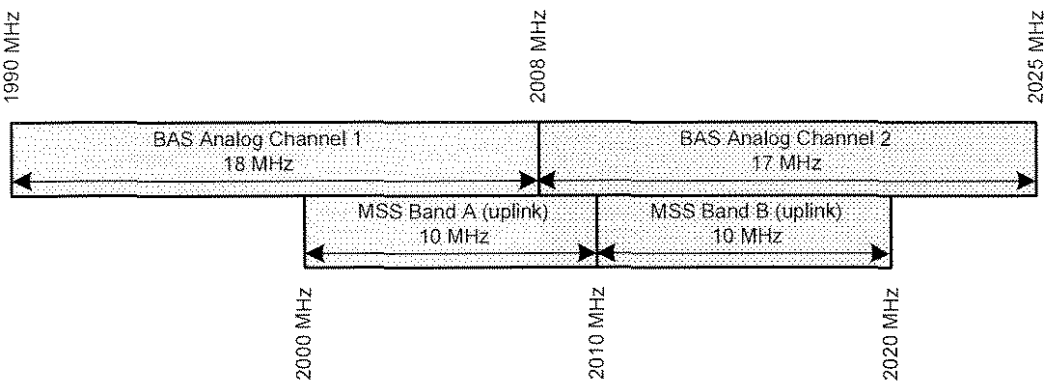
TerreStar Networks (TSN) holds FCC authorization in the 2 GHz Mobile Satellite Service (MSS). To provide spectrum for the 2 GHz MSS/ATC operations, the FCC re-allocated spectrum from the analog broadcast auxiliary services (BAS) and the fixed-microwave services (FS). TSN's will operate within the 2000 to 2020 MHz band, which is presently in use by analog BAS operations, but is scheduled to be vacated by BAS users when their operations are transitioned from analog to digital modulation above 2025 MHz. This BAS transition was originally scheduled to be completed by September 2007, but a twenty-nine month extension request is now pending with the FCC.

TSN's proposed system is an integrated satellite/terrestrial communications service involving communications to and from mobile handsets throughout North America. The satellite component of the system involves handsets communicating via radio links with a satellite.[1] The satellite component is supplemented with a terrestrial component, which will operate in a similar manner to a cellular phone system, with the mobile handsets communicating via radio links with a network of terrestrial base stations (called the ancillary terrestrial component or ATC).

TSN's system uses frequency division duplexing (FDD) techniques. The uplink channels (handset transmissions) will be within the 2000 to 2020 MHz portion of the MSS band. The downlink channels (terrestrial base station and satellite transmissions) will be within the 2180 to 2200 MHz portion of the MSS band. The downlink channels are well above the 2 GHz BAS band. The uplink channels will be within the 2000 to 2020 MHz portion of the MSS band and overlap analog BAS channels 1 and 2. Thus, only the uplink (handset transmissions) will be an interference concern to 2 GHz BAS operations. When the final spectrum allocation is made, TSN will be assigned 10 MHz of uplink spectrum, either the 2000 to 2010 MHz portion of the uplink band (MSS Band A) or the

[1] TSN must comply with two remaining regulatory milestones. It must launch its satellite not later than September 30, 2008 and certify to the FCC not later than November 30, 2008 that it has commenced satellite operation.

2010 to 2020 MHz portion of the uplink band (MSS Band B). The uplink band arrangement is shown in the following figure.



There is a considerable difference between the nature of handset transmissions in the terrestrial component of TSN's system and the nature of handset transmissions in the satellite component of TSN's system. The terrestrial component will make use of Code Division Multiple Access (CDMA) digital modulation with a 5 MHz, wide-band, noise-like signal; a handset will transmit with a maximum effective isotropic radiated power (EIRP) of 0.25 Watt with a typical EIRP of 0.01 watt. The satellite component will make use of a number of narrow-band signals, in a fashion similar to the GSM cellular system, using Time Division Multiple Access (TDMA) digital modulation; handset power will be 1 Watt. A common antenna will be employed for both terrestrial and satellite transmissions and will be enclosed within the handset. The handset antenna is characterized as omni-directional.

TerreStar has completed a series of tests to analyze any harmful interference impact to Broadcast Auxiliary 2 GHz electronic news gathering (ENG) operations from a TerreStar handset operating in the both the satellite and terrestrial service modes. The tested TerreStar emissions included the frequencies located within broadcast auxiliary services (BAS) Channels 1 and 2 in the TerreStar MSS Band A frequency band.

