Annex A

MSS-BAS Spectrum Sharing Analysis

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1. Introduction

New ICO Satellite Services G.P. (ICO) is authorized to use 20 MHz of the 2 GHz Mobile Satellite Services (MSS) spectrum using its recently launched ICO G1 satellite. ICO has indicated that it intends to select the 10 MHz downlink allocation at 2180-2190 MHz and the uplink allocation at 2010-2020 MHz. The uplink spectrum is currently occupied by Broadcast Auxiliary Service (BAS) operations. The Commission has sought comment on the likelihood and extent of interference between MSS and BAS if 2 GHz MSS operators were to begin offering nationwide service starting January 1, 2009 with MSS secondary to BAS in markets not already cleared, and how MSS can avoid or correct for interference that might occur. [1]

ICO is seeking to begin nationwide operations, beginning on January 1, 2009. It would only market its products in areas where BAS is cleared. As demonstrated in this report, (1) given the nature of ICO's MSS system, (2) technical characteristics of geostationary satellite communications, (3) the number of subscribers ICO will likely have during this BAS transition period, (4) the likelihood of roaming, and (5) the limited number and location of BAS receive sites in any given uncleared market, ICO's MSS operations will operate in a non-interfering manner in all BAS markets. Thus, commercial MSS operation may be initiated nationwide January 1, 2009 prior to complete BAS relocation.

This study benefits from substantial measurements and analysis filed by various parties with the Commission, most importantly through a TerreStar Networks, Inc. (TerreStar) filing including a study performed by du Treil, Lundin & Rackley, Inc. (dLR).[2] The dLR report summarized laboratory and field measurements evaluating the impact to BAS receivers in the presence of a simulated satellite user terminal (SUT) interferer. Section 2 reviews the test data from the dLR report to characterize the interference potential in a shared spectrum environment. Section 3 presents a theoretical model matching the test setup parameters, and demonstrates close agreement with the measurement results validating the model's accuracy. The model is then tailored to ICO's MSS deployment parameters to evaluate BAS impact. Finally, Section 4 describes the probabilities involved in the MSS-BAS operations as further reassurance of the non-interfering nature of ICO's MSS operations.

This study was produced to analyze the interference to BAS operations, during the period from January 1, 2009 through clearing of the BAS, under certain ICO's MSS deployment situations. This study is not meant to be a forecast of (1) any particular business results or strategies of ICO; (2) a stance on the longer term technology selections by ICO; or (3) to contemplate every change or improvement in services that may be offered by ICO.

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[1] *Improving Public Safety Communications in the 800 MHz Band*, Memorandum Opinion and Order and Further Notice of Proposed Rulemaking, 23 FCC Rcd 4393, ¶ 55 (2008).

[2] *Predicted Impact to Broadcast Auxiliary Operations from Proposed Handset to Satellite Emissions TerreStar Networks, January 30, 2008.* Study by du Treil, Lundin & Rackley, Inc., filed in an ex parte by TerreStar, January 30, 2008.

2. Laboratory and Field Measurements

ICO's anticipated B block uplink spectrum spans a portion of BAS Channel 2. The neighboring MSS A block will likely be occupied by TerreStar, and similarly overlaps part of BAS Channel 2 and a portion of BAS Channel 1 as shown in Figure 1.

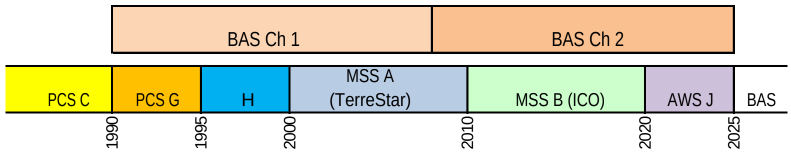

Figure 1: 2 GHz MSS Band

du Treil, Lundin & Rackley, Inc. established a laboratory test configuration and field trial setup to measure degradation to BAS analog and digital receivers as a function of the signal strength and inter-frequency separation of an interfering SUT signal. dLR presented an analysis of the conditions under which certain levels of interference were observed, and noted that these tests were very conservative in that they generated more interference than would be expected from the planned TerreStar operations. The measurements presented below are taken directly from the dLR report, and have been merely reformatted to clarify the inter-frequency spacing within the MSS A and B blocks.