Below are the BAS impact observations obtained from both the recent TerreStar MSS Band A Salt Lake City field test and multiple bench tests using both MRC and Nucomm BAS receivers:

- A TerreStar handset transmitting in *satellite* mode on specific frequencies should not cause interference to ENG digital operations on BAS Channels 1 and 2 that are "narrow in place."
- A TerreStar handset transmitting in *satellite* mode may cause interference to ENG analog operations occurring on BAS Channels 1 and 2 using the *normal* BAS receiver I.F. bandwidth selection. This interference is more likely to occur when the handset is located nearby to the ENG receive site, the ENG link is at or near threshold condition, and the handset is in the path between the ENG receiver and transmitter.
- A TerreStar handset transmitting in *satellite* mode on specific frequencies should not cause interference to ENG analog operations occurring on BAS Channels 1 and 2 using the *narrow* BAS receiver I.F. bandwidth selection.
- A TerreStar handset transmitting in *terrestrial ATC* mode on specific frequencies should not cause interference to ENG digital operations on BAS Channels 1 and 2 that are "narrow in place."

These observations suggest that the BAS digital mode and the analog *narrow* I.F. receiver bandwidth mode are immune from TerreStar handset (satellite and terrestrial) emissions. In some circumstances, the BAS analog mode using the *normal* BAS receiver I.F. bandwidth selection may suffer interference when exposed to TerreStar satellite mode handset emissions. The primary interference mechanism to analog BAS operating in the *normal* I.F. bandwidth mode from a TerreStar handset in *satellite* mode is audio impairment. Any video picture impairment would occur after the onset of any audio impairment.

A BAS receiver operating with a *narrow* I.F. receive filter would primarily limit the broadcaster to only one channel of audio. Typically, a broadcaster uses only one audio channel for non-fixed ENG operations, for example those paths originating from a mobile ENG truck. Those operations may be amenable to employing a *narrow* I.F. receive filter. However, fixed 2 GHz microwave and airborne ENG paths typically employ more than one channel of audio and therefore are likely to employ the *normal* or *wide* I.F. bandwidth modes.

NUCOMM BENCH TESTING DATA – SATELLITE MODE – MSS A IMPACT

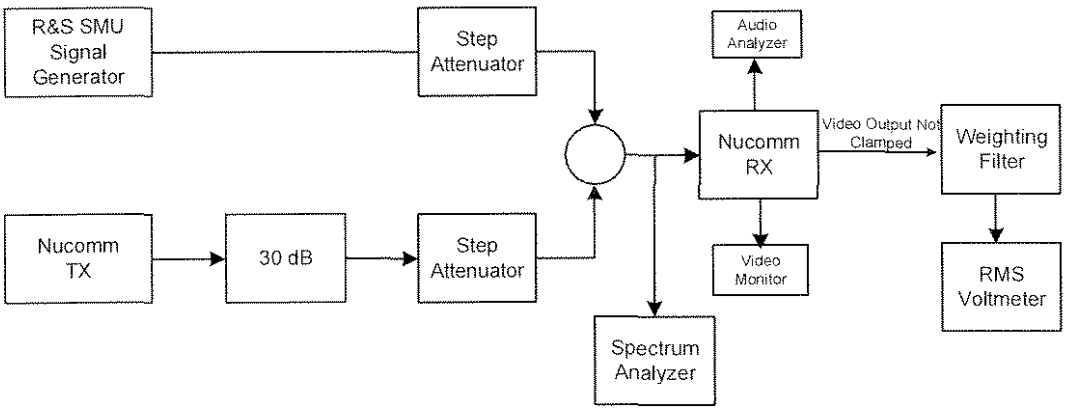
To characterize potential interference impacts to BAS operations, TerreStar preformed bench-testing on the performance of a representative BAS receiver in the presence of a test signal representative of TSN handset emissions if they were to occupy MSS Band A. Using a BAS 2 GHz ENG system transmitting a video signal, the ENG receiver was monitored for interference when an interfering signal is injected along with the BAS signal. Both analog and digital BAS ENG modulations were tested.

The bench testing was performed at Nucomm's lab facility in New Jersey. The purpose of these tests was to determine what level of signal(s) from TSN handset transmissions may be present at the input of a BAS ENG receiver without causing interference to reception of a desired BAS signal. The herein reported results are with respect to the TSN *satellite* emissions using both digital and analog BAS scenarios. Other bench tests were completed, but primarily those tests were with respect to the ATC (terrestrial) mode impact to BAS.

The analog BAS testing procedure is based upon the TIA/EIA Standard, Electrical Performance for Television Transmission Systems, TIA/EIA-250-C. Specifically, the procedure defined in Section 6.3, Interference to the Video Signal-to-Noise ratio[2] and Section 7.2, Performance Characteristics of the Audio Signal Channel, Total Harmonic Distortion.

A Nucomm CR6D receiver was used for testing interference to digital BAS reception and a Nucomm 22CR6 receiver was used for testing interference to analog BAS reception. Interfering signals from TerreStar handset(s) were simulated by use of a Rhode and Schwarz SMU Signal Generator. The test setup is illustrated in the following diagram.

[2] The video signal-to-noise ratio is the ratio of the peak-to-peak luminance signal to the weighted rms noise voltage.



Below is the selected procedure for Nucomm bench tests:

1. The Nucomm TX was set to BAS channel 1.
2. The received signal level from the Nucomm TX (desired signal) was adjusted by means of the step attenuator until the threshold of reception is achieved at the Nucomm receiver (37 dB baseband quieting for analog, 10^{-6} BER for digital).
3. The Nucomm digital mode was its "default" mode with 1/32 guard interval, ½ code rate, QPSK, OFDM and an 8 MHz receive bandwidth. A scrolling "test-bar" pattern was used for the digital test signal.
4. A single audio subcarrier on 4.83 MHz was modulated with a 1 kHz audio tone.
5. The signal from the Nucomm TX was increased by 1 dB and the resulting improvement in RX performance noted.
6. The interfering signal from the Rhode and Schwarz SMU signal generator was set for the maximum effective radiated power. With the use of step attenuators, the interfering signal was introduced at a very low level, and gradually increased while observing the effect of the Nucomm receiver performance.
7. An Audio Precision ATS-2 audio test system was employed to determine the Total Harmonic Distortion plus Noise (THD+N) using a 1 kHz tone.
8. The level of the interfering signal was noted and recorded, along with the ratio of the desired to undesired signal ratio.
9. In some analog tests, a greater video signal-to-ratio was tested.

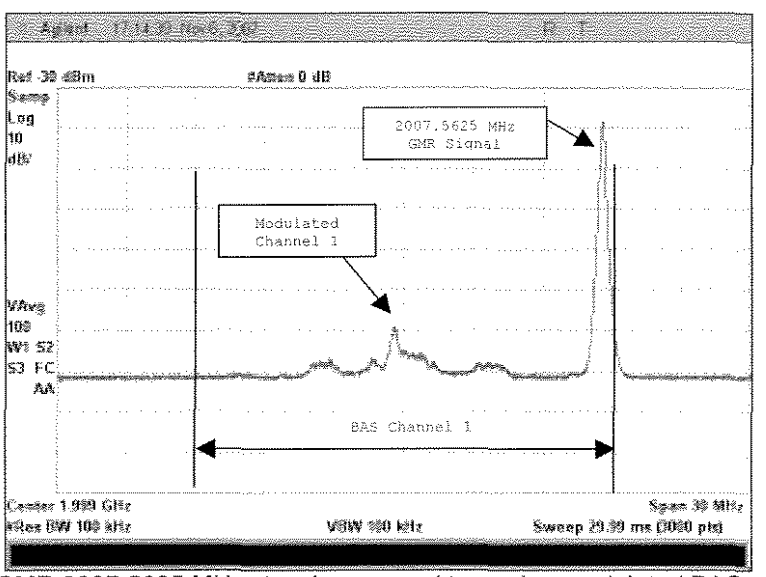
The TerreStar signal was generated by the Rhode and Schwarz SMU signal generator was internally modulated with an NADC (North American Digital Cellular) signal with a modulation bandwidth similar to that of a TerreStar *satellite* mode signal. The TerreStar center frequency was set to one of the candidate channels in MSS Band A.