In the laboratory and field measurements, dLR examined three BAS receiver units: two analog units with IF filter bandwidths of 10 MHz and 15 MHz, and an 8 MHz digital receiver. The BAS signals were centered in the respective channel under test, and the interfering signal was positioned in different portions of the MSS A and B blocks. The position of the BAS desired signals relative to the band plan is shown in figure 2.

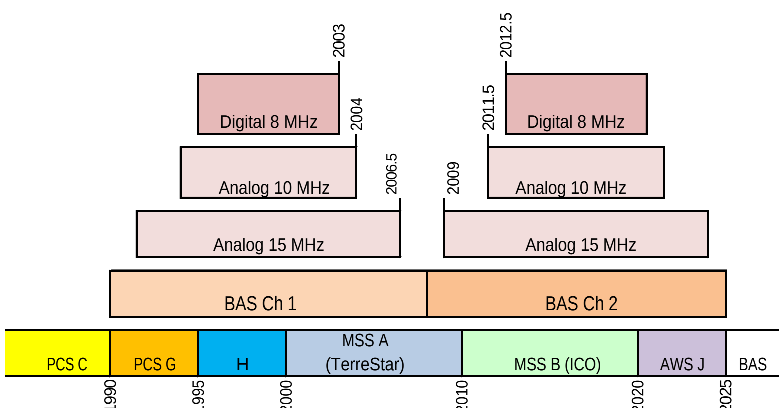

Figure 2: Desired Signal Placement within 2 GHz Band

The interfering signal simulating an SUT transmission was a 30 kHz North American Digital Cellular TDMA signal with power applied to all time slots, and an output EIRP of 1 W. The interfering signals were placed within the upper portion of the MSS A block and the lower portion of the MSS B block and dLR measured the resulting signal level at the BAS receiver and the impact to the video and audio quality.

2.1 Laboratory Measurements

The test procedure focused on identifying the strongest SUT signal level that still permitted BAS reception at the threshold of coverage. As expected, the SUT signal level varied with the inter-frequency separation between the two signals, with stronger signals tolerated as the frequency separation increased. The relationship between the SUT signal strength and the frequency separation appears consistent across the two analog BAS receivers, with better performance shown by the digital receiver. Table 1 shows the re-formatted results for the analog BAS receivers, indicating the frequency separation present at each measurement.

Analog BAS Interference Rejection versus Frequency Separation		
Frequency Separation (MHz)	Maximum Interferer Power (dBm)	Analog IF Filter BW (MHz)
3.75	-45	10
3.031	-43	10
1.484	-82	10
1.25	-92	15
1.0777	-92	10
0.8438	-93	15
0.5313	-99	15
Overlap	-104	15

Table 1: Analog BAS Measurements

The table indicates excellent rejection when frequency separation exceeds 2 to 3 MHz. When the signals overlap, the SUT signal must be -104 dBm to maintain BAS coverage threshold performance.

The digital measurements are shown in Table 2 below.

Digital BAS Interference Rejection versus Frequency Separation	
Frequency Separation (MHz)	Maximum Interferer Power (dBm)
4.75	-47
4.563	-47
4.344	-46
4.031	-43
2.484	-42
2.296	-47
2.0777	-53
1.7652	-63

Table 2: Digital BAS Measurements

Comparing measurements with 1 to 2 MHz spacing, the 8 MHz digital BAS receiver appears to better reject the SUT transmission by about 20 dB relative to the analog receivers. As BAS operators upgrade to digital equipment in preparation for relocation, the receiver interference tolerance will improve.