Below is a tabulation of the results of the selected bench tests:

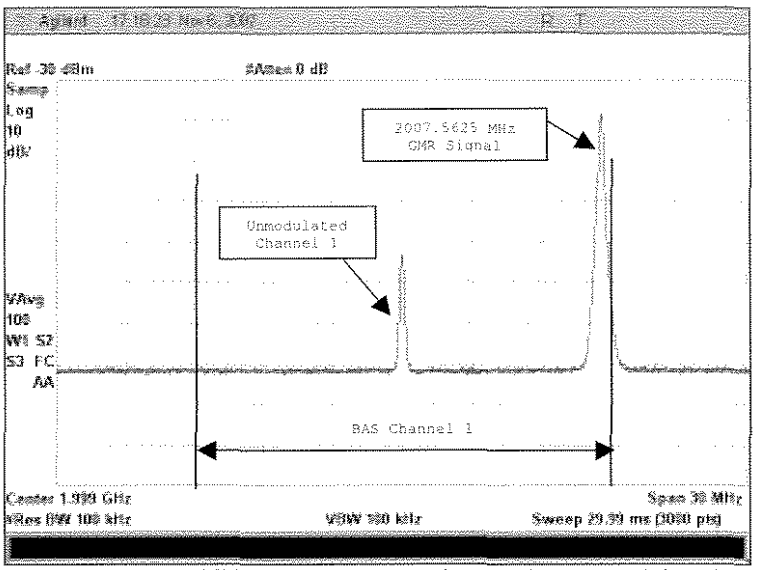
GMR Center Frequency (MHz)	BAS Mode	BAS Channel	I..F. Receiver Filter BW	ENG Receiver (desired) Power (dBm)	VSG (undesired) Power (dBm)	Target Video S/N Ratio	Desired-to-Undesired Ratio (db)	4.83 MHz Subcarrier THD+N	
								No U Signal	With U Signal
Nucomm 22CR6 Receiver (analog only)									
2007.75	Analog	1	15 MHz	-89.5	-90.4	37	0.9	OoR	OoR
2007.75	Analog	1	15 MHz	-83.1	-73.0	46	-10.1	0.7%	1.3%
2007.75	Analog	1	10 MHz	Not Tested	Not Tested	37	Not Tested	---	---
2007.75	Analog	1	10 MHz	-84.7	-49.7	46	Better than -35	1.6%	1.6%
2007.75	Analog	1	10 MHz	-84.7	-40.7	46	-44	1.6%	2.4%
2007.5625	Analog	1	15 MHz	Not Tested	Not Tested	37	Not Tested	---	---
2007.5625	Analog	1	15 MHz	-83.1	-83.1	46	0.0	0.7%	7.3%
2007.5625	Analog	1	10 MHz	-91.5	-61.5	37	Better than -30	18%	18%
2007.5625	Analog	1	10 MHz	-84.7	-49.7	46	Better than -35	1.6%	1.6%
Nucomm NewsCaster CR6D (analog & digital)									
2007.5625	Analog	1	12 MHz	-91.3	-61.3	37	Better than -30	7.0%	7.0%
2007.5625	Analog	1	12 MHz	-83.3	-43.3	46	Better than -40	0.4%	0.4%
2007.5625	Analog	2	12 MHz	Not Tested	Not Tested	37	Not Tested	---	---
2007.75	Analog	2	12 MHz	-82.4	-48.0	48	Better than -34	0.3%	0.3%
2007.5625	Digital	1	8 MHz	-96.0	-40.0	n/a	-56	n/a	n/a

Table 1. Selected Nucomm Bench Test Data.

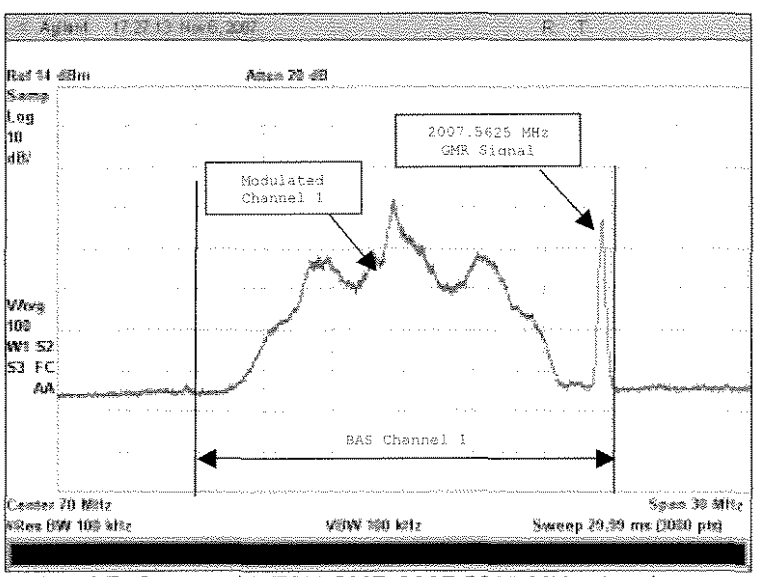
Below are several spectrum analyzer displays from a representative Nucomm bench test.



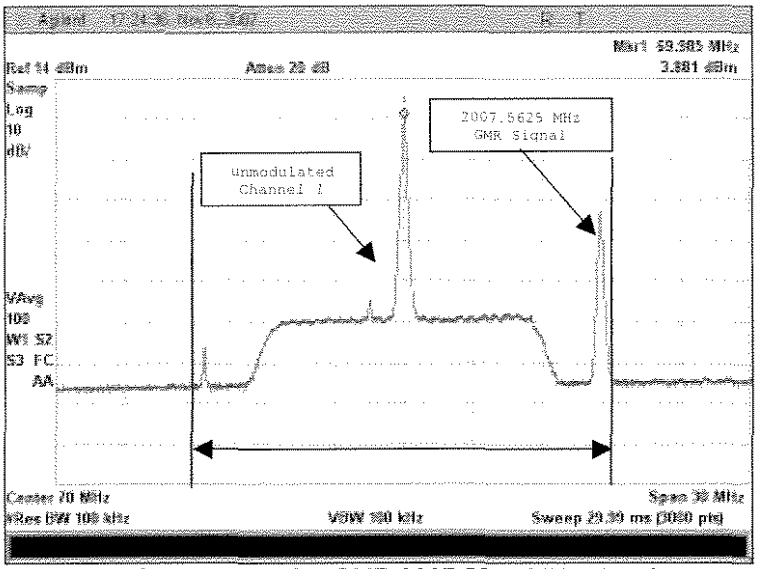
Graph 1. TSN GMR 2007.5625 MHz signal compared to analog modulated BAS with 12 MHz I.F. filter and a D/U ratio of –35 dB.



Graph 2. TSN GMR 2007.5625 MHz signal compared to analog unmodulated BAS with 12 MHz I.F. filter and a D/U ratio of –35 dB.



Graph 3. Receiver I.F. Output with TSN GMR 2007.5625 MHz signal compared to analog modulated BAS with 12 MHz I.F. filter and a D/U ratio of –35 dB.