2.2 Field Measurements

dLR similarly collected measurements in the field, selecting Salt Lake City as representative of a worst-case interference environment given the open space, lack of clutter at vehicular height and clear line-of-sight to the BAS receiver for long distances. Numerous measurements were made, with dLR reporting just a single instance of interference seen at a distance of 0.8 miles from the BAS 15 MHz analog receiver with an SUT interfering signal strength of -65 dBm. Increasing the BAS transmit power by 6 dB resolved the interference, so to be consistent with Tables 1 and 2, we have subtracted 6 dB from the -65 dBm measurement in Table 3 to reflect the similar threshold condition shown above.

Frequency Separation (MHz)	Maximum Interferer Power (dBm)	Analog IF Filter BW (MHz)
1.5	-65 - 6 = -71	15
4	No interference	15

Table 3: Field Trial Measurements

Note that the field test results for the 10 MHz analog and 8 MHz digital receivers did not show degradation, indicating better performance than the lab testing. The 15 MHz interference noted in Table 3 is caused when the frequency separation is 1.5 MHz within the MSS A block from the BAS 1 carrier. This effect is pronounced for the MSS B block, where frequency separation from a 15 MHz BAS carrier is impossible. The SUT signal is a co-channel interferer, and the signal's strength and duration must be considered in quantifying the BAS impact.

2.3 Conclusions from Measured Data

Comparing the field test results to the laboratory measurements for the 1.5 MHz spacing, the maximum SUT signal strength corresponding to no BAS receiver impact is 10 dB higher than the lab results, indicating that the laboratory setup was too conservative relative to the conditions seen in the field. In lab testing, both analog receivers required a significant reduction in SUT signal strength to avoid interference when the frequency separation was less than 2 MHz, while field testing showed no interference to the 8 MHz digital and 10 MHz analog receivers. Per the dLR field test data only the 15 MHz analog receiver experienced mild degradation with the 1.5 MHz inter-frequency spacing. Furthermore, all the measurements were made with the simulated SUT signal transmitting at full power on all time slots, while dLR notes that Terrestar's operations will be subject to power control, body loss, and other factors modifying the coverage limitations. Thus the actual deployment relative to the field and lab measurement would present significantly less power to BAS than reflected in the dLR report.

3. Theoretical Modeling

The ICO MSS initial system characteristics will vary substantially from the parameters tested in the dLR report. ICO's mim™ (mobile interactive media) product is expected to be a mobile video multicast service, with an interactivity link providing guidance and roadside assistance. Accordingly, the ICO SUT will not be transmitting continuously as was assumed in the dLR testing, but rather on an intermittent basis with short bursts of 5 to 20 ms. To understand the performance of this system relative to the dLR measurements, we first present a theoretical model replicating the full duty cycle approach as taken by dLR. Then, we modify the model to account for the actual ICO system operation, and quantify this interaction with BAS receivers.

3.1 Full Duty Cycle Model

The dLR measurement configuration placed 30 dBm of power in a 30 kHz TDMA channel transmitting continuously in all time slots. We modeled the SUT signal arriving at the BAS receiver through use of industry standard propagation equations, the BAS receive antenna pattern, and the angle to the antenna based on the SUT distance from the tower. We built a model matching the parameters in the dLR report, and validated its accuracy against the field trial measurement provided in Section 2.2: -65 dBm at 0.8 miles (equivalent to 1250 meters in the table below).

Distance to Tower (km)	Elevation Angle to Antenna (deg)	BAS Antenna Gain (dBi)	Path Loss to Antenna (dB)	Signal at BAS Ant Port (dBm)	Propagation model used
0.1	45	-5	82	-57	Free Space
0.3	18	-1	102	-73	COST-231
0.5	11	12	110	-68	COST-231
0.75	8	18	116	-68	COST-231
1.25	5	22	121	-69	COST-231
2	3	25	128	-73	COST-231
4	1	25	138	-83	COST-231
6	1	25	143	-88	COST-231
19	0	25	159	-104	COST-231

Table 4: Full Duty Cycle Model

We assumed a tower height of 100 m for the analysis. This is a reasonable assumption as the BAS site must be capable of receiving distant transmissions in order to encounter a threshold coverage situation. If the BAS range is limited by terrain or earth curvature due to a lower reception height, then the high power BAS transmission will be received at a level stronger than threshold, presenting a more robust communication link. Aside from a peak directly underneath the tower not observed in the dLR field trial, the highest predicted signal strength is -68 dBm. For co-channel SUT transmission at full power and full duty cycle, the SUT should be approximately 19 km from the BAS receive site.