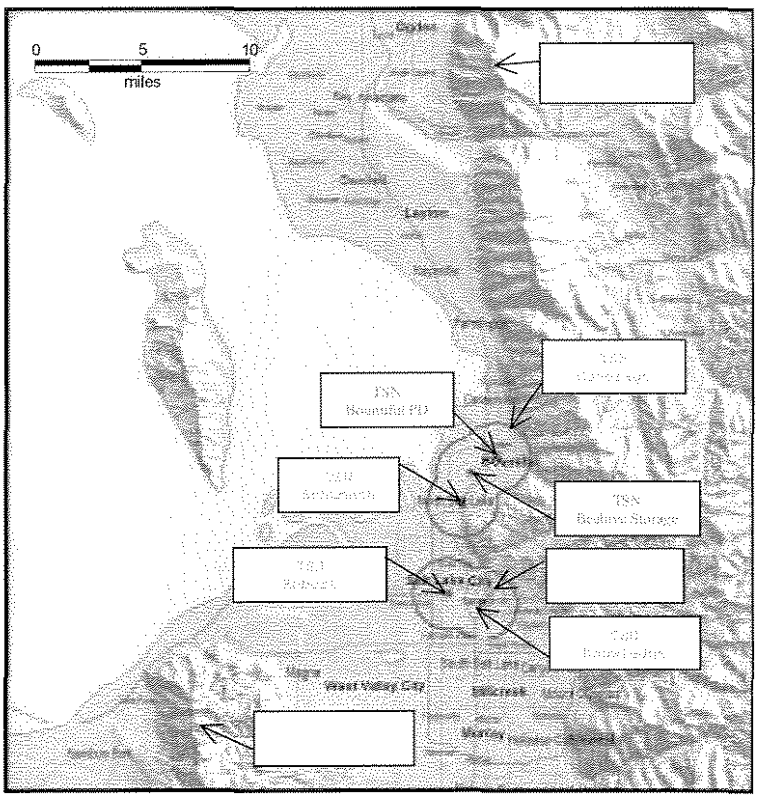


Graph 4. Receiver I.F. Output with TSN GMR 2007.5625 MHz signal compared to analog unmodulated BAS with 12 MHz I.F. filter and a D/U ratio of –35 dB.

SALT LAKE CITY TESTING DATA – SATELLITE MODE – MSS BAND A

A "field" test was conducted in the Salt Lake City to determine the impact to television station KSL BAS Channel 1 operation from proposed TSN operations. These data reported herein are for the TSN device operating in *satellite* mode and KSL operating with the analog *narrow* I.F. bandwidth mode and digital mode. The field test just subjectively analyzed the video and audio impairments.

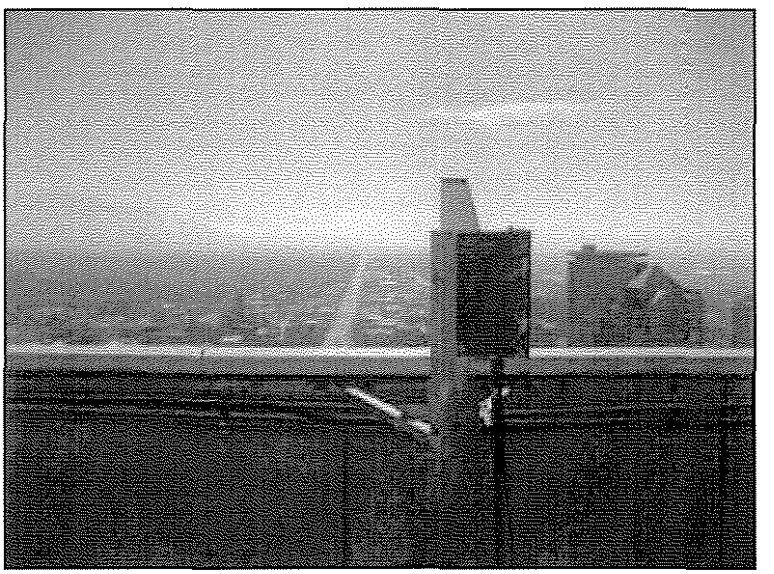
Two KSL BAS receive sites were tested, a downtown site located at the *Beneficial Life* building and the main site located atop *Farnsworth Peak*. Below is a map showing the locations of the BAS receive sites and the future locations of TerreStar base stations.



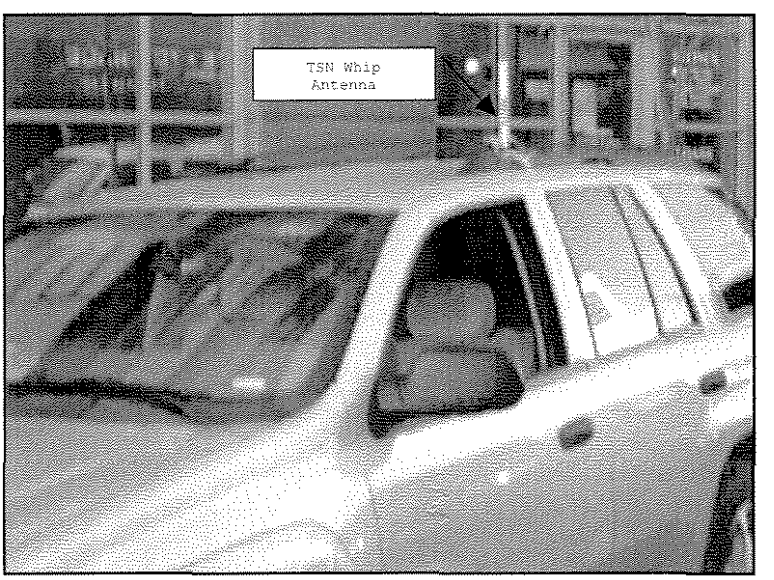
Map 1. KSL BAS Receive Site & TSN Base Station Locations