We also assumed the SUT is located in the BAS antenna main lobe for maximum gain. The antenna gain will vary by azimuth, with a significant reduction outside of the main lobe greatly reducing the SUT signal level at the receiver. Table 4 only reflects the deltas in antenna gain as a function of elevation – the antenna directionality aids in reducing the signal level of interferers near the tower; this is intuitive given the antenna gain pattern and also the design of the BAS receive site, and given the need to reduce the transmission power received from BAS transmitters on adjacent channels that may occasionally be located in proximity to the receive site. Near field antenna gain is minimized because it is not needed; the BAS system benefits more from range extension through the focused, narrow antenna elevation pattern.

The model predicts a 4 dB weaker signal than the dLR field measurement. This reasonably small delta is potentially due to a difference in antenna gain, height, or clutter profile relative to the Salt Lake City site, and we will consider this delta in the ICO-specific analysis.

3.2 ICO Operations Model

In the BAS relocation time period, ICO's interactions in the 2010-2020 MHz block will consist of transmissions from their SUTs using the GEO-Mobile Radio Release 1 (GMR-1) technology, a narrowband system that provides interactive data and voice communications. The bandwidth allocation in the GMR-1 system ICO is deploying is 156.25 kHz, more than five times the 30 kHz value assumed in the lab and field measurements, therefore spreading the power across a wider bandwidth which represents a 7 dB reduction in the peak interfering signal relative to the 30 kHz case.

The ICO SUTs are expected to be vehicle-based with higher transmit powers and antenna gains than assumed in the dLR report. ICO will deploy units with an estimated 4 W EIRP versus 1 W, a delta of 6 dB, partially offsetting the bandwidth delta above. The SUT antenna gain will be optimized for the satellite elevation of 25 to 55 degrees, providing several dB of BAS discrimination as reflected in Table 5.

In order to prevent impact to BAS operations, during the relocation period considered in this study, ICO intends to:

- Compress uplink data packets into 5 to 20 ms bursts.
- Operate one GMR-1 carrier per spot beam.
- Limit each GMR-1 carrier to one device transmitting at any instant (multiple devices will be transmitting within each frame through the time slot structure of the GMR-1 Time Division Multiple Access (TDMA) air interface, but only one device within one time slot).

While hundreds of GMR-1 devices may be supported in each city through the efficient data call model and time-sharing of the resource, it is essential to note that only one device will transmit in a specific time slot, greatly reducing the potential for interference to BAS since power will not be additive from multiple devices.

The ICO operations model is provided in Table 5 below. Significant changes from the full power model are the 1 dB delta from the bandwidth (-7 dB) and power (+6 dB) adjustments above and a 4 dB increase given the model's conservative approach relative to field measurements. Also, the SUT antenna gain is lower at the terrestrial elevation, reducing the signal level relative to the satellite angles of 25 to 55 degrees.

Distance to Tower (km)	Elevation Angle to Antenna (deg)	SUT Antenna Gain (dBi)	BAS Antenna Gain (dBi)	Path Loss to Antenna (dB)	Signal at BAS Ant Port (dBm)	Propagation model used
0.1	45	3	-5	82	-54	Free Space
0.3	18	2.0	-1	102	-71	COST-231
0.5	11	-1.5	12	110	-70	COST-231
0.75	8	-3.0	18	116	-71	COST-231
1.25	5	-3.0	22	121	-72	COST-231
2	3	-3.0	25	128	-76	COST-231
4	1	-3.0	25	138	-86	COST-231
7	1	-3.0	25	145	-93	COST-231
15	0	-3.0	25	156	-104	COST-231

Table 5: ICO Operations Model

Thus, at a distance of 15 km, the SUT signal meets the minimum acceptable signal level for non-interfering, co-channel operation to BAS, the worst case condition assuming a 15 MHz analog BAS signal. Factoring in the BAS antenna directionality in azimuth, the geographic area where an SUT could present a signal stronger than -104 dBm is a 10 degree arc with a fifteen kilometer radius, or [(3.14 x 15^2) x (10/360) = 19.6 sq. km]. This is equivalent to 7.57 square miles, a calculation used later in the probability analysis.

The next step is to examine the impact to the BAS audio and video signal from this extremely short SUT transmission. The dLR testing indicated that the audio portion of the BAS signal is more sensitive to interference than the video signal.[3] The 5 to 20 ms duration of an SUT signal has a negligible impact – the viewer should not detect a minor degradation or interruption of an audio signal of such short duration, in the unlikely event that a signal stronger than -104 dBm occurs. By limiting uplink transmissions to 5 to 20 ms bursts, ICO's MSS operations will not interfere with BAS reception.

There is a very low probability that an SUT transmission will arrive at the BAS receiver with a signal strength above the -104 dBm level. To support these assertions, we have included a probability analysis calculating the likelihood that an ICO SUT would be in position to transmit near a BAS receiver when the BAS transmission is near the edge of coverage.

4. Probabilistic Analysis of MSS-BAS Interaction

In response to the Commission's request for comment on the likelihood and extent of MSS interference to BAS operations, we have developed a probability analysis of the MSS-BAS interaction. In this section, we will show the worst case probability that an ICO mim device will ever be in a position to present a signal above threshold coverage to a BAS receive station. The assumptions have been chosen conservatively, so as to define a true worst case result representing the highest probability that an ICO

[3] *Predicted Impact to Broadcast Auxiliary Operations from Proposed Handset to Satellite Emissions TerreStar Networks, January 30, 2008.* page 18, Study by du Treil, Lundin & Rackley, Inc., filed in an ex parte by TerreStar, January 30, 2008.

device will cause the SNR of a BAS signal to fall below the acceptable threshold, if even for a brief moment in time.

4.1 Number of Roaming ICO Devices

As the number of ICO mim devices in the marketplace grows, the number of BAS markets that are left uncleared will also be reduced. By January 1, 2009, when ICO anticipates launching its service, approximately 102 Nielsen DMAs will have been cleared and 109 will remain uncleared, according to Sprint's report dated April 1, 2008. For purposes of this probability calculation we will assume that ICO sells 100,000 devices in cleared markets by the end of 2009. We have deduced that by the end of August 2009, ICO will have sold 66,667 units. Using this estimate and assuming an even distribution over the cleared DMAs, we can calculate the number of subscribers that ICO will serve per cleared DMA. The projected status of DMA clearance is based on the bi-monthly Sprint BAS clearing report of April 1st 2008.

We assume that 10% of ICO subscribers will be traveling by vehicle outside their DMA at any given time. These traveling subscribers may roam to cleared markets or uncleared markets, and as time passes the number of uncleared markets decreases, reducing the probability of traveling to an uncleared market. This is partially offset by the cumulative number of subscribers which is increasing by 8,333 new units per month. This analysis is shown in Table 6 below:

	Mkts to be Cleared	Cum Cleared	Cum Uncleared	New ICO Subs	Cum ICO Subs	Subs per Cleared DMA	% Traveling outside DMA	Probability of Traveling to Uncleared DMA	Number Subs per DMA in Uncleared DMA
Dec-08	6	102	109						
Jan-09	23	125	86	8,333	8,333	82	10%	52%	4
Feb-09	0	125	86	8,333	16,667	133	10%	41%	5
Mar-09	14	139	72	8,333	25,000	200	10%	41%	8
Apr-09	12	151	60	8,333	33,333	240	10%	34%	8
May-09	0	151	60	8,333	41,667	276	10%	28%	8
Jun-09	18	169	42	8,333	50,000	331	10%	28%	9
Jul-09	7	176	35	8,333	58,333	345	10%	20%	7
Aug-09	35	211	0	8,333	66,667	379	10%	17%	6

Table 6: Calculation of ICO SUTs traveling to uncleared BAS markets

Looking at Table 6, we can reasonably predict that no more than 9 ICO subscribers will be operating their ICO mim units in an uncleared DMA.