Below is the selected procedure for each tested KSL BAS receive site:

1. The KSL ENG MRC transmitter was set to BAS channel 1 in analog mode using a single 4.83 MHz audio subcarrier modulated with a 1 kHz tone. A standard ENG truck with a pneumatic mast and +20 dBi antenna was employed.
2. The TSN interfering signal at 2008 MHz, generated with a Rhode and Schwarz SMU signal generator, was set for the maximum effective radiated power. The TSN transmitting antenna was a non-directional vertical whip antenna mounted atop a vehicle. The maximum isotropic effective radiated power was 1 watt (+30 dBm).
3. At the KSL BAS receive locations, the MRC CodeRunner 4 BAS receiver was employed and set to a narrow (10 MHz) I.F. filter bandwidth.
4. The TSN interfering signal was moved radially outward from the BAS receive site to determine the location where the maximum interfering signal could be received, while boresight into the BAS receive antenna. The BAS receiving antenna polarization was selected to maximize the interfering signal level.
5. The KSL ENG truck was moved outward along the same bearing as the TSN device, to a location where a threshold ENG path could be obtained.
6. Upon establishment of the threshold BAS path, the TSN interfering signal was turned on to determine if there was any subjective impact from the TSN signal.



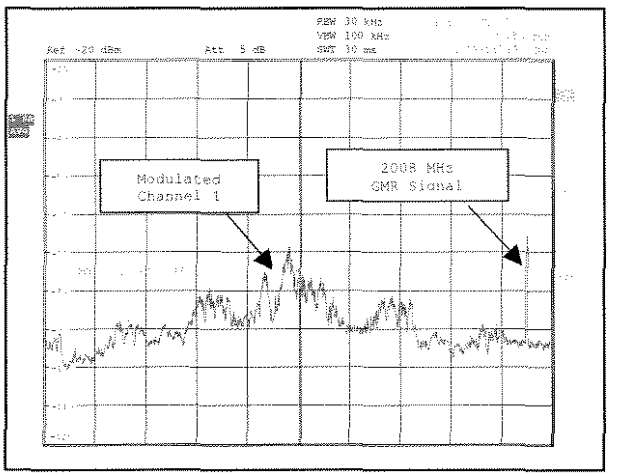
Picture 1. KSL Downtown Beneficial Life Receive Antenna (south sector)



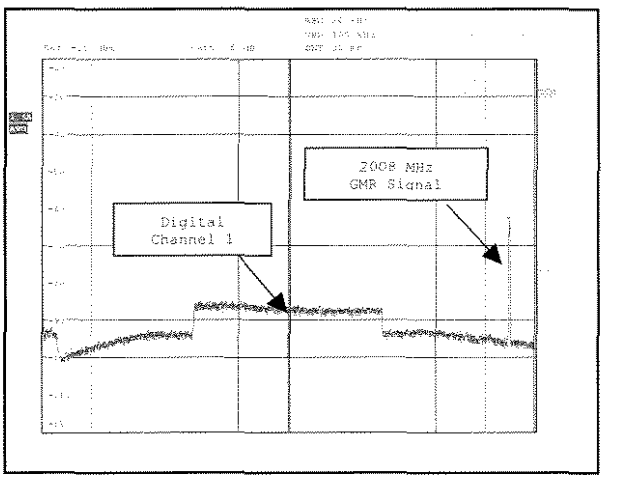
Picture 2. TerreStar Emitter with Vertical Whip Antenna.

Using the aforementioned scenario, no interference to the KSL BAS receivers, located at the downtown *Beneficial Life* building or *Farnsworth Peak*, were observed, both analyzing the recovered video and analog signals and digital signal, in the presence of the TSN *satellite* transmission.

Below are spectrum plots from the KSL *Farnsworth Peak* transmitter site.



Graph 5. TSN GMR 2008 MHz signal compared to analog modulated BAS with 10 MHz I.F. filter from Farnsworth Peak. BAS analog was at threshold and TSN was a maximum signal level.



Graph 6. TSN GMR 2008 MHz signal compared to digital BAS with 8 MHz Occupied Spectrum from Farnsworth Peak. BAS digital is at threshold and TSN was a maximum signal level.