4.2 Area Calculation

Next, we calculate the probability that one or more of the nine roaming ICO subscribers will be in an area in which they could deliver a signal of sufficient strength to cause interference to a BAS signal. First we must understand the size of the typical area in which BAS will be operating.

To be conservative, we assume that ICO users roaming into uncleared DMAs will only travel to the suburban or urban part of those DMAs, excluding millions of square miles of rural and open areas. Further, it is reasonable to assume that the majority of BAS transmitters will be located in the suburban and urban portions of a given DMA. Therefore, the geographic part of this probability analysis assumes all users are in urban and suburban areas, which conservatively concentrates all the BAS and MSS interactions into a smaller geography.

We estimated the amount of suburban and urban land in the United States. For our calculations, we have used US Census Bureau Zip Code Tabulation Area (ZCTA) data (available at http://www.census.gov/geo/www/gazetteer/places2k.html) and a commonly accepted threshold of suburban population density of 100 people per square kilometer (http://sedac.ciesin.columbia.edu/urban_rs/PozziSmall2002.pdf). Using this data, we have calculated that the approximate land mass in the United States that can be considered suburban or urban is about 162,980 square miles. Considering that there are 211 DMAs in the US (including Puerto Rico), it follows that the average urban/suburban area in each DMA is 772 square miles. Therefore, we will assume that each of the 9 roaming ICO users will be located at any given time somewhere within a 772 square mile area, or an average density of one user per 86 square miles, or 0.012 ICO users per square mile.

Next, we calculated the amount of area in an average DMA in which an ICO user could present a strong signal to a BAS receiver. As derived in the interference analysis in Section 3, we have calculated that there is an area of approximately 7.67 square miles per BAS receive site in which an ICO mobile could generate a co-channel signal exceeding the -104 dBm coverage threshold. This represents the worst case assumption that all BAS receivers in uncleared markets are using 15 MHz analog channels.

To calculate the total area, we estimated the number of BAS receive sites in the urban and suburban area of a DMA operating simultaneously on BAS Channel 2. This number varies considerably by market and unfortunately detailed data is not available, but we believe that three is a conservative estimate.

Per the dLR measurements, in order for a co-channel MSS transmission to interfere with a BAS link, the BAS link must be operating toward the outer edge of its range. Much of the time ENG trucks are set up in locations close enough to the receive station such that they are operating well above their minimum receive signal threshold. Assuming that 85% of the incidents covered by BAS occur in an area close enough to the BAS receive site to exceed the coverage threshold, we will apply a factor of 15% for the number of incidents that the BAS receiver is operating near the threshold. Since we are also applying a 24/7 transmission assumption to the BAS operation, this 15% factor is a conservative estimate.

Multiplying the area per site by the number of BAS sites per market yields a total area of 3 * 7.67 square miles or 23.01 square miles. As a percentage of the total suburban and urban area of an average DMA, this equates to (23.01 / 772 =) 2.98%. Using the number of roaming subscribers calculated above, the probability that an ICO roaming subscriber could be located in an area where the signal would exceed -104 dBm at a BAS receive site is 9 * 2.98% * 15% = 4.0%.

4.3 Time-Based Probability

Up to this point, the analysis has not considered the dimension of time, but this is critical for the obvious reason that both services must be operating simultaneously for interference to occur. For purposes of being conservative, we will assume that BAS transmissions on Channel 2 are operating continuously in time – transmitting 24 hours per day, seven days per week, versus the few hours per day more typical of BAS operations. However, as discussed previously, in ICO's initial mim product, the uplink transmissions to the satellite are not continuous, and in fact are quite "bursty" in nature.

ICO's mim applications allow for the uplink messages to fit into a few GMR-1 data frames. One data frame represents a burst of 5 ms in duration, and two in succession would create a 10 ms burst. The Random Access Channel (RACH) requires a minimum of 20 ms to transfer its control channel information. As discussed previously, GMR-1 is designed to permit one device at a time to transmit in a given carrier. Thus the notion that "millions of users" will cause significant cumulative interference to BAS is technically incorrect, since users are spread throughout the area covered by the spot beam and only one user can use the uplink channel at a time.

In the initial ICO mim service offering, we assume that a typical session length is two hours, and that during each session a user will make 12 interactive requests to the satellite. This results in one uplink transmission every 10 minutes. From the initial call model, the duration of a typical uplink data transmission will be 18 ms, and therefore each user will generate 12 * 18 ms = 216 ms of uplink traffic. Adding control channel overhead, a user will be transmitting on the uplink only 0.00053% of the time during each two hour session. Assuming initial behavior of one session per day, there will be significant periods of time when the device is not in use, and is therefore not capable of creating interference to a BAS receive site.

Given these highly conservative assumptions, the probability that an uplink transmission from an ICO user will occur while the ICO device is in a location where the average signal strength could be received at a level higher than the BAS coverage threshold is 0.00053% * 4%= 0.000021%.

To recap, this is the probability that a transmission may occur to deliver a signal higher than -104 dBm to the BAS receiver. The bursty nature of the transmission will result in an undetectable impact to the transmitted content.

5. Conclusions

The Commission sought comment on both the "likelihood and extent of interference between MSS and BAS." Regarding the extent, our analysis shows that uplink bursts from ICO devices will be of short duration and will not be detectable by BAS operators. Regarding the likelihood, the probability analysis shows that these occurrences will be extremely rare. Therefore, MSS and BAS can successfully share spectrum during the period of January 1, 2009 to August 31, 2009.

To address the extent of MSS-BAS interference, we demonstrated through evaluation of measurement data, theoretical modeling, and description of ICO's initial system that the SUT signal arriving at the BAS receiver would be of such short duration that any impact to BAS would be imperceptible to the end viewer.

In terms of the likelihood of elevated MSS-BAS interactions, we built a probability model with several key components:

- Worst case view of all BAS operations in a market employing 15 MHz analog receivers, driving a maximum SUT signal of -104 dBm at the receiver for co-channel operation.
- Derived the probability of an MSS SUT located in a position to deliver a signal level higher than -104 dBm, when BAS is operating in a marginal coverage area, as 4%.
- Derived the probability that the MSS SUT would be transmitting when in the 4% coverage area as 0.000021%.

Although the likelihood of MSS-BAS interaction above the threshold level is 0.000021%, the extent of that very short interaction is not perceptible in the transmitted content.

Many factors have contributed to the assertion that MSS will not interfere to BAS:

- Relatively small customer base during the BAS relocation period.
- Small ICO mim SUT vehicular roaming population.
- Satellite-focused SUT antenna gain.
- Burst transmissions of 5 to 20 ms.
- BAS antenna directivity in elevation and azimuth.
- Time probability of an SUT transmission overlapping with a BAS threshold transmission.

The following major factors have not been included in this analysis, and will significantly lower the probability of MSS-BAS interaction:

- BAS transmissions are assumed 24/7 but will realistically be less than this.
- All BAS operations are assumed to use the 15 MHz analog receiver. As BAS converts to digital as part of relocation, or uses the 10 MHz analog channel then the interference tolerance improves.
- The geographic part of this probability analysis assumes all users are in urban and suburban areas, excluding millions of square miles of rural area. This approach conservatively concentrates all the BAS and MSS interactions into a smaller geography.

Through analysis of laboratory and field measurements, theoretical modeling, and assessment of the likelihood of elevated signals arriving at the BAS receiver, we have demonstrated that ICO's MSS initial nationwide operations will not cause interference to BAS from January 1, 2009 to August 31, 2009.

6. About the Authors

Doug Hyslop is a partner at Wireless Strategy, LLC. He specializes in air interface technology research, evaluation and testing, base station architecture and performance, and technology testing and deployment planning. He has held positions as Director of Next Generation Access Technologies at Sprint Nextel, Director of iDEN base station development at Nextel, and Senior Principal Engineer at LCC International, Inc. Doug has a B.S. in Electrical Engineering from the University of Virginia.

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