PRELIMINARY BAS IMPACT CONCLUSIONS - SATELLITE MODE - MSS BAND A

A TerreStar handset transmitting in *satellite* mode on frequencies of approximately 2008 MHz should not cause interference to ENG digital operations on BAS Channels 1 and 2 that are "narrow in place." The Nucomm bench tests indicate a desired-to-undesired ratio of –56 dB is necessary to cause interference to the tested BAS digital signal at threshold. This desired-to-undesired ratio means the undesired TerreStar signal would have to be 56 dB stronger than the BAS threshold digital signal to cause a failure. This high ratio means the TerreStar handset operating in *satellite* mode would have to be in the immediate vicinity and within the boresight of the BAS receive antenna with the BAS path at a threshold condition for interference to be predicted. The likelihood of this type of scenario should be rare. Furthermore, the Salt Lake City field test did not produce a failure to the digital BAS signal at threshold in the presence of a "maximized" TerreStar emitter.

A TerreStar handset transmitting in *satellite* mode on frequencies of approximately 2008 MHz may cause interference to ENG analog operations occurring on BAS Channels 1 and 2 using the normal BAS receiver I.F. bandwidth selection. This interference is more likely to occur when the handset is located near the ENG receive site, the ENG link is at or near threshold condition, and the handset is in the path between the ENG receiver and transmitter. The Nucomm tests indicated that a desired-to-undesired ratio of between 0 to –10 dB is necessary to cause interference to the tested BAS analog signal at or close to threshold. This means the undesired TerreStar signal would have to be equal to or 10 dB stronger than the BAS analog signal at or near threshold to cause interference impairments. These ratios mean the TerreStar handset operating in *satellite* mode would have to be in the general vicinity of the BAS receive antenna for interference.

A TerreStar handset transmitting in *satellite* mode on frequencies of approximately 2008 MHz should not cause interference to ENG analog operations occurring on BAS Channels 1 and 2 using the *narrow* BAS receiver I.F. bandwidth. The Nucomm bench tests indicate a desired-to-undesired ratio of at least -35 dB is necessary to cause interference to the tested BAS analog signal at threshold. This desired-to-undesired ratio means the undesired TerreStar signal would have to be at least 35 dB stronger than the BAS threshold analog signal to cause interference. This high ratio means the TerreStar handset operating in *satellite* mode would have to be in the immediate vicinity and within the boresight of the BAS receive antenna with the BAS path

at or near a threshold condition for interference to be predicted. The likelihood of this scenario should be rare, especially if the BAS receiving antenna polarizations could be selected to further minimize the TSN handset signal. Furthermore, the Salt Lake City field test did not produce an interference impairment to the analog BAS signal using a narrow I.F. receive filter at or near threshold in the presence of a "maximized" TerreStar emitter.

The primary interference mechanism to an analog BAS operating from a TerreStar handset in *satellite* mode is audio impairment. Any video picture impairment would occur after the onset of any audio impairment. During the Nucomm bench tests, it was observed the recovered analog audio at the video threshold condition (37 dB signal-to-noise) experienced substantial audio distortion, at or exceeding 7 percent (THD+N), even without the presence of the TerreStar *satellite* mode emission. This means that while the picture may be satisfactory for broadcast at threshold, the audio would likely still be unsatisfactory for broadcast. With the video threshold increased to 46 dB signal-to-noise, the audio distortion decreased to less than 2 percent (THD+N). These data suggest that for satisfactory audio to be recovered, a greater video signal-to-noise is required, and should be considered as the modified threshold condition for any further tests.

PRELIMINARY BAS IMPACT CONCLUSIONS - SATELLITE MODE - MSS BAND B

The above tests were for a TerreStar devise operating in MSS Band A. Further tests are being considered for TerreStar operation in MSS Band B, which would solely affect BAS Channel 2. However, based upon the testing thus far, it is believed that co-existence with a TerreStar *satellite* emitter located in MSS Band B, but beyond the BAS Channel 2 digital occupied spectrum, should be possible, due to the observed strong adjacent channel rejection of BAS digital receivers. Also, co-existence with a BAS Channel 2 operating with an analog *narrow* I.F. bandwidth should be possible, if sufficient frequency spacing between the BAS occupied spectrum and the TerreStar satellite emitter is provided.